User's Manual

UTAdvanced

LL50A
Parameter Setting Software

with Ladder Program Building Function and Network Profile Creating Function

IM 05P05A01-02EN

vigilantplant.

YOKOGAWA
Yokogawa Electric Corporation

IM 05P05A01-02EN
6th Edition

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Introduction

Thank you for purchasing the digital indicating controller UTAdvanced Series and LL50A Parameter Setting Software.

This manual describes how to use LL50A and network profile tool, ladder program function. Please read through this user's manual carefully before using the product.

The following manuals are also available for this software and the main units.

- **Printed manual**

Manual Name	Manual Number	Description
LL50A Parameter Setting Software Installation Manual	IM 05P05A01-01EN	This manual describes how to install and uninstall the LL50A.

- **Electronic manuals**

Manual Name	Manual Number	Description
UT35A/UT32A Operation Guide (for Standard model)	IM 05P01D31-11EN	This manual describes basic operation of the UT35A/UT32A.
UT35A/UT32A Operation Guide (for Detailed model)	IM 05P01D31-15EN	Ditto
UT35A/UT32A User's Manual	IM 05P01D31-01EN	This manual describes the usage of all functions except the ladder sequence and communication functions.
UT55A/UT52A Operation Guide (for Standard model)	IM 05P01C31-11EN	This manual describes basic operation of the UT55A/UT52A.
UT55A/UT52A Operation Guide (for Detailed model)	IM 05P01C31-15EN	Ditto
UT55A/UT52A User's Manual	IM 05P01C31-01EN	This manual describes the usage of all functions except the ladder sequence and communication functions.
UT75A Operation Guide	IM 05P01B41-11EN	This manual describes basic operation of the UT75A.
UT75A User's Manual	IM 05P01B41-01EN	This manual describes the usage of all functions except the ladder sequence and communication functions.
UP55A Operation Guide (for Standard model)	IM 05P02C41-11EN	This manual describes basic operation of the UP55A.
UP55A Operation Guide (for Detailed model)	IM 05P02C41-15EN	Ditto
UP55A User's Manual	IM 05P02C41-01EN	This manual describes the usage of all functions except the ladder sequence and communication functions.
UP35A Operation Guide (for Standard model)	IM 05P02D41-11EN	This manual describes basic operation of the UP35A.
UP35A Operation Guide (for Detailed model)	IM 05P02D41-15EN	Ditto
UP35A User's Manual	IM 05P02D41-01EN	This manual describes the usage of all functions except the ladder sequence and communication functions.
UM33A Operation Guide	IM 05P03D21-11EN	This manual describes basic operation of the UM33A.
UM33A User's Manual	IM 05P03D21-01EN	This manual describes the usage of all functions except the communication functions.
UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual	IM 05P07A01-01EN	This manual describes how to use UTAdvanced in Ethernet and serial communications. For communication wiring, see the Operation Guide or User's Manual.
UTAdvanced Series Communication Interface (Open Network) User's Manual	IM 05P07A01-02EN	This manual describes how to use the UTAdvanced in PROFIBUS-DP/DeviceNet/CC-Link communication. For communication wiring, see the Operation Guide or User's Manual.
LL50A Parameter Setting Software Installation Manual	IM 05P05A01-01EN	This manual describes how to install and uninstall the LL50A.
LL50A Parameter Setting Software User's Manual	IM 05P05A01-02EN	This manual. This manual describes how to use the LL50A, ladder sequence function, peer-to-peer communication, and network profile creating function.

6th Edition : Feb. 2013 (YK)

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Release Number

The LL50A Parameter Setting Software is a software suite of parameter setting and network profile creating tools.

LL50A Parameter Setting Software

with the light-loader adapter, dedicated cable

- Setting Tool (Setting Tool)
- Network Profile Creating Tool (Network Profile Tool)

The release numbers of LL50A Parameter Setting Software and each tool are as follows:

LL50A Parameter Setting Software	Setting Tool	Network Profile Creating Tool
R1.01	R1.01.**	None
R1.02	R1.01.**	R1.01.**
R2.01	R2.01.**	R1.01.**
R2.02	R2.02.**	R2.01.**
R3.01	R3.01.**	R3.01.**
R3.01.**	R3.01.**	R3.01.**
R4.01.**	R4.01.**	R3.01.**
R5.01.**	R5.01.**	R4.01.**

The release number of the LL50A Parameter Setting Software is printed on the product CD.

Release Number of LL50A

The release number of LL50A Parameter Setting Software is displayed on the splash window when the setting tool is started.
The release number of the Setting Tool can be found by the operation in section 2.19.
For the Network Profile Tool, the release number can be found by the operation in section 6.13.

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Concluded.

How to Use This Manual

Structure of the Manual

This user's manual is organized into Chapters 1 to 6 and appendix as shown below.

Chapter	Title	Description
1	Overview	Describes the main functional overview of the LL50A.
2	LL50A Operation Guide	Describes how to set parameters, set program pattern, and perform upload/download operations, monitoring, file management operations, and printing on the UTAdvanced.
3	A Guide to Building Ladder Programs	Describes how to build ladder programs.
4	Operations of Ladder Program Instructions	Describes details of instructions, input/output registers and special registers used in ladder programs.
5	Using Ladder Program	Describes precautions for ladder program.
6	Profile Creating Guide	Describes how to create an Electronic Device Data Sheet required to connect the UTAdvanced to the open network, and perform profile data download/upload operations, file management operations, and printing.
App	Worksheets / Input/Output Tables	Provides worksheets that are used when designing programs. Input/output tables

Scope of the Manual

This manual does not explain the basic operations of Windows XP and Windows Vista. For information regarding the basic operations of Windows, see the user's guide that came with Windows.

Symbols Used in the Manual

Indications of the button:

All of them are enclosed by brackets ([ ]).

CAUTION

Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.

Note

Identifies important information required to operate the instrument.

▶

Indicates related operations or explanations for the user's reference.

Procedure

Describes operation procedures.

Description

Describes restrictions, etc. regarding a relevant operation.

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Contents

Chapter 4 Operations of Ladder Program Instructions

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1.1 Functional Overview

This section describes the main functional overview of the LL50A Parameter Setting Software.

Parameter setting function

This function is used to set the parameters of the main unit.
There are setup parameters for setting the basic functions of a main unit controller and operation parameters used for setting functions necessary to operate the main unit.
It is also possible to set them using the Setting wizard.

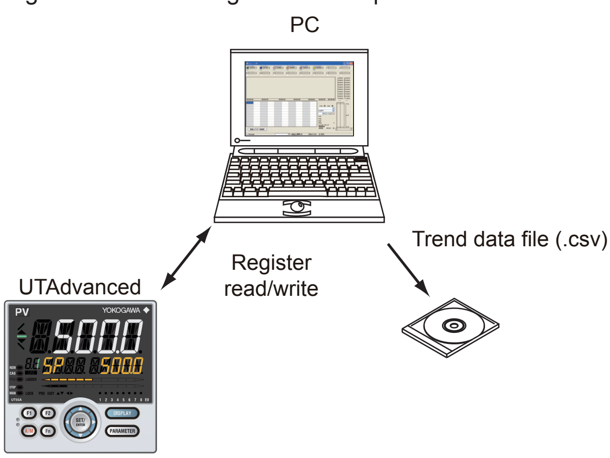
Program pattern setting function

This function is used to set the program pattern of the UP55A/UP35A.
Set the program pattern of the UT75A using the parameter setting function.

Monitoring function

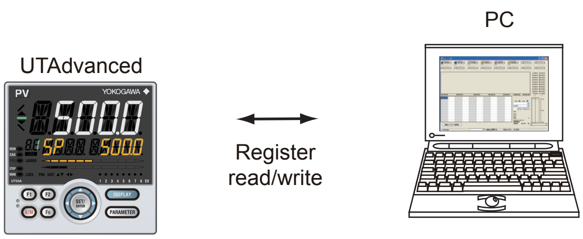
Tuning/change

With the PC connected to one controller, the tuning function tunes PID parameters by displaying PV input values (PV), target setpoints (SP), control output values (OUT), etc. on the PC screen. Furthermore, it also enables the PV, SP, and OUT values to be displayed as trend data and acquired together with the loop information and fixed registers in the Tuning window. Acquired trend data can be saved in a file of .csv format.



Monitoring/changing registers

The register monitoring function enables the main unit's registers to be monitored and/or changed during ladder program debugging.



Ladder program monitoring function

This function is used to check the operation of a ladder program you have built.

Note

The monitoring function is not available for UM33A.

Upload/download/comparison function

This function downloads parameter data, program pattern data and/or ladder program data to the main unit, uploads it from the main unit, and compares it with the main unit data.
You can specify all data, or individual data items, to be uploaded or downloaded.

File management/print function

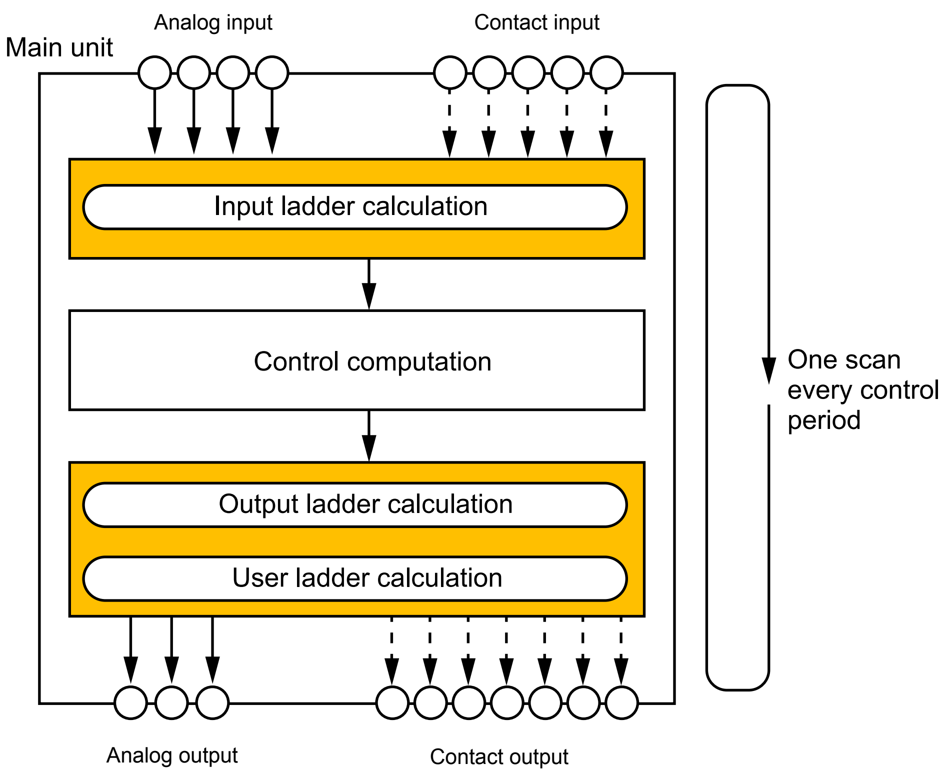
This function enables you to save created parameter data, program pattern data and/or ladder program data in a file. It also allows data to be printed out for submission to the customer.

Ladder program building function

In ladder programs, there are various computations for input and output signals, and sequence processing can be built using four fundamental arithmetic operations, logical operation, temperature compensation factor calculation, and pressure compensation factor calculation and between input and output contacts.

Configuration of ladder program

A ladder program consists of three parts: the input ladder calculation executed before control computation, and the output ladder calculation and the user ladder calculation performed after control computation. Each calculation section is respectively executed every control period.
The sequence of calculation is: input, input ladder calculation, control computation, output ladder calculation, user ladder calculation, and output.



Building a ladder program

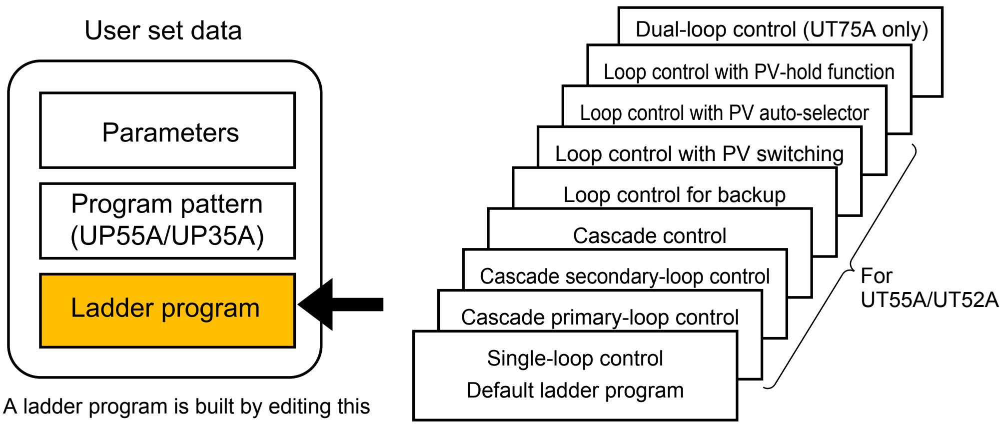
A ladder program is built by editing the default ladder programs provided for each control mode of system data.

It is recommended that the user ladder calculation section be used if a sequence is desired to be configured regardless of controller control computation.
As the initial status, the default ladder programs are described in the input ladder calculation and output ladder calculation sections on a control mode basis. No program is written in the user ladder calculation section.

► System data: Section 2.6, Setting System Data
► Default ladder programs: Section 3.10, Default Ladder Programs

CAUTION

If a new ladder program is built or the system data's control mode is changed, the ladder program is initialized to the default ladder program.
UT35A/UT32A/UP35A does not have the parameter CTLM (Control mode.)



A ladder program is built by editing this default program.

Note

The building a ladder program function is not available for UM33A.

Network Profile Creating Function

This function creates an Electronic Device Data Sheet for PROFIBUS-DP communication, DeviceNet communication and CC-Link communication (in UTAdvanced, PROFIBUS-DP, DeviceNet and CC-Link are collectively called Open Network.)
The following figure shows an example of one Open Network slave/Modbus master and 4 Modbus slaves. An arbitrary configuration like this can be created using the LL50A Network Profile Tool and Open Network Configuration tool*.
When using a fixed profile, a GSD file and EDS file can be downloaded from the YOKOGAWA website. When not using a fixed profile, an Electronic Device Data Sheet can be created as a user profile.

URL: www.yokogawa.com/ns/utadv/

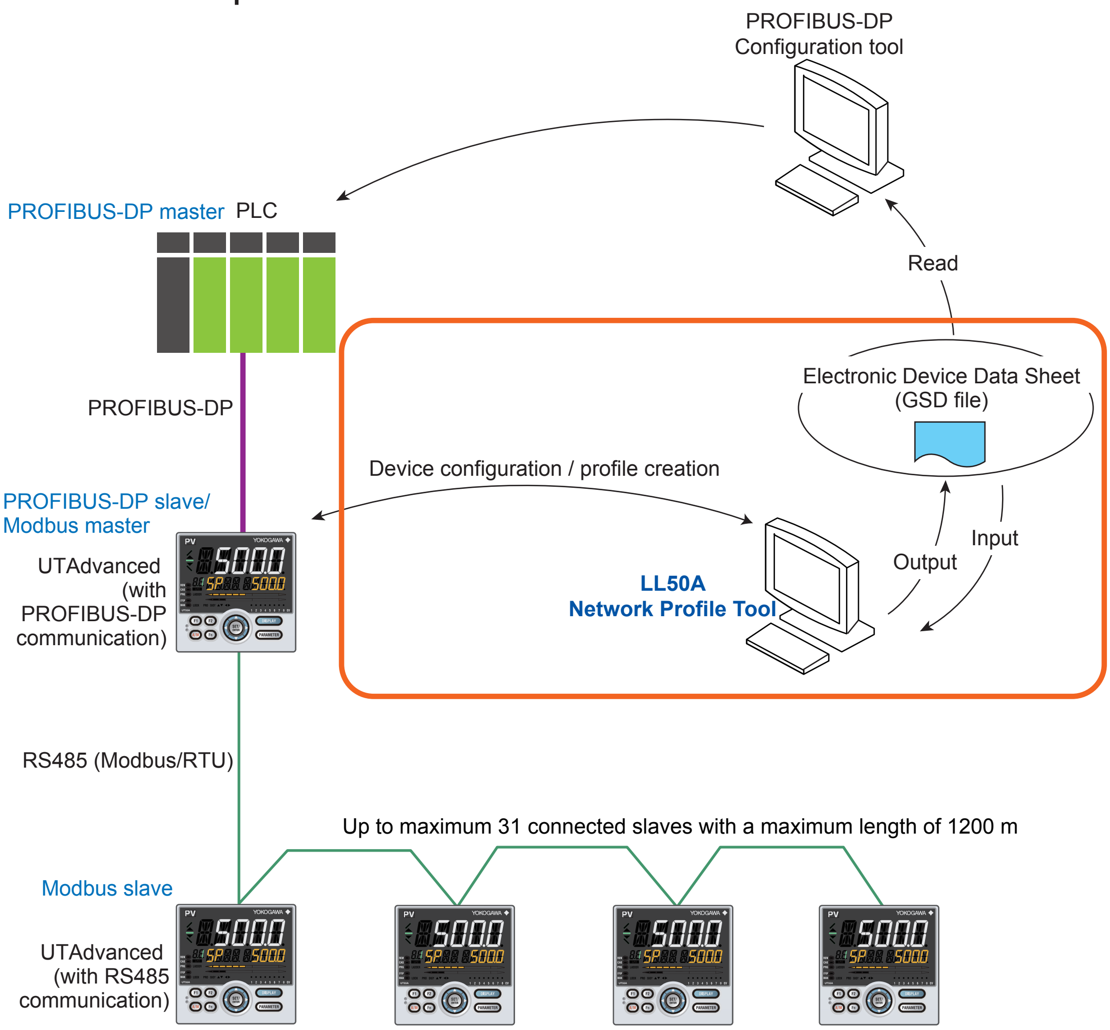
	File name	Explanation
PROFUBUS-DP	YEC45F2.GSD	
DeviceNet	UTAdvanced_Profile0.eds	Profile number: 0 (for UT55A/UT35A/UP55A/UP35A)
	UTAdvanced_Profile1.eds	Profile number: 1 (for UT55A/UT35A)
	UTAdvanced_Profile2.eds	Profile number: 2 (for UT55A/UT35A)
	UTAdvanced_Profile3.eds	Profile number: 3 (for UT55A/UT35A)
	UTAdvanced_Profile4.eds	Profile number: 4 (for UT55A)
	UTAdvanced_Profile5.eds	Profile number: 5 (for UT55A)
	UTAdvanced_Profile11.eds	Profile number: 11 (for UP55A/UP35A)
	UTAdvanced_Profile12.eds	Profile number: 12 (for UP55A/UP35A)
	UTAdvanced_Profile13.eds	Profile number: 13 (for UP55A/UP35A)
	UTAdvanced_Profile14.eds	Profile number: 14 (for UP55A)
	UTAdvanced_Profile15.eds	Profile number: 15 (for UP55A)
	UTAdvanced_Profile21.eds	Profile number: 21 (for UT75A)
	UTAdvanced_Profile22.eds	Profile number: 22 (for UT75A)
	UTAdvanced_Profile23.eds	Profile number: 23 (for UT75A)
	UTAdvanced_Profile24.eds	Profile number: 24 (for UT75A)
	UTAdvanced_Profile25.eds	Profile number: 25 (for UT75A)

*: CC-Link profile is created by using CC-Link master tool.

► OpenNetwork communication, fixed profile: UTAdvanced Series Communication Interface (OpenNetwork) User's Manual

For PROFIBUS-DP/DeviceNet configuration tool, contact PROFIBUS-DP/DeviceNet master vendor.
For CC-Link master tool, contact CC-Link master vendor.

Example: PROFIBUS-DP



Note

Network Profile Tool is available only for the light-loader adapter and the dedicated cable.

- **Electronic Device Data Sheet (GSD File (PROFIBUS-DP), EDS file (DeviceNet))**
  This is a file in the format specified by the PROFIBUS-DP/*DeviceNet communication protocol. It is called a GSD file in PROFIBUS-DP communication. It is called a EDS file in DeviceNet communication. This file is provided to the external connection device via the PLC configurator. Electronic Device Data Sheets created by other than the LL50A cannot be loaded into the LL50A.

- **Open network master**
  (PROFIBUS-DP master, DeviceNet master, CC-Link master)
  An open network master is a controller which exchanges information with slaves periodically and which is a PLC or PC (which is called a class 1 master in PROFIBUS-DP).
  An engineering or configuration device is also an open network master which is a PC on which configuration software is installed or software (which is called a class 2 master in PROFIBUS-DP.)

- **PROFIBUS-DP slave/Modbus master**
  This is an input and output device that is accessed by the master. UTAdvanced (with PROFIBUS-DP communication) runs as a PROFIBUS-DP slave.
  Furthermore, UTAdvanced (with PROFIBUS-DP communication), which runs as a PROFIBUS-DP slave, also runs as a Modbus master using the RS-485 terminal.
  It reads and writes the parameters of Modbus slaves, which are connected via RS-485 communication, according to the profile definition.

- **Modbus slave**
  This is UTAdvanced (with RS-485 terminal). Up to 31 slaves can be connected.

1.2 Operating Environment

PC

Applicable OS: Windows XP Professional (with Service Pack 2 or later) (32-bit version)
Windows Vista Business (with Service Pack 1) (32-bit version)
Windows 7 Professional (32-bit/64-bit versions)
Windows 8 Pro (32-bit/64-bit versions for Desktop)
In case of Windows XP/Vista, .NET Framework 3.5 SP1 and the Language pack are automatically installed.

Recommended CPUs: Pentium 4 Processor 2.4 GHz or higher
(3.0 GHz or higher in Windows Vista Business/Windows 7 Professional/Windows 8 Pro)
Pentium D Processor 2.6 GHz or higher
Pentium Core 2 Duo Processor 1.8 GHz or higher
Pentium Dual-Core Processor 1.6 GHz or higher

Recommended Main Memory:
Windows XP Professional; 512 MB or more
Windows Vista Business/Windows 7 Professional/Windows 8 Pro; 2 GB or more

Hard disk space:
Program storage capacity: 100 MB or more
.NET Framework 3.5 SP1 storage capacity: 620 MB or more

Display: 1024 x 768 pixels or more
Color: 256 or more colors

Communication port: For communication with a dedicated cable, use the USB port/one channel.
For communication via an RS-485 communication terminal, use an RS-232C port (An RS-232C/RS-485 converter is required; Model ML2 is recommended)
For Ethernet communication, use 10BASE-T/100BASE-TX.

CD-ROM drive: One (required for installation)

Printer: Paper size; Letter or A4 (required for printing)

Dedicated Adapter

Communication method:

Non-contact, two-way, serial optical communication on the controller side

Compliant with the USB Specification Rev. 1.1 on the PC side

Power supply: Supplied from the USB bus power

Rated input voltage; 4.75 to 5.25 VDC,

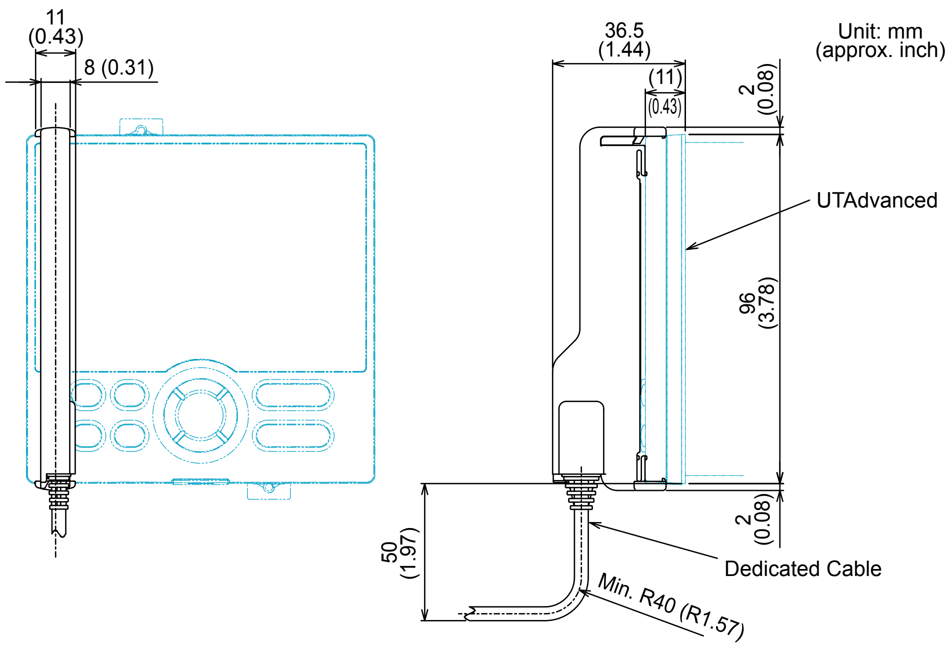
100 mA DC (including the dedicated cable)

Ambient temperature: 0 to 50°C

Ambient humidity: 20 to 90%RH (No condensation)

Transport and storage conditions: -20 to 70°C, 5 to 90%RH (No condensation)

Dust-proof and drip-proof: IP3x



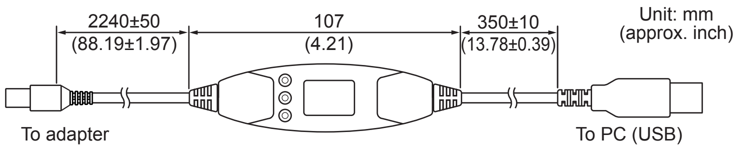
Dedicated Cable

USB serial converter is incorporated, Compliant with the USB Specification Rev. 1.1

USB Series “A” plug on the PC side

Dedicated plug (5-pin) on the adapter side

Cable length: About 2.7 m



CAUTION

- The dedicated cable is not waterproof. Do not use it in locations that are likely to be exposed to splashes of water or other liquids.
- Directly insert the USB plug into a USB port on the PC.

EMC Standards

CE marking: EN61326-1 Class A, Table 2 (For use in industrial locations)

C-tick mark: EN 55011 Class A, Group1

CAUTION

This instrument is an EMC class A product. In a domestic environment, this product may cause radio interference in which case the user needs to take adequate measures.

Light-loader communication interface on the controller’s front panel

Dedicated cable (with RS-232C/USB conversion function)

Compliant with the USB Specification Rev. 1.1 on the PC side

Maintenance port

Dedicated cable (with RS-232C/USB conversion function)

Ethernet communication

Specification: IEEE802.3 compliant, 10BASE-T/100BASE-TX, RJ45 connector

For a connection via a hub: Straight cable

For a direct connection: Cross cable

RS-485 communication

Specification: EIA RS-485 compliant

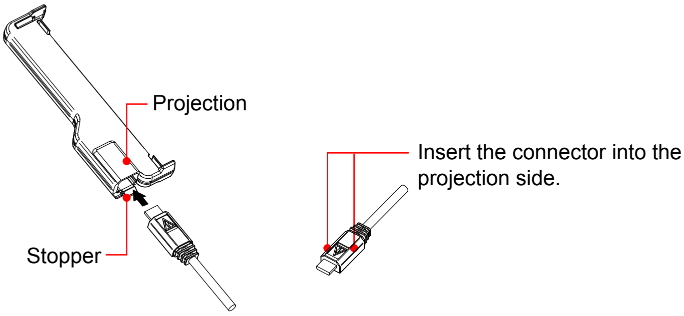
1.3 Connecting the Main Unit to a PC and Setting Parameters

Dedicated cable

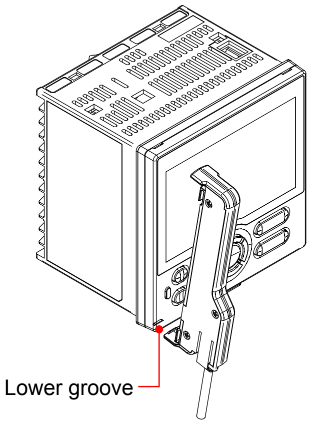
Light-loader Communication (front panel communication)
Attach the light-loader adapter to the main unit’s front panel and connect the dedicated cable between the PC’s USB terminal and the light-loader adapter.
Network Profile Tool is available only for the light-loader adapter and the dedicated cable.

Attach the light-loader adapter and the dedicated cable

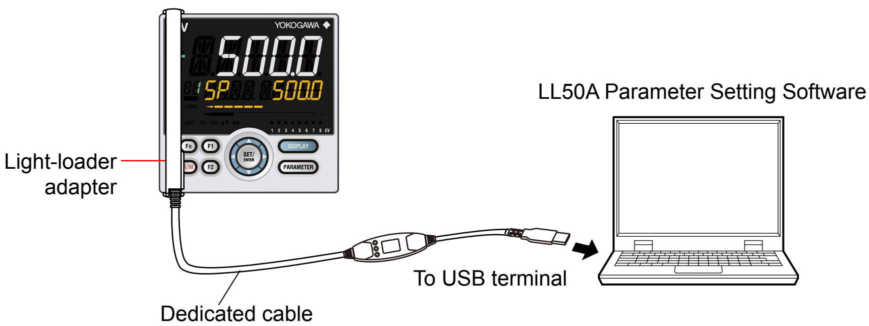
1. Attach the light-loader adapter and the dedicated cable.
   Insert the connector into the adapter until you hear a click.



2. Attach the light-loader adapter to the main unit’s front panel.
   Hang the dedicated adapter's bracket from the lower side groove.
   Bring the dedicated adapter into contact with the main unit’s front panel.

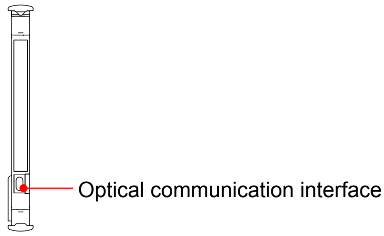


3. Connect the dedicated cable to the USB communication port of a personal computer.



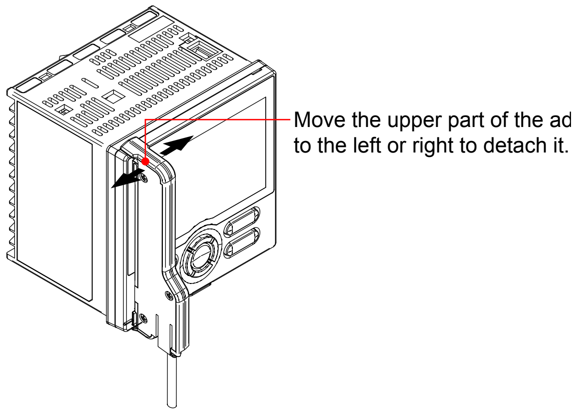
CAUTION

- Make sure the light-loader adapter is attached to the controller in a vertical orientation. Communication is not possible if the light-loader adapter is attached in a slanting position.
- Do not remove the dedicated cable while LL50A communicate, or it may affect the stability of the operation system.
- Do not suspend while LL50A communicate, or the system may fail to recover subsequently form the suspension.
- The dedicated adapter and the dedicated cable are not waterproof. Do not use them in locations that are likely to be exposed to splashes of water or other liquids.
- Do not make dirty the optical communication interface.

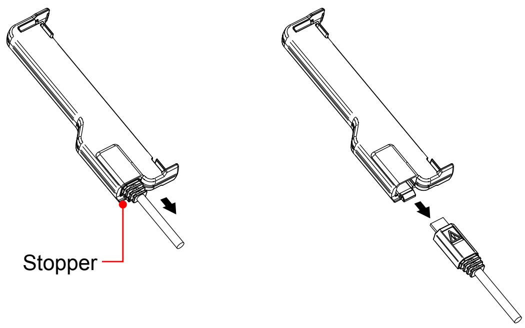


Detach the light-loader adapter and the dedicated cable

1. Detach the light-loader adapter from the main unit.



2. Disconnect the dedicated cable from the light-loader adapter.

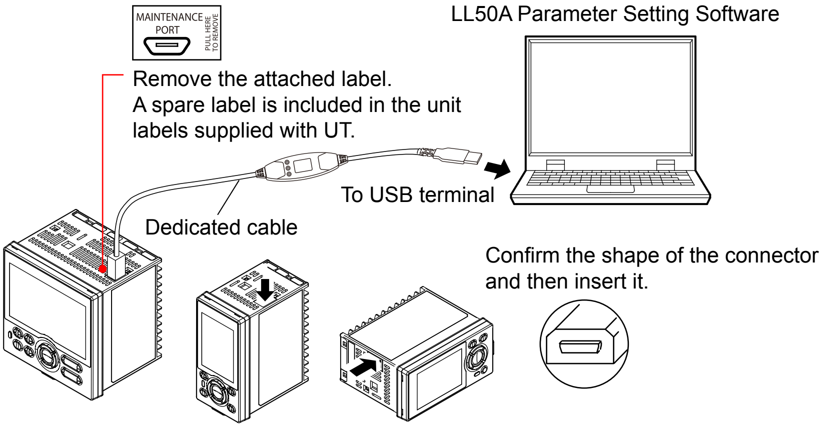


Maintenance Port (not necessary to supply power to the main unit)

Connect the dedicated cable between the PC's USB terminal and the connection port on top of the main unit.

Note

When connecting the PC to a main unit using the maintenance port, do not supply power to the main unit, otherwise the main unit will not function properly. If the dedicated cable is connected to the main unit and the power is turned on or if the main unit's power supply is turned on and the dedicated cable is connected, disconnect the cable and turn the main unit's power supply back on again. This returns the main unit to the normal condition.



The following table shows the functions available between the main unit and LL50A when the PC is connected using the main unit's maintenance port.

Menu	Function
Communication	Upload all
	Download all
	Upload parameter data
	Download parameter data
	Upload program pattern data
	Download program pattern data
	Upload ladder program
	Download ladder program
	Compare communication
Main unit operation	Factory defaults
	User defaults
	Set User defaults
	Program pattern clearance

Note

Network Profile Tool cannot be set via the maintenance port.

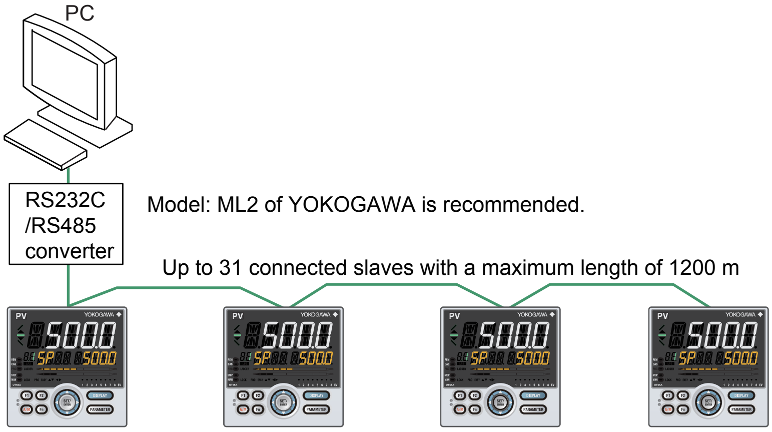
Setting parameters

It is not necessary to set communication parameters on the main unit side.

RS-485 communication terminal

Connect the PC to the main unit via the communication terminal on the main unit's rear face.

This connection requires an RS232C/RS485 converter (recommended model: ML2, Yokogawa Electric).



Note

Network Profile Tool cannot be set via the RS-485 communication terminal.

Setting parameters

Check the position of the RS-485 communication terminal and set the parameters. The terminal area to be used differs depending on the model and suffix codes. Confirm the specification of the main unit.

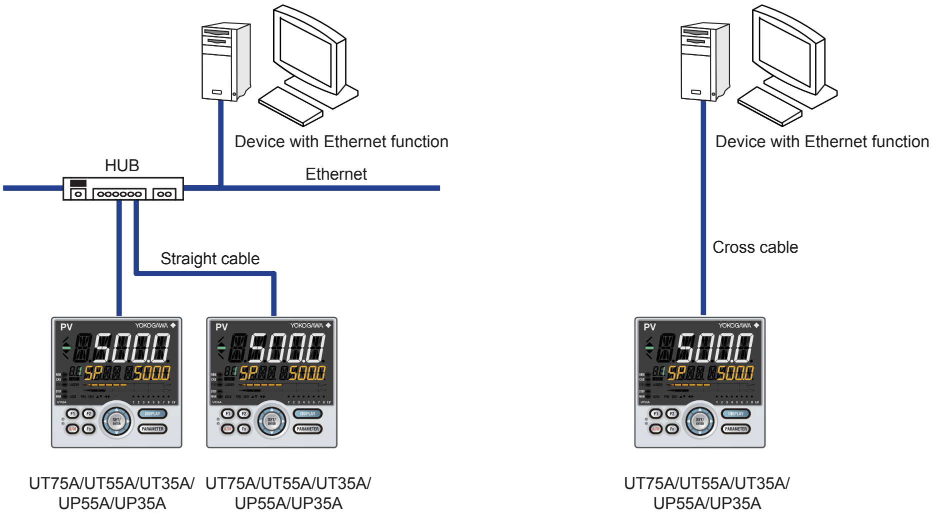
Parameter symbol	Name	Display level	Setting range	Menu symbol
PSL	Protocol selection	EASY	PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) Coordinated master station (2-loop mode) CO-S1: Coordinated slave station (Loop-1 mode) CO-S2: Coordinated slave station (Loop-2 mode) P-P: Peer-to-peer communication	R485 **Set**
BPS	Baud rate		600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps Up to 19.2k bps for RS-485 in E4-terminal area.	
PRI	Parity		NONE: None EVEN: Even ODD: Odd	
STP	Stop bit		1: 1 bit, 2: 2 bits	
DLN	Data length		7: 7 bits, 8: 8 bits	
ADR	Address		1 to 99	

Set: Setup parameter

When parameters have been displayed, the terminal areas (E1 to E4) are indicated in the group display area according to the suffix and optional suffix codes.

Ethernet communication

Use a 10BASE-T/100BASE-TX compatible cable to connect the PC to a network through which the PC can communicate, and then connect to main units on the network.



Note

When connecting a UT75A/UT55A/UT35A/UP55A/UP35A to a network, the baud rate, connectors, etc. must match. For more information, consult a network administrator who connects UT75A/UT55A/UT35A/UP55A/UP35A devices to networks.

Note

Network Profile Tool cannot be set via the Ethernet communication terminal.

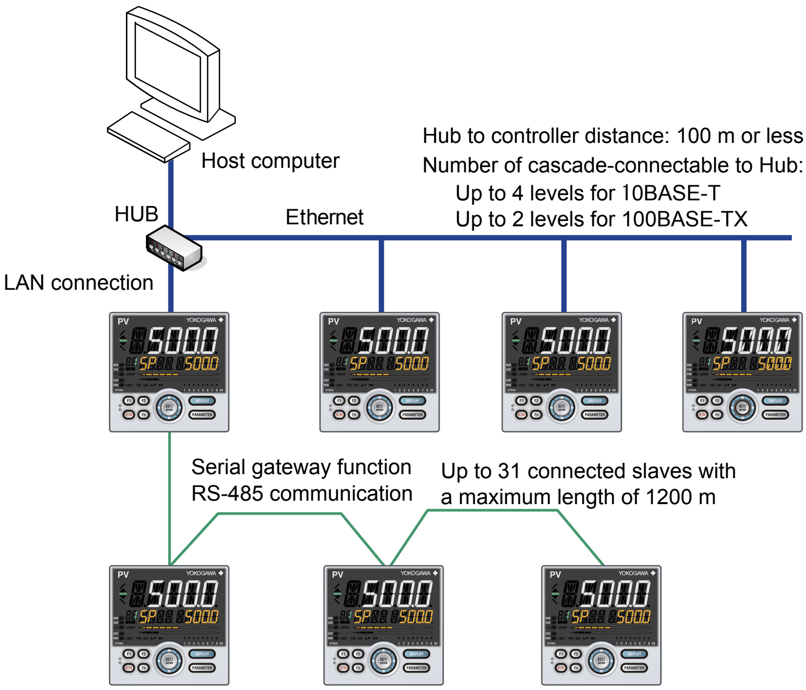
Setting parameters

Parameter symbol	Name	Display level	Setting range	Menu symbol
HSR	High-speed response mode		OFF, 1 to 8	
IP1 to IP4	IP address 1 to 4		0 to 255 Default: (IP1).(IP2).(IP3).(IP4) =(192).(168).(1).(1)	
SM1 to SM4	Subnet mask 1 to 4		0 to 255 Default: (SM1).(SM2).(SM3).(SM4) =(255).(255).(255).(0)	
DG1 to DG4	Default gateway 1 to 4		0 to 255 Default: (DG1).(DG2).(DG3).(DG4) =(255).(255).(255).(0)	
PRT	Port number	EASY	502, 1024 to 65535	ETHR Set
IPAR	IP access restriction		OFF: Disable, ON: Enable	
1.IP1 to 1.IP4	Permitted IP address 1-1 to 1-4		0 to 255 Default: (1.IP1).(1.IP2).(1.IP3).(1.IP4) =(255).(255).(255).(255)	
2.IP1 to 2.IP4	Permitted IP address 2-1 to 2-4		0 to 255 Default: (2.IP1).(2.IP2).(2.IP3).(2.IP4) =(255).(255).(255).(255)	
ESW	Ethernet setting switch		Setting this parameter to “ON” enables the Ethernet parameter settings. OFF, ON	

Set: Setup parameter

Ethernet-serial gateway function

Connect the main unit with RS-485 communication to the main unit with Ethernet-serial gateway function. The PC can access data of main unit with RS-485 communication.



The communication conditions between the main unit with gateway function and the slave main units should be the same settings (parameters PSL, STP, and DLN). ADR should be set so that there are no overlaps between slave units.
It is necessary to set the following parameters in addition to the Ethernet parameters.

Note

Network Profile Tool cannot be set via the Ethernet-serial gateway function.

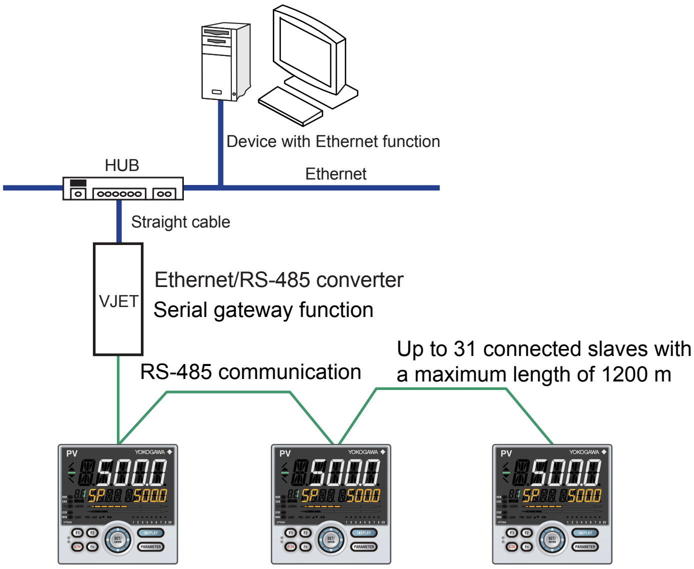
Setting parameters

Parameter symbol	Name	Display level	Setting range	Menu symbol
BPS	Baud rate	EASY	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	ETHR **Set**
PRI	Parity		NONE: None EVEN: Even ODD: Odd	

Set: Setup parameter

Connection via an Ethernet-RS485 converter

Connect the PC to main units via the Ethernet/RS-485 converter (recommended model: VJET, Yokogawa Electric).



Note

Network Profile Tool cannot be set via the Ethernet-RS485 converter.

Setting parameters

Set the communication conditions of slave main units in the same way as those of the VJET with the gateway function.
The VJET must be set using a VJET setting tool.
The VJET setting tool can be downloaded from:
https://y-link.yokogawa.com/YL007.po

Check the position of the RS-485 communication terminal and set the parameters. The terminal area to be used differs depending on the model and suffix codes. Confirm the specification of the main unit.

Parameter symbol	Name	Display level	Setting range	Menu symbol
PSL	Protocol selection	EASY	PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-M2: Coordinated master station (2-loop mode) CO-S1: Coordinated slave station (Loop-1 mode) CO-S2: Coordinated slave station (Loop-2 mode) P-P: Peer-to-peer communication	R485 Set
BPS	Baud rate		600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps Up to 19.2k bps for RS-485 in E4-terminal area.	
PRI	Parity		NONE: None EVEN: Even ODD: Odd	
STP	Stop bit		1: 1 bit 2: 2 bits	
DLN	Data length		7: 7 bits 8: 8 bits	
ADR	Address		1 to 99	

Set: Setup parameter

When parameters have been displayed, the terminal areas (E1 to E4) are indicated in the group display area according to the suffix and optional suffix codes.

1.4 Model Compatibility of LL50A Functions

The model compatibility of LL50A functions are as follows:

Functions		User File / Model	Release number of the Setting Tool									
			R5.xx.xx									
			R4.xx.xx									
			R3.xx.xx									
			R2.xx.xx									
			R1.xx.xx									
			Setting model in the System Data window									
			UT55A or UT52A		UT35A or UT32A	UT55A or UT52A	UT35A or UT32A	UP55A	UP35A	UM33A	UT35A-L	UT75A
User File	Open	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A				N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L				N/A	N/A	N/A	N/A	N/A	√	N/A
		UT75A				N/A	N/A	N/A	N/A	N/A	N/A	√
	Save	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A				N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L				N/A	N/A	N/A	N/A	N/A	√	N/A
		UT75A				N/A	N/A	N/A	N/A	N/A	N/A	√
Compare Files	Parameter	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A				N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L				N/A	N/A	N/A	N/A	N/A	√	N/A
		UT75A				N/A	N/A	N/A	N/A	N/A	N/A	√
	Ladder Program	UT55A/ UT52A	√	√	√√ (Note 1)	√	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	N/A	N/A	√√ (Note 1)
		UT35A/ UT32A	N/A	√√ (Note 1)	√	√√ (Note 1)	√	√√ (Note 1)	√√ (Note 1)	N/A	N/A	√√ (Note 1)
		UP55A	N/A			√√ (Note 1)	√√ (Note 1)	√	√√ (Note 1)	N/A	N/A	√√ (Note 1)
		UP35A				√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√	N/A	N/A	√√ (Note 1)
		UT75A	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	N/A	√
	Program pattern	UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A

√: Available, √√: Available with condition, N/A: Not available
Note 1: Each ladder program of UT75A, UT55A, UT52A, UT35A,UT32A, UP55A and UP35A can be compared mutually.

Functions		User File / Model										
			Release number of the Setting Tool									
			R5.xx.xx									
			R4.xx.xx									
			R3.xx.xx									
			R2.xx.xx									
			R1.xx.xx									
			Setting model in the System Data window									
			UT55A or UT52A		UT35A or UT32A	UT55A or UT52A	UT35A or UT32A	UP55A	UP35A	UM33A	UT35A-L	UT75A
Communication	Upload All	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A	N/A	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√	
		UT75A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
	Download All	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A				N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√√ (Note 4)	N/A	N/A	N/A
		UM33A		N/A		N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L				N/A	N/A	N/A	N/A	N/A	√	
		UT75A				N/A	N/A	N/A	N/A	N/A	N/A	√
	Upload Parameter Data	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A				N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A		N/A		N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L				N/A	N/A	N/A	N/A	N/A	√	N/A
		UT75A				N/A	N/A	N/A	N/A	N/A	N/A	√
	Download Parameter Data	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A				N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A		N/A		N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L				N/A	N/A	N/A	N/A	N/A	√	N/A
		UT75A				N/A	N/A	N/A	N/A	N/A	N/A	√
	Upload Ladder Program	UT55A/ UT52A	√	√	√√ (Note 2)	√	√√ (Note 2)	√√	√√ (Note 2)	N/A	N/A	√√ (Note 2)
		UT35A/ UT32A	N/A	√√ (Note 2)	√	√√ (Note 2)	√	√√ (Note 2)	√√	N/A	N/A	√√ (Note 2)
		UP55A				√√ (Note 2)	√√ (Note 2)	√	√√ (Note 2)	N/A	N/A	√√ (Note 2)
		UP35A		N/A		√√ (Note 2)	√√ (Note 2)	√√ (Note 2)	√	N/A	N/A	√√ (Note 2)
		UT35A-L				N/A	N/A	N/A	N/A	N/A	N/A	N/A
		UT75A	√√ (Note 2)	√√ (Note 2)	√√ (Note 2)	√√ (Note 2)	√√ (Note 2)	√√	√√ (Note 2)	N/A	N/A	√

Model Compatibility of LL50A Functions (Continued)

Functions		User File / Model	Release number of the Setting Tool									
			R5.xx.xx									
			R4.xx.xx									
			R3.xx.xx									
			R2.xx.xx									
			R1.xx.xx									
			Setting model in the System Data window									
			UT55A or UT52A		UT35A or UT32A	UT55A or UT52A	UT35A or UT32A	UP55A	UP35A	UM33A	UT35A-L	UT75A
Communication	Download Ladder Program	UT55A/ UT52A	√	√	√√ (Note 3)	√	√√ (Note 3)	√√	√√	N/A	N/A	√√ (Note 3)
		UT35A/ UT32A	N/A	√√ (Note 3)	√	√√ (Note 3)	√	√√	√√	N/A	N/A	√√ (Note 3)
		UP55A	N/A	N/A	N/A	√√ (Note 3)	√√ (Note 3)	√	√√	N/A	N/A	√√ (Note 3)
		UP35A	N/A	N/A	N/A	√√ (Note 3)	√√ (Note 3)	√√	√	N/A	N/A	√√ (Note 3)
		UT35A-L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		UT75A	√√ (Note 3)	√√ (Note 3)	√√ (Note 3)	√√ (Note 3)	√√ (Note 3)	√√	√√	N/A	N/A	√
	Upload Program Pattern Data	UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√√ (Note 5)	N/A	N/A	N/A
	Download Program Pattern Data	UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√√ (Note 4)	N/A	N/A	N/A
Compare Communication	Parameter Compare	UT55A/ UT52A	√	√	N/A	√	N/A	N/A	N/A	N/A	N/A	N/A
		UT35A/ UT32A	N/A	N/A	√	N/A	√	N/A	N/A	N/A	N/A	N/A
		UP55A	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A	N/A	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A	N/A
		UM33A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
		UT35A-L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√	N/A
		UT75A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
	Ladder Program Compare	UT55A/ UT52A	√	√	√√ (Note 1)	√	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	N/A	N/A	√√ (Note 1)
		UT35A/ UT32A	N/A	√√ (Note 1)	√	√√ (Note 1)	√	√√ (Note 1)	√√ (Note 1)	N/A	N/A	√√ (Note 1)
		UP55A	N/A	N/A	N/A	√√ (Note 1)	√√ (Note 1)	√	√√ (Note 1)	N/A	N/A	√
		UP35A	N/A	N/A	N/A	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√	N/A	N/A	√√ (Note 1)
		UT35A-L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		UT75A	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	√√ (Note 1)	N/A	N/A	√
	Program pattern	UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A
Program pattern file	Open	UT75A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√√ (Note 6)	N/A	N/A	N/A
	Save	UP55A	N/A			N/A	N/A	√	N/A	N/A	N/A	N/A
		UP35A				N/A	N/A	N/A	√	N/A	N/A	N/A

√: Available
√√: Available with condition
N/A: Not available

Note 1: Each ladder program of UT75A, UT55A, UT52A, UT35A,UT32A, UP55A and UP35A can be compared mutually.

Note 2: If the models are UT35A/UT32A/UP35A and UT75A/UT55A/UT52A/UP55A (when in single-loop control mode), the upload can be performed only when the condition is LL50A (maximum ladder program capacity) ≥ Main unit (the downloaded ladder program capacity).

Note 3: If the models are UT35A/UT32A/UP35A and UT75A/UT55A/UT52A/UP55A (when in single-loop control mode), the download can be performed only when the condition is LL50A (maximum ladder program capacity) ≤ Main unit (the downloaded ladder program capacity). The download cannot be performed when the ladder program in LL50A data includes an address that cannot be used in the downloading UT.

Max. ladder program capacity of UT75A: 1000 steps
Max. ladder program capacity of UT55A/UT52A/UP55A: 500 steps
Max. ladder program capacity of UT35A/UT32A/UP35A: 300 steps

Note 4: The number of patterns and the number of segments that can be set vary depending on whether or not option code /AP is specified. Only the pattern data that can be downloaded to the main unit can be downloaded.

Note 5: The number of patterns and the number of segments that can be set vary depending on whether or not option code /AP is specified. Only the pattern data that can be uploaded can be downloaded.

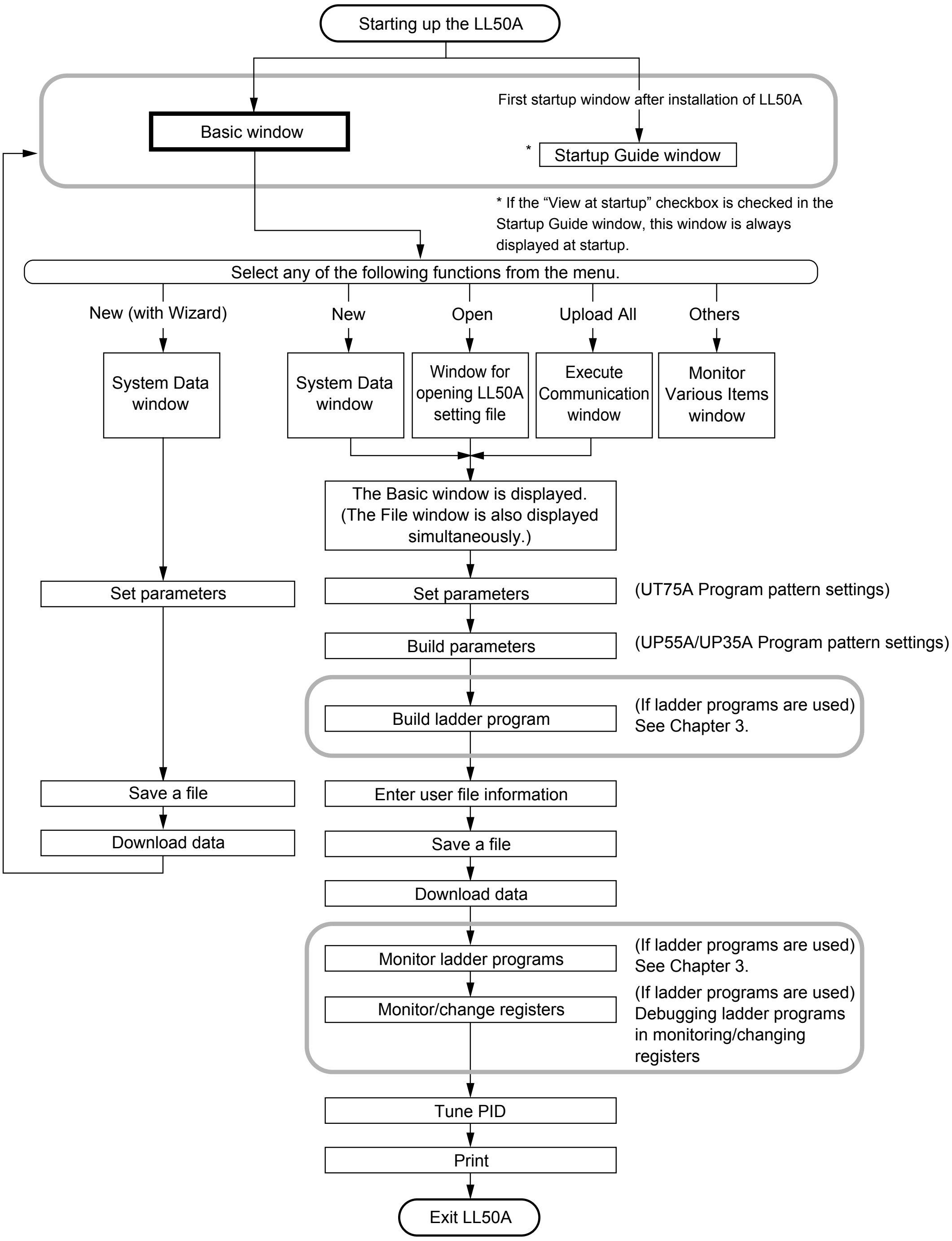
Note 6: The number of patterns and the number of segments that can be set vary depending on whether or not option code /AP is specified. Only readable pattern data can be read.

Note 7: When the ladder program includes an address that can be used only in UP55A/UP35A, the converted address is blank.

Blank Page

2.1 Setting Flow

The LL50A operation guide describes how to set parameters to the main unit, build program pattern, creating user file information, monitoring, downloading, uploading, file management, printing, etc. For how to build ladder programs, see Chapter 3, A Guide to Building Ladder Programs.
For how to create network profile, see Chapter 6, Profile Creating Guide.

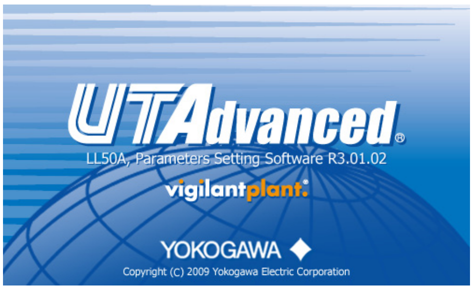


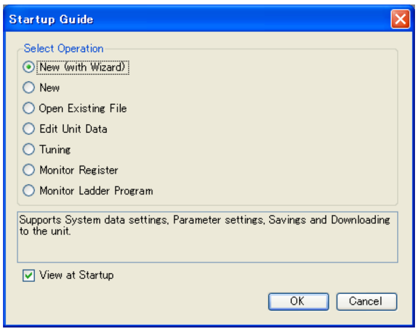
2.2 Starting up/Exiting the LL50A

Starting up the LL50A

Procedure

1. Click on Windows' [Start], select [Programs] – [UTAdvanced], and then click on [Setting Tool].





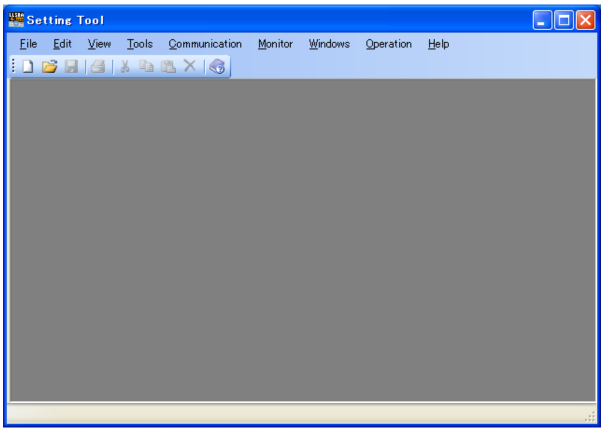
The Startup Guide window is displayed at the first startup after installing the LL50A and if the Use Startup Guide checkbox is checked in the Environmental Setting window.

- New (with Wizard)
  Enables you to set system data, set parameters, save a file, and download data to the main unit in sequence.
- New
  Creates new parameters.
- Open Existing File
  Enables you to open and edit an existing user file.
- Edit Unit Data
  Enables you to read out and edit data from the main unit.
- Tuning
  Enables you to tune main unit data.
- Monitor Registers
  Monitors main unit registers.
- Monitor Ladder Programs
  Monitors main unit ladder programs.
- View at Startup
  If this checkbox is checked, the Startup Guide window is displayed at the next startup.
- Guide message
  This section displays the description of a selected function.

2. Select a function and click the [OK] button. Click the [Cancel] button to close the window.

The Startup Guide window can also be started up by double-clicking on the Setting Tool shortcut or a setting file (user file extension: see section 2.15.2) on the Desktop.

If the Startup Guide window is disabled from being displayed at startup, the following Basic window appears.



Exiting the LL50A

Procedure

1. Click on [File] – [Exit] in the menu or click ☒.

Note

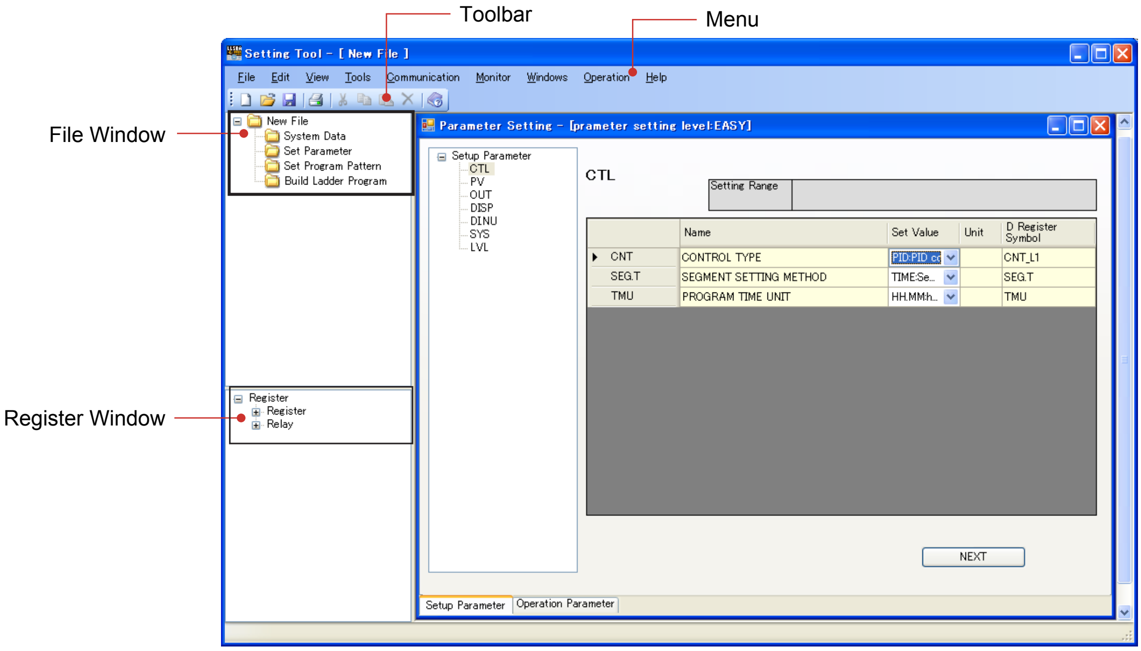
Save the current editing file as necessary.

2.3 Part Names of Window and Their Functions

Basic window

The Basic window is a background window for setting system data, setting parameters, performing tuning, building ladder programs, etc.

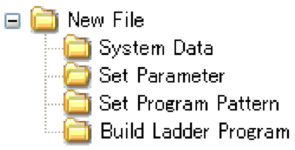
The window below shows an example display of the Parameter Setting window.



File window

The File window is displayed on the left of the Basic window. It can be made visible or invisible. If data is saved in a file, the file name is displayed.

Clicking on a folder on the tree causes the Set System Data, Set Parameter, Set Program pattern or Build Ladder Program window to appear.

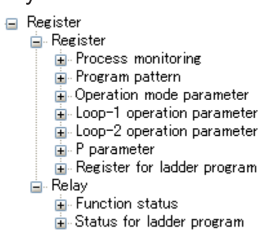


Clicking on “Build Ladder Program” in the File window causes the Build Ladder Program window to appear. In this case, the Instruction window is displayed. See Chapter 3, A Guide to Building Ladder Programs.

Register window

The Register window is also displayed on the left of the Basic window. It can be made visible or invisible. This window can be used to set parameters, set program pattern perform tuning, monitor registers, or build ladder programs.

Right-clicking in the Register window enables the [Expand] or [Collapse] shortcut menu to be selected. When Expand is selected, a register can be searched by using the keyboard to enter search conditions or something similar.



Data category of Register tree

Large class.	Middle class.	Small class.	UT55A	UT52A	UT35A	UT32A	UP55A	UP35A	UM33A	UT35A-L	UT75A
Register	Process monitoring	Process data	√	√	√	√	√	√	√	√	√
	Program pattern	Local mode setting	N/A	N/A	N/A	N/A	√	√	N/A	N/A	N/A
	Operation mode parameters	Loop-1/Loop-2 operation mode	√	√	N/A	N/A	√	N/A	N/A	N/A	√
		Operation mode	N/A	N/A	√	√	N/A	√	N/A	N/A	N/A
	Operation parameter	Loop-1/Loop-2 alarm setpoint setting	N/A	N/A	N/A	N/A	√	N/A	N/A	N/A	N/A
		Alarm setpoint setting	N/A	N/A	N/A	N/A	N/A	√	√	N/A	N/A
	Loop-1 operation parameters	SP and alarm setpoint setting	√	√	√	√	N/A	N/A	N/A	√	√
		SP-related setting	√	√	√	√	√	√	N/A	√	√
		Alarm function setting	√	√	√	√	√	√	√	√	√
		PV-related setting	√	√	√	√	√	√	√	√	√
		PID setting	√	√	√	√	√	√	N/A	N/A	√
		Control action-related setting	√	√	√	√	√	√	N/A	N/A	√
	Loop-2 operation parameters	SP and alarm setpoint setting	√	√	N/A	N/A	N/A	N/A	N/A	N/A	√
		SP-related setting	√	√	N/A	N/A	N/A	N/A	N/A	N/A	√
		Alarm function setting	√	√	N/A	N/A	√	N/A	N/A	N/A	√
		PV-related setting	√	√	N/A	N/A	√	N/A	N/A	N/A	√
		PID setting	√	√	N/A	N/A	√	N/A	N/A	N/A	√
		Control action-related setting	√	√	N/A	N/A	√	N/A	N/A	N/A	√
	P-parameters	P-parameter	√	√	√	√	√	√	N/A	N/A	√
	Custom display parameters	Custom display setting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
	Registers for ladder program	For input ladder calculation	√	√	√	√	√	√	N/A	N/A	√
		For output ladder calculation	√	√	√	√	√	√	N/A	N/A	√
		Status register	√	√	√	√	√	√	N/A	N/A	√
		Constant register	√	√	√	√	√	√	N/A	N/A	√
		Input range / scale	√	√	√	√	√	√	N/A	N/A	√
		DAT register	√	√	√	√	√	√	N/A	N/A	√
		Special register	√	√	√	√	√	√	N/A	N/A	√
		Peer-to-peer communication register	√	√	√	√	√	√	N/A	N/A	√
	Program pattern	Program pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√

√: Available
N/A: Not available

Data category of Register tree (Continued)

Large class.	Middle class.	Small class.	UT55A	UT52A	UT35A	UT32A	UP55A	UP35A	UM33A	UT35A-L	UT75A
Relay	Function status	System error	√	√	√	√	√	√	√	√	√
		Input error	√	√	√	√	√	√	√	√	√
		Operation mode	√	√	√	√	√	√	√	√	√
		Program pattern end signal Wait end signal	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
		Alarm	√	√	√	√	√	√	√	√	√
		Alarm latch	√	√	√	√	√	√	√	√	√
		Heater break alarm	√	√	√	√	√	√	N/A	N/A	N/A
		SP number, PID number	√	√	√	√	N/A	N/A	N/A	N/A	N/A
		SP number, PID number, Segment number	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
		PID number, Pattern number, Segment number	N/A	N/A	N/A	N/A	√	√	N/A	N/A	N/A
		Key	√	√	√	√	√	√	√	N/A	√
		Display	√	√	√	√	√	√	√	√	√
		PV event status	N/A	N/A	N/A	N/A	√	√	N/A	N/A	N/A
		Time event status	N/A	N/A	N/A	N/A	√	√	N/A	N/A	N/A
		Pattern number status, Segment number status	N/A	N/A	N/A	N/A	√	√	N/A	N/A	N/A
		Segment number status	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
	Status for ladder program	Input (status) relay	√	√	√	√	√	√	√	N/A	√
		Output (status) relay	√	√	√	√	√	√	√	N/A	√
		Control (status) relay	√	√	√	√	√	√	N/A	N/A	√
		Special relay	√	√	√	√	√	√	N/A	N/A	√
		Internal relay	√	√	√	√	√	√	√	N/A	√
		Peer-to-peer communication	√	√	√	√	√	√	N/A	N/A	√

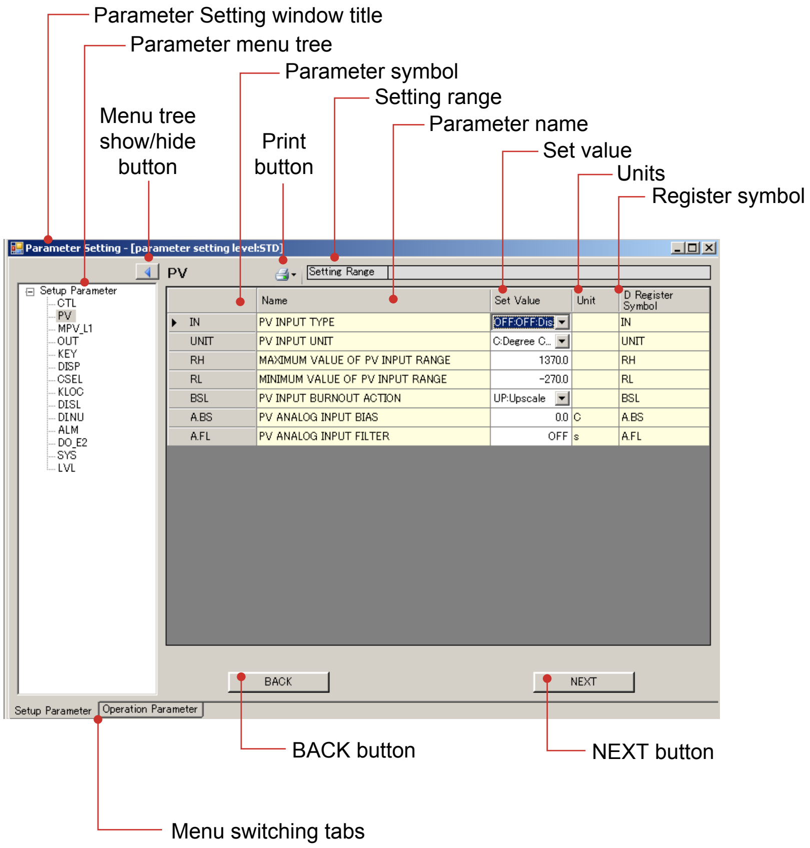
√: Available
N/A: Not available

Note

The registers and relays of Loop-2 are available for UT75A/UT55A/UT52A/UP55A.

* Only on the UT75A has groups 9 to 20.

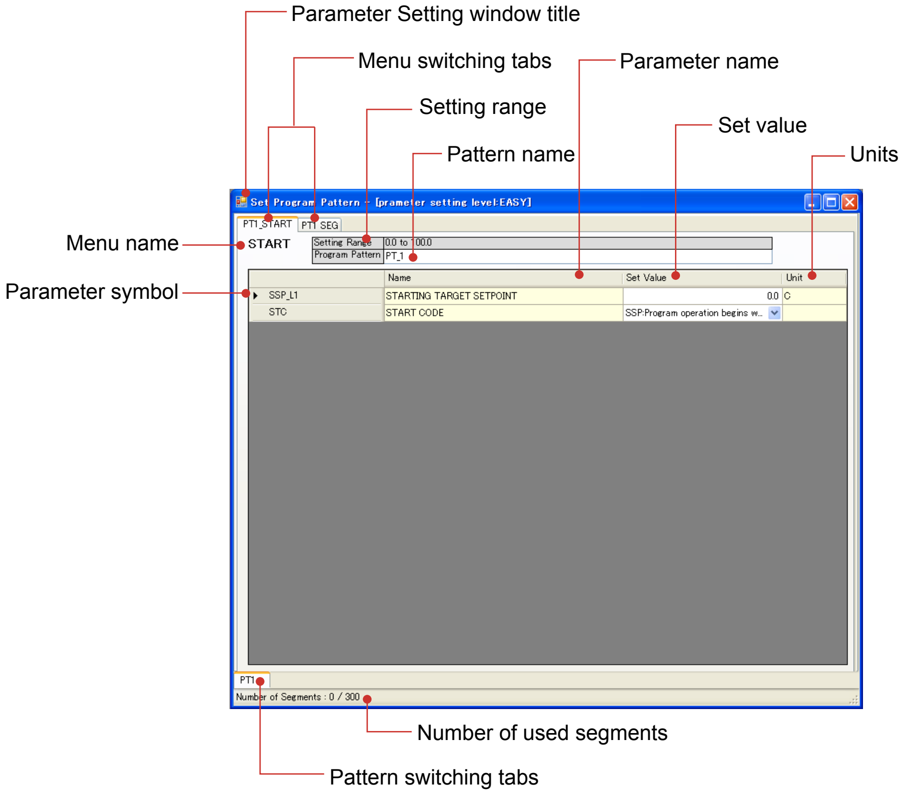
Parameter Setting window



Name	Specifications
Menu switching tabs	Used to switch to the operation parameter or setup parameter windows.
Parameter Setting window title	Parameter Setting – [Parameter display level:***] To set to easy setting mode display or parameter display level (LEVL = EASY): EASY To set to standard setting mode display or parameter display level (LEVL = STD): STD To set to professional setting mode display or parameter display level (LEVL = PRO): PRO
Parameter menu tree	A menu tree of operation parameters and setup parameters
Menu tree show/hide button	Shows/hides a parameter menu tree by clicking.
Print button	Prints parameters.
Setting Range	Shows the setting range of the selected parameter.
Parameter symbol	Shows parameter symbols.
Parameter name	Shows parameter names.
Set value	Shows parameter set values. Enter a set value into a cell directly or select it from a dropdown list. To register a register, enter a register symbol by drag-and-drop from the Register window or input a register symbol into a cell directly.
Units	Shows the unit of a parameter set value.
Register symbol	Shows register symbols. Use these symbols when performing tuning or building ladder programs.

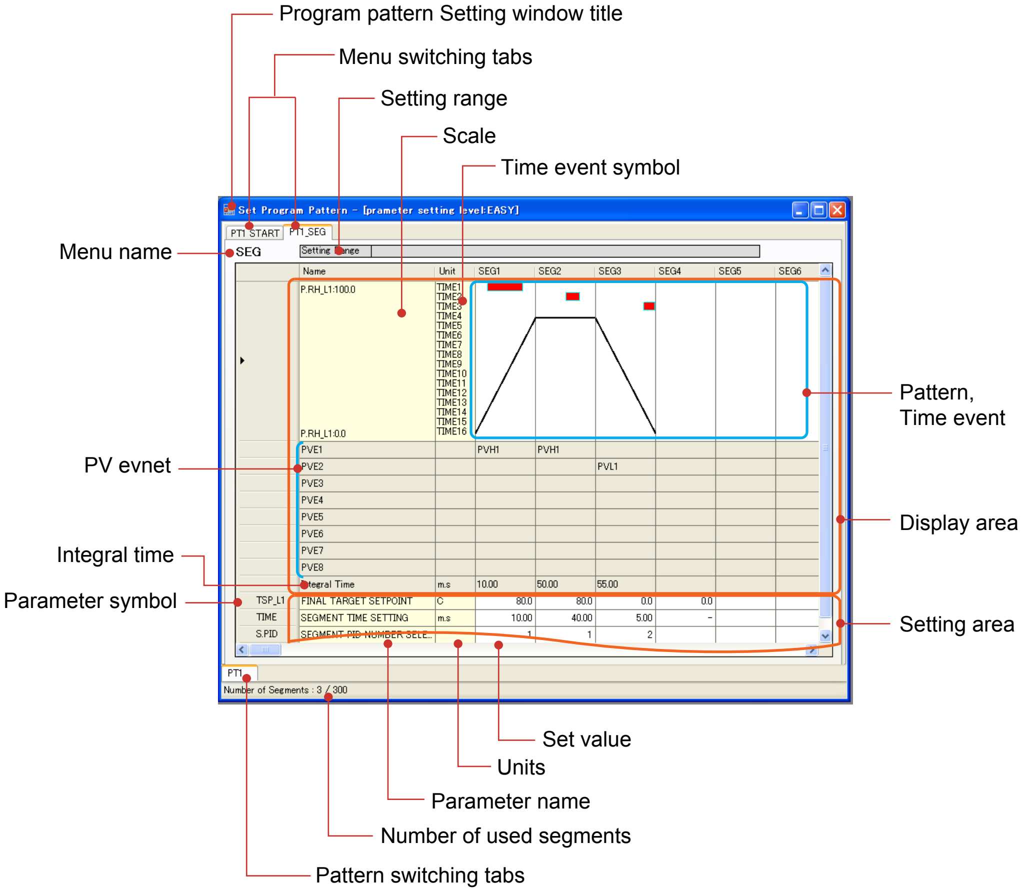
Program pattern Setting window (UP55A/UP35A only)

Action Setting



Name	Specifications
Parameter Setting window title	Parameter Setting – [Parameter display level:***] To set to easy setting mode display or parameter display level (LEVL = EASY): EASY To set to standard setting mode display or parameter display level (LEVL = STD): STD To set to professional setting mode display or parameter display level (LEVL = PRO): PRO
Menu switching tabs	Used to switch between the Operation Setting (PTn_START) and Segment Setting (PTn_SEG) windows. n = pattern number
Menu name	START, when the window is the Action Setting (PTn_START) window.
Setting range	This section shows the setting range of a selected parameter.
Pattern name	Sets or shows the specified program pattern name.
Parameter symbol	Parameter symbol (which, however, is followed by _L1 when the pattern is a control program pattern, and by _L2 when the pattern is a retransmission program pattern)
Parameter name	Shows parameter names.
Set value	Shows parameter set values. Enter a set value into a cell directly or select it from a dropdown list. To register a register, enter a register symbol by drag-and-drop from the Register window or input a register symbol into a cell directly.
Units	Shows the unit of a parameter set value.
Pattern switching tabs	Used to switch to the pattern number.
Number of used segments	Number of used segments/max number segments

Segment Setting



Name	Specifications
Parameter Setting window title	Parameter Setting – [Parameter display level:***] To set to easy setting mode display or parameter display level (LEVL = EASY): EASY To set to standard setting mode display or parameter display level (LEVL = STD): STD To set to professional setting mode display or parameter display level (LEVL = PRO): PRO
Menu switching tabs	Used to switch between the Operation Setting (PTn_START) and Segment Setting (PTn_SEG) windows. n = pattern number
Menu name	SEG, when the window is the Segment Setting (PTn_SEG) window.
Setting range	This section shows the setting range of a selected parameter.
Scale	Control PV input range
Parameter symbol	Parameter symbol (which, however, is followed by _L1 when the pattern is a control program pattern, and by _L2 when the pattern is a retransmission program pattern)
Parameter name	Shows parameter names.
Set value	Shows parameter set values.
Units	Shows the unit of a parameter set value.
Time event symbol	Shows the time event symbol.
Pattern, Time event	The ON/OFF status of the pattern and time events is displayed.
PV event	Shows PV evnet type.

Name	Specifications
Integral time	Shows integrated value of segment time. Note: With LL50A, the segment time of each of the segments starting with SEG1 is added up and displayed as the integral time. The integral time does not include the wait time and the segment time activated by the settings, such as repeat segment, number of repeat cycles and program start segment number. Furthermore, when the start code (STC) is set to RAMP, the integral time displayed in LL50A may differ from the actual action, since the start segment and segment time are determined by the measurement values at the time when the program operation starts. In ramp segment where the segment setting method (SEG.T) is set to TM.RT, the segment time is calculated from the setting value of the segment ramp-rate time (TM.RT). Therefore, the minimum digit of the segment time may include an error.
Pattern	Shows program pattern. Note: The setpoint in the start target setpoint (SSP_L1 or SSP_L2) is used as the start target value for SEG1 to plot the graph. When the start code (STC) is set to other than SSP, the pattern graph differs from the actual action. ► UP55A Program Controller User's Manual "9.3 Setting the Program Starting Conditions (STC)" ► UP35A Program Controller User's Manual "9.3 Setting the Program Starting Conditions (STC)"
Number of used segments	Number of used segments/max number segments

Ladder Program Building window

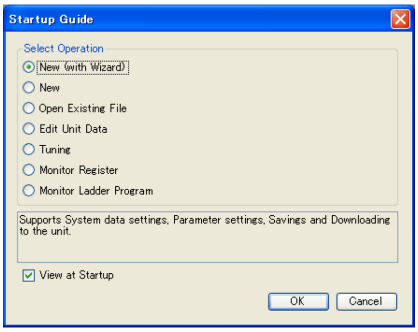
See **"Chapter 3 A Guide to Building Ladder Programs"**

2.4 Creating New Parameters Using the Wizard Function

The Wizard function supports operations from system data setting, parameter setting, and a file save to downloading data to the main unit. When using the Wizard function, parameters to be displayed are those available in the “easy setting mode” of the main unit’s parameter display level (LEVL).

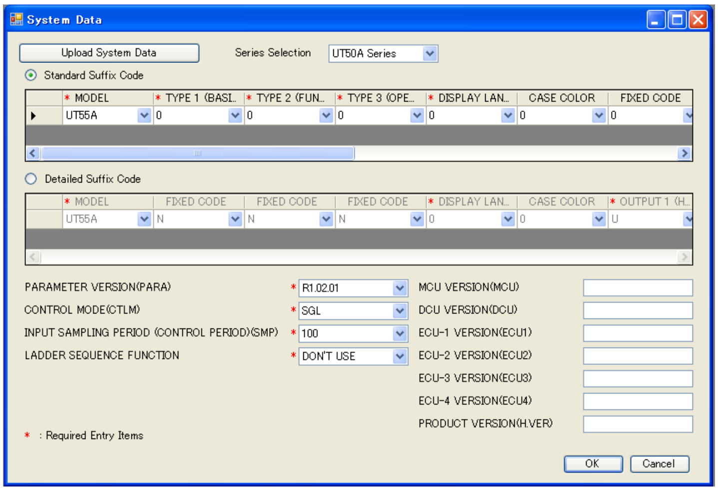
Procedure

1. Click on Windows’ [Start], select [All Programs] – [UTAdvanced], and then click on [Setting Tool].



The Startup Guide window appears at the first startup after installing the LL50A and if the Use Startup Guide checkbox is checked in the Environmental Setting window.

2. Click on New (with Wizard) and click the [OK] button to display the System Data window.



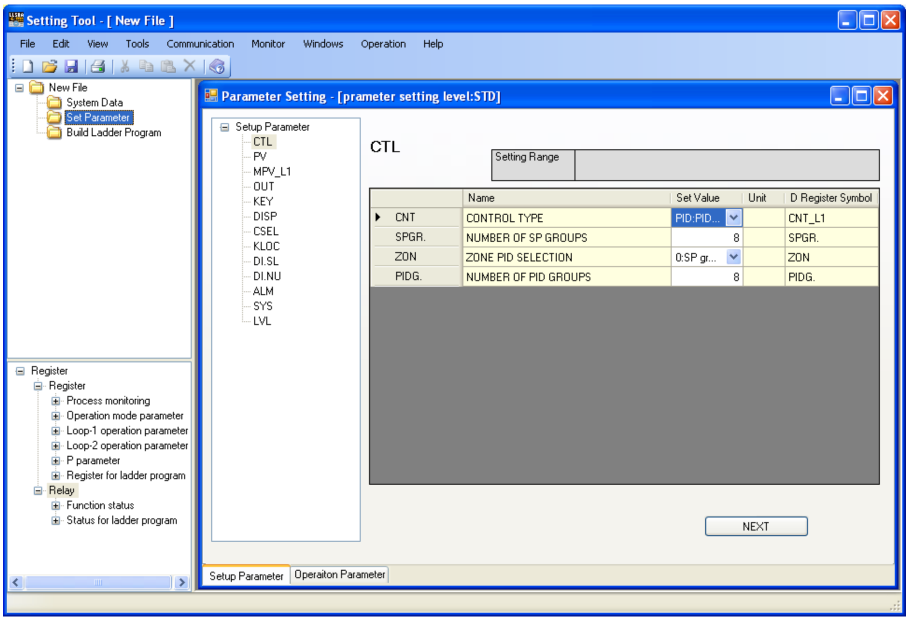
Items marked by an asterisk * are mandatory input fields.
CONTROL MODE (CTLM) and ECU-2 VERSION (ECU2) are displayed for UT75A/UT55A/UT52A/UP55A only.
INPUT SAMPLING PERIOD (CONTROL PERIOD) (SMP) is displayed for UT75A/UT55A/UT52A/UP55A/UM33A only.
LADDER SEQUENCE FUNCTION, ECU-2 VERSION (ECU2), and ECU-3 VERSION (ECU3) are not available for UM33A.

Clicking the [Upload System Data] button enables the LL50A to communicate with the main unit to load system data into it.
For the model and suffix codes, set them to the model and suffix codes of the main unit to be set.

Note

- For Model and Suffix codes, set the code except the hyphen in order.
- The Detailed Suffix Code is available when “Use Detailed Suffix Code” is selected in [File] – [Environmental setting].
  In the factory default setting, it is already selected. However, UT75A and UM33A have no detailed codes.

3. Enter system data and click the [OK] button to display the Parameter Setting window. Clicking the [Cancel] button closes the System Data window and cancels the settings that have been made.

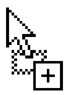
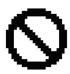


Setting parameters

- For entering a set value: Click in a cell to enable entry, enter the desired set value, then press the [Enter] key.
- For selecting a set value: Select it from a dropdown list.
- Entering a register symbol: Drag and drop register symbols from the Register window. When register symbols have been entered, candidates are displayed in a list; select a desired one from the list. It is also possible to register a register symbol by entering a register number. Entering and accepting a register number causes the indication to change to the register symbol.
  The cell’s background color is different, identifying it as a cell in which a register symbol can be entered. To disable setting, enter “OFF” or “0” (zero).

A cell’s column width can be increased or decreased by dragging the boundary line between columns.

► Register symbol, register number: UTAdvanced Series Communication Interface User’s Manual

Icon	Status
	Status enabling a drop
	Status disabling a drop

Set parameters in turn, starting at the top of the parameter menu tree. Clicking [NEXT] causes a list of parameters to be switched to the next list. Clicking [BACK] causes a list of parameters to be switched to the previous list.

Parameter setting sequence

First set parameters relating to the input/output of setup parameters (menus CTL, PV, RSP (PV2 in case of UT75A), AIN2, AIN4, MPV_L1, MPV_L2, and OUT), then set the other setup parameters. After setting most of the setup parameters, set the operation parameters.

Note

- Parameters to be displayed are the same as those in the “easy setting mode” of the main unit irrespective of the LL50A parameter view level.
- If setup parameter(s) are set after setting the operation parameters, there may be cases in which the operation parameters are initialized.

What are register symbols?

Register symbols are the symbols of registers containing data such as main unit parameter, operation status, alarm status, contact input, and error information in 16 bits or 1 bit.

When performing communication, registers are used as D-registers or I-relays.

For more information on them, see the UTAdvanced Communication Interface (RS-485, Ethernet) User’s Manual.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
 Ln: loop number (L1 or L2)
 Y: group number (1 to 8 (20) or 1 to 16, R)
xxxx_En
 En: terminal area number (E1 to E4)

Example:
 SP_L1_3: This means Loop-1 group-3 target setpoint.
 PYS_2: This means group-2 PYS.
 DI1.D_E1: This means E1-terminal area DI1.D.

Note

Since the UT35A/UT32A/UP35A/UM33A is a single-loop controller, it has no distinction between Loop-1 and Loop-2. However, the register symbol has "L1" which indicates Loop-1.

Menu symbols and parameter symbols different from those in the main unit

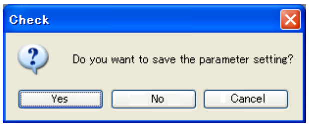
For menu symbols and parameter symbols, the loop number and terminal area number are indicated like register symbols. For example, the alarm function menu is indicated as ALRM in the main unit, while it is indicated as ALRM_L1 in the LL50A.

For the notation, refer to “D-register symbols” above.

- Alarm function setting parameters
  In the main unit, the alarm type, stand-by action, energized/de-energized, and latch settings are made using one parameter. However, they are set using one parameter each in the LL50A.

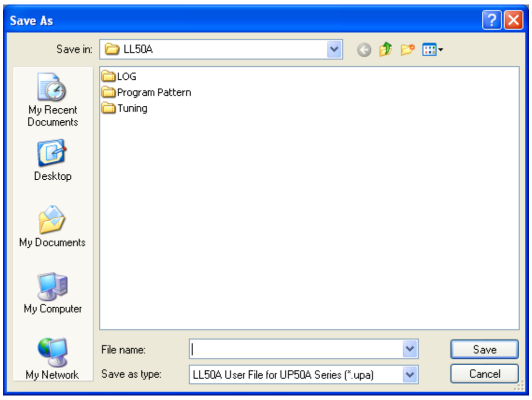
- Output type parameters
  These parameters are used only for setting during heating/cooling control.
  The output types are set using one parameter in the main unit, while they are set using the heating- and cooling-side parameters in the LL50A.
- P-parameters (when the ladder is used)
  The decimal point position can be set only in the LL50A.

4. Close the window or click . This causes the confirmation message to appear.

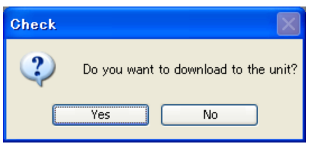


This message dialog is also displayed if the NEXT button is clicked until the end.

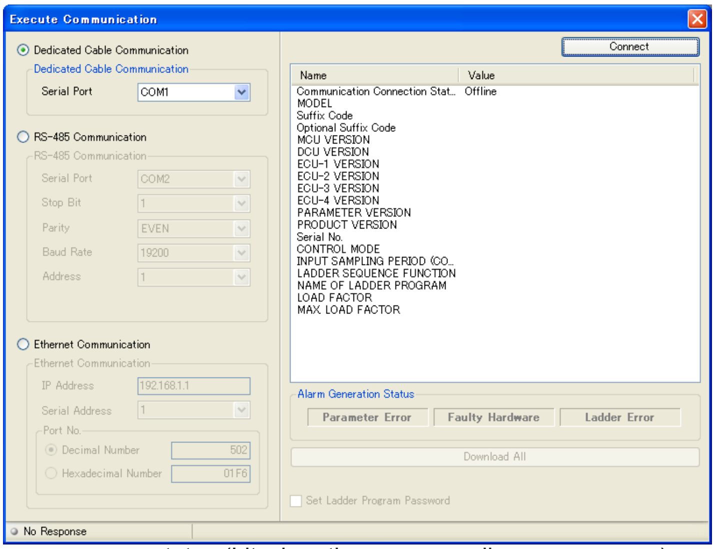
5. Click [Yes] to display the Save As window. Enter a name for the file and click the [Save] button.
LL50A User File for UT50A Series (*.uta)
LL50A User File for UT30A Series (*.utb)
LL50A User File for UT70A Series (*.utc)
LL50A User File for UT30L Series (*.utl)
LL50A User File for UP50A Series (*.upa)
LL50A User File for UP30A Series (*.upb)
LL50A User File for UM30A Series (*.umb)



6. Next, the download message is displayed. Click the [Yes] button to proceed with the download, or the [No] button not to download. If you click the [No] button, move to step 9.



7. When download is selected, the Execute Communication window appears. Set up the communication conditions and click the [Download All] button.

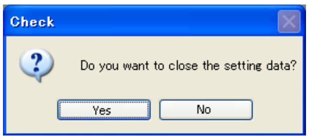


Alarm occurrence status (Lit when the corresponding errors occur.)
The symbols in parentheses indicate the register symbol.

Error display	Description
Parameter Error	System data error (SYSTEM_ERR) Calibration value error (CALB_ERR) User (parameter) default value error (UPARA_ERR) Setup parameter error (SETPA_ERR) Operation parameter error (OPEPA_ERR) Control parameter error (CTLPA_ERR) Faulty FRAM (FRAM_ERR)
Faulty Hardware	PV input A/D converter error (ADERR) RSP input A/D converter error (ADERR_E1) PV2 input A/D converter error (ADERR_E1) (In case of UT75A) AIN2 input A/D converter error (ADERR_E2) AIN4 input A/D converter error (ADERR_E3) PV input RJC error (RJCERR) RSP input RJC error (RJCERR_E1) PV2 input RJC error (RJCERR_E1) (In case of UT75A) Nonresponding hardware of E1 terminal area (E1_ERR) Nonresponding hardware of E2 terminal area (E2_ERR) Nonresponding hardware of E3 terminal area (E3_ERR) Nonresponding hardware of E4 terminal area (E4_ERR)
Ladder Error	Corrupted ladder program (LAD_ERR)

8. When download has completed, a download completed message appears. Click [OK] to close the Execute Communication window.

9. Next, the message asking if you want to close setting data appears.



If you click [Yes], the user file is closed, causing the Startup Guide window to appear. If you click [No], the Basic window and File window are displayed.

Note

If data is downloaded using the Wizard function, the ladder programs in the main unit will be initialized.

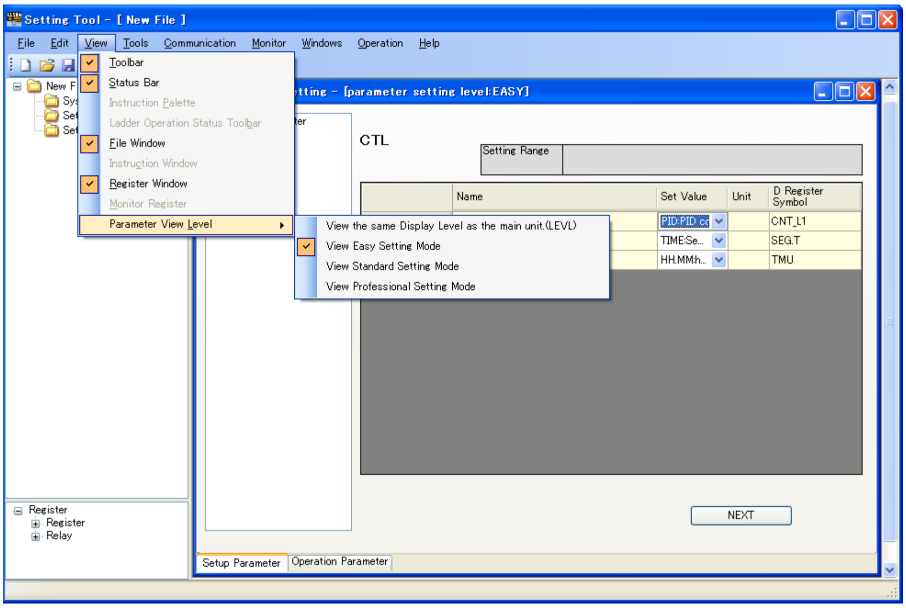
2.5 Setting the Parameter View Level

Aside from the main unit's parameter display level, this section sets the view level of parameters to be displayed in the LL50A. It is different from the main unit's parameter display level (LEVL).

Procedure

1. When the Parameter Setting window or the Set Program Pattern window is being displayed, click on [View], select [Parameter View Level], and click on the following command in the menu. This enables parameters to be set in each view level.

- View the same Display Level as the main unit: The parameter view level changes to Easy Setting Mode, Standard Setting Mode, and Professional Setting Mode according to the LEVL parameter set value of the parameter setting function.
- View Easy Setting Mode: Same as the main unit's easy setting mode
- View Standard Setting Mode: Same as the main unit's standard setting mode
- View Professional Setting Mode: Same as the main unit's professional setting mode



The parameter view level is displayed on the Parameter Setting window's and Program Pattern Setting window's title bar.
Parameter Setting window title: Parameter Setting – [Parameter display level: ***]
Program Pattern Setting window title: Parameter Setting – [Parameter display level: ***]

- To set to easy setting mode display or parameter display level (LEVL = EASY): EASY
- To set to standard setting mode display or parameter display level (LEVL = STD): STD
- To set to professional setting mode display or parameter display level (LEVL = PRO): PRO

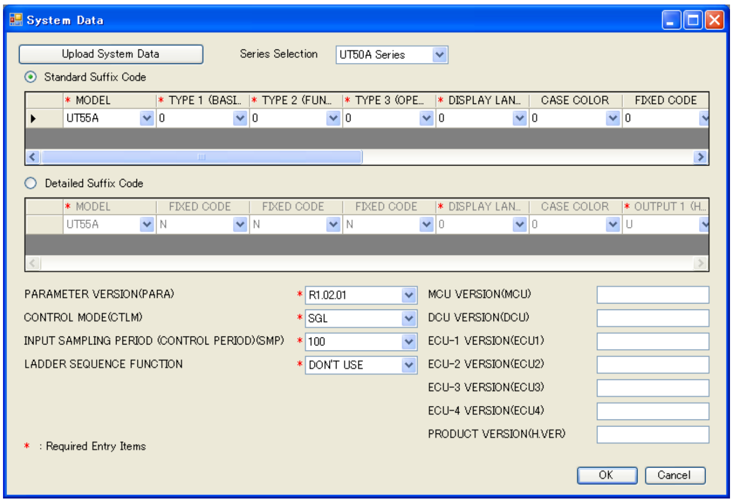
For the parameter display levels, see the the User's Manual corresponding to your controller.
Parameters menu-locked in the main unit unit can be displayed and set in the LL50A.

2.6 Setting System Data

Procedure

1. Open the System Data window in any of the following ways:

- Click on (or select) "New (with Wizard)" in the Startup Guide window and click the [OK] button.
- Click on (or select) "New" in the Startup Guide window and click the [OK] button.
- Click on "System Data" in the File window.
- Click on [File] – [New] in the menu.
- Click on [File] – [New (with Wizard)] in the menu.
- Click  on the toolbar.

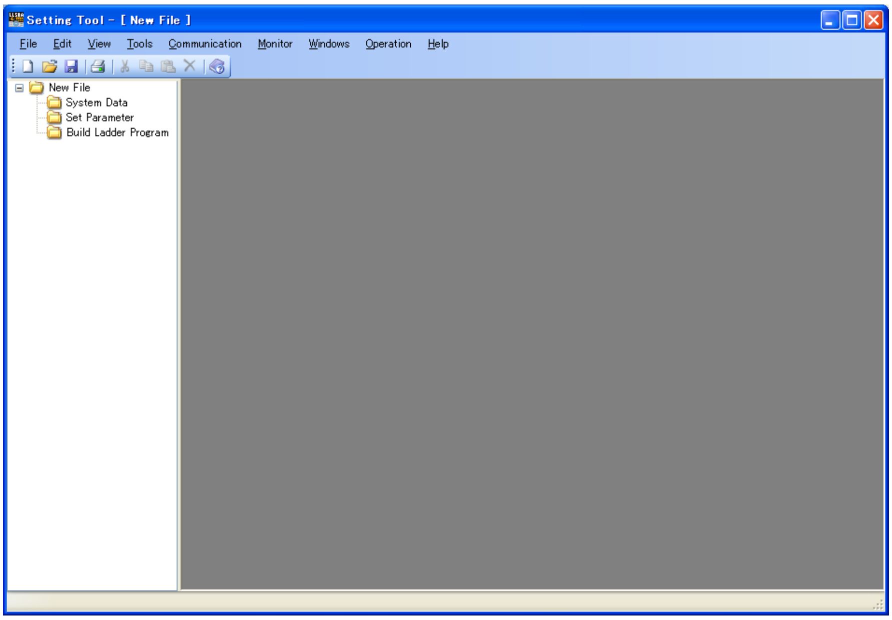


Items marked by an asterisk * are mandatory input fields.
CONTROL MODE (CTLM) and ECU-2 VERSION (ECU2) are displayed for UT75A/UT55A/UT52A/UP55A only.
INPUT SAMPLING PERIOD (CONTROL PERIOD) (SMP) is displayed for UT75A/UT55A/UT52A/UP55A/UM33A only.
LADDER SEQUENCE FUNCTION, ECU-2 VERSION (ECU2), and ECU-3 VERSION (ECU3) are not available for UM33A.

Note

- For Model and Suffix codes, set the code except the hyphen in order.
- The Detailed Suffix Code is available when "Use Detailed Suffix Code" is selected in [File] – [Environmental setting].
  In the factory default setting, it is already selected. However, UT75A and UM33A have no detailed codes.

2. Enter system data or upload it from the main unit and click the [OK] button. This causes the Basic window to appear. The File window is also displayed.



3. See each section for the successive operations.

Uploading system data

Connect a PC to the main unit and upload system data from the main unit to the PC. This makes it easy to set system data.

If a PC cannot be connected to the main unit, set up system data manually.

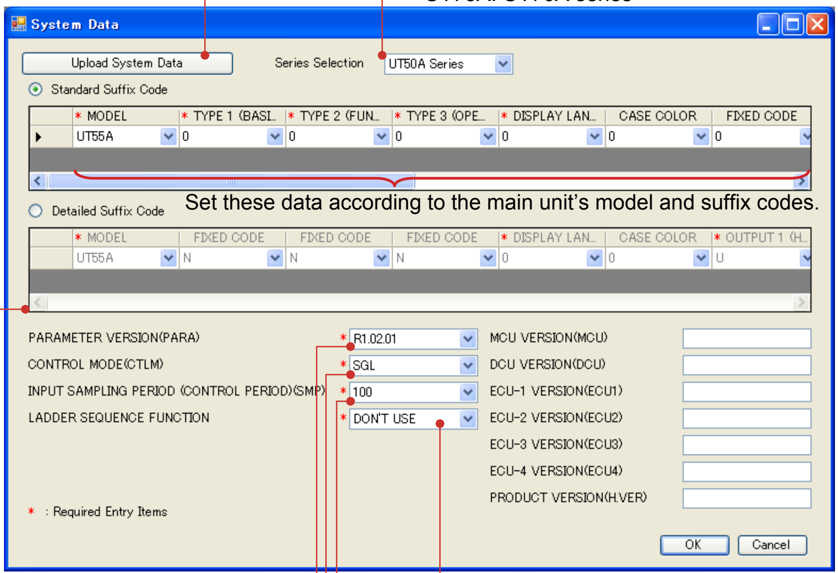
Example

UT55A-000-00-00

Model: UT55A
Type 1 (basic control): 0
Type 2 (functions): 0
Type 3 (open network): 0
Display language: 0
Fixed: 0
Fixed: 0
Fixed: 0
RSP direct input option: none
LPS option: none
Power supply option: none
Additional treatment option: none
Heater break alarm option: none
Custom order: /Sxxx or /SxxxN custom-order information can be displayed or input.

Connect a PC to the main unit and upload system data from the main unit to the PC.
In this case, the following system data need not be set.

Select the series corresponding to the model.
UT55A/UT52A: UT50A series
UT35A/UT32A: UT30A series
UT35A-L: UT30L series
UP55A: UP50A series
UP35A: UP30A series
UM33A: UM30A series
UT75A: UT70A series



Set these data according to the main unit's model and suffix codes.

The Detailed Suffix Code is available when "Use Detailed Suffix Code" is selected in [File] – [Environmental setting].
In the factory default setting, it is already selected. However, UT75A, UT35A-L and UM33A have no detailed codes.

Set the main unit's parameter PARA version.

Set the main unit's control mode (CTLM).

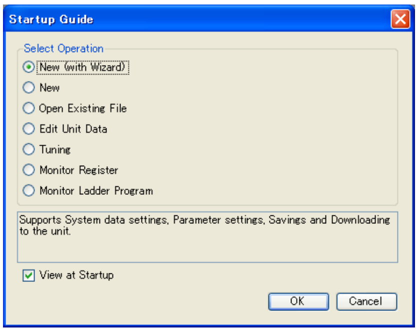
Set the main unit's input sampling period (control period).

Set the ladder sequence function to
USE to use it
DON'T USE if not using it

2.7 Setting Parameters

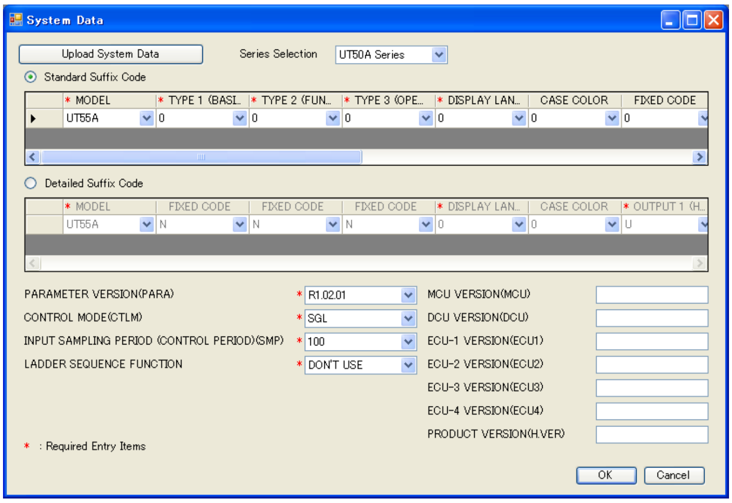
Procedure

1. Click on Windows' [Start], select [All Programs] – [UTAdvanced], and then click on [Setting Tool].



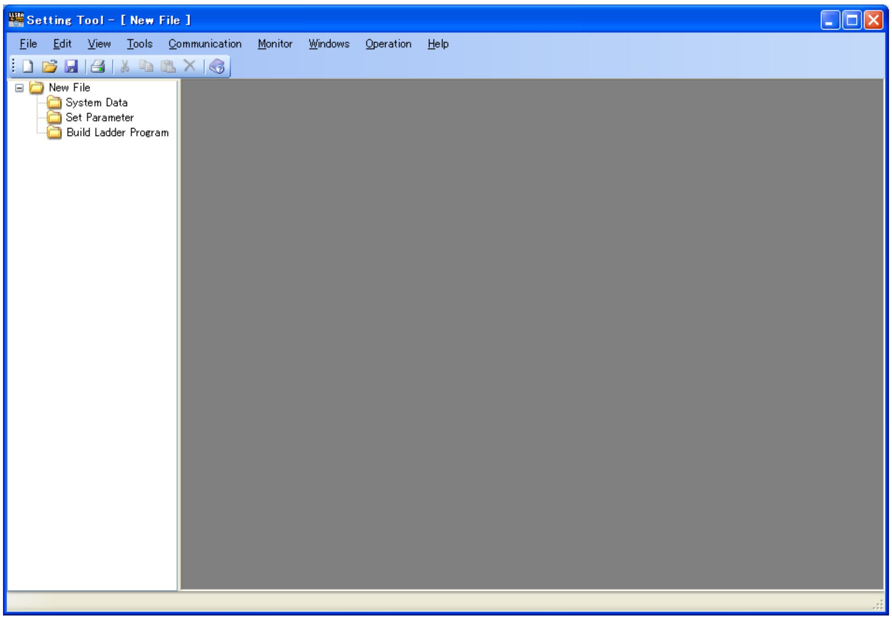
The Startup Guide window appears at the first startup after installing the LL50A and if the "Use the startup guide" checkbox is checked in the Environmental Setting window.

2. Click on "New" and click [OK] in the Startup Guide window, click on [File] – [New] in the menu, or click  on the toolbar to display the System Data window.

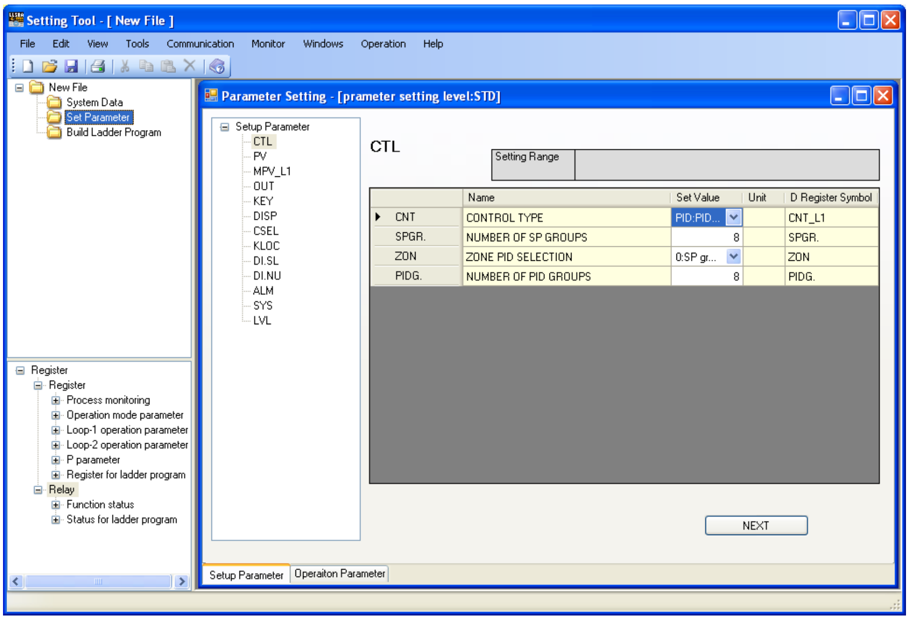


Items marked by an asterisk * are mandatory input fields.
CONTROL MODE (CTLM) and ECU-2 VERSION (ECU2) are displayed for UT75A/UT55A/UT52A/UP55A only.
INPUT SAMPLING PERIOD (CONTROL PERIOD) (SMP) is displayed for UT75A/UT55A/UT52A/UP55A/UM33A only.
LADDER SEQUENCE FUNCTION, ECU-2 VERSION (ECU2), and ECU-3 VERSION (ECU3) are not available for UM33A.

3. Enter system data and click the [OK] button to display the Basic window. The File window is also displayed.



4. Click "Set Parameter" in the File window to display the Parameter Setting window at the right of the Basic window.



Parameter setting sequence

First set parameters relating to the input/output of setup parameters (menus CTL, PV, RSP (PV2 in case of UT75A), AIN2, AIN4, MPV_L1, MPV_L2, and OUT), then set the other setup parameters. After setting most of the setup parameters, set the operation parameters.

Note

- Parameters to be displayed are as given by the setting of the parameter view level.
- If setup parameter(s) are set after setting the operation parameters, there may be cases in which the operation parameters are initialized.

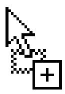
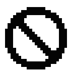
5. Click on the menu of a parameter that you want to set, to display a list of parameters in the Parameter Setting window. (Click the [+] button to expand the menu or click the [-] button to collapse it.)

6. Click on the parameter that you want to set.

7. Enter a value to be set.

- For entering a value to be set: Click in a cell to enable entry, enter the desired set value, then press the [Enter] key.
- For selecting a set value: Select it from a dropdown list.
- Entering a register symbol: Drag and drop register symbols from the Register window. When register symbols have been entered, candidates are displayed in a list; select a desired one from the list. It is also possible to register a register symbol by entering a register number. Entering and accepting a register number causes the indication to change to the corresponding register symbol.
  The cell’s background color is different, identifying it as a cell in which a register symbol can be entered. To disable setting, enter “OFF” or “0” (zero).

► Register symbols and register numbers: UTAdvanced Series Communication Interface (RS-485, Ethernet) User’s Manual

Icon	Status
	Status enabling a drop
	Status disabling a drop

8. Repeat steps 5 to 7 to set other parameters.

9. To finish parameter setting, click .

What are register symbols?

Register symbols are the symbols of registers containing data such as main unit parameter, operation status, alarm status, contact input, or error information in 16 bits or 1 bit.
When performing communication, registers are used as D-registers or I-relays.
For more information on them, see the UTAdvanced Communication Interface (RS-485, Ethernet) User’s Manual.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
  Ln: loop number (L1 or L2)
  Y: group number (1 to 8 (20) or 1 to 16, R)
xxxx_En
  En: terminal area number (E1 to E4)

Example:
  SP_L1_3: This means Loop-1 group-3 target setpoint.
  PYS_2: This means group-2 PYS.
  DI1.D_E1: This means E1-terminal area DI1.D.

Note

Since the UT35A/UT32A/UP35A/UM33A is a single-loop controller, it has no distinction between Loop-1 and Loop-2. However, the register symbol has "L1" which indicates Loop-1.

Menu symbols and parameter symbols different from those in the main unit

For menu symbols and parameter symbols, the loop number and terminal area number are indicated like register symbols. For example, the alarm function menu is indicated as ALRM in the main unit, while it is indicated as ALRM_L1 in the LL50A.
For the notation, refer to “D-register symbols” above.

- Alarm function setting parameters
  In the main unit, the alarm type, standby operation, energized/non-energized, and latch settings are made using one parameter. However, they are set using one parameter each in the LL50A.
- Output type parameters
  These parameters are used only for setting during heating/cooling control.
  The output types are set using one parameter in the main unit, while they are set using the heating- and cooling-side parameters in the LL50A.
- P-parameters (when the ladder is used)
  The decimal point position can be set only in the LL50A.

Message registration

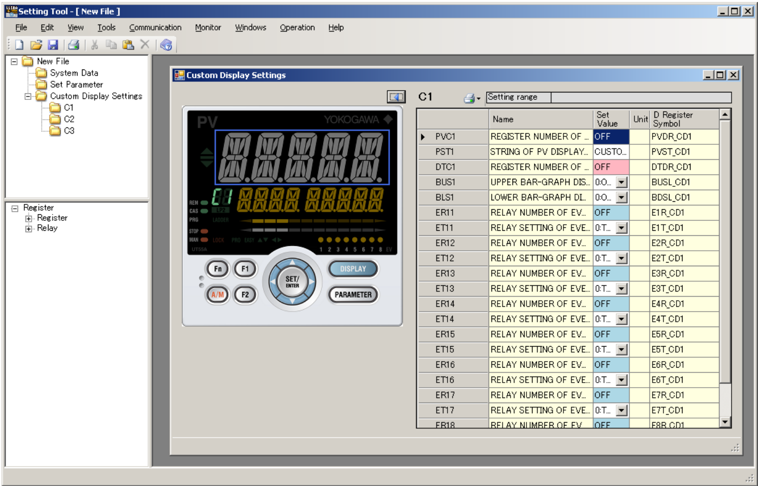
Register message to be displayed on the main unit.
Setup parameter menu: DI.SL
Symbol: MSG1 to MSG2

► Message function:
Section 13.1.10 Setting Message Function, of UT35A/UT32A Digital Indicating Controllers User’s Manual
Section 13.1.11 Setting Message Function, of UT55A/UT52A Digital Indicating Controllers User’s Manual
Section 13.1.11 Setting Message Function, of UT75A Digital Indicating Controllers User’s Manual
Section 13.1.10 Setting Message Function, of UP35A Program Controller User’s Manual
Section 13.1.10 Setting Message Function, of UP55A Program Controller User’s Manual
Section 12.1.8 Setting Message Function, of UM33A Digital Indicator with Alarms User’s Manual
► Characters to be registered:
Section 3.3 List of Display Symbols, of UT35A/UT32A Digital Indicating Controllers User’s Manual
Section 3.3 List of Display Symbols, of UT55A/UT52A Digital Indicating Controllers User’s Manual
Section 3.3 List of Display Symbols, of UT75A Digital Indicating Controllers User’s Manual
Section 3.3 List of Display Symbols, of UP35A Program Controller User’s Manual
Section 3.3 List of Display Symbols, of UP55A Program Controller User’s Manual
Section 3.3 List of Display Symbols, of UM33A Digital Indicator with Alarms User’s Manual

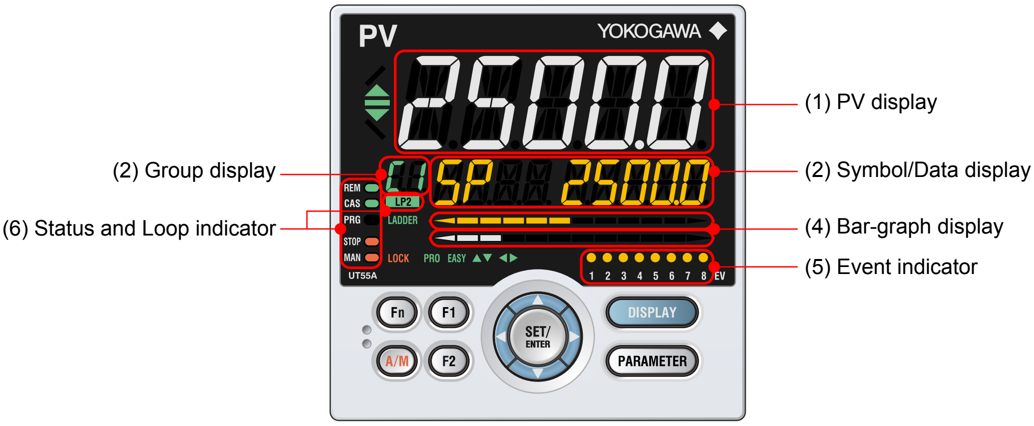
2.8 Creating a Custom Display (UT75A Only)

Procedure

1. When data is loaded in the LL50A after you create a new file, open a new file, or use the upload all feature, clicking a custom display number under Custom Display Setting in the file selection window opens a Custom Display Setting window.



2. Assign registers in the Set Value column, and select the values. For details on each parameter, see the explanation below.



Customizable Areas

No. in figure	Name	Description
(1)	PV display (white or red)	Can be hidden (OFF) or displays the assigned D-register value
(2)	Group display (green)	Displays the custom display number (C1 to C3)
(3)	Symbol/Data display (orange)	Can be hidden (OFF) or displays the assigned D-register symbol and value.
(4)	Bar-graph display (orange and white)	The data value is displayed as a bar graph depending on whether OFF, Normal, or D-register is selected.
(5)	Event indicator (orange)	Can be hidden (OFF) or displays the assigned I relay status.
(6)	Status and Loop indicator (green and red)	Can be hidden (OFF) or displays the status of the selected loop.

Custom Display Data

Custom display data is saved to an LL50A user file for the UT70A Series (.utc), which is the same file for storing parameter data.
See **"2.15.2 Opening a User File"**

Data can be downloaded from and uploaded to the main unit at once or individually.
See **"2.11 Downloading Data"** and **"2.12 Uploading Data"**

Only custom display data can be printed.
See **"2.17 Printing"**

What are register symbols?

Register symbols are the symbols of registers containing data such as main unit parameter, operation status, alarm status, contact input, or error information in 16 bits or 1 bit.
When performing communication, registers are used as D-registers or I-relays.
For more information on them, see the UTAdvanced Communication Interface (RS-485, Ethernet) User's Manual.

Description

Parameters

Parameter symbols			Parameter names
PVCn			Register number of PV display for Custom display n
PSTn			String of PV display for Custom display n
DTCn			Register number of Data display for Custom display n
BUSn			Upper bar-graph displays type selection for Custom display n
	Normal	BUCn	Upper bar-graph displays registration D for Custom display n
		UDCn	DVB of upper bar-graph for Custom display n
	D register selection	BUDn	Register number of upper bar-graph for Custom display n
		BUTn	Display method of upper bar-graph for Custom display n
		UDSn	Standard value of upper bar-graph for Custom display n
		UDCn	DVB of upper bar-graph for Custom display n
BLSn			Lower bar-graph displays type selection for Custom display nfor Custom display n
	Normal	BDCn	Lower bar-graph displays registration D for Custom display n
		LDCn	DVB of lower bar-graph for Custom display n
	D register selection	BLDn	Register number of lower bar-graph for Custom display n
		BLTn	Display method of lower bar-graph for Custom display n
		LDSn	Standard value of lower bar-graph for Custom display n
		LDCn	DVB of lower bar-graph for Custom display n
ERn1 to ERn8			Relay number of Event 1 to 8 for Custom display n
ETn1 to ETn8			Relay setting of Event 1 to 8 for Custom display n
LPCn			Status and Loop for Custom display n

n: 1 to 3 (Custom display number)

(1) PV display

A data item or character string of your choice can be shown in the PV display.

To show a data item, assign (drag-and-drop) a D-register shown in the register tree.

To show a character string, set a string up to 31 characters in the String (PSTn) box and set the following register, which appears in the register tree, in the Register number (PVCn) box.

Custom Display 1 “PVST_CD1 (6611)”

Custom Display 2 “PVST_CD2 (6641)”

Custom Display 3 “PVST_CD3 (6671)”

Specify OFF to hide it.

(2) Symbol/data display area

A symbol or data item of your choice can be shown in the symbol display/data display.

To show a symbol and data item, assign (drag-and-drop) a D-register shown in the register tree.

Specify OFF to hide it.

(3) Upper/lower bar-graph display

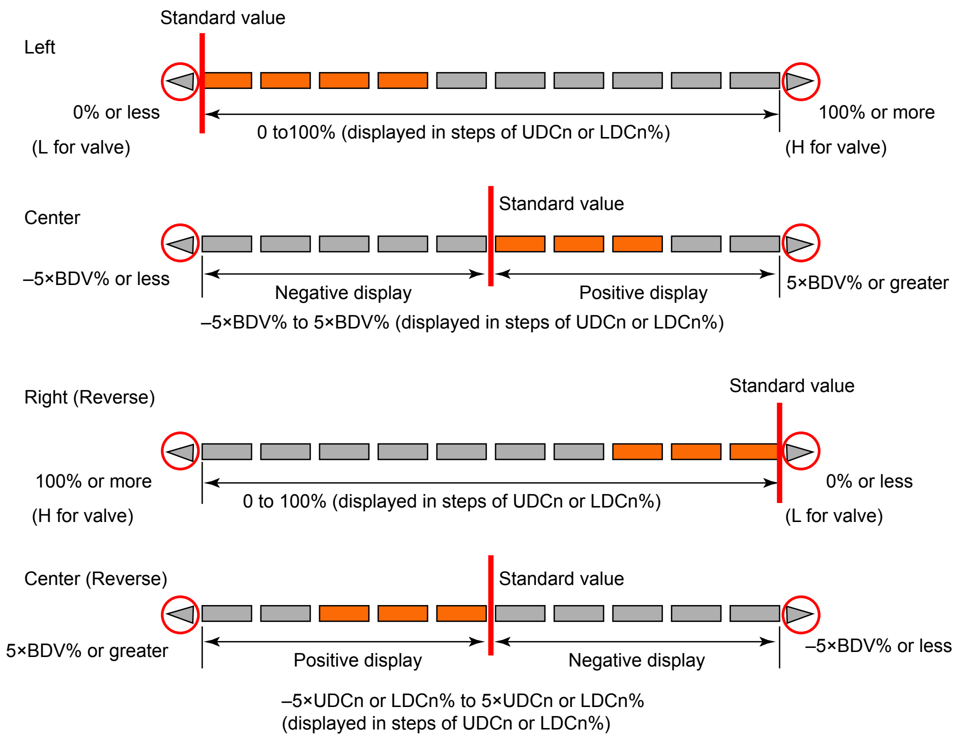
A data item of your choice can be shown in the upper or lower bar-graph display.

For Display Type Selection (BUSn), set Normal or D-register.

If Normal is set, the following set values are displayed in the drop-down list (BUCn).

0: No display
1: OUT, Heating side OUT, or internal value in position proportional control.
2: Cooling side OUT
3: PV
4: SP
5: Deviation
6: Loop-2 OUT, Loop-2 heating-side OUT
7: Loop-2 cooling-side OUT
8: Loop-2 PV
9: Loop-2 SP
10: Loop-2 deviation
11 to 16: Disable
17: Feedback input (valve opening)
18: PV terminals analog input
19: PV2 terminals analog input
20: AIN2 terminals analog input
21: AIN4 terminals analog input

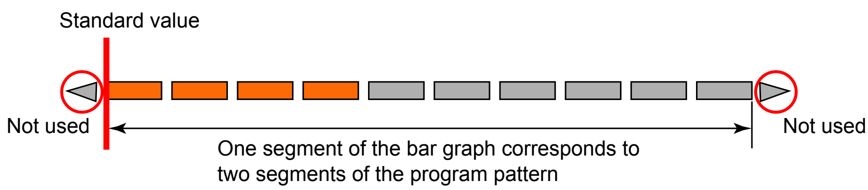
If D-register is set, the register value is displayed using the standard value and deviation band. For D-register (BUDn), set a D-register of your choice.
Display method (BUTn) can be set to Left, Center, Right, Right (Reverse), or Degree of segment.



Set Standard value (UDSn) within the data range of the registers to be assigned.
For Deviation band (DVB; UDCn), set the band that corresponds to one segment of the bar graph.

Degree of segment shows two segments of a program pattern as one segment on the bar graph.

Degree of segment



Note

After you have downloaded the custom display data, if you change the custom display parameters, such as the range and decimal point position on the main unit, check the settings, and download the custom display parameters again if necessary.

2.9 Creating Program Pattern (UP55A/UP35A only)

CAUTION

First, set the parameters, and then set the program pattern.
Changing the setting of the segment setting method (SEG.T) will initialize the setting of all the program patterns.

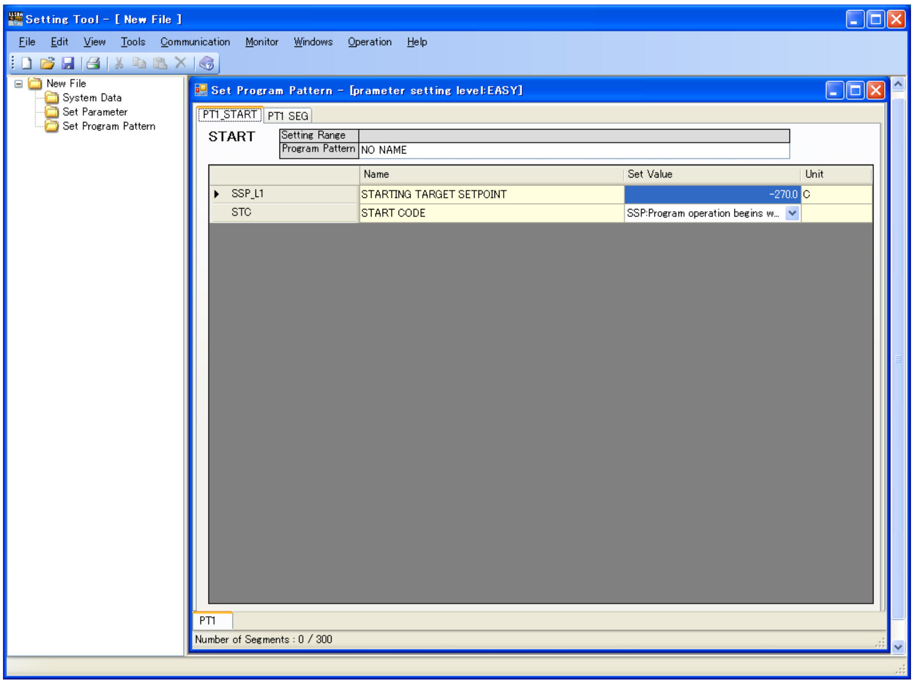
The numbers of settable pattern and segment depending on the model and suffix codes.

		UP55A	UP35A	UP35A with optin/AP
Per one user file	Max. number of pattern	30	2	4
	Max. number of segment	300	20	40
Per one pattern	Max. number of segment	99	20	40

2.9.1 Setting the Operation Setting

Procedure

1. Click "Set Program Pattern" in the File window to display the action setting screen [START] of Program Pattern Setting window.



Click on the pattern switching tab in the lower part of the Operation Setting window [START] to switch patterns. The PT1 tab is displayed for factory default.

2. Enter the pattern name.
Up to 20 single-byte or up to 10 two-byte characters can be entered.

3. Enter a value to be set.
- For entering a value to be set: Click in a cell to enable entry, enter the desired set value, then press the [Enter] key.
- For selecting a set value: Select it from a dropdown list.

Setting Item

UP55A

Parameter symbol	Neme
SSP_L1	Starting target setpoint of control program pattern
SSP_L2 *1	Starting target setpoint of retransmission program pattern
STC	Start code
WT.SW1	Wait function ON/OFF 1
WZ.UP1	Upper-side wait zone 1
WZ.LO1	Lower-side wait zone 1
WT.TM1	Wait time 1
WT.SW2	Wait function ON/OFF 2
WZ.UP2	Upper-side wait zone 2
WZ.LO2	Lower-side wait zone 2
WT.TM2	Wait time 2
WT.SW3	Wait function ON/OFF 3
WZ.UP3	Upper-side wait zone 3
WZ.LO3	Lower-side wait zone 3
WT.TM3	Wait time 3
WT.SW4	Wait function ON/OFF 4
WZ.UP4	Upper-side wait zone 4
WZ.LO4	Lower-side wait zone 4
WT.TM4	Wait time 4
WT.SW5	Wait function ON/OFF 5
WZ.UP5	Upper-side wait zone 5
WZ.LO5	Lower-side wait zone 5
WT.TM5	Wait time 5
R.CYCL	Number of repeat cycles
R.STRT	Repeat cycle start segment number
R.END	Repeat cycle end segment number

*1: To display the parameters for the retransmission program pattern, it is necessary to configure the following setting.
Parameter Setting window - Setup Parameters (CTL) - Program Pattern 2 Retransmission (PT2.G) = ON (Use)

UP35A

Parameter symbol	Neme
SSP_L1	Starting target setpoint of program pattern
STC	Start code
WT.SW1	Wait function ON/OFF
WZ.UP1	Upper-side wait zone
WZ.LO1	Lower-side wait zone
WT.TM1	Wait time
R.CYCL	Number of repeat cycles
R.STRT	Repeat cycle start segment number
R.END	Repeat cycle end segment number

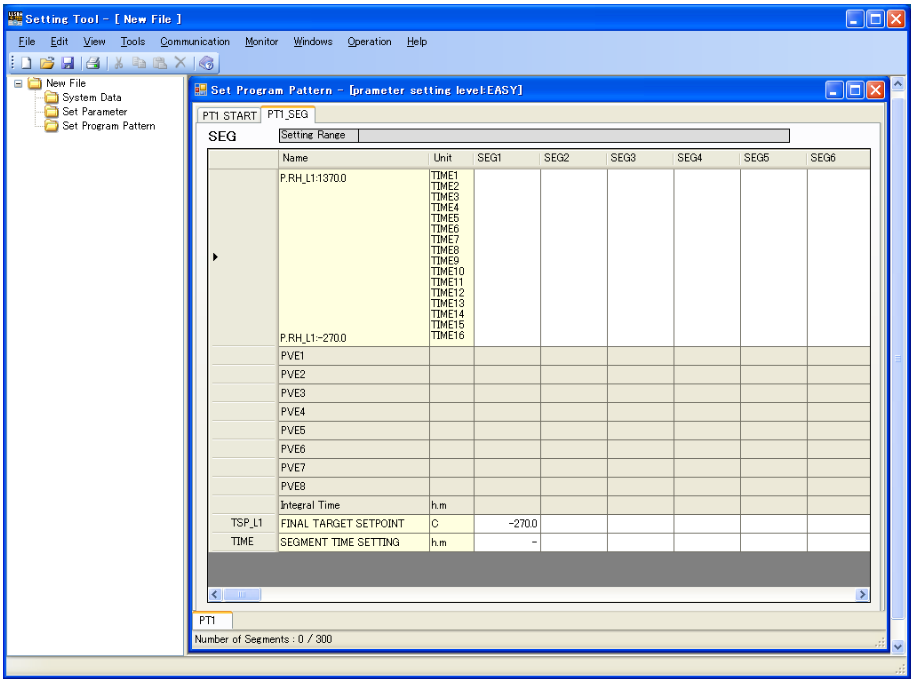
2.9.2 Setting the Segments

Note

First, set the parameters of the Operation Setting window [START], and then set the program pattern of the Segment Setting window [SEG].

Procedure

1. Click menu switching tab "PTn_SEG" in the Set Program Pattern window to display the Segment Setting Display [SEG].



Click on the pattern switching tab in the lower part of the Segment Setting window [SEG] to switch patterns. The PT1 tab is displayed for factory default.

2. Enter the pattern name.

- For entering a value to be set: Click in a cell to enable entry, enter the desired set value, then press the [Enter] key.
- For selecting a set value: Select it from a dropdown list.

3. To finish program pattern setting, click .

Setting Item

UP55A

Parameter symbol	Neme
TSP_L1	Final target setpoint of control program pattern
TSP_L2 *1	Final target setpoint of retransmission program pattern
TIME *2	Segment time setting
TM.RT *3	Segment ramp-rate setting
S.PID *4, *5	Segment PID number selection
JC *5	Junction code
PV.TY1 to PV.TY8 *5	PV evnet-1 to -8 type
PV.EV1 to PV.EV8 *5	PV evnet-1 to -8 setpoint
TME1 to TME16 *5	Start condition of time event 1 to 16
T.ON1 to T.ON16 *5	On time of time event 1 to 16
T.OF1 to T.OF16 *5	Off time of time event 1 to 16

*1: To display the parameters for the retransmission program pattern, it is necessary to configure the following setting.
Parameter Setting window - Setup Parameters (CTL) - Program Pattern 2 Retransmission (PT2.G) = ON (Use)
*2: Can be set when Segment setting method selection (SEG.T) is set to TIME.
*3: Can be set when Segment setting method selection (SEG.T) is set to TM.RT.
*4: Can be set when Zone PID selection (ZON) is set to 0.
*5: Can be set when a value is set to the segment time (TIME) or the segment ramp-rate time (TM.RT).

UP35A

Parameter symbol	Neme
TSP_L1	Final target setpoint of control program pattern
TIME *1	Segment time setting
TM.RT *2	Segment ramp-rate setting
S.PID *3, *4	Segment PID number selection
JC *4	Junction code
PV.TY1 to PV.TY2 *4	PV evnet-1 to -2 type
PV.EV1 to PV.EV2 *4	PV evnet-1 to -2 setpoint
TME1 to TME4 *4	Start condition of time event 1 to 4
T.ON1 to T.ON4 *4	On time of time event 1 to 4
T.OF1 to T.OF4 *4	Off time of time event 1 to 4

*1: Can be set when Segment setting method selection (SEG.T) is set to TIME.
*2: Can be set when Segment setting method selection (SEG.T) is set to TM.RT.
*3: Can be set when Zone PID selection (ZON) is set to 0.
*4: Can be set when a value is set to the segment time (TIME) or the segment ramp-rate time (TM.RT).

Note

- With LL50A, the segment time of each of the segments starting with SEG1 is added up and displayed as the integral time. The integral time does not include the wait time and the segment time activated by the settings, such as repeat segment, number of repeat cycles and program start segment number.
  Furthermore, when the start code (STC) is set to RAMP, the integral time displayed in LL50A may differ from the actual action, since the start segment and segment time are determined by the measurement values at the time when the program operation starts.
- In ramp segment where the segment setting method (SEG.T) is set to TM.RT, the segment time is calculated from the setting value of the segment ramp-rate time (TM.RT).
  Therefore, the minimum digit of the segment time may include an error.
- The setpoint in the start target setpoint (SSP_L1 or SSP_L2) is used as the start target value for SEG1 to plot the graph.
  When the start code (STC) is set to other than SSP, the pattern graph differs from the actual action.

► Section 9.3 Setting the Program Starting Conditions (STC), of UP35A Program Controller User's Manual
Section 9.3 Setting the Program Starting Conditions (STC), of UP55A Program Controller User's Manual

► Register symbol, register number: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

Displaying PV Events

The set PV event types are displayed in the PV event display area.

Set value	PV evnet type	PV evnet setpoint
0	Disable (OFF)	(nondisplay)
1	(Energized) PV high limit	PVH1
2	(Energized) PV low limit	PVL1
3	(Energized) SP high limit	SPH1
4	(Energized) SP low limit	SPL1
5	(Energized) Deviation high limit	DH1
6	(Energized) Deviation low limit	DL1
7	(Energized) Deviation high and low limits	D1
8	(Energized) Deviation within high and low limits	Dw1
9	(Energized) Target SP high limit	TSPH1
10	(Energized) Target SP low limit	TSPL1
11	(Energized) Target SP deviation high limit	TSPDH1
12	(Energized) Target SP deviation low limit	TSPDL1
13	(Energized) Target SP deviation high and low limits	TSPD1
14	(Energized) Target SP deviation within high and low limits	TSPDw1
15	(Energized) OUT high limit	OH1
16	(Energized) OUT low limit	OL1
17	(Energized) Cooling-side OUT high limit	OHc1
18	(Energized) Cooling-side OUT low limit	OLc1
101	(de-energized) PV high limit	dPVH1
102	(de-energized) PV low limit	dPVL1
103	(de-energized) SP high limit	dSPH1
104	(de-energized) SP low limit	dSPL1
105	(de-energized) Deviation high limit	dDH1
106	(de-energized) Deviation low limit	dDL1
107	(de-energized) Deviation high and low limits	dD1
108	(de-energized) Deviation within high and low limits	dDw1
109	(de-energized) Target SP high limit	dTSPH1
110	(de-energized) Target SP low limit	dTSPL1
111	(de-energized) Target SP deviation high limit	dTSPDH1
112	(de-energized) Target SP deviation low limit	dTSPDL1
113	(de-energized) Target SP deviation high and low limits	dTSPD1
114	(de-energized) Target SP deviation within high and low limits	dTSPDw1
115	(de-energized) OUT high limit	dOH1
116	(de-energized) OUT low limit	dOL1
117	(de-energized) Cooling-side OUT high limit	dOHc1
118	(de-energized) Cooling-side OUT low limit	dOLc1

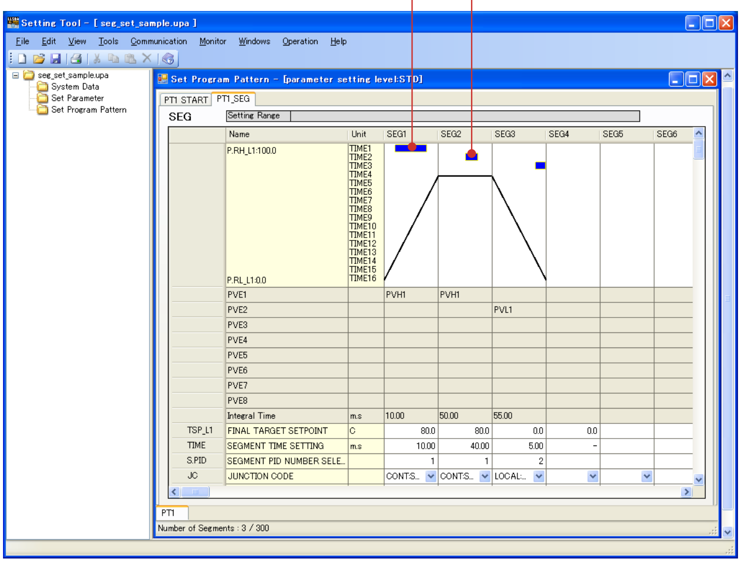
Example: Set program pattern (UP55A)

Program pattern 1 (PTNO. = 1)

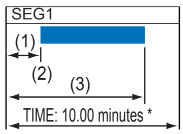
Segment setting method (SEG.T) = TIME (Segment time setting)

Set Segment (menu: SEG)

Prameter symbol	Name	SEG1:set value	SEG2: set value	SEG3: set value
TSP_L1	Final target setpoint	80.0	80.0	0.0
TIME	Segment time setting	10.00	40.00	5.00
S.PID	Segment PID number selection	1	1	2
JC	Junction code	CONT	CONT	LOCAL
PV.TY1	PV evnet-1 type	1	1	OFF
PV.EV1	PV evnet-1 setpoint	80.5	80.5	0.0
PV.TY2	PV evnet-2 type	OFF	OFF	2
PV.EV2	PV evnet-2 setpoint	0.0	0.0	-0.5
PV.TY3	PV evnet-3 type			
PV.EV3	PV evnet-3 setpoint			
⋮	⋮			
PV.TY8	PV evnet-8 type			
PV.EV8	PV evnet-8 setpoint			
TME1	Start condition of time event 1	OFF	OFF	OFF
T.ON1	On time of time event 1	2.00	-	-
T.OF1	Off time of time event 1	8.00	-	-
TME2	Start condition of time event 2	OFF	OFF	OFF
T.ON2	On time of time event 2	-	20.00	-
T.OF2	Off time of time event 2	-	30.00	-
TME3	Start condition of time event 3	OFF	OFF	OFF
T.ON3	On time of time event 3	-	-	4.00
T.OF3	Off time of time event 3	-	-	-
⋮	⋮			
TME16	Start condition of time event 16			
T.ON16	On time of time event 16			
T.OF16	Off time of time event 16			

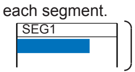


SEG1(Time Event)



(1) TME1 (Start condition of time event 1) :
OFF: Start (OFF start)
Set the time event for each segment.

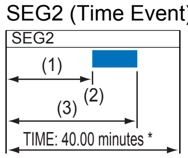
Example: ON start



(2) T.ON1 (On time of time event 1): 2.00 minutes after.*

(3) T.OF1 (Off time of time event 1): 8.00 minutes after.*

SEG2 (Time Event)



(1) TME2 (Start condition of time event 2) :
OFF: Start (OFF start)
Set the time event for each segment.

(2) T.ON2 (On time of time event 2): 20.00 minutes after.*

(3) T.OF2 (Off time of time event 2): 30.00 minutes after.*

*: TMU (Proguram time unit) = MM.SS:minute.second

Set Time Event

TME1 to TME16 (Start condition of time event 1 to 16):
Set the start condition (ON: start from ON-state, OFF: start from OFF-state) for each segment.

T.ON1 to T.ON16 (On time of time event 1 to 16):
Set the time from each segment start until the time event ON. The time can be set only within the TIME (segment time) of each segment.

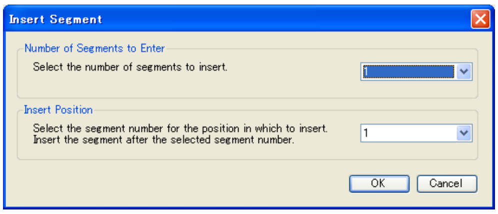
T.OF1 to T.OF16 (Off time of time event 1 to 16):
Set the time from each segment start until the time event OFF. The time can be set only within the TIME (segment time) of each segment.

Note: When the set time is outside the range of the segment time, the event action at the set time is not performed.

2.9.3 Inserting and Deleting a Segment

Inserting a Segment

1. In the Segment Setting window [SEG] of the Program Pattern Setting window, click on [Edit] – [Insert Segment] in the menu to display the Insert Segment window.

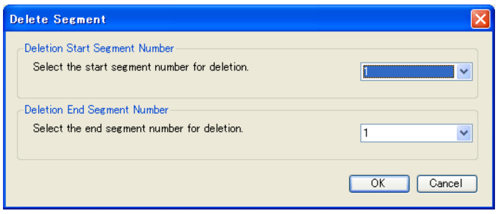


2. Select the number of segments to insert and the insertion position.

3. Click the [OK] button to insert the number of segments you entered in the position after the selected segment number.

Deleting a Segment

1. In the Segment Setting window [SEG] of the Program Pattern Setting window, click on [Edit] – [Delete Segment] in the menu to display the Delete Segment window.



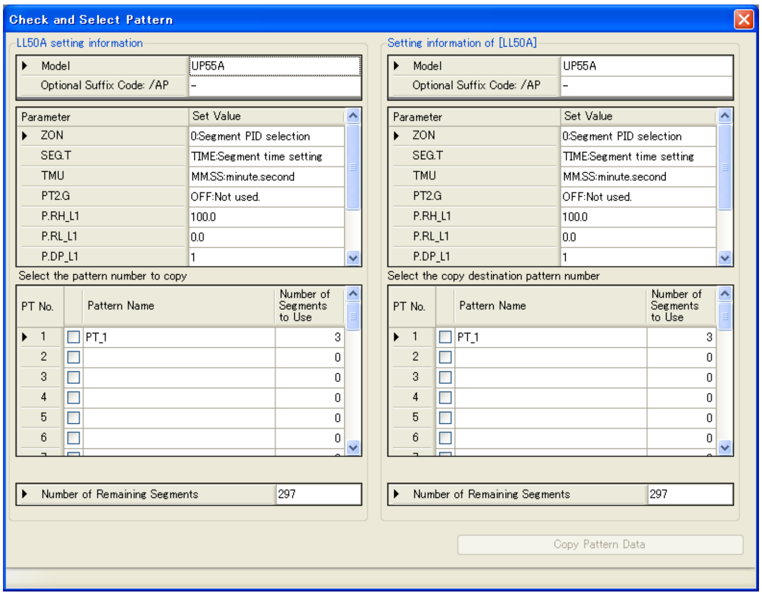
2. Select the deletion start segment number and deletion end segment number.

3. Click the [OK] button to delete the segment(s) for the selected segment number(s).

2.9.4 Copying, Adding, and Deleting a Pattern

Copying a Pattern

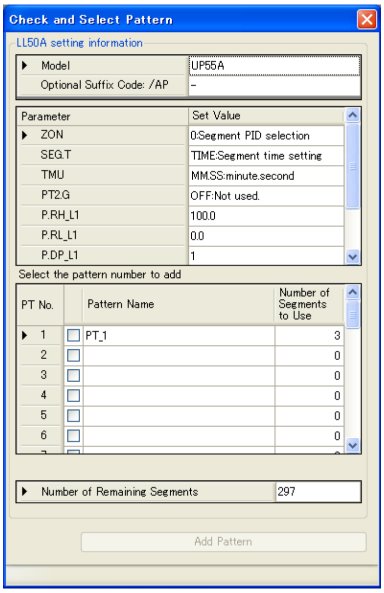
1. In the Program Pattern Setting window, click on [Edit] – [Copy Program Pattern] in the menu to display the Check and Select Pattern window.



2. Select the copy source pattern number and the copy destination pattern number, and click the [Copy Pattern Data] button.
   - When the copy source pattern number and the copy destination pattern number are the same, a message appears. Click [OK] and select the copy destination pattern number again.

Adding a Pattern

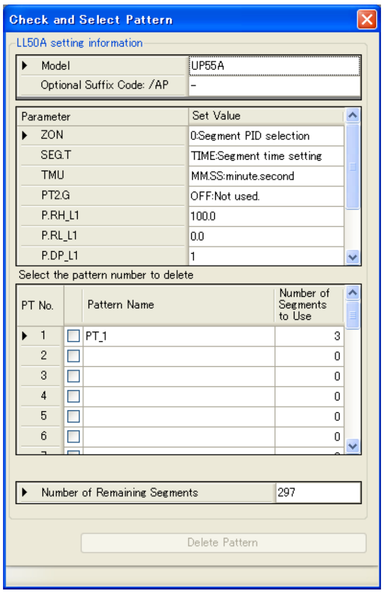
1. In the Program Pattern Setting window, click on [Edit] – [Add Program Pattern] in the menu to display the Check and Select Pattern window.



2. Select the pattern number to add, and click the [Add Pattern Data] button.
   - When the selected pattern number is already used, a message appears. Click [OK] and select the pattern number again.

Deleting a Pattern

1. In the Program Pattern Setting window, click on [Edit] – [Delete Program Pattern] in the menu to display the Check and Select Pattern window.



2. Select the pattern number to delete, and click the [Delete Pattern Data] button.

3. The confirmation message appears.

   To delete the pattern number, click the [OK] button.

   To cancel the deletion, click the [Cancel] button.

2.9.5 Hiding Time Event/PV Event

Time Event View

In the Segment Setting window [SEG] of the Program Pattern Setting window, click on [View] in the menu, and place a check mark in front of [Time Event] to display the time event ON time. (Removing the check mark hides the time event and the number is not displayed)

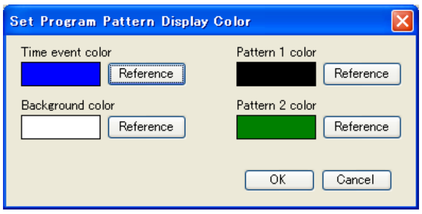
PV Event View

In the Segment Setting window [SEG] of the Program Pattern Setting window, click on [View] in the menu, and place a check in front of [PV Event] to display the PV event display area (line). (Removing the check mark hides the PV event and the display area [line] is not displayed.)

2.9.6 Changing the Display Color of a Program Pattern

The following procedure allows changing the color of the time event and pattern that are plotted.

1. In the Segment Setting window [SEG] of the Program Pattern Setting window, click on [Tools] – [Program Pattern Display Color Setting] in the menu to display the Program Pattern Display Color Setting window.



   Pattern 1 color: Pattern display color of Loop-1
   Pattern 2 color: Pattern display color of Loop-2

2. Click on the [Browse] button and select the color.

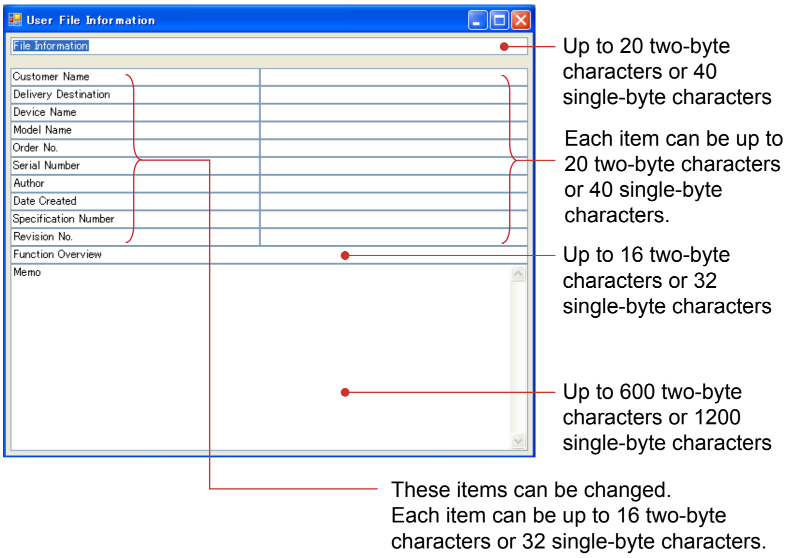
3. Click the [OK] button to change the color of the graph to be plotted.

2.10 Creating User File Information

User file information is used for creating data sheets that are submitted to the customer. Data sheets can also be printed out. User file information is saved in a user file and will not be downloaded to the main unit.

Procedure

1. Click on [File] – [Set User File Information] in the menu. Enter user file information in the window displayed.



2. To close the window, click ☒.

2.11 Downloading Data

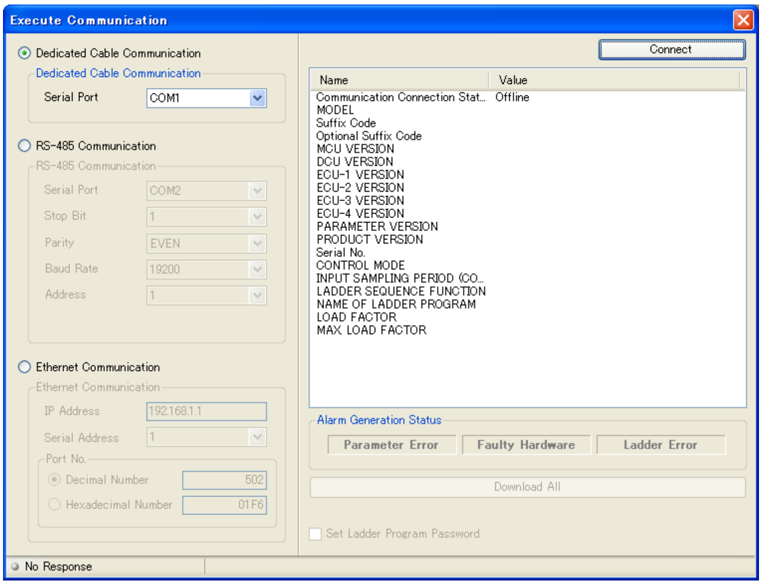
CAUTION

Do not download data while the controller is being used for control loop. Otherwise, it may cause a sudden change of the control output.
Be sure to disconnect the main unit from the target unit before downloading data.

Download All

Procedure

1. Click on [File] – [Download All] in the menu to display the Execute Communication window.



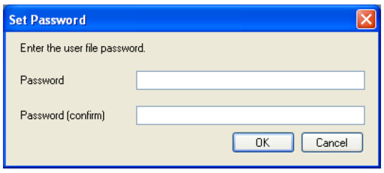
2. Set up the communication conditions and click the [Download All] button. When download is complete, the following message appears.
3. Click [OK] to close the Execute Communication window.

After clicking the [Download All] button, follow the prompts that are displayed.

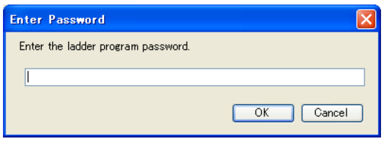
If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

If the “Set a ladder program password” checkbox is checked in the Execute Communication window, a dialog box asking if you want to set a password appears. Set a password using eight single-byte alphanumeric characters. If you do not want to set it, click the [OK] button without entering a password.
To change the password once it has been set to no password, click the [OK] button without entering a password.



In overwriting the main unit parameters for which a password has been set, entering the set password enables new data to be downloaded.



Description

Data which can be downloaded by one operation are a user file name, system data (only control mode, control period, and ladder program USE/DON’T USE information), parameter data, program pattern data, K-constant (K-register), and ladder program data. Circuit comment of ladder program is not downloaded.
Once a password has been set, it must be entered whenever you upload/download, compare, or monitor the ladder programs.
The password default value is non-setting. The password can be up to eight single-byte alphanumeric characters and is case sensitive.

Individual data can be downloaded as follows.

- Click on [Communication] – [Download Parameter Data] in the menu.
- Click on [Communication] – [Download Ladder Programs] in the menu.
  K-constant can be also downloaded by [Download Ladder Programs].
- Click on [Communication] – [Download Program Pattern Data] > [All Patterns] in the menu.
- Click on [Communication] – [Download Program Pattern Data] > [One Pattern] in the menu.

  * If the controller is UT75A, the downloaded data includes the data of Custom display.

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the main unit’s communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the main unit’s IP address (for Ethernet communication).
- Serial Address: Set the main unit’s RS-485 communication address if communication is made via an Ethernet/RS-485 converter (e.g., model VJET). (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

If data is downloaded via a maintenance port, nothing is displayed in the Alarm Generation Status in the Execute Communication window. In addition, “-” is displayed for the Load Factor and Max Load Factor when using a ladder program.

Note

- Do not disconnect a connection cable or turn off the main unit power supply during a download.
- If any ladder program is included in the downloaded data, the program is executed immediately after the download is completed.

Downloading Program Pattern Data

Note

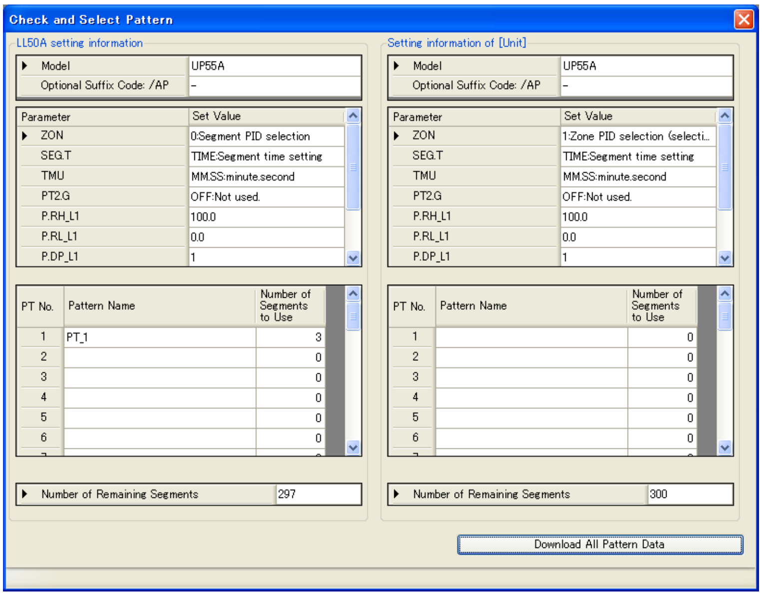
The following operations cannot be executed concurrently, otherwise the program pattern data cannot be read/written normally.

- Access to the program pattern via Open Network.
- Upload/download of the program pattern data using the LL50A Parameter Setting Tool.

All Patterns

Procedure

1. Click on [Communication] – [Download Program Pattern Data] – [All Patterns] in the menu to display the Execute Communication window.
2. Set the communication conditions and click the [Download All Program Pattern Data] button.
3. The Check and Select Pattern window appears. Confirm the details and click the [Download All Pattern Data] button. When downloading is completed, the message appears.



4. Click [OK] to close the Execute Communication window.

First, click the [Download All Pattern Data] button, and then perform the operation in accordance with the instructions in the message.

When the current work data is not saved, a dialog box appears to ask whether or not to save the data.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

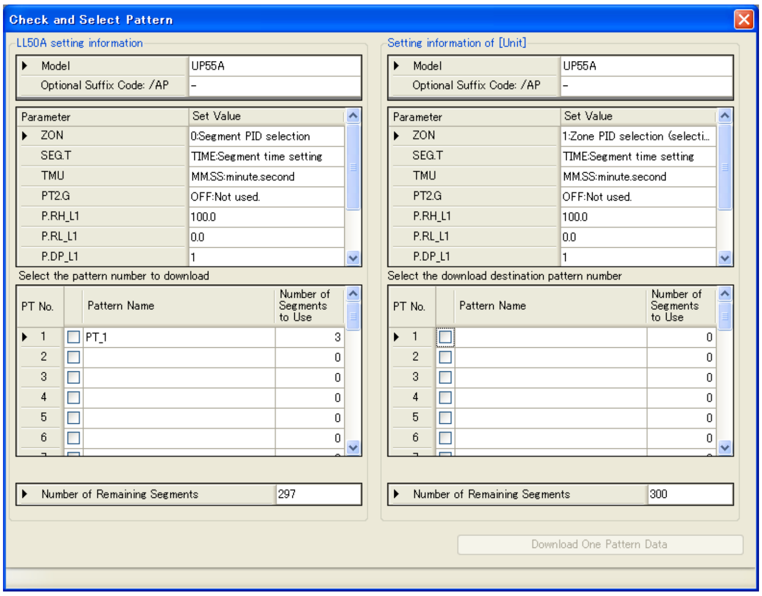
Note

- Be aware that when the downloading of all the patterns is executed, all the pattern data set in main unit will be cleared.
- The number of patterns that can be set in UP35A varies depending on whether or not option code /AP is specified. Only the number of patterns that can be downloaded to the main unit can be downloaded.

One Pattern

Procedure

1. Click on [Communication] – [Download Program Pattern Data] – [One Pattern] in the menu to display the Execute Communication window.
2. Set the communication conditions and click the [Download One Program Pattern Data] button.
3. The Check and Select Pattern window appears. Select the download source pattern number and the download destination pattern number, and click [Download One Pattern Data]. When downloading is completed, a message appears.



4. Click [OK] to close the Execute Communication window.

If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

Note

When downloading of one pattern is performed, do a batch upload and save the backup file.

Description

When the parameters displayed in the Check and Select Pattern window do not meet the following conditions, the pattern file cannot be read.

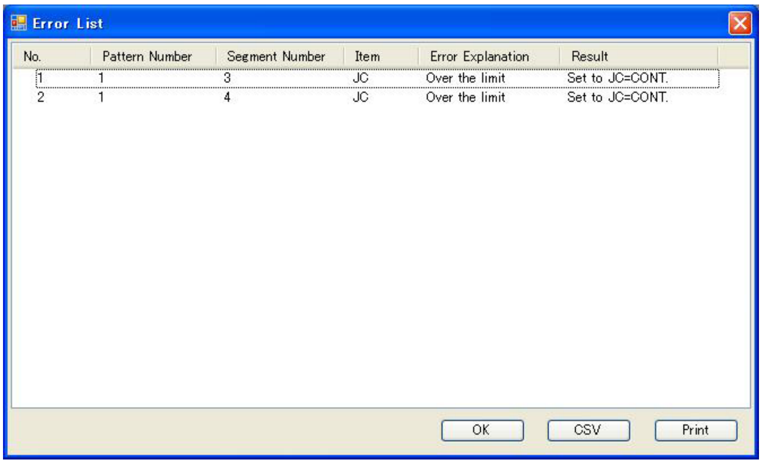
Parameter	Checkpoint
SEG.T	Main unit (or file) setting data = LL50A setting data
P.DP_L1	Main unit (or file) setting data = LL50A setting data
P.RH_L1 P.RL_L1	LL50A range ≤ Main unit (or file) range
P.DP_L2 (*1)	Main unit (or file) setting data = LL50A setting data
P.RH_L2 (*1) P.RL_L2 (*1)	LL50A range ≤ Main unit (or file) range
PT2.G	A message appears when both do not match “The setpoint for parameter PT2.G does not match. Do you want to continue the process?” “Yes/No” Clicking [Yes] allows you to continue the process
ZON	A message appears when both do not match “The setpoint for parameter ZON does not match. Do you want to continue the process?” “Yes/No” Clicking [Yes] allows you to continue the process
TMU	A message appears when both do not match “The setpoint for parameter TMU does not match. Do you want to continue the process?” “Yes/No” Clicking [Yes] allows you to continue the process

*1: To display the retransmission program pattern parameters, it is necessary to configure the following setting.
Parameter Setting window – Setup Parameters (CTL) – Program Pattern 2 Retransmission (PT2.G) = ON (Use)

Error List Window

When downloading of the program pattern data is performed and the download to the main unit is unsuccessful because of an error, such as the setpoint is over the limit, the Error List window appears.

Example: When the setpoint for the junction code (JC) cannot be downloaded, which may occur because the limit to the junction code (JC) varies depending on whether or not UP35A’s option code /AP is specified.

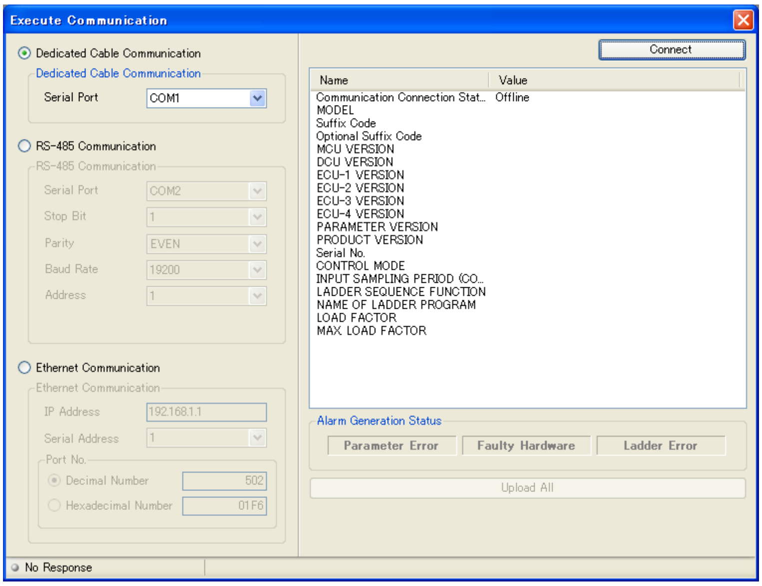


2.12 Uploading Data

Upload All

Procedure

1. Click on [Communication] – [Upload All] in the menu to display the Execute Communication window.



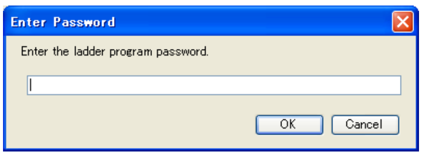
2. Set up the communication conditions and click the [Upload All] button. When an upload is complete, the Execute Communication window.

If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

If the following message appears after clicking the [Upload All] button, follow the instructions of the message.

If a ladder program password has been set to data to be uploaded, the Enter Password dialog box appears. Enter the password and click the [OK] button.



Description

Data which are uploaded at once are a user file name, system data, parameter data, program pattern data, and ladder program data.
Once a password has been set, it must be entered whenever you upload, download, compare, or monitor the ladder programs.
The password default value is non-setting. The password can be up to eight single-byte alphanumeric characters and is case-sensitive.

Individual data can be uploaded as follows.

- Click on [Communication] – [Upload Parameter Data] in the menu.
- Click on [Communication] – [Upload Ladder Programs] in the menu.
- Click on [Communication] – [Upload Program Pattern Data] > [All Patterns] in the menu.
- Click on [Communication] – [Upload Program Pattern Data] > [One Pattern] in the menu.

  * If the controller is UT75A, the uploaded data includes the data of custom display.

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the main unit's communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the main unit's IP address (for Ethernet communication).
- Serial Address: Set the main unit's RS-485 communication address if communication is made via an Ethernet/RS-485 converter (e.g., model VJET). (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

If data is downloaded via a maintenance port, nothing is displayed in the Alarm Generation Status in the Execute Communication window. In addition, "-" is displayed for the Load Factor and Max Load Factor when using a ladder program.

Note

Do not disconnect a connection cable or turn off the main unit power supply during an upload.

Uploading Program Pattern Data

Note

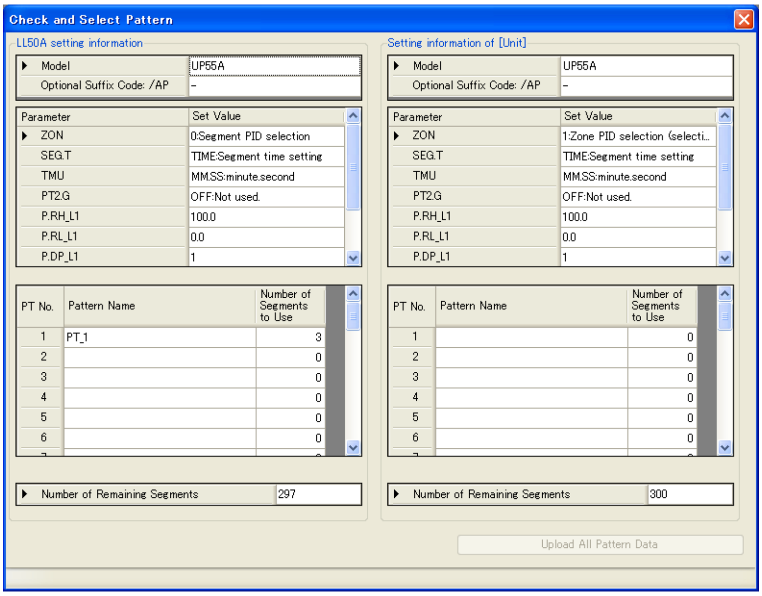
The following operations cannot be executed concurrently, otherwise the program pattern data cannot be read/written normally.

- Access to the program pattern via Open Network.
- Upload/download of the program pattern data using the LL50A Parameter Setting Tool.

All Patterns

Procedure

1. Click on [Communication] – [Upload Program Pattern Data] – [All Patterns] in the menu to display the Execute Communication window.
2. Set the communication conditions and click the [Upload All Program Pattern Data] button.
3. The Check and Select Pattern window appears. Confirm the details and click the [Upload All Pattern Data] button. When downloading is completed, the message appears.



When the current work data is not saved, a dialog box appears to ask whether or not to save the data.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

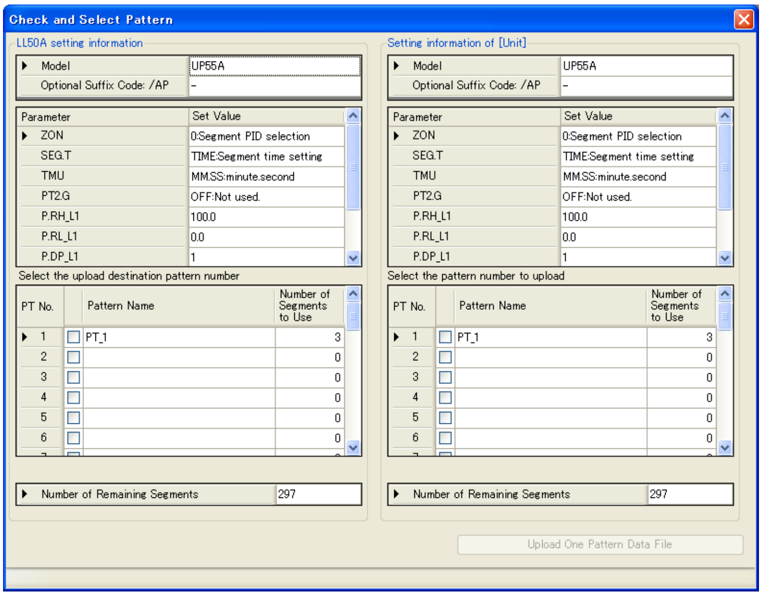
Note

- Be aware that when the uploading of all the patterns is executed, all the pattern data set in LL50A will be cleared.
- The number of patterns that can be set in UP35A varies depending on whether or not option code /AP is specified. Only the number of patterns that can be downloaded to the main unit can be downloaded.

One Pattern

Procedure

1. Click on [Communication] – [Upload Program Pattern Data] – [One Pattern] in the menu to display the Execute Communication window.
2. Set the communication conditions and click the [Upload One Program Pattern Data] button.
3. The Check and Select Pattern window appears. Select the upload source pattern number and the upload destination pattern number, and click [Upload One Pattern]. When uploading is completed, the Execute Communication window closes.



If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

Description

When the parameters displayed in the Check and Select Pattern window do not meet the following conditions, the pattern file cannot be read.

Parameter	Checkpoint
SEG.T	Main unit (or file) setting data = LL50A setting data
P.DP_L1	Main unit (or file) setting data = LL50A setting data
P.RH_L1 P.RL_L1	LL50A range ≥ Main unit (or file) range
P.DP_L2 (*1)	Main unit (or file) setting data = LL50A setting data
P.RH_L2 (*1) P.RL_L2 (*1)	LL50A range ≤ Main unit (or file) range
PT2.G	A message appears when both do not match "The setpoint for parameter PT2.G does not match. Do you want to continue the process?" "Yes/No" Clicking [Yes] allows you to continue the process
ZON	A message appears when both do not match "The setpoint for parameter ZON does not match. Do you want to continue the process?" "Yes/No" Clicking [Yes] allows you to continue the process
TMU	A message appears when both do not match "The setpoint for parameter TMU does not match. Do you want to continue the process?" "Yes/No" Clicking [Yes] allows you to continue the process

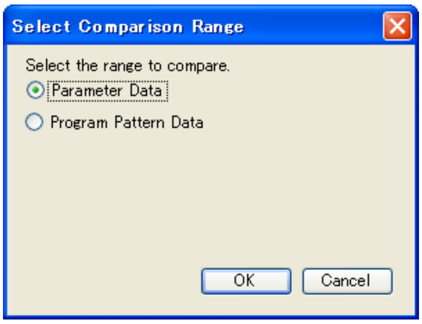
*1: To display the retransmission program pattern parameters, it is necessary to configure the following setting.
Parameter Setting window – Setup Parameters (CTL) – Program Pattern 2 Retransmission (PT2.G) = ON (Use)

When uploading of the program pattern data is performed and the upload to the main unit is unsuccessful because of an error, such as the setpoint is over the limit, the Error List window appears.

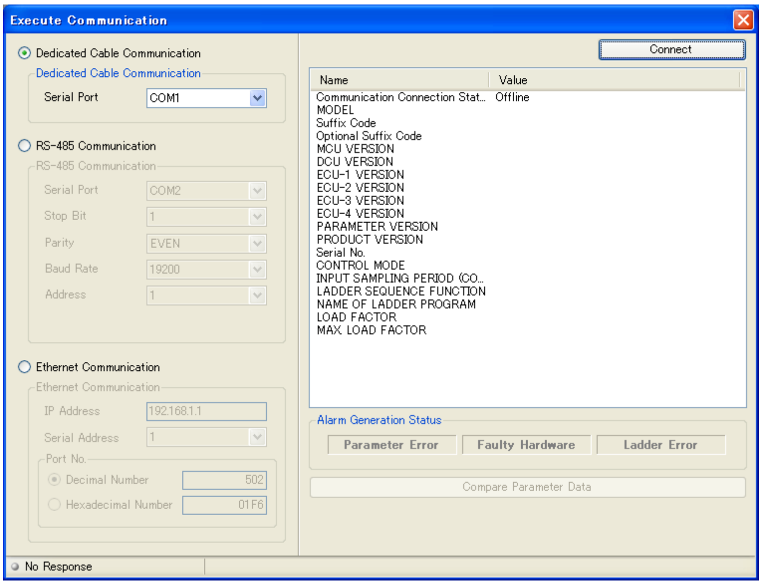
2.13 Comparing Data with Main unit's Data

Procedure

1. Click on [Communication] – [Compare Communication] in the menu to display the Select Comparison Range window.



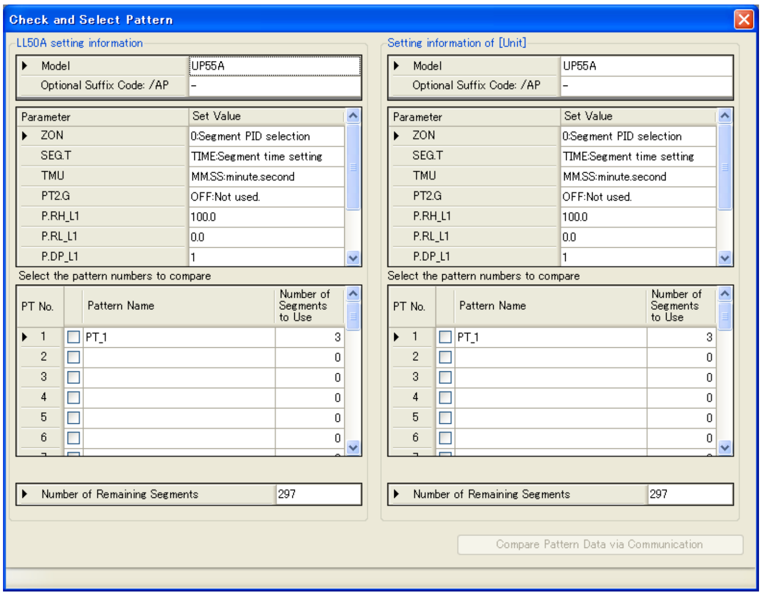
2. Select the comparison range and click the [OK] button to display the Execute Communication window.



3. Set up the communication conditions and click the [Execute Parameter Comparison] button to start parameter comparison. When parameter data matches the main unit's data, the following message appears. If there is any mismatch, the mismatched data is displayed.

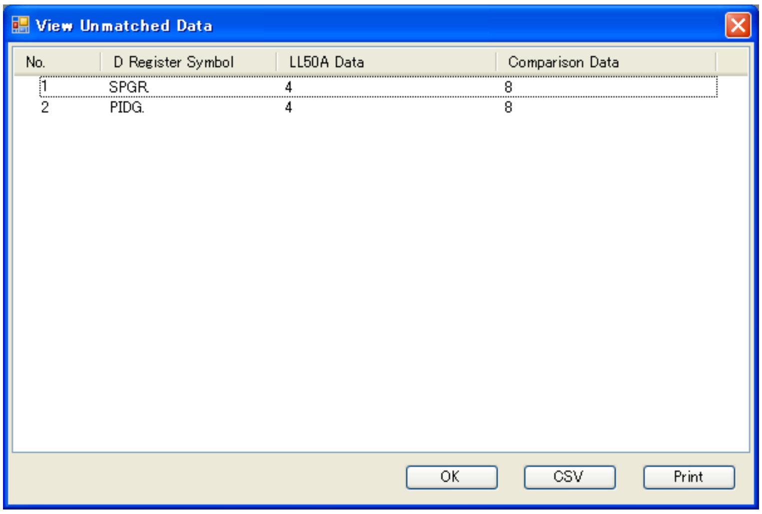
Note

When program pattern data is compared with each other, the Check and Select Pattern window appears. Select the program pattern numbers to compare and click the [Compare Pattern Data via Communication] button.



When the number of segments used in the LL50A data and the number of segments used in the comparison data are different in the comparison of the program pattern data, the number of the used segments is output as the unmatched data. The comparison segment range is only the segments common to the LL50A data and the comparison data.

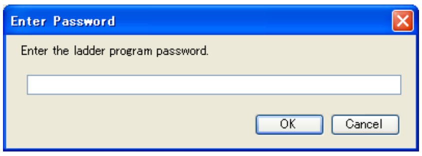
Window displayed if there is mismatched data



The contents of mismatch can be output to a .csv format file. If the following message appears during data comparison, follow the instructions of the message.
If the parameter version is different, data may not be properly compared.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

If a ladder program password has been set to data to be compared, the Enter Password dialog box appears. Enter the password and click the [OK] button.



Description

The password can be up to eight single-byte alphanumeric characters and is case-sensitive.

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the main unit's communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the main unit's IP address (for Ethernet communication).
- Serial Address: Set the main unit's RS-485 communication address if communication is made via an Ethernet/RS-485 converter (e.g., model VJET). (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

If data is downloaded via a maintenance port, nothing is displayed in the Alarm Generation Status in the Execute Communication window. In addition, "-" is displayed for the Load Factor and Max Load Factor when using a ladder program.

Note

- Do not disconnect a connection cable or turn off the main unit power supply during data comparison.

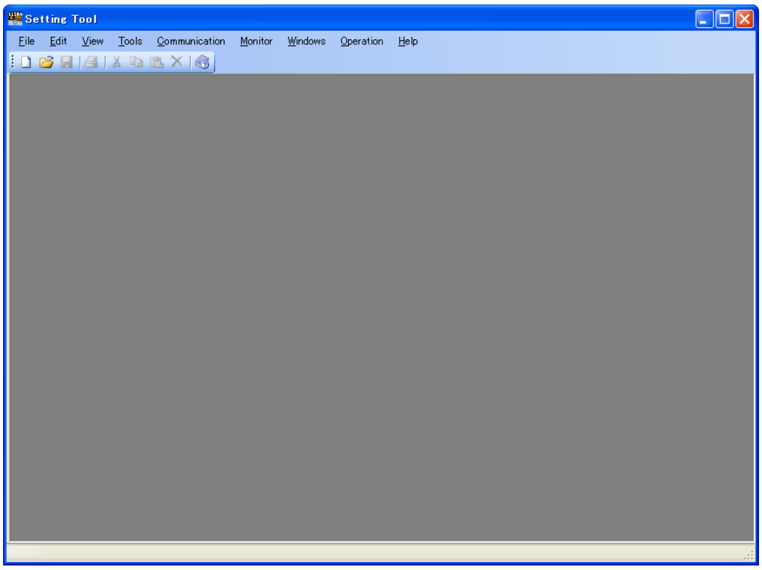
2.14 Monitoring/Changing Data

2.14.1 Monitoring/Changing Tuning Data

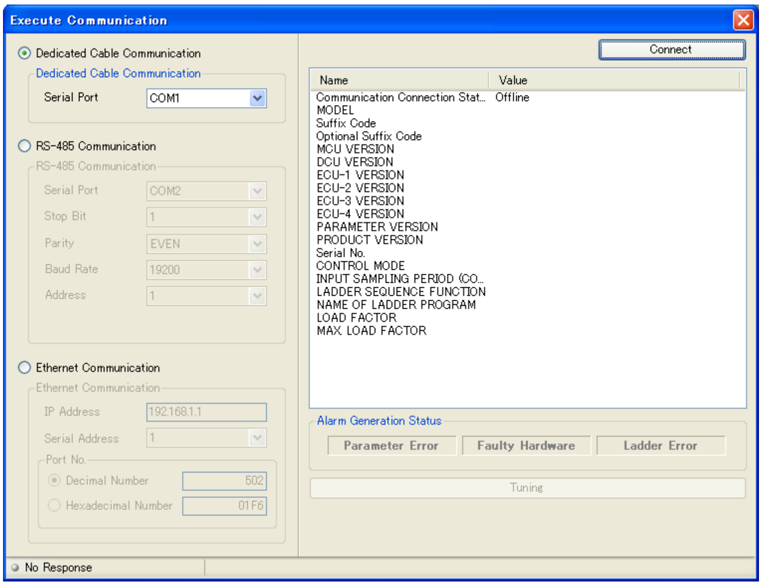
For details of the tuning function, see the “description” given later.

Procedure

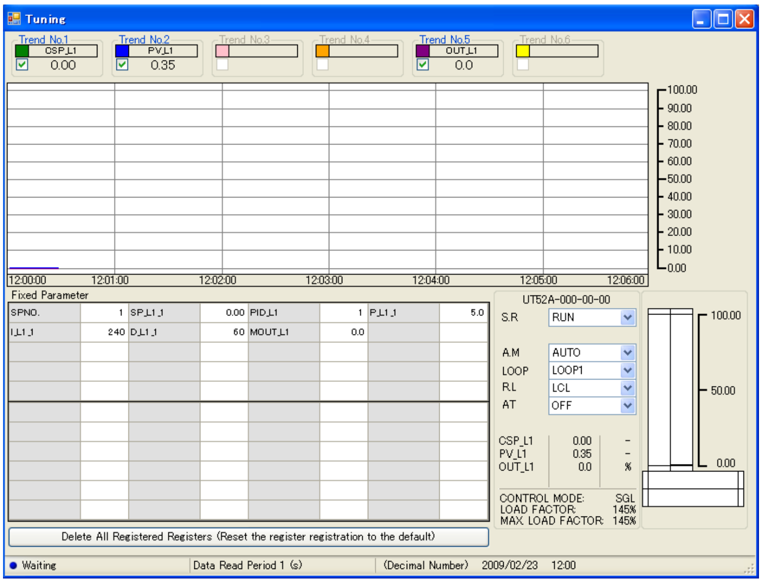
1. Display the Basic window.



2. Click on [Monitor] – [Tuning] in the menu to display the Execute Communication window.

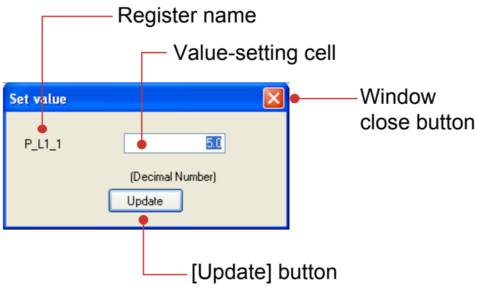


3. Set up the communication conditions and click the [Execute Tuning] button to display the Tuning window.



4. By observing PV, SP, and OUT trends, change the proportional band, integral time, and derivative time according to the register values in the register monitor display area.

5. Double-click in the cell of a register value that you want to change to display the Set Value window.



A value is displayed in the data format selected by clicking on [Monitor] – [Display Format] in the menu.

6. Enter a value and click the [Update] button.

7. To close the window, click ☒.

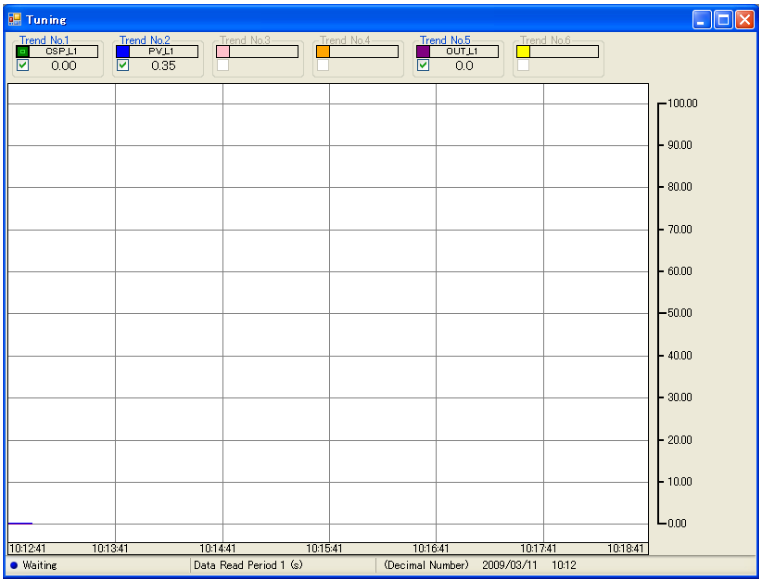
If trend data has not yet been saved during tuning, a dialog box asking if you want to save data appears.

- To save the data, click the [Yes] button.
- To discard the data, click the [No] button.
- To return to tuning, click the [Cancel] button.

Making register-monitoring display invisible

Procedure

1. Click on [View] – [Monitor Register] in the menu.



Clearing tuning trend

Procedure

1. Click on [Monitor] – [Clear Trend] in the menu.

This function clears only the display; no data will be deleted.

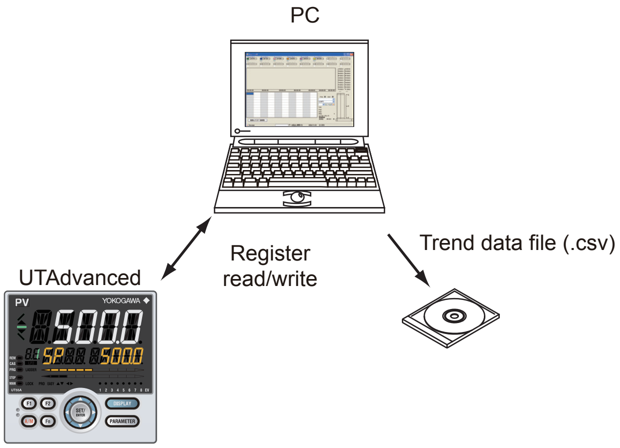
Description

The tuning function performs tuning by communicating with one main unit.
This function is primarily used at system startup. The recommended trend acquisition period is one day. Furthermore, it also enables the PV, SP, and OUT values to be displayed as trend data and acquired together with the loop information and fixed registers in the Tuning window. A maximum of 65,000 acquisition times of trend data can be saved irrespective of the data read cycle. If the number of acquisition times exceeds 65,000, acquired data will automatically be saved in another file. However, the trend data can not be saved for the first one minute when another file has been made.
Example: If data acquisition is performed the 65,000st time at 21:30:50 on May 20, 2009, the name of the file containing this data is 2009_05_20_21_30_50.csv.

Note

If the control mode, control type, scale parameter, or another item is changed while the Tuning window is displayed, once close the Tuning window and then re-open it to refresh the displayed values.

If a register value is changed, the change is reflected in the main unit.
Multiple Tuning windows cannot be displayed simultaneously.



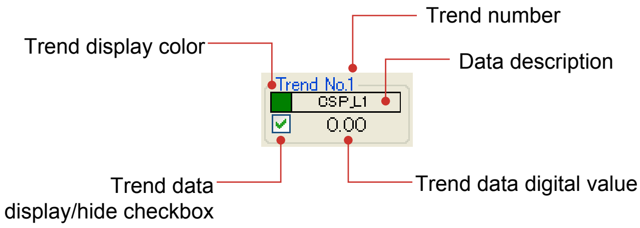
<Execute Communication window>

- Serial port: A port available for a PC is automatically displayed.
- Stop bit, parity, baud rate, data length, and address: Set these items according to the main unit's communication conditions.
- IP address: Set this address according to the main unit's IP address (for Ethernet communication).
- Serial address: Set the main unit's RS-485 communication address if communication is made via an Ethernet/RS-485 converter (e.g., model VJET). (Not allowed to be duplicated)
- Port number: Set the port number. (Decimal or Hexadecimal)

Note

Do not disconnect a connection cable or turn off the main unit power supply during trend data tuning.

(1) Trend data digital-value display section



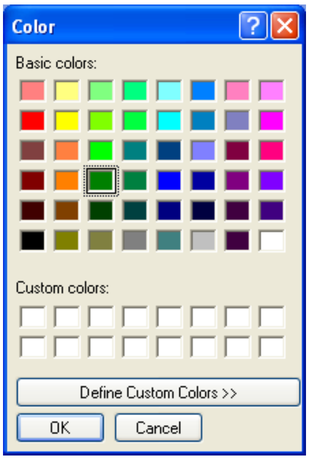
Display	Description
Number of trend data displayed	Up to six data
Trend data display/ hide checkbox	Select whether or not to display trend data on a graph using a check mark. Even if trend data is made invisible, a trend data digital value is displayed and can be output in .csv file format as trend data.
Trend display color	Clicking on the trend display color causes the Color dialog box to appear, enabling you to change the display color.
Data description	<When suffix code type 1 (basic control) is standard type or Position proportional type> When the control mode is anything other than Cascade control, and the control type is anything other than Two-position two-level control or Heating/ cooling control: Trend 1: CSP_L1 (target setpoint) Trend 2: PV_L1 (measured input value) Trend 3: None *1 Trend 4: None Trend 5: OUT_L1 (control output value) Trend 6: None When the Control mode is Cascade control, and the control type is anything other than Two-position two-level control or Heating/cooling control: Trend 1: CSP_L1 (Loop-1 target setpoint) Trend 2: PV_L1 (Loop-1 measured input value) Trend 3: CSP_L2 (Loop-2 target setpoint) Trend 4: PV_L2 (Loop-2 measured input value) Trend 5: OUT_L2 (control output value) Trend 6: None <When suffix code type 1 (basic control) is Heating/cooling type> When the control mode is anything other than Cascade control, and the control type is Heating/cooling control or Two-position two-level control: Trend 1: CSP_L1 (target setpoint) Trend 2: PV_L1 (measured input value) Trend 3: None *1 Trend 4: None Trend 5: HOUT_L1 (heating-side or main setting-side control output value) Trend 6: COUT_L1 (cooling-side or sub-setting-side control output value) When the control mode is Cascade control, and the control type is Two-position two-level control or Heating/cooling control: Trend 1: CSP_L1 (Loop-1 target setpoint) Trend 2: PV_L1 (Loop-1 measured input value) Trend 3: CSP_L2 (Loop-2 target setpoint) Trend 4: PV_L2 (Loop-2 measured input value) Trend 5: HOUT_L2 (heating-side or main setting-side control output value) Trend 6: COUT_L2 (cooling-side or sub-setting-side control output value)

Trend data digital-value display section (Continued)

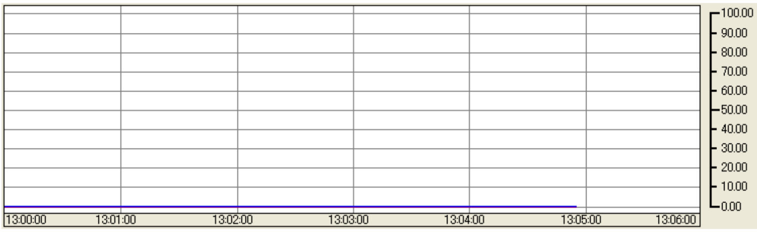
Display	Description
Data description	<When suffix code type 1 (basic control) is Dual-loop type> When the control mode is Dual-loop control, and the control type is anything other than Heating/cooling control: Trend 1: CSP_L1 (target setpoint) Trend 2: PV_L1 (measured input value) Trend 3: OUT_L1 (control output value) Trend 4: CSP_L2 (Loop-2 target setpoint) Trend 5: PV_L2 (Loop-2 measured input value) Trend 6: OUT_L2 (control output value) When the Control mode is Dual-loop control, and the control type is Heating/cooling control: Trend 1: CSP_L1 (Loop-1 target setpoint) Trend 2: PV_L1 (Loop-1 measured input value) Trend 3: HOUT_L1 (Loop-1 heating-side control output value) Trend 4: COUT_L1 (Loop-1 cooling-side control output value) Trend 5: CSP_L2 (Loop-2 target setpoint) Trend 6: PV_L2 (Loop-2 measured input value) Trend 7: HOUT_L2 (Loop-2 heating-side control output value) Trend 8: COUT_L2 (Loop-2 cooling-side control output value)
Trend data digital value	Data read from the main unit (Max. 7 digits including the sign and decimal point) is displayed.

*1: Only for UP55A. When the program pattern-2 retransmission (PT2.G) is ON, "CSP_L2" is displayed in Trend 3.

Color Setting window



(2) Trend display area

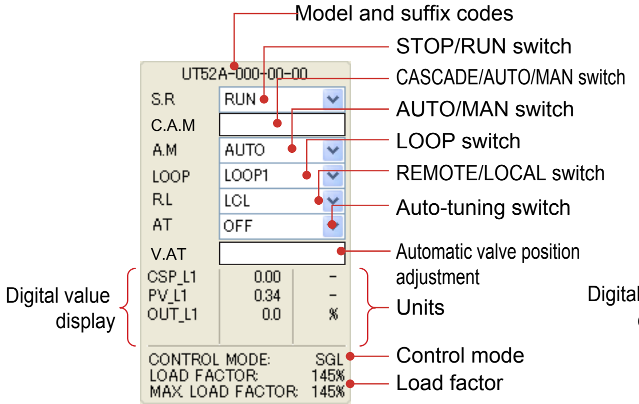


Display	Description
Scale display	Maximum value to minimum value of the input range (Loop 1 and Loop 2) Scale divisions: 11
Trend	Trend data of -5.0 to 105.0% (0 to 100% scale) is displayed. Display update period: Data read cycle Plotting: Plotting from the left When the trend is plotted up to the right end, the display area is scrolled to the left by 2/3 hours on the time-axis scale. If a value exceeds the range, trend display is limited. However, read data is saved as is in a .csv file. Trend data is displayed starting on the left end.
X-axis (time-axis) scale	The time axis is automatically calculated according to the data read cycle.
Background color	Right-clicking on the trend graph and selecting Background Color from the shortcut menu which appears causes the Color dialog box to appear, enabling you to change the trend display color.

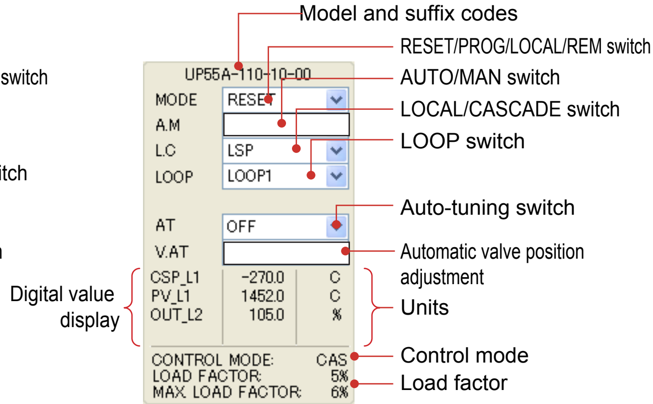
(3) Loop information display area

This area displays loop information selected by LOOP switching.

Example: UT52A



Example: UP55A

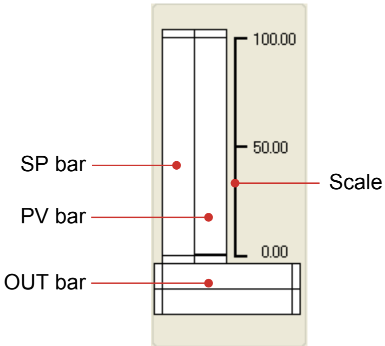


Display	Description
Model and suffix codes	This field displays the model and suffix codes read out when the window is opened.
STOP/RUN switching (only for UT75A/UT55A/ UT52A/UT35A/UT32A)	Displays the operation status, which can be switched. RUN: Starts operation. STOP: Stops operation.
RESET/PROG/LOCAL/REM switching (only for UP55A/UP35A)	RESET: Stop of program operation PROG: Start of program operation LOCAL: Start of local-mode operation REM: Start of remote-mode operation (only for UP55A)
CASCADE/AUTO/MAN switching (only for UT75A/UT55A/ UT52A)	Displays the operation status. It is displayed when the control mode is Cascade control or Secondary-loop cascade control. It can be switched. CAS: Cascade AUTO: Automatic MAN: Manual
LOCAL/CASCADE switching (only for UP55A)	Displays the operation status. It is displayed when the control mode is Cascade control. It can be switched. LCL: Local CAS: Cascade
AUTO/MAN switching	Displays the operation status. It is displayed when the control mode is anything other than Cascade control or Secondary-loop cascade control. It can be switched. AUTO: Automatic MAN: Manual
LOOP switching (only for UT75A/UT55A/ UT52A/UP55A)	The loop can be switched between LOOP1 and LOOP2 when the control mode is Cascade contro or Dual-loop controll.
REMOTE/LOCAL switching (only for UT35A/UT32A with communication)	Displays the operation status. It is displayed when the control mode is anything other than Secondary-loop cascade control.It can be switched. LCL: Local REM: Remote
Auto-tuning switching	Enables auto-tuning to be activated or deactivated. When auto-tuning is activated, optimized PID values are set to the main unit and are displayed and updated in the register monitor display area at the next data read cycle. When auto-tuning finishes, OFF is displayed at the next read cycle. UT35A/UT32A/UP35A: Switchable among OFF, 1 to 4, and R UT55A/UT52A/UP55A: Switchable among OFF, 1 to 8, and R UT75A: Switchable among OFF, 1 to 16, and R
Automatic valve position adjustment	Activates and deactivates automatic valve position adjustment. This is available only in position proportional type. When automatic valve position adjustment finishes, OFF is displayed at the next data read cycle. Switchable between OFF and ON If an automatic valve position adjustment error occurs in the main unit, an error icon is displayed.

Display	Description
SV and PV digital value display	PV and SV digital values are read from the main unit and displayed. The values are max. 7 digits including the sign and decimal point.
OUT digital value display	OUT digital values are read from the main unit and displayed. The values are max. 7 digits including the sign and decimal point.
Unit display	Displays units.
Control mode (only for UT75A/UT55A/UT52A/UP55A)	Displays control mode.
Load factor and maximum load factor	Displays the load factor and maximum load factor of ladder programs.

The display update period is the data read cycle. Data to be updated are those other than the model and suffix codes, unit display, and control mode.

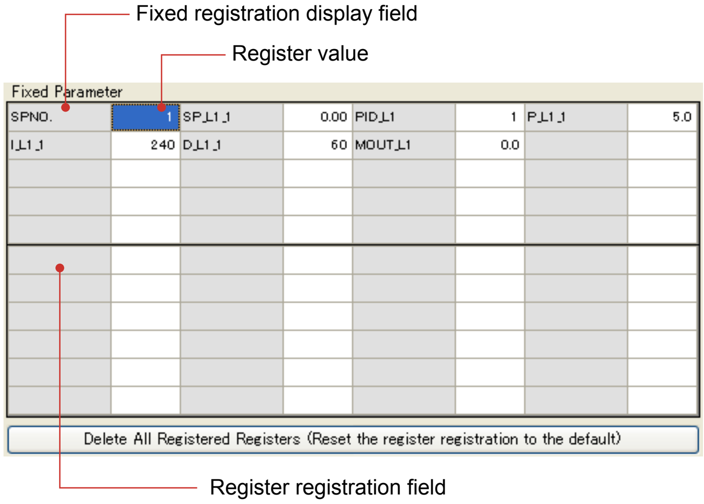
(4) Bar graph display area



Display	Description
SP and PV bars	Display the SP and PV values of the loop selected by LOOP switching in a bar graph. LOOP1 SP bar: green, PV bar: blue LOOP2 SP bar: pink, PV bar: orange
OUT bar	Displays OUT values in a bar graph. Control output or heating-side control output: purple Cooling-side control output: yellow
Scale	The maximum value to minimum value of the input scale (Loop 1 and Loop 2) Memory: 3 points

The display update period is the data read cycle. Data to be updated are SP bar, PV bar, and OUT bar.

(5) Register monitor display area



Display	Description
Fixed register display field	24 registers The registers that are displayed change depending on the model, control mode or control type. Registration details cannot be modified.
Register registration field	24 registers The registers are registered by drag-and-drop from the Register window. To delete a registered register: (1) Use the shortcut menu that is displayed by right-clicking in the register registration field concerned. (2) Click on the register name that you want to delete and press the Delete key. The cell in which a register has been registered can be overwritten.
Register value	Double-clicking on the cell concerned causes the Set Value window to appear, enabling you to change a register value. To switch between decimal and hexadecimal displays: Click on [Monitor], select [Display Format], and click on [Decimal] or [Hexadecimal] in the menu. The display update period is the data read cycle.
Delete All Registered Registers button	Deletes all registers registered in the register registration field to initialize register registration.

What are register symbols?

Register symbols are the symbols of registers containing data such as main unit parameter, operation status, alarm status, contact input, or error information in 16 bits or 1 bit.

When performing communication, registers are used as D-registers or I-relays.

For more information on them, see the UTAdvanced Communication Interface (RS-485, Ethernet) User’s Manual.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
  Ln: loop number (L1 or L2)
  Y: group number (1 to 8 (20) or 1 to 16, R)
xxxx_En
  En: terminal area number (E1 to E4)

Example:
  SP_L1_3: This means Loop-1 group-3 target setpoint.
  PYS_2: This means group-2 PYS.
  DI1.D_E1: This means E1-terminal area DI1.D.

Note

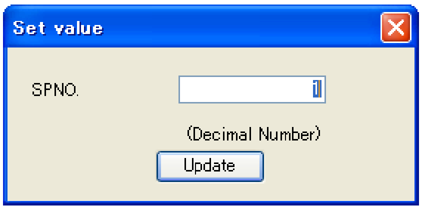
Since the UT35A/UT32A/UP35A is a single-loop controller, it has no distinction between Loop-1 and Loop-2. However, the register symbol has "L1" which indicates Loop-1.

Note

When hexadecimal display is selected, the integers of registers are displayed in hexadecimal numbers, except DAT01 to DAT20. (No decimal point position is displayed.)
DAT01 to DATA20 use 32-bit floating-point numbers of the IEEE 754 format in hexadecimal notation.

Set Value window

When a register set value is registered in the register monitor display area, the following Set Value window appears.



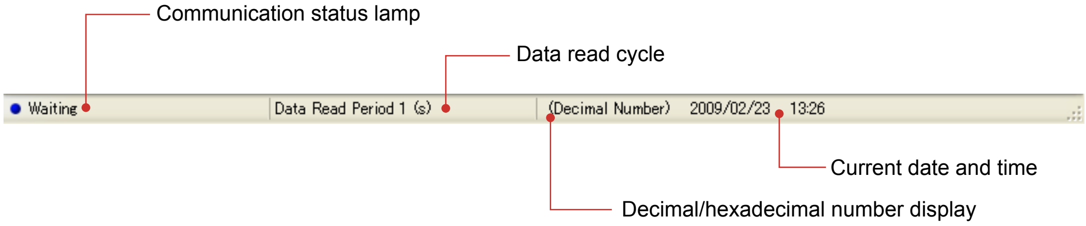
Actions to be taken when the Set Value window is closed

The display of the following data will be updated:

- Trend data digital value
- LOOP information display area
- Bar graph display
- Register monitor display area

Even if the Set Value window is opened and then closed without changing a set value, the displays will be updated irrespective of the data read cycle.

(6) Status bar display area



Display	Description
Communication status lamp	Green: Communicating Blinks at the data read cycle. Blue: Waiting (lit) Red: Delay occurring (Lit) Gray: No response
Progress bar display	The progress rate is indicated in a bar display (when Save Tuning Data)
Data read cycle	Double-clicking on this item causes the Set Data Read Cycle window to open.
Decimal/hexadecimal display	Enables you to check if a register value is displayed in whichever data format of decimal or hexadecimal numbers. It can be switched by the command from the menu. Click on [Monitor], select [Display Format], and click on [Decimal] or [Hexadecimal] in the menu.
Current date	PC system date (year/month/day)
Current time	PC system time (hour : minute)

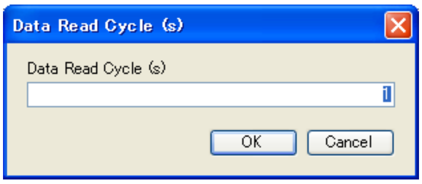
Note

When the communication status indicates “Red: Delay occurring (Lit)”, set the data read cycle longer.

2.14.2 Setting Data Read Cycle

Procedure

1. Double-click on the data read cycle display field in the status bar display area.



2. Set a data read cycle and click the [OK] button.

Description

Data is read during tuning, while monitoring registers, and at the set data read cycle.
Setting range: 1 to 3600 sec

If the data read cycle is changed during tuning, the X-axis (time-axis) span of the trend graph changes as shown in the table below. The trend graph displayed is deleted, and trend data starts to be plotted from the left end of the X axis (time axis).

Data Read Cycle	X-axis (Time-axis) Span
1 sec	6 min
2 sec	12 min
60 sec	6 hr

Note

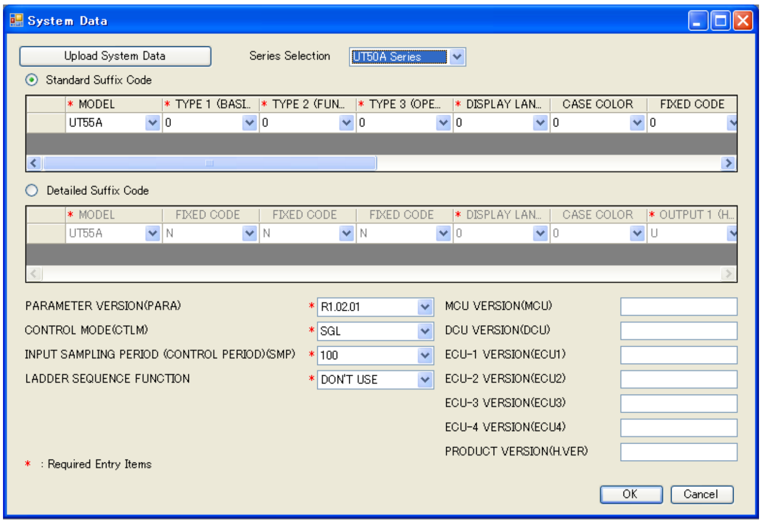
If communication processing is unable to meet the set data read cycle, a communication delay occurs.

2.15 Managing Files

2.15.1 Creating a New File

Procedure

1. Click on [File] – [New] in the menu or click on the toolbar to display the Set System Data window.



Items marked by an asterisk * are mandatory input fields.
CONTROL MODE (CTLM) and ECU-2 VERSION (ECU2) are displayed for UT75A/UT55A/UT52A/UP55A only.
INPUT SAMPLING PERIOD (CONTROL PERIOD) (SMP) is displayed for UT75A/UT55A/UT52A/UP55A/UM33A only.
LADDER SEQUENCE FUNCTION, ECU-2 VERSION (ECU2), and ECU-3 VERSION (ECU3) are not available for UM33A.

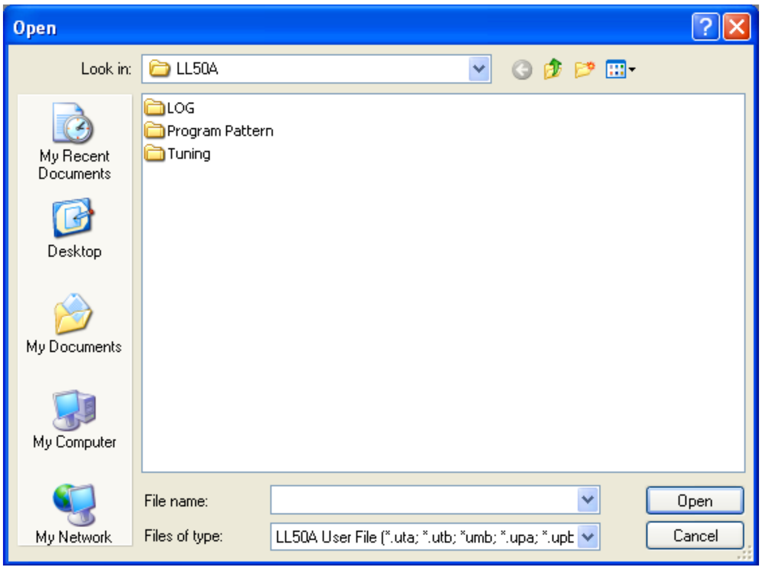
2. Enter system data or click the [Upload System Data] button and then click the [OK] button.

3. For operations such as setting parameters and creating user file information, see the relevant section.

2.15.2 Opening a User File

Procedure

1. Click on [File] – [Open] in the menu or click  on the toolbar to display the Open File window.



2. See the following table for the user file extension.
   For operations such as setting parameters and creating user file information, see the relevant section.

If a password has been set to a user file, enter the user file password.

Extension

Model	Extension
UT55A/UT52A	uta
UT35A/UT32A	utb
UT75A	utc
UT35A-L	utl
UP55A	upa
UP35A	upb
UM33A	umb

2.15.3 Opening a Program Pattern Data File

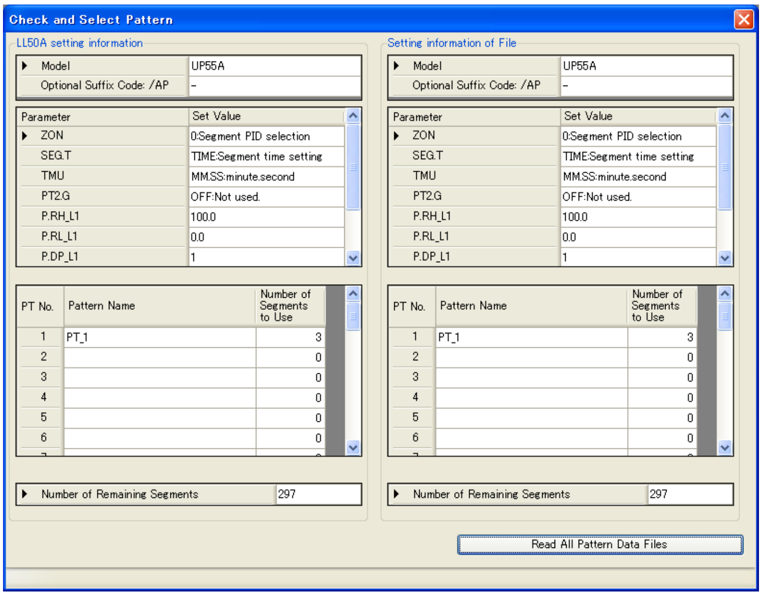
All Pattern Files

Procedure

1. Click on [File] – [Open Program Pattern File] – [All Pattern Files] in the menu to display the Browse Folders dialog box.

2. Select the folder and then click [OK].

3. The Check and Select Pattern window appears. Confirm the details and click the [Read All Pattern Data Files] button.



Note

- Be aware that when the uploading of all the patterns is executed, all the pattern data set in LL50A will be cleared.
- Files with file names of PTN001 to PTN030* can be read.
  *: PTN001 and PTN002 for UP35A (plus PTN004 when the option code is specified).

► File name: Section 2.15.8 Saving Program Pattern File in this Manual

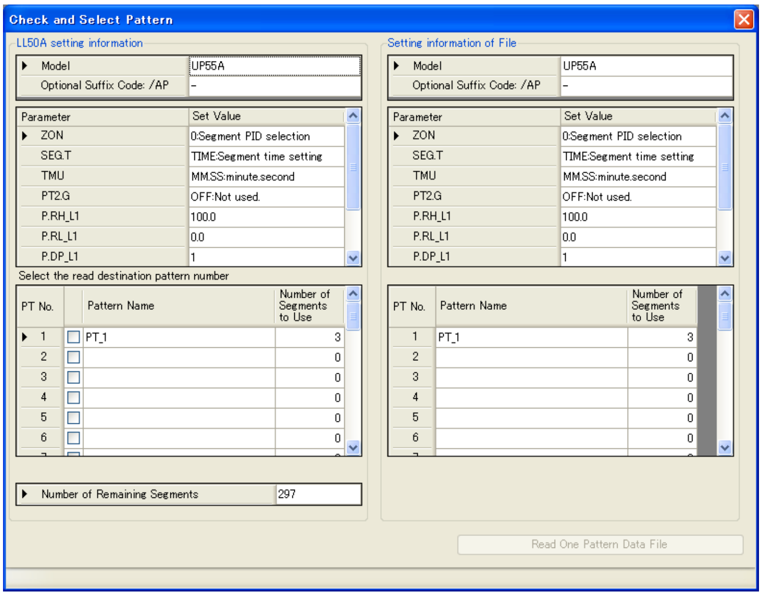
Extension

Model	Extension
UP55A	5pt
UP35A	3pt

One Pattern File

Procedure

1. Click on [File] – [Open Program Pattern File] – [One Pattern File] in the menu to display the Open File window.
2. Select the folder and then click [OK].
3. The Check and Select Pattern window appears. Select the the read destination pattern number, and click [Read One Pattern Data File].



Extension

Model	Extension
UP55A	5pt
UP35A	3pt

Description

When the parameters displayed in the Check and Select Pattern window do not meet the following conditions, the pattern file cannot be read.

Parameter	Checkpoint
SEG.T	Main unit (or file) setting data = LL50A setting data
P.DP_L1	Main unit (or file) setting data = LL50A setting data
P.RH_L1 P.RL_L1	LL50A range ≥ Main unit (or file) range
P.DP_L2 (*1)	Main unit (or file) setting data = LL50A setting data
P.RH_L2 (*1) P.RL_L2 (*1)	LL50A range ≤ Main unit (or file) range
PT2.G	A message appears when both do not match “The setpoint for parameter PT2.G does not match. Do you want to continue the process?” “Yes/No” Clicking [Yes] allows you to continue the process
ZON	A message appears when both do not match “The setpoint for parameter ZON does not match. Do you want to continue the process?” “Yes/No” Clicking [Yes] allows you to continue the process
TMU	A message appears when both do not match “The setpoint for parameter TMU does not match. Do you want to continue the process?” “Yes/No” Clicking [Yes] allows you to continue the process

*1: To display the retransmission program pattern parameters, it is necessary to configure the following setting.
Parameter Setting window – Setup Parameters (CTL) – Program Pattern 2 Retransmission (PT2.G) = ON (Use)

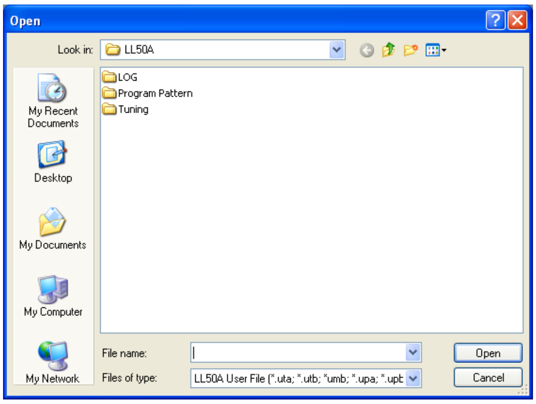
When uploading of the program pattern data is performed and the upload to the main unit is unsuccessful because of an error, such as the setpoint is over the limit, the Error List window appears.

2.15.4 Opening Custom Ladder Instruction Files (UT75A Only)

File Designation

Procedure

1. On the File menu, click Import custom ladder instruction and then File designation to display the Open window.

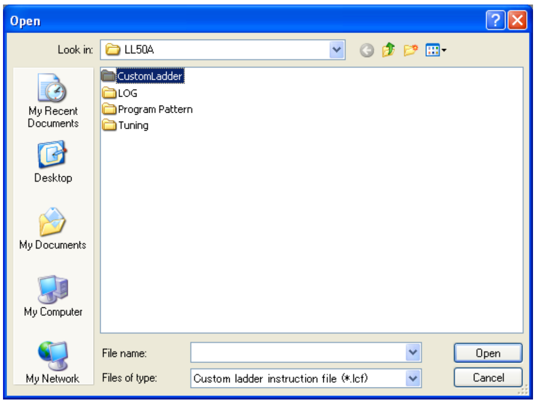


2. Select the file that you want to open, and click Open.
3. The user file extension is shown in the table below.

Directory Designation

Procedure

1. On the File menu, click Import custom ladder instruction and then Directory designation to display the Browse For Folder window. All the files in the folder that you specify will be imported.
2. Select the folder, and click OK.



3. The user file extension is shown in the table below.

For the procedure to create custom ladder instructions, see section 4.7.2, “Creating Custom Ladder Instructions (UT75A Only).”

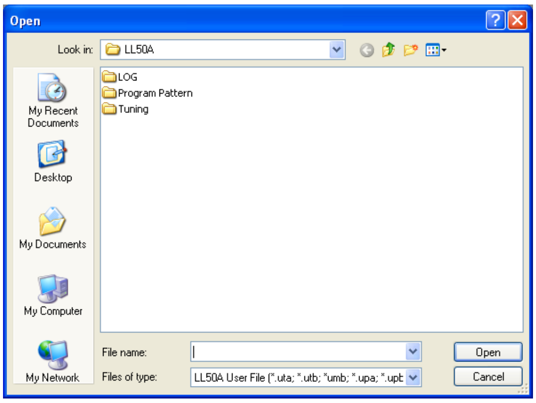
Extension

Model	Extension
UT75A	lcf

2.15.5 Setting a User File Password

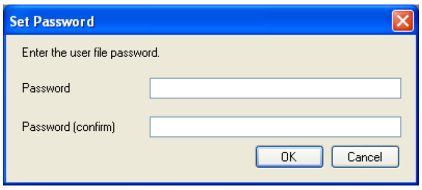
Procedure

1. With the file concerned closed, click on [File] – [Set User File Password] in the menu to display the Open File window.



2. Select the user file to which you want to set a password and then click [Open].

3. Enter the password and click the [OK] button. The password can be up to eight single-byte alphanumeric characters.



Description

If a user file password is set to the user file, it is necessary to enter the password in the opening a user file or comparing with file data.
When setting a user file password, it is necessary to close the file in use.

2.15.6 Closing a File

Procedure

1. Click on [File] – [Close] in the menu to close the file in use.
To save a file in use, save it by entering a file name.

2.15.7 Saving by Overwrite

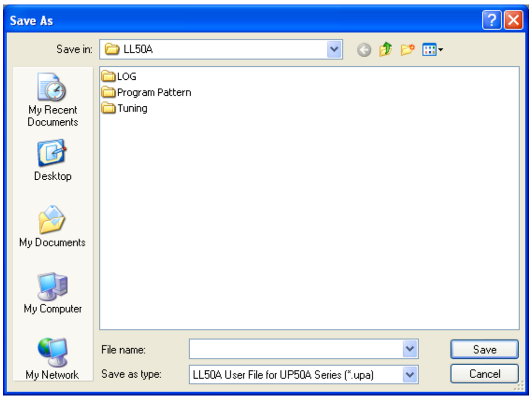
Procedure

1. Click on [File] – [Save] in the menu or click on the toolbar to save data in use.

2.15.8 Saving a File

Procedure

1. Click on [File] – [Save As] in the menu to display the Save As window. A file name can be up to 40 single-byte characters (20 two-byte characters).
LL50A User File for UT50A Series (*.uta)
LL50A User File for UT30A Series (*.utb)
LL50A User File for UT70A Series (*.utc)
LL50A User File for UT30L Series (*.utl)
LL50A User File for UP50A Series (*.upa)
LL50A User File for UP30A Series (*.upb)
LL50A User File for UM30A Series (*.umb)



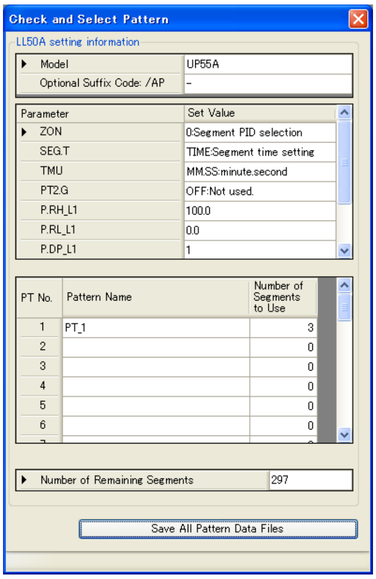
2. Enter a name for the file and click the [Save] button.

2.15.9 Saving Program Pattern File

All Pattern Files

Procedure

1. Click on [File] – [Save Program Pattern File] – [All Pattern Files] in the menu to display the Check and Select Pattern window.



2. Check the details and click the [Save All Pattern Data Files] button.

3. The Browse Folders dialog box appears. Select the save destination folder and click the [OK] button.

   The [Create New Folder] button allows you to create a folder.

Note

Program pattern numbers are used as the file names, which are PTN001 to PTN030*.
*: PTN001 and PTN002 for UP35A (plus PTN004 when the option code is specified).
Example: When the program pattern number is 10, the file name is PTN010.5pt.

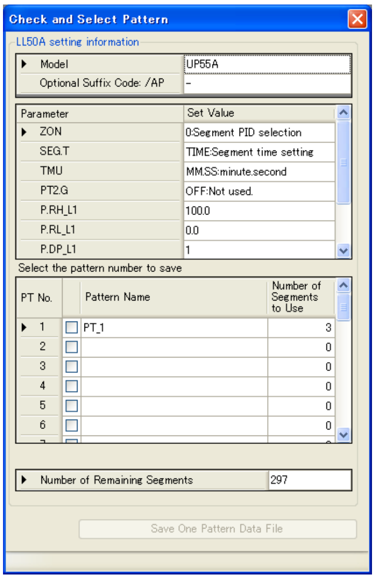
Extension

Model	Extension
UP55A	5pt
UP35A	3pt

One Pattern File

Procedure

1. Click on [File] – [Save Program Pattern File] – [One Pattern File] in the menu to display the Check and Select Pattern window.



2. Check the details and click the [Save One Pattern Data Files] button.
3. The Save As window appears. Name the file and click the [Save] button.

Extension

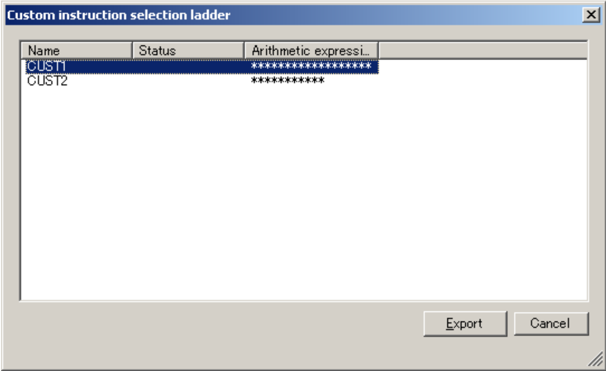
Model	Extension
UP55A	5pt
UP35A	3pt

2.15.10 Saving Custom Ladder Instruction Files (UT75A Only)

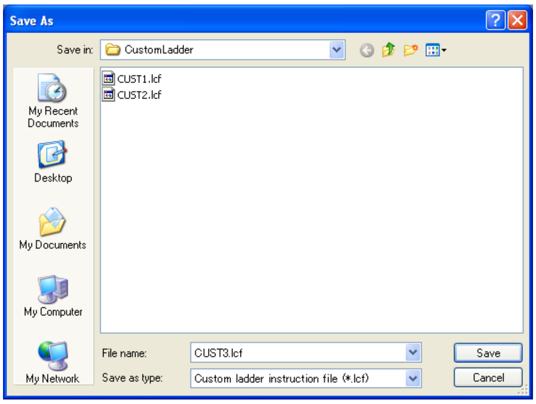
Instruction Selection

Procedure

1. On the File menu, click Export custom ladder instruction and then Instruction selection to display the Custom ladder instruction selection window.



2. Select the instruction to export, and click Export.



3. Assign a file name, and then click Save.

All Instructions

Procedure

1. On the File menu, click Export custom ladder instruction and then All instructions to display the Browse For Folder window.
2. Select the folder, and click OK.

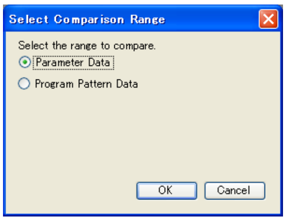
The default file name is the instruction name.

For the procedure to create custom ladder instructions, see section 4.7.2, “Creating Custom Ladder Instructions (UT75A Only).”

2.15.11 Comparing with File Data

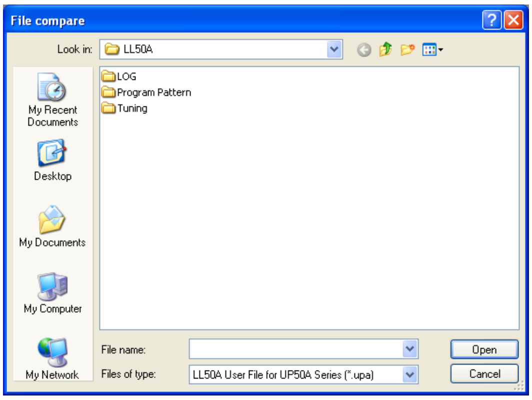
Procedure

1. Click on [File] – [Compare Files] in the menu to display the Select Compare Range window.



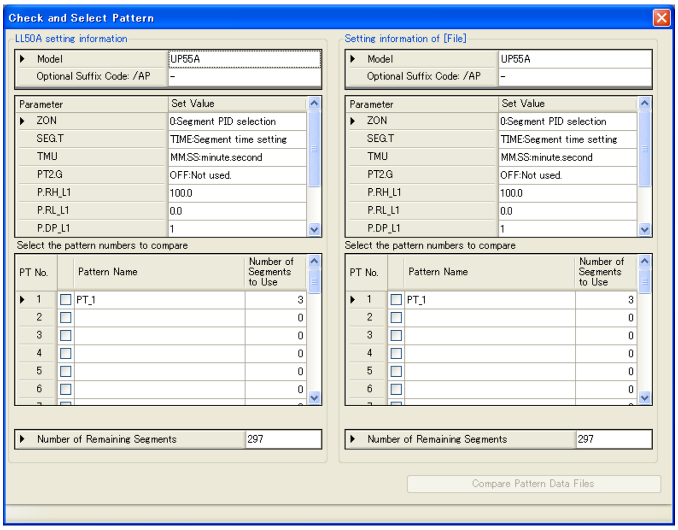
2. Select the comparison range and click the [OK] button.

3. Open a file to be compared and click the [Open] button.



Note

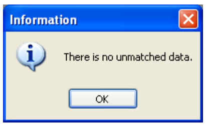
When program pattern data is compared with each other, the Check and Select Pattern window appears. Select the program pattern numbers to compare and click the [Compare Pattern Data Files] button.



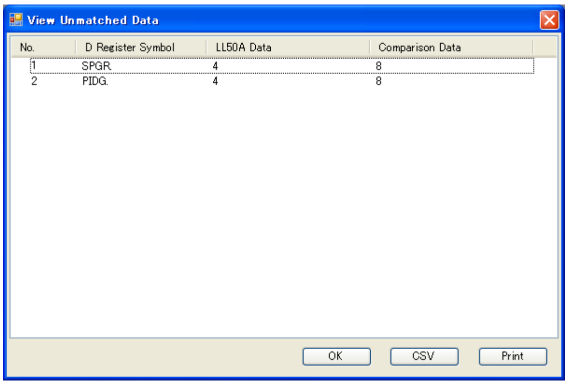
When the number of segments used in the LL50A data and the number of segments used in the comparison data are different in the comparison of the program pattern data, the number of the used segments is output as the unmatched data.

The comparison segment range is only the segments common to the LL50A data and the comparison data.

4. Execute data comparison. When working data matches the file data, the following message appears. If there is any mismatch, the mismatched data is displayed.



Window displayed if there is mismatched data

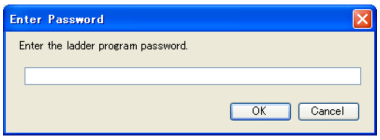


The details of the mismatch can be output to a file in .csv format.

If the following message appears during data comparison, follow the instructions of the message.
If there is a difference in the parameter version, data may not be properly compared.

- To cancel comparison, click the [No] button.
- To continue comparison, click the [Yes] button.

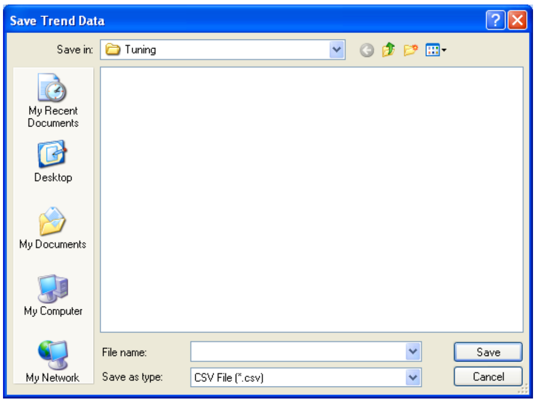
If a password has been set to data to be compared, the Enter Password dialog box appears. Enter the password and click the [OK] button.



2.15.12 Saving Tuning Data

Procedure

1. Click on [File] – [Save Trend Data] in the menu during tuning to display the Save Trend Data window.



2. Enter a name for the file and click the [Save] button.

Description

Trend data can be saved in .csv file format. A maximum of 65,000 acquisition times of trend data can be saved irrespective of the data read cycle. If the number of acquisition times exceeds 65,000, acquired data will automatically be saved in another file.
The save folder cannot be changed.
Example: If data acquisition is performed the 65,000st time at 21:30:50 on May 20, 2009, the name of the file containing this data is 2009_05_20_21_30_50.csv.

Example of Single-loop control for UT55A/UT52A

Title
Unit data

Model	IP Address	Serial Address	Loop	Control mode	Control type
UT55A-000-00-00			1	SGL	Standard type

Trend information

Trend number	Loop number	Data	Decimal point position	Unit	Line color	Min.	Max.
Trend number1	LOOP1	CSP_L1	1	C	Green	-2700	13700
Trend number2	LOOP1	PV_L1	1	C	Blue	-2700	13700
Trend number3							
Trend number4							
Trend number5	LOOP1	OUT_L1	1	%	Purple	0	100
Trend number6							

Trend data

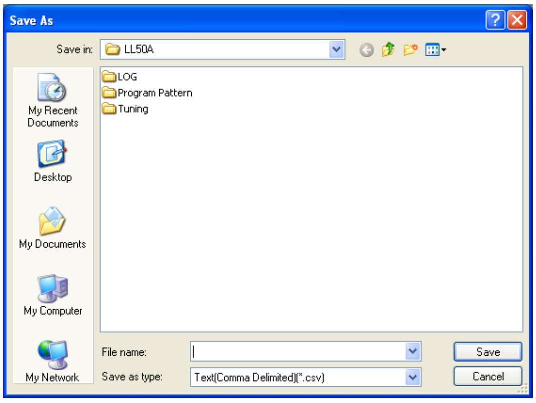
Date	Time	Trend1	Trend2	Trend3	Trend4	Trend5	Trend6	S_R	A_M_L1	C_A_M	R_L_L1	R_L_L2	AT_L1	AT_L2	V_AT	LOAD	LOAD_M	SPNO	
2010/7/29	10:38:46	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:47	-270	0.1			0		RUN	MAN		LCL		OFF			12	14		
2010/7/29	10:38:48	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:49	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:50	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:51	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:52	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:53	-270	0.1			0		RUN	MAN		LCL		OFF			12	14		
2010/7/29	10:38:54	-270	0.1			0		RUN	MAN		LCL		OFF			12	14		
2010/7/29	10:38:55	-270	0.1			0		RUN	MAN		LCL		OFF			14	14		
2010/7/29	10:38:56	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	
2010/7/29	10:38:57	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	
2010/7/29	10:38:58	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	
2010/7/29	10:38:59	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	
2010/7/29	10:39:00	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	
2010/7/29	10:39:01	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	
2010/7/29	10:39:02	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-
2010/7/29	10:39:03	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-2
2010/7/29	10:39:04	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:05	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:06	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:07	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:08	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:09	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:10	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:11	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:12	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:13	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:14	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:15	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:16	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:17	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:18	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:19	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:20	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:21	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:22	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:23	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:24	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:25	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:26	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:27	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:28	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:29	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270
2010/7/29	10:39:30	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:31	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:32	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:33	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:34	-270	0.1			0		RUN	MAN		LCL		OFF			14	14	1	-270
2010/7/29	10:39:35	-270	0.1			0		RUN	MAN		LCL		OFF			12	14	1	-270

2.15.13 Saving a CSV File

Save Parameter Data and File Information

Procedure

1. Click on [File] – [Save to CSV File] – [Save Parameter Data and File Information] to display the Save As window.



2. Enter a name for the file and click the [Save] button. The user file extension is “uta.”

Description

Example of CSV format

File	UT55A.uta		
Model	UT55A-000-00-00		
Control	SGL		
Product			
Parameter	R1.02.01		
File Information			
File Information			
Customer Name			
Delivery Destination			
Device Name			
Model Name			
Order No.			
Serial Number			
Author			
Date Created			
Specification Number			
Revision No.			
Function Overview			
Memo			
System Data			
Name	Set Value		
Model and suffix codes :	UT55A-000-00-00		
PARAMETER VERSION	R1.02.01		
CONTROL MODE	SGL		
INPUT SAMPLING PERIOD (CONTROL PERIOD)		100	
LADDER SEQUENCE FUNCTION	DON'T USE		
MCU VERSION			
DCU VERSION			
ECU-1 VERSION			
ECU-2 VERSION			
ECU-3 VERSION			
ECU-4 VERSION			
PRODUCT VERSION			
Setup Parameter - CTL			
D Register Symbol	Name	Set Value	Unit
CNT_L1	CONTROL TYPE	PID:PID control	
ALG_L1	PID CONTROL MODE	0:Standard PID control mode	
SPGR.	NUMBER OF SP GROUPS		8
ALNO._L1	NUMBER OF ALARMS		4
ZON	ZONE PID SELECTION	0:SP group number selection 1	
PIDG.	NUMBER OF PID GROUPS		8
Setup Parameter - PV			
D Register Symbol	Name	Set Value	Unit
IN	PV INPUT TYPE	OFF:OFF:Disable	
UNIT	PV INPUT UNIT	C:Degree Celsius	
RH	MAXIMUM VALUE OF PV INPUT RANGE		1370
RL	MINIMUM VALUE OF PV INPUT RANGE		-270
BSL	PV INPUT BURNOUT ACTION	UP:Upscale	
RJC	PV INPUT REFERENCE JUNCTION COMPENSATION	ON:RJC ON	
ERJC	PV INPUT EXTERNAL RJC SETPOINT		0 C
A.BS	PV ANALOG INPUT BIAS		0 C
A.FL	PV ANALOG INPUT FILTER	OFF	s
A.SR	PV ANALOG INPUT SQUARE ROOT EXTRACTION	OFF:No square root extraction.	
A.LC	PV ANALOG INPUT LOW SIGNAL CUTOFF		1 %

⋮

Save All Program Pattern Data

Procedure

1. Click on [File] – [Save to CSV File] – [Save All Program Pattern Data].

The Browse Folders dialog box appears. Select the save destination folder and click the [OK] button.

The [Create New Folder] button allows you to create a folder.

Note

Program pattern numbers are used as the file names, which are PTN001 to PTN030*.

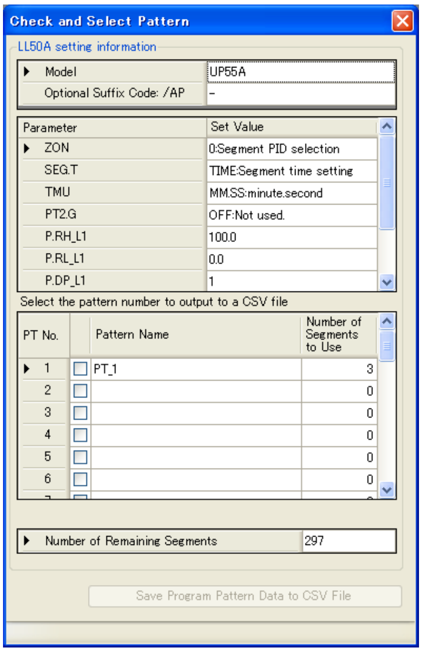
*: PTN001 and PTN002 for UP35A (plus PTN004 when the option code is specified).

Example: When the program pattern number is 10, the file name is PTN010.csv.

Select Program Pattern Number and Save

Procedure

1. Click on [File] – [Save to CSV File] – [Select Program Pattern Number and Save] to display the Check and Select Pattern window.



2. Select the pattern number to save to the CSV file and click the [Save Program Pattern Data to CSV File] button to display the Save As window.

3. Name the file and click the [Save] button.

Description

Example of CSV format

START

Pattern Name	PT_1		
D Register Symbol	Name	Set Value	Unit
SSP_L1	STARTING TARGET SETPOINT	0	C
STC	START CODE	"SSP:Program operation begins with the starting target setpoint."	
WT.SW1	WAIT FUNCTION ON/OFF 1	OFF:Disable	
WZ.UP1	UPPER-SIDE WAIT ZONE 1	0	C
WZ.LO1	LOWER-SIDE WAIT ZONE 1	0	C
WT.TM1	WAIT TIME 1	OFF	m.s
WT.SW2	WAIT FUNCTION ON/OFF 2	OFF:Disable	
WZ.UP2	UPPER-SIDE WAIT ZONE 2	0	C
WZ.LO2	LOWER-SIDE WAIT ZONE 2	0	C
WT.TM2	WAIT TIME 2	OFF	m.s
WT.SW3	WAIT FUNCTION ON/OFF 3	OFF:Disable	
WZ.UP3	UPPER-SIDE WAIT ZONE 3	0	C
WZ.LO3	LOWER-SIDE WAIT ZONE 3	0	C
WT.TM3	WAIT TIME 3	OFF	m.s
WT.SW4	WAIT FUNCTION ON/OFF 4	OFF:Disable	
WZ.UP4	UPPER-SIDE WAIT ZONE 4	0	C
WZ.LO4	LOWER-SIDE WAIT ZONE 4	0	C
WT.TM4	WAIT TIME 4	OFF	m.s
WT.SW5	WAIT FUNCTION ON/OFF 5	OFF:Disable	
WZ.UP5	UPPER-SIDE WAIT ZONE 5	0	C
WZ.LO5	LOWER-SIDE WAIT ZONE 5	0	C
WT.TM5	WAIT TIME 5	OFF	m.s
R.CYCL	NUMBER OF REPEAT CYCLES	0	
R.STRT	REPEAT CYCLE START SEGMENT NUMBER	1	
R.END	REPEAT CYCLE END SEGMENT NUMBER	1	

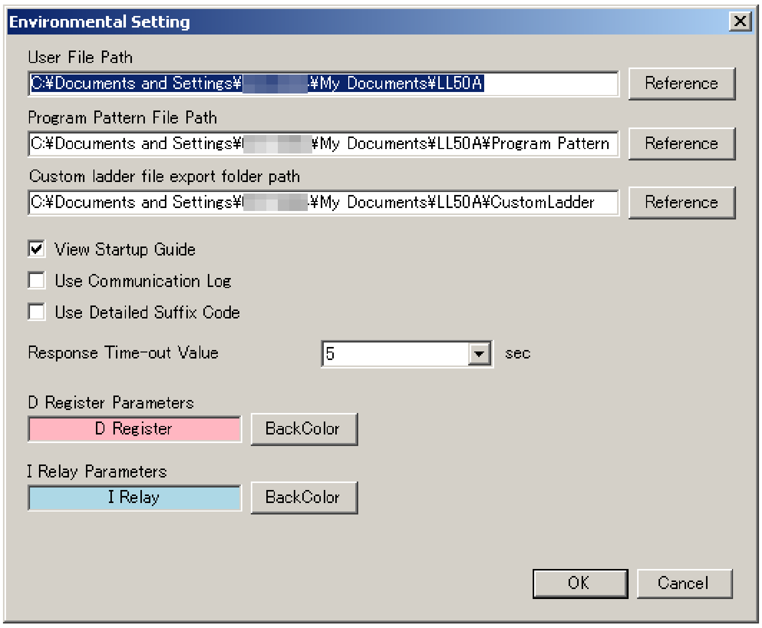
SEG

D Register Symbol	Name	Unit	SEG1	SEG2	SEG3	SEG4
TSP_L1	FINAL TARGET SETPOINT	C	80	80	0	0
TIME	SEGMENT TIME SETTING	m.s	10	40	5	-
S.PID	SEGMENT PID NUMBER SELECTION		1	1	2	1
JC	JUNCTION CODE		CONT:Switching for continuation	CONT:Switching for continuation	LOCAL:Local-mode switching	CONT:Switching for continuation
PV.TY1	PV EVNET-1 TYPE		1	1	OFF	OFF
PV.EV1	PV EVNET-1 SETPOINT		80.5	80.5	0	0
PV.TY2	PV EVNET-2 TYPE		OFF	OFF	2	OFF
PV.EV2	PV EVNET-2 SETPOINT		0	0	-0.5	0
PV.TY3	PV EVNET-3 TYPE		OFF	OFF	OFF	OFF
PV.EV3	PV EVNET-3 SETPOINT		0	0	0	0
PV.TY4	PV EVNET-4 TYPE		OFF	OFF	OFF	OFF
PV.EV4	PV EVNET-4 SETPOINT		0	0	0	0
PV.TY5	PV EVNET-5 TYPE		OFF	OFF	OFF	OFF
PV.EV5	PV EVNET-5 SETPOINT		0	0	0	0
PV.TY6	PV EVNET-6 TYPE		OFF	OFF	OFF	OFF
PV.EV6	PV EVNET-6 SETPOINT		0	0	0	0
PV.TY7	PV EVNET-7 TYPE		OFF	OFF	OFF	OFF
PV.EV7	PV EVNET-7 SETPOINT		0	0	0	0
PV.TY8	PV EVNET-8 TYPE		OFF	OFF	OFF	OFF
PV.EV8	PV EVNET-8 SETPOINT		0	0	0	0
TME1	START CONDITION OF TIME EVENT 1		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON1	ON TIME OF TIME EVENT 1	m.s	2	-	-	-
T.OF1	OFF TIME OF TIME EVENT 1	m.s	8	-	-	-
TME2	START CONDITION OF TIME EVENT 2		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON2	ON TIME OF TIME EVENT 2	m.s	-	20	-	-
T.OF2	OFF TIME OF TIME EVENT 2	m.s	-	30	-	-
TME3	START CONDITION OF TIME EVENT 3		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON3	ON TIME OF TIME EVENT 3	m.s	-	-	4	-
T.OF3	OFF TIME OF TIME EVENT 3	m.s	-	-	-	-
TME4	START CONDITION OF TIME EVENT 4		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON4	ON TIME OF TIME EVENT 4	m.s	-	-	-	-
T.OF4	OFF TIME OF TIME EVENT 4	m.s	-	-	-	-
TME5	START CONDITION OF TIME EVENT 5		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON5	ON TIME OF TIME EVENT 5	m.s	-	-	-	-
T.OF5	OFF TIME OF TIME EVENT 5	m.s	-	-	-	-
TME6	START CONDITION OF TIME EVENT 6		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON6	ON TIME OF TIME EVENT 6	m.s	-	-	-	-
T.OF6	OFF TIME OF TIME EVENT 6	m.s	-	-	-	-
TME7	START CONDITION OF TIME EVENT 7		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON7	ON TIME OF TIME EVENT 7	m.s	-	-	-	-
T.OF7	OFF TIME OF TIME EVENT 7	m.s	-	-	-	-
TME8	START CONDITION OF TIME EVENT 8		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON8	ON TIME OF TIME EVENT 8	m.s	-	-	-	-
T.OF8	OFF TIME OF TIME EVENT 8	m.s	-	-	-	-
TME9	START CONDITION OF TIME EVENT 9		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON9	ON TIME OF TIME EVENT 9	m.s	-	-	-	-
T.OF9	OFF TIME OF TIME EVENT 9	m.s	-	-	-	-
TME10	START CONDITION OF TIME EVENT 10		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON10	ON TIME OF TIME EVENT 10	m.s	-	-	-	-
T.OF10	OFF TIME OF TIME EVENT 10	m.s	-	-	-	-
TME11	START CONDITION OF TIME EVENT 11		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON11	ON TIME OF TIME EVENT 11	m.s	-	-	-	-
T.OF11	OFF TIME OF TIME EVENT 11	m.s	-	-	-	-
TME12	START CONDITION OF TIME EVENT 12		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON12	ON TIME OF TIME EVENT 12	m.s	-	-	-	-
T.OF12	OFF TIME OF TIME EVENT 12	m.s	-	-	-	-
TME13	START CONDITION OF TIME EVENT 13		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON13	ON TIME OF TIME EVENT 13	m.s	-	-	-	-
T.OF13	OFF TIME OF TIME EVENT 13	m.s	-	-	-	-
TME14	START CONDITION OF TIME EVENT 14		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON14	ON TIME OF TIME EVENT 14	m.s	-	-	-	-
T.OF14	OFF TIME OF TIME EVENT 14	m.s	-	-	-	-
TME15	START CONDITION OF TIME EVENT 15		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON15	ON TIME OF TIME EVENT 15	m.s	-	-	-	-
T.OF15	OFF TIME OF TIME EVENT 15	m.s	-	-	-	-
TME16	START CONDITION OF TIME EVENT 16		OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state	OFF:Start OFF state
T.ON16	ON TIME OF TIME EVENT 16	m.s	-	-	-	-
T.OF16	OFF TIME OF TIME EVENT 16	m.s	-	-	-	-

2.15.14 Making Environmental Settings

Procedure

1. Click on [File] – [Environmental Setting] in the menu to display the Environmental Setting window.



2. Set the path and click the [OK] button.

Description

- User File Path
  Shows the predetermined LL50A user file storage location.

Note

For Windows Vista/Windows 7, do not set a path that includes the Program Files folder. Otherwise, the LL50A Parameter Setting Software will not run properly.

- Program Pattern File Path
  Shows the predetermined LL50A user file storage location.

Note

For Windows Vista/Windows 7, do not set a path that includes the Program Files folder. Otherwise, the LL50A Parameter Setting Software will not run properly.

- View Startup Guide
  If this item is checked, the Startup Guide is displayed at startup.
- Use Communication Log
  If this item is checked, communication logs are output to the specified location.
- Use Detailed Suffix Code
  If this item is checked, the detailed model and suffix codes are available when creating a new file.
- Response time-out value
  Set the response time-out value longer if the response of main unit is late in each monitoring.
  The value can be set for 1 to 10 seconds.

The directories (default values) to which each file is stored are as shown below:

For Windows Vista/Windows 7/Windows 8

<table>
<tr><th>File Type</th><th>Storage Directory (Default)</th></tr>
<tr><td>User files for UT55A/UT52A (.uta)</td><td rowspan="7">C:\Users\<UserName>\Documents\LL50A</td></tr>
<tr><td>User files for UT35A/UT32A (.utb)</td></tr>
<tr><td>User files for UT75A (.utc)</td></tr>
<tr><td>User files for UT35A-L (.utl)</td></tr>
<tr><td>User files for UP55A (.upa)</td></tr>
<tr><td>User files for UP35A (.upb)</td></tr>
<tr><td>User files for UM33A (.umb)</td></tr>
<tr><td>Trend files (.csv)</td><td>C:\Users\<UserName>\Documents\LL50A\Tuning</td></tr>
<tr><td>Communication log files (.log)</td><td>C:\Users\<UserName>\Documents\LL50A\LOG
The directory cannot be changed.</td></tr>
<tr><td>Program pattern files for UP55A (.5pt)</td><td rowspan="2">C:\Users\<UserName>\Documents\LL50A\Program Pattern</td></tr>
<tr><td>Program pattern files for UP35A (.3pt)</td></tr>
<tr><td>Custom ladder instruction files for UT75A (.lcf)</td><td>C:\Users\<UserName>\Documents\LL50A\CustomLadder</td></tr>
</table>

For Windows XP

<table>
<tr><th>File Type</th><th>Storage Directory (Default)</th></tr>
<tr><td>User files for UT55A/UT52A (.uta)</td><td rowspan="7">C:\Documents and Settings\<UserName>\My Documents\LL50A</td></tr>
<tr><td>User files for UT35A/UT32A (.utb)</td></tr>
<tr><td>User files for UT75A (.utc)</td></tr>
<tr><td>User files for UT35A-L (.utl)</td></tr>
<tr><td>User files for UP55A (.upa)</td></tr>
<tr><td>User files for UP35A (.upb)</td></tr>
<tr><td>User files for UM33A (.umb)</td></tr>
<tr><td>Trend files (.csv)</td><td>C:\Documents and Settings\<UserName>\My Documents\LL50A\Tuning</td></tr>
<tr><td>Communication log files (.log)</td><td>C:\Documents and Settings\<UserName>\My Documents\LL50A\LOG
The directory cannot be changed.</td></tr>
<tr><td>Program pattern files for UP55A (.5pt)</td><td rowspan="2">C:\Documents and Settings\<UserName>\My Documents\LL50A\Program Pattern</td></tr>
<tr><td>Program pattern files for UP35A (.3pt)</td></tr>
<tr><td>Custom ladder instruction files for UT75A (.lcf)</td><td>C:\Documents and Settings\<UserName>\My Documents\LL50A\CustomLadder</td></tr>
</table>

2.16 Window Operations

Window operations

Procedure

1. Click on [Window] – [following command] in the menu.

The following window operations are available:
- Cascade
- Tile Horizontal
- Tile Vertical
- Arrange Icons
- Close All

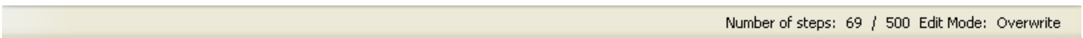
Making the toolbar, palette, or window visible/invisible

Procedure

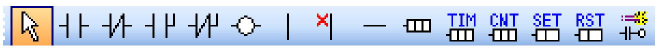
1. Click on [View] – [following command] in the menu.

The following operations are available:
- Making the toolbar visible/invisible

- Making the status bar visible/invisible

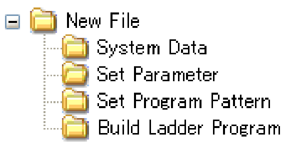


- Making the Instruction palette visible/invisible

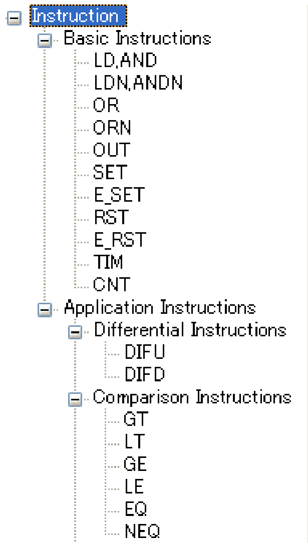


- Making the ladder operation status toolbar visible/invisible

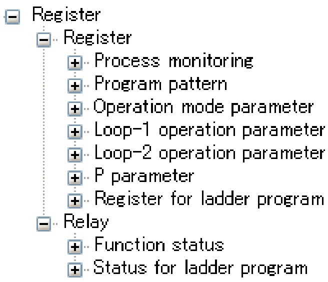
- Making the File window visible/invisible



- Making the Instruction window visible/invisible



- Making the Register window visible/invisible

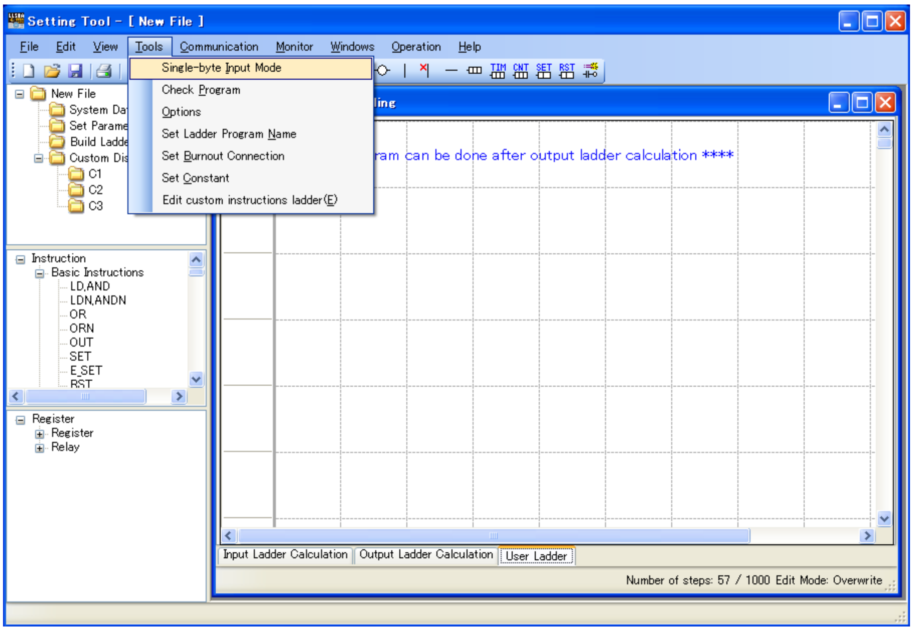


- Making the Monitor Register window visible/invisible
  See 2.14.1, Monitoring/Changing Tuning Data.

2.17 Activating Single-byte Character Entry

Procedure

1. Click on [Tool] and place a checkmark in [Single-byte Input Mode] in the menu to enable single-byte character entry.



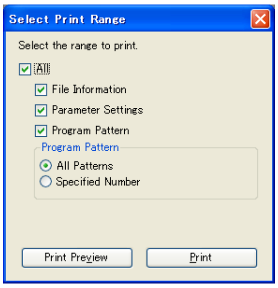
Description

The Single-byte Input mode is used for entering user file information or program comments and program pattern name. To upload/download data between operating systems (OS) of different languages or to open a file, do so in the Single-byte Input mode to prevent the corruption of characters.
To cancel the Single-byte Input mode, remove the checkmark as described above.

2.18 Printing

Procedure

1. Click on [File] – [Print] in the menu or click on the toolbar to display the Select Printing Range window.



2. Select the data to be printed and click the [Print] button to display the Printing window.

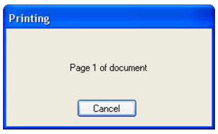
Clicking [Printing Preview] enables a printing image to be displayed as shown below.

Note: Select [Specify Number] for the program pattern and click the [Print Preview] or [Print] button to display the Check and Select Pattern window.

Select the program pattern number to print.

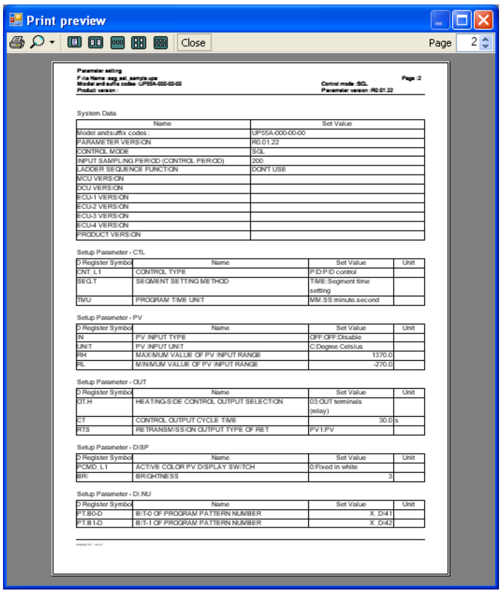
3. Printing window is displayed during printing.

To stop printing, click the [Cancel] button.



Description

The following shows a printing image.



2.19 Initializing the Main Unit

Initializing the Main Unit to Factory Defaults

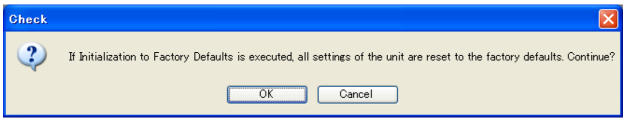
Use this feature if you have forgotten the password of ladder programs downloaded to the main unit and want to download new ladder programs.
Take care to prevent casual use of the password assigned in this section.

Note

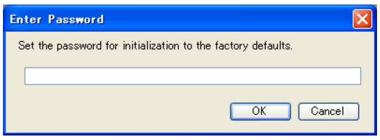
- The user setting values are not initialized even if the parameter setting values are initialized to the factory default values.
- UP55A/UP35A cannot be initialized via Ethernet communication. Use Light-loader communication for the initialization.

Procedure

1. Change to the status that enables communication with the main unit.
2. Click on [Operation] – [Initialize] – [Initialize to Factory Defaults] in the menu. The following confirmation message is displayed; click the [OK] button.



3. Enter the initialization password “UTAdvanced_INIT” and click the [OK] button. (Single-byte alphanumeric characters)



4. The Execute Communication window appears. Click the [Initialize to Factory Defaults] button to start initialization.
To cancel initialization, click ☒.

Setting the User Default Values

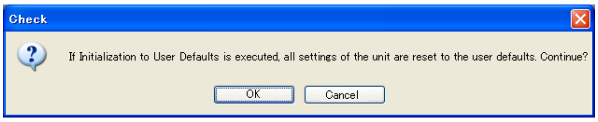
Parameter data set to the main unit can be set as the user default values.

CAUTION

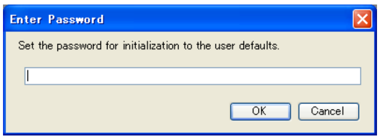
Before registering the user setting value as the user default value, make sure that the user setting value is set to the parameter. The ladder program can not be registered as user default values.

Procedure

1. Change to the status that enables communication with the main unit.
2. Click on [Operation] – [Set User Defaults] in the menu. The following confirmation message is displayed; click the [OK] button.



3. Enter the initialization password “UTAdvanced_INIT_SET” and click the [OK] button. (Single-byte alphanumeric characters)

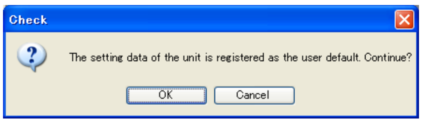


4. The Execute Communication window appears. Click the [Set User Defaults] button to start user default value setting.
   To cancel user default value setting, Click ☒.

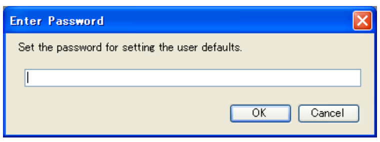
Initializing to the User Default Values

Procedure

1. Change to the status that enables communication with the main unit.
2. Click on [Operation] – [Initialize] – [Initialize to User Defaults] in the menu. The following confirmation message is displayed; click the [OK] button.



3. Enter the initialization password “UTAdvanced_USER_INIT” and click the [OK] button. (Single-byte alphanumeric characters)



4. The Execute Communication window appears. Click the [Initialize to User Defaults] button to start initialization.
   To cancel initialization, click ☒.

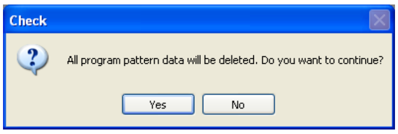
Deleting Pattern

Program pattern data set to the main unit can be delete.

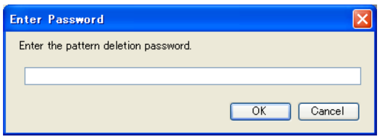
All Patterns

Procedure

1. Establish communication with main unit.
2. Click on [Operate Main Unit] – [Delete Program Pattern] – [All Patterns] in the menu. The confirmation message appears.



3. Enter the password “UTAdvanced_PATTERN_INIT” (single-byte alphanumeric characters) and click the [OK] button.

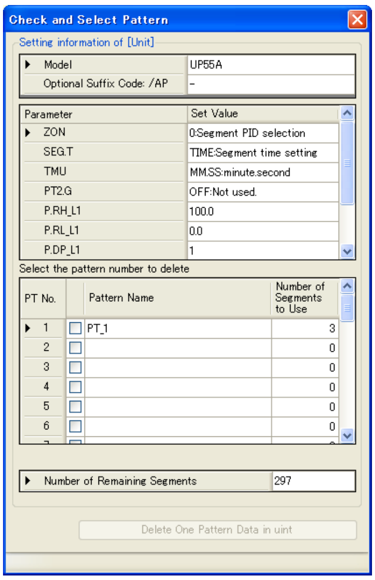


4. The Execute Communication window appears. Click the [Delete Program Pattern] button to start delete program pattern. To cancel delete program pattern, Click ☒.

One Pattern

Procedure

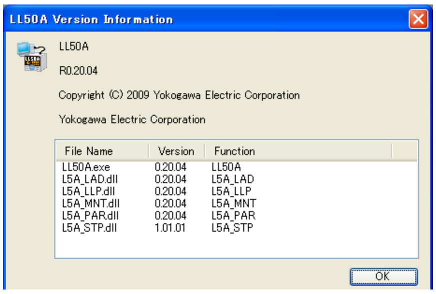
1. Establish communication with main unit.
2. Click on [Operation] – [Delete Program Pattern] – [One Pattern] in the menu to display the Execute Communication window. Click the [Delete Program Pattern].
3. The Check and Select Pattern window appears. Select the pattern number to delete and click [Delete One Pattern in main unit].



2.20 Checking Software Version

Procedure

1. Click on [Help] – [About...] in the menu to display the Setting Tool Version Information window.



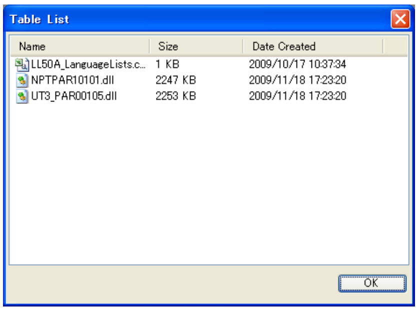
2. To close the window, click the [OK] button or .

2.21 Viewing the List of Tables

The list of tables shows the names of .dll and .xml files contained in the Table folder of the LL50A Parameter Setting Software.

Procedure

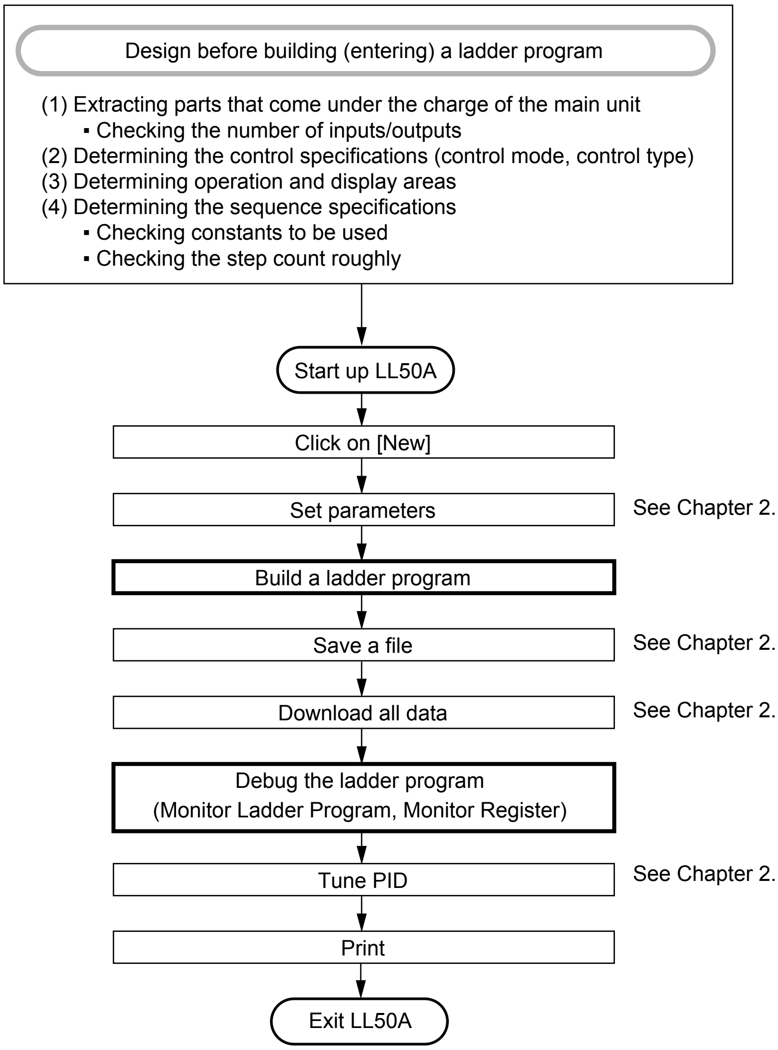
1. Click on [Help] – [Table List] in the menu to display the Table List window.



2. To close the window, click the [OK] button or .

3.1 Flow of Building a New Ladder Program

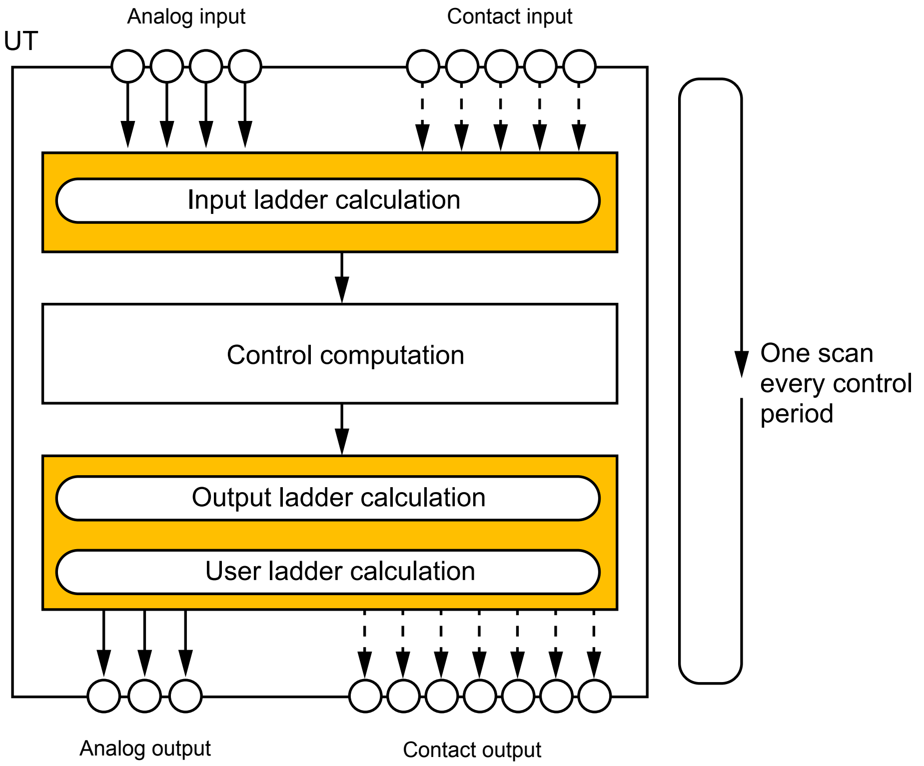
The ladder sequence function must be set to “USE” and the control mode must be set in the System Data window beforehand. UT35A/UT32A/UP35A does not have the parameter CTLM (Control mode.)



Configuration of ladder program

A ladder program consists of three parts: the input ladder calculation executed before control computation, the output ladder calculation performed after control computation, and user ladder calculation. Each calculation section is repetitively executed every control period.

The sequence of calculation/computation is: input, input ladder calculation, control computation, output ladder calculation, user ladder calculation, and output.

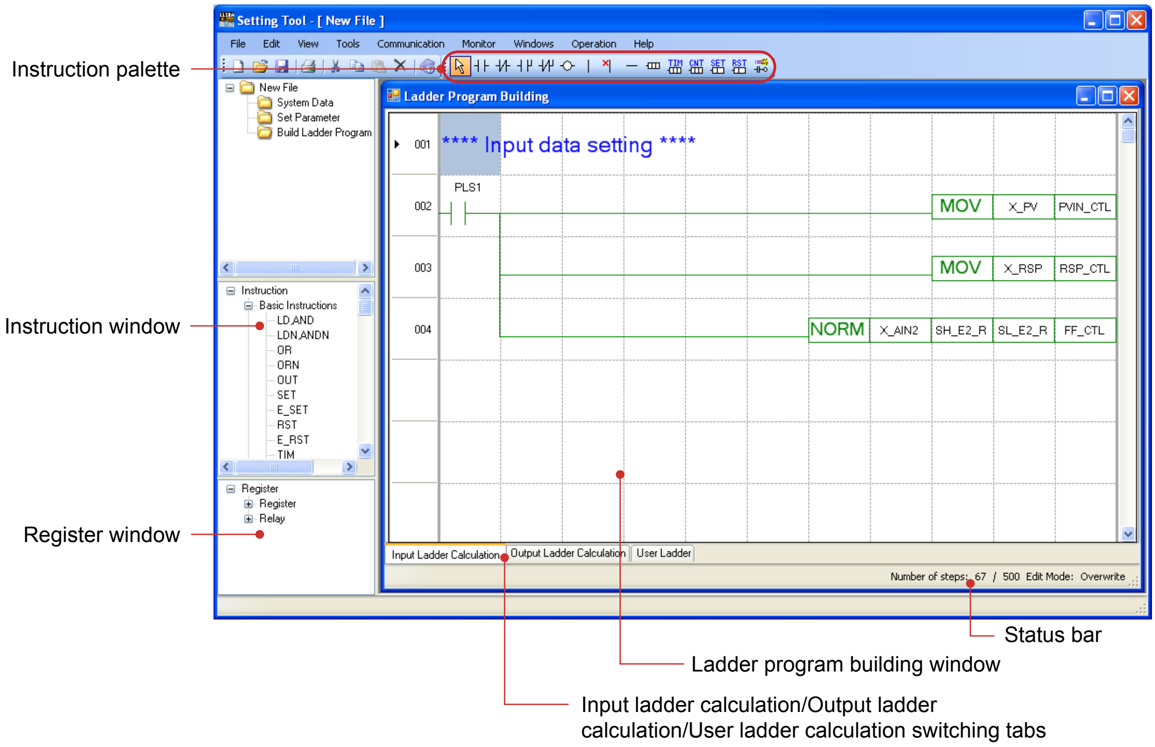


Load Factor of Ladder Program

Normally, use the ladder program with the load factor of the range not more than 100%. However, if the control period is set to 50 ms, the maximum load factor should be the value which subtracted the load factor for the following function usage from 100%.

Filter function: 10%
Alarm setpoints more than 5 points (ALNO≥5): 10%
Optional suffix code "/DR": 15%
UT55A-x7x (AIN2/AIN4): 10%
10-segment linearizer function: 5%
For Detailed model: Optional suffix code "/U1": 15%
For Detailed model: Same use of optional suffix code "/A2" and "/A4" or "/AC4": 10%
UT75A-5xx: (15%)
UT75A-x2x: (10%)

3.2 Part Names of the Window and Their Functions



Ladder program building window

This window is used to edit a circuit. It enables you to edit a ladder program of up to 200 lines x 11 columns.

Instruction palette

This area displays instruction icons. You select instruction(s) from the instruction palette to build a circuit.

Instruction window

This window displays a list of ladder instructions. An instruction can be dragged and dropped from the Instruction window to be registered in any column. The instructions in this window are the same as those available in the Input Instruction window displayed by clicking (application instruction) on the instruction palette.

Register window

This window displays a list of main unit registers. A register can be dragged and dropped from the Register window to input the address to any instruction.

Input ladder calculation/output ladder calculation/user ladder window switching tabs

Clicking on a tab below the Build Ladder Program window enables you to switch between the input ladder calculation, output ladder calculation, and user ladder calculation. In the initial status, nothing is described in the user ladder calculation section. These tabs are used to operate only DI and DO regardless of control.

Status bar

- Step count

  Displays the number of steps of the ladder program being edited and the maximum number of steps.

  Display format: Number of steps being edited/maximum step count
- Edit mode

  Displays whether the build ladder program function is in Overwrite mode or in Insert mode.

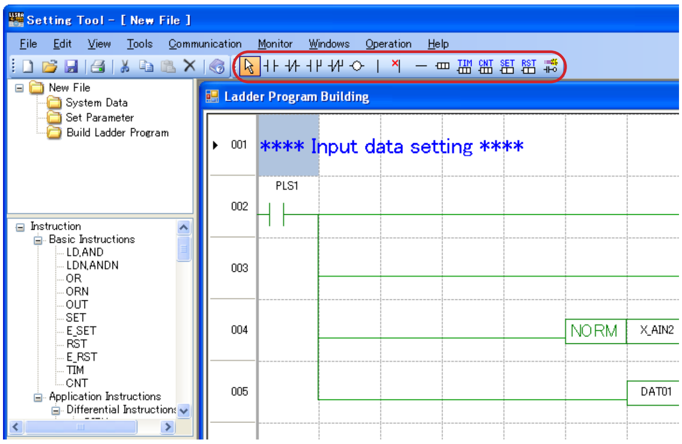
3.3 How to Build a Ladder Program

3.3.1 Registering Basic Instructions (Instruction Palette)

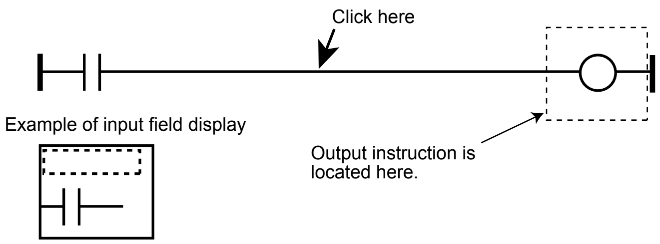
Register a basic instruction from the instruction palette.

Procedure

1. Click a basic instruction button on the instruction palette to change the shape of the mouse cursor to the shape of the selected instruction.



2. Click on the location where you want to enter the instruction. This enables the input field for data entry.
(If an output instruction is input, it is located at the final column instead of the location where you have clicked. In this case, a horizontal connection line is drawn up to the input instruction existing immediately before the clicked position. It is not possible to locate an output instruction in front of an input instruction.)



3. Enter a register in the input field directly or input it by drag-and-drop from the Register window.

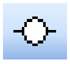
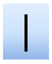
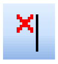
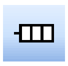
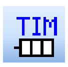
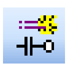
4. Press the Enter key. This causes a parameter to be input to the field, making the instruction accepted.

5. Selected instructions can be registered in succession.
To cancel instruction selection, press the ESC key or click the Selector on the instruction palette.

Note

An input field allows only a register to be registered. Constants, etc. cannot be directly entered in an input field. If you want to enter a constant, use K- or P-register.

List of instructions on the instruction palette

Icon	Name	Description
	Selector	Returns the mouse cursor shape to the ordinary cursor. Clicking on a circuit element causes it to be selected and double-clicking on it enables functions with respect to each circuit element to be selected.
	"a" contact (LD, AND)	Changes the mouse cursor shape to the "a" contact cursor. This function enters an "a" contact at any clicked position.
	"b" contact (LDN, NDN)	Changes the mouse cursor shape to the "b" contact cursor. This function enters a "b" contact at any clicked position.
	"a" contact OR (LDOR)	Changes the mouse cursor shape to the "a" contact OR cursor. This function enters an "a" contact OR at any clicked position.
	"b" contact OR (LDORN)	Changes the mouse cursor shape to the "b" contact OR cursor. This function enters a "b" contact OR at any clicked position.
	Out	Changes the mouse cursor shape to the Out cursor (output coil cursor). This function enters the Out instruction in the final column at any clicked position.
	OR connection line	Changes the mouse cursor shape to the OR connection-line cursor. This function enters an OR connection line to the right end of the column at any clicked position.
	Delete OR connection line	Changes the mouse cursor shape to the OR connection-line cursor. This function deletes an OR connection line from the right end of the column at any clicked position.
	Connection line	Changes the mouse cursor shape to the connection-line cursor. This function enters a connection line at any clicked position.
	Application instruction	Changes the mouse cursor shape to the application instruction cursor. This function displays the Input Instruction dialog box at any clicked position.
	Timer	Changes the mouse cursor shape to the timer cursor. This function enters a timer in the final column at any clicked position.
	Counter	Changes the mouse cursor shape to the counter cursor. This function enters a counter in the final column at any clicked position.
	Set	Changes the mouse cursor shape to the Set cursor. This function enters the Set instruction in the final column at any clicked position.
	Reset	Changes the mouse cursor shape to the Reset cursor. This function enters the Reset instruction in the final column at any clicked position.
	Circuit comment	Changes the mouse cursor shape to the circuit comment cursor. This function enters a circuit comment line at any clicked position.

Making the instruction palette visible/invisible

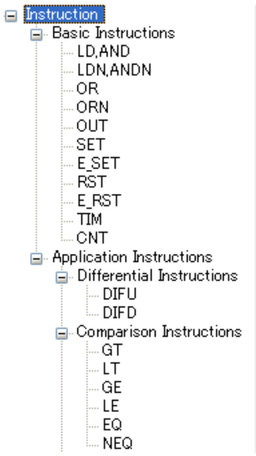
Procedure

1. Click on [View] – [Instruction Palette] in the menu to place a check mark ( ) in front of the menu item. This causes the instruction palette to be displayed. Removing the check mark ( ) causes it to be invisible.

Making the Instruction window visible/invisible

Procedure

1. Click on [View] – [Instruction Window] in the menu to place a check mark ( ) in front of the menu item. This causes the Instruction window to be displayed. Removing the check mark ( ) causes it to be invisible.

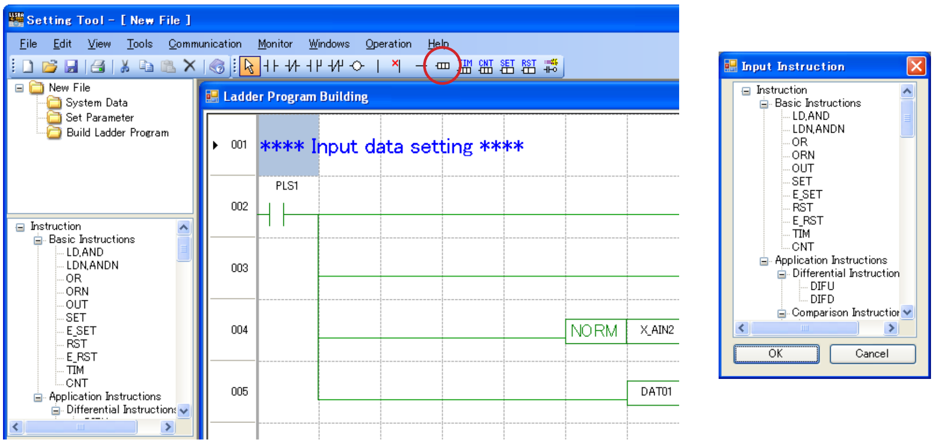


3.3.2 Registering an Application Instruction (Instruction Palette)

Register an application instruction from the instruction palette.

Procedure

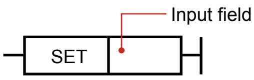
1. Click (application instruction) on the instruction palette to display the Input Instruction window.



2. Click on an instruction that you want to input from among those in the Input Instruction window.

3. Click the [OK] button.
This causes the mouse cursor to change to the shape of the selected instruction.
To cancel instruction selection, click the [Cancel] button.

4. Click on the location where you want to input the instruction to describe it at the clicked position. This enables the input field for data entry.
(If an output type instruction is input, it is located at the final column instead of the location where you have clicked. In this case, a horizontal connection line is drawn up to the input instruction immediately before the clicked position. It is not possible to locate an output instruction in front of an input instruction.)



5. Enter a register in the input field directly or input it by drag-and-drop from the Register window.

6. Press the Enter key. This causes a parameter to be input to the field, making the instruction accepted.
For an instruction with multiple input fields, move to the next field to enter a register, and after entering a register in the last field, press the Enter key to accept the instruction.
Even if all input fields are not filled with data, clicking on another column causes the instruction to be accepted.

7. Selected instructions can be registered in succession.
To cancel instruction selection, press the ESC key or click the Selector on the instruction palette.

Note

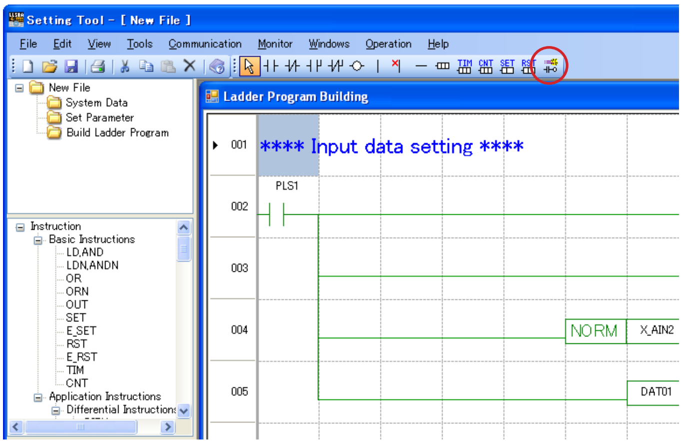
An input field allows only a register to be registered. Constants, etc. cannot be directly entered in an input field. If you want to enter a constant, use K- or P-register.

3.3.3 Registering Circuit Comments (Instruction Palette)

Enter circuit comments from the instruction palette.

Procedure

1. Click  (circuit comment) on the instruction palette. This causes the mouse cursor shape to change to the circuit comment cursor.



2. Click on the location where you want to input a circuit comment. This causes the circuit comment input field to be displayed at the clicked position.

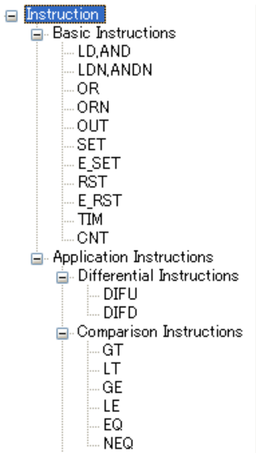
3. Enter a circuit comment and press the Enter key. This causes the circuit comment to be accepted.

3.3.4 Registering Basic Instructions (Instruction Window)

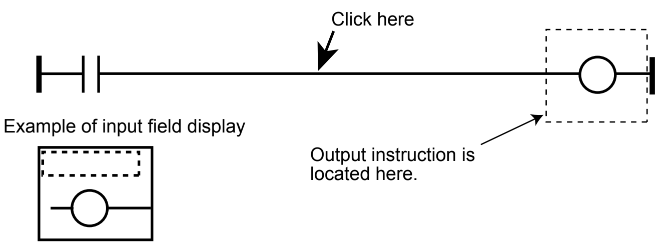
Enter a basic instruction from the Instruction window.

Procedure

1. Drag a basic instruction that you want to input from among those in the instruction tree.



2. Drop the instruction on the location where you want it.
This causes the instruction to be entered at the dropped location, and the input field to appear.
(If an output instruction is input, it is located at the final column instead of the location where you clicked. In this case, a horizontal connection line is drawn up to the input instruction existing immediately before the clicked position. It is not possible to put an output instruction in front of an input instruction.)



3. Enter a register in the input field directly or input it by drag-and-drop from the Register window.

4. Press the Enter key. This causes a parameter to be input to the field, making the instruction accepted.

Note

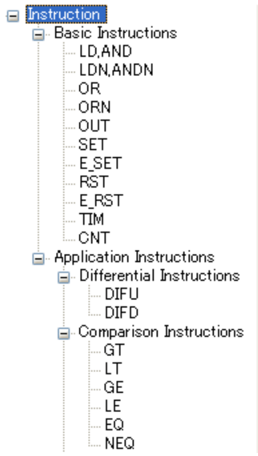
An input field allows only a register to be registered. Constants, etc. cannot be directly entered in an input field. If you want to enter a constant, use K- or P-register.

3.3.5 Registering an Application Instruction (Instruction Window)

Enter an application instruction from the Instruction window.

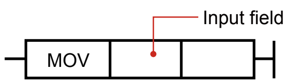
Procedure

1. Drag an application instruction that you want to input from among those in the instruction tree.



2. Drop the instruction on the location where you want it.
This causes the instruction to be described at the dropped location, and the input field to be enabled.
(If an output type instruction is input, it is located at the final column instead of the location where you clicked. In this case, a horizontal connection line is drawn up to the input instruction immediately before the clicked position. It is not possible to put an output instruction in front of an input instruction.)

3. Enter a register in the input field directly or input it by drag-and-drop from the Register window.



4. Press the Enter key. This causes a parameter to be input to the field, making the instruction accepted.
For an instruction with multiple input fields, move to the next field to enter a register, and after entering a register in the last field, press the Enter key to accept the instruction.
Even if all input fields are not filled with data, clicking on another column causes the instruction to be accepted.

Note

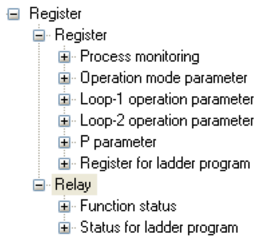
An input field allows only a register to be registered. Constants, etc. cannot be directly entered in an input field. If you want to enter a constant, use K- or P-register.

3.3.6 Registering a Register

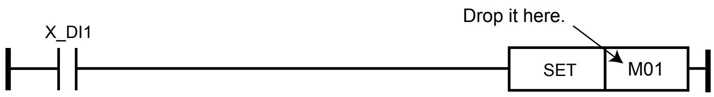
Register a register by drag-and-drop from the Register window.

Procedure

1. Drag a register that you want to register from the Register window.



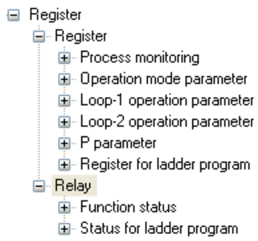
2. Drop it at the input field of an instruction.



Making the Register window visible/invisible

Procedure

1. Click on [View] – [Register Window] in the menu to place a check mark ( ) in front of the menu item. This causes the Register window to appear. Removing the check mark ( ) causes it to be invisible.



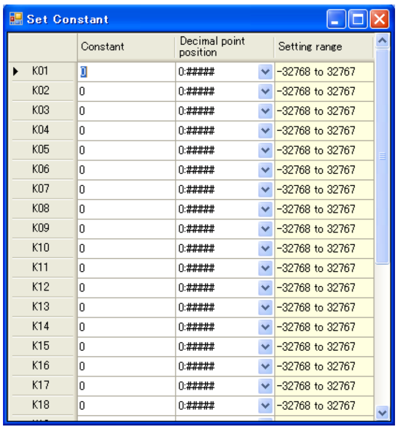
3.3.7 Setting a K-constant (K-register)

This section sets a constant to be used in a ladder program.

K-register constants can be set by clicking on [Tools] – [Set Constant] in the menu when the Ladder Program Building window is being displayed.

Procedure

1. Click on [Tool] – [Set Constant] in the menu to display the Set Constant window.



2. Click on the cell where you want to enter a constant.
3. After entering the settings for the constant, click .

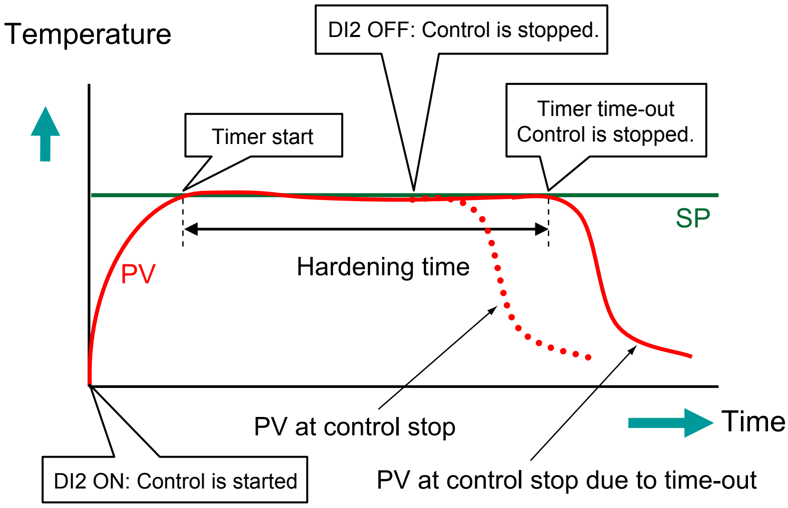
The Set Constant window

Item	Specification
Constant symbol	The symbol for the constant is displayed in the line header.
Constant	Enter a value for the constant.
Decimal point position	Set the decimal point position.
Range	Indicates the range that can be set.

3.4 Building a Ladder Program

The ladder sequence function is used by building a ladder program using the LL50A Parameter Setting Software and then downloading it to a main unit controller. This section describes the examples for UT55A/UT52A. The ladder program for UT75A/UT35A/UT32A/UP55A/UP35A can be created in the same way as UT55A/UT52A.

The figure below shows an example of part hardening temperature control.



Specifications

- Control is started when the contact input is ON.
- Timer starts when PV is within 1% of the input scale for SP.
- During the timer operation, if the power supply fails and resumes, control is restarted with the ongoing timer.
- Control stops when the hardening timer is up or when the contact input DI2 is OFF.

Parameter settings (main unit)

- Control mode (CTLM): Single loop control
- Control period (SMP): 200ms
- STOP/RUN switch (S/R): 0 (disables the contact input-basis switching function)
- P-parameter (P01): Timer current value
- P-parameter (P09): Timer set value
- P-parameter (P10): Condition of timer action

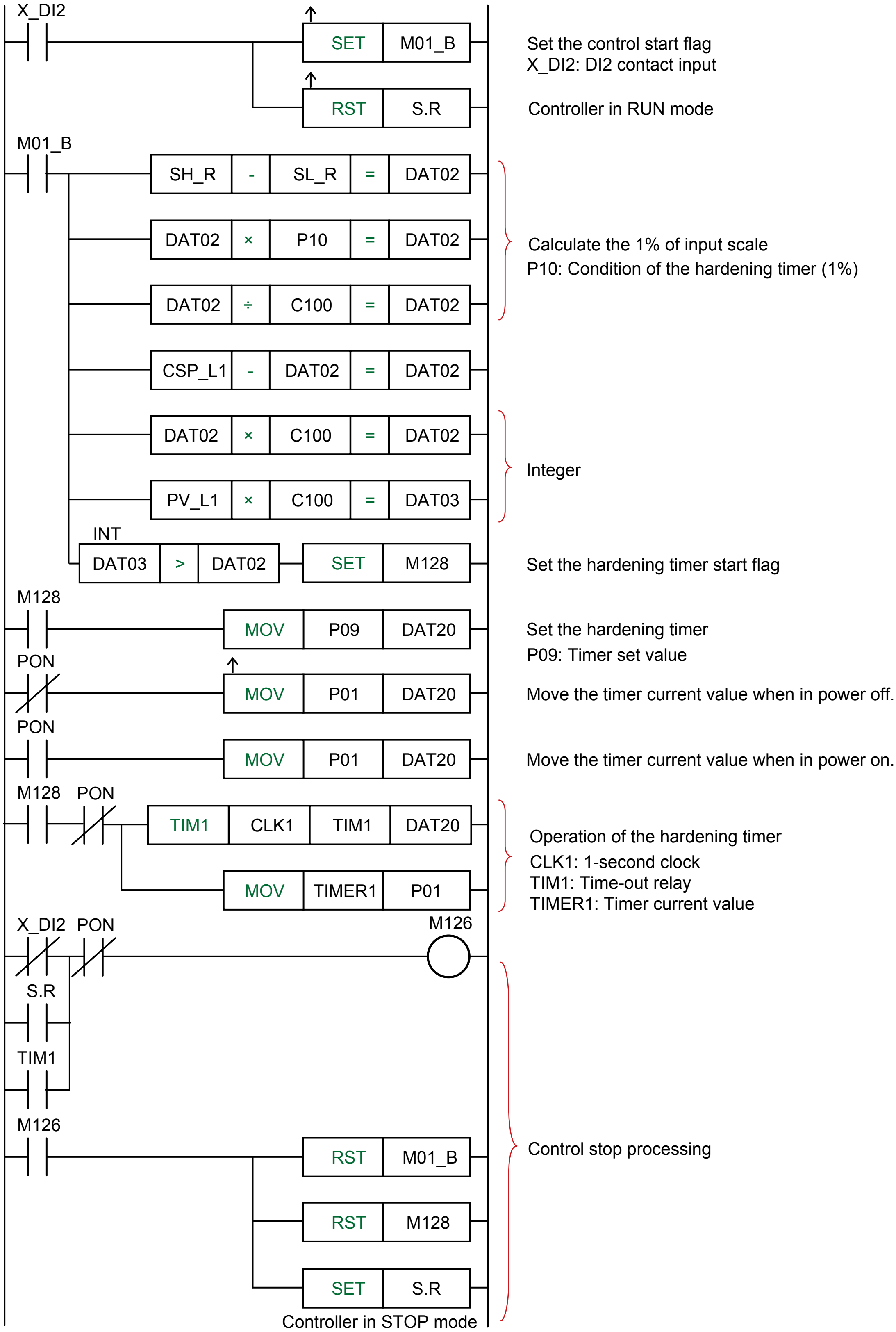
Devices used

- Internal relay: M01_B, M128
- DAT register: DAT02, DAT03, DAT20
- Parameter register: S.R, SH_R, SL_R, CSP_L1, PV_L1, P01, P09, and P10

- Constant register: C100
- Special relay: TIM1

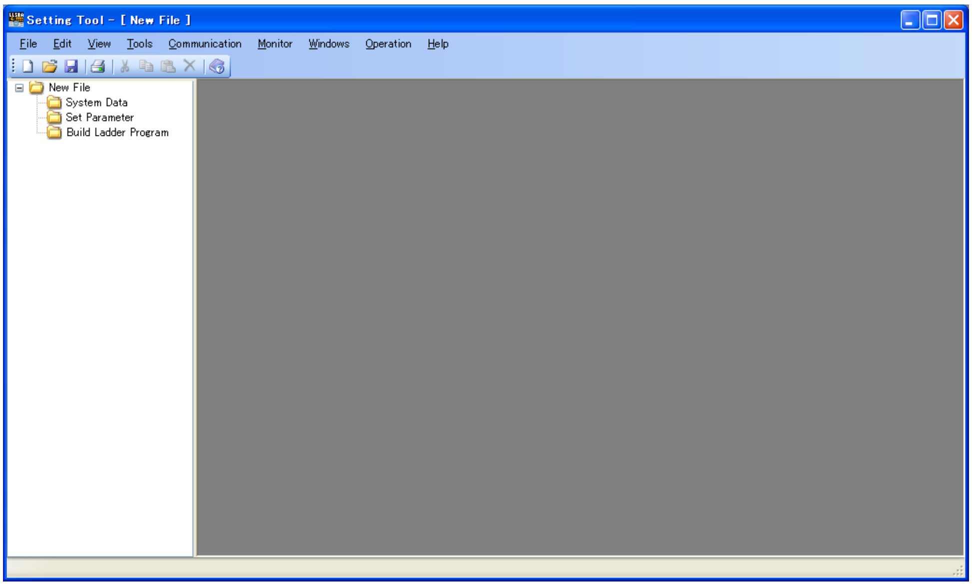
► Details of the instruction: See Chapter 4 , Operations of Ladder Program Instructions.

Example of a ladder program (input ladder calculation program)

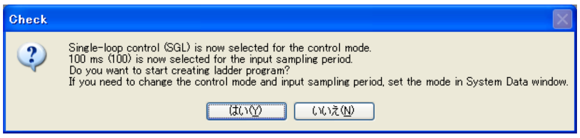


Procedure

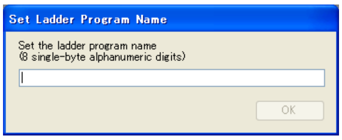
1. Display the Basic window.



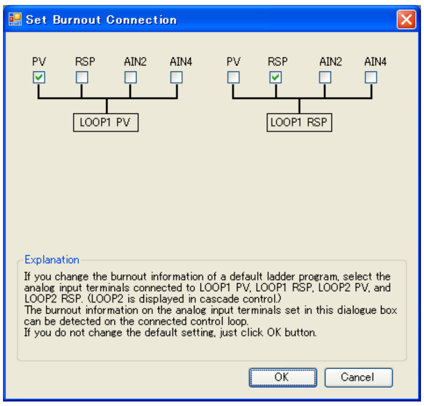
2. Click “Build Ladder Program” in the File window. This causes the control mode confirmation message to appear (when creating a new ladder program for UT75A/UT55A/UT52A/UP55A.)



3. Click [Yes] to display the Set Ladder Program Name window. Set a ladder program name of up to eight single-byte alphanumeric characters and click [OK]. If you click [No], the System Data window appears.

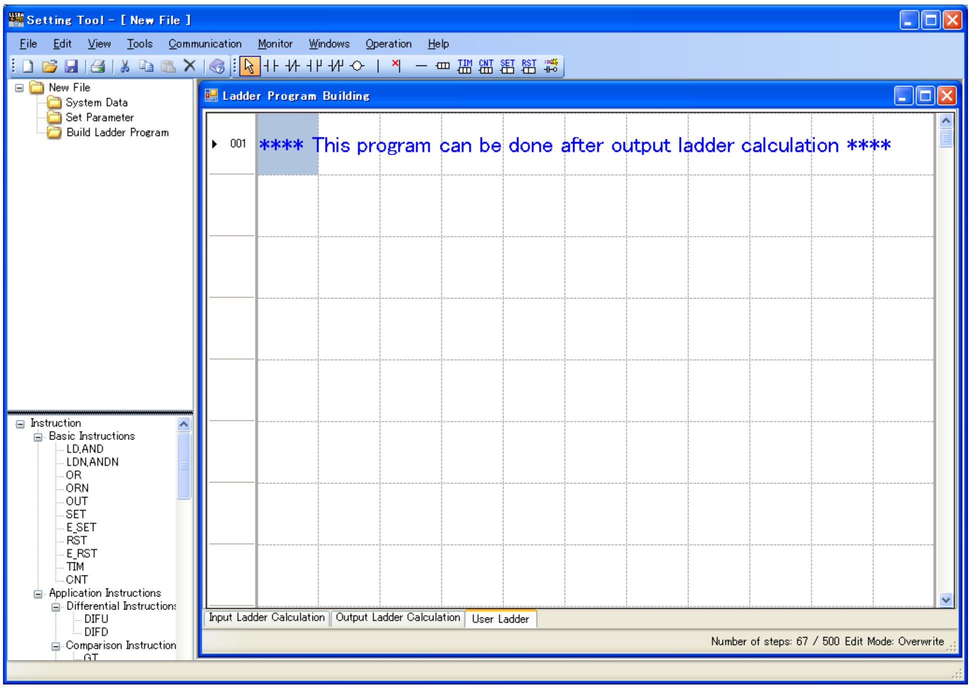


4. The Set Burnout Connection window appears. (LOOP1 PV: PV, LOOP1 RSP: RSP) (only for UT75A/UT55A/UT52A/UP55A)

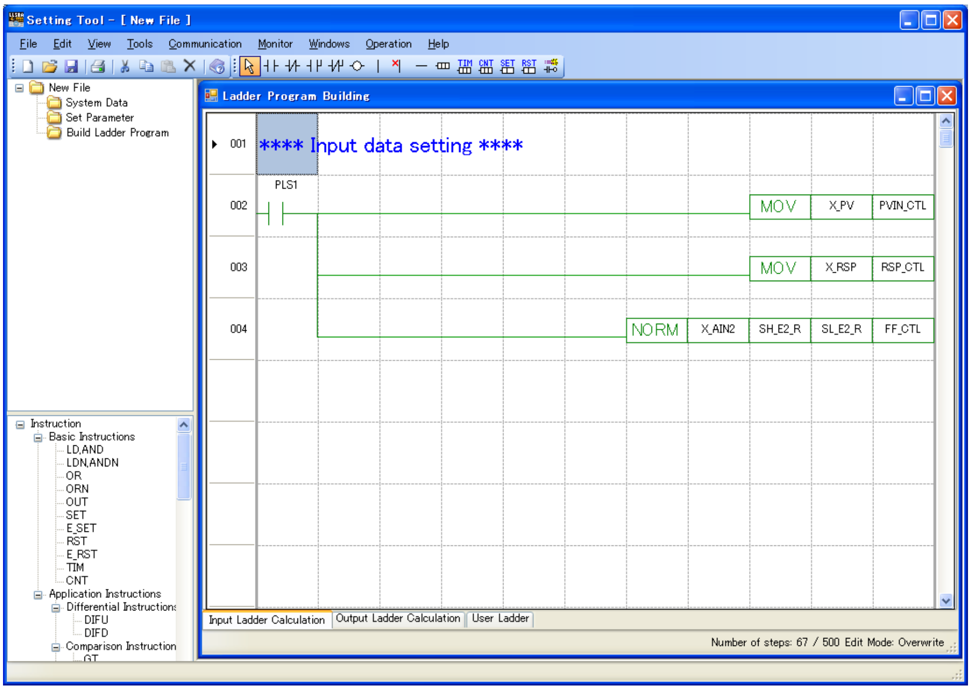


► Burnout connection settings: See 3.5.10, Setting a Burnout Connection.

5. Set burnout connection information and click the [OK] button. This causes the Ladder Program Building window to appear.

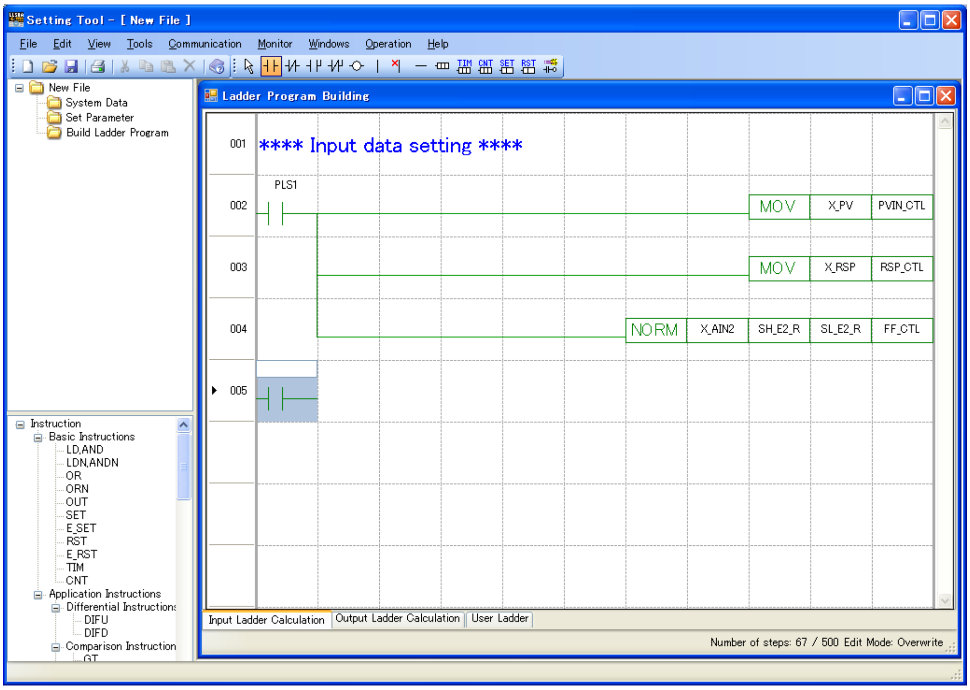


6. Click the [Input Ladder Calculation] tab.

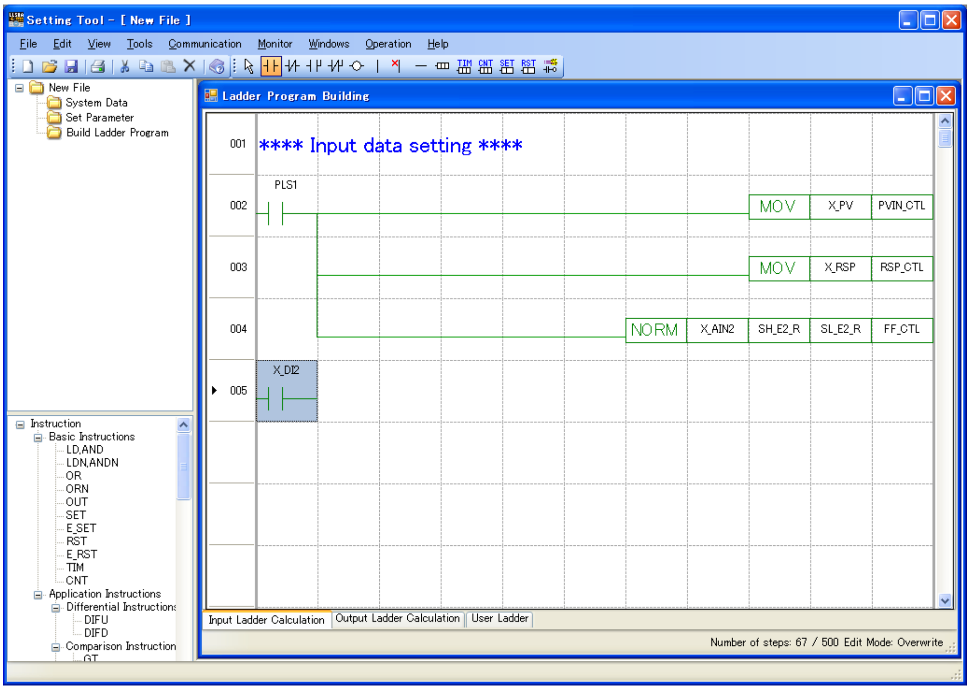


7. Build a circuit on the 5th line.

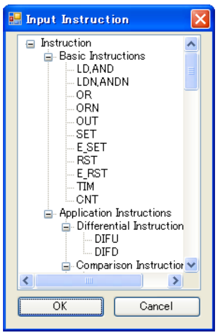
Click on (select) ┤├ (“a” contact instruction) on the instruction palette and click on the column of the location where you want to input the instruction.



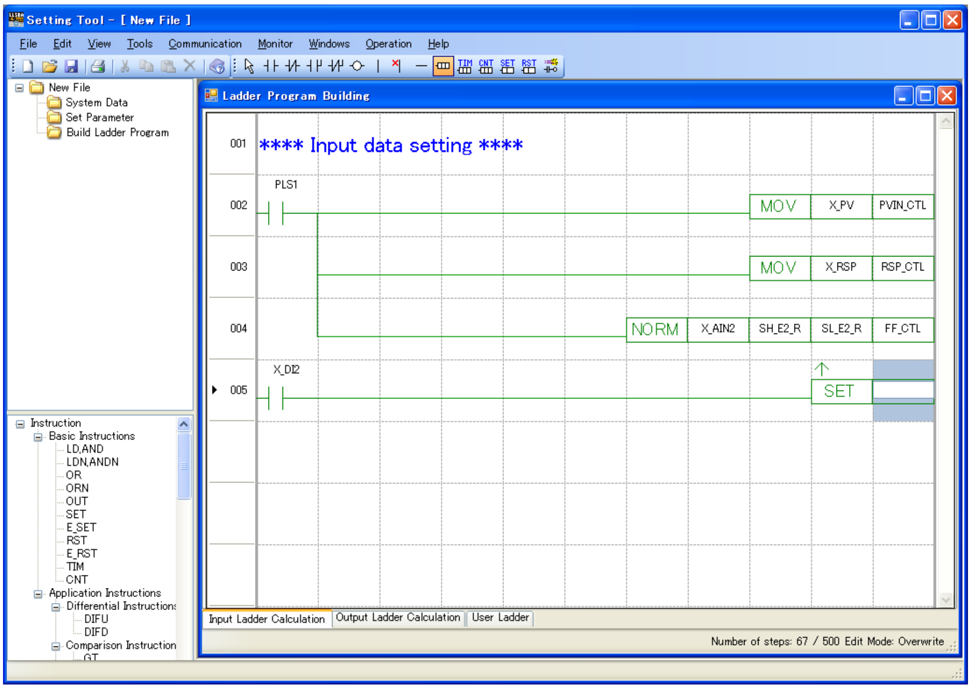
8. This causes the input field to appear. Input a DI2 register (X_DI2) in the “a” contact instruction’s input field. (It is also possible to input a register by drag-and-drop from the Register window.)



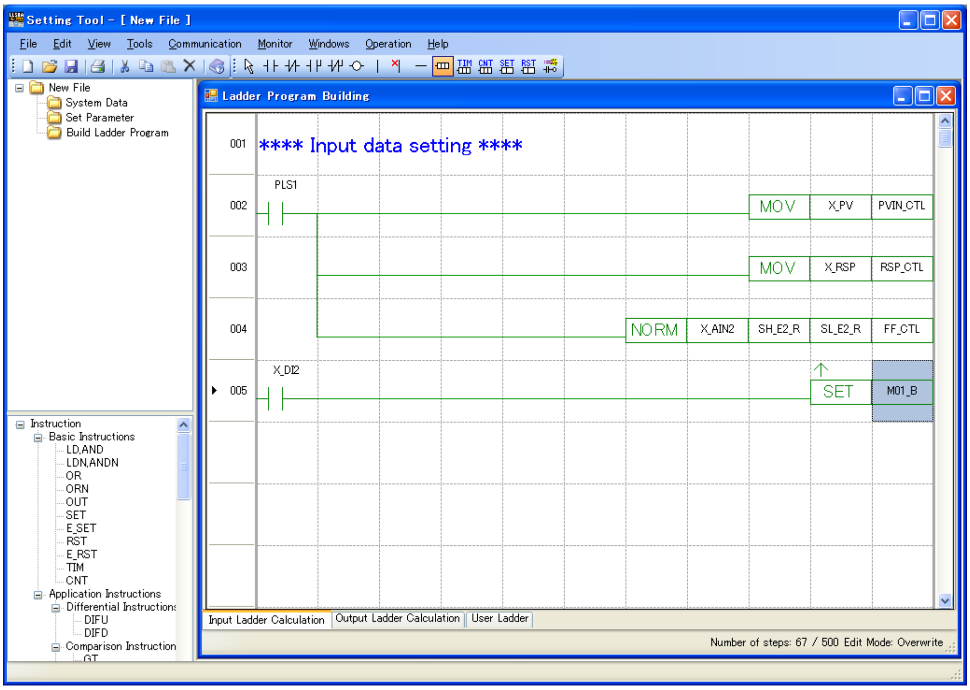
9. Click on (Application Instructions) on the instruction palette to display the Input Instruction window.



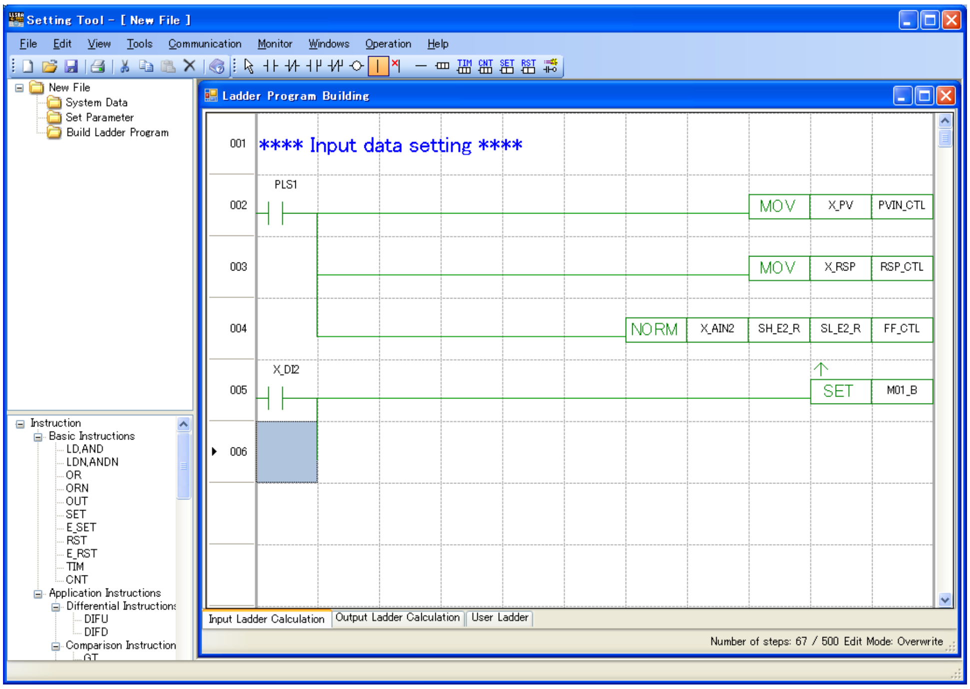
10. Click on (select) the E_SET instruction and click the column of the location where you want to input the instruction. This causes a connection line to be drawn from the "a" contact instruction to the E_SET instruction.



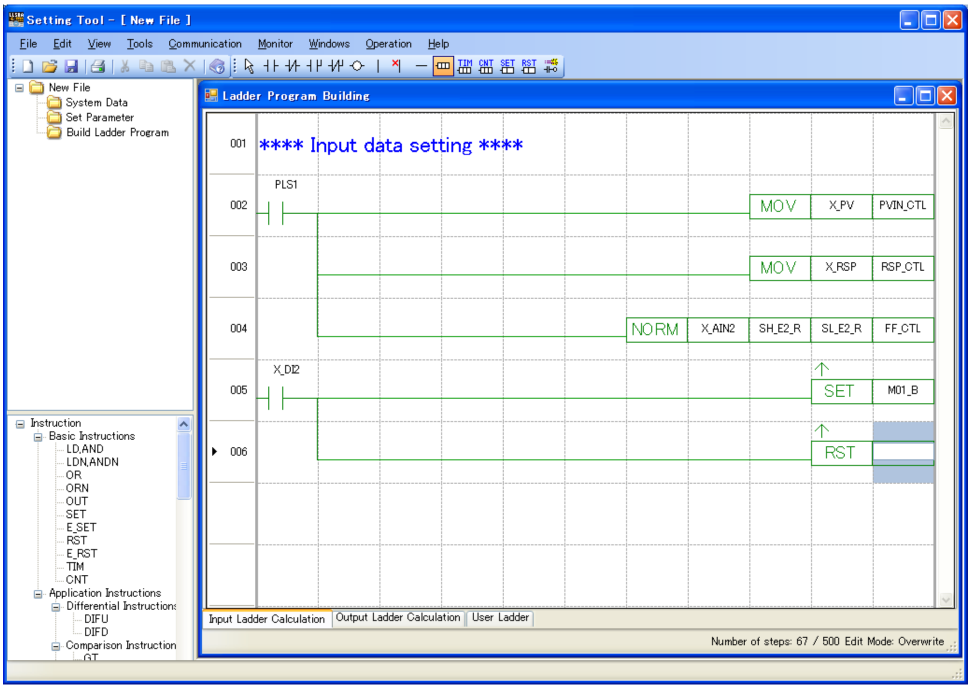
11. This causes the input field to appear. Enter an M127 register (M127) in the E_SET instruction's input field. (It is also possible to input a register by drag-and-drop from the Register window.)



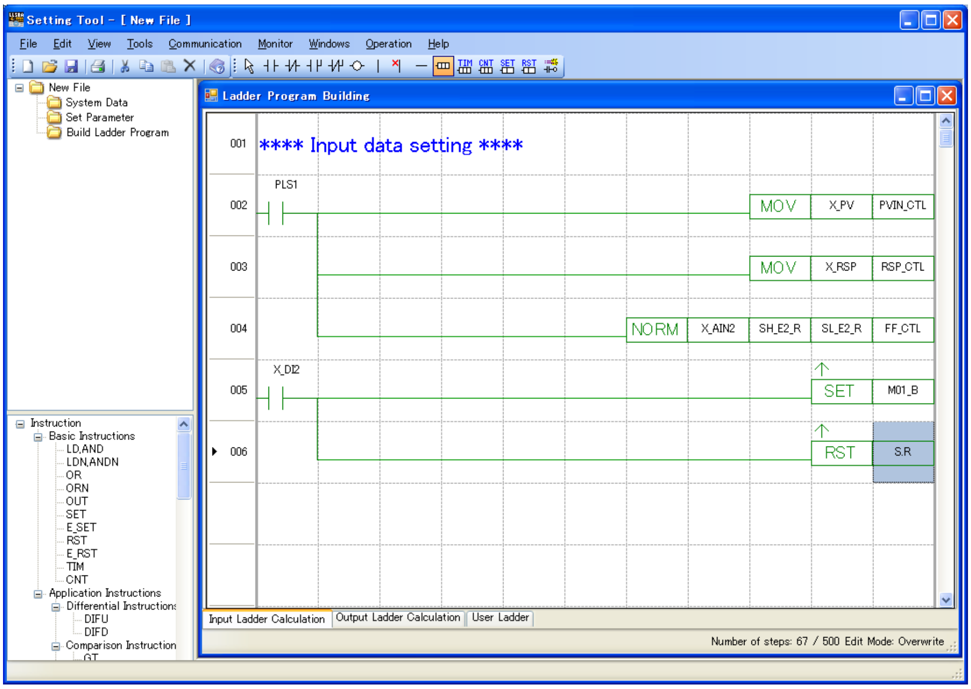
12. Locate | (OR Connection Line) on the 6th line.



13. Locate the E_RST instruction on the 6th line.

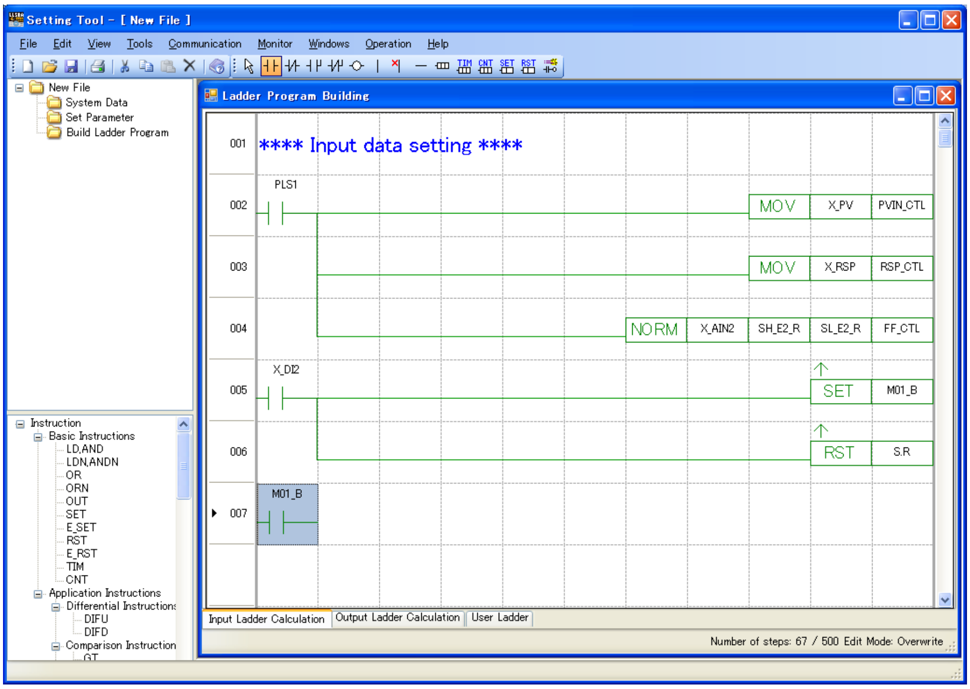


14. This causes the input field to appear. Enter an S/R register (S.R) in the E_RST instruction's input field. (It is also possible to input a register by drag-and-drop from the Register window.)

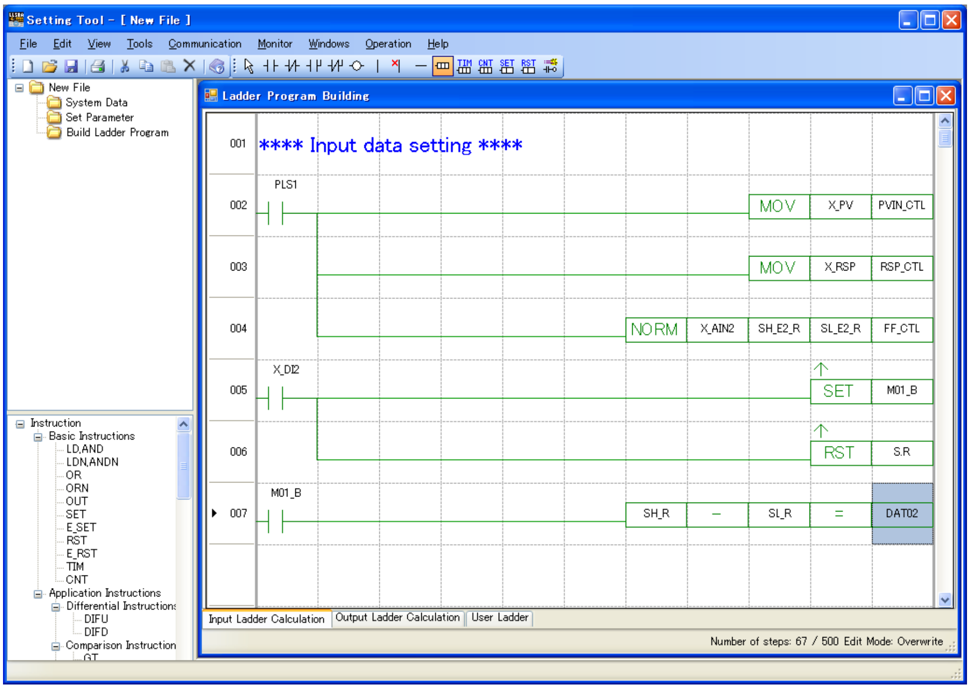


15. Build a circuit on the 7th line.

Click on (select) ┤├ ("a" contact instruction) on the instruction palette and click the column of the location where you want to input the instruction. Enter "M01_B" in the input field. (It is also possible to input a register by drag-and-drop from the Register window.)

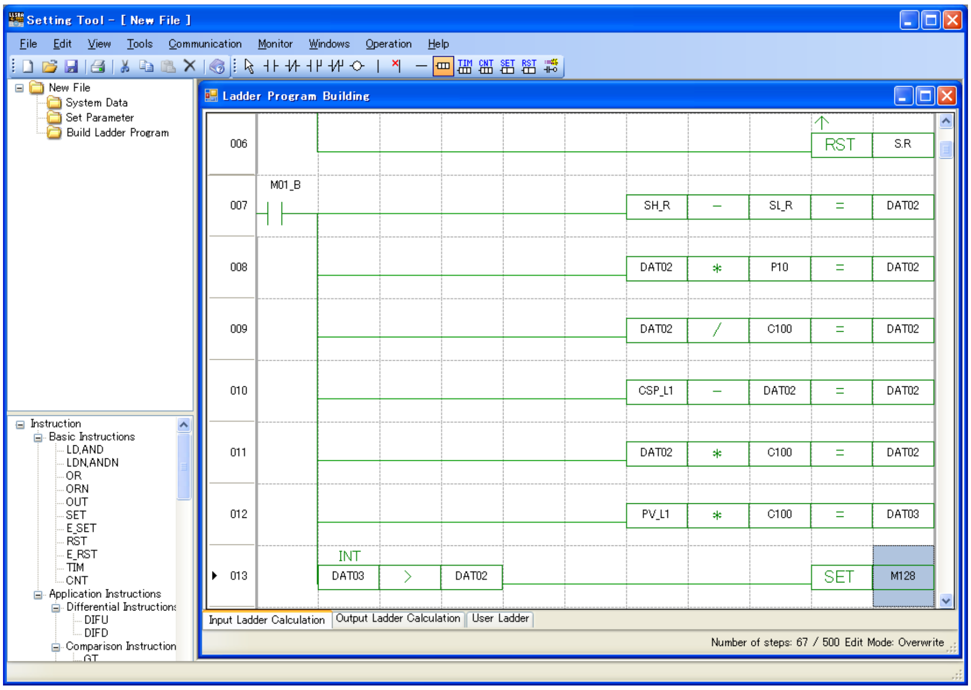


16. Select SUB (Subtraction) from the Input Instruction window by clicking on the Application Instructions icon (Application Instructions) of the instruction palette and locate it as shown below. Enter "SH_R", "SL_R", and "DAT02" in the input fields.



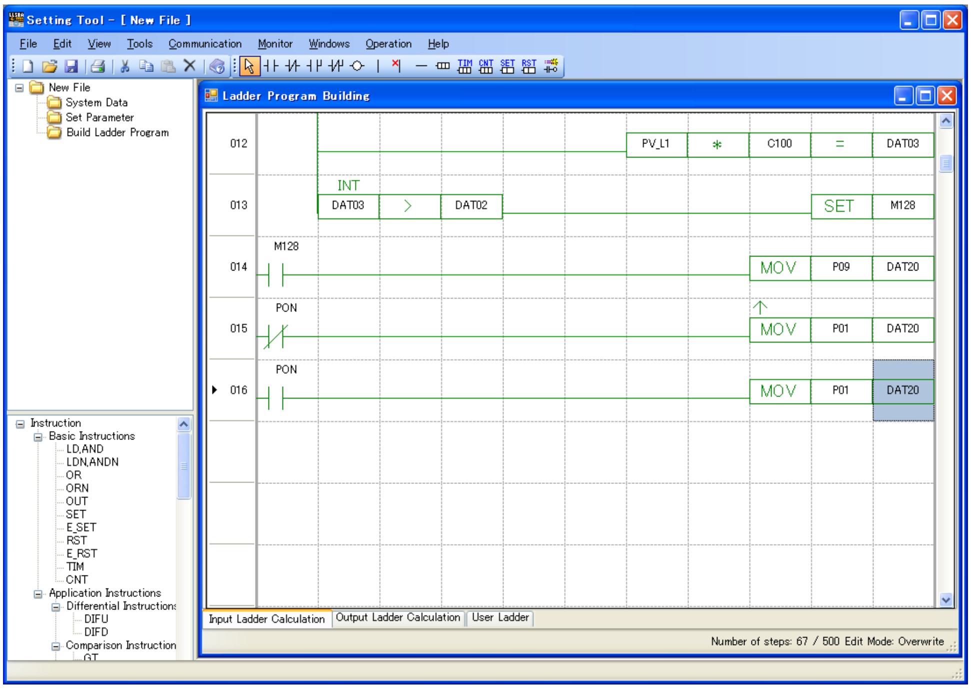
17. Build a circuit on the 8th to 13th lines.

Locate (OR Connection Line) on the 8th to 13th lines first.
Then, Locate MUL (Multiplication) instruction on the 8th line, DIV (Division) instruction on the 9th line, SUB (Subtraction) instruction on the 10th line, MUL instruction on the 11th to 12th lines, GT (>) and SET instruction on the 13th line. Also enter the register in the input field.



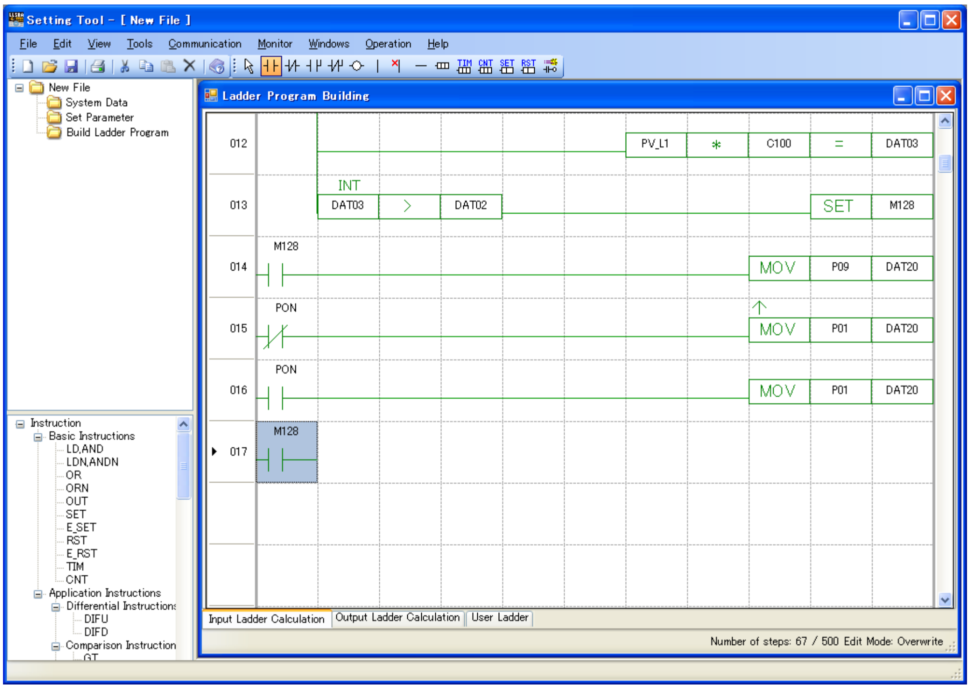
18. Build a circuit on the 14th to 16th lines same as above.

Locate (“a” contact instruction) and MOV (Move) instruction on the 14th line, (“b” contact instruction) and E_MOV instruction on the 15th line, (“a” contact instruction) and MOV instruction on the 16th line. Also enter the register in the input field.

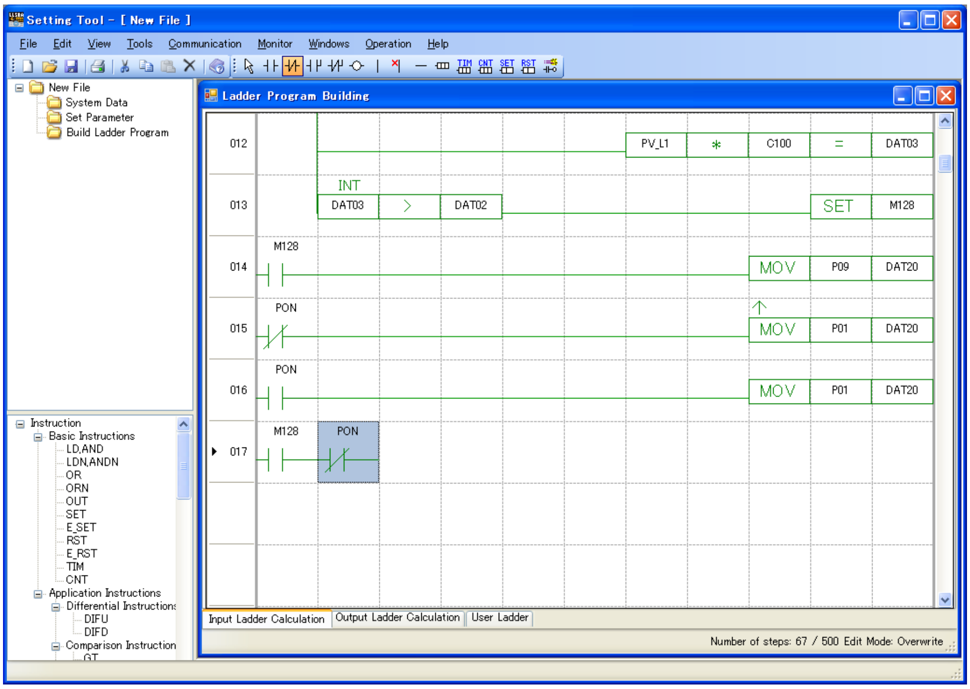


19. Build a circuit on the 17th line.

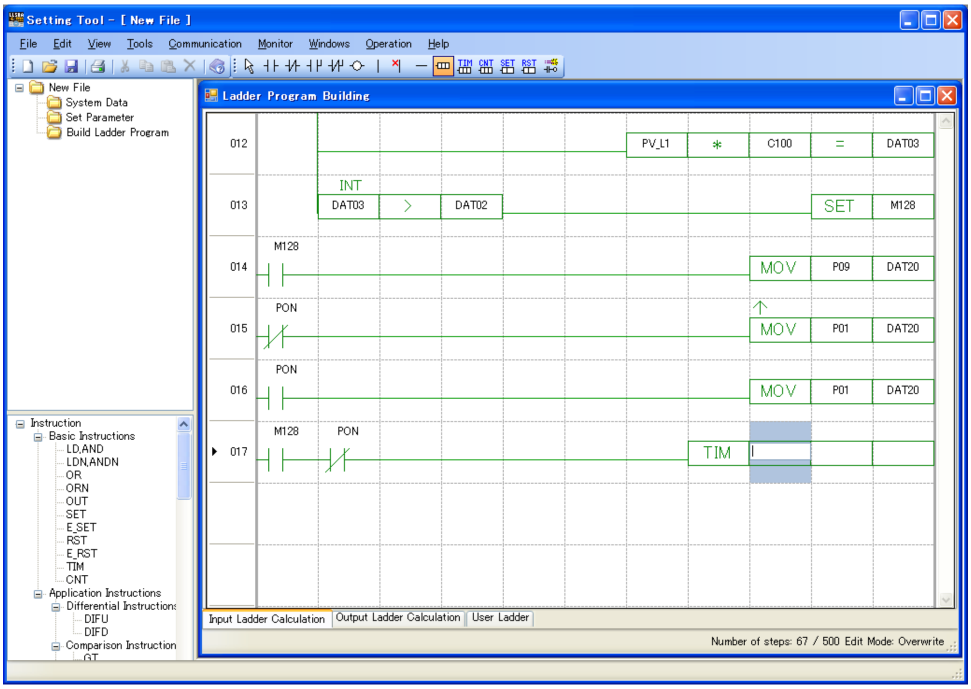
Click on (select) ┤├ (“a” contact instruction) on the instruction palette and click the column of the location where you want to input the instruction. Enter “M128” in the input field.



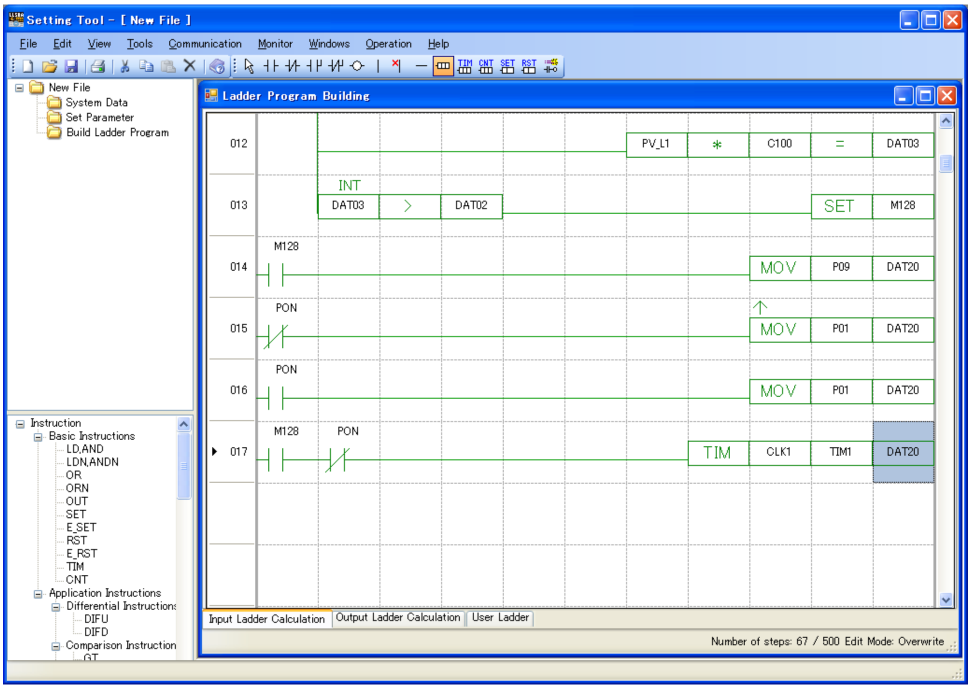
20. Click on (select) ┤/├ (“b” contact instruction) on the instruction palette and click the column of the location where you want to input the instruction. Enter “PON” in the input field. (It is also possible to input a register by drag-and-drop from the Register window.)



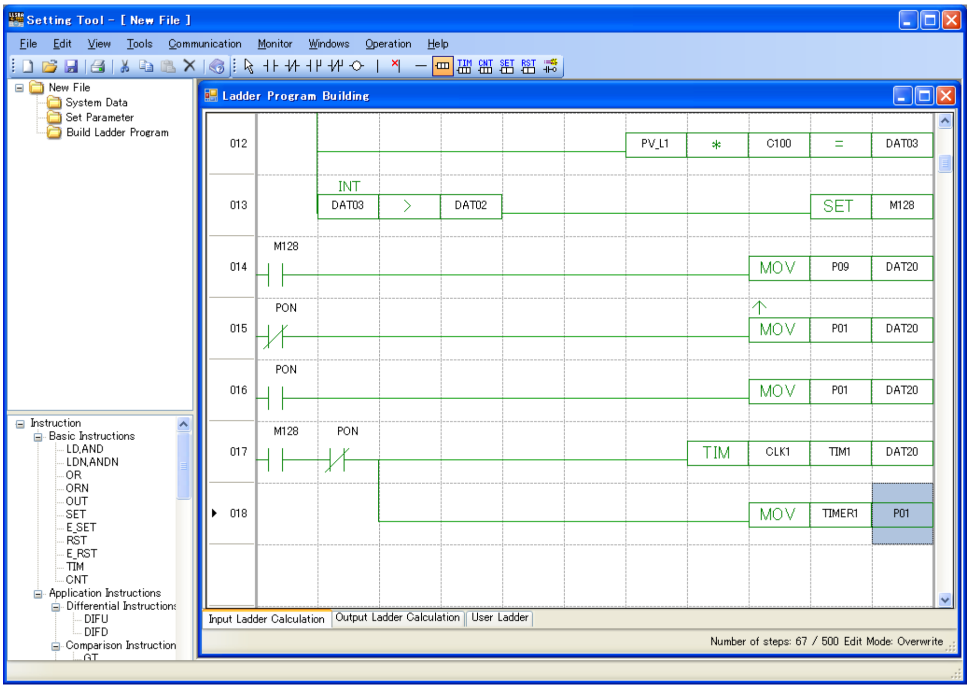
21. Select TIM (Timer) from the Input Instruction window by clicking on (Application Instructions) of the Instruction Palette and locate it as shown below.



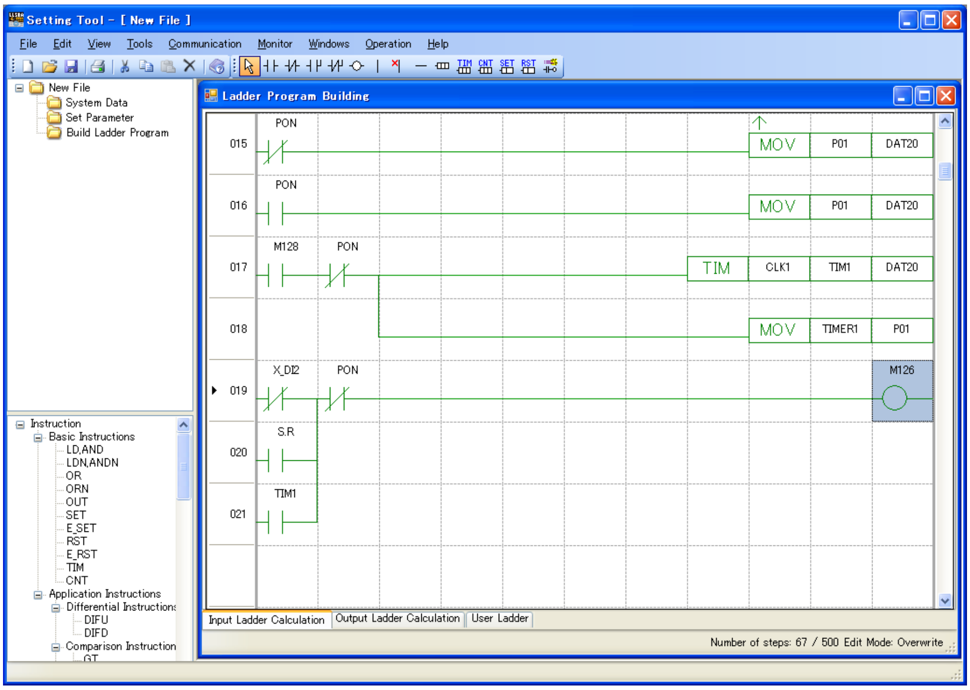
22. Enter "CLK1" (1-sec clock), "TIM1" (time-out relay), and "DAT20" (timer set value) in the input fields.



23. Locate the MOV instruction on the 18th line.
Enter “TIMER1” (timer current value) and “P01” in the input fields.

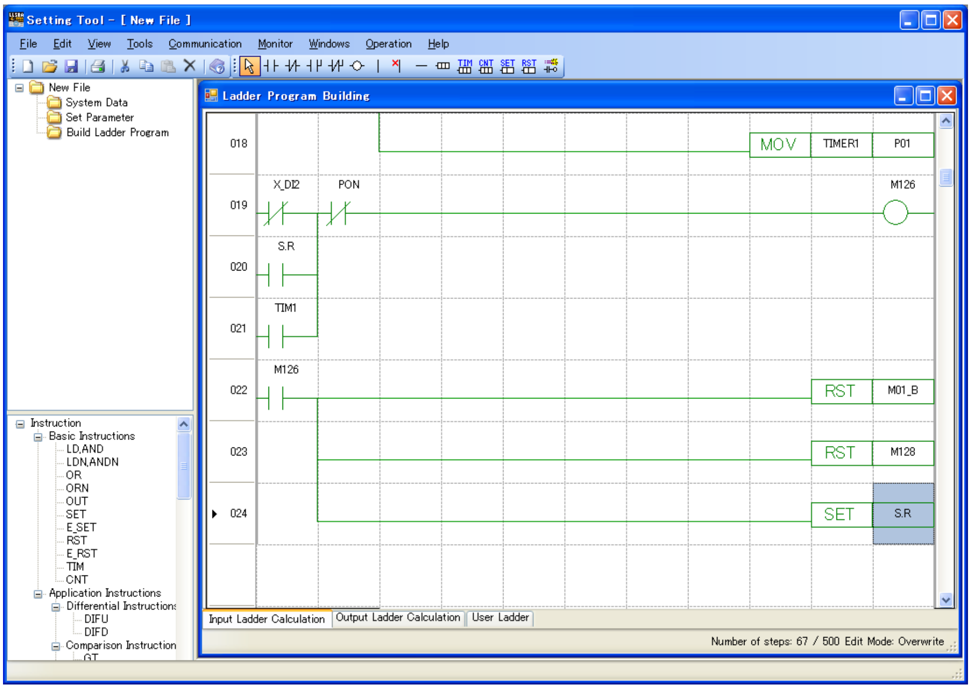


24. Build a circuit on the 19th to 21th lines.
Locate (“b” contact instruction) and OUT instruction on the 19th line, (“a” contact OR instruction) on the 20th and 21th lines. Also enter the register in the input field.



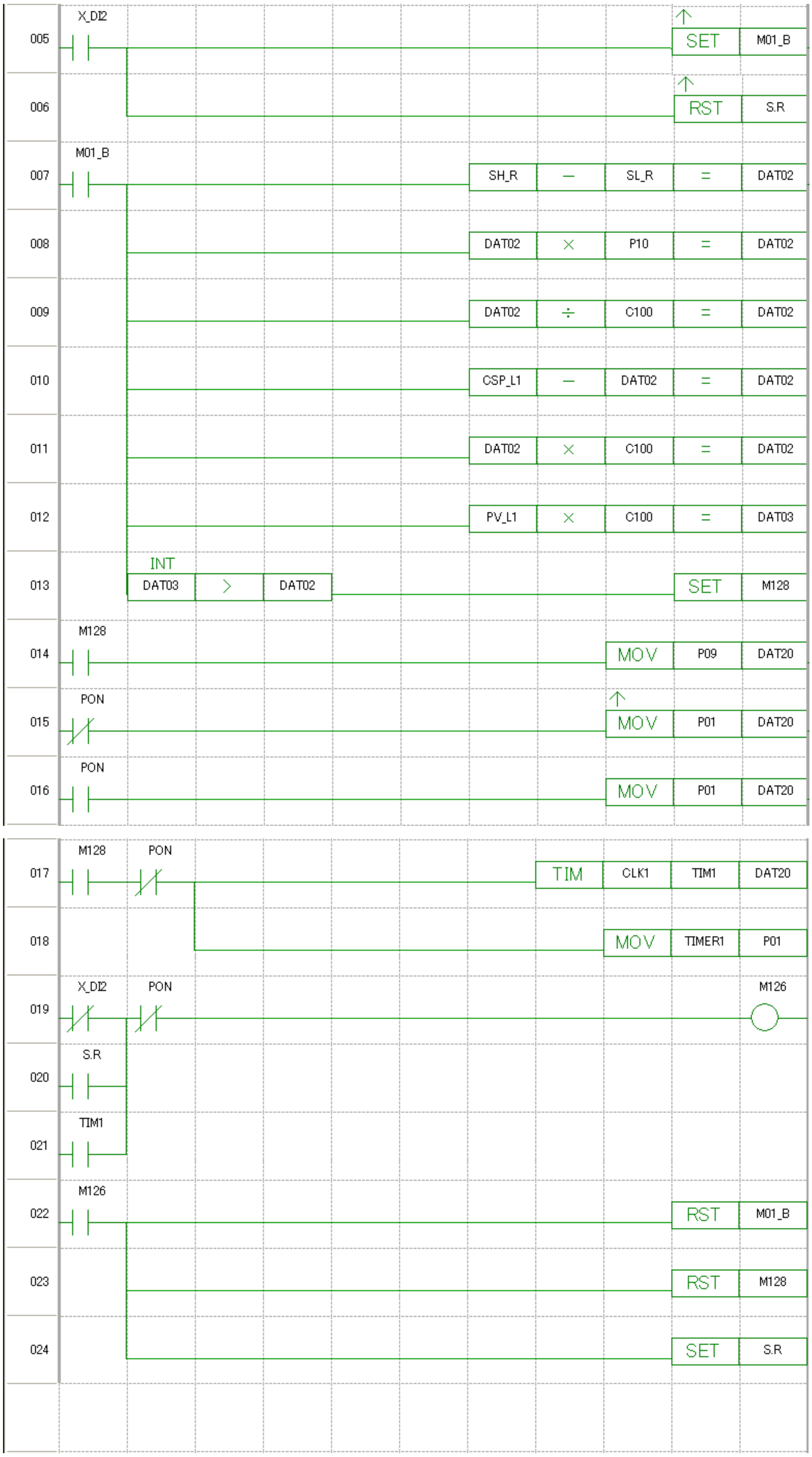
25. Build a circuit on the 22th to 24th lines same as above.

Locate ┤├ (“a” contact instruction) and RST (Reset) instruction on the 22th line, │ (OR connection line) on the 23th to 24th lines, RST instruction on the 23th line, SET instruction on the 24th line. (It is also possible to input a register by drag-and-drop from the Register window.)



26. Complete the ladder program building.

Ladder program



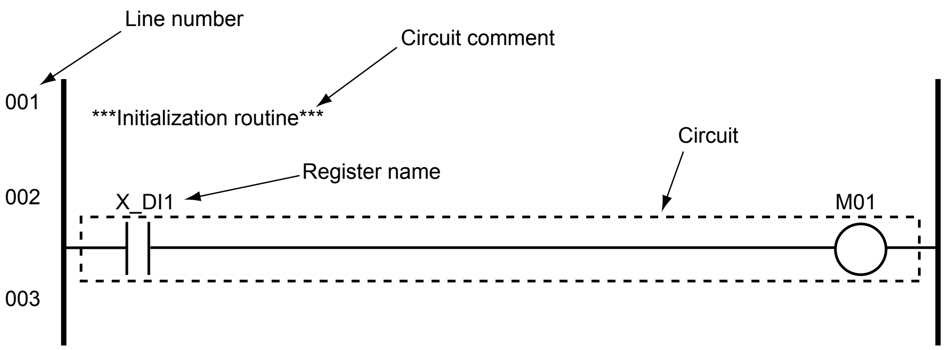
3.5 Editing Ladder Programs

3.5.1 Overwrite and Insert Modes

Instructions are input in either the Overwrite or Insert mode. The Insert key is used to switch between the two modes.

- Overwrite mode
  Inputting an instruction in Overwrite mode when there is already an instruction at the location of the cursor erases the existing instruction and causes the new instruction to be entered there.
- Insert mode
  Inputting an instruction in Insert mode when there is already an instruction at the location of the cursor causes the existing instruction to be shifted to the right and the new instruction to be entered at that location. If the existing instruction cannot be moved to the right or if moving an instruction to the right would cause it to be placed at the 11th column, no instruction can be input.

3.5.2 Circuit Editing Elements



Circuit	Item	Specifications
Circuit	Number of lines per circuit	15 lines or less
	Number of instructions per circuit	125 instructions or less
	Continuous line	None
	Horizontal columns	Fixed to 11 columns
Circuit comment	Number of characters	70 single-byte characters (35 two-byte characters) or less
	Available characters	Alphanumeric characters and symbols
	Number of items registered	50
Register name	Specification method	Contact input: X Contact output: Y Others: Register symbols

Limitations

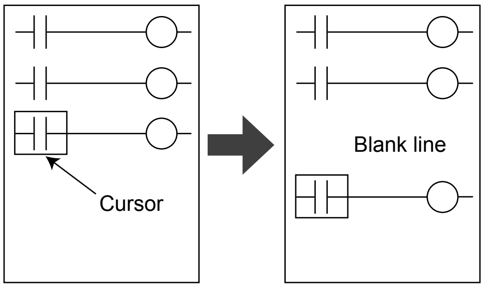
- Only one output instruction can be registered in one line.
- No input instruction can be registered at the 11th column, or an input instruction extending to the 11th column cannot be registered.

3.5.3 Inserting a Blank Line

This section describes how to insert a blank line in a ladder program.

Procedure

1. Place the cursor at the location where you want to insert a blank line.
2. Click on [Edit] – [Insert Line] in the menu.



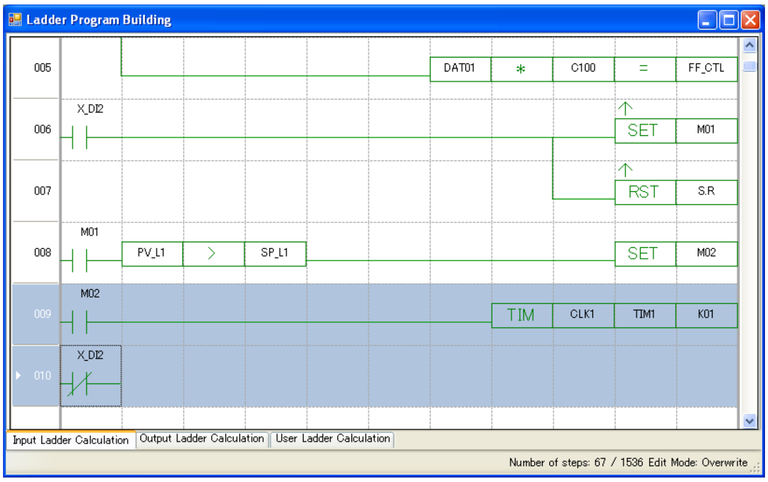
3.5.4 Selecting a Circuit Range

The following describes how to specify a circuit range. A cut, copy, or delete is performed by specifying the range of a circuit.

Selection in units of lines

Selecting a range using the mouse

To select a circuit range using the mouse, generally drag across the line number area with the cursor.



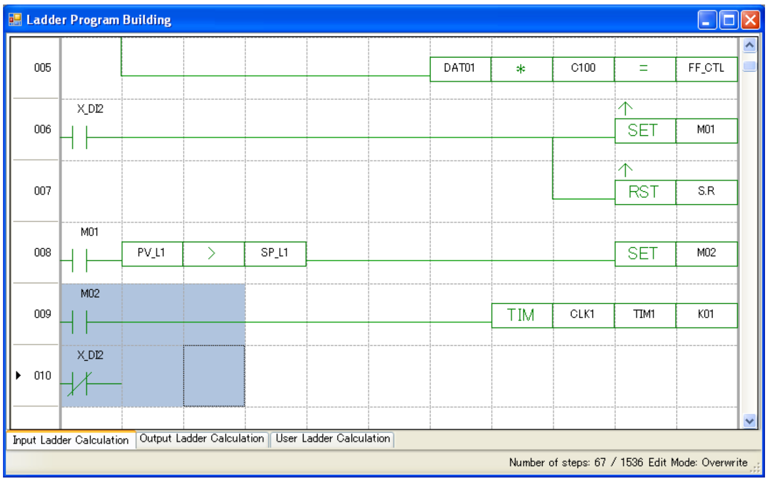
Selecting a range using the keyboard

To select a circuit range using the keyboard, move the cursor to any cell on the line where you want to start selection, press the Ctrl + Space keys to activate a line-selection status, or press the Shift + [Up arrow] keys or Shift + [Down arrow] keys to select the range.

Selection in units of cells

Selecting a range using the mouse

To select a circuit range using the mouse, drag across the cell range area with the mouse cursor.

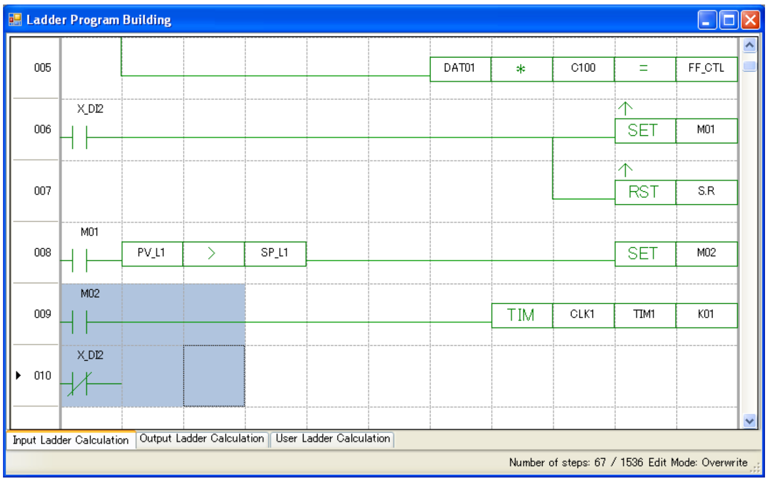


Selecting a range using the keyboard

To select a circuit range using the keyboard, press:

- Shift + [Right arrow] keys
- Shift + [Left arrow] keys
- Shift + [Up arrow] keys
- Shift + [Down arrow] keys

If the line-selection status has been activated, press the TAB key to cancel it.
With the SHIFT key held down, press any of the [Right arrow], [Left arrow], [Up arrow], and [Down arrow] keys.



3.5.5 Deleting a Circuit

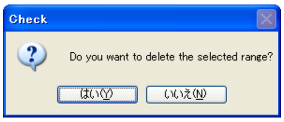
This section describes how to delete a circuit.

Deleting circuits in units of lines

Circuits can be deleted on a line basis by specifying the range of circuit lines and then selecting either [Edit] – [Delete] in the menu, or [Edit] – [Delete Line].

To select a circuit range:

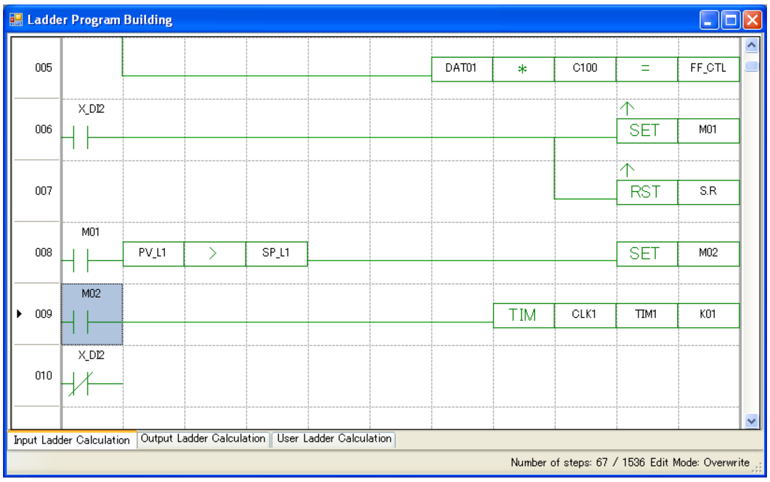
1. Specify a circuit range in lines (see Section 3.5.4).
2. Click on [Edit] – [Delete] or [Edit] – [Delete Line] in the menu.
3. The line deletion confirmation message appears.



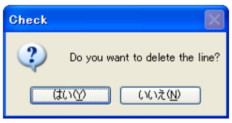
When not selecting a circuit range:

Click on [Edit] – [Delete Line] in the menu. This causes one selected line to be deleted.

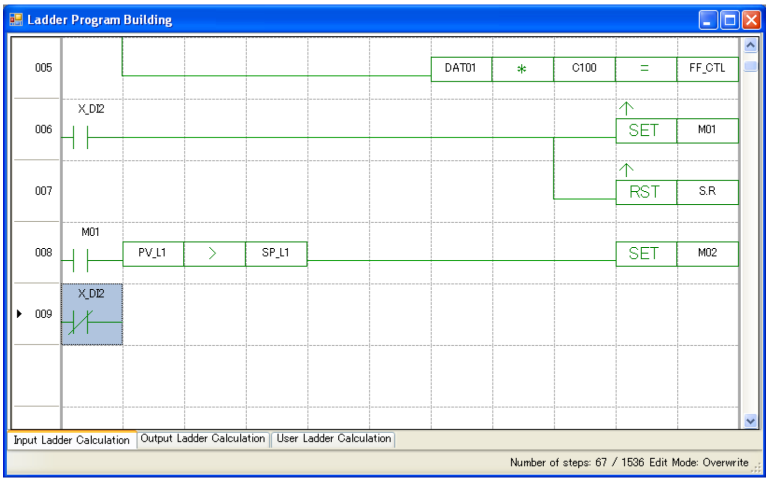
1. Move the cursor to any cell on the line that you want to delete.



2. Click on [Edit] – [Delete Line] in the menu.
3. The line deletion confirmation message appears.



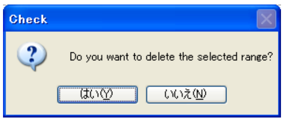
Results of deletion



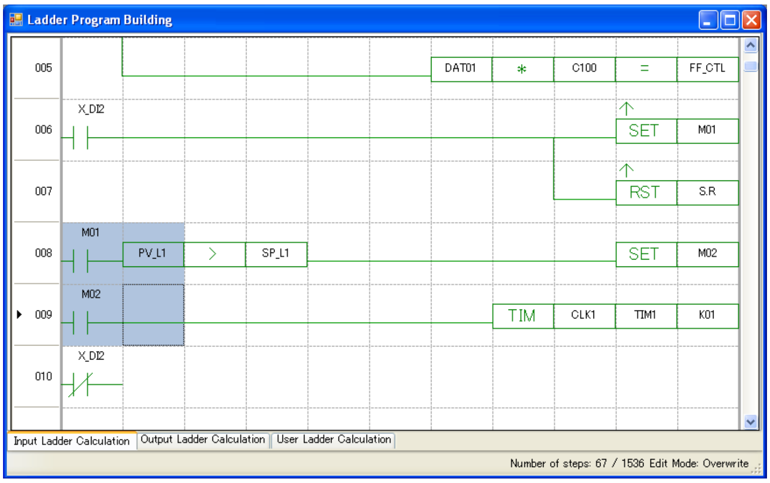
Deleting circuits in units of cells

To delete a specified circuit range in cells, click on [Edit] – [Delete] in the menu.

1. Specify a circuit range in cells (see Section 3.5.4).
2. Click on [Edit] – [Delete] in the menu.
3. This causes the line deletion confirmation message to appear.



Deletion is not possible if a selected circuit range includes part of an instruction.



3.5.6 Copying a Circuit

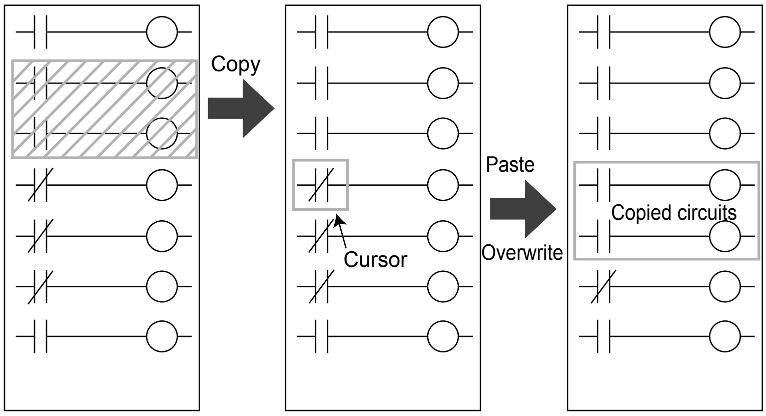
This section describes how to copy a circuit.

Copying circuits in units of lines

1. Specify a circuit range in lines (see 3.5.4).
2. Click on [Edit] – [Copy] in the menu.
3. Move the cursor to left side cell on the line at the copy destination.
4. Click on [Edit] – [Paste] in the menu.
   The circuits are copied to lines starting at the line where the cursor is placed.

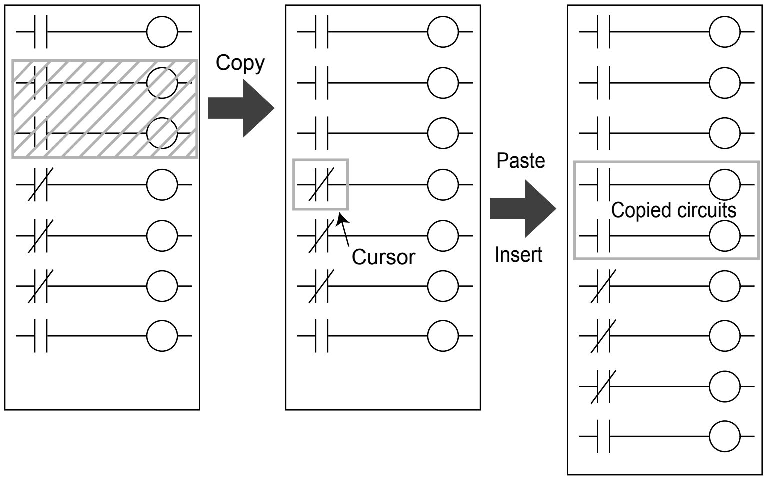
In Overwrite mode

Circuits starting at the line where the cursor is placed are replaced with the circuits to be copied, by the number of circuit lines to be copied.



In Insert mode

Circuits to be copied are inserted before the line where the cursor is placed.



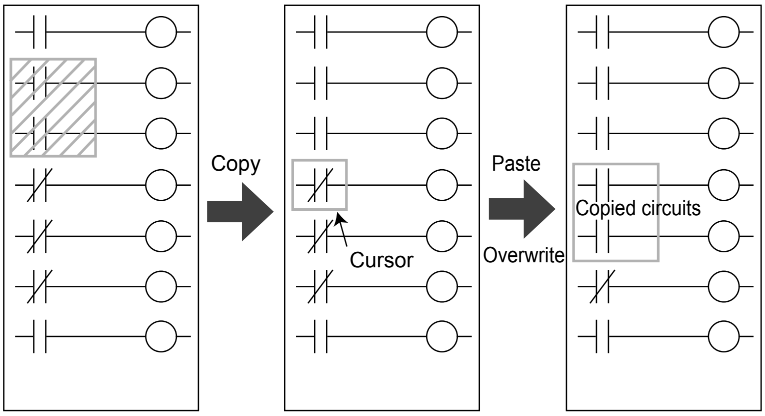
In Insert mode, it is not possible to copy if the number of circuit lines exceeds 200 lines after making the copy.

Copying circuits in units of cells

1. Specify a circuit range in cells (see 3.5.4).
2. Click on [Edit] – [Copy] in the menu.
3. Move the cursor to a cell at the copy destination.
4. Click on [Edit] – [Paste] in the menu.
   Circuits start to be copied to cells starting at the position of the cursor.

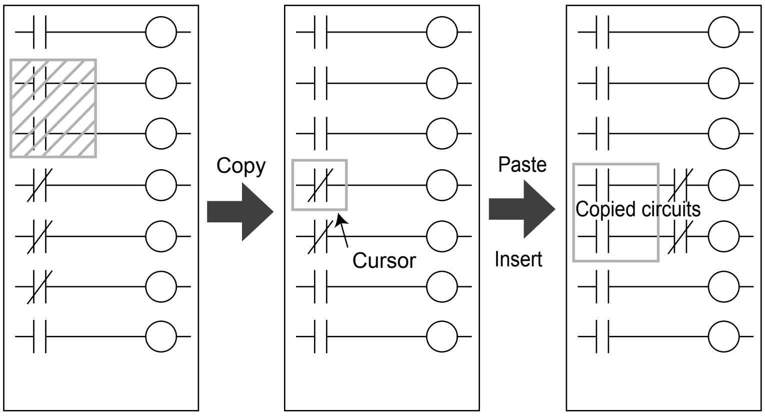
In Overwrite mode

The cells of circuits starting at the line where the cursor is placed are replaced with those of the circuits to be copied, by the number of circuit lines to be copied.



In Insert mode

The cells of circuits to be copied are inserted before the line where the cursor is placed.



Copying cannot be made on a cell basis in the following cases:

- An input instruction is pasted to column 11
- A paste in which an output instruction does not extend to column 11
- Data obtained after pasting exceeds the display range of columns
- A paste range in Overwrite mode reaches to within an instruction
- The number of instructions per line after a paste in Insert mode exceeds 11
- A line in a paste range in Insert mode is ORed with a line out of the paste range

3.5.7 Moving a Circuit

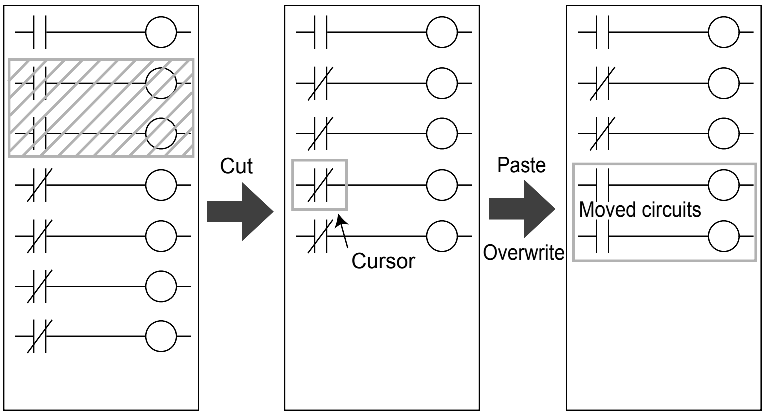
This section describes how to move a circuit.

Moving circuits in units of lines

1. Specify a circuit range in lines (see 3.5.4).
2. Click on [Edit] – [Cut] in the menu.
3. Move the cursor to left side cell on the line at the move destination.
4. Click on [Edit] – [Paste] in the menu.
   Circuits are moved to lines starting at the position of the cursor.

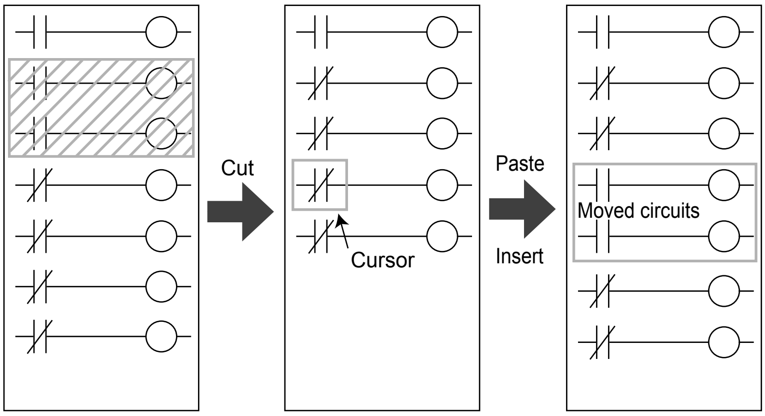
In Overwrite mode

The circuits starting at the line where the cursor is placed are replaced with the circuits to be moved, by the number of circuit lines to be moved.



In Insert mode

Circuits to be moved are inserted before the line where the cursor is placed.

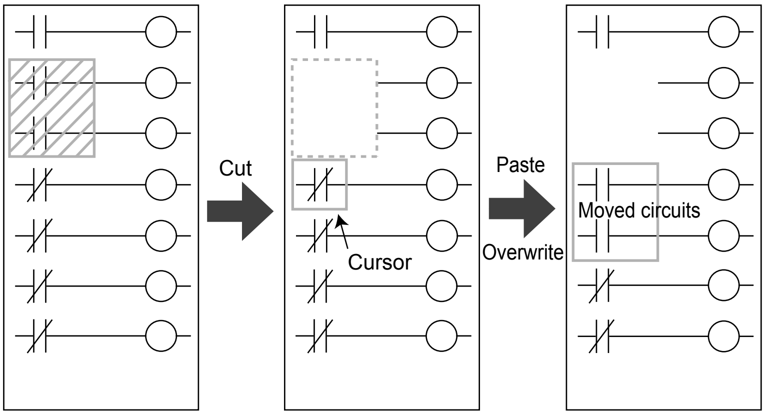


Moving circuits in units of cells

1. Specify a circuit range in cells (see 3.5.4).
2. Click on [Edit] – [Move] in the menu.
3. Move the cursor to a cell at the move destination.
4. Click on [Edit] – [Paste] in the menu.
   Circuits are moved to cells starting at the position of the cursor.

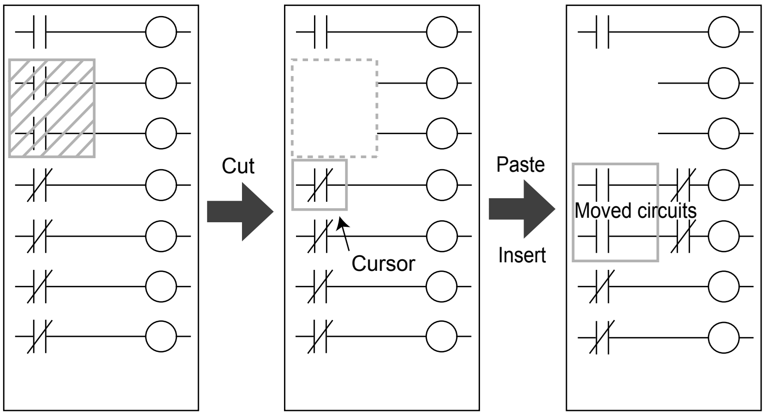
In Overwrite mode

The cells of circuits starting at the line where the cursor is placed are replaced with those of the circuits to be moved, by the number of circuit lines to be moved.



In Insert mode

The cells of circuits to be moved are inserted before the line where the cursor is placed.



A move cannot be made on a cell basis in the following cases:

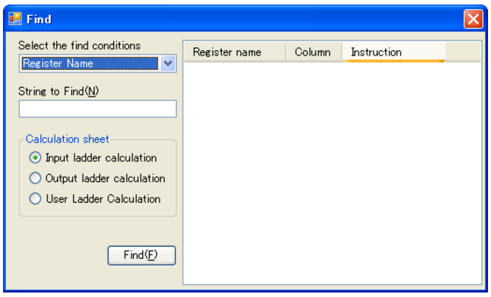
- An input instruction is pasted to column 11
- A paste in which an output instruction does not extend to column 11
- Data obtained after pasting exceeds the display range of columns
- A paste range in Overwrite mode reaches to within an instruction
- The number of instructions per line after a paste in Insert mode exceeds 11
- A line in a paste range in Insert mode is ORed with a line out of the paste range

3.5.8 Finding a Register or Instruction

This section describes how to find a register name or instruction in a ladder program.

Procedure

1. Click on [Edit] – [Find] in the menu to display the Find window.



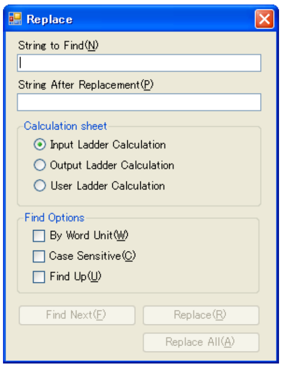
2. Input the character string you want to find.
   Number of characters: Up to 20
   Input characters: Single-byte alphanumeric characters + wildcard characters (*: number of characters is undefined, ?: 1 character)
3. Click the Find button to display a list of the results.
4. Clicking on a result causes the cursor to move to that position.

3.5.9 Replacing a Register or Instruction

This section describes how to replace a register name or instruction in a ladder program with a character string.

Procedure

1. Click on [Edit] – [Replace] in the menu to display the Replace window.



2. Enter the character string you want to search.
   Number of characters: Up to 20
   Input characters: Single-byte alphanumeric characters + wildcard characters (*: number of characters is undefined, ?: 1 character)
   Number of characters after replacement: Up to 20
   Input characters after replacement: Single-byte alphanumeric characters

   Search options
   Word basis: Character strings contained in a sentence are excluded.
   Case sensitive
   Upward search: with checkmark, Downward search: without checkmark

3. Click the [Replace Next] button to move the cursor to the position where the searched results are displayed.

4. Click the [Replace] button to replace the searched character string with the replacement character string. To replace all searched character strings in the program, click the [Replace All] button.

3.5.10 Setting a Burnout Connection

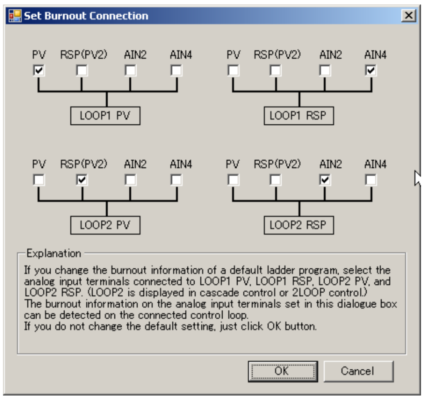
Burnout Connection Setting is only for UT75A/UT55A/UT52A/UP55A.

To change the burnout connection setting of the default ladder programs, select the analog input terminals connected to LOOP1 PV, LOOP1 RSP, LOOP2 PV, and LOOP2 RSP. (LOOP2 is displayed in Cascade control.)

The burnout information of the analog input terminals set up here can be detected by the control loop connected.

Procedure

1. Click on [Tool] – [Set Burnout Connection] in the menu to display the Set Burnout Connection window.



Item	Specification
LOOP1 PV	Select the input terminal connecting burnout information to loop-1 PV from among PV, RSP (PV2), AIN2, and AIN4.
LOOP1 RSP	Select the input terminal connecting burnout information to loop-1 RSP from among PV, RSP (PV2), AIN2, and AIN4.
LOOP2 PV	Select the input terminal connecting burnout information to loop-2 PV from among PV, RSP (PV2), AIN2, and AIN4.
LOOP2 RSP	Select the input terminal connecting burnout information to loop-2 RSP from among PV, RSP (PV2), AIN2, and AIN4.

LOOP2 PV and LOOP2 RSP are displayed in Cascade control or Dual-loop control.

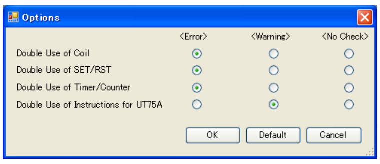
3.6 Checking Ladder Programs

This section describes how to check the program calculation instructions, program syntax, and step count when creating or editing a ladder program.

Setting up a syntax check

Procedure

1. Click [Tool] – [Set Option] in the menu to display the Options window.



2. Click on (select) the syntax check level and click the [OK] button.

The Options window

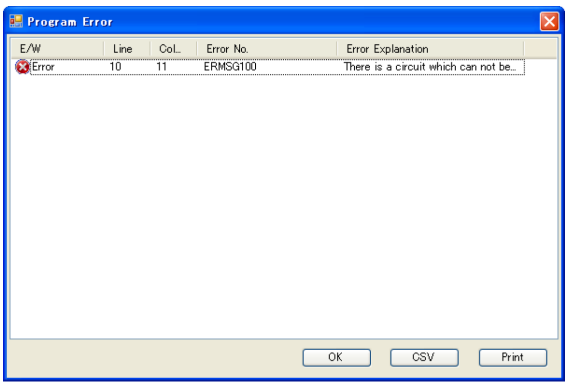
Item	Specification
Double use of coil	This option sets whether an error or warning is generated or whether no check is made if a coil (OUT) is used for the same device twice or more. Default: Error
Double use of SET/ RST	This option sets whether an error or warning is generated or whether no check is made if SET/RST is used for the same device twice or more. Default: Error
Double use of timer/ counter	This option sets whether an error or warning is generated or whether no check is made if the timer/counter instruction is used for the same device twice or more. Default: Error
Double use of instruction for UT75A	If two or more of the following instructions are used for the same device, this option determines whether it is indicated as an error or warning, or whether no check is made. MXHD1, MNHLD1, FLTR1 to FLTR4, DED1 to DED3, MAV1 to MAV3, VEL1 to VEL3, CLMT1 to CLMT4, CPO1, ONDY1 to ONDY8, OFDY1 to OFDY8. Default: Warning
Default	Returns the settings of the options to the defaults.

Checking the syntax

Procedure

1. After building a ladder program, click on [Tool] – [Check Program] in the menu to conduct a syntax check.

2. If an error is found, the Program Error window appears.



List of the Ladder Program Error Message

Error No.	Error Explanation
ERMSG11	The number of steps has been exceeded.
ERMSG100	There is a circuit which can not be converted.
ERMSG101	Exceeded max line number.
ERMSG102	Exceeded max step number.
ERMSG103	Exceeded max comment number.
ERMSG104	Exceeded max commands number.
ERMSG105	Double Use of Coil
ERMSG106	Double Use of SET
ERMSG107	Double Use of RST
ERMSG108	Double Use of Timer
ERMSG109	Double Use of Counter
ERMSG110	The address has not entered.
ERMSG111	The address is not suitable.
ERMSG112	Double use of instruction for UT75A

3.7 Saving a Ladder Program in a File and Downloading/Uploading It

After building and editing a ladder program, save it in a file, download it to the main unit, monitor and debug it, and then upload it from the main unit to save in the file.

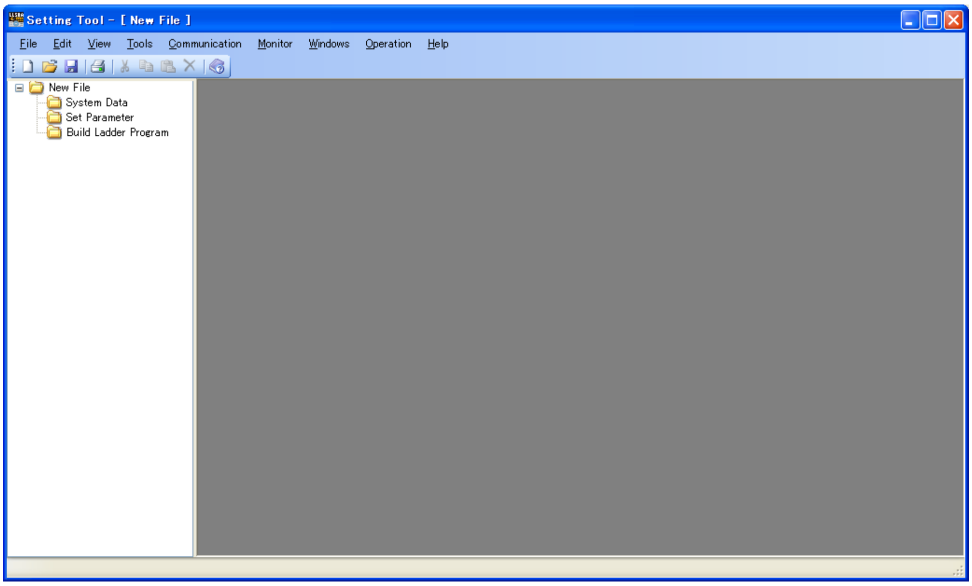
For the details of each operation, see the following sections:

- Saving in a file: Section 2.15, Managing files
- Downloading to main unit: Section 2.11, Downloading Data
- Uploading from main unit: Section 2.12, Uploading Data

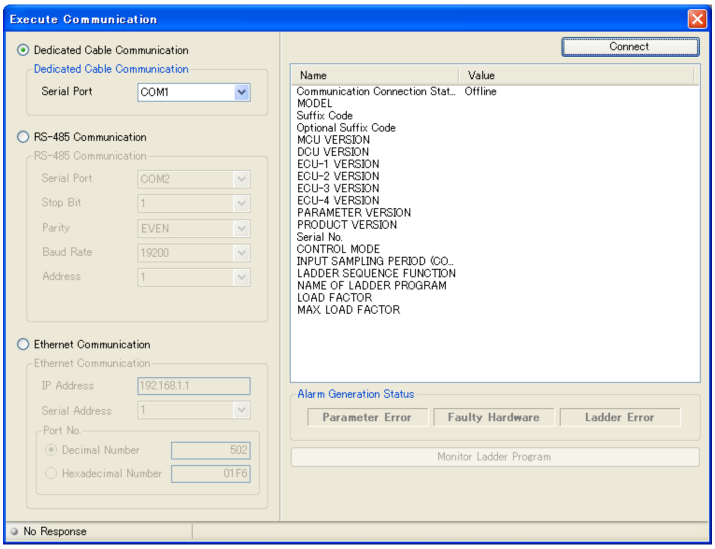
3.8 Monitoring a Ladder Program

Procedure

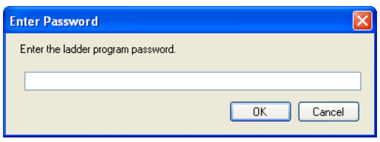
1. Display the Basic window.



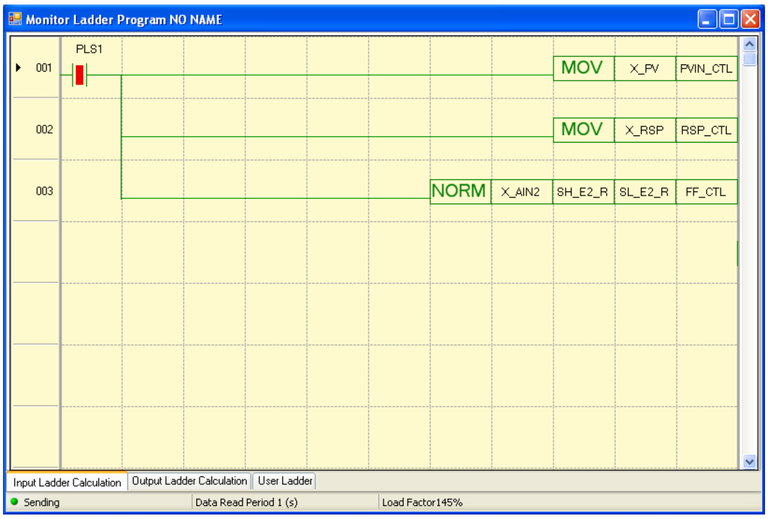
2. Click on [Monitor] – [Monitor Ladder Program] in the menu to display the Execute Communication window.



3. Set up the communication conditions and click the [Monitor Ladder Program] button to display the Enter Password dialog box.



4. If a ladder program password has been set to the ladder program, enter the password and click the [OK] button.
If a ladder program password has not been set to the ladder program, click the [OK] button asis. The Monitor Ladder Program window appears.



5. To close the window, click ☒.

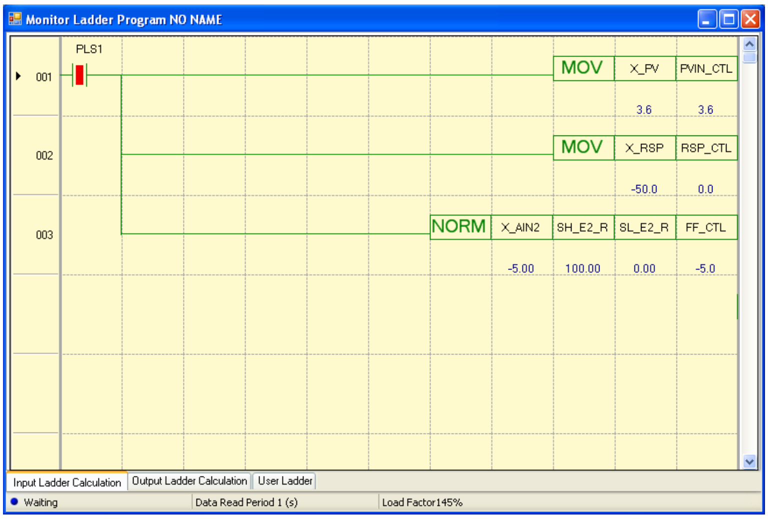
Switching between the input ladder calculation, output ladder calculation, and user ladder windows

Click on the desired tab at the bottom of the Monitor Ladder Program window to switch to any of these windows.

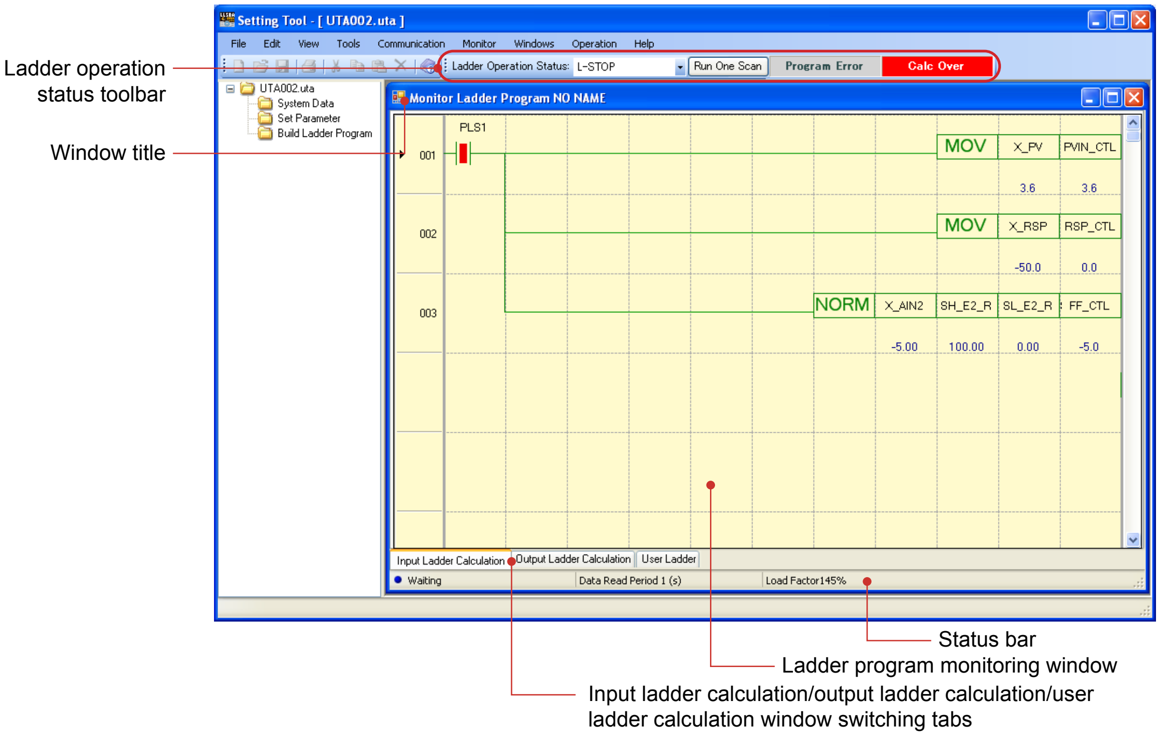
Detailed display of the Monitor Ladder Program window

Procedure

1. Place a check mark (☑) in front of [Detail View] that is accessed from [Monitor] in the menu to show a detailed view of the Monitor Ladder Program window. This view shows the current values of registers, etc.



The Monitor Ladder Program window



Window title

Indicates "Monitor Ladder Program, a program name read from the main unit."

Monitor Ladder Program window

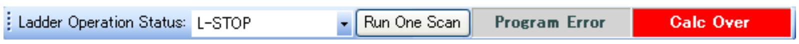
Displays the main unit ladder program. This is the monitor window used when debugging the ladder program. This window displays ladder program switches, lamp ON/OFF, and register values.

Input ladder calculation/output ladder calculation/user ladder calculation window switching tabs

Click on a tab at the bottom of the Ladder Program Building window to switch between the input ladder calculation, output ladder calculation, and user ladder calculation.

Ladder operation status toolbar

The following toolbar is displayed during ladder program monitoring.



- Ladder Operation Status
  Indicates the operating status of the main unit's ladder program.
  Running: L-RUN
  Stopped: L-STOP
  The status in the combo box can be switched to change the ladder program operation status of the main unit.
- Run One Scan (1SCAN)
  When this button is pressed, the LL50A runs one scan of the main unit ladder program and then stops it. This button is not available during L-RUN.
- Reset Start (L-RESET RUN)
  When this button is pressed, the main unit will perform the same operation as at power-on.

- Ladder program error (Program Error)
  If the ladder program is corrupted, “Program Error” is lit.
- Ladder calculation overflow (Calc Over)
  If a non-numerical value or infinity occurs during calculation or arises as a result, “Calc over” is lit.

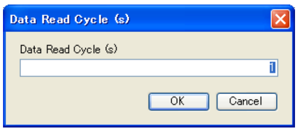
Status bar

Communication status

This item displays the status of communication with the main unit.
Green (blinking): Communicating
Red (lit): A communication delay occurred.

Data read cycle

Double-clicking on this area causes the Set Data Read Cycle window to appear. This item sets the read cycle for displaying main unit data on a PC.
If communication does not meet the set update cycle, a communication delay occurs.
Setting range: 1 to 3600 sec

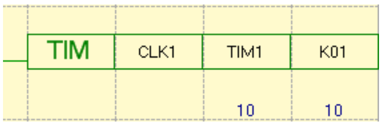


Load factor

Indicates the load factor of the main unit’s ladder program.

Displaying the current value of a timer or counter

The current value of a timer or counter is displayed in the detail view.



The current value can also be confirmed on the Monitor Register window.

- Register symbol of Timer-1 current value: TIMER1
- Register symbol of Timer-2 current value: TIMER2
- Register symbol of Timer-3 current value: TIMER3
- Register symbol of Timer-4 current value: TIMER4
- Register symbol of Timer-1 with back-up current value: TIMER1_B
- Register symbol of Timer-2 with back-up current value: TIMER2_B

- Register symbol of Counter-1 current value: COUNTER1
- Register symbol of Counter-2 current value: COUNTER2
- Register symbol of Counter-3 current value: COUNTER3
- Register symbol of Counter-4 current value: COUNTER4
- Register symbol of Counter-1 with back-up current value: COUNTER1_B
- Register symbol of Counter-2 with back-up current value: COUNTER2_B

Description

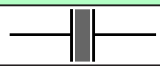
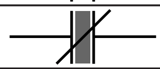
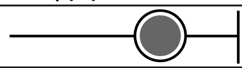
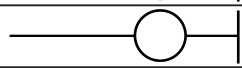
The Monitor Ladder Program window and Monitor Register window can be simultaneously displayed. The monitored data is refreshed only on the active window.
For the Monitor Register window, see Section 3.9, Monitoring/Changing Register Data.

Execute Communication window

- Serial port: A port available for a PC is automatically displayed.
- Stop bit, parity, baud rate, data length, and address: Set these items according to the main unit's communication conditions.
- IP address: Set this address according to the main unit's IP address (for Ethernet communication).
- Serial address: Set the main unit's RS-485 communication address if communication is made via an Ethernet/RS-485 converter (e.g., model VJET). (Not allowed to be duplicated)
- Port number: Set the port number.

ON/OFF display of relays

The ON/OFF status of relays in the Monitor Ladder Program window is displayed as shown below. Other instructions are also displayed in the same way.

Device Type		Status	Display
Input	"a" contact	ON	
		OFF	
	"b" contact	ON	
		OFF	
Output	Out	ON	
		OFF	
	SET	ON	
		OFF	
	RST	ON	
		OFF	

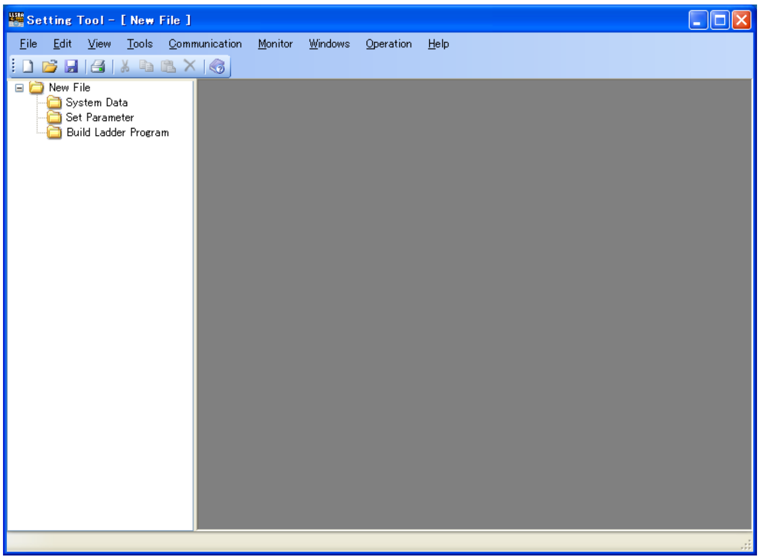
Note

Do not disconnect a connection cable or turn off the main unit power supply during register monitoring.

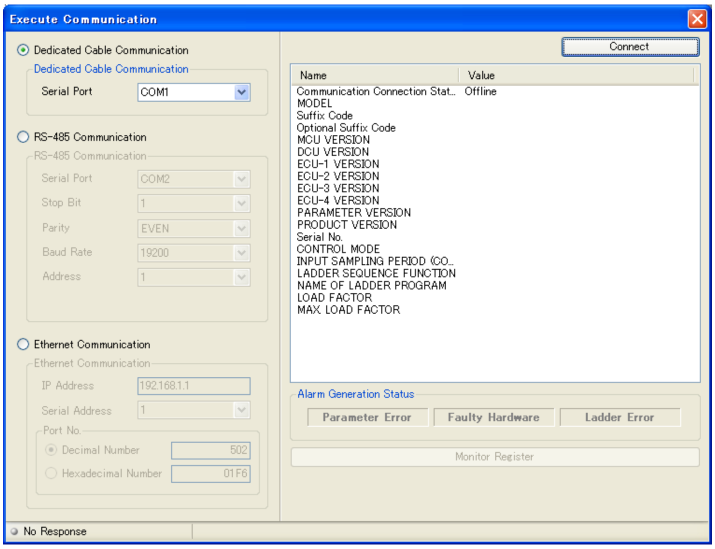
3.9 Monitoring/Changing Register Data

Procedure

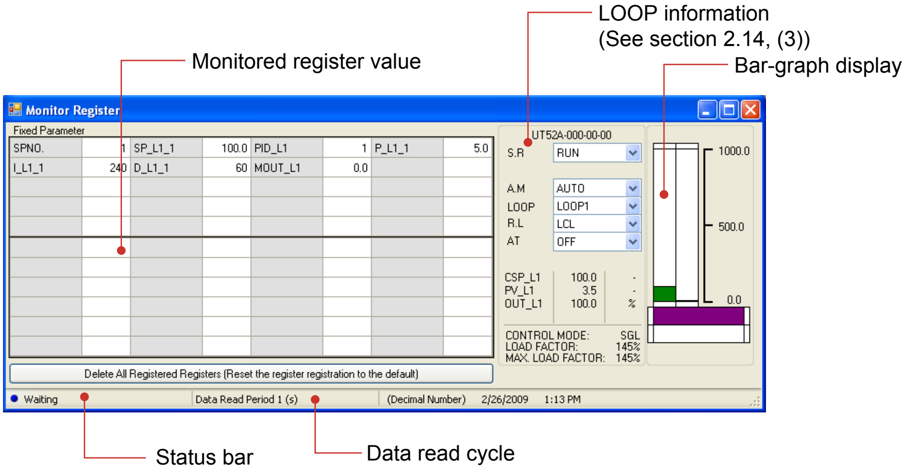
1. Display the Basic window.



2. Click on [Monitor] – [Monitor Register] in the menu to display the Execute Communication window.



3. Set up the communication conditions and click the [Execute Register Monitoring] button to display the Monitor Register window.



4. By observing PV, SP, and OUT trends, change the register settings.

5. Click ☒ to close the window.

What are register symbols?

Register symbols are the symbols of registers containing data such as main unit parameters, operation status, alarm status, contact input, and error information in 16 bits or 1 bit.

When performing communication, registers are used as D-registers or I-relays.

For more information on them, see the UTAdvanced Communication Interface (RS-485, Ethernet) User's Manual.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated with an underscore (_) added after the parameter symbol. If a parameter symbol has both a loop number and group number, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
  Ln: loop number (L1 or L2)
  Y: group number (1 to 8 (20) or 1 to 16, R)
xxxx_En
  En: terminal area number (E1 to E4)

Example: SP_L1_3: This means loop-1 group-3 target setpoint.
PYS_2: This means group-2 PYS.
DI1.D_E1: This means E1-terminal area DI1.D.

Note

Since the UT35A/UT32A/UP35A is a single-loop controller, it has no distinction between Loop-1 and Loop-2. However, the register symbol has "L1" which indicates Loop-1.

Switching between decimal and hexadecimal displays

Procedure

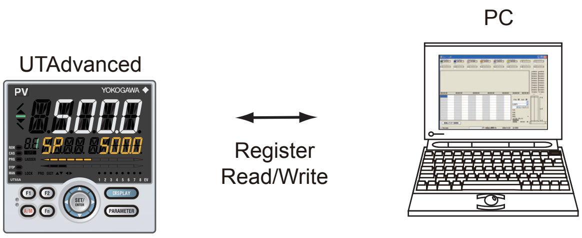
1. Click on [Monitor], select [Display Format], and click on [Decimal] or [Hexadecimal] in the menu.

Description

The monitor register function is used to check the operation of the main unit's ladder program. If a register value is modified, the modification is reflected in the main unit.

Note

If the control mode, control type, scale parameter, or other item is changed while the Monitor Register window is displayed, once close the Monitor Register window and then re-open it to display the new values.



Execute Communication window

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the main unit's communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the main unit's IP address (for Ethernet communication).
- Serial Address: Set the main unit's RS-485 communication address if communication is made via an Ethernet/RS-485 converter (e.g., model VJET). (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

Note

Do not disconnect a connection cable or turn off the main unit power supply during register monitoring.

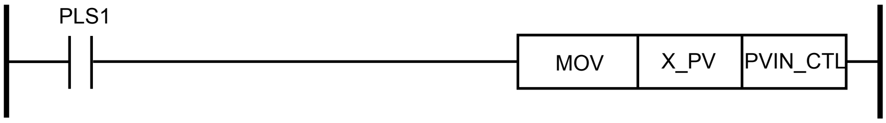
3.10 Default Ladder Programs

3.10.1 UT35A/UT32A/UP35A

Input ladder calculation program

Input registers	X_PV
Output registers	PVIN_CTL

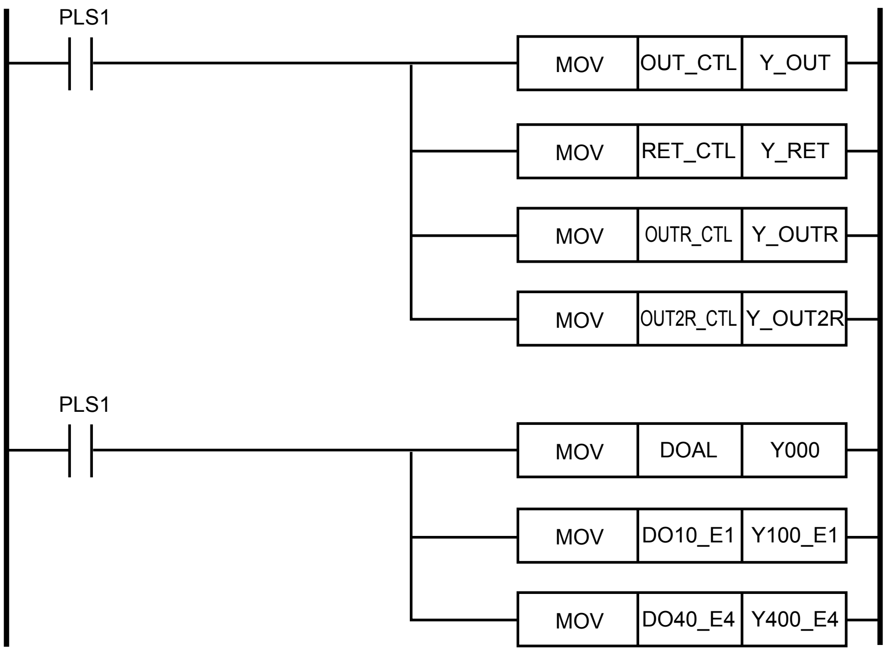
For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

Input registers	OUT_CTL, RET_CTL, OUTR_CTL, OUT2R_CTL, DOAL, DO10_E1, DO40_E3
Output registers	Y_OUT, Y_RET, Y_OUTR, Y_OUT2R, Y000, Y100_E1, Y400_E4

For an explanation of the registers, see Section 4.2, Registers.



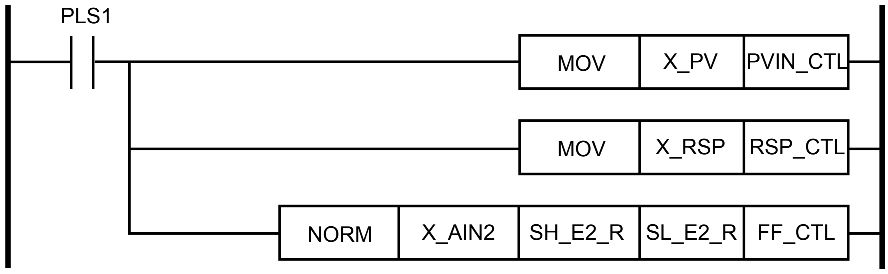
3.10.2 UT55A/UT52A/UP55A Single-loop Control

Input ladder calculation program

UT55A/UT52A

Input registers	X_PV, X_RSP, X_AIN2
Parameter registers	SH_E2_R, SL_E2_R
Output registers	PVIN_CTL, RSP_CTL, FF_CTL

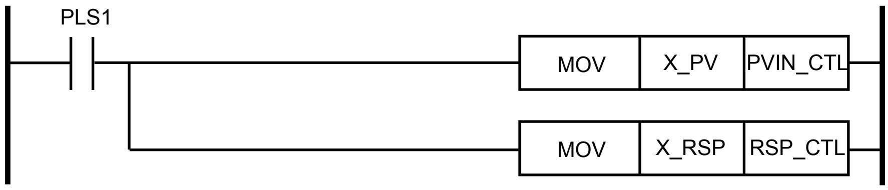
For an explanation of the registers, see Section 4.2, Registers.



UP55A

Input registers	X_PV, X_RSP
Parameter registers	SH_E2_R, SL_E2_R

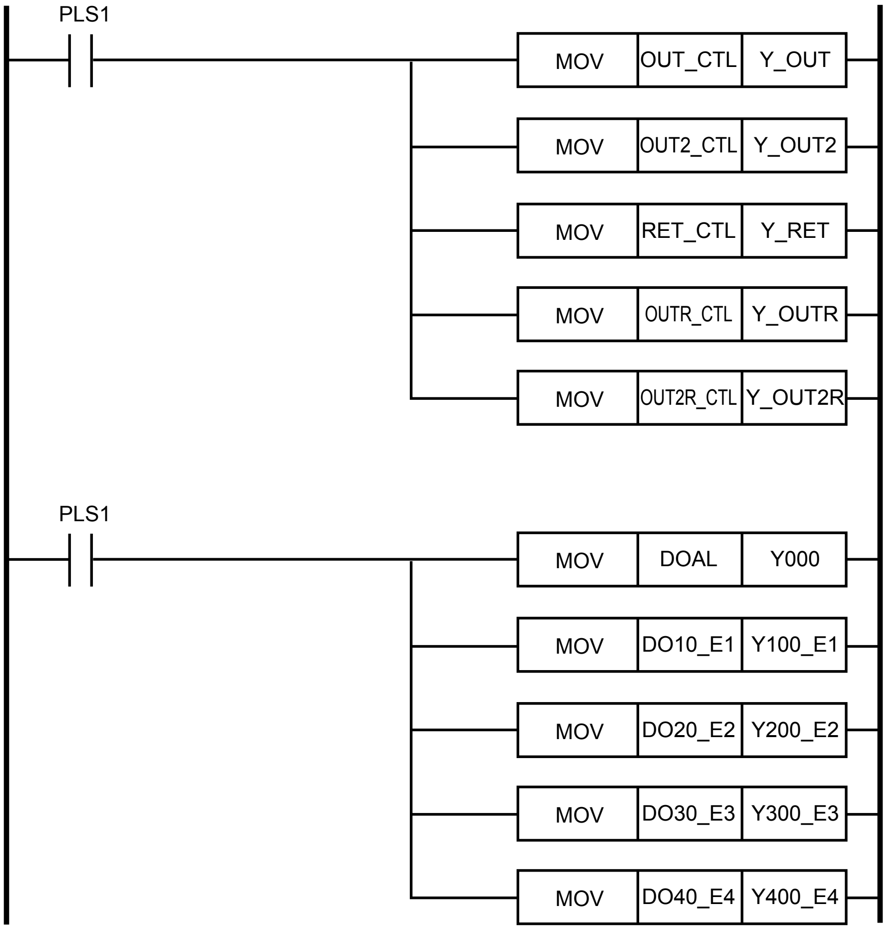
For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

Input registers	OUT_CTL, OUT2_CTL, RET_CTL, OUTR_CTL, OUT2R_CTL, DOAL, DO10_E1, DO20_E2, DO30_E3, DO40_E3
Output registers	Y_OUT, Y_OUT2, Y_RET, Y_OUTR, Y_OUT2R, Y000, Y100_E1, Y200_E2, Y300_E3, Y400_E4

For an explanation of the registers, see Section 4.2, Registers.

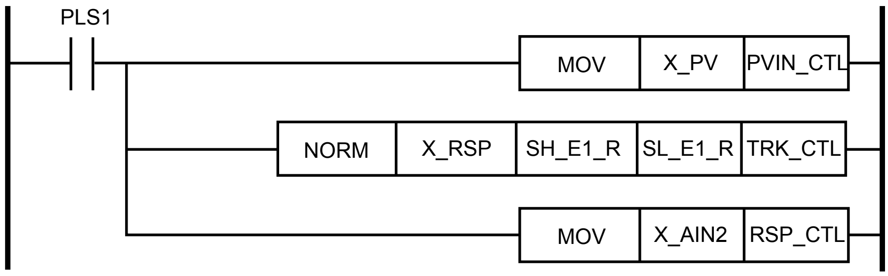


3.10.3 UT55A/UT52A/UP55A Cascade Primary-loop Control

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN2
Parameter registers	SH_E1_R, SL_E1_R
Output registers	PVIN_CTL, TRK_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

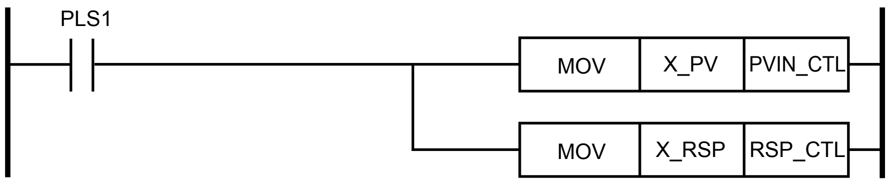
The output ladder calculation program is the same as that of UT55A/UT52A/UP55A Single-loop control.

3.10.4 UT55A/UT52A Cascade Secondary-loop Control

Input ladder calculation program

Input registers	X_PV, X_RSP
Output registers	PVIN_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

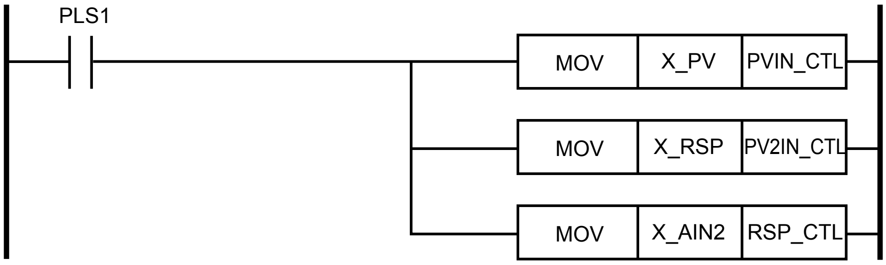
The output ladder calculation program is the same as that of UT55A/UT52A Single-loop control.

3.10.5 UT55A/UT52A/UP55A Cascade Control

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN2
Output registers	PVIN_CTL, PV2IN_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

The output ladder calculation program is the same as that of UT55A/UT52A /UP55A Single-loop control.

3.10.6 UT55A/UT52A Loop Control for Backup

Input ladder calculation program

The input ladder calculation program is the same as that of UT55A/UT52A Cascade primary-loop control.

Output ladder calculation program

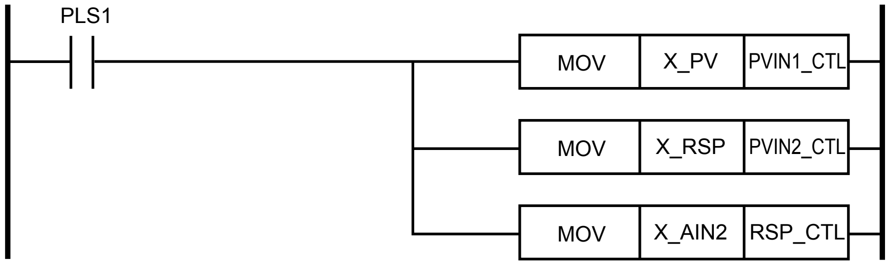
The output ladder calculation program is the same as that of UT55A/UT52A Single-loop control.

3.10.7 UT55A/UT52A/UP55A Loop Control with PV Switching

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN2
Output registers	PVIN1_CTL, PVIN2_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

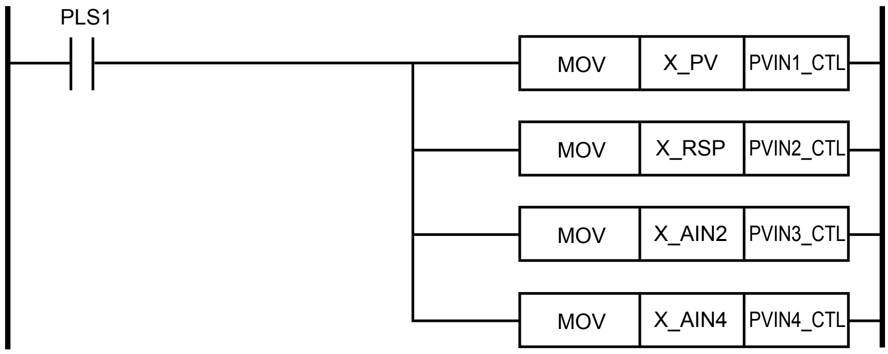
The output ladder calculation program is the same as that of UT55A/UT52A/UP55A Single-loop control.

3.10.8 UT55A/UT52A/UP55A Loop Control with PV Auto-selector

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN2, X_AIN4
Output registers	PVIN1_CTL, PVIN2_CTL, PVIN3_CTL, PVIN4_CTL

PVIN3_CTL and PVIN4_CTL can be used according to the number of inputs.
For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

The output ladder calculation program is the same as that of UT55A/UT52A/UP55A Single-loop control.

3.10.9 UT55A/UT52A Loop Control with PV-hold Function

Input ladder calculation program

The input ladder calculation program is the same as that of UT55A/UT52A Single-loop control.

Output ladder calculation program

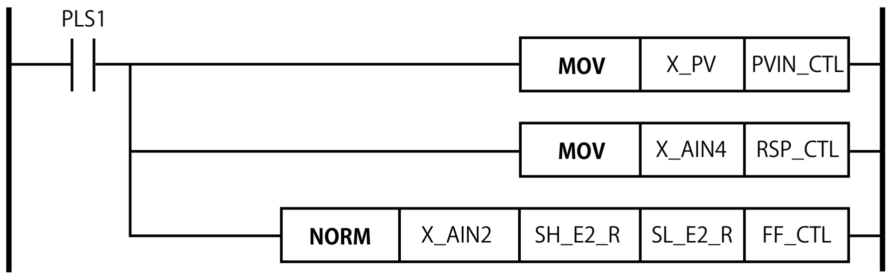
The output ladder calculation program is the same as that of UT55A/UT52A Single-loop control.

3.10.10 UT75A Single-loop Control

Input ladder calculation program

Input registers	X_PV, X_AIN2, X_AIN4
Parameter registers	SH_E2_R, SL_E2_R
Output registers	PVIN_CTL, RSP_CTL, FF_CTL

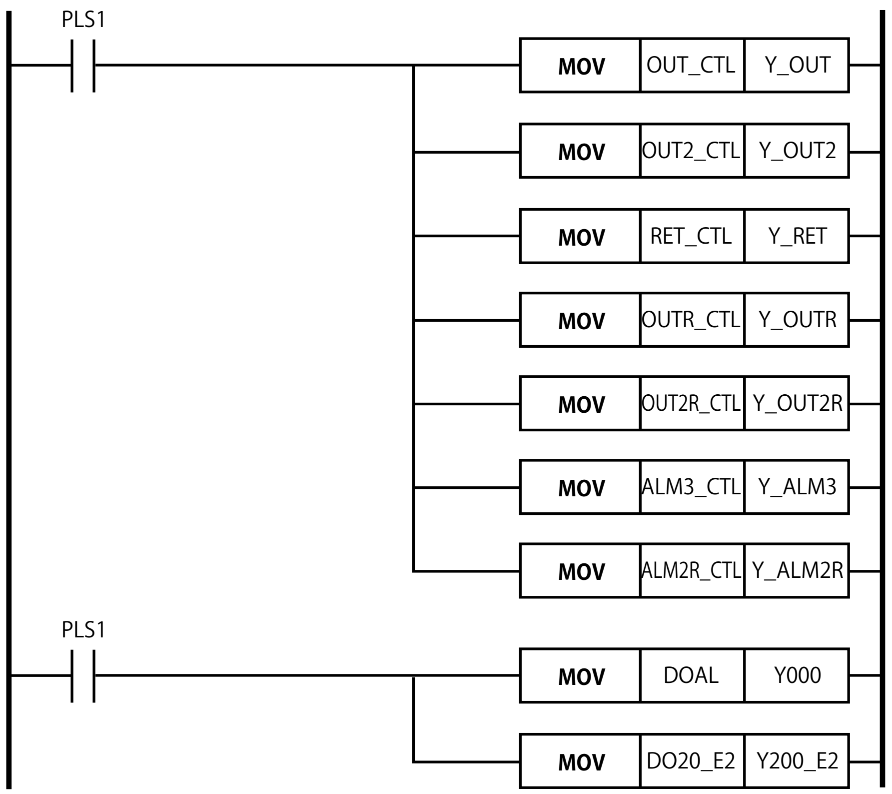
For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

Input registers	OUT_CTL, OUT2_CTL, RET_CTL, OUTR_CTL, OUT2R_CTL, ALM3_CTL, ALM2R_CTL, DOAL, DO20_E2
Output registers	Y_OUT, Y_OUT2, Y_RET, Y_OUTR, Y_OUT2R, Y_ALM3, Y_ALM2R, Y000, Y200_E2

For an explanation of the registers, see Section 4.2, Registers.

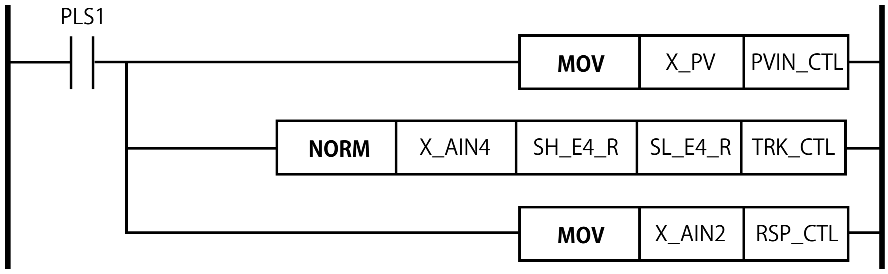


3.10.11 UT75A Cascade Primary-loop Control

Input ladder calculation program

Input registers	X_PV, X_AIN2, X_AIN4
Parameter registers	SH_E4_R, SL_E4_R
Output registers	PVIN_CTL, TRK_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

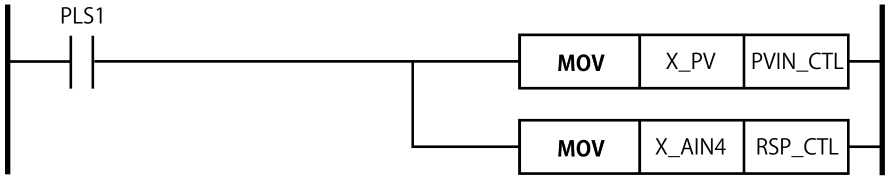
The output ladder calculation program is the same as that of UT75A Single-loop control.

3.10.12 UT75A Cascade Secondary-loop Control

Input ladder calculation program

Input registers	X_PV, X_AIN4
Output registers	PVIN_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

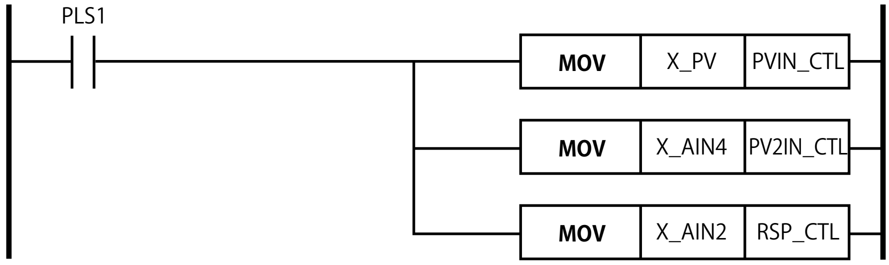
The output ladder calculation program is the same as that of UT75A Single-loop control.

3.10.13 UT75A Cascade Control

Input ladder calculation program

Input registers	X_PV, X_AIN2, X_AIN4
Output registers	PVIN_CTL, PVIN2_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

The output ladder calculation program is the same as that of UT75A Single-loop control.

3.10.14 UT75A Loop Control for Backup

Input ladder calculation program

The input ladder calculation program is the same as that of UT75A Cascade primary-loop control.

Output ladder calculation program

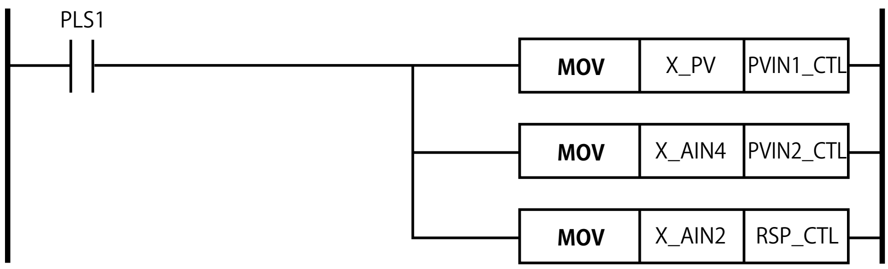
The output ladder calculation program is the same as that of UT75A Single-loop control.

3.10.15 UT75A Loop Control with PV Switching

Input ladder calculation program

Input registers	X_PV, X_AIN2, X_AIN4
Output registers	PVIN1_CTL, PVIN2_CTL, RSP_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

The output ladder calculation program is the same as that of UT75A Single-loop control.

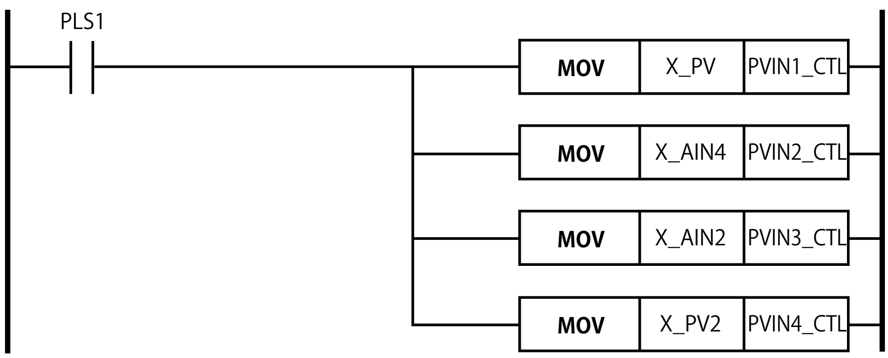
3.10.16 UT75A Loop Control with PV Auto-selector

Input ladder calculation program

Input registers	X_PV, X_PV2, X_AIN2, X_AIN4
Output registers	PVIN1_CTL, PVIN2_CTL, PVIN3_CTL, PVIN4_CTL

PVIN3_CTL and PVIN4_CTL can be used depending to the input numbers.

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

The output ladder calculation program is the same as that of UT75A Single loop control.

3.10.17 UT75A Loop Control with PV-hold Function

Input ladder calculation program

The input ladder calculation program is the same as that of UT75A Single-loop control.

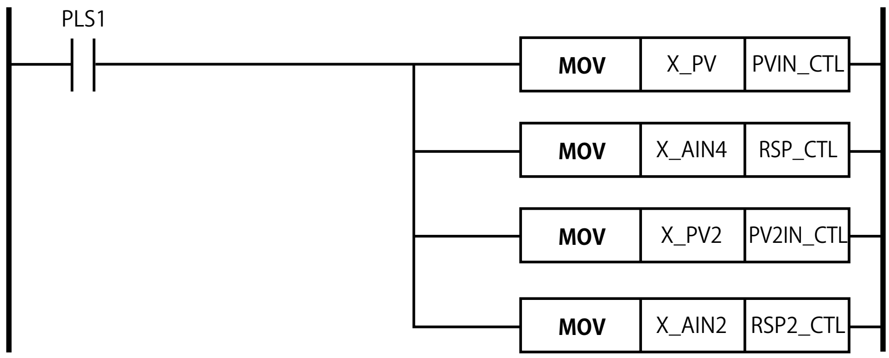
Output ladder calculation program

The output ladder calculation program is the same as that of UT75A Single-loop control.

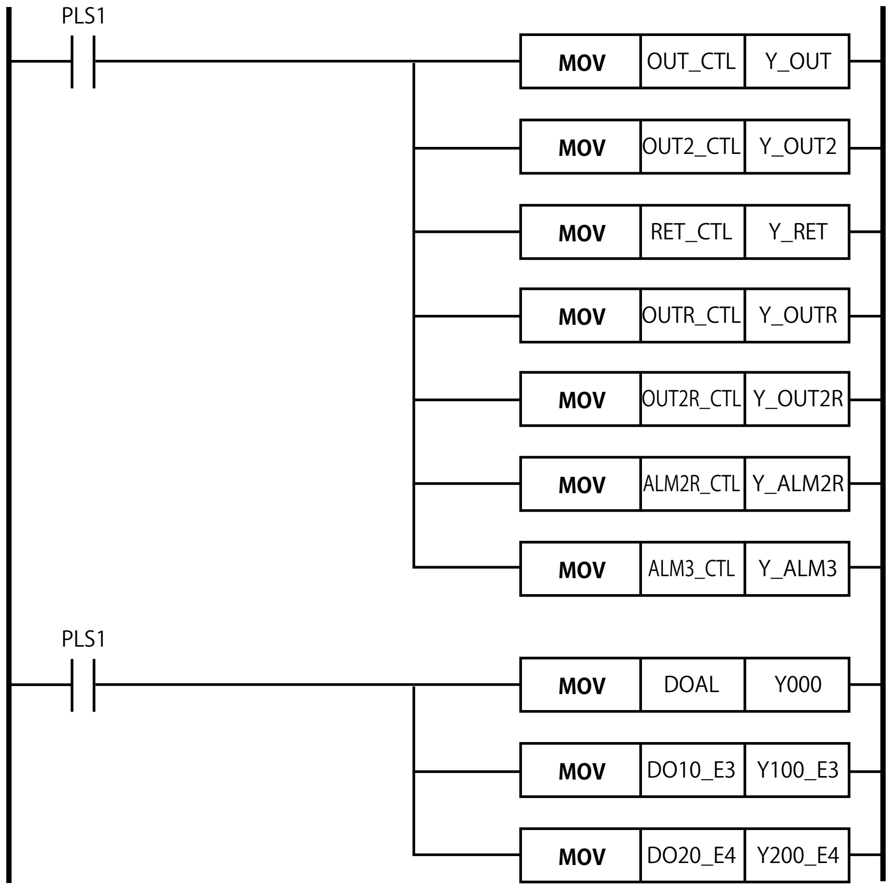
3.10.18 UT75A Dual-loop Control

Input ladder calculation program

Input registers	X_PV, X_PV2, X_AIN2, X_AIN4
Output registers	PVIN_CTL, RSP_CTL, PV2IN_CTL, RSP2_CTL



Output ladder calculation program



4.1 Basic Specifications

4.1.1 Control Period (Scan Time)

The control period is set using the parameter (SMP). The control period of UT35A/UT32A/UP35A is fixed to 200 ms. The control period functions in the set period irrespective of the ladder program capacity. The table below shows guidelines for the ladder program capacity (approximate average value) for each control period. The average of one ladder instruction is equivalent to four steps. In performing actual operations, check the load factor with the Monitor Ladder Program before using the ladder programs. The step count varies depending on the types of instructions used, parameter setting in the main unit, and control period. This step count includes the step count for the default ladder program.
The step count of the ladder program is the step count for Mnemonics into which the ladder program has been converted from a ladder diagram. For the number of steps of ladder instructions, see the lists of basic instructions and application instructions described later.

► Parameters: UT35A/UT32A Digital Indicating Controllers User's Manual or Operation Guide
► Parameters: UT55A/UT52A Digital Indicating Controllers User's Manual or Operation Guide
► Parameters: UT75A Digital Indicating Controllers User's Manual or Operation Guide
► Parameters: UP35A Program Controller User's Manual or Operation Guide
► Parameters: UP55A Program Controller User's Manual or Operation Guide
► Default ladder programs: Section 3.10, Default Ladder Programs

UT35A/UT32A/UP35A

Control period	Ladder program capacity (as a guide)
200 ms	300 steps

UT75A/UT55A/UT52A/UP55A

Control period	Ladder program capacity (as a guide)
50 ms *	100 steps
100 ms	200 steps
200 ms	400 steps

* Only for UT75A/UT55A/UT52A.

Max. Ladder Program Capacity

Model	Ladder program capacity (Max.)
UT35A/UT32A/UP35A	300 steps
UT55A/UT52A/UP55A	500 steps
UT75A	1000 steps

4.1.2 Number of Inputs/Outputs

The table below shows the maximum number of inputs/outputs, which varies depending on the model and suffix codes. See App.2, Input/Output Tables, of the each User's Manual.

		UT35A	UT32A	UT55A	UT52A	UT75A	UP55A	UP35A
Contact inputs	Standard model	Max. 7 points	Max. 4 points	Max. 9 points	Max. 5 points	Max. 13 points	Max. 8 points	Max. 9 points
	Detailed model	Max. 12 points	Max. 7 points	Max. 23 points	Max. 8 points	–	Max. 13 points	Max. 23 points
Contact outputs	Standard model	Max. 8 points	Max. 5 points	Max. 18 points	Max. 5 points	Max. 8 points	Max. 8 points	Max. 18 points
	Detailed model	Max. 13 points	Max. 8 points	Max. 23 points	Max. 8 points	–	Max. 13 points	Max. 23 points

* The number of contact outputs excludes control relays.

4.1.3 Types of Instructions

There are 13 types of basic instructions and 73 types of application instructions.
There are 15 types of basic instructions and 119 types of application instructions for UT75A.
For more information, see section 4.4 or later.

4.1.4 Sequence Devices

Device Type		Number of Points	Remarks
Contact inputs/outputs	Input relay (bit data)	See 4.1.2.	
	Output relay (bit data)		
Internal devices	M: relay (bit data)	256	Holding type/non-holding type
	DAT: register (floating point number)	28 or 58*	Holding type/non-holding type
	P: register (floating point number, held at power failure)	10 or 30*	Parameter settable
	K: register (floating point number)	30 or 50*	
Timers	Time-out relay (bit data)	4	
Timers with back-up	Time-out relay with back-up (bit data)	2*	
Counters	Count-out relay (bit data)	4	
Counters with back-up	Count-out relay with back-up (bit data)	2*	
Special devices	Relay (bit data)	12	
Registers	Process data, operation mode, parameter data, etc.	See Communication Interface User's Manual.	
Relays	Alarm status, alarm output status, key status, display status, events, etc.		

* UT75A only.

4.1.5 Operation Status

Whether or not to use the ladder sequence can be set.

When using the ladder sequence, there are four operation modes:

- L-STOP (No ladder program is run.)
- 1SCAN (The ladder program is run by one scan.)
- L-RUN (The ladder program is run.)
- L-RESET RUN (The main unit will perform the same operation as at power-on.)

These operation modes can be specified on the Monitor Ladder Program window.

► Monitor Ladder Program: Section 3.8, Monitoring a Ladder Program

4.1.6 Operation Conditions

The ladder programs run in all control modes (CTLM). UT35A/UT32A/UP35A does not have the parameter CTLM (Control mode.)

To use a ladder program, set the Ladder Sequence Function to "USE" on the System Data window.

4.1.7 Operation in Operation Mode L-RUN/L-STOP on the Monitor Ladder Program

When the operation mode is set to L-STOP on the Monitor Ladder Program, control computation and sequence control stop, the output is fixed to the value before stop, and input measurement is stopped.

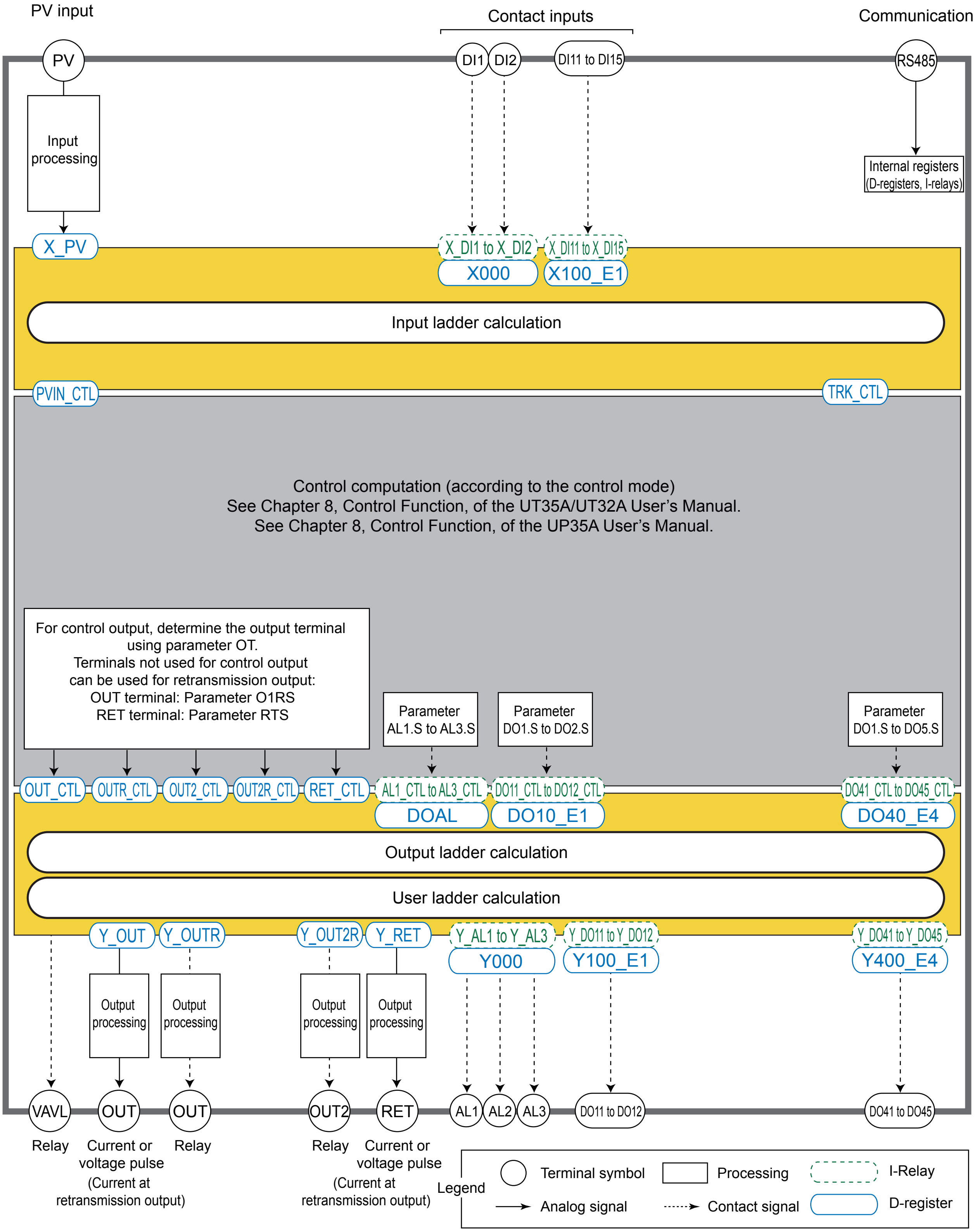
When ladder operation is executed by one scan, the input is measured during one scan and control computation and sequence calculation are made. The ladder operation then enters the L-STOP status.

If the Monitor Ladder Program is exited and the main unit's power is restarted, the timer's current value, etc. are initialized. The timer's current value, etc. will be held unless the main unit's power is restarted.

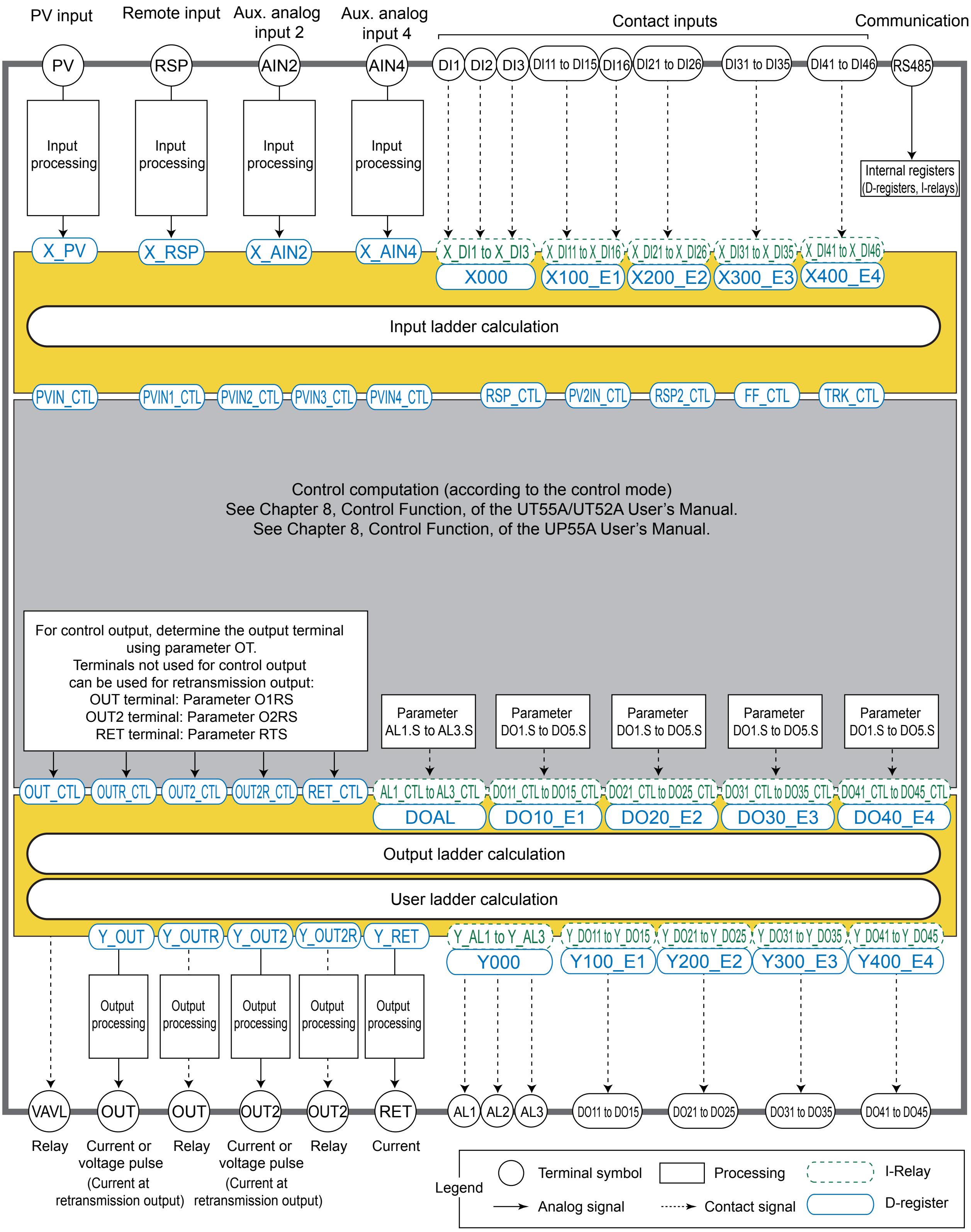
4.2 Registers

4.2.1 Input/Output Ladder Calculation Relays/Registers

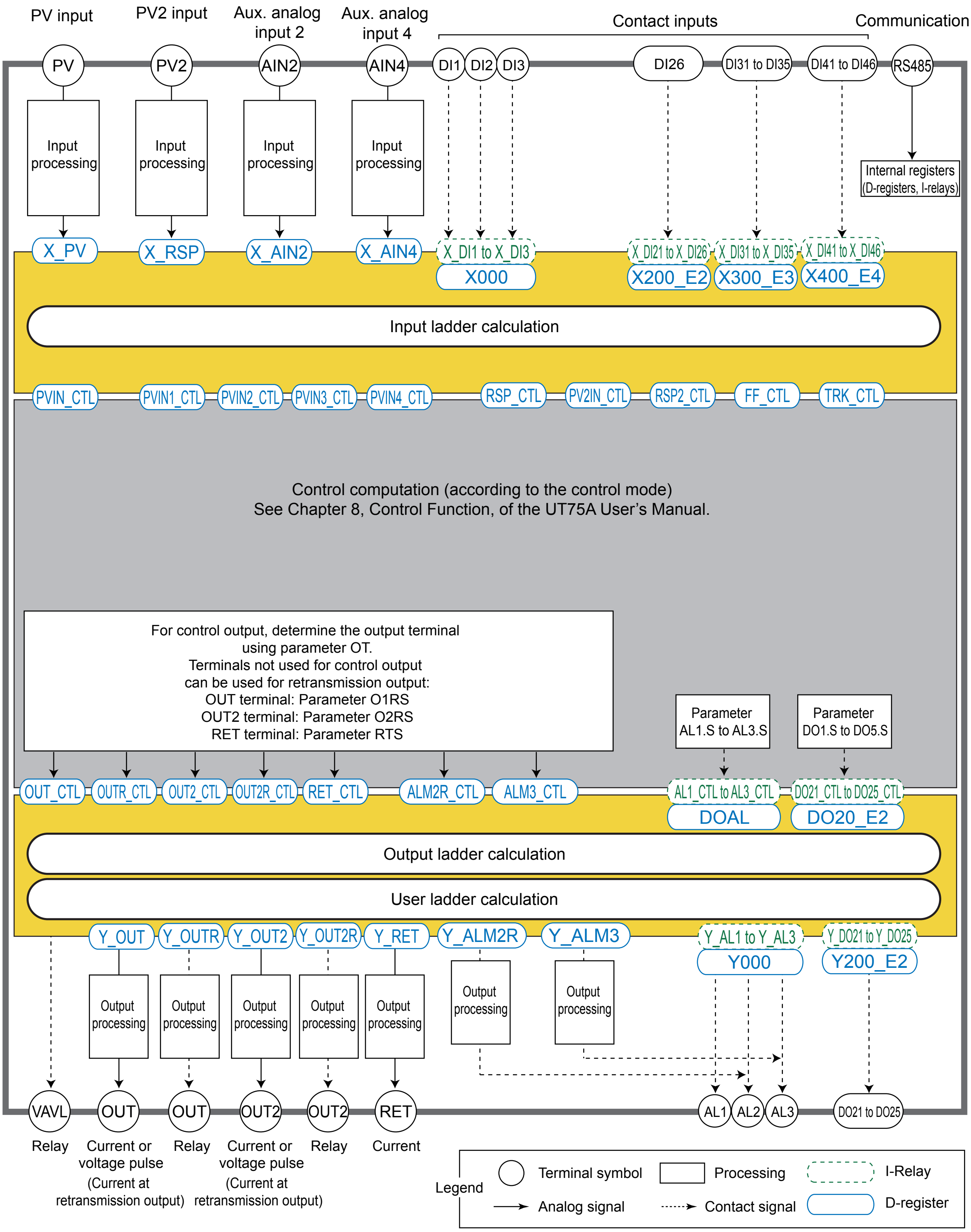
■ UT35A/UT32A/UP35A



■ UT55A/UT52A/UP55A



■ UT75A


PV input
PV2 input
Aux. analog input 2
Aux. analog input 4
Contact inputs
Communication
PV
PV2
AIN2
AIN4
DI1
DI2
DI3
DI26
DI31 to DI35
DI41 to DI46
RS485
Input processing
Internal registers (D-registers, I-relays)
X_PV
X_RSP
X_AIN2
X_AIN4
X_DI1 to X_DI3
X000
X_DI21 to X_DI26
X200_E2
X_DI31 to X_DI35
X300_E3
X_DI41 to X_DI46
X400_E4
Input ladder calculation
PVIN_CTL
PVIN1_CTL
PVIN2_CTL
PVIN3_CTL
PVIN4_CTL
RSP_CTL
PV2IN_CTL
RSP2_CTL
FF_CTL
TRK_CTL
Control computation (according to the control mode)
See Chapter 8, Control Function, of the UT75A User's Manual.
For control output, determine the output terminal using parameter OT.
Terminals not used for control output can be used for retransmission output:
OUT terminal: Parameter O1RS
OUT2 terminal: Parameter O2RS
RET terminal: Parameter RTS
Parameter AL1.S to AL3.S
Parameter DO1.S to DO5.S
OUT_CTL
OUTR_CTL
OUT2_CTL
OUT2R_CTL
RET_CTL
ALM2R_CTL
ALM3_CTL
AL1_CTL to AL3_CTL
DOAL
DO21_CTL to DO25_CTL
DO20_E2
Output ladder calculation
User ladder calculation
Y_OUT
Y_OUTR
Y_OUT2
Y_OUT2R
Y_RET
Y_ALM2R
Y_ALM3
Y_AL1 to Y_AL3
Y000
Y_DO21 to Y_DO25
Y200_E2
Output processing
VAVL
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
DO21 to DO25
Relay
Current or voltage pulse (Current at retransmission output)
Relay
Current or voltage pulse (Current at retransmission output)
Relay
Current
Legend
Terminal symbol
Processing
I-Relay
Analog signal
Contact signal
D-register

Input ladder calculation

Analog input registers (X_PV, X_RSP (X_PV2 in case of UT75A), X_AIN2, and X_AIN4) and input (status) relays (X_DI1 to X_DI3, X_DI11 to X_DI16, X_DI21 to X_DI26, X_DI31 to X_DI35, and X_DI41 to X_DI46) are captured to perform calculation in the input ladder calculation section. The calculated results are written into control input registers (PVIN_CTL, PVIN1_CTL, PVIN2_CTL, PVIN3_CTL, PVIN4_CTL, RSP_CTL, PV2IN_CTL, RSP2_CTL, FF_CTL, and TRK_CTL) and then passed to the control computation section.
Input (status) relays (X_DI1 to X_DI3, X_DI11 to X_DI16, X_DI21 to X_DI26, X_DI31 to X_DI35, and X_DI41 to X_DI46) are also stored in the input status registers (X000, X100_E1, X200_E2, X300_E3, and X400_E4).

Output ladder calculation

Control computation registers computed in the control computation section (OUT_CTL, OUTR_CTL, OUT2_CTL, OUT2R_CTL, RET_CTL, ALM2R_CTL*, and ALM3_CTL*), and control status registers (DOAL, DO10_E1, DO20_E2, DO30_E3, and DO40_E4) are captured to perform calculation in the output ladder calculation or user ladder calculation section. The calculated results are written into output registers (Y_OUT, Y_OUTR, Y_OUT2, Y_OUT2R, Y_RET, Y_ALM2R*, and Y_ALM3*), and output status registers (Y000, Y100_E1, Y200_E2, Y300_E3, and E400_E4) and then output to the terminals.
Control status registers are also stored in control (status) relays (AL1_CTL to AL3_CTL, DO11_CTL to DO45_CTL).
Output status registers are also stored in the output (status) relays (Y_AL1 to Y_AL3, Y_DO11 to Y_DO45).

* UT75A only.

User ladder calculation

It is recommended that the user ladder calculation section be used if a sequence is desired to be configured regardless of controller control computation.

As the initial status, the default ladder programs are described in the input ladder calculation and output ladder calculation sections on a control mode basis. No program is written in the user ladder calculation section.

► Default ladder programs: Section 3.10, Default Ladder Programs

Order of executing computation/calculation

The order of executing computation/calculation is as follows:

(1) Input ladder calculation
(2) Control computation
(3) Output ladder calculation
(4) User ladder calculation

Inputs/outputs differ depending on the model and suffix codes:

► Input/output: App.2, Input/Output Tables.

Input Ladder Calculation: Analog Input Registers (Read Only)

Position	Terminal Symbol	Register (16 bits)	Description
Standard terminal area	PV	X_PV	PV analog input
E1-terminal area	RSP	X_RSP	RSP analog input
E1-terminal area	PV2	X_PV2	PV2 analog input (for UT75A)
E2-terminal area	AIN2	X_AIN2	AIN2 aux. analog input
E4-terminal area	AIN4	X_AIN4	AIN4 aux. analog input

Registers can also be read in the output ladder calculation section or user ladder calculation section.

Data format

These registers handle analog inputs as values consisting of signed two-byte data of -19999 to 30000 including the decimal point position. They are range or scaling processed values (actual quantities).

Internal processing handles data as 4-byte floating-point numbers (IEEE 754 single-precision floating-point format).

Input Ladder Calculation: Input (Status) Relays/Input Status Registers (Read Only)

Position	Terminal Symbol	Relay (1 bit)	Status Register (16 bits)	Description
Standard terminal area	DI1	X_DI1	X000	DI1 status
	DI2	X_DI2		DI2 status
	DI3	X_DI3		DI3 status
E1-terminal area	DI11	X_DI11	X100_E1	DI11 status
	DI12	X_DI12		DI12 status
	DI13	X_DI13		DI13 status
	DI14	X_DI14		DI14 status
	DI15	X_DI15		DI15 status
	DI16	X_DI16		DI16 status
E2-terminal area	DI21	X_DI21	X200_E2	DI21 status
	DI22	X_DI22		DI22 status
	DI23	X_DI23		DI23 status
	DI24	X_DI24		DI24 status
	DI25	X_DI25		DI25 status
	DI26	X_DI26		DI26 status
E3-terminal area	DI31	X_DI31	X300_E3	DI31 status
	DI32	X_DI32		DI32 status
	DI33	X_DI33		DI33 status
	DI34	X_DI34		DI34 status
	DI35	X_DI35		DI35 status
E4-terminal area	DI41	X_DI41	X400_E4	DI41 status
	DI42	X_DI42		DI42 status
	DI43	X_DI43		DI43 status
	DI44	X_DI44		DI44 status
	DI45	X_DI45		DI45 status
	DI46	X_DI46		DI46 status

Relays/status registers can also be read in the output ladder calculation section or user ladder calculation section.

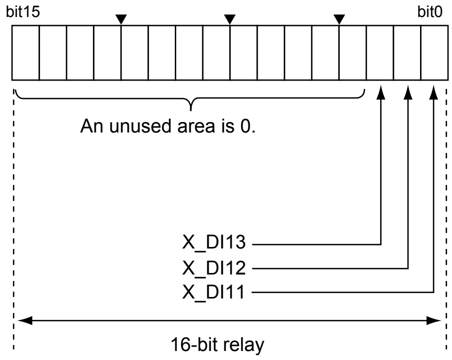
Data format

- Input ladder calculation Relays: 0 or 1
- Input ladder calculation Status registers: Unsigned 16-bit integers

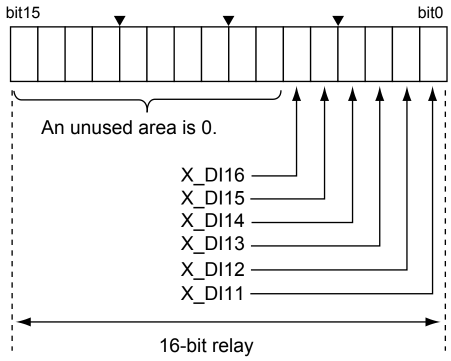
Note

When the contact input status is used in the ladder, deactivate the contact input function (STOP/RUN switch, AUTO/MAN switch, etc.) using the main main unit's parameter.
Check the parameter settings belonging to the setup parameter menu DI.SL (DI function registration menu) or DI.NU (DI function numbering menu).

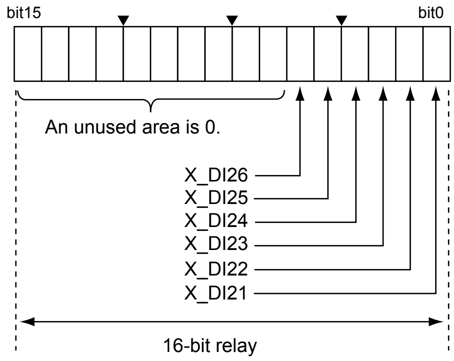
Status register: X000



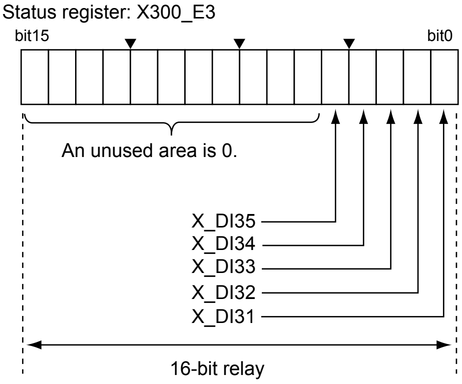
Status register: X100_E1



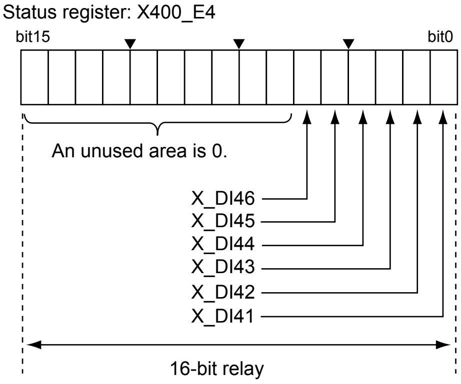
Status register: X200_E2



Status register: X300_E3



Status register: X400_E4



Input Ladder Calculation: Control Input Registers (Read/Write)

Register (16 bits)	Description
PVIN_CTL	Control PV input (in controls other than Loop control with PV switching or Loop control with PV auto-selector)
PVIN1_CTL	Control PV input 1 (in Loop control with PV switching or Loop control with PV auto-selector)
PVIN2_CTL	Control PV input 2 (in Loop control with PV auto-selector or Loop control with PV switching)
PVIN3_CTL	Control PV input 3 (in Loop control with PV auto-selector)
PVIN4_CTL	Control PV input 4 (in Loop control with PV auto-selector)
PV2IN_CTL	Control PV2 input (in Cascade control)
RSP_CTL	Control RSP input
RSP2_CTL	Control RSP2 input (in Cascade control)
TRK_CTL	Control tracking input (except for Cascade control)
FF_CTL	Control feedforward input (in Single-loop control or Loop control with PV-hold function)

Registers can also be read in the output ladder calculation section or user ladder calculation section.

Data format

These registers handle calculated results as values consisting of signed two-byte data of -19999 to 30000 including the decimal point position.

Internal processing handles data as 4-byte floating-point numbers (IEEE 754 single-precision floating-point format).

Output Ladder Calculation: Control Computation Registers (Read Only)

Register (16 bits)	Description
OUT_CTL	Control OUT output (current and voltage pulses)
OUTR_CTL	Control OUT output (relays)
OUT2_CTL	Control OUT2 output (current and voltage pulses)
OUT2R_CTL	Control OUT2 output (relays)
RET_CTL	Control RET output (current)
ALM2R_CTL	Control ALM2 output (relays)
ALM3_CTL	Control ALM3 output (relays)

Registers can also be read in the input ladder calculation section or user ladder calculation section.

Data format

These registers handle computed data as values consisting of signed two-byte data of -19999 to 30000 including the decimal point position.

Scaling

Internal processing handles data as 4-byte floating-point numbers (IEEE 754 single-precision floating-point format).

Output Ladder Calculation: Control (Status) Relays/Control Status Registers (Read Only)

Relay (1 bit)	Status Register (16 bits)	Description	
AL1_CTL	DOAL	Control AL1 status	Function set using parameter AL1.S
AL2_CTL		Control AL2 status	Function set using parameter AL2.S
AL3_CTL		Control AL3 status	Function set using parameter AL3.S
DO11_CTL	DO10_E1	Control DO11 status	Function set using parameter DO1.S
DO12_CTL		Control DO12 status	Function set using parameter DO2.S
DO13_CTL		Control DO13 status	Function set using parameter DO3.S
DO14_CTL		Control DO14 status	Function set using parameter DO4.S
DO15_CTL		Control DO15 status	Function set using parameter DO5.S
DO21_CTL	DO20_E2	Control DO21 status	Function set using parameter DO1.S
DO22_CTL		Control DO22 status	Function set using parameter DO2.S
DO23_CTL		Control DO23 status	Function set using parameter DO3.S
DO24_CTL		Control DO24 status	Function set using parameter DO4.S
DO25_CTL		Control DO25 status	Function set using parameter DO5.S
DO31_CTL	DO30_E3	Control DO31 status	Function set using parameter DO1.S
DO32_CTL		Control DO32 status	Function set using parameter DO2.S
DO33_CTL		Control DO33 status	Function set using parameter DO3.S
DO34_CTL		Control DO34 status	Function set using parameter DO4.S
DO35_CTL		Control DO35 status	Function set using parameter DO5.S
DO41_CTL	DO40_E4	Control DO41 status	Function set using parameter DO1.S
DO42_CTL		Control DO42 status	Function set using parameter DO2.S
DO43_CTL		Control DO43 status	Function set using parameter DO3.S
DO44_CTL		Control DO44 status	Function set using parameter DO4.S
DO45_CTL		Control DO45 status	Function set using parameter DO5.S

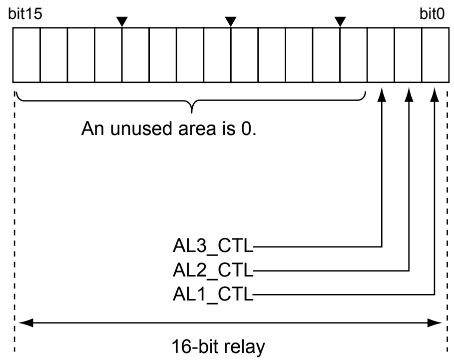
Relays/status registers can also be read in the input ladder calculation section or user ladder calculation section.

► Parameters: UT35A/UT32A Digital Indicating Controllers User's Manual or Operation Guide, UT55A/UT52A Digital Indicating Controllers User's Manual or Operation Guide, UT75A Digital Indicating Controllers User's Manual or Operation Guide, UP55A Program Controller User's Manual or Operation Guide, or UP35A Program Controller User's Manual or Operation Guide

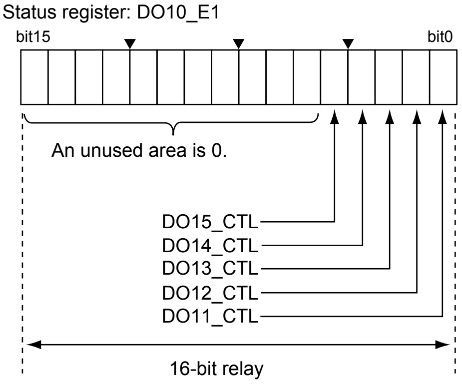
Data format

- Output ladder calculation Relays: 0 or 1
  Internal processing handles a value of less than 0.5 as “0” and a value of 0.5 or more as “1.” This is internal processing used for transferring register data to relays, etc.
- Output ladder calculation Status registers: Unsigned 16-bit integers

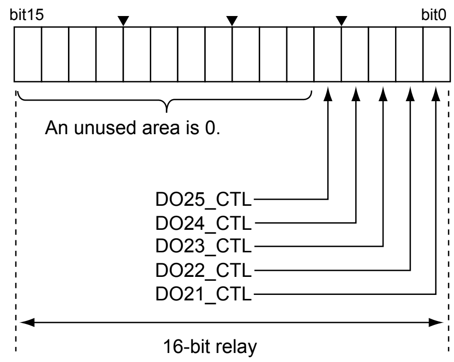
Status register: DOAL



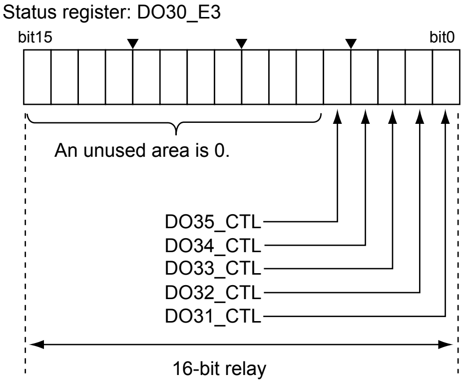
Status register: DO10_E1



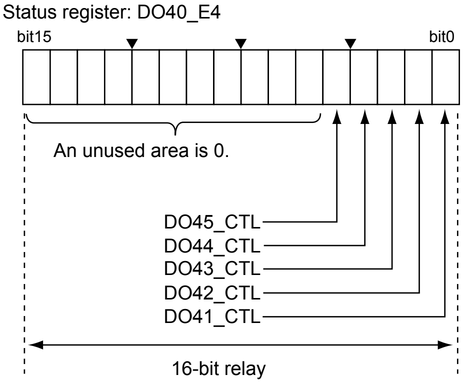
Status register: DO20_E2



Status register: DO30_E3



Status register: DO40_E4



The default ladder programs transfer control status registers in the output ladder calculation section to the output status registers collectively.

	Control Status Registers	Output Status Registers
AL1 to AL3 status outputs	**DOAL**	**Y000**
DO11 to DO15 status outputs	**DO10_E1**	**Y100_E1**
DO21 to DO25 status outputs	**DO20_E2**	**Y200_E2**
DO31 to DO35 status outputs	**DO30_E3**	**Y300_E3**
DO41 to DO45 status outputs	**DO40_E4**	**Y400_E4**

► Default ladder programs: Section 3.10, Default Ladder Programs

Leaving the default ladder programs as is and describing a ladder program desired to be computed after the default ladder programs causes data to be overwritten and executed.

Output Ladder Calculation: Output Registers (Read/Write)

Position	Terminal Symbol	Register (16 bits)	Description
Standard terminal area	OUT	Y_OUT	OUT control output (current and voltage pulses)
	OUT	Y_OUTR	OUTR control output (relays)
	OUT2	Y_OUT2	OUT2 control output (current and voltage pulses)
	OUT2	Y_OUT2R	OUT2R control output (relays)
	RET	Y_RET	RET retransmission output (current)
	AL2	Y_ALM2R	ALM2 control output (relays)*
	AL3	Y_ALM3	ALM3 control output (relays)*

Registers can also be read/write in the input ladder calculation section or user ladder calculation section.

* UT75A only.

Data format

These registers handle calculated results as values consisting of signed two-byte data of -19999 to 30000 including the decimal point position.

Output data is -5.0 to 105.0% data; the range of data that can be actually handled is from -50 to 1050.

Internal processing handles data as 4-byte floating-point numbers (IEEE 754 single-precision floating-point format).

Output Ladder Calculation: Output (Status) Relays/Output Status Registers (Read/Write)

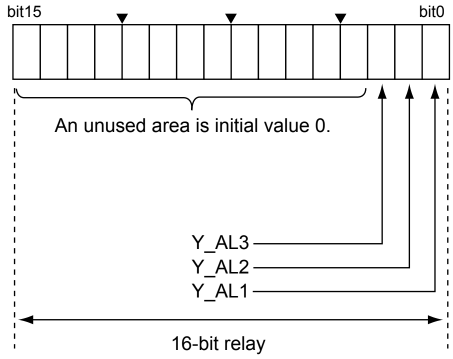
Position	Terminal Symbol	Relay (1 bit)	Status Register (16 bits)	Description
Standard terminal area	AL1	Y_AL1	Y000	AL1 status
	AL2	Y_AL2		AL2 status
	AL3	Y_AL3		AL3 status
E1-terminal area	DO11	Y_DO11	Y100_E1	DO11 status
	DO12	Y_DO12		DO12 status
	DO13	Y_DO13		DO13 status
	DO14	Y_DO14		DO14 status
	DO15	Y_DO15		DO15 status
E2-terminal area	DO21	Y_DO21	Y200_E2	DO21 status
	DO22	Y_DO22		DO22 status
	DO23	Y_DO23		DO23 status
	DO24	Y_DO24		DO24 status
	DO25	Y_DO25		DO25 status
E3-terminal area	DO31	Y_DO31	Y300_E3	DO31 status
	DO32	Y_DO32		DO32 status
	DO33	Y_DO33		DO33 status
	DO34	Y_DO34		DO34 status
	DO35	Y_DO35		DO35 status
E4-terminal area	DO41	Y_DO41	Y400_E4	DO41 status
	DO42	Y_DO42		DO42 status
	DO43	Y_DO43		DO43 status
	DO44	Y_DO44		DO44 status
	DO45	Y_DO45		DO45 status

Relays/status registers can also be read/write in the input ladder calculation section or user ladder calculation section.

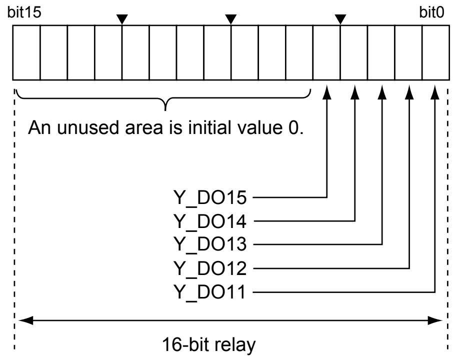
Data format

- Output ladder calculation Relays: 0 or 1
  Internal processing handles a value of less than 0.5 as "0" and a value of 0.5 or more as "1." This is internal processing used for transferring register data to relays, etc.
- Output ladder calculation Status registers: Unsigned 16-bit integers

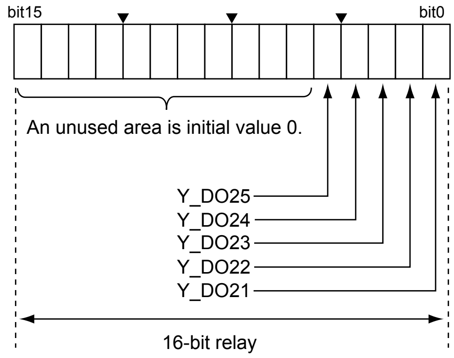
Status register: Y000



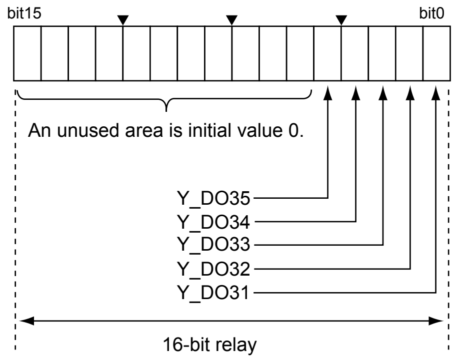
Status register: Y100_E1



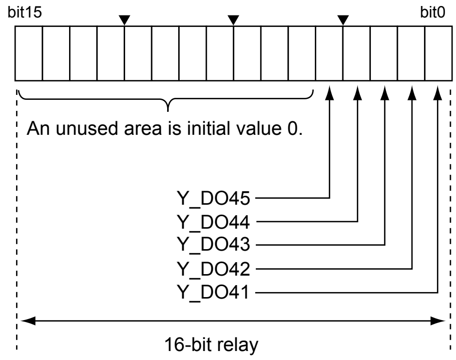
Status register: Y200_E2



Status register: Y300_E3



Status register: Y400_E4



Note

- The presence/absence of inputs/outputs differs depending on the model and suffix codes. See App.2, Input/Output Tables.
- For function registers other than the input/output registers, see the "UTAdvanced Series Communication Interface User's Manual."

Note

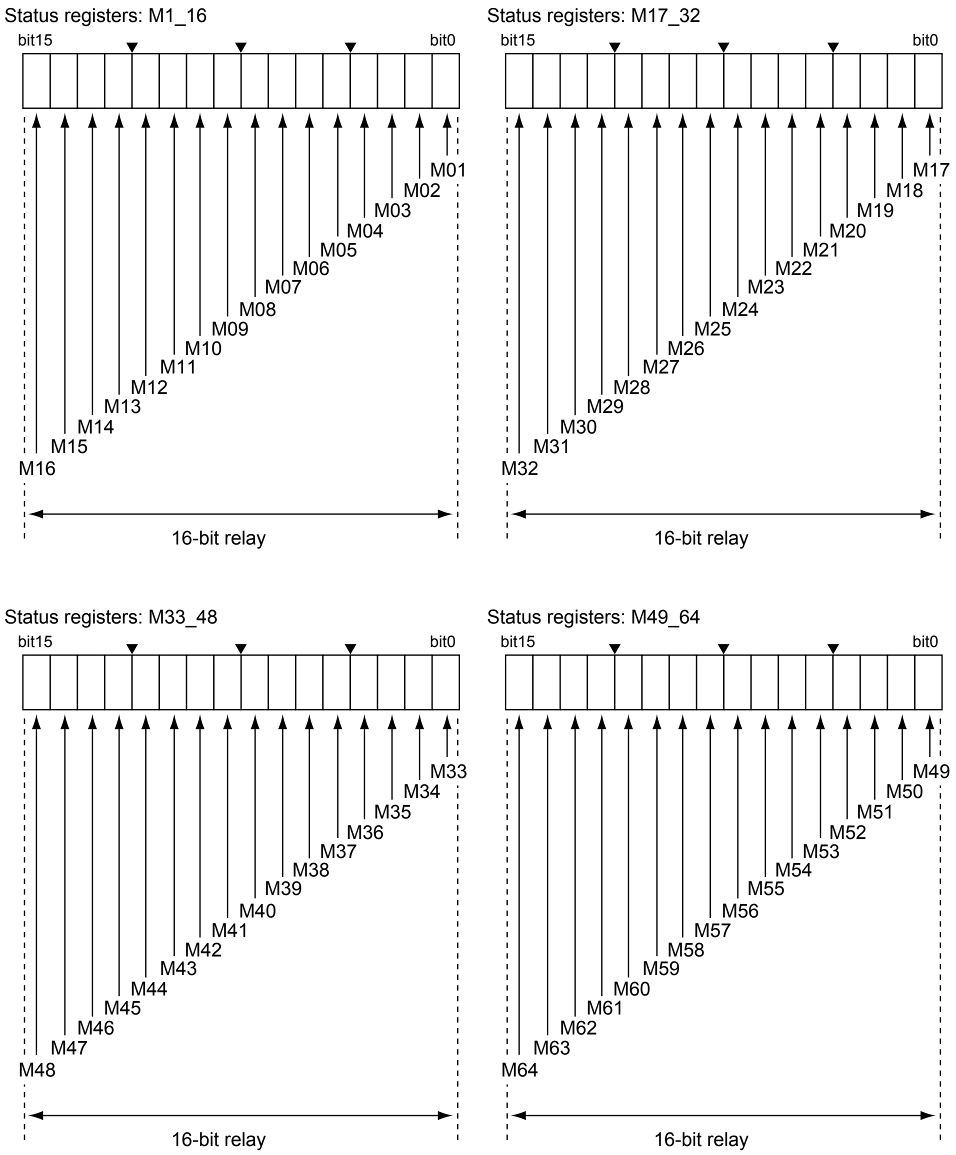
The contact output links the event display. When the contact output is changed in a ladder program, check the event display settings (parameters EV1 to EV8).

4.2.2 Internal Devices (Read/Write)

<table>
<tr><th>Device Name</th><th>Relay/Register</th><th>Data Format</th><th>Remarks</th></tr>
<tr><td rowspan="3">Internal (M) relays</td><td>M01 to M128</td><td>0 or 1
Internal processing handles a value of less than 0.5 as “0” and a value of 0.5 or more as “1.”
M1_16: status registers of M01 to M16 relays
M17_32: status registers of M17 to M32 relays
M33_48: status registers of M33 to M48 relays
M49_64: status registers of M49 to M64 relays
M65_80: status registers of M65 to M80 relays
M81_96: status registers of M81 to M96 relays
M97_112: status registers of M97 to M112 relays
M113_128: status registers of M113 to M128 relays</td><td>Non-holding type</td></tr>
<tr><td>M01_B to M32_B</td><td>0 or 1
Internal processing handles a value of less than 0.5 as “0” and a value of 0.5 or more as “1.”
M1_16_B: status registers of M01_B to M16_B relays
M17_32_B: status registers of M17_B to M32_B relays</td><td>Holding type</td></tr>
<tr><td>M33_B to M128_B</td><td>0 or 1
Internal processing handles a value of less than 0.5 as “0” and a value of 0.5 or more as “1.”
M33_48_B: status registers of M33_B to M48_B relays
M49_64_B: status registers of M49_B to M64_B relays
M65_80_B: status registers of M65_B to M80_B relays
M81_96_B: status registers of M81_B to M96_B relays
M97_112_B: status registers of M97_B to M112_B relays
M113_128_B: status registers of M113_B to M128_B relays</td><td>Holding type
However, when the control period is 50ms, the data is non-holding type.</td></tr>
<tr><td rowspan="2">DAT registers</td><td>DAT01 to DAT20 (DAT01 to DAT50 in case of UT75A)</td><td rowspan="2">Handles data as 4-byte floating-point numbers (IEEE 754 single-precision floating-point format).</td><td>Non-holding type</td></tr>
<tr><td>DAT01_B to DAT08_B</td><td>Holding type
However, when the control period is 50ms, the data is non-holding type.</td></tr>
<tr><td>P-registers</td><td>P01 to P10 (P01 to P30 in case of UT75A)</td><td>Handles 2-byte integer ranging from -19999 to 30000 and the decimal point position.</td><td>Holding type, parameter setting
P-registers are the same as P-parameters displayed on the main unit.</td></tr>
</table>

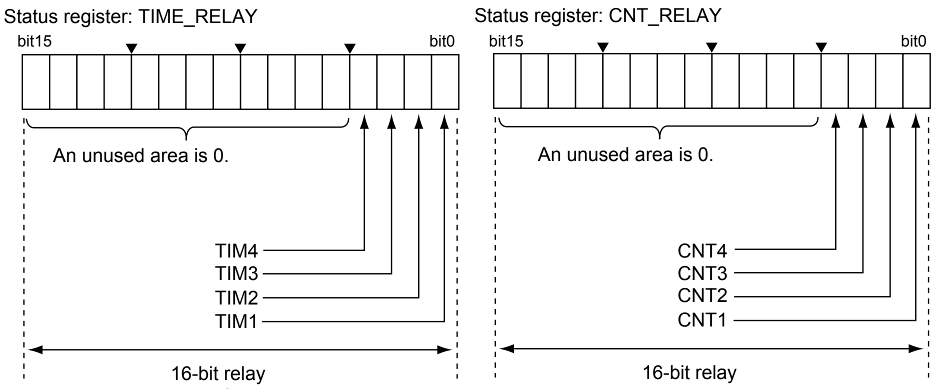
Device Name	Relay/Register	Data Format	Remarks
K-registers	**K01** to **K30** **(K01** to **K50 in case of UT75A)**	K01 to K20, K31 to K50: Handles 2-byte integer ranging from -32768 to 32767 and the decimal point position. K21 to K30: Handles 2-byte integer ranging from 0 to 65535 and the decimal point position.	Holding type In the ladder program, do not write to K-registers. K-register constants can be set by clicking on [Tools] – [Set Constant] in the menu when the Ladder Program Building window is being displayed.
Constant registers	**C_1**	Constant -1 (unsigned 2-byte integer)	Fixed values. Write disabled.
	C0	Constant 0 (unsigned 2-byte integer)	
	C1	Constant 1 (unsigned 2-byte integer)	
	C2	Constant 2 (unsigned 2-byte integer)	
	C3	Constant 3 (unsigned 2-byte integer)	
	C4	Constant 4 (unsigned 2-byte integer)	
	C5	Constant 5 (unsigned 2-byte integer)	
	C10	Constant 10 (unsigned 2-byte integer)	
	C50	Constant 50 (unsigned 2-byte integer)	
	C60	Constant 60 (unsigned 2-byte integer)	
	C100	Constant 100 (unsigned 2-byte integer)	
	C1000	Constant 1000 (unsigned 2-byte integer)	
	C10000	Constant 10000 (unsigned 2-byte integer)	
Time-out relays	**TIM1** to **TIM4**	"1" at time-out or "0" at reset TIM_RELAY: status registers of TIM1 to TIM4 relays	Used by a timer instruction. Write disabled.
	TIM1_B to **TIM2_B**	(UT75A only.) "1" at time-out or "0" at reset TIM_RELAY_B: status registers of TIM1_B to TIM2_B relays	
Count-out relays	**CNT1** to **CNT4**	"1" at count-out or "0" at reset CNT1 to CNT4: status registers of CNT_RELAY relays	Used by a counter instruction. Write disabled.
	CNT1_B to **CNT2_B**	(UT75A only.) "1" at count-out or "0" at reset CNT1_B to CNT2_B: status registers of CNT_RELAY_B relays	

Internal relays



Bits M65 to M128 are also arranged in the status registers in the same way.

Time-out relay and count-out relay



TIM_RELAY_B, CNT_RELAY_B: UT75A only.

No power failure is detected in the following cases, and the unit maintains normal operations.

- A momentary power failure of 20 ms or less in the case of 100 – 240 V AC
- A momentary power failure of 1 ms in the case of 24 V AC/DC

In case of a power failure, the timer and counter will be initialized.

4.2.3 Parameter Registers and Status Relays (Read/Write)

Parameter registers contain main unit's target setpoints, alarm setpoints, etc. Parameter register data is 16-bit integers.

Registers are provided for process data and operation modes in addition to parameters.

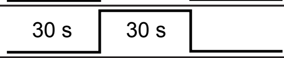
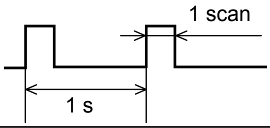
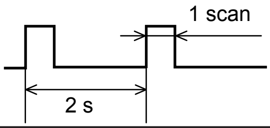
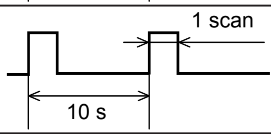
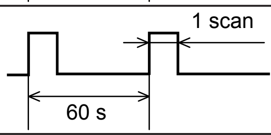
Relays are provided for the alarm statuses, operation modes, bar graphs, events, etc.

► Parameter Registers: UTAdvanced Series Communication Interface User's Manual

Note

In the ladder programs, read/write of setup parameter data is impossible. However, the range, decimal point position, and scale of each analog input can be read only. (D registers D7501 to 7539)

4.2.4 Special Relays (Read Only)

Special Relay	Action	
PON	Activates a device for control period at power-on, reset start (L-RESET RUN), download the ladder program, or change of each input type and control period.	
PLS1	Always ON	
ZERO	Always OFF	
SMPCLK	Control period clock	
CLK1	1-second clock	
CLK2	2-second clock	
CLK10	10-second clock	
CLK60	60-second clock	
CLK1P	1-second clock pulse	
CLK2P	2-second clock pulse	
CLK10P	10-second clock pulse	
CLK60P	60-second clock pulse	

Data format

0 or 1

Internal processing handles a value of less than 0.5 as “0” and a value of 0.5 or more as “1.”

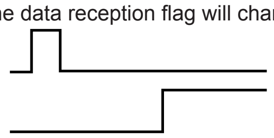
4.2.5 Registers/Relays for Peer-to-peer Communication (Read/Write)

Device Name	Address	Data Format
Analog input registers for peer-to-peer communication	CX01 to CX16	Handles data as 4-byte floating-point numbers (IEEE 754 single-precision floating-point format).
Analog output registers for peer-to-peer communication	CY01 to CY04	
Status input relays for peer-to-peer communication	CI01 to CI64	0 or 1 Internal processing handles a value of less than 0.5 as “0” and a value of 0.5 or more as “1.”
Status output relays for peer-to-peer communication	CO1 to CO16	
Reception time-out flag for peer-to-peer communication	CF01 to CF04	0 (normal) or 1 (error)
End of data reception flag for peer-to-peer communication	CE01 to CE04	0 (during reception) or 1 (end of reception) (*1)

*1: The data reception flag will change from 0 to 1 after the PON relay is turned on.

PON

CE01

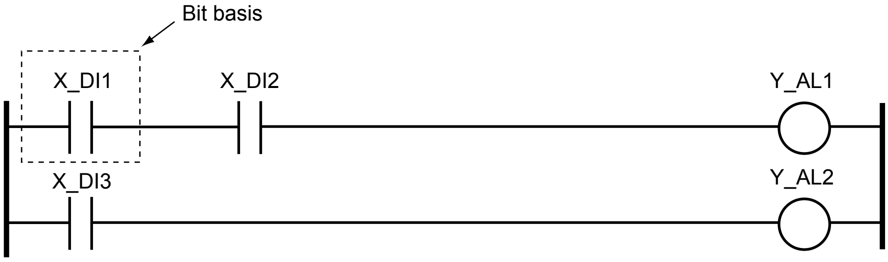


4.3 Data Format

This section gives an overview of the instructions. For more details, see sections 4.4 and 4.5.

4.3.1 Relay (Bit) Processing

Bit processing refers to processing that is performed when a bit device is specified in a basic instruction. It is executed in bits.



Type	Display Data	Internal Processing Data
Relay	0 or 1	Floating point number (Float)

4.3.2 Data (Register) Processing

Data processing refers to the processing of registers whose data is computed in 16-bit integers or in floating-point numbers.

Type	Display Data	Internal Processing Data
D-register	Signed 16-bit integer	Floating point number (Float)
Status register	Unsigned 16-bit integer	Unsigned 16-bit integer
DAT register	Floating point number (Float)	Floating point number (Float)

D-registers

Contain parameter data or process data. In the ladder programs, D-register data is handled as signed 16-bit integers (-19999 to 31500). In internal processing, it is handled as 4-byte floating-point numbers.
P-registers and K-registers are also in the same data format as D-registers.
Transfer source data is restricted according to the data format of the storage destination in case of using a transfer instruction, etc., so check and use the data format of the storage destination.

► D-Registers: UTAdvanced Series Communication Interface User's Manual

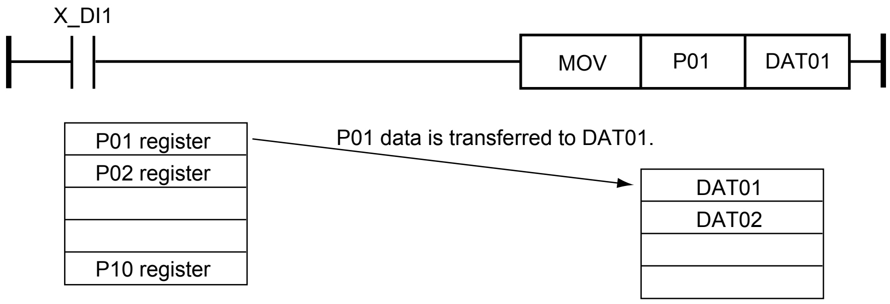
Status registers

M1_16 (status registers of internal relays M01 to M16), M17_32 (status registers of internal relays M17 to M32), M33_48 (status registers of internal relays M33 to M48), and M49_64 (status registers of internal relays M49 to M64)
These status registers are used to capture the statuses of contact inputs, etc. in 16 bits or to output the bit-basis ladder calculation results in 16 bits.

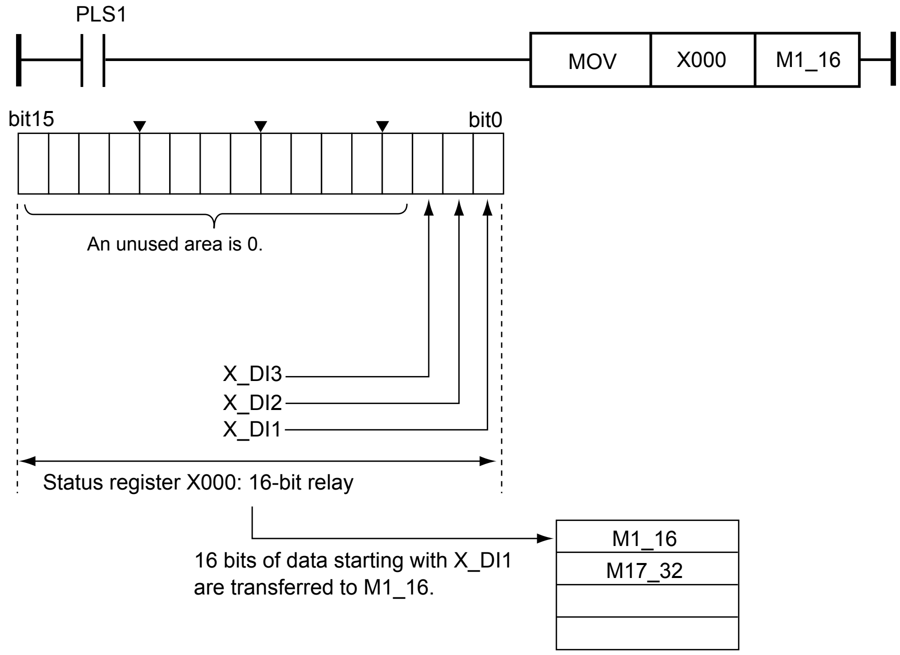
DAT registers

These registers are temporary registers used to store data during calculations. The Monitor Ladder Program window enables data to be monitored in floating-point numbers.

■ Data register processing

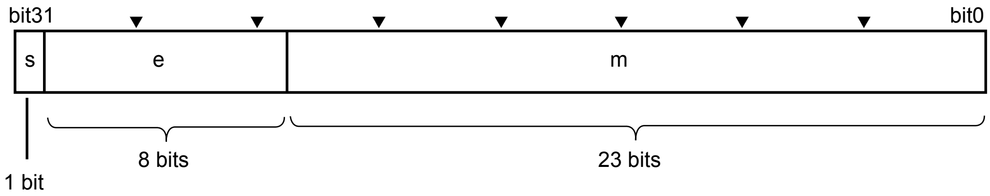


■ Status register processing



4.3.3 Floating Point Processing (Float)

Floating point data is represented by the IEEE 754 single-precision floating-point number format shown below. The DAT registers are represented by floating-point numbers.



s: sign specification (1 bit) (0: +, 1: –)
e: exponential specification (8 bits)
m: argument specification (23 bits)

(1) When $e \neq 0$, $r = (-1)^s \times 1.m \times 2^{e-127}$
(2) When e = 0, m = 0 and r = 0 (0 for all bits, indicating a numerical value “0”)

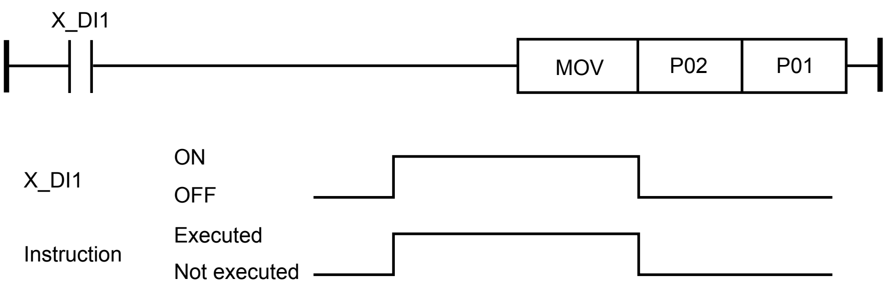
When a floating point data is stored in a short integer, the integer which rounded off below the decimal point is stored. For example, "1234.5f will be 1235.
It is displayed in the form of ***E-** on the Monitor Register or Monitor Ladder Program window. For a tool tip (placing the mouse on a register), it is displayed as *******E-**.

4.3.4 Execution-while-ON Instructions and Input Differential Instructions

There are execution-while-ON and input differential types in application instructions.

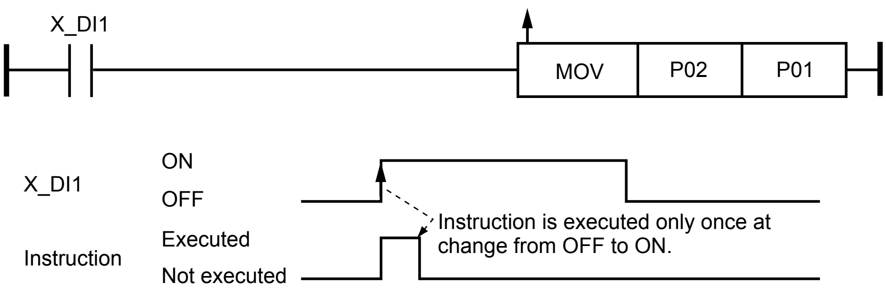
Execution-while-ON type

An instruction is executed for each scan while the execution condition of the application instruction is ON.



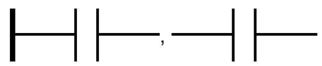
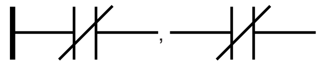
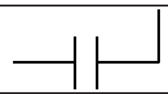
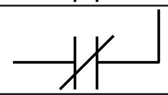
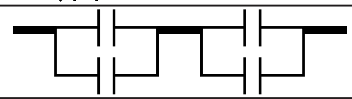
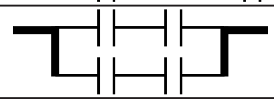
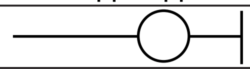
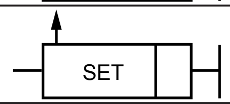
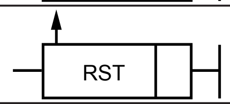
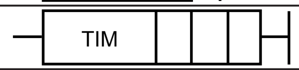
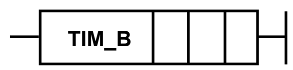
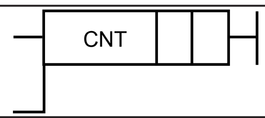
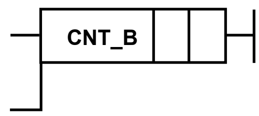
Input differential type

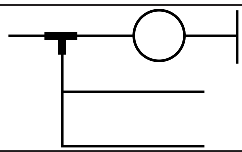
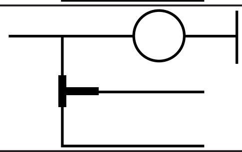
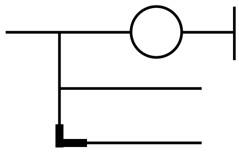
An instruction is executed only once when the execution condition of the application instruction changes from OFF to ON.
When you want to execute an instruction only for one scan, using this type of instruction conserves programs and shortens scan time because no input circuit needs to be configured in a differential instruction.



4.4 List of Instructions

4.4.1 List of Basic Instructions

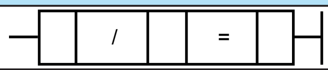
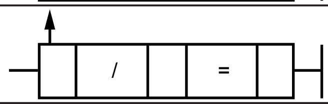
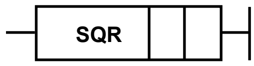
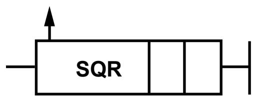
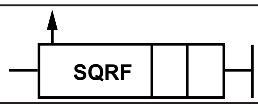
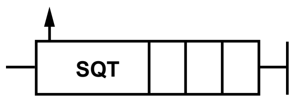
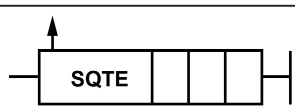
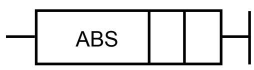
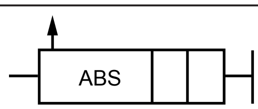
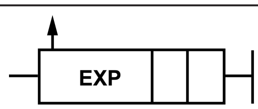
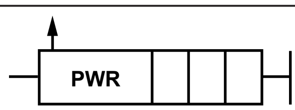
Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Load, And	LD, AND	√	1		Starts logic ("a" contact) Performs connection in logical AND ("a" contact in series).
Load Not, And Not	LDN, ANDN	√	1		Starts logical NOT ("b" contact). Performs connection in NAND ("b" contact in series).
Or	OR	√	1		Performs connection in logical OR ("a" contact in parallel).
Or Not	ORN	√	1		Performs connection in NOR ("b" contact in parallel).
And Load	ANDLD	*1	1		Executes logical AND between circuit elements.
Or Load	ORLD	*1	1		Executes logical OR between circuit elements.
Out	OUT	√	1		Outputs the previous calculation result.
Set	SET	√	1		Activates a specified device when input is ON.
	E_SET	√	1		Activates a specified device when an input changes from OFF to ON.
Reset	RST	√	1		Deactivates a specified device when input is ON.
	E_RST	√	1		Deactivates a specified device when an input changes from OFF to ON.
Timer	TIM	√	4		Performs a synchronous backward timer action.
Timer with back-up	TIM_B	√ (UT75A only)	4		Performs a synchronous backward timer action. The timer value is held even if the power is turned off. When recovered, the timer starts from the held value.
Counter	CNT	√	3		Performs a backward counter action.
Counter with back-up	CNT_B	√ (UT75A only)	3		Performs a backward counter action. The counter value is held even if the power is turned off. When recovered, the counter starts from the held value.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Differential Up	DIFU	√	1		Activates a device only for one scan when an input signal changes from OFF to ON.
Differential Down	DIFD	√	1		Activates a device only for one scan when an input signal changes from ON to OFF.
Push	PUSH	*1	1		Stores the calculation result (ON/OFF) obtained immediately before a Push.
Stack Read	STCRD	*1	1		Reads out the calculation result stored by Push and passes it to the next calculation processing.
Pop	POP	*1	1		Reads out the calculation result stored by Push and passes it to the next calculation processing. In addition, it clears the calculation result stored by Push.
End	-	*1	4	-	Indicates the exit of the input ladder calculation.

√: Visible
*1: Automatically appended when a ladder program is created.

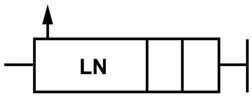
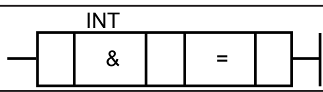
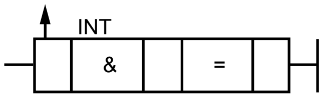
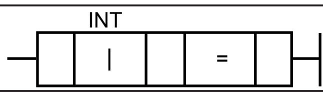
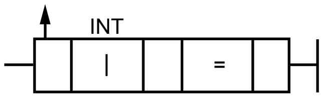
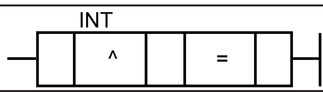
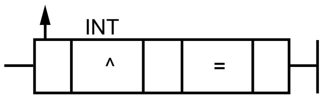
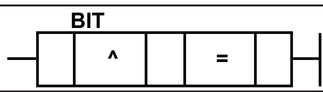
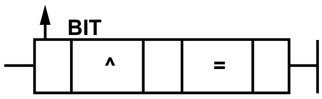
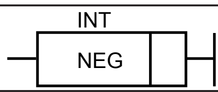
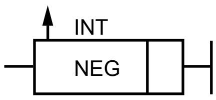
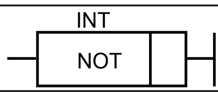
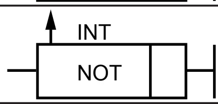
4.4.2 List of Application Instructions

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Comparison (Integers)	GT	√	4	INT >	Performs comparison and activates a device if the condition is met or deactivates it if the condition is not met.
	LT	√	4	INT <	
	GE	√	4	INT >=	
	LE	√	4	INT <=	
	EQ	√	4	INT =	
	NEQ	√	4	INT <>	
Comparison (floating point numbers)	GTF	√ (UT75A only)	4	>	Performs comparison and activates a device if the condition is met or deactivates it if the condition is not met.
	LTF	√ (UT75A only)	4	<	
	GEF	√ (UT75A only)	4	>=	
	LEF	√ (UT75A only)	4	<=	
In range	IRNGF	√ (UT75A only)	5	IRNGF	Performs comparison and activates a device if the condition is met or deactivates it if the condition is not met.
Out of range	ORNGF	√ (UT75A only)	5	ORNGF	
Addition	ADD	√	4	+ =	Performs addition when an input signal is ON.
	E_ADD	√	4	+ =	Performs addition when an input signal changes from OFF to ON.
Subtraction	SUB	√	4	- =	Performs subtraction when an input signal is ON.
	E_SUB	√	4	- =	Performs subtraction when an input signal changes from OFF to ON.
Multiplication	MUL	√	4	* =	Performs multiplication when an input signal is ON.
	E_MUL	√	4	* =	Performs multiplication when an input signal changes from OFF to ON.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Division	DIV	√	4		Performs division when an input signal is ON.
	E_DIV	√	4		Performs division when an input signal changes from OFF to ON.
Square Root (%)	SQR	√	3		Performs square root extraction when an input signal is ON.
	E_SQR	√	3		Performs square root extraction when an input signal changes from OFF to ON.
Square Root (floating point numbers)	SQRF	√ (UT75A only)	3		Performs square root extraction when an input signal changes from OFF to ON.
	E_SQRF	√ (UT75A only)	3		Performs square root extraction when an input signal is ON.
Square Root Extraction (Low cutoff point or less: zero)	SQT	√ (UT75A only)	4		Performs square root extraction (low cotoff point or less = zero) when an input signal changes from OFF to ON.
	E_SQT	√ (UT75A only)	4		Performs square root extraction (low cotoff point or less = zero) when an input signal is ON.
Square Root Extraction with variable low cutoff	SQTE	√ (UT75A only)	4		Performs square root extraction (with variable low cutoff) when an input signal changes from OFF to ON.
	E_SQTE	√ (UT75A only)	4		Performs square root extraction (with variable low cutoff) when an input signal is ON.
Absolute Value	ABS	√	3		Performs absolute-value calculation when an input signal is ON.
	E_ABS	√	3		Performs absolute-value calculation when an input signal changes from OFF to ON.
Exponential	EXP	√ (UT75A only)	3		Performs exponential calculation when an input signal is ON.
	E_EXP	√ (UT75A only)	3		Performs exponential calculation when an input signal changes from OFF to ON.
Power	PWR	√ (UT75A only)	4		Performs power calculation when an input signal is ON.
	E_PWR	√ (UT75A only)	4		Performs power calculation when an input signal changes from OFF to ON.

4

Operations of Ladder Program Instructions

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Natural Logarithm	LN	√ (UT75A only)	3		Performs natural logarithmic calculation when an input signal is ON.
	E_LN	√ (UT75A only)	3		Performs natural logarithmic calculation when an input signal changes from OFF to ON.
Common Logarithm	LOG	√ (UT75A only)	3		Performs common logarithmic calculation when an input signal is ON.
	E_LOG	√ (UT75A only)	3		Performs common logarithmic calculation when an input signal changes from OFF to ON.
Logical AND	AND	√	4		Executes logical AND when an input signal is ON.
	E_AND	√	4		Executes logical AND when an input signal changes from OFF to ON.
Logical OR	OR	√	4		Executes logical OR when an input signal is ON.
	E_OR	√	4		Executes logical OR when an input signal changes from OFF to ON.
Logical XOR	XOR	√	4		Executes logical XOR when an input signal is ON.
	E_XOR	√	4		Executes logical XOR when an input signal changes from OFF to ON.
Logical XOR (1 bit)	XORB	√ (UT75A only)	4		Executes logical XOR when an input signal is ON.
	E_XORB	√ (UT75A only)	4		Executes logical XOR when an input signal changes from OFF to ON.
Two's Complement	NEG	√	2		Converts data to two's complement when an input signal is ON.
	E_NEG	√	2		Converts data to two's complement when an input signal changes from OFF to ON.
Not	NOT	√	2		Inverts data when an input signal is ON.
	E_NOT	√	2		Inverts data when an input signal changes from OFF to ON.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Not (1bit)	NOTB	√ (UT75A only)	2	BIT NOT	Inverts data when an input signal is ON.
	E_NOTB	√ (UT75A only)	2	BIT NOT	Inverts data when an input signal changes from OFF to ON.
Right Rotate	RROT	√	3	INT RROT	Turns data to the right when an input signal is ON.
	E_RROT	√	3	INT RROT	Turns data to the right when an input signal changes from OFF to ON.
Left Rotate	LROT	√	3	INT LROT	Turns data to the left when an input signal is ON.
	E_LROT	√	3	INT LROT	Turns data to the left when an input signal changes from OFF to ON.
Right Shift	RSFT	√	3	INT RSFT	Shifts data to the right when an input signal is ON.
	E_RSFT	√	3	INT RSFT	Shifts data to the right when an input signal changes from OFF to ON.
Left Shift	LSFT	√	3	INT LSFT	Shifts data to the left when an input signal is ON.
	E_LSFT	√	3	INT LSFT	Shifts data to the left when an input signal changes from OFF to ON.
Shift Register	E_SFT	√	3	INT SFT	Shifts data to the right or left by 1 bit when an input signal changes from OFF to ON.
Move	MOV	√	3	MOV	Moves data to a destination when an input signal is ON.
	E_MOV	√	3	MOV	Moves data to a destination when an input signal changes from OFF to ON.
Binary Conversion	BIN	√	3	INT BIN	Converts data to binary data when an input signal is ON.
	E_BIN	√	3	INT BIN	Converts data to binary data when an input signal changes from OFF to ON.
BCD Conversion	BCD	√	3	INT BCD	Converts data to BCD codes when an input signal is ON.
	E_BCD	√	3	INT BCD	Converts data to BCD codes when an input signal changes from OFF to ON.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Ratio	RATIO	√	5	RATIO	Calculates a ratio when an input signal is ON.
	E_RATIO	√	5	RATIO	Calculates a ratio when an input signal changes from OFF to ON.
Reciprocal	RECIP	√ (UT75A only)	5	RECIP	Calculates a reciprocal when an input signal is ON.
	E_RECIP	√ (UT75A only)	5	RECIP	Calculates a reciprocal when an input signal changes from OFF to ON.
High Selector	HSL	√	4	HSL	Selects a higher value when an input signal is ON.
	E_HSL	√	4	HSL	Selects a higher value when an input signal changes from OFF to ON.
Low Selector	LSL	√	4	LSL	Selects a lower value when an input signal is ON.
	E_LSL	√	4	LSL	Selects a lower value when an input signal changes from OFF to ON.
High Limiter	HLM	√	4	HLM	Imposes a high limit on the input value when an input signal is ON.
	E_HLM	√	4	HLM	Imposes a high limit on the input value when an input signal changes from OFF to ON.
Low Limiter	LLM	√	4	LLM	Imposes a low limit on the input value when an input signal is ON.
	E_LLM	√	4	LLM	Imposes a low limit on the input value when an input signal changes from OFF to ON.
Limit	LIMIT	√ (UT75A only)	5	LIMIT	Calculates a reciprocal when an input signal is ON.
	E_LIMIT	√ (UT75A only)	5	LIMIT	Calculates a reciprocal when an input signal changes from OFF to ON.
Scaling	SCAL	√	5	SCAL	Scales an input value when an input signal is ON.
	E_SCAL	√	5	SCAL	Scales an input value when an input signal changes from OFF to ON.
Normalization	NORM	√	5	NORM	Normalizes an input value when an input signal is ON.
	E_NORM	√	5	NORM	Normalizes an input value when an input signal changes from OFF to ON.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Maximum Value	MAX	√	7	MAX	Selects the maximum value when an input signal is ON.
	E_MAX	√	7	MAX	Selects the maximum value when an input signal changes from OFF to ON.
Minimum Value	MIN	√	7	MIN	Selects the minimum value when an input signal is ON.
	E_MIN	√	7	MIN	Selects the minimum value when an input signal changes from OFF to ON.
Average Value	AVE	√	7	AVE	Obtains the average value of input values when an input signal is ON.
	E_AVE	√	7	AVE	Obtains the average value of input values when an input signal changes from OFF to ON.
Temperature Compensation (deg C)	TCMP1	√	5	TCMP1	Performs temperature compensation (in °C) when an input signal is ON.
	E_TCMP1	√	5	TCMP1	Performs temperature compensation (in °C) when an input signal changes from OFF to ON.
Temperature Compensation (deg F)	TCMP2	√	5	TCMP2	Performs temperature compensation (in °F) when an input signal is ON.
	E_TCMP2	√	5	TCMP2	Performs temperature compensation (in °F) when an input signal changes from OFF to ON.
Pressure Compensation (MPa)	PCMP1	√	5	PCMP1	Performs pressure compensation (in MPa) when an input signal is ON.
	E_PCMP1	√	5	PCMP1	Performs pressure compensation (in MPa) when an input signal changes from OFF to ON.
Pressure Compensation (kgf/cm^2)	PCMP2	√	5	PCMP2	Performs pressure compensation (in kgf/cm^2) when an input signal is ON.
	E_PCMP2	√	5	PCMP2	Performs pressure compensation (in kg/cm^2) when an input signal changes from OFF to ON.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Pressure Compensation (psi)	PCMP3	√	5	PCMP3	Performs pressure compensation (in psi) when an input signal is ON.
	E_PCMP3	√	5	PCMP3	Performs pressure compensation (in psi) when an input signal changes from OFF to ON.
Temperature and Humidity Calculation	TMPHM	√ (UT75A only)	6	**TMPHM**	Calculates temperature and humidity when an input signal is ON.
10-segment Linearizer Approximation	PLN1	√ (UT75A only)	3	**PLN1**	Performs 10-segment linearizer approximation when an input signal is ON.
	PLN2	√ (UT75A only)	3	**PLN2**	
	PLN3	√ (UT75A only)	3	**PLN3**	
	PLN4	√ (UT75A only)	3	**PLN4**	
Inverse Conversion of 10-segment Linearizer Approximation	ILN1	√ (UT75A only)	3	**ILN1**	Performs inverse conversion of 10-segment linearizer approximation when an input signal is ON.
	ILN2	√ (UT75A only)	3	**ILN2**	
	ILN3	√ (UT75A only)	3	**ILN3**	
	ILN4	√ (UT75A only)	3	**ILN4**	
20-segment Linearizer Approximation	PLN21	√ (UT75A only)	3	**PLN21**	Performs 20-segment linearizer approximation when an input signal is ON.
	PLN22	√ (UT75A only)	3	**PLN22**	
Maximum Input Hold	MXHD1	√ (UT75A only)	8	**MXHD1**	Hold the maximum input value when an input signal is ON.
Minimum Input Hold	MNHD1	√ (UT75A only)	8	**MNHD1**	Hold the minimum input value when an input signal is ON.

Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Filter	FLTR1	√ (UT75A only)	4	FLTR1	Calculates the first-order lag when an input signal is ON.
	FLTR2	√ (UT75A only)	4	FLTR2	
	FLTR3	√ (UT75A only)	4	FLTR3	
	FLTR4	√ (UT75A only)	4	FLTR4	
Dead Time	DED1	√ (UT75A only)	4	DED1	Calculates the dead time when an input signal is ON.
	DED2	√ (UT75A only)	4	DED2	
	DED3	√ (UT75A only)	4	DED3	
Moving Average	MAV1	√ (UT75A only)	4	MAV1	Calculates the moving average when an input signal is ON.
	MAV2	√ (UT75A only)	4	MAV2	
	MAV3	√ (UT75A only)	4	MAV3	
Velocity Computation	VEL1	√ (UT75A only)	4	VEL1	Performs the velocity computation when an input signal is ON.
	VEL2	√ (UT75A only)	4	VEL2	
	VEL3	√ (UT75A only)	4	VEL3	

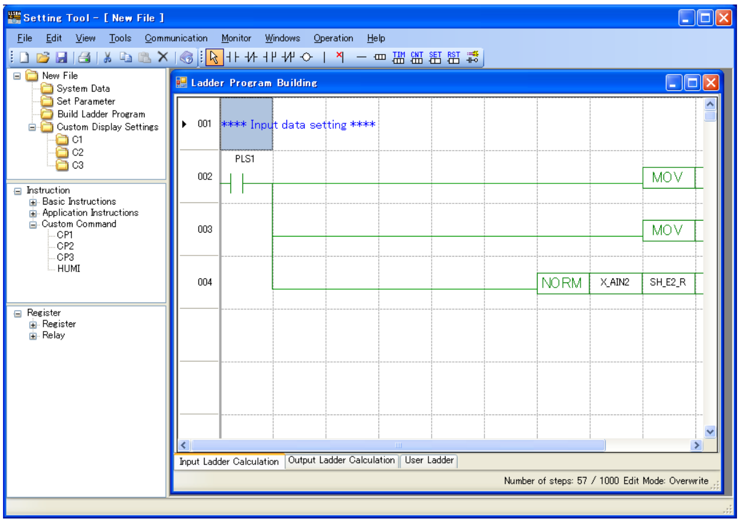
Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Velocity Limiter	CLMT1	√ (UT75A only)	4	CLMT1	Executes the velocity limiter when an input signal is ON.
	CLMT2	√ (UT75A only)	4	CLMT2	
	CLMT3	√ (UT75A only)	4	CLMT3	
	CLMT4	√ (UT75A only)	4	CLMT4	
Totalizer Pulse Output	CPO1	√ (UT75A only)	6	CPO1	Calculates the totalizer pulse output when an input signal is ON.
On-delay Timer	ONDY1	√ (UT75A only)	4	ONDY1	Sets the on-delay timer when an input signal is ON.
	ONDY2	√ (UT75A only)	4	ONDY2	
	ONDY3	√ (UT75A only)	4	ONDY3	
	ONDY4	√ (UT75A only)	4	ONDY4	
	ONDY5	√ (UT75A only)	4	ONDY5	
	ONDY6	√ (UT75A only)	4	ONDY6	
	ONDY7	√ (UT75A only)	4	ONDY7	
	ONDY8	√ (UT75A only)	4	ONDY8	

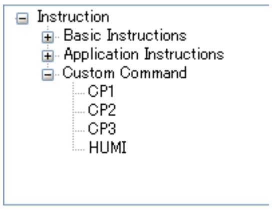
Instruction	Mnemonic	Display on Instruction Window	Number of Instructions	Symbol	Function
Off-delay Timer	OFDY1	√ (UT75A only)	4	OFDY1	Sets the off-delay timer when an input signal is ON.
	OFDY2	√ (UT75A only)	4	OFDY2	
	OFDY3	√ (UT75A only)	4	OFDY3	
	OFDY4	√ (UT75A only)	4	OFDY4	
	OFDY5	√ (UT75A only)	4	OFDY5	
	OFDY6	√ (UT75A only)	4	OFDY6	
	OFDY7	√ (UT75A only)	4	OFDY7	
	OFDY8	√ (UT75A only)	4	OFDY8	
CP Calculation 11 (°C)	CPC11	√ (UT75A only)	5	CPC11	Performs the CP calculation when an input signal is ON. Available for UT75A with “/CP” option.
CP Calculation 12 (°F)	CPC12	√ (UT75A only)	5	CPC12	
CP Calculation 21 (°C)	CPC21	√ (UT75A only)	5	CPC21	
CP Calculation 22 (°F)	CPC22	√ (UT75A only)	5	CPC22	

√: Visible

4.4.3 Custom Ladder Instructions (UT75A only)

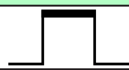
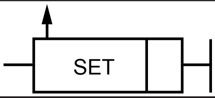
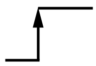
Custom ladder instructions can be created according to the procedure in section 4.7.2, “Creating Custom Ladder Instructions (UT75A Only).” Up to 100 instructions can be registered in the LL50A. You can use custom ladder instructions in the same way on the LL50A as basic instructions and application instructions by selecting the customer ladder instructions that you have created from a custom ladder instruction tree, as shown below. The example below shows an LL50A ladder instruction tree in which four custom ladder instructions—CP1, CP2, CP3, and HUMI—are registered.





4.5 Details of Basic Instructions

Functional quick reference guide
The following functional quick reference guide is provided at the start of the explanation of all the application instructions.

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Set	SET		√	-		1	Relay
	E_SET		√	-		1	

(1) (2) (3) (4) (5) (6) (7)

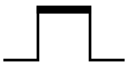
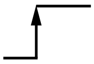
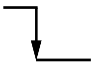
(1) Instruction
Indicates an instruction name.

(2) Mnemonic
Indicates the representation of an instruction by Mnemonic.

(3) Symbol
Indicates a representation method on LL50A.

(4) Input Condition Required?
Indicates whether the input condition is required for the instruction concerned.
An instruction with the "√" symbol in the Yes column always requires the input condition.
An instruction with the "√" symbol in the No column requires no input condition.

(5) Execution Condition

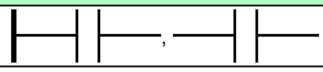
Symbol	Execution Condition
	This represents an execute-while-ON instruction. The instruction is executed only when the pre-condition of that instruction is ON. It is not executed if the pre-condition is OFF.
	This represents an instruction that is executed once when the pre-condition is set to ON. The instruction is executed only when the pre-condition of the instruction changes from OFF to ON, or a rise. After that, it is not executed even if the pre-condition is ON.
	This represents an instruction that is executed once when the pre-condition is set to OFF. The instruction is executed only when the pre-condition of the instruction changes from ON to OFF, or a fall. After that, it is not executed even if the pre-condition is OFF.
-	This indicates an instruction that is always executed. The instruction is executed irrespective of ON/OFF of the pre-condition of the instruction.

(6) Step Count
Indicates the number of steps of the instruction concerned. The step count differs depending on the presence/absence of the execution condition.

(7) Data Format
Indicates the processing unit to be used during execution of the instruction concerned.
In principle, all data formats are available for each instruction. The column shows the data format that is mainly used.
Instructions whose processing unit is a relay are intended for relays.
Instructions whose processing unit is a D-register, status register, or DAT register are intended for registers.
Relay data can be handled by integrating it in 16 bits or 32 bits.

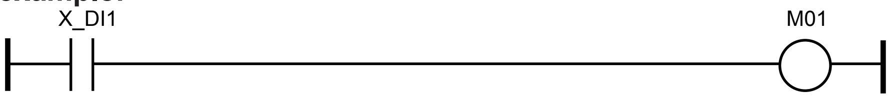
► Data format: Section 4.3, Data Format

4.5.1 Load, And

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Load, And	LD, AND		-	√	-	1	Relay

Load is a logical ("a" contact) operation start instruction. It captures the ON/OFF information of a specified device and regards it as the calculation result.

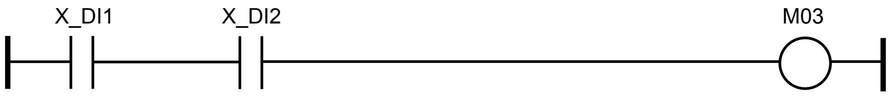
Program example:



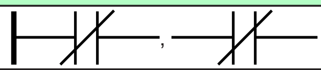
And is a logical AND ("a" contact in series connection) instruction. It captures the ON/OFF information of a specified device, ANDs it with the previous calculation result, and takes the obtained value as the calculation result.

Program example:

When X_DI1 is ON and X_DI2 is ON, M03 becomes ON. M03 is OFF in all other cases.



4.5.2 Load Not, And Not

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Load Not, And Not	LDN, ANDN		-	√	-	1	Relay

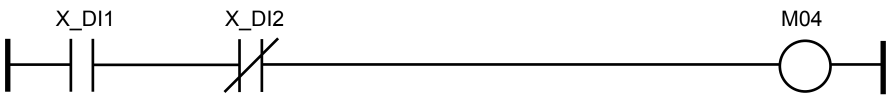
Load Not is a logical NOT ("b" contact) operation start instruction. It captures the ON/OFF information of a specified device and regards it as the calculation result.

Program example:

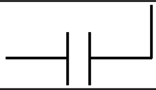
And Not is an NAND ("b" contact in series connection) instruction. It captures the ON/OFF information of a specified device, ANDs it with the previous calculation result, and takes the obtained value as the calculation result.

Program example:

When X_DI1 is ON and X_DI2 is OFF, M04 becomes ON. M04 is OFF in all other cases.



4.5.3 Or

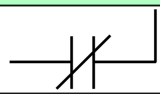
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Or	OR		-	√	-	1	Relay

Or is a logical OR ("a" contact in parallel connection) instruction. It captures the ON/OFF information of a specified device, ORs it with the previous calculation result, and takes the obtained value as the calculation result.

Program example:

When X_DI1 is ON or X_DI2 is ON, M05 becomes ON. M05 is OFF in all other cases.

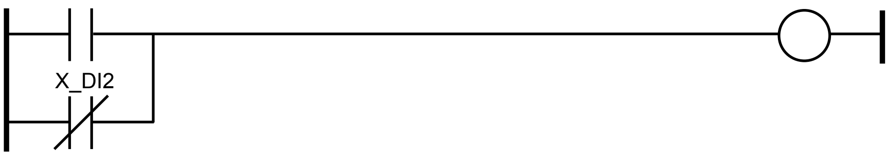
4.5.4 Or Not

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Or Not	ORN		-	√	-	1	Relay

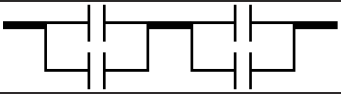
Or Not is an NOR ("b" contact in parallel connection) instruction. It captures the ON/OFF information of a specified device, ORs it with the previous calculation result, and takes the obtained value as the calculation result.

Program example:

When X_DI1 is ON or X_DI2 is OFF, M06 is activated. M06 is OFF in all other cases.



4.5.5 And Load

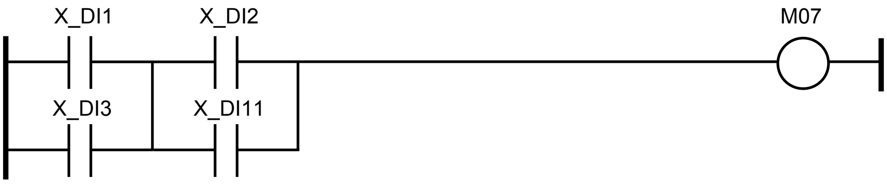
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
And Load	ANDLD		-	√	-	1	-

An And load instruction is not represented in thick lines in the actual ladder sequence program (circuit).

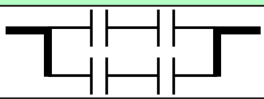
This instruction performs logical AND between circuit elements and passes the ANDed result to the next calculation processing.
An And Load instruction is automatically added to the ladder program by the combination of "a" contacts, "b" contacts, and compare instructions. The step counts are also added.

Program example:

When X_DI1 is ON or X_DI3 is ON and X_DI2 is ON or X_DI11 is ON, M07 is activated. M07 is OFF in all other cases.



4.5.6 Or Load

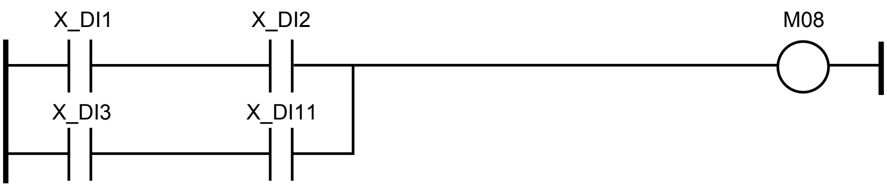
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Or Load	ORLD		-	√	-	1	-

An Or load instruction is not represented in thick lines in the actual ladder sequence program (circuit).

This instruction performs logical OR between circuit elements and passes the ORed result to the next calculation processing.
An Or Load instruction is automatically added to the ladder program by the combination of "a" contacts, "b" contacts, and compare instructions. The step counts are also added.

Program example:

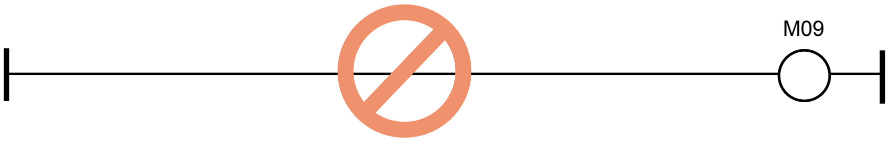
When X_DI1 is ON and X_DI2 is ON or X_DI3 is ON and X_DI11 is ON, M08 is activated. M08 is OFF in all other cases.



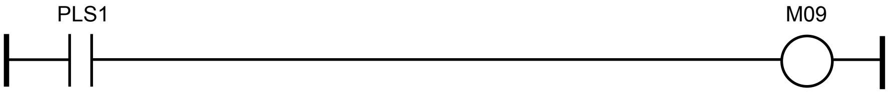
4.5.7 Out

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Out	OUT		√	-		1	Relay

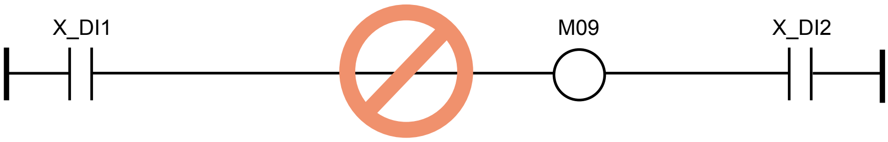
Out is an output instruction. It outputs the previous calculation result to a specified device as is. Direct output from the bus bar to a device is not possible.



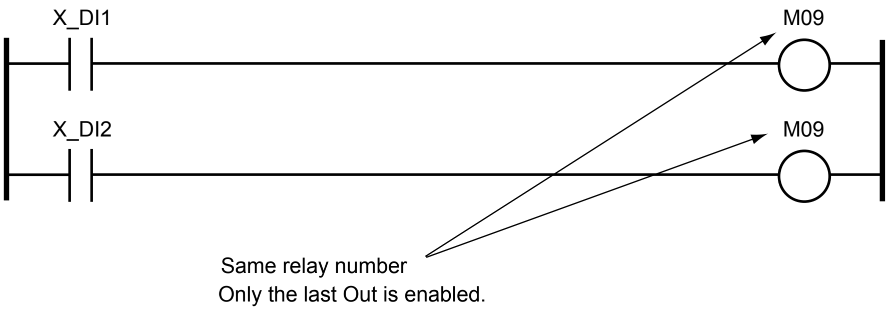
Furthermore, if output to a device is required irrespective of ON/OFF of a contact, use an always-ON relay (PLS1).



It is not possible to insert a contact next to an Out instruction.

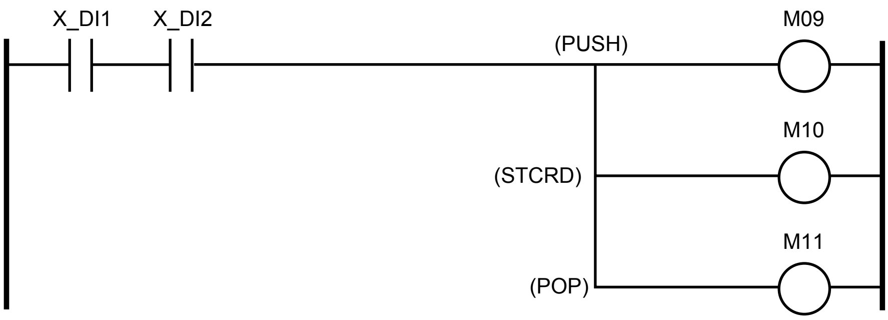


If the same device is used for two or more Out instructions, only the last Out is enabled and the results of Out instructions before that Out will be ignored.

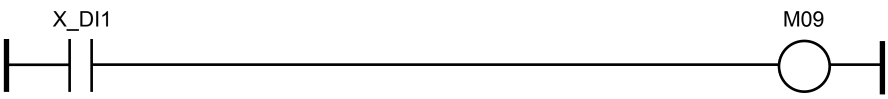


► Double use of coil: Section 3.6, Checking Ladder Programs

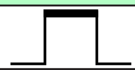
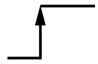
Out instructions can be used in parallel.



Program example:

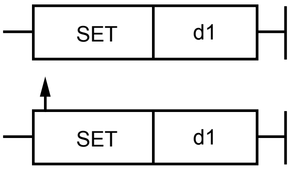


4.5.8 Set

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Set	SET	SET	√	-		1	Relay
	E_SET	SET	√	-		1	Relay

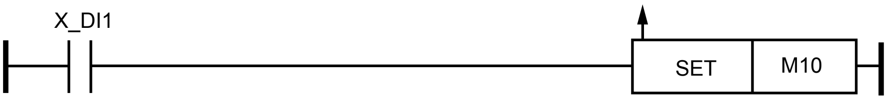
Parameter

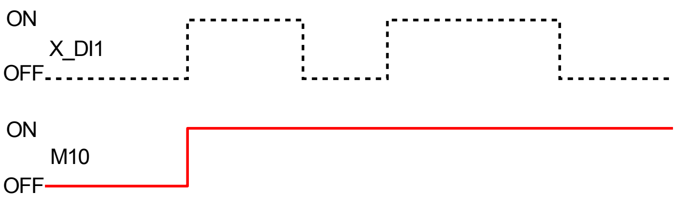
When the execution condition is met, a specified device (d1) is activated.



Program example:

When X_DI1 changes from OFF to ON, M10 is activated.



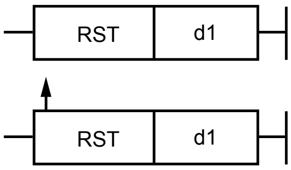


4.5.9 Reset

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Reset	RST	RST	√	-		1	Relay
	E_RST	RST	√	-		1	Relay

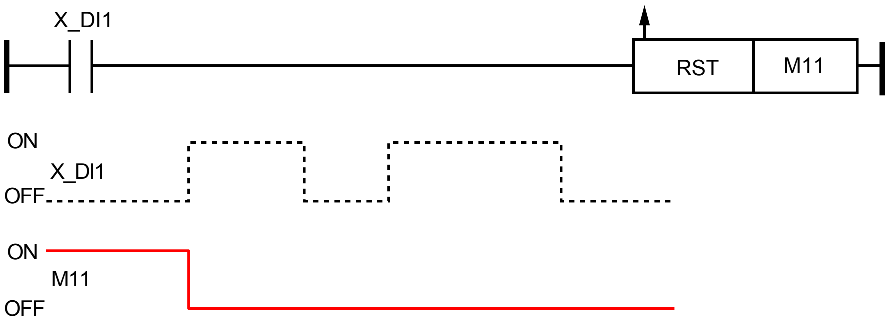
Parameter

When the execution condition is met, a specified device (d1) is deactivated.

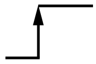
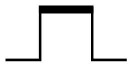
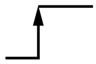
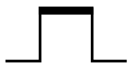


Program example:

When X_DI1 changes from OFF to ON, M11 is OFF.



4.5.10 Timer

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Timer	TIM	TIM	√	-	at start  during count 	4	Time-out Relay (TIM1 to TIM4): Relay Timer's current value (TIMER1 to TIMER4) Unsigned 16-bit integers
Timer with back-up	TIM_B	**TIM_B**	√	-	at start  during count 	4	Time-out Relay (TIM1 _B to TIM2_B): Relay Timer's current value (TIMER1_B to TIMER2_B) Unsigned 16-bit integers

Parameter

TIM	t1	d1	s

This instruction performs synchronous backward timer operation.
The synchronous type refers to the condition that ON/OFF of a timeout relay (d1) and the timer's current value (value obtained by subtraction from the timer set value (s)) do not change during the execution of one scan of the program. TIM1 to TIM4 are described in the timeout relay (d1).

For the timer, if the input condition is ON (while it is ON), the timer's current value is subtracted, and when it reaches 0, the corresponding timeout relay (d1) is activated. (The action of the timer's current value reaching "0" is called "to time out.")
When the input condition is ON and the timer set value (s) is "0," the timeout relay is always ON.

If there is a backup timer, the timeout relay behaves as follows when the power is turned off and then back on.
If the count is in progress, the count value continues, and the timeout relay is set to OFF.
If count-out is reached, the count value is zero, and the timeout relay is turned on.

If the following actions are implemented while the input condition is ON, the timer's current value is set to "0" and time-out relay is set to OFF; power OFF/ON, Reset Start (L-RESET RUN), ladder sequence program download, change of the input type and control period. Change the input condition into OFF again.

If the input condition is OFF and is switched from OFF to ON, the timer's current value returns to the timer set value (s) (namely initialized). If the timer set value (s) is other than "0", the time-out relay (d1) is OFF.
The timer's current value can be checked using the Monitor Ladder Program function of the LL50A Parameter Setting Software.

Timer (t1) should be selected from among five types: the special register's control period clock (SMPCLK), one-sec clock (CLK1), two-sec clock (CLK2), 10-sec clock (CLK10), and 60-sec clock (CLK60).
When timer (t1) is selected, it functions according to each attribute.

The setting time of the timer differs depending on the timer (t1) used. See the timer types and setting times described below.
The timer set value (s) should be set using a K-register or P-register.

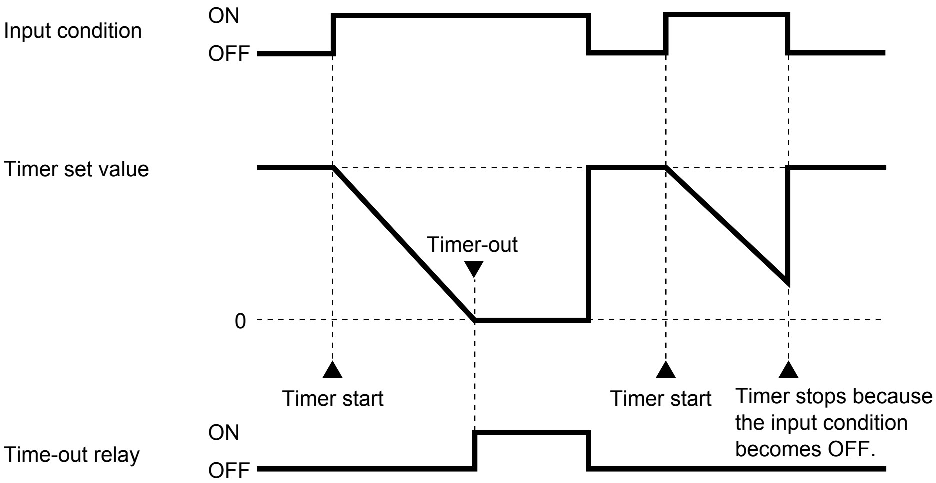
If the timer set value (s) is a negative value (value of less than "0"), it is handled as "0," and If it is "65535" or more, it is handled as "65535." Moreover, digits to the right of the decimal point will be discarded.

Timer types and setting time

Timer Type	Resolution	Setting Time
SMPCLK	50 ms	0 ms to 3276.75 seconds
	100 ms	0 ms to 6553.5 seconds
	200 ms	0 ms to 13107 seconds
CLK1	1 sec	0 sec to 65535 seconds
CLK2	2 sec	0 sec to 131070 seconds
CLK10	10 sec	0 sec to 655350 seconds
CLK60	60 sec	0 sec to 2199180 seconds

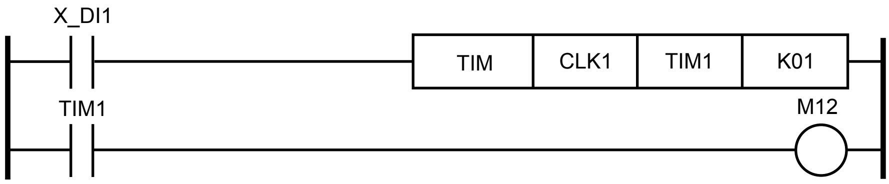
Note 1: SMPCLK works in the period set with the input sampling period (control period) parameter SMP.
Note 2: The maximum value of the set time is within the range handled by a K-register or P-register.

Example of timer operation

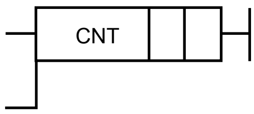
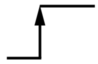
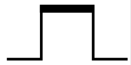
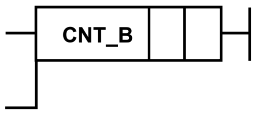
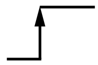
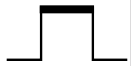


Program example:

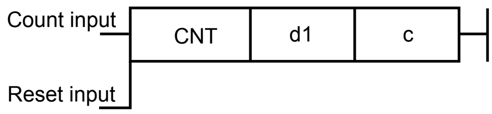
When X_DI1 becomes ON, M12 is activated 10 seconds later. The example uses a 1-second clock (CLK1). K01 = 10



4.5.11 Counter

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Counter	CNT		√	-	at start  during count 	3	Count-out Relay (CNT1 to CNT4): Relay Current timer (COUNTER1 to COUNTER4) Unsigned 16-bit integers
Counter with back-up	CNT_B		√	-	at start  during count 	3	Count-out Relay (CNT1_B to CNT2_B): Relay Current timer (CNTER1_B to CNTER2_B) Unsigned 16-bit integers

Parameter



This instruction performs backward counter operation.
When the count input changes from OFF to ON once, one count is subtracted from the counter set value (c).
When the counter’s current value (value obtained by subtraction from the counter set value (s)) reaches 0, the corresponding count-out relay (d1) is activated.
(The action of the counter’s current value reaching “0” is called “to count out.”)
No counting is performed excepting when the count input changes from OFF to ON.
CNT1 to CNT4 are described in the count-out relay.

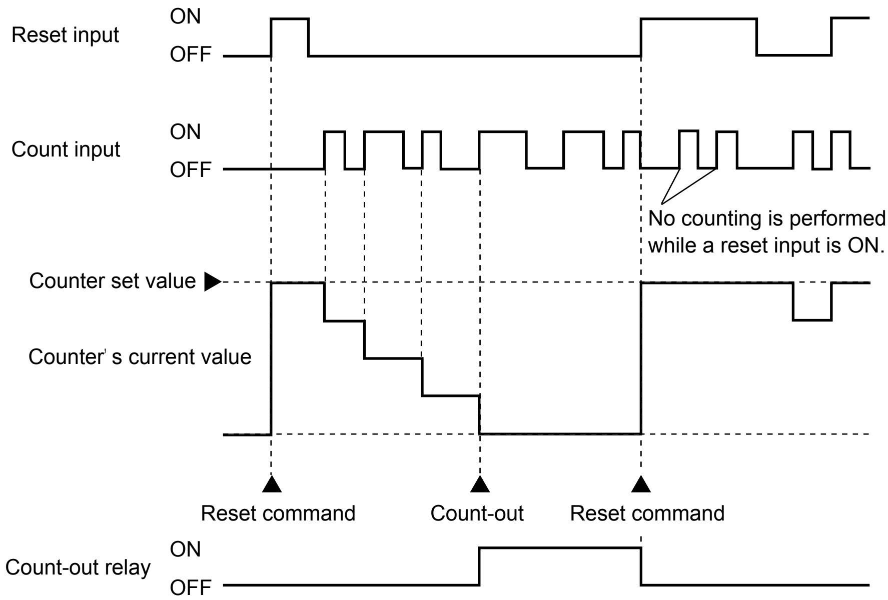
The counter current value is reset to the counter set value while the reset input is ON or power is switched from ON to OFF.

If the following actions are implemented while the reset input is OFF, the counter's current value is set to "0" and count-out flag is set to OFF; power OFF/ON, Reset Start (L-RESET RUN), ladder sequence program download, change of the input type and control period. Change the reset input into ON again.

If there is a backup counter, the count-out relay behaves as follows when the power is turned off and then back on.
If the count is in progress, the count value continues, and the count-out relay is set to OFF.
If count-out is reached, the count value is zero, and the count-out relay is turned on.

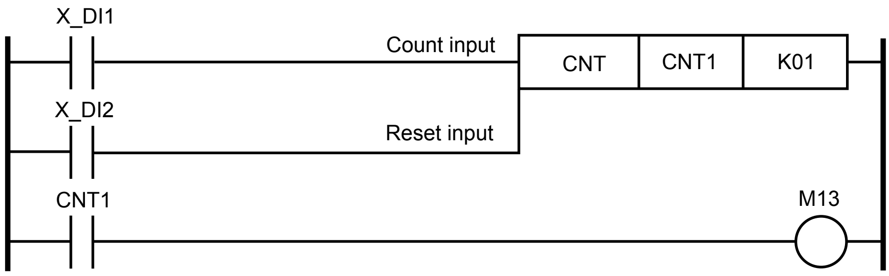
The counter set value (c) should be set using a K-register or P-register.
If the counter set value (s) is a negative value (value of less than “0”), it is handled as “0.” and If it is more than “65535”, it is handled as “65535.”
Moreover, values at the right of the decimal point will be discarded.

Before entering a count input, reset the counter's current value by reset input. If a count input and reset input are simultaneously made, the reset input has priority.



Program example:

When X_DI1 becomes ON 15 times, M13 is activated. K01 = 15

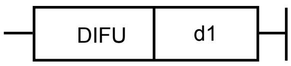


4.5.12 Differential Up and Differential Down

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Differential Up	DIFU	DIFU	√	-		1	Relay
Differential Down	DIFD	DIFD	√	-		1	Relay

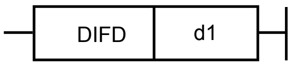
Parameters

Differential up



When an input signal changes from OFF to ON (raise), a specified device (d1) is activated for one scan.
For any condition other than a change of input signal from OFF to ON (raise), a specified device (d1) is OFF.

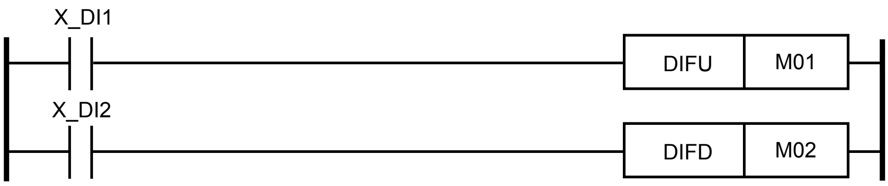
Differential up

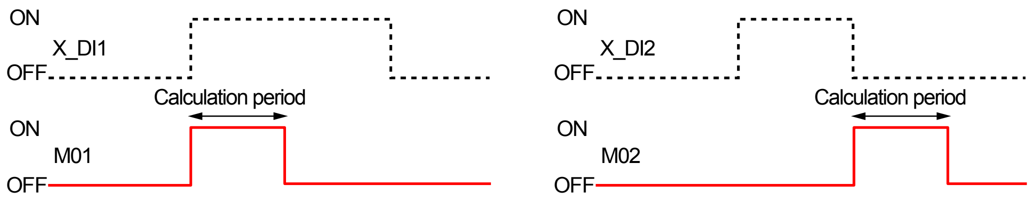


When an input signal changes from ON to OFF (fall), a specified device (d1) is activated for one scan.
For any condition other than a change of input signal from ON to OFF (fall), a specified device (d1) is OFF.

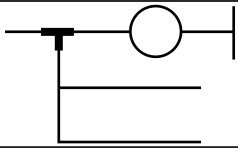
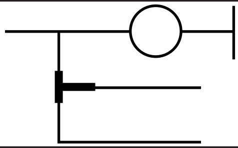
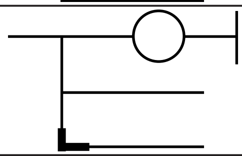
Program example

When X_DI1 changes from OFF to ON, M01 is activated for one scan. Also, when X_DI2 changes from ON to OFF, M02 is activated for one scan.





4.5.13 Push, Stack Read, and Pop

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Push	PUSH		-	√	-	1	-
Stack Read	STCRD		-	√	-	1	-
Pop	POP		-	√	-	1	-

The Push, Stack read, and Pop instructions are not represented by thick lines in the actual ladder sequence program (circuit).

Push

This instruction stores the calculation result (ON/OFF) obtained immediately before a Push. The number of pushes available in a circuit is up to 16.

Stack read

This instruction reads out the calculation result stored by Push and passes it to the next calculation processing.

Pop

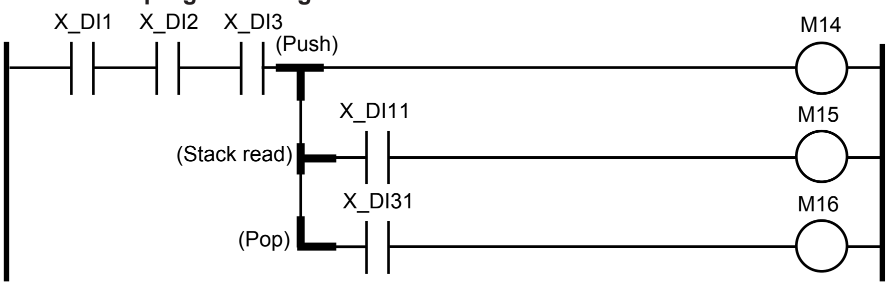
This instruction reads out the calculation result stored by Push and passes it to the next calculation processing. Moreover, it clears the calculation result stored by Push.

The number of Push instructions used and the number of Pop instructions used must be the same.

Note that it is not necessary for the user to program a Push, Stack read, or Pop instruction. These instructions are automatically appended.

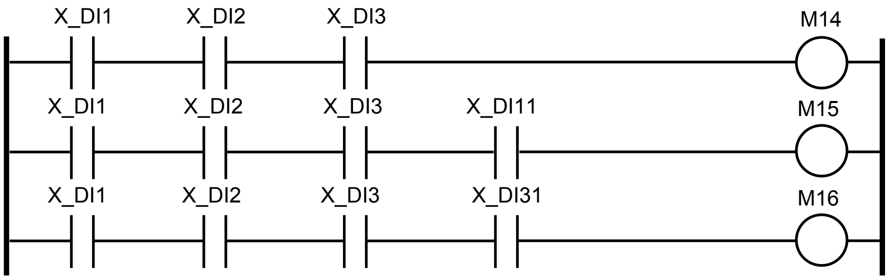
Program example:

Examle of a program using braches



Step count = 11 steps

Example of a program without branches



Step count = 14 steps

4.5.14 End

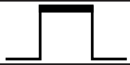
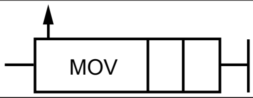
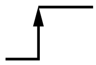
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
End	-	-	-	√	-	4	-

The End instruction is automatically appended to the end of a ladder sequence program created.

4.6 Details of Application Instructions

Functional quick reference guide

The following functional quick reference guide is provided at the start of the explanation of all the application instructions.

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Move	MOV		√	-		3	D-register, status register, relay, or DAT rgister
	E_MOV		√	-		3	

(1) (2) (3) (4) (5) (6) (7)

(1) Instruction

Indicates an instruction name.

(2) Mnemonic

Indicates the representation of an instruction by Mnemonic.

(3) Symbol

Indicates a representation method on LL50A.

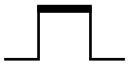
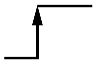
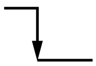
(4) Input Condition Required?

Indicates whether the input condition is required for the instruction concerned.

An instruction with the "√" symbol in the Yes column always requires the input condition.

An instruction with the "√" symbol in the No column requires no input condition.

(5) Execution Condition

Symbol	Execution Condition
	This represents an execute-while-ON instruction. The instruction is executed only when the pre-condition of that instruction is ON. It is not executed if the pre-condition is OFF.
	This represents an instruction that is executed once when the pre-condition is set to ON. The instruction is executed only when the pre-condition of the instruction changes from OFF to ON, or a rise. After that, it is not executed even if the pre-condition is ON.
	This represents an instruction that is executed once when the pre-condition is set to OFF. The instruction is executed only when the pre-condition of the instruction changes from ON to OFF, or a fall. After that, it is not executed even if the pre-condition is OFF.
-	This indicates an instruction that is always executed. The instruction is executed irrespective of ON/OFF of the pre-condition of the instruction.

(6) Step Count

Indicates the number of steps of the instruction concerned.

(7) Data Format

Indicates the processing unit to be used during execution of the instruction concerned.

In principle, all data formats are available for each instruction. The column shows the data format that is mainly used.

Instructions whose processing unit is a relay are intended for relays.

Instructions whose processing unit is a D-register, status register, or DAT register are intended for registers.

Relay data can be handled by integrating it in 16 bits or 32 bits.

► Data format: Section 4.3, Data Format

4.6.1 Comparison

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Comparison (Integers)	GT	INT >	-	√	-	4	D-register, DAT register or status register
	LT	INT <	-	√	-	4	
	GE	INT >=	-	√	-	4	
	LE	INT <=	-	√	-	4	
	EQ	INT =	-	√	-	4	
	NEQ	INT <>	-	√	-	4	
Comparison (Floating-point numbers)	GTF	>	-	√	-	4	D-register, or DAT register
	LTF	<	-	√	-	4	
	GEF	>=	-	√	-	4	
	LEF	<=	-	√	-	4	
In range	IRNGF	IRNGF	-	√	-	5	D-register, or DAT register
Out of range	ORNGF	ORNGF	-	√	-	5	

Parameter

Integer

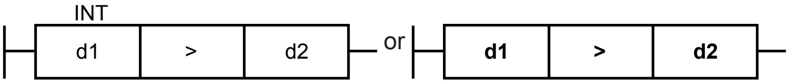
This instruction compares two integers and outputs the calculation result as “a” contact. An Compare instruction is the instruction comparing the integer part (rounded-off below the decimal point). For the comparison including decimal points, execute a compare instruction after applying required multipliers such as C10 (constant 10) and C100 (constant 100.)

Floating-Point Number

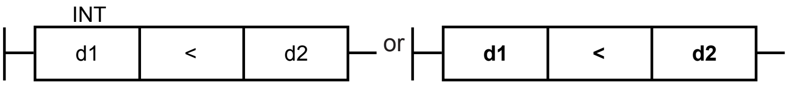
This instruction compares two single-precision floating-point numbers (32 bits) and outputs the calculation result as “a” contact.
The calculation result is as follows.

Mnemonic	Condition and Calculation Result			
	Condition	Result	Condition	Result
GT, GTF	d1>d2	ON (1)	d1<=d2	OFF (0)
LT, LTF	d1<d2		d1>=d2	
GE, GEF	d1>=d2		d1<d2	
LE, LEF	d1<=d2		d1>d2	
EQ	d1=d2		d1<>d2	
NEQ	d1<>d2		d1=d2	
IRNGF	d1<=d3<=d2		d3<d1 or d2 < d3	
ORNGF	d3<=d1 or d2<=d3		d1<d3<d2	

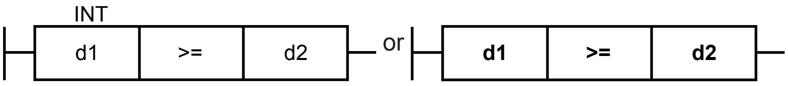
Greater than



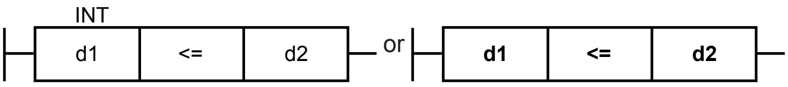
Less than



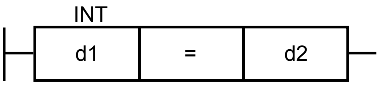
Greater than or equal



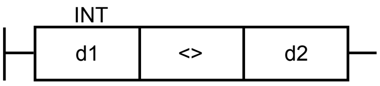
Less than or equal



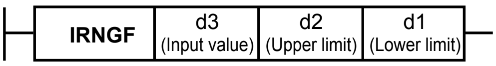
Equal



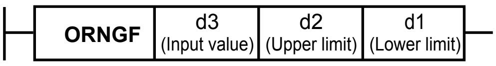
Not equal



In range



Out of range

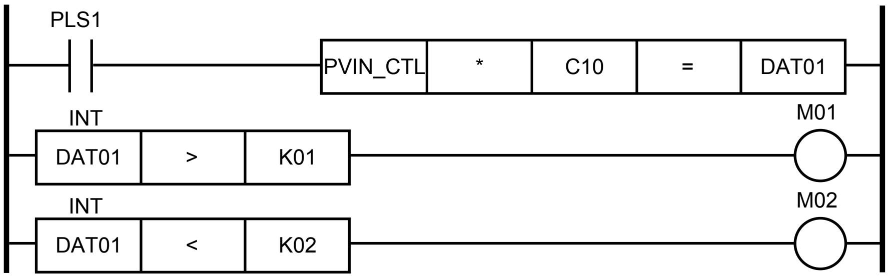


Program example

DAT01 is always calculated (PLS1).

When PVIN_CTL is more than 300.0 (3000) °C, M01 is activated. Moreover, when PVIN_CTL is less than 150.0 (1500) °C, M02 is activated.

(K01: 3000, K02: 1500)



4.6.2 Four Fundamental Arithmetic Operations

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Addition	ADD	+ =	√	-		4	D-register or DAT register
	E_ADD	+ =	√	-		4	
Subtraction	SUB	- =	√	-		4	
	E_SUB	- =	√	-		4	
Multiplication	MUL	* =	√	-		4	
	E_MUL	* =	√	-		4	
Division	DIV	/ =	√	-		4	
	E_DIV	/ =	√	-		4	

Parameter

When the calculation result immediately before any of the four fundamental arithmetic operations is ON or changes from OFF to ON, the fundamental arithmetic operation concerned is performed using two single-precision floating-point numbers d2 and d3 (32 bits) and stores the result in a specified device (d1).
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.

Addition

d2	+	d3	=	d1
d2	+	d3	=	d1

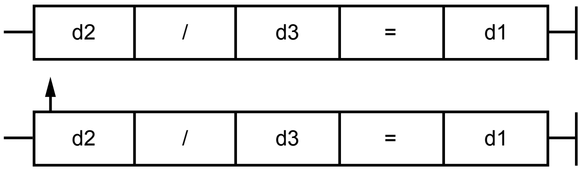
Subtraction

d2	-	d3	=	d1
d2	-	d3	=	d1

Multiplication

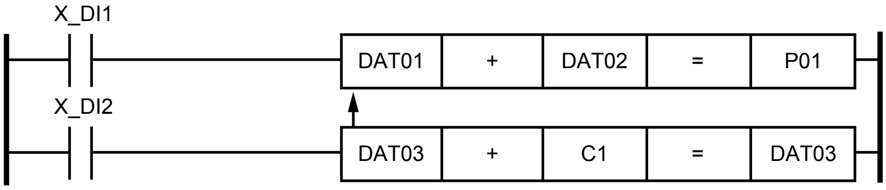
d2	*	d3	=	d1
d2	*	d3	=	d1

Division



Program example

When X_DI1 becomes ON, DAT01 and DAT02 are added together and stored in P01.
Each time X_DI2 is turned off and on, DAT03 is incremented.



4.6.3 Square Root

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Square Root (%)	SQR	SQR	√	-		3	D-register or DAT register
	E_SQR	SQR	√	-		3	
Square Root (floating point numbers)	SQRF	SQRF	√	-		3	D-register or DAT register
	E_SQRF	SQRF	√	-		3	

Parameter

Percent data

Square root extraction is performed to the normalized input value (0 to 100%), and the calculated result is stored in the specified device (d1.)

In a square root, the input value and the calculated result are expressed as percent data, i.e. the calculated result for the input value 100 (%) is 100 (%); 50 (%) is 70.71 (%); 25 (%) is 50 (%).

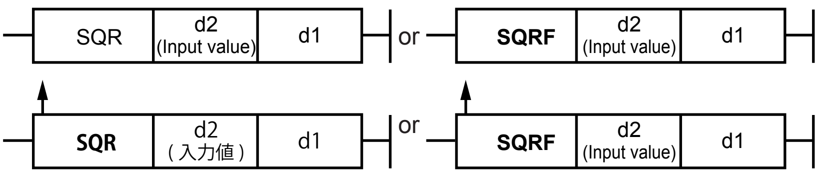
Furthermore, negative input values are calculated as "0" (%). The calculated result is 0 (%).

Floating-Point Number

This instruction takes the square root of a real single-precision floating-point number and stores the result in the specified device (d1).

If d2 ≤ 0.0, the calculated result is 0.0.

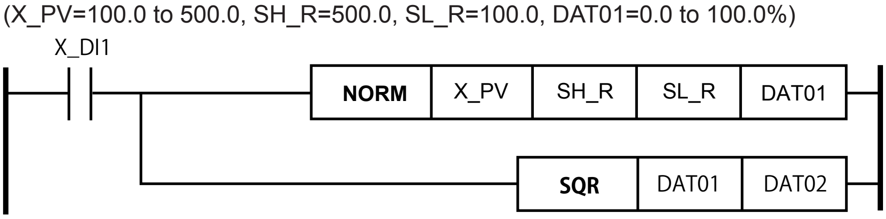
Square root of 1.0 is 1.0. Square root of 100.0 is 10.0.



Program example

When X_DI1 becomes ON, X_PV data is normalized to SL_R to SH_R and the result is stored in DAT01. The SQR instruction obtains the square root extraction of DAT01 data and stores it in DAT02.

(X_PV=100.0 to 500.0, SH_R=500.0, SL_R=100.0, DAT01=0.0 to 100.0%)



4.6.4 Square Root Extraction

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Square Root Extraction (Low cutoff point or less: zero)	SQT	SQT	√	-		4	D-register or DAT register
	E_SQT	SQT	√	-		4	
Square Root Extraction with variable low cutoff	SQTE	SQTE	√	-		4	
	E_SQTE	SQTE	√	-		4	

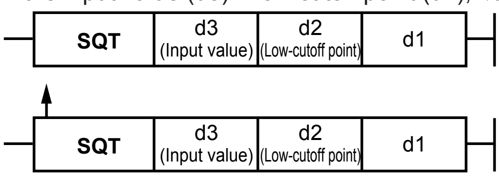
Parameter

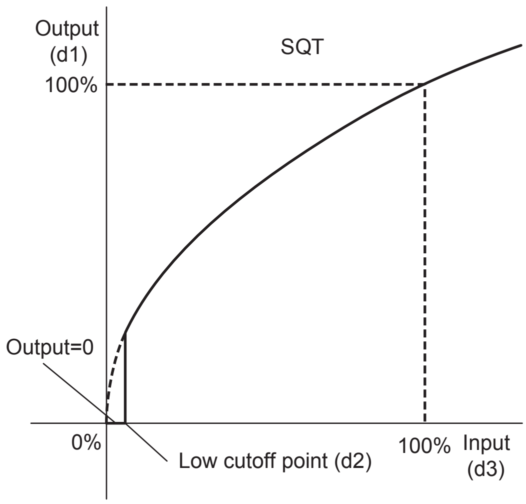
Square Root Extraction (Low Cutoff Point or Less: Zero)

This instruction takes the square root extraction of the input value (d3) and stores the result in the specified device (d1).

If the input value (d3) < low cutoff point (d2), 0 is stored in the specified device (d1).

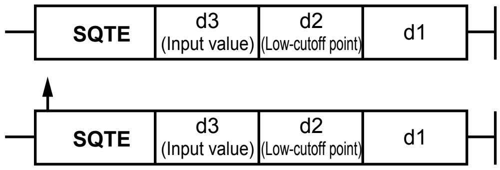
If the input value (d3) ≥ low cutoff point (d2), √d3 is stored in the specified device (d1).

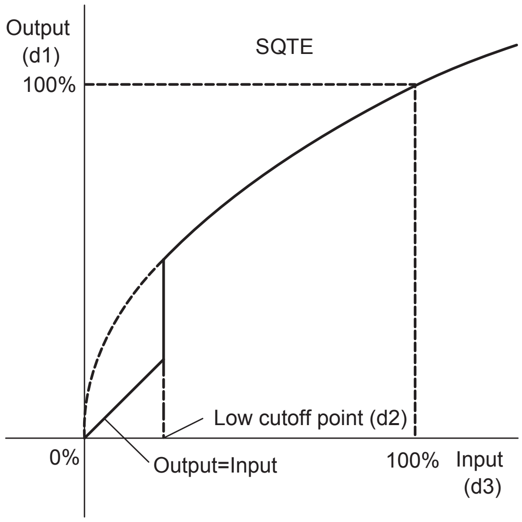




Square Root Extraction (Low Cutoff Point or Less)

This instruction takes the square root extraction of the input value (d3) and stores the result in the specified device (d1).
If the input value (d3) < low cutoff point (d2), d3 is stored as-is in the specified device (d1).
If the input value (d3) ≥ low cutoff point (d2), √d3 is output.

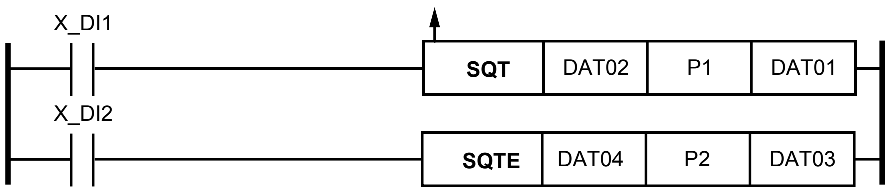




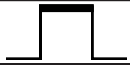
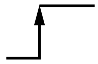
In both cases, the input and output are between 0.0% and 100.0%.
If the low cutoff point (d2) < 0.0, it is assumed to be 0.0. There is no hysteresis for the low cutoff point.

Program example

When X_DI1 becomes ON, a square root extraction is performed on DAT02 and stored in DAT01. If the result is less than or equal to the low cutoff point (P1), 0 is stored in DAT01.
When X_DI2 becomes ON, a square root extraction is performed on DAT04 and stored in DAT03. If the result is less than or equal to the low cutoff point (P2), DAT04 is stored as-is in DAT03.

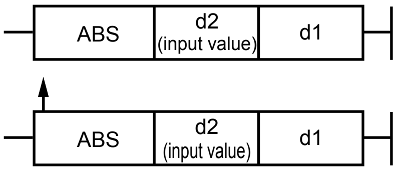


4.6.5 Absolute Value

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Absolute Value	ABS	ABS	√	-		3	D-register or DAT register
	E_ABS	ABS	√	-		3	

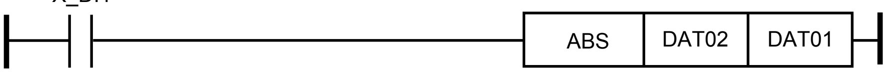
Parameter

This instruction obtains the absolute value from the input value (d2) and the result is stored in a specified device (d1).



Program example

When X_DI1 becomes ON, the instruction obtains the absolute value of DAT02 data and stores it in DAT01.



4

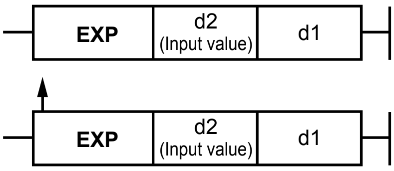
Operations of Ladder Program Instructions

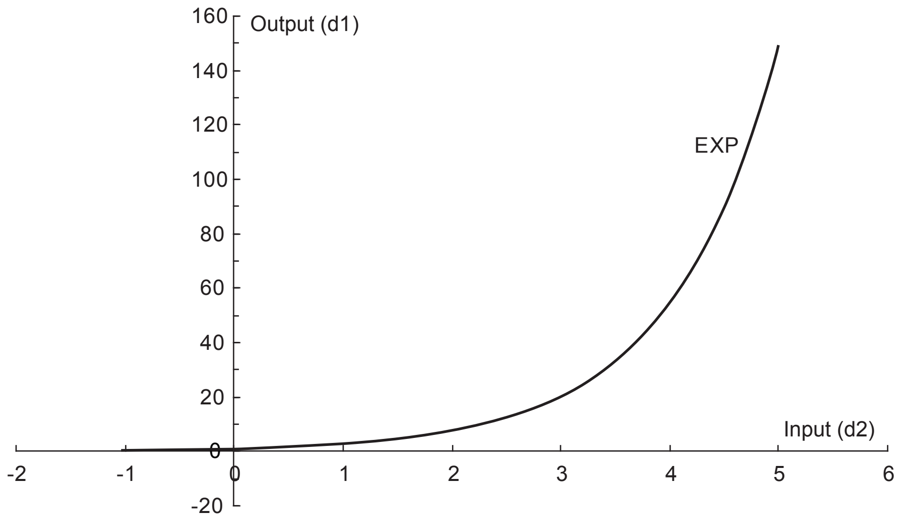
4.6.6 Exponential

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Exponential	EXP	EXP	√	-		3	D-register or DAT register
	E_EXP	EXP	√	-		3	

Parameter

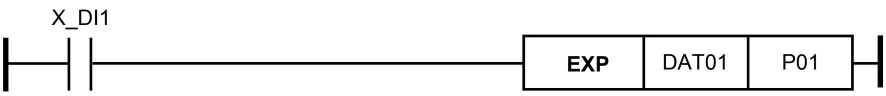
When the calculation result of the previous operations is ON or changes from OFF to ON, this instruction performs an e^{d2} calculation using a single-precision floating-point number d2 (32 bits) and stores the result in a specified device (d1).
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.





Program example

When X_DI1 becomes ON, e^{DAT01} is calculated and stored in P01.



4.6.7 Power

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Power	PWR	PWR	√	-		4	D-register or DAT register
	E_PWR	PWR	√	-		4	

Parameter

When the calculation result of the previous operations is ON or changes from OFF to ON, this instruction performs a $d3^{d2}$ calculation using a single-precision floating-point number d2 (32 bits) and stores the result in a specified device (d1).

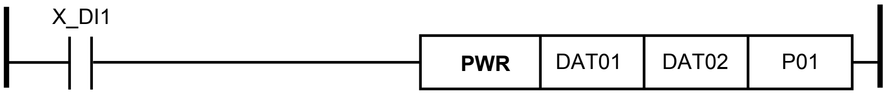
However, a ladder calculation overflow will occur in the following cases.

• If the base (d3) = 0.0 and the exponent (d2) ≤ 0.0
• If the base (d3) < 0.0 and the exponent is not an integer.
• If a non-numerical value or infinity occurs during calculation or arises as a result.

The output when a ladder calculation overflow occurs is 0.0.

Program example

When X_DI1 becomes ON, $DAT01^{DAT02}$ is calculated and stored in P01.



4.6.8 Natural Logarithm

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	No	Execution Condition	Step Count	Data Format
Natural Logarithm	LN	LN	√	-		3	D-register or DAT register
	E_LN	LN	√	-		3	

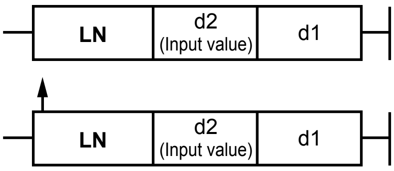
Parameter

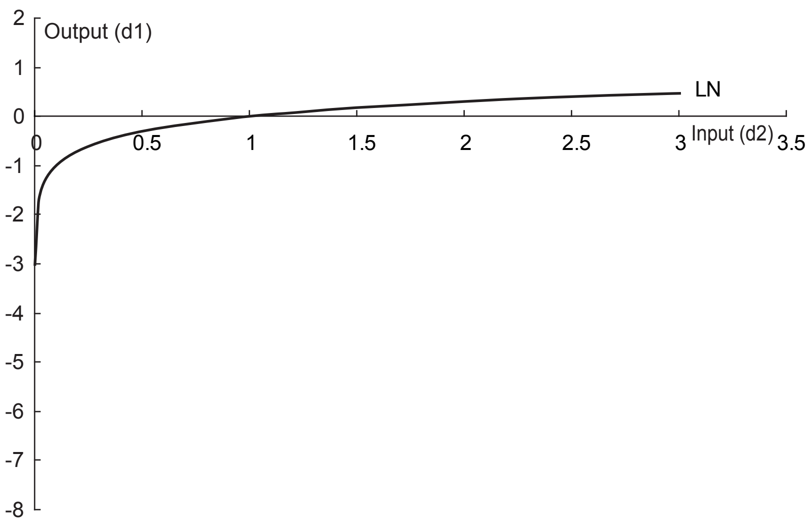
When the calculation result of the previous operations is ON or changes from OFF to ON, this instruction perform a $\log_e^{d2}$ calculation using a single-precision floating-point number d2 (32 bits) and stores the result in a specified device (d1).

However, a ladder calculation overflow will occur in the following cases.

- If input (d2) ≤ 0
- If a non-numerical value or infinity occurs during calculation or arises as a result.

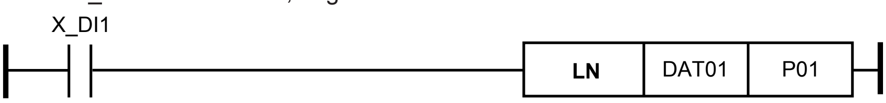
The output when a ladder calculation overflow occurs is input value d2.





Program example

When X_DI1 becomes ON, $\log_e^{DAT01}$ is calculated and stored in P01.



4.6.9 Common Logarithm

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Commonl Logarithm	LOG	LOG	√	-		3	D-register or DAT register
	E_LOG	LOG	√	-		3	

Parameter

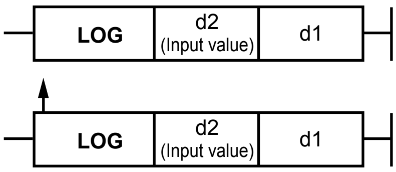
When the calculation result of the previous operations is ON or changes from OFF to ON, this instruction performs a $\log 10^{d2}$ calculation using a single-precision floating-point number d2 (32 bits) and stores the result in a specified device (d1).

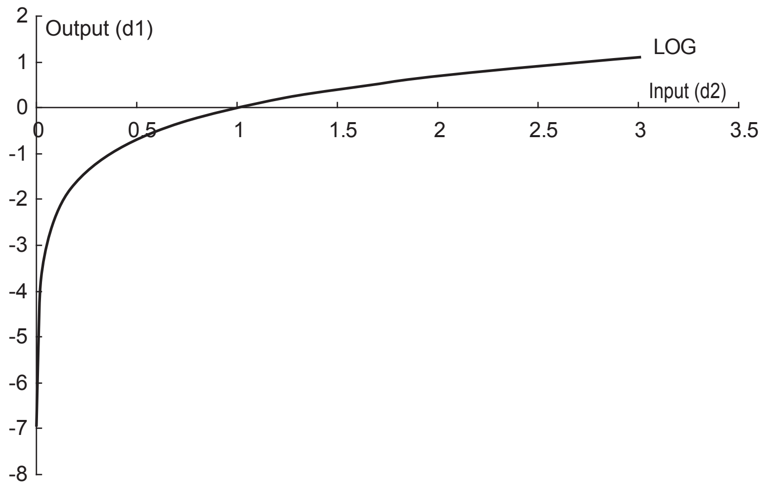
However, a ladder calculation overflow will occur in the following cases.

• If input (d2) ≤ 0

• If a non-numerical value or infinity occurs during calculation or arises as a result.

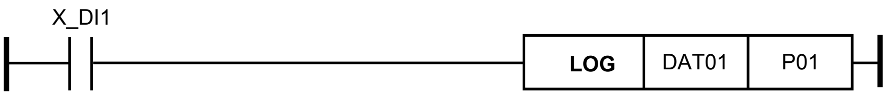
The output when a ladder calculation overflow occurs is input value d2.





Program example

When X_DI1 becomes ON, $\text{Log}10^{\text{DAT01}}$ is calculated and stored in P01.



4.6.10 Logical Operation

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Logical AND	AND	INT & =	√	-		4	Status register
	E_AND	INT & =	√	-		4	
Logical OR	OR	INT | =	√	-		4	
	E_OR	INT | =	√	-		4	
Logical XOR	XOR	INT ^ =	√	-		4	
	E_XOR	INT ^ =	√	-		4	
Logical XOR (1 bit)	XORB	BIT ^ =	√	-		4	Relay
	E_XORB	BIT ^ =	√	-		4	
Two's Complement	NEG	INT NEG	√	-		2	Status register
	E_NEG	INT NEG	√	-		2	
Not	NOT	INT NOT	√	-		2	
	E_NOT	INT NOT	√	-		2	
Not (1bit)	NOTB	BIT NOT	√	-		2	Relay
	E_NOTB	BIT NOT	√	-		2	

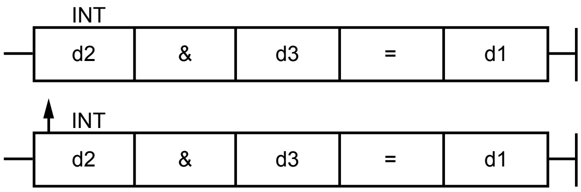
Parameter

Data format: 16-bit integer

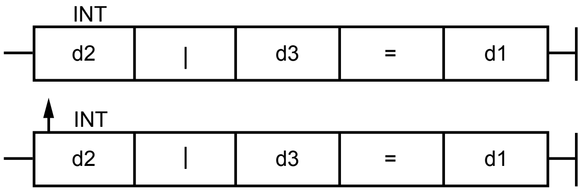
(Logical AND, logical OR, and logical XOR)

These instructions perform logical operations using two 16-bit data (d2 and d3) and store the result in a specified device (d1). If two 16-bit data (d2 and d3) is greater than negative or 65535, the calculation is not executed. In this case, a ladder calculation overflow error occurs.

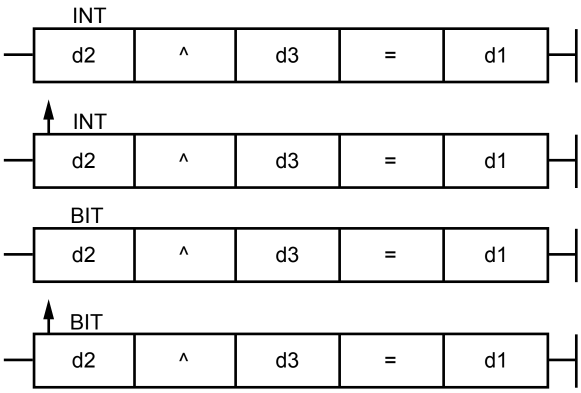
Logical AND



Logical OR



Logical XOR



When d2 and d3 Are Floating-Point Numbers

For example, if PV1 is 34.5, the fraction is rounded and handled as a 16-bit integer. If relay data (1 bit: 0 or 1) is assigned to d1, 0 is stored when the 16-bit integer is 0, and 1 is stored otherwise.

Logical AND (16-bit data)

(Before logical operation)

0	1	1	0	1	0	0	1	0	1	1	0	1	0	1	1	d2

&

1	1	0	0	1	1	0	1	1	1	0	0	1	1	1	0	d3

↓

(After logical operation)

0	1	0	0	1	0	0	1	0	1	0	0	1	0	1	0	d1

Logical OR (16-bit data)

(Before logical operation)

0	1	1	0	0	0	0	1	0	0	1	0	1	0	1	1	d2

|

0	1	0	0	0	1	0	1	1	0	0	0	1	0	1	0	d3

↓

(After logical operation)

0	1	1	0	0	1	0	1	1	0	1	0	1	0	1	1	d1

Logical XOR (16-bit data)

(Before logical operation)

0	1	1	0	1	0	0	1	0	1	1	0	1	0	1	1	d2

^

1	1	0	0	1	1	0	1	1	1	0	0	1	1	1	0	d3

↓

(After logical operation)

1	0	1	0	0	1	0	0	1	0	1	0	0	1	0	1	d1

Logical XOR (1-bit data)

(Before logical operation)

0	d2

^

1	d3

↓

(After logical operation)

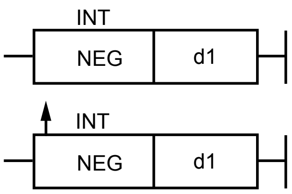
1	d1

(Not and Two’s complement)

Two’s complement

This instruction obtains the two’s complement of 16-bit data (d1) and the result is stored in a specified device (d1).

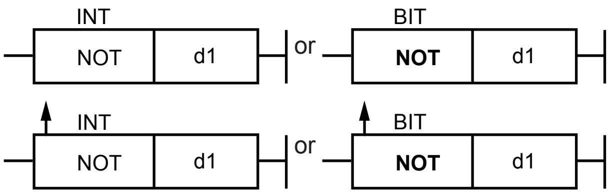
If 16-bit data (d1) is greater than negative or 65535, the calculation is not executed. In this case, a ladder calculation overflow error occurs.



Not

This instruction invert 16-bit data (d1) and the result is stored in a specified device (d1).

If 16-bit data (d1) is greater than negative or 65535, the calculation is not executed. In this case, a ladder calculation overflow error occurs.



These instructions invert 16-bit data (d1) or obtain the two’s complement of it and store the result in a specified device (d1).

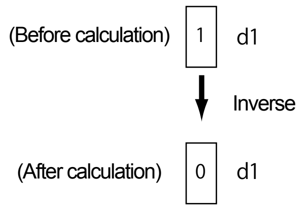
Two’s complement (16-bit data)

(Before calculation)	0	1	1	0	0	0	0	1	0	0	1	1	1	0	0	1	d1
Inverse																	
	1	0	0	1	1	1	1	0	1	1	0	0	0	1	1	0	
+1																	
(After calculation)	1	0	0	1	1	1	1	0	1	1	0	0	0	1	1	1	d1

Not (16-bit data)

(Before calculation)	0	1	1	0	0	0	0	1	0	0	1	1	1	0	0	1	d1
Inverse																	
(After calculation)	1	0	0	1	1	1	1	0	1	1	0	0	0	1	1	0	d1

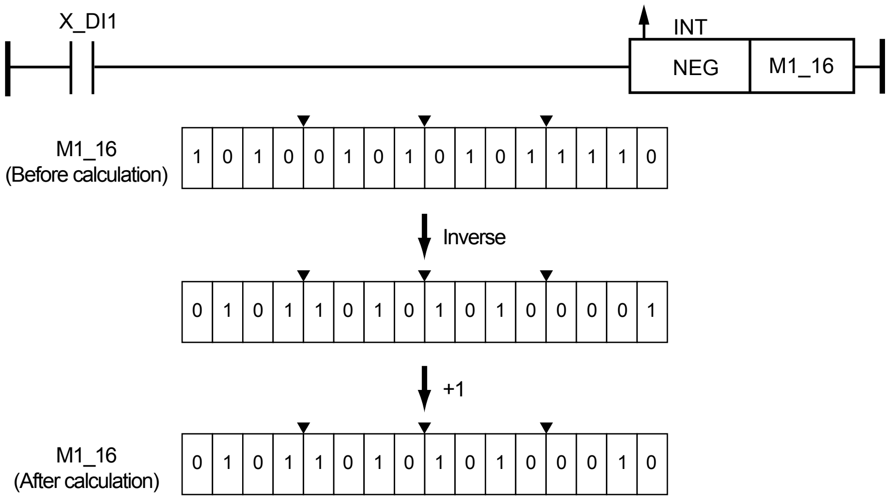
Not (1-bit data)



If the relay data is specified to the parameter, the data is handled as 16-bit data “0” (0x000) or “1” (0x0001).

Program example

When X_DI1 becomes ON, the instruction converts M1_16 data to the two’s complement.



4.6.11 Rotation

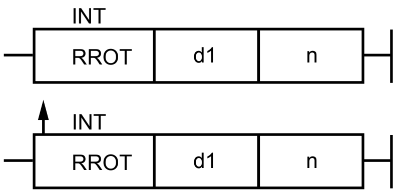
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Right Rotate	RROT	INT RROT	√	-		3	Status register
	E_RROT	INT RROT	√	-		3	
Left Rotate	LROT	INT LROT	√	-		3	
	E_LROT	INT LROT	√	-		3	

Parameter

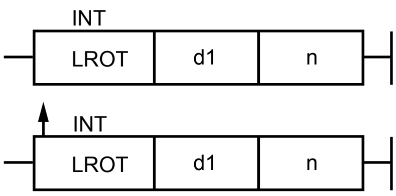
These instructions rotate 16-bit data (d1) to the right or left by "n" bits and store the rotation result in a specified device (d1).
If 16-bit data (d1) is greater than negative or 65535, the calculation is not executed. In this case, a ladder calculation overflow error occurs.
Specify the number of bits (n) within the range 1 to 16 when the number of bits out of the range is specified, the Rotation instruction is not executed.

The number of bits (n) is handled as
"1" if $0.5 \leq d2 < 1.5$
"2" if $1.5 \leq d2 < 2.5$
.
.
.
"16" if $15.5 \leq d2 < 16.5$

Right rotate



Left rotate



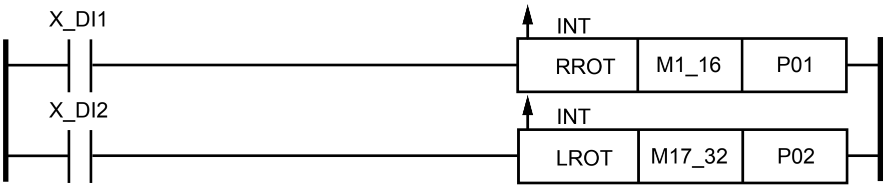
4

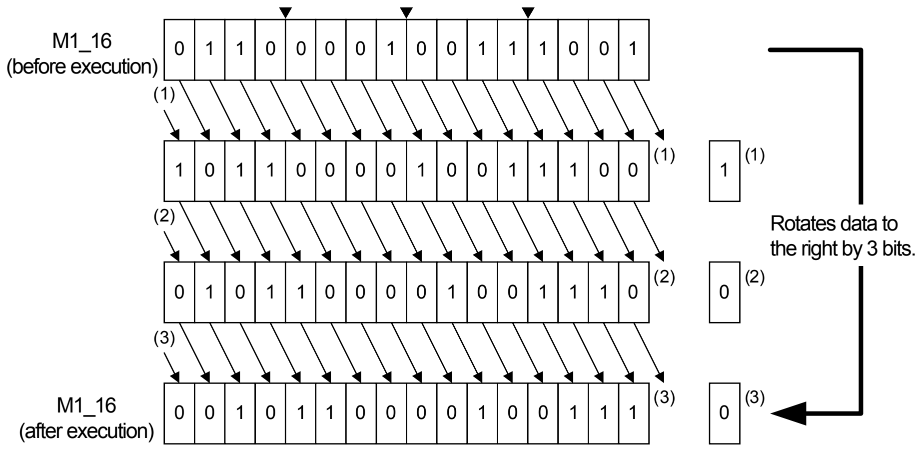
Operations of Ladder Program Instructions

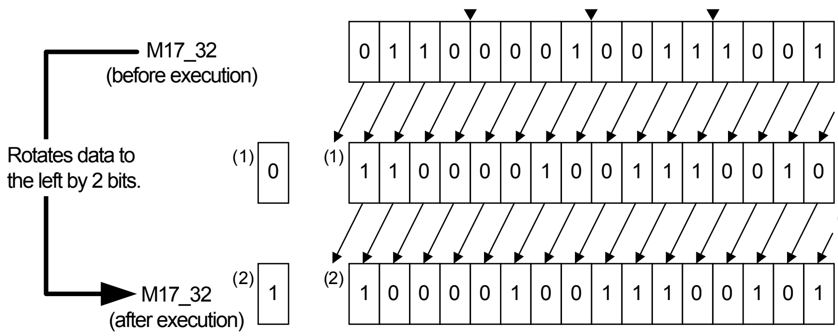
Program example

When X_DI1 becomes ON, M1_16 data is rotated to the right by P01 (number of rotations) bits.

When X_DI2 changes from OFF to ON, M17_32 data is rotated to the left by P02 (number of rotations) bits.







4.6.12 Shift

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Right Shift	RSFT	INT RSFT	√	-		3	Status register
	E_RSFT	INT RSFT	√	-		3	
Left Shift	LSFT	INT LSFT	√	-		3	
	E_LSFT	INT LSFT	√	-		3	
Shift Register	SFT	INT SFT	√	-		3	

Parameter

Right and left shifts

These instructions shift 16-bit data (d1) to the right or left by “n” bits and store the shift result in a specified device (d1).

If 16-bit data (d1) is greater than negative or 65535, the calculation is not executed. In this case, a ladder calculation overflow error occurs.

Specify the number of bits (n) within the range 1 to 16 when the number of bits out of the range is specified, the Right/Left shift instructions are not executed.

The number of bits (n) is handled as

“1” if 0.5 ≤ d2 < 1.5

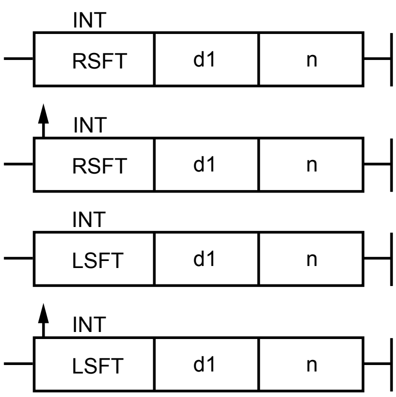
“2” if 1.5 ≤ d2 < 2.5

·

·

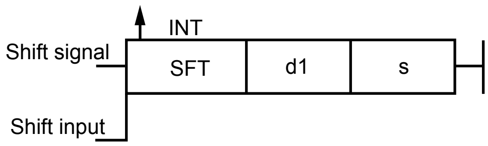
·

“16” if 15.5 ≤ d2 < 16.5



Shift register

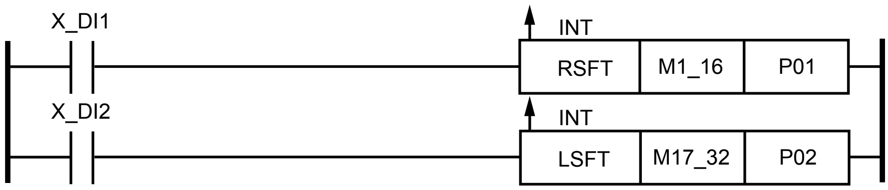
This instruction shifts 16-bit data (d1) to either the right or the left by one bit.
If 16-bit data (d1) is greater than negative or 65535, the calculation is not executed. In this case, a ladder calculation overflow error occurs.
The shift timing is at the rise of a shift signal (OFF to ON) and the shift direction is specified by “s.”
The instruction shifts data to the left if the value of the device specified by “s” is “0” or to the right if the value is “1.” (“s” is handled a value of less than 0.5 as “0” and a value of 0.5 or more as “1”.)
When data is shifted to the right or left, the shift input value enters the leftmost bit or rightmost bit.

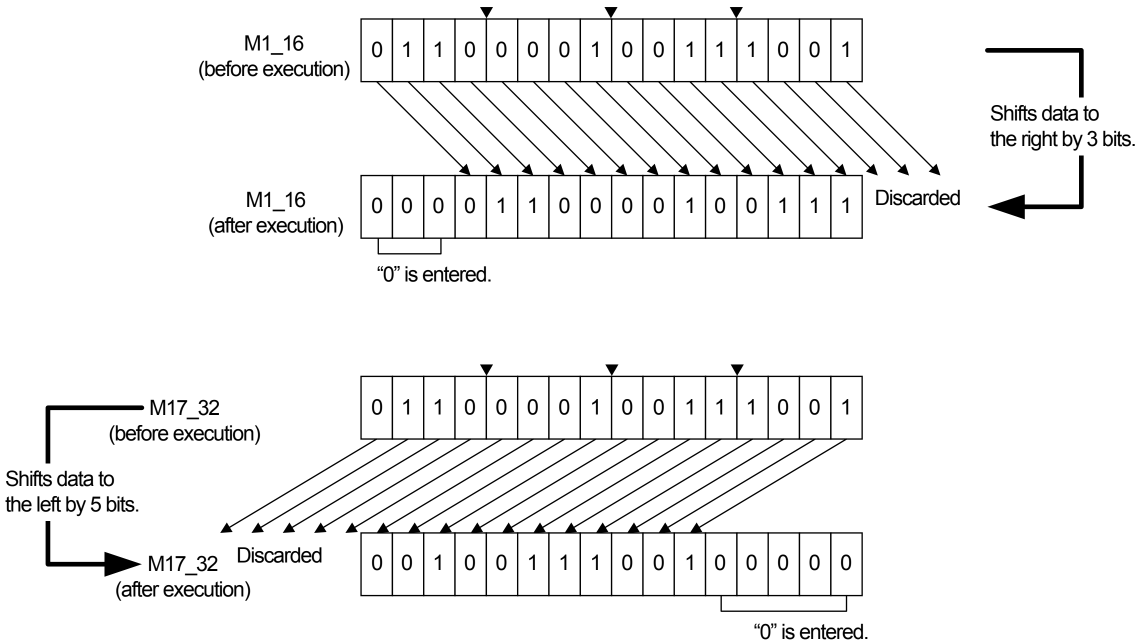


Program example

Right and left shifts

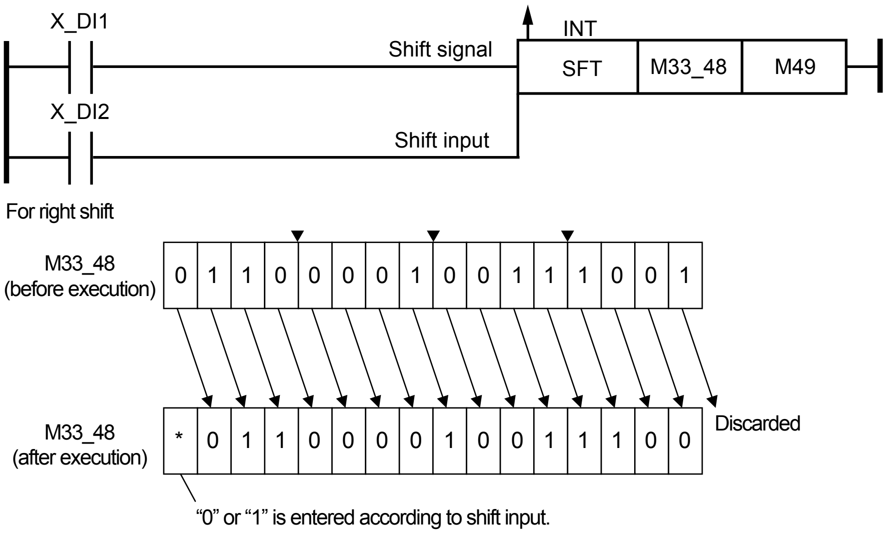
When X_DI1 changes from OFF to ON, M1_16 data is shifted to the right by P01 (number of shifts) bits. P01 = 3
When X_DI2 becomes ON, M17_32 data is shifted to the left by P02 (number of shifts) bits. P02 = 5





Shift register

When X_DI1 or X_DI2 becomes ON, the instruction shifts M33_48 data to the right by M49 bits (0 or 1.)

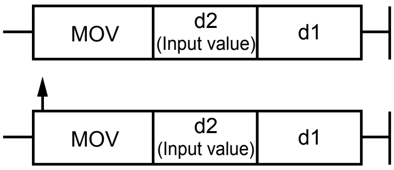


4.6.13 Move

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Move	MOV	MOV	√	-		3	D-register, status register, relay or DAT register
	E_MOV	MOV	√	-		3	

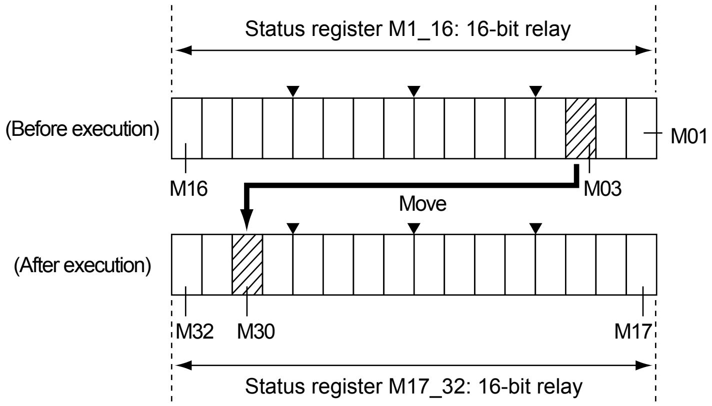
Parameter

This instruction moves data from the transfer source (d2) to transfer destination (d1).



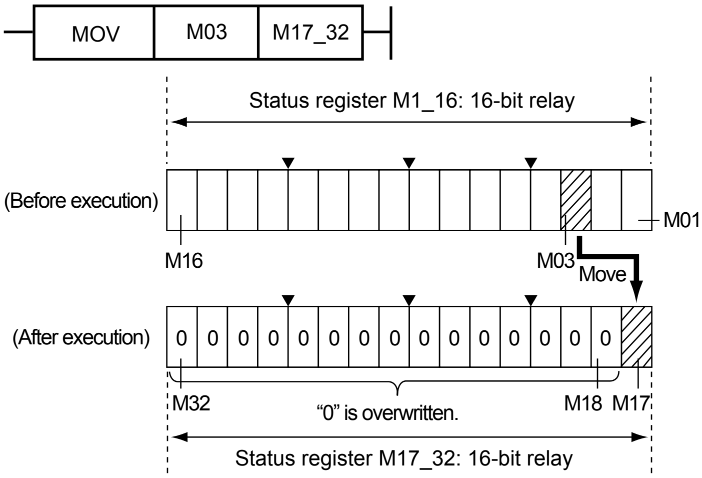
(1) For specification of d2 (relay) to d1 (relay)

The instruction moves M03 relay data (0 or 1) to the M30 relay.



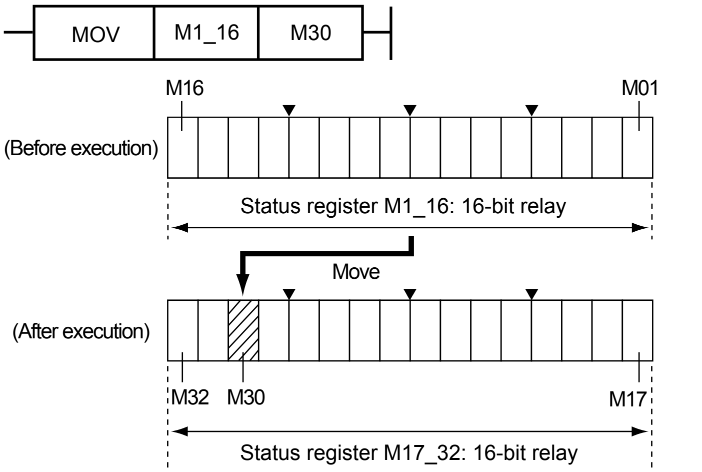
(2) For specification of d2 (relay) to d1 (status register)

The instruction moves M03 relay data (0 or 1) to the M17_32 status registers. The M03 relay data is stored in the M17 relay, and the M18 to M32 relays become “0.”



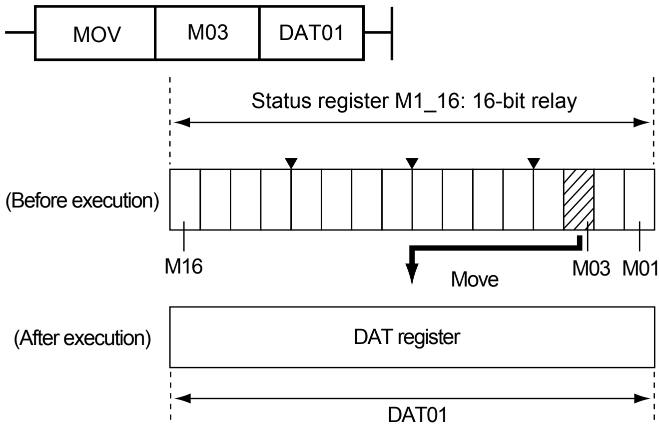
(3) For specification of d2 (status register) to d1 (relay)

The instruction moves M1_16 status register data (0 to 65535) to the M30 relay. If any one of the M01 to M16 relays is “1,” “1” is stored in the M30 relay and if the M01 to M16 are all “0,” “0” is stored in the M30 relay.



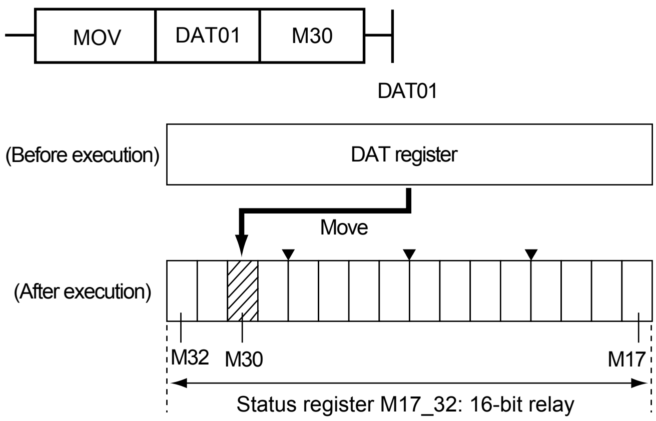
(4) For specification of d2 (relay) to d1 (DAT register)

The instruction moves M03 relay data (0 or 1) to the DAT01 register. If the M03 relay data is 0, “0.0f (0x00000000)” is stored in DAT01, and if it is 1, “1.0f (0x3F800000)” is stored in DAT01.



(5) For specification of d2 (DAT register) to d1 (relay)

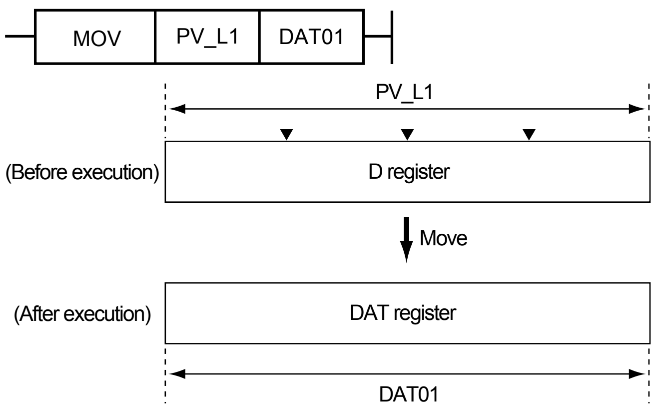
The instruction moves data in the DAT01 register to the M30 relay. If the DAT01 register data is less than “0.5f”, “0” is stored in the M30 relay, and if it is “0.5f” or more, “1” is stored in the M30 relay.



(6) For specification of d2 (D register) to d1 (DAT register)

The instruction moves data in the D register (PV_L1) to the DAT01 register.

Example: When the PV input range is -270.0 to 1370.0 °C and PV is 250.3 °C , if the PV (PV_L1 register) is moved to the DAT01 register, “250.3f” is stored. The data to move includes decimal point position.

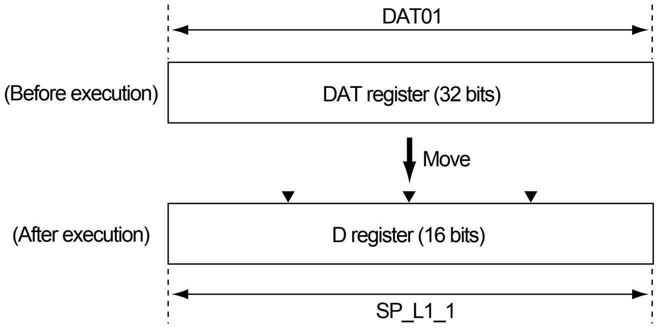


(7) For specification of d2 (DAT register) to d1 (D register)

The instruction moves data in the DAT01 register to the SP_L1_1 register.

Example: When the PV input range is -270.0 to 1370.0 °C, if the DAT01 register data "250.3f" is moved to the SP (SP_L1_1 register), "250.3f" is stored. When the DAT01 register data is out of the range of the storage destination register (parameter), data at the transfer source is restricted to the setting range of the storage destination register.

The data to move includes decimal point position.



For data other than range and scale

If the data "1" to "8" of the SPNO. register is moved to the DAT01 register, data "1.0f" to "8.0f" is stored.

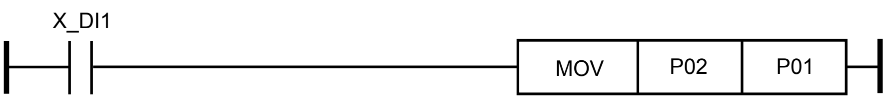
If the DAT01 register data "5.4f" is moved to the SPNO. register, data "5" is stored. If "5.5f" is moved to the SPNO. register, data "6" is stored.

(8) Specification of d2 (DAT register) to d1 (DAT register)

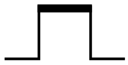
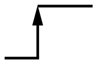
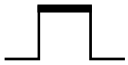
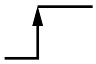
The instruction moves DAT register of the transfer source (d2) to the storage destination (d1) (DAT register).

Program example

When X_DI1 becomes ON, P02 data is moved to the P01 register.



4.6.14 Binary/BCD Conversion

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Binary Conversion	BIN	INT BIN	√	-		3	D-register or status register
	E_BIN	INT BIN	√	-		3	
BCD Conversion	BCD	INT BCD	√	-		3	
	E_BCD	INT BCD	√	-		3	

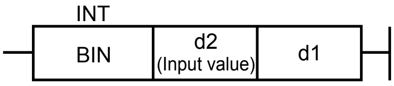
Parameter

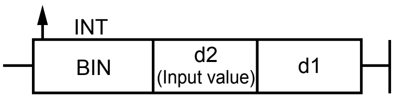
Binary conversion

This instruction converts the data of the transfer source for BCD code (d2) to an integer, and stores it to the transfer destination (d1).

If the data before binary conversion is negative or out of the BCD codes (each digit: 10 (0xa) to 15 (0xf)), binary conversion is not executed and the source value (d1) is not changed.

In this case, a ladder calculation overflow error occurs.



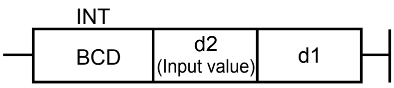


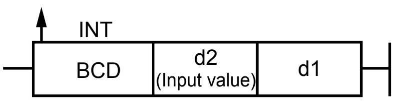
BCD conversion

This instruction converts the data of the transfer source for 16-bit binary code (an integer) to BCD, and stores it to the transfer destination (d1).

If the binary code (an integer) of the transfer source (d2) is greater than negative or 65535, BCD conversion is not executed and the transfer source value (d1) is not changed. In this case, a ladder calculation overflow error occurs.

If the binary code (an integer) of the transfer source (d2) is greater than ten-thousand (10,000), the value is BCD converted up to the thousands digit (1,000) and more than ten-thousands digit (10,000) is not converted.

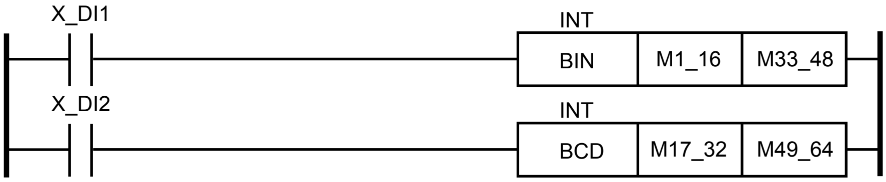




Program example

When X_DI1 becomes ON, M1_16 data is binary converted and the result is stored in M33_48.

When X_DI2 becomes ON, M17_32 data is BCD converted and the result is stored in M49_64.



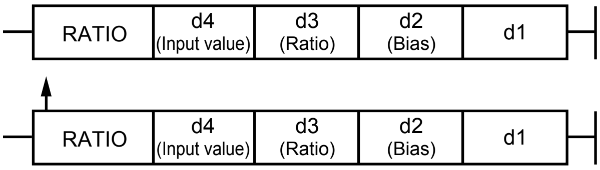
4.6.15 Ratio

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Ratio	RATIO	RATIO	√	-		5	D-register or DAT register
	E_RATIO	RATIO	√	-		5	

Parameter

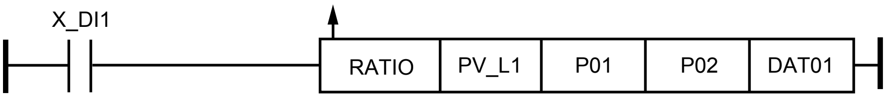
This instruction obtains the ratio from the equation “input value (d4) x ratio (d3) + bias value (d2)” and stores the result in a specified device (d1).

If a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.



Program example

When X_DI1 changes from OFF to ON, PV_L1 input data is multiplied by P01, P02 is added to the value obtained, and the result is stored in DAT01.



4.6.16 Reciprocal

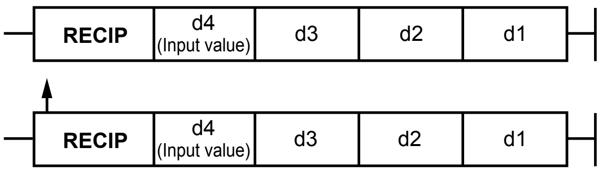
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Reciprocal	RECIP	RECIP	√	-		5	D-register
	E_RECIP	RECIP	√	-		5	

Parameter

When the calculation result of the previous operations is ON or changes from OFF to ON, this instruction takes the reciprocal of the single-precision floating-point number d4 using d3 and d2 and stores the result in a specified device (d1).

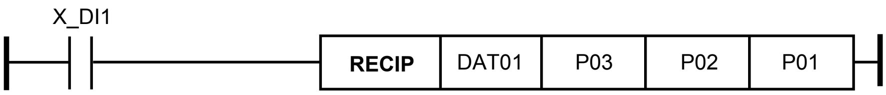
d1 = d3 ÷ (d4 + d2)

However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.



Program example

When X_DI1 becomes ON, P03 ÷ (DAT01+P02) is calculated and stored in P01.



4.6.17 Selectors

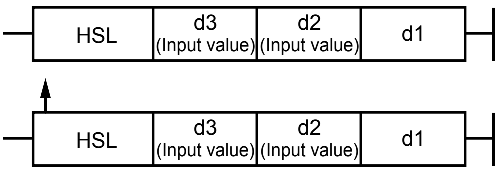
Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
High Selector	HSL	HSL	√	-		4	D-register
	E_HSL	HSL	√	-		4	
Low Selector	LSL	LSL	√	-		4	
	E_LSL	LSL	√	-		4	

Parameter

High selector

When input value (d3) > input value (d2), this instruction stores the input value (d3) in a specified device (d1).

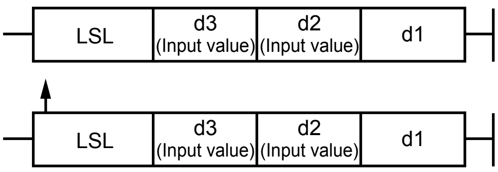
When input value (d3) ≤ input value (d2), the instruction stores the input value (d2) in a specified device (d1).



Low selector

When input value (d3) > input value (d2), this instruction stores the input value (d2) in a specified device (d1).

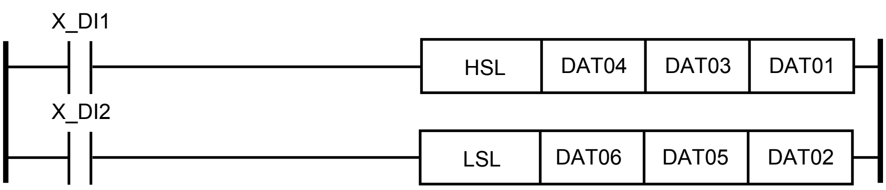
When input value (d3) ≤ input value (d2), the instruction stores the input value (d3) in a specified device (d1).



Program example

When X_DI1 becomes ON, DAT04 data is stored in DAT01 if DAT04 > DAT03. If DAT04 ≤ DAT03, DAT03 data is stored in DAT01.

When X_DI2 becomes ON, DAT05 data is stored in DAT02 if DAT06 > DAT05. If DAT06 ≤ DAT05, DAT06 data is stored in DAT02.



4.6.18 Limiters

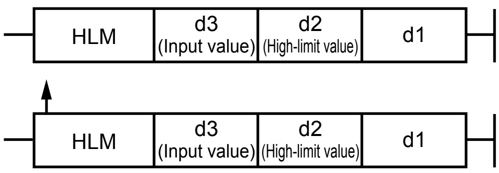
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
High Limiter	HLM	HLM	√	-		4	D-register
	E_HLM	HLM	√	-		4	
Low Limiter	LLM	LLM	√	-		4	
	E_LLM	LLM	√	-		4	

Parameter

High limiter

When input value (d3) < high-limit value (d2), this instruction stores the input value (d3) in a specified device (d1).

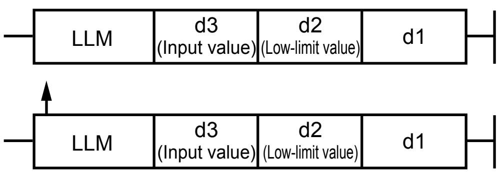
When input value (d3) ≥ high-limit value (d2), the instruction stores the high-limit value (d2) in a specified device (d1).



Low limiter

When input value (d3) < low-limit value (d2), this instruction stores the low-limit value (d2) in a specified device (d1).

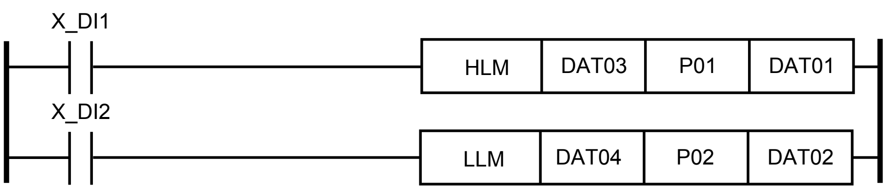
When input value (d3) ≥ low-limit value (d2), the instruction stores the input value (d3) in a specified device (d1).



Program example

When X_DI1 becomes ON, DAT03 data is stored in DAT01 if DAT03 < P01. If DAT03 ≥ P1, P01 data is stored in DAT01.

When X_DI2 becomes ON, P02 data is stored in DAT02 if DAT04 < P02. If DAT04 ≥ P02, DAT04 data is stored in DAT02.



4.6.19 Limit

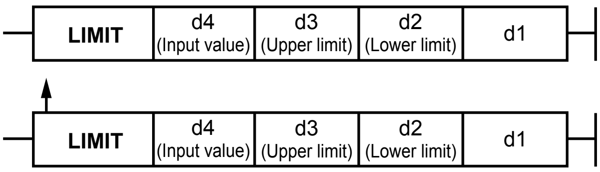
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Limit	LIMIT	LIMIT	√	-		5	D-register
	E_LIMIT	LIMIT	√	-		5	

Parameter

When the calculation result of the previous operations is ON or changes from OFF to ON, this instruction limits the single-precision floating-point number d4 using d3 (upper limit) and d2 (lower limit) and stores the result in a specified device (d1).

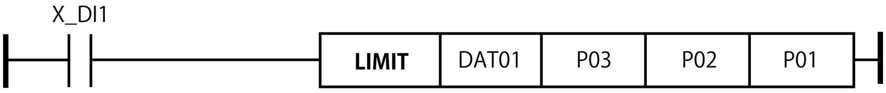
The calculation result is d1 = d3 if d4 > d3. Otherwise, d1 = d2 if d4 < d2. Otherwise, d1 = d4.

If d3 < d2, d3 is constantly output.

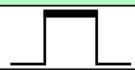
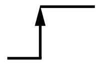
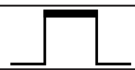
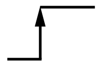


Program example

When X_DI1 becomes ON, input (DAT01) is stored in P01. However, If the result is outside the limits defined by the upper limit (P03) and lower limit (P02), the relevant limit value is stored in P01.



4.6.20 Scaling and Normalization

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	No	Execution Condition	Step Count	Data Format
Scaling	SCAL	SCAL	√	-		5	D-register or DAT register
	E_SCAL	↑ SCAL	√	-		5	
Normalization	NORM	NORM	√	-		5	
	E_NORM	↑ NORM	√	-		5	

Parameter

Scaling

This instruction performs scaling calculation for normalized input value (d5) and stores the result in a specified device (d1).

Scaling calculation is done by the following equation:

d1 = input value (d4) / 100 x (100% scale (d3) - 0% scale (d2)) + 0% scale value (d2)

If a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.

SCAL	d4 (Input value)	d3 (100% scale)	d2 (0% scale)	d1

↑

SCAL	d4 (Input value)	d3 (100% scale)	d2 (0% scale)	d1

Normalization

This instruction performs normalization calculation for scaled input value (d4) and stores the result in a specified device (d1).

Normalization is done by percent data of 0.0 to 100.0, and the following equation:

d1 = (input value (d4) - 0% scale (d2)) / (100% scale (d3) - 0% scale value (d2)) x 100

If a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.

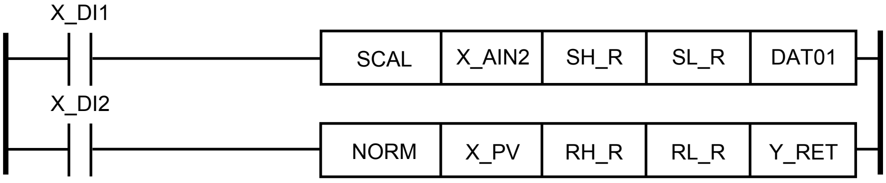
NORM	d4 (Input value)	d3 (100% scale)	d2 (0% scale)	d1

↑

NORM	d4 (Input value)	d3 (100% scale)	d2 (0% scale)	d1

Program example

When X_DI1 changes from OFF to ON, X_AIN2 data is scaled with SL_R to SH_R and the result is stored in DAT01.
When X_DI2 becomes ON, X_PV data is normalized with RL_R to RH_R and the result is stored in Y_RET.



4.6.21 Maximum, Minimum, and Average Values

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Maximum	MAX	MAX	√	-		7	D-register or DAT register
	E_MAX	MAX	√	-		7	
Minimum	MIN	MIN	√	-		7	
	E_MIN	MIN	√	-		7	
Average	AVE	AVE	√	-		7	
	E_AVE	AVE	√	-		7	

Parameter

Maximum value

This instruction obtains the maximum value from up to four inputs: inputs 1 to 4 (d5 to d2) and stores the result in a specified device (d1).

If the number of inputs (d6) is one, the instruction stores input 1 (d5) in the specified device (d1).

If the number of inputs (d6) is two, it stores input 1 (d5) or input 2 (d4), whichever is the greater, in the specified device (d1).

If the number of inputs (d6) is three, it stores the maximum value of input 1 (d5) through input 3 (d3) in the specified device (d1).

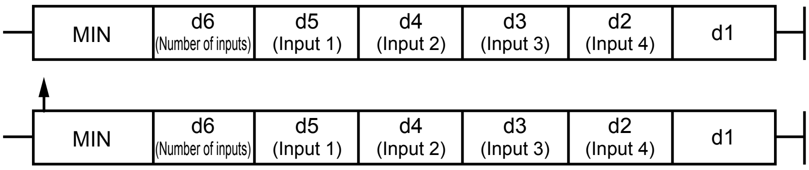
If the number of inputs (d6) is four, it stores the maximum value of input 1 (d5) through input 4 (d2) in the specified device (d1).

MAX	d6 (Number of inputs)	d5 (Input 1)	d4 (Input 2)	d3 (Input 3)	d2 (Input 4)	d1

MAX	d6 (Number of inputs)	d5 (Input 1)	d4 (Input 2)	d3 (Input 3)	d2 (Input 4)	d1

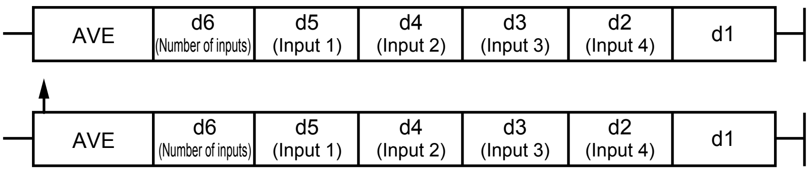
Minimum value

This instruction obtains the minimum value from up to four inputs: inputs 1 to 4 (d5 to d2) and stores the result in a specified device (d1).
If the number of inputs (d6) is one, the instruction stores input 1 (d5) in the specified device (d1).
If the number of inputs (d6) is two, it stores input 1 (d5) or input 2 (d4), whichever is the smaller, in the specified device (d1).
If the number of inputs (d6) is three, it stores the minimum value of input 1 (d5) through input 3 (d3) in the specified device (d1).
If the number of inputs (d6) is four, it stores the minimum value of input 1 (d5) through input 4 (d2) in the specified device (d1).



Average value

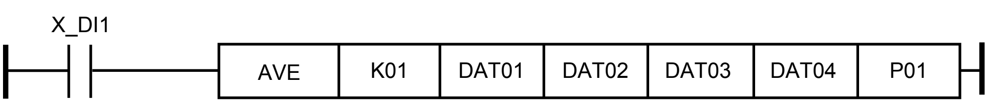
This instruction obtains the average value of up to four inputs: inputs 1 to 4 (d5 to d2) and stores the result in a specified device (d1).
If the number of inputs (d6) is one, the instruction stores input 1 (d5) in the specified device (d1).
If the number of inputs (d6) is two, it obtains the average value of input 1 (d5) and input 2 (d4) and stores it in the specified device (d1).
If the number of inputs (d6) is three, it stores the average value of input 1 (d5) through input 3 (d3) in the specified device (d1).
If the number of inputs (d6) is four, it stores the average value of input 1 (d5) through input 4 (d2) in the specified device (d1).



The number of inputs (d6) is regarded as
- "1" if d6 < 1.5
- "2" if 1.5 ≤ d6 < 2.5
- "3" if 2.5 ≤ d6 < 3.5
- "4" if 3.5 ≤ d6

Digits to the right of the decimal point will be discarded.

Program example



4.6.22 Temperature Compensation

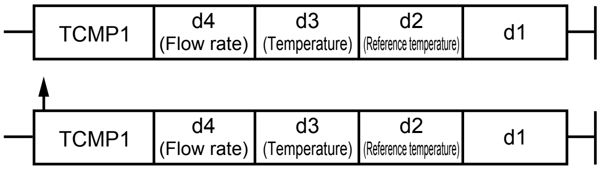
Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Temperature Compensation (deg C)	TCMP1	TCMP1	√	-		5	D-register or DAT register
	E_TCMP1	TCMP1	√	-		5	
Temperature Compensation (deg F)	TCMP2	TCMP2	√	-		5	
	E_TCMP2	TCMP2	√	-		5	

Parameter

Temperature compensation (°C)

This instruction performs temperature compensation (in °C) based on the reference temperature d2 (°C), temperature d3 (°C), and flow rate d4 and stores the result in a specified device (d1). Temperature compensation (°C) is done by the following equation.

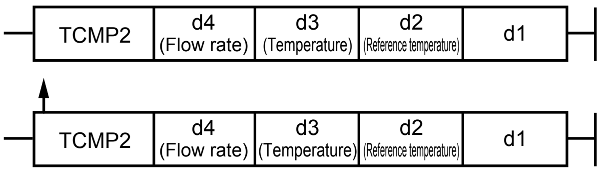
d1 = flow rate (d4) x (reference temperature (d2) + 273.15) / (temperature (d3) + 273.15)



Temperature compensation (°F)

This instruction performs temperature compensation (in °F) based on the reference temperature d2 (°F), temperature d3 (°F), and flow rate d4 and stores the result in a specified device (d1). Temperature compensation (°F) is done by the following equation.

d1 = flow rate (d4) x ((reference temperature (d2) - 32) / 1.8 + 273.15) / ((temperature (d3) - 32) / 1.8 + 273.15)



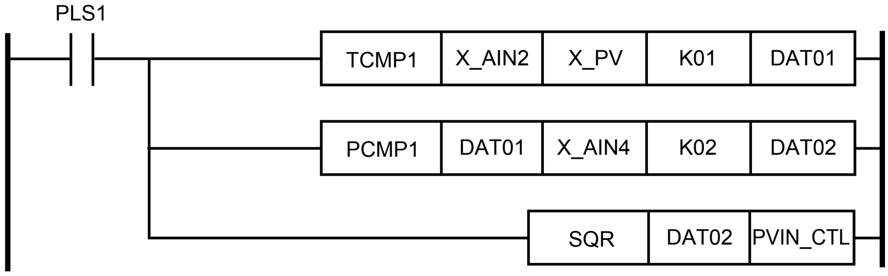
If a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.

4

Operations of Ladder Program Instructions

Program example

In the following program, the control PV input range (P.RH/P.RL) [PVIN_CTL: 0 to 100% scale] and the PV input range (RH/RL) or PV input scale (SH/SL) need to be equal.
X_PV: Temperature input that is scaled to 0 to 500°C.
X_AIN2: Flow input that is scaled to 0 to 100%.
K01: Reference temperature 300°C.
X_AIN4: Pressure input that is scaled to 0 to 1MPa.
K02: Reference pressure 0.6MPa.



4.6.23 Pressure Compensation

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Pressure Compensation (MPa)	PCMP1	PCMP1	√	-		5	D-register
	E_PCMP1	↑ PCMP1	√	-		5	
Pressure Compensation (kgf/cm^2)	PCMP2	PCMP2	√	-		5	
	E_PCMP2	↑ PCMP2	√	-		5	
Pressure Compensation (psi)	PCMP3	PCMP3	√	-		5	
	E_PCMP3	↑ PCMP3	√	-		5	

psi:pound per square inch

Parameter

Pressure compensation (MPa)

This instruction performs pressure compensation (in MPa) based on the reference pressure d2 (MPa), pressure d3 (MPa), and flow rate d4 and stores the result in a specified device (d1).

Pressure compensation (MPa) is done by the following equation.

d1 = flow rate (d4) x (pressure (d3) + 0.101325) / (reference pressure (d2) + 0.101325)

PCMP1	d4 (Flow rate)	d3 (Pressure)	d2 (Reference pressure)	d1

↑

PCMP1	d4 (Flow rate)	d3 (Pressure)	d2 (Reference pressure)	d1

Pressure compensation (kgf/cm^2)

This instruction performs pressure compensation (in kgf/cm^2) based on the reference pressure d2 (kgf/cm^2), pressure d3 (kgf/cm^2), and flow rate d4 and stores the result in a specified device (d1).

Pressure compensation (kgf/cm2) is done by the following equation.

d1 = flow rate (d4) x (pressure (d3) + 1.03323) / (reference pressure (d2) + 1.03323)

PCMP2	d4 (Flow rate)	d3 (Pressure)	d2 (Reference pressure)	d1

↑

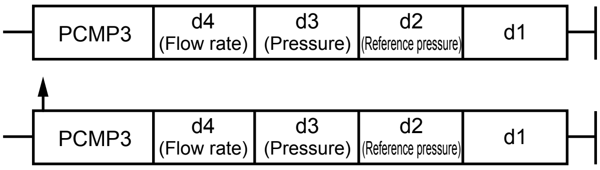
PCMP2	d4 (Flow rate)	d3 (Pressure)	d2 (Reference pressure)	d1

Pressure compensation (psi)

This instruction performs pressure compensation (in psi) based on the reference pressure d2 (psi), pressure d3 (psi), and flow rate d4 and stores the result in a specified device (d1).

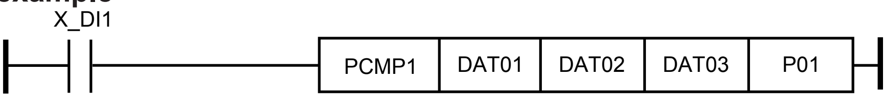
Pressure compensation (psi) is done by the following equation.

d1 = flow rate (d4) x (pressure (d3) + 14.6959) / (reference pressure (d2) + 14.6959)



If a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.

Program example



4.6.24 Temperature and Humidity Calculation

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Temperature and Humidity Calculation	TMPHM	TMPHM	√	-		6	D-register

Parameter

When the calculation result of the previous operations is ON,

$$\textbf{Relative humidity H (\%RH)} = \frac{1}{ed} \times \left(ew - 0.5 \times P \times \frac{Td - Tw}{755} \right)$$

is calculated, and the result is stored in the specified device (d1).

ed: Saturated vapor pressure at dry-bulb temperature (hPa, calculated from d3)
ew: Saturated vapor pressure at wet-bulb temperature (hPa), calculated from d2
Td (d5): Dry-bulb temperature (°C or °F)
Tw (d4): Wet-bulb temperature (°C or °F)
P: Air pressure 1013.25 (hPa)
d2: Wet-bulb temperature input selection (0: X_PV, 1: X_PV2, 2: X_AIN2, 3: X_AIN4)
d3: Dry-bulb temperature input selection (0: X_PV, 1: X_PV2, 2: X_AIN2, 3: X_AIN4)

If °F was specified for the unit of temperature, the temperatures are converted to °C to calculate the saturation vapor pressure and relative humidity.

TMPHM	d5 (dry-bulb temperature)	d4 (wet-bulb temperature)	d3 (dry-bulb temperature input)	d2 (wet-bulb temperature input)	d1

If d2 or d3 is outside the range (less than 0.5 or 3.5 or greater), it is assumed to be 0. However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.
This instruction calculates the relative humidity from the dry-bulb temperature and wet-bulb temperature.
Output data range = 0.0 to 100.0 %Rh
Calculation precision: ±0.01 %Rh
This calculation is possible when Td and Tw are between 0 to 100 °C and Td > Tw.
If Td or Tw < 0 °C, and the calculated result is negative, the relative humidity H is 0 %Rh.
If Td or Tw > 100 °C and Td ≤ Tw, the relative humidity H is 100 %Rh.
Saturation vapor pressure is calculated using the expression in JISZ8806—2001 SONNTAG.

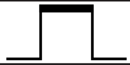
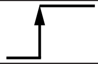
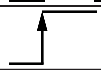
Program example

X_DI1

TMPHM	X_PV	X_AIN2	P01	P02	PVIN_CTL

To use the temperature and humidity calculation, humidity input errors must be considered.
We recommend that you use RTD input for the dry-bulb temperature input and wet-bulb temperature input.
(This is because TC input includes errors in RJC input.)
In addition, the errors in the two temperature inputs must be corrected in advance with a BS parameter or other means with the use of dry-bulb temperature input and wet-bulb temperature input not immersed in water.

4.6.25 10-segment Linearizer Approximation

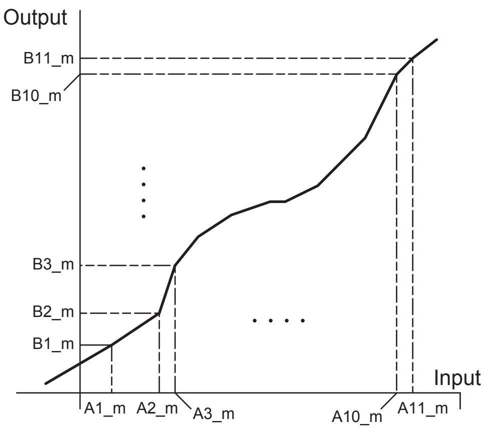
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
10-segment Linearizer Approximation	PLN1	PLN1	√	-		3	D-register
	PLN2	PLN2	√	-		3	
	PLN3	PLN3	√	-		3	
	PLN4	PLN4	√	-		3	

Parameter

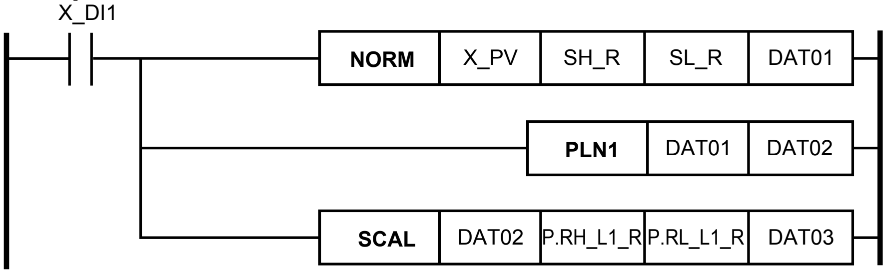
When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).
If d2 < A1_m, d1 = B1_m extension
If d2 > A11_m, d1 = B11_m extension
If An_m ≤ d2 ≤ An+1_m, d1 = Bn_m +(Bn+1_m – Bn_m)×(d2 – An_m)/(An+1_m – An_m)
(n = 1 to 10, m = 1 to 4)
An_m: 10-segment linearizer input parameter value
Bn_m: 10-segment linearizer input parameter value

Operation parameters PYS1 to PYS4 are used. Set 10-segment linearizer selection (PYS) parameters to the ladder program's 10 segments.
The input and output are handled as 0.0 to 100.0%. For engineering units (EUs), NORM and SCAL are necessary before the calculation. The output is limited in the range of –66.70% to 105.00%.
10-segment linearizer approximation, Inverse conversion of 10-segment linearizer approximation, and 20-segment linearizer approximation share the linearizer parameters.

PLN1	d2 (Input value)	d1	or	PLN2	d2 (Input value)	d1
PLN3	d2 (Input value)	d1	or	PLN4	d2 (Input value)	d1



Program example



Note

Set 10-segment linearizer inputs (A1 to A11) so that they increase linearly.

4.6.26 Inverse Conversion of 10-segment Linearizer Approximation

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Inverse Conversion of 10-segment Linearizer Approximation	ILN1	ILN1	√	-		3	D-register
	ILN2	ILN2	√	-		3	
	ILN3	ILN3	√	-		3	
	ILN4	ILN4	√	-		3	

Parameter

When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).

If d2 < B1_m, d1 = A1_m extension

If d2 > B11_m+1, d1 = A11_m+1 extension

If Bn_m ≤ d2 ≤ Bn+1_m, d1 = An_m +(An+1_m – An_m)×(d2 – Bn_m)/(Bn+1_m – Bn_m)

(n = 1 to 10, m = 1, 3)

An_m: 10-segment linearizer input parameter value

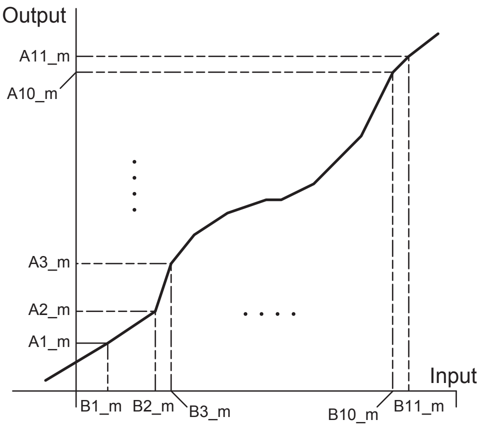
Bn_m: 10-segment linearizer output parameter value

Operation parameters PYS1 to PYS4 are used. Set 10-segment linearizer selection (PYS) parameters to the ladder program's 10 segments.

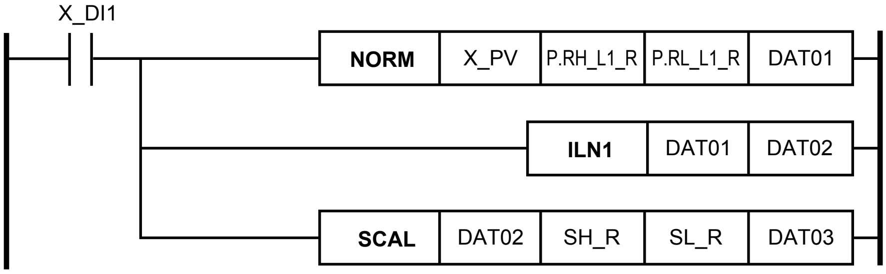
The input and output are handled as 0.0 to 100.0%. For engineering units (EUs), NORM and SCAL are necessary before the calculation. The output is limited in the range of –66.70% to 105.00%.

10-segment linearizer approximation, Inverse conversion of 10-segment linearizer approximation, and 20-segment linearizer approximation share the linearizer parameters.

ILN1	d2 (Input value)	d1	or	ILN2	d2 (Input value)	d1
ILN3	d2 (Input value)	d1	or	ILN4	d2 (Input value)	d1



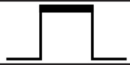
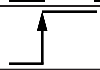
Program example



Note

Set 10-segment linearizer inputs (B1 to B11) so that they increase linearly.

4.6.27 20-segment Linearizer Approximation

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
20-segment Linearizer Approximation	PLN21	PLN21	√	-		3	D-register
	PLN22	PLN22	√	-		3	

Parameter

When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).

If d2 < A1_m, d1 = B1_m extension

If d2 > A11_m+1, d1 = B11_m+1 extension

If An_m ≤ d2 ≤ An+1_m, d1 = Bn_m +(Bn+1_m – Bn_m)×(d2 – An_m)/(An+1_m – An_m)

(n = 1 to 10, m = 1 or 3)

If A11_m ≤ d2 ≤ A2_m+1, d1 = B11_m + (B2_m+1 – B11_m)×(d2 – A11_m)/(A2_m+1 – A11_m)

(m=1 or 3)

If An_m+1 ≤ d2 ≤ An+1_m+1, d1 = Bn_m+1 + (Bn+1_m+1 – Bn_m+1)×(d2 – An_m+1)/(An+1_m+1 – An_m+1)

(n=2 to 10, m=1 or 3)

An_m: 10-segment linearizer input parameter value (A1_2, A1_4 are nonusable.)

Bn_m: 10-segment linearizer output parameter value (B1_2, B1_4 are nonusable.)

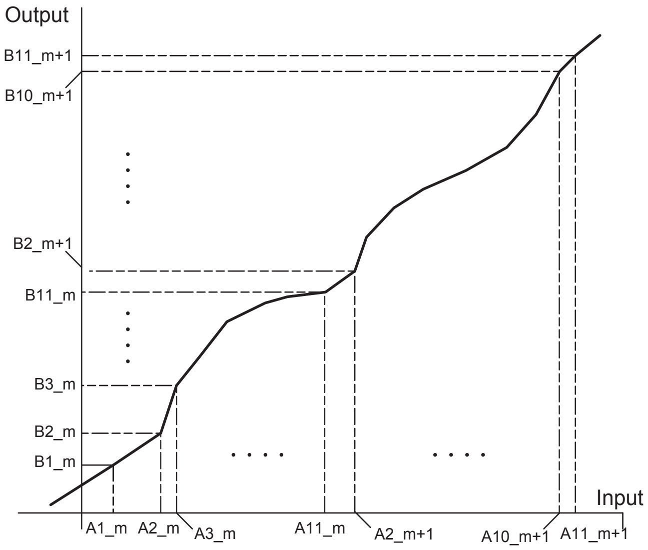
Operation parameters PYS1 to PYS4 are used. Set 10-segment linearizer selection (PYS) parameters to the ladder program's 20 segments.

The input and output are handled as 0.0 to 100.0%. For engineering units (EUs), NORM and SCAL are necessary before the calculation. The output is limited in the range of –66.70% to 105.00%.

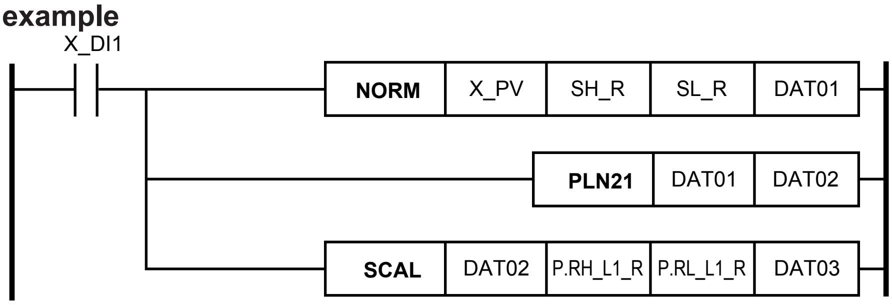
10-segment linearizer approximation, Inverse conversion of 10-segment linearizer approximation, and 20-segment linearizer approximation share the linearizer parameters.

PLN21	d2 (Input value)	d1

PLN22	d2 (Input value)	d1



Program example



Note

Set 10-segment linearizer inputs (A1_m to A11_m, A2_m+1 to A11_m+1) so that they increase linearly.

4.6.28 Maximum Input Hold

Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Maximum Input Hold	MXHD1	MXHD1	√	-		8	D-register

Parameter

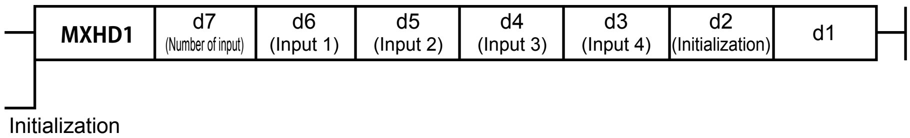
When the calculation result of the previous operations is ON, this instruction compares the maximum value among d6 to d3 and the previous output and stores the larger value in d1.

If $d7 < 1$, 1 is selected.

If $d7 > 4$, 4 is selected.

(If $0.5 \leq d7 < 1.5$, 1 is selected. If $1.5 \leq d7 \leq 2.5$, 2 is selected. . . If $3.5 \leq d7$, 4 is selected.)

If the initialization conditions are met irrespective of a power failure, d2 is output.



d7: Specify the number of inputs (1 to 4). The number of inputs specified by d7 among d6 to d3 are used in the calculation.

The first output is the maximum input after power recovery.

This instruction is executed once.

Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.

The number of inputs (d7) is regarded as

"1" if $d7 < 1.5$

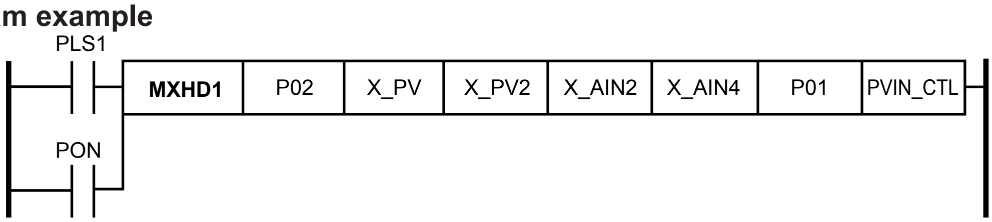
"2" if $1.5 \leq d7 < 2.5$

"3" if $2.5 \leq d7 < 3.5$

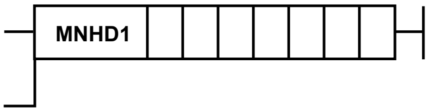
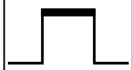
"4" if $3.5 \leq d7$

Digits to the right of the decimal point will be discarded.

Program example



4.6.29 Minimum Value Hold

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Miniimum Input Hold	MNHD1		√	-		8	D-register

Parameter

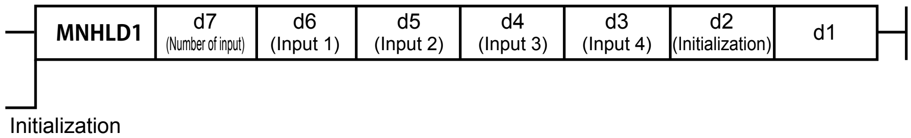
When the calculation result of the previous operations is ON, this instruction compares the maximum value among d6 to d3 and the previous output and stores the larger value in d1.

If d7 < 1, 1 is selected.

If d7 > 4, 4 is selected.

(If 0.5 ≤ d7 ≤ 1.5, 1 is selected. If 1.5 ≤ d7 ≤ 2.5, 2 is selected. . . If 3.5 ≤ d7 ≤ 4.5, 4 is selected.)

If the initialization conditions are met irrespective of a power failure, d2 is output.



d7: Specify the number of inputs (1 to 4). The number of inputs specified by d7 among d6 to d3 are used in the calculation.

The first output is the maximum input after power recovery.

This instruction is executed once.

Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.

The number of inputs (d7) is regarded as

"1" if d7 < 1.5

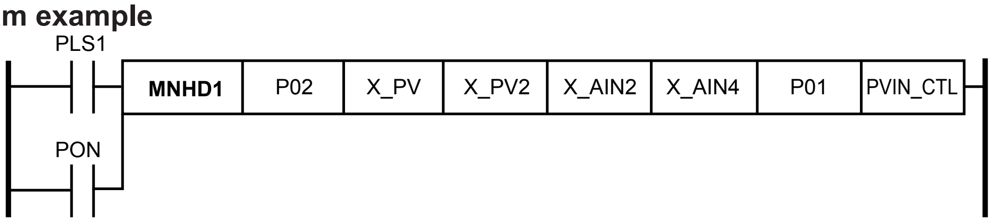
"2" if 1.5 ≤ d7 < 2.5

"3" if 2.5 ≤ d7 < 3.5

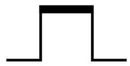
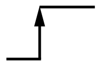
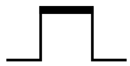
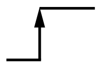
"4" if 3.5 ≤ d7

Digits to the right of the decimal point will be discarded.

Program example



4.6.30 Filter

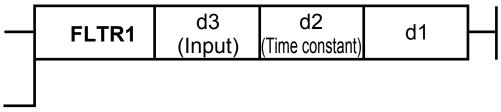
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Filter	FLTR1	FLTR1	√	-		4	D-register
	FLTR2	FLTR2	√	-		4	
	FLTR3	FLTR3	√	-		4	
	FLTR4	FLTR4	√	-		4	

Parameter

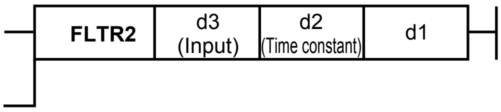
When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).

d1 = previous output + (d3 – previous output)/(1 + d2/control period)

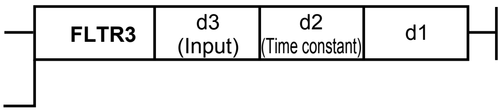
If the calculation result of the previous operations is OFF, d1 is not retained.



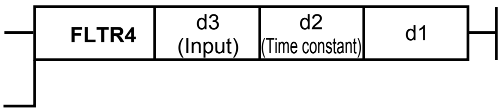
Initialization



Initialization



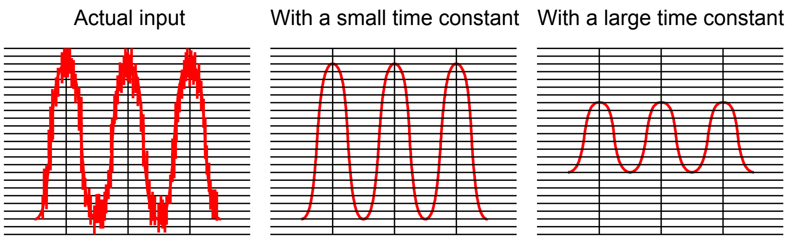
Initialization

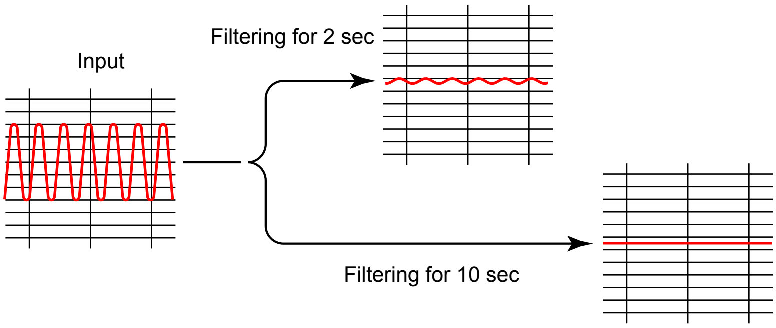


Initialization

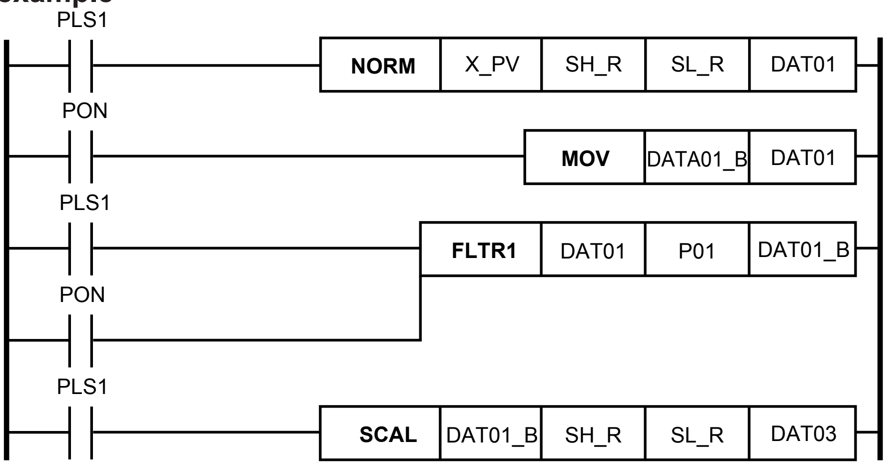
When d2 = 0, the filter is off and d3 = d1.
When d2 = 1 to 120 (seconds), the filter is a first order delay filter.
When d2 ≠ 1 to 120, the filter is off and d3 = d1.
When the initialization flag is ON, d1 = d3.

When a power failure occurs, the calculation is reset (first order delay).
Normally, the power-on relay (PON: 5457) is connected to the initialization flag.
d2 is converted to an integer and used in units of seconds. Fractions are rounded.
d3 (input value) is handled as a percentage between 0.0 and 100.0%, so for engineering units (EUs), NORM and SCAL calculations are needed before and after the calculation.
Up to four values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.

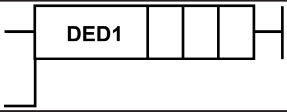
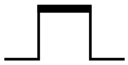
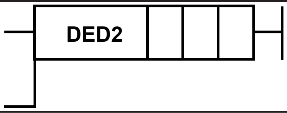
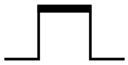
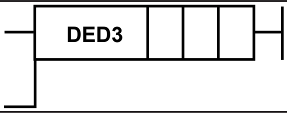
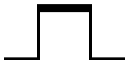




Program example

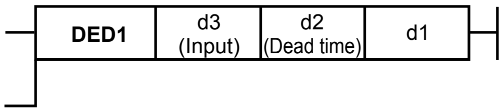


4.6.31 Dead Time

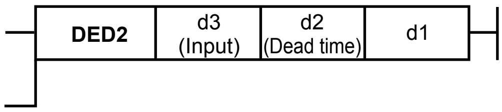
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Dead Time	DED1		√	-		4	D-register
	DED2		√	-		4	
	DED3		√	-		4	

Parameter

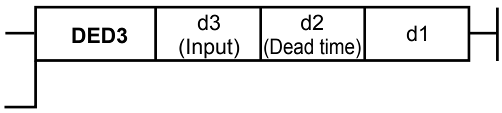
When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).
This instruction outputs the d3 value d2 hours earlier.
When the initialization flag is ON, d3 = d1.
The sampling time is d2/20 seconds. (If d2/20 is less than the control period, the sampling time is set to the control period.)
d2: Dead time (0 to 10000 seconds)



Initialization

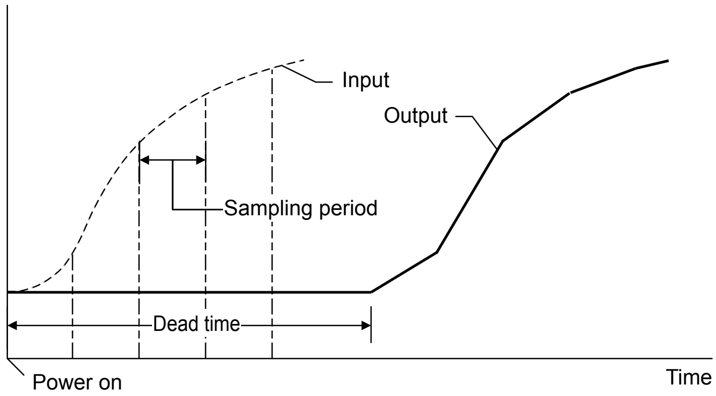


Initialization

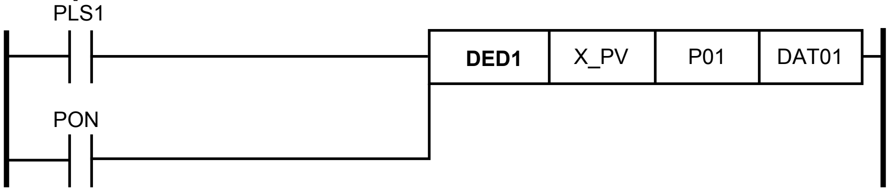


Initialization

When a power failure occurs, d1 is reset to 0.0%.
Normally, the power-on relay (PON: 5457) is connected to the initialization flag.
When d2 = 0, the dead time is off and d3 = d1.
d2 is converted to an integer and used in units of seconds. When d2 < 0 or d2 > 10000, d2 = 0. Fractions are rounded.
Up to three values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.



Program example

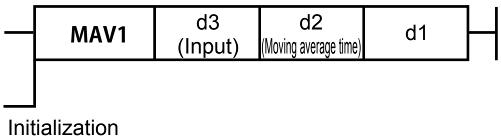


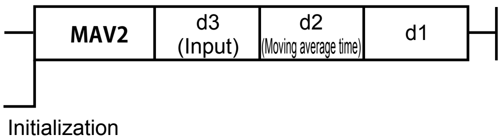
4.6.32 Moving Average

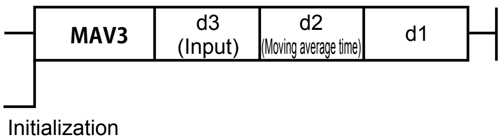
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Moving Average	MAV1	MAV1	√	-		4	D-register
	MAV2	MAV2	√	-		4	
	MAV3	MAV3	√	-		4	

Parameter

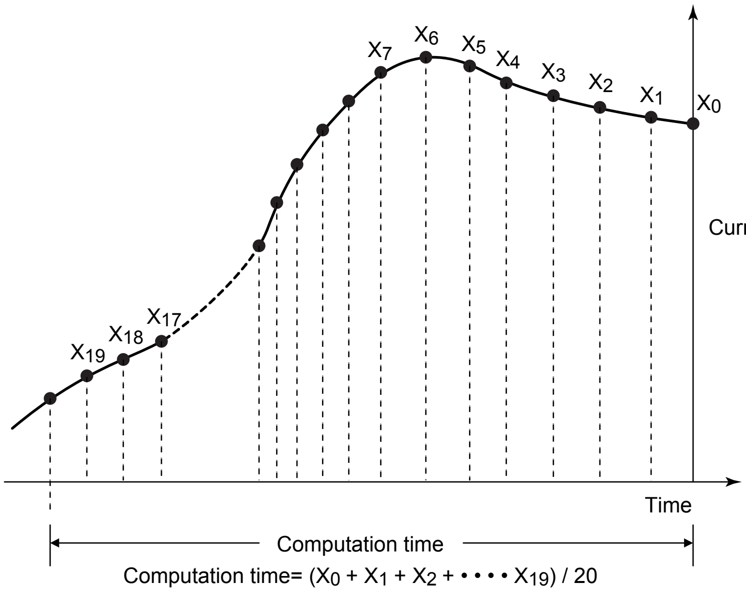
When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).
This instruction outputs the d3 average of d2 hours.
When the initialization flag is ON, d3 = d1.
The sampling time is d2/20 seconds. (If d2/20 is less than the control period, the sampling time is set to the control period.)
d2: Moving average time (0 to 10000 seconds)



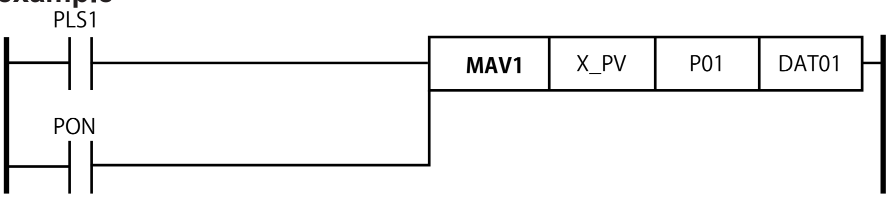




When a power failure occurs, d1 is reset to 0.0%.
Normally, the power-on relay (PON: 5457) is connected to the initialization flag.
When d2 = 0, the moving average time is off and d3 = d1.
d2 is converted to an integer and used in units of seconds. When d2 < 0 or d2 > 10000, d2 = 0. Fractions are rounded.
Up to three values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.



Program example

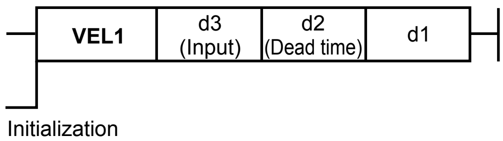


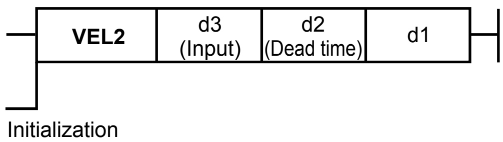
4.6.33 Velocity Computation

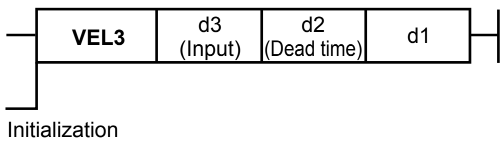
Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Velocity Computation	VEL1	VEL1	√	-		4	D-register
	VEL2	VEL2	√	-		4	
	VEL3	VEL3	√	-		4	

Parameter

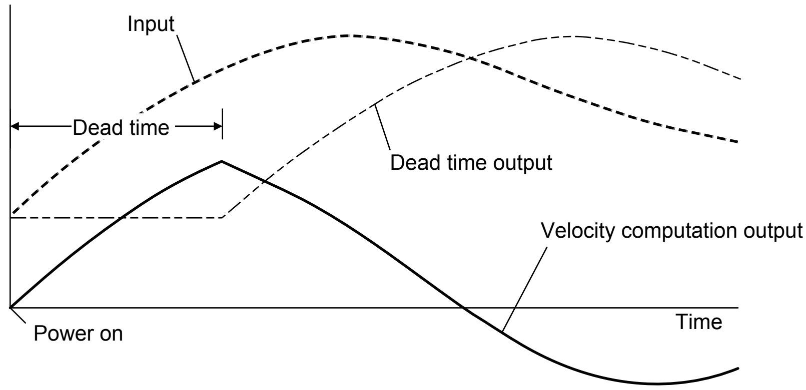
When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).
This instruction outputs the difference between the current d2 and the d3 value d2 hours earlier.
When the initialization flag is ON, d1 = 0.0%.
The sampling time is d2/20 seconds. (If d2/20 is less than the control period, the sampling time is set to the control period.)
d2: Dead time (0 to 10000 seconds)



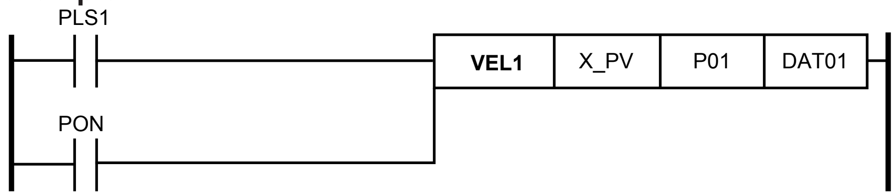




When a power failure occurs, d1 is reset to 0.0%.
Normally, the power-on relay (PON: 5457) is connected to the initialization flag.
When d2 = 0, the dead time is off and d3 = d1.
d2 is converted to an integer and used in units of seconds. When d2 < 0 or d2 > 10000, d2 = 0. Fractions are rounded.
Up to three values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.



Program example

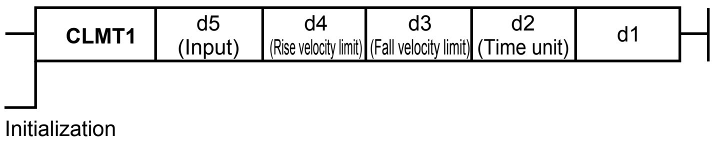


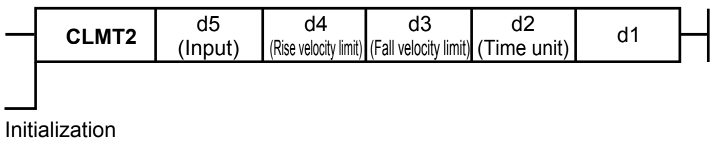
4.6.34 Velocity Limiter

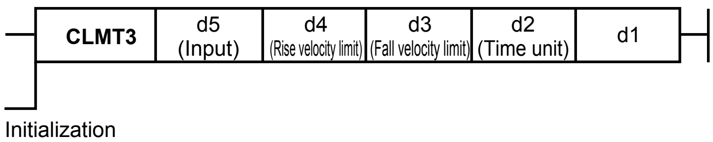
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Velocity Limiter	CLMT1	CLMT1	√	-		4	D-register
	CLMT2	CLMT2	√	-		4	
	CLMT3	CLMT3	√	-		4	
	CLMT4	CLMT4	√	-		4	

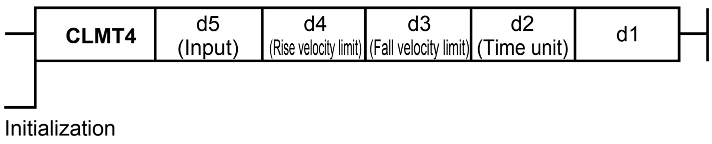
Parameter

When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).
If the calculation result of the previous operations is OFF, d1 is not retained.
d4: Rise velocity limit; limited within this value
d3: Fall velocity limit; limited within this value
d2: Velocity limit unit
d2 = 0: hours, d2 = 1: minutes
If the initialization flag is ON, d5 is output as it is. Normally, the power-on relay (PON: 5457) is connected to the initialization flag.
d5 (input value) is handled as a percentage between 0.0 and 100.0%, so for engineering units (EUs), NORM and SCAL calculations are needed before and after the calculation.
If the input is less than –5% or 105% or greater, the output is limited within –5% to 105%.
d3 and d4 are velocity limits that range from 0.1 to 100.0%. (If a value less than 0.1% or greater than 100.0% is specified, it is assumed to be 100.0%.)
d2 is converted to an integer and used as the unit of change. If d2 is set to a value other than 0 or 1, it is assumed to be 0 (time).
When a power failure occurs, the output is 0.0%.

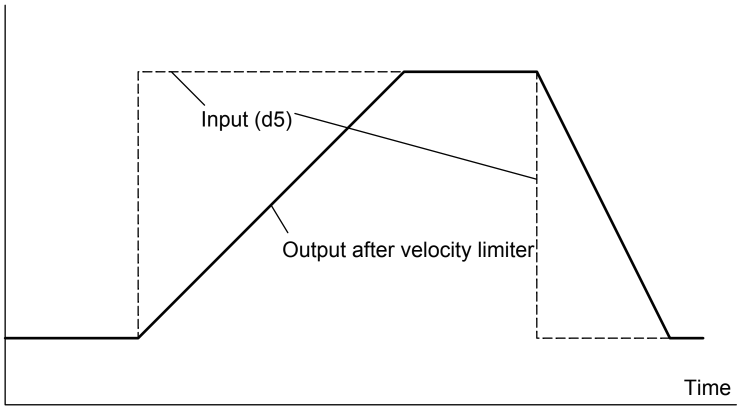


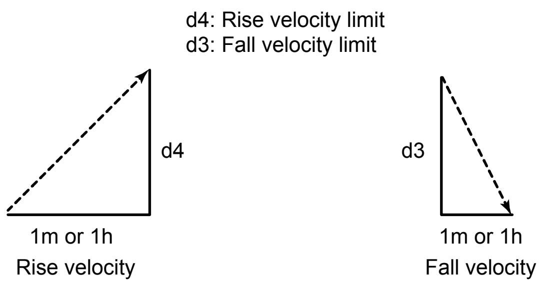




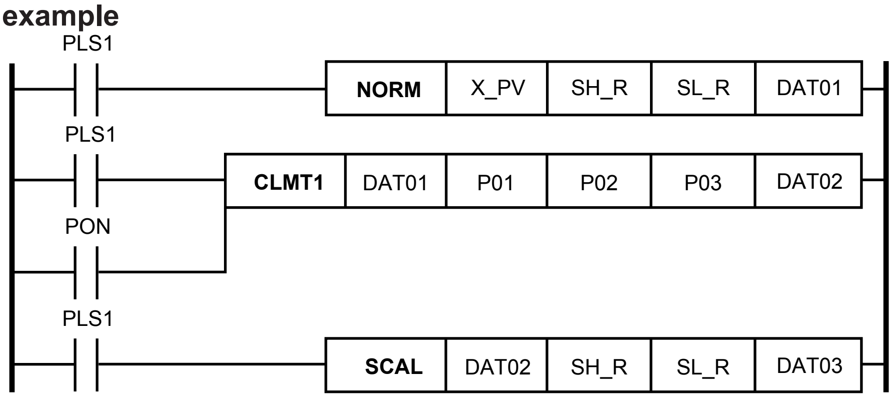


Up to four values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.





Program example

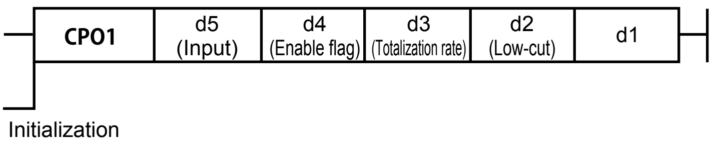


4.6.35 Totalizer Pulse Output

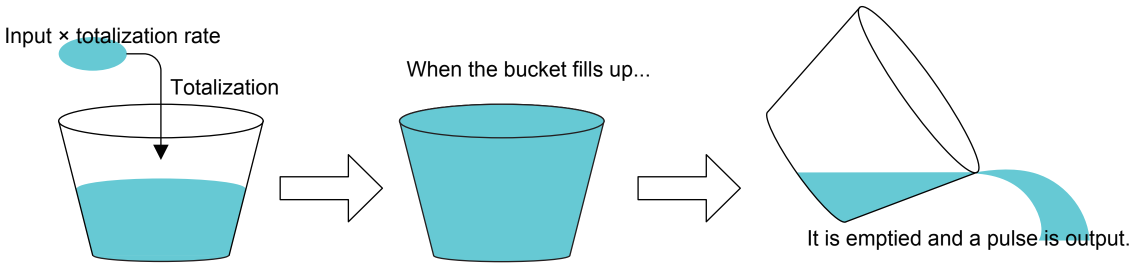
Instruction	Mnemonic	Symbol	Input Condition Required?		Execution Condition	Step Count	Data Format
			Yes	No			
Totalizer Pulse Output	CPO1	CPO1	√	-		6	D-register

Parameter

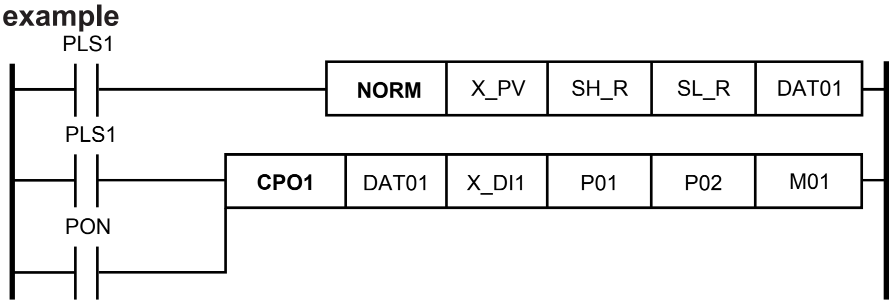
When the calculation result of the previous operations is ON, this instruction performs the following calculation and outputs the result to the storage location (d1).
Initialization flag (OFF: disable initialization, ON: enable initialization)
d4: Enable flag (OFF: stop calculation, ON: continue calculation)
d3: Totalization rate (unit: pulse/time)
Setting range: 100 to 8000
d2: Low cutoff value [%] 0.0 to 100.0% (values outside this range is assumed to be 0.0)
Inputs less than the low cutoff value are not totalized.



If d3 is set to a value less than 100, it is assumed to be 100. If d3 is set to a value greater than 8000, it is assumed to be 8000.
When a power failure occurs, the output is reset to 0.
d5 (input value) is handled as a percentage between 0.0 and 100.0%, so for engineering units (EUs), NORM calculation is needed before the calculation.
One value can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.
However, if a non-numerical value or infinity occurs during calculation or arises as a result, a ladder calculation overflow error occurs.



Program example



4.6.36 On-delay Timer

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
On-delay Timer	ONDY1	ONDY1	√	-		4	D-register
	ONDY2	ONDY2	√	-		4	
	ONDY3	ONDY3	√	-		4	
	ONDY4	ONDY4	√	-		4	
	ONDY5	ONDY5	√	-		4	
	ONDY6	ONDY6	√	-		4	
	ONDY7	ONDY7	√	-		4	
	ONDY8	ONDY8	√	-		4	

Parameter

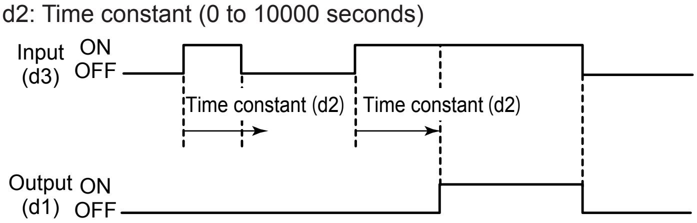
When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).

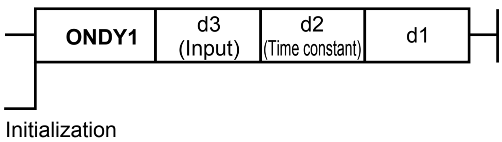
d2 seconds after the d3 input is set to ON, d1 is set to ON.

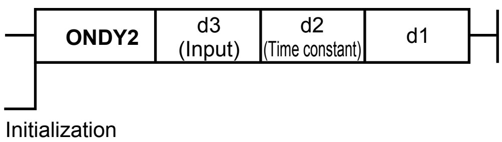
When the d3 input is set to OFF, d1 is immediately set to OFF.

After initialization, d1 = d3.

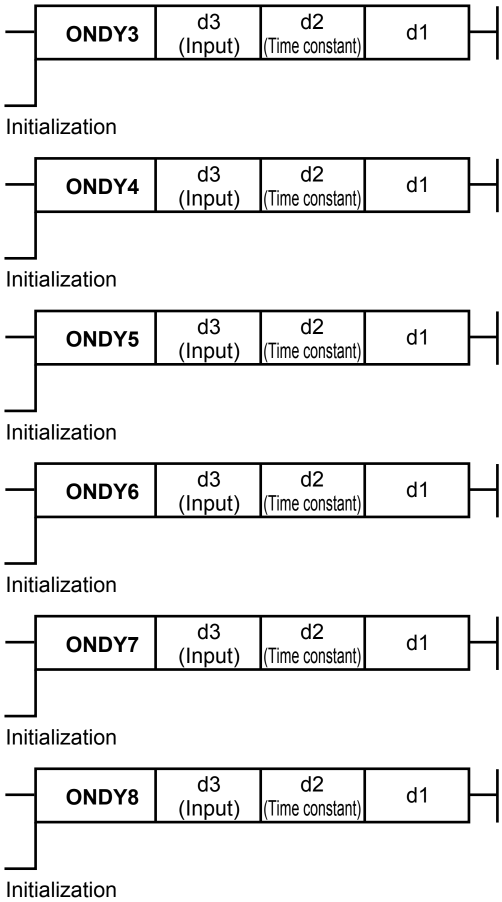
d2: Time constant (0 to 10000 seconds)





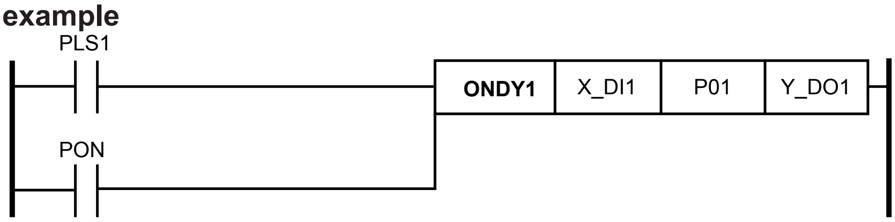


4 Operations of Ladder Program Instructions



When a power failure occurs, initialize.
d2 is converted to an integer and used in units of seconds. When d2 < 0 or d2 > 10000, d2 = 0. Fractions are rounded.
Up to eight values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.

Program example

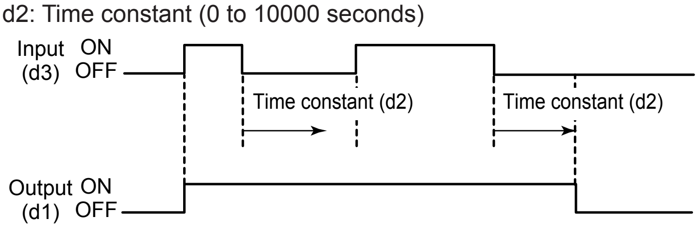


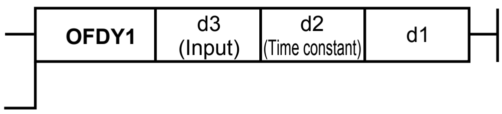
4.6.37 Off-delay Timer

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
Off-delay Timer	OFDY1	OFDY1	√	-		4	D-register
	OFDY2	OFDY2	√	-		4	
	OFDY3	OFDY3	√	-		4	
	OFDY4	OFDY4	√	-		4	
	OFDY5	OFDY5	√	-		4	
	OFDY6	OFDY6	√	-		4	
	OFDY7	OFDY7	√	-		4	
	OFDY8	OFDY8	√	-		4	

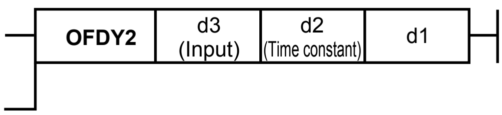
Parameter

When the calculation result of the previous operations is ON, this instruction performs the following calculation and stores the result in a specified device (d1).
When the d3 input is set to ON, d1 is immediately set to ON.
d2 seconds after the d3 input is set to OFF, d1 is set to OFF.
After initialization, d1 = d3.
d2: Time constant (0 to 10000 seconds)

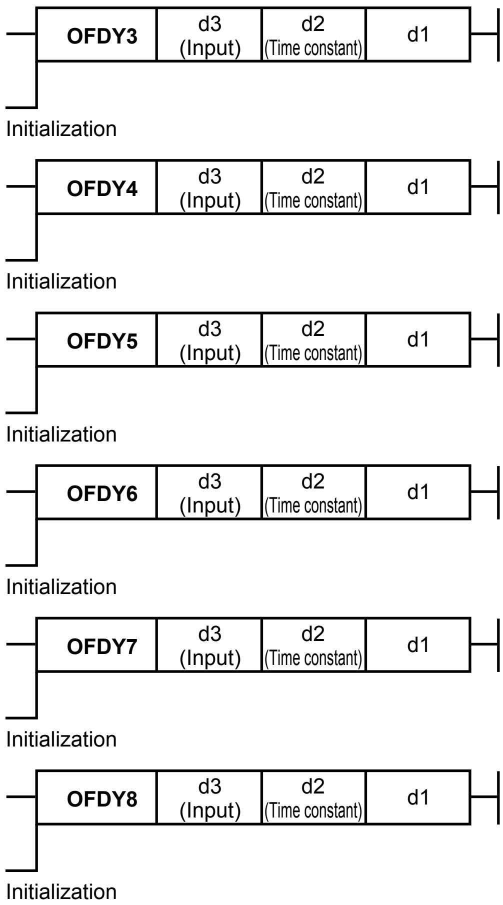




Initialization

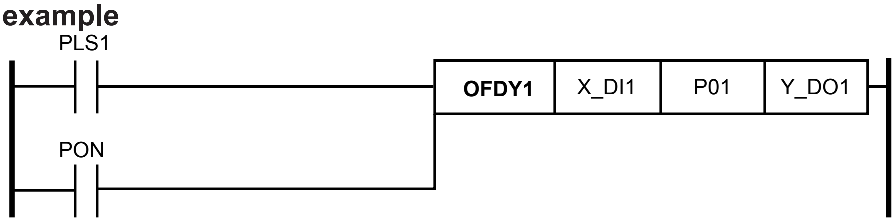


Initialization



When a power failure occurs, initialize.
d2 is converted to an integer and used in units of seconds. When d2 < 0 or d2 > 10000, d2 = 0. Fractions are rounded.
Up to eight values can be used.
Data is retained, so if the instruction is executed once in the control period, an appropriate calculation will be performed.

Program example



4.6.38 CP Calculation

This instruction can be used on a UT75A with the /CP option.

Instruction	Mnemonic	Symbol	Input Condition Required? Yes	Input Condition Required? No	Execution Condition	Step Count	Data Format
CP Calculation 1	CPC11	CPC11	√	-		5	D-register
	CPC12	CPC12	√	-		5	
CP Calculation 2	CPC21	CPC21	√	-		5	
	CPC22	CPC22	√	-		5	

CP Calculation 1

Parameter

When the calculation result of the previous operations is ON, this instruction performs the following calculation and outputs the result to the storage location (d1).

CP expression based on chamber temperature, CO partial pressure, and zirconia O_2 sensor electromotive force

CPC11	d4 °C (Chamber temp.)	d3 (CO partial pressure)	d2 (Zirconia O2 sensor)	d1
CPC12	d4 °F (Chamber temp.)	d3 (CO partial pressure)	d2 (Zirconia O2 sensor)	d1

d4 = Chamber temperature (°C or °F)

If the chamber temperature is less than 727.2°C or if a calculation overflow occurs, the CP value is set to 2.000 through error handling.

d3 = CO partial pressure (vol %)

(Input range: 0 to 100%; 0 for values less than 0; 100 for values greater than 100)

d2 = Zirconia O_2 sensor electromotive force (mV)

(Input range: 0 to 1250 mV; 0 for values less than 0; 1250 for values greater than 1250)

The calculation output will range from 0.000 to 2.000.

Note

When executing CP calculation 1, set the following setup parameters.

Burnout operation for input (PV), which is the chamber temperature input (d4): DOWN

High resistance input voltage range (AIN2 or AIN4): 0.000 to 1.250 V, scale 0 to 1250

Control PV input range (P.UNI, P.DP, P.RH, P.RL): 0.000 to 2.000

Program example

PLS1

CPC11	X_PV	P01	X_AIN4	DAT01

4

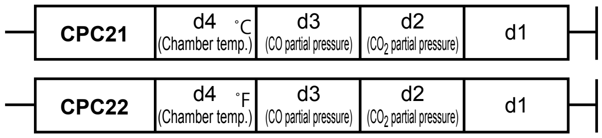
Operations of Ladder Program Instructions

CP Calculation 2

Parameter

When the calculation result of the previous operations is ON, this instruction performs the following calculation and outputs the result to the storage location (d1).

CP expression based on the chamber temperature, CO partial pressure, and CO_2 partial pressure.



d4 = Chamber temperature (°C or °F)

If the chamber temperature is less than 727.2°C or if a calculation overflow occurs, the CP value is set to 2.000 through error handling.

d3 = CO partial pressure (vol %)

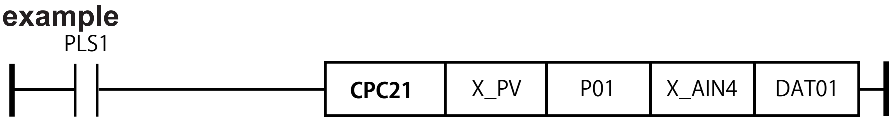
(Input range: 0 to 100%; 0 for values less than 0; 100 for values greater than 100)

d2 = CO_2 partial pressure (vol %)

(Input range: 0 to 100%; 0 for values less than 0; 100 for values greater than 100)

The calculation output will range from 0.000 to 2.000.

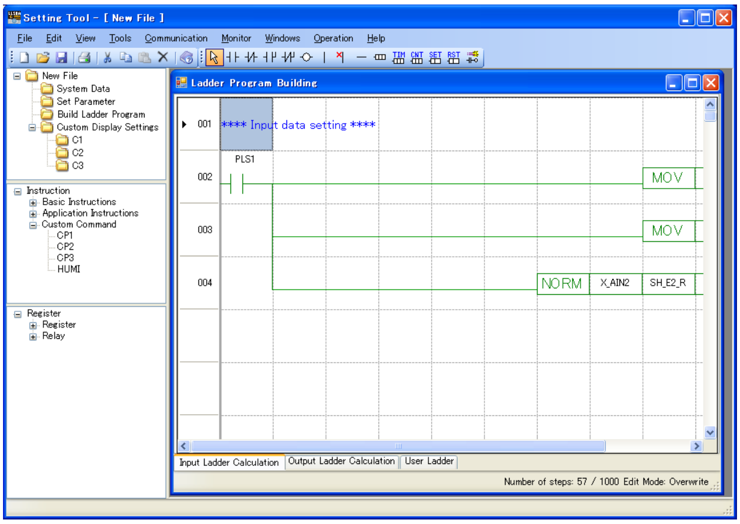
Program example

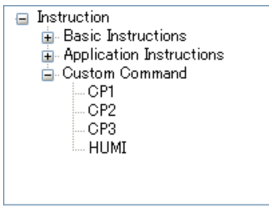


4.7 Details of Custom Ladder Instructions (UT75A Only)

4.7.1 Registering Custom Ladder Instructions

Custom ladder instructions can be created according to the procedure in section 4.7.2, “Creating Custom Ladder Instructions (UT75A Only).” Up to 100 instructions can be registered in the LL50A. You can use custom ladder instructions in the same way on the LL50A as basic instructions and application instructions by selecting the customer ladder instructions that you have created from a custom ladder instruction tree, as shown below. The example below shows an LL50A ladder instruction tree in which four custom ladder instructions—CP1, CP2, CP3, and HUMI—are registered.





Note

To edit on an LL50A of another PC a ladder program that uses the custom ladder instructions that you have created, import the custom ladder instruction file into the LL50A of the other PC. The procedure is the same for importing and editing a main unit ladder program on the LL50A.

If a ladder program that includes a custom ladder instruction that is not registered in the LL50A is imported from a user file or the main unit, the following limitations exist.

Function	Operation
Open or save user files	Yes
Write to or read from the main unit	Yes
Edit parameters	Yes
Edit ladder programs	No
Edit custom ladder instructions	Yes (however unregistered instructions cannot be edited)
Monitor ladders	Unregistered instructions are displayed using temporary names.

Note

If you change or delete a custom ladder instruction that is already in use, you will no longer be able to edit ladder programs that use the instruction. To achieve a different function, register a new instruction with a new custom ladder name.

Note

Assign a unique name to each custom ladder instruction.
Do not use names that are already used by basic instructions and application instructions.
If there is a custom ladder instruction that has the same expression as another instruction but registered with a different name, its name will be changed to the name of the other instruction that appears higher in the instruction tree when the instructions are uploaded via communication.

4.7.2 Creating Custom Ladder Instructions

You can create custom ladder instructions. By creating custom ladder instructions, you can easily create calculations consists of multiple expressions. Up to five custom ladder instructions can be registered.

The custom ladder instructions that you create here can be used in the same way as application instructions when you create ladder programs.

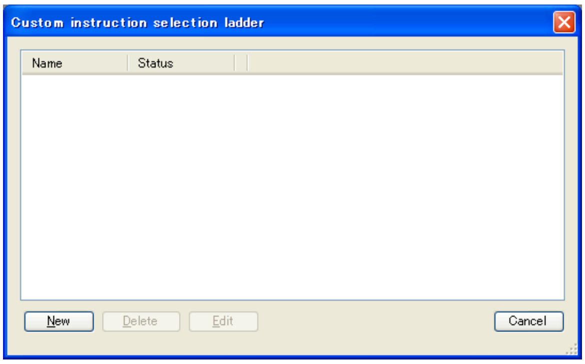
Custom ladder instructions can be saved to files and be used in other ladder programs.

File name extension: *****.LCF

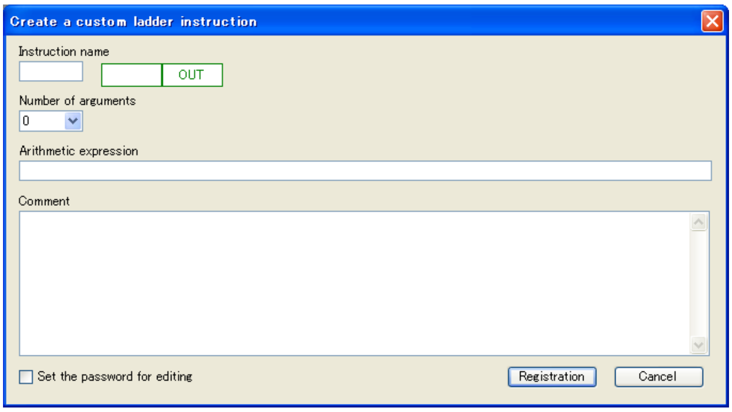
See section 2.15.4, “Opening Custom Ladder Instruction Files,” and section 2.15.10, “Saving Ladder Instruction Files.”

Procedure

1. On the Tools menu, click “Edit custom ladder instruction” to display the Custom ladder instruction selection window.



2. Click [New] to display the Create a custom ladder instruction window. To edit an existing custom ladder instruction, click [Edit].

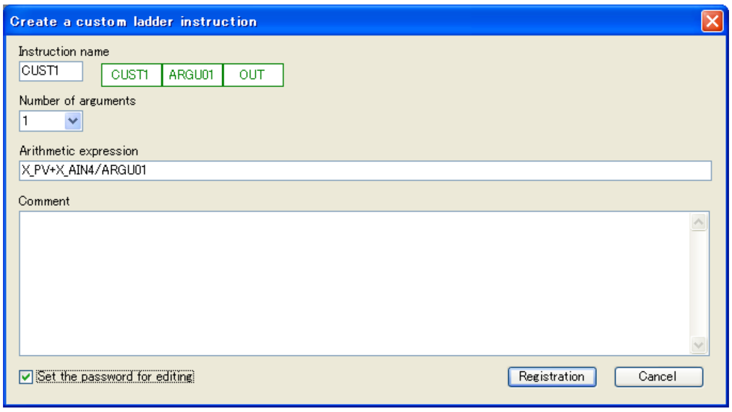


3. Set the instruction name, number of arguments, and arithmetic expression. If necessary, enter a comment. To enable the security feature, select the Set the password for editing check box.

4. When you are finished entering the information, click [Registration].

Item	Specifications
Instruction name	The characters that you can use are alphanumeric characters (uppercase and lowercase). The maximum length is five characters. The first character cannot be a number. Symbols cannot be used.
Number of arguments	0 to 8
Arithmetic expression	ARGU01 to ARGU08 can be used as arguments in the calculation expression. Registers such as PV input can also be used. Registers are not handled as arguments. If you use ARGU01 to ARGU08, you will need to specify registers in the custom ladder instruction input fields (arguments) when you create programs. For the available operators, see the list of instructions on the next page. Calculation expressions can be as long as 150 characters.
Comment	You can register operator descriptions, revisions, and other information as comments
Set the password for editing	Selecting this check box and clicking Registration opens a password input dialog box. If you set a password, you will need to enter the password when you edit instructions. The password is up to 8 alphanumeric characters.

Example: Instruction name: CUST1, Number of arguments: 1 (ARGU01),
Arithmetic expression: PV input + AIN4 input ÷ argument (ARGU01)



List of Instructions

Instruction	Name
(ADD, +)	Addition
(SUB, -)	Subtraction
(MUL, *)	Multiplication
(DIV, /)	Division
SQRF (Input value)	Square root
ABS (Input value)	Absolute
EXP (Input value)	Exponential
PWR (base, exponent)	Power
LN (Input value)	Natural Logarithm
LOG (Input value)	Common Logarithm
RATIO (Input value, Ratio, Bias)	Ratio
RECIP (Input value, Parameter 1, Parameter 2)	Reciprocal
HSL (Input value1, Input value 2)	High Selector
LSL (Input value1, Input value 2)	Low Selector
HLM (Input value1, Input value 2)	High Limiter
LLM (Input value1, Input value 2)	Low Limiter
LIMIT (Input value, upper value, lower value)	Limit
MAX (Number of inputs, Input 1, Input 2, Input 3, Input4)	Maximum
MIN (Number of inputs, Input 1, Input 2, Input 3, Input4)	Minimum
AVE (Number of inputs, Input 1, Input 2, Input 3, Input4)	Average
PLN1 (Input value)	10-segment Linearizer Approximation
PLN2 (Input value)	10-segment Linearizer Approximation
PLN3 (Input value)	10-segment Linearizer Approximation
PLN4 (Input value)	10-segment Linearizer Approximation
ILN1 (Input value)	Inverse Conversion of 10-segment Linearizer Approximation
ILN2 (Input value)	Inverse Conversion of 10-segment Linearizer Approximation
ILN3 (Input value)	Inverse Conversion of 10-segment Linearizer Approximation
ILN4 (Input value)	Inverse Conversion of 10-segment Linearizer Approximation
PLN21 (Input value)	20-segment Linearizer Approximation
PLN22 (Input value)	20-segment Linearizer Approximation

Calculating the Number of Steps in a Custom Ladder Instruction

(Number of arguments × 1) + (total number of steps in the arithmetic expression) + (number of variables in the arithmetic expression × 1) + 5

Example: Custom ladder instruction that divides two inputs by one argument value
Arithmetic expression: X_PV+X_AIN4/ARGU01
Number of steps = (1 × 1) + (4 + 4) + (0 × 1) + 5 = 14

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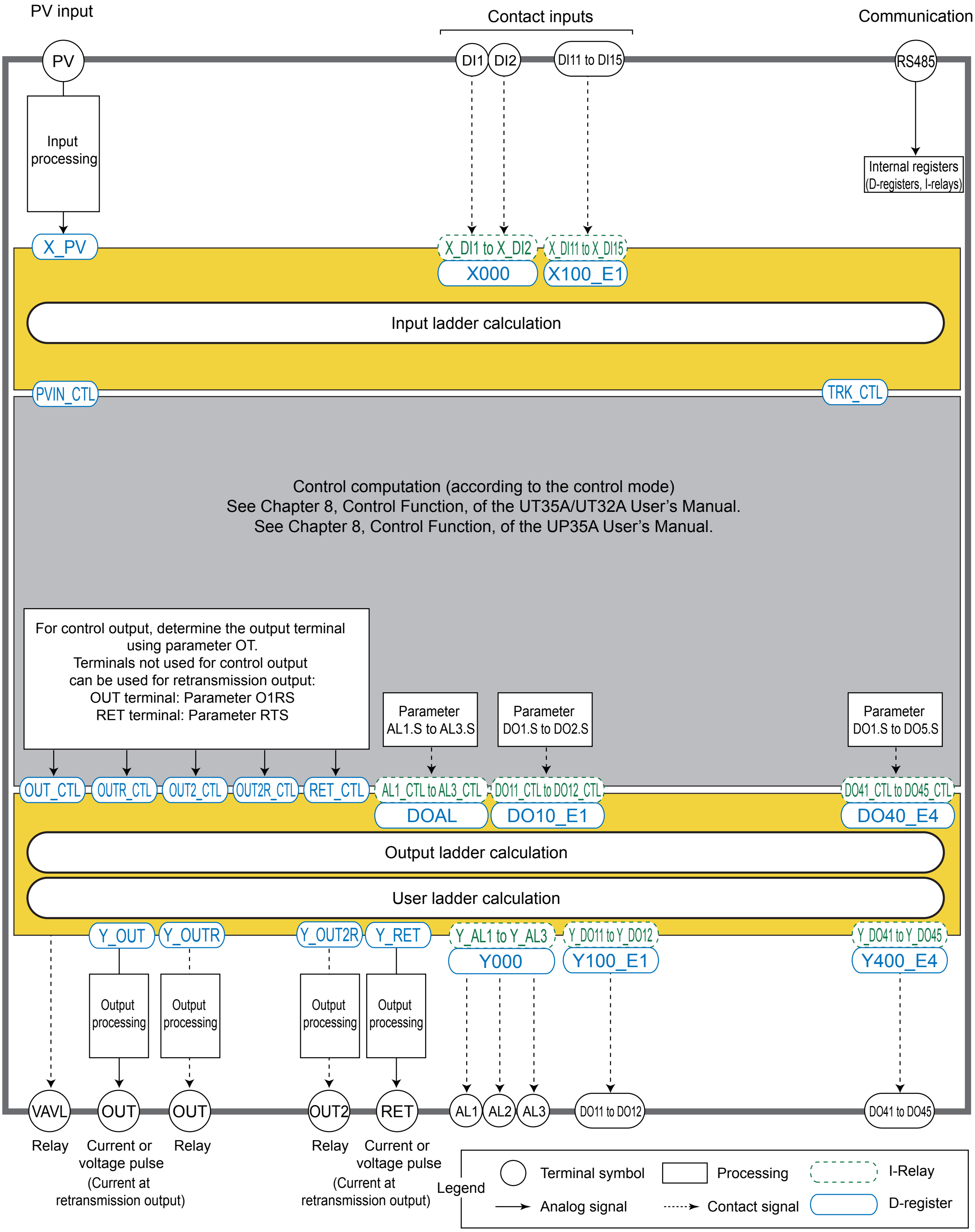
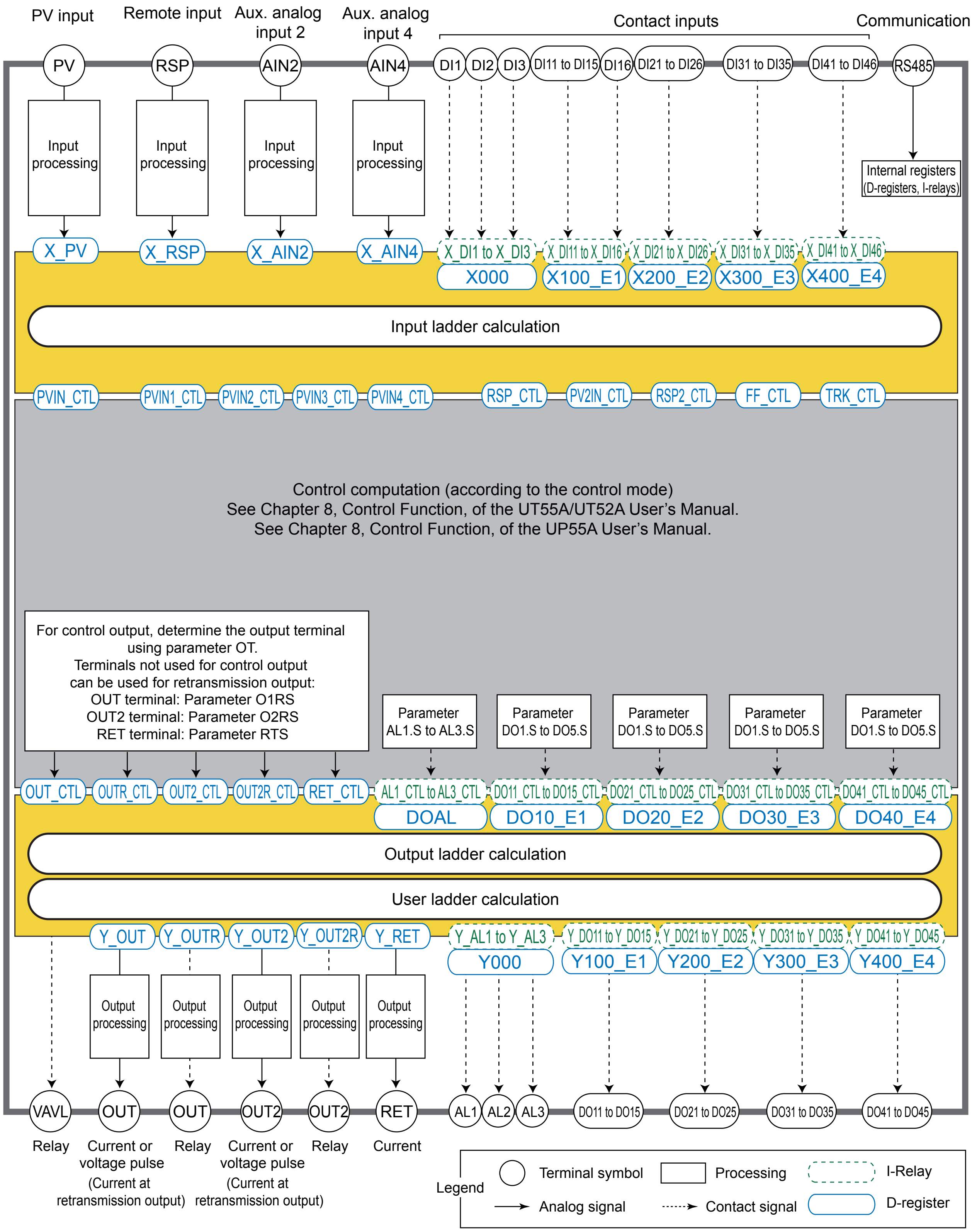
5.1 Precautions for Using Ladder Program

When building a ladder program, its actions upon power restoration should also be considered. This chapter explains the key items related to the actions of a ladder program upon power recovery.
UT35A/UT32A/UP35A does not have the parameter CTLM (Control mode.)
This chapter describes the examples for UT55A/UT52A.
The ladder program for UT75A/UT35A/UT32A/UP55A/UP35A can be created in the same way as UT55A/UT52A.

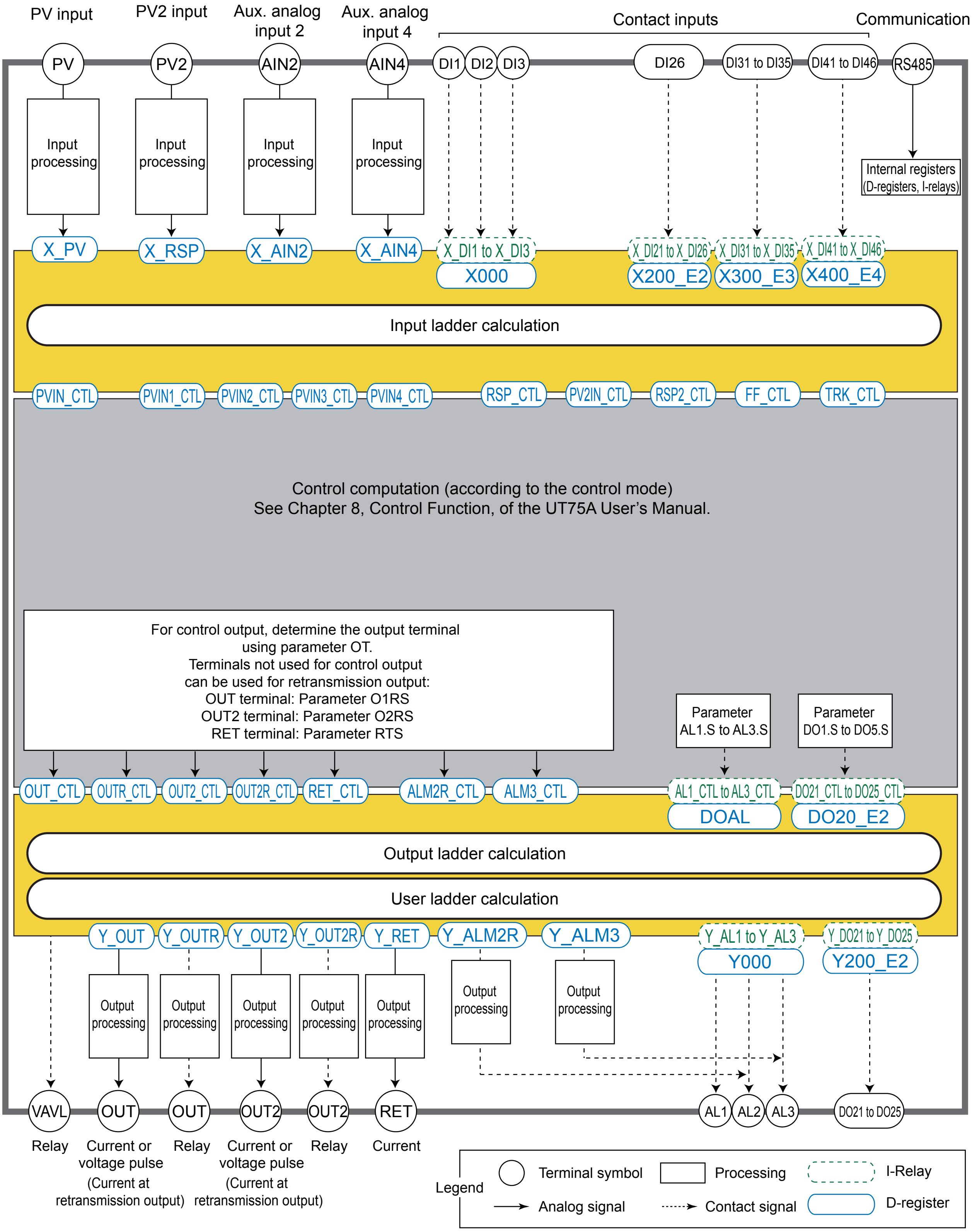
■ UT35A/UT32A/UP35A



■ UT55A/UT52A/UP55A



■ UT75A


PV input
PV2 input
Aux. analog input 2
Aux. analog input 4
Contact inputs
Communication
PV
PV2
AIN2
AIN4
DI1
DI2
DI3
DI26
DI31 to DI35
DI41 to DI46
RS485
Input processing
Internal registers (D-registers, I-relays)
X_PV
X_RSP
X_AIN2
X_AIN4
X_DI1 to X_DI3
X000
X_DI21 to X_DI26
X_DI31 to X_DI35
X_DI41 to X_DI46
X200_E2
X300_E3
X400_E4
Input ladder calculation
PVIN_CTL
PVIN1_CTL
PVIN2_CTL
PVIN3_CTL
PVIN4_CTL
RSP_CTL
PV2IN_CTL
RSP2_CTL
FF_CTL
TRK_CTL
Control computation (according to the control mode)
See Chapter 8, Control Function, of the UT75A User's Manual.
For control output, determine the output terminal
using parameter OT.
Terminals not used for control output
can be used for retransmission output:
OUT terminal: Parameter O1RS
OUT2 terminal: Parameter O2RS
RET terminal: Parameter RTS
Parameter AL1.S to AL3.S
Parameter DO1.S to DO5.S
OUT_CTL
OUTR_CTL
OUT2_CTL
OUT2R_CTL
RET_CTL
ALM2R_CTL
ALM3_CTL
AL1_CTL to AL3_CTL
DOAL
DO21_CTL to DO25_CTL
DO20_E2
Output ladder calculation
User ladder calculation
Y_OUT
Y_OUTR
Y_OUT2
Y_OUT2R
Y_RET
Y_ALM2R
Y_ALM3
Y_AL1 to Y_AL3
Y000
Y_DO21 to Y_DO25
Y200_E2
Output processing
VAVL
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
DO21 to DO25
Relay
Current or voltage pulse
(Current at retransmission output)
Relay
Current or voltage pulse
(Current at retransmission output)
Relay
Current
Legend
Terminal symbol
Processing
I-Relay
Analog signal
Contact signal
D-register

Input ladder calculation

It is recommended that the input ladder calculation section is used for sequence or arithmetic process before outputting the signal from input terminals into the control computation section.

Output ladder calculation

It is recommended that the output ladder calculation section is used in cases where control, alarm, and status outputs are outputted to output terminals after sequence or arithmetic process.

User ladder calculation

It is recommended that the user ladder calculation section be used if a sequence is desired to be configured regardless of controller control computation.

Order of executing computation/calculation

The order of executing computation/calculation is as follows:

(1) Input ladder calculation
(2) Control computation
(3) Output ladder calculation
(4) User ladder calculation

Note

Create your own programs using examples described in this manual.

5.1.1 Relay and Register Values upon Recovery from Power Failure

- Analog input registers (X_PV, X_RSP, X_AIN2, and X_AIN4), input (status) relays (X_DI1 to X_DI3, X_DI11 to X_DI16, X_DI21 to X_DI26, X_DI31 to X_DI35, and X_DI41 to X_DI46) and status input registers (X000, X100_E1, X200_E2, X300_E3, and X400_E4): The values must be defined before execution of the input ladder calculation.
- Control input registers (PVIN_CTL, PVIN1_CTL, PVIN2_CTL, PVIN3_CTL, PVIN4_CTL, RSP_CTL, PV2IN_CTL, RSP2_CTL, FF_CTL, and TRK_CTL): Reset to zeros immediately when the power supply recovers, and then their respective values will be defined by the input ladder calculation during execution.
- Control computation registers (OUT_CTL, OUTR_CTL, OUT2_CTL, OUT2R_CTL, , RET_CTL, , ALM2R_CTL, and ALM3_CTL), control status registers (DOAL, DO10_E1, DO20_E2, DO30_E3, and DO40_E4), and control (status) relays (AL1_CTL to AL3_CTL, and DO11_CTL to DO45_CTL): Reset to zeros immediately when the power supply recovers, and then their respective values will be defined by the control computation during execution. Thus, all values must be defined before execution of the output ladder calculation.
- Output registers (Y_OUT, Y_OUTR, Y_OUT2, Y_OUT2R, Y_RET, , Y_ALM2R, and Y_ALM3), status output registers (Y000, Y100_E1, Y200_E2, Y300_E3, and Y400_E4), and output (status) relays (Y_AL1 to Y_AL3 and Y_DO11 to Y_DO45): The values are defined by the output ladder calculation.
- Operation parameters of Loops 1 and 2 (such as SPs, SPNo's, alarm settings, PID tuning parameters): The values must be defined before execution of the input ladder calculation.
- Process data (such as PV, CSP, DEV, and PIDNo): The values must be defined when the control computation runs. Thus, their values will not be defined by execution of the input ladder calculation for the first time after a power recovery.
- Internal relays, internal status registers, and DAT registers: Whether the values are held or not is determined by the control period.

Device Name	Relay/Register	Holding type/Non-holding type		
		Control period		
		50 ms	100 ms	200 ms
Internal (M) relays	M01 to M128	N/A	N/A	N/A
	M01_B to M32_B	√	√	√
	M33_B to M128_B	N/A	√	√
Internal status registers	M1_M16, M17_32, M33_48, M49_64, M65_80, M81_96, M97_112, M113_M128	N/A	N/A	N/A
	M1_16_B, M17_32_B	√	√	√
	M33_48_B, M49_64_B, M65_80_B, M81_96_B, M97_112_B, M113_128_B	N/A	√	√
DAT registers	DAT01 to DAT20	N/A	N/A	N/A
	DAT01_B to DAT08_B	N/A	√	√
Time-out relays	TIM1 to TIM4	N/A	N/A	N/A
Timer registers (current value)	TIMER1 to TIMER4	N/A	N/A	N/A
Count-out relays	CNT1 to CNT4	N/A	N/A	N/A
Counter registers (Current value)	COUNTER1 to COUNTER4	N/A	N/A	N/A
Count-out relays with back-up (UT75A only)	CNT1_B to CNT2_B	N/A	N/A	N/A
Counter registers with back-up (Current value) (UT75A only)	CNTER1_B to CNTER2_B	N/A	N/A	N/A

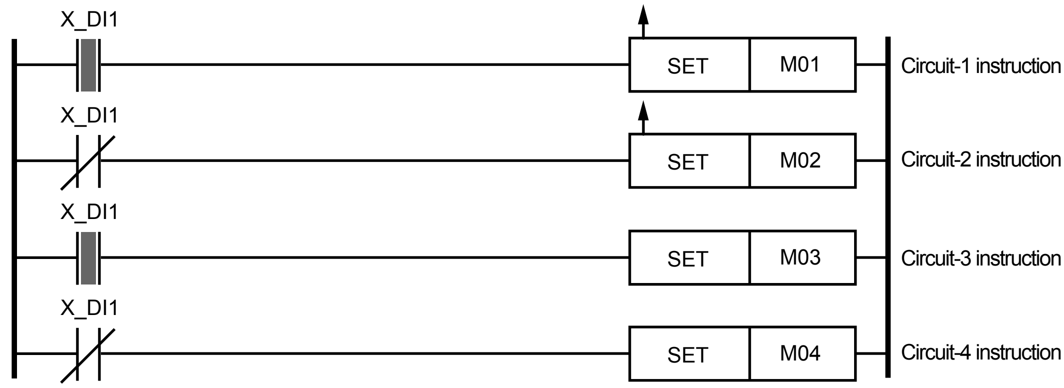
√: Available, N/A: Not available

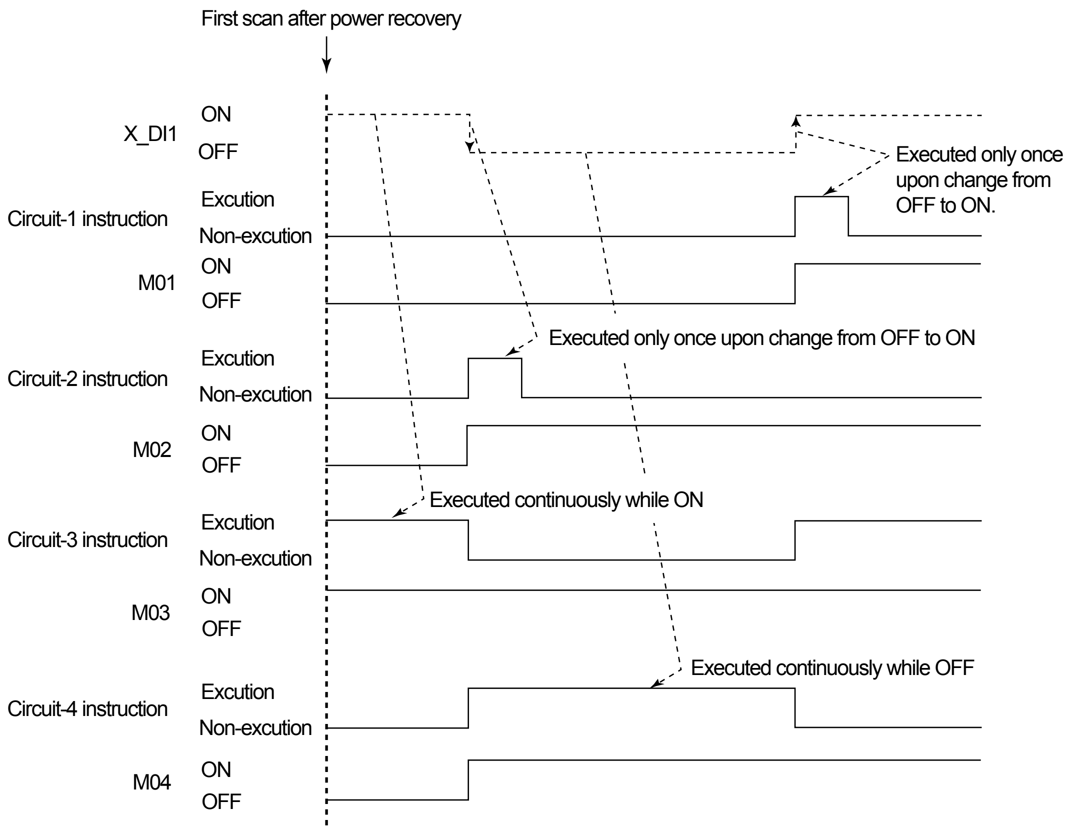
- The internal relays and registers are either the holding or the non-holding type. The non-holding type includes non-holding internal relays, non-holding DAT registers, time-out relays, count-out relays, timer registers, and counter registers, which will be reset to zeros upon power recovery. While, the holding type includes holding internal relays, holding DAT registers, P registers, and K registers, whose respective values immediately before a power failure will remain after power recovery. Holding internal relays in groups of 16 bits each can be used as status registers.

► Internal relay, internal register: Section 4.2.2, Internal Devices (Read/Write)
► Process data, operation mode, alarm status, alarm output status, key status, display status: UTAdvanced Series Communication Interface (RS-485, Ethernet) User’s Manual

5.1.2 Circuit Actions upon Recovery from Power Failure

Instructions are divided into two main types: those instructions that are executed continuously during the period when the execution condition is met; and those that are executed only once when the condition is met. Upon power recovery, instructions of the former type will be executed from the first time after the recovery, whereas instructions of the latter type will ignore the respective conditions at the first time and start judging the conditions and being executed depending on the condition from the second time.



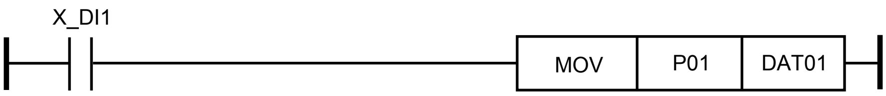


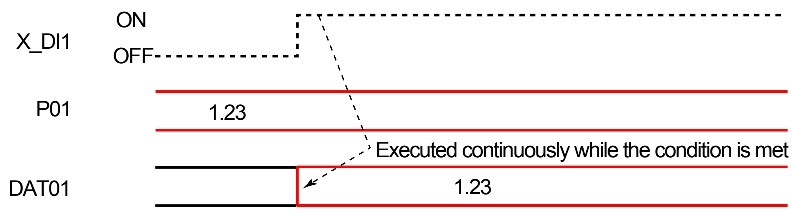
5.2 Functions That Require Parameter Setting

Some ladder programs require parameter setting before running. You can set parameters either with the keys on the front panel of the main unit controller, or using the LL50A parameter setting software and downloading the settings to the main unit controller. The following explains the method of using the LL50A parameter setting software.

5.2.1 Setting P Parameters

To set the values and decimal point positions of the individual P parameters, use the Parameter Setting window. The decimal point positions can only be set by using the LL50A parameter setting software.

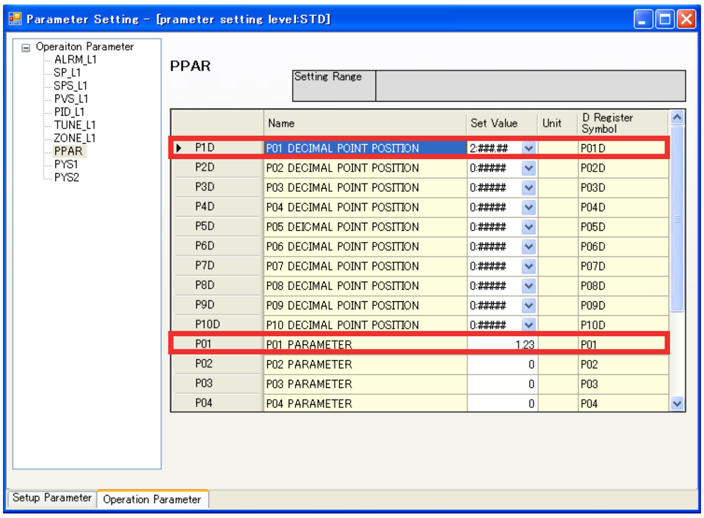




Parameter Settings

P1D: 2:###.##

P01: 1.23



5.2.2 Setting Contact Inputs for Switching Operation Mode from Ladder Program

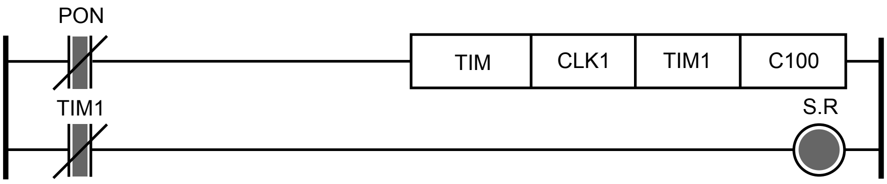
Operation mode switching can be performed in a ladder program. However, when contact inputs have been assigned to remote operation mode switching, those contact input statuses take precedence over the ladder program.

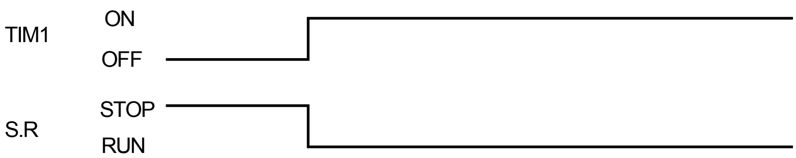
DI Function Registration Menu

Parameter	Name	Action type	Default Contact name (I relay number)
A/M	AUTO/MAN switch	Status	X_DI1 (5026)
R/L	REM/LCL switch	Status	X_DI16 (5046)
S/R	STOP/RUN switch	Status	X_DI2 (5027)

Note: An edge action results when in cascade mode.

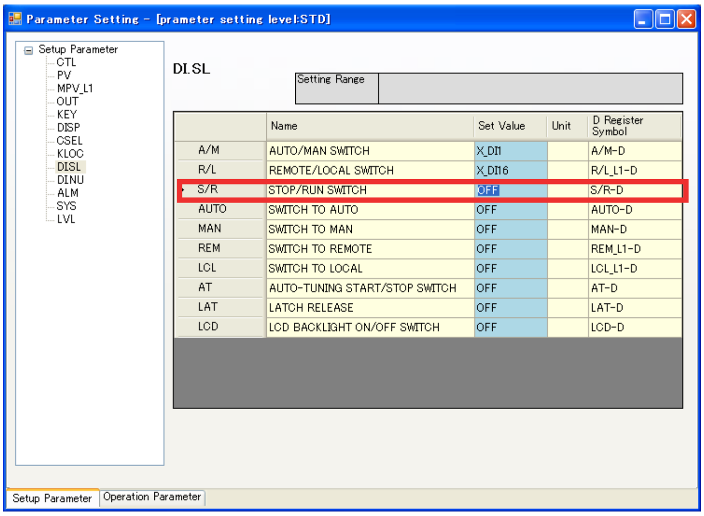
The table above shows the contact inputs assigned to mode switching by default. Use the LL50A parameter setting software or keys on the front panel of the main unit to change the parameter settings. The following shows an example when using LL50A.





Parameter Settings

S/R: OFF



5.2.3 Assigning Operation Mode Switching Functions to Keys on main unit's Front Panel

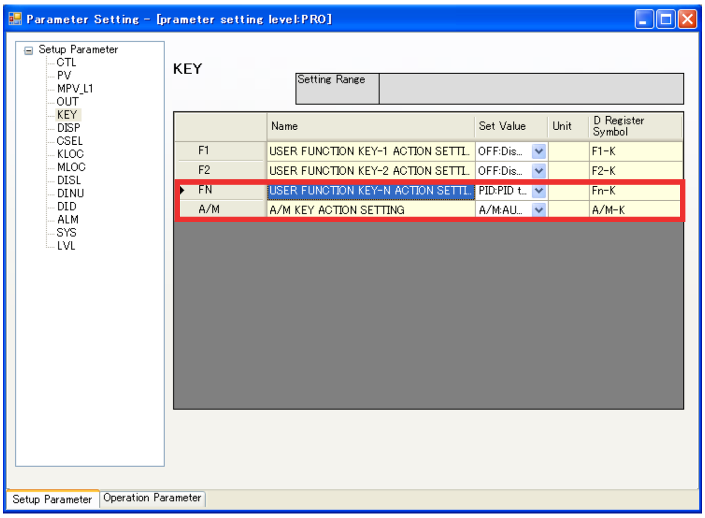
Operation mode switching can be performed from a ladder program as mentioned above. The mode switching functions can also be assigned to keys on the front panel of the main unit controller.

The keys to which the mode switching functions can be assigned and the window for setting are shown below.

Front keys to which mode switching functions can be assigned

Parameter	Factory set default
FN	PID tunig swtich
A/M	AUTO/MAN switch

Parameter Settings

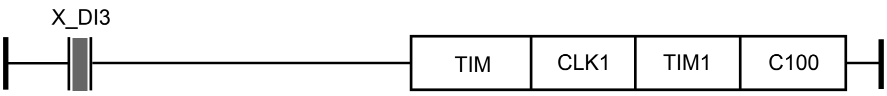


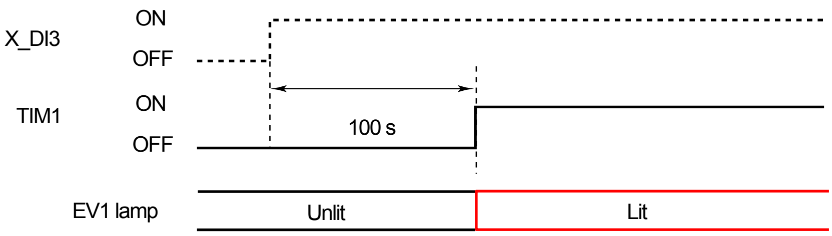
5

Using Ladder Program

5.2.4 Settings for Activating Contact Outputs and Event Lamps

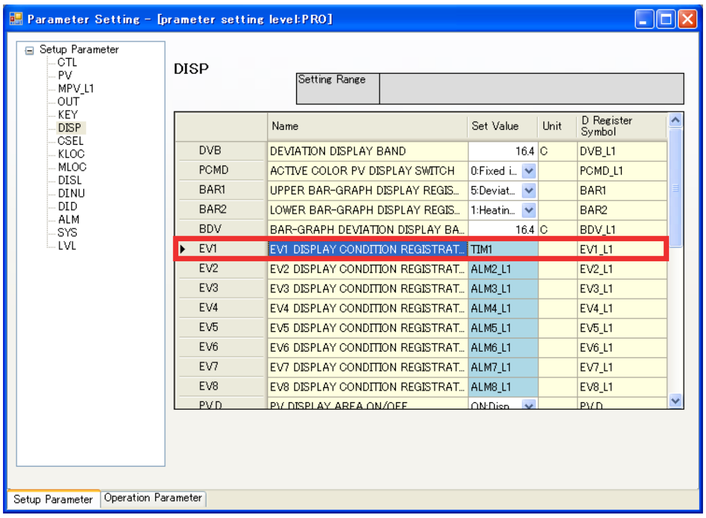
To activate contact outputs and event lamps from a ladder program for event status indications, the respective parameters must be set in the main unit controller. An example of setting using the LL50A parameter setting software is shown below.





Parameter Settings

EV1: TIM1

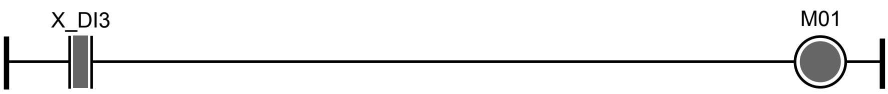


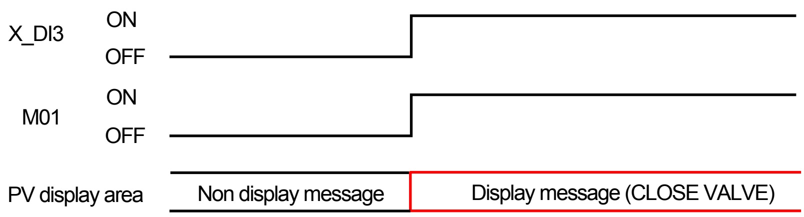
5.2.5 Settings for Interrupt Message Display in PV Display Area

To let a ladder program display interrupt messages, the respective parameters must be set in the main unit controller. An example of setting using the LL50A parameter setting software is shown below.

Note

Merely writing "1" in the D registers for interrupt message display (MG1 to MG4) inside a ladder program does not cause the message to appear.

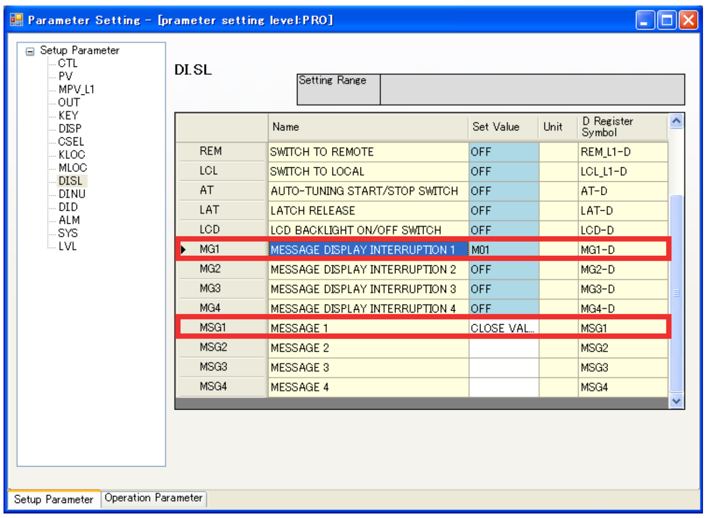




Parameter Settings

MG1: M01

MSG1: CLOSE VALVE



5

Using Ladder Program

5.3 Examples of Supplementing Instructions and General Specifications in Ladder Programming

Some functions cannot be achieved using only instructions provided with a ladder program. The following are examples of implementing such functions.

5.3.1 Retaining Timers and Counters from Previous Values after Power Failure

Examples of restarting a timer and counter after the power recovery with the value immediately before the power failure are shown below.

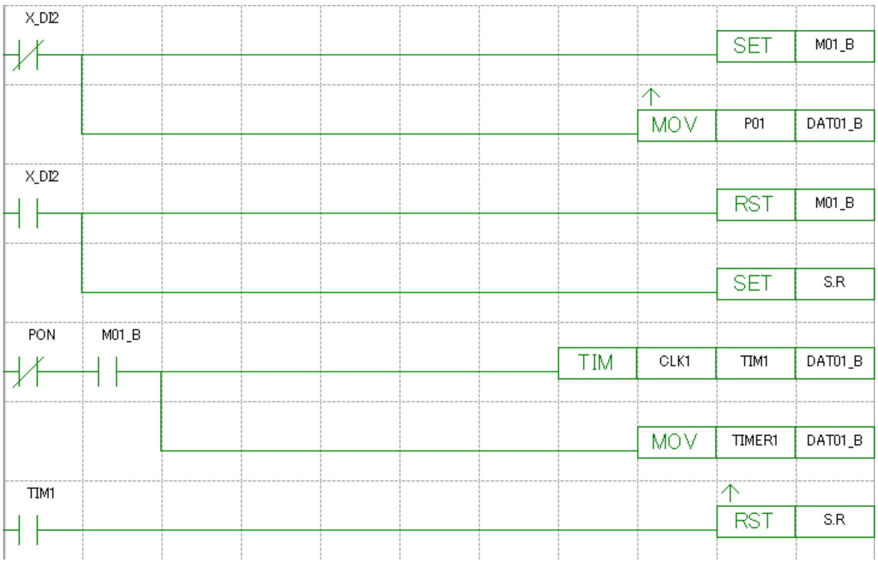
Timer

A timer instruction does not retain the current timer value during a power failure. The following shows an example of ladder programming when it is desired to restart a timer after the power recovery from the value immediately before the power failure.

Specifications of Example:

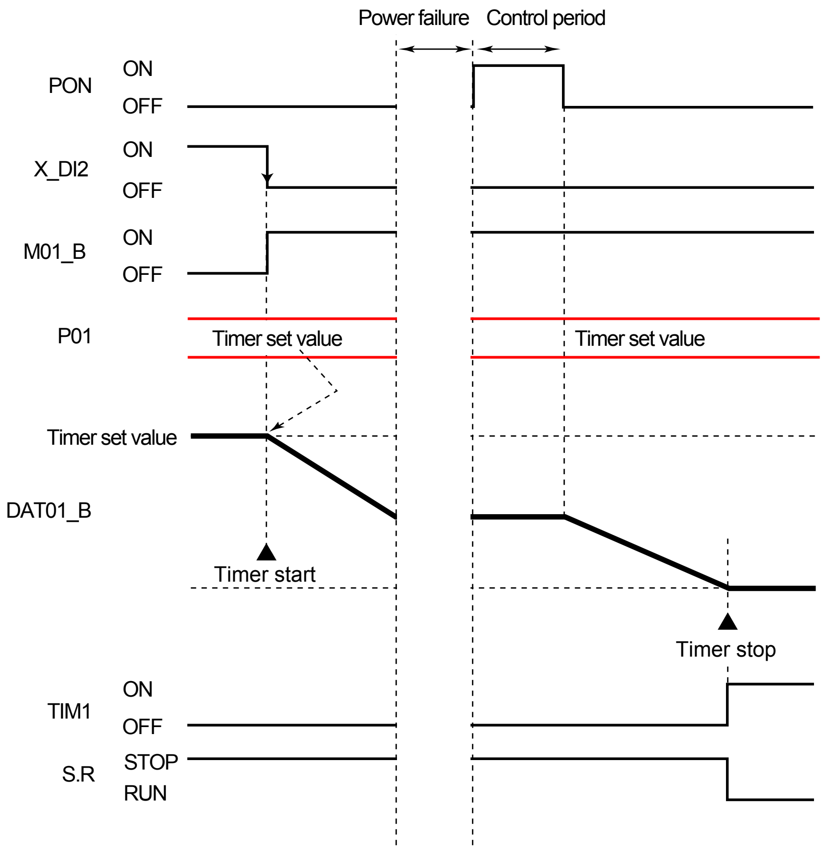
- If DI2 is ON, set STOP/RUN (S.R) to STOP.
- When DI2 turns ON to OFF, start the timer. When the timer value reaches the time (in seconds) set in P01, namely, when time-out is reached, set STOP/RUN (S.R) to RUN.
- If a power failure and recovery occur while the timer is running, the timer restarts continuously without its value being reset.

Ladder program



Note: Code the ladder program above in the input ladder calculation.
Note: Make sure to disable the contact input function for DI2.

Register	Function
X_DI2	OFF: Timer start ON: Timer stop
P01	Timer set value (s)
S.R	STOP/RUN ON: STOP OFF: RUN
M01_B	ON: Timer enable flag OFF: Timer disable flag
DAT01_B	Timer set value (use value)
TIM1	Time-out relay
TIMER1	Timer current value



Power failure
Control period
PON
ON
OFF
X_DI2
ON
OFF
M01_B
ON
OFF
P01
Timer set value
Timer set value
Timer set value
DAT01_B
Timer start
Timer stop
TIM1
ON
OFF
S.R
STOP
RUN

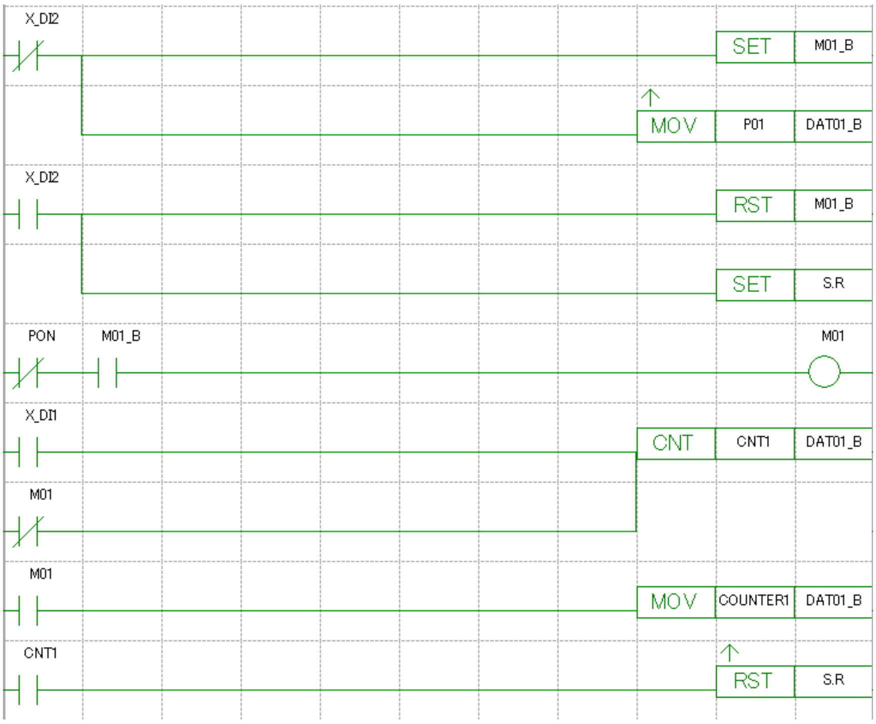
Counter

A counter instruction does not retain the current counter value during a power failure. The following shows an example of ladder programming when it is desired to restart a counter after the power recovery from the value immediately before the power failure.

Specifications of example:

- When DI1 turns ON, increment the counter by 1.
- If DI2 is ON, set STOP/RUN (S.R) to STOP.
- When DI2 turns ON to OFF, start the counter. When the counter value reaches the number set in P01, namely, when count-out is reached, set STOP/RUN (S.R) to RUN.
- If a power failure and recovery occur while the counter is running, the counter restarts continuously without its value being reset.

Ladder program



Note: Code the ladder program above in the input ladder calculation.

Note: Make sure to disable the contact input function for DI1 and DI2.

5.3.2 Holding Timer and Counter Values

Examples of programming to hold a timer and counter depending on a contact input status are shown below.

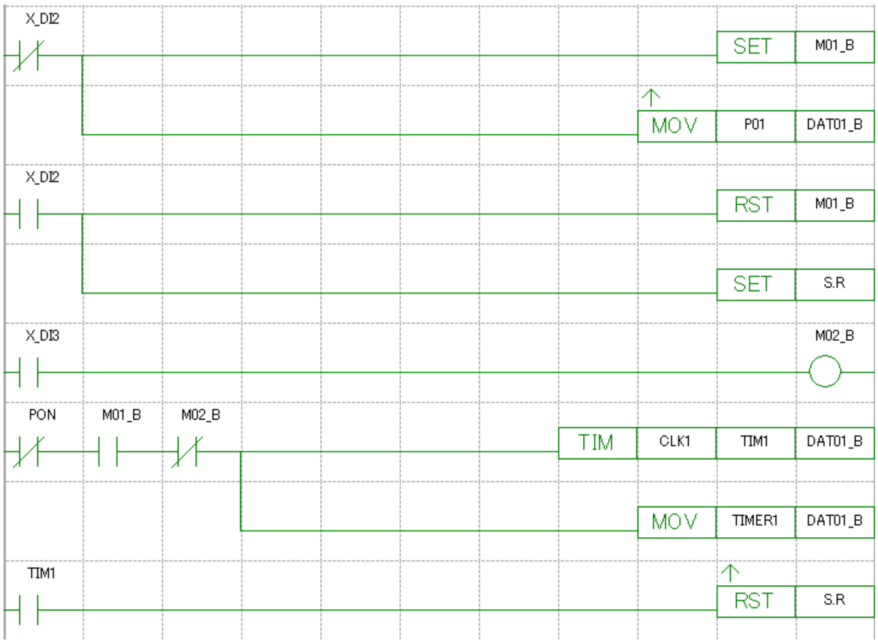
Timer

A timer instruction does not retain the current timer value. The following shows an example of ladder programming to hold the timer value.

Specifications of example

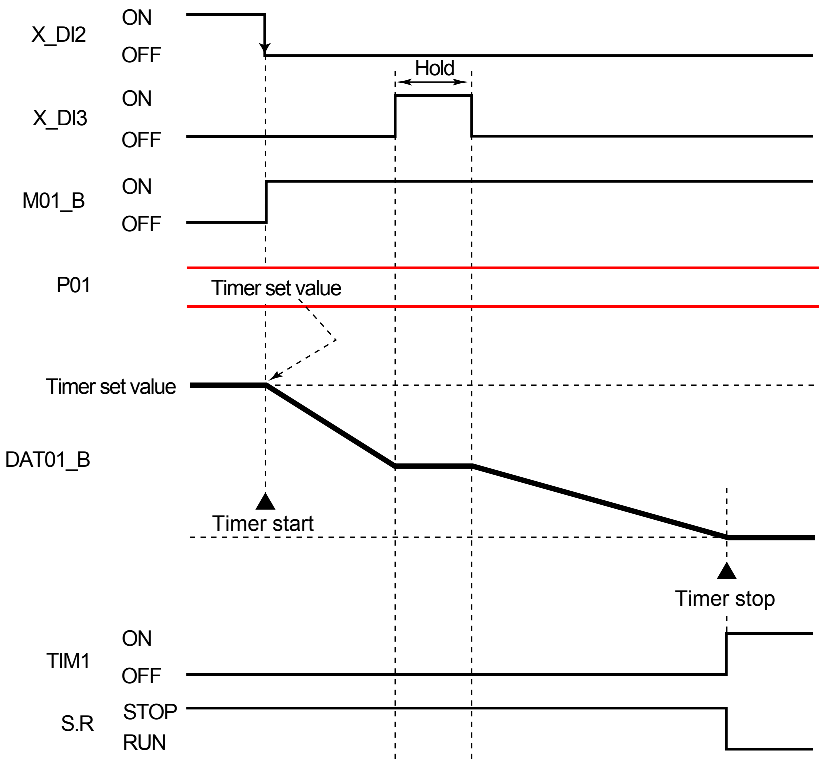
- If DI2 is ON, set STOP/RUN (S.R) to STOP.
- When DI2 turns ON to OFF, the timer starts. When the timer value reaches the time (in seconds) set in P01, namely, when time-out is reached, set STOP/RUN (S.R) to RUN.
- If a power failure and recovery occur while the timer is running, the timer restarts continuously without its value being reset.
- If DI3 turns OFF to request holding while the timer is running, the timer pauses holding the current value. If DI3 turns ON to release the timer holding, restart the timer from the value held.

Ladder program



Note: Code the ladder program above in the input ladder calculation.
Note: Make sure to disable the contact input function for DI2 and DI3.

Register	Function
X_DI2	OFF: Timer start ON: Timer stop
X_DI3	ON: Timer hold OFF: Timer holding release
P01	Timer set value (s)
S.R	STOP/RUN ON: STOP OFF: RUN
M01_B	ON: Timer enable flag OFF: Timer disable flag
M02_B	ON: Timer hold flag OFF: Timer holding release flag
DAT01_B	TImer set value (use value)
TIM1	Time-out relay
TIMER1	Timer current value



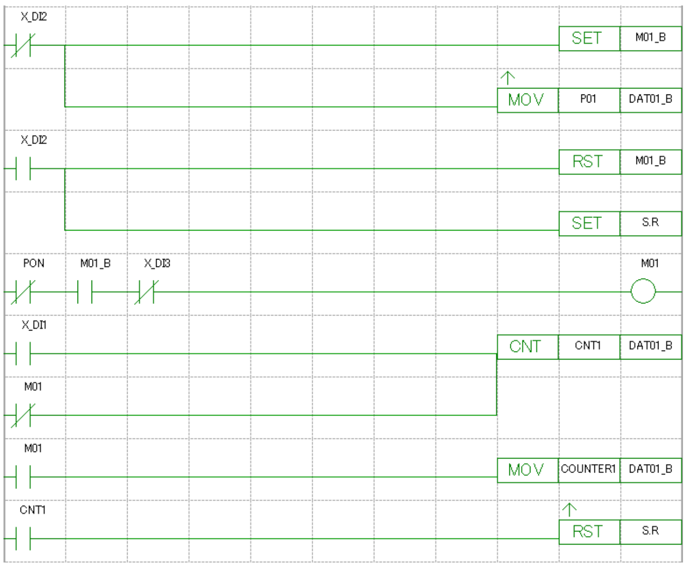
Counter

A counter instruction does not retain the current counter value. The following shows an example of ladder programming to hold the counter value.

Specifications of example

- When DI1 turns ON, increment the counter by 1.
- If DI2 is ON, set STOP/RUN (S.R) to STOP.
- When DI2 turns ON to OFF, the counter starts. When the counter value reaches the number set in P01, namely, when count-out is reached, set STOP/RUN (S.R) to RUN.
- If a power failure and recovery occur while the counter is running, the counter restarts continuously without its value being reset.
- If DI3 turns OFF to request holding while the counter is running, the counter pauses holding the current value. If DI3 turns ON to release the counter holding, restart the counter from the value held.

Ladder program



Note: Code the ladder program above in the input ladder calculation.
Note: Make sure to disable the contact input function for DI1 and DI2.

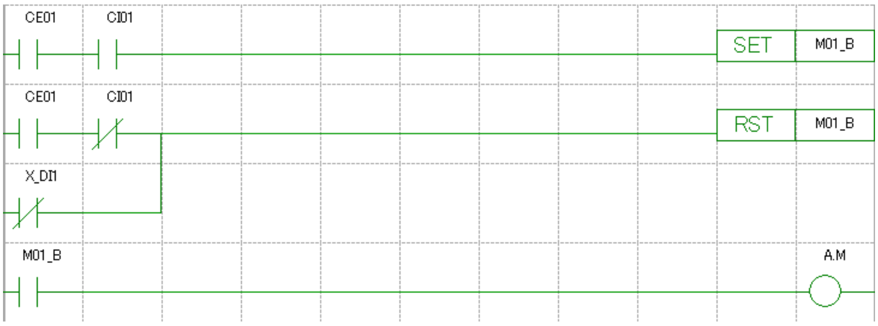
5.3.3 Retaining the Values of Peer-to-Peer Communication Status Input Relays (CIn) during Power Failure of Master or Slave main unit

This section describes the program to retain the values in peer-to-peer communication status input relays (CIn) during a power failure of the master or slave main unit by the time when the power recovers and receipt of communication data is completed.

Specifications of example:

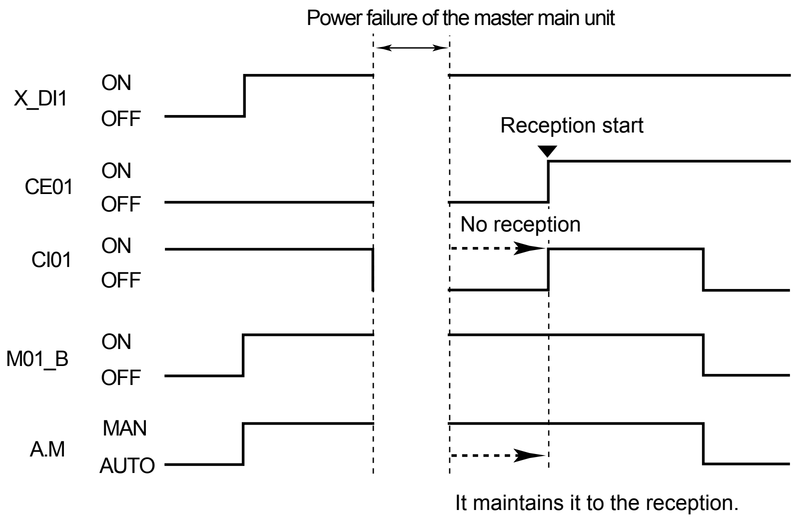
- The automatic/manual mode (A.M) of the master main unit is controlled depending on the status of a slave main unit. Communication address 1 in peer-to-peer communication indicates the master main unit, and its status is written to peer-to-peer communication status input relay CI01.
- If communication is established, and if CI01 is ON, then set the automatic/manual mode (A.M) to manual (1). If communication is established, and if CI01 is OFF, then set the automatic/manual mode (A.M) to automatic (0).
- Immediately after the power to the master main unit recovers, the automatic/manual mode (A.M) is retained at the value before the power failure. Then, when reception is enabled, the normal action based on the value of CI01 takes place. This is controlled based on flag CE01.
- When the communication is interrupted, the automatic/manual mode (A.M) is retained at the value before the communication failure.
- Control by communication is enabled only while DI1 is ON. If DI1 is OFF, then set A.M forcibly to automatic.

Ladder program



Note: Code the ladder program above in the input ladder calculation.
Note: Make sure to disable the contact input function for DI1.

Register	Function
DI1	ON: Enable control by peer-to-peer communication. OFF: Set the mode to automatic forcibly.
CI01	ON: Request switching to manual. OFF: Request switching to automatic.
CE01	OFF from the time of power recovery by the time of communication restart; ON after communication restart, and kept ON during communication interrupt
A.M	AUTO/MAN 1: Manual 0: Automatic
M01_B	ON: Manual OFF: Automatic


Power failure of the master main unit
X_DI1
ON
OFF
Reception start
CE01
ON
OFF
No reception
CI01
ON
OFF
M01_B
ON
OFF
A.M
MAN
AUTO
It maintains it to the reception.

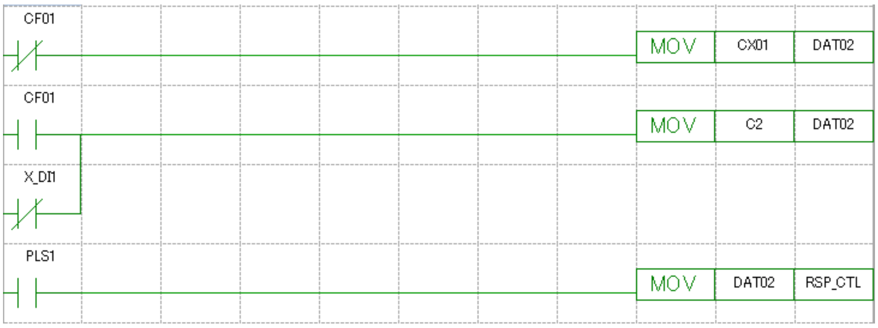
5.3.4 Retaining the Values of Peer-to-Peer Communication Analog Input Registers (CXn) during Power Failure of Master or Slave main unit

This section describes the program to retain the values in peer-to-peer communication analog input registers (CXn) during a power failure of the master or slave main unit by the time when the power recovers and receipt of communication data is complete.

Specifications of example:

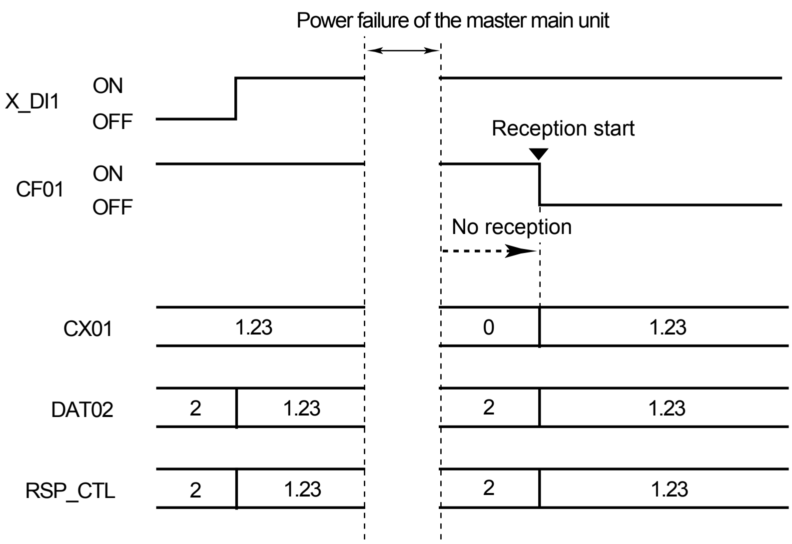
- A register value in a slave main unit is set in RSP_CTL of the master main unit. Communication address 1 in peer-to-peer communication indicates the master main unit, and its register value is written to peer-to-peer communication analog input register CX01.
- If a communication error has been detected, the set value for RSP_CTL will be "2".
- Communication is available only when DI1 is ON. When DI1 is OFF, the set value for RSP_CTL is "2".

Ladder program



Note: Code the ladder program above in the input ladder calculation.

Register	Function
CX01	Specified register for storing communication value
CF01	ON: Communication failure OFF: Normal
RSP_CTL	Remote setpoint for control



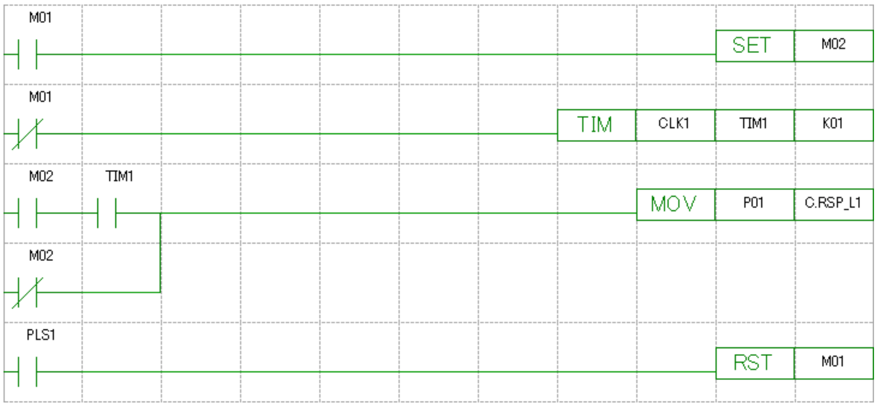
5.3.5 Detecting Communication Failure and Recovery Other Than Using Peer-to-Peer Communication

Communication failures and recoveries can also be detected using a non-holding internal relay (M).

An example to detect communication failures and recoveries using a non-holding internal relay (M) for setting of holding-type data C.RSP is shown below.

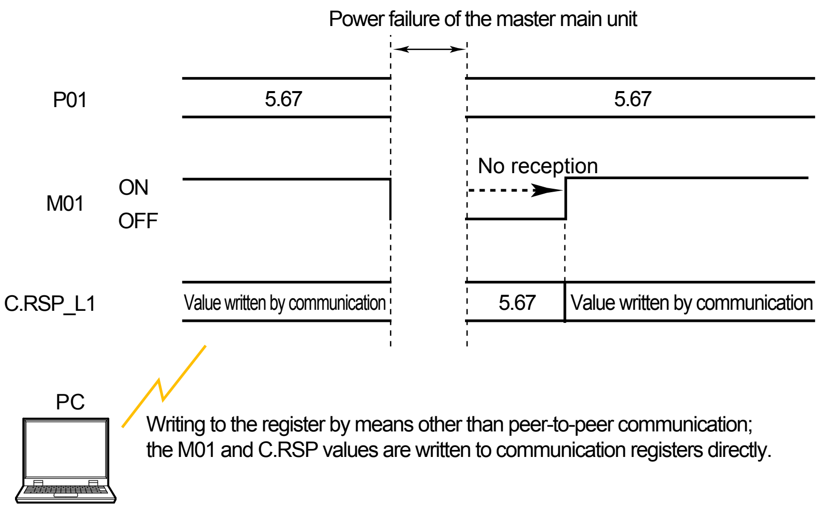
- During a communication failure, an internal value is written to C.RSP.
- P01 is outputted when a communication error is determined. A margin (sec) assigned in K01 is set for the communication error determination.
- After a power supply returns, P01 is outputted until the communication becomes normal.

Ladder program



Note: Code the ladder program above in the input ladder calculation.

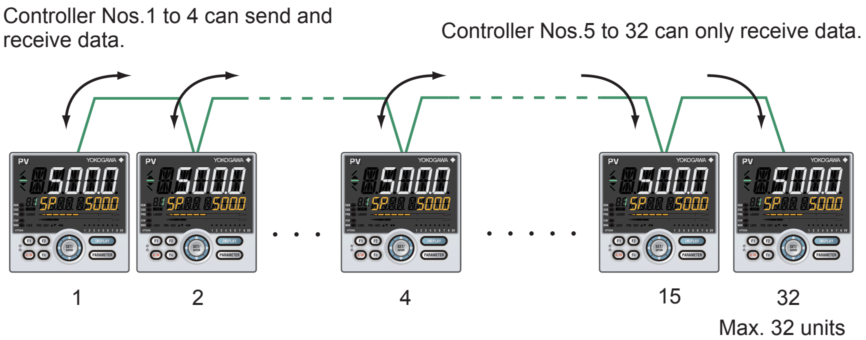
Register	Function
M01	Communication decision flag Write "1" from the upper device.
K01	A margin (timer value) for communication disconnect
P01	Output value at the communication error determination



5.4 Peer-to-peer Communication

5.4.1 Overview of Function Peer-to-peer Communication

Peer-to-peer communication enables up to 32 main units to be connected. Of these 32 main units, four units can send four analog data and 16 status data, and receive 16 analog data and 64 status data. The remaining 28 units can only receive 16 analog data and 64 status data. The user can send and receive data simply by reading data from peer-to-peer communication registers (data reception) or writing data to peer-to-peer communication registers (data transmission) by the ladder program on the main unit without being aware that communications is being performed.



Specifications of Peer-to-peer Communications

Item	Specifications
Number of connected units	Max. 32 (4 transmitting/receiving controllers, 28 receiving-only controllers
Amount of data transmitted	(4 analog data + 16 status data) per send/receiving controller
Amount of data received	16 analog data + 64 status data
Transmitted data update period	200 ms

5.4.2 Setting Peer-to-peer Communication and Communication Address

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PSL	Protocol selection	EASY	PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-S1: Coordinated slave station (Loop-1 mode) CO-S2: Coordinated slave station (Loop-2 mode) P-P: Peer-to-peer communication	R485 Set
ADR	Address	EASY	1 to 4: Controllers that can send and receive data 5 to 99: Controllers that only can receive data (Note)	R485 Set

Set: Setup parameter

Note: Do not set the same communication address to two or more controllers.

- **Protocol selection**
  Set "P-P" to the controllers that are made to perform peer-to-peer communication.

- **Address**
  Set any communication address between 1 to 4 to controllers that transmit and receive data. Set a unique address to each controller. Do not set the same address to two or more controllers.
  Set any communication address within the range 5 to 32 to controllers that only receive data. Set a unique address to each controller. Do not set the same address to two or more controllers.

5

Using Ladder Program

5.4.3 Peer-to-peer Communication Relays and Registers

Data that can be transferred by peer-to-peer communication is analog data and status relay data. Status relay data is in either of two states, ON (1) or OFF (0), depending on the rules of the ladder program.

Transmitted/received data can be used in the ladder program via peer-to-peer communication registers.

The following table shows the peer-to-peer communication registers and the read/write operations performed on these registers by the ladder program.

*Registers are floating point numbers (single-precision real numbers).

Peer-to-peer Communication Registers

Register symbol	Name	Explanation	Data Type
CXn	Peer-to-peer communication analog input register	n: 01 to 04 Data received from communication address 1 n: 05 to 08 Data received from communication address 2 n: 09 to 12 Data received from communication address 3 n: 13 to 16 Data received from communication address 4	Floating point number (single-precision real number)
CYn	Peer-to-peer communication analog output register	n: 01 to 04 Data transmitted to other controllers	Floating point number (single-precision real number)
CIn	Peer-to-peer communication status input relay	n: 01 to 16 Data received from communication address 1 n: 17 to 32 Data received from communication address 2 n: 33 to 48 Data received from communication address 3 n: 49 to 64 Data received from communication address 4	Relay status data (0, 1)
COn	Peer-to-peer communication status output relay	n: 01 to 16 Data transmitted to other controllers	Relay status data (0, 1)
CFn	Reception time-out flag	n: 01 to 04 Indicates the status (normal/error) of the data received from communication address n.	Status data (0: normal, 1: error)
CEn	End of data reception flag	n: 01 to 04 Indicates the status (end of reception/during of reception) of the data received from communication address n.	Status data (0: during reception, 1: end of reception)

Processing at Communication Failure

Item	Cause of Failure	Processing on Receiving Controller	Processing on Transmitting Controller
1	Broken communication line Receiving controller communication card malfunction	The receiving controller holds the previously received peer-to-peer communication input data. If the error continues for two seconds, the reception timeout flag changes the state to 1 (error).	An error cannot be detected. When the transmitting controller receives data, it detects an error on the transmitting controller as the receiving controller.
2	The user program is being downloaded or uploaded, or parameters are being set the transmitting controller.	Same as above	Functions are stopped.
3	The user program is being downloaded or uploaded, or parameters are being set the receiving controller.	Functions are stopped. Even if functions are stopped, peer-to-peer communication input data is received normally, and stored to registers CX and CI.	An error cannot be detected. When the transmitting controller receives data, it detects an error on the transmitting controller as the receiving controller.
4	Failure of transmitting controller	The receiving controller holds the previously received peer-to-peer communication input data. If the error continues for two seconds, the reception timeout flag changes the state to 1 (error).	Failure
5	Power failure on transmitting controller	The receiving controller holds the previously received peer-to-peer communication input data. If the error continues for two seconds, the reception timeout flag changes the state to 1 (error).	A power failure has occurred. For details on processing during a power failure, see "Processing at Power Failure."
6	Power failure on receiving controller	A power failure has occurred. For details on processing during a power failure, see "Processing at Power Failure."	An error cannot be detected. When the transmitting controller receives data, it detects an error on the transmitting controller as the receiving controller.
7	Communication error (parity error, framing error)	The receiving controller holds the previously received peer-to-peer communication input data. If the error continues for two seconds, the reception timeout flag changes the state to 1 (error).	An error cannot be detected. When the transmitting controller receives data, it detects an error on the transmitting controller as the receiving controller.

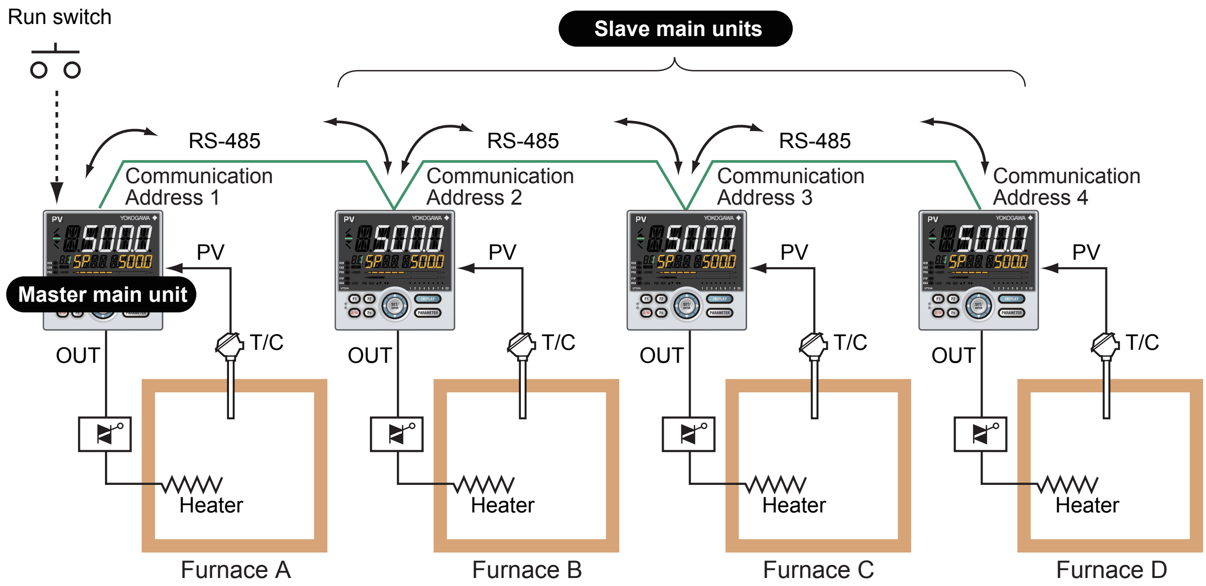
Processing at Power Failure

This item describes the processing when a main unit controller is recovered from a power failure during peer-to-peer communication.

The values of registers CX, CY, CI, and CO start from 0%.
When the transmitting controller or ladder program writes data to these registers, that data becomes valid.
At a start, the state of the reception time-out flag (CFn) is 1 (error). However, when communication is recovered, it changes to 0 (normal).

5.4.4 Ladder Programming Example

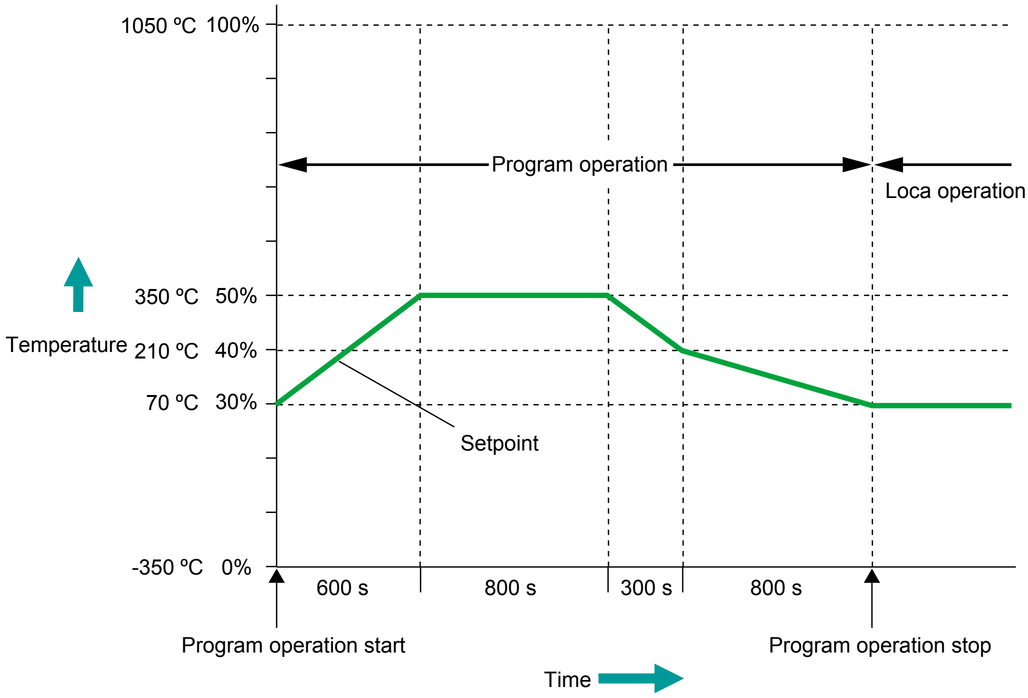
The following is an example of making four main unit controllers perform the same programmed-setpoint control synchronously.



Specifications of example:

- Four main unit controllers are linked via peer-to-peer communication, where one serves as the master main unit and others as slave main units. Slave main units perform programmed-setpoint control and change their modes synchronously with the master main unit.
- There are four operation modes: Run/Stop and Remote/Local.
- The program control starts when a contact input for the master main unit is turned on, and stops when the same input is turned off.
- When the program control starts, the modes of the master and slave main units are forcibly changed to Remote and Run.
- The program pattern is set as the remote setpoints.
- The time span of the program pattern is calculated based on the control period (200 ms).
- The operation mode changes to Stop when the program pattern has been implemented to the end. The modes of the master and local main units are changed to Local. Concurrently, and the setpoints are the final value of the programmed pattern.
- The control is forcibly stopped immediately when the contact input to the master main unit turns off or when an A/D converter error or burn-out error is detected in one of the four main units. The modes of the master and local main units are changed to Local. Concurrently, and the setpoints are the final value of the programmed pattern.

The programmed pattern is shown below.



Setting of master main unit

Parameter settings (main unit)

- Control mode (CTLM): SGL (Single-loop control)
- Input sampling period (control period) (SMP): 200 ms
- STOP/RUN switch (S/R): 0 (disable switching by a contact input)
- REMOTE/LOCAL switch (R/L): 0 (disable switching by a contact input)

Burnout connection settings

- LOOP1 PV: PV, LOOP1 RSP: RSP

Parameter settings (LL50A)

- K constant

Symbol	Set value	Description
K01	0.2	Control period at 200 ms, for program time span calculation
K02	4	Number of program pattern segments
K03	7	Slave main unit communication time-out interval (added to the time-out interval CF)

- P parameter

Symbol	Set value	Decimal point position	Description
P01	-	-	Unused
P02	30	0	Starting target setpoint (SSP)
P03	50	2	Segment-1 target setpoint (%)
P04	600	0	Segment-1 time (s)
P05	50	2	Segment-2 target setpoint (%)
P06	800	0	Segment-2 time (s)
P07	40	2	Segment-3 target setpoint (%)
P08	300	0	Segment-3 time (s)
P09	30	2	Segment-4 target setpoint (%)
P10	800	0	Segment-4 time (s)

Devices used

- Registers for peer-to-peer communication

Symbol		Description
CO01	CI01	Main unit of communication address 1 1: Start program operation (LOCAL -> REMOTE) 0: Stop program operation (REMOTE -> LOCAL)
CY01	CX01	Main unit of communication address 1 Programmed setpoint (CSP) output/input
CO01	CI17	Main unit of communication address 2 1: Input error in main unit of communication address 2 0: Input normal in main unit of communication address 2
CO01	CI33	Main unit of communication address 3 1: Input error in main unit of communication address 3 0: Input normal in main unit of communication address 3
CO01	CI49	Main unit of communication address 4 1: Input error in main unit of communication address 4 0: Input normal in main unit of communication address 4
CF01		1: Communication time-out in main unit of communication address 1 0: Communication normal in main unit of communication address 1
CF02		1: Communication time-out in main unit of communication address 2 0: Communication normal in main unit of communication address 2
CF03		1: Communication time-out in main unit of communication address 3 0: Communication normal in main unit of communication address 3
CF04		1: Communication time-out in main unit of communication address 4 0: Communication normal in main unit of communication address 4

- Parameter registers and control registers

Symbol	Description
S.R	1: Stop program control; 0: Start program control
R.L_L1	1: REMOTE; 0: LOCAL
ADERR	1: ADC error of PV input, 0: normal
BOERR	1: PV input burnout error, 0: normal
RSP_CTL	Control RSP input

- DAT registers

Symbol	Set value	Description
DAT02_B	0	Segment number
DAT03_B	0.00	CSP
DAT04_B		Elapsed time (1-second increment)
DAT07		Target setpoint of previous segment
DAT08		Target setpoint (TSP)
DAT09		Segment time
DAT10		Work data 1
DAT11		Work data 2

- M relays

Symbol	Set value	Description
M01		Master-slave communication input status 0: Normal, 1: Abnormal
M02		Forced stop by contact input, or master-slave communication input status 0: Normal, 1: Abnormal
M03		Segment end flag 0: Running within a segment interval 1: Segment end (for one scan only)
M04		Slave main unit communication error flag. Start a timer when this value changes to 1 for time-out monitoring.
M11		ADC error or burnout error in master main unit
M03_B		Flag used to delay the mode switching from Remote to Local by one scan
M02_B		Single-segment interval timeout
M01_B		1: Program running 0: Program stopped

Contact input:

DI2: Start/stop program control

Setting of slave units (identical for all units)

Parameter settings (main unit)

- Control mode (CTLM): SGL (Single-loop control)
- Input sampling period (control period) (SMP): 200 ms
- STOP/RUN switch (S/R): 0 (disable switching by a contact input)
- REMOTE/LOCAL switch (R/L): 0 (disable switching by a contact input)

Burnout connection setting

- LOOP1 PV: PV, LOOP1 RSP: RSP

Burnout connection setting

- K constant

Symbol	Set value	Description
K01	0.2	Control period at 200 ms, for program time span calculation
K02	4	Number of program pattern segments
K03	7	Slave main unit communication time-out interval (added to the time-out interval CF)

Devices used

- Registers for peer-to-peer communication

Symbol		Description
CO01	CI01	Main unit of communication address 1 1: Start program operation (LOCAL -> REMOTE) 0: Stop program operation (REMOTE -> LOCAL)
CY01	CX01	Main unit of communication address 1 Programmed setpoint (CSP) output/input
CO01	CI17	Main unit of communication address 2 1: Input error in main unit of communication address 2 0: Input normal in main unit of communication address 2
CO01	CI33	Main unit of communication address 3 1: Input error in main unit of communication address 3 0: Input normal in main unit of communication address 3
CO01	CI49	Main unit of communication address 4 1: Input error in main unit of communication address 4 0: Input normal in main unit of communication address 4
CF01		1: Communication time-out in main unit of communication address 1 0: Communication normal in main unit of communication address 1

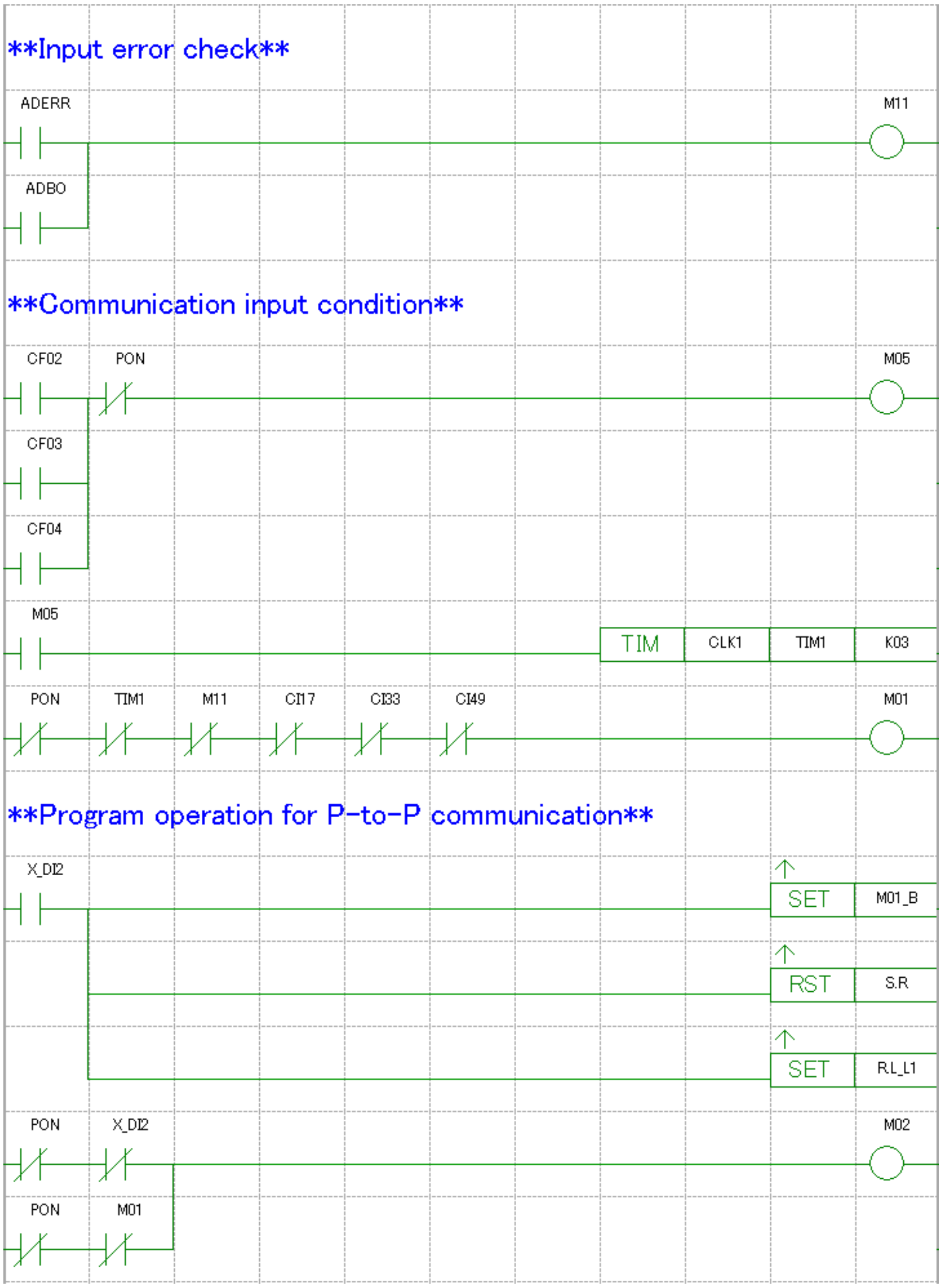
- M relays

Symbol	Set value	Description
M01		Master-slave communication input status 0: Normal, 1: Abnormal
M03_B		Flag used to delay the mode switching from Remote to Local by one scan
M01_B		1: Program running 0: Program stopped

- Parameter registers and control registers

Symbol	Description
S.R	1: Stop program control; 0: Start program control
R.L_L1	1: REMOTE; 0: LOCAL
ADERR	1: ADC error of PV input, 0: normal
BOERR	1: PV input burnout error, 0: normal
RSP_CTL	Control RSP input

Ladder program in master main unit



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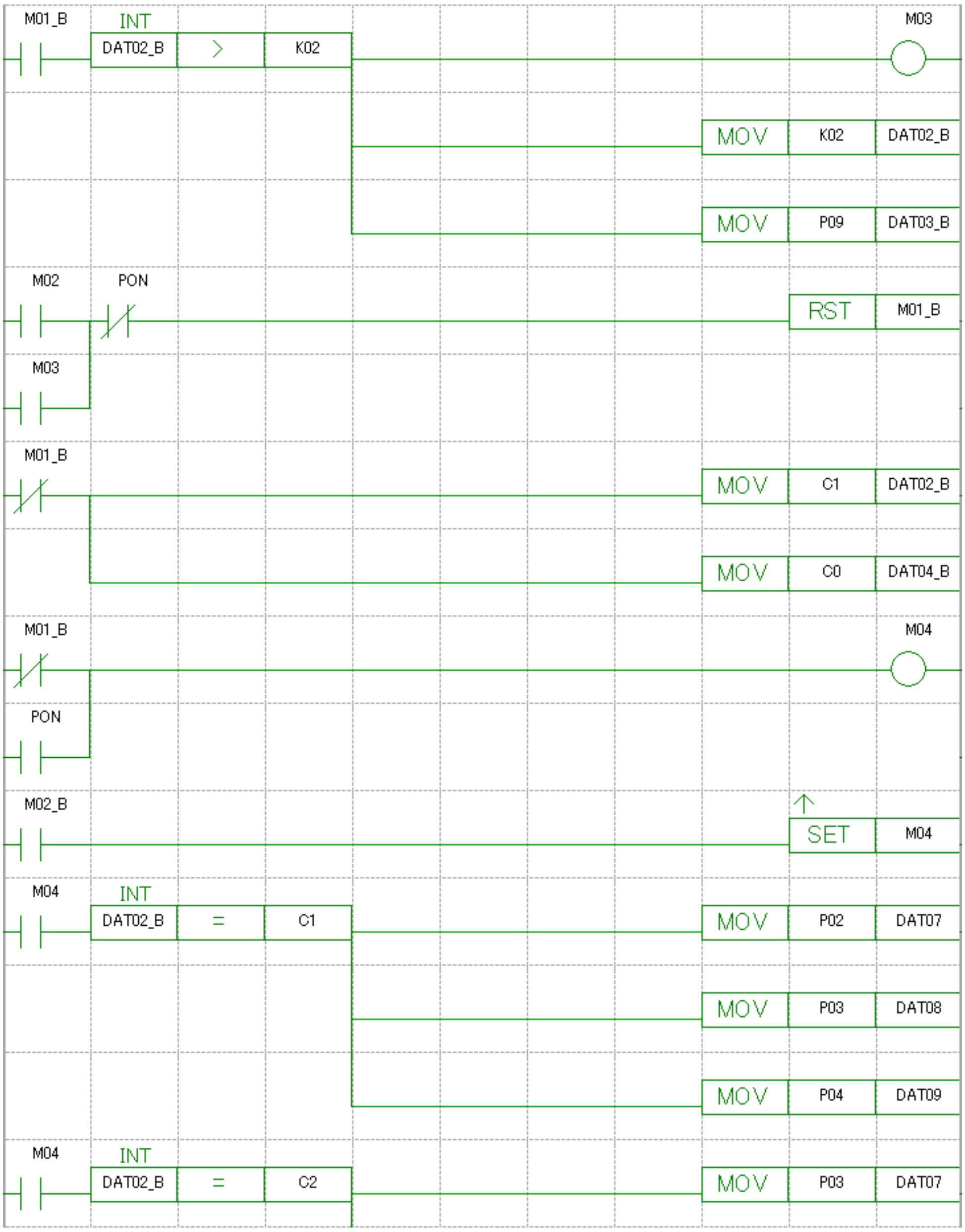
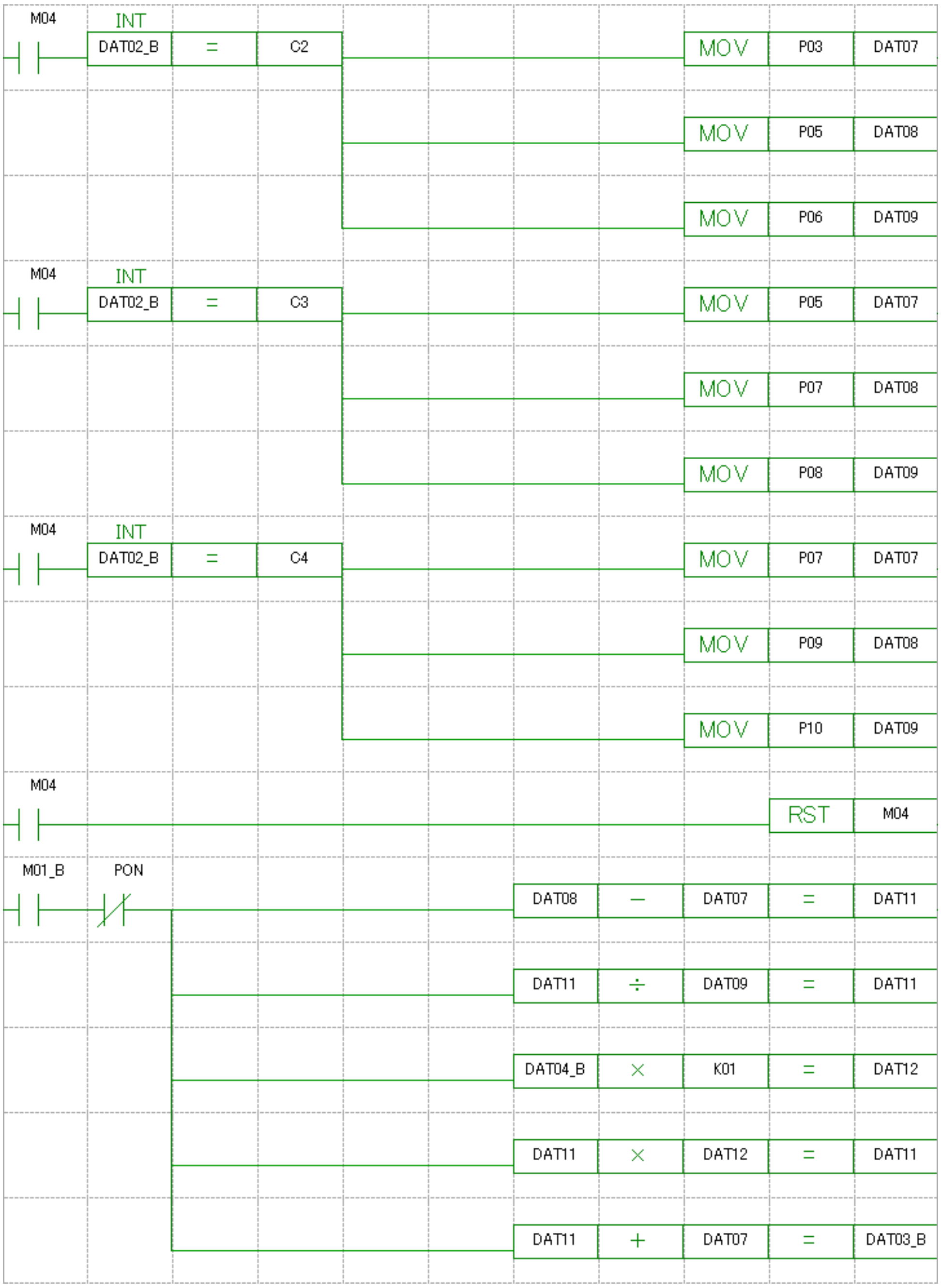
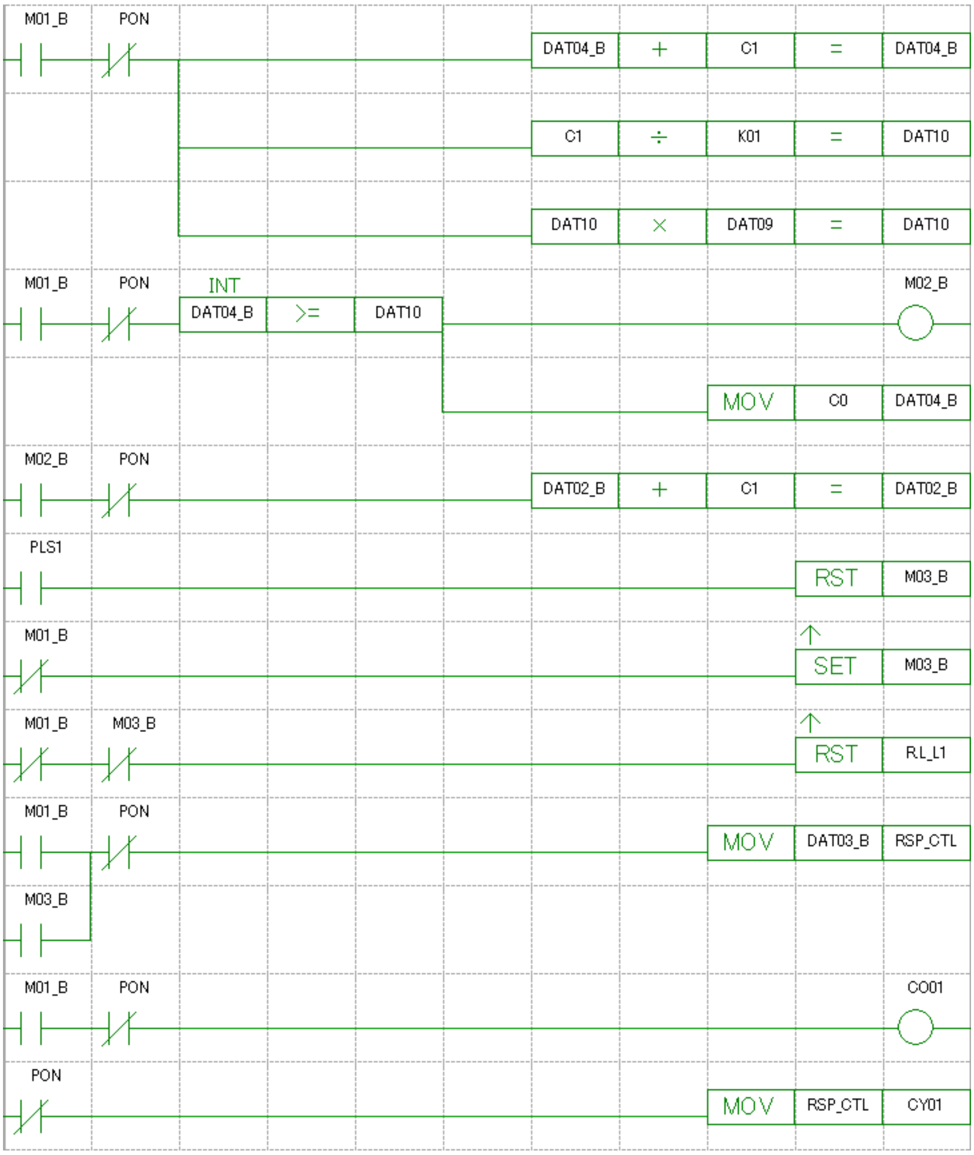

M01_B
INT
DAT02_B
>
K02
M03
MOV
K02
DAT02_B
MOV
P09
DAT03_B
M02
PON
RST
M01_B
M03
M01_B
MOV
C1
DAT02_B
MOV
C0
DAT04_B
M01_B
M04
PON
M02_B
SET
M04
M04
INT
DAT02_B
=
C1
MOV
P02
DAT07
MOV
P03
DAT08
MOV
P04
DAT09
M04
INT
DAT02_B
=
C2
MOV
P03
DAT07

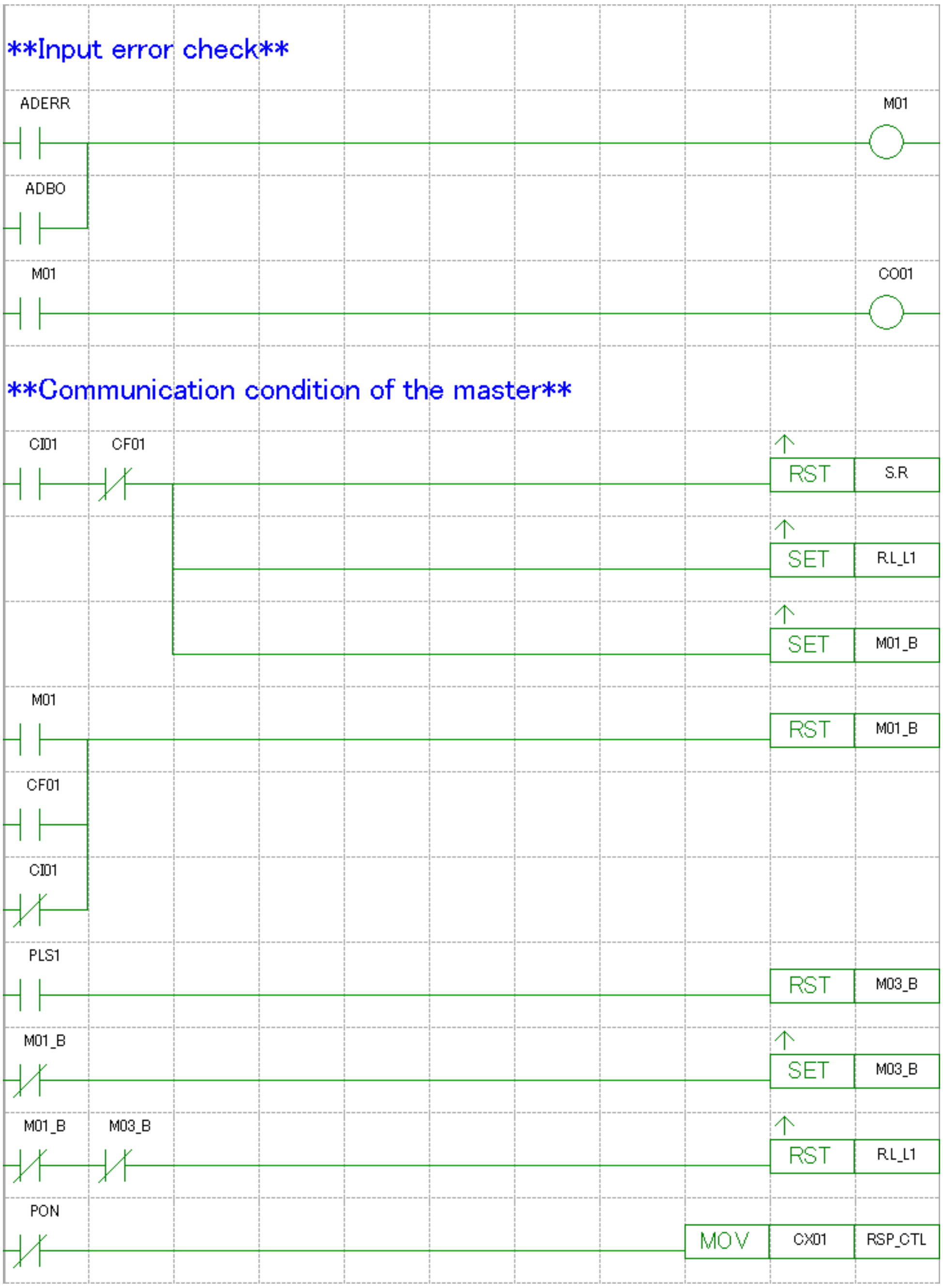
(continuing)


M04
INT
DAT02_B
=
C2
MOV
P03
DAT07
MOV
P05
DAT08
MOV
P06
DAT09
M04
INT
DAT02_B
=
C3
MOV
P05
DAT07
MOV
P07
DAT08
MOV
P08
DAT09
M04
INT
DAT02_B
=
C4
MOV
P07
DAT07
MOV
P09
DAT08
MOV
P10
DAT09
M04
RST
M04
M01_B
PON
DAT08
−
DAT07
=
DAT11
DAT11
÷
DAT09
=
DAT11
DAT04_B
×
K01
=
DAT12
DAT11
×
DAT12
=
DAT11
DAT11
+
DAT07
=
DAT03_B

(continuing)


M01_B
PON
DAT04_B
+
C1
=
DAT04_B
C1
÷
K01
=
DAT10
DAT10
×
DAT09
=
DAT10
M01_B
PON
INT
DAT04_B
>=
DAT10
M02_B
MOV
C0
DAT04_B
M02_B
PON
DAT02_B
+
C1
=
DAT02_B
PLS1
RST
M03_B
M01_B
SET
M03_B
M01_B
M03_B
RST
RL_L1
M01_B
PON
MOV
DAT03_B
RSP_CTL
M03_B
M01_B
PON
CO01
PON
MOV
RSP_CTL
CY01

Ladder program of slave main units

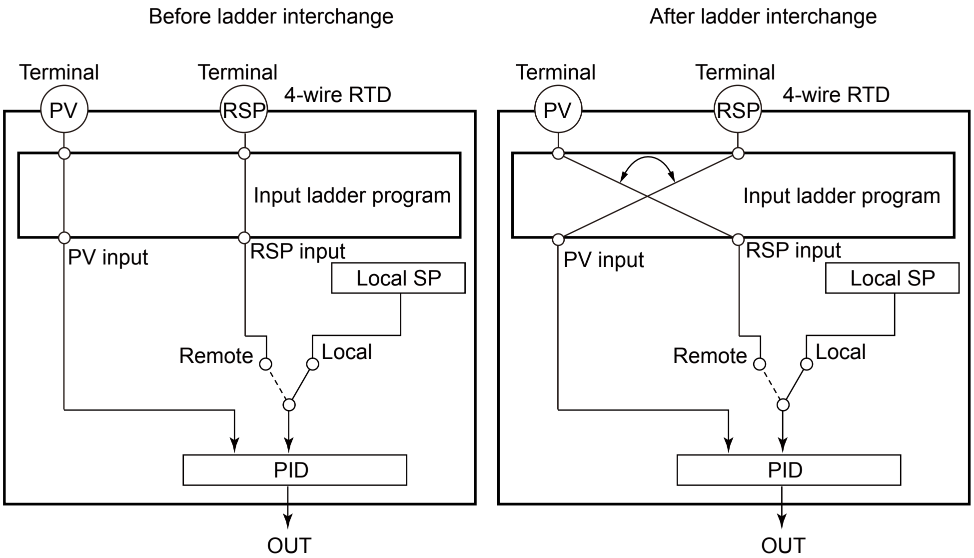


5.5 Extension Method of Control Input Combination

The description in this section applies to UT75A/UT55A/UT52A/UP55A only.

5.5.1 Using Four-wired RTD as PV (Example of using UT55A)

The following example shows interchanging the connection of a PV input terminal and RSP input terminal using the ladder in Single-loop control. (On the UT75A, the RSP input terminal in the following figure is the PV2 input terminal.) The parameter RTD.S must needs to set to 4-W.
For Detailed model, for the case where the input of the optional suffix code "/U1" is used as the PV.



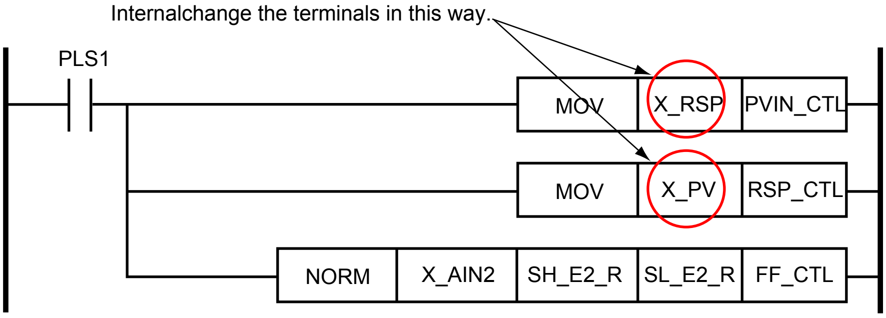
If the PV and RSP terminal inputs are interchanged with each other, it is also necessary to change the burnout connection settings.

► Burnout connection settings: Section 3.5.10, Setting a Burnout Connection

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN2
Parameter registers	SH_E2_R, SL_E2_R
Output registers	PVIN_CTL, RSP_CTL, FF_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

The output ladder calculation program is the same as that of Single-loop control.

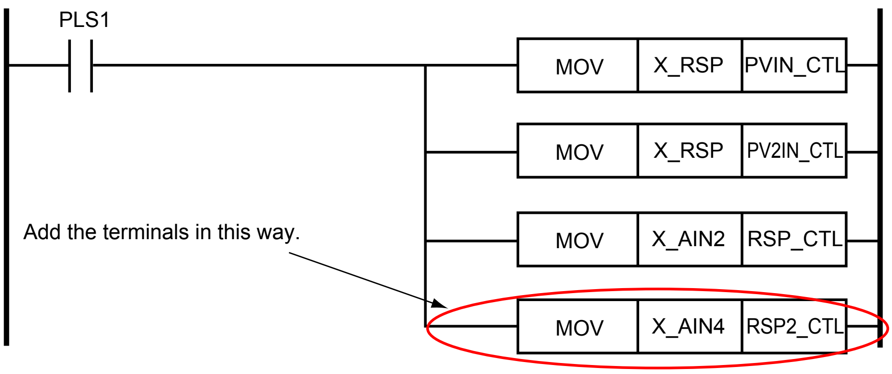
5.5.2 Build the Loop-2 RSP of Cascade Control Using the Ladder Program (Example for UT55A)

To capture the Loop-2 RSP via an analog input, build the function using the ladder program. This section describes an example to use AIN4 aux. analog input. AIN4 aux. analog input can be used when the suffix code: Type 2 = 7.
For Detailed model, AIN4 auxiliary analog input is for the controller with the optional suffix code "/A4" or "/AC4."
Change the default ladder program for Cascade control as follows.

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN2, X_AIN4
Output registers	PVIN_CTL, PV2IN_CTL, RSP_CTL, RSP2_CTL

For an explanation of the registers, see Section 4.2, Registers.



Output ladder calculation program

Do not change it.

5.5.3 Build the Feedforward Control Using the Ladder Program (Example for UT55A)

To use Feedforward control, use the prebuild Feedforward control (AIN2 aux. analog input) or any aux. analog input.
Feedforward control is available when the control mode is Single-loop control or Loop control with PV-hold function.

► Feedforward Control: Section 8.2.8, Feedforward Control, of the UT55A/UT52A Digital Indicating Controllers User's Manual

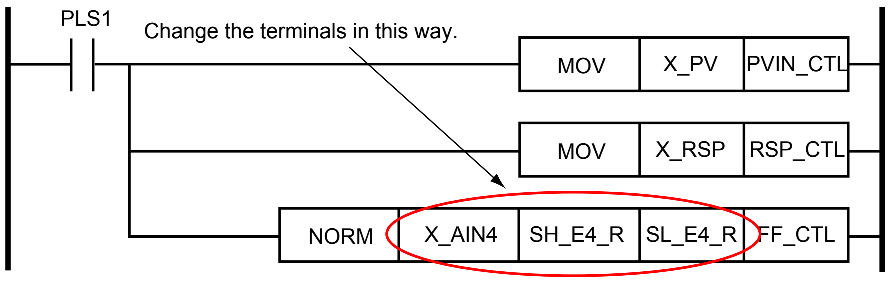
► Feedforward Control: Section 8.2.8, Feedforward Control, of the UT75A Digital Indicating Controllers User's Manual

To use any aux. analog input, build the function using the ladder program.
This section describes an example to use AIN4 aux. analog input as feedforward input.
AIN4 aux. analog input can be used when the suffix code: Type 2 = 7.
For Detailed model:
AIN2 auxiliary analog input is for the specification with the optional suffix code "/A2".
AIN4 auxiliary analog input is for the specification with the optional suffix code "/A4" or "/AC4."
Change the default ladder program for Single-loop control as follows.

Input ladder calculation program

Input registers	X_PV, X_RSP, X_AIN4
Parameter registers	SH_E4_R, SL_E4_R
Output registers	PVIN_CTL, RSP_CTL, FF_CTL

For an explanation of the registers, see Section 4.2, Registers.

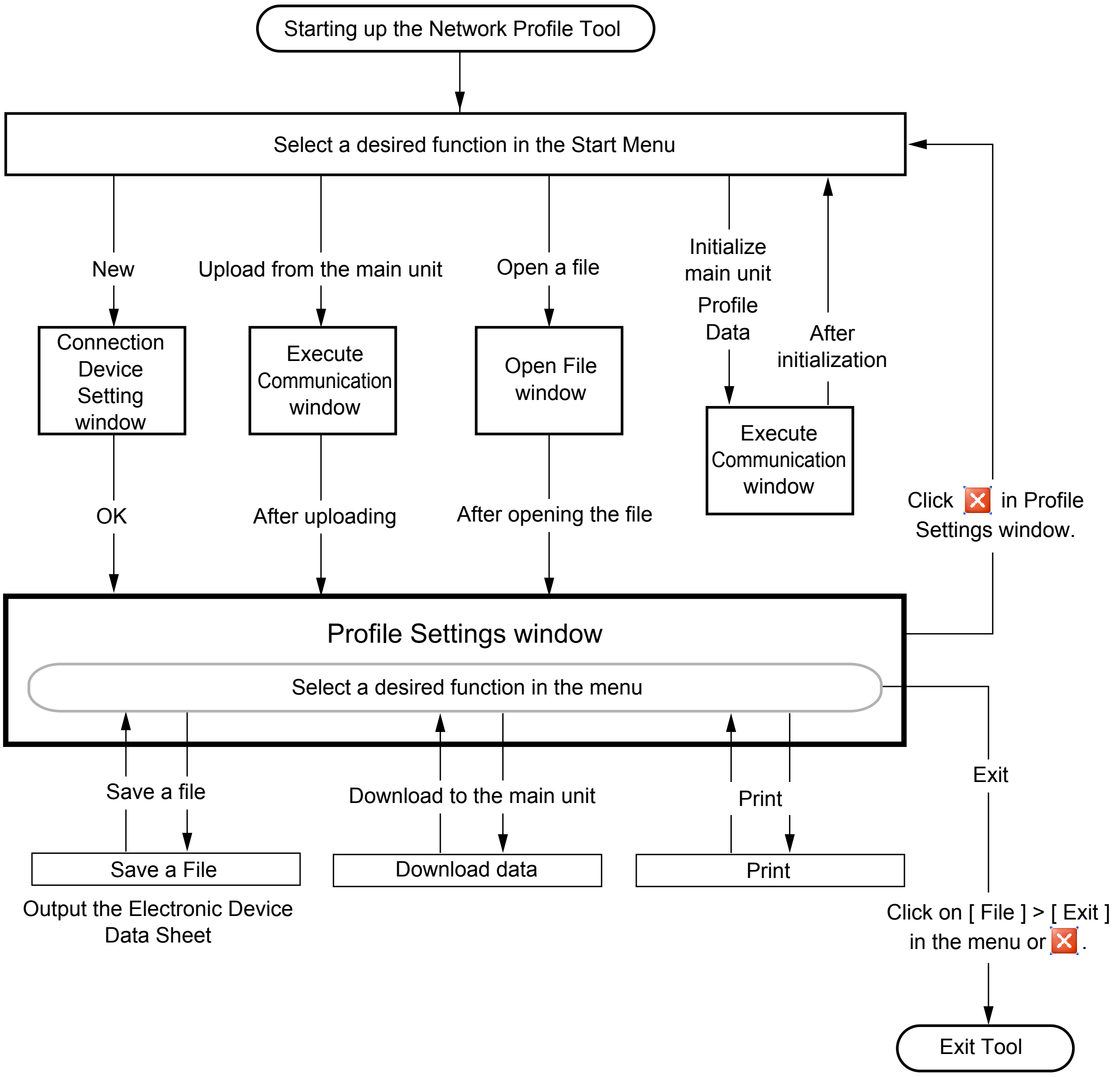


Output ladder calculation program

Do not change it.

6.1 Creating Flow

The profile creating guide describes how to set connection device, setting the profile, downloading, uploading, file management, printing, etc. For Open Network communication functions, see UTAdvanced Series Communication Interface (Open Network) User's Manual.

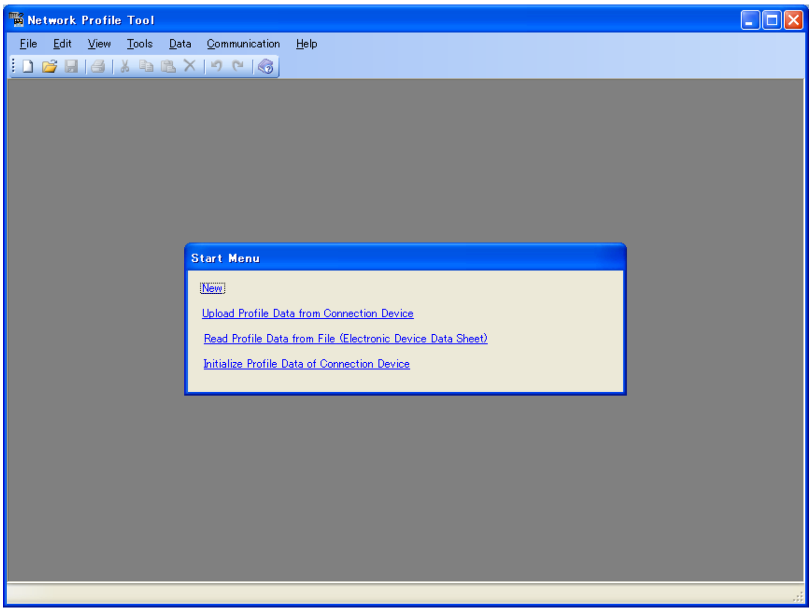


6.2 Starting up/Exiting the Network Profile Tool

Starting up the Network Profile Tool

Procedure

1. Click on Windows' [Start], select [Programs] – [UTAdvanced], and then click on [Network Profile Tool].



2. Select a desired function in the Start Menu.
   - New
     Enables you to create a new profile.
     Enables you to configure the connection device settings and profile settings, respectively.
   - Upload Profile Data from Connection Device
     Enables you to read out and edit data from the main unit.
   - Read Profile Data from File (Electronic Device Data Sheet)
     Enables you to open and edit an existing user file.
   - Initialize Profile Data of Connection Device
     See 6.12 Initializing the main unit's Profile Data

The Network Profile Tool can also be started up by double-clicking on the Network Profile Tool shortcut on the Desktop.

Exiting the Network Profile Tool

Procedure

1. Click on [File] – [Exit] in the menu or click .

Note

Save the current editing file as necessary.

6.3 Part Names of Window and Their Functions

Basic window

The Basic window is a background window for connection device settings, profile settings etc.

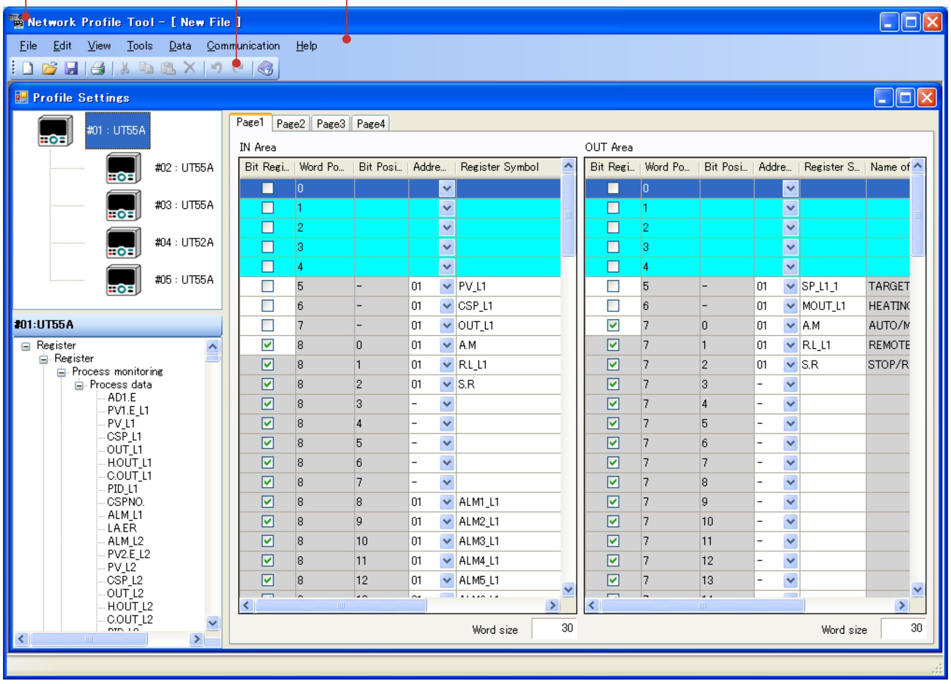
The window below shows an example display of the Profile Settings window.

PROFIBUS-DP/DeviceNet

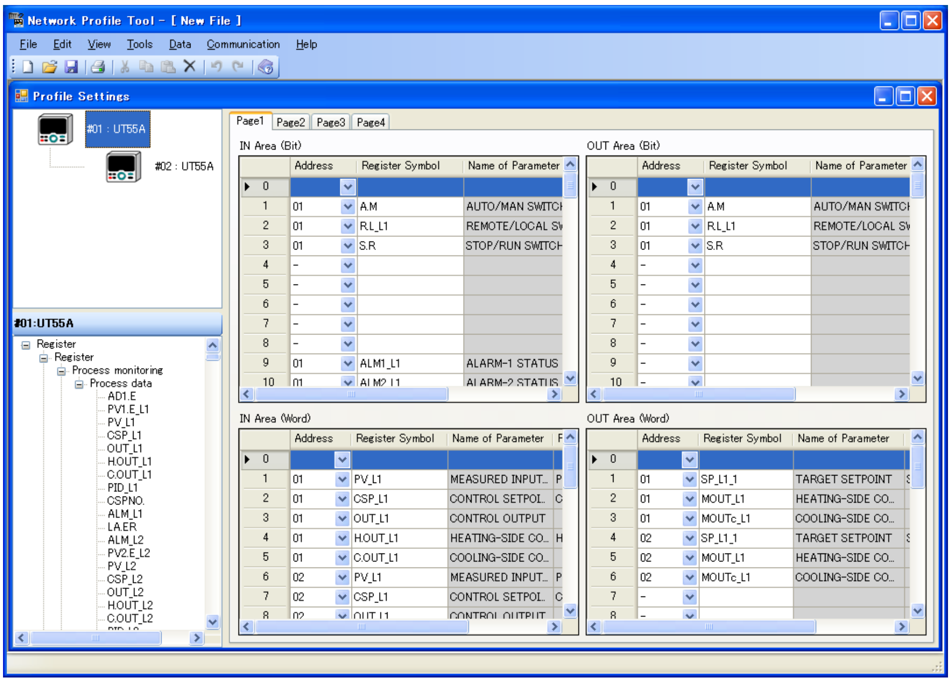
Window Title: Network Profile Tool - [File Name]

Toolbar

Menu



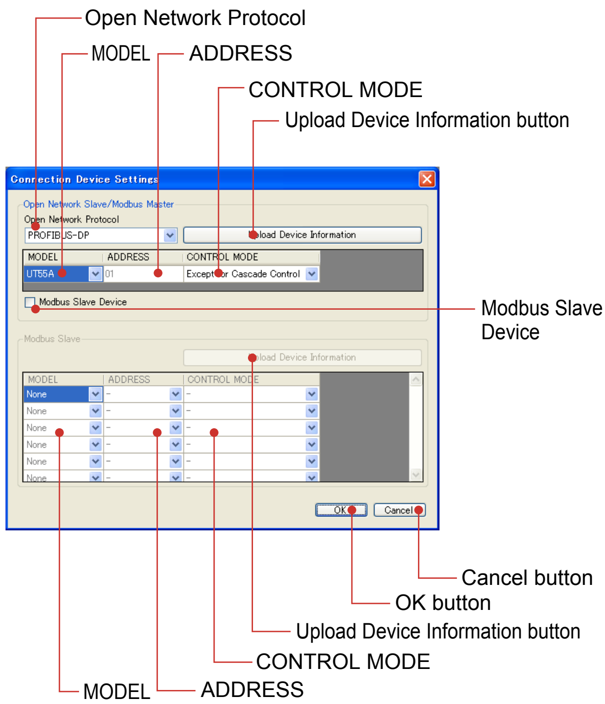
CC-Link



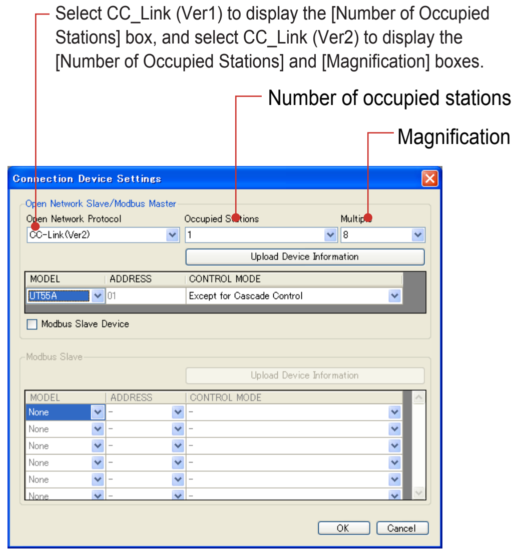
Connection Device Settings window

This is a window that enables you to set the device information for the open network slave/Modbus master device and Modbus slave devices.

PROFIBUS-DP/DeviceNet



CC-Link



Name		Specifications
Open Network Slave/Modbus Master Device	Open Network Protocol	Select the open network protocol. PROFIBUS-DP, DeviceNet, CC-Link (Ver1), and CC-Link (Ver2) When CC-Link (Ver1) or CC-Link (Ver2) is selected, select the number of occupied stations and the magnification. CC-Link (Ver1): number of occupied stations (3 or 4) CC-Link (Ver2): number of occupied stations (1 or 2) and magnification (8)
	Upload Device Information button	Connecting the open network slave/Modbus master device and clicking this button in a communication state loads the device information such as the model and control mode.
	MODEL	Displays UT55A. Select UT75A, UT55A, UT35A, UP55A or UP35A.
	ADDRESS	Fixed to 01. This is a Modbus/RTU communication address. There is no parameter in the main unit.
	CONTROL MODE	Enables you to select the control mode. • Except for Cascade Control and Dual-loop control: Single-loop control, Cascade primary-loop control, Cascade secondary-loop control, Loop control for backup, Loop control with PV switching, Loop control with PV auto-selector, Loop control with PV-hold function • Cascade Control: Cascade control • Dual-loop Control: Dual-loop control The default for the area setting is determined by the control mode when creating a new profile. (See Area Setting for Data Part in Each Control Mode [Default]) ► See “Area Setting for Data Part in Each Control Mode (Default)”

Name		Specifications
Modbus Slave Device	Modbus Slave Device	Select the checkbox when connecting Modbus slave devices.
	Upload Device Information button	Connecting Modbus slave devices and clicking this button in a communication state loads the device information such as the model, address, and control mode.
	MODEL	Enables you to select UT75A, UT55A, UT52A, UT35A, UT32A, UP55A, UP35A or None.
	ADDRESS	This is a Modbus/RTU communication address. Enables you to select from 02 to 30. Duplicate addresses cannot be selected.
	CONTROL MODE	Enables you to select the control mode. • Except for Cascade Control and Dual-loop control: Single-loop control, Cascade primary-loop control, Cascade secondary-loop control, Loop control for backup, Loop control with PV switching, Loop control with PV auto-selector, Loop control with PV-hold function • Cascade Control: Cascade control • Dual-loop Control: Dual-loop control The default for the area setting is determined by the control mode when creating a new profile. (See Area Setting for Data Part in Each Control Mode [Default]) ► See “Area Setting for Data Part in Each Control Mode (Default)”
[OK] button		Clicking the [OK] button displays the Profile Settings window according to the setting details.
[Cancel] button		Clicking the [Cancel] button closes the Connection Device Settings window.

Area Setting for Data Part in Each Control Mode (Default)

Example of PROFIBUS-DP: UT35A/UT32A (For Single Model)

Page	IN area PROFIBUS-DP slave (UTAdvanced) → PROFIBUS-DP master			OUT area PROFIBUS-DP master → PROFIBUS-DP slave (UTAdvanced)		
	Data Format	Register Symbol	Name of Parameter	Data Format	Register Symbol	Name of Parameter
1	Word	PV_L1	Measurment value	Word		
		CSP_L1	Control setpoint		SP_L1_1	Target setpoint of group 1
		OUT_L1	Control output (Valve opening in Position proportional control)		MOUT_L1	Control output in MAN mode (Heatingside)
		H.OUT_L1	Heating-side control output			
		C.OUT_L1	Cooling-side control output		MOUTc_L1	Cooling-side control output in MAN mode
	Bit	A.M	AUTO/MAN switch	Bit	A.M	AUTO/MAN switch
		R.L_L1	REMOTE/LOCAL switch		R.L_L1	REMOTE/LOCAL switch
		S.R	STOP/RUN switch		S.R	STOP/RUN switch
		ALM1_L1	Alarm-1 status			
		ALM2_L1	Alarm-2 status			
		ALM3_L1	Alarm-3 status			
		ALM4_L1	Alarm-4 status			
2	Word	P_L1_1	Proportional band of group 1	Word	P_L1_1	Proportional band of group 1
		I_L1_1	Integral time of group 1		I_L1_1	Integral time of group 1
		D_L1_1	Derivative time of group 1		D_L1_1	Derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
3	Word	Pc_L1_1	Cooling-side proportional band of group 1	Word	Pc_L1_1	Cooling-side proportional band of group 1
		Ic_L1_1	Cooling-side integral time of group 1		Ic_L1_1	Cooling-side integral time of group 1
		Dc_L1_1	Cooling-side derivative time of group 1		Dc_L1_1	Cooling-side derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
4	Word	A1_L1_1	Alarm-1 setpoint of group 1	Word	A1_L1_1	Alarm-1 setpoint of group 1
		A2_L1_1	Alarm-2 setpoint of group 1		A2_L1_1	Alarm-2 setpoint of group 1
		A3_L1_1	Alarm-3 setpoint of group 1		A3_L1_1	Alarm-3 setpoint of group 1
		A4_L1_1	Alarm-4 setpoint of group 1		A4_L1_1	Alarm-4 setpoint of group 1

Note

UT35A/UT32A/UP35A don't have the CONTROL MODE. Select "-" for the CONTROL MODE in Connection Device Settings window.

Area Setting for Data Part in Each Control Mode (Default)

Example of PROFIBUS-DP:
Other than UT55A/UT52A Cascade Control (for One Model)

Page	IN area PROFIBUS-DP slave (UTAdvanced) → PROFIBUS-DP master			OUT area PROFIBUS-DP master → PROFIBUS-DP slave (UTAdvanced)		
	Data Format	Register Symbol	Name of Parameter	Data Format	Register Symbol	Name of Parameter
1	Word	PV_L1	Measurment value	Word		
		CSP_L1	Control setpoint		SP_L1_1	Target setpoint of group 1
		OUT_L1	Control output (Valve opening in Position proportional control)		MOUT_L1	Control output in MAN mode (Heating-side)
		H.OUT_L1	Heating-side control output			
		C.OUT_L1	Cooling-side control output		MOUTc_L1	Cooling-side control output in MAN mode
	Bit	A.M	AUTO/MAN switch	Bit	A.M	AUTO/MAN switch
		R.L_L1	REMOTE/LOCAL switch		R.L_L1	REMOTE/LOCAL switch
		S.R	STOP/RUN switch		S.R	STOP/RUN switch
		ALM1_L1	Alarm-1 status			
		ALM2_L1	Alarm-2 status			
		ALM3_L1	Alarm-3 status			
		ALM4_L1	Alarm-4 status			
		ALM5_L1	Alarm-5 status			
		ALM6_L1	Alarm-6 status			
		ALM7_L1	Alarm-7 status			
		ALM8_L1	Alarm-8 status			
2	Word	P_L1_1	Proportional band of group 1	Word	P_L1_1	Proportional band of group 1
		I_L1_1	Integral time of group 1		I_L1_1	Integral time of group 1
		D_L1_1	Derivative time of group 1		D_L1_1	Derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
3	Word	Pc_L1_1	Cooling-side proportional band of group 1	Word	Pc_L1_1	Cooling-side proportional band of group 1
		Ic_L1_1	Cooling-side integral time of group 1		Ic_L1_1	Cooling-side integral time of group 1
		Dc_L1_1	Cooling-side derivative time of group 1		Dc_L1_1	Cooling-side derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
4	Word	A1_L1_1	Alarm-1 setpoint of group 1	Word	A1_L1_1	Alarm-1 setpoint of group 1
		A2_L1_1	Alarm-2 setpoint of group 1		A2_L1_1	Alarm-2 setpoint of group 1
		A3_L1_1	Alarm-3 setpoint of group 1		A3_L1_1	Alarm-3 setpoint of group 1
		A4_L1_1	Alarm-4 setpoint of group 1		A4_L1_1	Alarm-4 setpoint of group 1
		A5_L1_1	Alarm-5 setpoint of group 1		A5_L1_1	Alarm-5 setpoint of group 1

Example of PROFIBUS-DP: UT55A/UT52A Cascade Control (for One Model)

Page	IN area PROFIBUS-DP slave (UTAdvanced) → PROFIBUS-DP master			OUT area PROFIBUS-DP master → PROFIBUS-DP slave (UTAdvanced)		
	Data Format	Register Symbol	Name of Parameter	Data Format	Register Symbol	Name of Parameter
1	Word	PV_L1	Loop-1 measurment value	Word		
		PV_L2	Loop-2 measurment value			
		CSP_L1	Loop-1 control setpoint		SP_L1_1	Loop-1 target setpoint of group 1
		CSP_L2	Loop-2 control setpoint		SP_L1_1	Loop-2 target setpoint of group 1
		C.A.M	CAS/AUTO/MAN switch		C.A.M	CAS/AUTO/MAN switch
		OUT_L2	Control output (Valve opening in Position proportional control)		MOUT_L2	Control output in MAN mode (Heating-side)
		H.OUT_L2	Heating-side control output			
		C.OUT_L2	Cooling-side control output		MOUTc_L2	Cooling-side control output in MAN mode
	Bit	R.L_L1	REMOTE/LOCAL switch	Bit	R.L_L1	REMOTE/LOCAL switch
		S.R	STOP/RUN switch		S.R	STOP/RUN switch
		ALM1_L1	Loop-1 alarm-1 status			
		ALM2_L1	Loop-1 alarm-2 status			
		ALM3_L1	Loop-1 alarm-3 status			
		ALM4_L1	Loop-1 alarm-4 status			
		ALM5_L1	Loop-1 alarm-5 status			
		ALM6_L1	Loop-1 alarm-6 status			
		ALM7_L1	Loop-1 alarm-7 status			
		ALM8_L1	Loop-1 alarm-8 status			
		ALM1_L2	Loop-2 alarm-1 status			
		ALM2_L2	Loop-2 alarm-2 status			
		ALM3_L2	Loop-2 alarm-3 status			
		ALM4_L2	Loop-2 alarm-4 status			
		ALM5_L2	Loop-2 alarm-5 status			
		ALM6_L2	Loop-2 alarm-6 status			
		ALM7_L2	Loop-2 alarm-7 status			
		ALM8_L2	Loop-2 alarm-8 status			
2	Word	P_L1_1	Loop-1 Proportional band of group 1	Word	P_L1_1	Loop-1 Proportional band of group 1
		I_L1_1	Loop-1 Integral time of group 1		I_L1_1	Loop-1 Integral time of group 1
		D_L1_1	Loop-1 Derivative time of group 1		D_L1_1	Loop-1 Derivative time of group 1
		P_L2_1	Loop-2 Proportional band of group 1		P_L2_1	Loop-2 Proportional band of group 1
		I_L2_1	Loop-2 Integral time of group 1		I_L2_1	Loop-2 Integral time of group 1
		D_L2_1	Loop-2 Derivative time of group 1		D_L2_1	Loop-2 Derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
3	Word	Pc_L1_1	Loop-1 Cooling-side proportional band of group 1	Word	Pc_L1_1	Loop-1 Cooling-side proportional band of group 1
		Ic_L1_1	Loop-1 Cooling-side integral time of group 1		Ic_L1_1	Loop-1 Cooling-side integral time of group 1
		Dc_L1_1	Loop-1 Cooling-side derivative time of group 1		Dc_L1_1	Loop-1 Cooling-side derivative time of group 1
		Pc_L2_1	Loop-2 Cooling-side proportional band of group 1		Pc_L2_1	Loop-2 Cooling-side proportional band of group 1
		Ic_L2_1	Loop-2 Cooling-side integral time of group 1		Ic_L2_1	Loop-2 Cooling-side integral time of group 1
		Dc_L2_1	Loop-2 Cooling-side derivative time of group 1		Dc_L2_1	Loop-2 Cooling-side derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
4	Word	A1_L1_1	Loop-1 Alarm-1 setpoint of group 1	Word	A1_L1_1	Loop-1 Alarm-1 setpoint of group 1
		A2_L1_1	Loop-1 Alarm-2 setpoint of group 1		A2_L1_1	Loop-1 Alarm-2 setpoint of group 1
		A3_L1_1	Loop-1 Alarm-3 setpoint of group 1		A3_L1_1	Loop-1 Alarm-3 setpoint of group 1
		A4_L1_1	Loop-1 Alarm-4 setpoint of group 1		A4_L1_1	Loop-1 Alarm-4 setpoint of group 1
		A5_L1_1	Loop-1 Alarm-5 setpoint of group 1		A5_L1_1	Loop-1 Alarm-5 setpoint of group 1
		A1_L2_1	Loop-2 Alarm-1 setpoint of group 1		A1_L2_1	Loop-2 Alarm-1 setpoint of group 1
		A2_L2_1	Loop-2 Alarm-2 setpoint of group 1		A2_L2_1	Loop-2 Alarm-2 setpoint of group 1
		A3_L2_1	Loop-2 Alarm-3 setpoint of group 1		A3_L2_1	Loop-2 Alarm-3 setpoint of group 1
		A4_L2_1	Loop-2 Alarm-4 setpoint of group 1		A4_L2_1	Loop-2 Alarm-4 setpoint of group 1
		A5_L2_1	Loop-2 Alarm-5 setpoint of group 1		A5_L2_1	Loop-2 Alarm-5 setpoint of group 1

Example of PROFIBUS-DP: UT75A Dual-loop Control (for One Model)

Page	IN area PROFIBUS-DP slave (UTAdvanced) → PROFIBUS-DP master			OUT area PROFIBUS-DP master → PROFIBUS-DP slave (UTAdvanced)		
	Data Format	Register Symbol	Name of Parameter	Data Format	Register Symbol	Name of Parameter
1	Word	PV_L1	Loop-1 measurment value	Word		
		PV_L2	Loop-2 measurment value			
		CSP_L1	Loop-1 control setpoint		SP_L1_1	Loop-1 target setpoint of group 1
		CSP_L2	Loop-2 control setpoint		SP_L1_1	Loop-2 target setpoint of group 1
		OUT_L1	Loop-1 control output		MOUT_L1	Loop-1 control output in MAN mode (Heating-side)
		OUT_L2	Loop-2 control output		MOUT_L2	Loop-2 control output in MAN mode (Heating-side)
	Bit	A.M	Loop-1 AUTO/MAN switch	Bit	A.M	Loop-1 AUTO/MAN switch
		R.L_L1	Loop-1 REMOTE/LOCAL switch		R.L_L1	Loop-1 REMOTE/LOCAL switch
		S.R	Loop-1 STOP/RUN switch		S.R	Loop-1 STOP/RUN switch
		ALM1_L1	Loop-1 alarm-1 status	Bit		
		ALM2_L1	Loop-1 alarm-2 status			
		ALM3_L1	Loop-1 alarm-3 status			
		ALM4_L1	Loop-1 alarm-4 status			
		ALM5_L1	Loop-1 alarm-5 status			
		ALM6_L1	Loop-1 alarm-6 status			
		ALM7_L1	Loop-1 alarm-7 status			
		ALM8_L1	Loop-1 alarm-8 status			
		A.M_L2	Loop-2 AUTO/MAN switch		A.M_L2	Loop-2 AUTO/MAN switch
		R.L_L2	Loop-2 REMOTE/LOCAL switch		R.L_L2	Loop-2 REMOTE/LOCAL switch
		S.R_L2	Loop-2 STOP/RUN switch		S.R_L2	Loop-2 STOP/RUN switch
		ALM1_L2	Loop-2 alarm-1 status			
		ALM2_L2	Loop-2 alarm-2 status			
		ALM3_L2	Loop-2 alarm-3 status			
		ALM4_L2	Loop-2 alarm-4 status			
		ALM5_L2	Loop-2 alarm-5 status			
		ALM6_L2	Loop-2 alarm-6 status			
		ALM7_L2	Loop-2 alarm-7 status			
		ALM8_L2	Loop-2 alarm-8 status			
2	Word	P_L1_1	Loop-1 Proportional band of group 1	Word	P_L1_1	Loop-1 Proportional band of group 1
		I_L1_1	Loop-1 Integral time of group 1		I_L1_1	Loop-1 Integral time of group 1
		D_L1_1	Loop-1 Derivative time of group 1		D_L1_1	Loop-1 Derivative time of group 1
		SPNO.	SP number selection		SPNO.	SP number selection
		P_L2_1	Loop-2 Proportional band of group 1		P_L2_1	Loop-2 Proportional band of group 1
		I_L2_1	Loop-2 Integral time of group 1		I_L2_1	Loop-2 Integral time of group 1
		D_L2_1	Loop-2 Derivative time of group 1		D_L2_1	Loop-2 Derivative time of group 1
4	Word	A1_L1_1	Loop-1 Alarm-1 setpoint of group 1	Word	A1_L1_1	Loop-1 Alarm-1 setpoint of group 1
		A2_L1_1	Loop-1 Alarm-2 setpoint of group 1		A2_L1_1	Loop-1 Alarm-2 setpoint of group 1
		A3_L1_1	Loop-1 Alarm-3 setpoint of group 1		A3_L1_1	Loop-1 Alarm-3 setpoint of group 1
		A4_L1_1	Loop-1 Alarm-4 setpoint of group 1		A4_L1_1	Loop-1 Alarm-4 setpoint of group 1
		A5_L1_1	Loop-1 Alarm-5 setpoint of group 1		A5_L1_1	Loop-1 Alarm-5 setpoint of group 1
		A1_L2_1	Loop-2 Alarm-1 setpoint of group 1		A1_L2_1	Loop-2 Alarm-1 setpoint of group 1
		A2_L2_1	Loop-2 Alarm-2 setpoint of group 1		A2_L2_1	Loop-2 Alarm-2 setpoint of group 1
		A3_L2_1	Loop-2 Alarm-3 setpoint of group 1		A3_L2_1	Loop-2 Alarm-3 setpoint of group 1
		A4_L2_1	Loop-2 Alarm-4 setpoint of group 1		A4_L2_1	Loop-2 Alarm-4 setpoint of group 1
		A5_L2_1	Loop-2 Alarm-5 setpoint of group 1		A5_L2_1	Loop-2 Alarm-5 setpoint of group 1

IN area

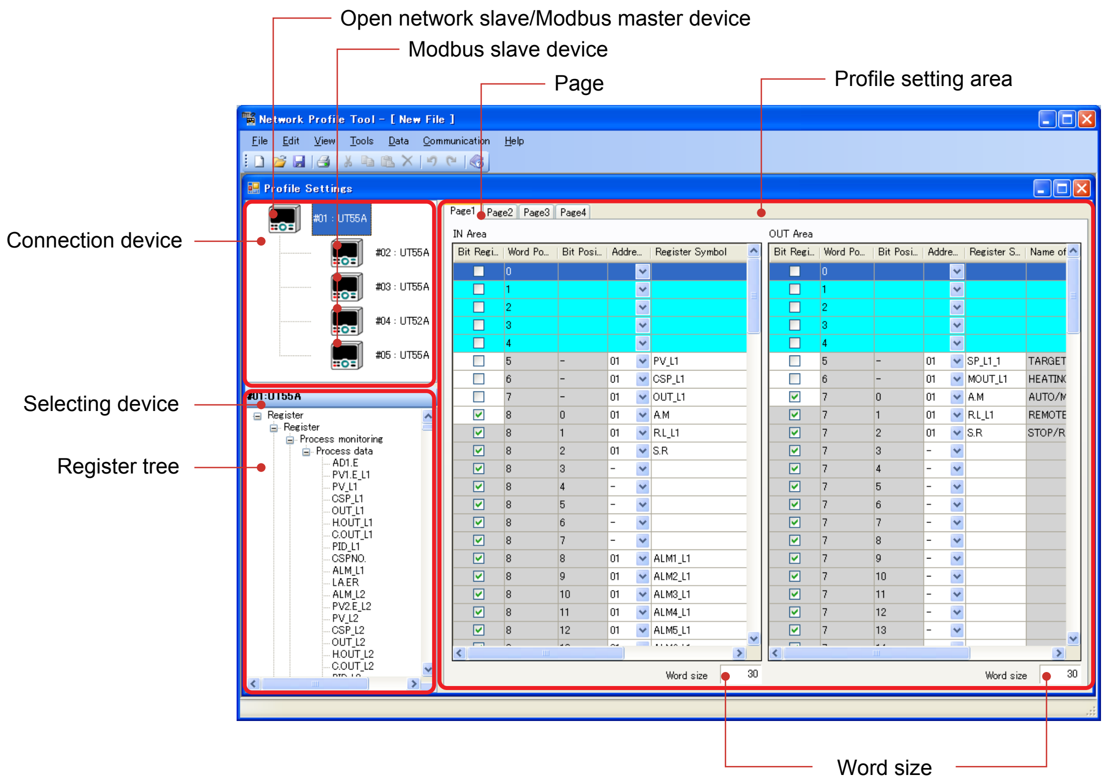
This is an area for a PLC to refer to the slave data. Parameters of the open network and Modbus slaves that are defined in the profile are always updated.

OUT area

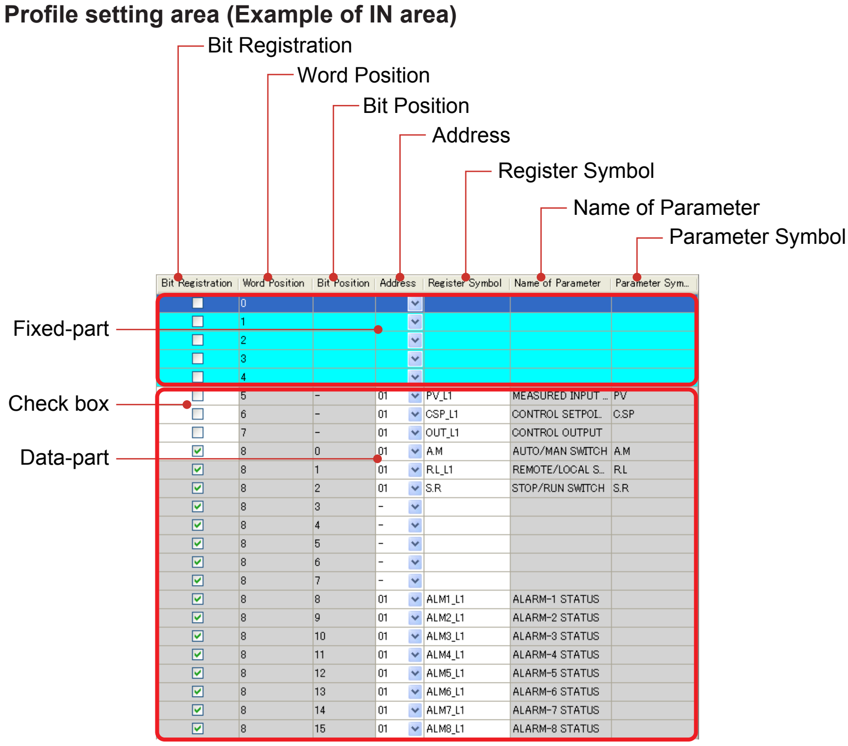
This is an area for a PLC to rewrite the slave parameters. When the OUT area is rewritten, the corresponding parameters of the open network and Modbus slaves are also rewritten.

Profile Settings window (PROFIBUS-DP/DeviceNet)

This is a window that enables you to set the profile.

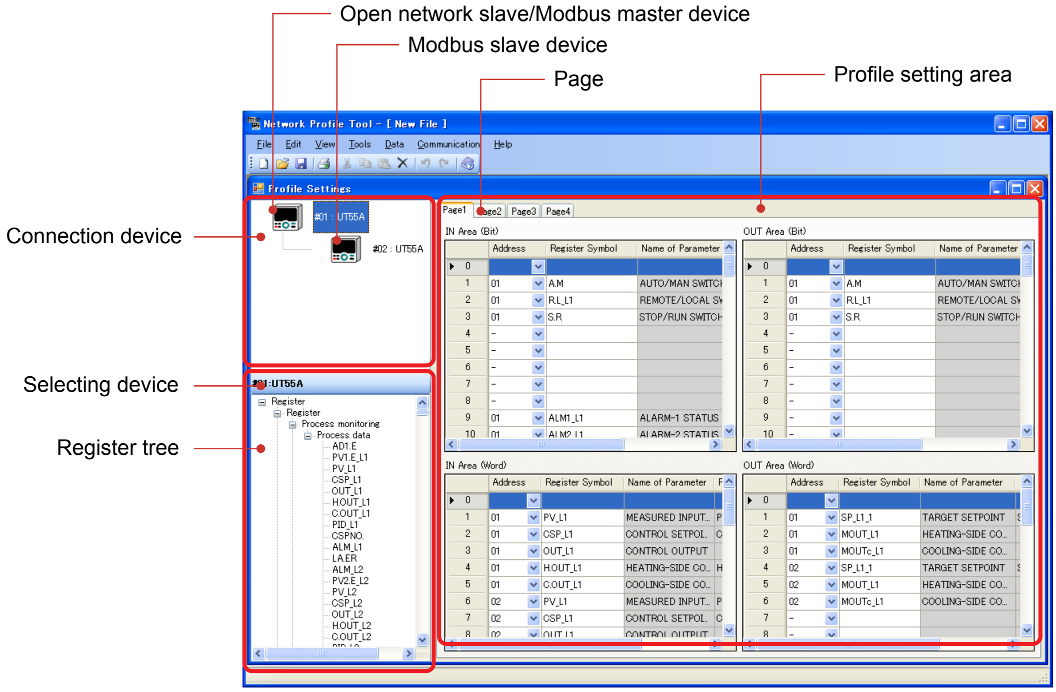


Profile setting area (Example of IN area)

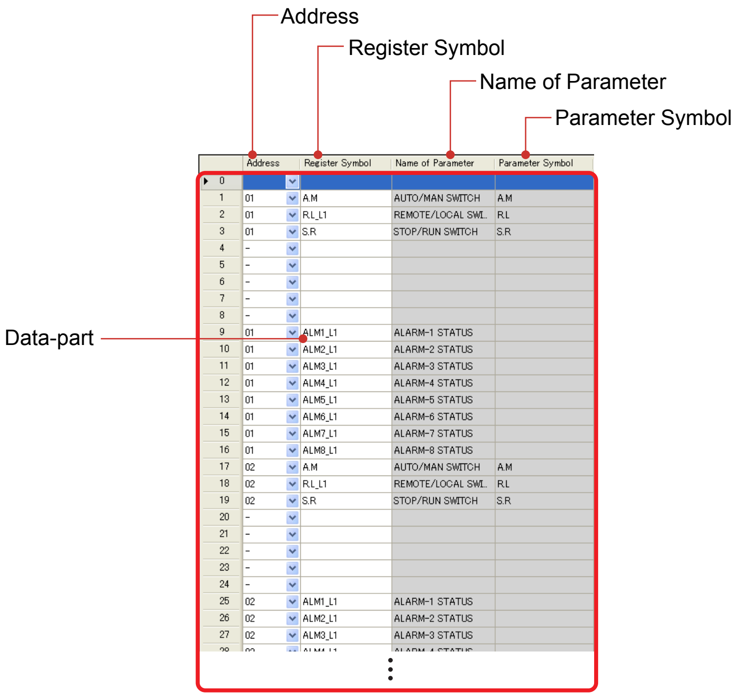


Profile Settings window (CC-Link)

This is a window that enables you to set the profile.



Profile setting area (Example of IN area, bit data)



Name	Specifications
Connection device	Connection devices are displayed on the left in the Profile Settings window. They can be displayed and hidden. The device configuration set in the Connection Device Settings window is displayed. Clicking on the connection device switches to the display of the register tree for the device.
Open network slave/Modbus master device	This is a diagram for the device with address 01.
Modbus slave device	This is a diagram for the devices with addresses 02 to 32.
Register tree	The register tree is displayed on the left in the Profile Settings window. It can be displayed and hidden. It is used when creating the profile. To register a parameter, drag the register and drop it on the table (in the white area) for the profile. Right-clicking on the register tree enables you to select Expand or Collapse in the shortcut menu. When the register tree is expanded, a desired register can be searched for by keyboard input. More information on the register classification is described later in this page.
Selecting device	Displays the model and address for the device that is clicked in Connection device. Example: #02: UT55A (UT55A with Modbus/RTU communication address 02)
Profile setting area	The profile setting area consists of an IN Area, OUT Area, and Pages 1 to 4. Displays the details according to the connection device settings. Data can be set in the white cells and cannot be set in the gray cells.
Page	Parameters that are supposed to be frequently read/written are registered with Page 1 and parameters that are supposed to be less frequently read/written are registered with Pages 2 to 4 when creating a new profile. The number of pages is fixed.
Word size	Displays the size for the area in the range of 5 to 122 words. Click on [Data] - [Set Word Size] in the menu. Specify the data for the profile by word size. The word size can be set in the IN and OUT areas, respectively. The word size is the same on each page.
Bit Registration	When the checkbox is unselected, the registered parameter is handled as word data. When the checkbox is selected, the parameter registered with each bit is handled as bit data. Selecting the [Bit Registration] checkbox when registered as word data deletes the content registered as word data.
Word Position	Displays the word numbers from the top up to the set word size.
Bit Position	When the [Bit Registration] checkbox is unselected, “-” is displayed. When the [Bit Registration] checkbox is selected, 0 to 15 (from 16 bits) is displayed.
Address	Sets the Modbus/RTU communication address for each device. Modbus master device: Fixed to 01. Modbus slave device: 02 to 32.
Register Symbol	The register symbol for the parameter to register can be dragged from the register tree and dropped. The register symbol can also be directly input into the cell, or selected from the drop-down list.
Name of Parameter	Displays the parameter name.
Parameter Symbol	Displays the parameter symbol. Display is the same as that in the main unit.
Fixed-part	The fixed part is an area for flags for received data valid, normal connection, rescan request, write request, batch write request, and so on. It is a fixed 5-word area. The details in the fixed part cannot be changed. Select [Display] in the menu and then select or deselect the [Display Fixed Part] checkbox to display or hide the fixed part. The fixed part is the same on each page.
Data-part	Enables you to register the UTAdvanced data. The data part can be used by switching the page

Example of PROFIBUS-DP/DeviceNet: Details in the fixed part (same on each page)

IN area PROFIBUS-DP slave (UTAdvanced) → PROFIBUS-DP master			OUT area PROFIBUS-DP master → PROFIBUS-DP slave (UTAdvanced)		
Word position	Bit position	Contents of assignment	Word position	Bit position	Contents of assignment
0	0	Receive data valid	0	0	Rescan request
	1	During-write		1	(Reserved)
	2	Write acknowledgement		2	Write request
	3	(Reserved)		3	(Reserved)
	4	(Reserved)		4	(Reserved)
	5	(Reserved)		5	(Reserved)
	6	(Reserved)		6	(Reserved)
	7	(Reserved)		7	(Reserved)
	8	(Reserved)		8	(Reserved)
	9	(Reserved)		9	(Reserved)
	10	(Reserved)		10	(Reserved)
	11	(Reserved)		11	(Reserved)
	12	(Reserved)		12	(Reserved)
	13	(Reserved)		13	(Reserved)
	14	(Reserved)		14	(Reserved)
	15	(Reserved)		15	(Reserved)
1	0	Normal connection slave (address 01)	1	0	Batch write request (address 01)
	1	Normal connection slave (address 02)		1	Batch write request (address 02)
	2	Normal connection slave (address 03)		2	Batch write request (address 03)
	3	Normal connection slave (address 04)		3	Batch write request (address 04)
	4	Normal connection slave (address 05)		4	Batch write request (address 05)
	5	Normal connection slave (address 06)		5	Batch write request (address 06)
	6	Normal connection slave (address 07)		6	Batch write request (address 07)
	7	Normal connection slave (address 08)		7	Batch write request (address 08)
	8	Normal connection slave (address 09)		8	Batch write request (address 09)
	9	Normal connection slave (address 10)		9	Batch write request (address 10)
	10	Normal connection slave (address 11)		10	Batch write request (address 11)
	11	Normal connection slave (address 12)		11	Batch write request (address 12)
	12	Normal connection slave (address 13)		12	Batch write request (address 13)
	13	Normal connection slave (address 14)		13	Batch write request (address 14)
	14	Normal connection slave (address 15)		14	Batch write request (address 15)
	15	Normal connection slave (address 16)		15	Batch write request (address 16)
2	0	Normal connection slave (address 17)	2	0	Batch write request (address 17)
	1	Normal connection slave (address 18)		1	Batch write request (address 18)
	2	Normal connection slave (address 19)		2	Batch write request (address 19)
	3	Normal connection slave (address 20)		3	Batch write request (address 20)
	4	Normal connection slave (address 21)		4	Batch write request (address 21)
	5	Normal connection slave (address 22)		5	Batch write request (address 22)
	6	Normal connection slave (address 23)		6	Batch write request (address 23)
	7	Normal connection slave (address 24)		7	Batch write request (address 24)
	8	Normal connection slave (address 25)		8	Batch write request (address 25)
	9	Normal connection slave (address 26)		9	Batch write request (address 26)
	10	Normal connection slave (address 27)		10	Batch write request (address 27)
	11	Normal connection slave (address 28)		11	Batch write request (address 28)
	12	Normal connection slave (address 29)		12	Batch write request (address 29)
	13	Normal connection slave (address 30)		13	Batch write request (address 30)
	14	Normal connection slave (address 31)		14	Batch write request (address 31)
	15	Normal connection slave (address 32)		15	Batch write request (address 32)
3		Current profile number	3		(Unused)
4		Current page	4		Page change request

► Fixed-part contents: UTAdvanced Series Communication Interface (Open Network) User's Manual

Example of CC-Link: Details in the fixed part (same on each page)

The shaded areas indicate fixed parts.

IN area CC-Link slave (UTAdvanced) → CC-Link master			OUT area CC-Link master → CC-Link slave (UTAdvanced)		
Word position	Bit position	Contents of assignment	Word position	Bit position	Contents of assignment
	RX0	Receive data valid		RY0	Rescan request
	RX1	During-write		RY1	(Reserved)
	RX2	Write acknowledgement		RY2	Write request
	RX3	(Reserved)		RY3	(Reserved)
	RX4	(Reserved)		RY4	(Reserved)
	RX5	(Reserved)		RY5	(Reserved)
	RX6	(Reserved)		RY6	(Reserved)
	RX7	(Reserved)		RY7	(Reserved)
	RX8	(Reserved)		RY8	(Reserved)
	RX9	(Reserved)		RY9	(Reserved)
	RX10	(Reserved)		RY10	(Reserved)
	RX11	(Reserved)		RY11	(Reserved)
	RX12	(Reserved)		RY12	(Reserved)
	RX13	(Reserved)		RY13	(Reserved)
	RX14	(Reserved)		RY14	(Reserved)
	RX15	(Reserved)		RY15	(Reserved)
	RX16	Normal connection slave (address 01)		RY16	Batch write request (address 01)
	RX17	Normal connection slave (address 02)		RY17	Batch write request (address 02)
	RX18	Normal connection slave (address 03)		RY18	Batch write request (address 03)
	RX19	Normal connection slave (address 04)		RY19	Batch write request (address 04)
	RX20	Normal connection slave (address 05)		RY20	Batch write request (address 05)
	RX21	Normal connection slave (address 06)		RY21	Batch write request (address 06)
	RX22	Normal connection slave (address 07)		RY22	Batch write request (address 07)
	RX23	Normal connection slave (address 08)		RY23	Batch write request (address 08)
	RX24	Normal connection slave (address 09)		RY24	Batch write request (address 09)
	RX25	Normal connection slave (address 10)		RY25	Batch write request (address 10)
	RX26	Normal connection slave (address 11)		RY26	Batch write request (address 11)
	RX27	Normal connection slave (address 12)		RY27	Batch write request (address 12)
	RX28	Normal connection slave (address 13)		RY28	Batch write request (address 13)
	RX29	Normal connection slave (address 14)		RY29	Batch write request (address 14)
	RX30	Normal connection slave (address 15)		RY30	Batch write request (address 15)
	RX31	Normal connection slave (address 16)		RY31	Batch write request (address 16)
	RX32	Normal connection slave (address 17)		RY32	Batch write request (address 17)
	RX33	Normal connection slave (address 18)		RY33	Batch write request (address 18)
	RX34	Normal connection slave (address 19)		RY34	Batch write request (address 19)
	RX35	Normal connection slave (address 20)		RY35	Batch write request (address 20)
	RX36	Normal connection slave (address 21)		RY36	Batch write request (address 21)
	RX37	Normal connection slave (address 22)		RY37	Batch write request (address 22)
	RX38	Normal connection slave (address 23)		RY38	Batch write request (address 23)
	RX39	Normal connection slave (address 24)		RY39	Batch write request (address 24)
	RX40	Normal connection slave (address 25)		RY40	Batch write request (address 25)
	RX41	Normal connection slave (address 26)		RY41	Batch write request (address 26)
	RX42	Normal connection slave (address 27)		RY42	Batch write request (address 27)
	RX43	Normal connection slave (address 28)		RY43	Batch write request (address 28)
	RX44	Normal connection slave (address 29)		RY44	Batch write request (address 29)
	RX45	Normal connection slave (address 30)		RY45	Batch write request (address 30)
	RX46	Normal connection slave (address 31)		RY46	Batch write request (address 31)
	RX47	Normal connection slave (address 32)		RY47	Batch write request (address 32)
	RX48	01: A.M		RY48	01: A.M
	RX49	01: R.L_L1		RY49	01: R.L_L1
	RX50	01: S.R		RY50	01: S.R
	RX51	(Unused)		RY51	(Unused)
	RX52	(Unused)		RY52	(Unused)
	RX53	(Unused)		RY53	(Unused)
	RX54	(Unused)		RY54	(Unused)
	RX55	(Unused)		RY55	(Unused)
	⋮			⋮	
	⋮			⋮	

Continued to the next page

IN area CC-Link slave (UTAdvanced) → CC-Link master		
Word position	Bit position	Contents of assignment
	RX80	(Reserved)
	⋮	
	RX91	Remote Ready
	⋮	
	RX95	(Reserved)
RWr0		Current page
RWr1		01: PV_L1
RWr2		02: PV_L1
RWr3		01: CSP_L1
RWr4		02: CSP_L1
RWr5		01: OUT_L1
RWr6		02: OUT_L1
RWr7		(Unused)
RWr8		(Unused)
RWr9		(Unused)
RWr10		(Unused)
RWr11		(Unused)

OUT area CC-Link master → CC-Link slave (UTAdvanced)		
Word position	Bit position	Contents of assignment
	RY80	(Reserved)
	⋮	
	RY91	(Reserved)
	⋮	
	RY95	(Reserved)
RWw0		Page change request
RWw1		(Unused)
RWw2		(Unused)
RWw3		01: SP_L1_1
RWw4		02: SP_L1_1
RWw5		01: MOUT_L1
RWw6		02: MOUT_L1
RWw7		(Unused)
RWw8		(Unused)
RWw9		(Unused)
RWw10		(Unused)
RWw11		(Unused)

Note

- The shaded areas indicate fixed parts.
- The bit position of remote Ready flag varies depending on the profile.

► Fixed-part contents: UTAdvanced Series Communication Interface (Open Network) User's Manual

Data category of Register tree

Large class.	Middle class.	Small class.	UT55A	UT35A	UP55A	UP35A	UT75A
Register	Process monitoring	Process data	√	√	√	√	√
	Program pattern	Local mode setting	N/A	N/A	√	√	N/A
	Operation mode parameters	Loop-1/Loop-2 operation mode	√	N/A	√	N/A	√
		Operation mode	N/A	√	N/A	√	N/A
	Operation parameter	Loop-1/Loop-2 alarm setpoint setting	N/A	N/A	√	N/A	N/A
		Alarm setpoint setting	N/A	N/A	N/A	√	N/A
	Loop-1 operation parameters	SP and alarm setpoint setting	√	√	N/A	N/A	√
		SP-related setting	√	√	√	√	√
		Alarm function setting	√	√	√	√	√
		PV-related setting	√	√	√	√	√
		PID setting	√	√	√	√	√
		Control action-related setting	√	√	√	√	√
	Loop-2 operation parameters	SP and alarm setpoint setting	√	N/A	N/A	N/A	√
		SP-related setting	√	N/A	N/A	N/A	√
		Alarm function setting	√	N/A	√	N/A	√
		PV-related setting	√	N/A	√	N/A	√
		PID setting	√	N/A	√	N/A	√
		Control action-related setting	√	N/A	√	N/A	√
	P-parameters	P-parameter	√	√	√	√	√
	Registers for ladder program	For input ladder calculation	√	√	√	√	√
		For output ladder calculation	√	√	√	√	√
		Input range / scale	√	√	√	√	√
	Program pattern	Program pattern					√
Relay	Function status	System error	√	√	√	√	√
		Input error	√	√	√	√	√
		Operation mode	√	√	√	√	√
		Program pattern end signal, Wait end signal					√
		Alarm	√	√	√	√	√
		Alarm latch	√	√	√	√	√
		Heater break alarm	√	√	√	√	N/A
		SP number, PID number	√	√	N/A	N/A	N/A
		SP number, PID number, Segment number					√
		PID number, Pattern number, Segment number	N/A	N/A	√	√	N/A
		Key	√	√	√	√	√
		Display	√	√	√	√	√
		PV evnet status	N/A	N/A	√	√	N/A
		Time event status	N/A	N/A	√	√	N/A
		Pattern number status, Segment number status	N/A	N/A	√	√	N/A
		Segment number status					√
	Status for ladder program	Input (status) relay	√	√	√	√	√
		Output (status) relay	√	√	√	√	√
		Control (status) relay	√	√	√	√	√
		Special relay	√	√	√	√	√

√: Available N/A: Not available

Note

The registers and relays of Loop-2 can be used only for UT75A/UT55A/UT52A/UP55A.

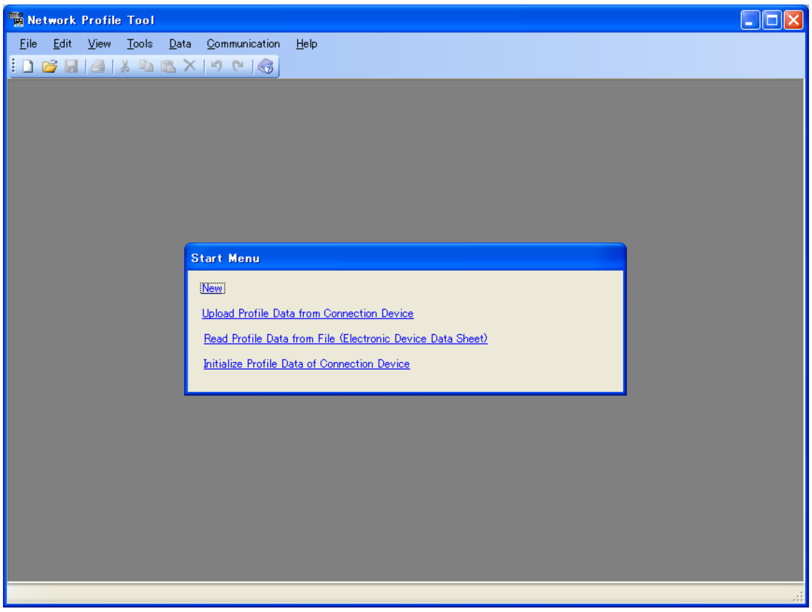
► Register symbols and register numbers: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

6.4 Create the Profile

The following describes an example of PROFIBUS-DP. This operating procedure also applies to DeviceNet and CC-Link.

Procedure

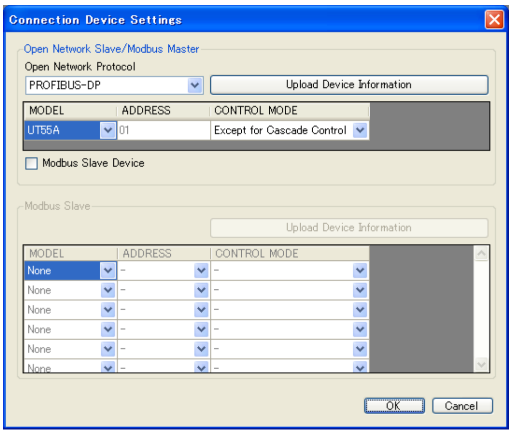
1. Click on Windows' [Start], select [All Programs] – [UTAdvanced], and then click on [Network Profile Tool].



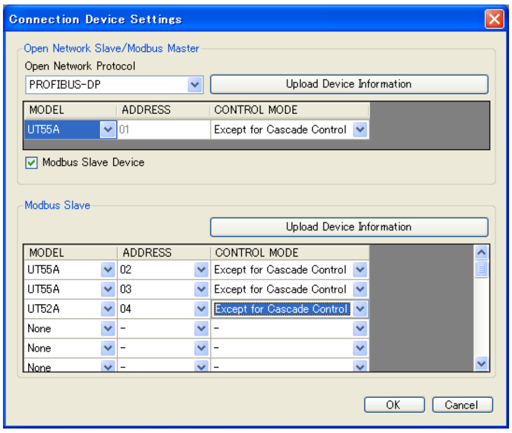
2. Click on "New" and click [OK] in the Start Menu window, click on [File] – [New] in the menu, or click on the toolbar to display the Connection Device Settings window.

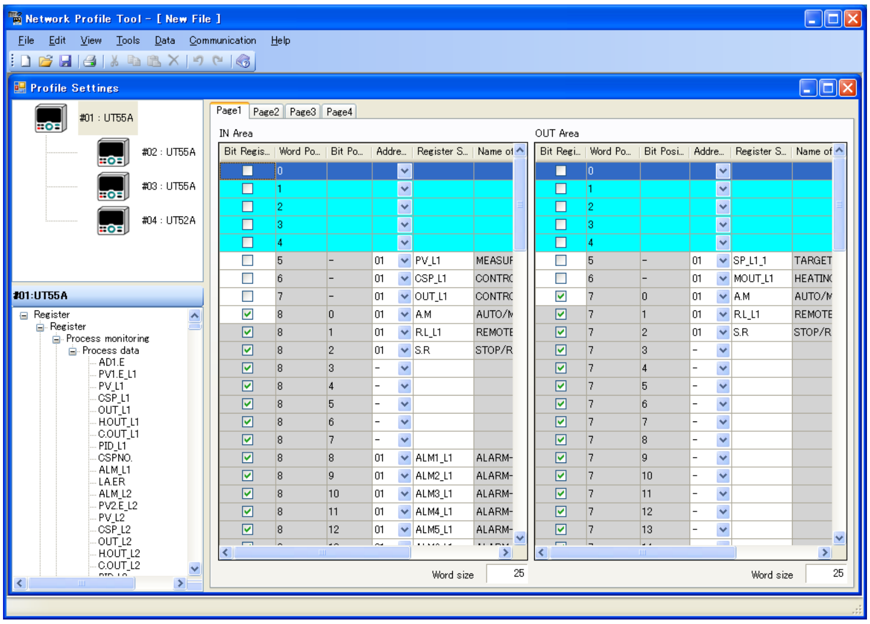
In addition to New, there are the following options.

- Upload Profile Data from Connection Device
  Enables you to read out and edit data from the main unit.
- Read Profile Data from File (Electronic Device Data Sheet)
  Enables you to open and edit an existing user file.
- Initialize Profile Data of Connection Device
  See 6.12 Initializing the main unit's Profile Data



3. The following shows how to set the device information for the open network slave /Modbus master device.
To upload the device information from the open network slave/Modbus master device, click the [Upload Connection Device Information] button to display the Execute Communication window, and execute the upload.
If there are Modbus slave devices, select the [Modbus Slave Device] checkbox, set the device information for the Modbus slave devices, and click the [OK] button to display the Profile Settings window.
The following window shows an example of one open network slave/Modbus master device and three Modbus slave devices.



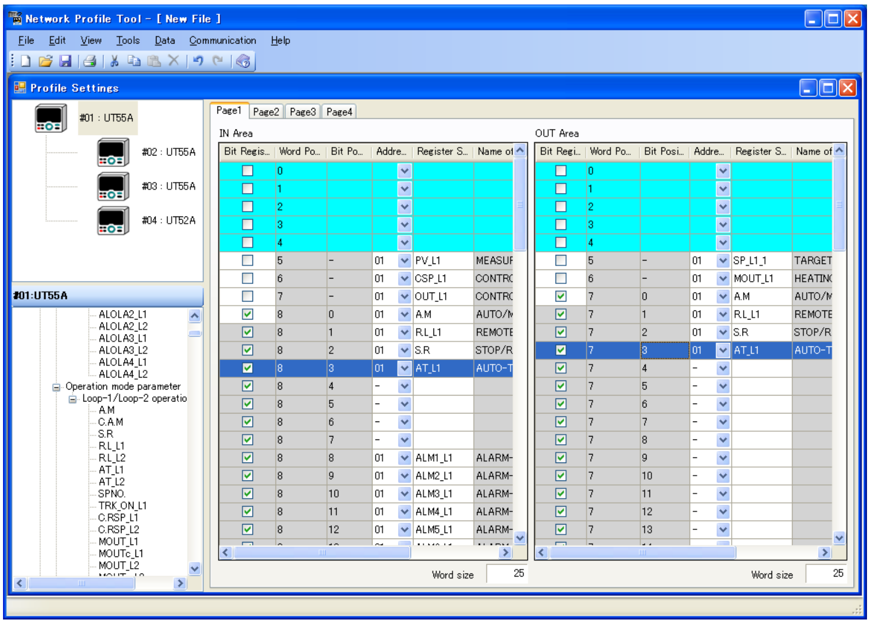


Note

- UT35A/UT32A/UP35A don't have the CONTROL MODE. Select "-" for the CONTROL MODE in Connection Device Settings window.
- In the case of CC-link communication, only "4 occupied stations, 8 magnification" of CC-Link (ver.2) is available for pattern settings in the CONTROL MODE.
  When the "pattern settings" is selected, "4 occupied stations, 8 magnification" is set automatically.

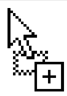
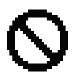
4. Clicking on the device diagram for which to set a profile enables you to switch to the register tree for that device.
The default is registered in the profile setting area according to the control mode (other than cascade control or cascade control). Check the default conditions and set the word size and add or delete registers as necessary.
To cancel the profile settings, click ❎. The Start Menu window appears.
The following describes how to add or delete a register.

5. The following describes how to add a register.
The following shows an example of registering the auto-tuning execution register (AT_L1) with the IN and OUT areas.

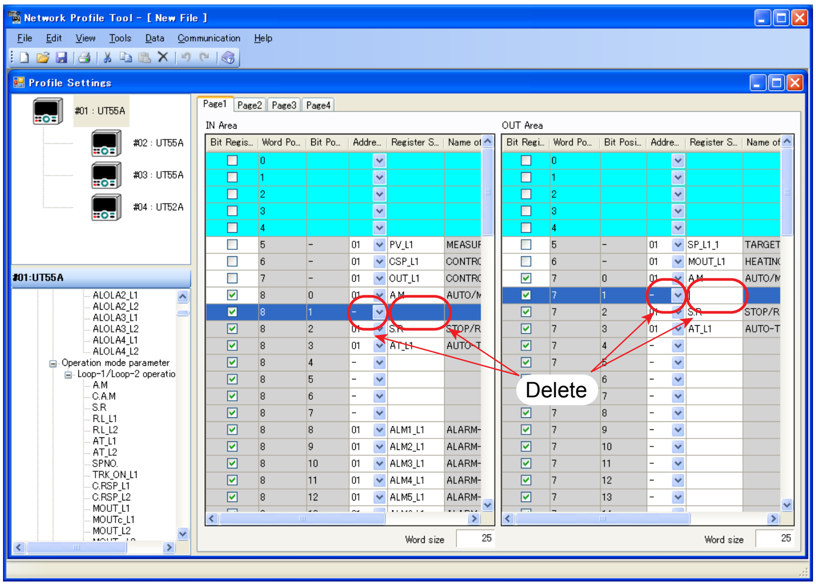


- The address can be selected from the drop-down list.
- The register symbol can be dragged from the register tree and dropped into the cell to which to register it. Inputting the register symbol displays a candidate list. Select the desired one from the list.

► Register symbols and register numbers: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

Icon	Status
	Status enabling a drop
	Status disabling a drop

6. The following describes how to delete a register.
The following shows an example of deleting the remote/local switching register (R.L_L1) from the IN and OUT areas. Place the cursor on the cells marked in red and press the Delete key, or click [Edit] – [Delete] in the menu.



7. To add or delete other registers, repeat steps 5 and 6.
For more information on the other editing methods, see 6.5, Edit the Profile.

8. Next, check the area setting.
Click [Tool] – [Check Area Setting] in the menu to execute the check.
If an error occurs, the Area Setting window appears.

9. Perform the following operations as necessary.

- Save the file: Saves the data as an Electronic Device Data Sheet (GSD file and EDS file).*1
  See 6.10, Managing Files.
  The GSD and EDS files need to be loaded into the configuration tool.*2
  The file name is fixed to YEC45F2.GSD for PROFIBUS-DP.
- Download: Downloads the created profile data to the main unit.
  See 6.7, Downloading the Profile Data.
- Print: Prints data. See 6.11, Printing.

*1: GSD is an extension for PROFIBUS-DP.
EDS is for DeviceNet, and CCL is for CC-Link.
These files can be assigned any name.
*2: Only PROFIBUS-DP and DeviceNet

10. Saving the file and executing the download completes the profile setting.

What are register symbols?

Register symbols are the symbols of registers containing data such as main unit parameter, operation status, alarm status, contact input, or error information in 16 bits or 1 bit.
When performing communication, registers are used as D-registers or I-relays.
For more information on them, see the UTAdvanced Communication Interface (RS-485, Ethernet) User's Manual.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
    Ln: loop number (L1 or L2)
    Y: group number (1 to 8 (29) or 1 to 16, R)
xxxx_En
    En: terminal area number (E1 to E4)

Example:
    SP_L1_3: This means Loop-1 group-3 target setpoint.
    PYS_2: This means group-2 PYS.
    DI1.D_E1: This means E1-terminal area DI1.D.

Note

Since the UT35A/UT32A/UP35A/UM33A is a single-loop controller, it has no distinction between Loop-1 and Loop-2. However, the register symbol has "L1" which indicates Loop-1.

Menu symbols and parameter symbols different from those in the main unit

For menu symbols and parameter symbols, the loop number and terminal area number are indicated like register symbols. For example, the alarm function menu is indicated as ALRM in the main unit, while it is indicated as ALRM_L1 in the LL50A.
For the notation, refer to "D-register symbols" above.

- Alarm function setting parameters
  In the main unit, the alarm type, standby operation, energized/non-energized, and latch settings are made using one parameter. However, they are set using one parameter each in the LL50A.
- Output type parameters
  These parameters are used only for setting during heating/cooling control.
  The output types are set using one parameter in the main unit, while they are set using the heating- and cooling-side parameters in the LL50A.
- P-parameters (when the ladder is used)
  The decimal point position can be set only in the LL50A.

6.5 Edit the Profile

The following describes an example of PROFIBUS-DP. This operating procedure also applies to DeviceNet and CC-Link.

6.5.1 Inserting a Row

The following shows how to insert rows in the editable area. Insertion into a bit row is not possible. The inserted rows delete the word data for the rows that cannot fit in the area as a result of the row insertion.

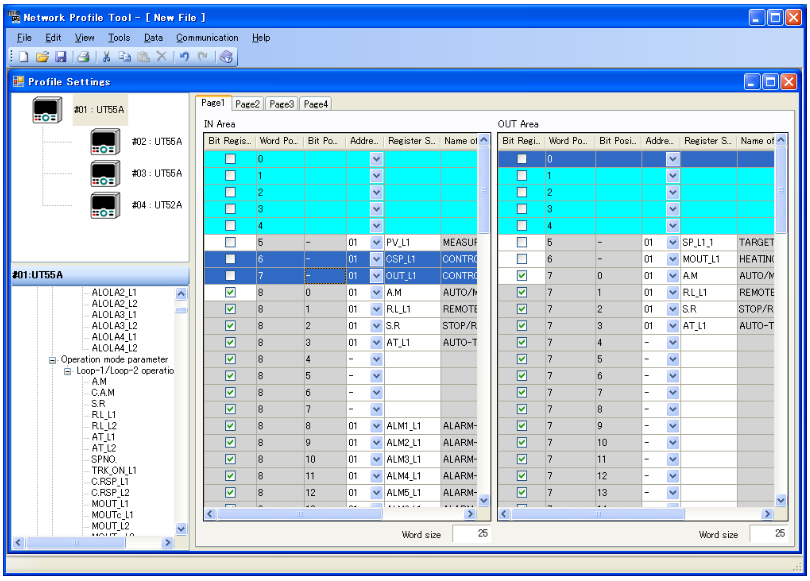
Selecting multiple rows

Select the row area with the cursor (from the current cursor position using the Shift key + up/down keys) or mouse. The rows are inserted into the top row of the selected row area.

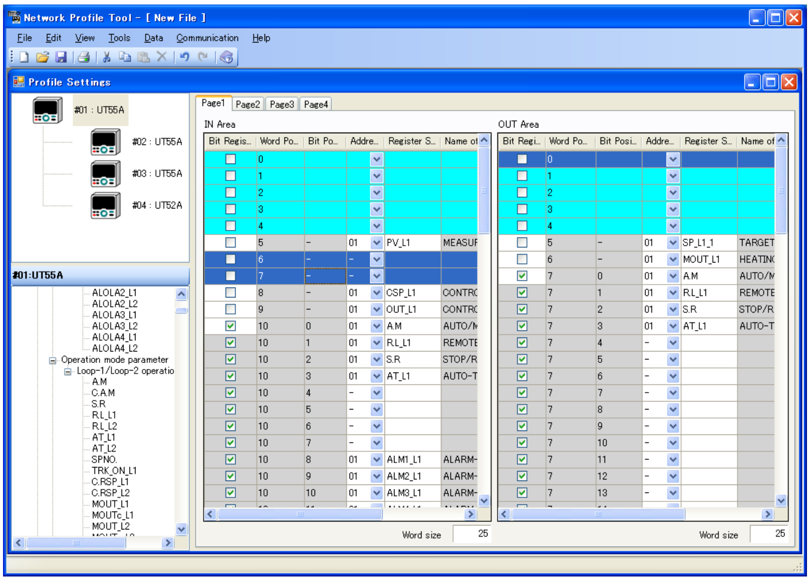
The following shows an example of inserting 2 rows from the word position 6.

Procedure

1. Select the inserting row.



2. Click on [Edit] – [Insert Row] in the menu.



6.5.2 Deleting a Row

The following shows how to delete rows from the editable area. A bit row cannot be deleted. When a row is deleted, the space for the deleted row is replaced by the next row.

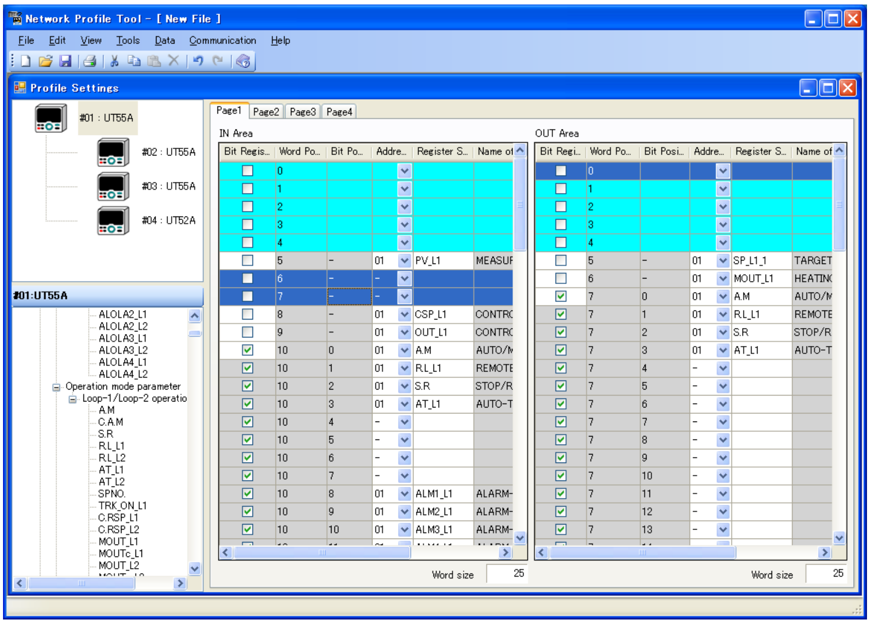
Selecting multiple rows

Select the row area with the cursor (from the current cursor position using the Shift key + up/down keys) or mouse.

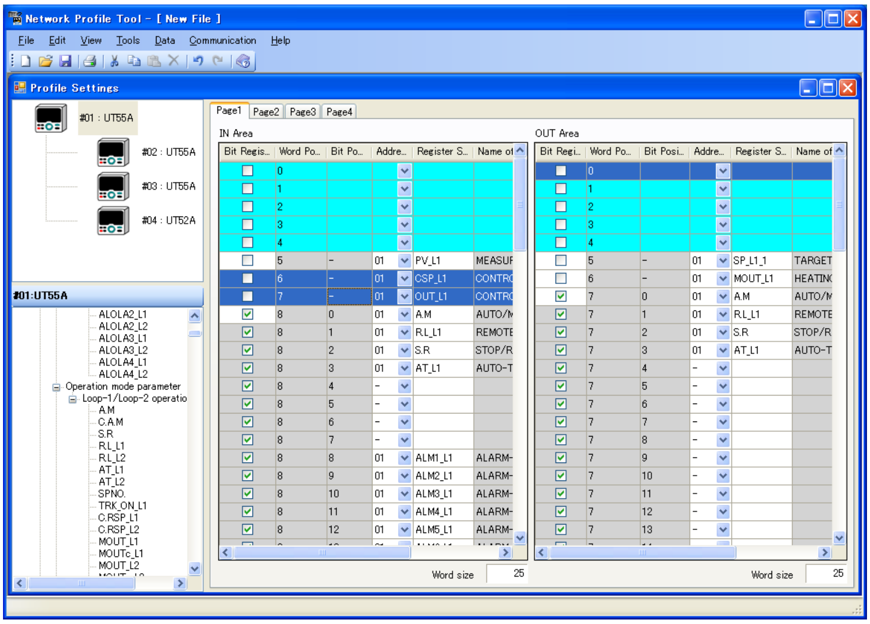
The following shows an example of deleting 2 rows from the word position 6.

Procedure

1. Select the deleting row.



2. Click on [Edit] – [Delete Row] in the menu.



6.5.3 Copying a Row

The following shows how to copy rows in the editable area. The copied row overwrites the copy destination.

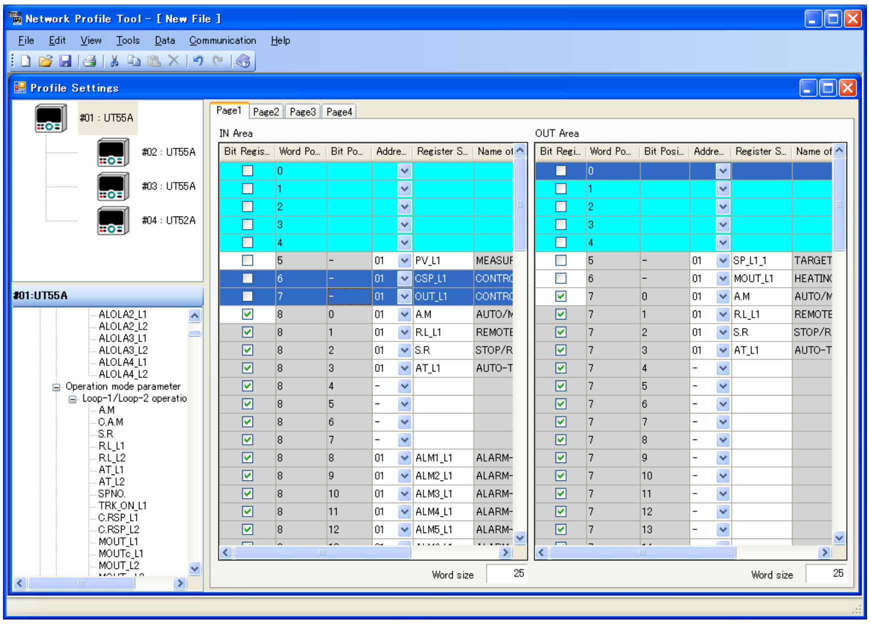
Selecting multiple rows

Select the row area with the cursor (from the current cursor position using the Shift key + up/down keys) or mouse.

The following shows an example of copying 2 rows from the word position 6 to the word position 10.

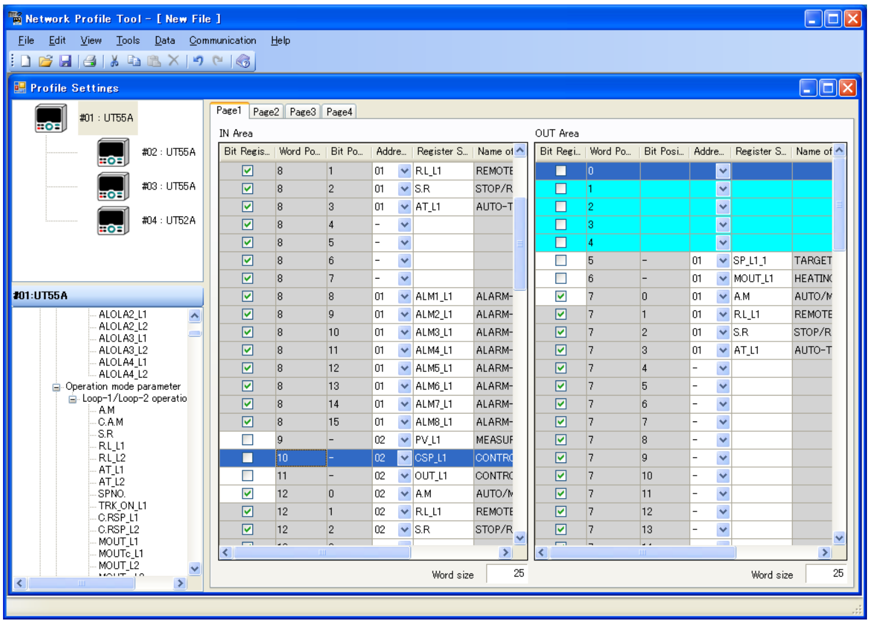
Procedure

1. Select the copying row.

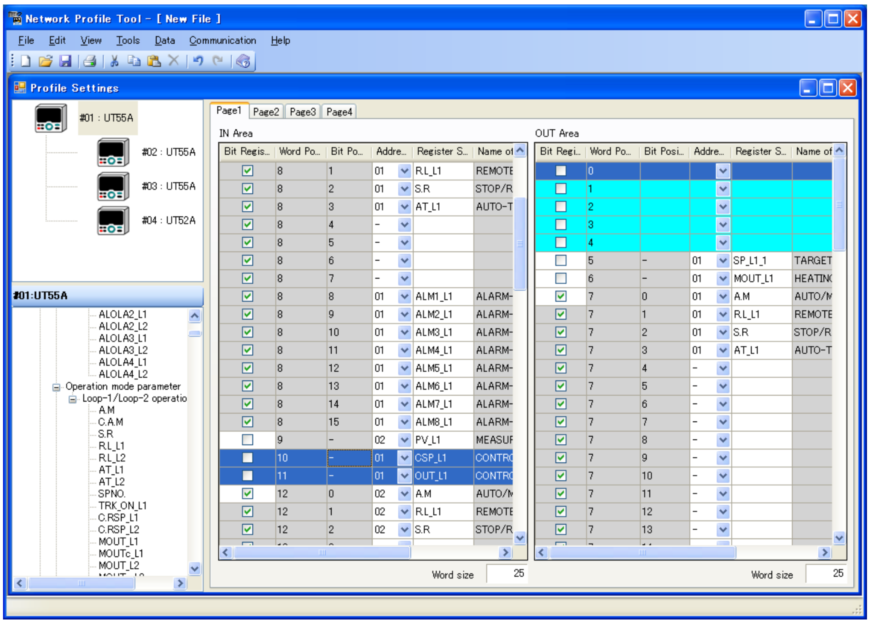


2. Click on [Edit] – [Copy] in the menu.

3. Click the copying row.



4. Click on [Edit] – [Paste] in the menu.



6.5.4 Setting the Word Size

The following shows how to set the data size for the IN and OUT areas for the profile.
The word size is the same on Pages 1 through 4.

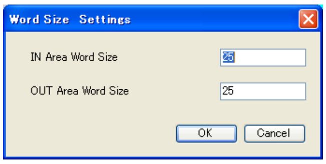
Protocol	Area	Setting range of word size
PROFIBUS-DP/ DeviceNet	IN	5 to 122 words
	OUT	5 to 122 words

Note

Reducing the word size deletes the word data for the rows that cannot fit in the area as a result of reducing the word size.

Procedure

1. Click on [Data] – [Set Word Size] in the menu.



2. Enter the word size and click the [OK] button. To cancel the settings, click the [Cancel] button.

6.5.5 Others

Functions	Specifications
Undo	Returns the area setting to the previous state. (Undo can be performed up to 5 times including the redo operation) The following operations can be undone. ▪ Changing the profile data ▪ Changing the area size
Redo	Redo the operation that was undone. (Redo can be performed up to 5 times including the undo operation) The following operations can be redone. ▪ Changing the profile data ▪ Changing the area size
Cut	Cut the string. The row is not deleted.
Paste	Paste the string and row.
Delete	Delete the string.

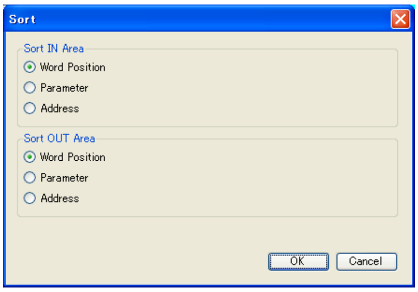
6.6 Window Operations

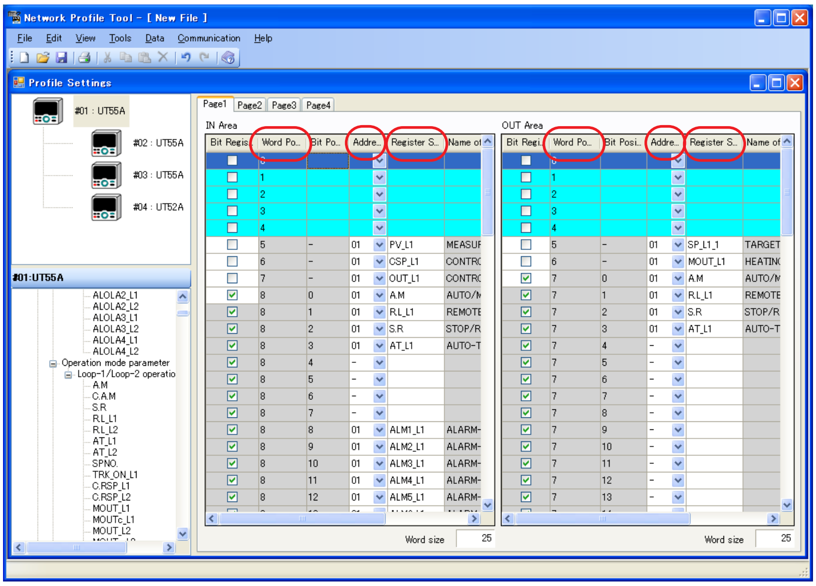
The following describes an example of PROFIBUS-DP. This operating procedure also applies to DeviceNet and CC-Link.

Sort Profile

Procedure

1. Click on [Data] – [Sort] in the menu, and select "Word Position", "Address" or "Register Symbol" in the Profile Settings window. Then click [OK] button.
   Click "Word Position", "Address" or "Register Symbol" in the Profile setting area of Profile Settings window.





Note

When the registers are sorted by register symbol, the registers are listed in order with the smallest D register number at the top and with the largest D register number at the bottom. A D register number is assigned to all the registers.

► Register symbols and register numbers: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

Making the toolbar, status bar, Connection Device, Register Tree, Fixed-part of the profile or Connection Device Settings window visible/invisible

Procedure

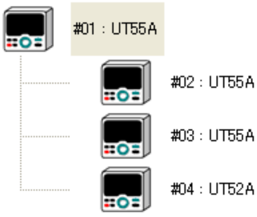
1. Click on [View] – [following command] in the menu.

The following operations are available:

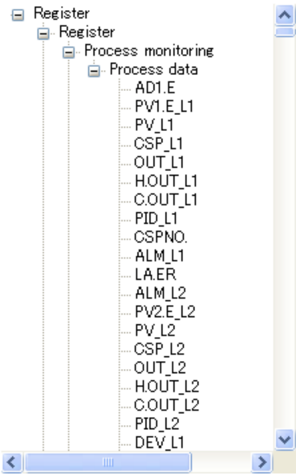
- Making the toolbar visible/invisible

- Making the status bar visible/invisible

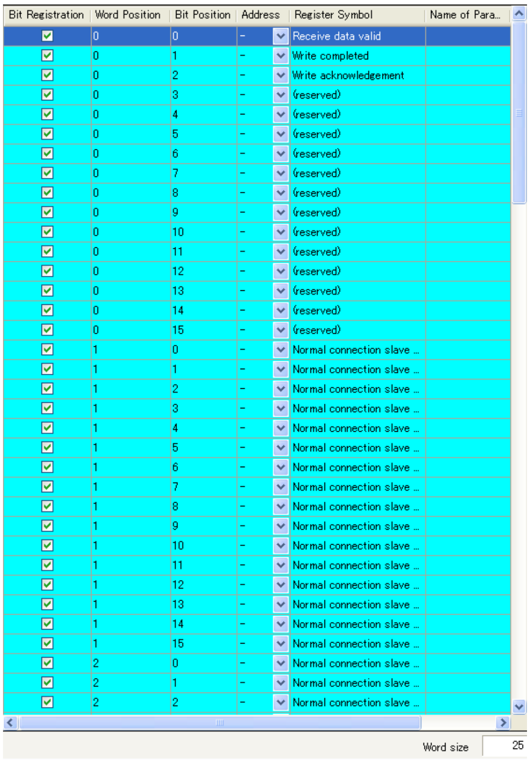
- Making the Connection Device visible/invisible



- Making the Register Tree visible/invisible



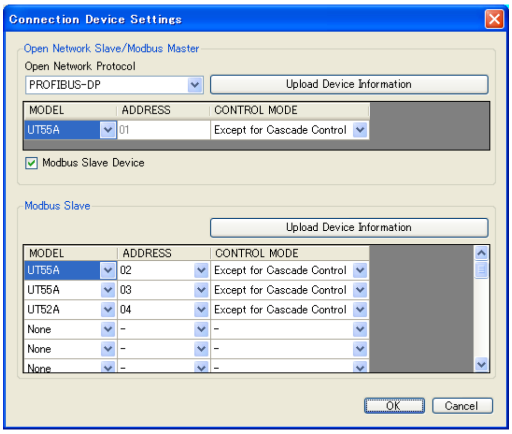
- Making the fixed-part of the profile visible/invisible



Bit Registration	Word Position	Bit Position	Address	Register Symbol	Name of Para...
☑	0	0	–	Receive data valid	
☑	0	1	–	Write completed	
☑	0	2	–	Write acknowledgement	
☑	0	3	–	(reserved)	
☑	0	4	–	(reserved)	
☑	0	5	–	(reserved)	
☑	0	6	–	(reserved)	
☑	0	7	–	(reserved)	
☑	0	8	–	(reserved)	
☑	0	9	–	(reserved)	
☑	0	10	–	(reserved)	
☑	0	11	–	(reserved)	
☑	0	12	–	(reserved)	
☑	0	13	–	(reserved)	
☑	0	14	–	(reserved)	
☑	0	15	–	(reserved)	
☑	1	0	–	Normal connection slave ...	
☑	1	1	–	Normal connection slave ...	
☑	1	2	–	Normal connection slave ...	
☑	1	3	–	Normal connection slave ...	
☑	1	4	–	Normal connection slave ...	
☑	1	5	–	Normal connection slave ...	
☑	1	6	–	Normal connection slave ...	
☑	1	7	–	Normal connection slave ...	
☑	1	8	–	Normal connection slave ...	
☑	1	9	–	Normal connection slave ...	
☑	1	10	–	Normal connection slave ...	
☑	1	11	–	Normal connection slave ...	
☑	1	12	–	Normal connection slave ...	
☑	1	13	–	Normal connection slave ...	
☑	1	14	–	Normal connection slave ...	
☑	1	15	–	Normal connection slave ...	
☑	2	0	–	Normal connection slave ...	
☑	2	1	–	Normal connection slave ...	
☑	2	2	–	Normal connection slave ...	

Word size 25

- Making the Connection Device Settings window visible/invisible



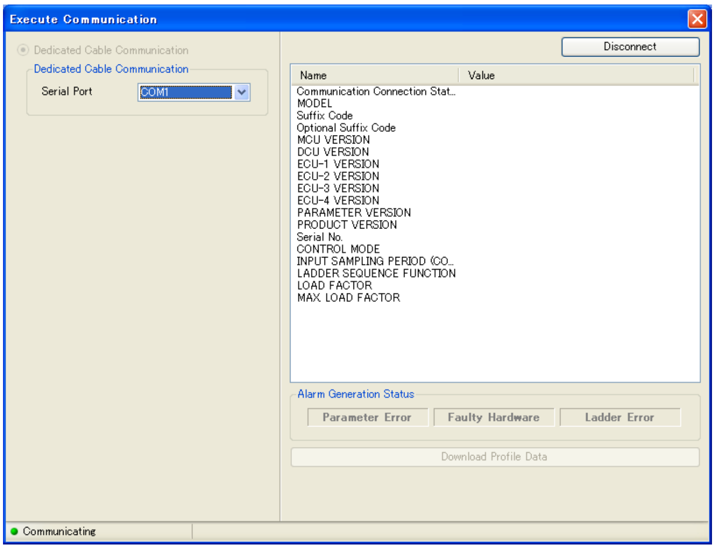
6.7 Downloading the Profile Data

CAUTION

Do not download data while the controller is being used for control loop. Otherwise, it may cause a sudden change of the control output.
Be sure to disconnect the main unit from the target unit before downloading data.

Procedure

1. Click on [Communication] – [Download] in the menu to display the Execute Communication window.



2. Set up the communication conditions and click the [Download Profile Data] button. When download is complete, the message appears.

3. Click [OK] to close the Execute Communication window.

To save a file in use, save it by entering a file name.

► Saving file: Section 6.10.4 Saving a File as

Description

Downloading the user file from the LL50A stops Open network communication. In case of PROFIBUS-DP, RDY LED (green) turns off and the ERR LED (red) blinks.*
After the download is completed, the main unit changes the profile number (in the parameter file) to 0, and restarts PROFIBUS-DP communication. If the I/O size of the user profile matches the I/O size configured in the PLC, a connection can be established. If the size does not match, a connection cannot be established. The PLC does not recognize the main unit during downloading.

*: For DeviceNet, one MNS LED turns on (green) or blinks (red).
For CC-Link, the L RUN LED turns off (green) and the L ERR LED blinks (red).

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.

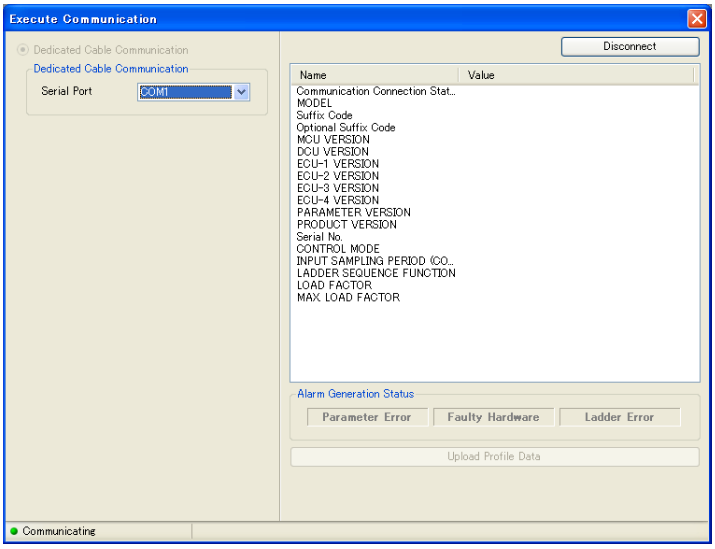
Note

Do not disconnect a connection cable or turn off the main unit power supply during a download.

6.8 Uploading the Profile Data

Procedure

1. Click on [Communication] – [Upload] in the menu to display the Execute Communication window.



2. Set up the communication conditions and click the [Upload Profile Data] button. When an upload is complete, the Execute Communication window.

If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data, click the [Yes] button.
- To cancel an upload, click the [Cancel] button.

► Saving file: Section 6.10.4 Saving a File as

Description

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.

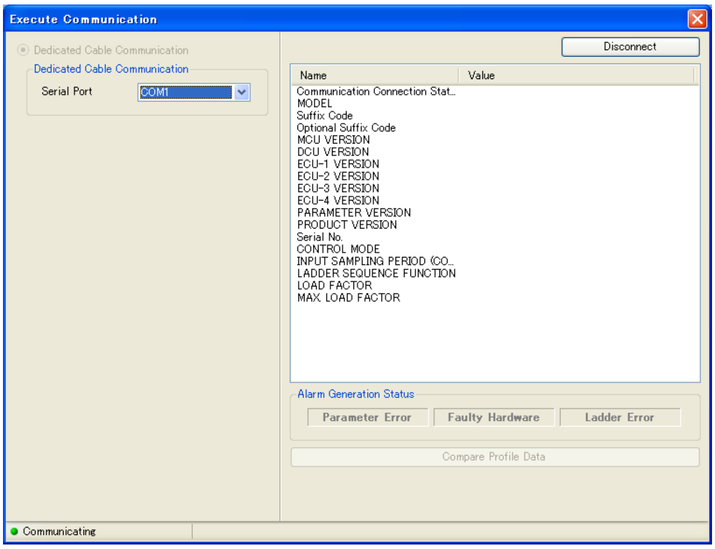
Note

Do not disconnect a connection cable or turn off the main unit power supply during an upload.

6.9 Comparing Data with Main Unit's Profile Data

Procedure

1. Click on [Communication] – [Compare Communication] in the menu to display the Execute Communication window.



2. Set up the communication conditions and click the [Compare Profile Data] button to start parameter comparison. When parameter data matches/mismatch the main unit's data, the message appears.

Description

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.

Note

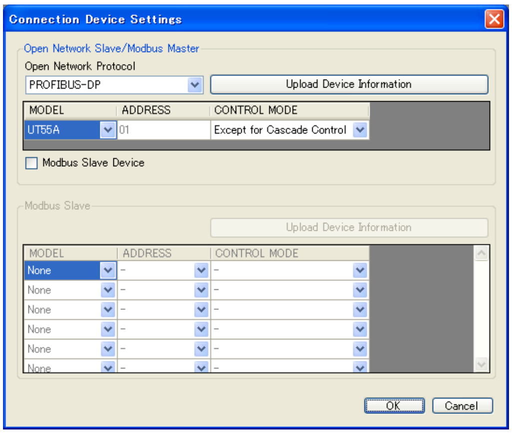
Do not disconnect a connection cable or turn off the main unit power supply during a comparing.

6.10 Managing Files

6.10.1 Creating a New File

Procedure

1. Click on [File] – [New] in the menu or click  on the toolbar to display the Connection Device Settings window.

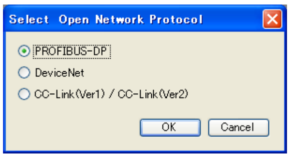


2. Set the connection device or click the [OK] button.
3. For operations such as setting profile, see section 6.4 or 6.5.

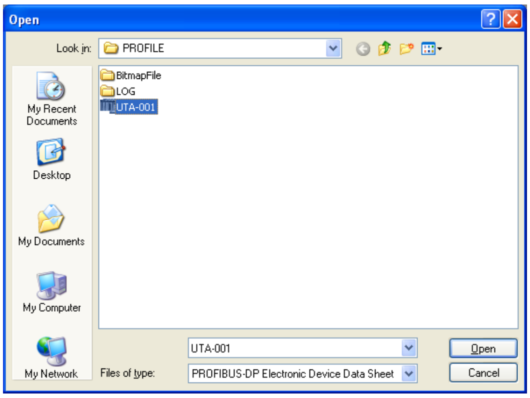
6.10.2 Opening a User File

Procedure

1. Click on [File] – [Open] in the menu or click  on the toolbar to display the Select Open Network Protocol window.



2. In the window, select the protocol and click the [OK] button.
Open File window appears.



3. Specify the folder for which icon () is displayed.
The folder contains the GSD file or EDS file* and connection device bitmap file.
The GSD file name is fixed to YEC45F2.GSD.*
For more information on the profile setting operation, see 6.4 and 6.5.

*: GSD is an extension for PROFIBUS-DP. EDS is for DeviceNet, and CCL is for CC-Link. These files can be assigned any name.

6.10.3 Saving by Overwrite

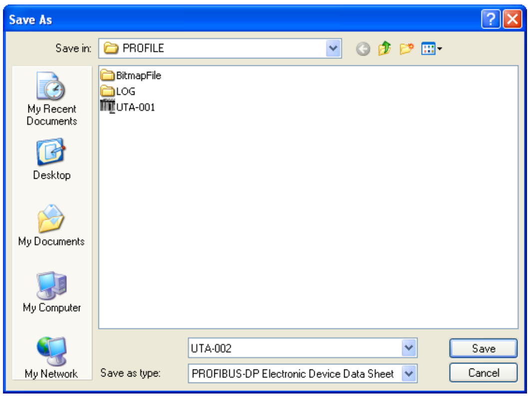
Procedure

1. Click on [File] – [Save] in the menu or click  on the toolbar to save data in use.

6.10.4 Saving a File as

Procedure

1. Click on [File] – [Save as] in the menu to display the Save As window.

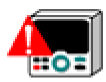


2. Name the folder and click the [Save] button.

The folder icon () appears in the LL50A.
The GSD file and connection device bitmap file are created in the created folder.
The file name for the GSD file*1 is fixed to YEC45F2.GSD because it needs to be loaded into the configuration tool.*2

*1: GSD is an extension for PROFIBUS-DP. EDS is for DeviceNet, and CCL is for CC-Link. These files can be assigned any name..
*2: Only PROFIBUS-DP and DeviceNet.

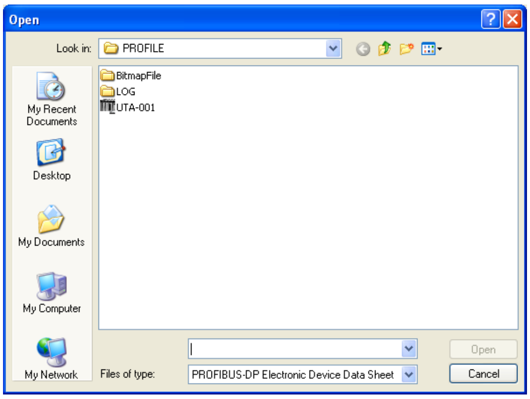
Connection Device Bitmap

UTA_SF.DIB	UTA_DE.DIB	UTA_DI.DIB
		

6.10.5 Comparing with File Data

Procedure

1. Click on [File] – [Compare File] in the menu to display the Select Compare Range window.
2. Select the comparison folder for which the icon () appears and click the [Open] button.

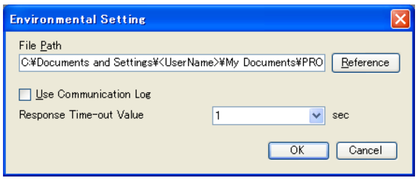


3. Execute the comparison. When parameter data matches/mismatch the file data, the message appears.

6.10.6 Making Environmental Settings

Procedure

1. Click on [File] – [Environmental Setting] in the menu to display the Environmental Setting window.



2. Set the path and click the [OK] button.

Description

- File Path
  Shows the predetermined Electronic Device Data Sheet storage location.

Note

For Windows Vista/Windows 7/Windows 8, do not set a path that includes the Program Files folder. Otherwise, the LL50A Parameter Setting Software will not run properly.

- Use Communication Log
  If this item is checked, communication logs are output to the specified location.
- Response time-out value
  Set the response time-out value longer if the response of main unit is late in each monitoring.
  The value can be set for 1 to 10 seconds.

The directories (default values) to which each file is stored are as shown below:

For Windows Vista/Windows 7/Windows 8

File Type	Storage Directory (Default)
Electronic Device Data Sheet (.gsd)	C:\Users\<UserName>\My Documents\PROFILE
Electronic Device Data Sheet (.eds)	
Electronic Device Data Sheet (.ccl)	
Communication log files (.log)	C:\Users\<UserName>\Documents\PROFILE\Log The directory cannot be changed.

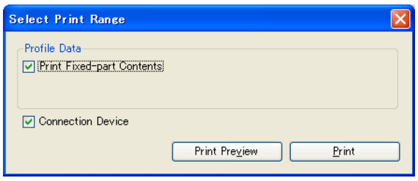
For Windows XP

File Type	Storage Directory (Default)
Electronic Device Data Sheet (.gsd)	C:\Documents and Settings\<UserName>\My Documents\PROFILE
Electronic Device Data Sheet (.eds)	
Electronic Device Data Sheet (.ccl)	
Communication log files (.log)	C:\Documents and Settings\<UserName>\My Documents\PROFILE\Log The directory cannot be changed.

6.11 Printing

Procedure

1. Click on [File] – [Print] in the menu or click on the toolbar to display the Select Print Range window.

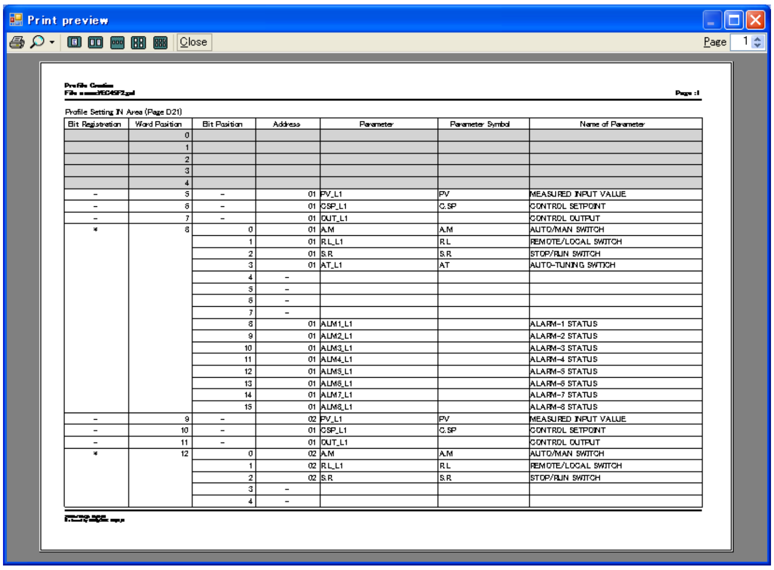


2. Select the data to be printed and click the [Print] button to display the Printing window.
Clicking [Print Preview] enables a printing image to be displayed as shown below.

3. After finishing printing, click .

Description

The following shows a printing image.

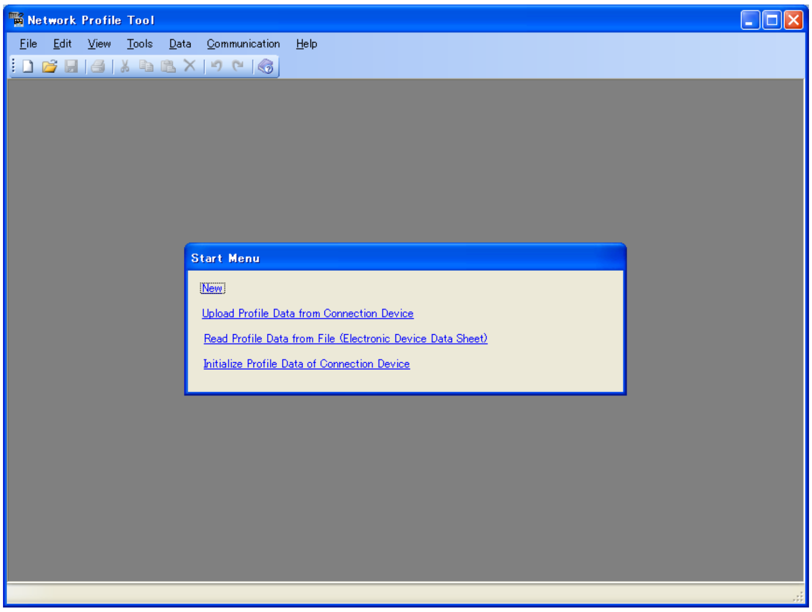


6.12 Initializing the Main Unit's Profile Data

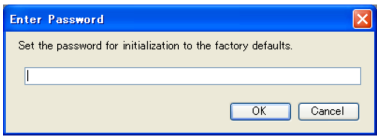
Procedure

1. Change to the status that enables communication with the main unit.

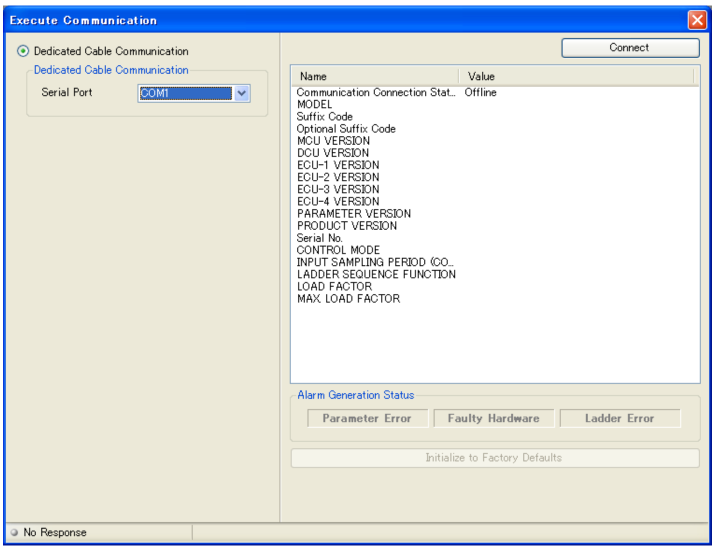
2. Click on [Initialize Profile Data of Connection Device] while the Start Menu window is displayed to display the confirmation message.



3. Enter the initialization password “**UTAdvanced_INIT**” and click the [OK] button. (Single-byte alphanumeric characters)



4. When the Execute Communication window appears, click on the [Initialize to Factory Defaults] button to start the initialization. Click on ☒ to stop the initialization. When the initialization is completed, a message appears.



Description

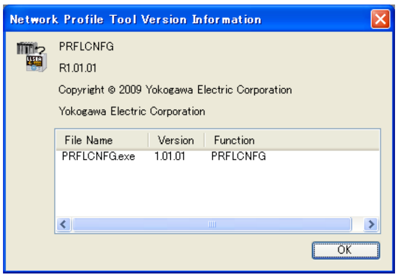
Executing the initialization initializes the profile data for the main unit. The initialized profile data is the default for the profile number 0 (in the parameter file).
Use this method if the profile is broken.
Be careful to make sure that the password described here is not used by unauthorized users.

► Initial value: UTAdvanced Series Communication Interface (Open Network) User's Manual

6.13 Checking Network Profile Tool Version

Procedure

1. Click on [Help] – [About...] in the menu to display the Network Profile Tool Version Information window.



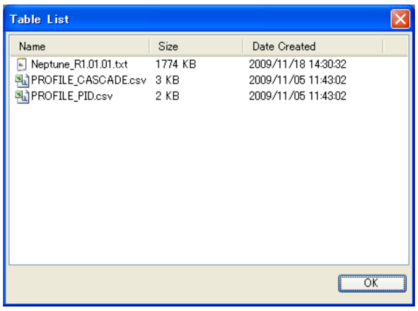
2. To close the window, click the [OK] button or ☒.

6.14 Viewing the List of Tables

The list of tables shows the names of .dll and .xml files contained in the Table folder of the LL50A Network Profile Tool.

Procedure

1. Click on [Help] – [Table List] in the menu to display the Table List window.



2. To close the window, click the [OK] button or ☒.

App.1 Worksheet

UTAdvanced WORKSHEET	☐ UT35A ☐ UP35A ☐ UT32A ☐ UP55A ☐ UT55A ☐ UM33A ☐ UT52A ☐ UT75A	Doc. No. / P. /
		Order No. / Sec. / Loop / Item
		Serial No.
Customer		Model and Suffix
Plant		Tag No.

					CUSTOMER		REP.		ENGINEER		
					DR.	CH.	DR.	CH.	DR.	CH.	
REV.	n	REMARKS	DATE	REV. BY							

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Addition of applicable model (UP55A/UP35A/UM33A) and CC-Link/DeviceNet communication.

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