Communication Instruction Manual

DIGITAL CONTROLLER <MICRO CONTROLLER X> COMMUNICATION FUNCTION (RS-485 MODBUS)

MODEL : PXG



Fuji Electric Systems Co., Ltd.

INP-TN514450-E

Introduction

Thank you for purchasing the Fuji Digital Temperature Controller.
This document describes how to connect the Micro controller PXG Series (referred to below as "Micro controller") to the personal computer or programmable controller. It also describes communication specifications for controlling and monitoring the communications with the micro controller, MODBUS protocol, and address map for the micro controller.
In addition to this document, please make sure to read the Instruction Manual (which comes with the product) and the Operations Manual (packaged separately).

NOTE

■ Exclusions

The contents of this document may change without prior notice.
Although great care has been taken in the accuracy of this document, Fuji Electric takes no responsibility for loss or indirect damages caused by mistakes, missing information, or use of information in this document.

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Chapter 1

Communication Functions

Overview – 4

Overview

- The micro controller is equipped with communication functions from the RS-485 interface and PC loader interface, which enables the transmission and reception of data between such devices as the personal computer, programmable controller, and graphic panel.
- The communication system is composed of a master and slave relationship. Up to thirty-one slaves (micro controllers) may be connected to one master (such as a personal computer) based on a “single master/multiple slave” method.
- However, the master can only communicate with one slave at a time. Therefore, each slave is specified by the "Station No." setting.With PC loader communication, only one slave can be connected to one master.

Caution

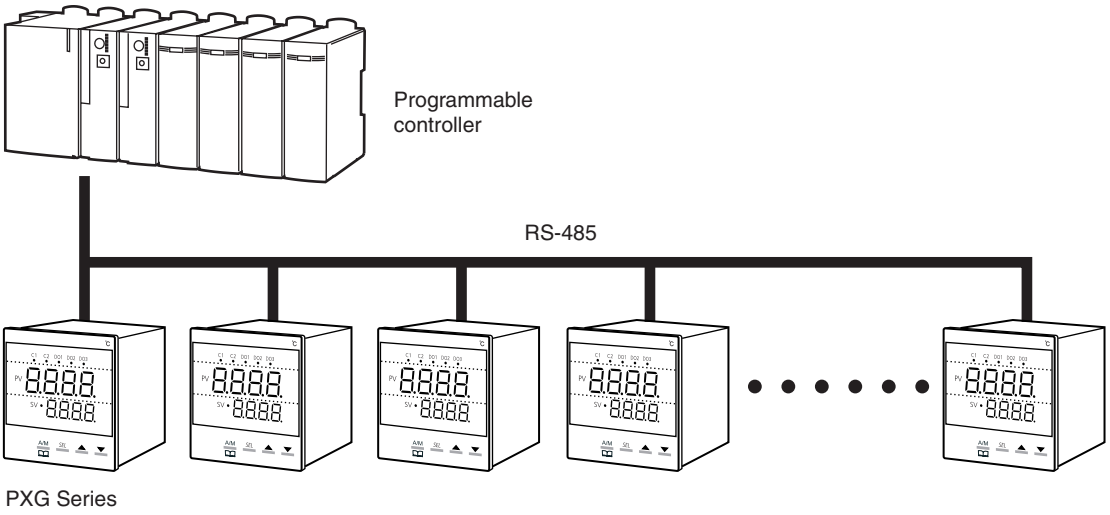
- Systems constructed with the micro controller as slaves do not respond to messages issued by the master with broadcast queries where the station number is "0".
- PC loader communication is not compatible with the multiple slave method.

- In order to have proper communication between master and slave, the transmission data must be in the same format. This document explains how to transmit data using the MODBUS protocol format.
- When using equipment with an RS-232C interface, such as a personal computer, as the master, make sure to use an RS-232C to RS-485 converter.
- When using PC loader communication, you can use RS-232C communication with the personal computer by connecting the PC loader interface on the bottom of this unit with the PC loader communication cable (RS-232C, model: ZZPPXH1∗TK4H4563) sold separately.

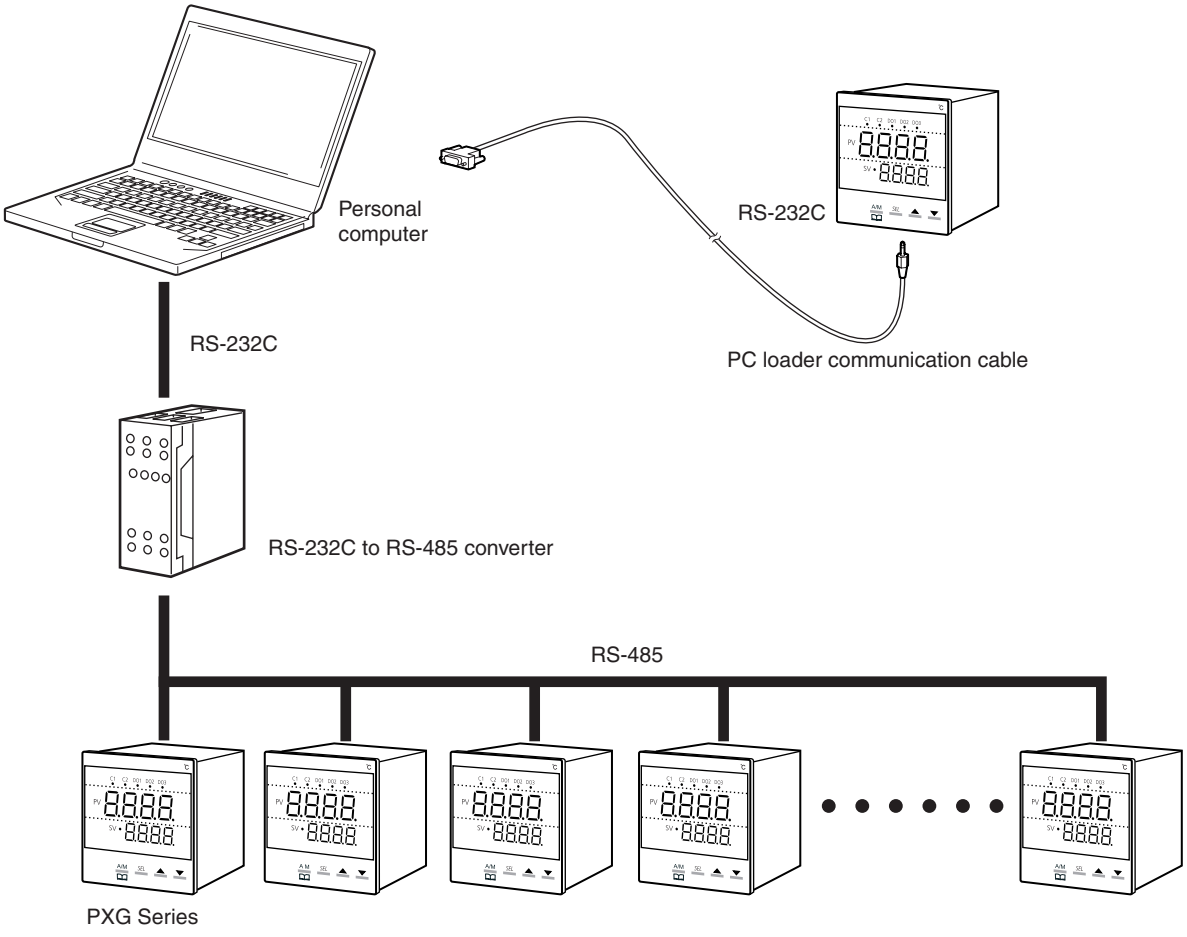
[RS-232C to RS-485 converter] (Recommended)

Model number/Type	Contact	URL
KS3C-10 (insulating type)	Made by Omron Corporation	http://www.omron.co.jp
RC-77 (insulating type)	Made by RA Systems Corporation	http://www.ras.co.jp

Connecting to a programmable controller



Connecting to a personal computer



Caution When using the RS-232C to RS-485 converter, check to make sure that the cable is properly connected between the converter and master. Communication will not work properly if the connection is incorrect.
Also be sure to correctly set the communication settings (such as communication speed and parity) on the RS-232C to RS-485 converter. Communication will not work properly if the settings are incorrect.

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Chapter 2

Specifications

Communication Specifications – 8

Communication Specifications

RS-485

Item	Specifications	
Electrical specifications	EIA RS-485 compliant	
Communication method	Two wire system, half double-bit serial	
Synchronous method	Asynchronous	
Connection status	1:N	
Max. no. of connections	31 units	
Communication distance	Max 500m (total length)	
Communication speed	9600bps, 19200 bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	None/Even/Odd (Selectable)
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16	
Insulation	Functional insulation for the transmission area and other areas (withstanding AC 500V)	

PC Loader Interface

Item	Specifications	
Electrical specifications	EIA RS232 C	
Communication method	3wire system, half double-bit serial	
Synchronous method	Asynchronous	
Connection status	1:1	
Communication speed	9600 bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	none
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16	
Insulation	Non-insulated internal circuit	

Chapter 3

Connection

Communication Terminal Configuration – 10

Wiring – 11

⚠ Warning

Do not turn on power until all of the wiring is completely finished.
There is a risk of electrical shock or damage.

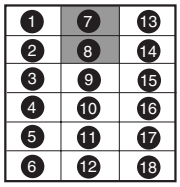
Chapter 3

Communication Terminal Configuration

■ RS-485 (rear terminal)

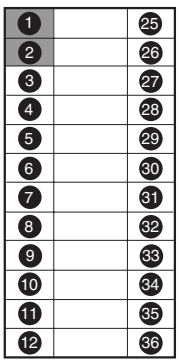
PXG4

Terminal Number	Signal Name
7	RS-485 +
8	RS-485 -



PXG5, PXG9

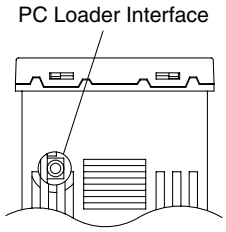
Terminal Number	Signal Name
1	RS-485 +
2	RS-485 -



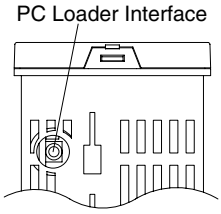
■ PC Loader Interface

(Bottom, ϕ2.5, three prong miniature jack)

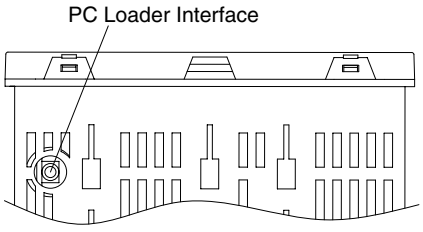
PXG4



PXG5



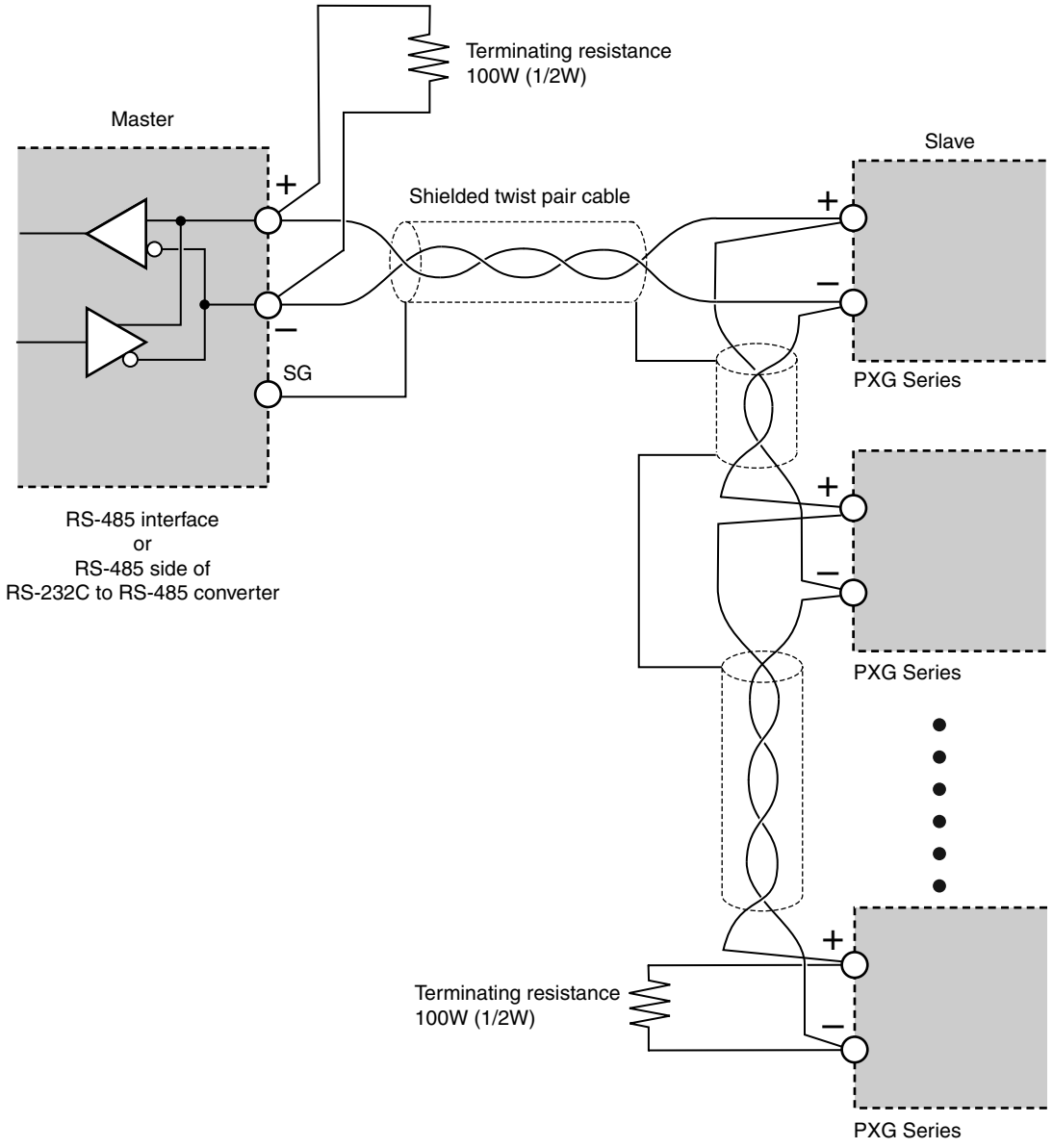
PXG9



Wiring

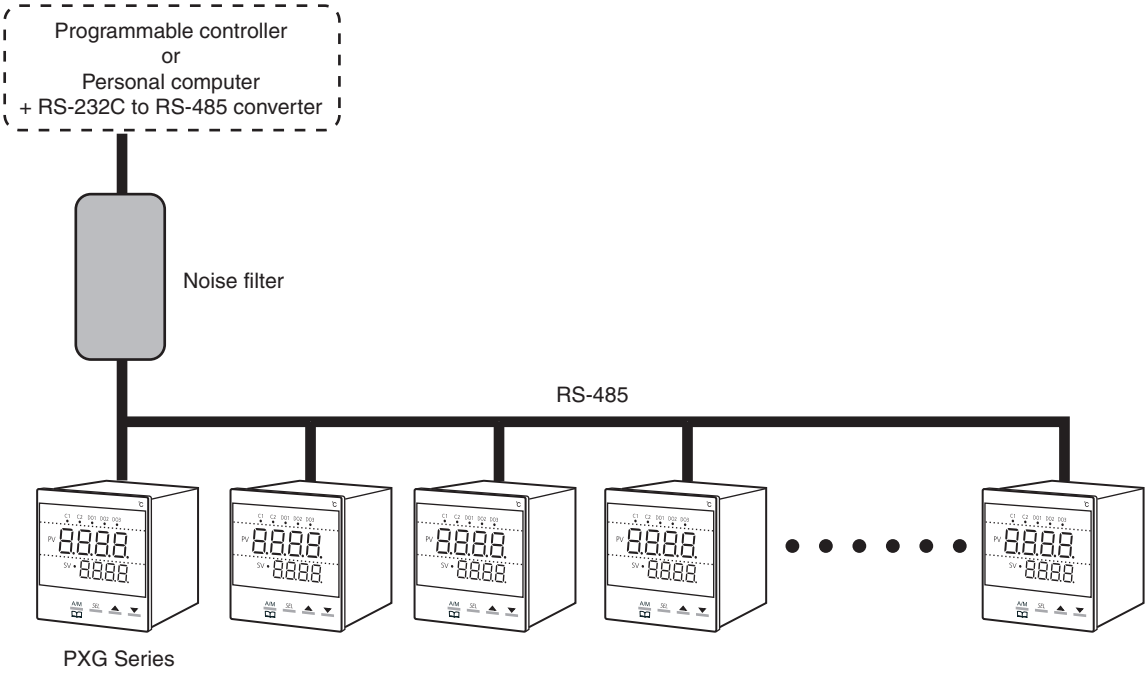
■ **RS-485**

- Please use a shielded twist pair cable. (Recommended cable: KPEV-SB (made by The Furukawa Electric Co., Ltd.))
- The maximum cable length should be 500m. One master and up to thirty-one micro controllers (slaves) can be connected per circuit.
- Terminate both ends of the circuit with a terminating resistance of 100Ω (1/2W or more).
- Ground the shielded cable once towards the master side.



- SG does not have to be connected, but it can be used as an effective countermeasure against communication errors due to noise.

- When using the micro controller in an area where the imposed noise level is expected to exceed 1000V, we recommend using a noise filter on the master side as seen in the figure below.
  [Noise filter] (recommended): ZRAC2203-11 (made by TDK Corporation)

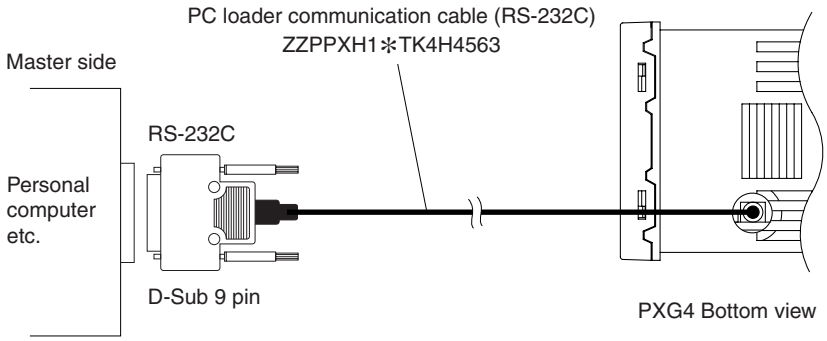


- If there are problems with EMC during communication, the noise level can be reduced by using a communication cable with a ferrite core.
  Ferrite core (recommended): ZCAT series (made by TDK Corporation)
  MSFC series (made by Morimiya Electric Co., Ltd.)

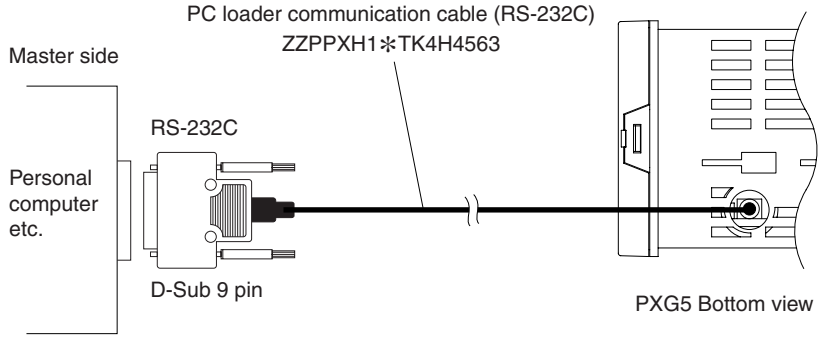
■ PC Loader Interface

- Use the PC loader communication cable (RS-232C) sold separately.

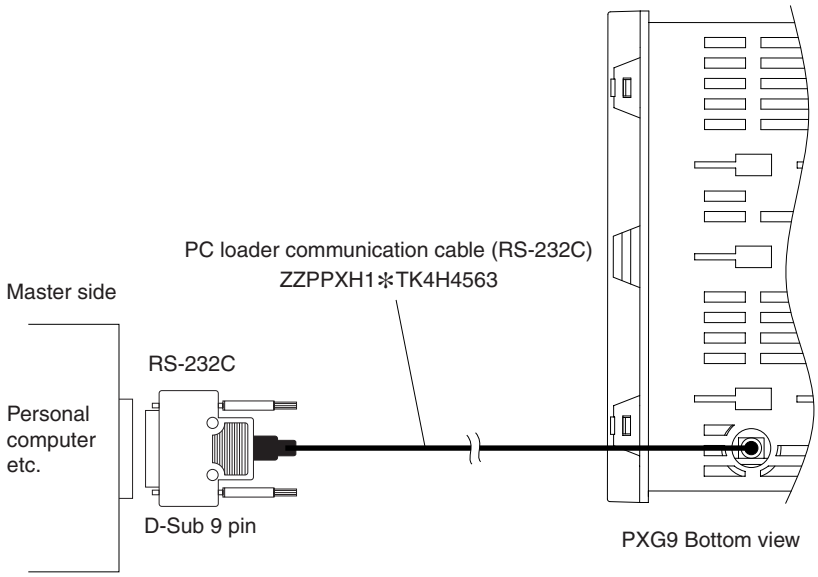
PXG4



PXG5



PXG9



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Chapter 4

Setting Communication Parameters

List of Setting Parameters – 16

Parameter Setting Procedure – 17

The following settings are required for proper communication between the master and micro controller units.

- The communication parameters for the master and all of the units must be set the same.
- During RS-485 communication, all of the micro controllers on a circuit must be set with different "Station No. (STno)" other than "0 (zero)". (Multiple micro controllers must not have the same "Station No.".)
- When using the PC loader interface, settings are not necessary on the main unit (the micro controller).

List of Setting Parameters

The setting parameters are shown in the chart shown below. Change the settings using the keys on the front of the micro controller.

■ RS-485 (main unit side)

Parameter channel	Parameter display symbol	Parameter name	Initial value	Setting range	Remarks
"CoM Ch9" (CoM Ch9)	"St no" (STno)	Station No.	1	0 to 255	Unit does not respond to communication when 0 is set.
	"CoM" (CoM)	Parity settings	96od	96od (9600 bps/odd) 96Ev (9600 bps/even) 96no (9600 bps/none) 19od (19200 bps/odd) 19Ev (19200 bps/even) 19no (19200 bps/none)	This is the procedure to specify communications speed and parity check. Set the master and all of the slaves with the same settings.
	"SCC" (SCC)	Communication permissions	rW	r (read only) rW (read and writable)	
	–	Data length	8 bits	Fixed (cannot be changed)	Set the master and all of the slaves with the same settings.
	–	Stop bit	1 bit	Fixed (cannot be changed)	

■ Loader interface (main unit side)

The parameters do not need to be set. Set the loader software (master) with the following settings.

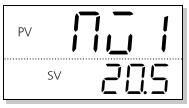
- Communication speed: 9600 bps
- Parity: none

Parameter Setting Procedure

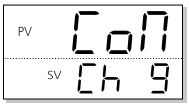
The following steps explain how to change the settings to station number "3", parity setting "9600bps/none", and communication permissions "read and writable" as an example.



1 **Press and hold the SEL key to display "MV1".**
The MV1 of the monitoring screen is displayed.

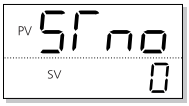


2 **Press and hold the SEL key to display the setup mode operation menu ("oPE Ch 1"), then use the ▲ ▼ keys to display "CoM Ch 9".**
The communication menu is displayed.



(Note) If your micro controller does not have a communication function, "CoM Ch 9" will not be displayed. Please check with your model.

3 **Press and hold the SEL key, the use the ▲ ▼ keys to display "SMno."**
The station number is displayed.



4 **Press the SEL key, then use the ▲ ▼ keys to set station number to "3" when the bottom part of the display begins to blink.**
This sets the parameter to "3".



5 **Press the SEL key to confirm the setting.**

6 **Use the ▲ ▼ keys to select the parity setting ("CoM").**



7 **Press the SEL key, then use the ▲ ▼ keys to set the parity setting to "96no" when the bottom part of the display begins to blink.**
The parity setting is set to "9600 bps/none".



8 **Press the SEL key to confirm the setting.**

9 **Use the ▲ ▼ keys to select the communication permissions ("SCC").**



10 **Press the SEL key, then use the ▲ ▼ keys to set the protocol to "rW" when the bottom part of the display begins to blink.**
"read/write" is selected.



11 **Press the SEL key to confirm the setting.**

12 **Press the A/M key to return to the operation mode PV/SV display.**

13 **Turn the power to the micro controller off and on again.**
The changes to the communication parameters become effective after the power turns off and on again.

Chapter 5

MODBUS Communication Protocol

Overview – 20

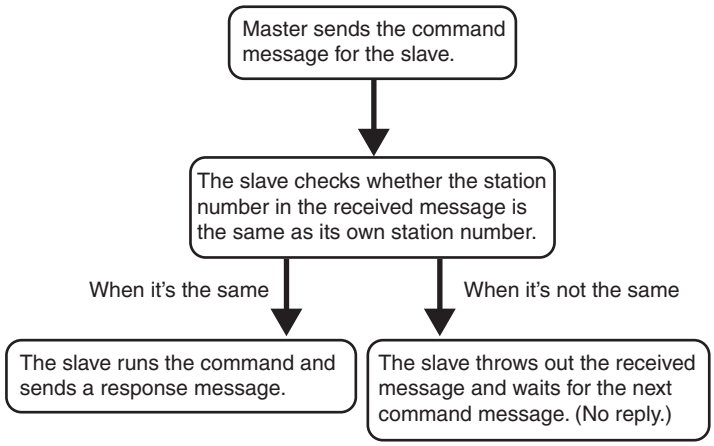
Message Composition – 21

Calculating Error Check Code (CRC-16) – 24

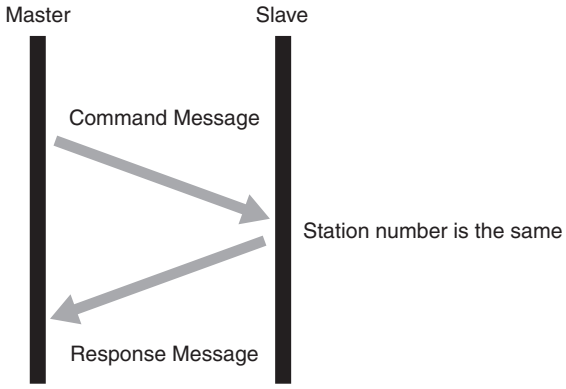
Transmission Control Steps – 25

Overview

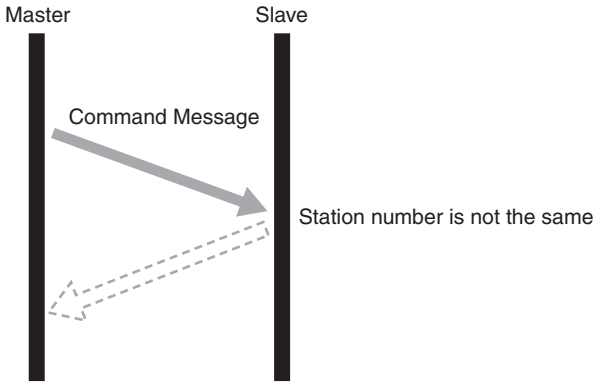
The communication system with the MODBUS protocol always operates using a method where the master first sends a command message and the applicable slave replys with a response message.
The following describes the communication steps.



● When the station number in the command message is the same as the unit's station number



● When the station number in the command message is not the same as the unit's station number



The master can communicate with an individual slave when multiple slaves are connected on the same circuit by the station number specified in the master's command message.

Message Composition

The command message and response message are composed of four parts: the station number, function code, data part, and error check code. These four parts are sent in that order.

Field name	No. of bytes
Station No.	1 byte
Function Code	1 byte
Data Part	2 to 125 bytes
Error Check Code (CRC-16)	2 bytes

The following describes each part of the message.

Station No.

This is the number specifying the slave. Commands can only be processed by slaves that have the same value set in the "STno" parameter.

Refer to  For more about setting the "STno" parameter, see "Chapter 4, Setting Communication Parameters" (p. 15).

Function Code

This code specifies the function for the slave to perform.

Refer to  For more about function codes, see "Function Code" (p. 23).

Data Part

This data is required to run the function code. The composition of the data part is different depending on the function code.

Refer to  See "Chapter 6, Message Details" (p. 27).

The data in the micro controller is assigned a coil number or resistor number. This coil number or resistor number is specified when the data is read or written through communication.
The coil number or resistor number used by the message employs a relative address.
The relative address is calculated using the following formula.

Relative address = (last four digits of the coil number or resistor number) – 1

(Ex.) When a function code specifies resistor number "40003"
Relative address= (the last four digits of 40003) – 1
= 0002
is used in the message.

Error Check Code

This code detects whether there are errors (changes in the bits) during the signal transmission processes. MODBUS protocol (RTU mode) uses CRC-16 (Cyclic Redundancy Check).

Refer to  For more about calculating CRC, see Section 5, "Calculating Error Check Code (CRC-16)" (p. 24).

Slave Response

■ Normal Slave Response

The slave creates and replies with a response message for each command message. The response message has the same format as the command message.

The contents of the data part are different depending on the function code.

Refer to
See "Chapter 6, Message Details".

■ Irregular Slave Response

If there are problems (such as specification of a nonexistent function code) with the contents of the command message other than transmission error, the slave creates and replies with an error response message without following the command.

The composition of the error response message uses the value of the function code in the command message plus 80H, as seen below.

Field name	No. of bytes
Station No.	1 byte
Function Code + 80 H	1 byte
Error Code	1 byte
Error Check Code (CRC-16)	2 bytes

The error code is shown as follows.

Error Code	Contents	Explanation
01H	Faulty function code	A nonexistent function code was specified. Please check the function code.
02H	Faulty address for coil or resistor	The specified relative address for the coil number or resistor number cannot be used by the specified function code.
03H	Faulty coil or resistor number	The specified number is too large and specifies a range that does not contain coil numbers or resistor numbers.

■ No Response

In the following situations, the slave will ignore the command message and not send a response message.

- The station number specified by the command message is not the same as the slave's specified station number.
- The error check code does not correspond, or a transmission error (such as parity error) is detected.
- The interval between the data comprising the message is empty for more than 24 bit time.

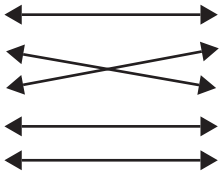
Refer to
See Section 5 "Transmission Control Steps" (p. 25).

- The slave station number is set to "0".

Function Code

For MODBUS protocol, coil numbers or resistor numbers are assigned by the function code, and each function code only works for the assigned coil number or resistor number.
The correspondence between the function code and the coil number or resistor number is as follows.

Function Code		
Code	Function	Target
02H	Read (continuous)	Input relay
03H	Read (continuous)	Hold resistor
04H	Read (continuous)	Input resistor
06H	Write	Hold resistor
10H	Write (continuous)	Retention resistor



Coil Number, Resistor Number	
Number	Contents
1xxxx	Read bit data
3xxxx	Read word data
4xxxx	Read/write word data

The message length for each function is as follows.

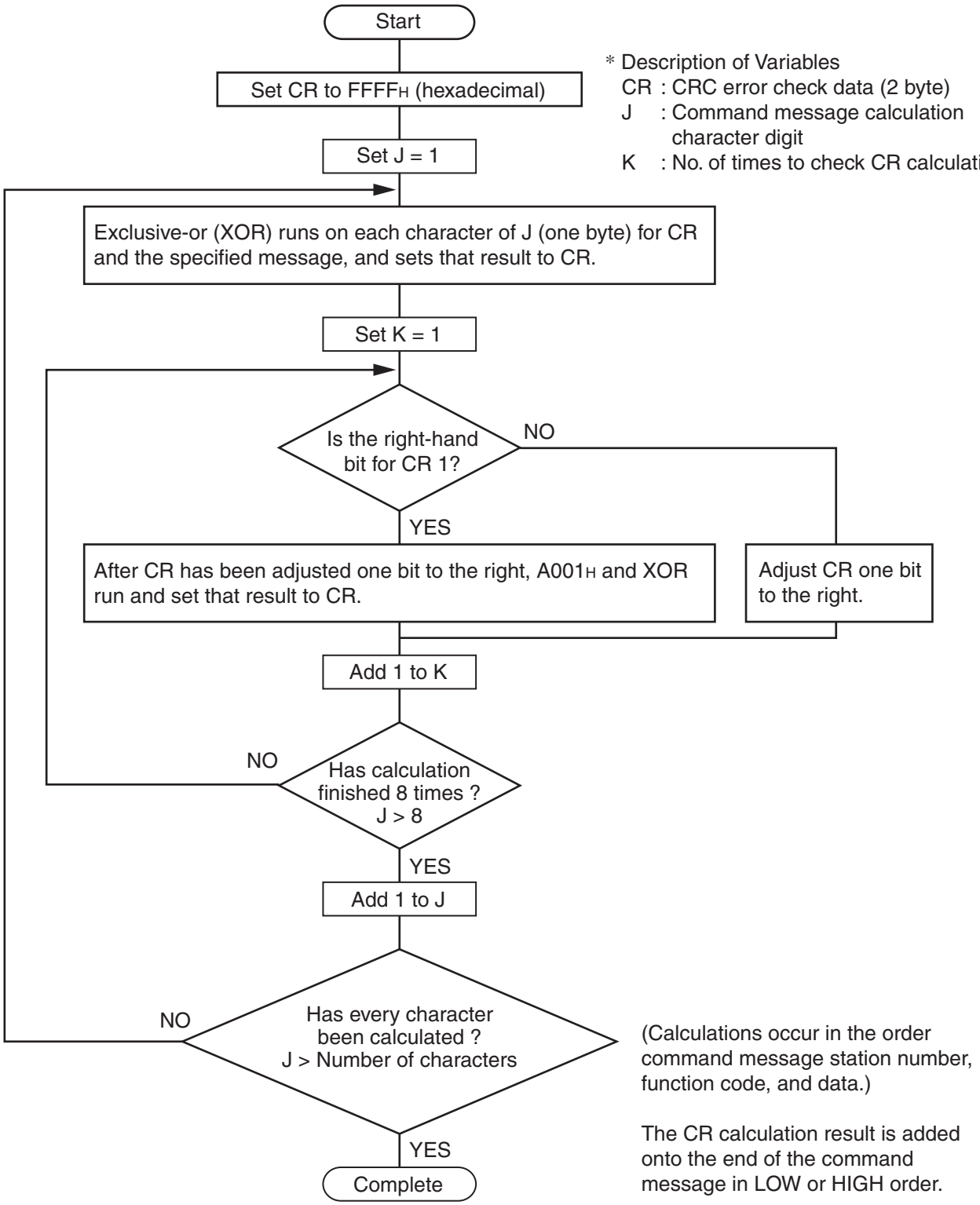
[unit: byte]

Code	Contents	Assignable Data Number	Command Message		Response Message	
			Minimum	Maximum	Minimum	Maximum
02H	Read bit data (read-only)	8 bit*1	8	8	6	6
03H	Read word data	60 words*1	8	8	7	125
04H	Read word data (read-only)	37 words*1	8	8	7	79
06H	Write word data	1 word	8	8	8	8
10H	Continuously write word data	60 words*1	11	129	8	8

*1: "Assignable Data Number" above is limited by the data number that the micro controller assigned to the coil number or address number.
(Excluding function code 06H).

Calculating Error Check Code (CRC-16)

CRC-16 is a 2-byte (16-bit) error check code. The calculation range extends from the start of the message (station number) to the end of the data part.
The slave calculates the CRC of the received message and ignores the message if this value is not the same as the received CRC code.
CRC-16 is calculated as follows.



Transmission Control Steps

Master Communication Method

Start communication from the master while following the rules below.

1. The command message, must be sent after an empty space of at least 48 bit time.
2. The interval between each byte in a command message should be less than 24 bit time.
3. After sending a command message, for less than 24 bit time the master will enter receiving standby.
4. After receiving the response message, the next command message must be sent after at least 48 bit time. (Similar to #1.)
5. For safety reasons, create a framework where the master checks the response message, and if there is no response or an error occurs, retry at least three times.

Caution The definitions written above are for the minimum required value. For safety reasons, we recommend creating a master side program that keeps margins two to three times as large. For a concrete example, with 9600 bps, we recommend programming a blank state (#1 above) of at least 10ms, and the interval between bytes (#2 above) and switching time from sending to receiving (#3 above) within 1 ms.

Explanation

■ Frame Detection

This communication system uses a two-wire RS-485 interface, and the circuit can therefore enter one of the following two states.

- Empty state (no data on the circuit)
- Communication state (data running on the circuit)

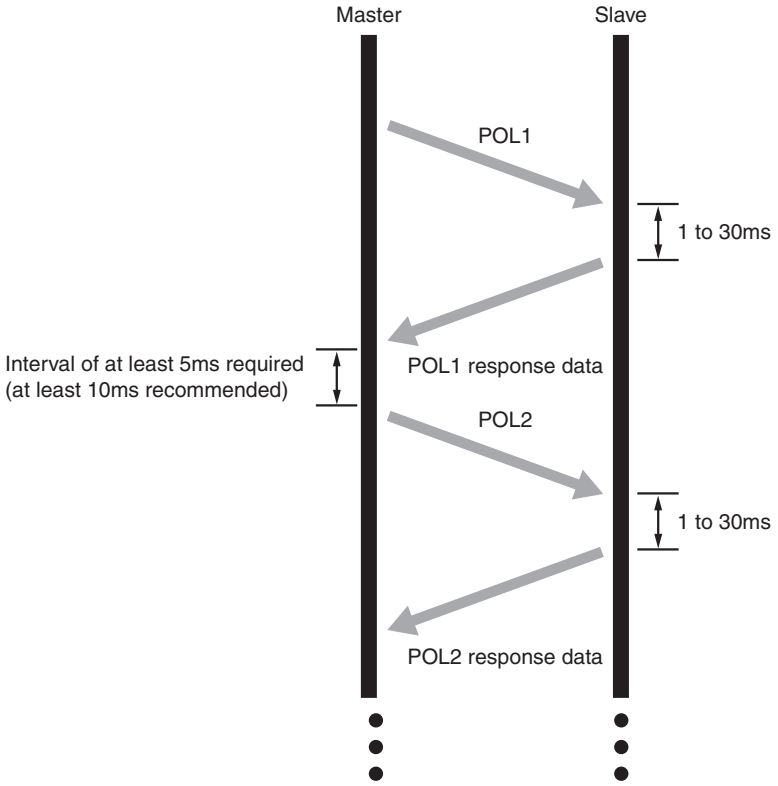
The units connected on the circuit start in receiving state and monitor the circuit. When a blank state appears on the circuit for at least 24 bit time, the unit detects the end of the previous frame, and within the next 24 bit time, enters receiving standby. When data appears on the circuit, the unit begins receiving data, and once another blank state of at least 24 bit time is detected, that frame is ended. In other words, the data on the circuit from the first time that a 24 bit time blank state appears to the second time one appears is loaded as one frame (a bundle of data). Therefore, one frame (command message) must be sent while following the rules below.

- Before sending the command message, leave an empty space of at least 48 bit time.
- The interval between each byte in a command message should be less than 24 bit time.

■ Micro controller Response

After the micro controller detects the frame (detects blank states at least 24 bit time long), that frame is used to send a command message. When a command message is sent locally, the response message is returned, but the processing time is about 1 to 30 ms. (The time may change depending on the contents of the command message.) Therefore, one frame (command message) must be sent while following the rules below.

- After sending a command message, for less than 24 seconds the master will enter receiving standby.



MEMO

Chapter 6

Command and Transmission Frame Details

Reading Data – 28

Writing Data – 34

Reading Data

Reading Read-Only Bit Data (Function Code: 02H)

The unit reads bit data continuously for the specified number of bits from the first number to start reading from.
The slaves systematically send the read data in 8-bit units.

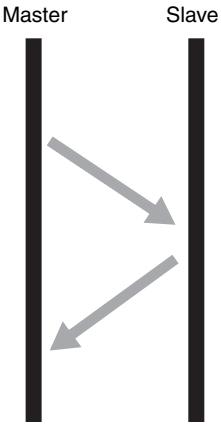
Caution When the number of bits to be read is not a multiple of eight, unrelated bits (on the MSB side) all become "0".

Function Code	02H
Max. No. of Bits to Read in One Message	8 bits
Relative Address	0000H to 000CH
Coil Number	10001H to 10013H

Message Composition

Command Message (bytes)

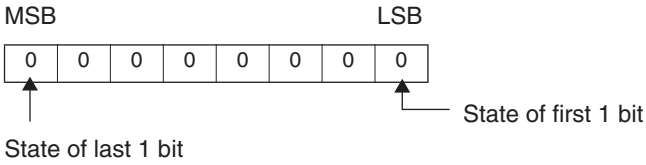
Station No.	
Function Code	
Number to Start Reading (Relative Address)	Upper number
	Lower number
No. of Bits to Read	00H
	Lower number
CRC Data	Upper number
	Lower number



Reply Message Composition (bytes)

Station No.	
Function Code	
No. of Bytes to Read (01H)	
State of first 8 bits	
CRC Data	Upper number
	Lower number

■ Bit Data to Read List



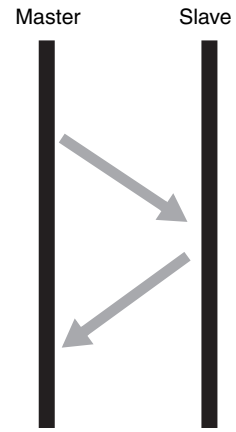
Example of Transmitting a Message

This following example explains how to read ALM1 and ALM2 on station number 31.

- ALM1 detection data bit Relative address: 0000H Data number: 2H
- ALM2 detection data bit Relative address: 0001H

Command Message (bytes)

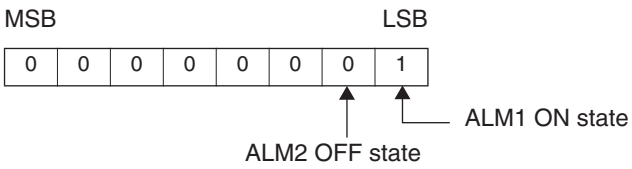
Station No.		1FH
Function Code		02H
No. to Start Reading (Relative Address)	Upper number	00H
	Lower number	00H
No. of Bits to Read	Upper number	00H
	Lower number	02H
CRC Data	Upper number	FAH
	Lower number	75H



Response Message (bytes)

Station No.		1FH
Function Code		02H
No. of Bytes to Read		01H
State of first 8 bits		01H
CRC Data	Upper number	66H
	Lower number	60H

■ Meaning of Read Data

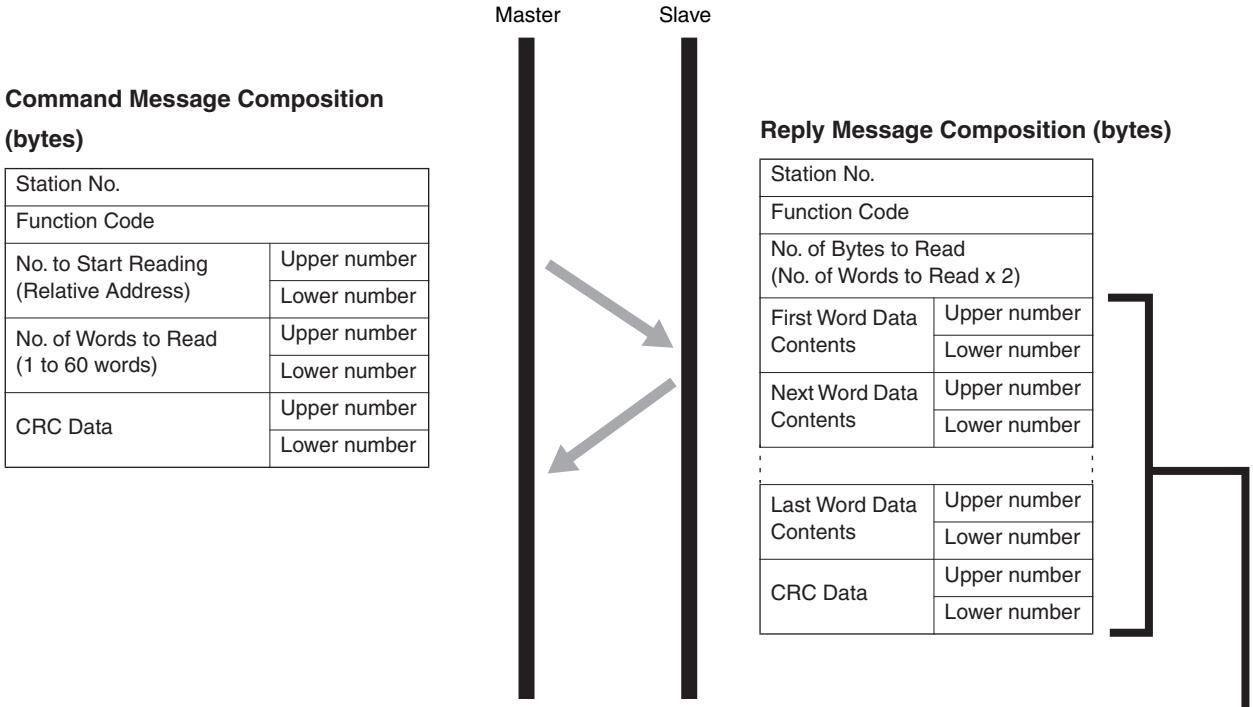


Reading Word Data (Function Code: 03H)

The unit reads word data continuously for the specified number of words from the first number to start reading from.
The slave forwards the read word data from the upper number of bytes to the lower number.

Function Code	03H	
Max. No. of Words to Read in One Message	60 words	
Relative Address	0000H to 0276H	03E8H to 065EH
Resistor Number	40001 to 40628	41001 to 41628
Contents	Internal Calculation Value	Engineering Unit

Message Composition



Command Message Composition (bytes)

Station No.	
Function Code	
No. to Start Reading (Relative Address)	Upper number
	Lower number
No. of Words to Read (1 to 60 words)	Upper number
	Lower number
CRC Data	Upper number
	Lower number

Reply Message Composition (bytes)

Station No.	
Function Code	
No. of Bytes to Read (No. of Words to Read x 2)	
First Word Data Contents	Upper number
	Lower number
Next Word Data Contents	Upper number
	Lower number
Last Word Data Contents	Upper number
	Lower number
CRC Data	Upper number
	Lower number

■ Meaning of Read Word Data

MSB LSB

First Word Data upper byte
First Word Data lower byte
Next Word Data upper byte
Next Word Data lower byte
Last Word Data upper byte
Last Word Data lower byte

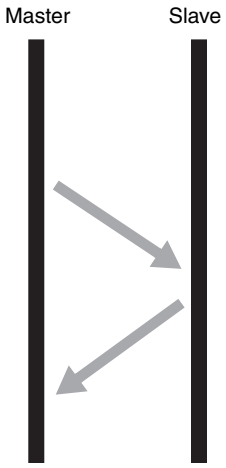
Example of Transmitting a Message (For Engineering Unit)

The message is composed as follows when reading the PV input lower limit and PV input upper limit from station number 2.

- PV Lower Limit Relative Address: 03F9H

Command Message (bytes)

Station No.		02H
Function Code		03H
No. to Start Reading (Relative Address)	Upper number	03H
	Lower number	F9H
No. of Words to Read	Upper number	00H
	Lower number	02H
CRC Data	Upper number	14H
	Lower number	4DH



Response Message (bytes)

Station No.		02H
Function Code		03H
No. of Bytes to Read		04H
First Word Data Contents	Upper number	00H
	Lower number	00H
Next Word Data Contents	Upper number	01H
	Lower number	90H
CRC Data	Upper number	C8H
	Lower number	CFH

■ Meaning of Read Data

PV Input Lower Limit 00 00H = 0

PV Input Upper Limit 01 90H = 400

If Decimal Point Position = 0, then the PV input upper limit and lower limit are as follows.

PV Lower Limit = 0°C

PV Upper Limit = 400°C

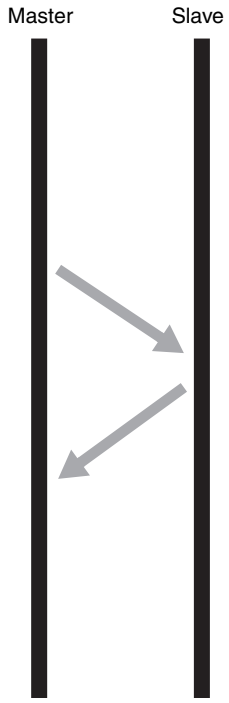
Refer to For more about the internal calculation value, engineering unit, and decimal point see "Chapter 7, Address Map and Data Configuration" (p. 39).

Reading Read-Only Word Data (Function Code: 04H)

The unit reads word data continuously for the specified number of words from the first number to start reading from.
The slave forwards the read word data from the upper number of bytes to the lower number.

Function Code	04H	
Max. No. of Words to Read in One Message	37 bytes	
Relative Address	0000H to 0064H	03E8H to 044CH
Resistor Number	30001 to 30100	31001 to 31100
Contents	Internal Calculation Value	Engineering Unit

Message Composition



Command Message Composition (bytes)

Station No.	
Function Code	
No. to Start Reading (Relative Address)	Upper number
	Lower number
No. of Words to Read (1 to 15 words)	Upper number
	Lower number
CRC Data	Upper number
	Lower number

Reply Message Composition (bytes)

Station No.	
Function Code	
No. of Bytes to Read (No. of Words to Read x 2)	
First Word Data Contents	Upper number
	Lower number
Next Word Data Contents	Upper number
	Lower number
Last Word Data Contents	Upper number
	Lower number
CRC Data	Upper number
	Lower number

■ Meaning of Read Word Data

MSB LSB

First Word Data upper byte
First Word Data lower byte
Next Word Data upper byte
Next Word Data lower byte
Last Word Data upper byte
Last Word Data lower byte

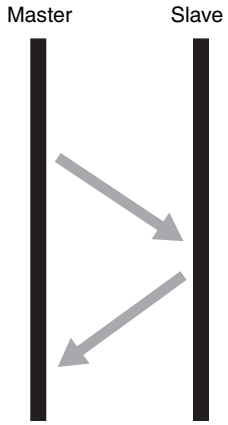
Example of Transmitting a Message (Internal Calculation Data)

The message is composed as follows when reading the PV input value from station number 1.

- PV value relative address: 0000H Data number: 01H

Command Message (bytes)

Station No.		01H
Function Code		04H
No. to Start Reading (Relative Address)	Upper number	00H
	Lower number	00H
No. of Bits to Read	Upper number	00H
	Lower number	01H
CRC Data	Upper number	31H
	Lower number	CAH



Response Message (bytes)

Station No.		01H
Function Code		04H
No. of Bytes to Read		02H
First Word Data Contents	Upper number	03H
	Lower number	46H
CRC Data	Upper number	38H
	Lower number	32H

■ Meaning of Read Data

Word Data Contents 03 46H = 838 (8.38% FS)
When the input range is 0 to 400°C
PV = 33.5°C (= 8.38FS x 400 (input range width))

Refer to For more about the internal calculation value, engineering unit, and decimal point see "Chapter 7, Address Map and Data Configuration" (p. 39).

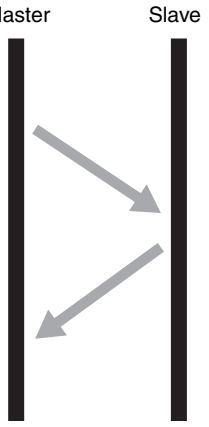
Example of Transmitting a Message (For Engineering Unit)

The message is composed as follows when reading the PV value from station number 1.

- PV value relative address: 03E8H Data number: 01H

Command Message (bytes)

Station No.		01H
Function Code		04H
No. to Start Reading (Relative Address)	Upper number	03H
	Lower number	E8H
No. of Words to Read	Upper number	00H
	Lower number	01H
CRC Data	Upper number	B1H
	Lower number	BAH



Response Message (bytes)

Station No.		01H
Function Code		04H
No. of Bytes to Read		02H
First Word Data Contents	Upper number	01H
	Lower number	4FH
CRC Data	Upper number	F9H
	Lower number	54H

■ Meaning of Read Data

Word Data Contents 01 4FH = 335
When the decimal point position = 1
PV = 33.5°C

Refer to For more about the internal calculation value, engineering unit, and decimal point see "Chapter 7, Address Map and Data Configuration" (p. 39).

Writing Data

Writing Word Data (1 word, function code: 06H)

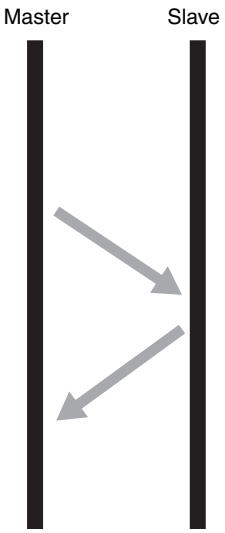
This writes the specified data to the specified number for word data. The master sends the data to be written from the upper number of bytes to the lower number.

Function Code	06H	
Max. No. of Bits to Read in One Message	1 words	
Relative Address	0001H to 0274H	03E9H to 065CH
Resistor Number	40002 to 40628	41002 to 41628
Contents	Internal Calculation Value	Engineering Unit

Message Composition

Command Message Composition (bytes)

Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper number
	Lower number
Word Data to Write	Upper number
	Lower number
CRC Data	Upper number
	Lower number



Response Message Composition (bytes)

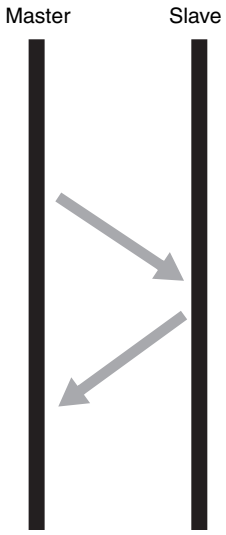
Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper number
	Lower number
Word Data to Write	Upper number
	Lower number
CRC Data	Upper number
	Lower number

Example of Transmitting a Message

This example explains how to set PID parameter "P" to 100.0 (1000D = 03E8H) on station number 1.
Parameter "P" relative address: 0005H (internal calculation value table)
03EDH (initial value table)

Command Message (bytes)

Station No.		01H
Function Code		06H
Specified Write Number (Relative Address)	Upper number	00H
	Lower number	05H
Word Data to Write	Upper number	03H
	Lower number	E8H
CRC Data	Upper number	99H
	Lower number	75H



Response Message (bytes)

Station No.		01H
Function Code		06H
Specified Write Number (Relative Address)	Upper number	00H
	Lower number	05H
Write Specification State	Upper number	03H
	Lower number	E8H
CRC Data	Upper number	99H
	Lower number	75H

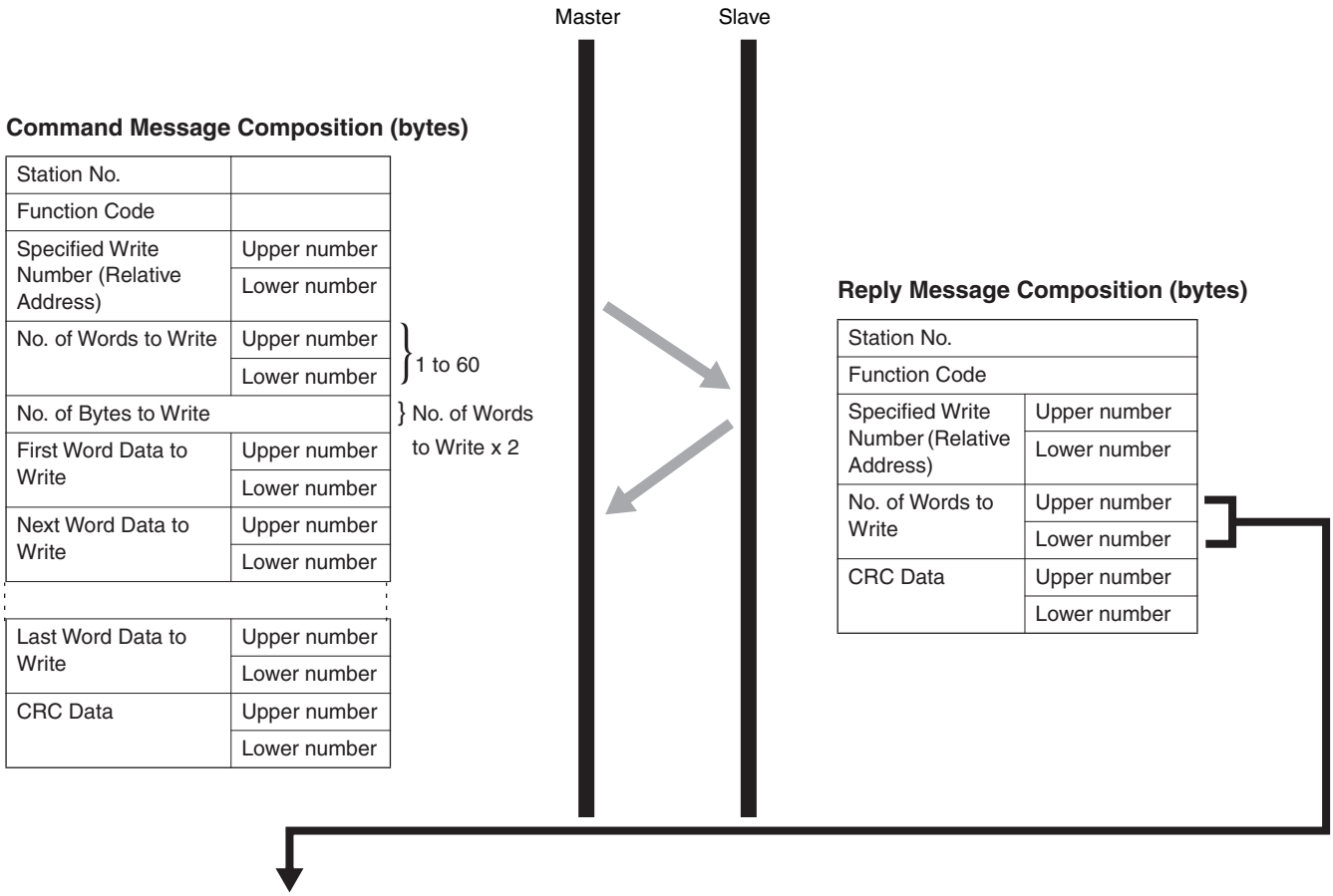
Point For more about the internal calculation value, engineering unit, and decimal point see "Transmission Data Format" (p. 40).

Writing Continuous Word Data (Function code: 10H)

This writes continuous word information for a number of written words from the first number for writing.
The master sends the data to be written from the upper number of bytes to the lower number.

Function Code	10H	
Max. No. of Bits to Read in One Message	60 words	
Relative Address	0000H to 0077H	03E8H to 045FH
Resistor Number	40001 to 40120	41001 to 41120
Contents	Internal Calculation Value	Engineering Unit

Message Composition



Command Message Composition (bytes)

Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper number
	Lower number
No. of Words to Write	Upper number
	Lower number
No. of Bytes to Write	
First Word Data to Write	Upper number
	Lower number
Next Word Data to Write	Upper number
	Lower number
Last Word Data to Write	Upper number
	Lower number
CRC Data	Upper number
	Lower number

} 1 to 60

} No. of Words to Write x 2

Reply Message Composition (bytes)

Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper number
	Lower number
No. of Words to Write	Upper number
	Lower number
CRC Data	Upper number
	Lower number

■ Meaning of Read Word Data

MSB LSB

First Word Data upper byte
First Word Data lower byte
Next Word Data upper byte
Next Word Data lower byte
Last Word Data upper byte
Last Word Data lower byte

Example of Transmitting a Message (Internal Calculation Data)

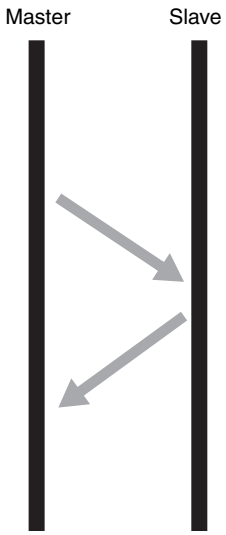
The message is composed as follows when writing the following PID parameters to station number 1.

P = 100.0 (= 1000D = 03E8H)
I = 10 (= 100D = 0064)
D = 5.0 (= 50D = 0032H)

- Parameter "P" relative address: 0005H, Data number: 03H

Command Message (bytes)

Station No.		01H
Function Code		10H
Specified Write Number (Relative Address)	Upper number	00H
	Lower number	05H
No. of Words to Write	Upper number	00H
	Lower number	03H
No. of Bytes to Write		06H
First Word Data to Write	Upper number	03H
	Lower number	E8H
Next Word Data to Write	Upper number	00H
	Lower number	64H
Last Word Data to Write	Upper number	00H
	Lower number	32H
CRC Data	Upper number	56H
	Lower number	BEH



Response Message (bytes)

Station No.		01H
Function Code		10H
Specified Write Number (Relative Address)	Upper number	00H
	Lower number	05H
Write Specification State	Upper number	00H
	Lower number	03H
CRC Data	Upper number	90H
	Lower number	09H

Point The decimal point cannot be included in the sent data, so data such as "100.0" above is sent as "1000".

Refer to For each type of send data format, see "Chapter 7, Address Map and Data Configuration" (p. 39).

MEMO

Chapter 7

Address Map and Data Format

Data Format – 40

Internal Calculation Value Data Address Map – 42

Engineering Unit Data Address Map – 66

Data Format

Sent Data Format

The MODBUS protocol used by this equipment employs RTU (Remote Terminal Unit) mode. The data is sent as "numerical value", not as ASCII code.

Internal Calculation Value and Engineering Unit

In this unit, parameter data and data dependent on an input range can handle the following two types of data.
Internal Calculation Value: Values listed as percentages of the input range (0.00 to 100.00, without decimal point)
Engineering Unit: Values subjected to scaling to actual values depending on the input range

"Engineering Unit" data is handled as the address (resister number) of 1000 added to the address (resister number) for "Internal Calculation Value".

(Ex.) The value is calculated as follows when the full scale is 400°C and the PV value is "150".

Class	Resistor Number	Data (HEX)		Data
Internal Calculation Value	30001	0EA6 (H)	→	3750 (37.5%)
Engineering unit	31001	0096 (H)		150

The PV value is received as follows.
37.50 (%) x 400 (full scale °C) = 150 °C

Chapter 7

Data not dependent on an input range the same data in both addresses.
Also, bit data cannot be handled in this manner. (Not effective for addresses with 1,000 added.)

Refer to For more about data dependent on an input range, see "Chapter 7 Address Map and Data Format" (page xx).

Caution Pay attention to the position of the decimal point when changing the input range by writing with communication. When changing the position of the decimal point by writing with communication, change the lower limit and upper limit of the input range at the same time.

(Ex.) When changing the input range from 0 to 400 to 0.0 to 400.0

■ Operating the keys on the front of the equipment
Change the position of the decimal point ("Pud") in the setup menu ("SEt Ch 6").
"Pud" = 0 → 1 (or 2)

■ Changing by communication
Set the decimal position parameter ("Pud"), as well as the corresponding values for PF input lower limit ("Pub") and PV input upper limit ("PuF").
"Pud" = 0 → 1
"Pub" = 0 → 0
"PuF" = 400 → 400

Managing the Decimal Point

Some of the internally stored data may contain may digits lower than the decimal point on the front display. Also, the decimal point is not added to sent data.
Carry out processes for the decimal point position (erasing the decimal point when sending data and adding the decimal point when receiving data).
Attention must be paid to the position of the decimal point for data where the parameters are dependent on a range in "Chapter 7 Address Map and Data Format". Refer to Address Map.

Data during Input Error

For situations such as overrange, underrange, and input breaks where "UUUU" or "LLLL" display on the front, read PV value becomes 105% or -5% of the input range.
Input errors can be detected via communication using "resistor number 30008 (or 31008): Input/Unit Error Status".

Written Data

When writing data to each parameter, set that written data within the range for the data. PXG can accept written data outside of the range, but do so with care as correct operations are not guaranteed.

Addresses Not Written

Do not write to addresses that are not public. Doing so may cause damage.

Internal Calculation Value Data Address Map

Handles data dependent on an input range as an internal value before scaling (0.00 to 100.00%).
See "Operation Manual" for more details about individual parameter functions and settings ranges.

Bit Data (read only): function code [02 (H)]

Relative address	Coil Number	Type	Memory contents	Read data	Dependent on range	Remarks/ related parameters
0000H	10001	bit	ALM1 ON/OFF	0: Alarm OFF 1: Alarm ON		
00001H	10002	bit	ALM2 ON/OFF	0: Alarm OFF 1: Alarm ON		
00002H	10003	bit	ALM3 ON/OFF	0: Alarm OFF 1: Alarm ON		
00003H	10004	bit	ALM4 ON/OFF	0: Alarm OFF 1: Alarm ON		
00004H	10005	bit	ALM5 ON/OFF	0: Alarm OFF 1: Alarm ON		
00008H	10009	bit	D01 ON/OFF	0: DO OFF 1: DO ON		
00009H	10010	bit	D02 ON/OFF	0: DO OFF 1: DO ON		
0000AH	10011	bit	D03 ON/OFF	0: DO OFF 1: DO ON		
0000BH	10012	bit	D04 ON/OFF	0: DO OFF 1: DO ON		
0000CH	10013	bit	D05 ON/OFF	0: DO OFF 1: DO ON		

Word Data (read/write): function code [03 (H), 06 (H), 10 (H)]

Operation (Ch1)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"MAn"	MAn	Switches to manual mode	0088H	40121	41121	Word	0: oFF (during auto) 1: on (during manual)	0: oFF (auto) 1: on (manual)	oFF	
"StbY"	STbY	Switches between RUN and standby	0003H	40004	41004	Word	0: oFF (during RUN) 1: on (during standby)		oFF	
"rEM"	rEM	Switches to remote mode	0084H	40117	41117	Word	0: LoCL (during Local) 1: rEM (during Remote)	0: LoCL (Local) 1: rEM (Remote)	LoCL	
"PrG"	PrG	Ramp/soak controls Command	0061H	40082	41082	Word	0: oFF (during stop) 1: rUn (during run) 2: hLd (during hold)	0: oFF (stop) 1: rUn (run) 2: hLd (hold)	oFF	
"AT"	AT	Auto-tuning run command	0004H	40005	41005	Word	0: oFF 1: rUn 2: Low		oFF	
"LACh"	LACh	Cancels the DO output latch Command	00B0H	40161	41161	Word	0: oFF 1: rST (latch reset)		oFF	
"Svn"	Svn	Selectable SV numbers	00F2H	40221	41221	Word	0: Sv0 (Local SV) 1: Sv1 (SV = SV-1) 2: Sv2 (SV = SV-2) 3: Sv3 (SV = SV-3) 4: Sv4 (SV = SV-4) 5: Sv5 (SV = SV-5) 6: Sv6 (SV = SV-6) 7: Sv7 (SV = SV-7) 8: di : SV = choose Di		Sv0	
"PLn1"	PLn1	Currently selected PID No.	00F3H	40222	41222	Word	0: PID0 (PID group local) 1: PID1 (PID group No. 1) 2: PID2 (PID group No. 2) 3: PID3 (PID group No. 3) 4: PID4 (PID group No. 4) 5: PID5 (PID group No. 5) 6: PID6 (PID group No. 6) 7: PID7 (PID group No. 7) 8: di (PID group Di selection)		PID0	
"AL 1"	AL1	ALM1 set value or A1-L	003BH	40044	41044	Word	0% to 100% FS		10°C	○
"AL 1L"	AL1L	AL1L set value	00B2H	40163	41163	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL 1h"	AL1h	AL1h set value	00B3H	40164	41164	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL2"	AL2	ALM2 set value or A2-L	003CH	40045	41045	Word	0% to 100% FS		10°C	○
"AL2L"	AL2L	AL2L set value	00B9H	40170	41170	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL2h"	AL2h	AL2h set value	00BAH	40171	41171	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL3"	AL3	ALM3 set value or A3-L	003DH	40046	41046	Word	0% to 100% FS		10°C	○
"AL3L"	AL3L	AL3L set value	00C0H	40177	41177	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL3h"	AL3h	AL3h set value	00C1H	40178	41178	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL4"	AL4	ALM4 set value or A4-L	00C7H	40184	41184	Word	0% to 100% FS		10°C	○
"AL4L"	AL4L	AL4L set value	00C7H	40184	41184	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"AL4h"	AL4h	AL4h set value	00C8H	40185	41185	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL5"	AL5	ALM5 set value or A5-L	00CEH	40191	41191	Word	0% to 100% FS		10°C	○
"AL5L"	AL5L	AL5L set value	00CEH	40191	41191	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"AL5h"	AL5h	AL5h set value	00CFH	40192	41192	Word	0% to 100% FS (absolute alarm) -100% to 100 % FS (deviation alarm)			○
"LoC"	LoC	Key lock	0037H	40040	41040	Word	0 : no lock 1 : all lock 2 : All but SV locked			

PID (Ch2)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"P"	P	Proportional band	0005H	40006	41006	Word	0 to 9999 (0.0% to 999.9%)		5.0%	
"I"	I	Integration time	0006H	40007	41007	Word	0 to 32000 (0 to 3200 sec)		240 sec	
"d"	D	Derivation time	0007H	40008	41008	Word	0 to 9999 (0.0 to 999.9sec)		60.0 sec	
"hYS"	hYS	ON/OFF control hysteresis	0008H	40009	41009	Word	0% to 50% FS		1°C	○
"CoL"	CoL	Cooling proportional band coefficient	0009H	40010	41010	Word	0.0 to 100.0		1.0	
"db"	db	Dead band	000AH	40011	41011	Word	-50 to 50%		0%	
"bAL"	bAL	Output convergence value	000CH	40013	41013	Word	-100 to 100%		0/50 (single/dual)	
"Ar"	Ar	Anti-reset windup	000BH	40012	41012	Word	0% to 100% FS		100%	○
"rEv"	rEv	Sets normal/reverse operations	0067H	40088	41088	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/ dual)	
"SvL"	SvL	SV limit (lower)	002EH	40031	41031	Word	0% to 100% FS		0% FS	○
"Svh"	Svh	SV limit (upper)	002FH	40032	41032	Word	0% to 100% FS		100% FS	○
"rC1"	TC1	OUT1 proportion cycle	0068H	40089	41089	Word	1 sec to 150 sec		30 or 2 sec	
"rC2"	TC2	OUT2 proportion cycle	0069H	40090	41090	Word	1 sec to 150 sec		30 or 3 sec	
"PLC1"	PLC1	OUT1 lower limit	0028H	40025	41025	Word	-3.00 to 103.00%		-3.0%	
"PhC1"	PhC1	OUT1 upper limit	0029H	40026	41026	Word	-3.00 to 103.00%		103.0%	
"PLC2"	PLC2	OUT2 lower limit	002AH	40027	41027	Word	-3.00 to 103.00%		-3.0%	
"PhC2"	PhC2	OUT2 upper limit	002BH	40028	41028	Word	-3.00 to 103.00%		103.0%	
"PCUT"	PCUT	Selects the output limiter type	0027H	40024	41024	Word	0 to 15		0	

PID Palette (Ch3)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"SU 1"	Sv1	SV set value 1	0106H	40241	41241	Word	0% to 100% FS		0% FS	○
"P 1"	P1	Proportional band 1	0107H	40242	41242	Word	0.0 to 999.9%		5.0%	
"I 1"	I1	Integration time 1	0108H	40243	41243	Word	0 sec to 3200 sec		240 sec	
"d 1"	D1	Derivation time 1	0109H	40244	41244	Word	0.0 sec to 999.9 sec		60.0sec	
"hYS 1"	hYS1	ON/OFF Control hysteresis 1	010AH	40245	41245	Word	0% to 50% FS		1°C	○
"CoL 1"	CoL1	Cooling proportional band 1	010BH	40246	41246	Word	0.0 to 100.0		1.0	
"db 1"	db1	Dead band 1	010CH	40247	41247	Word	-50.0 to 50.0%		0%	
"bAL 1"	bAL1	Output convergence value 1	010DH	40248	41248	Word	-100.0 to 100.0%		0/50 (sigle/dual)	
"Ar 1"	Ar1	Anti-reset windup 1	010EH	40249	41249	Word	0% to 100% FS		100% FS	○
"rEU 1"	rEv1	Normal/Reverse setting 1	010FH	40250	41250	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"SU2"	Sv2	SV set value 2	0110H	40251	41251	Word	0% to 100% FS		0% FS	○
"P2"	P2	Proportional band 2	0111H	40252	41252	Word	0.0 to 999.9%		5.0%	
"I2"	I2	Integration time 2	0112H	40253	41253	Word	0 sec to 3200 sec		240 sec	
"d2"	D2	Derivation time	0113H	40254	41254	Word	0.0 sec to 999.9 sec		60.0sec	
"hYS2"	hYS2	ON/OFF control hysteresis 2	0114H	40255	41255	Word	0% to 50% FS		1°C	○
"CoL2"	CoL2	Cooling proportional band 2	0115H	40256	41256	Word	0.0 to 100.0		1.0	
"db2"	db2	Dead band 2	0116H	40257	41257	Word	-50.0 to 50.0%		0%	
"bAL2"	bAL2	Output convergence value 2	0117H	40258	41258	Word	-100.0 to 100.0%		0/50 (sigle/dual)	
"Ar2"	Ar2	Anti-reset windup 2	0118H	40259	41259	Word	0% to 100% FS		100% FS	○
"rEU2"	rEv2	Normal/Reverse setting 2	0119H	40260	41260	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"SU3"	Sv3	SV set value 3	011AH	40261	41261	Word	0% to 100% FS		0% FS	○
"P3"	P3	Proportional band 3	011BH	40262	41262	Word	0.0 to 999.9%		5.0%	
"I4"	I3	Integration time 3	011CH	40263	41263	Word	0 sec to 3200 sec		240 sec	

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"d3"	D3	Derivation time 3	011DH	40264	41264	Word	0.0 sec to 999.9 sec		60.0 sec	
"hYS3"	hYS3	ON/OFF control hysteresis 3	011EH	40265	41265	Word	0% to 50% FS		1°C	○
"CoL3"	CoL3	Cooling proportional band 3	011FH	40266	41266	Word	0.0 to 100.0		1.0	
"db3"	db3	Dead band 3	0120H	40267	41267	Word	-50.0 to 50.0%		0%	
"bAL3"	bAL3	Output convergence value 3	0121H	40268	41268	Word	-100.0 to 100.0%		0/50 (sigle/dual)	
"Ar3"	Ar3	Anti-reset windup 3	0122H	40269	41269	Word	0% to 100% FS		100% FS	○
"rEv3"	rEv3	Normal/Reverse setting 3	0123H	40270	41270	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"Sv4"	Sv4	SV set value 4	0124H	40271	41271	Word	0% to 100% FS		0% FS	○
"P4"	P4	Proportional band 4	0125H	40272	41272	Word	0.0 to 999.9%		5.0%	
"I4"	I4	Integration time 4	0126H	40273	41273	Word	0 sec to 3200 sec		240 sec	
"d4"	d4	Derivation time 4	0127H	40274	41274	Word	0.0 sec to 999.9 sec		60.0sec	
"hYS4"	hYS4	ON/OFF control hysteresis 4	0128H	40275	41275	Word	0% to 50% FS		1°C	○
"CoL4"	CoL4	Cooling proportional band 4	0129H	40276	41276	Word	0.0 to 100.0		1.0	
"db4"	db4	Dead band 4	012AH	40277	41277	Word	-50.0 to 50.0%		0%	
"bAL4"	bAL4	Output convergence value 4	012BH	40278	41278	Word	-100.0 to 100.0%		0/50 (sigle/dual)	
"Ar4"	Ar4	Anti-reset windup 4	012CH	40279	41279	Word	0% to 100% FS		100% FS	○
"rEv4"	rEv4	Normal/Reverse setting 4	012DH	40280	41280	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"Sv5"	Sv5	SV set value 5	012EH	40281	41281	Word	0% to 100% FS		0% FS	○
"P5"	P5	Proportional band 5	012FH	40282	41282	Word	0.0 to 999.9%		5.0%	
"I5"	I5	Integration time 5	0130H	40283	41283	Word	0 sec to 3200 sec		240 sec	
"d5"	d5	Derivation time 5	0131H	40284	41284	Word	0.0 sec to 999.9 sec		60.0sec	
"hYS5"	hYS5	ON/OFF control hysteresis 5	0132H	40285	41285	Word	0% to 50% FS		1°C	○
"CoL5"	CoL5	Cooling proportional band 5	0133H	40286	41286	Word	0.0 to 100.0		1.0	
"db5"	db5	Dead band 5	0134H	40287	41287	Word	-50.0 to 50.0%		0%	
"bAL5"	bAL5	Output convergence value 5	0135H	40288	41288	Word	-100.0 to 100.0%		0/50 (sigle/dual)	
"Ar5"	Ar5	Anti-reset windup 5	0136H	40289	41289	Word	0% to 100% FS		100% FS	○

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"rEv5"	rEv5	Normal/Reverse setting 5	0137H	40290	41290	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"Sv6"	Sv6	SV set value 6	0138H	40291	41291	Word	0% to 100% FS		0% FS	○
"P6"	P6	Proportional band 6	0139H	40292	41292	Word	0.0 to 999.9%		5.0%	
"I6"	I6	Integration time 6	013AH	40293	41293	Word	0 sec to 3200 sec		240 sec	
"d6"	D6	Derivation time 6	013BH	40294	41294	Word	0.0 sec to 999.9 sec		60.0sec	
"hYS6"	hYS6	ON/OFF control hysteresis 6	013CH	40295	41295	Word	0% to 50% FS		1°C	○
"CoL6"	CoL6	Cooling proportional band 6	013DH	40296	41296	Word	0.0 to 100.0		1.0	
"db6"	db6	Dead band 6	013EH	40297	41297	Word	-50.0 to 50.0%		0%	
"bAL6"	bAL6	Output convergence value 6	013FH	40298	41298	Word	-100.0 to 100.0%		0/50 (single/ dual)	
"Ar6"	Ar6	Anti-reset windup 6	0140H	40299	41299	Word	0% to 100% FS		100% FS	○
"rEv6"	rEv6	Normal/Reverse setting 6	0141H	40300	41300	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"Sv7"	Sv7	SV set value 7	0142H	40301	41301	Word	0% to 100% FS		0% FS	○
"P7"	P7	Proportional band 7	0143H	40302	41302	Word	0.0 to 999.9%		5.0%	
"I7"	I7	Integration time 7	0144H	40303	41303	Word	0 sec to 3200 sec		240 sec	
"d7"	d7	Derivation time 7	0145H	40304	41304	Word	0.0 sec to 999.9 sec		60.0sec	
"hYS7"	hYS7	ON/OFF control hysteresis7	0146H	40305	41305	Word	0% to 50% FS		1°C	○
"CoL"	CoL7	Cooling proportional band 7	0147H	40306	41306	Word	0.0 to 100.0		1.0	
"db7"	db7	Dead band 7	0148H	40307	41307	Word	-50.0 to 50.0%		0%	
"bAL7"	bAL7	Output convergence value 7	0149H	40308	41308	Word	-100.0 to 100.0%		0/50 (sigle/dual)	
"Ar7"	Ar7	Anti-reset windup 7	014AH	40309	41309	Word	0% to 100% FS		100% FS	○

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"rEU7"	rEv7	Normal/Reverse setting 7	014BH	40310	41310	Word	0: rv-- (heat (reverse) / cool (none)) 1: no-- (heat (normal) / cool (none)) 2: rvno (heat (reverse) / cool (normal)) 3: norv (heat (normal) / cool (reverse)) 4: rvrv (heat (reverse) / cool (reverse)) 5: nono (heat (normal) / cool (normal))		rv--/rvno (single/dual)	
"SUMX"	SvMX	Selectable SV numbers	00F5H	40224	41224	Word	0: Sv0 (Local SV) 1: Sv1 (SV = SV-1) 2: Sv2 (SV = SV-2) 3: Sv3 (SV = SV-3) 4: Sv4 (SV = SV-4) 5: Sv5 (SV = SV-5) 6: Sv6 (SV = SV-6) 7: Sv7 (SV = SV-7) 8: di : SV = choose Di		Sv7	
"PL 1M"	PL1M	Currently selected PID No.	00F6H	40225	41225	Word	0: PID0 (PID group local) 1: PID1 (PID group No. 1) 2: PID2 (PID group No. 2) 3: PID3 (PID group No. 3) 4: PID4 (PID group No. 4) 5: PID5 (PID group No. 5) 6: PID6 (PID group No. 6) 7: PID7 (PID group No. 7) 8: di (PID group Di selection)		PID7	

Ramp/Soak (Ch4)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"PTn"	PTn	Ramp/Soak Activation Pattern	0231H	40561	41561	Word	0 (uses steps 1 to 4) 1 (uses steps 5 to 8) 2 (uses steps 1 to 8) 3 (uses steps 9 to 12) 4 (uses steps 13 to 16) 5 (uses steps 9 to 16) 6 (uses steps 1 to 16)		6	
"TIMU"	TIMU	Ramp/soak time units	029DH	40562	41562	Word	0 : hh.MM (hour: min) 1 : MM.SS (min: sec)		hh.MM	
"SU-1"	SV-1	Ramp/Soak 1 seg/SV Set Value	02B6H	40581	41581	Word	0% to 100% FS		0% FS	○
"TM1R"	TM1R	Ramp/Soak 1 seg ramp time	02B7H	40582	41582	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM1S"	TM1S	Ramp/Soak 1 seg soak time	02B8H	40583	41583	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-2"	SV-2	Ramp/Soak 2 seg/SV Set Value	02B9H	40584	41584	Word	0% to 100% FS		0% FS	○
"TM2R"	TM2R	Ramp/Soak 2 seg ramp time	02BAH	40585	41585	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM2S"	TM2S	Ramp/Soak 2 seg soak time	02BBH	40586	41586	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-3"	SV-3	Ramp/Soak 3 seg/SV Set Value	02BCH	40587	41587	Word	0% to 100% FS		0% FS	○
"TM3R"	TM3R	Ramp/Soak 3 seg ramp time	02BDH	40588	41588	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM3S"	TM3S	Ramp/Soak 3 seg soak time	02BEH	40589	41589	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-4"	SV-4	Ramp/Soak 4 seg/SV Set Value	02BFH	40590	41590	Word	0% to 100% FS		0% FS	○
"TM4R"	TM4R	Ramp/Soak 4 seg ramp time	02C0H	40591	41591	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM4S"	TM4S	Ramp/Soak 4 seg soak time	02C1H	40592	41592	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-5"	SV-5	Ramp/Soak 5 seg/SV Set Value	02C2H	40593	41593	Word	0% to 100% FS		0% FS	○
"TM5R"	TM5R	Ramp/Soak 5 seg ramp time	02C3H	40594	41594	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM5S"	TM5S	Ramp/Soak 5 seg soak time	02C4H	40595	41595	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-6"	SV-6	Ramp/Soak 6 seg/SV Set Value	02C5H	40596	41596	Word	0% to 100% FS		0% FS	○
"TM6R"	TM6R	Ramp/Soak 6 seg ramp time	02C6H	40597	41597	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM6S"	TM6S	Ramp/Soak 6 seg soak time	02C7H	40598	41598	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-7"	SV-7	Ramp/Soak 7 seg/SV Set Value	02C8H	40599	41599	Word	0% to 100% FS		0% FS	○
"TM7R"	TM7R	Ramp/Soak 7 seg ramp time	02C9H	40600	41600	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"TM7S"	TM7S	Ramp/Soak 7 seg soak time	02CAH	40601	41601	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"SU-8"	SV-8	Ramp/Soak 8 seg/SV Set Value	02CBH	40602	41602	Word	0% to 100% FS		0% FS	○
"rM8r"	TM8R	Ramp/Soak 8 seg ramp time	02CCH	40603	41603	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"rM8S"	TM8S	Ramp/Soak 8 seg soak time	02CDH	40604	41604	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU-9"	SV-9	Ramp/Soak 9 seg/SV Set Value	02CEH	40605	41605	Word	0% to 100% FS		0% FS	○
"rM9r"	TM9R	Ramp/Soak 9 seg ramp time	02CFH	40606	41606	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"rM9S"	TM9S	Ramp/Soak 9 seg soak time	02D0H	40607	41607	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 10"	SV10	Ramp/Soak 10 seg/SV Set Value	02D1H	40608	41608	Word	0% to 100% FS		0% FS	○
"r 10r"	T10R	Ramp/Soak 10 seg ramp time	02D2H	40609	41609	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"rM 10S"	T10S	Ramp/Soak 10 seg soak time	02D3H	40610	41610	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 11"	SV11	Ramp/Soak 11 seg/SV Set Value	02D4H	40611	41611	Word	0% to 100% FS		0% FS	○
"r 11r"	T11R	Ramp/Soak 11 seg ramp time	02D5H	40612	41612	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"r 11S"	T11S	Ramp/Soak 11 seg soak time	02D6H	40613	41613	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 12"	SV12	Ramp/Soak 12 seg/SV Set Value	02D7H	40614	41614	Word	0% to 100% FS		0% FS	○
"r 12r"	T12R	Ramp/Soak 12 seg ramp time	02D8H	40615	41615	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"r 12S"	T12S	Ramp/Soak 12 seg soak time	02D9H	40616	41616	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 13"	SV13	Ramp/Soak 13 seg/SV Set Value	02DAH	40617	41617	Word	0% to 100% FS		0% FS	○
"r 13r"	T13R	Ramp/Soak 13 seg ramp time	02DBH	40618	41618	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"r 13S"	T13S	Ramp/Soak 13 seg soak time	02DCH	40619	41619	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 14"	SV14	Ramp/Soak 14 seg/SV Set Value	02DDH	40620	41620	Word	0% to 100% FS		0% FS	○
"r 14r"	T14R	Ramp/Soak 14 seg ramp time	02DEH	40621	41621	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"r 14S"	T14S	Ramp/Soak 14 seg soak time	02DFH	40622	41622	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 15"	SV15	(Ramp/Soak 15 seg/SV Set Value)	02E0H	40623	41623	Word	0% to 100% FS		0% FS	○
"r 15r"	T15R	Ramp/Soak 15 seg ramp time	02E1H	40624	41624	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"r 15S"	T15S	Ramp/Soak 15 seg soak time	02E2H	40625	41625	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"SU 16"	SV16	Ramp/Soak 16 seg/SV Set Value	02E3H	40626	41626	Word	0% to 100% FS		0% FS	○
"r 16r"	T16R	Ramp/Soak 16 seg ramp time	02E4H	40627	41627	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"r 16S"	T16S	Ramp/Soak 16 seg soak time	02E5H	40628	41628	Word	00.00-99.59 (hour:min/min: sec)		00.00 (hour:min)	
"Mod"	Mod	Ramp/soak mode	0060H	40081	41081	Word	0 to 15		0	
"GSoE"	GSoK	Guaranty soak ON/OFF	02A6H	40571	41571	Word	0:oFF (guaranty soak off) 1:on (guaranty soak on)		oFF	
"GS-L"	GS-L	Guaranty soak (lower limit)	02A7H	40572	41572	Word	0% to 50% FS		5°C	○
"GS-h"	GS-h	Guaranty soak (upper limit)	02A8H	40573	41573	Word	0% to 50% FS		5°C	○
"PrnM"	PTnM	Sets the max pattern selection	029FH	40564	41564	Word	0 to 6		6	

Monitor (Ch5)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"StAt"	STAT	Ramp/soak progress	029CH	40561	41561	Word	0: oFF 1: 1-rP 2: 1-Sk 3: 2-rP 4: 2-Sk ⋮ 31: 16rP 32: 16Sk 33: End			

Setup (Ch6)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"PvT"	PvT	PV input type	000FH	40016	41016	Word	0 (JPT 100'3f) 1 (PT 100'3f) 2 (J) 3 (K) 4 (R) 5 (B) 6 (S) 7 (T) 8 (E) 9 (no function) 10 (no function) 11 (no function) 12 (N) 13 (PL- 2) 14 (no function) 15 (0V to 5V / 0mA to 20mA 16 (1V to 5V/4mA to 20mA) 17 (0mV to 10V) 18 (2V to 10V) 19 (0mV to 100mV)		3 (K)	
"Pvb"	Pvb	PV input lower limit	0021H	40018	41018	Word	-1999-9999		0°C	
"PvF"	PvF	PV input upper limit	0022H	40019	41019	Word	-1999-9999		400°C	
"Pvd"	Pvd	Decimal position	0023H	40020	41020	Word	0 (no decimal point) 1 (one decimal place) 2 (two decimal places)		0	
"PvU"	PvU	Unit display	016EH	40345	41345	Word	0: °C 1: °F		0	
"PvoF"	PvoF	PV input shift	000DH	40014	41014	Word	-10% to 10% FS		0% FS	
"SvoF"	SvoF	Sv shift	000EH	40015	41015	Word	-5000 to 5000 (-50.00% to 50.00% FS)			
"tF"	TF	PV input filter	0025H	40022	41022	Word	0 to 1200 (0.0 to 120.0 sec)		5 sec	
"AdJ0"	ADJ0	PV display zero adjustment	0072H	40099	41099	Word	-50% to 50% FS			○
"AdJS"	ADJS	PV display Splan adjustment	0073H	40100	41100	Word	-50% to 50% FS			○
"rCJ"	RCJ	Cold Junction Compensation	0026H	40023	41023	Word	0: oFF (off) 1: on (on)		on	
"rEM0"	rEM0	RSV zero adjustment	0085H	40118	41118	Word	-50% to 50% FS		0%FS	
"rEMS"	rEMS	RSV span adjustment	0086H	40119	41119	Word	-50% to 50% FS		0%	
"rEMr"	rEMr	RSV Input Range	0181H	40358	41358	Word	0: 0-5v (0V to 5V) 1: 1-5v (1V to 5V)		1-5	
"rtF"	rTF	RSV input filter	0182H	40359	41359	Word	0.0 sec to 120.0 sec		0.0 sec	
"C1r"	C1r	OUT1 range	0198H	40381	41381	Word	0: 0-5v (0V to 5V) 1: 1-5v (1V to 5V) 2: 0 to 10 (0V to 10V) 3: 2 to 10 (2V to 10V) 4: 0 to 20 (0mA to 20mA) 5: 4 to 20 (4mA to 20mA)		0 to 10 (voltage) 4 to 20 (current)	
"C2r"	C2r	OUT2 range	0199H	40382	41382	Word	0: 0-5v (0V to 5V) 1: 1-5v (1V to 5V) 2: 0 to 10 (0V to 10V) 3: 2 to 10 (2V to 10V) 4: 0 to 20 (0mA to 20mA) 5: 4 to 20 (4mA to 20mA)		0 to 10 (voltage) 4 to 20 (current)	

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"FLo 1"	FLo1	Output 1 set value during FALT	01A1H	40390	41390	Word	-300 to 10300 (-3.00 to 103.00%)			
"FLo2"	FLo2	Output 2 set value during FALT	01A2H	40391	41391	Word	-300 to 10300 (-3.00 to 103.00%)			
"SFo 1"	Sfo1	Soft start OUT1 set value	01A3H	40392	41392	Word	-300 to 10300 (-3.00 to 103.00%)			
"SFTM"	SFTM	Soft start set time	01A5H	40394	41394	Word	00:00 to 99:59 (hour:min)		00:00 (hour:min)	
"Sbo 1"	Sbo1	During standby, OUT1 set value	01A9H	40398	41398	Word	-300 to 10300 (-3.00 to 103.00%)			
"Sbo2"	Sbo2	During standby, OUT2 set value	01AAH	40399	41399	Word	-300 to 10300 (-3.00 to 103.00%)			
"SbMd"	SBMD	Standby mode setting	01ABH	40400	41400	Word	0 to 3		0	
"AoT"	AOT	Types of AO output	01ACH	40401	41401	Word	0: PV 1: SV 2: MV 3: DV 4: PFB		PV	
"AoL"	AoL	AO lower limit scaling	0082H	40115	41115	Word	-100% to 100%FS		0%	
"Aoh"	Aoh	AO upper limit scaling	0083H	40116	41116	Word	-100% to 100%FS		100%	

System (Ch7)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"UtEY"	UKEY	USER key assignment settings	009CH	40141	41141	Word	0 (no function) 1 (Switches between STBY ON/OFF) 2 (Switches between Auto/Manual) 3 (Switches between Local/Remote) 4 (Switches EXMV) 5 (Starts AT (standard)) 6 (Starts AT (low PV)) 7 (no function) 8 (Ramp SV HOLD) 9 (Ramp/soak RUN/OFF) 10 (Ramp/soak RUN/HOLD) 11 (no function) 12 (Latch cancel (all)) 13 (Latch cancel (DO1)) 14 (Latch cancel (DO2)) 15 (Latch cancel (DO3)) 16 (Latch cancel (DO4)) 17 (Latch cancel (DO5)) 18 (Start timer (DO1)) 19 (Start timer (DO2)) 20 (Start timer (DO3)) 21 (Start timer (DO4)) 22 (Start timer (DO5)) 23 (SV No. + 1 (send)) 24 (PID No. + 1 (send)) 25 (no function) 26 (Pattern No. + 1 (send)) 27 (SV No. + 1, PID No. + 1 (send))		2	

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"dI 1"	di1	DI-1 function select	009EH	40143	41143	Word	0 (no function) 1 (Switches between STBY ON/OFF) 2 (Switches between Auto/Manual) 3 (Switches between Local/Remote) 4 (Switches EXMV1) 5 (no function) 6 (Starts AT (standard)) 7 (Starts AT (low PV)) 8 (no function) 9 (no function) 10 (no function) 11 (Ramp SV HOLD) 12 (Ramp/soak OFF) 13 (Ramp/soak RUN/HOLD) 14 (no function) 15 (Latch cancel (all)) 16 (Latch cancel (DO1)) 17 (Latch cancel (DO2)) 18 (Latch cancel (DO3)) 19 (Latch cancel (DO4)) 20 (Latch cancel (DO5)) 21 (Start timer (DO1)) 22 (Start timer (DO2)) 23 (Start timer (DO3)) 24 (Start timer (DO4)) 25 (Start timer (DO5)) 26 (SV No. 1) 27 (SV No. 2) 28 (SV No. + 4) 29 (PID No. 1 +1) 30 (PID No. 1 +2) 31 (PID No. 1 + 4) 32 (no function) 33 (no function) 34 (no function) 35 (SV No.+1, PID No. 1+1) 36 (SV No.+2, PID No. 1+2) 37 (SV No.+4, PID No. 1+4)		0	
"dI2"	di2	DI-2 function select	009FH	40144	41144	Word	Same as above		0	
"dI3"	di3	DI-3 function select	00A0H	40145	41145	Word	Same as above		0	
"dI4"	di4	DI-4 function select	00A1H	40146	41146	Word	Same as above		0	
"dI 15"	di5	DI-5 function select	00A2H	40147	41147	Word	Same as above		0	
"do 1T"	do1T	DO1 output event type setting	0038H	40041	41041	Word	0-102		0	
"doP 1"	doP1	Sets DO1 option function	00B5H	40166	41166	Word	0000 to 1111		0	
"do2T"	do2T	DO2 output event type setting	0039H	40042	41042	Word	0 to 102		0	
"doP2"	doP2	DO5 option function setting	00BCH	40173	41173	Word	0000 to 1111		0	
"do3T"	do3T	DO3 output event type setting	003AH	40043	41043	Word	0 to 102		0	
"doP3"	doP3	DO3 option function setting	00C3H	40180	41180	Word	0000 to 1111		0	
"do4T"	do4T	DO4 output event type setting	00C6H	40183	41183	Word	0 to 102		0	
"doP4"	doP4	DO4 option function setting	00CAH	40187	41187	Word	0000 to 1111		0	
"do5T"	do5T	DO5 output event type setting	00CDH	40190	41190	Word	0 to 102		0	
"doP5"	doP5	DO5 option function setting	00D1H	40194	41194	Word	0000 to 1111		0	
"rMPL"	rMPL	Ramp SV - Decline	01C9H	40430	41430	Word	0% to 100% FS/°C		0°C	○
"rMPh"	rMPh	Ramp SV ñ Incline	01CAH	40431	41431	Word	0% to 100% FS/°C		0°C	○

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"rMPU"	rMPU	Ramp SV slope time unit	01CBH	40432	41432	Word	0: hour (slope temperature/hour) 1: Min (slope temperature/min)		hoUr	
"SUr"	SvT	Ramp SV - SV display mode selection	01CCH	40433	41433	Word	0: rMP (Ramp SV HOLD) 1: TrG (target SV)		rMP	
"CTrL"	CTrL	Control methods	0001H	40002	41002	Word	0: PiD (PID control) 1: FUZY (Fuzzy Pid control) 2: SELF (Self-tuning control) 3: PiD2 (Pid2 control)			
"PrCS"	PrCS	Control target	01C3H	40424	41424	Word	0: SRV1 (Servo control 1) 1: SRV2 (Servo control 2) 2: PFb (Position feedback control)		PFB/Srv1 (PFB on/PFB off)	
"STMd"	STMd	Startup mode	01CDH	40434	41434	Word	0: Auto (starts up in auto mode) 1: MAn (starts up in manual mode)		Auto	

Alarm (Ch8)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"A1hY"	A1hY	ALM1 hysteresis	0041H	40050	41050	Word	0% to 50% FS		1°C	○
"dLY1"	dLY1	ALM1 delay	0044H	40053	41053	Word	0-9999 [sec/min]		0	
"dL1U"	dL1U	ALM1 delay time units	00B7H	40168	41168	Word	0: sec 1: Min			
"A2hY"	A2hY	ALM2 hysteresis	0042H	40051	41051	Word	0% to 50% FS		1°C	○
"dLY2"	dLY2	ALM2 delay	0045H	40054	41054	Word	0 to 9999 [sec/min]		0	
"dL2U"	dL2U	ALM1 delay time units	00BEH	40175	41175	Word	0: sec 1: Min			
"A3hY"	A3hY	ALM3 hysteresis	0043H	40052	41052	Word	0% to 50% FS		1°C	○
"dLY3"	dLY3	ALM3 delay	0046H	40055	41055	Word	0 to 9999 [sec/min]		0	
"dL3U"	dL3U	ALM3 delay time units	00C5H	40182	41182	Word	0: sec 1: Min			
"A4hY"	A4hY	ALM4 hysteresis	00C9H	40186	41186	Word	0% to 50% FS		1°C	○
"dLY4"	dLY4	ALM4 delay	00CBH	40188	41188	Word	0 to 9999 [sec/min]		0	
"dL4U"	dL4U	ALM4 delay time units	00CCH	40189	41189	Word	0: sec 1: Min			
"A5hY"	A5hY	ALM5 hysteresis	00D0H	40193	41193	Word	0% to 50% FS		1°C	○
"dLY5"	dLY5	ALM5 delay	00D2H	40195	41195	Word	0 to 9999 [sec/min]		0	
"dL5U"	dL5U	ALM1 delay time units	00D3H	40196	41196	Word	0: sec 1: Min			
"hb1"	hb1	CT HB Alarm Set Value	0036H	40039	41039	Word	0.0 to 50.0 (A)			
"hb1h"	hb1h	CT HB alarm hysteresis	00D5H	40198	41198	Word	0.0 to 50.0 (A)			
"LbTM"	LbTM	Loop break detection time	00DCH	40205	41205	Word	0 sec to 9999 sec		0 sec	
"LbAb"	LbAb	Loop break detection range	00DDH	40206	41206	Word	0 to 9999 (0% to 100% FS)		0 sec	○

PFB (Ch10)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"PGAP"	PGAP	PFB dead band	01C4H	40425	41425	Word	0.0 to 100.0%		5%	○
"trUL"	TrvL	Valve Stroke Time	01C5H	40426	41426	Word	5 sec to 180 sec		30 sec	
"CAL"	CAL	PFB Input Adjustment Command	01C7H	40428	41428	Word	0 (none/ forcible termination) 1 (zero adjustment) 2 (span adjustment) 3 (automatic adjustment)	0 (none/ forcible termination) 1 (zero adjustment) 2 (span adjustment) 3 (automatic adjustment)	-	

Password Setup (Ch11)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"PAS1"	PAS1	Password1 setup	0225H	40522	41522	Word	-32768 to 32767 (8000 to 7FFF)		0	
"PAS2"	PAS2	Password2 setup	0226H	40523	41523	Word	-32768 to 32767 (8000 to 7FFF)		0	
"PAS3"	PAS3	Password3 setup	0227H	40524	41524	Word	-32768 to 32767 (8000 to 7FFF)		0	

Display (Ch12)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"dP01"	DP01	Parameter display mask	01DEH	40451	41451	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP02"	DP02	Parameter display mask	01DFH	40452	41452	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP03"	DP03	Parameter display mask	01E0H	40453	41453	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP04"	DP04	Parameter display mask	01E1H	40454	41454	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP05"	DP05	Parameter display mask	01E2H	40455	41455	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP06"	DP06	Parameter display mask	01E3H	40456	41456	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP07"	DP07	Parameter display mask	01E4H	40457	41457	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP08"	DP08	Parameter display mask	01E5H	40458	41458	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP09"	DP09	Parameter display mask	01E6H	40459	41459	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
"dP 10"	DP10	Parameter display mask	01E7H	40460	41460	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 11"	DP11	Parameter display mask	01E8H	40461	41461	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 12"	DP12	Parameter display mask	01E9H	40462	41462	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 13"	DP13	Parameter display mask	01EAH	40463	41463	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 14"	DP14	Parameter display mask	01EBH	40464	41464	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 15"	DP15	Parameter display mask	01ECH	40465	41465	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 16"	DP16	Parameter display mask	01EDH	40466	41466	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 17"	DP17	Parameter display mask	01EEH	40467	41467	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 18"	DP18	Parameter display mask	01EFH	40468	41468	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP 19"	DP19	Parameter display mask	01F0H	40469	41469	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP20"	DP20	Parameter display mask	01F1H	40470	41470	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP2 1"	DP21	Parameter display mask	01F2H	40471	41471	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP22"	DP22	Parameter display mask	01F3H	40472	41472	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP23"	DP23	Parameter display mask	01F4H	40473	41473	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP24"	DP24	Parameter display mask	01F5H	40474	41474	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP25"	DP25	Parameter display mask	01F6H	40475	41475	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP26"	DP26	Parameter display mask	01F7H	40476	41476	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP27"	DP27	Parameter display mask	01F8H	40477	41477	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP28"	DP28	Parameter display mask	01F9H	40478	41478	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP29"	DP29	Parameter display mask	01FAH	40479	41479	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	
"dP30"	DP30	Parameter display mask	01FBH	40480	41480	Word	-32768 to 32767 (8000 to 7FFF)		Different depending on model.	

Other

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Written data range	Factory Setting	Dependent on range
				Internal	Engineering unit					
SV	Front SV set value	Front SV set value	0002H	40003	41003	Word	0 to 10000 (in the 0% to 100% FS set value limit)			○
			0092H	40131	41131	Word				
MV	Front MV set value	Front MV set value	0089H	40122	41122	Word	-300 to 10300 (-3.0 to 103.0%)			
			0093H	40132	41132	Word				

Resistor Number Order Read/Write Parameter List

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
0001H	40002	41002	CTrL (control method)
0002H	40003	41003	Front SV set value
0003H	40004	41004	STbY (Switches between RUN and standby)
0004H	40005	41005	AT (Auto-tuning run command)
0005H	40006	41006	P (Proportional band)
0006H	40007	41007	I (Integration time)
0007H	40008	41008	D (Derivation time)
0008H	40009	41009	hYS (ON/OFF control hysteresis)
0009H	40010	41010	CoL (Cooling proportional band coefficient)
000AH	40011	41011	db (Dead band)
000BH	40012	41012	Ar (Anti-reset windup)
000CH	40013	41013	bAL (output convergence value)
000DH	40014	41014	PvoF (PV input shift)
000EH	40015	41015	SvoF (SV input shift)
000FH	40016	41016	PvT (PV input types)
0020H	40017	41017	P-F (Unit display)
0021H	40018	41018	Pvb (PV input lower limit)
0022H	40019	41019	Pvb (PV input upper limit)
0023H	40020	41020	Pvd (decimal position)
0024H	40021	41021	-
0025H	40022	41022	TF (PV input filter)
0026H	40023	41023	rCJ (Cold junction compensation)
0027H	40024	41024	PCUT (Selects the output limiter type)
0028H	40025	41025	PLC1 (OUT1 lower limit)
0029H	40026	41026	PHC1 (OUT1 upper limit)
002AH	40027	41027	PLC2 (OUT2 lower limit)
002BH	40028	41028	PHC2 (OUT2 upper limit)
002EH	40031	41031	SvL (SV limit (lower))
002FH	40032	41032	SvH (SV limit (upper))
0036H	40039	41039	Hb1 (CT HB alarm set value)
0037H	40040	41040	LoC (Key lock)
0038H	40041	41041	do1T (DO1 output event type)
0039H	40042	41042	do2T (DO2 output event type)
003AH	40043	41043	do3T (DO3 output event type)
003BH	40044	41044	AL1 (ALM1 set value) or A1-L
003CH	40045	41045	AL2 (ALM2 set value) or A2-L
003DH	40046	41046	AL3 (ALM3 set value) or A3-L
003EH	40047	41047	A1-H (Alarm 1 upper limit set value)
003FH	40048	41048	A2-H (Alarm 2 upper limit set value)
0040H	40049	41049	A3-H (Alarm 3 upper limit set value)
0041H	40050	41050	A1hY (ALM1 hysteresis)
0042H	40051	41051	A2hY (ALM2 hysteresis)
0043H	40052	41052	A3hY (ALM3 hysteresis)
0044H	40053	41053	dLY1 (ALM1 delay)
0045H	40054	41054	dLY2 (ALM2 delay)
0046H	40055	41055	dLY3 (ALM3 delay)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
0048H	40057	41057	Sv-1 (Ramp/soak 1 seg/SV set value)
0049H	40058	41058	Sv-2 (Ramp/soak 2 seg/SV set value)
004AH	40059	41059	Sv-3 (Ramp/soak 3 seg/SV set value)
004BH	40060	41060	Sv-4 (Ramp/soak 4 seg/SV set value)
004CH	40061	41061	Sv-5 (Ramp/soak 5 seg/SV set value)
004DH	40062	41062	Sv-6 (Ramp/soak 6 seg/SV set value)
004EH	40063	41063	Sv-7 (Ramp/soak 7 seg/SV set value)
004FH	40064	41064	Sv-8 (Ramp/soak 8 seg/SV set value)
0050H	40065	41065	TM1r (Ramp/soak 1 seg ramp time)
0051H	40066	41066	TM1S (Ramp/soak 1 seg soak time)
0052H	40067	41067	TM2r (Ramp/soak 2 seg ramp time)
0053H	40068	41068	TM2S (Ramp/soak 2 seg soak time)
0054H	40069	41069	TM3r (Ramp/soak 3 seg ramp time)
0055H	40070	41070	TM3S (Ramp/soak 3 seg soak time)
0056H	40071	41071	TM4r (Ramp/soak 4 seg ramp time)
0057H	40072	41072	TM4S (Ramp/soak 4 seg soak time)
0058H	40073	41073	TM5r (Ramp/soak 5 seg ramp time)
0059H	40074	41074	TM5S (Ramp/soak 5 seg soak time)
005AH	40075	41075	TM6r (Ramp/soak 6 seg ramp time)
005BH	40076	41076	TM6S (Ramp/soak 6 seg soak time)
005CH	40077	41077	TM7r (Ramp/soak 7 seg ramp time)
005DH	40078	41078	TM7S (Ramp/soak 7 seg soak time)
005EH	40079	41079	TM8r (Ramp/soak 8 seg ramp time)
005FH	40080	41080	TM8S (Ramp/soak 8 seg soak time)
0060H	40081	41081	Mod (Ramp/soak mode)
0061H	40082	41082	PrG (PROG) (Ramp/soak control command)
0062H	40083	41083	PTn (Ramp/soak activation pattern)
0064H	40085	41085	SLFb (Pv stable width during self-tuning)
0066H	40087	41087	Communication DI
0067H	40088	41088	rEv (Sets normal/reverse operations)
0068H	40089	41089	TC1 (OUT1 proportion cycle)
0069H	40090	41090	TC2 (OUT2 proportion cycle)
006BH	40092	41092	A10P (Alarm 1 option function)
006CH	40093	41093	A20P (Alarm 2 option function)
006DH	40094	41094	A30P (Alarm 3 option function)
006EH	40095	41095	DI-1 operation setting
006FH	40096	41096	DI-2 operation setting
0070H	40097	41097	ONOF (Hysteresis mode setting)
0072H	40099	41099	AdJ0 (PV display zero adjustment)
0073H	40100	41100	AdJS (PV display Splan adjustment)
0081H	40114	41114	AoT (AO output type)
0082H	40115	41115	AoL (AO lower limit scaling)
0083H	40116	41116	AoH (AO upper limit scaling)
0084H	40117	41117	rEM (CMOD) (switching remote mode)
0085H	40118	41118	rEM0 (RSV zero adjustment)
0086H	40119	41119	rEMS (RSV span adjustment)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
0087H	40120	41120	rTF (RSV input filter)
0088H	40121	41121	Man (switching manual mode)
0089H	40122	41122	Front MV set value
0092H	40131	41131	Front SV set value
0093H	40132	41132	Front MV set value
0094H	40133	41133	Man (switching manual mode)
0095H	40134	41134	STbY (Switches between RUN and standby)
0096H	40135	41135	AT (Auto-tuning run command)
0097H	40136	41136	rEM (switching remote mode)
009CH	40141	41141	UKEY (USER key allocation settings)
009EH	40143	41143	di-1 (DI-1 function selection)
009FH	40144	41144	di-2 (DI-2 function selection)
00A0H	40145	41145	di-3 (DI-3 function selection)
00A1H	40146	41146	di-4 (DI-4 function selection)
00A2H	40147	41147	di-5 (DI-5 function selection)
00B0H	40161	41161	LACh (DO output latch cancel command)
00B1H	40162	41162	do1T (DO1 output event type)
00B2H	40163	41163	AL1L (AL1 set value)
00B3H	40164	41164	AL1h (AL1h set value)
00B4H	40165	41165	A1hY (ALM1 hysteresis)
00B5H	40166	41166	doP1 (Sets DO1 option function)
00B6H	40167	41167	dLY1 (ALM1 delay)
00B7H	40168	41168	dL1U (ALM1 delay time units)
00B8H	40169	41169	do2T (DO2 output event type)
00B9H	40170	41170	AL2L (AL2 set value)
00BAH	40171	41171	AL2H (AL2h set value)
00BBH	40172	41172	A2hY (ALM2 hysteresis)
00BCH	40173	41173	doP2 (DO2 option function setting)
00BDH	40174	41174	dLY2 (ALM2 delay)
00BEH	40175	41175	dL2U (ALM2 delay time units)
00BFH	40176	41176	do3T (DO3 output event type)
00C0H	40177	41177	AL3L (AL3 set value)
00C1H	40178	41178	AL3H (AL3h set value)
00C2H	40179	41179	A3hY (ALM3 hysteresis)
00C3H	40180	41180	doP3 (DO3 option function setting)
00C4H	40181	41181	dLY3 (ALM3 delay)
00C5H	40182	41182	dL3U (ALM3 delay time units)
00C6H	40183	41183	do4T (DO4 output event type)
00C7H	40184	41184	AL4L (AL4 set value)
00C8H	40185	41185	AL4H (AL4h set value)
00C9H	40186	41186	A4hY (ALM4 hysteresis)
00CAH	40187	41187	do4P (DO4 option function setting)
00CBH	40188	41188	dLY4 (ALM4 delay)
00CCH	40189	41189	dL4U (ALM4 delay time units)
00CDH	40190	41190	do5T (DO5 output event type)
00CEH	40191	41191	AL5L (AL5 set value)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
00CFH	40192	41192	AL5h (AL5h set value)
00D0H	40193	41193	A5hY (ALM5 hysteresis)
00D1H	40194	41194	doP5 (Sets DO5 option function)
00D2H	40195	41195	dLY5 (ALM5 delay)
00D3H	40196	41196	dL5U (ALM5 delay time units)
00D4H	40197	41197	Hb1 (CT HB alarm set value)
00DCH	40205	41205	LbTM
00DDH	40206	41206	LbAb
00F2H	40221	41221	SvN (Selectable SV numbers)
00F3H	40222	41222	PLn1 (Currently selected PID No.)
00F5H	40224	41224	SvMX (Selectable SV numbers)
00F6H	40225	41225	PL1M (Currently selected PID No.)
00FCH	40231	41231	Front SV set value
00FDH	40232	41232	P (Proportional band)
00FEH	40233	41233	I (Integration time)
00FFH	40234	41234	d (Derivation time)
0100H	40235	41235	hYS (ON/OFF control hysteresis)
0101H	40236	41236	CoL (Cooling proportional band coefficient)
0102H	40237	41237	db (Dead band)
0103H	40238	41238	bAL (output convergence value)
0104H	40239	41239	Ar (Anti-reset windup)
0105H	40240	41240	rEv (Sets normal/reverse operations)
0106H	40241	41241	Sv1 (SV set value 1)
0107H	40242	41242	P1 (Proportional band 1)
0108H	40243	41243	I1 (Integration time 1)
0109H	40244	41244	d1 (Derivation time 1)
010AH	40245	41245	hYS1 (ON/OFF control hysteresis 1)
010BH	40246	41246	CoL1 (Cooling proportional band 1)
010CH	40247	41247	db1 (Dead band)
010DH	40248	41248	bAL1 (output convergence value1)
010EH	40249	41249	Ar1 (Anti-reset windup 1)
010FH	40250	41250	rEv1 (Sets normal/reverse operations 1)
0110H	40251	41251	Sv2 (SV set value 2)
0111H	40252	41252	P2 (Proportional band 2)
0112H	40253	41253	I2 (Integration time 2)
0113H	40254	41254	d2 (derivation time 2)
0114H	40255	41255	hYS2 (ON/OFF control hysteresis)
0115H	40256	41256	CoL2 (Cooling proportional band 2)
0116H	40257	41257	db2 (Dead band 2)
0117H	40258	41258	bAL2 (output convergence value 2)
0118H	40259	41259	Ar2 (Anti-reset windup 2)
0119H	40260	41260	rEv2 (Sets normal/reverse operations 2)
011AH	40261	41261	Sv3 (SV set value 3)
011BH	40262	41262	P3 (Proportional band 3)
011CH	40263	41263	I3 (Integration time 3)
011DH	40264	41264	d3 (derivation time 3)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
011E$_H$	40265	41265	hYS3 (ON/OFF control hysteresis)
011F$_H$	40266	41266	CoL3 (Cooling proportional band 3)
0120$_H$	40267	41267	db3 (Dead band 3)
0121$_H$	40268	41268	bAL3 (output convergence value 3)
0122$_H$	40269	41269	Ar3 (Anti-reset windup 3)
0123$_H$	40270	41270	rEv3 (Sets normal/reverse operations 3)
0124$_H$	40271	41271	Sv4 (SV set value 4)
0125$_H$	40272	41272	P4 (Proportional band 4)
0126$_H$	40273	41273	I4 (Integration time 4)
0127$_H$	40274	41274	d4 (derivation time 4)
0128$_H$	40275	41275	hYS4 (ON/OFF control hysteresis)
0129$_H$	40276	41276	CoL4 (Cooling proportional band 4)
012A$_H$	40277	41277	db4 (Dead band 4)
012B$_H$	40278	41278	bAL4 (output convergence value 4)
012C$_H$	40279	41279	Ar4 (Anti-reset windup 4)
012D$_H$	40280	41280	rEv4 (Sets normal/reverse operations 4)
012E$_H$	40281	41281	Sv5 (SV set value 5)
012F$_H$	40282	41282	P5 (Proportional band 5)
0130$_H$	40283	41283	I5 (Integration time 5)
0131$_H$	40284	41284	D5 (derivation time 5)
0132$_H$	40285	41285	hYS5 (ON/OFF control hysteresis)
0133$_H$	40286	41286	CoL5 (Cooling proportional band 5)
0134$_H$	40287	41287	db5 (Dead band 5)
0135$_H$	40288	41288	bAL5 (output convergence value 5)
0136$_H$	40289	41289	Ar5 (Anti-reset windup 5)
0137$_H$	40290	41290	rEv5 (Sets normal/reverse operations 5)
0138$_H$	40291	41291	Sv6 (SV set value 6)
0139$_H$	40292	41292	P6 (Proportional band 6)
013A$_H$	40293	41293	I6 (Integration time 6)
013B$_H$	40294	41294	D6 (Derivation time 6)
013C$_H$	40295	41295	hYS6 (ON/OFF control hysteresis)
013D$_H$	40296	41296	CoL6 (Cooling proportional band 6)
013E$_H$	40297	41297	db6 (Dead band 6)
013F$_H$	40298	41298	bAL6 (output convergence value 6)
0140$_H$	40299	41299	Ar6 (Anti-reset windup 6)
0141$_H$	40300	41300	rEv6 (Sets normal/reverse operations 6)
0142$_H$	40301	41301	Sv7 (SV set value 7)
0143$_H$	40302	41302	P7 (Proportional band 7)
0144$_H$	40303	41303	I7 (Integration time 7)
0145$_H$	40304	41304	d7 (Derivation time 7)
0146$_H$	40305	41305	hYS7 (ON/OFF control hysteresis)
0147$_H$	40306	41306	CoL7 (Cooling proportional band 7)
0148$_H$	40307	41307	db7 (Dead band 7)
0149$_H$	40308	41308	bAL7 (output convergence value 7)
014A$_H$	40309	41309	Ar7 (Anti-reset windup 7)
014B$_H$	40310	41310	rEv7 (Sets normal/reverse operations 7)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
016A$_H$	40341	41341	PvT (PV input types)
016B$_H$	40342	41342	PvB (PV input lower limit)
016C$_H$	40343	41343	PvF (PV input upper limit)
016D$_H$	40344	41344	Pvd (decimal position)
016E$_H$	40345	41345	PvU (Unit display)
0170$_H$	40347	41347	PvOF (PV input shift)
0171$_H$	40348	41348	SVOF (SV input shift)
0172$_H$	40349	41349	SVL (SV limit (lower))
0173$_H$	40350	41350	SVH (SV limit (upper))
0174$_H$	40351	41351	TF (PV input filter)
0175$_H$	40352	41352	ADJ0 (PV display zero adjustment)
0176$_H$	40353	41353	ADJS (PV display Splan adjustment)
0177$_H$	40354	41354	rCJ (Cold junction compensation)
0178$_H$	40355	41355	reM (Switching remote SV operation)
0179$_H$	40356	41356	rEM0 (RSV zero adjustment)
0180$_H$	40357	41357	rEMS (RSV span adjustment)
0181$_H$	40358	41358	rEMR (RSV Input Range)
0182$_H$	40359	41359	rTF (RSV input filter)
0183$_H$	40360	41360	-
0198$_H$	40381	41381	C1r (OUT1 range)
0199$_H$	40382	41382	C2r (OUT2 range)
019A$_H$	40383	41383	TC1 (OUT1 proportion cycle)
019B$_H$	40384	41384	TC2 (OUT2 proportion cycle)
019C$_H$	40385	41385	PLC1 (OUT1 lower limit)
019D$_H$	40386	41386	PHC1 (OUT1 upper limit)
019E$_H$	40387	41387	PLC2 (OUT2 lower limit)
019F$_H$	40388	41388	PHC2 (OUT2 upper limit)
01A0$_H$	40389	41389	PCUT (Selects the output limiter type)
01A1$_H$	40390	41390	FLo1
01A2$_H$	40391	41391	FLo2
01A3$_H$	40392	41392	SFo1
01A5$_H$	40394	41394	SFTM (Soft start set time)
01A9$_H$	40398	41398	SBo1
01AA$_H$	40399	41399	SBo2
01AB$_H$	40400	41400	SBMD (Standby mode settings)
01AC$_H$	40401	41401	AoT (AO output type)
01AD$_H$	40402	41402	AoL (AO lower limit scaling)
01AE$_H$	40403	41403	AoH (AO upper limit scaling)
01C0$_H$	40421	41421	CTRL (control method)
01C1$_H$	40422	41422	ONOF (ON/OFF control hysteresis)
01C2$_H$	40423	41423	SLFB (Pv stable width during self-tuning)
01C3$_H$	40424	41424	PrCS (Control target)
01C4$_H$	40425	41425	PGAP (PFB Dead Band)
01C5$_H$	40426	41426	TrVL (Valve stroke time)
01C7$_H$	40428	41428	CAL (PFB input adjustment command)
01C9$_H$	40430	41430	rMPL (Ramp SV - decline)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
01CA$_H$	40431	41431	rMPH (Ramp SV - incline)
01CB$_H$	40432	41432	rMPU (Ramp SV slope time unit)
01CC$_H$	40433	41433	SvT (Ramp SV - SV display mode selection)
01CD$_H$	40434	41434	STMd (Startup mode)
01DE$_H$	40451	41451	dP01 (Parameter display mask)
01DF$_H$	40452	41452	dP02 (Parameter display mask)
01E0$_H$	40453	41453	dP03 (Parameter display mask)
01E1$_H$	40454	41454	dP04 (Parameter display mask)
01E2$_H$	40455	41455	dP05 (Parameter display mask)
01E3$_H$	40456	41456	dP06 (Parameter display mask)
01E4$_H$	40457	41457	dP07 (Parameter display mask)
01E5$_H$	40458	41458	dP08 (Parameter display mask)
01E6$_H$	40459	41459	dP09 (Parameter display mask)
01E7$_H$	40460	41460	dP10 (Parameter display mask)
01E8$_H$	40461	41461	dP11 (Parameter display mask)
01E9$_H$	40462	41462	dP12 (Parameter display mask)
01EA$_H$	40463	41463	dP13 (Parameter display mask)
01EB$_H$	40464	41464	dP14 (Parameter display mask)
01EC$_H$	40465	41465	dP15 (Parameter display mask)
01ED$_H$	40466	41466	dP16 (Parameter display mask)
01EE$_H$	40467	41467	dP17 (Parameter display mask)
01EF$_H$	40468	41468	dP18 (Parameter display mask)
01F0$_H$	40469	41469	dP19 (Parameter display mask)
01F1$_H$	40470	41470	dP20 (Parameter display mask)
01F2$_H$	40471	41471	dP21 (Parameter display mask)
01F3$_H$	40472	41472	dP22 (Parameter display mask)
01F4$_H$	40473	41473	dP23 (Parameter display mask)
01F5$_H$	40474	41474	dP24 (Parameter display mask)
01F6$_H$	40475	41475	dP25 (Parameter display mask)
01F7$_H$	40476	41476	dP26 (Parameter display mask)
01F8$_H$	40477	41477	dP27 (Parameter display mask)
01F9$_H$	40478	41478	dP28 (Parameter display mask)
01FA$_H$	40479	41479	dP29 (Parameter display mask)
01FB$_H$	40480	41480	dP30 (Parameter display mask)
0224$_H$	40521	41521	PASS (Password input)
0225$_H$	40522	41522	PAS1 (Password 1 setup)
0226$_H$	40523	41523	PAS2 (Password 2 setup)
0227$_H$	40524	41524	PAS3 (Password 3 setup)
022E$_H$	40531	41531	ToUT (Display timeout setting)
0230$_H$	40533	41533	r-Fk (During remote selection setting, SV display blinking settings)
0231$_H$	40534	41534	SoFk (During soft start selection, SV display blinking settings)
0232$_H$	40535	41535	ALMF (During ALM, DO lamp blink settings)
0233$_H$	40536	41536	rST (Reset main unit)
0239$_H$	40542	41542	L-C2 (LED lamp allocation (C2))

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
029C$_H$	40561	41561	PTN (Ramp/soak progress)
029D$_H$	40562	41562	TiMU (Ramp/soak time units)
029E$_H$	40563	41563	Mod (Ramp/soak mode)
029F$_H$	40564	41564	PTnM (Sets the max pattern selection)
02A6$_H$	40571	41571	Gsok (Guaranty soak ON/OFF)
02A7$_H$	40572	41572	GS-L (Guaranty soak (lower limit))
02A8$_H$	40573	41573	GS-H (Guaranty soak (upper limit))
02B6$_H$	40581	41581	Sv-1 (Ramp/soak 1 seg/SV set value)
02B7$_H$	40582	41582	TM1r (Ramp/soak 1 seg ramp time)
02B8$_H$	40583	41583	TM1S (Ramp/soak 1 seg soak time)
02B9$_H$	40584	41584	SV-2 (Ramp/soak 2 seg/SV set value)
02BA$_H$	40585	41585	TM2r (Ramp/soak 2 seg ramp time)
02BB$_H$	40586	41586	TM2S (Ramp/soak 2 seg soak time)
02BC$_H$	40587	41587	Sv-3 (Ramp/soak 3 seg/SV set value)
02BD$_H$	40588	41588	TM3r (Ramp/soak 3 seg ramp time)
02BE$_H$	40589	41589	TM3S (Ramp/soak 3 seg soak time)
02BF$_H$	40590	41590	Sv-4 (Ramp/soak 4 seg/SV set value)
02C0$_H$	40591	41591	TM4r (Ramp/soak 4 seg ramp time)
02C1$_H$	40592	41592	TM4S (Ramp/soak 4 seg soak time)
02C2$_H$	40593	41593	Sv-5 (Ramp/soak 5 seg/SV set value)
02C3$_H$	40594	41594	TM5r (Ramp/soak 5 seg ramp time)
02C4$_H$	40595	41595	TM5S (Ramp/soak 5 seg soak time)
02C5$_H$	40596	41596	Sv-6 (Ramp/soak 6 seg/SV set value)
02C6$_H$	40597	41597	TM6r (Ramp/soak 6 seg ramp time)
02C7$_H$	40598	41598	TM6S (Ramp/soak 6 seg soak time)
02C8$_H$	40599	41599	Sv-7 (Ramp/soak 7 seg/SV set value)
02C9$_H$	40600	41600	TM7r (Ramp/soak 7 seg ramp time)
02CA$_H$	40601	41601	TM7S (Ramp/soak 7 seg soak time)
02CB$_H$	40602	41602	Sv-8 (Ramp/soak 8 seg/SV set value)
02CC$_H$	40603	41603	TM8r (Ramp/soak 8 seg ramp time)
02CD$_H$	40604	41604	TM8S (Ramp/soak 8 seg soak time)
02CE$_H$	40605	41605	Sv-9 (Ramp/soak 9 seg/SV set value)
02CF$_H$	40606	41606	TM9r (Ramp/soak 9 seg ramp time)
02D0$_H$	40607	41607	TM9S (Ramp/soak 9 seg soak time)
02D1$_H$	40608	41608	Sv10 (Ramp/soak 10 seg/SV set value)
02D2$_H$	40609	41609	T10r (Ramp/soak 10 seg ramp time)
02D3$_H$	40610	41610	T10S (Ramp/soak 10 seg soak time)
02D4$_H$	40611	41611	Sv11 (Ramp/soak 11 seg/SV set value)
02D5$_H$	40612	41612	T11r (Ramp/soak 11 seg ramp time)
02D6$_H$	40613	41613	T11S (Ramp/soak 11 seg soak time)
02D7$_H$	40614	41614	Sv12 (Ramp/soak 12 seg/SV set value)
02D8$_H$	40615	41615	T12r (Ramp/soak 12 seg ramp time)
02D9$_H$	40616	41616	T12S (Ramp/soak 12 seg soak time)
02DA$_H$	40617	41617	Sv13 (Ramp/soak 13 seg/SV set value)
02DB$_H$	40618	41618	T13R (Ramp/soak 13 seg ramp time)
02DC$_H$	40619	41619	T13S (Ramp/soak 13 seg soak time)

Relative address	Resistor Number		Parameter contents
	Internal	Engineering unit	
02DDH	40620	41620	Sv14 (Ramp/soak 14 seg/SV set value)
02DEH	40621	41621	T14r (Ramp/soak 14 seg ramp time)
02DFH	40622	41622	T14S (Ramp/soak 14 seg soak time)
02E0H	40623	41623	Sv15 (Ramp/soak 15 seg/SV set value)
02E1H	40624	41624	T15r (Ramp/soak 15 seg ramp time)
02E2H	40625	41625	T15S (Ramp/soak 15 seg soak time)
02E3H	40626	41626	Sv16 (Ramp/soak 16 seg/SV set value)
02E4H	40627	41627	T16r (Ramp/soak 16 seg ramp time)
02E5H	40628	41628	T16S (Ramp/soak 16 seg soak time)

Word Data (read only): function code [04 (H)]

Monitor (Ch5)

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Dependent on range
				Internal	Engineering unit			
"STAT"	STAT	Ramp/soak progress	0028H	30041	31041	Word	oFF (ramp/soak is stopped) 1rP (Step 1 Ramp) 1Sk (soak is in step 1) ⋮ 16rP (Step 16 Ramp) 16Sk (soak is in step 16) End (ramp/soak is finished)	
"Mv1"	Mv1	Control output 1	0029H	30042	31042	Word	-300 to 10300 (-3.00 to 103.00%FS)	
"Mv2"	Mv2	Control output 2	002AH	30043	31043	Word	-300 to 10300 (-3.00 to 103.00%FS)	
"PFb"	PFb	PFB Input Value Display	002BH	30044	31044	Word	-300 to 10300 (-3.00 to 103.00%FS)	
"rSv"	rSv	RSV input value display	002CH	30045	31045	Word	-500 to 10500 (-5.00 to 105.00%FS)	
"CT1"	CT1	Heater current 1	002DH	30046	31046	Word	0, 0.4 to 50.0A	
"TM1"	TM1	Remaining time on timer 1	0031H	30050	31050	Word	0 sec to 9999 sec / 0 min to 9999 min	
"TM2"	TM2	Remaining time on timer 2	0032H	30051	31051	Word	0 sec to 9999 sec / 0 min to 9999 min	
"TM3"	TM3	Remaining time on timer 3	0033H	30052	31052	Word	0 sec to 9999 sec / 0 min to 9999 min	
"TM4"	TM4	Remaining time on timer 4	0034H	30053	31053	Word	0 sec to 9999 sec / 0 min to 9999 min	
"TM5"	TM5	Remaining time on timer 5	0035H	30054	31054	Word	0 sec to 9999 sec / 0 min to 9999 min	
"FALT"	FALT	Error source display	0036H	30055	31055	Word	0000 to 1100	

Other

Parameter display	Parameter name	Contents	Relative address	Resistor Number		Type	Read data	Dependent on range
				Internal	Engineering unit			
Display PV value	Pv (measurement)		0000H	30001	31001	Word	0 to 10000 (0.00 to 100.00%FS)	○
Display SV Value	Sv (Currently used set value)		0001H	30002	31002	Word	0 to 10000 (0.00 to 100.01%FS)	○
	DV (Currently used deviation)		0002H	30003	31003	Word	-10000 to 10000 (-100.00 to 100.00%FS)	○
"oUt 1"	MV1	Output 1	0003H	30004	31004	Word	-300 to 10300 (-3.00 to 103.00%FS)	
"oUt2"	MV2	Output 2	0004H	30005	31005	Word	-300 to 10300 (-3.00 to 103.00%FS)	
"Stno"	STNo	STATION No.	0005H	30006	31006	Word	0 to 255	
	ALM STATUS		0006H	30007	31007	Word		
"FALt"	FALT	FALT STATUS	0007H	30008	31008	Word	0000 to 1100	
"StAt"	STAT	Ramp/Soak progress	0008H	30009	31009	Word		
"Hb"	HB		0009H	30010	31010	Word	0 to 500 (0.0 to 50.0A)	
"tM1"	TM1	Remaining time on timer 1	000AH	30011	31011	Word	0 sec to 9999 sec / 0 min to 9999 min	
"tM2"	TM2	Remaining time on timer 2	000BH	30012	31012	Word	0 sec to 9999 sec / 0 min to 9999 min	
"tM3"	TM3	Remaining time on timer 3	000CH	30013	31013	Word	0 sec to 9999 sec / 0 min to 9999 min	
"CMdC"	DI		000EH	30015	31015	Word		
	RJC (Cold junction compensation)		000FH	30016	31016	Word	FF (off) on (on)	
"rSU"	rSV	RSV input value display	0024H	30037	31037	Word		
	ALM STATUS		003BH	30060	31060	Word		
	DI STATUS		003CH	30061	31061	Word		
	STAT		003DH	30062	31062	Word		

Resistor Number Order Read Parameter List

Relative address	Resistor Number		Type	Memory contents
	Internal	Engineering unit		
0000H	30001	31001	Word	PV (measurement)
0001H	30002	31002	Word	SV (Currently used set value)
0002H	30003	31003	Word	DV (Currently used deviation)
0003H	30004	31004	Word	Mv1 (output 1)
0004H	30005	31005	Word	Mv2 (output 2)
0005H	30006	31006	Word	STATION No.
0006H	30007	31007	Word	ALM STATUS
0007H	30008	31008	Word	FALT STATUS
0008H	30009	31009	Word	STAT (Ramp/soak progress)
0009H	30010	31010	Word	HB INPUT
000AH	30011	31011	Word	TM1 (Remaining time on timer 1)
000BH	30012	31012	Word	TM2 (Remaining time on timer 2)
000CH	30013	31013	Word	TM3 (Remaining time on timer 3)
000EH	30015	31015	Word	DI STATUS
000FH	30016	31016	Word	rJC (Cold junction compensation)
0024H	30037	31037	Word	rEM (Remote switching status)
0028H	30041	31041	Word	STAT (Ramp/soak progress)
0029H	30042	31042	Word	Mv1 (output 1)
002AH	30043	31043	Word	Mv2 (output 2)
002BH	30044	31044	Word	PFb input value display
002CH	30045	31045	Word	rSv input value display
002DH	30046	31046	Word	CT1 (Heater current 1)
0031H	30050	31050	Word	TM1 (Remaining time on timer 1)
0032H	30051	31051	Word	TM2 (Remaining time on timer 2)
0033H	30052	31052	Word	TM3 (Remaining time on timer 3)
0034H	30053	31053	Word	TM4 (Remaining time on timer 4)
0035H	30054	31054	Word	TM5 (Remaining time on timer 5)
0036H	30055	31055	Word	FALT STATUS
003BH	30060	31060	Word	ALM STATUS
003CH	30061	31061	Word	DI STATUS
003DH	30062	31062	Word	STAT

Engineering Unit Data Address Map

Handles data dependent on an input range as a scaled value (engineering unit).
See "Operation Manual" for more details about individual parameter functions and settings ranges.

Bit Data (read only): function code [02 (H)]

Relative address	Coil Number	Type	Memory contents	Read data	Dependent on range	Remarks/ related parameters
0000H	10001	bit	ALM1 ON/OFF	0: Alarm OFF 1: Alarm ON		
00001H	10002	bit	ALM2 ON/OFF	0: Alarm OFF 1: Alarm ON		
00002H	10003	bit	ALM3 ON/OFF	0: Alarm OFF 1: Alarm ON		
00003H	10004	bit	ALM4 ON/OFF	0: Alarm OFF 1: Alarm ON		
00004H	10005	bit	ALM5 ON/OFF	0: Alarm OFF 1: Alarm ON		
00005H	10006		Not used			
00006H	10007		Not used			
00007H	10008		Not used			
00008H	10009	bit	D01 ON/OFF	0: DO OFF 1: DO ON		
00009H	10010	bit	D02 ON/OFF	0: DO OFF 1: DO ON		
0000AH	10011	bit	D03 ON/OFF	0: DO OFF 1: DO ON		
0000BH	10012	bit	D04 ON/OFF	0: DO OFF 1: DO ON		
0000CH	10013	bit	D05 ON/OFF	0: DO OFF 1: DO ON		

Chapter 8

Sample Program

Sample Program – 68

Sample Program

This chapter shows a sample program that runs in Microsoft Visual Basic 6.0 (SP6) for reading and writing data.
The program shown here is meant to be used as a reference for your own program creation, and therefore all its actions are not guaranteed.

Before running the program, check the following summary of points for communication conditions.
- Parity, communication speed to be set in this program. Please match these values with the conditions of the micro controller.

Warning when using an RS-232C to RS-485 converter
The sent data is sometimes added to the response data from the slave before it is received. In this case, when receiving the data, process the response data only after first getting rid of the number of bytes from the sent data.

Compatible OS
Windows 2000 Professional
Windows XP Professional Edition

Caution
- Windows® is a registered trademark of the Microsoft Corporation.
- Visual Basic® is a registered trademark of the Microsoft Corporation.

Fuji Electric Systems Co., Ltd. assumes no responsibility for damages or infringement upon third party rights as a result of using this sample program.
Use this program while conforming to the contents of the agreement listed within.

■ Example of data reading
- Operation: Reads and displays 2 word data of the set address at once.
- Function code to be used: 03H, 04H
- Number of read words: 2

```
' Variable Declaration ***************************************************************
Dim idx As Integer
  Dim Ansdat() As Byte               ' Response data stack
  Dim Rxbuff As Variant              ' Received data buffer
  Dim PauseTime                      ' Sets the communication wait time.
                                     ' The necessary wait time changes depending on the
                                       transmission speed and transmission frame length.
  Dim Stno As Byte                   ' Communication number

Private Sub Form_Load()

' Initializing the Variable ************************************************************
  Stno = 1
  Main.Visible = True

End Sub

'----------------------------------------
'Read continuous words sample program
'Function code : 03H, 04H
'Number of words : 2
'----------------------------------------

Private Sub TX1_Click()

  TX1.Enabled = False
```

```
' Communication Port Settings ***************************************************************
  If Com5.Value = True Then
     Comm_port = 5                    ' COM5
  ElseIf Com4.Value = True Then
     Comm_port = 4                    ' COM4
  ElseIf Com3.Value = True Then
     Comm_port = 3                    ' COM3
  ElseIf Com2.Value = True Then
     Comm_port = 2                    ' COM2
  Else
     Comm_port = 1                    ' COM1
  End If

  If SPD192.Value = True Then
     Comm_speed = "19200,"            ' 19200bps
  ElseIf SPD96.Value = True Then
     Comm_speed = "9600,"             ' 9600bps
  Else
     Comm_speed = "38400,"            ' 38400bps
  End If

  If Even1.Value = True Then
     Comm_parity = "E,"               ' Even parity
  ElseIf Odd1.Value = True Then
     Comm_parity = "O,"               ' Odd parity
  Else
     Comm_parity = "N,"               ' Parity none
  End If

  PauseTime = 0.2                     ' Sets the wait time. (0.2 sec)

  idx = 0

' Opening the Communication Port *************************************************************
  MSComm1.CommPort = Comm_port        ' COM port settings
  MSComm1.Settings = Comm_speed & Comm_parity & "8,1"' Speed / Party / 8bit_Data / Stop_1bit
  MSComm1.PortOpen = True             ' Port open

' Setting the Communication Number for the Other Party ***************************************
  St = Val(Stno1(idx).Text)
  Stno = St Mod 256
  Stno1(idx).Text = Str(Stno)

' Processing the Address *********************************************************************
  AD$ = Str(Val(Address(idx).Text) - 1)
  AD$ = Right$(("00000" & AD$), 5)
  Area = Val(Left$(AD$, 1))
  Adrsh = Int(Val(Right$(AD$, 4)) / 256)
  Adrsl = Val(Right$(AD$, 4)) Mod 256
```

```
' Creating the Send Command ********************************************************************

  Select Case Area
  Case 3
     ReDim Txdat(7) As Byte          ' Secured 8-byte array
     Txdat(0) = Stno                 ' Station No.
     Txdat(1) = &H4                  ' Command
     Txdat(2) = Adrsh                ' High address
     Txdat(3) = Adrsl                ' Low address
     Txdat(4) = &H0                  ' Read no. words (High)
     Txdat(5) = &H2                  ' Read no. of words (Low)
     Txsu = 5                        ' No. of sent data

  Case 4
     ReDim Txdat(7) As Byte          ' Secured 8-byte array
     Txdat(0) = Stno                 ' Station No.
     Txdat(1) = &H3                  ' Command
     Txdat(2) = Adrsh                ' High address
     Txdat(3) = Adrsl                ' Low address
     Txdat(4) = &H0                  ' Read no. of words (High)
     Txdat(5) = &H2                  ' Read no. of words (Low)
     Txsu = 5                        ' No. of sent data

  Case Else                          ' For other values
  MSComm1.PortOpen = False           ' COM port close
     TX1.Enabled = True
     Exit Sub
  End Select

' Sending the command.*************************************************************************

' Creating CRC for Send Data
GoSub 10000                          ' CRC computation
Txdat(Txsu + 1) = CRC1               '
Txdat(Txsu + 2) = CRC2               '

' Send the created command.
MSComm1.Output = Txdat' Send one byte

' Wait until all of the response data is sent.
Start = Timer                        ' Saves the waiting start time.
Do While Timer < Start + PauseTime   ' Has the set time passed?
  DoEvents                           ' Passes control to other processes.
  If ((Start + PauseTime) - Timer) > PauseTime Then
     Start = Timer
  End If
Loop
```

```
' Import the response data into a byte array.
MSComm1.InputMode = comInputModeBinary    ' Set binary mode
length = MSComm1.InBufferCount            ' Retrieve the no. of sent data bytes
MSComm1.InputLen = 0                      ' Set retrieval of all data
Rxbuff = MSComm1.Input                    ' Import received data into the received buffer
Ansdat = Rxbuff                           ' Assign received data into the byte array

' Calculating CRC for Received Data
Ansu = length - 3                    ' Received data length
GoSub 20000                          ' CRC computation

' Error check
If (length = 0) Then                                                        ' No answer
  Noans = Noans + 1: Rx_data.Caption = "Noans": GoTo 150'
ElseIf ((Ansdat(length - 2) <> CRC1) + (Ansdat(length - 1) <> CRC2)) Then    ' CRC error
  CRCErr = CRCErr + 1: Rx_data.Caption = "CRCErr": GoTo 150
ElseIf Ansdat(1) >= &H80 Then                                               ' Command error
  CMDErr = CMDErr + 1: Rx_data.Caption = "CMDErr": GoTo 150
End If

' Processing correctly received data
     wrk1 = Ansdat(3)
     wrk2 = Ansdat(4)
     wrk3 = Ansdat(5)
     wrk4 = Ansdat(6)
  If Ansdat(5) > 128 Then              ' Received data minus time
     Rx_data.Caption = Str(((wrk3 * (2 ^ 24)) + (wrk4 * (2 ^ 16)) + (wrk1 * (2 ^ 8)) + wrk2) - (2 ^ 32))
  Else
     Rx_data.Caption = Str(((wrk3 * (2 ^ 24)) + (wrk4 * (2 ^ 16)) + (wrk1 * (2 ^ 8)) + wrk2))
  End If
150
  MSComm1.PortOpen = False             ' COM port close

  TX1.Enabled = True

  Exit Sub
```

```
' ********************************************************************************************

10000 ' CRC calculation subroutine IN:Txdat(Txsu) / OUT CRC1,CRC2 ****************************
  CRC = &HFFFF
  For i = 0 To Txsu Step 1
     CRC = CRC Xor Txdat(i)
     For J = 1 To 8 Step 1
         CT = CRC And &H1
         If CRC < 0 Then CH = 1 Else: CH = 0: GoTo 11000
         CRC = CRC And &H7FFF
11000    CRC = Int(CRC / 2)
         If CH = 1 Then CRC = CRC Or &H4000
         If CT = 1 Then CRC = CRC Xor &HA001
     Next J
  Next i
  CRC1 = CRC And &HFF
  CRC2 = ((CRC And &HFF00) / 256 And &HFF)
  Return

20000 ' CRC calculation subroutine IN:Ansdat(Ansu) / OUT CRC1,CRC2 ****************************
  CRC = &HFFFF
  For i = 0 To Ansu Step 1
     CRC = CRC Xor Ansdat(i)
     For J = 1 To 8 Step 1
         CT = CRC And &H1
         If CRC < 0 Then CH = 1 Else: CH = 0: GoTo 21000
         CRC = CRC And &H7FFF
21000    CRC = Int(CRC / 2)
         If CH = 1 Then CRC = CRC Or &H4000
         If CT = 1 Then CRC = CRC Xor &HA001
     Next J
  Next i
  CRC1 = CRC And &HFF
  CRC2 = ((CRC And &HFF00) / 256 And &HFF)
  Return

End Sub
```

■ Example of data writing

- Operation: Writes 2 word data of the set address.
- Function code to be used: 10H
- Number of write words: 2

```
-----------------------------------
'Write 2 words sample program
'Function code : 10H
'Number of words : 2
'-----------------------------------

Private Sub Write_command_Click()
  Write_command.Enabled = False

' Communication Port Settings ***************************************************************
If Com5.Value = True Then
  Comm_port = 5                      ' COM5
ElseIf Com4.Value = True Then
  Comm_port = 4                      ' COM4
ElseIf Com3.Value = True Then
  Comm_port = 3                      ' COM3
ElseIf Com2.Value = True Then
  Comm_port = 2                      ' COM2
Else
  Comm_port = 1                      ' COM1
End If

If SPD192.Value = True Then
  Comm_speed = "19200,"              ' 19200bps
ElseIf SPD96.Value = True Then
  Comm_speed = "9600,"               ' 9600bps
Else
  Comm_speed = "38400,"              ' 38400bps
End If

If Even1.Value = True Then
  Comm_parity = "E,"                 ' Even parity
ElseIf Odd1.Value = True Then
  Comm_parity = "O,"                 ' Odd parity
Else
  Comm_parity = "N,"                 ' Parity none
End If

PauseTime = 0.2                      ' Sets the wait time. (0.2 sec)
idx = 1
' Opening the Communication Port ************************************************************
MSComm1.CommPort = Comm_port                          ' Com port
MSComm1.Settings = Comm_speed & Comm_parity & "8,1"   ' Speed / Party / 8bit_Data / Stop_1bit
MSComm1.PortOpen = True                               ' Open com port
```

```
' Setting the Communication Number for the Other Party ***************************************
St = Val(Stno1(idx).Text)
Stno = St Mod 256
Stno1(idx).Text = Str(Stno)

' Processing the Address ***********************************************************************
AD$ = Str(Val(Address(idx).Text) - 1)
AD$ = Right$(("00000" & AD$), 5)
Area = Val(Left$(AD$, 1))
Adrsh = Int(Val(Right$(AD$, 4)) / 256)
Adrsl = Val(Right$(AD$, 4)) Mod 256

'Creating the Send Command ********************************************************************

Select Case Area
Case 4

'Normal sending data is processed.
  Dim byteData(3) As Byte
  Dim sHex   As String

  sHex = Right("00000000" & Hex(Val(Write_data.Text)), 8)     'Decimal to hexadecimal
  byteData(0) = CByte("&H" & Mid(sHex, 1, 2))                 'hh byte
  byteData(1) = CByte("&H" & Mid(sHex, 3, 2))                 'hl byte
  byteData(2) = CByte("&H" & Mid(sHex, 5, 2))                 'lh byte
  byteData(3) = CByte("&H" & Mid(sHex, 7, 2))                 'll byte

  ReDim Txdat(12) As Byte            ' 13 bytes
     Txdat(0) = Stno                 ' Station No.
     Txdat(1) = &H10                 ' Command
     Txdat(2) = Adrsh                ' High address
     Txdat(3) = Adrsl                ' Low address
     Txdat(4) = &H0                  ' Write no. of words (High)
     Txdat(5) = &H2                  ' Write no. of words (Low)
     Txdat(6) = &H4                  ' Write no. of bytes
     Txdat(7) = byteData(2)          ' Write data (Lo high)
     Txdat(8) = byteData(3)          ' Write data (Lo lo)
     Txdat(9) = byteData(0)          ' Write data (High high)
     Txdat(10) = byteData(1)         ' Write data (High lo)
     Txsu = 10                       ' No. of sent data

Case Else                            ' For other values
  MSComm1.PortOpen = False           ' COM port close
     Write_command.Enabled = True
     Exit Sub
End Select
```

```
' Sending the command. ************************************************************************

' Creating CRC for Send Data
GoSub 10000                          ' CRC computation
Txdat(Txsu + 1) = CRC1               '
Txdat(Txsu + 2) = CRC2               '

' Send the created command.
MSComm1.Output = Txdat               ' Send one byte

' Wait until all of the response data is sent.
Start = Timer                        ' Saves the waiting start time.
Do While Timer < Start + PauseTime   ' Has the set wait time passed?
  DoEvents                           ' Passes control to other processes.
  If ((Start + PauseTime) - Timer) > PauseTime Then
     Start = Timer
  End If
Loop

MSComm1.PortOpen = False             ' COM port close

Write_command.Enabled = True

Exit Sub

' ************************************************************************************************

10000    ' CRC calculation subroutine IN:Txdat(Txsu) / OUT CRC1,CRC2 **************************
  CRC = &HFFFF
  For i = 0 To Txsu Step 1
     CRC = CRC Xor Txdat(i)
     For J = 1 To 8 Step 1
         CT = CRC And &H1
         If CRC < 0 Then CH = 1 Else: CH = 0: GoTo 11000
         CRC = CRC And &H7FFF
11000    CRC = Int(CRC / 2)
         If CH = 1 Then CRC = CRC Or &H4000
         If CT = 1 Then CRC = CRC Xor &HA001
     Next J
  Next i
  CRC1 = CRC And &HFF
  CRC2 = ((CRC And &HFF00) / 256 And &HFF)
  Return

End Sub
```

MEMO

Chapter 9

Troubleshooting

Troubleshooting – 78

Troubleshooting

Check the following items when the unit cannot communicate.

☐ Is the power turned on to all of the equipment related to communication?
☐ Are the wire connections correct? (Are the + and – poles matching?)
☐ Are the communication settings the same between the master (the top computer) and the slave (micro controller)?
- ☐ Communication speed : 9600bps, 19200 bps
- ☐ Data : 8-bit
- ☐ Stop bit : 1-bit
- ☐ Parity : ☐ Odd
  ☐ Even
  ☐ None

☐ Does the transmission signal timing satisfy "Chapter 5, MODBUS Communication Protocol" (p. 17)?
☐ Is the station number specified as the sending location from the master set at something other than "0"?
The communication function does not work when set to "0".
☐ When using RS-485, is the 7th digit of the model number (PXG☐☐☐■☐☐☐☐☐☐) any of M, V, K, J, U or F?
☐ When using RS-485, are the communication settings the same for the RS-232C to RS-485 converter?

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