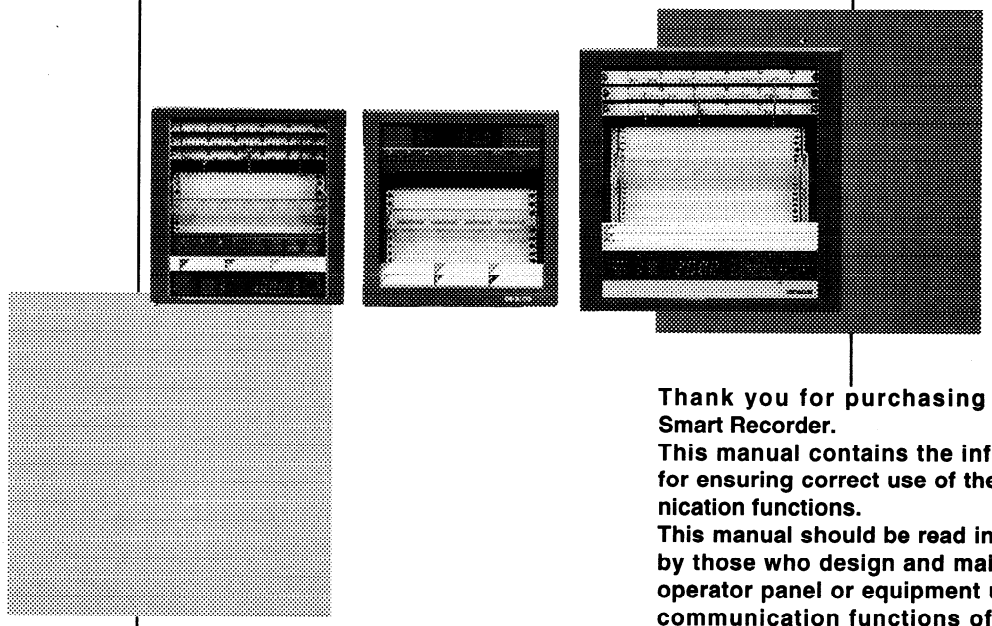
YAMATAKE

No. CP-UM-1668E

CPL Communications User's Manual

SRF101/102/103/106/201/202/203



Thank you for purchasing the SRF Smart Recorder.
This manual contains the information for ensuring correct use of the communication functions.
This manual should be read in advance by those who design and maintain the operator panel or equipment using the communication functions of the SRF Smart Recorder.
As this manual is required for installation, maintenance and troubleshooting, be sure to keep this manual nearby for handy reference.

Yamatake Corporation

RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.
Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

IMPORTANT

- If incoming data sent by communication does not match the EEPROM data from address 600 onwards (excluding addresses 603 to 606), the data is written in EEPROM.
- Writing to EEPROM addresses is guaranteed only up to 100,000 times.
- From address 600 onwards (excluding addresses 600 to 606), the response of a write command to the data which can be written is sent back at completion of RAM writing. Data is then internally written from RAM to EEPROM. When a large volume of data is written by communications, it may take several minutes to complete writing. If the power is turned OFF during writing, some of the data will not be stored in EEPROM, and therefore the operations expected by writing the full data will no longer be possible when power is restored.
- CPL communication is not possible on the SRF101/102/103/201/202/203 while the Smart Loader Package (SLP) is connected.

REQUEST

Ensure that this User's Manual is handed over to the user before the product is used.

Copying or duplicating this User's Manual in part or in whole is forbidden. The information and specifications in this User's Manual are subject to change without notice.

Considerable effort has been made to ensure that this User's Manual is free from inaccuracies and omissions.
If you should find any inaccuracies or omissions, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

SAFETY PRECAUTIONS

■ About Icons

Safety precautions are for ensuring safe and correct use of this product, and for preventing injury to the operator and other people or damage to property. You must observe these safety precautions. The safety precautions described in this manual are indicated by various icons.
As the following describes the icons and their meanings, be sure to read and understand the descriptions before reading this manual:

⚠WARNING	Warnings are indicated when mishandling this product might result in death or serious injury to the user.
⚠CAUTION	Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to this product.

■ Examples

	Triangles warn the user of a possible danger that may be caused by wrongful operation or misuse of this product. These icons graphically represent the actual danger. (The example on the left warns the user of the danger of electric shock.)
	White circles with a diagonal bar notify the user that specific actions are prohibited to prevent possible danger. These icons graphically represent the actual prohibited action. (The example on the left notifies the user that disassembly is prohibited.)
	Black filled-in circles instruct the user to carry out a specific obligatory action to prevent possible danger. These icons graphically represent the actual action to be carried out. (The example on the left instructs the user to remove the plug from the outlet.)

⚠WARNING

	Before removing or mounting the the SRF101/102/103/106/201/202/203, be sure to turn the power OFF. Failure to do so might cause electric shock.
	Ground the FG (Frame Ground) terminal to a terminal resistance of 100. or less before you connect the the SRF101/102/103/106/201/202/203 to the input circuit or control circuit. Failure to do so might cause electric shock or fire.
	Do not touch electrically charged parts such as power terminals. Doing so might cause electric shock.

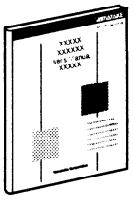
⚠CAUTION

	Wire the the SRF101/102/103/106/201/202/203 according to predetermined standards. Also wire the the SRF101/102/103/106/201/202/203 using specified power leads according to recognized installation methods. Failure to do might cause electric shock, fire or faulty operation.
	Use the the SRF101/102/103/106/201/202/203 within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.).
	Do not block ventilation holes. Doing so might cause fire or faulty operation.
	Do not disassemble the SRF101/102/103/106/201/202/203. Doing so might cause electric shock or faulty operation.
	Do not touch internal components during use or immediately after turning the power OFF. Doing so might cause burns.
	Do not allow lead clippings or chips to enter controller case. Doing so might cause fire or faulty operation.
	Do not use unused terminals on the the SRF101/102/103/106/201/202/203 as relay terminals. Doing so might cause electric shock, fire or faulty operation.
	Do not touch moving parts during operation. Doing so might cause injury.
	Do not operate the console keys using a sharp-pointed object such as propelling pencil or needle. Doing so might damage the console.

The Role of This Manual

Five different manuals in total are available for the SRF101/102/103/106/201/202/203.
Read each manual according to specific requirements. Below table shows all the manuals that accompany the SRF recorder and gives a brief outline on each manual.
If any manual requested is not available, contact Yamatake Corporation or its dealer.

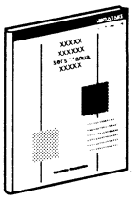
The SRF100 comes in two types, which are the SRF101/102/103 pen-printing type and the SRF106 dot-printing type. The SRF200 comes in one type, which is the SRF201/202/203 pen-printing type. Common specifications are described under SRF.
Specifications not common are described under individual model number.
For the SRF200 dot-printing type, refer to the User's Manual **"CPL Communications, Dot-Printing Model SRF206/212/224" (Manual No. CP-SP-1028E)**.



Smart Recorder Pen Printing Model SRF101/102/103
Installation/Operation **Manual No.CP-UM-1667E**

This manual is required reading for those who use the SRF101/102/103, those who design hardware for integrating the SRF101/102/103 into operator control panels, those who carry out maintenance, and those who operate instruments in which the SRF101/102/103 is integrated.

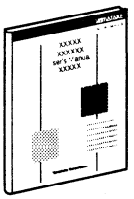
It describes how to install and wire the SRF101/102/103 for integrating into instruments, method of operation, maintenance and inspection, troubleshooting, and hardware specifications.



Smart Recorder Dot Printing Model SRF106
Installation/Operation **Manual No.CP-UM-1666E**

This manual is required reading for those who use the SRF106, those who design hardware for integrating the SRF106 into operator control panels, those who carry out maintenance, and those who operate instruments in which the SRF106 is integrated.

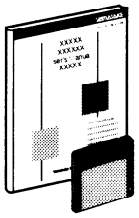
It describes how to install and wire the SRF106 for integrating into instruments, method of operation, maintenance and inspection, troubleshooting, and hardware specifications.



Smart Recorder Pen Printing Model SRF201/202/203
Installation/Operation **Manual No.CP-SP-1037E**

This manual is required reading for those who use the SRF201/202/203, those who design hardware for integrating the SRF201/202/203 into operator control panels, those who carry out maintenance, and those who operate instruments in which the SRF201/202/203 is integrated.

It describes how to install and wire the SRF201/202/203 for integrating into instruments, method of operation, maintenance and inspection, troubleshooting, and hardware specifications.

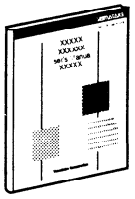


Smart Loader Package SLP-F10/F20
for Smart Recorder SRF100/200 **Manual No.CP-UM-5067E**

This manual is packaged with the SLP-F10/F20.

Running the SLP-F10/F20 package on a personal computer enables you to set up SRF100/200 parameters on the personal computer.
This manual describes operations on the personal computer.

This manual is the common manual of the SLP-F10 and the SLP-F20.



CPL Communications Manual
SRF101/102/103/106/201/202/203 **Manual No.CP-UM-1668E**

This Manual.
The SRF101/102/103/106/201/202/203 can communicate with other equipment via the RS-485 or RS-232C interfaces.

This manual is required reading for those who use the CPL communication functions of the SRF101/102/103/106/201/202/203.
It briefly describes CPL communications, how to wire the SRF101/102/103/106/201/202/203, communication procedures, communication data for the SRF101/102/103/106/201/202/203, troubleshooting and communication specifications.

Organization of this Manual

This manual is organized as follows.

Chapter 1 COMMUNICATION FUNCTIONS

This chapter lists communication functions and model numbers of SRF.

Chapter 2 WIRING

This chapter describes RS-232C and RS-485 wiring methods to enable communication between the SRF and other instruments.

Chapter 3 SETUP

This chapter describes SRF100 communication setup.

Chapter 4 COMMUNICATION PROCEDURE

This chapter describes communication procedures, message structure, data read/write and signal timing operations.

Chapter 5 COMMUNICATION DATA TABLES

This chapter gives various data tables for communication with SRF.

Chapter 6 COMMUNICATION PROGRAM FOR MASTER STATION

This chapter gives communication program examples for SRF using the PC-9800 series personal computer and N88BASIC.

Chapter 7 TROUBLESHOOTING

This chapter describes checkpoints to diagnose failures in SRF communication.

Chapter 8 SPECIFICATIONS

This chapter lists communication specifications for the SRF.

Appendices

The appendix gives code tables and network configurations using the CMC10L RS-232C/RS-485 converter.

Conventions Used in this Manual

This manual uses the following conventions to alert readers to important information.

: Cautions indicate a particularly important item. Cautions must be followed at all times.

[!] HANDLING PRECAUTIONS

: Handling Precautions indicate items that the user should pay attention to when handling the SRF.

NOTE : Notes indicate useful information that the user might benefit by knowing.

① ② ③ : Circled numbers indicate steps in a sequence or indicate corresponding parts in an explanation.

Contents

Chapter 1. COMMUNICATION FUNCTIONS

- On a system operating on the RS-232C interface, a master station (a host computer, usually a PC) is connected to the instrument in a point-to-point configuration. At this time, only one instrument can communicate with the master station using a preset station address.

- On a system operating on the RS-485 interface, up to 31 instruments (see *1) can be connected to a master station. Station addresses are then used to identify other stations for communication.

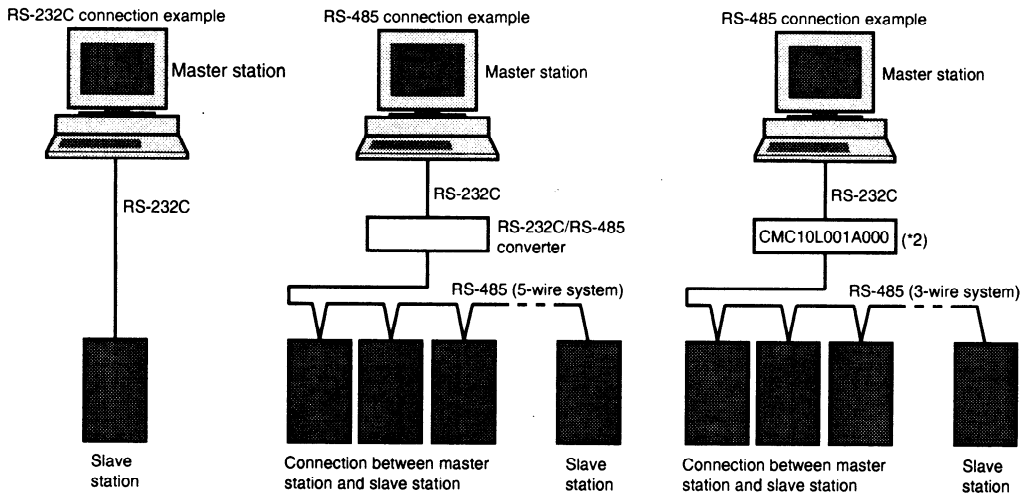
- The communication protocol and format conform to the RS-232C and RS-485 interfaces.

- When the following procedure is established during communication, instrument data can be read or written.
  1. The master station (host computer) transmits a request message to the slave station.
  2. The master station receives a response message from the slave station.

- The master station issues two types of requests to a slave station: read and write.

- The type of read/write data can be optionally selected with a data address.

- CPL(Controller Peripheral Link) communications is the Yamatake Corporation's host-communications.



- The high-performance communication controller CMC410A102 is available for conversion between the RS-232C and RS-485 interfaces.

(*1) When the master station is an MA500 DIM or CMC410, it can be connected to up to 16 slave stations.

(*2) The CMC10L001A000 communication controller is an RS-232C/RS-485 (3-wires type) converter available from Yamatake Corporation.

Chapter 2. WIRING

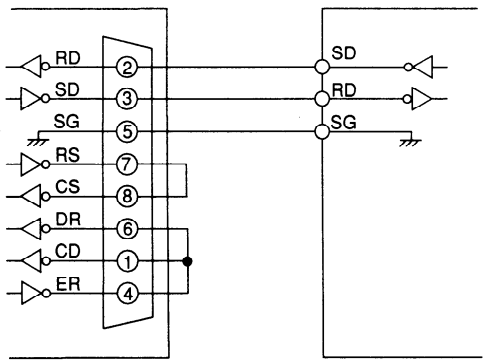
2 - 1 RS-232C Connection

The wiring of the SRF with communication functions supporting the RS-232C is shown below.

● **Communication with the master station in a point-to-point configuration**

Three communication terminals (RD, SD and SG) are provided. Data may not be output unless the other terminals of the master station RS-232C interface are short-circuited as shown in figure on the next page.

Check the RS-232C pin array in the host computer instruction manual.



Host computer (master station) DigitroniK control (slave station)

Example of connection using Yamatake Corporation CBL232FNZ02

Note

Cable catalog No. : CBL232FNZ02
(2m cable for RS-232C, 9-pin, D-Sub socket, contact - crimp style terminal)

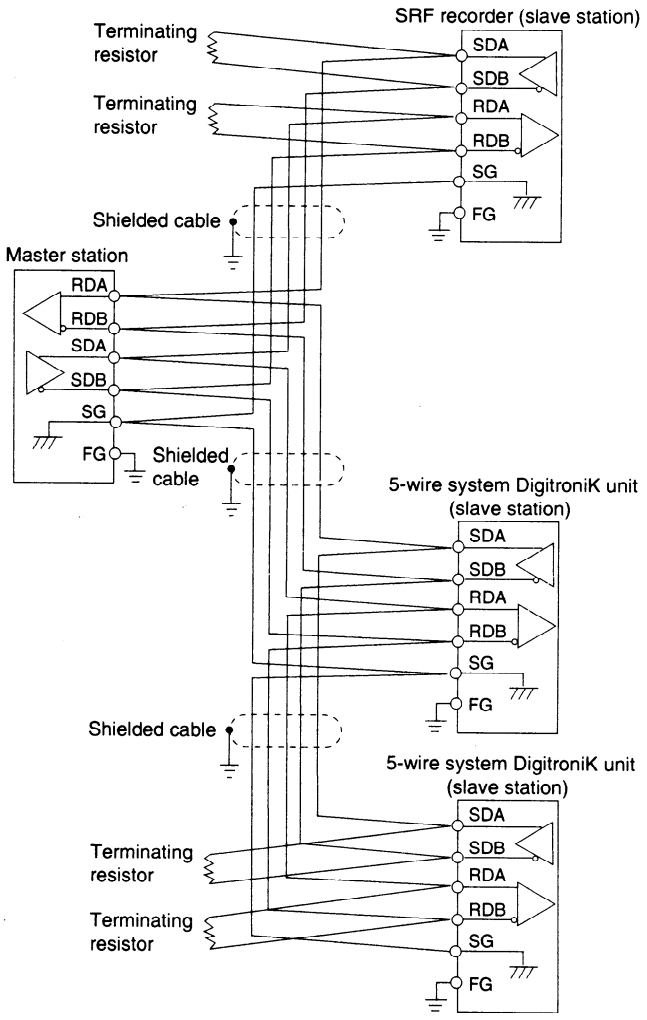
● **RS-232C connector signals**

Pin No.	JIS Code	Name	Signal Direction Host-station
1	CD	DCD	←
2	RD	RxD	←
3	SD	TxD	→
4	ER	DTR	→
5	SG	GND	
6	DR	DSR	←
7	RS	RTS	→
8	CS	CTS	←

2 - 2 RS-485 Connection

■ 5-wire system

An example of wiring with a 5-wire system unit is shown below.



Connect a terminating resistor of 150Ω±5%, 1/2W min. to the recorder at each end of the transmission line. Connect only one end of the shielded wire to the frame ground.

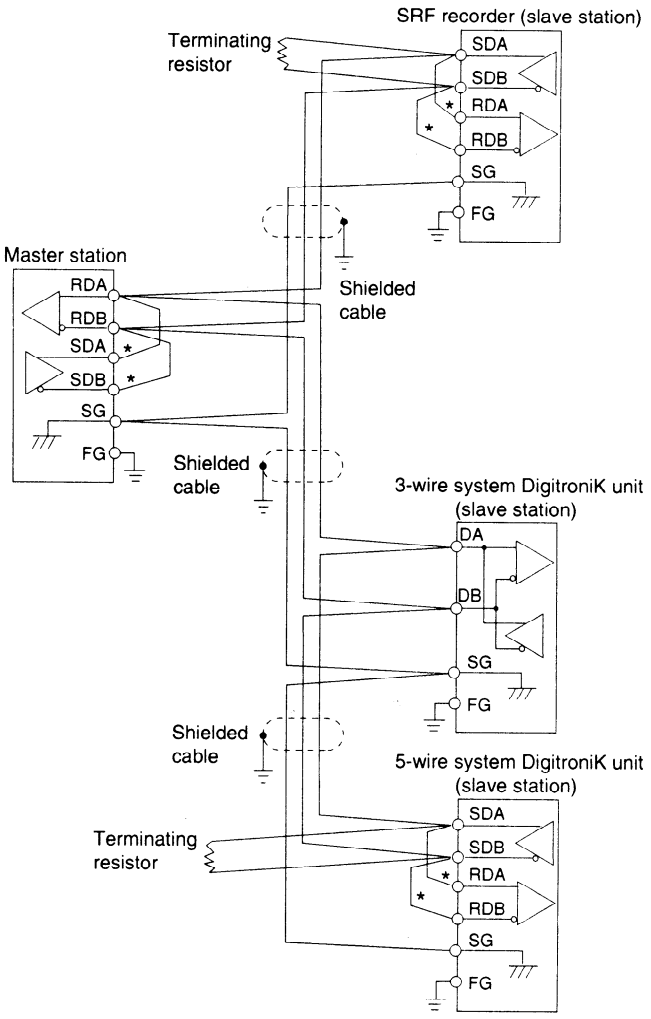
Other 3-wire system DigitroniK units of Yamatake Corporation can be used on the same communication line. Conduct the wiring shown at the item **"3-wire system" on page 2-3**.

[!] Handling Precautions

- Be sure to connect SG terminals each other.
  Failure to do so might cause unstable communications.

■ 3-wire system

An example of SRF wiring with a 3-wire system unit supporting the RS-485 is shown below.



Connect one terminating resistor of 150Ω±5% 1/2W min. at each end of the transmission line. Connect only one end of the shielded cable to the FG ground. Externally conduct the wiring for the wires marked with an asterisk.

On 3-wire system, the CMC10L001A000 of Yamatake Corporation can be used as a converter for master station.

For the details, refer to the item **"Connection with CMC10L" on page Appendix-3**.

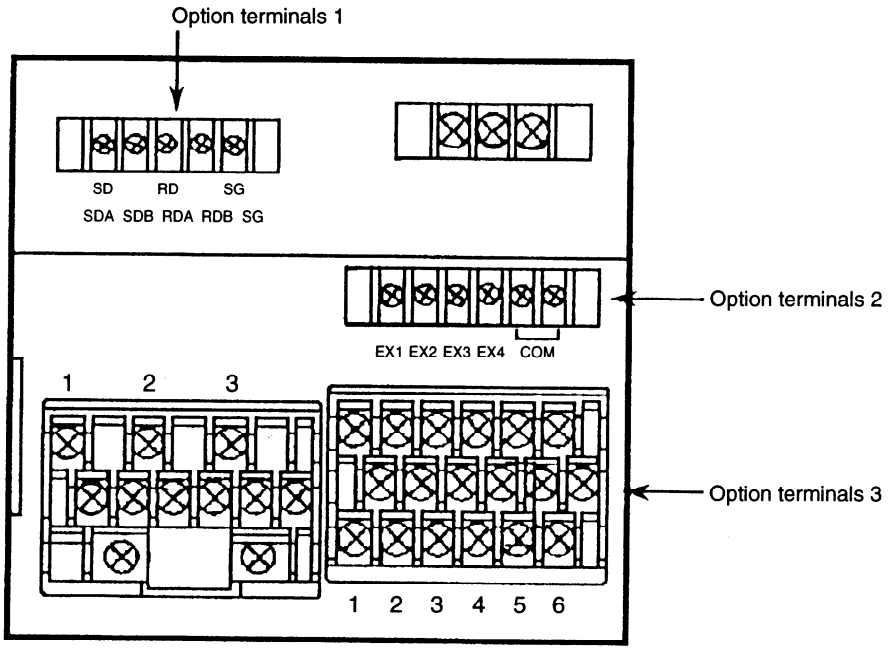
[!] Handling Precautions

- Be sure to connect SG terminals each other.
  Failure to do so might cause unstable communications.

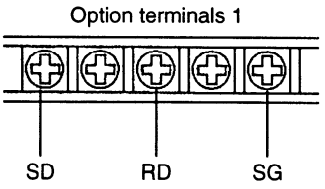
2-3 Terminal Array

■ SRF101/102/103

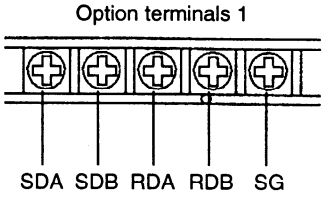
The communication terminal array of the SRF101/102/103 (pen printing type) is as follows:



● **Terminal array of RS-232C**

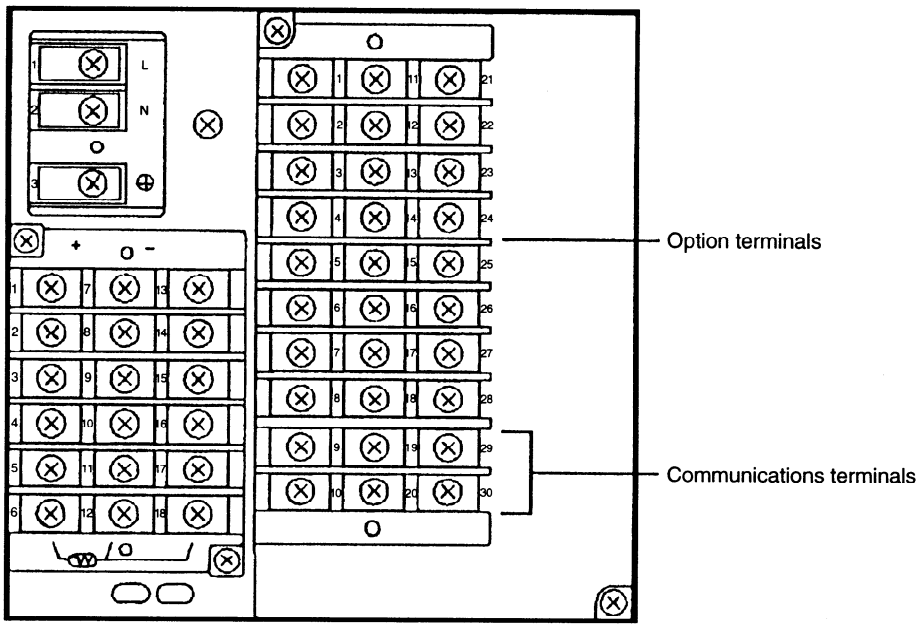


● **Terminal array of RS-485**

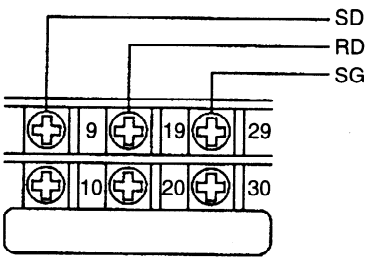


■ SRF106

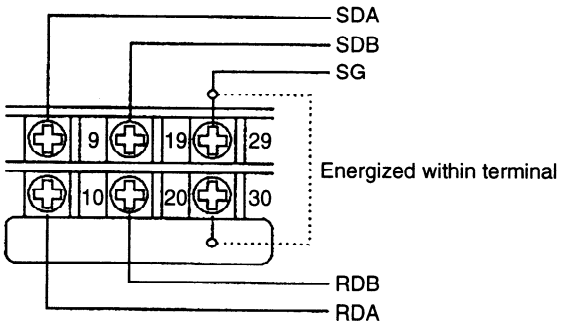
The communication terminal array of the SRF106 (multipoint printing type) is as follows:



● **Terminal array of RS-232C**

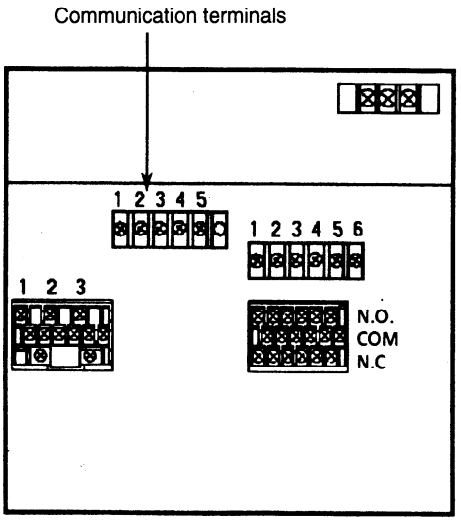


● **Terminal array of RS-485**

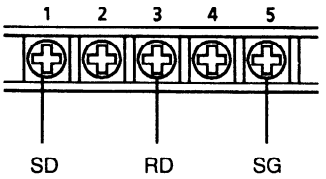


■ SRF201/202/203

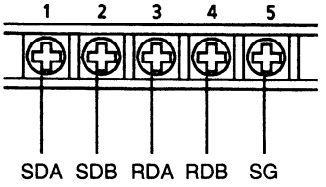
The communication terminal array of the SRF201/202/203 (pen printing type) is as follows:



● **Terminal array of RS-232C**



● **Terminal array of RS-485**



Chapter 3 SETUP

3-1 Communication Setup Items

The following items must be set up on the SRF to enable communication.

Item	Factory setting	Description
Communication access rights	1	1: Read only 2: Read/write
Station address	0	0 to 127
Communication system	1	1: 4800 bps 8 data bits, 1 stop bit, even parity 2: 4800 bps 8 data bits, 2 stop bits, no parity 3: 9600 bps 8 data bits, 1 stop bit, even parity 4: 9600 bps 8 data bits, 2 stop bits, no parity

- **Communication access rights**

  On the SRF101/102/103/201/202/203, set at system setup 1 (SYS).

  On the SRF106, set at system setup (SYS).

  Set either of Read only or Read/write.

- **Station address**

  On the SRF101/102/103/201/202/203, set at system setup 1 (SYS).

  On the SRF106, set at system setup (SYS).

  When connecting by the RS-485 interface, set a value that is different from other slave stations connected on the same transmission line in the multidrop network.

  Factory setting is "0" (zero) (communication disabled).

  To enable communication, set the station address to a value other than "0".

- **Communication system**

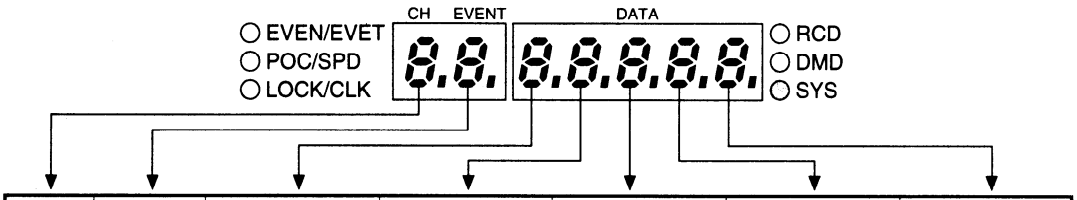
  Set the transmission speed and data format. On the SRF101/102/103/201/202/203, set at system setup 1 (SYS).

  On the SRF106, set at system setup (SYS).

  Set the master station to the same communication setup as the SRF.

3-2 Setup Procedure

■ SRF101/102/103/201/202/203 (pen printing type)



Channel No.	Setup step	Setup contents			
	1	Keylock			
	2	Print list start/stop			
	#*3	Communication access rights			
	#*4	Station address			Communication system
	*5	Recording format			
	*6	Recorder identification number			
	*7	Time recording ON/OFF			
	*8	Scale recording ON/OFF			
	*9	Pen phase sync selection			
	*A	Schedule demand ON/OFF			
	*B	No.1 schedule demand (Hour)			No.1 schedule demand (Minute)
	*C	No.2 schedule demand (Hour)			No.2 schedule demand (Minute)
	*D	No.3 schedule demand (Hour)			No.3 schedule demand (Minute)
	*E	No.4 schedule demand (Hour)			No.4 schedule demand (Minute)

Shaded areas ( ) are not displayed.

Items marked * are displayed when the extended menu is set to ON.

[!] HANDLING PRECAUTIONS

When the keylock is activated, you cannot change the setting.

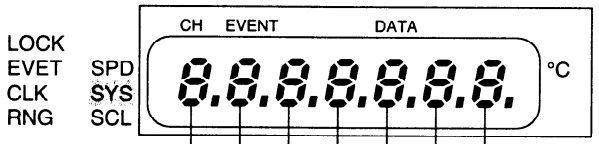
Set the keylock to deactivated in step 1.

● Setup

Keylock	[0] OFF: Deactivated [1] ON: Activated
Extended menu ON/OFF	[0] OFF [1] ON: Extended menu mode
Communication access rights	[1] Read only [2] Read/Write
Communication address	[0 to 127] 0: Communication is prohibited.
Communication system	[1] 4800 bps, 8 bits, even parity, 1 stop bit [2] 4800 bps, 8 bits, non parity, 2 stop bits [3] 9600 bps, 8 bits, even parity, 1 stop bit [4] 9600 bps, 8 bits, non parity, 2 stop bits
Recording format	[1] Trend [2] Trend and Tabular recording [3] Trend and Schedule demand
Recorder identification number	[0 to 99] 0: No identification number is printed.
Time recording ON/OFF	[0] OFF: Time is not recorded. [1] ON: Time is recorded.
Scale recording ON/OFF	[0] OFF: Scale is not recorded. [1] ON: Scale is recorded.
Pen phase sync selection	[1] Compensation for all pens using the printing pen as the reference [2] Compensation for all pens using the reference pen as the reference
Schedule demand ON/OFF	[0] No printing for all set times [1] Tabular printing for time No.1 [2] Tabular printing for times No.1 and No.2 [3] Tabular printing for times No.1, No.2, and No.3 [4] Tabular printing for all times No.1, No.2, No.3, and No.4
Schedule demand Hour/Minute setting	[0 to 23] Hour [0 to 59] Minute

■ SRF106 (dot printing type)

Follow the procedure below to set up communication. Press the SET key to enter the system setup mode. Make sure that SYS is lit. Press the ENT key to proceed to setup step 9. The Communication setup item is A in step 9.



Channel No.	Setup step	Setup contents		
	1	Keylock		
	2	Print list start/stop		
	*3	Extended menu ON/OFF		
	*4	Recording format		
	*5	Recorder identification number		
	*6	Time recording ON/OFF		
	*7	Scale recording ON/OFF		
	*8	Select recording color		
	*9	Communication access rights		
	*A	Station address		Communication system
	*B	Schedule demand ON/OFF		
	*C	No.1 schedule demand (Hour)		No.1 schedule demand (Minute)
	*D	No.2 schedule demand (Hour)		No.2 schedule demand (Minute)
	*E	No.3 schedule demand (Hour)		No.3 schedule demand (Minute)
	*F	No.4 schedule demand (Hour)		No.4 schedule demand (Minute)

Items marked * are displayed when the extended menu is set to ON.

Shaded areas ( ) are not displayed.

[!] HANDLING PRECAUTIONS

When the keylock is activated, you cannot change the setting.

Set the keylock to deactivated in step 1.

● Setup

Keylock	[0] OFF: Deactivated [1] ON: Activated
Print list start/stop	[0] Cancel [1] Start printing of partial list [2] Start printing of total list
Extended menu ON/OFF	[0] OFF [1] ON: Extended menu mode
Recording format	[1] Trend [2] Trend and tabular recording [3] Trend and schedule demand
Recorder identification number	[0 to 99] 0: No identification number is printed.
Time recording ON/OFF	[0] OFF: Time is not recorded. [1] ON: Time is recorded.
Scale recording ON/OFF	[0] OFF: Scale is not recorded. [1] ON: Scale is recorded.
Select recording color	[0] STD: Purpose, red, green, blue, brown, black [1] DIN: Purple, red, black, green, blue, brown
Communication access rights	[1] Read only [2] Read/Write
Communication address	[0 to 127] 0: Communication is prohibited.
Communication system	[1] 4800 bps, 8 bits, even parity, 1 stop bit [2] 4800 bps, 8 bits, non parity, 2 stop bits [3] 9600 bps, 8 bits, even parity, 1 stop bit [4] 9600 bps, 8 bits, non parity, 2 stop bits
Schedule demand ON/OFF	[0] No printing for all set times [1] Tabular printing for time No.1 [2] Tabular printing for times No.1 and No.2 [3] Tabular printing for times No.1, No.2, and No.3 [4] Tabular printing for all times No.1, No.2, No.3, and No.4
Schedule demand Hour/Minute setting	[0 to 23] Hour [0 to 59] Minute

Chapter 4 COMMUNICATION PROCEDURE

4-1 Outline of Communication Procedure and Messages

This chapter outlines of communication procedures and the concept of message structure.

■ Communication procedure

The following briefly describes the communication procedure.

(1) The master station transmits an instruction message to a slave station to specify a station for communication.

(2) The slave station processes the instruction message and executes read and write operations.

(3) The slave station transmits a response message according to the contents of processing.

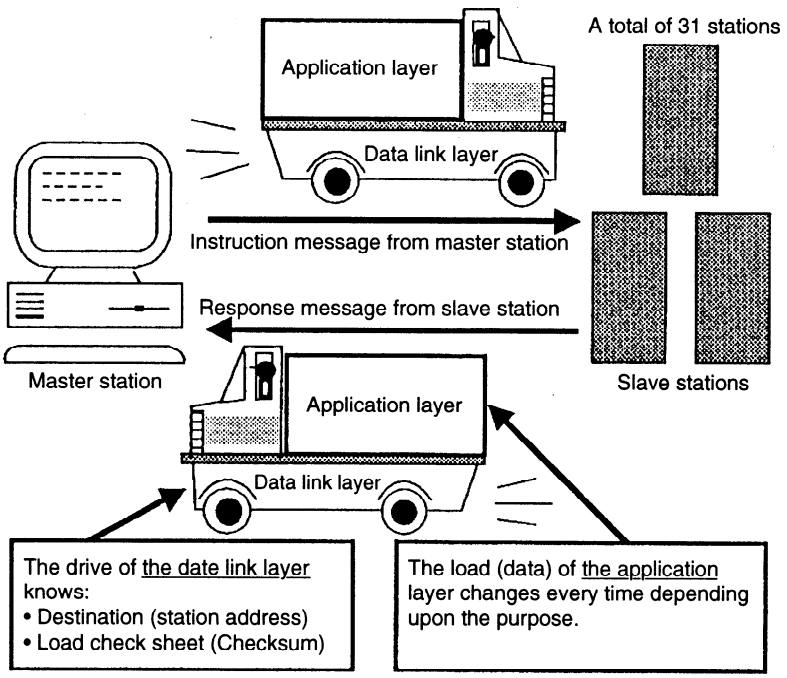
(4) The master station receives the response message and executes processing.

■ Message structure

A message consists of two layers as shown below. Both the instruction message from a master station and the response message from a slave station take this form.

- Data link layer
  - This layer contains the basic information required for communication.
  - It also contains the message destination and check information.
- Application layer
  - This layer is for data read and write operations.
  - The contents vary depending upon the purpose of communication.

The figure below shows the individual layers in more detail.



■ Examples

Messages have the following structure.

● Read instruction

• Instructions message

STX	0	1	0	0	X	R	S	,	1	0	0	1	W	,	2	ETX	9	A	CR	LF

Data link layer — Application layer — Data link layer

• Response message

STX	0	1	0	0	X	0	0	,	0	,	4	2	ETX	9	4	CR	LF

Data link layer — Application layer — Data link layer

● Write instruction

• Request message

STX	0	1	0	0	X	W	S	,	1	0	0	1	W	,	5	8	ETX	5	A	CR	LF

Data link layer — Application layer — Data link layer

• Response message

STX	0	1	0	0	X	0	0	ETX	8	2	CR	LF

Data link layer — Application layer — Data link layer

The following sections describe the data link layer and application layer in detail.

■ Data address concept

This recorder employs a concept called the "data address." This refers to making the address correspond to the data so that data can be read and write using addresses.

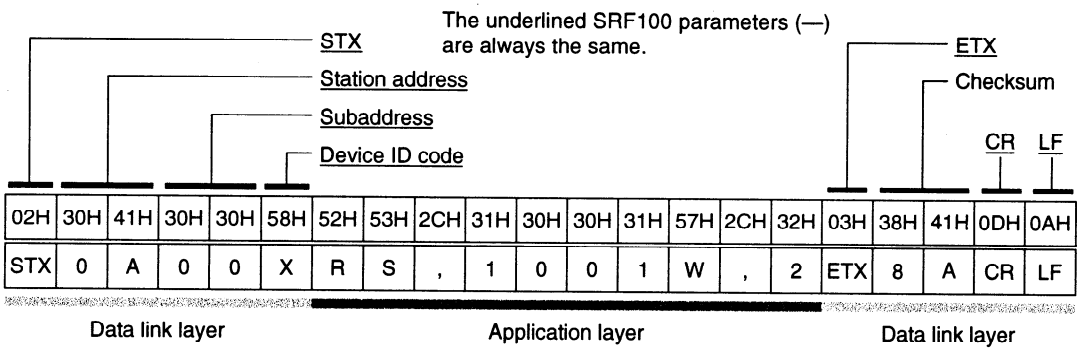
Data A	501W
Data B	502W
Data C	503W
:	:

For information on the correspondence between data and addresses, see Chapter 5 "Communication Data Tables."

4-2 Data Link Layer

■ Description

- The data link layer contains eight basic items of information for transmitting messages.
- In the data link layer, the instruction message and response message share the same structure.



The following describes each function in the data link layer.

● STX (Start of TeXt)

Role : Indicates the beginning of a message.

Description
- Fixed at 02H.
- When the instrument receives an STX, it is identified as the first character of a new instruction message regardless of location.

● Station address

Role : Specifies the destination instrument and allows communication with the designated instrument.

Description
- If "0" (zero) is set as the station address, the communication function is stopped.

  So, to enable communication be sure to set an address value of one or more.
- Two hexadecimal characters. For details, see the example.
- For details on station address setups, see chapter 3. "Setup."

Example : When the station address of the other station is 10:

(1) 10 (decimal) = 0AH (hexadecimal)

(2) This can be converted to character codes;
0 = 30H, A = 41H

(3) "0A" (30H, 41H) calculated in (2) is used as the station address.

! HANDLING PRECAUTIONS

Note that the function of the station address differs entirely from that of the data address in the application layer.

- **Sub-address**

  Description : The sub-address is meaningless on this instrument. Be sure to set a sub-address of 00 (30H, 30H) that has the same format as the station address.

- **Device ID code**

  Description : Only character code X (58H) or x (78H) can be set on this instrument.

- **ETX (End of TeXt)**

  Role : Indicates the end of the application layer.

  Description : Fixed at 03H.

- **Checksum**

  Role : A value to be used to check whether or not a message has been corrupted by an error (such as noise) during communication.

  Description
  - Two hexadecimal characters
  - This function operates as follows:

    (1) Add the bytes in the character codes of the message from STX to ETX.

    (2) Derive 2's complement of the result of this addition.

    (3) Convert the result into character code.

  Example : The instruction message on the preceding page is used in the following example.

  (1) Add the bytes in the character codes from STX to ETX. The low-order 1 byte of the calculation result is 76H.

  (2) The result of 2's complement addition is 8AH.

(3) 8AH is converted to character codes, and is used as the checksum value. The result is 8A, (38H) and (41H).

For details on character code conversion, see the station address (on the preceding page) example.

[!] HANDLING PRECAUTIONS

The checksum in the request message can be omitted, but no checksum is then included in the response message. The checksum function should not be omitted to assure proper message reception.

- **CR and LF (Carriage Return/Line Feed)**

Role : Indicates the end of a message.

Description
- "CR" is (0DH), and "LF" is (0AH).
- Be sure to use CR and LF as a pair.

[!] HANDLING PRECAUTIONS

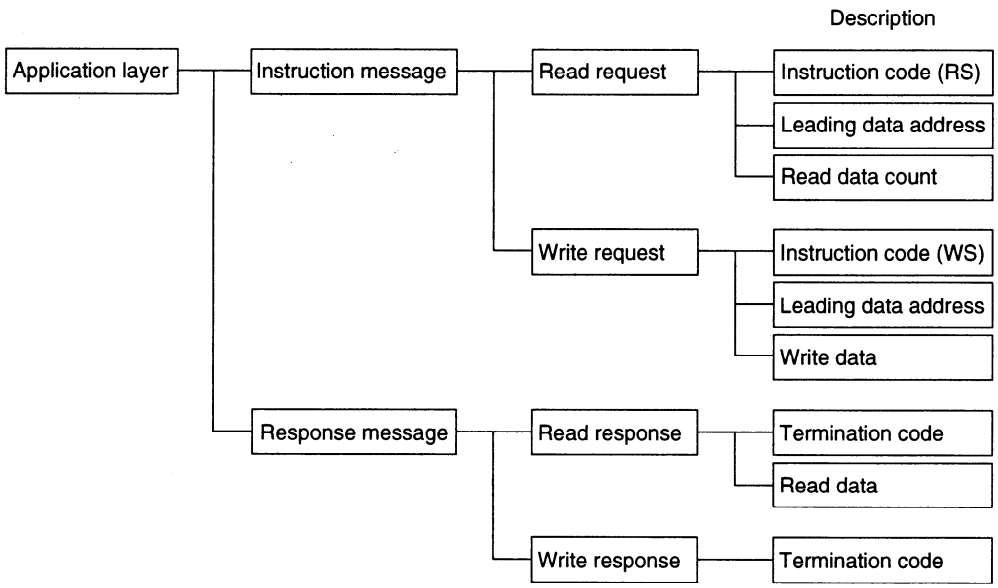
- If any of the following errors occur in the data link layer, the instrument does not respond.
  - The communication setups for both stations do not matched (different transmission speeds or the occurrence of a parity error).
  - The address of the transmitting station differs from the station address of the receiving instrument.
  - The station address is 00.
  - STX, ETX, CR and LF are not placed at the specified positions.
  - The device ID code is neither X nor x.
  - The station address, sub-address or checksum is not two characters long.
  - The calculation result of the checksum does not match the checksum of the message.
  - Non-designated characters are included in the messages.
- The data link layer contains a response message that is identical to the instruction message except for the checksum function.
- Use upper-case characters A to F in the hexadecimal numerics for station addresses and checksum.

4-3 Application Layer

■ Description

- The application layer contains instructions, data, data count and termination code.
- In the application layer, the instruction message and response message have a different structure.
- There are two types of instruction messages: read instructions and write instructions.

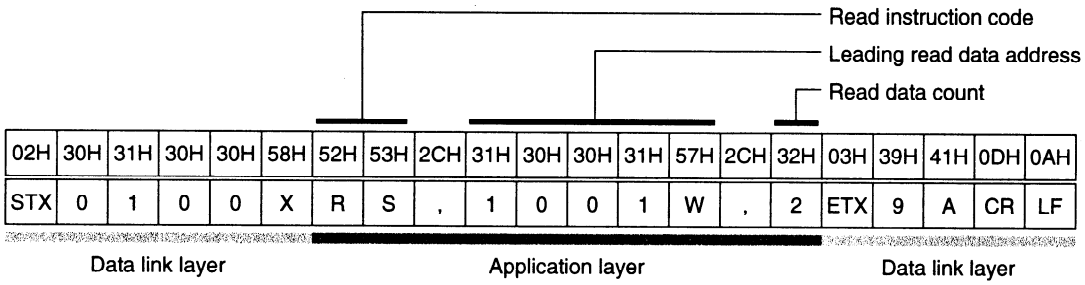
  The response message includes responses to each instruction.
- A termination code indicates how an instruction message has been processed.



4-4 Reading Data

■ Description of read instruction

- This instruction permits the contents of continuous data addresses starting with the specified leading read data address to be read in one message.
- The application layer of a read instruction consists of the following three types of data.



- Individual data items are delimited by a comma (,) (character code 2CH).
- An upper-case character code is used for each numeric or character in the application layer.
- A decimal number is used for each numeric.
- Additional "0's" (zeros) or spaces cannot be added to each data item.

  Example : The underlined portions of "RS, 01001W, 2" is not allowed.

  Example : The underlined portions of "RS, _1001W, 02" are not allowed.

  Example : The example above shows that two-data items are read from 1001W as one message.

● Read instruction code (RS)

Role : A read command.

Description : Two RS (52H, 53H) characters.

● Leading read data address

Role : Designates the leading data address from which data is read.

Description
- The communication data tables show the correspondence between data address and read data.
- Be sure to add W (57H) immediately after the data address numeric.

● **Read data count**

Role : Specifies how many data items are read continuously, starting with the designated data address.

📖 **NOTE** For details on the upper limit of the read data count, see Chapter 5 "Communication Data Tables."

■ Read response

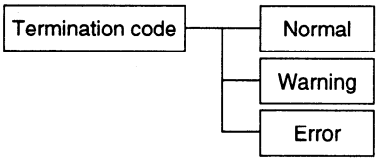
Role : When the message in the data link layer is correct, a response message is sent back according to the contents of the instruction message.

Description : All data in the application layer is expressed in decimal character code.

● **Termination code**

Role : A numeric that specifies how the instruction message has been processed by the instrument. Different values are set according to the processing result.

Description : The response message must include a termination code. The termination codes are classified as follows.



• The tarmination code is a two-digit decimal.

● **Normal response/warning response**

Role : Sends back the read data.

Description : Information in the application layer

• Termination code : For details on termination codes, see 4-6 "Termination Code Table."

• Read data : Only the specified number of data items are input.

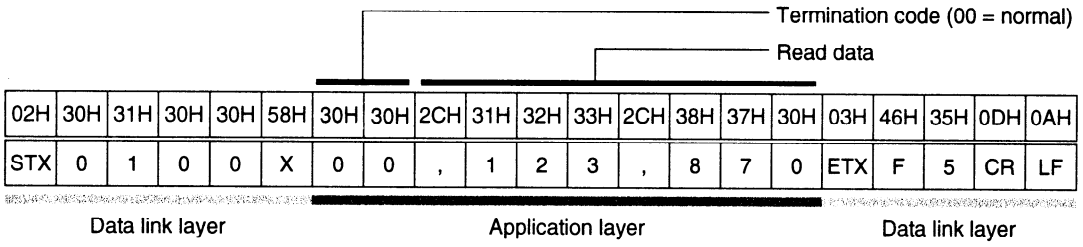
: The decimal point is removed from a numeric when it is entered.

Example : 55.6 is converted to 556 when entered.

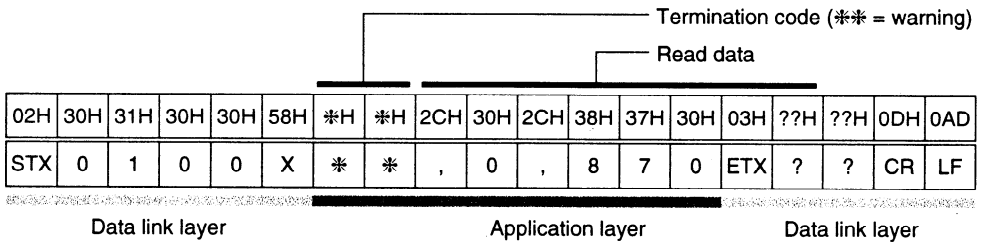
: Individual data items are delimited by a comma (2CH).

: The range and number of digits of each data item depend upon the read data.

Example : A normal response (when two data items are read properly)



Example : A warning response (✻✻ indicates the corresponding warning code numeric.)



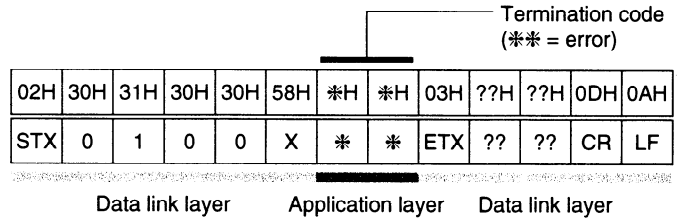
● **Abnormal response**

Role : Indicates that there is an error in an instruction message, that is, that there is no data and cannot be normally read.

Description : Information in the application layer

• Termination code : Indicates the error type. For details, see the 4-6 "Termination Code Table."

Example : An error response



■ Decimal numeric expression (numeric data)

Role : All the numerics, read count, write value (see the description of the WS command) and read data in the data address follow the rules given below.

(1) When a numeric is negative, add a minus sign "-" (2DH) before the numeric.

Example : -123 (2DH, 31H, 32H, 33H)

(2) When a numeric is "0" (zero), use one "0".

Example : 0 (30H)

Example : 00 (30H, 30H) is wrong.

(3) When a numeric is positive, never add a plus sign "+" before the numeric.

Example : +123 (2BH, 31H, 32H, 33H) is not allowed.

(4) Never add additional "0's" (zeros) or spaces before a numeric.

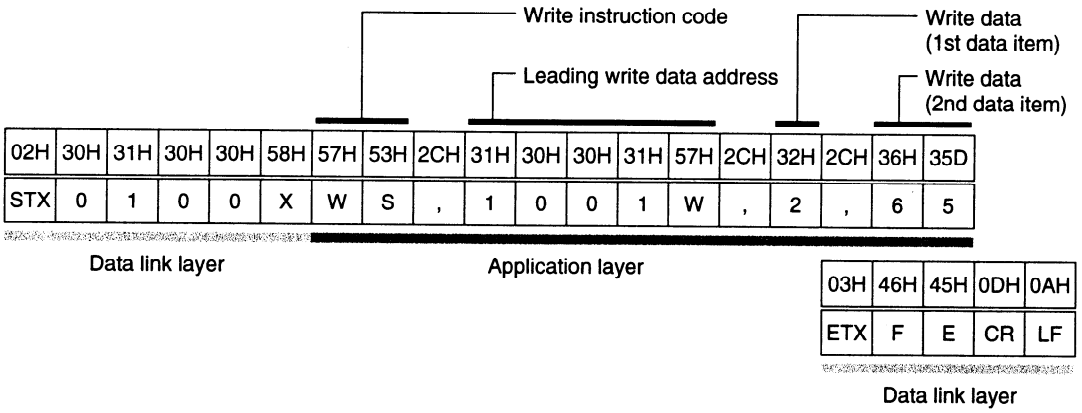
Example : 0123 (30H, 31H, 32H, 33H) is not allowed

Example : 123 (20H, 31H, 32H, 33H)

4-5 Writing Data

■ Description of write instruction

- This instruction permits the contents of continuous data addresses, starting with the specified leading write data address to be simultaneously written in one message.
- The application layer of a write instruction consists of the following three types of data.



- Individual data items are delimited with a comma (,) (character code 2CH).
- The write data count need not be designated.
- An upper-case character code is used for each numeric or character in the application layer.
- All numerics are decimals.
- Additional "0's" (zeros) (30H) or spaces cannot be added to each data item.

  Example : The underlined portion of WS, 0100W, 2 is not allowed.

  Example : The underlined portions of WS, 1001W, 02 are not allowed.

  Example : The above figure shows that 2 and 65 are written at addresses 1001W and 1002W in one message.

● Write instruction code (WS)

Role : A write command.

Description : Two WS (57H, 53H) characters.

● **Leading write data address**

Role : Specifies a leading write data address.

- For details on the relationship between data addresses and write data, see Chapter 5 "Communication Data Tables."
- Be sure to add W (57H) after the numeric representing the data address.

● **Write data**

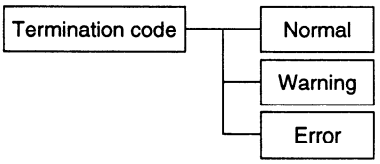
Role : Data to be written to continuous addresses starting with the designated data address.

Description
- The range of a numeric to be written differs, depending upon each data address.
- Individual data are delimited by a comma (2CH).
- The data address at which the corresponding data is written is sequentially incremented by one, starting with the leading data address (see the example on the preceding page).
- The number of data items that can be written in one message is limited. For details, see Chapter 5 "Communication Data Tables."

■ Write response

Role : When the message in the data link layer is correct, only the termination code is sent back.

Description : The termination codes are classified as follows:



- The tarmination code is a two-digit decimal.

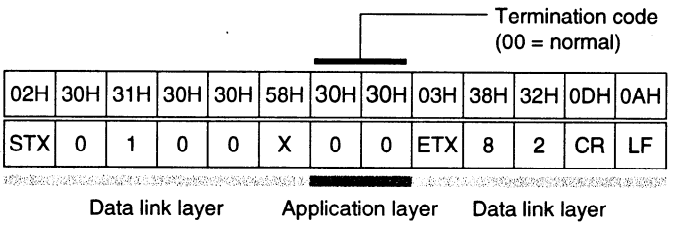
● **Normal response/warning response**

Role : Information concerning the result of processing the write instruction message is returned.

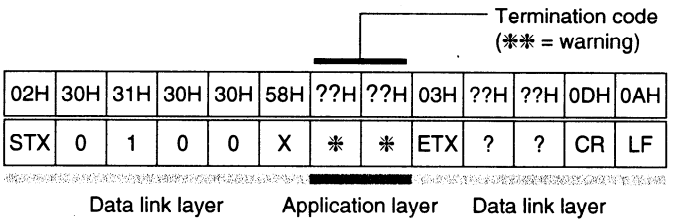
Description : Information in the application layer

- Termination code : A numeric specifying how the instruction message has been processed by the instrument.

Example : A normal response (when all data items are correctly written)



Example : A warning response (✻✻ indicates the warning code numeric.)



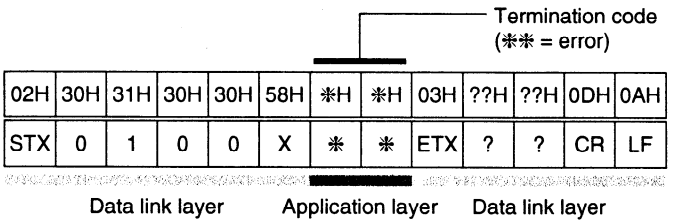
● **Error response**

Role : Only the abnormal termination code is returned.

Description : Information in the application layer

- Termination code : Indicates that the instruction message contains an error, and that write processing cannot be done. For details, see 4-6 "Termination Code Table."

Example : An error response (✻✻ indicates an error response.)



4-6 Termination Code Table

■ Normal and abnormal termination

Status code	Name	Type	
00		Normal	Normal termination
10	Parameter error	Abnormal	An abnormal frame was received.
30	Instrument control error	Alarm	A non-executable command was received.
31	Write busy error	Alarm	The write command was received while the instrument was executing a write operation.
40	Format error	Abnormal	An illegal character was received.
41	Data item number error	Abnormal	The specified data length exceeds 32 words.
42	Address range error	Abnormal	Writing or reading was carried out on the access inhibit address.
43	Numeric abnormal error	Abnormal	The data section contains an abnormal value.
44	Numeric value range abnormal error	Abnormal	The data section contains a numeric value outside the specified range.
46	Write inhibit status error	Alarm	An instrument in a write inhibit status received the write command.
80	Read inhibit data error	Alarm	An attempt was made to read the read data area.
81	Write inhibit data error	Alarm	An attempt was made to write to the read data area.
99	Command error	Abnormal	Undefined command error

■ Response code

● Response code and data when one word is read

When one word is read in response to SRF, the following response code and data is returned depending on the address and data attributes of the address specified by the read statement.

Address attribute	Data attribute	Response code from SRF	Data read from SRF
Access inhibit address	—	Error code 42	Data not provided
Valid address and option address	Read/write enabled and read only	Normal code 00	Data of specified address
	Write only enabled	Error code 80	Data not provided

● **Response code and data when one word is written**

When one word is written in response to SRF, the following data write processing and response code is returned depending on the address and data attributes of the address specified by the write statement, and on the write data.

Address attribute	Data attribute	Write data	Response code from SRF	Data write to SRF
Access inhibit address	—	—	Error code 42	No data is written.
Valid address and option address	Read/write enabled and read only	legal data	Normal code 00	Data in command is written.
		Illegal data	Error code 44	No data is written.
	Read only enabled	—	Error code 81	No data is written.

● **Response code and data when multiple words are read**

When two words or more are read in response to SRF, the following response code and data is returned depending on the address and data attributes of the address specified by the read statement.

Address attribute	Data attribute	Response code from SRF	Data read from SRF
When access inhibit address is included	—	Error code 42	Data is not provided.
When access inhibit address is not included (only in case of valid address and option address)	Data of all addresses is read/write enabled or read enabled.	Normal code 00	Data of all specified addresses
	Including write only enabled data	Error code 80	Data is not provided.

● **Response code and data when multiple words are written**

When two words or more are written in response to SRF, the following data write processing and response code is returned depending on the address and data attributes of the address specified by the write statement, and on the write data.

Address attribute	Data attribute	Write data	Response code from SRF	Data write to SRF
Access inhibit address	—	—	Error code 42	No data is written.
When access inhibit address is not included (only in case of valid address and option address)	Data of all addresses is read/write enabled or read enabled.	All legal data	Normal code 00	All data in command is written.
		Including illegal data	Error code 44	No data is written.
	Including write only enabled data	—	Error code 81	No data is written.

4-7 Timing Specifications

■ Timing specifications for instruction and response messages

When a slave station is connected with the master station directly, the following precautions regarding the transmission timing of instruction messages from the master station and response messages from the slave station should be observed.

● Response time-out

The maximum response time from the end of response message transmission by the master station and until it receives a response message from the slave station is two sec (section ①). So, the response time-out should be set to two sec.

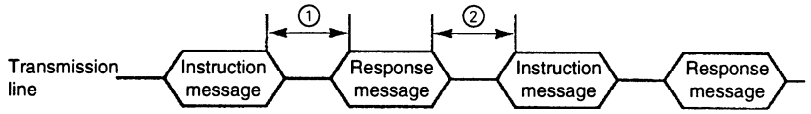
Generally, when a response time-out occurs, the instruction message is re-sent.

For details, see the Chapter 6 "Communication Program for Master Station."

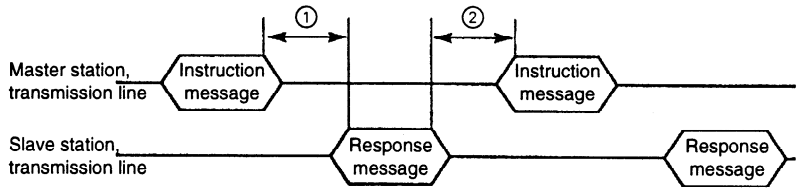
● Transmission start time

A wait time of 10 ms or more is required before the master station starts to transmit the next instruction message (to the same slave station or a different slave station) after the end of receiving a response message (section ②).

• RS-485 3-wire system



• RS-485 5-wire system and RS-232C

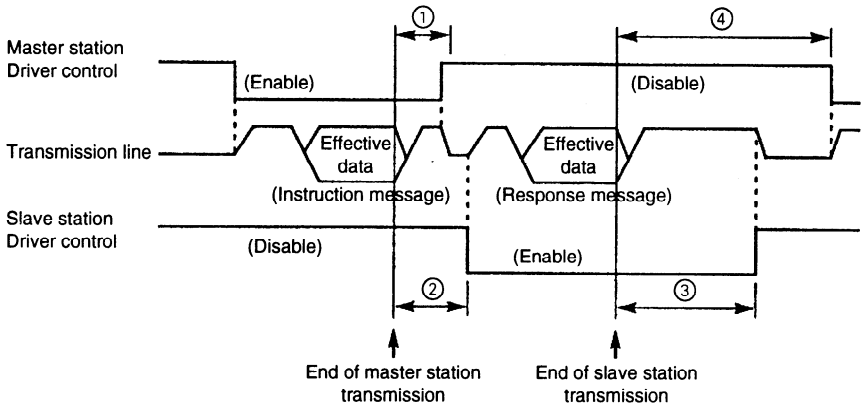


① End of master station transmission - Request interval time of slave station = 200 ms max.

② End of slave station transmission - Request interval time of master station = 10 ms min.

■ RS-485 driver control timing specification

When the transmission/receive on the RS-485 3-wire system is directly controlled by the master station, utmost care should be exercised about the following timing.



① End of master station transmission - Driver disable time = 500 μs max.

② End of slave station reception - Driver enable time = 1 ms min.

③ End of slave station transmission - Driver disable time = 10 ms max.

④ End of master station reception - Driver enable time = 10 ms min.

Chapter 5 COMMUNICATION DATA TABLES

5-1 Basic Communication Data Processing

■ Communication data types and formats

● Types of communication data

There are two types of communication data:

- Run status : Data indicating the run status (e.g. PV, event) of instrument.
- Configuration : Data (e.g. event setting values) for setting the instrument status.

● Format of communication data

Communication data is classified into the following formats.

- Numeric data : Data indicating a numeric value (PV, etc.)
- Bit data : Data where each bit is significant (alarms, etc.).

  The bit data must be composed during transmission, and be decomposed during reception.
- Text data : Data indicating text

  Text data (e.g. unit, tag name) must be converted according to the character code table.

■ Communication data storage memory

● Memory type

Communication data is stored in the memory (storage device) of the instrument. The following two types of memory are used by this instrument.

- RAM : Stored data is cleared when the power is turned OFF. However data can be written to this memory any number of times.
- EEPROM : Stored data is retained even when the power is turned OFF, whereas data write operations are limited to a total of 100,000 times.

The SRF writes configuration data from EEPROM to RAM when the power is turned ON, and operates using the RAM data. When data is written to the SRF using the communications functions described in this manual, data is temporarily stored in RAM before it is copied to EEPROM.

[!] HANDLING PRECAUTIONS

An EEPROM can be written to a total of 100,000 times.

■ Data addresses

The data addresses are allocated as shown in the table below.

Communications data	Address	Remarks
Control data	300 to 399	—
Process data	400 to 499	—
Event data	500 to 599	—
Common data	600 to 699	—
CH1 data	1100 to 1199	—
CH2 data	1200 to 1299	Not available on SRF101/201
CH3 data	1300 to 1399	Not available on SRF101/102/201/202
CH4 data	1400 to 1499	Not available on SRF101/102/103/201/202/203
CH5 data	1500 to 1599	Not available on SRF101/102/103/201/202/203
CH6 data	1600 to 1699	Not available on SRF101/102/103/201/202/203

■ Data read/write count

The maximum number of data items that can be read and written continuously in a single communication session is 32. For details of data being read or written that contains non-existing data as a result of a different catalog No., for example, refer to the response code and data when multiple words are read/written (page 4-15).

■ Data unit and decimal point position

A decimal point is not added to read/write data.

The unit or decimal point position is determined for each data item.

For details on data units, refer to the user's manual.

(For PV and event setting data units, the unit data can be referenced.)

For details on the decimal point position of each data item, refer to the decimal point data.

Example

For details on the unit of PV value (address 401) of channel 1, see addresses 1168 to 1173.

The decimal point position can be found out by referring to the following addresses:

Address 1108 When the input range can be scaled
Address 1105 When the input range cannot be scaled

5-2 Communication Data Tables

The address and read/write (R/W) enable status of each data item is determined as shown in the table below.

- Meaning of R/W column symbol
  - ○ R/W enabled
  - x R/W disabled

Special attention need not be paid to data items common to dot printing type (SRF106) and pen printing type (SRF101/102/103/201/202/203).
SRF101/201 (1-pen model) Only the addresses of channel 1 are valid.
SRF102/202 (2-pen model) Only the addresses of channels 1 and 2 are valid.
SRF103-203 (3-pen model) Only the addresses of channels 1, 2 and 3 are valid.

■ Control data

For details on items indicated by an asterisk "*", see bit information data.

Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Recording start/stop	300	X	○	Starts/stops recording. 0: Stop recording 1: Start recording	Common
• When this address is read, the response becomes error code 80. • When 1 (starts recording) is written after 0 (stops recording) is written to this address and before the instrument enters the recording stopped state, the response becomes error code 30.					
Demand printing start/stop	301	X	○	Carries out demand printing. 0: Cancel demand printing 1: Start demand printing	
• When this address is read, the response becomes error code 80. • When 1 (start demand printing) is received during demand printing, the response code becomes error code 30. • When 1 (start demand printing) after demand printing has ended and before sufficient recording paper has been fed, the response becomes error code 30. • When this command is received while another print job is printing, the response code becomes error code 30. • When this command is received during chart feed, the response code becomes error code 30.					
List printing start cancel	302	X	○	Carries out list printing. 0: Cancels list printing. 1: Starts printing of partial list. 2: Starts printing of entire list.	Dot printing only
• When this address is read, the response becomes error code 80. • When this command is received when recording is ON, the response becomes error code 30. • When this command is received while another print job is printing, the response code becomes error code 30. • When this command is received during chart feed, the response code becomes error code 30. • In the case of SRF101/102/103/201/202/203 (pen printing models), the response is normal even if data is written to this address.					
Chart feed ON/OFF	303	X	○	Feed the chart paper about 40 mm. 1: Chart feeding in progress	Common
• When this address is read, the response becomes error code 80. • When this command is received when recording is ON, the response becomes error code 30. • When this command is received while another print job is printing, the response code becomes error code 30. • When FEED key on the instrument is pressed during execution of chart feed by communications, FEED key operations take priority, and feeding is ended when the key is released.					

Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Message printing	304	X	○	Carries out message printing. 1: Start printing of #1 message 2: Start printing of #2 message 3: Start printing of #3 message 4: Start printing of #4 message	Common
• When this address is read, the response becomes error code 80. • When this command is received with the message print buffer full, the response becomes error code 30. • When this command is received while another print job is printing, the response code becomes error code 30. • When this command is received during chart feed, the response code becomes error code 30.					
Chart feed speed scale switching	305	X	○	Switches the chart feed speed. 1: #1 chart feed speed #1 scale 2: #2 chart feed speed #2 scale	Dot printing only
• When this address is read, the response becomes error code 80. • The scale to be switched to when this address has been written to is the scale that is set when the scale switching method has been set to external contact. • In the case of SRF101/102/103/201/202/203 (pen printing models), the response is normal even if data is written to this address.					
Recording start/stop status	310	○	X	Reads recording start/stop status. 0: Recording stopped 1: Recording	Common
Demand printing start/stop status	311	○	X	Reads demand printing start/stop. 0: Demand printing stopped 1: Demand printing in progress	
List printing start/stop status	312	○	X	Reads list printing start/stop status. 0: List printing canceled 1: Partial list printing in progress 2: Entire list printing in progress	Dot printing only
Chart feed spacing start/stop status	313	○	X	Reads chart feed spacing start/stop status. 0: Chart feed stopped 1: Chart feed in progress	Common
Message printing start/stop status	314	○	X	Reads message printing start/stop status. 0: Message printing stopped 1: Message printing in progress	
Chart feed speed selection status	315	○	X	Reads the selected chart speed. 1: #1 chart feed speed selected 2: #2 chart feed speed selected	Dot printing only
Basic catalog No. information	397	○	X	Reads the basic catalog No. 1: SRF101 201: SRF201 2: SRF102 202: SRF202 3: SRF103 203: SRF203 6: SRF106	Common
* Option information bitmap data	398	○	X	Reads the instrument option information. Bitmap data (See page 5-23.)	
Software information	399	○	X	Reads the software ROM version No. Indicated in decimal. So, 256 becomes 100H. Ver.1.00 is indicated as 1.00 at this time.	
When addresses 310 to 399 are written to, the response becomes error code 81.					

■ Process data

Item	RAM/EEPROM Address	R	W	Meaning of Data
PV value (channel 1)	401	○	X	-19999 to 29999 : Normal value
PV value (channel 2)	402	○	X	-20000 : -OL
PV value (channel 3)	403	○	X	30000 : +OL
PV value (channel 4)	404	○	X	-32767 : Recording mode OFF or non-existent channel
PV value (channel 5)	405	○	X	32767 : Unmeasured data
PV value (channel 6)	406	○	X	

- When this address is written to, the response becomes error code 81.
- For details on the decimal point in the case of the linear scaling range, see the engineering unit decimal point (address: 1108, 1208, 1308, 1408, 1508, 1608).
  For details on the decimal point in the case of other ranges, see measurement range decimal point (1105, 1205, 1305, 1405, 1505, 1605).

■ Event data

For details on items indicated by as asterisk "*", see Bitmap Data.

Item	RAM/EEPROM Address	R	W	Meaning of Data
* Event status summary	400 500	○	X	Reads a summary of the event status of channels 1 to 6. Bitmap data 0 to 63 (See page 5-25, 26.)
* Event status (channel 1)	501	○	X	Reads the event status. Bitmap data 0 to 255 (See page 5-25, 26.)
* Event status (channel 2)	502	○	X	
* Event status (channel 3)	503	○	X	
* Event status (channel 4)	504	○	X	
* Event status (channel 5)	505	○	X	
* Event status (channel 6)	506	○	X	
* Event relay status summary	550	○	X	Reads a summary of the event relay status of #1 to #6. Bitmap data 0 to 63 (See page 5-25, 26)
* #1 Event relay status	551	○	X	Reads the event relay status. 0: Event relay OFF 1: Event relay ON
* #2 Event relay status	552	○	X	
* #3 Event relay status	553	○	X	
* #4 Event relay status	554	○	X	
* #5 Event relay status	555	○	X	
* #6 Event relay status	556	○	X	

Addresses, 400, 500 to 506, 551 to 556
- When this address is written, the response becomes error code 81.

■ Common data (common setup items)

Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
#1 Chart speed #2 Chart speed	600 601	○	○	Reads and writes #1/#2 chart speeds. 1: 2.5 mm/hour 2: 5 mm/hour 3: 10 mm/hour 4: 20 mm/hour 5: 40 mm/hour 6: 60 mm/hour 7: 120 mm/hour 8: 240 mm/hour	Common
Chart speed unit	600	○	○	Reads and writes the chart speed unit. 0: mm/hour 1: mm/minute	Pen printing only
Chart speed	601	○	○	When the data of address 600 is 0 (mm/hour) : 1 to 599 When the data of address 600 is 0 (mm/minute): 10 to 200	
• When data 1 is written to this address when the data of address 601 is 1 to 9, the response becomes the "out of valid data range" error. • When data 0 is written to this address when the data of address 601 is 201 to 599, the response becomes the "out of valid data range" error.					Common
Time: Year	602	○	○	Reads and writes year/month/day/hour/minute of the internal clock. Year : 0 to 99 Month : 1 to 12 Day : 1 to 31 Hour : 0 to 23 Minute : 0 to 59	
Time: Month	603	○	○		
Time: Day	604	○	○		
Time: Hour	605	○	○		
Time: Minute	606	○	○		
Addresses 602 to 606 • When a date that actually does not exist in the data range is written, the response becomes error code 44.					
Key lock ON/OFF	607	○	○	Controls key lock start/stop. 0: Key lock OFF (unlocked) 1: Key lock ON (locked)	
Extended menu ON/OFF	608	○	○	Starts/stops extended menu. 0: Extended menu OFF 1: Extended menu ON	
Recording format	609	○	○	Reads and writes the recording format. 1: Trend 2: Trend + tabulation 3: Trend + schedule demand printing	
Recorder ID No.	610	○	○	Reads and writes time recording start/stop. Data range 0 to 99	
Time recording ON/OFF	611	○	○	Reads and writes time recording start/stop. 0: Read and writes time recording stop 1: Start time recording	
Scale recording ON/OFF	612	○	○	Reads and writes scale recording start/stop. 0: Scale recording stopped 1: Scale recording	

Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Recording color selection	613	○	○	Reads and writes the recording color selection. 1: Select standard type 2: Select DIN type	Dot printing only
Pen phase cycle selection	613	○	○	Reads and writes pen phase compensation 1: Compensate between all pens (standard is printing pen) 2: Compensate between all pens (standard is standard trend pen) 3: No compensation	Pen printing only
Standard contact compensation ON/OFF	614	○	○	Reads and writes standard contact compensation start/stop. 0: Standard contact compensation OFF 1: Standard contact compensation ON	Dot printing only
Communications access rights	615	○	X	Reads CPL communications access rights. 1: Read only 2: Read/write	Common
Communications address	616	○	X	Reads the CPL communications address. 0 to 127 Note that address 0 means "communications inhibited."	
Communications system	617	○	X	Reads the CPL communications system. 1: 4800 bps, 8 bits, even parity, 1 stop bit 2: 4800 bps, 8 bits, no parity, 2 stop bits 3: 9600 bps, 8 bits, even parity, 1 stop bit 4: 9600 bps, 8 bits, no parity, 2 stop bits	
Addresses 615 to 617 • When this address is written to, the response becomes error code 81.					

■ Common data (schedule demand printing)

Item	RAM/EEPROM Address	R	W	Meaning of Data
Schedule command printing setup	620	○	○	Reads and writes time setup start/stop. 0: Do not print schedule command 1: Print at #1 time 2: Print at #1 and #2 times 3: Print at #1, #2 and #3 times 4: Print at #1, #2, #3 and #4 times
#1 Time setup: hour	621	○	○	Reads and writes time (hour:minute) when printing schedule command printing. Time: hour: 0 to 23 Time: minute : 0 to 59
#1 Time setup: minute	622	○	○	
#2 Time setup: hour	623	○	○	
#2 Time setup: minute	624	○	○	
#3 Time setup: hour	625	○	○	
#3 Time setup: minute	626	○	○	
#4 Time setup: hour	627	○	○	
#4 Time setup: minute	628	○	○	

■ Common data (external contact input)

For details on items indicated by an asterisk "*", see bit information data.

Item	RAM/EEPROM Address	R	W	Meaning of Data
#1 DI function setup	640	○	○	Reads and writes the external contact input function setup. 0: No function setup 1: Start/stop recording 2: Demand printing 3: Chart feed 4: Print #1 message 5: Print #2 message 6: Print #3 message 7: Print #4 message 8: Switch chart speed/scale (multipoint printing only)
#2 DI function setup	641	○	○	
#3 DI function setup	642	○	○	
#4 DI function setup	643	○	○	
#1 Message (1st character)	644	○	○	Refer to Appendix, Character Codes.
#1 Message (2nd character)	645	○	○	
#1 Message (3rd character)	646	○	○	
#1 Message (4th character)	647	○	○	
#1 Message (5th character)	648	○	○	
#1 Message (6th character)	649	○	○	
#2 Message (1st character)	650	○	○	Refer to Appendix, Character Codes.
#2 Message (2nd character)	651	○	○	
#2 Message (3rd character)	652	○	○	
#2 Message (4th character)	653	○	○	
#2 Message (5th character)	654	○	○	
#2 Message (6th character)	655	○	○	
#3 Message (1st character)	656	○	○	Refer to Appendix, Character Codes.
#3 Message (2nd character)	657	○	○	
#3 Message (3rd character)	658	○	○	
#3 Message (4th character)	659	○	○	
#3 Message (5th character)	660	○	○	
#3 Message (6th character)	661	○	○	
#4 Message (1st character)	662	○	○	Refer to Appendix, Character Codes.
#4 Message (2nd character)	663	○	○	
#4 Message (3rd character)	664	○	○	
#4 Message (4th character)	665	○	○	
#4 Message (5th character)	666	○	○	
#4 Message (6th character)	667	○	○	
* DI input status summary	690	○	X	Reads a summary of the external contact input status. Bitmap data 0 to 15 (See page 5-27)
*1 DI input status	691	○	X	Reads #1 to #4 external contact input status. 0: Stop 1: Start
*2 DI input status	692	○	X	
*3 DI input status	693	○	X	
*4 DI input status	694	○	X	
Addresses 690 to 694 • When this address is written to, the response becomes error code 81.				

■ Data by channel (range)

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Channel 1	Recording mode	1100	○	○	Reads and writes the recording mode. 0: Stop mode 1: Display mode 2: Display/recording mode	Common
	Range code	1101	○	○	Range Code Table (see pages 5-21, 22, 23)	
	Input operation type	1102	○	○	Reads and writes the input operation type. 1: PV value 2: Channel deviation (1) (standard Ch - self Ch) 3: Channel deviation (2) (self Ch - standard Ch) 4: Fixed value deviation (1) (fixed value - self Ch) 5: Fixed value deviation (2) (self Ch - fixed value)	
	Standard channel	1103	○	○	Reads and writes standard channel. 1 to 6: Indicate standard channel No.	
	Burnout	1104	○	○	Reads and writes burnout. 0: Stop 1: Up 2: Down	Dot printing only
	Input filter	1104	○	○	Reads and writes input filter function. 0: Input filter NO 1: Input filter YES	Pen printing only
	Measurement range decimal point	1105	○	X	Reads the measurement range decimal point. 0: No decimal point □□□□□ 1: 1 digit past the decimal point □□□□.□ 2: 2 digits past the decimal point □□□.□□ 3: 3 digits past the decimal point □□.□□□ 4: 4 digits past the decimal point □.□□□□	Common
	• When this address 1105 is written to, the response becomes error code 81.					

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Channel 1	Measurement range lower limit	1106	○	○	Reads and writes the measurement range lower limit. Voltage input: Measurement range lower limit to measurement range upper limit Thermocouple input: Measurement range lower limit to measurement range upper limit Resistance thermometer input: Measurement range lower limit to measurement range upper limit Linear scaling input: Measurement range lower limit to measurement range upper limit	Common
	Measurement range upper limit	1107	○	○	Reads and writes the measurement range upper limit. Voltage input: Measurement range lower limit to measurement range upper limit Thermocouple input: Measurement range lower limit to measurement range upper limit Resistance thermometer input: Measurement range lower limit to measurement range upper limit Linear scaling input: Measurement range lower limit to measurement range upper limit	
	Addresses 1106, 1107 • For details on the decimal point, see measurement range decimal point (address: 1105).					
	Engineering unit range decimal point	1108	○	○	Reads and writes the engineering unit range decimal point. 0: No decimal point □□□□□ 1: 1 digit past the decimal point □□□□.□ 2: 2 digits past the decimal point □□□.□□ 3: 3 digits past the decimal point □□.□□□ 4: 4 digits past the decimal point □.□□□□	
	• When the range code is outside of the linear scaling range, the data is meaningless.					
	Engineering unit range lower limit	1109	○	○	-19999 to 29999	
	Engineering unit range upper limit	1110	○	○	-19999 to 29999	
	Fixed value for deviation	1111	○	○	-19999 to 29999	
	PV bias	1112	○	○	-19999 to 29999	
	Addresses 1109 to 1112, 1209 to 1212, 1309 to 1312 • For details on the decimal point, see engineering unit range decimal point (address 1n08).					

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Channel 2	Recording mode	1200	○	○	See address 1100.	Common
	Range code	1201	○	○	See range code table.	
	Input operation type	1202	○	○	See address 1102.	
	Standard channel	1203	○	○	See address 1103.	
	Burnout	1204	○	○	See address 1104.	Dot printing
	Input filter	1204	○	○	See address 1104.	Pen printing
	Measurement range decimal point	1205	○	X	See address 1105.	Common
	Measurement range lower limit	1206	○	○	See address 1106.	
	Measurement range upper limit	1207	○	○	See address 1107.	
	Engineering unit range decimal point	1208	○	○	See address 1108.	
	Engineering unit range lower limit	1209	○	○	-19999 to 29999	
	Engineering unit range upper limit	1210	○	○	-19999 to 29999	
	Fixed value for deviation	1211	○	○	-19999 to 29999	
	PV bias	1212	○	○	-19999 to 29999	
Channel 3	Recording mode	1300	○	○	See address 1100.	
	Range code	1301	○	○	See range code table.	
	Input operation type	1302	○	○	See address 1102.	
	Standard channel	1303	○	○	See address 1103.	
	Burnout	1304	○	○	See address 1104.	Dot printing
	Input filter	1304	○	○	See address 1104.	Pen printing
	Measurement range decimal point	1305	○	X	See address 1105.	Common
	Measurement range lower limit	1306	○	○	See address 1106.	
	Measurement range upper limit	1307	○	○	See address 1107.	
	Engineering unit range decimal point	1308	○	○	See address 1108.	
	Engineering unit range lower limit	1309	○	○	-19999 to 29999	
	Engineering unit range upper limit	1310	○	○	-19999 to 29999	
	Fixed value for deviation	1311	○	○	-19999 to 29999	
	PV bias	1312	○	○	-19999 to 29999	
Channel 4	Recording mode	1400	○	○	See address 1100.	
	Range code	1401	○	○	See range code table.	
	Input operation type	1402	○	○	See address 1102.	
	Standard channel	1403	○	○	See address 1103.	
	Burnout	1404	○	○	See address 1104.	Dot printing
	Input filter	1404	○	○	See address 1104.	Pen printing
	Measurement range decimal point	1405	○	X	See address 1105.	Common
	Measurement range lower limit	1406	○	○	See address 1106.	
	Measurement range upper limit	1407	○	○	See address 1107.	
	Engineering unit range decimal point	1408	○	○	See address 1108.	
	Engineering unit range lower limit	1409	○	○	-19999 to 29999	
	Engineering unit range upper limit	1410	○	○	-19999 to 29999	
	Fixed value for deviation	1411	○	○	-19999 to 29999	
	PV bias	1412	○	○	-19999 to 29999	

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Channel 5	Recording mode	1500	○	○	See address 1100.	Common
	Range code	1501	○	○	See range code table.	
	Input operation type	1502	○	○	See address 1102.	
	Standard channel	1503	○	○	See address 1103.	
	Burnout	1504	○	○	See address 1104.	Dot printing
	Input filter	1504	○	○	See address 1104.	Pen printing
	Measurement range decimal point	1505	○	X	See address 1105.	Common
	Measurement range lower limit	1506	○	○	See address 1106.	
	Measurement range upper limit	1507	○	○	See address 1107.	
	Engineering unit range decimal point	1508	○	○	See address 1108.	
	Engineering unit range lower limit	1509	○	○	-19999 to 29999	
	Engineering unit range upper limit	1510	○	○	-19999 to 29999	
	Fixed value for deviation	1511	○	○	-19999 to 29999	
	PV bias	1512	○	○	-19999 to 29999	
Channel 6	Recording mode	1600	○	○	See address 1100.	
	Range code	1601	○	○	See range code table.	
	Input operation type	1602	○	○	See address 1102.	
	Standard channel	1603	○	○	See address 1103.	
	Burnout	1604	○	○	See address 1104.	Dot printing
	Input filter	1604	○	○	See address 1104.	Pen printing
	Measurement range decimal point	1605	○	X	See address 1105.	Common
	Measurement range lower limit	1606	○	○	See address 1106.	
	Measurement range upper limit	1607	○	○	See address 1107.	
	Engineering unit range decimal point	1608	○	○	See address 1108.	
	Engineering unit range lower limit	1609	○	○	-19999 to 29999	
	Engineering unit range upper limit	1610	○	○	-19999 to 29999	
	Fixed value for deviation	1611	○	○	-19999 to 29999	

■ Data area by channel (scale)

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Channel 1	#1 Scale lower limit value	1120	○	○	Reads and writes the #1 scale lower limit value. -19999 to 29999	Common
	#1 Scale upper limit value	1121	○	○	Reads and writes the #1 scale upper limit value. -19999 to 29999	
	Addresses 1120 to 1121 • For details on the decimal point in the case of the linear scaling range, see the engineering unit decimal point (address: 1□08). For details on the decimal point in the case of other ranges, see measurement range decimal point (1105, 1205, 1305, 1405, 1505, 1605).					
	Scale switching method	1122	○	○	Reads and writes the scale switching method. 0: No switching 1: Auto-switching 2: Switching by external contact input	Dot printing only
	#2 Scale lower limit value	1123	○	○	Reads and writes #2 scale lower limit value. -19999 to 29999	
	#2 Scale upper limit value	1124	○	○	Reads and writes #2 scale upper limit value. -19999 to 29999	
	Auto-switching point	1125	○	○	Reads and writes the auto-switching point. -19999 to 29999	
	Auto-switching differential	1126	○	○	Reads and writes the auto-switching differential. 0 to 29999	
	Addresses 1123 to 1126 • For details on the decimal point in the case of the linear scaling range, see the engineering unit decimal point (address: 1□08).					Common
	Scale selection status	1127	○	X	Reads and writes the scale selection status. 1: #1 scale selected 2: #2 scale selected	
	• When this address is written to, the response becomes error code 81.					
Channel 2	#1 Scale lower limit value	1220	○	○	See address 1120.	
	#1 Scale upper limit value	1221	○	○	See address 1121.	
	Scale switching method	1222	○	○	See address 1122.	Dot printing only
	#2 Scale lower limit value	1223	○	○	See address 1123.	
	#2 Scale upper limit value	1224	○	○	See address 1124.	
	Auto-switching point	1225	○	○	See address 1125.	
	Auto-switching differential	1226	○	○	See address 1126.	
	Scale selection status	1227	○	X	See address 1127.	Common

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data	Model
Channel 3	#1 Scale lower limit value	1320	○	○	See address 1120.	Common
	#1 Scale upper limit value	1321	○	○	See address 1121.	
	Scale switching method	1322	○	○	See address 1122.	Dot printing only
	#2 Scale lower limit value	1323	○	○	See address 1123.	
	#2 Scale upper limit value	1324	○	○	See address 1124.	
	Auto-switching point	1325	○	○	See address 1125.	
	Auto-switching differential	1326	○	○	See address 1126.	
	Scale selection status	1327	○	X	See address 1127.	Common
Channel 4	#1 Scale lower limit value	1420	○	○	See address 1120.	
	#1 Scale upper limit value	1421	○	○	See address 1121.	
	Scale switching method	1422	○	○	See address 1122.	Dot printing only
	#2 Scale lower limit value	1423	○	○	See address 1123.	
	#2 Scale upper limit value	1424	○	○	See address 1124.	
	Auto-switching point	1425	○	○	See address 1125.	
	Auto-switching differential	1426	○	○	See address 1126.	
	Scale selection status	1427	○	X	See address 1127.	Common
Channel 5	#1 Scale lower limit value	1520	○	○	See address 1120.	
	#1 Scale upper limit value	1521	○	○	See address 1121.	
	Scale switching method	1522	○	○	See address 1122.	Dot printing only
	#2 Scale lower limit value	1523	○	○	See address 1123.	
	#2 Scale upper limit value	1524	○	○	See address 1124.	
	Auto-switching point	1525	○	○	See address 1125.	
	Auto-switching differential	1526	○	○	See address 1126.	
	Scale selection status	1527	○	X	See address 1127.	Common
Channel 6	#1 Scale lower limit value	1620	○	○	See address 1120.	
	#1 Scale upper limit value	1621	○	○	See address 1121.	
	Scale switching method	1622	○	○	See address 1122.	Dot printing only
	#2 Scale lower limit value	1623	○	○	See address 1123.	
	#2 Scale upper limit value	1624	○	○	See address 1124.	
	Auto-switching point	1625	○	○	See address 1125.	
	Auto-switching differential	1626	○	○	See address 1126.	
	Scale selection status	1627	○	X	See address 1127.	Common

■ Data area by channel (event)

* Only multipoint printing is available for events #3 and #4.

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data
Channel 1	#1 Event setting value	1140	○	○	Reads and writes the event setup value. Data range is -19999 to 29999.
	#2 Event setting value	1141	○	○	
	#3 Event setting value*	1142	○	○	
	#4 Event setting value*	1143	○	○	
	Addresses 1140 to 1143 • For details on the decimal point in the case of the linear scaling range, see the engineering unit decimal point (address: 1□08).				
	#1 Event type	1144	○	○	Reads and writes the event type. 0: OFF 1: Event LOW 2: Event HIGH
	#2 Event type	1145	○	○	
	#3 Event type*	1146	○	○	
	#4 Event type*	1147	○	○	
	#1 Event differential	1148	○	○	Reads and writes the event differential. Data range is 0 to 29999.
	#2 Event differential	1149	○	○	
	#3 Event differential*	1150	○	○	
	#4 Event differential*	1151	○	○	
	Addresses 1148 to 1151 • For details on the decimal point in the case of the linear scaling range, see the engineering unit decimal point (address: 1□08).				
	#1 Event recording ON/OFF	1152	○	○	Reads and writes event recording ON/OFF. 0: Recording OFF 1: Recording ON
	#2 Event recording ON/OFF	1153	○	○	
	#3 Event recording* ON/OFF	1154	○	○	
	#4 Event recording* ON/OFF	1155	○	○	
	#1 Event relay No.	1156	○	○	Reads and writes the event relay No. Data range is 0 to 6.
	#2 Event relay No.	1157	○	○	
	#3 Event relay No.*	1158	○	○	
	#4 Event relay No.*	1159	○	○	
Channel 2	#1 Event setting value	1240	○	○	See address 1140.
	#2 Event setting value	1241	○	○	See address 1141.
	#3 Event setting value*	1242	○	○	See address 1142.
	#4 Event setting value*	1243	○	○	See address 1143.
	#1 Event type	1244	○	○	See address 1144.
	#2 Event type	1245	○	○	See address 1145.
	#3 Event type*	1246	○	○	See address 1146.
	#4 Event type*	1247	○	○	See address 1147.
	#1 Event differential	1248	○	○	See address 1148.
	#2 Event differential	1249	○	○	See address 1149.
	#3 Event differential*	1250	○	○	See address 1150.
	#4 Event differential*	1251	○	○	See address 1151.
	#1 Event recording start/stop	1252	○	○	See address 1152.
	#2 Event recording start/stop	1253	○	○	See address 1153.
	#3 Event recording start/stop	1254	○	○	See address 1154.
	#4 Event recording start/stop	1255	○	○	See address 1155.
	#1 Event relay No.	1256	○	○	See address 1156.

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data
Channel 2	#2 Event relay No.	1257	○	○	See address 1157.
	#3 Event relay No.*	1258	○	○	See address 1158.
	#4 Event relay No.*	1259	○	○	See address 1159.
	#1 Event setting value	1340	○	○	See address 1140.
Channel 3	#2 Event setting value	1341	○	○	See address 1141.
	#3 Event setting value*	1342	○	○	See address 1142.
	#4 Event setting value*	1343	○	○	See address 1143.
	#1 Event type	1344	○	○	See address 1144.
	#2 Event type	1345	○	○	See address 1145.
	#3 Event type*	1346	○	○	See address 1146.
	#4 Event type*	1347	○	○	See address 1147.
	#1 Event differential	1348	○	○	See address 1148
	#2 Event differential	1349	○	○	See address 1149.
	#3 Event differential*	1350	○	○	See address 1150.
	#4 Event differential*	1351	○	○	See address 1151.
	#1 Event recording start/stop	1352	○	○	See address 1152.
	#2 Event recording start/stop	1353	○	○	See address 1153.
	#3 Event recording start/stop*	1354	○	○	See address 1154.
	#4 Event recording start/stop*	1355	○	○	See address 1155.
	#1 Event relay No.	1356	○	○	See address 1156.
	#2 Event relay No.	1357	○	○	See address 1157.
	#3 Event relay No.*	1358	○	○	See address 1158.
	#4 Event relay No.*	1359	○	○	See address 1159.
Channel 4	#1 Event setting value	1440	○	○	See address 1140.
	#2 Event setting value	1441	○	○	See address 1141.
	#3 Event setting value*	1442	○	○	See address 1142.
	#4 Event setting value*	1443	○	○	See address 1143.
	#1 Event type	1444	○	○	See address 1144.
	#2 Event type	1445	○	○	See address 1145.
	#3 Event type*	1446	○	○	See address 1146.
	#4 Event type*	1447	○	○	See address 1147.
	#1 Event differential	1448	○	○	See address 1148.
	#2 Event differential	1449	○	○	See address 1149.
	#3 Event differential*	1450	○	○	See address 1150.
	#4 Event differential*	1451	○	○	See address 1151.
	#1 Event recording start/stop	1452	○	○	See address 1152.
	#2 Event recording start/stop	1453	○	○	See address 1153.
	#3 Event recording start/stop*	1454	○	○	See address 1154.
	#4 Event recording start/stop*	1455	○	○	See address 1155.
	#1 Event relay No.	1456	○	○	See address 1156.
	#2 Event relay No.	1457	○	○	See address 1157.
	#3 Event relay No.*	1458	○	○	See address 1158.
	#4 Event relay No.*	1459	○	○	See address 1159.

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data
Channel 5	#1 Event setting value	1540	○	○	See address 1140.
	#2 Event setting value	1541	○	○	See address 1141.
	#3 Event setting value*	1542	○	○	See address 1142.
	#4 Event setting value*	1543	○	○	See address 1143.
	#1 Event type	1544	○	○	See address 1144.
	#2 Event type	1545	○	○	See address 1145.
	#3 Event type*	1546	○	○	See address 1146.
	#4 Event type*	1547	○	○	See address 1147.
	#1 Event differential	1548	○	○	See address 1148
	#2 Event differential	1549	○	○	See address 1149.
	#3 Event differential*	1550	○	○	See address 1150.
	#4 Event differential*	1551	○	○	See address 1151.
	#1 Event recording start/stop	1552	○	○	See address 1152.
	#2 Event recording start/stop	1553	○	○	See address 1153.
	#3 Event recording start/stop*	1554	○	○	See address 1154.
	#4 Event recording start/stop*	1555	○	○	See address 1155.
	#1 Event relay No.	1556	○	○	See address 1156.
	#2 Event relay No.	1557	○	○	See address 1157.
	#3 Event relay No.*	1558	○	○	See address 1158.
	#4 Event relay No.*	1559	○	○	See address 1159.
Channel 6	#1 Event setting value	1640	○	○	See address 1140.
	#2 Event setting value	1641	○	○	See address 1141.
	#3 Event setting value*	1642	○	○	See address 1142.
	#4 Event setting value*	1643	○	○	See address 1143.
	#1 Event type	1644	○	○	See address 1144.
	#2 Event type	1645	○	○	See address 1145.
	#3 Event type*	1646	○	○	See address 1146.
	#4 Event type*	1647	○	○	See address 1147.
	#1 Event differential	1648	○	○	See address 1148.
	#2 Event differential	1649	○	○	See address 1149.
	#3 Event differential*	1650	○	○	See address 1150.
	#4 Event differential*	1651	○	○	See address 1151.
	#1 Event recording start/stop	1652	○	○	See address 1152.
	#2 Event recording start/stop	1653	○	○	See address 1153.
	#3 Event recording start/stop*	1654	○	○	See address 1154.
	#4 Event recording start/stop*	1655	○	○	See address 1155.
	#1 Event relay No.	1656	○	○	See address 1156.
	#2 Event relay No.	1657	○	○	See address 1157.
	#3 Event relay No.	1658	○	○	See address 1158.
	#4 Event relay No.	1659	○	○	See address 1159.

■ Data area by channel (tag name/unit)

* Tag names supported only with multipoint printing.

CH	Item	RAM/EEPROM Address	R	W	Meaning of Data
Channel 1	* Tag name (1st character)	1160	○	○	Reads and writes the tag name. 32 to 131 Converts 20h to 83h hexadecimal character codes to decimal. (See Character Code Table.)
	* Tag name (2nd character)	1161	○	○	
	* Tag name (3rd character)	1162	○	○	
	* Tag name (4th character)	1163	○	○	
	* Tag name (5th character)	1164	○	○	
	* Tag name (6th character)	1165	○	○	
	Engineering unit (1st character)	1168	○	○	Reads and writes the engineering unit. 32 to 131 Converts 20h to 83h hexadecimal character codes to decimal. (See Character Code Table.)
	Engineering unit (2nd character)	1169	○	○	
	Engineering unit (3rd character)	1170	○	○	
	Engineering unit (4th character)	1171	○	○	
	Engineering unit (5th character)	1172	○	○	
	Engineering unit (6th character)	1173	○	○	
Channel 2	* Tag name (1st character)	1260	○	○	See address 1160.
	* Tag name (2nd character)	1261	○	○	See address 1161.
	* Tag name (3rd character)	1262	○	○	See address 1162.
	* Tag name (4th character)	1263	○	○	See address 1163.
	* Tag name (5th character)	1264	○	○	See address 1164.
	* Tag name (6th character)	1265	○	○	See address 1165.
	Engineering unit (1st character)	1268	○	○	See address 1168.
	Engineering unit (2nd character)	1269	○	○	See address 1169.
	Engineering unit (3rd character)	1270	○	○	See address 1170.
	Engineering unit (4th character)	1271	○	○	See address 1171.
	Engineering unit (5th character)	1272	○	○	See address 1172.
	Engineering unit (6th character)	1273	○	○	See address 1173.
Channel 3	* Tag name (1st character)	1360	○	○	See address 1160.
	* Tag name (2nd character)	1361	○	○	See address 1161.
	* Tag name (3rd character)	1362	○	○	See address 1162.
	* Tag name (4th character)	1363	○	○	See address 1163.
	* Tag name (5th character)	1364	○	○	See address 1164.
	* Tag name (6th character)	1365	○	○	See address 1165.
	Engineering unit (1st character)	1368	○	○	See address 1168.
	Engineering unit (2nd character)	1369	○	○	See address 1169.
	Engineering unit (3rd character)	1370	○	○	See address 1170.
	Engineering unit (4th character)	1371	○	○	See address 1171.
	Engineering unit (5th character)	1372	○	○	See address 1172.
	Engineering unit (6th character)	1373	○	○	See address 1173.

CH	Item	RAM/EEPROM			Meaning of Data
		Address	R	W	
Channel 4	* Tag name (1st character)	1460	○	○	See address 1160.
	* Tag name (2nd character)	1461	○	○	See address 1161.
	* Tag name (3rd character)	1462	○	○	See address 1162.
	* Tag name (4th character)	1463	○	○	See address 1163.
	* Tag name (5th character)	1464	○	○	See address 1164.
	* Tag name (6th character)	1465	○	○	See address 1165.
	Engineering unit (1st character)	1468	○	○	See address 1168.
	Engineering unit (2nd character)	1469	○	○	See address 1169.
	Engineering unit (3rd character)	1470	○	○	See address 1170.
	Engineering unit (4th character)	1471	○	○	See address 1171.
	Engineering unit (5th character)	1472	○	○	See address 1172.
	Engineering unit (6th character)	1473	○	○	See address 1173.
Channel 5	* Tag name (1st character)	1560	○	○	See address 1160.
	* Tag name (2nd character)	1561	○	○	See address 1161.
	* Tag name (3rd character)	1562	○	○	See address 1162.
	* Tag name (4th character)	1563	○	○	See address 1163.
	* Tag name (5th character)	1564	○	○	See address 1164.
	* Tag name (6th character)	1565	○	○	See address 1165.
	Engineering unit (1st character)	1568	○	○	See address 1168.
	Engineering unit (2nd character)	1569	○	○	See address 1169.
	Engineering unit (3rd character)	1570	○	○	See address 1170.
	Engineering unit (4th character)	1571	○	○	See address 1171.
	Engineering unit (5th character)	1572	○	○	See address 1172.
	Engineering unit (6th character)	1573	○	○	See address 1173.
Channel 6	* Tag name (1st character)	1660	○	○	See address 1160.
	* Tag name (2nd character)	1661	○	○	See address 1161.
	* Tag name (3rd character)	1662	○	○	See address 1162.
	* Tag name (4th character)	1663	○	○	See address 1163.
	* Tag name (5th character)	1664	○	○	See address 1164.
	* Tag name (6th character)	1665	○	○	See address 1165.
	Engineering unit (1st character)	1668	○	○	See address 1168.
	Engineering unit (2nd character)	1669	○	○	See address 1169.
	Engineering unit (3rd character)	1670	○	○	See address 1170.
	Engineering unit (4th character)	1671	○	○	See address 1171.
	Engineering unit (5th character)	1672	○	○	See address 1172.
	Engineering unit (6th character)	1673	○	○	See address 1173.

■ Range code tables

● SRF106 (dot printing type)

Address	Channel
Address 1101	Channel 1
Address 1201	Channel 2
Address 1301	Channel 3
Address 1401	Channel 4
Address 1501	Channel 5
Address 1601	Channel 6

Range code	Range	
0	±20 mV Linear scaling range	
1	±40 mV Linear scaling range	
2	±60 mV Linear scaling range	
3	±200 mV Linear scaling range	
4	±2V Linear scaling range	
5	±5V Linear scaling range	
6	0 to 10V Linear scaling range	
10	±20 mV Direct-reading range	
11	±40 mV Direct-reading range	
12	±60 mV Direct-reading range	
13	±200 mV Direct-reading range	
14	±2V Direct-reading range	
15	±5V Direct-reading range	
16	0 to 10V Direct-reading range	
20/50	Thermocouple (R)	°C/°F
21/51	Thermocouple (S)	°C/°F
22/52	Thermocouple (B)	°C/°F
23/53	Thermocouple (K)	°C/°F
24/54	Thermocouple (E)	°C/°F
25/55	Thermocouple (J)	°C/°F
26/56	Thermocouple (T)	°C/°F
27/57	Thermocouple (N)	°C/°F
28/58	Thermocouple (Wre0-26)	°C/°F
29/59	Thermocouple (Wre5-26)	°C/°F
30/60	Thermocouple (PR40-20)	°C/°F
31/61	Thermocouple (PL II)	°C/°F
32/62	Thermocouple (Ni-NiMo)	°C/°F
33	Thermocouple (KP vs Au7Fe)	K
40/70	Resistance thermometer (Pt100)	°C/°F
41/71	Resistance thermometer (JPT100)	°C/°F

● SRF101/102/103/201/202/203 (pen printing type)

Address	Channel	Caution
Address 1101	Channel 1	
Address 1201	Channel 2	In the case of 1-pen models, this address is handled as an option address.
Address 1301	Channel 3	In the case of 1- and 2-pen models, this address is handled as an option address.

Thermocouple, dc voltage group

Range code	Range	
100	±14.00 mV	
101	±25.00 mV	
102	±70.00 mV	
105	±5.000 mV	
200/500	Thermocouple (R)	°C/°F
210/510	Thermocouple (S)	°C/°F
220/520	Thermocouple (B)	°C/°F
230/530 231/531 232/532	Thermocouple (K)	°C/°F
240/540 241/541	Thermocouple (E)	°C/°F
250/550 251/551	Thermocouple (J)	°C/°F
260/560 261/561	Thermocouple (T)	°C/°F
270/570 271/571 272/572	Thermocouple (N)	°C/°F
280/580	Thermocouple (Wre0-26)	°C/°F
290/590	Thermocouple (Wre5-26)	°C/°F
310/610 311/611 312/612	Thermocouple (PL II)	°C/°F
320/620	Thermocouple (Ni-NiMo)	°C/°F

Resistance thermometer, dc voltage group

Range code	Range		
100	±14.00 mV		
101	±25.00 mV		
102	±70.00 mV		
105	±5.000 mV		
410	Resistance thermometer	Pt100	-200.0 to +300.0 °C/°F
402	Resistance thermometer	Pt100	-140.0 to +150.0 °C/°F
403	Resistance thermometer	Pt100	-100.0 to +100.0 °C/°F
411	Resistance thermometer	JPt100	-200.0 to +300.0 °C/°F
412	Resistance thermometer	Pt100	-140.0 to +150.0 °C/°F
413	Resistance thermometer	Pt100	-100.0 to +100.0 °C/°F
701	Resistance thermometer	Pt100	-328.0 to +572.0 °C/°F
702	Resistance thermometer	Pt100	-220.0 to +302.0 °C/°F
703	Resistance thermometer	Pt100	-148.0 to +212.0 °C/°F
711	Resistance thermometer	JPt100	-328.0 to +572.0 °C/°F
712	Resistance thermometer	Pt100	-220.0 to +302.0 °C/°F
713	Resistance thermometer	Pt100	-148.0 to +212.0 °C/°F

● **Bit information data**

No.1 SRF101/102/103/201/202/203 option information (address 398)

2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
⑯	⑮	⑭	⑬	⑫	⑪	⑩	⑨	⑧	⑦	⑥	⑤	④	③	②	①

① : RS-485 communication option
0: Communication option not supported
1: Communication option supported

② : RS-232C communication option
0: Communication option not supported
1: Communication option supported

③ : DI option supported
0: DI option supported not supported
1: DI option supported

④ : DO option supported
0: DO option supported not supported
1: DO option supported

⑤ : —

⑥ : —

⑦ : —

⑧ : —

⑨ : No.3 pen RTD, voltage input
0: Not supported 1: Supported

⑩ : No.3 pen thermocouple, voltage input
0: Not supported 1: Supported

⑪ : No.2 pen RTD, voltage input
0: Not supported 1: Supported

⑫ : No.2 pen thermocouple, voltage input
0: Not supported 1: Supported

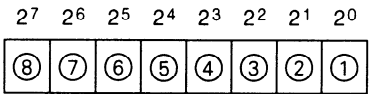
⑬ : No.1 pen RTD, voltage input
0: Not supported 1: Supported

⑭ : No.1 pen thermocouple, voltage input
0: Not supported 1: Supported

⑮ : —

⑯ : —

SRF106 option information (address 398)



① : RS-485 communication option
0: Communication option not supported
1: Communication option supported

② : RS-232C communication option
0: Communication option not supported
1: Communication option supported

③ : DI option supported
0: DI option supported not supported
1: DI option supported

④ : DO option supported
0: DO option supported not supported
1: DO option supported

⑤ : —

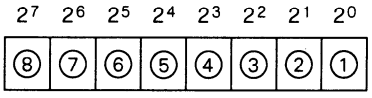
⑥ : —

⑦ : —

⑧ : —

No.2 Event status summary (address 400, 500)

This summary indicates whether or not an event has been generated in channels 1 to 6.



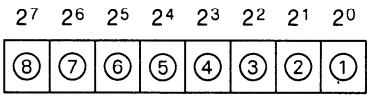
① : Channel 1 event status
② : Channel 2 event status
③ : Channel 3 event status
④ : Channel 4 event status
⑤ : Channel 5 event status
⑥ : Channel 6 event status

0: Event not generated
1: Event generated

⑦ : —

⑧ : —

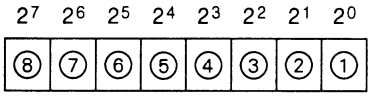
No.3 Event status (address 501 to 506)



① : #1 Lower-limit event status
② : #1 Upper-limit event status
③ : #2 Lower-limit event status
④ : #2 Upper-limit event status
⑤ : #3 Lower-limit event status
⑥ : #3 Upper-limit event status
⑦ : #4 Lower-limit event status
⑧ : #4 Upper-limit event status

0: Event not generated
1: Event generated

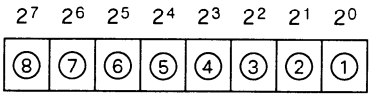
No.4 Event relay status summary (address 550 option)



① : #1 Event relay status
② : #2 Event relay status
③ : #3 Event relay status
④ : #4 Event relay status
⑤ : #5 Event relay status
⑥ : #6 Event relay status
⑦ : —
⑧ : —

0: Event not generated
1: Event generated

No.5 External contact input status summary (address 690 option)



① : #1 DI input status
② : #2 DI input status
③ : #3 DI input status
④ : #4 DI input status

0: OFF
1: ON

⑤ : —
⑥ : —
⑦ : —
⑧ : —

Chapter 6 COMMUNICATION PROGRAM FOR MASTER STATION

6-1 Programming Precautions

- The maximum response time-out of the instrument is one second. Therefore, set the response time-out to one second.
- If no response is obtained within one second, resend the same message. When there is no response even after two resends, assume that a communication error has occurred.
- The above resend is required since a message may not be property transmitted due to noise or the like during communication.

NOTE Use the "X" and "x" device ID codes alternately during message resend from the master station, to make it easier to identify whether the received response message is the latest message or the preceding one.

6-2 Communication Program Examples

The program examples in this section are for the MS-DOS version of N_{88}-Japanese BASIC (86) running on an NEC PC-9800 Series PC.

This program can be used as reference in writing programs. All operations by this program are not guaranteed.

■ Before executing the program

Check the instrument communication conditions and station address.

Set the transmission rate (baud rate) of the personal computer to that of the instrument using the MS-DOS SWITCH command. For details on the SWITCH command, refer to the MS-DOS manual.

■ Executing the program

The communication specifications used in the program examples are as follows:

Parity : Even (set on line 120 of the program)

Data length : 8 bits (set on line 120 of the program)

Stop bit : 1 (set on line 120 of the program)

Station address : 1 (set on line 130 of the program)

Make sure that these conditions and transmission rate (baud rate) both match on the SRF100 and personal computer.

■ Data read/write sample programs

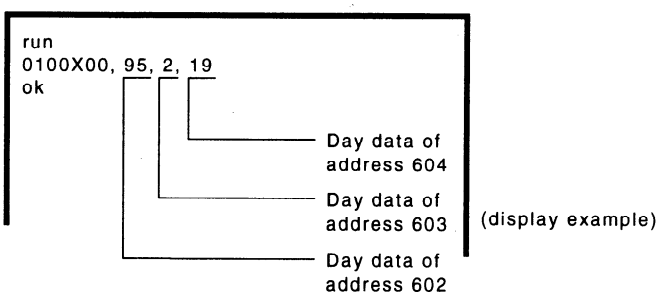
● **[Example 1]** **Read date (year, month, day) of SRF100 clock (addresses 602 to 604)**

```
100 ' (example 1)
110 '***** Set and initialize communication conditions *****
120 OPEN "COM:E81NN" AS #1
130 DEVADR$="0100":COMDEV$="X"
140 STX$=CHR$(2):EXT$=CHR$(3)
200 '***** Generate transmission message *****
210 TX$=STX$+DEVADR$+COMDEV$+"RS,602W,3"+ETX$
220 '***** Send message to SRF *****
230 PRINT #1,TX$
240 '**** Receive message from SRF *****
250 LINE INPUT #1,RX$
260 '**** Output to screen *****
270 PRINT RX$
280 END
```

Screen display at program execution

```
run
0100X00,95,2,19
Ok
```

When this program is executed, the screen on the personal computer changes as follows:



[!] HANDLING PRECAUTIONS

This program is displayed to indicate the basic communication procedure. So, this program example does not include functions such as resend at error checking of the response time-out that is required in 6-1 Programming Precautions. The following bugs may occur in the program.

(1) If there is trouble such as a disconnected communication cable, the program may hang up at line 230.

(2) When the receive buffer contains superfluous characters, the receive message may be stored to RX$ with the buffer still containing the unwanted superfluous characters.

(3) When something prevents the CR-LF from being received, the program may hang up at line 250.

● **[Example 2] Write date (year, month, day) of SRF100 clock (addresses 602 to 604)**

```
100 '(example 2)
110 '***** Set and initialize communication conditions *****
120 OPEN "COM:E81NN" AS #1
130 DEVADR$="0100":COMDEV$="X"
140 STX$=CHR$(2):ETX$=CHR$(3)
200 '***** Generate transmission message *****
210 TX$=STX$+DEVADR$+COMDEV$+"WS,602W,95,1,1"+ETX$
220 '***** Send message to SRF *****
230 PRINT #1,TX$
240 '***** Receive message from SRF *****
250 LINE INPUT #1,RX$
260 '***** Output to screen *****
270 PRINT RX$
280 END
```

Screen display at program execution

```
run
0100X00
0k
```

When this program is executed, the screen on the personal computer changes as follows:

```
run
0100X00
ok
```

(display example)

This program rewrites line 210 in example 1, and writes the data "1995, January, 1st" to the SRF using the WS command. The structure of the program is the same as that in example 1, so the same bugs as in example 1 may occur.

● **[Example 3]** **Of the bugs in example 1, this program corrects bugs relating to the receive buffer. It also adds a function for calculating the checksum of the data link layer (see page 4-4).**

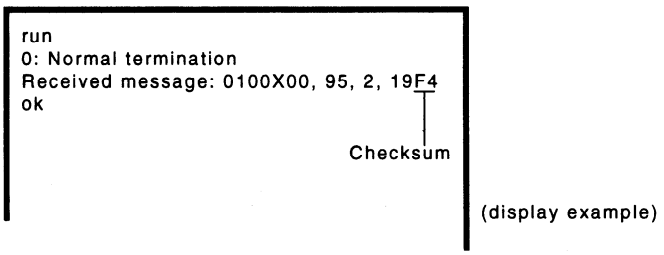
```
100 ' (example 3)
110 '***** Set and initialize communication conditions *****
120 OPEN "COM:E81NN" AS #1
130 DEVADR$="0100":COMDEV$="X"
140 STX$=CHR$(2):ETX$=CHR$(3)
150 CRLF$=CHR$(&HD)+CHR$(&HA)
200 '***** Generate transmission message *****
210 TX$=STX$+DEVADR$+COMDEV$+"RS,602W,3"+ETX$
220 X$=TX$:GOSUB *CALSUM:TX$=X$
230 '***** Send message to SRF *****
240 GOSUB *CLEAN:ER$="0:Normal termination"
250 PRINT #1,TX$
260 '***** Receive and examination of the message from SRF *****
270 GOSUB *RECEIVER
280 GOSUB *RX.CHECK
290 '***** Output to screen *****
300 PRINT ER$
310 PRINT "Received message:";RX$
320 END
1000 '===== Clear receive buffer =====
1010 *CLEAN
1030   IF LOC(#1) THEN RX$=INPUT$(1,#1):GOTO *CLEAN
1040   RX$=" "
1050 RETURN
1100 '===== Message reception sub-routine =====
1110 *RECEIVER
1130   WHILE RIGHT$(RX$,1)<>STX$
1140     IF LOC(#1) THEN RX$=INPUT$(1,#1)
1150   WEND
1160   WHILE RIGHT$(RX$,2)<>CRLF$
1170     IF LOC(#1) THEN RX$=RX$+INPUT$(1,#1)
1180   WEND
1200 RX$=LEFT$(RX$,LEN(RX$)-2)
1210 RETURN
1300 '*==== Calculate checksum =====
1310 *CALSUM
1320   SUM=0
1330   FOR I=1 TO LEN(X$)
1340     SUM=SUM+ASC(MID$(X$,I,1))
1350   NEXT I
1360   SUM=-SUM:SUM=SUM AND &HFF
1370   SUM$=RIGHT$("00"+HEX$(SUM),2)
1380   X$=$+SUM$
1390 RETURN
```

```
1400 '===== Examine received checksum =====
1410 *RX. CHECK
1420    IF LEFT$(ER$.1)<>"0"          THEN RETURN
1430    IF LEN(RX$)<=2                THEN ER$="1:Insufficient
received message length"          :RETURN
1440    X$=LEFT$(RX$,LEN(RX$)-2): GOSUB *CALSUM
1450    IF RIGHT$(RX$,2)<>SUM$        THEN ER$="2:Received
message checksum error"           :RETURN
1460    IF MID$ (RX$,2,4)<>DEVADR$ THEN ER$="3:Received
message address error"            :RETURN
1470    IF MID$ (RX$,6,1)<>COMDEV$ THEN ER$="4:Received
message device code"              :RETURN
1480    IF MID$ (RX$,7,2)<>"00"       THEN ER$="5:Received
message error response"           :RETURN
1490 RETURN
```

Screen display at program execution

```
run
0: Normal termination
Received message: 0100X00,95,2,19F4
Ok
```

When this program is executed, the screen on the personal computer changes as follows:



This program clears the receive buffer by the sub-routine "*CLEAN" before sending the command (line 250). It also receives the message from the SRF by the sub-routine "*RECEIVER".

This sub-routine discards all data before the STX is received. After STX is received, the message is stored to RX$ until CR-LF is received. The checksum is calculated by the sub-routine "*CALSUM". When the messages from STX through to ETX are entered to X$ and are called by the sub-routine, the checksum is appended to X$. SUM$ contains only the checksum.

● **[Example 4]** **Of the bugs in example 1, the bug in example 3 and bugs relating to the response time-out are corrected.**

```
100 ' (example 4)
110 '***** Set and initialize the communication conditions. Define constants
*****
120 OPEN "COM:E81NN" AS #1
130 DEVADR$="0100":COMDEV$="X"
140 STX$=CHR$(2):ETX$=CHR$(3)
150 CRLF$=CHR$(&HD)+CHR$(&HA)
160 DEF
FNST$(A)=RIGHT$("0"+RIGHT$(STR$(A),LEN(STR$(A))-1),2)
200 '***** Send and receive messages *****
210 ADR=602:WORD=3:TRY=2
220 GOSUB *COM.MAIN
230 '***** Output to screen *****
240 PRINT "Received message:";RX$
250 END
1000 '===== Clear receive buffer =====
1010 *CLEAN
1030   IF LOC(#1) THEN RX$=INPUT$(1,#1):GOTO *CLEAN
1040   RX$=" "
1050 RETURN
1100 '===== Message receive sub-routine =====
1110 *RECEIVER
1120   PHASE=2:GOSUB *TIMERSET
1130   WHILE RIGHT$(RX$,1)<>STX$
1140     IF LOC(#1) THEN RX$=INPUT$(1,#1)
1150   WEND
1160   WHILE RIGHT$(RX$,2)<>CRLF$
1170     IF LOC(#1) THEN RX$=RX$+INPUT$(1,#1)
1180   WEND
1190   TIME$ OFF:PHASE=0
1200   RX$=LEFT$(RX$,LEN(RX$)-2)
1210 RETURN
1300 '*==== Calculate checksum =====
1310 *CALSUM
1320   SUM=0
1330   FOR I=1 TO LEN(X$)
1340     SUM=SUM+ASC(MID$(X$,I,1))
1350   NEXT I
1360   SUM=-SUM:SUM=SUM AND &HFF
1370   SUM$=RIGHT$("00"+HEX$(SUM),2)
1380   X$=X$+SUM$
1390 RETURN
1400 '===== Examine received checksum =====
1410 *RX.CHECK
1420   IF LEFT$(ER$,1)<>"0"      THEN RETURN
```

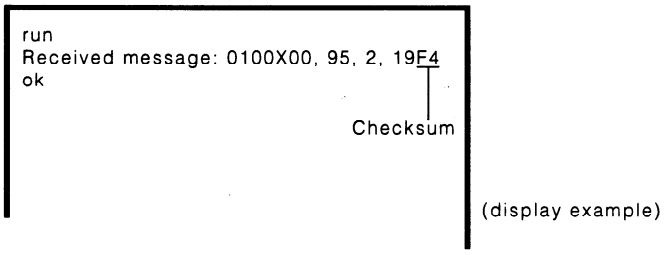
```
1430    IF LEN(RX$)<=2              THEN ER$="1:Insufficient
received message length "       :RETURN
1440    X$=LEFT$(RX$,LEN(RX$)-2):GOSUB *CALSUM
1450    IF RIGHT$(RX$,2)<>SUM$      THEN ER$="2:Received
message checksum error"         :RETURN
1460    IF MID$(RX$,2,4)<>DEVADR$ THEN ER$="3:Received
message address error"          :RETURN
1470    IF MID$(RX$,6,1)<>COMDEV$ THEN ER$="4:Received
message device code"            :RETURN
1480    IF MID$(RX$,7,2)<>"00"      THEN ER$="5:Received
message error response"         :RETURN
1490 RETURN
1500 '===== Message reception/transmission control =====
1510 *COM.MAIN
1520   ER$="0:Normal termination"
1530   GOSUB *SENDER
1540   GOSUB *RECEIVER
1550   GOSUB *RX.CHECK
1570 RETURN
1600 '===== Time-out processing =====
1610 *TIMEUP
1620   TIME$ OFF
1630   TRY=TRY-1
1640   IF TRY>0 THEN GOTO *COM.MAIN
1650   IF PHASE=1 THEN ER$="6:Time-out (sending message)"
1660   IF PHASE=2 THEN ER$="7:Time-out (receiving message)"
1670   PRINT ER$
1680   PRINT "Sent message:";TX$
1690   PRINT "Received message:";RX$: END
1700 '===== Send message sub-routine =====
1710 *SENDER
1720   Y=ADR :GOSUB *BIN.TO.ASC:AR$=Y$
1730   Y=WORD:GOSUB *BIN.TO.ASC:WD$=Y$
1740   X$=STX$+DEVADR$+COMDEV$+"RS,"+AR$+"W," +WD$+ETX$
1750   GOSUB *CALSUM:TX$=X$
1780   PHASE=1:GOSUB *TIMERSET
1790   PRINT #1,TX$
1800   TIME$ OFF:PHASE=0
1810 RETURN
1900 '===== Make text string sub-routine =====
1910 *BIN.TO.ASC
1920   Y$=STR$(Y)
1930   IF LEFT$(Y$,1)=" " THEN Y$=RIGHT$(Y$,LEN(Y$)-1)
1940 RETURN
2000 '===== Set time interrupts =====
2010 *TIMERSET
2020   NOW$=TIME$
```

```
2030    HH$=LEFT$(NOW$,2)       :HH=VAL(HH$)
2040    MM$=MID$(NOW$,4,2)      :MM=VAL(MM$)
2050    SS$=RIGHT$(NOW$,2)      :SS=VAL(SS$)
2060    SS=SS+3
2070    IF SS>=60   THEN SS=SS-60:MM=MM+1
2080    IF MM>=60   THEN MM=MM-60:HH=HH+1
2090    IF HH>=24   THEN HH=0
2100    HH$=FNST$(HH)
2110    MM$=FNST$(MM)
2120    SS$=FNST$(SS)
2130    TUP$=HH$+":"+MM$+":"+SS$
2140    ON TIME$=TUP$ GOSUB *TIMEUP
2150    TIME$ ON
2160 RETURN
```

Screen display at execution

```
run
Received message: 0100X00,95,2,19F4
Ok
```

When this program is executed, the screen on the personal computer changes as follows:



By this program, response time-out is monitored using the time interrupt function. The time interrupt three seconds ahead is activated by the sub-routine "*TIMERSET" before functions (e.g. send/receive message) that are likely to hang up are executed. The reason that the response time-out is set to three seconds as opposed to the specification response time-out of two seconds is to take into consideration errors of one second or less when the interrupt time is set. The resend function is created using the variable "TRY". Also, the sub-routine (*BIN.TO.ASC) for turning numerics into a character string is introduced in this program.

● **[Example 5] Display PV on the screen based on example 4.**

```
100 ' (example 5)
110 '***** Set and initialize the communication conditions. Define constants
*****
120 OPEN "COM:E81NN" AS #1
130 DEVADR$="0100":COMDEV$="X"
140 STX$=CHR$(2):ETX$=CHR$(3)
150 CRLF$=CHR$(&HD)+CHR$(&HA)
160 DEF
FNST$(A)=RIGHT$("0"+RIGHT$(STR$(A),LEN(STR$(A))-1),2)
170 DIM RXDATA(6),CODE(6),PV(6),MDP(6),DP(6)
180 CLS
200 '***** Read and display data *****
210 GOSUB *READ1
220 GOSUB *READ2
230 NXTIME=INT(VAL(RIGHT$(TIME$,2))/10)*10+10
240 WHILE (1)
250  IF VAL(RIGHT$(TIME$,2))=NXTIME THEN GOSUB *READ2
260 WEND
1000 '===== Clear receive buffer =====
1010 *CLEAN
1030   IF LOC(#1) THEN RX$=INPUT$(1,#1):GOTO *CLEAN
1040   RX$=" "
1050 RETURN
1100 '===== Receive message sub-routine =====
1110 *RECEIVER
1120   PHASE=2:GOSUB *TIMERSET
1130   WHILE RIGHT$(RX$,1)<>STX$
1140     IF LOC(#1) THEN RX$=INPUT$(1,#1)
1150   WEND
1160   WHILE RIGHT$(RX$,2)<>CRLF$
1170     IF LOC(#1) THEN RX$=RX$+INPUT$(1,#1)
1180   WEND
1190   TIME$ OFF:PHASE=0
1200   RX$=LEFT$(RX$,LEN(RX$)-2)
1210 RETURN
1300 '*==== Calculate checksum =====
1310 *CALSUM
1320   SUM=0
1330   FOR I=1 to LEN(X$)
1340     SUM=SUM+ASC(MID$(X$,I,1))
1350   NEXT I
1360   SUM=-SUM:SUM=SUM AND &HFF
1370   SUM$=RIGHT$("00"+HEX$(SUM),2)
1380   X$=X$+SUM$
1390 RETURN
```

```
1400 '===== Examine received checksum =====
1410 *RX.CHECK
1420   IF LEFT$(ER$,1)<>"0"        THEN RETURN
1430   IF LEN(RX$)<=2              THEN ER$="1:Insufficient
received message length"          :RETURN
1440   X$=LEFT$(RX$,LEN(RX$)-2):GOSUB *CALSUM
1450   IF RIGHT$(RX$,2)<>SUM$      THEN ER$="2:Received
message checksum error"           :RETURN
1460   IF MID$(RX$,2,4)<>DEVADR$ THEN ER$="3:Received
message address error"            :RETURN
1470   IF MID$(RX$,6,1)<>COMDEV$ THEN ER$="4:Received
message device code"              :RETURN
1480   IF MID$(RX$,7,2)<>"00"      THEN ER$="5:Received
message error response"           :RETURN
1490 RETURN
1500 '===== Message reception/transmission control =====
1510 *COM.MAIN
1520   ER$="0:Normal termination"
1530   GOSUB *SENDER
1540   GOSUB *RECEIVER
1550   GOSUB *RX.CHECK
1560   GOSUB *CUTOUT
1570 RETURN
1600 '===== Time-out processing =====
1610 *TIMEUP
1620   TIME$ OFF
1630   TRY=TRY-1
1640   IF TRY>0 THEN GOTO *COM.MAIN
1650   IF PHASE=1 THEN ER$="6:Time-out (sending message)"
1660   IF PHASE=2 THEN ER$="7:Time-out (receiving message)"
1670   LOCATE 0,8: PRINT ER$
1680   PRINT "Sent message:" ;TX$
1690   PRINT "Received message:" ;RX$: END
1700 '===== Send message sub-routine =====
1710 *SENDER
1720   Y=ADR :GOSUB *BIN.TO.ASC:AR$=Y$
1730   Y=WORD:GOSUB *BIN.TO.ASC:WD$=Y$
1740   X$=STX$+DEVADR$+COMDEV$+"RS,"+AR$+"W,"+WD$+ETX$
1750   GOSUB *CALSUM:TX$=X$
1780   PHASE=1:GOSUB *TIMERSET
1790   PRINT #1,TX$
1800   TIME$ OFF:PHASE=0
1810 RETURN
1900 '===== Make text string sub-routine =====
1910 *BIN.TO.ASC
1920   Y$=STR$(Y)
1930   IF LEFT$(Y$,1)=" " THEN Y$=RIGHT$(Y$,LEN(Y$)-1)
1940 RETURN
```

```
2000 '===== Set time interrupt =====
2010 *TIMERSET
2020   NOW$=TIME$
2030   HH$=LEFT$(NOW$,2)    :HH=VAL(HH$)
2040   MM$=MID$(NOW$,4,2)   :MM=VAL(MM$)
2050   SS$=RIGHT$(NOW$,2)   :SS=VAL(SS$)
2060   SS=SS+3
2070   IF SS>=60 THEN SS=SS-60:MM=MM+1
2080   IF MM>=60 THEN MM=MM-60:HH=HH+1
2090   IF HH>=24 THEN HH=0
2100   HH$=FNST$(HH)
2110   MM$=FNST$(MM)
2120   SS$=FNST$(SS)
2130   TUP$=HH$+":"+MM$+":"+SS$
2140   ON TIME$=TUP$ GOSUB *TIMEUP
2150   TIME$ ON
2160 RETURN
2200 '===== Cut out data =====
2210 *CUTOUT
2220   IF LEFT$(ER$,1)<>"0" THEN RETURN
2230   K=1:J=10:TEMP1$=""
2240   WHILE (TEMP1$<>ETX$)
2250     TEMP1$="":TEMP2$=""
2260     WHILE ((TEMP1$<>",") AND (TEMP1$<>ETX$))
2270       TEMP2$=TEMP2$+TEMP1$
2280       TEMP1$=MID$(RX$,J,1):J=J+1
2290     WEND
2300     RXDATA(K)=VAL(TEMP2$):K=K+1
2310   WEND
2320 RETURN
2400 '===== Read range code and decimal point position =====
2410 *READ1
2420   LOCATE 0,0:PRINT "+"
2430   WORD=1
2440   FOR CH=1 to 6
2450     ADR=1001+100*CH:TRY=2:GOSUB *COM.MAIN
2460     CODE(CH)=RXDATA(1)
2470     ADR=1005+100*CH:TRY=2:GOSUB *COM.MAIN
2480     MDP(CH)=RXDATA(1)
2490     ADR=1008+100*CH:TRY=2:GOSUB *COM.MAIN
2500     DP(CH)=RXDATA(1)
2510     IF CODE(CH)>=10 THEN DP(CH)=MDP(CH)
2520   NEXT CH
2530   LOCATE 0,0:PRINT " "
2540 RETURN
2600 '===== Read and display PV =====
2610 *READ2
2620    LOCATE 0,0:PRINT "*"
```

```
2630     ADR=401:WORD=6:TRY=2:GOSUB *COM.MAIN
2640     FOR CH=1 TO 6:PV(CH)=RXDATA(CH):NEXT CH
2650     FOR CH=1 TO 6
2660       LOCATE 0,CH:PRINT CH;"Channel";
2670       IF PV(CH)=-20000 THEN PRINT "     -OL" :GOTO
*EXIT
2680       IF PV(CH)=30000  THEN PRINT "     +OL" :GOTO
*EXIT
2690       IF PV (CH)=32767 THEN PRINT "     ---" :GOTO
*EXIT
2700       IF PV(CH)=-32767 THEN PRINT "     OFF" :GOTO
*EXIT
2710       IF DP(CH)=0      THEN PRINT USING "#######"
;PV(CH)
2720       IF DP(CH)=1      THEN PRINT USING "#####.#"
;PV(CH)/10
2730       IF DP(CH)=2      THEN PRINT USING "####.##"
;PV(CH)/100
2740       IF DP(CH)=3      THEN PRINT USING "###.###"
;PV(CH)/1000
2750       IF DP(CH)=4      THEN PRINT USING "##.####"
;PV(CH)/10000
2760     *EXIT
2770     NEXT CH
2780     LOCATE 0,0:PRINT " "
2790     NXTIME=NXTIME+10:IF NXTIME=60 THEN NXTIME=0
2800 RETURN
```

Screen display at program execution

```
*
Channel 1       -OL
Channel 2    1200.0
Channel 3   -100.00
Channel 4       OFF
Channel 5       +OL
Channel 6      2241
```

When this program is executed, the screen on the personal computer changes as follows:

```
*←Blinks
Channel 1       -OL
Channel 2    1200.0
Channel 3   -100.00
Channel 4       OFF
Channel 5       +OL
Channel 6      2241
```

(display example)

By this program, data relating to range code and decimal point position is read by the sub-routine "*READ1", and the PV data is read by the sub-routine "*READ2". At line 250 of the program, *READ2 is copied every 10 seconds. Generally, the range code and decimal point data do not change during recorder operation, so the range code and decimal point position are read only once at the beginning of the program. The sub-routine "*CUT-OUT" cuts out multiple data items from the received message.

Chapter 7 TROUBLESHOOTING

■ Check items in case communication is disabled

① Make sure that RS-232C connections are correctly wired.

② Make sure tht the communication conditions for the SRF100 match those of the host computer.

If any one of the following settings between stations differ, communication is disabled. The setting that can be used on the SRF100 is underlined.

Transmission rate : 1200, 2400, 4800, 9600 bps

Data length : 7, 8 bits

Stop bit : 1 stop bit, 2 stop bits

Parity : Non parity, odd parity, even parity

③ Check that the destination address of the command frame transmitted from the host computer matches the station address of the SRF.

The SRF default station address is 0. The instrument will not respond even when the destination address of the command frame is set to 00 (30H, 30H).

④ Use the upper case for all characters other than the device ID code ("X" or "x" with this instrument).

Chapter 8 SPECIFICATIONS

■ RS-232C Specifications

Item	Specification
Transmission mode	Unbalanced
Transmission line	3-wire system
Signal level	Input data 0 : +3V min. Input data 1 : -3V max. Output data 1 : +5V min. Output data 1 : -5V max.
Transmission rate (bps)	4800, 9600
Transmission distance	15 m max.
Communication method	Half duplex
Synchronization	Start/stop transmission
Data format	8 data bits, 1 stop bit, even parity 8 data bits, 2 stop bits, non parity
Error detection	Parity check, checksum
Communication address	0 to 127 (Communication functions are disabled when set to 0.)
Network type	1:1

■ RS-485 Specifications

Item	Specification
Transmission mode	Balanced
Transmission line	5-wire system/3-wire system
Signal level	Input data 0 : -0.2V max. Input data 1 : +1V min. Output data 1 : -0.2V max. Output data 1 : +2V min.
Transmission rate (bps)	4800, 9600
Transmission distance	500 m max. (300 m when connected with the MA500 DigitroniK interface module)
Communication method	Half duplex
Synchronization	Start/stop transmission
Data format	8 data bits, 1 stop bit, even parity 8 data bits, 2 stop bits, non parity
Error detection	Parity check, checksum
Communication address	0 to 127 (Communication functions are disabled when set to 0.)
Network type	1:N (max. 31 units)

APPENDIX

■ Character Code Table

Upper Bits / Lower Bits	2	3	4	5	6	7	8
0		0	@	P	`	p	³
1	!	1	A	Q	a	q	˙
2	"	2	B	R	b	r	₀
3	#	3	C	S	c	s	•
4	$	4	D	T	d	t	
05	%	5	E	U	e	u	
6	&	6	F	V	f	v	
7	´	7	G	W	g	w	
8	(	8	H	X	h	x	
9	)	9	I	Y	i	y	
A	*	:	J	Z	j	z	
B	+	;	K	[	k	Ω	
C	,	<	L	¥	l	ʊ	
D	—	=	M	]	m	μ	
E	.	>	N	^	n	²	
F	/	?	O	_	o	₂	

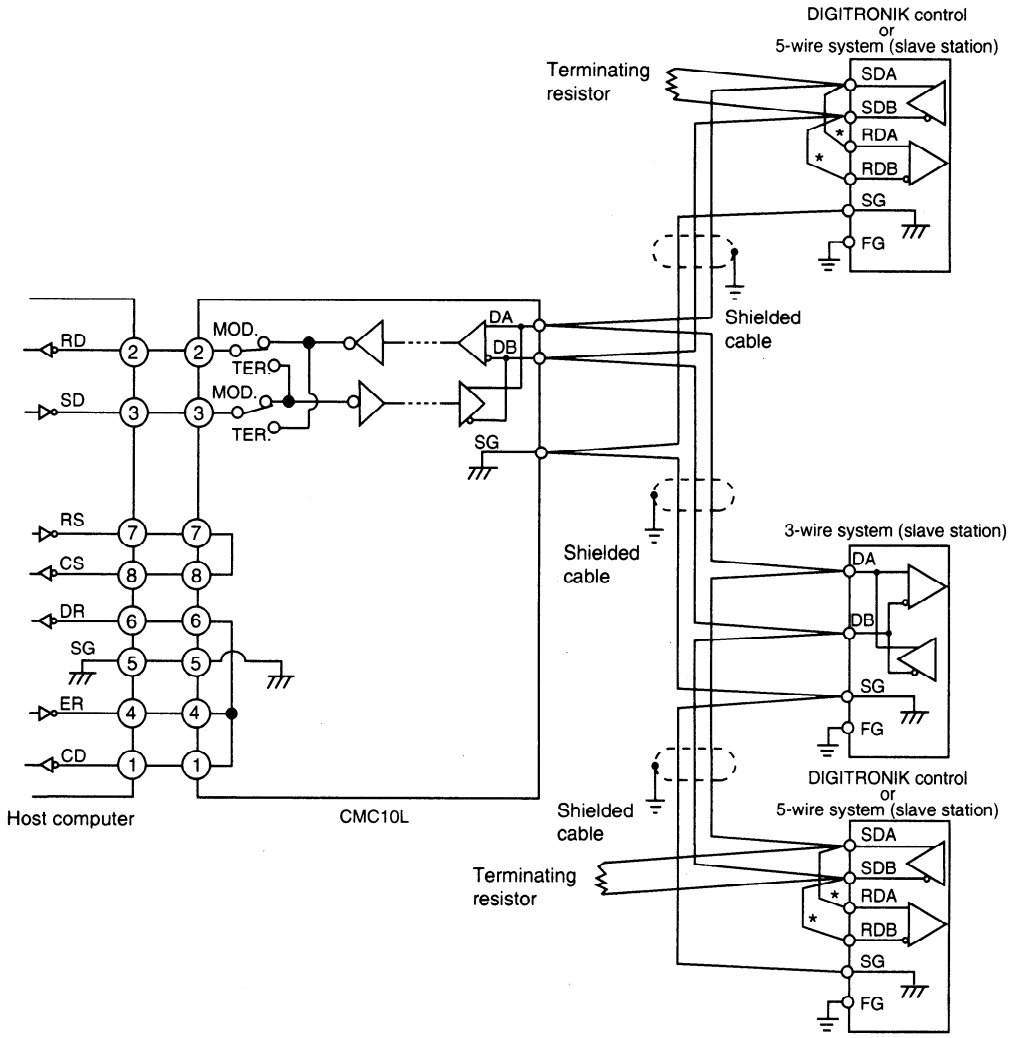
■ Code Table

Upper Bits / Lower Bits	0	1	2	3	4	5	6	7
0			SPACE	0	@	P	`	p
1			!	1	A	Q	a	q
2	STX		"	2	B	R	b	r
3	ETX		#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A	LF		*	:	J	Z	j	z
B			+	;	K	[	k	{
C			,	<	L	¥	l	¦
D	CR		—	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	

The shaded areas ( ) are not used by this communication system. (The codes depend on the station.)

■ Connection with CMC10L

The CMC10L001A000 is available as an RS-232C/RS-485 (3-wire system) converter from Yamatake Corporation. The following diagram shows an example of wiring using a straight cable for a host computer in the terminal mode:



Connect two terminating resistors of 150Ω±5%, 1/2W min. to the instrument at each end of the transmission line.

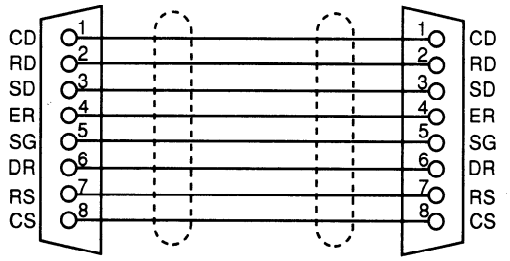
Connect only one end of the shielded wire to the frame ground (*) must be wired externally.

Connect the master station SD to the slave station RD, and the master station RD to the slave station SD.
To execute this connection, set the MODE switch provided in the CMC10L as shown in the following table in accordance with the host computer side RS-232C connector pin arrangement (modem/terminal) and the type of cable (cross/straight) used:

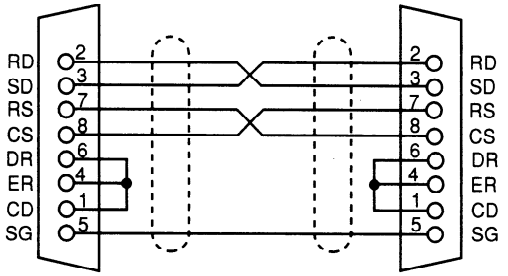
RS-232C	Cable type	MODE switch
TERMINAL	Straight	MODEM
TERMINAL	Cross	TERMINAL
MODEM	Straight	TERMINAL
MODEM	Cross	MODEM

● RS-232C cable

Straight: An RS-232C cable with a D-Sub (9-pin) connector at each end where pins with the same number are mutually connected (for example, pin ② to pin ②, and pin ③ to ③)

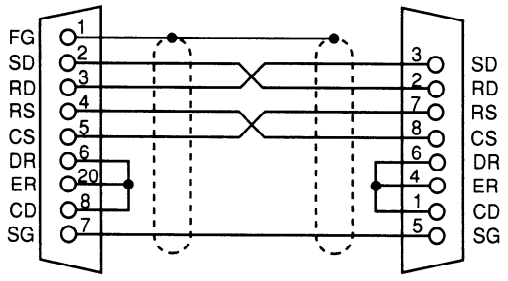


Cross: An RS-232C cable with a D-Sub (9-pin) connector at each end where different number pins are connected (for example, pin ② to pin ③, and pin ③ to pin ②)



D-Sub (25-pin) – D-Sub (9-pin) conversion cable:

An RS-232C cable for conversion between D-Sub (25-pin) and D-Sub (9-pin)



Revision History

Printed Date	Manual Number	Edition	Revised pages	Description
97-01	**CP-UM-1668E**	**1st Edition**		
01-02		**2nd Edition**		Overall revision
04-03		**3rd Edition**		RESTRICTIONS ON USE changed
			ii,iii	description of WARNING and CAUTION changed
			1-1	description of CPL changed
			2-1	diagram of terminal No.2 and 3 changed
				part No. 81408811-001 deleted
				RS-232C connector signal tables (25pins and 14pins) deleted
			2-2,2-3	HANDLING PRECAUTON added
			5-5	Event data's note changed
			5-11	Meaninng of Data at Address 1108 changed
				note changed
			6-1	time-out: two seconds to one second changed
			Appendix-3	diagram changed
			Appendix-4	RS-232C cable Straight,Cross: pin No.2 and 3 changed

YAMATAKE

Specifications are subject to change without notice.

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This has been printed on recycled paper. (01)

Printed in Japan.
1st Edition: Issued in Jan., 1997
3rd Edition: Issued in Mar., 2004(B)