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You can read the recommendations in the user guide, the technical guide or the installation guide for OMRON E5EN-H. You'll find the answers to all your questions on the OMRON E5EN-H in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

User manual OMRON E5EN-H
User guide OMRON E5EN-H
Operating instructions OMRON E5EN-H
Instructions for use OMRON E5EN-H
Instruction manual OMRON E5EN-H

The image shows the cover of the OMRON E5EN-H Digital Controllers User's Manual. The cover is blue and features the OMRON logo at the top right. Below the logo is a white line graph. Underneath the graph, the text reads "E5CN-H", "E5AN-H", and "E5EN-H" stacked vertically. Below this, it says "Digital Controllers". At the bottom of the cover, there are three images of the digital controllers. Below the images, it says "User's Manual" and "Advanced Type". At the very bottom, there is a small white box with the text "Cat. No. H157-E1-02".



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Manual abstract:

@@@ - Either standard or heating/cooling control can be performed. · Both auto-tuning and self-tuning are supported. @ - Heater burnout detection, heater short (HS) alarms, and heater overcurrent (OC) functions are supported. (Applicable to E5CN-H, E5AN-H, and E5EN-H models with heater burnout detection function.) · Communications are supported. (Applicable to E5CN-H, E5AN-H, and E5EN-H models with communications.) · User calibration of the sensor input is supported. · User calibration of transfer output is supported. (Applicable to E5CN-H, E5AN-H, and E5EN-H models with transfer outputs.) · Use position-proportional control.

(Applicable to the E5AN-H and E5ENH.) · Use a remote SP input (Applicable to the E5AN-H and E5EN-H.) · The structure is waterproof (IP66). · Conforms to UL, CSA, and IEC safety standards and EMC Directive. · The PV display color can be switched to make process status easy to understand at a glance. This manual describes the E5CN-H, E5AN-H, and E5EN-H. Read this manual thoroughly and be sure you understand it before attempting to use the Digital Controller and use the Digital Controller correctly according to the information provided. Keep this manual in a safe place for easy reference. Refer to the following manual for further information on communications: E5CN-H/E5AN-H/E5EN-H Digital Controllers Communications Manual Advanced Type (Cat. No.

H159). 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. OMRON, 2008 All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, mechanical, electronic, photocopying, recording, or otherwise, without the prior written permission of OMRON.

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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.



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vii Safety Precautions Definition of Precautionary Information The following notation is used in this manual to provide precautions required to ensure safe usage of the product. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions. The following notation is used. Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or in property damage. CAUTION Symbols Symbol Meaning General Caution Indicates non-specific general cautions, warnings, and dangers.

Caution Electrical Shock Caution Indicates possibility of electric shock under specific conditions. Prohibition General Prohibition Indicates non-specific general prohibitions. General Caution Indicates non-specific general cautions, warnings, and dangers. Mandatory Caution

Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock.

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction. Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur. Never disassemble, modify, or repair the product or touch any of the internal parts.

Minor electric shock, fire, or malfunction may occasionally occur. CAUTION - Risk of Fire and Electric Shock a) This product is UL listed as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally. b) When using more than one shutoff switch, always turn OFF all the shutoff switches to ensure that no power is being supplied before servicing the product. c) Signal inputs are SELV, limited energy. (See note 1.) d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. (See note 2.) If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy.

The life expectancy of output relays varies considerably with the output load and switching conditions. Note 1: An SELV circuit is one separated from the power supply with double insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC. Note 2: A class 2 power supply is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels. ix CAUTION Tighten the terminal screws to between 0.74 and 0.90 N·m.

Loose screws may occasionally result in fire. Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents. A malfunction in the Digital Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Digital Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.

When inserting the body of the Digital Controller into the case, confirm that the hooks on the top and bottom are securely engaged with the case. If the body of the Digital Controller is not inserted properly, faulty contact in the terminal section or reduced water resistance may occasionally result in fire or malfunction. When connecting the Control Output Unit to the socket, press it in until there is no gap between the Control Output Unit and the socket.

Otherwise contact faults in the connector pins may occasionally result in fire or malfunction. x Precautions for Safe Use Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product.

Not doing so may occasionally result in unexpected events. 1) The product is designed for indoor use only. Do not use the product outdoors or in any of the following locations. · Places directly subject to heat radiated from heating equipment. · Places subject to splashing liquid or oil atmosphere. · Places subject to direct sunlight. · Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas). · Places subject to intense temperature change. · Places subject to icing and condensation. · Places subject to vibration and large shocks.

2) Use and control output terminals to ground. (Doing so may result in an unwanted circuit path, causing error in the measured temperature.) 21) When replacing the body of the Digital Controller, check the condition of the terminals. If corroded terminals are used, contact failure in the terminals may cause the temperature inside the Digital Controller to increase, possibly resulting in fire. If the terminals are corroded, replace the case as well. 22) Use suitable tools when taking the Digital Controller apart for disposal. Sharp parts inside the Digital Controller may cause injury. 23) Check the specifications of the Control Output Unit and assemble it correctly. 24) When mounting the Control Output Unit, read and follow all relevant information in the product catalogs and manuals. 25) When applying Lloyd's standards, install the Digital Controller according to the requirements given in Shipping Standards.

Service Life Use the Digital Controller within the following temperature and humidity ranges: Temperature: -10 to 55°C (with no icing or condensation), Humidity: 25% to 85% If the Controller is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the Controller. The service life of electronic devices like Digital Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life and, the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Digital Controller. When two or more Digital Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Digital Controllers and the service life will decrease.

In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors. Ambient Noise To avoid inductive noise, keep the wiring for the Digital Controller's terminal block wiring away from power cables carrying high voltages or large currents.



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Also, do not wire power lines together with or parallel to Digital Controller wiring. Using shielded cables and using separate conduits or ducts is recommended.

Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component). When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the Digital Controller. Allow as much space as possible between the Digital Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge. xii Ensuring Measurement Accuracy When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types. When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same. Mount the Digital Controller so that it is horizontally level. If the measurement accuracy is low, check to see if input shift has been set correctly. Waterproofing The degree of protection is as shown below. Sections without any specification on their degree of protection or those with IP@0 are not waterproof.

Front panel: IP66 Rear case: IP20, Terminal section: IP00 xiii Precautions for Operation 1) It takes approximately two seconds for the outputs to turn ON from after the power supply is turned ON. Due consideration must be given to this time when incorporating Digital Controllers into a control panel or similar device. Make sure that the Digital Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display. When executing self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Digital Controller. If power is turned ON for the Digital Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved. When starting operation after the Digital Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Digital Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.) Avoid using the Controller in places near a radio, television set, or wireless installing.

The Controller may cause radio disturbance for these devices. 2) 3) 4) Shipping Standards The E5@N-H Digital Controllers comply with Lloyd's standards. When applying the standards, the following installation and wiring requirements must be met in the application. Application Conditions 1) Installation Location The E5@N-H Digital Controllers comply with installation categories ENV1 and ENV2 of Lloyd's standards. They must therefore be installed in a location equipped with air conditioning.

They cannot be used on the bridge or decks, or in a location subject to strong vibration. 2) Wiring Conditions Install the recommended ferrite core and wrap the line around it three turns for the applicable lines (e.g., power supply cable line and signal lines) of the models listed in the following table. (See illustrations.

) Install the ferrite cores as close to the terminal block of the E5@N-H as possible. (As a guideline, the ferrite core should be within 10 cm of the terminal block.) Lines Requiring Ferrite Cores Model E5CN, E5CN-U, or E5CN-H E5EN, E5AN, E5EN-H, or E5AN-H Signal line or power supply line onto which a ferrite core is installed Input power supply line Input power supply line and I/O lines (control outputs 1 and 2, communications, event inputs EV1, EV2, EV3, and EV4, transfer output, and external power supply (not provided on Advanced-type Digital Controllers (E5@N-H))) Recommended Ferrite Core Manufacturer Model Seiwa Electric Manufacturing Co., Ltd. E04RA310190100 xiv Ferrite Core Connection Examples 1. E5CN/E5CN-H + Control output 1 Auxiliary outputs (relay outputs) 1 2 3 4 5 11 12 13 14 15 6 Auxiliary output 2 + mA - DO NOT USE - V - DO NOT USE - 7 8 9 10 Auxiliary output 1 B B Power supply Input power supply DO NOT USE Analog input + + 3 turns AC/DC TC/Pt universal input 2. E5AN/E5EN/E5AN-H/E5EN-H Event Inputs Power supply AC/DC 3 turns Input power supply 1 2 3 4 5 Auxiliary output 3 21 22 23 24 25 26 27 28 29 30 11 12 13 14 15 16 17 18 19 20 EV2 EV1 Control CT1/CT2 Output 2 + Control CT1 Output 2 - CT2 DO NOT USE DO NOT USE DO NOT USE - A B B + DO NOT USE - + mA - DO NOT USE 3 turns External Power Supply + External power supply 12 VDC, 20 mA - DO NOT USE Connected to communications or event inputs 1 and 2. + Connected to control output 1. 3 turns Control output 1 - 3 turns 6 7 Auxiliary output 2 Connected to control output 2 or external power supply. 8 9 Auxiliary output 1 V + 10 TC/Pt universal input Analog input Communications 21 22 EV3 23 RS-232C 11 12 RS-485 11 12 13 21 22 SD RD SG DO NOT USE DO NOT USE B (+) A (-) DO NOT USE B (+) A (-) Connected to event inputs 3 and 4.

13 3 turns 24 EV4 25 DO NOT USE + 26 27 28 29 30 4 to 20 mA DC (Load: 600 max.) 21 22 Connected to transfer output. Transfer output 3 turns - DO NOT USE DO NOT USE xv Preparations for Use Be sure to thoroughly read and understand the manual provided with the product, and check the following points. Timing Check point Purchasing the prod- Product appearance uct Details After purchase, check that the product and packaging are not dented or otherwise damaged. Damaged internal parts may prevent optimum control. Product model and speci- Make sure that the purchased product meets the required specifications. Product installation loca- Provide sufficient space around the product for heat dissipation. Do not tion block the vents on the product. Terminal wiring Do not subject the terminal screws to excessive stress (force) when tightening them. Make sure that there are no loose screws after tightening terminal screws to the specified torque of 0.

74 to 0.90 N-m. Be sure to confirm the polarity for each terminal before wiring the terminal block and connectors. Power supply inputs Wire the power supply inputs correctly. Incorrect wiring will result in damage to the internal circuits.

Ambient temperature The ambient operating temperature for the product is -10 to 55°C (with no condensation or icing). To extend the service life of the product, install it in a location with an ambient temperature as low as possible. In locations exposed to high temperatures, if necessary, cool the products using a fan or other cooling method. Vibration and shock Check whether the standards related to shock and vibration are satisfied at the installation environment.



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(Install the product in locations where the conductors will not be subject to vibration or shock.

) Foreign particles Install the product in a location that is not subject to liquid or foreign particles entering the product. Setting the Unit Wiring Operating environment xvi Conventions Used in This Manual Meanings of Abbreviations The following abbreviations are used in parameter names, figures and in text explanations. These abbreviations mean the following: Symbol PV SP SV AT ST HB HS OC LBA EU RSP LSP Term Process value Set point Set value Auto-tuning Self-tuning Heater burnout Heater short (See note 1.) Heater overcurrent Loop burnout alarm Engineering unit (See note 2.) Remote SP Local SP Note: (1) A heater short indicates that the heater remains ON even when the control output from the Digital Controller is OFF because the SSR has failed or for any other reason. (2) "EU" stands for Engineering Unit. EU is used as the minimum unit for engineering units such as °C, m, and g. The size of EU varies according to the input type. For example, when the input temperature setting range is 200 to +1300°C, 1 EU is 1°C, and when the input temperature setting range is 20.0 to +500.

0°C, 1 EU is 0.1°C. For analog inputs, the size of EU varies according to the decimal point position of the scaling setting, and 1 EU becomes the minimum scaling unit. xvii How to Read Display Symbols The following tables show the correspondence between the symbols displayed on the displays and alphabet characters. The default is for 11-segment displays. abcdefghijklm ABCDEFGH I JKLM nopqrstuvwxyz NOPQRSTUVWXYZ The Character Select parameter in the advanced function setting level can be turned OFF to display the following 7-segment characters. ABCDEFGH I JKLM NOPQRSTUVWXYZ xviii

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351 xx About this Manual: This manual describes the E5CN/AN/EN-H Digital Controllers and includes the sections described below. Please read this manual carefully and be sure you understand the information provided before attempting to set up or operate an E5CN/AN/EN-H Digital Controller. · Overview Section 1 introduces the features, components, and main specifications of the E5CN/AN/EN-H Digital Controllers. · Setup Section 2 describes the work required to prepare the E5CN/AN/EN-H Digital Controllers for operation, including installation and wiring. · Basic Operations Section 3 describes the basic operation of the E5CN/AN/EN-H Digital Controllers, including key operations to set parameters and descriptions of display elements based on specific control examples.

Section 5 describes the individual parameters used to set up, control, and monitor operation. · Operations for Applications Section 4 describes scaling, the SP ramp function, and other special functions that can be used to make the most of the functionality of the E5CN/AN/EN-H Digital Controllers. Section 5 describes the individual parameters used to setup, control, and monitor operation. · User Calibration Section 6 describes how the user can calibrate the E5CN/AN/EN-H Digital Controllers. · Appendix The Appendix provides information for easy reference, including lists of parameters and settings.

!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. xxi xxii SECTION 1 Introduction This section introduces the features, components, and main specifications of the

E5CN-H, E5AN-H, and E5EN-H Digital Controllers. 1-1 Names of Parts

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... 1 Names of Parts Section 1-1 1-1 1-1-1 E5CN-H Names of Parts Front Panel Temperature unit No. 1 display Operation indicators No. 2 display Level Key Mode Key Down Key Up Key E5AN-H Temperature unit No. 1 display Operation indicators No. 2 display No. 3 display Up Key PF (Function (Auto/ Manual)) Key Level Key Mode Key Down Key Infrared Communications Light Receiver Ir 2 Names of Parts E5EN-H Operation indicators No. 1 display Temperature unit No. 2 display No. 3 display Operation indicators Up Key Section 1-1 Mode Key PF (Function (Auto/ Manual)) Key Level Key Down Key Ir Infrared Communications Light Receiver 1-1-2 Explanation of Indicators Displays the process value or parameter name. Lights for approximately one second during startup. Displays the set point, parameter operation read value, or the variable input value. Lights for approximately one second during startup.

Displays MV (valve opening), soak time remain, or bank number. Lights for approximately one second during startup. No. 1 Display No. 2 Display No. 3 Display (E5AN/EN-H Only) Operation Indicators 1,2,3... 1. SUB1 (Sub 1) Lights when the function set for the Auxiliary Output 1 Assignment parameter is ON.

SUB2 (Sub 2) Lights when the function set for the Auxiliary Output 2 Assignment parameter is ON. SUB3 (Sub 3) Lights when the function set for the Auxiliary Output 3 Assignment parameter is ON. 2. HA (Heater Burnout, Heater Short Alarm, Heater Overcurrent Detection Output Display) Lights when a heater burnout, heater short alarm, or heater overcurrent occurs. 3.

OUT1 (Control Output 1) Lights when the control output function assigned to control output 1 turns ON. For a current output, however, OFF for a 0% output only. With position-proportional models, OUT1 lights when the "open" output turns ON. 3 Names of Parts Section 1-1 OUT2 (Control Output 2) Lights when the control output function assigned to control output 2 turns ON. For a current output, however, OFF for a 0% output only.

With position-proportional models, OUT2 lights when the "close" output turns ON. 4. STOP Lights when operation is stopped. During operation, this indicator lights when operation is stopped by an event or by key input using the RUN/STOP function. 5. CMW (Communications Writing) Lights when communications writing is enabled and is not lit when it is disabled. 6. MANU (Manual Mode) Lights when the auto/manual mode is set to manual mode. 7. (Key) Lights when settings change protect is ON (i.

e., when the U and D Keys are disabled by protected status. 8. RSP Lights when the SP Mode parameter is set to Remote SP Mode. Temperature Unit The temperature unit is displayed when parameters are set to display a temperature. The display is determined by the currently set value of the Temperature Unit parameter. c indicates °C and f indicates °F. This indicator flashes during ST operation. It is OFF when an analog input is set. Ir Indicates whether infrared communications is enabled.

Lights when communications is enabled. Not lit when infrared communications is disabled. - Infrared Communications Light Receiver Used when infrared cable is used. 1-1-3 Using the Keys This section describes the basic functions of the front panel keys. This is a function key.

When it is pressed for at least 1 second, the function set in the PF Setting parameter will operate. Example: When A-M (auto/manual) is selected in the PF Setting parameter (initial value: A-M), the key operates as an auto/manual switch, switching between Auto Mode and Manual Mode.



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If the key is pressed for more than 1 second (regardless of key release timing), the mode will switch. Press this key to move between setting levels. The setting level is selected in the following order: operation level: adjustment level, initial setting level, communications setting level.

Press this key to change parameters within a setting level. The parameters can be reversed by holding down the key (moving one per second in reverse order). PF (Function (Auto/Manual)) Key (E5AN/EN-H Only) O Key M Key U Key D Key Each press of this key increments the value displayed on the No. 2 display or advances the setting. Holding the key down speeds up the incrementation. Each press of this key decrements values displayed on the No. 2 display or reverses the setting. Holding the key down speeds up the incrementation. 4 I/O Configuration and Main Functions O + M Keys Section 1-2 Press these keys to change to the protect level. For details on operations involving holding these keys down simultaneously, refer to 1-3 Setting Level Configuration and Key Operations.

For details on the protect level, refer to SECTION 5 Parameters. To restrict set value changes (in order to prevent accidental or incorrect operations), these key operations require simultaneously pressing the O key along with U or D key. This applies only to the parameter for the password to move to protect level. (Refer to page 174.) O + U Keys O + D Keys 1-2 1-2-1 E5CN-H I/O Configuration and Main Functions I/O Configuration Temperature input or analog input Control section Control output (heating) Control output (cooling) Control output 1 Control output 2 Heating/cooling Alarm 3 CT1 input Alarm 2 Alarm 1 CT2 input Auxiliary output 2 HB alarm HS alarm Event inputs 2 channels Auxiliary output 1 OC alarm Input error Program end output Communications function Note Functions can be assigned individually for each output by changing the set values for the Control Output 1 Assignment, the Control Output 2 Assignment, the Auxiliary Output 1 Assignment, and the Auxiliary Output 2 Assignment parameters in the advanced function setting level. 5 I/O Configuration and Main Functions Model Number Structure Model Number Legends Controllers Option Units Section 1-2 E5CN-@@@M@-@-500 12345 6 7 E53-@@@ 1234 1. Type H: Advanced 2. Control Output 1 R: Relay output Q: Voltage output (for driving SSR) C: Current output V: Linear voltage output 3. Auxiliary Outputs 2: Two outputs 4. Option 1 M: Option Unit can be mounted. 5. Power Supply Voltage Blank: 100 to 240 VAC D: 24 VAC/VDC 6. Case Color Blank: Black W: Silver 7. Terminal Cover -500: With terminal cover 1. Applicable Controller CN: E5CN-H or E5CN 2.

Function 1 Blank: None Q: Control output 2 (voltage output for driving SSR) P: Power supply for sensor C: Current output 3. Function 2 Blank: None H: Heater burnout/Heater short/ Heater overcurrent detection (CT1) HH: Heater burnout/Heater short/ Heater overcurrent detection (CT2) B: Two event inputs 03: RS-485 communications H03: Heater burnout/Heater short/ Heater overcurrent detection (CT1) + RS-485 communications HB: Heater burnout/Heater short/ Heater overcurrent detection (CT1) + Two event inputs HH03: Heater burnout/Heater short/ Heater overcurrent detection (CT2) + RS-485 communications H01: Heater burnout/Heater short/ Heater overcurrent detection (CT1)/RS-232C communications F: Transfer output BF: Two event inputs/Transfer output 4. Version N2: Available only to models released after January 2008 6 I/O Configuration and Main Functions E5AN/EN-H Temperature input or analog input Section 1-2 Control section Control output (heating) Control output (cooling) Control output 1 Heating/cooling Control output 2 RSP input error Alarm 3 CT1 input Alarm 2 Alarm output 3 Alarm output 2 Alarm 1 CT2 input HB alarm HS alarm Event inputs 1 and 2 (2 channels) Alarm output 1 OC alarm Input error Remote SP input error Event inputs 3 and 4 (2 channels) Program end output Communications function Note Functions can be assigned individually to each output by changing the set values for the Control Output 1 Assignment, Control Output 2 Assignment, Auxiliary Output 1 Assignment, Auxiliary Output 2 Assignment, and Auxiliary Output 3 Assignment parameters in the advanced function setting level. 7 I/O Configuration and Main Functions Model Number Structure Model Number Legends Controllers Option Units Section 1-2 E5AN/E5EN-@@@@@M@-@-500 1 2 3 4 5 6 7 8 9 10 11 E53-@ 1 1. Type H: Advanced 2.

Control Mode Blank: Standard or heating/cooling control P: Position-proportional control 3. Control Output 1 A: Control Output Unit R: Relay output S: SSR output 4. Control Output 2 A: Control Output Unit R: Relay output S: SSR output 5. Auxiliary Outputs 2: Two outputs 3: Three outputs 6. Option 1 Blank: None H: Heater burnout/Heater short/ Heater overcurrent detection (CT1) HH: Heater burnout/Heater short/ Heater overcurrent detection (CT2) 7. Option 2 B: Two event inputs BF: Event input + Transfer output 8. Option 3 M: Option Unit can be mounted. 9. Power Supply Voltage Blank: 100 to 240 VAC D: 24 VAC/VDC 10. Case Color Blank: Black W: Silver 11.

Terminal Cover -500: With Terminal Cover 1. Function EN01: RS-232C communications EN02: RS-422 communications EN03: RS-485 communications AKB: Event input Output Units E53-@@ 12 1. Control Output R: Relay output Q: Voltage output (for driving SSR) Q3: Voltage output (for driving SSR) + 24 VDC (NPN) Q4: Voltage output (for driving SSR) + 24 VDC (PNP) C3: Current output + 4 to 20 mA DC C3D: Current output + 0 to 20 mA DC V34: Linear voltage output + 0 to 10 VDC V35: Linear voltage output + 0 to 5 VDC 2. Version Blank: Available for E5AN-H/E5EN-H and E5AK/E5EK. N: Available only for E5AN-H/E5EN-H. 1-2-2 Main Functions This section introduces the main E5@N-H functions. For details on particular functions and how to use them, refer to SECTION 3 Basic Operation and following sections. Input Sensor Types · The following input sensors can be connected.: Thermocouple: K, J, T, E, L, U, N, R, S, B, W, PLII Platinum resistance thermometer: Pt100, JPt100 Current input: 4 to 20 mA DC, 0 to 20 mA DC Voltage input: 1 to 5 VDC, 0 to 5 V DC, 0 to 10 V DC 8 I/O Configuration and Main Functions Control Outputs Section 1-2 · A control output can be a relay output, voltage output (for driving SSR), linear voltage output, SSR output, or current output, depending on the model. · With the E5CN-H@2@@, auxiliary output 2 is used as control output (cooling) when heating/cooling control is selected.

(It is also possible to allocate a different output.) Therefore, use auxiliary output 1 if an auxiliary output is required while using heating/cooling control. Alarms · Set the alarm type and alarm value or the alarm value upper and lower limits. · If necessary, a more comprehensive alarm function can be achieved by setting a standby sequence, alarm hysteresis, auxiliary output close in alarm/open in alarm, alarm latch, alarm ON delay, and alarm OFF delay.



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· If the Input Error Output parameter is set to ON, the output assigned to alarm 1 function will turn ON when an input error occurs.

· If the Remote SP Input Error Output parameter is set to ON, the output assigned to the alarm 1 function will turn ON when an input error occurs. Control Adjustment Event Inputs · Optimum PID constants can be set easily by performing AT (auto-tuning) or ST (self-tuning). · With the E53-CN@B@N2 for the E5CN-H (for two event inputs), the E5AN/EN-H@B@M@-500 for E5AN/EN-H (for two event inputs) or the E5AN/EN-H@B@M@-500 with the E53-AKB for the E5AN/EN-H (for four event inputs), the following functions can be executed using event inputs: switching banks, switching RUN/STOP, switching between automatic and manual operation, starting/resetting the program, inverting direct/reverse operation, switching SP modes, 100% AT execute/cancel, 40% AT execute/cancel, setting change enable/disable, communications writing enable/disable and canceling the alarm latch. · With the E53-CN@H@N2 or E53-CN@HH@N2 for the E5CN-H, or the E5AN/EN-H@@H@-500 or E5AN/EN-H@@HH@-500, the heater burnout detection function, HS alarm function, and heater overcurrent detection function can be used. · Communications functions utilizing CompoWay/F (See note 1.), SYSWAY (See note 2.), or Modbus (See note 3.) can be used. RS-485 Interface Use the E53-CN@03N2 for the E5CN-H, or the E53-EN03 for the E5AN/EN-H. RS-232C Interface Use the E53-CN@01N2 for the E5CN-H, or the E53-EN01 for the E5AN/EN-H. RS-422 Interface Use the E53-EN02 for the E5AN/EN-H. Note (1) CompoWay/F is an integrated general-purpose serial communications protocol developed by OMRON. It uses commands compliant with the well-established FINS, together with a consistent frame format on OMRON Programmable Controllers to facilitate communications between personal computers and components. (2) SYSWAY communications do not support alarm 3. (3) Modbus is a communications control method conforming to the RTU Mode of Modbus Protocol.

Modbus is a registered trademark of Schneider Electric. Heater Burnout, HS Alarm, and Heater Overcurrent Communications Functions 9 I/O Configuration and Main Functions (4) The E5CN-H does not support the RS-422 interface. Transfer Output Remote SP Inputs Infrared Communications Section 1-2 A 4 to 20-mA transfer output can be used with the E53-CN@FN2 for the E5CN-H, or the E5AN/EN-H@@F-500. Remote SP inputs can be used with the E5AN-H and E5EN-H. When Support Software, such as CX-Thermo version 4.00 or later (EST2-2CMV4 or later), is used, the personal computer can be connected to the Digital Controller using infrared communications. 10 Setting Level Configuration and Key Operations Section 1-3 1-3 Setting Level Configuration and Key Operations Parameters are divided into groups, each called a level. Each of the set values (setting items) in these levels is called a parameter. The parameters on the E5CN/AN/EN-H are divided into the following 9 levels. When the power is turned ON, all of the display lights for approximately one second.

Start in manual mode. Power ON Start in automatic mode. Operation Level a-m Press the O Key for at least 3 s while a-m is displayed. (a-m will flash after 1st second.) Press the O Key less than 1 s. Adjustment Level Press the O Key less than 1 s. Manual mode PID Setting Level Press the O Key less than 1 s. Bank Setting Level Press the O + M Keys for at least 3 s. (Display will flash after 1st second.) Press the O+ M Keys for at least 1 s. c 25.0 100.0 Manual Control Level Press the PF Key for at least 1 s. Monitor/Setting Item Level Protect Level Note: The time taken to move to the protect level can be adjusted by changing the "Move to protect level time" setting. Press the O Key for at least 1 s. c 25.0 100.0 Press the O Key for at least 3 s. (Display will flash after 1st second.)

) Control stops. Initial Setting Level Press the O Key for at least 1 s. Advanced Function Setting Level Press the O Key for less than 1 s. Communications Setting Level Input password. Control in progress Control stopped Calibration Level Not displayed for some models Level change Note (1) You can return to the operation level by executing a software reset. (2) You cannot move to other levels by operating the keys on the front panel from the calibration level. You must turn OFF the power supply. (3) From the manual control level, key operations can be used to move to the operation level only. Level Protect level Operation level Adjustment level Bank setting level Control in progress Can be set. Can be set.

Can be set. Can be set. Control stopped ----- 11 Setting Level Configuration and Key Operations Level PID setting level Manual control level Monitor/setting item level Initial setting level Advanced function setting level Calibration level Communications setting level Control in progress Can be set. Can be set. Can be set.

----- Section 1-3 Control stopped -----Can be set. Can be set. Can be set. Can be set. Of these levels, the initial setting level, communications setting level, advanced function setting level, and calibration level can be used only when control is stopped.

Control outputs are stopped when any of these four levels is selected. (4) When the PF Setting is set to A-M in models with a PF Key (E5AN/EN-H) (5) When the PF Setting is set to PFDP in models with a PF Key (E5AN/ENH) Protect Level · To switch to the protect level from the operation level, the adjustment level, bank setting level, or PID setting level, simultaneously hold down the O and M Keys for at least 3 seconds. (See note.) This level is for preventing unwanted or accidental modification of parameters. Protected levels will not be displayed, and so the parameters in that level cannot be modified. Note Operation Level The key pressing time can be changed in Move to Protect Level parameter (advanced function setting level). · The operation level is displayed when the power is turned ON. You can move to the protect level, initial setting level, or adjustment level from this level. · Normally, select this level during operation. While operation is in progress, items such as the PV and manipulated variable (MV) can be monitored, and the set points, alarm values, and alarm upper and lower limits can be monitored and changed.

Adjustment Level · To move to the adjustment level, press the O Key once (for less than 1 s). · This level is for entering set values and offset values for control. In addition to AT (auto-tuning), communications write enable/disable switching, hysteresis settings, SP settings, and input offset parameters, it includes HB alarm, HS alarm, OC alarm, and PID constants. From the adjustment level, it is possible to move to the bank setting level, initial setting level, or protect level. Bank Setting Level · To move to the bank setting level from the adjustment level, press the O Key once (for less than 1 s).



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· This level is used to input parameters such as set points, alarm values, and PID set numbers. From the bank setting level, it is possible to move to the PID setting level, the initial setting level, or the protect level. PID Setting Level · To move to the PID setting level from the bank setting level, press the O Key once (for less than 1 s). · This level is used to input parameters such as the PID values for each PID set, MV upper and lower limits, and automatic selection range upper and lower limits. From the PID setting level, it is possible to move to the operation level, the initial setting level, or the protect level.

12 Setting Level Configuration and Key Operations Monitor/Setting Item Level Section 1-3 · To switch to the monitor/setting item level, press the PF Key from the operation level, adjustment level, bank setting level, or PID setting level. The contents set for monitor/setting items 1 to 5 can be displayed. You can move from the monitor/setting item level to the operation level or initial setting level. (E5AN/EN-H only.) · When the O Key is pressed for at least 3 seconds from the operation level's auto/manual switching display, the manual control level will be displayed.

(The MANU indicator will light.) · When the PF Setting is set to A-M (auto/manual) and the PF Key is pressed for more than one second from the operation level, adjustment level, bank setting level, or PID setting level the manual control level will be displayed. (E5AN/EN-H only.) · This is the level for changing the MV in manual mode. · To return to the operation level, press the O Key for at least one second.

It is also possible to return to the operation level by pressing the PF Key for more than one second when the PF Setting is set to A-M. Manual Control Level Initial Setting Level · To move to the initial setting level from the operation level, the adjustment level, bank setting level, PID setting level, or monitor/setting item level, press the O Key for at least 3 seconds. The PV display flashes after one second. This level is for specifying the input type and selecting the control method, control period, setting direct/reverse operation, setting the alarm types, etc. You can move to the advanced function setting level or communications setting level from this level. To return to the operation level, press the O Key for at least one second. To move to the communications setting level, press the O Key for less than one second. (When moving from the initial setting level to the operation level, all the indicators will light.) Note Pressing the O Key for at least 3 seconds in the operation level's auto/manual switching display will move to the manual control level, and not the initial setting level. Advanced Function Setting Level · To move to the advanced function setting level, set the Initial Setting/Communications Protect parameter in the protect level to 0 (the default) and then, in the initial setting level, input the password (-169).

· From the advanced function setting level, it is possible to move to the calibration level or to the initial setting level. · This level is for setting the automatic display return time and standby sequence, and it is the level for moving to the user calibration and other functions. Communications Setting Level · To move to the communications setting level from the initial setting level, press the O Key once (for less than 1 s). When using the communications function, set the communications conditions in this level. Communicating with a personal computer (host computer) allows set points to be read and written, and manipulated variables (MV) to be monitored. · To move to the calibration level, input the password (1201) from the advanced function setting level. The calibration level is for offsetting error in the input circuit. · You cannot move to other levels from the calibration level by operating the keys on the front panel. To cancel this level, turn the power OFF then back ON again. Calibration Level 13 Communications Function Section 1-4 1-3-1 Selecting Parameters · Within each level, the parameter is changed in order (or in reverse order) each time the M Key is pressed.

(In the calibration level, however, parameters cannot be changed in reverse order.) For details, refer to SECTION 5 Parameters. Moves in order after M key is pressed (if key is released within 1 s). While the M key is being held down, the parameter will move each second in reverse order. Parameter 1 M Parameter 2 Parameter 2 After M key has been held down for 2 s. Parameter 3 Hold down the M key during this interval. After M key has been held down for 1 s. M Parameter 3 After M key is pressed Parameter 4 1-3-2 Saving Settings · If you press the M Key at the final parameter, the display returns to the top parameter for the current level. · To change parameter settings, specify the setting using the U or D Key, and either leave the setting for at least two seconds or press the M Key. This saves the setting. · When another level is selected after a setting has been changed, the contents of the parameter prior to the change is saved. · When you turn the power OFF, you must first save the settings (by pressing the M Key). The settings are sometimes not changed by merely pressing the U or D Keys. 1-4 Communications Function The E5CN/AN/EN-H Digital Controllers are provided with a communications function that enables parameters to be checked and set from a host computer. If the communications function is required, use a model that has that function (E5CN-H@M@-500 with an E53-CN@01N2 or E53-CN@03N2, E5AN-H/ENH@M@-500 with an E53-EN01, E53-EN02, or E53-EN03). For details on the communications function, see the separate Communications Manual Advanced Type. Use the following procedure to move to the communications setting level. 1,2,3...

1. Press the O Key for at least three seconds to move from the operation level to the initial setting level. 14 Communications Function Section 1-4 2. Press the O Key for less than one second to move from the initial setting level to the communications setting level. 3. Select the parameters as shown below by pressing the M Key. 4. Press the U or D Key to change the parameter setting. psl cwf Protocol Setting M u-no 1 Communications Unit No. M bps 9.

6 Communications Baud Rate M len M Communications Data Length 7 (See note.) sbit M Communications Stop Bits 2 (See note.) prty even Communications Parity M sdwt 20 Send Data Wait Time M Note Setting Communications Data The Protocol Setting parameter is displayed only when CompoWay/F communications are being used. Match the communications specifications of the E5CN/AN/EN-H and the host computer. If a 1:N connection is being used, ensure that the communications specifications for all devices in the system (except the communications Unit No.

1. Press the O Key for at least three seconds to move from the operation level to the initial setting level. 14 Communications Function Section 1-4 2. Press the O Key for less than one second to move from the initial setting level to the communications setting level. 3. Select the parameters as shown below by pressing the M Key. 4. Press the U or D Key to change the parameter setting. psl cwf Protocol Setting M u-no 1 Communications Unit No. M bps 9.

6 Communications Baud Rate M len M Communications Data Length 7 (See note.) sbit M Communications Stop Bits 2 (See note.) prty even Communications Parity M sdwt 20 Send Data Wait Time M Note Setting Communications Data The Protocol Setting parameter is displayed only when CompoWay/F communications are being used. Match the communications specifications of the E5CN/AN/EN-H and the host computer. If a 1:N connection is being used, ensure that the communications specifications for all devices in the system (except the communications Unit No.



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) are the same. Setting (monitor) value CompoWay/F (SYSWAY), Modbus 0 to 99 1.2, 2.4, 4.8, 9.
6, 19.2, 38.4, 57.6 7, 8 1, 2 None, Even, Odd 0 to 99 none, even, odd Selection symbols cwf, mod Default CompoWay/F (SYSWAY) 1 9.6 7 2 Even 20 Unit
None None kbps Bits Bits None ms Parameter name Protocol Setting Communications Unit No. Communications Baud Rate Communications Data Length
Communications Stop Bits Communications Parity Send Data Wait Time Symbol psel u-no bps len sbit prty sdwe 1.2, 2.4, 4.8, 9.6, 19.

2, 38.4, 57.6 15 Communications Function Section 1-4 16 SECTION 2 Preparations This section describes the work required to prepare the E5CN-H, E5AN-H, and E5EN-H Digital Controllers for operation, including installation and wiring. 2-1 Installation.

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Panel Cutout

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... Mounting

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. Removing the Digital Controller from the Case.

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. Terminal Arrangement

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Precautions when Wiring

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. Wiring

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. 18 18 19 21 23 28 28 30 30 40 42 Wiring Terminals.

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. Using the Support Software Port.

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... Using Infrared Communications ...

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... 17 Installation Section 2-1 2-1 2-1-1 E5CN-H Installation Dimensions Unit: mm 48 × 48 6 91 78 1.5 44.

8 × 44.8 6 2 58 E5AN-H 79.2 78 96 × 96 48.8 E5EN-H 6 48 2 79.2 78 44 112 18 96 91 91 × 91 112 Installation Section 2-1 2-1-2 E5CN-H Panel Cutout Unit: mm Individual Mounting Group Mounting (48 × number of Units - 2.5) +1.0 0 E5AN-H Individual Mounting Group Mounting (See note.) (96 × number of Units - 3.5) +1.0 0 120 min.

60 min. Note Group mounting is not possible when an SSR output is used for control output 1 or 2 and an E53-C3N or E53-C3DN Output Unit is used. Mount at the intervals shown in the following diagram. 110 min. 120 min. 19 Installation E5EN-H Individual Mounting Group Mounting (See note.) (48 × number of Units - 2.5) +1.0 0 Section 2-1 120 min. Note Group mounting is not possible when an SSR output is used for control output 1 or 2 and an E53-C3N or E53-C3DN Output Unit is used.

Mount at the intervals shown in the following diagram. 60 min. 120 min. · Waterproofing is not possible when group mounting several Controllers. · The recommended panel thickness is 1 to 5 mm for E5CN-H, and 1 to 8 mm for E5AN/E5EN-H.

· Units must not be group mounted vertically. In addition, group mounting is not possible when an SSR output is used for control output 1 or 2 and an E53-C3N or E53-C3DN Output Unit is used. (Observe the recommended mounting intervals.) · When group mounting several Controllers, ensure that the surrounding temperature does not exceed the ambient operating temperature listed in the specifications. 20 Installation Section 2-1 2-1-3 E5CN-H Mounting E53-COV17 Terminal Cover Adapter Waterproof packing Panel Mounting to the Panel 1,2,3.

.. 1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function. 2. Insert the E5CN-H into the mounting hole in the panel. 3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5CN-H.

4. Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N·m. 21 Installation Mounting the Terminal Cover Section 2-1 Make sure that the "UP" mark is facing up, and then attach the E53-COV17 Terminal Cover to the holes on the top and bottom of the Digital Controller. E5AN/EN-H Mounting Bracket Panel Terminal Cover (E53-COV16) Waterproof packing E5AN-H Mounting Bracket Panel Terminal Cover (E53-COV16) Waterproof packing E5EN-H 22 Installation Mounting to the Panel 1,2,3... Section 2-1 1. For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function. 2.

Insert the E5AN/E5EN-H into the square mounting hole in the panel (thickness: 1 to 8 mm). Attach the Mounting Brackets provided with the product to the mounting grooves on the top and bottom surfaces of the rear case. 3. Use a ratchet to alternately tighten the screws on the top and bottom Mounting Brackets little by little to maintain balance, until the ratchet turns freely. Mounting the Terminal Cover Slightly bend the E53-COV16 Terminal Cover to attach it to the terminal block as shown in the following diagram.

The Terminal Cover cannot be attached in the opposite direction. Slightly bend the E53-COV16 Terminal Cover in the direction shown by the arrows to attach it to the terminal block. Enlarged Illustration of Terminal Section 2-1-4 Removing the Digital Controller from the Case The body of the Digital Controller can be removed from the case to set Output Units or to perform maintenance. Check the specifications of the case and Digital Controller before removing the Digital Controller from the case. E5CN-H Tool insertion hole Flat-blade screwdriver (Unit: mm) (1) (2) (3) 0.4 2.0 (1) 23 Installation 1,2,3... Section 2-1 1.

Insert a flat-blade screwdriver into the two tool insertion holes (one on the top and one on the bottom) to release the hooks. 2. Insert the flat-blade screwdriver in the gap between the front panel and rear case, and pull out the front panel slightly. Hold the top and bottom of the front panel and carefully pull it out toward you, without applying unnecessary force. 3. When inserting the body of the Digital Controller into the case, make sure the PCBs are parallel to each other, make sure that the sealing rubber is in place, and press the E5CN-H all the way to the rear case. While pushing the E5CN-H into place, push down on the hooks on the top and bottom surfaces of the rear case so that the hooks are securely locked in place. Be sure that electronic components do not come into contact with the case. Keep the PCBs parallel to each other and insert them into the rear case. Bottom View of the E5CN-H 24 Installation E5AN/EN-H Tool insertion hole Section 2-1 (1) (2) (3) (1) Tool insertion hole (1) (2) (3) Flat-blade screwdriver (Unit: mm) 0.

4 5.0 2.0 (1) 1,2,3...

1. Insert a flat-blade screwdriver into the two tool insertion holes (one on the top and one on the bottom) to release the hooks.



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