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INFRARED GAS ANALYZER

COMMUNICATION FUNCTIONS (MODBUS)

TYPE: ZPA, ZPB, ZPG

Fuji Electric Co., Ltd.

CONTENTS

1.   COMMUNICATION FUNCTIONS

1.1   General

- This instrument provides a communication function through RS-485 interface, which allows data transmit to or receive from the host computer and other devices.

- The communication system is comprised of a master station and slave stations. Up to 31 of slave station (present instrument) can be connected per master station (host computer, programmable controller, graphic display panel, etc.) through RS-485 interface.

- Because the master station can communicate with only one slave station at a time, the destination can be identified by the "Station No" set for each slave station.

- In order that the master station and the slave station can communicate, the format of the transmit/receive data must coincide. In this instrument, the format of the communication data is determined by the MODBUS protocol.

[RS-232 ↔ RS-485 converter] (recommended article)
     Type: KS-485 (non-isolated type)/SYSTEM SACOM Corp.
     Type: SI-30FA (isolated type)/SEKISUI ELECTRONICS Co., Ltd.

[USB ↔ RS-485 converter] (recommended article)
     Type: USB-485I/SYSTEM SACOM Corp.
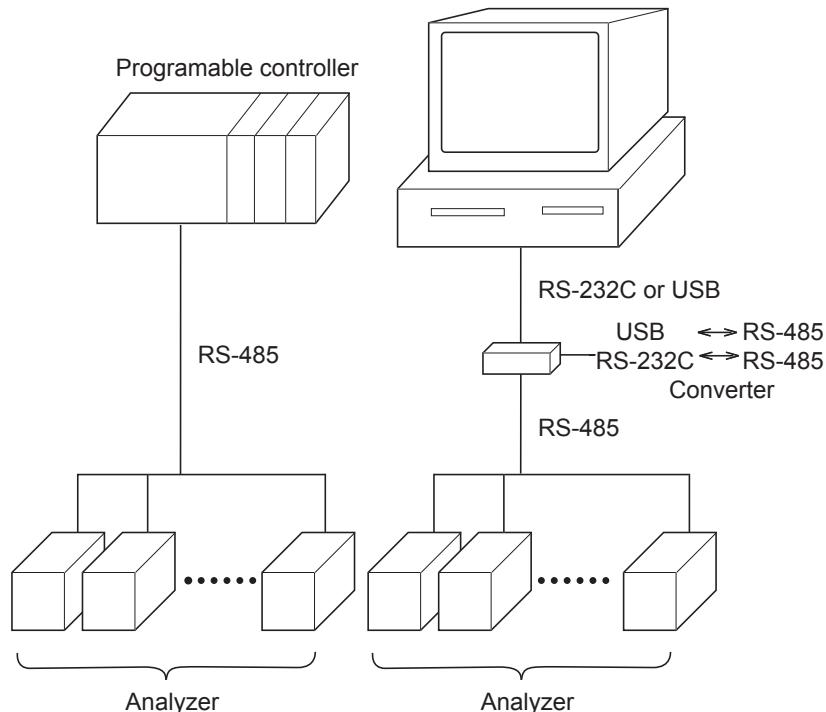
Fig. 1   Example of connection with host system

2. SPECIFICATIONS

2.1 Communication specifications

■ RS-485 interface

Item	Specification	
Electrical specification	Based on EIA RS-485	
Transmission system	2-wire, semi-duplicate	
Synchronizing system	Start-stop synchronous system	
Connection format	1 : N	
Maximum connectable units	31 units	
Transmission distance	500m max. (total extension distance)	
Transmission speed	38400bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	None
	X flow control	None
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16	
Isolation	Isolation from internal circuit	
	Functional isolation between signal line and ground	

3. CONNECTION

> ⚠ **WARNING**
>
> Do not turn on the power supply until all wiring have been completed to avoid electric shock and malfunctions.

3.1 Terminal allocation

■ RS-485 interface (RS-485 connector at the rear panel)

Pin No.	Signal name	Pin connection	
1	Signal ground		9-pin D-Sub (female)
2	RTxD+		
3	RTxD−		
Others	NC		
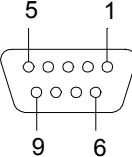
3.2　Wiring

■ RS-485 interface

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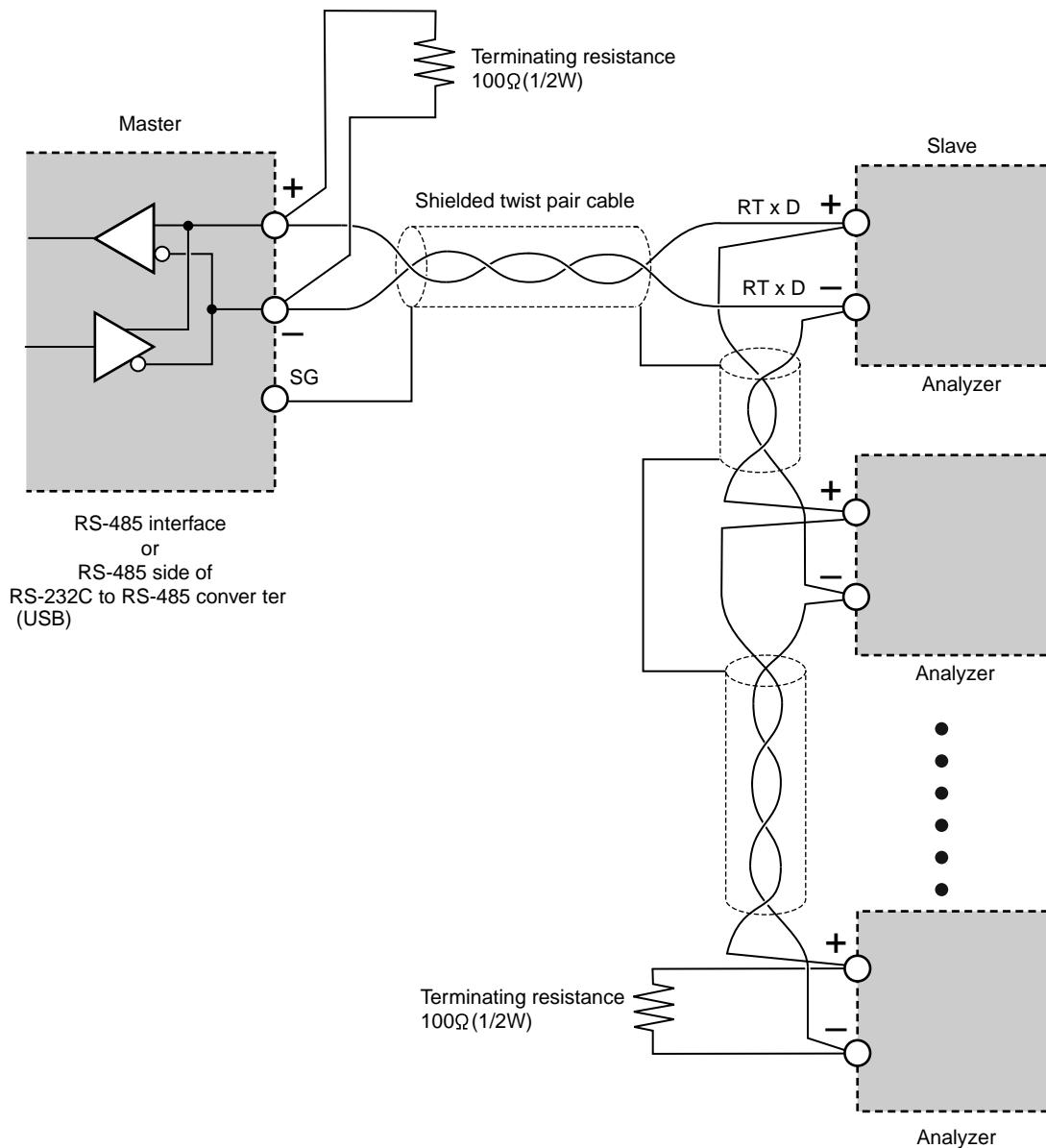
• SG does not have to be connected, but it can be used as an effective countermeasure against communication errors due to noise.

• When using the micro controller in an area where the imposed noise level is expected to exceed 500V, we recommend using a noise filter on the master side as seen in the figure below.

[Noise filter] (recommended): RSHN-2003 (made by TDK Corporation)
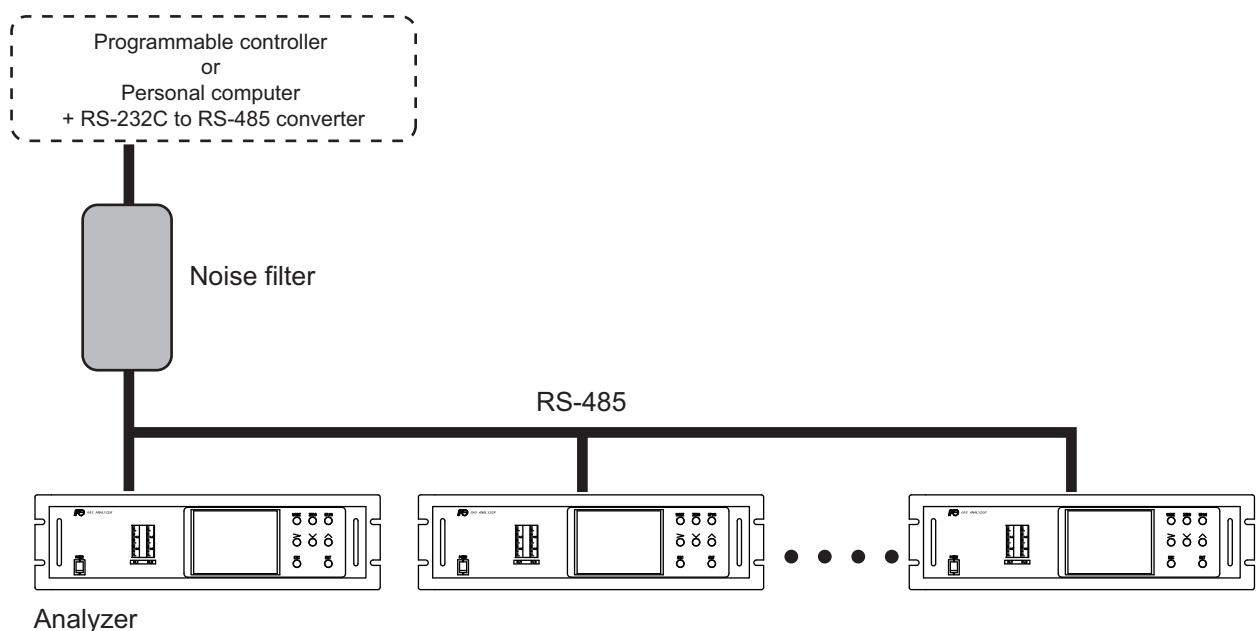
• If there are problems with EMC during communication, the noise level can be reduced by using a communication cable with a ferrite core.

Ferrite core (recommended): ZCAT series (made by TDK Corporation)

MSFC series (made by Morimiya Electric Co., Ltd.)

4. SETTING OF COMMUNICATION CONDITION

In order that the master station and instrument can correctly communicate, following settings are required.

- All communication condition settings of the master station are the same as those of instruments.

- All instruments connected on a line are set to "Station Nos. (STno)" which are different from each other.   (Any "Station No." is not shared by more than one instrument.)

4.1 Set items

The parameters to be set are shown in the following table.   Set them by operating the front panel keys.

Item	Value at delivery	Setting range	Remarks
Transmission speed	38400bps	Fixed (can not be changed)	Set the same communication condition to the master station and all slave stations.
Data length	8 bits	Fixed (can not be changed)	
Stop bit	1 bit	Fixed (can not be changed)	
Parity setting	None	Fixed (can not be changed)	
Station No.	1	0 to 31 (0:communication function stop)	Set a different value to each station.

4.2 Setting operation

Set the station No. on the analyzer maintenance mode display (see the instruction manual).

5. MODBUS COMMUNICATION PROTOCOL

5.1 General

The communication system by the MODBUS protocol is that the communication is always started from the master station and a slave station responds to the received message.

Transmission procedures is as shown below.

1) The master station sends a command message to a slave station.

2) The slave station checks that the station No. in the received message matches with the own station No. or not.

3) If matched, the slave station executes the command and sends back the response message.

4) If mismatched, the slave station leaves the command message and wait for the next command message.

a) In case when the station No. in the received command message matches with the own slave station No.

| Master to slave | Command message | | Data on the line |
| Slave to master | | Response message | |
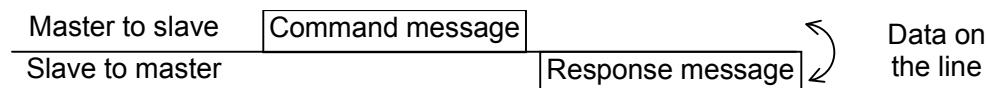
b) In case when the station No. in the received command message mismatches with the own slave station No.

| Master to slave | Command message | Data on the line |
| Slave to master | (Not respond) | |
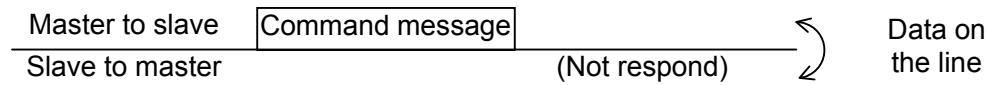
The master station can individually communicate with any one of slave stations connected on the same line upon setting the station No. in the command message.

5.2 Composition of message

Command message and response message consist of 4 fields ; Station No., Function code, Data and Error check code.   And these are send in this order.

Station No. (1 byte)
Function code (1 byte)
Data (2 to 133 bytes)
Error check code (CRC-16) (2 bytes)

Fig. 5-1   Composition of message

In the following, each field is explained.

(1)   Station No.

Station No. is the number specifying a slave station.   Only a slave station that corresponds to a value to which "Station No." is set on the analyzer maintenance mode display executes a command.

(2)   Function code

This is a code to designate the function executed at a slave station.
For details, refer to section 5.4.

(3)   Data

Data are the data required for executing function codes.   The composition of data varies with function codes.   For details, refer to chapter 6.

A register number is assigned to each data in the analyzer.   For reading/writing the data by communication, designate the register number.

Note that the register number transmitted on message is expressed as its relative address.
The relative address is calculated by the following expression.

$$\boxed{\text{Relative address}} = \left(\text{The lower 4 digits of the } \boxed{\text{Register number}} \right) - 1$$

For example, when the resister number designated by a function code is 40003,
    Relative address   = (lower 4 digits of 40003) – 1
        = 0002
is used on the message.

(4)　Error check code

This is the code to detect message errors (change in bit) in the signal transmission.
On the MODUBUS protocol (RTU mode), CRC-16 (Cycric Redundancy Check) is applied.

For CRC calculation method, refer to section 5.5.

5.3 Response of slave station

(1) Response for normal command

To a relevant message, the slave station creates and sends back a response message which corresponds to the command message.   The composition of message in this case is the same as in section 5.2.

Contents of the data field depend on the function code.   For details, refer to Chapter 6.

(2) Response for abnormal command

If contents of a command message have an abnormality (for example, non-actual function code is designated) other than transmission error, the slave station does not execute that command but creates and sends back a response message at error detection.

The composition of response message at error detection is as shown in Fig. 5-2   The value used for function code field is function code of command message plus 80_H.

Table 5-1 gives error codes.

Station No.
Function code + 80_H
Error code
Error check （CRC-16）

Fig. 5-2   Response message at error detection

Table 5-1   Error code

Error code	Contents	Description
01H	Illegal function	Non-actual function code is designated. Check for the function code.
02H	Illegal data address	A relative address of a resister number to which the designated function code can not be used.
03H	Illegal data value	Because the designation of number is too much, the area where resister numbers do not exist is designated.

(3) No response

Under any of the following items, the slave station takes no action of the command message and sends back no response.

・ A station number transmitted in the command message differs from the station number specified to the slave station.

・ A error check code is not matched, or a transmission error (parity error, etc.) is detected.

・ The time interval between the composition data of the message becomes longer than the time corresponding to 24 bits. (Refer to section 5.6   Transmission control procedure)

5.4 Function code

According to MODBUS protocol, register numbers are assigned by function codes.

Each function code acts on specific register number.

This correspondence is shown in Table 5-2, and the message length by function is shown in Table 5-3.

Table 5-2   Correspondence between function codes and objective address

Function code				Resister No.	
No.	Function	Object		No.	Contents
03_H	Read-out (continuously)	Holding register		4xxxx	Read-out/write-in word data
04_H	Read-out (continuously)	Input register		3xxxx	Read-out word data
06_H	Write-in	Holding register		4xxxx	Read-out/write-in word data
10_H	Write-in (continuously)	Holding register		4xxxx	Read-out/write-in word data

Table 5-3   Function code and message length   [Unit : byte]

Function code	Contents	Number of designatable data	Command message		Response message	
			Minimum	Maximum	Minimum	Maximum
03_H	Read-out of word data	64 words	8	8	7	133
04_H	Read-out of word data (read-out only)	64 words	8	8	7	133
06_H	Write-in of word data	1 word	8	8	8	8
10_H	Write-in of continuous word data	64 words	11	137	8	8

5.5 Calculation of error check code (CRC-16)

CRC-16 is the 2-byte (16-bits) error check code. From the top of the message (station No.) to the end of the data field are calculated.

The slave station calculates the CRC of the received message, and does not respond if the calculated CRC is different from the contents of the received CRC code.

The following shows the calculation procedure for CRC-16.

(a) Store $FFFF_H$ into 16 bit register (CRC register).

(b) Subject the 1st byte (8 bits) of transmit message and CRC register contents to an exclusive logical summation (XOR), and store the result into the CRC register.

(c) Shift the CRC register contents 1 bit to the right. Store 0 at MSB.

(d) If LSB before shifting is 0, do nothing.
If LSB before shifting is 1, subject it and A001H to XOR, and store the result into the CRC register.

(e) Repeat the steps (c) and (d) 8 times (shift by 8 bits).

(f) Execute steps (b) to (e) for the next byte of the transmit message.
Likewise, successively repeat the steps to each byte of the transmit message.

(g) The CRC code that is retained is the value of CRC register that stands when the processing has ended for latest byte (latest data except error code) of the transmit message.

(h) As error check code of the transmit message, store this CRC value in the order of lower 8 bits and upper 8 bits.

Transmit message (ex.)

| 01_H |
| 06_H |
| 00_H |
| 05_H |
| 03_H |
| $E8_H$ |
| 99_H |
| 75_H |

Successively calculate data included here to obtain CRC. In this case, CRC = 75 99_H.

Attach the error check code to message upon interchanging the upper and lower orders.
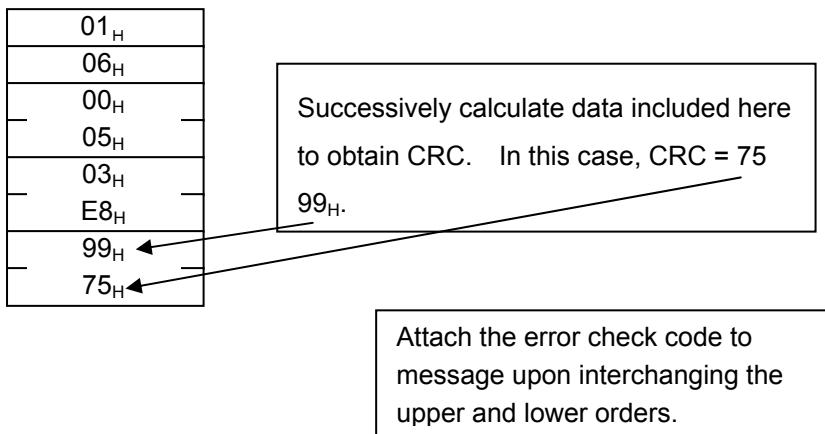
Fig. 5-3 shows the flow of the CRC-16 calculation system.

```
                          ┌─────────────┐
                          │    Start    │
                          └──────┬──────┘                    Explanation of variables
             ┌───────────────────────────────────┐           CR: CRC error check data (2 bytes)
             │ Set FFFF_H (hexadecimal number)    │            I: Digits of calculation characters
             │ in CR.                             │               in command message
             └──────────────────┬────────────────┘             J: Check on the number of times
                     ┌─────────────────────┐                      of CR calculation
                     │     Set 1 in I.     │
                     └──────────┬──────────┘
```

Set FFFF$_H$ (hexadecimal number) in CR.

Set 1 in I.

Exclusive logical sum (XOR) is executed with CR and one character (1 byte) of #I of the message, and its results is set in CR.

Set 1 in J.

Bit at right end of CR is 1? — NO

YES

Shift CR to right by 1 bit, and A001$_H$ and exclusive logical sum (XOR) are executed and its result is set in CR.

Shift CR to right by 1 bit.

Add 1 to J.

Calculation (8 times) is finished? J>8 — NO

YES

Add 1 to I.

Calculation of all characters is completed? I>All characters — NO

YES

End

(Calculation is executed in the order of command message station No., function code and data.)

CR calculation result shall be added to the last command message in the order of LOW byte and HIGH byte.

Fig. 5-3 Flow of CRC-16 calculation

5.6 Transmission control procedure

(1) Transmission procedure of master station

The master station must proceed to a communication upon conforming to the following items.

(1-1) Before sending a command message, provide 48 bits time or more vacant status.

(1-2) For sending, the interval between bytes of a command message is below 24 bits time.

(1-3) Within 24 bits time after sending a command message, the receiving status is posted.

(1-4) Provide 48 bits time or more vacant status between the end of response message reception and beginning of next command message sending [same as in (1-1)].

(1-5) For ensuring the safety, make a confirmation of the response message and make an arrangement so as to provide 3 times or more retries in case of no response, error occurrence, etc.

Note) The above definition is for most unfavorable value.   For ensuring the safety, it's recommended the program of the master to work with safety factors of 2 to 3.   Concretely, it is advised to arrange the program for 38400 bps with 5 ms or more for vacant status (1-1), and within 1 ms for byte interval (1-2) and changeover from sending to receiving (1-3).

(2) Description

1) Detection of the message frame
    The status on the line of the communication system is one of the 2 below.

   (a) Vacant status (no data on line)

   (b) Communication status (data is existing)
       Instruments connected on the line are initially at a receiving status and monitoring the line. When 24 bits time or more vacant status has appeared on the line, the end of preceding frame is assumed and, within following 24 bits time, a receiving status is posted.   When data appears on the line, instruments receive it while 24 bits time or more vacant status is detected again, and the end of that frame is assumed.   I.e., data which appeared on the line from the first 24 bits time or more vacant status to the next 24 bits time or more vacant status is fetched as one frame.

       Therefore, one frame (command message) must be sent upon confirming the following.

       (1-1) 48 bits time or more vacant status precedes before the command message sending.

       (1-2) Interval between bytes of 1 command message is smaller than 24 bits time.

2) Response of this instrument
    After a frame detection (24 bits time or more vacant status), this instrument carries out processing with that frame as a command message.   If the command message is destined to the own station, a response message is returned.   Its processing time is 1 to 30 ms (depends on contents of command message).   After sending a command message, therefore, the master station must observe the following.

    (1-3) Receiving status is posted within 24 bits time after sending a command message.

Space time of longer than 2.5ms is needed
(longer than 5ms is recommended)

Master station → Analyzer	POL1		POL2
Master station ← Analyzer		1 to 30msec POL1 response data	
Data on line	POL1	POL1 response data	POL2
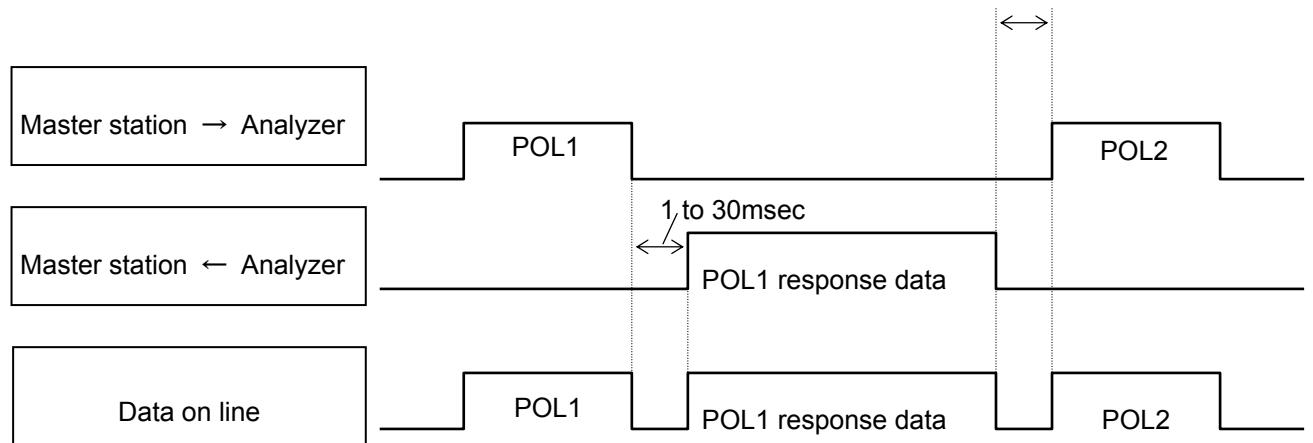
6. DETAILS OF MESSAGE

6.1 Read-out of word data [Function code:03$_H$]

Function code	Max. word number read-out in one message	Relative data address	Resister No.	Contents
03$_H$	64 words	0000$_H$—009D$_H$	40001—40158	User setting
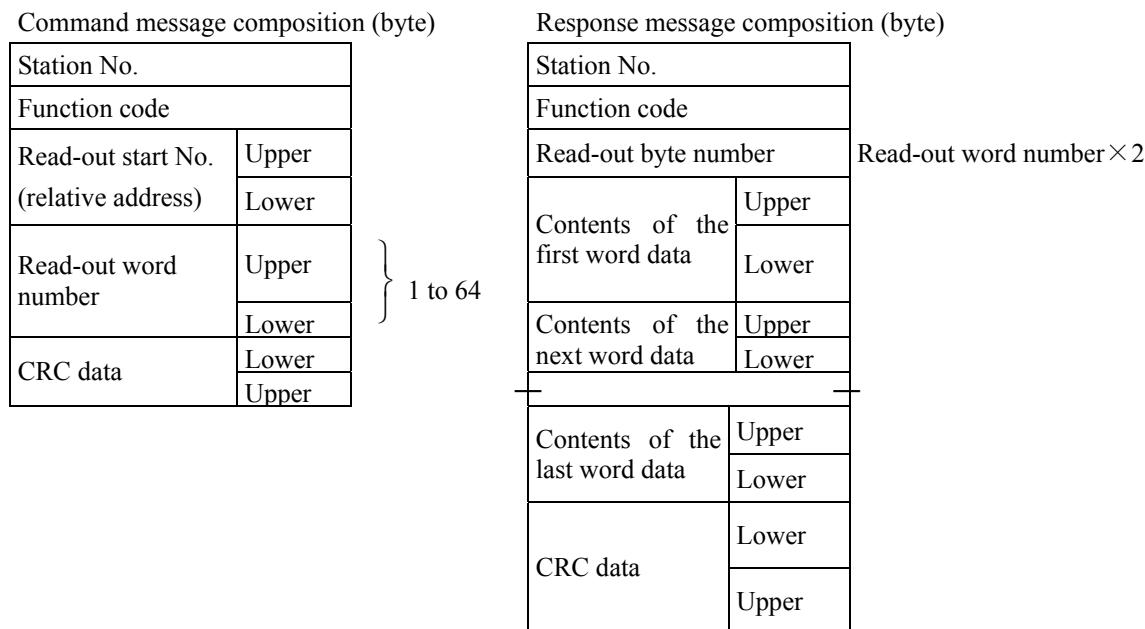
(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	Upper
	Lower
Read-out word number	Upper
	Lower
CRC data	Lower
	Upper

} 1 to 64

Response message composition (byte)

Station No.	
Function code	
Read-out byte number	
Contents of the first word data	Upper
	Lower
Contents of the next word data	Upper
	Lower
Contents of the last word data	Upper
	Lower
CRC data	Lower
	Upper

Read-out word number×2

* Arrangement of read-out word data

MSB   LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
Upper byte of contents of the last word data
Lower byte of contents of the last word data
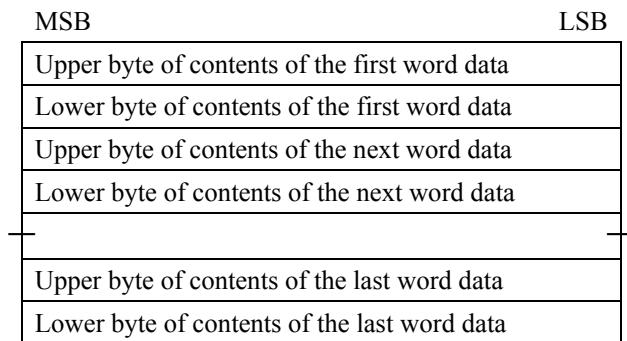
(2) Function explanations

Word data of continuous word numbers from the read-out start No. can be read. Read-out word data are transmitted from the slave station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of reading out from No. 1 station the setting Ch2 (2nd component) range-1 zero and span calibration concentration.

Relative address of Ch2 range-1 zero calibration concentration setting: 0004_H Data number: 02_H

Command message composition (byte)

Station No.		01_H
Function code		03_H
Read-out start No. (relative address)	Upper	00_H
	Lower	04_H
Read-out word number	Upper	00_H
	Lower	02_H
CRC data	Lower	85_H
	Upper	CA_H

Response message composition (byte)

Station No.		01_H
Function code		03_H
Read-out byte number		04_H
Contents of the first word data	Upper	00_H
	Lower	00_H
Contents of the next word data	Upper	03_H
	Lower	$E8_H$
CRC data	Lower	FA_H
	Upper	$8D_H$

* Meaning of read-out data

Ch2 range-1 zero calibration concentration setting 00 00_H $=$ 0
(contents of first word data)

Ch2 range-1 span calibration concentration setting 03 $E8_H$ $=$ 1000
(contents of next word data)

Provided decimal point position = 1, measurement unit = 1,
Ch2 range-1 zero calibration concentration setting = 0.0 ppm
Ch2 range-1 span calibration concentration setting =100.0 ppm

⟩Point⟩   For handling of decimal point and unit, refer to Section 7.1.

6.2 Read-out of read only word data [Function code:04$_H$]

Function code	Max. word number read-out in one message	Relative data address	Resister No.	Contents
04$_H$	64 words	0000$_H$－00C1$_H$	30001－30194	Measurement value and status
		0425$_H$－0469$_H$	31062－31130	Fixed setting

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	Upper
	Lower
Read-out word number	Upper
	Lower
CRC data	Lower
	Upper

Response message composition (byte)

Station No.	
Function code	
Read-out byte number	
Contents of the first word data	Upper
	Lower
Contents of the next word data	Upper
	Lower
Contents of the last word data	Upper
	Lower
CRC data	Lower
	Upper

Read-out word number×2

* Arrangement of read-out word data

MSB   LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2) Function explanations

Word data of continuous word numbers from the read-out start No. can be read. Read-out word data are transmitted from the slave station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of reading out from No. 1 station the Ch5 measurement concentration, decimal point position and measurement unit.

Relative address of Ch5 measurement concentration: $000C_H$ Data number: 03_H

Command message composition (byte)

Station No.		01_H
Function code		04_H
Read-out start No. (relative address)	Upper	00_H
	Lower	$0C_H$
Read-out word number	Upper	00_H
	Lower	03_H
CRC data	Lower	70_H
	Upper	08_H

Response message composition (byte)

Station No.		01_H
Function code		04_H
Read-out byte number		06_H
Contents of the first word data	Upper	04_H
	Lower	$B0_H$
Next word data contents	Upper	00_H
	Lower	02_H
Latest word data contents	Upper	00_H
	Lower	00_H
CRC data	Lower	81_H
	Upper	$0D_H$

* Meaning of read-out data

First word data contents	04	$B0_H = 1200$
Next word data contents	00	$02_H =$ 2 (decimal point position)
Latest word data contents	00	$00_H =$ 0 (vol %)

In the above case, measurement concentration = 12.00 vol%

⟩Point⟩   For handling of decimal point and unit, refer to Section 7.1.

6.3 Write-in of word data (1 word) [Function code:06$_H$]

Function code	Max. word number write-in in one message	Relative data address	Resister No.	Contents
06$_H$	1 word	0000$_H$－009D$_H$	40001－40158	User setting
		07D0$_H$－07D4$_H$	42001－42005	Operation command

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Write-in designate No. (relative address)	Upper
	Lower
Write-in word data	Upper
	Lower
CRC data	Lower
	Upper

Response message composition (byte)

Station No.	
Function code	
Write-in designate No. (relative address)	Upper
	Lower
Write-in word data	Upper
	Lower
CRC data	Lower
	Upper

(2) Function explanation

Designated word data is written in write-in designate No. Write-in data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of transmitting the "ZERO" key command to No. 1 station.
Key operation command Relative address: 07D0$_H$

Command message composition (byte)

Station No.		01$_H$
Function code		06$_H$
Write-in designate No. (relative address)	Upper	07$_H$
	Lower	D0$_H$
Write-in word data	Upper	00$_H$
	Lower	40$_H$
CRC data	Lower	88$_H$
	Upper	B7$_H$

} ZERO key command

Response message composition (byte)

Station No.		01$_H$
Function code		06$_H$
Write-in designate No. (relative address)	Upper	07$_H$
	Lower	D0$_H$
Write-in word data	Upper	00$_H$
	Lower	40$_H$
CRC data	Lower	88$_H$
	Upper	B7$_H$

6.4 Write-in of continuous word data [Function code:10_H]

Function code	Max. word number write-in in one message	Relative data address	Resister No.	Kind of data
10_H	64 words	$0000_H - 009D_H$	40001－40158	User setting

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Write-in start No. (relative address)	Upper
	Lower
Write-in word number	Upper
	Lower
Write-in byte number	
First write-in word data	Upper
	Lower
Next write-in word data	Upper
	Lower
Last write-in word data	Upper
	Lower
CRC data	Lower
	Upper

Write-in word number } 1 to 64

Write-in byte number } Write-in word number×2

Response message composition (byte)

Station No.	
Function code	
Write-in start No. (relative address)	Upper
	Lower
Write-in word number	Upper
	Lower
CRC data	Lower
	Upper

* Arrangement of write-in word data

MSB   LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
Upper byte of contents of the last word data
Lower byte of contents of the last word data
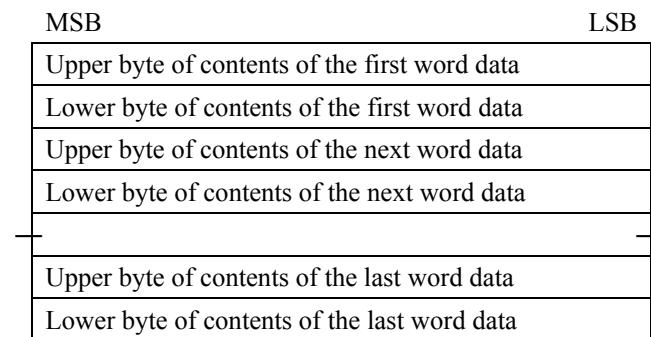
(2) Function explanation

Word data of continuous word number is written from write-in start address. Write-in word data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of writing the Ch1 (1st component) alarm settings to No. 1 station.

Ch1 range-1 high alarm setting = 1388_H (= 5000_D)
Ch1 range-1 low alarm setting = $000A_H$ (= 10_D)
Ch1 range-2 high alarm setting = $03E8_H$ (= 1000_D)
Ch1 range-2 low alarm setting = $000A_H$ (= 10_D)

Ch1 range-1 high alarm setting   Relative address: 0023_H Data number: 04_H

Command message composition (byte)

Station No.		01_H
Function code		10_H
Write-in start No.	Upper	00_H
	Lower	23_H
Write-in word number	Upper	00_H
	Lower	04_H
Write-in byte number		08_H
First write-in word data	Upper	13_H
	Lower	88_H
Next write-in word data	Upper	00_H
	Lower	$0A_H$
Next write-in word data	Upper	03_H
	Lower	$E8_H$
Last write-in word data	Upper	00_H
	Lower	$0A_H$
CRC data	Lower	$E2_H$
	Upper	$A6_H$

Response message composition (byte)

Station No.		01_H
Function code		10_H
Write-in start No.	Upper	00_H
	Lower	23_H
Write-in word number	Upper	00_H
	Lower	04_H
CRC data	Lower	30_H
	Upper	00_H

⟩Point⟩   Since the transmission data can not include a decimal point, data of 500.0 is transmitted as "5000".

For transmission format of each data, refer to the Address map (Chapter 7).

7.   ADDRESS MAP AND DATA FORMAT

7.1   Data format

7.1.1   Transmission data format

The MODBUS protocol used in this instrument is RTU (Remote Terminal Unit) mode.
Transmitted data is "numeric value" and not ASCII code".

7.1.2   Handling of decimal point position and measurement unit

When transmitted, the calibration concentration setting, alarm's high and low limits, the data of measurement concentration value and range value have no decimal point nor measurement unit.

Calculate exact values of data upon point positioning as shown below.

(a)   Calibration concentration setting (register No. 40001 to 40020)
Alarm setting (register No. 40036 to 40055)
Range value (register No. 31077 to 31086)

You can know the point position for each Ch (channel) and each range, and unit upon reading in the decimal point position data (register No. 31087 to 31096), and the unit data (register No. 31067 to 31076).

The decimal point position data has a value of 0, 1, 2 or 3.   You can obtain an exact value by the following calculation.

Case 0: Calibration concentration setting data /1
Case 1: Calibration concentration setting data /10
Case 2: Calibration concentration setting data /100
Case 3: Calibration concentration setting data /1000

The unit data has a value of 0, 1, 2 or 3, that corresponds as follows.

Case 0: vol%
Case 1: ppm
Case 2: mg/m^3
Case 3: g/m^3

For example, if:

Ch1 range-1 span calibration concentration setting (register No. 40002) = 2000,
Ch1 range-1 decimal point position (register No. 31087) = 1, and
Ch1 range-1 unit (register No. 31067) = 1,

the value is 200.0 ppm.

For writing-in, proceed in the reverse.   To obtain 200.0 ppm, write 2000 as calibration concentration setting.

The decimal point position and unit are unchangeable because fixed to each Ch and each range.

(b) Measurement concentration (register No. 30001 to 30036)

The decimal point position and measurement unit for each concentration are stored in registers following that of concentration, and can be known by reading them in.

The meaning of decimal point position data and measurement unit data values are the same as in (a) above.

For example, if:

Ch3 measurement concentration (register No. 30007) = 1270,
Ch3 decimal point position (register No. 30008) = 2,
Ch3 measurement unit (register No. 30009) = 0,

the value is 12.70 vol%

7.1.3 Handling at measurement data over-range

Even if the measurement data is at over-range, with "— — — —" displayed on the screen, the concentration that stands then is transmitted as read-out measurement concentration.

7.2 Address map

For details of functions and settable ranges of different parameters, refer to the instruction manual for the analyzer.

Word data [read-out/write-in]: Function code [03$_H$, 06$_H$, 10$_H$]
User settings

Relative address	Register No.	Data type	Memory contents	Read-out/write-in data	Remarks or corresponding parameter
0000$_H$	40001	Word	Ch1 range-1 zero calibration concentration	0 to 9999	Calibration value
0001$_H$	40002	Word	Ch1 range-1 span calibration concentration	Decimal point position depends on range	
0002$_H$	40003	Word	Ch1 range-2 zero calibration concentration		
0003$_H$	40004	Word	Ch1 range-2 span calibration concentration		
0004$_H$	40005	Word	Ch2 range-1 zero calibration concentration		
0005$_H$	40006	Word	Ch2 range-1 span calibration concentration		
0006$_H$	40007	Word	Ch2 range-2 zero calibration concentration		
0007$_H$	40008	Word	Ch2 range-2 span calibration concentration		
0008$_H$	40009	Word	Ch3 range-1 zero calibration concentration		
0009$_H$	40010	Word	Ch3 range-1 span calibration concentration		
000A$_H$	40011	Word	Ch3 range-2 zero calibration concentration		
000B$_H$	40012	Word	Ch3 range-2 span calibration concentration		
000C$_H$	40013	Word	Ch4 range-1 zero calibration concentration		
000D$_H$	40014	Word	Ch4 range-1 span calibration concentration		
000E$_H$	40015	Word	Ch4 range-2 zero calibration concentration		
000F$_H$	40016	Word	Ch4 range-2 span calibration concentration		
0010$_H$	40017	Word	Ch5 range-1 zero calibration concentration		
0011$_H$	40018	Word	Ch5 range-1 span calibration concentration		
0012$_H$	40019	Word	Ch5 range-2 zero calibration concentration		
0013$_H$	40020	Word	Ch5 range-2 span calibration concentration		

Word data [read-out/write-in]: Function code [03$_H$, 06$_H$, 10$_H$]

User settings

Relative address	Register No.	Data type	Memory contents	Read-out/write-in data	Remarks or corresponding parameter
0014$_H$	40021	Word	Ch1 auto calibration switch	0, 1	Auto calibration component
0015$_H$	40022	Word	Ch2 auto calibration switch	(0: Do not calibrate in auto calibration	
0016$_H$	40023	Word	Ch3 auto calibration switch	1: Calibrate in auto calibration)	
0017$_H$	40024	Word	Ch4 auto calibration switch		
0018$_H$	40025	Word	Ch5 auto calibration switch		
0019$_H$	40026	Word	Ch1 zero calibration switch	0,1	About zero calibration
001A$_H$	40027	Word	Ch2 zero calibration switch	(0: Selectable zero calibration,	
001B$_H$	40028	Word	Ch3 zero calibration switch	1: Zero calibration at once)	
001C$_H$	40029	Word	Ch4 zero calibration switch		
001D$_H$	40030	Word	Ch5 zero calibration switch		
001E$_H$	40031	Word	Ch1 calibration range switch	0,1	About calibration range
001F$_H$	40032	Word	Ch2 calibration range switch	(0: Calibrate indicated range only,	
0020$_H$	40033	Word	Ch3 calibration range switch	1: Calibrate both ranges at same time)	
0021$_H$	40034	Word	Ch4 calibration range switch		
0022$_H$	40035	Word	Ch5 calibration range switch		
0023$_H$	40036	Word	Ch1 range-1 high alarm setting	0 to 9999	Alarm setting (option)
0024$_H$	40037	Word	Ch1 range-1 low alarm setting	Decimal point position depends on range	
0025$_H$	40038	Word	Ch1 range-2 high alarm setting		
0026$_H$	40039	Word	Ch1 range-2 low alarm setting		
0027$_H$	40040	Word	Ch2 range-1 high alarm setting		
0028$_H$	40041	Word	Ch2 range-1 low alarm setting		
0029$_H$	40042	Word	Ch2 range-2 high alarm setting		
002A$_H$	40043	Word	Ch2 range-2 low alarm setting		
002B$_H$	40044	Word	Ch3 range-1 high alarm setting		
002C$_H$	40045	Word	Ch3 range-1 low alarm setting		
002D$_H$	40046	Word	Ch3 range-2 high alarm setting		
002E$_H$	40047	Word	Ch3 range-2 low alarm setting		
002F$_H$	40048	Word	Ch4 range-1 high alarm setting		
0030$_H$	40049	Word	Ch4 range-1 low alarm setting		
0031$_H$	40050	Word	Ch4 range-2 high alarm setting		
0032$_H$	40051	Word	Ch4 range-2 low alarm setting		
0033$_H$	40052	Word	Ch5 range-1 high alarm setting		
0034$_H$	40053	Word	Ch5 range-1 low alarm setting		
0035$_H$	40054	Word	Ch5 range-2 high alarm setting		
0036$_H$	40055	Word	Ch5 range-2 low alarm setting		

Word data [read-out/write-in]: Function code [03$_H$, 06$_H$, 10$_H$]

User settings

Relative address	Register No.	Data type	Memory contents	Read-out/write-in data	Remarks or corresponding parameter
0037$_H$	40056	Word	Ch1 alarm mode	0,1,2,3,4	Alarm setting
0038$_H$	40057	Word	Ch2 alarm mode	(0: High limit alarm,	
0039$_H$	40058	Word	Ch3 alarm mode	1: Low limit alarm,	
003A$_H$	40059	Word	Ch4 alarm mode	2: High or low limit)	
003B$_H$	40060	Word	Ch5 alarm mode	3: High-high limit alarm, 4: Low-low limit alarm	
003C$_H$	40061	Word	Ch1 alarm switch	0,1	
003D$_H$	40062	Word	Ch2 alarm switch	(0: Alarm OFF,	
003E$_H$	40063	Word	Ch3 alarm switch	1: Alarm ON)	
003F$_H$	40064	Word	Ch4 alarm switch		
0040$_H$	40065	Word	Ch5 alarm switch		
0041$_H$	40066	Word	Alarm hysteresis	0000H to 0014H (0 to 20%FS)	
0042$_H$	40067	Word	Auto calibration start time(day)	00H to 06H (Sun. to Sat.)	Setting of auto calibration (option)
0043$_H$	40068	Word	Auto calibration start time(hour)	00H to 23H (BCD code)	
0044$_H$	40069	Word	Auto calibration start time(min)	00H to 59H (BCD code)	
0045$_H$	40070	Word	Auto calibration cycle		
0046$_H$	40071	Word	Auto calibration cycle unit	0,1 (0: h, 1: days)	
0047$_H$	40072	Word	Auto calibration switch	0,1 (0: OFF, 1: ON)	
0048$_H$	40073		Not used		
0049$_H$	40074	Word	Key lock switch	0,1 (0: OFF, 1: ON)	Key lock
004A$_H$	40075		Not used		
004B$_H$	40076	Word	Ch1 response time	0000H to 003Ch (0 to 60 sec)	Response time
004C$_H$	40077	Word	Not used		The response time of O$_2$ measurement defines register No 40084, regardless of measurement Ch
004D$_H$	40078	Word	Ch2 response time		
004E$_H$	40079	Word	Not used		
004F$_H$	40080	Word	Ch3 response time		
0050$_H$	40081	Word	Not used		
0051$_H$	40082	Word	Ch4 response time		
0052$_H$	40083	Word	Not used		
0053$_H$	40084	Word	O$_2$ meter response time		
0054$_H$	40085	Word	1st order moving average period	0000H to 003bH (0 to 59 min or 1 to 4 h)	Average period (option)
0055$_H$	40086	Word	2nd order moving average period		
0056$_H$	40087	Word	3rd order moving average period		
0057$_H$	40088	Word	4th order moving average period		
0058$_H$	40089	Word	1st order moving average period unit	0,1 (0: h, 1: min)	
0059$_H$	40090	Word	2nd order moving average period unit		
005A$_H$	40091	Word	3rd order moving average period unit		
005B$_H$	40092	Word	4th order moving average period unit		

Word data [read-out/write-in]: Function code [03$_H$, 06$_H$, 10$_H$]

User settings

Relative address	Register No.	Data type	Memory contents	Read-out/write-in data	Remarks or corresponding parameter
005C$_H$	40093	Word	Hold switch	0,1　(0: OFF, 1: ON)	Output hold
005D$_H$	40094	Word	Oxygen conversion reference value	01H to 13H(1% to 19%)	Oxygen conversion reference value
005E$_H$	40095	Word	Peak alarm switch	0,1 (0: OFF, 1: ON)	Setting of peak alarm
005F$_H$	40096	Word	Peak alarm concentration	0064H to 03e8H (100 to 1000ppm)	
0060$_H$	40097	Word	Peak alarm count	0001H to 0063H (1 to 99 times)	
0061$_H$	40098	Word	Peak alarm hysteresis	0000H to 0014H (0 to 20%FS)	
0062$_H$	40099	Word	Auto zero calibration start (day)	00H to 06H　(Sun. to Sat.)	Setting of auto zero calibration (option)
0063$_H$	40100	Word	Auto zero calibration start (hour)	00H to 23H　(BCD code)	
0064$_H$	40101	Word	Auto zero calibration start (min)	00H to 59H　(BCD code)	
0065$_H$	40102	Word	Auto zero calibration cycle		
0066$_H$	40103	Word	Auto zero calibration cycle unit	0,1 (0: h, 1: days)	
0067$_H$	40104	Word	Auto zero calibration　switch	0,1　(0: OFF、1: ON)	
0068$_H$	40105	Word	Auto zero calibration gas flow time	003Ch to 0384H (60 to 900 sec)	
0069$_H$	40106	Word	Ch1 range change setting	0,1　(0: range-1, 1: range-2)	Range changeover (disabled if remote range ON)
006A$_H$	40107	Word	Ch2 range change setting		
006B$_H$	40108	Word	Ch3 range change setting		
006C$_H$	40109	Word	Ch4 range change setting		
006D$_H$	40110	Word	Ch5 range change setting		
006E$_H$	40111	Word	Ch1 range change method	0,1,2 (0:manual, 1:remote, 2:auto)	
006F$_H$	40112	Word	Ch2 range change method		
0070$_H$	40113	Word	Ch3 range change method		
0071$_H$	40114	Word	Ch4 range change method		
0072$_H$	40115	Word	Ch5 range change method		
0073$_H$	40116	Word	Ch1 auto calibration range	0,1 (0:range-1, 1:range-2)	
0074$_H$	40117	Word	Ch2 auto calibration range		
0075$_H$	40118	Word	Ch3 auto calibration range		
0076$_H$	40119	Word	Ch4 auto calibration range		
0077$_H$	40120	Word	Ch5 auto calibration range		
0078$_H$	40121	Word	Alarm 1 target channel	0,1,2,3,4,5,6	
0079$_H$	40122	Word	Alarm 2 target channel		
007A$_H$	40123	Word	Alarm 3 target channel		
007B$_H$	40124	Word	Alarm 4 target channel		
007C$_H$	40125	Word	Alarm 5 target channel		
007D$_H$	40126	Word	Alarm 6 target channel		
007E$_H$	40127	Word	alarm-6 range-1 high alarm setting	0 to 9999	Alarm-6 setting (option)
007F$_H$	40128	Word	alarm-6 range-1 low alarm setting	Decimal point position	
0080$_H$	40129	Word	alarm-6 range-2 high alarm setting	depends on range	
0081$_H$	40130	Word	alarm-6 range-2 low alarm setting		

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Word data [read-out/write-in]: Function code [03H, 06H, 10H]

User settings

Relative address	Register No.	Data type	Memory contents	Read-out/write-in data	Remarks or corresponding parameter
0082H	40131	Word	alarm-6 alarm mode	same as alarm Ch1 to 5	
0083H	40132	Word	alarm-6 alarm switch	same as alarm Ch1 to 5	
0084H	40133	Word	auto calibration gas flow time 1	003Ch to 0384H	
0085H	40134	Word	auto calibration gas flow time 2	(60 to 900 sec)	
0086H	40135	Word	auto calibration gas flow time 3		
0087H	40136	Word	auto calibration gas flow time 4		
0088H	40137	Word	auto calibration gas flow time 5		
0089H	40138	Word	auto calibration gas flow time 6		
008AH	40139	Word	auto calibration gas flow time 7		
008BH	40140	Word	Hold change	(0: Last value, 1: Setting)	
008CH	40141	Word	Ch1 hold set value	0 to 100 (%FS)	
008DH	40142	Word	Ch2 hold set value		
008EH	40143	Word	Ch3 hold set value		
008FH	40144	Word	Ch4 hold set value		
0090H	40145	Word	Ch5 hold set value		
0091H	40146	Word	Blowback start (day)	00H to 06H (Sun. to Sat.)	Blowback setting (Option)
0092H	40147	Word	Blowback start (hour)	00H to 23H (BCD code)	
0093H	40148	Word	Blowback start (min)	00H to 59H (BCD code)	
0094H	40149	Word	Blowback cycle	1 to 99 (h), 1 to 7 (days)	
0095H	40150	Word	Blowback cycle unit	0,1 (0:h, 1:days)	
0096H	40151	Word	Blowback time	0001H to 0384H (1 to 900 sec)	
0097H	40152	Word	Blowback switch	0,1 (0:OFF, 1:ON)	
0098H	40153	Word	Gas displacement time after blowback	003Ch to 0384H (60 to 900 sec)	
0099H	40154	Word	Measurement point change cycle	1 to 60 (min), 1 to 99 (h)	Measurement point change setting (Option)
009AH	40155	Word	Measurement point change cycle unit	0,1 (0: h, 1: min)	
009BH	40156	Word	Measurement point change displacement time	003Ch to 0384H (60 to 900 sec)	
009CH	40157	Word	Measurement point change setting	0,1,2 (0: Line, 1: Line 2, 2: Change)	
009DH	40158	Word	O_2 concentration limit at the time of oxygen correction	01H to 14H (1 to 20%)	
009EH	40159	Word	Reference Gas Switching Time	1 to 1Eh(1 to 30 sec)	for ZPB,ZPG
009FH	40160	Word	Reference Gas Measuring Time	1 to 3Ch(1 to 60 sec)	
00A0H	40161	Word	Average period Ch1	0 to 9h(0 to 9 cycle)	
00A1H	40162	Word	Average period Ch2	0 to 9h(0 to 9 cycle)	
00A2H	40163	Word	Average period Ch3	0 to 9h(0 to 9 cycle)	
00A3H	40164	Word	Average period Ch4	0 to 9h(0 to 9 cycle)	
00A4H	40165	Word	Interfernce compensation coefficient Ch1 renge1		
00A5H	40166	Word	Interfernce compensation coefficient Ch1 renge2		

Word data [read-out/write-in]: Function code [03$_H$, 06$_H$, 10$_H$]

User settings

Relative address	Register No.	Data type	Memory contents	Read-out/write-in data	Remarks or corresponding parameter
00A6$_H$	40167	Word	Interfernce compensation coefficient Ch2 renge1		for ZPB,ZPG
00A7$_H$	40168	Word	Interfernce compensation coefficient Ch2 renge2		
00A8$_H$	40169	Word	Interfernce compensation coefficient Ch3 renge1		
00A9$_H$	40170	Word	Interfernce compensation coefficient Ch3 renge2		
00AA$_H$	40171	Word	Interfernce compensation coefficient Ch4 renge1		
00AB$_H$	40172	Word	Interfernce compensation coefficient Ch4 renge2		

Word data [write-in] : Function code [06ₕ]

Operation command

Relative address	Register No.	Data type	Memory contents	Write-in data	Remarks or corresponding parameter
07D0ₕ	42001	Word	Keying command	01H:MODE 02H: Side, 04H: Up, 08H: Down 10H: ESC、20H: ENT 40H: ZERO、80H: SPAN	Sending a value simulates keying
07D1ₕ	42002	Word	Display change	1: Return to measurement mode display	Force to return to measurement mode
07D2ₕ	42003	Word	Auto calibration	1; Execute auto calibration	Auto calibration is executed only once.
07D3ₕ	42004	Word	Auto zero calibration	1; Execute auto zero calibration	Auto zero calibration is executed only once.
07D4ₕ	42005	Word	Blowback	1; Execute blowback	Blowback is executed only once. (Option)

Word data [read-out only] : Function code[04 $_H$]

Measurement value and status

Relative address	Register No.	Data type	Memory contents	Read-out data	Remarks or corresponding parameter
0000$_H$	30001	Word	Ch1 concentration	Concentration: -9999 to 9999 (value corresponding to indication without decimal point) Decimal point position: 0,1,2,3 (0; concentration/1 1; concentration/10 2; concentration/100 3; concentration/1000) Measurement unit: 0, 1, 2, 3 (0; vol% 1; ppm 2; mg/m^3 3; g/m^3) Transmit values under current measurement conditions	
0001$_H$	30002	Word	Ch1 decimal point position		
0002$_H$	30003	Word	Ch1 measurement unit		
0003$_H$	30004	Word	Ch2 concentration		
0004$_H$	30005	Word	Ch2 decimal point position		
0005$_H$	30006	Word	Ch2 measurement unit		
0006$_H$	30007	Word	Ch3 concentration		
0007$_H$	30008	Word	Ch3 decimal point position		
0008$_H$	30009	Word	Ch3 measurement unit		
0009$_H$	30010	Word	Ch4 concentration		
000A$_H$	30011	Word	Ch4 decimal point position		
000B$_H$	30012	Word	Ch4 measurement unit		
000C$_H$	30013	Word	Ch5 concentration		
000D$_H$	30014	Word	Ch5 decimal point position		
000E$_H$	30015	Word	Ch5 measurement unit		
000F$_H$	30016	Word	Ch6 concentration		
0010$_H$	30017	Word	Ch6 decimal point position		
0011$_H$	30018	Word	Ch6 measurement unit		
0012$_H$	30019	Word	Ch7 concentration		
0013$_H$	30020	Word	Ch7 decimal point position		
0014$_H$	30021	Word	Ch7 measurement unit		
0015$_H$	30022	Word	Ch8 concentration		
0016$_H$	30023	Word	Ch8 decimal point position		
0017$_H$	30024	Word	Ch8 measurement unit		
0018$_H$	30025	Word	Ch9 concentration		
0019$_H$	30026	Word	Ch9 decimal point position		
001A$_H$	30027	Word	Ch9 measurement unit		
001B$_H$	30028	Word	Ch10 concentration		
001C$_H$	30029	Word	Ch10 decimal point position		
001D$_H$	30030	Word	Ch10 measurement unit		
001E$_H$	30031	Word	Ch11 concentration		
001F$_H$	30032	Word	Ch11 decimal point position		
0020$_H$	30033	Word	Ch11 measurement unit		
0021$_H$	30034	Word	Ch12 concentration		
0022$_H$	30035	Word	Ch12 decimal point position		
0023$_H$	30036	Word	Ch12 measurement unit		

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Word data [read-out only] : Function code[04 H]

Measurement value and status

Relative address	Register No.	Data type	Memory contents	Read-out data	Remarks or corresponding parameter
0024H	30037	Word	Peak count	0 to 100 times/hour	
0025H	30038	Word	Ch1 current range	0, 1	
0026H	30039	Word	Ch2 current range	(0; range-1, 1;range-2)	
0027H	30040	Word	Ch3 current range		
0028H	30041	Word	Ch4 current range		
0029H	30042	Word	Ch5 current range		
002AH	30043	Word	Ch1 high/low limit alarm	0, 1, 2, 3, 4 (0: No alarm, 1: High limit alarm, 2: Low limit alarm 3: High-high limit alarm, 4: Low-low limit alarm	Whether or how alarm is currently produced.
002BH	30044	Word	Ch2 high/low limit alarm		
002CH	30045	Word	Ch3 high/low limit alarm		
002DH	30046	Word	Ch4 high/low limit alarm		
002EH	30047	Word	Ch5 high/low limit alarm		
002FH	30048	Word	Peak count alarm	0,1 (0: No, 1: Yes)	
0030H	30049	Word	Auto (Auto zero) calibration in progress	0,1 (0: No, 1: Yes)	
0031H	30050	Word	Ch1 zero calibration in progress	0,1 (0: No, 1: Yes)	
0032H	30051	Word	Ch2 zero calibration in progress		
0033H	30052	Word	Ch3 zero calibration in progress		
0034H	30053	Word	Ch4 zero calibration in progress		
0035H	30054	Word	Ch5 zero calibration in progress		
0036H	30055	Word	Ch1 span calibration in progress		
0037H	30056	Word	Ch2 span calibration in progress		
0038H	30057	Word	Ch3 span calibration in progress		
0039H	30058	Word	Ch4 span calibration in progress		
003AH	30059	Word	Ch5 span calibration in progress		
003BH	30060	Word	Instrument error	0,1 (0; No, 1; Yes)	Whether error is produced
003CH	30061	Word	Calibration error	0,1 (0; No, 1; Yes)	Whether error is produced
003DH	30062	Word	Latest error No.	-1 to 9 (Error No.-1) * (a)	Error log contents
003EH	30063	Word	Latest error DAY	1 to 31 (date)	
003FH	30064	Word	Latest error HOUR	0 to 23 （hours）	
0040H	30065	Word	Latest error MIN	0 to 59 （min）	
0041H	30066	Word	Latest error TARGET	0 to 4	

Word data [read-out only] : Function code[04 H]

Measurement value and status

Relative address	Register No.	Data type	Memory contents	Read-out data	Remarks or corresponding parameter
0042H	30067	Word	The previous error No.	-1 to 9 (Error No.-1)	
0043H	30068	Word	The previous error DAY	1 to 31 (date)	
0044H	30069	Word	The previous error HOUR	0 to 23 (hours)	
0045H	30070	Word	The previous error MIN	0 to 59 （min）	
0046H	30071	Word	The previous error TARGET	0 to 4	
￨	￨		￨		
007EH	30127	Word	Oldest error No.	-1 to 9 (Error No.-1)	
007FH	30128	Word	Oldest error DAY	1 to 31 (date)	
0080H	30129	Word	Oldest error HOUR	0 to 23 （hour）	
0081H	30130	Word	Oldest error MIN	0 to 59 （min）	
0082H	30131	Word	Oldest error TARGET	0 to 4	
0083H	30132	Word	Error 1	0,1 (0: No, 1: Yes)	Whether error is currently produced
0084H	30133	Word	Error 2		
0085H	30134	Word	Error 3		
0086H	30135	Word	Error 10		
0087H	30136	Word	Ch1 Error 4	0,1 (0: No, 1: Yes)	
0088H	30137	Word	Ch1 Error 5		
0089H	30138	Word	Ch1 Error 6		
008AH	30139	Word	Ch1 Error 7		
008BH	30140	Word	Ch1 Error 8		
008CH	30141	Word	Ch1 Error 9		
￨	￨		￨		
0099H	30154	Word	Ch4 Error 4	0,1 (0: No, 1: Yes)	
009AH	30155	Word	Ch4 Error 5		
009BH	30156	Word	Ch4 Error 6		
009CH	30157	Word	Ch4 Error 7		
009DH	30158	Word	Ch4 Error 8		
009EH	30159	Word	Ch4 Error 9		
009FH	30160	Word	Ch5 Error 4	0,1 (0: No, 1: Yes)	
00A0H	30161	Word	Ch5 Error 5		
00A1H	30162	Word	Ch5 Error 6		
00A2H	30163	Word	Ch5 Error 7		
00A3H	30164	Word	Ch5 Error 8		
00A4H	30165	Word	Ch5 Error 9		

Word data [read-out only] : Function code[04 H]

Measurement value and status

Relative address	Register No.	Data type	Memory contents	Read-out data	Remarks or corresponding parameter
00A5$_H$	30166	Word	Ch1 auto zero calibration in progress	0,1 (0: No, 1: Yes)	
00A6$_H$	30167	Word	Ch1 auto span calibration in progress		
00A7$_H$	30168	Word	Ch1 hold in progress	0,1 (0: No, 1: Yes)	
00AE$_H$	30175	Word	Ch4 auto zero calibration in progress	0,1 (0: No, 1: Yes)	
00AF$_H$	30176	Word	Ch4 auto span calibration in progress		
00B0$_H$	30177	Word	Ch4 hold in progress	0,1 (0: No, 1: Yes)	
00B1$_H$	30178	Word	Ch5 auto zero calibration in progress	0,1 (0: No, 1: Yes)	
00B2$_H$	30179	Word	Ch5 auto span calibration in progress		
00B3$_H$	30180	Word	Ch5 hold in progress	0,1 (0: No, 1: Yes)	
00B4$_H$	30181	Word	Display information (1)	* (b)	
00B5$_H$	30182	Word	Display information (2)		
00B6$_H$	30183	Word	Display information (3)		
00B7$_H$	30184		(Do not use)		
00B8$_H$	30185		(Do not use)		
00B9$_H$	30186		(Do not use)		
00BA$_H$	30187		(Do not use)		
00BB$_H$	30188		(Do not use)		
00BC$_H$	30189	Word	Manual calibration channel	Cursor Ch-1 * (c)	
00BD$_H$	30190		(Do not use)		
00BE$_H$	30191	Word	High/Low limit alarm (6)		
00BF$_H$	30192		(Do not use)		
00C0$_H$	30193		(Do not use)		
00C1$_H$	30194		(Do not use)		

Word data [read-out only] : Fuction code[04$_H$]

Fixed setting

Relative address	Register No.	Data type	Memory contents	Read-out data	Remarks or corresponding parameter
0425$_H$	31062	Word	Ch1 range numbers	1, 2	
0426$_H$	31063	Word	Ch2 range numbers	(1: 1 range,	
0427$_H$	31064	Word	Ch3 range numbers	2: 2 ranges)	
0428$_H$	31065	Word	Ch4 range numbers		
0429$_H$	31066	Word	Ch5 range numbers		
042A$_H$	31067	Word	Ch1 range-1 unit	0,1,2,3	
042B$_H$	31068	Word	Ch1 range-2 unit	(0;vol%	
042C$_H$	31069	Word	Ch2 range-1 unit	1; ppm	
042D$_H$	31070	Word	Ch2 range-2 unit	2; mg/m3	
042E$_H$	31071	Word	Ch3 range-1 unit	3; g/m3)	
042F$_H$	31072	Word	Ch3 range-2unit		
0430$_H$	31073	Word	Ch4 range-1 unit		
0431$_H$	31074	Word	Ch4 range-2 unit		
0432$_H$	31075	Word	Ch5 range-1 unit		
0433$_H$	31076	Word	Ch5 range-2 unit		
0434$_H$	31077	Word	Ch1 range-1 value	1 to 9999	The actual range value is calculated with the decimal point position taken into consideration. Actual range value = Read range value / X (X is 1 when 0 is selected, 10 when 1 is selected, and 100 when 2 is selected, and 1000 when 3 is selected for decimal point position.)
0435$_H$	31078	Word	Ch1 range-2 value		
0436$_H$	31079	Word	Ch2 range-1 value		
0437$_H$	31080	Word	Ch2 range-2 value		
0438$_H$	31081	Word	Ch3 range-1 value		
0439$_H$	31082	Word	Ch3 range-2 value		
043A$_H$	31083	Word	Ch4 range-1 value		
043B$_H$	31084	Word	Ch4 range-2 value		
043C$_H$	31085	Word	Ch5 range-1 value		
043D$_H$	31086	Word	Ch5 range-2 value		
043E$_H$	31087	Word	Ch1 range-1 decimal point position	0,1,2,3	
043F$_H$	31088	Word	Ch1 range-2 decimal point position	(0: Nothing below decimal point,	
0440$_H$	31089	Word	Ch2 range-1 decimal point position	1: 1 digit below decimal point,	
0441$_H$	31090	Word	Ch2 range-2 decimal point position	2: 2 digits below decimal point,	
0442$_H$	31091	Word	Ch3 range-1 decimal point position	3: 3 digits below decimal point.	
0443$_H$	31092	Word	Ch3 range-2 decimal point position		
0444$_H$	31093	Word	Ch4 range-1 decimal point position		
0445$_H$	31094	Word	Ch4 range-2 decimal point position		
0446$_H$	31095	Word	Ch5 range-1 decimal point position		
0447$_H$	31096	Word	Ch5 range-2 decimal point position		

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Word data [read-out only] : Fuction code[04H]

Fixed setting

Relative address	Register No.	Data type	Memory contents	Read-out data	Remarks or corresponding parameter
0448H	31097	Word	Type: 1st digit	Z	
0449H	31098	Word	Type: 2nd digit	P	
044AH	31099	Word	Type: 3rd digit	A, B, G	
044BH	31100	Word	Type: 4th digit	0 to 9, A to Z	
044CH	31101	Word	Type: 5th digit	0 to 9, A to Z	
044DH	31102	Word	Type: 6th digit	0 to 9, A to Z	
044EH	31103	Word	Type: 7th digit	0 to 9, A to Z	
044FH	31104	Word	Type: 8th digit	1	
0450H	31105	Word	Type: 9th digit	0 to 9, A to Z	
0451H	31106	Word	Type: 10th digit	0 to 9, A to Z	
0452H	31107	Word	Type: 11th digit	0 to 9, A to Z	
0453H	31108	Word	Type: 12th digit	0 to 9, A to Z	
0454H	31109	Word	Type: 13th digit	0 to 9, A to Z	
0455H	31110	Word	Type: 14th digit	0 to 9, A to Z	
0456H	31111	Word	Type: 15th digit	0 to 9, A to Z	
0457H	31112	Word	Type: 16th digit	0 to 9, A to Z	
0458H	31113	Word	Type: 17th digit	0 to 9, A to Z	
0459H	31114	Word	Type: 18th digit	0 to 9, A to Z	
045AH	31115	Word	Type: 19th digit	0 to 9, A to Z	
045BH	31116	Word	Type: 20th digit	0 to 9, A to Z	
045CH	31117	Word	Type: 21st digit	0 to 9, A to Z	
045DH	31118	Word	Type: 22nd digit	0 to 9, A to Z	
045EH	31119	Word	Type: 23rd digit	0 to 9, A to Z	
045FH	31120	Word	Type: 24th digit	0 to 9, A to Z	
0460H	31121	Word	Type: 25th digit	0 to 9, A to Z	
0461H	31122	Word	Type: 26th digit	0 to 9, A to Z	
0462H	31123	Word	Board: 1st digit	0 to 9, A to Z	
0463H	31124	Word	Board: 2nd digit	0 to 9, A to Z	
0464H	31125	Word	Board: 3rd digit	0 to 9, A to Z	
0465H	31126	Word	Board: 4th digit	0 to 9, A to Z	
0466H	31127	Word	Board: 5th digit	0 to 9, A to Z	
0467H	31128	Word	Board: 6th digit	0 to 9, A to Z	
0468H	31129	Word	Board: 7th digit	0 to 9, A to Z	
0469H	31130	Word	Board: 8th digit	0 to 9, A to Z	

Notes

1. Set "0" for accessing to the area not used within address map.

2. For contents of *(a) to *(c), refer to Section 7.3 "Supplements to address map".

7.3 Supplement to address map

* (a) Register No. 30062 to 30131 (error log)

Up to 14 errors logged can be read in the order from the latest to older ones.

The contents are as follows.

Error No.:   No. of produced error.   Stored value is error number minus 1.

Error DAY: Date

Error HOUR: Indicates at what o'clock error occurred.

Error MIN: Indicates at what minutes error occurred.

Error TARGET: No. of Ch where error occurred.

　　　　　　　　Ch No. minus 1 is stored.

　　　　　　　　0 at error No. 3 or 10.

* (b) Register numbers 30181, 30182, 30183 (display information (1), (2), (3))

The display information is values for knowing the current display status of the instrument.

• Contents of values of display information (1) (status of each setting panel)

0: Measurement mode display (manual calibration display included)

1: Menu mode display

2: Changeover of range display

3: Calibration setting display

4: Alarm setting display

5: Automatic calibration setting display

6: Peak alarm setting display

7: Parameter setting display

8: Maintenance mode display

9: Factory mode display

10: Auto zero calibration setting display

• Contents of values of display information (2) (status at manual calibration)

0: Measurement mode display

4: Channel selection display at manual zero calibration

5: Zero calibration wait display at manual zero calibration

6: Zero calibration in progress display at manual zero calibration

7: Channel selection display at manual span calibration

8: Span calibration wait display at manual span calibration

9: Span calibration in progress display at manual span calibration

10: Error contents indication display

• Contents of values of display information (3)

Correspond to value of Ch (channel) from which the measurement mode is displayed.

Top channel number minus 1 is stored.

* (c) Register number 30189 (manual calibration channel)

Data for knowing a channel (component) which the cursor is positioned at to carry out a calibration at when a manual calibration is under way.

Channel number to carry out a calibration at minus 1 is stored.

8. TROUBLESHOOTING

If the communication is unavailable, check the following items.

☐ Whether all devices related to communication are turned on.

☐ Whether connections are correct.

☐ Whether the number of connected instruments and connection distance are as specified

☐ Whether communication conditions coincide between the master station (host computer) and slave stations (instrument)

    ☐ Transmission speed   :   38400bps

    ☐ Data length   :   8 bits

    ☐ Stop bit   :   1 bit

    ☐ Parity   :   None

☐ Whether send/receive signal timing conforms to Section 5.6 in this manual.

☐ Whether the station No. designated as send destination by the master station coincides with the station No. of the connected instrument.

☐ Whether more than one instrument connected on the same transmission line shares the same station No.

☐ Whether the station No. of instruments is set at other than 0.
If it's 0, the communication function does not work.