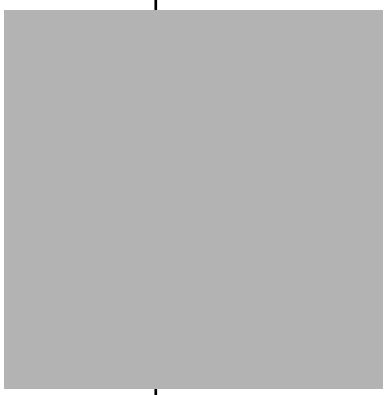
No. CP-UM-1572E

DIGITRONIK
CPL Communications
User's Manual
SDC20/21



Yamatake Corporation

RESTRICTIONS ON USE

When using this product in applications that require particular safety or when using this product in important facilities, pay attention to the safety of the overall system and equipment. For example, install fail-safe mechanisms, carry out redundancy checks and periodic inspections, and adopt other appropriate safety measures as required.

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.

Introduction

Thanks for the choice of the DIGITRONIK digital indicating Controller SDC20/21.
The CPL (Control Products Link) communication means a base band system simplified communication whose connection object is a personal computer or equivalent.
This instruction manual not only outlines the CPL communication functions of the SDC20/21, but also describes its wiring methods, communication procedure, communication data table, troubleshooting, and communication specifications.
The items required for the SDC20/21 CPL communication functions to be properly used are given in this manual.
Persons in charge of design or maintenance of operation panels or equipment using the SDC20/21 CPL communication functions should read this manual without fail.

PRECAUTIONS

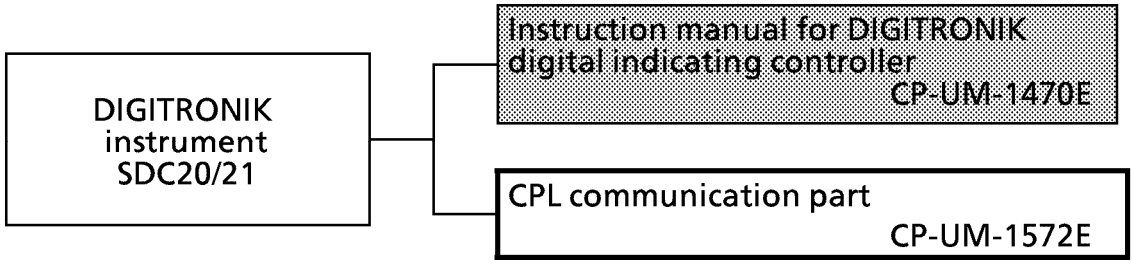
If it is necessary to change the parameters of the SDC20/21 frequently during communication, be sure to write 1 (enable) at the "RAM write enable bit word address (312W)", then write data at addresses of RAM.

If the "RAM write enable bit" is 0 (disable), data is written at addresses of EEPROM.
The guaranteed data write count at EEPROM addresses is limited to 10,000 times.
For the "RAM write enable bit", see "Run status relation addresses" in 5-2.

Note that the data in RAM is cleared, and the data in EEPROM is copied on RAM if the power supply to the SDC20/21 is interrupted.

Positioning of this instruction manual

This instruction manual is essential to data exchange with a personal computer or the like, or a control system configuration, using the communication functions of the DIGITRONIK instruments.
This instruction manual provides descriptions on the wiring methods, communication procedure, troubleshooting concerning communication, and communication specifications of the DIGITRONIK instruments.
The instruction manuals for the DIGITRONIK instruments are classified into the following parts.



"Instruction manual for DIGITRONIK Digital Indicating Controller " **CP-UM-1470E**

Persons in charge of hardware design, maintenance, and operation of control panels or equipment using the DIGITRONIK instruments should read these manuals without fail.
These manuals outlines the DIGITRONIK instrument products and describes their panel mounting, and wiring methods, setting and operating methods, maintenance and inspection, troubleshooting, and hardware specifications.

Configuration of this instruction manual

This instruction manual consists of eight chapters, in which the respective items are described as shown below.

1. **Communication functions**
   Communication functions and model numbers of the DIGITRONIK instruments.
2. **Wiring**
   RS-485 wiring methods to make communication between the DIGITRONIK instruments and other equipment.
3. **Setting**
   Setting for communication of DIGITRONIK instruments.
4. **Communication procedure**
   Communication procedure, message configuration, data read/write and signal timing.
5. **Communication data table**
   Table of various data addresses used for communication of DIGITRONIK instruments.
6. **Communication program for master station**
   Communication program example of DIGITRONIK instruments using F-BASIC in personal computer.
7. **Troubleshooting**
   Check points required if the DIGITRONIK instrument communication should not operate normally.
8. **Specifications**
   Communication specifications for the DIGITRONIK instruments.

Appendix
Code table, network configuration using the RS-232C/RS-485 converter CMC10L, input range code table and event code table.

Contents

1. Communication functions

- In the RS-232C system, this instrument is connected with one master station (also called a host computer as which a personal computer or the like is used) in the form of one to one.
  In this system, only one instrument can communicate with the master station.
  The "station address" must be set to make communication.

- In the RS-485 system, up to 31 instruments (see *1) can be connected with one master station. The “instrument addresses” are then used to identify mate stations for communication

- The communication procedure and format are in common to the both RS-232C and RS-485.

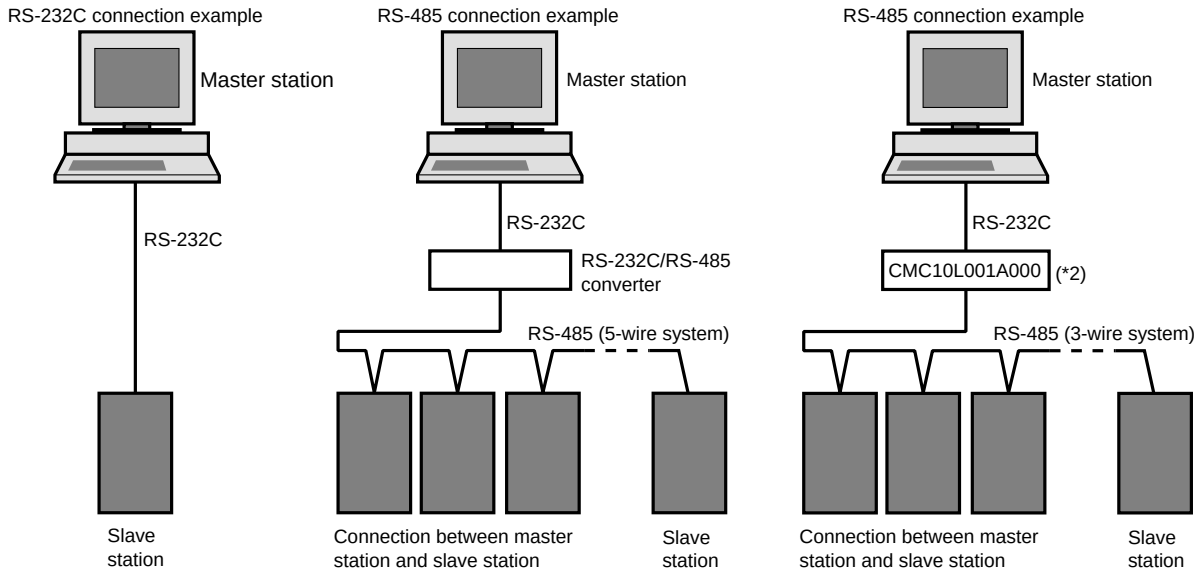
- The communication protocol and format conform to the RS-232C and RS-485 interfaces.

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

- Instructions from master station to slave station are classified into two types; “read” and “write”.

- The type of ready/write data can be optionally selected by “data address”.

- “CPL communications” is a host communications protocol established by the Control Products Division of Yamatake Corporation.



- 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.

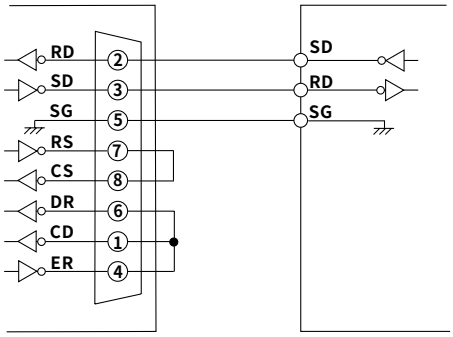
2. WIRING

2 - 1 RS-232C Connection

The DIGITRONIK instrument with the RS-232C communication function is wired for communication as shown below.

- **Connection with the master station in the form of 1 to 1.**

  This instrument is provided with three communication terminals (RD, SD, and SG). Data may not be output unless the other kind terminals of the master station side RS-232C interface are short-circuited as shown in the figure below.
  Usually, the pin array of the RS-232C connector of a personal computer, or the like is as shown below (Terminal mode). In a rare case, pins (2) and (3), (4) and (5), and (6) and (20) may be replaced with each other, respectively (MODEM mode).
  Check the RS-232C pin array by referring to the instruction manual for the host computer.



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)
Conversion connector part No. : 81408811-001
(D-Sub, 9-pin / 25-pin conversion)

- **RS-232C connector signals**

(9 pins) Example: IBM and compatibles

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	←

(25 pins) Example: PC-9800 Series

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

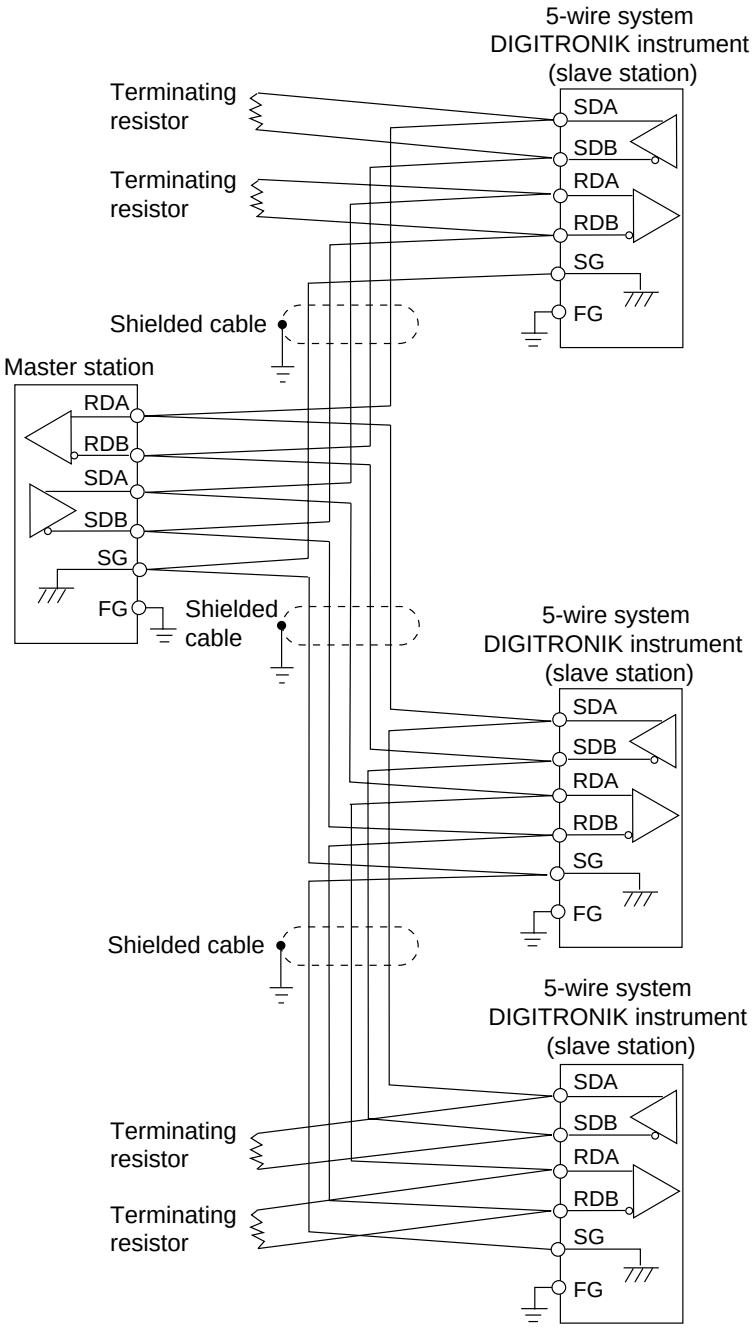
(14 pins) Example: PC-9821Ne

Pin No.	JIS Code	Name	Signal Direction Host-station
1	RD	RxD	←
2	DR	DSR	←
3	CD	DCD	←
4	CS	CTS	←
9	SD	TxD	→
10	RS	RTS	→
11	ER	DTR	→
13	SG	GND	
14	SG	GND	

2 - 2 RS-485 Connection

■ 5-wire system

When the DIGITRONIK instruments with the communication functions in compliance with the RS-485 are used in the 5-wires system, they are connected, for example, as follows;

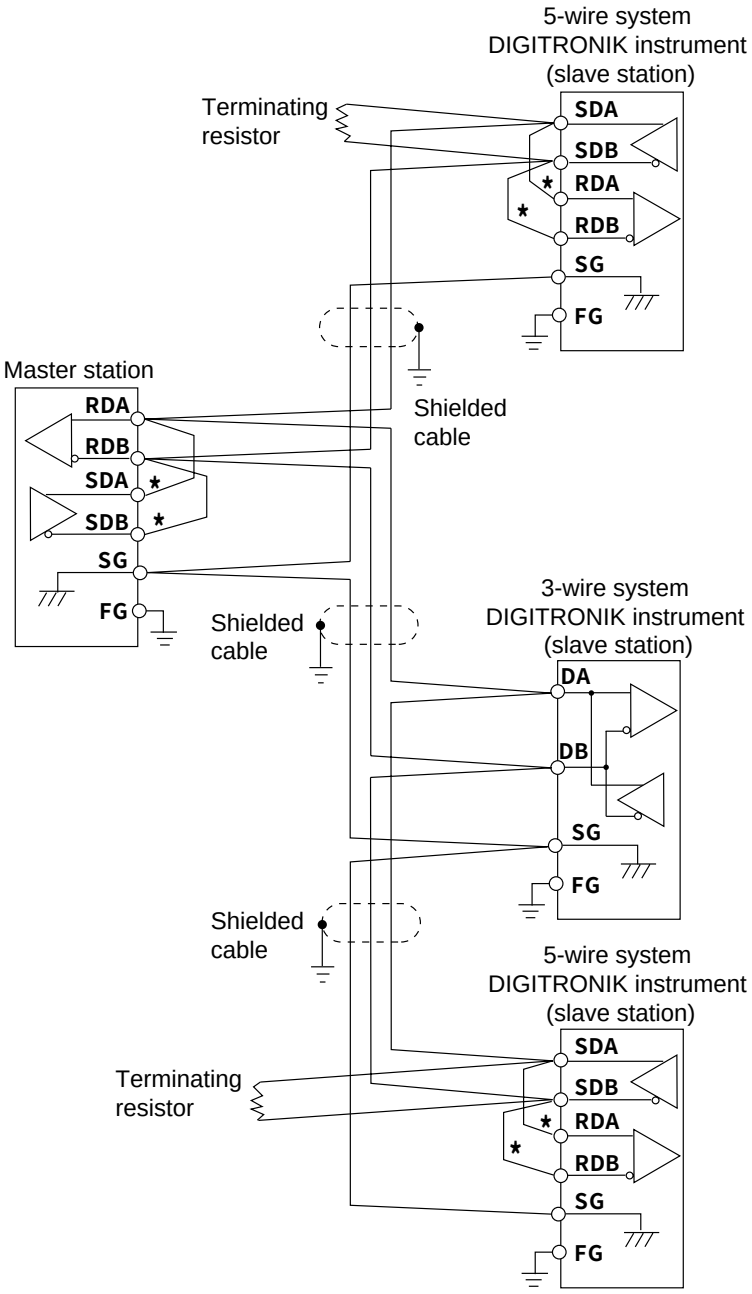


Connect two terminating resistors of 150Ω±5%, 1/2W min. to the instrument at each end of the transmission line. Also connect the shield wires to FG at one place.

In the 5-wires system, the Yamatake Corporationl CMC10L can be used as a converter in the master station. It can also be used as a converter in the slave station when the number of the slave stations is only one, but cannot be used as a converter in a slave station when two or more slave stations are used.

■ 3-wire system

The DIGITRONIK instruments with the communication functions in compliance with the RS-485 can also be used in the 3-wires system. An example of connection methods in such a case is shown below.



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

Also connect the shield wires to FG at one place.

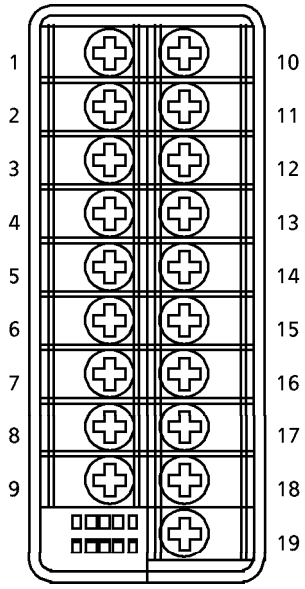
In the 3-wires system, the Yamatake Corporation CMA50A105 cannot be used as a converter in the master station or slave station.

In an instrument equipped with only three RS-485 terminals, the asterisked (*) wiring is done internally.

2 - 3 Terminal array of SDC20/21

■ SDC20

The communication terminal array of the SDC20 having the communication functions is as shown below.

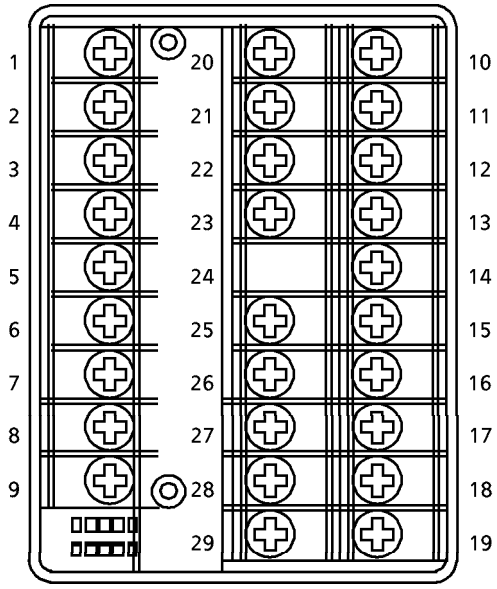


Optional Function Model No.	SDA	SDB	RDA	RDB	SD	RD	SG	FG
002	15	16	17	18	—	—	5	3.4
003	—	—	—	—	17	18	5	3.4
004	15	16	17	18	—	—	5	3.4
005	—	—	—	—	17	18	5	3.4
009	16	17	18	19	—	—	5	3.4
010	—	—	—	—	16	17	18	3.4

Note) Terminal No.3 and 4 are connected inside the SDC20.

■ SDC21

The communication terminal array of the SDC21 having the communication functions is as shown below.



Optional Function Model No.	SDA	SDB	RDA	RDB	SD	RD	SG	FG
003	25	26	27	28	—	—	29	3.4
004	—	—	—	—	27	28	29	3.4
006	25	26	27	28	—	—	29	3.4
007	—	—	—	—	27	28	29	3.4
008	25	26	27	28	—	—	29	3.4
009	—	—	—	—	27	28	29	3.4

Note) Terminal No.3 and 4 are connected inside the SDC21.

3. Setting

3 - 1 SETUP items of SDC20/21

Code	Item	Setting at delivery from factory	Setting range
C31	Station address	0	0 to 127
C32	Transmission speed	0	0 : 9600bps 1 : 4800bps 2 : 2400bps 3 : 1200bps
C33	Character format	0	0 : data 8bits, even parity, 1 stop bit 1 : data 8bits, no parity, 2 stop bits

3 - 2 Initialize

Before starting communication, initialize the communication conditions for the DIGITRONIK instrument and master station.

■ Station address

Set a decimal number within 0 to 127 to the SETUP item C31 of the DIGITRONIK instrument. In the RS-485 system, set a different address value from the addresses of the other slave stations connected in multi-drop on the same transmission line.
Address 0 is set as an station address at delivery from the factory. Since the communication function is not activated at address 0, be sure to set a value other than 0 to execute communication.

■ Baud rate

Set one of 0 to 3 to the SETUP item C32 of the DIGITRONIK instrument. At this time, set the same transmission speed value as in the master station.

0: 9600bps (factory setting)
1: 4800bps
2: 2400bps
3: 1200bps

■ Character format

Set 0 or 1 to the SETUP item C33 of the DIGITRONIK instrument.
At this time, set the same data format as the DIGITRONIK instrument in the master station.
0: data 8bits, even parity, 1 stop bit (factory setting)
1: data 8bits, no parity, 2 stop bits

4. Communication procedure

4 - 1 Outline of communication procedure and messages

The outline of communication procedure, and the concept of message configuration are given in this paragraph.

■ Communication procedure

The communication procedure used is given below in simple expression.

(1) The master station transmits a request message to a slave station to designate the mate instrument for communication.

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

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

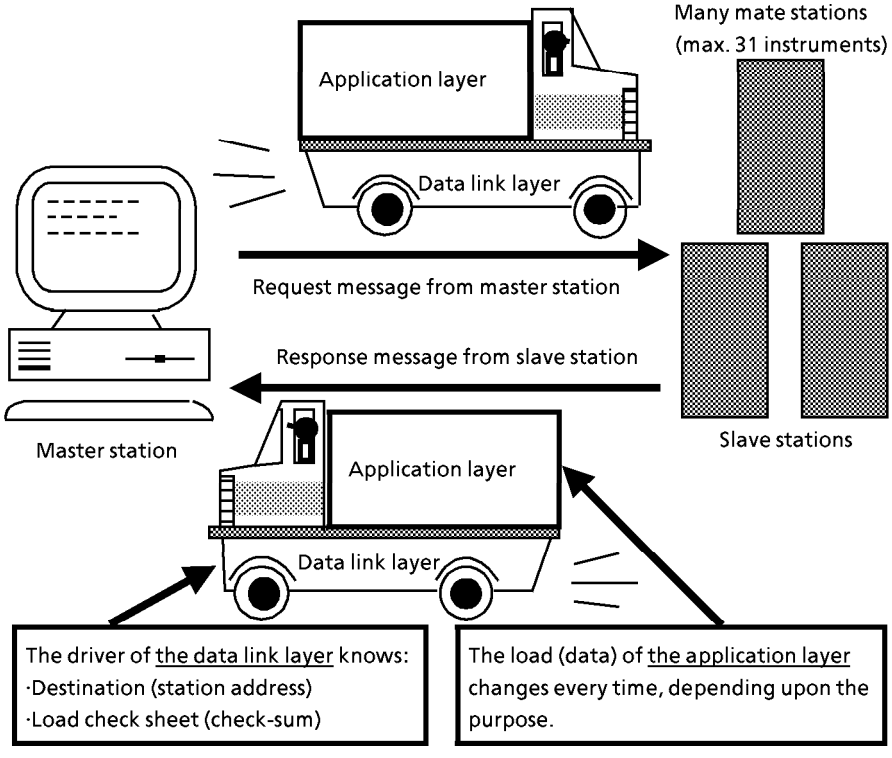
(4) The master station receives the response message and executes processing.

■ Configuration of message

One message consists of two layers as shown below. This is common to the request message from the master station and response message from a slave station.

- Data link layer
  - · This layer has the basic information required for communication.
  - · This layer has the destination of communication message and message check information.
- Application layer
  - · A layer for data read and write
  - · The contents change, depending upon the purpose.

The individual layers are detailed in the following items.



■ Definite examples

Definitely, the messages are as shown below.

● In case of read request

·Request 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

● In case of write request

·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 data link layer and application layer are detailed in and after the next paragraph.

■ Concept of data address

This instrument uses the concept of data address to facilitate reading or writing each intended data by addressing.

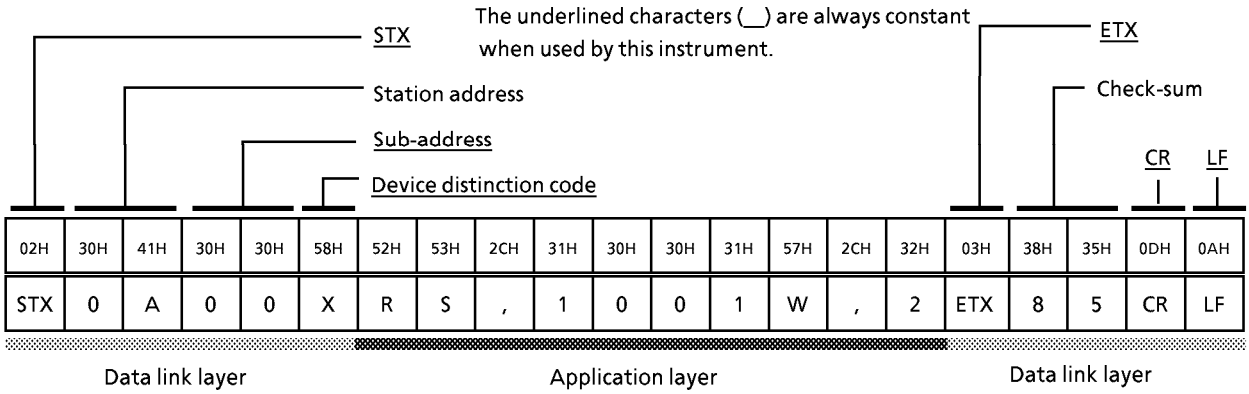
Data A	501W
Data B	502W
Data C	503W
:	:

For the actual correspondence between data and address, see the "Communication data table".

4 - 2 Data link layer

■ Description of data link layer

- The data link layer includes eight basic information for transmitting a message.
- The data link layers of a request message and response message have the same structure.



Each function of the data link layer is shown below.

● STX (Start of TeXt)

◆Role : Indicates the head of a message.

◇Description · Fixed at 02H.

· When the instrument receives "STX", it is identified as the first character of a new request message even on the course of any message.

● Station address

◆Role : Designates the destination instrument. Communication with one instrument designated is permitted.

◇Description · If 0 is set as a station address, the communication function is stopped.
Therefore, to make communication be sure to set an address value of 1 or more.

· 2 hexadecimal characters. For details, see the example.

· For the details of setting of the station address, see the"SETTING".

□Example : When the station address of the mate is 10:

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

(2) When converted into character codes:
0 = 30H, A = 41H

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

◇Caution◇ ● Note that the function of the station address differs absolutely from that of the data address of the application layer.

● Sub-address

◇Description: The sub-address is meaningless in this instrument. Be sure to set "00" (30H, 30H) as the sub-address in the same format as in the station address.

● Device ID code

◇Description: The character code "X" (58H) or "x" (78H) only can be designated in this instrument.

● ETX (End of TeXt)

◆Role : Indicates that the application layer existed up to immediately before.

◇Description: Fixed at 03H.

● Check-sum

◆Role : A value to be used to check whether or not the message has been changed due to any error (such as noise) on the course of communication.

◇Description · Two hexadecimal characters

. The preparing method for the check-sum is as follows;

(1) The character codes of the message from STX to ETX are added byte by byte.

(2) The two's complement of the result of addition is taken.

(3) The above value is converted into character codes.

□Example : Description is given below, citing the example of the above request message on the preceding page.

(1) The character codes from STX to ETX are added byte by bytes. The one lower byte of the result of calculation is 7BH.

(2) The two's complement of the result of addition is taken. The result is 85H.

(3) The 85H is converted into character codes. this value is used as the check-sum. The result is "85"; (38H) and (35H).

For the conversion into character codes, see the example of the station address (on the preceding page).

◇Caution◇ • The check-sum in the request message can be omitted, but no check-sum is then included in the response message. The check-sum should not be omitted to assure the proper reception of a message.

● 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 in pair.

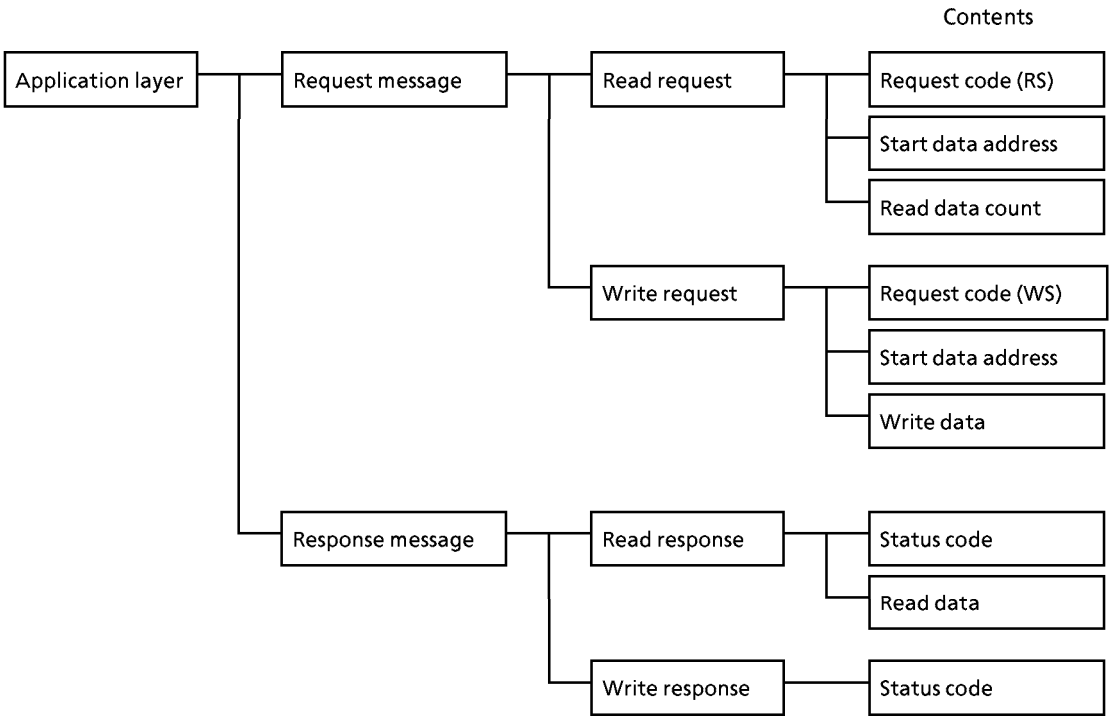
◇Caution◇

- If any of the following errors has occurred in the contents of the data link layer, the instrument does not respond to them.
  - · The communication conditions for both stations do not meet each other (such as different transmission speeds, or parity error occurrence).
  - · The transmitted station address differs from the station address of the object instrument.
  - · The station address is "00".
  - · STX, ETX, CR and LF are not placed at the specified positions.
  - · The device distinction code is neither "X" nor "x".
  - · The station address, sub-address, or check-sum is not two characters long.
  - · The calculation result of the check-sum does not meet the check-sum of the message.
  - · Non-designated characters are included in the message.
- As for the contents of the data link layer, the same message as the request message of an instrument is set as a response message, except for the check-sum.
- Use the upper-case characters "A" to "F" in the hexadecimal numeric part to be used for the station address and check-sum.

4 - 3 Application layer

■ Outline of application layer

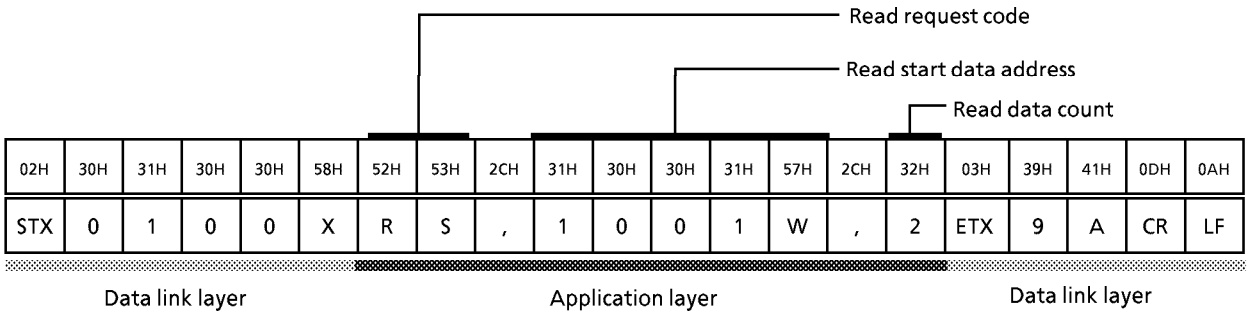
- The application layer includes a request, data, data count, and message decision information (status code).
- The application layers of the request message and response message differ in structure from each other.
- There are two types of request messages; "a read request" and "a write request".
  The response message includes a response corresponding to each request.
- It can be identified by a status code how the request message has been processed.



4 - 4 Data read

■ Description of read request

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



- Individual data are partitioned by a comma "," (character code 2CH), respectively.
- An upper-case character code is used for each numeric or character in the application layer.
- Decimal number is used for each numeric.
- Unnecessary "0" or a space cannot be added to each data.
  - ☐Example : The underlined part of "RS, 01001W, 2" is wrong.
  - ☐Example : The underlined parts of "RS, 1001W, 02" are wrong.
  - ☐Example : The above figure indicates an example that two-data information is read from 1001W in one message.

● Read request code (RS)

◆Role : A command which indicates read.

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

● Read start data address

◆Role : Designates the start data address from which data is to be read.

◇Description : The correspondence between data address and read data is shown in the "Communication data table"

· Be sure to add "W" (57H) immediately after the numeric of the data address.

● Read data count

◆Role : It is designated how many data are read continuously, starting with the designated data address.

◇Caution◇

- For the high limit of the read data count, see the "Communication data table".

■ Read response

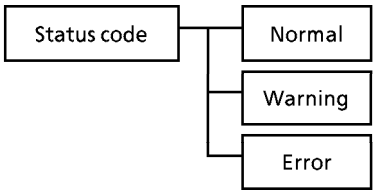
◆Role : When the message in the data link layer is proper, a response message is sent back according to the contents of the request message.

◇Description : All the data in the application layer are expressed in decimal character codes.

● Status code

◆Role : A numeric by which it can be identified how the request message has been processed on the instrument side. Different value is set according to the result of processing.

◇Description : The response message includes a "Status code" without fail. The status codes are classified as follows;



* The status code is two decimal digits.

● Normal response/warning response

◆Role : Sends back the read data.

◇Description : Information in the application layer

· Status code : For the details of the status code, see the "Status code table".

· Read data : Data are put in by the designated count.

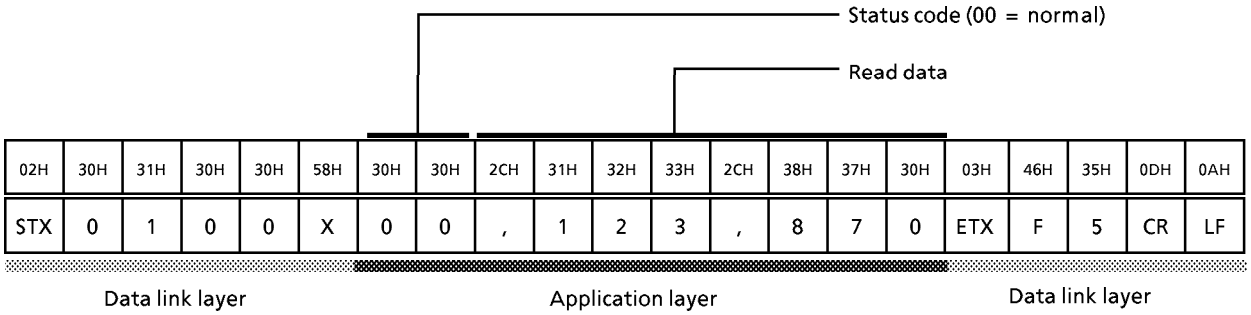
: The decimal point is removed from a numeric to be put in.

□Example : "55.6" is converted into "556" when it is put in.

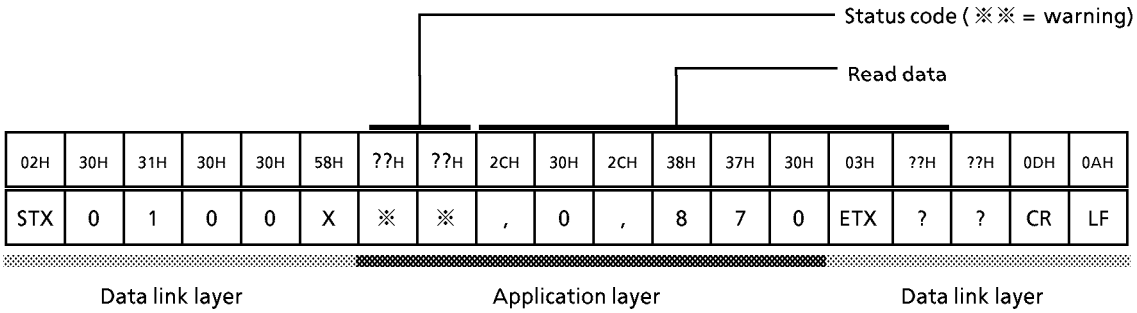
: Individual data are partitioned with a comma (2CH), respectively.

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

□Example : In case of normal response (when there are two read data, and all the data are read properly)



☐Example : In case of warning response (numeric corresponding to the warning code is put in ※※ .)



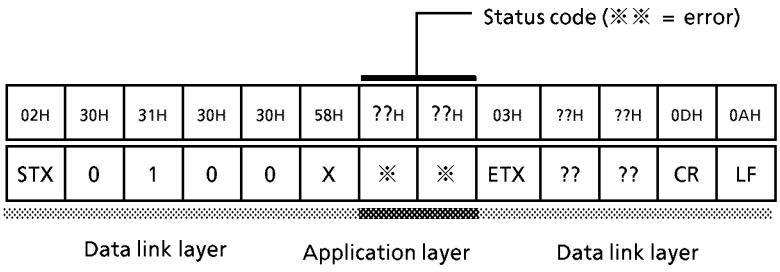
● Error response

◆Role : Indicates that there is an error in the request message, and it cannot be normally read. Therefore, there is no data herein.

◇Description : Information in the application layer.

· Status code : Indicates an error type.
For details, see the "4-6 Status code table".

☐Example : In case of error response:



■ Expression of decimal numeric (numeric data)

◆Role : All the numeric part, read count, write value (described in WS command), and read data at 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, 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 wrong.

(4) Never add unnecessary 0 or a space before a numeric.

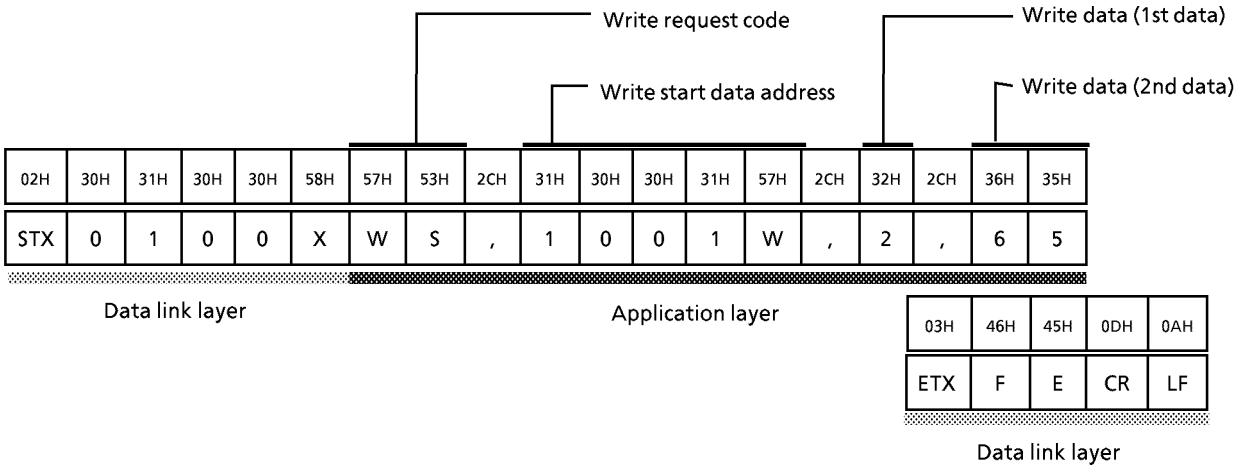
☐Example: "0123" (30H, 31H, 32H, 33H) is wrong.

☐Example : " 123" (20H, 31H, 32H, 33H) is wrong.

4 - 5 Data Write

■ Description of write request

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



- Individual data are partitioned with a comma "," (character code 2CH), respectively.
- The write data count need not be designated.
- An upper case character code is used for each numeric or character in the application layer.
- Decimal number is used for each numeric.
- Unnecessary "0" (30H) or a space cannot be added to each data.
  - ☐Example : The underlined part of "WS, 01001W, 2" is wrong.
  - ☐Example : The underlined parts of "WS, 1001W, 02" are wrong.
  - ☐Example : The above figure shows an example that 2 and 65 are written at addresses 1001W and 1002W, respectively, in one message.

● Write request code (WS)

◆Role : A command which indicates write.
◇Description : Two characters "WS" (57H, 53H)

● Write start data address

◆Role : Designates the start data address for write.
- For the correspondence between the data address and write data, see the "Communication data table".
- Be sure to add "W" (57H) after the numeric representing the data address.

● Write data

◆Role : Data to be written at 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 partitioned with a comma (2CH), respectively.

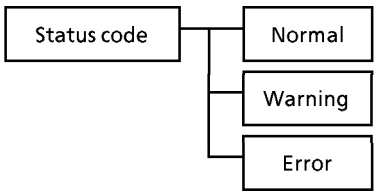
· The data address at which the corresponding data is written is incremented by 1 sequentially, starting with the start data address (see the example given on the preceding page).

· The number of data which can be written in one message is limited. For details, see the "Communication data table".

■ Write response

◆Role : When the message in the data link layer is proper, the status code only is sent back.

◇Description : The status codes are classified as follows;



* The status code is expressed in two decimal digits.

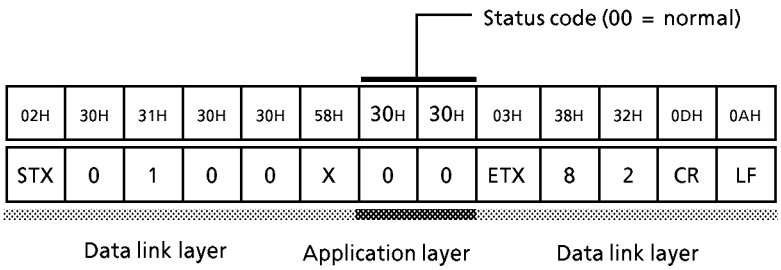
● Normal response/warning response

◆Role : Information concerning the result of processing the write request message is sent back.
Only the normal status code or warning status code is sent back.

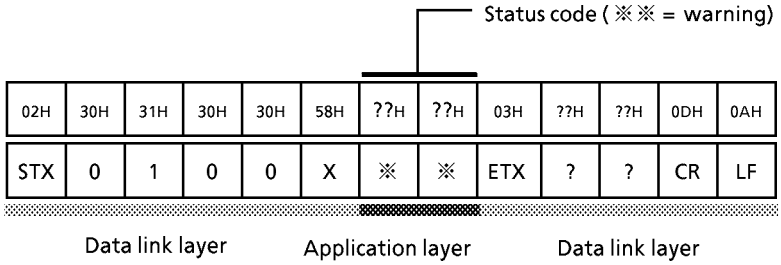
◇Description : Information in the application layer

· Status code : A numeric by which it can be identified how the request message has been processed on the instrument side.

□Example : An example of normal response (when all data are properly written)



☐Example : In case of warning response (numeric corresponding to the warning code is put in ※※.)



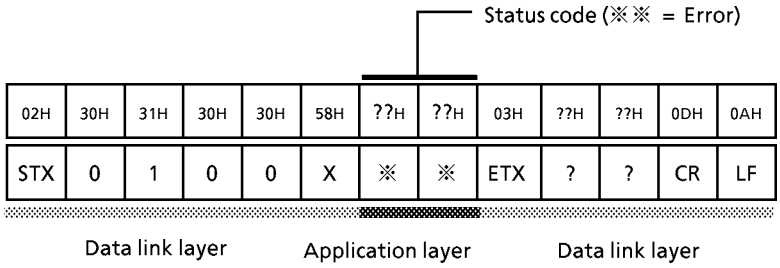
● Error response

◆Role : Only the error status code is sent back.

◇Description : Information in the application layer

· Status code : Indicates that there is an error in the request message, and write processing cannot be done.
For details, see the "4-6 Status code table".

☐Example : In case of error response (numeric corresponding to the error code is put in ※※).



4 - 6 Status code table

■ Normal and warning ends

Status code	Type	Contents and action
00	—	Normal end
21	Warning	Data is written at a protected address due to an influence of other parameters, or for a parameter which has not been set to the relevant instrument. Processing is continued, except for the relevant address.
22	Warning	SP group cannot be changed (since RSW is set to SP changeover). Processing is continued, except for the relevant address. For the same reason, there is a possibility that a read value differs from an actual value during EEPROM read.
23	Warning	Read is stopped since an address out of the range has been accessed.
24	Warning	Auto tuning cannot be executed (due to an occurrence of alarm). Processing is continued, except for the relevant address.
25	Warning	A read disabled address of RAM is accessed. Read is continued with data 0 pad in the relevant address.
26	Warning	A read disabled address of EEPROM is accessed. Read is continued with data 0 pad in the relevant address.
27	Warning	Data is attempted to be written at a write protected address of RAM. Write is continued without writing any data at the relevant address.
28	Warning	Data is attempted to be written at a protected word address of EEPROM. Write is continued without writing any data at the relevant word address.

■ Error ends

Status code	Type	Contents and action
40	Error	"W" has not been set at the address.
41	Error	"WS", ",", or "RS" has not been set. All messages are aborted.
42	—	—
43	Error	"ETX(03H)" has not been set at a proper position. All messages are aborted.
44	—	—
45	—	—
46	Error	The address is erroneous. All messages are aborted.
47	Error	There is an error in the read word count. All messages are aborted.
48	Error	There is an error in the written numeric. Write has been executed, except for the error address.
80	—	—
81	—	—
82	—	—
83	Error	The set value exceeds the predetermined range. Processing is continued, except for the relevant address.
85	Error	WS and RS have not been set. All messages are aborted.
99	Error	An undefined command or other message error.

4 - 7 Timing specifications

■ Timing specifications for request message and response message

When the master station and slave station are interconnected directly by means of RS-232C, the following precautions should be observed concerning the transmit timings of a request message from the master station and a response message from the slave station.

● Response monitor time

The maximum response time required from the end of transmitting an request message from the master station to the start of receiving a response message from the slave station is 2sec (section (1)). Therefore, the response monitor time should be set to 2sec.

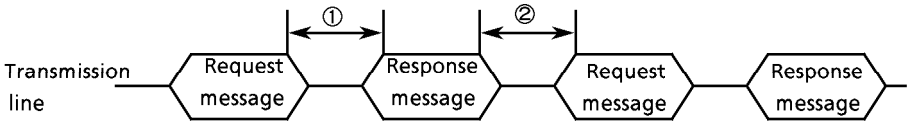
Generally, when the response monitor time reaches time up, the request message is retransmitted.

For details, see the "6 Communication program for master station".

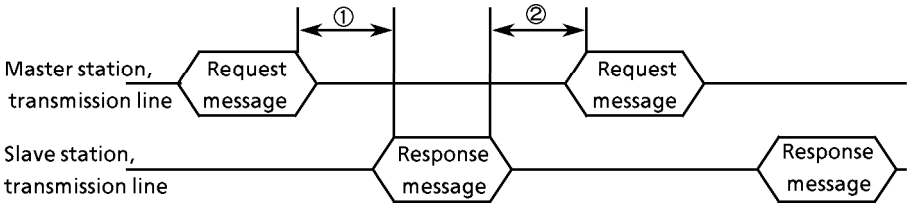
● Transmit start time

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

- RS-485 3-wires system



- RS-485 5-wires system and RS-232C

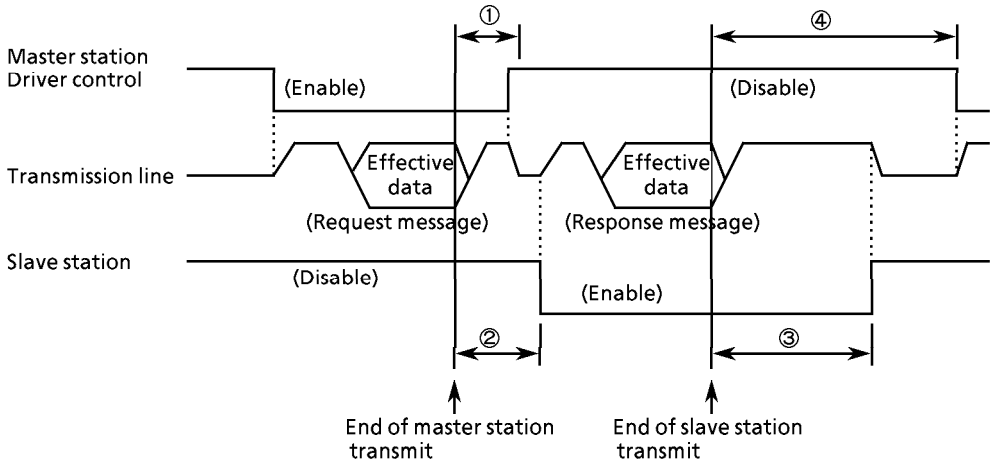


① End of master station transmit - Request interval time of slave station = 2000ms max.

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

■ RS-485 driver control timing specification

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



① Transmit end of master station - Driver disable time = 500μs max.
② Receive end of slave station - Driver enable time = 1ms min.
③ Transmit end of slave station - Driver disable time = 10ms max.
④ Receive end of master station - Driver enable time = 10ms min.

5. Communication data table

5 - 1 Preliminary knowledge of communication data handling

■ Types and formats of communication data

● Types of communication data

The communication data are classified into the following types.

- Run status relation address : Data indicating the run status of instrument. (PV, alarm, etc.)
- SETUP relation address : Data for setting the status of instrument before running (setting of input range, etc.).
- Parameter relation address : Data to be changed/operated during running (PID constants or the like).

These data are communicated every data type.

● Format of communication data

The communication data are classified into the following formats.

- Numeric data : Data indicating numerics (PV, SP, etc.)
- Bit data : Data, each bit of which is given meaning (alarm, etc.). The bit data must be composed during transmit, and be decomposed during receive.

■ Communication data storing memory

● Types of memory

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

- RAM : Data in RAM are cleared when the power supply is turned off. However, data can be written in RAM any number of times.
- EEPROM : Data in EEPROM are not cleared even when the power supply is turned off. However, the data write count is limited due to the characteristics of the device. The allowable maximum write count is 10,000 times.

PRECAUTION

The write count in EEPROM is 10,000 times or less.

When such data as an SP must be written frequently and repeatedly by communication, select RAM as an object memory.

● Communication object memory

In communication, it is necessary to read/write data from/into the above-mentioned two types of memory according to the purpose and use. There is a difference between the object memories as follows;

- RAM : Data is read/written from/into RAM only. If the power supply is turned off after writing data into RAM, and then it is turned on again, the data in EEPROM is copied on RAM, so the data in RAM becomes the same as in EEPROM.
- EEPROM : Data are written in both RAM and EEPROM.
  Data is read only from RAM.
  Data stored in EEPROM cannot be read directly.

■ Data address

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

Communication date	RAM		EEPROM	
	Offset value	Address	Offset value	Address
Run status relation	300	301 to 312	350	351 to 362
SETUP relation	400	401 to 439	450	451 to 489
Parameter relation	600	601 to 640	650	651 to 690

■ Data read/write count

The number of data which can be continuously read/written by once communication is as shown in the table below.

	RAM	EEPROM
Read	1 to 16	1 to 10
Write	1 to 16	1 to 5

Among the continuous data, any data which do not exist due to difference in model number are handled as shown below.

- Read : 0 is read as a dummy data (warning end).
- Write : Not written (warning end).

■ Data unit and decimal point position

A decimal point is not added to read/write data.
The unit or decimal point position is predetermined every data.
For the unit and decimal point position of each data, see the instruction manual for the main unit of instrument.

Example : When data to be read/written is numeric value 105, its unit or decimal point position is automatically determined by the data address, the SETUP item of the instrument and the others.
Therefore, the numeric data 105 is expressed as 10.5%, 105°C, or the like according to the data address of data to be read/written.

5 - 2 Communication data table

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

- Meaning of symbols in R/W column
  ○ : Read/write enable
  × : Read/write disable

● Run status relation addresses

The asterisked (*) Nos. are detailed later as bit information data.

Item	Input range	RAM			EEPROM		
		Address	R	W	Address	R	W
Alarm status	Bit map 1*	301	○	×	351	×	×
Event status	Bit map 2*	302	○	×	352	×	×
Control relation status	Bit map 3*	303	○	×	353	×	×
Current SP group	0 to 3 (Note 1)(Note 3)	304	○	○	354	○	○
Current SP group (SP in use)	Low limit of SP limit to (Note2), (Note 3)	305	○	○	355	○	○
PV (process variable)		306	○	×	356	×	×
MV (manipulated variable)		307	○	×	357	×	×
Current transformer value	Undefined value, except for set model	311	○	×	361	×	×
RAM (write enable bit)	0: Disable; enabled in EEPROM (When power supply is turned ON) 1: Enable; disabled in EEPROM	312	○	○	362	×	×
RUN/READY changeover	0: RUN 1: READY (Note 4)	313	○	○	363	×	×

(Note 1) Current SP group : SP group in use

(Note 2) Current SP value : SP value of SP group selected.

(Note 3) When "2" (SP selection) is set to C27 to C29 in a model having the remote switch function, the remote switch has priority.Therefore, write is rejected, and an error response is returned.

(Note 4)
- Write is disabled irrespective of a set value at 312W.
- To identify the RUN/READY status of the instrument, monitor the value at 302W
- If READY is designated by communication or a remote switch, the instrument is placed in the READY status.

● Bit information data

No. 1 Alarm staus

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
⑧	⑦	⑥	⑤	④	③	②	①

①: A/D converter error
②: Illegal loader communication message
③: Error in RTD wiring resistance correction or TC cold junction compensation
④: Parameter error
⑤: PV input overrange
⑥: PV input underrange
⑦: Parameter error
⑧: Adjustment data error (check-sum)

No. 2 Event status

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
⑧	⑦	⑥	⑤	④	③	②	①

①: 0:RUN 1:READY
②: .....
③: Event 1 starting status (1:ON, 0:OFF)
④: Event 2 starting status (1:ON, 0:OFF)
⑤: Event 3 starting status (1:ON, ,0:OFF)
⑥: REMOTE SWITCH 1 selection status (1:OFF, 0:ON)
⑦: .....
⑧: .....

The following bit allocation is used by all the communication models having the model numbers given below, when provided with two points of events.

- C210DA003X
- C210DA004X
- C216DA003X
- C216DA004X
- C215GA003X
- C215GA004X

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
⑧	⑦	⑥	⑤	④	③	②	①

①: 0:RUN 1:READY
②: .....
③: .....
④: Event 1 starting status (1:ON, 0:OFF)
⑤: Event 2 starting status (1:ON, ,0:OFF)
⑥: REMOTE SWITCH 1 selection status (1:OFF, 0:ON)
⑦: .....
⑧: .....

No. 3 Control relation status

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
⑧	⑦	⑥	⑤	④	③	②	①

①：0:PID control 1:ON/OFF control
②：0:Learning wait/stop 1:During learning
③：.....
④：.....
⑤：AT start
⑥：.....
⑦：.....
⑧：.....

● SETUP relation addresses

Data item	Input range	RAM			EEPROM		
		Address	R	W	Address	R	W
Key lock	0 to 1 0: Without key lock 1: Key lock	401W	○	○	451W	○	○
Temperature unit	0 to 1 0: Centigrade(℃) 1: Fahrenheit(℉)	402W	○	○	452W	○	○
Control action	0 to 1 0: Reverse action 1: Direct action	403W	○	○	453W	○	○
Input range	See the input range code table (Appendix-5).	404W	○	○	454W	○	○
Decimal point position	T/C、RTD : 0 to 1 Linear : 0 to 3	405W	○	○	455W	○	○
Low limit of PV range	Low limit of range to C7 (Linear: 2000)	406W	○	○	456W	○	○
High limit of PV range	C6 to high limit of range (Linear : 9999)	407W	○	○	457W	○	○
SP setting system	0 to 1 0: Single SP 1: Multi SP	408W	○	○	458W	○	○
Low limit of SP limit	Low limit of range to C10 set value	409W	○	○	459W	○	○
High limit of SP limit	C9 to set value of high limit of range	410W	○	○	460W	○	○
PV error time output	0: Result of PID operation 1: C12 set value	411W	○	○	461W	○	○
Manipulated variable in special status	0 to 100%	412W	○	○	462W	○	○
Time proportional output cycle (CH1)	Relay output : 5 to 120sec Voltage output : 1 to 120sec	413W	○	○	463W	○	○
PID operation initial manipulated variable	0 to 100	415W	○	○	465W	○	○
PID operation initialize	0: AUTO 1: Initialize in SP change 2: Continuous PID	416W	○	○	466W	○	○

Data item	Input range	RAM			EEPROM		
		Address	R	W	Address	R	W
Selection of control system	0: Normal PID control 1: Overshoot suppression 2: Learning function 3: Learning fixed	418W	○	○	468W	○	○
Auxiliary output type	0: PV (process variable) 1: SP (set point) 2: MV (manipulated variable)	421W	○	○	471W	○	○
Green belt	0 to 1/2 PV range	423W	○	○	473W	○	○
Event type 1	Event code table (See Appendix-6, -7.)	424W	○	○	474W	○	○
Event 2 type	Event code table (See Appendix-6, -7.)	425W	○	○	475W	○	○
Event 3 type	Event code table (See Appendix-6, -7.)	426W	○	○	476W	○	○
Remote switch 1 function	0: NOP 1: READY 2: SP selection 3: Timer start	427W	○	○	477W	○	○
Communication address	0 to 127	431W	○	×	481W	○	×
Transmission speed	0: 9600bps 1: 4800bps 2: 2400bps 3: 1200bps	432W	○	×	482W	○	×
Data format	0: 8 data bits, even parity, 1 stop bit 1: 8 data bits, no parity, 2 stop bits	433W	○	×	483W	○	×
SP ramp up gradient	0 to 9999 unit/min or unit/hour	435W	○	○	485W	○	○
SP ramp down gradient	0 to 9999 unit/min or unit/hour	436W	○	○	486W	○	○

● Parameter relation addresses

Display	Item	RAM			EEPROM		
		Address	R	W	Address	R	W
Proportional band P 0	0.0 to 999.9%	601W	○	○	651W	○	○
Integral time 0	0 to 3600sec Write disable when P = 0	602W	○	○	652W	○	○
Derivative time 0	0 to 1200sec Write disable when P = 0	603W	○	○	653W	○	○
Manipulated variable low limit 0	0 to high limit %	604W	○	○	654W	○	○
Manipulated variable high limit 0	Low limit to 100%	605W	○	○	655W	○	○
Manual reset 0	0 to 100% Enable when 1 = 0	606W	○	○	656W	○	○
Differential 0	0 to 100 unit (enabled on ON/OFF control)	607W	○	○	657W	○	○
Proportional band 1	0.0 to 999.9%	608W	○	○	658W	○	○
Integral time 1	0 to 3600sec Write disable when P = 0	609W	○	○	659W	○	○
Derivative time 1	0 to 1200sec Write disable when P = 0	610W	○	○	660W	○	○
Manipulated variable low limit 1	0 to high limit %	611W	○	○	661W	○	○
Manipulated variable high limit 1	Low limit to 100%	612W	○	○	662W	○	○
Manual reset 1	0 to 100% Enable when 1 = 0	613W	○	○	663W	○	○
Differential 1	0 to 100 unit (enabled on ON/OFF control)	614W	○	○	664W	○	○
SP (0th group)	Low limit of SP limit to high limit of SP limit	629W	○	○	679W	○	○
SP (1st group)	SP write at 629 to 630W, and 679 to 680W is enabled only in multi SP type	630W	○	○	680W	○	○
EV1 hysteresis	0 to 100 unit	633W	○	○	683W	○	○
EV2 hysteresis	0 to 100 unit	634W	○	○	684W	○	○
EV3 hysteresis	0 to 100 unit	635W	○	○	685W	○	○
EV1 set value		636W	○	○	686W	○	○
EV2 set value		637W	○	○	687W	○	○
EV3 set value		638W	○	○	688W	○	○
PV bias	-1000 to + 1000	639W	○	○	689W	○	○
Auto tuning	0: Stop, pause 1: Start (note)	640W	○	○	690W	×	×

(note) AT (auto tuning) start is rejected in an alarm status, or READY status. Therefore, when AT start is requested by communication in such status, an error response is returned.

6. Communication for master station

6 - 1 Precautions for programming

- The longest response time of the instrument is 2sec.
  Therefore, the response monitor time should be set to 2sec.
- If no response is obtained within 2sec, retransmit the same message. When no response remains coming even after making retransmission twice, it should be regarded as a communication error.
- The above-mentioned retransmission is required since a message may not be properly transmitted due to noise or the like during communication.

Note

When the device distinction codes "X" and "x" are used alternately during message retransmission from the master station, the received response message can be conveniently identified to be the latest message or preceding one.

6 - 2 Examples of communication program

The program examples given in this paragraph are written in FUJITSU F-BASIC Ver.6.0 for Windows95/98/NT. This program is shown as a reference for making a program.

■ Before executing the program

Check the instrument communication conditions, and station address.

■ Executing the program

This program is used for data read and data write. When the program is executed, the application layers of the request message and response message communicated are indicated.

```
RS, 123W, 4
Application layer in response message
00, 10, - 20, 0, 40
Application layer in  request message
WS, 234W, 1, 1
Application layer in response message
00
```

Example of indication of execution result

● Setting for communication

Set the station address of a mate instrument to "ADDRESS".
Open the RS-232C and call the subroutine *INIT. DATA.

● Data reading

After setting the read start data address to "READ. ADRS" and the read data count to "READ. LEN", call the subroutine *DATA. READ.
This program permits four data to be read from the data address 123.
Change the setting so as to meet the instrument used.

● Data writing

After setting the write start data address to "WRITE. ADRS", the write data count to "WRITE. LEN", and the write data to "WRITE. DATA", call the subroutine *DATA. WRITE.
This program permits two data to be written from the data address 234. Change the setting so as to meet the instrument used.

■ Data read/write sample program

! Handling Precautions

Yamatake - Honeywell won't be absolutely responsible for any trouble caused by applying this program sample.

```
'*************************************************************
'* Data Read Write Sample Program  (Ver.1.00)                *
'*                                                           *
'* OS:Windows 95/98                                          *
'* Language: Fujitsu F-BASIC V6.0                            *
'* All rights reserved. Copyright(C) 1999, Yamatake Corporation *
'*************************************************************
'
'Initilize data
*INITIALIZE
    DEFLNG A - Z
    dim READ_DATA( 100 ), WRITE_DATA( 100 )  'Read/write data area
    ADDRESS  = 1              'Device address
    OPEN "COM0:(S8E1N8NN,SD200,RB4096)" AS #1               'Open RS-232C
                              '(8bit,Even parity,1 stop bit)
                              '(8bit,No Parity,2stop bit"S8N2N8NN")
    baud 0,9600               'Transmission Speed(9600bps)

    GOSUB *INIT_DATA
'
' Main routine
*MAIN
    'Reading 4 data from the data address 123
    READ_ADRS =  123          'Read start data address
    READ_LEN  =      4        'Read count
    GOSUB *DATA_READ          '<Output>COM_ERROR:Communication error
                              '        RESPONSE:End code
                              '        READ_DATA(i)(i=0 to READ_LEN-1):Read data
    '
    'Writing 4 data from the data address 234
    WRITE_ADRS =  234         'Write start data address
    WRITE_LEN  =      2       'Write count
    WRITE_DATA(0) = 1         'Write data No.1
    WRITE_DATA(1) = 1         'Write data No.2
    gosub *DATA_WRITE         '<Output>COM_ERROR:Communication error
                              '       RESPONSE:End code
    goto *PROCESS_END
'
'Ending routine
*PROCESS_END
    CLOSE #1                  'Close RS-232C
    INPUT "Press any key", x$:END
'
'**********************
'* Read Subroutine     *
'**********************
*DATA_READ
    A = READ_ADRS: gosub *BIN_TO_ASCII
    CMD$ = "RS," + A$ + "W,"
    A = READ_LEN: gosub *BIN_TO_ASCII
    CMD$ = cmd$ + A$
    GOSUB *COMMUNICATION
    IF COM_ERROR <> 0 OR RESPONSE <> 0 THEN RETURN
    A$ = RIGHT$( RECEIVE$, LEN( RECEIVE$ ) - 3 ) + ","
    J1 = 1
    FOR I = 0 TO READ_LEN - 1
        J2 = INSTR( J1, A$, "," )
        READ_DATA( I ) = VAL( MID$( A$, J1, J2 - J1 ) )
```

```
        J1 = J2 + 1
    NEXT
    RETURN
'
'**********************
'* Write Subroutine   *
'**********************
*DATA_WRITE
    A = WRITE_ADRS: GOSUB *BIN_TO_ASCII
    CMD$ = "WS," + A$ + "W"
    FOR I = 0 TO WRITE_LEN - 1
        A = WRITE_DATA( I ): GOSUB *BIN_TO_ASCII
        CMD$ = CMD$ + "," + A$
    NEXT
    GOSUB *COMMUNICATION
    RETURN
'
'ASCII character conversion subroutine
'
*BIN_TO_ASCII
    A$ = STR$( A )
    IF LEFT$( A$, 1 ) = " " THEN A$ = RIGHT$( A$, LEN( A$ ) - 1 )
    RETURN
'
'****************************
'* Communication Subroutine *
'****************************
*COMMUNICATION
    COM_RETRY = 3: COM_ERROR = -1
    WHILE ( COM_RETRY > 0 AND COM_ERROR <> 0 )
            COM_ERROR = 0                       '
            WHILE ( eof( 1 )=0 ): A$ = INPUT$( 1, #1 ): WEND '
            GOSUB *SEND_COMMAND       '
                   PRINT "Application layer in response message": PRINT CMD$
            GOSUB *RECEIVE_COMMAND    '
                   IF COM_ERROR=0 THEN PRINT "Application layer in response message": PRINT RECEIVE$
                   IF COM_ERROR=1 THEN PRINT "Time out error"
                   IF COM_ERROR=2 THEN PRINT "Check sum error"
                   IF COM_ERROR<0 THEN PRINT "Data link layer error"
                   PRINT
            COM_RETRY = COM_RETRY - 1
    WEND
    RETURN
'
'********************
'*  Send Subroutine *
'********************
*SEND_COMMAND
    A$ = RIGHT$( "0" + HEX$( ADDRESS ), 2 )
    A$ = STX$ + A$ + SUB_ADR$ + DEVICE$ + CMD$ + ETX$
    GOSUB *MAKE_SUM
    SEND$ = A$ + SUM$ + CR$ + LF$
    PRINT #1, SEND$;
    RETURN
'
'**********************
'*  Recive Subroutine *
'**********************
'COM_ERROR:
'   = 0: Normal
'   = 1: Time out error
'   = 2: Check sum error
'   < 0: Data link layer error
'
*RECEIVE_COMMAND
     '
     'Waiting for STX
```

```
    A$ = ""
    WHILE ( A$ <> STX$ )
            RECEIVE$ = ""
            GOSUB *RECV_SUB: IF COM_ERROR THEN RETURN
    WEND
    '
    'Waiting for ETX
    WHILE ( A$ <> ETX$ )
            GOSUB *RECV_SUB: IF COM_ERROR THEN RETURN
    WEND
    IF SUM_FLAG = 0 THEN SUM$ = "": GOTO *RECV_CR
    '
    'Waiting for 1'st character in check sum
    GOSUB *RECV_SUB: IF COM_ERROR THEN RETURN
    '
    'Waiting for 2'nd character in check sum
    GOSUB *RECV_SUB: IF COM_ERROR THEN RETURN
    A$ = LEFT$( RECEIVE$, LEN( RECEIVE$ ) - 2 ): GOSUB *MAKE_SUM
    IF RIGHT$( RECEIVE$, 2 ) <> SUM$ THEN COM_ERROR = 2: RETURN
    '
    'Waiting for CR
*RECV_CR
    GOSUB *RECV_SUB: IF COM_ERROR THEN RETURN
    IF A$ <> CR$ THEN COM_ERROR = -2: RETURN
    '
    'Waiting for LF
    GOSUB *RECV_SUB: IF COM_ERROR THEN RETURN
    IF A$ <> LF$ THEN COM_ERROR = -3: RETURN
    '
    'Checking data link layer
    IF MID$(SEND$,2,5) <> MID$(RECEIVE$,2,5) THEN COM_ERROR = -1: RETURN
    RECEIVE$ = MID$( RECEIVE$, 7, LEN( RECEIVE$ ) - LEN( SUM$ ) - 9 )
    RESPONSE = VAL( LEFT$( RECEIVE$, 2 ) )
    RETURN
'
'Waiting for 1 character subroutine
'(Same routine as time out monitoring)
'
*RECV_SUB
    A = 0
    WHILE ( 1 )
            A$ = TIME$
            WHILE ( A$ = TIME$ )
                    IF EOF(1)=0 THEN A$ = INPUT$(1,#1): RECEIVE$=RECEIVE$+A$: RETURN
                    A = A + 1: IF A = TIME_CNT THEN *RECV_ERR
            WEND
    WEND
*RECV_ERR
    COM_ERROR = 1
    RETURN
'
'Check sum subroutine
'
*MAKE_SUM
    A = 0: SUM$ = ""
    IF SUM_FLAG = 0 THEN RETURN
    FOR I = 1 TO LEN( A$ )
            A = A + ASC( MID$( A$, I, 1 ) )
    NEXT
    SUM$ = RIGHT$( "0" + HEX$( (-A) AND &HFF ), 2 )
    RETURN
'
'Data initializeing subroutine
'
*INIT_DATA
    STX$ = CHR$(  2 )        'STX code
    ETX$ = CHR$(  3 )        'ETX code
```

```
        CR$  = CHR$( 13 )        'CR code
        LF$  = CHR$( 10 )        'LF code
        '
        SUB_ADR$ = "00"  '
        DEVICE$  = "X"   '
        SUM_FLAG = 1             '
        TIME_OUT = 2000  '
        TIME_CNT = 0             '
        '
        'Time out monitoring
        '(Same routine as waiting for 1 charcter subroutine)
        A = 0
        while ( eof( 1 )=0 ): A$ = input$( 1, #1 ): wend
        A$ = TIME$
        WHILE ( A$ = TIME$ ): WEND
        A$ = TIME$
        WHILE ( A$ = TIME$ )
                if eof( 1 )=0 then *I_LOOP1
    *I_LOOP1
                TIME_CNT = TIME_CNT + 1: IF TIME_CNT = A THEN *I_LOOP2
    *I_LOOP2
        WEND
        TIME_CNT = (TIME_OUT / 1000!) * TIME_CNT + 1 'Round up
        RETURN
    '
    '--- Last Line ---
```

7. Troubleshooting

■ Check items in case communication is disabled

(1) Check the wiring of RS-232C.

(2) Check the communication conditions the DIGITRONIK instrument and the host computer.
If any one of the following setting items is different between both stations, communication is disabled.
The underlined items mean that they can be set on the DIGITRONIK side.

Transmission speed	: 1200, 2400, 4800, 9600bps
Data length	: 7、 8 bits
Stop bit	: 1 stop bit, 2 stop bits
Parity	: No parity, odd parity, even parity

(3) Check if the destination address of the command frame transmitted from the host computer meets the address set to the SDC20/21.
The address of the SDC20/21 is set to 0 at delivery from the factory. Even when the destination address of the command frame is set to 00 (30H, 30H), the SDC20/21 does not respond to such a message.

(4) Use the upper-case character codes for all the character codes other than the device distinction code ("X" or "x" in this instrument).

8. Specifications

■ RS-232C Specifications

Name	Remarks
Transmission mode	Unbalanced type
Transmission line	3-wires system
Transmission speed (bps)	1200、2400、4800、9600
Transmission distance	15m max.
Communication system	Half duplex
Synchronous method	Start/stop transmission
Data format	8 data bits, 1 stop bit, even parity 8 data bits, 2 stop bits, no parity
Error detection	Parity check, check sum
Station address	0 to 127 (Communication functions are disabled when set to 0.)
Network type	1:1

■ RS-485 Specifications

Name	Remarks
Transmission mode	Balanced type
Transmission line	5-wires/3-wires system
Transmission speed (bps)	1200、2400、4800、9600
Transmission distance	500m max. (300m when connected with the MA500 DIGITRONIK interface module)
Communication system	Half duplex
Synchronous method	Start/stop transmission
Data format	8 data bits, 1 stop bit, even parity 8 data bits, 2 stop bits, no parity
Error detection	Parity check, check sum
Station address	0 to 127 (Communication functions are disabled when set to 0.)
Network type	1:N (31 units max.)

Appendix

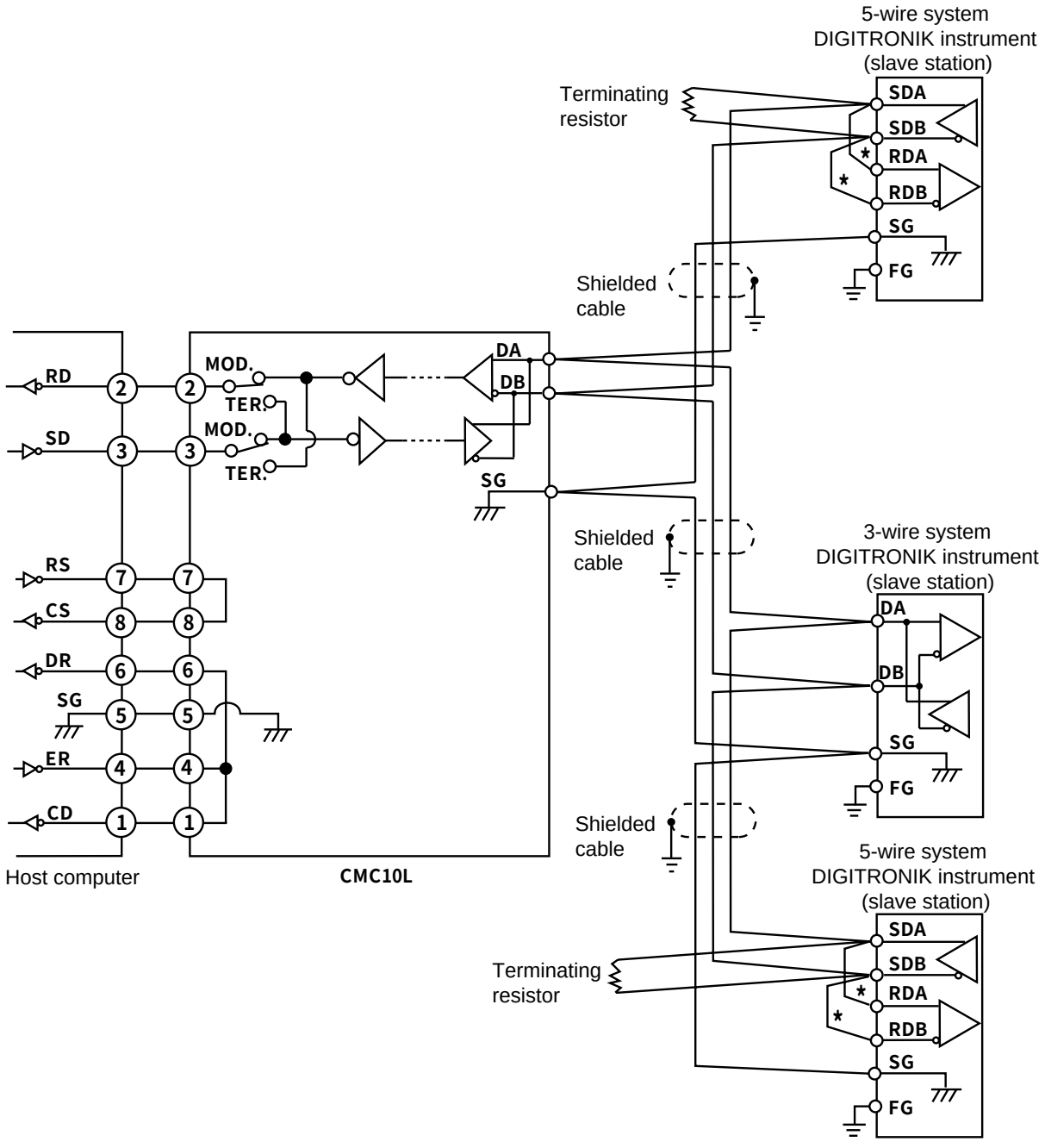
■ Code Table

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.

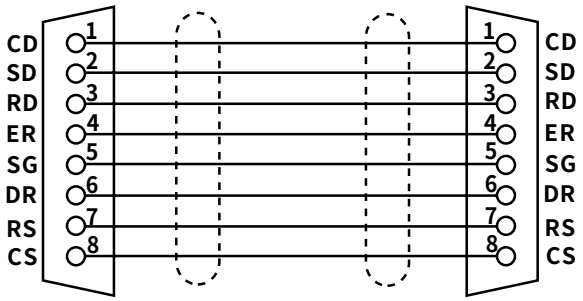
Conduct the wiring externally for the wires marked with an asterisk.

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:

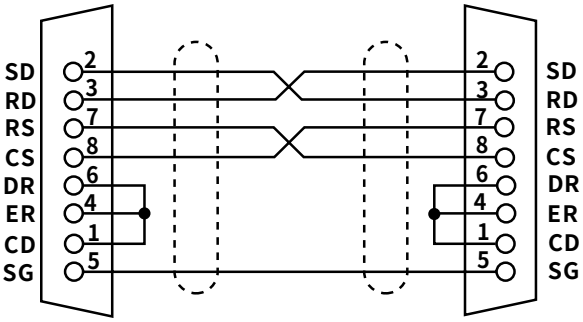
RS-232C	Cable type	MODE switch
TERMINAL	Straight	MODEM
TERMINAL	Cross	TERMINAL
MODEM	Straight	TERMINAL
MODEM	Cross	MODEM

- **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 pin (3))

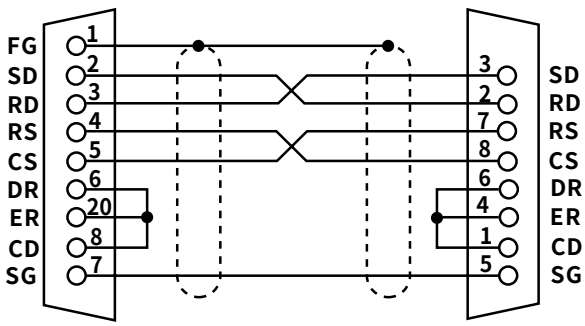


Cross: An RS-232C cable with a D-Sub (9-pin) connector at each end where different number pins are connected (for example, pin (2) to pin (3), and pin (3) to pin (2))

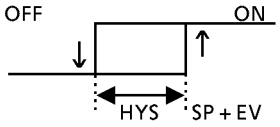
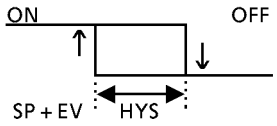
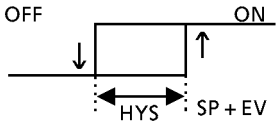
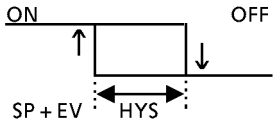
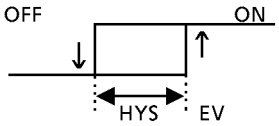
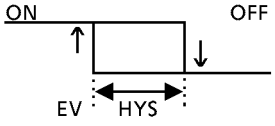
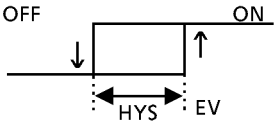
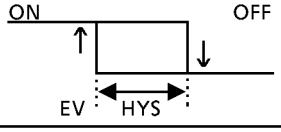
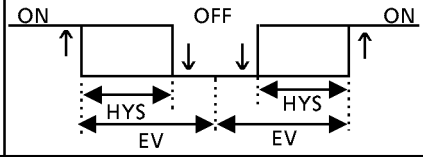
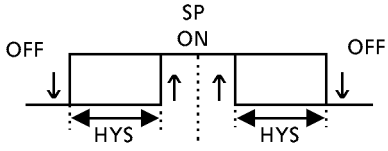


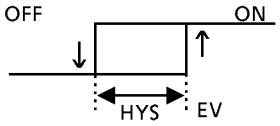
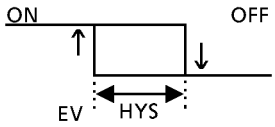
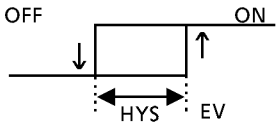
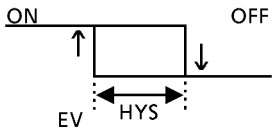
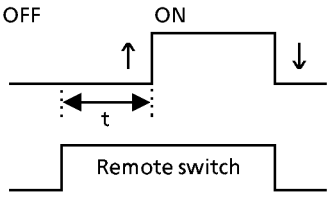
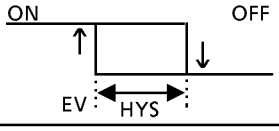
D-Sub (25-pin) – D-Sub (9-pin) conversion cable:

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



■ Event code table

Code	Event type	Action	Remarks
1	Deviation Direct action		
2	Deviation Reverse action		
3	Deviation Direct action with wait		Even under the condition that the event output is turned ON by power ON, the event output is kept OFF in wait status until the OFF condition is satisfied once.
4	Deviation Reverse action with wait		
5	PV Direct action		
6	PV Reverse action		
7	PV Direct action with wait		Same as 3, 4
8	PV Reverse action with wait		
9	Absolute value deviation Direct action		
10	Absolute value deviation Reverse action		
11	Absolute value deviation Direct action with wait	Same as 9	Same as 3, 4

Code	Event type	Action	Remarks
12	Absolute value deviation Reverse action with wait	Same as 10	Same as 3, 4
13	SP Direct action		
14	SP Reverse action		
15	SP Direct action with wait		Same as 3, 4
16	SP Reverse action with wait		
17	Alarm	ON during alarm occurrence	This event is output when an alarm occurs. There are none of setting range and hysteresis.
18	Timer		There is no hysteresis. This event is used in combination with a remote switch. The timer event can be allocated only by one point. Timer start and reset are done with the timer event. When the remote switch is turned ON, the timer event is started, and the event output is turned ON after set time. When the remote switch is turned OFF, the timer is reset, and the event output is turned OFF. (Note) If the remote switch is turned OFF during the timer operation, the timer is reset. Therefore, keep the remote switch ON until the event is output completely.
19	Heater disconnection		
0		Event OFF	

■ Input range code table

Code	Type	°C range	°F range
01	K	0 to 1200	0 to 2200
02		0.0 to 800.0	0 to 1400
03		-200.0 to + 400.0 **	-300 to + 700
04	J	0 to 1200	0 to 2000
05		0.0 to 800.0	0 to 1400
06		-200.0 to + 400.0 **	-300 to + 700
07	E	0.0 to 800.0	0 to 1400
08	T	-200.0 to + 400.0 **	-300 to + 700
09	R	0 to 1600	0 to 3000
10	S	0 to 1600	0 to 3000
11	B *	0 to 1800	0 to 3200
12	N	0 to 1300	32 to 2372
13	PLII	0 to 1300	32 to 2372
14	Wre5-26	0 to 2300	0 to 4000
16	Ni-Mo	0 to 1300	32 to 2372
17	DIN U	-200.0 to + 400.0 **	-300 to + 700
18	DIN L	0.0 to 800.0	0 to 1400
20	JIS Pt 100	-200.0 to + 500.0 **	-300 to + 700
21		-100.0 to + 200.0	-150.0 to + 400.0
30	JIS JPt 100	-200.0 to + 500.0 **	-300 to + 700
31		-100.0 to + 200.0	-150.0 to + 400.0
40	4 to 20mA	Scaling, or a decimal point position can be changed within the range of -1999 to + 9999.	
41	0 to 20mA		
45	1 to 5V		
46	0 to 5V		
50	0 to 10mV		
51	0 to 100mV		
52	-10 to + 10mV		

* The accuracy is undefined below 260°C (500°F).
A temperature of less than 20°C is not given in °C indication.
A temperature of less than 68°F is not given in °F indication.

** -200.0 can neither be indicated nor set, but adjustment can be done at -200.0°C.

Revision History

Printed Date	Manual Number	Edition	Revised pages	Description
94-08	**CP-UM-1572E**	**1st Edition**		
01-04		**2nd Edition**	2-1 to 2-3, Appendix1 to 3 6-1 to 6-6	RS-232C and RS-485 connection diagrams changed. Sample program changed.

Specifications are subject to change without notice.

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