Digital
Human Machine Interface

Pro-face®

MES Action for Pro-Server EX

Reference Manual

PREFACE

Thank you for choosing 'MES ACTION for Pro-Server EX by Digital Electronics Corporation' (herein referred to as MES ACTION).

Please read this manual and the reference manuals thoroughly before use to understand how to operate this product safely and correctly.

Please be sure to keep the manuals handy at all times.

NOTE

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November, 2008 Digital Electronics Corporation

MES ACTION Reference Manual

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TRADEMARK RIGHTS

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This product omits individual descriptions of each of these rights.

Trademark/Trade Name	Right Holder
Microsoft, Windows, Windows XP Windows 2000, Windows Server 2003, Windows Explorer Microsoft .NET Framework Microsoft Internet Explorer SQL Server 2005 Express Edition	Microsoft, U.S.
Intel, Pentium, MMX	Intel, U.S.
Pro-face Pro-Server EX	Digital Electronics Corporation
PC/AT	IBM, U.S.

DESCRIPTION RULES

■ Safety Symbols and Terms

This manual uses the following symbols and terms for precautions on how to operate 'MES ACTION' correctly. The following precautions represent important safety information. For those symbols and descriptions, see the table below.

Display	Description
⚠WARNING	Incorrect operation resulting from negligence of this instruction may result in serious injury or death.
⚠CAUTION	Incorrect operation resulting from negligence of this instruction may cause injury or property damage.
	Indicates instructions/procedures that MUST be performed to ensure correct product use.
	Indicates actions/procedures that should NOT be performed.
IMPORTANT	Failure to follow the description/instructions accompanied by this symbol may result in malfunction of the equipment or disappearance of data.

■ Abbreviation

This manual uses the following abbreviation for the terms repeatedly used in this manual.

Abbreviation	Name
GP	Digital Programmable Display (GP3000 Series, GP2000 Series, WinGP)/Graphic Logic Controller (GLC)/Factory Gateway
GP Series	Programmable Display (GP2000 Series) / Graphic Logic Controller (GLC) / Factory Gateway
GP3000 Series	Digital Programmable Display (GP3000 Series)
OS	Operating system
PLC	Programmable Logic Controller
WinGP	Digital Programmable Display (PS Series)
LT3000	Digital Programmable Display (LT3000 Series)
PC	Personal Computer

⚠ CAUTION

■ Disk Handling

To prevent errors and/or disk damage, follow the instructions below.

- DO NOT touch the recording side of the CD-ROM.
- DO NOT remove the CD-ROM while the disk drive light is ON.
- DO NOT store the disk in an area exposed to the extreme high or low temperatures and/or high levels of moisture or dust.

⃠ DO NOT turn off the main power to the PC while the program is running.

■ How to Read the Manual

Manual Configuration

This manual describes how to operate "MES ACTION".

Please also refer to the related manual (Pro-Server EX Reference Manual).

1 Outline of MES ACTION

1 Outline of MES ACTION

MES ACTION provides the "Data Collection" functions defined in MES (Manufacturing Execution System). Companies will collect and save data for the purpose of analyzing data to solve a problem. Through data analysis, they can understand what happened. After understanding what happened, they can understand why it happened. After understanding why, they can expect what will happen next, and understand what to do.
MES ACTION offers basic data required for companies to analyze data. Furthermore, by using the analyzing and reporting functions of SQL Server 2005, MES ACTION can visualize information.

1.1 Using SQL Server 2005 Express Edition for Database Server

SQL Server 2005 Express Edition is a database designed based on Microsoft SQL Server 2005, aiming for quick development of database applications. Introduction of SQL Server 2005 Express Edition provides the following features:

1 Quick Database Application Development

In close combination with Visual Studio 2005, SQL Server 2005 Express Edition enables simplified development of excellent database applications.
All tasks such as table definition and data addition can be performed with Visual Studio 2005 . Security is intensified, and data allocation speed is increased. If the user needs more advanced functions, it can be smoothly upgraded to a higher edition.
Since SQL Server 2005 Express Edition is available free of charge, many users can use the SQL Server 2005 database engine. As a free database, MSDE 2000 has already been supplied. However, SQL Server 2005 Express Edition, which is positioned as a successor to MSDE 2000, is improved in various functions, such as database application development and management, in comparison with MSDE 2000.
Furthermore, SQL Server 2005 Express Edition simplifies database management by using SQL Server Management Studio Express, a new tool specialized in basic database management tasks.

2 Creating Report

In close combination with SQL Server 2005 Reporting Services, SQL Server 2005 Express Edition enables you to create excellent reports easily by using tables, charts and images. However, to use this function, you must install IIS (Internet Information Service) on your PC.

1.2 Operating Environment

The hardware and software requirements for execution of MES ACTION are listed below:

PC	IBM-PC and PC/AT compatible
Processor	Intel Pentium III processor 600MHz or more, or compatible processor (1GHz or more recommended)
Memory Requirements	512MB or more (1GB or more recommended)
Hard Disk Capacity	Available capacity: 600MB
Suppported Operating System	Microsoft Windows Server 2003 R2 Microsoft Windows Vista (Ultimate Edition/Home Premium Edition/Home Basic Edition/Business Edition/Enterprise Edition) Microsoft Windows XP Professional Edition SP2 Microsoft Windows 2000 Professional Edition SP4 Microsoft Windows 2000 Server Edition SP4
Other Software	SQL Server 2005 Express Edition (Only SP2 or later is compatible with Windows Vista) SQL Server Management Studio Express (Only SP2 or later is compatible with Windows Vista) Microsoft .NET Framework 2.0 Pro-Server EX V1.20 or later version * The SP2 version is applied to "SQL Server 2005 Express Edition" and "SQL Server Management Studio Express", which are included in this product.

IMPORTANT
- SQL Server 2005 Express Edition with Advanced Services incorporates the functions of both SQL Server 2005 Express Edition and SQL Server Management Studio Express.
- When using SQL Server Management Studio Express, log on to Windows using the administrator's account.

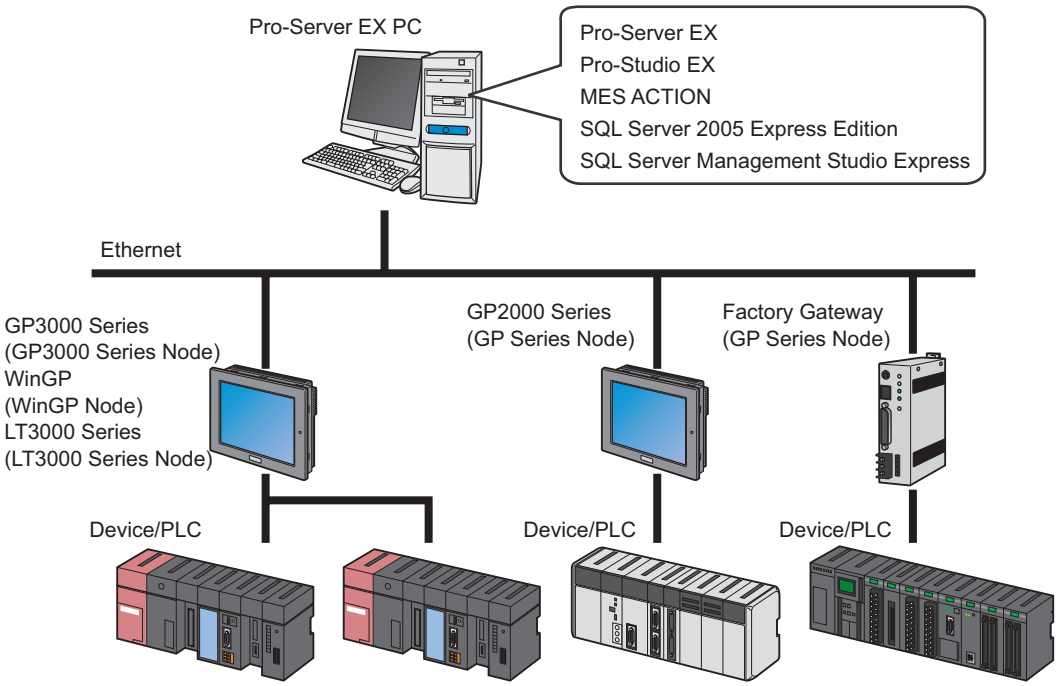
NOTE
- Since 'Pro-Server EX V1.23' supports 'SQL Server SP1', you do not need to upgrade the installed 'SQL Server SP1' to SP2.
- To upgrade the installed 'SQL Server' to the SP2 version, refer to "6.1.2Upgrading SQL Server".

1.3 System Configuration and System Required

MES ACTION is comprised of the following three functions:

- MES ACTION (Operates as a part of Pro-Server EX)
- SQL Server 2005 Express Edition
- SQL Server Management Studio Express

An example of the MES ACTION configuration (including hardware and software) is shown below.



IMPORTANT • SQL Server 2005 Express Edition and Pro-Server EX must be installed on the same PC.

1.4 Features of MES ACTION

In today's production fields, automation and IT promotion have improved equipment availability and productivity. Accordingly, it comes to be essential to ensure uniform product qualities and stable operations of equipment through prediction and preventive maintenance as the next step.

To ensure uniform product qualities and stable operations of equipment, we must conduct data analysis by collecting and saving process data. Furthermore, we must effectively transfer process data from local points in a factory to a quality control place.

MES ACTION is the data collection tool that can meet such needs. In combination with the data analyzing and reporting functions of SQL Server 2005, MES ACTION enables intensified data analysis.

1 Using SQL Server 2005 Express Edition for the database server

Process data and actual data collected by MES ACTION are saved in the database server. MES ACTION uses SQL Server 2005 Express Edition for the database server. SQL Server 2005 Express Edition is an advanced database server available free of charge, which is suitable as an entry database server.

For the MES ACTION database server, the right version of SQL Server 2005 Formal Edition is also available.

2 Collecting process data and actual data through engineering unit conversion

The MES ACTION data collecting functions collect symbol data and device data managed with Pro-Server EX at a specified cycle or status change, and save the collected data in SQL Server 2005 Express Edition. The collected process data and actual data can be related with each other by using time stamps.

Thus, the system can automatically monitor X-R control charts by using the data saved in SQL Server 2005 Express Edition on-line.

For example, MES ACTION enables real-time monitoring of an abnormal value that exceeds a control limit, or abnormal trend such as continuous up/down, to stop the relevant lot or device, or to send a message to a registered engineer by e-mail.

a) Process Data Collection

The Process Data Collection ACTION collects specified symbol data and device data from a specified starting time to a specified ending time, or at a specified time or cycle (unit: minute), and saves the collected data into the database. The database table is created by the day.

When saving collected data into the database, MES ACTION can execute scale conversion, control limit detection, bit data-string relation conversion, depending on the tag type.

b) Actual Data Collection

The Actual Data Collection ACTION collects symbol data and device data by event (status change or time to start/stop data collection), and saves the collected data into the database.

As with the Process Data Collection ACTION, the collected data can execute scale conversion and control limit detection. If planning data are linked with the actual data, an achievement ratio can be calculated from a value specified in the planning system.

c) Scale conversion

SQL Server 2005 Express Edition can create a stored procedure in a .NET language by using SQLCLR. (For the SQLCLR function, refer to SQL Server 2005 Express Edition operation manual.)

The Data Collection ACTION creates a scale conversion stored procedure with SQLCLR functions. The scale conversion stored procedure processes an input value according to the condition specified in the I/O signal condition (BCD conversion, masking by specified bit length, etc.), and executes scale conversion between the input range and output range.

If the I/O signal condition is set to "None", the ACTION executes real number conversion processing (The real number conversion processing converts an integer number into a real number with specified decimal places). If the I/O signal condition is set to "String", a numeric value can be converted into a character string.

3 Collecting alarm history, sampling data and other data from GP SRAM or CF card

MES ACTION can effectively save alarm history and sampling data that have been stored in the GP SRAM into SQL Server 2005 Express Edition.

Furthermore, MES ACTION reads alarm history files, sampling data files and GP screen files that have been stored in the CF card, and saves the files into the SQL Server 2005 Express Edition. The collected files can be deleted from CF card, thus enabling effective use of the CF card.

a) Alarm History Collection

The Alarm History Collection ACTION saves alarm logs that have been stored in the GP SRAM and CF card into the database.

To eliminate duplication of alarm history, Alarm History Collection ACTION reads alarm logs at a specified cycle, and compares the read data with the previous data to save the read data into the database by deleting duplicated data.

b) Sampling Data Collection

The Sampling Data Collection ACTION collects sampling data that have been stored in the GP SRAM and CF card at a specified cycle, and saves the collected data into the database.

c) GP Screen File Collection

Save the JPEG files, which have been stored in the CF card after capturing GP screens, into SQL Server 2005 Express Edition.

Because a JPEG file has a large volume, the user can select the file saving method ("Folder Specification" or "In Database") to save screen files. To back up captured data time stamps, the system collects screen files in the event collection mode, and saves the timestamps at occurrence of events.

Folder Specification:	Only file names are saved in the database. Contents of screen files are saved in another folder.
In Database:	Image data are saved in the database.

NOTE

- If a screen file is saved in the [In Database] mode, the data volume stored in the database increases. Therefore, it is recommended to use SQL Server of the standard or higher version.

4 Transferring image data and CSV data with a single action

The Composite Document Recipe Transfer ACTION can solve a recipe transfer problem about download to several media.

In addition to the function for setting a receipt for device data, the Composite Document Recipe Transfer ACTION provides the function that enables batch transfer of text files and image file with a single Action. GP3000 and WinGP support this function.

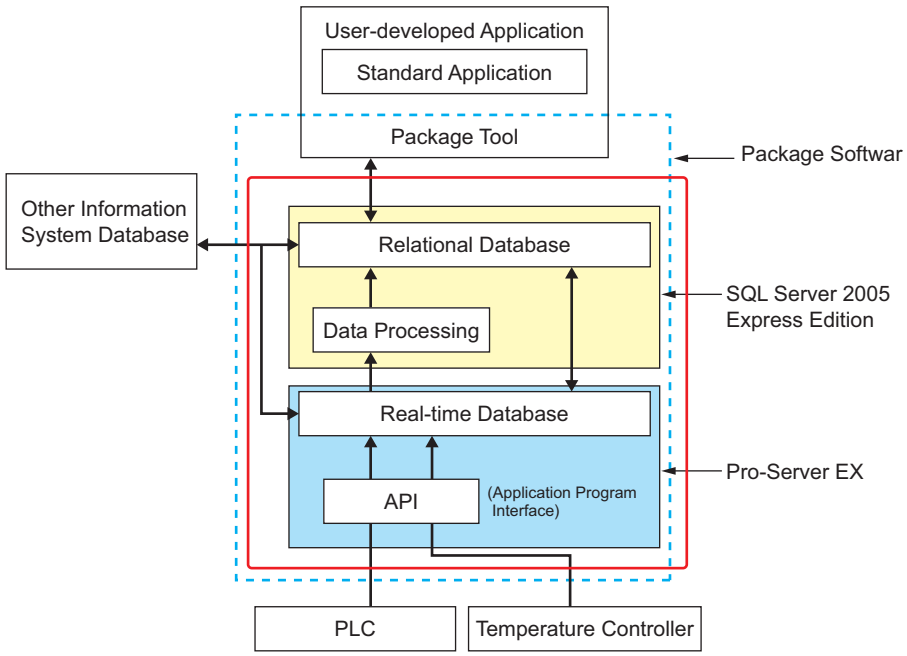
1.5 Functional Configuration of MES ACTION

MES integrates a manufacturing plan obtained from an operation system and the information on product lot, equipment and quality entered in the filed by using factory/product models that have been registered in the system, to provide various data on actual performance and qualities of products and equipment and output reports based on such data.

1.5.1 MES ACTION system configuration

As the ACTION functions of "Pro-Server EX", MES ACTION collects process data and actual data collected by GP, and alarm and event information created in GP, and saves the data into the database server (SQL Server 2005 Express Edition).

The following figure shows the position of the MES ACTION functions in MES.



1.5.2 Outline of MES Data Collection ACTION

This section describes how the "Data Collection" functions defined in MES is implemented by Pro-Server EX and MES ACTION, as follows:

Required function	Implementation method
On-line connection with a device	Pro-Server EX keeps the device on-line.
POP (Point of Production)	Implemented by MES Actual Data Collection ACTION.
Real-time processing and measurement data collection	Implemented by MES Process Data Collection ACTION.
Parameter information (Recipe)	Composite Document Recipe Transfer ACTION downloads recipe data stored in SQL Server 2005 Express Edition into a connected GP or PLC.
Control system interface	OPC server (GP and PLC) provided by Pro-Server EX , and ADO.NET 2.0 (database) provided by .NET 2.0 can be used as the control system interface.
Storage of actual data, progress data and quality data	Actual data are saved in SQL Server 2005 Express Edition.
Production data recording	Production data can be recorded with the report service and report builder functions of SQL Server 2005.

MES ACTION is classified into the following two categories: "Data Collection ACTION" and "Recipe Setting ACTION".

■ Data Collection ACTION

Data Collection ACTION is the function to collect equipment operation status and alarm history data. MES ACTION provides the following Data Collection ACTIONs:

- Process-Data-/Actual-Data-Collection ACTION
- GP SRAM Alarm-History-File Collection ACTION
- GP CF-card Alarm-History-File Collection ACTION
- GP SRAM Sampling-Data Collection ACTION
- GP CF-card Sampling-Data-File Collection ACTION
- GP CF-card Screen-File Collection ACTION

Data Collection ACTION provides the DESIGN mode and RUNTIME mode: The DESIGN mode registers setting information via the graphical user interface (herein referred to as GUI) registered in Pro-Studio EX ACTION. The RUNTIME mode calls setting information at a specified cycle or status change as specified in the Pro-Studio EX DESIGN mode, to execute each Data Collection ACTION.

■ Recipe Setting ACTION

Recipe Setting ACTION is the function to download parameters to a connected device such as GP and PLC. MES ACTION provides the following Data Collection ACTIONs:

- Recipe Data Download ACTION
- Composite Document Recipe Transfer ACTION

Recipe Collection ACTION provides the DESIGN mode and RUNTIME mode: The DESIGN mode registers setting information via GUI registered in Pro-Studio EX ACTION. The RUNTIME mode calls setting information at a specified cycle or status change as specified in the DESIGN mode, to actually execute the parameter setting.

2 Before Using MES ACTION

2 Before Using MES ACTION

2.1 Installing SQL Server 2005 Express Edition

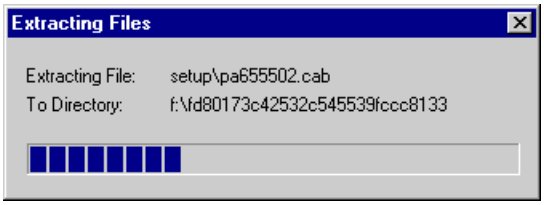
IMPORTANT

- If you have any question about the contents and operations of Microsoft SQL Server 2005 Express Edition, or about the contents of this manual, contact DIGITAL SUPPORT (see "7 Inquiry"). For other questions, contact Microsoft at the following site:

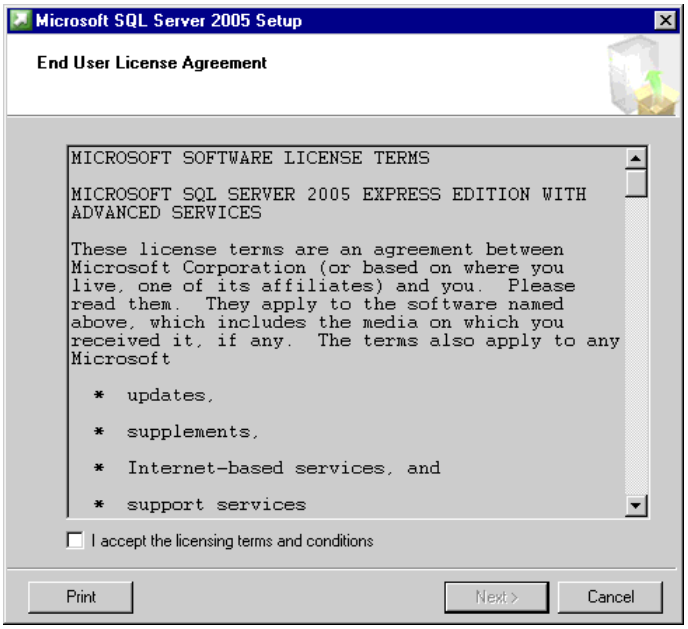
  http://www.microsoft.com/sql/editions/express/default.mspx (as of January, 2007)

2.1.1 Installing SQL Server 2005 Express Edition

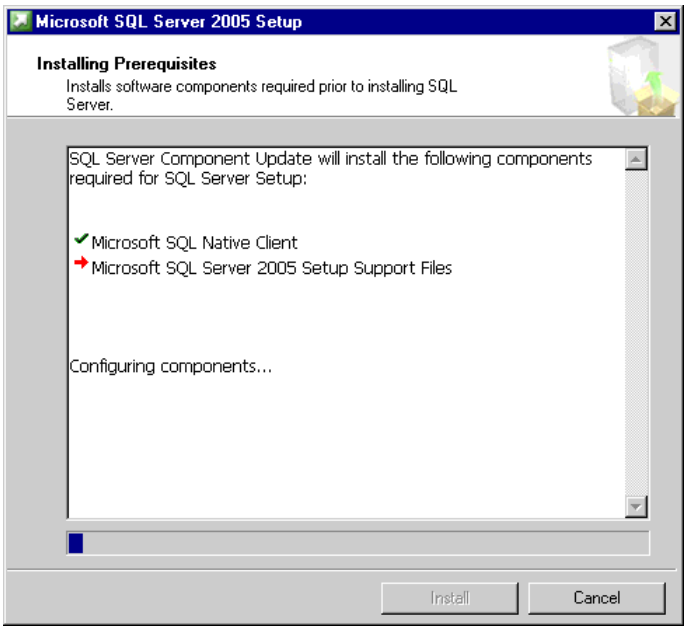
1 Double-click on "SQLEXPR_ADV.EXE" (self-decompression package that stores both SQL Server 2005 Express Edition and SQL Server Management Studio Express). The self-decompression package starts decompressing.



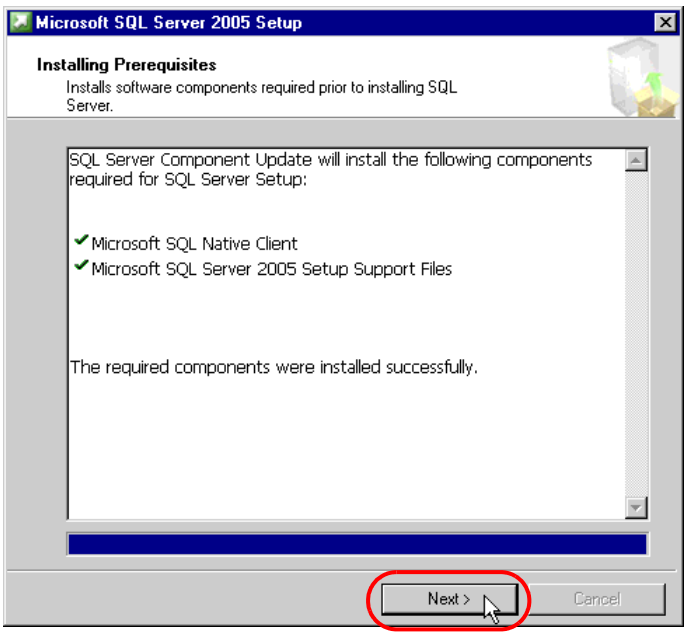
2 Check [I accept the licensing terms and conditions] , and click [Next] .



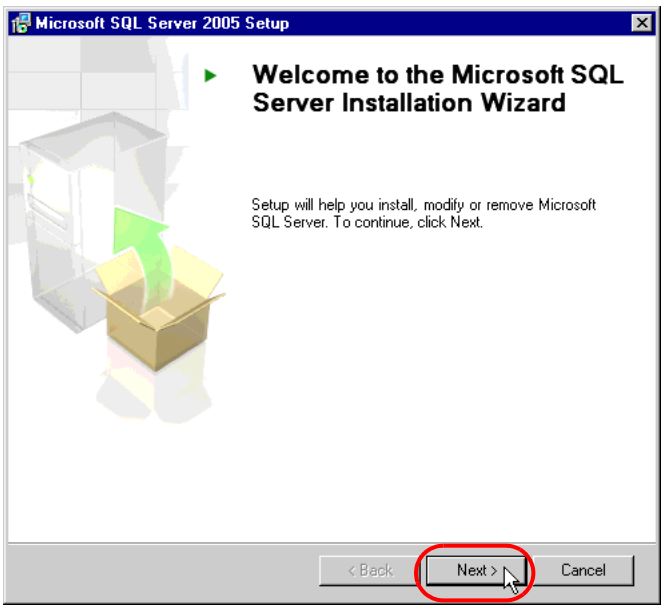
3 A required component is displayed in the setup dialog box. Click [Install] to install the component.



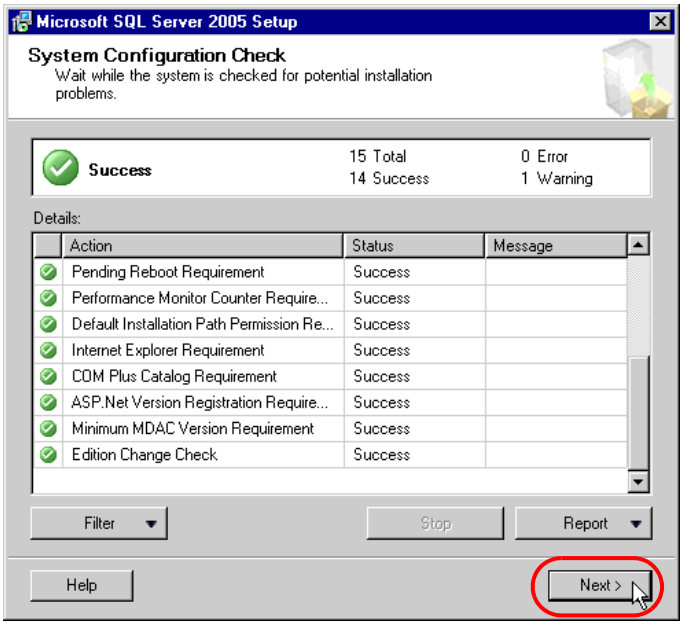
4 When installation is complete, click [Next] .



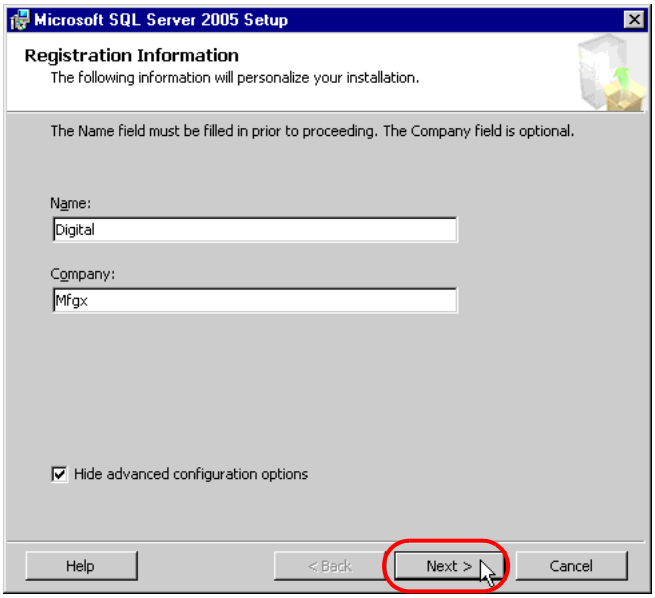
5 The Microsoft SQL Server Install Wizard starts. Click [Next].



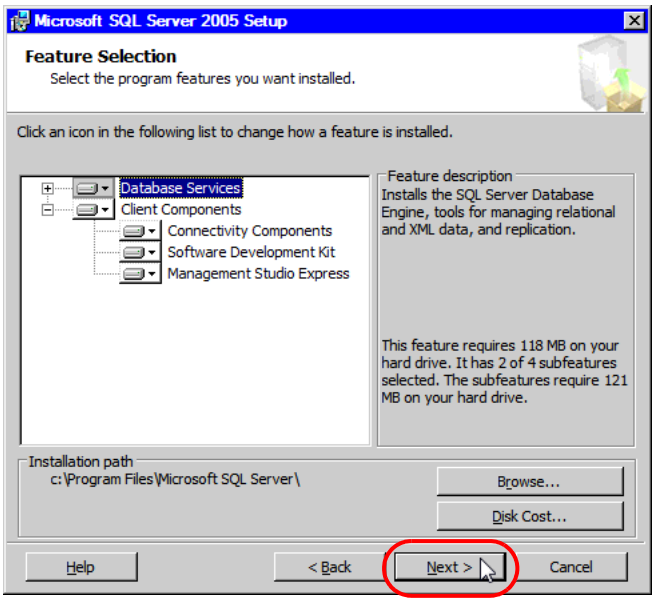
6 The system configuration check starts. When installation is complete, click [Next] .



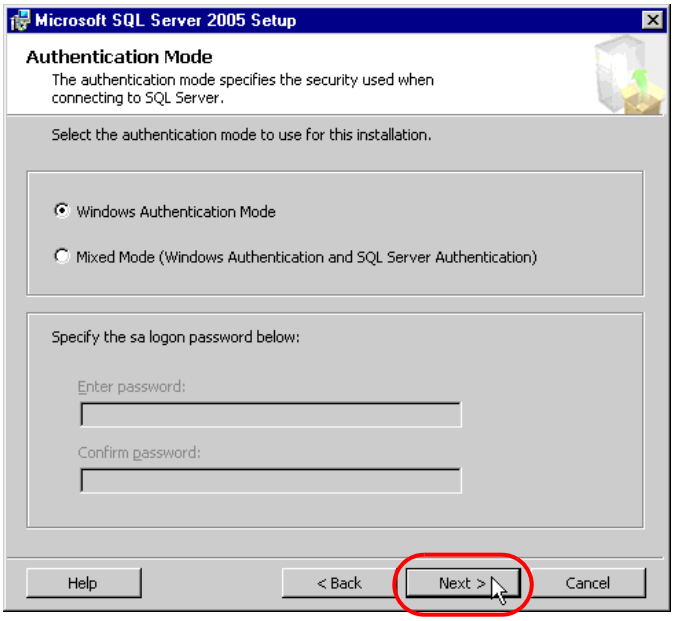
7 When preparations for installing SQL Server 2005 Express Edition are complete, the user information registration screen appears. Enter [Name] and [Company], and click [Next] .



8 The system prompts you to select the functions to be installed. Install all client components. Click [Connectivity Components] under [Client Components], and then click [Install to Local Hard Drive] in the displayed menu. For [Software Development Kit] and [Management Studio Express], perform the same procedure, and click [Next].



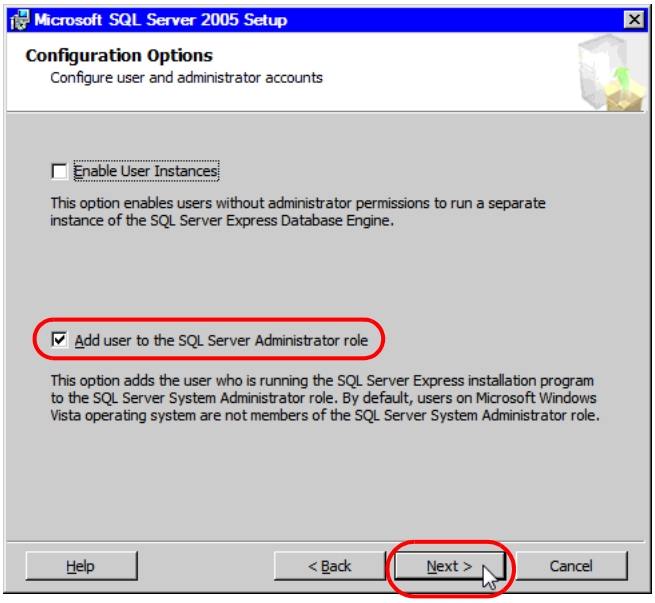
9 Select [Windows Authentication Mode] in the authentication mode settings, and click [Next].



NOTE

- With the Windows authentication mode, SQL Server relies on the Windows login user account to permit user's access. On the other hand, with the SQL Server authentication mode, SQL Server independently authenticates a user's account to permit user's access, regardless of Windows authentication.

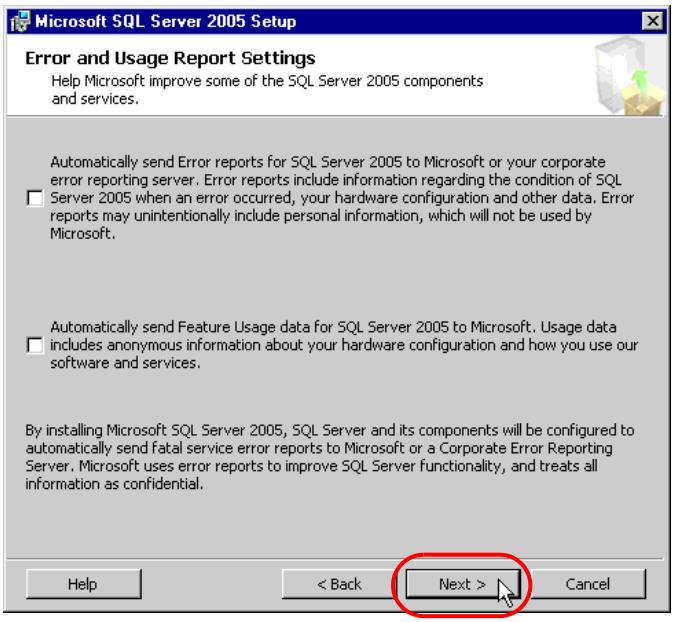
10 Set the configuration option. Check the [Add user to the SQL Server Administrator role] option and click [Next].



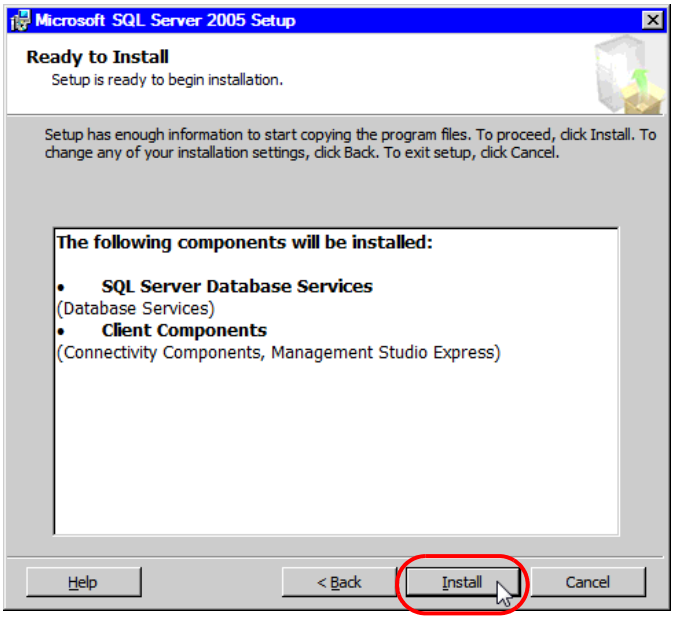
IMPORTANT

- If you install the program without checking it, MES ACTION will not operate properly.

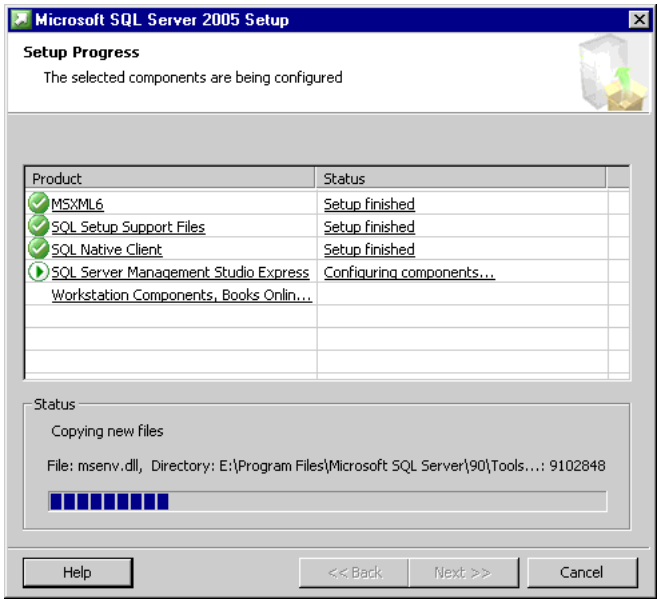
11 You can send an error and operating status report to Microsoft. In this example, leave the current setting and click [Next].



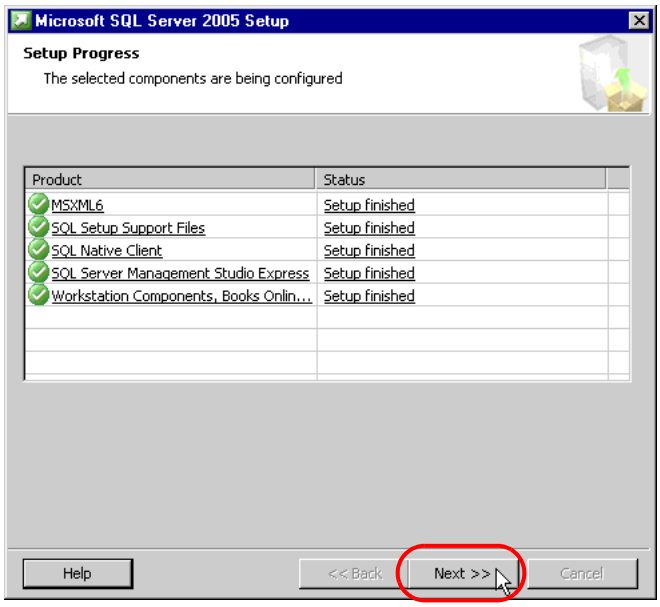
12 This completes preparations for installing SQL Server 2005 Express Edition. Confirm the component to be installed, and click [Install] .



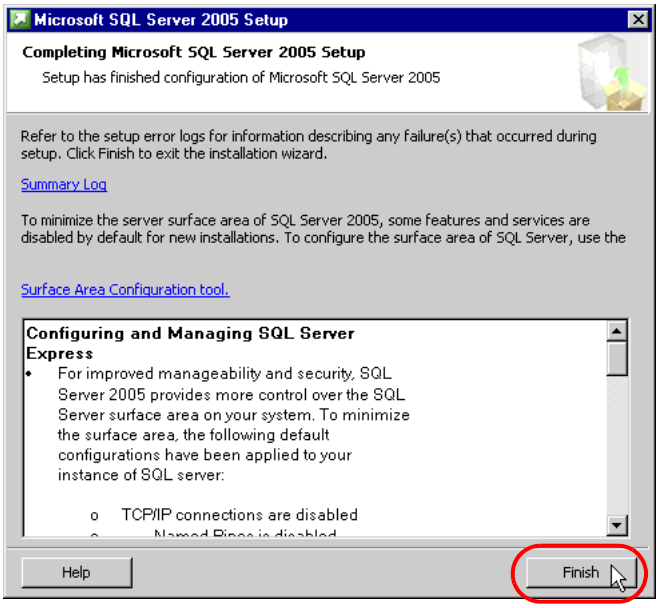
13 The setup starts, and setup status of each product is displayed.



14 When the setup is complete, click [Next].



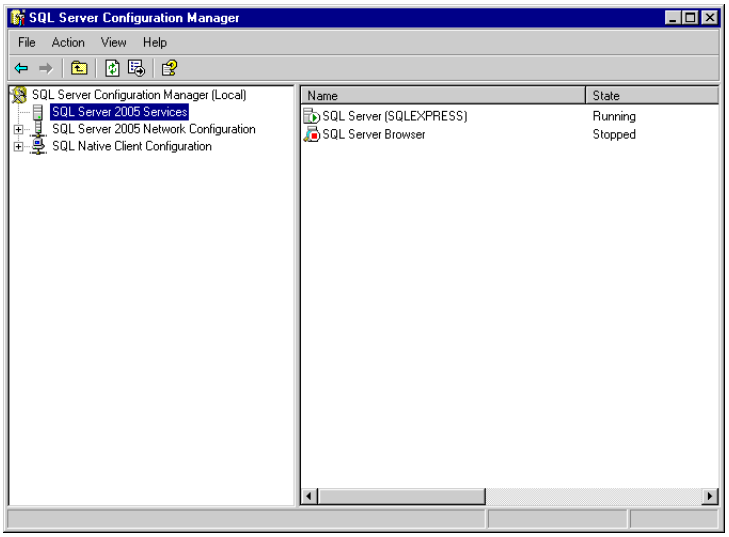
15 The system indicates that the setup is complete. Click [Finish], and close the setup dialog box.



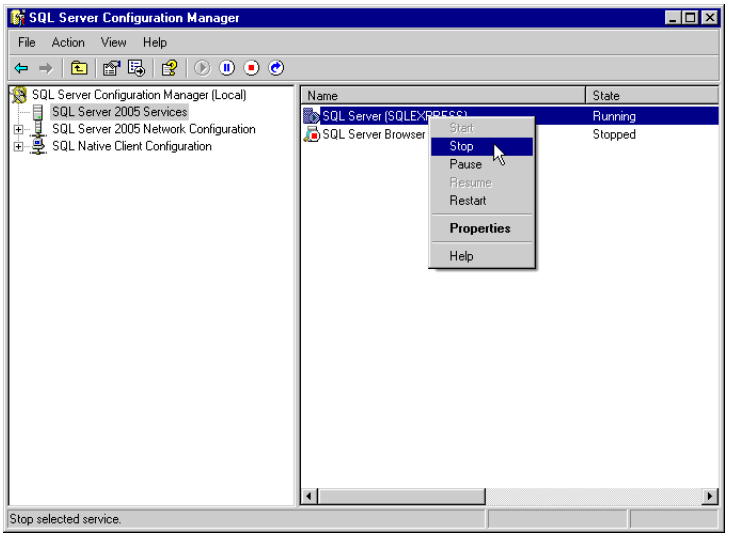
2.1.2 Starting and Stopping the Service

Because MES ACTION uses SQL Server 2005 Express Edition, SQL Server 2005 Express Edition must be operated as a Windows service. The service starting and stopping procedures are described below.
To start and stop the service, open SQL Server Configuration Manager to select the corresponding component, and run the component in the Start menu.

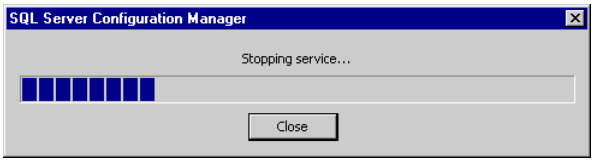
1 Select [All Programs] (or [Programs], depending on your OS) from the [Start] menu, and click [SQL Server Configuration Manager] under [Configuration Tool] of [Microsoft SQL Server 2005] to open SQL Server Configuration Manager.



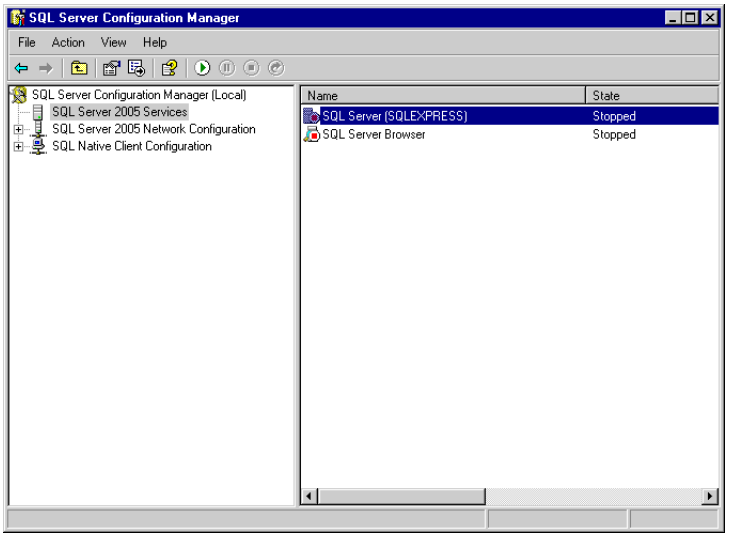
2 To stop the service, click [SQL Server 2005 Services] on the left pane. Right-click on [SQL Server (SQLEXPRESS)] under the server service list on the right pane, and click [Stop].



3 When the database engine is stopped, the SQL Server Agent service automatically stops, and the "Service Stop" dialog box appears. Click the [Yes] button. Until the service stops, the "Stopping service" message is displayed.



4 When the service stops, the [SQL Server (SQLEXPRESS)] icon in the service list on the right pane changes to indicate the stop status.



5 As the service has stopped, right-click again and select [Start] to start the service. To restart the service, click [Restart].

NOTE • You can also start or stop the service using the toolbar ( ) on the top of the screen.

2.2 Attaching MES ACTION database to SQL Server 2005

MES ACTION operates with the setting data stored in the "MESActionDB" table in the database.
The data collected by MES ACTION will be also stored in "MESActionDB".
When MES ACTION is installed, the MESActionDB database will be copied into the installation folder.
However, this database cannot be used in the current status. This database must be attached to SQL Server, so that SQL Server recognizes the database.
The procedure for attaching the MES ACTION database is described below.

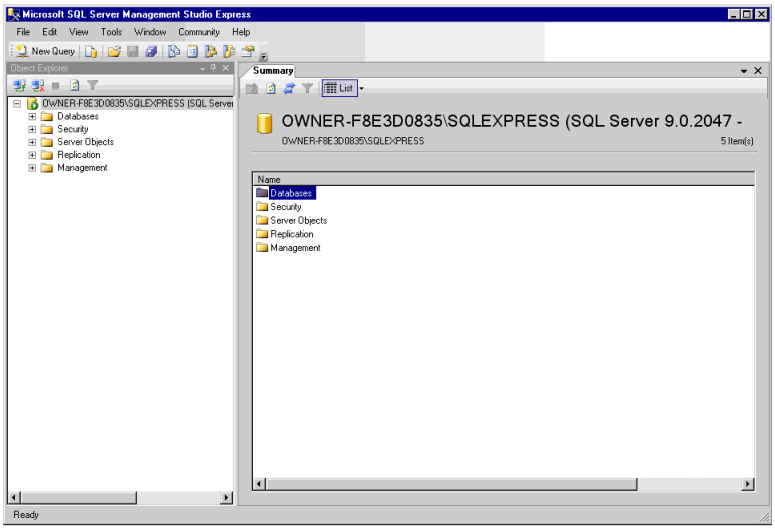
IMPORTANT • To perform the following procedure, log on to Windows with the administrator's account.

2.2.1 Starting SQL Server Management Studio Express

1 To start SQL Server Management Studio Express, select [All Programs] (or [Programs], depending on your OS) from the [Start] menu, and click [SQL Server Management Studio Express] under [Microsoft SQL Server 2005].

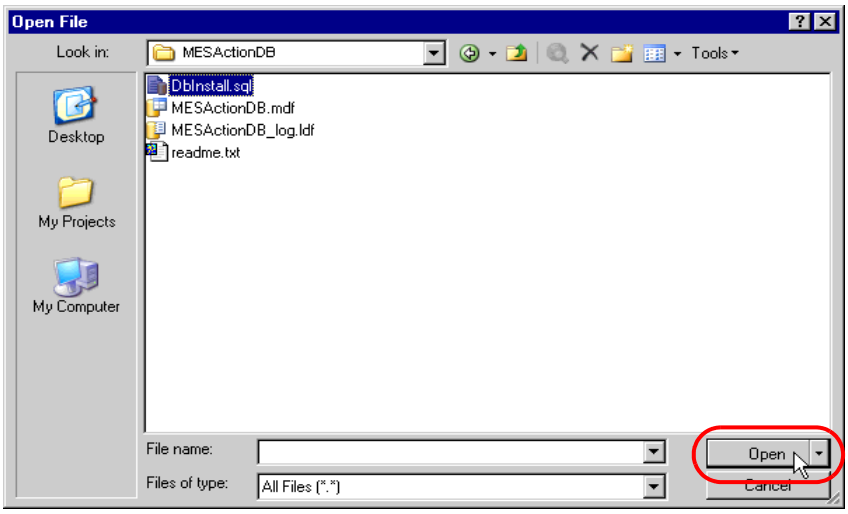
2 Select [Database Engine] under the server type, and specify the server name, authentication method and login account to log into SQL Server. Enter "localhost\sqlexpress" for [Server name], select [Windows Authentication] for [Authentication], and click [Connect].
If you select [SQL Server Authentication] for [Authentication], specify the user name (sa login) and password, and click [Connect].

3 When the SQL Server login procedure is complete, the following "Microsoft SQL Server Management Studio Express" screen appears.

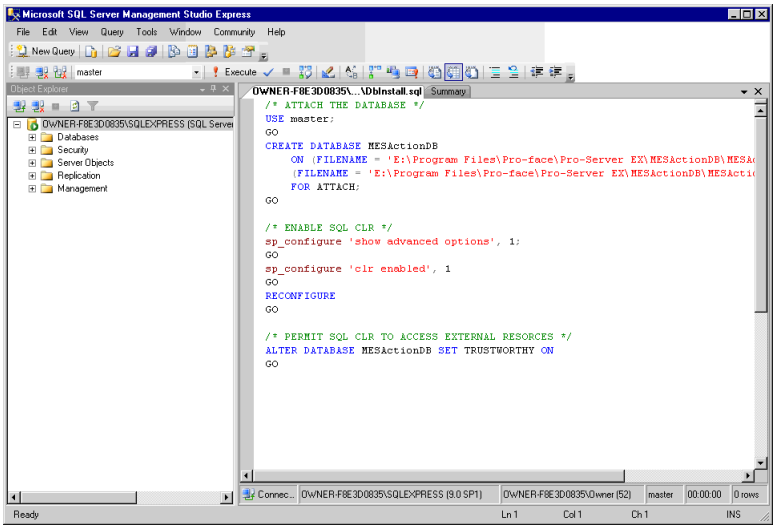


2.2.2 Attaching MESActionDB

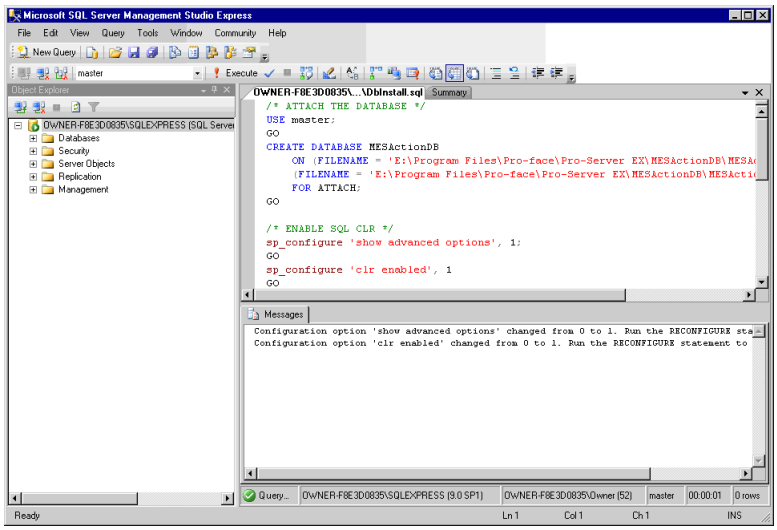
1 Select [Open] from the [File] menu of SQL Server Management Studio Express, click [Open].



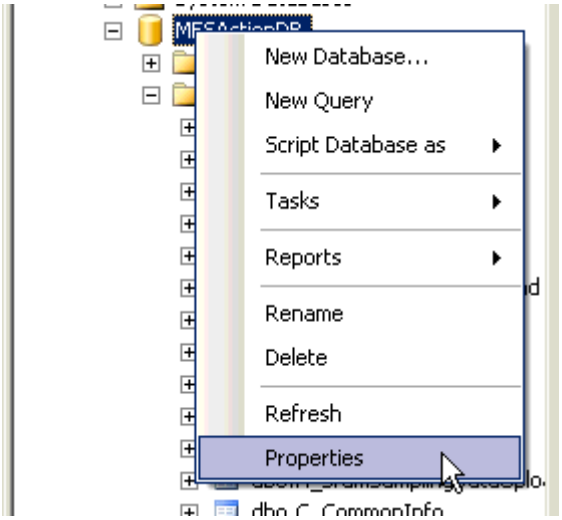
2 Open "DbInstall_No1.sql" in the MESActionDB folder (default: C:\Program Files\Pro-face\Pro-Server EX (Windows Vista : C:\Pro-face\Pro-Server EX)) under the Pro-Server EX installation folder.



3 To execute "DbInstall_No1.sql", click [Execute] on the toolbar. Then, execute "Refresh" in SQL Server Management Studio Express, and confirm that the MESActionDB database has been added to Object Explorer.

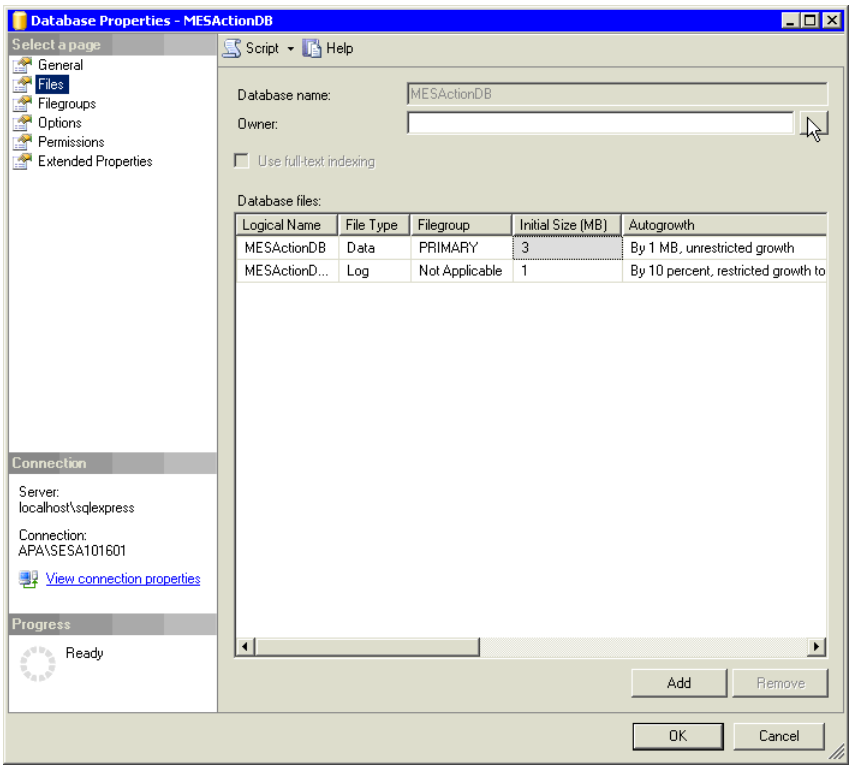


4 Right-click [MesActionDB] created in step 3 in order to display the menu. Click [Properties].



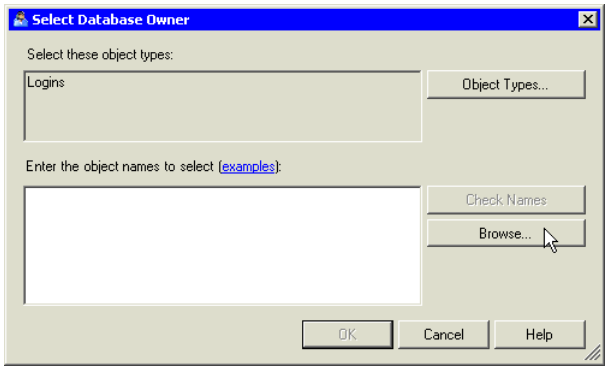
The [MesActionDB] properties screen is displayed.

5 Click [File] from the [Page Selection] field, and click the button on the right of the [Owner] field.



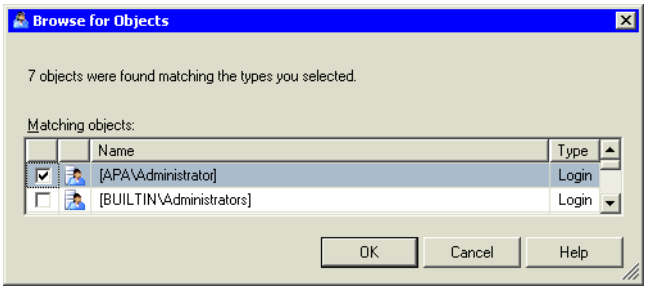
The [Database Owner Selection] dialog box is displayed.

6 Click the [Browse] button.



The [Browse Object] screen appears.

7 Check the user account having the administrator privileges in the [Browse Object] dialog box, and click [OK].

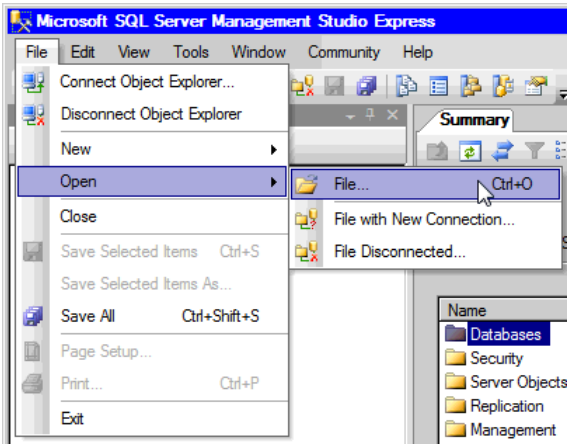


This takes you back to the [Database Owner Selection] dialog box.

8 Click [OK]. This takes you back to the [MesActionDB] properties screen.

9 Click [OK]. It takes you back to the [SQL Server Management Studio Express] screen.

10 Select [Open] from the [File] menu, and click [File].



The [Open File] dialog box appears.

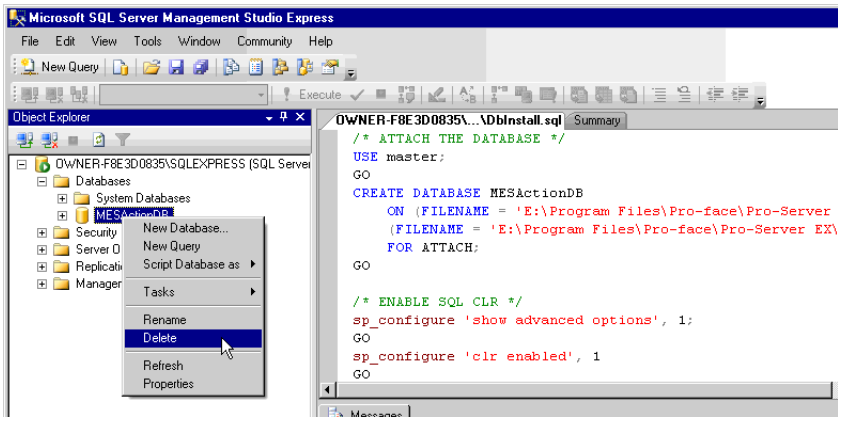
11 Open "DbInstall_No2.sql" in the MESActionDB folder (default: C:\ProgramFiles\Pro-face\Pro-Server EX [On Windows Vista, C:\Pro-face\Pro-Server EX]) in the 'Pro-Server EX' installation folder.

12 To execute "DbInstall_No2.sql", click [Execute] on the toolbar. Then, execute "Update to Latest Data" in 'SQL Server Management Studio Express', and confirm that the MESActionDB database has been added to Object Explorer.

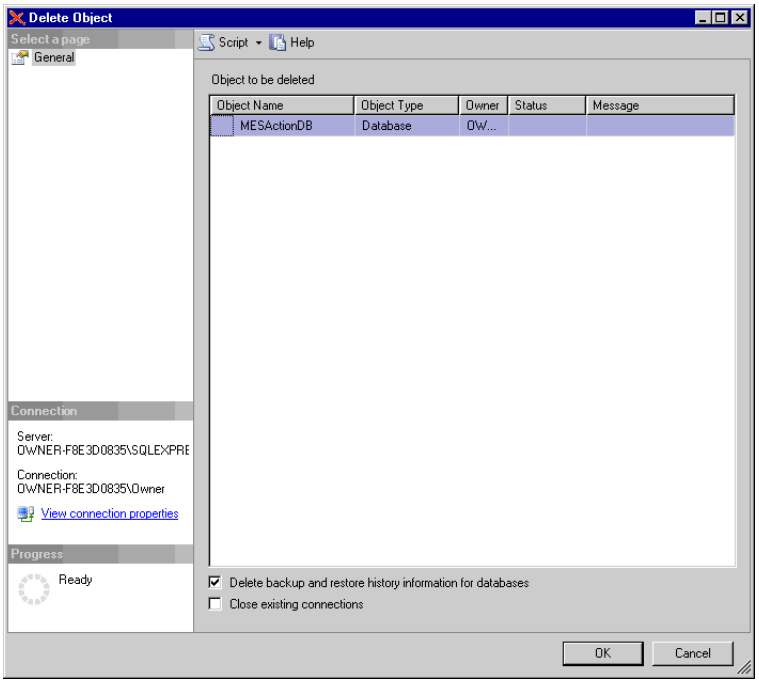
2.2.3 Detaching MESActionDB

IMPORTANT • If MESActionDB is detached, you need to reinstall MES ACTION.

1 To detach MESActionDB, right-click on "MESActionDB" under "Databases" in the SQL Server Management Studio Express "Object Explorer" tool.



2 Click [Delete] in the shortcut menu to display the [Delete Object] dialog box.



3 Specify "MESActionDB" in [Object to be deleted], and click [OK]. Then, MESActionDB will be deleted.

2.3 Setting MES ACTION Common Tables

Before using MES ACTION, set two tables commonly required for MES ACTION. The names and description of the tables to be set are listed below. For the table registration procedure, refer to "6.1.1 Basic Operations of SQL Server Management Studio Express".

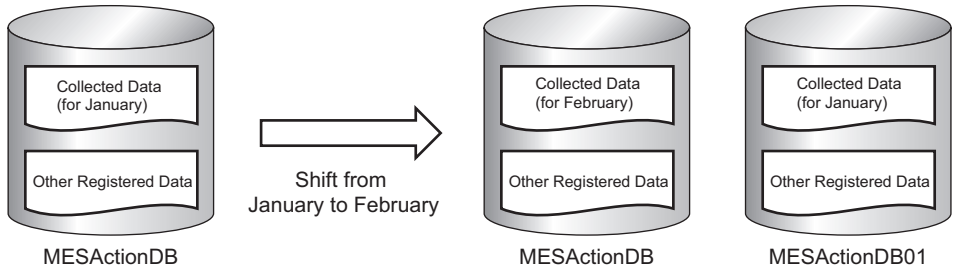
2.3.1 Registering C_CommonInfo Table

The "C_CommonInfo" table is used to set the collected data saving method and information required to send e-mail. Only one record is enough to use for the C_CommonInfo table. If several records are available, the record with the smallest ID number is used.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	SaveMode	nchar(1)	Database saving mode. Specify "C" (Continuous saving mode) or "M" (Monthly division mode). If the monthly division mode is selected, data on the previous month will be moved to other database (MESActionDB01 to MESActionDB12: the number indicates month) at a shift from every month to the next month.	
	SMTPServer	nvarchar(255)	SMTP Server Name. Used to send E-mail for control limit monitoring in Process Data Collection ACTION and Actual Data Collection ACTION.	
	SMTPPort	int	SMTP Port No. Used to send E-mail for control limit monitoring in Process Data Collection ACTION and Actual Data Collection ACTION.	
	SMTPAuth	bit	SMTP Authentication (False: Authentication is not required, True: Authentication is required) Used to send E-mail for control limit monitoring in Process Data Collection ACTION and Actual Data Collection ACTION. If "True" (Authentication is required) is selected, the SMTP server is requested to authenticate the user account by using the following user name and password.	
	SMTPUserName	nvarchar(255)	SMTP User Name. Used when SMTP authentication is required.	○
	InputSMTPPassword	nvarchar(255)	SMTP Password. The entered password is encoded at trigger of SQL Server, and saved in CodedSMTPPassword. Then, the InputSMTPPassword value is set to NULL. Therefore, unauthorized people cannot see the password.	○
	CodedSMTPPassword	varbinary(8000)	Encoded SMTP password. Used when SMTP authentication is required.	○
	MailFrom	nvarchar(255)	Mail Source Address. Used to send E-mail for control limit monitoring in Process Data Collection ACTION and Actual Data Collection ACTION.	

2.3.2 Registering C_MonthlyProcess Table

The C_MonthlyProcess table is used to set information required for monthly shift processing in the monthly division mode. The database saving mode is classified into the continuous saving mode and the monthly division mode. If the monthly division mode is selected, data on the previous month will be moved to other database (MESActionDB01 to MESActionDB12) at a shift from every month to the next month. This processing is called "monthly shift processing".



When the monthly shift processing is executed, if other program (SQL Server Management Studio Express, etc.) has accessed MESActionDB, or if the monthly shift processing is disabled for any reason (e.g. shortage of the disk space), the system outputs a message log to indicate a failure in the monthly shift processing, and adds new data to MESActionDB, without executing the monthly shift processing. Therefore, the database saves data for two months.

Only one record is enough to use for the C_MonthlyProcess table. If several records are available, the record with the smallest ID number is used.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	LastDateTime	datetime	Last collection time. MES ACTION automatically updates the value. Users need not specify it. Used to judge whether monthly shift processing is to be executed or not.	○
	InProcess	bit	Processing flag (False: Processing is not in progress. True: Processing is in progress) MES ACTION automatically updates the value. Users need not specify it. Used to prohibit monthly shift processing and database writing processing from being simultaneously executed.	

Main Key	Column Name	Data Type	Description	NULL Enabled
	WaitingTime	int	Wait time [second] for True processing flag. If monthly shift processing or collected data writing processing is being executed by other MES ACTIONs at the time when such processing is to be started, users can specify the time [second] to wait for completion of each processing. If the monthly shift processing or collected data writing processing executed by other MES ACTIONs is not completed after elapse of the specified wait time, it is judged to be an error. For monthly shift processing, a database file (.mdf) and log file (.log) are copied. However, if a file in the database is large, the copying time is prolonged. In such a case, the wait time setting in this column must be increased. However, when the wait time is long, the system takes a long time for error output, if the monthly shift processing or collected data writing processing cannot be completed within the specified time for any reason.	

3 Using MES ACTION

3 Using MES ACTION

MES ACTION provides the following functions. or details of the procedure for registering each ACTION, refer to the corresponding section for each ACTION listed below.

Type of ACTION	Reference section
MES ACTION Process Data Collection	3.2 Collecting Process Data
MES ACTION Actual Data Collection	3.3 Collecting Actual Data
MES ACTION GP SRAM Alarm-History Collection	3.4 Collecting Alarm-History from SRAM
MES ACTION GP CF-card Alarm-History-File Collection	3.5 Collecting Alarm-History-File from CF Card
MES ACTION GP SRAM Sampling-Data Collection	3.6 Collecting Sampling-Data from SRAM
MES ACTION GP CF-card Sampling-Data-File Collection	3.7 Collecting Sampling-Data-File from CF Card
MES ACTION GP CF-card Screen-File Collection	3.8 Collecting Captured Data from CF Card
MES ACTION Recipe Download	3.9 Writing Recipe Data from Database into CF Card
MES ACTION Composite Document Recipe-Transfer ACTION	3.10 Batch Transfer of Recipe, Text and Image Data

IMPORTANT

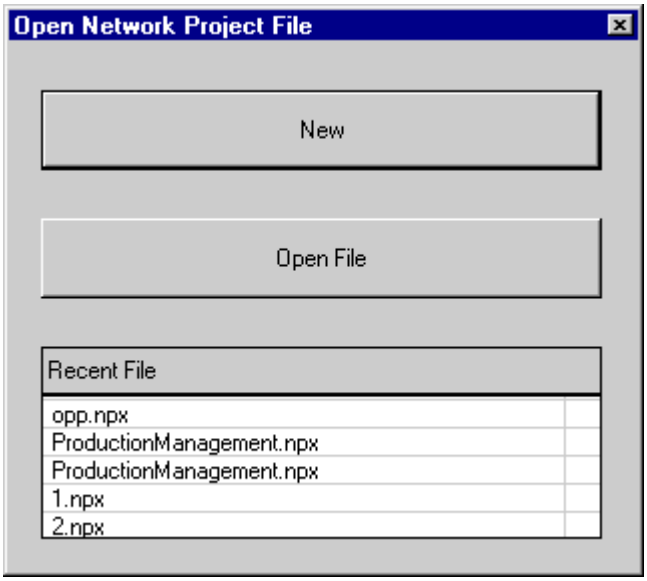
- If you have any question about the contents and operations of Microsoft SQL Server 2005 Express Edition, or about the contents of this manual, contact DIGITAL SUPPORT (see "7 Inquiry"). For other questions, contact Microsoft at the following site: http://www.microsoft.com/sql/editions/express/default.mspx (as of January, 2007)

3.1 Setting MES ACTION

3.1.1 Starting 'Pro-Studio EX'

1 To set MES ACTION, start 'Pro-Studio EX'. You can start 'Pro-Studio EX' by double-clicking on the 'Pro-Studio EX' shortcut icon on the desktop, or by selecting [Pro-face] - [Pro-Server EX] - [Pro-Studio EX] from [All Programs](or [Programs], depending on your OS) in the Start menu.

2 When 'Pro-Studio EX' starts, the "Open Network Project File" dialog box appears. To create a new network project, click the [New] button. To use an existing network project, click the [Open File] button, or select a desired network project name from the "Recent File" list.

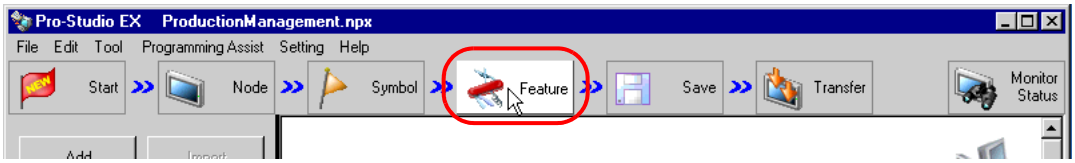


3 'Pro-Studio EX' starts with the selected network project.

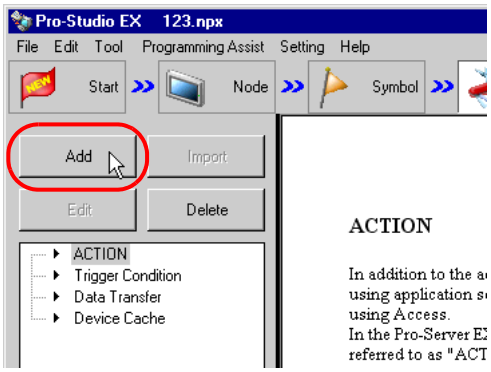
3.1.2 Registering MES ACTION

Before registering MES ACTION, you must register the node and symbol data used for MES ACTION. After that, click the [Feature] icon on the status bar and select a desired function of MES ACTION. The MES ACTION selecting procedure is described below.

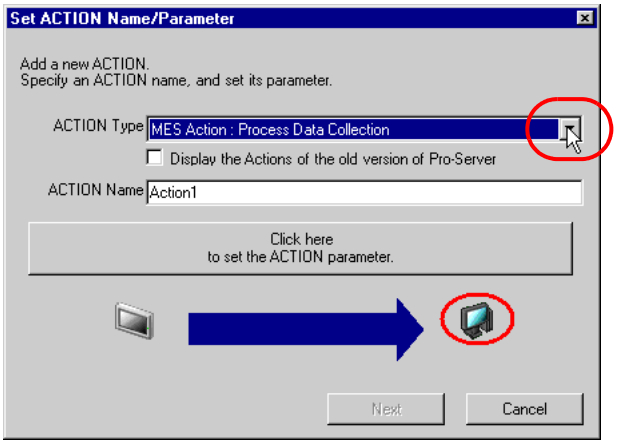
1 Click the [Feature] icon on the status bar.



2 Select [ACTION] from the tree display on the left of the screen and click [Add].



3 Click the [ACTION Type] list button and select the type of ACTION to be registered.



3.2 Collecting Process Data

Process-Data-Collection ACTION collects device data at a specified cycle, executes scale conversion with related tags, and saves the data into the database.

To use Process-Data-Collection ACTION, register the database tables used for Process-Data-Collection ACTION according to the procedure described in "6.1.1 Basic Operations of SQL Server Management Studio Express", and register Process-Data-Collection ACTION with 'Pro-Studio EX'.

3.2.1 Registering T_TagName Table

Tags to be collected by Process-Data-Collection ACTION must be registered in the T_TagName table in advance.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag.	
	Description	nvarchar(255)	Description	○
	Type	nchar(1)	Type of tag. Specify "A (Analog)", "D (Digital)" or "S (String)".	

3.2.2 Registering T_LinearAnalog Table

The T_LinearAnalog table is used to register the information required for engineering value conversion for the tag whose type is registered as "Analog" in the T_TagName table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of the tag whose type is registered as "Analog" in the T_TagName table.	
	SignalIO	nvarchar(6)	Signal Condition. Specify any of the following items: 8BN, 12BN, 13BN, 15BN, 3BCD, 4BCD, BCD, Lin, None, SQRT,String For details, refer to "Signal Condition".	
	InRL	float	Input lower limit value. Used for linearize conversion.	
	InRH	float	Input upper limit value. Used for linearize conversion.	
	OutRL	float	Output lower limit value. Used for linearize conversion.	
	OutRH	float	Output upper limit value. Used for linearize conversion.	
	DecimalPoint	Int	Decimal-Point Position. (0 to 7) Used when "None" is specified for Signal Condition.	○
	StringConvertMethod	nchar(5)	Numeric value-string conversion method. Select TABLE or QUERY. TABLE: Specifies a conversion table in the Table - Field format. QUERY: Specifies a conversion table with Query (SELECT statement).	○
	EngineeringUnit	nvarchar(257)	When SignalIO is other than String, specify the industrial unit of process data (kg, m, etc.). When SignalIO is String and StringConvertMethod is TABLE, specify the names of numeric value-string conversion table and column in the Table.Field format. When SignalIO is String and StringConvertMethod is QUERY, specify the SELECT statement to obtain a string.	○

NOTE
- "Linearize" means the conversion processing using a linear equation for input range and measuring instrument range.

■ Signal Condition

The engineering value conversion method based on Signal Condition specified in the SignalIO column is as follows:

8BN,12BN,13BN,15BN:

After masking by a specified bit length (when a high-order bit is not necessary, it is set to "0"), the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Value after masking - InRL)/(InRH - InRL) × (OutRH - OutRL) + OutRL

This method is available only when any of 16Bit(Signed), 16Bit(Unsigned), or 16Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

3BCD,4BCD:

After masking BCD data by a specified number of digits, the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Value after masking - InRL)/(InRH - InRL) × (OutRH - OutRL) + OutRL

This method is available only when any of 16Bit(Signed), 16Bit(Unsigned), or 16Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

BCD:

The result of linearize conversion without BCD data masking is defined as the engineering conversion value.

This method is available only when any of 32Bit(Signed), 32Bit(Unsigned), or 32Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

Lin:

The result of linearize conversion without masking is defined as the engineering conversion value.

SQRT:

After extracting the square root of an input value without masking, the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Input value - InRL)/SQRT(InRH - InRL) × (OutRH - OutRL) + OutRL

None(Real number conversion):

Masking and linearize conversion are not executed. If the type of 16-bit or 32-bit integer is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table, the following calculation result, based on the value of the DecimalPoint column, is defined as the engineering conversion value.

Input value / n-th power of 10 (n = value of DecimalPoint column)

String:

Masking and linearize conversion are not executed.

NOTE

- If "String" is specified in the SignalIO column, specify the character string corresponding to the row number, with reference to the following table. The table name is selected randomly.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main Key	
	(Arbitrary column name 1)	nvarchar(32)	Character string corresponding to string No.	○
	(Arbitrary column name 2)	nvarchar(32)	Character string corresponding to string No.	○
	:	:	:	:
	(Arbitrary column name N)	nvarchar(32)	Character string corresponding to string No.	○

When StringConvertMethod is TABLE:

ACTION finds the row number from the input value with the following formula:

Row number = (Input value - outRL) MOD (outRH - outRL) + outRL

("A MOD B" is a residue of A divided by B)

For example, provided that outRL is "1" and outRH is "11", the relationship between the input value and the row number is as follows:

Entered Value	...	-1	0	1	2	...	9	10	11	12	...	19	20	21	22	...
Row Number	...	-1	0	1	2	...	9	10	1	2	...	9	10	1	2	...

The table name and column name specified in the EngineeringUnit column and the string corresponding to the row number obtained above are used as the tag value.

If the row number is smaller than "1", or if there is no row corresponding to the row number, it is judged as a conversion error.

When StringConvertMethod is QUERY:

The execution result of the query (SELECT statement) specified in the EngineeringUnit column is used as the tag value.

If "@VALUE" is used as a parameter in the query, the input value is set in this parameter.

For example, provided that the input value is "10" and a query of "SELECT TagString FROM TestTable WHERE TagValue = @VALUE" is set in the EngineeringUnit column, the system finds the record with a TagValue column value of "10" from TestTable. The value of the TagString column in the first found record is used as the tab value.

3.2.3 Registering T_ LimitControl Table

The control limit monitoring function outputs an alarm when a tag value is the lower control limit value or lower, or a tag value is the upper control limit value or higher is collected continuously by a specified count or more, and reports it by sending E-mail, or by writing a value into a device. The tag used for control limit monitoring is set in the T_ LimitControl table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of tag used for control limit monitoring.	
	LCL	float	Lower control limit value.	
	CL	float	Center value.	
	UCL	float	Upper control limit value.	
	Count	Int	Preset number of continuous occurrences of control limit alarm values before alarm output.	
	Message	nvarchar(255)	Alarm message. Title of the mail to report occurrence of an alarm event.	
	EMailEnabled	bit	To report an alarm by e-mail, set True. Not to report an alarm, set False.	
	EMailListID	int	ID of the mail address list to send E-mail at occurrence of an alarm event. E-mail is sent to the address that matches the ID column value in the EMailList table.	○
	DeviceEnabled	bit	To write a value into a device when an alarm event occurs, set True. Not to write a value into a device, set False.	
	DeviceListID	int	ID of the device list to write a value at occurrence of an alarm event. A value is written into the device that matches the ID column value in the DeviceList table.	○
	CountNow	int	Current count of continuous occurrences of control limit alarm values. MES ACTION automatically updates the value. Users need not specify it.	○

3.2.4 Registering T_EMailList Table

To report occurrence of an alarm event by E-mail with the control limit monitoring function, specify the mail destination address in the T_EMailList table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	ID of the mail address list to send E-mail at occurrence of an alarm event. Set the same ID as the setting of the EMailListID column in the T_LimitControl table.	
○	Address	nvarchar(255)	E-mail Address.	

3.2.5 Registering T_DeviceList Table

To report occurrence of an alarm event by writing a value into a device with the control limit monitoring function, specify the write-destination device address in the T_DeviceList table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	ID of the device list to write a value at occurrence of an alarm event. Set the same ID as the setting of the DeviceListID column in the T_LimitControl table.	
○	StationName	nvarchar(32)	Node Name	
○	EquipmentName	nvarchar(32)	Name of Device/PLC.	
○	DeviceAddress	nvarchar(131)	Device address or symbol name. For symbol name, the format is "Sheet name. Symbol name".	
	DataType	nvarchar(15)	Type of device data. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), Float, Double, Bit, String	
	Count	int	Indicates a length (number of bytes) of string for String data type. If the DataType setting is other than String, this column is not used.	
	Value	nvarchar(255)	A value to be written into a device.	

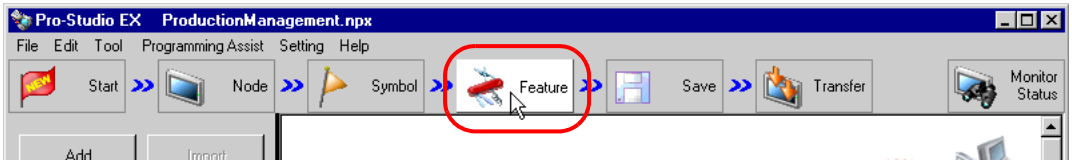
3.2.6 Registering T_ LineDigital Table

The T_ LineDigital table is used to register the tag value and corresponding string for the tag whose type is registered as "Digital" in the T_TagName table.

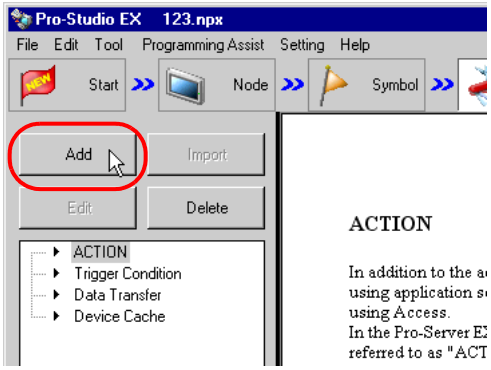
Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of the tag whose type is registered as "Digital" in the T_TagName table.	
	OnChar	nvarchar(32)	A string corresponding to value 1.	
	OffChar	nvarchar(32)	A string corresponding to value 0.	

3.2.7 Registering Process-Data-Collection ACTION

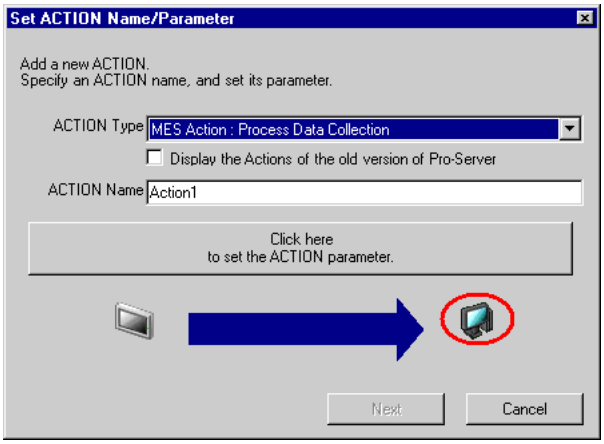
1 Click the [Feature] icon on the status bar.



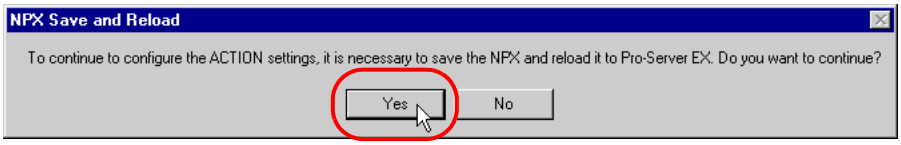
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



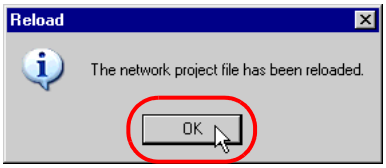
3 Click the [ACTION Type] list button and select "MES Action : Process Data Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



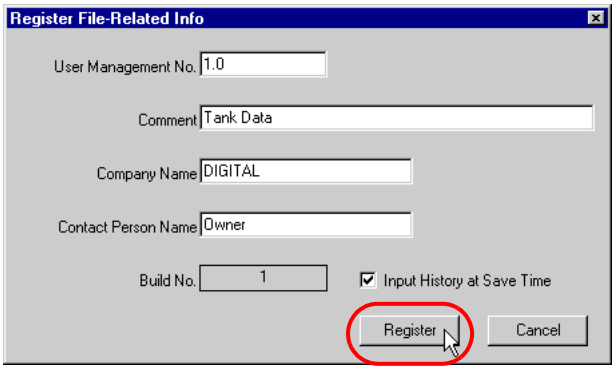
4 Click [Yes] on the "NPX Save and Reload" screen.



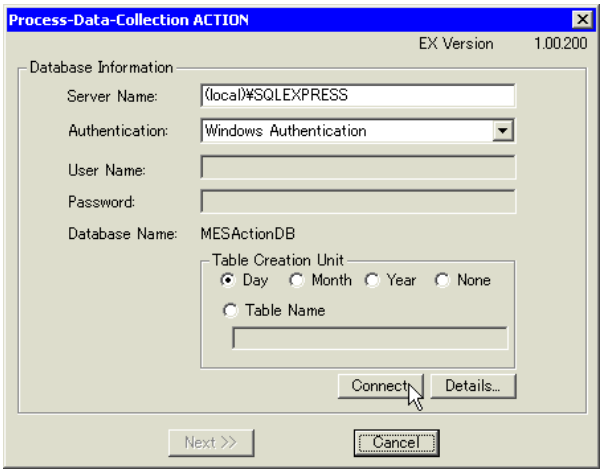
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

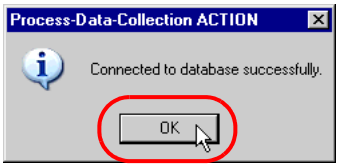


Information required for database connection is listed below.

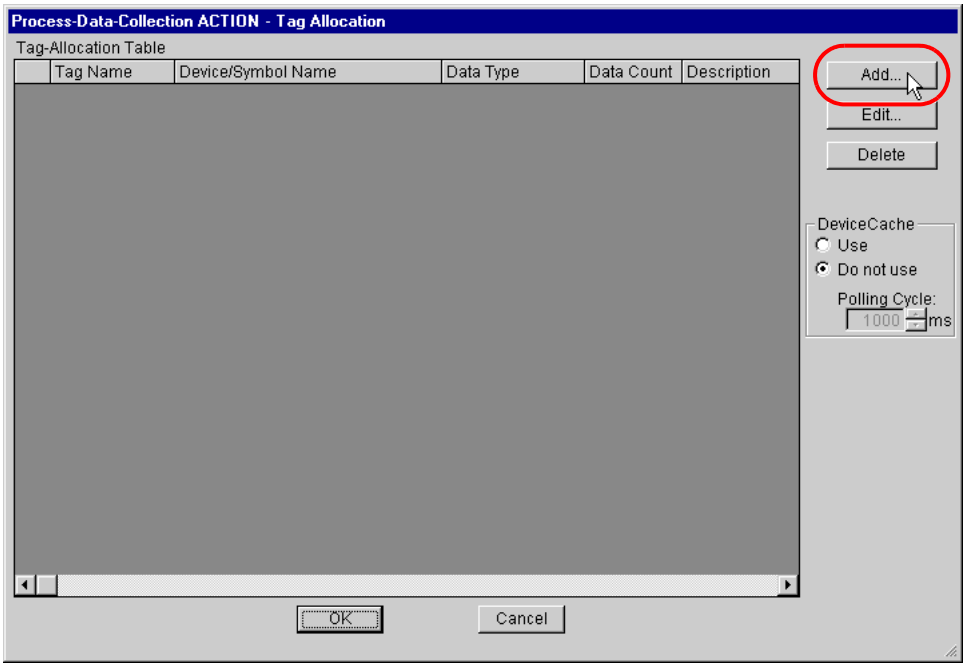
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server. Only local PC is supported.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.
	Table Creation Unit	Specify the unit (Day/Month/Year/None/Table name specification) in which the database table will be saved.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

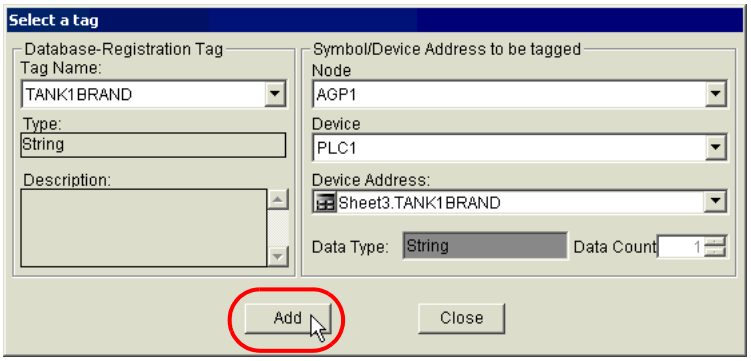
8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



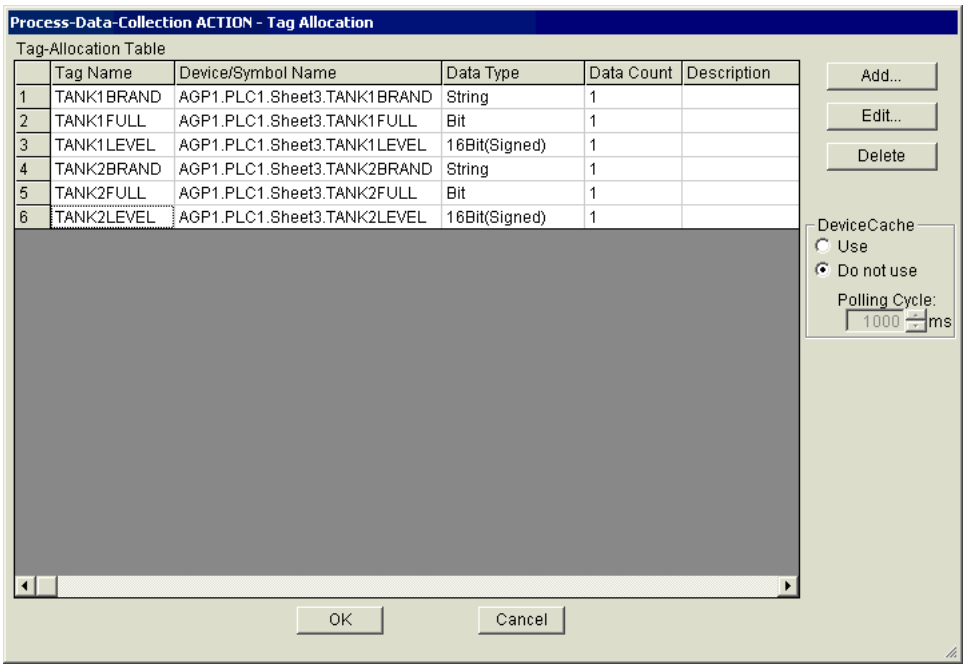
9 After the tag allocation screen appears, click [Add].



10 Select a tag registered in the database, specify the symbol/device address to be allocation to the tag, and click [Add]. After allocations to all necessary tags are completed, click [Close].

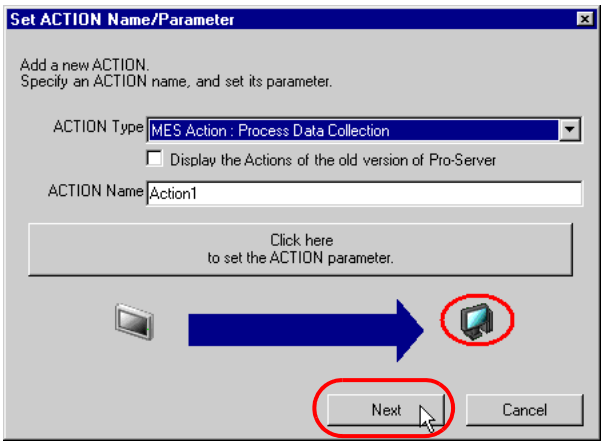


11 Set the device cache parameter and click [OK]. This completes the Process-Data-Collection ACTION parameter setting procedure.

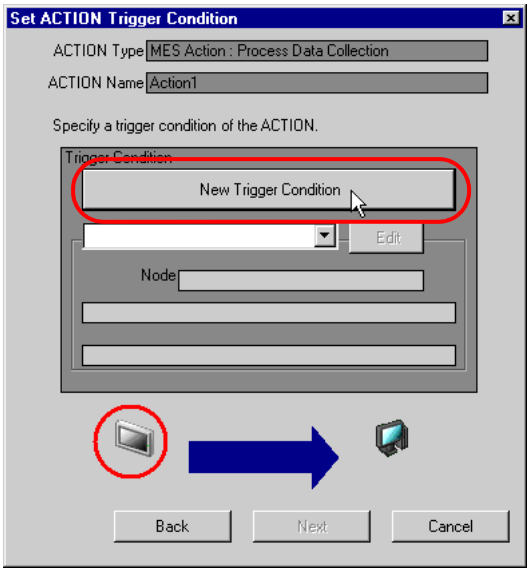


Parameter		Description
Device Cache	Use/ Do not use	Select whether to use the device cache or not. If the device cache is used, the response is improved during execution of ACTION, but the load of 'Pro-Server' increases.
	Polling Cycle	When "Device Cache" is set to "Use", specify a collecting cycle (polling cycle) in the range of 100ms to 10000s.

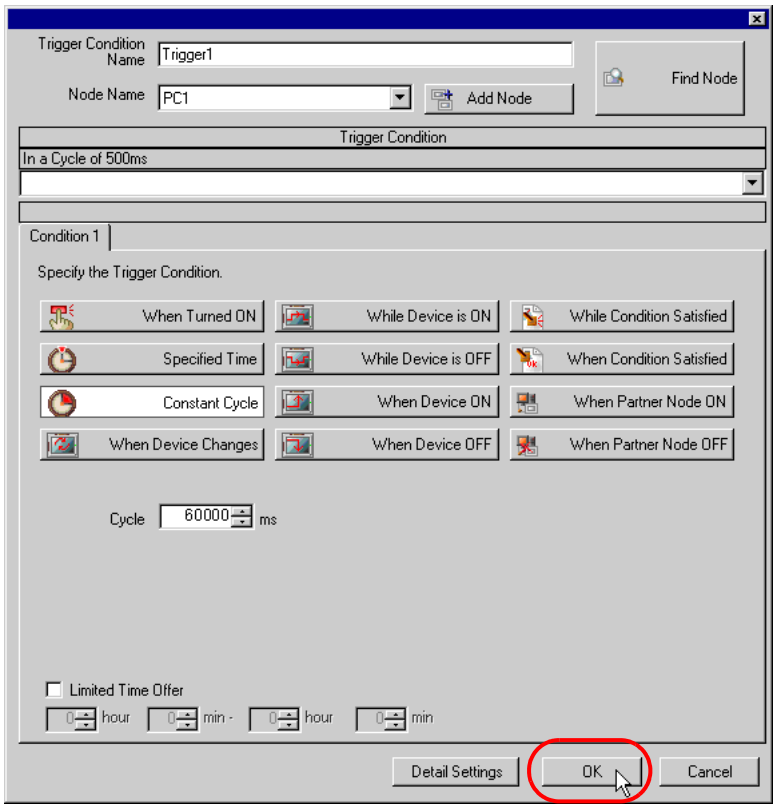
12 Then, specify the Process-Data-Collection ACTION trigger condition. Click [Next] on the "Set ACTION Name/Parameter" screen.



13 Click the [New Trigger Condition] button. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 15.



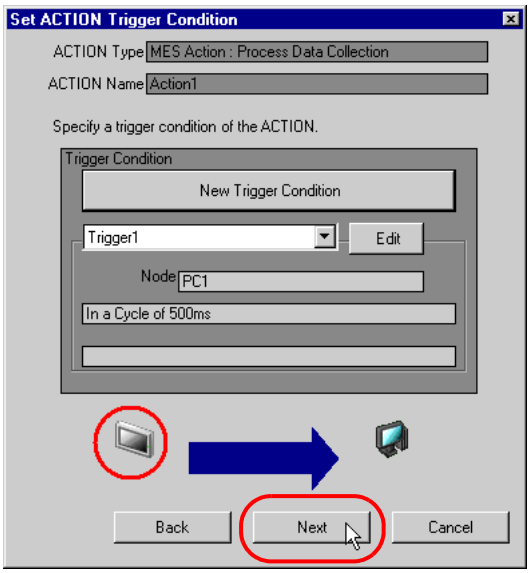
14 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



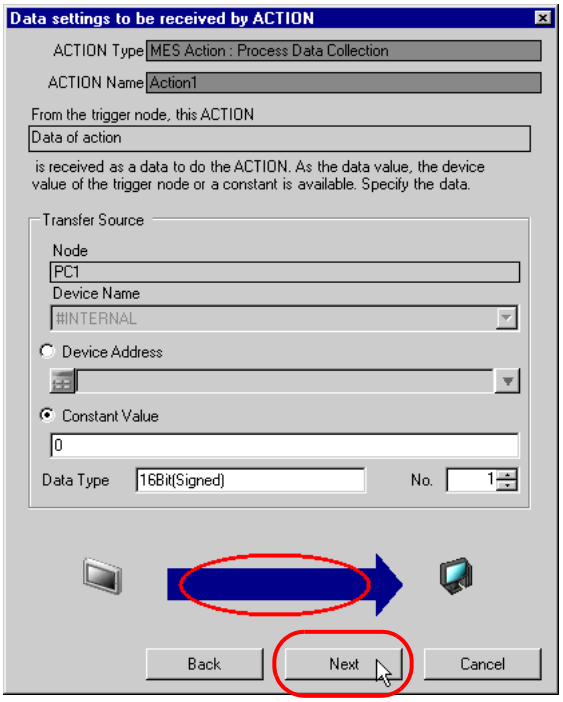
IMPORTANT

- For the Process-Data-Collection ACTION trigger condition, specify a constant cycle of "one minute (60000ms)" or longer.

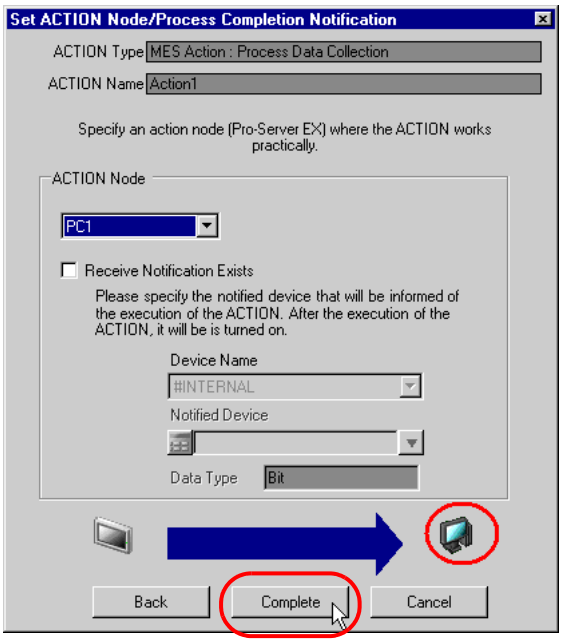
15 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



16 Specify the data to be received by the ACTION, and click the [Next] button. For Process-Data-Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



17 Specify the ACTION operating node and whether to enable or disable receiving notice, and click the [Complete] button. Through the above procedure, Process-Data-Collection ACTION is added.



3.2.8 Management of Collected Data

The tag values collected by Process-Data-Collection ACTION are saved in the D_ProcessData table. Actually, the table name is expressed with the ACTION ID of the Process-Data-Collection ACTION ('Pro-Studio EX' internal information indicated by string) and the date, as shown below:

When the table is created daily :D_ProcessData_ACTION ID_YYYYMMDD
When the table is created monthly : D_ProcessData_ ACTION ID _YYYYMM
When the table is created yearly : D_ProcessData_ ACTION ID _YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Data collection date/time.	
	(Tag 1)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	(Tag 2)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	:	:	:	
	(Tag n)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○

The data type of (Tag 1) to (Tag n) depends on the data type of the symbol/device allocated to each tag, as shown below.

Symbol / Device Data Type	Numeric value-string conversion	Data type of (Tag 1) to (Tag n)
16-bit (Signed), 16-bit (Unsigned), 16-bit(BCD), 16-bit (HEX), 32-bit (Signed), 32-bit (Unsigned), 32-bit(BCD), 32-bit (HEX)	Disabled	real
	Enabled	nvarchar(32)
Single-precision floating point	-	real
Double-precision floating point	-	float
Bit	-	nvarchar(32)
String	-	nvarchar(1020)

3.3 Collecting Actual Data

Actual-Data-Collection ACTION collects symbol data and device data from 'Pro-Server EX' at a specified status change, executes scale conversion with related tags, and saves the data into the database. Furthermore, this ACTION can calculate an achievement ratio from a plan value.
To use Actual-Data-Collection ACTION, register the database tables used for Actual-Data-Collection ACTION according to the procedure described in "6.1.1 Basic Operations of SQL Server Management Studio Express", and register Actual-Data-Collection ACTION with 'Pro-Studio EX'.

NOTE
- To collect data periodically for a trend chart, refer to "3.2 Collecting Process Data".

3.3.1 Registering T_TagName Table

Tags to be collected by Actual-Data-Collection ACTION must be registered in the T_TagName table in advance.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag.	
	Description	nvarchar(255)	Description	○
	Type	nchar(1)	Type of tag. Specify "A (Analog) " or "D (Digital)" .	

3.3.2 Registering T_LinearAnalog Table

The T_LinearAnalog table is used to register the information required for engineering value conversion for the tag whose type is registered as "Analog" in the T_TagName table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of the tag whose type is registered as "Analog" in the T_TagName table.	
	SignalIO	nvarchar(6)	Signal Condition Specify any of the following items: 8BN, 12BN, 13BN, 15BN, 3BCD, 4BCD, BCD, Lin, None, SQRT,String For details, refer to "Signal Condition".	
	InRL	float	Input lower limit value. Used for linearize conversion.	
	InRH	float	Input upper limit value. Used for linearize conversion.	
	OutRL	float	Output lower limit value. Used for linearize conversion.	
	OutRH	float	Output upper limit value. Used for linearize conversion.	
	DecimalPoint	Int	Decimal-Point Position. (0 to 7) Used when "None" is specified for Signal Condition.	○
	String Convert Method	nchar(5)	Numeric value-string conversion method. sed when String is specified for Signal I/O. Select TABLE or QUERY. TABLE: Specifies a conversion table in the Table-Field format. QUERY: Specifies a conversion table with Query (SELECT statement).	○
	Engineering Unit	nvarchar(257)	When SignalIO is other than String, specify the industrial unit of process data (kg, m, etc.). When SignalIO is String and StringConvertMethod is TABLE, specify the names of numeric value-string conversion table and column in the Table.Field format. When SignalIO is String and StringConvertMethod is QUERY, specify the SELECT statement to obtain a string.	○

NOTE

- "Linearize" means the conversion processing using a linear equation for input range and measuring instrument range.
- When "String" is specified for Signal Condition, the value prior to value-string conversion is saved as the actual value.
- When "bit" is specified for Data Type, "0" at OFF or "1" at ON is saved as the actual value.

■ Signal Condition

The engineering value conversion method based on Signal Condition specified in the SignalIO column is as follows:

8BN,12BN,13BN,15BN:

After masking by a specified bit length (when a high-order bit is not necessary, it is set to "0"), the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Value after masking - InRL)/(InRH - InRL) × (OutRH - OutRL) + OutRL

This method is available only when any of 16Bit(Signed), 16Bit(Unsigned), or 16Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

3BCD,4BCD:

After masking BCD data by a specified number of digits, the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Value after masking - InRL)/(InRH - InRL) × (OutRH - OutRL) + OutRL

This method is available only when any of 16Bit(Signed), 16Bit(Unsigned), or 16Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

BCD:

The result of linearize conversion without BCD data masking is defined as the engineering conversion value.

This method is available only when any of 32Bit(Signed), 32Bit(Unsigned), or 32Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

Lin:

The result of linearize conversion without masking is defined as the engineering conversion value.

SQRT:

After extracting the square root of an input value without masking, the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Input value - InRL)/SQRT(InRH - InRL) × (OutRH - OutRL) + OutRL

None(Real number conversion):

Masking and linearize conversion are not executed. If the type of 16-bit or 32-bit integer is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table, the following calculation result, based on the value of the DecimalPoint column, is defined as the engineering conversion value.

Input value / n-th power of 10 (n = value of DecimalPoint column)

String:

Masking and linearize conversion are not executed.

NOTE

- If "String" is specified in the SignalIO column, specify the character string corresponding to the row number, with reference to the following table. The table name is selected randomly.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main Key	
	(Arbitrary column name 1)	nvarchar(32)	Character string corresponding to string No.	○
	(Arbitrary column name 2)	nvarchar(32)	Character string corresponding to string No.	○
	:	:	:	:
	(Arbitrary column name N)	nvarchar(32)	Character string corresponding to string No.	○

When StringConvertMethod is TABLE:

ACTION finds the row number from the input value with the following formula:

Row number = (Input value - outRL) MOD (outRH - outRL) + outRL

("A MOD B" is a residue of A divided by B)

For example, provided that outRL is "1" and outRH is "11", the relationship between the input value and the row number is as follows:

Entered Value	...	-1	0	1	2	...	9	10	11	12	...	19	20	21	22	...
Row Number	...	-1	0	1	2	...	9	10	1	2	...	9	10	1	2	...

The table name and column name specified in the EngineeringUnit column and the string corresponding to the row number obtained above are used as the tag value.

If the row number is smaller than "1", or if there is no row corresponding to the row number, it is judged as a conversion error.

When StringConvertMethod is QUERY:

The execution result of the query (SELECT statement) specified in the EngineeringUnit column is used as the tag value.

If "@VALUE" is used as a parameter in the query, the input value is set in this parameter.

For example, provided that the input value is "10" and a query of "SELECT TagString FROM TestTable WHERE TagValue = @VALUE" is set in the EngineeringUnit column, the system finds the record with a TagValue column value of "10" from TestTable. The value of the TagString column in the first found record is used as the tab value.

3.3.3 Registering T_LineDigital Table

The T_LineDigital table is used to register the tag value and corresponding string for the tag whose type is registered as "Digital" in the T_TagName table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of the tag whose type is registered as "Digital" in the T_TagName table.	
	OnChar	nvarchar(32)	A string corresponding to value 1.	
	OffChar	nvarchar(32)	A string corresponding to value 0.	

3.3.4 Registering T_LimitControl Table

The control limit monitoring function outputs an alarm when a tag value is the lower control limit value or lower, or a tag value is the upper control limit value or higher is collected continuously by a specified count or more, and reports it by sending E-mail, or by writing a value into a device. The tag used for control limit monitoring is set in the T_LimitControl table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of tag used for control limit monitoring.	
	LCL	float	Lower control limit value.	
	CL	float	Center value.	
	UCL	float	Upper control limit value.	
	Count	Int	Preset number of continuous occurrences of control limit alarm values before alarm output.	
	Message	nvarchar(255)	Alarm message. Title of the mail to report occurrence of an alarm event.	
	EMail Enabled	bit	To report an alarm by e-mail, set True. Not to report an alarm, set False.	
	EMailList ID	int	ID of the mail address list to send E-mail at occurrence of an alarm event. E-mail is sent to the address that matches the ID column value in the EMailList table.	○
	Device Enabled	bit	To write a value into a device when an alarm event occurs, set True. Not to write a value into a device, set False.	
	Device ListID	int	ID of the device list to write a value at occurrence of an alarm event. A value is written into the device that matches the ID column value in the DeviceList table.	○
	Count Now	int	Current count of continuous occurrences of control limit alarm values. MES ACTION automatically updates the value. Users need not specify it.	○

NOTE
- To use the mail function in the T_LimitControl table, you must configure the SMTP settings.
- When "bit" is specified for Data Type, "0" at OFF or "1" at ON is saved as the actual value.

3.3.5 Registering T_EMailList Table

To report occurrence of an alarm event by E-mail with the control limit monitoring function, specify the mail destination address in the T_EMailList table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	ID of the mail address list to send E-mail at occurrence of an alarm event. Set the same ID as the setting of the EMailListID column in the T_LimitControl table.	
○	Address	nvarchar(255)	E-mail Address.	

3.3.6 Registering T_DeviceList Table

To report occurrence of an alarm event by writing a value into a device with the control limit monitoring function, specify the write-destination device address in the T_DeviceList table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	ID of the device list to write a value at occurrence of an alarm event. Set the same ID as the setting of the DeviceListID column in the T_LimitControl table.	
○	Station Name	nvarchar(32)	Node Name	
○	Equipment Name	nvarchar(32)	Name of Device/PLC.	
○	Device Address	nvarchar(131)	Device address or symbol name. For symbol name, the format is "Sheet name.Symbol name".	
	DataType	nvarchar(15)	Type of device data. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), Float, Double, Bit, String	
	Count	int	Indicates a length (number of bytes) of string for String data type. If the DataType setting is other than String, this column is not used.	
	Value	nvarchar(255)	A value to be written into a device.	

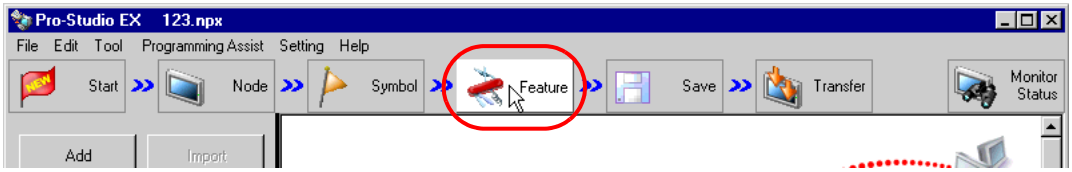
3.3.7 Registering T_PlanValueQuery Table

Action Data Collection ACTION records a plan value and achievement ratio into the database, as well as the actual value. The "T_PlanValueQuery" table allows the user to specify the plan value acquiring method.

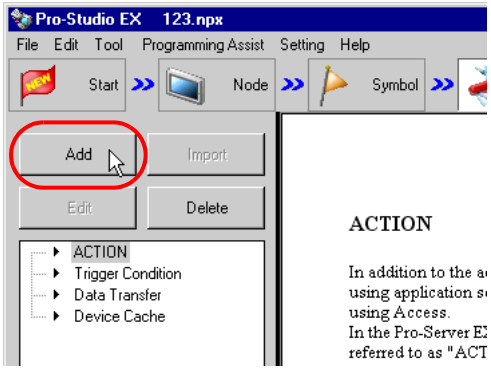
Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of tag used for actual data collection.	
	Method	nchar(5)	Plan value acquiring method. Select TABLE or QUERY. TABLE: Specifies a plan value table in the Table.Field format. QUERY: Specifies a plan value table with Query(SELECT statement).	
	Query	nvarchar(257)	If Method is TABLE, specify the plan value table name and column name in the Table.Field format. The value of the first row of the specified table-field is defined as the plan value. If Method is QUERY, specify the SELECT statement to obtain a plan value.	

3.3.8 Registering Actual-Data-Collection ACTION

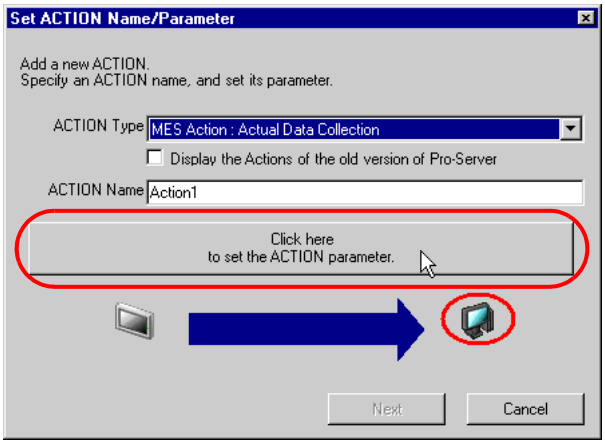
1 Click the [Feature] icon on the status bar.



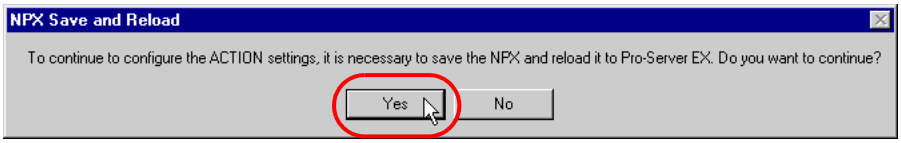
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



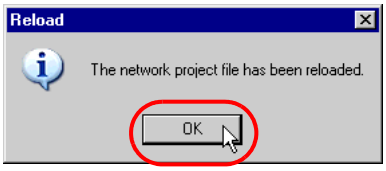
3 Click the [ACTION Type] list button and select "MES Action : Actual Data Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



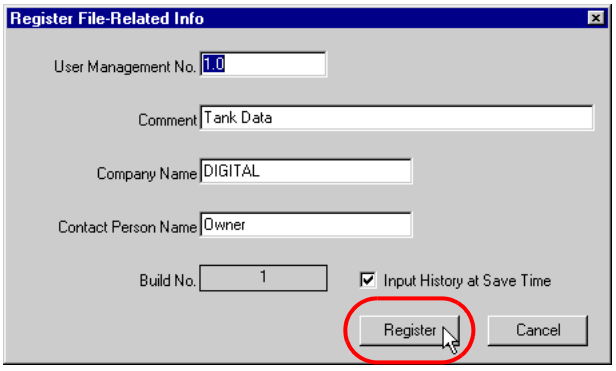
4 Click [Yes] on the "NPX Save and Reload" screen.



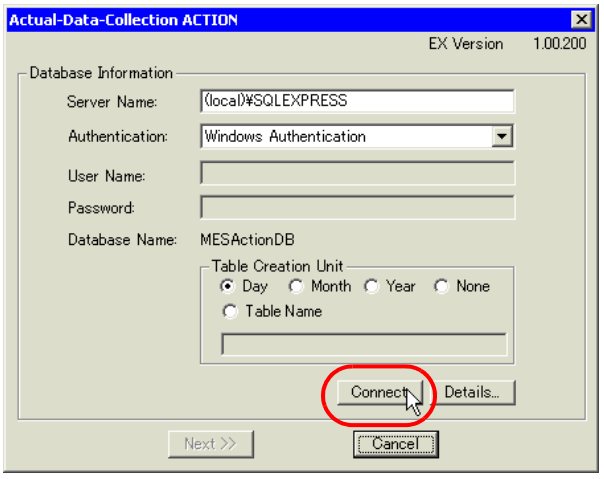
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click the [Connect] button.



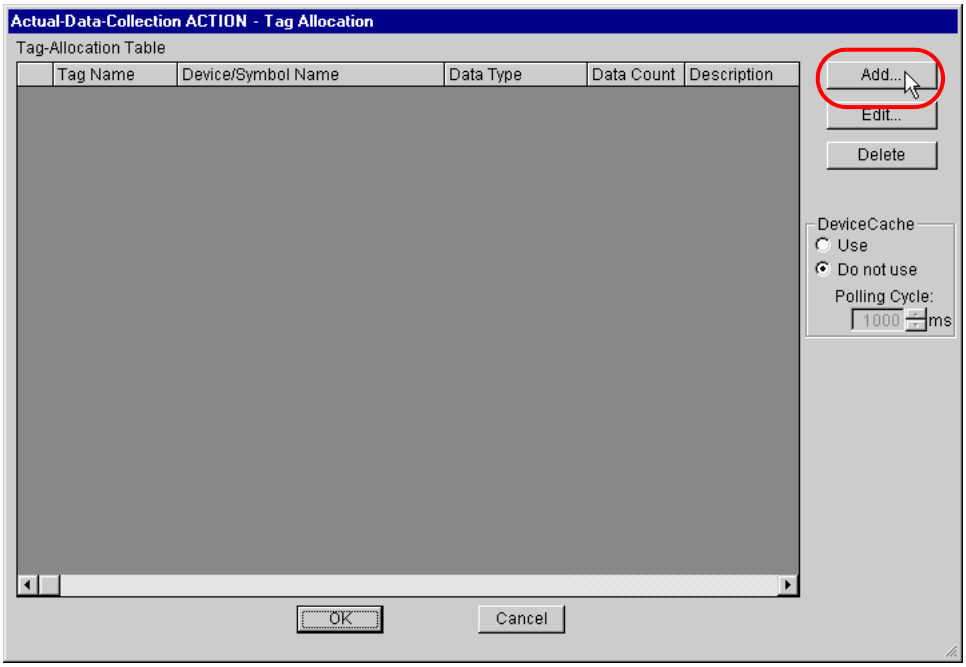
Information required for database connection is listed below.

Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.
	Table Creation Unit	Specify the unit (Day/Month/Year/None/Table name specification) in which the database table will be saved.

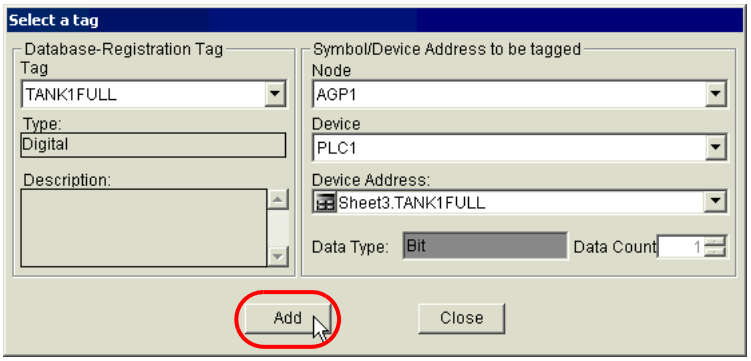
Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout: the amount of time until Timeout when executing the command request to the SQL server

8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.

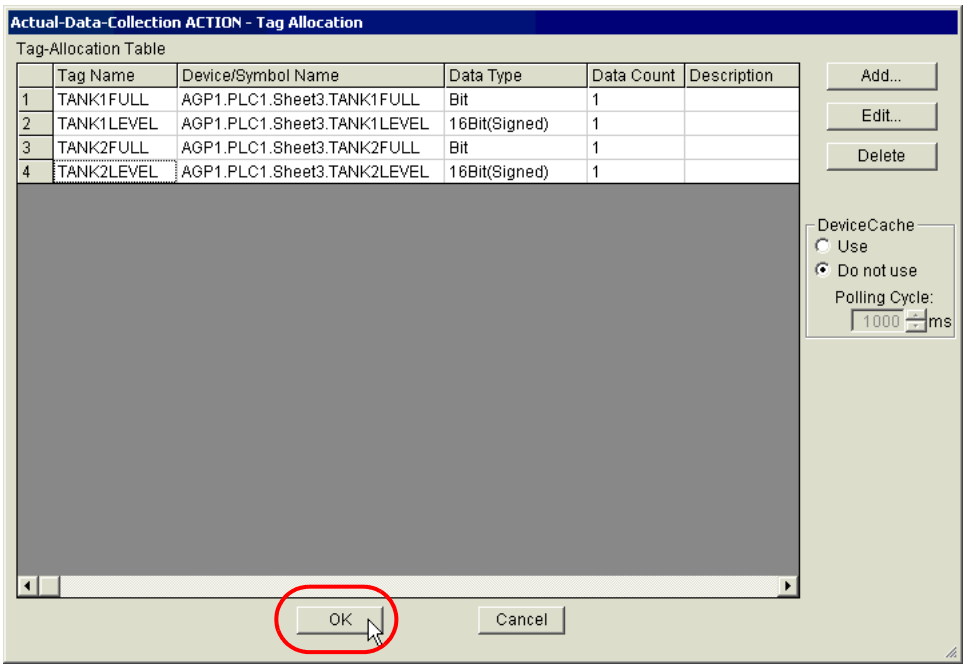
9 After the tag allocation screen appears, click [Add].



10 Select a tag registered in the database, specify the symbol/device address to be allocation to the tag, and click [Add]. After allocations to all necessary tags are completed, click [Close].

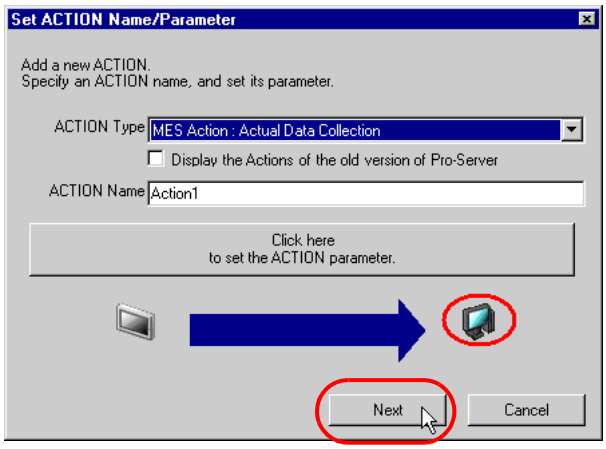


11 Set the device cache parameter and click [OK]. This completes the Process-Data-Collection ACTION parameter setting procedure.

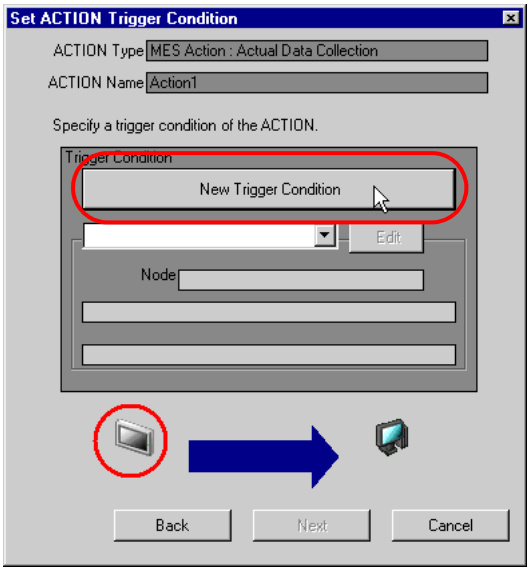


Parameter		Description
Device Cache	Use/Do not use	Select whether to use the device cache or not using the radio button.
	Polling Cycle	When "Device Cache" is set to "Use", specify a collecting cycle (polling cycle) in the range of 100ms to 10000s.

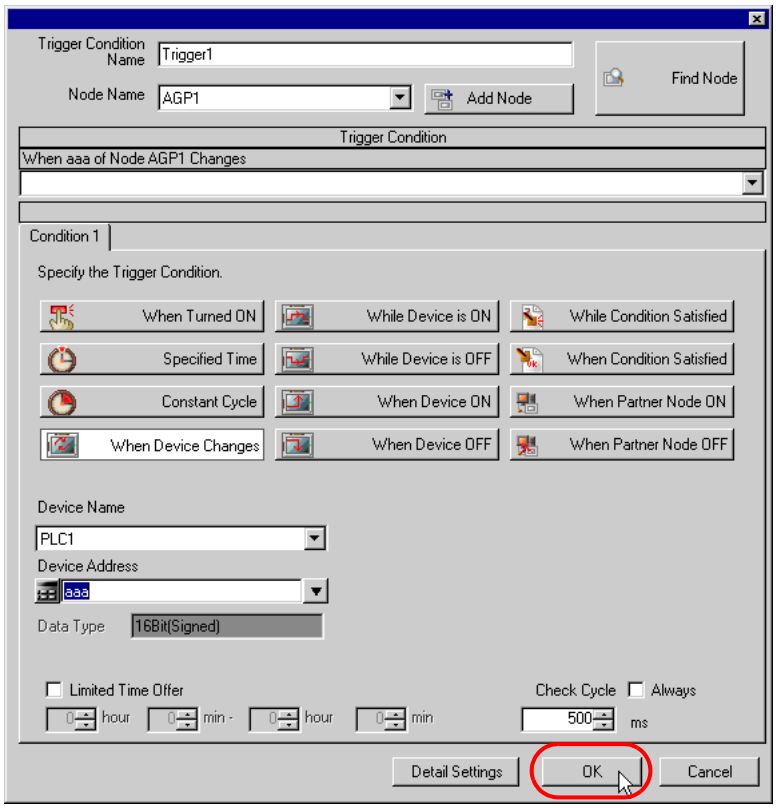
12 Then, specify the Actual-Data-Collection ACTION trigger condition. Click the [Next] button on the "Set ACTION Name/Parameter" screen.



13 Click the [New Trigger Condition] button. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 15.

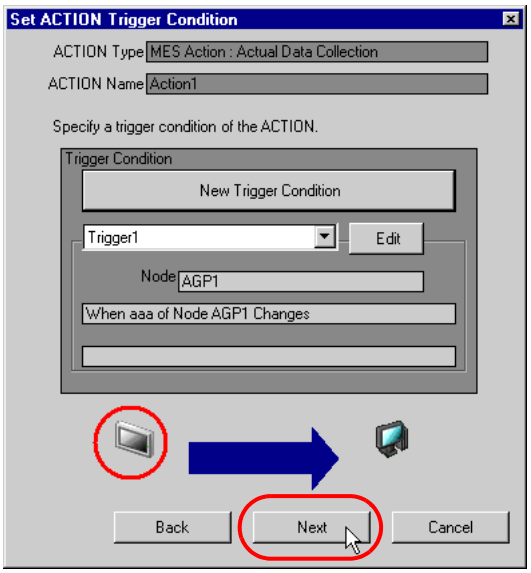


14 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.

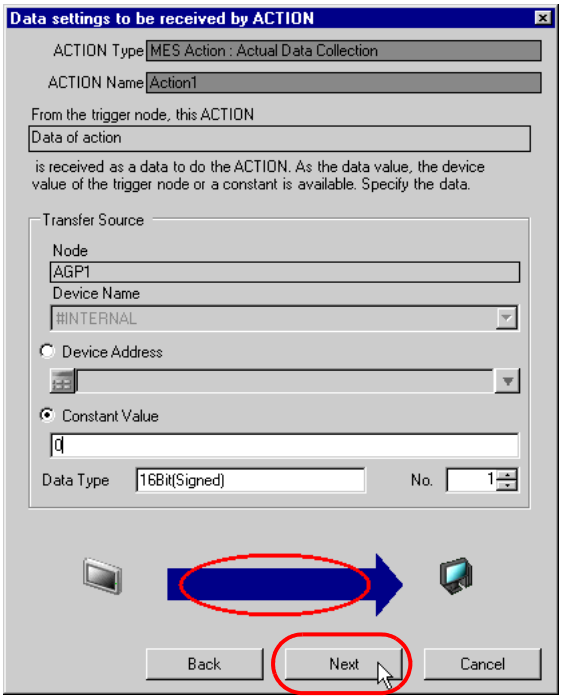


IMPORTANT
- For the Actual-Data-Collection ACTION trigger condition, specify a constant cycle of "one minute (60000ms)" or longer.

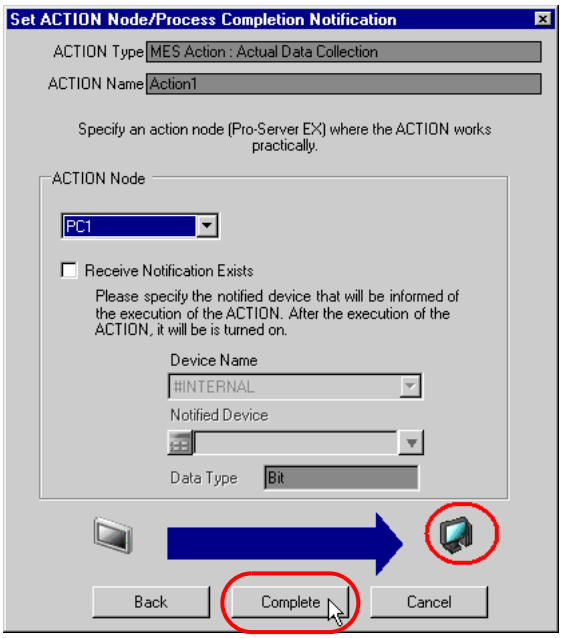
15 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



16 Specify the data to be received by the ACTION, and click the [Next] button. For Actual-Data-Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



17 Specify the ACTION operating node and whether to enable or disable receiving notice, and click the [Complete] button. Through the above procedure, Actual-Data-Collection ACTION is added.



3.3.9 Management of Collected Data

The tag values collected by Actual-Data-Collection ACTION are saved in the D_ActualData table. Actually, the table name is expressed with the ACTION ID of the Actual-Data-Collection ACTION ('Pro-Studio EX' internal information indicated by string) and the date, as shown below:

When the table is created daily : D_ActualData_ACTION ID_YYYYMMDD
When the table is created monthly : D_ActualData_ACTION ID_YYYYMM
When the table is created yearly : D_ActualData_ACTION ID_YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Data collection date/time.	
	(Tag 1)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	(Tag 1)_plan	(Depending on tag)	Plan value. In case of data collection failure, this value is NULL.	○
	(Tag 1)	real	Achievement ratio [%]. If either tag value or plan value is NULL, this value is NULL.	○
	:	:	:	
	(Tag n)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	(Tag n)_plan	(Depending on tag)	Plan value. In case of data collection failure, this value is NULL.	○
	(Tag n)_achieve	real	Achievement ratio [%]. If either tag value or plan value is NULL, this value is NULL.	○

The data type of (Tag 1) to (Tag n).plan and plan to (Tag n).plan depends on the data type of the symbol/device allocated to each tag, as shown below.

Symbol / Device Data Type	Data type of (Tag 1) to (Tag n)
16-bit (Signed), 32-bit (Unsigned), 16-bit(BCD), 16-bit (HEX), 32-bit (Signed), 32-bit (Unsigned), 32-bit(BCD), 32-bit (HEX)	real
Single-precision floating point	real
Double-precision floating point	float
Bit	real
String	Not applied to Actual Data Collection ACTION.

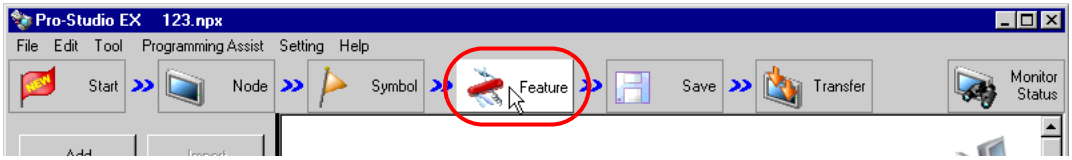
3.4 Collecting Alarm-History from SRAM

GP SRAM Alarm-History Collection ACTION collects alarm logs that have been stored in the GP3000 or GP SRAM at a specified cycle by node and block number, and saves the collected data into the database.
GP SRAM Alarm-History Collection ACTION can collect the GP3000 or GP alarm history storing blocks (Block 1 to Block 8) by specifying individual blocks (several blocks) or all blocks. GP SRAM Alarm-History Collection ACTION compares the alarm logs that have been stored in the SRAM with the previously collected ones to eliminate duplicated data, and saves the alarm logs into the database.

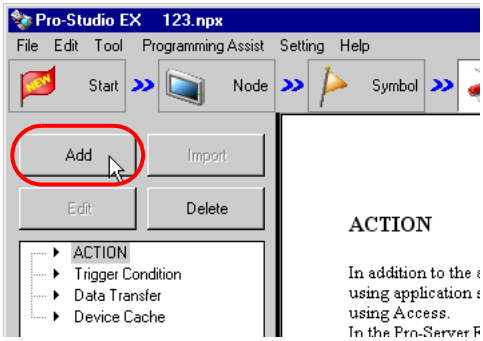
IMPORTANT
- Only the "Log" display mode of alarm history can collect.

3.4.1 Registering GP SRAM Alarm-History Collection ACTION

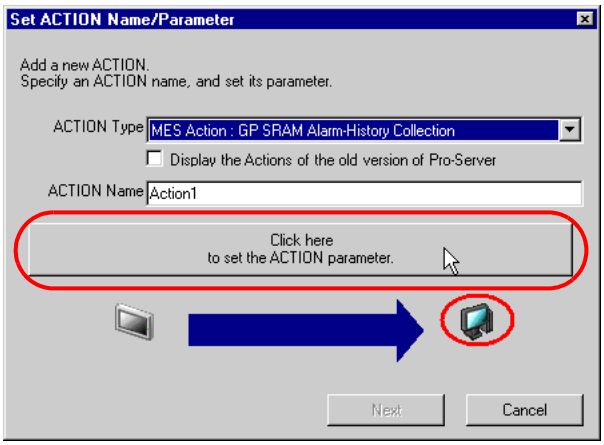
1 Click the [Feature] icon on the status bar.



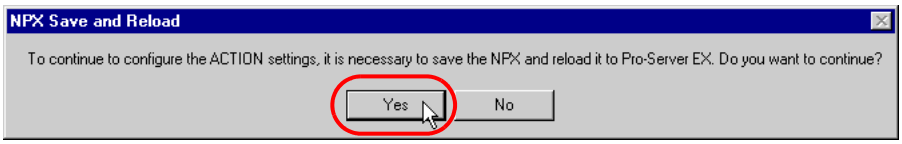
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



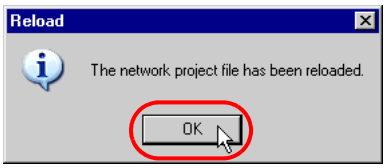
3 Click the [ACTION Type] list button and select "MES Action : GP SRAM Alarm-History Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



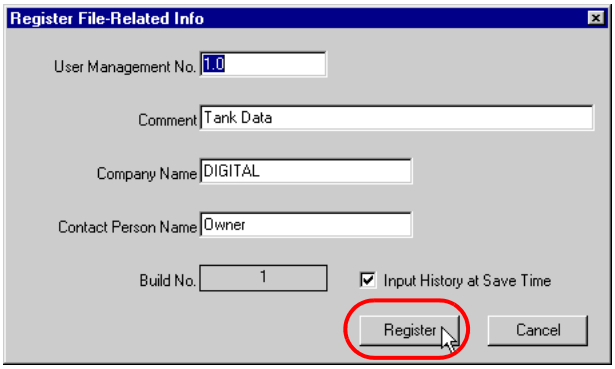
4 Click [Yes] on the "NPX Save and Reload" screen.



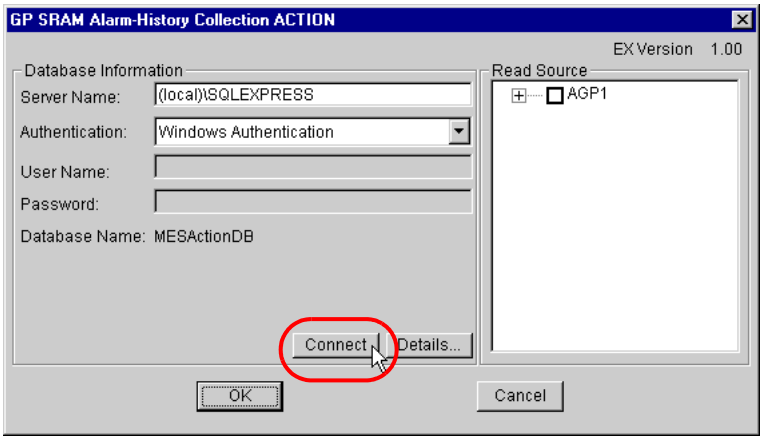
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

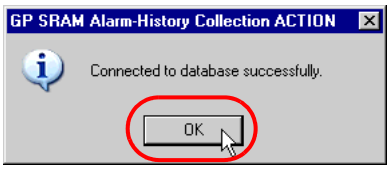


Information required for database connection is listed below.

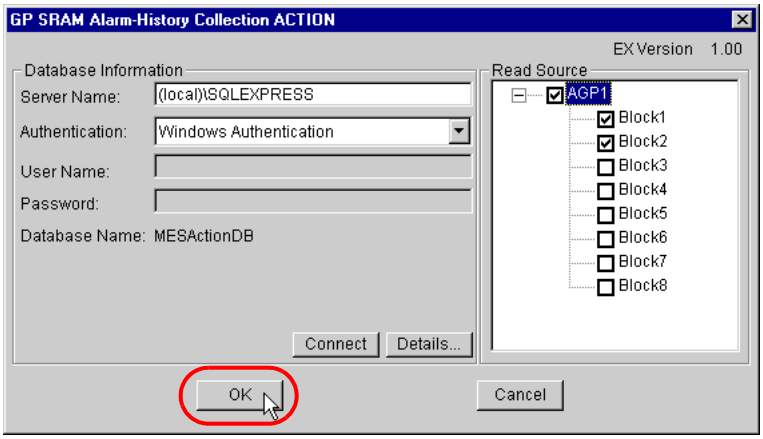
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

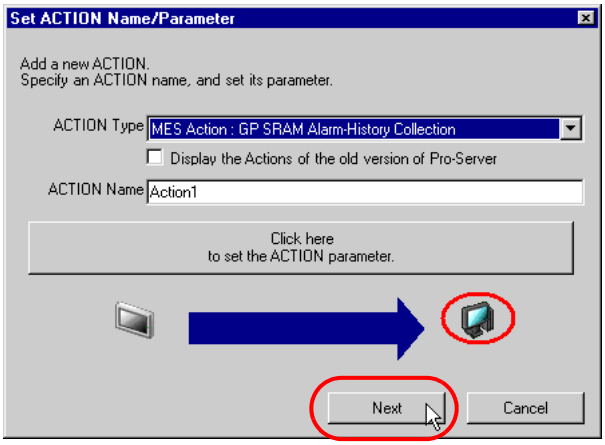
8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



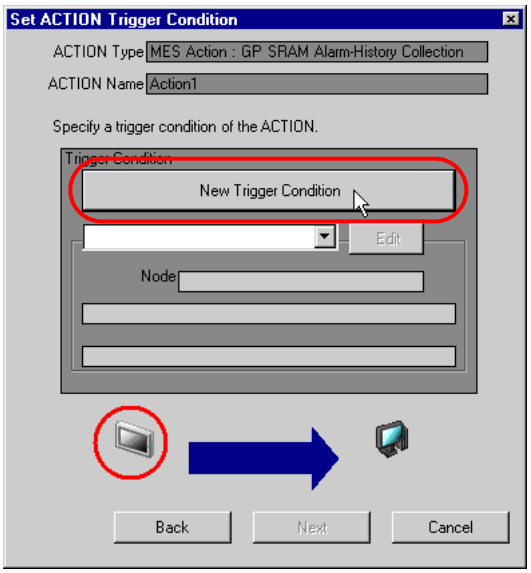
9 Check the read source node and block numbers, and click the [OK] button.



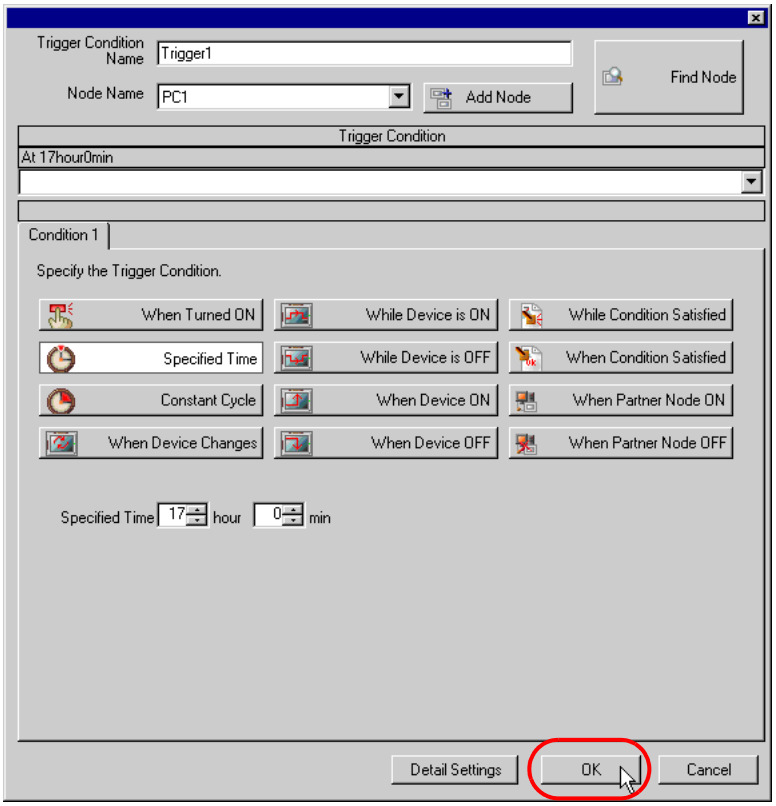
10 Then, specify the GP SRAM Alarm-History Collection ACTION trigger condition. Click the [Next] button on the "Set ACTION Name/Parameter" screen.



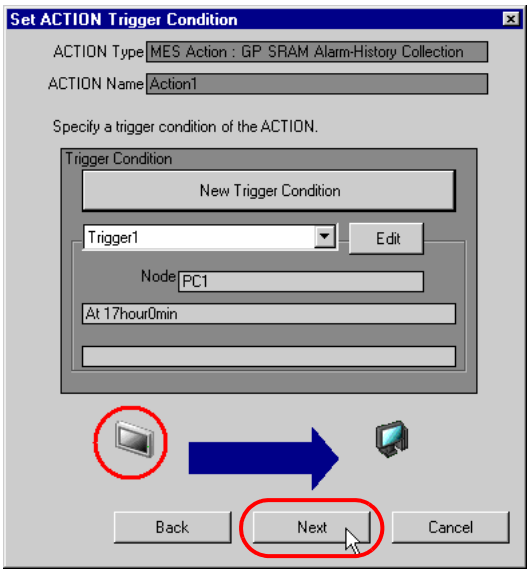
11 Click the [New Trigger Condition] button. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 13.



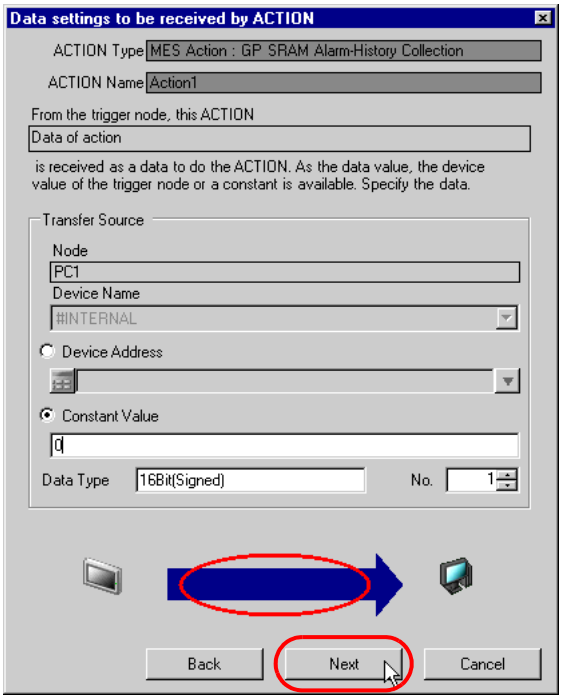
12 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



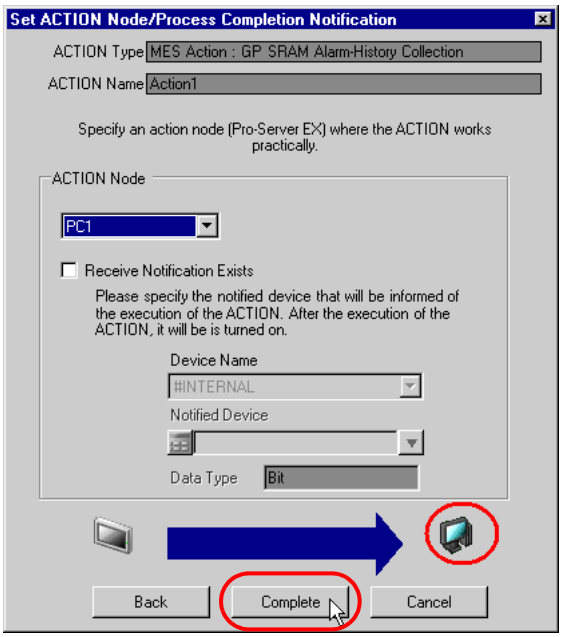
13 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



14 Specify the data to be received by the ACTION, and click the [Next] button. For GP SRAM Alarm-History Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



15 Specify the ACTION operating node and whether to enable or disable receiving notice, and click the [Complete] button. Through the above procedure, GP SRAM Alarm-History Collection ACTION is added.



3.4.2 Management of Collected Data

The data collected by GP SRAM Alarm-History Collection ACTION are saved in the D_SramAlarm table. Actually, the table name is expressed with the ACTION ID ('Pro-Studio EX' internal information indicated by string) and the date, as shown below:

Table Name: D_SramAlarm_ACTION ID

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	StationName	nvarchar(32)	Node Name	
	Block	int	Alarm block number.	
	Datetime	datetime	Date and time.	
	Kind	nvarchar(7)	One of Trigger, Acknowledge or Recovery is specified.	
	Message	nvarchar(160)	Message	
	Count	int	Number of occurrences. (A value at the time of first collection of the ACTION)	
	TotalTime	bigint	Total time. (Unit: second) (A value at the time of first collection of the ACTION)	
	Level	int	Level.	

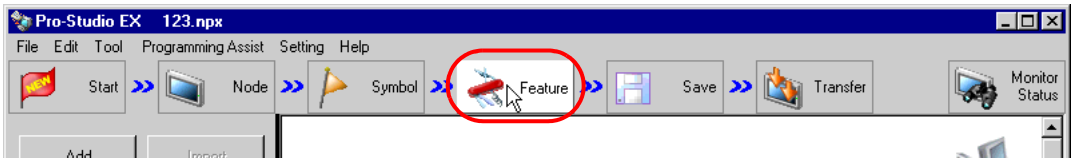
3.5 Collecting Alarm-History-File from CF Card

GP CF-card Alarm-History-File Collection ACTION collects alarm logs that have been stored in the GP3000 or GP CF card at a specified cycle by node and block number, and saves the collected data into the database.
GP CF-card Alarm-History-File Collection ACTION can collect the GP3000 or GP alarm history storing blocks (Block 1 to Block 8) by specifying individual blocks (several blocks) or all blocks. GP CF-card Alarm-History-File Collection ACTION compares the alarm logs that have been stored in the CF card with the previously collected ones to eliminate duplicated data, and saves the alarm logs into the database.

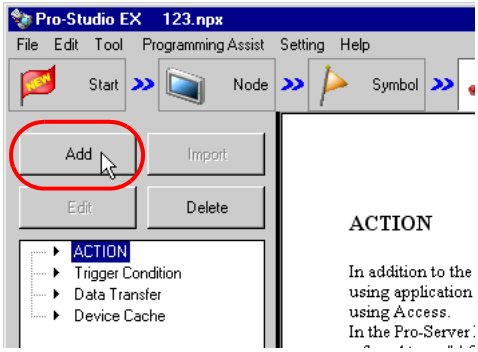
IMPORTANT
- Only the "Log" display mode of alarm history can collect.

3.5.1 Registering GP CF-card Alarm-History-File Collection ACTION

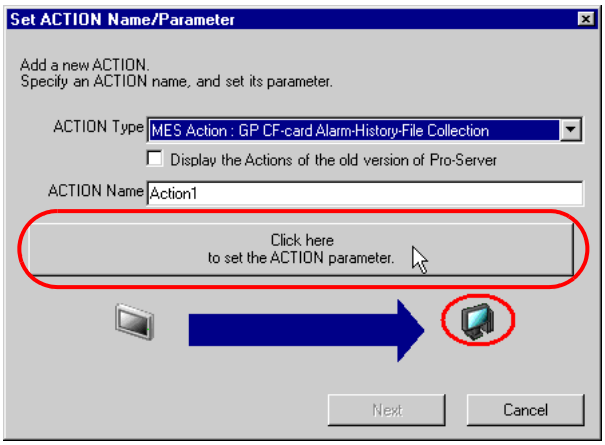
1 Click the [Feature] icon on the status bar.



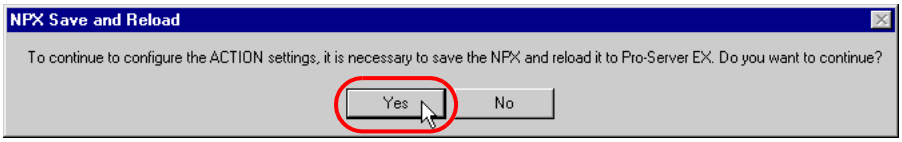
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



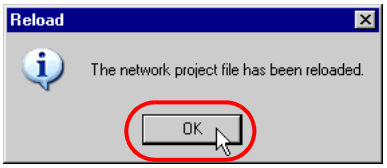
3 Click the [ACTION Type] list button and select "MES Action : GP CF-card Alarm-History-File Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



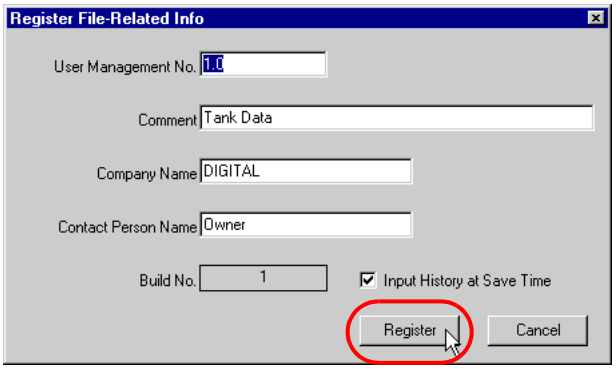
4 Click [Yes] on the "NPX Save and Reload" screen.



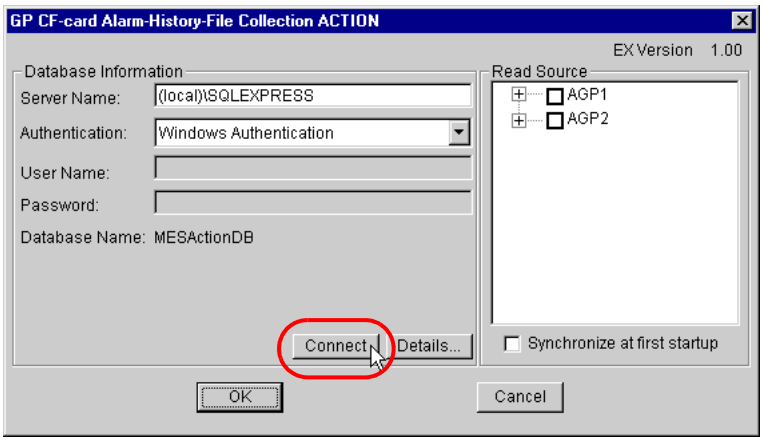
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

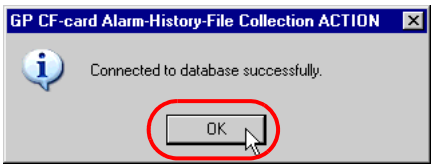


Information required for database connection is listed below.

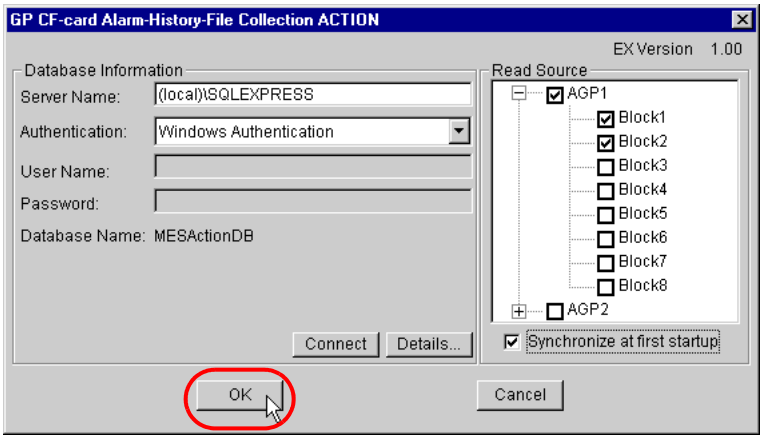
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



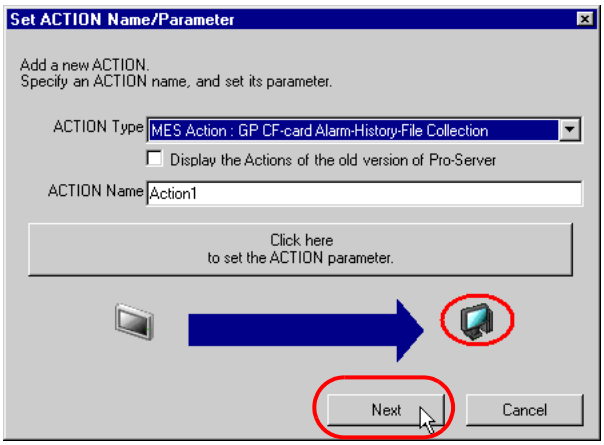
9 Check the read source node and block numbers, and click the [OK] button. To further store in the database the alarm history that has been stored in the CF card (whether while 'Pro-Server EX' is running or not) before the set ACTION is first activated, check "Synchronize at first startup" as well, and then click [OK].



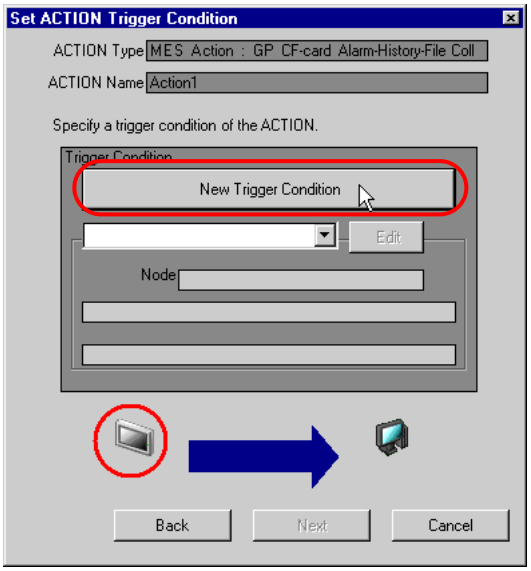
NOTE

- When "Synchronize at first startup" is checked, the system takes more time to communicate with GP, if many alarm history files have been stored in the CF file (whether while 'Pro-Server EX' is running or not) before the set ACTION is first activated.

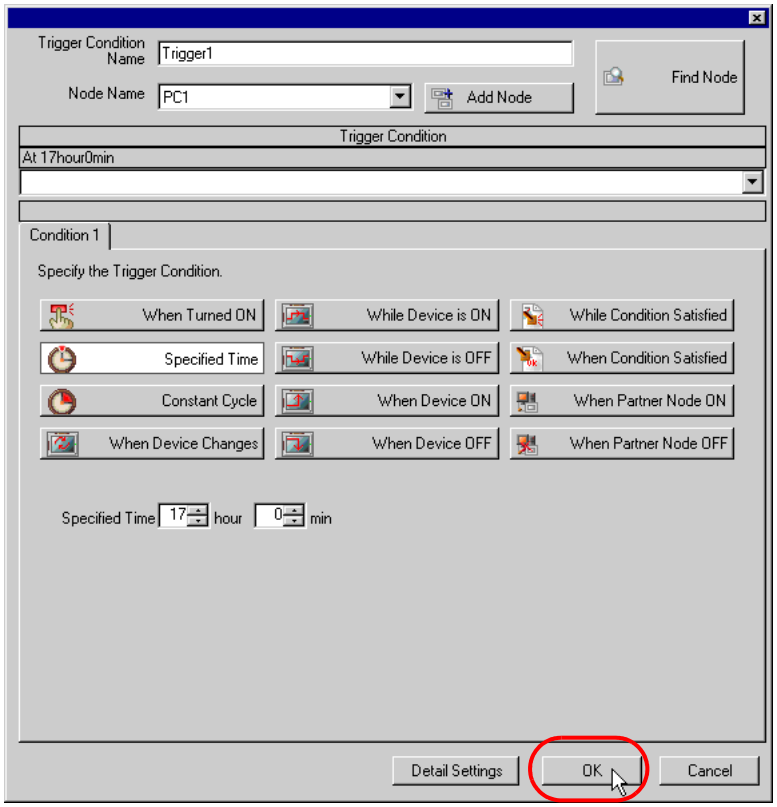
10 Then, specify the GP CF-card Alarm-History-File Collection ACTION trigger condition. Click the [Next] button on the "Set ACTION Name/Parameter" screen.



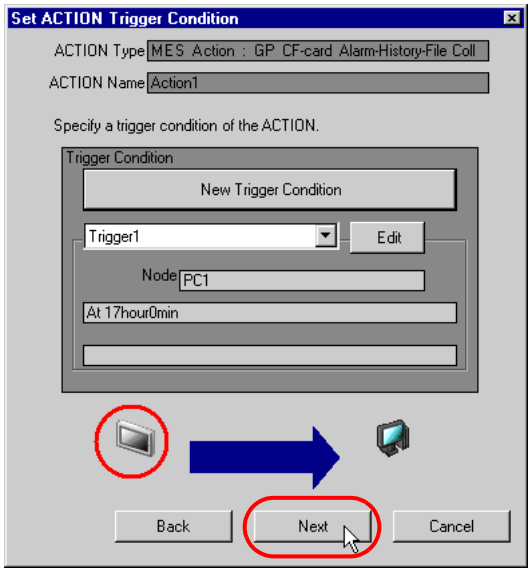
11 Click the [New Trigger Condition] button. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 13.



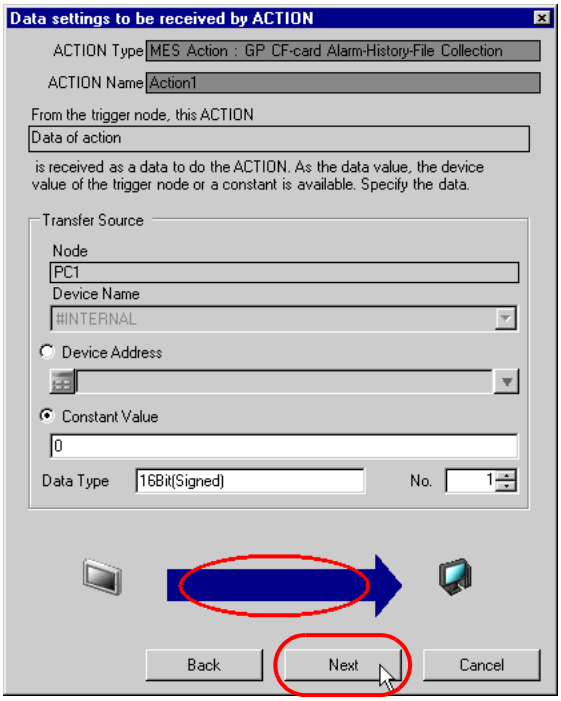
12 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



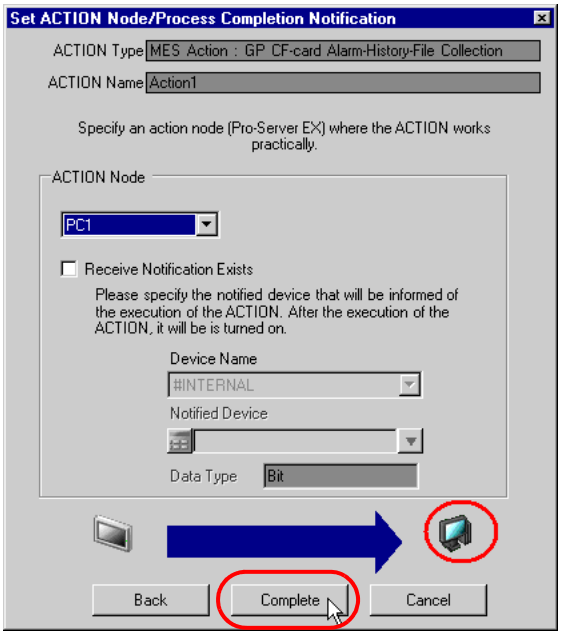
13 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



14 Specify the data to be received by the ACTION, and click the [Next] button. For GP CF-card Alarm-History-File Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



15 Specify the ACTION operating node and whether to enable or disable receiving notice, and click the [Complete] button. Through the above procedure, GP CF-card Alarm-History-File Collection ACTION is added.



3.5.2 Management of Collected Data

The data collected by GP CF-card Alarm-History-File Collection ACTION are saved in the D_CfAlarm table. Actually, the table name is expressed with the ACTION ID ('Pro-Studio EX' internal information indicated by string) and the date, as shown below:

Table Name: D_CfAlarm_ACTION ID

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	StationName	nvarchar(32)	Node Name	
	Block	int	Alarm block number.	
	Datetime	datetime	Date and time.	
	Kind	nvarchar(7)	One of Trigger, Acknowledge or Recovery is specified.	
	Message	nvarchar(160)	Message	
	Count	int	Number of occurrences. (A value at the time of first collection of the ACTION)	
	TotalTime	bigint	Total time. (Unit: second) (A value at the time of first collection of the ACTION)	
	Level	int	Level	

3.6 Collecting Sampling-Data from SRAM

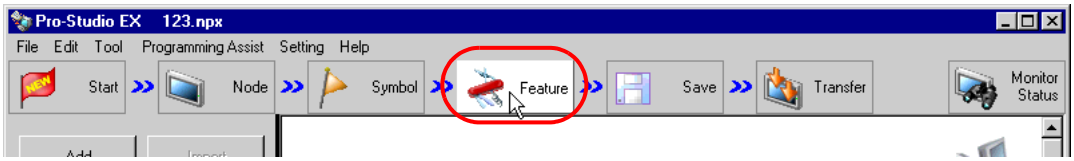
GP SRAM Sampling-Data Collection ACTION collects sampling data that have been stored in the GP3000 or GP SRAM at a specified cycle by node and group number, and saves the collected data into the database (Since GP sampling data are subjected to group management, the collection target is a group).
GP SRAM Sampling-Data Collection ACTION can collect the GP3000 or GP sampling data group (Block 1 to Block 64) by specifying individual groups (several groups) or all groups. GP SRAM Sampling-Data Collection ACTION saves the sampling data that have been stored in the SRAM into the database.

IMPORTANT

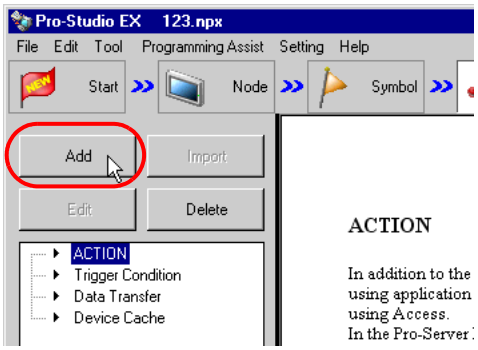
- In the Common Settings window of 'GP-Pro EX', if the symbol is specified in [Sampling Start Address] on the [Address] tab, accessible from an arbitrary [Group] under [Sampling], check [Display/Save in CSV] on the [Display/Save in CSV] tab, select the custom setting, and then change the item name to prevent duplicate names.
- When saving the data of less than 1 second in the SRAM, select [Constant Cycle] or [Constant Cycle while Bit is ON] as the sampling execution condition on 'GP-Pro EX'. If other option is selected, the time information of less than 1 second cannot be saved in the SRAM. When [Constant Cycle] or [Constant Cycle while Bit is ON] is selected as the sampling execution condition on 'GP-Pro EX', the value of less than 1 second cannot be checked after the sampling data is collected since the value of less than 1 second in the time information is not saved in MES Action.

3.6.1 Registering GP SRAM Sampling-Data Collection ACTION

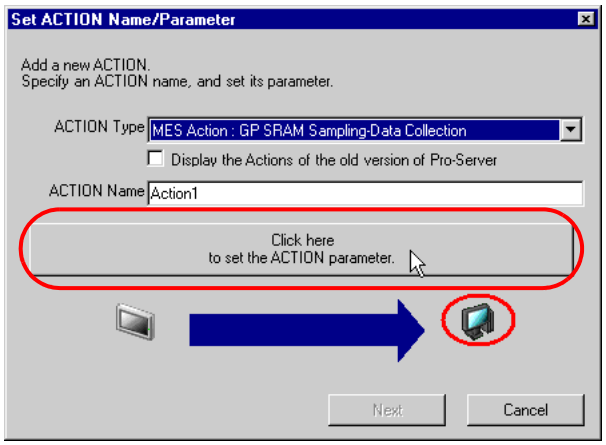
1 Click the [Feature] icon on the status bar.



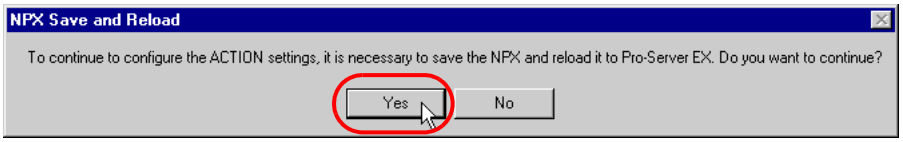
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



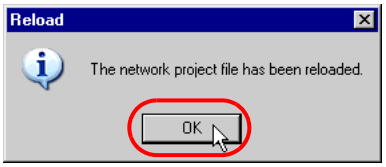
3 Click the [ACTION Type] list button and select "MES Action : GP SRAM Sampling-Data Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



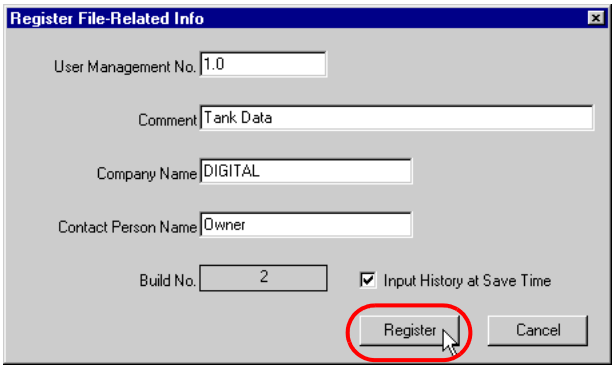
4 Click [Yes] on the "NPX Save and Reload" screen.



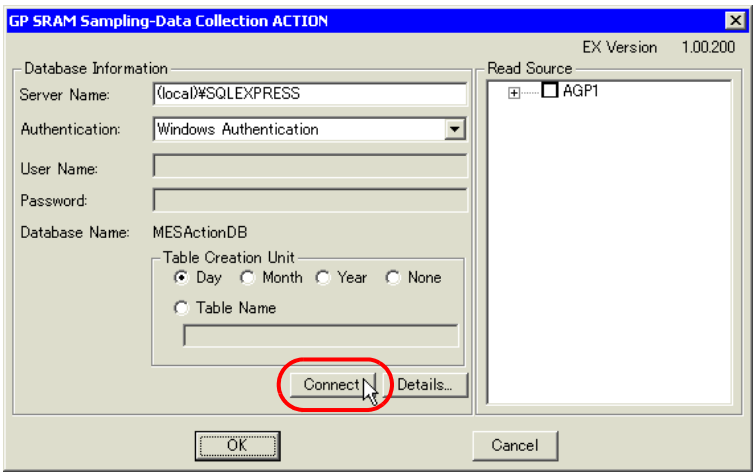
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

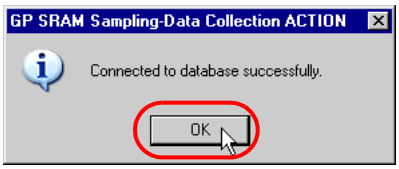


Information required for database connection is listed below.

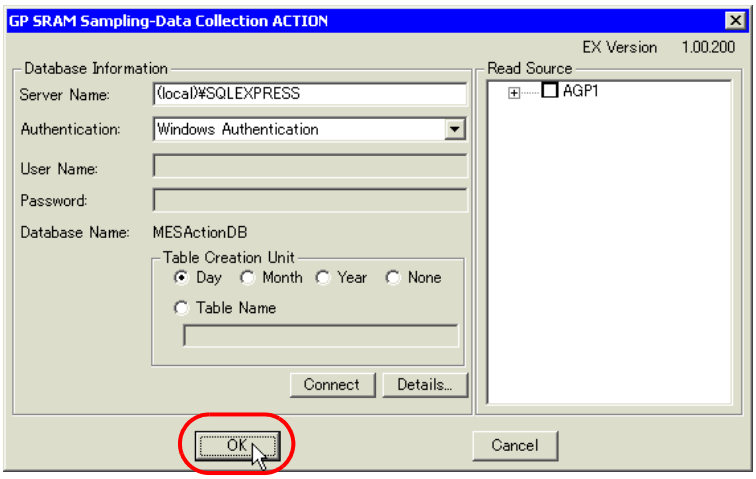
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.
	Table Creation Unit	Specify the unit (Day/Month/Year/None/Table name specification) in which the database table will be saved.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

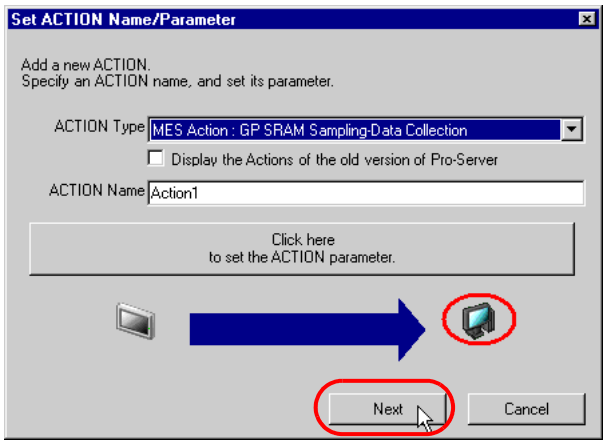
8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



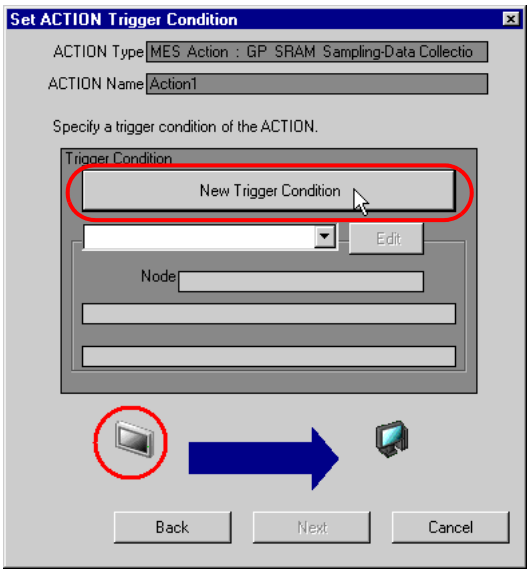
9 Check the read source node and group numbers, and click [OK].



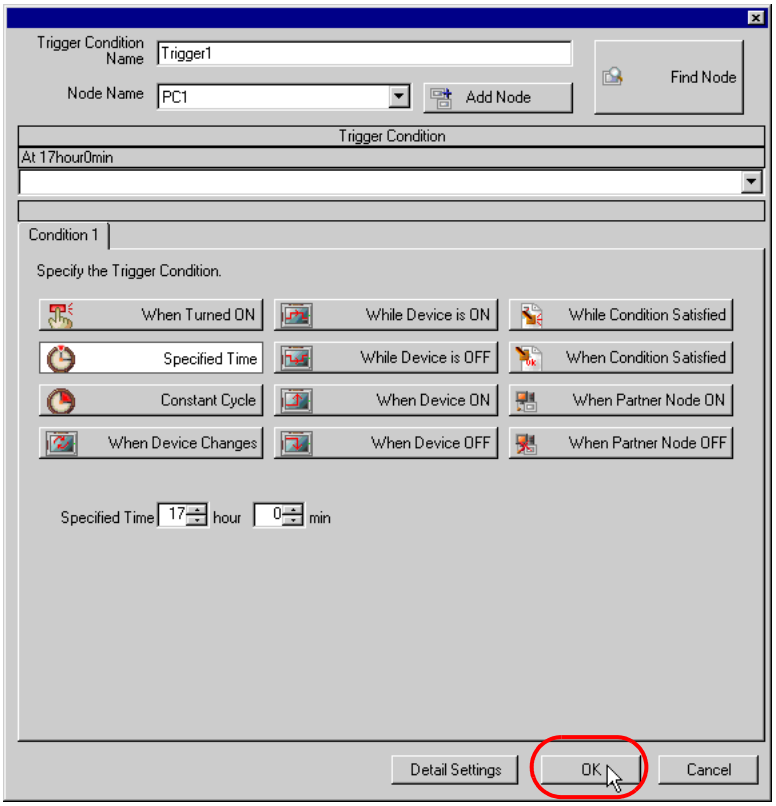
10 Then, specify the GP SRAM Sampling-Data Collection ACTION trigger condition. Click [Next] on the "Set ACTION Name/Parameter" screen.



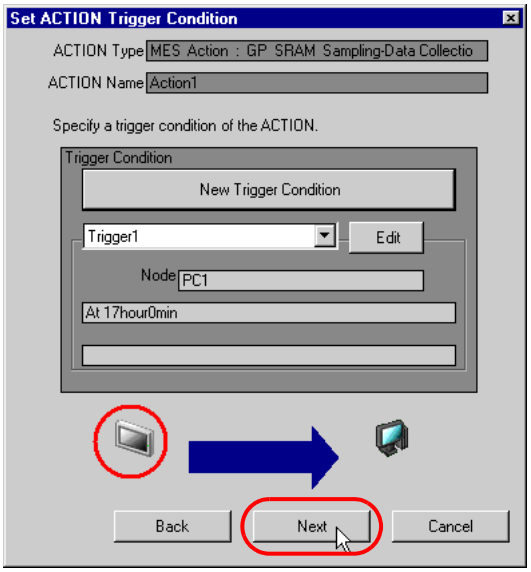
11 Click [New Trigger Condition]. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 13.



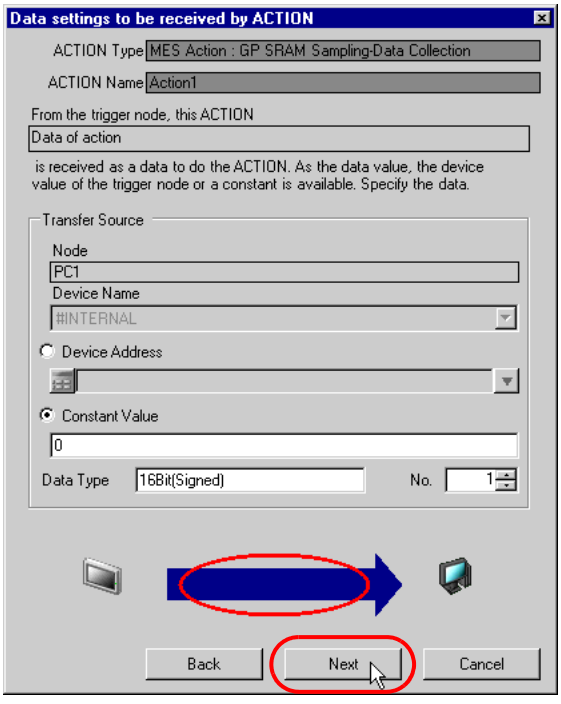
12 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



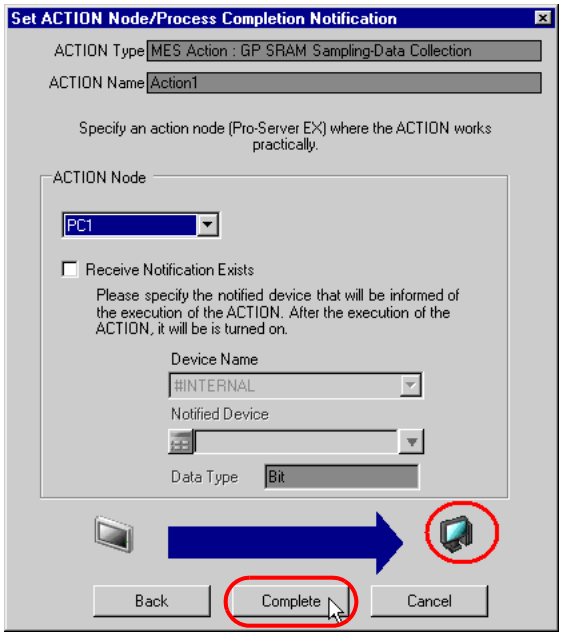
13 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



14 Specify the data to be received by the ACTION, and click [Next]. For GP SRAM Sampling-Data Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



15 Specify the ACTION operating node and whether to enable or disable receiving notice, and click [Complete].
Through the above procedure, GP SRAM Sampling-Data Collection ACTION is added.



3.6.2 Management of Collected Data

The data collected by GP SRAM Sampling-Data Collection ACTION are saved in the D_SramSamp table. Actually, the table name is expressed with the ACTION ID ('Pro-Studio EX' internal information indicated by string) GP node name, group number and table creation unit, as shown below:

When the table is created daily : D_SramSamp_ACTION ID_GP node name_Group number_YYYYMMDD
When the table is created monthly : D_SramSamp_ACTION ID_GP node name_Group number_YYYYMM
When the table is created yearly : D_SramSamp_ACTION ID_GP node name_Group number_YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Date and time.	
	(Item name 1)	real	Sampling data.	○
	(Item name 2)	real	Sampling data.	○
	:			○
	(Item name n)	real	Sampling data.	○

3.7 Collecting Sampling-Data-File from CF Card

GP CF-card Sampling-Data-File Collection ACTION collects sampling data that have been stored in the GP3000 or GP CF card at a specified cycle by node and group number, and saves the collected data into the database (Since GP sampling data are subjected to group management, the collection target is a group).
GP CF-card Sampling-Data-File Collection ACTION can collect the GP3000 or GP sampling data group (Block 1 to Block 64) by specifying individual groups (several groups) or all groups. GP CF-card Sampling-Data-File Collection ACTION reads sampling data that have been stored in the CF card in the CSV format, and saves the data into the database.

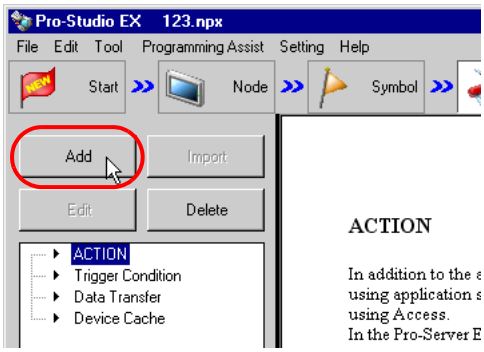
IMPORTANT

- When saving the data of less than 1 second in the CF card, select [Constant Cycle] or [Constant Cycle while Bit is ON] as the sampling execution condition on 'GP-Pro EX'. If other option is selected, the time information of less than 1 second cannot be saved in the CF card. When [Constant Cycle] or [Constant Cycle while Bit is ON] is selected as the sampling execution condition on 'GP-Pro EX', the value of less than 1 second cannot be checked after the sampling data is collected since the value of less than 1 second in the time information is not saved in MES Action.

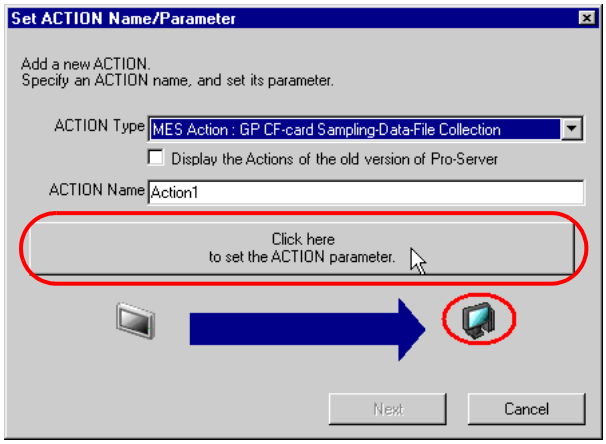
3.7.1 Registering GP CF-card Sampling-Data-File Collection ACTION

1 Click the [Feature] icon on the status bar.

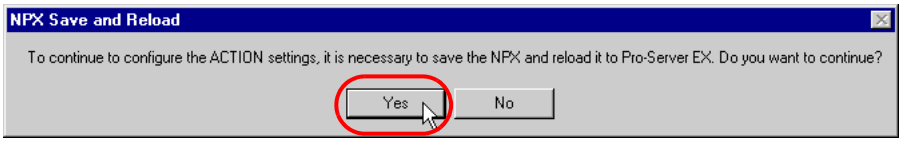
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



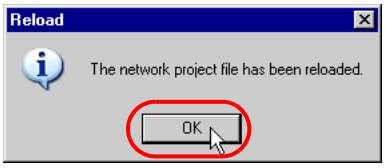
3 Click the [ACTION Type] list button and select "MES Action : GP CF-card Sampling-Data-File Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



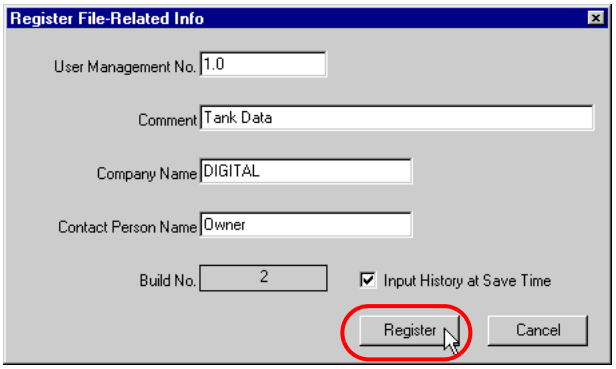
4 Click [Yes] on the "NPX Save and Reload" screen.



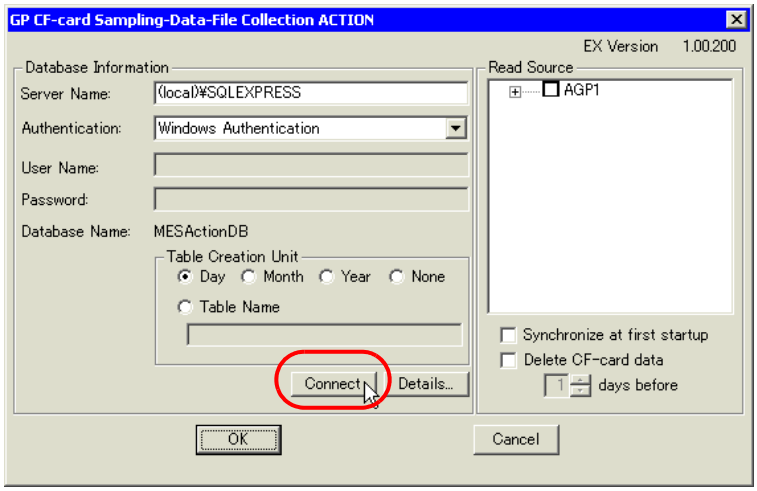
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

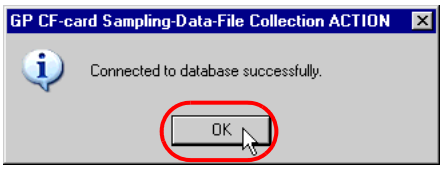


Information required for database connection is listed below.

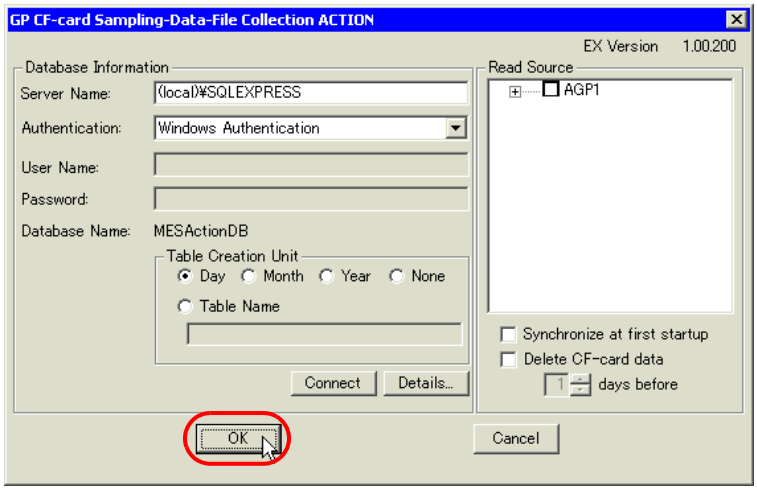
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.
	Table Creation Unit	Specify the unit (Day/Month/Year/None/Table name specification) in which the database table will be saved.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



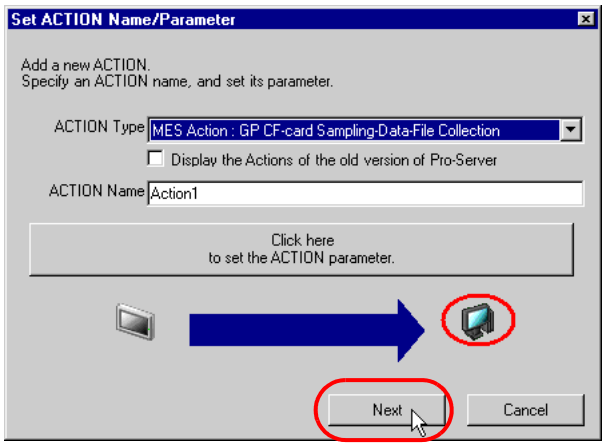
9 Check the read source node and block numbers, and click the [OK] button. To further store in the database the alarm history that has been stored in the CF card (whether while 'Pro-Server EX' is running or not) before the set ACTION is first activated, check "Synchronize at first startup" as well, and then click [OK].



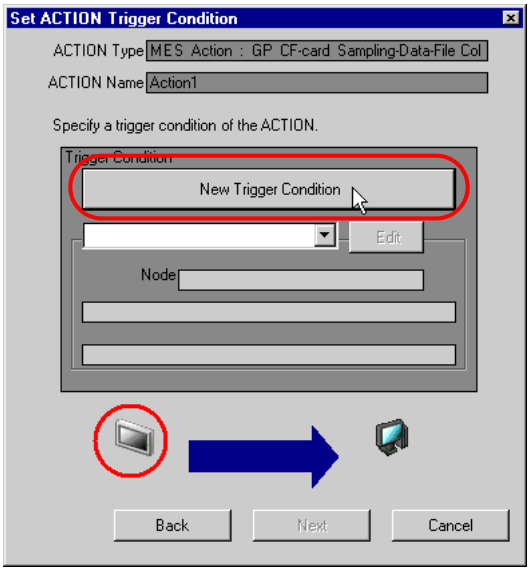
NOTE

- When "Synchronize at first startup" is checked, the system takes more time to communicate with GP, if many alarm history files have been stored in the CF file (whether while 'Pro-Server EX' is running or not) before the set ACTION is first activated.
- To delete old sampling data files stored in the CF card automatically, check "Delete CF-card data", and specify a number of days to delete files older than the storing period.

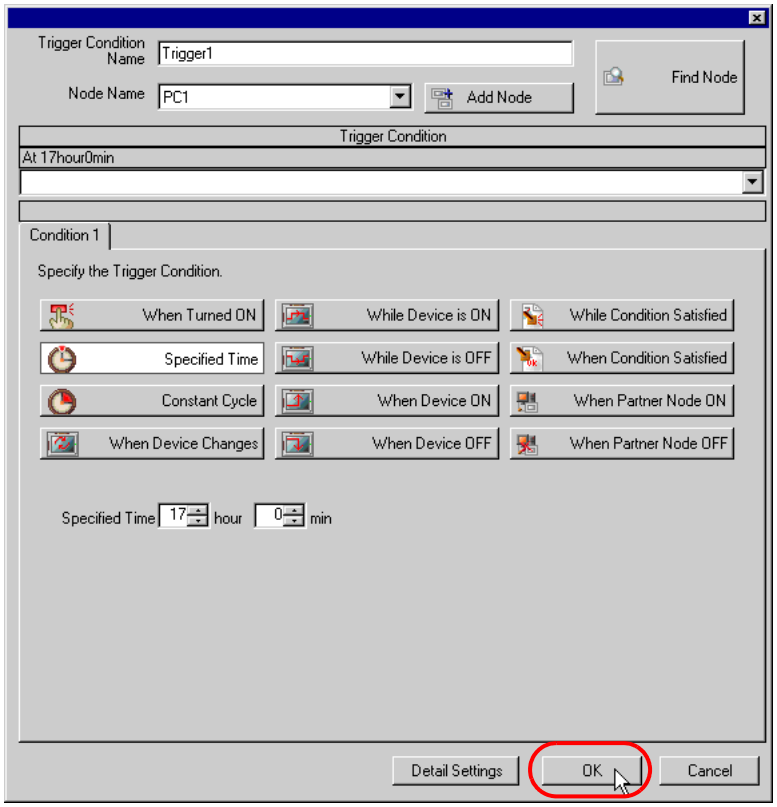
10 Then, specify the GP CF-card Sampling-Data-File Collection ACTION trigger condition. Click the [Next] button on the "Set ACTION Name/Parameter" screen.



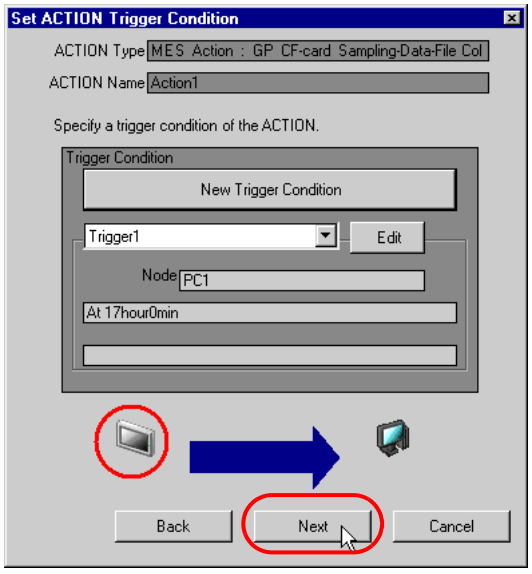
11 Click the [New Trigger Condition] button. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 13.



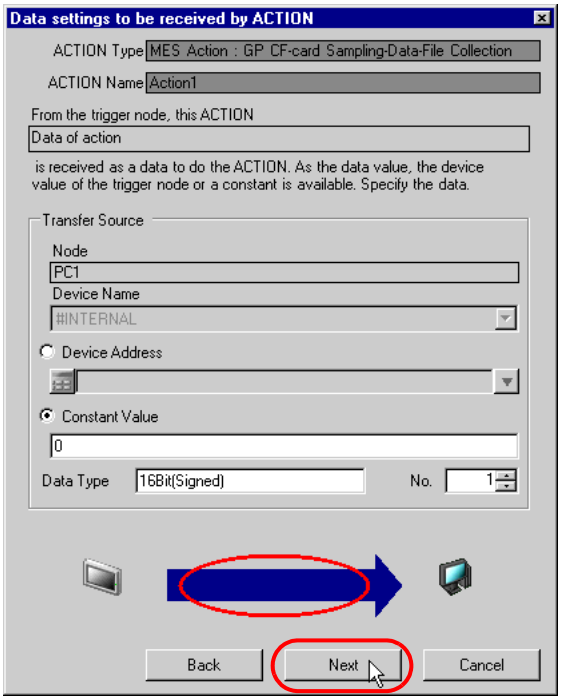
12 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



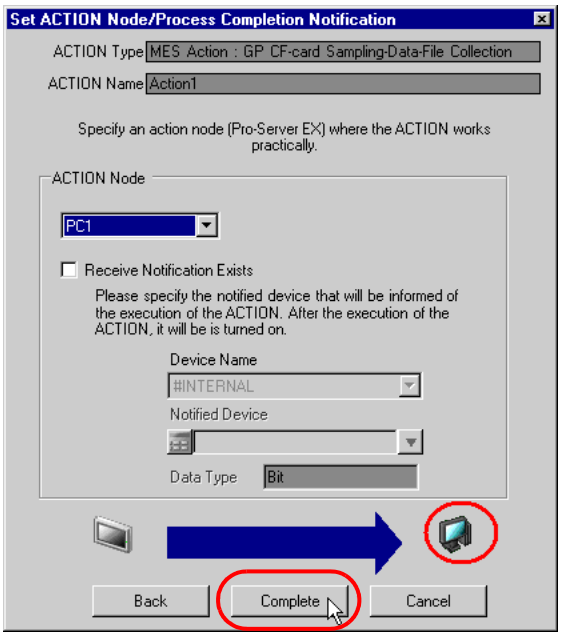
13 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



14 Specify the data to be received by the ACTION, and click the [Next] button. For GP CF-card Sampling-Data-File Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



15 Specify the ACTION operating node and whether to enable or disable receiving notice, and click the [Complete] button. Through the above procedure, GP CF-card Sampling-Data-File Collection ACTION is added.



3.7.2 Management of Collected Data

The data collected by GP CF-card Sampling-Data-File Collection ACTION are saved in the D_CfSamp table. Actually, the table name is expressed with the ACTION ID ('Pro-Studio EX' internal information indicated by string) GP node name, group number and table creation unit, as shown below:

When the table is created daily : D_CfSamp_ACTION ID_GP node name_Group number_YYYYMMDD
When the table is created monthly : D_CfSamp_ACTION ID_GP node name_Group number_YYYYMM
When the table is created yearly : D_CfSamp_ACTION ID_GP node name_Group number_YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Date and time.	
	(Item name 1)	real	Sampling data.	○
	(Item name 2)	real	Sampling data.	○
	:			○
	(Item name n)	real	Sampling data.	○

3.8 Collecting Captured Data from CF Card

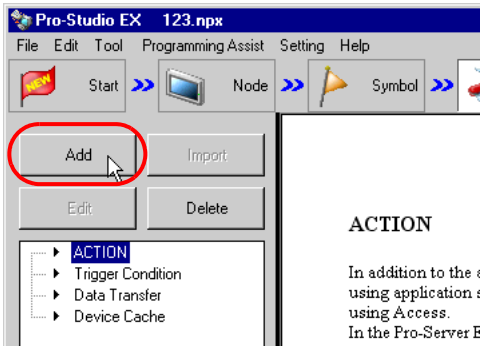
GP CF-card Screen-File Collection ACTION collects captured data (image files in the JPEG format) that have been stored in the GP3000 or GP CF card at a specified start condition or cycle, and saves the JPEG image files into the database.

For GP CF-card Screen-File Collection ACTION, you can specify whether to save captured data in a local PC hard disk or in the database. If you select a local PC hard disk as the storage media, only file names are saved in the database.

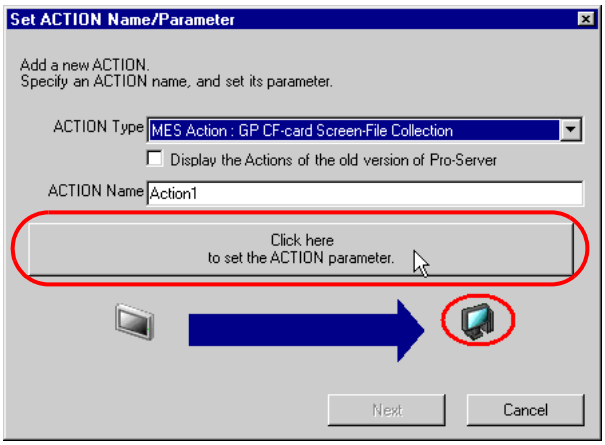
3.8.1 Registering GP CF-card Screen-File Collection ACTION

1 Click the [Feature] icon on the status bar.

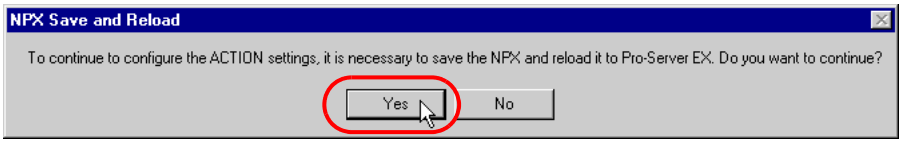
2 Select [ACTION] from the tree display on the left of the screen and click the [Add] button.



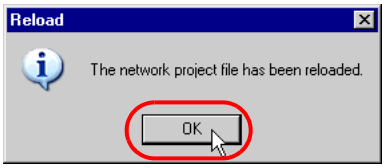
3 Click the [ACTION Type] list button and select "MES Action : GP CF-card Screen-File Collection". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



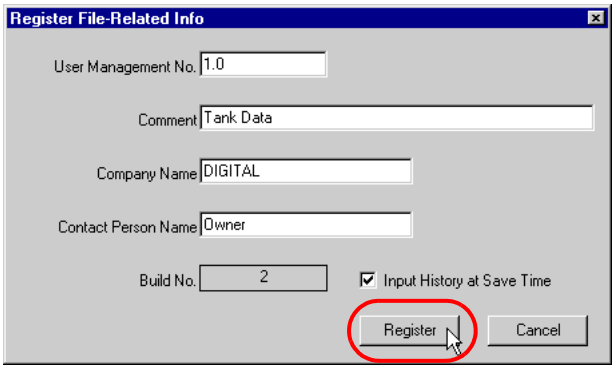
4 Click [Yes] on the "NPX Save and Reload" screen.



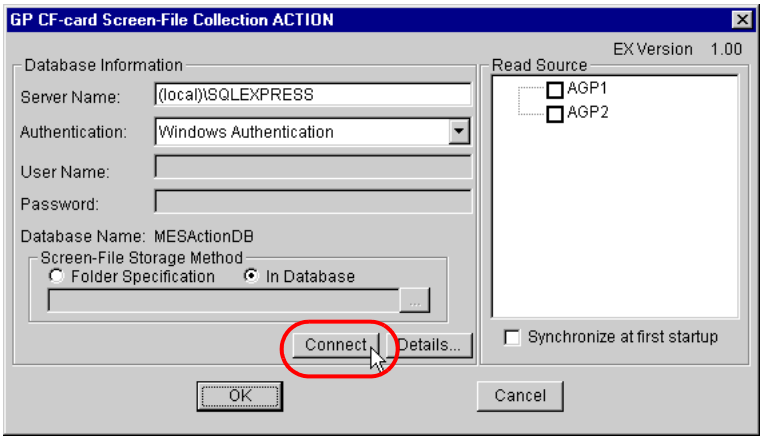
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

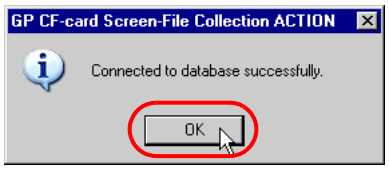


Information required for database connection is listed below.

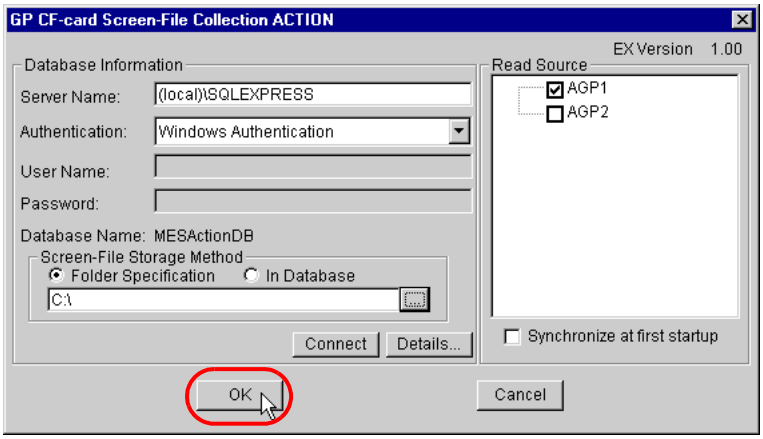
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.
	Screen-File Storage Method	Folder Specifications: Stores only the file name of the captured data in the database, and stores the captured data itself in the PC. If you select [Folder Specification], specify a destination folder for storing the captured data. In Database: Stores the captured data and its file name in the database.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



9 Check the read source node and click [OK]. To further store in the database the captured data that has been stored in the CF card (whether while 'Pro-Server EX' is running or not) before the set ACTION is first activated, check "Synchronize at first startup" as well, and then click [OK].

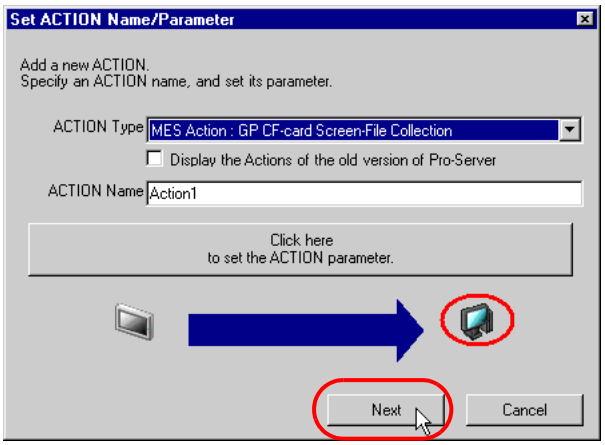


NOTE

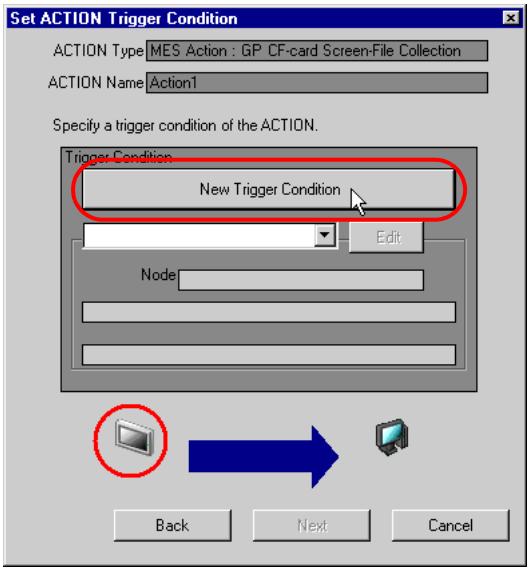
- When "Synchronize at first startup" is checked, the system takes more time to communicate with GP, if many captured data have been stored in the CF file (whether while 'Pro-Server EX' is running or not) before the set ACTION is first activated.

Setup Item	Selectable method	Description
Screen-File Storage Method	Folder Specification	To save a captured data read from the CF card, a folder in a local PC is specified. The database saves only the file pathname.
	In Database	Contents of a captured data read from the CF card are saved in the database as binary data.

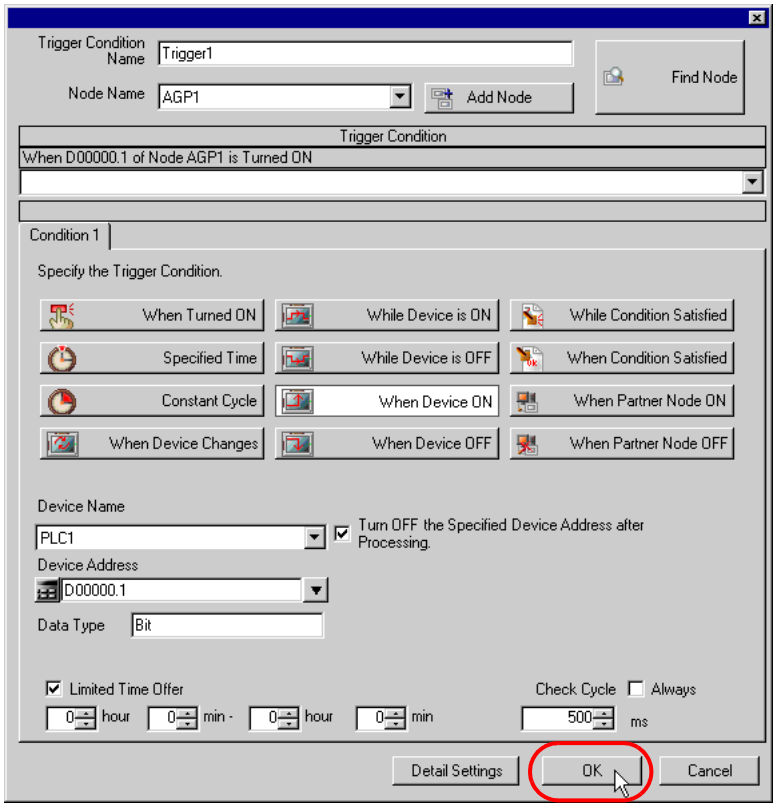
10 Then, specify the GP CF-card Screen-File Collection ACTION trigger condition. Click the [Next] button on the "Set ACTION Name/Parameter" screen.



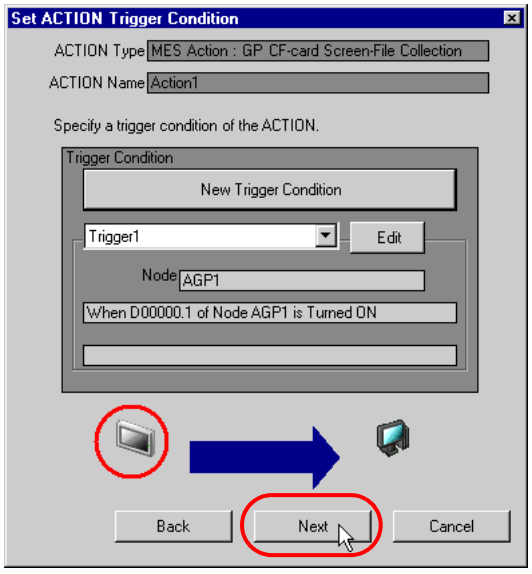
11 Click the [New Trigger Condition] button. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 13.



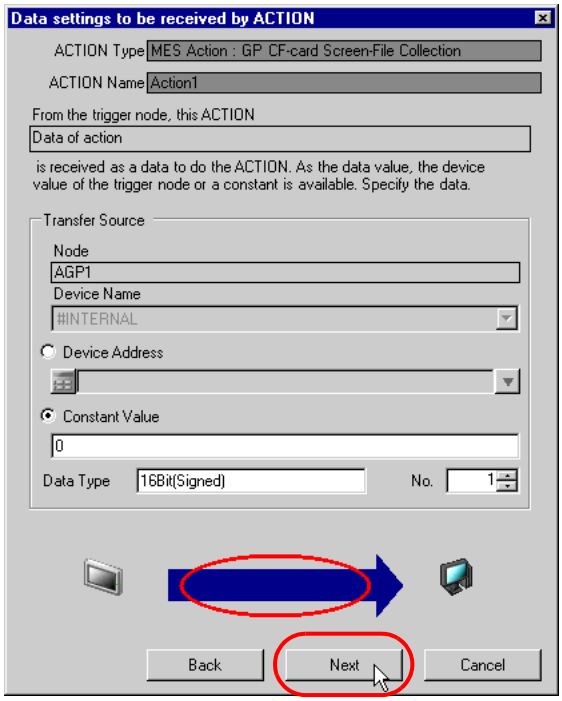
12 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



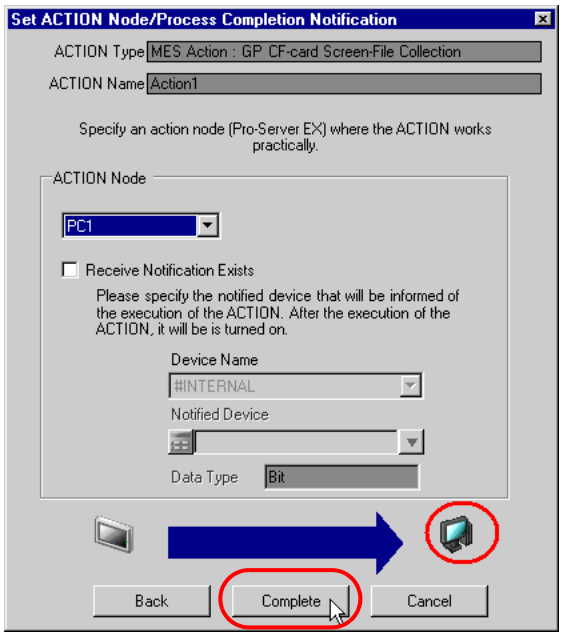
13 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



14 Specify the data to be received by the ACTION, and click the [Next] button. For GP CF-card Screen-File Collection ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



15 Specify the ACTION operating node and whether to enable or disable receiving notice, and click the [Complete] button. Through the above procedure, GP CF-card Screen-File Collection ACTION is added.



3.8.2 Management of Collected Data

The data collected by GP CF-card Screen-File Collection ACTION are saved in the D_CfScreenFile table. Actually, the table name is expressed with the ACTION ID ('Pro-Studio EX' internal information indicated by string) and the date, as shown below:

Table Name: D_CfScreenFile_ACTION ID

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	ACTION trigger date/time.	
	StationName	nvarchar(32)	Name of node.	
	FileName	nvarchar(255)	Captured data name in the CF card.	
	FilePath	nvarchar(260)	When the saving method is "Folder Specification", the full pathname of the captured data stored in the PC is specified. When the saving method is "In Database", this value is NULL.	○
	Image	varbinary(max)	When the saving method is "Folder Specification", this value is NULL. When the saving method is "In Database", contents of the captured data are specified.	○

3.9 Writing Recipe Data from Database into CF Card

When a recipe parameter template file is prepared in the GP CF card with GP-ProEX, Recipe Download ACTION overwrites the recipe file (ZR*****.CSV) with the recipe data stored in SQL Server 2005.
Recipe Download ACTION downloads recipe parameters to a specified node under a specified start condition.

3.9.1 Registering R_Recipe Table

To use Recipe Download ACTION, create an "R_Recipe" table (R_Recipe_xxxxx: 5-digit recipe number) with Management Studio Express.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	Line	int	Row Number. (Row number of the CSV file to be overwritten)	
	Item	nvarchar(32)	Item name. (Corresponding to the first column of the CSV file to be overwritten.)	
	Value	nvarchar(32)	Value. (Corresponding to the second column of the CSV file to be overwritten.)	○

An example of recipe table registration is shown below.

Table - dbo.R_...pe_00001_SAMPLE | Summary

	Line	Item	Value
▶	1	:DATE	2006/10/01 10:...
	2	:GROUP No.	0
	3	:GROUP NAME	buttered roll
	4	ITEM NAME	VALUE
	5	wheat flour	400
	6	dry yeast	8
	7	common salt	8
	8	sugar	16
	9	milk	310
	10	butter	40
*	NULL	NULL	NULL

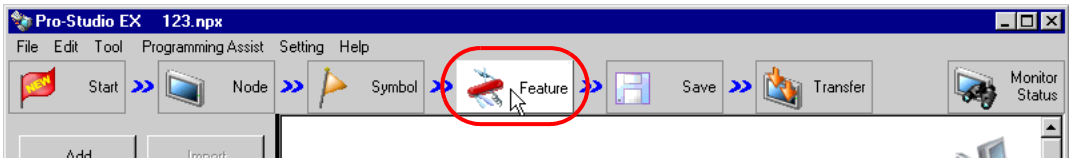
3.9.2 Registering R_RecipeIndex Table

The "R_RecipeIndex" table is used to allocate a condition name to a recipe registered in the R_Recipe table. The items registered in the R_RecipeIndex table are listed in the recipe list of Recipe Download ACTION. Create the R_RecipeIndex table with Management Studio Express.

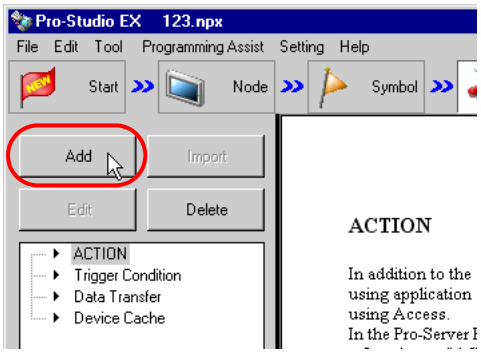
Main Key	Column Name	Data Type	Description	NULL Enabled
○	RecipeNumber	int	Recipe number. (Use the same recipe number as the table name specified in the R_Recipe table.)	
	ConditionName	nvarchar(32)	Condition name.	

3.9.3 Registering Recipe Download ACTION

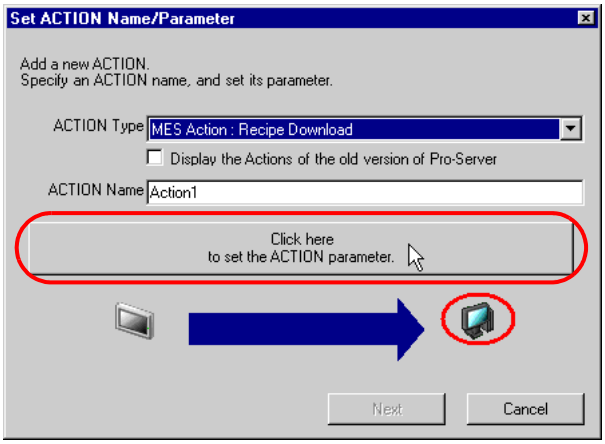
1 Click the [Feature] icon on the status bar.



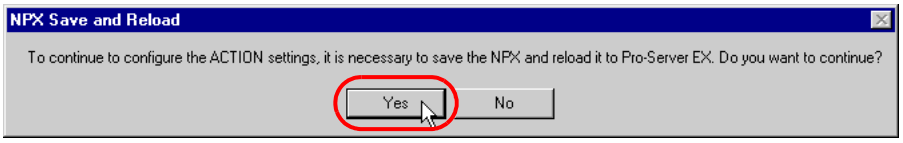
2 Select [ACTION] from the tree display on the left of the screen and click [Add].



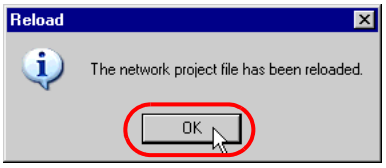
3 Click the [ACTION Type] list button and select "MES Action : Recipe Download". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



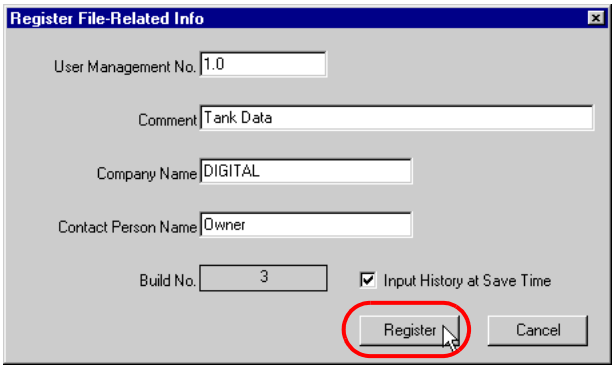
4 Click [Yes] on the "NPX Save and Reload" screen.



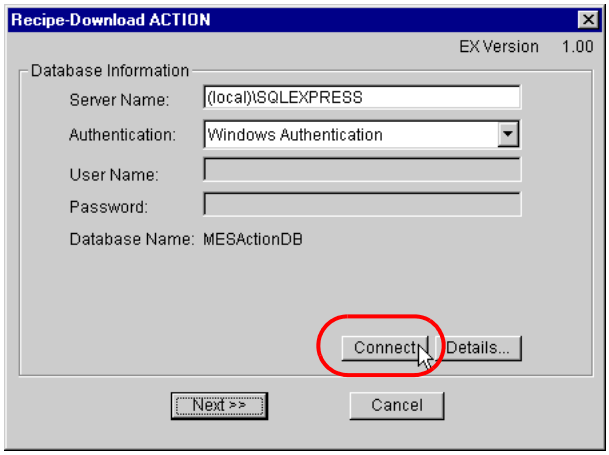
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

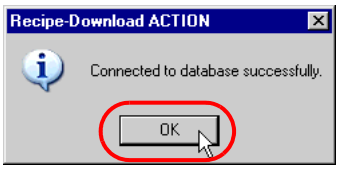


Information required for database connection is listed below.

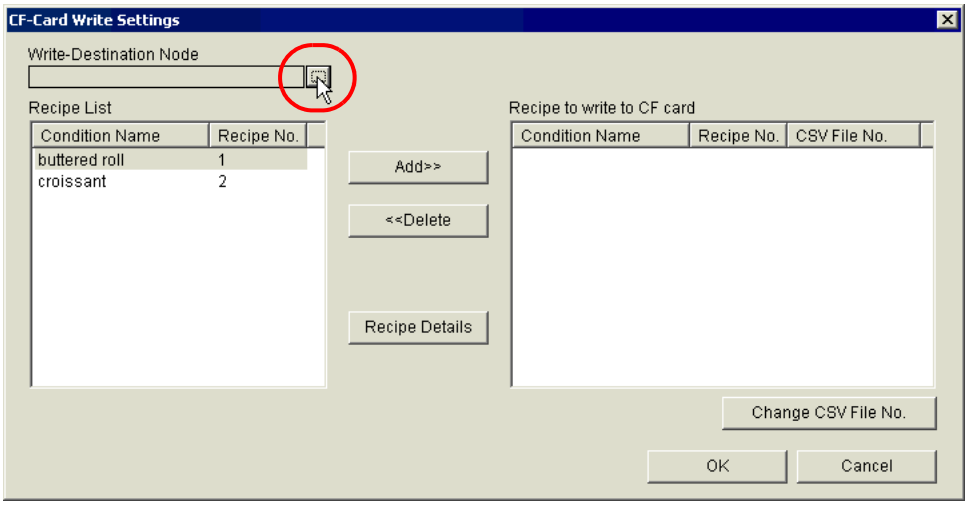
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

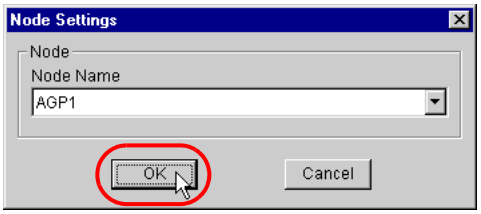
8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



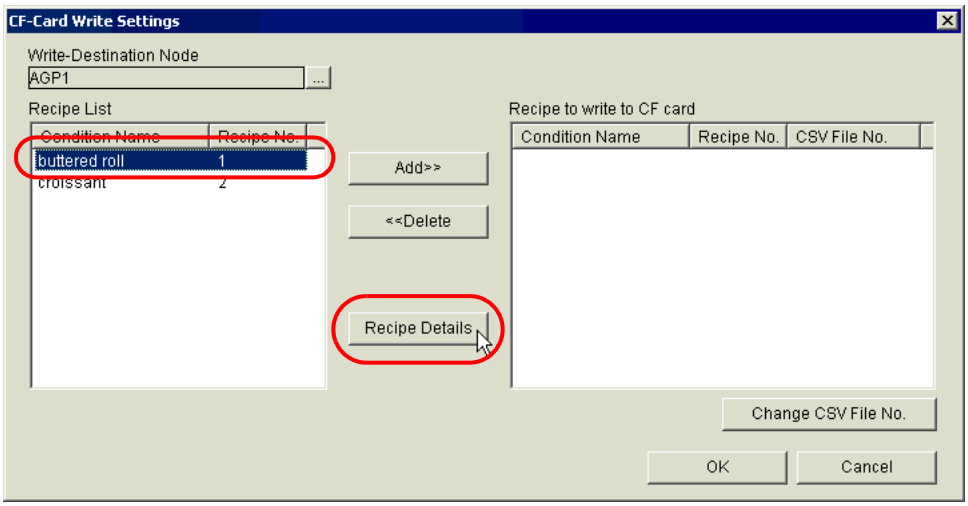
9 Click the [Write-Destination Node] selection button.



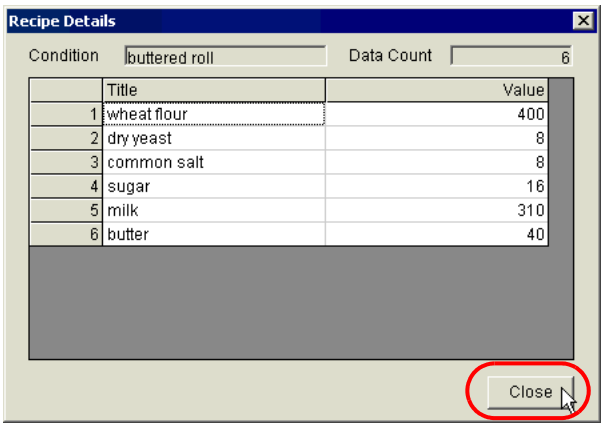
10 Select a node, and click [OK].



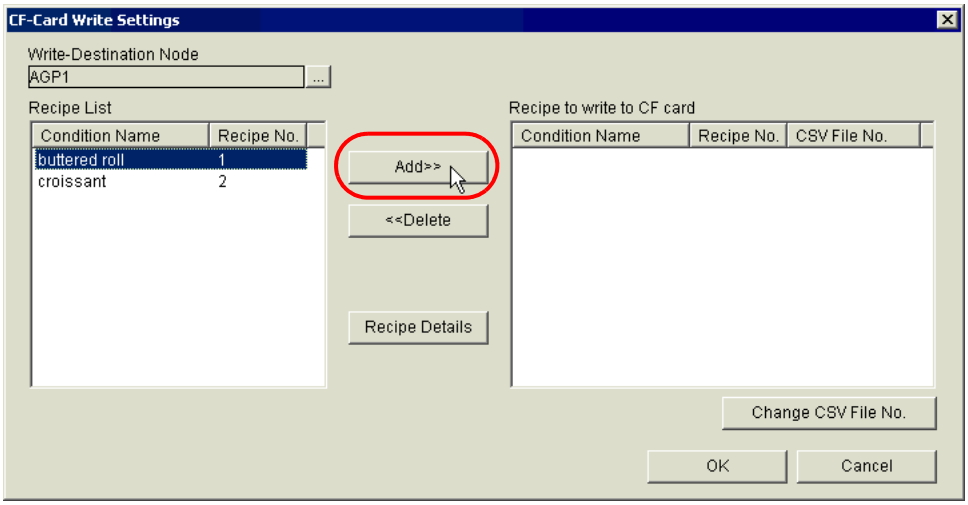
11 The recipe list shows the items registered in the R_RecipeIndex table. Select a recipe from the recipe list, and click [Recipe Details].



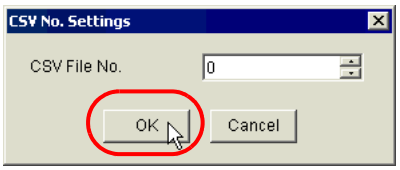
12 Contents of the recipe selected above (data registered in the R_Recipe table) are displayed. Check the data and click [Close].



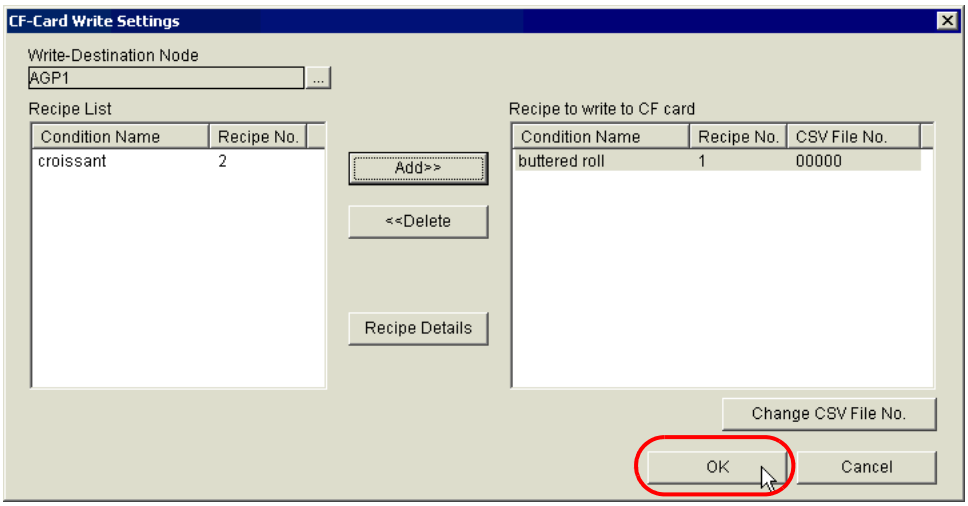
13 Select a recipe to be written into the CF card from the recipe list, and click [Add].



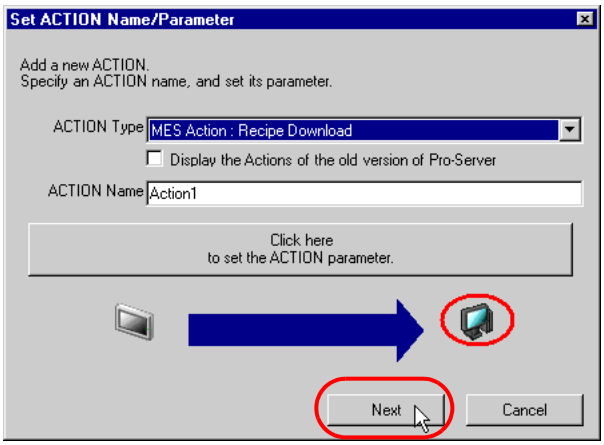
14 To write the recipe selected above into the CF card as a CSV file, specify a number used for the CSV file name on the [CSV No. Settings] screen, and click [OK] (A recipe file (CSV file) name is expressed as "ZR*****.CSV". "*****" indicates the CSV number specified here).



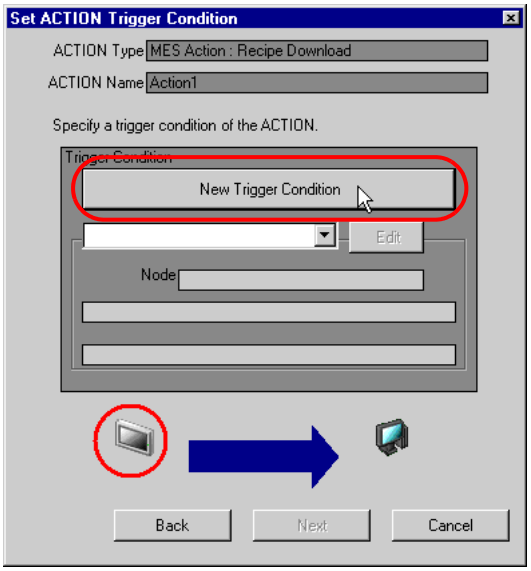
15 Confirm that the selected recipe is displayed in the "Recipe to write to CF card" list, and click [OK].



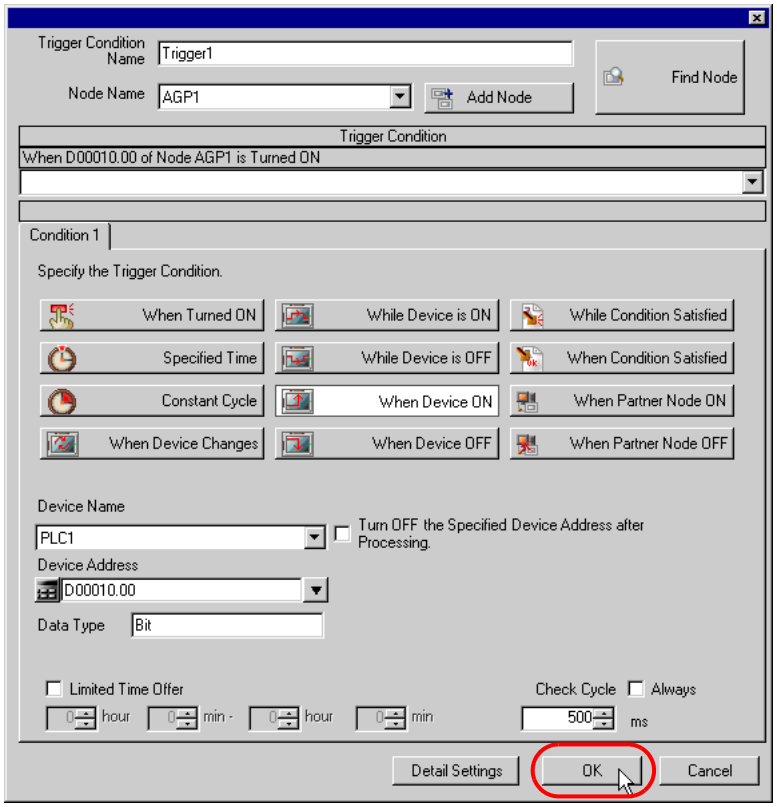
16 Then, specify the Recipe Download ACTION start condition. Click [Next] on the "Set ACTION Name/ Parameter" screen.



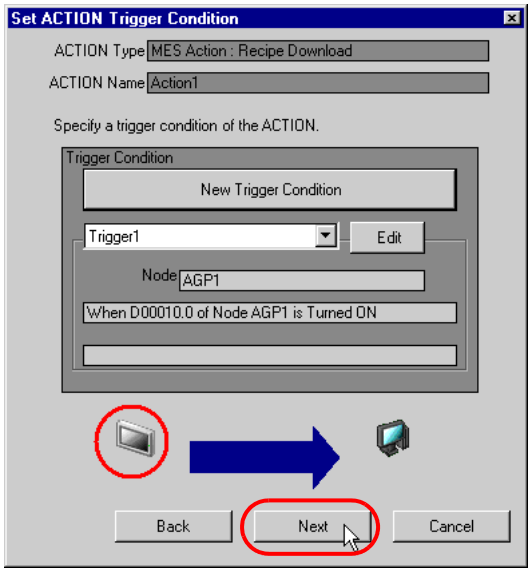
17 Click [New Trigger Condition]. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 19.



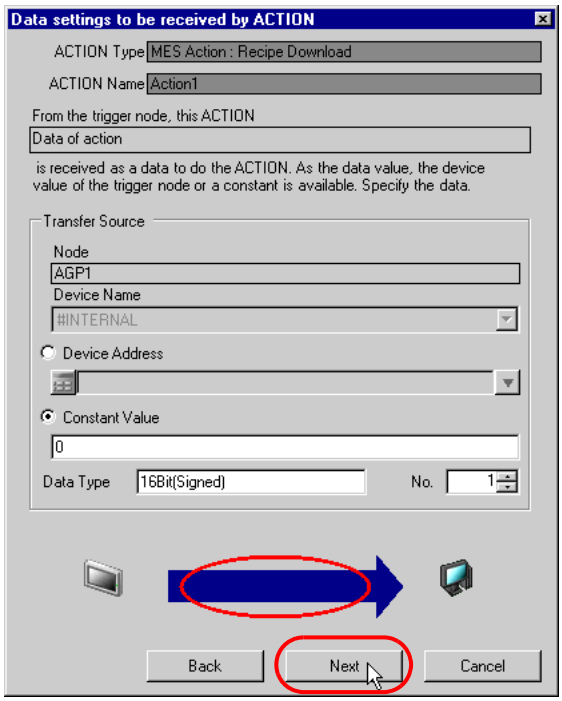
18 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



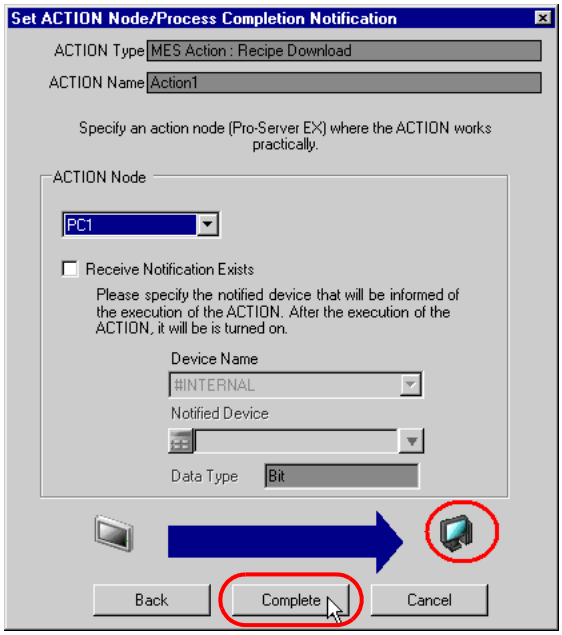
19 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.



20 Specify the data to be received by the ACTION, and click [Next]. For Recipe Download ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



21 Specify the ACTION operating node and whether to enable or disable receiving notice, and click [Complete]. Through the above procedure, Recipe Download ACTION is added.



3.10 Batch Transfer of Recipe, Text and Image Data

By using Composite Document Recipe-Transfer ACTION, you can transfer composite data including recipe, text and image that have been registered in the database into GP3000 at once. With the index search function, you can select composite data depending on a symbol or device value.

IMPORTANT
- The GP3000 Series and WinGP supports Composite Document Recipe-Transfer ACTION.

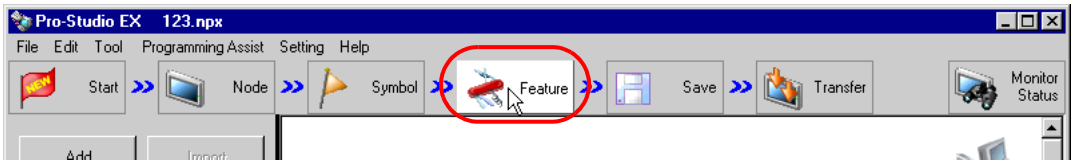
3.10.1 Registering R_MultiRecipe Table

To use Composite Document Recipe-Transfer ACTION, create a "R_MultiRecipe" table with Management Studio Express. Actually, the table name is expressed as "R_MultiRecipe_xxx" ("xxx" indicates a desired character string). Contents of the R_MultiRecipe table are listed below:

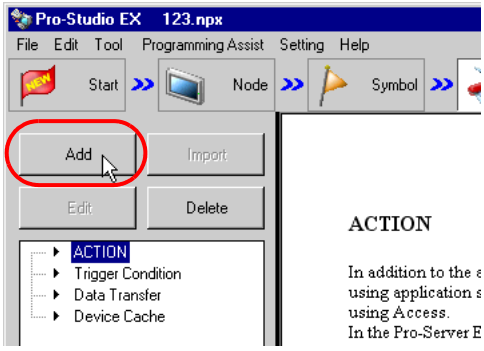
Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Unique integer used for index search. Main key.	
	Index	nvarchar(32)	Unique string used for index search.	
	Title	varchar(32)	String to be transferred by title transfer.	○
	toTextFile	nvarchar(255)	Name of the CSV file to be stored into the GP CF card by CSV file transfer.	○
	fromTextFile	nvarchar(255) or nvarchar(max)	When Data Type is nvarchar(255), specify a pathname of the text file to be transferred by CSV file transfer. When Data Type is nvarchar(max), specify the text data to be transferred by CSV file transfer.	○
	toImageFile	nvarchar(255)	Name of the image file to be stored in the GP CF card by image file transfer.	○
	fromImageFile	nvarchar(255) or varbinary(max)	When Data Type is nvarchar(255), specify a pathname of the image file to be transferred by image file transfer. When Data Type is varbinary(max), specify the image data to be transferred by image file transfer.	○
	(Arbitrary recipe item name 1)	float	Recipe parameter 1. If this value is NULL, writing is skipped.	○
	:	:	:	:
	(Arbitrary recipe item name n)	float	Recipe parameter n. If this value is NULL, writing is skipped.	○

3.10.2 Registering Composite Document Recipe-Transfer ACTION

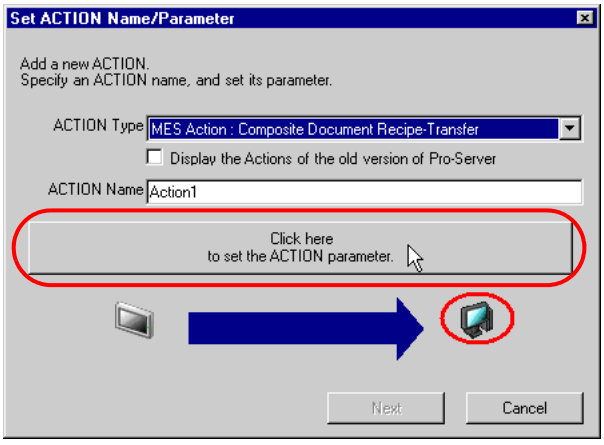
1 Click the [Feature] icon on the status bar.



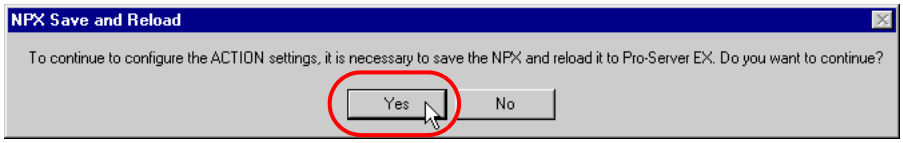
2 Select [ACTION] from the tree display on the left of the screen and click [Add].



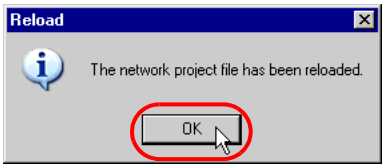
3 Click the [ACTION Type] list button and select "MES Action : Composite Document Recipe-Transfer". Then, enter a desired ACTION name in [ACTION Name]. Then, click the [Click here to set the ACTION parameter.] button.



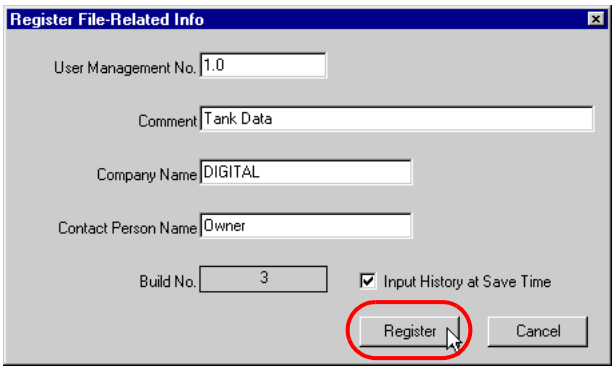
4 Click [Yes] on the "NPX Save and Reload" screen.



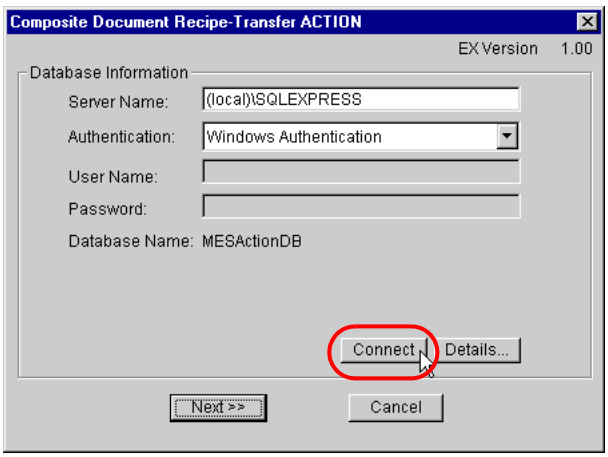
5 After the reloading completion message appears, click [OK].



6 Enter required items, and click [Register] to save NPX.



7 Enter database connection information, and click [Connect].

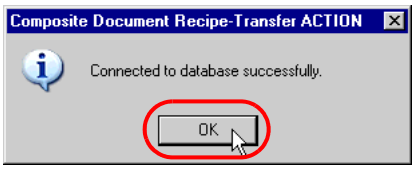


Information required for database connection is listed below.

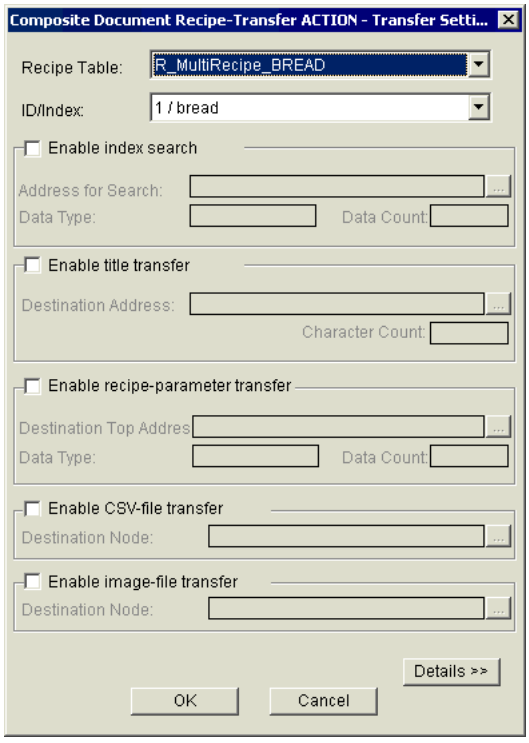
Setup Item		Description
Database Information	Server Name	Specify "PC Name" or "IP Address"/"Instance" of the database server.
	Authentication	Select the authentication method: Windows Authentication or SQL Server Authentication.
	User Name	Specify a user name for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Password	Specify a password for access to the database server when SQL Server Authentication is selected. When Windows Authentication is selected, this item is not required.
	Database Name	Displays the corresponding database to save data.

Button	Description
Connect	Test button to check if the database can be normally connected under the registered database information settings.
Details	Opens the database information detail window. Server Connection Time : Database server communication timeout time Retry Count : Database server communication retry count SQL Command Timeout : the amount of time until Timeout when executing the command request to the SQL server

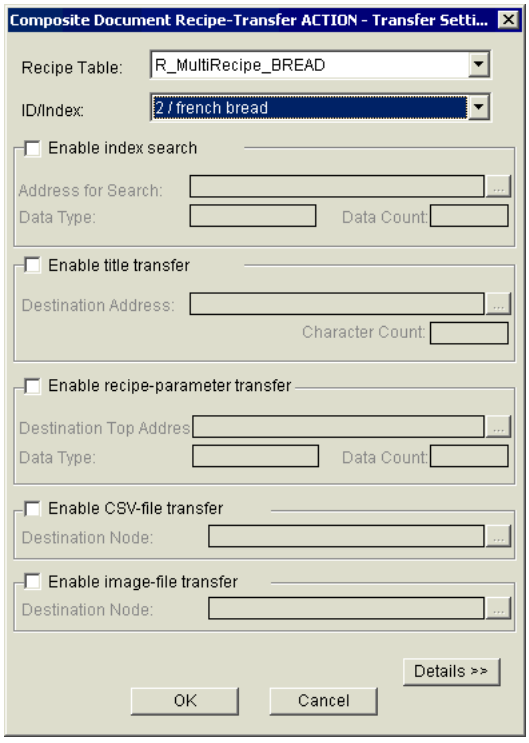
8 After the connection success message appears, click [OK] to close the message window, and click [Next]. If the connection failure message appears, correct the database connection information.



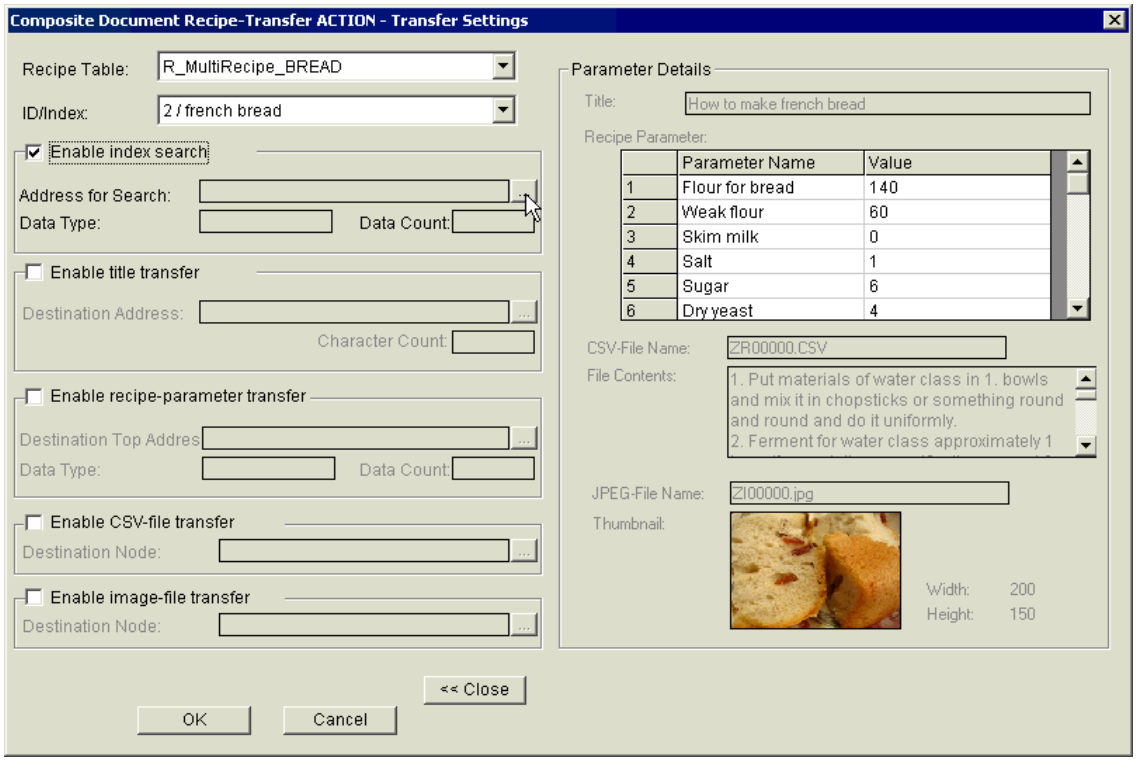
9 Select the R_MultiRecipe table where transfer data are saved.



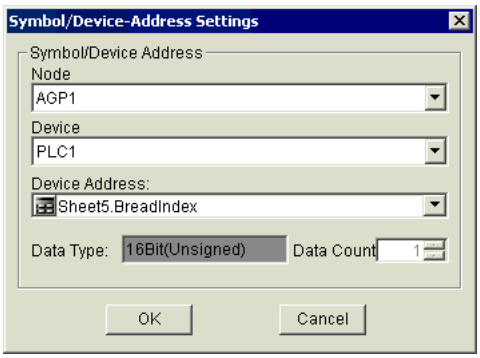
10 Select the composite data to be transferred from the list of the composite data stored in the selected table in [ID/Index], and click [Details]. Then, details of the selected composite data are displayed.



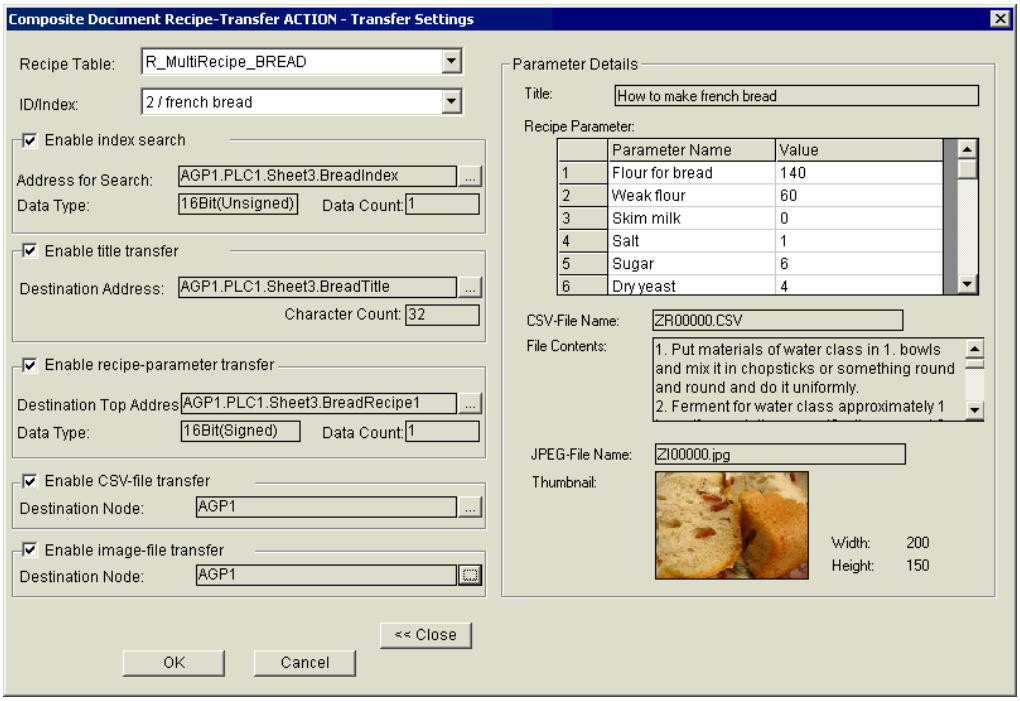
11 To change composite data to be transferred depending on a symbol or device value during execution of the ACTION instead of fixing the target data in advance, check [Enable index search], and click the [Address for Search] selection button.



12 Specify a search address, and click [OK]. If the specified data type is "String", the ACTION transfers composite data by searching for the data with an index matching the address value (string) specified here. If the specified data type is not "String", the ACTION transfers composite data by searching for the data with an ID matching the address value (numeric) specified here.

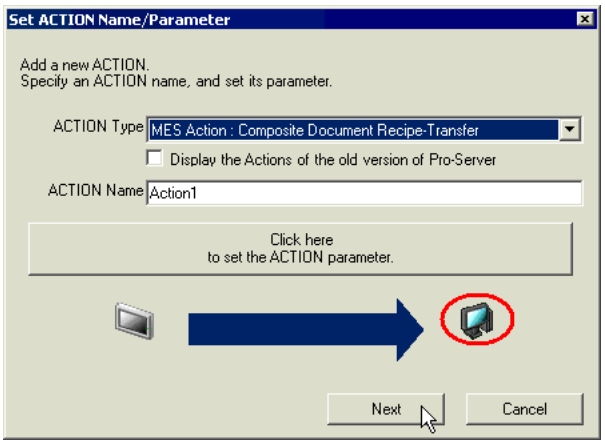


13 To transfer the title, recipe parameter, CSV file and image file, check the item to be transferred, and specify the transfer destination address in the same manner as above.

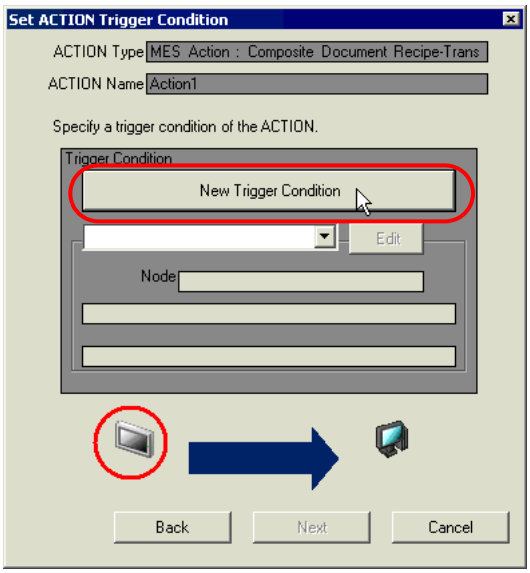


14 Click [OK] to finish the transfer settings of the ACTION.

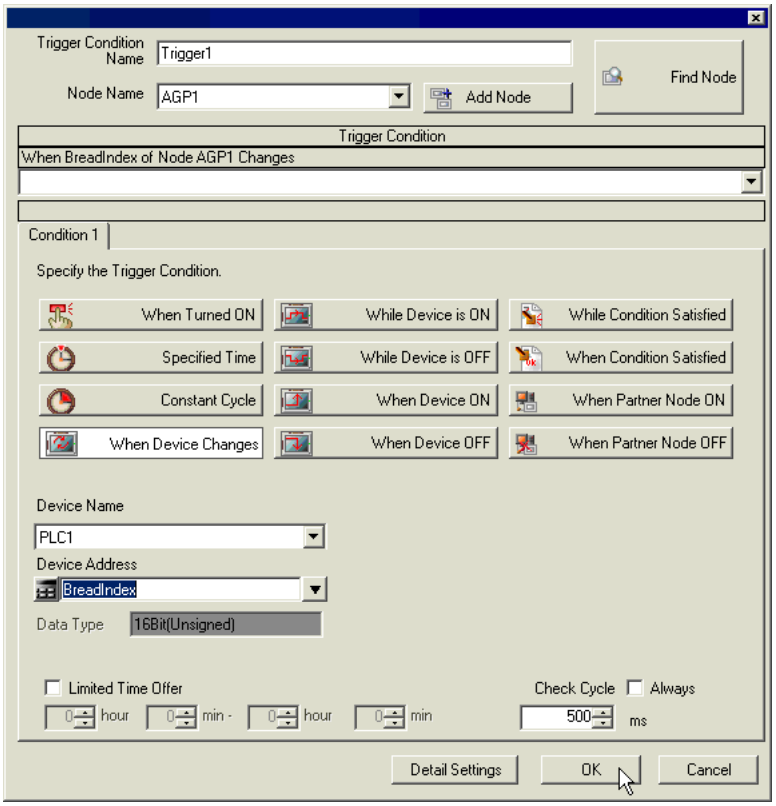
15 Then, specify the Composite Document Recipe-Transfer ACTION trigger condition. Click [Next] on the "Set ACTION Name/Parameter" screen.



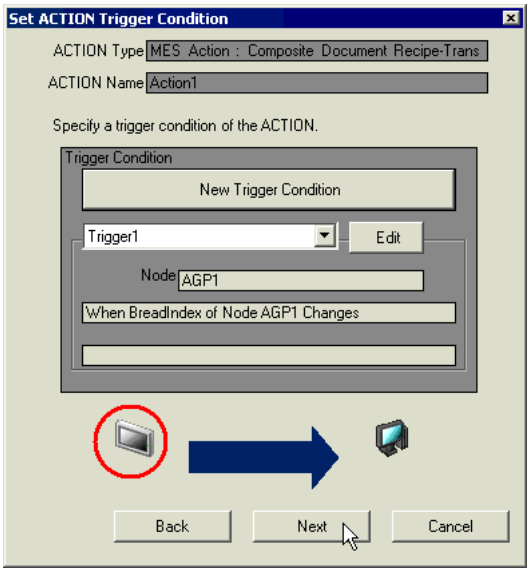
16 Click [New Trigger Condition]. If a trigger condition has already been registered, select a trigger condition from the dropdown list, and proceed to Step 18.



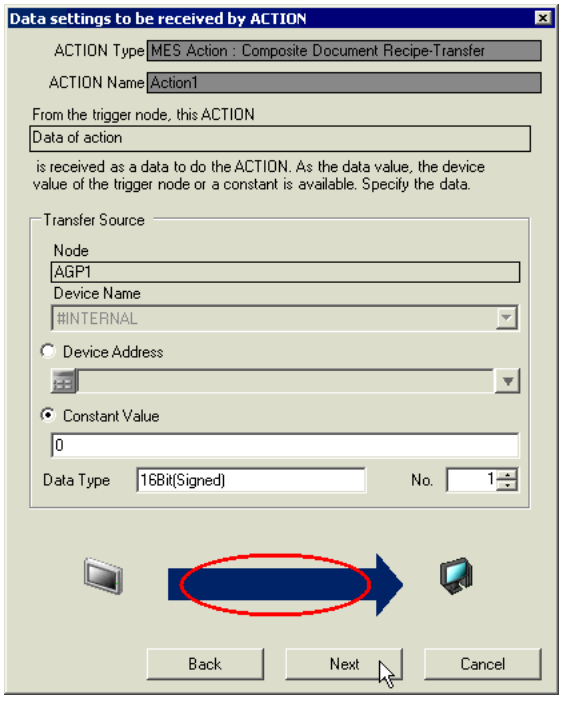
17 Specify a trigger condition name and node name. Then, specify a trigger condition in the [Condition 1] tab.



18 Specify the data to be transferred during operation of the ACTION. Click [Next] on the "Set ACTION Trigger Condition" screen.

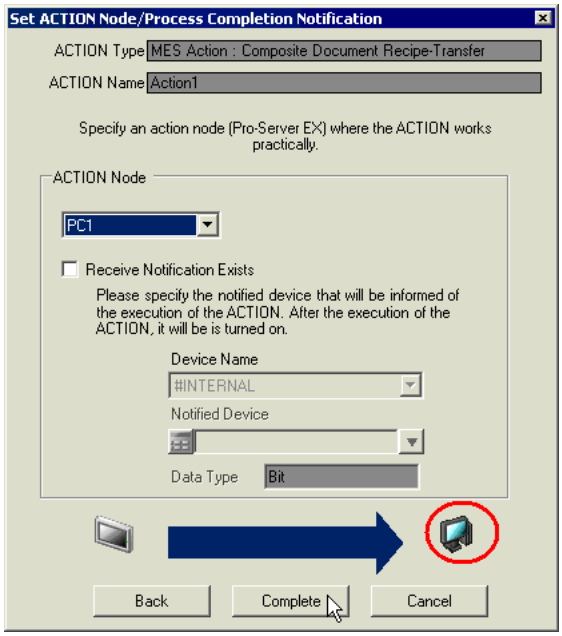


19 Specify the data to be received by the ACTION, and click [Next]. For Composite Document Recipe-Transfer ACTION, you can specify any value, because the settings on this screen do not affect the operation of the ACTION.



20 Specify the ACTION operating node and whether to enable or disable receiving notice, and click [Complete].

Through the above procedure, Composite Document Recipe-Transfer ACTION is added.



4 MESActionDB Table Schema Reference

4.1 Common Tables

The following tables are commonly required to use each MES ACTION. Before using MES ACTION, set the common tables.

4.1.1 C_CommonInfo Table

The C_CommonInfo table is used to set information commonly used for each MES ACTION. Only one record is enough to use for the C_CommonInfo table. If several records are available, the record with the smallest ID number is used.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	SaveMode	nchar(1)	Database saving mode. Specify C (Continuous saving mode) or M (Monthly division mode). If the monthly division mode is selected, data on the previous month will be moved to other database (MESActionDB01 to MESActionDB12) at a shift from every month to the next month.	
	SMTPServer	nvarchar(255)	SMTP Server Name. Used to send E-mail for control limit monitoring in Process-Data-Collection ACTION and Actual-Data-Collection ACTION.	
	SMTPPort	int	SMTP Port No. Used to send E-mail for control limit monitoring in Process-Data-Collection ACTION and Actual-Data-Collection ACTION.	
	SMTPAuth	bit	SMTP Authentication (False: Authentication is not required, True: Authentication is required) Used to send E-mail for control limit monitoring in Process-Data-Collection ACTION and Actual-Data-Collection ACTION. If "True" (Authentication is required) is selected, the SMTP server is requested to authenticate the user account by using the following user name and password.	
	SMTP UserName	nvarchar(255)	SMTP User Name. Used when SMTP authentication is required.	○
	InputSMTPPassword	nvarchar(255)	SMTP Password. The entered password is encoded at trigger of SQL Server, and saved in CodedSMTPPassword. Then, the InputSMTPPassword value is set to NULL. Therefore, unauthorized people cannot see the password.	○
	CodedSMTPPassword	varbinary(8000)	Encoded SMTP password. Used when SMTP authentication is required.	○
	MailFrom	nvarchar(255)	Mail Source Address. Used to send E-mail for control limit monitoring in Process-Data-Collection ACTION and Actual-Data-Collection ACTION.	

4.1.2 C_MonthlyProcess Table

The C_MonthlyProcess table is used to set information required for monthly shift processing in the monthly division mode. Only one record is enough to use for the C_MonthlyProcess table. If several records are available, the record with the smallest ID number is used.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	LastDateTime	datetime	Last collection time. MES ACTION automatically updates the value. Users need not specify it. Used to judge whether monthly shift processing is to be executed or not.	○
	InProcess	bit	Processing flag (False: Processing is not in progress. True: Processing is in progress) MES ACTION automatically updates the value. Users need not specify it. Used to prohibit monthly shift processing and database writing processing from being simultaneously executed.	
	WaitingTime	int	Wait time [second] for True processing flag. If monthly shift processing or collected data writing processing is being executed by other MES ACTIONs at the time when such processing is to be started, users can specify the time [second] to wait for completion of each processing. If the monthly shift processing or collected data writing processing executed by other MES ACTIONs is not completed after elapse of the specified wait time, it is judged to be an error. For monthly shift processing, a database file (.mdf) and log file (.log) are copied. However, if a file in the database is large, the copying time is prolonged. In such a case, the wait time setting in this column must be increased. However, when the wait time is long, the system takes a long time for error output, if the monthly shift processing or collected data writing processing cannot be completed within the specified time for any reason.	

4.2 Tables for Process Data/Actual Data Collection ACTION

The following tables are used for Process-Data-Collection ACTION and Actual-Data-Collection ACTION.

4.2.1 T_TagName Table

Users must register the tags to be collected by Process-Data-Collection ACTION and Actual-Data-Collection ACTION in the T_TagName table in advance. The tags registered in the T_TagName table are displayed in the tab selection dialog of Process-Data-Collection ACTION and Actual-Data-Collection ACTION.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag.	
	Description	nvarchar(255)	Description	○
	Type	nchar(1)	Type of tag. Specify A (Analog), D (Digital) or S (String).	

4.2.2 T_LinearAnalog Table

For the tag whose type is registered as "Analog" in the T_TagName table, users must register the information required for engineering value conversion in this table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of the tag whose type is registered as "Analog" in the T_TagName.	
	SignalIO	nvarchar(6)	Signal Condition Specify any of the following items: 8BN, 12BN, 13BN, 15BN, 3BCD, 4BCD, BCD, Lin, None, SQRT, String For details, refer to "Signal Condition".	
	InRL	float	Input lower limit value. Used for linearize conversion.	
	InRH	float	Input upper limit value. Used for linearize conversion.	
	OutRL	float	Output lower limit value. Used for linearize conversion.	
	OutRH	float	Output upper limit value. Used for linearize conversion.	
	DecimalPoint	Int	Decimal-Point Position. (0 to 7) Used when "None " is specified for Signal Condition.	○
	StringConvertMethod	nchar(5)	Numeric value-string conversion method. Select TABLE or QUERY. TABLE : Specifies a conversion table in the Table.Field format. QUERY : Specifies a conversion table with Query (SELECT statement).	○
	Engineering Unit	nvarchar(257)	When SignalIO is other than String, specify the industrial unit of process data (kg, m, etc.). When SignalIO is String and StringConvertMethod is TABLE, specify the names of numeric value-string conversion table and column in the Table.Field format. When SignalIO is String and StringConvertMethod is QUERY, specify the SELECT statement to obtain a string.	○

NOTE
- "Linearize" means the conversion processing using a linear equation for input range and measuring instrument range.

■ Signal Condition

The engineering value conversion method based on the setting of the "Signal IO" column in the T_LinearAnalog table is as follows:

8BN,12BN,13BN,15BN:

After masking by a specified bit length (when a high-order bit is not necessary, it is set to "0"), the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Value after masking - InRL)/(InRH - InRL) × (OutRH - OutRL) + OutRL

This method is available only when any of 16Bit(Signed), 16Bit(Unsigned), or 16Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

3BCD,4BCD:

After masking BCD data by a specified number of digits, the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Value after masking - InRL)/(InRH - InRL) × (OutRH - OutRL) + OutRL

This method is available only when any of 16Bit(Signed), 16Bit(Unsigned), or 16Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

BCD:

The result of linearize conversion without BCD data masking is defined as the engineering conversion value.

This method is available only when any of 32Bit(Signed), 32Bit(Unsigned), or 32Bit(HEX) is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table.

Lin:

The result of linearize conversion without masking is defined as the engineering conversion value.

SQRT:

After extracting the square root of an input value without masking, the result of linearize conversion is defined as the engineering conversion value.

Conversion result = (Input value - InRL)/SQRT(InRH - InRL) × (OutRH - OutRL) + OutRL

None(Real number conversion):

Masking and linearize conversion are not executed. If the type of 16-bit or 32-bit integer is specified in the DataType column in the A_ProcessTagDevice or A_ActualTagDevice table, the following calculation result, based on the value of the DecimalPoint column, is defined as the engineering conversion value.

Input value / n-th power of 10 (n = value of DecimalPoint column)

String:

Masking and linearize conversion are not executed.

NOTE

- If "String" is specified in the SignalIO column, specify the character string corresponding to the row number, with reference to the following table. The table name is selected randomly.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main Key	
	(Arbitrary column name 1)	nvarchar(32)	Character string corresponding to string No.	○
	(Arbitrary column name 2)	nvarchar(32)	Character string corresponding to string No.	○
	:	:	:	:
	(Arbitrary column name N)	nvarchar(32)	Character string corresponding to string No.	○

When StringConvertMethod is TABLE:

ACTION finds the row number from the input value with the following formula:

Row number = (Input value - outRL) MOD (outRH - outRL) + outRL

("A MOD B" is a residue of A divided by B)

For example, provided that outRL is "1" and outRH is "11", the relationship between the input value and the row number is as follows:

Entered Value	...	-1	0	1	2	...	9	10	11	12	...	19	20	21	22	...
Row Number	...	-1	0	1	2	...	9	10	1	2	...	9	10	1	2	...

The table name and column name specified in the EngineeringUnit column and the string corresponding to the row number obtained above are used as the tag value.

If the row number is smaller than "1", or if there is no row corresponding to the row number, it is judged as a conversion error.

When StringConvertMethod is QUERY:

The execution result of the query (SELECT statement) specified in the EngineeringUnit column is used as the tag value.

If "@VALUE" is used as a parameter in the query, the input value is set in this parameter.

For example, provided that the input value is "10" and a query of "SELECT TagString FROM TestTable WHERE TagValue = @VALUE" is set in the EngineeringUnit column, the system finds the record with a TagValue column value of "10" from TestTable. The value of the TagString column in the first found record is used as the tab value.

4.2.3 T_ LineDigital Table

For the tag whose type is registered as "Digital" in the T_TagName table, users must register the tag value and corresponding string in this table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of the tag whose type is registered as "Digital" in the T_TagName table.	
	OnChar	nvarchar(32)	A string corresponding to value 1.	
	OffChar	nvarchar(32)	A string corresponding to value 0.	

4.2.4 T_PlanValueQuery Table

Actual-Data-Collection ACTION records a plan value and achievement ratio into the database, as well as the actual value. The "T_PlanValueQuery" table allows the user to specify the plan value acquiring method.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of tag used for actual data collection.	
	Method	nchar(5)	Plan value acquiring method. Select TABLE or QUERY. TABLE : Specifies a plan value table in the Table.Field format. QUERY : Specifies a plan value table with Query(SELECT statement).	
	Query	nvarchar(257)	If Method is TABLE, specify the plan value table name and column name in the Table.Field format. The value of the first row of the specified table-field is defined as the plan value. If Method is QUERY, specify the SELECT statement to obtain a plan value.	

4.2.5 T_ LimitControl Table

Users must register the tag used for control limit monitoring in the T_LimitControl table. The control limit monitoring function outputs an alarm when a tag value is the lower control limit value or lower, or a tag value is the upper control limit value or higher is collected continuously by a specified count or more, and reports it by sending E-mail, or by writing a value into a device.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	TagName	nvarchar(40)	Name of tag. Register the name of tag used for control limit monitoring.	
	LCL	float	Lower control limit value.	
	CL	float	Center value.	
	UCL	float	Upper control limit value.	
	Count	Int	Preset number of continuous occurrences of control limit alarm values before alarm output.	
	Message	nvarchar(255)	Alarm message. Title of the mail to report occurrence of an alarm event.	
	EMailEnabled	bit	To report an alarm by e-mail, set True. Not to report an alarm, set False.	
	EMailListID	int	ID of the mail address list to send E-mail at occurrence of an alarm event. E-mail is sent to the address that matches the ID column value in the EMailList table.	○
	DeviceEnabled	bit	To write a value into a device when an alarm event occurs, set True. Not to write a value into a device, set False.	
	DeviceListID	int	ID of the device list to write a value at occurrence of an alarm event. A value is written into the device that matches the ID column value in the DeviceList table.	○
	CountNow	int	Current count of continuous occurrences of control limit alarm values. MES ACTION automatically updates the value. Users need not specify it.	○

4.2.6 T_EMailList Table

To report occurrence of an alarm event by E-mail with the control limit monitoring function, specify the mail destination address in the T_EMailList table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	ID of the mail address list to send E-mail at occurrence of an alarm event. Set the same ID as the setting of the EMailListID column in the T_LimitControl table.	
○	Address	nvarchar(255)	E-mail Address. Serves as the main key in combination of the ID column.	

4.2.7 T_DeviceList Table

To report occurrence of an alarm event by writing a value into a device with the control limit monitoring function, specify the write-destination device address in the T_DeviceList table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	ID of the device list to write a value at occurrence of an alarm event. Set the same ID as the setting of the DeviceListID column in the T_LimitControl table.	
○	StationName	nvarchar(32)	Node name.	
○	EquipmentName	nvarchar(32)	Name of Device/PLC.	
○	DeviceAddress	nvarchar(131)	Device address or symbol name. For symbol name, the format is "Sheet name.Symbol name".	
	DataType	nvarchar(15)	Type of device data. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), Float, Double, Bit, String	
	Count	int	Indicates a length (number of bytes) of string for String data type. If the DataType setting is other than String, this column is not used.	
	Value	nvarchar(255)	A value to be written into a device.	

4.2.8 A_ProcessTagDevice Table

The A_ProcessTagDevice table is used to save the tag and device/symbol allocation settings that have been specified in registration of Process-Data-Collection ACTION. This table will be automatically registered when Process-Data-Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	TagName	nvarchar(40)	Name of tag.	
	StationName	nvarchar(32)	Node name.	
	EquipmentName	nvarchar(32)	Name of Device/PLC.	
	DeviceAddress	nvarchar(131)	Device address or symbol name. For symbol name, the format is "Sheet name.Symbol name".	
	DataType	nvarchar(15)	Type of device data. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), Float, Double, Bit, String	
	Count	Int	Indicates a length (number of bytes) of string for String data type. If the DataType setting is other than String, this column is not used.	

4.2.9 A_ActualTagDevice Table

The A_ActualTagDevice table is used to save the tag and device/symbol allocation settings that have been specified in registration of Actual-Data-Collection ACTION. This table will be automatically registered when Actual-Data-Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	TagName	nvarchar(40)	Name of tag.	
	StationName	nvarchar(32)	Node name.	
	EquipmentName	nvarchar(32)	Name of Device/PLC.	
	DeviceAddress	nvarchar(131)	Device address or symbol name. For symbol name, the format is "Sheet name.Symbol name".	
	DataType	nvarchar(15)	Type of device data. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), Float, Double, Bit	

4.2.10 A_ProcessDataSampling Table

The A_ProcessDataSampling table is used to save the collection data table creation unit and device cache settings that have been specified in registration of Process-Data-Collection ACTION. This table will be automatically registered when Process-Data-Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
	TableUnit	nchar(1)	Collection data table creation unit. Specify any of the following items: D (daily basis), M (monthly basis), Y (yearly basis), N (None), S (Table name specification)	
	TableName	nvarchar(128)	Specified Table Name	
	Cache	bit	Device cache (False: Disabled, True: Enabled)	
	CachePolling	int	Device cache updating interval (Unit: msec)	

NOTE

- To upgrade the MES Action version, change the data table in the following procedures.

1.Open both data tables of the old and new databases.

2.Copy all the data from the old database to the new database.

3.Since the TableName field in the new database shows NULL, set the blank space.

4.2.11 A_ActualDataSampling Table

The A_ActualDataSampling table is used to save the collection data table creation unit and device cache settings that have been specified in registration of Actual-Data-Collection ACTION. This table will be automatically registered when Actual-Data-Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID (GUID automatically determined when a new ACTION is created)	
	TableUnit	nchar(1)	Collection data table creation unit. Specify any of the following items: D (daily basis), M (monthly basis), Y (yearly basis), N (None), S (Table name specification)	
	TableName	nvarchar(128)	Specified Table Name	
	Cache	bit	Device cache (False: Disabled, True: Enabled)	
	CachePolling	int	Device cache updating interval (Unit: msec)	

NOTE

- To upgrade the MES Action version, change the data table in the following procedures.

1.Open both data tables of the old and new databases.

2.Copy all the data from the old database to the new database.

3.Since the TableName field in the new database shows NULL, set the blank space.

4.2.12 D_ProcessData Table

The D_ProcessData table is used to save the tag values collected by Process-Data-Collection ACTION. This table will be automatically created when Process-Data-Collection ACTION is executed in the RUNTIME mode. Actually, the table name is expressed with the ACTION ID of Process-Data-Collection ACTION and the date, as shown below:

When the table is created daily : D_ProcessData_ACTION ID_YYYYMMDD
When the table is created monthly : D_ProcessData_ ACTION ID _YYYYMM
When the table is created yearly : D_ProcessData_ ACTION ID _YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Data collection date/time.	
	(Tag 1)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	(Tag 2)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	:	:	:	
	(Tag n)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○

The data type of (Tag 1) to (Tag n) depends on the value of the DataType column of the A_ProcessTagDevice table, as shown below.

Value of DataType column	Numeric value-string conversion	Data type of (Tag 1) to (Tag n)
16Bit(Signed), 16Bit(Unsigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(Unsigned), 32Bit(BCD), 32Bit(HEX)	Disabled	real
	Enabled	nvarchar(32)
Float	-	real
Double	-	float
Bit	-	nvarchar(32)
String	-	nvarchar(1020)

4.2.13 D_ActualData Table

The D_ActualData table is used to save the tag values collected by Actual-Data-Collection ACTION. This table will be automatically created when Actual-Data-Collection ACTION is executed in the RUNTIME mode. Actually, the table name is expressed with the ACTION ID of Actual-Data-Collection ACTION and the date, as shown below:

When the table is created daily : D_ActualData_ACTION ID_YYYYMMDD
When the table is created monthly : D_ActualData_ACTION ID _YYYYMM
When the table is created yearly : D_ActualData_ACTION ID _YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Data collection date/time.	
	(Tag 1)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	(Tag 1)_plan	(Depending on tag)	Plan value. In case of data collection failure, this value is NULL.	○
	(Tag 1)_achieve	real	Achievement ratio [%]. If either tag value or plan value is NULL, this value is NULL.	○
	:	:	:	
	(Tag n)	(Depending on tag)	Tag value. In case of data quality error or data collection failure, this value is NULL.	○
	(Tag n)_plan	(Depending on tag)	Plan value. In case of data collection failure, this value is NULL.	○
	(Tag n)_achieve	real	Achievement ratio [%]. If either tag value or plan value is NULL, this value is NULL.	○

The data type of (Tag 1) to (Tag n) and (Tag 1)_plan to (Tag n)_plan depends on the value of the DataType column of the A_ProcessTagDevice table, as shown below.

Value of DataType column	Data type of (Tag 1) to (Tag n)
16Bit(Signed), 16Bit(Unsigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(Unsigned), 32Bit(BCD), 32Bit(HEX)	real
Float	real
Double	float
Bit	real
String	Not applied to Actual-Data-Collection ACTION.

4.3 Tables for SRAM Alarm-History Collection ACTION

The following tables are used for GP SRAM Alarm-History Collection ACTION.

4.3.1 A_SramAlarmUpload Table

The A_SramAlarmUpload table is used to save the GP node name and block numbers (1 to 8) subjected to collection, that have been specified in registration of GP SRAM Alarm-History Collection ACTION. This table will be automatically registered when GP SRAM Alarm-History Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
	Block1	bit	Specification of Block 1 collection. (False: Collection disabled, True: Collection enabled)	
	Block2	bit	Specification of Block 2 collection. (False: Collection disabled, True: Collection enabled)	
	Block3	bit	Specification of Block 3 collection. (False: Collection disabled, True: Collection enabled)	
	Block4	bit	Specification of Block 4 collection. (False: Collection disabled, True: Collection enabled)	
	Block5	bit	Specification of Block 5 collection. (False: Collection disabled, True: Collection enabled)	
	Block6	bit	Specification of Block 6 collection. (False: Collection disabled, True: Collection enabled)	
	Block7	bit	Specification of Block 7 collection. (False: Collection disabled, True: Collection enabled)	
	Block8	bit	Specification of Block 8 collection. (False: Collection disabled, True: Collection enabled)	

4.3.2 D_SramAlarm Table

The D_SramAlarm table is used to save alarm history data collected from the SRAM.
This table will be automatically created when GP SRAM Alarm-History Collection ACTION is executed in the RUNTIME mode.
Actually, the table name is expressed as follows:

Table Name: D_SramAlarm_ACTION ID

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	StationName	nvarchar(32)	Node name.	
	Block	int	Alarm block number.	
	Datetime	datetime	Date and time.	
	Kind	nvarchar(7)	One of Trigger, Acknowledge or Recovery is specified.	
	Message	nvarchar(160)	Message	
	Count	int	Number of occurrences. (A value at the time of first collection of the ACTION)	
	TotalTime	bigint	Total time. (Unit: second) (A value at the time of first collection of the ACTION)	
	Level	int	Level.	

4.3.3 D_SramAlarmLastId Table

The D_SramAlarm table is used to save the ID of the latest record added to the D_SramAlarm table by block. This table will be automatically registered when GP SRAM Alarm-History Collection ACTION is executed in the RUNTIME mode, without necessity of user's registration procedure. This ID is used to speed up the processing to check if the same alarm history already exists in the Sram alarm log table when a new history is added to this table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
○	Block	int	Alarm block number.	
	LastID	int	ID of the latest record added to the SRAM alarm log table.	

4.4 Tables for CF-card Alarm-History-File Collection ACTION

The following tables are used for GP CF-card Alarm-History-File Collection ACTION.

4.4.1 A_CfAlarmUpload Table

The A_CfAlarmUpload table is used to save the GP node name and block numbers (1 to 8) subjected to collection, that have been specified in registration of GP CF-card Alarm-History-File Collection ACTION. This table will be automatically registered when GP CF-card Alarm-History-File Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
	Block1	bit	Specification of Block 1 collection. (False: Collection disabled, True: Collection enabled)	
	Block2	bit	Specification of Block 2 collection. (False: Collection disabled, True: Collection enabled)	
	Block3	bit	Specification of Block 3 collection. (False: Collection disabled, True: Collection enabled)	
	Block4	bit	Specification of Block 4 collection. (False: Collection disabled, True: Collection enabled)	
	Block5	bit	Specification of Block 5 collection. (False: Collection disabled, True: Collection enabled)	
	Block6	bit	Specification of Block 6 collection. (False: Collection disabled, True: Collection enabled)	
	Block7	bit	Specification of Block 7 collection. (False: Collection disabled, True: Collection enabled)	
	Block8	bit	Specification of Block 8 collection. (False: Collection disabled, True: Collection enabled)	
	Synchronize	bit	Synchronization at first startup. (False: Not synchronized, True: Synchronized)	

4.4.2 D_CfAlarm Table

The D_CfAlarm table is used to save alarm history data collected from the CF card. This table will be automatically created when GP CF-card Alarm-History-File Collection ACTION is executed in the RUNTIME mode. Actually, the table name is expressed as follows:

Table Name: D_CfAlarm_ACTION ID

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	StationName	nvarchar(32)	Node name.	
	Block	int	Alarm block number.	
	Datetime	datetime	Day/Time	
	Kind	nvarchar(7)	One of Trigger, Acknowledge or Recovery is specified.	
	Message	nvarchar(160)	Message	
	Count	int	Number of occurrences. (A value at the time of first collection of the ACTION)	
	TotalTime	bigint	Total time. (Unit: second) (A value at the time of first collection of the ACTION)	
	Level	int	Level.	

4.4.3 D_CfAlarmLastId Table

The D_CfAlarmLastId table is used to save the ID of the latest record added to the D_CfAlarm table by block. This table will be automatically registered when GP CF-card Alarm-History-File Collection ACTION is executed in the RUNTIME mode, without necessity of user's registration procedure. This ID is used to speed up the processing to check if the same alarm history already exists in the D_CfAlarm table when a new history is added to this table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
○	Block	int	Alarm block number.	
	LastID	int	ID of the latest record added to the CF-card alarm log table.	

4.5 Tables for SRAM Sampling-Data Collection ACTION

The following tables are used for GP SRAM Sampling-Data Collection ACTION.

4.5.1 A_SramSamplingDataUpload Table

The A_SramSamplingDataUpload table is used to save the GP node name and group numbers (1 to 64) subjected to collection and table creation unit that have been specified in registration of GP SRAM Sampling-Data Collection ACTION. This table will be automatically registered when GP SRAM Sampling-Data Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
	Group1	bit	Specification of Group 1 collection. (False: Collection disabled, True: Collection enabled)	
	:	:	:	
	Group64	bit	Specification of Group 64 collection. (False: Collection disabled, True: Collection enabled)	
	TableUnit	nchar(1)	Collection data table creation unit. Specify any of the following items: D (daily basis), M (monthly basis), Y (yearly basis), N (None), S (Table name specification)	
	TableName	nvarchar(128)	Specified Table Name	

NOTE

- To upgrade the MES Action version, change the data table in the following procedures.

1.Open both data tables of the old and new databases.

2.Copy all the data from the old database to the new database.

3.Since the TableName field in the new database shows NULL, set the blank space.

4.5.2 D_SramSamp Table

The D_SramSamp table is used to save the sampling data collected from the SRAM. This table will be automatically created when GP SRAM Sampling-Data Collection ACTION is executed in the RUNTIME mode. Actually, the table name is expressed with the ACTION ID, GP node name, group number and table creation unit, as shown below:

When the table is created daily : D_SramSamp_ACTION ID_GP node name_Group number_YYYYMMDD
When the table is created monthly : D_SramSamp_ACTION ID_GP node name_Group number_YYYYMM
When the table is created yearly : D_SramSamp_ACTION ID_GP node name_Group number_YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Date and time.	
	(Item name 1)	real	Sampling data.	○
	(Item name 2)	real	Sampling data.	○
	:			○
	(Item name n)	real	Sampling data.	○

4.5.3 D_SramSampLastDatetime Table

The D_SramSampLastDatetime table is used to save the date/time of the latest record added to the D_SramSamp table by group. This table will be automatically registered when GP SRAM Sampling-Data Collection ACTION is executed in the RUNTIME mode, without necessity of user's registration procedure.
This date/time is used to speed up the processing to check if a record with the same contents already exists in the D_SramSamp table when a new record is added to this table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
○	Group	Int	Group number.	
	LastDatetime	Datetime	Date/time of the latest record added to the D_SramSamp table.	

4.6 Tables for CF-card Sampling-Data-File Collection ACTION

The following tables are used for GP CF-card Sampling-Data-File Collection ACTION.

4.6.1 A_CfSamplingDataUpload Table

The A_CfSamplingDataUpload table is used to save the GP node name and group numbers (1 to 64) subjected to collection and table creation unit that have been specified in registration of GP CF-card Sampling-Data-File Collection ACTION. This table will be automatically registered when GP CF-card Sampling-Data-File Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
	Group1	bit	Specification of Group 1 collection. (False: Collection disabled, True: Collection enabled)	
	:	:	:	
	Group64	bit	Specification of Group 64 collection. (False: Collection disabled, True: Collection enabled)	
	TableUnit	nchar(1)	Collection data table creation unit. Specify any of the following items: D (daily basis), M (monthly basis), Y (yearly basis), N (None), S (Table name specification)	
	TableName	nvarchar(128)	Specified Table Name	
	Synchronize	bit	Synchronization at first startup. (False: Not synchronized, True: Synchronized)	
	CfFileAutoDel	bit	CF-card data automatic deletion. (False: Not to be deleted, True: To be deleted)	
	CfFileAutoDel Date	int	Number of days to activate CF-card data automatic deletion.	○

NOTE

- To upgrade the MES Action version, change the data table in the following procedures.

1.Open both data tables of the old and new databases.

2.Copy all the data from the old database to the new database.

3.Since the TableName field in the new database shows NULL, set the blank space.

4.6.2 D_CfSamp Table

The D_CfSamp table is used to save the sampling data collected from the CF card. This table will be automatically created when GP CF-card Sampling-Data-File Collection ACTION is executed in the RUNTIME mode.
Actually, the table name is expressed with the ACTION ID, GP node name, group number and table creation unit, as shown below:

When the table is created daily : D_CfSamp_ACTION ID_GP node name_Group number_YYYYMMDD
When the table is created monthly : D_CfSamp_ACTION ID_GP node name_Group number_YYYYMM
When the table is created yearly : D_CfSamp_ACTION ID_GP node name_Group number_YYYY

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	Date and time.	
	(Item name 1)	real	Sampling data.	○
	(Item name 2)	real	Sampling data	○
	:			○
	(Item name n)	real	Sampling data	○

4.6.3 D_CfSampLastDatetime Table

The D_CfSampLastDatetime table is used to save the date/time of the latest record added to the D_CfSamp table by group. This table will be automatically registered when GP CF-card Sampling-Data-File Collection ACTION is executed in the RUNTIME mode, without necessity of user's registration procedure.
This date/time is used to speed up the processing to check if a record with the same contents already exists in the D_CfSamp table when a new record is added to this table.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Node name.	
○	Group	Int	Group number.	
	LastDatetime	Datetime	Date/time of the latest record added to the D_CfSamp table.	

4.7 Tables for CF-card Screen-File Collection ACTION

The following tables are used for GP CF-card Screen-File Collection ACTION.

4.7.1 A_CfScreenFileUpload Table

The A_CfSceenFileUpload table is used to save the GP node name subjected to collection, saving method (indirect saving or direct saving), and the folder to save screen files with the indirect saving method, that have been specified in registration of GP CF-card Screen-File Collection ACTION. This table will be automatically registered when GP CF-card Screen-File Collection ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	StationName	nvarchar(32)	Name of node.	
	SaveMethod	nchar(1)	Saving method. Specify any of the following items: D (Direct saving), I (Indirect saving)	
	SaveFolder	nvarchar(256)	Folder path to save a screen file with the indirect saving method.	○
	Synchronize	bit	Synchronization at first startup. (False: Not synchronized, True: Synchronized)	

4.7.2 D_CfScreenFile Table

The D_CfScreenFile table is used to save the captured data collected from the CF card. This table will be automatically created when GP CF-card Screen-File Collection ACTION is executed in the RUNTIME mode. Actually, the table name is expressed with the ACTION ID, as follows:

Table Name: D_CfScreenFile_ACTION ID

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Main key with IDENTITY attribute.	
	Datetime	datetime	ACTION trigger date/time.	
	StationName	nvarchar(32)	Name of node.	
	FileName	nvarchar(255)	Captured data name in the CF card.	
	FilePath	nvarchar(260)	With the direct saving method, this value is NULL. With the indirect saving method, a full pathname of the captured data stored in the PC is specified.	○
	Image	varbinary(max)	With the direct saving method, contents of the captured data are specified. With the indirect saving method, this value is NULL.	○

4.8 Tables for Recipe-Download ACTION

The following tables are used for Recipe-Download ACTION.

4.8.1 A_CfRecipeDownload Table

The A_CfRecipeDownload table is used to save the GP node name and file number that have been specified in the CF-Card Write Settings dialog of Recipe-Download ACTION. This table will be automatically registered when Recipe-Download ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
○	RecipeNumber	int	Recipe number.	
	StationName	nvarchar(32)	Node name.	
	FileNumber	int	CSV file number.	

4.8.2 R_Recipe Table

The R_Recipe table is used to register a recipe to be specified by Recipe-Download ACTION. Users must create this table by using SQL Server Management Studio Express. Actually, the table name is expressed with the recipe number, as follows:

Table Name: R_Recipe_Recipe number (5 digits)

Main Key	Column Name	Data Type	Description	NULL Enabled
○	Line	int	Row Number. (Row number of the CSV file to be overwritten)	
	Item	nvarchar(32)	Item name. (Corresponding to the first column of the CSV file to be overwritten.)	
	Value	nvarchar(32)	Value. (Corresponding to the second column of the CSV file to be overwritten.)	○

4.8.3 R_RecipeIndex Table

The R_RecipeIndex table is used to allocate a condition name to a recipe registered in the R_Recipe table. Users must register this table by using SQL Server Management Studio Express. The items registered in this table are listed in the recipe list of Recipe-Download ACTION.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	RecipeNumber	int	Recipe number.	
	ConditionName	nvarchar(32)	Condition name.	

4.9 Tables for Composite Document Recipe-Transfer ACTION

The following tables are used for Composite Document Recipe-Transfer ACTION.

4.9.1 A_MultiRecipeWrite Table

The A_MultiRecipeWrite is used to save the information specified in registration of Composite Document Recipe-Transfer ACTION. This table will be automatically registered when Composite Document Recipe-Transfer ACTION is executed in the DESIGN mode, without necessity of user's registration procedure.

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ActionID	nchar(32)	Action ID. (Automatically determined when a new ACTION is created)	
	RecipeTableName	nvarchar(128)	Name of recipe table.	
	RecipeID	int	Recipe ID.	
	IndexSearch	bit	Index search. (False: Disabled, True: Enabled)	
	IndexStationName	nvarchar(32)	Name of node corresponding to index search address.	○
	IndexEquipmentName	nvarchar(32)	Name of connected Device/PLC corresponding to index search address.	○
	IndexDeviceAddress	nvarchar(131)	Device address or symbol name corresponding to index search address. For symbol name, the format is "Sheet name.Symbol name".	○
	IndexDataType	nvarchar(15)	Data type for the device corresponding to index search address. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), String	○
	IndexCount	int	Indicates a length (number of bytes) of string, when IndexDataType is String. If the IndexDataType setting is other than String, this column is not used.	○
	TitleWrite	bit	Title transfer. (False: Disabled, True: Enabled)	
	TitleStationName	nvarchar(32)	Name of node corresponding to title transfer destination address.	○
	TitleEquipmentName	nvarchar(32)	Name of connected Device/PLC corresponding to title transfer destination address.	○
	TitleDeviceAddress	nvarchar(131)	Device address or symbol name corresponding to title transfer destination address. For symbol name, the format is "Sheet name.Symbol name".	○
	TitleCount	Int	Length of title to be transferred (Number of bytes).	○
	ParameterWrite	bit	Recipe parameter transfer. (False: Disabled, True: Enabled)	

Main Key	Column Name	Data Type	Description	NULL Enabled
	ParameterStationName	nvarchar(32)	Name of node corresponding to recipe parameter transfer destination address.	○
	ParameterEquipmentName	nvarchar(32)	Name of connected Device/PLC corresponding to recipe parameter transfer destination address.	○
	ParameterDeviceAddress	nvarchar(131)	Device address or symbol name corresponding to recipe parameter transfer destination top address. For symbol name, the format is "Sheet name.Symbol name".	○
	ParameterDataType	nvarchar(15)	Data type for the device corresponding to recipe parameter transfer destination address. Specify any of the following items: 16Bit(Signed), 16Bit(UnSigned), 16Bit(BCD), 16Bit(HEX), 32Bit(Signed), 32Bit(UnSigned), 32Bit(BCD), 32Bit(HEX), Float, Double,	○
	ParameterCount	int	Number of recipe parameters transferred.	○
	CsvWrite	bit	CSV file transfer.(False: Disabled, True: Enabled)	
	CsvStationName	nvarchar(32)	Name of CSV file transfer destination node.	○
	ImageWrite	bit	Image file transfer.(False: Disabled, True: Enabled)	
	ImageStationName	nvarchar(32)	Name of image file transfer destination node.	○

4.9.2 R_MultiRecipe Table

The R_MultiRecipe table is used to register data to be transferred by Composite Document Recipe-Transfer ACTION. Create the R_MultiRecipe table with SQL Server Management Studio Express. Actually, the table name is expressed as follows:

Table Name: R_MultiRecipe_ arbitrary string

Main Key	Column Name	Data Type	Description	NULL Enabled
○	ID	int	Unique integer used for index search. Main key.	
	Index	nvarchar(32)	Unique string used for index search.	
	Title	varchar(32)	String to be transferred by title transfer.	○
	toTextFile	nvarchar(255)	Name of the CSV file to be stored into the GP CF card by CSV file transfer.	○
	fromTextFile	nvarchar(260) or nvarchar(max)	When Data Type is nvarchar(260), specify a pathname of the text file to be transferred by CSV file transfer. When Data Type is nvarchar(max), specify the text data to be transferred by CSV file transfer.	○
	toImageFile	nvarchar(255)	Name of the image file to be stored in the GP CF card by image file transfer.	○
	fromImageFile	nvarchar(260) or varbinary(max)	When Data Type is nvarchar(260), specify a pathname of the image file to be transferred by image file transfer. When Data Type is varbinary(max), specify the image data to be transferred by image file transfer.	○
	(Arbitrary recipe item name 1)	float	Recipe parameter 1. If this value is NULL, writing is skipped.	○
	:	:	:	:
	(Arbitrary recipe item name n)	float	Recipe parameter n. If this value is NULL, writing is skipped.	○

5 Error Information

5.1 Error Information

5.1.1 Error Code List

Error codes 0xC0B00601 or later are used in MES ACTION.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
1	TERRCODE_ACTION_APP_ERROR	0xC0B00601	Program execution error occurred.{0:s}	An unexpected error occurred in the program. Reboot the PC. If the error still occurs, reinstall MES ACTION.
2	TERRCODE_ACTION_CF_FREESPACE_ERROR	0xC0B00602	Cannot transfer due to insufficient CF space of the destination Node.	Confirm the available space of the CF card of the destination node.
3	TERRCODE_ACTION_DB_NOT_CONNECT	0xC0B00604	Cannot access the database. Check the connection parameter of the database.	The parameter to log in the database does not match the one registered in SQL Server. Confirm the SQL login parameter.
4	TERRCODE_ACTION_CF_FILELIST_SIZE_ERROR	0xC0B00605	The file size got by reading CF-card files is invalid.	The file list obtained from GP in CF card is damaged. Confirm the GP connection / operation status.
5	TERRCODE_ACTION_CF_FILELIST_RECORD_ERROR	0xC0B00606	The file count got by reading CF-card files does not agree.	The file list obtained from GP in CF card is damaged. Confirm the GP connection / operation status.
6	TERRCODE_ACTION_CF_FILELIST_FORMAT_ERROR	0xC0B00607	The file got by reading CF-card files is damaged.	The file list obtained from GP in CF card is damaged. Confirm the GP connection / operation status.
7	TERRCODE_ACTION_SERVERNAME_ERROR	0xC0B00608	Server name not specified.	Specify the SQL server name.
8	TERRCODE_ACTION_TAG_ENTRY_OVER_ERROR	0xC0B00609	Up to {0:s} tags can be registered in an ACTION.	The number of tags available to register in the process-data or actual-data collection is up to 200.
9	TERRCODE_ACTION_SYMBOL_ERROR	0xC0B0060A	Invalid symbol/device name or data-type mismatching.	Specify a correct symbol name or device name.
10	TERRCODE_ACTION_TAG_NAME_NO_INPUT_ERROR	0xC0B0060B	No tag name inputted.	Specify the tag name.
11	TERRCODE_ACTION_DATA_SIZE_STRING_ONLY_ERROR	0xC0B0060C	Data count is valid only for texts.	You can specify the data count for the string type. Select 1 for other data types.
12	TERRCODE_ACTION_CACHECYCLE_NO_INPUT_ERROR	0xC0B0060D	Input cache update cycle.	The cache update rate has not been registered. Register cache update rate.
13	TERRCODE_ACTION_CACHECYCLE_NO_NUMERIC_ERROR	0xC0B0060E	Specified update cycle is not a numeric value. Input a correct value.	Specify a numeric value in the cache update rate.
14	TERRCODE_ACTION_INPUT_NUMERIC_OUT_RANGE_ERROR	0xC0B0060F	Specified numeric value is out of range. Input a correct value.	You specified the cache update rate out of range. Specify it between 1ms and 100000ms.
15	TERRCODE_ACTION_CF_SAMPLE_DELETE_DAY_ERROR	0xC0B00612	Specify a day to delete CF sampling data.	Correctly enter a day to delete between 1 and 10.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
16	TERRCODE_ACTION_DAY_NO_NUMERIC_ERROR	0xC0B00613	Specified day is not a numeric value. Input a correct value.	Correctly enter a day to delete between 1 and 10.
17	TERRCODE_ACTION_CF_SAVE_FOLDER_NO_INPUT_ERROR	0xC0B00614	Folder in which to save screen files not specified.	Enter a valid folder name correctly.
18	TERRCODE_ACTION_CF_FOLDERSTRING_ERROR	0xC0B00615	Specified folder name in which to save screen files is incorrect.	Enter a valid folder name correctly.
19	TERRCODE_ACTION_RECIPE_TABLE_EXISTS_ERROR	0xC0B00616	Recipe table not found in the database.	There is no R_Recipe table for RecipeNumber registered in the R_RecipeIndex table. Delete the nonexistent RecipeNumber in the R_RecipeIndex table, or register the R_Recipe table correctly.
20	TERRCODE_ACTION_RECIPE_TABLE_NODATA_ERROR	0xC0B00617	No recipe information registered in the database.	Parameter to download the recipe is not described in the registered R_Recipe table. Confirm the R_Recipe table.
21	TERRCODE_ACTION_RECIPE_DATA_FORMAT_ERROR	0xC0B00618	The type of recipe information is incorrect.	Parameter description defined in the registered R_Recipe table is incorrect. Confirm the parameter description.
22	TERRCODE_ACTION_RECIPE_CSVFILE_EXISTS_ERROR	0xC0B00619	CSV file not found.	The recipe CSV file generated inside is not found when downloading the recipe. Errors may occur in the system or application. Reboot the PC. If the error still occurs, reinstall MES ACTION.
23	TERRCODE_ACTION_RECIPE_CONDITIONALNAME_SELECT_ERROR	0xC0B0061B	Select a conditional-name in the recipe list.	Select the condition name in the recipe list and add the recipe to write into the CF card.
24	TERRCODE_ACTION_RECIPE_CHANGEFILE_SELECT_ERROR	0xC0B0061C	Select a conditional-name of which the file-number is to be changed.	After selecting the condition name to chage the file number, change the file number.
25	TERRCODE_ACTION_RECIPE_DEL_SELECT_ERROR	0xC0B0061D	Select the conditional-name to be deleted.	Select the recipe you want to cancel writing in CF card, and click the [Delete] button.
26	TERRCODE_ACTION_RECIPE_NODE_SELECT_ERROR	0xC0B0061E	Specify a participating node.	A writing destination node is not specified. Specify a writing destination node.
27	TERRCODE_ACTION_RECIPE_FILENO_FORMAT_ERROR	0xC0B0061F	Wrong file-number.	GP cannot control this file number. Specify the file number between 0 and 65535.
28	TERRCODE_ACTION_RECIPE_FILENO_DUPLICATE_ERROR	0xC0B00620	Duplicated file-number is specified.	The file number you specified is duplicated. Specify the file number which is not duplicated.
29	TERRCODE_ACTION_RECIPE_FILENO_SELECT_ERROR	0xC0B00621	Select a recipe-number.	After selecting the recipe number you want to change, change the CSV file number.
30	TERROR_ACTION_INDEX_NO_INPUT_ERROR	0xC0B00623	Address for index search not specified.	Address for the index search is not specified. Define the address. If the index search is not required, disable it.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
31	TERROR_ACTION_TITLE_NO_INPUT_ERROR	0xC0B00624	Title transfer-destination address not specified.	Address to which the title is transferred is not specified. Define the address. If the title transfer is not required, disable it.
32	TERROR_ACTION_PARMS_TRANSFER_ADDRESS_ERROR	0xC0B00625	Recipe-parameter transfer-destination address not specified.	Address to which the recipe parameter is transferred is not specified. Define the address. If the recipe parameter transfer is not required, disable it.
33	TERRCODE_ACTION_CSV_TRANSFER_NODE_NO_INPUT_ERROR	0xC0B00626	CSV-file transfer-destination Node not specified.	Address to which the CSV file is transferred is not specified. Define the address. If the CSV file transfer is not required, disable it.
34	TERRCODE_ACTION_IMAGE_TRANSFER_NODE_NO_INPUT_ERROR	0xC0B00627	Image-file transfer-destination Node not specified.	Address to which the image file is transferred is not specified. Define the address. If the image file transfer is not required, disable it.
35	TERRCODE_ACTION_TABLE_NO_INPUT_ERROR	0xC0B00628	Select a recipe-table.	A recipe table is not selected. Select a recipe table.
36	TERRCODE_ACTION_INDEX_DATA_TYPE_ERROR	0xC0B00629	Data types of [Float], [Double] and [Bit] are not available for "Address for Search".	You cannot specify the data types of [Float], [Double] and [Bit] for the index search address. Specify other data types.
37	TERRCODE_ACTION_TITLE_TRANSFER_DATA_TYPE_ERROR	0xC0B0062A	Data type available for "title transfer-destination address" is [String] only.	You can specify the string only for the data type of symbol/device address in case of the title transfer. Specify the data type of string.
38	TERRCODE_ACTION_ID_NO_INPUT_ERROR	0xC0B0062B	Select either the ID or the Index.	The ID or index is not specified. Select the ID or index.
39	TERRCODE_ACTION_ID_NO_ENTRY_ERROR	0xC0B0062C	No ID or Index is registered in the database, thereby the Index-search is not executed.	No ID or index is registered in the recipe table. Specify each parameter in the recipe table.
40	TERRCODE_ACTION_DATA_NUM_ERROR	0xC0B0062D	The Data-number is specified only in Character-string-type.	You can specify the data count for the string type. Select 1 for other data types.
41	TERRCODE_ACTION_PARAMS_TRANSFER_DATA_TYPE_ERROR	0xC0B0062E	Recipe-parameter-transfer-address is not specified in Character-string-type.	You cannot specify the string for the recipe parameter transfer address. Specify other data types.
42	TERRCODE_ACTION_TABLE_NO_ENTRY_ERROR	0xC0B0062F	No recipe-parameter is registered in the {0:s} recipe-table.	The recipe parameter is not defined in the recipe table you specify. Confirm the recipe parameter table and set again.
43	TERRCODE_ACTION_ANALOG_TAG_DATATYPE_ERROR	0xC0B00630	Analog-data-tag is not specified in this Symbol/Device-data-type.	Specify the symbol/device address with the data type of other than bit or string for the analog registered tag.
44	TERRCODE_ACTION_DIGITAL_TAG_DATATYPE_ERROR	0xC0B00631	Digital-data-tag is not specified in this Symbol/Device-data-type.	Specify the symbol/device address with the data type of bit for the digital registered tag.
45	TERRCODE_ACTION_STRING_TAG_DATATYPE_ERROR	0xC0B00632	String-data-tag is not specified in this Symbol/Device-data-type.	The registered parameter required for ACTION cannot be loaded, and the following ACTION cannot be executed. Confirm the database connection parameter, table registration and ACTION parameter, and correct them.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
46	TERRCODE_ACTION_DEVICE_ACCESS_ERROR	0xC0B00633	Failed in accessing the device. Please confirm the network connection correct between the destination node. ({0:s})	Confirm the connection of the device you collect the data from.
47	TERRCODE_ACTION_CONTROL_LIMIT_ERROR	0xC0B00634	Error occurred on writing the control-limit-monitoring-information in the device. ({0:s})	Confirm the connection of the device in which you write the control-limit-monitoring-information.
48	TERRCODE_ACTION_INIT_FAILURE_ERROR	0xC0B00635	Initialization failed, thereby the requested action is no more executed.	The registered parameter required for ACTION cannot be loaded, and the following ACTION cannot be executed. Confirm the database connection parameter, table registration and ACTION parameter, and correct them.
49	DB_CONNECT_ERR	0xC0B00641	Failed to connect to database. Connection String: {0:s}	Confirm the database information settings of ACTION.
50	DB_CONNECTED_ER R	0xC0B00642	Already connected to database. Cannot doubly connect.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
51	DB_PROCESS_FLAG_SET_ERR	0xC0B00643	Cannot change the value of InProcess column of C_MonthlyProcess table from False to True.	Exit 'Pro-Server EX', and confirm the value of the InProcess column (processing flag) in the C_MonthlyProcess table. If it is True, change it to False. If it is False already, increase the value of the WaitingTime column (waiting time [sec] when the processing flag is True).
52	DB_MONTHLY_CHECK_ERR	0xC0B00644	Failed to check whether monthly process is required. Current Time: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
53	DB_MONTHLY_CHANGE_MASTER_ERR	0xC0B00645	In monthly process, failed to switch to Master database.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
54	DB_MONTHLY_GET_PATH_ERR	0xC0B00646	In monthly process, failed to get the paths of database file and log file.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
55	DB_MONTHLY_DETACH_ERR	0xC0B00647	In monthly process, failed to detach the database.	Do not open the MESActionDB database using Management Studio etc. on the point of passing the month. Monthly process was not completed, and the data in this month is saved following the data of the previous month or earlier.
56	DB_MONTHLY_COPY_ERR	0xC0B00648	In monthly process, failed to copy database file and log file.	Confirm that the disk drive has a sufficient space to save the copied database file and log file. Monthly process was not completed, and the data in this month is saved following the data of the previous month or earlier.
57	DB_MONTHLY_ATTACH_ERR	0xC0B00649	In monthly process, failed to attach the copy-source database.	Reinstall MES ACTION.
58	DB_MONTHLY_TRUSTWORTHY_ERR	0xC0B0064A	In monthly process, failed in external-resource access permission of copy-source database using SQLCLR.	Reinstall MES ACTION.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
59	DB_MONTHLY_COPY_ATTACH_ERR	0xC0B0064B	In monthly process, failed to attach the copy-destination database.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
60	DB_MONTHLY_COPY_TRUSTWORTHY_ERR	0xC0B0064C	In monthly process, failed in external-resource access permission of copy-destination database using SQLCLR.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
61	DB_MONTHLY_CHANGE_MESACTIONDB_ERR	0xC0B0064D	In monthly process, failed to switch from Master database to database for MES ACTION.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
62	DB_MONTHLY_DATA_TABLE_CLEAR_ERR	0xC0B0064E	In monthly process, failed to clear the data from the data table.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
63	DB_PROCESS_FLAG_RESET_ERR	0xC0B0064F	Failed to update the values of InProcess column and LastDateTime column of C_MonthlyProcess table.	Exit 'Pro-Server EX', and confirm the value of the InProcess column (processing flag) in the C_MonthlyProcess table. If it is True, change it to False. If the error still occurs, reinstall MES ACTION.
64	DB_CF_ALARM_CSV_READ_ERR	0xC0B00650	Failed to read the CSV file of CF Alarm. CSV File Path: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
65	DB_CF_ALARM_DB_SAVE_ERR	0xC0B00651	Error while writing the CSV contents of CF Alarm into database. ACTION ID: {0:s}, Node Name: {1:s}, Block No.: {2:s}, CSV File Path: {3:s}	Exit 'Pro-Server EX', delete the D_CfAlarm table, and start 'Pro-Server EX' again. If the error still occurs, reinstall MES ACTION.
66	DB_CF_SAMPLING_CSV_READ_ERR	0xC0B00652	Failed to read the CSV file of CF Sampling Data. CSV File Path: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
67	DB_CF_SAMPLING_DB_SAVE_ERR	0xC0B00653	Error while writing the CSV contents of CF Sampling Data into database. ACTION ID: {0:s}, Node Name: {1:s}, Group No.: {2:s}, CSV File Path: {3:s}	Exit 'Pro-Server EX', delete the D_CfSamp table, and start 'Pro-Server EX' again. If the error still occurs, reinstall MES ACTION.
68	DB_CF_SCREEN_READ_ERR	0xC0B00654	Failed to read the CF screen file. Screen File Path: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
69	DB_CF_SCREEN_DB_SAVE_ERR	0xC0B00655	Error while writing the CF-screen-file contents into database. ACTION ID: {0:s}, Date and Time: {1:s}, Node Name: {2:s}, File Name: {3:s}, File Path: {4:s}, Storage Method: {5:s}	Exit 'Pro-Server EX', delete the D_CfScreenFile table, and start 'Pro-Server EX' again. If the error still occurs, reinstall MES ACTION.
70	DB_SRAM_ALARM_CSV_READ_ERR	0xC0B00656	Failed to read the CSV file of SRAM Alarm. CSV File Path: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
71	DB_SRAM_ALARM_DB_SAVE_ERR	0xC0B00657	Error while writing the CSV contents of SRAM Alarm into database. ACTION ID: {0:s}, Node Name: {1:s}, Block No.: {2:s}, CSV File Path: {3:s}	Exit 'Pro-Server EX', delete the D_SramAlarm table, and start 'Pro-Server EX' again. If the error still occurs, reinstall MES ACTION.
72	DB_SRAM_SAMPLING_CSV_READ_ERR	0xC0B00658	Failed to read the CSV file of SRAM Sampling Data. CSV File Path: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
73	DB_SRAM_SAMPLING_DB_SAVE_ERR	0xC0B00659	Error while writing the CSV contents of SRAM Sampling Data into database. ACTION ID: {0:s}, Node Name: {1:s}, Group No.: {2:s}, CSV File Path: {3:s}	Exit 'Pro-Server EX', delete the D_SramSamp table, and start 'Pro-Server EX' again. If the error still occurs, reinstall MES ACTION.
74	DB_RECIPE_TABLE_CHECK_ERR	0xC0B0065A	Failed to check whether the recipe table (R_Recipe) exists. Recipe No.: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
75	DB_RECIPE_TABLE_GET_ERR	0xC0B0065B	Failed to get data from the recipe table (R_Recipe). Recipe No.: {0:s}	Create the recipe table in the correct format.
76	DB_RECIPE_TABLE_STRING_GET_ERR	0xC0B0065C	Failed to get data from the recipe table (R_Recipe). Recipe No.: {0:s}	Create the recipe table in the correct format.
77	DB_RECIPE_INDEX_GET_ERR	0xC0B0065D	Failed to get data from the recipe index table (R_RecipeIndex).	Reboot the PC. If the error still occurs, reinstall MES ACTION.
78	DB_A_TABLE_UPDATE_INSERT_ERR	0xC0B0065E	Failed to write data into the {0:s} table. SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
79	DB_A_TABLE_DELETE_ERR	0xC0B0065F	Failed to clear data from the {0:s} table. SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
80	DB_A_TABLE_READ_ERR	0xC0B00660	Failed to get data from the {0:s} table. SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
81	DB_ACTUAL_CONV_MASK_ERR	0xC0B00661	Failed in the mask process of engineering-value conversion. Check the registration of the T_LinearAnalog table. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Confirm the specified signal condition in the T_LinearAnalog table and the device data type assigned to the tag, and set that combination correctly.
82	DB_ACTUAL_CONV_TAGNAME_ERR	0xC0B00662	Tag Name not registered in the T_TagName table. Tag Name: {0:s}	Register the tags to be collected in the T_TagName table.
83	DB_ACTUAL_CONV_INPUT_RANGE_ERR	0xC0B00663	Input range for the data type and signal condition is incorrect. Check the registration of the T_LinearAnalog table. Tag Name: {0:s}, Data Type: {1:s}	Set the correct input upper limit and input lower limit in the T_LinearAnalog table according to the data type of the signal condition and device.
84	DB_ACTUAL_CONV_CALC_ERR	0xC0B00664	Math error in linearization operation. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Review the input upper and lower limit values, as well as the output upper and lower limit values in the T_LinearAnalog table.
85	DB_ACTUAL_CONV_DATA_TYPE_ERR	0xC0B00665	Wrong data type. Tag Name: {0:s}, Data Type: {1:s}	Delete the tag collection registration, and register again. If the error still occurs, reinstall MES ACTION.
86	DB_ACTUAL_CONV_ERR	0xC0B00666	Failed in engineering-value conversion. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Set the data type of the tag-assigned device correctly.
87	DB_ACTUAL_TABLE_CHECK_ERR	0xC0B00667	Error while checking whether the D_ActualData table exists. Table Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
88	DB_ACTUAL_CLEATE_TABLE_ERR	0xC0B00668	Error while creating the D_ActualData table. Table Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
89	DB_ACTUAL_FIELD_CHECK_ERR	0xC0B00669	Error while getting the column of the D_ActualData table. Table Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
90	DB_ACTUAL_CLEATE_FIELD_ERR	0xC0B0066A	Error while getting the column of the D_ActualData table. Table Name: {0:s}, SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
91	DB_ACTUAL_TABLE_INSERT_ERR	0xC0B0066B	Error while adding record to the D_ActualData table. Table Name: {0:s}, SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
92	DB_ACTUAL_LIMIT_CONTROL_ERR	0xC0B0066C	Error in the process of control-limit monitoring. Tag Name: {0:s}, Tag Value: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
93	DB_ACTUAL_ACHIEVEMENT_RATE_ERR	0xC0B0066D	Error in the process of achievement-rate calculation. Tag Name: {0:s}, Tag Value: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
94	DB_ACTUAL_MAIL_SEND_ERR	0xC0B0066E	Failed to send mail in the process of control-limit monitoring. Tag Name: {0:s}	Confirm the connection to the SMTP Server. If the error occurs, though connected, review the SMTP server-related settings in the C_CmmonInfo table.
95	DB_PROCESS_CONV_MASK_ERR	0xC0B0066F	Failed in the mask process of engineering-value conversion. Check the registration of the T_LinearAnalog table. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Set the data type of the tag-assigned device correctly.
96	DB_PROCESS_CONV_STRING_TABLE_ERR	0xC0B00670	Failed to convert from numeric value to string. Check the specification of the StringConvertMethod column and the EngineeringUnit column in the T_LinearAnalog table. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Check the specification of the StringConvertMethod column and the EngineeringUnit column in the T_LinearAnalog table.
97	DB_PROCESS_CONV_STRING_QUERY_ERR	0xC0B00671	Failed to convert from numeric value to string. Check the specification of the StringConvertMethod column and the EngineeringUnit column in the T_LinearAnalog table. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Check the specification of the StringConvertMethod column and the EngineeringUnit column in the T_LinearAnalog table.
98	DB_PROCESS_CONV_STRING_DIGITAL_ERR	0xC0B00672	Failed to convert the string of the digital tag. Check the T_LineDigital table. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Register the digital tag registered for collection in the T_LineDigital table.
99	DB_PROCESS_CONV_TAGNAME_ERR	0xC0B00673	Tag Name not registered in the T_TagName table. Tag Name: {0:s}	Register the tag registered for collection in the T_TagName table.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
100	DB_PROCESS_CONV_INPUT_RANGE_ERR	0xC0B00674	Input range for the data type and signal condition is incorrect. Check the registration of the T_LinearAnalog table. Tag Name: {0:s}, Data Type: {1:s}	Set the correct input upper limit and input lower limit in the T_LinearAnalog table according to the data type of the signal condition and device.
101	DB_PROCESS_CONV_CALC_ERR	0xC0B00675	Math error in linearization operation. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Review the input upper and lower limit values, as well as the output upper and lower limit values in the T_LinearAnalog table.
102	DB_PROCESS_CONV_DATA_TYPE_ERR	0xC0B00676	Wrong data type. Tag Name: {0:s}, Data Type: {1:s}	Delete the tag collection registration, and register again. If the error still occurs, reinstall MES ACTION.
103	DB_PROCESS_CONV_ERR	0xC0B00677	Failed in engineering-value conversion. Tag Name: {0:s}, Data Type: {1:s}, Value before Conversion: {2:s}	Set the data type of the tag-assigned device correctly.
104	DB_PROCESS_TABLE_CHECK_ERR	0xC0B00678	Error while checking whether the D_ProcessData table exists. Table Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
105	DB_PROCESS_CLEATE_TABLE_ERR	0xC0B00679	Error while creating the D_ProcessData table. Table Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
106	DB_PROCESS_FIELD_CHECK_ERR	0xC0B0067A	Error while getting the column of the D_ProcessData table. Table Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
107	DB_PROCESS_CLEATE_FIELD_ERR	0xC0B0067B	Error while creating the column of the D_ProcessData table. Table Name: {0:s}, SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
108	DB_PROCESS_TABLE_INSERT_ERR	0xC0B0067C	Error while adding record to the D_ProcessData table. Table Name: {0:s}, SQL Statement: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
109	DB_PROCESS_LIMIT_CONTROL_ERR	0xC0B0067D	Error in the process of control-limit monitoring. Tag Name: {0:s}, Tag Value: {1:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.
110	DB_PROCESS_MAIL_SEND_ERR	0xC0B0067E	Failed to send mail in the process of control-limit monitoring. Tag Name: {0:s}	Confirm the connection to the SMTP Server. If the error occurs, though connected, review the SMTP server-related settings in the C_CmmonInfo table.
111	DB_MULTI_GET_TABLE_INFO_ERR	0xC0B0067F	Failed to get the column composition of the R_MultiRecipe table. Table Name: {0:s}	Confirm if there is the R_MultiRecipe table. If the error occurs, though it exists, reboot the PC. If the error still occurs, reinstall MES ACTION.
112	DB_MULTI_GET_RECIPE_ERR	0xC0B00680	Failed to get the recipe information from the R_MultiRecipe table. Table Name: {0:s}	Create the R_MultiRecipe table in the correct column configuration.
113	DB_MULTI_FROM_TEXT_FILE_ERR	0xC0B00681	Failed to read the file to transfer the CSV file of composite document recipe. File Path: {0:s}	Confirm if there is the file to transfer the CSV file, the path of which is set in the fromTextFile column in the R_MultiRecipe table. If it does not exist, create a file.

No	Name	Error Code	Message ({0:s} etc. shows an arbitrary string)	Troubleshooting
114	DB_MULTI_FROM_IMAGE_FILE_ERR	0xC0B00682	Failed to read the file to transfer the image file of composite document recipe. File Path: {0:s}	Confirm if there is the file to transfer the image file, the path of which is set in the fromImageFile column in the R_MultiRecipe table. If it does not exist, create a file.
115	DB_TAG_NAME_TABLE_READ_ERR	0xC0B00683	Failed to read T_TagName table.	Reboot the PC. If the error still occurs, reinstall MES ACTION.
116	DB_ACTUAL_FIELD_TYPE_ERR	0xC0B00684	Incongruous Tag-data-type in existing queue of the {0:s}-table. Please delete the queue or change the queue name. Tag Name: {1:s}	Delete the corresponding tag column in the D_ProcessData table or change the column name.
117	DB_PROCESS_FIELD_TYPE_ERR	0xC0B00685	Incongruous Tag-data-type in existing queue of the {0:s}-table. Please delete the queue or change the queue name. Tag Name: {1:s}	Delete the corresponding tag column in the D_ProcessData table or change the column name.
118	DB_TAG_TYPE_ERR	0xC0B00686	Incorrect set of combination of the tag-type specified in the T_TagName-table and the data-type of the device-symbol. Tag-name: {0:s}, Tag-type: {1:s}, Data-type: {2:s}	Change the tag type specified in the T_TagName table or change the device data type.
119	DB_TAG_TYPE_GET_ERR	0xC0B00687	Failed to get the Tag-type out of the T_TagName-table. Tag Name: {0:s}	Reboot the PC. If the error still occurs, reinstall MES ACTION.

6 Appendix

6.1 Appendix

6.1.1 Basic Operations of SQL Server Management Studio Express

To configure the database, mainly operate as follows:

- Creating a database
- Crating a database table or view

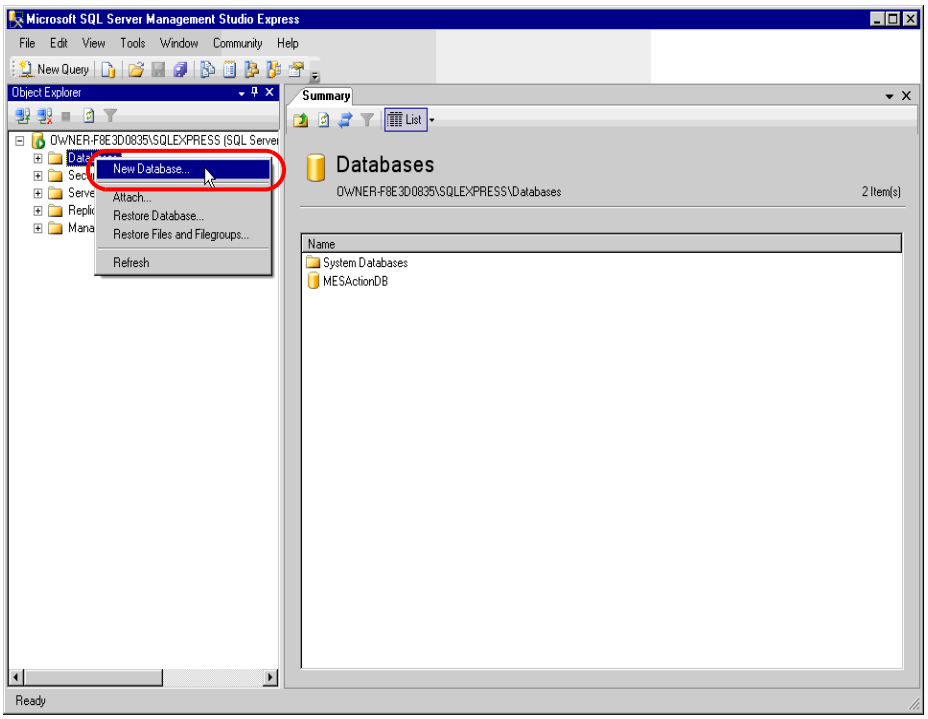
This section describes about these operations using SQL Server Management Studio Express as follows:

■ Creating a Database

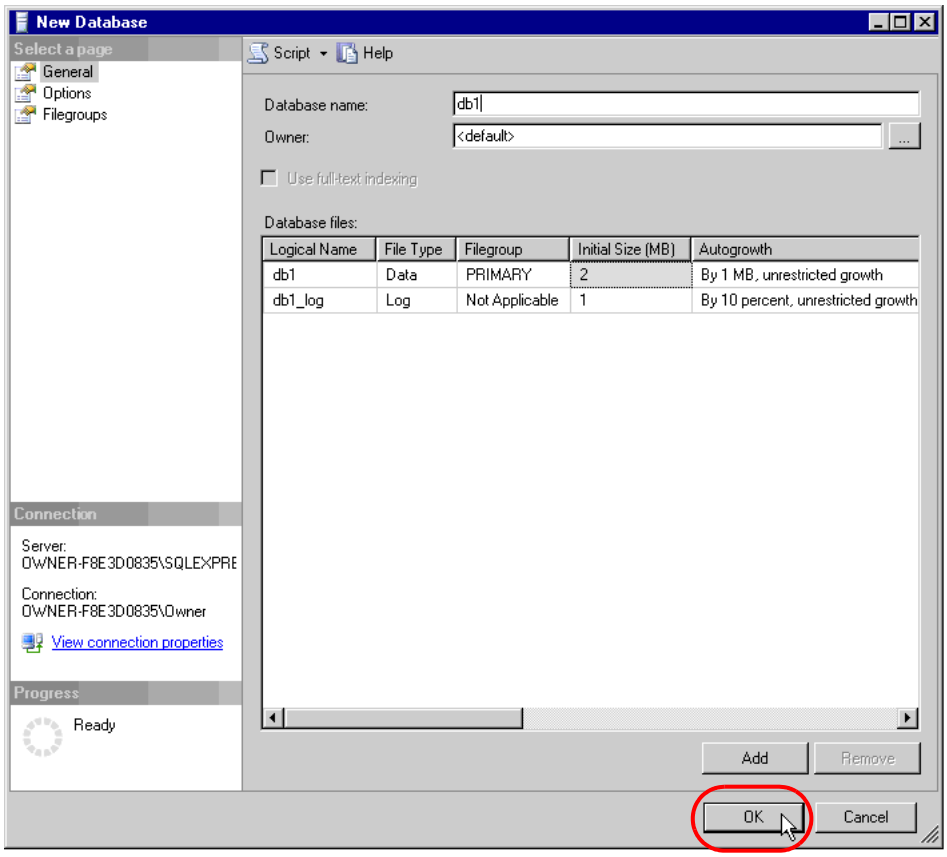
Many procedures are required to create a database. However, if you use SQL Server 2005 Express Edition and SQL Server Management Studio Express together, you can create a database easily. The following describes how to create the basic database.

1 To start SQL Server Management Studio Express, select [All Programs] (or [Programs], depending on your OS) in the [Start] menu and click [SQL Server Management Studio Express] under [Microsoft SQL Server 2005].

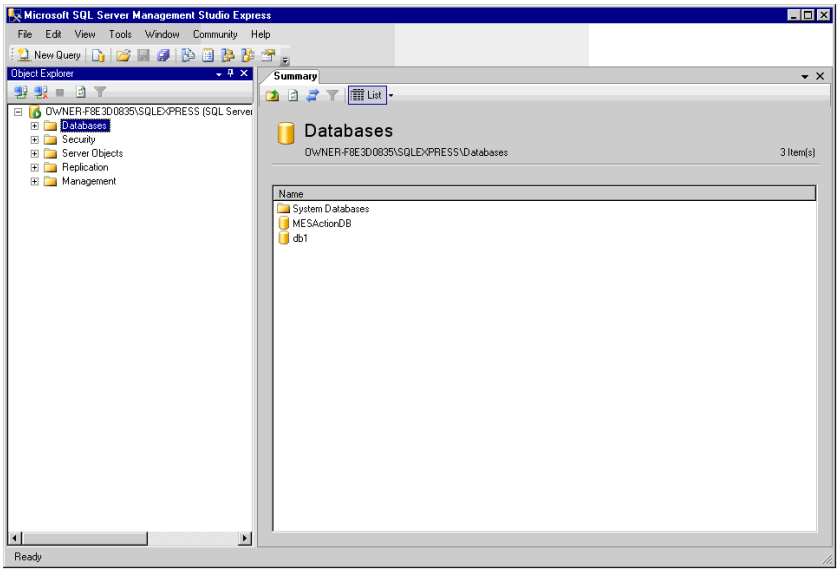
2 Specify the server name, authentication method and login account to log into SQL Server. When the SQL Server Management Studio Express appears, right-click [Database] on the left pane. Click [New Database] in the shortcut menu.



3 Enter "db1" under [Database name] in the "New Database" dialog box. [Database files] is automatically set. Click [OK].



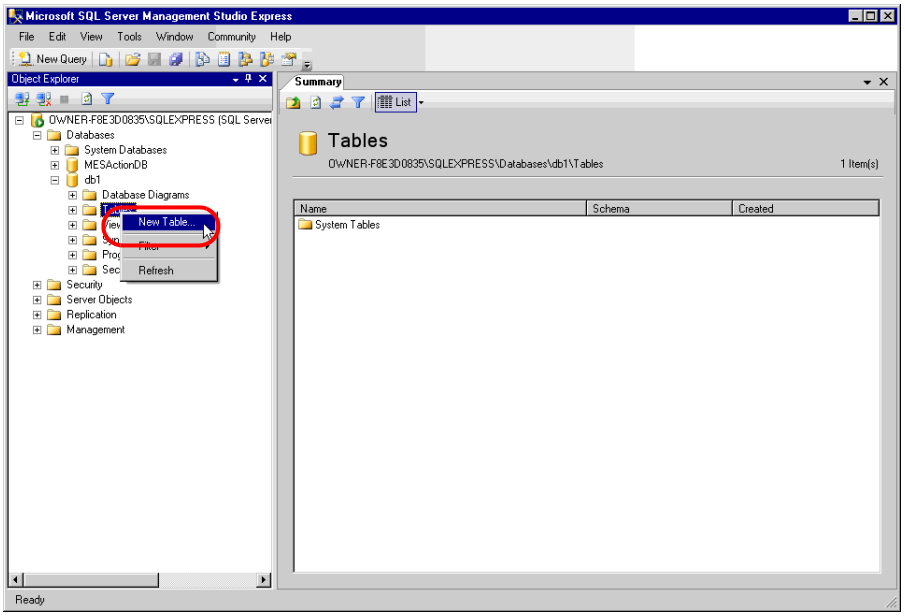
4 The created new database is displayed on the [Summary] tab.



■ Creating a Table

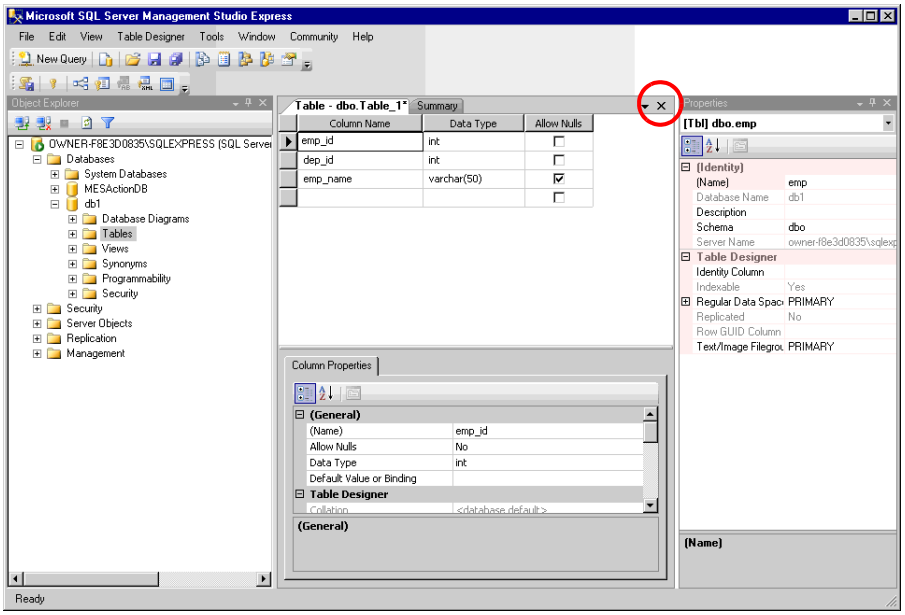
Create a table which is one of the basic database objects. Create the department table "dep" and the employee table "emp" combined with the department ID. Similarly with the database, you can create a table easily.

1 On the left pane of SQL Server Management Studio Express, right-click [Databases] - [db1] - [Tables]. Click [New Table] in the shortcut menu.



2 Enter the definition of a table to be created on the displayed center pane. For the table definition, refer to the table below. After entering the table definition, enter "emp" under [Name] in the "Properties" window and click the [X] button on the center pane. When confirmation of the save is asked, click [OK].

Column Name	Data Type	NULL Enabled
emp_id	int	No
dep_id	int	No
emp_name	varchar(50)	Yes



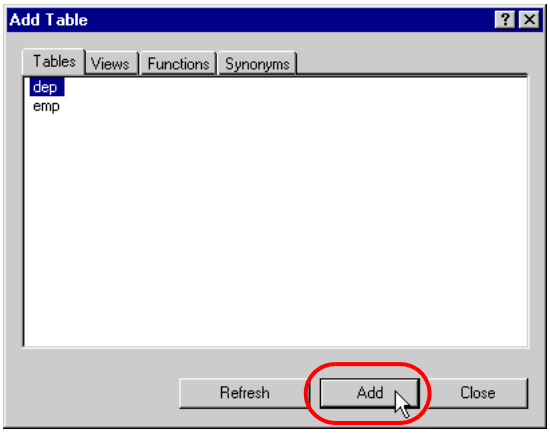
3 Create the dep table in the same manner. For the table definition, refer to the table below.

Column Name	Data Type	NULL Enabled
dep_id	int	No
dep_name	varchar(50)	Yes

■ Creating a View

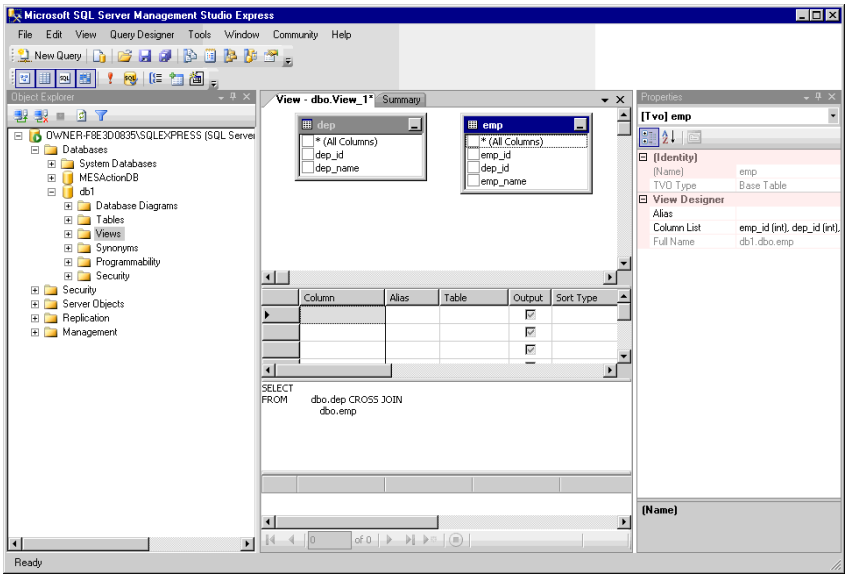
A view is also one of the basic database objects In this section, to browse the employees and departments collectively, create the view where the department table "dep" and employee table "emp" are combined with the department ID "dep_id".

1 Right-click [Databases] - [db1] - [Views] on the left pane. Click [New View] in the shortcut menu. Click [dep] on the [Tables] tab in the "Add Table" dialog box, and click [Add]. Operate for [emp] in the same manner.

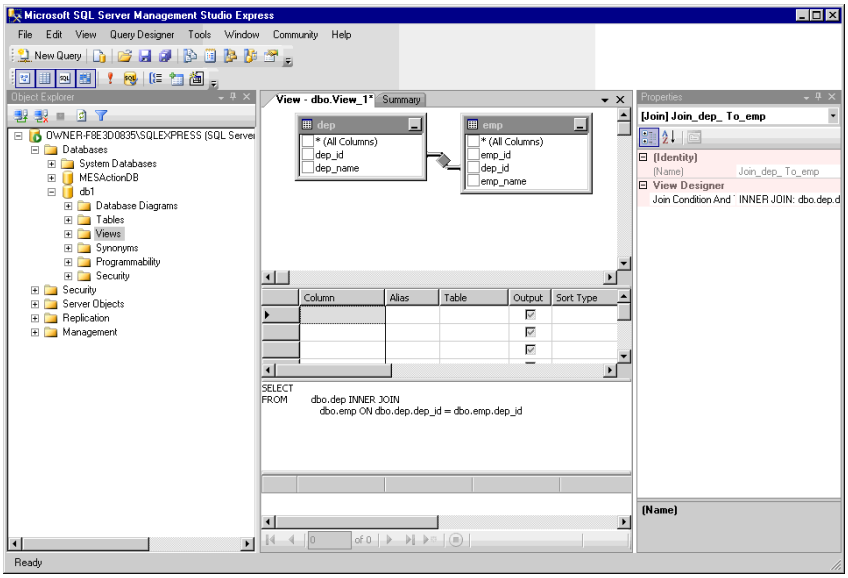


2 Click [Close].

3 Define the view on the displayed center pane. The table definition you have added is displayed.

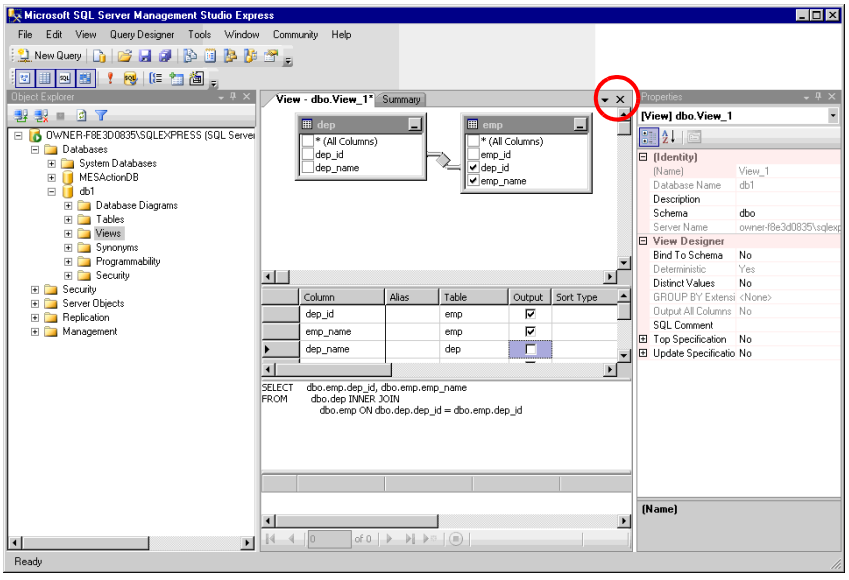


4 Drag and drop the dep_id field in the dep table on the dep_id field in the emp table. The combination relationship is set.

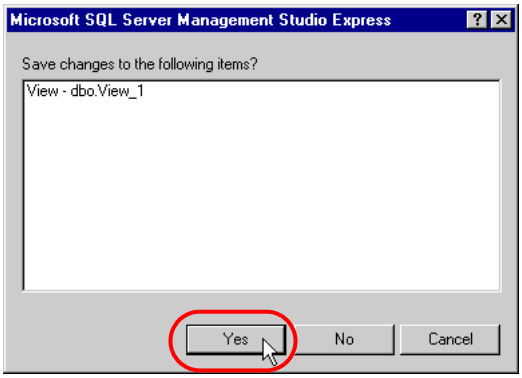


5 Define the columns to be output in the view. Refer to the table below and define the view. When the definition is completed, click [X] on the center pane.

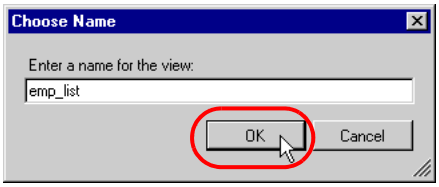
Column	Alias	Table	Output	Sort Type
dep_id		emp	Yes	
emp_name		emp	Yes	
dep_name		dep		



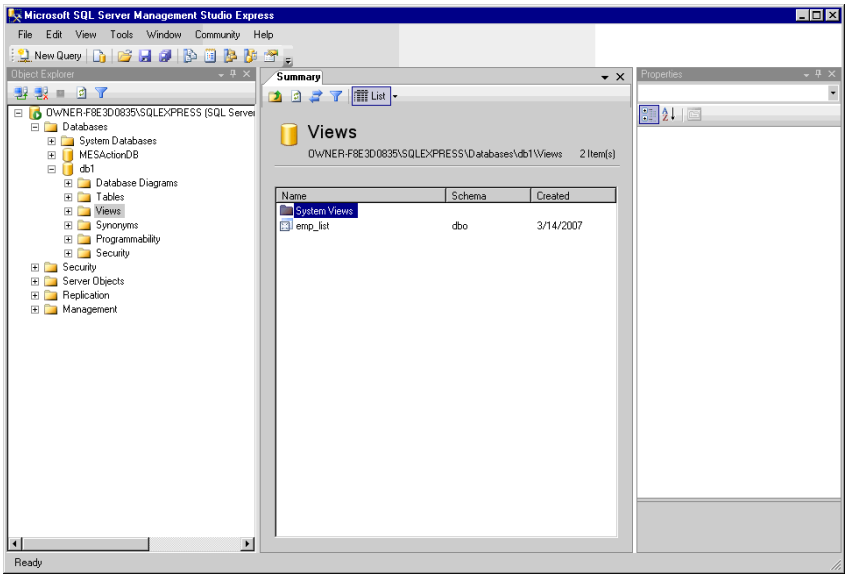
6 Confirm the view save and click [Yes].



7 When a view name is asked, enter "emp_list" and click [OK].



8 The created new view is displayed on the [Summary] tab.

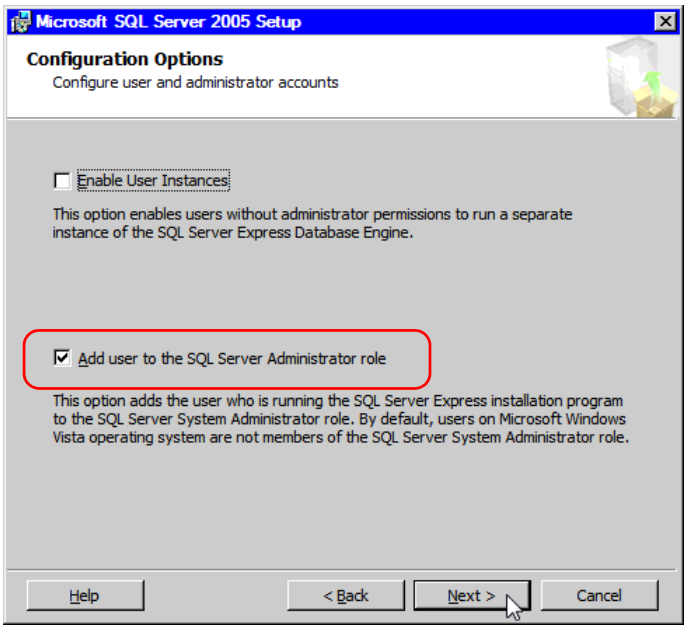


6.1.2 Upgrading SQL Server

To upgrade the SQL Server, double-click on "SQLEXPR_ADV.EXE" (self-decompression package that stores both SQL Server 2005 Express Edition and SQL Server Management Studio Express). The self-decompression package starts decompressing.

■ Notes on Version Upgrade

When the following screen is displayed during version upgrade, check the [Add User to SQL Server Administrator Role] option and click [Next].



■ Notes After Version Upgrade

Since the database owner is cleared after version upgrade, set it again.

7 Inquiry

7.1 Inquiry

Do you have any questions about difficulties with MES ACTION?

Before contacting us

Introducing "Otasuke Pro!" which is the site that offers support for Pro-Server EX products
"Otasuke Pro!" is loaded with contents to support your questions and requests.Please access our site anytime that you need help with a solution.

http://www.proface.com/otasuke/

* If you have any question about the contents and operations of Microsoft SQL Server 2005 Express Edition, or about the contents of this manual, contact DIGITAL SUPPORT. For other questions, contact Microsoft at the following site:

  http://www.microsoft.com/sql/editions/express/default.mspx

  (as of October, 2008)