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User manual OMRON E5CK
User guide OMRON E5CK
Operating instructions OMRON E5CK
Instructions for use OMRON E5CK
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Cat. No. H090-E1-01B

E5CK

**Digital Controller
(Programmable Type)**

USERS MANUAL

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Manual abstract:

No. @@@@This User's Manual describes how to use the E5CK T. @@Also, store this manual in a safe place so that it can be retrieved whenever necessary. PRECAUTIONS IN USING THE PRODUCT When the product is used under the circumstances or environment below, ensure adherence to limitations of the ratings and functions. Also, take countermeasures for safety precautions such as fail safe installations. (1) Use under circumstances or environments which are not described in this user's manual. (2) Use for nuclear power control, railway, air craft, vehicle, incinerator, medical equipment, entertainment equipment, safety device, etc. (3) Use for applications where death or serious property damage is possible and extensive safety precautions are required. About this manual (1) 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. (2) Moreover, because OMRON is constantly striving to improve its high-quality products, the information in this manual is subject to change without notice. (3) Every precaution has been taken in the preparation of this manual. Nevertheless, if you find any errors or omissions, please contact the branch of OMRON or sales office listed at the end of this manual, and inform them of the catalog No. on the front cover. I Conventions Used in This Manual J Meanings of Abbreviations Sometimes the following abbreviations are used in parameter names, figures and in text explanations. These abbreviations mean the following: Symbol PV SP LBA AT EU Process value (Present) set point *1 Loop break alarm Auto tuning Engineering unit *2 Term *1 In program pattern diagrams, the present SP is indicated. *2 _C, m, g and other units are indicated for scaled data. However, EU" is used as the minimum unit for the data. For example, for 50.02 (m)", 1EU is taken as the minimum unit 0.

01 (m). JHow to Read Display Symbols The following tables show the correspondence between the symbols displayed on the displays and alphabet characters. ABCDEF GHI JKLM N O P Q R S T U V WX Y Z J"Reference" mark This mark indicates that extra, useful information follows, such as supplementary explanations and how to apply functions. II JHow This Manual is Organized Purpose Title Description This chapter describes the features of the E5CK T, names of parts, and typical functions. D Learning about the general- Chapter 1 INTRODUCTION al features of the E5CK-T D Setting up Chapter 2 TIONS PREPARA This chapter describes the operations that you must carry out (e.g. installation, wiring and switch settings) before you can use the E5CK T. These chapters describe using basic control examples how to use the front panel keys and how to view the display when setting the parameters of the major functions for the E5CK T. portant functions of the E5AK T and how to use the parameters for making full use of the E5CK T. D Basic E5CK-T operations Chapter 3 TION Chapter 5 BASIC OPERA PARAMETERS D Applied tions E5CK-T opera- Chapter 4 APPLIED OP These chapters describes the im ERATION Chapter 5 PARAMETERS THE This chapter mainly describes D Communications with a Chapter 6 USING COMMUNICATIONS how to use the communications host computer FUNCTION commands, and gives program examples.

D Calibration Chapter 7 CALIBRATION This chapter describes how the user should calibrate the E5CK T. This chapter describes what to do if any problems occur. D Troubleshooting Chapter 8 TROUBLE SHOOTING III PRECAUTIONS ON SAFETY F Marks For Ensuring Safe Use and Their Meanings This manual uses the following marks to indicate precautions for ensuring that the E5CK T is used safely. The precautions indicated below describe important information regarding safety. Be sure to follow the instructions described in these precautions. WARNING Incorrect handling may cause death or injury. WARNING Do not touch the terminals while the power is ON. This may cause an electric shock. IV NOTICE Be sure to observe these precautions to ensure safe use. F Do not use the product in places where explosive or flammable gases may be present.

F Never disassemble, repair or modify the product. F Tighten the terminal screws properly. F Use the specified size of solderless terminals for wiring. F Use the product within the rated supply voltage. F Use the product within the rated load.

F The life expectancy of the output relay varies considerably according to its switching capacity and operating conditions. Be sure to use the output relay within its rated load and electrical life expectancy. If the output relay is used beyond its life expectancy, its contacts may become fused or burned. F If you remove the controller from its case, never touch nor apply shock to the electronic parts inside. F Do not cover the E5CK T. (Ensure sufficient space around the controller to allow heat radiation.) F Do not use the controller in the following places: · Places subject to icing, condensation, dust, corrosive gas (especially sulfide gas or ammonia gas). · Places subject vibration and large shocks. · Places subject to splashing liquid or oil atmosphere. · Places subject to intense temperature changes. · Places subject to heat radiation from a furnace. F Be sure to wire properly with correct polarity of terminals. F When wiring input or output lines to your controller, keep the following points in mind to reduce the influence from inductive noise: · Allow adequate space between the high voltage/current power lines and the input/output lines. · Avoid parallel or common wiring with high voltage sources and power lines carrying large currents. · Using separating pipes, ducts, and shielded line is also useful in protecting the controller, and its lines from inductive noise.

F Cleaning: Do not use paint thinner or organic solvents. Use standard grade alcohol to clean the product. F Use a voltage (100 to 240 VAC at 50 to 60 Hz). At power ON, the prescribed voltage level must be attained within two seconds. F Allow as much space as possible between the controller and devices that generate a powerful high frequency (high frequency welders, high frequency sewing machines, etc.) or surge. These devices may cause malfunctions. F If there is a large power generating peripheral device and any of its lines near the controller, attach a surge suppressor or noise filter to the device to stop the noise affecting the controller system. In particular, motors, transformers, solenoids and magnetic coils have an inductance component, and therefore can generate very strong noise. F When mounting a noise filter on the power supply to the controller, be sure to first check the filter's voltage and current capacity, and then mount the filter as close as possible to the controller.



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V F Use within the following temperature and humidity ranges: · Temperature: 10_C to 55_C, humidity: 35%RH to 85%RH (with no icing or condensation) 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. If the controller is subjected to heat radiation, use a fan to cool the surface of the controller to under 55_C. F Store within the following temperature and humidity ranges: · Temperature: 25_C to 65_C, humidity: 35%RH to 85%RH (with no icing or condensation) F Never place heavy objects on, or apply pressure to the controller that may cause it to deform and deteriorate during use or storage. F Avoid using the controller in places near a radio, television set, or wireless installation. These devices can cause radio disturbances which adversely affect the performance of the controller.

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2 display F Operation status indicators Displays the process value or parameter symbols. Displays the set point, manipulated variable or parameter settings. · OUT1 Lights when the pulse output function assigned to control output 1" is ON. · OUT2 Lights when the pulse output function assigned to control output 2" is ON. · SUB1 Lights when the pulse output function assigned to auxiliary output 1" is ON. · MANU Lights in the manual operation mode. · RST Lights when the control is in reset status. · RMT Lights during remote operation. · AT Flashes during auto tuning. 13 CHAPTER 1 INTRODUCTION JHow to use keys F RUN/RST The following describes basic key operations.

To change to run operation from the reset status, press this key for one second minimum. To change to the reset status from run operation, press this key for two seconds minimum. key F key The functions of this key change according to how long it is pressed. If the key is pressed for less than one second, the parameters are switched. If the key is pressed for one second minimum, the menu display appears.

In key operations from here on, press the key" refers to pressing the key for less than one second. For details on switching of parameters and menu display items, see page 1 10. F key Each press of key increments or advances the values or settings on the key decrements or returns the No.2 display, while each press of the values or settings on the No.2 display.

Functions vary, for example, when the key is held down simultaneously with the RUN/RST key, or a key is held down continuously. For details, see page 1 10. Also, chapters 3 and 4 describe examples using various key combinations. 14 1.



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2 Input and Output 1.2 Input and Output Temperature input Input type jumper Controller Control output (heat) Control output (cool) Alarm 1 Control output 1 Control output 2 Voltage input Current input Alarm 2 Alarm 3 LBA Error 1 Error 2 LBA Error 1 Error 2 Error 2 Auxiliary output 1 Event input Transfer output 1 Input The E5CK T supports the following inputs: Temperature input, Current input, Voltage input, and Event input. F Temperature input/Voltage input/Current input · Only one of temperature input, current input and voltage input can be selected and connected to the controller. In the above figure, temperature input is selected. · The following input sensors can be connected for temperature input: Thermocouple: K, J, T, E, L, U, N, R, S, B, W, PLII Platinum resistance thermometer: JPt100, Pt100 · The following currents can be connected for current input: 4 to 20 mA, 0 to 20 mA · The following voltages can be connected for voltage input: 1 to 5 VDC, 0 to 5 VDC, 0 to 10 VDC F Event input Add on the input unit (E53-CKB) when using event input. You can select from the following five event inputs: Run/Reset, Auto/Manual, Hold/Hold Cancel, Advance, Pattern 15 CHAPTER 1 INTRODUCTION JOutput The output functions of the E5CK T do not operate for five seconds after the E5CK T is turned ON.

The E5CK T supports the following five outputs: Control output 1 Control output 2 Auxiliary output 1 Transfer output When using control output 1 and 2, set the output unit (sold separately). Nine output units are available to suit the output circuit configuration. When using transfer output, add on the communication unit (E53 AKF). F Output assignments · The E5CK-T supports the following twelve output functions: Control output (heat), Control output (cool), Alarms 1 to 3, LBA, Time Signals 1 and 2, Program End, Stage Output, Error 1 (input error), Error 2 (A/D converter error) · Assign these output functions to control output 1, control output 2 and auxiliary output 1. · Only control output (heat), control output (cool), alarms 1 to 3 and LBA can be assigned to control outputs 1 and 2. Only alarms 1 to 3, LBA, error 1 and error 2 can be assigned to auxiliary output 1. In the example on the previous page, control output (heat)" is assigned to "control output 1", "alarm 1" is assigned to "control output 2", and "alarm 2" is assigned to "auxiliary output 1". Accordingly, the configuration is such that heating control output is connected to control output 1, and alarm output is connected to control output 2 and auxiliary output 1. · When the control is heating and cooling control, assign "control output (cool)" to "control output 1" or "control output 2". F Transfer output · The E5AK-T supports the following four transfer outputs: Present SP Process value, Heating side manipulated variable, Cooling side manipulated variable · These transfer outputs can be output after being scaled.

Setting of an upper limit value smaller than the lower limit value is allowed, so reverse scaling can also be carried out. 16 1.3 Program 1.3 Program JHow programs are structured E5CK-T allows you to configure programs made up of a maximum of four patterns (pattern 0 to 3) each comprising a maximum of 16 steps. The number of patterns and steps in each pattern can be specified in parameters.

Pattern 3 Pattern 1 Pattern 0 Step 0 Step 1 Step 2 Step 15 · Generally, the time setup method" is used to configure programs. By this method, set points at each step and time are used as program elements. However, the ramp rise rate setup method" can also be used. By this method, the set point, ramp time and soak times are used as program elements. JProgram tion opera- · Generally, the target patterns are specified before the program is executed.

· In parameter setup, you can specify repeated execution of the same pattern (Repeat) or consecutive execution of all patterns 0 to 4 (Run all). · During program operation, steps can be skipped (Advance) and the control monitoring can be paused (Hold). · Alarms that are assigned as outputs operate referenced to the alarm values preset to each pattern. · Time signals, program end and stage output can be output according to output assignment. · ON/OFF signals are output as time signals according to the timer that takes a specified step as its start point. F Step operation JAlarm output JProgram output 17 CHAPTER 1 INTRODUCTION 1.4 Parameters and Menus JParameter types E5CK T parameters are distributed between the following ten modes: Protect mode Manual mode Level 0 mode Program mode Level 1 mode Level 2 mode Setup mode Expansion mode Option mode Calibration mode The settings of parameters in each of eight modes (excluding the protect mode and manual mode) can be checked and modified by selection on the menu display. F Protect mode The protect function is for preventing unwanted modification of parameters, and switching between run and reset operation or auto and manual operation. In this mode, the controller can be switched to manual operation. The manipulated variable can be manipulated manually only in this mode.

Set the controller to this mode during normal operation. In this mode, you can change the set point and pattern during operation, and execute step operation (e.g. advance). You can only monitor (not change) the process value, step No., standby time, pattern elapsing time, pattern execution count and manipulated variable. F Manual mode F Level 0 mode F Program mode This is the programming mode. In this mode, you can set the number of steps used in each pattern, pattern execution count, alarm values, set points for each step, step time, and time signals for two steps. This is the main mode for adjusting control. In this mode, you can execute AT (auto tuning), and set up the control period, PID parameters.

This is the auxiliary mode for adjusting control. In this mode, you can set the parameters for limiting the manipulated variable, switch between the remote and local modes, and set the loop break alarm (LBA), alarm hysteresis and the digital filter value of inputs. F Level 1 mode F Level 2 mode F Setup mode This is the mode for setting the basic specifications. In this mode, you can set parameters that must be checked or set before operation such as the input type, scaling, output assignments and direct/reverse operation. 18 1.

4 Parameters and Menus F Expansion mode This is the mode for setting expanded functions. In this mode, you can set SP setting limiter, switching between advanced PID control or ON/OFF control, program time unit, selection of step time/rate of rise programming, time unit of ramp rise rate, and the time for automatic return to the monitoring display.



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This is the mode for setting optional functions. You can select this mode only when an option unit is mounted in the controller. In this mode, you can set the communications conditions, transfer output and event input parameters to match the type of option unit mount in the controller.

This mode is provided so that the user can calibrate inputs and output. When calibrating input, the selected input type is calibrated. Whereas, transfer output can be calibrated only when the communication unit (E53 CKF) is set in the controller. The following diagram shows the order in which modes are selected. Power ON F Option mode F Calibration mode JSelecting modes + 1 second min. 1 second min. Level 0 mode 1 second min. Manual mode Program mode 1 second min. + 1 second min. Level 1 mode 1 second min.

RUN/RST + RUN/RST + 1 second min. 1 second min. Level 2 mode Protect mode 1 second min. Setup mode 1 second min. RUN/RST + 1 second min. Expansion mode 1 second min. Option mode 1 second min. Calibration mode · To select the menu display in any of the above modes (excluding the protect mode and manual mode), press the key for 1 second minimum. When you have selected the menu display, the previous mode is selected. For example, if you selected the menu display while in the level 0 mode, the No.

2 display changes to [] as shown on the left. · To move to the desired mode after you have entered the menu display, select the desired mode using the keys and hold down the key for one second minimum. The display switches to the first parameter of the mode that you specified. · Protected modes cannot be selected. Also, the menu display does not appear when modes are protected up to the program mode.

19 CHAPTER 1 INTRODUCTION], [], [] or [] in the menu display, the · If you select [level 0, program, level 1 and level 2 modes, respectively, are selected. These modes are selected with control still continuing. · If you select[][] or [] in the menu display, the setup, expansion, option and calibration modes, respectively, are selected. When these modes are selected, the control is reset. So, control outputs and auxiliary output are turned OFF.

When another mode is selected while in these modes control, reset is canceled. · To set the controller to the protect mode or to return to the level 0 mode from the protect mode, press the key for 1 second minimum. key for one se · To set the controller to the manual mode, press the cond minimum with the key held down in the level 0 to 2 modes. To return to the level 0 mode in the manual mode, press the key for one key pressed. Be sure to press the key second minimum with the first in this operation. RUN/RST key and the key simulta JSelecting parameters · When the controller is not in the manual mode, each press of the switches the parameter in the respective mode. Parameter 1 key Parameter 2 Parameter 3 Parameter n JFixing settings · If you press the key when at the final parameter, the display returns to the top parameter for the current mode. · When you change parameter settings or contents, specify the parameter using the or keys, and either leave the setting for at least two key. This fixes the setting. seconds or press the · When another mode is selected, the content of the parameters before the mode was selected is fixed.

· When you turn the power OFF you must first fix the settings and param , key or selecting another mode). The eter contents (by pressing the settings and parameter contents are sometimes not changed by merely pressing the or keys. 110 1.5 About the Communications Function 1.5 About the Communications Function The E5CK T can be provided with a communications function that allows you to check and set controller parameters from a host computer. If the communications function is required, add on the communications unit. For details on the communications function, refer to Chapter 6. F RS-232C F RS-485 When using the communications function on the RS 232C interface, add on the communications unit (E53 CK01). When using the communications function on the RS 485 interface, add on the communications unit (E53 CK03). 111 CHAPTER 1 INTRODUCTION 1.

6 About Calibration The E5CK T controller is calibrated before shipment from the factory. So, the user need not calibrate the E5CK T controller during regular use. However, if the E5CK T controller must be calibrated by the user, use the parameters provided for the user to calibrate temperature input, analog input (voltage, current) and transfer output. In this case, note that the re sults of calibration will not be assured. Also, note that calibration data is updated to the latest value each time that the E5CK T controller is calibrated.

Calibration data set before ship ment from the factory cannot be returned to after calibration by the user. F Calibrating inputs The input type selected in parameters is the item to be calibrated. The E5CK T is provided with the following four calibration parameters: · Thermocouple · Platinum resistance thermometer · Current input · Voltage input Two parameters are provided for thermocouple and voltage input. F Calibrating transfer output F Registering calibration data Transfer output also can be calibrated when the communications unit (E53 CKF) is added on. When calibrating each item, the calibration data is temporarily regis tered.

This data can be registered as final calibration data only when all items have been newly calibrated. So, all items must be temporarily regis tered when the E5CK T controller is calibrated. When registering data, information regarding whether or not calibration has been carried out is also registered. To calibrate these items, the user must prepare separate measuring de vices and equipment. For details on handling these measuring devices and equipment, refer to the respective manuals. For details, see Chapter 7 Calibration. 112 CHAPTER 2 PREPARATIONS CHAPTER2 CHAPTER 2 PREPARATIONS This chapter describes the operations (e.g. setup, installation and wir ing) you should carry out before turning the E5CK T ON. 2.

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JDraw-out Draw out the internal mechanism from the housing. (1) Press in both of the hooks on the left and right sides of the front panel to unlock the internal mechanism from the housing. (2) Draw out the internal mechanism towards you holding both sides of the front panel. **JSetting the input type jumper** For details on where the input type jumper is located, see the figure on page 1-2. Set the jumper to one of temperature input, voltage input or current input matched to the type of sensor connected to the input terminal.

I : Current input **V** : Voltage input **TC/PT** : Temperature input The input type jumper is factory-set to TC/PT (temperature input). When you disconnect or insert the input type jumper, do not hold it directly by its pins. When you have finished setting the input type jumper, insert the internal mechanism back into the housing. To do this, push in the internal mechanism until you hear the hooks on the front panel snap into place. 22 2.

1 Setup JSetting up the output unit F Output unit list The following table shows the output units that can be set in the E5CK controller. Model E53-R4R4 E53-Q4R4 E53-Q4HR4 E53-C4R4 E53-C4DR4 E53-V44R4 E53-Q4Q4 E53-Q4HQ4H Specifications (control output 1/control output 2) Relay/Relay Voltage (NPN)/Relay Voltage (PNP)/Relay 4 to 20 mA/Relay 0 to 20 mA/Relay 0 to 10 V/Relay Voltage (NPN)/Voltage (NPN) Voltage (PNP)/Voltage (PNP) (1) Two rectangular holes for slotting are provided on the power board (on right side of controller). Fit the two protrusions on the output unit into these two holes. (2) With the output unit fitted into the power board, fit the output unit into the connector on the control board (on left side of controller). **F Setup JSetting up the option unit F Option unit list** The following table shows the option units that can be connected to the E5CK controller.

Unit Communications unit Communications unit Input unit Communications unit Model E53-CK01 E53-CK03 E53-CKB E53-CKF Specifications Communications (RS-232C) Communications (RS-485) Event input: 1 input Transfer output: 4 to 20 mA F Setup (1) Place the controller with its bottom facing up, and fit the board horizontally into the connector on the power board (on right side of controller). (2) With the power board connected, fit the board vertically into the connector on the control board (on left side of controller). 23 CHAPTER 2 PREPARATIONS 2.2 Installation JDimensions 58 53j PV 13 100 OUT1 OUT2 MANU STOP RMT RUN RST A AT SUB1 M E5CK JPanel cutout 65 min. Unit (mm) 60 min. 45 +0.6 0 Recommended panel thickness is 1 to 5 mm. +0.6 0 45 Maintain the specified vertical and horizontal mounting space between each controller. Controllers must not be closely mounted vertically or horizontally.

24 44.8 48 SV j 2.2 Installation JMounting Adapter Panel Watertight packing (1) Insert the E5CK controller into the mounting hole in the panel at the position shown in the figure above. (2) Push the adapter along the controller body from the terminals up to the panel, and fasten temporarily. (3) Tighten the two fixing screws on the adapter. When tightening screws, tighten the two screws alternately keeping the torque to approximately 0.29 to 0.39 N·m, or 3 to 4 kgf·cm. About the Terminal Cover E5CK AAI 500 controller is provided with a terminal cover (E53 COV07). Fasten the terminal cover as follows by using the snap pin.

25 CHAPTER 2 PREPARATIONS 2.3 Wiring Terminals JTerminal arrangement AC100-240V (AC/DC24V) SOURCE 5 4 SUB1 3 2 1 13 14 OUT1 11 12 10 9 8 7 6 OUT2 IN OPTION JPrecautions when wiring Separate input leads and power lines in order to protect the controller and its lines from external noise. We recommend using solderless terminals when wiring the controller. Tighten the terminal screws using a torque no greater than 0.78 Nm (8kgfcm). Use the following type of solderless terminals for M3.5 screws. 7.2mm max. 7.

2mm max. JWiring F Power supply 5 4 3 2 1 11 12 10 9 8 7 6 In the following wiring diagrams, the left side of the terminal Nos. indicates the inside of the controller. Input power to terminals Nos. 4 and 5. Power specifications are as follows: 100 to 240 VAC, 50/60 Hz, 15 VA or 24 VAC, 50/60 Hz, 6 VA 24 VDC, 3.5W 13 14 About the power blocks The E5CK has independent power supplies for each of the terminal blocks shown on the right. However, note that the power supplies for blocks C (exclude relay output) and D are shared for the following option unit. Option unit : E53-CKB or E53-CKF C 5 11 12 10 9 4 8 3 C 7 2 1 13 14 6 D B A 26 2.3 Wiring Terminals F Input 5 4 3 2 1 11 12 10 9 8 7 6 Connect the sensor input to terminal Nos.

6 to 8 as follows according to the input type. 8 7 6 8 8 7 6 8 + 7 6 V 7 6 mA 13 14 + + Thermocouple Platinum resistance thermometer Voltage input Current input TC PT V I Set the input type jumper inside the controller matched to the input type. Set thermocouples and platinum resistance thermometer as temperature input to the shared jumper setting (TC/PT). For details on the input type jumper, see page 2-2. F Control output 5 4 3 2 1 11 12 10 9 8 7 6 Terminal Nos. 11 and 12 are for control output 1 (OUT1). The following diagrams show the available outputs and their internal equalizing circuits. 11 +v + 11 L 12 Relay E53-R4R4 GND NPN 12 GND PNP 12 +v + 11 L V 0 to 10V E53-V44R4 12 11 L mA 12 + 11 L + 13 14 4 to 20mA E53-C4R4 E53-C4DR4 E53-Q4R4 E53-Q4Q4 E53-Q4HR4 E53-Q4HQ4H Terminal Nos. 9 and 10 are for control output 2 (OUT2). The following diagrams show the available outputs and their internal equalizing circuits.

10 +v + 10 L 9 Relay E53-R4R4 /E53-V44R4 E53-Q4R4 /E53-C4R4 E53-Q4HR4/E53-C4DR4 GND 9 NPN E53-Q4Q4 GND 9 PNP +v 10 L + E53-Q4HQ4H The following table shows the specifications for each output type. Output Type Relay Voltage (NPN) Voltage (PNP) 0 to 10V 4 to 20mA Specifications 250VAC, 3 A 12VDC, 20 mA (with short-circuit protection) 12VDC, 20 mA (with short-circuit protection) 0 to 10VDC, Permissible load impedance: 1 k min., Resolution: Approx. 2600 4 to 20 mA, Permissible load impedance: 500 max., Resolution: Approx.

2600 27 CHAPTER 2 PREPARATIONS F Auxiliary output 1 Terminal Nos.2 and 3 are for auxiliary output 1 (SUB1). 5 4 3 2 1 11 12 10 9 8 7 6 The internal equalizing circuit for auxiliary output 1 is as follows: 3 2 13 14 Relay specifications are as follows: 1a, 250 VAC, 1 A Terminal Nos.1, 13 and 14 are available only for controllers that support optional functions. These terminals can be wired as follows depending on the controller type.



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32 34 34 35 35 37 37 37 38 39 39 39 3 10 3 10 3 13 3 14 3 14 3 14 3 15 3 18 3 18 3 20 3 21 3 21 3 23 3 24 31 CHAPTER 3 BASIC OPERATION 3.1
Convention Used in this Chapter This chapter describes basic E5CKT operations such as how to set up parameters, start and stop operation, and adjust control operation. For more complex control examples, refer to Chapter 4 Applied Operation and Chapter 5 Parameters. F Basic Operation Flow The following diagram shows the basic flow of operation.

Power ON Setup Setting input specifications Setting output specifications Setting alarm output Setting patterns Protecting parameters Operation Start Adjustment Stop Power OFF The descriptions in this chapter follow the order of basic operations shown in the flow above. Examples of operation of each of the items are described up to completion of parameter setup. However, you must move to the top parameter of the following Setting. For example, when you have finished setting input specifications" and you want to set output specifications," move to the top parameter of setting output specifications" from the bottom parameter of setting input specifications." For details on moving to parameters between items, refer Chapter, Selecting modes and Selecting parameters (page 1 10).

32 3.1 Convention Used in this Chapter F Setup examples This description assumes that the controller is operated under the following conditions. · A K thermocouple is used as the input. · Control output (heat), alarm 1 and alarm 2 functions are assigned to control output 1," control output 2" and auxiliary output 1, respectively. Of these, only control output 1 and auxiliary output 1 are used. · The relay output unit is mounted at control output 1. · The upper limit alarm is set as alarm 2. The alarm is output when the temperature exceeds 10_C with respect to the PV. · The program is made up of one pattern comprising four steps. · The following figures show terminal wiring and the program used in the setting examples.

Humidifier Control target Temperature sensor K thermocouple AC100-240V (AC/DC24V) 5 4 3 2 1 OUT1 11 12 10 9 8 7 13 14 6 OUT2 Alarm 1 (deviation upper-and lower-limit) E5CKT SP Step 1 100 Step 2 Step 3 Pattern 0 50 0.20 0.40 0.20 Time: hr, min 33 CHAPTER 3 BASIC OPERATION 3.2 Setting Input Specifications Setting input specifications Input type N Temperature input? Y Temperature unit Scaling Setup mode Decimal point Level 2 mode Temperature input shift End of setup · With temperature input, scaling and decimal point parameters need not be set as this information is determined by the input (sensor) type. (These parameters are not displayed.) Note that temperature unit and temperature input shift parameters need to be set. · With analog input, the scaling upper limit", scaling lower limit" and decimal point" parameters need to be set. JInput type · Set the type No. (0 to 21) in the input type" parameter (Set up mode).

The factory setting is 2: K1 (thermocouple)." · When you set the input type" parameter, be sure to check the setting of the input type jumper. If the jumper setting does not match the type of input connected to the input terminal, reset the input type jumper. · For details on input types, setting ranges and setting of the input type jumper, see Chapter 5 Parameter/Setup mode/Input type on page 5 31. · For details on input types and setting ranges, see page 5 31.

34 3.2 Setting Input Specifications JTemperature input F Temperature unit · To switch the temperature unit from _C" to _F" when input is temperature, switch the _C/_F selection" parameter (setup mode) from " to ". F Temperature input shift · When input is temperature input, the upper and lower limit values of the sensor can be shifted linearly. For example, if both the upper and lower limit values are shifted by 1.2_C, the process value (before shift) is regarded as 201.2_C after shift when input is 200_C before shift. · To set input shift, set shift values in the input shift upper limit" and in put shift lower limit" parameters (level 2 mode). Temperature Input shift upper limit value Upper limit value After shift Before shift Lower limit value 0 Input shift lower limit value Input (%FS) 100

· Analog input · When the analog input (the voltage input and current input) is selected, scaling matched to the control is required. · The scaling upper limit", scaling lower limit" and decimal point" pa rameters (setup mode) are used for scaling. These parameters cannot be used when the temperature input type is selected. · The scaling upper limit" parameter sets the physical quantity to be ex pressed by the upper limit value of input, and the scaling lower limit" parameter sets the physical quantity to be expressed by the lower limit value of input.



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Default is 2: Upper limit alarm (deviation)". Alarm value · Alarm values are indicated by X" in the table above. Alarm output operation differs according to whether the value of the alarm is positive or negative. · Alarm values are built into the program and are set for each pattern. For details, see 3.5 Setting Patterns" (page 3 14). 39 CHAPTER 3 BASIC OPERATION Alarm hysteresis · The hysteresis of alarm outputs when alarms are switched ON/OFF can be set as follows: Upper limit alarm Lower limit alarm Alarm hysteresis ON ON Alarm hysteresis OFF Alarm value OFF Alarm value · Alarm hysteresis is set independently for each alarm in the alarm 1 to 3 hysteresis" parameters (level 2 mode). Default is 0.

02: 0.02%FS". F Standby sequence · Standby sequence" is a function for unconditionally turning alarm output OFF when the process value has left the alarm range once and it next enters the alarm range. · For example, when the alarm type is set to lower limit alarm," generally the process value is within the alarm range, and alarm output smaller than the set point, and alarm output becomes ON when this state continues. However, if the alarm type is set to lower limit alarm with standby sequence", alarm output first becomes ON when the process value exceeds the alarm setting value to leave the alarm range and once again falls below the alarm value. · The standby sequence is canceled when an alarm is output. It is, however, restarted later by one of the following conditions: Operation is started or power is turned ON. A pattern is started. The program advances to the next step. The SP of the current step is changed. The currently running alarm value is changed. The input shift value is changed. Advance is executed. JClose in alarm/open in alarm · When the controller is set to close in alarm," the status of the alarm output function is output as it is. When set to open in alarm," the status of the alarm output function is output inverted.

Alarm ON OFF ON OFF Output ON OFF OFF ON Output LED Lit Not lit Lit Not lit Close in alarm Open in alarm · Alarm type and close in alarm (normally open)/open in alarm (normally close) can be set independently for each alarm. · Close in alarm/open in alarm is set in the alarm 1 to 3 open in alarm" parameters (setup mode). Default is : close in alarm". 310 3.4 Setting Alarm Type F Summary of alarm operations The figure below visually summarizes the above descriptions of alarm operations (when alarm type is set to lower limit alarm with standby sequence PV Alarm value Alarm hysteresis Time Standby sequence canceled Alarm output ON OFF ON (closed) OFF (open) 311 CHAPTER 3 BASIC OPERATION Setting Example Alarm 2 is output when the temperature exceeds alarm value 2 programmed to the SP Parameter factory settings for alarm type 2," alarm .

hysteresis" and close in alarm/open in alarm" are used. In this example, the related parameters are set as follows: alarm type 2" = 2: upper limit" alarm value 2" = (set in program setting) alarm hysteresis: = 0.02" : close in alarm" close in alarm/open in alarm" = In this example, let's check the alarm type. (1) Select the menu display, and select or 1 second min. : setup mode" pressing the keys. For details on selecting the menu display, see page 1 9. key to enter the setup mode. The top parameter in the (2) Press the : input type" is displayed. setup mode (3) Press the key until [] (alarm type 2" parameter) is displayed. Default is 2: upper limit".

312 3.5 Setting Patterns 3.5 Setting Patterns If you want to set parameters in the program mode during controller operation, you must first stop operation. Operation may continue only in special instances, for example, to change SP during controller operation. · This section describes the procedure to follow when setting two or more patterns. Select the number of patterns in the number of patterns" parameter (expansion mode). · Parameters that you use frequently for programming can be set in the program mode." The flow below shows the parameters that are available in the program mode and the order in which they are set. Select the program mode. Select pattern No.

Set number of steps Rate of rise setting Step time/Rate of rise programming Step time setting Set step SP/step time Set SP/Ramp time /Soak time of each step Set pattern execution count Set alarm value Set time signal 1, 2 Step/ON time/OFF time n All patterns completed? y End of program This chapter describes the basic operation of programming. For details on the following parameters, refer to Chapter 4 Applied Operation: Step time/Rate of rise programming", Pattern execution count", Time signal 1, 2" 313 CHAPTER 3 BASIC OPERATION JPattern No. · This parameter cannot be changed during controller operation. · Set the desired pattern No. Step SP step time, alarms and other parameters that follow this parameter are set for the pattern that is set in this parameter.

· Set within the range 0 to (number of patterns 1). The number of patterns" parameter is factory set to 0". JNumber of steps JStep SP/Step time · Set the number of steps for the pattern that you specified in the pattern No." parameter. · Set within the range 1 to 16 (step). Default is 8". · Set only the number of steps used in the program in order from step 0, as step 0 SP", step 0 time", step 1 SP", step 1 time" and so forth. · Set within the range from set point lower limit to set point upper limit for step SP Default is 0". · Set within the range 0.00 to 99.59 (hours:minutes or minutes:seconds). Default is 0.00". SP Step 0 Step 1 Step 2 Step 3 : : : 0 to 15 Step 0 hour Step 1 hour Step 2 hours Step 3 hours A: SP of steps 0 and 3 B: SP of steps 1 and 2 Time · As shown in the above figure, step 0 is a fixed value, so when ramp operation is started, set the step 0 time" parameter to 0.

00" to configure the program so that ramp operation starts from step 1. 314 3.5 Setting Patterns JAlarm value : : 0 to 3 · Alarm values can be set only for alarms that have been assigned as output. · When a deviation alarm is assigned as output, the alarm value is set with respect to SP The following example shows the relationship between the . SP and alarm value when the alarm type is set to upper limit." SP Step 0 Step 1 Step 2 Step 1 SP Step 0 SP Alarm value Alarm type: upper-limit alarm Time About the Alarm Value Decimal Point The decimal point of the alarm value conforms to the setting of the decimal point" parameter In this example, the decimal point" parameter is set to 1".



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