

ES100

**ES/TOOLS Support
Software for Windows**

OPERATION MANUAL

OMRON

Introduction

Thank you for your purchase of the Windows support software ES/TOOLS for the ES100.

ES/TOOLS has been developed so that you easily operate and make full use of the extensive functions of the ES100.

Please read this Operation Manual thoroughly before using ES/TOOLS.

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Contents of the ES/TOOLS package

The ES/TOOLS package contains the following items. When unpacking, make sure that the ES/TOOLS package contains all of these items. If the ES/TOOLS package is insufficient or damaged, contact the store of purchase.


- ES/TOOLS master program CD----- 1
- ES/TOOLS (for Windows) ----- 1
 User's Manual (this manual)
- User Registration Card (Valid only in Japan) --- 1
- Special communication cable ----- 1

PRECAUTIONS ON SAFETY

- Marks for ensuring safe use and their meanings.


This manual uses the following marks to indicate precautions for ensuring that the ES/TOOLS is used safely.

The precautions indicated below describe important information regarding safety. Be sure to follow the instructions described in these precautions.

 CAUTION	Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.
--	--

*The "property damage" indicates extended damage to your family, property, and pets.

- Graphic symbol

	General caution This symbol indicates non-specific cautions, warnings, and danger.
--	--

 CAUTION	
Enclosed disk is a CD-ROM disk. Do not attempt to play it on an audio CD player. Excessively high volumes may damage your ears the speakers.	

How to Read this Manual

■ ES100 manuals

Four manuals are provided for the ES100 as follows:

- When using the general features of the ES100P:
 - ES100P Digital Controller
 - User's Manual (Cat.No.H069-E1-x)
- When using the general features of the ES100X:
 - ES100X Digital Controller
 - User's Manual (Cat.No.H070-E1-x)
- When using the communications features:
 - ES100 Digital Controller
 - User's Manual (Communications Guide) (Cat.No.H072-E1-x)
- When using the support software:
 - ES100 Support Software
 - ES/TOOLS Support Software (for Windows)
 - User's Manual (Cat.No.H115-E1-1)

■ The meaning of icons used in this manual

Icons used in this manual in addition to explanatory text. Icons are used in order to visually represent information and facilitate understanding as you read through this manual.

The following icons are used throughout this manual, and mean the following:



“Important” mark

This mark indicates that follows must be heeded at all times.



“Reference” mark

This mark indicates that supplementary and application information for operations, explanations, and settings.

■ How this Manual is Organized

Purpose	Title	Description
<ul style="list-style-type: none"> • Learning about the general features of ES/TOOLS 	Chapter 1 What is ES/TOOLS?	Chapter 1 describes the features and typical functions of ES/TOOLS.
<ul style="list-style-type: none"> • Setting up ES/TOOLS 	Chapter 2 Setting up ES/TOOLS	ES/TOOLS must be installed before it can be used. Chapter 2 describes mainly how to install ES/TOOLS.
<ul style="list-style-type: none"> • ES/TOOLS operation 	Chapter 3 Basic Operation	Chapter 3 describes basic methods for using ES/TOOLS as an application program.
<ul style="list-style-type: none"> • About ES100 settings 	Chapter 4 Menus Chapter 5 Basic Application Chapter 6 Advanced Application	Chapter 4 describes ES/TOOLS menus. Chapter 5 describes the major functions of ES/TOOLS. Chapter 6 describes advanced ways of applying these functions.
<ul style="list-style-type: none"> • Useful Setting Examples 	Chapter 7 Setting examples	Chapter 7 describes useful examples of how to apply ES/TOOLS to specific digital controller applications while actually referring to the ES/TOOLS menus.
<ul style="list-style-type: none"> • Troubleshooting 	Appendices Errors and Troubleshooting	This appendix describes errors that may occur during running of ES/TOOLS and how to judge the cause of the error from symptoms.

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CHAPTER 1

WHAT IS ES/TOOLS?

CHAPTER 1

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1.1 Features

■ *ES/TOOLS allows you to set ES100 parameters with ease.*

- You can easily find the target parameter by merely selecting menu items.
- The Help function helps you to verify the setting ranges and unit of parameters at a glance.
- A wide range of functions is provided so that you can quickly set up programs.

■ *ES/TOOLS allows you to verify settings by on-screen pattern images.*

- You can verify programs that you have set up as on-screen pattern images, which improves work efficiency.
- You can verify operation assignment setting in block diagrams. It is sometimes more convenient to verify settings by representing them as block diagrams on screen.
- When you view approximation characteristics as on-screen pattern images, you can easily ascertain the outputs designated for any input.

■ *ES/TOOLS allows you to check control and adjustment the ES100 with ease.*

- Trend graphs allow you to verify process values (PV) and manipulated variables (MV).
- Operations such as auto-tuning, fine tuning, and changing SP can be carried out by one-touch operation.

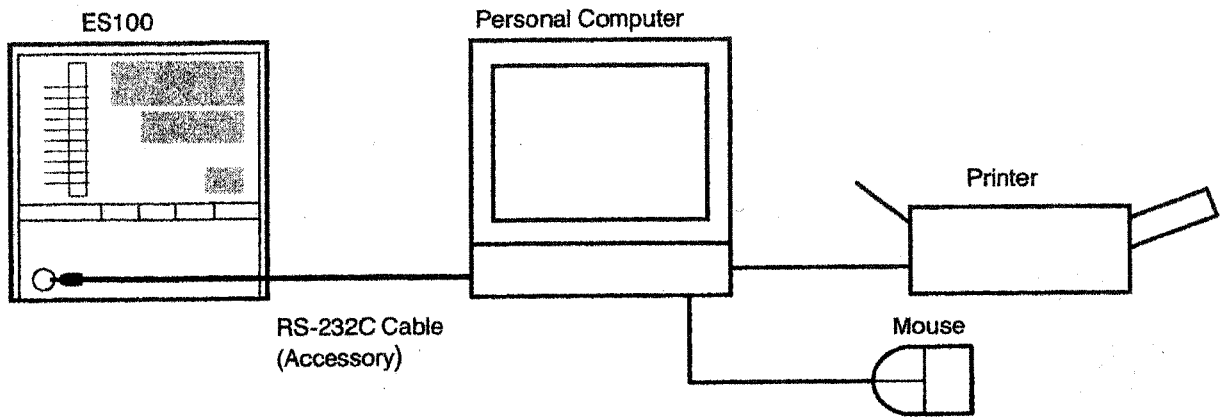
■ *ES/TOOLS facilitates maintenance on the ES100*

- Settings can be saved. This means that you can not only make backups but also use previously set data again when setting up similar applications.
- If necessary, you can also print out settings.

■ *Enhanced features tailored to Windows*

- You can edit parameters in multiple window environments.
- You can use exiting data without converting them.
- You can display trend graphs up to 5 types.
- You can output the results from trend graphs to a CSV file and use it as a dump list for analysis.
- You can conduct not only printing the setting data, but also outputting them to a CSV file.
Also, you can incorporate the setting data to other application software such as spreadsheets.

1.2 Operating Environment



CHAPTER 1

■ Hardware

- ES100 All models of ES100
- RS-232C cable Accessory cable (Model ES100-CT023-202)
- Personal computer

Unit:	Computer with at least a Pentium processor
Main Memory:	At least 16 MB for Windows 95 and Windows 98 At least 24MB for Windows NT and Windows 2000
Display:	At least 800×600 dots
- Printer Windows compatible printer

■ Software

- OS (basic software) Windows 95, Windows 98, Windows NT 4.0, or Windows 2000
- ES/TOOLS ES/TOOLS (for Windows)

1.3 Functions

ES/TOOLS supports the following three functions:

- Setting
- Checking Control
- Data transfer

Each of these functions can be used independently or in combination.

■ Setting



Setting
(Offline)



Setting
(Online)

ES/TOOLS is provided with two setting modes: offline and online

The Windows Start menu, **Setting (Offline)** is provided for the offline setting function.

When you set parameters in the offline mode, the ES100 need not be connected to ES/TOOLS. In the offline mode, setting can be made independently at the personal computer. So, this mode is suitable when you are setting ES100 initially.

Up to 32 of offline settings can be operated at the same time (without consideration of the memory capacity). So you can make the settings by referring to existing files.

The Windows Start menu, **Setting (Online)** is provided for the online setting function.

When you set parameters in the online mode, the ES100 is connected to ES/TOOLS. Settings made in ES/TOOLS are transferred to the ES100 for each parameter. So, this mode is suitable when you are adjusting the control.

Settings can be saved as setup file. These files are managed on the personal computer. Setup files can be used as backup data or basic data in other ES100 applications.

● Parameter categories

ES/TOOLS parameters are divided into the following categories:

- Controller type
Set the model of ES100 to be used in the control system. If ES/TOOLS is connected to the ES100, data can be directly loaded to the ES100. This omits the work of inputting setting directly on the ES100.
- Configuration parameters
Parameters that determine the basic operation of the ES100. These parameters are managed in independent blocks.
- Parameters
All parameters other than configuration parameters, program (bank) parameters, and operation assignment parameters
- Programs (bank)
Parameters related to program setup. When a programmable ES100 is used, menus become program menus. When a fixed type ES100 is used, menus become bank menus.
- Operations
Parameters relating to operation assignment

- **Print**

The print function allows you to print out parameters by the following two types.

You can select the print item block by block that are listed below.

- **By ES/TOOLS setup menus**
 - Controller type
 - Configuration parameters
 - Parameters
 - Program/Bank
 - Operation
- **By ES100 setting mode**
 - Program (bank) setting parameters
 - PID control parameters
 - Adjustment parameters
 - Setting level 1 technical parameters
 - Specification setting parameters
 - Event setting parameters
 - ON/OFF timer setting parameters
 - Digital operation setting parameters
 - Analog operation assignment setting parameters
 - Setting level 2 technical parameters

CHAPTER 1

Also, the following three items can be included in the printout.

- **Parameter type**
 - Select: Code settings are displayed, for example, for input type or function.
 - Number: Number settings are displayed, for example, for SP.
 - Time: Displays number settings, in particular, time unit settings.
- **Setting range**
- **Defaults**
(settings made before shipment of the ES100 from the factory)

Also, you can output the parameters as a file other than to a printer. These files will be in CSV format.

■ Checking control



Check control

● Trend graph

The **“Check control”** menu is provided for the check control function, and is provided with following functions:

- A monitor function utilizing a trend graph
- An abridged operation function that allows you to easily set parameters and some operating instructions.

These functions allows you to use the required control parameters or control operating instructions while checking control status on screen while the program (bank) is running.

Changes in the current process value (PV) and manipulated variable (MV) can be monitored on ES/TOOLS in graphs. These graphs are called “trend graphs.”

Five data items (e.g. PV, SP, and manipulated variable (MV)) can be displayed as monitor data, which are plotted against a time axis.

Trend graph functions as data scale, monitor data sampling interval (trend cycle) and display (draw mode) allow you to change the display range or display graphs containing a combination of trend waveforms. This allows you set up monitoring matched to your specific application requirements.

● Abridged operation

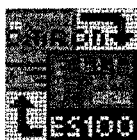
You can carry out the following operations directly in the **“Check control”** menu:

- Run/reset (stop)
- Manual operation
- Changing SP
- A.T. execution/cancel
- F.T. execution/undo
- Other control parameter operations

Some communication commands and control status checks can be executed merely by selecting menus.

You can monitor the status of digital I/O.

■ Transfer



Transfer
(PC to ES)



Transfer
(ES to PC)

The transfer function allows you to batch transfer all ES100 parameters between the controller and your PC. In ES/TOOLS, the data transfer direction is selected by the following menus:

- When transferring from your PC to the ES100:
The **Transfer(PC to ES)** menu is used.
- When transferring from the ES100 to your PC:
The **Transfer(ES to PC)** menu is used.

CHAPTER 2

SETTING UP ES/TOOLS

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2.1 Installation

■ Disk required

Prepare the following:
ES/TOOLS master program CD

■ Installation

At least 6MB is required in your hard disk to install the system.
Prepare the ES/TOOLS master program CD and conduct the following steps:

- (1) Close all application programs and insert the ES/TOOLS master program CD into the CD-ROM drive. The setup program starts automatically.

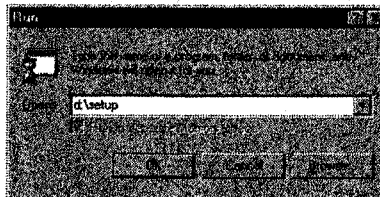
After this, proceed to step (5).

If the setup program does not start automatically, conduct the following step to start the program.


- (2) Click the Windows Start button and select "Run..."



- (3) Enter "d:\setup" in the field displayed in the window. Be sure to designate the drive in which the CD-ROM is inserted. For example, if you insert the CD-ROM in drive E, enter "e:\setup."



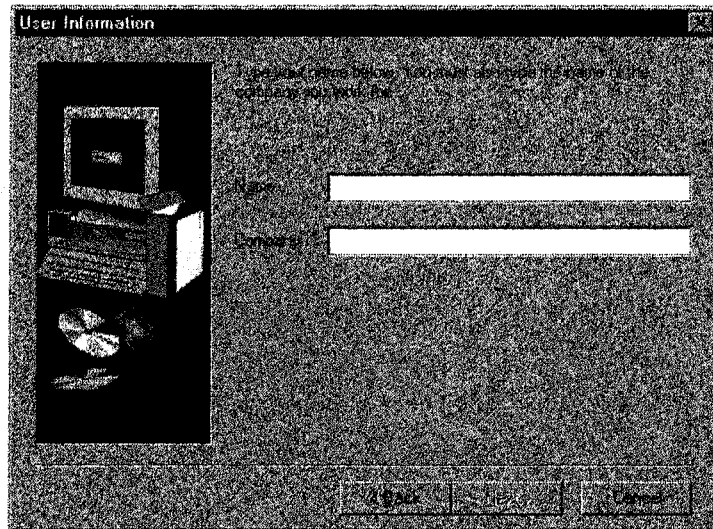
- (4) Click . The installation procedure of ES/TOOLS starts.

- (5) When the Setup screen ("Welcome screen") appears, click . The screen for inputting user information appears.



You can start the setup program by double-clicking "Setup.exe" in the system disk using Explorer. In this case you can skip steps from (2) to (4).

- (6) Enter your name and the name of your company.

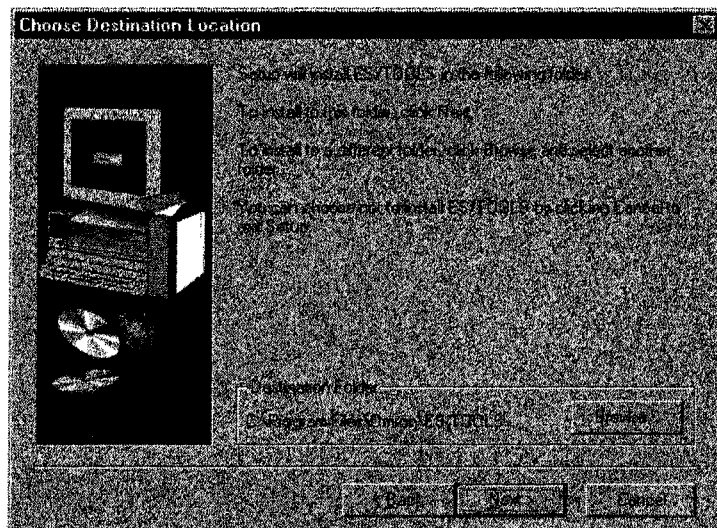


CHAPTER 2

After you input the information, click **Next >**.
The screen for designating the destination for installation appears.

- (7) Select the destination folder for installation.
By default rule, the following folder is designated for the destination:
C: \Program Files\Omron\ES TOOLS

Click **Browse...** to designate a different drive or folder.
If you designate a folder that does not exist, it will be created automatically.

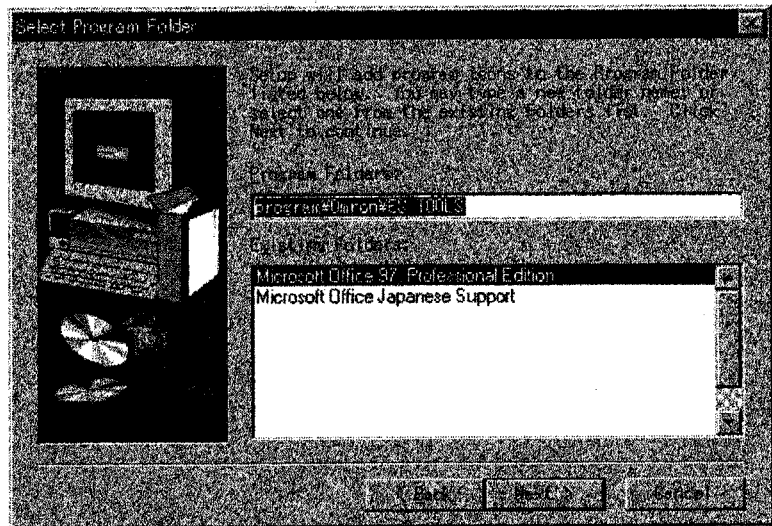



After you have selected a folder, click **Next >**.
The screen for designating a shortcut in the Start menu appears.


- (8) In the Windows Start menu, designate the folder in which to create a shortcut of the application. By default rule, the shortcut is created in the following folder:

Start\program\Omron\ES TOOLS

To designate a different folder, select one from "Existing Folders" or enter the name of a folder. If you designate a directory that does not exist, it will be created automatically. Be sure to use half size letter when you input the name of a folder.



After you designate the directory, click . The installation procedure will start and the files will be copied. A percentage graph will indicate the progress of the installation.

- (9) An End message will appear upon the completion of installation. Click  to finish the installation procedure.



About installation with floppy disks

If your PC only has an FD drive instead of a CD-ROM drive, copy all of the files in Disk1 to Disk4 of the ES/TOOLS master program CD to floppy disks with a personal computer that has both a CD-ROM and FD drive. After this, conduct "Setup.exe" in the Disk1.

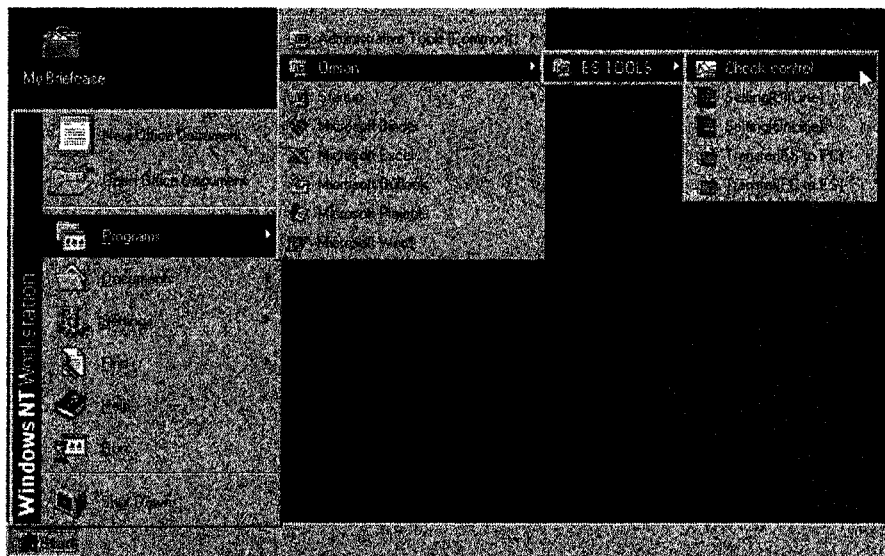
2.2 Starting and Exiting ES/TOOLS

■ Starting

From the Windows Start menu, select "Program" → "Omron" → "ES TOOLS".

Select the desired function from the menus that are displayed:


- Check control
- Setting (Offline)
- Setting (Online)
- Transfer (ES to PC)
- Transfer (PC to ES)



CHAPTER 2

■ Exiting

To exit from an ES/TOOLS program, conduct one of the following procedures.

- Select "File" → "Exit" from the menu.
- Click the button  in the upper right corner of the main window.
- Double-click the icon in the upper left corner of the main window.
- Click the icon in the upper left corner of the main window and select "Close" from the control menu.
- Press and hold the Alt and F4 keys.

When you select Setting (Offline), a message will be displayed if the data has not been saved.

CHAPTER 3

BASIC OPERATION

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3.1 Before Setting Up

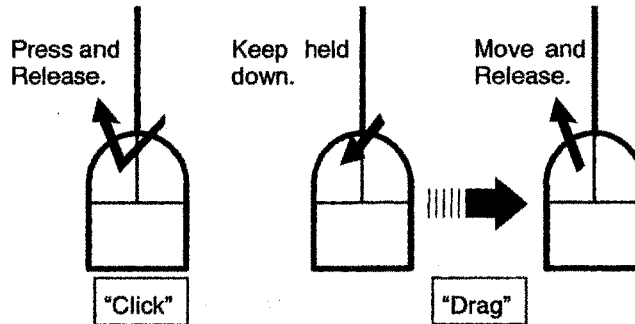
■ How to use the mouse

● Basic operation

For most operations, the left button on the mouse is used.

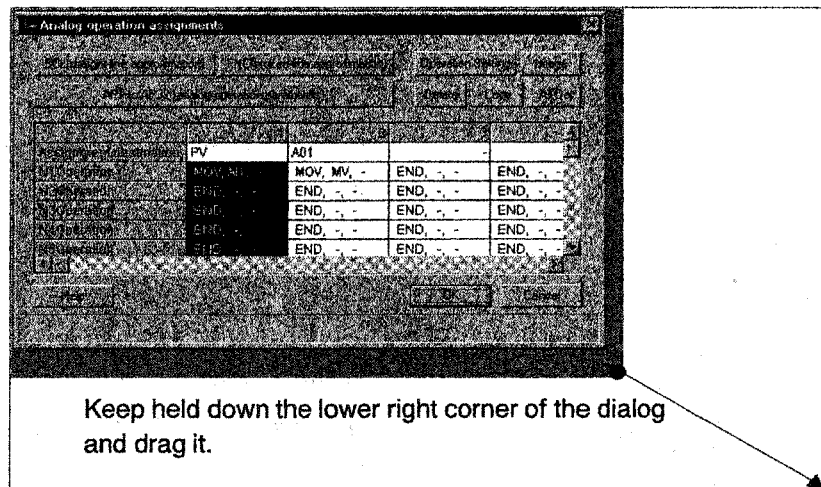
- "Click" refers to quickly pressing and releasing the mouse button.
- "Double-click" refers to two consecutive clicks.
- "Drag" refers to holding down the mouse button and moving the mouse, and then releasing the mouse button at the target.

The right button is used for displaying pull down menus for editing, such as "Cut" and "Copy."



● Scroll bar

In some operations, such as analog operation assignments, all setting items cannot fit inside the window. Scroll bars allows you move inside the whole window. Dialog boxes that use scroll bars can be enlarged to display more information of settings.

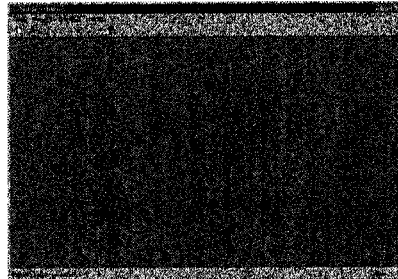


■ ES/TOOLS startup screen

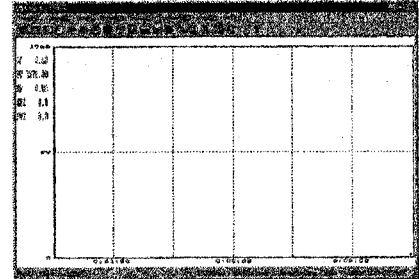
The following screens are displayed when you start "Setting (Offline)" and "Check control."

In the following sections, the operational contents of "Setting (Offline)", "Setting (Online)", "Check control" are explained from these startup screens.

"Setting (Offline)" startup screen



"Check control" startup screen



■ Setting options

You can select the following options for "Setting (Offline)", "Setting (Online)", and "Check control."



CHAPTER 3

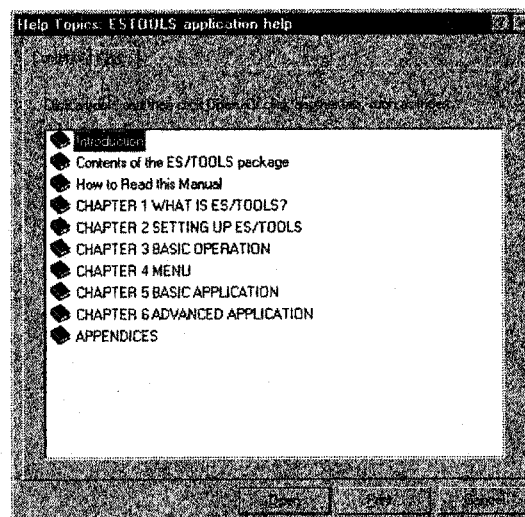
If you select "Display Technical parameters," the technical parameters are free for setting.

If you de-select "Optimizing Setting Items," the display of Optimizing Setting Items of each parameter will not be done.

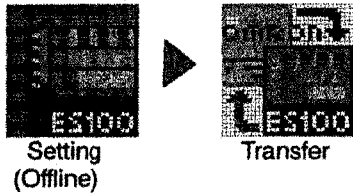
Optimizing Setting Items means that the system automatically judge items that require setting or not according to contents of models and configuration parameters. After that shades unnecessary items, so that they can not be set.

■ Help function

You can use the online help by selecting Help menus of "Setting (Offline)" and "Setting(Online)", the "Help" button for the setting dialog, and Help menu of "Check control."



3.2 ES100 Initial Setup



■ Preparing files

When initially setting up ES100 parameters, you must transfer the setup files prepared at the **Setting (Offline)** menu to the ES100 by the **Transfer (PC to ES)**

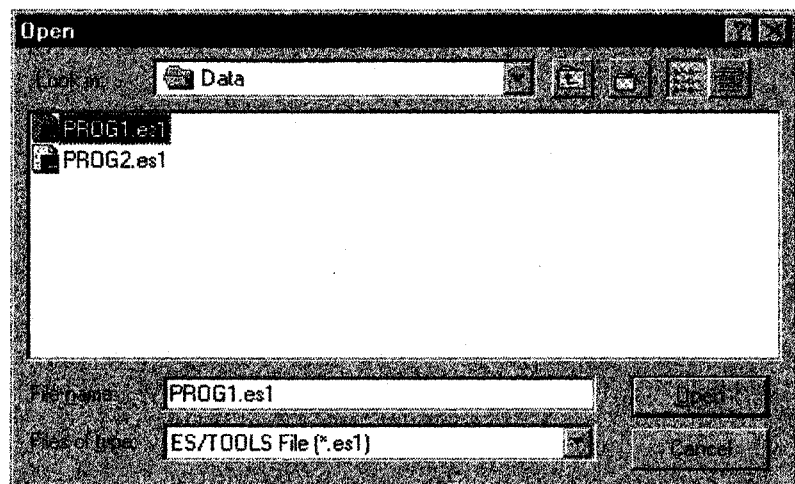
There are two ways of preparing setup files:

- By using (loading) files that have already been prepared ("File" → "Open")
- By preparing new files ("File" → "New")

Selection of how you are to prepare the file determines the process up to display of the "Setting(Offline)."

● Opening files

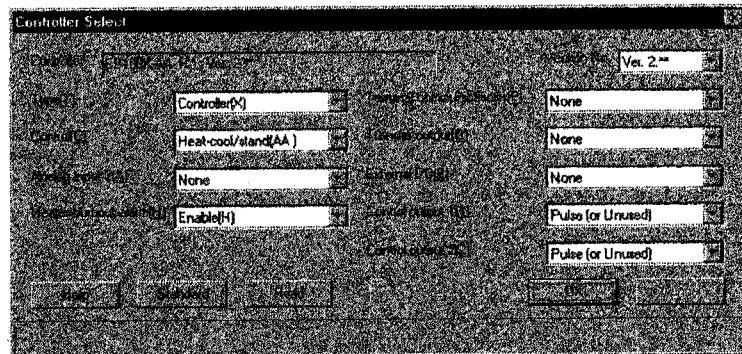
- (1) Select "File" → "Open."
- (2) Select the desired file.



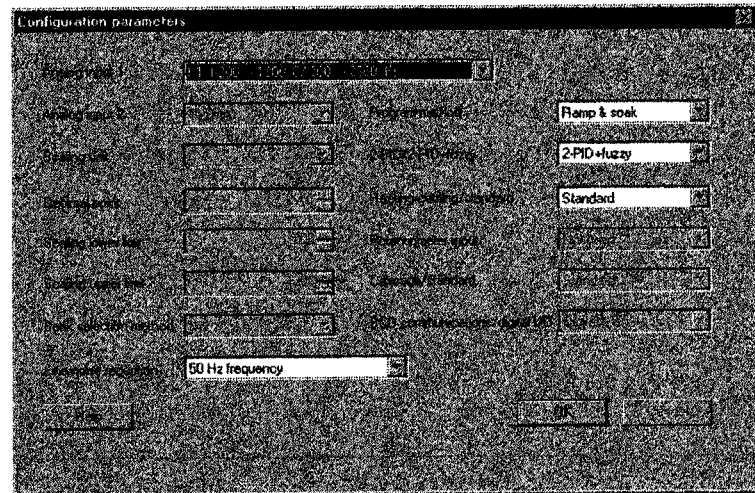
- (3) Press the "Open" button.
The selected file can be edited.

- Creating new files

- (1) Select "File" → "New."
- (2) The "Controller select" dialog appears.
Select a Controller type, and then press the "OK" button.



- (3) The "Configuration parameters" dialog appears.
Set the configuration parameters such as input type, then press the "OK" button.
After this, the file can be edited.

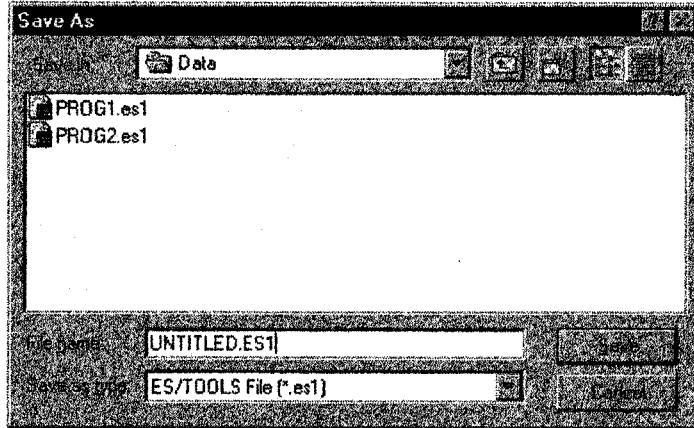


* For selecting the controller type, see 5.1 "Selecting the Model of ES100." (Page 5-2)

* For selecting configuration parameters, see 5.2 "Checking and Setting I/O Specifications." (Page 5-4)

- Saving files

- (1) Select "File" → "Save as" or "Save."
- (2) Select the location for file saving.
- (3) Input the file name, then press the "Save" button.
After you press the button, the file returns to the edit screen.

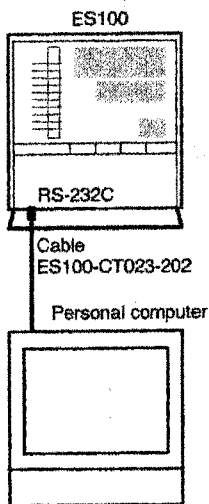


About file names

- For ES/TOOLS (MS-DOS version), file names are limited to eight alphanumeric characters (excluding an extension). For ES/TOOLS (Windows version), you can enter up to 256 characters; however, if you share the file with ES/TOOLS (MS-DOS version), you should limit the file name to eight alphanumeric characters.
- You need not to input the extension (".ES1" for ES/TOOLS).

■ Data transfer

● Preparations



Before transferring data, first connect the ES100 to your PC using the accessory cable (ES100-CT023-202). At the ES100, open the front panel cover. You will see a jack marked "RS-232C" at the bottom left. Insert the cable into this jack. At your PC, connect the other end of the cable to the RS-232C port after checking the connection in your PC's instruction manual.

Also, firmly fasten connectors that need to be snap-fastened or fastened by screw in place.

● Precautions during data transfer

● Precautions at the ES100

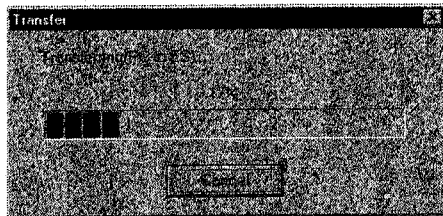
- Do not issue operating instructions by operating the panel keys, or by executing BCD communications or terminal communications. Also, do not change controller settings.
- Do not remove the cable during data transfer.

● Precautions when transferring from personal computer to the ES100

- Setup files prepared for different models of the ES100 cannot be transferred. Before transferring data, make sure that the ES100 at the transfer destination matches the controller type data in the setup file.
- If data transfer is due to a communication error, the ES100 has received only the parameters up to when data transfer was canceled. So, operation using these parameters cannot be assured. All of the parameters must be transferred again.

● How to cancel data transfer

To cancel the transfer, press the "Cancel" button.



About communication ports

- By default rule, ES/TOOLS uses COM1 on your computer. If COM1 is being used for another application, use COM2. In this case, at first, change the communication COM port to "COM2" by using "Online Option" in the "Online" → "Option" menu of Setting(Offline). Once you change the setting, the selected communication COM port is used for "Check control", "Setting (Online)", and "Transfer."

- Transfer (PC to ES)

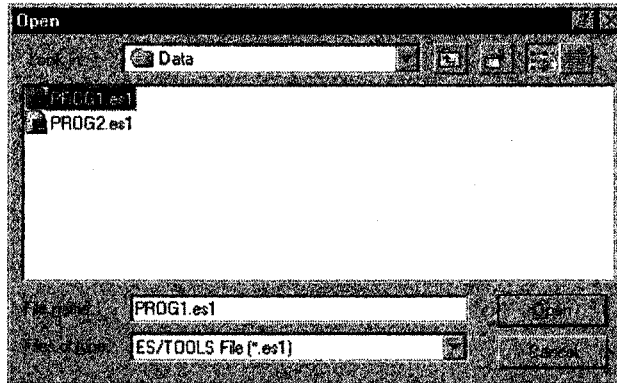
Data transfer can be conducted either from the Windows Start menu or "Setting(Offline)".

From the Start menu, select the file to transfer.

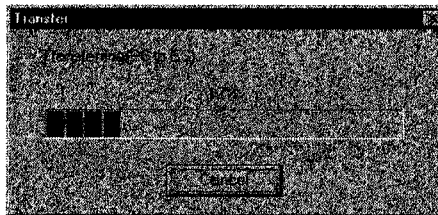
From "Setting (Offline)", transfer the data that you have been editing.

When you transfer from the Start menu, conduct the following steps:

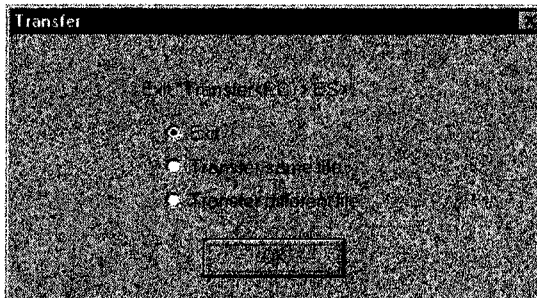
- (1) Select "Transfer (PC to ES)."
- (2) Select the desired file, and press "Open" button.



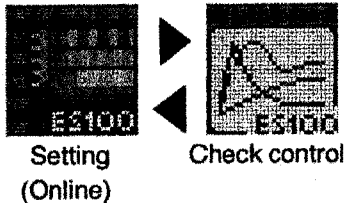
- (3) After confirming the message "Start Transfer", press the "OK" button. Then the transfer starts.



- (4) After confirming the message "Exit Transfer (PC to ES)", press the "OK" button. This completes the transfer. You can transfer the same file again, or select different files to transfer.



3.3 Adjusting the ES100

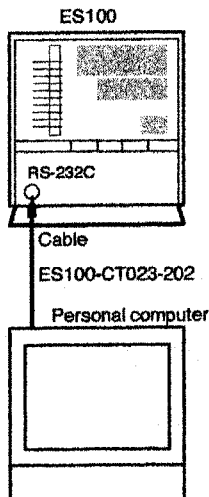


In ES/TOOLS, you adjust the ES100 parameters using the following two menus depending on what functions are to be adjusted:

“Setting (Online)” for adjusting parameters.

“Check control” for checking the control status using trend graphs.

■ Connecting the ES100



Before carrying out adjustments, first connect the ES100 to your PC using the accessory cable (ES100-CT023-202). At the ES100 series digital controller, open the front panel cover. You will see a jack marked “RS-232C” at the bottom left. Insert the cable into this jack. At your PC, connect the other end of the cable to the RS-232C port after checking the connection in your PC’s instruction manual.

Also, firmly fasten connectors that need to be snap-fastened or fastened by screw in place.

CHAPTER 3

■ Setting (Online)

Data is transferred from the ES100 in the setting dialog unit in **Setting (Online)** menu. (Also, the control status display changes during data transfer.)

Operations in the **Setting (Online)** menu are the same as those in the “**Setting (Offline)**”.

However, the controller select and configuration parameters, and other parameter cannot be changed. (These are only monitored.)

The control status of the ES100 is displayed at the bottom line on screen.

The following items are displayed:

Setting level, Setting mode, Run/reset (stop), A.T., Auto/Manual

For details, see Chapter 4 Menu.

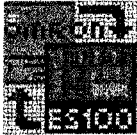
■ Check control

In “**Check control**”, you can verify the status of the ES100 connected to your PC. For details, see 5.7 Adjusting Operating Conditions.

3.4 Managing Setup Files

■ Saving ES100 files

● Transfer (ES to PC)



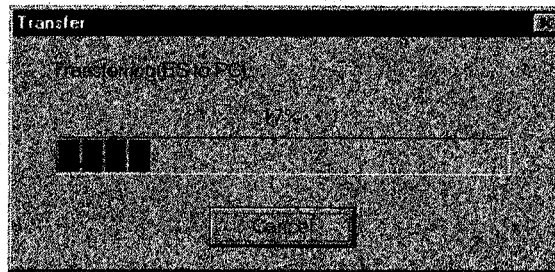
Data transfer can be conducted from either the "Transfer (ES to PC)" of Windows Start menu or "Setting (Offline)."

From the Start menu, only saving to files are executed.

From "Setting (Offline)", read data become editing condition.

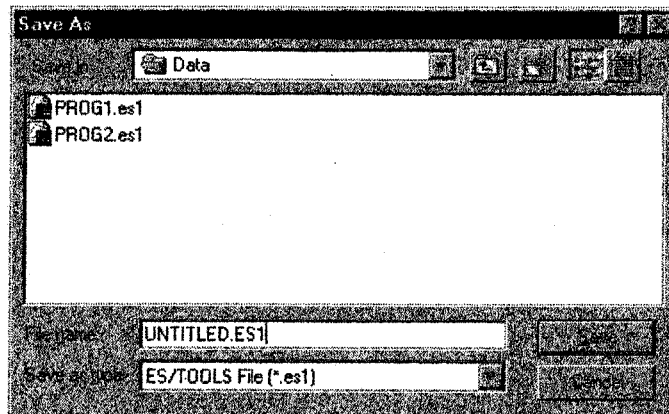
When you use the Start menu, conduct the following steps:

- (1) Select "Transfer (ES to PC)."
- (2) Start the transfer.



- (3) When the transfer completes, "Save as" dialog box will appear.

Select the location to save the file, enter the file name, and then press "Save" button.



- (4) Confirm the message "Exit Transfer (ES to PC)," and then press the "OK" button.



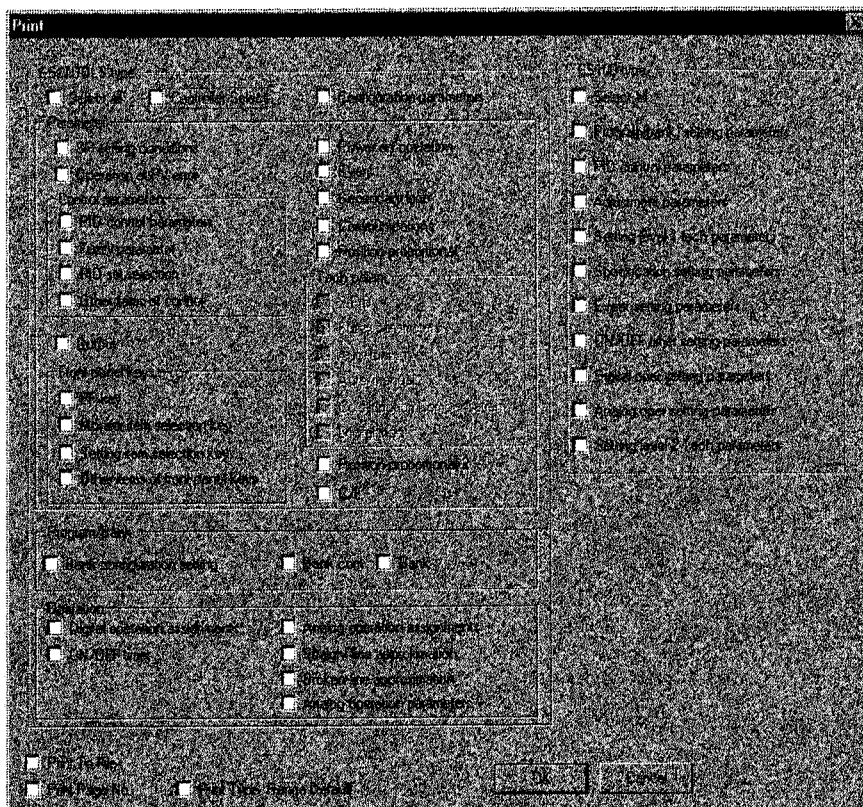
About file comments on forwarded data

- Conduct the transfer from "Setting(Offline)", and select "File" → "File Comment" and input a file comment.

■ **Printing setup files**

Select “Setting (Offline)” to print a configuration file.

- (1) Select “File” → “Print.”
- (2) Select the item you want to print.



(3) Press the “OK” button to start printing.

If you select “Print To File,” the data is output to a CSV file instead of to a printer.

CHAPTER 4

MENU

Conventions Used in This chapter	4-2
4.1 Setting Menus	4-3
■ Controller select	4-3
■ Configuration parameters	4-4
■ SP setting conditions	4-4
■ Operation at PV error	4-5
■ Control parameters	4-5
■ Output	4-6
■ Front panel keys	4-6
■ Power on operation	4-7
■ Event	4-7
■ Secondary loop	4-8
■ Communications	4-8
■ Position-proportional	4-9
■ Technical parameters	4-9
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■ Bank (SP setting)	4-10
■ Program	4-11
■ Digital operation assignments	4-12
■ Analog operation assignments	4-13
4.2 Check Control Menu	4-15
■ Trend	4-15
■ Tuning	4-15
■ Run	4-15
■ Parameter	4-16
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■ Command	4-17

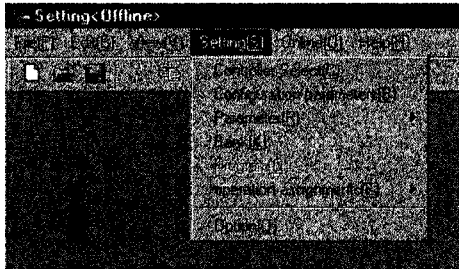
Conventions Used in This Chapter

- This chapter describes the menu for setting parameters, and checking and adjusting control of the ES100.
- For the WINDOWS Start menu, see Chapter 2. For the setting menus' "Setting option," "Online", "Help", "File", "Transfer", and "Print" see Chapter 3.
- The configurations of setting menus for "Setting(Offline)" and "Setting(Online)" are all same. However, "Setting(Online)" has the following different features because it needs the connection with ES100 for setting procedure. Other than the following features, no different feature is found. Consequently, operating instructions are described without making any distinction between "Offline" and "Online".

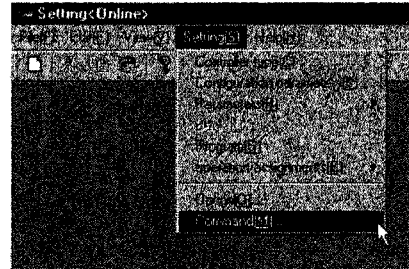
- The main status of the ES100 are displayed at the status bar of the Windows



- Some of the basic information, including "Controller Select" and "Configuration parameters", are not required to be changed or cannot be changed. These items are displayed as disabled for inputting.
- Some of the operation commands to be sent to the ES100 such as changes in the control mode can be used.
- The "Online" menu for starting "Setting (Online)" and other functions does not exist.

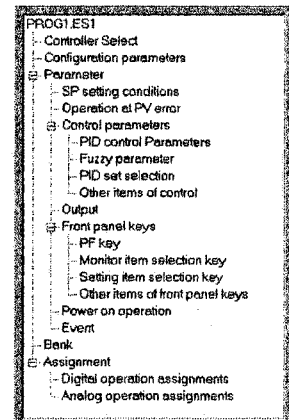


"Setting <Offline>" menu



"Setting <Online>" menu

- You can view items such as parameter in "Setting" as a hierarchical tree view. You can display the setting dialog by double-clicking of each item.

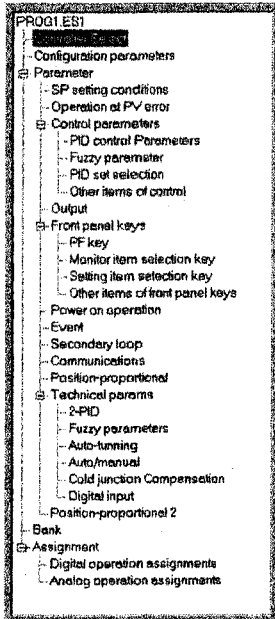


- The "optimizing" mode automatically judges which parameters need to be set depending on the model of ES100 you are using. This explanation is omitted in this chapter.

- Explanations for each parameter are not provided. For details, see the OMRON ES100 User's Manual.

4.1 Setting Menus

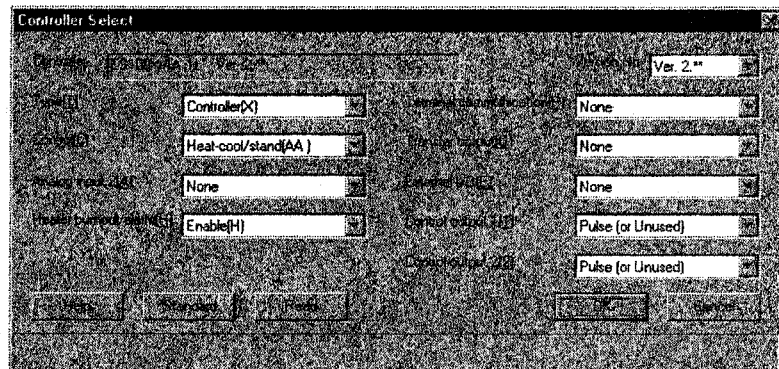
■ Controller Select



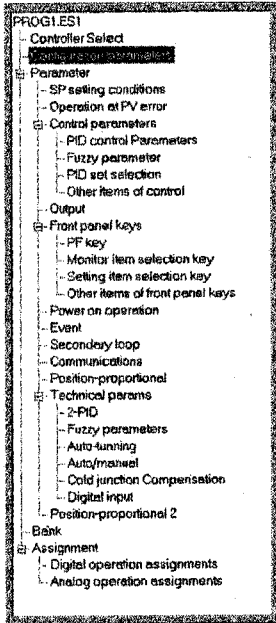
Set the following items in the order to designate the controller type.

- **Type**
Designate the controller type, controller or programmable type.
- **Control**
Designate the control method, heat-cooling/standard or position-proportional.
- **Analog input 2**
Set to "ON" when a 2-input controller is used.
- **Heater burnout alarm**
Set to "ON" when the controller supports the heater burnout alarm function.
- **Terminal communications**
Designate either of RS-232C or RS-422/485 when the controller supports the terminal communications (serial communication) function.
- **Transfer output**
Set to "ON" when the controller supports transfer output (analog output 3).
- **External I/O**
Designate one of the following when the controller supports the digital I/O function.
Digital input only "Digital I (B)"
Digital I/O (terminal) "Digital I/O (D)"
Digital I/O (connector) "Expanded I/O (E)"
- **Control output 1**
Designate as "Current" when control output 1 is current output. Otherwise, designate as "Pulse (or Unused)".
- **Control output 2**
Designate as "Current" when control output 2 is current output. Otherwise, designate as "Pulse (or Unused)".

If you select the controller by type, press the "Standard" button. If you load the controller type from the ES100, press the "Read" button.



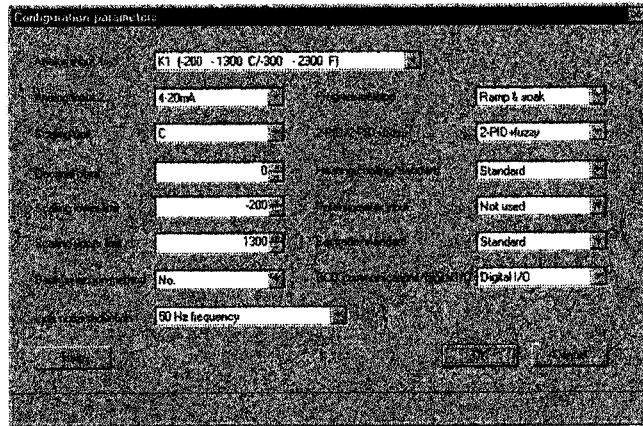
■ Configuration parameters



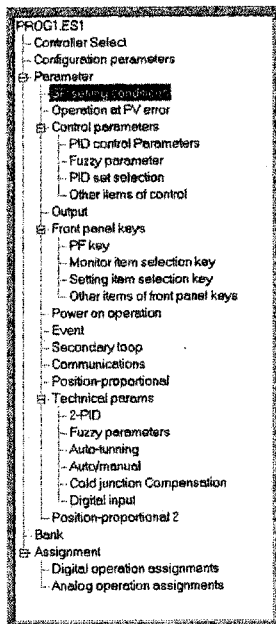
Set the main specification parameters.

Parameters are as follows:

- Analog input 1 type
- Analog input 2 type
- Scaling unit
- Decimal point
- Scaling lower limit
- Scaling upper limit
- Bank selection method
- Line noise reduction
- Program method
- 2-PID/2-PID+fuzzy
- Heating-cooling/standard
- Potentiometer input
- Cascade/standard
- BCD communications/digital I/O

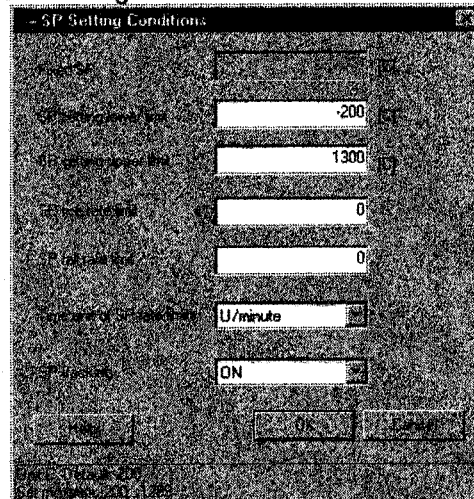


■ SP setting conditions

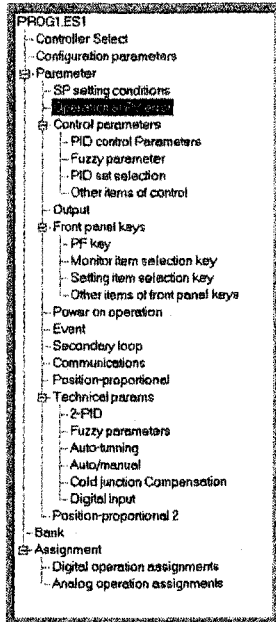


Set the SP operation setting conditions. Parameters are as follows:

- Fixed SP
- SP setting lower limit
- SP setting upper limit
- SP rise rate limit
- SP fall rate limit
- Time unit of SP rate limits
- SP tracking

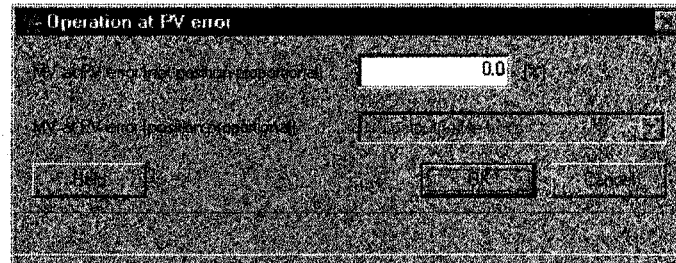


■ Operation at PV error

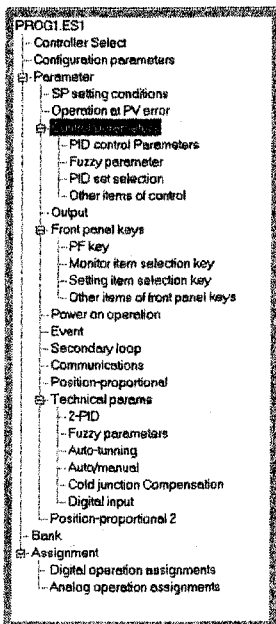


Set the manipulated variable at PV error. Parameters are as follows:

- MV at PV error (not position-proportional)
- MV at PV error (position-proportional)



■ Control parameters



Set control parameters including PID set control parameters.

Parameters are as follows:

PID control parameters

- P, I, D
- MV lower limit
- MV upper limit
- PV bias value
- Automatic selection range upper limit

1	10.0	240	40	0.0	100.0
2	10.0	240	40	0.0	100.0
3	10.0	240	40	0.0	100.0
4	10.0	240	40	0.0	100.0
5	10.0	240	40	0.0	100.0
6	10.0	240	40	0.0	100.0
7	10.0	240	40	0.0	100.0
8	10.0	240	40	0.0	100.0

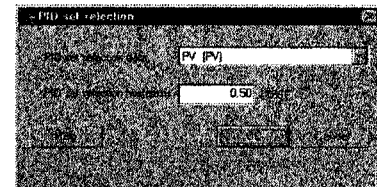
Fuzzy parameter

- Fuzzy strength



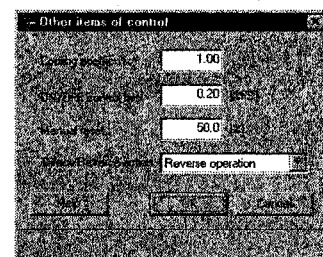
PID set selection

- PID set selection data
- PID set selection hysteresis

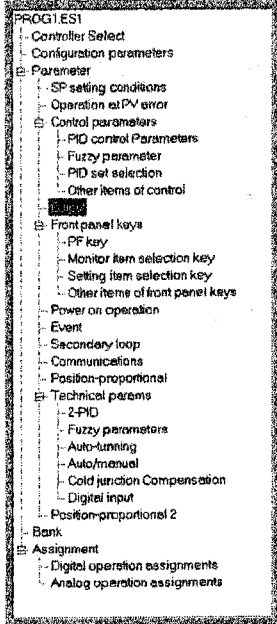


Other items of control

- Cooling coefficient
- ON/OFF control hysteresis
- Manual reset
- Direct/Reverse action

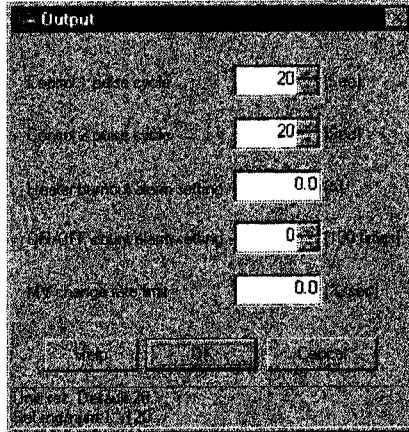


■ Output

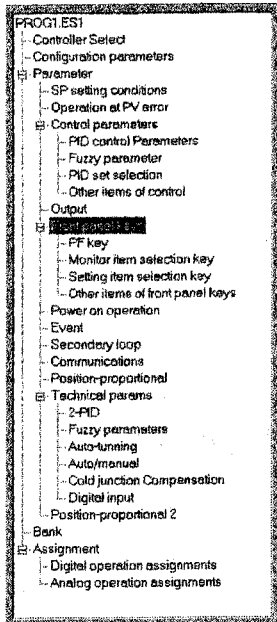


Set the conditions relating to control output. Parameters are as follows:

- Control 1 pulse cycle
- Control 2 pulse cycle
- Heater burnout alarm setting
- ON/OFF count alarm setting
- MV change rate limit



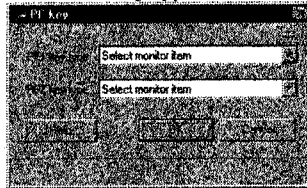
■ Front panel keys



Set the keys and bar graphs specifications. Parameters are as follows.

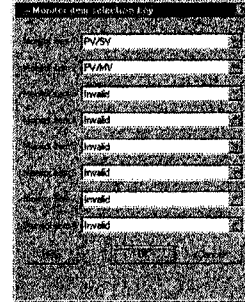
PF key

- PF1 key type
- PF2 key type



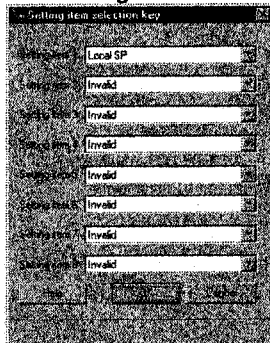
Monitor item selection key

- Monitor items 1 to 8



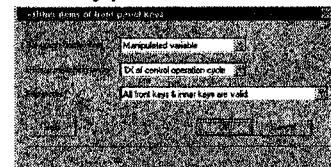
Setting item selection key

- Setting items 1 to 8



Other items of front panel keys

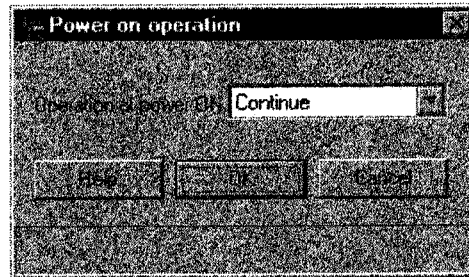
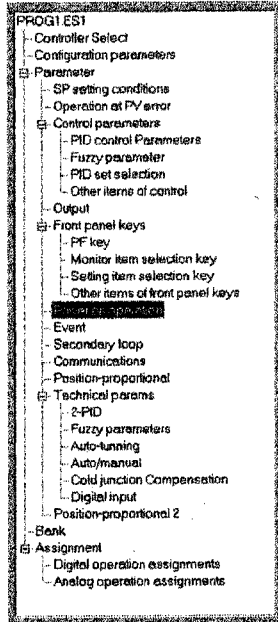
- Bar graph display item
- Display refreshing cycle
- Key protect



Power on operation

Set the operation specifications after the power is turned ON. Parameter is as follow:

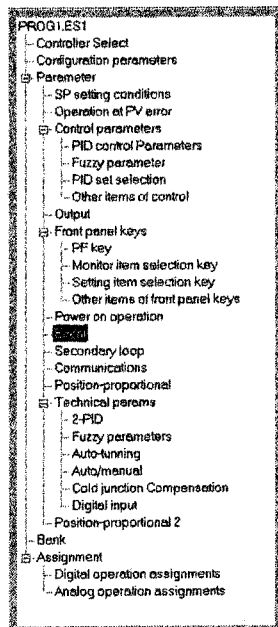
- Operation at power ON



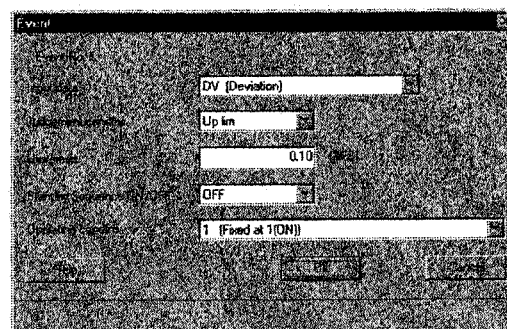
Event

Set the event specifications. Parameters are as follows:

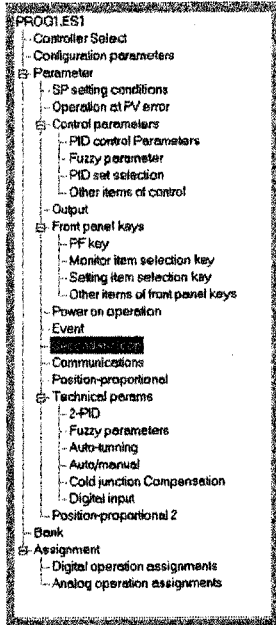
- Input data
- Judgement conditions
- Hysteresis
- Standby sequence ON/OFF
- Operating conditions



Event No.	Input	Condition	Up lim	Down lim	Standby	Operating
1	DV	Up lim	0.10	OFF	1	
2	DV	Up lim	0.10	OFF	1	
3	-	Up lim	0.10	OFF	1	
4	-	Up lim	0.10	OFF	1	
5	-	Up lim	0.10	OFF	1	
6	-	Up lim	0.10	OFF	1	
7	-	Up lim	0.10	OFF	1	
8	-	Up lim	0.10	OFF	1	
9	-	Up lim	0.10	OFF	1	



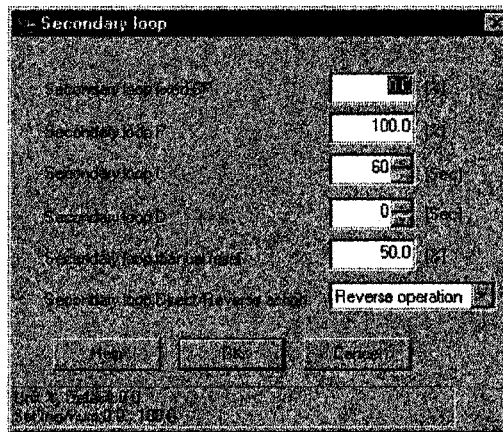
■ Secondary loop



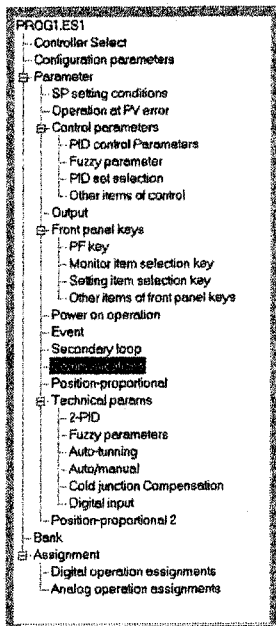
Set the secondary loop parameters for controlling for cascade control.

Parameters are as follows:

- Secondary loop fixed SP
- Secondary loop P
- Secondary loop I
- Secondary loop D
- Secondary loop manual reset
- Secondary loop Direct/Reverse action



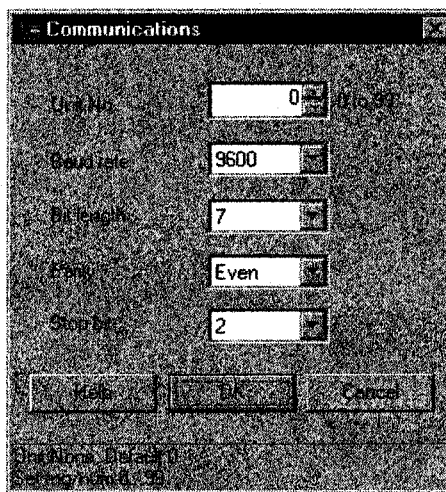
■ Communications



Set communications protocol for terminal communications.

Parameters are as follows:

- Unit No.
- Baud rate
- Bit length
- Parity
- Stop bit

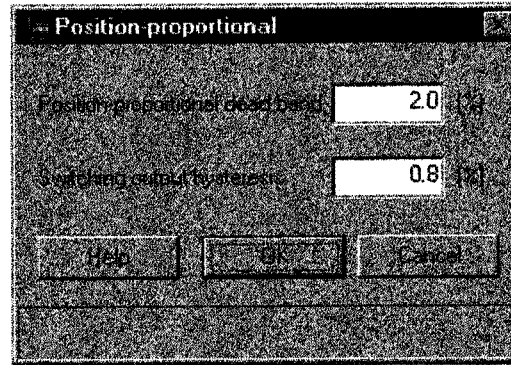
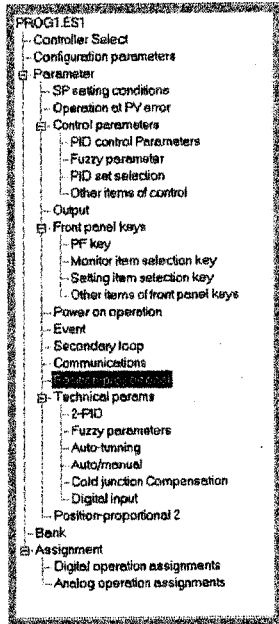


■ Position-proportional

Set the control output specifications for position-proportional controllers.

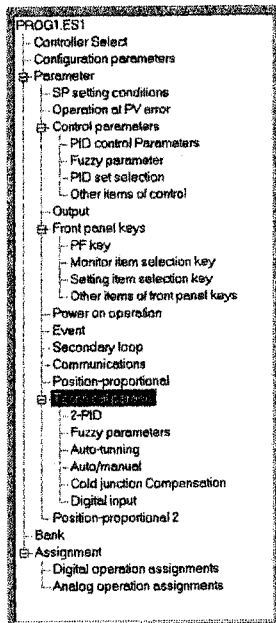
Parameters are as follows:

- Position-proportional dead band
- Switching output hysteresis



■ Technical parameters

Technical parameters of setting level 2 of the ES100. This menu can be set when "Display technical parameters" have been enabled by selecting "Setting" → "Option". Parameters are as follows:



2-PID

- 2-PID control parameters α , β

Cold junction compensation

- Cold junction compensating method

Fuzzy parameters

- Fuzzy scale 1 adjustment
- Fuzzy scale 2 adjustment
- Fuzzy I coefficient adjustment
- Fuzzy adjustment bandwidth
- Fuzzy SP change judgement value

Digital input

- Digital input response time
- External No. selection setting time

Auto-tuning

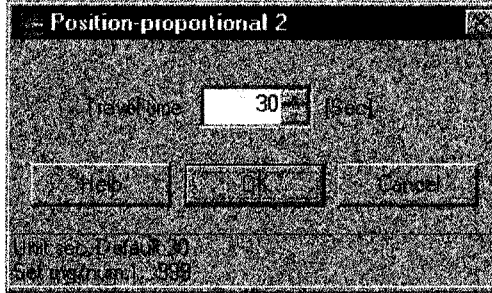
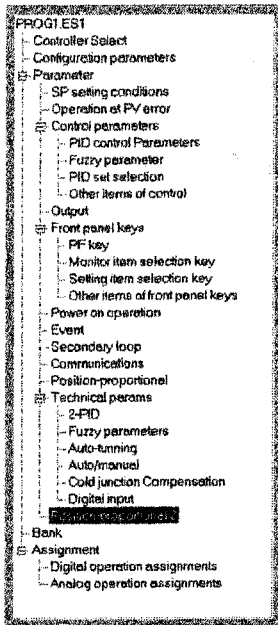
- A.T. calculated gain
- Limit cycle MV range
- Temporary A.T. execution judgement deviation
- Number of limit cycles

Auto/manual

- PV tracking
- Manual output mode
- Manual MV preset value
- Balance rate at PD operation

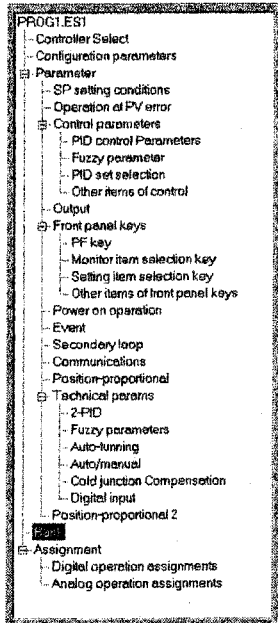
■ Position-proportional 2

Set the valve travel time. Parameter is as follow:
 • Travel time



■ Bank (SP setting)

Set the bank parameters of a fixed value type controller.
 Parameters are as follows. Sets these parameters for each table (bank).

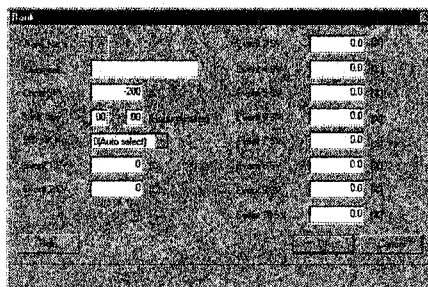
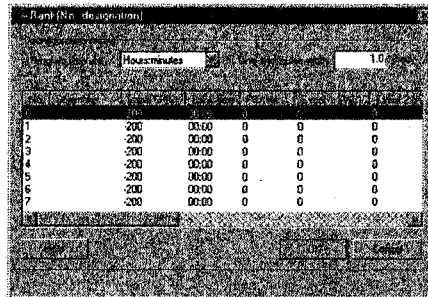


Configuration setting

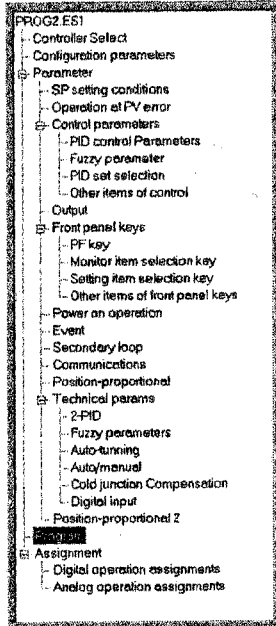
- Program time unit
- One-shot pulse width

Configuration of bank 0 to 7

- Comment
- Local SP
- Bank time
- PID set No.
- Event 1 to 10 setting(Event 1 to 10 SV)



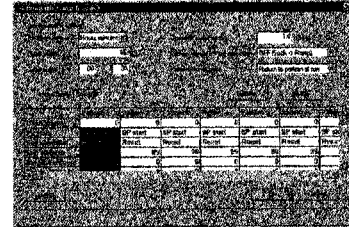
■ Program



Set the pattern parameters and step parameters on programmable controllers.

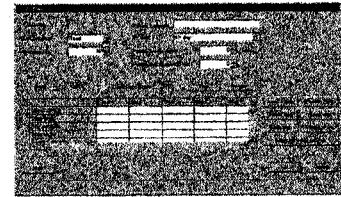
Configuration setting

- Program time unit
- Wait width
- Wait time
- One-shot pulse width
- Pattern vs. PV lag reduction
- Pattern No. at reset



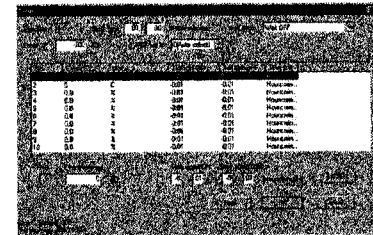
Pattern parameters (Patterns 1 to 99)

- Pattern comment
- End condition
- End step No.
- PV start
- Pattern repeat count
- Pattern link destination No.



Step parameters for each patterns (Steps 0 to 99)

- Step time
- Wait code
- Local SP
- PID set No.
- Event 1 to 10 settings

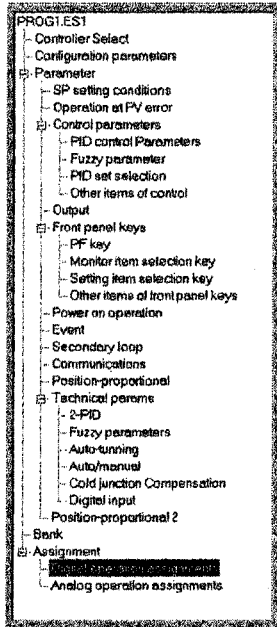


- Time signals 1 to 10 ON time
- Time signals 1 to 10 OFF time

In addition, you can use the following buttons for editing:

- Program <Ramp & soak> or <Soak step> diagram
 - Image
- Pattern configuration diagram
 - Insert 1 step, Delete 1 step, Delete step, Copy step, Paste step, Delete all step, Batch set event settings, Image

■ Digital operation assignments



Execute digital operation assignments. Parameters are as follows. Settings are carried out for each table.

Assignment	END	END	END	EN
...
...
...
...

Operation setting (Tables 1 to 30)

- Assignment destination
- Operations of N1 to N4
- Argument 1 of N1 to N4
- Argument 2 of N1 to N4

Operation	Argument 1	Argument 2
...
...
...
...

ON/OFF timer setting

- Timing run/reset input
- Timing run/hold input
- Time unit
- ON time
- OFF time

Timing run/reset input	Timing run/hold input	Time unit	ON time	OFF time
...
...
...
...

In addition, you can use the following buttons for editing:
 Image, Copy, Delete, All Delete

■ Analog operation assignments

PROG1ES1

- Controller Select
- Configuration parameters
- Parameter
 - SP setting conditions
 - Operation at PV error
 - Control parameters
 - PID control Parameters
 - Fuzzy parameter
 - PID set selection
 - Other items of control
 - Output
 - Front panel keys
 - PF key
 - Monitor item selection key
 - Setting item selection key
 - Other items of front panel keys
 - Power on operation
 - Event
 - Secondary loop
 - Communications
 - Position-proportional
 - Technical paramns
 - 2-PID
 - Fuzzy parameters
 - Auto-tuning
 - Auto/manual
 - Cold junction Compensation
 - Digital input
 - Position-proportional 2
 - Bank
 - Assignment
 - Digital operation assignments
 - Analog operation assignments

Execute analog operation assignments. Parameters are as follows. Settings are carried out for each table.

PV	ADT	END	END
MOV MV		END	END
END	END	END	END
END	END	END	END
END	END	END	END
END	END	END	END
END	END	END	END

Operation setting (Tables 1 to 15)

- Assignment destination
- Operations of N1 to N15
- Argument 1 of N1 to N15
- Argument 2 of N1 to N15

MV	ADT	END	END
MOV (Move)	ADT (Analog input)	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END
END (Operation end)	END	END	END

SCL(straight-line approximation) (Tables 1 to 4)

- Input 1, 2
- Output 1, 2

0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000

FNC(broken-line approximation) (Tables 1 to 2)

- Input 1 to 10
- Output 1 to 10

0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

AP1 to 32(analog operation parameters) (Parameters 1 to 32)

- Analog operation parameters 1 to 32

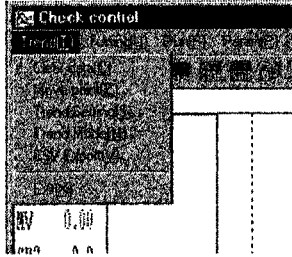
The image shows a digital display with a table of 32 rows. Each row contains a parameter number (1 to 32) and a value of 0.000. The display has a dark background with light-colored text. The title at the top of the display reads 'AP1 to 32(analog operation parameters)'. Below the table, there are several buttons for editing the parameters.

Parameter No.	Value
1	0.000
2	0.000
3	0.000
4	0.000
5	0.000
6	0.000
7	0.000
8	0.000
9	0.000
10	0.000
11	0.000
12	0.000
13	0.000
14	0.000
15	0.000
16	0.000
17	0.000
18	0.000
19	0.000
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000

In addition, you can use the following buttons for editing:
Image, Copy, Delete, All Delete

4.2 Check Control Menu

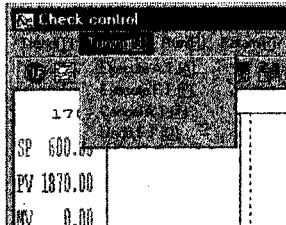
■ Trend



The menu types and functions are as follows:

- Clear data
Clears display of the trend graph.
- Move point
Moves drawing point to the left side of the screen. This function is useful when you check multiple graphs by overlapping them.
- Trend setting
Data scale: Designates the scale of the trend data.
Trend item: Assigns display items to trends 1 to 5.
- Trend mode
Trend interval : Designates sampling interval of the trend data.
Draw mode : Designates the operation when the trend graphs reaches the right side of the screen.
- CSV export
Saves the trend data as a CSV file.

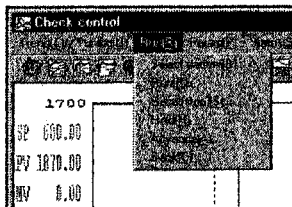
■ Tuning



- Execute A.T.
Starts execution of auto-tuning.
- Execute F.T.
Starts execution of fine-tuning.
- Cancel A.T.
Cancels auto-tuning currently in execution.
- Undo F.T.
Undoes the immediately preceding fine-tuning operation.

CHAPTER 4

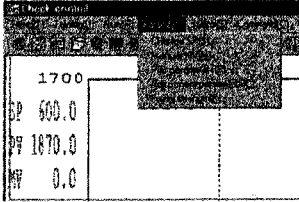
■ Run



The menu types and functions are as follows:

- Select pattern/Select bank
Designates the pattern No. on programmable controllers and the bank No. on fixed value type controllers.
- Run
Starts operation of the ES100 connected to your PC.
- Reset (stop)
Stops operation of the ES100 connected to your PC.
- Hold, Advance, Back
Used for executing step operation on programmable controllers.

■ Parameter(Param)



Set the parameters required for adjusting and checking control.

Parameters are as follows:

Change SP

You can change fixed SP mode for the programmable type, and SP in local SP mode for the fixed value type.

Manual MV

You can change manipulated variables in manual mode.

PID parameter

- P, I, D
- MV lower limit
- MV upper limit
- PV bias value
- Automatic selection range upper limit(Auto select upper)

Adjustment parameter

- Fixed SP
- Control output 1 pulse cycle
- Control output 2 pulse cycle
- Cooling coefficient
- Heater burnout alarm setting
- Position-proportional dead band
- Switching output hysteresis
- ON/OFF count alarm setting
- ON/OFF control hysteresis
- Manual reset
- SP setting lower limit
- SP setting upper limit
- SP rise rate limit
- SP fall rate limit
- MV change rate limit
- Secondary loop fixed SP
- P (secondary loop)
- I(secondary loop)
- D(secondary loop)
- Manual reset(secondary loop)

Fuzzy strength

- Fuzzy strength

■ Status



Check the status of the ES100 currently connected to your PC.
Parameters are as follows:

Status

- Setting level
- Setting mode
- SP mode
- Run
- A.T.
- Auto/manual
- Wait
- Hold

Digital I/O monitor

- Input 1 to 8
- Output 1 to 10

■ Command



Issue the commands as operation instructions to the ES100 currently connected to your PC. Commands are as follows:

- Reset software(reset setting level)
- Change setting mode
- Change SP mode
- Change auto/manual
- Change key protect
- Reset event standby sequence
- Change direct/reverse action inversion
- Change integral reset
- Change MV (output) tracking ON/OFF
- Change feed-forward ON/OFF
- Change cascade ON/OFF
- Change cascade open/closed
- Pattern advance
- Pattern restart
- ON/OFF timer reset 1 to 4
- ON/OFF counter reset 1 to 12

CHAPTER 5

BASIC APPLICATION

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5.1 Selecting the Model of ES100

ES/TOOLS supports all models of the ES100. When using ES/TOOLS, you must designate the controller type. When designating the controller type, obtain the following information by one of following methods in order to determine which ES100 is to be used.

- Designate the controller at the menu.
- Upload the controller type information directly from the ES100.
- Set each items required for selecting the controller type.

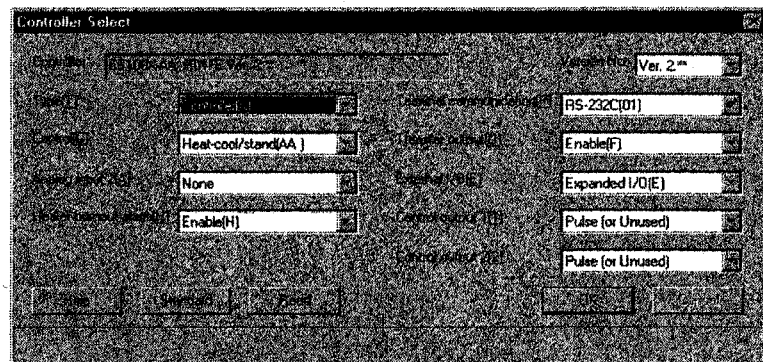
In most cases, the controller type is selected when creating a new setup files. The controller information, however, need not be set when automatically reading the controller type from the ES100 connected to your PC in the **Setting (Online)**. The following describes how to select the controller type when creating a new setup file in the **Setting (Offline)**.

● Controller Type menu

Select "New" from the "File" drop-down menu.

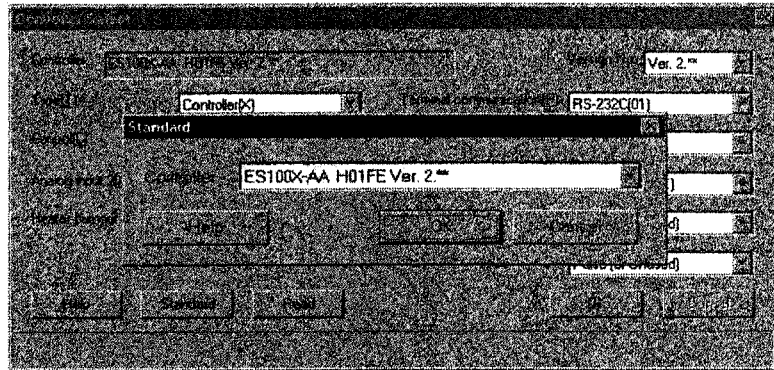
- When designating the controller type at the menu, press the "Standard" button.
- When loading the controller type information from the ES100, press the "Read" button. Before carrying this operation, make sure that your PC is connected to the ES100.
- Set the each items required for selecting the controller type.

Use this selection method when selecting the controller type that has not been registered to ES/TOOLS as a standard model. Reset the controller type when the following message appears:
"Selected type is not provided as OMRON standard. Are you sure?"



- Selecting controller by standard model

- (1) Press "Standard" from "Controller select" menu.
- (2) Select a controller from the list.



- Reading from the ES100

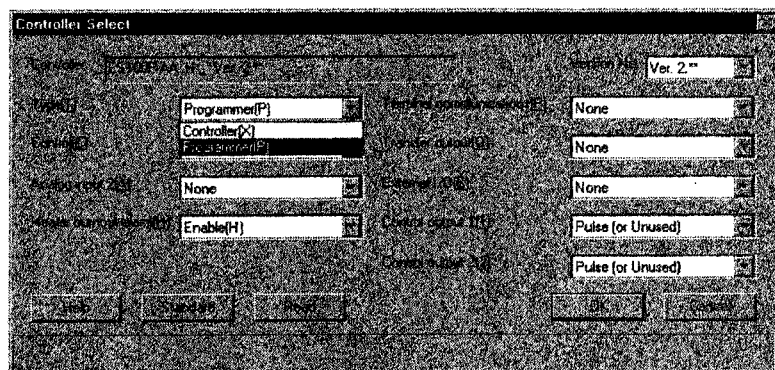
- (1) Press "Read" from "Controller select" menu.
- (2) When the following message appears, make sure that your PC is connected to the ES100 series digital controller, and press "OK" button.
"Read controller type from ES100. Connect PC to ES100 via RS-232C Cable."
- (3) The details of the displayed controller type will be changed.

- Settings items

- (1) Select the items to be changed.
- (2) If the selected items are the selectable one, choose it from the drop-down list. If the selected items are not the selectable one, the setting range will be displayed at the bottom of setting dialog box.
- (3) Either select from the drop-down list or enter the details according to the setting range.

- Exiting the Controller Type menu

When you have finished selecting the controller type, press "OK" bottom.



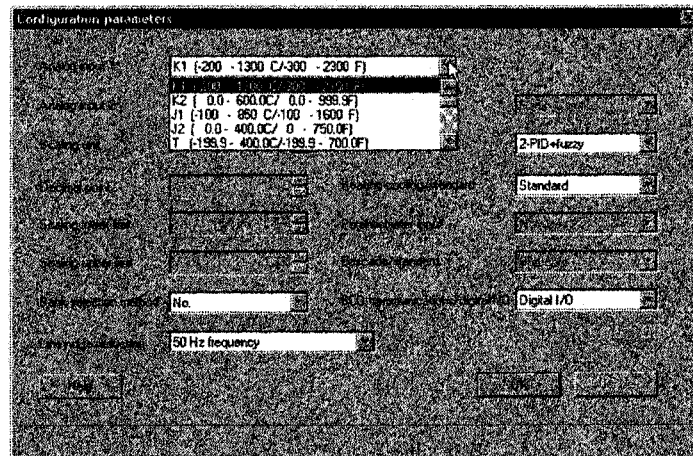
5.2 Checking and Setting I/O Specifications

■ Analog input

Analog input 1 and 2 type are just two of the configuration parameters. In most cases, the configuration parameters are set when creating new files. Configuration parameters can be set in both **Setting(Offline)** or **Setting(Online)** parameters. If the settings items must be changed when setting configuration parameters, the changed settings items must be confirmed after the configuration parameters have been set. The following describes how to select the input type when creating a new setup file.

● Selecting input type

- (1) When you have finished selecting the controller type when creating a new file setup, the dialog box of "Configuration parameters" appears.
- (2) Click analog input 1 type and select from the drop-down list.



● Scaling

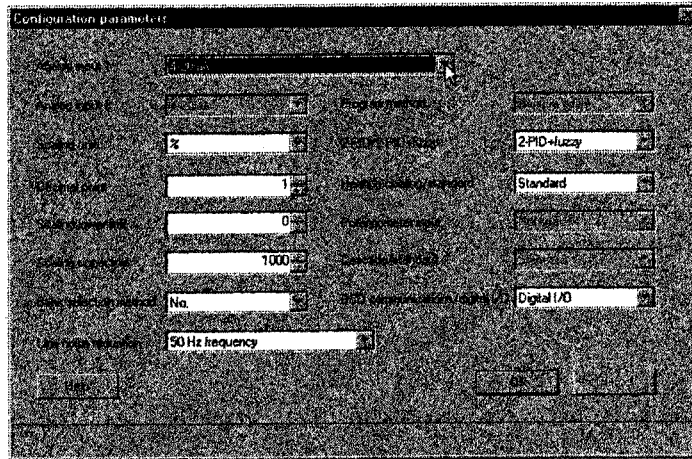
When analog input 1 type is set for a temperature sensor, scaling parameters are automatically set matched to the sensor. When the following message appears when selecting the input type, select the temperature unit either "°C" or "°F".

"Temperature sensor has been selected by analog input 1 type.
Scaling is automatically selected."

When analog input 1 type is linear input, scaling is carried out. Automatic scaling defaults are "0.0" for the scaling lower limit, "100.0" for the upper limit. Follow the procedure below to set the scaling parameters.

(1) When the following message appears, press "OK" :

"Linear input has been selected by analog input 1 type. Decimal point 1,
lower limit 0, upper limit 1000 are automatically set for scaling."



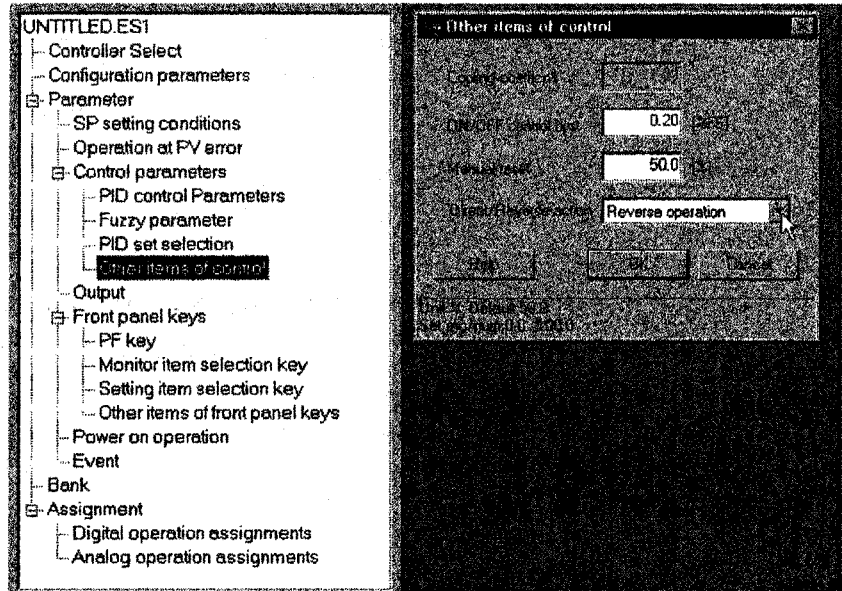
(2) Hidden scaling setting items are displayed by the "Optimize" function. Set each item.



About analog input 2 type

- Analog input 2 type setting items are displayed by the Optimize function when a 2-input type controller is in use.
- Linear inputs can be connected to analog input 2. However, in this case, the scaling function is not supported. The input range is fixed to 0 to 100%.

- **Direct/reverse action** Designate direct/reverse action : "Parameter" → "Control parameters" → "Other items of control"
- Designate "Reverse action" for a heating control system and "Direct action" for a cooling control system.
- The following describes how to make settings in the "Setting(Offline)".
- (1) Select "Parameter"→"Control parameters" →"Other items of control".
 - (2) Designate either of "Reverse operation" or "Direct operation".

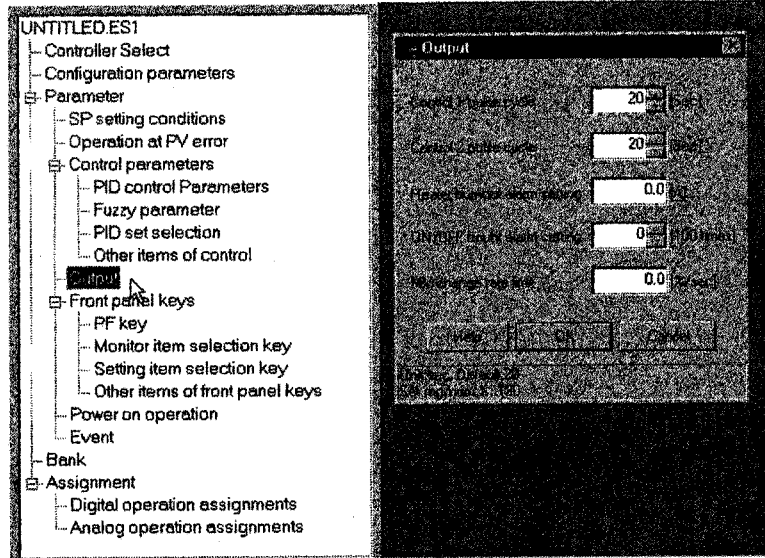


■ Control output cycle

When the output unit is the pulsed output such as a relay or SSR, check "Parameter"→"Output"→"Control 1 pulse cycle" and "Control 2 pulse cycle", and input numerical values if necessary.

The following describes how to make settings when checking control 1 pulse cycle at the "Setting (Offline)".

- (1) Select "Parameter"→"Output".
- (2) Designate "Control 1 pulse cycle" and change the numerical value.

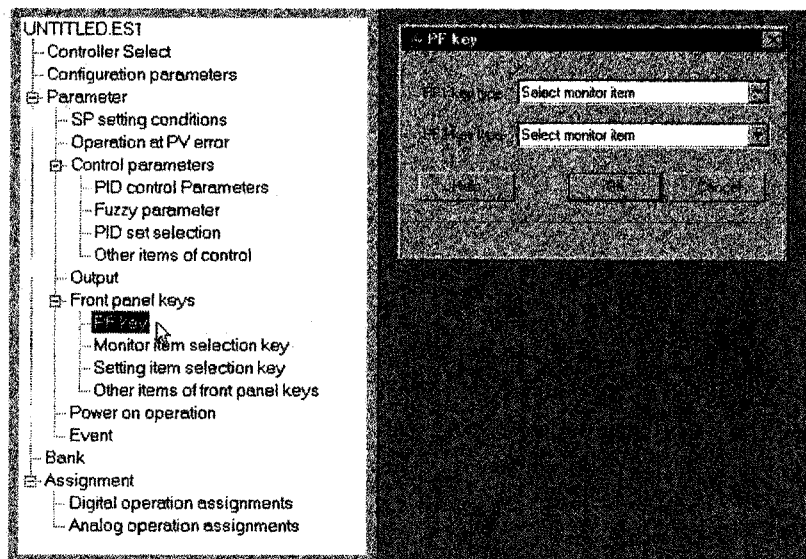


5.3 Assigning Functions to Front Panel Keys

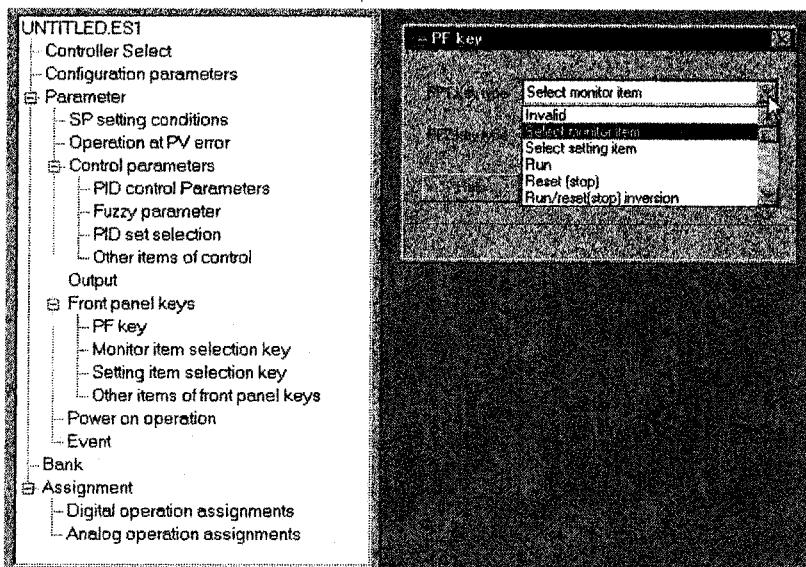
Assign PF key functions and the display items for bar graphs:
 "Parameter" → "Front panel keys" → "PF key".

The following describes how to designate PF key functions at first and how to designate the bar graph display items later. The setting procedure is as follows.

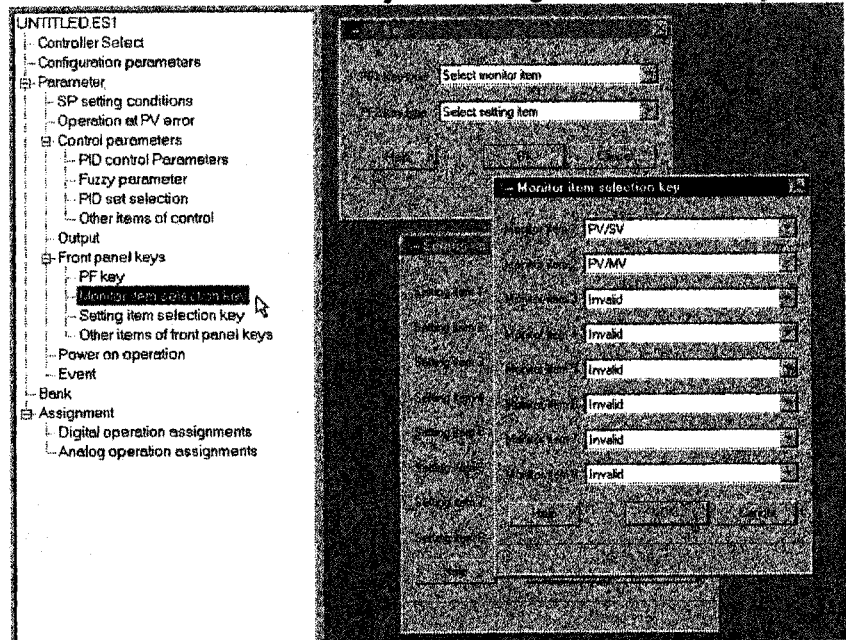
(1) Select "Parameter" → "Front panel keys" → "PF key".



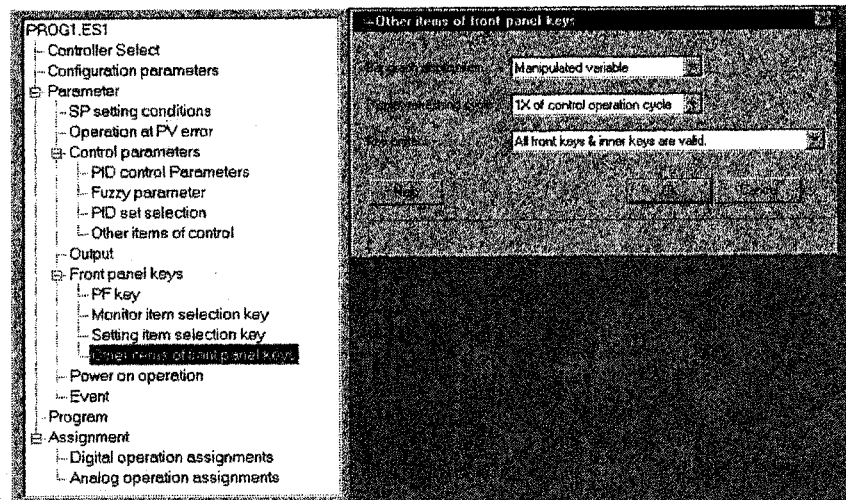
(2) Press "OK" if you do not make any changes. To make a change, press the ▼ and select an item.



(3) When selecting "Monitor item selection" or "Setting item selection" for each key type, designate each item in "Parameter" → "Front panel keys" → "Monitor item selection key" or "Setting item selection key".



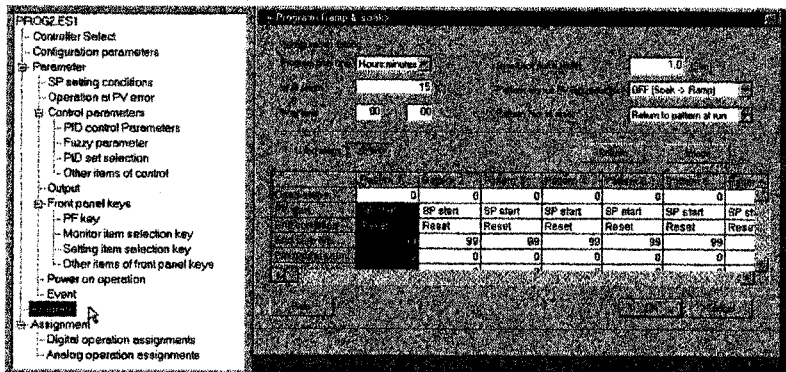
(4) Designate the bar graph display items in "Parameter" → "Front panel keys" → "Other Items of front panel keys".



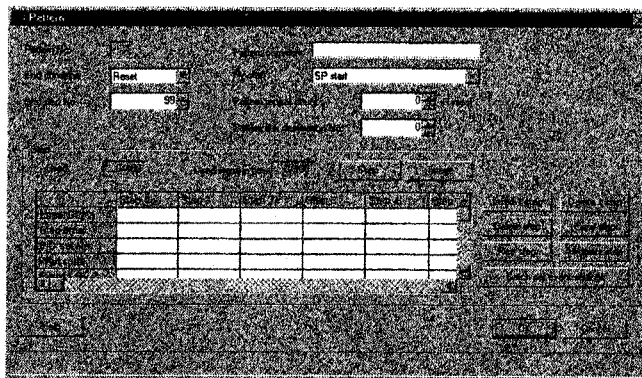
5.4 Setting up Programs

The following describes how to set up programs for programmable type.

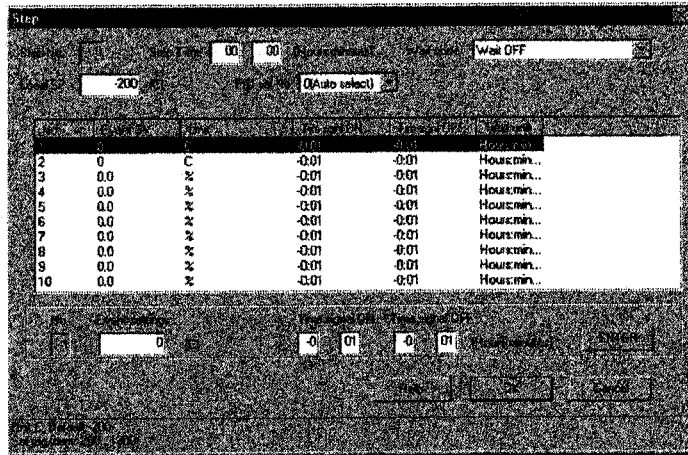
- **Setting up programs** The following describes how to set up programs in the "Setting(Offline)".
 - (1) Select "Program".



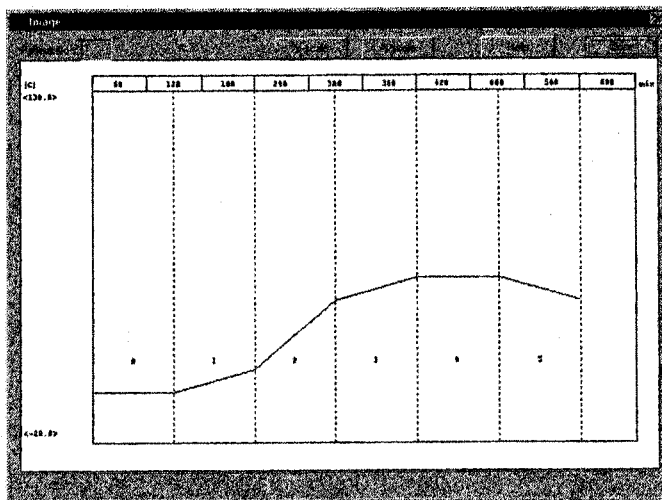
- (2) Set the "Program time unit" before setting up programs. Select either of "hours : minutes" or "minutes : seconds".
- (3) Click the target pattern position to highlight it. Next, press the "Pattern" button to display the "Pattern" dialog box. Conduct the settings for each item. Comments can be set for each pattern in the "Pattern comment" window.



- (4) When you have finished setting pattern parameters, set the step parameters. The following describes how to set the local SP and step time. Click the target step location to highlight it. Next, press the "Step" button to display the "Step" dialog box.
- (5) Set the local SP and step time for each step, and press "OK".



- (6) Check the program with the image. Check the program image with the "Image" button in the "Program<Ramp & soak>" or "Program<Soak step>" dialog box. By using the "Y-scale" and "X-scale" buttons, you can change the scale of the graph.

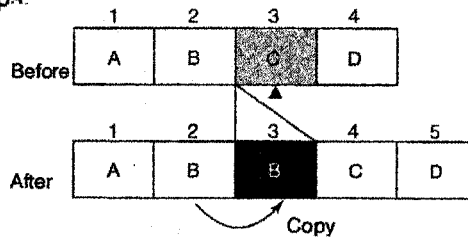


■ Editing steps

The step editing function can be used in the "Pattern" dialog box. You can conduct not only moving between steps, but also copying and deleting step parameters. This feature is useful for creating similar programs. The following all examples describe an editing operation carried out in step 3 of the program. A to E, X, and Y indicate step parameters.

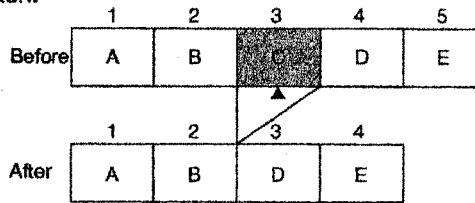
● Inserting 1 step

When you insert a step, the content of the immediately previous step is copied to the currently selected step, and the contents of steps following the currently selected step are fed forward by one step each. As you can see from this figure, if you select "Insert 1 step" with step 3 selected, the contents of step 3 is substituted with the content of step 2, the contents of step 4 is substituted with the contents of step 3, and so forth. You cannot insert a step into a program already setting 99, the maximum number of steps.



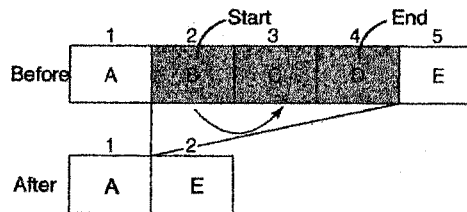
● Delete 1 step

When you delete a step, the currently selected step is deleted, and subsequent steps are fed backward by one step each. As you can see from this figure, if you select "Delete 1 step" with step 3 selected, step 3 is deleted and step 4 and subsequent steps are fed back by one step each.



● Deleting a designated range of steps

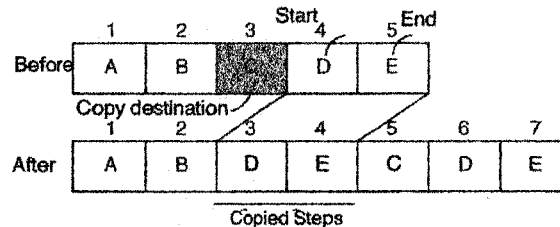
You can delete the contents of a designated range of steps. As you can see from this figure, if you designate step 2 as the start of the range and step 4 as the end of the range, Steps 2 to 4 are deleted, and steps 5 and all subsequent steps are fed backwards to step 2.



● Copying

When you designate the copy range and designate the copy destination step, the parameters of the designated steps are inserted in front of the copy destination step. In this way, steps following the designated copy destination step move forward by the number of copied steps.

As you can see from this figure, step 4 and 5(D and E) are copied(inserted) in front of step 3 (C) and step 3 (C) onward move forward by two steps.



● Paste

Contents of steps that have been "deleted" or "copied", are temporarily held in special memory called the "paste buffer".

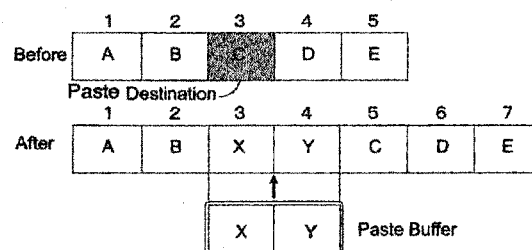
When you select "**Paste**", the contents of the paste buffer is inserted at the designated step.

Use "**Paste**" function in the following cases:

- To recover a step that you have deleted by mistake
 However, note that the content of the paste buffer is replaced when **Delete** or **Copy** is next selected. So, you can recover only the content of steps in the immediately previous editing operation.
- To move step parameters
 (1) "Delete" the content of the step parameter from the step where you are moving from.
 (2) "Paste" the content of the step parameter to the step where you are moving to.

This operation can also be conducted between patterns.

- To copy between patterns
 (1) Start the "Copy" process at the copy source pattern.
 (2) Press "Cancel" when you have designated the copy destination to cancel copying.
 (3) "Paste" at the copy destination pattern.



Copying undefined steps

If you set one of the parameters in a step whose parameters have not been set, the content of previous step (defaults when step is step 0) is automatically copied to other parameters.

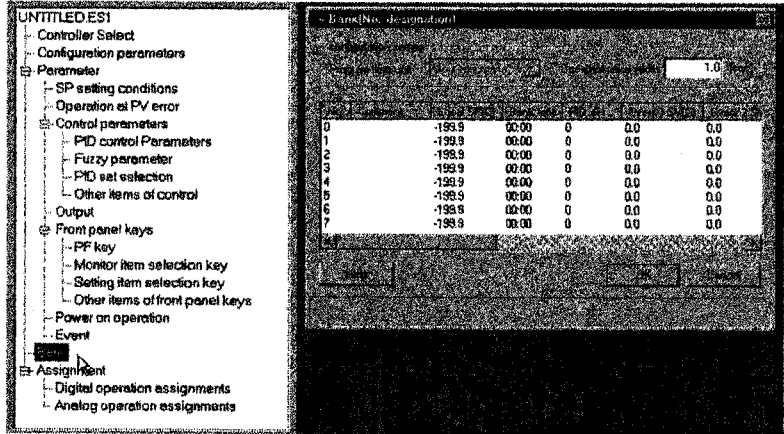
For example, if you set only the local SP and step time, defaults of step 0 are automatically copied to other parameters such as events and wait codes.

5.5 Setting up Banks

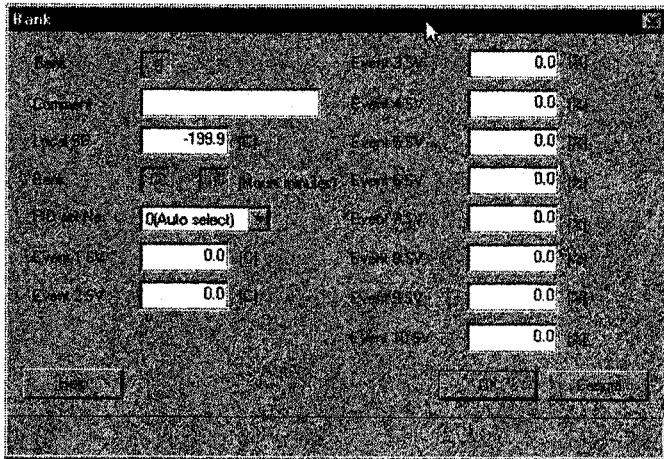
The following describes how to set up banks for fixed value type ES100.

The following describes how to set up programs in **Setting<Offline>**.

(1) Select **"Bank"**.



(2) Double Click the row of the bank number for the target item and display its setting dialog box.



(3) Set the "Local SP" for the target bank.

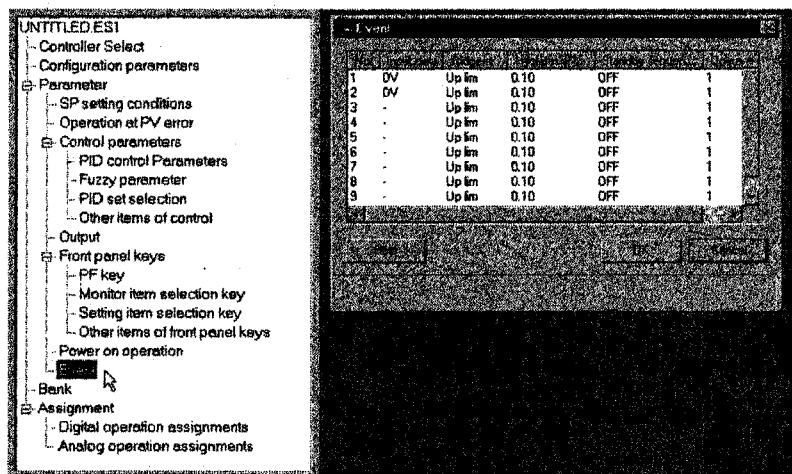
5.6 Setting Events

Event specifications are set in "Event" under "Parameter".

With programmable type controllers, event settings are set in "Program", and with fixed type controllers in "Bank".

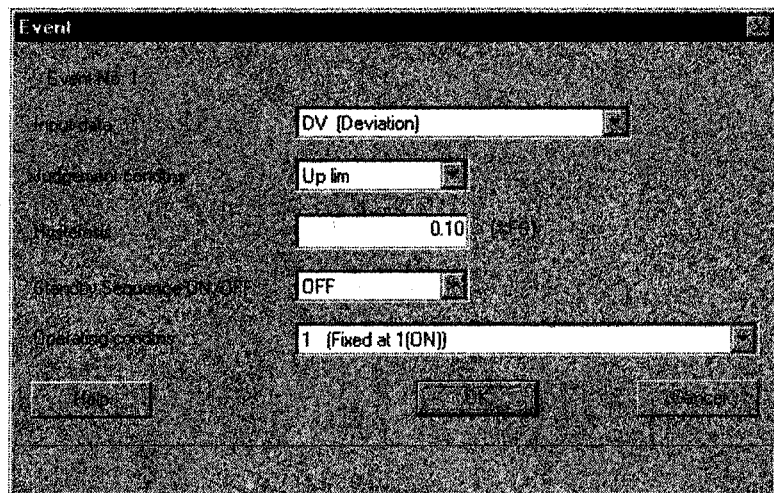
First, set the event specifications in **Setting (Offline)**, and then set the event settings.

(1) Select "Parameter"→"Event".



(2) Double Click the row for the event number of the target item, and display its setting dialog box.

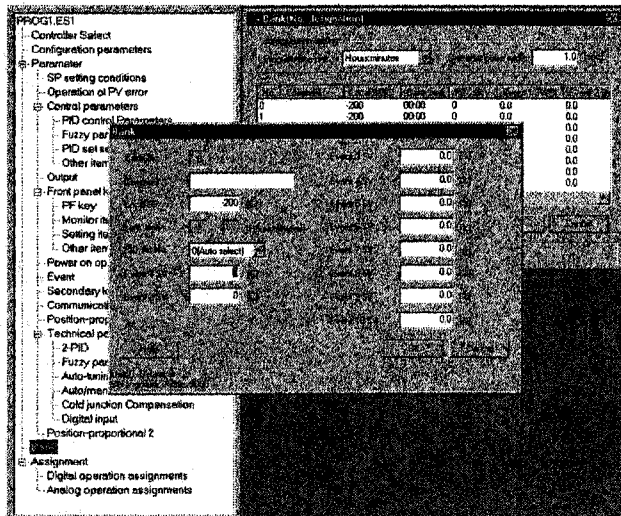
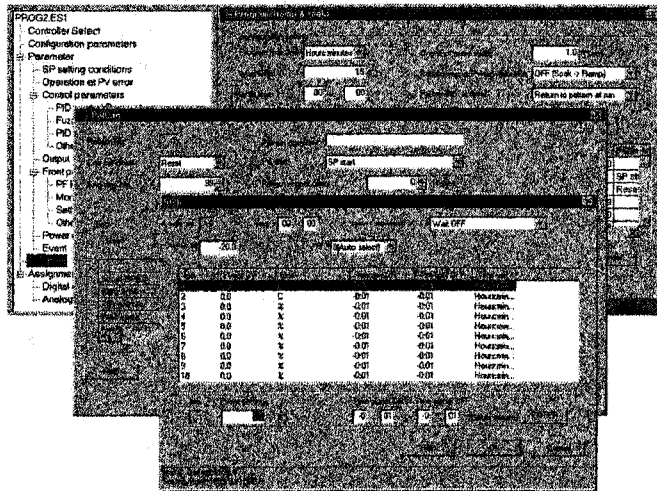
CHAPTER 5



(3) Set the specification items of events 1 to 10.

- (4) Select "Program" for programmable type and "Bank" for fixed value type.
- (5) Set the event setting value at each step for programmable type and at each bank for fixed value type.

Click the row of the event number for the target item in the "Step" dialog box, and input the data in the setting box that appears below it. Click the "ENTER" button after inputting the data.



About setting level

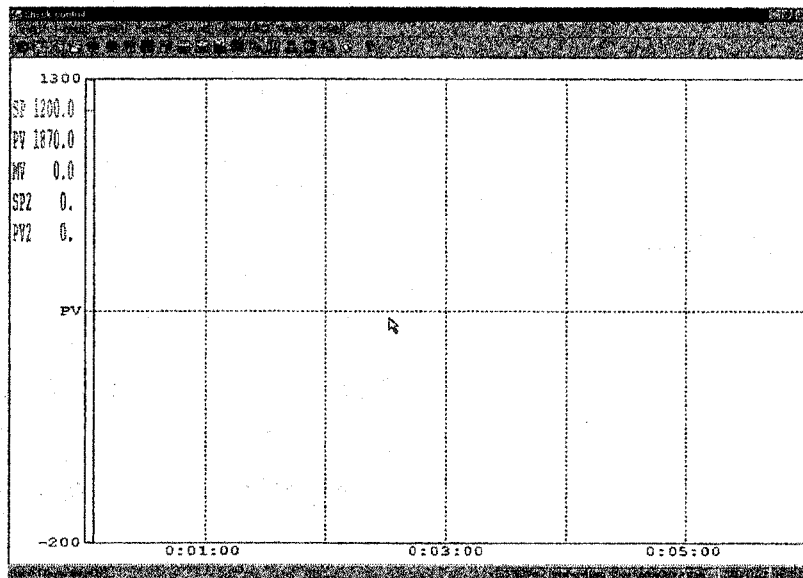
Setting level

- The setting level must be set by the DIP switches on the PCB inside the main unit as the setting level varies according to event specification and event settings. However, there is no need to be conscious of this at **Setting(Offline)** in ES/TOOLS, as there is no distinction in parameters by setting level.
- In **Setting(Online)**, the setting level must be checked in order to directly change the data of the ES100. However, note that the setting of DIP switches on the PCB inside the main unit need not be changed as the setting level can be changed in ES/TOOLS.

5.7 Adjusting Operating Conditions

Before adjusting conditions, make sure that the ES100 is correctly connected to your PC.

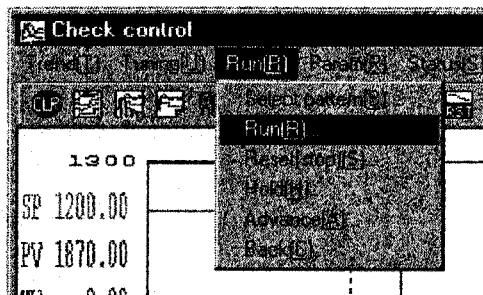
Execute **"Check control"** in the **Windows start menu**. The main screen changes as follows.



■ Run/reset

Follow the procedure below to start running and stop running of programs on the ES100. The screen is for a fixed value type controller.

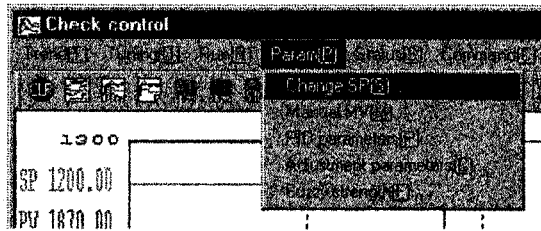
- (1) From the "Run" menu, select "Run" to start running or "Reset (stop)" to stop running.



■ Changing the SP

Follow the procedure below to change to SP during running. The screen is for a fixed value type.

- (1) Select "Parameter" → "Change SP".



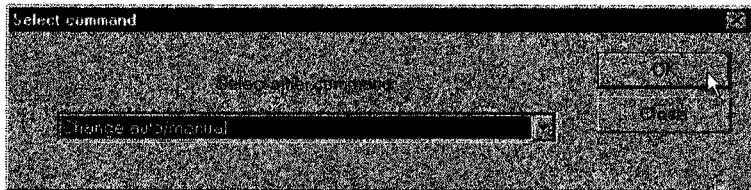
- (2) Input the numerical value for the SP and press "OK".



■ Manual operation

Follow the procedure below to carry out manual operation. The screen is for a fixed value type.

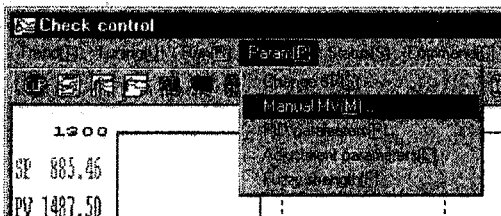
- (1) Select the "Command" menu.
- (2) Select "Change auto/manual" and press "OK".



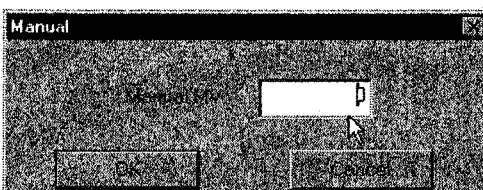
- (3) Select "Manual" and press "OK".



- (4) Select "Param" → "Manual MV".

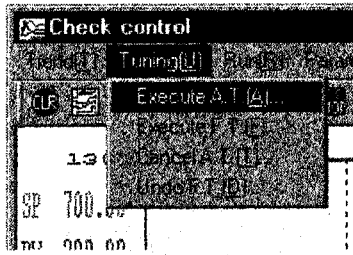


- (5) Input the numerical value for manual MV and press "OK".



■A.T.(auto-tuning)

(1) Select "Tuning"→"Execute A.T."

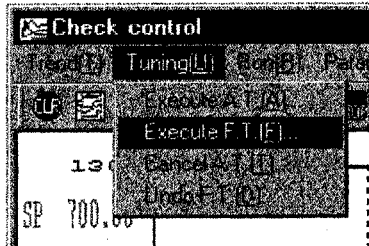


(2) Input the PID set No. to register tuning results, and press "OK".



■F.T. (fine-tuning)

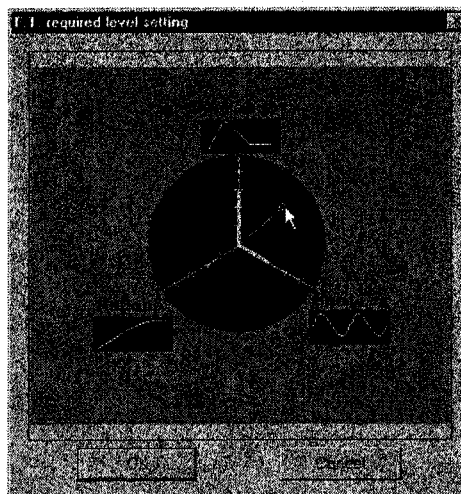
(1) Select "Tuning"→"Execute F.T."



(2) Input the PID set No. to register tuning results, and press "OK".



(3) Use the mouse to click and adjust the improvement required level setting, and then press "OK".

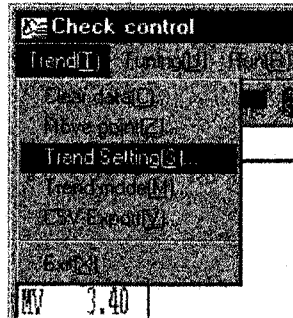


■ Trend graph

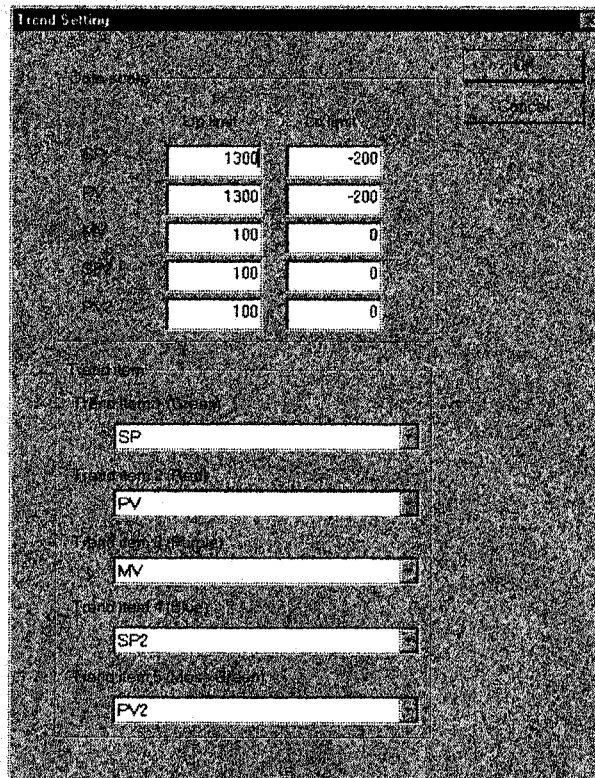
ES/TOOLS can check five (5) types of "Trends" with trend graphs. The conditions for displaying trends are designated at "Trend setting" or "Trend mode" in "Trend".

● Trend Setting

"Trend setting" command is for designating "Data scale" and "Trend item".



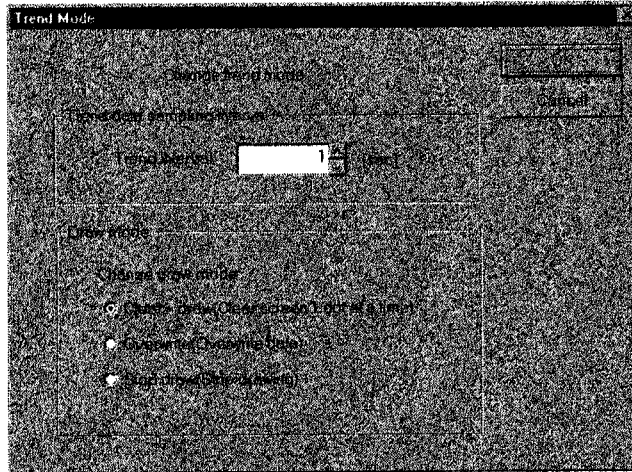
- "Data scale" is for setting the upper and lower limit values of the trend items to be displayed.
- "Trend item" is for assigning each "Trend item 1 to 5".



- Trend mode

"Trend mode" command is for designating "Trend interval" and "Draw mode".

- "Trend interval" is for setting the trend interval (unit: seconds) of the trend item data.
- "Draw mode" is for designating how sampled trend item data is displayed.



- CSV file output

Select "Trend"→"CSV export".

Save the contents of the displayed trend graph as a dump list to CSV file separated by commas.

CSV files can be read with spreadsheet software.



About Restrictions when "Overwrite" is selected in "Draw mode".

- Overwrite (Overwrite data) mode in Draw mode stops its operation after 100 times overwriting occurred. So, the maximum interval value overwriting is (interval value) X (36,000 seconds).

CHAPTER 6

ADVANCED APPLICATION

6.1 Digital Operation Assignments	6-2
■ON/OFF timers	6-3
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6.1 Digital Operation Assignments

Digital operation assignment tables are set up in "Digital operation assignments" of "Assignment". "Digital operation assignments" can be selected either in "Setting(Offline)" or "Setting(Online)".

Settings(defaults) matched to the controller type are already assigned to digital operation assignment tables before shipment from the factory. Defaults are important settings. So, take care when changing them.

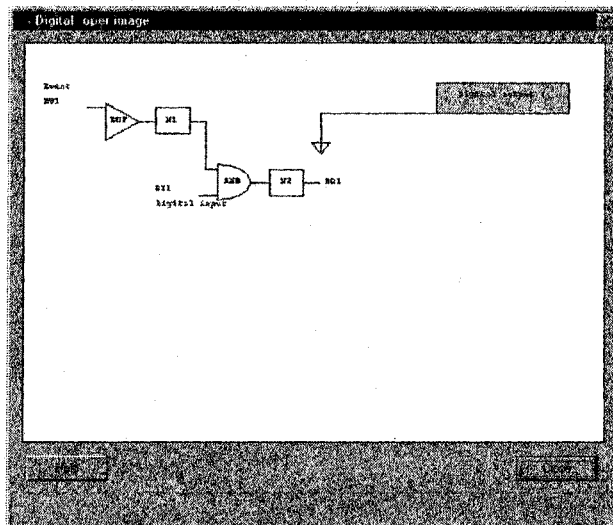
■ Assignment example

In the following example, the default table assigned to digital output 1 (auxiliary output 1) is retained by changing event 1 output when digital input 1 is "1" even if event 1 output becomes "0".

Event	D01	D02	D01	D02
END	END	AND	BUF	EV2
END	END	AND	EV1	END
END	END	AND	END	END
END	END	AND	END	END

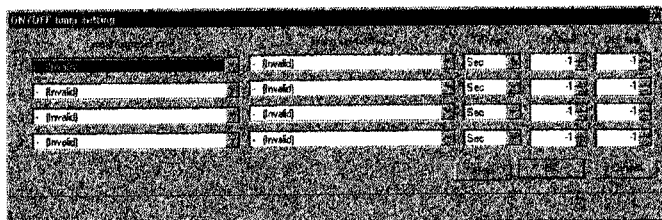
● Assignment image

The inputted information can be confirmed by displaying the image by clicking "Image" button. For example, the settings in the table 11 above are displayed as the following assignment image.



■ ON/OFF timers

To set ON/OFF timer settings, conduct "ON/OFF timer setting" in "Digital operation assignments".



The followings describe the item in "ON/OFF timer setting".

- Timing starts when both "Timing run/reset input" and "Timing run/hold input" are set to "1".
- The "ON time" and "OFF time" conform to the time units in "Time unit".
- When the timer set in "ON time" is reached, timer output is turned ON.
- When the timer set in "OFF time" is reached, timer output is turned OFF.
- When the times set to "ON time" and "OFF time" are both "-1", the state of timer output does not change from either OFF to ON or from ON to OFF.

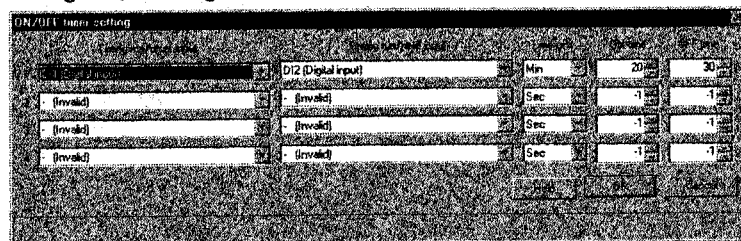
Timer output is used as the argument (TM1 to TM4) of digital operation. Note that the time setting changes according to the unit set in Time unit.

Time Unit	Setting range
Seconds, minutes, hours	-1 to 9999
10 hours	-1 to 5000

● Setting example

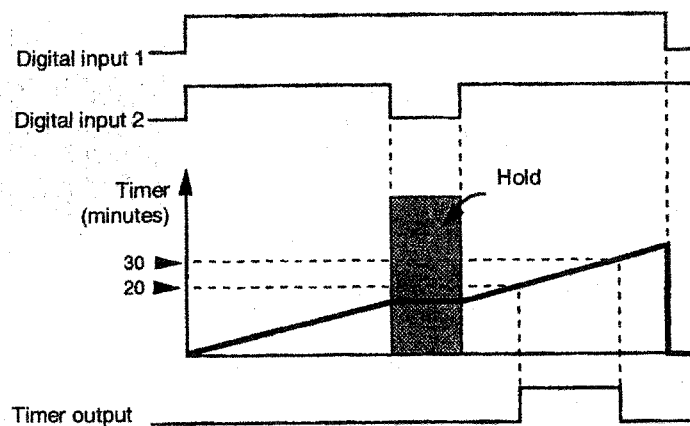
In this example, let's set the timer 1 "ON time" as 20 minutes and "OFF time" as 30 minutes.

Set digital input 1 to the timing run/reset signal, and digital input 2 to the timing run/hold signal.



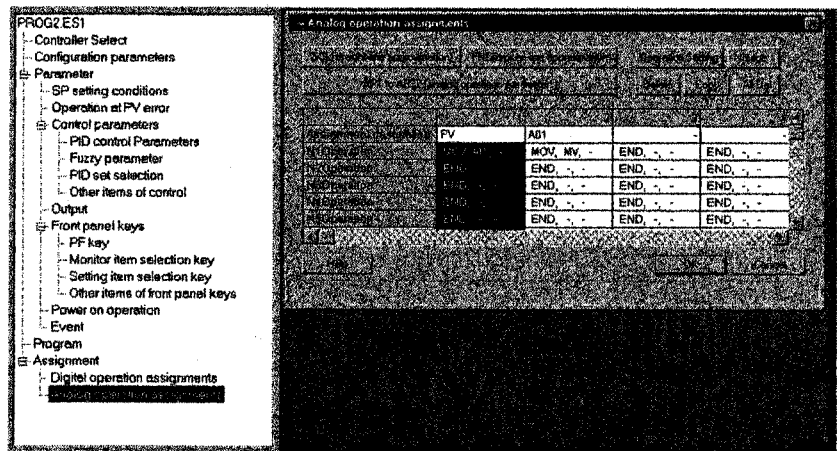
CHAPTER 6

The operation of timer 1 changes as follows.



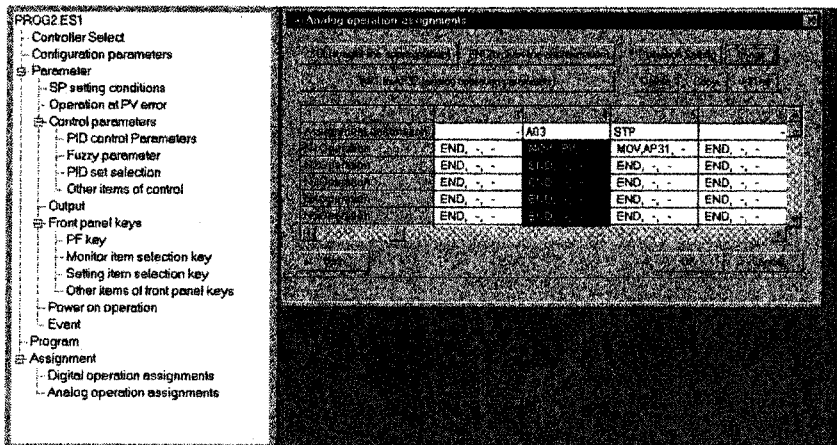
6.2 Analog Operation Assignments

Analog operation assignment tables are set up in "Analog operation assignments" in "Assignment". "Analog operation assignments" can be selected either in "Setting(Offline)" or "Setting(Online)". Settings(defaults) matched to the controller type are already assigned to analog operation assignment tables before shipment from the factory. Defaults are important settings. So, take care when changing them.



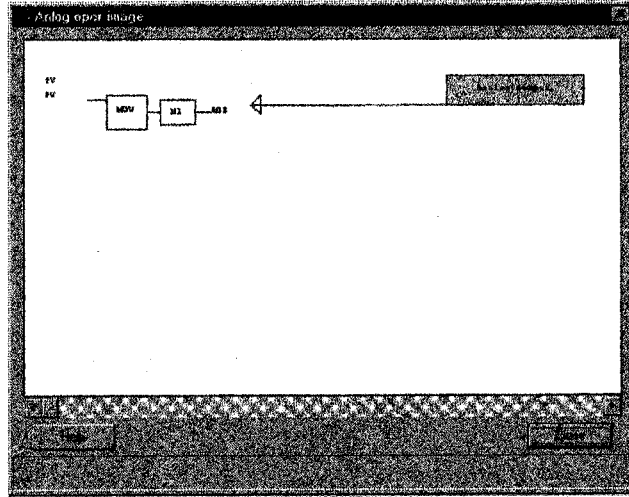
■ Assignment example

In the following example, table 4 is added to the default table. The content of additional table 4 instructs external monitoring of the table by assigning PV to transfer output (analog output 3).



- Assignment image

The inputted information can be confirmed by displaying the image by clicking "Image" button. For example, the settings in the table 4 above are displayed as the following assignment image.



6.3 PID Switching

■ Settings by Setting menus

Set the PID set for each step: When using a programmable type controller, set in "Step", and when using a fixed value type controller, set in "Bank". In the following example, PID set No. is automatically selected according to the value of the designated data in steps(banks) to which the "PID set No." has been set to "0".

<Programmable type controller>

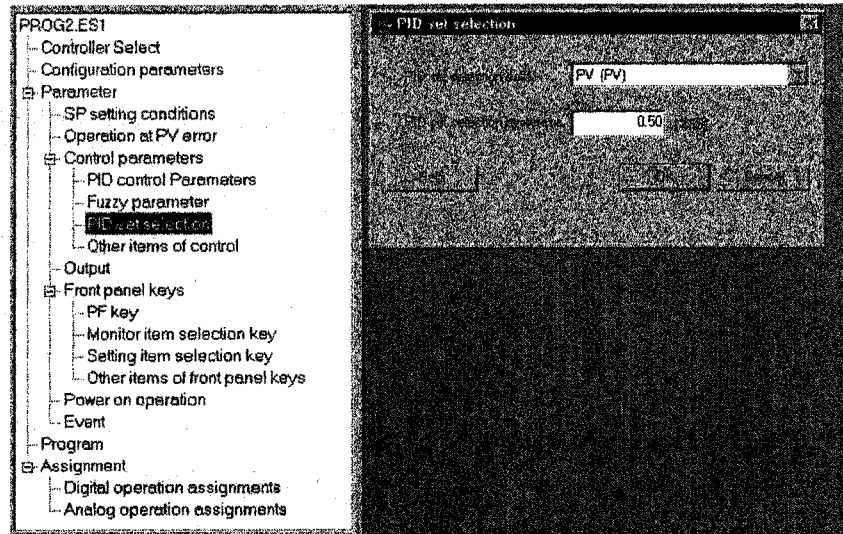
Step No.	SP	Control	Gain	Int. time	Der. time	Unit
1	0	C	-0.01	-0.01	Hours min.	
2	0	C	-0.01	-0.01	Hours min.	
3						
4	0.0	%	-0.01	-0.01	Hours min.	
5	0.0	%	-0.01	-0.01	Hours min.	
6	0.0	%	-0.01	-0.01	Hours min.	
7	0.0	%	-0.01	-0.01	Hours min.	
8	0.0	%	-0.01	-0.01	Hours min.	
9	0.0	%	-0.01	-0.01	Hours min.	
10	0.0	%	-0.01	-0.01	Hours min.	

< Fixed value type controller >

Bank No.	SP	Control	Gain	Int. time	Der. time	Unit
0	-200		00.00	0	0	0
1	-200		00.00	0	0	0
2	-200		00.00	0	0	0
3	-200		00.00	0	0	0
4	-200		00.00	0	0	0
5	-200		00.00	0	0	0
6	-200		00.00	0	0	0

- Designating the automatic selection data

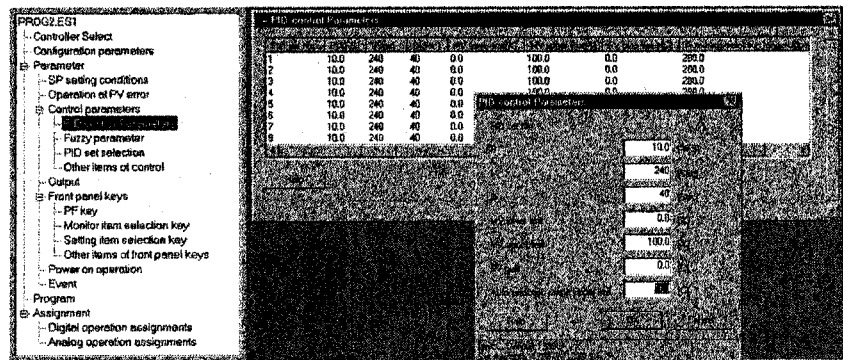
(1) Select "Parameter"→"Control parameters"→"PID set selection".



(2) Set the data in "PID set selection data" parameter, which will be referenced when switching the PID. To change the hysteresis at PID switching, set in "PID set selection hysteresis" parameter.

- Setting the automatic selection range upper limit

(1) When you have finished setting the automatic selection data, select "Parameter"→"Control parameters"→"PID control Parameters".



(2) Set "Auto selection range upper limit" parameter for each PID set. Set the values to the table Nos. in ascending order, for example, 100, 200, 300 and so forth.

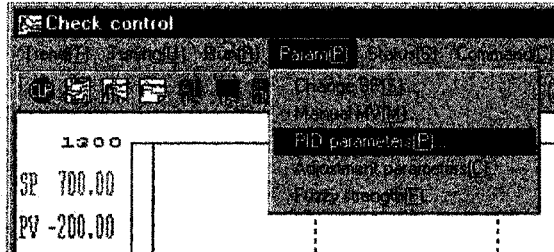
Table 8 is already set to the maximum value (200% full-scale), and does not need to be set.

In this example, when PV(set selection data) exceeds 100 °C, PID set is switched to PID set 2, and when PV exceeds 200 °C, PID set is switched to PID set 3.

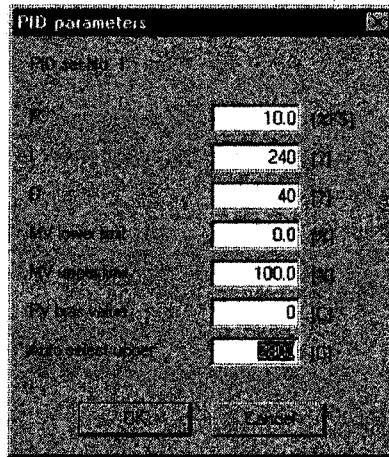
■ Settings by the Check control menu

"Automatic selection range upper limit" can also be changed in "Check control".

- (1) When you select "PID parameters" under "Param", ES/TOOLS stands by for input of the "PID set No." In this case, input "1".



- (2) "PID parameters" dialog box for PID set No.1 are displayed.



- (3) Set "Auto select upper " for PID set 1.
- (4) Repeat the above procedure for the required number of PID sets in PID sets 2 to 8.

6.4 Program Running Applications

This following description is for programmable type controllers only.

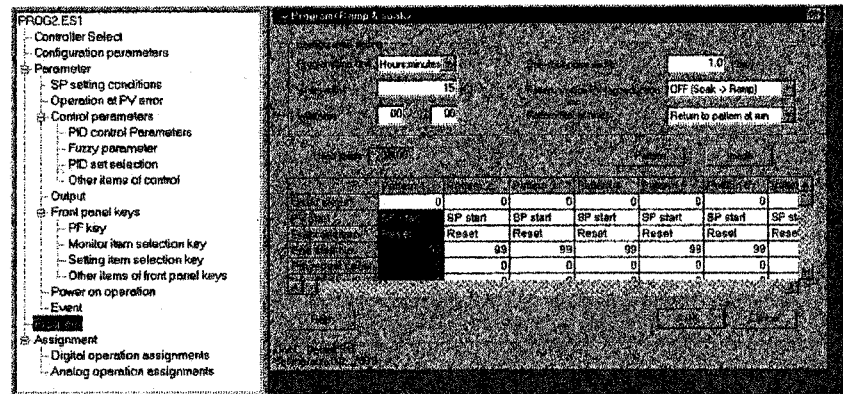
■ Wait operation

"Wait" occurs at the end of a step in the program if PV is not within a set range to which the difference(deviation) between the PV and local SP has been set. This set range is called "wait width".

Wait operation parameters are set in "Program"

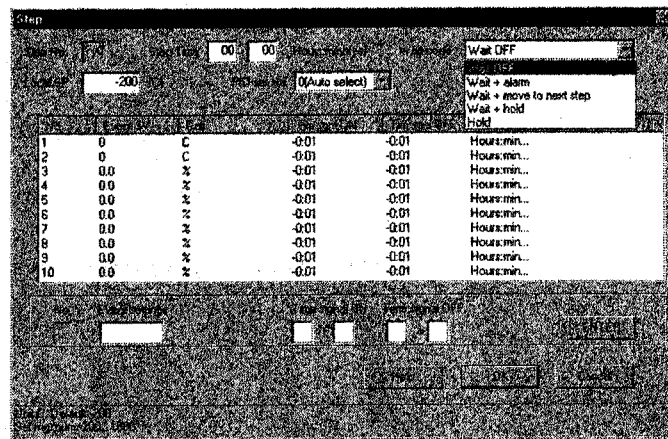
- Wait width
- Wait time

"Wait width" and "Wait time" (time from the start of wait operation up to the start of subsequent operation designated by the wait code) parameters are set in "configuration setting" under "Program".



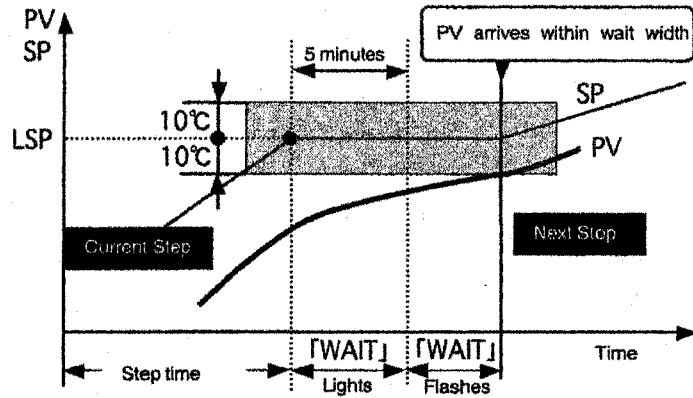
- Wait code

Set "Wait code" parameters in "Step".



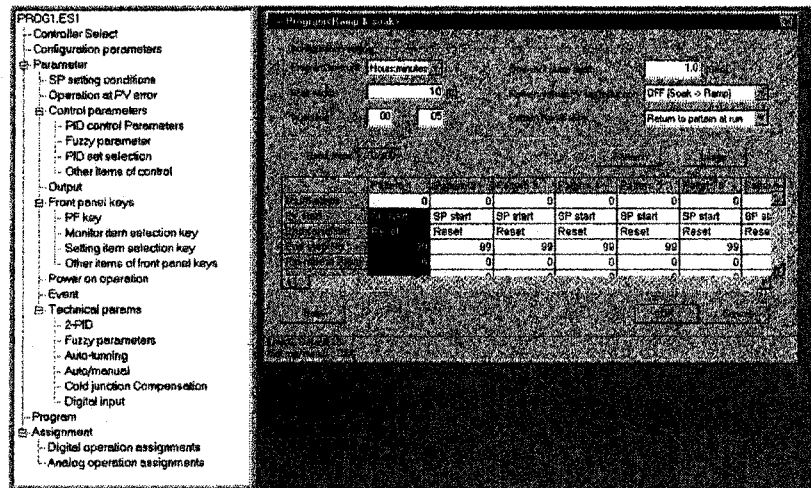
● Setting example

In this example, let's set up a program using the wait operation where the program advances to the next step when the PV arrives within the set deviation (wait width). Set the deviation to 10°C. Set the wait width to 10°C and the wait time to 5 minutes. Set the wait code to "1" (Alarm is activated after wait time). Assume all relevant steps are already designated.

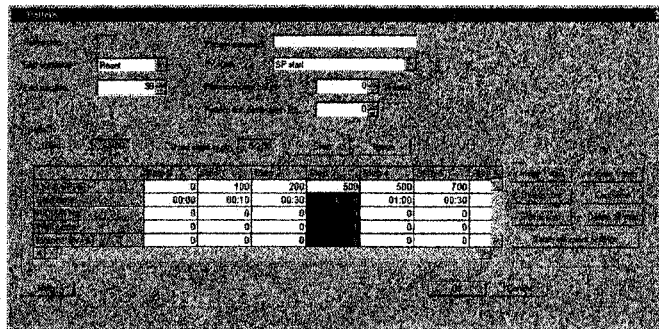


Set each menu as follows.

- "Wait width" = 10°C, "Wait time" = 5 minutes



"Wait code" (step 3) = "1"



■ Time signals

Time signals are timers synchronized with the program. Timers operate in response to each ON and OFF time. The timing start point is the start point of each step. When a hold is executed in the program, timing of the time signals is stopped temporarily.

Time signal output is turned ON when "ON time" is reached after the start of timing operation, and is turned OFF when "OFF time" is reached. However, note that output turns OFF at the end of pattern when carrying out pattern repeat or linked operations.

Time signal outputs are used as the arguments(TS 1 to 10) in digital operation assignments.

"Time signals 1 to 10 ON times" and "Time signal 1 to 10 OFF times" are set in "Step" dialog box.

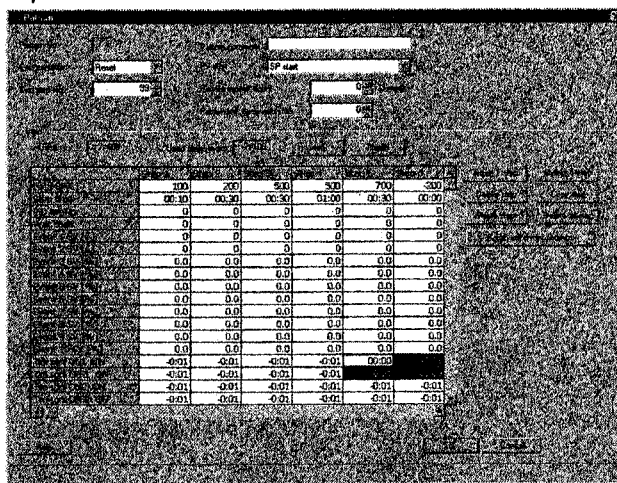
At "Step" dialog box, click the row of the target step number, and input "Time signal ON" and "Time signal OFF" in the setting box that appears below. Click "ENTER" after inputting the information.

Timers corresponding to "ON time" and "OFF time" parameters set as "-0.01" do not operate. As "-0.01" is set as the default, the timer signals of all steps are initially set not to operate.

● Setting example

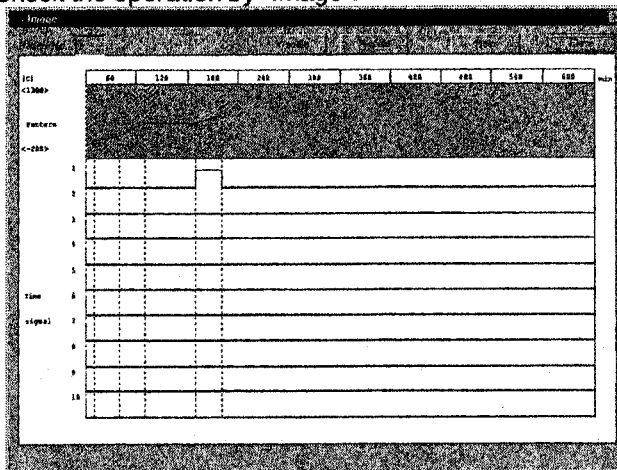
In this example, let's set time signal 1 in step 5 to ON.

- Set "Time signal 1 ON" in step 5 to "00:00" and "Time signal 1 OFF" in step 6 to "00:00".



CHAPTER 6

- Check the operation by "Image".

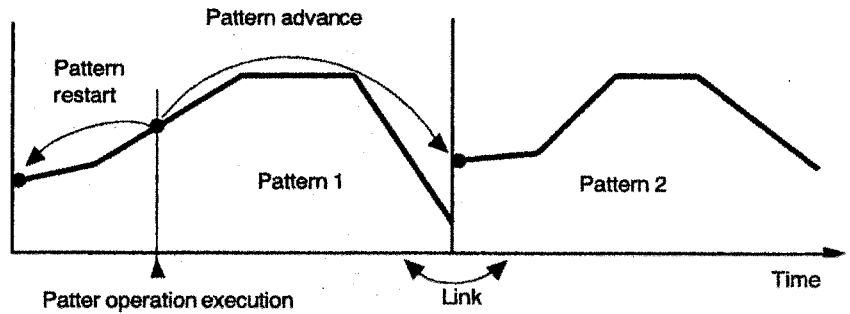
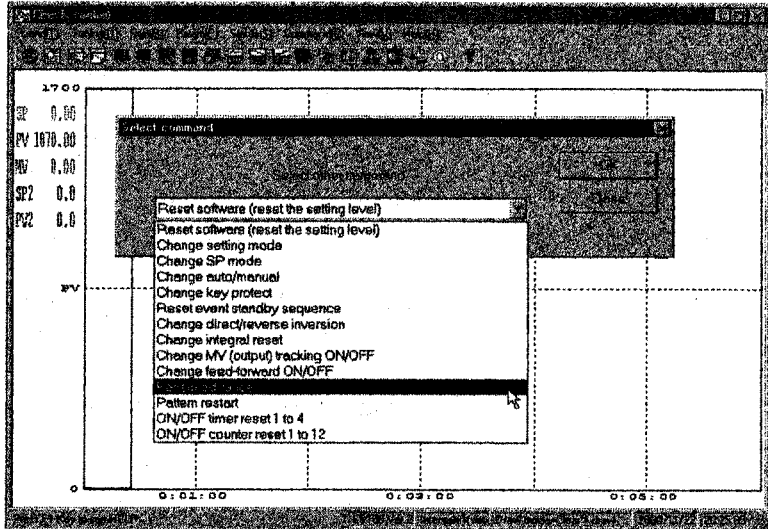


■ Pattern operation

Patterns can be advanced (pattern advance) or returned to their beginning (pattern restart) while the program is running.

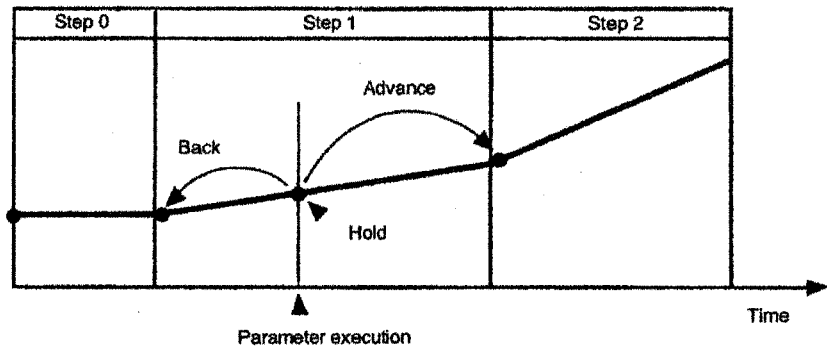
Pattern operations are carried out in "Check control".

When you select "Command" menu, "Pattern advance" or "Pattern restart" parameters can be executed.

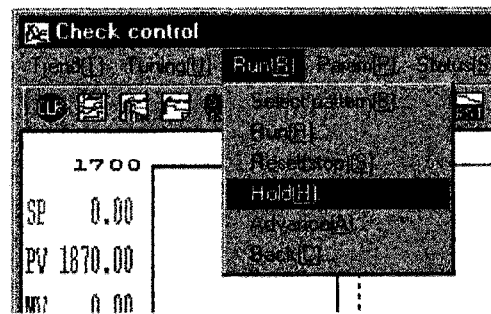


■ Step operation

Steps can be returned to the beginning of the step(back), advanced(advance), or temporarily stopped (hold) while the program is running.



These operations are carried out in "Check control". When you select "Run" menu, "Hold", "Advance" or "Back" parameters can be executed.



CHAPTER 7

SETTING EXAMPLES

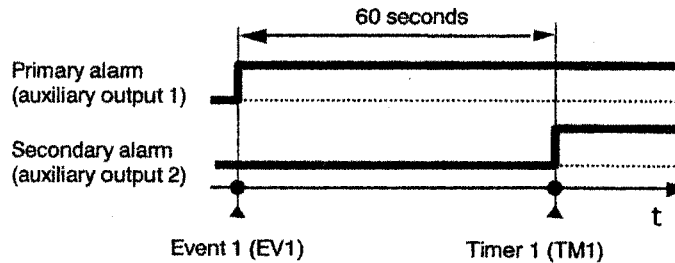
- Outputting an alarm in two stages, primary response and secondary response 7-2
- Temporarily canceling key protect 7-3
- Enlarging the partial range to full range and executing transfer output 7-4
- Inverting the proportional relationship between analog input and PV 7-5
- Averaging ripple wave input 7-6
- Reducing the influence of line noise applied to the sensor 7-7
- Changing the PID set at the heating and cooling sides in a heating-cooling control system 7-8
- Changing the set temperature according to the preset correspondence between in-furnace set temperature and outside atmosphere temperature 7-9
- Adjusting the manipulated variable by combining ON/OFF valves having different unit flow rates 7-11
- Running by up/down shifting the set temperature of three furnaces by a fixed value 7-13

● Outputting an alarm in two stages, primary response and secondary response

Settable ES100models: all models

Setting Example

- Output the alarm for the primary response to auxiliary output 1.
- Assign event 1 output to digital output 1.
- Output the alarm for the secondary response to auxiliary output 2.
- If event 1 output is set, ON/OFF timer is operated.
- Assign timer 1 output to digital output 2.
- Set the time from the primary response alarm to the secondary response alarm to 60 seconds.
- Set the ON time for timer 1 to 60 seconds.



Details

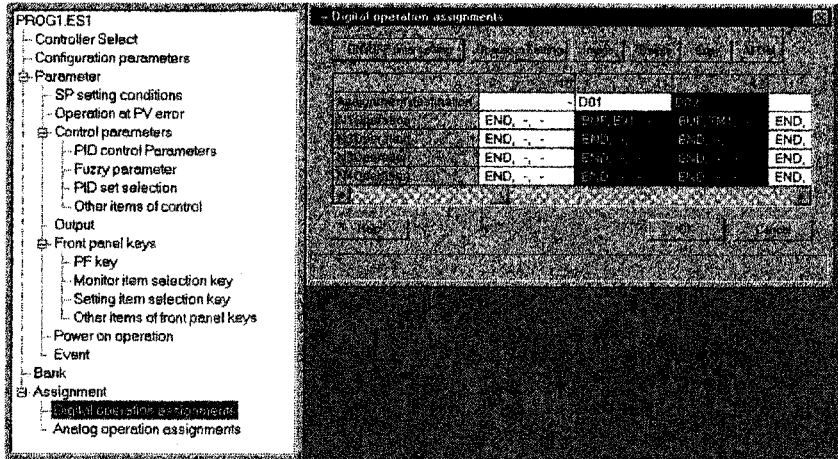


Table 11:
Assign event 1 output to digital output 1.

Table 12:
Assign the timer output to digital output 2.

Table 1:
Set the time from the primary response alarm to the secondary response alarm to 60 seconds.

● Temporarily canceling key protect

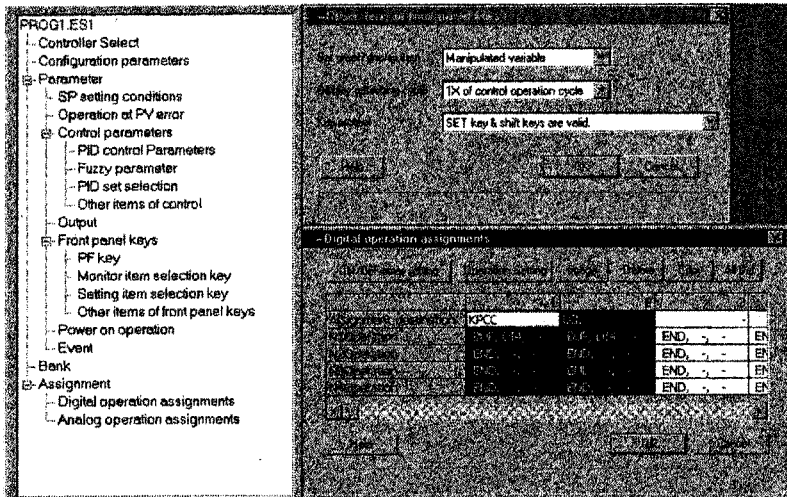
Settable ES100 models: ES100 - ** B, ES100 - ** D, ES100 - ** E

Setting Example

When the designated input turns ON, set to the local setting mode and cancel key protect.

→ Set digital input 4 to "1", setting mode to "Local" and key protect to "Cancel".

Details



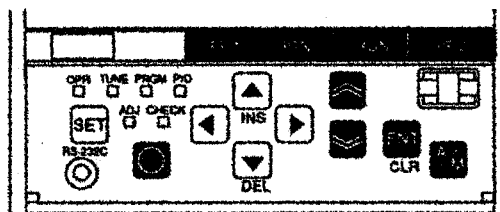
Set the key protect to "Set key & shift keys are valid."

Table 1:
Assign digital input 4 to the key protect cancel function.

Table 2:
Assign digital input 4 to the local setting mode.

Following keys cannot be used when "Set key & shift keys are valid."

Inactive keys



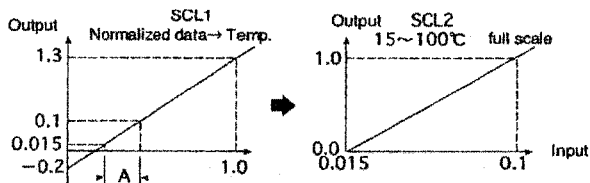
● Enlarging the partial range to full range and executing transfer output

Settable ES100 models: ES100 - ** F

Setting Example

Output the range 15 to 100°C (A in figure below) of K sensor input (full-scale: -200 to 1300°C) to transfer output (analog output 3) by using straight-line approximation in analog operation assignments.

- (1) Convert normalized data to temperature full-scale by executing straight-line approximation of PV.
- (2) Convert to normalized data using 15 to 100 as full scale.



Details

PV	AD1	AD2	AD3
MOV, All	MOV, MV	END	END
END	END	END	END
END	END	END	END
END	END	END	END

AD1	AD2	AD3	AD4
0.015	0.000	0.100	1.000
0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000

Table 4:

Convert to PV temperature scale at N1, and convert 15 to 100 °C in that temperature scale as full-scale at N2.

Table 1:

Characteristic of SCL1

Table 2:

Characteristic of SCL2

● Inverting the proportional relationship between analog input and PV

Settable ES100 models: all models

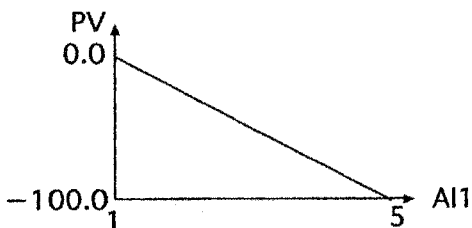
Setting Example

Set scaling from 0.0 to -100.0%

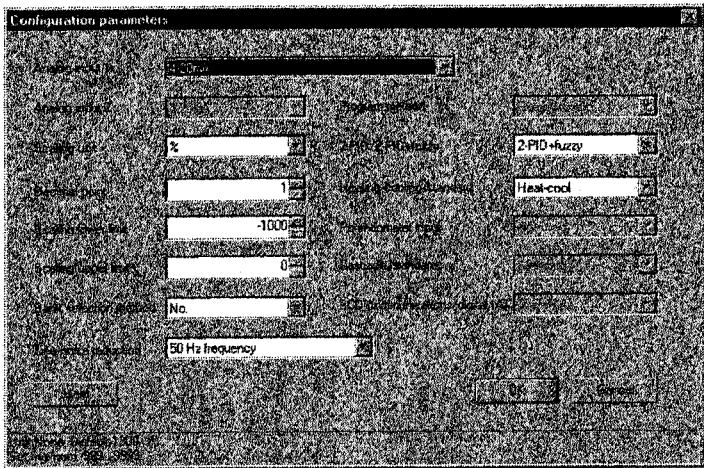
→ Set the scaling unit to "%", the scaling lower limit to "-1000", the scaling upper limit to "0", and the scaling decimal point to "1".

PV display is changed inversely proportional to the range 100 to 0% when analog input 1 changes from 1 to 5V.

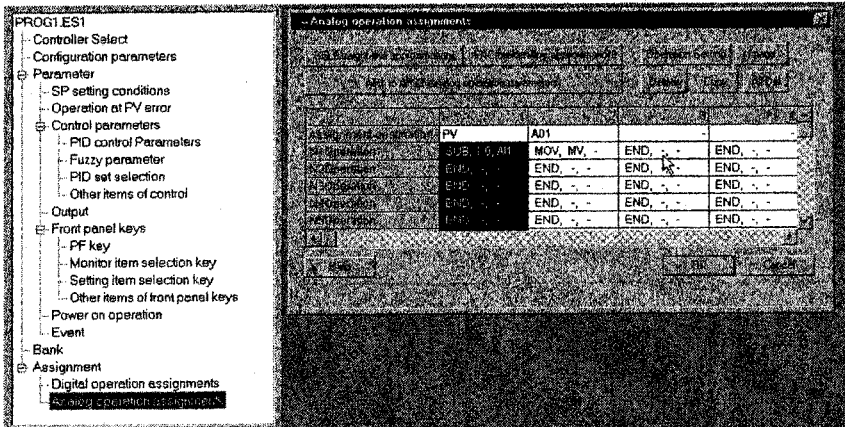
→ Set PV obtained by subtracting the value of analog input 1 from 1.0 (100%).



Details



Set the scaling units to "%", the scaling lower limit to "-1000", the scaling upper limit to "0", and the scaling decimal point to "1".



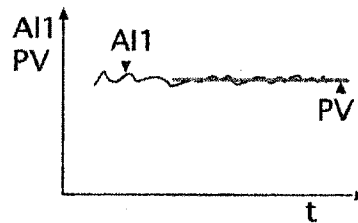
Set the PV obtained by subtracting the value of analog input 1 from 1.0 (100%).

● Averaging ripple wave input

Settable models: all models

Setting Example

Set the move average value of analog input for one minute as PV.
 → Assign analog operation parameter 2 as the move average range (60 seconds) to PV taking the move average of analog input 1.
 Up to 20 sets of move average data can be used, so calculate using the data of a 3-second interval.



Details

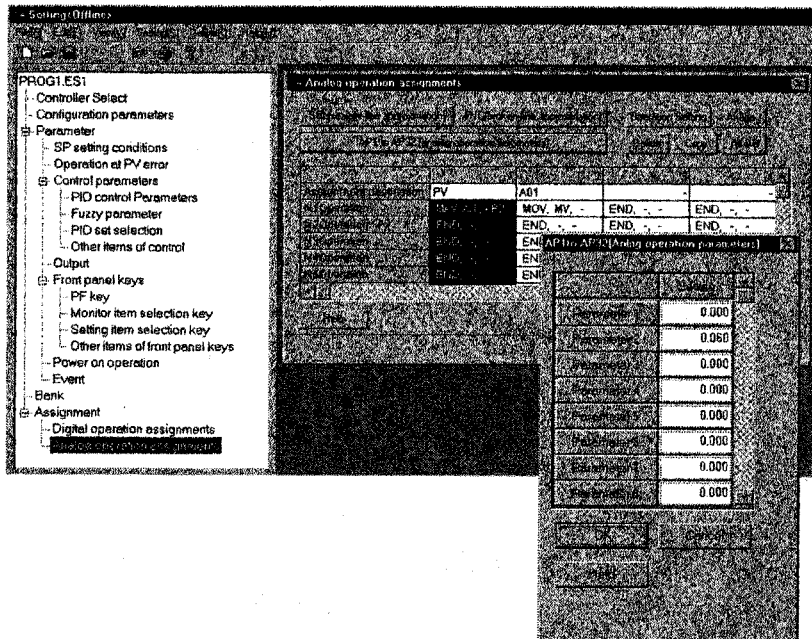


Table 1:

Set the move average value of analog input 1 as PV.

Set the value of 1000 seconds as "1.000". As a result, 60 seconds is "0.060".

- Reducing the influence of line noise applied to the sensor

Settable ES100 models: all models

Setting Example

Apply a digital filter to analog input 1 using the first order lag filter of analog operation assignments.

→ Assign analog input 1 that has passed through the first order lag filter of time constant 2 seconds to PV.

In order to reduce the influence of induction noise from the power supply, match the line noise reduction parameter to the power frequency in use.

→ Set to 50Hz.

Details

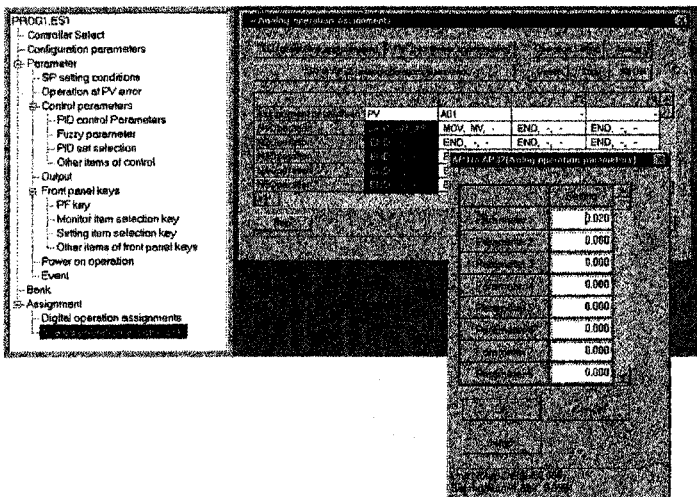
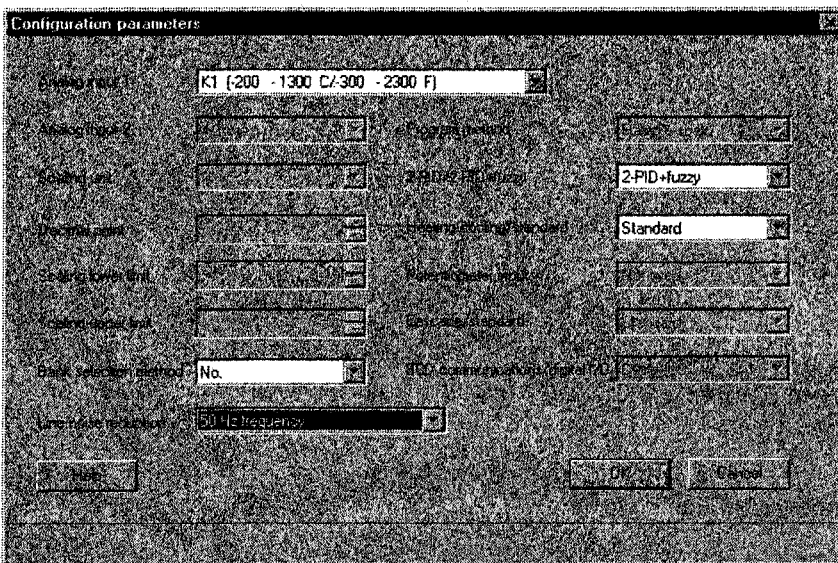


Table 1:
Set the first order lag value of analog input 1 as PV.

Set 100.0 seconds as "1.000".
As a result, 2 seconds is "0.020".



Match to the frequency of the power supply in use.

- Changing the PID set at the heating and cooling sides in a heating-cooling control system

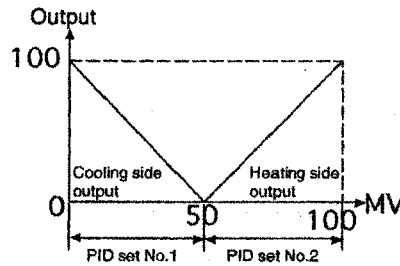
Settable ES100 models: ES100 -AA **

Setting Example

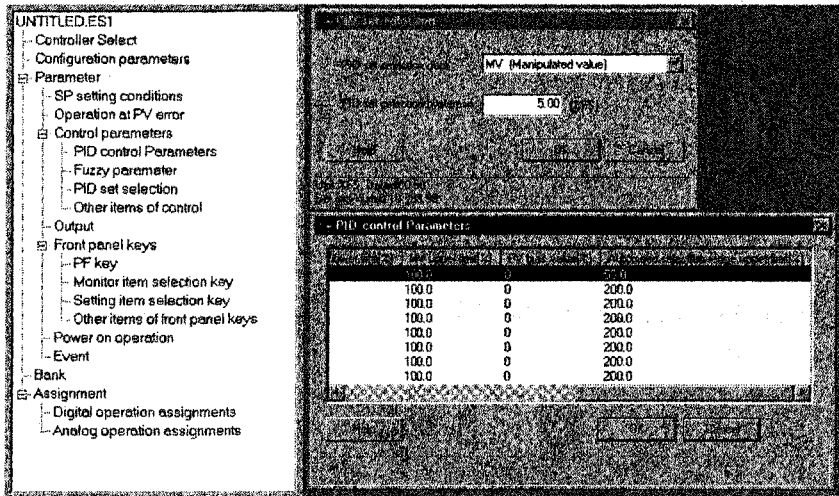
Automatically set PID sets 1 and 2 using 50% manipulated variables as the switching point.

→ Set the automatic selection data to MV, and the automatic selection range upper limit of PID set 1 to 50.0%.

Set the PID set selection hysteresis to 5.0%.



Details



Set the automatic selection data to MV.

Set the PID set selection hysteresis to 5.0%.

Set the automatic selection range upper limit of PID set 1 to 50.0%.

- Changing the set temperature according to the preset correspondence between in-furnace set temperature and outside atmosphere temperature

Settable ES100 models: ES100 - W **

Setting Example

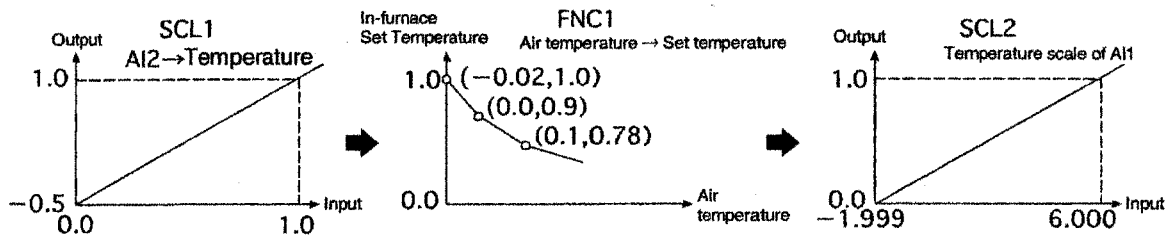
Air temperature	Set temperature
-2°C	100°C
0°C	90°C
10°C	78°C
⋮	⋮
⋮	⋮

Calculate the set temperature corresponding to the outside air temperature using broken-line approximation.

For the in-furnace temperature sensor, connect a platinum resistance thermometer (-199.9 to 600.0°C) to analog input 1.

For the outside air temperature sensor, connect the current input sensor (4 to 20mA: -50 to 100°C) to analog input 2.

- (1) Convert analog input 2 to temperature scale from the normalized data using straight-line approximation1.
- (2) Calculate the set temperature corresponding to the outside air temperature using broken-line approximation1.
- (3) Normalize the calculated set temperature data by the scaling of analog input 1 using straight-line approximation 2.



Details

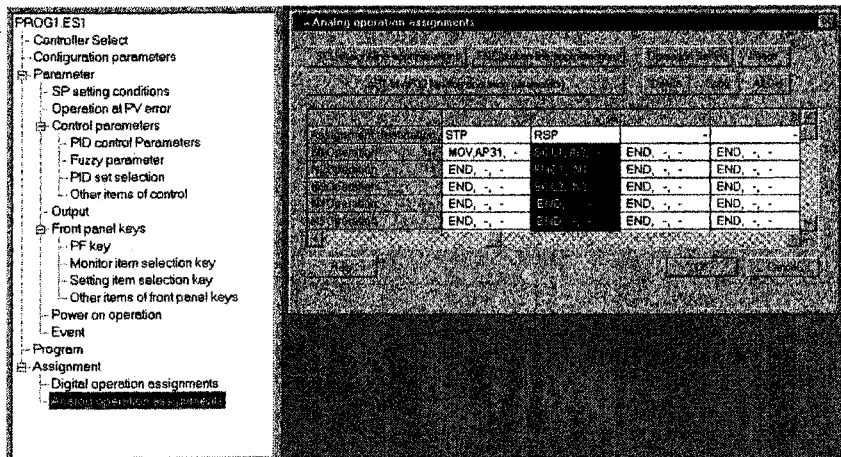


Table 6:

Assign the operation results to the set temperature (remote SP).

- (N1) Convert analog input 2 to temperature scale from normalized data using straight-line approximation1.
- (N2) Calculate the set temperature corresponding to the outside air temperature using broken-line approximation 1.
- (N3) Normalize the calculated set temperature data by the scaling of analog input 1 using straight-line approximation 2.

SCL (straight-line approximation)

is (mm)	is (mm)	is (mm)	is (mm)
0.000	-0.500	1.000	1.000
-1.999	0.000	6.000	1.000
0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000

Minimum: 0.000
Maximum: 0.000

Table 1: Characteristics of SCL1

Table 2: Characteristics of SCL2

FNC (broken-line approximation)

is (mm)	is (mm)	is (mm)	is (mm)	is (mm)	is (mm)	is (mm)	is (mm)	is (mm)	is (mm)
0.000	1.000	0.000	0.000	0.100	0.780	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 1: Characteristics of FNC1

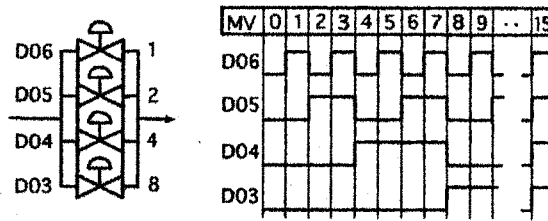
● Adjusting the manipulated variable by combining ON/OFF valves having different unit flow rates

Settable ES100 models: all models

Setting Example

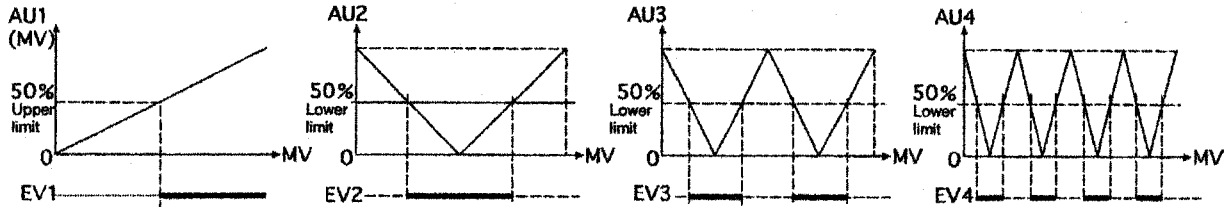
Connect ON/OFF valves having unit flow rate ratio of 1:2:4:8, and control the flow rate having an output resolution of 1/16.

→ Set digital outputs connected to valves having unit flow rate weighed at 1, 2, 4, and 8 to D06, D05, D04, and D03, respectively.



The weighting of each of these digital outputs is achieved as follows:

- (1) Store the conditions for dividing MV by weights of 1, 2, 4, and 8 to analog user buffers 1 to 4 using broken-line approximation.
- (2) Generate events 1 to 4 that take analog user buffer 1 to 4 as their input data. Change the range of hysteresis corresponding to weights.



- (3) Carry out logical operations on the event outputs in order to calculate digital outputs 6 to 3.

Details

PROG1.ES1

- Controller Select
- Configuration parameters
- Parameter
- SP setting conditions
- Operation of PV error
- Control parameters
- PID control Parameters
- Fuzzy parameter
- PID set selection
- Other items of control
- Output
- Front panel keys
 - PF key
 - Monitor item selection key
 - Setting item selection key
 - Other items of front panel keys
- Power on operation
- Event
- Program
- Assignment
 - Digital operation assignments

Analog operation assignments

AU1	AU2	AU3	AU4
MV, MV, -	FNC1, MV, -	FNC1, AU2, -	
END, -, -	END, -, -	END, -, -	
END, -, -	END, -, -	END, -, -	
END, -, -	END, -, -	END, -, -	
END, -, -	END, -, -	END, -, -	

Tables 6 to 9:
Store the conditions for dividing MV by weights of 1, 2, 4, and 8 to analog user buffers 1 to 4 using broken-line approximation.

1.000	1.000	0.500	0.000	1.000	1.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 1: Characteristics of FNC1

No.	Input	Condition	Weight	Control	Output
1	AU1	Up lim	0.10	OFF	1
2	AU2	Low lim	0.20	OFF	1
3	AU3	Low lim	0.40	OFF	1
4	AU4	Low lim	0.80	OFF	1
5	-	Up lim	0.10	OFF	1
6	-	Up lim	0.10	OFF	1
7	-	Up lim	0.10	OFF	1
8	-	Up lim	0.10	OFF	1
9	-	Up lim	0.10	OFF	1

Generate events 1 to 4 that take analog user buffer as their input data.
Change the range of hysteresis corresponding to weights.

No.	Target	Value	Unit	Control	Output				
1	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0
2	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0
3	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0
4	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0
5	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0
6	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0
7	-200	00.00	0	0.0	0.0	0.0	0.0	0.0	0.0

When a fixed value type ES100 is used, set all events 1 to 4 settings of the target banks to "50.0". When a programmable type ES100 is used, set all events 1 to 4 settings to "50.0" for all steps in target patterns. Figure show examples for a fixed value type ES100.

Operation	D03	D04	D05	D06
AND	BUF, EV1, -	XOR, D03, EV2	XOR, D04, EV3	AND, D05, EV4
END	-	-	-	-
AND	-	-	-	-
END	-	-	-	-

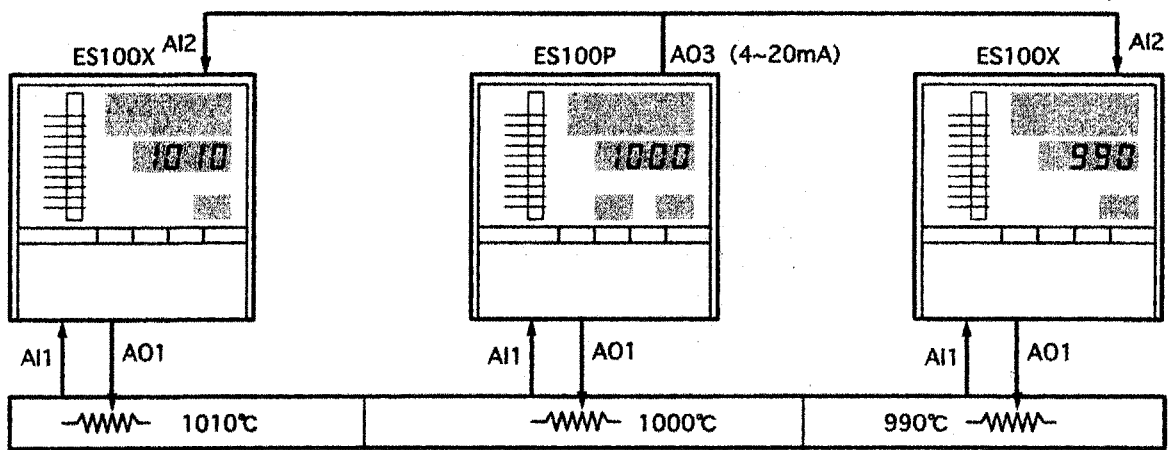
Carry out logical operations on event outputs in order to calculate digital outputs 6 to 3.

● Running by up/down shifting the set temperature of three furnaces by a fixed value

Master Model: ES100P- ** F
Slave model: ES100X- W **

Setting Example

- Control the set temperatures of points A, B, and C by shifting 10°C at a time.
 - Use a programmable type ES100 for controlling point B, and two fixed value type ES100 for controlling points A and C.
 - Output the set temperature of the programmable type controller to the two fixed value type controllers, and shift +10° at point A and shift -10° at point C at the fixed value type controllers.
- (1) With programmable type controllers, output SP to transfer output.
(2) With fixed value type controllers, assign results of shift operation to remote SP. Use analog operation parameter 1 as the values to be shifted.
- Accordingly, set the same settings for analog operation assignment for both of the two fixed value type controllers.



Details

● ES100P setting

PROG1 ES1

- Controller Select
- Configuration parameters
- Parameter
 - SP setting conditions
 - Operation at PV error
- Control parameters
 - PID control Parameters
 - Fuzzy parameter
 - PID set selection
 - Other items of control
- Output
- Front panel keys
 - PF key
 - Monitor item selection key
 - Setting item selection key
 - Other items of front panel keys
- Power on operation
- Event
- Program
- Assignment
 - Digital operation assignments

PV	AD1	AD2	AD3	STP	
MOV, AI1	MOV, MV	END	END	MOVAP31	E
END	END	END	END	END	E
END	END	END	END	END	E
END	END	END	END	END	E
END	END	END	END	END	E
END	END	END	END	END	E
END	END	END	END	END	E

Table 4:
Assign SP to the transfer output (analog output 3).

● ES100X setting

Make the same settings on both controllers.

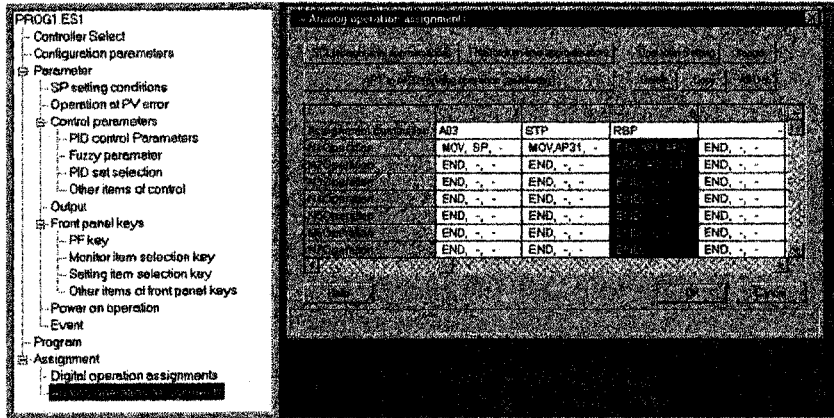


Table 6:

Assign the operation results to set temperature (remote SP)
 (N1) Calculate the %full-scale value using analog operation parameter 1 as the shift value, and analog operation parameter 2 as the full-scale value.
 (N2) Add the value calculated in N1 to analog input 2.

Analog operation parameter for point A.

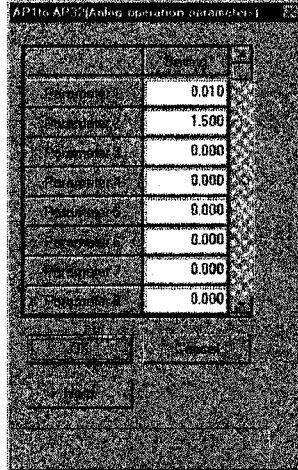


Table 1: Shift value

Table 2: Full-scale (1500 °C) value

Analog operation parameter of point C.

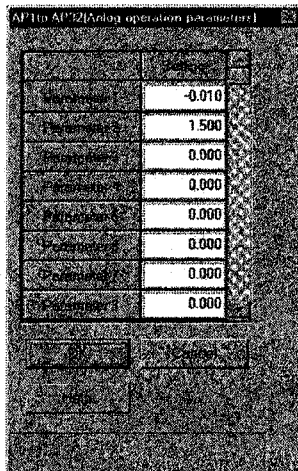


Table 1: Shift value

Table 2: Full-scale value

APPENDICES

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CORRESPONDENCE BETWEEN ES/TOOLS & ES100 PARAMETERS.....	A-6
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TROUBLESHOOTING

If you feel that ES/TOOLS is not running properly, first of all check the following:

- Make sure that the cables are properly connected.
- Make sure that power is being supplied to your PC.

Even if this does not correct operation of ES/TOOLS, take the action described for each symptom below.

- **The program does not accept alphanumerical entry.**
 - Make sure that the "Num Lock" and "Caps Lock" keys have not been pressed. If pressed, deactivate them.
 - Make sure that the keyboard cable is connected properly.

- **Power to personal computer was accidentally turned OFF while running ES/TOOLS.**
 - If you were in Setting(Offline), all settings have been lost, and cannot be recovered. To avoid this, when settings require a long period of time, make sure to save your work periodically.
 - In Transfer(PC to ES), Setting(Online), and Check control, a power interruption can destroy settings in the ES100. Always check settings of ES100 after recovering power.

- **Communication errors**
 - Make sure that your PC and the ES100 are connected properly.
 - Make sure that the ES100 was started up properly. If not, end all online functions. After confirming proper ES100 start up, restart online functions
Never turn off the power of the ES100 while using ES/TOOLS.
 - Make sure that the ES100 is ready to accept transfer of data from your PC. If not, change the status of the ES100 to accept transfer of data, and retry data transfer.
Refer to the ES100P and ES100X User's Manuals for details on ES100 status.

- **Files can not be read from disk.**
- **Files can not be saved to disk.**
 - Make sure that the disk is loaded properly.
 - Make sure that the disk is formatted. Retry using a formatted disk.
 - If ES/TOOLS cannot save its settings to disk, make sure that the disk is not write-protected.

- Can not execute printout.
 - Make sure that the printer is online.
 - Make sure that the printer has paper.

- Can not start ES/TOOLS.

- Program terminates while in progress.
 - Refer to "1.2 Operating Environment" and make sure that the operating environment is correct.

STARTUP OPTIONS

Options can be designated for arguments by using "/X" when starting up setting functions.

- How to Designate Startup Options

ESTOOLS _ "Option 1" _ "Option 2"

Note: A space must be input between options.

- Startup options and Functions

(Entry using either upper and lower case characters is accepted.)

/T

: Opens technical parameters for setting and printout.

/I

: Enable the ES100 initialize functions.

An initialization button is added to "Option" under "Online" of Setting Functions.

/n

: Starts up in online mode.



Initializing the ES100

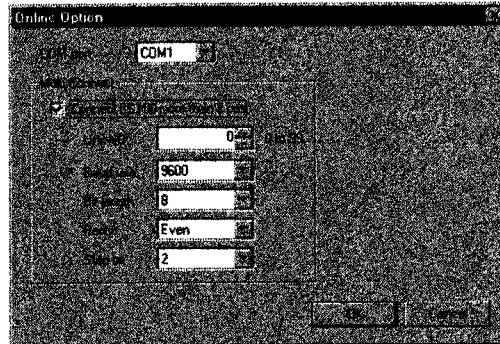
Follow the procedure below to initialize the settings of the ES100:

- (1) Connect your PC to the ES100.
- (2) Start up ES/TOOLS with the "/I" option added.
- (3) Press "Initialization" button in "Option" under "Online".
- (4) Follow the on-screen guidance.

For details on initialization mode, see the ES100 User's Manual.

ES100 MULTIPLE CONNECTIONS

When you designate multiple connections at "Online Option" under "Online" in "Setting(Offline)", your PC is set up for connection to two or more ES100 for data communications.



- Preparation

- Use the ES100□-□04□ when setting a multiple unit connections (1:N) on ES/TOOLS.
- Terminal communications is used, so the special communications cable supplied in the ES/TOOLS package cannot be used. You must prepare separate cables.

- Setting communications protocol

Set the communications protocol at "Option" under "Online" in "Setting(Offline).

Set the following items and ranges:

Unit No.	0 – 99
Baud rate	4800/9600
Bit length	7/8
Parity	None/Even/Odd
Stop bit	1/1.5/2

- Unit No. display

Target unit Nos. are displayed in "Setting(Online)" and "Check control" menus.

- Transferring settings

Designate the transfer unit Nos. in "Transfer(PC to ES)" menu, and transfer data to all designated units.

If data transfer is not successful for a certain units, cancel data transfer to that unit, and transfer data to the next unit. All units to which data transfer was not successful are displayed when data transfer to all designated units have ended.

CORRESPONDENCE BETWEEN ES/TOOLS & ES100 PARAMETERS

ES/TOOLS Menu	Parameter	ES100	
		Mode	Setting Level
Controller select	Type	(N/A)	-
	Control		
	Analog input 2		
	Heater burnout alarm		
	Terminal communications		
	Transfer output		
	External I/O		
	Control output 1		
	Control output 2		
Configuration parameters	Analog input 1 type	Specification setting mode	2
	Analog input 2 type		
	Scaling unit		
	Decimal point		
	Scaling lower limit		
	Scaling upper limit		
	Bank selection method		
	Program method		
	2-PID/2-PID + fuzzy		
	Heating-cooling/standard		
	Potentiometer input		
	Cascade/standard		
	BCD communications/digital I/O		
	Line noise reduction		
SP setting condition	Fixed SP	Adjustment mode	1
	SP setting lower limit		
	SP setting upper limit		
	SP rise rate limit		
	SP fall rate limit		
	Time unit of SP rate limits	Specification setting mode	2
	SP tracking		
Output	Control output 1 pulse cycle	Adjustment mode	1
	Control output 2 pulse cycle		
	Heater burnout alarm setting		
	ON/OFF count alarm setting		
	MV change rate limit		
Event	Input data	Event setting mode	2
	Judgement conditions		
	Hysteresis		
	Standby sequence ON/OFF		
	Operation conditions		

ES/TOOLS Menu	Parameter	ES100	
		Mode	Setting Level
Position-proportional	Position-proportional dead band	Adjustment mode	1
	Switching output hysteresis		
Operation at PV error	MV at PV error (not position-proportional)	Specification setting mode	2
	MV at PV error (position-proportional)		
Front panel keys	PF1 key type	Specification setting mode	2
	PF2 key type		
	Monitor items 1 to 8		
	Setting items 1 to 8		
	Bar graph display item		
	Display refreshing cycle		
	Key protect		
Secondary loop	Secondary loop fixed SP	Adjustment mode	1
	Secondary loop P		
	Secondary loop I		
	Secondary loop D		
	Secondary loop manual reset		
	Secondary loop Direct/Reverse action	Specification setting mode	2
Technical parameters	2-PID control parameter α	Technical mode (level 2)	2
	2-PID control parameter β		
	Fuzzy scale 1 adjustment		
	Fuzzy scale 2 adjustment		
	Fuzzy I coefficient adjustment		
	Fuzzy adjustment bandwidth		
	Fuzzy SP change judgement value		
	A.T. calculated gain		
	Limit cycle MV range		
	Temporarily A.T. execution judgement deviation		
	Number of limit cycles		
	PV tracking		
	Manual output method		
	Manual MV preset value		
	Balance rate at PD operation		
	Cold junction compensating method		
Digital input response time			
External No. selection setting time			

ES/TOOLS Menu	Parameter	ES100	
		Mode	Setting Level
Control parameters	P	PID set setting mode	1
	I		
	D		
	MV lower limit		
	MV upper limit		
	PV bias value		
	Automatic selection range upper limit		
	Fuzzy strength	Adjustment mode	
	PID set selection data	Specification setting mode	2
	PID set selection hysteresis		
	Cooling coefficient	Adjustment mode	1
	ON/OFF control hysteresis		
	Manual reset		
	Direct/Reverse action	Specifications setting mode	2
Power on operation	Operations at power ON	Specification setting mode	2
Communications	Unit No.	Specification setting mode	2
	Baud rate		
	Bit length	Technical mode (level 2)	
	Parity		
	Stop bit		
Position-proportional 2	Travel time	Specification setting mode	2
Bank (SP setting) : Fixed SP controller	Local SP	Bank mode	1
	Bank time		
	PID set No.		
	Events 1 to 10 settings		
	Program time unit	Specification setting mode	2
Program : Programmable controller	One-shot pulse width	Program setting mode	1
	Local SP		
	Step time		
	PID set No.		
	Wait code		
	Events 1 to 10 settings		
	Time signals 1 to 10		
	PV start		
	End condition		
	End step No.		
	Pattern repeat count		
Pattern link destination No.			

ES/TOOLS Menu	Parameter	ES100	
		Mode	Setting Level
Program : Programmable controller	Program time unit	Specification setting mode	2
	Wait width		
	Wait time		
	One-shot pulse width	Technical mode (level 2)	
	Pattern versus PV lag reduction		
	Pattern No. at reset		
Digital operation assignment	Assignment destination	Digital operation assignment setting mode	2
	Operations of N1 to N4		
	Argument 1 of N1 to N4		
	Argument 2 of N1 to N4		
	Timing run/reset input	ON/OFF timer setting mode	
	Timing run/hold input		
	Time unit		
	ON time		
	OFF time		
Analog operation assignment	Assignment destination	Analog operation assignment setting mode	2
	Operations of N1 to N15		
	Argument 1 of N1 to N15		
	Argument 2 of N1 to N15		
	Straight-line approximation inputs 1,2	Technical mode (level 1)	1
	Straight-line approximation outputs 1,2		
	Broken-line approximation inputs 1 to 10		
	Broken-line approximation outputs 1 to 10		
Analog operation parameters 1 to 32			

HANDLING ES100 CONTROLLER VER.1.0

How to Handle ES100 Controller Ver.1.0

We advise using the ES/TOOLS(for Windows) and ES100 controller Ver.2.0.

However, ES100 controller Ver.1.0 or file of ES/TOOLS Ver.1.0 (MS-DOS version) can be used if the following conditions are observed.

However, ES/TOOLS(for Windows) can be used for ES100 controller Ver.1.0 and the files created by ES/TOOLS(MS-DOS version) Ver.1.0 with the following conditions.

- ES/TOOLS(for Windows) can also be used for ES100 controller Ver.1.0.
However, note that the functions added to ES100 controller Ver.2.0 can not be used.
- ES/TOOLS(for Windows) can utilize file data created by using ES/TOOLS Ver.1.0 (MS-DOS version).

However, note that when the version of the target ES100 controller is Ver.2.0, the version No. of files to be utilized must be changed to "Ver.2.0".

How to Check the Version No. of the ES100 Controller

There are two ways of checking the version No. of the ES100.

- At the "**Setting(Online)**" and "**Check control**"

The version No. is displayed in the status bar of the window.

- At the "**Setting(Offline)**"

The version No. is read and displayed by pressing "Read" button in the "**Controller Select**" settings dialog box.

How to Change the File Version No. of the ES100

To change file version No., execute "Version" item under the "**Controller Select**" settings dialog box in "**Setting(Offline)**".

How to Handle Data created with the ES/TOOLS (MS-DOS version)

Data created with the ES/TOOLS (MS-DOS version) can be used as it is.

Data created with the Windows version can also be used with the MS-DOS version.

In this case, however, note the following:

- File name length

File names are limited to 8 characters (excluding file extensions) for the ES/TOOLS (MS-DOS version).

The Windows version allows file names of up to 256 characters. However, these file names must be 8 characters or less if the Windows version to be used with the MS-DOS version.

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OMRON CORPORATION

Industrial Automation Company

Measuring and Supervisory Controls Department
Shiokoji Horikawa, Shimogyo-ku,
Kyoto, 600-8530 Japan
Tel: (81)75-344-7080/Fax: (81)75-344-7189

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69, NL-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC

1 East Commerce Drive, Schaumburg, IL 60173
U.S.A.
Tel: (1)847-843-7900/Fax: (1)847-843-8568

OMRON ASIA PACIFIC PTE. LTD.

83 Clemenceau Avenue,
#11-01, UE Square,
239920 Singapore
Tel: (65)835-3011/Fax: (65)835-2711

OMRON CHINA CO., LTD.

BEIJING OFFICE
Room 1028, Office Building,
Beijing Capital Times Square,
No. 88 West Chang'an Road,
Beijing, 100031 China
Tel: (86)10-8391-3005/Fax: (86)10-8391-3688

OMRON

Authorized Distributor: