SYSMAC CS/CJ-series High-speed Data Storage Units

Storage and Processing Units

SYSMAC SPU
CS1W-SPU01/02-V2
CJ1W-SPU01-V2

SYSMAC SPU Unit Setting Software
SPU-Console
WS02-SPTC1-V2

SYSMAC SPU-Host Data Link Software
Data Management Middleware
WS02-EDMC1-V2

Plc data collected and saved as CSV files

Automatic transfer of CSV files collected in the SYSMAC SPU

Data Management Middleware (EDMS)

SYSMAC SPU
Use the **SYSMACH SPU** to record data such as production history data, inspection data, and process data. Electronically managing data on the operation of equipment and devices enables root cause analysis when errors occur, as well as a proper understanding of operational tendencies.
PLC data is collected in a PLC Unit with superior environmental resistance without using a computer. Until now, data has been collected in PLC memory. Using an SYSMAC SPU Unit, however, eliminates the need for a PLC with a large-capacity memory and also eliminates the need for programming data collection in the ladder program. Direct use of the PLC bus instead of communications via a serial connection or LAN enables large amounts of data to be collected at a high speed.

Some data collection devices from other companies may not provide data concurrency. The SYSMAC SPU Unit, however, provides concurrency of simultaneous data.

Files can be created with the desired data configuration for only the necessary data from PLC memory. The data to be collected can be stored in files in the required data type, such as BOOL, REAL, INT, BCD, or STRING.

Data configuration files required for the host computer can be created, so necessary data can be retrieved even if the SPU is mounted in a device after the PLC is already set up. CHANNEL_BLOCK has been added to the variable data types from SYSMAC SPU Unit version 2.0. When the data type is set to CHANNEL_BLOCK, the data in a consecutive memory area starting from the specified address for the specified number of elements is handled as a single data item with no commas.

When using an SPU, no computer is required for data collection. High-speed, reliable data collection via the CS1 bus is possible.
### Functions

#### Sampling Mode (Previous Function)

- In this mode, I/O memory data for the PLC is sampled at a constant time interval. Data can be faithfully reproduced from the collected data.

#### Data Storage Mode

- In this mode, the specified PLC I/O memory can be recorded when triggered by a specific event. The mode can be used to record data when a specified bit turns ON or at a specified time. Data can also continue being recorded at a constant time interval after an event occurs. This enables establishing a system for error monitoring and production management for each lot and value by recording snapshots of data during production or when errors occur.

*Note: The time interval is less precise than the interval in Sampling Mode.*

#### Data Connectivity with the Computer

- The collected data can be loaded onto a computer via a PC card or Ethernet.
- FTP can be used to transfer data between the SPU Unit and the computer. (SPU Units with unit version 2.1 or later can function as an FTP client.)
- Data can be loaded onto the host computer with simple settings by using the Data Management Middleware software (refer to p. 10).
- Using shared folders, data files collected in the SYSMAC SPU Unit can be accessed from a LAN-connected Windows computer just as if accessing files on the computer itself.

#### Using FTP to Send Collected Data (Unit Version 2.1 or Later)

- With unit version 2.1 of the SPU Unit, collected data can be sent to the host computer using FTP.
- There is no need to create a data collection application on the host computer. (All that is required on the computer is an FTP server.)
- SPU-Console version 2.1 is used to set up the FTP server at the send destination. There is no need for special ladder programming in the PLC.
- The loads on the host computer and network are reduced.

#### Collection Methods to Match the Application

Depending on the application, the Data Storage Mode can be used to collect data at a specific time or when there is a change in data, and the Sampling Mode can be used to accurately collect data at high speed. The Data Storage Mode enables establishing a system for error monitoring and production management for each lot or value by recording snapshots of data during production and when errors occur.

*Note: The Sampling Mode and Data Storage Mode cannot be used at the same time.*

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**Journal folder**

- DataWriter_0000.csv
- DataWriter_0001.csv
- DataWriter_0002.csv
- DataWriter_0003.csv
- DataWriter_0004.csv

**Data folder**

- DataWriter_20070101_101010-ABC_000.csv
- DataWriter_20070101_101020-XYZ_001.csv

CSV files for which data collection has been completed are copied under a new name.
Event-triggered Collection Patterns

The patterns include memory events, which occur when a memory value matches a specified condition, and scheduled events, which occur at a specified time or time interval. The occurrence of these events can be used to implement rules, such as those for starting and stopping data collection. (Applicable only in Data Storage Mode.)

Memory Events

- Memory events can be set to generate an event when a change occurs in I/O data in PLC memory. Using memory events, events can be generated for a change in a bit ON/OFF status or by comparison to a set value (i.e., equal, above, below, or within range). For example, data could be collected only once when bit A turns ON. Alternatively, an event rule could be defined to start collection when bit A turns ON and stop collection when bit B turns ON.

Scheduled Events

- Scheduled events can be set to generate an event at a specific date and time using Scheduler settings.
- Event rules can be defined with Scheduler settings for collecting data as a result of events specified, for example, by the hour (e.g., every hour), day (e.g., every day), or week (e.g., every Monday). It is also possible to specify events by operating days or for the end of the month.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours/minutes</td>
<td>Select to generate the scheduled event at an interval specified in units of hours and minutes.</td>
</tr>
<tr>
<td>Days</td>
<td>Select to generate the scheduled event at an interval specified in days.</td>
</tr>
<tr>
<td>Weeks</td>
<td>Select to generate the scheduled event at an interval specified in units of weeks.</td>
</tr>
<tr>
<td>Months</td>
<td>Select to generate the scheduled event at an interval specified in units of months.</td>
</tr>
<tr>
<td>User defined</td>
<td>Select to generate the scheduled event at a user-defined interval.</td>
</tr>
<tr>
<td>Once only</td>
<td>Select to start the scheduled event once only.</td>
</tr>
</tbody>
</table>

Actions

- Start copying: Data collection is started.
- Stop copying: Data collection is stopped.
- Acquisition of data (one-shot): Records data once only when the condition is satisfied.
- Switch files: The next file is switched to if data is being stored in multiple files.

Collection Settings Changeable during PLC Operation

- Collection settings can be changed and collection can be restarted without turning OFF the PLC.
- Required data can be added and the collection interval can be changed even while the system is operating. Installing an SPU enables adding various systems after the system is already in operation.

Note: The PLC cycle time increases in proportion to the number of points collected.

These functions enable the following applications simply by making settings.

- Process data for each wafer can be recorded from receiving the wafer until completion.
- During the testing, process data can be recorded for each product from the start of tests until completion.
- The movement end position and filling pressure are recorded for each workpiece at events generated for starting and stopping filling.
- Data is recorded when filling starts and stops.
Data can be collected at up to 5 ms for realtime sampling in Sampling Mode.

Collection Interval Examples (Maximum Performance)
- 25 data items (variables): 5 ms
- 250 data items (variables): 10 ms
- 500 data items (variables): 20 ms

Note: These times may not be possible for some settings.

Conventional Collection with a Computer at an Interval of Hundreds of Milliseconds

Collection with a SYSMAC SPU at an Interval of a Few Milliseconds

Using FTP to Receive Recipe Files (Unit Version 2.1 or Later)

- Once you set up a Request Bit in the PLC with the SPU-Console Setup, all you have to do is turn ON the bit for the SPU Unit to function as an FTP client and receive a recipe file from the FTP server.
- A recipe file can be automatically received from the host computer (functioning as the FTP server) simply by turning ON an input to the PLC.
- You can combine the recipe function with a PT to create an application in which production parameters can be downloaded to equipment simply by pressing a button on the PT.

Recipe Function

- The recipe function enables writing numeric data (such as production parameters) and text strings to a memory area of the PLC. Using the recipe-writing function simplifies tasks such as retooling. (Note: The recipe function can be used only in Data Storage Mode.)
- Numeric data and text strings to be written to a memory area of the PLC must be created in advance as recipe data (i.e., a CSV file) and stored in a Memory Card in the SYSMAC SPU Unit.
- Ladder programming for developing recipe data is not required.
- Using the recipe function saves PLC memory by saving recipe data to a Memory Card in the SYSMAC SPU Unit rather than requiring saving to the PLC data memory.
- Recipe data can be written in response to a request from the PLC or from a computer or other external device.
- Numeric data and text strings can be changed even when the SYSMAC SPU Unit is operating.

Recipe data created

PC

SPU

CPU

Recipe file reception completed

Request for Key1 recipe

Key1 recipe data loaded

Recipe settings

PLC CPU

Ladder programming

DM

Recipe data

Memory Card in SPU Unit

Recipe file

SPU Unit

Key Name Width Height Color
Key 1 Product 1 100 52 Red
Key 2 Product 2 150 54 Green
Key 3 Product 3 200 62 Blue

The key is set from the ladder programming or from an external source and the Write Request Bit is turned ON.

The recipe data for the specified key is written to the PLC.
Setting Software That Is Easier To Use than Ever Before

- **Project Explorer**
  SYSMAC SPU Unit connection destinations can be managed using the SPU-Console. SYSMAC SPU Unit settings can be saved as projects, edited, and managed. For example, a project that has been previously set can be copied and easily reused.

- **Data Collection Status Display and Error Log Display**
  The SYSMAC SPU Unit’s operating status and error information can be displayed on the SPU-Console. A list can be displayed showing the status of data being collected, current errors, or error log. For example, the total time required to collect data and the total size of data collection files can be displayed.

- **Importing and Exporting Variable Definitions Using CSV Files**
  All variable definitions can be exported to CSV files. Variable definitions can then be edited using software such as spreadsheets. Also, data on units and scaling, for example, can be batch-edited using a spreadsheet and imported to the SPU-Console.

- **Unit Setup Using the CX-programmer**
  Unit setup for SYSMAC SPU Unit can be performed from CX-One version 2.1. IP addresses can be set from the CX-Programmer.

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Report Function

- The report function is used to display in Microsoft Excel a CSV file that was collected by the SYSMAC SPU Unit. This is different from simply opening the CSV file in Excel. Variable data collected by the SYSMAC SPU Unit can be displayed in any specified cells.

- The report function can be used to easily create reports, such as daily reports, from CSV files collected by the SYSMAC SPU Unit. Sample templates, such as daily manufacturing reports and error logs, are provided to make it easier to create various kinds of reports.
Data or bit signals can be read from devices (e.g., MFC or RF power supplies) in equipment via DeviceNet or using a PLC Unit to reliably collect data at high speed with a SYSMAC SPU. Making the required settings is simple.

Data format can be created freely for the collection data taking into account the link with the host.

The collection interval can be set freely according to the device or part for collection.

One file can be made of data collection starting when the chamber is entered and stopping when the chamber is exited.

The collected data is transferred to the host for each wafer process and each lot.

The file name can be set to the collection time or device name when it is transferred.

- **Advantages of Data Collection for Equipment and Facilities**
  - **Startup time is reduced by early extraction of the optimal process conditions for overall equipment and individual parts during equipment development or startup.**
  - Based on the data, the operation causing bottlenecks can be found and improved, which will lead to improvements in throughput.
  - The operating rate can be improved by collecting data for each device and performing combinations to find the points of machine variations.
  - Fast recovery can be achieved based on the data when there are product (i.e., wafer) faults by analyzing the causes in the process of entire devices and individual device parts or in machine operation.
  - The condition of equipment and facilities can be understood to effectively use spare parts at the optimal time.

- **Features of a System Using the SYSMAC SPU**
  - Data or bit signals can be read from devices (e.g., MFC or RF power supplies) in equipment via DeviceNet or using a PLC Unit to reliably collect data at high speed with a SYSMAC SPU.
  - Data format can be created freely for the collection data taking into account the link with the host.
  - The collection interval can be set freely according to the device or part for collection.
  - One file can be made of data collection starting when the chamber is entered and stopping when the chamber is exited.
  - The collected data is transferred to the host for each wafer process and each lot.
  - The file name can be set to the collection time or device name when it is transferred.

- **Sampling Examples**
  - **Monitor the deterioration of an actuator (e.g., monitoring the time from the starting edge to the stopping edge).**
  - **Monitor interlocks between robots (e.g., the interlock signal times).**
  - **Monitor motor deterioration trends (e.g., monitoring the ON time, revolutions, and speed).**

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- **Auto Parts Production Line**

- **Benefits of Data Collection for Equipment and Facilities**
  - **Reduce startup time**
  - Reduce startup time by quickly finding differences during startup in the operation of entire facilities and individual machines compared with during development.
  - Based on the data, the operations causing bottlenecks can be found and improved, which will lead to improvements in the production time per unit.
  - The operating rate can be improved by collecting data for each device and performing combinations to find the points of machine variations.
  - Quick recovery can be achieved by analyzing causes based on the equipment data when an error occurs.
  - The condition of equipment and facilities can be understood to effectively use spare parts at the optimal time.

- **Features of a System Using the SYSMAC SPU Unit**
  - Data can be collected from equipment controlled by a PLC without restrictions.
  - Collection data can be formatted without restrictions.
  - Collection intervals can be set freely according to the device or part for collection.
  - One file can be made of data collection starting when the chamber is entered and stopping when the chamber is exited.
  - Data can be transferred to the host system without turning OFF the PLC controlling the system.
  - Settings for the items to be collected can also be changed without turning OFF the PLC.
Data Measurement Applications

Application Examples
- Factory data on temperatures, electric power, and pressure can be collected and stored without a computer.
- Production history data can be collected easily and applied for traceability and root cause analysis.
- Inspection process data can be collected easily and applied for traceability.
- Collection and storage of process data at device startup enable stabilization of process conditions in the device and maintenance of product quality.

Benefits of SPU Introduction
- Relief from anxiety over data collection using a computer
- Collecting large amounts of data at a high speed
- Eliminating development costs for data collection software
- High-speed collection

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Applications for Facility Improvement, Troubleshooting, and Preventive Maintenance

Application Examples
- Electronic management of data on operation of machines and facilities enables precise measurement for improvement of the production time per unit without using a conventional stopwatch.
- Electronic management of data on operation of machines and facilities enables troubleshooting based on data rather than the conventional reliance on experience or intuition. Even non-expert employees can perform troubleshooting to minimize downtime.
- The efficiency of preventive measures can be improved for remote machines by transferring operation data and enabling prediction of causes.
- Electronic management of data on operation of machines and facilities enables understanding of equipment trends and assists in preventive maintenance.

Benefits of SPU Introduction
- Collect data at the same interval as the PLC cycle time
- Collecting large amounts of data at a high speed
- Eliminating development costs for data collection software
- Electronic management of data on operation of devices for analysis and understanding of trends
The Data Management Middleware for the SYSMAC SPU Unit is Windows-based software for transferring data files collected by the SYSMAC SPU to the computer and managing the files.

- The CSV files can be transferred to a computer by setting only the CSV files the user wants to transfer. It is not necessary to install or set up FTP server software on the computer.
- The data collected by the SYSMAC SPU Unit is automatically stored in an untitled table as a database. It isn’t necessary to create a program to store data to the database, reducing the cost of system development. (This is a new version-2 function.)

- The user can select a name and folder when copying the data files to the computer.
- Files can be copied with easily distinguished names, for example, by adding the collection date and time to a chosen character string such as “Device1.”
- The SYSMAC SPU Unit will continue recording data even if the computer is turned OFF because of a network interruption or other cause.
- Copying can be resumed from a data file if it is not already transferred. Data collection systems can therefore be established with strong resistance against system disturbances.
- The SYSMAC SPU Unit time and CPU Unit time can be periodically set to the computer time automatically.

### Data Management Middleware for the SYSMAC SPU

- **CSV file**
  - Memory Card
  - Ethernet
  - SYSMAC SPU Unit

- **Data Management Middleware**
  - Automatic file copying onto a computer

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<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System requirements</strong></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>WS02-EDMC1-V2</td>
</tr>
<tr>
<td>Computer</td>
<td>Personal computer with a Pentium, Celeron, or equivalent processor</td>
</tr>
<tr>
<td>Display</td>
<td>SVGA (800 x 600) or better high-resolution video adapter and monitor</td>
</tr>
<tr>
<td>OS</td>
<td>Microsoft Windows 2000 Professional</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows XP Home Edition</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows XP Professional</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows 2003 Server</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows Vista</td>
</tr>
<tr>
<td>Platform (execution</td>
<td>Microsoft .NET Framework Version 1.1</td>
</tr>
<tr>
<td>environment)</td>
<td>Microsoft Data Access Components (MDAC) 2.6 or higher</td>
</tr>
<tr>
<td>Communications platform</td>
<td>FinsGateway Version 2003</td>
</tr>
<tr>
<td>Other required software</td>
<td>The separate SPU-Console is required to make SPU Unit settings.</td>
</tr>
<tr>
<td><strong>Copy functions</strong></td>
<td></td>
</tr>
<tr>
<td>Number of copies</td>
<td>Up to 256 copies can be set.</td>
</tr>
<tr>
<td>Initial start condition</td>
<td>Automatic startup when computer starts or use Start Button.</td>
</tr>
<tr>
<td>Storage location</td>
<td>Any folder</td>
</tr>
<tr>
<td>Storage file name</td>
<td>The file name can be created automatically by combining the following string</td>
</tr>
<tr>
<td></td>
<td>formats: Any user-set string, copied name, copy-source Unit name, copy date</td>
</tr>
<tr>
<td></td>
<td>(year, month, day) and time, copied file’s serial number, date/time of the</td>
</tr>
<tr>
<td></td>
<td>first record in the file, or date/time of the last recorded record.</td>
</tr>
<tr>
<td>**Database storage</td>
<td></td>
</tr>
<tr>
<td>function**</td>
<td></td>
</tr>
<tr>
<td>Number of stored databases</td>
<td>Up to 65 databases can be set.</td>
</tr>
<tr>
<td>Initial start condition</td>
<td>Automatic startup when computer starts or use Start Button.</td>
</tr>
<tr>
<td>Applicable database formats</td>
<td>Microsoft Access, Microsoft SQL Server, Oracle Database</td>
</tr>
</tbody>
</table>

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**Data is automatically stored in the database.**
### General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable PLCs</td>
<td>CS Series, CJ Series</td>
</tr>
<tr>
<td>Unit model number</td>
<td>CJ1W-SPU0102/2, CJ1W-SPU0102</td>
</tr>
<tr>
<td>Unit classification</td>
<td>CPU Bus Unit</td>
</tr>
<tr>
<td>Unit number</td>
<td>0 to F</td>
</tr>
<tr>
<td>Mounting location</td>
<td>16 Unit max. (See note 1.)</td>
</tr>
</tbody>
</table>

### Functional and Performance Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting methods</td>
<td>Any one of the following methods can be used:</td>
</tr>
<tr>
<td></td>
<td>• Start automatically when SPU Unit is started.</td>
</tr>
<tr>
<td></td>
<td>• Start with an SPU-Console operation.</td>
</tr>
<tr>
<td></td>
<td>• Start with the SPU Units front-panel command buttons.</td>
</tr>
<tr>
<td></td>
<td>(Specify the command number.)</td>
</tr>
<tr>
<td></td>
<td>• Start from the CPU Units ladder program.</td>
</tr>
</tbody>
</table>

### Data Collection Patterns

#### Basic Collection Pattern (1 pattern required)

- **Data Collection Patterns:** Basic Collection Pattern (Up to 64 patterns)

#### Sampling

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling method</td>
<td>Realtime sampling: 1 pattern Normal sampling: Up to 3 patterns</td>
</tr>
<tr>
<td>User-specified intervals</td>
<td>Realtime sampling: 0 ms min. Normal sampling: 100 ms min.</td>
</tr>
</tbody>
</table>

#### Interval

- **Interval:** User-specified intervals

#### Copy options

- **Copy options:** Basic Collection Pattern: Setting not possible. Other Data Collection Patterns: Up to 10 patterns

### Standard Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1W-SPU0102</td>
<td>SYSCOM SPU Main Unit (Ver. 2.1) for the CS Series</td>
<td>One LAN port, PC card slot</td>
</tr>
<tr>
<td>CS1W-SPU0102</td>
<td>SYSCOM SPU Main Unit (Ver. 2.1) for the CS Series</td>
<td>Two LAN ports, one PC card slot</td>
</tr>
<tr>
<td>CJ1W-SPU0102</td>
<td>SYSCOM SPU Main Unit (Ver. 2.1) for the CJ Series</td>
<td>One LAN port, CF Card slot</td>
</tr>
<tr>
<td>WS2B-SPUC1</td>
<td>SPU Unit Data Management Middleware (Ver. 1/2)</td>
<td>Optional software</td>
</tr>
<tr>
<td>WS2B-SPUC1</td>
<td>SPU Unit Data Management Middleware (Ver. 1/2)</td>
<td>Optional software, five licenses</td>
</tr>
<tr>
<td>HMC-AP01</td>
<td>Memory Card Adapter</td>
<td>Compact flash-PC card adapter</td>
</tr>
<tr>
<td>HMC-AP01</td>
<td>Memory Card Adapter (see note 2.)</td>
<td>128-MB compact flash card</td>
</tr>
<tr>
<td>HMC-AP01</td>
<td>Memory Card Adapter (see note 2.)</td>
<td>256-MB compact flash card</td>
</tr>
<tr>
<td>HMC-AP01</td>
<td>Memory Card Adapter (see note 2.)</td>
<td>512-MB compact flash card</td>
</tr>
</tbody>
</table>

### Recipe function

- **Recipe function:** File format: CSV The file size is restricted by the file size that can be stored in the recipe folder. Records: Specified by the user.

### Writing method

- **Writing method:** Continuous region method: Data is written to continuous memory addresses.
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.

Note: Do not use this document to operate the Unit.