



**RS485 Communication
INSTRUCTION MANUAL
For
VS3/4 controller**

Ver1.0 :

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1. Setup about the communication

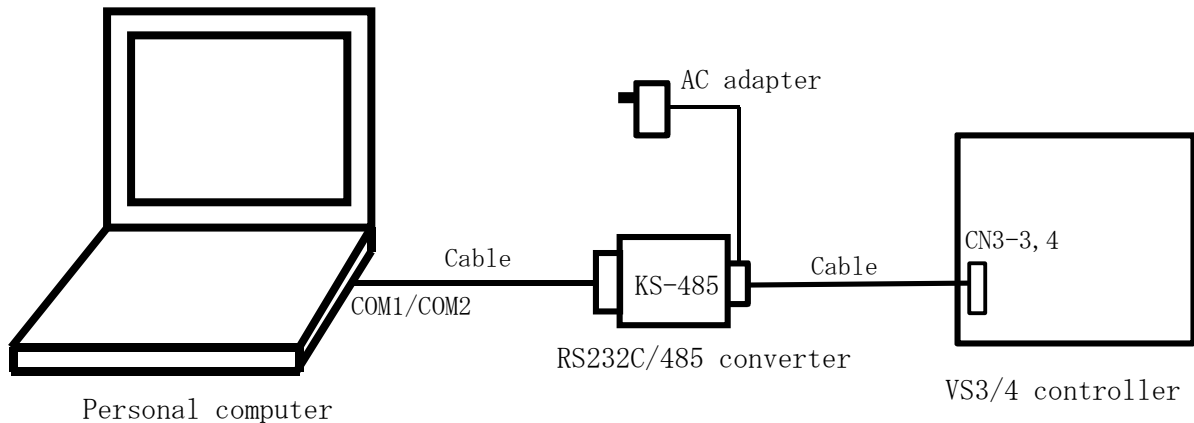
1.1. Setup of communication

Before doing communication with the VS3/4 controller (It is called controller from now on.), on the personal computer side, you must do the setup of six items on the table below.

	Item	Setup of communication
1	Data length	8 bit
2	Stop bit length	2 bit
3	Parity	not
4	BCC check	does
5	Communication speed	4800BPS
6	Response delay time	0msec

1.2. Communication connection

- personal computer
 - One channel (COM1/COM2) uses a RS232C interface.
- RS232C/RS485 converter
 - recommend is KS-485 manufactured by [SYSTEM SACOM]
- Communication cable for the connection



2. Data transmission form

Item	Specificatipons
Communication standard.	EIA standard RS-485 conformity
Synchronous form	Start-stop synchronization
Communication form	Half-duplex
Transmission code	ASCII code
Communication speed	1200/2400/ <u>4800</u> /9600BPS
Communication distance	Maximum 500m (But, the distance varies with the cable used and the environmental conditions.)
Network	Multi-drops form (maximum 1 to 31 stations)
Signal line	Two wires of transmission/reception
Stop bit length	1/ <u>2</u> bit s
Data length	7/ <u>8</u> bit s
Parity	<u>No</u> /odd/even
BCC check	<u>Dose</u> /dose not
Response delay time	<u>0</u> ~250msec
Communication address	<u>1</u> ~99stations
Communication mode switching	RO/ <u>RW</u>

Note) ☐ is the initialization of controller.

3. Transmission control character

Sign	Item	Code	Contents
STX	Start of text	02H	To show the start of the text
ETX	End of text	03H	To show the end of the text
R	Read	52H	Read out of the data from the controller
W	Write	57H	Write or store of the data to the controller
ACK	Acknowledge Character	06H	Affirmative response about the receiving
NAK	Negative Acknowledge	15H	Negative response about the receiving

Note) R: Read (The command of read out setup, measurement and conditions etc.)

W: Write (The command of write or store the setup value)

R command can always communicate in all mode.

W command can usually communicate only in the standby mode, and the parameter which communication can be set up to by the operation condition varies in the W command. Refer to "7.Identifier/command list".

4. Transmission control process

4.1. Communication process

Controller returns "an Response message" toward "the request message" from the host computer. Therefore, transmission is never started from controller.

Controller doesn't do communication for about four seconds power supply injection. (no Response)

Set up delay before you start communication after the power supply injection.

4.2. The kind of the message

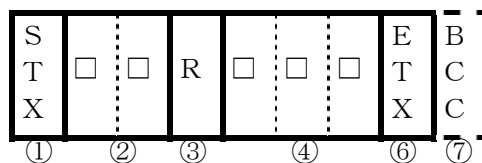
The kind of the message is separated from the request message transmitted by host computer, and the Response message transmitted by controller.

All the codes (except BCC) from STX to ETX include data etc. are shown in ASCII code.

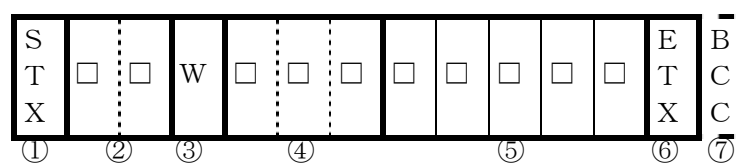
4.3. Configuration of request messages

(Transmission from the host computer to controller)

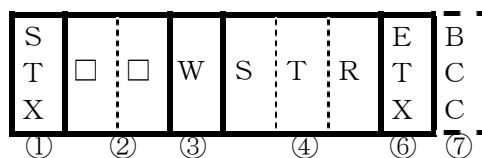
4.3.1. Configuration of request message for readout



4.3.2. Configuration of request message for writie



4.3.3. Configuration of request message for store



①Start code

②Address

③Request

④Identifier

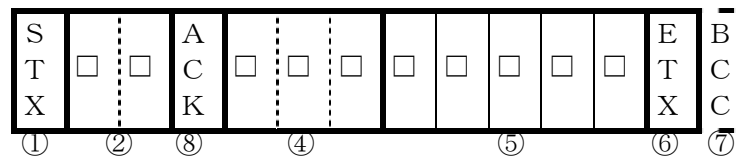
⑤Numeric data

⑥End code

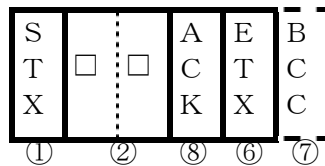
⑦BCC code

4.4. Configuration of Response message

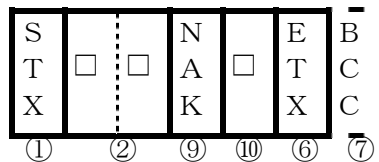
4.4.1. Response message to request message for readout



4.4.2. Response message to request message for write/store



4.4.3. Response message for error



- ① Start code
- ② Address
- ④ Identifier
- ⑤ Numeric data
- ⑥ End code
- ⑦ BCC code
- ⑧ Affirmative acknowledge
- ⑨ Negative acknowledge
- ⑩ Form of error

4.5. Description of code

- The code from "STX" to "the error kind" that it is expressed to the following is shown with the ASCII code.
- Refer to "8.ASCII code list" for the ASCII
- Refer to "5. communication example" for the change to the ASCII code.

① STX

A receiving side is a necessary code to detect the head of the message. It is put at the head of a character line to transmit.

② Address

It is the address of the controller with which the host computer communicates. The address in the Response message from controller indicates the source of the response message transmitted.

③ Requests

Put code R or W.

R : Readout of the data from the controller

W: Write or store of data into the controller.

④ Identifier

It is shown with the classified sign (Identifier) for the data which is read out, or written in with 3-alphabetic character made of the ASCII code. (Refer to "7.Identifier/command list".)

⑤ Numeric data

All the data regardless of read out or written in are shown in 5-digit figures.

- Minus data : Code "-" is on MSD(most significant digit).
- The position of the decimal point : A decimal point isn't contained in 5-digit data.

Example) 5-digit numeric data 00101 is as mentioned on the table below.

Example		the meaning of the numeric data
Set temperature (SV1)	K thermocouple sensor	→ 101℃
	Pt100Ω sensor	→ 10.1℃
Set time (TIM)		→ 1hour 1minute

⑥ ETX

A receiving side is a necessary code to detect the end of the message. It is put at the end of a character line to transmit. (except BCC)

⑦ BCC

(EX-OR) of the exclusive logic of all the characters from STX to ETX in total is taken with the check code for the mistake detection. This code (BCC) isn't included into the Response message when a BCC check is set up in no by the setup of the communication of controller.

⑧ ACK

This is the code for affirmative acknowledge.

When there is no error in the message that it was received, this code is incorporated in "the Response message" transmitted by the controller.

⑨ NAK

This is the code for negative acknowledge

When there is an error in "the request message" that it was received, this code is incorporated in "the Response message" transmitted by the controller.

⑩ Error

When there is an error in "the request message" that it was received, the form of the error is incorporated following "⑨ NAK" in the "Response message" transmitted from the controller. This error is an error about the communication, and it is omitted as for the details of the indication.

After the host computer transmits BCC, and it haven't received the STX that transmitted in the fixed Response waiting time by the controller. It is shown a receiving Time-out.

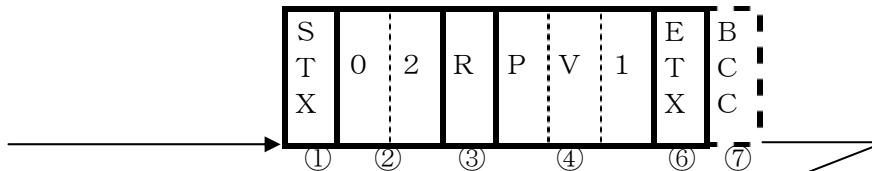
5. Communication example

5.1. An example of communication for readout

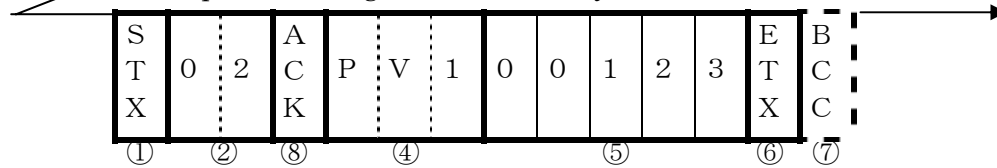
Example) Request message : Readout of PV is requested to the controller which is set at address 02.

Response message : The data (00123) of PV are sent back.

Request message for readout (Transmitted by the host computer.)



Response message (Transmitted by the controller.)



Code		Sign · Data	ASCII code note2)
① Start code		S T X	02H
② Address		0 2	30H 32H
③ Request		R (read)	52H
④ Identifier note 1)		P V 1	50H 56H 31H
⑤ Numeric data		0 0 1 2 3	30H 30H 31H 32H 33H
⑥ End code		E T X	03H
⑦ BCC data	Request		61H
	Response		02H
⑧ Affirmative code		A C K	06H

Note 1) : Refer to “7.Identifier／Command list”

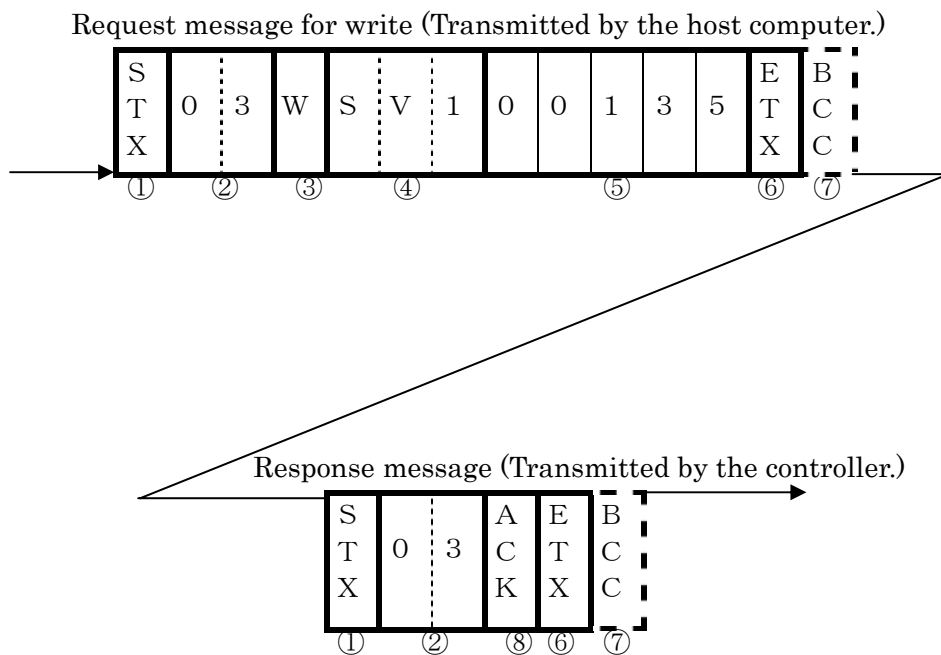
Note 2) : Refer to “8.ASCII code list” for the ASCII code.

5.2. An example of communication for write

Example) Request message : "Set SV1 to 135" is written into the controller which is set at address 03.

Response message : Response message is sent back confirming that the request message has been received.

☆ Readout data to confirm that it was written correctly.



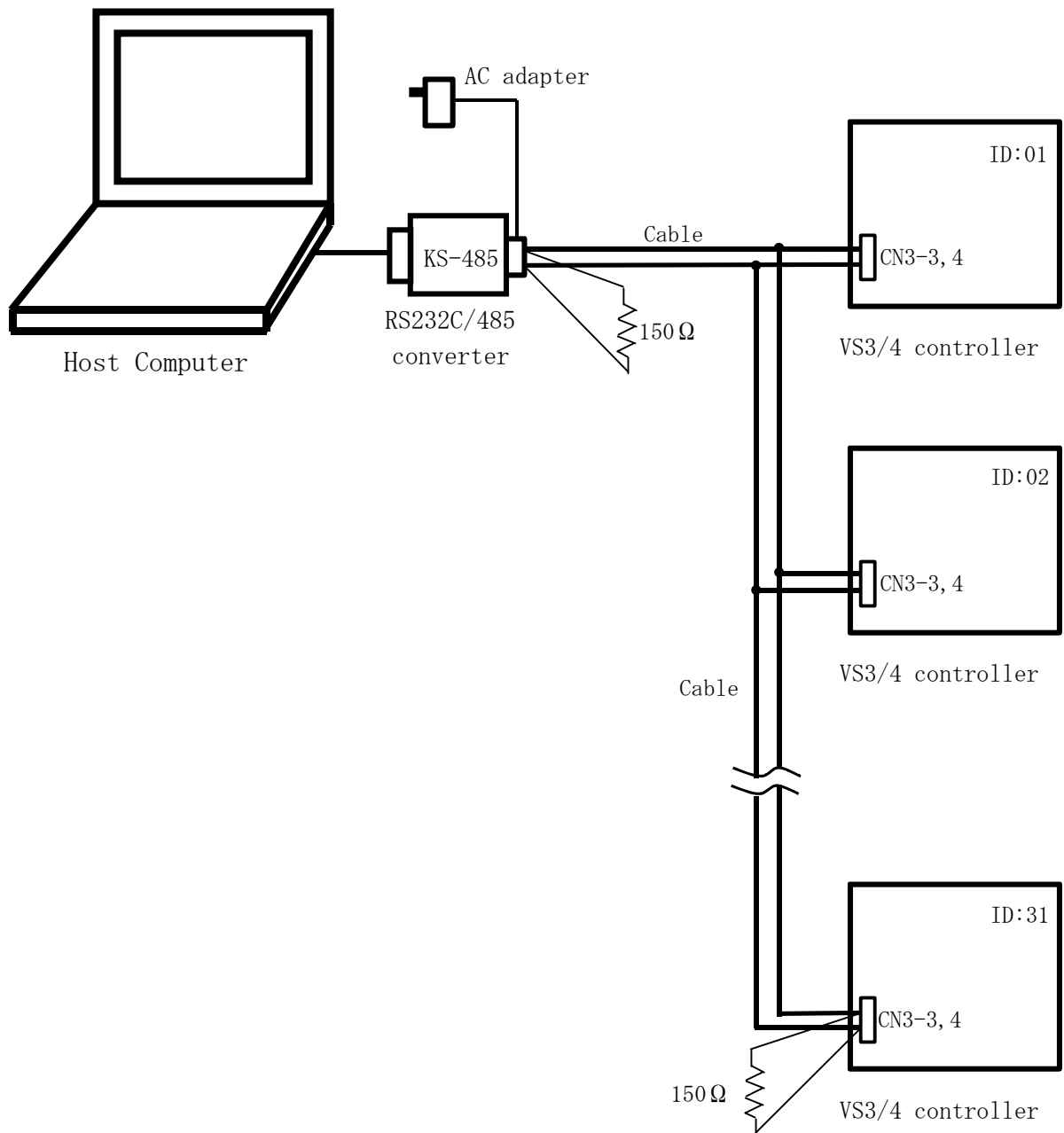
Code	Sign · data	A S C II code note 2)
① Start code	S T X	02H
② Address	0 3	30H 33H
③ Request	W (It is written)	57H
④ Identifier note 1)	S V 1	53H 56H 31H
⑤ Numeric data	0 0 1 3 5	30H 30H 31H 33H 35H
⑥ End code	E T X	03H
⑦ BCC data	Request	56H
	Response	04H
⑧ Affirmative code	A C K	06H

Note 1) : Refer to "7.Identifier/command list".

Note 2) : Refer to "8.ASCII code list" for the ASCII code.

6. Communication Wiring Diagram

Multi-drops communication wiring diagram as follows



It should be provide a terminal resistor both on Host computer side and the farthest controller side. Use a resistor whose resistance value matches with the characteristic impedance of the cable, but the total resistance must be greater than 75 ohms.

7. Identifier/command list

<About the Identifier and the setup value>

- *1 : This parameter only use for the VS-4 controller.
- *2 : A unit can't be set up for 1 minute that the time is more than 100 hours.
- *3 : _ means the space.
- *4 : A setup range varies with other parameter. (Refer to the table below.)
- *5 : Program No.2 pattern No.2: The Identifier of step 1 to 15 is "x16 to x30"
 Program No.3 pattern No.2: The Identifier of step 1 to 10 is "x11 to x20"
 Program No.3 pattern No.3: The Identifier of step 1 to 10 is "x21 to x30"
- *6 : It is parameter which "W" command is effective during operation mode.

Fixed value operation mode

Item	Identifier	Comm and	Setup value
Temperature Setting value	SV1	R/W	SLL~SLH : °C setting value between low and high limit *4 *6

Program operation mode

Item	Identifier	Comm and	Setup value
Program choice	PRG	R/W	00001 : choice of programNo.1 *1 00002 : choice of programNo.2 00003 : choice of programNo.3
Program No.2 Pattern choice	PT2	R/W	00001 : choice of Pattern No.1 *1 00002 : choice of Pattern No.2
Program No.3 Pattern choice	PT3	R/W	00001 : choice of Pattern No.1 *1 00002 : choice of Pattern No.2 00003 : choice of Pattern No.3
ProgramNo.1 Setup of Final step	E11	R/W	00001~00030 : Step1~step30 *1
ProgramNo.2, PatternNo.1 Setup of Final step	E21	R/W	00001~00015 : Step1~step15 *1
Program, No.2 PatternNo.2 Setup of Final step	E22	R/W	00001~00015 : Step1~step15 *1
ProgramNo.3, PatternNo.1 Setup of Final step	E31	R/W	00001~00010 : Step1~step10 *1
ProgramNo.3, PatternNo.2 Setup of Final step	E32	R/W	00001~00010 : Step1~step10 *1
ProgramNo.3, PatternNo.3 setup of Final step	E33	R/W	00001~00010 : Step1~step10 *1
Step 1~30 Temperature setting	S01~S30	R/W	SLL~SLH : Setting value between low and high limit *1 *4 *5 *6
Step 1~30 Time setting	T01~T30	R/W	00000~99950 : 0 hour 0 minutes~999 hour 50 minutes *1 *2 *5 *6
Step 1~30 Setup a return place of step	R01~R30	R/W	00001~00030 : Step1~Step30 *1 *5
Step 1~30 Setup the times of executive number	C01~C30	R/W	00001~00099 : 1~99times *1 *5

Store command

Item	Identifier	Comm and	Setup value
Setup value memory	STR	W	NO (It is a necessary order to memorize the setup value of the temperature, time etc..)

Others parameter

Item	Identifier	Comm and	Setup value
Key lock	LOC	R/W	00000 : key lock release 00001 : key lock
Operation start/stop	RUN	R/W	00000 : stop *6 00001 : start
Operation kind choice	RST	R/W	00000 : fixed value operation *6 00002 : program operation
Step No. monitor	_ST	R	00000 : program stop *3 00001~00030 : step1~step30
Operation step the rest time monitor	_TI	R	00000 : timeup *3 00001~99950 : 000 hour01minute~999 hour 50 minutes
Output. monitor	OM1	R	00000 : digit-1=heater output digit-2=freezing machine output digit-3=main output digit-4=timeup output or alarm output digit-5=overheat prevention2 output ※ output condition 0= Output Off 1= Output On
Error monitor 1	ER1	R	00000 : digit-1=memory error digit-2=sensor error digit-3=AT error digit-4=heater breakage error digit-5=SSR short error ※ Error condition 0=no error 1= error.
Error monitor 2	ER2	R	00000 : digit-1=water tank is empty digit-2=overheat prevention1 error digit-3=overheat prevention2 error digit-4=inside CPU communication / temperature input circuit error digit-5=no use ※ error condition 0=no error 1= error
Process value monitor	PV1	R	Example : 00100=100℃ (K thermocouple) 01000=100.0℃ (Pt100) HHHHH=Process value over scale LLLLL=Process value under scale ※ The resolution of Pt100 sensor is 10 times than K thermocouple sensor.

8. ASCII code list

ASCII code	0 2 H	0 3 H	0 6 H	1 5 H						
Use sign	S T X	E T X	A C K	N A K						

ASCII code	3 0 H	3 1 H	3 2 H	3 3 H	3 4 H	3 5 H	3 6 H	3 7 H	3 8 H	3 9 H
Use number	0	1	2	3	4	5	6	7	8	9

ASCII code	2 D H	2 0 H								
Use character	— minus	S P Space								

ASCII code	4 1 H	4 2 H	4 3 H	4 4 H	4 5 H	4 6 H	4 7 H	4 8 H	4 9 H	4 A H
Use character	A	B	C	D	E	F	G	H	I	J

ASCII code	4 B H	4 C H	4 D H	4 E H	4 F H	5 0 H	5 1 H	5 2 H	5 3 H	5 4 H
Use character	K	L	M	N	O	P	Q	R	S	T

ASCII code	5 5 H	5 6 H	5 7 H	5 8 H	5 9 H	5 A H	2 0 H			
Use character	U	V	W	X	Y	Z	S P Space			