

Digital Temperature Controllers

Communications Manual

E5CC

E5EC

1

Communications
Methods

2

CompoWay/F Commu-
nications Procedures

3

Communications
Data for CompoWay/F

4

Modbus Commu-
nications Procedure

5

Communications
Data for Modbus

A

Appendices

I

Index



Preface

Serial communications can be performed with the E5CC and E5EC Digital Controllers.

This manual describes the communications capabilities supported by the E5CC and E5EC Digital Controllers. Read and understand this manual before using communications with the E5CC and E5EC Digital Controllers and be sure you are performing communications correctly.

Keep this manual in a safe location where it will be available when needed.

© OMRON, 2011

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.

No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

Read and Understand this Manual

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

Warranty and Limitations of Liability

| <i>WARRANTY</i> |
|---|
| <p>OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.</p> <p>OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.</p> |

| <i>LIMITATIONS OF LIABILITY</i> |
|--|
| <p>OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.</p> <p>In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.</p> <p>IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.</p> |

Application Considerations

SUITABILITY FOR USE

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

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

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

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

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

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

PROGRAMMABLE PRODUCTS

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

Disclaimers

CHANGE IN SPECIFICATIONS

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

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

DIMENSIONS AND WEIGHTS

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

PERFORMANCE DATA

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

ERRORS AND OMISSIONS

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

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.

| | |
|--|--|
|  CAUTION | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage. |
|--|--|

Symbols

| Symbol | Meaning |
|--------------------------|---|
| Caution |  <ul style="list-style-type: none"> • General Caution Indicates non-specific general cautions, warnings, and dangers. |
| Caution |  <ul style="list-style-type: none"> • Electrical Shock Caution Indicates possibility of electric shock under specific conditions. |
| Prohibition |  <ul style="list-style-type: none"> • General Prohibition Indicates non-specific general prohibitions. |
| Mandatory Caution |  <ul style="list-style-type: none"> • General Caution Indicates non-specific general cautions, warnings, and dangers. |

● Safety Precautions

 **CAUTION**

Minor injury due to electric shock may occasionally occur.
Do not touch the terminals while power is being supplied.



Electric shock, fire, or malfunction may occasionally occur.
Do not allow metal objects, conductors, cuttings from installation work, or moisture to enter the Digital Controller or a Setup Tool port. Attach the cover to the front-panel Setup Tool port whenever you are not using it to prevent foreign objects from entering the port.



Minor injury from explosion may occasionally occur.
Do not use the product where subject to flammable or explosive gas.



Fire may occasionally occur.
Do not allow dirt or other foreign objects to enter a Setup Tool port, or between the pins on the connectors on the Setup Tool cable.



Minor electric shock, fire, or malfunction may occasionally occur.
Never disassemble, modify, or repair the product or touch any of the internal parts.



CAUTION - Risk of Fire and Electric Shock

- (a) This product is UL recognized as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
- (b) More than one disconnect switch may be required to de-energize the equipment before servicing.
- (c) Signal inputs are SELV, limited energy.*1
- (d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits.*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.



*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.
*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.

 **CAUTION**

Loose screws may occasionally result in fire.
Tighten the terminal screws to the specified torque of 0.43 to 0.58 N·m.



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.



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. Use the product within specifications.

- The product is designed for indoor use only. Do not use or store the product in any of the following locations.

Locations directly subject to heat radiated from heating equipment.

Locations subject to splashing liquid or oil atmosphere.

Locations subject to direct sunlight.

Locations subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).

Locations subject to intense temperature change.

Locations subject to icing and condensation.

Locations subject to vibration and large shocks.

- Use and store the Digital Controller within the rated ambient temperature and humidity. Gang-mounting two or more Digital Controllers, or mounting Digital Controllers above each other may cause heat to build up inside the Digital Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Controllers.
- To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
- Be sure to wire properly with correct polarity of terminals.
- Use the specified size of crimped terminals (M3.0, width of 5.8 mm or less) for wiring. To connect bare wires to the terminal block, use copper braided or solid wires with a gage of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.8231 mm²). (The stripping length is 6 to 8 mm.) Up to two wires of the same size and type, or two crimped terminals can be inserted into a single terminal.
- Do not wire the terminals that are not used.
- To avoid inductive noise, keep the wiring for the Digital Controller's terminal block away from power cables that carry high voltages or large currents. Also, do not wire power lines together with or parallel to Digital Controller wiring. Using shielded cables and using separate conduits or ducts are 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.

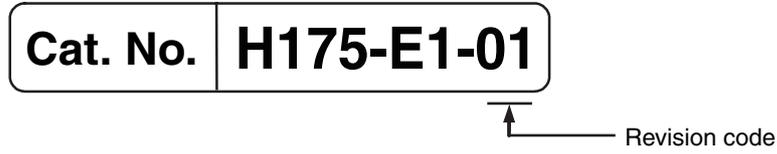
Allow as much space as possible between the Digital Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.

- Use this product within the rated load and power supply.
- Make sure that the rated voltage is attained within 2 seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.
- 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.

- A switch or circuit breaker must be provided close to the Digital Controller. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for the Digital Controller.
- Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
- Design the system (e.g., control panel) considering the 2 seconds of delay in setting the Digital Controller's output after the power supply is turned ON.
- The output will turn OFF when you move to the initial setting level. Take this into consideration when performing control.
- The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data.
- Use suitable tools when taking the Digital Controller apart for disposal. Sharp parts inside the Digital Controller may cause injury.
- Do not connect cables to both the front-panel Setup Tool port and the top-panel Setup Tool port at the same time. The Digital Controller may be damaged or may malfunction.
- Do not exceed the communications distance that is given in the specifications and use the specified communications cable. Refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174) for the communications distance and cable specifications.
- Do not turn the power supply to the Digital Controller ON or OFF while the USB-Serial Conversion Cable is connected. The Digital Controller may malfunction.

Revision History

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

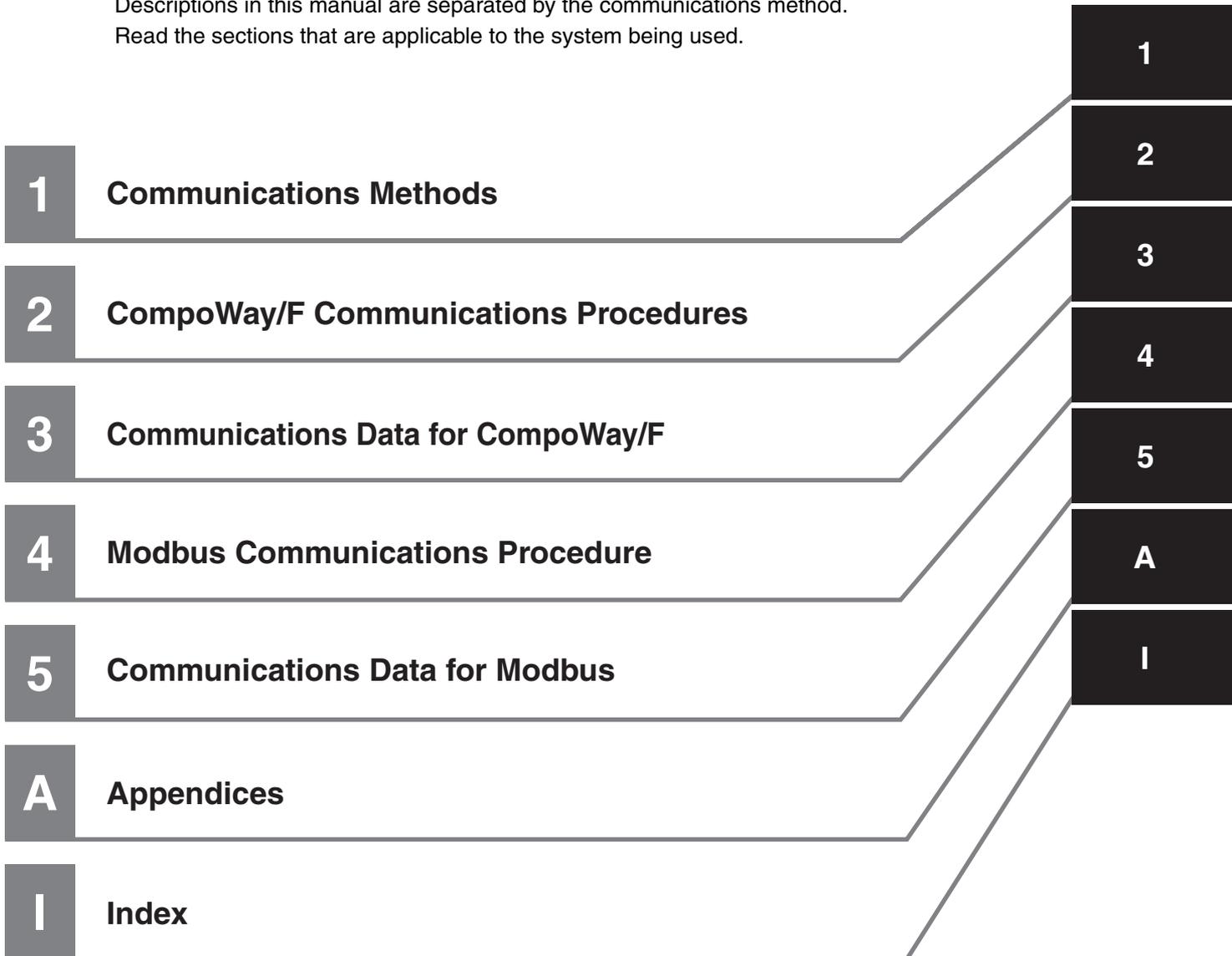


| Revision code | Date | Revised content |
|---------------|---------------|---------------------|
| 01 | December 2011 | Original production |

Sections in This Manual

How This Manual is Organized

Descriptions in this manual are separated by the communications method. Read the sections that are applicable to the system being used.



Related Manuals

This manual describes the communications functions of the E5CC and E5EC Digital Controllers. For details on the functions of the E5CC and E5EC Digital Controllers, refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174).

CONTENTS

| | |
|---|-----------|
| Preface | 1 |
| Read and Understand this Manual | 2 |
| Safety Precautions | 5 |
| Definition of Precautionary Information | 5 |
| Symbols | 5 |
| Precautions for Safe Use | 8 |
| Revision History | 10 |
| Sections in This Manual | 11 |
| How This Manual is Organized | 11 |
| Related Manuals | 11 |

Section 1 **Communications Methods**

| | |
|--|------------|
| 1-1 Overview of Communications Methods | 1-2 |
| 1-1-1 Introduction | 1-2 |
| 1-1-2 Communications Specifications | 1-2 |
| 1-1-3 Transmission Procedure..... | 1-3 |
| 1-1-4 Interface | 1-3 |
| 1-1-5 Wiring..... | 1-4 |
| 1-1-6 Communications Parameters | 1-5 |
| 1-1-7 Communications Parameter Setup | 1-6 |
| 1-1-8 Description of Communications Parameters | 1-7 |

Section 2 **CompoWay/F Communications Procedures**

| | |
|---|-------------|
| 2-1 Data Format..... | 2-2 |
| 2-1-1 Command Frame | 2-2 |
| 2-1-2 BCC Calculation Example..... | 2-3 |
| 2-1-3 Response Frame..... | 2-3 |
| 2-1-4 Communications Data..... | 2-4 |
| 2-1-5 End Code Example | 2-4 |
| 2-2 Structure of Command Text..... | 2-6 |
| 2-2-1 PDU Structure | 2-6 |
| 2-2-2 Area Definitions..... | 2-6 |
| 2-2-3 Type Code (Variable Type) | 2-6 |
| 2-2-4 Addresses | 2-7 |
| 2-2-5 Number of Elements | 2-7 |
| 2-2-6 List of Services (Main Request Codes and Sub-Request Codes) | 2-7 |
| 2-3 Detailed Description of the Services | 2-8 |
| 2-3-1 Read Variable Area | 2-8 |
| 2-3-2 Write Variable Area | 2-9 |
| 2-3-3 Composite Read from Variable Area..... | 2-10 |
| 2-3-4 Composite Write to Variable Area..... | 2-12 |
| 2-3-5 Read Controller Attributes..... | 2-13 |
| 2-3-6 Read Controller Status..... | 2-14 |
| 2-3-7 Echoback Test..... | 2-15 |
| 2-3-8 Operation Command..... | 2-16 |
| 2-4 Response Code List | 2-21 |

Section 3 Communications Data for CompoWay/F

| | | |
|-----|--|------|
| 3-1 | Variable Area (Setting Range) List | 3-2 |
| 3-2 | Status and Status 2 | 3-18 |

Section 4 Modbus Communications Procedure

| | | |
|-------|--|------|
| 4-1 | Data Format | 4-2 |
| 4-1-1 | Command Frame | 4-2 |
| 4-1-2 | Response Frame | 4-4 |
| 4-1-3 | Error Codes | 4-5 |
| 4-2 | Function List | 4-6 |
| 4-3 | Variable Area | 4-7 |
| 4-4 | Detailed Description of the Functions | 4-8 |
| 4-4-1 | Variable Read, Multiple | 4-8 |
| 4-4-2 | Variable Write, Multiple | 4-10 |
| 4-4-3 | Variable Write, Single/Operation Command | 4-12 |
| 4-4-4 | Echoback Test | 4-15 |

Section 5 Communications Data for Modbus

| | | |
|-----|--|------|
| 5-1 | Variable Area (Setting Range) List | 5-2 |
| 5-2 | Status | 5-13 |

Section A Appendices

| | | |
|-----|-----------------------|-----|
| A-1 | ASCII List | A-2 |
| A-2 | Troubleshooting | A-3 |

Index

1

Communications Methods

This section briefly describes the supported communications methods and how to wire equipment. Refer to this section when setting up equipment.

| | | |
|------------|---|------------|
| 1-1 | Overview of Communications Methods | 1-2 |
| 1-1-1 | Introduction | 1-2 |
| 1-1-2 | Communications Specifications | 1-2 |
| 1-1-3 | Transmission Procedure | 1-3 |
| 1-1-4 | Interface | 1-3 |
| 1-1-5 | Wiring | 1-4 |
| 1-1-6 | Communications Parameters | 1-5 |
| 1-1-7 | Communications Parameter Setup | 1-6 |
| 1-1-8 | Description of Communications Parameters | 1-7 |

1-1 Overview of Communications Methods

1-1-1 Introduction

The program for the communications functions is created on the host (personal computer, PLC, or other type of communications master), and the E5CC/E5EC's parameters are monitored or set from the host. Therefore, the description provided here is from the viewpoint of the host.

CompoWay/F is OMRON's standard communications format for general serial communications. This format uses a standard frame format as well as the well-established FINS* commands used for OMRON's PLCs. Therefore, it can simplify communications between components and the host.

* FINS (Factory Interface Network service)

The FINS protocol provides message communications between controllers in OMRON FA networks.

Modbus is a standard communications control method that conforms to the Modicon Company's RTU-mode Modbus Protocol (PI-MBUS-300 Revision J). Modbus is a registered trademark of Schneider Electric.

It supports functions equivalent to the CompoWay/F Read Variable Area, Write Variable Area, Operation Command, and Echoback Test functions.

The E5CC/E5EC supports the following communications functions.

- Reading/writing of parameters
- Operation instructions
- Selection of setup levels

Communications are subject to the following condition:

- Parameters can be written only when the Communications Writing parameter is set to ON (enabled).

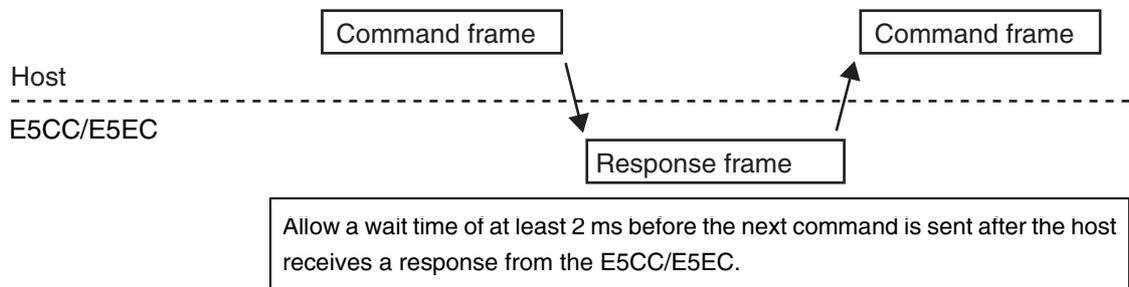
1-1-2 Communications Specifications

| | |
|-------------------------------------|--|
| Transmission line connection | RS-485: Multidrop |
| Communications method | RS-485 (2-wire, half-duplex) |
| Synchronization method | Start-stop synchronization |
| Communications baud rate * | 9,600, 19,200, 38,400 or 57,600 bps |
| Communications code | ASCII |
| Communications data length * | 7 or 8 bits |
| Communications stop bits * | 1 or 2 bits |
| Error detection | Vertical parity (none, even, or odd) * BCC (Block Check Character) with CompoWay/F communications CRC-16 (Cyclic Redundancy Check 16) with Modbus communications |
| Flow control | None |
| Interface | RS-485 |
| Retry function | None |
| Communications buffer | 217 bytes |
| Send data wait time | 0 to 99 ms, default time: 20 ms |

* Communications baud rate, data length, stop bits and vertical parity can each be set independently in the communications setting level. Highlighted values indicate default settings.

1-1-3 Transmission Procedure

When the host transmits a command frame, the E5CC/E5EC transmits a response frame that corresponds to the command frame. A single response frame is returned for each command frame. The following diagram shows the operation of the command and response frames.



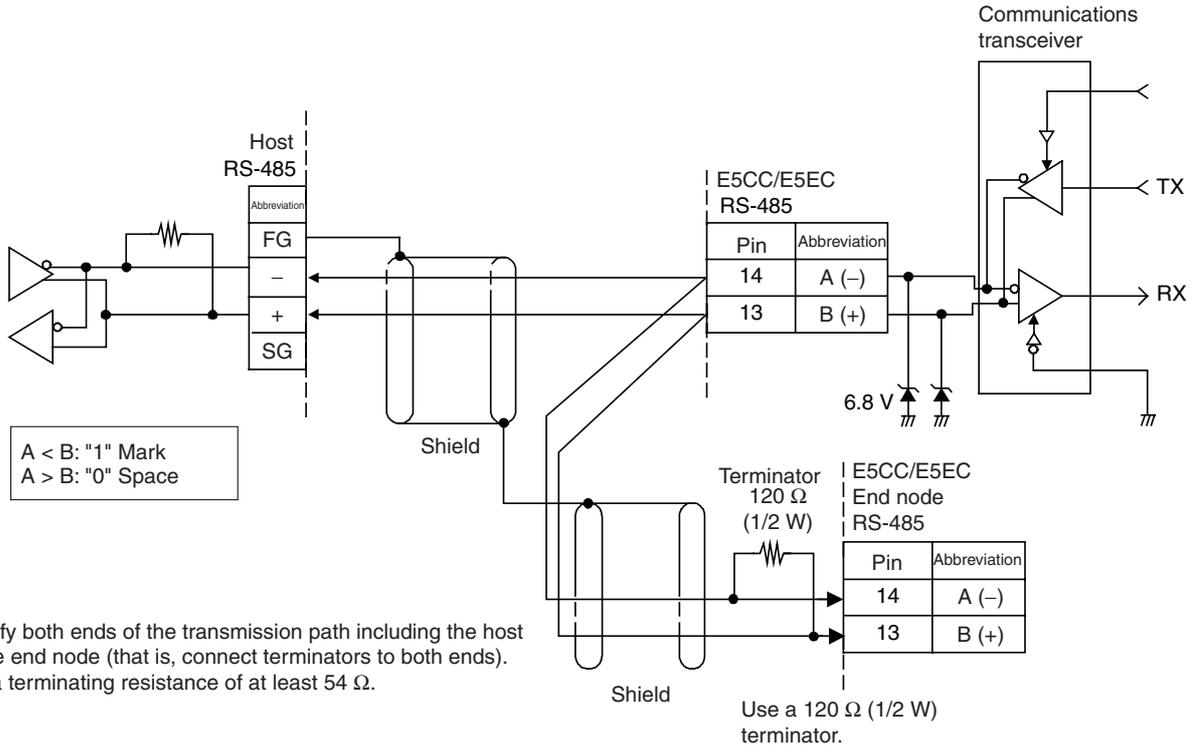
1-1-4 Interface

Communications with the host are carried out through a standard RS-485 interface. Use a K3SC Interface Converter for RS-485 interface conversion.

1-1-5 Wiring

● **RS-485**

- The RS-485 connection can be either one-to-one or one-to-N. Up to 32 units including the host can be connected in a one-to-N system.
- The total cable length is 500 m max.
- Use a shielded twisted-pair cable with a wire gauge of AWG24 to AWG18 (cross-sectional area of 0.205 to 0.823 mm²).



Match the communications specifications of the E5CC/E5EC and the host. When using a 1:N connection, set the same communications specifications in all of the Units. Each Communications Unit must have a unique unit number.

This section explains how to set the E5CC/E5EC's communications specifications. For details on the host, refer to the user's manual provided with the host.

1-1-6 Communications Parameters

The E5CC/E5EC's communications specifications are set in the communications setting level. These parameters are set on the E5CC/E5EC's front panel. The following table shows the communications parameters and their setting ranges.

| Item | Code | Settings | Set Values |
|---------------------------------|-------------|-----------------------------|--|
| Communications protocol setting | <i>PSEL</i> | CompoWay/F /Modbus | <i>CWF/Mod</i> |
| Communications unit number | <i>U-Nō</i> | 0 to 99 | 0, 1 to 99 |
| Communications baud rate | <i>bPS</i> | 9.6/19.2/38.4/57.6 (kbit/s) | 9.6 /19.2 /38.4/57.6 (kbit/s) |
| Communications data length * | <i>LEN</i> | 7/8 (bit) | 7 /8 (bit) |
| Communications stop bits * | <i>Sbct</i> | 1/2 | 1/ 2 |
| Communications parity | <i>PRTY</i> | None, Even, Odd | <i>NONE/EVEN/odd</i> |
| Send data wait time | <i>SDWT</i> | 0 to 99 | 0 to 99 ms, default time: 20 ms |

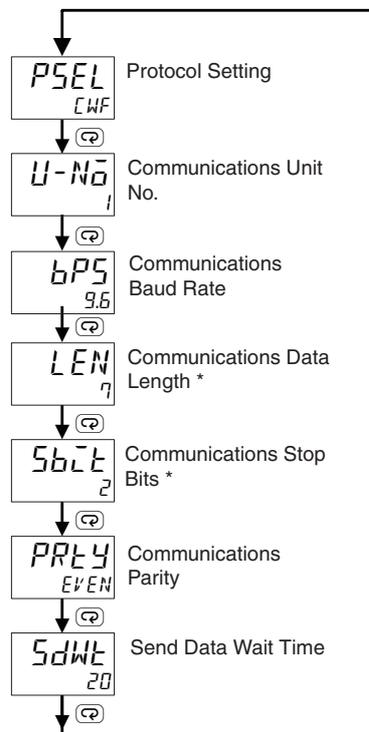
Highlighted values indicate default settings.

- * When the Protocol Setting parameter is set to Modbus, the communications data length must be 8 bits, and the communications stop bits must be 1 bit by setting the communications parity to Even/Odd or it must be 2 bits by setting the parity to None. These two parameters are not displayed on the Controller's display.

1-1-7 Communications Parameter Setup

Before you carry out communications with the E5CC/E5EC, set up the communications unit number, baud rate, and other parameters by carrying out the following procedure. For details on operations other than communications parameter setup, refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174) for the devices being used.

- (1) Press the  Key for at least three seconds to move from the "operation level" to the "initial setting level."
- (2) Press the  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  Key.
- (4) Use the  or  Keys to change the parameter set values.



* Displayed only when the Protocol Setting parameter is set to CompoWay/F.

1-1-8 Description of Communications Parameters

When communications parameter settings have been changed, the new settings must be enabled by resetting the Controller.

- Protocol Setting (*PSEL*)
The communications protocol can be selected. Set CompoWay/F or Modbus.
- Communications Unit No. (*U-N \bar{a}*)
This parameter is for setting a unique unit number for each of the Digital Controllers. This unit number is set so that the host can identify the Digital Controller when communications are carried out with the host. The unit number can be set to an integer value between 0 and 99. The default is "1." When two or more Digital Controllers are used, do not set the same unit number. Doing so will prevent normal operation.
- Communications Baud Rate (*bPS*)
This parameter is for setting the baud rate for communications with the host. The communications baud rate settings are as follows: 9.6 (9600 bps), 19.2 (19200 bps), 38.4 (38400 bps) or 57.6 (57600 bps)
- Communications Data Length (*LEN*)
This parameter is for setting the number of communications data bits. Set either "7 bits" or "8 bits."
- Communications Stop Bits (*St \bar{t}*)
This parameter is for setting the number of communications stop bits. Set either "1" or "2."
- Communications Parity (*PR \bar{t}*)
This parameter is for setting the communications parity. Set the parity to "none," "even," or "odd."
- Send Data Wait Time (*Sdwt*)
The send data wait time is the delay from when the Controller receives a command from the host computer until it returns a response. If the response is returned too quickly, the host computer may not be able to receive the response. Change the send data wait time as required. To increase the response speed for communications, reduce the send data wait time. The send data wait time can be set in 1-ms increments between 0 and 99 ms. The default is 20 ms.

2

CompoWay/F Communications Procedures

Read this section if you are to communicate using the CompoWay/F format.

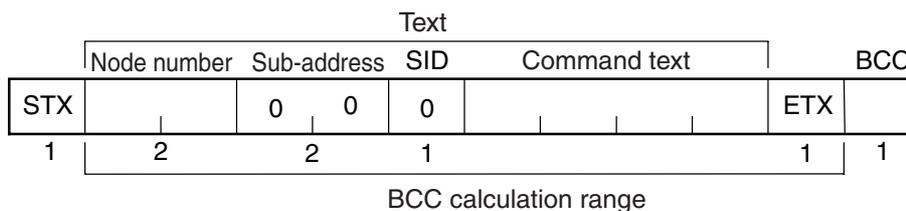
| | | |
|------------|---|-------------|
| 2-1 | Data Format | 2-2 |
| 2-1-1 | Command Frame | 2-2 |
| 2-1-2 | BCC Calculation Example | 2-3 |
| 2-1-3 | Response Frame | 2-3 |
| 2-1-4 | Communications Data | 2-4 |
| 2-1-5 | End Code Example | 2-4 |
| 2-2 | Structure of Command Text | 2-6 |
| 2-2-1 | PDU Structure | 2-6 |
| 2-2-2 | Area Definitions | 2-6 |
| 2-2-3 | Type Code (Variable Type) | 2-6 |
| 2-2-4 | Addresses | 2-7 |
| 2-2-5 | Number of Elements | 2-7 |
| 2-2-6 | List of Services (Main Request Codes and Sub-Request Codes) | 2-7 |
| 2-3 | Detailed Description of the Services | 2-8 |
| 2-3-1 | Read Variable Area | 2-8 |
| 2-3-2 | Write Variable Area | 2-9 |
| 2-3-3 | Composite Read from Variable Area | 2-10 |
| 2-3-4 | Composite Write to Variable Area | 2-12 |
| 2-3-5 | Read Controller Attributes | 2-13 |
| 2-3-6 | Read Controller Status | 2-14 |
| 2-3-7 | Echoback Test | 2-15 |
| 2-3-8 | Operation Command | 2-16 |
| 2-4 | Response Code List | 2-21 |

2-1 Data Format

Hexadecimal values are expressed by adding the prefix H' before the number, e.g., H'02. Numbers shown without the H' prefix are ASCII characters.

The number underneath each item in a frame indicates the number of bytes.

2-1-1 Command Frame



| | |
|-------------------------|---|
| STX | This code (H'02) indicates the beginning of the communications frame (text). Always set this character in the first byte. When STX is received again during reception, reception is carried out again from the point where STX was received. |
| Node number | <ul style="list-style-type: none"> This number specifies the transmission's destination. Specify the E5CC/E5EC's communications unit number. A BCD value between 00 and 99 or an ASCII value of XX can be set. Specify "XX" for a broadcast transmission. No responses will be returned for broadcast transmissions. No responses will be returned from node numbers other than the ones in the above range. |
| Sub-address | The sub-address is not used in the E5CC/E5EC. Be sure to set the sub-address to "00." |
| SID (Service ID) | The service ID is not used in the E5CC/E5EC. Be sure to set the service ID to "0." |
| Command text | This is the command text area. For details, refer to <i>2-2 Structure of Command Text</i> . |
| ETX | This code (H'03) indicates the end of the text. |
| BCC | This is the Block Check Character. The BCC result is found by calculating the exclusive OR of the bytes from the node number up to ETX. |

2-1-2 BCC Calculation Example

The BCC (Block Check Character) is determined by calculating the exclusive OR of the bytes from the node number up to ETX. The 8-bit result is written to the BCC byte at the end of the frame.

| STX | Node number | | Sub-address | | SID | Command text | | | ETX | BCC | |
|-----|-------------|---------|-------------|---------|---------|--------------|---------|---------|---------|-----|-----|
| 02H | 0 (30H) | 0 (30H) | 0 (30H) | 0 (30H) | 0 (30H) | 0 (30H) | 5 (35H) | 0 (30H) | 3 (33H) | 03H | 35H |

$$BCC = 30H \oplus 30H \oplus 30H \oplus 30H \oplus 30H \oplus 30H \oplus 35H \oplus 30H \oplus 33H \oplus 03H = 35H$$

The result of the calculation (35 hex) is written to the BCC byte.

The ⊕ symbols indicate XOR (exclusive OR) operations.

2-1-3 Response Frame

| STX | Node number | | Sub-address | | End code | Command text | | | ETX | BCC |
|-----|-------------|---|-------------|---|----------|--------------|--|--|-----|-----|
| 1 | 2 | 2 | 2 | 2 | | | | | 1 | 1 |

| End code | Name | Description | Error detection priority |
|----------|--------------------|--|--------------------------|
| 00 | Normal completion | The command ended normally without error. | None |
| 0F | FINS command error | The specified FINS command could not be executed. The FINS response code should indicate why the command could not be executed. | 8 |
| 10 | Parity error | The sum total of bits whose received data is "1" does not match the set value of the "communications parity" bit. | 2 |
| 11 | Framing error | Stop bit is "0." | 1 |
| 12 | Overrun error | An attempt was made to transfer new data when the reception data buffer was already full. | 3 |
| 13 | BCC error | The calculated BCC value is different from the received BCC value. | 5 |
| 14 | Format error | <ul style="list-style-type: none"> The command text contains characters other than 0 to 9, and A to F. This error does not apply to Echoback Tests. (Refer to 2-3-7 Echoback Test for details.) There was no SID and command text. There was no command text. "MRC/SRC" not included in command text. | 7 |
| 16 | Sub-address error | <ul style="list-style-type: none"> Illegal (unsupported) sub-address There was no sub-address, SID, and command text. Sub-address was less than two characters, and there was no SID and command text | 6 |
| 18 | Frame length error | The received frame exceeds the specified (supported) number of bytes. | 4 |

- An end code is returned for each command frame received that was addressed to the local node.
- No response will be returned unless the frame contained all elements up to the ETX and BCC.
- "Error Detection Priority" indicates the priority when two or more errors occur simultaneously.

2-1-4 Communications Data

| Communications format | Set (monitor) values | Negative values | Decimal point |
|-----------------------|----------------------|-----------------|---|
| CompoWay/F | 8-digit hexadecimal | 2's complement | Decimal point is removed and the result is converted to hexadecimal. Example conversion: 105.0 → 1050 → H'0000041A |

2-1-5 End Code Example

The following examples show the end code when a command did not end normally.

Example 1) Illegal Sub-address, No SID, and No Command Text

- Command

| | Node number | Sub-address | BCC |
|-----|-------------|-------------|-----|
| STX | | 0 A | ETX |

- Response

| | Node number | Sub-address | End code | BCC |
|-----|-------------|-------------|----------|-----|
| STX | | 0 A | 1 6 | ETX |

End code is "16" (sub-address error).

The sub-address error code is used because the sub-address error has a higher error detection priority than the format error.

Example 2) No Command Text

- Command

| | Node number | Sub-address | SID | BCC |
|-----|-------------|-------------|-----|-----|
| STX | | 0 0 | 0 | ETX |

- Response

| | Node number | Sub-address | End code | BCC |
|-----|-------------|-------------|----------|-----|
| STX | | 0 0 | 1 4 | ETX |

The end code is "14" (format error).

Example 3) No Node Number Provided

- Command

| | BCC |
|-----|-----|
| STX | ETX |

The node number is lacking one character.

- Response

There is no response.

Example 4) No Sub-address and Illegal BCC

- Command

| Node number | | BCC | |
|-------------|--|-----|-----|
| STX | | ETX | Err |

- Response

| Node number | | Sub-address | | End code | | BCC | |
|-------------|--|-------------|---|----------|---|-----|--|
| STX | | 0 | 0 | 1 | 3 | ETX | |

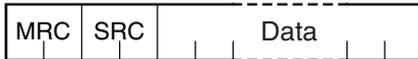
The sub-address is "00" and the end code is "13" (BCC error).

2-2 Structure of Command Text

2-2-1 PDU Structure

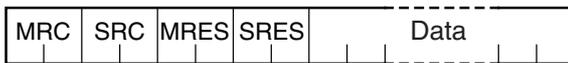
An MRC (Main Request Code) and SRC (Sub-Request Code) followed by the various required data is transferred to the command text.

- Service Request PDU



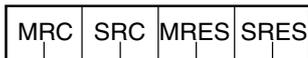
The MRES (Main Response Code) and SRES (Sub-Response Code) are transferred to the response frame following the above MRC/SRC. Data is then transferred following the MRES and SRES.

- Service Response PDU (Normal Response)



If the specified command text could not be executed, the service response PDU will contain only the MRC/SRC and MRES/SRES.

- Service Response PDU (Command Text Not Executed)



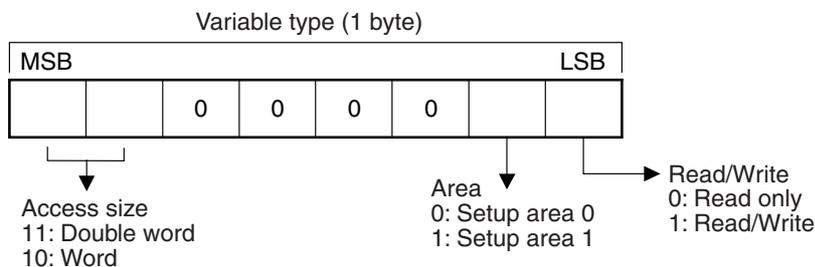
MRES/SRES provides the response code. MRES/SRES are not output when processing ends in a normal completion.

2-2-2 Area Definitions

Areas comprise only the variable area.

2-2-3 Type Code (Variable Type)

The following figure shows the variable area type code.



The following table summarizes setup areas 0 and 1.

| Area | Description |
|--------------|---|
| Setup area 0 | This area groups together the protect, manual control, operation, and adjustment levels. |
| Setup area 1 | This area groups together the initial setting, communications setting, advanced function setting, and calibration levels. |

The type code depends on the parameter. Refer to *3-1 Variable Area (Setting Range) List* for details.

The variable type is converted to 2-byte ASCII and loaded to the frame. The following table shows the available variable types.

| Variable type | Description |
|---------------|---|
| C0/80 | R/O (read only) parameter for setup area 0. |
| C1/81 | R/W parameter for setup area 0. |
| C3/83 | R/W parameter for setup area 1. |

Note: Setup area 1 has no read-only parameters, so there is no variable type "C2."

2-2-4 Addresses

An address is appended to each of the variable types. Express addresses in 2-byte hexadecimal and append them for the specified access size. The address depends on the parameter. Refer to *3-1 Variable Area (Setting Range) List* for details.

2-2-5 Number of Elements

The number of elements is expressed in 2-byte hexadecimal. The range that can be specified for the number of elements depends on the command. Refer to *2-3 Detailed Description of the Services* for details.

2-2-6 List of Services (Main Request Codes and Sub-Request Codes)

| MRC | SRC | Name of service | Processing |
|-----|-----|-----------------------------------|---|
| 01 | 01 | Read Variable Area | This service reads from the variable area. |
| 01 | 02 | Write Variable Area | This service writes to the variable area. |
| 01 | 04 | Composite Read from Variable Area | This service reads from the variable area in the order specified by the parameters. |
| 01 | 13 | Composite Write to Variable Area | This service writes to the variable area in the order specified by the parameters. |
| 05 | 03 | Read Controller Attributes | This service reads the model number and communications buffer size. |
| 06 | 01 | Read Controller Status | This service reads the operating status. |
| 08 | 01 | Echoback Test | This service performs an echoback test. |
| 30 | 05 | Operation Command | This service performs operations such as RUN/STOP, executing/stopping AT (auto-tuning), and moving to Setup Area 1. |

Note: No commands will be accepted and no responses will be returned when a memory error (RAM error) has occurred or the Controller is initializing (until the Controller recognizes the process value after the power is turned ON).

2-3 Detailed Description of the Services

2-3-1 Read Variable Area

This service reads data from the variable area.

- Service Request PDU

| MRC | SRC | Variable type | Read start address | Bit position | Number of elements |
|-------|-------|---------------|--------------------|--------------|--------------------|
| 0 1 | 0 1 | | | 0 0 | |
| 2 | 2 | 2 | 4 | 2 | 4 |

- Service Response PDU

| MRC | SRC | Response code | Read data (for number of elements) |
|-------|-------|---------------|------------------------------------|
| 0 1 | 0 1 | | |
| 2 | 2 | 4 | Number of elements × 8 or 4 |

(1) Variable Type and Read Start Address

For details on variable types and read start addresses, refer to *Section 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CC/E5EC does not support bit access. Fixed to “00.”

(3) Number of Elements

| Number of elements | Processing |
|--|--|
| 0000 | The read operation is not performed (read data is not appended to the service response PDU), and processing ends in a normal completion. |
| Double word (variable type C0, C1, or C3) | 0001 to 0019 (1 to 25) |
| Word (variable type 80, 81, or 83) | 0001 to 0032 (1 to 50) |

(4) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

(4) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

- Error Occurred

| Response code | Error name | Cause |
|---------------|----------------------------------|--|
| 1002 | Command too short | The command is too short. |
| 1101 | Area type error | The variable type is wrong. |
| 1103 | Start address out-of-range error | Write start address is out of range. |
| 1104 | End address out-of-range error | The write end address (write start address + number of elements) exceeds the final address of the variable area. |
| 1003 | Number of elements/data mismatch | The number of data does not match the number of elements. |
| 1100 | Parameter error | <ul style="list-style-type: none"> • Bit position is not "00." • The write data is out of the setting range. |
| 3003 | Read-only error | Variable type "C0" was written to. |
| 2203 | Operation error | <ul style="list-style-type: none"> • The Communications Writing parameter is set to "OFF" (disabled). • Attempted to write to a parameter in setup area 1 from setup area 0. • Attempted to write to a protect parameter from other than the protect level. • AT (auto-tuning) was in progress. * • Non-volatile memory error |

* For details on AT (auto-tuning), refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174).

(5) Precautions

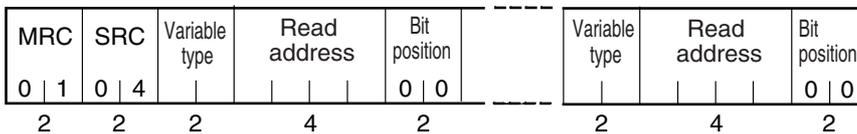
- Alarm Function

Even though alarms are not displayed on the Controller's display, they function normally in communications.

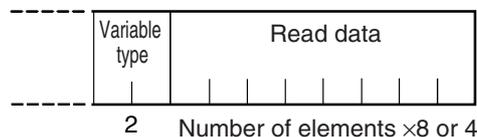
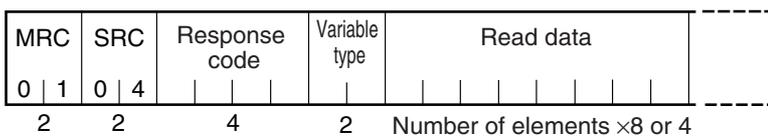
2-3-3 Composite Read from Variable Area

This service reads in order the contents of specified addresses in the variable area.

- Service Request PDU



- Service Response PDU



Note: The read data is read together with the variable type in the order specified by the command.

(1) Variable Type and Read Start Address

For details on variable types and read start addresses, refer to *Section 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CC/E5EC does not support bit access. Fixed to "00."

(3) Number of Read Data Items (Variable Type + Read Data + Bit Position Counted As 1 Item)

| Read data length | Number of read data items |
|---|---------------------------|
| For double word (variable type C0, C1, or C3) | 20 max. |
| For word (variable type 80, 81, or 83) | 25 max. |

Note: The following table gives the maximum number of read data items when double-word data and word data are used together.

| Composite Read | | Composite Read | |
|---|--|---|--|
| Double word (variable type C0, C1, or C3) | Word (variable type 80, 81, or 83) | Double word (variable type C0, C1, or C3) | Word (variable type 80, 81, or 83) |
| 20 | 0 | 11 | 14 |
| 19 | 1 | 10 | 15 |
| 18 | 2 | 9 | 16 |
| 18 | 3 | 8 | 17 |
| 17 | 4 | 7 | 18 |
| 17 | 5 | 6 | 19 |
| 16 | 6 | 8 | 20 |
| 15 | 7 | 4 | 21 |
| 15 | 8 | 3 | 22 |
| 14 | 9 | 2 | 23 |
| 14 | 10 | 1 | 24 |
| 13 | 11 | 0 | 25 |
| 12 | 12 | | |
| 12 | 13 | | |

(4) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

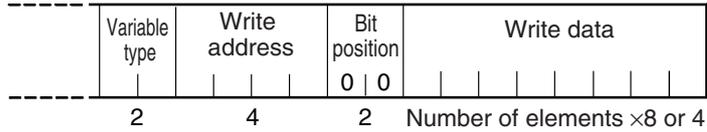
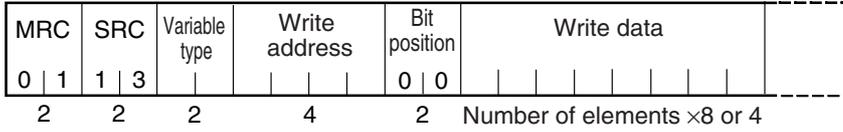
- Error Occurred

| Response code | Error name | Cause |
|---------------|-------------------|---|
| 1002 | Command too short | The command is too short. |
| 1101 | Area type error | The variable type is wrong. |
| 110B | Response too long | The number of elements exceeds the maximum. |
| 1100 | Parameter error | Bit position is not "00." |
| 2203 | Operation error | Non-volatile memory error |

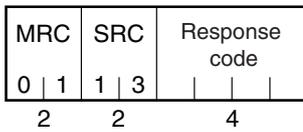
2-3-4 Composite Write to Variable Area

This service writes in order the contents of specified addresses to a variable area.

- Service Request PDU



- Service Response PDU



(1) Variable Type and Write Start Address

For details on variable types and write start addresses, refer to *Section 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CC/E5EC does not support bit access. Fixed to “00.”

(3) Number of Write Data Items (Variable Type + Write Address + Bit Position + Write Data Counted As 1 Item)

| Write data length | Number of write data items |
|---|----------------------------|
| For double word (variable type C0, C1, or C3) | 12 max. |
| For word (variable type 80, 81, or 83) | 17 max. |

Note: The following table gives the maximum number of write data items when double-word data and word data are used together.

| Composite Write | |
|---|------------------------------------|
| Double word (variable type C0, C1, or C3) | Word (variable type 80, 81, or 83) |
| 12 | 0 |
| 12 | 1 |
| 11 | 2 |
| 10 | 3 |
| 9 | 4 |
| 9 | 5 |
| 8 | 6 |
| 7 | 7 |
| 6 | 8 |
| 6 | 9 |

| Composite Write | |
|---|------------------------------------|
| Double word (variable type C0, C1, or C3) | Word (variable type 80, 81, or 83) |
| 5 | 10 |
| 4 | 11 |
| 3 | 12 |
| 3 | 13 |
| 2 | 14 |
| 1 | 15 |
| 0 | 16 |
| 0 | 17 |

(4) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

- Error Occurred

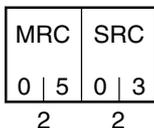
| Response code | Error name | Cause |
|---------------|-------------------|--|
| 1002 | Command too short | The command is too short. |
| 1101 | Area type error | The variable type is wrong. |
| 1100 | Parameter error | <ul style="list-style-type: none"> • Bit position is not "00." • The write data is out of the setting range. |
| 3003 | Read-only error | Variable type "C0" was written to. |
| 2203 | Operation error | <ul style="list-style-type: none"> • The Communications Writing parameter is set to "OFF" (disabled). • Attempted to write to a parameter in setup area 1 from setup area 0. • Attempted to write to a protect parameter from other than the protect level. • AT (auto-tuning) was in progress. * • Non-volatile memory error |

* For details on AT (auto-tuning), refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174).

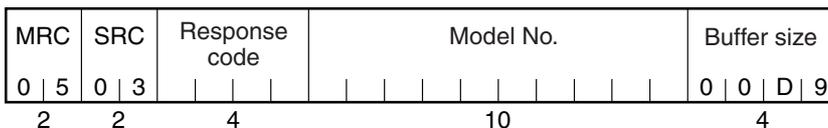
2-3-5 Read Controller Attributes

This service reads the model number and communications buffer size.

- Service Request PDU



- Service Response PDU



(1) Model Number

The model number is expressed in 10-byte ASCII.

Example: The model is given as shown below for the E5CC-RX2ASM-000 (relay output, 2 auxiliary outputs, and no options).



(2) Buffer Size

The communications buffer size is expressed in 2-byte hexadecimal, and read after being converted to 4-byte ASCII.

Buffer size: 217 bytes (= H'00D9)

(3) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

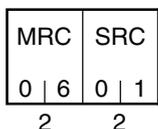
- Error Occurred

| Response code | Error name | Description |
|---------------|------------------|---------------------------|
| 1001 | Command too long | The command is too long. |
| 2203 | Operation error | Non-volatile memory error |

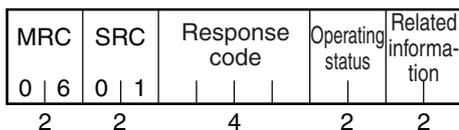
2-3-6 Read Controller Status

This service reads the operating status and error status.

- Service Request PDU



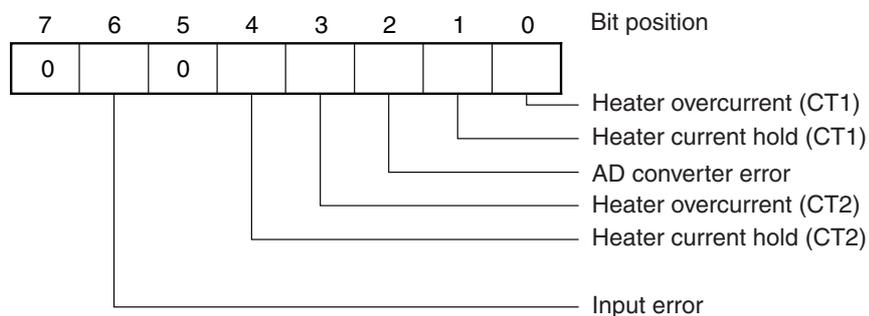
- Service Response PDU



(1) Operating Status

| Operating status | Description |
|------------------|--|
| 00 | Control is being carried out (error has not occurred in setup area 0 and the Controller is running). |
| 01 | Control is not being carried out (state other than above). |

(2) Related Information



(3) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

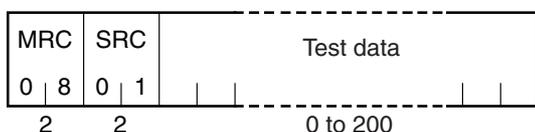
- Error Occurred

| Response code | Error name | Description |
|---------------|------------------|---------------------------|
| 1001 | Command too long | The command is too long. |
| 2203 | Operation error | Non-volatile memory error |

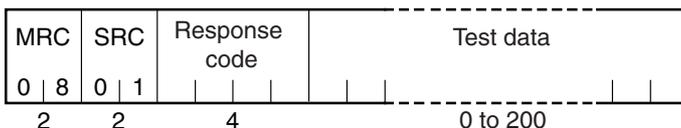
2-3-7 Echoback Test

This service performs an echoback test.

- Service Request PDU



- Service Response PDU

**(1) Test Data**

Set between 0 and 200 bytes of user-defined test data.

Set a value for the test data within the ranges shown below according to the communications data length.

| Communications data length | Test Data |
|----------------------------|--|
| 8 bits | ASCII data: H'20 to H'7E or H'A1 to H'FE |
| 7 bits | ASCII data: H'20 to H'7E |

(2) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

- Error Occurred

| Response code | Error name | Description |
|---------------|------------------|---------------------------|
| 1001 | Command too long | The command is too long. |
| 2203 | Operation error | Non-volatile memory error |

2-3-8 Operation Command

- Communications Writing
- AT Execute/Cancel
- Software Reset
- Auto/Manual Switch
- Invert Direct/Reverse Operation
- RUN/STOP
- Write Mode
- Move to Setup Area 1
- Parameter Initialization
- Program Start
- Multi-SP
- Save RAM Data
- Move to Protect Level
- Alarm Latch Cancel
- SP Mode

• Service Request PDU

| | | | |
|-------|-------|----------------------|-----------------------------|
| MRC | SRC | Com- mand code | Related infor- mation |
| 3 0 | 0 5 | | |
| 2 | 2 | 2 | 2 |

• Service Response PDU

| | | |
|-------|-------|------------------|
| MRC | SRC | Response code |
| 3 0 | 0 5 | |
| 2 | 2 | 4 |

(1) Command Code and Related Information

| Command code | Command content | Related Information |
|--------------|--------------------------|--|
| 00 | Communications Writing | 00: OFF (disabled) 01: ON (enabled) |
| 01 | RUN/STOP | 00: Run 01: Stop |
| 02 | Multi-SP | 00: Set point 0 01: Set point 1 02: Set point 2 03: Set point 3 04: Set point 4 05: Set point 5 06: Set point 6 07: Set point 7 |
| 03 | AT Execute/Cancel | 00: AT cancel 01: 100% AT execute 02: 40% AT execute |
| 04 | Write Mode | 00: Backup 01: RAM write mode |
| 05 | Save RAM Data | 00 |
| 06 | Software Reset | 00 |
| 07 | Move to Setup Area 1 | 00 |
| 08 | Move to Protect Level | 00 |
| 09 | Auto/Manual Switch | 00: Automatic mode 01: Manual mode |
| 0B | Parameter Initialization | 00 |

| Command code | Command content | Related Information |
|--------------|---------------------------------|--|
| 0C | Alarm Latch Cancel | 00: Alarm 1 latch cancel 01: Alarm 2 latch cancel 02: Alarm 3 latch cancel 03: HB alarm latch cancel 04: HS alarm latch cancel 05: Alarm 4 latch cancel 0F: All alarm latch cancel |
| 0D | SP Mode | 00: Local SP mode 01: Remote SP mode |
| 0E | Invert Direct/Reverse Operation | 00: Not invert 01: Invert |
| 11 | Program Start | 00: Reset 01: Start |

(2) Response Code

- Normal Completion

| Response code | Name | Description |
|---------------|-------------------|-----------------------|
| 0000 | Normal completion | No errors were found. |

- Error Occurred

| Response code | Error name | Description |
|---------------|-------------------|--|
| 1001 | Command too long | The command is too long. |
| 1002 | Command too short | The command is too short. |
| 1100 | Parameter error | Command code and related information are wrong. |
| 2203 | Operation error | <ul style="list-style-type: none"> • The Communications Writing parameter is set to "OFF" (disabled). The command is received regardless of the Communications Writing parameter setting (ON/OFF). • Processing could not be performed. For details, refer to (3) Operation Commands and Precautions below. • Non-volatile memory error |

(3) Operation Commands and Precautions

- Communications Writing

Set the Communications Writing parameter to "ON: enabled" or "OFF: disabled" with the related information setting. The setting can be accepted in both setup area 0 and setup area 1. An operation error will occur, however, if enabling or disabling communications writing is set for an event input.

- RUN/STOP

Set control to "run" or "stop" with the related information setting. The setting can be accepted in both setup area 0 and setup area 1. An operation error will occur, however, if RUN/STOP is set for an event input.

- **Multi-SP**

Set eight set points beforehand in the adjustment level so that you can switch to a desired set point. The setting can be accepted in both setup area 0 and setup area 1. An operation error will occur in the following situations.

- When AT is being executed.
- When the Number of Multi-SP Points parameter is set to OFF.
- When the Number of Multi-SP Points parameter is not set to OFF, but Multi-SP No. Switch is set for an event input.

- **AT Execute/Cancel**

Set AT (auto-tuning) to “execute” or “cancel” with the related information setting. This command can be accepted in setup area 0 only. An “operation error” will be generated in the following instances:

- When the RUN/STOP parameter is set to “stop”
- When the command is executed in “setup area 1”
- When ON/OFF control is being used
- When 40% AT is specified during 100% AT execution.
- When 100% AT is specified during 40% AT execution.

In addition, a parameter error will occur if 40% AT is specified during heating and cooling control.

Note: If the same type of AT execution is specified during AT execution (e.g., if 100% AT is specified during 100% AT execution), the AT will not be restarted and the operation will end in normal completion with no processing.

- **Write Mode**

Set either the backup mode or RAM write mode with the related information setting. The setting can be accepted in both setup area 0 and setup area 1.

The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data.

| Write mode | Description |
|----------------|---|
| Backup mode | The data is written to non-volatile memory when the parameters in the operation/adjustment levels (excluding read-only parameters) are written by communications. |
| RAM write mode | The data is not written to non-volatile memory when the parameters in the operation/adjustment levels (excluding read-only parameters) are written by communications. Parameters can be changed by operating the keys on the front panel of the Controller. |

- When the mode is switched from RAM write mode to backup mode, the parameters in the operation/adjustment levels (excluding read-only parameters) are written to non-volatile memory.
- The RAM write mode is enabled only when the Communications Writing parameter is set to “ON” (enabled).
Consequently, when the Communications Writing parameter setting is changed to “OFF” (disabled), the parameters in the operation/adjustment levels (excluding read-only parameters) are written to non-volatile memory even if the mode is set to RAM write mode.

- **Save RAM Data**

This command writes the parameters in the operation/adjustment levels (excluding read-only parameters) to non-volatile memory. The setting can be accepted in both setup area 0 and setup area 1.

- **Software Reset**
Restarts processing from the point when power is turned ON. The setting can be accepted in both setup area 0 and setup area 1.
- **Move to Setup Area 1**
This command moves to “setup area 1” and can be accepted at both setup areas 0 and 1. If the “initial setting/communications protect” is set to “2,” an “operation error” will be generated, and the move to setup area 1 will be prohibited.
When this move is carried out from setup area 0, the display indicates the Input Type parameter in the “initial setting level.” When this operation command is executed in setup area 1, the display will not change.
- **Move to Protect Level**
This command moves to the "protect level" and can be accepted only in setup area 0. When this command is issued in setup area 1, an "operation error" will be generated, and the move to the protect level will be prohibited.
 - **Moving to Protect Level in Manual Mode**
When this operation command is issued in manual mode, an “operation error” will be generated, and the move to the protect level will be prohibited.
- **Auto/Manual Switch**
This operation command switches the mode to manual mode or automatic mode, based on the related information setting. This command can be accepted in setup area 0 only. An “operation error” will be generated in the following instances:
 - **When the command is executed in “setup area 1”**
When the Controller is switched to manual mode, the “manual manipulated variable” will be displayed. When the Controller is switched from manual mode to automatic mode, the operation level's first parameter will be displayed. When the Controller is switched to auto mode while already in auto mode or switched to manual mode while already in manual mode, the command will be completed normally and the display will not change (the contents will not be refreshed).
 - **Writing Auto/Manual Status in Non-volatile memory**
The write mode determines whether the auto/manual status is written to non-volatile memory.

| Write mode | Description |
|----------------|--|
| Backup mode | When the auto/manual mode is switched by communications, the auto/manual status is written to non-volatile memory. |
| RAM write mode | When the auto/manual mode is switched by communications, the auto/manual status is not written to non-volatile memory. The status can be written with the Controller key operation. |

Note: When the auto/manual mode is switched with an operation command through communications and the Controller is in RAM write mode, the auto/manual status is not stored in non-volatile memory. Consequently, if the Controller is restarted by performing a software reset or turning the power OFF and ON again, the auto/manual mode is set to the last saved status.

 - **Switching to Manual Mode during Auto-tuning**
If the mode is switched during auto-tuning (AT), the AT will be cancelled and the Controller will be switched to manual mode.
- **Parameter Initialization**
The present settings are returned to the default values and written to non-volatile memory. This command can be accepted in setup area 1 only. When this command is issued in setup area 0, an

“operation error” will be generated. (These settings are the same as the ones used when “FACT” is selected for the setting data's set value initialization.)

- Alarm Latch Cancel

The applicable alarm latch can be cleared with the related information setting. The setting can be accepted in both setup area 0 and setup area 1. An operation error will occur if communications writing is disabled or if a non-volatile memory error occurs.

- Invert Direct/Reverse Operation

Inverting or not inverting direct/reverse operation can be selected with the related information setting. The setting can be accepted in both setup area 0 and setup area 1. The related information specifications are written to non-volatile memory according to the write mode settings. An operation error will occur in the following situations:

- When AT is being executed.
- When inverting direct/reverse operation is set for an event input.
- When executed in manual mode.

- Program Start

The simple program function can be reset/started with the related information setting. The setting can be accepted in both setup area 0 and setup area 1. An operation error will be generated if program start has been set in the event input.

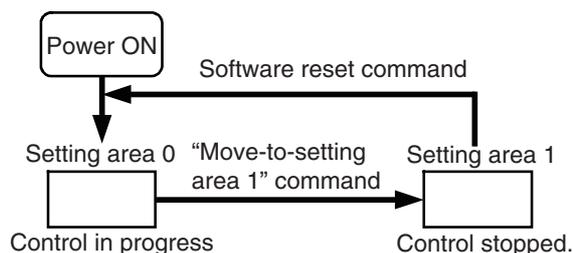
- Setting Areas

Control operation is executed in setting area 0. In this state, you can perform operations that are permitted only during control or those that cause no problems even if control is in progress. These operations include reading PVs, writing SPs, and changing RUN/STOP status.

Setting area 0, however, prohibits operations that affect control, including writing data at the initial setting level. (Reading setting data is always allowed.)

In setting area 1, control operation is stopped. In this state, you can perform operations that are not allowed in setting area 0. These operations include writing data at the initial setting level.

At power-ON, the Digital Controller is set in setting area 0. To move to setting area 1, use the "move-to-setting area 1" command. To return to setting area 0, turn the power OFF and ON again, or use the "software reset" command.



2-4 Response Code List

Normal Completion

| Response code | Name | Description | Error detection priority |
|---------------|-------------------|-----------------------|--------------------------|
| 0000 | Normal completion | No errors were found. | None |

Error Occurred

| Response code | Name | Description | Error detection priority |
|---------------|----------------------------------|---|--------------------------|
| 0401 | Unsupported command | The service function for the relevant command is not supported. | 1 |
| 1001 | Command too long | The command is too long. | 2 |
| 1002 | Command too short | The command is too short. | 3 |
| 1101 | Area type error | Wrong variable type | 4 |
| 1103 | Start address out-of-range error | The read/write start address is out of range. | 5 |
| 1104 | End address out-of-range error | The write end address (write start address + number of elements) exceeds the final address of the variable area. | 6 |
| 1003 | Number of elements/data mismatch | The amount of data does not match the number of elements. | 7 |
| 110B | Response too long | The response length exceeds the communications buffer size (when the number of elements is greater than the maximum number of elements for that service). | 8 |
| 1100 | Parameter error | <ul style="list-style-type: none"> • Bit position is not "00." • The write data is out of the setting range. • The command code or related information in the operation command is wrong. | 9 |
| 3003 | Read-only error | Variable type "C0" was written to. | 10 |
| 2203 | Operation error | <ul style="list-style-type: none"> • The Communications Writing parameter is set to "OFF" (disabled). • Attempted to write to a parameter in setup area 1 from setup area 0. • Attempted to write to a protect parameter from other than the protect level. • Writing was carried out during AT execution. • Processing is not possible by operation command. • Non-volatile memory error | 11 |

3

Communications Data for CompoWay/F

This section lists the details of the communications data in the CompoWay/F communications protocol.

| | |
|---|-------------|
| 3-1 Variable Area (Setting Range) List | 3-2 |
| 3-2 Status and Status 2 | 3-18 |

3-1 Variable Area (Setting Range) List

- For communications using a variable type not enclosed in parentheses in the following table, the set value is double-word data (8 digits). For communications using a variable type enclosed in parentheses, the set value is single-word data (4 digits).
- For example, variable type C0 is double-word data (8 digits), and variable type 80 is single-word data (4 digits).
- Items expressed in hexadecimal in the "Setting (monitor) value" column are the setting range for CompoWay/F communications. The values in parentheses are the actual setting range. When there is a section reference for a setting item, refer to that reference for details.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-------------------------------------|---|-----------|
| C0 (80) | 0000 | PV | Temperature: Use the specified range for each sensor. Analog: Scaling lower limit -5% FS to Scaling upper limit +5% FS | Operation |
| C0 (80) | 0001 | Status ^{*1} *2 | Refer to 3-2 <i>Status and Status 2</i> for details. | |
| C0 (80) | 0002 | Internal Set Point ^{*1} | SP lower limit to SP upper limit | |
| C0 (80) | 0003 | Heater Current 1 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| C0 (80) | 0004 | MV Monitor (Heating) | Standard: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling: H'00000000 to H'0000041A (0.0 to 105.0) | |
| C0 (80) | 0005 | MV Monitor (Cooling) | H'00000000 to H'0000041A (0.0 to 105.0) | |
| C0 (80) | 0006 | Heater Current 2 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| C0 (80) | 0007 | Leakage Current 1 Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| C0 (80) | 0008 | Leakage Current 2 Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| C0 (80) | 0009 | Soak Time Remain | H'00000000 to H'0000270F (0 to 9999) | |
| C0 (80) | 000B | Remote SP Monitor | Remote SP lower limit -10%FS to Remote SP upper limit +10%FS | |
| C0 (80) | 000C | Multi-SP No. Monitor | H'00000000 to H'00000007 (0 to 7) | |
| C0 (80) | 000E | Decimal Point Monitor ^{*1} | H'00000000 to H'00000003 (0 to 3) | |
| C0 (80) | 0011 | Status 2 ^{*1} *2 | Refer to 3-2 <i>Status and Status 2</i> . | |
| C0 (80) | 0012 | Status ^{*1} *3 | Refer to 3-2 <i>Status and Status 2</i> . | |
| C0 (80) | 0013 | Status 2 ^{*1} *3 | Refer to 3-2 <i>Status and Status 2</i> . | |

*1 Not displayed on the Controller display.

*2 When the variable type is 80 (word access), the rightmost 16 bits are read.

*3 When the variable type is 80 (word access), the leftmost 16 bits are read.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--|---|------------|
| C1 (81) | 0000 | Operation/Adjustment Protect | H'00000000 (0): No restrictions in operation and adjustment levels H'00000001 (1): Move to adjustment level is prohibited. H'00000002 (2): Display and change of only "PV" and "PV/SP" parameters is allowed. H'00000003 (3): Display of only "PV" and "PV/SP" parameters is allowed. | Protect |
| C1 (81) | 0001 | Initial Setting/Communications Protect | H'00000000 (0): Move to initial setting/communications setting level is allowed. (Move to advanced function setting level is displayed.) H'00000001 (1): Move to initial setting/communications setting level is allowed. (Move to advanced function setting level is not displayed.) H'00000002 (2): Move to initial setting/communications setting level is prohibited. | |
| C1 (81) | 0002 | Setting Change Protect | H'00000000 (0): OFF (Changing of setup on Controller display is allowed.) H'00000001 (1): ON (Changing of setup on Controller display is prohibited.) | |
| C1 (81) | 0003 | Set Point | SP lower limit to SP upper limit | Operation |
| C1 (81) | 0004 | Alarm Value 1 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0005 | Alarm Value Upper Limit 1 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0006 | Alarm Value Lower Limit 1 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0007 | Alarm Value 2 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0008 | Alarm Value Upper Limit 2 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0009 | Alarm Value Lower Limit 2 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 000A | Alarm Value 3 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 000B | Alarm Value Upper Limit 3 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 000C | Alarm Value Lower Limit 3 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 000D | Heater Burnout Detection 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| C1 (81) | 000E | SP 0 | SP lower limit to SP upper limit | |
| C1 (81) | 000F | SP 1 | SP lower limit to SP upper limit | |
| C1 (81) | 0010 | SP 2 | SP lower limit to SP upper limit | |
| C1 (81) | 0011 | SP 3 | SP lower limit to SP upper limit | |
| C1 (81) | 0012 | Process Value Input Shift | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0013 | Process Value Slope Coefficient | H'00000001 to H'0000270F (0.001 to 9.999) | |
| C1 (81) | 0015 | Proportional Band | H'00000001 to H'0000270F (0.1 to 999.9) | |

Note: The alarm function can also be used in Digital Controllers without auxiliary output terminals. In this case, confirm alarm occurrences via the status data.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|----------------------------|--|------------|
| C1 (81) | 0016 | Integral Time | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | Adjustment |
| C1 (81) | 0017 | Derivative Time | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | |
| C1 (81) | 0019 | Dead Band | H'FFFFFF831 to H'0000270F (-199.9 to 999.9 for temperature input) (-19.99 to 99.99 for analog input) | |
| C1 (81) | 001A | Manual Reset Value | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| C1 (81) | 001B | Hysteresis (Heating) | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |
| C1 (81) | 001C | Hysteresis (Cooling) | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |
| C1 (81) | 001D | Heater Burnout Detection 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| C1 (81) | 001E | HS Alarm 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| C1 (81) | 001F | HS Alarm 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| C1 (81) | 0020 | Soak Time | H'00000001 to H'0000270F (1 to 9999) | |
| C1 (81) | 0021 | Wait Band | H'00000000 (0): OFF H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |
| C1 (81) | 0022 | MV at Stop | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | |
| C1 (81) | 0023 | MV at PV Error | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---|---|----------------|
| C1 (81) | 0024 | Manual MV | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | Manual Control |
| C1 (81) | 0025 | SP Ramp Set Value | H'00000000 (0): OFF H'00000001 to H'0000270F (1 to 9999) | Adjustment |
| C1 (81) | 0026 | MV Upper Limit | Standard control: MV lower limit + 0.1 to H'0000041A (MV lower limit + 0.1 to 105.0) Heating and cooling control: H'00000000 to H'0000041A (0.0 to 105.0) | |
| C1 (81) | 0027 | MV Lower Limit | Standard control: H'FFFFFFCE to MV upper limit - 0.1 (-5.0 to MV upper limit - 0.1) Heating and cooling control: H'FFFFFFBE6 to H'00000000 (-105.0 to 0.0) | |
| C1 (81) | 0028 | Move to Protect Level | H'FFFFFF831 to H'0000270F (-1999 to 9999) | Protect |
| C1 (81) | 0029 | Password to Move to Protect Level | H'FFFFFF831 to H'0000270F (-1999 to 9999) (Can only be set. The monitor value is always H'00000000.) | |
| C1 (81) | 002A | Parameter Mask Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| C1 (81) | 002B | PF Key Protect | H'00000000 (0): OFF H'00000001 (1): ON | |
| C1 (81) | 002C | MV Change Rate Limit | H'00000000 to H'000003E8 (0.0 to 100.0) | Adjustment |
| C1 (81) | 002F | Remote SP Input Shift | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0030 | Remote SP Slope Input Coefficient | H'00000001 to H'0000270F (0.001 to 9.999) | |
| C1 (81) | 0031 | Extraction of Square Root Low-cut Point | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| C1 (81) | 0032 | Alarm Value 4 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0033 | Alarm Value Upper Limit 4 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0034 | Alarm Value Lower Limit 4 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| C1 (81) | 0035 | SP 4 | SP lower limit to SP upper limit | |
| C1 (81) | 0036 | SP 5 | SP lower limit to SP upper limit | |
| C1 (81) | 0037 | SP 6 | SP lower limit to SP upper limit | |
| C1 (81) | 0038 | SP 7 | SP lower limit to SP upper limit | |
| C1 (81) | 0039 | Proportional Band (Cooling) | H'00000001 to H'0000270F (0.1 to 999.9) | |
| C1 (81) | 003A | Integral Time (Cooling) | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | |
| C1 (81) | 003B | Derivative Time (Cooling) | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level | |
|---------------|---------|-------------------------|--|------------|---------|
| C1 (81) | 003C | SP Ramp Fall Value | H'FFFFFFFF (-1): Same (Same as SP Ramp Set Value.) H'00000000(0): OFF H'00000001 to H'0000270F (1 to 9999) | Adjustment | |
| C1 (81) | 003D | Work Bit 1 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 003E | Work Bit 1 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 003F | Work Bit 2 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0040 | Work Bit 2 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0041 | Work Bit 3 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0042 | Work Bit 3 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0043 | Work Bit 4 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0044 | Work Bit 4 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0045 | Work Bit 5 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0046 | Work Bit 5 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0047 | Work Bit 6 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0048 | Work Bit 6 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 0049 | Work Bit 7 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 004A | Work Bit 7 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 004B | Work Bit 8 ON Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 004C | Work Bit 8 OFF Delay | H'00000000 to H'0000270F (0 to 9999) | | |
| C1 (81) | 004D | Changed Parameters Only | H'00000000(0): OFF H'00000001(1): ON | | Protect |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---------------------|--|-----------------|
| C3 (83) | 0000 | Input Type | H'00000000 (0): Pt (–200 to 850°C/–300 to 1500°F) H'00000001 (1): Pt (–199.9 to 500.0°C/–199.9 to 900.0°F) H'00000002 (2): Pt (0.0 to 100.0°C/0.0 to 210.0°F) H'00000003 (3): JPt (–199.9 to 500.0°C/–199.9 to 900.0°F) H'00000004 (4): JPt (0.0 to 100.0°C/0.0 to 210.0°F) H'00000005 (5): K (–200 to 1300°C/–300 to 2300°F) H'00000006 (6): K (–20.0 to 500.0°C/0.0 to 900.0°F) H'00000007 (7): J (–100 to 850°C/–100 to 1500°F) H'00000008 (8): J (–20.0 to 400.0°C/0.0 to 750.0°F) H'00000009 (9): T (–200 to 400°C/–300 to 700°F) H'0000000A (10): T (–199.9 to 400.0°C/–199.9 to 700.0°F) H'0000000B (11): E (–200 to 600°C/–300 to 1100°F) H'0000000C (12): L (–100 to 850°C/–100 to 1500°F) H'0000000D (13): U (–200 to 400°C/–300 to 700°F) H'0000000E (14): U (–199.9 to 400.0°C/–199.9 to 700.0°F) H'0000000F (15): N (–200 to 1300°C/–300 to 2300°F) H'00000010 (16): R (0 to 1700°C/0 to 3000°F) H'00000011 (17): S (0 to 1700°C/0 to 3000°F) H'00000012 (18): B (100 to 1800°C/300 to 3200°F) H'00000013 (19): W (0 to 2300°C/0 to 3200°F) H'00000014 (20): PL II (0 to 1300°C/0 to 2300°F) H'00000015 (21): Infrared temperature sensor (K 140°F/60°C) H'00000016 (22): Infrared temperature sensor (K 240°F/120°C) H'00000017 (23): Infrared temperature sensor (K 280°F/140°C) H'00000018 (24): Infrared temperature sensor (K 440°F/220°C) H'00000019 (25): 4 to 20 mA H'0000001A (26): 0 to 20 mA H'0000001B (27): 1 to 5 V H'0000001C (28): 0 to 5 V H'0000001D (29): 0 to 10 V | Initial setting |
| C3 (83) | 0001 | Scaling Upper Limit | Scaling lower limit + 1 to H'0000270F (Scaling lower limit + 1 to 9,999) | |
| C3 (83) | 0002 | Scaling Lower Limit | H'FFFFF831 to Scaling upper limit – 1 (–1999 to Scaling upper limit – 1) | |
| C3 (83) | 0003 | Decimal Point | H'00000000 to 00000003 (0 to 3) | |
| C3 (83) | 0004 | Temperature Unit | H'00000000 (0): °C H'00000001 (1): °F | |
| C3 (83) | 0005 | SP Upper Limit | The range of values (without decimal point) is as follows: Temperature input: SP lower limit + 1 to Input range upper limit Analog input: SP lower limit + 1 to Scaling upper limit | |
| C3 (83) | 0006 | SP Lower Limit | The range of values (without decimal point) is as follows: Temperature input: Input range lower limit to SP upper limit – 1 Analog input input: Scaling lower limit to SP upper limit – 1 | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-----------------------------|---|-----------------|
| C3 (83) | 0007 | PID ON/OFF | H'00000000 (0): ON/OFF H'00000001 (1): 2 PID control | Initial setting |
| C3 (83) | 0008 | Standard or Heating/Cooling | H'00000000 (0): Standard H'00000001 (1): Heating and cooling | |
| C3 (83) | 0009 | ST | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 000A | Control Period (Heating) | H'FFFFFFFE (-2): 0.1 s H'FFFFFFF (-1): 0.2 s H'00000000 (0): 0.5 s H'00000001 to H'00000063 (1 to 99) | |
| C3 (83) | 000B | Control Period (Cooling) | H'FFFFFFFE (-2): 0.1 s H'FFFFFFF (-1): 0.2 s H'00000000 (0): 0.5 s H'00000001 to H'00000063 (1 to 99) | |
| C3 (83) | 000C | Direct/Reverse Operation | H'00000000 (0): Reverse operation H'00000001 (1): Direct operation | |
| C3 (83) | 000D | Alarm 1 Type | H'00000000 (0): Alarm function OFF H'00000001 (1): Upper and lower-limit alarm H'00000002 (2): Upper-limit alarm H'00000003 (3): Lower-limit alarm H'00000004 (4): Upper and lower-limit range alarm H'00000005 (5): Upper and lower-limit alarm with standby sequence H'00000006 (6): Upper-limit alarm with standby sequence H'00000007 (7): Lower-limit alarm with standby sequence H'00000008 (8): Absolute-value upper-limit alarm H'00000009 (9): Absolute-value lower-limit alarm H'0000000A (10): Absolute-value upper-limit alarm with standby sequence H'0000000B (11): Absolute-value lower-limit alarm with standby sequence H'0000000C (12): LBA (Loop Burnout Alarm) H'0000000D (13): PV change rate alarm H'0000000E (14): SP absolute-value upper-limit alarm H'0000000F (15): SP absolute-value lower-limit alarm H'00000010 (16): MV absolute-value upper-limit alarm H'00000011 (17): MV absolute-value lower-limit alarm H'00000012 (18): RSP absolute-value upper-limit alarm H'00000013 (19): RSP absolute-value lower-limit alarm Note: Valid only with a remote SP input. | |
| C3 (83) | 000E | Alarm 2 Type | H'00000000 to H'00000013 (0 to 19) Note: Same settings as the Alarm 1 Type. However, the LBA (loop burnout alarm) cannot be set. | |
| C3 (83) | 000F | Alarm 3 Type | H'00000000 to H'00000013 (0 to 19) Note: Same settings as the Alarm 1 Type. However, the LBA (loop burnout alarm) cannot be set. | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---|---|------------------------|
| C3 (83) | 0010 | Communications Unit No.* ¹ | H'00000000 to H'00000063 (0 to 99) | Communications setting |
| C3 (83) | 0011 | Communications Baud Rate * ¹ | H'00000003 (3): 9.6 H'00000004 (4): 19.2 H'00000005 (5): 38.4 H'00000006 (6): 57.6 | |
| C3 (83) | 0012 | Communications Data Length * ¹ | H'00000007 (7): 7 H'00000008 (8): 8 | |
| C3 (83) | 0013 | Communications Stop Bits* ¹ | H'00000001 (1): 1 H'00000002 (2): 2 | |
| C3 (83) | 0014 | Communications Parity* ¹ | H'00000000 (0): None H'00000001 (1): Even H'00000002 (2): Odd | |

*¹ After communications parameters have been changed, reset the Digital Controller to enable them.

Note: The alarm function can also be used in Digital Controllers without auxiliary output terminals. In this case, confirm alarm occurrences via the status data.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|----------------------------------|--|---------------------------|
| C3 (83) | 0016 | Event Input Assignment 1 | H'00000000 (0): None H'00000001 (1): RUN/STOP H'00000002 (2): Auto/Manual Switch H'00000003 (3): Program Start ^{*1} H'00000004 (4): Direct/Reverse Operation H'00000005 (5): SP Mode Switch Note: Valid only with a remote SP input. H'00000006 (6): 100% AT Execute/Cancel H'00000007 (7): 40% AT Execute/Cancel H'00000008 (8): Setting Change Enable/Disable H'00000009 (9): Communications Writing Enable/Disable Note: Valid only with external communications. H'0000000A (10): Alarm Latch Cancel H'0000000B (11): Multi-SP No. Switch, Bit 0 H'0000000C (12): Multi-SP No. Switch, Bit 1 H'0000000D (13): Multi-SP No. Switch, Bit 2 | Initial setting |
| C3 (83) | 0017 | Event Input Assignment 2 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| C3 (83) | 0018 | Event Input Assignment 3 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| C3 (83) | 0019 | Event Input Assignment 4 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| C3 (83) | 001A | Number of Multi-SP Points | H'00000001 (1): OFF H'00000002 to H'00000008 (1 to 8) | Advanced function setting |
| C3 (83) | 001B | SP Ramp Time Unit | H'00000000 (0): EU/second H'00000001 (1): EU/minute H'00000002 (2): EU/hour | |
| C3 (83) | 001D | Standby Sequence Reset | H'00000000 (0): Condition A H'00000001 (1): Condition B | |
| C3 (83) | 001E | Auxiliary Output 1 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | |
| C3 (83) | 001F | Alarm 1 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |

*1 PRST (program start) can be set even when the program pattern is set to OFF, but the function will be disabled.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-------------------------------------|--|---------------------------|
| C3 (83) | 0020 | Auxiliary Output 2 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | Advanced function setting |
| C3 (83) | 0021 | Alarm 2 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| C3 (83) | 0022 | Auxiliary Output 3 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | Advanced function setting |
| C3 (83) | 0023 | Alarm 3 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| C3 (83) | 0024 | HB ON/OFF | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| C3 (83) | 0025 | Heater Burnout Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0026 | Heater Burnout Hysteresis | H'00000001 to H'000001F4 (0.1 to 50.0) | |
| C3 (83) | 0027 | ST Stable Range | H'00000001 to H'0000270F (0.1 to 999.9) | |
| C3 (83) | 0028 | α | H'00000000 to H'00000064 (0.00 to 1.00) | |
| C3 (83) | 002B | Input Digital Filter | H'00000000 to H'0000270F (0.0 to 999.9) | |
| C3 (83) | 002C | PV/SP No. 2 Display Selection | H'00000000 (0): Nothing displayed. H'00000001 (1): PV/SP H'00000002 (2): PV H'00000003 (3): PV/SP (character display) H'00000004 (4): PV/SP/MV H'00000005 (5): PV/SP/Multi-SP No. H'00000006 (6): PV/SP/Soak time remain H'00000007 (7): PV/SP/Internal SP (ramp SP) H'00000008 (8): PV/SP/Alarm value 1 | |
| C3 (83) | 002D | MV Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 002E | Automatic Display Return Time | H'00000000 (0): OFF H'00000001 to H'00000063 (1 to 99) | |
| C3 (83) | 002F | Alarm 1 Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0030 | Alarm 2 Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0031 | Alarm 3 Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0032 | Move to Protect Level Time | H'00000001 to H'0000001E (1 to 30) | |
| C3 (83) | 0033 | Integrated Alarm Assignment | H'00000000 to H'000000FF (0 to 255) | |
| C3 (83) | 0034 | Cold Junction Compensation Method | H'00000000 (0): OFF H'00000001 (1): ON | |

Note: The alarm function can also be used in Digital Controllers without auxiliary output terminals. In this case, confirm alarm occurrences via the status data.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-------------------------------|--|---------------------------|
| C3 (83) | 0038 | Alarm 1 ON Delay | H'00000000 to H'000003E7 (0 to 999) | Advanced function setting |
| C3 (83) | 0039 | Alarm 2 ON Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003A | Alarm 3 ON Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003B | Alarm 1 OFF Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003C | Alarm 2 OFF Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003D | Alarm 3 OFF Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003E | Transfer Output Type | H'00000000 (0): OFF H'00000001 (1): Set point H'00000002 (2): Set point during SP ramp H'00000003 (3): PV H'00000004 (4): MV (heating) H'00000005 (5): MV (cooling) | Initial setting |
| C3 (83) | 003F | Transfer Output Upper Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) ^{*1} | Advanced function setting |
| C3 (83) | 0040 | Transfer Output Lower Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) ^{*1} | |
| C3 (83) | 0041 | Control Output 1 Signal | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA | |
| C3 (83) | 0043 | MV at Stop and Error Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0044 | Auto/Manual Select Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0045 | RT | H'00000000 (0): OFF H'00000001 (1): ON Note: Valid only with temperature input. | |
| C3 (83) | 0046 | HS Alarm Use | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0047 | HS Alarm Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0048 | HS Alarm Hysteresis | H'00000001 to H'000001F4 (0.1 to 50.0) | |
| C3 (83) | 0049 | LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C3 (83) | 004A | LBA Level | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |
| C3 (83) | 004B | LBA Band | H'00000000 to H'0000270F (0.0 to 999.9 for temperature input) (0.00 to 99.99 for analog input) | |

*1 The setting (monitor) range depends on the transfer output type setting. (Refer to *Section 5 Parameters* in the *E5CC/E5EC Digital Temperature Controllers User's Manual* (Cat. No. H174).)

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-----------------------------------|--|---------------------------|
| C3 (83) | 004C | Protocol Setting ^{*1} | H'00000000 (0): CompoWay/F H'00000001 (1): Modbus | Communications setting |
| C3 (83) | 004D | Send Data Wait Time ^{*1} | H'00000000 to H'00000063 (0 to 99) | |
| C3 (83) | 004E | Control Output 1 Assignment | Control output 1 is a relay output or voltage output (for driving SSR): H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 4 H'00000007 (7): Heater alarm H'00000008 (8): HB alarm H'00000009 (9): HS alarm H'0000000A (10): Input error H'0000000B (11): RSP input error H'0000000C (12): Program end output ^{*2} H'0000000D (13): RUN output H'0000000E (14): Integrated alarm H'0000000F (15): Work bit 1 H'00000010 (16): Work bit 2 H'00000011 (17): Work bit 3 H'00000012 (18): Work bit 4 H'00000013 (19): Work bit 5 H'00000014 (20): Work bit 6 H'00000015 (21): Work bit 7 H'00000016 (22): Work bit 8 When control output 1 is a current output: H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) | Advanced function setting |
| C3 (83) | 004F | Control Output 2 Assignment | Control output 2 is a relay output or voltage output (for driving SSR): H'00000000 to H'00000016 (0 to 22) * Same as for the Control Output 1 Assignment parameter. When control output 2 is a current output: H'00000000 to H'00000002 (0 to 2) * Same as for the Control Output 1 Assignment parameter. | |

*1 After communications parameters have been changed, reset the Digital Controller to enable them.

*2 P.END (program end output) can be set even when the program pattern is set to OFF, but the function will be disabled.

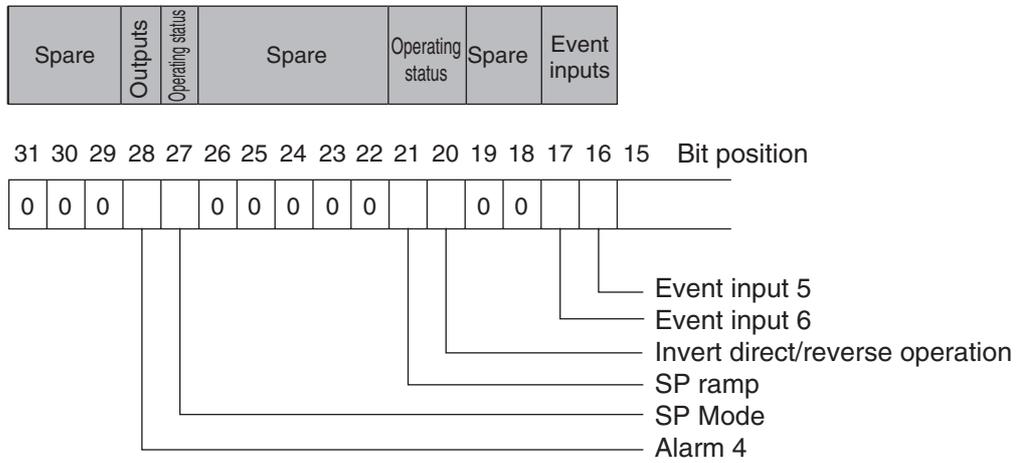
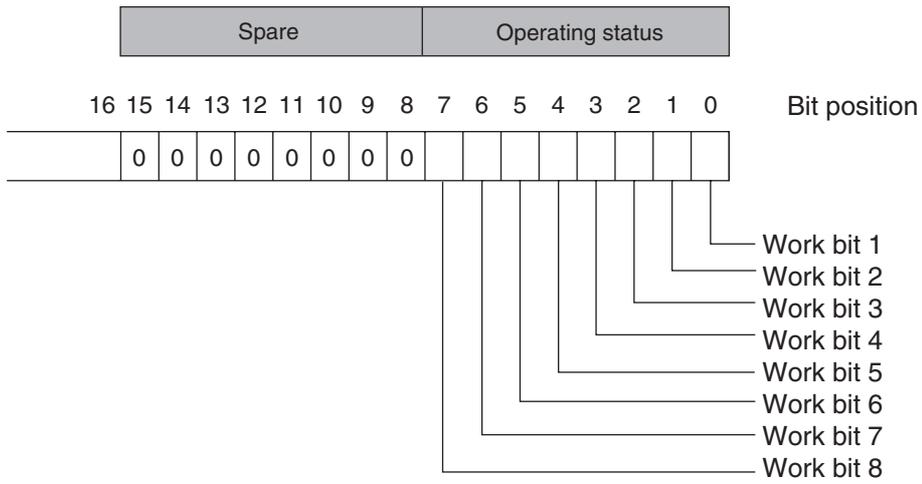
| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-------------------------------|--|---------------------------|
| C3 (83) | 0050 | Auxiliary Output 1 Assignment | H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 4 H'00000007 (7): Heater alarm H'00000008 (8): HB alarm H'00000009 (9): HS alarm H'0000000A (10): Input error H'0000000B (11): RSP input error H'0000000C (12): Program end output H'0000000D (13): RUN output H'0000000E (14): Integrated alarm H'0000000F (15): Work bit 1 H'00000010 (16): Work bit 2 H'00000011 (17): Work bit 3 H'00000012 (18): Work bit 4 H'00000013 (19): Work bit 5 H'00000014 (20): Work bit 6 H'00000015 (21): Work bit 7 H'00000016 (22): Work bit 8 | Advanced function setting |
| C3 (83) | 0051 | Auxiliary Output 2 Assignment | H'00000000 to H'00000016 (0 to 22) Note: Same as for the Auxiliary Output 1 Assignment parameter. | |
| C3 (83) | 0053 | Program Pattern | H'00000000 (0): OFF H'00000001 (1): STOP H'00000002 (2): CONT | Initial setting |
| C3 (83) | 0054 | Soak Time Unit | H'00000000 (0): Minutes H'00000001 (1): Hours | Advanced function setting |
| C3 (83) | 0055 | Alarm SP Selection | H'00000000 (0): Set point during SP ramp H'00000001 (1): Set point | |
| C3 (83) | 0056 | Auxiliary Output 3 Assignment | H'00000000 to H'00000016 (0 to 22) Note: Same as for the Auxiliary Output 1 Assignment parameter. | |
| C3 (83) | 005B | Manual MV Limit Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 005D | AT Calculated Gain | H'00000001 to H'00000064 (0.1 to 10.0) | |
| C3 (83) | 005E | AT Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 9.99 for analog input) | |
| C3 (83) | 005F | Limit Cycle MV Amplitude | H'00000032 to H'000001F4 (5.0 to 50.0) | |
| C3 (83) | 0060 | Remote SP Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0061 | Remote SP Upper limit | Input range lower limit to Input range upper limit for temperature input Scaling lower limit to Scaling upper limit for analog input | |
| C3 (83) | 0062 | Remote SP Lower limit | Input range lower limit to Input range upper limit for temperature input Scaling lower limit to Scaling upper limit for analog input | |
| C3 (83) | 0063 | SP Tracking | H'00000000 (0): OFF H'00000001 (1): ON | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--------------------------------------|---|---------------------------|
| C3 (83) | 0067 | PV Rate of Change Calculation Period | H'00000001 to H'000003E7 (1 to 999) | Advanced function setting |
| C3 (83) | 0068 | Heating/Cooling Tuning Method | H'00000000 (0): Same (Same as for heating.) H'00000001 (1): Linear H'00000002 (2): Air cooling H'00000003 (3): Water cooling | |
| C3 (83) | 006C | Extraction of Square Root Enable | H'00000000 (0): OFF H'00000001 (1): ON | Initial setting |
| C3 (83) | 006D | PF Setting | H'00000000 (0): Disabled. H'00000001 (1): Run H'00000002 (2): Stop H'00000003 (3): RUN/STOP H'00000004 (4): 100% AT execute H'00000005 (5): 40% AT execute H'00000006 (6): Alarm latch cancel H'00000007 (7): Auto/manual switch H'00000008 (8): Monitor/setting item H'00000009 (9): Digit shift key | Advanced function setting |
| C3 (83) | 006E | Monitor/Setting Item 1 | H'00000000 (0): Disabled H'00000001 (1): PV/SP/Multi-SP H'00000002 (2): PV/SP/MV H'00000003 (3): PV/SP/soak time remain H'00000004 (4): Proportional band H'00000005 (5): Integral time H'00000006 (6): Derivative time H'00000007 (7): Alarm value 1 H'00000008 (8): Alarm value upper limit 1 H'00000009 (9): Alarm value lower limit 1 H'0000000A (10): Alarm value 2 H'0000000B (11): Alarm value upper limit 2 H'0000000C (12): Alarm value lower limit 2 H'0000000D (13): Alarm value 3 H'0000000E (14): Alarm value upper limit 3 H'0000000F (15): Alarm value lower limit 3 H'00000010 (16): Alarm value 4 H'00000011 (17): Alarm value upper limit 4 H'00000012 (18): Alarm value lower limit 4 H'00000013 (19): PV/SP/Internal set point H'00000014 (20): PV/SP/Alarm value 1 H'00000015 (21): Proportional band (cooling) H'00000016 (22): Integral time (cooling) H'00000017 (23): Derivative time (cooling) | |
| C3 (83) | 006F | Monitor/Setting Item 2 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |
| C3 (83) | 0070 | Monitor/Setting Item 3 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |
| C3 (83) | 0071 | Monitor/Setting Item 4 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |
| C3 (83) | 0072 | Monitor/Setting Item 5 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|----------------------------------|--|---------------------------|
| C3 (83) | 0073 | PV/SP No. 1 Display Selection | H'00000000 (0): Nothing displayed. H'00000001 (1): PV/SP H'00000002 (2): PV H'00000003 (3): PV/SP (character display) H'00000004 (4): PV/SP/MV H'00000005 (5): PV/SP/Multi-SP No. H'00000006 (6): PV/SP/Soak time remain H'00000007 (7): PV/SP/Internal SP (ramp SP) H'00000008 (8): PV/SP/Alarm value 1 | Advanced function setting |
| C3 (83) | 0074 | MV Display Selection | H'00000000 (0): MV (heating) H'00000001 (1): MV (cooling) | |
| C3 (83) | 0075 | PV Decimal Point Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0076 | PV Status Display Function | H'00000000 (0): OFF H'00000001 (1): Manual H'00000002 (2): Stop H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 4 H'00000007 (7): Alarm 1 to 4 OR status H'00000008 (8): Heater alarm | |
| C3 (83) | 0077 | SV Status Display Function | H'00000000 to H'00000008 (0 to 8) Note: Same as for PV Status Display Function | |
| C3 (83) | 0083 | Display Refresh Period | H'00000000 (0): OFF H'00000001 (1): 0.25 H'00000002 (2): 0.5 H'00000003 (3): 1.0 | |
| C3 (83) | 0084 | Alarm 4 Type | H'00000000 to H'00000013 (0 to 19) Note: Same settings as the Alarm 1 Type. However, the LBA (loop burnout alarm) cannot be set. | Initial setting |
| C3 (83) | 0085 | Event Input Assignment 5 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| C3 (83) | 0086 | Event Input Assignment 6 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| C3 (83) | 0087 | Auxiliary Output 4 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | Advanced function setting |
| C3 (83) | 0088 | Alarm 4 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| C3 (83) | 0089 | Moving Average Count | H'00000000 (0): OFF H'00000001 (1): 2 times H'00000002 (2): 4 times H'00000003 (3): 8 times H'00000004 (4): 16 times H'00000005 (5): 32 times | Advanced function setting |
| C3 (83) | 008A | Alarm 4 Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 008B | Alarm 4 ON delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 008C | Alarm 4 OFF delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 008D | Control Output 2 Signal | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA | Initial setting |
| C3 (83) | 008E | Transfer Output Signal | H'00000000 (0): 4 to 20 mA H'00000001 (1): 1 to 5 V | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-------------------------------|---|---------------------------|
| C3 (83) | 008F | Auxiliary Output 4 Assignment | H'00000000 to H'00000016 (0 to 22) Note: Same as for the Auxiliary Output 1 Assignment parameter. | Advanced function setting |
| C3 (83) | 0090 | Remote SP Input | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA H'00000002 (2): 1 to 5 V H'00000003 (3): 0 to 5 V H'00000004 (4): 0 to 10 V | |
| C3 (83) | 0091 | Integral/Derivative Time Unit | H'00000000 (0): 1 s H'00000001 (1): 0.1 s | |
| C3 (83) | 0092 | Manual Output Method | H'00000000 (0): HOLD H'00000001 (1): INIT | |
| C3 (83) | 0093 | Manual MV Initial Value | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | |
| C3 (83) | 0094 | Minimum Output ON/OFF Band | H'00000000 to H'000001F4 (0 to 50.0) | |
| C3 (83) | 0095 | Display Brightness | H'00000001 to H'00000003 (1 to 3) | |

● Status 2 Structure



● Status Details

| Bit position | Status | Bit Description | | |
|---------------------------|--------------------|---------------------------------|------------------------------|------------------------------|
| | | 0 | 1 | |
| Status (lower word) | 0 | Heater overcurrent (CT1) | Not generated | Generated |
| | 1 | Heater current hold (CT1)* | Update | Hold |
| | 2 | A/D converter error | Not generated | Generated |
| | 3 | HS alarm (CT1) | OFF | ON |
| | 4 | RSP input error | Not generated | Generated |
| | 5 | Spare | OFF | --- |
| | 6 | Input error | Not generated | Generated |
| | 7 | Spare | OFF | --- |
| | 8 | Control output (heating) | OFF | ON |
| | 9 | Control output (cooling) | OFF | ON |
| | 10 | HB (heater burnout) alarm (CT1) | OFF | ON |
| | 11 | HB (heater burnout) alarm (CT2) | OFF | ON |
| | 12 | Alarm 1 | OFF | ON |
| | 13 | Alarm 2 | OFF | ON |
| | 14 | Alarm 3 | OFF | ON |
| 15 | Program end output | OFF | ON | |
| Status (upper word) | 16 | Event input 1 | OFF | ON |
| | 17 | Event input 2 | OFF | ON |
| | 18 | Event input 3 | OFF | ON |
| | 19 | Event input 4 | OFF | ON |
| | 20 | Write mode | Backup mode | RAM write mode |
| | 21 | Non-volatile memory | RAM = Non-volatile memory | RAM ≠ Non-volatile memory |
| | 22 | Setup area | Setup area 0 | Setup area 1 |
| | 23 | AT execute/cancel | AT canceled | AT execution in progress |
| | 24 | RUN/STOP | Run | Stop |
| | 25 | Communications writing | OFF (disabled) | ON (enabled) |
| | 26 | Auto/manual switch | Automatic mode | Manual mode |
| | 27 | Program start | Reset | Start |
| | 28 | Heater overcurrent (CT2) | Not generated | Generated |
| | 29 | Heater current hold (CT2) | Update | Hold |
| | 30 | Spare | OFF | --- |
| | 31 | HS alarm (CT2) | OFF | ON |

Note 1 "Spare" bits are always OFF.

2 When read in setup area 1, the status of the bits will be as follows:

- Overcurrent: Last value held
- A/D converter error: Last value held
- Input error: Last value held
- HB and HS outputs: Cleared
- Program end output: Cleared
- Current hold: Last value held
- Heating and cooling outputs: Cleared
- Alarm outputs: Cleared

* When the control output ON time is less than 30 ms for a control period of 0.1 s or 0.2 s or when it is less than 100 ms for any other control period, the bit is set to "1" and the heater current is held at the last current value.

● Status 2 Details

| Bit position | Status | Bit Description | | |
|---------------------------|--------|---------------------------------|---------------|----------------|
| | | 0 | 1 | |
| Status (lower word) | 0 | Work bit 1 | OFF | ON |
| | 1 | Work bit 2 | OFF | ON |
| | 2 | Work bit 3 | OFF | ON |
| | 3 | Work bit 4 | OFF | ON |
| | 4 | Work bit 5 | OFF | ON |
| | 5 | Work bit 6 | OFF | ON |
| | 6 | Work bit 7 | OFF | ON |
| | 7 | Work bit 8 | OFF | ON |
| | 8 | Spare | OFF | --- |
| | 9 | Spare | OFF | --- |
| | 10 | Spare | OFF | --- |
| | 11 | Spare | OFF | --- |
| | 12 | Spare | OFF | --- |
| | 13 | Spare | OFF | --- |
| | 14 | Spare | OFF | --- |
| 15 | Spare | OFF | --- | |
| Status (upper word) | 16 | Event input 5 | OFF | ON |
| | 17 | Event input 6 | OFF | ON |
| | 18 | Spare | OFF | --- |
| | 19 | Spare | OFF | --- |
| | 20 | Invert direct/reverse operation | Not invert | Invert |
| | 21 | SP ramp | OFF | During SP ramp |
| | 22 | Spare | OFF | --- |
| | 23 | Spare | OFF | --- |
| | 24 | Spare | OFF | --- |
| | 25 | Spare | OFF | --- |
| | 26 | Spare | OFF | --- |
| | 27 | SP Mode | Local SP Mode | Remote SP Mode |
| | 28 | Alarm 4 | OFF | ON |
| | 29 | Spare | OFF | --- |
| | 30 | Spare | OFF | --- |
| | 31 | Spare | OFF | --- |

Note 1 "Spare" bits are always OFF.

2 When read in setup area 1, the status of the bits will be as follows:

- Work bits 1 to 8: Cleared
- SP ramp: Last value held

4

Modbus Communications Procedure

Read this section if you are to communicate using the Modbus format.

| | |
|--|------------|
| 4-1 Data Format | 4-2 |
| 4-1-1 Command Frame | 4-2 |
| 4-1-2 Response Frame | 4-4 |
| 4-1-3 Error Codes | 4-5 |
| 4-2 Function List | 4-6 |
| 4-3 Variable Area | 4-7 |
| 4-4 Detailed Description of the Functions | 4-8 |
| 4-4-1 Variable Read, Multiple | 4-8 |
| 4-4-2 Variable Write, Multiple | 4-10 |
| 4-4-3 Variable Write, Single/Operation Command | 4-12 |
| 4-4-4 Echoback Test | 4-15 |

4-1 Data Format

The data format complies with the Modbus (RTU) communications protocol, so commands from the host and responses from the E5CC/E5EC are contained in data blocks called frames.

The structure of the command and response frames is described below.

In the following explanations, hexadecimal values are expressed by adding the prefix H' before the number, e.g., H'02. Numbers and alphabetic characters without the H' prefix are ASCII characters.

4-1-1 Command Frame

When using RTU mode, start with a silent interval of at least 3.5 character times and end with a silent interval of at least 3.5 character times.



| | |
|----------------------|---|
| | Silent interval of 3.5 character times minimum. |
| Slave address | Specify the unit number. The unit number can be set between H'00 to H'63 hexadecimal (0 to 99 decimal). Specify H'00 for a broadcast transmission. No responses will be returned for broadcast transmissions. |
| Function code | The function code is a 1-byte hexadecimal code that indicates the type of command sent from the host device. |
| Data | This is the text data associated with the specified function code. Specify the required data, such as the variable address or setting data. (Set in hexadecimal.) |
| CRC-16 | Cyclic Redundancy Check This check code is calculated with the data from the slave address to the end of the data. The check code is 2-byte hexadecimal. |
| | Silent interval of 3.5 character times minimum. |

● CRC-16 Calculation Example

Messages are processed one byte at a time in the work memory (a 16-bit register known as the CRC register).

- (1) The CRC register is initialized to H'FFFF.
- (2) An XOR operation is performed on the content of the CRC register and the first byte of the message, and the result is returned to the CRC register.
- (3) The MSB is packed with zeroes and the CRC register is shifted 1 bit to the right.
- (4) If the bit shifted from the LSB is 0, step 3 is repeated (next bit-shift processing).
If the bit shifted from the LSB is 1, an XOR is performed on the content of the CRC register and H'A001, and the result is returned to the CRC register.
- (5) Steps 3 and 4 are repeated until 8 bits are shifted.
- (6) CRC processing continues to the end of the message, as XOR operations are performed on the content of the CRC register and the next byte of the message, step 3 is repeated, and the result is returned to the CRC register.
- (7) The result of the CRC calculation (value in the CRC register) is appended to the last byte of the message.

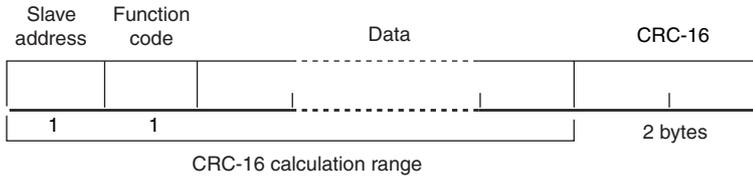
• Example of Appending the Calculation Result

When the calculated CRC value is H'1234, the CRC value is appended to the command frame as follows.

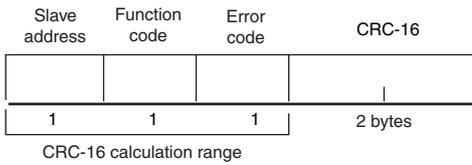


4-1-2 Response Frame

● Normal Response Frame



● Error Response Frame



| | |
|----------------------|--|
| Slave address | The number specified in the command frame is entered as-is. This is the unit number of the Unit returning the response. |
| Function code | This is the received function code with the hexadecimal value of H'80 added to indicate that the response is an error response. Example: Received function code = H'03 Function code in response frame when an error occurred = H'83 |
| Error code | This code indicates the kind of error that occurred. |
| CRC-16 | Cyclic Redundancy Check This check code is calculated with the data from the slave address to the end of the data. The check code is 2-byte hexadecimal. |

4-1-3 Error Codes

| End code | Name | Description | Error detection priority |
|----------|------------------------|---|--------------------------|
| H'01 | Function code error | An unsupported function code was received. | 1 |
| H'02 | Variable address error | The specified variable area address is out-of-range. | 2 |
| H'03 | Variable data error | The amount of data does not match the number of elements. The byte count is not 2 times the number of elements. The response length exceeds the size of the communications buffer. The command code or related information in the operation command is wrong or the write data is not in the setting range. | 3 |
| H'04 | Operation error | The write data contents are not allowed in the present operation mode. <ul style="list-style-type: none"> • The Communications Writing parameter is set to "OFF" (disabled). • Attempted to write to a parameter in setup area 1 from setup area 0. • Attempted to write to a protect parameter from other than the protect level. • AT execution is in progress. • The command cannot be processed. | 4 |

● No Response

In the following cases, the received command will not be processed and a response will not be returned.

Consequently, a timeout error will occur at the host device.

- The slave address in the received command does not match the communications unit number.
- A parity error, framing error, or overrun error occurred due to a problem such as a transfer error.
- A CRC-16 code error occurred in the received command frame.
- There was a time interval of more than 3.5 character times between data packets that make up the command frame.

Furthermore, the specified function's processing will be performed but no response will be returned for broadcast functions (slave address = H'00).

4-2 Function List

The following table lists the function codes.

Function Code List

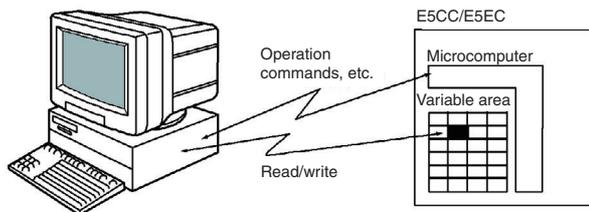
| Function code | Name | Process |
|---------------|---|--|
| 03 (H'03) | Read variable (multiple) | This function reads from the variable area. It is possible to read two or more consecutive variables. |
| 16 (H'10) | Write variable (multiple) | This function writes to the variable area. It is possible to write two or more consecutive variables. It is also possible to broadcast this function (broadcast transmission). |
| 06 (H'06) | Write variable (Single/operation command) | This function writes to the variable area and writes operation commands. It is also possible to write to a single parameter by specifying the address in 2-byte mode. (This is not supported in 4-byte mode.) It is also possible to broadcast this function (broadcast transmission.) |
| 08 (H'08) | Echoback Test | This function performs an echoback test. |

4-3 Variable Area

The variable area is the region of memory used to exchange data with the E5CC/E5EC through communications.

Operations such as reading the process value and reading/writing parameters are performed on the variable area.

On the other hand, operation commands do not use the variable area.



When accessing the variable area, the position of a variable in the variable area is specified with a word identifier, area number, and address in the area.

● Addresses

An address is appended to each of the variable types. Express addresses in 2-byte hexadecimal and append them for the specified access size.

● Number of Elements

The number of elements is expressed in 2-byte hexadecimal. The setting range for the number of elements varies according to the command.

Four-byte Mode

One element uses 2 bytes of data, so specify two-element units. Reading and writing in 4-byte units is executed by specifying an even address and specifying the number of elements in multiples of 2.

Two-byte Mode

One element uses 2 bytes of data, so specify one-element units. Reading and writing in 2-byte data units is executed by specifying 1-element units.

● Set Values

The values read from the variable area or written to the variable area are expressed in hexadecimal, ignoring the decimal point position. (Negative values are expressed in 2's complement format.)

Example: D'105.0 → H'000041A

The variables are 4-digit or 8-digit hexadecimal values. Negative values are expressed in 2's complement format. The values are hexadecimal values with no decimal point indication.

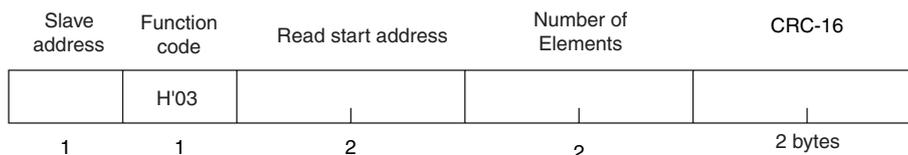
For example, if the E5CC/E5EC's process value is read in 4-byte mode when the process value is 105.0, the read value will be H'000041A (105.0 → 1050 → H'000041A).

4-4 Detailed Description of the Functions

4-4-1 Variable Read, Multiple

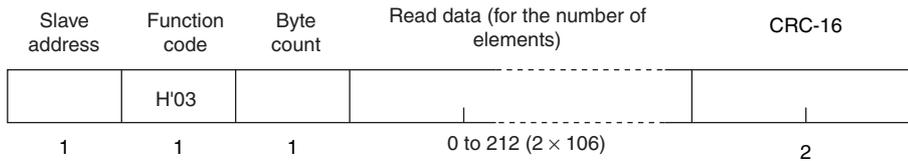
To read from the variable area, set the required data in the command frame, as shown in the following diagram.

Command Frame



| Name | Description |
|--------------------|--|
| Slave address | Specify the E5CC/E5EC's unit number. The unit number can be set between H'01 and H'63 hexadecimal (1 to 99 decimal). |
| Function code | The Read Variable Area function's function code is H'03. |
| Read start address | Specify the address containing the data to be read. Refer to <i>Section 5 Communications Data for Modbus</i> for details on addresses. |
| Number of elements | <p>4-byte Mode Specify 2 times the number of setting data items as the number of elements to be read. The setting range for the number of elements is H'0002 to H'006A (2 to 106). When H'006A is set, 53 items of setting data can be read. Example: When reading 2 items of setting data, set the number of elements to H'0004.</p> <p>2-byte Mode Specify the number of setting data items to be read as the number of elements. The setting range for the number of elements is H'0001 to H'006A (1 to 106). When H'006A is set, 106 items of setting data can be read. Example: When reading two items of setting data, set the number of elements to H'0002.</p> |
| CRC-16 | This check code is calculated with the data from the slave address to the end of the data. For details on the CRC-16 calculation, refer to <i>CRC-16 Calculation Example</i> in 4-1-1 <i>Command Frame</i> on page 4-2. |

Response Frame



| Name | Description |
|---------------|--|
| Slave address | The value from the command frame is entered as-is. |
| Function code | This is the received function code. When the function ended normally, the function code is left as-is. When an error occurred, the hexadecimal value of H'80 is added to the function code to indicate that the response is an error response. Example: Received function code = H'03 Function code in response frame when an error occurred = H'83 |
| Byte count | Contains the number of bytes of read data. |
| Read data | Contains the number of setting data items that were read. |
| CRC-16 | This check code is calculated with the data from the slave address to the end of the data. For details on the CRC-16 calculation, refer to <i>CRC-16 Calculation Example</i> in 4-1-1 <i>Command Frame</i> on page 4-2. |

Response Code

| Function code | Error code | Error name | Cause |
|---------------|------------|------------------------|---|
| H'83 | H'02 | Variable address error | The read start address is incorrect. |
| | H'03 | Variable data error | The number of elements exceeds the allowed range. |
| H'03 | --- | Normal completion | No errors were found. |

Reading Undisplayed Parameters

It is possible to read the parameters that are not displayed due to display settings as well as the parameters that are never displayed in the Controller.

• Example Command and Response

The following example shows the command and response when reading the process value (slave address: H'01).

Process Value in 4-byte Mode

- Address: H'0000; Read data: H'000003E8 (100.0 °C)

Command:

| | | | | |
|----|----|-------|-------|---------------|
| 01 | 03 | 00 00 | 00 02 | C4 0B(CRC-16) |
|----|----|-------|-------|---------------|

Response:

| | | | | |
|----|----|----|-------------|---------------|
| 01 | 03 | 04 | 00 00 03 E8 | FA 8D(CRC-16) |
|----|----|----|-------------|---------------|

Process Value in 2-byte Mode

- Address: H'2000; Read data: H'03E8 (100.0 °C)

Command:

| | | | | |
|----|----|-------|-------|--------------|
| 01 | 03 | 20 00 | 00 01 | 8FCA(CRC-16) |
|----|----|-------|-------|--------------|

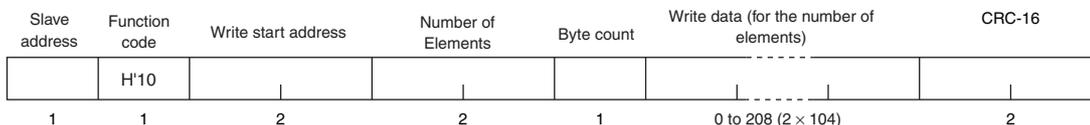
Response:

| | | | | |
|----|----|----|-------|---------------|
| 01 | 03 | 02 | 03 E8 | B8 FA(CRC-16) |
|----|----|----|-------|---------------|

4-4-2 Variable Write, Multiple

To write data to the variable area, set the required data in the command frame, as shown in the following diagram.

Command Frame



| Name | Description |
|---------------------|--|
| Slave address | Specify the E5CC/E5EC's unit number. The unit number can be set between H'01 and H'63 hexadecimal (1 to 99 decimal). |
| Function code | The Write Variable Area function's function code is H'10. |
| Write start address | Specify the starting address where the setting data will be written. Refer to <i>Section 5 Communications Data for Modbus</i> for details on addresses. |
| Number of elements | <p>4-byte Mode</p> <p>Specify 2 times the number of setting data items as the number of elements to be written.</p> <p>The setting range for the number of elements is H'0002 to H'0068 (2 to 104). When H'0068 is set, 52 items of setting data can be read. Example: When writing 2 items of setting data, set the number of elements to H'0004.</p> <p>2-byte Mode</p> <p>Specify the number of setting data items to be written as the number of elements.</p> <p>The setting range for the number of elements is H'0001 to H'0068 (1 to 104). When H'0068 is set, 104 items of setting data can be read. Example: When reading two items of setting data, set the number of elements to H'0002.</p> |
| Byte count | Specify the number of bytes of write data. |
| CRC-16 | This check code is calculated with the data from the slave address to the end of the data. For details on the CRC-16 calculation, refer to <i>CRC-16 Calculation Example</i> in <i>4-1-1 Command Frame</i> on page 4-2. |

● Response Frame

| Slave address | Function code | Write start address | Number of Elements | CRC-16 |
|---------------|---------------|---------------------|--------------------|---------|
| 1 | H' 10 | 2 | 2 | 2 bytes |

| Name | Description |
|---------------------|--|
| Slave address | The value from the command frame is entered as-is. |
| Function code | This is the received function code. When the function ended normally, the function code is left as-is. When an error occurred, the hexadecimal value of H'80 is added to the function code to indicate that the response is an error response. Example: Received function code = H'10 Function code in response frame when an error occurred = H'90 |
| Write start address | This is the received write start address. |
| Number of elements | This is the received number of elements. |
| CRC-16 | This check code is calculated with the data from the slave address to the end of the data. For details on the CRC-16 calculation, refer to <i>CRC-16 Calculation Example</i> in 4-1-1 Command Frame on page 4-2. |

Response Code

| Function code | Error code | Error name | Cause |
|---------------|------------|------------------------|---|
| H'90 | H'02 | Variable address error | The write start address is incorrect. |
| | H'03 | Variable data error | <ul style="list-style-type: none"> The amount of data does not match the number of elements. The byte count is not 2 times the number of elements. The write data is out of the setting range. |
| | H'04 | Operation error | <p>The Controller cannot write the data in its present operating status.</p> <p>The write data contents are not allowed in the present operation mode.</p> <ul style="list-style-type: none"> The Communications Writing parameter is set to "OFF" (disabled). Attempted to write to a parameter in setup area 1 from setup area 0. Attempted to write to a protect parameter from other than the protect level. AT execution is in progress. |
| H'10 | --- | Normal completion | No errors were found. |

Writing Undisplayed Parameters

It is possible to write the parameters that are not displayed due to display settings as well as the parameters that are never displayed in the Controller.

- Example Command and Response

The following example shows the command/response when writing the Alarm Value Upper Limit 1 and Alarm Value Lower Limit 1 parameters.

(In this case, the slave address is H'01.)

Four-byte Mode

Alarm Value Upper Limit 1

- Address: H'010A; Write data: H'000003E8 (when 1000)

Alarm Value Lower Limit 1

- Address: H'010C; Write data: H'FFFFFFC18 (when -1000)

| | | | | | | | | |
|-----------|----|----|-------|-------|---------------|-------------|-------------|---------------|
| Command: | 01 | 10 | 01 0A | 00 04 | 08 | 00 00 03 E8 | FF FF FC 18 | 8D E9(CRC-16) |
| Response: | 01 | 10 | 01 0A | 00 04 | E0 34(CRC-16) | | | |

Two-byte Mode

Alarm Value Upper Limit 1

- Address: H'2105; Write data: H'03E8 (when 1000)

Alarm Value Lower Limit 1

- Address: H'2106; Write data: H' FC18 (when -1000)

| | | | | | | | | |
|-----------|----|----|-------|-------|---------------|-------|-------|---------------|
| Command: | 01 | 10 | 21 05 | 00 02 | 04 | 03 E8 | FC 18 | 66 BB(CRC-16) |
| Response: | 01 | 10 | 21 05 | 00 02 | 5B F5(CRC-16) | | | |

4-4-3 Variable Write, Single/Operation Command

This function performs operations such as writing to the variable area (single) and operation commands (communications writing, RUN/STOP, multi-SP, AT execute/cancel, write mode, save RAM data, software reset, move to setup area 1, move to protect level, auto/manual switch, initialize settings, alarm latch cancel, invert direct/reverse operation, program start, and SP mode.)

Writing is enabled in only the 2-byte mode.

Command Frame

| Slave address | Function code | Write variable address | Write data | CRC-16 |
|---------------|---------------|------------------------|------------|---------|
| 1 | H'06 | 2 | 2 | 2 bytes |

Response Frame

| Slave address | Function code | Write variable address | Write data | CRC-16 |
|---------------|---------------|------------------------|------------|---------|
| 1 | H'06 | 2 | 2 | 2 bytes |

(1) Write variable address

Specify the address of the setting data that is to be written. For details on addresses, refer to *Section 5 Modbus Communications Procedure*.

For an operation command, specify 0000 or FFFF.

(2) Command Code and Related Information

| Command code | Command content | Related information |
|--------------|---------------------------------|--|
| 00 | Communications writing | 00: OFF (disabled) 01: ON (enabled) |
| 01 | RUN/STOP | 00: Run 01: Stop |
| 02 | Multi-SP | 00: Set point 0 01: Set point 1 02: Set point 2 03: Set point 3 04: Set point 4 05: Set point 5 06: Set point 6 07: Set point 7 |
| 03 | AT execute/cancel | 00: AT cancel 01: 100% AT execute 02: 40% AT execute |
| 04 | Write mode | 00: Backup 01: RAM write mode |
| 05 | Save RAM data | 00 |
| 06 | Software reset | 00 |
| 07 | Move to setup area 1 | 00 |
| 08 | Move to protect level | 00 |
| 09 | Auto/manual switch | 00: Automatic mode 01: Manual mode |
| 0B | Parameter initialization | 00 |
| 0C | Alarm latch cancel | 00: Alarm 1 latch cancel 01: Alarm 2 latch cancel 02: Alarm 3 latch cancel 03: HB alarm latch cancel 04: HS alarm latch cancel 05: Alarm 4 latch cancel 0F: All alarm latch cancel |
| 0D | SP Mode | 00: Local SP Mode 01: Remote SP Mode |
| 0E | Invert direct/reverse operation | 00: Not invert 01: Invert |
| 11 | Program start | 00: Reset 01: Start |

(3) Response Code

- Normal Completion

| Function code | Error code | Name | Description |
|---------------|------------|-------------------|-----------------------|
| H'06 | --- | Normal completion | No errors were found. |

- Error Occurred

| Function code | Error code | Name | Description |
|---------------|------------|------------------------|---|
| H'86 | H'02 | Variable address error | The write variable address is incorrect. |
| | H'03 | Variable data error | The write data is incorrect. <ul style="list-style-type: none"> • The write data is out of the setting range. • Command code or related information are incorrect. |
| | H'04 | Operation error | The Controller cannot write the data in its present operating status. <ul style="list-style-type: none"> • The Communications Writing parameter is set to "OFF" (disabled). The command is received regardless of the Communications Writing parameter setting (ON/OFF). • Attempted to write to a parameter in setup area 1 from setup area 0. • Attempted to write to a protect parameter from other than the protect level. • AT execution is in progress. • The command cannot be processed. For details, refer to (5) <i>Operation Commands and Precautions</i> following this table. |

Note: For details on variable writing, refer to 4-4-2 *Variable Write, Multiple*. For details on AT, refer to the *E5CC/E5EC Digital Temperature Controllers User's Manual Basic Type* (Cat. No. H174).

(4) Example Command and Response

The following example shows the command/response for a Stop command. (In this case, the slave address is H'01.)

Stop command (command code: 01; related information: 01)

- Address: H'0000 (fixed)

Write data: H'0101 (Run/Stop, Stop command)

Command:

| | | | | |
|----|----|-------|-------|---------------|
| 01 | 06 | 00 00 | 01 01 | 49 9A(CRC-16) |
|----|----|-------|-------|---------------|

Response:

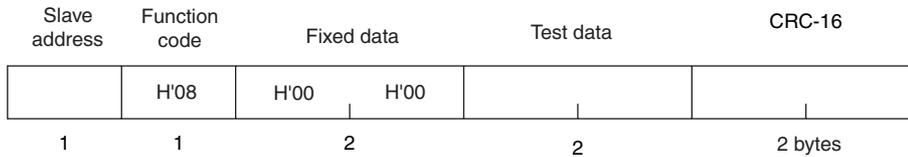
| | | | | |
|----|----|-------|-------|---------------|
| 01 | 06 | 00 00 | 01 01 | 49 9A(CRC-16) |
|----|----|-------|-------|---------------|

(5) Operation Commands and Precautions

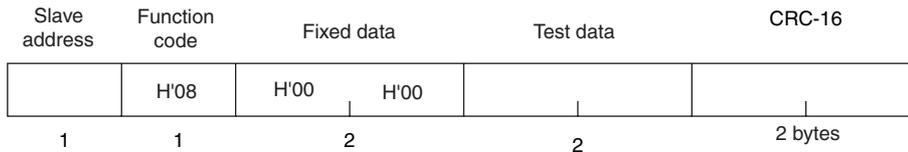
This information is the same as that for CompoWay/F. Refer to page 2-17.

4-4-4 Echoback Test

Command Frame



Response Frame



Note: When the command is executed normally, the response returns the same data sent in the command.

(1) Test Data

Enter any 2-byte hexadecimal data.

(2) Response Code

| Function code | Error code | Name | Description |
|---------------|------------|---------------------|--|
| H'88 | H'03 | Variable data error | A different value (not H'00, H'00) was returned. |
| H'08 | --- | Normal completion | No errors were found. |

(3) Example Command and Response

The following example shows the command/response for an Echoback Test command.

(In this case, the test data is H'1234.)

(In this case, the slave address is H'01.)

Command:

| | | | | |
|----|----|-------|-------|---------------|
| 01 | 08 | 00 00 | 12 34 | ED 7C(CRC-16) |
|----|----|-------|-------|---------------|

Response:

| | | | | |
|----|----|-------|-------|---------------|
| 01 | 08 | 00 00 | 12 34 | ED 7C(CRC-16) |
|----|----|-------|-------|---------------|

5

Communications Data for Modbus

This section lists the details of the communications data in the Modbus communications protocol.

| | |
|---|-------------|
| 5-1 Variable Area (Setting Range) List | 5-2 |
| 5-2 Status | 5-13 |

5-1 Variable Area (Setting Range) List

- Four-byte Mode
One element uses 4 bytes of data (H'00000000 to H'FFFFFFFF), so specify two-element units. Reading and writing in 4-byte units is executed by specifying an even address and specifying the number of elements in multiples of 2.
- Two-byte Mode
One element uses 2 bytes of data (H'0000 to H'FFFF), so specify one-element units. Reading and writing in 2-byte data units is executed by specifying 1-element units.

The following table lists the variable area. Items expressed in hexadecimal in the "Setting (monitor) value" column are the setting range in the Modbus specifications. Values in parentheses "()" are the actual setting range.

When there is a section reference for a setting item, refer to that reference for details.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|----------------------------------|---|-----------|
| Four-byte mode | Two-byte mode | | | |
| 0000 | 2000 | PV | Temperature: Use the specified range for each sensor. Analog: Scaling lower limit – 5% FS to Scaling upper limit + 5% FS | Operation |
| 0002 | 2001 | Status ^{*1*2} | Refer to 5-2 Status for details. | |
| 0004 | 2002 | Internal Set Point ^{*1} | SP lower limit to SP upper limit | |
| 0006 | 2003 | Heater Current 1 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| 0008 | 2004 | MV Monitor (Heating) | Standard: H'FFFFFFCE to H'0000041A (–5.0 to 105.0) Heating and cooling: H'00000000 to H'0000041A (0.0 to 105.0) | |
| 000A | 2005 | MV Monitor (Cooling) | H'00000000 to H'0000041A (0.0 to 105.0) | |
| 0106 | 2103 | Set Point | SP lower limit to SP upper limit | |
| 0108 | 2104 | Alarm Value 1 | H'FFFFFF831 to H'0000270F (–1999 to 9999) | |
| 010A | 2105 | Alarm Value Upper Limit 1 | H'FFFFFF831 to H'0000270F (–1999 to 9999) | |
| 010C | 2106 | Alarm Value Lower Limit 1 | H'FFFFFF831 to H'0000270F (–1999 to 9999) | |
| 010E | 2107 | Alarm Value 2 | H'FFFFFF831 to H'0000270F (–1999 to 9999) | |
| 0110 | 2108 | Alarm Value Upper Limit 2 | H'FFFFFF831 to H'0000270F (–1999 to 9999) | |
| 0112 | 2109 | Alarm Value Lower Limit 2 | H'FFFFFF831 to H'0000270F (–1999 to 9999) | |
| 0404 | 2402 | PV | Temperature: Use the specified range for each sensor. Analog: Scaling lower limit – 5% FS to Scaling upper limit + 5% FS | |
| 0406 | 2403 | Internal Set Point ^{*1} | SP lower limit to SP upper limit | |
| 0408 | 2404 | Multi-SP No. Monitor | H'00000000 to H'00000007 (0 to 7) | |
| 040C | 2406 | Status ^{*1*2} | Refer to 5-2 Status for details. | |
| 040E | 2407 | Status ^{*3} | Refer to 5-2 Status for details. | |
| 0410 | 2408 | Status 2 ^{*1*2} | Refer to 5-2 Status for details. | |
| 0412 | 2409 | Status 2 ^{*1*3} | Refer to 5-2 Status for details. | |
| 0420 | 2410 | Decimal Point Monitor | H'00000000 to H'00000003 (0 to 3) | |

*1 Not displayed on the Controller display.

*2 In 2-byte mode, the rightmost 16 bits are read.

*3 In 2-byte mode, the leftmost 16 bits are read.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|--|---|----------------|
| Four-byte mode | Two-byte mode | | | |
| 0500 | 2500 | Operation/Adjustment Protect | H'00000000 (0): No restrictions in operation and adjustment levels H'00000001 (1): Move to adjustment level is prohibited. H'00000002 (2): Display and change of only "PV" and "PV/SP" parameters is allowed. H'00000003 (3): Display of only "PV" and "PV/SP" parameters is allowed. | Protect |
| 0502 | 2501 | Initial Setting/Communications Protect | H'00000000 (0): Move to initial setting/communications setting level is allowed. (Move to advanced function setting level is displayed.) H'00000001 (1): Move to initial setting/communications setting level is allowed. (Move to advanced function setting level is not displayed.) H'00000002 (2): Move to initial setting/communications setting level is prohibited. | |
| 0504 | 2502 | Setting Change Protect | H'00000000 (0): OFF (Changing of setup on controller display is allowed.) H'00000001 (1): ON (Changing of setup on controller display is prohibited.) | |
| 0506 | 2503 | PF Key Protect | H'00000000 (0): OFF H'00000001 (1): ON | |
| 0508 | 2504 | Move to Protect Level | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| 050A | 2505 | Password to Move to Protect Level | H'FFFFFF831 to H'0000270F (-1999 to 9999) (Can only be set. The monitor value is always H'00000000.) | |
| 050C | 2506 | Parameter Mask Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| 050E | 2507 | Changed Parameters Only | H'00000000 (0): OFF H'00000001 (1): ON | |
| 0600 | 2600 | Manual MV | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | Manual control |
| 0602 | 2601 | Set Point | SP lower limit to SP upper limit | Operation |
| 0604 | 2602 | Remote SP Monitor | Remote SP lower limit -10% FS to Remote SP upper limit +10% FS | |
| 0608 | 2604 | Heater Current 1 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| 060A | 2605 | MV Monitor (Heating) | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'00000000 to H'0000041A (0.0 to 105.0) | |
| 060C | 2606 | MV Monitor (Cooling) | H'00000000 to H'0000041A (0.0 to 105.0) | |
| 0702 | 2701 | Proportional Band (Cooling) | H'00000001 to H'0000270F (0.1 to 999.9) | |
| 0704 | 2702 | Integral Time (Cooling) | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | |
| 0706 | 2703 | Derivative Time (Cooling) | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | |
| 0708 | 2704 | Dead Band | H'FFFFFF831 to H'0000270F (-199.9 to 999.9 for temperature input) (-19.99 to 99.99 for analog input) | Adjustment |
| 070A | 2705 | Manual Reset Value | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| 070C | 2706 | Hysteresis (Heating) | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |
| 070E | 2707 | Hysteresis (Cooling) | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |

5 Communications Data for Modbus

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-----------------------------------|--|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0710 | 2708 | Control Period (Heating) | H'FFFFFFFE (-2): 0.1 s H'FFFFFFF (-1): 0.2 s H'00000000 (0): 0.5 s H'00000001 to H'00000063 (1 to 99) | Initial setting |
| 0712 | 2709 | Control Period (Cooling) | H'FFFFFFFE (-2): 0.1 s H'FFFFFFF (-1): 0.2 s H'00000000 (0): 0.5 s H'00000001 to H'00000063 (1 to 99) | |
| 0718 | 270C | SP Ramp Time Unit | H'00000000 (0): EU/second H'00000001 (1): EU/minute H'00000002 (2): EU/hour | Advanced function setting |
| 071A | 270D | SP Ramp Set Value | H'00000000 (0): OFF H'00000001 to H'0000270F (1 to 9999) | Adjustment |
| 071C | 270E | SP Ramp Fall Value | H'FFFFFFF (-1): Same (Same as SP Ramp Set Value.) H'00000000 (0): OFF H'00000001 to H'0000270F (1 to 9999) | |
| 071E | 270F | MV at Stop | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | |
| 0722 | 2711 | MV at PV Error | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | |
| 0726 | 2713 | MV Change Rate Limit | H'00000000 to H'000003E8 (0.0 to 100.0) | Adjustment |
| 0730 | 2718 | PV Input Slope Coefficient | H'00000001 to H'0000270F (0.001 to 9.999) | |
| 0734 | 271A | Heater Current 1 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | Operation |
| 0736 | 271B | Heater Burnout Detection 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| 0738 | 271C | Leakage Current 1 Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | Operation |
| 073A | 271D | HS Alarm 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| 0746 | 2723 | Process Value Input Shift | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| 0748 | 2724 | Heater Current 2 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | Operation |
| 074A | 2725 | Heater Burnout Detection 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| 074C | 2726 | Leakage Current 2 Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | Operation |
| 074E | 2727 | HS Alarm 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| 0750 | 2728 | Soak Time Remain | H'00000000 to H'0000270F (0 to 9999) | Operation |
| 0752 | 2729 | Soak Time | H'00000001 to H'0000270F (1 to 9999) | Adjustment |
| 0754 | 272A | Wait Band | H'00000000 (0): OFF H'00000001 to H'0000270F (0.1 to 999.9 for Temperature input) (0.01 to 99.99 for Analog input) | |
| 0756 | 272B | Remote SP Input Shift | H'FFFFFF831 to H'0000270F (-1999 to 9999) | |
| 0758 | 272C | Remote SP input Slope Coefficient | H'00000001 to H'0000270F (0.001 to 9.999) | |
| 0800 | 2800 | Input Digital Filter | H'00000000 to H'0000270F (0.0 to 999.9) | Advanced function setting |
| 0808 | 2804 | Moving Average Count | H'00000000 (0): OFF H'00000001 (1): 2 times H'00000002 (2): 4 times H'00000003 (3): 8 times H'00000004 (4): 16 times H'00000005 (5): 32 times | |

| Address | | Parameter name | Setting (monitor) value | Level | |
|----------------|---------------|---|---|------------|------------|
| Four-byte mode | Two-byte mode | | | | |
| 0810 | 2808 | Extraction of Square Root Low-cut Point | H'00000000 to H'000003E8 (0.0 to 100.0) | Adjustment | |
| 0900 | 2900 | SP 0 | SP lower limit to SP upper limit | | |
| 0904 | 2902 | Alarm Value 1 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | Operation | |
| 0906 | 2903 | Alarm Value Upper Limit 1 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 0908 | 2904 | Alarm Value Lower Limit 1 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 090A | 2905 | Alarm Value 2 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 090C | 2906 | Alarm Value Upper Limit 2 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 090E | 2907 | Alarm Value Lower Limit 2 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 0910 | 2908 | Alarm Value 3 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 0912 | 2909 | Alarm Value Upper Limit 3 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 0914 | 290A | Alarm Value Lower Limit 3 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 0916 | 290B | Alarm Value 4 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 0918 | 290C | Alarm Value Upper Limit 4 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 091A | 290D | Alarm Value Lower Limit 4 | H'FFFFFF831 to H'0000270F (-1999 to 9999) | | |
| 091C | 290E | SP 1 | SP lower limit to SP upper limit | | Adjustment |
| 0938 | 291C | SP 2 | SP lower limit to SP upper limit | | |
| 0954 | 292A | SP 3 | SP lower limit to SP upper limit | | |
| 0970 | 2938 | SP 4 | SP lower limit to SP upper limit | | |
| 098C | 2946 | SP 5 | SP lower limit to SP upper limit | | |
| 09A8 | 2954 | SP 6 | SP lower limit to SP upper limit | | |
| 09C4 | 2962 | SP 7 | SP lower limit to SP upper limit | | |
| 0A00 | 2A00 | Proportional Band | H'00000001 to H'0000270F (0.1 to 999.9) | | |
| 0A02 | 2A01 | Integral Time | H'00000001 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | | |
| 0A04 | 2A02 | Derivative Time | H'00000000 to H'0000270F (0 to 9999: Integral/derivative time unit is 1 s.) (0.0 to 999.9: Integral/derivative time unit is 0.1 s.) | | |
| 0A0A | 2A05 | MV Upper Limit | Standard control: MV lower limit + 0.1 to H'0000041A (MV lower limit + 0.1 to 105.0) Heating and cooling control: H'00000000 to H'0000041A (0.0 to 105.0) | | |
| 0A0C | 2A06 | MV Lower Limit | Standard control: H'FFFFFFCE to MV upper limit - 0.1 (-5.0 to MV upper limit - 0.1) Heating and cooling control: H'FFFFFFBE6 to H'00000000 (-105.0 to 0.0) | | |

Note: The alarm function can also be used in Digital Controllers without auxiliary output terminals. In this case, confirm alarm occurrences via the status data.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-----------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0C00 | 2C00 | Input Type | H'00000000 (0): Pt (-200 to 850°C/-300 to 1500°F) H'00000001 (1): Pt (-199.9 to 500.0°C/-199.9 to 900.0°F) H'00000002 (2): Pt (0.0 to 100.0°C/0.0 to 210.0°F) H'00000003 (3): JPt (-199.9 to 500.0°C/-199.9 to 900.0°F) H'00000004 (4): JPt (0.0 to 100.0°C/0.0 to 210.0°F) H'00000005 (5): K (-200 to 1300°C/-300 to 2300°F) H'00000006 (6): K (-20.0 to 500.0°C/0.0 to 900.0°F) H'00000007 (7): J (-100 to 850°C/-100 to 1500°F) H'00000008 (8): J (-20.0 to 400.0°C/0.0 to 750.0°F) H'00000009 (9): T (-200 to 400°C/-300 to 700°F) H'0000000A (10): T (-199.9 to 400.0°C/-199.9 to 700.0°F) H'0000000B (11): E (-200 to 600°C/-300 to 1100°F) H'0000000C (12): L (-100 to 850°C/-100 to 1500°F) H'0000000D (13): U (-200 to 400°C/-300 to 700°F) H'0000000E (14): U (-199.9 to 400.0°C/-199.9 to 700.0°F) H'0000000F (15): N (-200 to 1300°C/-300 to 2300°F) H'00000010 (16): R (0 to 1700°C/0 to 3000°F) H'00000011 (17): S (0 to 1700°C/0 to 3000°F) H'00000012 (18): B (100 to 1800°C/300 to 3200°F) H'00000013 (19): W (0 to 2,300°C/0 to 3,200°F) H'00000014 (20): PLII (0 to 1,300°C/0 to 2,300°F) H'00000015 (21): Infrared temperature sensor (K 140°F/60°C) H'00000016 (22): Infrared temperature sensor (K 240°F/120°C) H'00000017 (23): Infrared temperature sensor (K 280°F/140°C) H'00000018 (24): Infrared temperature sensor (K 440°F/220°C) H'00000019 (25): 4 to 20 mA H'0000001A (26): 0 to 20 mA H'0000001B (27): 1 to 5 V H'0000001C (28): 0 to 5 V H'0000001D (29): 0 to 10 V | Initial setting |
| 0C02 | 2C01 | Temperature Unit | H'00000000 (0): °C H'00000001 (1): °F | |
| 0C12 | 2C09 | Scaling Lower Limit | H'FFFFFF831 to scaling upper limit -1 (-1999 to scaling upper limit -1) | |
| 0C16 | 2C0B | Scaling Upper Limit | Scaling lower limit + 1 to H'0000270F (Scaling lower limit + 1 to 9999) | |
| 0C18 | 2C0C | Decimal Point | H'00000000 to 00000003 (0 to 3) | |
| 0C1A | 2C0D | Remote SP Upper limit | Input range lower limit to Input range upper limit for temperature input Scaling lower limit to Scaling upper limit for analog input | Advanced function setting |
| 0C1C | 2C0E | Remote SP Lower limit | Input range lower limit to Input range upper limit for temperature input Scaling lower limit to Scaling upper limit for analog input | |
| 0C1E | 2C0F | PV Decimal Point Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| 0D06 | 2D03 | Control Output 1 Signal | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA | Initial setting |
| 0D08 | 2D04 | Control Output 2 Signal | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA | |
| 0D1E | 2D0F | SP Upper Limit | The range of values (without decimal point) is as follows: Temperature input: SP lower limit + 1 to Input range upper limit Analog input: SP lower limit + 1 to Scaling upper limit | |
| 0D20 | 2D10 | SP Lower Limit | The range of values (without decimal point) is as follows: Temperature input: Input range lower limit to SP upper limit - 1 Analog input: Scaling lower limit to SP upper limit - 1 | |
| 0D22 | 2D11 | Standard or Heating/Cooling | H'00000000 (0): Standard H'00000001 (1): Heating and cooling | |

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-----------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0D24 | 2D12 | Direct/Reverse Operation | H'00000000 (0): Reverse operation H'00000001 (1): Direct operation | Initial setting |
| 0D28 | 2D14 | PID ON/OFF | H'00000000 (0): ON/OFF H'00000001 (1): 2 PID control | |
| 0D2A | 2D15 | ST | H'00000000 (0): OFF H'00000001 (1): ON | |
| 0D2C | 2D16 | Program Pattern | H'00000000 (0): OFF H'00000001 (1): STOP H'00000002 (2): CONT | |
| 0D30 | 2D18 | Remote SP Input | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA H'00000002 (2): 1 to 5 V H'00000003 (3): 0 to 5 V H'00000004 (4): 0 to 10 V | Advanced function setting |
| 0D32 | 2D19 | Minimum Output ON/OFF Band | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| 0E00 | 2E00 | Transfer Output Type | H'00000000 (0): OFF H'00000001 (1): Set point H'00000002 (2): Set point during SP ramp H'00000003 (3): PV H'00000004 (4): MV (heating) H'00000005 (5): MV (cooling) | Initial setting |
| 0E02 | 2E01 | Transfer Output Signal | H'00000000 (0): 4 to 20 mA H'00000001 (1): 1 to 5 V | |
| 0E0C | 2E06 | Control Output 1 Assignment | Control output 1 is a relay output or voltage output (for driving SSR): H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 4 H'00000007 (7): Heater alarm H'00000008 (8): HB alarm H'00000009 (9): HS alarm H'0000000A (10): Input error H'0000000B (11): RSP input error H'0000000C (12): Program end output* H'0000000D (13): RUN output H'0000000E (14): Integrated alarm H'0000000F (15): Work bit 1 H'00000010 (16): Work bit 2 H'00000011 (17): Work bit 3 H'00000012 (18): Work bit 4 H'00000013 (19): Work bit 5 H'00000014 (20): Work bit 6 H'00000015 (21): Work bit 7 H'00000016 (22): Work bit 8 When control output 1 is a current output: H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) | Advanced function setting |
| 0E0E | 2E07 | Control Output 2 Assignment | Control output 2 is a relay output or voltage output (for driving SSR): H'00000000 to H'00000006 (0 to 22) Note: Same as for the Control Output 1 Assignment parameter. When control output 2 is a current output: H'00000000 to H'00000002 (0 to 2) Note: Same as for the Control Output 1 Assignment parameter. | |

* P.END (program end output) can be set even when the program pattern is set to OFF, but the function will be disabled.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-------------------------------|--|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0E14 | 2E0A | Event Input Assignment 1 | H'00000000 (0): None H'00000001 (1): RUN/STOP H'00000002 (2): Auto/Manual Switch H'00000003 (3): Program Start* ¹ H'00000004 (4): Direct/Reverse Operation H'00000005 (5): SP Mode Switch Note: Valid only with a remote SP input. H'00000006 (6): 100% AT Execute/Cancel H'00000007 (7): 40% AT Execute/Cancel H'00000008 (8): Setting Change Enable/Disable H'00000009 (9): Communications Writing Enable/Disable Note: Valid only with external communications. H'0000000A (10): Alarm Latch Cancel H'0000000B (11): Multi-SP No. Switch, Bit 0 H'0000000C (12): Multi-SP No. Switch, Bit 1 H'0000000D (13): Multi-SP No. Switch, Bit 2 | Initial setting |
| 0E16 | 2E0B | Event Input Assignment 2 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| 0E18 | 2E0C | Event Input Assignment 3 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| 0E1A | 2E0D | Event Input Assignment 4 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| 0E1C | 2E0E | Event Input Assignment 5 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| 0E1E | 2E0F | Event Input Assignment 6 | H'00000000 to H'0000000D (0 to 13) Note: Same as for Event Input Assignment 1. | |
| 0E20 | 2E10 | Auxiliary Output 1 Assignment | H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 4 H'00000007 (7): Heater alarm H'00000008 (8): HB alarm H'00000009 (9): HS alarm H'0000000A (10): Input error H'0000000B (11): RSP input error H'0000000C (12): Program end output H'0000000D (13): RUN output H'0000000E (14): Integrated alarm H'0000000F (15): Work bit 1 H'00000010 (16): Work bit 2 H'00000011 (17): Work bit 3 H'00000012 (18): Work bit 4 H'00000013 (19): Work bit 5 H'00000014 (20): Work bit 6 H'00000015 (21): Work bit 7 H'00000016 (22): Work bit 8 | Advanced function setting |
| 0E22 | 2E11 | Auxiliary Output 2 Assignment | H'00000000 to H'00000016 (0 to 22) Note: Same as for the Auxiliary Output 1 Assignment parameter. | |
| 0E24 | 2E12 | Auxiliary Output 3 Assignment | H'00000000 to H'00000016 (0 to 22) Note: Same as for the Auxiliary Output 1 Assignment parameter. | |
| 0E26 | 2E13 | Auxiliary Output 4 Assignment | H'00000000 to H'00000016 (0 to 22) Note: Same as for the Auxiliary Output 1 Assignment parameter. | |
| 0E28 | 2E14 | Transfer Output Upper Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) * ² | Initial setting |
| 0E2A | 2E15 | Transfer Output Lower Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) * ² | |

*1 PRST (program start) can be set even when the program pattern is set to OFF, but the function will be disabled.

*2 The setting (monitor) range depends on the transfer output type setting. Refer to *Section 6 Parameters* in the *E5CC/E5EC Digital Temperature Controller User's Manual* (Cat. No. H174).

*3 P.END (program end output) can be set even when the program pattern is set to OFF, but the function will be disabled.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|----------------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0E48 | 2E24 | Extraction of Square Root Enable | H'00000000 (0): OFF H'00000001 (1): ON | Initial setting |
| 0F00 | 2F00 | Alarm 1 Type | H'00000000 (0): Alarm function OFF H'00000001 (1): Upper and lower-limit alarm H'00000002 (2): Upper-limit alarm H'00000003 (3): Lower-limit alarm H'00000004 (4): Upper and lower-limit range alarm H'00000005 (5): Upper and lower-limit alarm with standby sequence H'00000006 (6): Upper-limit alarm with standby sequence H'00000007 (7): Lower-limit alarm with standby sequence H'00000008 (8): Absolute-value upper-limit alarm H'00000009 (9): Absolute-value lower-limit alarm H'0000000A (10): Absolute-value upper-limit alarm with standby sequence H'0000000B (11): Absolute-value lower-limit alarm with standby sequence H'0000000C (12): LBA (Loop Burnout Alarm) H'0000000D (13): PV change rate alarm H'0000000E (14): SP absolute-value upper-limit alarm H'0000000F (15): SP absolute-value lower-limit alarm H'00000010 (16): MV absolute-value upper-limit alarm H'00000011 (17): MV absolute-value lower-limit alarm H'00000012 (18): RSP absolute-value upper-limit alarm * H'00000013 (19): RSP absolute-value lower-limit alarm * * Valid only with a remote SP input. | Initial setting |
| 0F02 | 2F01 | Alarm 1 Latch | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F04 | 2F02 | Alarm 1 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| 0F06 | 2F03 | Alarm 2 Type | H'00000000 to H'00000013 (0 to 19) Note: Same settings as the Alarm 1 Type. However, the LBA (loop burnout alarm) cannot be set. | Initial setting |
| 0F08 | 2F04 | Alarm 2 Latch | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F0A | 2F05 | Alarm 2 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| 0F0C | 2F06 | Alarm 3 Type | H'00000000 to H'00000013 (0 to 19) Note: Same settings as the Alarm 1 Type. However, the LBA (loop burnout alarm) cannot be set. | Initial setting |
| 0F0E | 2F07 | Alarm 3 Latch | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F10 | 2F08 | Alarm 3 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| 0F12 | 2F09 | Alarm 4 Type | H'00000000 to H'00000013 (0 to 19) Note: Same settings as the Alarm 1 Type. However, the LBA (loop burnout alarm) cannot be set. | Initial setting |
| 0F14 | 2F0A | Alarm 4 Latch | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F16 | 2F0B | Alarm 4 Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | Initial setting |
| 0F18 | 2F0C | Standby Sequence Reset | H'00000000 (0): Condition A H'00000001 (1): Condition B | Advanced function setting |
| 0F1A | 2F0D | Auxiliary Output 1 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | Advanced function setting |

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|----------------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0F1C | 2F0E | Auxiliary Output 2 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | Advanced function setting |
| 0F1E | 2F0F | Auxiliary Output 3 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | |
| 0F20 | 2F10 | Auxiliary Output 4 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | |
| 0F22 | 2F11 | Alarm 1 ON delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F24 | 2F12 | Alarm 2 ON delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F26 | 2F13 | Alarm 3 ON delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F28 | 2F14 | Alarm 4 ON delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F2A | 2F15 | Alarm 1 OFF delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F2C | 2F16 | Alarm 2 OFF delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F2E | 2F17 | Alarm 3 OFF delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F30 | 2F18 | Alarm 4 OFF delay | H'00000000 to H'000003E7 (0 to 999) | |
| 1000 | 3000 | PV/SP No. 1 Display Selection | H'00000000 (0):Nothing displayed. H'00000001 (1):PV/SP H'00000002 (2):PV H'00000003 (3):PV/SP (character display) H'00000004 (4):PV/SP/MV H'00000005 (5):PV/SP/Multi-SP No. H'00000006 (6):PV/SP/Soak time remain H'00000007 (7):PV/SP/Ramp SP H'00000008 (8):PV/SP/Alarm value 1 | |
| 1002 | 3001 | MV Display Selection | H'00000000 (0): MV (heating) H'00000001 (1): MV (cooling) | |
| 1006 | 3003 | Automatic Display Return Time | H'00000000 (0): OFF H'00000001 to H'00000063 (1 to 99) | |
| 1008 | 3004 | Display Refresh Period | H'00000000 (0):OFF H'00000001 (1): 0.25 H'00000002 (2): 0.5 H'00000003 (3): 1.0 | |
| 1010 | 3008 | PV/SP No. 2 Display Selection | H'00000000 to H'00000008 (0 to 8) Note: Same as PV/SP No. 1 Display Selection. | |
| 1014 | 300A | Display Brightness | H'00000001 to H'00000003 (1 to 3) | |
| 1016 | 300B | MV Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1018 | 300C | Move to Protect Level Time | H'00000001 to H'0000001E (1 to 30) | |
| 101E | 300F | Auto/Manual Select Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1022 | 3011 | PV Status Display Function | H'00000000 (0): OFF H'00000001 (1): Manual H'00000002 (2): Stop H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 4 H'00000007 (7): Alarm 1 to 4 OR status H'00000008 (8): Heater alarm | |
| 1024 | 3012 | SV Status Display Function | H'00000000 to H'00000008 (0 to 8) Note: Same as for PV Status Display Function. | |

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|------------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 1100 | 3100 | Protocol Setting (See note.) | H'00000000 (0): CompoWay/F H'00000001 (1): Modbus | Communications setting |
| 1102 | 3101 | Communications Unit No. * | H'00000000 to H'00000063 (0 to 99) | |
| 1104 | 3102 | Communications Baud Rate * | H'00000003 (3): 9.6 H'00000004 (4): 19.2 H'00000005 (5): 38.4 H'00000006 (6): 57.6 | |
| 1106 | 3103 | Communications Data Length * | H'00000007 (7): 7 H'00000008 (8): 8 | |
| 1108 | 3104 | Communications Stop Bits * | H'00000001 (1): 1 H'00000002 (2): 2 | |
| 110A | 3105 | Communications Parity * | H'00000000 (0): None H'00000001 (1): Even H'00000002 (2): Odd | |
| 110C | 3106 | Send Data Wait Time * | H'00000000 to H'00000063 (0 to 99) | |
| 1200 | 3200 | PF Setting | H'00000000 (0): Disabled H'00000001 (1): Run H'00000002 (2): Stop H'00000003 (3): RUN/STOP H'00000004 (4): 100% AT execute/cancel H'00000005 (5): 40% AT execute/cancel H'00000006 (6): Alarm latch cancel H'00000007 (7): Auto/manual switch H'00000008 (8): Monitor/setting item H'00000009 (9): Digit shift key | Advanced function setting |
| 1204 | 3202 | Monitor/Setting Item 1 | H'00000000 (0): Disabled H'00000001 (1): PV/SP/multi-SP H'00000002 (2): PV/SP/MV H'00000003 (3): PV/SP/soak time remain H'00000004 (4): Proportional band H'00000005 (5): Integral time H'00000006 (6): Derivative time H'00000007 (7): Alarm value 1 H'00000008 (8): Alarm value upper limit 1 H'00000009 (9): Alarm value lower limit 1 H'0000000A (10): Alarm value 2 H'0000000B (11): Alarm value upper limit 2 H'0000000C (12): Alarm value lower limit 2 H'0000000D (13): Alarm value 3 H'0000000E (14): Alarm value upper limit 3 H'0000000F (15): Alarm value lower limit 3 H'00000010 (16): Alarm value 4 H'00000011 (17): Alarm value upper limit 4 H'00000012 (18): Alarm value lower limit 4 H'00000013 (19): PV/SP/Internal set point H'00000014 (20): PV/SP/Alarm value 1 H'00000015 (21): Proportional band (cooling) H'00000016 (22): Integral time (cooling) H'00000017 (23): Derivative time (cooling) | |
| 1206 | 3203 | Monitor/Setting Item 2 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |
| 1208 | 3204 | Monitor/Setting Item 3 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |
| 120A | 3205 | Monitor/Setting Item 4 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |
| 120C | 3206 | Monitor/Setting Item 5 | H'00000000 to H'00000017 (0 to 23) Note: Same as for Monitor/Setting Item 1. | |

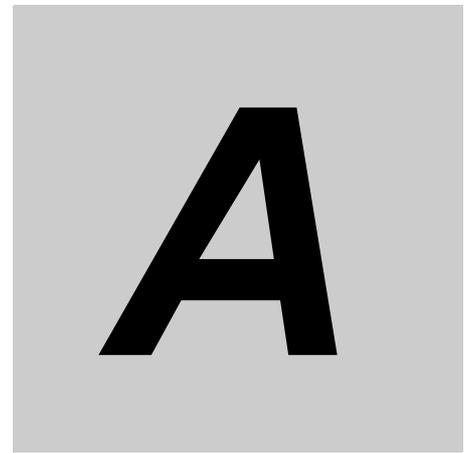
* After communications parameters have been changed, reset the Digital Controller to enable them.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|--------------------------------------|--|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 1302 | 3301 | SP Tracking | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 130A | 3305 | Cold Junction Compensation Method | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1312 | 3309 | Integral/Derivative Time Unit | H'00000000 (0): 1 s H'00000001 (1): 0.1 s | |
| 1314 | 330A | α | H'00000000 to H'00000064 (0.00 to 1.00) | |
| 1318 | 330C | Manual Output Method | H'00000000 (0): HOLD H'00000001 (1): INIT | |
| 131A | 330D | Manual MV Initial Value | Standard control: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling control: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) | |
| 131E | 330F | AT Calculated Gain | H'00000001 to H'00000064 (0.1 to 10.0) | |
| 1320 | 3310 | AT Hysteresis | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) H'00000001 to H'000003E7 (0.01 to 9.99 for analog input) | |
| 1322 | 3311 | Limit Cycle MV Amplitude | H'00000032 to H'000001F4 (5.0 to 50.0) | |
| 1328 | 3314 | Heater Burnout Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| 132A | 3315 | Heater Burnout Hysteresis | H'00000001 to H'000001F4 (0.1 to 50.0) | |
| 132C | 3316 | HS Alarm Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| 132E | 3317 | HS Alarm Hysteresis | H'00000001 to H'000001F4 (0.1 to 50.0) | |
| 1336 | 331B | Number of Multi-SP Points | H'00000001 (1): OFF H'00000002 to H'00000008 (1 to 8) | |
| 1338 | 331C | HB ON/OFF | H'00000000 (0): OFF H'00000001 (1): ON | |
| 133C | 331E | Integrated Alarm Assignment | H'00000000 to H'000000FF (0 to 255) | |
| 1340 | 3320 | MV at Stop and Error Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1342 | 3321 | ST Stable Range | H'00000001 to H'0000270F (0.1 to 999.9) | |
| 1344 | 3322 | RT | H'00000000 (0): OFF H'00000001 (1): ON Note: Valid only with temperature input. | |
| 1346 | 3323 | HS Alarm Use | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1348 | 3324 | LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 134A | 3325 | LBA Level | H'00000001 to H'0000270F (0.1 to 999.9 for temperature input) (0.01 to 99.99 for analog input) | |
| 134C | 3326 | LBA Band | H'00000000 to H'0000270F (0.0 to 999.9 for temperature input) (0.00 to 99.99 for analog input) | |
| 134E | 3327 | Soak Time Unit | H'00000000 (0): Minutes H'00000001 (1): Hours | |
| 1350 | 3328 | Alarm SP Selection | H'00000000 (0): Set point during SP ramp H'00000001 (1): Set point | |
| 1352 | 3329 | Remote SP Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1356 | 332B | Manual MV Limit Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| 135A | 332D | PV Rate of Change Calculation Period | H'00000001 to H'000003E7 (1 to 999) | |
| 135C | 332E | Heating/Cooling Tuning Method | H'00000000 (0): Same as heating control. H'00000001 (1): Linear H'00000002 (2): Air cooling H'00000003 (3): Water cooling | |

* The logic of the Modbus Write Variable operation command is not affected.

5-2 Status

The status data for Modbus is the same as that for CompoWay/F. Refer to page 4-11.



Appendices

| | |
|---------------------------|-----|
| A-1 ASCII List | A-2 |
| A-2 Troubleshooting | A-3 |

A

A-1 ASCII List

| | | | | | | | | |
|----|---|---|---|---|---|---|---|---|
| b8 | | | | | | | | |
| b7 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| b6 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| b5 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

| | | | | | | | |
|------------------|----|----|----|----|----|----|----|
| b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 |
| ↑ Even parity | | | | 0 | 0 | 0 | 0 |
| | | | | 0 | 0 | 0 | 1 |
| | | | | 0 | 0 | 1 | 0 |
| | | | | 0 | 0 | 1 | 1 |
| | | | | 0 | 1 | 0 | 0 |
| | | | | 0 | 1 | 0 | 1 |
| | | | | 0 | 1 | 1 | 0 |
| | | | | 0 | 1 | 1 | 1 |
| | | | | 1 | 0 | 0 | 0 |
| | | | | 1 | 0 | 0 | 1 |
| | | | | 1 | 0 | 1 | 0 |
| | | | | 1 | 0 | 1 | 1 |
| | | | | 1 | 1 | 0 | 0 |
| | | | | 1 | 1 | 0 | 1 |
| | | | | 1 | 1 | 1 | 0 |
| | | | | 1 | 1 | 1 | 1 |

| | | | | | | | | | |
|---|-----|-----|-------|---|---|---|---|-----|---|
| | C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| R | | | | | | | | | |
| 0 | NUL | DLE | SPACE | 0 | @ | P | ' | p | |
| 1 | SOH | DC1 | ! | 1 | A | Q | a | q | |
| 2 | STX | DC2 | " | 2 | B | R | b | r | |
| 3 | ETX | DC3 | # | 3 | C | S | c | s | |
| 4 | EOT | DC4 | \$ | 4 | D | T | d | t | |
| 5 | ENQ | NAK | % | 5 | E | U | e | u | |
| 6 | ACK | SYN | & | 6 | F | V | f | v | |
| 7 | BEL | ETB | ' | 7 | G | W | g | w | |
| 8 | BS | CAN | (| 8 | H | X | h | x | |
| 9 | HT | EM |) | 9 | I | Y | i | y | |
| A | LF | SUB | * | : | J | Z | j | z | |
| B | VT | ESC | + | ; | K | [| k | { | |
| C | FF | FS | , | < | L | \ | l | | |
| D | CR | GS | - | = | M |] | m | } | |
| E | S0 | RS | . | > | N | ^ | n | ~ | |
| F | SI | US | / | ? | O | _ | o | DEL | |

A-2 Troubleshooting

Before Requesting Repairs

If communications are not functioning properly, check the items in the following table before requesting repairs. If normal operation cannot be restored even after checking everything, return the product to your OMRON representative.

Problem: Communications are not possible or communications errors occur.

| Item | Confirmation | Page |
|---|---|------------|
| The communications wiring is not correct. | Correct the wiring. | 1-4 |
| The communications line has become disconnected. | Connect the communications line securely and tighten the screws. | --- |
| The communications cable is broken. | Replace the cable. | --- |
| The communications cable is too long. | The total cable length is 500 m maximum for RS-485 communications. | 1-4 |
| The wrong communications cable has been used. | Use a shielded, AWG24 to AWG18 (cross-sectional area of 0.205 to 0.823 mm ²) twisted-pair cable for the communications cable. | 1-4 |
| Too many communications devices are connected to the communications path. | When 1:N, RS-485 communications are used, a maximum of 32 nodes may be connected, including the host node. | 1-4 |
| An end node has not been set at each end of the communications line. | Set or connect terminating resistance at each end of the line. If the E5CC/E5EC is the end node, 120-Ω (1/2-W) terminating resistance is used. Be sure that the combined resistance with the host device is 54 Ω minimum. | 1-4 |
| The specified power supply voltage is not being supplied to the Controller. | Supply the specified power supply voltage. | --- |
| The specified power supply voltage is not being supplied to an Interface Converter (e.g., the K3SC). | Supply the specified power supply voltage. | --- |
| The same baud rate and communications method are not being used by all of the Controllers, host devices, and other nodes on the same communications line. | Set the same values for the following on all nodes: baud rate, protocol, data length, stop bits, and parity. | 1-2 |
| The unit number specified in the command frame is different from the unit number set for the Controller. | Use the same unit number. | 2-2 4-2 |
| The same unit number as the Controller is being used for another node on the same communications line. | Set each unit number for only one node. | 1-4 |
| There is a mistake in programming in the host device. | Use a line monitor to check the commands. | --- |
| The host device is detecting the absence of a response as an error before it receives the response from the Controller. | Shorten the send data wait time in the Controller or increase the response wait time in the host device. | 1-5 |

| Item | Confirmation | Page |
|---|---|----------------------------|
| The host device is detecting the absence of a response as an error after broadcasting a command or sending a software reset command. | The Controller does not return responses for broadcast or software reset commands. | 2-2 2-17 4-2 4-14 |
| The host device sent another command before receiving a response from the Controller. | Always read the response after sending a command (except for broadcast or software reset commands). | --- |
| The host device sent the next command too soon after receiving a response from the Controller. | Wait for at least 2 ms after receiving a response before sending the next command. | 1-2 |
| The communications line became unstable when the Controller's power was turned ON or interrupted, and the host device read the unstable status as data. | Initialize the reception buffer in the host device before sending the first command and after turning OFF the power to the Controller. | --- |
| The communications data was corrupted by noise from the environment. | Try using a slower baud rate. Separate the communications cable from the source of noise. Use a shielded, twisted-pair cable for the communications cable. Use as short a communications cable as possible and do not lay or loop extra cable. Do not run the communications cable parallel to a power line to prevent inductive noise. If noise countermeasures are difficult to implement, use an Optical Interface. | --- |



Index



Index

| | |
|---|---------------|
| A | |
| <hr/> | |
| addresses | |
| CompoWay/F | 2-7 |
| Modbus | 4-7 |
| area definitions | 2-6 |
| ASCII list | A-2 |
| B | |
| <hr/> | |
| BCC | 2-2, 2-3 |
| C | |
| <hr/> | |
| command frame | |
| CompoWay/F | 2-2 |
| Modbus | 4-2 |
| command text | 2-2 |
| communications baud rate | 1-5, 1-7 |
| communications data | |
| CompoWay/F | 2-4, 3-1 |
| Modbus | 5-1 |
| communications data length | 1-5, 1-7 |
| communications parameter setup | 1-6 |
| communications parameters | 1-5 |
| communications parity | 1-5, 1-7 |
| communications protocol | 1-5, 1-7 |
| communications specifications | 1-2 |
| communications stop bits | 1-5, 1-7 |
| communications unit number | 1-5, 1-7 |
| Composite Read from Variable Area (CompoWay/F) | 2-7, 2-10 |
| Composite Write to Variable Area (CompoWay/F) | 2-7, 2-12 |
| CompoWay/F | 1-2, 2-1, 3-1 |
| CRC-16 | 4-2, 4-3 |
| D | |
| <hr/> | |
| data | 4-2 |
| data format | |
| CompoWay/F | 2-2 |
| Modbus | 4-2 |
| description of communications parameters | 1-7 |
| double-word data | 3-2 |
| E | |
| <hr/> | |
| Echoback Test | |
| CompoWay/F | 2-7, 2-15 |
| Modbus | 4-6, 4-15 |
| end codes | |
| CompoWay/F | 2-3, 2-4 |
| error codes | |
| Modbus | 4-5 |
| ETX | 2-2 |
| F | |
| <hr/> | |
| FINS | 1-2 |
| Four-byte Mode | 4-7, 5-2 |
| function code | 4-2 |
| functions (Modbus) | |
| detailed description | 4-8 |
| list | 4-6 |
| I | |
| <hr/> | |
| interface | 1-3 |
| M | |
| <hr/> | |
| Modbus | 1-2, 4-1, 5-1 |
| N | |
| <hr/> | |
| no response | 4-5 |
| node number | 2-2 |
| number of elements | |
| CompoWay/F | 2-7 |
| Modbus | 4-7 |
| O | |
| <hr/> | |
| operation command | |
| CompoWay/F | 2-7 |
| Modbus | 4-12 |
| P | |
| <hr/> | |
| PDU structure | 2-6 |
| protocol setting | 1-7 |
| R | |
| <hr/> | |
| Read Controller Attributes (CompoWay/F) | 2-7, 2-13 |
| Read Controller Status (CompoWay/F) | 2-7, 2-14 |
| Read Variable Area (CompoWay/F) | 2-7, 2-8 |
| response code list (CompoWay/F) | 2-21 |
| response frame | |
| CompoWay/F | 2-3 |
| Modbus | 4-4 |
| RS-485 | 1-4 |
| S | |
| <hr/> | |
| send data wait time | 1-5, 1-7 |
| services (CompoWay/F) | |

| | |
|-----------------------------|------|
| detailed description | 2-8 |
| list | 2-7 |
| set values (Modbus) | 4-7 |
| SID | 2-2 |
| single-word data | 3-2 |
| slave address | 4-2 |
| Status | |
| CompoWay/F | 3-18 |
| Modbus | 5-13 |
| Status 2 (CompoWay/F) | 3-18 |
| STX | 2-2 |
| sub-address | 2-2 |

T

| | |
|---------------------------------|----------|
| transmission procedure | 1-3 |
| troubleshooting | A-3 |
| Two-byte Mode | 4-7, 5-2 |
| type code (variable type) | 2-6 |

V

| | |
|--|------|
| variable area | 4-7 |
| variable area (setting range) list | |
| CompoWay/F | 3-2 |
| Modbus | 5-2 |
| Variable Read, Multiple (Modbus) | 4-8 |
| variable type | 2-6 |
| Variable Write, Multiple (Modbus) | 4-10 |
| Variable Write, Single/Operation Command (Modbus) | 4-12 |

W

| | |
|--|----------|
| wiring | 1-4 |
| Write Variable Area (CompoWay/F) | 2-7, 2-9 |

OMRON Corporation Industrial Automation Company

Tokyo, JAPAN

Contact: www.ia.omron.com

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69-2132 JD Hoofddorp
The Netherlands

Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC

One Commerce Drive Schaumburg,
IL 60173-5302 U.S.A.

Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967

Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China

Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Authorized Distributor:

© OMRON Corporation 2011 All Rights Reserved.
In the interest of product improvement,
specifications are subject to change without notice.

Cat. No. H175-E1-01

1211