

**PRO-iO2**  
**User Manual**

# Preface

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Thank you for purchasing Pro-face's PRO-iO2 module. The PRO-iO2 is an easy-to-use logic relay control module that contains a variety of useful features. Also, the PRO-iO2 Editor software lets you easily modify logic program functions (Calendar, timer, counter, input/output), making this module 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 others.

Please read this manual carefully as it explains, step by step, how to use the PRO-iO2 module correctly and safely. Also, be sure to read this manual to fully understand the PRO-iO2 module's features and correct installation procedures.

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# Essential Safety Precautions


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This manual includes procedures that must be followed to operate the PRO-iO2 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-iO2 operation procedures requiring special attention, and provide essential safety information. These icons indicate the following levels of danger:

 <b>DANGER</b>	A hazardous situation that will result in serious injury or even death if instructions are not followed.
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 <b>WARNING</b>	A potentially hazardous situation that could result in serious injury or even death if instructions are not followed.
--	---

 <b>CAUTION</b>	A potentially hazardous situation that could result in minor injury or equipment damage if instructions are not followed.
---	---

 <b>DANGER</b>
<ul style="list-style-type: none"><li>• <b>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.</b></li><li>• <b>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.</b></li><li>• <b>Systems using this unit should be designed so that output signals which would cause a serious accident are monitored from outside the unit.</b></li></ul>

 **DANGER**

- 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. Be sure to contact your local PRO-iO2 distributor 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.

 **WARNING**

- Whenever installing or dismantling wiring, or conducting maintenance or inspections, be sure to disconnect this unit's power cord to prevent the possibility of an electric shock or fire.
- Do not disassemble or redesign 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.

 **CAUTION**

- 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.

### **CAUTION**

- **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-iO2 unit's model type. Be sure to read the directions in the Installation Guide and this manual before turning this unit's power ON.**
- **When disposing of this unit, be sure to do so according to your country's standards for industrial waste disposal.**




#### ■ **To Prevent PRO-iO2 Module Damage**

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

# Documentation Conventions

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

Symbol	Meaning
 <i>Important</i>	Indicates important information or procedures that must be followed for correct and risk-free software/device operation.
 <i>Note:</i>	Provides useful or important supplemental information.
* 1	Indicates useful or important supplemental information.
 <i>Reference</i>	Refers to useful or important supplemental information.



# PRO-iO2 Module Model Numbers

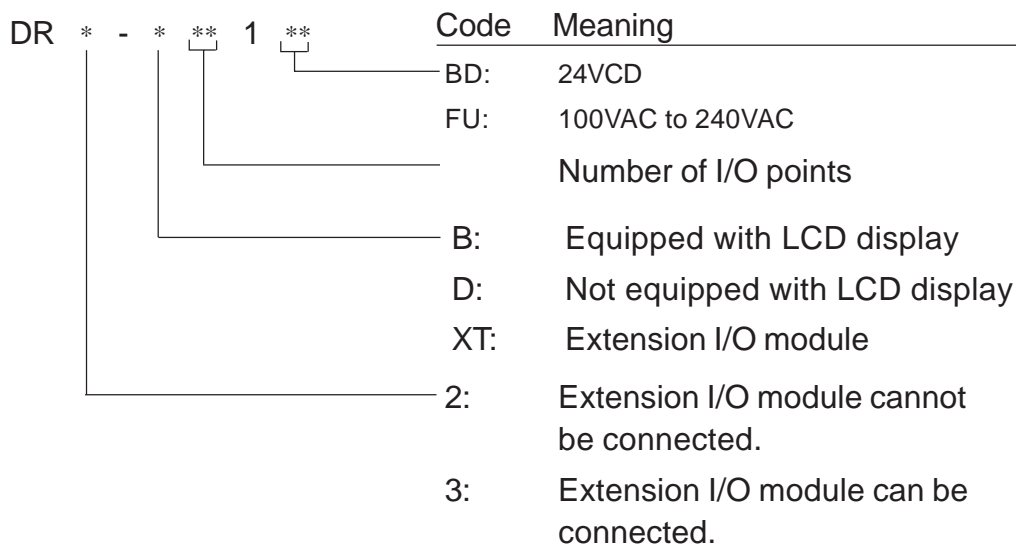
The features of each PRO-iO2 module (I/O points, LCD screen, etc.) will vary depending on the model. Also, certain modules can be connected to I/O extension modules.

Model Number	Power Supply	No. of I/O Points	LCD Display Screen	I/O Extension Module
DR2-B121BD	24VDC	8/4	Yes	Not connectable
DR2-B201BD	24VDC	12/8	Yes	Not connectable
DR2-D101BD	24VDC	38142	No	Not connectable
DR2-D201BD	24VDC	12/8	No	Not connectable
DR2-B121FU	100VAC to 240VAC	8/4	Yes	Not connectable
DR2-B201FU	100VAC to 240VAC	12/8	Yes	Not connectable
DR2-D101FU	100VAC to 240VAC	6/4	No	Not connectable
DR2-D201FU	100VAC to 240VAC	12/8	No	Not connectable
DR3-B101BD	24VDC	6/4	Yes	Connectable
DR3-B261BD	24VDC	16/10	Yes	Connectable
DR3-B101FU	100VAC to 240VAC	6/4	Yes	Connectable
DR3-B261FU	100VAC to 240VAC	16/10	Yes	Connectable



- Note:**
- Even though LCD display-equipped PRO-iO2 modules can be programmed using only the screen display, the easy-to-use PRO-iO2 Editor software (sold separately) is recommended for programming.
  - Prior to downloading your logic program to the PRO-iO2 unit you can test and debug logic programs via the PRO-iO2 Editor's simulation feature.

### To identify Model Numbers:



## Extension Module Model Numbers

### ■ PRO-iO2 I/O Extension Module Models

The PRO-iO2 I/O extension module's number of input/output points varies depending on the model number.

For how to identify the model of your PRO-iO2 module, refer to the following section on "Model Identification"

Model Number	Voltage	No. of Input/Output Points
DR3-XT61BD	24VDC	4/2
DR3-XT141BD	24VDC	8/6
DR3-XT61FU	100VAC to 240VAC	4/2
DR3-XT141FU	100VAC to 240VAC	8/6

### ■ When Connecting Modules



## CAUTION

- **Be sure to follow the connection instructions given in the module's Installation Guide and in the User Manual. Connecting modules with incompatible electrical specifications may lead to a module malfunction or breakdown.**

When connecting a main module to an extension module, be sure the extension module's model number is DR3-\*\*\*\*\* and has the same power supply voltage rating (AC or DC) as the main module.

The figures given below are the number of input/output points available when the I/O extension module is connected to the PRO-iO2 main module.

Model	DR3-XT61BD	DR3-XT141BD	DR3-XT61FU	DR3-XT141FU
DR2-B121BD	-	-	-	-
DR2-B201BD	-	-	-	-
DR2-D101BD	-	-	-	-
DR2-D201BD	-	-	-	-
DR2-B121FU	-	-	-	-
DR2-B201FU	-	-	-	-
DR2-D101FU	-	-	-	-
DR2-D201FU	-	-	-	-
DR3-B101BD	10/6	14/10	-	-
DR3-B261BD	20/12	24/16	-	-
DR3-B101FU	-	-	10/6	14/10
DR3-B261FU	-	-	20/12	24/16



- Note:**
- Only one extension I/O module can be connected.  
Two or more modules cannot be connected at the same time.

# PRO-iO2 Editor

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PRO-iO2 Editor is a Windows®-based, easy-to-use software that has the following features:

- 2 edit modes:
  - Ladder Logic
  - Electrical Circuit Diagram Method
- Logic program simulation feature
- Use a PC to monitor PRO-iO2 module operation
- Transfer circuit data from the PC to the PRO-iO2 module, or vice-versa
- Program Validation Check
- Creation of Display Messages

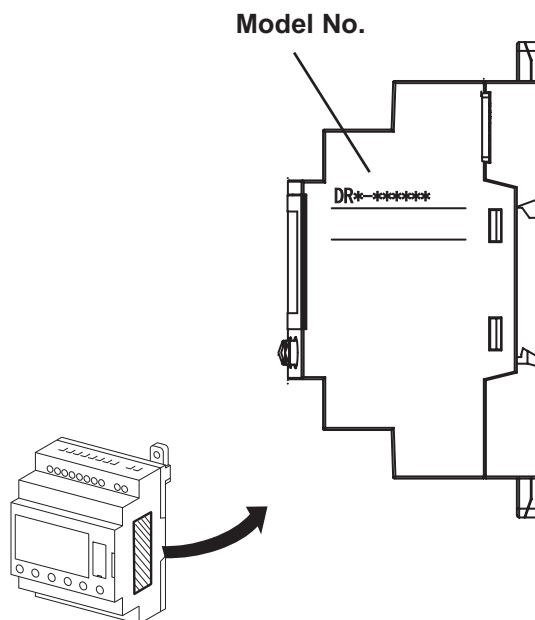
For PRO-iO2 Editor details,

**Reference** *“PRO-iO2 Editor Operation Manual”*

## Model Number Identification

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The model number of a PRO-iO2 module can be identified using the marking on the side panel of the PRO-iO2 unit (see below).



# Optional Items

The following tables describe PRO-iO2 related software and optional items. Please note that all optional items are sold separately.

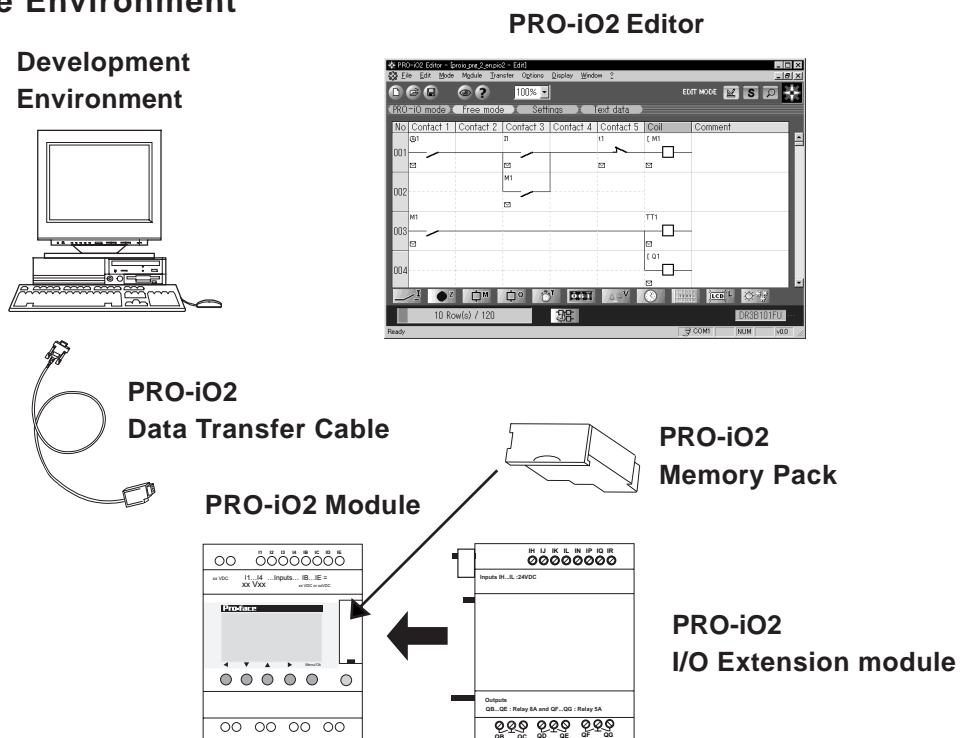
## ■ Editor Software

Name	Model	Description
PRO-iO2 Editor	DR2-SFT01	For logic program development

## ■ Options

Name	Model Number	Description
PRO-iO2 Data Transfer Cable	DR2-CBL01	Connects a PRO-iO2 module to the PC to transfer logic programs.
PRO-iO2 Memory Pack	DR2-MEM01	Used with DR*-B***** models to backup (save) logic programs. Can copy logic programs to other DR*-B*****-type PRO-iO2 modules.
PRO-iO2 I/O Extension module	DR3-XT61BD	24 VDC extension I/O module, equipped with 4 input and 2 output points.
	DR3-XT141BD	24 VDC extension I/O module, equipped with 8 input and 6 output points.
	DR3-XT61FU	100VAC to 240 VAC extension I/O module, equipped with 4 Input and 2 Output points.
	DR3-XT141FU	100VAC to 240 VAC extension I/O module, equipped with 8 Input and 6 Output points.

## ■ Usage Environment



# UL/c-UL Application Notes

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Modules DR2-B121BD, DR2-B201BD, DR2-D101BD, DR2-D201BD, DR2-B121FU, DR2-B201FU, DR2-D101FU, DR2-D201FU, DR3-B101BD, DR3-B261BD, DR3-B101FU, DR3-B261FU, DR3-XT61BD, DR3-XT141BD, DR3-XT61FU and DR3-XT141FU are UL/c-UL listed products.

UL File No. E220851

DR2-B121BD	(UL Registration Model No. :DR2-B121BD)
DR2-B201BD	(UL Registration Model No. :DR2-B201BD)
DR2-D101BD	(UL Registration Model No. :DR2-D101BD)
DR2-D201BD	(UL Registration Model No. :DR2-D201BD)
DR2-B121FU	(UL Registration Model No. :DR2-B121FU)
DR2-B201FU	(UL Registration Model No. :DR2-B201FU)
DR2-D101FU	(UL Registration Model No. :DR2-D101FU)
DR2-D201FU	(UL Registration Model No. :DR2-D201FU)
DR3-B101BD	(UL Registration Model No. :DR3-B101BD)
DR3-B261BD	(UL Registration Model No. :DR3-B261BD)
DR3-B101FU	(UL Registration Model No. :DR3-B101FU)
DR3-B261FU	(UL Registration Model No. :DR3-B261FU)
DR3-XT61BD	(UL Registration Model No. :DR3-XT61BD)
DR3-XT141BD	(UL Registration Model No. :DR3-XT141BD)
DR3-XT61FU	(UL Registration Model No. :DR3-XT61FU)
DR3-XT141FU	(UL Registration Model No. :DR3-XT141FU)

The PRO-iO2 module and PRO-iO2 extension I/O module conform to the following standards.

- **UL508 Electrical Control Systems for Industry**
- **CAN/CSA-C22.2, No.142-M1987 (c-UL listed) Electrical Control Systems for Industry**

### <Notes>

Note the following points when applying for UL certification of equipment on which a PRO-iO2 module or PRO-iO2 extension I/O module is installed.

- The PRO-iO2 module is designed to be used only when installed in other equipment.
- If the module is installed in an area with no air conditioning system, be sure to install it in a vertical panel using a DIN rail or mounting holes.

Also, be sure the module 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 module's internal components may cause the module to fail to meet UL standard requirements.

- The power supply connected to the module must be a UL/c-UL approved Class 2 power supply module or Class 2 transformer\*<sup>1</sup>.

When a PRO-iO2 module under load is operated with a single power supply, the amount of current consumption and full-load current of the I/O modules must be within the rated load of a Class 2 power supply module or a 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

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Modules DR2-B121BD, DR2-B201BD, DR2-D101BD, DR2-D201BD, DR2-B121FU, DR2-B201FU, DR2-D101FU, DR2-D201FU, DR3-B101BD, DR3-B261BD, DR3-B101FU, DR3-B261FU, DR3-XT61BD, DR3-XT141BD, DR3-XT61FU and DR3-XT141FU are CE marked products that conform to EMC directives EN55011 Class B, EN61000-6-2 and EN61131-2.

# *Memo*

# Chapter 1 Specifications

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

This chapter describes the general specifications, part names, and external view of the PRO-iO2 module.

## 1.1 General Specifications

### 1.1.1 Electrical (Power)

#### ■ DR\*-\*\*\*\*BD (DC Power)

	24VDC
<b>Allowable Voltage Range</b>	19.2VDC to 30VDC
<b>Allowable Voltage Drop</b>	1ms or less
<b>Power Consumption</b>	DR2-*1*1BD 3W
	DR2-*201BD 6W
	DR3-B101BD 3W
	(With I/O Extension Module) 8W
	DR3-B261BD 6W
(With I/O Extension Module) 10W	
<b>In-Rush Current</b>	30A or less
<b>Insulation Endurance</b>	1500VAC 5mA for 1 minute (Between output terminals and DIN Rail)
<b>Insulation Resistance</b>	100MΩ or higher at 500VDC (Between output terminals and DIN Rail)

#### ■ DR\*-\*\*\*\*FU (AC Power)

<b>Rated Voltage</b>	100VAC to 240VAC
<b>Allowable Voltage Range</b>	85VAC to 264VAC
<b>Rated Frequency</b>	50Hz/60Hz
<b>Allowable Frequency Range</b>	47Hz to 63Hz
<b>Allowable Voltage Drop</b>	10ms or less
<b>Power Consumption</b>	DR2-*1*1FU 7VA
	DR2-*201FU 11VA
	DR3-B101FU 7VA
	(With I/O Extension Module) 12VA
	DR3-B261FU 12VA
(With I/O Extension Module) 17VA	
<b>In-Rush Current</b>	30A or less
<b>Insulation Endurance</b>	1500VAC 5mA for 1 minute (Between output terminals and DIN Rail)
<b>Insulation Resistance</b>	100MΩ or higher at 500VDC (Between output terminals and DIN Rail)



# PRO-iO2 Specifications

## 1.1.2 Environmental

<b>Ambient Operating Temperature</b>	0°C to 55°C
<b>Storage Temperature</b>	-25°C to +70°C
<b>Ambient Operating Humidity</b>	95%RH or less (No condensation) Wet bulb temperature: 39°C or less
<b>Storage Humidity</b>	95%RH or less (No condensation) Wet bulb temperature: 39°C or less
<b>Pollution Level</b>	Level 2
<b>Atmospheric Pressure (Operating Altitude)</b>	800hPa to 1114hPa (At 2000m or less)
<b>Vibration Endurance</b>	IEC60068-2-6 Compliant 10Hz to 57Hz 0.075mm 57Hz to 150Hz 9.8m/s <sup>2</sup> X, Y, Z directions 10 times each (80 minutes)
<b>Shock Endurance</b>	IEC60068-2-27 Compliant (147m/s <sup>2</sup> , 3 times in X, Y, and Z directions)
<b>Electrostatic Discharge Immunity</b>	Contact discharge 6kV (IEC61000-4-2 level 3)
<b>Electric Field Endurance</b>	IEC61000-4-3 level 3
<b>First Transient Endurance</b>	IEC61000-4-4 level 3
<b>Surge Endurance</b>	IEC61000-4-5 level 3

## 1.1.3 Structural

<b>Ratings</b>	IP20
<b>Cooling Method</b>	Natural air circulation
<b>Weight</b>	DR2-B121** : 250g or less DR2-B201** : 380g or less DR2-D101** : 220g or less DR2-D201** : 350g or less DR3-B101** : 250g or less DR3-B261** : 400g or less DR3-XT 61** : 125g or less DR3-XT 141** : 220g or less
<b>External Dimensions</b>	DR**1*1** W71.2[2.80] x D90.0[3.54] x H57.4[2.26] mm[in.]
	DR**2*1** W124.6[4.91] x D90.0[3.54] x H57.4[2.26] mm[in.]
	DR3-XT 61** W35.5[1.40] x D90.0[3.54] x H54.0[2.13] mm[in.]
	DR3-XT 141** W72.0[2.83] x D90.0[3.54] x H54.0[2.13] mm[in.]

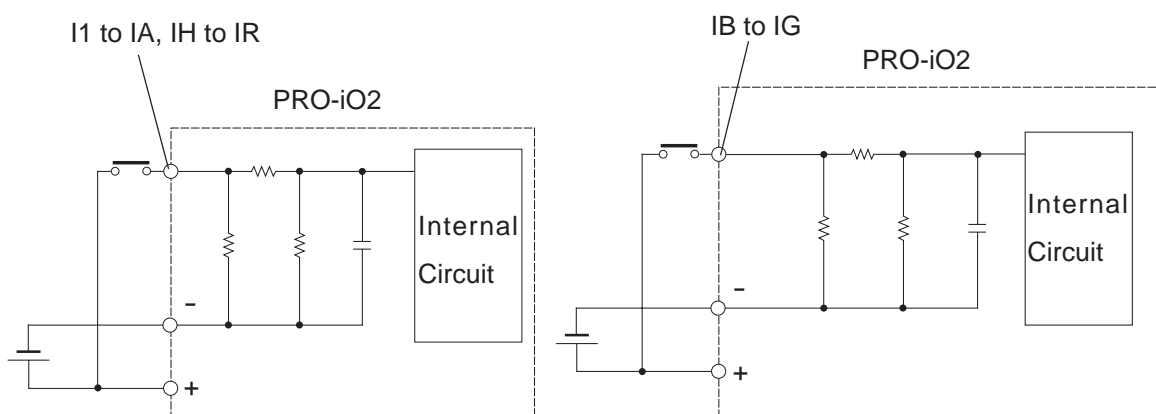
## 1.1.4 DC Input (DR\*-\*\*\*\*BD)

<b>Model Number</b>		I1 to IA, IH to IR	IB to IG
<b>Input Voltage</b>		24VDC	
<b>Rated Current</b>		4mA	
<b>Input Impedance</b>		7.4kΩ (at ON)	12kΩ (at ON)
<b>No. of Input Points</b>		6 Points (DR**-*101BD)	
		8 Points (DR2-B121BD)	
		12 Points (DR2-*201BD)	
		16 Points (DR3-B261BD)	
		4 Points (DR3-XT 61BD)	
		8 Points (DR3-XT 141BD)	
<b>Operating Voltage</b>	<b>ON Voltage</b>	15VDC or more (2.20mA or more)	15VDC or more (1.20mA or more)
	<b>OFF Voltage</b>	5VDC or less (0.75mA or less)	5VDC or less (0.45mA or less)
<b>Input Delay (Letters in parentheses indicate filter setting)</b>	<b>OFF → ON</b>	0.3ms (FAST) / 3ms (SLOW)* <sup>1</sup>	3ms (Fixed)
	<b>ON → OFF</b>	0.5ms (FAST) / 5ms (SLOW)* <sup>1</sup>	5ms (Fixed)
<b>Maximum Frequency*<sup>2</sup></b>		1kHz	-
<b>Input Signal Display</b>		via LCD (Models DR*-B***** only)	
<b>Insulation Method</b>		No insulation between input points, and between input points and power supply	

\*1 The delay time varies depending on the input filter setting. This setting is common for all points.

\*2 The terminals used for the high-speed counter are I1 (up counter) and I2 (down counter).

### ■ DR\*-\*\*\*\*BD Input Circuit (DC Input)

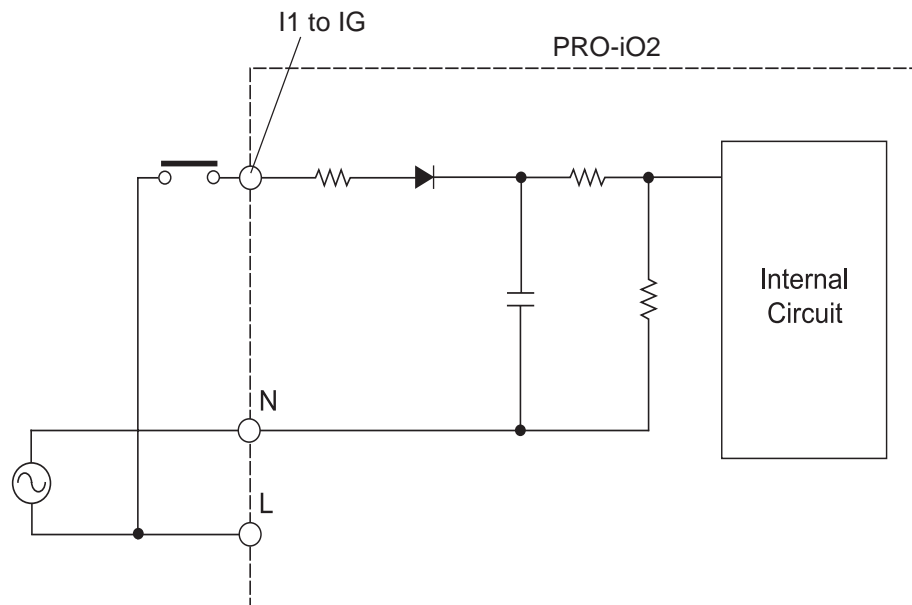


# PRO-iO2 Specifications

## 1.1.5 AC Input (DR\*-\*\*\*FU)

<b>Input Voltage</b>		100VAC to 240VAC
<b>Rated Frequency</b>		50/60Hz
<b>Rated Current</b>		0.6mA
<b>Input Impedance</b>		350kΩ
<b>No. of Input Points</b>		6 Points (DR*-*101FU)
		8 Points (DR2-B121FU)
		12 Points (DR2-*201FU)
		16 Points (DR3-B261FU)
		4 Points (DR3-XT61FU)
		8 Points (DR3-XT141FU)
<b>Operating Voltage</b>	<b>ON Voltage</b>	79VAC or more (0.1750mA or more)
	<b>OFF Voltage</b>	40VAC or less (0.05mA or less)
<b>Input Delay</b>	<b>OFF → ON</b>	50ms
	<b>ON → OFF</b>	50ms
<b>Input Signal Display</b>		via LCD (Models DR*-B***** only)
<b>Insulation Method</b>		No insulation between input points, and between input points and power supply

### ■ DR\*-\*\*\*FU Input Circuit (AC Input)

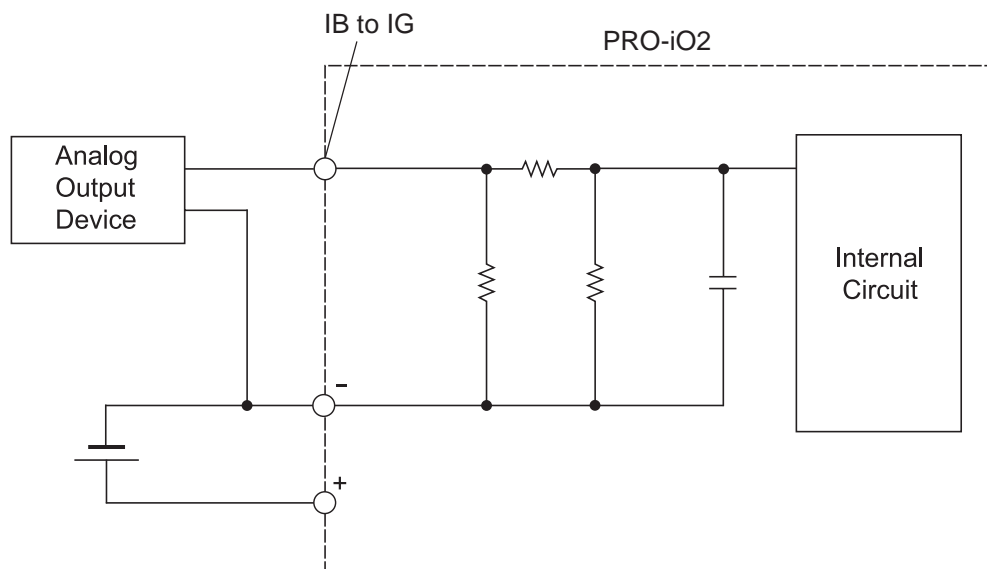


## 1.1.6 Analog Comparator Input

<b>No. of Input Channels</b>	DR2-D201BD	2 (IB,IC)
	DR*-B1*1BD	4 (IB,IC,ID,IE)
	DR*-B2*1BD	6 (IB,IC,ID,IE,IF,IG)
<b>Input Voltage Range</b>	0V to 10V	
<b>Resolution</b>	8 bits	
<b>Accuracy</b>	Full-scale value $\pm 5\%$ (at 25°C) Full-scale value $\pm 6.2\%$ (at 55°C)*1	
<b>Absolute Max Input</b>	30VDC (Voltage)	
<b>Input Filter</b>	None	
<b>Conversion Time</b>	Unit cycle time	
<b>Input Impedance</b>	12k $\Omega$	
<b>Insulation Method</b>	No insulation between analog input points, and between analog input section and power supply	
<b>Cable Length</b>	10 m max. (Shielded cable)	

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

### ■ Analog Input Circuit



# PRO-iO2 Specifications

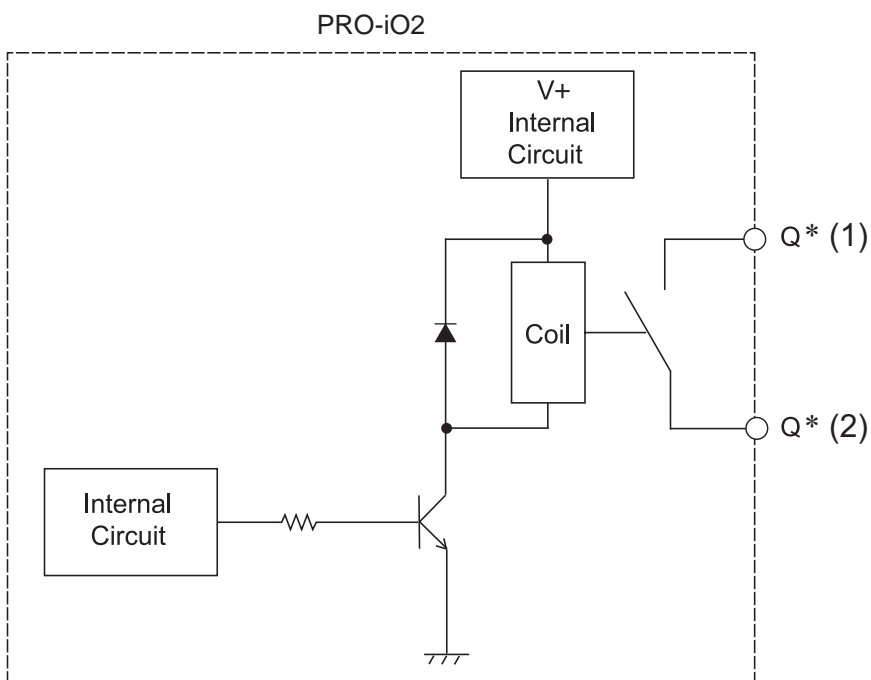
## 1.1.7 Relay Output

<b>Output</b>	Q1 to Q8, QB to QE	Q9, QA, QF, QG
<b>Rated Output Voltage</b>	5VDC to 30VDC, 24VAC to 250VAC	
<b>No. of Output Points</b>	4 Points (DR*-1*1**)	
	8 Points (DR2-*201**)	
	10 Points (DR3-B261**)	
	2 Points (DR3-XT61**)	
	6 Points (DR3-XT141**)	
<b>Load Current</b>	8A/1 Point	5A/1 Point
<b>Common</b>	Independent Common*1	
<b>Mechanical Lifetime</b>	10 million operations	
<b>Electrical Lifetime</b>	100,000 operations at contact rated load	
<b>Min. Open/Close Load</b>	12V, 10mA	
<b>Built-in Fuse</b>	None	
<b>Voltage Endurance</b>	4kV (IEC60947-1, IEC60664-1)	
<b>Output Signal Display</b>	via LCD (Models DR*-B***** only)	
<b>Short Circuit Protection</b>	None	
<b>Overvoltage and Overcurrent Protection</b>	None	
<b>Output Delay</b>	<b>OFF → ON</b>	10ms or less
	<b>ON → OFF</b>	5ms or less

\*1 For DR3-B261\*\*, Q8, Q9, and QA share a single common terminal.

For DR3-XT141\*\*, each of QB-QC, QD-QE, and QF-QG uses a single common terminal respectively.

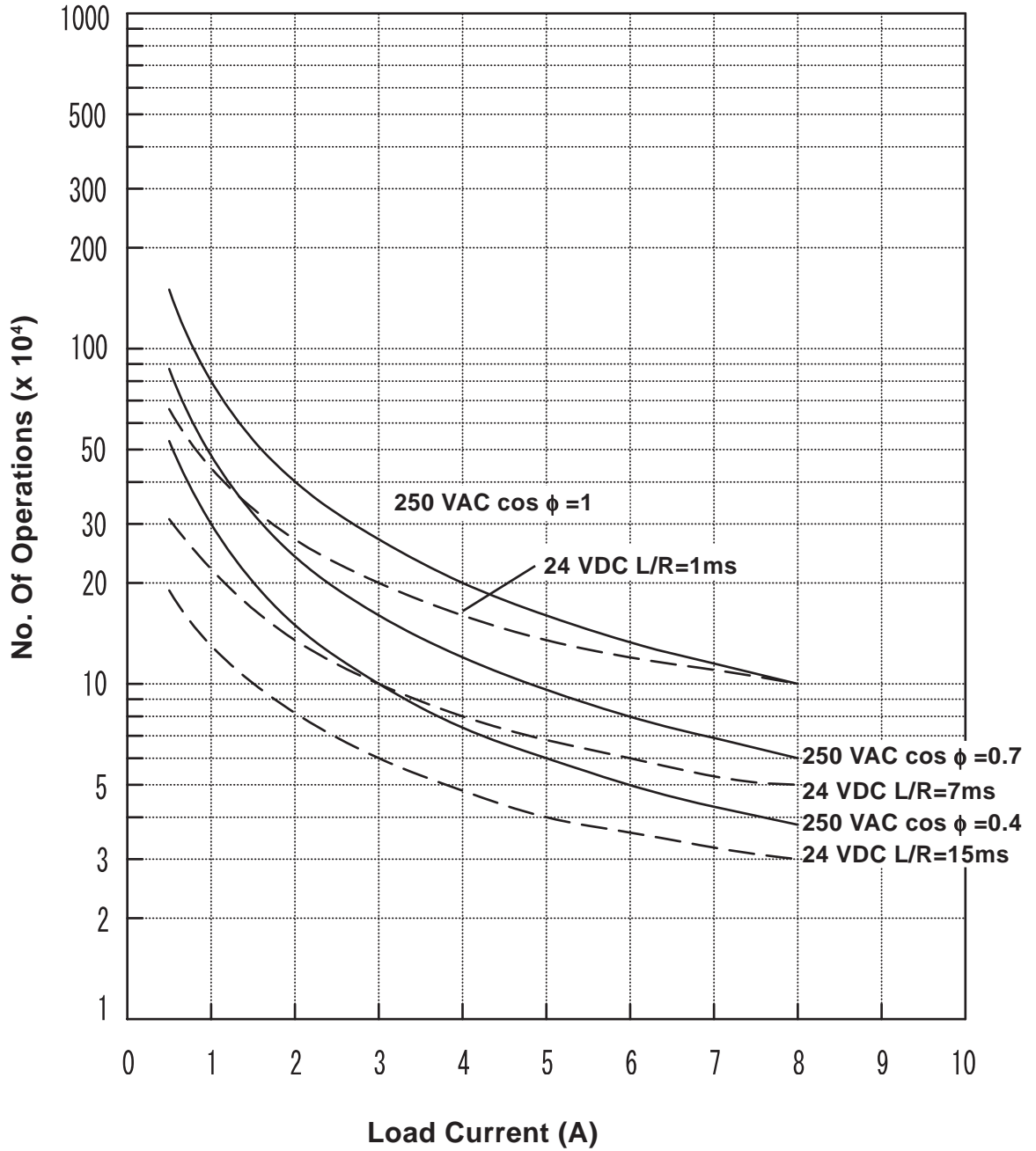
### ■ Relay Output Circuit



■ Relay Durability Curves

◆ For a load current of 8A (Q1 to Q8, QB to QE)

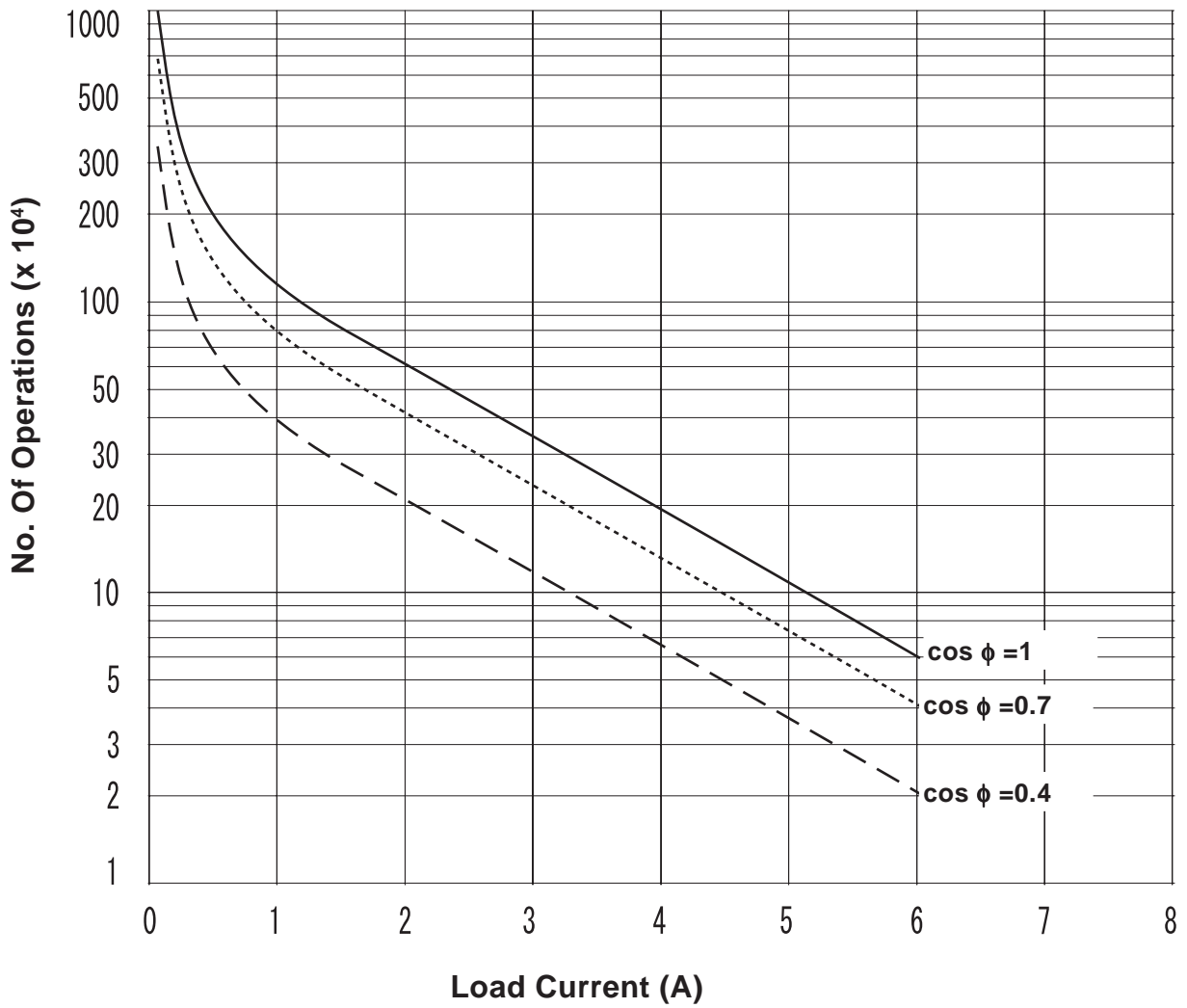
Relay Lifetime Performance (24VDC/250VAC)



# PRO-iO2 Specifications

◆ For a load current of 5A (Q9, QA, QF, QG)

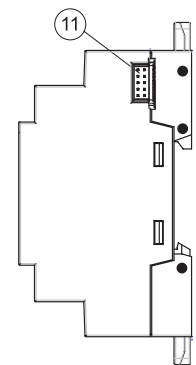
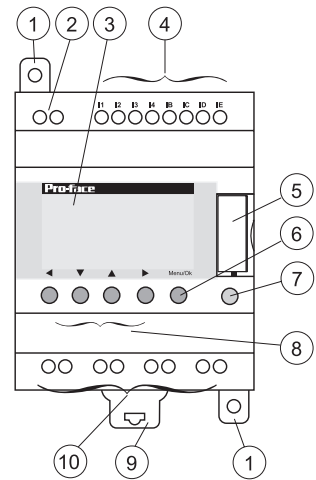
Relay Lifetime Performance (250VAC)



## 1.2 Part Names and Functions

This section describes the names and functions of each part of the PRO-iO2 module (DR\*-B\*\*\*\*\*).

- (1) **Module attachment tab (Retracting type)**  
Used to fasten the main module to the panel with a screw.
- (2) **Power terminals**
- (3) **LCD display screen**
- (4) **Input terminals\*1**  
Depending on the model, PRO-iO2 modules have 6, 8, 12 or 16 input terminals.
- (5) **Connectors for PRO-iO2 Data Transfer Cable (DR2-CBL01) and PRO-iO2 Memory Pack (DR2-MEM01)**
- (6) **Menu/Ok button**  
Determines each setting or displays the menu screen.
- (7) **Shift button**  
While this button is held down and any of the Menu/Ok button and Z keys is pressed, a specified function is executed.  
The specified functions are displayed at the bottom of the screen when the Shift button is pressed.
- (8) **Z keys (cursor keys)**  
Used to move the cursor position. It can also function as a contact's open/close button when creating/modifying a logic programs.
- (9) **DIN Rail detachment hook**  
Used when detaching the main module from a DIN rail.
- (10) **Relay output terminals**  
Depending on the model, the PRO-iO2 Modules have 4, 8, or 10 output terminals.
- (11) **I/O Extension module interface connector\*2**  
Used to connect the PRO-iO2 module with an I/O extension module (DR3-XT\*\*\*\*\*).



\*1 The input terminals which can be used for the high-speed counter and analog comparator functions vary depending on the model. For details,

▼ **Reference** ▲ “1.1 General Specifications”

When the high-speed counter or analog comparator function is not used, these terminals can be used as standard input terminals. Note that their input specifications are different from other terminals. For details,

▼ **Reference** ▲ “1.1 General Specifications”

\*2 For the models to which an I/O extension unit can be connected:

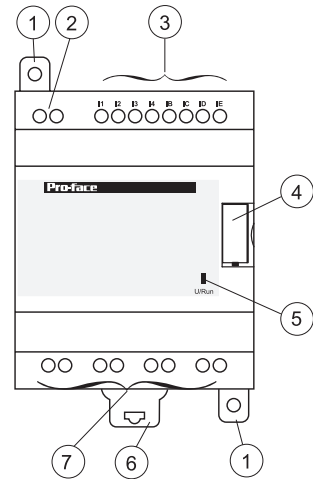
▼ **Reference** ▲ “About PRO-iO2 I/O Extension Module”



# PRO-iO2 Specifications

This section describes the names and functions of each part of the PRO-iO2 module (DR\*-D\*\*\*\*\*).

- (1) **Module attachment tab (Retracting type)**  
Used to fasten the main module to the panel with a screw.
- (2) **Power terminals**
- (3) **Input terminals\*<sup>1</sup>**  
Depending on the model, PRO-iO2 modules have 6 or 12 input terminals.
- (4) **Connectors for PRO-iO2 Data Transfer Cable (DR2-CBL01)**
- (5) **U/Run LED**  
RUN : Flashes slowly (3 times/sec.)  
STOP : Lights  
Error \*<sup>2</sup> : Flashes quickly (5 times/sec.)
- (6) **DIN Rail detachment hook**  
Used when detaching the main module from a DIN rail.
- (7) **Relay output terminals**  
Depending on the model, the PRO-iO2 Modules have 4 or 8 output terminals.



\*1 The input terminals which can be used for the high-speed counter and analog comparator functions vary depending on the model. For details,

**Reference** “1.1 General Specifications”

When the high-speed counter or analog comparator function is not used, these terminals can be used as standard input terminals. Note that their input specifications are different from other terminals. For details,

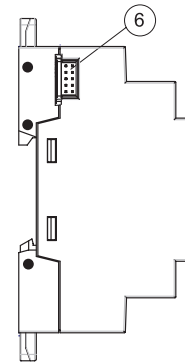
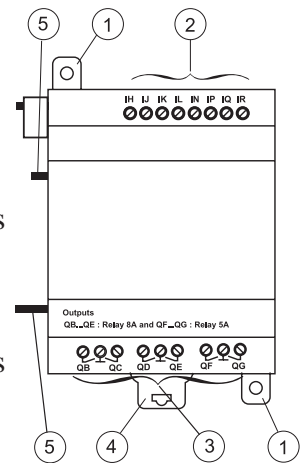
**Reference** “1.1 General Specifications”

\*2 For details about errors, **Reference** “5. Error Messages”

## PRO-iO2 Specifications

This section describes the names and functions of each part of the PRO-iO2 I/O extension module (DR3-XT\*\*\*\*\*).

- (1) **Module attachment tab (Retracting type)**  
Used to fasten the module directly to the panel with a screw.
- (2) **Input terminals\*<sup>1</sup>**  
Depending on the model, the I/O extension modules have 4 or 8 input terminals.
- (3) **Relay output terminals**  
Depending on the model, the I/O extension modules have 2 or 6 output terminals.
- (4) **DIN Rail detachment hook**  
Used when detaching the main module from a DIN Rail.
- (5) **Guide pin**  
Used as a guide when the I/O extension modules are connected to the main module (PRO-iO2).
- (6) **Main module connector**  
Connected to the main module (PRO-iO2).



\*1 The input terminals which can be used for the high-speed counter and analog comparator functions vary depending on the model. For details,

**Reference**  "1.1 General Specifications"

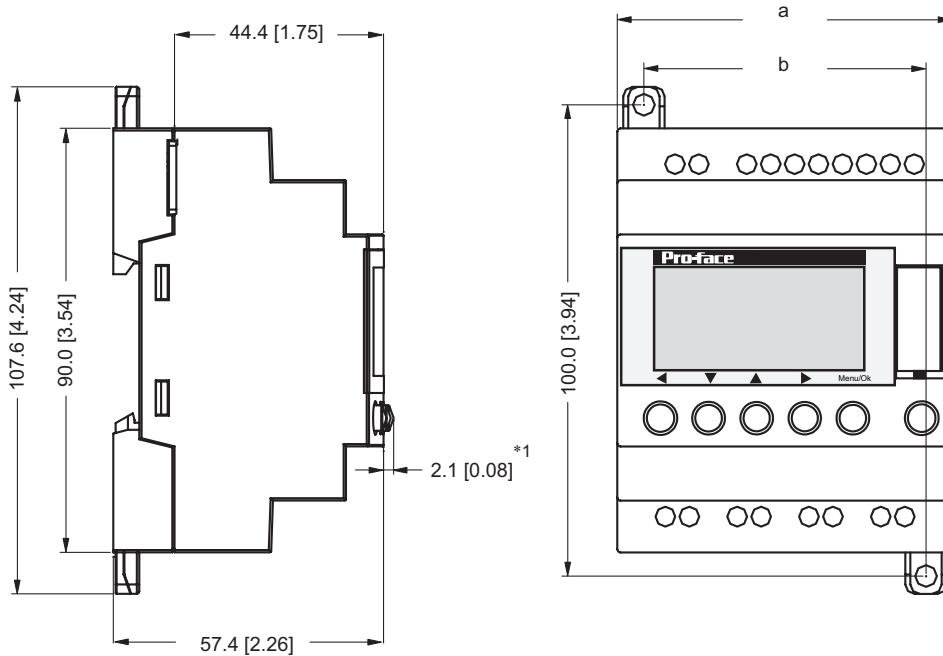
When the high-speed counter or analog comparator function is not used, these terminals can be used as standard input terminals. Note that their input specifications are different from other terminals. For details,

**Reference**  "1.1 General Specifications"

## 1.3 External View and Dimensions

This section provides the external view and dimensions of the PRO-iO2 module.

Unit: mm [in.]



\*1 DR2-D\*\*\*\*\* modules are not equipped with these operation buttons.

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

	DR*-*1****	DR*-*2****
a	71.2 mm [2.80 in.]	124.6 mm [4.91 in.]
b	59.9 mm [2.36 in.]	113.3 mm [4.46 in.]



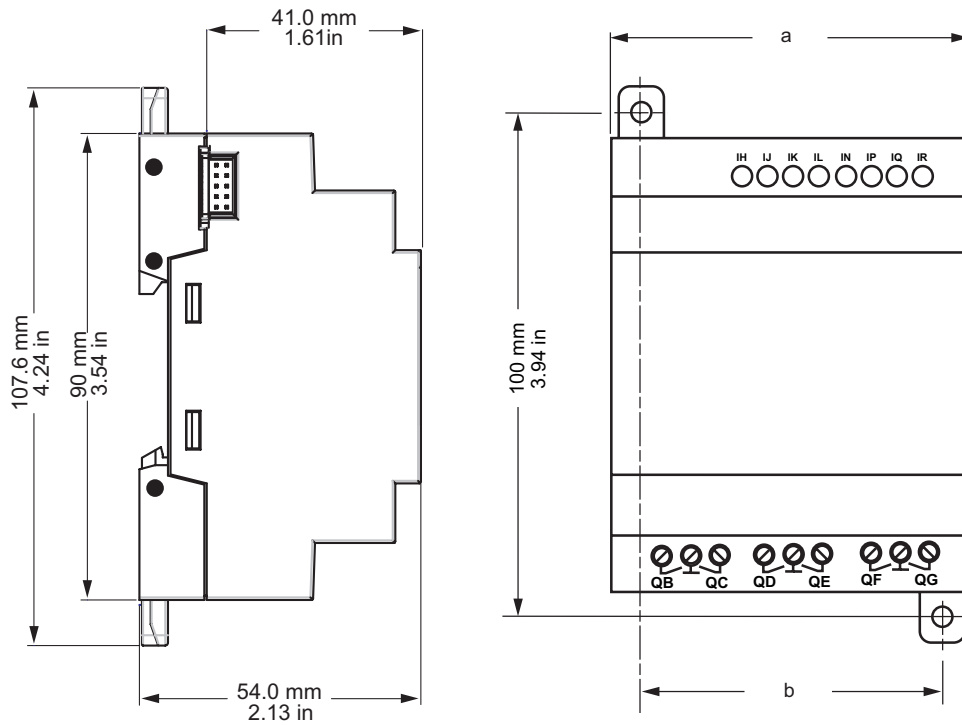
**Note:**

When attaching the PRO-iO2 module to a panel, extend the module’s attachment tabs. When attaching the PRO-iO2 module to a DIN rail, retract the module’s attachment tabs.

# PRO-iO2 Specifications

The following provides the external view and dimensions of the PRO-iO2 I/O extension module.

Unit: mm [in.]



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

	DR3-XT141**	DR3-XT61**
a	72.0 mm [2.83 in.]	35.5 mm [1.40 in.]
b	60.0 mm [2.36 in.]	25.0 mm [0.98 in.]



**Note:**

When attaching the PRO-iO2 I/O extension module to a panel, extend the module’s attachment tabs. When attaching the PRO-iO2 I/O extension module to a DIN rail, retract the module’s attachment tabs.

# *Memo*

# Chapter

## 2 Installation and Wiring

1. Installation
2. Wiring

This chapter describes the installation and wiring procedures for the PRO-iO2 module and PRO-iO2 I/O extension module.

### 2.1 Installation

---

This section describes the procedures and precautions for installing the PRO-iO2 module and PRO-iO2 I/O extension module.



#### **WARNING**

**Prior to installing the PRO-iO2 module or the PRO-iO2 I/O extension module, be sure to disconnect them from the power supply to prevent an electric shock.**

# Installation and Wiring

## 2.1.1 Panel Installation

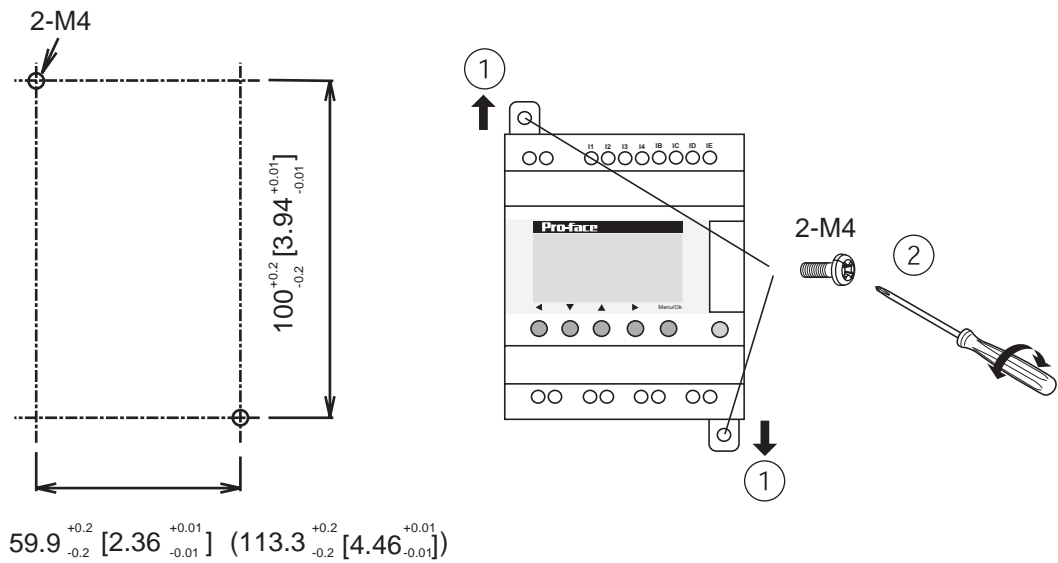
### ■ Installing the PRO-iO2 Module

Use the dimensions given below when drilling attachment holes in a panel, and secure the module in place using M4 attachment screws. The required screw torque is 1N•m.

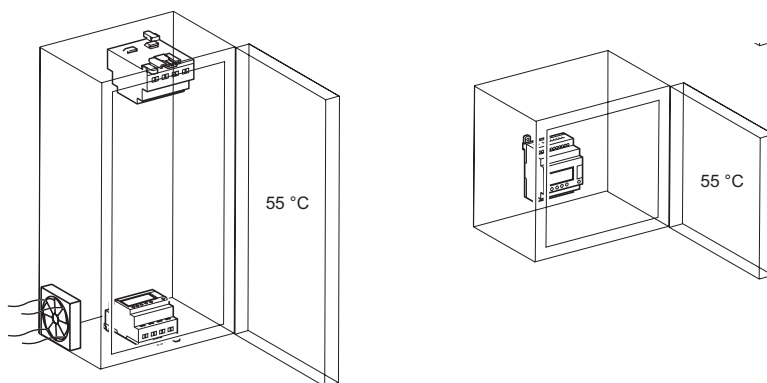
When installing the module in a direction other than vertical (i.e. horizontal), be sure to install a cooling fan.

The dimensions in parentheses are for the DR\*-2\*\*\*\* model.

Unit: mm[in.]



### ■ Module Orientation



## ■ Installation Procedure (with PRO-iO2 I/O Extension Module)

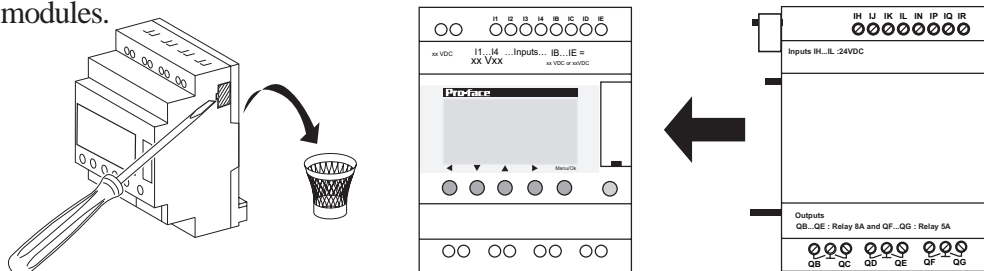
### **WARNING**

Prior to connecting the I/O extension module, be sure to disconnect the power to the main module (PRO-iO2). Otherwise, a malfunction or breakdown may occur.

### **CAUTION**

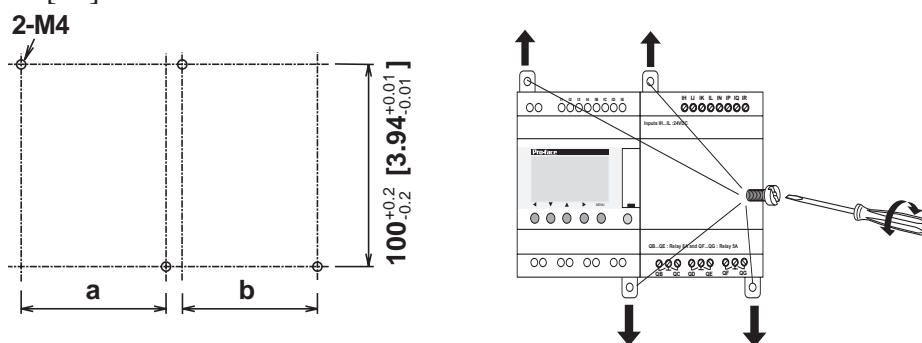
Since the connector cover can pop open, insert the tip of a flat-blade screwdriver into the groove as shown below, and lift the cover slowly to remove it.

1. Remove the PRO-iO2 module's right-side protective cover and connect the two modules.



2. Drill attachment holes in the panel as shown below and secure the module in place using M4 attachment screws. Required torque is 1N•m.

Unit: mm [in.]



Dimensions for “a” and “b” in the above diagram will vary depending on the model, as shown in the following table.

	PRO-iO2		I/O Extension Module	
	DR3-B101**	DR3-B261**	DR3-XT61**	DR3-XT141**
a	59.9 <sup>+0.2</sup> <sub>-0.2</sub> mm [2.36 <sup>+0.01</sup> <sub>-0.01</sub> in.]	113.3 <sup>+0.2</sup> <sub>-0.2</sub> mm [4.46 <sup>+0.01</sup> <sub>-0.01</sub> in.]	-	-
b	-	-	25.0 <sup>+0.2</sup> <sub>-0.2</sub> mm [0.98 <sup>+0.01</sup> <sub>-0.01</sub> in.]	60.0 <sup>+0.2</sup> <sub>-0.2</sub> mm [2.36 <sup>+0.01</sup> <sub>-0.01</sub> in.]



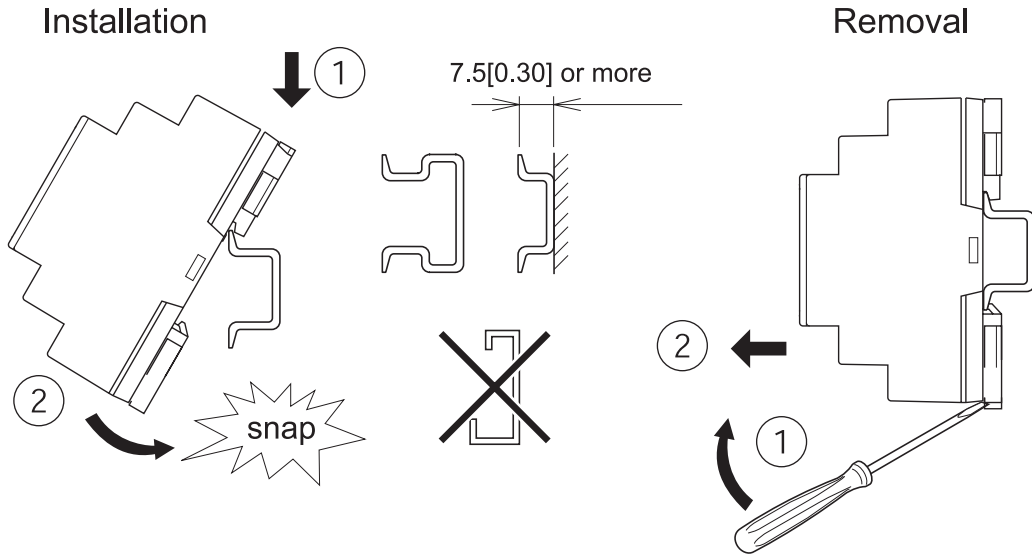
# Installation and Wiring

## 2.1.2 DIN Rail Installation

### ■ PRO-iO2 Module

Check that the module's DIN rail hook is raised (up) and the module is held securely in place.

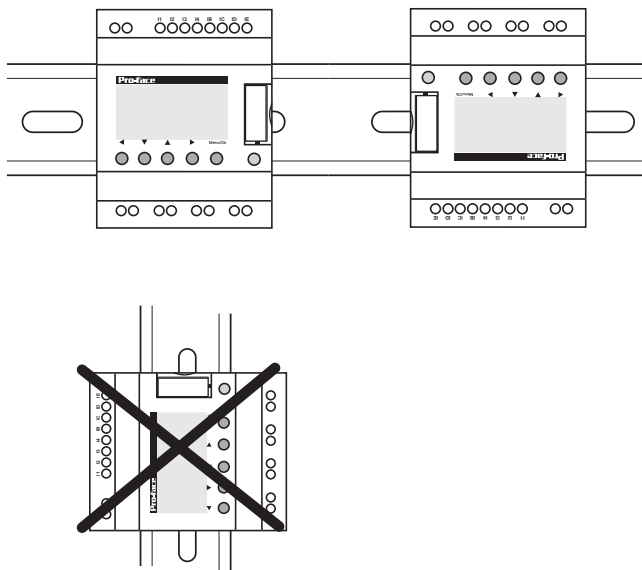
Unit: mm [in.]



**Note:**

When attaching the PRO-iO2 module to a panel, extend the unit's attachment tabs and attach the unit to the panel using attachment screws. When attaching the PRO-iO2 module to a DIN rail, retract the module's attachment tabs.

### ■ DIN Rail Module Orientations



## ■ Installation Procedure (with PRO-iO2 I/O Extension Module)



### WARNING

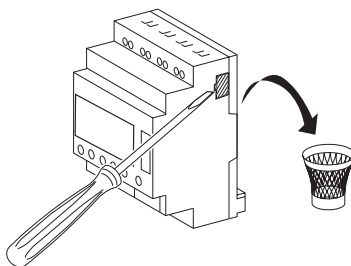
Prior to connecting the I/O extension module, be sure to disconnect the power to the main module (PRO-iO2). Otherwise, a malfunction or breakdown may occur.



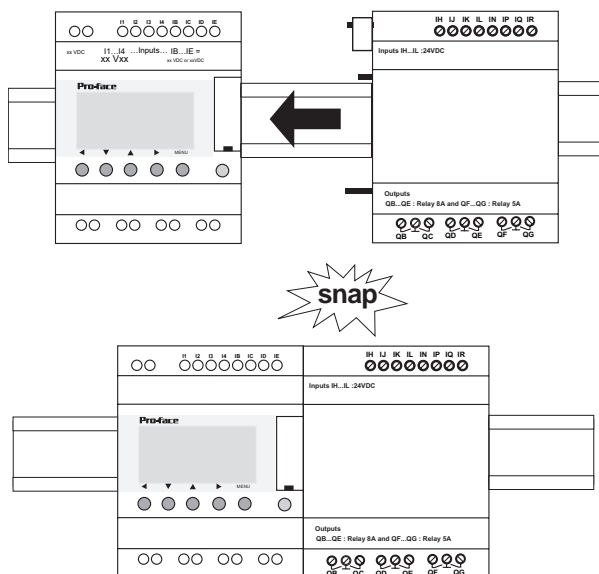
### CAUTION

Since the connector cover can pop open, insert the tip of a flat-blade screwdriver into the groove as shown below, and lift the cover slowly to remove it.

1. Remove the PRO-iO2 module's right-side protective cover .



2. Attach the PRO-iO2 module and I/O extension module separately on the DIN rail.
3. Slide the PRO-iO2 module and I/O extension module together to connect them.



## 2.2 Wiring



### WARNING

Prior to installing the PRO-iO2 module or the PRO-iO2 I/O extension module, be sure to disconnect them from the power supply to prevent an electric shock.

#### ■ Wire types

The following types of wires can be used:

Wire Type	Pin-type Terminal		Lay wire	Simple Wires	
mm <sup>2</sup>	0.25 to 2.5	0.25 to 0.75	0.2 to 2.5	0.2 to 2.5	0.2 to 1.5
AWG* <sup>1</sup>	24 to 14	24 to 18	25 to 14	25 to 14	25 to 16

\*1 AWG stands for “American Wire Gauge” and indicates conductor thickness.



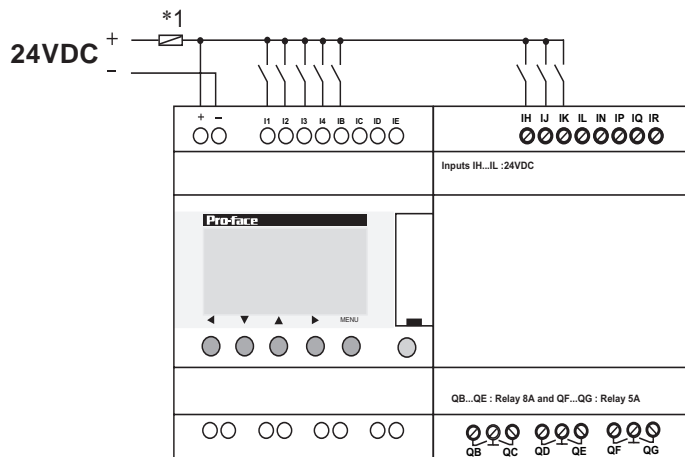
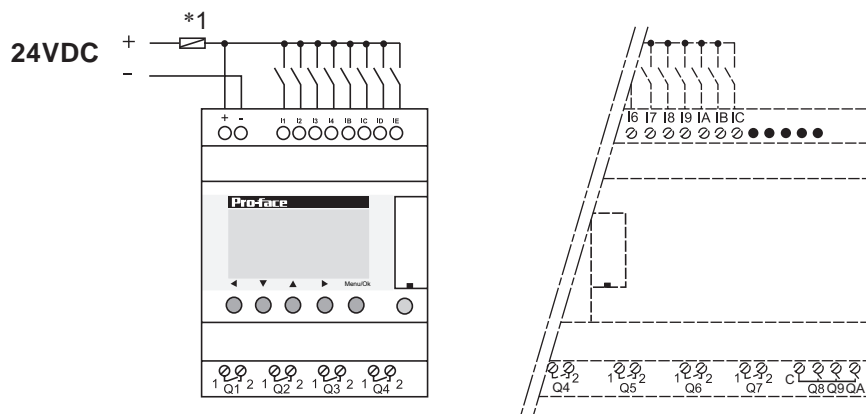
- Strip the wire’s plastic covering to expose approximately 6.8mm [0.3in] of wire.
- When using a lay wire, Pro-face recommends you install a blade-type or pin-type terminal connector.
- The torque required to secure a wire to a terminal is 0.5 N•m.

## 2.2.1 DC Power Module

The following PRO-iO2 modules use DC power:

- |            |               |
|------------|---------------|
| DR2-B121BD | DR3-B101BD    |
| DR2-B201BD | DR3-B261BD    |
| DR2-D101BD | (DR3-XT61BD)  |
| DR2-D201BD | (DR3-XT141BD) |

Be sure to wire the PRO-iO2 modules using the following wiring diagrams.




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

# Installation and Wiring

## 2.2.2 AC Power Module

The following 8 PRO-iO2 modules use AC power:

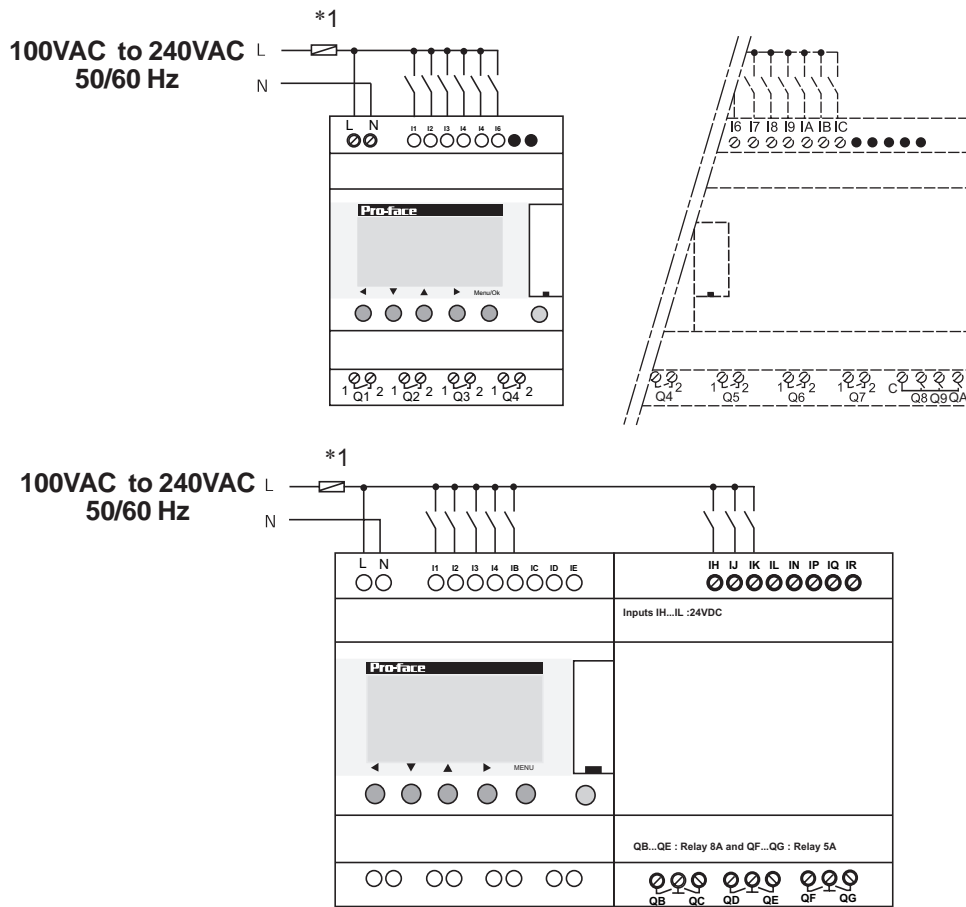
- |            |               |
|------------|---------------|
| DR2-B121FU | DR3-B101FU    |
| DR2-B201FU | DR3-B261FU    |
| DR2-D101FU | (DR3-XT61FU)  |
| DR2-D201FU | (DR3-XT141FU) |



# WARNING

**Be sure to connect the L (Live, not grounded) terminal to the power supply's non-earthed terminal, and the N (Neutral, grounded) terminal to the power supply's earthed terminal. When a power supply fault occurs (AC line and earth line short), the fuse connected to the L terminal will break and stop the flow of power.**

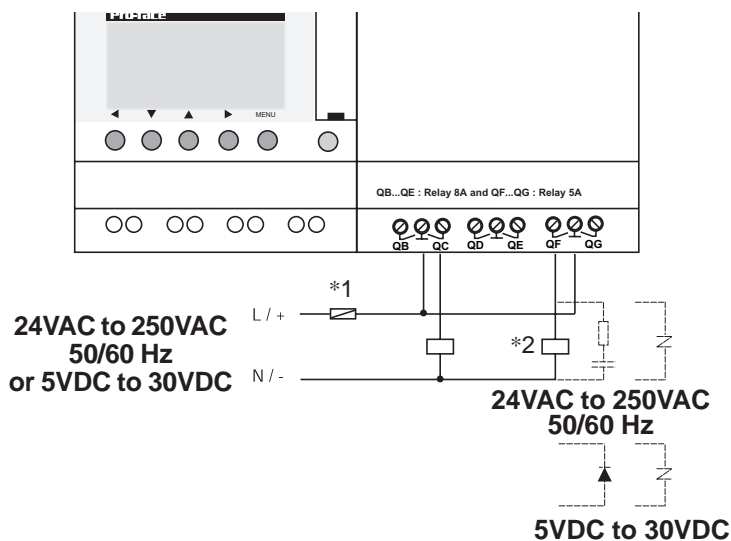
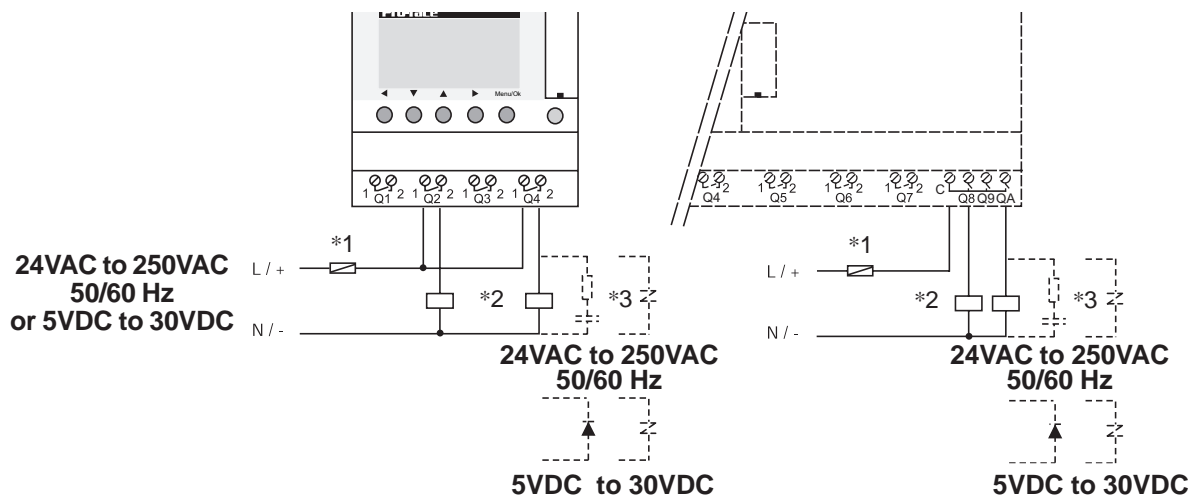
Be sure to perform PRO-iO2 module wiring as shown below.



## 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 module, and a surge killer or a varistor for AC power module.

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



- **With DR3-B261\*\* modules, Q8, Q9, and QA share a single common terminal.**
- **With the DR3-XT141 module, QB-QC, QD-QE, and QF-QG use a single common terminal.**

\*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.

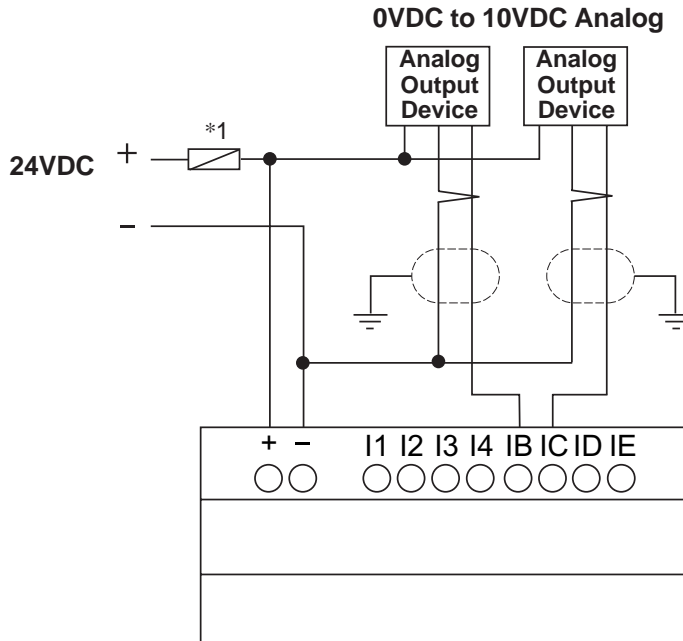
## 2.2.4 Analog Connection (DR\*-B1\*1BD)

---

Wire the following two modules as shown below.

DR2-B121BD (Input channels: IB, IC, ID, IE)

DR3-B101BD (Input channels: IB, IC, ID, IE)



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



- **Do not use negative voltages for the analog inputs. Doing so can damage the internal circuit.**
- **The maximum length of the cable connected to an analog device is 10 m.**

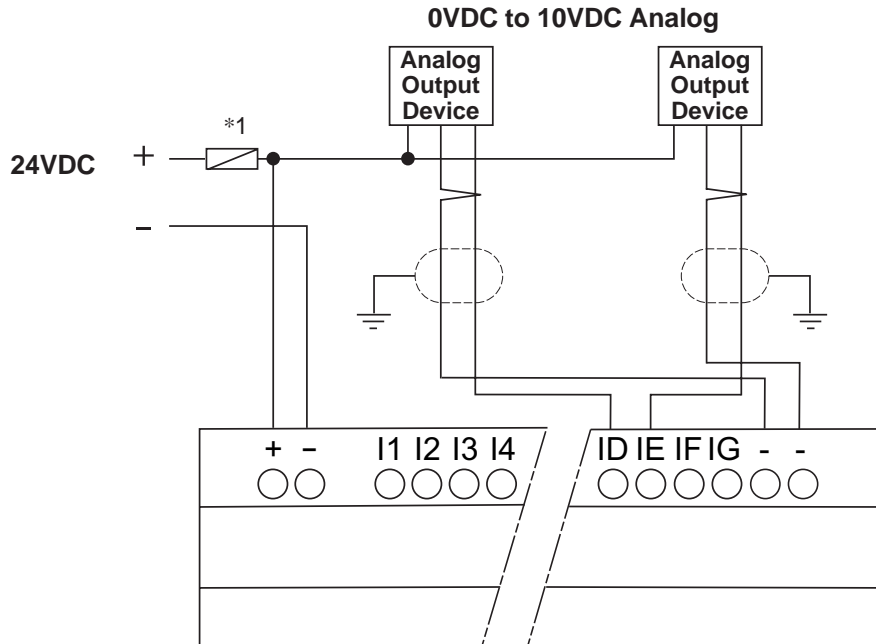
## 2.2.5 Analog Connection (DR\*-2\*1BD)

Wire the following three modules as shown below.

DR2-D201BD (Input channels: IB, IC)

DR2-B201BD (Input channels: IB, IC, ID, IE, IF, IG)

DR3-B261BD (Input channels: IB, IC, ID, IE, IF, IG)



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



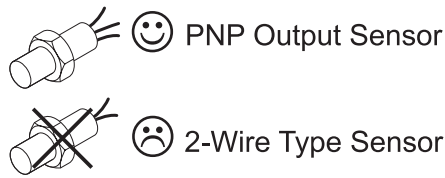
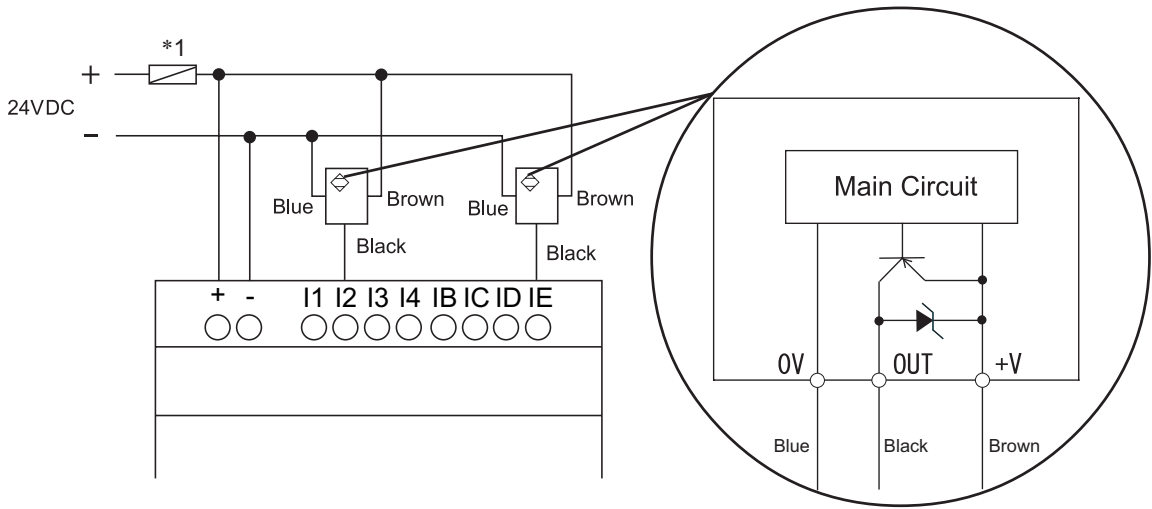
- **Do not use negative voltages for the analog inputs. Doing so can damage the internal circuit.**
- **The maximum length of the cable connected to an analog device is 10 m.**



# Installation and Wiring

## 2.2.6 Sensor Connection

The PNP output sensor connection diagram is as follows.



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



**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.**

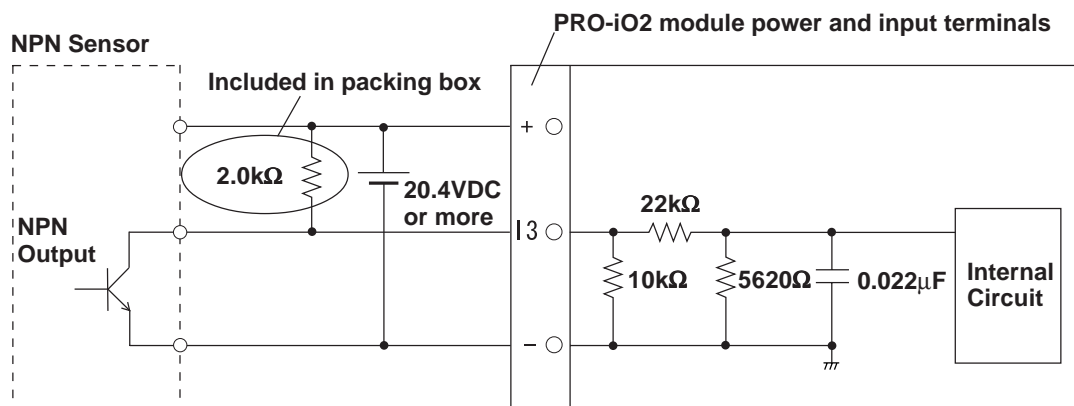
## ■ Example of NPN-type Sensor Connection

A PRO-iO2 module and NPN-type sensor can be connected using a resistor via external wiring as shown in the following circuit diagram. Connect the devices as illustrated below, and reverse the input logic in the logic program before starting operation.

Resistors required for wiring are included in the DR\*-\*\*\*\*BD package for your convenience. Use 2.0-k $\Omega$  resistors for normal input terminals (I1 to IA), and use 6.2-k $\Omega$  resistors for analog input dual-purpose terminals (IB to IG). All of the supplied resistors may not be used depending on the model of the PRO-iO2 module.

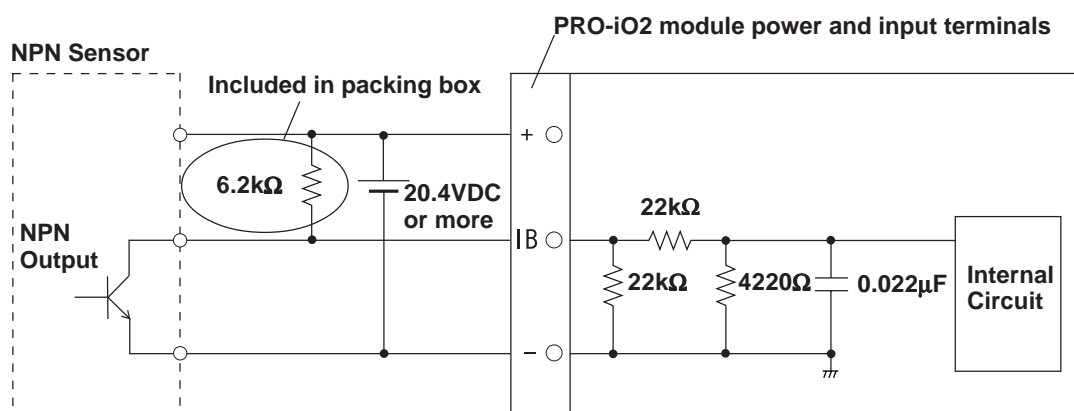
The circuit diagram examples below show how to connect a sensor to input terminals I3 and IB of the PRO-iO2 module.

### ◆ Connecting to a normal input terminal (I1 to IA):



- *The above circuit's input logic is reversed from the PNP.*
- *When an NPN sensor is connected, use an external resistance of 2.0k $\Omega$  and 1W or more.*

### ◆ Connecting to an analog input dual-purpose terminal (IB to IG):



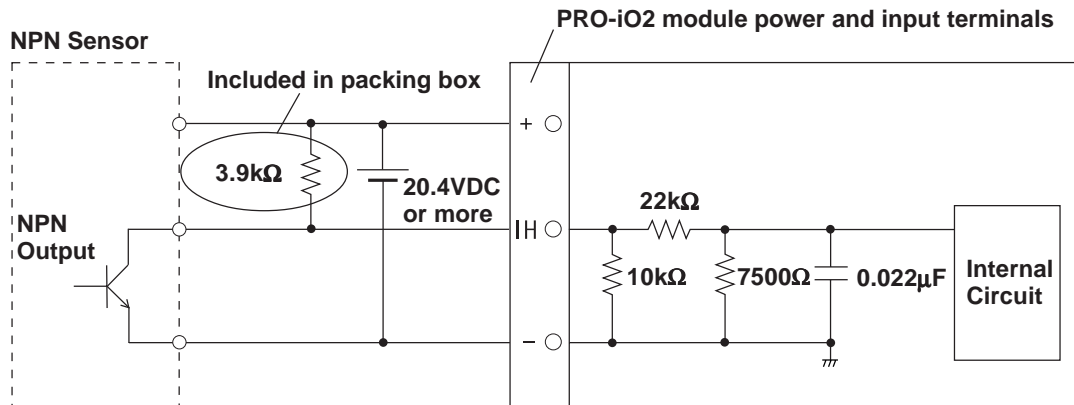
- *The above circuit's input logic is reversed from the PNP.*
- *When an NPN sensor is connected, use an external resistance of 6.2k $\Omega$  and 1/4W or more.*

## Installation and Wiring

Resistors required for wiring are included in the DR3-XT\*\*\*BD package for your convenience. Use a 3.9-k $\Omega$  resistor for a normal input terminal. It is not necessary to use all of the supplied resistors, depending on your PRO-iO2 model number.

The circuit diagram example below shows how to connect a sensor to input terminal IH of the PRO-iO2 module.

### ◆ Connecting to an input terminal (IH to IR):



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

# Chapter

## 3 PRO-iO2 Operation

1. Basic Operation and Commands
2. LCD Display and Menu Screen
3. Initial Settings
4. Logic Program Editing

### ◆ Logic Program Creation

- PRO-iO2 Module Program Creation  
▼ **Reference** ▲ “CHAPTER 3 Operating the PRO-iO2 Module”
- PRO-iO2 Editor Software Program Creation  
▼ **Reference** ▲ “PRO-iO2 Editor Operation Manual”

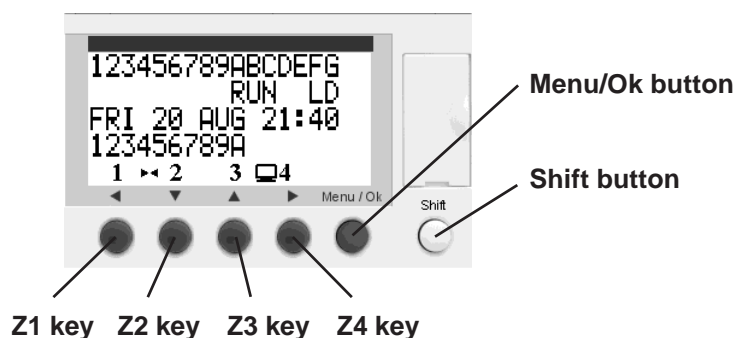
## 3.1 Basic Operation and Commands

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### 3.1.1 Basic Operation

---

Initial Settings and Logic Program Editing are performed via the PRO-iO2 module front face's operation keys. The function of each key is explained below:



- Z1/Z2/Z3/Z4 keys : Used to move the cursor, select an option, or return to the previous rung (Z1 key)
- Menu/Ok button : Used to confirm the selection
- Shift button : Pressing the Z keys or Menu/Ok button while holding down the Shift button will insert an instruction or rung.  
The functions pre-assigned to the Z keys are displayed at the bottom of screen.

# Operating the PRO-iO2 Module

## 3.1.2 Contacts / Coils

---

### ■ Contacts

Symbol	Number	No. of Contacts	Description
l	l1 to l*	*1	a contact (Bit input)
i	i1 to i*	*1	b contact (Bit input)
Z <sup>*2</sup>	Z1 to Z4	4	a contact (Z key)
z <sup>*2</sup>	z1 to z4	4	b contact (Z key)
M	M1 to MV	28	a contact (Auxiliary relay)
m	m1 to mV	28	b contact (Auxiliary relay)
Q	Q1 to Q*	*1	a contact (Bit output)
q	q1 to q*	*1	b contact (Bit output)
T	T1 to TG	16	a contact (Timer)
t	t1 to tG	16	b contact (Timer)
C	C1 to CG	16	a contact (Counter)
c	c1 to cG	16	b contact (Counter)
K <sup>*3</sup>	K1	1	a contact (High-Speed Counter)
k <sup>*3</sup>	k1	1	b contact (High-Speed Counter)
V	V1 to V8	8	a contact (Counter Comparator)
v	v1 to v8	8	b contact (Counter Comparator)
A <sup>*4</sup>	A1 to A8	16	a contact (Analog Comparator)
a <sup>*4</sup>	a1 to a8	16	b contact (Analog Comparator)
H <sup>*2</sup>	H1 to H8	8	a contact (Calender)
h <sup>*2</sup>	h1 to h8	8	b contact (Calender)
W <sup>*2</sup>	W1	1	a contact (Summer Time)
w <sup>*2</sup>	w1	1	b contact (Summer Time)

\*1 The number of points varies depending on the model type.

**▼ Reference ▲** “PRO-iO2 module Models”

For the number of points with an I/O extension module being connected:

**▼ Reference ▲** “About PRO-iO2 I/O Extension Module”

\*2 Applies only to a DR\*-B\*\*\*\*\* module. Not applicable for a DR\*-D\*\*\*\*\* module.

\*3 Applies only to a DR\*-\*\*\*\*BD module. Not applicable for a DR\*-\*\*\*\*FU module.

\*4 Applies only to a DR\*-B\*\*\*BD and DR2-D201BD. Not applicable for a DR2-D101BD or DR\*-\*\*\*\*FU module.

## ■ Coils

Symbol		Number	No. of Contacts	Description
Q	□	□Q1 to □Q*	*1	Normal coil
	┘	┘Q1 to ┘Q*	*1	Reverse when condition is true (Rising)
	S	SQ1 to SQ*	*1	Set coil
	R	RQ1 to RQ*	*1	Reset coil
M	□	□M1 to □MV	28	Normal coil
	┘	┘M1 to ┘MV	28	Reverse when condition is true (Rising)
	S	SM1 to SMV	28	Set coil
	R	RM1 to RMV	28	Reset coil
T	TT	TT1 to TTG	16	Timer start coil
	TR	RT1 to RTG	16	Timer reset coil
C	CC	CC1 to CCG	16	Counter coil
	RC	RC1 to RCG	16	Counter reset coil
	DC	DC1 to DCG	16	Count direction designation coil
K <sup>*2</sup>	TK	TK1	1	High-speed counter coil
	RK	RK1	1	High-speed counter reset coil
X <sup>*3</sup>	TX	TX1 to TXG	16	Text show coil
	RX	RX1 to RXG	16	Text hide coil
L <sup>*3</sup>	TL	TL1	1	Turns ON LCD backlight

\*1 The number of points varies depending on the model type.

**▼Reference** “PRO-iO2 module Models”

For the number of points with an I/O extension module being connected:

**▼Reference** “About PRO-iO2 I/O Extension Module”

\*2 Applies only to a DR\*-\*\*\*\*BD module. Not applicable for a DR\*-\*\*\*\*FU module.

\*3 Applies only to a DR\*-B\*\*\*\*\* module. Not applicable for a DR\*-D\*\*\*\*\* module.

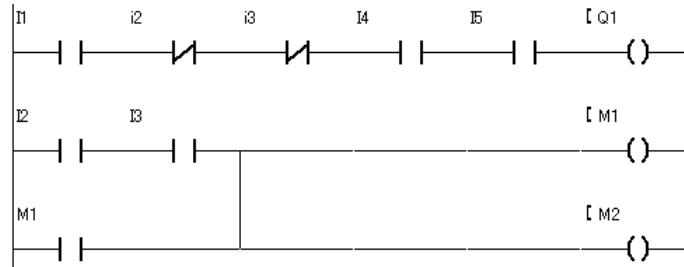
# Operating the PRO-iO2 Module

## 3.1.3 Maximum Number of Program Lines

---

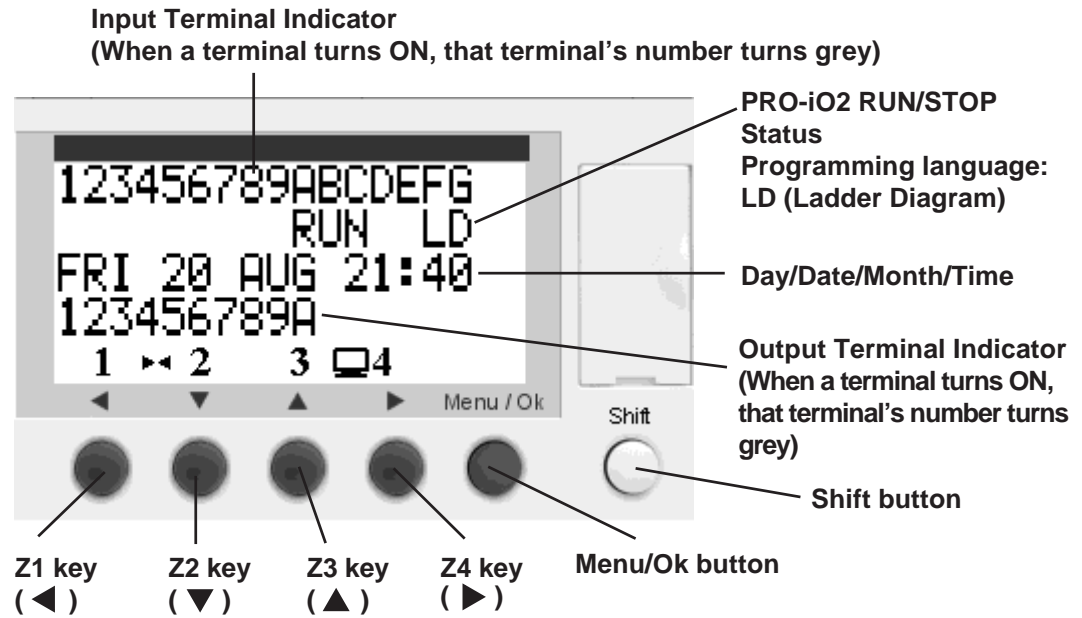
The maximum number of program lines is 120, and each line can have five contacts (maximum) and one coil.

The following diagram shows a sample program consisting of three rungs (lines). (Up to 120 similar rungs can be created.)

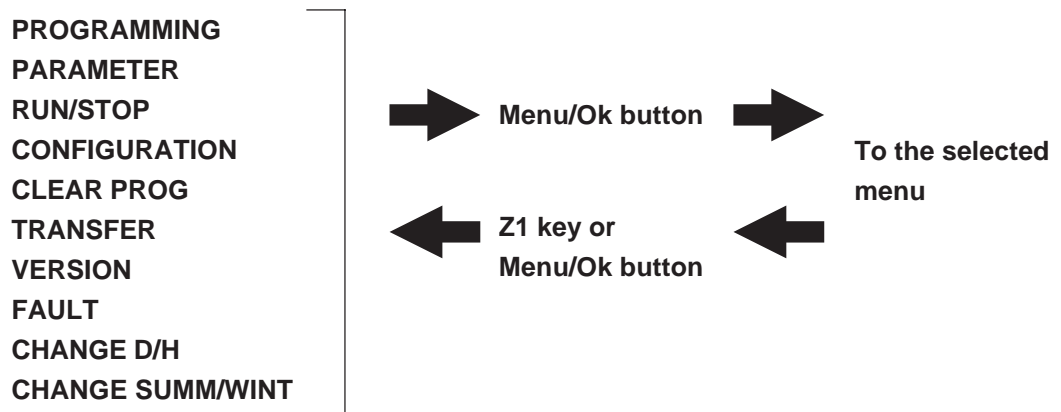


## 3.2 LCD Display and Menu Screen

The PRO-iO2 Display screen displays the RUN/STOP status and time data as shown in the illustration below. Press the Menu/Ok button to display the Menu screen, allowing you to set the following parameters. Press the Z1 key to return to the previous Display screen.



The menu options from “PROGRAMMING” through “CHANGE SUMM/WINT” on the Menu screen can be selected or scrolled through using the Z2 and Z3 keys. After selecting the desired option, press the Menu/Ok button to enter the menu. To exit from the menu, press the Z1 key or press the Menu/Ok button again.





## Operating the PRO-iO2 Module

### ■ Menu Screen

- PROGRAMMING** : Logic program monitoring can be performed in RUN mode. Logic program creation/update can be performed in STOP mode.  
In RUN mode, “MONITORING” is displayed.
- PARAMETER** : Timer and Counter parameters can be changed even in RUN mode.
- RUN/STOP** : Selects whether to run or stop the PRO-iO2 module.
- CONFIGURATION** : Designates the following settings (This function is disabled in RUN mode.):
- PASSWORD** : Designates the password needed to access the logic program. Press the Menu/Ok button to enable the setting, select a password using the Z1 to Z4 keys, and press the Menu/Ok button again to confirm the password. To cancel the setting, hold down the Shift button and then press the Menu/Ok button.  
Note that parameters can be modified even when a password is set.  
Deleting the password will require the same password to be entered again. A valid password can be any four digit number (0000 to 9999).
  - FILT** : Designates the input filter time. The module is designed only for a DC input filter. Select either SLOW (3ms to 5ms), or FAST (0.3ms to 0.5ms).
  - 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.
  - CYCLE & WATCHDOG** : The WATCHDOG operates based on the setting selected from the following options when the scan time of the logic program exceeds the time specified in the CYCLE setting (1 x 10 ms to 9 x 10 ms).
    - INACTIVE** : Normal operation mode
    - ALARM** : Displays an alarm status. The alarm number for “Cycle time overflow” can be checked with the FAULT menu.
    - ERROR** : Stops the program (STOP mode). The alarm number for “Cycle time overrun” can be checked with the FAULT menu.

## Operating the PRO-iO2 Module

CLEAR PROG	: Selects if the logic program is to be deleted or not. (This function is disabled in RUN mode.)
TRANSFER	: Transfers a logic program to or from the memory pack. PRO-iO → MEMORY : From the PRO-iO2 module to the memory pack MEMORY → PRO-iO : From the memory pack to the PRO-iO2 module
VERSION	: Identifies the model and the version of the PRO-iO2 module.
FAULT	: Allows users to check the alarm number of the current error or to cancel the error.
CHANGE D/H	: Designates the year, month, day, and time. CAL corrects the time deviation for the week (-31 secs to +31 secs).
CHANGE SUMM/WINT	: Sets the summer time and winter time from the following options: USA, GB, EUROPE, NO (no setting), and OTHER ZONE (manual setting)



**SUMM represents summer daylight saving time and WINT 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 NO (no setting).**

**The Summer Time contact (W1) remains ON during the specified summer time period.**

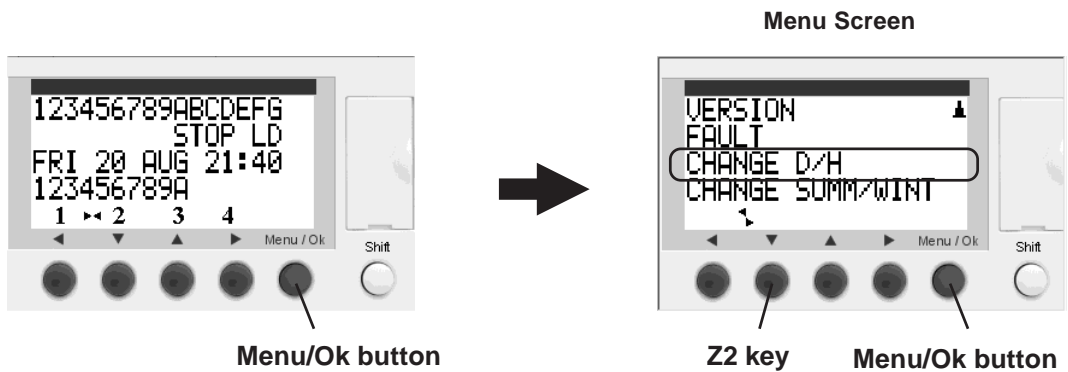
## 3.3 Initial Settings

When turning on the PRO-iO2 for the first time, make sure to set the current time.

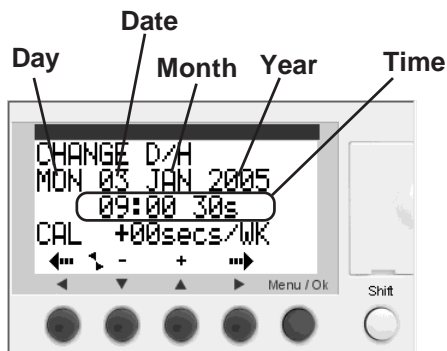
### ■ Setting the Current Time

Press the Menu/Ok button while the time and RUN/STOP status are being displayed. The screen switches to the Menu screen.

Use the Z2 key to scroll through the Menu screen and to select the “CHANGE D/H” menu option, and then press the Menu/Ok button to change the time setting.



Set up the year, month, date, day of the week, and time as shown below.



**Note:** • CAL is used to correct the time deviation per week. (-31 secs to +31 secs)

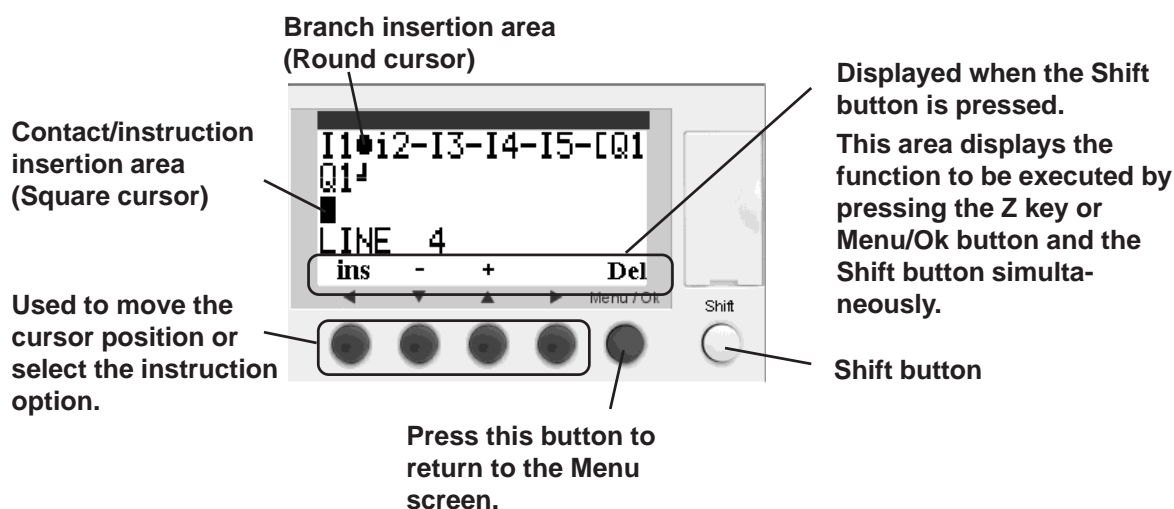
### 3.4 Creating a Logic Program

Press the Menu/Ok button while the time data and RUN/STOP status are displayed on the Display screen, and the Menu screen appears. Select “PROGRAMMING” using the Z2 and Z3 keys, and press the Menu/Ok button to enable writing of the logic program.

If the logic program is running, stop the program.

#### ■ Screen configuration

As shown in the illustration below, a rung (a line connecting two instructions) consists of up to five contacts and one coil.



#### ■ List of functions assigned to the Shift button

As described in the table below, a rung (line) or branch can be inserted by pressing one of the operation buttons and the Shift button simultaneously.

When the cursor is in the contact/instruction insertion area:

Operation button	Displayed symbol	Description
Z1key(◀)	ins.	Inserts a rung (line).
Z2key(▼)	-	Scrolls the instruction in the minus direction.
Z3key(▲)	+	Scrolls the instruction in the plus direction.
Z4key(▶)	Param	Sets the parameters for each instruction.
Menu/Ok button	Del.	Deletes an instruction or a line.

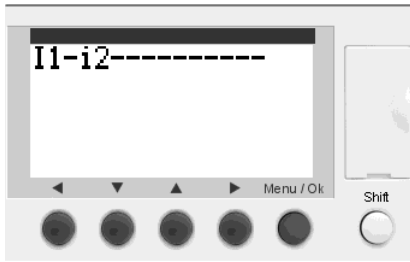
When the cursor is in the branch insertion area:

Operation button	Displayed symbol	Description
Z1key(◀)	←	Extends the rung (line) or inserts a branch in each direction.
Z2key(▼)	↓	
Z3key(▲)	↑	
Z4key(▶)	→	
Menu/Ok button	Del.	Deletes a rung (line) or a branch.

# Operating the PRO-iO2 Module

## 3.4.1 Bit Input (Symbol: I)

A bit input can only be used as a contact.

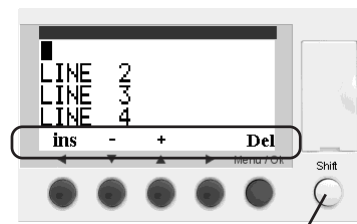


Display format	Function	Description
I + Number	a contact	Contacts for an external input
i + Number	b contact	

### ■ Operating procedure

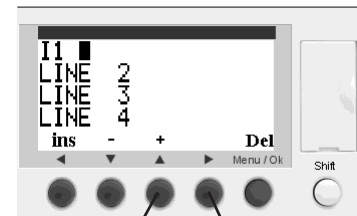
This section describes the procedure for creating an AND circuit that consists of a-contact and b-contact bit inputs as shown above.

1. Press the Shift button when the cursor is in the contact/instruction insertion area (square cursor).  
The [+] and [-] scroll symbols are displayed on the bottom of the screen, allowing you to insert an instruction.



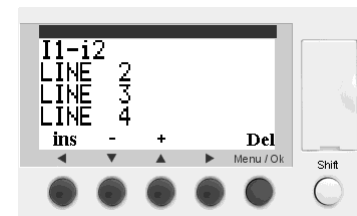
Shift button

2. Press the Z3 key ([+] button) once while holding down the Shift button. An I1 bit input is inserted.  
Release the Shift button and press the Z4 key three times to move the cursor to the next insertion point for a contact.



Z3 key Z4 key

3. Press the Z3 key twice while holding down the Shift button. An i1 bit input is inserted.  
Release the Shift button and press the Z4 key once to move the cursor to the contact number area.

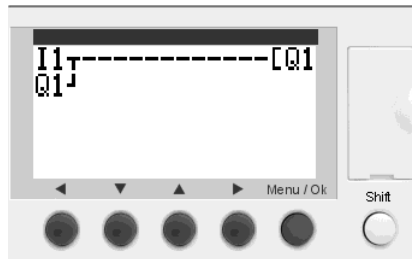


4. Press the Z3 key once while holding down the Shift button. The contact number changes to "2", and i2 is inserted.

5. Press the Z4 key once to move the cursor to the branch area. Press the Z4 key while holding down the Shift button to insert a line.

## 3.4.2 Bit Output (Symbol: Q)

A bit output can be used as a contact or a coil.



When used as a contact:

Display format	Function	Description
Q + Number	a contact	Contacts for an external output
q + Number	b contact	

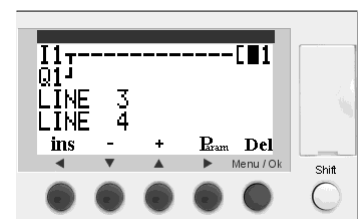
When used as a coil:

Display format	Description
□Q + Number	Outputs only when the contact connected to this coil is closed.
┌Q + Number	A pulse output. The output turns on when the rising edge is detected as the status of the input changes.
SQ + Number	A Set coil. The output turns on when the contact connected to the coil is closed, and remains on regardless of the status of the contact.
RQ + Number	A Reset coil. The coil turns off when the contact connected to the coil is closed, and remains off regardless of the status of the contact.

### ■ Latch function upon power failure

The Latch function saves the conditions set for a given function block in the event of a power failure, and retrieves the conditions when recovering from the power failure. The following section describes the setting procedure.

1. Place the cursor on the desired device symbol, and press the Z4 key (Param) while holding down the Shift button.



2. Place the cursor on the “lightning” icon on the right edge, and invert the display of the icon using the Z2 or Z3 key.



When latched

When unlatched



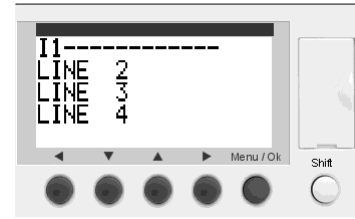
# Operating the PRO-iO2 Module

## ■ Operating procedure

This section describes the procedure for creating a self-holding circuit for the bit outputs.

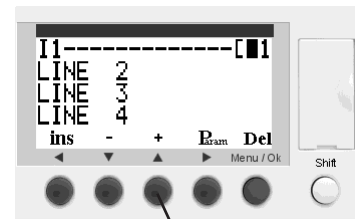
1. Insert I1 (bit input) and then insert the remainder of the rung, up to the coil insertion area.

**Reference** “3.4.1 Bit Input (Symbol: I)”



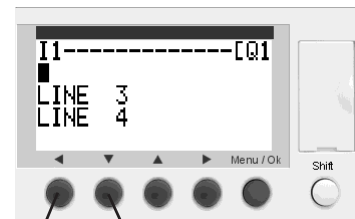
2. Press the Z3 key ([+] button) once while holding down the Shift button. An [M1 auxiliary coil is inserted.

Release the Shift button and then move the cursor to the M position.



Z3 key

3. Press the Z3 key ([+] button) once while holding down the Shift button. Q1 (bit output) is inserted. Release the Shift button and then move the cursor to the left edge of LINE 2 using the Z1 and Z2 keys.



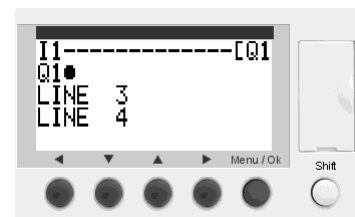
Z1 key Z2 key



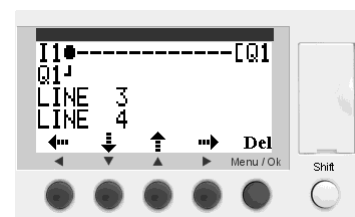
**To convert the settings of a rising edge detector coil, set coil, or reset coil, move the cursor to “[” and press the Z3 key ([+] button) or Z2 key ([–] button) while holding down the Shift button.**

4. Press the Z3 key ([+] button) seven times while holding down the Shift button. A Q1 bit output is inserted.

Release the Shift button and then move the cursor to the branch insertion area using the Z4 key.



5. Press the Z3 key once while holding down the Shift button. A branch is inserted.



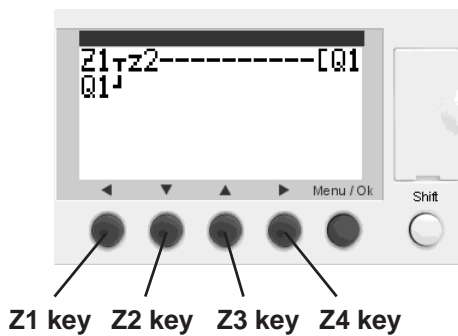
## 3.4.3 Z Keys (Symbol: Z)

The Z keys refer to the four keys on the front panel of the PRO-iO2 module. Depending on the setting, the Z keys function as push buttons which can be used as contacts within a program.



**To use the Z keys as contacts, the appropriate setting should be configured (CONFIGURATION/Zx=Keys) on the Menu screen of the PRO-iO2 module.**

**Reference** “3.2 LCD Display and Menu Screen”



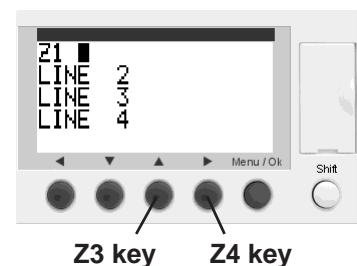
Display format	Function	Description
Z + Number	a contact	A contact for the four buttons on the front panel of the PRO-iO2 module.
z + Number	b contact	

### ■ Operating procedure

This section describes the procedure for creating a circuit in which the Q1 bit output is turned on by pressing the Z1 key and turned off by pressing the Z2 key, as shown in the illustration above.

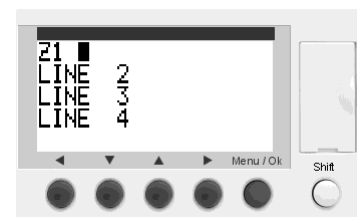
1. Place the cursor on the contact/instruction insertion area (square cursor) and press the Shift button, and then press the Z3 key three times. The contact for the Z1 key is inserted.

Release the Shift button and press the Z4 key three times to move the cursor to the next contact insertion area.



2. Press the Z3 key ([+] button) four times while holding down the Shift button. The b-contact for the Z1 key is inserted.

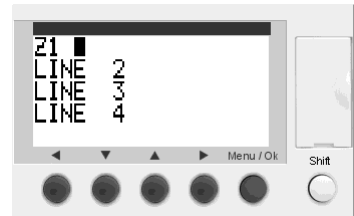
Release the Shift button and press the Z4 key once to move the cursor to the contact number area.



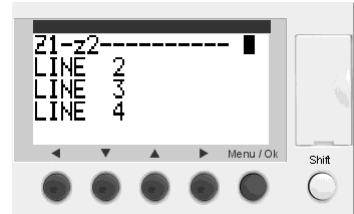


## Operating the PRO-iO2 Module

3. Press the Z3 key once while holding down the Shift button. The contact number changes to “2”, and z2 is inserted.

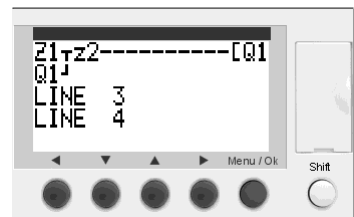


4. Press the Z4 key once to move the cursor to the branch insertion area. Press the Z4 key while holding down the Shift button to insert a rung.



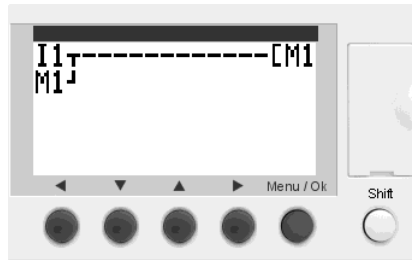
5. This creates a self-holding circuit for bit output Q1.

**Reference** “3.4.2 Bit Output (Symbol: Q)”



## 3.4.4 Auxiliary Coils (Symbol: M)

An auxiliary coil can be used as a contact or a coil.



When used as a contact:

Display format	Function	Description
M + Number	a-contact	Also called internal relays or internal auxiliary relays. These contacts can only be used within a program.
m + Number	b-contact	

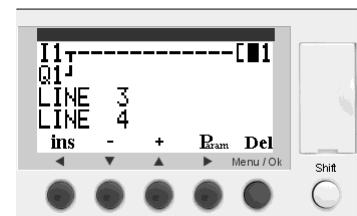
When used as a coil:

Display format	Description
[ M + Number	Outputs only when the connected contact is closed.
] M + Number	A pulse output. The output turns on when the rising edge is detected as the status of the input changes.
SM + Number	A Set coil. The output turns on when the contact connected to the coil is closed, and remains on regardless of the status of the contact.
RM + Number	A Reset coil. The coil turns off when the contact connected to the coil is closed, and remains off regardless of the status of the contact.

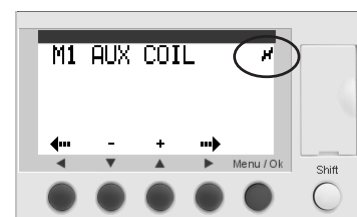
### ■ Latch function upon power failure

The Latch function saves the conditions set for a given function block in the event of a power failure, and retrieves the conditions when recovering from the power failure. The following section describes the setting procedure.

1. Place the cursor on the desired device symbol, and press the Z4 key (Param) while holding down the Shift button.



2. Place the cursor on the “lightning” icon on the right edge, and invert the display of the icon using the Z2 or Z3 key.



When latched



When unlatched



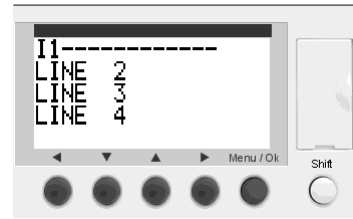
# Operating the PRO-iO2 Module

## ■ Operating procedure

This section describes the procedure for creating a self-holding circuit for the auxiliary coil.

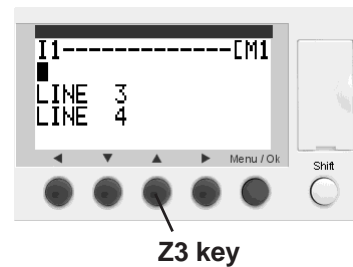
1. Insert an I1 bit input and insert rungs up to the coil insertion area.

**Reference** “3.4.1 Bit Input (Symbol :I)”



2. Press the Z3 key ([+] button) once while holding down the Shift button. An [M1 auxiliary coil is inserted.

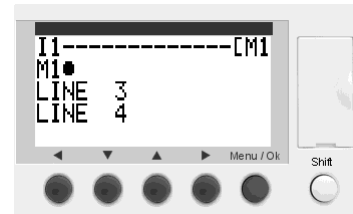
Release the Shift button and then move the cursor to the left edge of LINE 2 using the Z1 and Z2 keys.



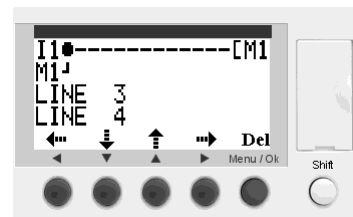
**To convert the settings of a rising edge detector coil, set coil, or reset coil, move the cursor to “[” and press the Z3 key ([+] button) or Z2 key ([-] button) while holding down the Shift button.**

3. Press the Z3 key ([+] button) five times while holding down the Shift button. An M1 auxiliary output is inserted.

Release the Shift button and then move the cursor to the branch insertion area using the Z4 key.

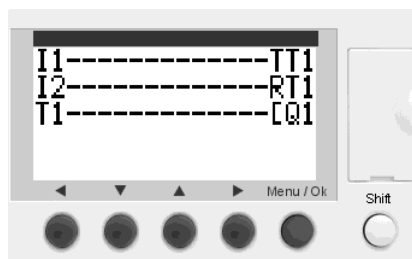


4. Press the Z3 key once while holding down the Shift button. A branch is inserted.



## 3.4.5 Timer (Symbol: T)

A timer can be used as a contact or a coil.



When used as a contact:

Display format	Function	Description
T + Number	a contact	Operation of a contact varies depending on the parameter settings of the timer. Refer to the description below.
t + Number	b contact	

When used as a coil:

Display format	Description
TT + Number	Turning this coil from OFF to ON or from ON to OFF will start the counting operation of the timer. The counting type varies depending on the timer function described below.
RT + Number	Turning this coil from OFF to ON will reset the current value of the timer.

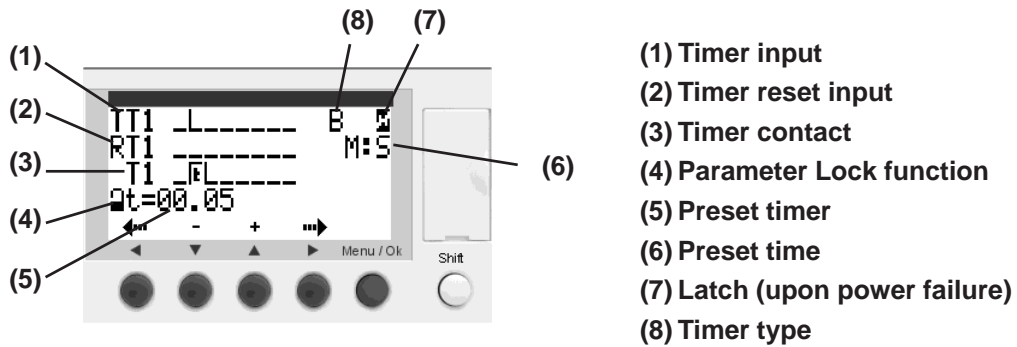
### ■ Overview

This section describes the following items required when using a timer.

- Parameter display screen
- Latch function upon power failure
- Timer operations
- Operating procedure

# Operating the PRO-iO2 Module

## Parameter display screen



Display	Description
s	The following five types of time modules are available for the preset value. s (second): 00.01 seconds to 99.99 seconds S (second): 000.1 seconds to 999.9 seconds M:S (minute: second): 00 minutes 01 second to 99 minutes 59 seconds H:M (hour: minute): 00 hours 01 minute to 99 hours 59 minutes H (hour): 01 hour to 9999 hours
	Enabling this option allows you to lock the preset value of the timer function. When the lock is activated, the preset value will not be displayed on the PARAMETER menu.
T or t	Used as a contact, and represents a timer output. The action of this contact varies depending on the timer type you have selected.
	Enabling this option allows you to retain the preset value of the timer in the event of a power failure.

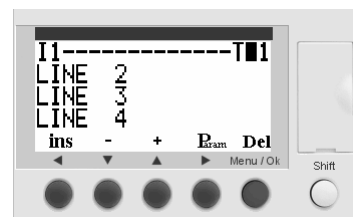


- **The Timer for the PRO-iO2 module will have a margin of error of “preset value x 1%± scan time x 2”. The “scan time” refers to the “CYCLE” value that is set in the CYCLE& WATCHDOG setting in the CONFIGURATION menu.**
- **Be sure to adjust the settings so that the preset value is at least twice the value of the scan time. Otherwise, timer processing will be inaccurate.**

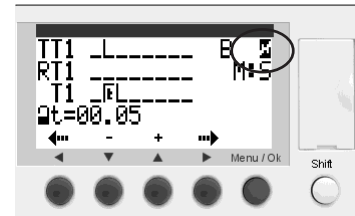
## Latch function upon power failure

The Latch function saves the conditions set for a given function block in the event of a power failure, and retrieves the conditions when recovering from the power failure. The following section describes the setting procedure.

1. Place the cursor on the desired device symbol, and press the Z4 key (Param) while holding down the Shift button.



- Place the cursor on the “lightning” icon on the right edge, and invert the display of the icon using the Z2 or Z3 key.



When latched



When unlatched



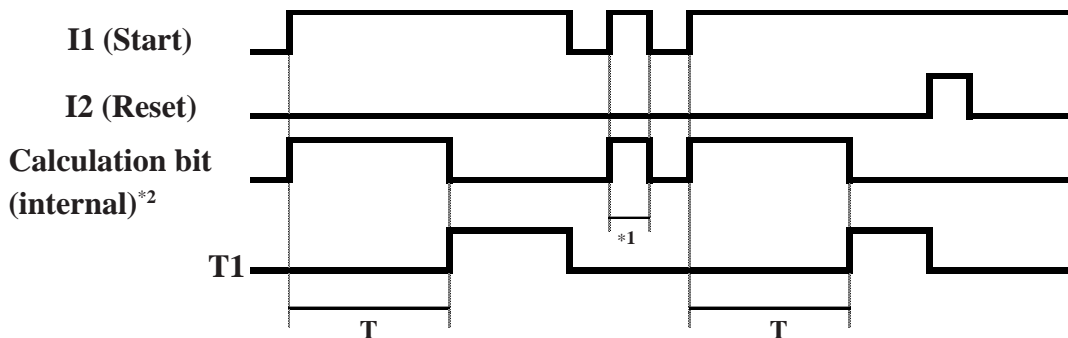
## ■ Timer operations

This section describes the operations of each of the 11 types of timers using the following sample circuit.



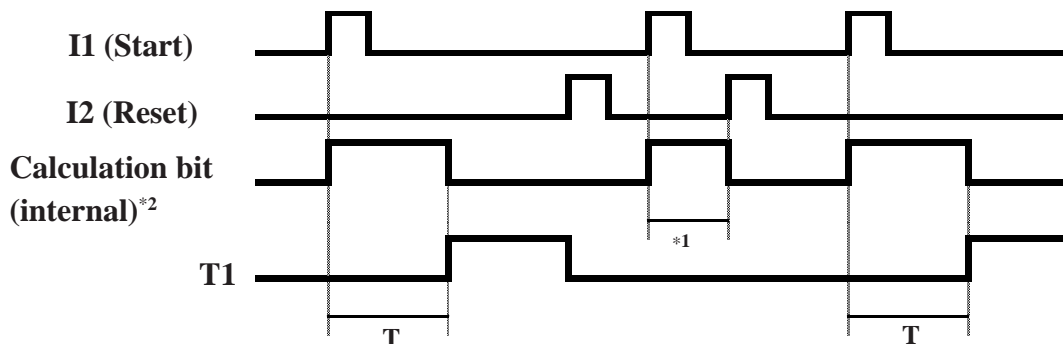
### ◆ Feature A : ON Delay Timer

The Calculation bit turns ON when I1 is turned ON. The timer activates when the Calculation bit turns ON, and T1 is turned ON when the timer count reaches the preset value. (Timer value is reset if I1 turns OFF, or if reset signal (I2) turns ON while the Timer is activated.)



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

The Calculation bit turns ON when I1 is turned ON. The timer activates when the Calculation bit turns ON, and T1 is turned ON when the timer count reaches the preset value. (The Calculation bit will not be turned OFF until it is reset.)



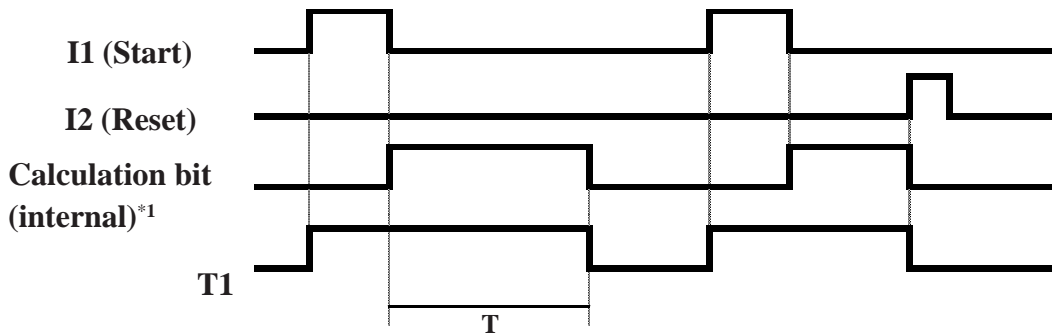
\*1 The timer calculation value is less than the timer preset value.

\*2 The calculation bit is an internal processing bit and cannot be displayed externally.

## Operating the PRO-iO2 Module

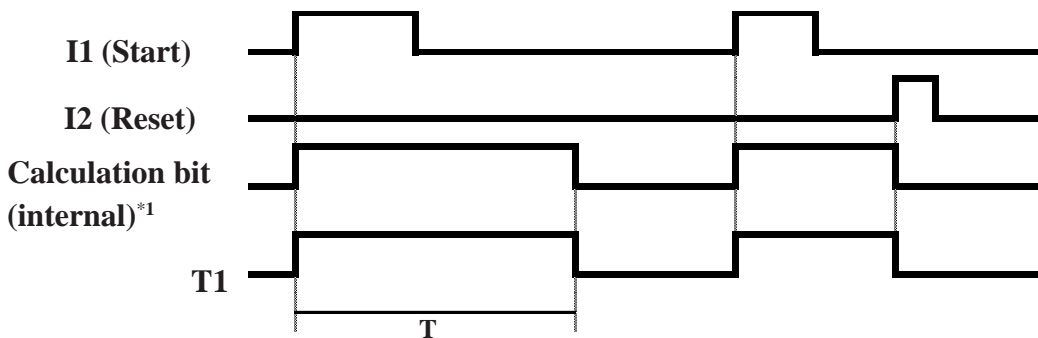
### ◆ Feature C: OFF Delay Timer

The T1 turns ON when I1 is turned ON. The Calculation bit turns ON when I1 changes from ON to OFF, and T1 turns OFF when the timer count reaches the preset value. (Timer value is reset if I1 turns ON while the Timer is activated.)



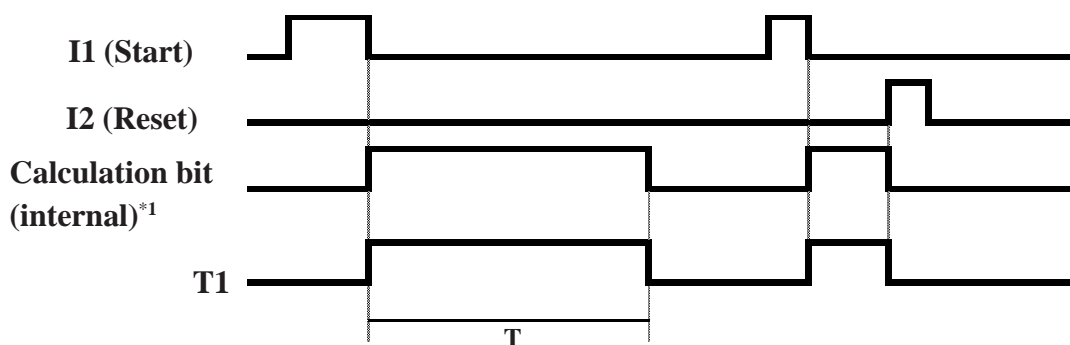
### ◆ Feature B: ON Pulse Timer

The Calculation bit and T1 turn ON when I1 is turned ON. The timer activates when the Calculation bit turns ON, and T1 is turned OFF when the timer count reaches the preset value. (Timer value is reset when counting starts.)



### ◆ Feature W: OFF Pulse Timer

The Calculation bit and T1 turn ON when I1 changes from ON to OFF. The timer activates when the Calculation bit turns ON, and T1 is turned OFF when the timer count reaches the preset value. (Timer value is reset when counting starts.)



\*1 The calculation bit is an internal processing bit and cannot be displayed externally.

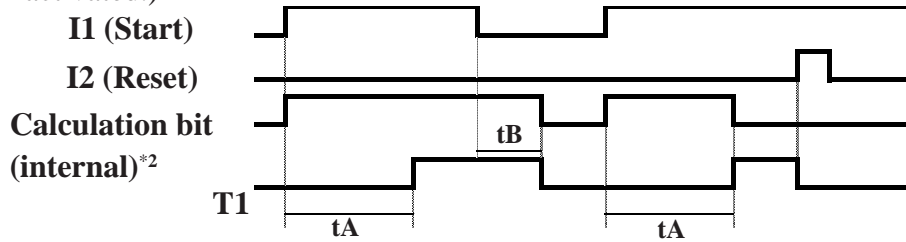




## Operating the PRO-iO2 Module

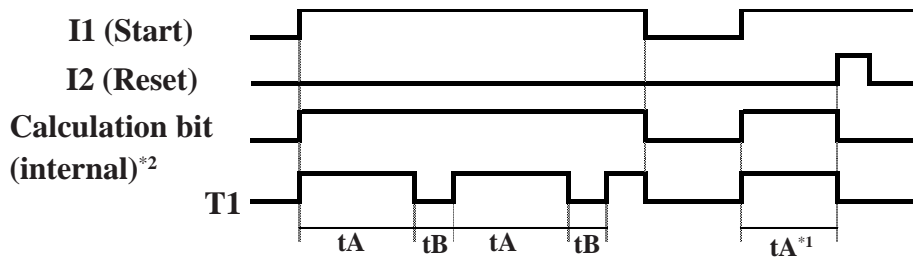
### ◆ Feature AC: ON/OFF Delay Timer

The Calculation bit turns ON when I1 is turned ON. T1 turns ON after  $t_A$  has elapsed and turns OFF after  $t_B$  has elapsed after the Calculation bit is turned ON. (Timer value is reset if I1 turns OFF, or if reset signal (I2) turns ON while the Timer is activated.)



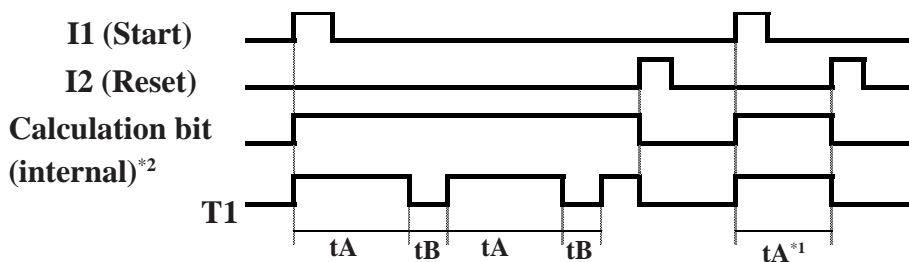
### ◆ Feature L: Asymmetrical Blinking Relay

The Calculation bit turns ON when I1 is turned ON. T1 turns ON/OFF repeatedly at the interval of the preset value ( $t_A$ ,  $t_B$ ) while the Calculation bit is ON. (The Calculation bit is turned OFF if I1 turns OFF, or if reset signal (I2) turns ON while the Timer is activated.)



### ◆ Feature I: Asymmetrical Blinking Timer (ON/OFF)

The Calculation bit turns ON when I1 is turned ON. T1 turns ON/OFF repeatedly at the interval of the preset value ( $t_A$ ,  $t_B$ ) while the Calculation bit is ON. (The Calculation bit will not be turned OFF until it is reset.)



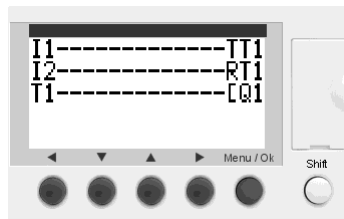
\*1 The timer calculation value is less than the timer preset value.

\*2 The calculation bit is an internal processing bit and cannot be displayed externally.

# Operating the PRO-iO2 Module

## ■ Operating procedure

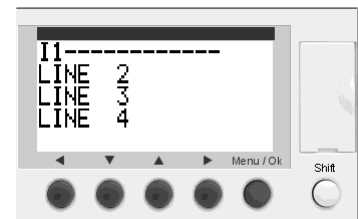
This section describes the procedure for creating a delay circuit as illustrated on the screen below.



Timer type : ON Delay Timer (A)  
 Preset value : 1 minute 30 seconds  
 Latch : Disabled  
 Parameter Lock : Disabled

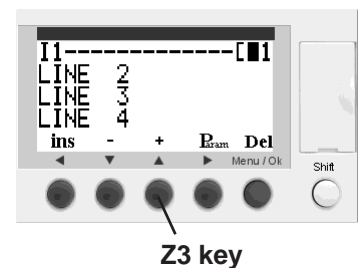
1. Insert an I1 bit input and insert rungs up to the coil insertion area.

**Reference** “3.4.1 Bit Input (Symbol: I)”



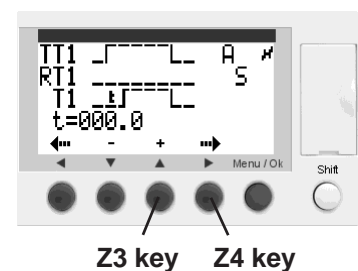
2. Press the Z3 key ([+]) button once while holding down the Shift button. An [M1 auxiliary coil is inserted.

Release the Shift button and move the cursor to the M position.



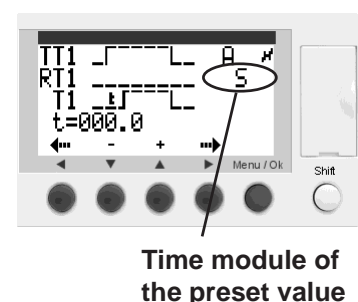
3. Press the Z3 key ([+]) button twice while holding down the Shift button. A TT1 timer coil is inserted.

Place the cursor on the TT1 timer coil and press the Z4 key (Param) while holding down the Shift button.



4. Press the Z4 key ([→]) button three times. The time module of the preset value “s” flashes.

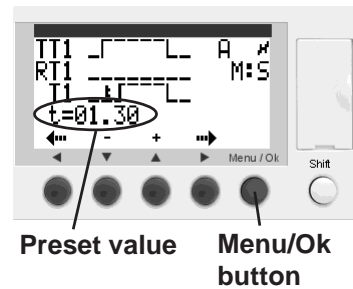
Press the Z3 key ([+]) button three times. “M: S” (minute: second) is displayed.



Time module of the preset value

## Operating the PRO-iO2 Module

- Press the Z4 key ([→] button) twice. The time of the preset value, “t=00.00”, flashes. Set the value to 01:30 using the Z2 key ([–] button) and Z3 key ([+] button), and then press the Menu/Ok button. Move the cursor to the left edge of LINE 2 using the Z1 and Z2 keys.

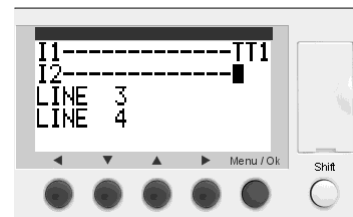


**Note:**

Press and hold the Z2 or Z3 key to change the time setting in increments of 10 seconds, 1 minute, or 1 hour.

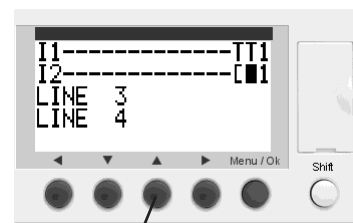
- Insert an I2 bit input and insert rungs up to the coil insertion area.

▼ **Reference** ▲ “3.4.1 Bit Input (Symbol: I)”



- Press the Z3 key once ([+] button) while holding down the Shift button. An [M1 auxiliary coil is inserted.

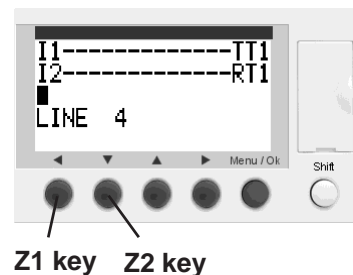
Release the Shift button and move the cursor to the M position.



- Press the Z3 key ([+] button) twice while holding down the Shift button. A TT1 timer coil is inserted.

Press the Z1 key ([←] button) once to place the cursor on the T (the first letter of TT1). Press the Z3 key ([+] button) while holding down the Shift button. An RT1 reset coil is inserted.

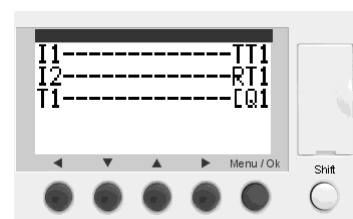
Move the cursor to the left edge of LINE 3 using the Z1 and Z2 keys.



- Press the Z3 key ([+] button) nine times while holding down the Shift button. A T1 timer contact is inserted.

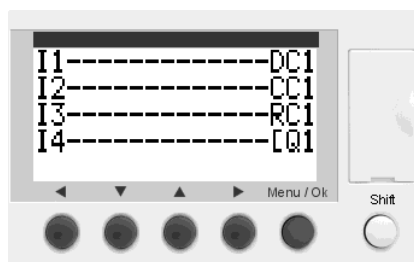
Extend the rung and insert a Q1 bit output.

▼ **Reference** ▲ “3.4.2 Bit Output (Symbol: Q)”



## 3.4.6 Counter (Symbol: C)

A Counter can be used as a contact or a coil.



When used as a contact:

Display format	Function	Description
C + Number	a-contact	The contact turns ON/OFF when the Counter reaches the preset value.
c + Number	b-contact	

When used as a coil:

Display format	Description
CC + Number	Turning this coil from OFF to ON or from ON to OFF will start the counting operation. The Counter increments/decrements by 1 according to the count direction designated by the DC coil. The range of Counter operation is between 0 and 32767. The count operation stops when the current value reaches 0 (in FROM mode) or +32767 (in TO mode).
DC + Number	Designates the count direction by turning ON or OFF this coil. The default is a count-up operation. OFF: Count-up (TO) ON: Count-down (FROM)
RC + Number	Turning this coil from OFF to ON will reset the current value of the Counter. TO mode: Resets the value to 0. FROM mode: Resets the value to the preset value.

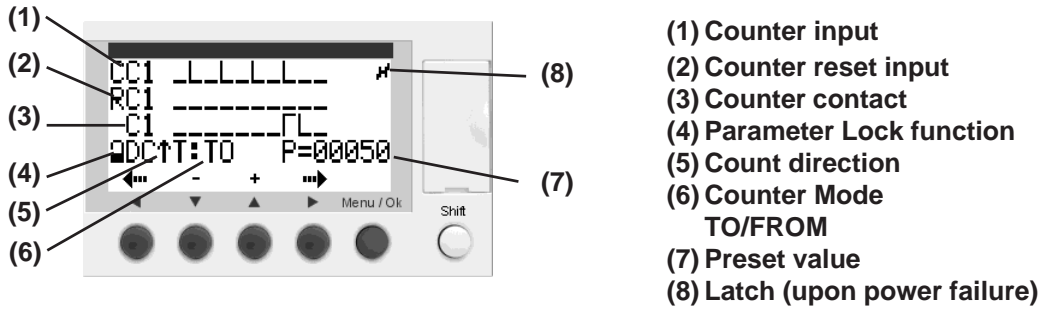
### ■ Overview

This section describes the following items required when using a Counter.

- Parameter display screen
- Latch function upon power failure
- Count operations
- Operating procedure

# Operating the PRO-iO2 Module

## Parameter display screen

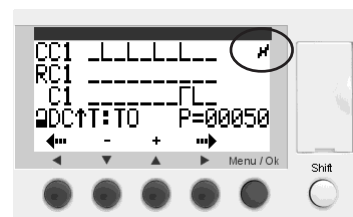
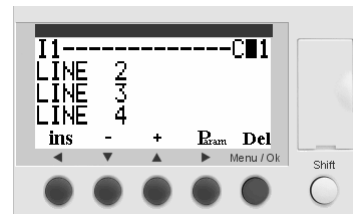


Display	Description
T	The Counter has the following two modes. TO: The count direction that starts from 0 and counts to the preset value. The Counter output turns ON when the current value becomes equal to the preset value. FROM: The count direction that starts from the preset value and counts to 0. The Counter output turns ON when the current value becomes 0.
P	Represents the preset value. The value can be set within the range of 0 to 32767.
	Enabling this option allows you to lock the preset value of the Counter function. When the lock is activated, the preset value will not be displayed on the PARAMETER menu.
C or c	Used as a contact, and represents a Counter output.
	Enabling this option allows you to retain the preset value of the Counter in the event of a power failure.

## Latch function upon power failure

The Latch function saves the conditions set for a given function block in the event of a power failure, and retrieves the conditions when recovering from the power failure. The following section describes the setting procedure.

- Place the cursor on the desired device symbol, and press the Z4 key (Param) while holding down the Shift button.
- Place the cursor on the “lightning” icon on the right edge, and invert the display of the icon using the Z2 or Z3 key.



When latched



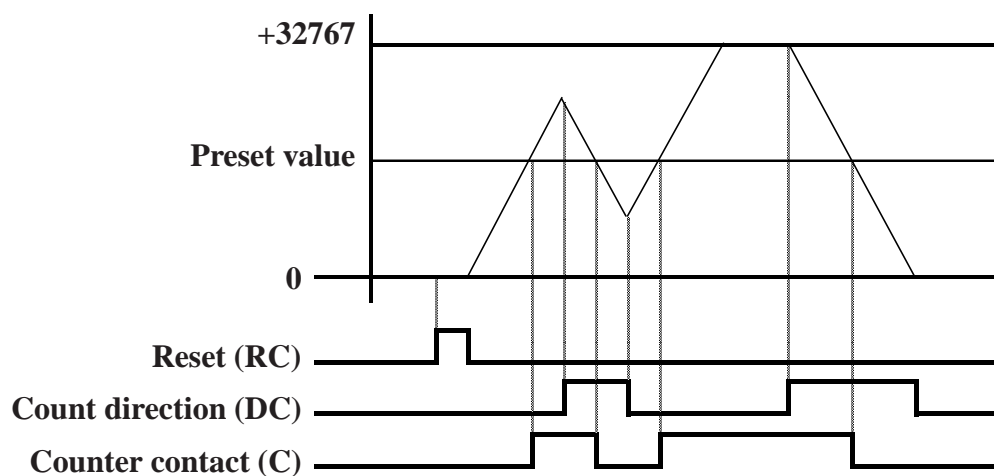
When unlatched



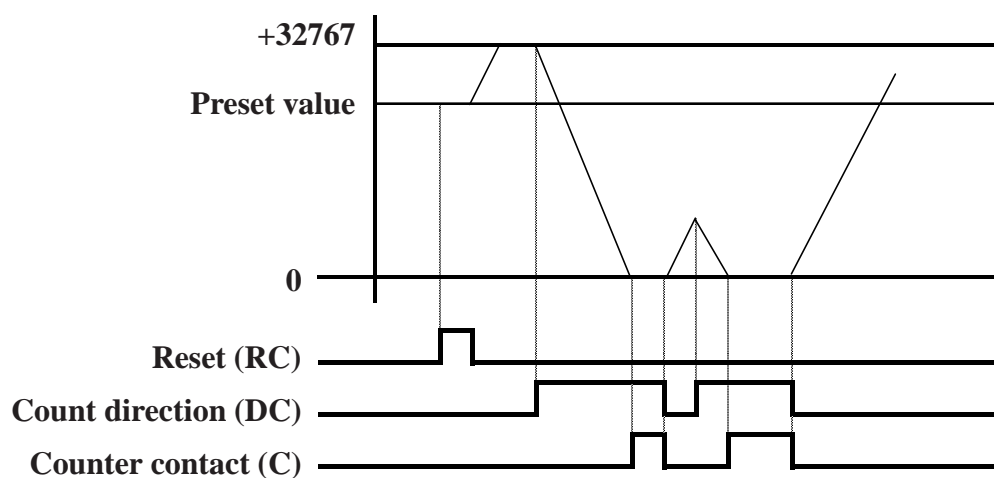
## ■ Count operation

In the following operation example, the counter's condition is “normally ON”.

### TO mode



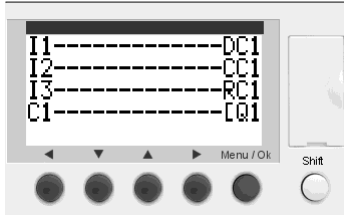
### FROM mode



# Operating the PRO-iO2 Module

## ■ Operating procedure

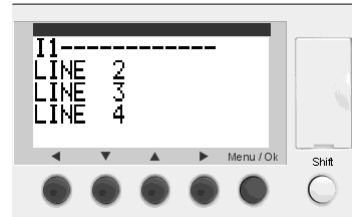
This section describes the procedure for creating a circuit illustrated in the screen below that counts I2 inputs and outputs a Q1 bit output when the preset value is reached.



**Count** : I2 input signal  
**Count direction** : I1 input signal  
**Reset** : I3 input signal  
**Preset value** : 500  
**Latch** : Disabled  
**Parameter Lock** : Disabled

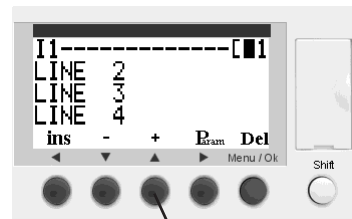
1. Insert an I1 bit input and insert rungs up to the coil insertion area.

**Reference** “3.4.1 Bit Input (Symbol: I)”



2. Press the Z3 key ([+]) button once while holding down the Shift button. An [M1 auxiliary coil is inserted.

Release the Shift button and move the cursor to the M position.



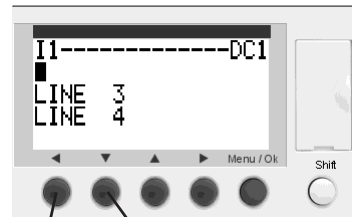
Z3 key

3. Press the Z3 key ([+]) button three times while holding down the Shift button.

A CC1 Counter coil is inserted.

Press the Z1 key ([←]) button once to place the cursor on the C (the first letter of CC1). Press the Z3 key ([+]) button while holding down the Shift button. A DC1 Count direction coil is inserted.

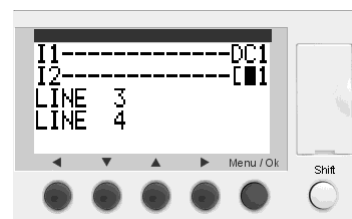
Move the cursor to the left edge of LINE2 using the Z1 and Z2 keys.



Z1 key Z2 key

4. Insert an I2 bit input and insert rungs up to the coil insertion area.

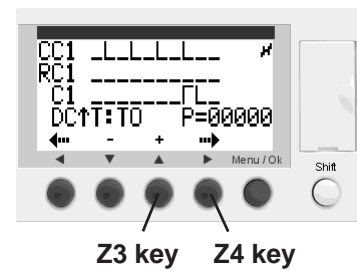
Follow the procedure in Step 2 to insert an [M1 auxiliary coil and move the cursor to the M position.



## Operating the PRO-iO2 Module

5. Press the Z3 key ([+]) button) three times while holding down the Shift button. A CC1 Counter coil is inserted.

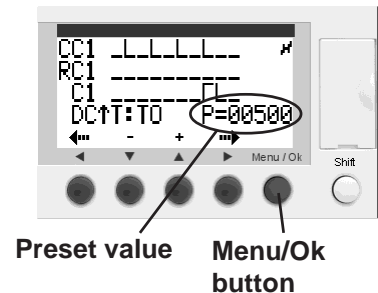
Place the cursor on the CC1 Counter coil and press the Z4 key (Param) while holding down the Shift button.



6. Press the Z4 key ([→]) button) four times. The preset value flashes.

Set the preset value to P=500 using the Z2 key ([-]) button) and Z3 key ([+]) button), and then press the Menu/Ok button.

Move the cursor to the left edge of LINE 3 using the Z1 and Z2 keys.

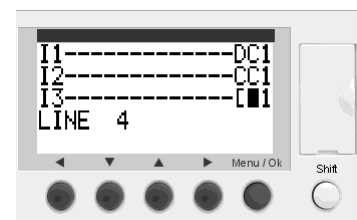


### Note:

Press and hold the Z2 or Z3 key to change the preset value setting in increments of 10 or 100.

7. Insert an I3 bit input and insert rungs up to the coil insertion area.

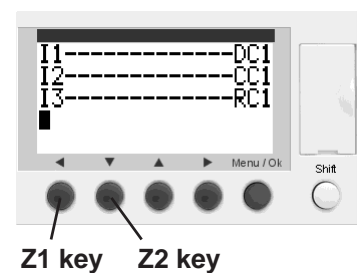
Follow the procedure in Step 2 to insert an [M] auxiliary coil and move the cursor to the M position.



8. Press the Z3 key ([+]) button) three times while holding down the Shift button. A CC1 Counter coil is inserted.

Press the Z1 key ([←]) button) once to place the cursor on the C (the first letter of CC1). Press the Z3 key ([+]) button) twice while holding down the Shift button. An RC1 reset coil is inserted.

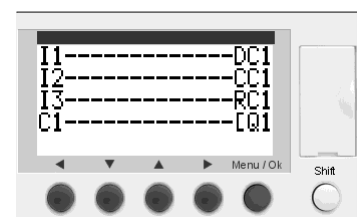
Move the cursor to the left edge of LINE 4 using the Z1 and Z2 keys.



9. Press the Z3 key ([+]) button) 11 times while holding down the Shift button. A C1 counter contact is inserted.

Extend the rung and then insert a Q1 bit output.

**Reference** “3.4.2 Bit Output (Symbol: Q)”



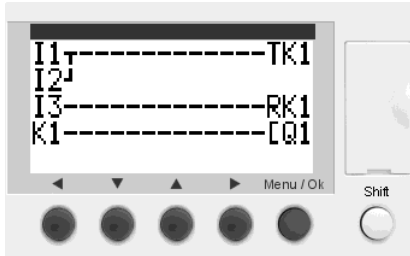


# Operating the PRO-iO2 Module

## 3.4.7 High-speed Counter (Symbol: K)

A High-speed Counter can be used as a contact or a coil. A pulse with a frequency of up to 1 kHz can be counted using a High-speed Counter.

The High-speed Counter input counts up with the pulse of input I1 (rising edge), and counts down with the pulse of input I2 (rising edge).



When used as a contact:

Display format	Function	Description
K1	a-contact	The contact turns ON/OFF when the High-speed Counter reaches the preset value.
k1	b-contact	

When used as a coil:

Display format	Description
TK1	Turning this coil from OFF to ON or from ON to OFF will start the counting operation. The current value of the Counter becomes 0 when it exceeds the upper limit 65535, and becomes 65535 when it exceeds the lower limit (0).
RK1	Turning this coil from OFF to ON will reset the current value of the Counter. TO mode: Resets the value to 0. FROM mode: Resets the value to the preset value.

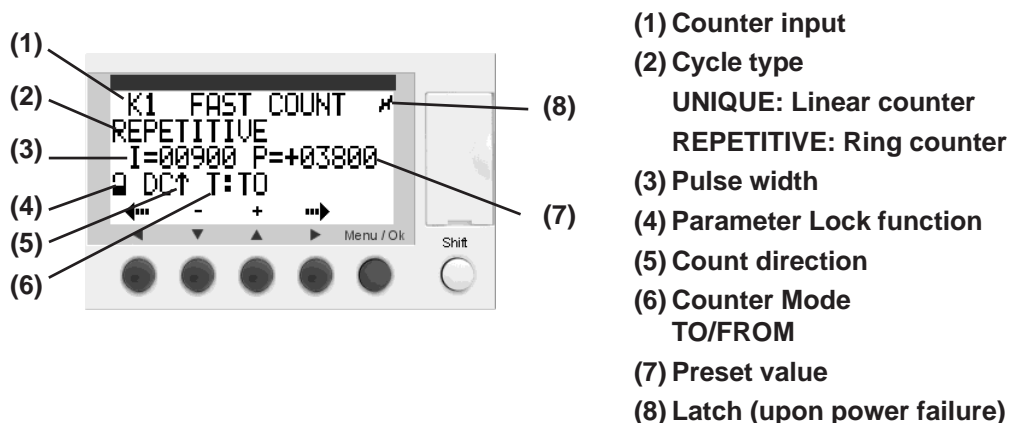
### ■ Overview



This section describes the following items required when using a Counter.

- Parameter display screen
- Latch function upon power failure
- Count operations
  - Linear Counter (TO mode and FROM mode)
  - Ring Counter (TO mode and FROM mode)
- Operating procedure

# Operating the PRO-iO2 Module

## ■ Parameter display screen



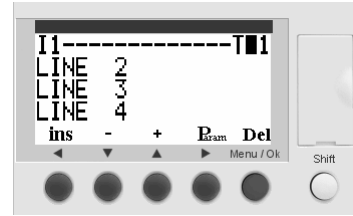
Display	Description
UNIQUE or REPETITIVE	<p>The cycle type can be selected from the following two options.</p> <p>UNIQUE: (Linear Counter) In the "TO" mode, the Counter counts up (I1 input) or counts down (I2 input) starting from the initial value 0, and the Counter output turns ON when the current value becomes equal to the preset value. In the "FROM" mode, the Counter counts up (I1 input) or counts down (I2 input) starting from the state of initial value=preset value, and the Counter output turns ON when the current value becomes 0.</p> <p>REPETITIVE: (Ring Counter) In the "TO" mode, the Counter counts up (I1 input) or counts down (I2 input) starting from the initial value 0, and the Counter output turns ON for the duration designated by the output time. At this timing, the current value is initialized to 0. In the "FROM" mode, the Counter counts up (I1 input) or counts down (I2 input) starting from the state of initial value=preset value, and the Counter output turns ON for the duration designated by the output time. At this timing, the current value is initialized to the preset value.</p>
I	Displayed when REPETITIVE is selected, and indicates the duration in which the Counter output is turned ON. The setting can be made in the range of 1 to 32767 (x 100 ms).
P	Represents the preset value. The value can be set within the range of 0 to 32767.
T	<p>The counter mode can be selected from the following two options:</p> <p>TO: The count direction that starts from 0 and counts to the preset value. The Counter output turns ON when the current value becomes equal to the preset value.</p> <p>FROM: The count direction that starts from the preset value and counts to 0. The Counter output turns ON when the current value becomes 0.</p>
	Enabling this option allows you to lock the preset value of the Counter function. When the lock is activated, the preset value will not be displayed on the PARAMETER menu.
K1 or k1	Used as a contact, and represents a Counter output.
	Enabling this option allows you to retain the preset value of the Counter in the event of a power failure.

# Operating the PRO-iO2 Module

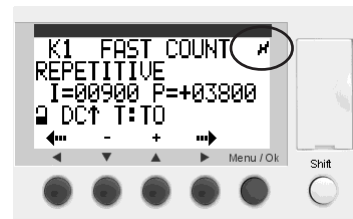
## ■ Latch function upon power failure

The Latch function saves the conditions set for a given function block in the event of a power failure, and retrieves the conditions when recovering from the power failure. The following section describes the setting procedure.

1. Place the cursor on the desired device symbol, and press the Z4 key (Param) while holding down the Shift button.



2. Place the cursor on the “lightning” icon on the right edge, and invert the display of the icon using the Z2 or Z3 key.

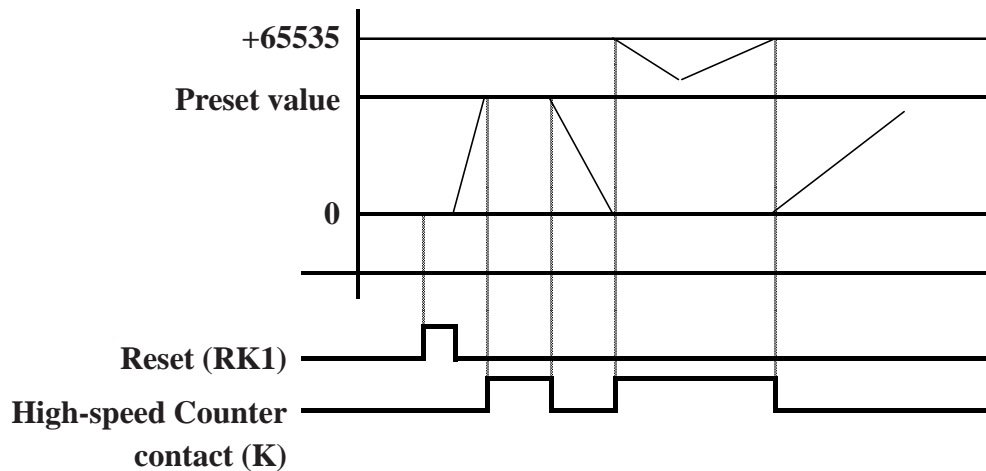


When latched      When unlatched

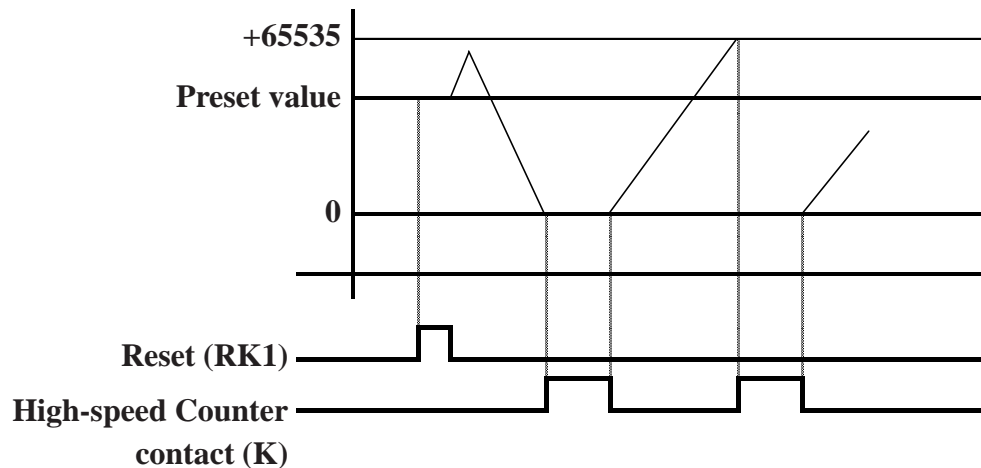


## ■ Count operation

### Linear Counter (TO mode)

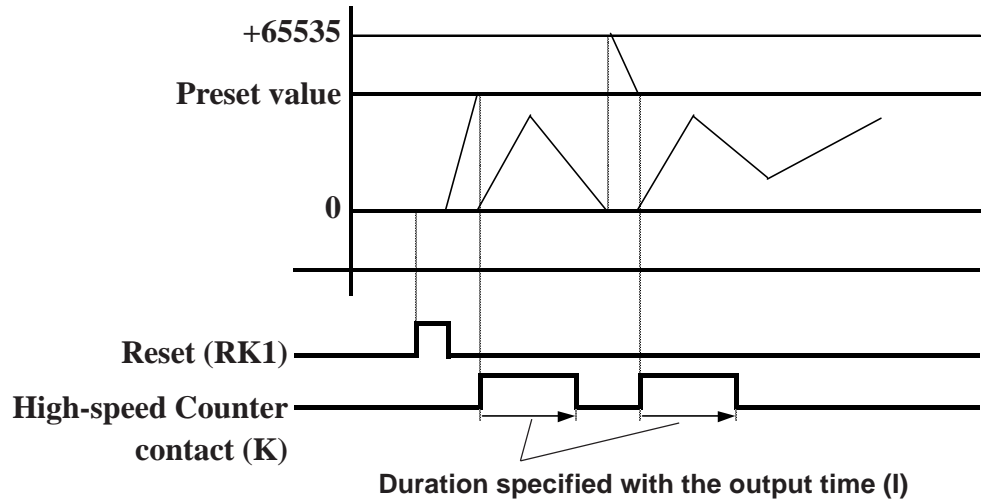


### Linear Counter (FROM mode)

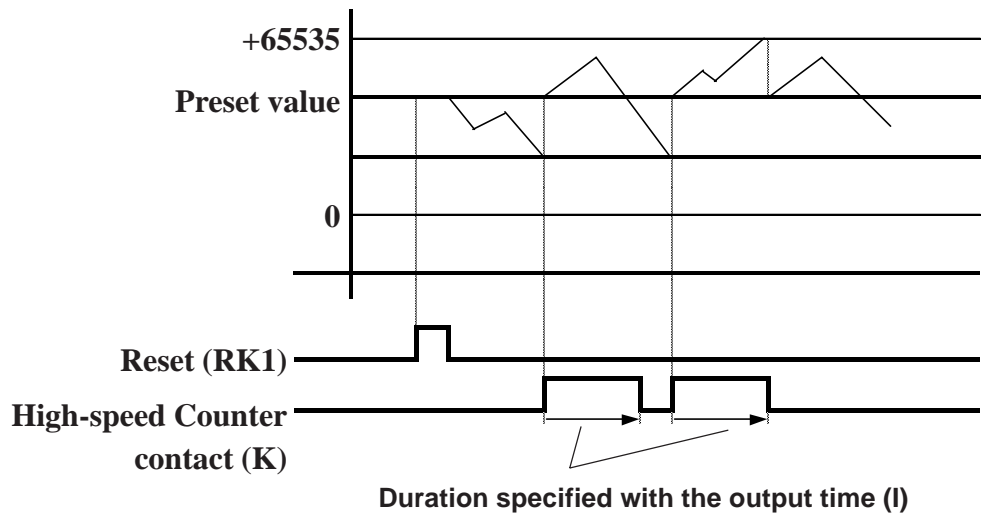


# Operating the PRO-iO2 Module

## Ring Counter (TO mode)



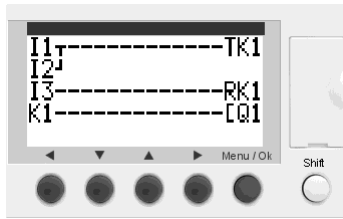
## Ring Counter (FROM mode)



# Operating the PRO-iO2 Module

## ■ Operating procedure

This section describes a circuit as illustrated in the screen below that counts the I1 input (counting-up) and I2 input (counting-down), and outputs the Q1 bit output when the preset value is reached.



Count operation : Linear Counter (TO mode)

Reset : I3 input signal

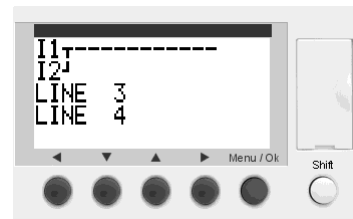
Preset value : 1500

Latch : Disabled

Parameter Lock : Disabled

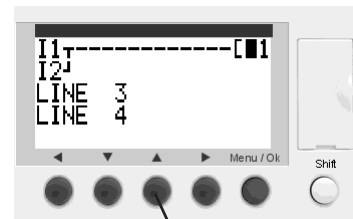
1. Create an OR circuit for bit inputs I1 and I2, and insert rungs up to the coil insertion area.

**Reference** *“3.4.1 Bit Input (Symbol: I)” and “3.4.2 Bit Output (Symbol: Q)”*



2. Press the Z3 key ([+]) button once while holding down the Shift button. An [M1 auxiliary coil is inserted.

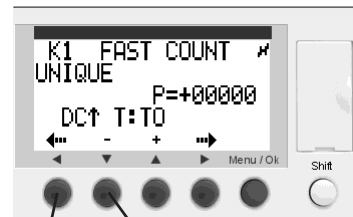
Release the Shift button and move the cursor to the M position.



Z3 key

3. Press the Z3 key ([+]) button four times while holding down the Shift button. A TK1 High-speed Counter coil is inserted.

Place the cursor on the TK1 High-speed Counter coil and press the Z4 key (Param) while holding down the Shift button.

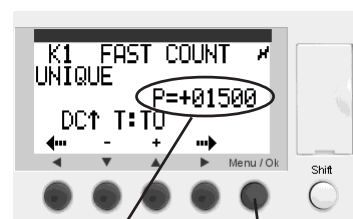


Z1 key Z2 key

4. Press the Z4 key ([→]) button four times and the preset value flashes.

Set the preset value to P=1500 using the Z2 key ([−]) button and Z3 key ([+]) button, and then press the Menu/OK button.

Move the cursor to the left edge of LINE3 using the Z1 and Z2 keys.



Preset value Menu/OK button



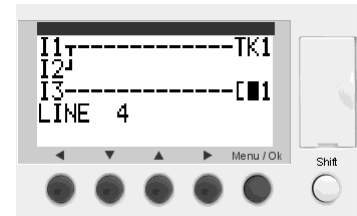
**Note:**

Press and hold the Z2 or Z3 key to change the preset time in increments of 10 or 100.

## Operating the PRO-iO2 Module

5. Insert an I3 bit input and insert rungs up to the coil insertion area.

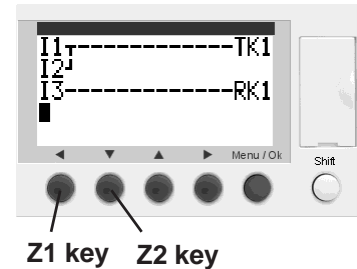
Follow the procedure in Step 2 to insert an [M1 auxiliary coil and move the cursor to the M position.



6. Press the Z3 key ([+]) button four times while holding down the Shift button. A TK1 High-speed Counter coil is inserted.

Press the Z1 key ([←]) button once to place the cursor on the T (the first letter of “TK1”). Press the Z3 key ([+]) button while holding down the Shift button to insert an RK1 reset coil.

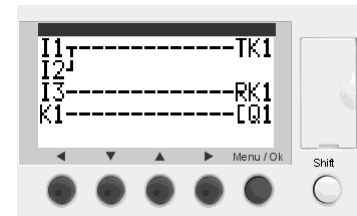
Move the cursor to the left edge of LINE4 using the Z1 and Z2 keys.



7. Press the Z3 key ([+]) button 13 times while holding down the Shift button. A K1 Counter contact is inserted.

Extend the rung and insert a Q1 bit output.

**Reference** “3.4.2 Bit Output (Symbol: Q)”



## Operating the PRO-iO2 Module

### 3.4.8 Counter Comparator (Symbol: V)

---

A Counter Comparator can only be used as a contact. A Counter Comparator is used to compare the measured counter value with the internal reference value. It is also used to compare two measured counter values. For details:

**Reference** *“PRO-iO2 Editor Operation Manual”*



- **When using the Counter Comparator function, it is necessary to configure the parameters using the PRO-iO2 Editor. The parameters cannot be set on the PRO-iO2 module.**
- **The Counter Comparator does not support a negative value. The Counter Comparator function may not operate properly when values are set such that the sum of the count value and offset value becomes a negative value.**

**<Example>**

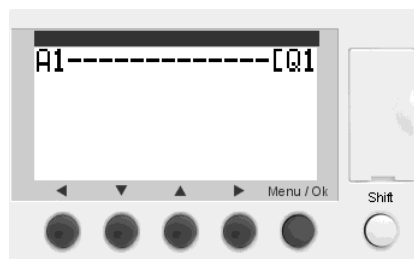
**When making settings such as “Cx-5>Cy”, make sure to designate the settings as “Cx>Cy+5”.**

Display format	Function	Description
V + Number	a contact	The contact turns ON/OFF when the comparison formula is satisfied.
v + Number	b contact	

## 3.4.9 Analog Comparator (Symbol: A)

---

An Analog Comparator can only be used as a contact. An Analog Comparator is used to compare a measured analog value with an internal preset value. It is also used to compare two measured analog values.



Display format	Function	Description
A + Number	a contact	The contact turns ON/OFF when the comparison formula is satisfied.
a + Number	b contact	

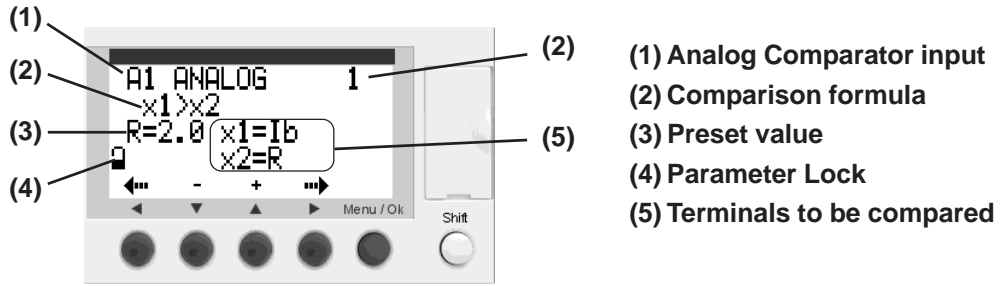
An Analog Comparator is used for the following operations.

- Comparing a measured analog value with an internal preset value.
- Comparing two measured analog values.
- Comparing two measured analog values with the hysteresis value.



# Operating the PRO-iO2 Module

## ■ Parameter display screen



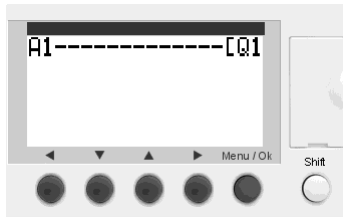
## ◆ Comparison formula

Type of comparator	Description
$x1 > x2$	The contact turns ON when the formula “ $x1 > x2$ ” is true.
$x1 \geq x2$	The contact turns ON when the formula “ $x1 \geq x2$ ” is true.
$x1 = x2$	The contact turns ON when the formula “ $x1 = x2$ ” is true.
$x1 \neq x2$	The contact turns ON when the formula “ $x1 \neq x2$ ” is true.
$x1 \leq x2$	The contact turns ON when the formula “ $x1 \leq x2$ ” is true.
$x1 < x2$	The contact turns ON when the formula “ $x1 < x2$ ” is true.
$x1 - H \leq x2 \leq x1 + H$	<p>The contact turns ON when the formula “<math>x1 - H \leq x2 \leq x1 + H</math>” is true.</p>

# Operating the PRO-iO2 Module

## ■ Operating procedure

This section describes the procedure for creating a circuit as illustrated in the screen below that measures the Ib analog input, and outputs a Q1 bit output when the value is below the preset value of 5 V.



Analog input terminal : Ib

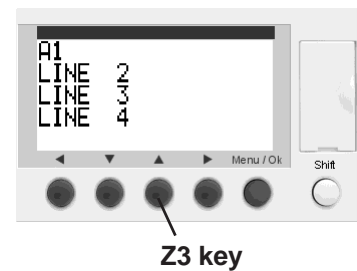
Comparison operator :  $x1 \leq x2$

$Ib \leq R$  (R = 5.0)

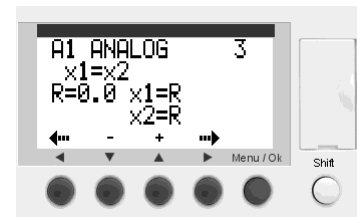
Preset value : 5.0

Parameter Lock : Disabled

1. Press the Z3 key ([+]) button) 17 times while holding down the Shift button. The A1 Analog Comparator contact is inserted.

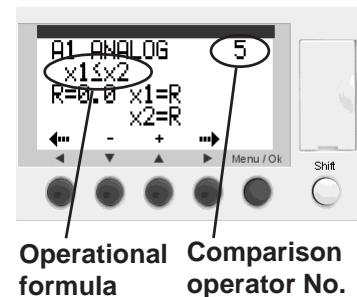


2. Place the cursor on the A1 Analog Comparator and press the Z4 key (Param) while holding down the Shift button.



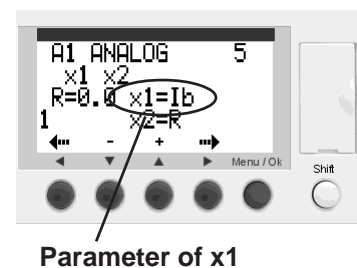
3. Press the Z4 key ([→]) button) once. The comparison operator No. flashes.

Set the comparison operator No. to “5 (x1 ≤ x2)” using the Z2 key ([−]) button) and Z3 key ([+]) button).



4. Press the Z4 key ([→]) button) twice. The parameter of x1 flashes.

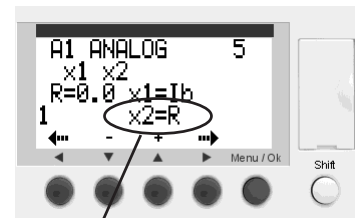
Set the parameter to “Ib” using the Z3 key ([+]) button).



## Operating the PRO-iO2 Module

5. Press the Z4 key ([→]) button) once. The parameter of x2 flashes.

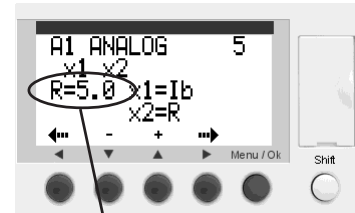
Set the parameter to “R” (preset value) using the Z3 key ([+]) button).



Parameter of x2

6. Press the Z4 key ([→]) button) once. The parameter of R (preset value) flashes.

Set the parameter to “R= 5.0” using the Z2 key ([-]) button) and Z3 key ([+]) button), and then press the Menu/Ok button.



Parameter of R  
(preset value)

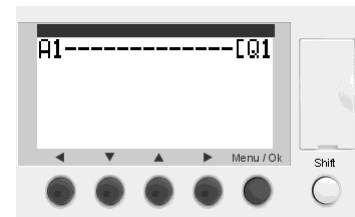


**Note:**

Press and hold the Z2 or Z3 key to change the preset value setting in increments of 10.

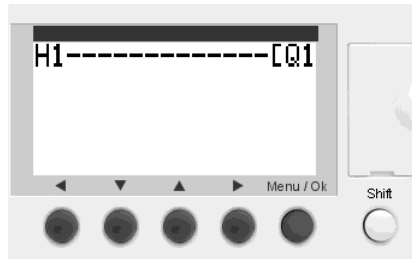
7. Insert rungs up to the coil insertion area and insert a Q1 bit output.

**Reference** “3.4.2 Bit Output (Symbol: Q)”



## 3.4.10 Calendar (Symbol: H)

A Calendar can only be used as a contact. A Calendar is used to activate the contact at a preprogrammed time on the day of the week. It is also capable of controlling the output status for four channels (A, B, C, and D).



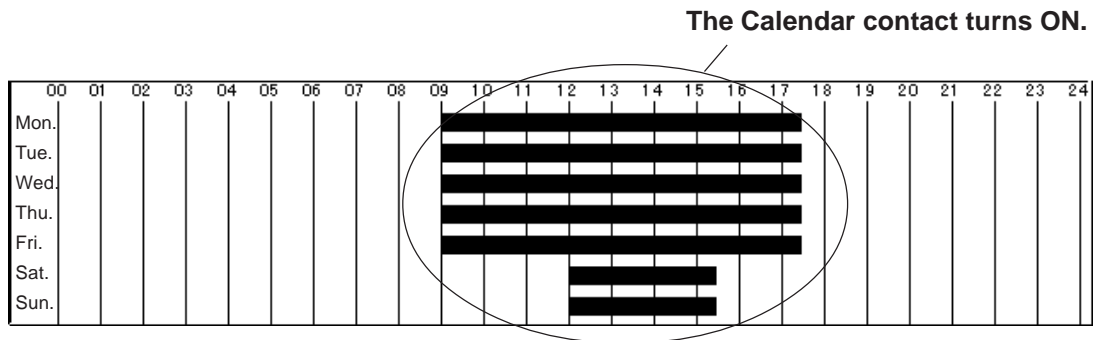
Display format	Function	Description
H + Number	a contact	The contact turns ON/OFF for the specified period of time.
h + Number	b contact	

### ■ Outline of the operation

The Calendar contact turns ON during the following period of time when the parameters are set up as described below.

Channel A: Monday to Friday (9:00 to 17:30)

Channel C: Saturday to Sunday (12:00 to 15:30)

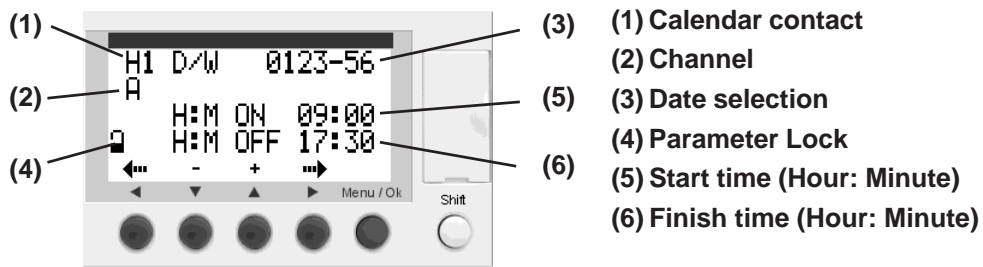



**Note:**

Specify the ON/OFF Time setting in the range between 0:00 and 23:59. To turn ON the contact from 21:00 to 5:00, adjust the settings so that the contact will be OFF from 21:00 to 5:00, and then assign a "b contact" to the Calendar contact you placed in the program.

# Operating the PRO-iO2 Module

## ■ Parameter display screen



Display	Description
A	Designate the channel. The output status can be controlled for four channels (A, B, C, and D).
DW	Designated the day of the week. Select "-" (hyphen) for the day on which the operation will be deactivated. 0: Monday   1: Tuesday   2: Wednesday   3: Thursday 4: Friday   5: Saturday   6: Sunday
	Use this option to lock the parameters of the Calendar. When the lock is activated, the preset value will not be displayed on the PARAMETER menu.
H: M ON	Designate the start time of the operation in "hour: minute" (00:00 to 23:59) format.
H: M OFF	Designate the finish time of the operation in "hour: minute" (00:00 to 23: 59) format.



- **When the ON time settings for two channels overlap each other, the channel with the later time setting will not operate.**

**<Example>**

**When Channel A is set to turn ON from 10:00 to 12:00, and Channel B is set to turn ON from 11:00 to 13:00, the contact will be turned ON only from 10:00 to 12:00. When making such a setting, be sure to set it so that the contact will be turned ON from 10:00 to 13:00 by one channel.**

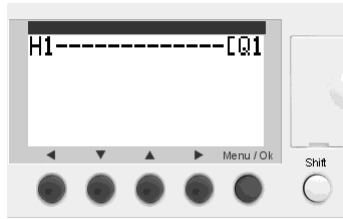
- **The same time cannot be entered for both the ON and OFF times of the same channel.**

# Operating the PRO-iO2 Module

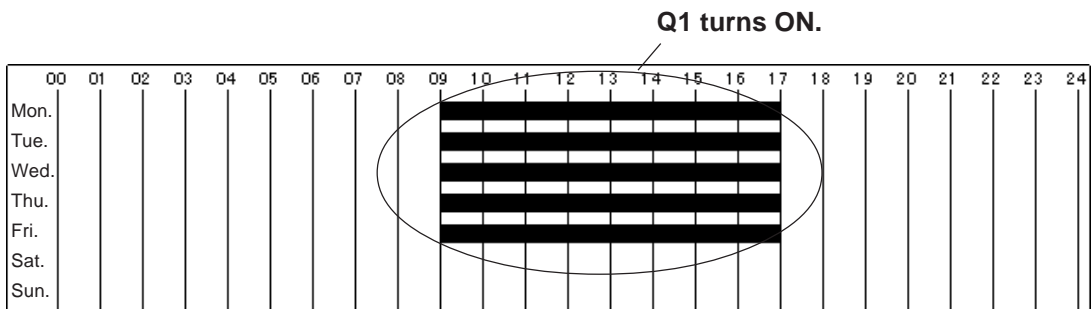
## ■ Operating procedure

This section describes the procedure for creating a circuit that outputs the Q1 bit output during the following period of time.

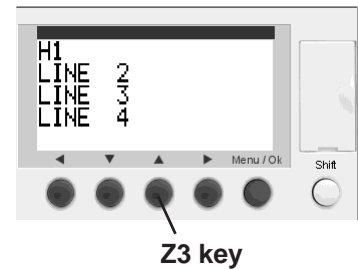
Channel A : Monday to Friday (9:00 to 17:00)



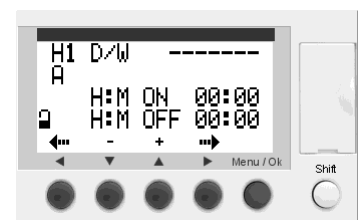
Channel : A  
 Date selection : Monday to Friday  
 Start time : 9:00  
 Finish time : 17:00  
 Parameter Lock : Disabled



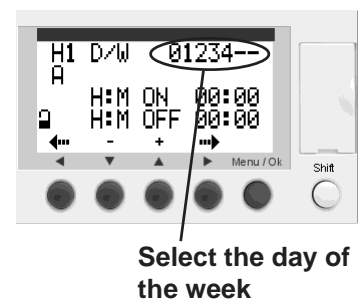
1. Press the Z3 key ([+]) button 19 times while holding down the Shift button. An H1 Calendar contact is inserted.



2. Place the cursor on the H1 Calendar contact and press the Z4 key (Param) while holding down the Shift button.



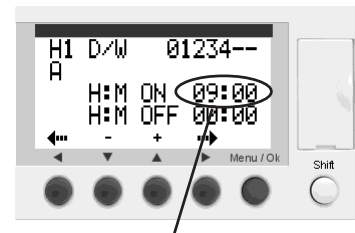
3. Press the Z4 key ([→]) button three times. The hyphen for the date selection flashes. As shown in the illustration on the right, change the settings from “-” (hyphens) to “0” (Monday) through “4” (Friday) using the Z3 and Z4 key. Leave the settings of “5” (Saturday) and “6” (Sunday) unchanged “-” (hyphens).



## Operating the PRO-iO2 Module

4. Press the Z4 key ([→]) button) once. The start time flashes.

Change the setting to “9:00” using the Z2 key ([–]) button) and Z3 key ([+]) button).



**Specify the start time.**

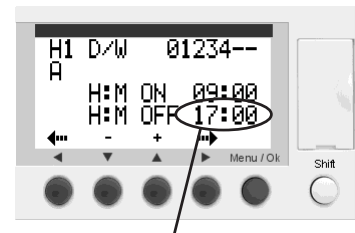


**Note:**

Press and hold the Z2 or Z3 key to change the preset value setting in increments of 10.

5. Press the Z4 key ([→]) button) once. The finish time flashes.

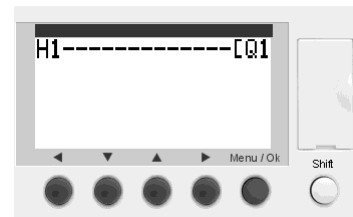
Change the setting to “17:00” using the Z2 key ([–]) button) and Z3 key ([+]) button), and then press the Menu/OK button.



**Specify the finish time.**

6. Insert rungs up to the coil insertion area and insert a Q1 bit output.

**Reference** “3.4.2 Bit Output (Symbol: Q)”



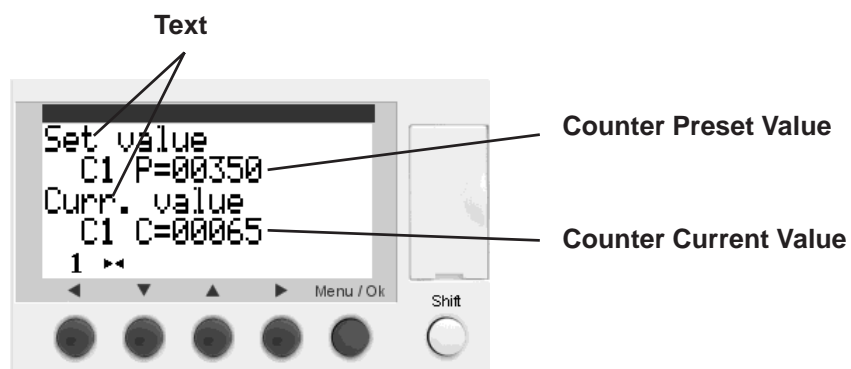
## 3.4.11 Text Block (Symbol: TX)

A Text block can only be used as a coil. A Text block is used to display text (alphabets and numerals) on the screen on the PRO-iO2 module, and display values for a Timer or Counter. For details,

**Reference** *“PRO-iO2 Editor Operation Manual”*



**When using the Text block function, it is necessary to configure the parameters via the PRO-iO2 Editor. The parameters cannot be set on the PRO-iO2 module.**



Display format	Description
TX + Number	Turning this coil from OFF to ON will display text on the PRO-iO2 module's screen.
RX + Number	Turning this coil from OFF to ON will reset the text display and return the screen to the normal display.



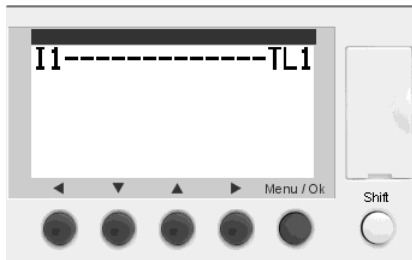
# Operating the PRO-iO2 Module

## 3.4.12 LCD Backlight (Symbol: TL)

The LCD Backlight can only be used as a coil. This function is used to turn on the backlight of the PRO-iO2 module's screen.



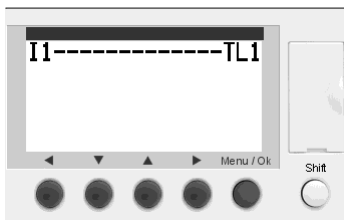
**Note:** Pressing the operation button on the PRO-iO2 module will turn on the backlight for 30 seconds regardless of the ON/OFF status of the LCD Backlight coil.



Display format	Description
TL1	Turning this coil from OFF to ON will turn on the backlight of the screen of the PRO-iO2 module.

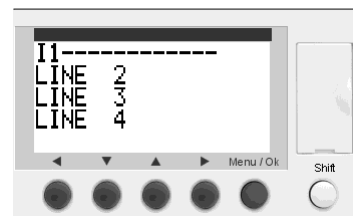
### ■ Operating procedure

This section describes the procedure for creating a circuit as illustrated in the following screen, in which the backlight of the PRO-iO2 module's screen turns on when the I1 bit input is turned ON.



1. Insert an I1 bit input and insert rungs up to the coil insertion area.

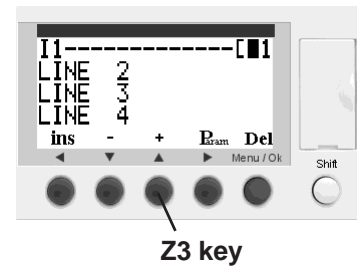
**Reference** “3.4.1 Bit Input (Symbol: I)”



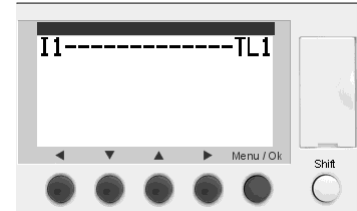
## Operating the PRO-iO2 Module

2. Press the Z3 key ([+]) button once while holding down the Shift button. An [M1 auxiliary coil is inserted.

Release the Shift button and move the cursor to the M position.



3. Press the Z3 key ([+]) button six times while holding down the Shift button. A TL1 LCD Backlight coil is inserted.



# Operating the PRO-iO2 Module

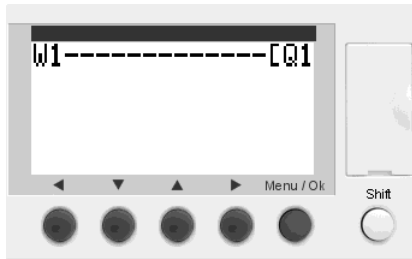
## 3.4.13 Summertime (Symbol: W)

A Summertime function can only be used as a contact. A Summertime contact turns on during the period of summer daylight savings time.



**When using a Summertime contact, it is necessary to select the time zone on the Menu Screen of the PRO-iO2 module (CONFIGURATION/CHANGE SUMM/WINT).**

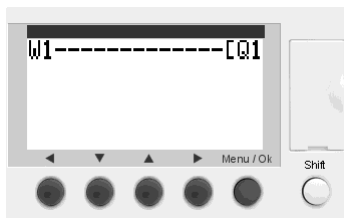
**Reference** “3.2 LCD Display and Menu Screen”



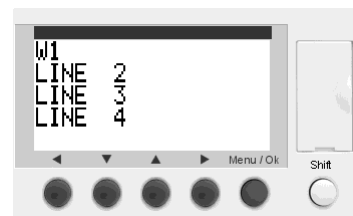
Display format	Function	Description
W + Number	a contact	The contact turns ON during the period of summer daylight savings time.
w + Number	b contact	

### ■ Operating procedure

This section describes the procedure for creating a circuit as illustrated in the following screen. In this screen the W1 Summertime contact turns ON and the Q1 bit output turns ON during the period of summer daylight savings time.

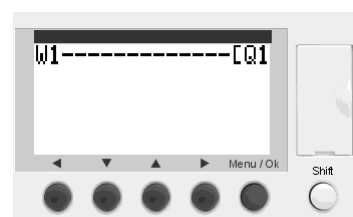


1. Press the Z2 key ([–] button) twice while holding down the Shift button. A W1 Summertime contact is inserted.



2. Insert rungs up to the coil insertion area and then insert a Q1 bit output.

**Reference** “3.4.2 Bit Output (Symbol: Q)”



# Chapter 4 Backup

1. PRO-iO2 Memory Pack
2. Memory Backup upon a Power Interruption

This section describes the procedure for making backup data for the PRO-iO2.

## 4.1 PRO-iO2 Memory Pack

This section describes the special Memory Pack unit for the PRO-iO2 (DR2-MEM01) that is used to store logic programs you have created. The PRO-iO2 Memory Pack is available as an option.



*The PRO-iO2 Memory Pack can be used only with the DR\*-B\*\*\*\*\*. With the DR2-D\*\*\*\*\*, backup data and logic programs cannot be transferred using the PRO-iO2 Memory Pack.*

### CAUTION

When handling the PRO-iO2 Memory Pack, avoid the following. Otherwise, the recorded data will be lost or a malfunction will result.

- Do not drop the PRO-iO2 Memory Pack unit, or subject it to excessive vibration.
- Do not soak the product in water or moisten the product with water.
- Do not touch the connector terminals. Doing so can cause an electric shock.
- Do not disassemble or remodel the PRO-iO2 Memory Pack.

## Backup (PRO-iO2 Memory Pack)

You can transfer logic programs from the PRO-iO2 memory pack to the PRO-iO2 module and vice-versa, via the PRO-iO2 module **Transfer** menu.

For menu screen,

**Reference** “3.2 LCD Display and Menu Screen”

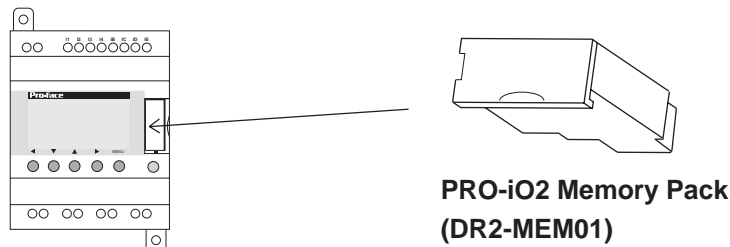
Select from one of the following program transfer directions:

1. **PRO-iO** → **Memory** :

From the PRO-iO2 module to the PRO-iO2 memory pack.

2. **Memory** → **PRO-iO** :

From the PRO-iO2 memory pack to the PRO-iO2 module.



**Be sure to disconnect power to the PRO-iO2 module when installing the PRO-iO2 Memory Pack.**



- Logic programs saved on the PRO-iO2 Memory Pack can be transferred from a DR\*-B\*\*\*\*\* to another DR\*-B\*\*\*\*\* module.
- The PRO-iO2 Memory Pack is an Electrically Erasable Programmable Read Only Memory (EEPROM). You can write data to the Memory Pack approximately 100,000 times.

### ■ Backup Items

The following items will be saved in the PRO-iO2 Memory Pack:

- Logic Program
- Password
- Scan Time and Watchdog Settings
- 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.)

## 4.2 Memory Backup during a Power Outage

---

### 4.2.1 Memory

---

The PRO-iO2 module uses EEPROM memory, which stores the following data items.

#### ■ Backup Items

- Logic Program
- RUN/STOP status of the Module
- Password
- Scan Time and Watchdog Settings
- Input Filter Time
- If the “Use the Z Keys as contacts” setting is enabled/disabled. (Excluding the DR2-D\*\*\*\*\*)
- The Latched data (Data retained at power failure)



- **The Latched data includes the following items. Refer to the corresponding page for the setup procedure.**

M: Auxiliary relay: **Reference** “3.4.4 Auxiliary Coils”

Q: Bit Output: **Reference** “3.4.2 Bit Output”

T: Timer: **Reference** “3.4.5 Timer”

C: Counter: **Reference** “3.4.6 Counter”

K: High-speed Counter: **Reference** “3.4.7 High-speed Counter”

### 4.2.2 Primary Battery

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The PRO-iO2 module is equipped with an internal primary battery. The internal primary battery is used for operating the clock if there is a power failure.

(DR2-D\*\*\*\*\* is not equipped with an internal primary battery.)

The service life of the primary battery is approximately 10 years (at 25°C). The primary battery cannot be replaced.

#### ■ Backup Items

Current Time: The current time clock also includes the year, month, date, and day of the week.

# *Memo*

# Chapter

# 5 Error Messages

## 1. Error Messages

This chapter describes the error messages displayed on the PRO-iO2 module.

## 5.1 Error Messages

### ■ Messages

One of the following messages will be displayed when an inappropriate operation is performed on the PRO-iO2 module.

Message	Cause	Solution
NO PARAMETER	The PARAMET function was accessed when no parameter existed.	Confirm that the element's parameter values can be set.
T RANSF.ERR	Connection to the PC was broken during data transfer.	Check the connection between the PRO-iO2 module and the PC.
T RANSFER ERR: NO MEMORY	The Memory Pack was not set up correctly when transferring the program.	Confirm that the Memory Pack has been correctly set up.
T RANSFER ERR: CONFIG INCOMPAT	The properties of the program to be transferred are incompatible with the PRO-iO2 specifications. (e.g. The Calendar function is used in the program although the destination PRO-iO2 module does not support the Calendar function.)	Check the type of program you are transferring to the PRO-iO2 module. Be sure to select a program that is compatible with the PRO-iO2 specifications.
T RANSFER ERR: VERSION INCOMPAT	The firmware version of the PRO-iO2 modules is incompatible.	Select the [Module/Firmware Update] command on the PRO-iO2 Editor to upgrade the version.
Outputs are displayed blinking on the main screen	Short-circuit or overload has been generated by some output.	Remove the short-circuit cause or overload from the output, and turn the PRO-iO2 module OFF to cancel the screen's blinking display. Then, put the PRO-iO2 module in RUN mode again.



## Error Messages

### ■ Errors

The following list describes the troubleshooting procedure for each Error No. displayed by selecting [Menu/FAULT].

No.	Cause	Solution
00	No error is detected.	—
01	Error in transferring data to the Memory Pack.	Check that the Memory Pack is loaded properly.
02	Error in writing data to the clock.	Set the time again by selecting the [Menu/CHANGE D/H] command.
50, 52, 58	Firmware or logic program is destroyed.	Transfer the firmware and logic program again. The firmware can be transferred by selecting the [Module/Firmware Update] command on the PRO-iO2 Editor.
51	The scan time is shorter than the execution time of the logic program.	When it is necessary to precisely sample the inputs/outputs on the program, specify a longer scan time. When precise sampling is not required, select the [Menu/CYCLE & WATCHDOG] command, and set the parameter to INACTIVE (disabled).
54	Error between the I/O extension modules	An error is detected in the connection between the PRO-iO2 module and I/O extension module. Turn off the power supply, and reconnect the extension module with the PRO-iO2 module again.
59	At the start of RUN mode: The program is incompatible with the connected PRO-iO2 module. The program cannot be switched to the RUN mode.	Check the model number of the PRO-iO2 to which the extension module is connected.
61	At the start of RUN mode: The program is incompatible with the connected I/O extension module.	Check the model number of the PRO-iO2 to which the extension module is connected.
62	The versions do not agree when a logic program is read from the Memory Pack.	Check the version information again by selecting the [Menu/VERSION] command.
63	The settings are incompatible with the hardware settings when a logic program is read from the Memory Pack.	Check the hardware information again by selecting the [Menu/CONFIGURATION] command.