

E5CN-HT
E5AN-HT
E5EN-HT

Digital Controllers

Communications Manual Programmable Type

Preface

The E5CN/AN/EN-HT support serial communications.

This Communications Manual describes the communications functions of the E5CN/AN/EN-HT. Before using your E5CN/AN/EN-HT, thoroughly read and understand this manual in order to ensure correct use. Also, store this manual in a safe place so that it can be retrieved whenever necessary.

For information on the E5CN/AN/EN-H Advanced Type Digital Controllers, refer to the *E5CN-H/E5AN-H/E5EN-H Digital Controllers Advanced Type Communications Manual* (Cat. No. H159).

For information on the E5CN/AN/EN/GN Basic Type Digital Controllers, refer to the *E5CN/E5AN/E5EN/E5GN Digital Controllers Basic Type Communications Manual* (Cat. No. H158).

A PDF version of these manuals can be downloaded from the OMRON website.

<http://www.ia.omron.com>

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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, Limitations of Liability

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- 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.

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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, is likely to result in minor or moderate injury or in property damage.

■ Symbols

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

■ Safety Precautions

|  CAUTION | |
|--|---|
| Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock. |  |
| Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction. |  |
| Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur. | |
| Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur. | |
| <p>CAUTION - Risk of Fire and Electric Shock</p> <p>a) This product is UL listed as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.</p> <p>b) When using more than one shutoff switch, always turn OFF all the shutoff switches to ensure that no power is being supplied before servicing the product.</p> <p>c) Signal inputs are SELV, limited energy. (See note 1.)</p> <p>d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. (See note 2.)</p> |  |
| If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions. | |

Note 1: An SELV circuit is one separated from the power supply with double insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC.

Note 2: A class 2 power supply is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.

 **CAUTION**

Tighten the terminal screws to between 0.74 and 0.90 N·m. Loose screws may occasionally result in fire.

Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents.

A malfunction in the Digital Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Digital Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.

When inserting the body of the Digital Controller into the case, confirm that the hooks on the top and bottom are securely engaged with the case. If the body of the Digital Controller is not inserted properly, faulty contact in the terminal section or reduced water resistance may occasionally result in fire or malfunction.

When connecting the Control Output Unit to the socket, press it in until there is no gap between the Control Output Unit and the socket. Otherwise contact faults in the connector pins may occasionally result in fire or malfunction.



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. Do not handle the Controller in ways that exceed product specifications.

- 1) The product is designed for indoor use only. Do not use the product outdoors or in any of the following locations.
 - Places directly subject to heat radiated from heating equipment.
 - Places subject to splashing liquid or oil atmosphere.
 - Places subject to direct sunlight.
 - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
 - Places subject to intense temperature change.
 - Places subject to icing and condensation.
 - Places subject to vibration and large shocks.
- 2) Use and 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.
- 3) To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
- 4) Be sure to wire properly with correct polarity of terminals.
- 5) Use specified size (M3.5, width 7.2 mm or less) crimped terminals for wiring. To connect bare wires, use stranded or solid copper wires with a gage of AWG24 to AWG14 (equal to cross-sectional areas of 0.205 to 2.081 mm²). (The stripping length is 5 to 6 mm.) Up to two wires of same size and type, or two crimp terminals can be inserted into a single terminal.
- 6) Do not wire the terminals which are not used.
- 7) To avoid inductive noise, keep the wiring for the Digital Controller's terminal block away from power cables 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 is recommended.

Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component).

When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the Digital controller.

Allow as much space as possible between the Digital Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
- 8) Use this product within the rated load and power supply.
- 9) Make sure that the rated voltage is attained within two 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.
- 10) 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.
- 11) A switch or circuit breaker should be provided close to this unit. The switch or circuit breaker should be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
- 12) Always turn OFF the power supply before pulling out the interior of the product, and never touch nor apply shock to the terminals or electronic components. When inserting the interior of the product, do not allow the electronic components to touch the case.

- 13) Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
- 14) Design system (control panel, etc) considering the 2 second of delay that the controller's output to be set after power ON.
- 15) The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
- 16) The number of nonvolatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data during communications or other operations.
- 17) Always touch a grounded piece of metal before touching the Digital Controller to discharge static electricity from your body.
- 18) Do not remove the terminal block. Doing so may result in failure or malfunction.
- 19) Control outputs that are voltage outputs are not isolated from the internal circuits. When using a grounded thermocouple, do not connect any of the control output terminals to ground. (Doing so may result in an unwanted circuit path, causing error in the measured temperature.)
- 20) When replacing the body of the Digital Controller, check the condition of the terminals. If corroded terminals are used, contact failure in the terminals may cause the temperature inside the Digital Controller to increase, possibly resulting in fire. If the terminals are corroded, replace the case as well.
- 21) Use suitable tools when taking the Digital Controller apart for disposal. Sharp parts inside the Digital Controller may cause injury.
- 22) Check the specifications of the Control Output Unit and assemble it correctly.
- 23) When mounting the Control Output Unit, read and follow all relevant information in the product catalogs and manuals.
- 24) Do not continue to use the product if the front surface peels or becomes cracked.

Conventions Used in This Manual

■ How This Manual is Organized

Descriptions in this manual are separated by the communications method.

Read the sections that are application to the system being used.

Overview

CompoWay/F

Communications Data
for CompoWay

Modbus

Communications Data
for Modbus

Appendix

Overview

CompoWay/F

Com Data for
CompoWay/F

Modbus

Com Data
for Modbus

Appendix

■ Related Manuals

This manual describes the communications functions of the E5CN/AN/EN-HT.

For details on the functions of the E5CN/AN/EN-HT, refer to *E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169)

Table of Contents

| | |
|------------------------------------|------|
| Preface | -I |
| Read and Understand this Manual | II |
| Warranty, Limitations of Liability | II |
| Application Considerations | II |
| Disclaimers | -III |
| Safety Precautions | -IV |
| Precautions for Safe Use | VII |
| Conventions Used in This Manual | -IX |

SECTION 1

Communications Methods

| | |
|--|-----|
| 1.1 Overview of Communications Methods | 1-2 |
| Introduction | 1-2 |
| Communications Specifications | 1-3 |
| Transmission Procedure | 1-3 |
| Interface | 1-4 |
| Wiring | 1-4 |
| Communications Parameters | 1-8 |

SECTION 2

CompoWay/F Communications Procedures

| | |
|--|------|
| 2.1 Data Format | 2-2 |
| Command Frame | 2-2 |
| Response Frame | 2-3 |
| Communications Data | 2-4 |
| End Code Example | 2-4 |
| 2.2 Structure of Command Text | 2-6 |
| PDU Structure | 2-6 |
| Area Definitions | 2-6 |
| Type Code (Variable Type) | 2-6 |
| Addresses | 2-7 |
| Number of Elements | 2-7 |
| List of Services | 2-7 |
| 2.3 Detailed Description of the Services | 2-9 |
| Read Variable Area | 2-9 |
| Write Variable Area | 2-10 |
| Composite Read from Variable Area | 2-12 |
| Composite Write to Variable Area | 2-13 |
| Read Controller Attributes | 2-16 |
| Read Controller Status | 2-17 |
| Echoback Test | 2-18 |
| Operation Command | 2-19 |
| 2.4 Response Code List | 2-26 |

SECTION 3

Communications Data for CompoWay/F

| | | |
|-----|--|------|
| 3.1 | Variable Area (Setting Range) List | 3-2 |
| 3.2 | Status and Status 2 | 3-20 |
| | Status Structure | 3-20 |
| | Status 2 Structure | 3-22 |
| | Status Details | 3-23 |
| | Status 2 Details | 3-24 |

SECTION 4

Modbus Communications Procedure

| | | |
|-----|--|------|
| 4.1 | Data Format | 4-2 |
| | Command Frame | 4-2 |
| | Response Frame | 4-4 |
| | Error Codes | 4-5 |
| 4.2 | Function List | 4-6 |
| 4.3 | Variable Area | 4-7 |
| 4.4 | Detailed Description of the Services | 4-9 |
| | Variable Read, Multiple | 4-9 |
| | Variable Write, Multiple | 4-11 |
| | Variable Write, Single/Operation Command | 4-14 |
| | Echoback Test | 4-21 |

SECTION 5

Communications Data for Modbus

| | | |
|-----|--|------|
| 5.1 | Variable Area (Setting Range) List | 5-2 |
| 5.2 | Status and Status 2 | 5-16 |
| | Status Structure | 5-16 |
| | Status 2 Structure | 5-18 |
| | Status Details | 5-19 |
| | Status 2 Details | 5-20 |

Appendix

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

| | |
|-------------|-----|
| Index | I-1 |
|-------------|-----|

| | |
|------------------------|-----|
| Revision History | R-1 |
|------------------------|-----|

SECTION 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 |
| | Introduction..... | 1-2 |
| | Communications Specifications..... | 1-3 |
| | Transmission Procedure..... | 1-3 |
| | Interface..... | 1-4 |
| | Wiring | 1-4 |
| | Communications Parameters | 1-8 |
| | Communications Parameter Setup | 1-8 |
| | Communications Parameters..... | 1-9 |
| | Setting Communications Writing | 1-10 |

1.1 Overview of Communications Methods

■ Introduction

The program for the communications functions are created on the host (personal computer, PLC, or other type of communications master), and the E5CN/AN/EN-HT'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 E5CN/AN/EN-HT 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).

■ Communications Specifications

| | |
|---|--|
| Transmission line connection | RS-485: Multidrop RS-232C: Point-to-point RS-422: Multidrop |
| Communications method (See note 1.) | RS-485 (2-wire, half-duplex)/RS-232C/ RS-422 (4-wire, half-duplex) |
| Synchronization method | Start-stop synchronization |
| Communications baud rate (See note 2.) | 1,200, 2,400, 4,800, 9,600 , 19,200, 38,400 or 57,600 bps |
| Communications code | ASCII (CompoWay/F) Binary (Modbus) |
| Communications data length (See notes 2 and 3.) | 7 or 8 bits |
| Communications stop bits (See note 2.) | 1 or 2 bits |
| Error detection | Vertical parity (none, even , or odd) (See note 2.) BCC (Block Check Character) with CompoWay/F communications CRC-16 (Cyclic Redundancy Check 16) with Modbus communications |
| Flow control | None |
| Interface | RS-485/RS-232C/RS-422 |
| Retry function | None |
| Communications buffer | 217 bytes |
| Send data wait time | 0 to 99 ms, default time: 20 ms |

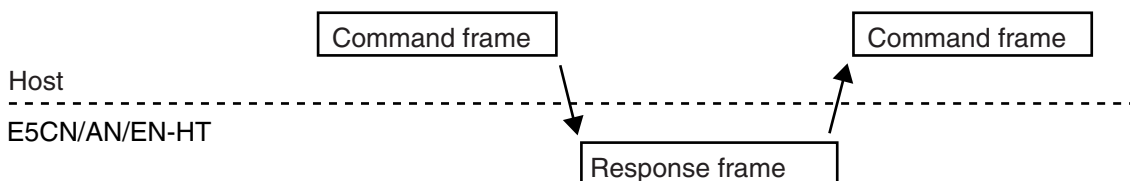
Note 1: RS-422 is supported by E5AN-HT and E5EN-HT only.

Note 2: Communications speed, data bits, stop bits and vertical parity can each be set independently in the communications setting level. Highlighted values indicate default settings.

Note 3: The communications data length for Modbus must be 8 bits.

■ Transmission Procedure

When the host transmits a command frame, the E5CN/AN/EN-HT 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.



Allow a wait time of at least 2 ms before the next command is sent after the host receives a response from the E5CN/AN/EN-HT.

■ Interface

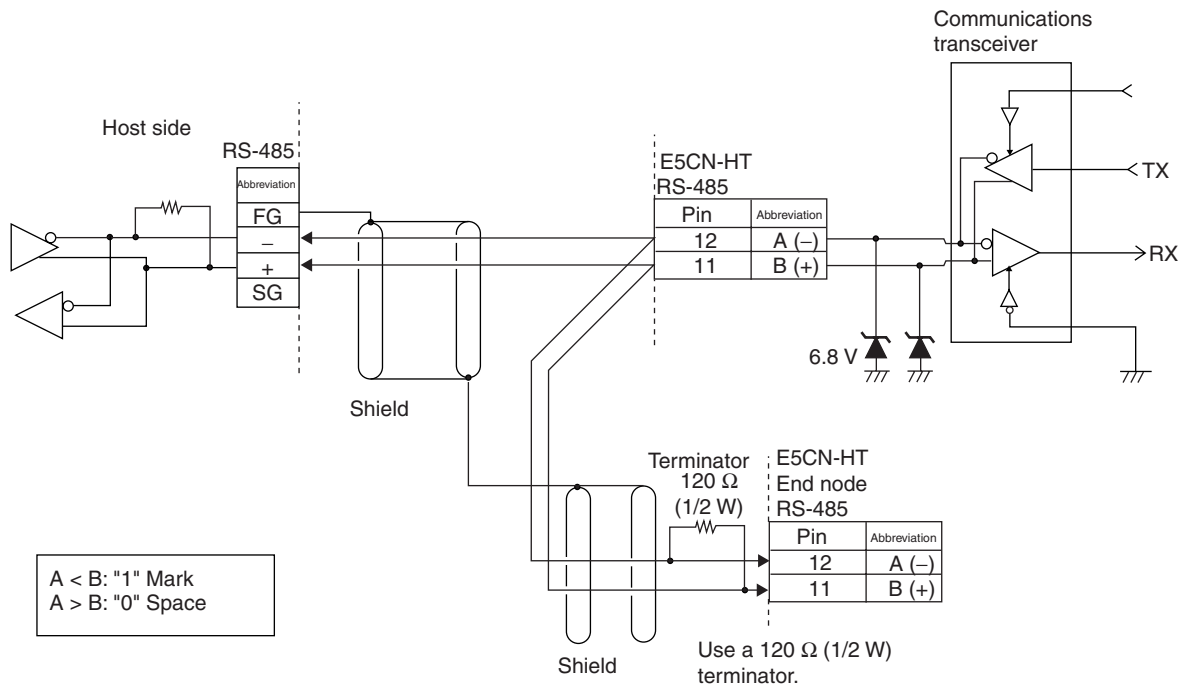
Communications with the host are carried out through a standard RS-485 interface, RS-232C interface, or RS-422 interface (E5AN/E5EN-HT). Use a K3SC Interface Converter for RS-485, RS-232C, and RS-422 interface conversion.

■ Wiring

RS-485

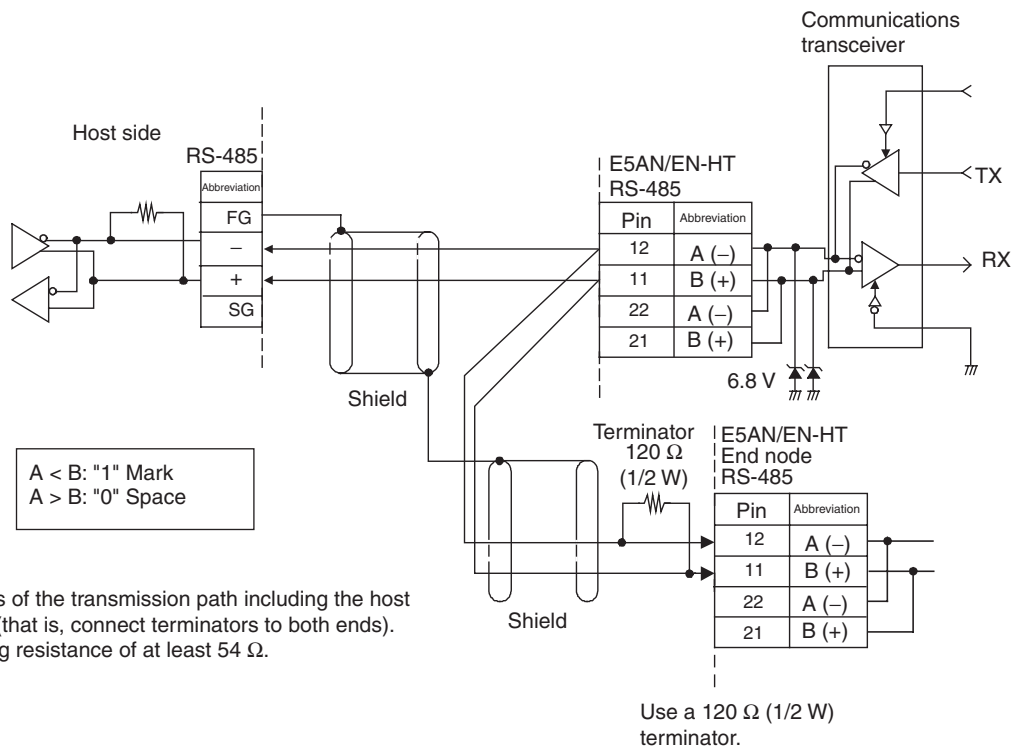
- The RS-485 connection can be either one-to-one or one-to-N. Up to 32 units including the host can be connected in a one-to-N system.
- The total cable length is 500 m max.
- Use a shielded twisted-pair cable with wires of a thickness of AWG24 (0.205 mm²) to AWG14 (2.081 mm²).

● E5CN-HT



Specify both ends of the transmission path including the host as the end node (that is, connect terminators to both ends).
Use a terminating resistance of at least 54 Ω .

● E5AN/EN-HT



Specify both ends of the transmission path including the host as the end node (that is, connect terminators to both ends).
Use a terminating resistance of at least 54 Ω .

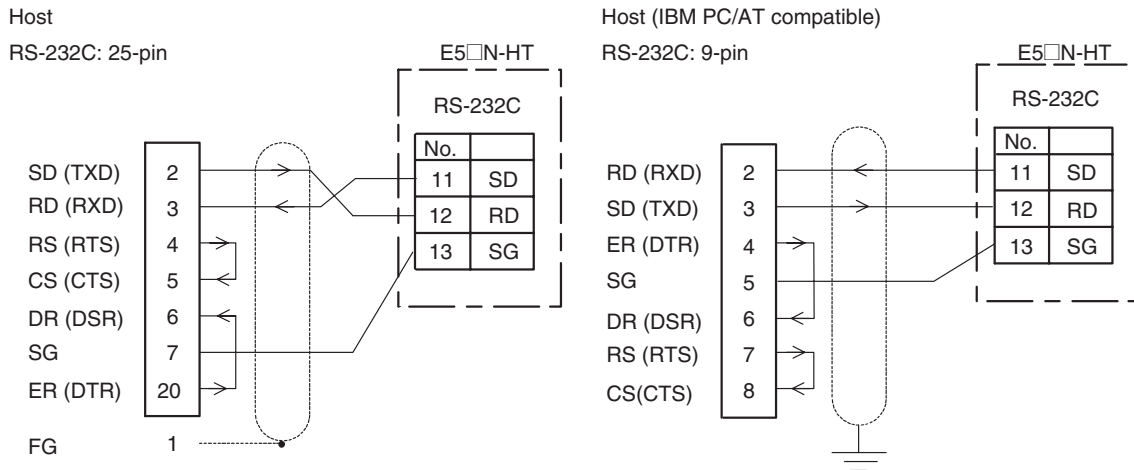
Match the communications specifications of the E5CN/AN/EN-HT and the host. When using a 1: N connection, set the same communications specifications in all of the Units. (Of course, each Unit must have a unique unit number.)

This section explains how to set the E5CN/AN/EN-HT's communications specifications. For details on the host, refer to the User's Manual provided with the host.

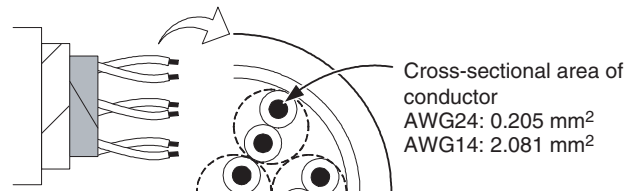
RS-232C

A 1:1 connection is used. The maximum cable length is 15 m.

Use AWG24 (cross-sectional area: 0.205 mm²) to AWG14 (cross-sectional area: 2.081 mm²) shielded twisted-pair cable.

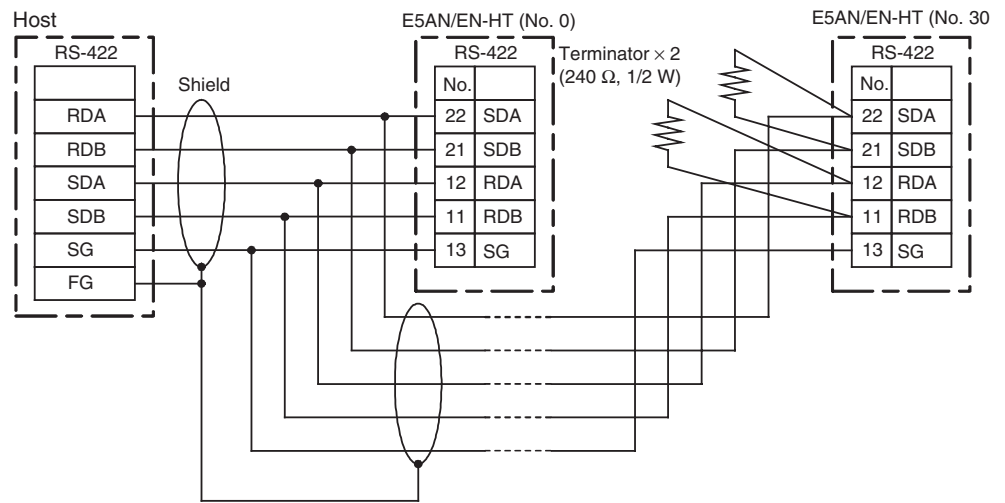


Cable Diagram



RS-422 (E5AN/EN-HT Only)

- Connections are 1:1 or 1:N. With 1:N, a maximum of 32 nodes including the host can be connected.
- The maximum total cable length is 500 m.
- Use shielded twisted-pair cable (AWG28 min.).
- Connect a terminator at each end of the transmission path. In the following example, connect a terminator to the host and to Unit #30 and not to any of the other Units (#0 to #29).
- Use terminators with a resistance of 240 Ω (1/2 W). (The combined resistance at both ends must be 100 Ω min.)



■ Communications Parameters

The E5CN/AN/EN-HT's communications specifications are set in the communications setting level. These parameters are set on the E5CN/AN/EN-HT's front panel. The following table shows the communications parameters and their setting ranges.

| Item | Code | Settings | Set Values |
|--|-------------|---|--|
| Communications protocol | <i>PSEL</i> | CompoWay/F or Modbus | LF /Mod |
| Communications unit number | <i>U-N</i> | 0 to 99 | 0, 1 to 99 |
| Communications baud rate | <i>bPS</i> | 1.2/2.4/4.8/9.6/19.2/38.4/57.6 (kbit/s) | 1.2/2.4/4.8/ 9.6 /19.2/38.4/57.6 (kbit/s) |
| Communications data length (See note.) | <i>LEN</i> | 7/8 (bit) | 7 /8 (bit) |
| Communications stop bits | <i>SbL</i> | 1/2 | 1/ 2 |
| Communications parity | <i>PRTY</i> | None, Even, Odd | None/ EVEN /Odd |
| Send data wait time | <i>SDWT</i> | 0 to 99 | 0 to 99 ms, default time: 20 ms |



Highlighted values indicate default settings.

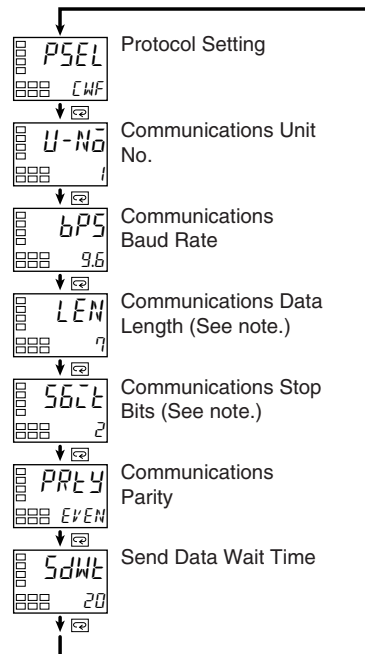
Note: The communications data length for Modbus must be 8 bits.

● Communications Parameter Setup

Before you carry out communications with the E5CN/AN/EN-HT, 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 *E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169) 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.



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

● 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: 1.2 (1200 bps), 2.4 (2400 bps), 4.8 (4800 bps), 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.”

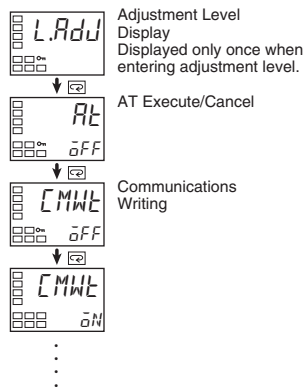
- Communications Stop Bits (*Sb̄t*)
This parameter is for setting the number of communications stop bits. Set either “1” or “2.”
- Communications Parity (*PR̄Y*)
The communications parity can be set. Set the parity to “none,” “even,” or “odd.”
- Send Data Wait Time (*Sd̄Wt*)
The send data wait time is the time that the Controller waits from when it receives a command from the host computer until it returns a response. The wait time can be made longer if the response is returned too quickly for the host computer to receive it. The wait time can also be made shorter to make the communications response time faster.
The send data wait time can be set in 1-ms increments between 0 and 99 ms. The default is 20 ms.

● Setting Communications Writing

Set the communications writing parameter to ON to allow the host to write to the E5CN/AN/EN-HT via communications.

Parameter Setting

1. Press the  Key for less than one second to move from the operation level to the adjustment level.
2. Select the parameter as shown below by pressing the  Key.
3. Press the  or  Key to set the communications writing parameter to ON.



SECTION 2

CompoWay/F Communications Procedures

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

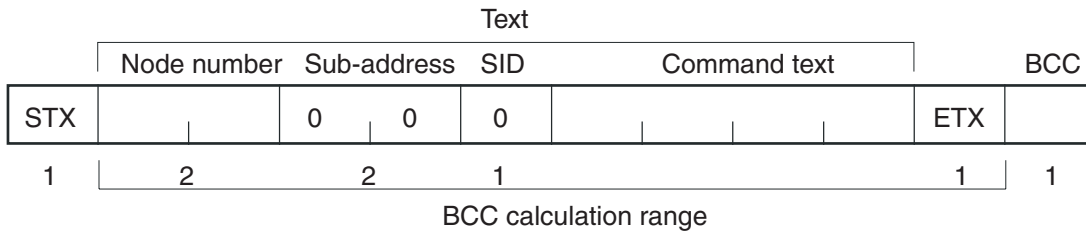
| | | |
|-----|---|------|
| 2.1 | Data Format..... | 2-2 |
| | Command Frame..... | 2-2 |
| | BCC Calculation Example | 2-3 |
| | Response Frame | 2-3 |
| | Communications Data | 2-4 |
| | End Code Example..... | 2-4 |
| 2.2 | Structure of Command Text | 2-6 |
| | PDU Structure | 2-6 |
| | Area Definitions | 2-6 |
| | Type Code (Variable Type) | 2-6 |
| | Addresses..... | 2-7 |
| | Number of Elements..... | 2-7 |
| | List of Services | 2-7 |
| 2.3 | Detailed Description of the Services..... | 2-9 |
| | Read Variable Area | 2-9 |
| | Write Variable Area | 2-10 |
| | Composite Read from Variable Area..... | 2-12 |
| | Composite Write to Variable Area | 2-13 |
| | Read Controller Attributes | 2-16 |
| | Read Controller Status | 2-17 |
| | Echoback Test..... | 2-18 |
| | Operation Command | 2-19 |
| 2.4 | Response Code List | 2-26 |

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.

■ 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 E5CN/AN/EN-HT'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 E5CN/AN/EN-HT. Be sure to set the sub-address to "00." |
| SID (Service ID) | The service ID is not used in the E5CN/AN/EN-HT. Be sure to set the service ID to "00." |
| Command text | This is the command text area. For details, see <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. |

● 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 |

$BCC = 30H \oplus 30H \oplus 30H \oplus 30H \oplus 30H \oplus 30H \oplus 30H \oplus 35H \oplus 30H \oplus 33H \oplus 03H = 35H$
 The result of the calculation (35 hex) is written to the BCC byte.

The ⊕ symbols indicate XOR (exclusive OR) operations.

■ Response Frame

| STX | Node number | Sub-address | End code | Command text | ETX | BCC |
|-----|-------------|-------------|----------|--------------|-----|-----|
| | 0 | 0 | | | | |
| 1 | 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 the 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.

■ 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 However, when reading or writing time data in hh.mm, mm.ss, or dd.hh, BCD data is used (the same format as the display). Example: The data is H'00009959 for a display of 99.59. |

■ 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 | EXT |

Response

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

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 | EXT |

Response

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

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

Example 3) No Node Number Provided
Command

| | BCC |
|-----|-----|
| STX | EXT |

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 | | EXT | Err |

Response

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

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

2.2 Structure of Command Text

■ 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)



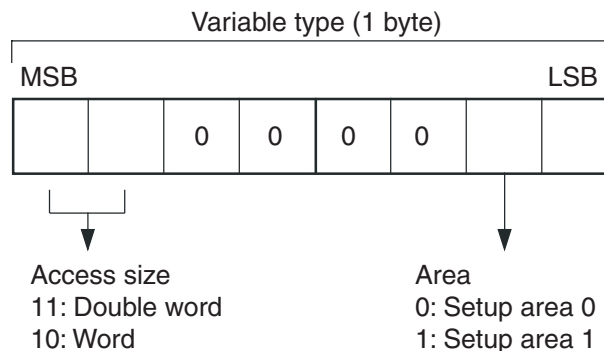
MRES/SRES provides the response code. MRES/SRES are not output when processing ends in a normal completion.

■ Area Definitions

Areas comprise only the variable area.

■ Type Code (Variable Type)

The following tables show the variable area type codes.



The following table summarizes setup areas 0 and 1.

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

The variable type depends on the parameter. Refer to *3.1 Variable Area (Setting Range) List*.

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. |
| C4/84 | R/W parameters for setup area 0 (program setting level, currently selected number). |
| C5/85 | R/W parameter for setup area 0. |
| DA/9A | R/W parameters for setup area 0 (program setting level, all). |

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

■ 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*.

■ 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.

■ List of Services

| 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. |

| MRC | SRC | Name of service | Processing |
|-----|-----|----------------------------------|--|
| 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/Reset, 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

■ 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, see *SECTION 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CN/AN/EN-HT 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 "normal completion." |
| Double word (variable types C0, C1, C3, C4, C5, or DA) | 0001 to 0019 (1 to 25) Up to 25 elements (H'19) are read, and processing ends in a normal completion. |
| Word (variable types 80, 81, 83, 84, 85, or 9A) | 0001 to 0032 (1 to 50) Up to 50 elements (H'32) are read, and processing ends in a normal completion. |

(4) Response Code

Normal Completion

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

Error Occurred

(5) Precautions

- Alarm Function

| Response code | Error name | Cause |
|---------------|----------------------------------|---|
| 1001 | Command too long | The command is too long. |
| 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 | The read start address is out of range. |
| 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 |

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

■ Write Variable Area

This service writes data to the variable area.

Service Request PDU

| MRC | SRC | Variable type | Start write address | Bit position | Number of elements | Write Data (for number of elements) |
|-------|-------|---------------|---------------------|--------------|--------------------|-------------------------------------|
| 0 1 | 0 2 | | | 0 0 | | |
| 2 | 2 | 2 | 4 | 2 | 4 | Number of elements × 8 or 4 |

Service Response PDU

| MRC | SRC | Response code |
|-------|-------|---------------|
| 0 1 | 0 2 | |
| 2 | 2 | 4 |

(1) Variable Type and Write Start Address

For details on variable types and write start addresses, see *SECTION 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CN/AN/EN-HT does not support bit access. Fixed to "00."

(3) Number of Elements

| Number of elements | | Processing |
|--|------------------------|--|
| 0000 | | The write operation is not performed (do not append write data to the service request PDU) and processing ends in "normal completion." |
| Double word (variable types C0, C1, C3, C4, C5, or DA) | 0001 to 0018 (1 to 24) | Up to 24 elements (H'18) are written, and processing ends in a normal completion. |
| Word (variable types 80, 81, 83, 84, 85, or 9A) | 0001 to 0030 (1 to 48) | Up to 48 elements (H'30) are written, and processing ends in a normal completion. |

(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" or "80" 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. (See note.) • Non-volatile memory error. • The program number was written during operation. |

Note: For details on AT (auto-tuning), refer to the separate *E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169).

(5) Precautions

● Alarm Function

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

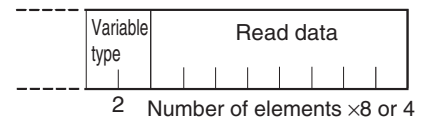
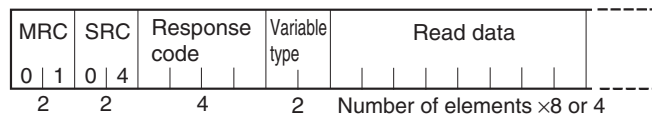
■ Composite Read from Variable Area

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, see *SECTION 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CN/AN/EN-HT does not support bit access. Fixed to "00."

(3) Number of Read Data Items (Variable Type + Read Data)

| Read data length | Number of read data items |
|--|---------------------------|
| Double word (variable types C0, C1, C3, C4, C5, or DA) | 20 max. |
| Word (variable types 80, 81, 83, 84, 85, or 9A) | 25 max. |

Note: The maximum number of data that can be read when double-word data and word data are mixed is given in the following table.

| Composite read | | Composite read | |
|---|---|---|---|
| Double word (variable types C0, C1, C3, C4, C5, or DA) | Word (variable types 80, 81, 83, 84, 85, or 9A) | Double word (variable types C0, C1, C3, C4, C5, or DA) | Word (variable types 80, 81, 83, 84, 85, or 9A) |
| 20 | 0 | 9 | 16 |
| 19 | 1 | 8 | 17 |
| 18 | 3 | 7 | 18 |
| 17 | 5 | 6 | 19 |
| 16 | 6 | 5 | 20 |
| 15 | 8 | 4 | 21 |
| 14 | 10 | 3 | 22 |
| 13 | 11 | 2 | 23 |
| 12 | 13 | 1 | 24 |
| 11 | 14 | 0 | 25 |
| 10 | 15 | | |

(4) Response Code

Normal Completion

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

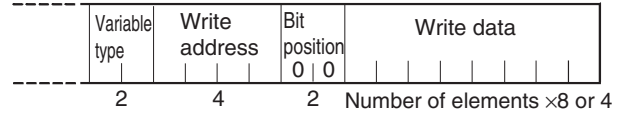
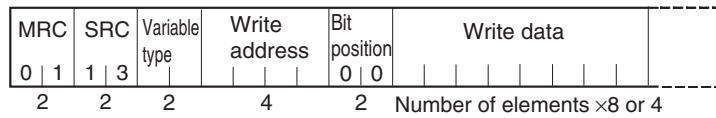
Error Occurred

| 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 |

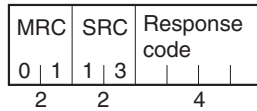
■ Composite Write to Variable Area

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, see *SECTION 3 Communications Data for CompoWay/F*.

(2) Bit Position

The E5CN/AN/EN-HT does not support bit access. Fixed to “00.”

(3) Number of Write Data Items (Variable Type + Write Data)

| Write data length | Number of write data items |
|--|----------------------------|
| Double word (variable types C0, C1, C3, C4, C5, or DA) | 12 max. |
| Word (variable types 80, 81, 83, 84, 85, or 9A) | 17 max. |

Note: The maximum number of data that can be written when double-word data and word data are mixed is given in the following table.

| Composite write | | Composite write | |
|--|---|--|---|
| Double word (variable types C0, C1, C3, C4, C5, or DA) | Word (variable types 80, 81, 83, 84, 85, or 9A) | Double word (variable types C0, C1, C3, C4, C5, or DA) | Word (variable types 80, 81, 83, 84, 85, or 9A) |
| 12 | 1 | 6 | 9 |
| 11 | 2 | 5 | 10 |
| 10 | 3 | 4 | 11 |
| 9 | 5 | 3 | 13 |
| 8 | 6 | 2 | 14 |
| 7 | 7 | 1 | 15 |
| 6 | 8 | 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" or "80" 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. (See note.) • Non-volatile memory error. • The program number was written during operation. |

Note: For details on AT (auto-tuning), refer to the separate *E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169).

■ Read Controller Attributes

This service reads the model number and communications buffer size.

Service Request PDU

| | |
|-------|-------|
| MRC | SRC |
| 0 5 | 0 3 |
| 2 | 2 |

Service Response PDU

| | | | | |
|-------|-------|---------------|-----------|---------------|
| MRC | SRC | Response code | Model No. | Buffer size |
| 0 5 | 0 3 | | | 0 0 D 9 |
| 2 | 2 | 4 | 10 | 4 |

(1) Model Number

The model number is expressed in 10-byte ASCII. When 10 bytes are not required, pad the remaining bytes with spaces.

Example: The following model number is used for the E5CN-HTQ2HH03-FLK (voltage output, two auxiliary outputs, two heater burnout detection inputs, and communications).

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| E | 5 | C | N | - | H | T | Q | 2 | H | H |
|---|---|---|---|---|---|---|---|---|---|---|

(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. |

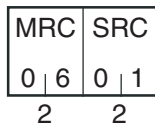
Error Occurred

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

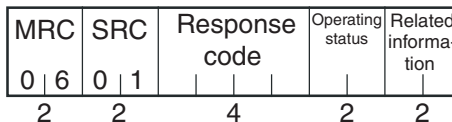
■ Read Controller Status

This service reads the operating status and error status.

Service Request PDU



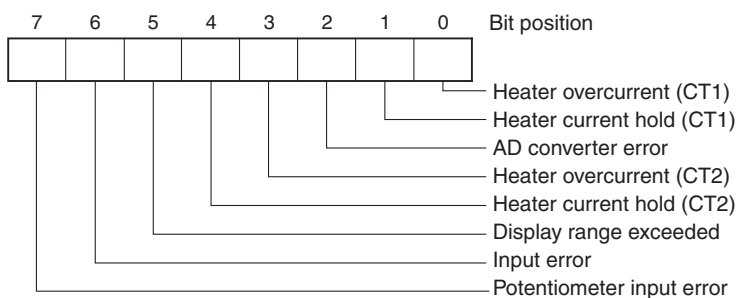
Service Response PDU



(1) Operating Status

| Operating status | Description |
|------------------|--|
| 01 | Control is not being performed (the manual MV, MV at reset, or MV at error from setup area 1 is being output). |
| 00 | Control is being carried out (state other than the above). |

(2) Related Information



(3) Response Code

Normal Completion

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

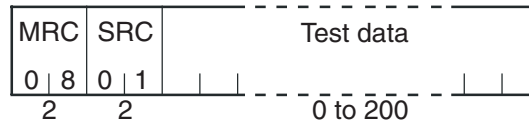
Error Occurred

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

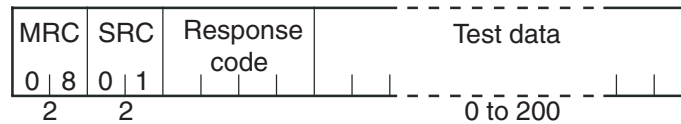
■ Echoback Test

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 |

Do not set the value H'40. No response will be returned.

(2) Response Code

Normal Completion

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

Error Occurred

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

■ Operation Command

This service performs operations such as the following:

- Communications Writing
- Write Mode
- Move to Setup Area 1
- Parameter Initialization
- Invert Direct/Reverse Operation
- Advance
- Run/Reset
- Save RAM Data
- Move to Protect Level
- Alarm Latch Cancel
- Infrared Communication Use
- AT Execute/Cancel
- Software Reset
- Auto/Manual Switch
- SP Mode
- Hold

Service Request PDU

| | | | |
|-------|-------|----------------------|-----------------------------|
| MRC | SRC | Com- mand code | Related informa- tion |
| 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/Reset | 00: Run 01: Reset |
| 03 | AT Execute/Cancel | 00: AT cancel 01: 100% AT execute 02: 40% AT execute |
| 04 | Write Mode | 00: Backup mode 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: Initialize to defaults |

| 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: OC alarm latch cancel 0F: All alarm latch cancel |
| 0D | SP Mode | 00: Program SP Mode 01: Remote SP Mode 02: Fixed SP Mode |
| 0E | Invert Direct/Reverse Operation | 00: Not invert 01: Invert |
| 12 | Infrared Communication Use | 00: OFF 01: ON |
| 13 | Hold | 00: Clear hold 01: Hold |
| 14 | Advance | 00 |

(2) Response Code
Normal Completion

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

Error Occurred

| Response code | Error name | Cause |
|---------------|-------------------|--|
| 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, see (3) <i>Operation Commands and Precautions</i> 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/Reset

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.

● 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/Reset parameter is set to Reset (and the reset operation is set to stop control).
- During standby status (when the reset operation is set to stop control).
- During manual operation or when executing from 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.
- When 100% AT execute/cancel or 40% AT execute/cancel is assigned to an event input.

In addition, a parameter error will occur if 40% AT is specified during heating and cooling control or during position-proportional floating 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 a parameter in the operation, program setting, adjustment, or PID setting level (excluding read-only parameters) is written using communications. |
| RAM write mode | The data is not written to non-volatile memory when a parameter in the operation, program setting, adjustment, or PID setting level (excluding read-only parameters) is written using communications. Parameters can be changed by using key operations on the front panel of the Controller. |

- When the mode is changed from RAM write mode to backup mode, the parameters in the operation, program setting, adjustment, or PID setting level (excluding read-only parameters) are written to non-volatile memory.
- RAM write mode is enabled only when communications are enabled in the Communications Writing parameter (i.e., set to ON). Therefore, if the Communications Writing parameter is changed to OFF (disabled), the parameter settings from the operation, program setting, adjustment, and PID setting levels (excluding read-only parameters) are written to non-volatile memory even if the RAM write mode is set.

● **Save RAM Data**

This command writes the parameters in the operation, program setting, adjustment, or PID setting levels (excluding read-only parameters) to non-volatile memory. The setting can be made in either setup area 0 or 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 auto/manual switching is disabled (not displayed)

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 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).

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.

| Related information | Explanation (initialization values) |
|---------------------|--|
| 00 | Default initialization values (See <i>SECTION 3 Communications Data for CompoWay/F</i> for details.) (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.

● SP Mode

Select program SP mode, remote SP mode, or fixed SP mode with the related information setting. 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 SP Mode parameter is disabled (not displayed at the Controller).

● 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.

● Infrared Communications Use

Select ON or OFF to enable or disable using infrared communications with the related information setting. The setting can be accepted in both setup area 0 and setup area 1.

● Hold

Turn the hold operation ON or OFF with the related information setting. The setting can be made only in setup area 0. An operation error will occur in the following situations.

- When AT is being executed
- During standby status

- During a reset or when continuing control at the end of operation
- When Hold/Clear Hold is assigned to an event input

● Advance

This operation command performs the advance operation. The setting can be made only in setup area 0. An operation error will occur in the following situations.

- When AT is being executed
- During standby status
- During a reset or when continuing control at the end of operation

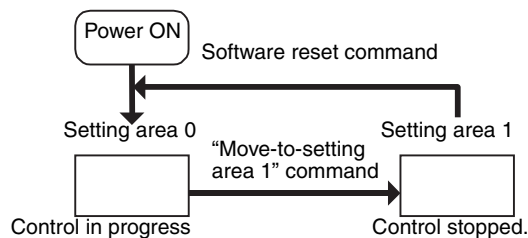
● Setting Areas

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 change Run/Reset 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" or "80" 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. • The program number was written during operation. | 11 |

SECTION 3

Communications Data for CompoWay/F

This section gives 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 | 3-20 |
| | Status Structure | 3-20 |
| | Status 2 Structure | 3-22 |
| | Status Details | 3-23 |
| | Status 2 Details | 3-24 |

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 “Set (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 | Process Value | 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 (See notes 1 and 2.) | See 3.2 <i>Status and Status 2</i> for details. | None | |
| C0 (80) | 0002 | Present SP | 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) | Operation | |
| C0 (80) | 0004 | MV Monitor (Heating) | Standard: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/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) | 000A | Valve Opening Monitor | H'FFFFFF9C to H'0000044C (-10.0 to 110.0) | | |
| C0 (80) | 000B | Remote SP Monitor | SP Lower Limit to SP Upper Limit | | |
| C0 (80) | 000D | PID Set No. Monitor | H'00000001 to H'00000008 (1 to 8) | | None |
| C0 (80) | 000E | Decimal Point Monitor (See note 1.) | H'00000000 to H'00000003 (0 to 3) | | |
| C0 (80) | 000F | Control Output 1 ON/OFF Count Monitor | H'00000000 to H'0000270F (0 to 9999) | Advanced function setting | |
| C0 (80) | 0010 | Control Output 2 ON/OFF Count Monitor | H'00000000 to H'0000270F (0 to 9999) | | |
| C0 (80) | 0011 | Status 2 (See notes 1 and 2.) | Refer to 3.2 <i>Status and Status 2</i> . | None | |
| C0 (80) | 0012 | Status (See notes 1 and 3.) | Refer to 3.2 <i>Status and Status 2</i> . | | |
| C0 (80) | 0013 | Status 2 (See notes 1 and 3.) | Refer to 3.2 <i>Status and Status 2</i> . | | |
| C0 (80) | 0014 | Program No. Monitor | H'00000000 to H'00000007 (0 to 7) | Operation | |
| C0 (80) | 0015 | Segment No. Monitor | H'00000000 to H'0000001F (0 to 31) | | |
| C0 (80) | 0016 | Remaining Standby Time Monitor | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | | |
| C0 (80) | 0017 | Elapsed Program Time Monitor | H'00000000 to H'00009959 | | |
| C0 (80) | 0018 | Remaining Program Time Monitor | H'00000000 to H'00009959 | None | |
| C0 (80) | 0019 | Elapsed Segment Time Monitor | H'00000000 to H'00009959 | | |
| C0 (80) | 001A | Remaining Segment Time Monitor | H'00000000 to H'00009959 | | |
| C0 (80) | 001B | Program Repetitions Monitor | H'00000000 to H'0000270F (0 to 9999) | Operation | |
| C0 (80) | 001C | SP Mode Setting Monitor | H'00000000(0): Program SP mode H'00000001(1): Remote SP mode H'00000002(2): Fixed SP mode | None | |

Note 1: Not displayed on the Controller display.

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

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

Note 4: If the Run/Reset parameter is set to Run, the current program number will be read.

If the Run/Reset parameter is set to Reset, the program number that is set in the Program No. parameter will be read.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---|--|------------|
| C1 (81) | 0000 | Operation/Adjustment Protect | H'00000000(0) to H'00000005(5) 0: No control 1: Run level (PV allowed, PV/SP allowed, others allowed), program level allowed, adjustment level allowed, PID setting level prohibited 2: Run level (PV allowed, PV/SP allowed, others allowed), program level allowed, adjustment level prohibited, PID setting level prohibited 3: Run level (PV allowed, PV/SP allowed, others allowed), program level prohibited, adjustment level prohibited, PID setting level prohibited 4: Run level (PV allowed, PV/SP allowed, others prohibited), program level prohibited, adjustment level prohibited, PID setting level prohibited 5: Run level (PV allowed, PV/SP prohibited, others prohibited), program level prohibited, adjustment level prohibited, PID setting level prohibited | 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 (See note 1.) | SP lower limit to SP upper limit | Operation |
| C1 (81) | 000D | Heater Burnout Detection 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| C1 (81) | 0012 | Temperature Input Shift | H'FFFFB1E1 to H'00007E90 (-199.99 to 324.00) | |
| C1 (81) | 0013 | Upper Limit Temperature Input Shift Value | H'FFFFB1E1 to H'00007E90 (-199.99 to 324.00) | |
| C1 (81) | 0014 | Lower Limit Temperature Input Shift Value | H'FFFFB1E1 to H'00007E90 (-199.99 to 324.00) | |
| C1 (81) | 0015 | Proportional Band (See note 2.) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| C1 (81) | 0016 | Integral Time (See note 2.) | Standard, heating/cooling, positional proportional (closed): H'00000000 to H'00007E90 (0.0 to 3240.0) Positional proportional (floating): H'00000001 to H'00007E90 (0.1 to 3240.0) | |
| C1 (81) | 0017 | Derivative Time (See note 2.) | H'00000000 to H'00007E90 (0.0 to 3240.0) | |
| C1 (81) | 0018 | Cooling Coefficient (See note 2.) | H'00000001 to H'0000270F (0.01 to 99.99) | |
| C1 (81) | 0019 | Dead Band | Temperature: H'FFFFB1E1 to H'00007E90 (-199.9 to 3240.0) Analog: H'FFFFF831 to H'0000270F (-19.99 to 99.99) | |
| C1 (81) | 001A | Manual Reset Value | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| C1 (81) | 001B | Hysteresis (Heating) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| C1 (81) | 001C | Hysteresis (Cooling) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| 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) | 0021 | Wait Band | H'00000000(0): OFF Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |

Note 1: This is a read-only parameter. To change the SP, edit the SP parameter for the SP mode.

- Program SP (PSP): C4 (84), segment SP at 0004 or segment SP for each program under DA (9A)
- Fixed SP (FSP): C1 (81), Fixed SP at 0033

Note 2: The parameter for the currently selected PID set will be accessed. For setup area 1, however, the currently selected PID set is fixed at PID1.

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---|---|----------------|
| C1 (81) | 0022 | MV at Reset | Standard: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) Position proportional (Floating or direct setting of position proportional MV OFF): H'FFFFFFF to H'00000001 (-1 to 1) Position proportional (Closed and direct setting of position proportional MV ON): H'FFFFFFCE to H'0000041A (-5.0 to 105.0) | Adjustment |
| C1 (81) | 0023 | MV at PV Error | Standard: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) Position proportional (Floating or direct setting of position proportional MV OFF): H'FFFFFFF to H'00000001 (-1 to 1) Position proportional (Closed and direct setting of position proportional MV ON): H'FFFFFFCE to H'0000041A (-5.0 to 105.0) | Adjustment |
| C1 (81) | 0024 | Manual MV | Standard: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) Position proportional (Floating or direct setting of position proportional MV OFF): H'FFFFFFF to H'00000001 (-1 to 1) Position proportional (Closed and direct setting of position proportional MV ON): H'FFFFFFCE to H'0000041A (-5.0 to 105.0) | Manual Control |
| C1 (81) | 0026 | MV Upper Limit (See note 1.) | Standard: MV lower limit + 0.1 to H'0000041A (MV lower limit + 0.1 to 105.0) Heating/cooling: H'00000000 to H'0000041A (0.0 to 105.0) Position proportional (closed): MV lower limit +0.1 to H'0000041A (MV lower limit +0.1 to 105.0) | Adjustment |
| C1 (81) | 0027 | MV Lower Limit (See note 1.) | Standard: H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) Heating/cooling: H'FFFFFFBE6 to H'00000000 (-105.0 to 0.0) Position proportional (closed): H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) | Adjustment |
| 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) | 002D | Position Proportional Dead Band | H'00000001 to H'00000064 (0.1 to 10.0) | |
| C1 (81) | 002E | Open/Close Hysteresis | H'00000001 to H'000000C8 (0.1 to 20.0) | |
| C1 (81) | 002F | Heater Overcurrent Detection 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| C1 (81) | 0030 | Heater Overcurrent Detection 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| C1 (81) | 0031 | Extraction of Square Root Low-cut Point | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| C1 (81) | 0032 | Program No. | H'00000000 to Hi00000007 (0 to 7) | Operation |
| C1 (81) | 0033 | Fixed SP | SP lower limit to SP upper limit | Adjustment |
| C1 (81) | 0034 | Standby Time | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | |
| C1 (81) | 0035 | Program SP Shift Value | H'FFFFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0036 | RSP 0 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 0037 | RSP 1 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 0038 | RSP 2 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 0039 | RSP 3 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 003A | RSP 4 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 003B | RSP 5 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 003C | RSP 6 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 003D | RSP 7 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 003E | RSP 8 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 003F | RSP 9 before Correction | Remote SP lower limit to remote SP upper limit | |
| C1 (81) | 0040 | RSP 10 before Correction | Remote SP lower limit to remote SP upper limit | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-------------------------------------|--|------------|
| C1 (81) | 0041 | RSP Broken-line Correction Value 0 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | Adjustment |
| C1 (81) | 0042 | RSP Broken-line Correction Value 1 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0043 | RSP Broken-line Correction Value 2 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0044 | RSP Broken-line Correction Value 3 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0045 | RSP Broken-line Correction Value 4 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0046 | RSP Broken-line Correction Value 5 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0047 | RSP Broken-line Correction Value 6 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0048 | RSP Broken-line Correction Value 7 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 0049 | RSP Broken-line Correction Value 8 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 004A | RSP Broken-line Correction Value 9 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C1 (81) | 004B | RSP Broken-line Correction Value 10 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |

Note 1: The parameter for the currently selected PID set will be accessed. For setup area 1, however, the currently selected PID set is fixed at PID1.

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|-----------------------------|---|-----------------|
| C3 (83) | 0000 | Input Type (See note.) | H'00000000 (0): Pt (-200.0 to 850.0°C/-300.0 to 1500.0°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 (-200.0 to 1300.0°C/-300.0 to 2300.0°F) H'00000006 (6): K (-20.0 to 500.0°C/0.0 to 900.0°F) H'00000007 (7): J (-100.0 to 850.0°C/-100.0 to 1500.0°F) H'00000008 (8): J (-20.0 to 400.0°C/0.0 to 750.0°F) H'00000009 (9): T (-200.0 to 400.0°C/-300.0 to 700.0°F) H'0000000A (10): T (-199.9 to 400.0°C/-199.9 to 700.0°F) H'0000000B (11): E (-200.0 to 600.0°C/-300.0 to 1100.0°F) H'0000000C (12): L (-100.0 to 850.0°C/-100.0 to 1500.0°F) H'0000000D (13): U (-200.0 to 400.0°C/-300.0 to 700.0°F) H'0000000E (14): U (-199.9 to 400.0°C/-199.9 to 700.0°F) H'0000000F (15): N (-200.0 to 1300.0°C/-300.0 to 2300.0°F) H'00000010 (16): R (0.0 to 1700.0°C/0.0 to 3000.0°F) H'00000011 (17): S (0.0 to 1700.0°C/0.0 to 3000.0°F) H'00000012 (18): B (100.0 to 1800.0°C/300.0 to 3200.0°F) H'00000013 (19): W (0.0 to 2300.0°C/0.0 to 3200.0°F) H'00000014 (20): PLII (0.0 to 1300.0°C/0.0 to 2300.0°F) H'00000015 (21): K (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000016 (22): J (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000017 (23): T (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000018 (24): Pt (-50.00 to 200.00°C/-50.00 to 200.00°F) 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'00007E90 (Scaling lower limit +1 to 32400) | |
| C3 (83) | 0002 | Scaling Lower Limit | H'FFFFB1E1 to scaling upper limit -1 (-19,999 to scaling upper limit -1) | |
| C3 (83) | 0003 | Decimal Point | H'00000000 to H'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: SP lower limit + 1 to input setting range upper limit Analog: 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 setting range lower limit to SP upper limit -1 Analog: Scaling lower limit to SP upper limit -1 | |
| C3 (83) | 0007 | PID ON/OFF | H'00000000 (0): ON/OFF H'00000001 (1): 2 PID control | |
| C3 (83) | 0008 | Standard or Heating/Cooling | H'00000000 (0): Standard H'00000001 (1): Heating/cooling | |
| C3 (83) | 000A | Control Period (Heating) | H'00000000 (0): 0.5 H'00000001 to H'00000063 (1 to 99) | |
| C3 (83) | 000B | Control Period (Cooling) | H'00000000 (0): 0.5 H'00000001 to H'00000063 (1 to 99) | |
| C3 (83) | 000C | Direct/Reverse Operation | H'00000000 (0): Reverse operation H'00000001 (1): Direct operation | |

Note: The input type can be selected to match the connected sensor.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--|---|------------------------|
| 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): RSP absolute value upper limit alarm H'0000000F (15): RSP absolute value lower limit alarm | Initial setting |
| C3 (83) | 000E | Alarm 2 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): No alarm function H'0000000D (13): PV change rate alarm H'0000000E (14): RSP absolute value upper limit alarm H'0000000F (15): RSP absolute value lower limit alarm | |
| C3 (83) | 000F | Alarm 3 Type (See note 1.) | Same settings as the alarm 2 type | |
| C3 (83) | 0010 | Communications Unit No. (See note 2.) | H'00000000 to H'00000063 (0 to 99) | Communications setting |
| C3 (83) | 0011 | Communications Baud Rate (See note 2.) | H'00000000 (0): 1.2 H'00000001 (1): 2.4 H'00000002 (2): 4.8 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 (See note 2.) | H'00000007 (7): 7 H'00000008 (8): 8 | |
| C3 (83) | 0013 | Communications Stop Bits (See note 2.) | H'00000001 (1): 1 H'00000002 (2): 2 | |
| C3 (83) | 0014 | Communications Parity (See note 2.) | H'00000000 (0): None H'00000001 (1): Even H'00000002 (2): Odd | |

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

Note 1: Not displayed on the Controller display when Alarm 3 is not assigned to the output.

Note 2: After communications parameters have been changed, reset the Controller to enable them.

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|----------------------------------|---|---------------------------|
| C3 (83) | 0016 | Event Input Assignment 1 | H'00000000 (0): None H'00000001 (1): Run (OFF)/reset (ON) H'00000002 (2): Run (ON)/reset (OFF) H'00000003 (3): Auto/manual switch H'00000004 (4): Reset H'00000005 (5): Run H'00000006 (6): Hold/clear hold H'00000007 (7): Hold H'00000008 (8): Advance H'00000009 (9): Program No. switch 0 H'0000000A (10): Program No. switch 1 H'0000000B (11): Program No. switch 2 H'0000000C (12): Invert direct/reverse operation H'0000000D (13): Program SP mode/remote SP mode (See note 1.) H'0000000E (14): Remote SP mode/fixed SP mode (See note 1.) H'0000000F (15): Program SP mode/fixed SP mode H'00000010 (16): 100% AT execute/cancel H'00000011 (17): 40% AT execute/cancel H'00000012 (18): Setting change enable/disable H'00000013 (19): Communications writing enable/disable (See note 2.) H'00000014 (20): Latch cancel H'00000015 (21): Wait enable (ON)/disable (OFF) | Initial setting |
| C3 (83) | 0017 | Event Input Assignment 2 | H'00000000 to H'00000015 (0 to 21) * Same as for Event Input Assignment 1. | |
| C3 (83) | 0018 | Event Input Assignment 3 | H'00000000 to H'00000015 (0 to 21) * Same as for Event Input Assignment 1. | |
| C3 (83) | 0019 | Event Input Assignment 4 | H'00000000 to H'00000015 (0 to 21) * Same as for Event Input Assignment 1. | |
| C3 (83) | 001D | Standby Sequence Reset | H'00000000 (0): Condition A H'00000001 (1): Condition B | Advanced function setting |
| 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 | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | Initial setting |

Note 1: E5AN/EN-HT only.

Note 2: Only with external communications.

| 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 | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | Initial setting |
| C3 (83) | 0022 | Auxiliary Output 3 Open in Alarm (See note 1.) | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | Advanced function setting |
| C3 (83) | 0023 | Alarm 3 Hysteresis (See note 1.) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | 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) | 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 | Additional PV Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 002D | MV Display | H'00000000 (0): OFF (display of manipulated variable OFF) H'00000001 (1): ON (display of manipulated variable 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 (See note 1.) | 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 | Input Error Output | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0034 | Cold Junction Compensation Method | H'00000000 (0): OFF H'00000001 (1): ON | |

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

Note 1: Not displayed on the Controller display when Alarm 3 is not assigned to the output.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|----------------------------------|---|---------------------------|
| C3 (83) | 0036 | PV Change Color | H'00000000 (0): Orange H'00000001 (1): Red H'00000002 (2): Green H'00000003 (3): Red to green: When ALM1 is ON H'00000004 (4): Green to red: When ALM1 is ON H'00000005 (5): Red to green to red: Within PV stable band: Green Outside stable band: Red H'00000006 (6): Green to orange to red: Within PV stable band: Orange Outside stable band: Green, red H'00000007 (7): Orange to green to red: Within PV stable band: Green Outside stable band: Orange, red H'00000008 (8): Red to orange to green: Linked to program. Rising: red, Constant: orange, Falling: green | Advanced function setting |
| C3 (83) | 0037 | PV Stable Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| C3 (83) | 0038 | Alarm 1 ON Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 0039 | Alarm 2 ON Delay | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003A | Alarm 3 ON Delay (See note 1.) | 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 (See note 1.) | H'00000000 to H'000003E7 (0 to 999) | |
| C3 (83) | 003E | Transfer Output Type | H'00000000 (0): OFF H'00000001 (1): Present SP H'00000002 (2): PV H'00000003 (3): MV (heating) H'00000004 (4): MV (cooling) H'00000005 (5): Valve opening | Initial setting |
| C3 (83) | 003F | Transfer Output Upper Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) H'FFFFFFB1E1 to H'00007E90 (-19999 to 32400) (See note 2.) | |
| C3 (83) | 0040 | Transfer Output Lower Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) H'FFFFFFB1E1 to H'00007E90 (-19999 to 32400) (See note 2.) | |
| C3 (83) | 0041 | Linear Current Output | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA | |
| C3 (83) | 0042 | Input Shift Type | H'00000000 (0): Temperature input 1-point shift H'00000001 (1): Temperature input 2-point shift | Advanced function setting |
| C3 (83) | 0043 | MV at Reset 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 | |
| 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 (See note 3.) | H'00000000 to H'0000270F (0 to 9999) | |
| C3 (83) | 004A | LBA Level | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| C3 (83) | 004B | LBA Band | Temperature: H'00000000 to H'00007E90 (0.0 to 3240.0) Analog: H'00000000 to H'0000270F (0.00 to 99.99) | |

Note 1: Not displayed on the Controller display when Alarm 3 is not assigned to the output.

Note 2: The setting (monitor) range depends on the transfer output type setting. (For details, refer to *SECTION 5 Parameter in E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169).)

Note 3: This parameter can be set only for ON/OFF control.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--|---|----------------------------------|
| C3 (83) | 004C | Communications Protocol Setting (See note 1.) | H'00000000 (0): CompoWay/F H'00000001 (1): Modbus | Communi- cations set- ting |
| C3 (83) | 004D | Send Data Wait Time (See note 1.) | H'00000000 to H'00000063 (0 to 99) | |
| C3 (83) | 004E | Control Output 1 Assignment | When control output 1 is a linear output: H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) When control output 1 is an ON/OFF output: 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): Program end output H'00000007 (7): Control output ON/OFF count alarm (See note 2.) H'00000008 (8): Stage output H'00000009 (9): Run output H'0000000A (10): Time signal 1 output H'0000000B (11): Time signal 2 output H'0000000C (12): Work bit 1 H'0000000D (13): Work bit 2 H'0000000E (14): Work bit 3 H'0000000F (15): Work bit 4 H'00000010 (16): Work bit 5 H'00000011 (17): Work bit 6 H'00000012 (18): Work bit 7 H'00000013 (19): Work bit 8 | Advanced function setting |
| C3 (83) | 004F | Control Output 2 Assignment | Same as for Control Output 1 Assignment. | |

Note 1: After communications parameters have been changed, perform a software reset or turn the power OFF and ON again, to enable the changes.

Note 2: The output turns ON when the status of either the Control Output 1 ON/OFF Count Alarm or the Control Output 2 ON/OFF Count Alarm turns ON.

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

| 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): Program end output H'00000007 (7): Control output ON/OFF count alarm (See note 1.) H'00000008 (8): Stage output H'00000009 (9): Run output H'0000000A (10): Time signal 1 output H'0000000B (11): Time signal 2 output H'0000000C (12): Work bit 1 H'0000000D (13): Work bit 2 H'0000000E (14): Work bit 3 H'0000000F (15): Work bit 4 H'00000010 (16): Work bit 5 H'00000011 (17): Work bit 6 H'00000012 (18): Work bit 7 H'00000013 (19): Work bit 8 | Advanced function setting |
| C3 (83) | 0051 | Auxiliary Output 2 Assignment | H'00000000 to H'00000013 (0 to 19) * Same as for the Auxiliary Output 1 Assignment parameter. | |
| C3 (83) | 0052 | Character Select | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0055 | Alarm SP Selection | H'00000000 (0): Present SP H'00000001 (1): Segment SP | Advanced function setting |
| C3 (83) | 0056 | Auxiliary Output 3 Assignment | H'00000000 to H'0000000F (0 to 15) * Same as for the Auxiliary Output 1 Assignment parameter. | Initial setting |
| C3 (83) | 0057 | Closed/Floating | H'00000000 (0): Floating H'00000001 (1): Closed | |
| C3 (83) | 0058 | Travel Time | H'00000001 to H'000003E7 (1 to 999) | Advanced function setting |
| C3 (83) | 0059 | PV Dead Band | H'00000000 to H'00007E90 (0 to 32400) | |
| C3 (83) | 005B | Manual MV Limit Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 005C | Direct Setting of Position Proportional MV | 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 | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'000003E7 (0.01 to 9.99) | |
| 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 | SP lower limit to SP upper limit | |
| C3 (83) | 0062 | Remote SP Lower limit | SP lower limit to SP upper limit | |
| C3 (83) | 0063 | SP Tracking | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0064 | Remote SP Input Error Output | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0065 | PID Set Automatic Selection Data | H'00000000 (0): PV H'00000001 (1): DV H'00000002 (2): SP | |

Note 1: The output turns ON when the status of either the Control Output 1 ON/OFF Count Alarm or the Control Output 2 ON/OFF Count Alarm turns ON.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--|---|---------------------------|
| C3 (83) | 0066 | PID Set Automatic Selection Hysteresis | H'0000000A to H'0000270F (0.10 to 99.99) | Advanced function setting |
| C3 (83) | 0067 | PV Rate of Change Calculation Period | H'00000001 to H'000003E7 (1 to 999) | |
| C3 (83) | 0068 | Automatic Cooling Coefficient Adjustment | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 0069 | Heater Overcurrent Use | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 006A | Heater Overcurrent Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 006B | Heater Overcurrent Hysteresis | H'00000001 to H'000001F4 (0.1 to 50.0) | Initial setting |
| C3 (83) | 006C | Extraction of Square Root Enable | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| C3 (83) | 006D | PF Setting | H'00000000 (0): OFF H'00000001 (1): RUN H'00000002 (2): Reset H'00000003 (3): Run/reset H'00000004 (4): Hold/clear hold H'00000005 (5): Advance H'00000006 (6): 100% AT execute/cancel H'00000007 (7): 40% AT execute/cancel H'00000008 (8): Alarm latch cancel H'00000009 (9): Auto/manual H'0000000A (10): Monitor/setting item | |
| C3 (83) | 006E | Monitor/Setting Item 1 | H'00000000 (0): Disable H'00000001 (1): PV/SP/Program No. or segment No. H'00000002 (2): PV/SP/MV H'00000003 (3): PV/SP/Remaining segment time 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): Program No. H'00000011 (17): Segment No. H'00000012 (18): Elapsed program time H'00000013 (19): Remaining program time H'00000014 (20): Elapsed segment time H'00000015 (21): Remaining segment time | |
| C3 (83) | 006F | Monitor/Setting Item 2 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |
| C3 (83) | 0070 | Monitor/Setting Item 3 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |
| C3 (83) | 0071 | Monitor/Setting Item 4 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |
| C3 (83) | 0072 | Monitor/Setting Item 5 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---|--|---------------------------|
| C3 (83) | 0073 | PV/SP Display Screen Selection | H'00000000 (0): Only PV/SP displayed (no No. 3 display). H'00000001 (1): The PV/SP/Program No. or Segment No., and the PV/SP/MV are displayed in order. H'00000002 (2): The PV/SP/MV and PV/SP/Program No. or Segment No. are displayed in order. H'00000003 (3): Only the PV/SP/Program No. or Segment No. are displayed. H'00000004 (4): Only the PV/SP/MV are displayed. H'00000005 (5): The PV/SP/Program No. or Segment No., and the PV/SP/Remaining Segment Time are displayed in order. H'00000006 (6): The PV/SP/MV and PV/SP/Remaining Segment Time are displayed in order. H'00000007 (7): Only the PV/SP/Remaining Segment Time are displayed. | 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): Reset H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 1 to 3 OR status H'00000007 (7): Heater alarm H'00000008 (8): Standby | |
| C3 (83) | 0077 | SV Status Display Function | H'00000000 to H'00000008 (0 to 8) * Same as for PV Status Display Function | |
| C3 (83) | 0078 | Control Output 1 ON/OFF Count Alarm Set Value | H'00000000 to H'0000270F (0 to 9999) | |
| C3 (83) | 0079 | Control Output 2 ON/OFF Count Alarm Set Value | H'00000000 to H'0000270F (0 to 9999) | |
| 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 | Advanced function setting |
| C3 (83) | 0084 | Program Time Unit | H'00000000 (0): Hours, minutes H'00000001 (1): Minutes, seconds | Initial setting |
| C3 (83) | 0085 | Time Setting/Gradient Setting | H'00000000 (0): Time setting H'00000001 (1): Gradient setting | |
| C3 (83) | 0086 | Gradient Time Setting Unit | H'00000000 (0): Minutes H'00000001 (1): Hours | |
| C3 (83) | 0087 | Reset Operation | H'00000000 (0): Stop control H'00000001 (1): Fixed SP operation | |
| C3 (83) | 0088 | Startup Operation | H'00000000 (0): Continue control at final SP H'00000001 (1): Reset H'00000002 (2): Run H'00000003 (3): Manual (See note 1.) | |
| C3 (83) | 0089 | Operation End Operation | H'00000000 (0): Reset H'00000001 (1): Continue control at final SP H'00000002 (2): Fixed SP mode (See note 2.) | |
| C3 (83) | 008A | PV Start | H'00000000 (0): SP-priority SP start H'00000001 (1): Slope-priority PV start | |
| C3 (83) | 008B | Program End ON Time | H'00000000 to H'00000064 (0.0 to 10.0) H'FFFFFFF(ON) | Advanced function setting |
| C3 (83) | 008C | Standby Time Unit | H'00000000 (0): Hours, minutes H'00000001 (1): Days, hours | |
| C3 (83) | 008D | Program SP Shift Value Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| C3 (83) | 008E | RSP Broken-line Correction Display Addition | H'00000000 (0): OFF H'00000001 (1): ON | |

Note 1: Selection is not possible when ON/OFF control is set.

Note 2: Selection is not possible if the Reset Operation parameter is set to fixed SP operation.

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--|--|-----------------|
| C4 (84) | 0000 | Program Selection | H'00000000 to H'00000007 (0 to 7) | Program setting |
| C4 (84) | 0001 | No. of Segments Used (See note 1.) | H'00000001 to H'00000020 (32) | |
| C4 (84) | 0002 | Segment Selection (See note 1.) | H'00000000 to H'0000001F (31) | |
| C4 (84) | 0003 | Segment Type (See note 2.) | H'00000000 (0): Ramp H'00000001 (1): Soak H'00000002 (2): Step | |
| C4 (84) | 0004 | Segment SP (See note 2.) | SP lower limit to SP upper limit | |
| C4 (84) | 0005 | Segment Slope (See note 2.) | H'00000000 to H'00007E90 (0 to 32400) | |
| C4 (84) | 0006 | Segment Time (See note 2.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| C4 (84) | 0007 | PID Set No. (See note 1.) | H'00000000 to H'00000008 (0 to 8) (0): Automatic Selection | |
| C4 (84) | 0008 | Alarm Value 1 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 0009 | Alarm Upper Limit 1 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 000A | Alarm Lower Limit 1 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 000B | Alarm Value 2 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 000C | Alarm Upper Limit 2 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 000D | Alarm Lower Limit 2 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 000E | Alarm Value 3 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 000F | Alarm Upper Limit 3 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 0010 | Alarm Lower Limit 3 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| C4 (84) | 0011 | Program Repetitions (See note 1.) | '00000000 to '0000270F (0 to 9999) | |
| C4 (84) | 0012 | Program Link Destination No. (See note 1.) | H'FFFFFFF(-1): No link H'00000000 to H'00000007 (0 to 7) | |
| C4 (84) | 0013 | Time Signal 1 Set Segment (See note 1.) | H'00000000 (0) to No. of segments used -1 | |
| C4 (84) | 0014 | Time Signal 1 ON Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| C4 (84) | 0015 | Time Signal 1 OFF Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| C4 (84) | 0016 | Time Signal 2 Set Segment (See note 1.) | H'00000000 (0) to No. of segments used -1 | |
| C4 (84) | 0017 | Time Signal 2 ON Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| C4 (84) | 0018 | Time Signal 2 OFF Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |

Note 1: The set values for the program specified in the Program Selection parameter are accessed for the following parameters: No. of Segments Used, Segment Selection, PID Set No., Alarm Values 1 to 3, Alarm Upper Limits 1 to 3, Alarm Lower Limits 1 to 3, Program Repetitions, Program Link Destination No., Time Signal 1 and 2 Set Segments, Time Signal 1 and 2 ON Times, and Time Signal 1 and 2 OFF Times. Check the set value of the Program Selection parameter before accessing these parameters.

Note 2: The set values for the program specified in the Program Selection parameter and the section specified in the Segment Selection parameter are accessed for the following parameters: Segment Type, Segment SP, Segment Slope, and Segment Time. Check the set values of the Program Selection parameter and the Segment Selection parameter before accessing these parameters.

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|---|---|-------------|
| C5 (85) | 0000 | PID 1 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | PID setting |
| C5 (85) | 0001 | PID 1 Integral Time | Standard, heating/cooling, position proportional (closed): H'00000000 to H'00007E90 (0.0 to 3240.0) Position proportional (floating): H'00000001 to H'00007E90 (0.1 to 3240.0) | |
| C5 (85) | 0002 | PID 1 Derivative Time | H'00000000 to H'00007E90 (0.0 to 3240.0) | |
| C5 (85) | 0003 | PID 1 MV Upper Limit | Standard: MV lower limit + 0.1 to H'0000041A (MV lower limit + 0.1 to 105.0) Heating/cooling: H'00000000 to H'0000041A (0.0 to 105.0) Position proportional (closed): MV lower limit +0.1 to H'0000041A (MV lower limit + 0.1 to 105.0) | |
| C5 (85) | 0004 | PID 1 MV Lower Limit | Standard: H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) Heating/cooling: H'FFFFFFB6 to H'00000000 (-105.0 to 0.0) Position proportional (closed): H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) | |
| C5 (85) | 0005 | PID 1 Automatic Selection Range Upper Limit | Temperature: H'FFFFFFB1E1 to H'00007E90 (-19999 to 32400) Analog: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) | |
| C5 (85) | 0006 | PID 1 Cooling Coefficient | H'00000001 to H'0000270F (0.01 to 99.99) | |
| C5 (85) | 0007 | PID 1 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0010 | PID 2 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0017 | PID2 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0020 | PID3 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0027 | PID3 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0030 | PID4 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0037 | PID4 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0040 | PID5 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0047 | PID5 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0050 | PID6 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0057 | PID6 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0060 | PID7 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0067 | PID7 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| C5 (85) | 0070 | PID8 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| C5 (85) | 0077 | PID8 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--|--|-----------------|
| DA (9A) | 0000 | Program 0 No. of Segments Used | H'00000001 to H'00000020 (1 to 32) | Program setting |
| DA (9A) | 0001 | Program 0 PID Set No. | H'00000000 to H'00000008 (0 to 8) (0): Automatic Selection | |
| DA (9A) | 0002 | Program 0 Alarm Value 1 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0003 | Program 0 Alarm Upper Limit 1 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0004 | Program 0 Alarm Lower Limit 1 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0005 | Program 0 Alarm Value 2 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0006 | Program 0 Alarm Upper Limit 2 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0007 | Program 0 Alarm Lower Limit 2 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0008 | Program 0 Alarm Value 3 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 0009 | Program 0 Alarm Upper Limit 3 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 000A | Program 0 Alarm Lower Limit 3 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| DA (9A) | 000B | Program 0 Program Repetitions | H'00000000 to H'0000270F (0 to 9999) | |
| DA (9A) | 000C | Program 0 Program Link Destination No. | H'FFFFFFFF(-1): No link H'00000000 to H'00000007 (0 to 7) | |
| DA (9A) | 000D | Program 0 Time Signal 1 Set Segment | H'00000000 (0) to No. of segments used -1 | |
| DA (9A) | 000E | Program 0 Time Signal 1 ON Time | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| DA (9A) | 000F | Program 0 Time Signal 1 OFF Time | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| DA (9A) | 0010 | Program 0 Time Signal 2 Set Segment | H'00000000 (0) to No. of segments used -1 | |
| DA (9A) | 0011 | Program 0 Time Signal 2 ON Time | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| DA (9A) | 0012 | Program 0 Time Signal 2 OFF Time | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| DA (9A) | 0013 | Program 0 Segment 0 Type | H'00000000 (0): Ramp H'00000001 (1): Soak H'00000002 (2): Step | |
| DA (9A) | 0014 | Program 0 Segment 0 SP | SP lower limit to SP upper limit | |
| DA (9A) | 0015 | Program 0 Segment 0 Slope | H'00000000 to H'00007E90 (0 to 32400) | |
| DA (9A) | 0016 | Program 0 Segment 0 Time | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| DA (9A) | 0017 | Program 0 Segment 1 Type | Same as for segment 0. | |
| DA (9A) | | to | | |
| DA (9A) | 001B | Program 0 Segment 2 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 001F | Program 0 Segment 3 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0023 | Program 0 Segment 4 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0027 | Program 0 Segment 5 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 002B | Program 0 Segment 6 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 002F | Program 0 Segment 7 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0033 | Program 0 Segment 8 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0037 | Program 0 Segment 9 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 003B | Program 0 Segment 10 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 003F | Program 0 Segment 11 Type | | |
| DA (9A) | | to | | |

SECTION 3 Communications Data for CompoWay/F

Com Data for CompoWay/F

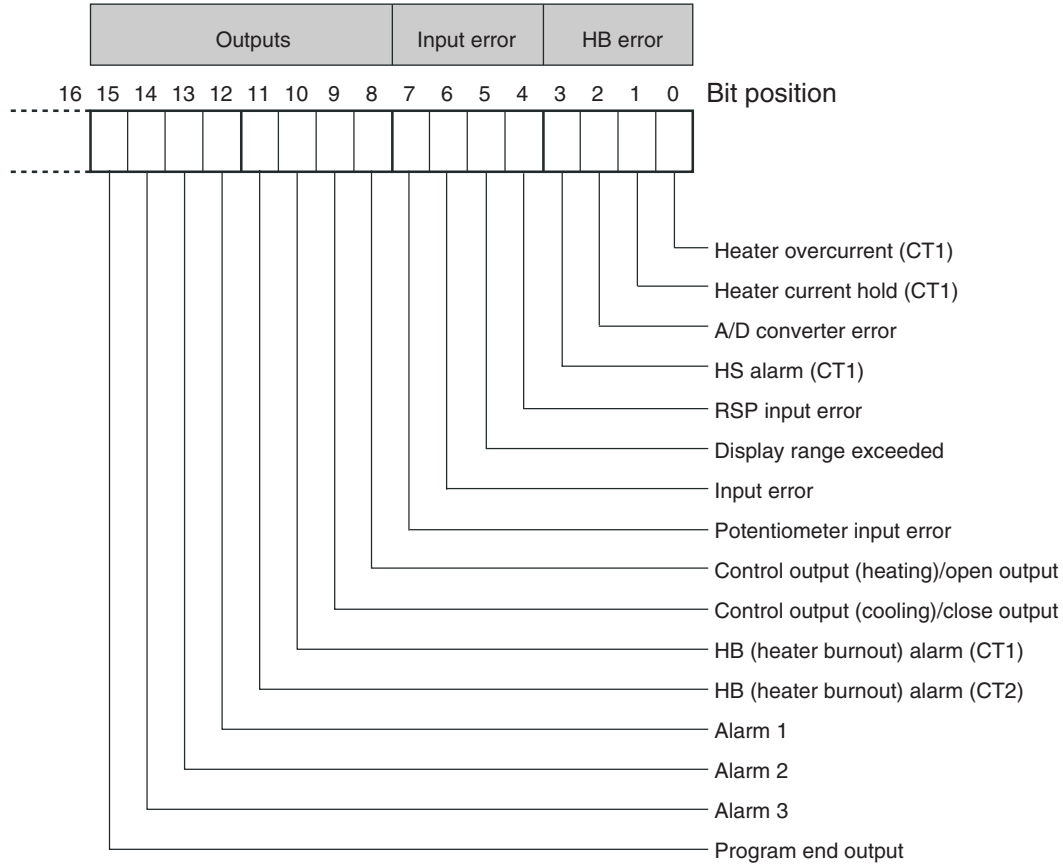
| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--------------------------------|-------------------------|-------|
| DA (9A) | 0043 | Program 0 Segment 12 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0047 | Program 0 Segment 13 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 004B | Program 0 Segment 14 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 004F | Program 0 Segment 15 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0053 | Program 0 Segment 16 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0057 | Program 0 Segment 17 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 005B | Program 0 Segment 18 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 005F | Program 0 Segment 19 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0063 | Program 0 Segment 20 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0067 | Program 0 Segment 21 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 006B | Program 0 Segment 22 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 006F | Program 0 Segment 23 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0073 | Program 0 Segment 24 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0077 | Program 0 Segment 25 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 007B | Program 0 Segment 26 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 007F | Program 0 Segment 27 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0083 | Program 0 Segment 28 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0087 | Program 0 Segment 29 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 008B | Program 0 Segment 30 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 008F | Program 0 Segment 31 Type | | |
| DA (9A) | | to | | |
| DA (9A) | 0100 | Program 1 No. of Segments Used | Same as for program 0. | |
| DA (9A) | | to | | |
| DA (9A) | 0200 | Program 2 No. of Segments Used | | |
| DA (9A) | | to | | |
| DA (9A) | 0300 | Program 3 No. of Segments Used | | |
| DA (9A) | | to | | |
| DA (9A) | 0400 | Program 4 No. of Segments Used | | |
| DA (9A) | | to | | |
| DA (9A) | 0500 | Program 5 No. of Segments Used | | |
| DA (9A) | | to | | |

| Variable type | Address | Parameter name | Setting (monitor) value | Level |
|---------------|---------|--------------------------------|-------------------------|-------|
| DA (9A) | 0600 | Program 6 No. of Segments Used | | |
| DA (9A) | | to | | |
| DA (9A) | 0700 | Program 7 No. of Segments Used | | |
| DA (9A) | | to | | |

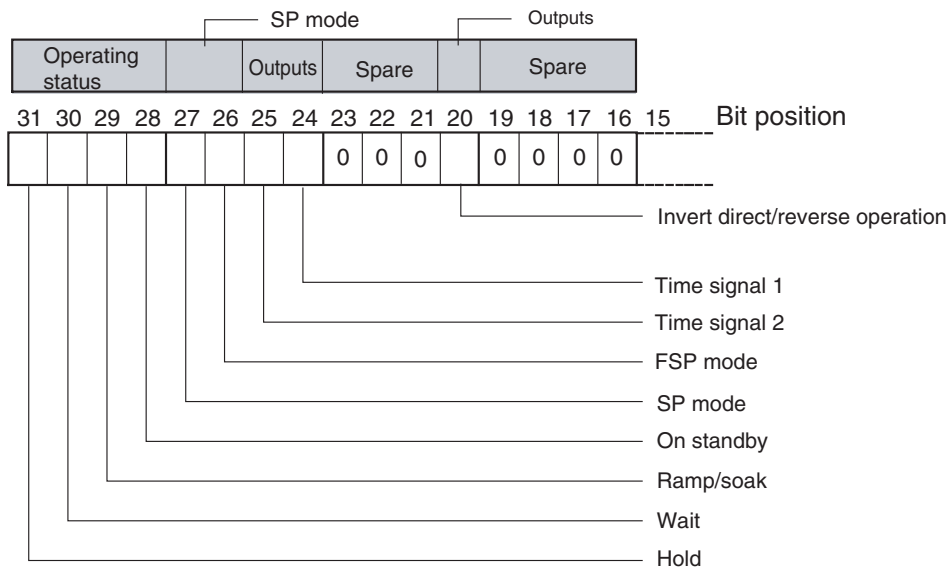
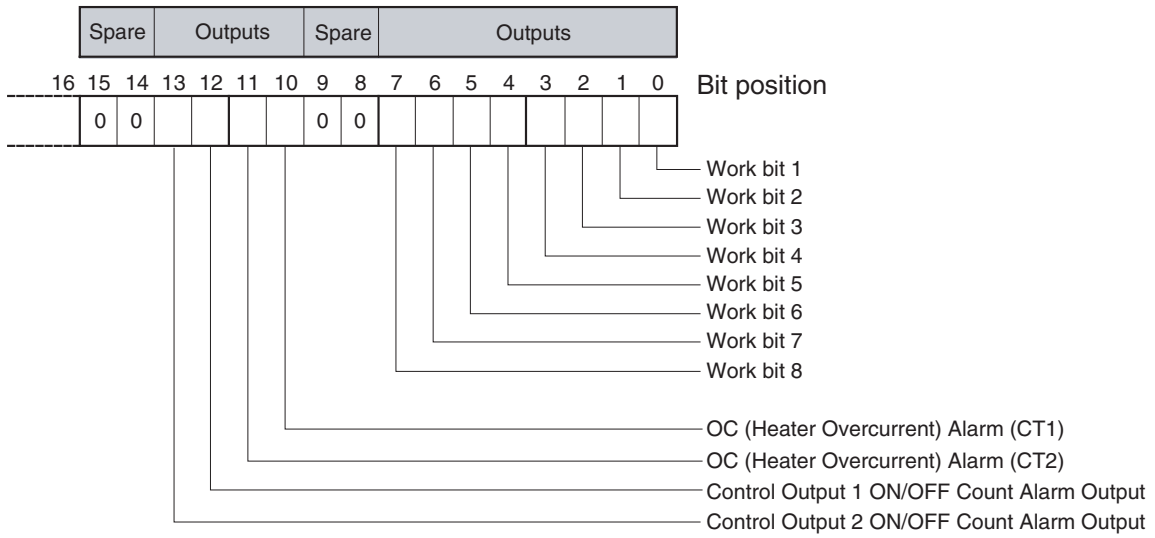
3.2 Status and Status 2

The figure below shows the structure of the status data.

■ Status Structure



■ Status 2 Structure



Com Data for CompoWay/F

■ Status Details

| Bit position | Status | Bit Description | | |
|------------------------|--------------------|---|---------------------------|---------------------------|
| | | 0 | 1 | |
| Status (lower word) | 0 | Heater overcurrent (CT1) | Not generated | Generated |
| | 1 | Heater current hold (CT1) (See note 1.) | Update | Hold |
| | 2 | A/D converter error | Not generated | Generated |
| | 3 | HS alarm (CT1) | OFF | ON |
| | 4 | RSP input error | Not generated | Generated |
| | 5 | Display range exceeded | Not generated | Generated |
| | 6 | Input error | Not generated | Generated |
| | 7 | Potentiometer input error | Not generated | Generated |
| | 8 | Control output (heating)/open output | OFF | ON |
| | 9 | Control output (cooling)/close output | 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/Reset | Run | Reset |
| | 25 | Communications writing | OFF (disabled) | ON (enabled) |
| | 26 | Auto/manual switch | Automatic mode | Manual mode |
| | 27 | Spare | OFF | --- |
| | 28 | Heater overcurrent (CT2) | Not generated | Generated |
| | 29 | Heater current hold (CT2) (See note 1.) | Update | Hold |
| | 30 | Spare | OFF | --- |
| | 31 | HS alarm (CT2) | OFF | ON |

Note 1: When the control output ON time is less than 100 ms, the bit is set to “1” and the heater current is held at the last current value.

Note 2: “Spare” bits are always OFF.

Note 3: 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
- Potentiometer input error: Last value held
- HB and HS outputs: Cleared
- Program end output: Cleared
- Current hold: Last value held
- Display range exceeded: Last value held
- RSP input error: Last value held
- Heating output, cooling output, open output, close output: Cleared
- Alarm outputs: Cleared

■ 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 | OC (Heater Overcurrent) Alarm (CT1) | OFF | ON |
| | 11 | OC (Heater Overcurrent) Alarm (CT2) | OFF | ON |
| | 12 | Control Output 1 ON/OFF Count Alarm Output | OFF | ON |
| | 13 | Control Output 2 ON/OFF Count Alarm Output | OFF | ON |
| | 14 | Spare | OFF | |
| 15 | Spare | OFF | --- | |
| Status (upper word) | 16 | Spare | OFF | --- |
| | 17 | Spare | OFF | --- |
| | 18 | Spare | OFF | --- |
| | 19 | Spare | OFF | --- |
| | 20 | Invert direct/reverse operation | Not Invert | Invert |
| | 21 | Spare | OFF | --- |
| | 22 | Spare | OFF | --- |
| | 23 | Spare | OFF | --- |
| | 24 | Time signal 1 | OFF | ON |
| | 25 | Time signal 2 | OFF | ON |
| | 26 | FSP mode (See note 1.) | OFF (PSP/RSP) | ON (FSP) |
| | 27 | SP mode (See note 1.) | PSP | RSP |
| | 28 | On standby | OFF | On standby |
| | 29 | Ramp/soak | Soak | Ramp |
| | 30 | Wait | OFF | Waiting |
| | 31 | Hold | OFF | Holding |

Note 1: Bit 27 (SP mode) is enabled when bit 26 (FSP mode) is 1 (ON: FSP).

Note 2: "Spare" bits are always OFF.

Note 3: When read in setup area 1, the status of the bits will be as follows:

- Overcurrent Output: Cleared
- Control Output 1 ON/OFF Count Alarm: Cleared
- Control Output 2 ON/OFF Count Alarm: Cleared
- Work bits 1 to 8: Cleared
- Time signal 1 to 2: Last value held
- FSP mode: Last value held
- SP mode: Last value held
- On standby: Last value held
- Ramp/soak: Last value held
- Wait: Last value held
- Hold: Last value held

SECTION 4

Modbus Communications Procedure

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

| | | |
|-----|---|------|
| 4.1 | Data Format..... | 4-2 |
| | Command Frame..... | 4-2 |
| | CRC-16 Calculation Example..... | 4-3 |
| | Response Frame | 4-4 |
| | Normal Response Frame | 4-4 |
| | Error Response Frame..... | 4-4 |
| | Error Codes | 4-5 |
| | No Response..... | 4-5 |
| 4.2 | Function List | 4-6 |
| 4.3 | Variable Area | 4-7 |
| | Addresses | 4-7 |
| | Number of Elements..... | 4-8 |
| | Set Values | 4-8 |
| 4.4 | Detailed Description of the Services..... | 4-9 |
| | Variable Read, Multiple | 4-9 |
| | Variable Write, Multiple..... | 4-11 |
| | Variable Write, Single/Operation Command..... | 4-14 |
| | Echoback Test..... | 4-21 |

4.1 Data Format

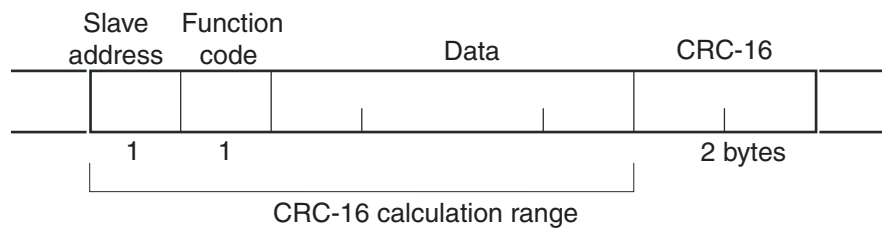
The data format complies with the Modbus (RTU) communications protocol, so commands from the host and responses from the E5CN/AN/EN-HT are contained in data blocks called frames.

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.

■ 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 | Cyclical 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. |

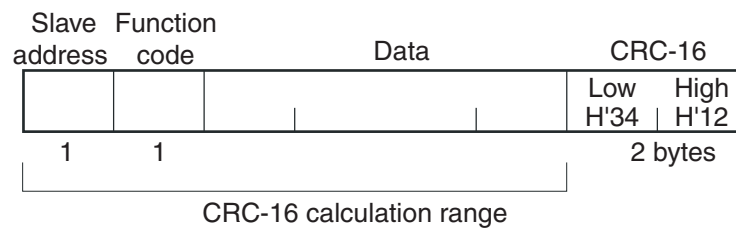
● CRC-16 Calculation Example

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.

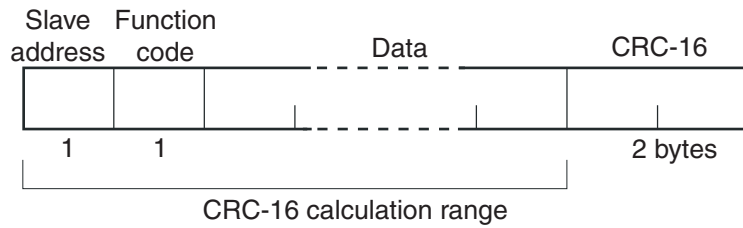
Example of Appending the Calculation Result

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

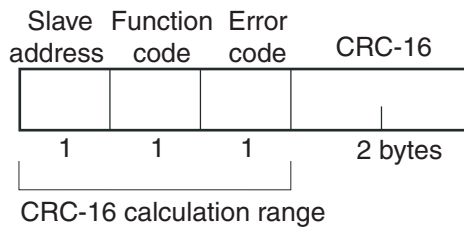


■ Response Frame

● 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 | Cyclical 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. |

■ 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 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

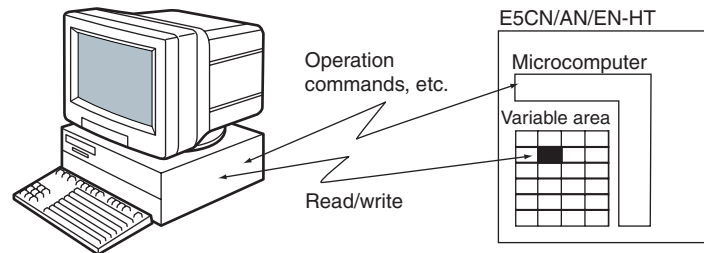
| Function code | Name | Process |
|---------------|---|--|
| 03 (H'03) | Read variable (multiple) | This function reads from the variable area. It is possible to read two or more consecutive variables. |
| 16 (H'10) | Write variable (multiple) | This function writes to the variable area. It is possible 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 E5CN/AN/EN-HT 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.

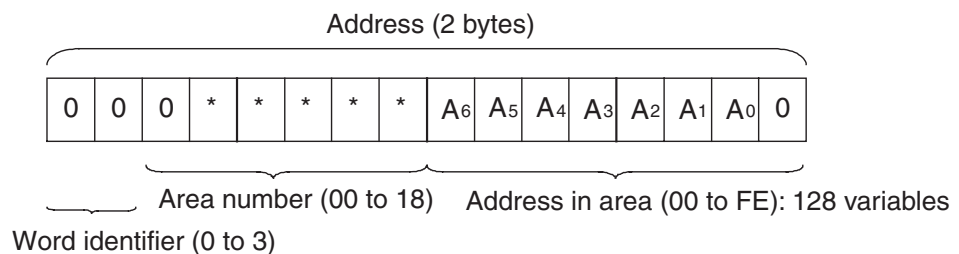


When accessing the variable area, the position of a variable in the variable area is specified with a word identifier, area number, and address in the area.

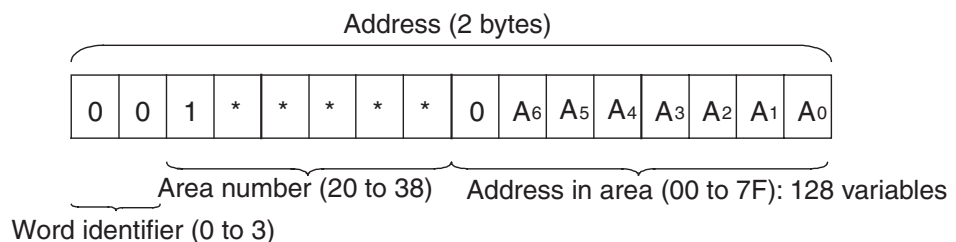
● Addresses

An address is appended to each of the variable types. Express addresses in 2-byte hexadecimal and append them for the specified access size. Each address is composed of a word identifier, area number, and address in the area.

• Four-byte Mode



• Two-byte Mode



◆ Modbus Addresses Corresponding to CompoWay/F Setup Areas 0 and 1

Setup area 0 and setup area 1 do not correspond directly to Modbus addresses, but the following areas have a rough correspondence with one exception.

* Partial Exception to Modbus Address Correspondence

| Setup area | Modbus addresses | |
|--------------|--|--|
| | Area number | Address range |
| Setup area 0 | 00 to 0B, 20 to 2B, 15, 18, 35, and 38 | 0000 to 0BFE, 2000 to 2B7F, 1500 to 15FE, 1800 to 1830, 3500 to 357F, and 3800 to 3818 |
| Setup area 1 | 0C to 13 and 2C to 33 | 0C00 to 136C and 2C00 to 3336 |

The Hysteresis (Heating), Hysteresis (Cooling), Control Period (Heating), and Control Period (Cooling) parameters are assigned to consecutive addresses, but the control period parameters are setup area 1 parameters. For this reason, an operation error will occur when writing the control period (heating or cooling) from the setup area 0 side, e.g., from the operation level.

● 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.

For example, when the number of elements is "0010," this specifies eight items of data (H'10) from the address.

- **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'0000041A

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 E5CN/AN/EN-HT's process value is read in 4-byte mode when the process value is 105.0, the read value will be H'0000041A (105.0 → 1050 → H'0000041A).

However, when reading or writing time data in hh.mm, mm.ss, or dd.hh, BCD data is used (the same format as the display).

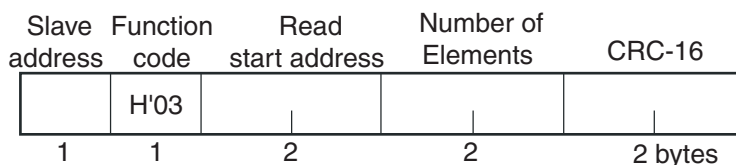
Example: The data is H'00009959 for a display of 99.59.

4.4 Detailed Description of the Services

Variable Read, Multiple

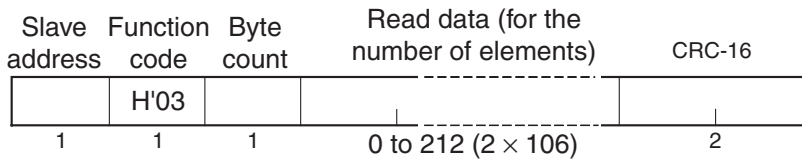
To read from the variable area, set the required data in the command frame, as shown in the following diagram.

Command Frame



| Name | Description |
|--------------------|---|
| Slave address | Specify the E5CN/AN/EN-HT'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. See <i>SECTION 5 Communications Data for Modbus</i> for details on addresses. |
| Number of elements | <p>Four-byte Mode</p> <p>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>Two-byte Mode</p> <p>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, see <i>CRC-16 Calculation Example</i> in <i>4.1 Data Format</i> on page 5-3. |

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. |
| Number of elements | 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, see <i>CRC-16 Calculation Example</i> in 4.1 Data Format on page 5-3. |

Response Code

| Function code | Error code | Error name | Cause |
|---------------|------------|------------------------|--|
| H'83 | H'02 | Variable address error | The read start variable address is incorrect. <ul style="list-style-type: none"> The variable area number 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 Four-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 Two-byte Mode

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

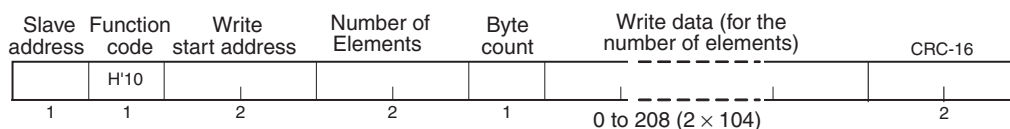
Command: 01 03 00 00 00 01 8F CA (CRC-16)

Response: 01 03 02 03 E8 B8 FA (CRC-16)

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 E5CN/AN/EN-HT'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. See <i>SECTION 5 Communications Data for Modbus</i> for details on addresses. |
| Number of elements | <p>Four-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).</p> <p>When H'0068 is set, 52 items of setting data can be read.</p> <p>Example: When writing 2 items of setting data, set the number of elements to H'0004.</p> |
| | <p>Two-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).</p> <p>When H'0068 is set, 104 items of setting data can be read.</p> <p>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, see <i>CRC-16 Calculation Example</i> in <i>4.1 Data Format</i> on page 5-3. |

Response Frame

| Slave address | Function code | Write start address | Number of Elements | CRC-16 |
|---------------|---------------|---------------------|--------------------|---------|
| | H'10 | | | |
| 1 | 1 | 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, see <i>CRC-16 Calculation Example</i> in 4.1 Data Format on page 5-3. |

Response Code

| Function code | Error code | Error name | Cause |
|---------------|------------|------------------------|--|
| H'90 | H'02 | Variable address error | The write start variable address is incorrect. <ul style="list-style-type: none"> The variable area number 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 | The Controller cannot write the data in its present operating status. 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 in progress The program number was written during operation. |
| 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'1812; Write data: H'000003E8 (when 1000)

Alarm Value Lower Limit 1

- Address: H'1814; Write data: H'FFFFFFC18 (when -1000)

Command: 01 10 18 12 00 04 08 00 00 03 E8 FF FF FC 18 8E 9C(CRC-16)

Response: 01 10 18 12 00 04 67 6F(CRC-16)

Two-byte Mode

Alarm Value Upper Limit 1

- Address: H'3809; Write data: H'03E8 (when 1000)

Alarm Value Lower Limit 1

- Address: H'380A; Write data: H' FC18 (when –1000)

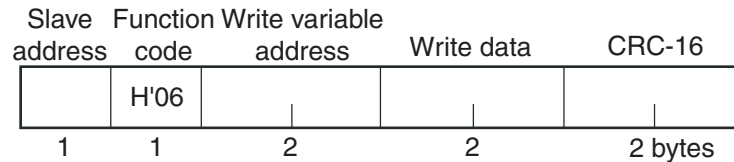
Command: 01 10 38 09 00 02 04 03 E8 FC 18 C1 72 (CRC-16)

Response: 01 10 38 09 00 02 9C AA (CRC-16)

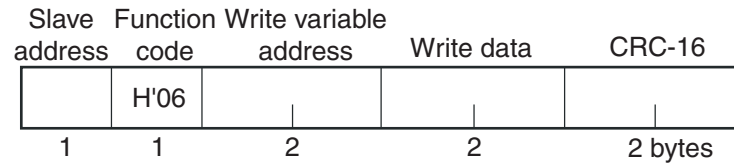
■ Variable Write, Single/Operation Command

This function performs operations such as writing to the variable area (single) and operation commands (Communications Writing, Run/Reset, 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, SP Mode, Invert Direct/Reverse Operation, Infrared Communications Use, Hold, and Advance). Writing is enabled in only the Two-byte Mode.

Command Frame



Response Frame



(1) Write variable address

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

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/Reset | 00: Run 01: Reset |
| 03 | AT execute/cancel | 00: AT cancel 01: 100% AT execute 02: 40% AT execute |
| 04 | Write mode | 00: Backup mode 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 |

| Command code | Command content | Related information |
|--------------|---------------------------------|---|
| 09 | Auto/manual switch | 00: Automatic mode 01: Manual mode |
| 0B | Parameter initialization | 00: Initialize to defaults |
| 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: OC alarm latch cancel 0F: All alarm latch cancel |
| 0D | SP mode | 00: Program SP mode 01: Remote SP mode 02: Fixed SP mode |
| 0E | Invert direct/reverse operation | 00: Not invert 01: Invert |
| 12 | Infrared communications use | 00: OFF 01: ON |
| 13 | Hold | 00: Clear hold 01: Hold |
| 14 | Advance | 00 |

(2) 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. The variable area number (2-byte data) is wrong, or the address is not 0000 or FFFF. |
| | 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). Writing was attempted from setup area 0 to setup area 1. AT execution was in progress. Processing could not be performed. For details, see (4) <i>Operation Commands and Precautions</i> below. |

Note: For details on variable writing, refer to *Variable Write, Multiple* on page 4-11. For details on AT, refer to *E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169).

(3) Example Command and Response

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

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

•Address: H'0000 (fixed)

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

Command: 01 06 00 00 01 01 49 9A(CRC-16)

Response: 01 06 00 00 01 01 49 9A(CRC-16)

(4) 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 communications writing enable/disable is set for an event input.

● Run/Reset

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.

● 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/Reset parameter is set to Reset (and the reset operation is set to stop control).
- During standby status (when the reset operation is set to stop control).
- In Manual Mode or when executing from 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.
- When 100% AT execute/cancel or 40% AT execute/cancel is assigned to an event input.

In addition, a variable data error will occur if 40% AT is specified during heating and cooling control or during position-proportional floating control.

Note: If the same type of AT execution is specified during AT execution (e.g., if 100% AT execution 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 “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 a parameter in the operation, adjustment, program setting, or PID setting level (excluding read-only parameters) is written using communications. |
| RAM write mode | The data is not written to non-volatile memory when a parameter in the operation, adjustment, program setting, or PID setting level (excluding read-only parameters) is written using communications. Parameters can be changed by using key operations on the front panel of the Controller. |

- When you switch from RAM Write Mode to Backup Mode, the parameters in the operation, adjustment, program setting, and PID setting levels (excluding read-only parameters) are written to non-volatile memory.

- RAM write mode is enabled only when communications are enabled in the Communications Writing parameter (i.e., set to ON). Therefore, if the Communications Writing parameter is changed to OFF (disabled), the parameter settings from the operation, adjustment, program setting, and PID setting levels (excluding read-only parameters) are written to non-volatile memory even if the RAM write mode is set.

- RAM Data

This command writes the parameters in the operation, adjustment, program setting, and PID setting 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” 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.

- 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 auto/manual switching is disabled (not displayed)

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 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).

◆ 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.

| Related information | Explanation (initialization values) |
|---------------------|---|
| 00 | Default set values (See <i>SECTION 3 Communications Data for CompoWay/F</i> for details.) (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.

● SP Mode

Select program SP mode, remote SP mode, or fixed SP mode with the related information setting. 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 SP Mode parameter is disabled (not displayed at the Controller)

● 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.

● Infrared Communications Use

Select ON or OFF to enable or disable using infrared communications with the related information setting. The setting can be accepted in both setup area 0 and setup area 1.

● Hold

Turn the hold operation ON or OFF with the related information setting. The setting can be made only in setup area 0.

An operation error will occur in the following situations.

- When AT is being executed
- During standby status
- During a reset or when continuing control at the end of operation
- When Hold/Clear Hold is assigned to an event input

● Advance

This operation command performs the advance operation. The setting can be made only in setup area 0.

An operation error will occur in the following situations.

- When AT is being executed
- During standby status
- During a reset or when continuing control at the end of operation

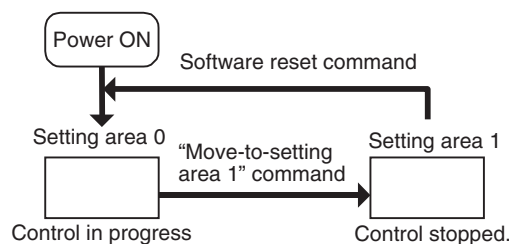
● Setting Areas

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/Reset status.

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

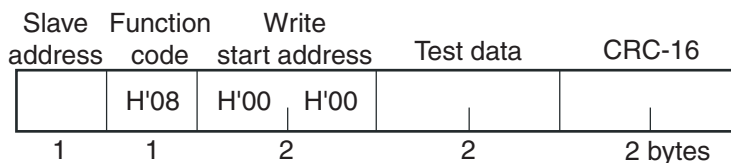
In setting area 1, control operation is stopped. In this state, you can perform operations that are not allowed in setting area 0. These operations include writing data at the initial setting level.

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.

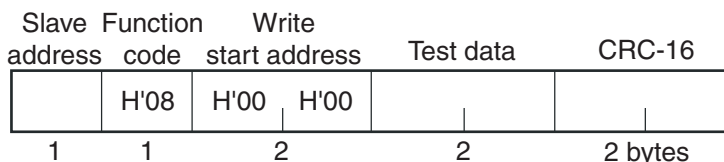


■ Echoback Test

Command Frame



Response Frame



* 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 | The data following the function code was not the fixed data (H'00, H'00). |
| 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)

SECTION 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 and Status 2 | 5-16 |
| | Status Structure | 5-16 |
| | Status 2 Structure | 5-18 |
| | Status Details | 5-19 |
| | Status 2 Details | 5-20 |

5.1 Variable Area (Setting Range) List

- Four-byte Mode

One element uses 2 bytes of data (H'0000 to H'FFFF), 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 “Set (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 | Process Value | Temperature: Use the specified range for each sensor. Analog: Scaling lower limit -5% FS to Scaling upper limit +5% FS | Operation |
| 0002 | 2001 | Status (See notes 1 and 2.) | See the 5.2 <i>Status and Status 2</i> for details. | None |
| 0004 | 2002 | Present SP | SP lower limit to SP upper limit | Operation |
| 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/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) | |
| 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 | Present SP | SP lower limit to SP upper limit | |
| 0408 | 2404 | Program No. Monitor | H'00000000 to H'00000007 (0 to 7) | |
| 040A | 2405 | PID Set No. Monitor | H'00000001 to H'00000008 (1 to 8) | |
| 040C | 2406 | Status (See notes 1 and 2.) | See the 5.2 <i>Status and Status 2</i> for details. | |
| 040E | 2407 | Status (See note 3.) | See the 5.2 <i>Status and Status 2</i> for details. | |
| 0410 | 2408 | Status 2 (See note 2.) | See the 5.2 <i>Status and Status 2</i> for details. | |
| 0412 | 2409 | Status 2 (See note 3.) | See the 5.2 <i>Status and Status 2</i> for details. | |
| 0420 | 2410 | Decimal Point Monitor | H'00000000 to H'00000003 (0 to 3) | |
| 0422 | 2411 | Control Output 1 ON/OFF Count Monitor | H'00000000 to H'0000270F (0 to 9999) | Advanced function setting |
| 0424 | 2412 | Control Output 2 ON/OFF Count Monitor | H'00000000 to H'0000270F (0 to 9999) | |

Note 1: Not displayed on the Controller display.

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

Note 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) to H'00000005(5) 0: No control 1: Run level (PV allowed, PV/SP allowed, others allowed), program level allowed, adjustment level allowed, PID setting level prohibited 2: Run level (PV allowed, PV/SP allowed, others allowed), program level allowed, adjustment level prohibited, PID setting level prohibited 3: Run level (PV allowed, PV/SP allowed, others allowed), program level prohibited, adjustment level prohibited, PID setting level prohibited 4: Run level (PV allowed, PV/SP allowed, others prohibited), program level prohibited, adjustment level prohibited, PID setting level prohibited 5: Run level (PV allowed, PV/SP prohibited, others prohibited), program level prohibited, adjustment level prohibited, PID setting level prohibited | 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 | |
| 0600 | 2600 | Manual MV | Standard: H'FFFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) Position proportional (Closed and direct setting of position proportional MV ON): H'FFFFFFFCE to H'0000041A (-5.0 to 105.0) | Manual Control |
| 0604 | 2602 | Remote SP Monitor | SP Lower Limit to SP Upper Limit | Operation |
| 0608 | 2604 | Heater Current 1 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| 060A | 2605 | MV Monitor (Heating) | Standard: H'FFFFFFFCE to H'0000041A (-5.0 to 105.0) Heating and cooling: 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) | |
| 060E | 2607 | Valve Opening Monitor | H'FFFFFFF9C to H'0000044C (-10.0 to 110.0) | |
| 0610 | 2608 | Program No. | H'00000000 to H'00000007 (0 to 7) | |
| 0612 | 2609 | Segment No. Monitor | H'00000000 to H'0000001F (0 to 31) | |
| 0614 | 260A | Remaining Standby Time Monitor | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | |
| 0616 | 260B | Elapsed Program Time Monitor | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | |
| 0618 | 260C | Remaining Program Time Monitor | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | None |
| 061A | 260D | Elapsed Segment Time Monitor | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | |
| 061C | 260E | Remaining Segment Time Monitor | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | |
| 061E | 260F | Program Repetitions Monitor | H'00000000 to H'0000270F (0 to 9999) | Operation |
| 0620 | 2610 | SP Mode Setting Monitor | H'00000000 (0): Program SP mode H'00000001 (1): Remote SP mode H'00000002 (2): Fixed SP mode | None |

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-----------------------------------|---|-----------------|
| Four-byte mode | Two-byte mode | | | |
| 0700 | 2700 | Cooling Coefficient (See note 1.) | H'00000001 to H'0000270F (0.01 to 99.99) | Adjustment |
| 0708 | 2704 | Dead Band | Temperature: H'FFFFFFB1E1 to H'00007E90 (-1999.9 to 3240.0) Analog: H'FFFFFF831 to H'0000270F (-19.99 to 99.99) | |
| 070A | 2705 | Manual Reset Value | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| 070C | 2706 | Hysteresis (Heating) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| 070E | 2707 | Hysteresis (Cooling) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| 0710 | 2708 | Control Period (Heating) | H'00000000 (0): 0.5 H'00000001 to H'00000063 (1 to 99) | Initial setting |
| 0712 | 2709 | Control Period (Cooling) | H'00000000 (0): 0.5 H'00000001 to H'00000063 (1 to 99) | |
| 0714 | 270A | Position Proportional Dead Band | H'00000001 to H'00000064 (0.1 to 10.0) | Adjustment |
| 0716 | 270B | Open/Close Hysteresis | H'00000001 to H'000000C8 (0.1 to 20.0) | |
| 071E | 270F | MV at Reset | Standard: H'FFFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) Position proportional (Floating or direct setting of position proportional MV OFF): H'FFFFFFF to H'00000001 (-1 to 1) Position proportional (Closed and direct setting of position proportional MV ON): H'FFFFFFFCE to H'0000041A (-5.0 to 105.0) | Adjustment |

Note 1: The parameter for the currently selected PID set will be accessed. For setup area 1, however, the currently selected PID set is fixed at PID1.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|---|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0722 | 2711 | MV at PV Error | Standard: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) Heating/cooling: H'FFFFFFBE6 to H'0000041A (-105.0 to 105.0) Position proportional (Floating or direct setting of position proportional MV OFF): H'FFFFFFF to H'00000001 (-1 to 1) Position proportional (Closed and direct setting of position proportional MV ON): H'FFFFFFCE to H'0000041A (-5.0 to 105.0) | Adjustment |
| 0726 | 2713 | MV Change Rate Limit | H'00000000 to H'000003E8 (0.0 to 100.0) | |
| 072C | 2716 | Lower Limit Temperature Input Shift Value | H'FFFFB1E1 to H'00007E90 (-199.99 to 324.00) | |
| 0730 | 2718 | Upper Limit Temperature Input Shift Value | H'FFFFB1E1 to H'00007E90 (-199.99 to 324.00) | |
| 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 | Temperature Input Shift | H'FFFFB1E1 to H'00007E90 (-199.99 to 324.00) | Adjustment |
| 0748 | 2724 | Heater Current 2 Value Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| 074A | 2725 | Heater Burnout Detection 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| 074C | 2726 | Leakage Current 2 Monitor | H'00000000 to H'00000226 (0.0 to 55.0) | |
| 074E | 2727 | HS Alarm 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | Adjustment |
| 0754 | 272A | Wait Band | H'00000000 (0): OFF Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | Adjustment |
| 0756 | 272B | Heater Overcurrent Detection 1 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| 0758 | 272C | Heater Overcurrent Detection 2 | H'00000000 to H'000001F4 (0.0 to 50.0) | |
| 075A | 272D | Fixed SP | SP lower limit to SP upper limit | |
| 075C | 272E | Standby Time | H'00000000 to H'00009959 (hours, minutes) H'00000000 to H'00009923 (days, hours) | |
| 075E | 272F | Program SP Shift Value | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0800 | 2800 | Input Digital Filter | H'00000000 to H'0000270F (0.0 to 999.9) | Advanced function setting |
| 0810 | 2808 | Extraction of Square Root Low-cut Point | H'00000000 to H'000003E8 (0.0 to 100.0) | Adjustment |
| 0838 | 281C | RSP 0 before Correction | Remote SP lower limit to remote SP upper limit | |
| 083A | 281D | RSP 1 before Correction | Remote SP lower limit to remote SP upper limit | |
| 083C | 281E | RSP 2 before Correction | Remote SP lower limit to remote SP upper limit | |
| 083E | 281F | RSP 3 before Correction | Remote SP lower limit to remote SP upper limit | |
| 0840 | 2820 | RSP 4 before Correction | Remote SP lower limit to remote SP upper limit | |
| 0842 | 2821 | RSP 5 before Correction | Remote SP lower limit to remote SP upper limit | |
| 0844 | 2822 | RSP 6 before Correction | Remote SP lower limit to remote SP upper limit | |
| 0846 | 2823 | RSP 7 before Correction | Remote SP lower limit to remote SP upper limit | |
| 0848 | 2824 | RSP 8 before Correction | Remote SP lower limit to remote SP upper limit | |
| 084A | 2825 | RSP 9 before Correction | Remote SP lower limit to remote SP upper limit | |
| 084C | 2826 | RSP 10 before Correction | Remote SP lower limit to remote SP upper limit | |
| 084E | 2827 | RSP Broken-line Correction Value 0 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0850 | 2828 | RSP Broken-line Correction Value 1 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0852 | 2829 | RSP Broken-line Correction Value 2 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0854 | 282A | RSP Broken-line Correction Value 3 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0856 | 282B | RSP Broken-line Correction Value 4 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0858 | 282C | RSP Broken-line Correction Value 5 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 085A | 282D | RSP Broken-line Correction Value 6 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 085C | 282E | RSP Broken-line Correction Value 7 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 085E | 282F | RSP Broken-line Correction Value 8 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0860 | 2830 | RSP Broken-line Correction Value 9 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 0862 | 2831 | RSP Broken-line Correction Value 10 | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1800 | 3800 | Program Selection | H'00000000 to H'00000007 (0 to 7) | Program |

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|--|--|------------|
| Four-byte mode | Two-byte mode | | | |
| 1802 | 3801 | No. of Segments Used (See note 1.) | H'00000001 to H'00000020 (32) | Program |
| 1804 | 3802 | Segment Selection (See note 1.) | H'00000000 to H'0000001F (31) | |
| 1806 | 3803 | Segment Type (See note 2.) | H'00000000 (0): Ramp H'00000001 (1): Soak H'00000002 (2): Step | |
| 1808 | 3804 | Segment SP (See note 2.) | SP lower limit to SP upper limit | |
| 180A | 3805 | Segment Slope (See note 2.) | H'00000000 to H'00007E90 (0 to 32400) | |
| 180C | 3806 | Segment Time (See note 2.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| 180E | 3807 | PID Set No. (See note 1.) | H'00000000 to H'00000008 (0 to 8) (0): Automatic Selection | |
| 1810 | 3808 | Alarm Value 1 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1812 | 3809 | Alarm Value Upper Limit 1 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1814 | 380A | Alarm Value Lower Limit 1 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1816 | 380B | Alarm Value 2 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1818 | 380C | Alarm Value Upper Limit 2 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 181A | 380D | Alarm Value Lower Limit 2 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 181C | 380E | Alarm Value 3 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 181E | 380F | Alarm Value Upper Limit 3 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1820 | 3810 | Alarm Value Lower Limit 3 (See note 1.) | H'FFFFB1E1 to H'00007E90 (-19999 to 32400) | |
| 1822 | 3811 | Program Repetitions (See note 1.) | '00000000 to '0000270F (0 to 9999) | |
| 1824 | 3812 | Program Link Destination No. (See note 1.) | H'FFFFFFF(-1): No link H'00000000 to H'00000007 (0 to 7) | |
| 1826 | 3813 | Time Signal 1 Set Segment (See note 1.) | H'00000000 (0) to No. of segments used -1 | |
| 1828 | 3814 | Time Signal 1 ON Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| 182A | 3815 | Time Signal 1 OFF Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| 182C | 3816 | Time Signal 2 Set Segment (See note 1.) | H'00000000 (0) to No. of segments used -1 | |
| 182E | 3817 | Time Signal 2 ON Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| 1830 | 3818 | Time Signal 2 OFF Time (See note 1.) | H'00000000 to H'00009959 (0.00 to 99.59) (hours, minutes) H'00000000 to H'00009959 (0.00 to 99.59) (minutes, seconds) | |
| 0A00 | 2A00 | Proportional Band (See note 3.) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | Adjustment |
| 0A02 | 2A01 | Integral Time (See note 3.) | Standard, heating/cooling, position proportional (closed): H'00000000 to H'00007E90 (0.0 to 3240.0) Position proportional (floating): H'00000001 to H'00007E90 (0.1 to 3240.0) | |
| 0A04 | 2A02 | Derivative Time (See note 3.) | H'00000000 to H'00007E90 (0.0 to 3240.0) | |
| 0A0A | 2A05 | MV Upper Limit (See note 3.) | Standard: MV lower limit +0.1 to H'0000041A (MV lower limit +0.1 to 105.0) Heating/cooling: H'00000000 to H'0000041A (0.0 to 105.0) Position proportional (closed): MV lower limit +0.1 to H'0000041A (MV lower limit +0.1 to 105.0) | |

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

Note 1: The set values for the program specified in the Program Selection parameter are accessed for the following parameters: No. of Segments Used, Segment Selection, PID Set No., Alarm Values 1 to 3, Alarm Upper Limits 1 to 3, Alarm Lower Limits 1 to 3, Program Repetitions, Program Link Destination No., Time Signal 1 and 2 Set Segments, Time Signal 1 and 2 ON Times, and Time Signal 1 and 2 OFF Times. Check the set value of the Program Selection parameter before accessing these parameters.

Note 2: The set values for the program specified in the Program Selection parameter and the section specified in the Segment Selection parameter are accessed for the following parameters: Segment Type, Segment SP, Segment Slope, and Segment Time. Check the set values of the Program Selection parameter and the Segment Selection parameter before accessing these parameters.

Note 3: The parameter for the currently selected PID set will be accessed. For setup area 1, however, the currently selected PID set is fixed at PID1.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|------------------------------|--|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0A0C | 2A06 | MV Lower Limit (See note 1.) | Standard: H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) Heating/cooling: H'FFFFFFBE6 to H'00000000 (-105.0 to 0.0) Position proportional (closed): H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) | Adjustment |
| 0C00 | 2C00 | Input Type (See note.) | H'00000000 (0): Pt (-200.0 to 850.0°C/-300.0 to 1500.0°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 (-200.0 to 1300.0°C/-300.0 to 2300.0°F) H'00000006 (6): K (-20.0 to 500.0°C/0.0 to 900.0°F) H'00000007 (7): J (-100.0 to 850.0°C/-100.0 to 1500.0°F) H'00000008 (8): J (-20.0 to 400.0°C/0.0 to 750.0°F) H'00000009 (9): T (-200.0 to 400.0°C/-300.0 to 700.0°F) H'0000000A (10): T (-199.9 to 400.0°C/-199.9 to 700.0°F) H'0000000B (11): E (-200.0 to 600.0°C/-300.0 to 1100.0°F) H'0000000C (12): L (-100.0 to 850.0°C/-100.0 to 1500.0°F) H'0000000D (13): U (-200.0 to 400.0°C/-300.0 to 700.0°F) H'0000000E (14): U (-199.9 to 400.0°C/-199.9 to 700.0°F) H'0000000F (15): N (-200.0 to 1300.0°C/-300.0 to 2300.0°F) H'00000010 (16): R (0.0 to 1700.0°C/0.0 to 3000.0°F) H'00000011 (17): S (0.0 to 1700.0°C/0.0 to 3000.0°F) H'00000012 (18): B (100.0 to 1800.0°C/300.0 to 3200.0°F) H'00000013 (19): W (0.0 to 2300.0°C/0.0 to 3200.0°F) H'00000014 (20): PLII (0.0 to 1300.0°C/0.0 to 2300.0°F) H'00000015 (21): K (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000016 (22): J (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000017 (23): T (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000018 (24): Pt (-50.00 to 200.00°C/-50.00 to 200.00°F) H'00000019 (25): 4 to 20mA H'0000001A (26): 0 to 20mA H'0000001B (27): 1 to 5V H'0000001C (28): 0 to 5V H'0000001D (29): 0 to 10V | Initial setting |
| 0C02 | 2C01 | Temperature Unit | H'00000000 (0): °C H'00000001 (1): °F | |
| 0C12 | 2C09 | Scaling Lower Limit | H'FFFFFFB1E1 to Scaling upper limit -1 (-19999 to Scaling upper limit -1) | |
| 0C16 | 2C0B | Scaling Upper Limit | Scaling lower limit +1 to H'00007E90 (Scaling lower limit +1 to 32400) | |
| 0C18 | 2C0C | Decimal Point | H'00000000 to 00000003 (0 to 3) | |
| 0C1A | 2C0D | Remote SP Upper Limit | SP lower limit to SP upper limit | Advanced function setting |
| 0C1C | 2C0E | Remote SP Lower Limit | SP lower limit to SP upper limit | |
| 0C1E | 2C0F | PV Decimal Point Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| 0D06 | 2D03 | Linear Current Output | H'00000000 (0): 4 to 20 mA H'00000001 (1): 0 to 20 mA | Initial setting |
| 0D1E | 2D0F | SP Upper Limit | The range of values without decimal point is as follows: Temperature: SP lower limit +1 to Input setting range upper limit Analog: 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 setting range lower limit to SP upper limit -1 Analog: Scaling lower limit to SP upper limit -1 | |

Note: The input type can be selected to match the connected sensor.

Note 1: The parameter for the currently selected PID set will be accessed. For setup area 1, however, the currently selected PID set is fixed at PID1.

SECTION 5 Communications Data for Modbus

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-------------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0D22 | 2D11 | Standard or Heating/Cooling | H'00000000 (0): Standard H'00000001 (1): Heating/cooling | Initial setting |
| 0D24 | 2D12 | Direct/Reverse Operation | H'00000000 (0): Reverse operation H'00000001 (1): Direct operation | |
| 0D26 | 2D13 | Closed/Floating | H'00000000 (0): Floating H'00000001 (1): Closed | |
| 0D28 | 2D14 | PID ON/OFF | H'00000000 (0): ON/OFF H'00000001 (1): 2 PID control | |
| 0D2C | 2D16 | Program Time Unit | H'00000000 (0): Hours, minutes H'00000001 (1): Minutes, seconds | |
| 0D2E | 2D17 | Time Setting/Gradient Setting | H'00000000 (0): Time setting H'00000001 (1): Gradient setting | |
| 0D30 | 2D18 | Gradient Time Setting Unit | H'00000000 (0): Minutes H'00000001 (1): Hours | |
| 0D32 | 2D19 | PV Start | H'00000000 (0): SP-priority SP start H'00000001 (1): Slope-priority PV start | |
| 0D34 | 2D1A | Reset Operation | H'00000000 (0): Stop control H'00000001 (1): Fixed SP operation | |
| 0E00 | 2E00 | Transfer Output Type | H'00000000 (0): OFF H'00000001 (1): Present SP H'00000002 (2): PV H'00000003 (3): MV (heating) H'00000004 (4): MV (cooling) H'00000005 (5): Valve opening | |
| 0E0C | 2E06 | Control Output 1 Assignment | When control output 1 is a linear output: H'00000000 (0): Not assigned. H'00000001 (1): Control output (heating) H'00000002 (2): Control output (cooling) When control output 1 is an ON/OFF output: 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): Program end output H'00000007 (7): Control output ON/OFF count alarm (See note 1.) H'00000008 (8): Stage output H'00000009 (9): Run output H'0000000A (10): Time signal 1 output H'0000000B (11): Time signal 2 output H'0000000C (12): Work bit 1 H'0000000D (13): Work bit 2 H'0000000E (14): Work bit 3 H'0000000F (15): Work bit 4 H'00000010 (16): Work bit 5 H'00000011 (17): Work bit 6 H'00000012 (18): Work bit 7 H'00000013 (19): Work bit 8 | Advanced function setting |
| 0E0E | 2E07 | Control Output 2 Assignment | When control output 2 is a linear output: H'00000000 to H'00000002 (0 to 2) (Same as for Control Output 1 Assignment.) When control output 2 is an ON/OFF output: H'00000000 to H'00000013 (0 to 19) (Same as for Control Output 1 Assignment.) | |

Note 1: The output turns ON when the status of either the Control Output 1 ON/OFF Count Alarm or the Control Output 2 ON/OFF Count Alarm turns ON.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|-------------------------------|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0E18 | 2E0C | Event Input Assignment 3 | H'00000000 to H'00000015 (0 to 21) H'00000000 (0): None H'00000001 (1): Run (OFF)/reset (ON) H'00000002 (2): Run (ON)/reset (OFF) H'00000003 (3): Auto/manual switch H'00000004 (4): Reset H'00000005 (5): Run H'00000006 (6): Hold/clear hold H'00000007 (7): Hold H'00000008 (8): Advance H'00000009 (9): Program No. switch 0 H'0000000A (10): Program No. switch 1 H'0000000B (11): Program No. switch 2 H'0000000C (12): Invert direct/reverse operation H'0000000D (13): Program SP mode/remote SP mode (See note 1.) H'0000000E (14): Remote SP mode/fixed SP mode (See note 1.) H'0000000F (15): Program SP mode/fixed SP mode H'00000010 (16): 100% AT execute/cancel H'00000011 (17): 40% AT execute/cancel H'00000012 (18): Setting change enable/disable H'00000013 (19): Communications writing enable/disable (See note 2.) H'00000014 (20): Latch cancel H'00000015 (21): Wait enable (ON)/disable (OFF) | Initial setting |
| 0E1A | 2E0D | Event Input Assignment 4 | H'00000000 to H'00000015 (0 to 21) * Same as for Event Input Assignment 3. | |
| 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): Program end output H'00000007 (7): Control output ON/OFF count alarm (See note 3.) H'00000008 (8): Stage output H'00000009 (9): Run output H'0000000A (10): Time signal 1 output H'0000000B (11): Time signal 2 output H'0000000C (12): Work bit 1 H'0000000D (13): Work bit 2 H'0000000E (14): Work bit 3 H'0000000F (15): Work bit 4 H'00000010 (16): Work bit 5 H'00000011 (17): Work bit 6 H'00000012 (18): Work bit 7 H'00000013 (19): Work bit 8 | Advanced function setting |
| 0E22 | 2E11 | Auxiliary Output 2 Assignment | H'00000000 to H'00000013 (0 to 19) (Same settings as the Auxiliary Output 1 Assignment) | |
| 0E24 | 2E12 | Auxiliary Output 3 Assignment | H'00000000 to H'0000000F (0 to 15) (Same settings as the Auxiliary Output 1 Assignment) | |
| 0E28 | 2E14 | Transfer Output Upper Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) H'FFFFB1E1 to H'00007E90 (-19999 to 32400) (See note 4.) | |
| 0E2A | 2E15 | Transfer Output Lower Limit | H'FFFFFF831 to H'0000270F (-1999 to 9999) H'FFFFB1E1 to H'00007E90 (-19999 to 32400) (See note 4.) | Initial setting |

Note 1: E5AN/EN-HT only.

Note 2: Only with external communications.

Note 3: The output turns ON when the status of either the Control Output 1 ON/OFF Count Alarm or the Control Output 2 ON/OFF Count Alarm turns ON.

Note 4: The setting (monitor) range depends on the transfer output type setting. (For details, refer to *SECTION 5 Parameter* in *E5CN/AN/EN-HT Digital Controllers Program Type User's Manual* (Cat. No. H169).)

SECTION 5 Communications Data for Modbus

| 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 |
| 0E60 | 2E30 | Travel Time | H'00000001 to H'000003E7 (1 to 999) | |
| 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): RSP absolute value upper limit alarm H'0000000F (15): RSP absolute value lower limit alarm | |
| 0F02 | 2F01 | Alarm 1 Latch | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F04 | 2F02 | Alarm 1 Hysteresis | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | Initial setting |
| 0F06 | 2F03 | Alarm 2 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): No alarm function H'0000000D (13): PV change rate alarm H'0000000E (14): RSP absolute value upper limit alarm H'0000000F (15): RSP absolute value lower limit alarm | |
| 0F08 | 2F04 | Alarm 2 Latch | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F0A | 2F05 | Alarm 2 Hysteresis | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | Initial setting |
| 0F0C | 2F06 | Alarm 3 Type (See note 1.) | Same settings as the alarm 2 type. | |
| 0F0E | 2F07 | Alarm 3 Latch (See note 1.) | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 0F10 | 2F08 | Alarm 3 Hysteresis (See note 1.) | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | 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 | |
| 0F1C | 2F0E | Auxiliary Output 2 Open in Alarm | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | |
| 0F1E | 2F0F | Auxiliary Output 3 Open in Alarm (See note 1.) | H'00000000 (0): Close in alarm H'00000001 (1): Open in alarm | |

Note 1: Not displayed on the Controller display when Alarm 3 is not assigned to the output.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|---------------------------------|--|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 0F22 | 2F11 | Alarm 1 ON delay | H'00000000 to H'000003E7 (0 to 999) | Advanced function setting |
| 0F24 | 2F12 | Alarm 2 ON delay | H'00000000 to H'000003E7 (0 to 999) | |
| 0F26 | 2F13 | Alarm 3 ON delay (See note 1.) | 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 (See note 1.) | H'00000000 to H'000003E7 (0 to 999) | |
| 1000 | 3000 | PV/SP Display Screen Selection | H'00000000 (0): Only PV/SP displayed (no No. 3 display). H'00000001 (1): The PV/SP/Program No. or Segment No., and the PV/SP/MV are displayed in order. H'00000002 (2): The PV/SP/MV and PV/SP/Program No. or Segment No. are displayed in order. H'00000003 (3): Only the PV/SP/Program No. or Segment No. are displayed. H'00000004 (4): Only the PV/SP/MV are displayed. H'00000005 (5): The PV/SP/Program No. or Segment No., and the PV/SP/Remaining segment time are displayed in order. H'00000006 (6): The PV/SP/MV and PV/SP/Remaining Segment Time are displayed in order. H'00000007 (7): Only the PV/SP/Remaining segment time are displayed. | |
| 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 | Additional PV Display | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1016 | 300B | MV Display | H'00000000 (0): OFF (display of manipulated variable OFF) H'00000001 (1): ON (display of manipulated variable ON) | |
| 1018 | 300C | Move to Protect Level Time | H'00000001 to H'0000001E (1 to 30) | |
| 101A | 300D | PV Change Color | H'00000000 (0): Orange H'00000001 (1): Red H'00000002 (2): Green H'00000003 (3): Red to green: When ALM1 is ON H'00000004 (4): Green to red: When ALM1 is ON H'00000005 (5): Red to green to red: Within PV stable band: Green Outside stable band: Red H'00000006 (6): Green to orange to red: Within PV stable band: Orange Outside stable band: Green, red H'00000007 (7): Orange to green to red: Within PV stable band: Green Outside stable band: Orange, red H'00000008 (8): Red to orange to green: Linked to program. Rising: red, Constant: orange, Falling: green | |
| 101C | 300E | PV Stable Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| 101E | 300F | Auto/Manual Select Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1020 | 3010 | Character Select | H'00000000 (0): OFF H'00000001 (1): ON | |

Note 1: Not displayed on the Controller display when Alarm 3 is not assigned to the output.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|---|---|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 1022 | 3011 | PV Status Display Function | H'00000000 (0):OFF H'00000001 (1): Manual H'00000002 (2): Reset H'00000003 (3): Alarm 1 H'00000004 (4): Alarm 2 H'00000005 (5): Alarm 3 H'00000006 (6): Alarm 1 to 3 OR status H'00000007 (7): Heater alarm H'00000008 (8): Standby | Advanced function setting |
| 1024 | 3012 | SV Status Display Function | H'00000000 to H'00000008 (0 to 8) * Same as for PV Status Display Function. | |
| 1100 | 3100 | Communications Protocol Setting (See note 1.) | H'00000000 (0): CompoWay/F H'00000001 (1): Modbus | Communications setting |
| 1102 | 3101 | Communications Unit No. (See note 1.) | H'00000000 to H'00000063 (0 to 99) | |
| 1104 | 3102 | Communications Baud Rate (See note 1.) | H'00000000 (0): 1.2 H'00000001 (1): 2.4 H'00000002 (2): 4.8 H'00000003 (3): 9.6 H'00000004 (4): 19.2 H'00000005 (5): 38.4 H'00000006 (6): 57.6 | |
| 110A | 3105 | Communications Parity (See note 1.) | H'00000000 (0): None H'00000001 (1): Even H'00000002 (2): Odd | |
| 110C | 3106 | Send Data Wait Time (See note 1.) | H'00000000 to H'00000063 (0 to 99) | |
| 1200 | 3200 | PF Setting | H'00000000 (0): OFF H'00000001 (1): RUN H'00000002 (2): Reset H'00000003 (3): Run/reset H'00000004 (4): Hold/clear hold H'00000005 (5): Advance H'00000006 (6): 100% AT execute/cancel H'00000007 (7): 40% AT execute/cancel H'00000008 (8): Alarm latch cancel H'00000009 (9): Auto/manual switch H'0000000A (10): Monitor/setting item | Advanced function setting |
| 1204 | 3202 | Monitor/Setting Item 1 | H'00000000 (0): Disable H'00000001 (1): PV/SP/program No. or segment No. H'00000002 (2): PV/SP/MV H'00000003 (3): PV/SP/remaining segment time 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): Program No. H'00000011 (17): Segment No. H'00000012 (18): Elapsed program time H'00000013 (19): Remaining program time H'00000014 (20): Elapsed segment time H'00000015 (21): Remaining segment time | |

Note 1: After communications parameters have been changed, perform a software reset or turn the power OFF and ON again, to enable the changes.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|--|--|---------------------------|
| Four-byte mode | Two-byte mode | | | |
| 1206 | 3203 | Monitor/Setting Item 2 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | Advanced function setting |
| 1208 | 3204 | Monitor/Setting Item 3 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |
| 120A | 3205 | Monitor/Setting Item 4 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |
| 120C | 3206 | Monitor/Setting Item 5 | H'00000000 to H'00000015 (0 to 21) * Same as for Monitor/Setting Item 1. | |
| 1300 | 3300 | Startup Operation | H'00000000 (0): Continue control at final SP H'00000001 (1): Reset H'00000002 (2): Run H'00000003 (3): Manual (See note 1.) | |
| 1302 | 3301 | SP Tracking | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1304 | 3302 | PID Set Automatic Selection Data | H'00000000 (0): PV H'00000001 (1): DV H'00000002 (2): SP | |
| 1306 | 3303 | PID Set Automatic Selection Hysteresis | H'0000000A to H'0000270F (0.10 to 99.99) | |
| 1308 | 3304 | PV Dead Band | H'00000000 to H'00007E90 (0 to 32400) | |
| 130A | 3305 | Cold Junction Compensation Method | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1314 | 330A | α | H'00000000 to H'00000064 (0.00 to 1.00) | |
| 131E | 330F | AT Calculated Gain | H'00000001 to H'00000064 (0.1 to 10.0) | |
| 1320 | 3310 | AT Hysteresis | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'000003E7 (0.01 to 9.99) | |
| 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) | |
| 1334 | 331A | Operation End Operation | H'00000000 (0): Reset H'00000001 (1): Continue control at final SP H'00000002 (2): Fixed SP mode | Initial setting |
| 1338 | 331C | HB ON/OFF | H'00000000 (0): OFF H'00000001 (1): ON | Advanced function setting |
| 133A | 331D | Program End ON Time (See note 1.) | H'00000000 to H'00000064 (0.0 to 10.0) H'FFFFFFF(-1): ON | |
| 133C | 331E | Input Error Output | H'00000000 (0): OFF H'00000001 (1): ON | |
| 133E | 331F | Input Shift Type | H'00000000 (0): Temperature input 1-point shift H'00000001 (1): Temperature input 2-point shift | |
| 1340 | 3320 | MV at Reset and Error Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1344 | 3322 | RT | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1346 | 3323 | HS Alarm Use | H'00000000 (0): OFF H'00000001 (1): ON | |

Note 1: Selection is not possible when ON/OFF control is being used.

| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|---|---|---------------------------------|
| Four-byte mode | Two-byte mode | | | |
| 1348 | 3324 | LBA Detection Time (See note 1.) | H'00000000 to H'0000270F (0 to 9999) | Advanced function setting |
| 134A | 3325 | LBA Level | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.01 to 99.99) | |
| 134C | 3326 | LBA Band | Temperature: H'00000000 to H'00007E90 (0.0 to 3240.0) Analog: H'00000000 to H'0000270F (0.00 to 99.99) | |
| 1350 | 3328 | Alarm SP Selection | H'00000000 (0): Present SP H'00000001 (1): Segment SP | |
| 1352 | 3329 | Remote SP Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1354 | 332A | Remote SP Input Error Output | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1356 | 332B | Manual MV Limit Enable | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1358 | 332C | Direct Setting of Position Proportional MV | 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 | Automatic Cooling Coefficient Adjustment | H'00000000 (0): OFF H'00000001 (1): ON | |
| 135E | 332F | Heater Overcurrent Use | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1360 | 3330 | Heater Overcurrent Latch | H'00000000 (0): OFF H'00000001 (1): ON | |
| 1362 | 3331 | Heater Overcurrent Hysteresis | H'00000001 to H'000001F4 (0.1 to 50.0) | |
| 1364 | 3332 | Control Output 1 ON/OFF Count Alarm Set Value | H'00000000 to H'0000270F (0 to 9999) | |
| 1366 | 3333 | Control Output 2 ON/OFF Count Alarm Set Value | H'00000000 to H'0000270F (0 to 9999) | |
| 1368 | 3334 | Standby Time Unit | H'00000000 (0): Hours, minutes H'00000001 (1): Days, hours | |
| 136A | 3335 | Program SP Shift Value Addition | H'00000000 (0): OFF H'00000001 (1): ON | |
| 136C | 3336 | RSP Broken-line Correction Display Addition | H'00000000 (0): OFF H'00000001 (1): ON | |

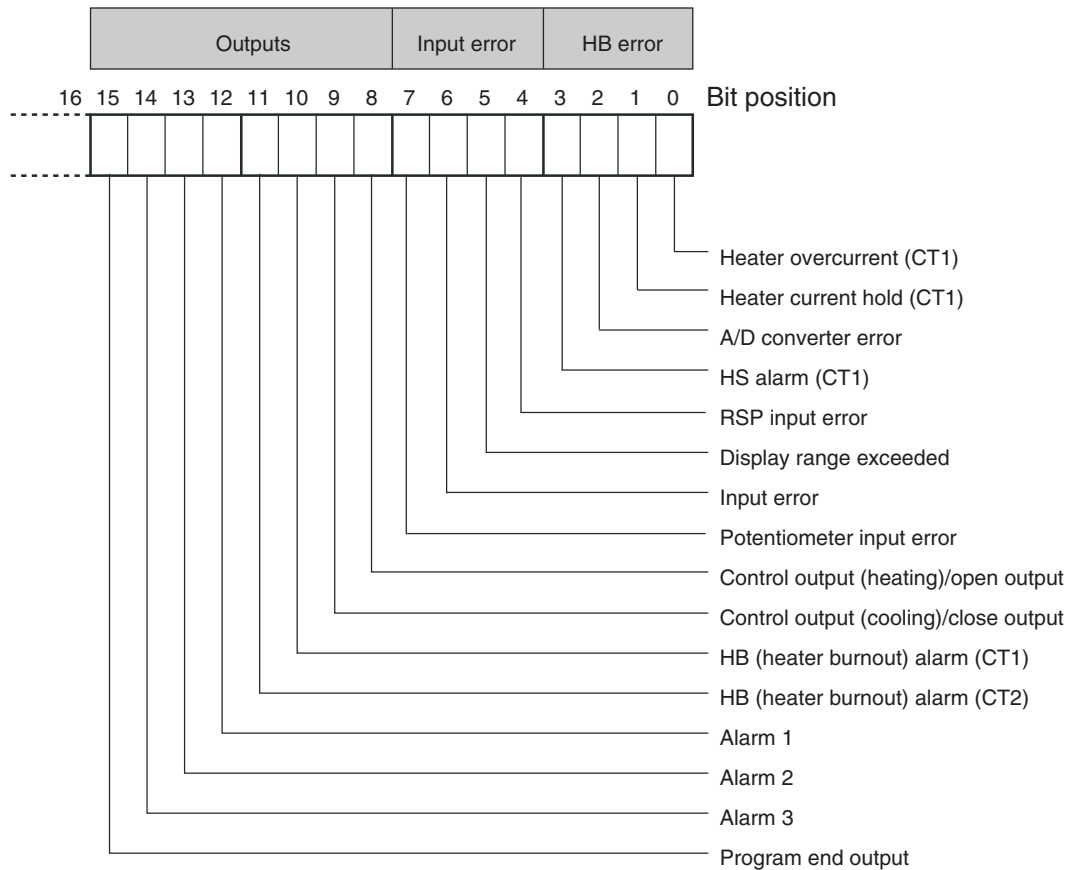
Note 1: This parameter can be set only for ON/OFF control.

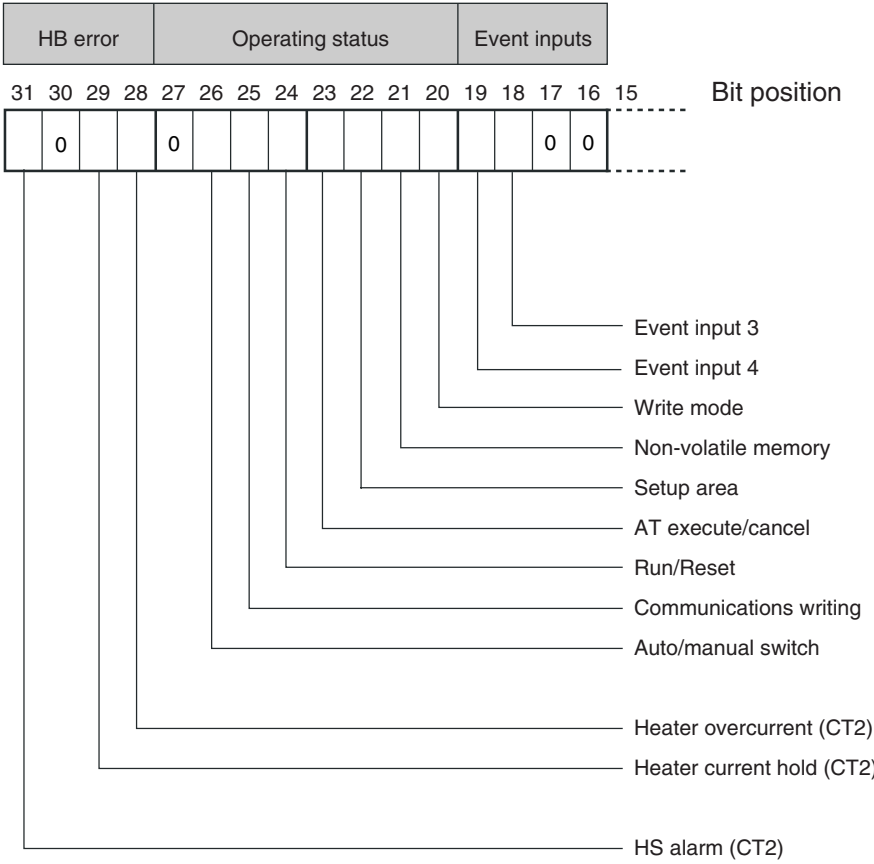
| Address | | Parameter name | Setting (monitor) value | Level |
|----------------|---------------|---|--|-------------|
| Four-byte mode | Two-byte mode | | | |
| 1500 | 3500 | PID 1 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | PID setting |
| 1502 | 3501 | PID 1 Integral Time | Standard, heating/cooling, position proportional (closed): H'00000000 to H'00007E90 (0.0 to 3240.0) Position proportional (floating): H'00000001 to H'00007E90 (0.1 to 3240.0) | |
| 1504 | 3502 | PID 1 Derivative Time | H'00000000 to H'00007E90 (0.0 to 3240.0) | |
| 1506 | 3503 | PID 1 MV Upper Limit | Standard: MV lower limit +0.1 to H'0000041A (MV lower limit +0.1 to 105.0) Heating/cooling: H'00000000 to H'0000041A (0.0 to 105.0) Position proportional (closed): MV lower limit +0.1 to H'0000041A (MV lower limit +0.1 to 105.0) | |
| 1508 | 3504 | PID 1 MV Lower Limit | Standard: H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) Heating/cooling: H'FFFFFFBE6 to H'00000000 (-105.0 to 0.0) Position proportional (closed): H'FFFFFFCE to MV upper limit -0.1 (-5.0 to MV upper limit -0.1) | |
| 150A | 3505 | PID 1 Automatic Selection Range Upper Limit | Temperature: H'FFFFFFB1E1 to H'00007E90 (-19999 to 32400) Analog: H'FFFFFFCE to H'0000041A (-5.0 to 105.0) | |
| 150C | 3506 | PID 1 Cooling Coefficient | H'00000001 to H'0000270F (0.01 to 99.99) | |
| 150E | 3507 | PID 1 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 1520 | 3510 | PID 2 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 152E | 3517 | PID 2 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 1540 | 3520 | PID 3 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 154E | 3527 | PID 3 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 1560 | 3530 | PID 4 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 156E | 3537 | PID 4 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 1580 | 3540 | PID 5 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 158E | 3547 | PID 5 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 15A0 | 3550 | PID 6 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 15AE | 3557 | PID 6 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 15C0 | 3560 | PID 7 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 15CE | 3567 | PID 7 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |
| 15E0 | 3570 | PID 8 Proportional Band | Temperature: H'00000001 to H'00007E90 (0.1 to 3240.0) Analog: H'00000001 to H'0000270F (0.1 to 999.9) | |
| | | to | | |
| 15EE | 3577 | PID 8 LBA Detection Time | H'00000000 to H'0000270F (0 to 9999) | |

5.2 Status and Status 2

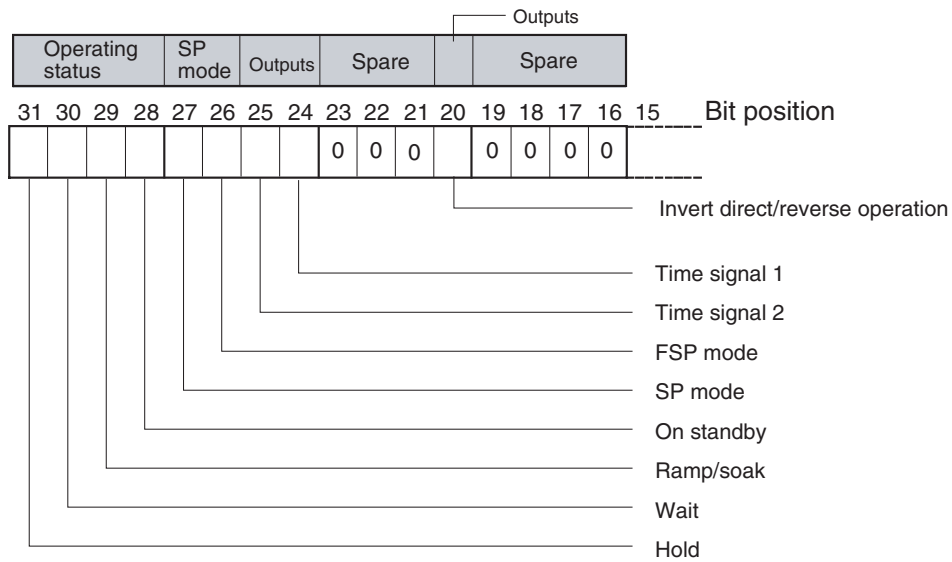
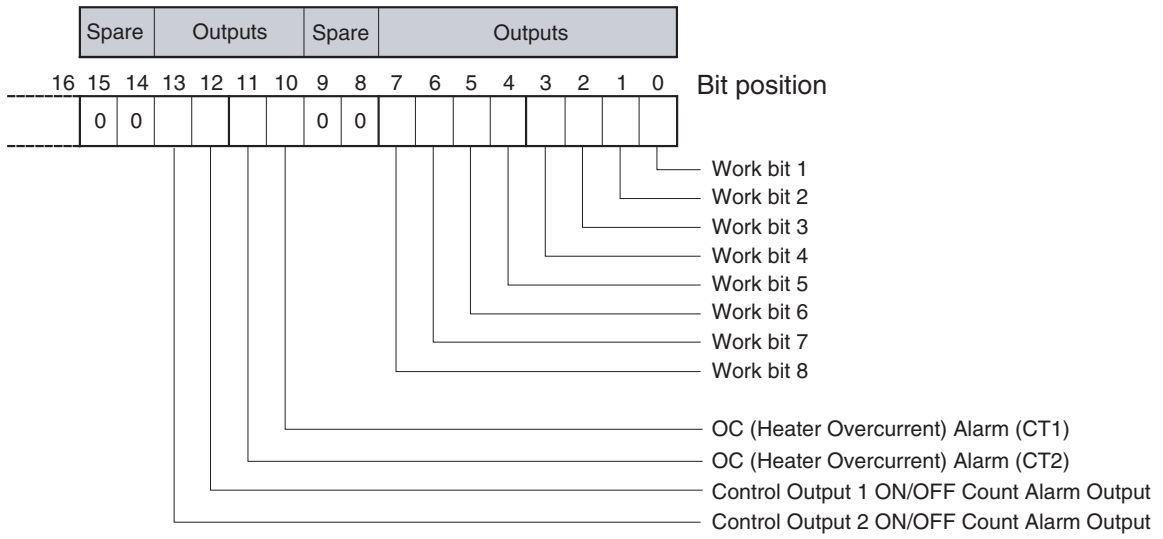
The figure below shows the structure of the status data.

■ Status Structure





■ 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) (See note 1.) | Update | Hold |
| | 2 | A/D converter error | Not generated | Generated |
| | 3 | HS alarm (CT1) | OFF | ON |
| | 4 | RSP input error | Not generated | Generated |
| | 5 | Display range exceeded | Not generated | Generated |
| | 6 | Input error | Not generated | Generated |
| | 7 | Potentiometer input error | Not generated | Generated |
| | 8 | Control output (heating)/open output | OFF | ON |
| | 9 | Control output (cooling)/close output | 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 | Spare | OFF | --- |
| | 17 | Spare | OFF | --- |
| | 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/Reset | Run | Reset |
| | 25 | Communications writing | OFF (disabled) | ON (enabled) |
| | 26 | Auto/manual switch | Automatic mode | Manual mode |
| | 27 | Spare | OFF | --- |
| | 28 | Heater overcurrent (CT2) | Not generated | Generated |
| | 29 | Heater current hold (CT2) (See note 1.) | Update | Hold |
| 30 | Spare | OFF | --- | |
| 31 | HS alarm (CT2) | OFF | ON | |

Note 1: When the control output ON time is less than 100 ms, the bit is set to "1" and the heater current is held at the last current value.

Note 2: "Spare" bits are always OFF.

Note 3: 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
- Potentiometer input error: Last value held
- HB and HS outputs: Cleared
- Program end output: Cleared
- Current hold: Last value held
- Display range exceeded: Last value held
- RSP input error: Last value held
- Heating output, cooling output, open output, close output: Cleared
- Alarm outputs: Cleared

■ 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 | OC (Heater Overcurrent) Alarm (CT1) | OFF | ON |
| | 11 | OC (Heater Overcurrent) Alarm (CT2) | OFF | ON |
| | 12 | Control Output 1 ON/OFF Count Alarm Output | OFF | ON |
| | 13 | Control Output 2 ON/OFF Count Alarm Output | OFF | ON |
| | 14 | Spare | OFF | |
| 15 | Spare | OFF | --- | |
| Status (upper word) | 16 | Spare | OFF | --- |
| | 17 | Spare | OFF | --- |
| | 18 | Spare | OFF | --- |
| | 19 | Spare | OFF | --- |
| | 20 | Invert direct/reverse operation | Not invert | Invert |
| | 21 | Spare | OFF | --- |
| | 22 | Spare | OFF | --- |
| | 23 | Spare | OFF | --- |
| | 24 | Time signal 1 | OFF | ON |
| | 25 | Time signal 2 | OFF | ON |
| | 26 | FSP mode (See note 1.) | OFF (PSP/RSP) | ON (FSP) |
| | 27 | SP mode (See note 1.) | PSP | RSP |
| | 28 | On standby | OFF | On standby |
| | 29 | Ramp/soak | Soak | Ramp |
| | 30 | Wait | OFF | Waiting |
| | 31 | Hold | OFF | Holding |

Note 1: Bit 27 (SP mode) is enabled when bit 26 (FSP mode) is 1 (ON: FSP).

Note 2: "Spare" bits are always OFF.

Note 3: When read in setup area 1, the status of the bits will be as follows:

- Overcurrent Output: Cleared
- Control Output 1 ON/OFF Count Alarm: Cleared
- Control Output 2 ON/OFF Count Alarm: Cleared
- Work bits 1 to 8: Cleared
- Time signal 1 to 2: Last value held
- FSP mode: Last value held
- SP mode: Last value held
- On standby: Last value held
- Ramp/soak: Last value held
- Wait: Last value held
- Hold: Last value held

Appendix

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

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 | 0 |
| | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

| | | | | | | | | |
|-------|-----|-----|-------|---|---|---|---|-----|
| R \ C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 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 | SO | RS | . | > | N | ^ | n | ~ |
| F | SI | US | / | ? | O | _ | o | DEL |

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/RS-422 and 15 m maximum for RS-232C communications. To extend the communications distance for RS-232C communications, use Optical Interface. | 1-4 1-5 |
| The wrong communications cable has been used. | Use a shielded, twisted-pair, AWG24 to AWG14 (cross-sectional area of 0.205 to 2.081 mm ²) cable for the communications cable. | 1-4 1-5 |
| Too many communications devices are connected to the communications path for RS-485 communications. | 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 for RS-485/RS-422 communications. | Connect or disconnect terminating resistance so that it is connected only at both ends of the transmission path. For RS-485 communications, use a terminating resistance of 120 Ω (1/2 W) on the E5CN/AN/EN-HT end of the path and make sure the combined resistance including the terminating resistance at the host is 54 Ω minimum. For RS-422 communications, use a terminating resistance of 240 Ω (1/2 W) on the E5AN/EN-HT end of the path and make sure the combined resistance including the terminating resistance at the host is 100 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. | 1-4 |
| 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 5-2 |
| The same unit number as the Controller is being used for another node on the same communications line for RS-485/RS-422 communications. | Set each unit number for only one node. | 1-4 |

| Item | Confirmation | Page |
|---|--|----------------------------|
| There is a mistake in programming in the host device. | Use a line monitor to check the commands. Check operation using a sample program. | --- |
| 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. | 1-6 |
| 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 2-14 5-2 5-14 |
| 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. | 1-3 |
| 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. | <p>Try using a slower baud rate.</p> <p>Separate the communications cable from the source of noise.</p> <p>Use a shielded, twisted-pair cable for the communications cable.</p> <p>Use as short a communications cable as possible and do not lay or loop extra cable.</p> <p>Do not run the communications cable parallel to a power line to prevent inductive noise.</p> <p>If noise countermeasures are difficult to implement, use an Optical Interface.</p> | --- |

Index

| | | | |
|----------|--|----------|--|
| A | <ul style="list-style-type: none"> addresses <ul style="list-style-type: none"> CompoWay/F 2-7 Modbus 4-7 area definitions 2-6 ASCII list A-2 | M | <ul style="list-style-type: none"> Modbus 1-2, 4-1, 5-1 |
| B | <ul style="list-style-type: none"> BCC 1-3, 2-2, 2-3 | N | <ul style="list-style-type: none"> no response <ul style="list-style-type: none"> Modbus 4-5 node number 2-2 number of elements <ul style="list-style-type: none"> CompoWay/F 2-7 Modbus 4-8 |
| C | <ul style="list-style-type: none"> command frame <ul style="list-style-type: none"> CompoWay/F 2-2 Modbus 4-2 command text 2-2, 2-6 communications baud rate 1-8, 1-9 communications data <ul style="list-style-type: none"> CompoWay/F 2-4, 3-1 communications data length 1-8, 1-9 communications methods 1-2 communications parameter setup 1-8 communications parameters 1-8, 1-9 communications parity 1-8, 1-10 communications protocol 1-8, 1-9 communications specifications 1-3 communications stop bits 1-8, 1-10 communications unit number 1-8, 1-9 CompoWay/F 1-2, 2-1 CRC-16 4-3 | O | <ul style="list-style-type: none"> Operation Command <ul style="list-style-type: none"> CompoWay/F 2-8, 2-19 |
| D | <ul style="list-style-type: none"> data format <ul style="list-style-type: none"> CompoWay/F 2-2 Modbus 4-2 | P | <ul style="list-style-type: none"> PDU structure 2-6 protocol setting 1-9 |
| E | <ul style="list-style-type: none"> Echoback Test <ul style="list-style-type: none"> CompoWay/F 2-8, 2-18 Modbus 4-21 end code <ul style="list-style-type: none"> CompoWay/F 2-3, 2-4 error code 4-5 ETX 2-2 | R | <ul style="list-style-type: none"> Read Controller Attributes <ul style="list-style-type: none"> CompoWay/F 2-8, 2-16 Read Controller Status 2-8, 2-17 Read Variable Area <ul style="list-style-type: none"> CompoWay/F 2-7, 2-9 response code list <ul style="list-style-type: none"> CompoWay/F 2-26 response frame <ul style="list-style-type: none"> CompoWay/F 2-3 Modbus 4-4 RS-485 1-4 |
| F | <ul style="list-style-type: none"> FINS 1-2, 2-3 function code 4-2 function list 4-6 | S | <ul style="list-style-type: none"> send data wait time 1-8, 1-10 services details <ul style="list-style-type: none"> CompoWay/F 2-9 list (CompoWay/F) 2-7 Modbus 4-9 set values <ul style="list-style-type: none"> Modbus 4-8 SID 2-2, 2-4 slave address 4-2 status 3-20, 5-16 STX 2-2 |
| I | <ul style="list-style-type: none"> interface 1-4 | T | <ul style="list-style-type: none"> transmission procedure 1-3 type code (variable type) 2-6 |

V

variable area
 Modbus 4-7
Variable Area (setting range) list
 CompoWay/F 3-2
 Modbus 5-2
variable type 2-6, 2-7

W

wiring 1-4
Write Variable Area
 CompoWay/F 2-10

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