SYSMAC
CS1W-SPU01/SPU02
CJ1W-SPU01
SYSMAC SPU Units

OPERATION MANUAL

OMRON

CS1W-SPU01/SPU02
CJ1W-SPU01
SYSMAC SPU Units

Operation Manual

Revised November 2005

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation "Ch," which appears in some displays and on some OMRON products, often means "word" and is abbreviated "Wd" in documentation in this sense.

The abbreviation "PLC" means Programmable Controller. "PC" is used, however, in some Programming Device displays to mean Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

Unit Versions of CS/CJ-series SYSMAC SPU Units

Unit Versions

A "Unit version" has been introduced to manage SYSMAC SPU Units in the CS/CJ Series according to differences in functionality accompanying Unit upgrades.

Notation of Unit Versions on Products

The Unit version is given to the right of the lot number on the nameplate of the applicable SYSMAC SPU Units, as shown below.
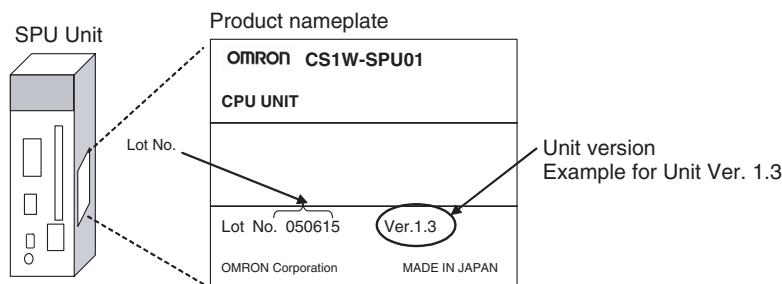
Checking the Unit Version from the SPU-Console

A SYSMAC SPU Unit's version can be checked from the SPU Console by clicking the **Unit Information** Tab and displaying the System Information Tab Page. The unit version appears next to the model number in the *Product Information* Area. The unit version can be checked from the CX-Programmer (Ver. 4.0 or higher) by selecting **Unit Manufacturing Information**.

Functions Supported by SYSMAC SPU Units According to Unit Versions

Function	CS1W-SPU01/02			CJ1W-SPU01
	Unit Ver. 1.0	**Unit Ver. 1.2**	**Unit Ver. 1.3**	**Unit Ver. 1.3**
Data Storage Mode added as a sampling operating mode.	Not supported	Supported (The earlier version's functions moved to Sampling Mode.)		Supported (The earlier version's functions moved to Sampling Mode.)
Scaling function for collection data	Not supported	Supported		Supported
Recording without specifying the number of records	Not supported	Supported		Supported
Terminology changes	Sampling Condition	Record Condition		Record Condition

SPU-Console Compatibility with Unit Versions of SYSMAC SPU Units

SPU-Console version	CS1W-SPU01/02			CJ1W-SPU01
	Unit Ver. 1.0	**Unit Ver. 1.2**	**Unit Ver. 1.3**	**Unit Ver. 1.3**
SPU-Console Ver. 1.0	Can be connected.	Cannot be connected.	Cannot be connected.	Cannot be connected.
SPU-Console Ver. 1.2	Can be connected, but there are some limitations.	Can be connected.	Cannot be connected.	Cannot be connected.
SPU-Console Ver. 1.3		Can be connected, but there are some limitations.	Can be connected.	Can be connected.

Note 1. It is not possible to connect to a SYSMAC SPU Unit with unit version 1.3 from SPU-Console versions lower than 1.3. Use SPU-Console version 1.3 to connect to a SYSMAC SPU Unit with unit version 1.3.

2. It is possible to connect to a SYSMAC SPU Unit with a unit version earlier than 1.3 from SPU-Console version 1.3, but the SPU-Console's operations will be limited to SPU-Console operations for the lower unit version.

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About this Manual:

This manual describes the installation and operation of the CS1W-SPU01, CS1W-SPU02, and CJ1W-SPU01 SYSMAC SPU Units and includes the sections described below.

Please read this manual and all related manuals listed in the following table, and be sure you understand the information provided before attempting to install or operate a SYSMAC SPU Unit. Be sure to read the precautions provided in the following section.

Name	Cat. No.	Contents
CS1W-SPU01/SPU02 CJ1W-SPU01 SYSMAC SPU Units Operation Manual (this manual)	V229	Describes the installation and operation of the SYSMAC SPU Units.
WS02-SPTC1-V1 SPU-Console Ver. 1.3 Operation Manual	V231	Describes the installation and operation of the SYSMAC SPU-Console Ver. 1.3.
WS02-EDMC1 SYSMAC SPU Data Management Middleware User's Manual	V232	Describes the installation and operation of the SYSMAC SPU Data Management Middleware (EDMS).

Precautions provides general precautions for using the SYSMAC SPU Unit, Programmable Controller, and related devices.

Section 1 provides an overview of the SYSMAC SPU Units and their functionality and provides Unit specifications.

Section 2 describes how to install and wire the SYSMAC SPU Units.

Section 3 provides maintenance and inspection information.

⚠ **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

x

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PRECAUTIONS

This section provides general precautions for using the CS1W-SPU01, CS1W-SPU02, and CJ1W-SPU01 SYSMAC SPU Units.

The information contained in this section is important for the safe and reliable application of SYSMAC SPU Units. You must read this section and understand the information contained before attempting to set up or operate a SYSMAC SPU Unit.

1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating the Unit. Be sure to read this manual before attempting to use the Unit and keep this manual close at hand for reference during operation.

⚠ **WARNING** It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above-mentioned applications.

3 Safety Precautions

⚠ **WARNING** Do not attempt to take any Unit apart while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING** Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING** Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.

⚠ **Caution** Execute online editing only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

⚠ **Caution** Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

⚠ **Caution** Tighten the screws on the terminal block of the AC Power Supply Unit to the torque specified in the operation manual. The loose screws may result in burning or malfunction.

4 Operating Environment Precautions

⚠ **Caution** Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

⚠ **Caution** Install the SYSMAC SPU Unit correctly as described in the *CS Series Programmable Controllers Operation Manual* or *CJ Series Programmable Controllers Operation Manual.*

⚠ **Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

5   Application Precautions

Observe the following precautions when using the SYSMAC SPU Unit.

⚠ **WARNING**   Always heed these precautions. Failure to abide by the following precautions could lead to serious or possibly fatal injury.

- Always connect to a ground of 100 Ω or less when installing the Units. Not connecting to a ground of 100 Ω or less may result in electric shock.
- Always turn OFF the power supply to the CPU Unit, Slaves, and Communications Units before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Mounting or dismounting I/O Units, CPU Units, Memory Packs, or Master Units.
  - Assembling the Units.
  - Setting DIP switches or rotary switches.
  - Connecting cables or wiring the system.

⚠ **Caution**   Failure to abide by the following precautions could lead to faulty operation of the SYSMAC SPU Unit or the system, or could damage the SYSMAC SPU Unit. Always heed these precautions.

- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Interlock circuits, limit circuits, and similar safety measures in external circuits (i.e., not in the Programmable Controller) must be provided by the customer.
- Always use the power supply voltages specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.
- Make sure that all the Backplane mounting screws, terminal block screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.
- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring may result in burning.
- Wire all connections correctly.

- Mount Units only after checking terminal blocks and connectors completely.
- Make sure that the terminal blocks, expansion cables, and other items with locking devices are locked in place.
- When transporting the Unit, use special packing boxes and protect it from being exposed to excessive vibration or impacts during transportation.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in unexpected operation.
- Observe the following precautions when wiring the communications cable.
    - Separate the communications cables from the power lines or high-tension lines.
    - Do not bend the communications cables past their natural bending radius.
    - Do not pull on the communications cables.
    - Do not place heavy objects on top of the communications cables.
    - Always lay communications cable inside ducts.
    - Use appropriate communications cables.
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up. Not doing so may result in malfunction or damage.
- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
    - Changing the operating mode of the PLC.
    - Force-setting/force-resetting any bit in memory.
    - Changing the present value of any word or any set value in memory.
    - Touch the Unit only after first touching a grounded metal object to discharge any static electricity from your body.
    - Do not remove the Memory Card while the CARD indicator is lit. Doing so may damage the files on the Memory Card.
    - Do not turn OFF the power supply while Memory Card data is being accessed. Doing so may damage the files on the Memory Card.
    - Maintain the operating environment for the Memory Cards (such as the ambient operating temperature and other conditions). Request operating environment conditions from the manufacture of the card.
    - OMRON is not responsible for the operation of any memory cards produced by other manufacturers.
    - We recommend making a backup of the PC Card or Memory Card to prevent loosing the data inadvertently, e.g., by mistakenly deleting it.
    - Only Memory Cards can be used in the PC Card slot in the CS-series SYSMAC SPU Unit. Modem cards and Ethernet cards, which are not Memory Cards, cannot be used. Do not insert anything but Memory Cards into the Memory Card slot.
    - Make sure that the Memory Card is in the guides when inserting it. Faulty operation may result if the Memory Card is not in the guides.
    - After inserting the Memory Card, always lock it in place with the Memory Card fittings or cover. The Memory Card may become disconnected if it is not locked in place, causing faulty operation.

- Always confirm that the Memory Card is facing the correct direction before inserting it. If a Memory Card is forced into the slot in the wrong direction, the Memory Card or guides may be damaged.

- Always confirm the command number displayed on the 7-segment display before pressing the ENTER button. Faulty operation may result if the command number is incorrect.

- Never restart or turn OFF the power to the SYSMAC SPU Unit while changing settings such as the sampling settings. "P1," "P2," and through "PE" will be displayed on the 7-segment display while sampling settings are being changed. The SYSMAC SPU Unit is restarted or turned OFF before completing the change operation, the system file being changed may be damaged.

- Do not turn OFF the power supply to the Unit while transferring the Unit parameters or other data. Doing so may result in incorrect data being transferred to the Unit or the Unit may malfunction.

- With the CJ1W-SPU01, do not connect anything other than a UPS to the COMM port. Doing so may inadvertently shut down the SYSMAC SPU Unit.

6 Conformance to EC Directives

6-1 Applicable Directives

- EMC Directives
- Low Voltage Directive

6-2 Concepts

EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards (see the following note). Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer.

EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

Note Applicable EMS (Electromagnetic Susceptibility) and EMI (Electromagnetic Interference) Standards in the EMC (Electromagnetic Compatibility) standards are as follows:

Unit	EMS	EMI
CS1W-SPU01	EN 61000-6-2	EN 61000-6-4 (Radiated emission: 10-m regulations)
CJ1W-SPU02		
CJ1W-SPU01		

Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 V AC and 75 to 1,500 V DC meet the required safety standards for the PLC (EN 61131-2).

SECTION 1
Overview and Specifications

This section provides an overview of the SYSMAC SPU Units and their functionality and provides Unit specifications.

1-1 Overview of the SYSMAC SPU Unit

A SYSMAC SPU Unit is a CS/CJ-series CPU Bus Unit that periodically and automatically collects the specified I/O memory data from the CPU Unit and stores it in a Memory Card in CSV-format files.

The SYSMAC SPU Unit has two modes that can be selected to suit the application: Sampling Mode and Data Storage Mode. The SYSMAC SPU Unit's functions are different in these two modes.

- Sampling Mode

  In this mode, the SYSMAC SPU Unit samples the specified I/O memory data from the CPU Unit at regular time intervals. The time intervals are nearly constant, so the data can be recorded at particular times and more reliable information can be reproduced from the collected data.

- Data Storage Mode (Unit Ver. 1.2 or Later Only)

  In this mode, the SYSMAC SPU Unit records the specified I/O memory data from the CPU Unit when a particular event occurs. This mode can record data when a particular bit goes ON or at a particular time. In addition, it is also possible to record data at a fixed time after the event occurs, although the time interval is not as precise as it is in Sampling Mode.

Either of these modes can be selected after the SYSMAC SPU Unit is installed.

A personal computer can be connected to the LAN port on the SYSMAC SPU Unit to use the SPU-Console SPU Basic Software to set the variable settings, collection pattern settings, set and control the CPU Unit, and display trend graphs.

A Windows 2000 or XP computer on a Windows network can also access the SYSMAC SPU Unit via Ethernet to share the files saved in the Memory Card in the SYSMAC SPU Unit.

The SYSMAC SPU Unit thus enables collecting and saving large quantities of digital data without affecting the control operation of the PLC merely by adding a SYSMAC SPU Unit, providing an easy means to see trends in process data, analyze relationships between data and quality, and achieve other data/ system management applications.
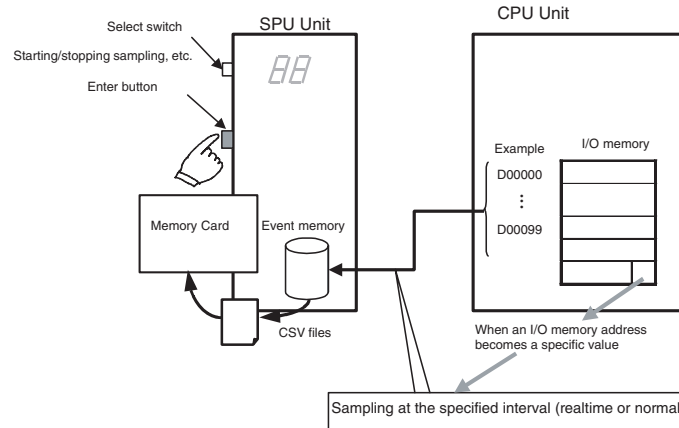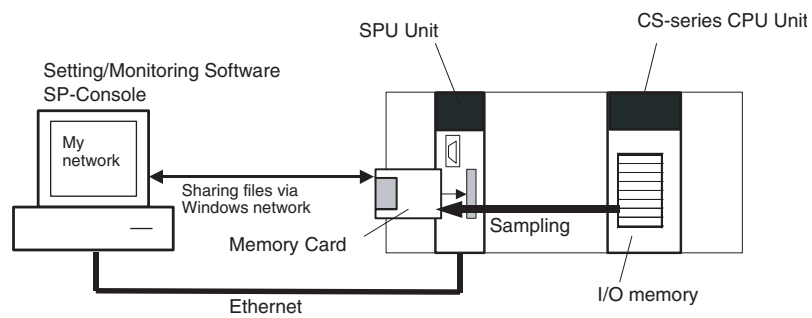
Note (1) Sampling Mode operation:
Sampling can be started and stopped 1) manually from the SYSMAC SPU Unit or SPU-Console, 2) automatically when the SYSMAC SPU Unit is started, or 3) when specified from the ladder program.

(2) Data Storage Mode operation:
Data can be stored when a particular event occurs, such as a memory event (e.g., when a data area word equals a set value) or scheduled event (e.g., at a specified date and time). When the Basic Collection Pattern is used, sampling can also be executed 1) manually from the SYSMAC SPU Unit or SPU-Console, 2) automatically when the SYSMAC SPU Unit is started, or 3) when specified from the ladder program.

1-2 SYSMAC SPU Unit Features

Automatic Data Collection from CPU Unit without Any Special Programming

The specified data from the I/O memory in the CPU Unit can be automatically sampled and saved without altering the ladder program in the CPU Unit.

No External Data Collection Device Required

A SYSMAC SPU Unit can be easily added whenever required to enable sampling. An external data collection device is not required.

Easily Set Sampling Parameters with SPU Basic Software

- Sampling parameters is easily set from the SPU-Console Basic Software.
- The SPU-Console dynamically creates windows based on setting information in the SYSMAC SPU Unit. There is no need to select the model.

High-speed Sampling at Precise Sampling Periods (Sampling Mode)

Data can be collected at high-speed and at very precise intervals from the CPU Unit's I/O memory areas (CIO, WR, HR, DM, and EM Areas).

Examples:
    25 sampling items: 5 ms
    250 sampling items: 10 ms
    500 sampling items: 20 ms
    These times may not be possible for some settings.

Note   Sampling is not possible at intervals that are faster than the CPU Unit's cycle time.

This mode allows the operation of the system (factors such as analog data changes or timing of logical sequences) to be tracked very accurately in nearly realtime time intervals.

Sampling Triggered by an Event (Data Storage Mode, Unit Ver. 1.2 or Later Only)

Data sampling can be started or stopped when a bit or word in the CPU Unit's data area reaches a certain value (e.g., a specified bit goes ON or a word equals 100) or at scheduled times (e.g., at 17:00 or every hour).

Event-triggered sampling can be used to easily record operations under certain conditions, to provide a snapshot of device status when an error occurs, to understand temporal changes in operation, to periodically collect device data, or to achieve many other jobs based on data in the CPU Unit of the PLC.

User-settable Data Recording Conditions

The SYSMAC SPU Unit can be set to record the collected data only when a particular condition is satisfied, such as while a specified bit is ON or a specified word equals a specified set value. This feature can be used in both Sampling Mode and Data Storage Mode.

Scaling Function (Unit Ver. 1.2 or Later Only)

The collected data can be scaled in the SYSMAC SPU Unit before being recorded. Both linear equation conversion and upper/lower limit conversion are supported.

High-volume Storage of CSV-format Data

- Data is saved in CSV format so that it can be easily imported for analysis in Excel, databases, or other software.

- With a CS-series SYSMAC SPU Unit, data is stored in a Memory Card mounted in the PC card slot of the SYSMAC SPU Unit using an HMC-AP001 Memory Card Adapter. With a CJ-series SYSMAC SPU Unit, data is stored in a Memory Card mounted directly in the Memory Card slot of the SYSMAC SPU Unit. If the HMC-EF582 is used, large-capacity storage of 512 MB is possible.

Sampling Data Concurrency

During each cycle of the CPU Unit, data is transferred from the CPU Unit to the SYSMAC SPU Unit in a single batch and the data is written to files in the Memory Card to ensure data concurrency. Data is transferred to the SYSMAC SPU Unit during the I/O refresh period of the CPU Unit.

Windows Network Supported

Shared folders on a Windows network can be used to share files with a Windows 2000 or XP computer. The CSV files containing the results of sampling on the Memory Card mounted in the PC card slot of the SYSMAC SPU Unit can be easily read from a Windows 2000/XP computer. In addition, the WS02-EDMC1 SYSMAC SPU Data Management Middleware (sold separately) can be used to automatically collect data files at the computer.

1-3   Product Configuration

The SYSMAC SPU Units and related products are listed in the following table.

Model	Name	Specification
CS1W-SPU01	SYSMAC SPU Unit	One LAN port
CS1W-SPU02	SYSMAC SPU Unit	Two LAN ports
CJ1W-SPU01	SYSMAC SPU Unit	One LAN port

Model	Name	Specification
WS02-SPTC1-V1	SPU-Console (SPU Basic Software)	SPU Unit Setting Software
HMC-EF372	Memory Card	Flash memory, 30-MB
HMC-EF672	Memory Card	Flash memory, 64-MB
HMC-EF282	Memory Card	Flash memory, 256-MB
HMC-EF582	Memory Card	Flash memory, 512-MB
HMC-AP001	Memory Card Adapter	Adapts a Memory Card for use in a PC card slot. (See note.)

Note   CS1W-SPU01 and CS1W-SPU02 SYSMAC SPU Units only.

1-4   Specifications

1-4-1   SYSMAC SPU Unit Specifications

General Specifications   CS1W-SPU01/SPU02 SYSMAC SPU Units: Specifications conform to the general specifications of the SYSMAC CS-series CPU Units.

CJ1W-SPU01 SYSMAC SPU Units: Specifications conform to the general specifications of the SYSMAC CJ-series CPU Units.

Functional and Performance Specifications

Item		Specification	
Unit model number		CS1W-SPU01/02	CJ1W-SPU01
Applicable CPU Units		CS Series	CJ Series
Unit classification		CPU Bus Unit	
Unit number		0 to F	
Mounting location		CPU Backplane or CS-series Expansion Backplane (Cannot be mounted to C200H Expansion I/O Rack or SYSMAC BUS Remote I/O Slave Rack.)	CPU Backplane or CJ-series Expansion Backplane
No. of Units per PLC		16 Unit max.	
Interfaces	PC card slot	PC card Type II, 1 slot (Conforms to PC Card Standard Release 8.0.) Used by mounting Memory Card (see note) and HMC-AP001 Memory Card Adapter.	Memory Card slot Used by mounting a Memory Card (see note).
	COMM port	For future expansion	Connects to an uninterruptive power supply (UPS) for detection of power failure.
	Ethernet (LAN) ports	CS1W-SPU01: One port (10/100Base-TX, RJ45 Modular Connector) CS1W-SPU02: Two ports (10/100Base-TX, RJ45 Modular Connectors)	CJ1W-SPU01: One port (10/100Base-TX, RJ45 Modular Connector)
	UPS power failure input	24 VDC (+10%/−15%) input Connect the power failure signal output line from the UPS.	None (UPS connected to COMM port.)

	Item	Specification	
Settings and operation	Unit number switch (UNIT)	Rotary switch: Sets the unit number of the Unit as a CPU Bus Unit.	
	Select switch (SELECT)	Toggle switch: Sets the number of the command to execute.	
	Enter button (ENTER)	Pushbutton switch: Confirms and starts execution of the command number set using the select switch.	
	DIP switch (DIPSW)	DIP switch: System settings	
	Card button	Pressed to release the Memory Card inserted in the PC card slot. The Memory Card can then be removed.	Pressed to release the Memory Card inserted in the Memory Card slot. The Memory Card can then be removed.
Indications	LED indicators	RUN, ERC, ERH, COMM, LAN1, LAN2, CARD, and PF-IN (See note.) **Note** PF-IN: CS1W-SPU-01/SPU02 only.	
	7-segment display	• Displays error information and operating status of the SYSMAC SPU Unit. • Displays the command number set on the select switch. • Displays the IP address. • Display other information.	
Functions		• Sampling • Saving files • Network communications	
Operating modes		Sampling Mode and Data Storage Mode (Either mode can be selected with the Change Operating Mode command.)	
Current consumption		CS1W-SPU01: 5 VDC, 560 mA max. (SYSMAC SPU Unit only) Other: Memory Card (HMC-EF☐☐): 120 mA max. (Supplied from Power Supply Unit.)	CJ1W-SPU01: 5 VDC, 560 mA max. (SYSMAC SPU Unit only) Other: Memory Card (HMC-EF☐☐): 120 mA max. (Supplied from Power Supply Unit.)
		CS1W-SPU02: 5 VDC, 700 mA max. (SYSMAC SPU Unit only) Other: Memory Card (HMC-EF☐☐): 120 mA max. (Supplied from Power Supply Unit.)	
Dimensions (mm)		CS1W-SPU01/SPU02: $35 \times 130 \times 101$ mm (W $\times$ H $\times$ D)	CJ1W-SPU01: $51 \times 90 \times 65$ mm (W $\times$ H $\times$ D)
Weight		CS1W-SPU01: 280 g max. (including enclosed connector)	CJ1W-SPU01: 180 g max.
		CS1W-SPU02: 290 g max. (including enclosed connector)	

Note Memory Card: HMC-EF☐☐ Memory Card from OMRON or commercially available compact flash card. Normal operation may not be possible with commercially available compact flash cards depending on the manufacturer and model of the card.

Detailed Specifications (Same for CS1W-SPU01/02 and CJ1W-SPU01)

Item			Specification	
Sampling	Sampling Mode	Sampling patterns	Realtime sampling: 1 pattern Normal sampling: Up to 3 patterns	
		Starting methods	Any one of the following methods can be used: • Start automatically when SYSMAC SPU Unit is started. • Start with an SPU-Console operation. • Start with the SYSMAC SPU Unit's front-panel command buttons. (Specify the command number.) • Start from the CPU Unit's ladder program.	

		Interval	User-specified intervals:
			   Realtime sampling: 5 ms min.
			   Normal sampling: 100 ms min.
			
			Note In both cases, the sampling cannot be performed faster than the CPU Unit's cycle time. The actual sampling interval will always be longer than the CPU Unit's cycle time even if the sampling interval is set shorter than the cycle time.	

	Data Storage Mode (Unit Ver. 1.2 or later only)	Data Collection Patterns	Basic Collection Pattern: 1 pattern (required) Data Collection Patterns: Up to 64 patterns	
Sampling	Data Storage Mode (Unit Ver. 1.2 or later only)	Starting methods	Basic Collection Pattern (required)	Any one of the following methods can be used: • Start when a specified event occurs. (Use a memory event or scheduled event. For details, see the description of Data Collection Patterns 1 to 64 below.) • Start automatically when SYSMAC SPU Unit is started. • Start with an SPU-Console operation. • Start with the SYSMAC SPU Unit's front-panel command buttons. (Specify the command number.) • Start from the CPU Unit's ladder program.
			Data Collection Patterns 1 to 64	Either of the following methods can be used to start when an event occurs: • Memory events: Start when a CPU Unit bit or word value matches a specified condition. Up to 500 memory events can be specified. • Scheduled events: Start at a specified time or time interval. Up to 16 scheduled events can be specified.

		Interval	User-specified intervals:
			   Basic Collection Pattern: 5 ms min.
			   Data Collection Patterns: 100 ms min.
			
			Note
			1. The Data Collection Patterns use the data collected by the Basic Collection Pattern, so the data will be collected at the Basic Collection Pattern's interval even if the Data Collection Pattern's interval is set shorter than the Basic Collection Pattern's interval.
			2. The actual Basic Collection Pattern interval will always be longer than the CPU Unit's cycle time even if the sampling interval is set shorter than the cycle time.	

Item			Specification	
Sampling, continued	Shared Sampling Mode and Data Storage Mode settings	Applicable CPU Unit I/O memory areas	CIO Area, WR Area, HR Area, AR Area, DM Area, and EM Area banks 0 to C	
		Specifying I/O memory areas	Specify the desired CPU Unit I/O memory area (data area) with a variable. The data type can be specified with the variable. The variables can be managed in groups.	
			Variable data types	BOOL, INT, UINT, DINT, UDINT, REAL, LREAL, STRING, CHANNEL, UINT BCD, UDINT BCD, WORD, DWORD
		Record Condition setting	Set whether or not to use a record condition. If a record condition is used, sampling data is stored within the SYSMAC SPU Unit only when the record condition is met. For example, sampling data can be recorded only while a specified bit is ON or a specified word contains a particular value (comparison).	
		Data exchange with the CPU Unit	Status memory (allocated to any part of the CPU Unit's I/O memory) • CPU Unit to SYSMAC SPU Unit: Command execution (such as starting/stopping sampling, clearing a sampling file, or saving a sampling file). • SYSMAC SPU Unit to CPU Unit: SYSMAC SPU Unit status information	
Saving files		Collected data file format	CSV files	Indices (record number), time stamps (hh:mm:ss:ms), ns, sampling indices (serial numbers starting at 0 when sampling is started), data for each symbol delimited with comma, records delimited with carriage returns
			Record contents	
		Number of sampling result records stored in one file	Any one of the following methods can be used. • The number of records can be specified. • A time period can be specified. (The number of records is calculated automatically from the time period and interval between samples.) • With a version 1.2 or later SYSMAC SPU Unit, the number of records can be left unspecified. (In this case, data is added to the file until data collection is stopped. Records are added to one file from the start of data collection until the end.)	
		Scaling	Instead of directly storing the values collected from the CPU Unit's I/O memory, the collected values can be scaled with a linear equation or upper/lower limit range before storage (unit version 1.2 or later).	
		File size	2 GB per file	
		Record size	Specified by user.	
		Number of records	Specified by user or calculated automatically.	
		Saving method	Data can be saved to a single file or multiple files (up to 1,200 files).	
Network communications		Windows network shared folders	Files in the Memory Card inserted in the PC card slot in the SYSMAC SPU Unit can be shared with a Windows 2000/XP personal computer.	
		FTP server	FTP server provided.	
		FINS communications	• FINS server to execute FINS command • Routing to transfer FINS messages	

1-4-2　SPU-Console (Setting/Monitoring Software) Specifications

Item		Specification
Model number		WS02-SPTC1-V1 (SPU-Console Ver. 1.3)
System requirements	Computer hardware	Computer that meets the system requirements for Microsoft Windows XP Professional
	CD-ROM drive	Required for installation.
	Display	Super VGA (800 × 600) or better high-resolution video adapter and monitor
	Mouse	Must conform to the models supported by the applicable OS.
	Network card	A separate Ethernet network card is required for computers that do not have a LAN port.
	OS	Microsoft Windows 2000 Professional
		Microsoft Windows XP Home Edition
		Microsoft Windows XP Professional
	Application platform	Microsoft.NET Framework Version 1.1
Communications platform		FinsGateway Version 2003
Functions		Unit information, Unit setup, variable settings, collection pattern settings, event settings, and trend graphs
Unit information	Monitor	SYSMAC SPU Unit operating status and error information are displayed.
	Operation	Operations, such as starting sampling
Unit setup		IP network settings
		FINS network settings
Variable settings		Setting items to sample (by specifying I/O memory addresses using variables)
Collection Pattern settings		Collection pattern settings (interval, specification of save filename, etc.)
Event settings (for Data Storage Mode)	Memory Event	Set the condition as a change in the CPU Unit's memory status, such as a specified bit going ON.
	Schedule Event	Set a scheduled event, such as a specified time or time difference.
Trend graphs	Historical trends	CSV files are read and displayed.
	Realtime trends	Current sampling data is read and displayed in trend graphics in real time.

Note (1) It is not possible to connect to a SYSMAC SPU Unit with unit version 1.3 from SPU-Console versions lower than 1.3. Use SPU-Console version 1.3 to connect to a SYSMAC SPU Unit with unit version 1.3.

(2) It is possible to connect to a SYSMAC SPU Unit with a unit version earlier than 1.3 from SPU-Console version 1.3, but the SPU-Console's operations will be limited to SPU-Console operations for the lower unit version.

1-4-3　SYSMAC SPU Unit Sampling Specifications

Sampling Capacity　The sampling capacity of the SYSMAC SPU Unit varies with the following factors:

- Operating Mode (Sampling Mode or Data Storage Mode)
- Sampling period
- Quantity of variables recorded as sampling data
- Writing speed of media where sampling data is saved
- Number of samplings that are set
- CPU Unit cycle time

There are no predetermined restrictions on these factors for SYSMAC SPU Unit sampling. It is assumed that the required sampling will be tested on the actual system to confirm applicability. We recommend that the above factors be studied and tested sufficiently before using the sampling function in an actual system to determine suitable settings.

Examples:
- When precise sampling periods are required, use Sampling Mode.
- To shorten the sampling period:
    - Reduce the quantity of sampling data.
    - Reduce the number of sets of data being sampled.
    - Use a faster storage media.
- To record a large volume of sampling data:
    - Increase the sampling period.

Realtime Sampling Characteristic

Sampling Mode

With realtime sampling, sampling is performed by the SYSMAC SPU Unit as much as possible according to the sampling settings. The following conditions, however, may prevent sampling from being performed at completely fixed intervals. Be sure to consider possible affects of this on the application in advance.

- Offset between the timer accuracy and the time of the SYSMAC SPU Unit
- Changes in the sampling period during compensation by the time compensation function with the CPU Unit
- Delays caused by system traffic, particularly concentrated access to the storage media

To handle these problems, the SYSMAC SPU Unit provides time stamps with sampling data. We recommend that tests be performed in advance so that the results of sampling are not radically different from those for fixed-interval sampling.

Data Storage Mode

In Data Storage Mode, only the Basic Collection Pattern reads data from the CPU Unit's I/O memory to the SYSMAC SPU Unit. The other Data Collection Patterns (patterns 1 to 64) use the data collected by the Basic Collection Pattern and record the data when the corresponding event condition setting is met.

Data Collection Patterns 1 to 64 use the data collected by the Basic Collection Pattern, so the interval settings for the Data Collection Patterns must be longer than the interval setting for the Basic Collection Pattern.

We recommend thoroughly testing the settings in trial operation before using the data collection functions in actual operation.

Relationship to Cycle Time of CPU Unit

- The SYSMAC SPU Unit collects I/O memory data during the I/O refresh period of the CPU Unit. The cycle time of the CPU Unit, however, will be longer when the SYSMAC SPU Unit is sampling I/O memory. The affect of the SYSMAC SPU Unit on the CPU Unit cycle time depends on the series of CPU Unit, as given below.
    - CS1 CPU Units: 1.0 ms + No. of words sampled × 1 µs
    - CS1-H CPU Units: 0.2 ms + No. of words sampled × 0.8 µs
    - CJ1-H CPU Units: 0.2 ms + No. of words sampled × 0.8 µs
    - CJ1M CPU Units: 0.2 ms + No. of words sampled × 0.8 µs
- The sampling period of the SYSMAC SPU Unit cannot be shorter than the cycle time of the CPU Unit. This is because the SYSMAC SPU Unit uses the I/O refresh period of the CPU Unit's cycle time to collect data. If a sampling period is set that is shorter than the cycle time of the CPU Unit, I/O memory will be sampled at an period equivalent to the cycle time of the CPU Unit.

• When the CPU Unit is in PROGRAM mode, the CPU Unit's cycle time will be longer so it may not be possible to read the data within the set time interval.

Sampling File Size

• The maximum size of one sampling file is 2 GB.

• If sufficient space cannot be secured in advance for the sampling settings, the disk may become full during sampling, causing an error.

• Depending on the file sizes, time may be required to change sampling settings to secure space in advance.

Note To use a sampling period that is as close as possible to the cycle time of the CPU Unit, set a sampling period that is a few milliseconds shorter than the CPU Unit cycle time.

SECTION 2
Installation and Wiring

This section describes how to install and wire the SYSMAC SPU Units.
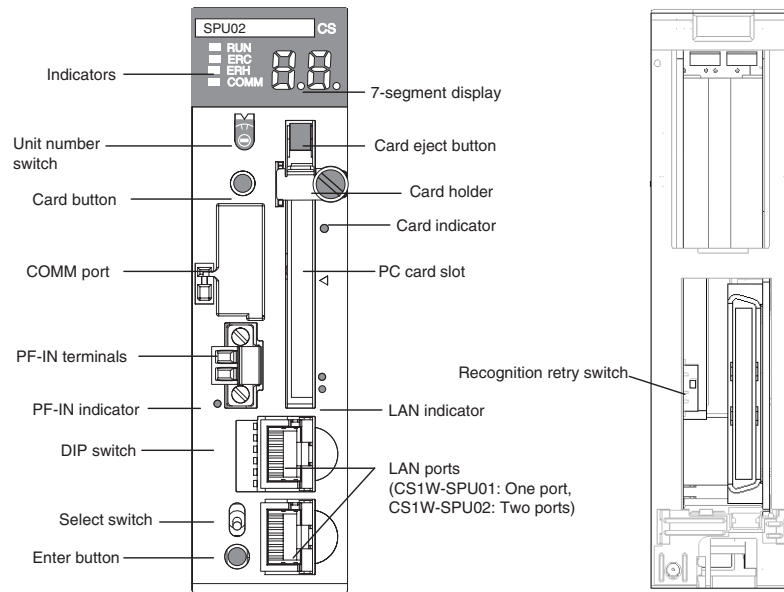
2-1 Part Names and Functions

The names and function of SYSMAC SPU Unit parts are described in this section. The meaning of indicators and the display is also described.

2-1-1 Part Names

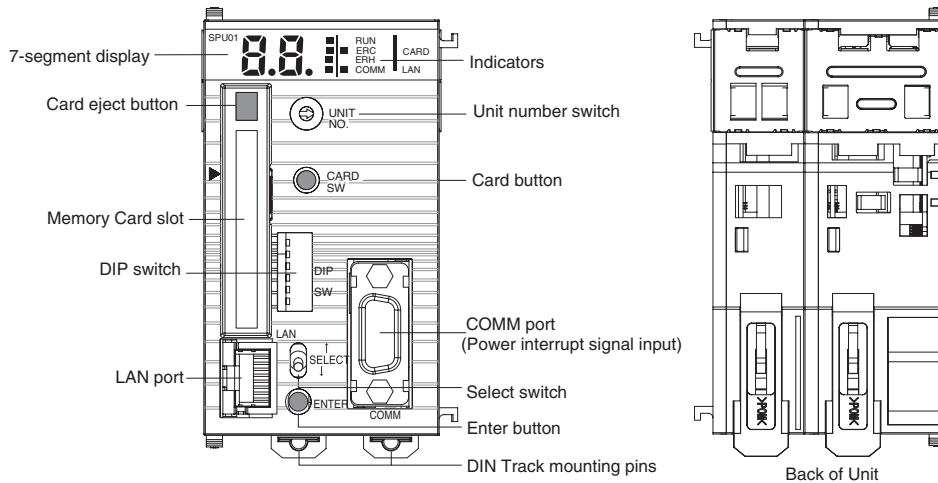The parts of the SYSMAC SPU Unit are listed below.

CS1W-SPU01/SPU02   Here, the CS1W-SPU02, which has two LAN ports, is taken as an example. The CS1W-SPU01 has only one LAN port.

Name	Function
Unit number switch (UNIT NO.)	Sets the unit number of the SYSMAC SPU Unit as a one-digit hexadecimal value.
	Do not set the same unit number for more than one CPU Bus Unit under the same CPU Unit.
DIP switch (DIP SW)	Used for system settings.
Card button (CARD SW)	Press this button to allow the Memory Card inserted in the PC card slot to be removed.
Card eject button	Press to remove the PC card.
Card holder	Holds the PC card.
Select switch	Sets the command to be executed. The command number will be displayed on the seven-segment display.
Enter button	Executes the command set using the select switch.
Indicators	The following indicators show the operating status of the Unit: RUN, ERC, ERH, and COMM.
Seven-segment display	Displays error information and the operating status of the SYSMAC SPU Unit.
	Displays the command number when the select switch is operated.
	Displays the IP address and other results of command execution.
LAN indicator	Indicates the operating status of the LAN port.
Card indicator	Indicates the operating status of the PC card.
PF-IN indicator	Lights when the power failure input is received from a UPS or other device.
PC card slot	A slot used to insert a card conforming to PC Card Type II.
Communications ports LAN1/LAN2	LAN communications ports. Connect to 10Base-T/100Base-TX cables.
COMM port	For future expansion.

Name	Function
PF-IN terminals	Connected to the power failure input from a UPS or other device.
Recognition retry switch	Refer to *2-1-7 Starting CPU Unit Operation Immediately upon Power Application.*

CJ1W-SPU01

Back of Unit

Name	Function
Unit number switch (UNIT NO.)	Sets the unit number of the SYSMAC SPU Unit as a one-digit hexadecimal value. Do not set the same unit number for more than one CPU Bus Unit under the same CPU Unit.
DIP switch (DIP SW)	Used for system settings.
Card button (CARD SW)	Press this button to allow the Memory Card inserted in the Memory Card slot to be removed.
Card eject button	Press to remove the Memory Card.
Select switch	Sets the command to be executed. The command number will be displayed on the seven-segment display.
Enter button	Executes the command set using the select switch.
Indicators	The following indicators show the operating status of the Unit: RUN, ERC, ERH, COMM, CARD, and LAN.
Seven-segment display	Displays error information and the operating status of the SYSMAC SPU Unit. Displays the command number when the select switch is operated. Displays the IP address and other results of command execution.
Memory Card slot	The slot used to insert a Memory Card.
LAN port	LAN communications port. Connects to 10Base-T/100Base-TX cables.
COMM port	Connects to the power failure signal from an uninterruptive power supply (UPS).

2-1-2   Indicators

Name	Color	Function
RUN indicator	Green	Lit when the SYSMAC SPU Unit is operating normally.
ERC indicator	Red	Lit when there is a controller error.
ERH indicator	Red	Lit when there is a host error.
COMM indicator	Orange	Lit when communications are active on the COMM port (for future expansion).
LAN indicator	Green	Lit when a LAN cable is connected. Flashing when data is being sent or received.

Name	Color	Function
Card indicator	Green	CS1W-SPU01/SPU02: Lit when the PC card is being used. Not lit when the PC card is not being used.
		CJ1W-SPU01: Lit when the Memory Card is being used. Not lit when the Memory Card is not being used.
	Orange	CS1W-SPU01/SPU02: Lit when the PC card is being accessed.
		CJ1W-SPU01: Lit when the Memory Card is being accessed.
PF-IN indicator	Red	Lit when the power failure input is being received from a UPS or other device. (CS1W-SPU01/SPU02 only.)

2-1-3 Seven-segment Display

The seven-segment display shows error information and operating conditions of the SYSMAC SPU Unit. It also displays command numbers when the select switch is manipulated, as well as command execution results.

The seven-segment display shows alphanumeric characters and symbols. Alphabet characters are displayed as shown below.


2-1-4 Setting the Unit Number

Set the unit number switch to a unique unit number for each CPU Bus Unit mounted under the same CPU Unit. Use a small, flat-blade screwdriver and be careful not to damage the slot. The default setting is 0.

CS1W-SPU01/02

UNIT NO.

Setting range
0 to F

CJ1W-SPU01

UNIT No.

Setting range
0 to F

Note Turn the power supply OFF before setting the unit number.
Always create the I/O tables in the CPU Unit after setting the unit number for the first time or after changing the unit number.

2-1-5 Setting the DIP Switch

CS1W-SPU01/02   CJ1W-SPU01

DIPSW   DIPSW
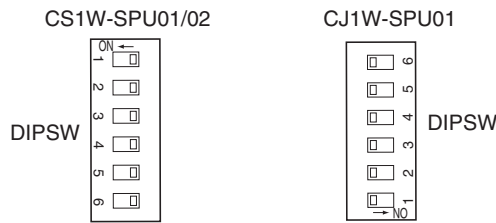
Pin	Setting	Meaning	Default setting
SW1	---	Not used. Keep set to OFF.	OFF
SW2	---	Not used. Keep set to OFF.	OFF
SW3	OFF	Setup file can be read.	OFF
	ON	Setup file cannot be read and changes will not be possible from the Setting Software. This setting is used to prevent unintentional changes to settings.	
SW4	OFF	IP address is set according to the SYSMAC SPU Unit setup.	OFF
	ON	The IP addresses are set to the following default values. LAN1 port = 192.168.0.100 LNA2 port = 192.168.2.100	
SW5	---	Not used. Keep set to OFF.	OFF
SW6	OFF	Starts the SYSMAC SPU Unit in normal operating mode.	OFF
	ON	Starts the SYSMAC SPU Unit in maintenance mode. This setting is used to set up the SYSMAC SPU Unit.	

2-1-6 Select Switch and Enter Button

The select switch and enter button on the SYSMAC SPU Unit can be manipulated to execute commands, such as one to start sampling.
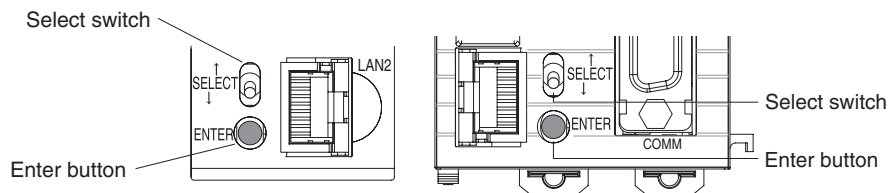
Setting Commands on the Select Switch

The command number will be incremented when the switch is press up and decremented when the switch is pressed down.

The currently set command number will be displayed on the seven-segment display.

Executing Commands with the Enter Button

The enter button is used to executed the command set using the select switch. When the enter button is pressed once, the command number displayed on the seven-segment display will start flashing. When the enter button is pressed again, "A" will be displayed on the seven-segment display and the command will be executed.

To cancel executing the command after pressing the enter button the first time, do not press the enter button again and wait for 10 s.

The main commands are listed below. Refer to *Section 6 Executing Commands* in the *SPU-Console Ver. 1.3 Operation Manual* (V231).

| Command number	Command	Function
01	Start all samplings	Starts all sampling that has been set.
02	Stop all samplings	Stops all sampling that is in progress.
03	Save the sampling data	Saves the sampling data and settings file in a ZIP file.
04	Clear the sampling data	Deletes the sampling data.
05	Display the IP address (LAN1)	Displays the IP address of LAN1 on the seven-segment display.
06	Display the IP address (LAN2)	Displays the IP address of LAN2 on the seven-segment display.
07	Display the unit name	Displays the name of the Unit on the seven-segment display.
08	Display the FINS address	Displays the FINS address of the Ethernet Communications Unit on the seven-segment display.
09	Display of PC card used space (%)	Displays the percentage of the PC card capacity that has been used.
10	Error display	Displays any errors that exist.
11	Forced clear of error	Clears the record of any errors that exist.
12	Restart unit	Restarts the Unit.

2-1-7 Starting CPU Unit Operation Immediately upon Power Application

If a SYSMAC SPU Unit is mounted to a PLC, a minimum of one second is required for SYSMAC SPU Unit initialization, and the CPU Unit will remain on standby until initialization has been completed. This means that the CPU Unit will not start operation when the power supply is turned ON even if the startup mode of the CPU Unit is set to RUN or MONITOR mode.

When using a CS1-H CPU Unit, the recognition retry switch on the SYSMAC SPU Unit can be turned ON to omit waiting for the completion of initialization and start operation of the CPU Unit as soon as the power supply is turned ON. If this is done, the SYSMAC SPU Unit will initially not participate in PLC operation.

Note With the CJ1W-SPU01, the recognition retry function is always ON, and is not a switch. To use this function, however, the Startup Condition setting in the PLC Setup for the CS1-H, CJ1-H, or CJ1M CPU Unit must be changed to *Don't Wait*. Use the following procedure.

1,2,3...   1. Turn ON the recognition retry switch on the back of the SYSMAC SPU Unit.

Recognition retry button
(Default: OFF)

ON
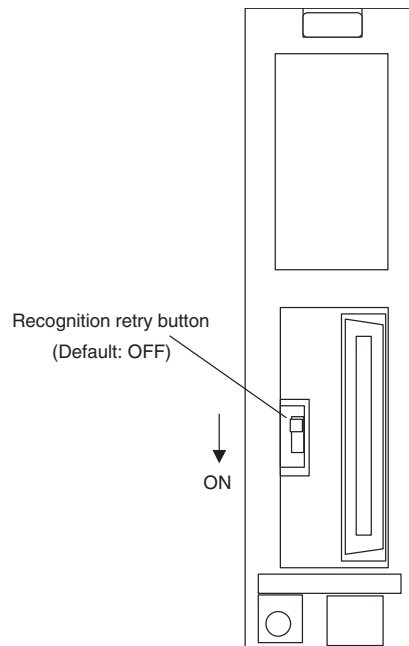
Back of Unit

If the CPU Unit is in RUN or MONITOR mode after the power supply is turned ON, operation will depend on the setting of the recognition retry button as follows:

OFF: CPU Unit will remain on standby until initialization of the SYSMAC SPU Unit has been completed.

ON: The CPU Unit will not go on standby and execution of the ladder program will be started. This function can be used only for a CS1-H CPU Unit.

This operation is not required with the CJ1W-SPU01, for which recognition retry processing is always ON.

Note   Keep this switch turned OFF when the SYSMAC SPU Unit is mounted under any CPU Unit other than a CS1-H CPU Unit. If this switch is turned ON for other CPU Units, a unit number duplication error will occur.

2. For both the CS1W-SPU01/SPU02 and the CJ1W-SPU01, set the following setting in the PLC Setup from the CX-Programmer.

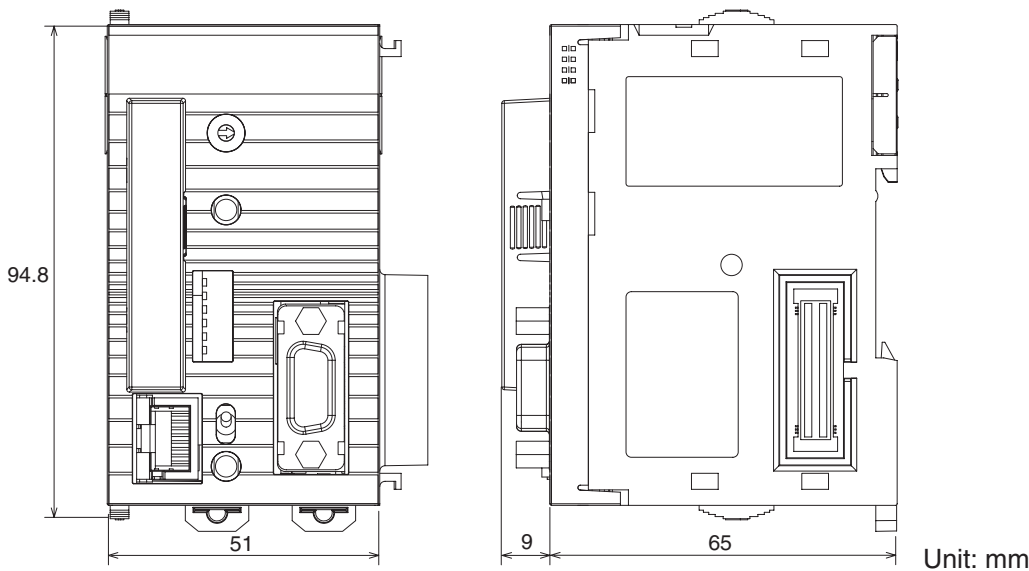Set *PLC Setup - Execution Settings - Startup Condition* to *Don't Wait*.

For details on the startup condition, refer to *7-1-2 PLC Setup Settings* in the *CS Series PLC Operation Manual* (W339) and in the *CJ Series PLC Operation Manual* (W393).

2-1-8   Dimensions

CS1W-SPU01 and CS1W-SPU02

130

35   20   101   Unit: mm

CJ1W-SPU01

94.8

51   9   65   Unit: mm
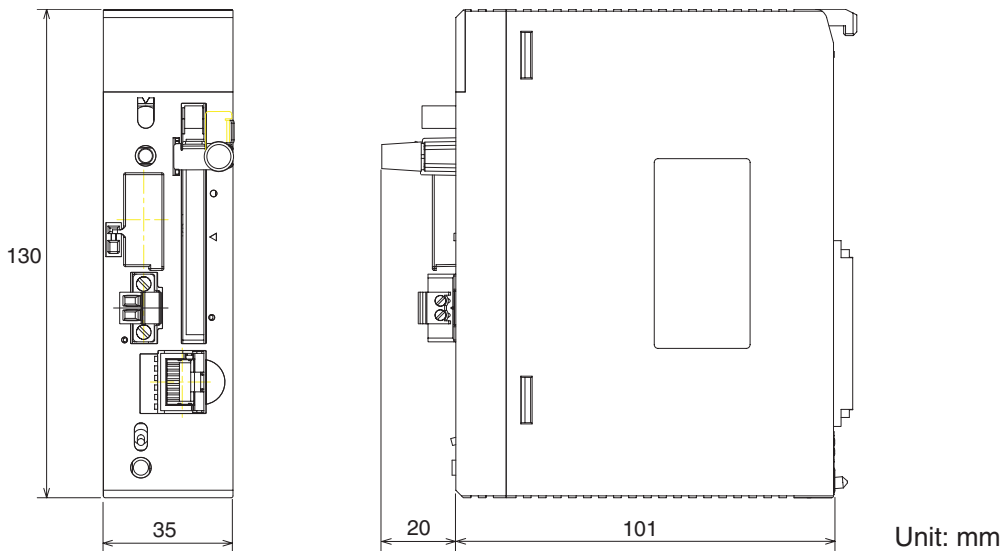
2-2   Mounting to the Backplane

CS1W-SPU01/SPU02   The SYSMAC SPU Unit is used mounted to the CPU Backplane. Refer to the *CS Series PLC Operation Manual* (W339) for instructions on mounting to the Backplane.

The SYSMAC SPU Unit must be counted as a CS-series CPU Bus Unit. A maximum of 16 CS-series CPU Bus Units can be mounted to one PLC.

After mounting the SYSMAC SPU Unit to the Backplane and setting the unit number, turn ON the power supply to the PLC and create the I/O tables. Use a Programming Device, such as a Programming Console or the CX-Programmer, to create the I/O tables.

Note   The maximum current consumption for CS1W-SPU01 and CS1W-SPU02 SYSMAC SPU Units is 560 mA and 700 mA respectively. Make sure that the

total current consumption of all the Units mounted to the same CPU Backplane or Expansion Backplane does not exceed the maximum output capacity of the Power Supply Unit.

CJ1W-SPU01   Connect the SYSMAC SPU Unit horizontally with the other Units. For details on connecting Units together, refer to the *CJ Series PLC Operation Manual* (W393).

When mounting other CJ-series CPU Bus Units at the same time, the total number of CJ-series CPU Bus Units must not exceed 16.

After the Units have been connected together and the unit numbers set, turn ON the power supply to the CPU Unit.

Note   The maximum current consumption for an CJ1W-SPU01 SYSMAC SPU Unit is 560 mA. Make sure that the total current consumption of all the Units mounted to the same CPU Backplane or Expansion Backplane does not exceed the maximum output capacity of the Power Supply Unit.

2-3   Connecting the LAN Cable

This section describes how to connect the LAN cable.

Connect a LAN cable conforming to 10Base-T or 100Base-TX to the LAN1 port on the SYSMAC SPU Unit.

Note   Use a 100Base-TX-conforming cable when connecting with 100Base-TX Ethernet.

2-4   Connecting the Power Failure Signal

CS1W-SPU01/SPU02   Connect the power failure signal output line from a UPS or other device to the power failure input terminals on the SYSMAC SPU Unit.
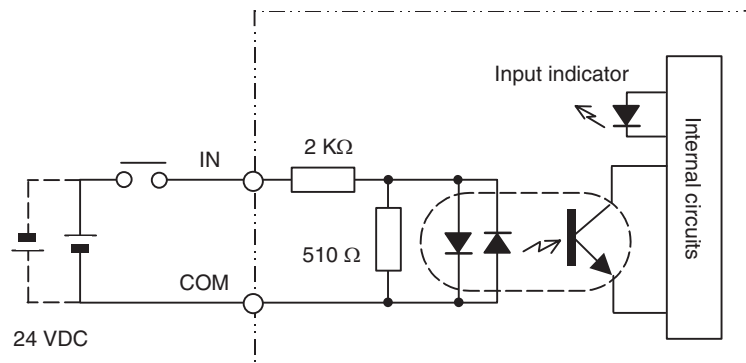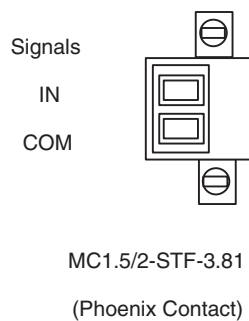
Note   Tighten the cable screws to a torque of 0.3 N·m.

Signal Input Specifications

Item	Specification
Rated input voltage	24 VDC (+10% / −15%)
Input impedance	2 kΩ
Input current	10 mA (typical)
ON voltage	17.4 V min.
OFF voltage	5 V max.

Uninterruptive Power Supply for Checking Operation
- BU70XS (OMRON) operating temperature range: 0 to 40°C
- BU606F (OMRON) operating temperature range: 0 to 55°C

<u>**CJ1W-SPU01**</u>

With the CJ1W-SPU01, the power failure signal from an uninterruptive power supply (UPS) is connected to the COMM port. Special Cable can be used when either the BU70XS or BU606F (both by OMRON) is used as the uninterruptive power supply.

Connecting the BU70XS or BU606F by Special Cable

Connect the Uninterruptive Power Supply to the COMM port on the CJ1W-SPU01 using the Special Cable. For the UPS setting in the Setup Tool, set the power failure signal as a negative logic input.

UPS	Applicable Special Cable
BU606F	BUC10
BU70XS	BUC16

Special Cable Wiring (Reference)
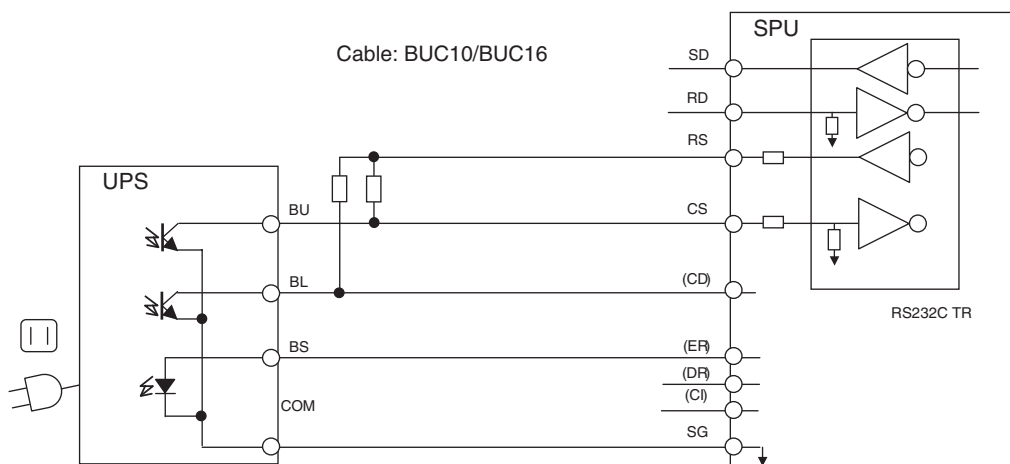
Connecting the BU70XS or BU606F by Cable or Connecting to Another UPS

The SYSMAC SPU Unit detects a power failure by the CS signal input turning ON. Therefore, wire the connection between the SYSMAC SPU Unit and the uninterruptive power supply (UPS) so that when a power failure occurs the RS signal output from the COMM port at the SYSMAC SPU Unit is returned to the CS signal input. For the UPS setting in the Setup Tool, set the power failure signal as a positive logic input.
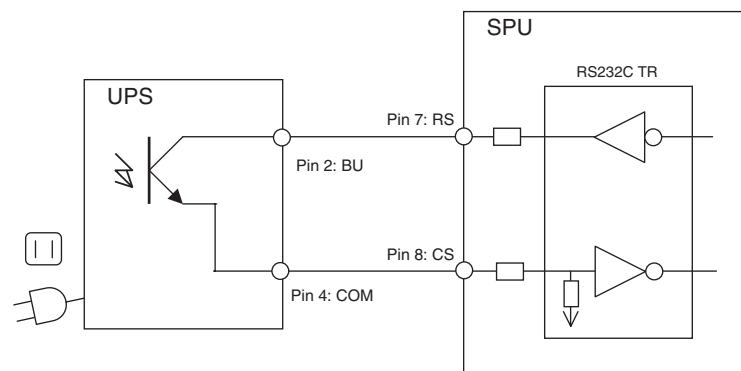
**COMM Port Specifications**

Connector type: D-Sub 9-pin male (#4-40UNC)
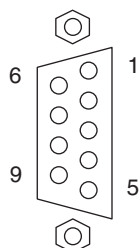
Connector Pin Arrangement

Pin No.	Abbrev.	Signal name	I/O
1	NC	Not used.	---
2	RD	Receive Data	Input
3	SD	Send Data	Output
4	NC	Not used.	---
5	SG	Signal Ground	---
6	NC	Not used.	---
7	RS	Request to Send	Output
8	CS	Clear to Send	Input
9	NC	Not used.	---
Shell	FG	Shield	

Connection Example 1: Connecting the BU606F with Cable

Connection Example 2: Connecting the BU70XS with Cable
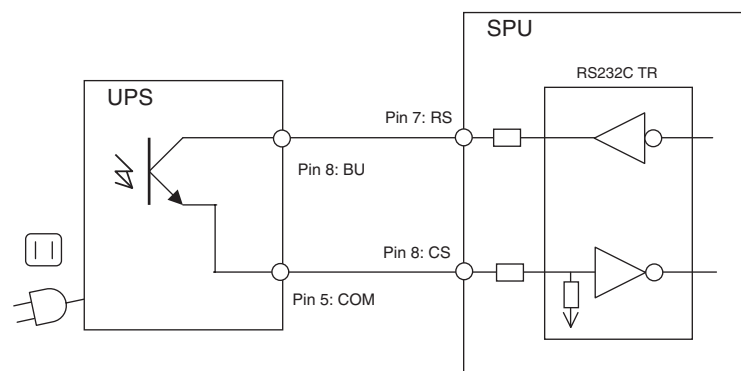
2-5 Handling a PC Card or Memory Card

2-5-1 CS1W-SPU01/SPU02

Inserting a PC Card

This section describes how to insert a PC card into the PC card slot on the SYSMAC SPU Unit.

1,2,3...   1. Loosen the screw on the card holder and move the holder out of the way.

2. Press the PC card firmly to the back of the card slot.

   Note   Be sure the PC card is facing the correct direction.

   "PC" will flash on the seven-segment display and the card indicator will light when the PC card can be used.

3. Place the card holder on the PC card and tighten the screw on the card holder.

Removing a PC Card

This section describes how to remove a PC card from the PC card slot on the SYSMAC SPU Unit.

1,2,3... 1. Press the card button for at least 2 seconds.

"PC" will flash on the seven-segment display and the card indicator will go out when the PC card can be removed.

2. Loosen the screw on the card holder and move the holder out of the way.

3. Make sure that the card indicator is not lit and then press the card eject button.

4. Remove the PC card from the PC card slot.

Formatting a PC Card

This section describes how to format a PC card for use with the SYSMAC SPU Unit.

A PC card can also be used if it is formatted on a personal computer using the FAT32 format.

1,2,3... 1. Insert the PC card as described above in *Inserting a PC Card*.

2. Be sure that the card indicator is lit and then press the select switch to select command 31.

3. Press the enter button once. "31" will flash on the seven-segment display.

4. Press the enter button again.

"PC" will flash on the seven-segment display while the PC card is being formatted. When formatting has been completed, "- -" (hyphens) will be displayed on the seven-segment display.

2-5-2   CJ1W-SPU01

Inserting a Memory Card

This section describes how to insert a Memory Card into the Memory Card slot on the SYSMAC SPU Unit.

1,2,3... 1. Remove the card cover.

2. Press the Memory Card firmly to the back of the card slot.

Note Be sure the Memory Card is facing the correct direction.
"PC" will flash on the seven-segment display and the card indicator will light when the PC card can be used.

3. Replace the card cover.

Removing a Memory Card

This section describes how to remove a Memory Card from the Memory Card slot on the SYSMAC SPU Unit.

1,2,3... 1. Press the card button for at least 2 seconds.
"PC" will flash on the seven-segment display and the card indicator will go out when the Memory Card can be removed.

2. Remove the card cover.

3. Make sure that the card indicator is not lit and then press the card eject button.

4. Remove the Memory Card from the Memory Card slot.

Formatting a Memory Card

This section describes how to format a Memory Card for use with the SYS-MAC SPU Unit.

A Memory Card can also be used if it is formatted on a personal computer using the FAT32 format.

1,2,3... 1. Insert the Memory Card as described above in *Inserting a Memory Card*.

2. Be sure that the card indicator is lit and then press the select switch to select command 31.

3. Press the enter button once. "31" will flash on the seven-segment display.

4. Press the enter button again. "PC" will flash on the seven-segment display while the Memory Card is being formatted. When formatting has been completed, "- -" (hyphens) will be displayed on the seven-segment display.

2-6 Initial Settings for the SYSMAC SPU Unit

Initial software settings must be made to use the SYSMAC SPU Unit. To make the initial settings, network parameters are set, product information is registered, and system data is transferred.

Initial settings are made using the Initial Setting Wizard in the SPU-Console Basic Software installed on a personal computer. For details, refer to *Section 3 Initial Settings of the SYSMAC SPU Unit* in the *SPU-Console Ver. 1.3 Operation Manual* (V231).

SECTION 3
Troubleshooting and Maintenance

This section provides maintenance and inspection information.

3-1   Seven-segment Display

Seven-segment display		Meaning
03 to 67	Lit	The SYSMAC SPU Unit is operating.
-S	Lit	The SYSMAC SPU Unit is idle. (Sampling Mode)
-D	Lit	The SYSMAC SPU Unit is idle. (Data Storage Mode)
---	Flashing	The sampling program is running in the SYSMAC SPU Unit.
PC	Flashing	PC card or Memory Card insertion processing is being performed.
		PC card or Memory Card removal processing is being performed.
NG	Flashing	PC card or Memory Card removal processing failed and use of the PC card or Memory Card was forcibly disabled.
		The PC card or Memory Card can be removed.
NM	Lit	The SYSMAC SPU Unit was started in Maintenance Mode.
		(Pin 6 on the DIP switch is ON.)
N2	Lit	Automatically obtaining an IP address failed.
		Check to see if the LAN cable is connected correctly and if the system is set up to obtain addresses from the DHCP.
41	Lit	Turn OFF DIP switch pins 5 and 6.
66	Lit	Turn OFF DIP switch pin 5.
Clockwise rotation		Sampling is being performed.
P<*number*>/PE	Flashing	Sampling is being set.
AA	Lit	Sampling data is being saved.
C<*number*>/CE	Flashing	Sampling data is being cleared.
B<*number*>/BE	Flashing	Sampling settings are being backed up.
M<*number*>/ME	Flashing	Operating Mode is being changed.
R<*number*>/RE	Flashing	Sampling settings are being restored.
T<*number*>/TE	Flashing	System check values are being optimized.
U<*number*>/UE	Flashing	SYSMAC SPU Unit settings are being changed.

3-2   Restrictions and Precautions

A) Never restart the SYSMAC SPU Unit or turn OFF the power supply to the PLC when changing settings such as the sampling settings. "P1," "P2," … "PE" will be displayed on the 7-segment display when sampling settings are being changed. If the SYSMAC SPU Unit is restarted or the power supply is turned OFF when sampling settings are being changed, the system or files being changed may be corrupted.

B) Sampling Capacity

The sampling capacity of the SYSMAC SPU Unit varies with the following factors:

- Sampling Operating Mode (Sampling Mode or Data Storage Mode)
- Sampling period
- Quantity of variables recorded as sampling data
- Writing speed of media where sampling data is saved

- Number of samplings that are set
- CPU Unit cycle time

There are no predetermined restrictions on these factors for SYSMAC SPU Unit sampling. It is assumed that the required sampling will be tested on the actual system to confirm applicability. We recommend that the above factors be studied and tested sufficiently before using the sampling function in an actual system to determine suitable settings.

Examples:

- When precise sampling periods are required, use Sampling Mode.
- To shorten the sampling period:
  - Reduce the quantity of sampling data.
  - Reduce the number of sets of data being sampled.
  - Use a faster storage media.
- To record a large volume of sampling data:
  - Increase the sampling period.

C) Realtime Sampling Characteristic

With realtime sampling, sampling is performed by the SYSMAC SPU Unit as much as possible according to the sampling settings. The following conditions, however, may prevent sampling from being performed at completely fixed intervals. Be sure to consider possible affects of this on the application in advance.

- Offset between the timer accuracy and the time of the SYSMAC SPU Unit
- Changes in the sampling period during compensation by the time compensation function with the CPU Unit
- Delays caused by system traffic, particularly concentrated access to the storage media

To handle these problems, the SYSMAC SPU Unit provides time stamps with sampling data. We recommend that tests be performed in advance so that the results of sampling are not radically different from those for fixed-interval sampling.

D) Relationship to Cycle Time of CPU Unit

- The SYSMAC SPU Unit collects I/O memory data during the I/O refresh interval of the CPU Unit. The cycle time of the CPU Unit, however, will be longer when the SYSMAC SPU Unit is sampling I/O memory. The affect of the SYSMAC SPU Unit on the CPU Unit cycle time depends on the series of CPU Unit, as given below.
  - CS1 CPU Units: 1.0 ms + No. of words sampled $\times$ 1 μs
  - CS1-H CPU Units: 0.2 ms + No. of words sampled $\times$ 0.8 μs
  - CJ1-H CPU Units: 0.2 ms + No. of words sampled $\times$ 0.8 μs
  - CJ1M CPU Units: 0.2 ms + No. of words sampled $\times$ 0.8 μs
- The sampling period of the SYSMAC SPU Unit cannot be shorter than the cycle time of the CPU Unit. This is because the SYSMAC SPU Unit uses the I/O refresh period of the CPU Unit's cycle time to collect data. If a sampling period is set that is shorter than the cycle time of the CPU Unit, I/O memory will be sampled at an interval equivalent to the cycle time of the CPU Unit.

- When the CPU Unit is in PROGRAM mode, the CPU Unit's cycle time will be longer so it may not be possible to read the data within the set time interval.

E) **Sampling File Size**
- The maximum size of one sampling file is 2 GB.
- If sufficient space cannot be secured in advance for the sampling settings, the disk may become full during sampling, causing an error.
- Depending on the file sizes, time may be required to change sampling settings to secure space in advance.
- When saving data without a specified number of records, the file size will continuously increase until data collection is stopped. Be sure that there is enough available memory for the data.

F) Always execute the Change Sampling Settings command, e.g., from the SPU-Console, when inserting a new PC card. If this command is not executed, it may not be possible to secure sufficient file space for sampling files during the sampling operation.

G) A long period of time may be required to search for a SYSMAC SPU Unit on the Windows network depending on the proxy server settings in Windows Internet Explorer. Change the Windows proxy server setting to one of the following settings from Internet Explorer: ***Tools - Internet Options - Connections Tab - LAN Settings - Proxy Server.***
- Clear the selection to use the proxy server for LAN.
- Click the **Details** Button and set the IP address of the SYSMAC SPU Unit so that the proxy server is not used for it.

H) **Executing SYSMAC SPU Unit Commands from the CPU Unit.**

The SYSMAC SPU Unit supports functions that allow specific words in the I/O memory of the CPU Unit to be used to specify commands to be executed and to provide SYSMAC SPU Unit status in the CPU Unit. These words are automatically read and written by the SYSMAC SPU Unit. Be sure to allocate words in the CPU Unit to the SYSMAC SPU Unit so that the allocated words will not affect the control program in any way.

I) Never delete the files and folders in the Journal folder, which is a Windows network-shared folder. Sampling may not be possible if these folders or files are deleted. If any of these folder or files is deleted, perform the procedure to set sampling from the SPU-Console.

J) The SYSMAC SPU Unit operates on UTC (coordinated universal time), so the creation date of the network-shared folder may not be appropriate for the local time. Before using the SYSMAC SPU Unit, change the time zone in the SPU-Console's Unit settings.

3-3   Inspection and Unit Replacement Precautions

Periodic inspections are required to ensure using the SYSMAC SPU Unit under optimum conditions.

3-3-1   Inspections

Inspection Items

The main functional components of the SYSMAC SPU Unit are semiconductors. There are no components that will stop functioning all of a sudden when a specific life is reached, but the components may deteriorate depending on the operating environment. Periodic inspections are thus very important.

Inspection Period

Inspections should normally be performed every six months to one year. The inspection period must, however, be based on the ambient conditions.

Inspection Items

Corrective measures must be performed to maintain the following items within the criteria.

Inspection Items	Inspection	Criteria
Ambient environment	Inspect the ambient temperature and the temperature inside the control panel.	0 to 55°C
	Inspect the ambient humidity and the humidity inside the control panel.	10% to 90% (with no condensation)
	Inspect for the collection of dust.	There must be no dust.
Installation	Inspect the mounting of the Unit.	The Unit must not be loose.
	Inspect the LAN cables to be sure they are inserted properly.	The Unit must not be loose.
	Inspect the LAN cables for abnormalities.	There must be no abnormalities in the exterior appearance.
	Inspect the PC card holder to be sure it is secure.	The Unit must not be loose.

Tools Required for Inspection

The following items are used during inspection.

Items Normally Required

Both flat-blade and Phillips screwdrivers

Circuit tester or voltage meter

Industrial alcohol and cotton cloth

Items Sometimes Required

Synchroscope

Oscilloscope with pen recorder

Thermometer and hygrometer

3-3-2 Unit Replacement Precautions

If a faulty SYSMAC SPU Unit is discovered during inspections, the SYSMAC SPU Unit will need to be replaced. Observe the following precautions when replacing a SYSMAC SPU Unit.

Always turn OFF the power supply before replacing the Unit.

After replacing the Unit, check the new Unit to be sure it is operating correctly.

- When returning a fault Unit for repairs, provide as many details on the nature of the problem as possible, attach the information to the Unit, and return it to your OMRON representative.

- If contact faults are discovered, use a cotton cloth wetted in industrial-quality alcohol to clean the contacts and then remove all lint from the contacts before mounting the Unit.

All SYSMAC SPU Unit parameters can be backed up in the Memory Card by executing command number 21 (Back up the sampling settings). This file can then be read after replacing the SYSMAC SPU Unit by executing command number 22 (Recover the sampling settings) to easily make the proper settings for any Unit.

3-4 Restarting the SYSMAC SPU Unit

The SYSMAC SPU Unit can be restarted by itself without turning OFF the power supply to the CPU Unit. For some applications, it is difficult to turn OFF the power supply to the entire PLC. The methods described here can be used to restart only the SYSMAC SPU Unit.

There are three different ways that can be used to restart the SYSMAC SPU Unit.

1,2,3...   1. Execute SYSMAC SPU Unit command number 12 (Restart unit).
This is the most recommended method.

2. Turn ON the CPU Bus Unit Restart Bit allocated to the SYSMAC SPU Unit in the Auxiliary Area in the CPU Unit.
If you use this method, be careful not to restart the wrong Unit by turning ON the wrong bit.

3. Turn ON pin 6 on the DIP switch on the SYSMAC SPU Unit and press the ENTER button for a few seconds.
"NM" will be displayed on the 7-segment display after restarting. Turn OFF pin 6 on the DIP switch and then execute SYSMAC SPU Unit command number 12 (Restart unit).
This method can be used to force-restart the SYSMAC SPU Unit. Using this method is not recommended because all processing for saving sampling data to files will be force-ended.

Index

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. V229-E1-03

Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	September 2004	Original production
02	June 2005	Revised to explain the features added in the SYSMAC SPU Unit upgrade from version 1.0 to version 1.2.
03	November 2005	Revised to add the CJ-series CJ1W-SPU01 SYSMAC SPU Unit, and to explain the SYSMAC SPU Unit upgrade from unit version 1.2 to unit version 1.3.

OMRON