Instruction Manual

RS-485 TRANSMISSION PROTOCOL

(PYX INTERFACE)

Fuji Electric Systems Co., Ltd.

INP-TN508165a-E

INTRODUCTION

1. Scope of this manual

This instruction manual describes the transmission protocol of the Type PYX controller with an RS485 transmission function.

2. Related manuals

Refer to the following references as required.

(1) Instruction manual for RS-485 transmission board

(2) Catalogue of fuzzy controller (PYX) (C.NO: 1119)

(3) Instruction manual for fuzzy controller (PYX) (INP-TN1PYX-E)

CONTENTS

FILE LIST

I. PYX Transmission Protocol Specifications

1. General

The PYX transmission protocol is so-called 1:N type transmission system where N (N=15 units) controlled station units are connectable to one control station unit, and PYX acts as a controlled station of this transmission line.

All transmission control is executed under the controlled of the control station and the preferential processing request function from controlled stations is absent to simplify the transmission procedure.

The control station can transmits max. 16W continuous data every transmission unit.

Since all the following pieces of information are included, this PYX transmission protocol is easily connectable to the decentralized digital instrumentation.

Since all the following data are included, this system is easily connectable to the decentralized digital instrumentation.

(1) SPC information

(2) DDC (manual operation) information

(3) Monitoring (process) information

(4) Information on the display and operation of control parameters and running modes

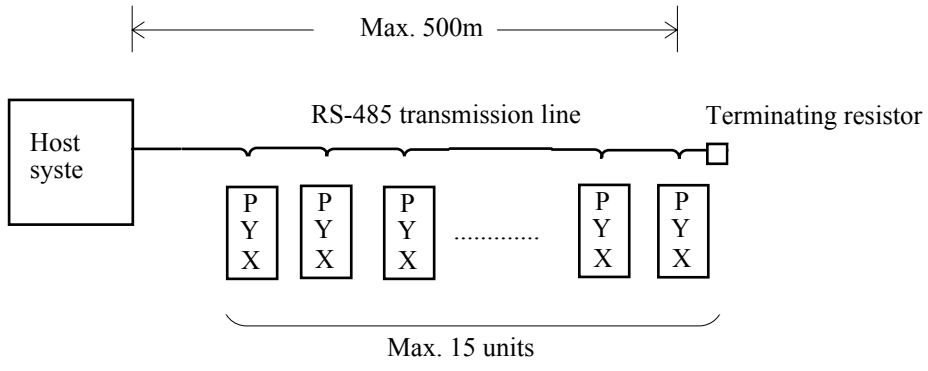
(5) Other pieces of information (operation parameters & industrial values)

2. Transmission specifications

Table 2 Transmission specifications

Items	Specifications	Remarks
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	
Response	ACK, NACK system	
Error control system	Parity and BCC (*1)	
Connection control system	Polling/selecting system	
Transmission rate	9600 bps	
Transmission block length	Max. 18 words (36 bytes) without BCC	
Transmission distance	Total extension length Max. 500m	
Transmission cable	Twisted paired cable with shield	
No. of connectable units (PYH)	Max. 15 units	

Connection mode



*1) BCC: Block Check Character (horizontal parity)

3. Transmissions information and format

3.1 Kinds of messages

Six kinds of messages shown below are used for transmission between the control station (host system) and controlled stations (PYX).

Table 3.1 Kinds of messages

Message	Transmission direction	Description
Polling message	(M) ⟶ (S)	A message for reading internal files of PYX
Selecting message	(M) ⟶ (S)*	A message for writing into PYX to internal files of PYX
Control message	(M) ⟶ (S)	A message for enabling PYX to execute specified action
ACK 1 message	(S) ⟶ (M)*	An ACK message to polling message
ACK 2 message	(S) ⟶ (M)	An ACK message to selecting message/control message
NACK message	(S) ⟶ (M)	An NACK message to selecting message/control message

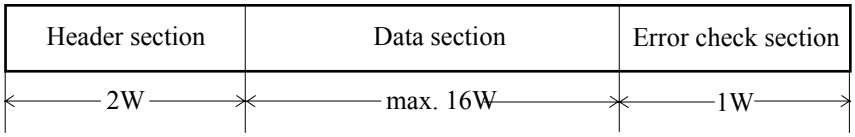
(M) : Master (host system)

(S) : Slave (PYX)

Asterisk (*) shows a message with data.

Note: Since there is no NACK message to polling message, the control station should confirm the negative acknowledgment (NACK).

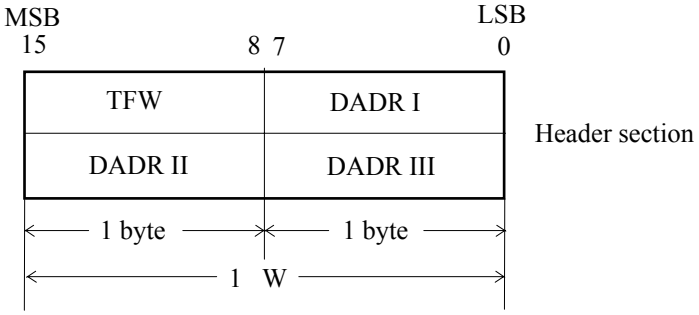
3.2 Formats of message



The selection message and ACK 1 message containing data are composed of the 2W header section, 16W (or less) data section, and 1W error check section respectively as shown in the above format. Other messages without data are composed of a fixed length of 2W header section only.

(1) Header section

The header section is composed of 1 byte transmission function word (TFW) and 3 bytes of data address word, that is, 2W in total.



Elements of the header section are explained in units of byte as follows.

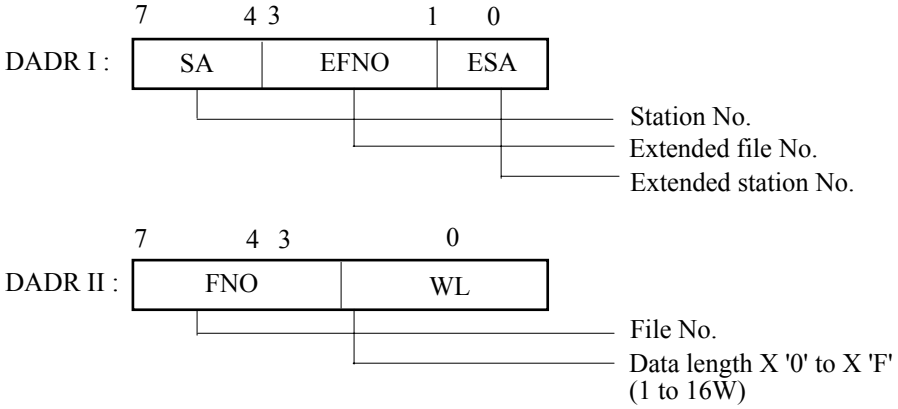
(a) Transmission function words (TFW)

Table 3.2a Transmission function word

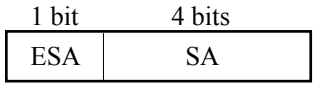
Function word	Symbol	Code	Meaning of function word
Polling	POL	Note 1) X ' D4'	Code of polling message
Selecting	SEL	X ' 69'	Code of selecting message
Control	CONT	X ' 8A'	Code of control message
Acknowledgment 1 (polling response)	ACK1	X ' AC'	Code of ACK1 message
Acknowledgment 2 (selecting & control response)	ACK2	X ' C5'	Code of ACK2 message
Negative acknowledgment	NACK	X ' 1B'	Code of NACK message

Note 1): X '**' shows a hexadecimal expression.

(b) Data zone designation

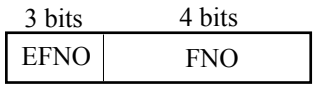


- The station number of each controlled station connected to the line is designated by 5 bits with ESA and SA as shown in the following figure.



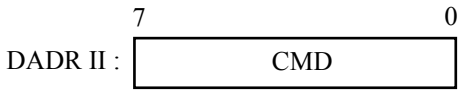
X' 01' to X' 0F' (Station 1 to 15)

- Transmission destination file No. is also designated by 7 bits with EFNO and FNO.



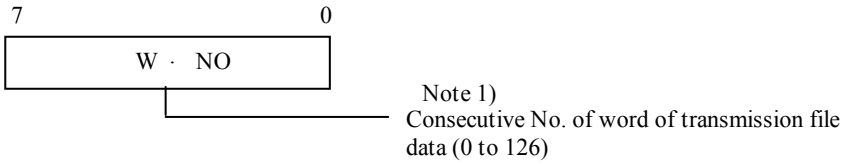
X' 00' to X' 7F' (File No. 0 to 127)

- When the function word is control (CONT), DADR II becomes a code to specify the kinds of specified action.



Specified code X' 1E' only is prepared as CMD for saving various parameters, constants and other data into the non-volatile memory.

DADR III : In case where function word is POL, SEL, or ACK1 or ACK2 for selecting



In case where function word is NACK

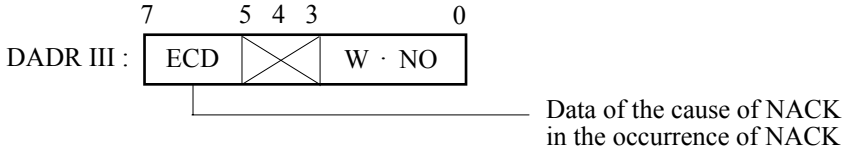
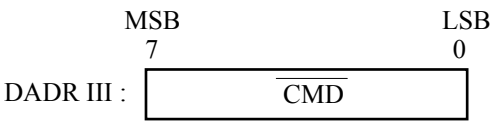


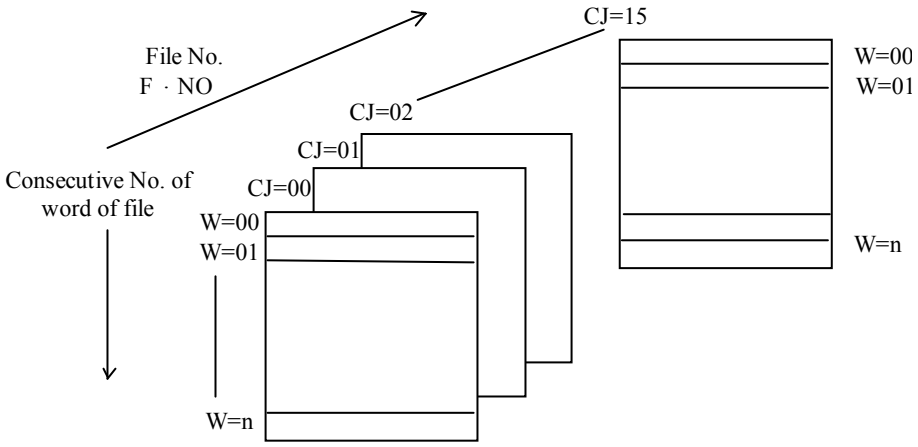
Table 3.2 b Error codes

Error code	Causes of NACK
X' 1'	Access to non-volatile memory is in progress.
X' 2'	Parity or flaming error occurs.
X' 3'	BCC error occurs.
X' 4'	File protect error occurs.
X' 5'	Non-volatile memory write error occurs.
X' 6'	Improper transmission function word (TFW)

If the function word is control (CONT) or ACK2 to control, error code becomes inverted code X' E1' of CMD.



Note 1) The controlled station file is composed as shown below.

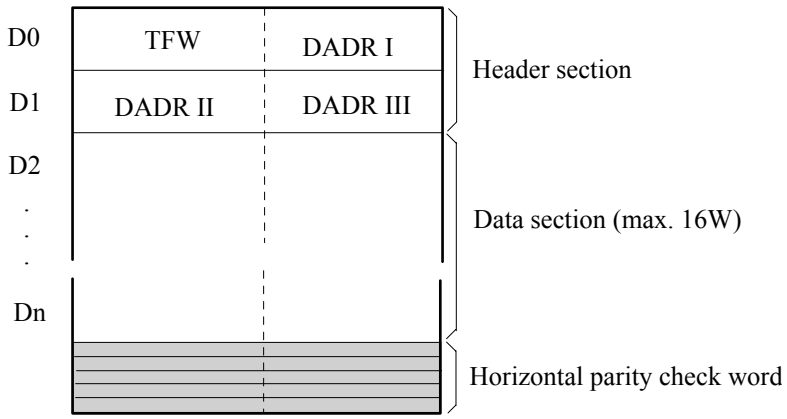


(2) Data section

The data section is composed of data with a word length designated by DADR II WL of the header section. The 1W data on the transmission line are transmitted in the order of high order byte to low order byte.

(3) Error check section (BCC)

This section is composed of a 1W horizontal parity check word up to the final word of the data section from the header section.



Calculation formula of horizontal parity check word

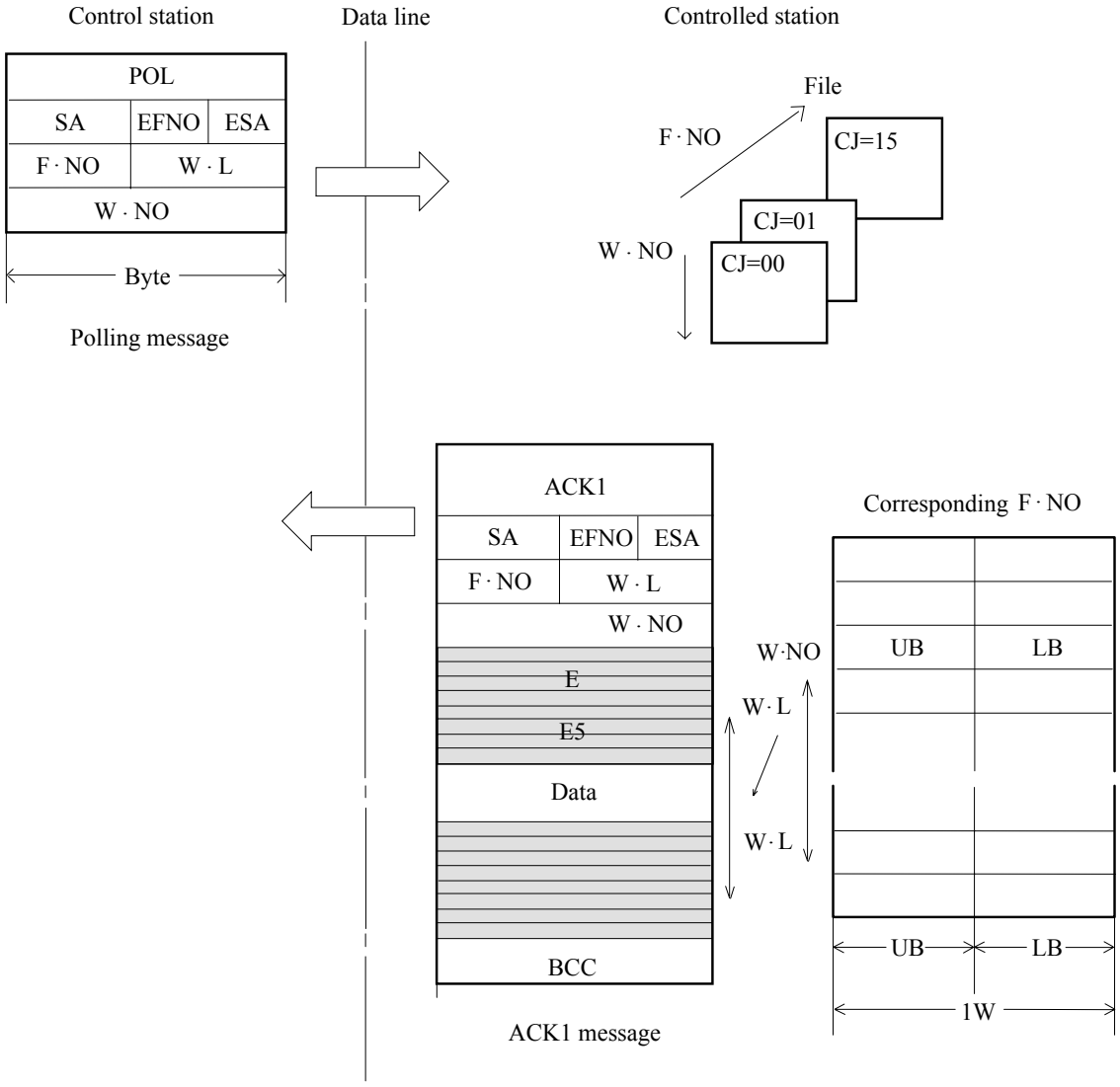
Horizontal parity check word = X' FFFF' ∀ D0 ∀ D1 ∀ D2 ∀ .....∀ Dn

∀ shows the calculation of exclusive-or.

3.3 Examples of message communication

A communication message is described in units of characters (bytes) according to the transmission format.

(1) Polling message

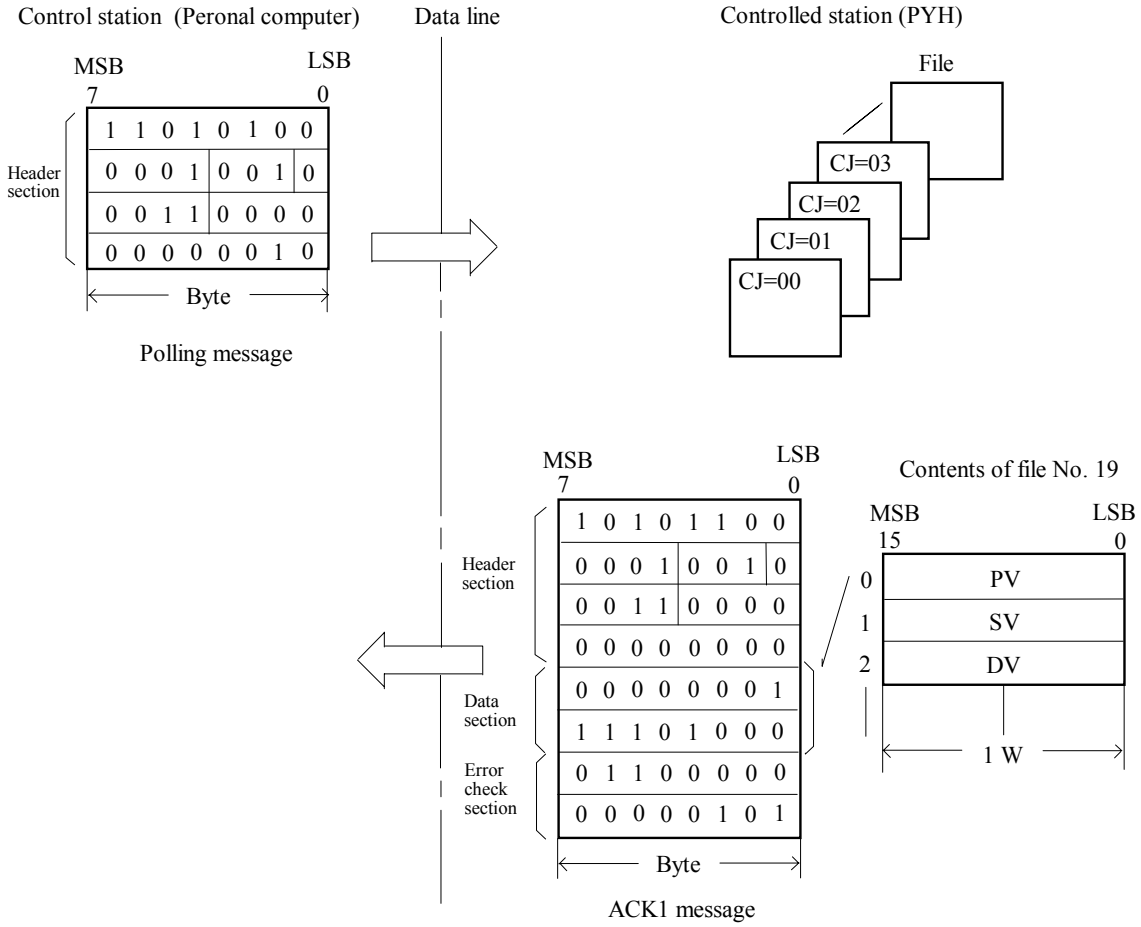


*1 PYX returns no response when W · NO • 127.

Example 1

Request-to-send (READ) of the present process variable (PV) from the personal computer to station No. 1 microcontroller.

Assume that the measuring range of the microcontroller is 0◦ to 1000◦C and the present process variable (PV) is 100◦C.



*1 PV is a % value to the measuring range, and 0 to 10000 corresponds to 0 to 100.00%.
Since PV is 100◦C in the measuring range of 0◦ to 1000◦C in this example, PV is 10%, that is, 1000 (X' 3E8') is stored into the file.

<Sample program>

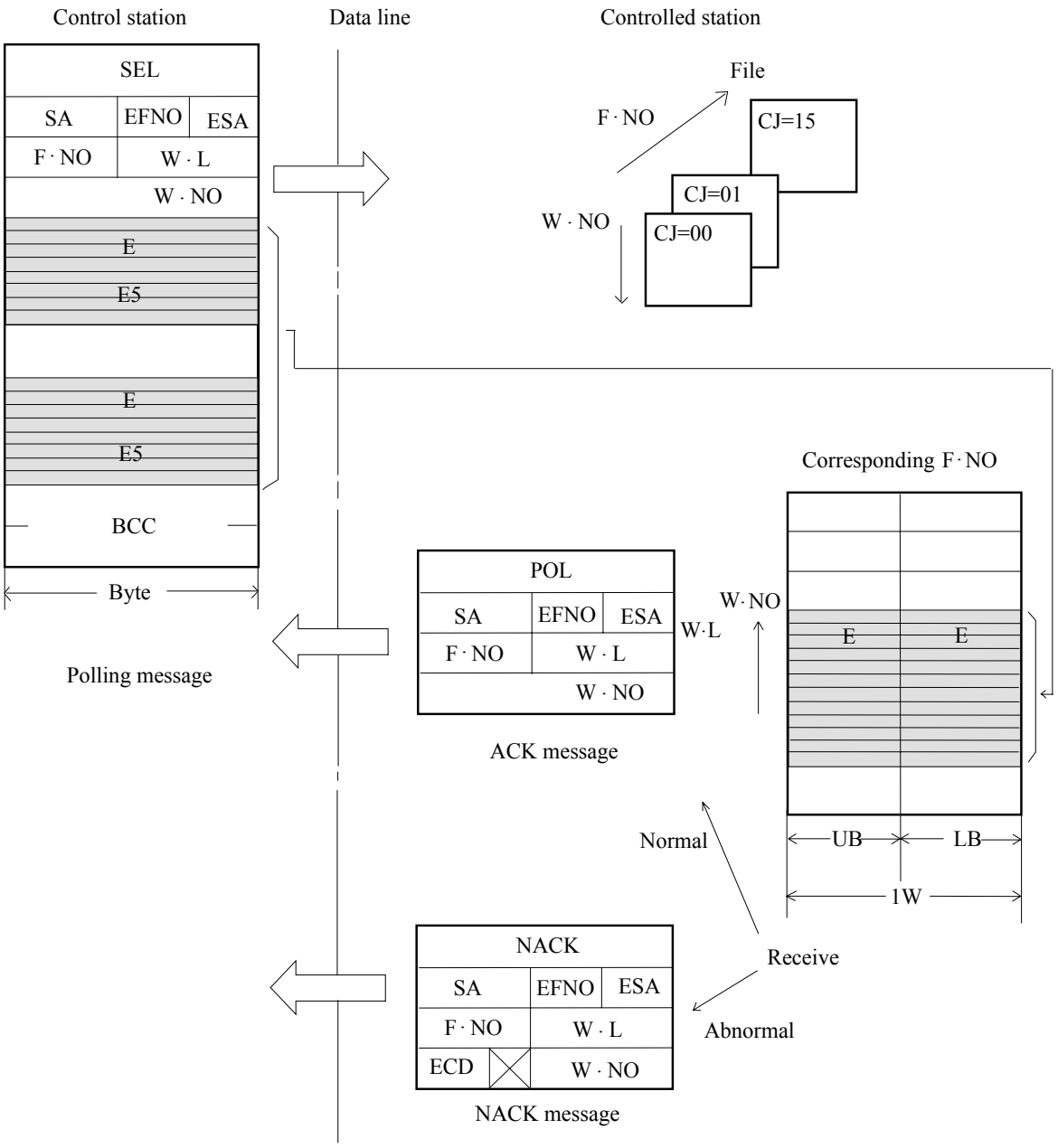
Polling message program in example 1 is shown by using BASIC language of the personal computer as follows.

```
10   OPEN "COM1:9600, 0, 8, 1 " AS   #1
20   TX$=CHR$(&HD4)+CHR$(&H12)+CHR&(&H30)+CHR$(&H0)
30   PRINT #1, TX$;   ' Send Polling message
40   FOR I=0 TO 2000:NEXT   ' wait
50   LENGTH=LOC(1)
60   RX$=INPUT$(LENGTH, #1)
70   FOR C=1 TO LENGTH
80   PRINT RIGHT$("0"+HEX$(ASC(MID$(RX$, C, 1))), 2); "␣":
90   NEXT C
100  GOTO 30
```

<After run>

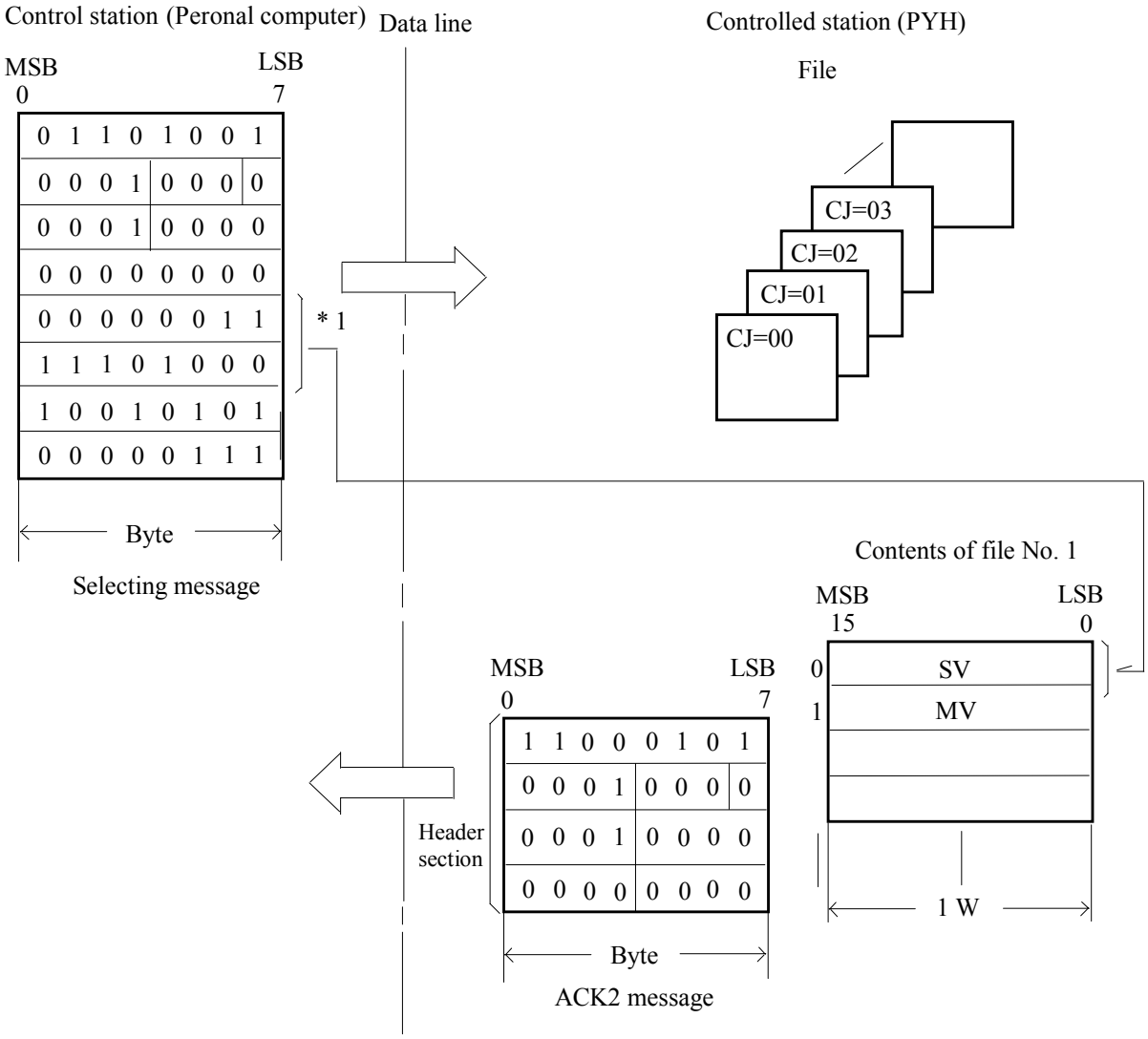
```
RUN
    AC      12      30      00      03      E8      60      05
```

(2) Selecting message



Example 2

Setting (WRITE) of a set value (SV) from the personal computer to station No. 1 microcontroller. Assume that the measuring range of the microcontroller is 0◦ to 1000◦C and the SV is set to 100◦C.



* 1 SV is a % value to the measuring range, and 0 to 10000 corresponds to 0 to 100.00%. Since the SV is set to 100◦C in the measuring range of 0◦ to 1000◦C in this example, SV is 10%, that is, 1000 (X' 3E8') is stored into the file.

<Sample program>

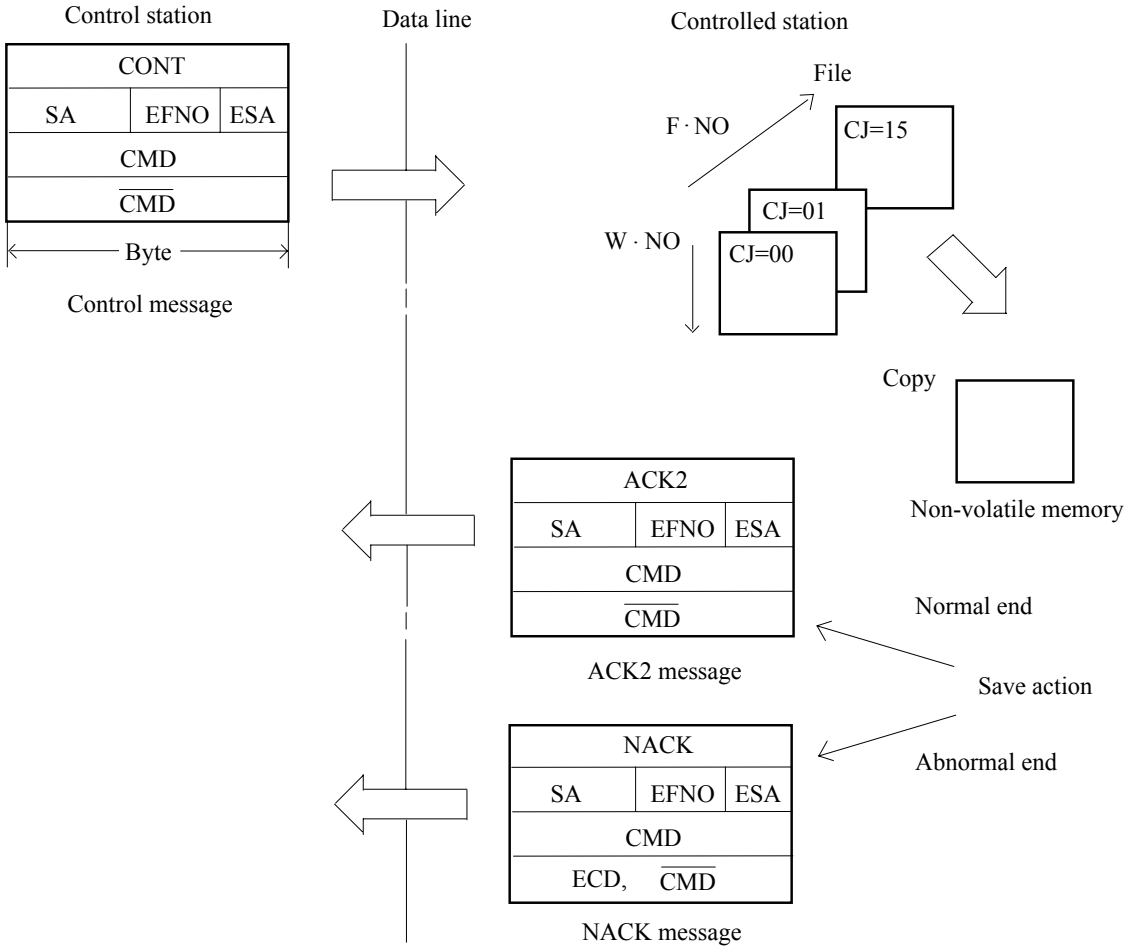
The selecting message program in example 2 is shown by using BASIC language of the personal computer as follows.

```
10   OPEN   "COM1 : 9600, 0, 8, 1" AS #1

20   TX$=CHR$(&H69)+CHR$(&H10)+CHR$(&H10)+CHR$(&H00)
     +CHR$(&H03)+CHR$(&HE8)+CHR$(&H85)+CHR$(&H07)

30   PRINT #1, TX$;   'SEND SELECTING MESSAGE

40   FOR I=0 TO 2000:NEXT   ' wait answer

50   LENGTH=LOC(1)

60   RX$=INPUT$(LENGTH,#1)

70   FOR C=0 TO LENGTH

80   PRINT RIGHT$("0"+HEX$(ASC(MID$(RX$, C, 1))),2); "␣";

90   NEXT C

100  GOTO 30
```

<After run>

```
RUN
     C5    10    10    00
```

(3) Control message



It takes 5 seconds until PYX saves memory data completely after receiving this message.

If the PYX power supply is turned off during this time, memory data are broken to be unemployable.

(4) Others

NAK response (Error Code 6) is returned if a transmission function word other than POL code, SEL code, and CONT code is received by the controlled station.

4. 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.

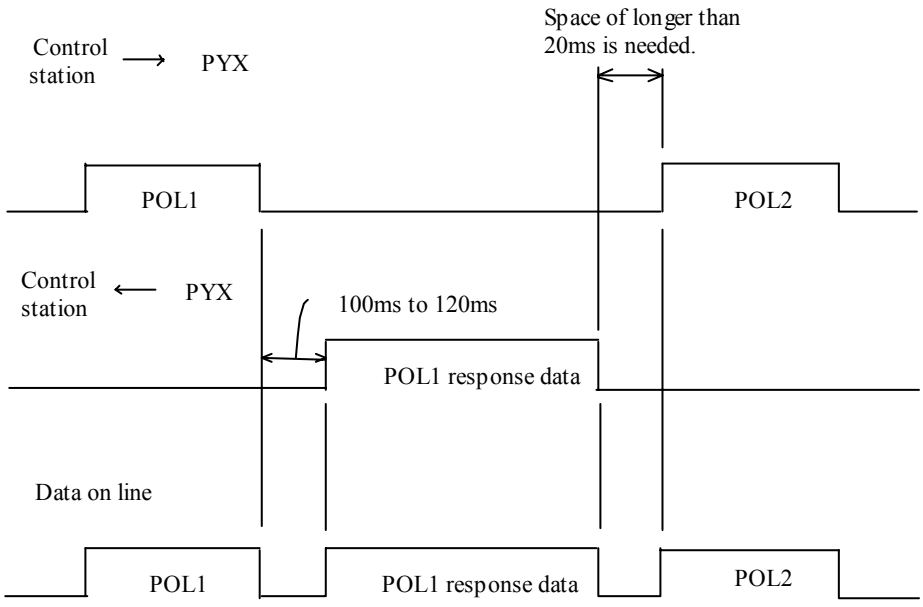
Accordingly, the space between frames must be secured correctly. The time required for spacing the frames is longer than 20msec.

> A polling message or a selecting message from the control station and corresponding response message from the controlled station are called polling frame and selecting frame, respectively.

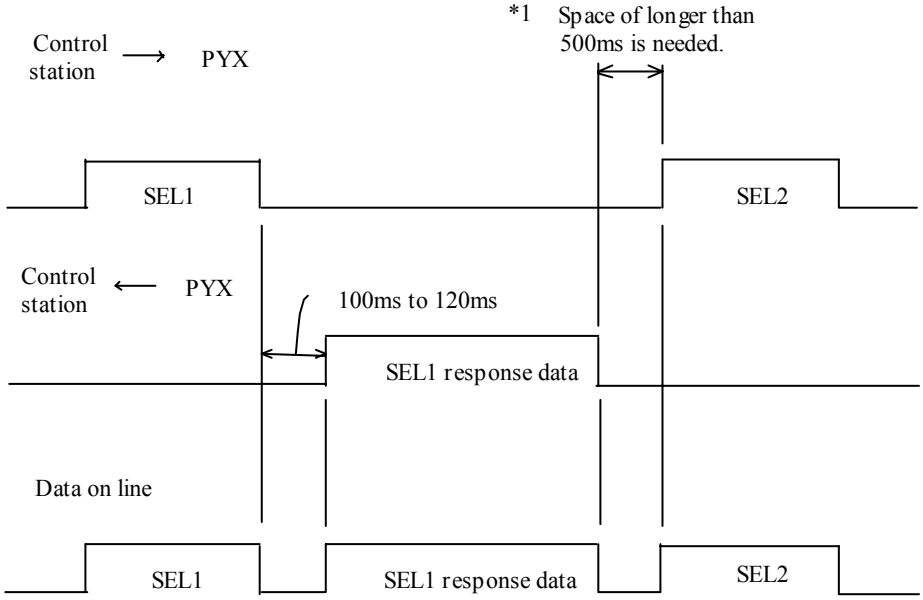
In other words, when the control station has no received one character data for longer than 20msec on the line, the data link initializes reception based on the judgement that a new frame is started. If the character space becomes 10msec. or longer during the reception (during the transmission from the 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 transmission function words (POL, SEL, CONT).

In the controlled station, when the function words are 'POL' or 'CONT', the header section, or, only 2 words are taken. When the function words are 'SEL', the data (data section) of the data length shown in the header section are taken, while others are all neglected.

<In case polling message>



<In case selecting message>



*1 The selecting message data transmitted to PYX is transforred to the internal file of PYX every 500ms. Therefore, the time required for spacing the frames must be longer than 500ms.

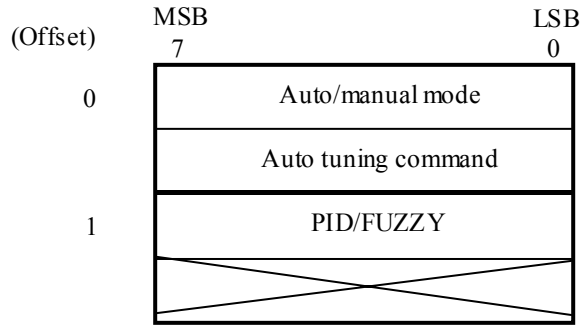
II. File Specifications (PYX)

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 values 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 manipulated 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

(Offset)	MSB 7	LSB 0
0	Second SV (H)	
	Second SV (L)	

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 100.0% 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)	7 — 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	Hy s (H)
	Hy s (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 value obtained by converting P (proportional band) of 0.0 to 999.9% into 0 to 9999 are stored.
(Setting range: 0 to 9999)

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/Overlapband high order byte
	Dead band/Overlapband low order byte (word size)

The values obtained by converting the Dead band/Overlapband 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

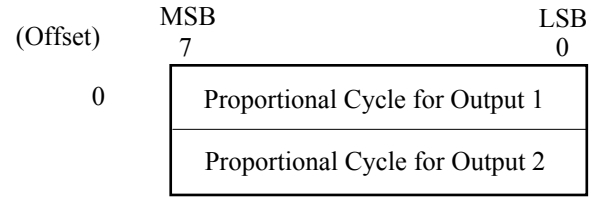
01H : Reverse action

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: 1 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: 1 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

(Offset)	MSB 7	LSB 0
0	Rate of Digital Filter (H)	
	Rate of Digital Filter (L)	

3. Individual contents

MSB

	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

(Offset)	MSB 7 — LSB 0
0	Lower scale for PV (H)
	Lower scale for PV (L)
1	Upper scale for PV (H)
	Upper scale for PV (L)
2	Decimal point position

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

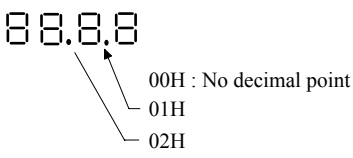
	Upper scale for PV high order byte
	Upper scale for PV low order byte (word size)

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

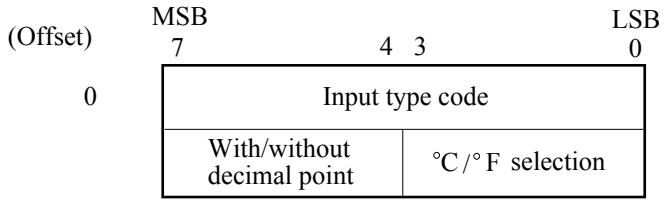


F NO.	Name of file	Attribute
J07	Input type file	Read/Write

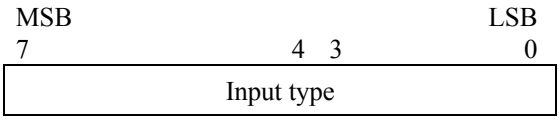
1. Outline

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

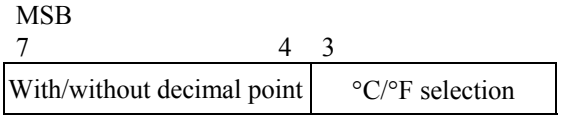
2. Structure



3. Individual contents



An input type code is stored (byte size).



Whether decimal point is present or not and °C/°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	°C 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

(Offset)	MSB 7	LSB 0
0	PV offset (H)	
	PV offset (L)	

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 low 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.

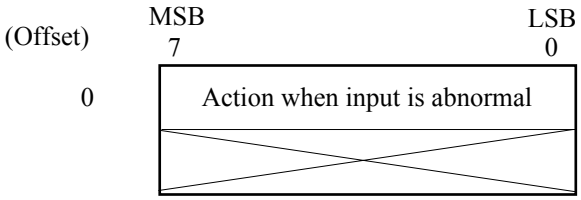
(Setting range: -300 to 10300)

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

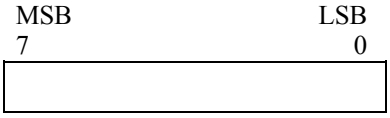
1. Outline

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



(byte size)

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 operation (H)	
	Lock for front operation (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 parameters only are settable.
0003	All parameters are settable.

F NO.	Name of file	Attribute
J19	Monitor file	Read

1. Outline

This read only file stores set values (SV), process variables (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 variables (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 7 — 4 | 3 — LSB 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 7 — 4 | 3 — LSB 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 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 l sec. (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 parameters 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.1target 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 high order byte

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 high order byte

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 high order byte

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

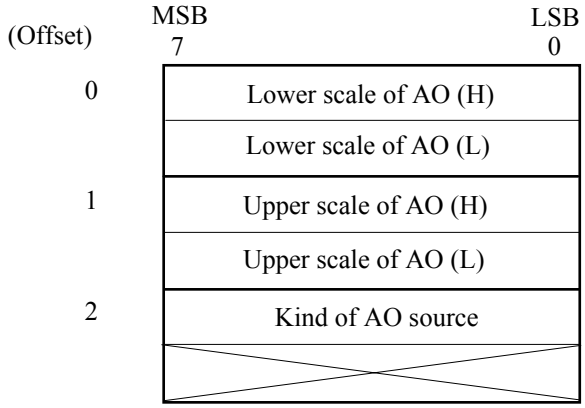
* END (code 3) cannot be written, but it can be read only.

F NO.	Name of file	Attribute
J 32	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 - 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.

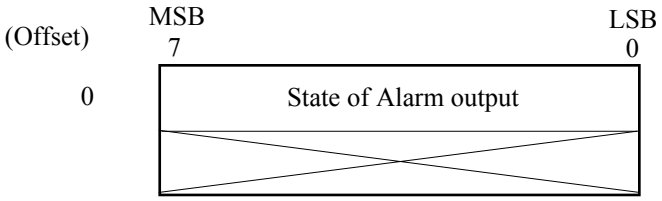
Code	Source type
0	Process variables (PV)
1	Setting values (SV)
2	Manipulated variables (MV)

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

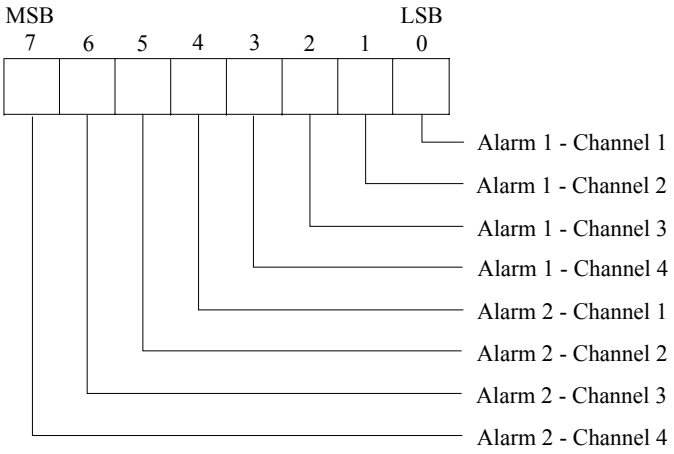
1. Outline

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. sork	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.

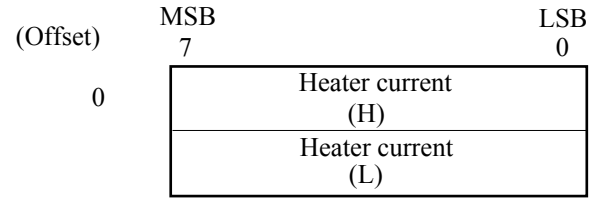
Code	Running conditions
0	OFF
1	RUN
2	HOLD
3	*END

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

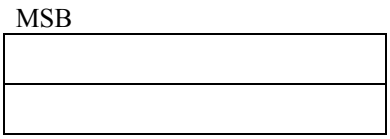
1. Outline

This read only file stores a heater current value.

2. Structure



3. Individual contents



	Heater current	high order byte
	Heater current	low order byte (word size)

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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