FUJI ELECTRIC

Instruction Manual

RS-485 TRANSMISSION PROTOCOL (MODBUS)

(PYX INTERFACE)

Fuji Electric Co.,Ltd.

INP-TN511189-E

CONTENTS

1 Code symbols

1 2 3 4 5 6 7 8	9 10 11 12 13	Description
P Y X		
		Front panel size[mm]
4		48x48
		Kinds of input
M		TC/RTD/voltage/current
		Control output1
Y		Without
A		Relay(SPST) (reverse action)
B		Relay(SPST) (direct action)
C		SSR drive (reverse action)
D		SSR drive (direct action)
E		4 to 20mA dc (reverse action)
F		4 to 20mA dc (direct action)
G		Relay(SPDT) (reverse action)
H		Relay(SPDT) (direct action)
		Control output2
Y		Without
A		Relay(SPST) (reverse action)
B		Relay(SPST) (direct action)
C		SSR drive (reverse action)
D		SSR drive (direct action)
		Alarm function
	0	Without
	1	1 point
	2	2 points
	3	HB detection
	4	HB detection + 1point
		Input range code
		00 to 41
		Additional function
	Y	Without
	P	SV selection command input(DI)
	Q	4 ramp/soak + start/reset
	R	RS485 (**1)
	S	RS485 (**1) + 4 ramp/soak
	M	RS485 (**2)
	N	RS485 (**2) + 4 ramp/soak
	A	Re-transmission
	B	Re-transmission + 4ramp/soak
	C	Remote SV
		Front panel label
	E	English label in ℃
	F	English label in ℉
	K	English label in %

**1: CC-data line protocol
**2: Modbus(RTU) protocol

1 2 3 4 5 6 7 8	9 10 11 12 13	Description
P Y X		
		Front panel size[mm]
5		48x96
9		96x96
		Kinds of input
M		TC/RTD/voltage/current
		Control output1
Y		Without
C		SSR drive (reverse action)
D		SSR drive (direct action)
E		4 to 20mA dc (reverse action)
F		4 to 20mA dc (direct action)
G		Relay(SPDT) (reverse action)
H		Relay(SPDT) (direct action)
J		Universal (reverse action)
K		Universal (direct action)
		Control output2
Y		Without
C		SSR drive (reverse action)
D		SSR drive (direct action)
E		4 to 20mA dc (reverse action)
F		4 to 20mA dc (direct action)
G		Relay(SPDT) (reverse action)
H		Relay(SPDT) (direct action)
		Alarm function
	0	Without
	1	1 point
	2	2 points
	3	HB detection
	4	HB detection + 1point
		Input range code
		00 to 41
		Additional function
	Y	Without
	P	SV selection command input(DI)
	Q	4 ramp/soak + start/reset
	R	RS485 (**1)
	S	RS485 (**1) + 4 ramp/soak
	M	RS485 (**2)
	N	RS485 (**2) + 4 ramp/soak
	A	Re-transmission
	B	Re-transmission + 4ramp/soak
	C	Remote SV
		Front panel label
	E	English label in ℃
	F	English label in ℉
	K	English label in %

**1: CC-data line protocol
**2: Modbus(RTU) protocol

2 PYX Modbus Protocol

Transimssion specifications

Items	Specifications
Interface standard	RS-485
Communication system	Half-duplex communication system
Synchronizing system	Start-stop synchronizing
Data length	8 bits
Parity	Odd parity
Stop bit	1 bit
Error control system	Parity and CRC
Tranmission rate	9600bps
Tranmission distance	Total extension distance Max.500m
Transmission cable	Twisted paired cable with shield.
No. of connectable units	1 to 31 units(PYX)

3 MODBUS transmission system

MODBUS transmission system is that a command message is transmitted from the master station to PYX (slave station) and a response message corresponding to the command message is sent from PYX to the master station.
MODBUS transmission mode uses RTU (Remote Terminal Unit).
Command message and response message are detailed below.

3.1 Composition of command message

Command message consists of 4 factors; station No., function code, data and CRC error check. Fig 3.1 shows the composition of command message.

Station No.	1 byte
Function code	1 byte
Data	Length of data varies with functions
CRC error check	2 bytes

Fig. 3-1 Composition of command message

(1) Station No.

Station No. is an address No. set to each slave station. It is set to a slave station with which communication is made for transmitting a command message. PYX is capable of setting station No. 1 through 31.

Note: When communication is made with a number of slave stations connected, transmission errors could occur if station No. is overlapped. Be careful not to overlap station No. It should be noted that slave stations do not accept the function of transmitting a command to every slave station when "0" is designated to the station No. of command message.

(2) Function code

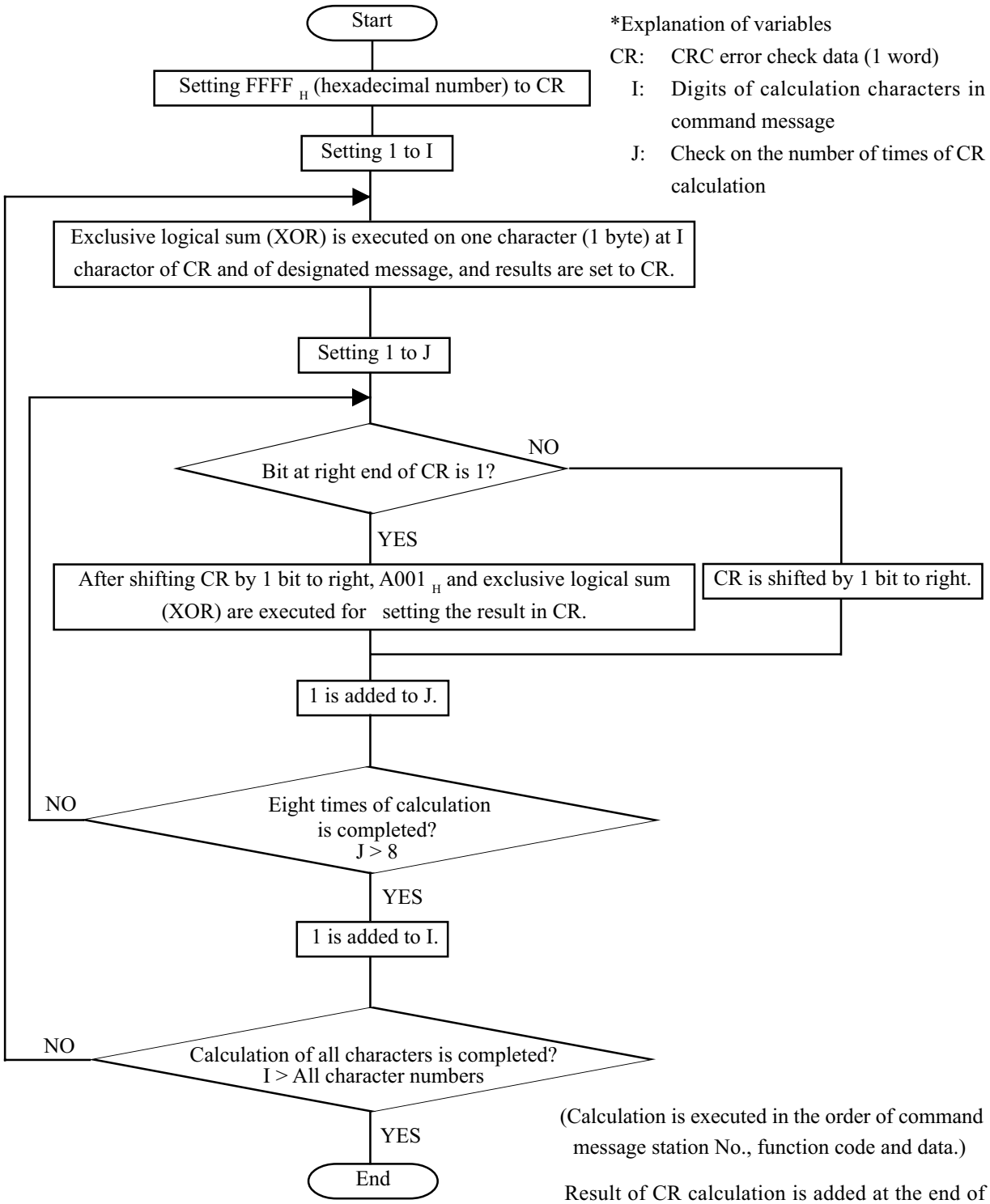
This is a code to designate the function executed at a slave station. Table 3-1 shows a list of function codes to be used by PYX. These function codes are expressed in hexadecimal number ("H" of 01H means a hexadecimal number).

(3) Data

Data required for executing function codes that have been transmitted: The composition of data varies with function codes, while the number of data contained in one message is different on each function (see Table 3-1). Data to be processed is not designated by the address of each data but is designated by the relative address in which 1 is subtracted from the lower 4 digits of the Register/Coil number. For example, when the Register/Coil number of "Auto/manual selection" is 40001, the relative address becomes 0000. Data to be processed are detailed in Chapter 4.

(4) CRC error check

Data for checking command message errors (change in bit): Error is detected by CRC-16 (Cyclic Redundancy Check) system. Fig. 3-2 shows the flow of CRC calculation system.



*Explanation of variables

CR: CRC error check data (1 word)

I: Digits of calculation characters in command message

J: Check on the number of times of CR calculation

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

Result of CR calculation is added at the end of command message in the order of LOW and HIGH bytes.

Fig. 3-2 Flow of CRC calculation

Table 3-1 List of MODBUS function codes (PYX)

Function code	Meaning	Max data number handled by one message	Max/Min message length (byte)		Contents of command message (byte)							Contents of response message (byte)				
			Command	Response	Station No.	Function code	Data				CRC	Station No.	Function code	Data		CRC
01_H	Read output bit data	1 bit	8	6 6	1	1	Start address 2	Quantity 2			2	1	1	No. of data 1	Bit contents MAX 8	2
02_H	Read input bit data	8 bits	8	6 6	1	1	Start address 2	Quantity 2			2	1	1	No. of data 1	Bit contents MAX 8	2
03_H	Read output word data	60 words	8	125 7	1	1	Start address 2	Quantity 2			2	1	1	No. of data 1	Data contents MAX 60	2
04_H	Read input word data	9 words	8	23 7	1	1	Start address 2	Quantity 2			2	1	1	No. of data 1	Data contents MAX 9	2
05_H	Write output bit data, 1 bit	1 bit	8	8 8	1	1	Designate address 2	Designate state 2			2	1	1	Designate No. 2	Designate state 2	2
06_H	Write output word data	1 word	8	8 8	1	1	Designate address 2	Write data 2			2	1	1	Designate No. 2	Write data 2	2
$0F_H$	Write output bit data, continuous	1 bit	10	8 1	1	1	Start address 2	Quantity 2	No. of data 1	Write data MAX 1	2	1	1	Start No. 2	Quantity 2	2
10_H	Write output word data, continuous	60 words	129 11	8	1	1	Start address 2	Quantity 2	No. of data 1	Write data MAX 60	2	1	1	Start No. 2	Quantity 2	2

The above applies to PYX alone, and is not specifications for MODBUS®

(5) Transmission control procedure

In general, the transmission control procedures can be divided into the following three phases.

(1) Data link setup

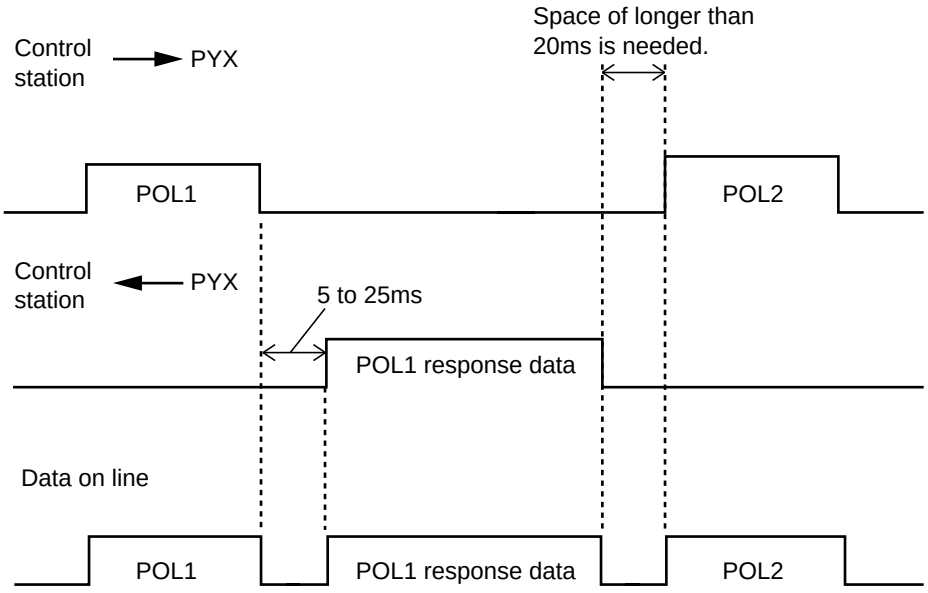
(2) Data transfer

(3) Data link release

In this transmission system, the data link setup (1) also serves for the data link release (3) of the previous frame.

Accordingly, the space between frames must be secured correctly. The time required for spacing the frames is longer than 20msec.

In other words, when the control station has no received one character data for longer than 20msec on the line, the data link initializes reception based on the judgement that a new frame is started. If the character space becomes 10msec. or longer during the reception (during the transmission from the control station), the controlled station is automatically initialized and all received data are completely cleared. Under the condition of initialized reception, the first character is limited to station number, and a series of messages stating with other characters are all neglected.



(6) FIX

When you write some data, you should execute FIX.

(FIX : PYX saves memory data from RAM to EEPROM.)

Please refer to "4.5 Write output data, 1 bit (Function code: 05_H)."

If you turn off the PYX before executing FIX, the previously stored values are effective. (PYX doesn't save new written value.)

4 Detail of MODBUS message

PYX MODBUS has functions as shown in Table 3-1. Details of function command and response message are shown in the following.

4.1 Read output bit data

Function code	Max bit number read in one message	Relative data address	Coil No.
01_H	1 bit	0000_H	00001

(Data applied to PYX is limited only to FIX)

(1) Message composition

Command message composition (byte)

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

} 1

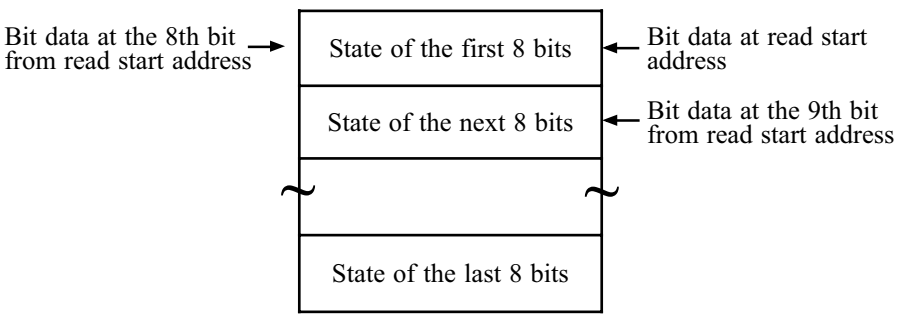
Response message composition(byte)

Station No.	
Function code	
Read byte number	
State of the first 8 bits	
State of the next 8 bits	
~	~
State of the last 8 bits	
CRC data	Upper
	Lower

Integer of $\left(\frac{N+7}{8}\right)$

N: Read bit number

*Arrangement of read bit number



(2) Function explanations

Bit data of continuous bit numbers can be read from read start address. Read bit data are arranged in 8-bit unit and transmitted from slave station. When read bit data number is not a multiple of 8, all the bits (MSB side) not related with the state of the last 8 bits will become “0”.

(3) Message transmission (example)

The following shows an example of reading the contents of FIX execution request data transmitted from No.1 slave station.

FIX execution request bit address: 0000_H Data number: 01_H

Command message composition (byte)

Station No.		01_H
Function code		01_H
Read start address	Upper	00_H
	Lower	00_H
Read bit number	Upper	00_H
	Lower	01_H
CRC data	Upper	FD_H
	Lower	CA_H

Response message composition (byte)

Station No.		01_H
Function code		01_H
Read byte number		01_H
State of the first 8 bits		00_H
CRC data	Upper	51_H
	Lower	88_H

*Meaning of read data

State of FIX execution request

	MSB							LSB
00_H	0	0	0	0	0	0	0	0

↑

No FIX execution

4.2 Read input bit data

Function code	Max bit number read in one message	Relative data address	Coil No.
02_H	8 bits	0000_H - 0007_H	10001 -10008

(1) Message composition

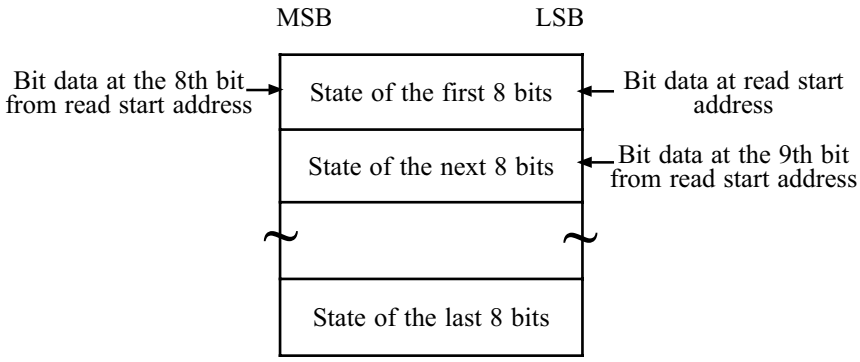
Command message composition (byte)

Station No.		
Function code		
Read start address (relative)	Upper	
	Lower	
Read bit number	Upper	} 1~8
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Read byte number		} Integer of $\left(\frac{N+7}{8}\right)$
State of the first 8 bits		
State of the next 8 bits		N: Read bit number
~		
State of the last 8 bits		
CRC data	Upper	
	Lower	

Arrangement of read bit number



(2) Function explanations

Bit data of continuous bit numbers can be read from read start address. Read bit data are arranged in 8-bit unit and transmitted from slave station. When read bit data number is not a multiple of 8, all the bits (MSB side) not related with the state of the last 8 bits will become “0”.

(3) Message transmission (example)

The following shows an example of reading the contents of Alarm 1 channel (1-4) and Alarm 2 channel (1-4) data transmitted from No.31 slave station.

Alarm 1 detect data bit address: 0000_H-0003_H Data number: 08_H

Alarm 2 detect data bit address: 0004_H-0007_H

Command message composition (byte)

Station No.		$1F_H$
Function code		02_H
Read start address	Upper	00_H
	Lower	00_H
Read bit number	Upper	00_H
	Lower	08_H
CRC data	Upper	$7A_H$
	Lower	72_H

Response message composition (byte)

Station No.		$1F_H$
Function code		02_H
Read byte number		01_H
State of the first 8 bits		01_H
CRC data	Upper	66_H
	Lower	60_H

Meaning of read data
State of alarm detect of alarms 1, 2
(State of the first 8 bits)

0.1_H=

MSB							LSB
0	0	0	0	0	0	0	1

↑

Alarm ON by Alarm 1-1

All of alarm 2 should be set to OFF.

4.3 Read output word data

Function code	Max word number read in one message	Relative data address	Register No.
03_H	60 words	0000_H - $003B_H$	40001 - 40060

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Read start address (relative)	Upper	
	Lower	
Read word number	Upper	} 1 ~ 60
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Read byte number		Read word number × 2
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	Upper	
	Lower	

*Read word data arrangement

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 read from the read start address can be read. Read word data are transmitted from slave station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of reading the high and low limits of set values from No.2 slave station.
Address of high limit set value: 0016_H Data number: 02_H

Command message composition (byte)

Station No.		02_H
Function code		03_H
Read start address	Upper	00_H
	Lower	16_H
Read word number	Upper	00_H
	Lower	02_H
CRC data	Upper	25_H
	Lower	FC_H

Response message composition (byte)

Station No.		02_H
Function code		03_H
Read byte number		04_H
Contents of the first word data	Upper	27_H
	Lower	10_H
Contents of the next word data	Upper	0_H
	Lower	0_H
CRC data	Upper	$C2_H$
	Lower	42_H

*Meaning of read data

High limit of set value 27 10_H = 10000 (=100.00%FS)
(contents of first word data)
Low limit of set value 00 00_H = 0 (= 0.00%FS)
(contents of next word data)

When input code (PVT) is 22 (K 0-400˚C):

High limit set value = 400˚C (=100.00%FS)
Low limit set value = 0˚C (= 0.00%FS)

4.4 Read input word data

Function code	Max word number read in one message	Relative data address	Register No.
04_H	9 words	0000_H - 0008_H	30001 - 30009

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Read start address (relative)	Upper	
	Lower	
Read word number	Upper	} 1 ~ 9
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Read byte number		Read word number × 2
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	Upper	
	Lower	

*Read word data arrangement

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 read from the read start address can be read. Read word data are transmitted from slave station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of reading PV from No.1 slave station.

PV address: 0000_H Data number: 01H

Command message composition (byte)

Station No.		01_H
Function code		04_H
Read start address	Upper	00_H
	Lower	00_H
Read word number	Upper	00_H
	Lower	01_H
CRC data	Upper	31_H
	Lower	CA_H

Response message composition (byte)

Station No.		01_H
Function code		04_H
Read byte number		02_H
Contents of the first word data	Upper	03_H
	Lower	46_H
CRC data	Upper	38_H
	Lower	32_H

*Meaning of read data

Contents of first word data 03 46_H = 838 (=8.38%FS)

When input code is 22 (K 0.0-400˚C):

PV=33.5˚C(=8.38%FS × 400)

4.5 Write output data, 1 bit

Function code	Max bit number written in one message	Relative data address	Coil No.
05_H	1 bit	0000_H	00001

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Write designate address (relative)	Upper	
	Lower	
State of write designation	Upper	
	Lower	
CRC data	Upper	
	Lower	

$0000_H = 0$

$FF00_H = 1$

Response message composition (byte)

Station No.		
Function code		
Write designate address	Upper	
	Lower	
State of write designation	Upper	
	Lower	
CRC data	Upper	
	Lower	

(2) Function explanations

Data of "0" or "1" can be written in write designate address bit. When "0" is written, data of 0000 is transmitted, and when "1" is written, data of $FF00_H$ is transmitted.

(3) Message transmission (example:This is the way of FIX)

The following shows an example of executing FIX to No.1 slave station.

FIX address: 0000_H

Command message composition (byte)

Station No.		01_H
Function code		05_H
Write designate address	Upper	00_H
	Lower	00_H
State of write designation	Upper	FF_H
	Lower	00_H
CRC data	Upper	$8C_H$
	Lower	$3A_H$

Response message composition (byte)

Station No.		01_H
Function code		05_H
Write designate address	Upper	00_H
	Lower	00_H
State of write designation	Upper	FF_H
	Lower	00_H
CRC data	Upper	$8C_H$
	Lower	$3A_H$

After receiving above command, it takes 5 seconds that PYX saves memory data from RAM to EEPROM.

Caution!

If you turn off the PYX during above time (within 5 seconds), memory data are broken and can not be used.

4.6 Write output word, 1 word

Function code	Max word number written in one message	Relative data address	Register No.
06_H	1 word	0000_H - $003B_H$	40001 - 40060

(1) Message composition

Command message composition (byte)

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

Response message composition (byte)

Station No.		
Function code		
Write designate address	Upper	
	Lower	
Write word data	Upper	
	Lower	
CRC data	Upper	
	Lower	

(2) Function explanations

Designated data can be written in the word data of write designate address. Write data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of setting 100.0 ($1000_D = 03E8_H$) to the parameter "P" of No.1 slave station.

Parameter P address: 0005_H

Command message composition (byte)

Station No.		01_H
Function code		06_H
Write designate address	Upper	00_H
	Lower	05_H
State of write designation	Upper	03_H
	Lower	$E8_H$
CRC data	Upper	99_H
	Lower	75_H

Response message composition (byte)

Station No.		01_H
Function code		06_H
Write designate address	Upper	00_H
	Lower	05_H
State of write designation	Upper	03_H
	Lower	$E8_H$
CRC data	Upper	99_H
	Lower	75_H

4.7 Write output bit data, continuous bits

Function code	Max bit number read in one message	Relative address	Coil No.
$0F_H$	1 bit	0000_H	00001

(Data applied to PYX is limited only to FIX)

(1) Message composition

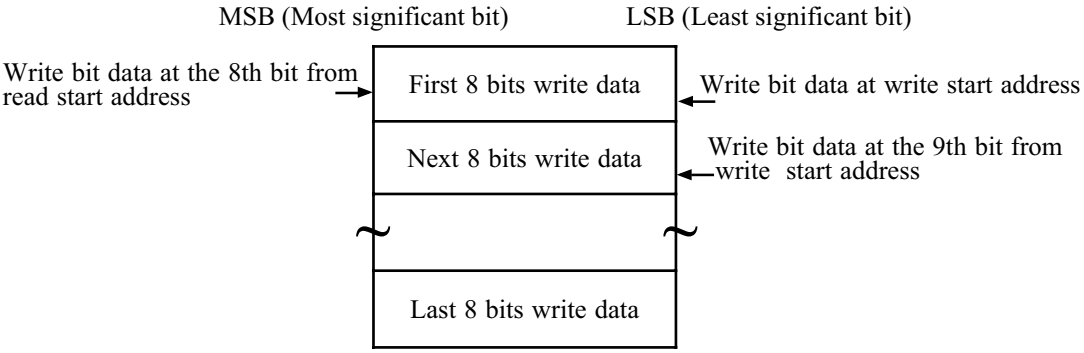
Command message composition (byte)

Station No.		
Function code		
Write start address (relative)	Upper	
	Lower	
Write bit number	Upper	} 1
	Lower	
Write byte number		
First 8 bits write data		Integer of $\left(\frac{N+7}{8}\right)$
Next 8 bits write data		N: Write bit number
~		~
Last 8 bits write data		
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.	
Function code	
Write start address	Upper
	Lower
Write bit number	Upper
	Lower
CRC data	Upper
	Lower

*Arrangement of write bit number



(2) Function explanations

Bit data of continuous write bits can be written from write start address. Bit data are arranged in the order of 8-bit unit and transmitted from master station.

(3) Message transmission (example)

The following shows an example of writing FIX execution request for No.1 slave station.
FIX execution request bit address: 0000_H Data number: 01_H

Command message composition (byte)

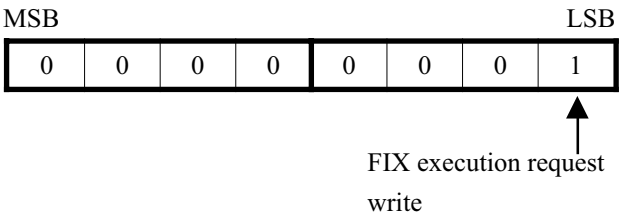
Station No.		01_H
Function code		$0F_H$
Write start address	Upper	00_H
	Lower	00_H
Write bit number	Upper	00_H
	Lower	01_H
Write byte number		01_H
First 8 bits write data		01_H
CRC data	Upper	EF_H
	Lower	57_H

Response message composition (byte)

Station No.		01_H
Function code		$0F_H$
Write start address	Upper	00_H
	Lower	00_H
Write bit number	Upper	00_H
	Lower	01_H
CRC data	Upper	94_H
	Lower	OB_H

* Meaning of write data

State of FIX execution request 01_H=



4.8 Write output word data, continuous words

Function code	Max word number written in one message	Relative data address	Register No.
10_H	60 words	0000_H - $003B_H$	40001 - 40060

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Write start address (relative)	Upper	
	Lower	
Write word number	Upper	} 1 - 60
	Lower	
Write byte number		} Write word number × 2
First write word data	Upper	
	Lower	
Next write word data	Upper	
	Lower	
~	~	~
Last write word data	Upper	
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.	
Function code	
Write start address	Upper
	Lower
Write word number	Upper
	Lower
CRC data	Upper
	Lower

*Arrangement of write 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 write word number can be written from write start address. 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 P=100.0, I=10 and D=5.0 of No.1 slave station.

($P = 03\ E8_H$. $I = 0064_H$. $D = 00\ 32_H$)

P address: 0005_H Data number: 03_H

Command message composition (byte)

Station No.		01_H
Function code		10_H
Write start address	Upper	00_H
	Lower	05_H
Write word number	Upper	00_H
	Lower	03_H
Write byte number		06_H
First write word data	Upper	03_H
	Lower	$E8_H$
Next write word data	Upper	00_H
	Lower	64_H
Last write word data	Upper	00_H
	Lower	32_H
CRC data	Upper	56_H
	Lower	BE_H

Response message composition (byte)

Station No.		01_H
Function code		10_H
Write start address	Upper	00_H
	Lower	05_H
Write word number	Upper	00_H
	Lower	03_H
CRC data	Upper	90_H
	Lower	09_H

4.9 Sample Program

Basic programs (GW basic) acting on Windows 95 MS-DOS PROMPT :

Read programs are listed on this page, and write programs on the next page.

Set ST No. of PYX to 1 and start this program.

(GW-basic is a registered trademark of Microsoft Corporation.)

When you program, make a routine trying a few times (re-try routine).

```
1 ' SAVE"MOD04W.BAS",A
1010 ' ------------------------------------------------------------------
1020 '  READ WORD DATA PROGRAM
1030 ' ------------------------------------------------------------------
1040 CLS
1050 DIM SAV(100,20)
1060 DIM CC(255)
1070 PYXN=1: CONVE=0
1080   CC(0)=&H1: CC(1)=&H4
1090   CC(2)=&H0: CC(3)=&H0' start address= "P"
1100   CC(4)=&H0: CC(5)=&H4' 4 WORD READ(=PV,SV,DV,MV_OUT1)
1110 OPEN "COM1:9600,o,8,1" AS #1
1120 ' ------------CR data make --------------
1130 CR=&HFFFF
1140 FOR I=0 TO 5
1150 CR=CR XOR CC(I)
1160   FOR J=1 TO 8
1170     CT= CR AND &H1
1180     IF CR<0 THEN CH=1 ELSE CH=0:GOTO 1200
1190     CR = CR AND &H7FFF
1200     CR = INT(CR/2)
1210     IF CH=1 THEN CR=CR OR &H4000
1220     IF CT=1 THEN CR=CR XOR &HA001
1230   NEXT J
1240 NEXT I
1250 CC(6)=CR AND &HFF: CC(7)=((CR AND &HFF00)/256 AND &HFF)
1260 ' -----------data send ---------------------------
1270 PRINT "Sending data  : "
1280 FOR I=0 TO 7
1290   PRINT #1,CHR$(CC(I));' DATA SENDING
1300   PRINT HEX$(CC(I));" ";
1310 NEXT I
1320 PRINT " "
1330 FOR I=0 TO 12000: NEXT I' INTERVAL
1340 ' -----------data receive ----------------------------
1350 PRINT
1360 LENGTH=LOC(1)
1370 IF LENGTH=CONVE THEN PRINT"No answer": GOTO 1480
1380 PRINT"Receiving data  : "
1390 X$=INPUT$(LENGTH,#1)' DATA RECEIVING
1400 FOR C=1 TO LENGTH
1410   A=ASC(MID$(X$,C,1)) : B$=HEX$(A)
1420   PRINT RIGHT$("0"+B$,2);" ";
1430   CC(C)=A
1440 NEXT
1450 IF CC(1)=&H83 THEN PRINT" Communication error"
1460 LOCATE 5,11
1470 GOSUB 1500
1480 END
1490 ' ---------------------------------------
1500 ' *CR.CALC
1510 CR= &HFFFF
1520 FOR I=1 TO LENGTH-2
1530 CR=CR XOR CC(I)
1540 FOR J=1 TO 8
1550  CT= CR AND &H1
1560  IF CR<0 THEN CH=1 ELSE CH=0:GOTO 1580
1570   CR = CR AND &H7FFF
1580   CR = INT(CR/2)
1590   IF CH=1 THEN CR=CR OR &H4000
1600   IF CT=1 THEN CR=CR XOR &HA001
1610  NEXT J
1620  NEXT I
1630  PRINT
1640  PRINT "CRC DATA ";
1650  CC(LENGTH+1)=CR AND &HFF
1660  PRINT HEX$(CC(LENGTH+1));
1670  PRINT " ";
1680  CC(LENGTH+2)=((CR AND &HFF00)/256)AND &HFF
1690  PRINT HEX$(CC(LENGTH+2));
1700 RETURN
```

Result of execution

```
== Read data of "PV","SV","DV","MV1" ==
  Sending data  :
  1 4 0 0 0 4 F1 C9

  Receiving data  :
  01 04 08 03 73 09 C4 F9 AF 27 10 CD 16
           ----- ----- ----- -----
           PV    SV    DV    MV

ex) PVT=2210 ( Thermocouple,K 0.0 to 400.0 degree)
  PV=(0373)h =( 883)d =  8.83%FS =  8.83%x400.0 = 35.3 degree
  SV=(09C4)h =(2500)d = 25.00%FS = 25.00%x400.0 =100.0 degree
  DV=(F9AF)h =(-1617)d=-16.17%FS =-16.17%x400.0 =-64.3 degree
  MV=(2710)h =(10000)d=100.00%
```

```
1 ' save"MOD06W.bas",a
1010 ' ---------------------------------------------------------------
1020 '  WRITE WORD DATA PROGRAM
1030 ' ---------------------------------------------------------------
1040 CLS
1050 DIM SAV(100,20)
1060 DIM CC(255)
1070 PYXN=1: CONVE=0
1080   CC(0)=&H1: CC(1)=&H6
1090   CC(2)=&H0: CC(3)=&H1B' start address="LOCK"(Front key lock)
1100   CC(4)=&H0: CC(5)=&H1' Write data.
1110 OPEN "COM1:9600,o,8,1" AS #1
1120 ' ------------CR data make ---------------
1130 CR=&HFFFF
1140 FOR I=0 TO 5
1150 CR=CR XOR CC(I)
1160   FOR J=1 TO 8
1170     CT= CR AND &H1
1180     IF CR<0 THEN CH=1 ELSE CH=0:GOTO 1200
1190     CR = CR AND &H7FFF
1200     CR = INT(CR/2)
1210     IF CH=1 THEN CR=CR OR &H4000
1220     IF CT=1 THEN CR=CR XOR &HA001
1230   NEXT J
1240 NEXT I
1250 CC(6) = CR AND &HFF:CC(7)= ((CR AND &HFF00)/256 AND &HFF)
1260 ' -----------data send ---------------------------
1270 PRINT "Sending data  : "
1280 FOR I=0 TO 7
1290   PRINT #1,CHR$(CC(I));' Data sending
1300   PRINT HEX$(CC(I));" ";
1310 NEXT I
1320 PRINT " "
1330 FOR I=0 TO 12000: NEXT I' interval
1340 ' -----------data receive ---------------------------
1350 LENGTH=LOC(1)
1360 IF LENGTH=CONVE THEN PRINT"No answer": GOTO 1470
1370 PRINT"Receiving data  : "
1380 X$=INPUT$(LENGTH,#1)' DATA RECEIVING
1390 FOR C=1 TO LENGTH
1400   A=ASC(MID$(X$,C,1)) : B$=HEX$(A)
1410   PRINT RIGHT$("0"+B$,2);" ";
1420   CC(C)=A
1430 NEXT
1440 IF CC(1)=&H83 THEN PRINT" Communication error"
1450 LOCATE 5,11
1460 GOSUB 1490
1470 END
1480 ' ---------------------------------------
1490 ' *CR.CALC
1500 CR= &HFFFF
1510 FOR I=1 TO LENGTH-2
1520 CR=CR XOR CC(I)
1530 FOR J=1 TO 8
1540  CT= CR AND &H1
1550  IF CR<0 THEN CH=1 ELSE CH=0:GOTO 1570
1560   CR = CR AND &H7FFF
1570   CR = INT(CR/2)
1580   IF CH=1 THEN CR=CR OR &H4000
1590   IF CT=1 THEN CR=CR XOR &HA001
1600  NEXT J
1610  NEXT I
1620  PRINT
1630  PRINT "CRC DATA ";
1640  CC(LENGTH+1)=CR AND &HFF
1650  PRINT HEX$(CC(LENGTH+1));
1660  PRINT " ";
1670  CC(LENGTH+2)=((CR AND &HFF00)/256)AND &HFF
1680  PRINT HEX$(CC(LENGTH+2));
1690 RETURN
```

Result of execution

```
== Write "1" to "Lock" ==
  Sending data  :
  1 6 0 1B 0 1 38 D
  Receiving data  :
  01 06 00 1B 00 01 38 0D
```

5. MODBUS protocol address map

For details, refer to Chapter 6 File specifications (PYX).

5.1 Function code 01, 05, 0F: Output bit data to read/write

Relative data address	Register or coil No.	Type	Memory contents		Memory name	Detailed Description		Read/write	Remarks
						File No.	Offset		
0000_H	00001	bit	Non-volatile memory		FIX_FLG			Read/write	

5.2 Function code 02: Input bit data to read

Relative data address	Register or coil No.	Type	Memory contents		Memory name	Detailed Description		Read/write	Remarks
						File No.	Offset		
0000_H	10001	bit	Alarm 1 - Channel 1		ALM_STAT	J33	0	Read	
0001_H	10002	bit	Alarm 1 - Channel 2			J33	0	Read	
0002_H	10003	bit	Alarm 1 - Channel 3			J33	0	Read	
0003_H	10004	bit	Alarm 1 - Channel 4			J33	0	Read	
0004_H	10005	bit	Alarm 2 - Channel 1			J33	0	Read	
0005_H	10006	bit	Alarm 2 - Channel 2			J33	0	Read	
0006_H	10007	bit	Alarm 2 - Channel 3			J33	0	Read	
0007_H	10008	bit	Alarm 2 - Channel 4			J33	0	Read	

5.3 Function code 03, 06, 10: Output word data to read/write

Relative data address	Register or coil No.	Type	Memory contents	PYX Parameter	Memory name	Detailed Description		Read/write	Remarks
						File No.	Offset		
0000_H	40001	Low byte	Auto/manual selection	MOD	MAN_MOD	J00	0	Read/write	
		High byte	Auto tuning command	AT	AT_CMD	J00		Read/write	
0001_H	40002	Low byte	PID/FUZZY selection	CTRL	CTRL_TYPE	J00	1	Read/write	
0002_H	40003	word	SV		FRNT_SV	J01	0	Read/write	
0003_H	40004	word	Manual MV		FRNT_MV	J01	1	Read/write	
0004_H	40005	word	Sub-set value	D-SV	SECND_SV	J02	0	Read/write	
0005_H	40006	word	P	P	P_VAL	J03	0	Read/write	
0006_H	40007	word	I	I	I_VAL	J03	1	Read/write	
0007_H	40008	word	D	D	D_VAL	J03	2	Read/write	
0008_H	40009	word	2-position action hysteresis	HYS	GAP_VAL	J03	3	Read/write	
0009_H	40010	word	COOL	COOL	COOL_VAL	J03	4	Read/write	
$000A_H$	40011	word	Dead band	DB	DB_VAL	J03	5	Read/write	
$000B_H$	40012	word	Anti-reset wind up	AR	ARW_VAL	J03	6	Read/write	
$000C_H$	40013	word	Manual reset value	MAN	MAN_VAL	J03	7	Read/write	
$000D_H$	40014	word	Control calculation cycle	DT	DT_VAL	J03	8	Read/write	
$000E_H$	40015	Low_byte	Normal/reverse designation(output 1)	REV1	REV1_VAL	J03	9	Read/write	
		High_byte	Normal/reverse designation(output 2)	REV2	REV2_VAL	J03		Read/write	

Function code 03, 06, 10: Output word data to read/write

Relative data address	Register or coil No.	Type	Memory contents	PYX Parameter	Memory name	Detailed Description		Read/write	Remarks
						File No.	Offset		
$000F_H$	40016	Low_byte	Output proportional cycle (output 1)	TC-1	OUT1_CYC	J04	0	Read/write	
		High_byte	Output proportional cycle (output 2)	TC-2	OUT2_CYC	J04		Read/write	
0010_H	40017	word	Input filter time constant	TF	INPUT_TF	J05	0	Read/write	
0011_H	40018	word	Voltage/current input base scale	PVB	SCAL_BS	J06	0	Read/write	
0012_H	40019	word	Voltage/current input full scale	PVF	SPN	J06	1	Read/write	
0013_H	40020	Low_byte	Voltage/current input decimal point position	PVD	DP_POS	J06	2	Read/write	
0014_H	40021	Low_byte	Kind of input	PVT	INPUT_TY	J07	0	Read/write	
		High_byte	ºC/ºF selection, with/without decimal point		PE	J07		Read/write	
0015_H	40022	word	PV shift value	SFT	PV_OFSET	J08	0	Read/write	
0016_H	40023	word	High limit set value (SV)	SV-H	SV LIM H	J09	0	Read/write	
0017_H	40024	word	Low limit set value (SV)	SV-L	SV LIM L	J09	1	Read/write	
0018_H	40025	word	High limit MV	MV-H	MV_H	J10	0	Read/write	
0019_H	40026	word	Low limit MV	MV-L	MV_L	J10	1	Read/write	
$001A_H$	40027	Low_byte	Abnormal time output designation	BURN	BURN_COD	J11	0	Read/write	
$001B_H$	40028	word	LOCK	LOCK	FR_LOCK	J12	0	Read/write	
$001C_H$	40029	word	Alarm 1 type	AL1T	ALM1_TYPE	J30	0	Read/write	
$001D_H$	40030	word	Alarm 2 type	AL2T	ALM2_TYPE	J30	1	Read/write	
$001E_H$	40031	word	Heater burnout alarm set value	HB-A	HB_AMP	J30	2	Read/write	
$001F_H$	40032	word	Loop burnout alarm set value	LOOP	LOOP_TIME	J30	3	Read/write	
0020_H	40033	word	Alarm 1: Channel 1 set value	AL11	ALM1 1 SP	J30	4	Read/write	
0021_H	40034	word	Alarm 1: Channel 2 set value	AL12	ALM1 2 SP	J30	5	Read/write	
0022_H	40035	word	Alarm 1: Channel 3 set value	AL13	ALM1 3 SP	J30	6	Read/write	
0023_H	40036	word	Alarm 2: Channel 1 set value	AL21	ALM2 1 SP	J30	7	Read/write	
0024_H	40037	word	Alarm 2: Channel 2 set value	AL22	ALM2 2 SP	J30	8	Read/write	
0025_H	40038	word	Alarm 3: Channel 3 set value	AL23	ALM2 3 SP	J30	9	Read/write	
0026_H	40039	word	Alarm 1: Channel 1 set hysteresis	A11H	ALM1 1 HYS	J30	10	Read/write	
0027_H	40040	word	Alarm 1: Channel 2 set hysteresis	A12H	ALM1 2 HYS	J30	11	Read/write	
0028_H	40041	word	Alarm 1: Channel 3 set hysteresis	A13H	ALM1 3 HYS	J30	12	Read/write	
0029_H	40042	word	Alarm 2: Channel 1 set hysteresis	A21H	ALM2 1 HYS	J30	13	Read/write	
$002A_H$	40043	word	Alarm 2: Channel 2 set hysteresis	A22H	ALM2 2 HYS	J30	14	Read/write	
$002B_H$	40044	word	Alarm 2: Channel 3 set hysteresis	A23H	ALM2 3 HYS	J30	15	Read/write	
$002C_H$	40045	word	No.1 ramp target value	SV-1	SV_SEG1	J31	0	Read/write	
$002D_H$	40046	word	No.2 ramp target value	SV-2	SV_SEG2	J31	1	Read/write	
$002E_H$	40047	word	No.3 ramp target value	SV-3	SV_SEG3	J31	2	Read/write	
$002F_H$	40048	word	No.4 ramp target value	SV-4	SV_SEG4	J31	3	Read/write	
0030_H	40049	word	No.1 ramp time	TM1R	TM SEG1 RM	J31	4	Read/write	

Function code 03, 06, 10: Output word data to read/write

Relative data address	Register or coil No.	Type	Memory contents	PYX Parameter	Memory name	Detailed Description		Read/write	Remarks
						File No.	Offset		
0031_H	40050	word	No.1 soak time		TM SEG1 SO	J31	5	Read/write	
0032_H	40051	word	No.2 ramp time		TM SEG2 RM	J31	6	Read/write	
0033_H	40052	word	No.2 soak time		TM SEG2 SO	J31	7	Read/write	
0034_H	40053	word	No.3 ramp time		TM SEG3 RM	J31	8	Read/write	
0035_H	40054	word	No.3 soak time		TM SEG3 SO	J31	9	Read/write	
0036_H	40055	word	No.4 ramp time		TM SEG4 RM	J31	10	Read/write	
0037_H	40056	word	No.4 soak time		TM SEG4 SO	J31	11	Read/write	
0038_H	40057	Low_byte	Power ON start command		P. ON START	J31	12	Read/write	
		High_byte	Ramp/soak command		PROG_CMD	J31		Read/write	
0039_H	40058	word	AO scaling base scale value		AO_SCAL_	J32	0	Read/write	
$003A_H$	40059	word	AO scaling full scale value		BS_SPN	J32	1	Read/write	
$003B_H$	40060	Low_byte	AO output source		AO_KIND	J32	2	Read/write	

Function code 04: Input word data to read

Relative data address	Register or coil No.	Type	Memory contents	PYX Parameter	Memory name	Detailed Description		Read/write	Remarks
						File No.	Offset		
0000_H	30001	word	Measured value (PV)		PV_VAL	J19	0	Read	
0001_H	30002	word	Presently used set value (SV)		SV_VAL	J19	1	Read	
0002_H	30003	word	Presently used deviation (DV)		DV_VAL	J19	2	Read	
0003_H	30004	word	MV (output 1)		OUT MV1 VAL	J20	0	Read	
0004_H	30005	word	MV (output 2)		OUT MV2 VAL	J20	1	Read	
0005_H	30006	Low byte	Station No.		STATION	J28	0	Read	
0006_H	30007	word	Ramp/soak remaining time		TM_RMIN	J34	0	Read	
0007_H	30008	Low byte	Present ramp/soak run position		PROG_LOC	J34	1	Read	
		High byte	Present status of ramp/soak		PROG_STAT	J34		Read	
0008_H	30009	word	Heater current		INP CURENT	J35	0	Read	

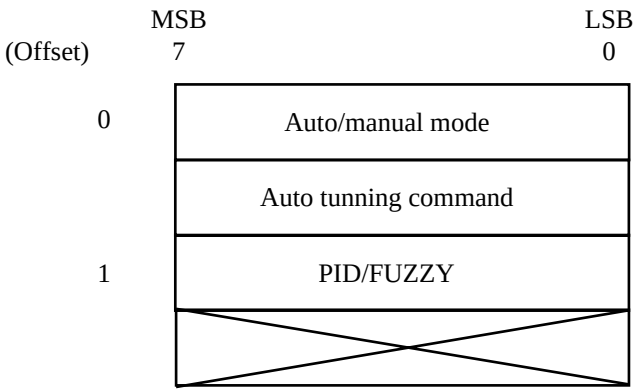
6 File specifications (PYX)

F NO.	Name of file	Attribute
J00	Control command file	Read/Write

1. Outline

This file stores commands to designate the selection of AUTO/MANUAL mode and kinds of control (PID/FUZZY) and the ON/OFF operation of AT (auto tuning).

2. Structure



3. Individual contents

MSB

Auto/manual mode (byte size) selection

00H : AUTO
01H : MANUAL

MSB

Auto tuning command (byte size)

00H : AT (Auto tuning) off
01H : Normal AT
02H : Low PV type AT

MSB

PID/FUZZY (byte size) selection

00H : FUZZY control
01H : PID control

F NO.	Name of file	Attribute
J01	SV file	Read/Write

1. Outline

This file stores setting values (SV) in local run and manipulated variables (MV) in manual run.

2. Structure

(Offset)	MSB 7	LSB 0
0	Setting value (H)	
	Setting value (L)	
1	Manual manipulated variable (H)	
	Manual manipulated variable (L)	

3. Individual contents

MSB

	Setting value (SV) high order byte
	Setting value (SV) low order byte (word size)

The values obtained by representing setting value as 0 to 100% of the input range (scale), and then, converting them into 0 to 10000 are stored. (Setting range : 0 to 10000)

MSB

	Manual maniplated variable high order byte
	Manual manipulated variable low order byte (word size)

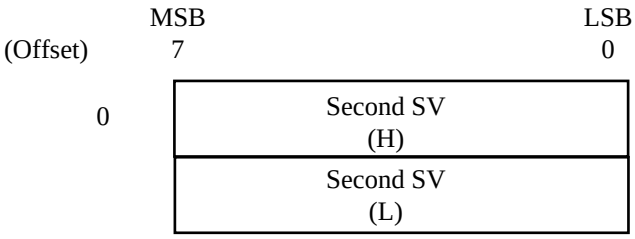
The values obtained by converting manipulated variables (MV) of -3.00 to 103.00% during manual operation into -300 to 10300 are stored. (Setting range : -300 to 10300)

F NO.	Name of file	Attribute
J02	Second SV file	Read/Write

1. Outline

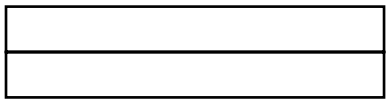
This file stores second setting values used for SV selection (option).

2. Structure



3. Individual contents

MSB



Second SV high order byte

Second SV low order byte (word size)

The values obtained by representing second setting values as 0.00 to 100.00% of the input range (scale), and then, converting them into 0 to 10000 are stored. (Setting range : 0 to 10000)

F NO.	Name of file	Attribute
J03	PID/FUZZY parameter file	Read/Write

1. Outline

This file stores parameters used for control calculation.

2. Structure

(Offset)	MSB 7 — LSB 0
0	Proportional band (H)
	Proportional band (L)
1	Automatic reset time (H)
	Automatic reset time (L)
2	Rate time (H)
	Rate time (L)
3	Hys (H)
	Hys (L)
4	Rate of proportional Band for cooling (H)
	Rate of proportional Band for cooling (L)
5	Dead band/Overlap band (H)
	Dead band/Overlap band (L)
6	Anti-reset wind-up (H)
	Anti-reset wind-up (L)
7	Manual reset value (H)
	Manual reset value (L)
8	Cycle of computing (H)
	Cycle of computing (L)
9	Reverse/Normal action (Output 1)
	Reverse/Normal action (Output 2)

3. Individual contents

MSB

P (proportional band) high order byte

P (proportional band) low order byte (word size)

The values obtained by converting P (proportional band) of 0.0 to 999.9% into 0 to 9999 are stored.
(Setting range : 0 to 10000)

MSB

I (integral time) high order byte

I (integral time) low order byte (word size)

The values obtained by converting I (integral time) of 0 to 3200sec. into 0 to 32000 are stored.
(Setting range : 0 to 32000)

MSB

D (derivative time) high order byte

D (derivative time) low order byte (word size)

The values obtained by converting D (derivative time) of 0.0 to 999.9sec. into 0 to 9999 are stored.
(Setting range : 0 to 9999)

MSB

Hysteresis high order byte

Hysteresis low order byte (word size)

The values obtained by representing the 2-position action hysteresis width as 0 to 100% to the input range width, and then, converting them into 0 to 10000 are stored. (Setting range : 0 to 10000)

MSB

2nd output side proportional band coefficient high order byte

2nd output side proportional band coefficient low order byte (word size)

The values obtained by converting the 2nd output side proportional band coefficients of 0.0 to 10.0 into 0 to 100 are stored. (Setting range : 0 to 100)

MSB

Dead band/Overlap band high order byte

Dead band/Overlap band low order byte (word size)

The values obtained by converting the dead band/overlap band of -50 to 50% into -5000 to 5000 are stored. (Setting range : -5000 to 5000)

MSB

	Anti-reset wind-up high order byte
	Anti-reset wind-up low order byte (word size)

The values obtained by converting the Anti-reset wind-up of 0.0 to 100.0% into 0 to 10000 are stored.
(Setting range : 0 to 10000)

MSB

	Manual reset value high order byte
	Manual reset value low order byte (word size)

The values obtained by converting manual reset values of -100.0 to 100.0% into -10000 to 10000 are stored. (Setting range : -10000 to 10000)

MSB

	Cycle of computing high order byte
	Cycle of computing low order byte (word size)

The values obtained by converting the control calculation cycle of 0.5 to 999.5sec. into 5 to 9995 are stored. (Setting range : 5 to 9995)

MSB

	(Output 1) Reverse/Normal action selection (byte size)

00H : Normal action
01H : Reverse action

MSB

	(Output 2) Reverse/Normal action selection (byte size)

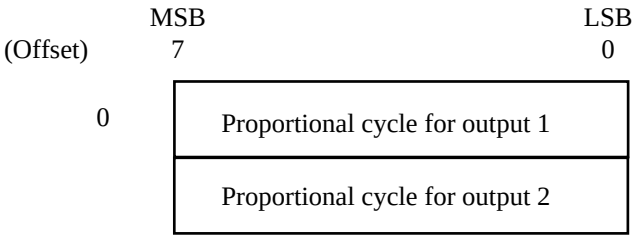
00H : Normal action
01H : Reverse action

F NO.	Name of file	Attribute
J04	Proportional cycle for output file	Read/Write

1. Outline

This file stores the proportional cycle for output data.

2. Structure



3. Individual contents

MSB

Proportional cycle for output 1 (byte size)

The proportional cycle for output 1 side of 1 to 120sec. is stored as it is.

(Setting range : 0 to 120)

MSB

Proportional cycle for output 2 (byte size)

The proportional cycle for output 2 side of 1 to 120sec. is stored as it is.

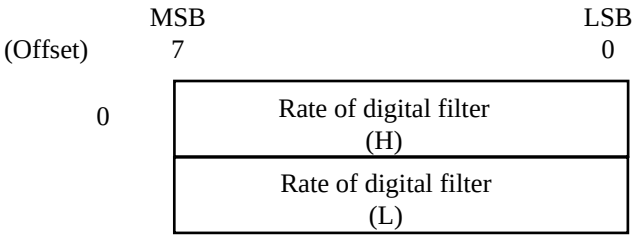
(Setting range : 0 to 120)

F NO.	Name of file	Attribute
J05	Rate of digital filter file	Read/Write

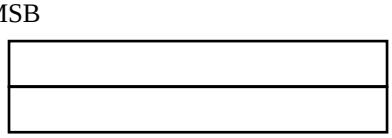
1. Outline

This file stores the rate of digital filter.

2. Structure



3. Individual contents



Rate of digital filter high order byte

Rate of digital filter low order byte (word size)

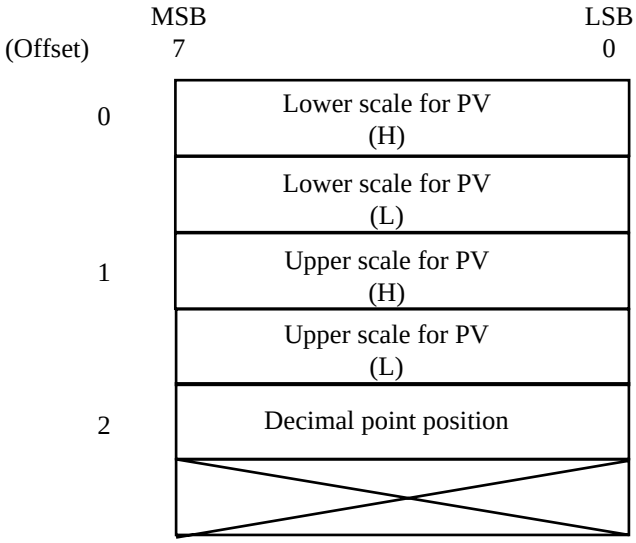
The values obtained by converting rate of digital filter of 0.0 to 900.0sec. into 0 to 9000 are stored.
(Setting range : 0 to 9000)

F NO.	Name of file	Attribute
J06	Input scaling file	Read/Write

1. Outline

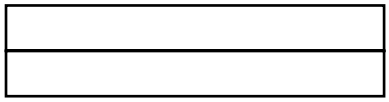
This file is used for determining the voltage/current input scale.

2. Structure



3. Individual contents

MSB

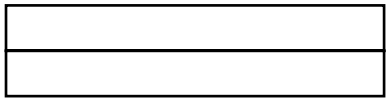


Lower scale for PV high order byte

Lower scale for PV low order byte (word size)

The lower scale for PV of -1999 to 9999 is stored as it is. (Setting range : -1999 to 9999)

MSB

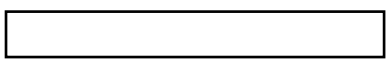


Upper scale for PV high order byte

Upper scale for PV low order byte (word size)

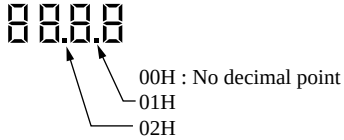
The upper scale for PV of -1999 to 9999 is stored as it is. (Setting range : -1999 to 9999)

MSB



Decimal point position (byte size)

Decimal point position

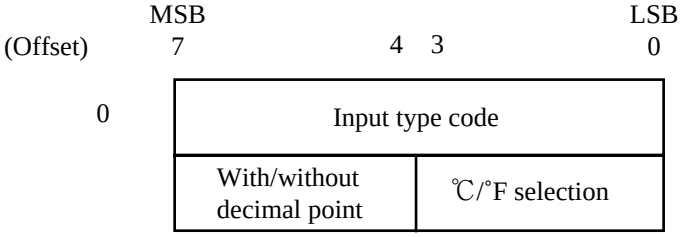


F NO.	Name of file	Attribute
J07	Input type filter	Read/Write

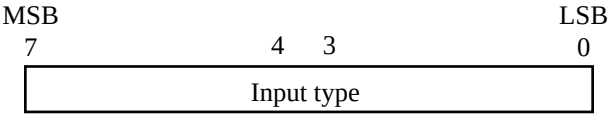
1. Outline

This file stores the input type, input range, whether decimal point is present or not, and ℃/˚F setting.

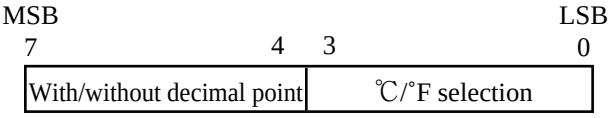
2. Structure



3. Individual contents



An input type code is stored (byte size).



Whether decimal point is present or not and ℃/˚F selection are set by the codes shown in the following table.

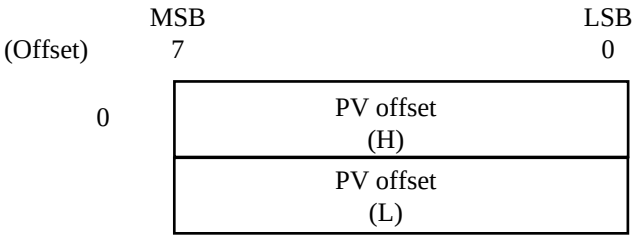
Higher significant 4 bits	0	No decimal point is present.
	1	Indication down to one place of decimals
Lower significant 4 bits	0	℃ indication
	1	˚F indication

F NO.	Name of file	Attribute
J08	PV offset file	Read/Write

1. Outline

This file stores PV offset values.

2. Structure



3. Individual contents

MSB

	PV offset value high order byte
	PV offset value low order byte (word size)

The values obtained by representing the PV offset values as 0 to 100% to the input range width, and then, converting them into 0 to 10000 are stored. (Setting range : 0 to 10000)

F NO.	Name of file	Attribute
J09	Setting value limit file	Read/Write

1. Outline

This file stores the setting value (SV) limit values.

2. Structure

(Offset)	MSB 7	LSB 0
0	High limit setting of SV (H)	
	High limit setting of SV (L)	
1	Low limit setting of SV (H)	
	Low limit setting of SV (L)	

3. Individual contents

MSB

	High limit setting of SV high order byte
	High limit setting of SV 1ow order byte (word size)

The values obtained by representing the high limit value of SV limit as 0 to 100% to the input range, and then, converting them into 0 to 10000 are stored. (Setting range : 0 to 10000)

MSB

	Low limit setting of SV high order byte
	Low limit setting of SV low order byte (word size)

The values obtained by representing the low limit value of SV limit as 0 to 100% to the input range, and then, converting them into 0 to 10000 are stored. (Setting range : 0 to 10000)

F NO.	Name of file	Attribute
J10	MV limit file	Read/Write

1. Outline

This file stores the limit values of manipulated variables (MV).

2. Structure

(Offset)	MSB 7	LSB 0
0	High limit setting of MV (H)	
	High limit setting of MV (L)	
1	Low limit setting of MV (H)	
	Low limit setting of MV (L)	

3. Individual contents

MSB

• Manipulated variable (MV) limit high limit value high order byte

• Manipulated variable (MV) limit high limit value low order byte (word size)

The values obtained by representing the high limit values of manipulated variable (MV) limit as -3.00 to 103.00% to the input range, and then, converting them into -300 to 10300 are stored.

(Setting range : -300 to 10300)

MSB

• Manipulated variable (MV) limit low limit value high order byte

• Manipulated variable (MV) limit low limit value low order byte (word size)

The values obtained by representing the low limit values of manipulated variable (MV) limit as -3.00 to 103.00% to the input range, and then, converting them into -300 to 10300 are stored.

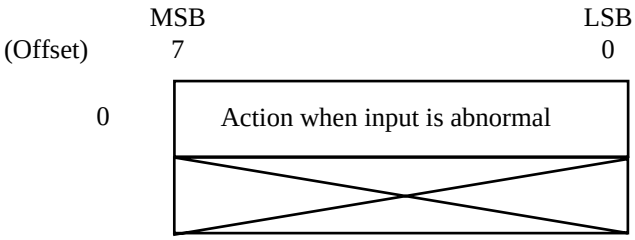
(Setting range : -300 to 10300)

F NO.	Name of file	Attribute
J11	Abnormal output file	Read/Write

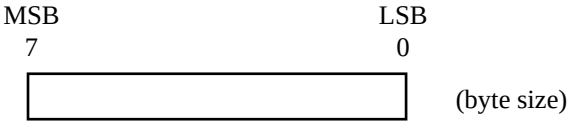
1. Outline

This file is used to designate a manipulated variable (MV) output at an abnormal input or at the end of a ramp soak function (option) program.

2. Structure



3. Individual contents



This file is used to designate a manipulated variable (MV) output at an abnormal output or at the end of a ramp soak function (option) program.

Code	Output 1	Output 2
00H	-3%	-3%
01H	103%	103%
02H	-3%	103%
03H	103%	-3%

F NO.	Name of file	Attribute
J12	Keylock file	Read/Write

1. Outline

This file stores keylock function parameters.

2. Structure

(Offset)	MSB 7	LSB 0
0	Lock for front operaiton (H)	
	Lock for front operaiton (L)	

3. Individual contents

MSB

	Lock parameter high order byte
	Lock parameter low order byte (word size)

Keylock levels of 0000 to 0003 are stored as they are. The following table shows the details of each level.

Lock level	Contents
0000	Setting of all parameters is inhibited.
0001	Setting of all parameters other than setting values (SV) is inhibited.
0002	Normal paramters only are settable.
0003	All paramters are settable.

F NO.	Name of file	Attribute
J19	Monitor file	Read

1. Outline

This read only file stores set values (SV), process variable (PV), and deviations (DV) being controlled at present.

2. Structure

(Offset)	MSB 7	LSB 0
0	Measured value (PV) (H)	
	Measured value (PV) (L)	
1	Setting value (SV) (H)	
	Setting value (SV) (L)	
2	Deviation value (DV) (H)	
	Deviation value (DV) (L)	

3. Individual contents

MSB

	Measured value (PV) high order byte
	Measured value (PV) low order byte (word size)

The values obtained by representing present measured value (PV) as 0 to 100% to the input range, and then, converting them into 0 to 10000 are stored.

MSB

	Setting value (SV) high order byte
	Setting value (SV) low order byte (word size)

The values obtained by representing present setting value of SV for control as 0 to 100% to the input range, and then, converting them into 0 to 10000 are stored.

MSB

	Deviation value (DV) high order byte
	Deviation value (DV) low order byte (word size)

The values obtained by representing present deviation value (DV=PV-SV) as 0 to 100% to the input range width, and then, converting them into 0 to 10000 are stored.

F NO.	Name of file	Attribute
J20	Output monitor file	Read

1. Outline

This read only file stores manipulated variable (MV) being output at present.

2. Structure

(Offset)	MSB 7	LSB 0
0	MV for output 1 (H)	
	MV for output 1 (L)	
1	MV for output 2 (H)	
	MV for output 2 (L)	

3. Individual contents

MSB

	MV for output 1 high order byte
	MV for output 1 low order byte (word size)

The values obtained by converting output 1 side manipulated variables (MV) of 0 to 100% now being output into 0 to 10000 are stored.

MSB

	MV for output 2 high order byte
	MV for output 2 low order byte (word size)

The values obtained by converting output 2 side manipulated variables (MV) of 0 to 100% now being output into 0 to 10000 are stored.

F NO.	Name of file	Attribute
J30	Alarm parameter file	Read/Write

1. Outline

This file stores the alarm types and setting values.

2. Structure

(Offset)	MSB 7	LSB 0
0	Alarm 1-4 type	Alarm 1-3 type
	Alarm 1-2 type	Alarm 1-1 type
1	Alarm 2-4 type	Alarm 2-3 type
	Alarm 2-2 type	Alarm 2-1 type
2	Setting for heater break detection (H)	
	Setting for heater break detection (L)	
3	Setting for loop break detection (H)	
	Setting for loop break detection (L)	
4	Setting for alarm 1-1 (H)	
	Setting for alarm 1-1 (L)	
5	Setting for alarm 1-2 (H)	
	Setting for alarm 1-2 (L)	
6	Setting for alarm 1-3 (H)	
	Setting for alarm 1-3 (L)	
7	Setting for alarm 2-1 (H)	
	Setting for alarm 2-1 (L)	
8	Setting for alarm 2-2 (H)	
	Setting for alarm 2-2 (L)	
9	Setting for alarm 2-3 (H)	
	Setting for alarm 2-3 (L)	
10	Setting for alarm 1-1 hysteresis (H)	
	Setting for alarm 1-1 hysteresis (L)	
11	Setting for alarm 1-2 hysteresis (H)	
	Setting for alarm 1-2 hysteresis (L)	
12	Setting for alarm 1-3 hysteresis (H)	
	Setting for alarm 1-3 hysteresis (L)	
13	Setting for alarm 2-1 hysteresis (H)	
	Setting for alarm 2-1 hysteresis (L)	
14	Setting for alarm 2-2 hysteresis (H)	
	Setting for alarm 2-2 hysteresis (L)	
15	Setting for alarm 2-3 hysteresis (H)	
	Setting for alarm 2-3 hysteresis (L)	

3. Individual contents

MSB LSB

7 4 3 0

** Alarm 1-4 type	* Alarm 1-3 type
* Alarm 1-2 type	* Alarm 1-1 type

Alarm types of channel 1 to 4 of alarm 1 are set by the codes shown in the following table.

MSB LSB

7 4 3 0

** Alarm 2-4 type	* Alarm 2-3 type
* Alarm 2-2 type	* Alarm 2-1 type

Alarm types of channel 1 to 4 of alarm 2 are set by the codes shown in the following table.

* Alarm types selectable in case of alarms other than alarm 1-4/2-4.

Code	Alarm type
0	No alarm
1	High limit absolute alarm
2	Low limit absolute alarm
3	High limit deviation alarm
4	Low limit deviation alarm
5	High limit deviation alarm (reverse output)
6	Low limit deviation alarm (reverse output)
7	High/low limit deviation alarm
8	High/low limit deviation alarm (reverse output)
9	Low limit absolute alarm (with low limit hold)
A	Low limit deviation alarm (with low limit hold)
B	Low limit deviation (with reverse output and low limit hold)
C	High/low limit deviation alarm (with low limit hold)
D	High/low limit deviation alarm (with reverse output and low limit hold)

* Alarm types selectable in case of alarms other than alarm 1-4/2-4 only.

Code	Alarm type
0	No alarm
1	Heater break alarm
2	Loop break alarm
3	Heater break alarm + loop break alarm

MSB

Setting for heater break detection high order byte

Setting for heater break detection low order byte (word size)

Setting value for heater break detection is stored in units of 0.1A. (Setting range: 10 to 500)

MSB

Setting for loop break detection high order byte

Setting for loop break detection low order byte (word size)

Setting value for loop break detection is stored in units of 1sec. (Setting range: 0 to 5999)

MSB

Setting for alarm 1-1 high order byte

Setting for alarm 1-1 low order byte (word size)

A value obtained by representing a setting value of channel 1 of alarm 1 as 0 to 100% to the input range in case of an absolute value alarm or to the input range width in case of a deviation alarm, and then converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

Setting for alarm 1-2 high order byte

Setting for alarm 1-2 low order byte (word size)

A value obtained by representing a setting value of channel 2 of alarm 1 as 0 to 100% to the input range in case of an absolute value alarm or to the input range width in case of a deviation alarm, and then converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

Setting for alarm 1-3 high order byte

Setting for alarm 1-3 low order byte (word size)

A value obtained by representing a setting value of channel 3 of alarm 1 as 0 to 100% to the input range in case of an absolute value alarm or to the input range width in case of a deviation alarm, and then converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

Setting for alarm 2-1 high order byte

Setting for alarm 2-1 low order byte (word size)

A value obtained by representing a setting value of channel 1 of alarm 2 as 0 to 100% to the input range in case of an absolute value alarm or to the input range width in case of a deviation alarm, and then converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 2-2 high order byte
	Setting for alarm 2-2 low order byte (word size)

A value obtained by representing a setting value of channel 2 of alarm 2 as 0 to 100% to the input range in case of an absolute value alarm or to the input range width in case of a deviation alarm, and then converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 2-3 high order byte
	Setting for alarm 2-3 low order byte (word size)

A value obtained by representing a setting value of channel 3 of alarm 2 as 0 to 100% to the input range in case of an absolute value alarm or to the input range width in case of a deviation alarm, and then converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 1-1 hysteresis high order byte
	Setting for alarm 1-1 hysteresis low order byte (word size)

A value obtained by representing the hysteresis of channel 1 of alarm 1 as 0 to 100% to the input range value, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 1-2 hysteresis high order byte
	Setting for alarm 1-2 hysteresis low order byte (word size)

A value obtained by representing the hysteresis of channel 2 of alarm 1 as 0 to 100% to the input range value, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 1-3 hysteresis high order byte
	Setting for alarm 1-3 hysteresis low order byte (word size)

A value obtained by representing the hysteresis of channel 3 of alarm 1 as 0 to 100% to the input range value, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 2-1 hysteresis high order byte
	Setting for alarm 2-1 hysteresis low order byte (word size)

A value obtained by representing the hysteresis of channel 1 of alarm 2 as 0 to 100% to the input range value, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 2-2 hysteresis high order byte
	Setting for alarm 2-2 hysteresis low order byte (word size)

A value obtained by representing the hysteresis of channel 2 of alarm 2 as 0 to 100% to the input range value, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

	Setting for alarm 2-3 hysteresis high order byte
	Setting for alarm 2-3 hysteresis low order byte (word size)

A value obtained by representing the hysteresis of channel 3 of alarm 2 as 0 to 100% to the input range value, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

F NO.	Name of file	Attribute
J31	Ramp soak parameter file	Read/Write

1. Outline

This file stores ramp/soak function parameter and commands.

2. Structure

(Offset)	MSB 7 — LSB 0
0	1st. target point [SV] (H)
	1st. target point [SV] (L)
1	2nd. target point [SV] (H)
	2nd. target point [SV] (L)
2	3rd. target point [SV] (H)
	3rd. target point [SV] (L)
3	4th. target point [SV] (H)
	4th. target point [SV] (L)
4	Time of 1st. ramp segment (H)
	Time of 1st. ramp segment (L)
5	Time of 1st. soak segment (H)
	Time of 1st. soak segment (L)
6	Time of 2nd. ramp segment (H)
	Time of 2nd. ramp segment (L)
7	Time of 2nd. soak segment (H)
	Time of 2nd. soak segment (L)
8	Time of 3rd. ramp segment (H)
	Time of 3rd. ramp segment (L)
9	Time of 3rd. soak segment (H)
	Time of 3rd. soak segment (L)
10	Time of 4th. ramp segment (H)
	Time of 4th. ramp segment (L)
11	Time of 4th. soak segment (H)
	Time of 4th. soak segment (L)
12	Power ON start command
	Ramp/Soak command

3. Individual contents

MSB

1st. target point [SV] high order byte

1st. target point [SV] low order byte (word size)

A value obtained by representing 1st. target point value as 0 to 100% to the input range, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

2nd. target point [SV] high order byte

2nd. target point [SV] low order byte (word size)

A value obtained by representing 2nd. target point value as 0 to 100% to the input range, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

3rd. target point [SV] high order byte

3rd. target point [SV] low order byte (word size)

A value obtained by representing 3rd. target point value as 0 to 100% to the input range, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

4th. target point [SV] high order byte

4th. target point [SV] low order byte (word size)

A value obtained by representing 4th. target point value as 0 to 100% to the input range, and then, converting it into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

Time of 1st. ramp segment high order byte

Time of 1st. ramp segment low order byte (word size)

The time of 1st. ramp section is stored as a word in units of one minute. (Setting range :0 to 5999)

MSB

Time of 1st. soak segment high order byte

Time of 1st. soak segment low order byte (word size)

The time of 1st. soak section is stored as a word in units of one minute. (Setting range :0 to 5999)

MSB

Time of 2nd. ramp segment high order byte

Time of 2nd. ramp segment low order byte (word size)

The time of 2nd. ramp section is stored as a word in units of one minute. (Setting range :0 to 5999)

MSB

Time of 2nd. soak segment high order byte

Time of 2nd. soak segment low order byte (word size)

The time of 2nd. soak section is stored as a word in units of one minute. (Setting range: 0 to 5999)

MSB

Time of 3rd. ramp segment high order byte

Time of 3rd. ramp segment low order byte (word size)

The time of 3rd. ramp section is stored as a word in units of one minute. (Setting range :0 to 5999)

MSB

Time of 3rd. soak segment high order byte

Time of 3rd. soak segment low order byte (word size)

The time of 3rd. soak section is stored as a word in units of one minute. (Setting range :0 to 5999)

MSB

Time of 4th. ramp segment high order byte

Time of 4th. ramp segment low order byte (word size)

The time of 4th. ramp section is stored as a word in units of one minute. (Setting range :0 to 5999)

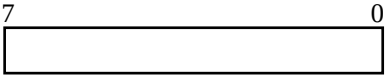
MSB

Time of 4th. soak segment high order byte

Time of 4th. soak segment low order byte (word size)

The time of 4th. soak section is stored as a word in units of one minute. (Setting range :0 to 5999)

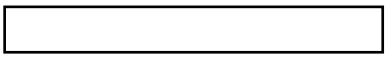
MSB LSB
7 0



Power ON start command (byte size)

A program can run automatically when turning on the power supply of the main unit.
(Power ON start function)
For turning on and off this function, set the following value to the power ON start command.
(O:Function OFF 1:Function ON)

MSB LSB
7 0



Ramp/soak command (byte size)

An operation command is given to the ramp/soak function by the codes shown in the following table.

Code	Operation
0	Function OFF
1	RUN
2	HOLD
3	*END

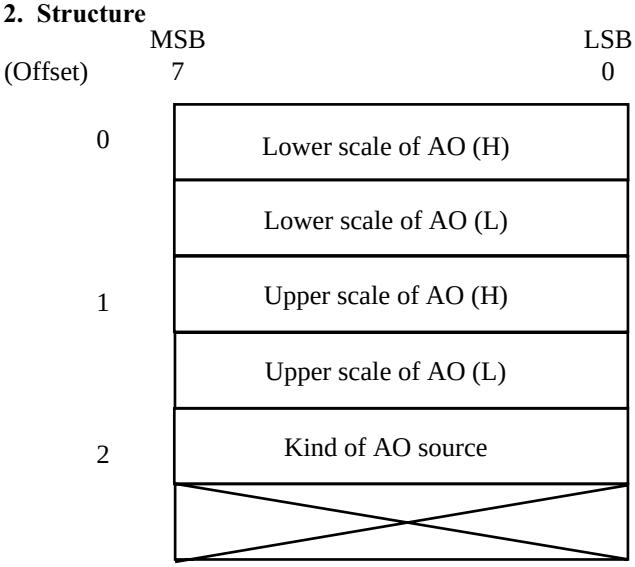
* END (Code 3) can not be written, but it can be read only.

F NO.	Name of file	Attribute
J32	AO scaling file	Read/Write

1. Outline

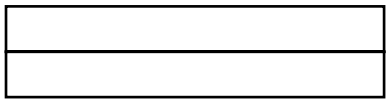
This file stores auxiliary analog output (AO) parameters.

2. Structure



3. Individual contents

MSB

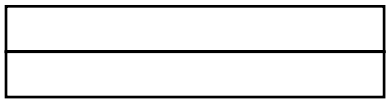


Lower scale of AO high order byte

Lower scale of AO low order byte (word size)

A value obtained by converting % value (0 to 100%) of the source corresponding to 1V output of AO into 0 to 10000 is stored. (Setting range : 0 to 10000)

MSB

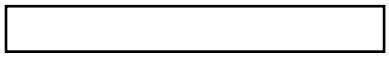


Upper scale of AO high order byte

Upper scale of AO low order byte (word size)

A value obtained by converting % value (0 to 100%) of the source corresponding to 5V output of AO into 0 to -10000 is stored. (Setting range : 0 to 10000)

MSB



AO output source (byte size)

Sources being output to AO are stored by the codes shown in the following table.

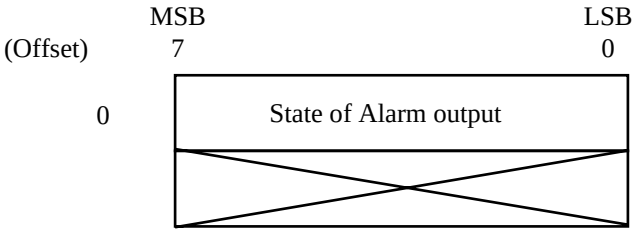
Code	Source type
0	Process variable (PV)
1	Setting values (SV)
2	Manipulated variables (MV)

F NO.	Name of file	Attribute
J33	State of alarm output file	Read

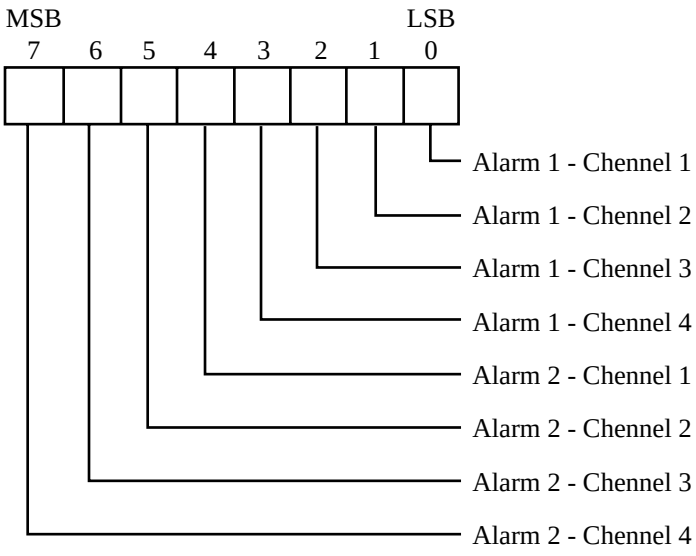
1. Outline

This file stores alarm decision results.

2. Structure



3. Individual contents



Alarm decision result ON : Corresponding bit = 1
OFF : Corresponding bit = 0

F NO.	Name of file	Attribute
J34	Ramp/soak monitor file	Read

1. Outline

This read only file stores data about the program running conditions of ramp/soak function.

2. Structure

(Offset)	MSB 7 LSB 0
0	Ramp/soak rest time (H)
	Ramp/soak rest time (L)
1	Ramp soak location
	Ramp/soak state

3. Individual contents

MSB

Ramp/soak rest time high order byte

Ramp/soak rest time low order byte (word size)

The program run rest time of ramp/soak function is stored in units of minute.

MSB 7 LSB 0

Ramp/soak location (byte size)

The program run location data of ramp/soak function are stored by the codes shown in the following table.

Code	Present position	Code	Present position	Code	Present position
0	Function OFF	4	2nd. soak	8	4th. soak
1	1st. ramp	5	3rd. ramp	9	End
2	1st. soak	6	3rd. soak		
3	2nd. ramp	7	4th. ramp		

MSB 7 LSB 0

Ramp/soak state (byte size)

Present running conditions of ramp/soak function are stored by the codes shown in the following table.

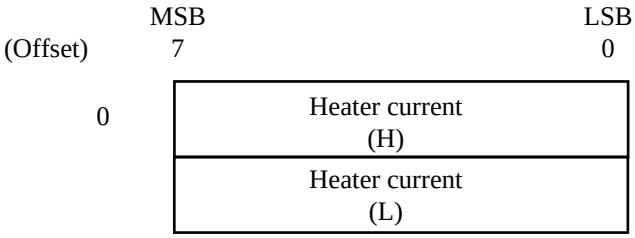
Code	Running conditions
0	OFF
1	RUN
2	HOLD
3	*END

F NO.	Name of file	Attribute
J35	Heater current file	Read

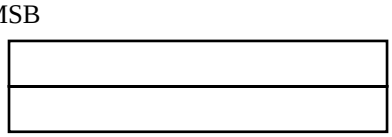
1. Outline

This read only file stores a heater current value.

2. Structure



3. Individual contents



A heater current value is stored in units of 0.1A.
(No heater current is detectable, if the heater breakage option is not provided).

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