

PRO-iO2 Editor Operation Manual

Preface

Thank you for purchasing Pro-face's PRO-iO2 Editor Software.

PRO-iO2 Editor is a Windows®-based, easy-to-use software.

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

<Notice>

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Essential Safety Precautions

This manual includes procedures that must be followed to operate the PRO-iO2 Editor correctly and safely. Be sure to read this manual and any related materials thoroughly to understand the correct operation and functions of this software.

■ Safety Icons

Throughout this manual the following icons are provided next to PRO-iO2 Editor operation procedures requiring special attention, and provide essential safety information. These icons indicate the following levels of danger:

**DANGER**

Indicates situations where severe bodily injury, death or major equipment damage will occur.

**WARNING**

Indicates situations where severe bodily injury, death or major equipment damage can occur.

**CAUTION**

Indicates situations where bodily injury or machine damage can occur.

**DANGER**

- **Sample circuits and application examples in this manual are listed for your reference. When introducing this product, make sure to check the functions and safety of the system, equipment, and devices before starting operation.**
- **This product is not designed on the assumption that it will be used under conditions and environments described in this manual, or for applications requiring extremely high reliability and safety such as equipment and systems related to nuclear power, electrical power, aerospace, medical, and passenger transportation vehicles. This product cannot be used for these applications.**
- **When introducing this product with equipment in which breakdown of the PRO-iO2 will cause serious accidents or damage, make sure to prepare a backup or install a fail-safe system*1.**

**1 Refers to a device that minimizes damage caused by faulty operation by the operator or malfunctions in sensors or controllers.*

 WARNING

- The PRO-iO2 is manufactured as a general-purpose product for general industries, and is not designed and manufactured as a product to be used in equipment or systems used under conditions involving human lives. Therefore, make sure not to use this product for control involving human lives and serious physical loss or damage.
- Do not turn off the power to the PC while operating the program.
- Do not alter the content of files included in this product using the Text Editor or other systems.

 CAUTION

- Be sure this product is operated only by personnel trained in control system programming and design.

■ Cautions on handling disks

To prevent damage and breakdown of disks, follow the precautions below:

- Make sure to remove the disk before turning on/off the power to the PC.
- Do not remove a CD-ROM while the indicator lamp for the disk drive is illuminated.
- Do not touch the recording surface of a CD-ROM.
- Do not leave the disks in a location where the temperature becomes extremely high or low, or in a humid or dusty environment.

Documentation Conventions

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

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

About PRO-iO2 Editor

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

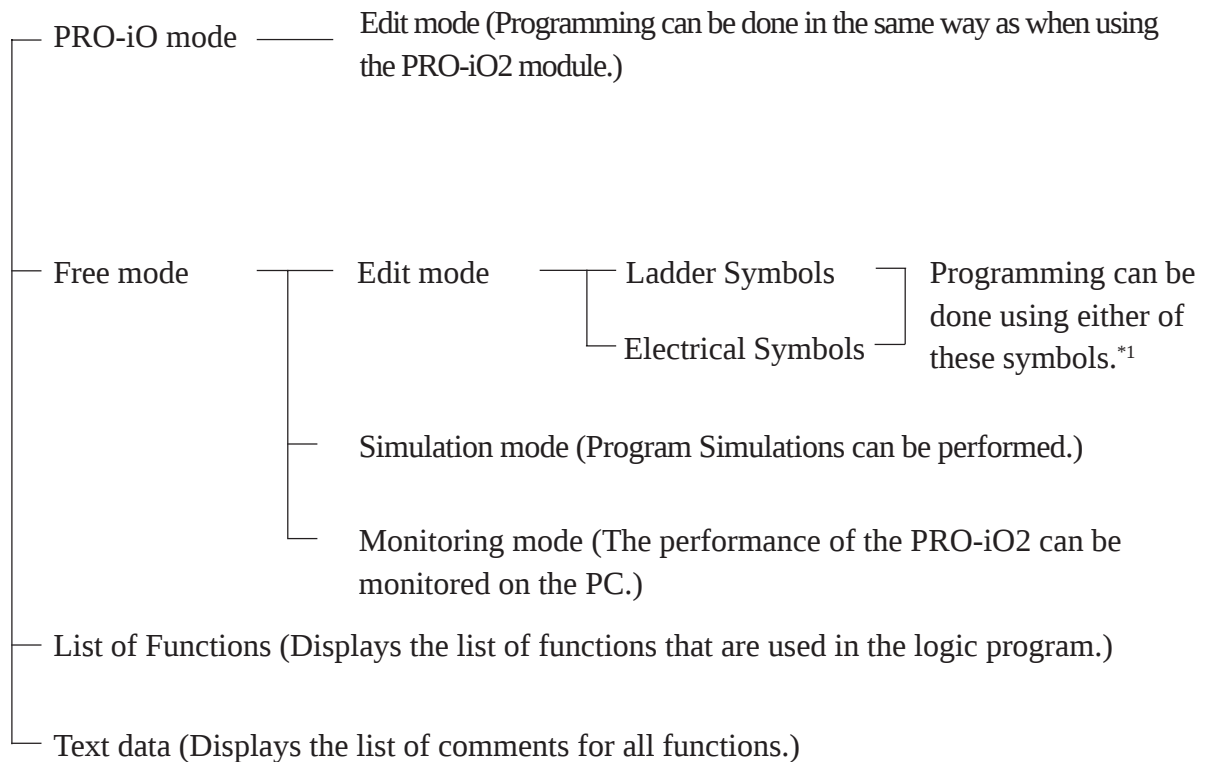
- 2 edit modes:
 - Ladder Symbols
 - Electrical Symbols
- Simulation feature (The PRO-iO2 main module is not required to determine if the ladder program operates correctly)
- Monitor PRO-iO2 module operation via the PC (PRO-iO2 Editor)
- Transfer circuit data from the PC to the PRO-iO2 module, or vice-versa
- Program Validation Check Feature (Between the PRO-iO2 main module and PRO-iO2 Editor)
- Creating Display Messages

Chapter 1 PRO-iO2 Editor

◆ Overview

1.1 Overview

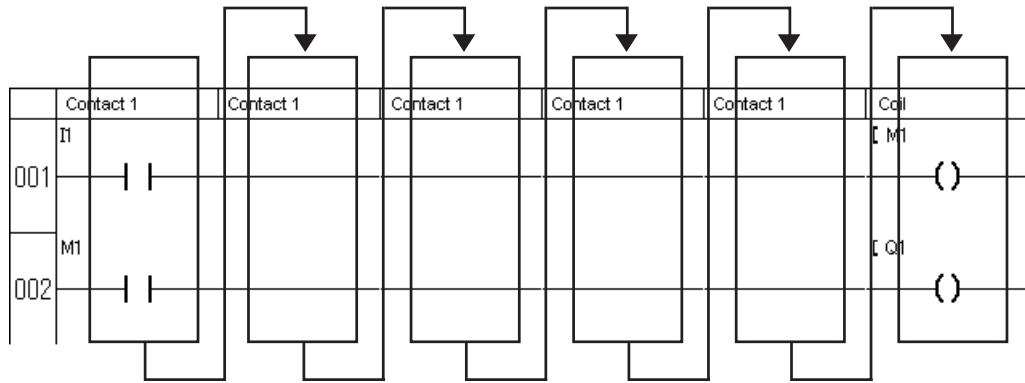
The chart below shows PRO-iO2 Editor Design.



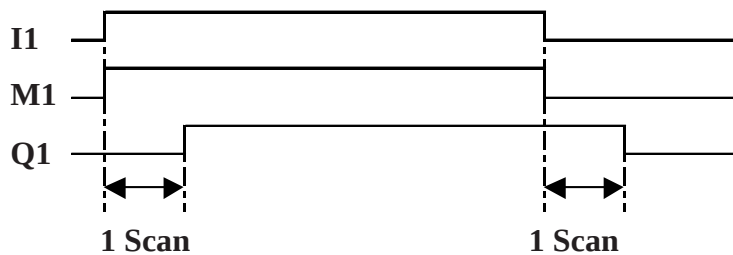
*1 For symbol details,
➤ **Reference** ➤ “1.1.3 Display Symbols”

1.1.1 Logic Program Execution

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

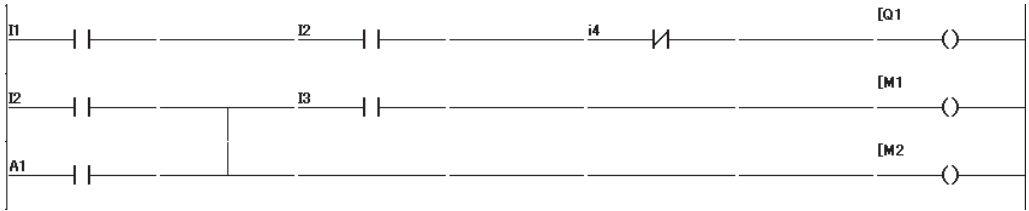


In the above logic program, coil M1 turns ON when input I1 turns ON. However, output Q1 turns ON after a delay of one scan interval.



1.1.2 Maximum Number of Program Lines

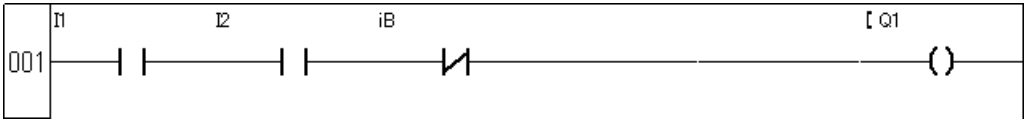
A program rung can have a maximum of five contacts and one coil. A maximum of 120 rungs may be used. The following example consists of three (3) rungs.



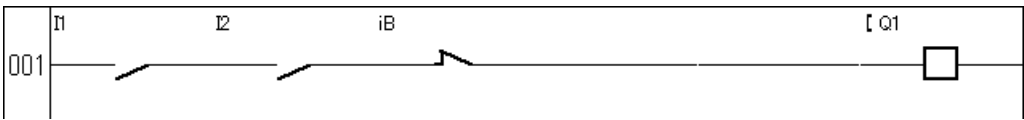
1.1.3 Display Symbols

When using PRO-iO2 Editor to create logic program data, the following symbols are available in Edit mode’s Program.

Ladder Symbols



Electrical Symbols



1.1.4 List of Functions by Model

Auxiliary coils (28 points), Timers (16 points), Counters (16 points), and Counter Comparators (8 points) are common to all model types.

Model	Z key 4 points	High-Speed Counter 1 point	Analog Comparator 16 points	Calender 8 points	Text Block 16 points	LCD Backlight 1 point	Summer Time 1 point
DR2-B121BD	Y	Y	Y	Y	Y	Y	Y
DR2-B201BD	Y	Y	Y	Y	Y	Y	Y
DR2-D101BD	N	Y	N	N	N	N	N
DR2-D201BD	N	Y	Y	N	N	N	N
DR2-B121FU	Y	N	N	Y	Y	Y	Y
DR2-B201FU	Y	N	N	Y	Y	Y	Y
DR2-D101FU	N	N	N	N	N	N	N
DR2-D201FU	N	N	N	N	N	N	N
DR3-B101BD	Y	Y	Y	Y	Y	Y	Y
DR3-B261BD	Y	Y	Y	Y	Y	Y	Y
DR3-B101FU	Y	N	N	Y	Y	Y	Y
DR3-B261FU	Y	N	N	Y	Y	Y	Y

1.1.5 Contacts / Coils

■ Contacts

Symbol	Number	No. of Contacts	Description
I	I1 to I*	*1	a contact (Discrete input)
i	i1 to i*	*1	b contact (Discrete input)
Z ^{*2}	Z1 to Z4	4	a contact (Z key)
z ^{*2}	z1 to z4	4	b contact (Z key)
M	M1 to MV	28	a contact (Auxiliary coil)
m	m1 to mV	28	b contact (Auxiliary coil)
Q	Q1 to Q*	*1	a contact (Discrete output)
q	q1 to q*	*1	b contact (Discrete 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 ^{*3}	K1	1	a contact (High-Speed Counter)
k ^{*3}	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 ^{*4}	A1 to A8	16	a contact (Analog Comparator)
a ^{*4}	a1 to a8	16	b contact (Analog Comparator)
H ^{*2}	H1 to H8	8	a contact (Calendar)
h ^{*2}	h1 to h8	8	b contact (Calendar)
W ^{*2}	W1	1	a contact (Summer Time)
w ^{*2}	w1	1	b contact (Summer Time)

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

▼Reference▲ PRO-iO2 User Manual “PRO-iO2 Types”

For the number of points when an expansion I/O unit is connected,

▼Reference▲ PRO-iO2 User Manual “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 ^{*2}	TK	TK1	1	High-speed counter coil
	RK	RK1	1	High-speed counter reset coil
X ^{*3}	TX	TX1 to TXG	16	Text show coil
	RX	RX1 to RXG	16	Text hide coil
L ^{*3}	TL	TL1	1	Turns ON LCD backlight

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

▼Reference▲ PRO-iO2 User Manual “PRO-iO2 Types”

For the number of points when an expansion I/O unit is connected,

▼Reference▲ PRO-iO2 User Manual “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.

Chapter

2 Operating the PRO-iO2 Editor

1. Startup and Initial Settings
2. Creating Contacts and Lines
3. Creating Coils
4. Coil Types
5. Using the “Z” Keys
6. Creating Timers
7. Creating Counters
8. Creating High-speed counters
9. Creating Counter Comparators
10. Creating Analog Comparators
11. Creating Calendars
12. Creating Text
13. Creating LCD Backlight
14. Creating Summer time

◆ Logic Program Creation

PRO-iO Module Program Creation

▼ **Reference** ▲ “PRO-iO2 User Manual”

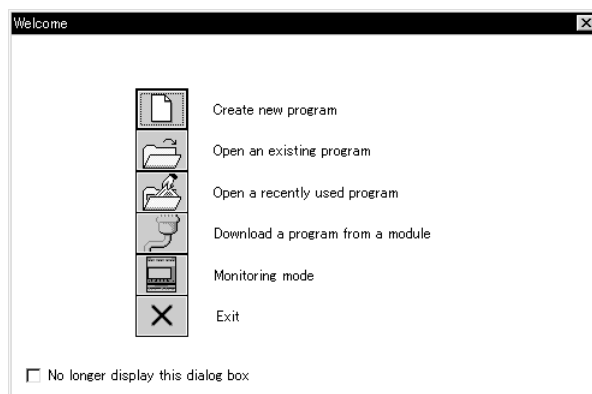
PRO-iO Editor Software Program Creation

▼ **Reference** ▲ “Chapter2 Operating the PRO-iO2 Editor”

2.1 Startup and Initial Settings

2.1.1 Selecting Files and Unit Type

1. When the PRO-iO2 Editor program is started, the following screen appears. Select the desired item, and click on the corresponding icon.



Note:

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

Operating the PRO-iO2 Editor

2. Selecting the “Create new program” command or “New” from the File menu will display the following Module Selection screen.

Clicking on the type of your PRO-iO2 from the “Select the module category” screen will display the model on the “Select the type of PRO-iO module to program” on the bottom of the screen. For the model type of your PRO-iO2 module,

▼ **Reference** ▲ *PRO-iO2 User Manual “Model Identification”*

Select the model type of the PRO-iO2 module you want to use from the model column, and click the [Next] button. The screen changes to the Edit mode in which programming can be performed.

Power supply	Inputs	Mixed inputs	Outputs	Screen	Clock	Language	Reference
24VDC	4 DISCR	4 (0-10V)	4 RELAY	Yes	Yes	LD	DR2B121BD
100-240VAC	8 DISCR	-	4 RELAY	Yes	Yes	LD	DR2B121FU

When DR3-B***** is selected, the setting dialog box for the extension I/O module connection appears.

■ When selecting the DR3-B*****

When selecting the DR3-B*****, the following dialog box appears for you to indicate the presence or absence of an extension I/O module connection.

Type	ID	Inputs	Outputs
DR3KT161BD	88968211	4 DISCR	2 RELAY
DR3KT141BD	88968231	8 DISCR	6 RELAY

Displays the models of compatible extension I/O modules.

Displays the model type of the registered extension I/O module.



When not connecting an extension I/O module, check that the “Selected extension I/O module” field is blank, and then click the [Next] button.

■ When connecting an extension I/O module

When connecting an extension I/O module as shown below, select the desired module from the list of “Compatible extensions”, and click the [Add] button.

The selected module is displayed in the “Selected extensions” field. Click the [Next] button to go to the Edit mode in which programming can be performed.

Choice of module

Current selection

Type: DR3B261BD
Power supply: 24VDC
Inputs: 10 DISCR + 6 (0-10V)
Outputs: 10 RELAY
Clock: Yes
Language: LD

Select extensions

Compatible extensions

Type	ID	Inputs	Outputs
DR3KT61BD	88968211	4 DISCR	2 RELAY
DR3KT141BD	88968231	8 DISCR	6 RELAY

Add Delete

Total number of inputs/outputs: 201 / 12 0

Selected extensions

Type	ID	Inputs	Outputs
KT2: DR3KT61BD	88968211	4 DISCR	2 RELAY

< Back Next > Cancel Help

Add Button

The model type of the registered extension I/O module is displayed here.



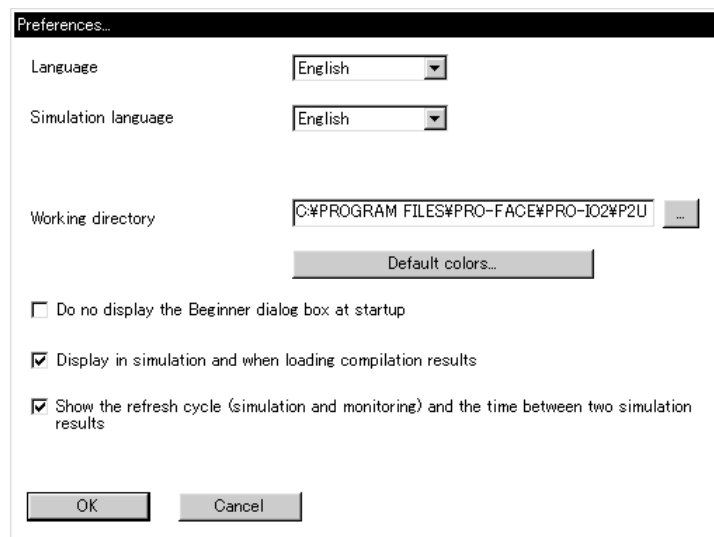
Note:

When replacing the existing extension I/O module with another model, select the module you have registered and delete it with the [Delete] button, and then add the desired module.

Operating the PRO-iO2 Editor

2.1.2 Initial Settings

The environmental settings for the PRO-iO2 Editor can be set by selecting the [File/ Preferences] menu.



Language : Select the display language (Japanese/English) for the PRO-iO2 Editor.



To enable the display language setting, it is necessary to restart the PRO-iO2 Editor.

Simulation Language :

The display language used in simulations. Only English can be selected.

Working directory : Designate the default directory that Explorer displays when opening or saving an existing project.

Default colors... : Select the default colors for the rung in active/inactive conditions. The actual display colors can be set by selecting [Option/Color setting].

Do not display the Beginner dialog box at startup :

The Beginner's dialog box refers to the dialog box described in Step 1 in the procedure in "2.1.1 Selecting Files and Unit Type". This option determines whether to Show or Hide the dialog box.

Display in simulation and when loading compilation results :

Select whether to Show/Hide the [Edit/Program Information] dialog box.

Show the refresh cycle (simulation and monitoring) and the time between two simulation results :

Designate whether to Show/Hide the refresh cycle of the screen displayed on the top of the PRO-iO2 Editor during a simulation and the operation cycle of the simulation.

2.2 Creating Contacts and Lines

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

2.2.1 Placing Contacts

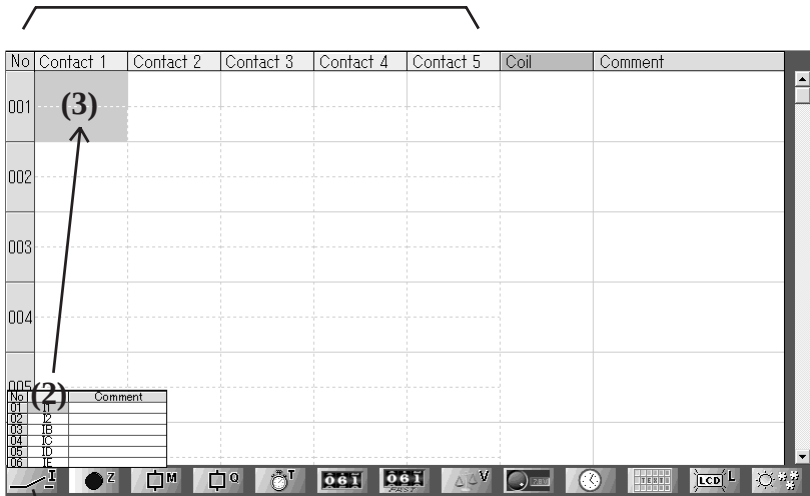
The following “a” and “b” contacts can be used.

Discrete Input		“Z” key		Auxiliary Coil	
Discrete Output		Timer		Counter	
High-speed Counter		Counter Comparator		Analog Comparator	
Calendar		Summer Time			

■ Setup Procedure

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

Insertion Points

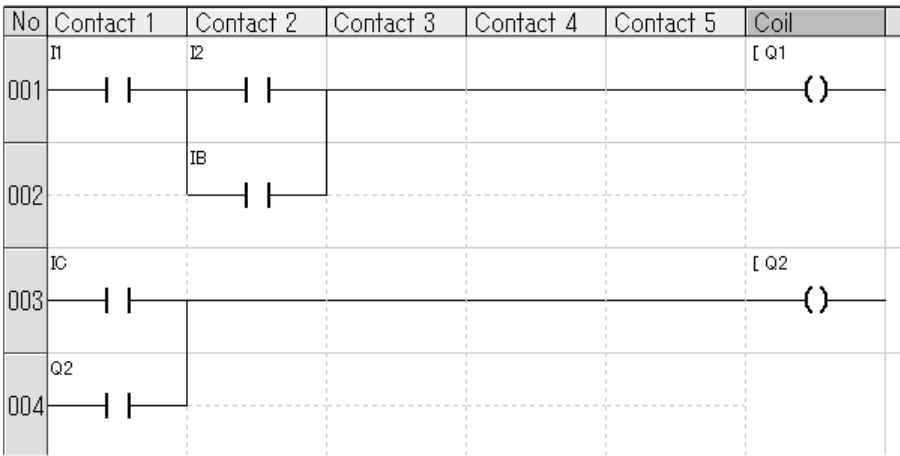


(1)

Operating the PRO-iO2 Editor

2.2.2 Creating Lines

Simply click on the dotted portion of the area where you wish to create/delete a line (Wire).



2.3 Creating Coils

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

2.3.1 Placing Coils

The following types of coils can be used:

Auxiliary Coil



Discrete Output



Timer



Counter



High-speed Counter



Text

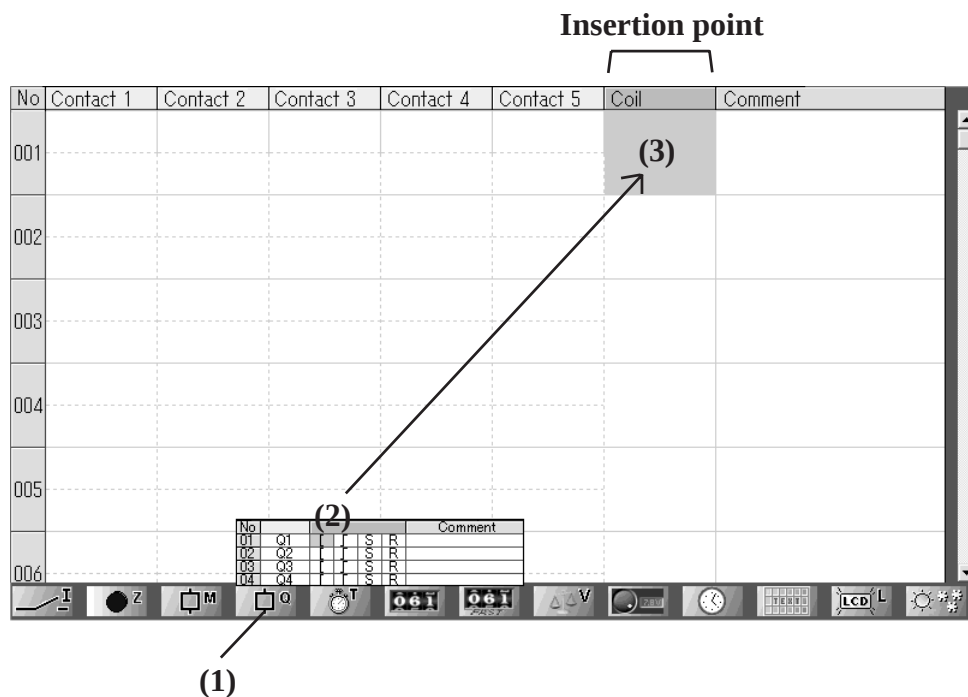


LCD
Backlight



■ Setup Procedure

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



The type of coil to be placed is determined by the point (“□”, “⊔”, “S”, or “R”) you drag with the mouse. Refer to the following section for the coil types.

2.4 Coil Types

The following four types of coils are available: Normal Coil, Reverse on Trigger, Set Coil, and Reset Coil.

Normal Coil



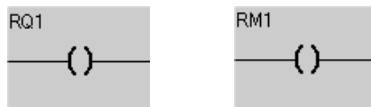
Reverse on Trigger



Set Coil

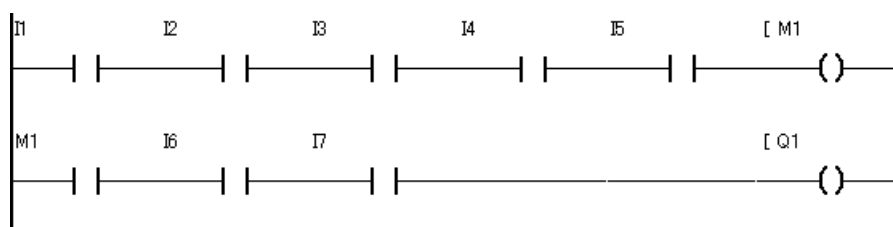


Reset Coil



■ Using a Normal Coil

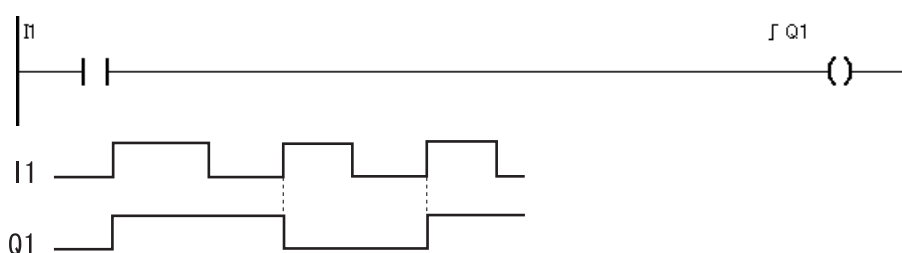
When coil “activation” conditions change from “0” to “1”, the coil turns ON. The Auxiliary Coil (M) is often referred to as an “Internal Relay” or an “Internal Auxiliary Relay”. It is used internally by the logic program. It cannot produce direct output. When a relay’s ON, OFF conditions exceed 5, the following type of Auxiliary Coil is temporarily used.



■ Using a “Reverse on Trigger” Coil

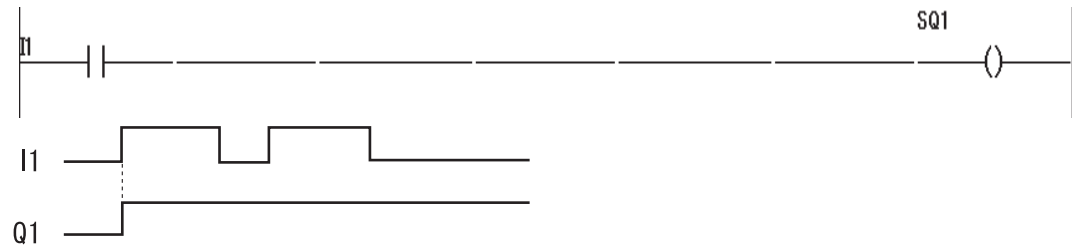
When coil “activation” conditions change from “0” to “1”, the coil’s condition is reversed.

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



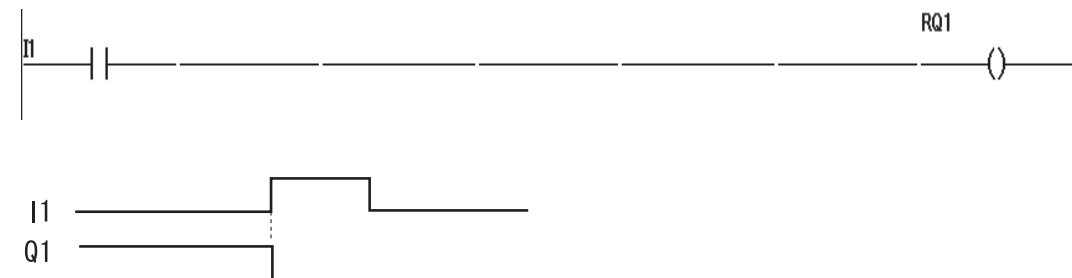
■ Using a Set Coil

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



■ Using a Reset Coil

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



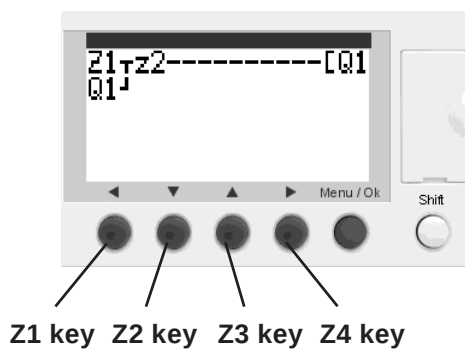
2.5 Using the “Z” Keys

The four keys on the face of the PRO-iO2 modules are called “Z” keys (Z1 to Z4). The Z keys can be preprogrammed to function as push buttons, which can be used for turning ON/OFF the contacts in a program.

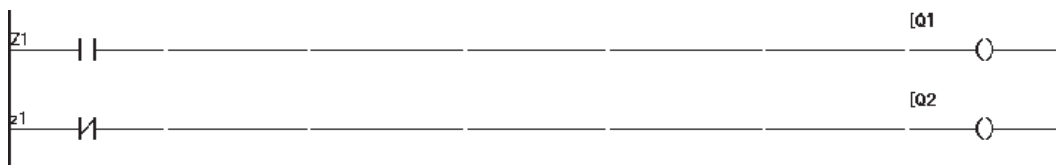


When using a Z key as a contact, the PRO-iO2 module’s menu screen (CONFIGURATION/Zx=Keys) must also be set.

Reference PRO-iO2 User Manual “3.2 LCD Display and Menu Screen”



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



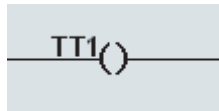
2.6 Creating Timers

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

2.6.1 Types of Timers

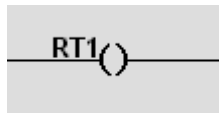
There are the following coils and contact available as a timer.

Timer Start



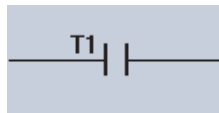
When the coil turns from OFF to ON, or from ON to OFF, the Timer begins counting. 11 types of counting methods are available.

Timer Reset



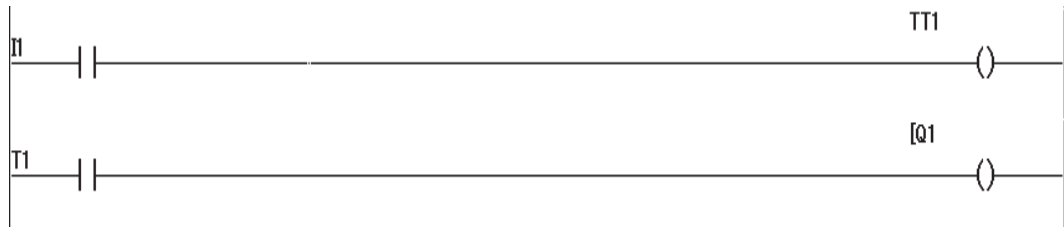
When the coil changes from OFF to ON, the timer's current value is reset.

Timer Contact



Depending on the timer type, this contact turns ON or OFF. See the following section for an explanation of the 11 timer types.

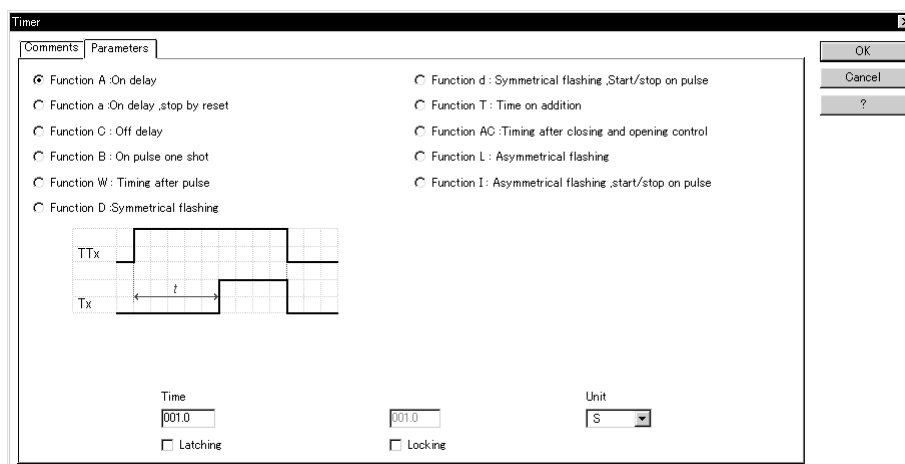
A Timer contact is used to show when "Time Up" has occurred. In the following example diagram, turning ON input I1 will turn ON output Q1 after the time designated by the timer is up.



Operating the PRO-iO2 Editor

2.6.2 Timer (Time) Settings

There are 11 types of timers. If you double-click on a timer coil, the following dialog box will appear. This dialog box is used to select features and enter preset (time) values.



Time : Sets the time and unit.

Locking : Enabling this function will lock the Preset value of the Timer function. After the Lock function is enabled, the Preset value is not displayed on the PARAMETER menu.

Unit : Sets the unit.

Time Unit	Time Range
s (Seconds)	00.01 seconds to 99.99 seconds
S (Seconds)	000.1 seconds to 999.9 seconds
M:S (Minutes:Seconds)	00 minutes 01second to 99 minutes 59 seconds
H:M (Hours:Minutes)	00 hours 01 minute to 99 hours 59 minutes
H (Hours)	0001 hour to 9999 hours



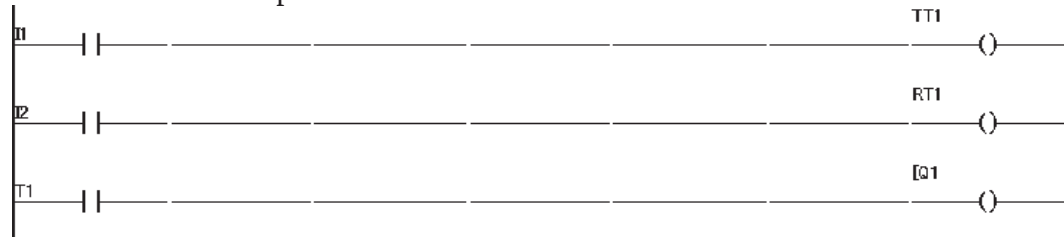
- **The Timer of the PRO-iO2 will have a margin of error of “Preset value x 1%±Scan time x2”.**

The value of the Scan time is set on the [Configuration] tab that can be displayed by selecting the [Edit/Program Configuration] menu.

- **Adjust the settings so that the Preset value is at least two times greater than the scan time. Otherwise, the system will fail to perform accurate timer processing.**

2.6.3 Using Timers

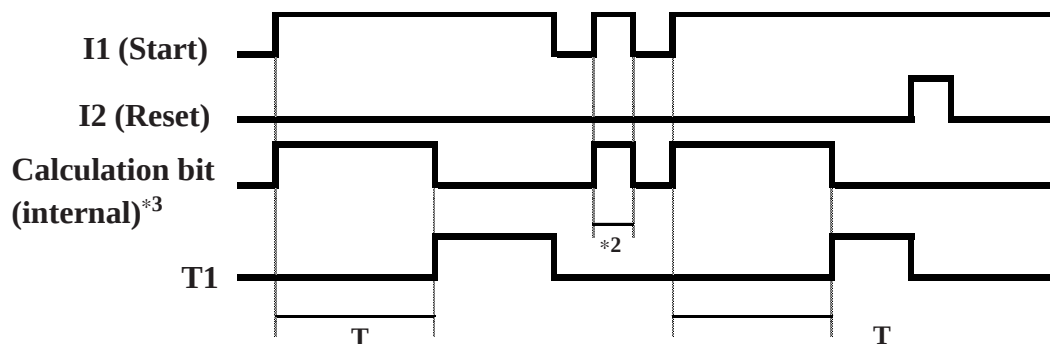
PRO-iO2 has a total of 11 different types of timers. The following pages explain how to set up each type of timer. To start a timer, Timer Start Coils TT1 to TTG*¹ are used, and to reset a coil, Timer Reset Coils RT1 to RTG*¹ are used. When the preset value is reached, T1 to TG*¹ (a-contact) and t1 to tG*¹ (b-contact) turn ON. In the example below, Timer TT1 activates when Input I2 is turned ON. TT1 is reset when Input I2 is turned ON.



The above example is used to explain each of the following 11 types of timers.

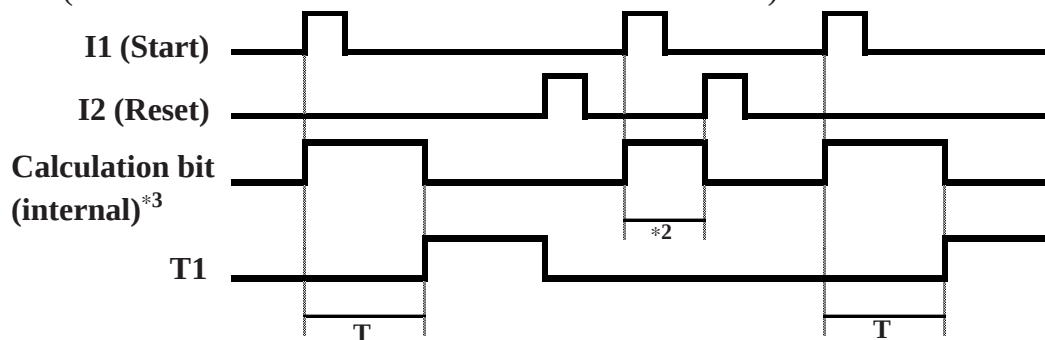
■ Feature A : ON Delay Timer

The Calculation bit turns ON when I1 is turned ON. The Timer activates when the Calculation bit is turned on, and when it reaches the preset value, T1 is turned ON. (Timer is reset if I2 turns ON.)



■ Feature a : Trigger ON Delay Timer

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



*1 The number of points varies depending on the model type. For details,

Reference PRO-iO2 User Manual

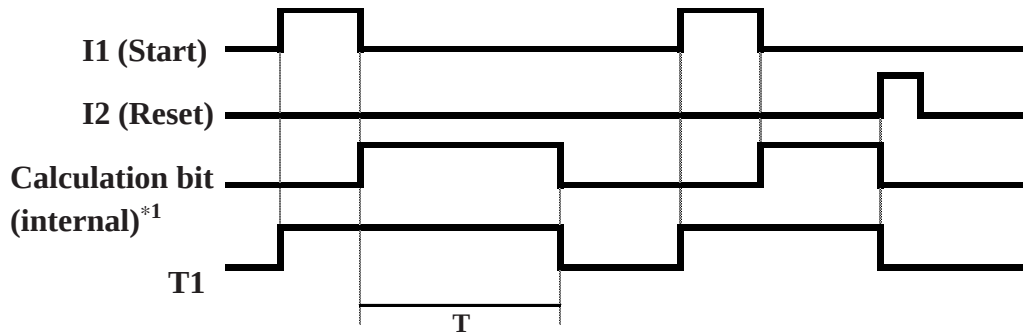
*2 The timer calculation value is less than the timer preset value.

*3 The calculation bit value cannot be displayed via the PRO-iO2 module or PRO-iO2 Editor.

Operating the PRO-iO2 Editor

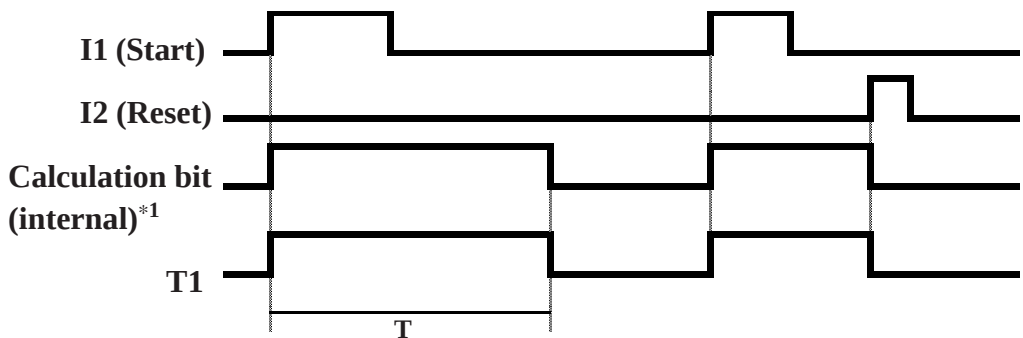
■ Feature C: OFF Delay Timer

T1 turns ON when I1 is turned ON. When I1 is changed from ON to OFF, the Calculation bit activates. When the preset value is reached, T1 is turned OFF. (Timer is reset if I1 turns ON.)



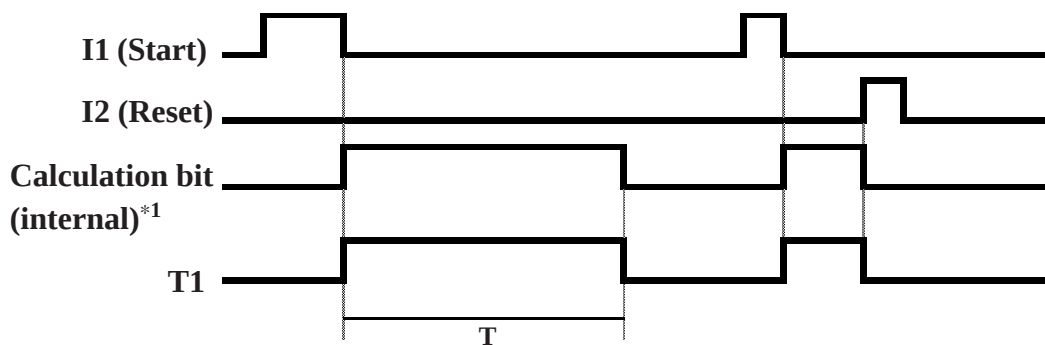
■ Feature B: ON Pulse Timer

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

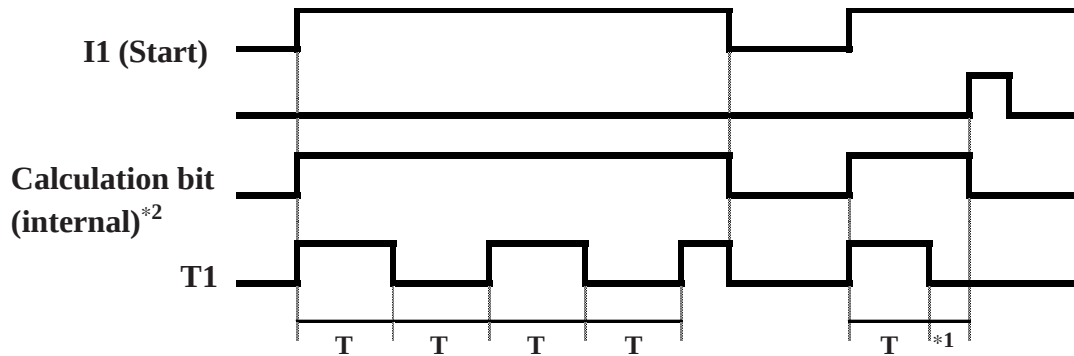


*1 The timer calculation value is less than the timer preset value.

*2 The calculation bit value cannot be displayed via the PRO-iO2 module or PRO-iO2 Editor.

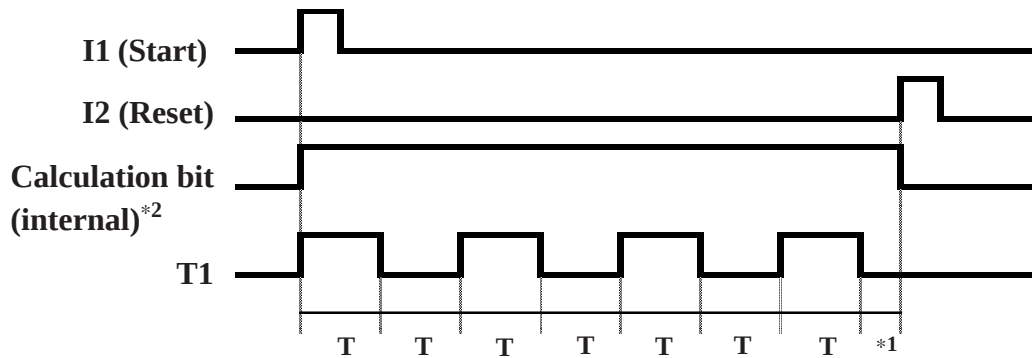
■ Feature D: Blinking Relay

The Calculation bit turns ON when I1 is turned ON. T1 repeatedly turns ON and OFF at the preset interval while the Calculation bit is ON. (Timer is reset if I1 turns OFF, or if reset signal (I2) turns ON.)



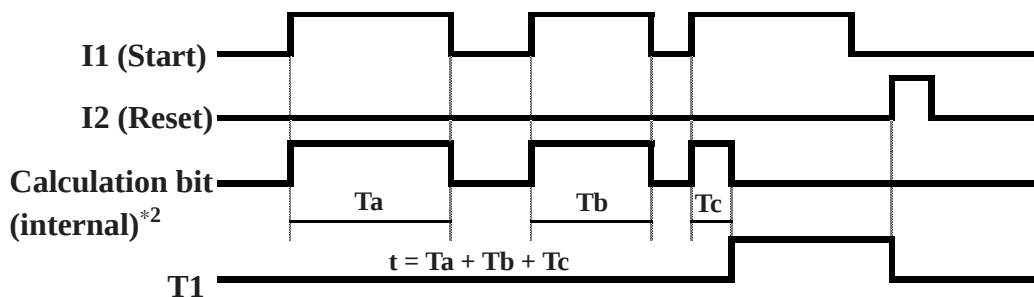
■ Feature d: Blinking Timer (ON/OFF)

The Calculation bit turns ON when I1 is turned ON. T1 repeatedly turns ON and OFF at the preset interval while the Calculation bit is ON. (The Calculation bit will not be turned OFF until it is reset.)



■ Feature T: Accumulation Timer

The Calculation bit remains ON while I1 is ON. The duration in which the Calculation bit is turned ON is added, and when the preset value is reached, T1 is turned ON. (The value of T1 will not be turned OFF until it is reset.)

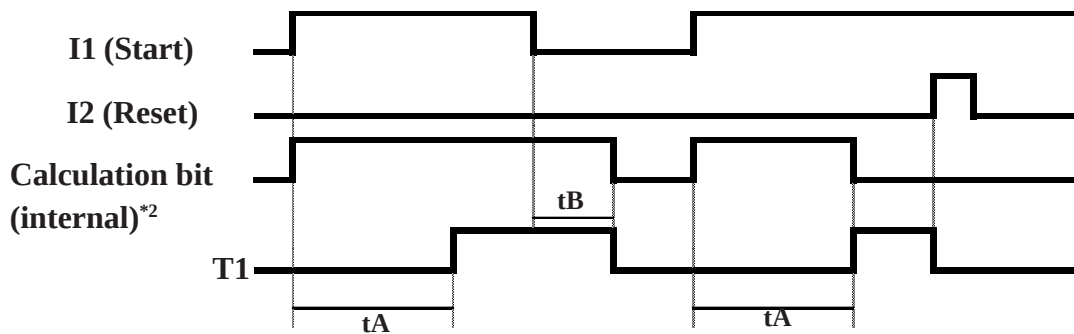


*1 The timer calculation value is less than the timer preset value.

*2 The calculation bit value cannot be displayed via the PRO-iO2 module or PRO-iO2 Editor.

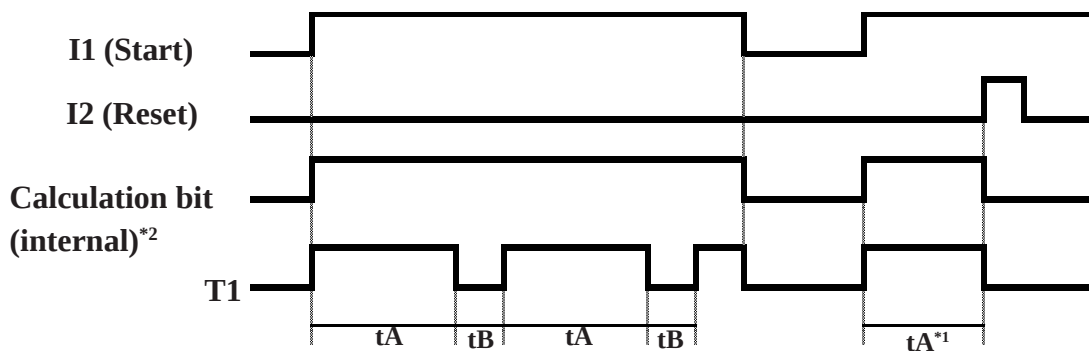
■ Feature AC: ON/OFF Delay Timer

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 is reset if I1 turns OFF, or if reset signal (I2) turns ON.)



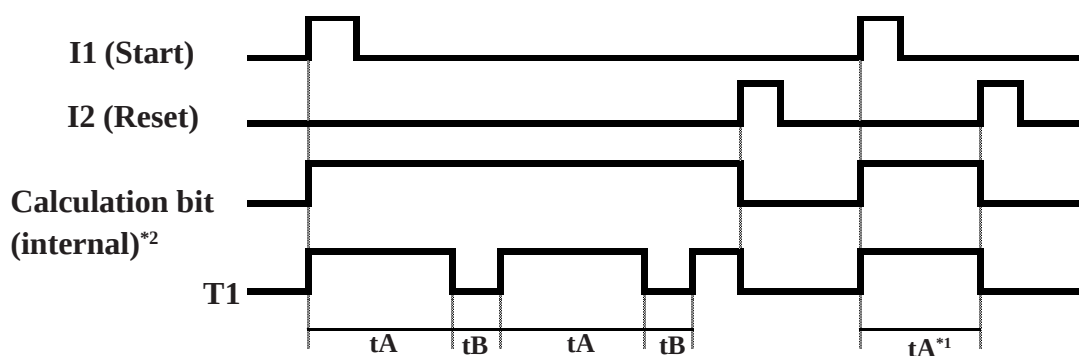
■ Feature L: Asymmetrical Blinking Relay

The Calculation bit turns ON when I1 is turned ON. T1 repeatedly turns ON and OFF at the preset time interval (t_A and t_B) while the Calculation bit is ON. (The Discrete bit turns OFF if I1 turns OFF, or if reset signal (I2) turns ON.)



■ Feature I: Asymmetrical Blinking Timer (ON/OFF)

The Calculation bit turns ON when I1 is turned ON. T1 repeatedly turns ON and OFF at the preset time interval (t_A and t_B) while the Calculation bit is ON. (The Discrete bit will not turn OFF until it is reset.)



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

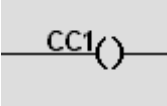
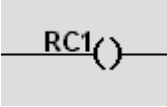
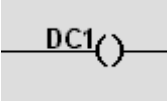
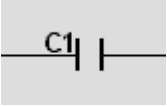
*2 The calculation bit value cannot be displayed via the PRO-iO2 module or PRO-iO2 Editor.

2.7 Creating Counters

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

2.7.1 Types of Counters

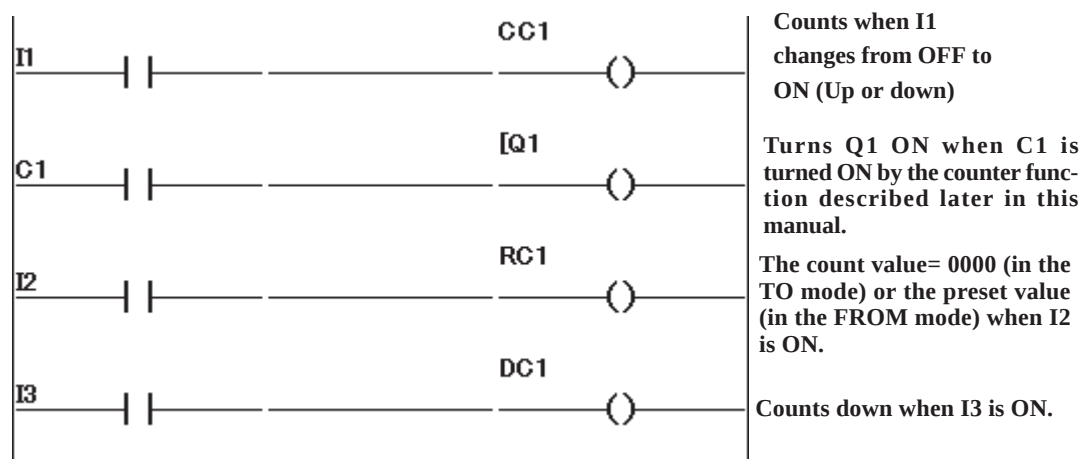
The following types of counters are available. A Counter or a Counter coil's turning from OFF to ON increments the count. Counters include the following coils and contacts.

Counting		An OFF to ON change increments the count
Reset		Turning this coil from OFF to ON will reset the counter value to "0" in the TO mode, and to the preset value in the FROM mode.
Direction		The counter counts up when this coil is turned OFF, and counts down when it is turned ON.
Counter Contact		This contact is turned ON/OFF by the counter function described later in this manual.



Note: For details about the TO mode and FROM mode settings,

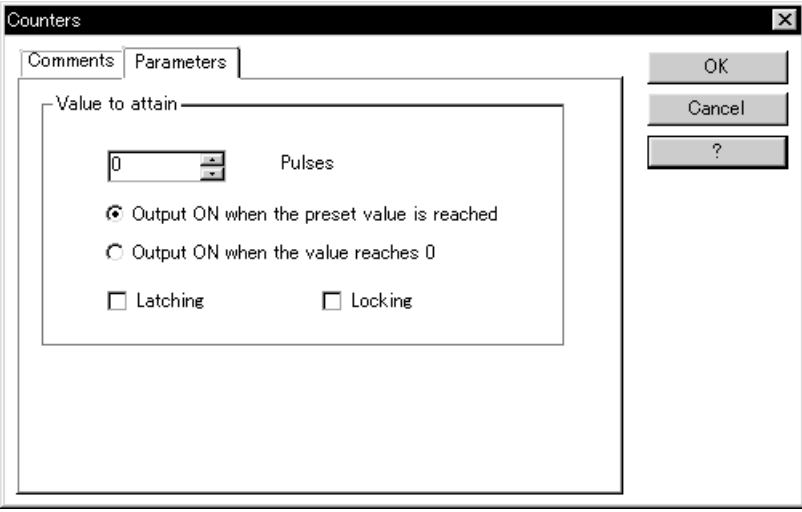
Reference ["2.7.2 Counter \(Pulse Count\) Settings"](#)



When counter input is performed, it is required that the counter be reset. Make sure that the logic program includes a reset input.

2.7.2 Counter (Pulse Count) Settings

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



Value to attain : Designates the pulse count. (Count Range: 0 to 32767)

Output ON when the preset value is reached :

Set the condition in which the counter contact turns ON. In the TO mode, resetting the counter changes the current value to “0”, and the counter contact turns ON when the current value becomes equal to the preset value.

Output ON when the value reaches 0 :

Set the condition in which the counter contact turns ON. In the FROM mode, resetting the counter changes the current value to the preset value, and the counter contact turns ON when the current value becomes “0”.

Latching :

When this option is enabled, the current value of the counter can be retained upon power-off.

Locking :

Enabling this function will lock the Preset value of the Timer function. After the Lock function is enabled, the Preset value is not displayed on the PARAMETER menu.

2.7.3 Counter Operation Example

The range of Counter operation is between 0 and 32767. Designates the count direction by turning ON or OFF this coil.

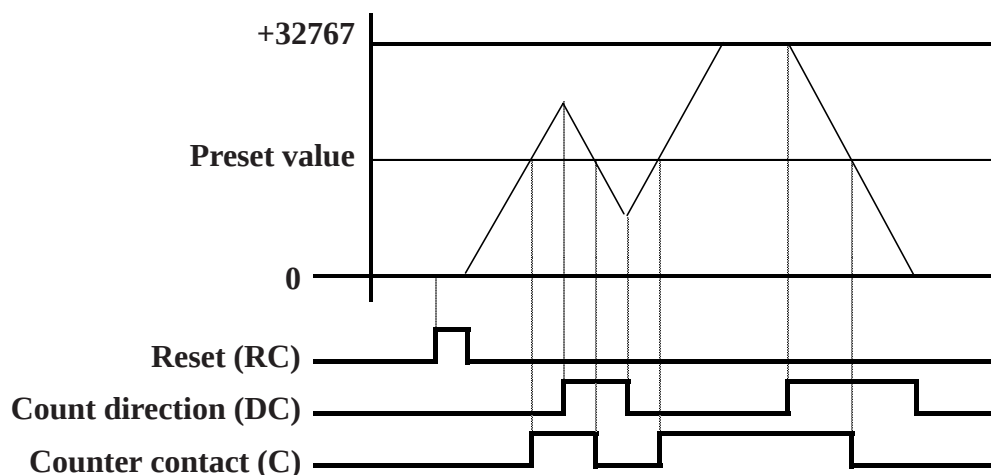
The following section describes the counter operation using the operations in the TO mode and FROM mode as an example. In the following operation example, the counter's condition is "normally ON".

TO mode : Resetting the counter changes the current value to "0", and the counter contact turns ON when the current value becomes equal to the Preset value.

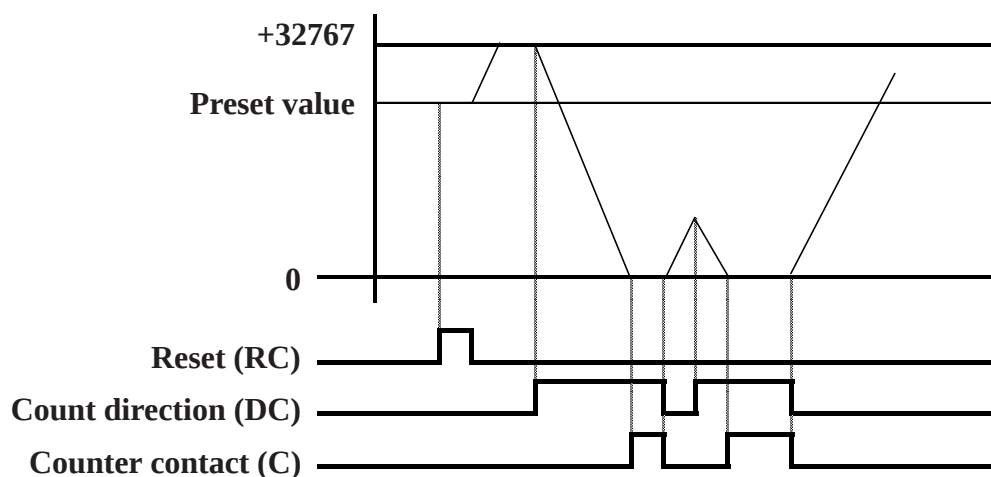
FROM mode : Resetting the counter changes the current value to the Preset value, and the counter contact turns ON when the current value becomes "0".

■ Count operation

TO mode



FROM mode

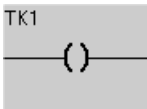
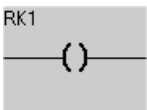
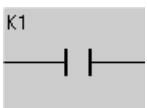


2.8 Creating High-speed counters

This section describes the High-speed counters available when creating logic programs and the procedure for creating a High-speed counter.

2.8.1 Types of High-speed counters

A High-speed counter performs a count function when the counter coil is turned from OFF to ON. A High-speed counter has a contact with one of the following contacts.

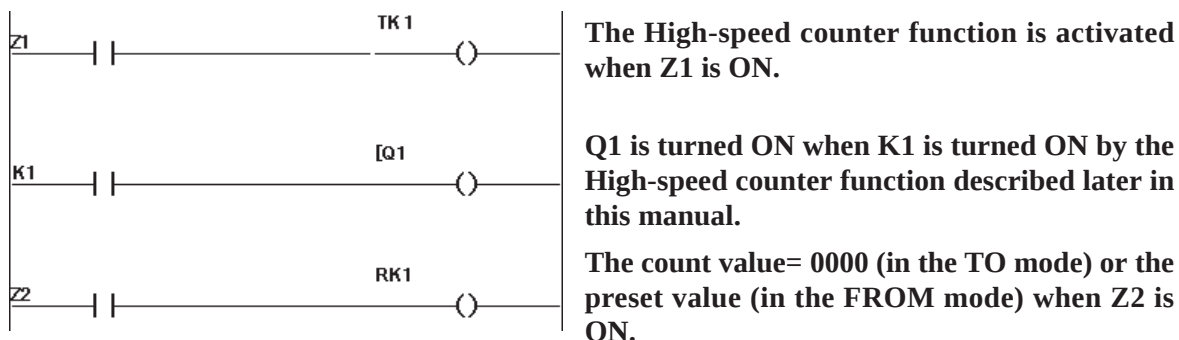
Counting		Turning ON this coil will activate the operation of the High-speed counter.
Reset		Turning this coil from OFF to ON will reset the counter value to “0” in the TO mode, and to the preset value in the FROM mode.
High-speed Counter Contact		This contact is turned ON/OFF by the counter function described later in this manual.



Note: For details about the TO mode and FROM mode settings,

Reference “2.8.2 High-speed Counter (Pulse Count) Settings”

The following describes simple examples of High-speed counter operations.



2.8.2 High-speed Counter (Pulse Count) Settings

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

- TO mode :** Specifies the condition in which the High-speed counter contact turns ON. In the TO mode, the High-speed counter contact turns ON when the current value becomes equal to the preset value.
- FROM mode :** Specifies the condition in which the High-speed counter contact turns ON. In the TO mode, the High-speed counter contact turns ON when the current value becomes “0”.
- Preset value :** Designates the pulse count (Count Range: 0 to 32767)
- Single Cycle :** In the “TO mode”, the counter counts up (I1 input) or counts down (I2 input) from the initial value of “0”, and the High-speed counter contact 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) from the initial value=preset value, and the High-speed counter contact turns ON when the current value becomes “0”.
- Repetitive Cycle :** In the “TO mode”, the counter counts up (I1 input) or counts down (I2 input) from the initial value of “0”, and the High-speed counter contact turns ON for the duration designated with the Output time when the current value becomes equal to the preset value. In this case, the current value is changed to “0”.
In the “FROM mode”, the counter counts up (I1 input) or counts down (I2 input) from the initial value=preset value, and the High-speed counter contact turns ON for the duration designated with the Output time when the current value becomes “0”. In this case, the current value is changed to the preset value.
- Duration of pulse :** Specifies the duration in which the counter output of a Ring counter remains ON.
- Latching :** When this option is enabled, the current value of the counter can be retained upon power-off.
- Locking :** Enabling this function will lock the Preset value of the Fast Timer function. After the Lock function is enabled, the Preset value is not displayed on the PARAMETER menu.

2.8.3 Count Operations

Pulses with a frequency 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).



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).

The following section describes examples of Linear counter and Ring counter operations.

Linear Counter (UNIQUE) :

In the “TO mode”, the counter counts up (I1 input) or counts down (I2 input) from the initial value of “0”, and the High-speed counter contact 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) from the initial value=preset value, and the High-speed counter contact turns ON when the current value becomes “0”.

Ring Counter (REPETITIVE) :

In the “TO mode”, the counter counts up (I1 input) or counts down (I2 input) from the initial value of “0”, and the High-speed counter contact turns ON for the duration designated with the Output time when the current value becomes equal to the preset value. In this case, the current value is changed to “0”.

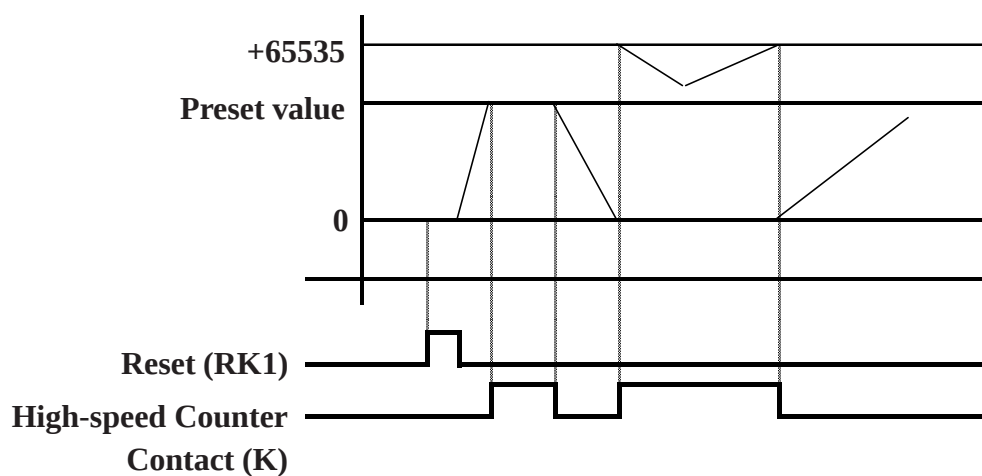
In the “FROM mode”, the counter counts up (I1 input) or counts down (I2 input) from the initial value=preset value, and the High-speed counter contact turns ON for the duration designated with the Output time when the current value becomes “0”. In this case, the current value is changed to the preset value.



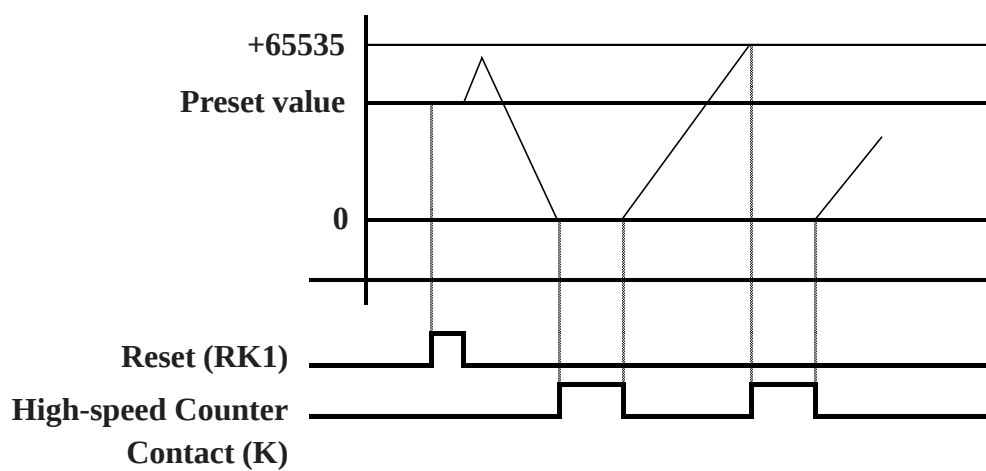
Note: For the operations of the TO mode, FROM mode, Linear counter, and Ring counter, refer to the following page.

■ Operation Example of a Linear Counter

Linear Counter (TO mode)



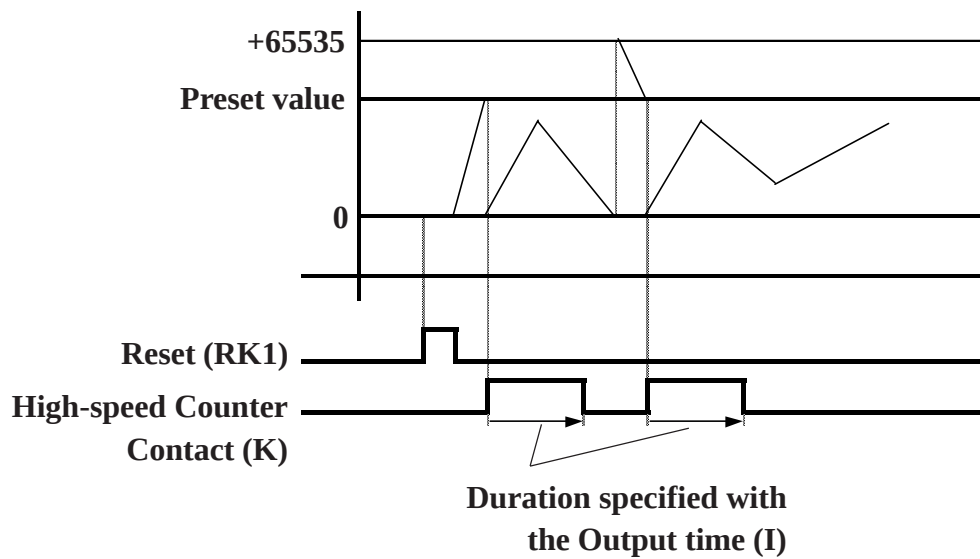
Linear Counter (FROM mode)



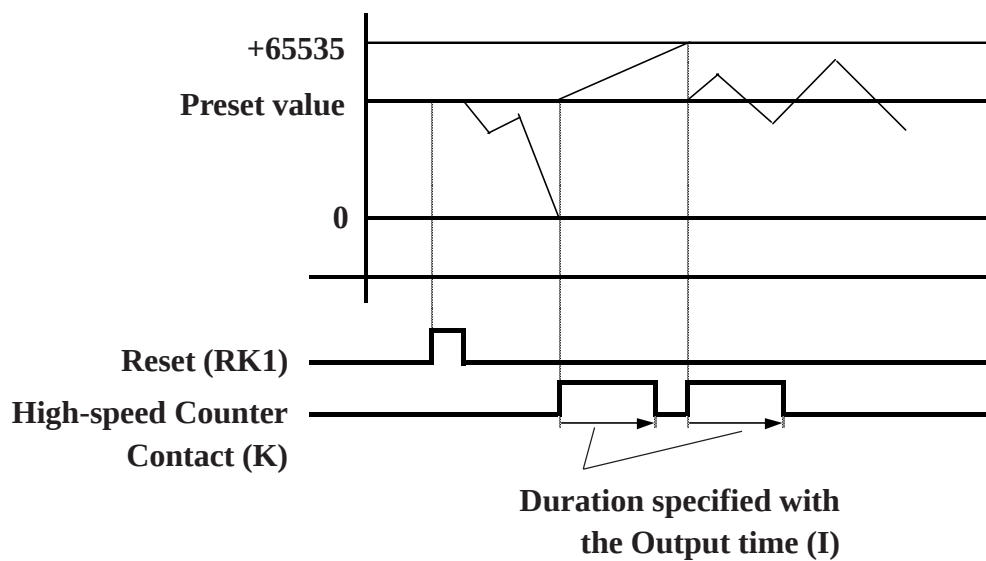
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■ Operation Example of a Ring Counter

Ring Counter (TO mode)



Ring Counter (FROM mode)



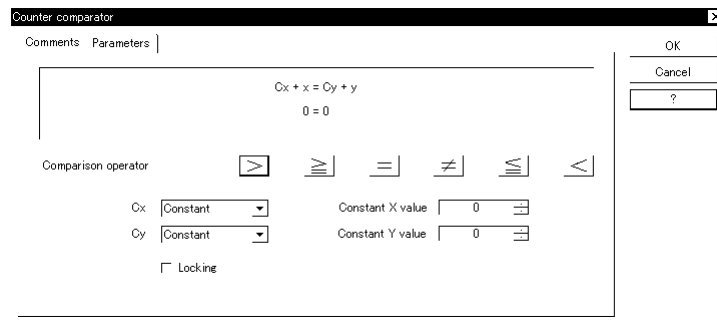
2.9 Creating Counter Comparators

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

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

2.9.1 Counter Comparator (Preset) Settings

Double-click on a contact to call up the following dialog box, allowing the user to select the desired option from 6 comparison expressions. Different comparison expressions can be designated for individual contacts.



Comparison operator :

Specifies an operator used to compare count values. Also specifies the terminal or preset value to be compared.

Cx, Cy : Specifies the current value of the counter or the “preset value”.

X, Y (Constant value) :

Designates a constant value when “preset value” is selected for Cx or Cy.

X, Y (Offset value) : Designates the offset value when current value is selected for Cx or Cy.

Locking :

Enabling this function will lock the Preset value of the Counter Comparator function. After the Lock function is enabled, the Preset value is not displayed on the PARAMETER menu.



- **The Counter Comparator does not support a negative value. The Counter Comparator function may not operate properly when settings are made 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”.

2.9.2 Using Counter Comparators

The counter comparator function compares the current values of counters and outputs the result as a relay output.

◆ 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.

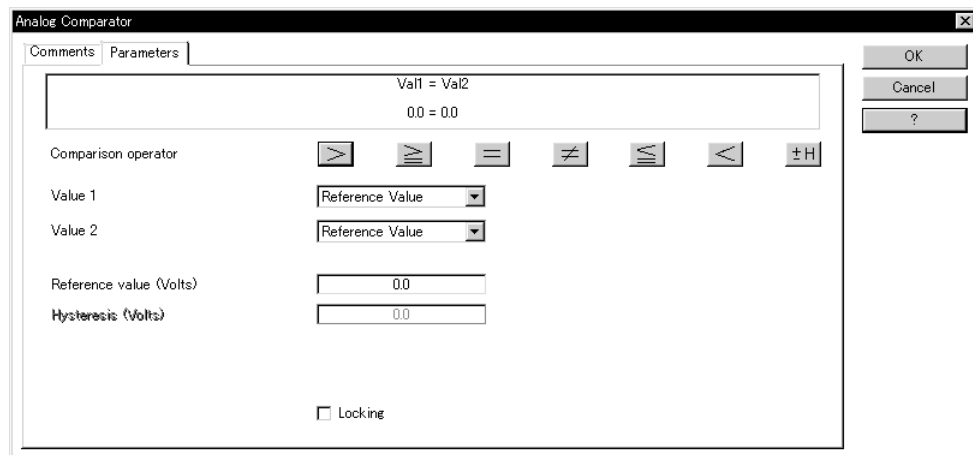
2.10 Creating Analog Comparators

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

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

2.10.1 Analog Comparator (Preset) Settings

Double-click on a contact to call up the following dialog box, allowing the user to select the desired option from 7 comparison expressions. Different comparison expressions can be designated for individual contacts.



Comparison operator :

Specify an operator to be used for comparing analog values.

Value 1 : Specifies the terminal or “Reference value” to be compared.

Value 2 : Specifies the terminal or “Reference value” to be compared.

Reference value : Designates an analog value when “Reference value” is selected for Data 1 or Data 2.

Hysteresis : Designates the upper and lower limits of Data value 1.

Locking : Enabling this function will lock the Preset value of the Analog Comparator function. After the Lock function is enabled, the Preset value is not displayed on the PARAMETER menu.

2.10.2 Using Analog Comparator (Preset)

An Analog Comparator is used for the following operations.

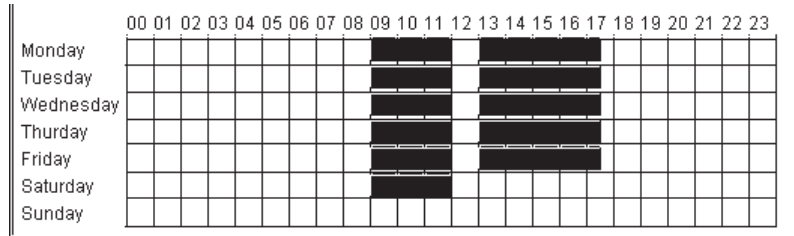
- Comparing a measured analog value with an internal preset value.
- Comparing two measured analog values with the hysteresis value.

◆ 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.
$x1 - H \leq x2 \leq x1 + H$	The contact turns ON when the formula "$x1 - H \leq x2 \leq x1 + H$" is true.

2.11 Creating Calendars

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



2.11.1 Calendar Settings

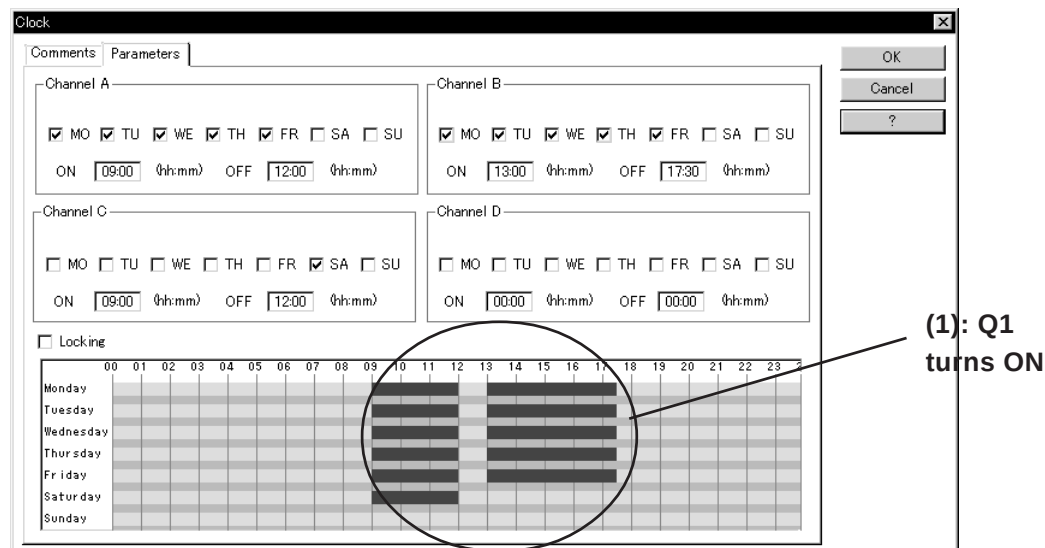
PRO-iO2 has 4 types of 1-week calendars, with each calendar having 4 channels (A to D). During a specified period, an “a” contact can be turned ON up to four times.

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

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

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

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



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- ***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.

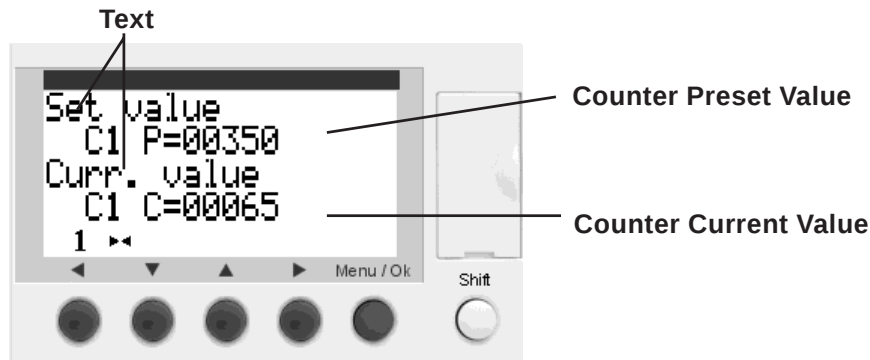
- ***The ON and OFF time settings for a channel cannot be set to the same time.***



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

2.12 Creating Text

The following explanation describes the types of text features available, as well as their setup procedure. This feature can be used to display text (Characters and numbers) in the PRO-iO2 module's screen.



■ List of Displayed Parameters

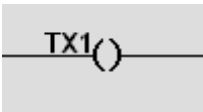
The following function blocks can be displayed as parameters using text coils.

- Date
- Time
- Time calibration
- Current value of Timer
- Preset value of Timer
- Current value of Counter
- Preset value of Counter
- Current value of High-speed counter
- Output time of High-speed counter
- Preset value of High-speed counter
- Preset value of Analog Comparator

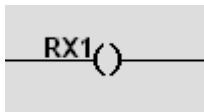
2.12.1 Text Coil Types

Text coils have the following two types.

Text Display coil

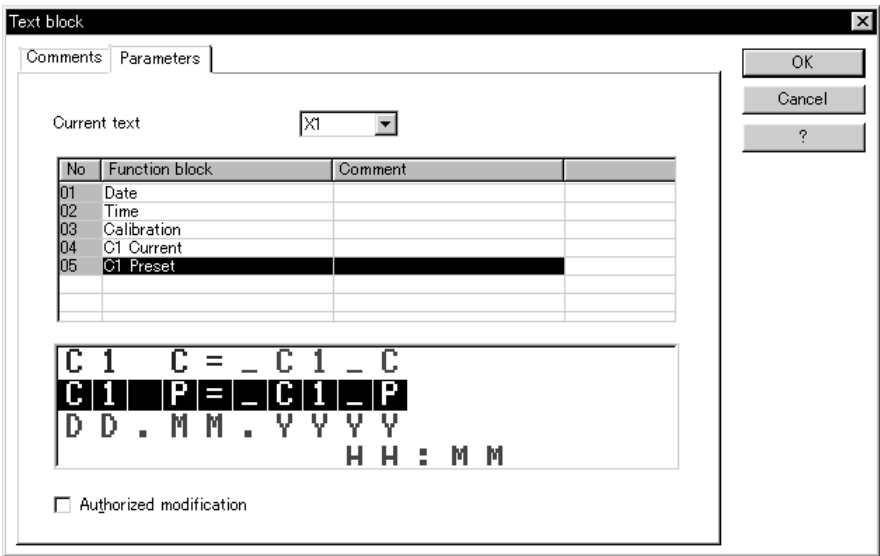


Text Hide coil



■ Text Coil Settings

Double-clicking the Text coil calls up the following dialog box. Text can be inserted by dragging and dropping the desired text from the list of parameters used in the logic program, or by double-clicking the parameter.



Current text : Designate the setting for each text block (TX1, TX2, and TX3, etc.) when two or more text blocks are placed in a logic program.

2.13 Creating LCD Backlight

This section describes the LCD backlight available when creating a logic program, as well as the setup procedure.

The LCD backlight is used as a coil. The backlight for the screen of the PRO-iO2 module can be turned on while the LCD backlight coil is turned ON.



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.

In the example below, the LCD backlight illuminates while input I1 is ON.



2.14 Creating Summer Time

This section describes the Summer Time contact available when creating a logic program, as well as the setup procedure.

Summer Time is used as a contact. The Summer Time contact remains ON during the summer daylight savings period.



When using the Summer Time contact, it is necessary to designate the CHANGE SUMM/WINT setting option on the [Date Setting] tab displayed by selecting the [Edit/Program Setting] menu.

Reference “3.2.2 Program Configuration”

In the example below, the discrete output Q1 turns ON from the last Sunday of March until the last Sunday of October. (When the Summer daylight savings setting for Europe is selected.)



Chapter

3 Program Transfer

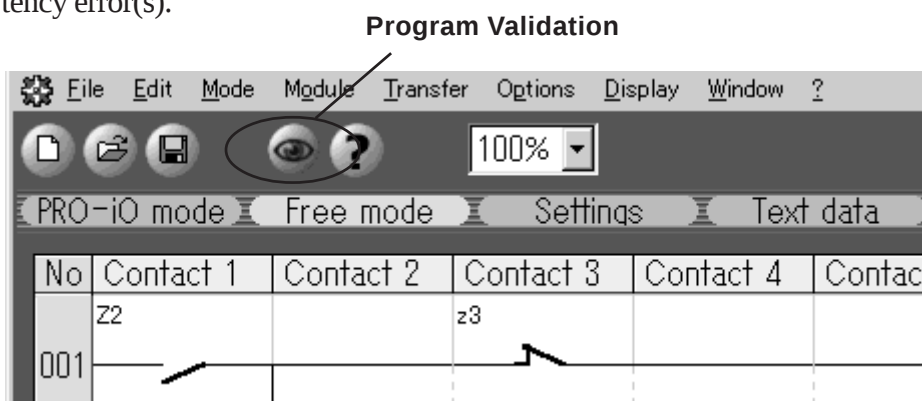
1. Validating Programs
2. Communication Setup
3. Simulation
4. Program Transfer

5. Backup (PRO-iO2 Memory Pack)
6. Monitoring
7. Update module FIRMWARE

This chapter describes how to transfer the PRO-iO2 program.

3.1 Validating Programs

Clicking the PRO-iO2 Editor main screen's  icon checks the validity of your logic program. If this icon turns red, it means your ladder program contains consistency error(s).



If consistency errors are found, the following dialog box appears on the screen.

Program consistency			
No	Row	Column	Description
001	009	001	Not connected with right-hand cell
002	009	006	Not connected with left-hand cell
003	009	006	The coil output contact M1 is not used
004	009	001	Timeout value zero

No : Indicates the error number.

Row/Column : Indicates the block in which the error was found.

Description : Displays a description of the errors.



Note that a program can be transferred even when it contains consistency errors. For the description of errors,

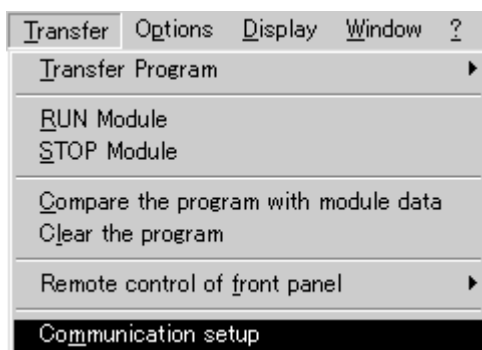
Reference “Appendix 1 Error Messages”

3.2 Communication Setup

This section describes the settings required to connect the PRO-iO2 Editor with the PRO-iO2 module. Configure the [Communication setup] and [Program configuration] settings.

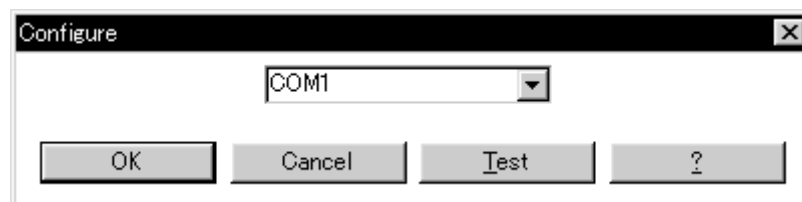
3.2.1 Communication Setup

Specify the COM port to be used for communications. From the main menu of the PRO-iO2 Editor, select [Transfer/Communication setup].



The dialog box for the Communication setup contains the following setting parameters.

■ Setting parameters on the [Configure] dialog box

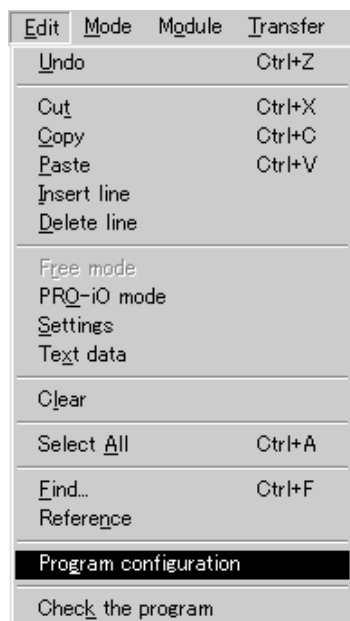


COM port selection : Select the desired COM port to be used for communications.

Test button : Executes a test to determine whether communications can be performed properly. If the test fails, use another COM port.

3.2.2 Program Configuration

Configure the system settings related to the program you have created. From the main menu of the PRO-iO2 Editor, select [Edit/Program configuration].

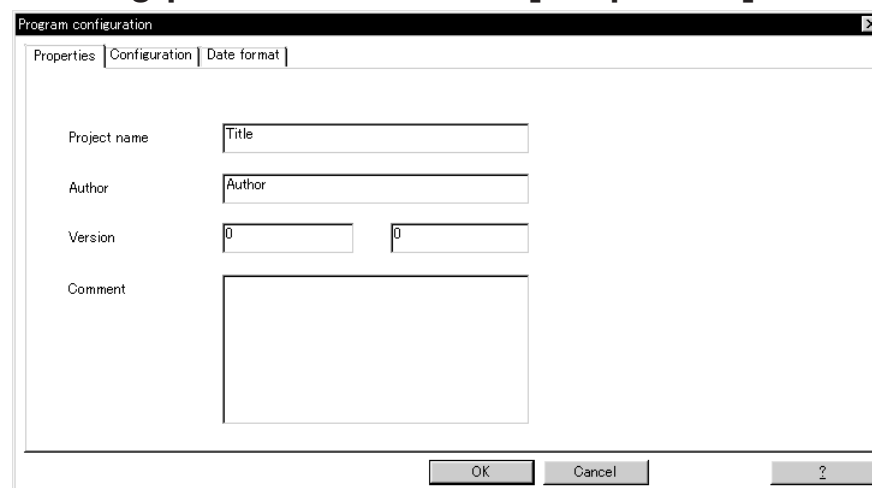


The Program configuration dialog box consists of three tabs: [Properties], [Configuration] and [Date setting].



The settings for Program Configurations can be reflected in the system by transferring the program to the module.

■ Setting parameters on the [Properties] tab



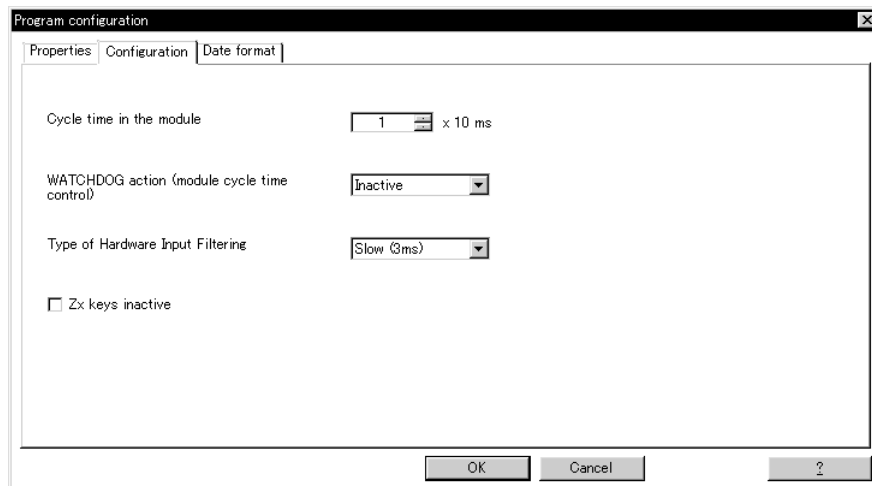
Project name : Set the name of the project using up to 24 single-byte characters.

Author : Set the name of the author of the program using up to 32 single-byte characters.

Version : Set the version of the program in the format of [integer part, decimal part]. A value between 0 and 255 can be specified for each part respectively.

Comment : Set a comment for the program using up to 369 single-byte characters.

■ Setting parameters on the [Configuration] tab



Cycle time in the module :

Set the execution time of the program. Specify the time in the module of N·10 ms (N should be an integer between 1 and 9).

WATCHDOG action (module cycle time control) :

Designate the action of Watchdog to be performed when the program execution time exceeds the pre-determined Cycle time in the module.

Inactive : The Watchdog function will perform no action when the execution time exceeds the pre-determined cycle time.

Alarm : The Watchdog function will display an alarm on the module's LCD when the execution time exceeds the pre-determined cycle time. The alarm number can be reviewed in the FAULT menu of the module.

Error : The Watchdog function will display an alarm on the module's LCD and stop the program when the execution time exceeds the pre-determined cycle time. The alarm number can be reviewed in the FAULT menu of the module.

Type of Hardware Input Filtering :

Set the Input filtering time. Only the models with DC input types include this function. Select either SLOW (3 to 5 ms) or FAST (0.3 to 0.5 ms). Note that the Input filtering time for terminals IB, IC, ID, IE, IF, IG is fixed to 3 to 5 ms.

Zx keys inactive :

Determine whether to use the Z1/Z2/Z3/Z4 keys on the front panel in the logic program. Put a checkmark in the box when not using the keys.

■ Setting parameters on the [Date format] tab

Date format :

Select the display format for the date.

Activate the summer/winter time change :

Put a checkmark in this box when using the summer/winter time change.

Zone :

Specify the time zone to be used. This option is enabled only when the [Activate the summer/winter time change] checkbox is checked. Select from [Europe], [UK], [USA], and [Others].

When [Others] is selected, it is required to manually specify the [Indicate the day and month of the change to summertime/wintertime] parameters.

Indicate the day and month of the change to summer/wintertime :

Select the date and month on which the summertime starts/ends. This option is enabled only when the [Activate the summer/winter time change] checkbox is checked. When [Others] is selected for the Zone, manually set the [Sunday of the month] and [Month] parameters.



Note:

The Summertime change function is used for the Summertime contact. For Summer-time contact,

▼ **Reference** “2.14 Creating Summertime”

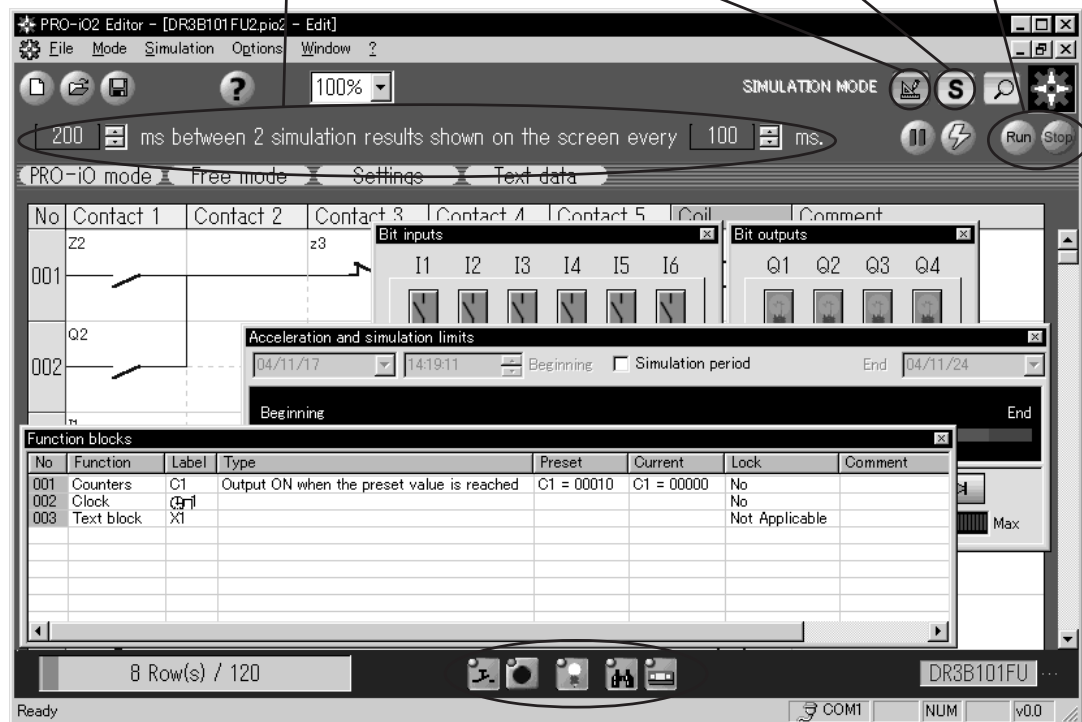
3.3 Simulation

Clicking the PRO-iO2 Editor main screen's **S** icon allows you to simulate the operation of your program. You can control start and stop of the simulation via the **Run** and **Stop** buttons in the upper right corner of the PRO-iO2 Editor screen.

You can quit Simulation mode by pressing the **Exit** button.

Spin button for changing the operation cycle and screen display refresh cycle

Simulation button
Edit button
Run, Stop buttons



Note:

- Clicking on the PRO-iO Editor main screen's lower icon bar displays that feature's dialog box.
- The status of the contact can be altered forcefully from the menu that is displayed by right-clicking on the contact.
- A simulation is only trial operation. Simulation results may not match actual operation results.
- When the [Display in simulation and when loading compilation results] option displayed via [File/Preferences] is checkmarked, the compile result screen is displayed when the PRO-iO2 enters the Simulation. Click the OK button to display the Simulation screen.

3.4 Program Transfer

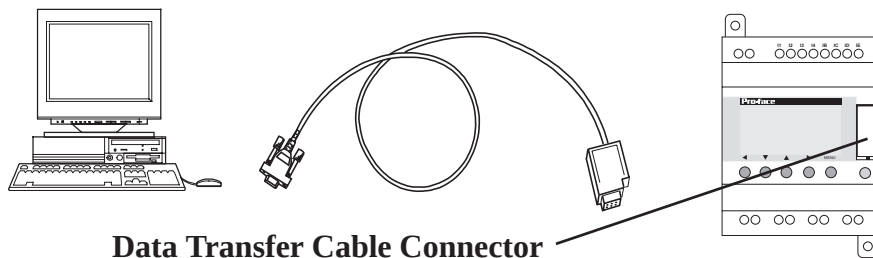
This chapter describes how to transfer the PRO-iO2 program.

3.4.1 Connecting the Data Transfer Cable

WARNING

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

Connect the optional PRO-iO2 Data Transfer Cable (DR2-CBL01)'s serial connector to your PC's serial port.



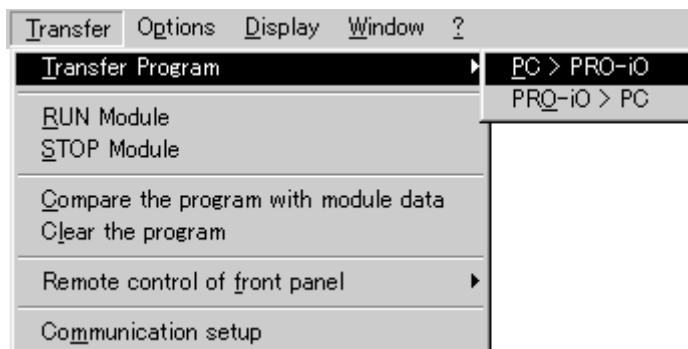
- Do not use excessive force when connecting the Data Transfer Cable, and be sure the connector is connected at the correct angle. Failure to attach the connector correctly may damage the PRO-iO module and/or the connector.
- Do not disconnect the Data Transfer Cable during data transfer. This may cause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

Program Transfer

3.4.2 Program Transfer

This section describes the procedure for transferring a program. Select [Transfer Program] from the main menu of the PRO-iO2 Editor.

1. **PC > PRO-iO** : From the PC (PRO-iO2 Editor) to the PRO-iO module.
2. **PRO-iO > PC** : From the PRO-iO module to the PC (PRO-iO2 Editor).



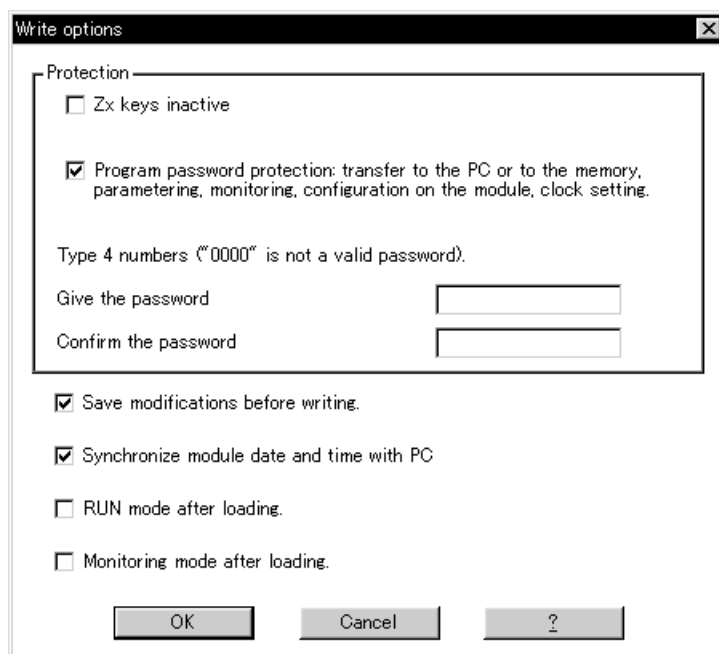
When transferring a program from the PRO-iO2 Editor to the Module, the [Write options] screen appears on the screen. The [Write options] screen contains the following setting parameters.



Note:

- When the [Display in simulation and when loading compilation results] option displayed via [Edit/Options] is checkmarked, the compile result screen is displayed when the PRO-iO2 Editor transfers the program. Click the OK button to display the Write options setting screen.

■ Setting parameters on the [Write options] dialog box



Zx keys inactive : Determine whether to use the Z1/Z2/Z3/Z4 keys on the front panel in the logic program. Put a checkmark in the box when not using the keys.

Program password protection :

Set up a password that will be required to access the logic program. To cancel the password protection, the user is required to enter the password again. (0001 to 9999)

Save modifications before writing. :

Put a checkmark in this checkbox to save the program to be transferred before starting the program transfer.

Synchronize module date and time with PC :

Put a checkmark in this checkbox to synchronize the date and time of the module with those of the PC.

RUN mode after loading. :

Put a checkmark in this checkbox to automatically start the RUN operation when the program transfer is complete.

Monitoring mode after loading. :

Put a checkmark in this checkbox to automatically change to the Monitoring mode when the program transfer is complete.

3.5 Backup (PRO-iO2 Memory Pack)

The optional PRO-iO2 Memory Pack (DR2-MEM01) can be used to store backup copies of ladder programs.



The backup operation and transfer of logic programs using the special PRO-iO2 Memory Pack can be performed only with the PRO-iO2 modules with the model type DR-B*****.*

*With the DR2-D*****, backup operation and transfer of logic programs cannot be performed using the special PRO-iO2 Memory Pack.*



CAUTION

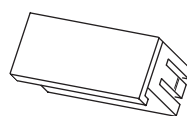
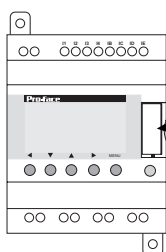
- Do not drop the PRO-iO Memory Pack unit, or subject it to excessive vibration.
- Do not allow water to enter the PRO-iO Memory Pack unit.
- Do not touch the connector terminals. Doing so can cause an electric shock.
- Do not disassemble or remodel the PRO-iO Memory Pack .

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

▼ **Reference** ▼ *PRO-iO2 User Manual "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.



**PRO-iO2 Memory Pack
(DR2-MEM01)**



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



- You can also transfer program data stored in the PRO-iO2 Memory Pack to other PRO-iO2 modules.
- The PRO-iO2 Memory Pack is an Electrically Erasable Programmable Read Only Memory (EEPROM). You can write data to the Memory Pack for approximately 100,000 times.

■ Backup Items

The following items will be saved in the PRO-iO2 Memory Pack (The same as the items set via the Main menu's CONFIG. feature):

- Logic Program
- Password
- Input Filter Time
- Scan time and Watchdog action settings
- 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.)

3.6 Monitoring

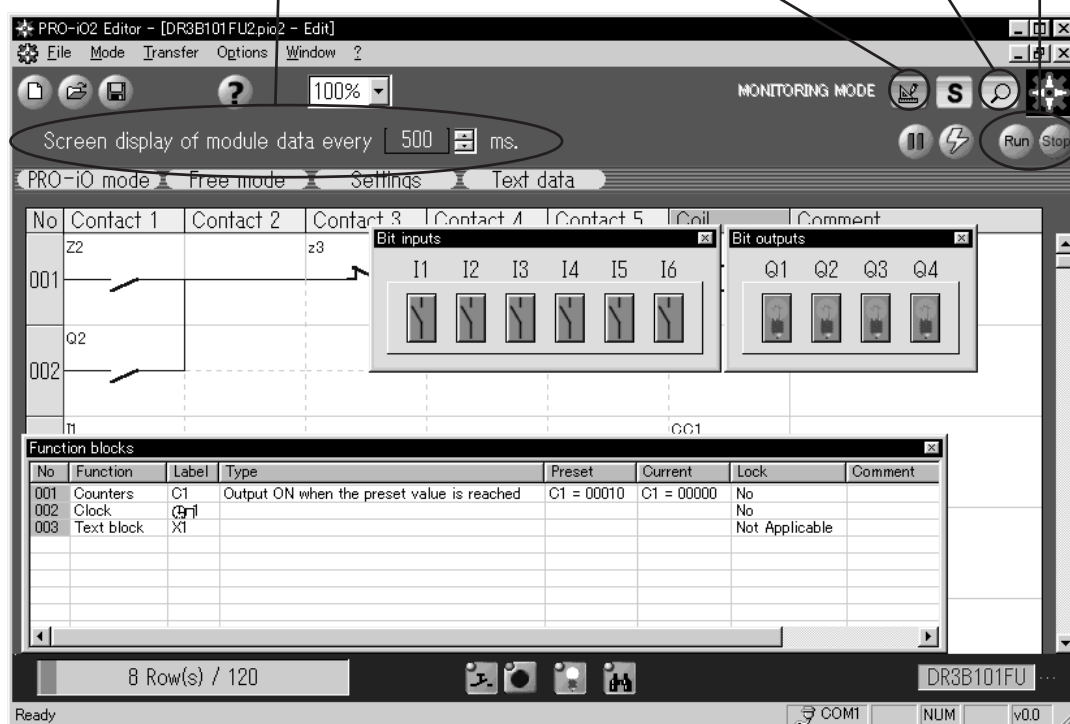
The operation of the PRO-iO2 module in the RUN mode can be monitored on a PC. To monitor the PRO-iO2 operation, press the Monitor button (🔍) on the PRO-iO2 Editor while the PRO-iO2 module is connected to the PC with a special transfer cable for the PRO-iO2. The program can be executed and stopped using the RUN button and STOP button on the upper-right corner of the screen.

Pressing the Edit button (🔧) will automatically stop the Monitoring mode.

Spin button for changing the operation cycle and screen display refresh cycle

Edit button

Run, Stop buttons
Monitor button

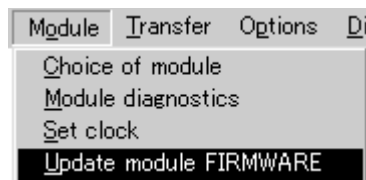


PRO-iO2 Editor RUN and STOP buttons operate in synch with the PRO-iO module's RUN/STOP button. However, the PRO-iO2 Editor's RUN and STOP buttons operate differently from the simulation function's RUN/STOP button.

- When the PRO-iO2 changes from the Monitoring mode to the Edit mode, the output coils and auxiliary coils are always turned OFF once.
- The status of the contact can be altered forcefully from the displayed menu by right-clicking on the contact.

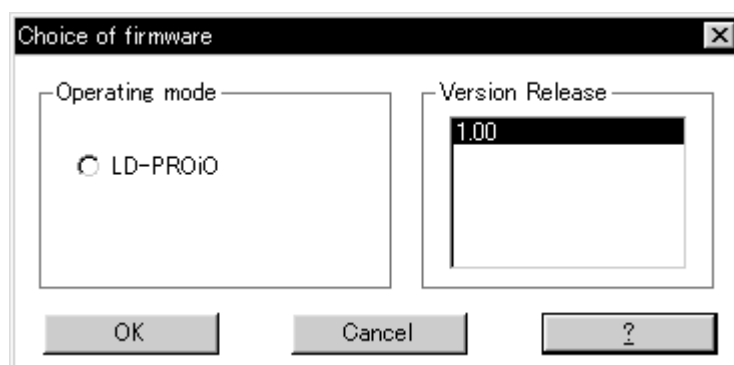
3.7 Update module FIRMWARE

When using a firmware with a different version, it is possible to rewrite the firmware of the PRO-iO2. Select the [Module/Update module Firmware] commands from the main menu of the PRO-iO2 Editor.



The [Choice of firmware] screen contains the following setting parameters.

■ Setting parameters on the [Choice of firmware] dialog box



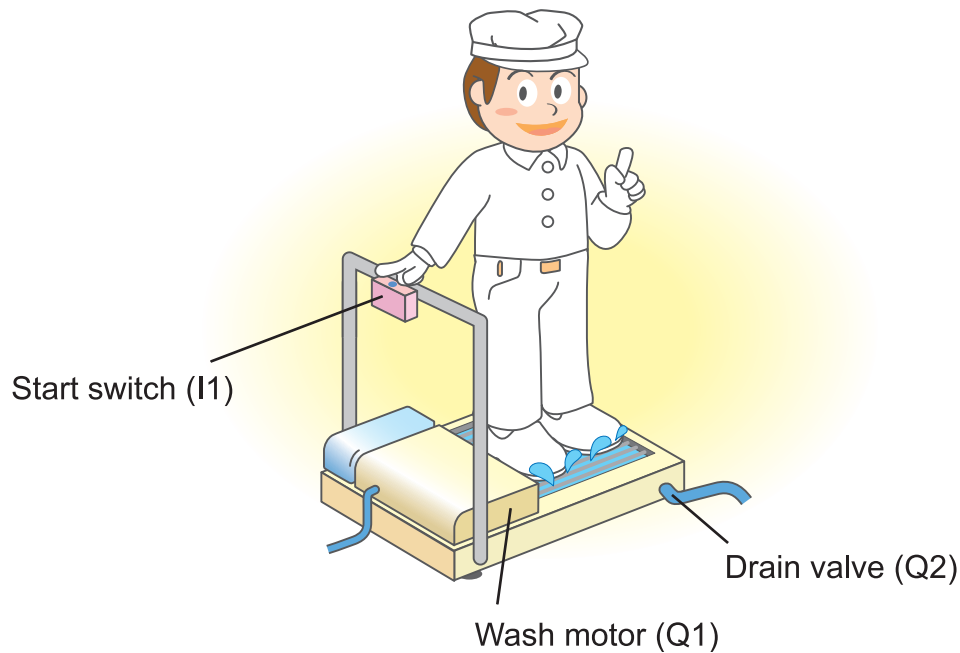
Operating mode: Set the programming language to be used with the PRO-iO2. Only “LD-PROiO” is available.

Version Release : Select the version of the firmware to be updated.

Memo

Chapter

4 Program Example - Automatic Shoe Cleaner



■ Logic Program

No	Contact 1	Contact 2	Contact 3	Contact 4	Contact 5	Coil
001						[M1]
	☐ Operation S...		☐ Start switch		☐ Wash time	☐ Internal save
002						
			☐ Internal save			
003						TT1
	☐ Internal save					☐ Wash time
004						[Q1]
						☐ Wash motor
005						CC1
	☐ Wash time					☐ Wash cycle
006						[Q2]
	☐ Wash cycle					☐ Drain valve
007						TT2
						☐ Drain time
008						RC1
	☐ Drain time					☐ Wash cycle
009						TX1
	☐ Screen displ...					☐ Wash param...
010						RX1
	☐ Screen displ...					☐ Wash param...

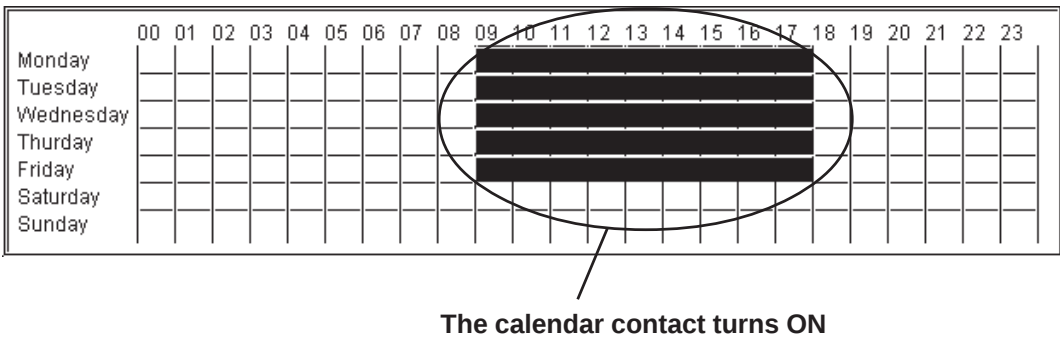
■ Program Overview

The Automatic Shoe Cleaner performs the following four functions:

- (1) Operates only on the specified date and for the specified time period.
- (2) Automatically washes shoe soles for a fixed length of time.
- (3) Automatically drains wash water after the specified number of wash cycles is completed.
- (4) The wash time and the number of wash cycles completed can be seen on the PRO-iO2 screen.

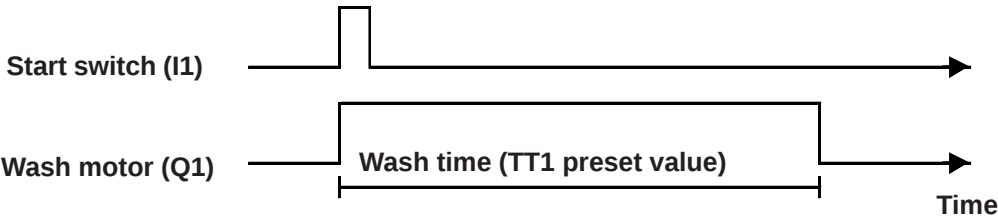
(1) Operates only on the specified date and for the specified time period.

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

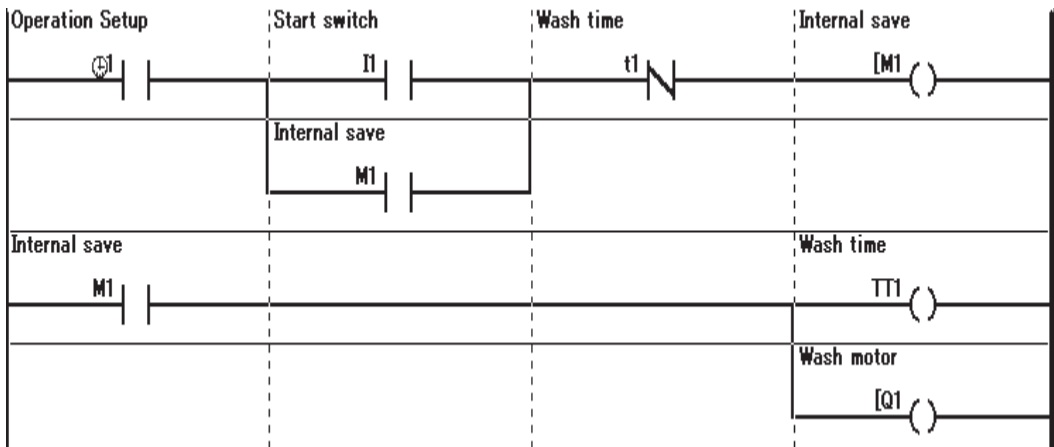


(2) Automatically washes shoe soles for a fixed length of time.

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

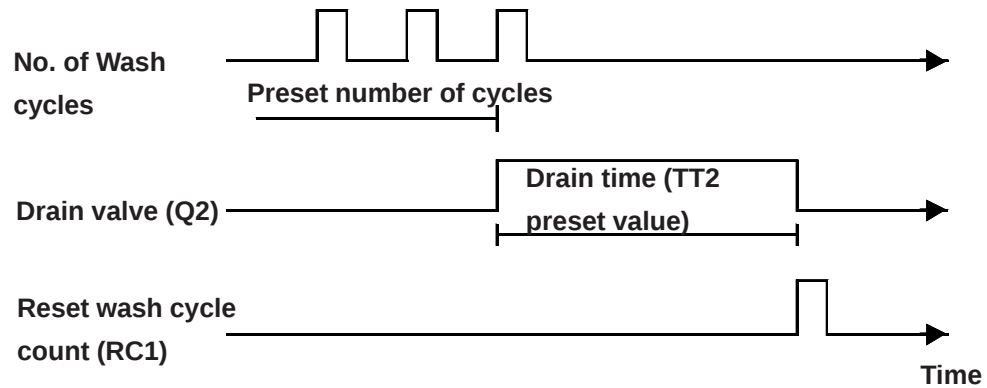


<Start-switch-based automatic wash program>



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

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

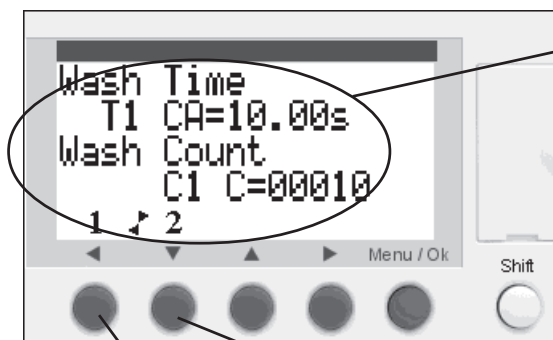


<Automatic drain control logic program>

Wash time	T1		Wash cycle	CC1 ()
Wash cycle	C1		Drain valve	[Q2 ()
			Drain time	TT2 ()
Drain time	T2		Wash cycle	RC1 ()

(4) The wash time and the number of wash cycles completed can be seen on the PRO-iO2 screen.

You can display the number of wash cycles completed (CC1) and the wash time (TT1) on the PRO-iO2 screen using the Text feature. Pressing Z1 displays the number of wash cycles completed and the wash time. Pressing Z2 takes you back to the main PRO-iO2 screen.



Wash time and the number of wash cycles

Z1 key displays text

Z2 key hides text

<Z-key-based text display logic program>

Screen display ON	Z1		Wash parameter	TX1 ()
Screen display OFF	Z2		Wash parameter	RX1 ()

■ Creating the program

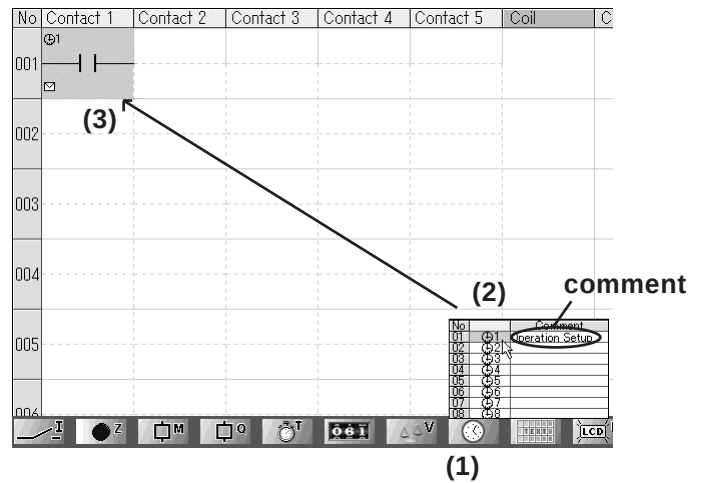
(1) Operates only on the specified date and for the specified time period.

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



Note:

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

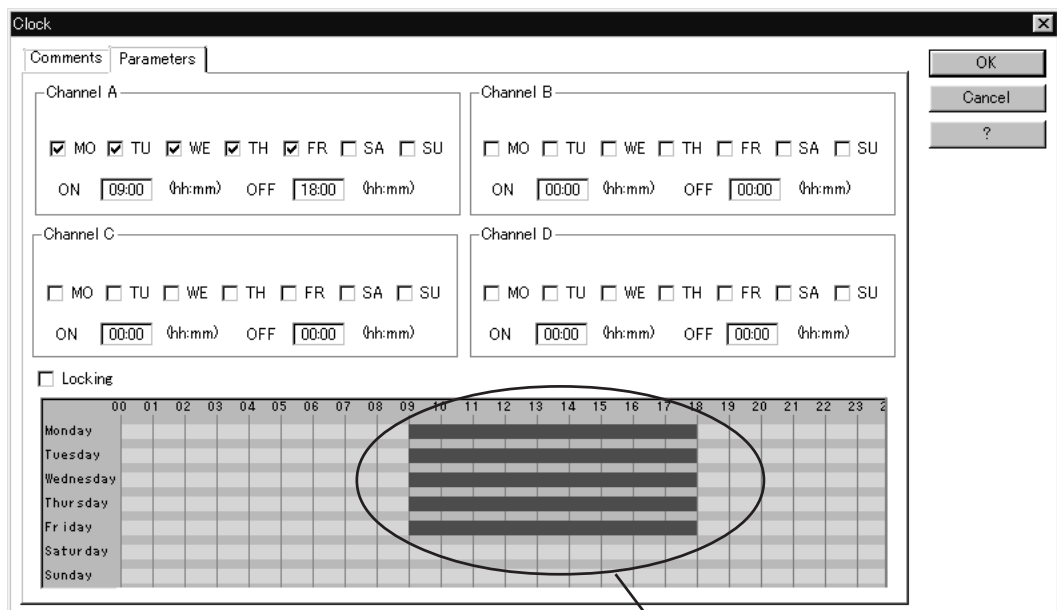


3. Designate the ON date and time for the calendar contact. Double-click on the contact, or right-click on the calendar contact and select [Properties]. The following dialog box will appear.

Enter Channel A settings as follows:

Channel A:

From Monday To Friday
On 09:00 (hh:mm) Off 18:00 (hh:mm)

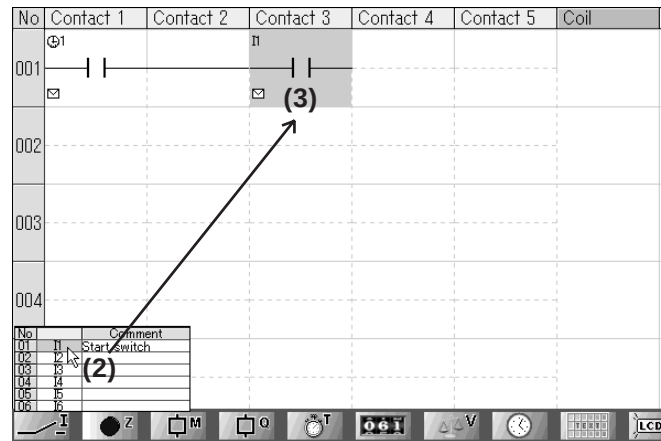


Red section indicates time when  contact turns ON

Program Example - Automatic Shoe Cleaner

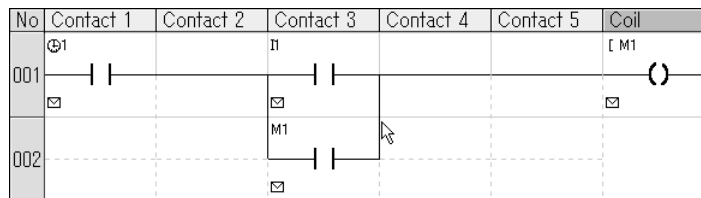
(2) Automatically washes shoe soles for a fixed length of time.

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

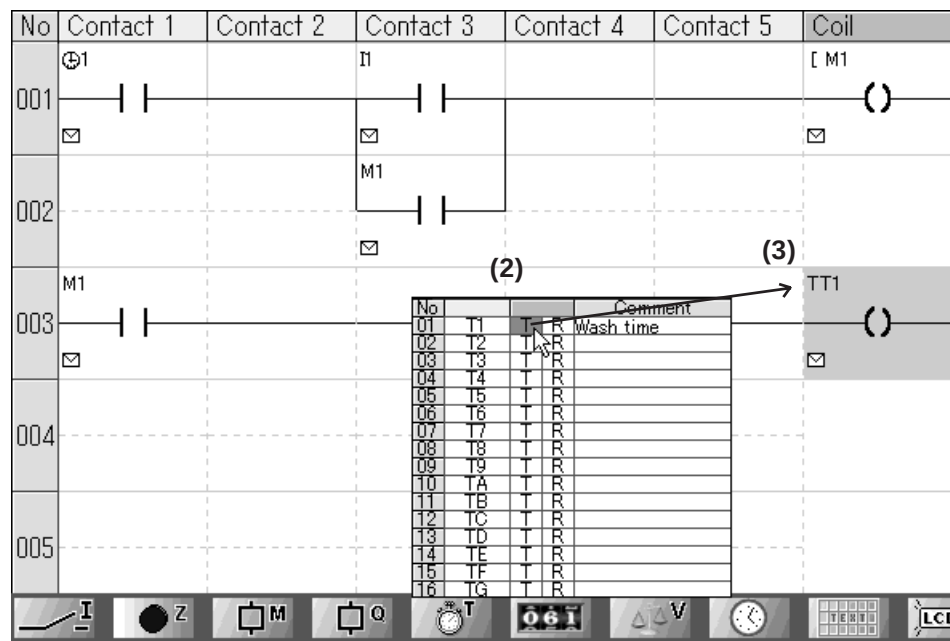


(1)

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



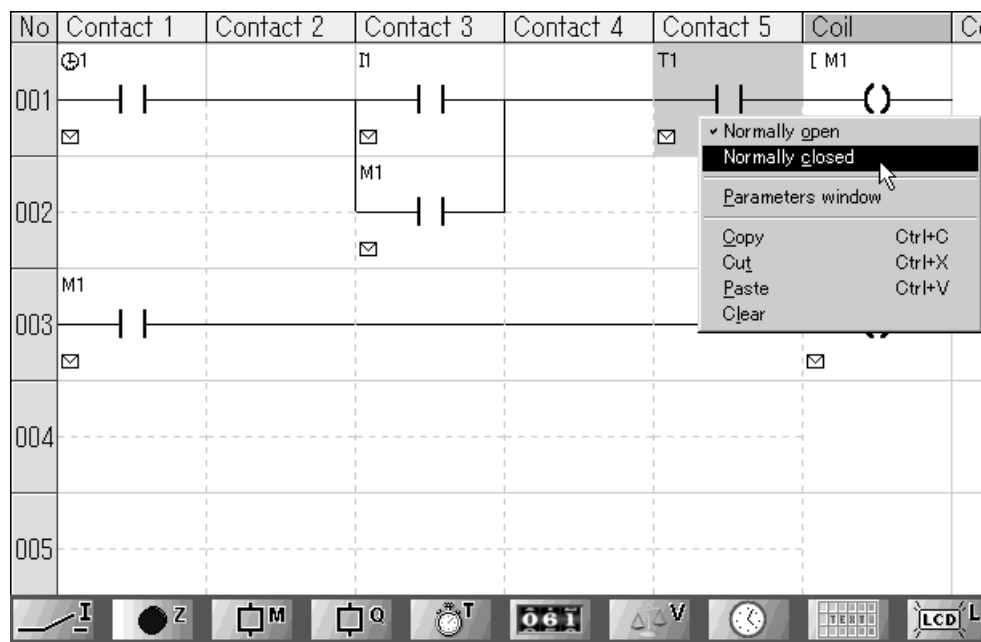
5. Repeat steps 1 and 2 to insert the auxiliary coil M1 and the timer coil TT1 in rung no.3 (see below).



(1)

Program Example - Automatic Shoe Cleaner

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

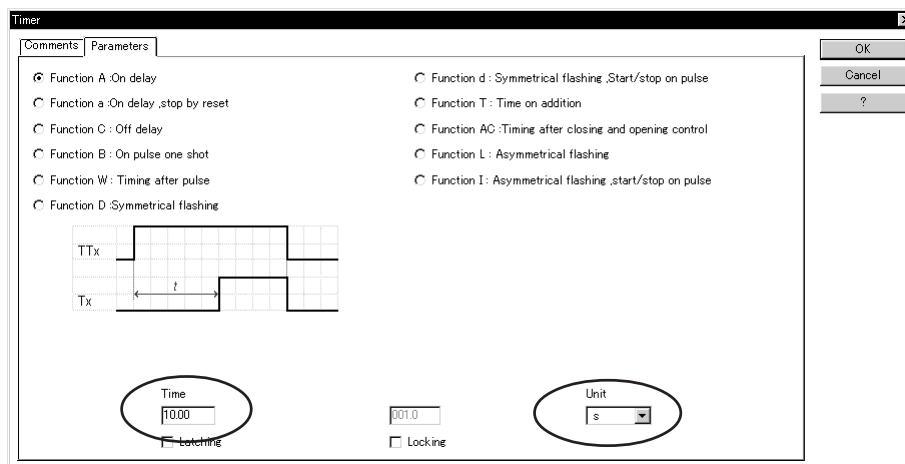


- Designate when the timer coil starts. To do this, double-click on the timer coil, or right-click the timer coil and select [Parameters].

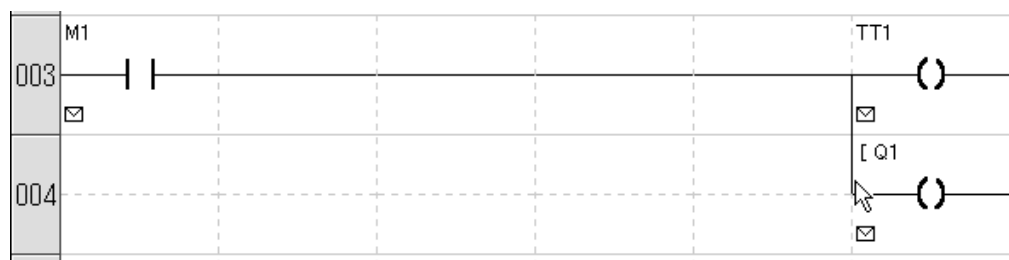
Set the Preset value and Designation, as shown below:

Time: 10.00s (Wash time)

Designation: Function A: On Delay



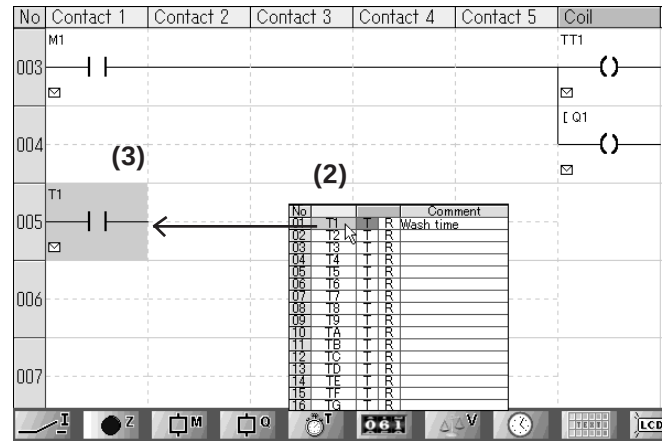
- Next, click on the dotted lines to create connecting lines, and place the discrete output Q1.



Program Example - Automatic Shoe Cleaner

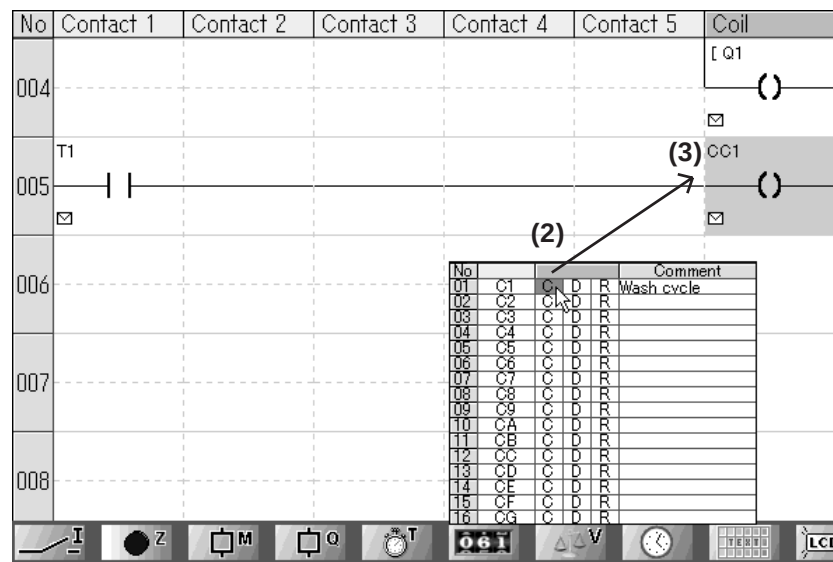
(3) Automatically drains wash water after the specified number of wash cycles is completed.

1. Position the mouse pointer on the icon (1).
2. Click on T1 (2), drag to the desired position (3) and release to place it in the ladder program.



(1)

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

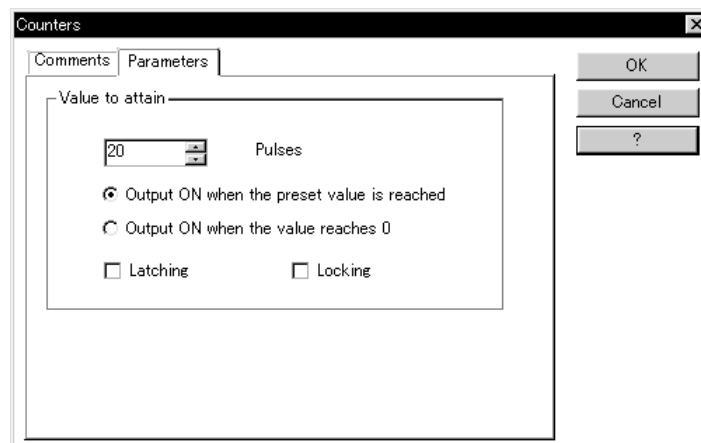


(1)

4. Designate the counter pulse count. To do this, double-click on the counter coil, or right-click on the counter coil and select [Parameters]. The following dialog box will appear.

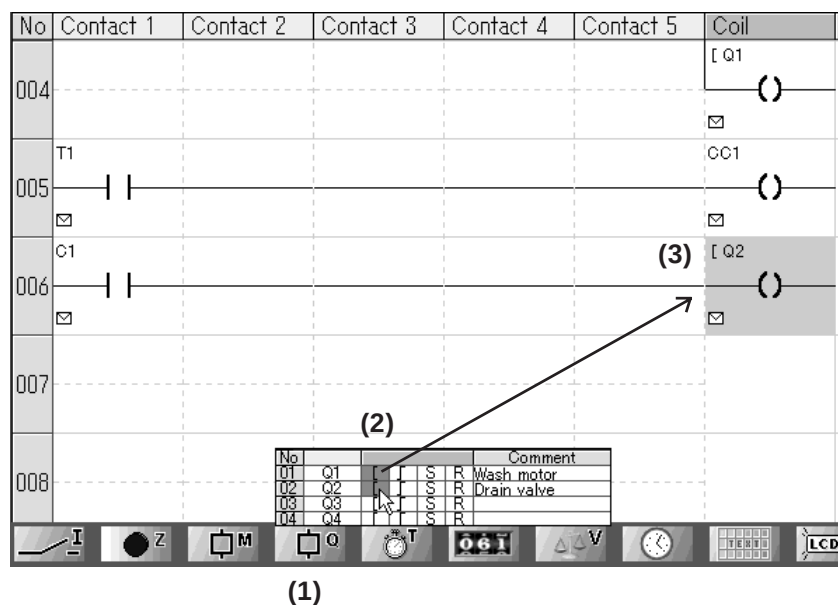
Set the preset value as follows:

Value to attain: 20 Pulses (Wash cycle)

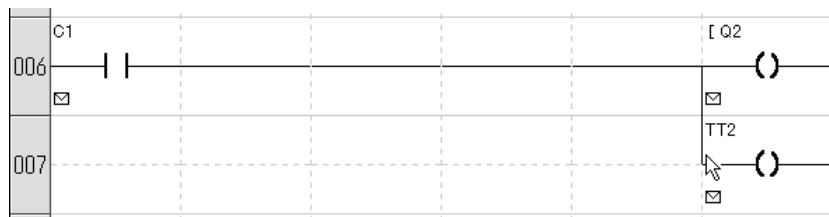


Program Example - Automatic Shoe Cleaner

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



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

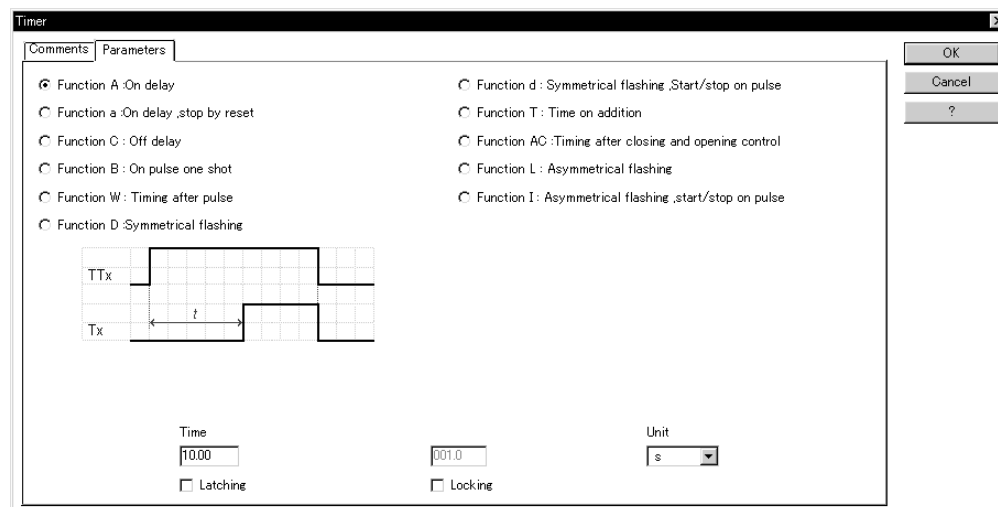


- Designate when the timer coil starts. To do this, double-click on the timer coil, or right-click on the timer coil and select [Properties].

Set the Preset value and designation as shown below:

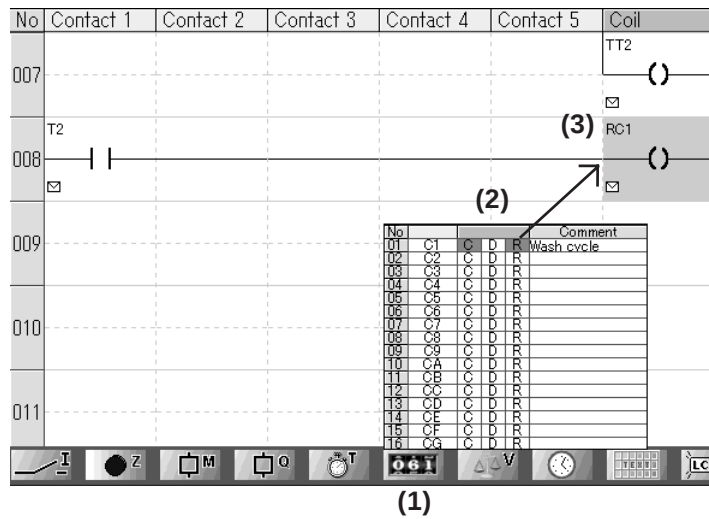
Time: 10.00s (Drain time)

Designation: Function A: On Delay



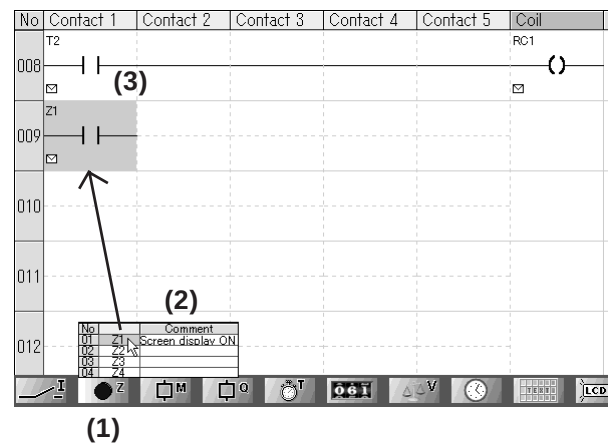
Program Example - Automatic Shoe Cleaner

8. Place the timer coil contact T2 and the counter reset coil RC1 you created in step 6.

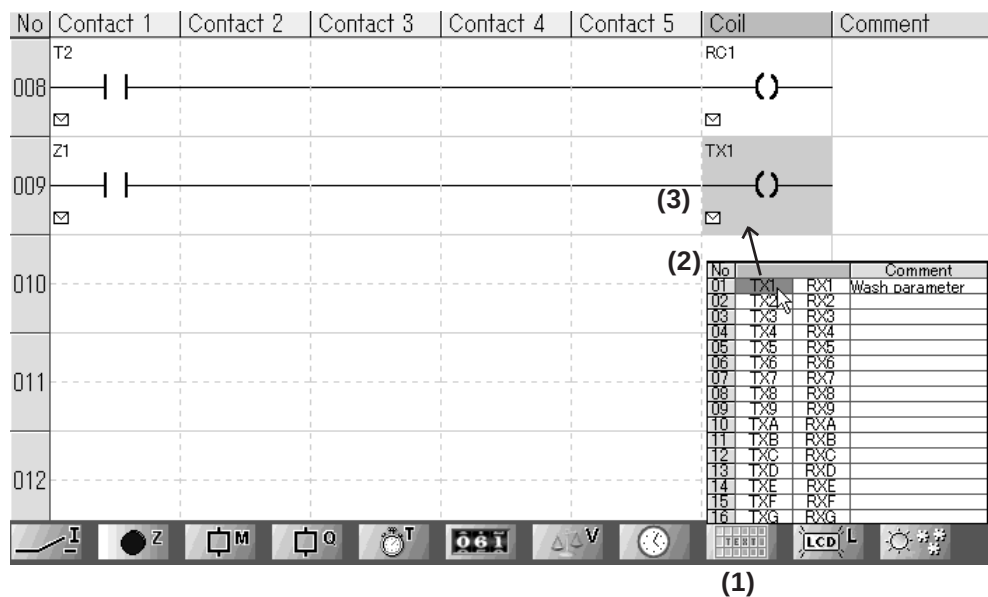


- (4) The wash time and the number of wash cycles completed can be seen on the PRO-iO2 screen

1. Position the mouse pointer on the icon (1).
2. Click on Z1 (2), drag to the desired position (3) and release to place it in the ladder program.

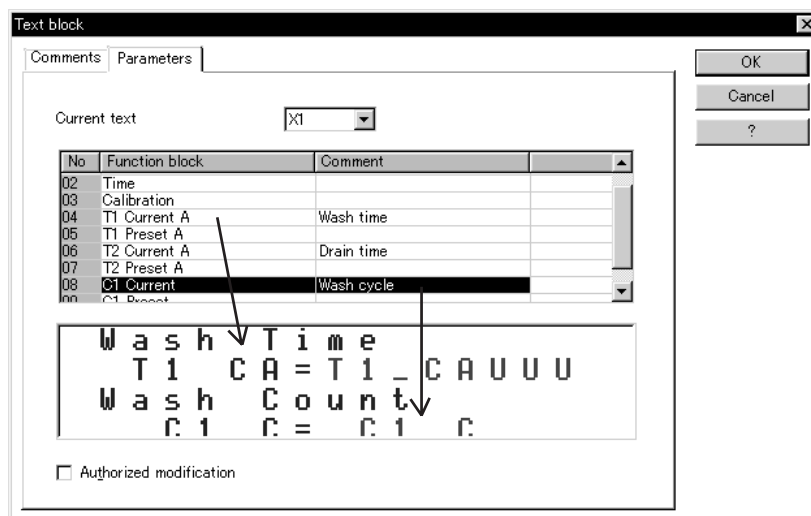


3. Repeat steps 1 and 2 to insert the text coil TX1.



Program Example - Automatic Shoe Cleaner

4. When the text coil starts, designate the parameter to be displayed on the PRO-iO2 screen. To do this, double-click the text coil, or right-click on the text coil and select [Parameters]. The following dialog box will appear.
Enter the text in rows 1 and 3. Then, select the necessary parameter from the “Text block” window and drag and drop it into row 2, and row 4.
Row 1: Enter “Wash Time” via the keyboard.
Row 2: Select “T1 current A” from the “Available function blocks” window and drag and drop it into row 2.
Row 3: Enter “Wash Count” via the keyboard.
Row 4: Select “C1 current” from the “Available function blocks” window, and drag and drop it into row 4.



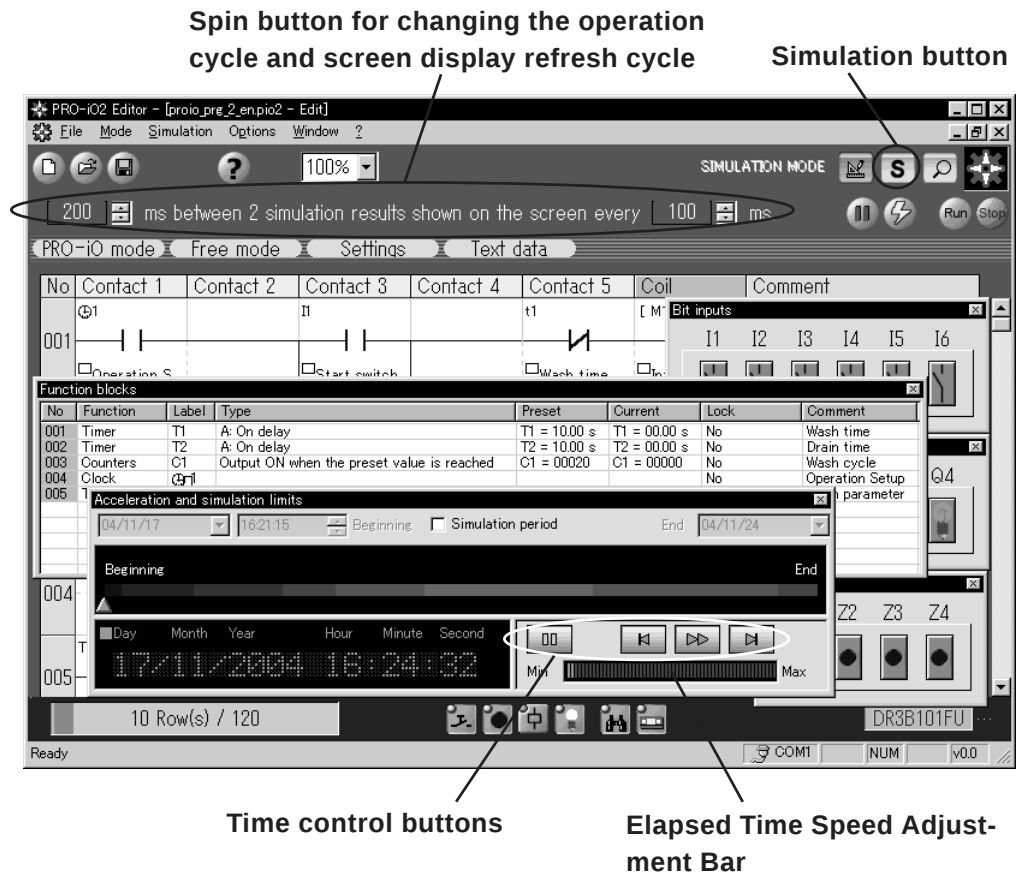
5. Repeat steps 1 and 2 to insert the Z-key contact “Z2” and the text reset “RX1” in rung no.10.

No	Contact 1	Contact 2	Contact 3	Contact 4	Contact 5	Coil	Comment
009	Z1					TX1	
	☒					☒	
010	Z2					RX1	
	☒					☒	
011							
012							
013							

No	TX1	RX1	Comment
01	TX1	RX1	Wash parameter
02	TX2	RX2	
03	TX3	RX3	
04	TX4	RX4	
05	TX5	RX5	
06	TX6	RX6	
07	TX7	RX7	
08	TX8	RX8	
09	TX9	RX9	
10	TXA	RXA	
11	TXB	RXB	
12	TXC	RXC	
13	TXD	RXD	
14	TXE	RXE	
15	TXF	RXF	
16	TXG	RXG	

■ Using the Simulation Feature

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



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

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



Note:

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

Program Example - Automatic Shoe Cleaner

- (2) The drain valve Q2 turns ON when the number of wash cycles completed reaches 20. Drain valve Q2 turns OFF automatically after 10 seconds.
- (3) Note that the above operation check was performed in the [Edit mode | Simulation] mode. However, to check the PRO-iO2 screen wash time and number of wash cycles completed display, it will be necessary to switch to [Front Panel] on the PRO-iO2 Editor menu.

To switch to [Front Panel] mode, select [Window | Front Panel] on the PRO-iO2 Editor menu, and click on the  button in the screen's upper-right corner. Doing so will check your logic program in PRO-iO mode.

Click on the “Z keys” show/hide dialog box’s Z1 key. The PRO-iO2 screen image now displays the wash time and number of wash cycles completed.

Click on the Z2 key to return to the main PRO-iO2 screen.



App.1 Error Messages

■ Error Messages Displayed in the Program Consistency Dialog Box



The errors that occur on the PRO-iO2 are different from those that occur on the PRO-iO. When opening a project in the PRO-iO2 Editor that was created with the PRO-iO, note that errors that have not been detected on the PRO-iO may be displayed.

Error Message	Cause	Solution
Not connected with right-hand cell	The right end of the rung is not connected to an instruction or another rung.	Connect an instruction or a rung to the right end of the rung.
Not connected with left-hand cell	The left end of the rung is not connected to an instruction or another rung.	Connect an instruction or a rung to the left end of the rung.
Vertical link not connected	The vertical rung of the link is not connected to an instruction or another rung.	Connect an instruction or a rung to the vertical rung of the link.
Timeout value zero	The Preset value of the Timer is set to zero.	Set the Preset value of the Timer properly.
Preset counter to 0	The Preset value of the Counter (No. of pulses) is set to zero.	Set the Preset value of the Counter properly.
Reference value of analog comparator zero	The Preset value of the Analog Comparator is set to zero.	Set the Preset value of the Analog Comparator properly.
Hysteresis value zero	The hysteresis value is set to zero when it is used as the conditional expression of the Analog Comparator.	Set the hysteresis value properly.
I*: Input I* already used in an analog comparator	The bit input that references the voltage value in the Analog Comparator and the bit input used in the logic program are used redundantly.	Change the bit input for the terminal that is not used with the Analog Comparator.
A*: Input I* already used as discrete	The bit input that references the voltage value in the Analog Comparator and the bit input used in the logic program are used redundantly.	Change the Analog Comparator input for the terminal that is not used with the Analog Comparator.
Counters Cx and Cy are identical	The same counter current value is specified for both the Cx and Cy in the Counter Comparator.	Change the settings so that different counter current values are specified for Cx and Cy.

(Continued on the next page.)

Error Messages

(Continued from the previous page.)

Error Message	Cause	Solution
The coil output contact C* is not used	A Counter contact corresponding to the Counter used in the logic program does not exist.	Place a Counter contact correctly.
C* Reset input not connected	A Counter Reset corresponding to the Counter used in the logic program does not exist.	Place a Counter Reset coil correctly.
M* Reset input not connected	An Auxiliary Relay Reset corresponding to the Auxiliary Relay used in the logic program	Place an Auxiliary Relay Reset coil properly.
No summer time change programmed	A Summertime contact is used without configuring the Summertime settings properly.	Configure the Summertime settings on the [Date Format] tab displayed by selecting the [Edit/Program Configuration] menu.
Coil * used several times	The same coil is used on two or more lines in the logic program.(Duplicate coils cannot be used in the PRO-iO2. When coils are duplicated, all duplicated coils will not function in the actual product.)	Modify the logic program so that the coils are not duplicated.

■ Error Messages Displayed During a Program Transfer

Error Message	Cause	Solution
The target peripheral is not reacting. Check the connection.	The cable may not be connected, or power may not be supplied to the module.	Check the status of the cable or the module.
The target does not contain any executable code.	The compilation during the transfer may have failed.	Perform the transfer again.
- Internal error - Unknown error	A critical error has occurred.	Contact your local PRO-iO2 distributor.

App.2 PRO-iO Compatibility

App.2.1 Model Conversion

When a project file created using the PRO-iO Editor is opened in the PRO-iO2 Editor, the model selected in the project is converted automatically.

Refer to the tables below for the model type conversion and differences in the number of input/output points.

■ When using the DR1-A101BD:

DR1-A101BD is automatically converted to DR2-B121BD in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		IB			
I6		IC			
		ID			
		IE			

■ When using the DR1-B121BD:

DR1-B121BD is automatically converted to DR2-B121BD in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		IB			
I6		IC			
IB		ID			
IC		IE			



Note:

The Analog Comparator input terminals IB and IC are converted to IF and IG respectively as the result of the model conversion. Check the terminals to be compared on the setting dialog box for the Analog Comparator.

PRO-iO Compatibility

■ When using the DR1-A201BD:

DR1-A201BD is automatically converted to DR2-B201BD in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		I5	Q5		Q5
I6		I6	Q6		Q6
I7		IB	Q7		Q7
I8		IC	Q8		Q8
I9		ID			
IA		IE			
IB		IF			
IC		IG			

■ When using the DR1-B201BD:

DR1-B201BD is automatically converted to DR2-B201BD in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		I5	Q5		Q5
I6		I6	Q6		Q6
I7		IB	Q7		Q7
I8		IC	Q8		Q8
I9		ID			
IA		IE			
IB		IF			
IC		IG			



Note:

The Analog Comparator input terminals IB and IC are converted to IF and IG respectively as the result of the model conversion. Check the terminals to be compared on the setting dialog box for the Analog Comparator.

■ When using the DR1-A101FU:

DR1-A101FU is automatically converted to DR2-B121FU in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		I5			
I6		I6			
		I7			
		I8			

■ When using the DR1-B101FU:

DR1-B101FU is automatically converted to DR2-B121FU in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		I5			
I6		I6			
		I7			
		I8			

■ When using the DR1-A201FU:

DR1-A201FU is automatically converted to DR2-B201FU in the PRO-iO2 Editor. The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		I5	Q5		Q5
I6		I6	Q6		Q6
I7		I7	Q7		Q7
I8		I8	Q8		Q8
I9		I9			
IA		IA			
IB		IB			
IC		IC			

PRO-iO Compatibility

■ When using the DR1-B201FU:

DR1-B201FU is automatically converted to DR2-B201FU in the PRO-iO2 Editor.
The following table shows the differences in the number of input/output points caused by the model conversion.

Input			Output		
PRO-iO	→	PRO-iO2	PRO-iO	→	PRO-iO2
I1	→	I1	Q1	→	Q1
I2		I2	Q2		Q2
I3		I3	Q3		Q3
I4		I4	Q4		Q4
I5		I5	Q5		Q5
I6		I6	Q6		Q6
I7		I7	Q7		Q7
I8		I8	Q8		Q8
I9		I9			
IA		IA			
IB		IB			
IC		IC			

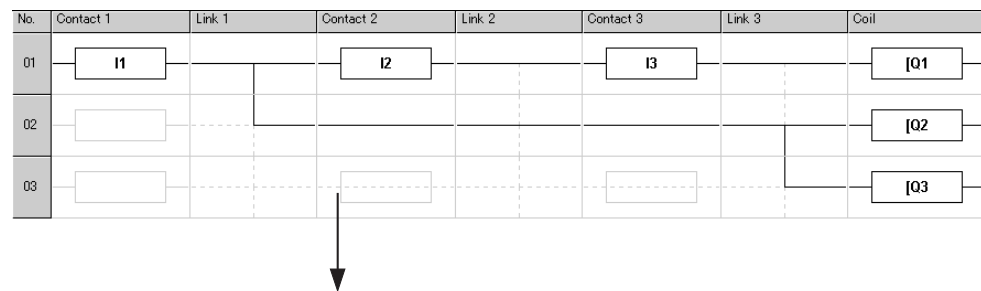
App.2.2 Changing Contact and Link Cells

With PRO-iO Editor, special cells are prepared for contacts and links that can be used to place the elements; however, the special cells for links are not featured in the PRO-iO2 Editor. To place a link in the PRO-iO2 Editor, click on the ruled outline of the cell.

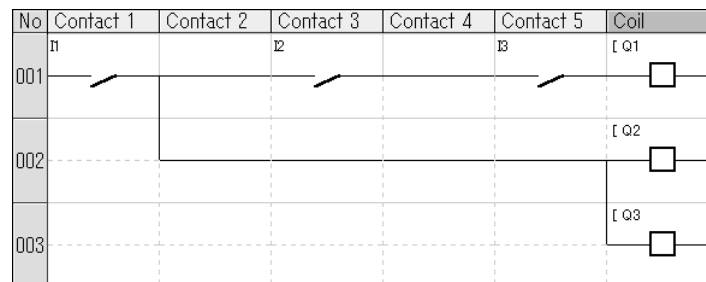
<Example>

When a logic program prepared with the PRO-iO Editor is opened in the PRO-iO2 Editor

PRO-iO Editor



PRO-iO2 Editor



In addition to the column for coils, 6 columns can be set up on the PRO-iO Editor, while 5 columns can be set up on the PRO-iO2 Editor. Therefore, Contact 1, Contact 2, and Contact 3 that have been set up on the PRO-iO Editor will be assigned to Contact 1, Contact 3, and Contact 5 respectively in the PRO-iO2 Editor. (Refer to the diagram above.)

The branches that have been set up on Link 3 of the PRO-iO Editor will be displayed in the Coil column in the PRO-iO2 Editor.



Note:

When a project file created with the PRO-iO Editor is opened in the PRO-iO2 Editor, the logic program is displayed with electrical symbols regardless of the settings of the project file.

App.2.3 Initialization of Parameter Settings

When a project file created with the PRO-iO Editor is opened in the PRO-iO2 Editor, the following parameters are initialized.

■ Cycle time

Since the PRO-iO does not feature the scan time setting, the scan time is automatically modified by the logic program you have created. On the PRO-iO2, the cycle time setting is always initialized to the default value of “1 x 10 ms”.

■ Watchdog action

The PRO-iO does not feature the watchdog setting. On the PRO-iO2, the watchdog setting is always initialized to “No action”.

■ Password

The password set up on the PRO-iO is always initialized on the PRO-iO2, and the password protection is cleared.

■ Module language

The module language setting on the PRO-iO is always initialized on the PRO-iO2, and set to “English”. The PRO-iO2 only supports English for the module language.

■ Z keys

The Active/Inactive status of Z-key settings on the PRO-iO is initialized on the PRO-iO2, and always set to “Active”.

■ Footer information in Print settings

The footer information set up on the PRO-iO is reflected in the [Header and Footer] on the [File/Print Setting] or in the [Properties] tab of the [Edit/Program Configuration] menu.

There are the following restrictions on the header/footer information.

- “Department name”, “Authorized by” and “Date”

The PRO-iO2 Editor does not feature the “Department name”, “Authorized by” and “Date” parameters. Enter the information in the Comment field on the [Properties] tab as necessary, which is displayed by selecting the [Edit/Program Configuration] menu.

- “Version”

The PRO-iO2 Editor defines the notation format of the “Version”. Some version information set up in the PRO-iO Editor may not be reflected properly. If this is the case, enter the information in the Version field on the [Properties] tab as necessary, which is displayed by selecting the [Edit/Program Configuration] menu.

Enter the version information within the range of “0.0” to “255.255”.

App.2.4 Prohibition on Duplicated Coils

In the PRO-iO Editor, the same coil can be used on two or more lines (hereafter referred to as a duplicated coil).

The PRO-iO2 Editor prohibits the use of duplicated coils, and if duplicated coils are used, all of the duplicated coils will not function. In addition, the PRO-iO2 Editor allows the user to select the coil from the menu only one time.

When opening a project file created with the PRO-iO in which duplicated coils are set up, make sure to modify the program so that only one coil will be used in the program.

Note that an error will be detected in the program consistency check when duplicated coils are used in the logic program.

App.2.5 Counter Accuracy

The PRO-iO2 counter can count at a precision of up to 30ms. When using this high level of precision, be sure to use the "High Speed Counter" feature.