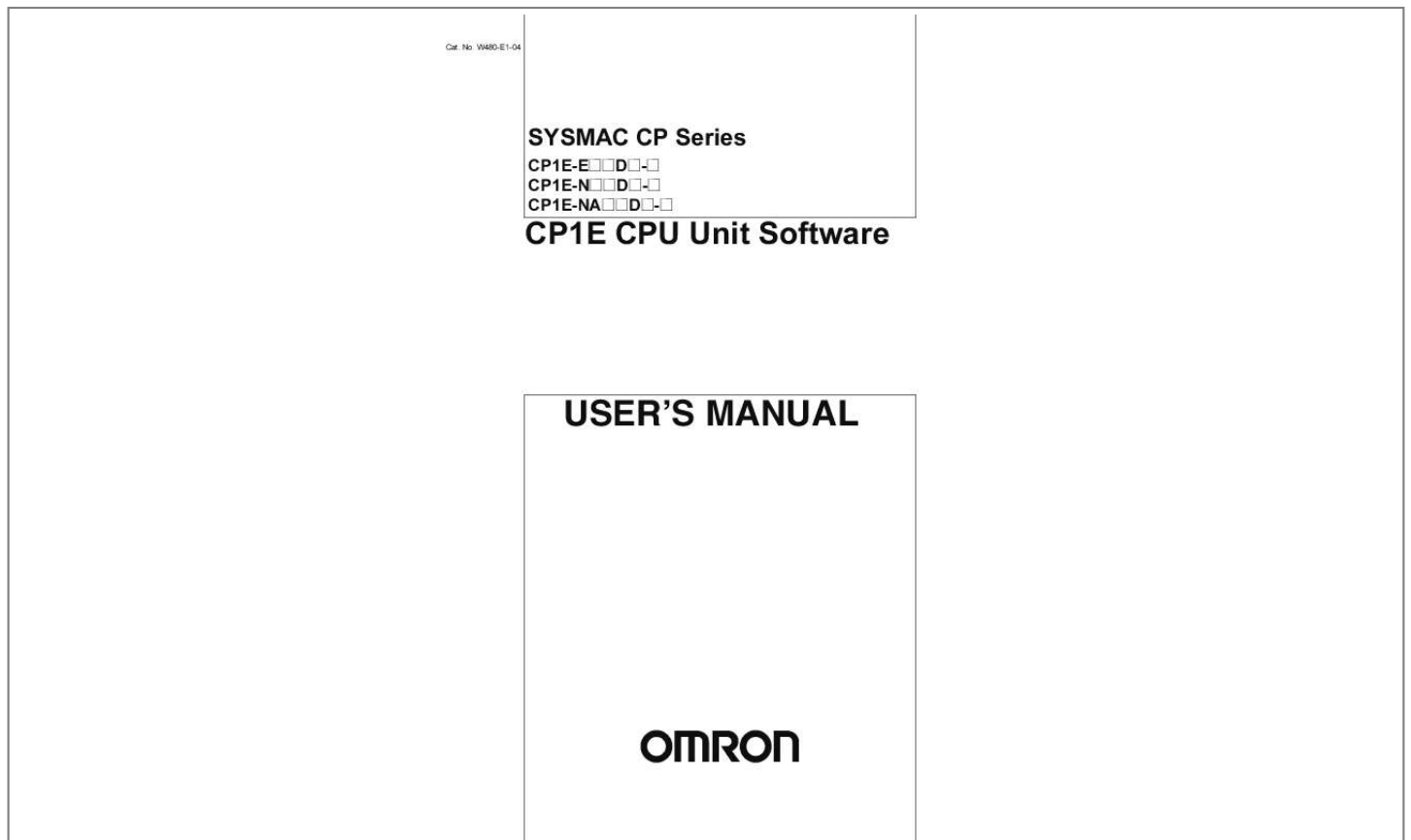




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You can read the recommendations in the user guide, the technical guide or the installation guide for OMRON CP1E CPU UNIT SOFTWARE. You'll find the answers to all your questions on the OMRON CP1E CPU UNIT SOFTWARE in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

**User manual OMRON CP1E CPU UNIT SOFTWARE**  
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**Operating instructions OMRON CP1E CPU UNIT SOFTWARE**  
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**Manual abstract:**

No. W480-E1-04 SYSMAC CP Series CP1E-E@@D@-@ CP1E-N@@D@-@ CP1E-NA@@@@@@@@@Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication. SYSMAC CP Series CP1E-E@@D@-@ CP1E-N@@D@-@ CP1E-NA@@D@-@ CP1E CPU Unit Software User's Manual Revised June 2010 Introduction Thank you for purchasing a SYSMAC CP-series CP1E Programmable Controller. This manual contains information required to use the CP1E. Read this manual completely and be sure you understand the contents before attempting to use the CP1E.

*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 *Applicable Products* CP-series CP1E CPU Units · Basic Models CP1E-E DA basic model of CPU Unit that support basic control applications using instructions such as basic, movement, arithmetic, and comparison instructions. · Application Models CP1E-N/NA DAN application model of CPU Unit that supports connections to Programmable Terminals, inverters, and servo drives.

The CP Series is centered around the CP1H, CP1L, and CP1E CPU Units and is designed with the same basic architecture as the CS and CJ Series. Always use CP-series Expansion Units and CP-series Expansion I/O Units when expanding I/O capacity. I/O words are allocated in the same way as for the CPM1A/CPM2A PLCs, i.e., using fixed areas for inputs and outputs.

CP1E CPU Unit Software User's Manual(W480) 1 CP1E CPU Unit Manuals Information on the CP1E CPU Units is provided in the following manuals. Refer to the appropriate manual for the information that is required. This Manual CP1E CPU Unit Hardware User's Manual(Cat. No. W479) CP1E CPU Unit Software User's Manual(Cat.

No. W480) CP1E CPU Unit Instructions Reference Manual(Cat. No. W483) 1 Setting Hardware · Names and specifications of the parts of all Units · Basic system configuration for each CPU Unit · Connection methods for Expansion I/O Units and Expansion Units Mounting and 2 Wiring · Wiring methods for the power supply · Wiring methods between external I/O devices and Expansion I/O Units or Expansion Units 3 Online to the PLC Connecting Cables for CX-Programmer Support Software Procedures for connecting the CX-Programmer Support Software Connecting 4 Software Setup Software setting methods for the CPU Units (PLC Setup) 5 Creating the Program · Program types and basic information · CPU Unit operation · Internal memory · Built-in CPU functions · Settings Detailed information on programming instructions 6 Debugging Operation · Checking I/O wiring, setting the Auxiliary Area settings, and performing trial operation · Monitoring and debugging with the CX-Programmer Checking and 7 Troubleshooting Maintenance and Error codes and remedies if a problem occurs 2 CP1E CPU Unit Software User's Manual(W480) Manual Configuration The CP1E CPU manuals are organized in the sections listed in the following tables. Refer to the appropriate section in the manuals as required. CP1E CPU Unit Software User's Manual (Cat. No. W480) (This Manual) Section Section 1 Overview Section 2 CPU Unit Memory Section 3 CPU Unit Operation Section 4 Programming Concepts Section 5 I/O Memory Section 6 I/O Allocation Section 7 PLC Setup Section 8 Overview and Allocation of Built-in Functions Section 9 Quick-response Inputs Section 10 Interrupts Section 11 High-speed Counters Section 12 Pulse Outputs Section 13 PWM Outputs Section 14 Serial Communications Contents This section gives an overview of the CP1E, describes its application procedures. This section describes the types of internal memory in a CP1E CPU Unit and the data that is stored. This section describes the operation of a CP1E CPU Unit.

This section provides basic information on designing ladder programs for a CP1E CPU Unit. This section describes the types of I/O memory areas in a CP1E CPU Unit and the details. This section describes I/O allocation used to exchange data between the CP1E CPU Unit and other units. This section describes the PLC Setup, which are used to perform basic settings for a CP1E CPU Unit. This section lists the built-in functions and describes the overall application flow and the allocation of the functions. This section describes the quick-response inputs that can be used to read signals that are shorter than the cycle time. This section describes the interrupts that can be used with CP1E PLCs, including input interrupts and scheduled interrupts. This section describes the high-speed counter inputs, high-speed counter interrupts, and the frequency measurement function. This section describes positioning functions such as trapezoidal control, jogging, and origin searches. This section describes the variable-duty-factor pulse (PWM) outputs.

This section describes communications with Programmable Terminals (PTs) without using communications programming, no-protocol communications with general components, and connections with a ModbusRTU Easy Master, Serial PLC Link, and host computer. This section describes the built-in analog function for NA-type CPU Units. This section describes PID temperature control, clock functions, DM backup functions, security functions. This section gives an overview of the Ethernet Option Board, describes its setting methods, I/O memory allocations, troubleshooting, how to connect the CX-Programmer, and how to install an Ethernet network. This section describes basic functions of the CX-Programmer, such as using the CX-Programmer to write ladder programs to control the CP1E CPU Unit, to transfer the programs to the CP1E CPU Unit, and to debug the programs.

The appendices provide lists of programming instructions, the Auxiliary Area, cycle time response performance, PLC performance at power interruptions. Section 15 Analog I/O Function Section 16 Built-in Functions Section 17 Ethernet Option Board Section 18 Operating the Programming Device Appendices CP1E CPU Unit Software User's Manual(W480) 3 CP1E CPU Unit Hardware User's Manual (Cat. No. W479) Section Section 1 Overview and Specifications Section 2 Basic System Configuration and Devices Contents This section gives an overview of the CP1E, describes its features, and provides its specifications. This section describes the basic system configuration and unit models of the CP1E.

Section 3 Part Names and Functions This section describes the part names and functions of the CPU Unit, Expansion I/O Units, and Expansion Units in a CP1E PLC.



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Section 4 Programming Device This section describes the features of the CX-Programmer used for programming and debugging PLCs, as well as how to connect the PLC with the Programming Device by USB. This section describes how to install and wire CP1E Units. This section describes how to troubleshoot problems that may occur with a CP1E PLC, including the error indications provided by the CP1E Units. This section describes periodic inspections, the service life of the Battery, and how to replace the Battery. This section describes application methods for Expansion Units. The appendices provide information on dimensions, wiring diagrams, and wiring serial communications for the CP1E. Section 5 Installation and Wiring Section 6 Troubleshooting Section 7 Maintenance and Inspection Section 8 Using Expansion Units and Expansion I/O Units Appendices CP1E CPU Unit Instructions Reference Manual (Cat. No. W483) Section Section 1 Summary of Instructions Section 2 Instruction Section 3 Instruction Execution Times and Number of Steps Section 4 Monitoring and Computing the Cycle Time Appendices Contents This section provides a summary of instructions used with a CP1E CPU Unit.

This section describes the functions, operands and sample programs of the instructions that are supported by a CP1E CPU Unit. This section provides the execution times for all instructions used with a CP1E CPU Unit. This section describes how to monitor and calculate the cycle time of a CP1E CPU Unit that can be used in the programs. The appendices provide a list of instructions by Mnemonic and ASCII code table for the CP1E CPU Unit. 4 CP1E CPU Unit Software User's Manual(W480) Manual Structure Page Structure and Icons The following page structure and icons are used in this manual. 5 Installation and wiring Level 2 heading Level 3 heading Step in a procedure Indicates a step in a procedure. 5-2 5-2-1 Installation Installation Location Level 1 heading Level 2 heading Level 3 heading Gives the current headings. DIN Track Installation 1 5-2 Installation Use a screwdriver to pull down the DIN Track mounting pins from the back of the Units to release them, and mount the Units to the DIN Track. DIN Track mounting pins 5 5-2-1 Installation Location Page tab Gives the number of the section. Release 2 Fit the back of the Units onto the DIN Track by catching the top of the Units on the Track and then pressing in at the bottom of the Units, as shown below.

DIN Track 3 Press in all of the DIN Track mounting pins to securely lock the Units in place. Special Information (See below.) Icons are used to indicate precautions and additional information. DIN Track mounting pins Precautions for Correct Use Tighten terminal block screws and cable screws to the following torques. M4: 1.

2 N-m M3: 0.5 N-m Manual name CP1E CPU Unit Hardware User's Manual(W479) 5-3 This illustration is provided only as a sample and may not literally appear in this manual. Special Information Special information in this manual is classified as follows: Precautions for Safe Use Precautions on what to do and what not to do to ensure using the product safely. Precautions for Correct Use Precautions on what to do and what not to do to ensure proper operation and performance. Additional Information Additional information to increase understanding or make operation easier.

References to the location of more detailed or related information. CP1E CPU Unit Software User's Manual(W480) 5 Terminology and Notation Term E-type CPU Unit Description A basic model of CPU Unit that support basic control applications using instructions such as basic, movement, arithmetic, and comparison instructions. Basic models of CPU Units are called "E-type CPU Units" in this manual. N-type CPU Unit An application model of CPU Unit that supports connections to Programmable Terminals, inverters, and servo drives. Application models of CPU Units are called "N-type CPU Units" in this manual. NA-type CPU Unit An application model of CPU Unit that supports built-in analog and connections to Programmable Terminals, inverters, and servo drives. Application models of CPU Units with built-in analog are called "NA-type CPU Units" in this manual. CX-Programmer A programming device that applies for programming and debugging PLCs. The CX-Programmer includes the Micro PLC Edition CX-Programmer (CX-One Lite), the CX-Programmer (CX-One) and the CX-Programmer for CP1E. This manual describes the unique applications and functions of the Micro PLC Edition CX-Programmer version 9.

03 or higher/CX-Programmer for CP1E. "CX-Programmer" refers to the Micro PLC Edition CX-Programmer version 9.03 or higher/ CX-Programmer for CP1E in this manual. Note E20/30/40 and N20/30/40 CPU Units are supported by CX-Programmer version 8.2 or higher. E10/14, N14/60 and NA20 CPU Units are supported by CX-Programmer version 9.03 or higher. 6 CP1E CPU Unit Software User's Manual(W480) Sections in this Manual 1 2 11 12 13 14 15 16 17 18 APP 1 2 3 4 5 6 7 8 Overview 11 12 13 14 15 16 17 18 High-speed Counters 3 Internal Memory in the CPU Unit Pulse Outputs 4 CPU Unit Operation PWM Outputs 5 6 7 8...

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.. 7-5 Serial Option Port.....

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*... 11-26 11-5 Application Example ..*

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*12-2 Flow of Operation .....*

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*... 12-13 High-speed Jogging..*

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*12-15 Low-speed Jogging.....*

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*15-7 15-3 I/O Allocation and Related Auxiliary Area Flags.....*

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*.... 16-2 Flow of Operation.....*

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*.. 16-3 Application Example.....*

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*... 17-6 Differences in version of the Ethernet Option Board.....*

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*.. 17-25 17-5 Trouble Shooting .....*

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*..... 17-32 17-6 Connection Method with the CX-Programmer .....*

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Sequence Input Instructions .



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<http://yourpdfguides.com/dref/3215892>







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*to ensure safe usage of a CP-series PLC. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions. WARNING Caution Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage. Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage. Precautions for Safe Use Indicates precautions on what to do and what not to do to ensure using the product safely.*

*Precautions for Correct Use Indicates precautions on what to do and what not to do to ensure proper operation and performance.*



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*Symbols* The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock. The circle and slash symbol indicates operations that you must not do. The specific operation is shown in the circle and explained in text. The filled circle symbol indicates operations that you must do. The specific operation is shown in the circle and explained in text. This example shows a general precaution for something that you must do. The triangle symbol indicates precautions (including warnings).

The specific operation is shown in the triangle and explained in text. This example indicates a general precaution. The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for hot surfaces.

18 CP1E CPU Unit Software User's Manual(W480) Caution Be sure to sufficiently confirm the safety at the destination when you transfer the program or I/O memory or perform procedures to change the I/O memory. Devices connected to PLC outputs may incorrectly operate regardless of the operating mode of the CPU Unit. With an E-type CPU Unit or with an N/NA-type CPU Unit without a Battery, the contents of the DM Area (D) \*, Holding Area (H), the Counter Present Values (C), the status of Counter Completion Flags (C), and the status of bits in the Auxiliary Area (A) related to clock functions may be unstable when the power supply is turned ON. \*This does not apply to areas backed up to EEPROM using the DM backup function. If the DM backup function is being used, be sure to use one of the following methods for initialization.

1. Clearing All Areas to All Zeros Select the Clear Held Memory (HR/DM/CNT) to Zero Check Box in the Startup Data Read Area in the PLC Setup. 2. Clearing Specific Areas to All Zeros or Initializing to Specific Values Make the settings from a ladder program. If the data is not initialized, the unit or device may operate unexpectedly because of unstable data. Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable. The DM Area (D), Holding Area (H), Counter Completion Flags (C), and Counter Present Values (C) will be held by the Battery if a Battery is mounted in a CP1EN/NA D - CPU Unit. When the battery voltage is low, however, I/O memory areas that are held (including the DM, Holding, and Counter Areas) will be unstable. The unit or device may operate unexpectedly because of unstable data.

Use the Battery Error Flag or other measures to stop outputs if external outputs are performed from a ladder program based on the contents of the DM Area or other I/O memory areas. Sufficiently check safety if I/O bit status or present values are monitored in the Ladder Section Pane or present values are monitored in the Watch Pane. If bits are set, reset, force-set, or force-reset by inadvertently pressing a shortcut key, devices connected to PLC outputs may operate incorrectly regardless of the operating mode. CP1E CPU Unit Software User's Manual(W480) 19 Caution Program so that the memory area of the start address is not exceeded when using a word address or symbol for the offset. For example, write the program so that processing is executed only when the indirect specification does not cause the final address to exceed the memory area by using an input comparison instruction or other instruction. If an indirect specification causes the address to exceed the area of the start address, the system will access data in other area, and unexpected operation may occur. Set the temperature range according to the type of temperature sensor connected to the Unit. Temperature data will not be converted correctly if the temperature range does not match the sensor. Do not set the temperature range to any values other than those for which temperature ranges are given in the following table. An incorrect setting may cause operating errors.

20 CP1E CPU Unit Software User's Manual(W480) Precautions for Safe Use Observe the following precautions when using a CP-series PLC. Handling · To initialize the DM Area, back up the initial contents for the DM Area to backup memory using one of the following methods. · Set the number of words of the DM Area to be backed up starting with D0 in the Number of CH of DM for backup Box in the Startup Data Read Area. · Include programming to back up specified words in the DM Area to built-in EEPROM by turning ON A751.15 (DM Backup Save Start Bit).

· Check the ladder program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation. · The ladder program and parameter area data in the CP1E CPU Units are backed up in the built-in EEPROM backup memory. The BKUP indicator will light on the front of the CPU Unit when the backup operation is in progress. Do not turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. The data will not be backed up if power is turned OFF and a memory error will occur the next time the power supply is turned ON. · With a CP1E CPU Unit, data memory can be backed up to the built-in EEPROM backup memory. The BKUP indicator will light on the front of the CPU Unit when backup is in progress. Do not turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. If the power is turned OFF during a backup, the data will not be backed up and will not be transferred to the DM Area in RAM the next time the power supply is turned ON. · Before replacing the battery, supply power to the CPU Unit for at least 30 minutes and then complete battery replacement within 5 minutes. Memory data may be corrupted if this precaution is not observed. · The equipment may operate unexpectedly if inappropriate parameters are set. Even if the appropriate parameters are set, confirm that equipment will not be adversely affected before transferring the parameters to the CPU Unit. · Before starting operation, confirm that the contents of the DM Area is correct.

· After replacing the CPU Unit, make sure that the required data for the DM Area, Holding Area, and other memory areas has been transferred to the new CPU Unit before restarting operation. · Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock. · 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 (including the setting of the startup operating mode). · Force-setting/force-resetting any bit in memory. · Changing the present value of any word or any set value in memory. External Circuits · Always configure the external circuits to turn ON power to the PLC before turning ON power to the control system.



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If the PLC power supply is turned ON after the control power supply, temporary errors may result in control system signals because the output terminals on DC Output Units and other Units will momentarily turn ON when power is turned ON to the PLC.

· Fail-safe measures must be taken by the customer to ensure safety in the event that outputs from output terminals remain ON as a result of internal circuit failures, which can occur in relays, transistors, and other elements. CP1E CPU Unit Software User's Manual(W480) 21 · If the I/O Hold Bit is turned ON, the outputs from the PLC will not be turned OFF and will maintain their previous status when the PLC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS instruction, all outputs from PLC will be turned OFF and only the internal output status in the CPU Unit will be maintained.) 22 CP1E CPU Unit Software User's Manual(W480) Regulations and Standards Trademarks SYSMAC is a registered trademark for Programmable Controllers made by OMRON Corporation.

CX-One is a registered trademark for Programming Software made by OMRON Corporation. Windows is a registered trademark of Microsoft Corporation. Other system names and product names in this document are the trademarks or registered trademarks of their respective companies. CP1E CPU Unit Software User's Manual(W480) 23 Related Manuals The following manuals are related to the CP1E. Use them together with this manual.

Manual name SYSMAC CP Series CP1E CPU Unit Software User's Manual (this manual) Cat. No. W480 Model numbers CP1E-E CP1E-N CP1E-NA DDDApplication To learn the software specifications of the CP1E PLCs Contents Describes the following information for CP1E PLCs. · CPU Unit operation · Internal memory · Programming · Settings · CPU Unit built-in functions · Interrupts · High-speed counter inputs · Pulse outputs · Serial communications · Analog I/O function · Other functions Use this manual together with the CP1E CPU Unit Hardware User's Manual (Cat. No. W479) and Instructions Reference Manual (Cat. No. W483). SYSMAC CP Series CP1E CPU Unit Hardware User's Manual W479 CP1E-E CP1E-N CP1E-NA DDDTo learn the hardware specifications of the CP1E PLCs Describes the following information for CP1E PLCs. · Overview and features · Basic system configuration · Part names and functions · Installation and settings · Troubleshooting Use this manual together with the CP1E CPU Unit Software User's Manual (Cat.

No. W480) and Instructions Reference Manual (Cat. No. W483). SYSMAC CP Series CP1E CPU Unit Instructions Reference Manual W483 CP1E-E CP1E-N CP1E-NA DDDTo learn programming instructions in detail Describes each programming instruction in detail. When programming, use this manual together with the CP1E CPU Unit Software User's Manual (Cat. No. W480). Describes 1) C-mode commands and 2) FINS commands in detail. Read this manual for details on C-mode and FINS commands addressed to CPU Units.

CS/CJ/CP/NSJ Series Communications Commands Reference Manual W342 CS1G/H-CPU CS1G/H-CPU CS1D-CPU CS1D-CPU CS1W-SCU CS1W-SCB CJ1G/H-CPU CJ1G-CPU CJ1M-CPU CJ1G-CPU CJ1W-SCU P H S H -V1 To learn communications commands for CS/CJ/CP/NSJseries Controllers in detail -V1 -V1 H Note This manual describes commands addressed to CPU Units. It does not cover commands addressed to other Units or ports (e.g., serial communications ports on CPU Units, communications ports on Serial Communications Units/Boards, and other Communications Units). -V1 To learn the basic setup methods of the CP1L/CP1E PLCs Describes the following information for CP1L/CP1E PLCs.

· Basic configuration and component names · Mounting and wiring · Programming, data transfer, and debugging using the CX-Programmer · Application program examples SYSMAC CP Series CP1L/CP1E CPU Unit Introduction Manual W461 CP1L-L10D CP1L-L14D CP1L-L20D CP1L-M30D CP1L-M40D CP1L-M60D CP1E-E DCP1E-N DCP1E-NA D- 24 CP1E CPU Unit Software User's Manual(W480) 1 Overview This section gives an overview of the CP1E and describes its procedures. 1-1 CP1E Overview . . . .

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. . . . 1-2 1-1-1 Overview of Features . . . . .

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. . . 1-2 1 1-2 Basic Operating Procedure . .

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. . . . . 1-3 CP1E CPU Unit Software User's Manual(W480) 1-1 1 Overview 1-1 1-1-1 CP1E Overview Overview of Features The SYSMAC CP1E Programmable Controller is a package-type PLC made by OMRON that is designed for easy application. The CP1E includes E-type CPU Units (basic models) for standard control operations using basic, movement, arithmetic, and comparison instructions, and N/NA-type CPU Units (application models) that supports connections to Programmable Terminals, Inverters, and Servo Drives. Basic Models (E-type CPU Units) CPU with 10, 14 or 20 I/O Points CPU Unit with 30 or 40 I/O Points CP1E Application Models NA-type CPU N-type CPU Units Units CPU Unit with CPU with 14 or CPU Unit with 30, 40 or 60 I/O 20 I/O Points 20 I/O Points Points Appearance Program capacity DM Area capacity Mounting Expansion I/O Units and Expansion Units Model with transistor outputs Pulse outputs Built-in serial communications port Built-in analog Option Board Connection port for Programming Device Clock Using a Battery Backup time of built-in capacitor Battery-free operation 2K steps 2K words Of these 1,500 words can be written to the built-in EEPROM. Not possible.

3 Units maximum 8K steps 8K words Of these 7,000 words can be written to the built-in EEPROM. Not possible. 3 Units maximum Available (CPU Unit with 10 I/O points only) Not supported. Not provided. Not available. Not supported. USB port Not provided. Cannot be used. 50 hours at 25°C Available Supported (Model with transistor outputs only) RS-232C port provided Not available. Not supported.

USB port Available Supported (for one port) Provided Can be used (sold separately). 40 hours at 25°C Always battery-free operation. Battery-free operation



*if no battery is attached. Only data in the built-in EEPROM will be retained if power is interrupted for longer than 50 hours. Only data in the built-in EEPROM will be retained if power is interrupted for longer than 40 hours.*

*Precautions for Correct Use For CP1E CPU Units, the following I/O memory area will be unstable after a power interruption. · DM Area (D) (excluding words backed up to the EEPROM using the DM function) · Holding Area (H) · Counter Present Values and Completion Flags (C) · Auxiliary Area related to clock functions(A) Mount the CPIW-BAT01 Battery (sold separately) to an N/NA-type CPU Unit if data in the above areas need to be retained after a power interruption.*



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A Battery cannot be mounted to an E-type CPU Unit. 1-2 CP1E CPU Unit Software User's Manual(W480) 1 Overview 1-2 Basic Operating Procedure 1-2 Basic Operating Procedure In general, use the following procedure. 1.

Setting Devices and Hardware Connect the CPU Unit, Expansion I/O Units, and Expansion Units. Set the DIP switches on the Option Board and Expansion Units as required. Refer to Section 3 Part Names and Functions and Section 5 Installation and Wiring in the CP1E CPU Unit Hardware User's Manual (Cat. No. W479). 1 2. Wiring Wire the power supply, I/O, and communications. Refer to Section 5 Installation and Wiring in the CP1E CPU Unit Hardware User's Manual (Cat. No. W479).

3. Connecting Online to the PLC Connect the personal computer online to the PLC. Refer to Section 4 Programming Device in the CP1E CPU Unit Hardware User's Manual (Cat. No. W479). 4. I/O Allocations Allocations for built-in I/O on the CPU Unit are predetermined and memory is allocated automatically to Expansion I/O Units and Expansion Units, so the user does not have to do anything. Refer to Section 6 I/O Allocation in the CP1E CPU Unit Software User's Manual (Cat. No. W480).

5. Software Setup Make the PLC software settings. With a CP1E CPU Unit, all you have to do is set the PLC Setup. When using an E-type CPU Unit or when using an N/NA-type CPU Unit without a Battery, be sure to consider selecting the Clear retained memory area (HR/DM/CNT) Check Box in the Startup Data Read Area in the PLC Settings. Refer to 3-2-4 Initializing I/O Memory at Startup, Section 7 PLC Setup in the CP1E CPU Unit Software User's Manual (Cat. No. W480). 6. Writing the Programs Write the programs using the CX-Programmer. Refer to Section 4 Programming Concepts in the CP1E CPU Unit Software User's Manual (Cat.

No. W480). 7. Checking Operation Check the I/O wiring and the Auxiliary Area settings, and perform trial operation. The CX-Programmer can be used for monitoring and debugging. Refer to Section 8 Overview and Allocation of Built-in Functions. 8. Basic Program Operation Set the operating mode to RUN mode to start operation. CP1E CPU Unit Software User's Manual(W480) 1-3 1 Overview 1-4 CP1E CPU Unit Software User's Manual(W480) 2 2 Internal Memory in the CPU Unit This section describes the types of internal memory in a CP1E CPU Unit and the data that is stored. 2-1 Internal Memory in the CPU Unit .

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... 2-2 2-1-1 2-1-2 2-1-3 2-1-4 CPU Unit Memory Backup Structure .....

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..... Memory Areas and Stored Data .....

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..... Transferring Data from a Programming Device. ...

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..... Backup .....

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. 2-2 2-3 2-4 2-4 CP1E CPU Unit Software User's Manual(W480) 2-1 2 Internal Memory in the CPU Unit 2-1 2-1-1 Internal Memory in the CPU Unit CPU Unit Memory Backup Structure The internal memory in the CPU Unit consists of built-in RAM and built-in EEPROM. The built-in RAM is used as execution memory and the built-in EEPROM is used as backup memory. CPU Unit Built-in EEPROM Backup memory User Program Area (Backup) Built-in RAM Execution Memory Automatic backup Read at startup User Program Area Area where data is backed up even if the power supply is interrupted for longer than the back-up time of the built-in capacitor. \* Automatic backup PLC Setup Read at startup PLC Setup I/O Memory Areas Backup using bit in Auxiliary Area DM Area DM Area data read at startup DM Area Area where data is cleared if the power supply is interrupted for longer than the back-up time of the built-in capacitor. \* \* E-type CPU Units: 50 hours at 25, N/NA-type CPU Units: 40 hours at 25 Data is retained even if the power supply is interrupted for longer than the backup time of the built-in capacitor. If a CPIW-BAT01 Battery (sold separately) is mounted to an N/NA-type CPU Unit, which is normally backed up by a built-in capacitor, data will be backed up by the battery. Built-in RAM The built-in RAM is the execution memory for the CPU Unit. The user programs, PLC Setup, and I/O memory are stored in the built-in RAM. The data is unstable when the power is interrupted.

If a CPIW-BAT01 Battery (sold separately) is mounted to an N/NA-type CPU Unit, the data is backed up by the Battery. The user programs and parameters are backed up to the built-in EEPROM, so they are not lost. Built-in EEPROM The built-in EEPROM is the backup memory for user programs, PLC Setup, and Data Memory backed up using control bits in the Auxiliary Area. Data is retained even if the power supply is interrupted. Only the Data Memory Area words that have been backed up using the Auxiliary Area control bits are backed up (Refer to 16-3 DM Backup Function).

All data in all other words and areas is not backed up. 2-2 CP1E CPU Unit Software User's Manual(W480) 2 Internal Memory in the CPU Unit 2-1 Internal

*Memory in the CPU Unit Caution With an E-type CPU Unit or with an N/NA-type CPU Unit without a Battery, the contents of the DM Area (D) \*, Holding Area (H), the Counter Present Values (C), the status of Counter Completion Flags (C), and the status of bits in the Auxiliary Area (A) related to clock functions may be unstable when the power supply is turned ON. \*This does not apply to areas backed up to EEPROM using the DM backup function. If the DM backup function is being used, be sure to use one of the following methods for initialization. 1.*

*Clearing All Areas to All Zeros Select the Clear retained memory area (HR/DM/CNT) to Zero Check Box in the Startup Data Read Area in the PLC Setup. 2-1-2 Memory Areas and Stored Data 2. Clearing Specific Areas to All Zeros or Initializing to Specific Values Make the settings from a ladder program. If the data is not initialized, the unit or device may operate unexpectedly because of unstable data. 2-1-2 Memory Areas and Stored Data The following table lists the CPU Unit memory areas and the data stored in each area. Memory area and stored data User Program Area User Program Symbol Table Comments Program Index Details Built-in RAM Stored Built-in EEPROM Stored The User Program Area stores the object code for executing the user program that was created using the CX-Programmer. The symbol table contains symbols created using the CX-Programmer (symbol names, addresses, and I/O comments). Comments are created using the CX-Programmer and include annotations and row comments. The program index provides information on program sections created using the CX-Programmer, as well as program comments. Stored Various initial settings are made in the PLC Setup using software switches.*

*Refer to Section 7 PLC Setup. The I/O Memory Areas are used for reading and writing from the user programs. It is partitioned into the following regions according to purpose. · Regions where data is cleared when power to the CPU Unit is reset, and regions where data is retained.*



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·Regions where data are exchanged with other Units, and regions that are used internally. DM Area words backed up to backup memory (built-in EEPROM) using control bits in the Auxiliary Area. Stored Stored Stored Not stored Stored Parameter Area Setting PLC Setup I/O Memory Areas CP1E CPU Unit Software User's Manual(W480) 2-3 2 Internal Memory in the CPU Unit 2-1-3 Transferring Data from a Programming Device Data that has been created using the CX-Programmer is transferred to the internal memory in the CPU Unit as shown in the following diagram. CX-Programmer User-created Programs User programs CPU Unit User Program Area User programs Symbol Table Comments and program index Symbol Table Comments and program index Parameter Area PLC Setup PLC Memory I/O Memory Areas CIO Area, Work Area, Holding Area, Timer Area, Counter Area, DM Area, and Auxiliary Area ·The CX-Programmer can be used to set status in each I/O memory area and to write data to the I/O memory areas. PLC Setup 2-1-4 Backup The CPU Unit will access the backup memory in the following process. ·The program or PLC Setup are transferred from the CX-Programmer. ·The program is changed during online editing. ·DM backup is operated by the Auxiliary Area. During these processes, BKUP LED will light, indicating that the CX-Programmer is being backed up. There are the following limitations during backup. ·The operation mode cannot be switched from PROGRAM mode to MONITOR/RUN mode. ·If the power is interrupted when the program or PLC Setup are being backed up, memory error may occur the next time power is turned ON. ·If the power is interrupted when the DM area is being backed up, the reading of backed up DM area will fail the next time power is turned ON. 2-4 CP1E CPU Unit Software User's Manual(W480) 3 CPU Unit Operation 3 This section describes the operation of the CP1E CPU Unit. Make sure that you understand the contents of this section completely before writing ladder programs. 3-1 CPU Unit Operation.

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.... 3-2 3-1-1 3-1-2 Overview of CPU Unit Operation .....

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..... 3-2 CPU Unit Operating Modes .

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... 3-3 3-2 Backing Up Memory . .

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.. 3-5 3-2-1 3-2-2 3-2-3 3-2-4 CPU Unit Memory Configuration .....

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..... 3-5 Backing Up Ladder Programs and PLC Setup . . .

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.. 3-6 I/O Memory Backup .....

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.. 3-6 Initializing I/O Memory at Startup . . .

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.. 3-8 CP1E CPU Unit Software User's Manual(W480) 3-1 3 CPU Unit Operation 3-1 CPU Unit Operation This section gives an overview of the CPU Unit operation, describes the operating modes, and explains how the Unit operates when there is a power interruption. 3-1-1 Overview of CPU Unit Operation The

CPU Unit reads and writes data to the internal I/O memory areas while executing user ladder programs by executing the instructions in order one at a time from the start to the end. CPU Unit Internal Memory Overhead processing (self-diagnosis) Change in status after all instructions have been executed  
01010100 01101010 11001010 10111011 10001101 Program execution Access CPU Unit processing cycle I/O memory 00000 00000 11011 00111 10101 0 0  
0 0 0 0 0 1 0 0 0 0 0 1 Inputs Exchange Outputs I/O refreshing Refreshes external devices at this timing Peripheral servicing Overhead Processing (Self-diagnosis) Self-diagnosis, such as an I/O bus check, is performed. Ladder Program Execution Instructions are executed from the beginning of the program and I/O memory is refreshed. I/O Refresh Data to and from external devices, such as sensors and switches, directly connected to the built-in I/O terminals and expansion I/O terminals, is exchanged with data in the I/O memory of the PLC. This process of data exchange is called the I/O refresh. Peripheral Servicing Peripheral servicing is used to communicate with devices connected to the communications port or for exchanging data with the CX-Programmer. Cycle Time The cycle time is the time between one I/O refresh and the next.

The cycle time can be determined beforehand for SYSMAC PLCs. 3-2 CP1E CPU Unit Software User's Manual(W480) 3 CPU Unit Operation Additional Information The average cycle time during operation will be displayed in the status bar on the bottom right of the Ladder Program Window on the CX-Programmer. 3-1 CPU Unit Operation I/O Memory These are the PLC memory areas that are accessed by the ladder programs. SYSMAC PLCs refer to these areas as the I/O memory. It can be accessed by specifying instruction operands. There are words in the I/O memory area where data is cleared and words where data is retained when recovering from a power interruption. There are also words that can be set to be cleared or retained. Refer to Section 5 I/O Memory. 3-1-2 CPU Unit Operating Modes 3 3-1-2 CPU Unit Operating Modes Overview of Operating Modes CPU Units have the following three operating modes. PROGRAM mode: The programs are not executed in PROGRAM mode.

This mode is used for the initial settings in PLC Setup, transferring ladder programs, checking ladder programs, and making preparations for executing ladder programs such as force-setting/resetting bits. In this mode, it is possible to perform online editing, force-set/reset bits, and change I/O memory present values while the ladder programs are being executed. Adjustments during trial operation are also made in this mode. This is the mode in which the ladder program is executed. Some operations are disabled during this mode.

It is the startup mode at initial value when the CPU Unit is turned ON. MONITOR mode: RUN mode: Changing the Operating Mode The operating mode can be changed from the CX-Programmer. Changing the Startup Mode The default operating mode when the CPU Unit is turned ON is RUN mode. To change the startup mode to PROGRAM or MONITOR mode, set the desired mode in Startup Setting in PLC Setup from the CX-Programmer. CP1E CPU Unit Software User's Manual(W480) 3-3 3 CPU Unit Operation Changing the Operating Mode after Startup Use one of the following procedures.

· Select PROGRAM, MONITOR, or RUN from the Startup Mode Menu. · Right-click the PLC in the project tree, and then select PROGRAM, MONITOR, or RUN from the Startup Mode Menu. Operating Modes and Operation The following table lists status and operations for each mode. Operating mode Ladder program execution I/O refresh External I/O status PROGRAM Stopped Executed OFF after changing to PROGRAM mode but can be turned ON from the CX-Programmer afterward. Cleared Retained Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes MONITOR Executed Executed Controlled by the ladder programs. RUN Executed Executed Controlled by the ladder programs.



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I/O memory Non-retained memory Retained memory Controlled by the ladder programs. Yes Yes Yes No No No Yes Yes Yes Yes Yes Controlled by the ladder programs. Yes Yes Yes No No No No No No CX-Programmer operations I/O memory monitoring Ladder program monitoring Ladder program transfer From CPU Unit To CPU Unit Checking programs Setting the PLC Setup Changing ladder programs Forced-set/reset operations Changing timer/counter SV Changing timer/counter PV Change I/O memory PV The Retaining of I/O Memory When Changing the Operating Mode Non-retained areas . . . . I/O bits Serial PLC Link Words Work bits Timer PV/Completion Flags Data Registers (Auxiliary Area bits/words are retained or not retained depending on the address.) Retained areas · Holding Area · DM Area · Counter PV and Completion Flags (Auxiliary Area bits/words are retained or not retained depending on the address.)

) Retained Retained Retained Mode changes RUN or MONITOR to PROGRAM PROGRAM to RUN or MONITOR RUN to MONITOR or MONITOR to RUN Cleared\* Cleared\* Retained\* \* The data is cleared when the IOM Hold Bit is OFF. The outputs from the Output Units will be turned OFF when a fatal error is occurred, regardless of the status of the IOM Hold Bit, and the status of the output bits in CPU Unit's I/O memory is retained. Refer to Section 5 I/O Memory for details on the I/O memory. 3-4 CP1E CPU Unit Software User's Manual(W480) 3 CPU Unit Operation 3-2 3-2-1 Backing Up Memory This section describes backing up the CP1E CPU Unit memory areas. CPU Unit Memory Configuration Data backup to the CP1E CPU Unit's built-in RAM memory describes as below. 3-2 Backing Up Memory Ladder programs and PLC Setup Automatically backed up to the built-in EEPROM whenever changed. DM Area in the I/O memory Data in specified words of the DM Area can be backed up to the built-in EEPROM by using bits in the Auxiliary Area. Other words are not backed up. 3 3-2-1 CPU Unit Memory Configuration Other areas in the I/O memory (including Holding Area data, Counter PVs, and Counter Completion Flags) Not backed up to the built-in EEPROM. CP1E CPU Unit Built-in EEPROM backup memory Ladder programs Changing program Built-in RAM Ladder programs PLC power turned ON Parameter Area PLC Setup PLC Setup changed Parameter Area PLC Setup I/O Memory Areas PLC power turned ON · I/O Area · Work Area · Holding Area · Auxiliary Area · Timer/Counter Areas · DM Area Operation using control bits in Auxiliary Area Part of DM Area PLC power turned ON CP1E CPU Unit Software User's Manual(W480) 3-5 3 CPU Unit Operation 3-2-2 Backing Up Ladder Programs and PLC Setup Ladder programs and the PLC Setup are automatically backed up to and restored from the built-in EEPROM backup memory.

Backing Up Memory Ladder programs and PLC Setup are backed up to the built-in EEPROM backup memory by transferring them from the CX-Programmer or writing them using online editing. Restoring Memory Ladder programs and PLC Setup are automatically transferred from the built-in EEPROM backup memory to the RAM memory when power is turned ON again or at startup. Precautions for Safe Use The BKUP indicator on the front of the CPU Unit turns ON when data is being written to the built-in EEPROM backup memory. Never turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. 3-2-3 I/O Memory Backup I/O memory is backed up to the built-in EEPROM backup memory only when a bit in the Auxiliary Area is turned ON to back up specified words in the DM Area.

Backup to built-in EEPROM backup memory Not backed up. Status at startup N/NA-type CPU Unit with no Battery mounted or E-type CPU Unit Cleared to all zeros. N/NA-type CPU Unit with Battery mounted Area CIO Area Work Area (W) Timer Area (T) Holding Area (H) Unstable when the power supply is OFF for longer than the I/O memory backup time. \* The values immediately before power interruption are retained. Counter Area (C) Auxiliary Area (A) Initialized (For N/NA-type CPU Units, status of bits related to clock functions is unstable when the power supply is OFF for longer than the I/O memory backup time.

\*) The specified number of words starting from D0 is backed up by turning ON A751.15 (DM Backup Save Start Bit). Not backed up. Initialized (For N/NA-type CPU Units, status of bits related to clock functions are retained at their status immediately before power interruption.) DM Area (D) Number of words starting from D0 set in the Number of CH of DM for backup Box in the Startup Data Read Area in the PLC Settings. Ranges not given above. The specified number of words starting from D0 is restored from the built-in EEPROM backup memory if the Restore D0- from backup memory Check Box is selected in the Startup Data Read Area in the PLC Settings. Unstable when the power supply is OFF for longer than the I/O memory backup time. The values immediately before power interruption are retained. \* The values will be cleared to all zeros at startup if the Clear retained memory area (HR/DM/CNT) Check Box is selected in the PLC Settings.

3-6 CP1E CPU Unit Software User's Manual(W480) 3 CPU Unit Operation I/O Memory Backup Time The built-in capacitor's backup time for I/O memory during a power interruption is listed below for E-type CPU Units and N/NA-type CPU Units. E-type CPU Units: 50 hours at 25°C N/NA-type CPU Units (without a battery): 40 hours at 25°C CP1E E-type CPU Unit 50 hours Backup time for I/O memory 3-2 Backing Up Memory 40 hours CP1E N/NA-type CPU Unit without a battery 25 hours 20 hours 3 3-2-3 I/O Memory Backup 9 hours 7 hours 25°C 40°C Ambient temperature 60°C The following areas are unstable when power is interrupted for longer than the I/O memory backup times given above. · DM Area (D) (excluding words backed up to the EEPROM using the DM backup function) · Holding Area (H) · Counter PVs and Completion Flags (C) · Auxiliary Area related to clock function (A) Additional Information Words in the Auxiliary Area related to clock function are unstable. Others are cleared to default values. Power interruption time Words Name Less than I/O memory backup time Retained Longer than I/O memory backup time Unstable CPU Unit E-type CPU Unit Supported Supported Not supported. Not supported. Not supported. Supported Not supported. Not supported. Not supported.

N/NA-type CPU Unit Supported A100 to A199 A300 A351 to A354 A510 to A511 A512 to A513 A514 A515 to A517 A518 to A520 A720 to A749 Error Log Area Error Log Pointer Clock Area Startup Time Power Interruption Time Number of Power Interruptions Operation Start Time Operation End Time Power ON Clock Data 1 to 10 Precautions for Correct Use Use an N/NA-type CPU Unit with a Battery mounted if it is necessary to retain the contents of the DM Area (D) and Holding Area (A), the Counter Present Values (C), the status of Counter Completion Flags (C), and the status of bits in the Auxiliary Area (A) related to clock functions when the power supply is turned ON after the power has been OFF for a period of time.



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