Panasonic

Programmable Controller

FP7 CPU Unit

User's Manual

Logging Trace Function

WUME-FP7CPULOG-06

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(MEMO)

Introduction

Thank you for purchasing a Panasonic product. Before you use the product, please carefully read through the user's manual, and understand it in detail to use the product properly.

Types of Manual

- There are different types of user's manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded from the Panasonic website:https://industry.panasonic.com/global/en/downloads/?tab=manual.

Unit name or purpose of use	Manual name	Manual code
FP7 Power Supply Unit	FP7 CPU Unit User's Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit	FP7 CPU Unit Command Reference Manual	WUME-FP7CPUPGR
	FP7 CPU Unit User's Manual (Logging Trace Function)	WUME-FP7CPULOG
	FP7 CPU Unit User's Manual (Security Function)	WUME-FP7CPUSEC
Instructions for Built-in LAN Port	FP7 CPU Unit User's Manual (LAN Port Communication)	WUME-FP7LAN
	FP7 CPU Unit User's Manual (Ethernet Expansion Function)	WUME-FP7CPUETEX
	FP7 CPU Unit User's Manual (EtherNet/IP Communication)	WUME-FP7CPUEIP
	Web Server Function Manual	WUME-FP7WEB
Instructions for Built-in COM Port	FP7 Series User's Manual (SCU Communication)	WUME-FP7COM
FP7 Extension Cassette (Communication) (RS-232C / RS485 type)		
FP7 Extension Cassette (Communication) (Ethernet Type)	FP7 Series User's Manual (Communication Cassette Ethernet Type)	WUME-FP7CCET
FP7 Extension (Function) Cassette Analog Cassette	FP7 Analog Cassette User's Manual	WUME-FP7FCA
FP7 Digital Input / Output Unit	FP7 Digital Input / Output Unit User's Manual	WUME-FP7DIO
FP7 Analog Input Unit	FP7 Analog Input Unit User's Manual	WUME-FP7AIH
FP7 Analog Output Unit	FP7 Analog Output Unit User's Manual	WUME-FP7AOH
FP7 Thermocouple Multi-analog Input Unit	FP7 Thermocouple Multi-analog Input Unit FP7 RTD Input Unit User's Manual	WUME-FP7TCRTD
FP7 RTD Input Unit		
FP7 Multi Input / Output Unit	FP7 Multi Input / Output Unit User's Manual	WUME-FP7MXY
FP7 High-speed counter unit	FP7 High-speed Counter Unit User's Manual	WUME-FP7HSC
FP7 Pulse Output Unit	FP7 Pulse Output Unit User's Manual	WUME-FP7PG

Unit name or purpose of use	Manual name	Manual code
FP7 Positioning Unit	FP7 Positioning Unit User's Manual	WUME-FP7POSP
FP7 Serial Communication Unit	FP7 Series User's Manual (SCU Communication)	WUME-FP7COM
FP7 Multi-wire Link Unit	FP7 Multi-wire Link Unit User's Manual	WUME-FP7MW
FP7 Motion Control Unit	FP7 Motion Control Unit User's Manual	WUME-FP7MCEC
PHLS System	PHLS System User's Manual	WUME-PHLS
Programming Software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

Safety Precautions

- In order to prevent injuries and accidents, always adhere to the following.
- Always read this manual thoroughly before performing installation, operation, maintenance, and inspection, and use the device correctly.
- Ensure you are familiar with all device knowledge, safety information, and other precautions before use.
- In this manual, safety precaution levels are classified into "warnings" and "cautions".

⚠ **WARNING**	Cases where dangerous situations are expected to arise whereby the user could die or suffer serious injury if handled incorrectly

- Implement safety measures externally from this product so that the entire system can operate safely even if a failure occurs due to a fault in this product or some external factor.
- Do not use in an environment containing flammable gases.
  Doing so could cause explosions.
- Do not dispose of this product by placing it in fire.
  This could cause rupture of batteries, electronic components, etc.
- Do not apply force, electrical charge, fire or heat to the lithium batteries.
  It may lead to ignition and/or rupture.

⚠ **CAUTION**	Cases where dangerous situations are expected to arise whereby the user could suffer injury or physical damage could occur if handled incorrectly

- In order to prevent the product from generating abnormal heat or emitting smoke, use the product with some margin to the guaranteed characteristics and performance values.
- Do not disassemble or modify the product.
  Doing so could cause abnormal heat generation or smoke.
- Do not touch electrical terminals while the power is on.
  There is a risk of electrical shock.
- Construct external emergency stop and interlock circuits.
- Securely connect wires and connectors.
  Poor connections can cause abnormal heat generation or smoke.
- Do not perform work (connection, disconnection, etc.) while the power is on.
  There is a risk of electrical shock.
- If methods other than those specified by our company are used when operating this product, the protection functions of the unit may be lost.
- This product was developed and manufactured for use in industrial environments.

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FP7 Connector Compatibility

The connectors of old and new model FP7CPU units and add-on cassettes (hereinafter "cassettes") are shaped differently. Please use old model cassettes with old model units and new model cassettes with new model units as shown in the table below.

■ Old Model

Type	Old Product No.
CPU unit	AFP7CPS41ES, AFP7CPS41E, AFP7CPS31ES, AFP7CPS31E, AFP7CPS31S, AFP7CPS31, AFP7CPS21
Serial Communication Unit	AFP7NSC
Cassette	AFP7CCS1、AFP7CCS2、AFP7CCM1、AFP7CCM2、AFP7CCS1M1、AFP7CCET1、AFP7FCA21、AFP7FCAD2、AFP7FCTC2

■ New Model

Type	New Product No.
CPU unit	AFP7CPS4RES, AFP7CPS4RE, AFP7CPS3RES, AFP7CPS3RE, AFP7CPS3RS, AFP7CPS3R, AFP7CPS2R
Serial Communication Unit	AFP7NSCR
Cassette	AFP7CCRS1、AFP7CCRS2、AFP7CCRM1、AFP7CCRM2、AFP7CCRS1M1、AFP7CCRET1、AFP7FCRA21、AFP7FCRAD2、AFP7FCRTC2

Note

- Each FP7 unit can be connected to the CPU unit of a new or old model.
- Firmware version upgrades for the CPU unit are available for both new and old models.
- When attaching expansion cassettes to the FP7CPU unit, please use only old models, or only new models. Trying to attach a combination of old models and new models may cause damage.

Handling Precautions

■ In this manual, the following symbols are used to indicate safety information that must be observed.

Stop	Indicates an action that is prohibited or a matter that requires caution.
!	Indicates an action that must be taken.
Info.	Indicates supplemental information.
Note	Indicates details about the subject in question or information useful to remember.
1 2 Procedure	Indicates operation procedures.

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1 Overview of Functions

1.1 For Using Logging and Trace Functions

1.1.1 Precautions on Using This Function

As an SD memory card is used for the logging function, there are risks of loss of data or data damage depending on usage conditions. Consider possible risks, design a system and make an evaluation of the system before using the function.

■ Precautions when powering off the PLC

If the PLC is powered off during logging or accessing an SD memory card, the following problems may occur.

- Data accumulated in the buffer memory are lost.
- Files may be damaged.
- The SD memory card may be damaged.

Take necessary measures such as the use of an uninterruptible power system (UPS) as necessary.

■ Logging speed and writing speed into an SD memory card

If the speed to accumulate data is normally faster than that to write to the SD memory card, data saving or file determination may not operate properly.

Check logging over-speed relays (SR103, SR113, SR123, etc.) and buffer overflow relays (SR104, SR114, SR124, etc.) to thoroughly evaluate the system before using the function.

1.1.2 Models Supporting the Logging/Trace Function

The following FP7 CPU Units support the logging/trace function.

Function	Supported
Logging	All FP7 CPU Units other than the low-cost type (AFP7CPS2R)
Trace	All FP7 CPU Units

1.1.3 Selection of SD Memory Cards

■ Usable SD memory cards

We recommend SLC SD memory cards and SLC SDHC memory cards.

For details on compatible SD memory cards and SDHC memory cards, visit https://industry.panasonic.com/global/en/products/fasys/information/sd-card/.

Printed logo on CPU unit	Usable SD memory cards	
	Card type	Capacity
	SD memory card	2GB
	SDHC memory card	4GB to 32GB

■ Cautions on handling an SD memory card

The data saved in the SD memory card may be lost in the following cases. We assume no responsibility whatsoever for the loss of saved data.

- When the user or a third party has misused the SD memory card.
- When the SD memory card was affected by any static electricity or electrical noise.
- • The SD memory card was taken out, or the PLC body was powered off, while the card was being accessed (e.g. saving data into the card, deleting data from the card).

■ Formatting an SD memory card

In principle, SD memory cards have been formatted by the time of purchase, and no formatting by the user is required. If formatting becomes necessary, download formatting software for SD memory cards from the SD Association website.

- A file system formatted by PC's standard formatting software does not satisfy the SD memory card specifications. Please use the dedicated formatting software.

  It is recommended to save important data in another media for backup.

  Never remove the card or power off the PLC body while the SD LED on the CPU unit is flashing (data is being read from or written into the card). Data may be damaged.
- Do not use an SD memory card the memory capacity of which is more than the usable capacity. Data in the card may be damaged.

1.2 Overview of Functions

1.2.1 Overview of Logging Function

■ Overview

- The logging function is used to record arbitrary contacts and data information together with time stamp information at any time, and save them in an SD memory card inserted in the CPU unit.
- Log data is saved as csv format files.
- Use the **Logging/Trace Settings** menu of the tool software FPWIN GR7 to set the conditions.
- The settings are downloaded to the PLC as a part of project data, and stored in the ROM1. The setting data can be saved in SD memory cards and used.
- The logging operation is executed by any of these operations: (1) tool software FPWINGR7, (2) dedicated instructions or (3) Autostart via setting.
- To perform data logging at high speed, the buffer memory in the CPU unit is used.

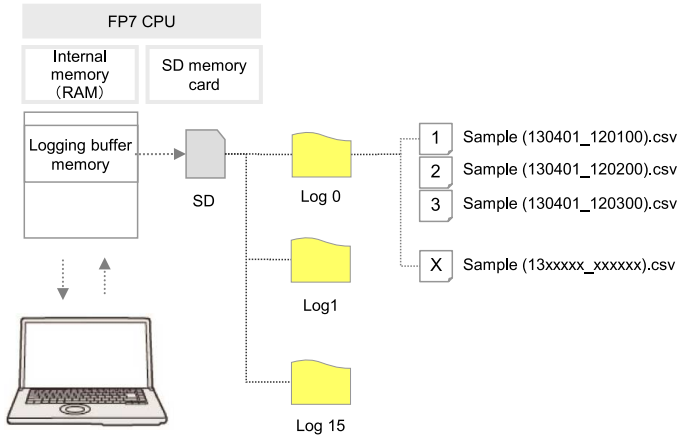
■ Specifications

Item	Specifications	Remarks
Max. number of records	1,000,000 records	
Number of file generations	Max. 2,000 generations / 1 log	
Number of logs	Max. 500 devices (500 to 2,000 words) / 1 record	
Buffer memory	Max. 1M words Can be divided into max. 16 (LOG0 to LOG15) areas for use. Capacity per division: 8k words to 1M words	Shared with the trace function.
Logging start-stop	Selectable from the tool software, instructions or autostart.	
Logging trigger condition	Bit device ON (Note 1) Cycle: Hour, minute, second Time: Per minute, Per hour, Every day, Every week, Every month, Every year Instruction: Executes an instruction with an arbitrary condition and starts logging.	
File determination condition (Logging stop trigger condition)	Bit device ON (Note 2) Time: Per minute, Per hour, Every day, Every week, Every month, Every year Max. number of records	
File format	Data is saved in csv format.	Arbitrary comments can be given. The upper limit of the capacity on the file system is 4 GB.

(Note 1) Logging is executed when the condition is met at the end of scan.

(Note 2) Use it together with the (DF) instruction to turn ON only for one scan.

■ Image of logging function



1.2.2 Overview of Trace Function

■ Overview

- The trace function is used to record arbitrary contacts and data information together with time stamp information in the buffer memory in the CPU unit at any time.
- Logging data can be uploaded from the buffer memory to the tool software after the trace operation, and can be displayed as a time chart. Traced data can be saved in SD memory cards as csv format files.
- When the trace stop condition is set to bit device, the operation can be stopped after logging data of the specified number of samplings after the stop condition has been met.
- Use the **Logging/Trace Settings** menu of the tool software FPWIN GR7 to set the conditions.
- The settings are downloaded to the PLC as a part of project data, and stored in the ROM1. The setting data can be saved in SD memory cards and used.
- The logging operation is executed by any of these operations: (1) tool software FPWINGR7, (2) dedicated instructions or (3) Autostart via setting.

■ Specifications

Item	Specifications	Remarks
Max. number of records	1,000,000 records	
Number of logs	Max. 500 devices (500 to 2,000 words) / 1 record	
Buffer memory	Max. 1M words Can be divided into max. 16 (LOG0 to LOG15) areas for use. Capacity per division: 8k words to 1M words	Shared with the logging function.
Trace start	Selectable from the tool software, instructions or autostart.	
Trace trigger condition	Bit device ON (Note 1) Cycle: By millisecond	

Item	Specifications	Remarks
	Instruction: Executes an instruction with an arbitrary condition and starts trace.	
Trace stop condition	Bit device ON (Note 2)(Note 3) Buffer full	
File format	Data is saved in csv format.	Arbitrary comments can be given. The upper limit of the capacity on the file system is 4 GB.

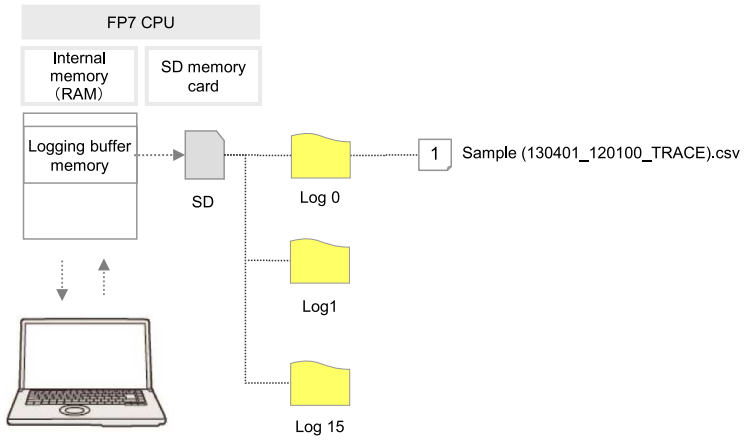
(Note 1) The trace operation is executed when the condition is met at the end of scan.

(Note 2) When selecting "Bit" for the trace stop condition, logging data of the specified number of samples is possible after the condition is met.

(Note 3) Unlike the file determination condition of the logging function, logging of data for the specified number of samples starts when the bit device changes from OFF to ON.

■ Image of trace function

- The trace function can also be activated only with the internal memory of the CPU unit.
- SD memory cards are used only for recording trace data in recording media.



1.3 Format of Saved Files

1.3.1 File Format (For Logging Function)

- Files are saved in csv format.
- For the details of setting methods, refer to "2.2 Logging Information Setting".

■ CSV format

- Time stamp information (year/month/day/hour/minute/second) and information of registered devices are saved.
- The data length varies depending on the types of specified devices.
- Comments can be given at the beginning of data.

	1st line	2nd line	3rd line	4th line	5th line	
Comment part (Note 1)			1	2	3	-
			Data name 1	Data name 2	Data name 3	-
			Arbitrary comment	Arbitrary comment	Arbitrary comment	-
			MOMENT	MOMENT	MOMENT	-
			Data format 1	Data format 2	Data format 3	-
			Unit 1	Unit 2	Unit 3	-
(Note 2)	date format	time format	Data 1	Data 2	Data 3	-
	date format	time format	Data 1	Data 2	Data 3	-
	date format	time format	Data 1	Data 2	Data 3	-
	-	-	-	-	-	-
			←――――――――――(Note 3)――――――――――→			

(Note 1) The contents of comment part vary depending on the settings of configuration data.

(Note 2) The number of records varies depending on the settings of file determination condition. Max. 1,000,000 records.

(Note 3) The number of data varies depending on the setting of the number of devices. Max. 500 devices

1.3.2 File Name (For Logging Function)

- A file name to be saved is an arbitrary file name (date_hour-minute-second data of the first record).
- Enter the desired file name in the "Logging/Trace Settings" dialog box for each LOG number.

Example) When the file name is "Sample", and the time stamp of the first record is 12:00:00 on April 01, 2013;

Sample(130401_120000).csv

1.3.3 File Format (For Trace Function)

- Files are saved in csv format.
- For the details of setting methods, refer to "2.3 Trace Information Setting".

■ CSV format

- Time stamp information (year/month/day/hour/minute/second), obtaining interval and information of registered devices are saved.
- Comments can be given at the beginning of data.
- The unit for the obtaining interval is 10 μs. The intervals of obtaining data are saved. The time from the previous obtainment of data is saved in the line of stop trigger (STOP TRG).
- The data length varies depending on the types of specified devices.

		1st line	2nd line	3rd line	4th line	5th line	
		Date	Time	Obtaining interval	1	2	-
					Data name 1	Data name 2	-
	Comment part (Note 1)				Arbitrary comment	Arbitrary comment	-
					MOMENT	MOMENT	-
					Data format 1	Data format 2	-
					Unit 1	Unit 2	-
(Note 2)		date format	time format	0	Data 1	Data 2	-
		date format	time format	Interval	Data 1	Data 2	-
		date format	time format	Interval	Data 1	Data 2	-
		date format	time format	Interval	STOP TRG		
	(Note 3)	date format	time format	Interval	Data 1	Data 2	
		-	-	-	-	-	-
					(Note 4)		

(Note 1) The contents of comment part vary depending on the settings of configuration data.

(Note 2) The number of records varies depending on the settings of file determination condition. Max. 1,000,000 records.

(Note 3) The number of records after the stop trigger varies depending on the settings of configuration data.

(Note 4) The number of data varies depending on the setting of the number of devices. Max. 500 devices

1.3.4 File Name (For Trace Function)

- A file name to be saved is an desired file name (date_hour-minute-second data of the stop trigger).
- Enter the desired file name in the "Logging/Trace Settings" dialog box for each LOG number.

Example) When the file name is "Sample", and the time stamp of the stop trigger is 12:00:00 on Monday, April 01, 2013;

Sample(130401_120000_TRACE).csv

1.4 Data Format

- The format of the data to be output as logging data and saved in a file varies according to the type of devices.
- For the details of setting methods, refer to "2.4 Registration of Device Information".

■ Device type and output format

Bit data

Data type	Bit data
Data size	1 words
Number of characters saved	1
Data range	0 or 1

Decimal integer (unsigned)

Data type	Unsigned 16-bit integer	Unsigned 32-bit integer type
Data size	1 words	2 words
Number of characters saved (number of digits)	5 digits when a specified decimal point output position value is 0, 6 digits when it is 1-4, and 7 digits when it is 5	10 digits when a specified decimal point output position value is 0, 11 digits when it is 1-9, and 12 digits when it is 10
Data range	0 to 65536	0 to 4294967295
Remarks	Output in zero suppression format.	

Decimal integer (signed)

Data type	Signed 16-bit integer type	Signed 32-bit integer type
Data size	1 words	2 words
Number of characters saved (number of digits)	6 digits when a specified decimal point output position value is 0, 7 digits when it is 1-4, and 8 digits when it is 5	11 digits when a specified decimal point output position value is 0, 12 digits when it is 1-9, and 13 digits when it is 10
Data range	-32768 to 32767	-2147483648 to 2147483647
Remarks	Output in zero suppression format. A sign is output at the beginning and “+” is replaced with a space.	

Real number

Data type	Single-precision real number	Double-precision real number
Data size	2 words	4 words
Data type	Decimal or exponential form (auto)	
Number of characters saved	13	23
Data range	-1.175494E-38	-2.2250738585072014E-308

Hexadecimal integer (unsigned)

Data type	HEX (1-word)	HEX (2-word)	HEX (4-word)
Data size	1 words	2 words	4 words
Number of characters saved	4	8	16
Data range	0 to FFFF	0 to FFFF FFFF	0 to FFFF FFFF FFFF FFFF
Remarks	Output in zero suppression format.		

Character string

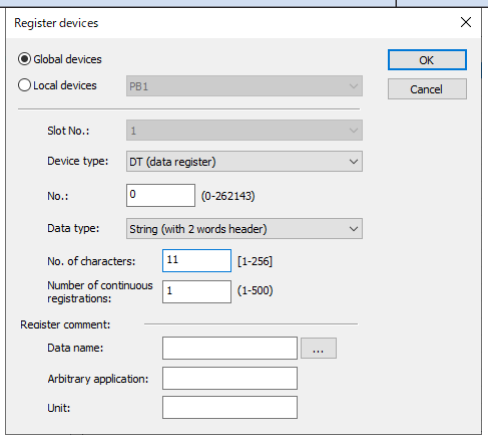
Data type	Character string
Data size (Character count)	Specified in a range of 1 to 20 bytes (1 to 20 characters)
Number of characters saved	Outputs the specified number of characters plus 2 characters (Note 1)
Output sample	“ABCD”

(Note 1) Double quotation marks " " are added before and after the character string when outputting the file.

Character string (with header)

Available with CPS4R*/CPS3R* firmware Ver. 4.54 or later and CPS2R firmware Ver. 1.54 or later.

Data type	Character string (with one-word header)	Character string (with two-word header)
Description	The character string stored in the **SSET** command can be specified.	The character string stored in the **ESSET** command can be specified.
Data size (Character count)	2 to 129 words (number of characters + 1 word) (Note 2)	3 to 130 words (number of characters + 2 words) (Note 2)
Number of characters saved	Outputs the number of characters stored by the **SSET/ESSET** command + 2 characters(Note 3), up to the specified number of characters (1 to 256).	
Output example	When specifying a character string stored in the next **ESSET** command  ● Device registration example	

Data type	Character string (with one-word header)	Character string (with two-word header)
	 ● Saved character string "ABC1230DEF"	

(Note 1) Up to 128 devices can be registered under a single LOG number, including the "character string (with one-word header)" and the "character string (with two-word header)".

(Note 2) This varies depending on the specified value of the number of characters (1 to 256). The number of words is rounded up if the specified value is odd.

(Note 3) Double quotation marks " " are added before and after the character string when outputting the file.

(Note 4) For detailed operation of the **SSET/ESSET** command, refer to the *FP7 CPU Unit Command Reference Manual*.

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2 Configuration

2.1 Definition of Buffer Memory

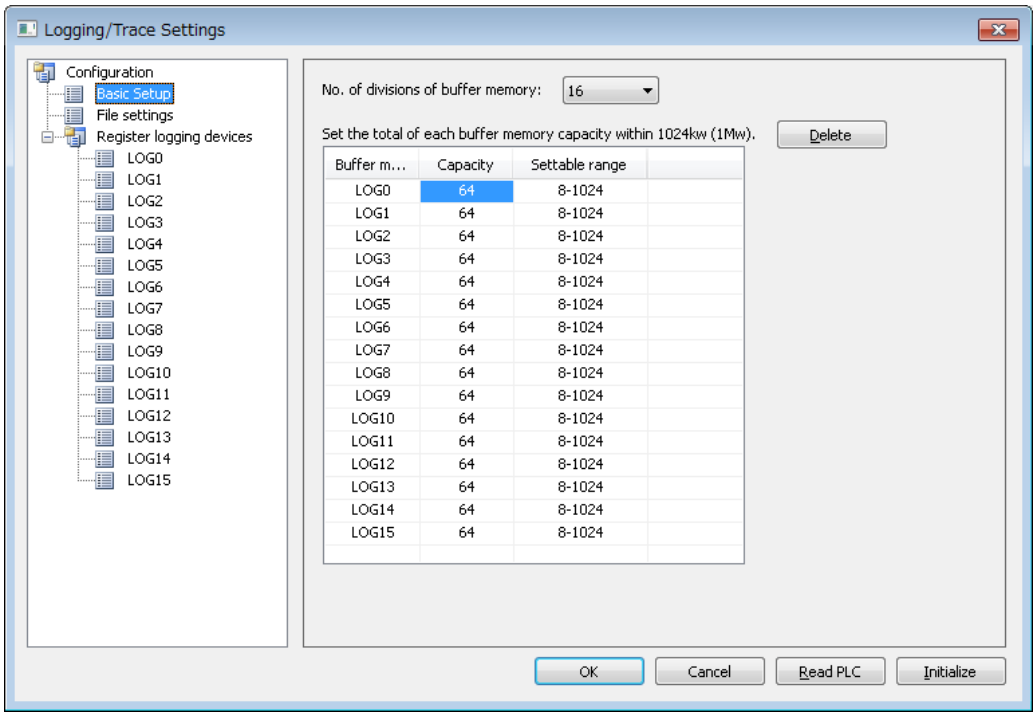
2.1.1 Setting method

■ Setting method

- Define the buffer memory of the CPU unit to be used for logging/trace.
- The buffer memory is set with the tool software FPWIN GR7.

1 2 Procedure

1. Select **Tool**>**Logging Settings** in the menu bar.
The "Logging/Trace Settings" dialog box appears.



2. Select a number of divisions of buffer memory from the range of 1 to 16.

3. Double-click on the field of Capacity, and input a desired capacity.
Capacity is allocated to each buffer memory.

Setting range

Item	Default	Setting range
No. of divisions of buffer memory	16	1-16
LOG0-LOG15 Buffer memory capacity (unit: k word)	64	8-1024

2.2 Logging Information Setting

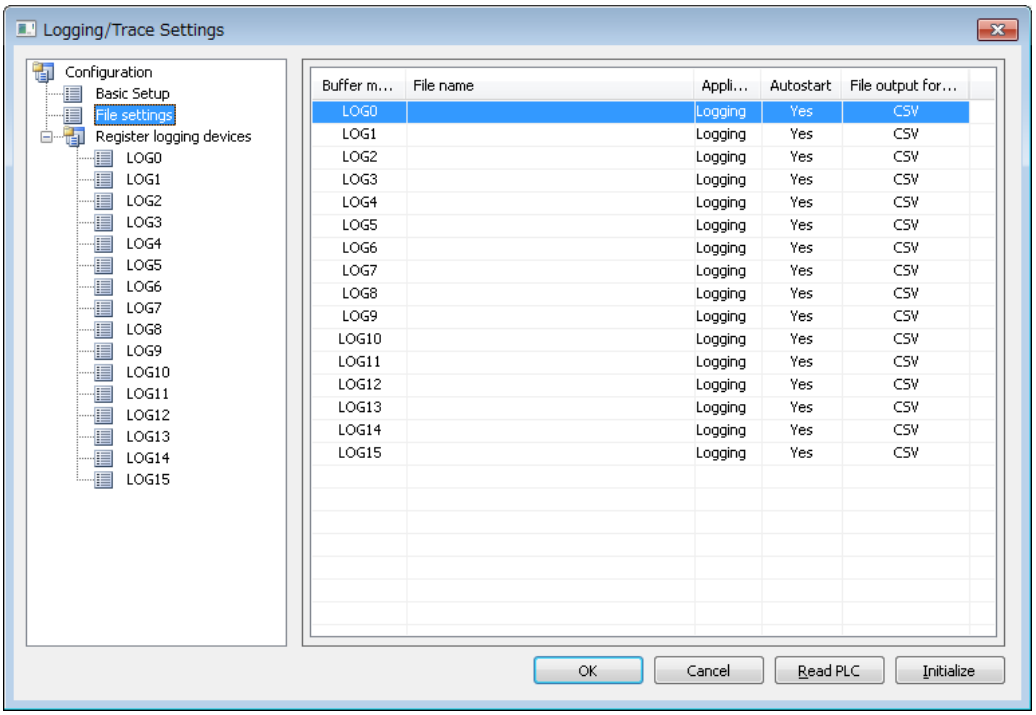
2.2.1 Confirmation and Settings of File Information

■ **Overview**

- After completing the definition of buffer memory, set the data to be logged and the format of saved files.
- File formats and logged device data are set for each buffer memory (LOG0 to LOG15).

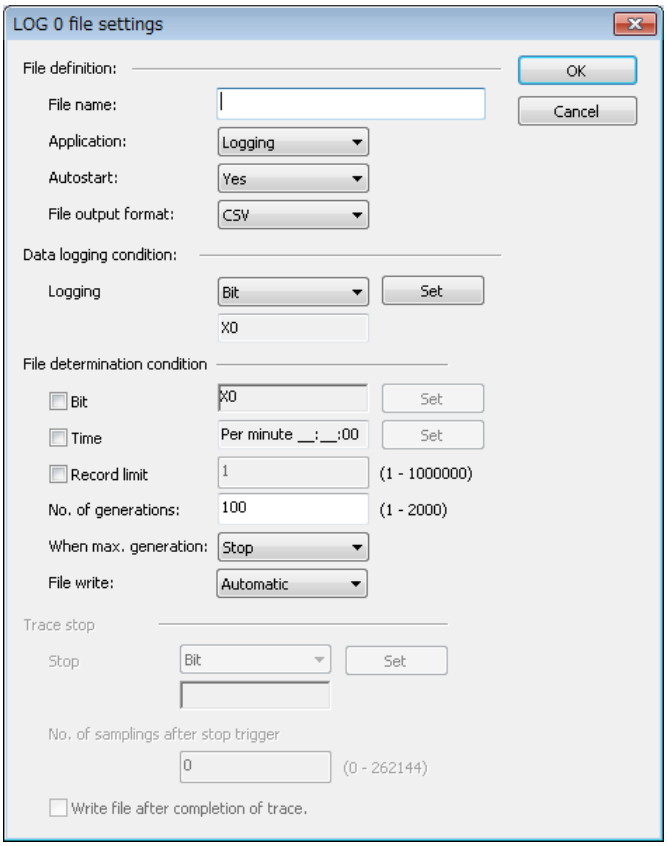
1 2 Procedure

1. Select **Tool>Logging/Trace Settings** in the menu bar.
   The "Logging/Trace Settings" dialog box appears.
2. Select "File settings" in the left pane.



3. Double-click a desired buffer memory in the right pane.
   The "LOG 0 - LOG 15 file settings" dialog box appears.

LOG file settings dialog box



4. Set information in each field of File definition, Data logging condition and File determination condition.
For the details of setting methods, refer to "2.2.2 LOG File Setting Items (For Logging)".

5. Click the [OK] button.
This returns to the "Logging/Trace Settings" dialog box.

Info.

- More than one file determination condition can be set for logging application.
- Even when active logging stops, a file is determined.
- For the bit device of file determination condition, select a bit which turns on for only one scan at the end of scan.

2.2.2 LOG File Setting Items (For Logging)

- The following items are set in the "LOG file settings" dialog box.

■ Setting items

File definition

Item	Setting range	Description
File	Within 32 one-byte characters	Enter a file name to be saved in a selected LOG number.
Application	Logging	Select Logging.
Autostart	Yes / No	Yes: Logging operation starts when changing to the RUN mode. No: Logging operation is started or stopped by the operation of programming tool or the LOGST instruction/LOGED instruction in user programs.
File output format	CSV	Select CSV.

Data logging condition

Item		Setting range	Description
Logging trigger			Select a condition to start logging data.
	Bit device	Specify an arbitrary bit device.	Select this for setting bit conditions as logging trigger. Press the [Set] button, and select a device type and a number. (Note 1)
	Cycle	Time data	Select this for setting time as logging trigger. Input a cycle for executing logging. 1 second, 2 seconds, 3 seconds, 4 seconds, 5 seconds, 6 seconds, 10 seconds, 15 seconds, 30 seconds, 1 minute, 2 minutes, 3 minutes, 4 minutes 5 minutes, 6 minutes, 10 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 12 hours, 24 hours (Note 2)
	Time	Clock data	Select this for setting clock time as logging trigger. Specify the time for starting logging. Per minute, Per hour, Every day, Every week, Every month, Every year
	Instruction	-	Trigger conditions occur by executing the SMPL instruction under arbitrary conditions in user programs.

(Note 1) For the bit device of file determination condition, select a bit which turns on for only one scan at the end of scan.

(Note 2) When the logging trigger is cycle and setting per second or per minute, adjust to occur a trigger at 0 min. 0 sec. of every hour. When the unit of cycle is time, adjust to occur a trigger at 00:00:00 of every day. For details, refer to "2.5 Operation When Setting Cycle for Logging Trigger".

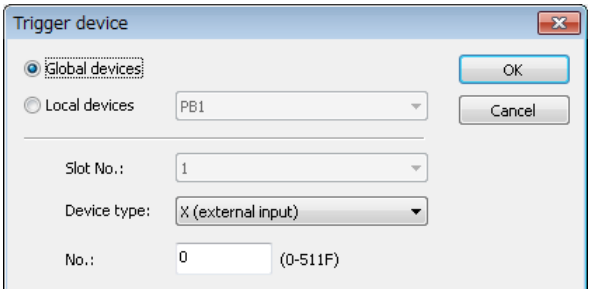
File determination condition

Item	Setting range	Description
Bit	Specify an arbitrary bit device.	Select this for setting bit conditions as file determination condition. Press the [Set] button, and select a device type and a number.
Time	Per minute, Per hour, Every day, Every week, Every month, Every year	Select this for setting a fixed time as file determination condition. Specify a time for determining files.
	Clock data	

Item	Setting range	Description
Record limit	1-1000000	Select this for setting the number of records as file determination condition. Specify the upper limit.
No. of generations	1-2000	Set the number of generations to be saved in one file.
When max. generation	Stop/Continue	Stop: Stops logging. Continue: Determines a file, and deletes the oldest file in the PLC. After that, creates a new file.
File write	Automatic	Automatic: Once a file is determined, executes writing it into an SD memory card.

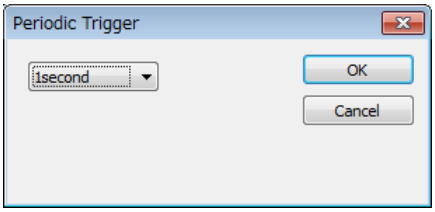
■ Logging trigger - Trigger device settings dialog box

- Set this for using bit device for the condition to start logging.



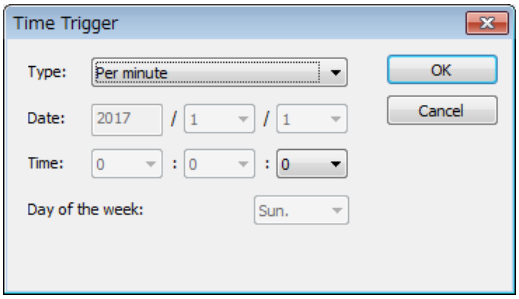
■ Logging trigger - Periodic Trigger settings dialog box

- Set this for performing logging periodically.



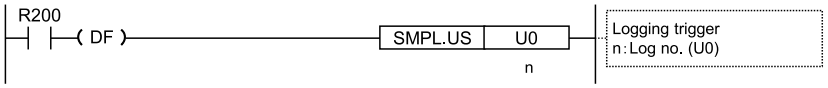
■ Logging trigger - Time trigger settings dialog box

- Set this for performing logging at fixed intervals.



■ Logging trigger - Trigger condition setting with SMPL instruction

- Specify a logging number with the dedicated instruction, and execute with an arbitrary condition.



2.3 Trace Information Setting

2.3.1 Confirmation and Settings of File Information

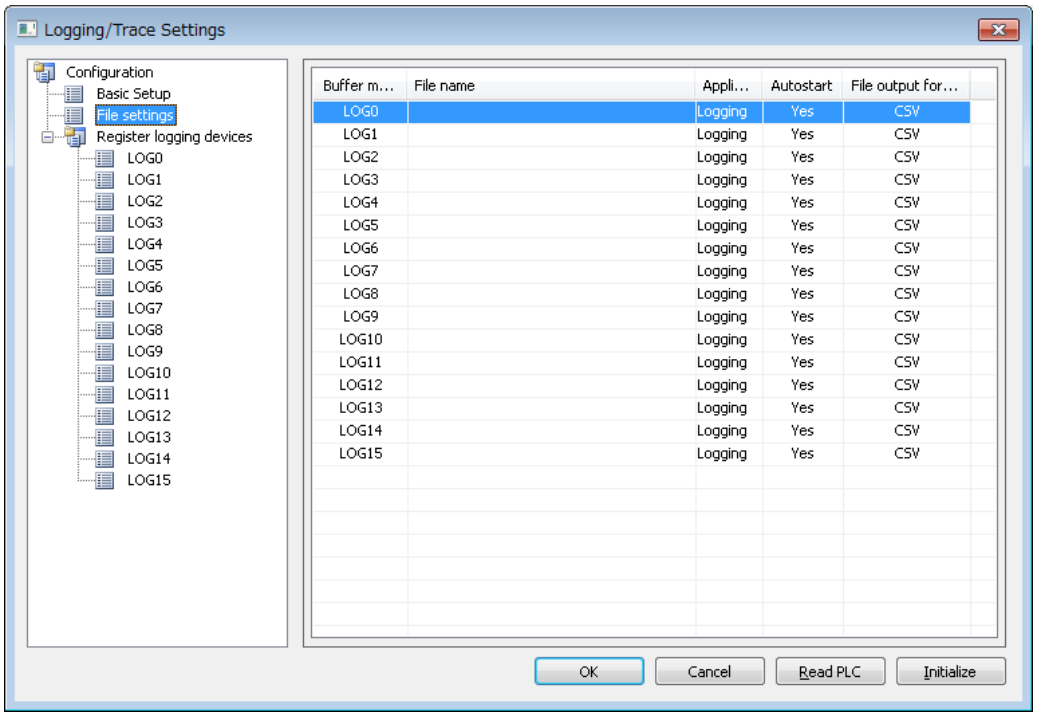
- The following items are set in the "LOG file settings" dialog box.

■ **Overview**

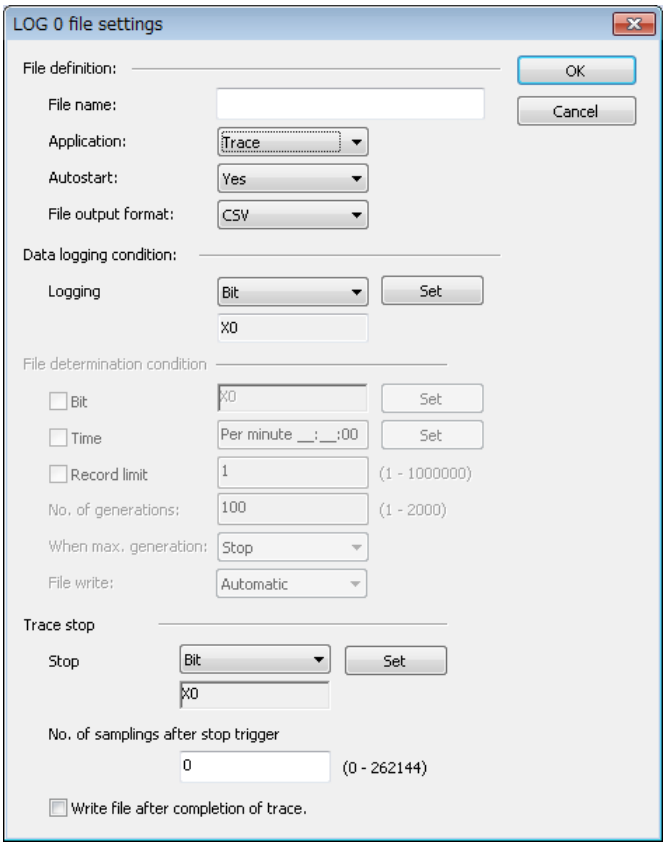
- After completing the definition of buffer memory, set the data to be traced and the format of saved files.
- File formats and traced device data are set for each buffer memory (LOG0 to LOG15).

Procedure

1. Select **Tool>Logging/Trace Settings** in the menu bar.
   The "Logging/Trace Settings" dialog box appears.
2. Select "File settings" in the left pane.



3. Double-click a desired buffer memory in the right pane.
   The "LOG 0 - LOG 15 file settings" dialog box appears.



4. Set information in each field of File definition, Data logging condition and Trace stop.
For the details of setting methods, refer to "2.3.2 LOG File Setting Items (For Trace)".

5. Click the [OK] button.
This returns to the "Logging/Trace Settings" dialog box.

Info.

- "No. of samplings after stop trigger" is available only when the stop trigger is set to Bit.
- Check the box of "Write file after completion of trace" to create a file in a SD memory card after the completion of trace.

2.3.2 LOG File Setting Items (For Trace)

- The following items are set in the "LOG file settings" dialog box.

■ Setting items

File definition

Item	Setting range	Description
File	Within 32 one-byte characters	Enter a file name to be saved in a selected LOG number.
Application	Trace	Select Trace.
Autostart	Yes / No	Yes: Trace operation starts when changing to the RUN mode. No: Trace operation is started by the operation of programming tool or the LOGST instruction in user programs.
File output format	CSV	Select CSV.

Data logging condition

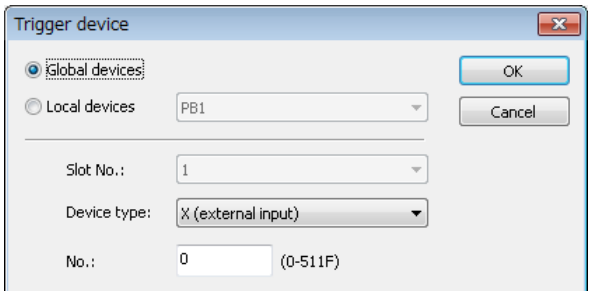
Item		Setting range	Description
Logging trigger		—	Select a condition to start logging data.
	Bit device	Specify an arbitrary bit device.	Select this for setting bit conditions as logging trigger. Press the [Set] button, and select a device type and a number.
	Cycle	Time data	Select this for setting time as logging trigger. Input a cycle for executing trace. 1 second, 2 seconds, 3 seconds, 4 seconds, 5 seconds, 6 seconds, 10 seconds, 15 seconds, 30 seconds, 1 minute, 2 minutes, 3 minutes, 4 minutes 5 minutes, 6 minutes, 10 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 12 hours, 24 hours
	Instruction	—	Trigger conditions occur by executing the SMPL instruction under arbitrary conditions in user programs.

Trace stop condition

Item	Setting range	Description
Stop trigger		Stops Trace.
	Bit	Press the [Set] button to specify a device type, a number and the number of samplings after the detection of stop trigger.
	Buffer full	Trace operation stops once the buffer is full.
No. of samplings after stop trigger detection	0-262144	Specify the number of samplings after the detection of stop trigger.
File write	Automatic	On completion of trace operation, executes writing data into an SD memory card.

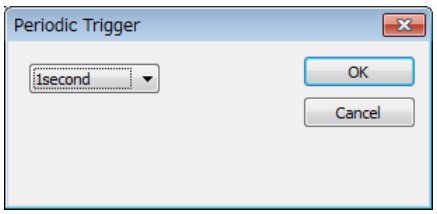
■ Logging trigger - Trigger device settings dialog box

- Set this to use bit device startup as the condition to start tracing.



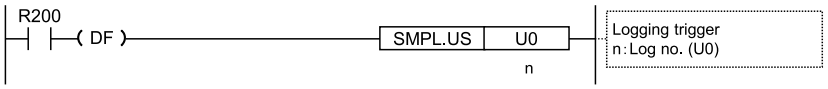
■ Logging trigger - Periodic Trigger settings dialog box

- Set this for performing trace periodically. When selecting Trace for Application, it can be specified in msec.



■ Logging trigger - Trigger condition setting with SMPL instruction

- Specify a logging number with the dedicated instruction, and execute with an arbitrary condition.



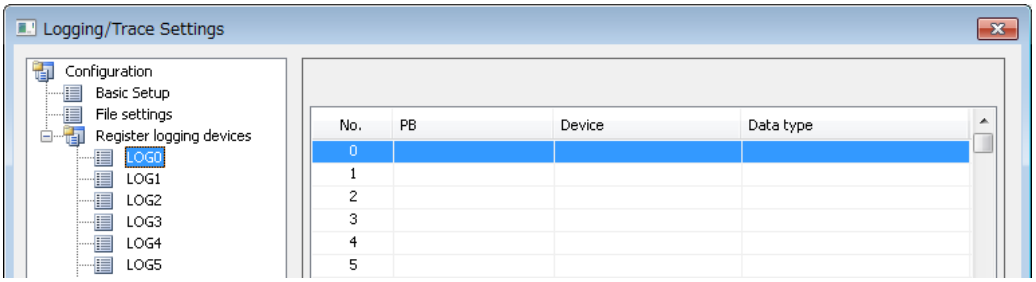
2.4 Registration of Device Information

■ Overview

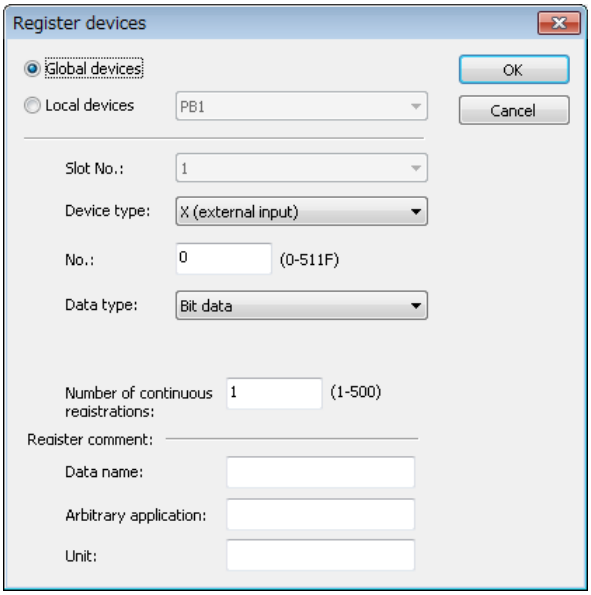
- Devices on which logging/trace is performed are registered in "Register logging devices".

Procedure

1. Select a desired LOG number for a logging device in the left pane.



2. Double-click on the line of a desired number in the right pane.
   The "Register devices" dialog box is displayed.



3. Enter a desired device number and comments, and press the [OK] button.
   The device on which logging is performed is registered in the LOG number.

4. Repeat the registration of devices for each LOG number.

Info.

- The number of devices that can be registered in one LOG number is up to 500 devices.
- Press the <INS> key to insert items in the device list, and press the <DEL> key to delete them.

Setting items ("Register devices" dialog box)

Data logging conditions of devices

Item	Setting range	Description
Device	Global devices Local devices	In case of local devices, specify a PB number.
Slot No.	1-16	Specify a slot number when specifying IN, OT, WI, WO or UM for the device type.
Device type	X, Y, R, L, T, C, P, SR, IN, OT, DT,n, LD,n	Specify a device type to be logged.
	WX, WY, WR, WL, WS, IN, OT, DT, LD, SD, WI, WO, UM, TS, TE, CS, CE, I	
No.	Device number	Specify a device number to be logged.
Data type	Bit data	Specify a data format to be output. The settable range varies according to the number of selected devices.
	16-bit unsigned integer 16-bit signed integer 32-bit unsigned integer 32-bit signed integer Single-precision real number Double-precision real number HEX (1 words) HEX (2 words) HEX (4 words) Character string Character string (with one-word header) Character string (with two-word header)	
Decimal point position	0-11	The position of decimal point can be set when an integer type is selected for Data type. The settable range varies according to the selected data type.
No. of continuous registrations	1 to max. 500	Input a number for specifying the same type of devices all at once. The settable range varies according to the number of selected devices.

Comment registration

Item	Setting range	Description
Data name	Within 16 characters	Output to the comment area when saving data in CSV format.
Arbitrary application	Within 8 characters	
Unit	Set with any combination of 8 half-width characters	

2.5 Operation When Setting Cycle for Logging Trigger

When setting Cycle for logging triggers, the time of the first trigger is adjusted to perform subsequent logging at good timing.

- When the unit of cycle is second or minute, adjust to occur a trigger at 0 min. 0 sec. of every hour.
- When the unit of cycle is time, adjust to occur a trigger at 00:00:00 of every day.

■ Example of timing of trigger occurrence (when the unit of cycle is second)

Time at which logging trigger condition is met	Set cycle	Time at which the 1st trigger occurs after adjustment	Time at which subsequent triggers occur
12:01:05	1 seconds	12:01:06	12:01:07, 12:01:08
12:01:05	2 seconds	12:01:06	12:01:08, 12:01:10
12:01:05	3 seconds	12:01:06	12:01:09, 12:01:12
12:01:05	4 seconds	12:01:08	12:01:12, 12:01:16
12:01:05	5 seconds	12:01:10	12:01:15, 12:01:20
12:01:05	10 seconds	12:01:10	12:01:20, 12:01:30
12:01:05	15 seconds	12:01:15	12:01:30, 12:01:45
12:01:05	30 seconds	12:01:30	12:02:00, 12:02:30

■ Example of timing of trigger occurrence (when the unit of cycle is minute)

Time at which logging trigger condition is met	Set cycle	Time at which the 1st trigger occurs after adjustment	Time at which subsequent triggers occur
12:01:00	1 minutes	12:02:00	12:03, 12:04, 12:05
12:03:00	2 minutes	12:04:00	12:04, 12:06, 12:08
12:05:00	3 minutes	12:06:00	12:09, 12:12, 12:15
12:05:00	4 minutes	12:08:00	12:12, 12:16, 12:20
12:05:00	5 minutes	12:10:00	12:15, 12:20, 12:25
12:01:00	10 minutes	12:10:00	12:20, 12:30, 12:40

Time at which logging trigger condition is met	Set cycle	Time at which the 1st trigger occurs after adjustment	Time at which subsequent triggers occur
12:59:00	15 minutes	13:00:00	13:15, 13:30, 13:45
12:10:00	30 minutes	12:30:00	13:00, 13:30, 14:00

■ Example of timing of trigger occurrence (when the unit of cycle is hour)

Time at which logging trigger condition is met	Set cycle	Time at which the 1st trigger occurs after adjustment	Time at which subsequent triggers occur
12:59:00	1 hours	13:00:00	14, 15, 16 o'clock ...
12:59:00	2 hours	14:00:00	16, 18, 20 o'clock ...
12:30:00	3 hours	15:00:00	18, 21, 24 o'clock ...
12:30:00	4 hours	16:00:00	20, 24, 28 o'clock ...
12:30:00	6 hours	18:00:00	24, 30, 36 o'clock ...
12:30:00	12 hours	24:00:00	36, 48, 60 o'clock ...
12:30:00	24 hours	24:00:00	48, 72, 96 o'clock ...

2.6 Downloading Setting Data to CPU Unit

2.6.1 Downloading to Execution Memory RAM/ROM1

■ Overview

- Parameters set in the **Logging/Trace Settings** menu are downloaded together with programs and configuration data as project data.

2.6.2 Copying from SD Memory Card to Execution Memory RAM/ROM1

■ Overview

- Logging/trace settings auto-run files are copied to the memory RAM/ROM1 for program execution via SD memory cards.

1 2 Procedure

1. Create an "AUTO" folder in an SD memory card.
2. Select **Tool**>**SD Memory Card**>**Create Logging/Trace Settings Auto-Run File** in the menu bar.
   The "Create auto-run file" dialog box appears.
3. Select "Create new settings" and "LOG numbers", and press the [Yes] button.
   The "Browse Folders" dialog box appears.
4. Select a desired folder, and press the [Yes] button.
   A logging/trace settings auto-run file "logtrc.fp7" is created.
5. Save the created file in the "AUTO" folder in the SD memory card.
6. Insert the SD memory card into the CPU unit.
7. Set the mode switch of the CPU unit to "COPY" (right-hand side) until the SD LED and COPY LED flashes.
   The logging/trace settings auto-run file "logtrc.fp7" is copied into the execution memory RAM/ROM1.

2.6.3 Saving to SD Memory Card (In SD Memory Card Operation)

■ Overview

- To perfrom SD memroy card operation, write a file for automatic start in an SD memory card. Create the setting file in the following procedure.

Procedure

1. Create an "AUTO" folder in an SD memory card.
2. Select **Tool**>**SD Memory Card**>**Create Logging/Trace Settings Auto-Run File** in the menu bar.
   The "Create auto-run file" dialog box appears.
3. Select "Create new settings" and LOG numbers, and press the [Yes] button.
   The "Browse Folders" dialog box appears.
4. Select a desired folder, and press the [Yes] button.
   A logging/trace settings auto-run file "logtrc.fp7" is created.
5. Save the created file in the "AUTO" folder in the SD memory card.
6. Insert the SD memory card, in which the logging/trace settings auto-run file "logtrc.fp7" is written together with the auto-run file "autoexec.fp7", into the CPU unit.
7. Set the mode switch to the SD side, and execute the operation.

Info.

- The logging/trace settings are saved in the non-volatile memory ROM1 in the CPU unit as a part of project data. However, they are not saved in the non-volatile memory ROM during the SD memory card operation.

2.7 Precautions on Downloading Setting Data

2.7.1 Storage of Setting Data

- Downloaded data is stored in the non-volatile memory in the PLC, and held until it is deleted or re-registered.

2.7.2 Project Data Consistency

- Use the logging/trace setting data created in the project to be executed. The logging/trace settings created in a different project from the executed project may not be activated. Be careful when downloading only the logging/trace settings or loading/copying them from an SD memory card.
- When there is an inconsistency in project data, the error code (81) is returned, and the data cannot be downloaded from a PC.
- When there is an inconsistency in loading data form an SD memory card, the self-diagnostic error (125) is reported.

2.7.3 Autostart Setting

- "2.2 Logging Information Setting"When "Autostart" has been selected in the "LOG file settings" dialog box, the logging/trace operation starts immediately after the mode is switched to the RUN mode.

3 Start-Stop and Monitor

3.1 Start and Stop of Logging/Trace Operation

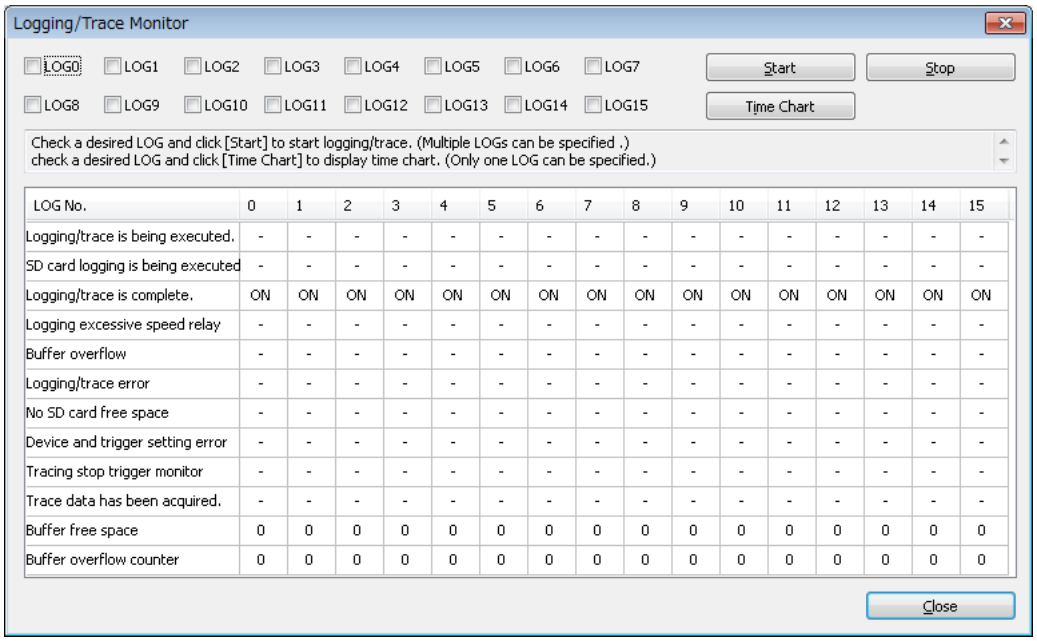
3.1.1 Start and Stop with Tool Software

■ Overview

- The logging/trace operation can be started and stopped with the tool software.

Procedure

1. Select **Tool**>**Logging/Trace Monitor** in the menu bar.
   The "Logging/Trace Monitor" dialog box appears.



LOG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Logging/trace is being executed.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SD card logging is being executed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace is complete.	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Logging excessive speed relay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer overflow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No SD card free space	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Device and trigger setting error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tracing stop trigger monitor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trace data has been acquired.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer free space	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buffer overflow counter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2. Check the box of a desired LOG number, and press the [Start] button.
   A confirmation message is displayed.

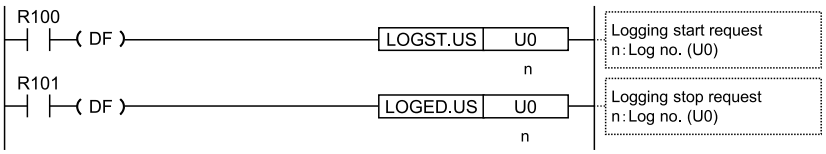
3. Press the [Yes] button.
   Starting the logging operation is requested by the operation specified in the "Logging/Trace Settings" dialog box. System relays relating to the execution of logging/trace can be monitored in the above dialog box. Once the operation is started normally, the "logging/trace active" and "SD card logging/trace active" flags turn on.

4. For stopping the logging/trace operation, check the box of a desired LOG number and press the [Stop] button.
   Stopping the logging/trace operation is requested. Once the logging/trace operation ends normally, the "logging/trace done" flag turns on.

3.1.2 Start and Stop with Instructions

■ Overview

- The logging/trace operation can be started and stopped with user programs for each logging/trace number.
- Specify a logging/trace number (0 to 15) with the dedicated instruction, and execute with arbitrary conditions.



- It takes a few milliseconds to a few seconds to start or stop the logging/trace operation.
- For stopping the logging/trace operation with instructions, request the stop after confirming that the active flags (SR100, SR101) turn on. If requesting to stop LOG n during start operation, the operation error flags (SR7, SR8) or the logging/trace error flag (SR105) turn on.
- For starting the logging/trace operation with instructions, request the start after confirming that the logging/trace done flag (SR102) turns on. If requesting to start LOG n during stop operation, the operation error flags (SR7, SR8) or the logging/trace error flag (SR105) turn on.
- There is no problem if a start request is made for LOG n during startup or in startup processing.
- There is no problem if a stop request is made for LOG n that stops or in stop processing.

3.1.3 Automatic Start by Setting

- When "Autostart" has been selected in the "LOG file settings" dialog box, the start request of the logging/trace operation is made immediately after the mode is switched to RUN mode.

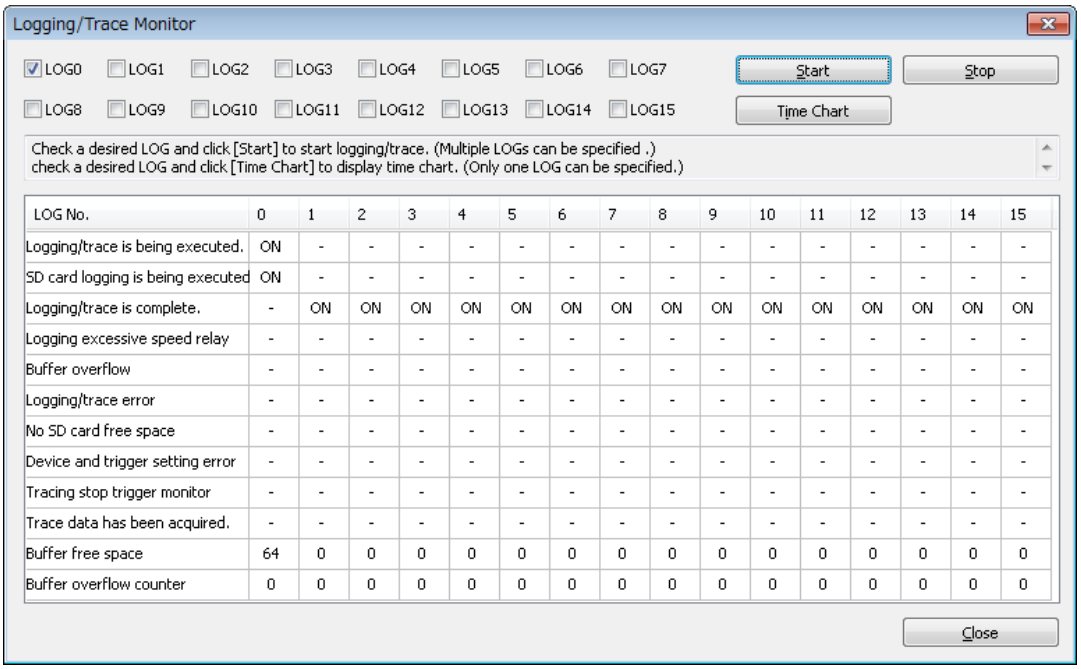
- The trace operation stops when the trace stop condition (bit device ON or buffer full) is met. If the operation is forcibly stopped with the tool software or instruction while the trace stop condition has not been satisfied, the trace operation is canceled and the data is not saved.

3.2 Operation Check Using Logging/Trace Monitor

3.2.1 Logging/Trace Monitor

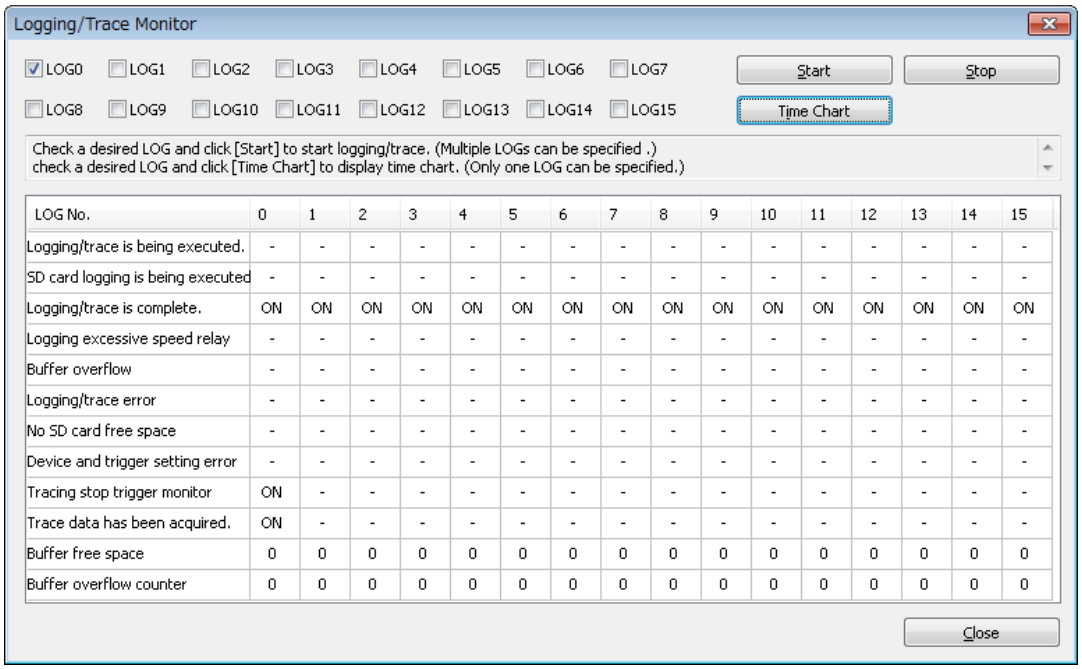
The progress situation can be confirmed with the logging/trace monitor.

■ **Example of monitoring in logging operation**



LOG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Logging/trace is being executed.	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SD card logging is being executed	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace is complete.	-	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Logging excessive speed relay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer overflow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No SD card free space	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Device and trigger setting error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tracing stop trigger monitor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trace data has been acquired.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer free space	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buffer overflow counter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

■ **Example of monitoring on the completion of trace operation**



LOG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Logging/trace is being executed.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SD card logging is being executed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace is complete.	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Logging excessive speed relay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer overflow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No SD card free space	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Device and trigger setting error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tracing stop trigger monitor	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trace data has been acquired.	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer free space	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buffer overflow counter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

3.2.2 System Relays Relating to Logging/Trace Operation

■ **System relays**

Device number	Name	Operation
SR100	Logging trace execution	● Turns on during the startup of logging/trace operation. Another system relay allocated to the same LOG number is reset during the start operation. ● The logging/trace function is activated by any of the following methods; 1: Autostart setting, 2: Start by instructions, 3: Start by the tool software. Storing data in the buffer is executed while this relay is on.
SR101	SD card logging execution	● Turns on when writing files into an SD memory card becomes enabled after turning on the logging/trace active relay and enabling logging in the buffer. This relay is always off when selecting Trace for the application.
SR102	Logging trace completed	● Turns on after the completion of the stop request for logging/trace or the completion of file writing at the time of automatic stop.
SR103	Logging over-speed relay	● Turns on when the buffer logging speed exceeds the writing speed to an SD memory card in logging operation. Turns on when the number of data previously stored and the number of data stored this time increase. ● Turns on at the timing of buffer logging, and turns off at the timing of buffer logging or the end of scan.
SR104	Buffer overflow	● Turns on when the buffer memory has been exhausted. The buffer overflow counters (SD120-SD135) are incremented (+1). At that time, new data cannot be stored. Also, writing data into the SD memory card does not stop.

Device number	Name	Operation
		● The buffer overflow relay turns off at the end of scan when a vacancy occurs in the buffer as writing data into an SD memory card progresses, and the buffer overflow counter is cleared to 0. Also, after the occurrence of buffer vacancy, data logging is executed once the logging trigger condition is met. ● This relay is always on when buffer full occurs as the stop condition when selecting Trace for the application.
SR105	Logging/trace error	● Turns on when an error is detected during the logging/trace operation and stops logging/trace.
SR106	No SD card free space	● Turns on when an SD memory card is running out of free space during the logging/trace operation and stops logging/trace.
SR107	Device/trigger setting error	● Turns on when an error is detected in set values during the startup operation. The logging/trace error relay SR105 also turns on. At that time, the active relay does not turn on because the logging/trace function cannot be activated.
SR108	Tracing stop trigger monitor	● Monitors a registered trace stop trigger when executing tracing. Turns on when conditions are met. This relay is always off when selecting Logging for the application.
SR109	Trace data acquisition completed	● Turns on after logging data for a specified number of times after detecting the trace stop trigger during the execution of trace. This relay is always off when selecting Logging for the application.

(Note 1) The above device numbers are those for LOG0. System relay numbers vary depending on LOG numbers as shown in the table below.

LOG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SR No.	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169	170 to 179	180 to 189	190 to 199	200 to 209	210 to 219	220 to 229	230 to 239	240 to 249	250 to 259

3.2.3 System Data Registers Relating to Logging/Trace Operation

■ System data registers (SD)

Device number	Name	Operation
SD100	Buffer free space	● Stores free space of buffer memory during logging. This is always zero when selecting Trace for the application.
SD120	Buffer overflow counter	● Increments the value (+1) when the buffer overflow occurs. This is always zero when selecting Trace for the application.

(Note 1) The above device numbers are those for LOG0. System data register numbers vary depending on LOG numbers as shown in the table below.

LOG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SD No.	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135

3.2.4 Checking Logging Speed (When Selecting Logging For Application)

- When the logging speed to the buffer memory of the CPU unit is faster than the writing speed to an SD memory card, the logging over-speed relay turns on. The logging over-speed relay turns on at the timing of logging trigger, and turns off if the speed does not exceed at the end of scan.
- If overspeed occurs frequently, the buffer memory will be full and data cannot be accumulated.
- Once the buffer memory is full, the buffer overflow flag turns on, and the buffer overflow counter is incremented (+1).
- If the buffer overflow occurs continuously, revise the logging conditions to decrease the logging speed.
- To know how much logging data was lost at the time of buffer overflow, register the buffer overflow counter as logging data.
- Even if the buffer overflow occurs, recording data into an SD memory card goes on, and logging continues when free space becomes available in the buffer.
- The free space of buffer memory can be checked with the system data registers SD100 to SD115.
- The system relays (SR104, SR114, SR124 ...) give a warning when the buffer memory is full.

3.3 Operation Check Using System Monitor

3.3.1 Monitoring Method of System Monitor Area (SM)

- By using the system monitor function, the number of written records in a current file, the number of files stored in a folder (number of generations) and the oldest clock data of files stored in the folder can be monitored.
- The system monitor area can be monitored with the tool software FPWIN GR7.

Procedure

1. Select **Online**>**System Monitor** in the menu bar.
   The "System monitor" dialog box is displayed.
2. Press the [Refresh] button.
   The latest information is read.

3.3.2 List of System Monitor Area (SM)

■ SM211-SM290: Logging/Trace information

SM No.	Name		Description
211-212	For LOG0	No. of written records of current file	Stores the number of written records in a current file as 32-bit data. One is added every time a file is written, and it is reset to zero when a new file is created.
213-214	For LOG1		
215-216	For LOG2		
217-218	For LOG3		
219-220	For LOG4		
221-222	For LOG5		
223-224	For LOG6		
225-226	For LOG7		
227-228	For LOG8		
229-230	For LOG9		
231-222	For LOG10		
233-224	For LOG11		
235-226	For LOG12		
237-228	For LOG13		
239-240	For LOG14		
241-242	For LOG15		
243	For LOG0	No of files (generations) stored in folder	Stores the number of files stored in a folder (number of generations) as 16-bit data.
244	For LOG1		
245	For LOG2		

SM No.	Name		Description
246	For LOG3		
247	For LOG4		
248	For LOG5		
249	For LOG6		
250	For LOG7		
251	For LOG8		
252	For LOG9		
253	For LOG10		
254	For LOG11		
255	For LOG12		
256	For LOG13		
257	For LOG14		
258	For LOG15		
259-260	For LOG0	Oldest clock data of file stored in folder	Stores the oldest clock data of a file stored in a folder as 32-bit data by seconds.
261-262	For LOG1		
263-264	For LOG2		
265-266	For LOG3		
267-268	For LOG4		
269-270	For LOG5		
271-272	For LOG6		
273-274	For LOG7		
275-276	For LOG8		
277-278	For LOG9		
279-280	For LOG10		
281-282	For LOG11		
283-284	For LOG12		
285-286	For LOG13		
287-288	For LOG14		
289-290	For LOG15		

(MEMO)

4 Logging Operation

4.1 Flow of logging operation

4.1.1 Operation Flow

■ Triggers of logging operation and file contents

STEP	Operation	Trigger of operation	File in LOG folder	File contents
(1)	Start	Tool software operation Instruction Auto start by setting		
(2)	Logging	Bit device ON Cycle Instruction Time	“Sample(------current------).csv”	Comment file part First record
		Bit device ON Cycle Instruction Time	“Sample(------current------).csv”	Comment file part First record Second record
		Logging operation continues until the file determination condition is met.		
(3)	File determination	Bit device ON Time Record limit	“Sample(130401_120000).csv”	Comment file part First record Second record .....
			“Sample(------current------).csv”	Comment file part
(2)	Logging	Bit device ON Cycle Instruction Time	“Sample(------current------).csv”	Comment file part First record
		Logging operation continues until the file determination condition is met.		
(3)	File determination	Bit device ON Time Record limit	“Sample(130401_120000).csv” “Sample(130401_130000).csv”	Comment file part First record Second record .....
			“Sample(------current------).csv”	Comment file part
(2)	Logging			
Logging, file determination, and logging operation continues until the stop condition is met.				
(4)	Stop	Tool software operation Instruction Max. generation	“Sample(130401_120000).csv” “Sample(130401_130000).csv”	Comment file part First record Second record .....
			“Sample(130401_140000).csv”	Comment file part ..... (Records up to stop) .....

■ Flow of logging operation

Step (1) Startup of logging operation

- The logging operation is started by any of the following methods; Tool software operation, Instruction in a user program, and Autostart setting.

Step (2): Data logging

- After the startup of logging operation, logging data is executed with a specified condition once the specified trigger condition (bit device ON, cycle, or time) is met.
- A LOG folder is created in an SD memory card for the LOG number that a file name is set.
- A file "specified file name (------current------).csv" for saving logging data is created in the LOG folder.
- Logged data is stored in the logging buffer memory (RAM) in the CPU unit once, and they are automatically written into files in an SD memory card by the CPU unit. It is not necessary to write them using user programs.
- After that, the CPU unit continues saving data into the same file until the file determination condition is met.

Step (3): Determination of file

- A file is determined when the specified file determination condition (bit device ON, time, record limit) is met.
- The file determination is to rename the file "specified file name (------current------).csv" created in step (2) after writing all the data stored in the buffer into the SD memory card.
- The time data of the oldest record is added to the specified file name.

  Example) When the file name is "Sample", and the oldest record was recorded at 12:00 on April 1, 2013, it is saved as "specified file name (130401_120000).csv".
- Once the file is determined, a new file "specified file name (------current------).csv" for saving the next logged data is created. The logging operation restarts when the logging trigger condition is met.

Step (4): Stop of logging operation

- The logging operation is stopped by either of instruction in user programs or tool software operation.
- Once the logging operation stop is requested, all the data in the buffer memory in the CPU unit is written into the file in the SD memory card and determined. When the logging operation is conitnuing, the records logged so far are saved and the file is determined even if the specified file determination condition has not been satisfied.
- The time data of the oldest record is added to the specified file name.

Info.

- When the logging trigger setting is "Bit, Cycle or Time", the buffer memory data is stored at the end of the scan time. In the case of Instruction, it is stored when the SMPL instruction is executed.

4.2 Operation When Logging is Selected for Application

4.2.1 Operation When Logging Operation Starts

The following operations are executed when the start operation is requested.

- Registered data is confirmed.
- Once the logging/trace becomes executable, the logging/trace active flags (SR100, SR110, SR122 ...) turn on. When the logging trigger condition is met under this condition, the logging/trace operation starts.
- All other flags than the logging/trace active flag for LOG n are cleared during the start request operation.
- Once writing data into an SD memory card becomes enabled after the logging/trace active flags (SR100, SR110, SR122 ...) turned on, the SD card logging active flags (SR101, SR111, SR112 ...) turn on.
- When an SD memory card that can be normally read and written is not inserted, or the card cover is open, an operation error occurs.

4.2.2 Operation When Logging Operation Stops

■ Operation when switching from RUN mode to PROG. mode

- All logging operations stop.
- All information saved in the buffer memory of the CPU unit is written into a file, and the file is determined.

4.2.3 Operation when power supply turns off

■ Operation when power supply turns off

- When activating logging/trace, the power off flag during file access SR3F turns on.
- The data stored in the logging buffer of the CPU unit is discarded.

- In case of the middle of file writing, written data or files may be damaged, or the SD memory itself may not be read.

4.2.4 Operation When the Card Cover of CPU Unit Opens

The following operations are performed when the card cover is open during the logging operation.

■ Operation of system relays

- The logging/trace active flag and the SD card logging active flag stay on while the card cover is open.

- Although the logging/trace active flag turns off once the logging stop condition is met, the SD card logging active flag stays on.
- When the card cover is closed, the SD card logging active flag also turns off.
- The logging operation into the logging buffer (RAM) continues even when no SD memory card is inserted. Once the logging buffer (RAM) becomes full, the buffer overflow flag turns on.

■ File status in SD memory card

- The file "specified file name (------current------).csv" in which logging data was saved before opening the cover is held in the SD memory card.
- Once the card cover is closed, the saving into files starts again.

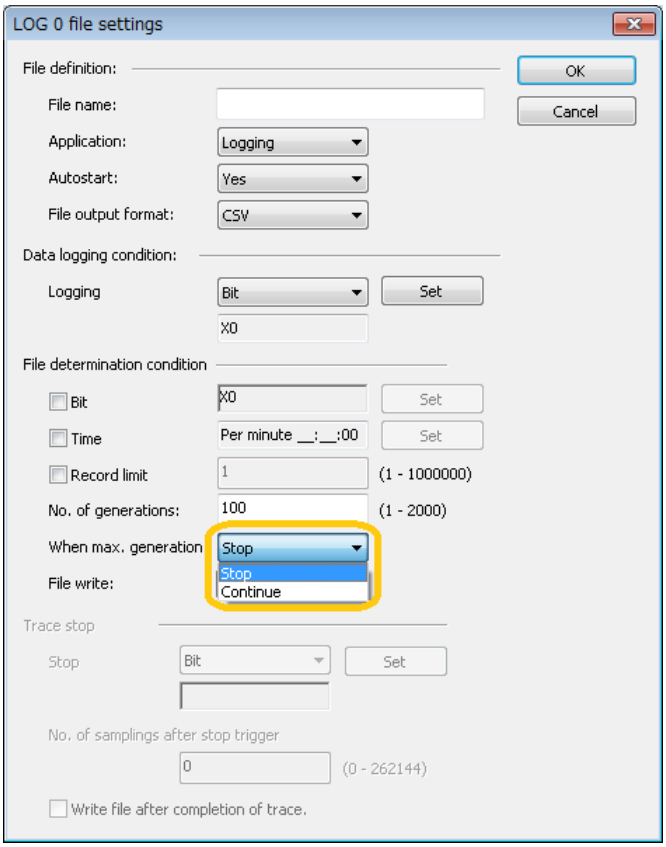
4.2.5 Operation when the number of determination files reaches the maximum number of generations

■ Operation when the number of determination files reaches the maximum number of generations

- The operation when the number of determination files reaches the maximum number of generations varies depending on the log file settings.

File determination condition Setting of "When max. generation"	Operation
Stop	1. Determines a current file "specified file name (------current------).csv", gives the time data of the oldest record, and renames it. 2. Creates a new current file "specified file name (------current------).csv".
Continue	1. Determines a current file "specified file name (------current------).csv", gives the time data of the oldest record, and renames it. 2. Deletes the oldest file. After deleting it, updates the data of the oldest file displayed in the system monitor area (SM). 3. Creates a new current file "specified file name (------current------).csv".

"Logging File Settings" dialog box



4.3 System Management Information Relating to Logging Function

4.3.1 System Management Information and Operation

- The PLC manages files as follows. So, the PLC performs operations based on the stored management information even if an SD memory card is removed during logging, and another SD memory card in different conditions from the conditions managed in the PLC is inserted.
- Writing data into an undetermined file "specified file name (------current------).csv" is executed every time specified records are stored. The number of written records can be confirmed in the system monitor area (SM212 to SM242).
- The number of generations of determined files is managed during the logging operation. The number of determined files can be confirmed in the system monitor area (SM243 to SM258).
- The determined date is managed in the internal memory at the time of file determination, and the time data of the oldest file is stored in the system monitor area (SM259 to SM290).

4.3.2 Clearing Management Information

■ Clearing management information

Log file management information of the PLC is cleared in the following cases.

- When LOG n settings are deleted or all log settings are initialized from the tool software FPWIN GR7
- When a buffer allocation different from stored data is downloaded, all log settings are initialized.
- When a LOGn definition different from stored data is downloaded, only the different LOG n is cleared.

Info.

- If the above clearing operation is performed, log file management information is initialized, and files remained in the SD memory card are regarded as non-existent. Delete files beforehand, and use it.
- When restarting logging with the same condition without changing setting information, the operation continues with the previous system information, the number of generations (SM243 to SM258) and the oldest time data of the file (SM259 to SM290). After restarting logging, the number of generations is added to the data before the restart, and the existing value is held for the oldest time data.

(MEMO)

5 Trace Operation and Time Chart

5.1 Flow of trace operation

5.1.1 Flow of trace operation

■ Triggers of trace operation and file contents

STEP	Operation	Trigger of operation	File in LOG folder	File contents
(1)	Start	Tool software operation Instruction Auto start by setting		
(2)	Logging	Bit device ON Cycle Instruction		
		Bit device ON Cycle Instruction		
		Logging operation continues until the trace stop condition is met.		
(3)	Trace stop	When buffer full is set for stop trigger	“Sample(130401_120000_TRACE).csv”	Comment file part First record Second record ..... STOP TRG
	Trace stop	When bit device ON is set for stop trigger	“Sample(------current------).csv”	Comment file part First record Second record ..... STOP TRG
		Logging operation continues for the number of smplings after the detection of stop trigger.		
		Completion of logging for the number of samplings	“Sample(130401_120030_TRACE).csv”	Comment file part First record Second record ..... STOP TRG ..... XXX records

■ Flow of trace operation

Step (1) Startup of trace operation

- The trace operation is started by any of the following methods: Tool software operation, Instruction in a user program, and Autostart setting.

Step (2): Data logging

- After the startup of the trace operation, tracing data is executed with a specified condition when the specified trigger condition (bit device ON, cycle, or instruction) is met.
- Traced data is stored in the logging buffer memory (RAM) in the CPU unit.

- After that, the trace operation continues until the trace stop condition is met.

Step (3): Stop of trace operation

- The trace operation stops when either condition is met, bit or buffer full.
- When the trace stop condition is bit, the trace operation stops after the logging performed for the specified number of samplings after the condition was met.
- When the trace stop condition is buffer full, the trace operation stops immediately.
- When the trace operation is complete successfully, the trace data acquisition done flags (SR109, SR119 ...) turn on. At that time, a time chart can be displayed on the programming tool FPWIN GR7 by reading the logged data.
- When "Write file after completion of trace" is set, all the data in the buffer memory of the CPU unit is written into the file in the SD memory card and determined. The time stamp information is the time data at the time of the occurence of stop trigger.

Info.

- In the data logging process into the buffer memory, when Bit or Cycle has been specified, the bit or the cycle is checked at the end of scan, and data is stored in the buffer memory when the condition is met. When Instruction has been set, data is stored into the buffer memory when the instruction is executed.
- If the trace operation is stopped by the tool software operation or the LOGED instruction while the trace stop condition has not been met, logged data is not saved in either the buffer memory (RAM) or an SD memory card.

5.2 Operation When Trace is Selected for Application

5.2.1 Operation When Trace Operation Starts

The following operations are executed when the start operation is requested.

- Registered data is confirmed.
- The logging/trace active flags (SR100, SR110, SR122 ...) turn on.
- All other flags than the logging/trace active flag for LOG n are cleared during the start request operation.
- Once writing data into an SD memory card becomes enabled after the logging/trace active flags (SR100, SR110, SR122 ...) turned on, the SD card logging active flags (SR101, SR111, SR112 ...) turn on.
- When the box of "Write file after completion of trace" has been checked in the "LOG file settings" dialog box, an operation error occurs if no SD memory card that is normally readable and writable is inserted, or the card cover is open.

5.2.2 Operation When Logging Operation Stops

■ Operation when switching from RUN mode to PROG. mode

- All logging operations stop.
- The data stored in the buffer memory of the CPU unit is discarded.

5.2.3 Operation when power supply turns off

■ Operation when power supply turns off

- When activating logging/trace, the power off flag during file access SR3F turns on.
- The data stored in the logging buffer (RAM) of the CPU unit is discarded.

- In case of the middle of file writing into an SD memory card, written data or files may be damaged, or the SD memory itself may not be read.

5.2.4 Operation When the Card Cover of CPU Unit Opens

The following operations are performed when the card cover is open during the trace operation.

■ Operation of system relays

- The logging/trace active flag and the SD card logging active flag stay on while the card cover is open.
- Although the logging/trace active flag turns off once the trace stop condition is met, the SD card logging active flag stays on.
- When the card cover is closed, the SD card logging active flag also turns off.

- The logging operation into the logging buffer (RAM) continues even when no SD memory card is inserted. Once the logging buffer (RAM) becomes full, the buffer overflow flag turns on.

■ File status in SD memory card

- If data cannot be written into an SD memory card after the completion of trace, the logging/trace error flag turns on, and the operation ends.

5.3 Trace Monitor (Time Chart)

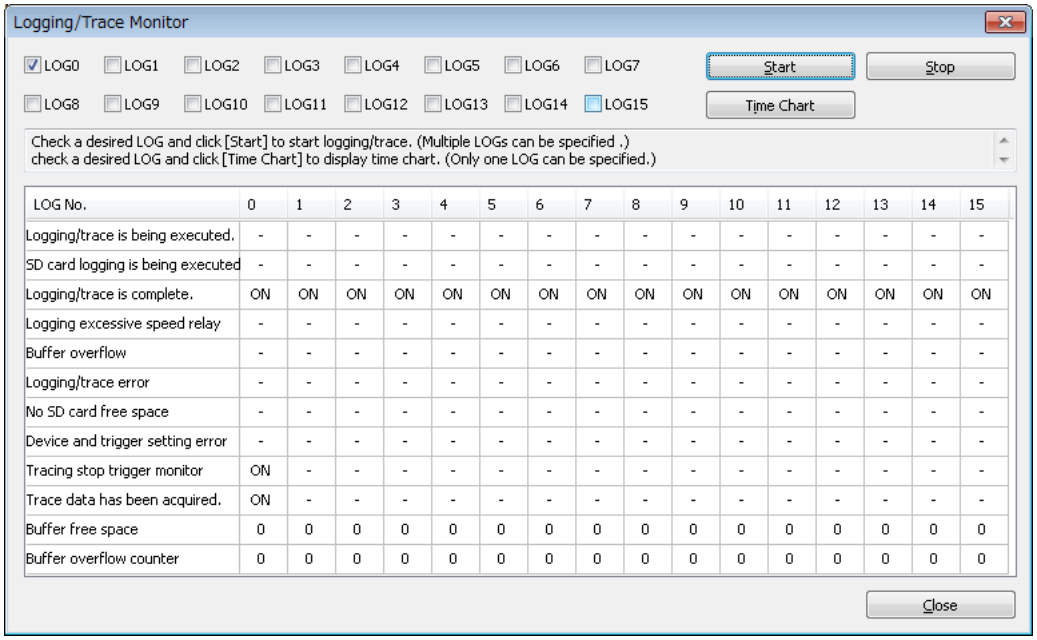
5.3.1 Display Method of Time Chart

■ Overview

- Time chart is a function to read the data stored in the PLC using the trace function and display them in graph form.
- By setting the trace function, the change in contacts/data can be checked by one scan.

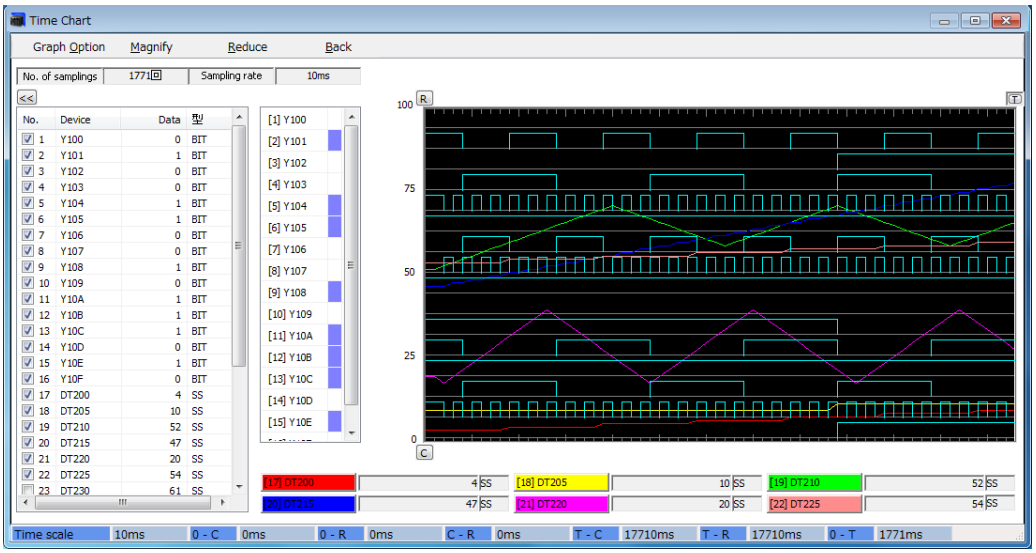
1 2 Procedure

1. Select **Tool**>**Logging/Trace Monitor** in the menu bar.
   The "Logging/Trace Monitor" dialog box appears.



LOG No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Logging/trace is being executed.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SD card logging is being executed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace is complete.	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Logging excessive speed relay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer overflow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logging/trace error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No SD card free space	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Device and trigger setting error	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tracing stop trigger monitor	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trace data has been acquired.	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffer free space	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buffer overflow counter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2. Check the box of one LOG number, and press the [Time Chart] button.
   The trace data is read from the PLC, and the time chart is displayed.



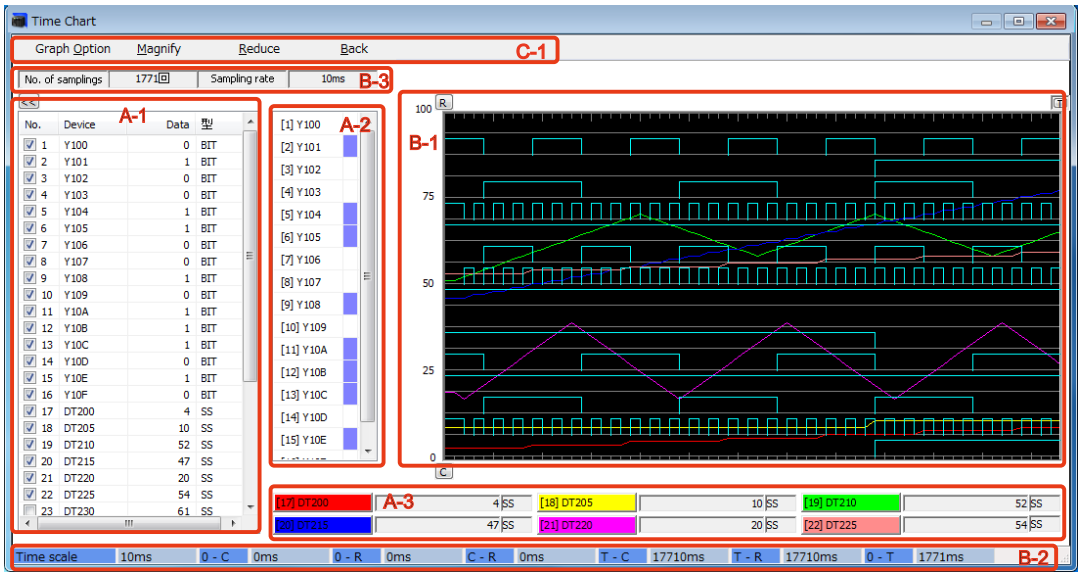
Info.

- The following conditions are required to display a time chart.
  - Only one LOG number is selected.
  - The target LOG is set to "Trace".
  - The "logging/trace done flag" of the target LOG is "ON".

    When the stop trigger is detected, the "Trace stop trigger monitor flag" and "Trace data acquisition done flag" turn on.
- The time chart cannot be activated during executing the logging/trace operation.
- The indication of the "Buffer free space" of the LOG that has been set to Trace is always zero.

5.3.2 Explanation of Time Chart Monitor

The time chart window is composed of the following parts.

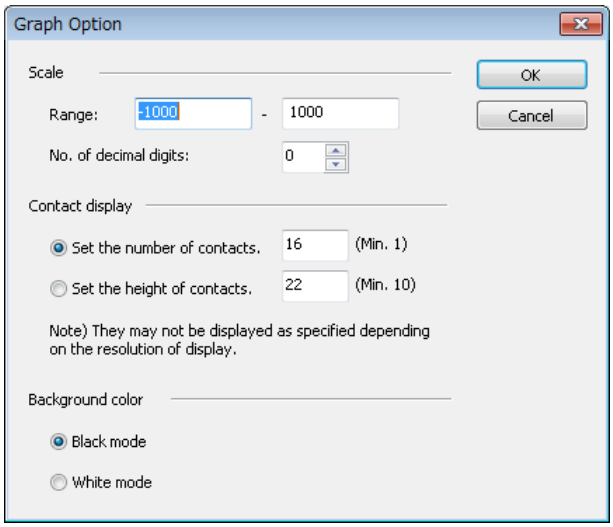


■ Names and functions of parts

Mark	Name	Function
A-1	Trace data display area (All devices)	Displays the devices registered in the target LOG for the time chart display. ● Select the device to be displayed in graphs from this list. ● Corresponding data is displayed at the position of the cursor [C] or [R] in the graph display area (B-1).
A-2	Trace data display area (Contact devices)	● Contact data selected in A-1 is displayed in this area. ● When a lot of devices are registered, a scroll bar is displayed.
A-3	Trace data display area (Data devices)	● Data other than the contact data selected in A-1 is displayed in this area. ● Up to six data can be displayed in this area. ● Pressing the button which displays a device name can change the line color.
B-1	Graph display area	● Trace data is displayed as line graphs in chronological order. (The on/off state of contacts is displayed with a rectangular waveform.) ● The vertical line with a [T] mark is displayed at the point where a trigger occurs.
B-2	Time display area	● Displays the time between arbitrary two points or the time between the point where a trigger occurs and an arbitrary point using the two cursors [C] and [R] in B-1. However, time is not displayed when the selected trigger type is other than "Constant period".
B-3	Trace information display area	● Displays the number of samplings and sampling rate. ● The sampling rate is displayed by time unit when the logging trigger is "Constant period". ● When the logging trigger is "Bit" or "Instruction", this area is not available. (A hyphen is displayed.)
C-1	Graph Option button (O)	
	Magnify (M)	● Enlarges graphs by pressing the button. (The values of the time scale become small.)

Mark	Name	Function
		Desired parts can be confirmed closely.
	Reduce (R)	● Reduces graphs by pressing the button. (The values of the time scale become large.) This is used to see the whole area.
	Back (B)	● Closes the time chart and returns to the logging/trace monitor screen by pressing this button.

■ Graph Option



Field name		Function
Scale	Range	● Specify the display range of the vertical axis of a graph.
	No. of decimal digits	● Specify the number of decimal places for the vertical axis.
Contact display	Set the number of contacts.	● Fix the number of contacts to be displayed in graphs. The height of displayed contacts varies depending on the resolution of the display.
	Set the height of contacts.	● Fix the height of the display of contacts. (Unit is dot.) The higher the display resolution becomes, the more contacts can be displayed.
Background color		● Select the background color of the graph.

Info.

- The time display area is available only when the logging trigger is "Constant period". This area is not displayed when the logging trigger is "Bit" or "Instruction".

5.3.3 Restrictions on Time Chart Monitor

The restrictions on the time chart are as follows.

- Although a maximum of 16 patterns of trace can be executed (in the case all LOGs are operated for trace application), only one LOG can be displayed on the time chart.
- A maximum of 500 devices can be registered for one LOG, however, there are restrictions on devices to be graphically displayed on the time chart.
  - For contacts: Depends on the resolution of a used display
  - For data: Up to 6 devices
- Time cannot be measured with the cursors (C, R) on graphs when the LOG displayed as a time chart is the data that was traced with logging triggers other than constant period.

6 Troubleshooting

6.1 Operations When Errors Occur

6.1.1 Operation when power supply turns off

■ Operation when power supply turns off

- When activating logging/trace, the power off flag during file access SR3F turns on.
- The data stored in the buffer of the CPU unit is discarded.

- In case of the middle of file writing, written data or files may be damaged, or the SD memory itself may not be read.

6.1.2 Operation When Errors Occur (Only When Selecting Logging for Application)

■ Operations when determined files with the same time data are created

Status	Operation
When multiple data are logged in one second	Create an error file with the following file name, and exclude them from the target for generation management. File name (Date_Time_ERR).csv If the same file is created, discard the current file and continue the logging operation.
When time data was turned back	If detecting that time is turned back from the previous record in logging operation, it is regarded as a file determination trigger, and a file with the following file name is created and excluded from the target for generation management. File name (Date_Time_TIM).csv The logging operation continues.

■ Operations when reactivating the power supply

Status	Operation
When a current file with 0 record exists	Newly create a current file based on the file definition.
When a current file with N records exists	Newly create a current file based on the file definition after determining the current file. The determined file name is "file name (date_time_POW).csv, and it is excluded from the target for generation management.

■ Operation when log data is zero and file determination is requested

The request for file determination is ignored.

■ Operation when SMPL instructions in main program and interrupt program are executed simultaneously

The SMPL command in the interrupt program is not executed.

6.1.3 Operations When Inserting/Removing SD Memory Card During Logging/Trace

■ Operations when inserting/removing an SD memory card

- If the cover is opened during the execution of logging/trace, all open files are closed and access stops after the completion of active file access.
- Once the access stops, the SD memory card access LED turns off, and the SD memory card can be removed.
- As the logging into the buffer memory in the control unit continues even after removing the SD memory card, pay attention to buffer overflow.
- A file in the middle of logging when the cover was opened is saved as "specified file name (------current------).csv". Once the SD memory card is inserted again, writing into the file in the SD memory card restarts adding data to the "specified file name (------current------).csv".

6.2 Troubleshooting

6.2.1 Errors When Start/Stop Operation was Executed Using FPWIN GR7

This section describes the messages displayed when the start or stop operation is performed on the "Logging/Trace Monitor" dialog box, and countermeasures.

■ List of error messages

Error message	Situation	Countermeasures
60 From PLC : Application error - Parameter error	Any box of LOG number is not checked.	Check the box of the LOG number to be started.
62 From PLC: Application error - Registration error	An unregistered LOG number was activated.	Check if the settings matches the LOG number to be activated.
78 From PLC: Application error - No SD error	No SD memory card is inserted, or the battery cover is open.	Check if an SD memory card is inserted, and close the battery cover.
90 From PLC: Application error - Logging error	An attempt was made to download logging setting parameters during logging operation.	Depending on the situation, wait for the completion of logging operation, or download the setting parameters again after performing the logging stop operation.
	An attempt was made to display data on a time chart during trace operation.	Depending on the situation, wait for the completion of trace operation, or press the [Time Chart] button after performing the trace stop operation.

6.2.2 Errors When Operation was Executed Using LOGST, LOGED or LOGSMPL Instruction

This section describes the situations and countermeasures when logging operation starts or stops, or logging trigger operation is performed with instructions in user programs.

■ List of errors

Situation or Error message	Situation	Countermeasures
ERR/ALM LED Flashes	A self-diagnostic error such as an operation error occurs.	Wen an operation error occurs in the address of LOGST, LOGED, or LOGSMPL instruction, check the followings.
An operation error occurred in the address of LOGST or LOGED instruction.	The instruction might have been executed for an unregistered LOG number.	Check if the settings match the LOG number for which the instruction is executed.
	There is a possibility that no SD memory card is inserted, or the battery cover is open.	Check if an SD memory card is inserted, and close the battery cover.

Situation or Error message	Situation	Countermeasures
An operation error occurred in the address of LOGSMPL instruction.	The instruction was executed for the LOG number the logging trigger of which is not set to "Instruction".	Check if the settings of logging trigger match the LOG number for which the instruction is executed.
Logging/Trace operation is not executed with LOGSMPL instruction.	There is a possibility that the LOG number does not match.	Check if the settings match the LOG number for which the instruction is executed.

6.2.3 Error of Logging/Trace

Other assumed situation and countermeasure are as follows.

■ List of errors

Situation or Error message	Situation	Countermeasures
Logging/trace starts or is complete right after the execution.	Autostart might be set.	Set Autostart to "No" in the logging/trace setting menu.

6.2.4 Error When Copying Data in SD Memory Card

Other assumed situation and countermeasure are as follows.

■ List of errors

Error message	Situation	Countermeasures
43 From PLC : Copy failed.	Data in an SD memory card cannot be copied into the control unit.	Create an "AUTO" folder in the SD memory card. Check if the setting file is saved in the SD memory card.

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Record of changes

Manual numbers can be found at the bottom of the manual cover.

Date	Manual No.	Record of Changes
Jul. 2013	-	-
Dec. 2013	WUME-FP7CPULOG-01	1st Edition ● Error correction
Feb. 2021	WUME-FP7CPULOG-02	2nd Edition ● Revised due to the discontinuation of Panasonic SD memory cards and SDHC memory cards
Jul. 2022	WUME-FP7CPULOG-04	4th Edition ● Addition of Logging/Trace Function data type • Character string (with one-word header) • Character string (with two-word header) ● Changed format of manual
Jul. 2023	WUME-FP7CPULOG-05	5th Edition Added notes on using the logging/trace function. "1.1.1 Precautions on Using This Function"
Apr. 2024	WUME-FP7CPULOG-06	6th Edition ● Change in Corporate name

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