Instruction Manual

MICRO CONTROLLER X COMMUNICATION FUNCTIONS (RS-485 Z-ASCII)

TYPE : PXR

Fuji Electric Systems Co., Ltd.

INP-TN512644b-E

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1. Exemption items from responsibility
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1. COMMUNICATION FUNCTIONS

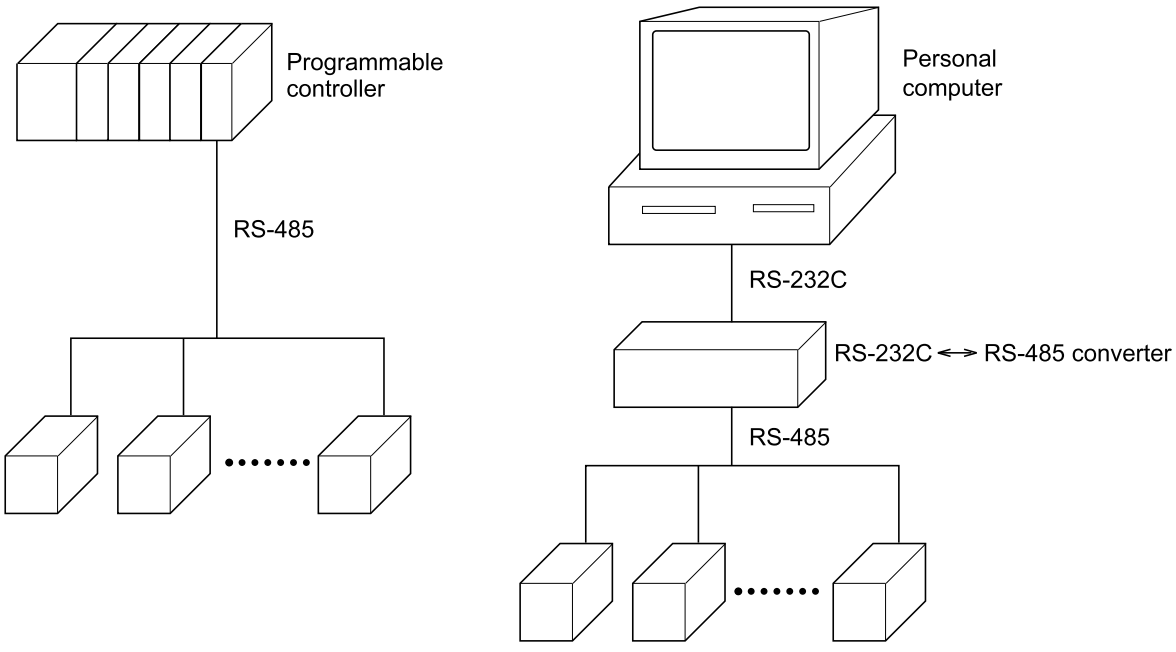
1.1 General

・PXR provides a communication function by RS-485 interface, by which it can transmit and receive data to and from host computer, programmable controller, graphic display panel, etc.

・The communication system consists of master station and slave stations. Up to 31 slave stations (PXR) can be connected per master station.
Note that, because the master station can communicate with only one slave station at a time, a party to communicate with must be specified by the "Station No." set at each slave station.

・In order that the master station and slave station can communicate, the format of the transmit/receive data must coincide. Before using communication function, it is necessary for master station to create a program to operate data transmit/receive in accordance to Z-ASCII protocol described in this manual.

・Please use on RS-232C ⇔ RS-485 converter in case of designating a personal computer or other devices which have an RS-232C interface as a master station.
［RS-232C ⇔ RS-485 converter] (recommended article)
Type: KS-485 (non-isolated type)/SYSTEM SACOM Corp.
Type: SI-30A (isolated type)/SEKISUI ELECTRONICS Co., Ltd.



Caution:
When using the RS-232C ⇔ RS-485 converter, pay attention to cable connection between the converter and master station. If the cable is not connected correctly, the master station and slave station cannot communicate. In addition, be careful about communication settings such as baud rate and parity set for the converter.

2. SPECIFICATIONS

2.1 Communication Specifications

Item	Specification	
Electrical specification	Based on ETA RS-485	
Transmission system	2-wire, semi-duplicate	
Synchronizing system	Start-stop synchronous system	
Connection format	1:N	
Number connectable units	Up to 31 units	
Transmission distance	500m max. (total extension distance)	
Transmission speed	9600bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	none, even, odd (selectable)
Transmission code	ASCII code	
Error detection	BCC (Addition)	
Isolation	Functional isolation between transmission circuit and others (withstand voltage : 500V AC)	

3. CONNECTION

> ⚠ WARNING
>
> For avoiding electric shock and malfunctions, do not turn on the power supply untill all wiring have been completed.

3.1 Communication Terminal Allocation

PXR3

Terminal number	⑮	⑭
Signal name	RS485 ⊕	RS485 ⊖

PXR4

Terminal number	⑦	⑧
Signal name	RS485 ⊕	RS485 ⊖

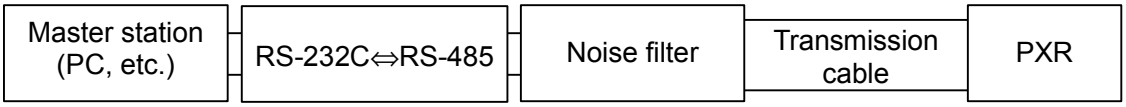
PXR5, PXR9

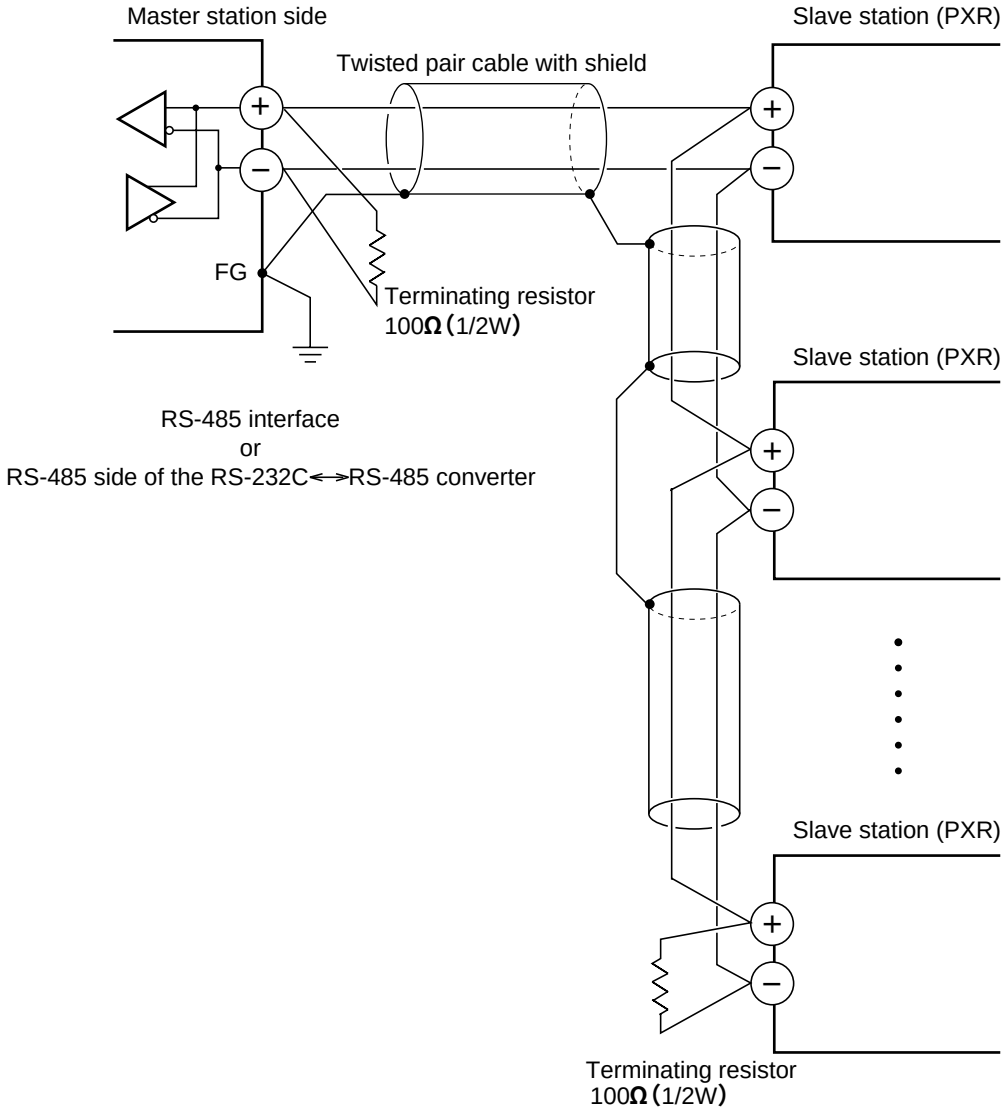
Terminal number	①	②
Signal name	RS485 ⊕	RS485 ⊖

3.2 Wiring

- Use twisted pair cables with shield.
- The total extension length of the cable is up to 500 m. A master station and up to 31 units of the PXR can be connected per line.
- Both ends of the cable should be terminate with terminating resistors 100Ω 1/2W.
- The shield wire of the cable should be grounded at one place on the master station unit side.
- If the PXR is to be installed where the level of noise applied to the PXR may exceed 1000 V, it is recommended to install a noise filter in the master station side as below.

  Recommended noise filter: ZRAC2203-11/TDK





4. SETTING OF COMMUNICATION CONDITION

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

- All communication condition settings of the master station are the same as those of instruments (PXR).
- All instruments (PXR) connected on a line are set to "Station Nos. (STno)" which are different from each other. (Any "Station No." is not shared by more than one instrument.)

4.1 Set Items

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

Parameter symbol	Item	Value at delivery	Setting range	Remarks
————	Transmission speed	9600bps	Fixed (can not be changed)	Set the same communication condition to the master station and all slave stations.
————	Data length	8 bits	Fixed (can not be changed)	
————	Stop bit	1 bit	Fixed (can not be changed)	
CoM	Parity setting	0	0: odd parity 1: even parity 2: none parity	
STno	Station No.	1	0 to 255	Set a different value to each station.
PCoL	Communication protocol	As specified in order	0: Z-ASCII 1: Modbus	Set the parameter to “0”. (The parameter is not displayed depending on models).

4.2 Setting Operation Method

The following example shows how to set the communication conditions.

Example: Selecting an even parity and “STno=18” on a station.

Key operation	Indication	Description
	200 200	Running state (PV/SV indication)
SEL (6 seconds)	P-n1 0	Press the SEL key for approximately 6 seconds. P-n1 appears and No. 3 block parameter is selected.
∨	STno 0	Operate the ∨ key repeatedly until STno parameter appears. (If past over, operate the ∧ key to return.)
SEL	STno 0	Press the SEL key. The numeric value on the lower indicator blinks and the setting mode is selected.
∧∨	STno 18	Operate the ∧ or ∨ key to change the numeric value to 18.
SEL	STno 18	Press the SEL key again. The numeric value stops blinking and the setting is registered.
∨	CoM 0	Press the ∨ key to display the CoM parameter.
SEL	CoM 0	Press the SEL key. The numeric value on the lower indicator blinks and the setting mode is selected.
∧∨	CoM 1	Operate the ∧ or ∨ key until the numeric value changes to 1 (even parity).
SEL	CoM 1	Press the SEL key again. The numeric value stops blinking and the setting is registered.
∨	PCoL 0	Press the ∨ key to display the PCoL parameter. Make sure that the set value is set to “0”. (If the set value is set to another one, set it to “0”).
SEL (3 seconds)	200 200	Press the SEL key for 3 seconds to resume the running indication (PV/SV indication).

5. Z-ASCII PROTOCOL

5.1 General

Transmission procedures according to the Z-ASCII protocol is as shown below

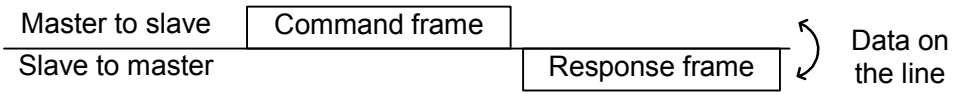
1） The master station sends a command frame in a pre-determined format to a slave station.

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

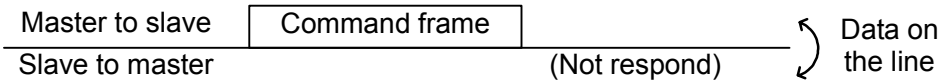
3） If matched, the slave station executes the command and sends back the result in a pre-determined format.

4) If mismatched, the slave station stops receiving the command frame and wait for the next command frame.

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



b） In case when the station No. in the received command message mismatches with the own slave station No.



The master station can individually communicate with any one of slave stations connected on the same line upon setting the station No. in the command message.

5.2 Composition of the Command Frame

The communication frames (Command Frame & Response Frame) consist of the following 6 fields, and these 6 fields are always sent in order.

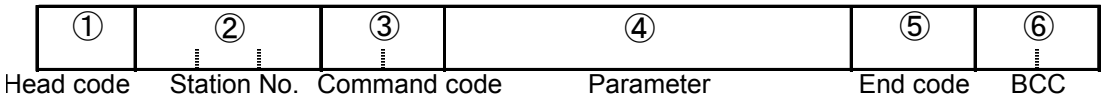


Fig. 5-1 Composition of message

The details of each fields are as described in the foliowings.

(1) Head code [1 digit]

This code means "Head of Frame". One of the following code can be used.
":"($3A_H$) or STX(02_H)
Depending on the code used, the End code automatically selected according to the below shown table.

	Combination 1	Combination 2
Head code	“：”（3AH） [1 digit]	STX（02H） [1 digit]
End code	CR（0DH）＋LF（0AH） [2digits]	ETX（03H） [1 digit]

Whenever the slave (PXR) receives the Head Code, it starts receiving new command frame.
In other words, the previously received command frame is automatically cancelled even not completed

(2) Station No. [3 digits]

This code means the slave station number.

Only one slave, which has same station number as determined at "STno" parameter, accept the command from the master.

Please refer to chapter 4 for the details of "STno" settings.

Note : This code is always defined with 3 digits.

Please add "0" in front of the station No. in case it is less than 100.

Ex.) Station No. =5 → "STno." Setting = "005"

(3) Command code [2 digits]

By setting this code, commands type to be performed by the slave (PXR) can be determined.

There are two kinds of command, "Read-out" and "Write-in".

For the details, please refer to chapter 6.

(4) Parameter [Number of digit is depending on kind of command]

This is the data which is essential to operate the command.

The kind of necessary data is depending on the each command.

Please refer to chapter 6.

(5) End Code [1 digit or 2digits]

This code means "End of Communication Frame".

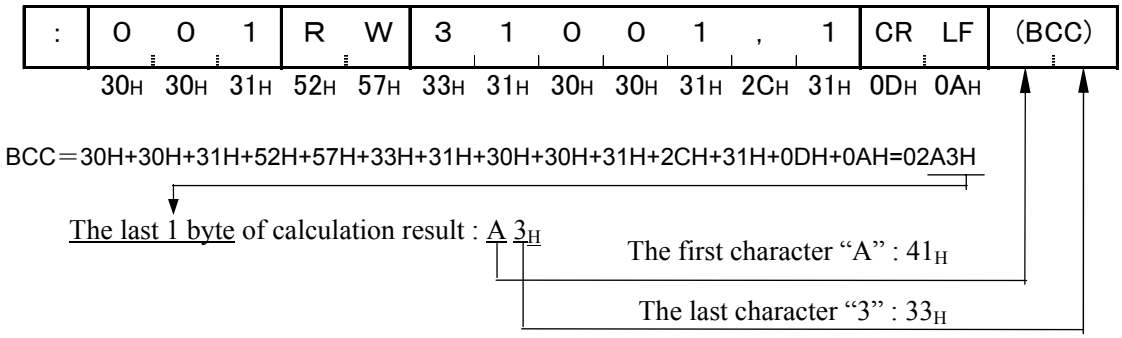
Please refer to chapter 5.2(1).

(6) BCC (Block Check Character) [2 digits]

This code is used for detecting errors in data transmission. First of all, each character of station No., command code, Parameter and End Code are summed.

From last 1 byte of the calculation result, the first character goes to the 1st byte, and the last character goes to the 2nd byte in BCC.

Ex.)



5.3 Response of Slave Station

(1) Response for normal command

To a relevant message, the slave station creates and sends back a response frame which corresponds to the command frame. The composition of frame in this case is the same as in chapter 5.2.
For details, refer to chapter 6.

(2) Response for abnormal command

If there is any abnormality in the contents of a command frame, other than transmission error like parity error (ex. an indefinite command code), the slave station does not execute that command but creates and sends back a response frame at error detection.

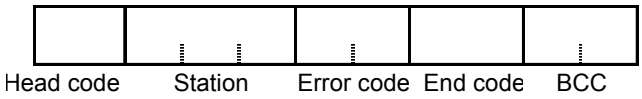


Fig. 5-2 Response frame at error direction

Table 5-1 Error code

Error code	Name	Meaning
CE	Command Error	Indefinite command code is used
PE	Parameter Error	Parameter format/range towards command code is not correct.

(3) No response

Under any of the following events, the slave station takes no account of the command frame and sends back no response.

- A station number transmitted in the command frame differs from the station number specified to the slave station.
- Received BCC differs from calculated BCC
- Any transmission error (parity error, buffer overflow and etc.) is detected.
- Time distance between the datas in command frame is longer than 1 second.
- Indefinite combination of Head code and End code is used. (ex. Head code : STX, and End code : CR.LF)

5.4 Transmission Control Procedure

(1) Transmission procedure of master station

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

(1-1) Before sending a command frame, provide 5 ms or more vacant status.

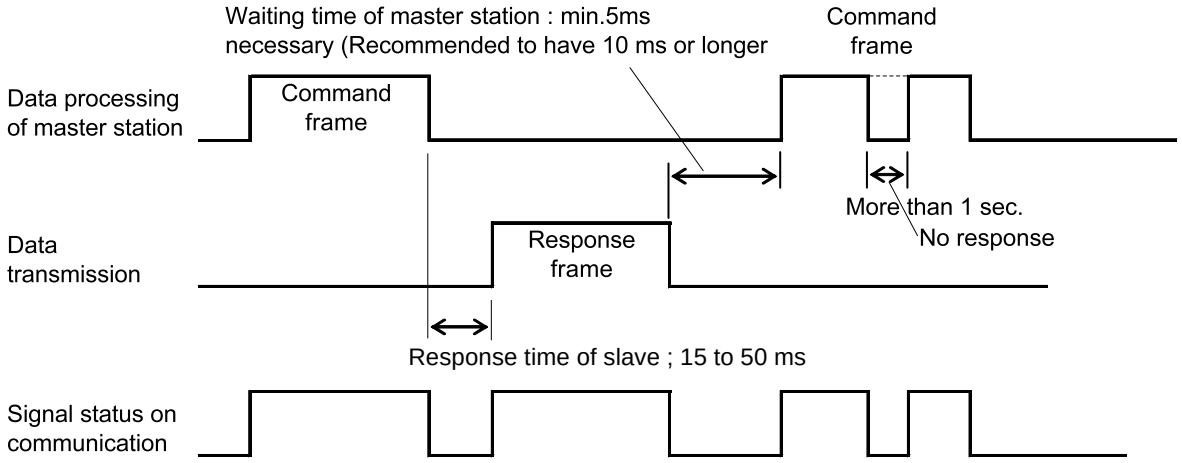
(1-2) For sending, the interval between bytes of a command message is below 1 second.

(1-3) Within 15 ms after sending a command message, the receiving status is posted.

(1-4) Provide 5 ms or more vacant status between the end of response frame reception and beginning of next command frame sending [same as in (1-1)].

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

Note) The above definition is for most unfavorable value. For ensuring the safety, it's recommended the program of the master to work with safety factors of 2 to 3. Concretely, it is advised to arrange the program with 10 ms or more for vacant status (1-1), and within 10 ms for byte interval (1-2) and changeover from sending to receiving (1-3).



5.5 FIX Processing (Cautions in data write)

The instrument is provided inside with a non-volatile memory (EEPROM) for holding the setting parameters.
Data written in the non-volatile memory is not lost even if turning off the power. Data written in via communication are not written in this non-volatile memory but stored in the internal memory (RAM). If it is desired to hold the parameters written in via communication even after turning off the power, FIX processing must be carried out.
FIX execution writes the parameters stored in the internal memory into the non-volatile memory.
Fig. 5-3 shows the FIX procedure.

Cautions:

- FIX processing lasts approximately 5 seconds.
- While in FIX processing, do not turn off the power of the PXR. Otherwise, the data in the non-volatile memory will be destroyed, whereby the PXR could not be used any longer.
- Do not change the parameters on the face panel while in FIX execution. Otherwise, the memory may become abnormal.
- The non-volatile memory (EEPROM) is a device where the number of write-in times is limited. The guaranteed number of write-in times of the non-volatile memory used on the instrument is 10,000 minimum. Do not carry out the FIX processing except when absolutely necessary such as after rewriting the setting parameters. Refrain from carrying out the FIX processing periodically for example or while such is not absolutely required.

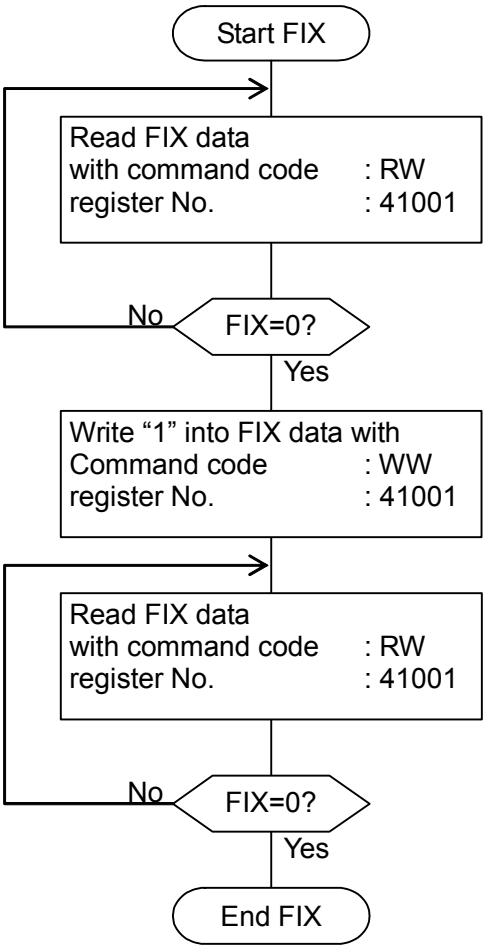
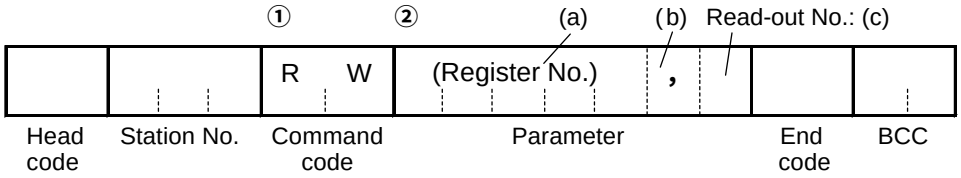


Fig. 5-3 FIX prodedure

6. DETAILS OF COMMAND AND RESPONSE FRAMES

6.1 Data Read-out

(1) Command Frame



① Command Code

"RW" : Command to start "Read-out"

ASCII code : [52_H, 57_H]

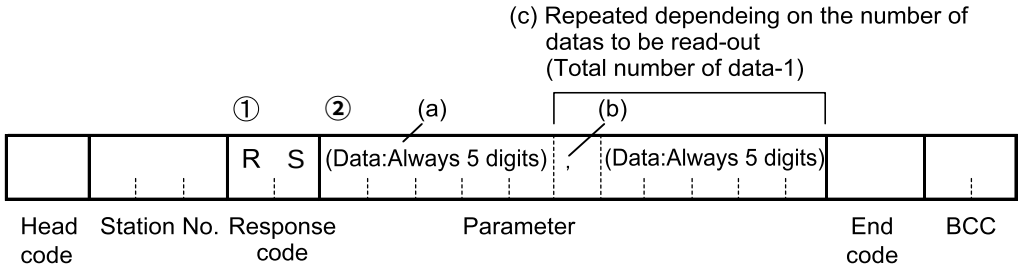
② Parameters

(a) Register No. : Defines data register No. 5 digits to be Read-out

(b) Partition character " , " : Always added after Register No.
(ASCII code : [$2C_H$])

(c) Read-out No. : Defines number of continuous data starting from the register No. defined in above (c). (Max data No. is 4.)

(2) Response Frame



① Response Code

"RS" : Defines that Read-out procedure was performed successfully.

ASCII code : [52_H, 53_H]

② Parameters

(a) Data codes : Always in 5 digits
(Sign part : 1 digit + Numeral part : 4 digits)
·Sign part :

Data value	Character	ASCII code
Minus	"－"	$2D_H$
Plus or 0	"0"	30_H

·Numeral part : Always in 4 digits

Ex. 1234→1234
123→0123
12→0012
1→0001

(b) Partition character " , " : In case number of data (s) is more than 2, this character is put between data codes. ASCII code : [$2C_H$]

(c) (Repeat) : In case number of data (s) to be read-out is more than 2, this part is added.

[Example of data read-out command]

To read-out 4 continuous data parameters starting from register No. 31001 (station No. =125)

→PV, SV, DV and MV data will be read out

<Condition> Decimal point position = 1 (parameter P-dP = 1)

- Command Frame

:	1	2	5	R	W	3	1	0	0	1	,	4	CR	LF	A	D	←Character
3AH	31H	32H	35H	52H	57H	33H	31H	30H	30H	31H	2CH	34H	ODH	OAH	41H	44H	←ASCII code

- Response Frame

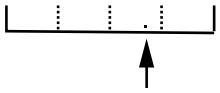
:	1	2	5	R	S	0	2	4	5	5	,	0	3	0	0	0	,	>
3AH	31H	32H	35H	52H	53H	30H	32H	34H	35H	35H	2CH	30H	33H	30H	30H	30H	2CH	

<	−	0	5	4	5	,	0	1	0	3	0	CR	LF	B	A
	2DH	30H	35H	34H	35H	2CH	30H	31H	30H	33H	30H	ODH	OAH	42H	41H

- Read-out Result

Register No.	Meaning	Read-out data		→	Values (Note *1)
		Sign part	Numeral part		
31001	PV	0	2455		245.5
31002	SV	0	3000		300.0
31003	DV	−	0545		-54.5
31004	MV	0	1030		103.0

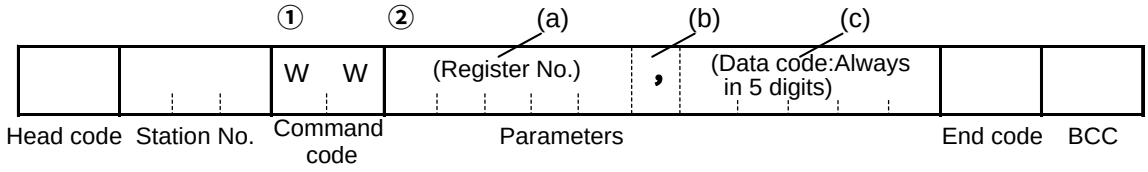
(Note *l) Data in Register No. 31004 is always defined to have decimal point position as shown below.



For the other datas, the decimal point position is depending on PXR parameter setting at "P-dP". (See chapter 7.1.1 for the details.)

6.2 Data Write-in

(1) Command Frame



① Command Code

"WW" : Command to start "Write-in"

ASCII code : [57_H, 57_H]

② Parameters

(a) Register No. : Defines data register No. to be read-out.

Please refer to chapter 7. for details of parameter, Register No.

(b) Partition character " , " : Always added after Register No.

ASCII code : [$2C_H$]

(c) Data codes : Always in 5 digits

(Sign part:1digit + Numeral part:4 digits)

·Sign part :

Data value	Character	ASCII code
Minus	"－"	$2D_H$
Plus or 0	"0"	30_H

·Numeral part : Always in 4 digits

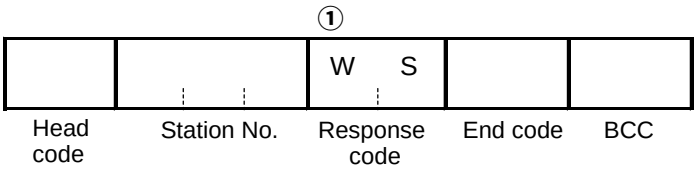
Ex. 1234→1234

123→0123

12→0012

1→0001

(2) Response Frame



① Response code

"WS" : Defines that write-in procedure was performed successfully.

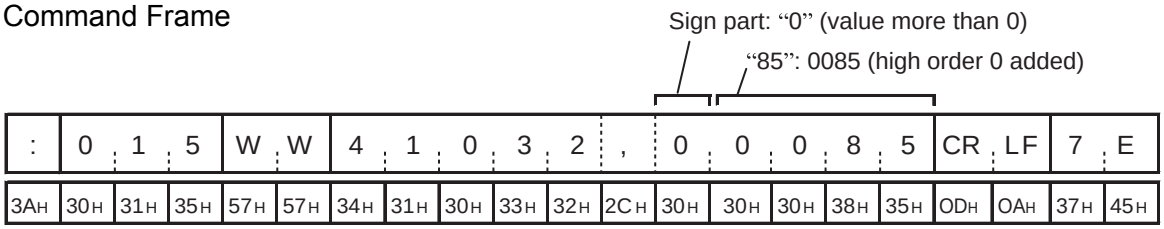
ASCII code : [57_H, 53_H]

Caution When setting is being locked, response is returned normally. However, the command is not executed. If the write-in command message is sent to any slave station during the FIX process, response is not returned from it.

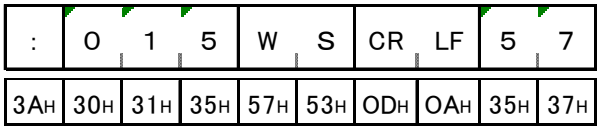
[Example of data Write-in command]
To write-in "85" into registered No.41032 (Upper limit of set value).
(station No. =15)

<Condition> Decimal point position = 0 (parameter P-dP = 0)

- Command Frame



- Response Frame



7. ADRESS MAP AND DATA FORMAT

7.1 Data Format

7.1.1 Transmission data format

With this protocol, all data is sent/received in ASCII codes.

7.1.2 Handling of decimal point

Transmission data has no decimal point, so, it is necessary for the master station to perform the following treatment.

(1) Delete decimal point(s) from data to be transmit.

(2) Add decimal point(s) to data received.

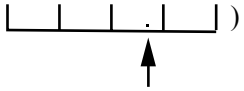
Please refer to the following table for the details.

Table 7-1 List of datas which require treatment of decimal point

Digit No. after decimal point	Kind of data	Register No.
0, 1 or 2 digit(s) PXR parameter	Parameter [P-SL]	41018
	Parameter [P-SU]	41019
	Datas dependent on input range	See address map (Chapter 7.2)
1 digit	Parameter [P]	41006
	Parameter [d]	41008
	Parameter [CooL]	41010
	Parameter [dB]	41011
	Parameter [bAL]	41013
	Parameter [P-dF]	41022
	Parameter [PLC1]	41025
	Parameter [PHC1]	41026
	Parameter [PLC2]	41027
	Parameter [PHC2]	41028
	Parameter [HB]	41039
	Parameter [Ao-L]	40115
	Parameter [Ao-H]	40116
	Parameter [r-dF]	40120
	Parameter [OUT1]	31004
	Parameter [OUT2]	31005
	Parameter [CT]	31010

[Ex. 1] Read-out result from resister No. 31001 (process value : PV) is "300".

(1) In case of P-dP=0 (No. decimal point defined)
Actual SV=300

(2) In case of P-dP=l (decimal point setting )
Actual SV=30.0

[Ex. 2] Write-in "46" to register No. 41003 (set value : SV)

(1) In case of P-dP=0
Write-in value=46

(2) In case of P-dP=l
Write-in value=460

[Note: Actual transmission data is "00046".]

7.1.3 Data status during abnormal data input indication

When "UUUU" or "LLLL" is displayed on the face panel on account of over-range, under-range or input open circuit for example, PV read-out value is 105% or -5% of input range.
Presence of any input abnormality via communication can be detected by:

"Register No. 31008: Input/main unit abnormal status"

7.1.4 Range of write-in data

When data is written in each parameter, the write-in data should be kept within the setting range. PXR accepts the write-in data beyond the range. However, be careful since the PXR performance will not be guaranteed.

7.2 Data Address Map

For details about individual parameter functions or setting ranges, please refer to the Operation Manual (ECNO: 406).

Word data [read-out/write-in]:

Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
41001	Word	Non-volatile memory write-in (FIX execution)	0: Not writing-in 1: Writing in memory	0: No request 1: Request to write in		(Same function as 00001)
41002	Word	PID/FUZZY/SELF selection	0: PID control 1: FUZZYcontrol 2: SELF tuning control			CTrL * Inhibit change while controlling
41003	Word	SV value set on face panel	-1999 to 9999 (within set value limits)		*	
41004	Word	Control RUN/standby	0: Invalidate standby (RUN) 1: Validate standby			STby
41005	Word	Auto tuning command	0: Auto tuning disabled 1: While executing standard type AT executed 2: While executing low PV type AT executed	0: Disable auto tuning 1: Request execution of standard type 2: Request execution of low PV type AT		AT
41006	Word	P	0 to 9999（0.0 to 999.9%）			P
41007	Word	I	0 to 3200（0 to 3200 sec）			i
41008	Word	D	0 to 9999（0.0 to 999.9 sec）			D
41009	Word	Hysteresis range at two-position control	0 to 9999（0 to 50% value of input scale）		*	HyS
41010	Word	COOL	0 to 1000（0.0 to 100.0）			CooL
41011	Word	Dead band	-500 to 500（-50.0 to +50.0%）			db
41012	Word	Anti-reset windup	-1999 to 9999 (0 to 100% value of input scale)		*	Ar
41013	Word	Output convergence value	-1000 to 1000 （-100.0 to 100.0%）			bAL
41014	Word	PV shift	-1999 to 9999 （-10 to 10% value of input scale）		*	PVOF
41015	Word	SV offset	-1999 to 9999 （-50 to 50% value of input scale）		*	SVOF
41016	Word	Input type code	0 to 16			P-n2
41017	Word	Temperature unit	0:ºC 1:°F			P-F
41018	Word	Input scale lower limit	-1999 to 9999			P-SL
41019	Word	Input scale upper limit	-1999 to 9999			P-SU
41020	Word	Decimal point place	0 to 2			P-dP

Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
41021	Word	(Do not use)				
41022	Word	Input filter time constant	0 to 9000（0.0 to 900.0 sec）			P-dF
41023	Word	RCJ yes/no	0: Disable RCJ compensation (do not perform reference cold junction compensation) 1: Enable RCJ compensation (perform reference cold junction compensation)			rCJ
41024	Word	MV limit kind	0 to 15			PCUT
41025	Word	Output 1 lower limit	-30 to 1030（-3.0 to 103.0%）			PLC1
41026	Word	Output 1 upper limit	-30 to 1030（-3.0 to 103.0%）			PHC1
41027	Word	Output 2 lower limit	-30 to 1030（-3.0 to 103.0%）			PLC2
41028	Word	Output 2 upper limit	-30 to 1030（-3.0 to 103.0%）			PHC2
41029		(Do not use)				
41030		(Do not use)				
41031	Word	Set value (SV) lower limit	-1999 to 9999（within input scale）		*	SV-L
41032	Word	Set value (SV) upper limit	-1999 to 9999（within input scale）		*	SV-H
41033		(Do not use)				
41034		(Do not use)				
41035		(Do not use)				
41036		(Do not use)				
41037		(Do not use)				
41038		(Do not use)				
41039	Word	Heater burnout alarm set value	0 to 500（0.0 to 50.0A）			Hb
41040	Word	Setting lock	0 to 5			LoC
41041	Word	Alarm 1 type	0 to 34			ALM1
41042	Word	Alarm 2 type	0 to 34			ALM2
41043	Word	Alarm 3 type	0 to 34			ALM3
41044	Word	Alarm 1 set value or alarm 1 lower limit set value	-1999 to 9999 For absolute value alarm 0 to 100% value of input scale For deviation alarm -100 to 100% value of input scale		*	AL1 or A1-L
41045	Word	Alarm 2 set value or alarm 2 lower limit set value			*	AL2 or A2-L
41046	Word	Alarm 3 set value or alarm 3 lower limit set value			*	AL3 or A3-L
41047	Word	Alarm 1 upper limit set value	-1999 to 9999 For absolute value alarm 0 to 100% value of input scale For deviation alarm -100 to 100% value of input scale		*	A1-H
41048	Word	Alarm 2 upper limit set value			*	A2-H
41049	Word	Alarm 3 upper limit set value			*	A3-H
41050	Word	Alarm 1 hysteresis	0 to 9999 （0 to 50% value of input scale）		*	A1hy
41051	Word	Alarm 2 hysteresis			*	A2hy
41052	Word	Alarm 3 hysteresis			*	A3hy
41053	Word	Alarm 1 ON-delay set value	0 to 9999（0 to 9999 sec）			dLy1
41054	Word	Alarm 2 ON-delay set value				dLy2
41055	Word	Alarm 3 ON-delay set value				dLy3
41056		(Do not use)				
41057	Word	Ramp/soak No. 1 target value	-1999 to 9999 (within set value limit)		*	Sv-1
41058	Word	Ramp/soak No. 2 target value			*	Sv-2
41059	Word	Ramp/soak No. 3 target value			*	Sv-3
41060	Word	Ramp/soak No. 4 target value			*	Sv-4
41061	Word	Ramp/soak No. 5 target value			*	Sv-5
41062	Word	Ramp/soak No. 6 target value			*	Sv-6
41063	Word	Ramp/soak No. 7 target value			*	Sv-7
41064	Word	Ramp/soak No. 8 target value			*	Sv-8

Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
41065	Word	Ramp/soak No. 1 ramp time	0 to 5999（0 to 5999 min） * With main unit parameter, Hour | Min is displayed and set. Therefore, correspondence occurs as: 3601: Data via communication ‖ 6001: Display/setting on main unit			TM1r
41066	Word	Ramp/soak No. 1 soak time				TM1S
41067	Word	Ramp/soak No. 2 ramp time				TM2r
41068	Word	Ramp/soak No. 2 soak time				TM2S
41069	Word	Ramp/soak No. 3 ramp time				TM3r
41070	Word	Ramp/soak No. 3 soak time				TM3S
41071	Word	Ramp/soak No. 4 ramp time				TM4r
41072	Word	Ramp/soak No. 4 soak time				TM4S
41073	Word	Ramp/soak No. 5 ramp time				TM5r
41074	Word	Ramp/soak No. 5 soak time				TM5S
41075	Word	Ramp/soak No. 6 ramp time				TM6r
41076	Word	Ramp/soak No. 6 soak time				TM6S
41077	Word	Ramp/soak No. 7 ramp time				TM7r
41078	Word	Ramp/soak No. 7 soak time				TM7S
41079	Word	Ramp/soak No. 8 ramp time				TM8r
41080	Word	Ramp/soak No. 8 soak time				TM8S
41081	Word	Ramp/soak mode	0 to 15			MOD
41082	Word	Ramp/soak command	0: oFF Ramp/soak stopped 1: rUn Ramp/soak operated 2: HLd Ramp/soak halted 3: End Ramp/soak ended	0: oFF Stop ramp/soak 1: rUn Start ramp/soak 2: HLd Halt ramp/soak		ProG
Note 41083	Word	Ramp/soak execution mode	0: Execute No. 1 to 4 ramp/soak 1: Execute No. 5 to 8 ramp/soak 2: Execute No. 1 to 8 ramp/soak			PTn
41084		(Do not use)				
41085	Word	PV stable range	-1999 to 9999 (within input scale)		*	SLFb
41086		(Do not use)				
41087	Word	Communication DI action request	*② (refer to section 7.3.)			
41088	Word	Control action type code	0 to 19			P-n1
41089	Word	Output proportional cycle (output 1)	0: Current output type 1 to 150（1 to 150 sec）: Relay, SSR drive output type			TC
41090	Word	Output proportional cycle (output 2)	1 to 150（1 to 150 sec）			TC2
41091	Word	(Do not use)				
41092	Word	Alarm 1 option function	0 to 7（binary data 000B to 111B）			A1op
41093	Word	Alarm 2 option function				A2op
41094	Word	Alarm 3 option function				A3op
41095	Word	DI1 action setting	0 to 12			di-1
41096	Word	DI2 action setting				di-2
41097	Word	Hysteresis mode setting	0: off (main unit parameter setting) 1: on (main unit parameter setting)			ONOF
41098	Word	(Do not use)				
41099	Word	User zero adjustment	-1999 to 9999 （-50 to 50% value of input scale）		*	ADJ0
41100	Word	User span adjustment	-1999 to 9999 （-50 to 50% value of input scale）		*	ADJS
41101	Word	DSP1 (parameter mask designation)	0 to 255			dSP1
41102	Word	DSP2 (parameter mask designation)	0 to 255			dSP2
41103	Word	DSP3 (parameter mask designation)	0 to 255			dSP3
41104	Word	DSP4 (parameter mask designation)	0 to 255			dSP4

Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
41105	Word	DSP5 (parameter mask designation)	0 to 255			dSP5
41106	Word	DSP6 (parameter mask designation)	0 to 255			dSP6
41107	Word	DSP7 (parameter mask designation)	0 to 255			dSP7
41108	Word	DSP8 (parameter mask designation)	0 to 255			dSP8
41109	Word	DSP9 (parameter mask designation)	0 to 255			dSP9
41110	Word	DSP10 (parameter mask designation)	0 to 255			dSP10
41111	Word	DSP11 (parameter mask designation)	0 to 255			dSP11
41112	Word	DSP12 (parameter mask designation)	0 to 255			dSP12
41113	Word	DSP13 (parameter mask designation)	0 to 255			dSP13
41114	Word	Type of Re-transmission output	0:PV, 1:SV, 2:MV, 3:DV			Ao-T
41115	Word	Re-transmission output scaling lower limit	-10000 to 10000 (-100.00 to 100.00%)			Ao-L
41116	Word	Re-transmission output scaling upper limit	-10000 to 10000 (-100.00 to 100.00%)			Ao-H
41117	Word	Local/remote operation changeover	0: Local 1: Remote			CMod
41118	Word	Remote SV input zero adjustment	-1999 to 1999 (-50 to 50% of input scale)		*	rEM0
41119	Word	Remote SV input span adjustment	-1999 to 1999 (-50 to 50% of input scale)		*	rEMS
41120	Word	Remote SV input filter time constant	0 to 9000 (0.0 to 900.0 sec)			r-dF

Note) Read-out/write-in data from resister No. 41083 (ramp/soak mode selection) correspond to parameter "PTn" to be displayed as shown below:

Read-out/write-in data	Parameter PTn	Ramp/soak execution mode
0	1	1 to 4 ramp/soak executed
1	2	5 to 8 ramp/soak executed
2	3	1 to 8 ramp/soak executed

Word data (read-out only) :

Register No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
31001	Word	Process value (PV)	-1999 to 9999 (within input scale)	*	(Displayed PV)
31002	Word	Currently used set value (SV)	-1999 to 9999 (within set value limit)	*	(Displayed SV)
31003	Word	Currently used deviation (DV)	-1999 to 9999 (-100 to 100% value of input scale)	*	
31004	Word	MV (output 1)	-30 to 1030 (-3.0 to 103.0%)		OUT1
31005	Word	MV (output 2)	-30 to 1030 (-3.0 to 103.0%)		OUT2
31006	Word	Station No.	0 to 255		STno
31007	Word	Alarm status	*③ (refer to Section 7.3.)		
31008	Word	Input/main unit abnormal status	*④ (refer to Section 7.3.)		
31009	Word	Ramp/soak current running Position	0 to 17 *⑥ (refer to Section 7.3.)		STAT
31010	Word	Heater current	0 to 500 (0.0 to 50.0A)		CT
31011	Word	Timer 1 current count	0 to 9999 (0 to 9999 sec)		TM-1
31012	Word	Timer 2 current count	0 to 9999 (0 to 9999 sec)		TM-2
31013	Word	Timer 3 current count	0 to 9999 (0 to 9999 sec)		TM-3
31014		(Reserve)			
31015	Word	DI action status	*⑤ (refer to Section 7.3.)		
31037	Word	Remote SV input value	-1999 to 9999	*	rSV

Notes)

- For details of * ② to * ⑥ in the table, refer to Section 7.3.
- The area marked (Do not use) is a reserve area. Do not write in there.
- Register numbers 31002 (currently used SV) and 41003 (face panel set SV) do not become the same value while switching-SV is active or ramp/soak is under way. (Example: While SV-1 is selected, the value of SV-1 is read out of register number 31002.) For reading out SV for monitoring, use SV in register number 31002.

7.3 Additional Explanation of Address Map

Datas in the ② to ⑤ are Numerous Value calculated from corresponding bit data.

Therefore, calculation from value to bit data or is based on the following calculation formura.

(1) Write-in data

Add the all bit values corresponding to bits to be written-in as "1" according to the Bit value table (7-2).

Ex.) How to write-inbit 0, 5 and 9 as "1"

Write-in data = 1 (bit 0) +32 (bit 5) +512 (bit 9)=555

(2) Read-out data

Execute AND logic calculation of Read-out data and the bit value of bit which you would like to know the status.

Ex.) How to take out bit 8 and 9 when Read-out data is 324.

Read-out data		= 324 = 0000101000100B
Bit value of 8 and 9	= 256+512	= 768 =
Result of AND		256 =

= Bit value 8, then only bit 8 = “1”

Table 7-2 Bit value

Bit	Bit weight (additional value)
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024
11	2048
12	4096

*② Register number 41087 (read-out/write-in area)

Contents of the communication DI action

Used for requesting a DI action via communication. Once written in, the contents remain held unless the power is turned off or another value is written in. Pay attention to this point particularly when canceling the alarm latching.

Read-out data is the data which was written in via communication and is different from hardware DI action request data (see * ⑤). Do not doubly request the action of the same function as hardware DI.

Bit	Contents	Read-out		Write-in	
0 1	Switching-SV selection	Bit 1 0		Bit 1 0	
		0 0	While selecting face panel set SV	0 0	While selecting face panel set SV
		0 1	While selecting SV-1	0 1	While selecting SV-1
2	(Reserve)				
3	(Reserve)				
4	(Reserve)				
5	Canceling the alarm 1 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		0: Not requested to cancel the latching 1: Requested to cancel the latching	
6	Canceling the alarm 2 latching				
7	Canceling the alarm 3 latching				
8	ALM1 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		0: Timer DI = OFF 1: Timer DI = ON	
9	ALM2 relay timer action				
10	ALM3 relay timer action				
11 to 15	(Reserve)				

*③ Register numbers 31007 (read-out only area)

Alarm status contents

Bit	Contents	Read-out
0	Alarm 1 output (calculation result of de-energizing alarm)	0: Alarm 1 relay output OFF 1: Alarm 1 relay output ON
1	Alarm 2 output (calculation result of de-energizing alarm)	0: Alarm 2 relay output OFF 1: Alarm 2 relay output ON
2	Alarm 3 output (calculation result of de-energizing alarm)	0: Alarm 3 relay output OFF 1: Alarm 3 relay output ON
3	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON
4	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON
5	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON
6	Alarm 3 ON/OFF	0: Alarm 3 OFF, 1: Alarm 3 ON
7	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON
8 to 12	(Reserve)	

*④ Register numbers 31008 (read-out only area)

Input/main unit abnormal status

Bit	Contents	Read-out
0	Input Lower open-circuit	0: Lower open-circuit absent 1: Lower open -circuit present
1	Input Upper open-circuit	0: Lower open-circuit absent 1: Lower open -circuit present
2	Input under-range	0: Under-range absent 1: Under-range present
3	Input over-range	0: Over-range absent 1: Over-range present
4	(Reserve)	
5	(Reserve)	
6	Setting range error	0: Setting range normal 1: Setting range abnormal
7	EEPROM error	0: EEPROM normal 1: EEPROM abnormal
8 to 12	(Reserve)	

*⑤ Register numbers 310105 (read-out only area)

Contents of DI action status

Hardware DI (DI input terminal) action request information

Bit	Contents	Read-out	
0 1	Switching-SV selection	Bit 1 0	
		0 0	Face panel set SV selected
		0 1	SV-1 selected
2	Control RUN/standby	0: Control RUN requested 1: Control standby requested	
3	Auto tuning (standard)	0: AT not requested 1: AT (standard) action requested	
4	Auto tuning (low PV type)	0: AT not requested 1: AT (low PV type) action requested	
5	Canceling the alarm 1 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching	
6	Canceling the alarm 2 latching		
7	Canceling the alarm 3 latching		
8	ALM1 relay timer action	0: Timer DI = OFF 1: Timer DI = ON	
9	ALM2 relay timer action		
10	ALM3 relay timer action		
11	RUN/RESET selection of ramp/soak	0: Not requested RUN （RESET） 1: Requested RUN	
12 to 15	(Reserve)		

*⑥ Register numbers 31009 (read-out only area)

Ramp/soak current tuning position

Read-out data	Indication of parameter "STAT"	Running position (status)
0	oFF	Stop status of ramp/soak
1	1-rP	No.1 ramp time
2	1-Sk	No.1 soak time
3	2-rP	No.2 ramp time
4	2-Sk	No.2 soak time
5	3-rP	No.3 ramp time
6	3-Sk	No.3 soak time
7	4-rP	No.4 ramp time
8	4-Sk	No.4 soak time
9	5-rP	No.5 ramp time
10	5-Sk	No.5 soak time
11	6-rP	No.6 ramp time
12	6-Sk	No.6 soak time
13	7-rP	No.7 ramp time
14	7-Sk	No.7 soak time
15	8-rP	No.8 ramp time
16	8-Sk	No.8 soak time
17	End	End status of ramp/soak

8. SAMPLE PROGRAM

This section concerns data read-out/write-in sample program by GW-BASIC*1 which operated on Windows 95*1 MS-DOS*1 PROMPT.
Note that the program shown here is for reference for you to create a program and not for guaranteeing all actions.
Before executing the program, make sure of the communication conditions in the following procedure.

・Communication speed (baud rate), data length, stop bits and parity bit
Set in this program. Match the conditions with this instrument.

Note) Cautions on using SEKISUI's RS232C and RS485 converter unit (SI-30A)
In SI-30A, send data are received, added to start of the answer data from the slave station. After cleared data corresponding to the number of sending bytes, treat the remaining data as the answer data in the data receiving process.

*1: GW-BASIC, Windows 95 and MS-DOS are registered trademarks of Microsoft Corporation.

(a) Example of data read-out

How to Read-out PV, SV (currently used), DV, MV (control output 1) in one time. (From Read-only memory)

Head code	: ":"
Read-out start No.	: 1
Command code	: RW
Read-out resister No.	: 31001
Number of read out data	: 4
End code	: CR, LF

```
1000 '-----------------------------------------------------
1010 ' READ DATA   SAMPLE PROGRAM
1020 '-----------------------------------------------------
1030 '
1040 '
1050 '
1060 CLS
1100 '-------------- Setting of transmission data -----------------------
1110 SCODE$  =":"                          'Head code
1120 STN$    ="001"                        'Station No.
1130 CMMD$   ="RW"                         'Command
1140 REGS    ="31001"                      'Read-out resistor No.
1150 RDNUMS  =",4"                         'Partition character "," + Read-out No.
1160 ECODES  =CHR$(&H0D)+CHR$(&H0A)        'End code
1200 '
1210 '------------- Creation of Command Frame --------------
1215 'BCALC$ =STN$+CMMD$+REG$+RDNUM$+ECODE$  'Object for BCC calculation
1220 GOSUB 3050                            'BCC calculation routine
1230 TXFRM$ =SCODE$+BCALC$+BCC$            'Transmission Frame
1300 '
1310 '------------- Data transmission-----------------------------
1320 PRINT "Transmission Frame > ";
1330 OPEN "COM1:9600,o,8,1" AS #1 '9600bps, Odd Parity, Data Length=8, Stop bit=1
1340 PRINT #1,TXFRM$                       'Write-in Comm. port
1350 PRINT TXFRM$                          'Displaying on screen
1360             *BCC is always displayed at the top of next line
1370             after unshown character [CR LF].
1380 '
1390 FOR I=O TO 30000 :NEXT I              'Time interval
1500 '
1510 '------------- Data receive ---------------------------
1520 PRINT
1530 RXFRM$=" "
1540 LENGTH= LOC(1)                        'Number of data in Receiving buffer
1550 IF LENGTH=O THEN PRINT "No answer" :END 'Execution at no response
1560 PRINT "Receive Frame <";
1570 FOR I=1 TO LENGTH
1580 X$=INPUT$(1,#1)                       'Data take-in from Receiving buffer
1590
1600 PRINT X$;                             'Displaying on the screen
1610             *BCC is always displayed at the top of next line
1620             after unshown character [CR LF].
1630 NEXT I
1640 CLOSE #1
1700 '
1710 '------------- Check comm. error ----------------------
1720 PRINT
1730 RXCMD$=MID$ (RXFRM$,5,2)              'Responce code take-out from receive frame
1740 RXBCC$=RIGHT$ (RXFRM$,2)              'BCC take-out from receive frame
1750 BCALC$=MID$ (RXFRM$,2,LENGTH-3)       'Data take-out for BCC calculation
1760 GOSUB 3050                            'BCC calculation routine
1770 IF RXBCC$oBCC$ THEN GOTO 1800         'Comparison BCC take-out data and calc. data
1780 IF RXCMD$o"RS" THEN GOTO 1800         'Judgement of Normal/Abnormal response
1790 GOTO 1920
1800 'ER.MESSAGE
1810 PRINT "Communication error"
1820 END
```

```
1900
1910 '------------- Result Display ---------------------------
1920 PRT.RESULT
1930 In case of decimal point position (P-dP) =1
1940 PRINT
1950 PTR=7                                   'Data position in receive frame
1960 PV$=MID$(RXFRM$,PTR,5) : PTR=PTR+6     'Take-out lst data
1970 SV$=MID$(RXFRM$,PTR,5) : PTR=PTR+6     'Take-out 2nd data
1980 DV$=MID$(RXFRM$,PTR,5) : PTR=PTR+6     'Take-out 3rd data
1990 MV$=MID$(RXFRM$,PTR,5)                 'Take-out 4th data
2000 PRINT "PV =";VAL(PV$)/10; "degree C"   '1 digit after decimal point(depend on P-dp setting)
2010 PRINT "SV =";VAL(SV$)/10; "degree C"   '1 digit after decimal point(depend on P-dp setting)
2020 PRINT "DV =";VAL(DV$)/10; "degree C"   '1 digit after decimal point(depend on P-dp setting)
2030 PRINT "MVl=";VAL(MV$)/10;"%"           'In case of MV, always 1digit after decimal point
2040 END
3000 '
3010 '------------ BCC calculation routine -----------------------------
3020 '
3030   input : BCALCS ・・・ Object characters for BCC calculation
3040   output : BCC$  ・・・ 2 Characters as result of BCC calculation
3050 'BCC.CALC
3060 COUNT=LEN(BCALC$) : SUM=0
3070 FOR J=1 TO COUNT
3080   BYTE$=MID$(BCALC$,J,l)          'Take-out one character from object characters
3090   SUM=SUM+ASC(BYTES)              'Add as ASCII code
3100 NEXT J
3110 BCC=SUM AND &HFF                  'Take out the last 1 byte from added result
3120 BCC$=RIGHT$("0"+HEX$(BCC) ,2)     'Transform the Hexadecimal number into 2 characters
3130 RETURN
```

(b) Example of data write-in

How to set lower limit of input scale as “-10.0”.
(Decimal point position setting, P-dP=1)

Head code	: ”:”
Write-in startion No.	: 1
Command code	: WW
Write-in resister No.	: 41018
Number of write-in data	: 4
End code	: CR, LF

```
1000 '-----------------------------------------------------
1010 ' WRITE DATA   SAMPLE PROGRAM
1020 '-----------------------------------------------------
1030 '
1040 '
1050 '
1060 CLS
1100 '-------------- Setting of transmission data -----------------------
1110 SCODE$  =":"                          'Head code
1120 STN$    ="001"                        'Station No.
1130 CMMD$   ="WW"                         'Command
1140 REGS    ="41018"                      'Write-in resistor No.
1150 SP$     =","                          'Partition character ","
1160 SIG$    =”-”                          'Sign (minis) *”0” when zero or plus numbers
1170 WRNUM$  =”0100”                       'Numeral data *always in 4 digits
1180 '           *Decimal point setting p-dp=l:l digit after decimal point
1190 '           and numeral data is always in 4 digits  ····· 10.0 -> 0100
1200 'ECODE$ =CHR$(&H0D)+CHR$ (&H0A)       'End code
1250 '
1260 '------------- Creation of Command Frame-----------------------------
1270 BCALC$ =STN$+CMMD$+REG$+SP$+SIG$+WRNUM$+ECODE$     'Object for BCC calculation
1280 GOSUB 3050                                         'BCC calculation routine
1290 TXFRM$ =SCODE$+BCALC$+BCC$                         'Transmission Frame
1300 '
1310 '------------- Data transmission-----------------------------
1320 PRINT "Transmission Fram > ";
1330 OPEN "COM1:9600,o,8,1" AS #1 '9600bps, Odd Parity, Data Length=8, Stop bit=1
1340 PRINT #1,TXFRM$                       'Write-in Comm. port
1350 PRINT TXFRM$                          'Displaying on screen
1360                       *BCC is always displayed at the top of next line
1370                       after unshown character [CR LF].
1380 '
1390 FOR I=O TO 30000 :NEXT I              'Time interval
1500 '
1510 '------------- Data receive ---------------------------
1520 PRINT
1530 RXFRM$=” ”
1540 LENGTH= LOC(1)                        'Number of data in Receiving buffer
1550 IF LENGTH=0 THEN PRINT "No answer"     :END 'Execution at no response
1560 PRINT "Receive Frame <”;
1570 FOR I=1 TO LENGTH
1580   X$=INPUT$(1,#1)                     'Data take-in from Receiving buffer
1590
1600 PRINT X$;                             'Display on the screen
1610                       *BCC is always displayed at the top of next line
1620                       after unshown character [CR LF].
1630 NEXT I
1640 CLOSE #1
1700 '
1710 '------------- Check comm. error ----------------------
1720 PRINT
1730 RXCMD$=MID$ (RXFRM$,5,2)              'Responce code take-out from receive frame
1740 RXBCC$=RIGHT$ (RXFRM$,2)              'BCC take-out from receive frame
1750 BCALC$=MID$ (RXFRM$,2,LENGTH-3)       'Data take-out for BCC calculation
1760 GOSUB 3050                            'BCC calculation routine
1770 IF RXBCC$ <> BCC$ THEN GOTO 1800      'Comparison BCC take-out data and calc. data
1780 IF RXCMD$ <> "WS" THEN GOTO 1800      'Judgement of Normal/Abnormal response
1790 GOTO 1920
```

```
1800 'ER.MESSAGE
1810 PRINT "Communication error"
1820 END
1900
1910 '------------- Result Display ---------------------------
1920 'PRT.RESULT
1930 PRINT
1940 PRINT "Normal response !”
2040 END
3000 '
3010 '------------ BCC calculation routine -------------------------------
3020 '
3030   input : BCALCS ····· Object characters for BCC calculation
3040   output : BCC$  ····· 2 Characters as result of BCC calculation
3050 'BCC.CALC
3060 COUNT=LEN(BCALC$) : SUM=0
3070 FOR J=1 TO COUNT
3080   BYTE$=MID$(BCALC$,J,l)          'Take-out one character from object characters
3090   SUM=SUM+ASC(BYTES)              'Add as ASCII code
3100 NEXT J
3110 BCC=SUM AND &HFF                  'Take out the last 1 byte from added result
3120 BCC$=RIGHT$("0"+HEX$(BCC) ,2)     'Transform the Hexadecimal number into 2 characters
3130 RETURN
```

9. TROUBLESHOOTING

If the communication is unavailable, check the following items.

- ☐ Whether all devices related to communication are turned on.
- ☐ Whether connections are correct.
- ☐ Whether the number of connected instruments and connection distance are as specified.
- ☐ Whether communication conditions coincide between the master station (host computer) and slave stations (PXR).
  - ☐ Transmission speed : 9600bps
  - ☐ Data length : 8 bits
  - ☐ Stop bit : 1 bit
  - ☐ Parity : ☐odd
    ☐even
    ☐none
- ☐ Whether send/receive signal timing conforms to Section 5.4 in this manual.
- ☐ Whether the station No. designated as send destination by the master station coincides with the station No. of the connected PXR.
- ☐ Whether more than one instrument connected on the same transmission line shares the same station No..
- ☐ Whether the station No. of instruments is set at other than 0.
  If it is 0, the communication function does not work.
- ☐ Whether the 11th digit of type cord of this controller is N or W?

  (PXR4☐☐☐☐－☐☐$^{N}_{W}$☐☐－☐)

10. APPENDIX

・ASCII code table

b8	b7	b6	b5	b4	b3	b2	b1	Upper bits / Lower bits	0	1	2	3	4	5	6	7
				0	0	0	0	0	NUL	DLE	SPACE	0	@	P	‘	p
				0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
				0	0	1	0	2	STX	DC2	“	2	B	R	b	r
				0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
				0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
				0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
				0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
				0	1	1	1	7	BEL	ETB	‘	7	G	W	g	w
				1	0	0	0	8	BS	CAN	(	8	H	X	h	x
				1	0	0	1	9	HT	EM	)	9	I	Y	i	y
				1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
				1	0	1	1	B	VT	ESC	+	;	K	[	k	{
				1	1	0	0	C	FF	FS	,	<	L	\	l	¦
				1	1	0	1	D	CR	GS	−	=	M	]	m	}
				1	1	1	0	E	SO	RS	.	>	N	^	n	¯
				1	1	1	1	F	SI	US	/	?	O	_	o	DEL

Example：“A” ＝41H

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