Instruction Manual
RS-232C, GP-IB
For RA1000 Series

NEC San-ei Instruments, Ltd.
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INTRODUCTION

We thank you for your purchase of our product OMNIACE II RA1000 Series. Please read this manual before operating this instrument.
Refer to this manual to operate the GP-IB and RS-232C interfaces, which are provided as standard in the RA1000. This manual provides the information necessary to operate the RA1000 recorder safely. Place this manual within reach of the RA1000.

For basic operations, please refer to the RA1000 Recorder Manual. Please read the user's manual of the PC or modem before connecting the RA1000 to a PC or modem. If you encounter any problems in the manuals, please contact our sales representative.

This manual covers handling precautions and basic command operations of the RA1000 communication interface. For operation of basic functions, please refer to the separate-volume manuals listed below.

<Separate-volume manuals>

Manual	Document No.	Contents
Instruction Manual Mainframe For RA1000 Series	95691-2074-0000	This manual explains functions and how to operate the RA1000.
Instruction Manual Amplifier Units For RA1000 Series	95691-2076-0000	This manual explains how to use and install amp units.

*RA1000 , RA1200 and RA1300 are generically represented as the RA1000 or RA1000 Series in this manual.

■ Before Using

Notice

- Turn off the power when the operation is abnormal.
  If it is impossible to trace the cause of an abnormal operation, please contact our sales representative. In this case, let us know in what way the unit was operating incorrectly and what the environmental conditions are.
- The contents of this manual are subject to change without notice.
- This manual is copyrighted with all rights reserved. No parts of this manual may be transcribed or reproduced without written permission.
- Please let us know if there are any points that are unclear or missing in this manual.

■ Safety Measures - Warnings and Cautions

To safely use the product
The RA1000 Series is a product conforming to the IEC standard safety class I. The recorder is manufactured with safety in mind, however, accidents may occur due to misuse by the user. To avoid such accidents, read this manual carefully before use. Observe the following warnings and cautions when using the interface and remote control functions. To safely use the input units, the following statements are used in this manual to call the readers' attention.

⚠ WARNINGG

This indicates a condition or practice that could result in personal injury or loss of life, or may result in light injury or physical damage if this equipment is misused due to neglect of a Warning.

⚠ CAUTION

This indicates a condition or practice that could result in light injury or damage to the equipment or other property if this equipment is misused due to neglect of a Caution.

Be sure to observe the following instructions when using this recorder. The warranty does not cover damages resulting from actions contrary to the instructions, cautions, or warnings appearing in this manual.

⚠ WARNING

- **Connecting GP-IB or RS-232C cable to the RA1000**

  Be sure to observe the following instructions. Improper handling may lead to damage o f the recorder and the connected equipment.

  ·**Check to be sure the cable is one specified by NEC San-ei**.
  Especially, when using the RS-232C cable, different cables are used according to the connection target, personal computer or modem.

  ·**Turn off the power of the recorder before connecting the cable.**
  When connecting the RA1000 and another instrument, make sure that there is no potential difference between the RA1000 and the instrument. If there is a potential difference, determine the cause of the potential difference. Cable connection under a potential difference may cause damage to the recorder.

  ·**Do not insert the connector with more force than necessary.**
  Insert the connector at the right angle and in the right direction. Inserting the connector more forcefully than necessary may lead to damage.

■ Warranty - General

We ship our products after conducting quality control, which covers from design to manufacturing. It is, however, possible that failures may occur in products. If the product does not operate correctly, please make a check of the power supply, cable connections, or other conditions before returning this product to us. For repair or calibration, contact our sales agency. Before returning, be sure to inform us of the model, serial number, and problematic points. The following is our warranty.

■ Limited Warranty

1. Warranty period
   One year from our shipment.

2. Warranty limit
   We will repair the defects of our product free of charge within the warranty period; however, this warranty does not apply in the following cases.
(1) Damage or faults caused by incorrect use.
(2) Damage or faults caused by fire, earthquake, traffic accident, or other natural disasters.
(3) Damage or faults caused by a repair or modification that is carried out by someone other than a service representative of NEC San-ei Instruments.
(4) Damage or faults caused by use or storage in environmental conditions that should be avoided.
(5) Periodical calibration.
(6) Damage or faults caused during transportation.

3. Liability
   We do not assume any liabilities for equipment other than NEC San-ei Instruments.

■ Organization of This Manual

- **The contents of this manual are organized as follows.**

1. Selection of Communication Interface

Setting of communication interface used in the RA1000.

2. Overview of Communication Control

Explains major functions of communication manipulation and control in the RA1000.

3. Communication Control Command – X∗∗

Explains the communication manipulation commands and detailed communication manipulation of RS-232C and GP-IB interface.

4. Setting Command – S∗∗

Explains setting commands to be used to set the RA1000.

5. Information Readout Command – I∗∗

Explains the commands used to read the setup information of the RA1000.

6. Execute Command – E∗∗

Explains execution commands such as the commands used to start or stop recording in the RA1000.

7. File/Data Operation Command – F∗∗

Explains commands used to process data that is stored in the RT1000 internal memory or externally connected drive.

8. Text Operation Command – T∗∗

Explains commands related to the character strings that are used for printing such as page annotation or channel annotation.

9. Other Commands – R∗∗, W∗∗

Explains the commands used to read and write data from/to RA1000.

10. Data

Sample BASIC programs and code tables are introduced.

11. Specifications

Lists specifications of communication products.

■ Terms and Symbols in This Manual

The terms and symbols used in this manual denote the following.

Term or Symbol	Description
⚠ WARNING	This indicates a condition or practice that could result in personal injury or loss of life, or may result in light injury or physical damage if this equipment is misused due to neglect of a Warning.
⚠ CAUTION	This indicates a condition or practice that could result in light injury or damage to the equipment or other property if this equipment is misused due to neglect of a Caution.
NOTE	This indicates a condition or practice that could result in incorrect operation or damage to data if this equipment is misused due to neglect of a Note.
TIPS	This symbol gives setting restrictions and additional descriptions.
☞	Reference page
This recorder	RA1000 Series recorder
< >	Characters enclosed by the bracket < > indicate a key in the operating panel. example: the <START> key
〈 〉	Characters enclosed by the bracket 〈 〉 indicate a title of a display screen. example: <Real-time>
[ ]	Characters enclosed by the bracket [ ] indicate a title of a display screen that appears upon pressing a key in the operating panel.
Memory	Internal memory of RA1000 Series When measuring with a memory recorder or transient recorder, measured data is recorded in this memory.
Disk	The following recording media can be used in this product. • FD: 3.5-inch floppy disk, 2HD (double-sided, high-density type) • MO: 3.5-inch magneto-optic disk (340 MB or 640 MB) • PD: 12-cm phase change disk (650 MB) "Disk" in this manual is interpreted as the above three recording media.
PC card	The following PC cards can be used in this product. • IC memory card (SRAM card): 64 KB to 4 MB • Flash memory card: 2 MB to 100 MB "PC card" in this manual is interpreted as the above two cards.
k (lower case) K (upper case)	A unit of numerical value "k" is used to represent 1000 such as "10 kg". "K" is used to represent 1024 such as "4 K data"

NOTE

Setting channel No.
Channel numbers are specified as 1-A, 1-B , ・・・ in RA1000 main unit, but setting in communication command uses 1, 2, ・・・, 16 for channel numbers.
The comparison table of channel numbers between the main unit and this instruction manual as follows.

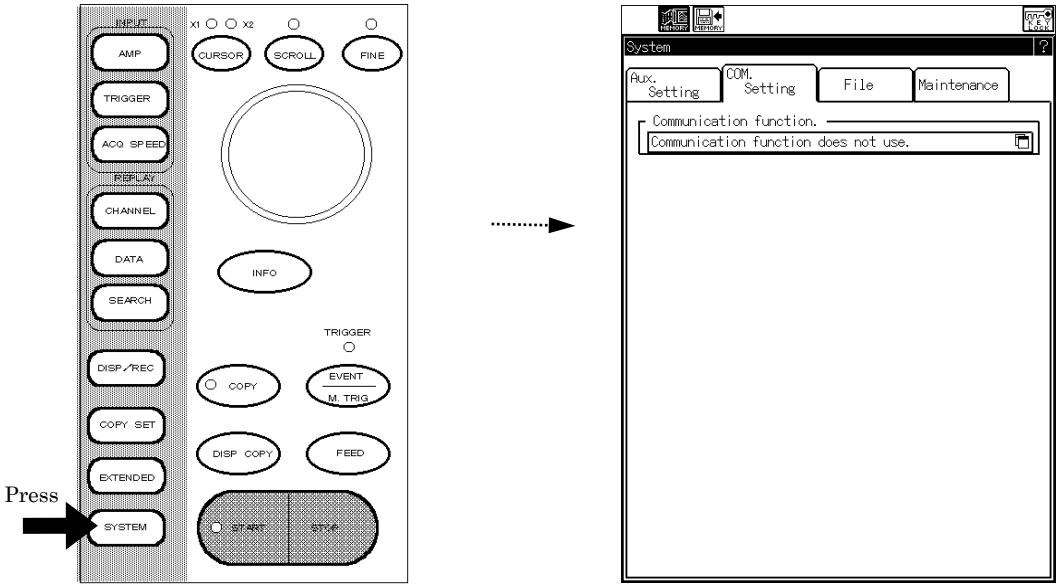
Channel No. of Main Unit	1-A	1-B	2-A	2-B	3-A	3-B	4-A	4-B	5-A	5-B	6-A	6-B	7-A	7-B	8-A	8-B
Channel No. of Communication Command	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

CONTENTS

1. Selection of Communication Interface

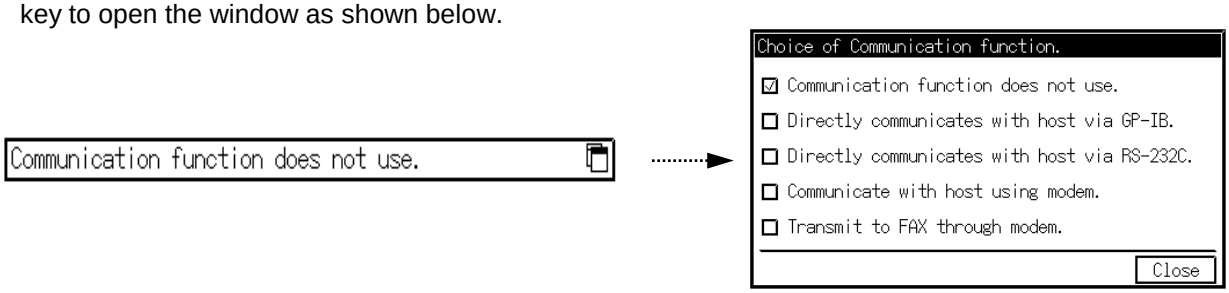
1.1 RA1000 Communication Interface Setup

◆ To control the RA1000 using an instrument such as a personal computer via a communication interface, you must allow RA1000 to conform to the specifications of the communication interface to be used in advance.



1.1.1 Overview of Communication Functions and How to Select Them

On the Communication Setting tab screen on the System window, press the Communication Function key to open the window as shown below.



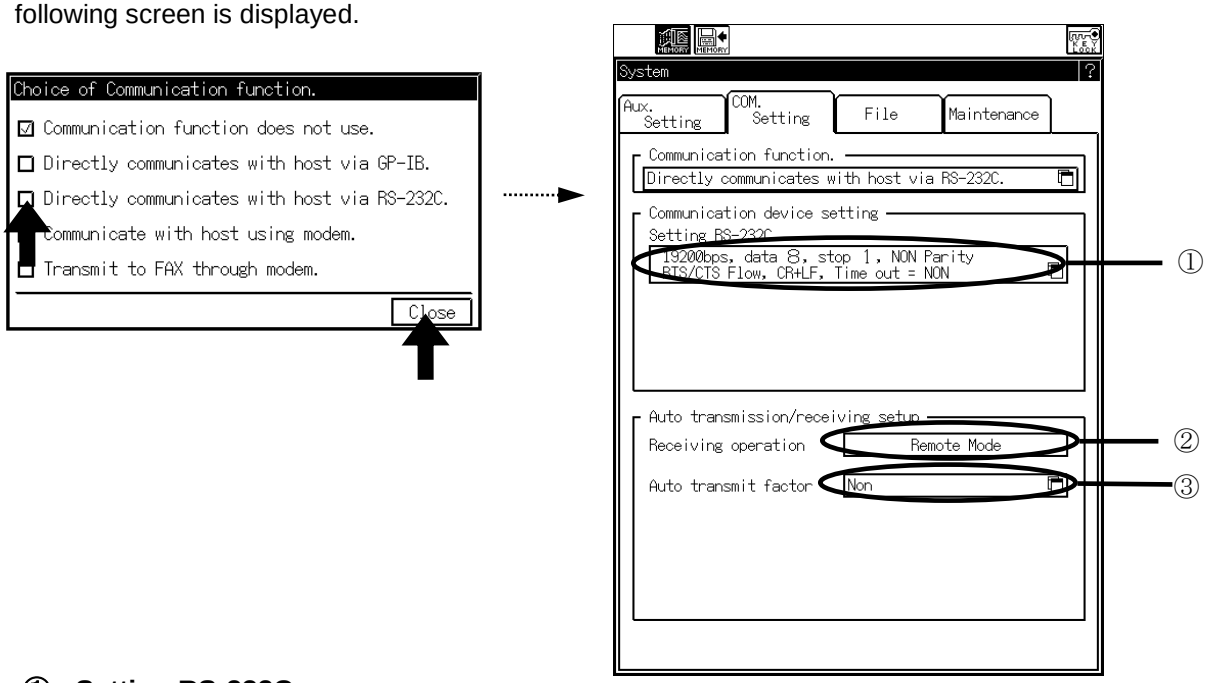
- **Communication function does not use.**
  Reception of the RS-232C and GP-IB interfaces are neglected and commands are rejected.
- **Communicate Directly with the Host.**
  Connecting the RA1000 and the host computer via RS-232C or GP-IB cable allows operating the RA1000 by remote control.
- **Communicate eith host using modem.**
  Connects the RA1000 to a modem and allows remote control through telephone line.
- **Transmit to FAX through modem.**
  Connects the RA1000 to a fax modem and allows to send a fax message.

NOTE When communicating with the host directly, use the cross cable, and when using a modem, use the straight cable for RS-232C cables.

1.2 How to Control RA1000 Using RS-232C

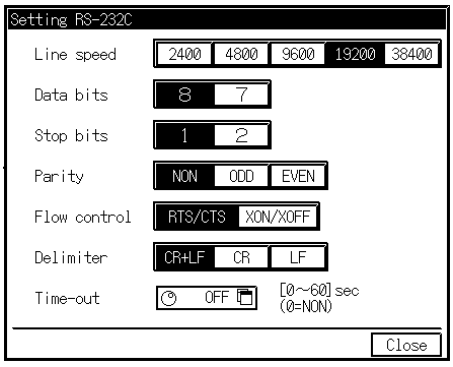
◆ By using the RS-232C interface, it is possible for the host computer to directly control the RA1000.

On the Communication Function setup screen, check Directly communicates with host via RS-232C. The following screen is displayed.



① Setting RS-232C

Sets the RS-232C communication protocol.



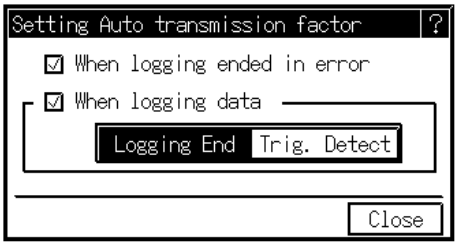
② Receiving operation

When the RS-232C interface receives a signal, the RA1000 goes into the remote condition.

③ Auto transmit factor

Sets the automatic transmission cause.

When the specified cause is generated, "!" is transmitted from the RS-232C interface.

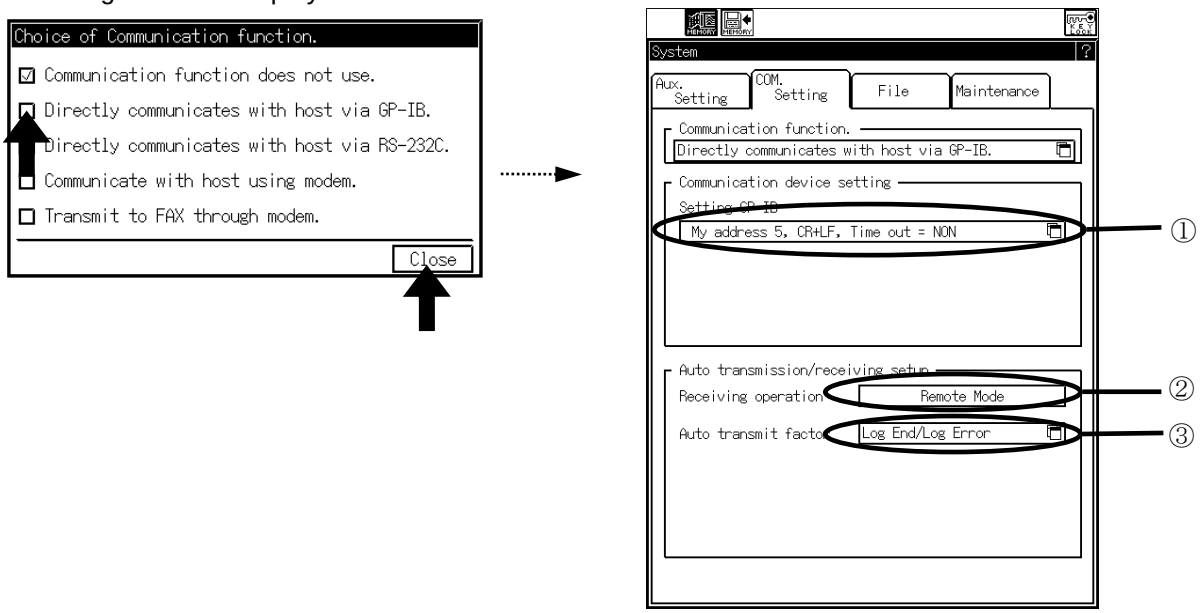


1.3 How to Control RA1000 Using GP-IB

◆ By using the GP-IB interface, it is possible for the host computer to directly control the RA1000.

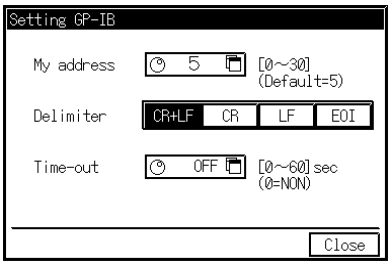
1.3.1 Making the GP-IB Setting on the Recorder

On the Communication Function setup screen, check Directly communicates with host via GP-IB. The following screen is displayed.



① Setting GP-IB

Sets the GP-IB communication protocol.



② Receiving operation

When the GP-IB interface receives a signal, the RA1000 goes into the remote condition.

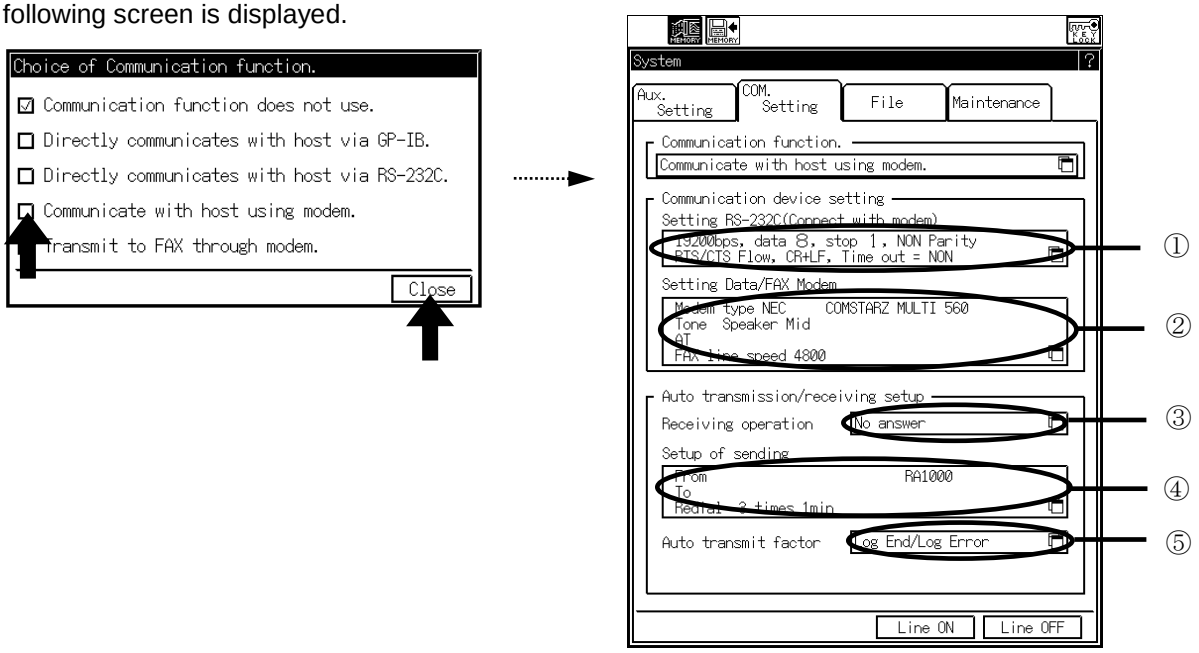
③ Auto transmit factor

Sets the automatic transmission cause.
When the specified cause is generated, "!" is transmitted from the GP-IB interface.

1.4 How to Operate RA1000 by Remote Control Using Modem

◆ By connecting the RA1000 to a modem, it is possible to operate the RA1000 through telephone line by remote control

On the Communication Function setup screen, check Communicate with host using modem. The following screen is displayed.

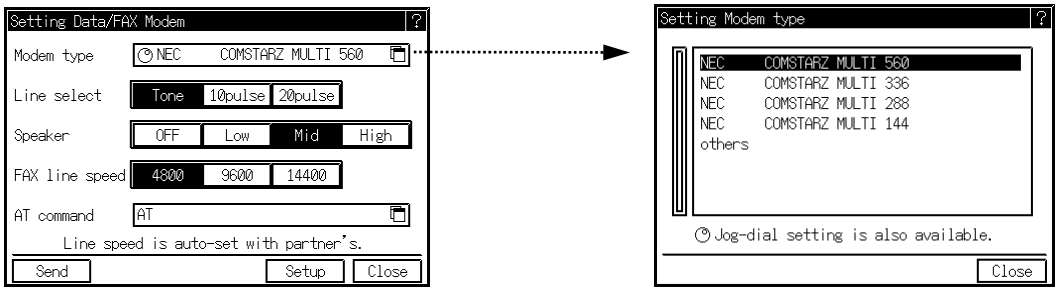


① Setting RS-232C (Connect with modem)

Sets the RS-232C communication protocol. For details, refer to the use's manual of your modem.

② Setting Data / FAX Modem

Sets the modem.

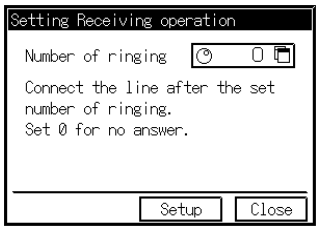


TIPS

- Each setting is transmitted to the modem by the AT command when communication is started.
- When setting up the modem before conducting communication, press the Setup key below the window. When setting only an edited AT command to the modem, press the Send key.
- After specifying the modem type, the AT command specific to the modem type is sent.

③ Receiving operation

Allows connection with the telephone line after waiting for specified number of incoming tone. When 0 is set to the number, incoming call is rejected and the line is not connected.

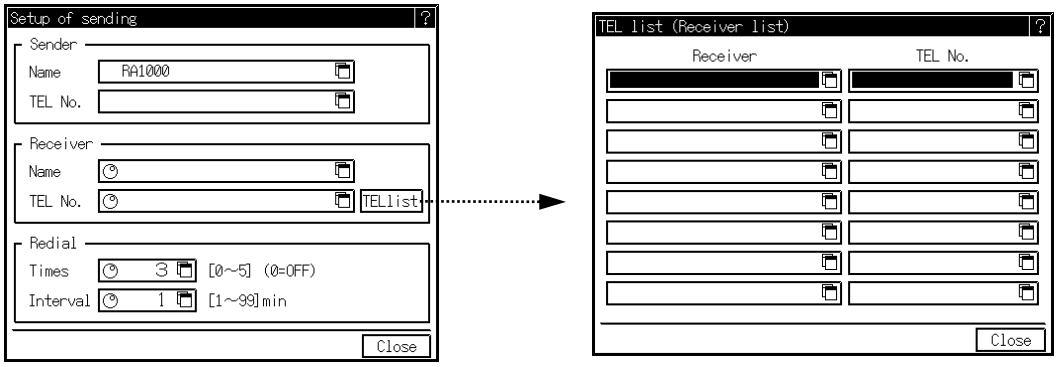


TIPS

Press the Setup key to set the modem.
To permit automatic termination, press this key.

④ Setup of sending

Sets sender and receiver names, phone numbers, and times of redial.



TIPS

- Always set the destination telephone number. Without the phone number, communication cannot be made.
- By using the telephone book function, up to eight receivers can be memorized. To open the window for this setting, press the “Telephone Book Function” key.

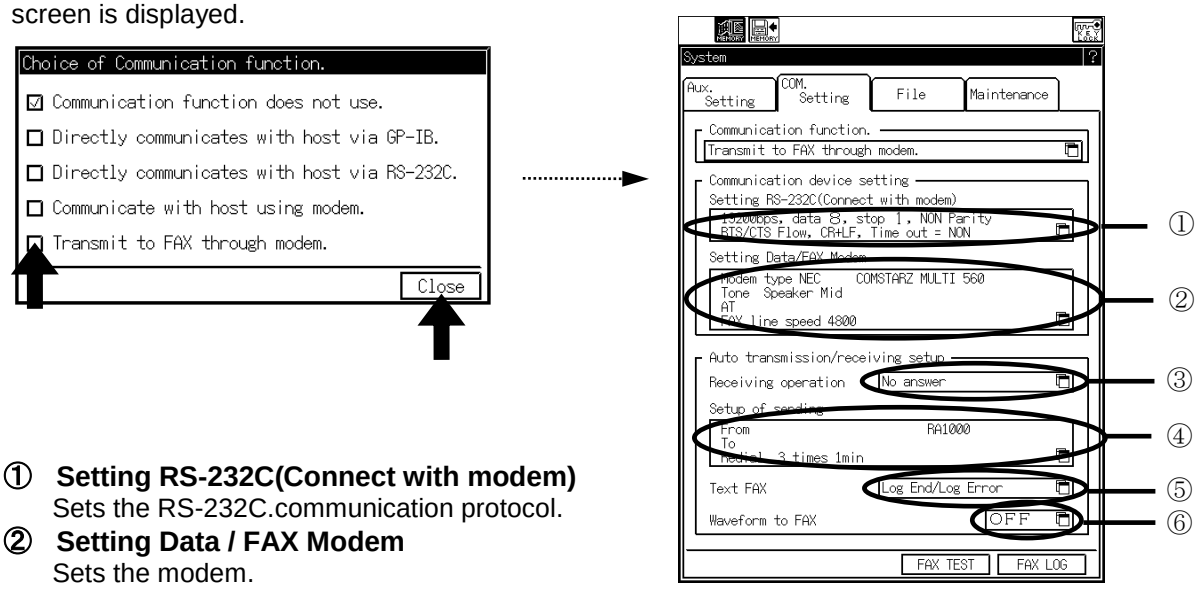
⑤ Auto transmit factor

Sets the automatic transmission cause.
When the specified cause is generated, the line is automatically connected.

1.5 How to Send Fax Message from RA1000

◆ By connecting the RA1000 to a fax modem, wavelength data and messages can be sent by fax.

On the Communication Function setup screen, check Transmit to FAX through modem. The following screen is displayed.



① Setting RS-232C(Connect with modem)
Sets the RS-232C.communication protocol.

② Setting Data / FAX Modem
Sets the modem.

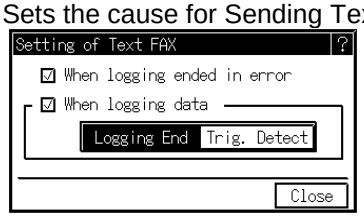
③ Receiving operation
Allows connection with the telephone line after waiting for specified number of incoming tone. When 0 is set to the number, incoming call is rejected and the line is not connected.

TIPS Even when Send Fax Message Using a Modem is selected on the Communication Function Setup window, calls can be received as in modem communication.

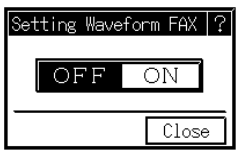
④ Setup of sending
Sets sender and receiver names, phone numbers, and times of redial.

TIPS By inputting names and phone numbers of sender and receiver in advance, they are printed on the header when sending a fax message.

⑤ Text FAX
Sets the cause for Sending Text via Fax.



⑥ Waveform to FAX
After stored into memory, recorded data are automatically sent via fax in the form of waveform.



2. Overview of Communication Control

2.1 Local/Remote Control

◆ The RA1000 has two control modes: 1) a local mode that allows control through the control panel and the touch panel, and 2) a remote control mode that allows control only through the communication port.

2.1.1 Local Mode

This is the default state after the power is turned on. Control can be performed either by the control panel and the touch panel, or by input from the remote terminal.

2.1.2 Remote Control Mode

If data is received when a communication function is selected, the RA1000 goes into the remote control mode and a dedicated screen is displayed. Also, when a preset automatic transmission cause is generated, the RA1000 is switched to the remote control mode. At this time, it is possible to control the RA1000 from the communication interface.

- **Data reception other than [NUL] occurs (RS-232C)**
- **Control Line REN-"L" + MLA or MTA command (GP-IB)**

When the RA1000 is switched to remote control mode, **recording continues** and the **remote control mode screen** is displayed. In the remote control mode, **all controls performed via the control/touch panel and the remote terminal are ignored**.

2.1.3 Returning to Local Mode

Returning to the local mode differs depending on which communication port is in use.

- **Receiving [ESC]-Z (RS-232C)**
- **Control Line REN-"H"(GP-IB)**
- **The local key at the upper right corner of the Remote Control screen**

☞ For details, see CHAPTER 3.

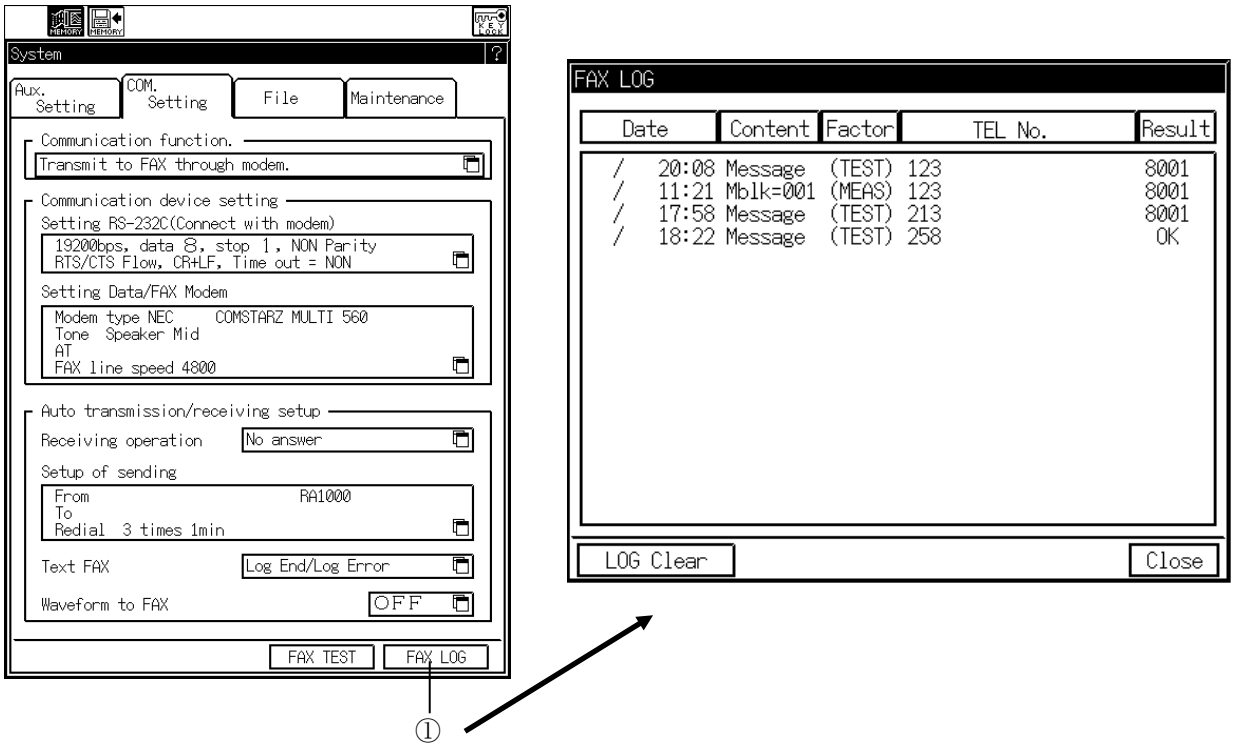
2.1.4 Cautions about Communication Using a Fax Modem

When a fax modem is connected to the RA1000 for communication using the telephone line, the following points must be observed.

- **Be sure to use a dedicated cable to connect the RA1000 to a modem.**
- **Communication can be impaired depending on the state of the line.**
- **Communication can be impaired when sender and receiver use different types of modem.**
- **For the response demand command, check answers from time to time.**
- **Do not use lines that can be interrupted by call waiting.**

2.1.5 Error Codes of Fax Transmission/Troubleshooting

You can check if the fax transmission has been normally performed. Press ①FAX LOG shown below to display fax transmissions made in the past. If OK is displayed on ②Result, fax transmissions have been performed normally. For other codes, check the list shown below.



Error Codes of Fax Transmission and Troubleshooting

Error Codes	Causes and Troubleshooting
OK	Normal Transmission
,0101,0102,0103 ,0201,0202,0203 ,0301,0302,0401	Line quality is suspect. (Ex. Synchronism with modem cannot be obtained/Cannot send data normally/Timeout occurs during data transmission). Check the line by lowering the Line Speed on fax settings or by retransmission.
8001	Modem is not connected or modem's power cable or the RS-232C cable is not connected normally. This error code is also generated when it is not possible to communicate with the modem correctly (result is not returned with the AT command). Check the modem settings.
C002	Modem initialization failed. It is not possible to normally communicate with the modem. Check the modem settings.
C003	Error occurred with the user command transmission. Check the content of the user command (e.g. Not the formal AT command or AT command that receives a result other than OK)
C004	Cannot be switched to the FAX mode. Check if the connected model supports the fax mode. Error occurs with modems not corresponding to CLASS1.
C005	Receiver's phone number was not registered. Check to see if receiver's phone number has been registered.
4006	Connection failed because the line was busy. If the redial setting has been made, the number is redialed. This error occurs when connection fails even after redialing. Send fax again.
C007	Dial connection with receiver failed. Check to see if the phone number is correct.
FFFF	Forcibly terminated.

2.2 Overview of the Communication Commands

◆ Communication commands to control the RA1000 remotely are categorized into three types.

○ **String Commands**

Controls such as settings and recordings are basically performed by string commands. The string commands consist of a 3-character command and parameter string following the command.

○ **Escape Sequence Commands**

The [ESC]+1 character is used as a command. By using these commands, operation/error information of the RA1000 can be obtained. This command cannot control settings and operation of the RA1000.

○ **1 Byte Control Command**

Execution is possible by sending a 1-byte control code alone, but functions are limited. The above-mentioned **string commands** and **escape sequence commands** have functions of equal or higher quality.

2.2.1 Format of String Command

The string command consists of a 3-character command and a parameter string following the command.
The initial character of the command represents the command type, and the second and third characters represent the contents of the command. The **EST command, which** starts recording, stands for **E**xecute **S**tar**T.**

E S T

Command content **S**tar**T**

Command type

X	**Communication Control**
S	**Setting**
I	**Read Information**
E	**Execute**
F	**File/Data Control**
T	**Text**
R	**Read Data**
W	**Write Data**

Input a parameter following the 3-character command. Insert a separator (comma "," or space " ") between parameters. When it is possible to omit parameters, it is necessary to insert commas in sequence instead of parameters in order to clearly indicate that the parameters are omitted. Lastly input a delimiter and operation is complete.
Available delimiters are **[CR+LF], [CR], [LF], [EOI]** (for GP-IB only), etc., and it is necessary to use the same delimiter as that set in the RA1000.

○*Format Examples of SMO Command (Memory Partition Number, Block No., Output Length Setting)*

SMO 6, 13, 40 [CR]	Sets Memory Partition 1/64, Block No.13, and Output Length of 40%
SMO 6,, [CR]	Sets 1/64 (Memory Partition Only)
SMO, 13, [CR]	Sets 13 (Block No. Only)
SMO,, 40 [CR]	Sets 40% (Output Length Only)

- **Omitting the parameter**
  When the parameter can be omitted, "**Can be omitted**" is specified in the command description. In other cases, parameters cannot be omitted.

2.3 1-Byte Control Command

◆ Execution is possible by sending a 1-byte control code alone, but functions are limited. The string commands and escape sequence command, mentioned in the preceding section, have functions of equal or higher quality. Note that usable commands are restricted depending on the communication interface.

● **Example of Basic Program Format**

100 PRINT#MAD,CHR$(&H05); (MAD = Line Number)

[ENQ]

<RS-232C>

Function	Outputs the state of the RA1000.
Input Format	[ENG](05h)
Description	When the RA1000 is operating, [NAK](15h) is returned. When the RA1000 is stopped and waiting for a command, [ACK](06) is returned. To see the status of the RA1000 in detail, use the [ESC]+C command.

[CAN]

<RS-232C><GP-IB>

Function	Cancels the command that is operating now.
Input Format	[CAN](18h)
Description	Command that has the same meaning as the ESP command that stops recording. When receiving a command, the command is canceled. When the RA1000 is performing an operation, the operation is terminated. However, an execution operation for amp settings such as auto-scale cannot be terminated.

[DC4]

<RS-232C>

Function	Initializes the RA1000
Input Format	[DC4](14h)
Description	Command that has the same meaning as the ESI command, which initializes the RA1000. This command can be executed while the RA1000 is not operating. When a command (e.g. data input and output) is being executed, this command cannot be executed.

2.4 Escape Sequence

◆ The [ESC]+1 character is used as a command. By using this command the RA1000's operation/error information can be obtained. This command cannot control settings and operation of the RA1000.

- Character code of [ESC] is 1Bh
- Example of basic program

```
100   PRINT#MAD,CHR$(&H1B)+"Z"; (MAD = Line Number)
```

In the Escape Sequence Command, a parameter or delimiter is not used.

[ESC]+Z

<RS-232C>

Function	Returns to the local state. The key control on the panel becomes valid.
Input Format	[ESC]+Z
Description	If sending [ESC] + Z with a delimitter (CR, LF, etc), it will be remote again by detecting the delimitter after returned to Local.

[ESC]+R

<RS-232C>

Function	Clears the interface transmit/receive buffer
Input Format	[ESC]+R
Description	When command transmission/reception becomes abnormal during communication, or unnecessary data accumulates in the transmit/receive buffer, it is possible to recover normal communication by initializing the interface.

[ESC]+C

<RS-232C><GP-IB>

Function	Outputs status (present status of the RA1000)
Input Format	[ESC]+C
Output Format	A1 (delimiter)
Answer	

A1	Outputs status (present status of the RA1000)
0	The RA1000 is not operating
1	Recording or measurement is in progress (includes real-time filing)
2	Memory copy is in progress (includes file save and load)
3	Paper feed is in progress
4	List print is in progress
5	Test print is in progress
6	Other operation is in progress (includes amp auto balance, etc.)

[ESC]+E

<RS-232C><GP-IB>

Function	Outputs error information of the RA1000.
Input Format	[ESC]+E
Output Format	A1, A2 (delimiter)
Answer	

A1	RA1000's hardware error information
0	Normal
1	When clamping of thermal head is released
2	No chart
4	Abnormal increase of thermal head temperature
8	Filing device error

A2	Software error information
0	Normal
1	Command grammar error
2	Parameter error
3	Mode error
4	Execution error

Description

Answer A1:

When two or more errors occurred simultaneously in the RA1000, the sum of all error numbers is output.

Error information on Answer A1 is not cleared until the error state is cleared.

Answer A2:

Command grammar error ····Grammar error when receiving command
Parameter error ····· Parameter has exceeded specified range
Mode error ····· Setting mode of the RA1000 and setting items are different
Execution error ·····Operation mode of the RA1000 and execution command are different.

When an error occurred in Answer A2, the error-causing command can be read out using the IES command.
Answer A2 is cleared after the contents are checked with the IES command.

*3. Communication Control Command - X** and Interface Function*

3.1 RS-232C/ GP-IB Common Command

◆ Delimiter settings and timeout settings of communication commands can be used for the communication interface both in the RS-232C and GP-IB.

XDL

< RS-232C>< GP-IB>

Function	Sets delimiter of communication command.
Input Format	XDL P1 (Delimiter)
Parameter	P1: 0 = CR+LF; 1 = CR; 2 = LF; 3 = [EOI] *** for GP-IB only**; None = CR+LF
Description	When initialized, the delimiter is CR+LF. [EOI] is valid only in the GP-IB, and if P1 = 3 is set when the RS-232C is connected, the delimiter is set to CR+LF.

XTO (Time Out)

<RS-232C><GP-IB>

Function	Sets time for communication timeout
Input Format	XTO P1 (Delimiter)
Parameter	P1: 0 = OFF; 1 | 99 = 1 second | 99 seconds
Description	In the RS-232C, when receiving data, if no data is transmitted from the host after the specified time elapses, the process is terminated by timeout. In the GP-IB, if data cannot be transceived in the talker or listener status, the process is terminated by timeout.

3.1.1 About Timeout

Timeout is normally set to OFF. If handshake blackout occurs when transceiving data, and this is not recovered after the timeout period has elapsed, the present operation is cancelled.

3.2 Communication Control Command Dedicated for RS-232C

◆ In the case of the communication control command dedicated for RS-232C, it is possible to select software control by the X Parameter or hardware control by RTS/CTS signals.

XON < RS-232C>

Function	Enables flow control of Xon/Xoff.
Input Format	XON (Delimiter)
Description	Sets RS-232C flow control by pairing with the following XOF and XRC commands. In the case of the Xon/Xoff command, the advantage is that only a small number of communication lines are required in a communication where only characters are sent and received. In the case of binary data communication, modem, or FAX communication, however, it is necessary to use RS/CS control.

XOF < RS-232C>

Function	Disables Xon/Xoff flow control, and enables RTS/CTS hardware control.
Input Format	XOF(Delimiter) or XRC(Delimiter)
Description	This setting must be made first after connection is made with a controller such as a personal computer (when not in operation, the setting can be made anytime). Default (initial status) is Xon/Xoff control.

3.2.1. About Communication Flow Control by RS/CS

Normally, this flow control is used. Since the flow control is operated by hardware (RTS/CTS signal), high-speed and reliable control is possible.

● **Flow Control When Receiving Data**

When the reception speed is high and the amount of unprocessed data in the receive buffer exceeds 2/3, 0 is output to the host through the RS-232C RS signal line to demand the host to stop the transmission. After that, when processing continues until the number of unprocessed data in the receive buffer is 1/3 or less, 1 is output through the RS-232C RS signal line to inform the host that data reception is possible.

● **Flow Control When Receiving Data**

When the RS-232C RS signal line becomes 0, output is stopped. When the RS signal line becomes 0, transmission is restarted.

RS signal specifications (RS-232C connector pin NO.4)

RS Signal Status	Output Voltage
1 (TRUE)	+8 V
0 (FALSE)	-8 V

CS signal specifications (RS-232C connector pin NO.5)

RS Signal Status	Input Voltage
1 (TRUE)	+5 V to +15 V
0 (FALSE)	-5 V to -15 V

3.2.2 Communication Flow Control by Xon/Xoff

Binary transmission of data is impossible using software Xon/Xoff control.

- **Flow control when receiving data**
  When the reception speed is high and amount of unprocessed data in the receive buffer exceeds 2/3, the Xoff (13h) code is transmitted to the host to demand the host to stop the transmission. After that, when processing continues until the amount of unprocessed data in the receive buffer is 1/3 or less, Xon (11h) is output to inform the host that data reception is possible.

- **Flow control when transmitting data**
  If Xoff is received from the host during transmission, the host judges the line is busy and interrupts the output. If Xon is received after Xoff is received, transmission is restarted.

3.3 Communication Control Command Dedicated to GP-IB

◆ This command sets whether to enable or disable the service request of the GP-IB interface.

XSR (Service Request) < GP-IB>

Function	Enables/disables service request according to parameter P1.
Input Format	XSR P1 (Delimiter)
Parameter	P1: 0 = Disable; 1 = Enable
Description	After receiving this command with Parameter 1, when a service request cause occurs, the command requests the controller to perform servicing (interrupt). By default, service requests are disabled. When the power is turned on, and when device is cleared, service requests are disabled.

3.3.1. Service Request Function (SR1)

When a status shown below occurs in the remote status, the RA1000 makes the SRQ signal on GP-IB "true", and demands a controller such as a personal computer to perform servicing.

- **When chart has run out**
- **Release of thermal head clump lever**
- **Abnormal rise of thermal head temperature**
- **When command can not be executed or set**
- **When measurement is finished**

When a controller such as a personal computer performs a serial polling as a result of a service request, the following status bytes are sent.

DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1
-	***SRQ***	-	***-***	***TRIG***	***MESURE***	***FILE***	***PRINTER***

SRQ Becomes 1 when service request is sent
TRIG Becomes 1 when trigger is generated
MESURE Becomes 1 when measurement terminates
FILE Becomes 1 when trouble occurs while filing
PRINTER Becomes 1 when recording paper runs out, paper lock is released, or thermal head is abnormally heated. This bit is set when the printer equipped in the RA1000 cannot be used.

All bits are cleared if a status byte is transmitted by serial pole.

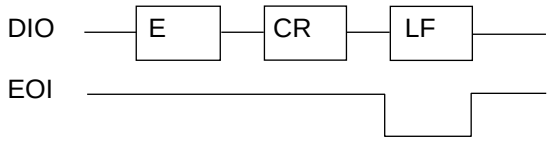
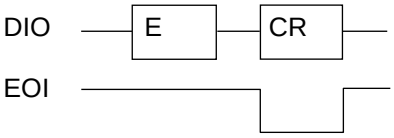
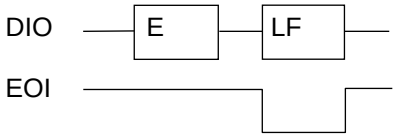
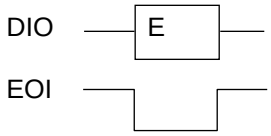
3.3.2. GP-IB Interface - Talker Function (T6)

The RA1000 transmits data when specified as the talker by a controller (such as a personal computer). The transmission data depends on the command that is received as a listener just before the RA1000 is specified as the talker.

○ **Transmission Output Format**

【Output Format】(Transmission output data) (Delimiter)

【Description】 The contents of the transmission output data depend on the command. See Chapter 4. About Commands and Communication Control. Delimiters are separators of data, and the RA1000 transmits the delimiter that has been set. The relationship between setting and transmission of data are shown below.

Delimiter	GP-IB signal
CR･LF	
CR	
LF	
EOI	

DIO: Input/Output Data Line
EOI: EOI signal
E : Last byte of Transmission Data

When binary output is specified by the data readout command, only EOI is output as a delimiter regardless of the setting.

The RA1000 becomes a talker when MTA (My Talk Address) is received, and the talker is released in the following cases.

- **When MLA (My Listen Address) is received**
- **When OTA (Other Talk Address) is received.**
- **When UNT (Untalk) is received.**
- **When IFC (Interface Clear) is received.**

3.3.3 GP-IB Interface - Listener Function (L4)

When the RA1000 is specified as the listener by a controller such as a personal computer, it receives original commands and user annotation text and data. Also it is possible to receive the address specification command (GP-IB multi line message) from a controller (such as a personal computer).

- **Command Input**
- **User Annotation**
- **Write Data**
- **Address Specification Command (GP-IB Multi Line Message)**

If specified as the listener, this unit receives and executes the following three address specification commands.

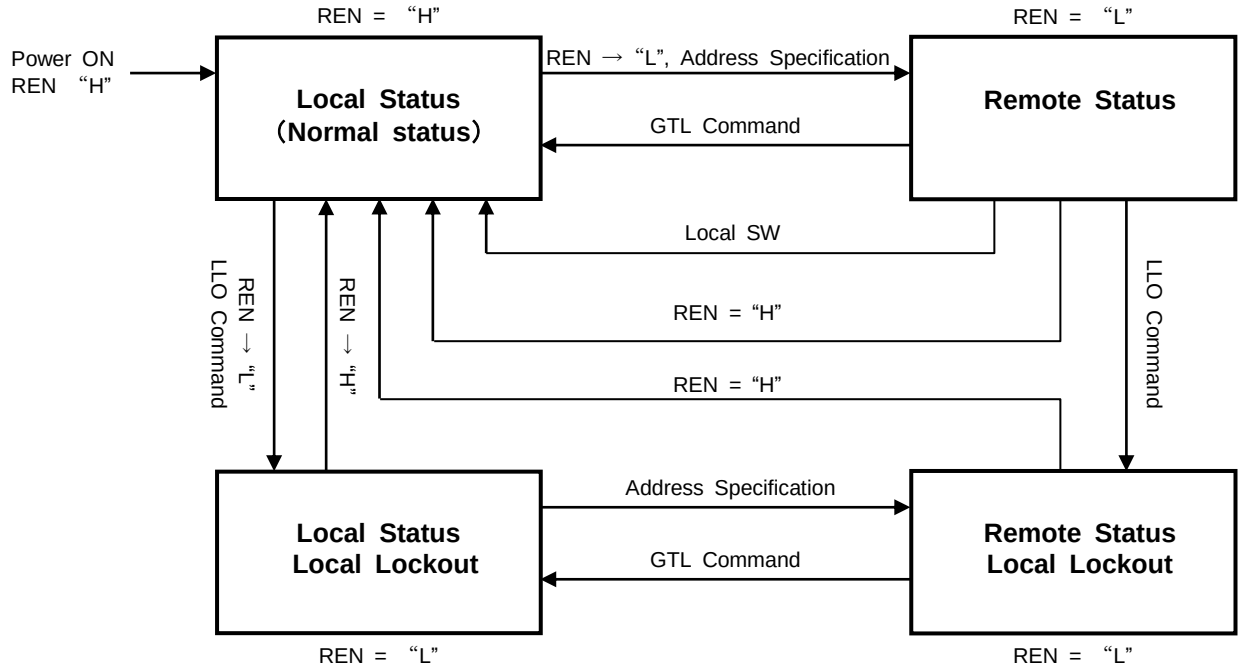
- **GET (Group Execute Trigger)**
- **GTL (Go To Local)**
- **DC (Selected Device Clear)**

This unit becomes the listener when MLA (My Listen Address) is received, and the listener is released in the following cases.

- **When MTA (My Talk Address) is received**
- **When UNL (Unlisten) is received**
- **When IFC (Interface Clear) is received**

3.3.4 Remote Control / Local Function (RL1)

The RA1000 has a local control that consists of a remote control by the GP-IB, operation panel key, and remote connector input signal. These relationships are shown below.



- In the lockout status, the local switch on the touch panel cannot be used.
- Do not set anything for at least 20 ms after remote/local switching.

3.3.5 GP-IB Interface - Device Clear Function (DC1)

When GP-IB commands (multi-line message) are received, the RA1000 is set to the initial status. These commands do not change my address/delimiter.

- **SDC (Selected Device Clear) Command (04h)**
  Effective only when address-specified as listener.

- **DCL (Device Clear) Command (14h)**
  This is a universal command and executable without the address specification.

3.3.6 GP-IB Interface - Device Trigger Function (DT1)

If address specification command GET (Group Execute Trigger) is received when the RA1000 is specified as the listener, measurement starts. When the start key of the RA1000 is pressed, the operation is the same as when recording start command EST is received.

*4. Setting Command - S**

4.1 Measurement Mode/Recording Format

SRM (Set Recording Mode)

<RS-232C><GP-IB>

Function	Sets measurement mode.
Input Format	SRM P1 (Delimiter)
Parameters	P1: Sets measuring mode (Recorder Type) 1: Memory (Memory Recorder) 2: Real-time (Real-Time Recorder) 3: Transient (Transient Recorder) 4: Filing mode (Filing mode) 5: FFT mode (expansion) (FFT mode)
Description	These settings are recording basics. For details of each recording type, see the RA1000 Mainframe Instructin Manual. While the RA1000 is operating, an execution error occurs.

SPF (Set Print Form)

<RS-232C><GP-IB>

Function	Sets recording format (FORM) .
Input Format	SPF P1 (Delimiter)
Parameter	P1: Recorder Form 1: Waveform Recording 2: X-Y Recording 3: Digital Recording (DATA) 4: A4 (Use of a recorder other than the memory recorder causes a mode error.)
Description	In the filing recording in the transient recorder and the real-time recorder data becomes waveforms regardless of the recording format. A4 waveform output is enabled only when the memory recorder is used. Recording output in the filing mode is recorded in waveform irrespective of this setting. While the RA1000 is operating, an execution error occurs.

4.2 Real-Time Mode

SCS (Set Chart Speed) <RS-232C><GP-IB>

Function	Sets chart feeding speed and sample speed of the real-time mode.
Input Format	SCS P1, P2 (Delimiter)
Parameter	• In real-time waveform recording

P1	Sets real-time waveform recording speed
1 - 100	1 to 100 (Recordable by 1 step, recording unit is set by P2)
E	External synchronization recording (external synchronization pulse is set by P2)

When P1=n, recording speed unit

P2	Sets recording unit
1	mm/s
2	mm/min
Omitted	mm/s

When P1=E

P2	Sets external synchronization recording pulse
1	0.1mm/pulse
2	0.025mm/pulse
Omitted	0.1mm/pulse

• In real-time digital recording

P1	Sets real-time digital recording speed
1-999	1-999 (Recording unit is set by P2)
E	External synchronization recording

When P1 = value, speed unit (invalid, when external synchronization is specified)

P2	Sets recording unit
2	s (1-999: 1 Step)
3	min (1-999: 1 Step)
4	h (1- 24: 1 Step)
Omitted	s (1-999: 1 Step)

* In real-time digital recording, this command is not valid.

Description	The parameter range varies depending on the recording mode. A setting exceeding the range causes a parameter error. If the setting is made with the memory recorder a mode error occurs, and if the setting is made when X-Y recording is in progress an execution error occurs. In X-Y recording, the recording speed is not set.

SSL (Set Shot Length) <RS-232C><GP-IB>

Function	Sets printing length in the real-time mode.
Input Format	SSL P1、P2(Delimiter)
Parameter	<Waveform Recording> P1: Recording length (SHOT) 1: CONT (sequent) 2: 100 div 3: 50 div 4: 20 div U: User setting When P1=U P2: Recording length (SHOT) 1-1000: 1-1000 div < Digital Recording> P1: Recording length (SHOT) 1: CONT (sequent) 2: 500 data 3: 250 data 4: 100 data U: User setting When P1=U P2: Recording length (SHOT) 1-1000: 1-1000 data
Description	When a P1 recording length other than U is specified, P2 becomes invalid. If this command is set while the RA1000 is operating, an execution error occurs. When the trigger is set to repeat in real-time trigger mode, setting in sequence is impossible (a mode error occurs).

SFS (Set Full Scale) <RS-232C><GP-IB>

Function	Sets full scale in waveform recording.
Input Format	SFS P1 (Delimiter)
Parameter	P1: 1 = Full Scale 1/1, Recording Width 200 mm 2 = 1/2, 100 mm 3 = 1/4, 50 mm 4 = 1/8, 25 mm 5 = 1/16, 10 mm U = User setting
Description	If this is set while the RA1000 is operating, an execution error occurs.

SRT (Set Real-Time Trigger) <RS-232C><GP-IB>

Function	Sets real-time recording operation.
Input Format	SRT P1, P2 (Delimiter)
Parameter	P1: Timing of starting recording 0: When “START” key is pressed (OFF) 1: When trigger is detected: Once 2: When trigger is detected: Repeat P2: Sets ON/OFF mark print with trigger 0: OFF 1: ON
Description	For details on operation, see the RA1000 Mainframe Instruction Manual. If set while the RA1000 is operating, an execution error occurs. If P1 = 0 is specified when the recording format is X-Y, P2 is invalidated and becomes 0.

4.3 Memory Mode

NOTE If a setting command related to memory recording is set while the RA1000 is operating, an execution error occurs.

SSC (Set Sampling Clock) <RS-232C><GP-IB>

Function	Sets sampling speed in memory mode/transient mode
Input Format	SSC P1, P2 (Delimiter)
Parameter	P1: Sets sampling speed 1 - 999: 1 - 999 E: External synchronization sample When P1 = value P2: Sets sample unit 1: µs 2: ms 3: s When external synchronization sampling is specified, P2 is invalid.
Description	Setting of 1 to 999 µs, ms, or s by one step is possible

SPS (Set Print Size) <RS-232C><GP-IB>

Function	Sets copy scaling (data interval) of memory recorder or transient recorder in memory copy
Input Format	SPS P1 (Delimiter)
Parameter	★When recording form is waveform

P1	Sets copy scaling
1	x5
2	x2
3	1/1
4	1/2
5	1/5
6	1/10
7	1/20
8	1/50
9	1/100
10	1/200
11	1/500
12	1/1000

★ When recording form is digital, X-Y

P1	Sets data interval
1	1 step
2	2 step
3	5 step
4	10 step
5	20 step
6	50 step
7	100 step
8	200 step
9	500 step
10	1000 step

Description	The digital and data interval of X-Y are reflected in the data interval of memory filing in the CSV format.

SMO (Set Memory Read Out) <RS-232C><GP-IB>

Function	Sets memory segmentation number, memory block No., and readout amount in copying
Input Format	SMO P1, P2, P3 (Delimiter)
Parameter	

P1	Sets memory block segmentation (Memory block SEG)
0	No memory segmentation (memory block = 1 block)
1	1/2 segmentation (memory block = 2 blocks)
2	1/4 segmentation (memory block = 4 blocks)
3	1/8 segmentation (memory block = 8 blocks)
4	1/16 segmentation (memory block = 16 blocks)
5	1/32 segmentation (memory block = 32 blocks)
6	1/64 segmentation (memory block = 64 blocks)
7	1/128 segmentation (memory block = 128 blocks)

※P1 can be omitted (when omitted, there is no change)

P2	Sets block No. (MEM block)
1-128	1-128

※P2 can be omitted (when omitted, there is no change)

P3	Sets readout amount (MEM read)
1-100	1-100%

※P3 can be omitted (when omitted, there is no change)

Description	By omitting parameters, setting of only 1 item is possible. SMO P1,, : Sets only memory segmentation. In this case, block number is reset to 1. SMO, P2, : Sets only memory block No. When specified memory block No. is larger than segmentation number, a parameter error occurs. SMO,, P3 : Sets only readout amount. When segmentation is changed, data in memory is cleared. When this command is executed, the output range setting always becomes “% specification centering trigger”.

SAC (Set Auto Copy) <RS-232C><GP-IB>

Function	Sets ON/OFF the auto copy of the transient mode when recording is performed using the memory mode.
Input Format	SAC P1 (Delimiter)
Parameter	

P1	Sets auto copy (AUTO COPY)
0	OFF
1	ON

Description	This command is preserved for compatibility. Use the SMI command.

SMB (Set Memory Block)

<RS-232C><GP-IB>

Function	Sets block No. of the RA1000's internal memory in memory mode or transient mode.
Input Format	SMB P1 (Delimiter)
Parameter	P1: Sets memory block No. 1-128: 1-128
Description	The maximum value varies depending on the setting of the memory segmentation.

SMC (Set Memory Copy)

<RS-232C><GP-IB>

Function	Sets the readout amount of the RA1000's internal memory when copying
Input Format	SMC P1 (Delimiter)
Parameter	P1: Sets readout amount (MEM read) 1-100: 1-100 %
Description	After this command is executed, output range setting will always be "% specification with reference to trigger point".

4.4 Trigger

◆ The following commands are trigger-setting commands that are effective when trigger is set to ON in the memory recorder, transient recorder, and real-time recorder. When the RA1000 is operating, an execution error occurs.

STM (Set Trigger Mode) <RS-232C><GP-IB>

Function	Sets trigger mode
Input Format	STM P1, P2 (Delimiter)
Parameter	P1: Sets trigger mode (Trigger mode) 0: OFF 1: OR 2: AND 3: A*B 4: WINDOW P2: Reserved Parameter
Description	P2 is a reserved parameter and invalid even if set.

STD (Set Trigger Delay) <RS-232C><GP-IB>

Function	Sets pre-trigger capacity
Input Format	STD P1 (Delimiter)
Parameter	P1: Sets pre-trigger capacity (pre-trigger) 0-100: 0-100 %
Description	Becomes valid when recording in a memory block.

STE (Set Trigger Execution) <RS-232C><GP-IB>

Function	Sets memory recording operation (Once/Repeat/Endless).
Input Format	STE P1 (Delimiter)
Parameter	P1: Sets measurement number 1: Once (Single) 2: Repeat (Repeat) 3: Endless (Over WR)
Description	The STE command is enabled in the memory and transient modes. Use SRT for trigger operation in the real-time mode.

STC (Set Trigger mode OR, AND Channel) <RS-232C><GP-IB>

Function	Sets trigger ON/OFF, trigger level, and trigger slope for each trigger source channel of trigger mode AND or OR.
Input Format	STC P1, P2, P3, P4 (Delimiter)
Parameter	

P1	Sets channel
1-16	1-A to 8-B

P2	Sets ON/OFF trigger
0	OFF
1	ON

In the case of input unit other than ***EV***

P3	Sets trigger level
-500.0 to 500.0	-500.0 to 500.0

*Can be set with 1% resolution of each range (The table above is a case of 500 V measuring mode. The trigger level varies depending on the range of each amp unit.)

P4	Sets slope
1	↑ (Rising Edge)
2	↓ (Falling Edge)

*P3 and P4 can be omitted at the same time

In the case of ***EV***

P3	Sets AND/OR trigger in the unit
1	AND
2	OR

P4	X/H/L trigger condition of each signal in the unit	
0	X	n1n2n3n4n5n6n7n8 1ch·····8ch
1	H	
2	L	

*P3 and P4 can be omitted at the same time

Description	Parameters P3 and P4 can be omitted at the same time. To omit them, use " , " to separate the two parameters. A trigger level unit is not necessary and complies with the range setting.

STA (Set Trigger A*B)

<RS-232C><GP-IB>

Function	Sets trigger channel, trigger level, and trigger slope for trigger mode A*B.
Input Format	STA P1, P2, P3, P4, P5, P6, P7, P8 (Delimiter)

Parameter

P1	A*B Set No.
1	1-A*B
2	2-A*B
3	3-A*B
4	4-A*B

P2	Sets ON/OFF A*B
0	OFF
1	ON

In the case of input unit other than ***EV***

P3	Sets A Source Channel
1-8, 9-16	1-A to 4-B / 5-A to 8-B CH

P4	Sets trigger level of A source
-500.0 to 500.0	-500.0 to 500.0

*Can be set with 1% resolution of each range (The table above is a case of 500 V measuring mode. The trigger level varies depending on the range of each amp unit.)

P5	Sets trigger slope of A source
1	↑ (Rising Edge)
2	↓ (Falling Edge)

P6	Sets B source channel
1-8, 9-16	1-A to 4-B / 5-A to 8-B CH

P7	Sets trigger level of B source
-500.0-500.0	-500.0-500.0

※Can be set with 1% resolution of each range (The table above is a case of 500 V measuring mode. The trigger level varies depending on the range of each input unit.)

P8	Sets trigger slope of B source
1	↑ (Rising Edge)
2	↓ (Falling Edge)

In the case of ***EV*** unit

P3	Sets A source channel
1-8, 9-16	1-A to 4-B/5-A to 8-B CH

P4	Sets AND/OR trigger in A source unit
1	AND
2	OR

P5	Sets X/H/L trigger condition of each signal in A source unit	
0	X	n1n2n3n4n5n6n7n8 1ch·····8ch
1	H	
2	L	

P6	Sets B source channel
1-8, 9-16	1-A to 4-B / 5-A to 8-B CH

P7	Sets AND/OR trigger in B source unit
1	AND
2	OR

P8	Sets X/H/L trigger condition of each signal in B source unit	
0	X	n1n2n3n4n5n6n7n8 1ch·····8ch
1	H	
2	L	

Description

For a unit other than ***EV***, the same channel can be set for the source channels of A and B, or channels already connected to other A*B can be set.
When trigger A is invalid, a mode error occurs.
A trigger level unit is unnecessary and complies with the range setting.
When 1-8 is specified for A source channel, also specify 1-8 for B source channel.
When 9-16 is specified for A source channel, also specify 9-16 for B source channel.
Combinations other than the above cause a parameter error.

STW (Set Trigger Window) <RS-232C><GP-IB>

Function	Sets trigger source channel, maximum level, minimum level, and direction of trigger occurrence on trigger mode WINDOW Valid in amp unit other than ***EV***.
Input Format	STW P1, P2, P3, P4, P5, P6 (Delimiter)
Parameter	

P1	WINDOW Set No.
1-8	1-WINDOW to 8-WINDOW

P2	Sets ON/OFF WINDOW
0	OFF
1	ON

P3	Sets source channel
1-8, 9-16	1-A to 4-B / 5-A to 8-B CH

P4	Sets the maximum level of trigger
-500.0 to 500.0	-500.0 to 500.0

※Can be set with 1% resolution of each range (The table above is a case of 500 V measuring mode. The trigger level varies depending on the range of each amp unit.)

P5	Sets the minimum level of trigger
-500.0 to 500.0	-500.0 to 500.0

※Can be set with 1% resolution of each range (The table above is a case of 500V measuring mode. Trigger level varies depending on the range of each input unit.)

P6	Sets direction of trigger occurrence
1	Out (trigger occurrence outside the setting range)
2	In (trigger occurred within setting range)

Description	For the WINDOW trigger, when set to OUT, if the signal exceeds the set maximum and minimum level, a trigger is generated, and when set to IN, if the signal is within the set maximum and minimum level, a trigger is generated. A trigger level unit is unnecessary and complies with the range setting. When ***EV*** is selected for the source channel, a parameter error occurs. Specify source channel 1-8 (1-A to 4-B) for 1-4 WINDOW, and source channel 9 -16 (5-A to 8-B) for 5 - 8 WINDOW. When 9-16 is specified for A source channel, also specify 9-16 for B source channel. Combinations other than the above cause a parameter error.

STF (Set Trigger Filter)

<RS-232C><GP-IB>

Function	Sets trigger filter.
Input Format	STF P1 (Delimiter)
Parameter	

P1	Sets trigger filter (TRIG FILTER)
0	OFF
1-65535	1-65535

STP (Set Trigger Pass count)

<RS-232C><GP-IB>

Function	Sets trigger pass count
Input Format	STP P1 (Delimiter)
Parameter	

P1	Sets pass count (TRIG PASS COUNT)
0	OFF
1-255	1-255 times

STT (Set Trigger Time)

<RS-232C><GP-IB>

Function	Sets time trigger
Input Format	STT P1, P2, P3, P4 (Delimiter)
Parameter	

P1	Setting items
1	Timer-start time
2	Timer-stop time
3	Interval
4	Interval operating time

P2	Sets date
1-31	1-31
*	Invalid

P3	Sets hour
0-23	0-23
*	Invalid

P4	Sets minute
0-59	0-59
*	Invalid

Description	When P1* is set, the time trigger is set to OFF. When P2=P3=P4=* is set, items set by P1 are set to OFF. For items whose parameters are omitted, values set in the RA1000 become valid. When all parameters are omitted, a parameter error occurs.

4.5 X-Y

◆ The following commands are setting commands for X-Y recording. They are effective when the RA1000 is not operating, and when it is operating, an execution error occurs.

SXA (Set X-Axis) <RS-232C><GP-IB>

Function	Sets standard axis channel in X-Y recording
Input Format	SXA P1(Delimiter)
Parameter	P1: Sets channel 1-16: 1-A to 8-B CH
Description	If X/Y axis is user settable, an execution error occurs.

SYA (Set Y-Axis) <RS-232C><GP-IB>

Function	Sets auxiliary-axis channel in X-Y recording
Input Format	SYA P1 (Delimiter)
Parameter	P1: Sets ON/OFF auxiliary axis channel (16 characters) 0: OFF 1: ON n1n2n·····n16 1-ACH·····8-BCH
Description	If X/Y axis is user settable, an execution error occurs.

SXM (Set X-Y Multi draw) <RS-232C><GP-IB>

Function	Sets overwrite in X-Y recording in memory mode.
Input Format	SXM P1 (Delimiter)
Parameter	P1: Sets ON/OFF over write (Over Write) 0: OFF 1: ON
Description	This function is valid in memory mode (X-Y recording).

SXL (Set X-Y Line or dot) <RS-232C><GP-IB>

Function	Sets recording mode in X-Y recording.
Input Format	SXL P1 (Delimiter)
Parameter	P1: Sets recording mode (Record mode) 1: Line (LINE) 2: Dot (DOT) *P1 can not be omitted

SXY (Set X-Y axis mode) <RS-232C><GP-IB>

Function	Sets reference axis in X-Y recording.
Input Format	SXY P1 (Delimiter)
Parameter	

P1	Standard axis in X-Y recording
1	X axis
2	Y axis
3	User settable

SXX (Set X-y axis pattern) <RS-232C><GP-IB>

Function	Sets axis pattern of reference axis in X-Y recording
Input Format	SXX
Parameter	

P1	X-axis channel
1 | 16	1-A | 8-B

P2	Y-axis channel	
0	OFF	n1n2n · · · · · · · · n16 1-A CH ..... 8-B CH
1	ON	

Caution	When the number of channels of the specified Y axis exceeds 15 in total, an error occurs. In this case, cancel all Y-axis specifications, and then set the desired channel to the Y axis.

4.6 Amp Unit

◆ The followings are setting commands of the input unit. If recording is performed using a recorder other than the real-time recorder or the real-time recorder with the trigger ON, an execution error occurs.

(Some commands cannot be made during recording using the real-time recorder. For details, see each command.)

Names of amp units are represented by the following symbols.

Name of Amp Unit	Symbol
2-CH high resolution DC amp unit	***HRDC***
2-CH FFT amp unit	***FFT***
2-CH high speed DC amp unit	***HSDC***
2-CH AC strain amp unit	***ACST***
Event amp unit	***EV***

Name of Amp Unit	Symbol
2-CH TC/DC amp unit	***TCDC***
TC/DC amp unit	***TDC***
F/V converter unit	***FV***
2-CH oscillation･RMS amp unit	***RMS***
2-CH DC strain amp unit	***DCST***

SCH (Set CHannel)

<RS-232C><GP-IB>

Function	Sets input condition of amp unit
Input Format	SCH P1, P2, P3, P4,... (Delimiter)

Parameter

P1	Selects setting channel
1 | 16	Channel to be set 1-A to 8-B
A	Batch setting

P2	Sets amp type
0	None
1	***HRDC*** (AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC*** (AP11-103)
4	***ACST*** (AP11-104)
5	***EV*** (AP11-105)
6	***TCDC*** (AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST*** (AP11-110)

MEMO

For P3 or later, the parameter number and parameter function differ depending on the amp type.

In the case of ***HRDC***,***HSDC*** (P2=1,3)

P3	Sets ON/GND/OFF input
0	OFF
1	ON
2	GND

P4	Sets range
1	500 V
2	200 V
3	100 V
4	50 V
5	20 V
6	10 V
7	5 V
8	2 V
9	1 V
10	500 mV
11	200 mV
12	100 mV

P5	Sets filter	
	HRDC	HSDC
0	OFF	OFF
1	30Hz	5Hz
2	300Hz	50Hz
3	3kHz	500Hz
4	-	5kHz
5	-	50kHz

P6	Sets position
0.00 | 100.00	0.00(%) | 100.00(%)

P7	Input combination
1	AC
2	DC

In the case of ***FFT*** (P2 = 2)

P3	Sets ON/GND/OFF input
O	OFF
1	ON
2	GND

P4	Sets range
1	500 V
2	200 V
3	100 V
4	50 V
5	20 V
6	10 V
7	5 V
8	2 V
9	1 V
10	500 mV
11	200 mV
12	100 mV

P5	Sets filter
O	OFF
1	30 Hz
2	300 Hz
3	3 kHz
4	Antil-aliasing (Expand)

P6	Sets position
0.00 | 100.00	0.00(%) | 100.00(%)

P7	Input combination
1	AC
2	DC

P8	Vibration mode
0	Voltage Input
1	Oscillation Measurement

P9	Sets sensor
1	Amp-sensor hybrid
2	Sensor + Charge converter

P10	Vibration units
1	m/s^2
2	G

P11	Hybrid-type sensor sensitivity
0.01 | 999	(Unit is the same as P10)

P12	Charge converter sensitivity
0.01 | 999	(mV/pC)

P13	Acceleration sensor sensitivity
0.01 | 999	(Unit is based on P10)

MEMO

The setup of the anti-aliasing filter is effective when the mode is FFT and Memory. In other modes, this setup is ignored.
Sensor power is set to ON by a command.

In the vibration mode, the settable range is 5 V - 100 mV (P4 = 7 - 12).
The sensitivity displayed here is a value multiplied by the sensor sensitivity.
When P8 = 0, P9 - P13 can be omitted.

In the case of ***ACST*** (P2 = 4)

P3	Sets ON/GND/OFF input
O	OFF
1	ON
2	GND

P4	Sets range
2	20k με
3	10k με
4	5k με
5	2k με
6	1k με

P5	Sets filter
0	OFF
1	10 Hz
2	30 Hz
3	100 Hz
4	300 Hz

P6	Sets position
0.00 | 100.00	0.00(%) | 100.00(%)

P7	Reserved parameter

*P7 can be omitted (value set with P7 is ignored)

P8	Sets calibration polarity
0	OFF
1	[+]
2	[-]

P9	Sets calibration level
2	5000 με
3	3000 με
4	2000 με
5	1000 με
6	500 με

In the case of ***EV*** (P2=5)

P3	Sets ON/OFF print
O	OFF
1	ON

P4	Sets signal type of each input
1	V (Voltage input)
2	C (Contact input)

P5	Switches ON/OFF each signal printing
0	OFF
1	ON

P6	Selects position specification signal
1 | 8	ch 1 | ch 8

P7	Sets display and print position
0.0 | 198.0	0.0 (mm) | 198.0 (mm)

P8	Sets signal vibration
2.0 | 25	2.0 (mm) | 25 (mm)

P9	Width of signal base line
0.5 | 2.0	0.5 (mm) | 2.0 (mm)

MEMO

P4 and P5 consist of 8-digit character strings, corresponding to each bit (signal) in the unit as shown below.
Output values are input from signal 1 to signal 8, in this order.

n1n2n3n4n5n6n7n8
ch1 ..... ch8

P6 - P9 can be omitted in batch.
All channels are set same for P7 to P9 as P6 is invalid in case of setting with RA13000.

In the case of ***TCDC*** (P2 = 6)

P3	Sets ON/GND/OFF input
O	OFF
1	ON
2	GND

P4	Range setting		
	Type	Thermocouple amp mode	Voltage measurement mode
1	R-type	1800° C	50 V
2	T-type	400° C	20 V
3	J-type	1200° C	10 V
4	K-type	1400° C	5 V
5	K-type	500° C	2 V
6	W-type	2400° C	1 V
7	R-type	3200° F	500 mV
8	T-type	800° F	200 mV
9	J-type	2000° F	100 mV
10	K-type	2500° F	-
11	K-type	1000° F	-
12	W-type	4200° F	-

P5	Sets filter
O	OFF
1	1 Hz
2	30 Hz
3	500 Hz
4	5 kHz

P6	Sets position
0.00 | 100.00	0.00 (%) | 100.00 (%)

P7	Sets input mode
1	Thermocouple amp mode
2	Voltage measurement mode

P8	Sets reference junction temperature compensation
1	EXT (External)
2	INT (Internal)

In the case of ***TDC*** (P2=7)

P3	Sets ON/GND/OFF input
0	OFF
1	ON
2	GND

P4	Sets input sensitivity		
	Type	Thermocouple amp mode	Voltage measurement mode
1	R-type	1600° C	50 V
2		800° C	20 V
3	T-type	400° C	10 V
4		200° C	5 V
5	J-type	1000° C	2 V
6		200° C	1 V
7	K-type	1200° C	500 mV
8		200° C	200 mV
9	R-type	3000° F	100 mV
10		1500° F	50 mV
11	T-type	800° F	20 mV
12		400° F	10 mV
13	J-type	2000° F	-
14		400° F	-
15	K-type	2500° F	-
16		400° F	-

P5	Filter
0	OFF
1	1 Hz
2	30 Hz
3	500 Hz
4	5 kHz

P6	Sets position
0.00 | 100.00	0.00 (%) | 100.00 (%)

P7	Sets input mode
1	Thermocouple amp mode
2	Voltage measurement mode

P8	Sets reference junction temperature compensation
1	EXT (External)
2	INT (Internal)

In the case of ***FV*** (P2=8)

P3	Sets ON/OFF print
0	OFF
1	ON

P4	Sets range
1	10 kHz
2	5 kHz
3	2 kHz
4	1 kHz
5	500 Hz
6	200 Hz
7	100 Hz

P5	Sets position
0.00 | 100.00	0.00(%) | 100.00(%)

P6	Combines input
1	AC
2	DC

P7	Filter
1	Prioritizes ripple
2	Prioritizes answer

P8	Detection level
1	0V
2	2.5V

In the case of ***RMS*** (P2 = 9)

P3	Sets ON/GND/OFF input
0	OFF
1	ON
2	GND

P4	DC mode	RMS mode
1	500 V	350 V rms
2	200 V	200 V rms
3	100 V	100 V rms
4	50 V	50 V rms
5	20 V	20 V rms
6	10 V	10 V rms
7	5 V	5 V rms
8	2 V	2 V rms
9	1 V	1 V rms
10	500 mV	500 mV rms
11	200 mV	200 mV rms
12	100 mV	100 mV rms

P5	Sets low-pass filter
O	OFF
1	30 Hz
2	100 Hz
3	300 Hz
4	1 kHz

P6	Sets high-pass filter
0	OFF
1	10 Hz
2	30 Hz
3	100 Hz

P7	Sets position
0.00 | 100.00	0.00(%) | 100.00(%)

P8	Sets input mode
1	RMS mode
2	DC mode

P9	Input combination
1	AC
2	DC

NOTE

Sensor power is set to ON by a command.
P10 - P15 is the same as P8 - P13 of the FFT amp.
When P10 = 0, P10 - P15 can be omitted.

In the case of ***DCST*** (P2=10)

P3	Sets ON/OFF print
0	OFF
1	ON
2	GND

P4	Sets input sensitivity		
	DC strain amp mode		Voltage measurement mode
	P9=1	P9=2	P9=3
1	50 kμε	20 kμε	50 mV
2	20 kμε	8 kμε	20 mV
3	10 kμε	4 kμε	10 mV
4	5 kμε	2 kμε	5 mV
5	2 kμε	800 με	2 mV

P5	Filter
0	OFF
1	10 Hz
2	30 Hz
3	300 Hz
4	1 kHz

P6	Sets position
0.00 | 100.00	0.00 (%) | 100.00 (%)

P7	Reserved Parameter

*P7 can be omitted (values set by P7 are ignored).

P8	Sets input mode and bridge voltage
1	DC strain amp mode BV = 2 V
2	DC strain amp mode BV = 5 V
3	Voltage measurement mode

4.7 Other Settings

SAS (Set Auto Scaling) <RS-232C><GP-IB>

Function	Sets auto scaling for print
Input Format	SAS P1 (Delimiter)
Parameter	P1: Sets auto scaling (SET AUTO SCALE) 0: OFF 1: ON (scale after recording) 2: ON (scale before recording) 3: ON (scale before recording + scale after recording)
Description	Corresponds to the setting of the recording condition screen [DISP / REC].

STS (Set Time axis Scale) <RS-232C><GP-IB>

Function	Sets time axis scale for print
Input Format	STS P1 (Delimiter)
Parameter	P1: Sets time axis scale 0: OFF 1: ON
Description	Corresponds to the setting of the recording condition screen [Waveform details]. If this command is set when the RA1000 is operating, an execution error occurs.

SAN (Set ANnotation ON/OFF) <RS-232C><GP-IB>

Function	Sets ON/OFF annotation print
Input Format	SAN P1, P2, P3, P4, P5, P6 (Delimiter)

Parameter

P1	Sets ON/OFF system annotation print
0	OFF
1	ON

P2	Sets ON/OFF system channel annotation print
0	OFF
1	ON

P3	Sets ON/OFF user channel annotation print by one operation
0	OFF
1	ON

P4	Sets ON/OFF user page annotation print
0	OFF
1	ON

P5	Sets ON/OFF instrument ID print
0	OFF
1	ON

	P6: Sets annotation print interval 0: Prints the first time only 30	1000: 30 (cm)	1000 (cm)
Description	Corresponds to the setting of the recording condition screen [Annotation]. If this command is received when waveform recording is being performed, it becomes effective when the next recording starts. During operation, the annotation print interval specified by P6 is disabled.

SMK (Set channel Mark)

<RS-232C><GP-IB>

Function	Sets ON/OFF the channel identification mark.
Input Format	SMK P1 (Delimiter)
Parameter	P1: Sets ON/OFF channel mark print (CH mark) 0: OFF 1: ON
Description	Corresponds to the setting of the recording condition screen [Waveform details]. If this command is received when waveform recording is being performed, it becomes effective when the next recording starts.

SGP (Set Recording Time Axis)

<RS-232C><GP-IB>

Function	Sets grid pattern
Input Format	SGP P1 (Delimiter)
Parameter	P1: Sets grid pattern (Grid) 0: OFF 1: Main grid + Sub Grid (STD.) 2: Main grid only
Description	Enabled in waveform recording and X-Y recording. Always settable when the unit is not operating. Recording is possible only during waveform recording, and setting to other type of recording cause an execution error. Corresponds to the setting of the recording condition screen [Waveform details].

SBR (Set Basic Record setting) <RS-232C><GP-IB>

Function	Sets recorder basics
Input Format	SBR P1, P2, P3, P4 (Delimiter)
Parameter	P1: Reserved parameter The value set with P1 is ignored. P2: Display･recording selection 1: Value 2: Duration 3: Time P3: Make trigger point standard 0: No 1: Yes P4: Use of [Sensitivity/div] 0: Not used (Standard) 1: Used
Description	Corresponds to Setup of measurement mode of the system setting screen [Auxiliary setting]. If set when the RA1000 is operating, an execution error occurs.

SLA (Set user Line Annotation) <RS-232C><GP-IB>

Function	Sets ON/OFF the user channel annotation print in waveform recording
Input Format	SLA P1,P2 (Delimiter)
Parameter	P1: Channel setting 1 to 16: 1-A CH to 8-B CH A: Batch Setting P2: Sets ON/OFF channel annotation print 0: OFF 1: ON
Description	Data for user channel annotation is input by the TIL command. If set while recording, it is enabled from where the next recording starts. For details of user channel annotation, see the RA1000 Mainframe Instruction Manual. When no amplifier is installed, it is not available to print in spite of any setting.

SUS (Set User Scale) <RS-232C><GP-IB>

Function	Sets amp's user scale except ***EV***.
Input Format	SUS P1, P2, P3, P4, P5, P6, P7, P8, P9, P10 (Delimiter)

Parameter

P1	Channel setting
1 | 16	1-A CH | 8-B CH

P2	Sets ON/OFF physical conversion
0	OFF
1	ON

P3	Sets maximum input value of physical conversion

*P3 can be omitted.

P4	Sets minimum input value of physical conversion

*P4 can be omitted.

P5	Sets maximum output value of physical conversion

*P5 can be omitted.

P6	Sets minimum output value of physical conversion

*P6 can be omitted.

P7	Sets the upper limit of recording full scale

*P7 can be omitted.

P8	Sets the upper lower of recording full scale

*P8 can be omitted.

P9	Sets unit
0	Standard
2	N
3	Pa
4	mm
5	μ ε
6	m/s²

P9	Sets unit
7	°C
8	Ω
9	kg
10	kgf
11	kgf/cm²
12	g
U	User defined

*P9 can be omitted.

P10	User-specified unit (character string of up to 9 characters)

*P10 cannot be omitted only when P9 = U.

Description

Corresponds to the amp details screen [User scale]. Setting is effective for subsequent recording and also for data in the present copy block.
If an ***EV***-installed channel is specified, a parameter error occurs.
If set during recording, an execution error occurs.

The wide range settings are P2 = 0, P7 = maximum range value, P8 = minimum range value, and P9=0.
To set the range back to the standard range, make the settings P2 = 0, P7 = 1/2 maximum range value, P8 = 1/2 minimum range value, and P9 = 0.

When setting only P3 and P4, the same values are written in P5 to P8.
When setting only P5 and P6, the same values are written in P7 and P8.
In case of P2 = 0, setting of P3 to P6 are invalid.

SBZ (Set BuZzer, click Mode) <RS-232C><GP-IB>

Function	Sets ON / OFF buzzer click.
Input Format	SBZ P1, P2 (Delimiter)
Parameter	P1: Sets ON / OFF buzzer (Buzzer). 0: OFF 1: ON P2: Sets ON / OFF click (Click). 0: OFF 1: ON
Description	Corresponds to the system screen [Auxiliary setting/buzzer click].

SMD (Set Memory Division) <RS-232C><GP-IB>

Function	Sets memory capacity of channel
Input Format	SMD P1 (Delimiter)
Parameter	P1: Sets memory capacity (MEM Division) 1: 16 CH×256 kW (at memory expansion: 8 CH × 1024 kW) 2: 8 CH×512 kW (at memory expansion: 4 CH × 2048 kW) 3: 4 CH×1024 kW (at memory expansion: 2 CH × 4096 kW) 4: 2 CH×2048 kW (at memory expansion: 1 CH × 8192 kW)
Description	For details on changing the memory capacity, see the RA1000 Mainframe Instruction Manual. If this command is executed, the memory contents are cleared. Also, memory segmentation (refer to command SMO) is set to [No segmentation]. If set when the main unit is operating, an execution error occurs. Corresponds to the setting of the system screen [Auxiliary setting/changing memory capacity].

SDN (Set Data No.) <RS-232C><GP-IB>

Function	Sets data No. according to parameters.
Input Format	SDN P1 (Delimiter)
Parameter	P1: Sets data No. (Data No.) 1 to 9999: 1 to 9999
Description	When the number of the parameter exceeds 4, the first 4 characters are input. If this command is set while the recorder is operating, an execution error occurs. Corresponds to the setting of the system screen [Auxiliary setting/data No.].

SDT (Set DaTe) <RS-232C><GP-IB>

Function	Sets year/month/date and time for the internal clock.
Input Format	SDT P1, P2, P3, P4, P5, P6 (Delimiter)
Parameter	
Description	If this command is set while the RA1000 is operating, an execution error occurs. Corresponds to the setting of the system screen [Maintenance/clock setting].

P1	Sets A.D
0 | 99	0 | 99

P2	Sets month
1 | 12	January | December

P3	Sets date
1 | 31	1 | 31

P4	Sets hour
0 | 23	0 | 23

P5	Sets minute
0 | 59	0 | 59

P6	Sets second
0 | 59	0 | 59

SPL (Set Print Line) <RS-232C><GP-IB>

Function	Sets base-line width for wavelength recording.
Input Format	SPL P1, P2 (Delimiter)
Parameter	
Description	When there is no input amp in the batch setting, a parameter error occurs.

P1	Sets channel
1 | 16	1-A CH | 8-B CH
A	Batch setting

P2	Sets the type of base-line width (Line)
1	1 dot (0.125mm, Standard)
2	2 dots (0.25mm)
3	3 dots (0.375mm)
4	4 dots (0.5mm)

SEL (EL auto-OFF) <RS-232C><GP-IB>

Function	Sets screen auto-off or screen saver.
Input Format	SEL P1, P2 (Delimiter)
Parameter	

P1	Sets screen auto-off or screen saver function
0	OFF
1	Back light auto-off ON
2	Start screen saver ON

	P2: Sets time to start auto-off or screen saver 1 (minute) | 60 (minutes)
Description	See system screen [Auxiliary setting/back light auto-off].

SST (auto STart) <RS-232C><GP-IB>

Function	Sets ON/OFF the Auto Start (Wait Function).
Input Format	SST P1 (Delimiter)
Parameter	P1: Sets wait function 0: OFF 1: ON
Description	See the system screen [Auxiliary setting/auto START].

SFL (wave Feed length) <RS-232C><GP-IB>

Function	Sets length of paper feed (Feed) at the end of waveform recording.
Input Format	SFL P1 (Delimiter)
Parameter	P1: Sets the length of paper feeding (Feed) 0 | 100: Settable from 0 to 100 mm
Description	See the setting of the [DISP/REC] screen [Feed Length after Print].

STR (Set TRans CH.) <RS-232C><GP-IB>

Function	Sets transfer channel for the real-time transfer.
Input Format	STR P1, P2 (Delimiter)
Parameter	P1: Transfer channel 1 | 16: 1-A CH | 8-B CH A: All channels P2: Sets transfer ON/OFF 0: OFF 1: ON
Description	Real-time transfer is executed with the ETS command.

SFN (Set Fax No.) <RS-232C>

Function	Sets telephone number of receiver in auto-transmission
Input Format	SFN P1 (Delimiter)
Parameter	P1: Sets telephone number (ASCII character string: 20 characters max.)
Description	Rewrites the last line of the "telephone book" as a specified number, and makes this setting on the target. When a character that is not settable as a telephone number is used, a parameter error occurs.

SAT (Set Auto Transmit) <RS-232C><GP-IB>

Function	Sets service request/transmission factor.
Input Format	SAT P1, P2 (Delimiter)
Parameter	P1: ON/OFF setting for when recording ended with an error 0: OFF 1: ON P2: Setting for when to record (when recording is finished/trigger detection) 0: OFF 1: When recording is finished 2: When trigger is detected

SWT (Set Wave Transmit) <RS-232C>

Function	Sets ON/OFF waveform FAX transmission
Input Format	SWT P1 (Delimiter)
Parameter	0 P1: Sets ON/OFF waveform FAX transmission OFF 1: ON
Description	The ON/OFF setting is available for a communication target other than FAX. If this command is set to ON when the target is not FAX, the setting is executed and then a mode error is returned.

SFI (Set Filing Icon) <RS-232C><GP-IB>

Function	Sets ON/OFF the filing icon.
Input Format	SFI P1 (Delimiter)
Parameter	P1: Sets ON/OFF the filing icon. 0: OFF 1: ON
Description	If this command is set while the RA1000 is operating, an execution error occurs. In a mode other than memory mode, if filing is set to OFF with the real-time recording set to OFF, a mode error occurs.

SRI (Set Realtime record Icon) <RS-232C><GP-IB>

Function	Sets ON/OFF real-time wavelength recording.
Input Format	SRI P1 (Delimiter)
Parameter	P1: Sets ON/OFF real-time wavelength recording. 0: OFF 1: ON
Description	If this command is set while the RA1000 is operating, an execution error occurs. The mode is valid only when the mode is Filing and Transient.

SMI (Set Memory autocopy Icon) <RS-232C><GP-IB>

Function	Sets ON/OFF auto copy.
Input Format	SMI P1 (Delimiter)
Parameter	P1: Sets ON/OFF auto copy. 0: OFF 1: ON
Description	If this command is set while the RA1000 is operating, an execution error occurs.

SRF (Set Realtime Filing) <RS-232C><GP-IB>

Function	Sets filing mode.
Input Format	SRF P1, P2, P3, P4, P5 (Delimiter)

Parameter

P1	Recording·monitor speed
1 | 999	1 | 999
E	External synchronization

P2	Recording unit (sampling synchronization)
1	µs
2	ms
3	s

When P1=E, P2 is not valid.

P3	Data format
1	Peak
2	Sampling

P4	Recording method
1	Normal
2	Ringing

P5	Recording length

Description	P3, P4, and P5 have the following restrictions. (1) In the transient mode, the setting becomes P3 = peak, P4 = normal, irrespective of the settings. (2) When ringing recording is selected, the capacity is 1 megabyte or more. If this is not sufficient, the capacity is normalized. The capacity range of the recording length is, in normal recording, from 10 data to the remaining capacity, and in ringing recording, from 1 megabyte to the remaining capacity. When this command is executed, the link execution with chart paper feeding speed is set to OFF.

SMF (Set Memory Filing) <RS-232C><GP-IB>

Function	Sets save format of memory filing.
Input Format	SMF P1,P2 (Delimiter)
Parameter	

P1	Data format
1	Binary format
2	CSV format

P2	Data interval
0	1 step
1	2 steps
2	5 steps
3	10 steps
4	20 steps
5	50 steps
6	100 steps
7	200 steps
8	500 steps
9	1000 steps

Description	P2 data intervals are valid only when the data format is CSV. This command has no meaning when a binary format is used. Data intervals are reflected in the intervals of data recording and X-Y recording.

SSS (Set filing Save Setting) <RS-232C><GP-IB>

Function	Sets where to save files.
Input Format	SSS P1, P2, P3, P4, P5 (Delimiter)
Parameter	

P1	Selects drive.
A | I	A drive | I drive

P2	Uses user-name specified folder
0	OFF
1	ON

P3	Creates folder by each day
0	OFF
1	ON

	P4: User-name specified folder *P4 can be omitted (MAX. 8 characters: alphanumeric characters) P5: File･Folder Name *P5 can be omitted (MAX. 4 characters: alphanumeric characters)
Description	If a character is specified that cannot be used for the user-name specification folder and the file/folder name, a parameter error occurs.

SWJ (Set Wave Judge) <RS-232C><GP-IB>

Function	Sets waveform evaluation.
Input Format	SWJ P1, P2 (Delimiter)
Parameter	P1: Sets ON/OFF waveform evaluation. 0: OFF 1: ON P2: Sets copy 1: Copies in NG only 2: Copies all
Description	While the RA1000 is operating, an execution error occurs.

SAR (Set Ac strain amp R-fine) <RS-232C><GP-IB>

Function	Sets R-fine (fine adjustment of resistance balance) of ***ACST/DCST***.
Input Format	SAR P1, P2 (Delimiter)
Parameter	P1: Sets channel 1-16: 1-A to 8-B CH P2: Adjustment amount -100 | 100: -100 to 100 0 can not be specified
Description	After execution of the EAS command (auto balance execution), this command adjusts the unbalanced portion.

SPA (Set Print Auxiliary) <RS-232C><GP-IB>

Function	Sets report printing.
Input Format	SPA P1,P2,P3,P4,P5,P6,P7,P8,P9 (Delimiter)

Parameter

P1	Output of measurement information print
0	OFF
1	ON (before recording)
2	ON (after recording)
3	ON (before and after recording)

P2	Number of characters of measurement information print
1 | 31	1 | 31 characters

P3	Output of signal name print
0	OFF
1	ON (before recording)
2	ON (after recording)
3	ON (before and after recording)

P4	Number of characters of measurement information print
1 | 31	1 | 31 characters

P5	Binding margin
0 | 20	0 | 20 mm

P6	Title printing
0	OFF
1	Title 1
2	Title 2
3	Title 1 and 2

P7	Date printing
0	OFF
1	Date at recording
2	Current date

P8	Data no. printing
0	OFF
1	ON

P9	Time axis information printing
0	OFF
1	ON

*5. Information Readout Command – I**

5.1 Recorder Type･Recording Format

IRM (Inquire Recording Mode) <RS-232C><GP-IB>

Function	Outputs measurement mode.
Input Format	IRM (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: Output of measurement mode 1: Memory mode (Memory mode) 2: Real-time mode (Real-time mode) 3: Transient mode (Transient mode) 4: Filing mode (Filing mode) 5: FFT mode (Expansion)
Description	When an error occurs, “?” is returned.

IPF (Inquire Print Form) <RS-232C><GP-IB>

Function	Outputs recording format (Record Form)
Input Format	IPF (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: Recording form 1: Waveform recording (WAVE) 2: X-Y recording (X-Y) 3: Digital recording (DATA) 4: A4 (Report)
Description	When filing is set to ON and the recording format is X-Y, ”1” is returned as the answer. When the transient recorder is specified, ”1” is returned as the answer. When an error occurs, “?” is returned.

5.2 Real-Time Mode

ICS (Inquire Chart Speed) <RS-232C><GP-IB>

Function	Outputs printing speed of real-time recorder.
Input Format	ICS (Delimiter)
Output Format	A1, A2 (Delimiter)
Answer	• In real-time waveform recording

A1	Output of real-time waveform recording speed
1 | 100	1 (Recording unit is set by A2) | 100
E	External synchronous recording (External synchronous pulse is set by A2)

When A1=numerical value

A2	Output of printing speed unit
1	mm/s
2	mm/min

When A1=E (1 line=1/10mm)

A2	Output of external synchronous recording pulse
1	1 pulse/1 line
2	4 pulses/1 line

• In real-time digital recording

A1	Output of real-time digital recording speed
1 | 999	1 | 999
E	External synchronous recording

When A1=numerical value

A2	Output of recording unit
1	ms
2	s
3	min
4	h

When A1=E, A2 is not available.

Description	When an error occurs, “?” is returned.

IFS (Inquire Full Scale) <RS-232C><GP-IB>

Function	Outputs full scale (recording width) of waveform printing.
Input Format	IFS (Delimiter)
Output Format	A1 (Delimiter)
Answer	

A1	Full-scale	Recording width
1	1/1	200 mm
2	1/2	100 mm
3	1/4	50 mm
4	1/8	25 mm
5	1/16	10 mm
U	User setting	

Description	When an error occurs, “?” is returned.。

ISL (Inquire Shot Length) <RS-232C><GP-IB>

Function	Outputs length of real-time recording.
Input Format	ISL (Delimiter) or A1, A2 (Delimiter)
Output Format	A1 (Delimiter)
Answer	

<Waveform recording>

A1	Recording length (SHOT)
1	CONT (Sequence)
2	100 div
3	50 div
4	20 div
U	User setting

When A1=U

A2	Recording length (SHOT)
1 ｜ 1000	1 div ｜ 1000 div

<Digital recording>

A1	Recording length (SHOT)
1	CONT (Sequence)
2	500 data
3	250 data
4	100 data
U	User setting

When A1=U

A2	Recording length (SHOT)
1 ｜ 1000	1 data ｜ 1000 data

Description	When the filing is set to ON and the recording format is X-Y, the value set for waveform recording is returned. When the transient mode is specified, ”1” is returned as an answer. When the recording format is X-Y, a mode error occurs. When an error occurs, “?” is returned.

IRT (Inquire Real-time Trigger)

<RS-232C><GP-IB>

Function	Outputs real-time recording settings.
Input Format	IRT (Delimiter)
Output Format	A1、A2 (Delimiter)

Answer

A1	Timing of recording start
0	When “START” key is pressed
1	When trigger is detected (Once)
2	When trigger is detected (Repeat)

A2	Sets ON/OFF the mark prints with trigger
0	OFF
1	ON

5.3 Memory Mode

ISC (Inquire Sampling Clock) <RS-232C><GP-IB>

Function	Outputs sampling speed.
Input Format	ISC (Delimiter)
Output Format	A1, A2 (Delimiter)

Answer

A1	Outputs sampling speed
1 | 999	1 | 999
E	External synchronous sampling

When A1=numerical value

A2	Outputs sampling unit
1	μs
2	ms
3	s

When A1=E, A2 is *.

IPS (Inquire copy Print Size) <RS-232C><GP-IB>

Function	Outputs copy magnification setting.
Input Format	IPS (Delimiter)
Output Format	A1 (Delimiter)

Answer

- In Waveform Recording

A1	Outputs copy magnification
1	×5
2	×2
3	1/1
4	1/2
5	1/5
6	1/10
7	1/20
8	1/50
9	1/100
10	1/200
11	1/500
12	1/1000

- In the case of digital and X-Y recording

A1	Outputs copy interval
1	1 step
2	2 steps
3	5 steps
4	10 steps
5	20 steps

6	50 steps
7	100 steps
8	200 steps
9	500 steps
10	1000 steps

IMO (Inquire Memory Read Out)

<RS-232C><GP-IB>

Function	Outputs memory capacity setting.
Input Format	IMO (Delimiter)
Output Format	A1, A2, A3 (Delimiter)
Answer	

A1	Outputs memory block segmentation (Memory block SEG)
0	No memory segmentation (memory block = 1)
1	1/2 segmentation (memory block = 2)
2	1/4 segmentation (memory block = 4)
3	1/8 segmentation (memory block = 8)
4	1/16 segmentation (memory block = 16)
5	1/32 segmentation (memory block = 32)
6	1/64 segmentation (memory block = 64)
7	1/128 segmentation (memory block = 128)

A2	Outputs block No. (MEM block)
1 | 128	1 | 128

A3	Outputs readout amount (MEM read)
1 | 100	1 % | 100%

Description	The value of the readout amount is effective when “% specification with reference to trigger” is selected.

IAC (Inquire Auto Copy)

<RS-232C><GP-IB>

Function	Outputs the settings of auto copy ON/OFF done at the end of memory recording.
Input Format	IAC (Delimiter)
Output Format	A1 (Delimiter)
Answer	

A1	Outputs auto copy (AUTO COPY)
0	OFF
1	ON

IME (Inquire Memory Expand) <RS-232C><GP-IB>

Function	Outputs the installation status of the additional memory unit.
Input Format	IME (Delimiter)
Output Format	A1(Delimiter)
Answer	A1: 0 = Standard, 1 = Additional memory available
Description	Additional memory is optional. When not installed, "0" is returned.

IMB (Inquire Memory Block No) <RS-232C><GP-IB>

Function	Outputs the block No. setting of the internal memory of the RA1000 in memory or transient mode.
Input Format	IMB (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: 1 | 128 → Memory block No. setting: 1 | 128

IMC (Inquire Memory Copy) <RS-232C><GP-IB>

Function	Outputs the readout amount setting in copying the memory of the RA1000.
Input Format	IMC (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: 1 | 100 → Readout amount setting (MEM read): 1% | 100%

5.4 Trigger

◆ The following commands are effective when a trigger is set to ON in the memory mode, transient mode and real-time mode. If readout is performed in any other setting mode, an error occurs. (There are some commands that disable readout even when the real-time mode is used and the trigger is set to ON. For details, refer to the descriptions of each command.)

ITM (Inquire Trigger Mode) <RS-232C><GP-IB>

Function	Outputs trigger mode setting.
Input Format	ITM(Delimiter)
Output Format	A1(Delimiter)
Answer	A1: Outputsf trigger mode setting (Trigger mode) 0: OFF 1: OR 2: AND 3: A*B 4: WINDOW

ITD (Inquire Trigger Delay) <RS-232C><GP-IB>

Function	Outputs pre-trigger setting.
Input Format	ITD (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: Outputs pre-trigger setting (Pre-trigger) 0 to 100: 0 % to 100 %
Description	This command is enabled when the mode is memory or transient. If readout is performed when another type of mode is used, a mode error occurs. When an error occurs, “?” is returned.

ITE (Inquire Trigger Execution) <RS-232C><GP-IB>

Function	Outputs trigger operation settings (single/repeat/endless).
Input Format	ITE (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: Outputs number of measurement (TRIG) 1: Single 2: Repeat 3: Endless
Description	Even when the trigger of real-time mode is set to ON and the recording length is set to other than sequence, the readout value is valid.

ITC (Inquire Trigger mode OR、AND Channel) <RS-232C><GP-IB>

Function	Outputs the settings of each source channel with trigger set to AND or OR.
Input Format	ITC P1 (Delimiter)
Output Format	A1, A2, A3 (Delimiter)
Parameter	P1: Readout channel setting 1	1-A CH | 16	8-B CH
Answer	In the case of input unit other than ***EV***

A1	Outputs trigger ON/OFF
0	OFF
1	ON

A2	Outputs trigger slope
-500.0 | 500.0	-500.0 | 500.0

※The values in the tables on the left are for when the voltage measurement mode is in the 500 V range. Values vary depending on the range of each input unit.

A3	Outputs trigger slope
1	↑ (rising edge)
2	↓ (falling edge)

In the case of ***EV***

A1	Outputs trigger ON/OFF
0	OFF
1	ON

A2	Outputs AND/OR trigger in the unit
1	AND
2	OR

A3	Outputs X/H/L trigger condition of signals in the unit	
0	X	n1n2n3n4n5n6n7n8 1ch・・・・・・・・・・・・・・・・・・・・・・・・8ch
1	H	
2	L	

Description	When a blank channel is specified as the readout channel, a parameter error occurs. When the trigger mode is set to neither AND nor OR, a mode error occurs. When an error occurs, “?” is returned.

ITA (Inquire Trigger A*B) <RS-232C><GP-IB>

Function	Outputs the settings of source channel, level, and slope of A when trigger mode A*B is set.
Input Format	ITA P1 (Delimiter)
Output Format	A1,A2,A3,A4,A5,A6,A7 (Delimiter)
Parameter	

P1	Set A*B number
1	A*B1
2	A*B2
3	A*B3
4	A*B4

Answer

In the case of input unit other than ***EV***

A1	Outputs A*B ON/OFF
0	OFF
1	ON

A2	Outputs A source channel
1 | 16	1-A CH | 8-B CH

A3	Outputs A source trigger level
-500.0 | 500.0	-500.0 | 500.0

*The values in the tables above are for when the voltage measurement mode is in the 500 V range. Values vary depending on the range of each amp unit.

A4	Outputs trigger slope of A source
1	↑ (rising edge)
2	↓ (falling edge)

A5	Outputs B source channel
1 | 16	1-A CH | 8-B CH

A6	Outputs trigger level of B source
-500.0 | 500.0	-500.0 | 500.0

*The values in the tables above are for when the voltage measurement mode is in the 500 V range. Values vary depending on the range of each amp unit.

A7	Outputs trigger slope of B source
1	↑ (rising edge)
2	↓ (falling edge)

In the case of ***EV***

A1	Outputs A*B ON/OFF
0	OFF
1	ON

A2	Outputs A source channel
1 | 15	1-A CH | 8-A CH

A3	Outputs AND/OR trigger in A source channel unit
1	AND
2	OR

A4	Outputs X/H/L trigger condition of signals in A source unit	
0	X	n1n2n3n4n5n6n7n8 1ch·····8ch
1	H	
2	L	

A5	Outputs B source channel
1 | 15	1-A CH | 8-A CH

A6	Output of AND/OR trigger in B source channel unit
1	AND
2	OR

A7	Output of X/H/L trigger condition of signals in B source unit	
0	X	n1n2n3n4n5n6n7n8 1ch·····8ch
1	H	
2	L	

ITW (Inquire Trigger Window) <RS-232C><GP-IB>

Function	Outputs the settings when trigger mode is WINDOW.
Input Format	ITW P1(Delimiter)
Output Format	A1,A2,A3,A4,A5 (Delimiter)
Parameter	

P1	WINDOW trigger number setting
1-8	1-WINDOW to 8-WINDOW

Answer

A1	Outputs ON/OFF for WINDOW trigger
0	OFF
1	ON

A2	Outputs source channel
1 | 16	1-A CH | 8-B CH

A3	Outputs maximum trigger level
-500.0 | 500.0	-500.0 | 500.0

*The values in the tables above are for when the voltage measurement mode is in the 500 V range. Values vary depending on the range of each amp unit.

A4	Outputs minimum trigger level
-500.0 | 500.0	-500.0 | 500.0

*The values in the tables above are for when the voltage measurement mode is in the 500 V range. Values vary depending on the range of each amp unit.

A5	Outputs direction trigger is generated
1	Out (Trigger is generated when signal exceeds the set range)
2	In (Trigger is generated when signal is within the setting range)

Description	In A5, Out means a trigger is generated when signal exceeds the setting range, and In means a trigger is generated when signal comes within the setting range.

ITF (Inquire Trigger Filter)

<RS-232C><GP-IB>

Function	Outputs settings of trigger filter.
Input Format	ITF(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Outputs trigger filter (TRIG FILTER)
0	OFF
1 | 65535	1 | 65535

ITP (Inquire Trigger Pass count)

<RS-232C><GP-IB>

Function	Outputs settings of trigger pass count.
Input Format	ITP (Delimiter)
Output Format	A1 (Delimiter)
Answer	

A1	Outputs trigger pass count. (TRIG PASS COUNT)
0	OFF
1 | 100	1 | 100

ITT (Inquire Trigger Time) <RS-232C><GP-IB>

Function	Outputs settings of time trigger.
Input Format	ITT P1 (Delimiter)
Output Format	A1,A2, and A3
Parameter	

P1	Setting items
1	Timer start time
2	Timer stop time
3	Interval
4	Interval operation time

Answer

A1	Sets day
1 | 31	1 | 31
*	Invalid

A2	Sets hour
0 | 23	0 | 23
*	Invalid

A3	Sets minute
0 | 59	0 | 59
*	Invalid

Description	When the time trigger is set to OFF, "*,*,* is returned.

5.5 X-Y

IXA (Inquire X-Axis) <RS-232C><GP-IB>

Function	Outputs No. of channel set to X-axis of X-Y recording.
Input Format	IXA (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: Outputs standard channel axis 0: User setting → Return ϕ 1: 1-A CH | 16: 8-B CH
Description	When the recording format is other than X-Y, when an amp unit other than ***EV*** exists in only 1 unit, or when X-Y recording can not be performed, a mode error occurs. When an error occurs, "?" is returned. For X-axis 1ch, a channel specified for the X axis is output, and for Y-axis 1ch, a channel specified for the Y axis is output.

IYA (Inquire Y-Axis) <RS-232C><GP-IB>

Function	Outputs the channel set to the Y-axis of X-Y recording.
Input Format	IYA (Delimiter)
Output Format	A1 (Delimiter)
Answer	A1: Outputs ON/OFF for Y-axis channel (16 characters) 0: OFF 1: ON *: Unusable channel n1n2n·····n16 1-A CH··········8-B CH
Description	When an error occurs, "?" is returned. * is sent to a channel specified for Y-axis, ***EV*** and a channel not included in an amp unit. (When the memory capacity is changed, the valid channel changes.) For X-axis 1ch, a channel specified for the Y axis is output, and for Y-axis 1ch, a channel specified for the X axis is output.

IXM (Inquire X-Y Multi draw) <RS-232C><GP-IB>

Function	Outputs overwrite settings in X-Y recording.
Input Format	IXM(Delimiter)
Output Format	A1(Delimiter)
Answer	A1: Outputs ON/OFF for overwrite setting (Over Write) 0: OFF 1: ON

IXL (Inquire X-y Line or dot) <RS-232C><GP-IB>

Function	Outputs recording mode of X-Y recording.
Input Format	IXL (Delimiter)
Output Format	A1(Delimiter)
Answer	A1: 1 = LINE, 2 = DOT (Recording mode setting (Record mode))
Description	When X-Y recording can not be performed, a mode error occurs. When an error occurs, "?" is returned.

IXY (Inquire X-Y axis mode) <RS-232C><GP-IB>

Function	Outputs standard axis of X-Y recording.
Input Format	IXY (Delimiter)
Output Format	A1(Delimiter)
Answer	A1: 1 = X-axis standard, 2 = Y-axis standard, 3 = User setting (Standard axis setting)

IXX (Inquire X-y aXis pattern) <RS-232C><GP-IB>

Function	Outputs axis pattern settings for when performing X-Y recording and user setting.
Input Format	IXX (Delimiter)
Output Format	P1(Delimiter)
Answer	A1[○○○○○○○○…○] ↑ 16-digit 0/1 string
Description	Outputs the setting irrespective of the installation status and the type of amp.

5.6 Amp Units

The names of the input units are denoted by the following symbols.

Namesof Input Unit	Symbol
2CH high-resolution DC amp unit	***HRDC***
2CH FFT amp unit	***FFT***
2CH high-speed DC amp unit	***HSDC***
2CH AC strain amp unit	***ACST***
Event amp unit	***EV***

Name of Input Unit	Symbol
2CH TC･DC amp unit	***TCDC***
TC･DC amp unit	***TDC***
F/V converter unti	***FV***
2CH oscillation･RMS amp unit	***RMS***
2CH DC strain amp unit	***DCST***

ICH (Inquire Ch) <RS-232C><GP-IB>

Function	Outputs settings of amp unit.
Input Format	ICH P1,(P2)(Delimiter)
Output Format	A1,A2,A3,A4･･･････(Delimiter)

Parameter

P1	Selects readout channel
1 | 16	Readout channel

Answer

A1	Outputs amp type
0	None
1	***HRDC***(AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC***(AP11-103)
4	***ACST***(AP11-104)
5	***EV*** (AP11-105)
6	***TCDC***(AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST***(AP11-110)

MEMO

For A2 and later, the number and contents of answers varies depending on the amp type.

When no amp is specified, ”0,0,0,0” is returned, and if an error occurs, “?,?,?,?” is returned.

Specify P2 to read the waveform display of the event amp.
P2 is ignored when using the waveform amp.

In the case of ***HRDC***, ***HSDC***(A1=1,3)

A2	ON/GND/OFF setting for input
0	OFF
1	ON
2	GND

A3	Voltage measurement mode
1	500V
2	200V
3	100V
4	50V
5	20V
6	10V
7	5V
8	2V
9	1V
10	500mV
11	200mV
12	100mV

A4	Filter output	
	HRDC	HSDC
O	OFF	OFF
1	30 Hz	5 Hz
2	300 Hz	50 Hz
3	3 kHz	500 Hz
4	-	5 kHz
5	-	50 kHz

A5	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A6	Input combination status
1	AC
2	DC

In the case of ***FFT***(A1=2)

A2	ON/GND/OFF setting of input
0	OFF
1	ON
2	GND

A3	Voltage measurement mode	Oscillation sensor mode
1	500V	—
2	200V	—
3	100V	—
4	50V	—
5	20V	—
6	10V	—
7	5V	5km/s^2
8	2V	2km/s^2
9	1V	1km/s^2
10	500mV	500m/s^2
11	200mV	200m/s^2
12	100mV	100m/s^2

*The values in the oscillation sensor mode column are for when the sensor sensitivity is 1mV/m/s^2.

A4	Filter output
0	OFF
1	30 Hz
2	300 Hz
3	3 kHz
4	Anti-aliasing (expansion)

A5	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A6	Input combination status
1	AC
2	DC

A7	Powering ON/OFF of oscillation mode sensor	
0	Voltage input	(POWER OFF)
1	Oscillation measurement	(POWER ON)

A8	Sensor setting
1	Amp combined sensor
2	Sensor + charge converter

A9	Oscillation unit
1	m/s^2
2	G

A10	Sensitivity value of combined sensor
0.01 | 100	(Unit is determined by A9.)

A11	Charge converter sensitivity
0.01 | 100	(mV/pC)

A12	Acceleration sensor sensitivity
0.01 | 100	(Unit is determined by A9.)

In the case of ***ACST***(A1=4)

A2	ON/GND/OFF status of input
0	OFF
1	ON
2	GND

A3	Range output
2	20kμ ε
3	10kμ ε
4	5kμ ε
5	2kμ ε
6	1kμ ε

A4	Filter output
0	OFF
1	10 Hz
2	30 Hz
3	100 Hz
4	300 Hz

A5	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A6	Reserved answer

※ 0 is always returned.

A7	Outputs calibration polarity
0	OFF
1	[+]
2	[-]

A9	Outputs calibration level
2	5000 μ ε
3	3000 μ ε
4	2000 μ ε
5	1000 μ ε
6	500 μ ε

In the case of ***EV*** (A1=5)

A2	ON/OFF status of print
0	OFF
1	ON

A3	Outputs input signal type
1	V (Voltage input)
2	C (Contact input)

A4	Outputs signal print ON/OFF
0	OFF
1	ON

A5	Outputs display and print location
0.0 | 198.0	0.0 (mm) | 198.0 (mm)

A6	Outputs signal oscillation
2.0 | 25.0	2.0 (mm) | 25.0 (mm)

A7	Signal baseline width
0.5 | MEMO	0.5 (mm) | 2.0 (mm)

P3 and P4 consist of 8-digit character strings corresponding to each bit (signal) in the unit as shown below.
The values to be output are in the order from signal 1 to signal 8
n1n2n3n4n5n6n7n8
ch1·····ch8
P5, P6, and P7 are valid only when ***EV*** is 2 units or less.
A5, A6 and A7 specify each bit in the unit with P2.

In the case of ***TCDC***(A1=6)

A2	ON/GND/OFF status of input
0	OFF
1	ON
2	GND

A3	Range output		
	Type	Thermocouple amp mode	Voltage measurement mode
1	R-type	1800° C	50 V
2	T-type	400° C	20 V
3	J-type	1200° C	10 V
4	K-type	1400° C	5 V
5	K-type	500° C	2 V
6	W-type	2400° C	1 V
7	R-type	3200° F	500 mV
8	T-type	800° F	200 mV
9	J-type	2000° F	100 mV
10	K-type	2500° F	-
11	K-type	1000° F	-
12	W-type	4200° F	-

A4	Filter setting
O	OFF
1	1 Hz
2	30 Hz
3	500 Hz
4	5 kHz

A5	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A6	Outputs input mode
1	Thermocouple amp mode
2	Voltage measurement mode

A7	Outputs standard contact temperature compensation
1	EXT (external)
2	INT (internal)

In the case of ***TDC*** (A1=7)

A2	ON/GND/OFF status of input
0	OFF
1	ON
2	GND

A3	Outputs input sensitivity		
	Type	Thermocouple amp mode	Voltage measurement mode
1	R-type	1600° C	50 V
2		800° C	20 V
3	T-type	400° C	10 V
4		200° C	5 V
5	J-type	1000° C	2 V
6		200° C	1 V
7	K-type	1200° C	500 mV
8		200° C	200 mV
9	R-type	3000° F	100 mV
10		1500° F	50 mV
11	T-type	800° F	20 mV
12		400° F	10 mV
13	J-type	2000° F	-
14		400° F	-
15	K-type	2500° F	-
16		400° F	-

A4	Filter output
0	OFF
1	1 Hz
2	30 Hz
3	500 Hz
4	5 kHz

A5	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A6	Outputs input mode
1	Thermocouple amp mode
2	Voltage measurement mode

A7	Outputs standard contact temperature compensation
1	EXT (external)
2	INT (internal)

In the case of ***FV*** (A1=8)

A2	ON/OFF status of print
0	OFF
1	ON

A3	Range output
1	10 kHz
2	5 kHz
3	2 kHz
4	1 kHz
5	500 Hz
6	200 Hz
7	100 Hz

A4	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A5	Input combination status
1	AC
2	DC

A6	Filter
1	Ripple prioritized
2	Answer prioritized

A7	Detection level
1	0V
2	2.5V

In the case of ***RMS*** (A1=9)

A2	ON/GND/OFF status of input
0	OFF
1	ON
2	GND

A3	Range output		
	Voltage mode	RMS mode	Oscillation sensor (RMS) mode
1	500 V	350 Vrms	—
2	200 V	200 Vrms	—
3	100 V	100 Vrms	—
4	50 V	50 Vrms	—
5	20 V	20 Vrms	—
6	10 V	10 Vrms	—
7	5 V	5 Vrms	5k m/s^2(RMS)
8	2 V	2 Vrms	2k m/s^2(RMS)
9	1 V	1 Vrms	1k m/s^2(RMS)
10	500 mV	500 mVrms	500 m/s^2(RMS)
11	200 mV	200 mVrms	200 m/s^2(RMS)
12	100 mV	100 mVrms	100 m/s^2(RMS)

* The values in the oscillation sensor (RMS) mode column are for when the sensor sensitivity is 1m/s^2(RMS).

A4	Low-pass filter output
0	OFF
1	30 Hz
2	100 Hz
3	300 Hz
4	1 kHz

A5	High-pass filter setting
0	OFF
1	10 Hz
2	30 Hz
3	100 Hz

A6	Position output
-100.00 | +200.00	-100.00 (%) | +200.00 (%)

A7	Outputs measurement mode
1	RMS mode
2	DC mode

A8	Input combination status

1	AC
2	DC

A9	ON/OFF status of oscillation mode sensor power	
0	Voltage input	(POWER OFF)
1	Oscillation measurement	(POWER ON)

A10	Sensor setup
1	Amp combined sensor
2	Sensor + charge converter

A11	Oscillation units
1	m/s^2
2	G

A12	Sensitivity value of combined sensor
0.01 | 999	(Unit is determined by A11.)

A13	Charge converter sensitivity
0.01 | 999	(mV/pC)

A14	Acceleration sensor sensitivity
0.01 | 999	(Unit is determined by A11.)

In the case of ***DCST*** (A1=10)

A2	ON/OFF status of print
0	OFF
1	ON
2	GND

A3	Outputs input sensitivity		
	DC strain amp mode		Voltage measurement mode
	A7=1	A7=2	A7=3
1	50k με	20k με	50 mV
2	20k με	8k με	20 mV
3	10k με	4k με	10 mV
4	5k με	2k με	5 mV
5	2k με	800 με	2 mV

A4	Filter output
0	OFF
1	10 Hz
2	30 Hz
3	300 Hz
4	1 kHz

A5	Position output
-100.00 | +200.00	-100.00(%) | +200.00(%)

A6	Reserved answer

※0 is always returned.

A7	Output of input mode and bridge voltage
1	DC STRAIN AMP MODE BV=2V
2	DC STRAIN AMP MODE BV=5V
3	Voltage measurement mode

5.7 Other Commands

IAS (Inquire Auto Scaling)

<RS-232C><GP-IB>

Function	Outputs auto scaling ON/OFF information.
Input Format	IAS(Delimiter)
Output Format	A1(Delimiter)
Answer	A1: Outputs auto scaling (SET AUTO SCALE) 0: OFF 1: ON (scale after recording) 2: ON (scale before recording) 3: ON (scale before and after recording)
Description	When the recording format is other than waveform, an error occurs. When an error occurs, "?" is returned.

ITS (Inquire Time axis Scale)

<RS-232C><GP-IB>

Function	Outputs time-axis graduation settings.
Input Format	ITS(Delimiter)
Output Format	A1(Delimiter)
Answer	A1: Outputs time-axis graduation settings 0: OFF 1: ON

IAN (Inquire Annotation)

<RS-232C><GP-IB>

Function	Outputs ON/OFF information on annotation printing.
Input Format	IAN(Delimiter)
Output Format	A1,A2,A3,A4,A5,A6 (Delimiter)
Parameter	A1: Outputs ON/OFF for printing system information 0: OFF 1: ON A2: Outputs ON/OFF for printing channel information 0: OFF 1: ON A3: Outputs ON/OFF for printing user-channel annotation 0: OFF 1: ON A4: Outputs ON/OFF for printing user page annotation 0: OFF 1: ON

A5	Outputs ON/OFF for printing instrument ID
0	OFF
1	ON

A6	Outputs printing interval
0	Prints only the first time
30 | 1000	30(cm) | 1000(cm)

Description	For details on annotation, see the RA1000 User's Manual.

IMK (Inquire channel Mark) <RS-232C><GP-IB>

Function	Outputs ON/OFF information on channel identification mark printing.
Input Format	IMK (Delimiter)
Output Format	A1 (Delimiter)

Answer

A1	Outputs ON/OFF for printing channel mark (CH mark)
0	OFF
1	ON

Description	For details on channel identification marks, see the RA1000 Mainframe Instruction Manual.

IGP (Inquire Grid Pattern) <RS-232C><GP-IB>

Function	Outputs grid pattern settings.
Input Format	IGP(Delimiter)
Output Format	A1(Delimiter)

Answer

A1	Outputs grid pattern (Grid)
0	OFF
1	Main grid + sub grid (standard)
2	Main grid only

Description	When the recording format is digital, a mode error occurs. When an error occurs, "?" is returned.

IPA (Inquire Print Auxiliary) <RS-232C><GP-IB>

Function	Outputs report print settings
Input Format	IPA (Delimiter)
Output Format	A1,A2,A3,A4,A5,A6,A7,A8,A9 (Delimiter)

Parameter

A1	Outputs measurement information printing
0	OFF
1	ON (before recording)
2	ON (after recording)
3	ON (before and after recording)

A2	Number of characters for measurement information printing
1 | 31	1 | 31 characters

A3	Outputs signal name printing
0	OFF
1	ON (before recording)
2	ON (after recording)
3	ON (before and after recording)

A4	Number of characters for signal name printing
1 | 31	1 | 31 characters

A5	Margin length
0 | 20	0 | 20mm

A6	Title print
0	OFF
1	Title 1
2	Title 2
3	Title 1+2

A7	Date print
0	OFF
1	Recording date
2	Present date

A8	Data No. print
0	OFF
1	ON

A9	Time axis information print
0	OFF
1	ON

IBR (Inquire Basic Record setting) <RS-232C><GP-IB>

Function	Outputs basic recorder settings.
Input Format	IBR (Delimiter)
Output Format	A1, A2, A3, A4 (Delimiter)

A1	Reservation parameter ϕ is returned.

A2	Selects display/recording
1	Value
2	Time
3	Hour

A3	Set trigger point as standard
0	No
1	Yes

A4	Use of [sensitivity/div]
0	Not used (standard)
1	Used

ILA (Inquire User Line Annotation**)** <RS-232C><GP-IB>

Function	Outputs ON/OFF status of user channel annotation printing.
Input Format	ILA,P1(Delimiter)
Output Format	A1(Delimiter)

Parameter

P1	Sets readout channel.
1 | 16	1-A CH | 8-B CH

Answer

A1	Outputs ON/OFF of channel annotation printing
0	OFF
1	ON

Description

Reads the ON/OFF status of the user channel annotation channel by channel.
This setting is independent of the system channel annotation.
Data input is performed by the TIL command, and the ON/OFF setting by the SPL command. For details on user channel annotation, see the RA1000 Mainframe Instruction Manual.

IUS (Inquire User Scale) <RS-232C><GP-IB>

Function	Reads user-scale setting values.
Input Format	IUS P1 (Delimiter)
Output Format	A1, A2, A3, A4, A5, A6, A7, A8, A9 (Delimiter)

Parameter

P1	Sets readout channel.
1 | 16	1-A CH | 8-B CH

Answer

A1	Outputs ON,OFF for physical conversion
0	OFF
1	ON

A2	Outputs the maximum input value.

A3	Outputs the minimum input value.

A4	Outputs the maximum output value.

A5	Outputs the minimum output value.

A6	Outputs the upper limit of recording full scale.

A7	Outputs the lower limit of recording full scale.

A8	Unit setting
0, 1	Standard
2	N
3	Pa
4	mm
5	μ ε
6	m/s^2

A8	Unit setting
7	° C
8	Ω
9	kg
10	kgf
11	kgf/cm^2
12	g
U	User-defined

A9	User-specified unit (character string of a maximum of 9 characters)

Description	When a blank channel is read, "*" is returned.

IBZ (Inquire BuZzer,click) <RS-232C><GP-IB>

Function	Outputs ON/OFF settings of buzzer/click.
Input Format	IBZ (Delimiter)
Output Format	A1,A2 (Delimiter)
Answer	

A1	Outputs ON/OFF for buzzer
0	OFF
1	ON

A2	Outputs ON/OFF for click sound
0	OFF
1	ON

IMD (Inquire Memory Division) <RS-232C><GP-IB>

Function	Outputs information on memory capacity settings for each channel.
Input Format	IMD (Delimiter)
Output Format	A1 (Delimiter)
Answer	

A1	Outputs memory capacity
1	16CH× 256 kW
2	8CH× 512 kW
3	4CH×1024 kW
4	2CH×2048 kW

Description	When an error occurs, "?" is returned.

IDN (Inquire Data No.) <RS-232C><GP-IB>

Function	Outputs data No..
Input Format	IDN(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Outputs data No. (Data No.)
1 | 9999	1 | 9999

Description	The data No. is the numerical order of the data to be recorded next.

IDT (Inquire DaTe,Time)

<RS-232C><GP-IB>

Function	Outputs year/month/day and time (current date) settings of internal clock.
Input Format	IDT (Delimiter)
Output Format	A1, A2, A3, A4, A5, A6 (Delimiter)

Answer

A1	Outputs Roman calendar year
00 | 99	00 | 99

A2	Outputs month
01 | 12	January | December

A3	Outputs day
01 | 31	01 | 31

A4	Outputs hour
00 | 23	00 | 23

A5	Outputs minute
00 | 59	00 | 59

A6	Outputs second
00 | 59	00 | 59

IMS (Inquire Memory Status)

<RS-232C><GP-IB>

Function	Outputs memory status. Functions and output format vary depending on the parameters. The memory to be referred to is the block currently selected by key input or the SMO command.
Input Format	IMS P1(Delimiter)

IMS (0) <P1=0 (or omitted)>

Function	or omitted
Output Format	A1(Delimiter)

Answer

A1	Outputs the presence or absence of data
0	Absent (buffer is disabled)
1	Present (buffer is enabled)

IMS 1 < When P1=1>

Function	Outputs time for sampling/trigger.
Output Format	A1,A2,A3(Delimiter)

Answer

A1	Outputs time to start sampling
YY:MM:DD_HH:MM:SS	YY:MM:DD_HH:MM:SS

A2	Outputs time to detect trigger
YY:MM:DD_HH:MM:SS	YY:MM:DD_HH:MM:SS

A3	Outputs time to end sampling
YY:MM:DD_HH:MM:SS	YY:MM:DD_HH:MM:SS

(YY: year, MM: month, DD: day, HH: hour, MM: minute, SS: second)

Description	When no valid data exists in memory or no trigger is detected, **:**:**_**:**:** is returned for the relevant item.

<table>
<tr><td colspan="2">IMS 2< When P1=2></td></tr>
<tr><td>Function</td><td>Detects and outputs the presence or absence of measurement data in all in-memory blocks together.</td></tr>
<tr><td>Output Format</td><td>A1,A2,A3 ····· ,A127,A128</td></tr>
<tr><td>Answer</td><td>
<table>
<tr><td>An</td><td>Outputs the presence or absence of measurement data</td></tr>
<tr><td>0</td><td>No measurement data</td></tr>
<tr><td>1</td><td>Measurement data is present</td></tr>
<tr><td>*</td><td>Memory block №. is not valid</td></tr>
</table>
</td></tr>
<tr><td>Description</td><td>For example, when memory is divided into 4, * is output to A5 to A128.</td></tr>
<tr><td colspan="2">IMS 3<When P1=3></td></tr>
<tr><td>Function</td><td>Outputs items of parameters 0 and 1.</td></tr>
<tr><td>Output Format</td><td>A1,T1,T2,T3 (Delimiter)</td></tr>
<tr><td>Answer</td><td>
<table>
<tr><td>A1</td><td>Outputs whether buffer is valid or invalid</td></tr>
<tr><td>T1</td><td>Time to start sampling</td></tr>
<tr><td>T2</td><td>Time to detect trigger</td></tr>
<tr><td>T3</td><td>Time to end sampling</td></tr>
</table>
</td></tr>
<tr><td>Description</td><td>Outputs contents of P1=0 and P1=1 in the order shown above.</td></tr>
<tr><td colspan="2">IMS 4< When P1=4></td></tr>
<tr><td>Function</td><td>Outputs trigger address and end address.</td></tr>
<tr><td>Output Format</td><td>A1, A2 (Delimiter)</td></tr>
<tr><td>Answer</td><td>
<table>
<tr><td>A1</td><td>Outputs trigger address.</td></tr>
<tr><td>0
|
262143</td><td>0
|
262143 (256KW/CH)</td></tr>
<tr><td>*</td><td>No trigger</td></tr>
</table>
<table>
<tr><td>A2</td><td>Outputs the last address of valid memory</td></tr>
<tr><td>0
|
262143</td><td>0
|
262143(256KW/CH)</td></tr>
</table>
</td></tr>
<tr><td>Description</td><td>When the memory block is not valid, both A1 and A2 return “*”.</td></tr>
<tr><td colspan="2">IMS 5< When P1=5></td></tr>
<tr><td>Function</td><td>Returns the maximum block No.</td></tr>
<tr><td>Output Format</td><td>A1 (Delimiter)</td></tr>
<tr><td>Answer</td><td>
<table>
<tr><td>A1</td><td>Block number of valid data</td></tr>
<tr><td>1
|
128</td><td>1
|
128</td></tr>
<tr><td>*</td><td>No valid block</td></tr>
</table>
</td></tr>
<tr><td>Description</td><td>This function can be used to ascertain the number of blocks that have received data when repeated use with memory division is carried out.
However, if a block is used from the middle of the block №. or if data is not obtained in sequence, the valid block number and the maximum block №. do not match.
When no block with valid data is present, * is returned.</td></tr>
</table>

General Description	During memory recording, an error occurs. If memory is divided into blocks and then used repeatedly, the block of the latest data may not be pointed to when recording is stopped. In this case, use the SMO command to specify the block again. MEMO If a data readout command (RDB/RDA etc.) is executed when the memory has no valid data, an error may occur, causing a bus-lock. Therefore, it is advised to use this command to check the memory before reading data.

IES (Inquire Error Status)

<RS-232C><GP-IB>

Function	Outputs characters corresponding to the command type if an error is detected when command is input.
Input Format	IES (Delimiter)
Output Format	A1 (Delimiter)
Answer	・When control code is erroneous A code where 40h is added to "^" and an input code, such as 01h[SOH] → ^A, is output. ・When escape sequence is erroneous A lowercase character "e" and the second character of the input code, such as in [ESC]+A → "eA", is output,. ・When character string command is erroneous, 3 characters of the command that was input are output. ・When parameter is erroneous The command that caused the parameter error is output. ・When command is normal Outputs "*".
Description	When the IES command is executed, the internal error information is cleared. The internal error information is cleared also in the following cases. 1) When the power is turned on 2) When interface clear ([ESC]+R) is executed 3) When remote/local is switched. 4) When the RA1000 is initialized.

IDA (Inquire Data Ascii) <RS-232C><GP-IB>

Function	Reads current input data in binary format. When Un is specified for a parameter, amp information is read.
Input Format	IDA P1 (Delimiter)
Output Format	(data) (Delimiter)·····When 1 channel is specified (d1),(d2),(d3) - (d16) (Delimiter)····· When all channels are specified A1,A2 (Delimiter) ·····Input unit information

Parameter

P1	Readout channel setting
1 | 16	1-A CH | 8-B CH
A	Reads all channels

P1	Setting for reading amp setting information
U1 | U16	U1 | U16

Answer

When reading data
(data):readout data (ASCII)
(The same as the data type of the RDA command)

When reading amp information (ASCII)

A1	Outputs amp type
0	None
1	***HRDC***(AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC***(AP11-103)
4	***ACST***(AP11-104)
5	***EV*** (AP11-105)
6	***TCDC***(AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST***(AP11-110)

A2	Outputs unit No. (unit of set value)
In the case of ***HRDC,HSDC***	
0	V
1	mV
In the case of ***TCDC,TDC***	
0	°C [°F(Fahrenheit)],V
1	mV
The unit changes by switching Centigrade/Fahrenheit	
In the case of ***FFT,RMS***	
0	V[rms],k m/s^2,kG
1	mV[rms],m/s^2,G
In the case of ***EV***	
0	0
In the case of ***FV***	
0	Hz
1	kHz
In the case of ***ACST,DCST***	
0	μ ε
1	kμ ε

MEMO

In A2, 0 and 1 mean preset values, and numbers other than 0 and 1 indicate that special characters have been set.

Description	Reads the current amp unit data and outputs it in ASCII format (delimiter other than EOI (GPIB) is not attached). When “all” is specified, eight data items are always output irrespective of the number of the installation channel. When a blank channel is read, “*” is returned. “User Scale” is not supported.

IWH (Inquire Who) <RS-232C><GP-IB>

Function	Outputs instrument format.
Input Format	IWH P1 (Delimiter)
Output Format	A1 (Delimiter)
Parameter	P1: Sets format/ROM version/product number section 0 (omitted): Instrument format 1: ROM version 2: RA1000 product number (7 columns)
Answer	A1 When P1=0 (or omitted) Instrument Format :RA1100,RA1200 When P1=1 ROM Version :V*** When P1=2 Product Number :1234567
Description	Answers are in ASCII character string.

IPL (Inquire Print Line) <RS-232C><GP-IB>

Function	Reads the recording line width of the amp unit.
Input Format	IPL P1,(P2) (Delimiter)
Output Format	A1 (Delimiter)
	P1: Reads out channel setting 1	1-A CH 16	8-B CH P2: Outputs line type of waveform recording (Line) 1	1 8	8
Answer	A1: Output of Waveform recording line 1: 1 dot (0.125mm, standard) 2: 2 dots (0.25mm) 3: 3 dots (0.375mm) 4: 4 dots (0.5mm)
Description	When a blank channel that indicates no input unit is specified, a parameter error will occur. When an error occurs, “?” is returned. P2 cannot be omitted. P2 is ignored for an amp other than the event amp. If P2 is omitted when using the event amp, value of signal 1 is read.

IEL (EL display auto-off) <RS-232C><GP-IB>

Function	Outputs ON/OFF information on screen auto-off or screen saver functions.
Input Format	IEL (Delimiter)
Output Format	A1, A2 (Delimiter)
Answer	

A1	Outputs ON/OFF information on screen auto-off or screen saver functions.
0	OFF
1	Display back-light auto-off
2	Start screen saver

A2	Outputs the set time for auto-off or to start screen saver.
1 | 60	1 (miniute) | 60 (minutes)

IST (auto STart) <RS-232C><GP-IB>

Function	Outputs ON/OFF information on the auto-start function (wait function).
Input Format	IST(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Outputs ON/OFF for wait function
0	OFF
1	ON

IFL (wave Feed Length) <RS-232C><GP-IB>

Function	Outputs paper feed (FEED) length at the end of a waveform recording.
Input Format	IFL(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Outputs the paper feed (FEED) length.
0 | 1000	0 mm | 1000 mm

IMP (Inquire Memory Point) <RS-232C><GP-IB>

Function	Outputs memory block write information .
Input Format	IMP (Delimiter)
Output Format	A1, A2 (Delimiter)
Answer	

A1	No. of blocks about to receive data

A2	No. of blocks targeted for copying.

IMI (Inquire Memory Information) <RS-232C><GP-IB>

Function	Outputs memory information.
Input Format	IMI P1,P2(Delimiter)
Output Format	A1,A2,A3,A4,A5,A6,A7,A8,A9,A10(Delimiter)
Parameter	

P1	Readout block
1 | 128	1 block | 128 blocks

P2	Information section
1	Only presence or absence of data (A1 only)
2	Outputs recording information

Answer

A1	Recording information
0	No data
1	Recording
2	Recording complete

A2	Number of all data (*: data invalid)

A3	Trigger address (*:No trigger)

A4	Sampling speed
1 | 999	1 | 999

A5	Unit of sampling speed
1	µs
2	ms
3	s

A6	Data format
1	Peak
2	Sample

A7	Starting time [format] YY/MM/DD HH:MM:SS Year/Month/Day Hour:Minute:Second

A8	Trigger time [format] is the same as the starting time
A9	Ending time [format] is the same as the starting time
A10	Valid CH information (”0” to ”FF” character string)

IAI (Inquire memory AMP Information) <RS-232C><GP-IB>

Function	Outputs memory amp information.
Input Format	IFL P1, P2, P3 (Delimiter)
Output Format	A1,A2(Delimiter)/A1,A2,…,A7(Delimiter)/A1,A2,…,A10(Delimiter)
Parameter	

P1	Readout Block
0	Amp information set by the RA1000
1 | 128	Memory Block

P2	CH number
1 | 16	1-ACH | 8-BCH

P3	Answers Section
1	Type Only
2	Setting Information
3	Scale Information

Answer

★When P3=1

A1	Amp type setup
0	None
1	***HRDC***(AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC***(AP11-103)
4	***ACST***(AP11-104)
5	***EV*** (AP11-105)
6	***TCDC***(AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST***(AP11-110)

A2	Number of parameter whenP3=2 in amp type

★When P3=2

Amp Setting Information **:** An answer having the same contents as the ICH command is returned.

★When P3=3

A1	Scaling ON/OFF
0	ON
1	OFF

A2	Sets the maximum input
A3	Sets the minimum input
A4	Sets the maximum output
A5	Sets the minimum output
A6	Sets the maximum recording scale
A7	Sets the minimum recording scale

A8	Unit Number

A9	User-defined unit character string (*=invalid)

A10	Standard range

Description	When an error occurs, “?” is returned.

IFN (Inquire Fax No.) <RS-232C>

Function	Outputs telephone number of receiver in auto-transmission.
Input Format	IFN(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Telephone Number (ASCII character string) When number is not set, "*" is returned.

IAT (Inquire Fax or Modem) <RS-232C>

Function	Outputs service request/transmission factors.
Input Format	IAT (Delimiter)
Output Format	A1, A2 (Delimiter)
Answer	

A1	ON/OFF setting for when printer error has occured
0	OFF
1	ON

A2	When to record data (end of recording, trigger detection)
0	OFF
1	When recording ended
2	When trigger is detect

ICA (Inquire Cause of Action) <RS-232C><GP-IB>

Function	Outputs auto-transmission executing factors.
Input Format	ICA(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Automatic Transmission Factors
0	OFF
1	Printer Error
2	File Error
4	End of Measurement
8	Trigger Detection

※Two or more factors are output as the sum of each numerical value.

IWT (Inquire Wave Transmit) <RS-232C><GP-IB>

Function	Outputs waveform FAX transmission.
Input Format	IWT(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Waveform FAX transmission
0	OFF
1	ON

IRS (Inquire Rec Icon)

<RS-232C><GP-IB>

Function	Outputs REC icon settings.
Input Format	IRS(Delimiter)
Output Format	A1,A2,A3(Delimiter)
Answer	

A1	ON/OFF setting for real-time recording icon
0	OFF
1	ON

A2	ON/OFF setting for auto-copy icon
0	OFF
1	ON

A3	ON/OFF setting for filing icon
0	OFF
1	ON

IRF (Inquire Realtime Filing) <RS-232C><GP-IB>

Function	Outputs filing mode setting value.
Input Format	IRF(Delimiter)
Output Format	A1,A2,A3,A4,A5,A6(Delimiter)
Answer	

A1	Filing recording･speed
1 | 100	1 | 100
E	External synchronization

A2	Recording unit
0	External synchronization
1	μs
2	ms
3	s

A3	Data Format
1	Peak
2	Sample

A4	Recording Method
1	Normal
2	Ring

A5	Recording Length

IMF (Inquire Memory Filing) <RS-232C><GP-IB>

Function	Outputs memory filing settings.
Input Format	IMF(Delimiter)
Output Format	A1,A2(Delimiter)
Answer	

1

A1	Data Format
Binary	
2	CSV

A2	Data interval
1	1 step
2	2 steps
5	5 steps
10	10 steps
20	20 steps
50	50 steps
100	100 steps
200	200 steps
500	500 steps
1000	1000 steps

ISS (Inquire filing Save Setting) <RS-232C><GP-IB>

Function	Outputs filing save settings.
Input Format	ISS (Delimiter)
Output Format	A1,A2,A3,A4,A5(Delimiter)
Answer	

A1	Drive Selection
A | I	A drive | I drive

A2	User name specifying folder (MAX. 8 characters: Alphanumerics)

A3	File/Folder name (MAX. 4 characters: Alphanumerics)

A4	Use the user-name specified folder
0	OFF
1	ON

A5	Create a folder for each day
0	OFF
1	ON

ISP (Inquire filing Save Path) <RS-232C><GP-IB>

Function	Outputs settings on filing save path.
Input Format	ISP(Delimiter)
Output Format	A1(Delimiter)
Answer	

A1	Save Path

IEC (Inquire Enable record Condition) <RS-232C><GP-IB>

Function	Outputs filing record enabling conditions.
Input Format	IEC(Delimiter)
Output Format	A1,A2(Delimiter)
Answer	

A1	Number of recordable channel
0 | 16	0 :Recordable with the current status 1-16:Number of recordable channel

A2	Enabled Recording Speed
0 |	0:Recordable with the present status (unit is µs)

※A2 varies depending on the specified filing recording drive.

Description	The recording target is the current drive.

IWJ (Inquire Wave Judge) <RS-232C><GP-IB>

Function	Outputs waveform judgement settings.
Input Format	IWJ(Delimiter)
Output Format	A1,A2(Delimiter)
Answer	

A1	Waveform Judgement ON/OFF
0	OFF
1	ON

A2	Copy setting
1	Copy in NG only
2	Copy all

ICD (Inquire Connect Drive) <RS-232C><GP-IB>

Function	Outputs connected drives.
Input Format	ICD(Delimiter)
Output Format	A1,A2,A3,A4,A5,A6,A7,A8,A9(Delimiter)
Answer	

A1	Connection status of A drive
A	Connected
*	Disconnected

A2	Connection status of B drive
B	Connected
*	Disconnected

A3	Connection status of C drive
C	Connected
*	Disconnected

A4	Connection status of D drive
D	Connected
*	Disconnected

A5	Connection status of E drive
E	Connected
*	Disconnected

A6	Connection status of F drive
F	Connected
*	Disconnected

A7	Connection status of G drive
G	Connected
*	Disconnected

A8	Connection status of H drive
H	Connected
*	Disconnected

A9	Connection status of I drive
I	Connected
*	Disconnected

*6. Execution Command - E**

EST (Execute StarT) <RS-232C><GP-IB>

Function	Starts recording as when the ***Start*** key (***REC***) is pressed.
Input Format	EST P1 (Delimiter)
Parameter	P1: Reserved Parameter ※P1 can be omitted.
Description	P1 setting is disabled.

ESP (Execute StoP) <RS-232C><GP-IB>

Function	Stops recording as when the ***Stop*** key (***STOP***) on the operation panel is pressed.
Input Format	ESP (Delimiter)

EFD (Execute FeeD) <RS-232C><GP-IB>

Function	Feeds paper in the same way as when the ***Stop*** key (***STOP***) on the operation panel is pressed.
Input Format	EFD P1 (Delimiter)
Parameter	P1: Sets recording paper feeding amount 1 | 999: 1 mm | 999mm
Description	When P1 is omitted, feeding continues until another command is received. When P1 is set, paper is fed according to the set amount.

ECP (Execute CoPy) <RS-232C><GP-IB>

Function	Copies memory in the same way as when the ***Memory Copy*** key (***COPY***) on the operation panel is pressed.
Input Format	ECP P1 (Delimiter)
Parameter	P1: Sets start address 0 | Storage Memory Size: 0 | Storage memory size P2: Sets data number 2 | Storage Memory Size: 2 | Storage memory size
Description	Copies the memory block that is presently selected. When Parameters P1 and P2 are omitted, all data in the block is copied . Omitting either parameter causes an error. When P1 and P2 exceed the memory size, an error occurs. Information on the stored memory can be confirmed by the IMS command. When the recorder type is neither a memory recorder nor transient recorder, a mode error occurs.

ECM (Execute Clear Memory) <RS-232C><GP-IB>

Function	Clears memory contents.
Input Format	ECM P1 (Delimiter)
Parameter	P1: Sets number of memory block to be cleared 1 | 128: 1 | 128 A: Clears all memory Omitted: Current memory block
Description	Clears the specified memory block. When the specified number is more than the current number of block divisions, an errorr occurs.

EMT (Execute Manual Trigger) <RS-232C><GP-IB>

Function	Generates trigger internally in the same way as when the ***Manual Trigger*** key (***M.TRIG***) on the operation panel is pressed.
Input Format	EMT (Delimiter)
Description	Regardless of the state of the RA1000, an error does not occur no matter when this is executed.

EMK (Execute MarK) <RS-232C><GP-IB>

Function	Prints an event mark and time if data is received during real-time recording in the same way as when the ***Mark Print*** key (***EVENT***]) on the operation panel is pressed. Also, if data is received during real-time filing, event mark and time data is added to the stored data.
Input Format	EMK (Delimiter)
Description	Even when the RA1000 is not operating or set to memory recorder, reception of data does not cause an error.

EPA (Execute Print Annotation) <RS-232C><GP-IB>

Function	Prints page annotation
Input Format	EPA (Delimiter)
Description	When the RA1000 is not operating, only page annotation is printed before closing. When real-time and memory-copy waveforms are being recorded, annotation is reprinted at the moment data is received. If data is received while system annotation and page annotation are being printed, a reprint occurs with the latest annotation information. If this unit is executed while another RA1000 is operating, a mode error occurs.

ETA (Execute Time Adjust) <RS-232C><GP-IB>

Function	Adjusts built-in clock
Input Format	ETA (Delimiter)
Description	Calibrates by setting the second of the in-built clock to 0. 0 to 29 seconds is set to 0 and 30 to 59 seconds to 0 rounding up to the next minute. Use the SDT/STM command to set the time and date,

ESI (Execute System Initialize) <RS-232C><GP-IB>

Function	Initializes the RA1000 in the same way as when [*Maintenance/initialize] (Initialize)* is executed. See the RA1000 Mainframe Instruction Manual.
Input Format	ESI P1 (Delimiter)
Parameter	P1 = Sets contents of initialization 1 = Initializes setting data of RA1000 only 2 = Initializes setting data of RA1000 and all memory blocks 3 = Initializes with the stored contents of setting values included. Omitted = Initializes RA1000 settings and all memory blocks.
Description	The communication setting is not initialized. Command enabled only when the RA1000 is not operating. In other cases a mode error occurs. MEMO During initialization, communicationi via the RS-232C/GP-IB does not occur. If the host machine outputs this command, stop the data transmission for about 5 seconds.

ETP (Execute Test pattern Print) <RS-232C><GP-IB>

Function	Records test prints. (Test print for the system display) See the RA1000 Mainframe Instruction Manual.
Input Format	ETP (Delimiter)
Description	Enabled only when the RA1000 is not operating. In other cases, and when the chart paper has run out, a mode error occurs.

EAB (Execute STamp Auto Balance) <RS-232C><GP-IB>

Function	Executes auto balance of ***DCST*** .
Input Format	EAB P1 (Delimiter)
Parameter	P1: Sets execution channel 1: 1CH 3: 3CH 5: 5CH 7: 7CH A: Batch setting for all ***DCST***
Description	Performs auto balance in the same way as when the Auto Balance key is pressed in the ***DCST*** setting screen. Operations other than recording with the real-time recorder result in an operation error. Execution of auto balance takes about 1 second per channel. When this command is executed, other commands (including [ESC]+C) can not be accepted. Setting a channel other than ***DCST*** results in a parameter error.

EAR (Execute Auto Range) <RS-232C><GP-IB>

Function	Executes auto-range of input unit.
Input Format	EAR P1 (Delimiter)
Parameter	P1: Selects setting channel 1 | 16: 1-A CH | 8-B CH A: Sets simultaneously

ESE (Execute Status read or savE) <RS-232C><GP-IB>

Function	Stores and reads out the set values of the RA1000 in the same way as when [Auxiliary setting/storage, readout] is executed. See the RA1000 Mainframe Instruction Manual.
Input Format	ESE P1 (Delimiter)
Parameter	P1: Strorage or Readout. 1: Save 2: Readout P2: Contents to be strored or readout 1: Storage No.1 2: Storage No.2 3: Storage No.3 4: Storage No.4 5: User annotation

Description	After this command is transmitted, do not transmit any other command for about 2 seconds. User annotation proceeds all items of user channel page / header / signal name / channel mark / report title in a lump.

ETS (Execute realtime TranS) <RS-232C><GP-IB>

Function	Executes real-time transmission
Input Format	ETS P1, P2, P3 (Delimiter)
Answer	A1 (Delimiter)[STX](data1)(data2)…(data8)[SUM]
Parameter	

P1	Data type
0	Sample
1	Compression (peak)

P2	Unit of transmission speed
0	ms
1	s

P3	Transmission speed
1 | 1000	1 | 1000

※P3 cannot be omitted

Answer

A1	Execution result
*	Transmission speed is not fast enough with RS-232C
?	Execution error (such as when RA1000 is operating)
0	No transmission CH
2-32	Number of transmission bytes

Answer

(In the case of sample data)
[STX](D1.DAT)(D2.DAT)(D3.DAT)……(D8.DAT)[SUM]

(In the case of peak data)
[STX](D1.MAX)(D1.MIN)(D2.MAX)……(D8.MIN)[SUM]
[ ] : 1 byte, () : 2 bytes

Description

The transmission channel is set with the STR command.
In the case where amp input is set to OFF for all channels, a transmission error (A1 = 0) occurs.
When amp input is OK, data is output in accordance with the transmission CH specification register.
When amp input is OFF and specified as ON, zero data is output.

Exception processing
If a transmission state has an error during command execution, a start code [STX] showing the beginning of data and the following error codes are output.

[EOT](04h)…Main unit received a command and execution was terminated
[CAN](18h)…Since reception process on the host side was not done in time, the buffer of the RA1000 overflowed and execution was terminated
[ENQ](05h)…Buffer status of the RA1000

	If [EOT] and [CAN] were received in addition to [STX] when receiving start code, transmission is terminated. In this case, only 1 byte is output and the RA1000 terminates transmission. Also, if reception processing is not done in time and the buffer of the RA1000 is 2/3 or more full, the 2 bytes of [ENQ][01h] are output as a warning. If the buffer is fuller than 2/3 and [ENQ][01h] are output, and then the buffer of the RA1000 becomes 1/3 or less full, the 2 bytes of [ENQ][00h] are output. After [ENQ][01h] are output, [ENQ][01h] are output again only when buffer of the RA1000 becomes 1/3 or less full and the 2 bytes of [ENQ][00h] are output (In the case of GP-IB, [EOI] is output to the last byte of the received data of exception processing.)
	Terminating transmission Execute the ESP command to terminate transmission. When ESP is executed, the RA1000 outputs [EOT] to terminate transmission, and the normal state of receiving commands is entered. (In the case of GP-IB, after ESP is transmitted, the talker address is output to the RA1000 and the terminating code [EOT] is received.

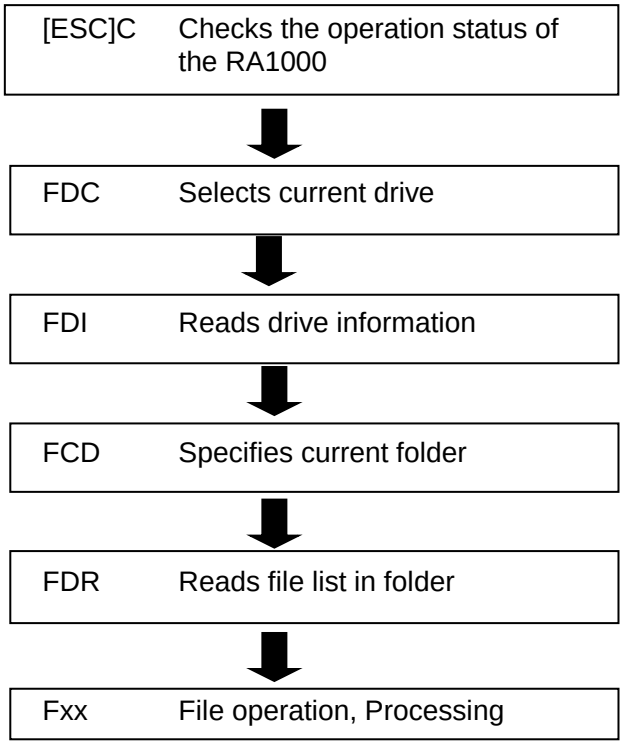
EAS (Execute Ac strain amp auto balance) <RS-232C><GP-IB>

Function	Executes auto balance of ***AS***.
Input Format	EAS P1 (Delimiter)
Parameter	<table><tr><th>P1</th><th>Sets execution channel</th></tr><tr><td>1 | 16</td><td>1 - A CH | 8 - B CH</td></tr><tr><td>A</td><td>Batch setting for all AS</td></tr></table>
Description	Executes auto balance of ***AS***. To execute the auto balance, about 1 second is necessary per channel. During this command execution, other commands (C including [ESC]+) are not accepted. When a channel other than ***AS*** is specified, a parameter error occurs.

*7. File/Data Operation Command - F**

◆ The following are commands for file operation. Note that if a file operation command is transmitted when the RA1000 is recording files, an error occurs. Before operating files through communication, check whether the RA1000 is operating or not.

● **The general procedure of the file operation is as follows.**



FDC (File Drive Change) <RS-232C><GP-IB>

Function	Sets current drive
Input Format	FDC P1 (delimiter)
Output Format	A1 (delimiter)
Parameters	P1: A = A drive (FD drive), B = B drive (PC card), C = C drive, | = | (SCSI Connection), I = I drive ※P1 cannot be omitted.
Answers	A1: 0 = All access possible; 1 = Read only; 2 = Change disk; 3 = Unidentified format; 4 = No media; 5 = No drive; 6 = Other error
Description	When a drive connected to A, B and SCSI is specified, the current drive is changed. When a drive not connected to SCSI is specified, "A1=5" is returned and the current drive is not changed.

FDI (File Drive information) <RS-232C><GP-IB>

Function	Outputs current drive information
Input Format	FDI (delimiter)
Output Format	A1, A2, A3, A4, A5 (delimiter)
Answers	A1: Current drive; A2: Current folder; A3: Full capacity (byte number); A4: Remaining capacity (byte number); A5: Number of files in current folder
Description	A sum of file, folder, ”this folder” ("."), and ”folder one above” ("..") is returned to the file number returned for A5. When media is not inserted into the current drive, "?" is returned for A2 to A5.

FDR (File Directly Read) <RS-232C><GP-IB>

Function	Outputs folder (directory) information (list of files)
Input Format	FDR (delimiter)
Output Format	A1, A2, A3 (delimiter) A4-a, A4-b, A4-c, A4-d, A4-e (delimiter) A4-a, A4-b, A4-c, A4-d, A4-e (delimiter) ・・・ A5 (delimiter) } (Number of files responded with A3)
Answers	

A1	Drive information
0	All access possible
1	Read only
2	Change disk
3	Unidentified format
4	No media
5	No drive
6	Other error

A2	Directory path
A3	Number of files

A4- is output by the number obtained by A3.

A4-a	Attribution (VOL,DIR,FIL)
A4-b	File name
A4-c	Date (YY/MM/DD)
A4-d	Time (HH:MM)
A4-e	Size (byte number)

A5	“END”(Ending code)

Description	In the case of an error (such as no media inserted), its error number is returned for A1, and "?" for A2 and A3. There is no response after A4.

FCD (File Change Directly) <RS-232C><GP-IB>

Function	Changes (moves) current folder (directory)
Input Format	FCD P1 (delimiter)
Output Format	A1, A2 (delimiter)
Parameters	P1: Change folder ※P1 cannot be omitted.
Answers	A1: Drive information 0: All access possible 1: Read only 2: Change disk 3: Unidentified format 4: No media 5: No drive 6: Other error A2: Current folder after changed
Description	Changes current folder. The change folder that can be specified with P1 is adjacent to the current folder that was obtained by the FRD command readout, or a full-path specified folder described from the drive. In the case of the adjacent folder, specify ".." in order to specify the ”folder one above”. Up to 8 characters can be used for a folder name, and in the case of full-path specification, up to 160 characters can be used. In the case of the full-path specification, if no media has been inserted in the specified drive, “4, ?” is returned and the current drive is changed to the specified drive. If no drive is connected to the specified drive, “5, ?” is returned and the current folder is not changed.

FDL (File DeLete) <RS-232C><GP-IB>

Function	Deletes files
Input Format	FDL P1 (delimiter)
Output Format	A1, A2 (delimiter)
Parameters	P1: Name of file to be deleted (including extension) ※P1 cannot be omitted.
Answers	A1: Drive information 0: All access possible 1: Read only 2: Change disk 3: Unidentified format 4: No media 5: No drive 6: Other error A2: Command execution information 0: Successful 1: Lack of capacity 2: Write error

	3 Read error 4 Illegal characters detected 5 Reserved file name 6 Same file name 7 Other error
Description	Deletes P1-specified files in the current folder. The file name is not path-specifiable. A file name should be specified with 8 characters or less, or 12 characters or less including the extension ".XXX". The folder and volume label cannot be deleted. Save files are saved in the current folder with the name specified with P1. When the memory block has no data, an execution error occurs.

FDS (File Data file Save) <RS-232C><GP-IB>

Function	Saves "DAT" files (saves memory data to files)
Input Format	FDS P1 (delimiter)
Output Format	A1, A2 (delimiter)
Parameters	P1 Write file name ※P1 cannot be omitted.
Answers	A1 Drive information 0 All access possible 1 Read only 2 Change disk 3 Unidentified format 4 No media 5 No drive 6 Other error A2 Command execution information 0 Successful 1 Lack of capacity 2 Write error 3 Read error 4 Illegal characters detected 5 Reserved file name 6 Same file name 7 Other error
Description	According to the current copy setting (memory block number, copy range), memory data is saved in the specified file. The save file is saved in the current folder with the file name specified with P1. Specify a file name with 8 characters or less. ".DAT" is automatically added to extension. When a file name is specified with an extension, an error occurs. When the memory block has no data, an execution error occurs.

FES (File Environment file Save) <RS-232C><GP-IB>

Function	Saves “ENV” files
Input Format	FES P1, P2, P3 (delimiter)
Output Format	A1, A2 (delimiter)

Parameters

P1	Write file name

※P1 cannot be omitted. (when P2=2, omitted)

P2	Save type
1	Specify and save name
2	Save as start file

※P2 cannot be omitted.

P3	Save data
1	System environment
2	Annotation text
3	System environment + Annotation text

※P3 cannot be omitted.

Answers

A1	Drive information
0	All access possible
1	Read only
2	Change disk
3	Unidentified format
4	No media
5	No drive
6	Other error

A2	Command execution information
0	Successful
1	Lack of capacity
2	Write error
3	Read error
4	Illegal characters detected
5	Reserved file name
6	Same file name
7	Other error

Description

When P2=1
An ENV file is saved in the current folder with the file name specified with P1. Specify a file name with 8 characters or less. ".ENV" is automatically added to extension. When a file name is specified with an extension, an error occurs.

When P2=2 (save as a start file)
When a start file is specified, it is saved in the A drive (FD root drive) with the file name of "STARTUP. ENV", irrespective of the P1 specification, and the state of current folder and current drive. Therefore, it is necessary to set a FD disk into the A drive before execution.

If "STARTUP.ENV" has already been created, an error “Same file name” occurs and the file is not saved. In this case, delete the older file before saving the file. When P2=2, P1 can be omitted.

FLD (File LoaD) <RS-232C><GP-IB>

Function	Loads file
Input Format	FLD P1 (delimiter)
Output Format	A1, A2 (delimiter)
Parameters	P1: Readout file name (extension indispensable) ※P1 cannot be omitted.

Answers

A1	Drive information
0	All access possible
1	Read only
2	Change disk
3	Unidentified format
4	No media
5	No drive
6	Other error

A2	Command execution information
0	Successful
1	Lack of capacity
2	Write error
3	Read error
4	Illegal characters detected
5	Reserved file name
6	Same file name
7	Other error

Description

Usable file formats are :
xxx.DAT、xxx.ENV、xxx.TXT

When xxx.ENV is specified, the contents saved in the file are read out, and main unit setting is performed. At this moment, the current drive is "A". When an ENV file is loaded, the input monitor on the screed stops scrolling.
To restart scrolling, execute the EDR command (screen is refreshed).

When xxx.DAT is specified, data saved in files is read out to the memory block currently set.

When xxx.TXT is specified, Annotation text saved in the file is read out, and user annotation is set. Even if user annotation is read out at this moment, printing of user annotation is not set to ON. Make a print setting with the SAN command.

FIL (File Information Load) <RS-232C><GP-IB>

Function	Reads out file information or memory block information
Input Format	FIL P1, P2 (delimiter)
Output Format	A1 (delimiter) / A1, A2, A3,..., A10 (delimiter)

Parameters

P1	File name or memory block number
File name	Specify name of file in current directory with extension
1 to 128	Memory block number

※P1 cannot be omitted.

P2	Information section
1	Only whether data exists or not (A1 only)
2	Outputs recorded information

※P2 cannot be omitted.

Answers

A1	Recording information
0	No data
1	Recording
2	Recording finished

A2	All data numbers (*:data invalid)

A3	Trigger address (*:No trigger)

A4	Recording speed
1 | 999	1 | 999

A5	Unit of recording speed
1	μs
2	ms
3	s

A6	Data format
1	Peak
2	Sample

A7	Starting time [Format] xxxx/xx/xx ○○:○○:○○ (year/month/date h:min.:sec.)

A8	Trigger time [Format] is same as starting time

A9	Finishing time [Format] is same as starting time

A10	Valid CH information (”0” to ”FF” string)

Description	P1 specifies file name (including extension) or memory block number. Names of files in the current folder or files with full-path format specified from the drive can be specified. Specify names of files in the current folder with 12 characters or less including extension. In the case of the full-path format, start specifying from the drive name with up to 160 characters including extension. In the case of a memory block, specify 1 to 128 numbers. The CH pattern of A10 is the expression of the valid CH in the HEX format. (1=valid/0=invalid) (Example) Only CH1 is valid=01 Only CH8 is valid=80 All from CH1 to CH8 are valid=FF When an error occurs, “?” is returned for all the 10 answers.

FAR (File Amp information Read) <RS-232C><GP-IB>

Function	Reads out amp information saved in data recording to data files.
Input Format	FAR P1, P2, P3 (delimiter)
Output Format	A1, A2 (delimiter) / A1,A2,…,A7 (delimiter) / A1,A2,…,A10 (delimiter)
Parameters	P1: File name ※P1 cannot be omitted. P2: Readout CH 1	16 : 1 - ACH	8 - BCH ※P2 cannot be omitted. P3: Answers section 1: Type only 2: Setting information 3: Scale information ※P3 cannot be omitted.
Answers	★When P3=1 A1: Amp type 0: None 1: ***HRDC*** (AP11-101) 2: ***FFT*** (AP11-102) 3: ***HSDC*** (AP11-103) 4: ***ACST*** (AP11-104) 5: ***EV*** (AP11-105) 6: ***TCDC*** (AP11-106) 7: ***TDC*** (AP11-107) 8: ***FV*** (AP11-108) 9: ***RMS*** (AP11-109) 10: ***DCST*** (AP11-110)

A2	Number of parameters by amp type when P3=2

★When P3=2

Amp Setting information: Answers having the same contents as the ICH command are returned.

★When P3=3 (output scale information)

A1	Scaling ON/OFF
0	OFF
1	ON

A2	Maximum input
A3	Minimum input
A4	Maximum output
A5	Minimum output
A6	Maximum recording scale value
A7	Minimum recording scale value

A8	Unit number

A9	User-defined unit character string (*=invalid)

A10	Standard range

Description

When P3=3

Either there is no amp, or the event amp's channel response is to return "*" for all of A1 to A10.

Names of files in the current folder or files with full-path format specified from the drive can be specified.
Specify names of files in the current folder with 12 characters or less including extension.
In the case of the full-path format, start specifying from the drive name using up to 160 characters including extension.
When an error occurs, "?". is returned.

FRC (File Read Common) <RS-232C><GP-IB>

Function	Reads out file (memory) data
Input Format	FDS P1, P2, P3, P4, P5 (delimiter)
Output Format	A1, A2, A3 (delimiter) [data string]

Parameters

P1	Reads out file name (extension cannot be omitted)

※P1 cannot be omitted.

P2	Reads out start address
P3	Reads out data range
P4	Reads out CH pattern ("0" to "FF" character string)

※P2, P3, P4 cannot be omitted.

P5	Data format
1	Binary
2	ASCII

※P5 cannot be omitted.

Answers

A1	Line number

★When P5 = 1 (binary)

A2	Byte number per line

★When P5 = 2 (ASCII)

A2	Channel number (by P4)

A3	Format
1	Peak
2	Sample

Description

Before executing this command, it is necessary to read out (FIL command) data information.

Transmission data has following formats.

・Data string for 1 line (binary, sample)
[STX][ch1 H][ch1 L][ch2 H][ch2 L]……[ch8 H][ch8 L]
[SUM][EOT] ← Normal end

・Data string for 1 line (binary, peak)
[STX][ch1MaxH][ch1MaxL][ch1MinH][ch1MinL]……[ch8MinL]
[SUM][EOT] ← Normal end

・Data string for 1 line (ASCII, sample)
[ch1][,][ch2][,]……[ch8][dl] (character string spaced with a comma)
["END"] ← Normal end

Data string for 1 line (ASCII, peak)
[ch1Max][,][ch1Min][,]……[ch8Min][dl] (character string spaced with a comma)
["END"] ← Normal end

	However, data not found in the CH pattern is not output. Data with no CH installed or data with CH installed but input is OFF are zero data. (In the case of binary transmission) Before starting to output data, [STX] is always output. If an error occurs during a file access, [CAN] is output and file operation is terminated. (Normal ending ends with [EOT].) All data numbers are obtained by [readout CH number]×[line number] (×2: at peak). (In the case of ASCII transmission) Normal ending ends with “END”. If an error occurs, “ERROR” is output and file operation is terminated.

*8. Text Operation Command - T**

8.1.Writing Annotation Information

◆ There are two types of user annotation, user channel annotation and user page annotation. When the RA1000 is used as a standalone unit, Japanese characters cannot be input, however, by using the communication command, it is possible to set and record Japanese.

● **User Channel Annotation**
This is a function that allows arbitrary channel information to be printed following channel information printing. Channel annotation is printed when waveforms are recorded after text (character) is input.

● **User Page Annotation**
This is a function that allows printing a comment (up to 64 characters × 108 lines) on chart paper. Printing is carried out in synchronization with system annotation printing after characters are input, or by receiving the user page annotation printing command.

TIL (Text Input Line) <RS-232C><GP-IB>

Function	Inputs user channel annotation text
Input Format	TIL (delimiter) text (delimiter)
Description	Text is given in the following format. C: channel No. (1-8) : Setting string (Max. 31 characters) Example of Command TIL (DLMT) C:1: Vertical Oscillation (DLMT) TIL (DLMT) C:3: Horizontal Acceleration (DLMT) Both ems and ens can be input for the setting string. They are both counted as one character. All characters printed on the main unit printer are converted to Ms to be printed.

TTL (Text Title Line) <RS-232C><GP-IB>

Function	Inputs report title characters
Input Format	TTL (Delimiter) Text (Delimiter)
Description	Text is given in the following format. T: Title No. (1-2):Setting string (Max. 31 characters) Example of Command TTL (DLMT) T:1: Vertical Oscillation (DLMT) TTL (DLMT) T:3: Horizontal Acceleration (DLMT) Both ems and ens can be input for the setting string. They are both counted as one character. All characters printed on the main unit printer are converted to Ms to be printed.

THD (Text HeaDer)

<RS-232C><GP-IB>

Function	Inputs report header characters
Input Format	THD (Delimiter) Text (Delimiter)
Description	Text is given in the following format. H: Line No. (1-108):Setting string (Max. 31 characters) Example of Command THD (DLMT) H:1: Vertical Oscillation (DLMT) THD (DLMT) H:3: Horizontal Acceleration (DLMT) Both ems and ens can be input for the setting string. They are both counted as one character. All characters printed on the main unit printer are converted to Ms to be printed.

TSN (Text Signal Name)

<RS-232C><GP-IB>

Function	Inputs report signal names
Input Format	TSN (Delimiter) Text (Delimiter)
Description	Text is given in the following format. S: Channel No. (1-16) : Setting string (Max. 31 characters) In the case of an event amp S: Channel No. (1-16) : EV Channel No. (1-8):Setting string (Max. 31 characters) Example of Command TSN (DLMT) S:1: Vertical Oscillation (DLMT) TSN (DLMT) S:3: Horizontal Acceleration (DLMT) Both ems and ens can be input for the setting string. They are both counted as one character. All characters printed on the main unit printer are converted to Ms to be printed.

TCH (Text Channel Mark)

<RS-232C><GP-IB>

Function	Inputs channel marks
Input Format	TCH (Delimiter) Text (Delimiter)
Description	Text is given in the following format. M : Channel No. (1-16) : Setting string (alphanumerics only, Max. 4 characters) Example of Command TCH (DLMT) M:1: Vertical Oscillation (DLMT) TCH (DLMT) M:3: Horizontal Acceleration (DLMT) Channel mark setting strings are treated as ens.

TIP (Text Input Page)

<RS-232C><GP-IB>

Function	Inputs user page annotation
Input Format	TIP (delimiter) text (delimiter) | text (delimiter) E:: (delimiter)
Description	Texts are input by line in the following format. P : Line number (1-108) : Setting string (Max. 64 characters) Line input is terminated with the end command E::. Example of Command TIP (DLMT) P:1: Content of measurement (DLMT) P:3: Distortion on Dam surface (DLMT) E:: Both ems and ens can be input for the setting string. They are both counted as one character. All characters printed on the main unit printer are converted to Ms to be printed.

8.2. Reading Annotation Information

TOL (Text Output Line)

<RS-232C><GP-IB>

Function	Reads user annotation text
Input Format	TOL P1 (Delimiter)
Output Format	When channel no. is specified C : Channel No. :character string (DLMT) When all channels are specified (a channel without a character string specification is not output) C:1:character string (DLMT) C:2:character string (DLMT) …… C:16:character string (DLMT) E::(end code)
Description	Input parameter is given in the following format. P1:Channel No. (1-16,'A'(all channel are output)) Example of Command TOL A (DLMT) All character strings are output as ems.

TOT (Text Output Title)

<RS-232C><GP-IB>

Function	Reads report title characters
Input Format	TOT P1 (Delimiter)
Output Format	T: Line No. : character string (DLMT)
Description	Input parameter is given in the following format. P1 : 1 or 2 Example of Command TOL 1 (DLMT) All character strings are output as ems.

TOH (Text Output HeaDer)

<RS-232C><GP-IB>

Function	Reads report header characters
Input Format	TOH P1 (Delimiter)
Output Format	When line no. is specified H: Line No. :character string (DLMT) When all lines are specified (a line without a character string specification is not output) H:1:character string (DLMT) H:2:character string (DLMT) …… H:108:character string (DLMT) E::(End code)
Description	Input parameter is given in the following format. P1: Line No. (1-108,'A'(all lines are output)) Example of Command TOH A(DLMT) All character strings are output as ems.

TOS (Text Output Signal name)

<RS-232C><GP-IB>

Function	Reads report signal names
Input Format	TOS P1 (,P2) (Delimiter) Text (Delimiter)
Output Format	When channel No. is specified S : Channel No. : character string (DLMT) When all channels are specified (a channel without a character string specification is not output) S:1:1 (EV Channel No.) : character string (DLMT) (example when the 1st channel is for an event amp) S:1:2 (EV Channel No.) : character string (DLMT) …… S:1:8 (EV Channel No.) : character string (DLMT) S:2:character string (DLMT) …… S:16:character string (DLMT) E::(end code)
Description	Input parameter is given in the following format. P1:Channel No. (1-16,'A'(all channel are output)) P2:event amp Channel No. (1-8) (only for an event amp) (When P2 is omitted, operation is carried out with P2 = 1.) Example of Command TOS 1(,1) (DLMT) All character strings are output as ems.

TOC (Text Output Channel Mark)

<RS-232C><GP-IB>

Function	Reads channel marks
Input Format	TOC P1(Delimiter)
Output Format	M:Channel No. : character string (DLMT)
Description	Input parameter is given in the following format. P1:Channel No. (1-16) Example of Command TOC 1 (DLMT) Channel mark character strings are ens.

TOP (Text Output Page)

<RS-232C><GP-IB>

Function	Reads user page annotation
Input Format	TOP P1 (Delimiter)
Output Format	When line No. is specified P: Line No. :character string (DLMT) When all lines are specified (unspecified character strings are not output) P:1:character string (DLMT) P:2:character string (DLMT) …… P:108:character string (DLMT) E::(end code)
Description	Input parameter is given in the following format. P1: Line No. (1-108,'A'(all lines are output)) Example of Command TOP A (DLMT) All character strings are output as ems.

*9. Other Commands - R**, W***

9.1.Data Readout

◆ These are commands to read data of input units written in the memory.

RDB (Read Data Binary) <RS-232C><GP-IB>

Function	Outputs data in memory in the binary format.
Input Format	RDB P1, P2, P3 (Delimiter)
Output Format	A1, A2, A3 (Delimiter) [STX] (UP DATA1) (LOW DATA1)・・・・・・ (UP DATAn) (LOW DATAn)

Parameter

P1	Sets readout channel
1 | 16	1-A CH | 8-B CH

P2	Sets starting address of readout data
0 | 262143 | 2097151	0 | 262143 (256kW/CH) | 2097151 (2MW/CH)

P3	Sets number of readout data
1 | 262144 | 2097152	1 | 262144 (256kW/CH Max.) | 2097152 (2MW/CH Max.)

Answer

A1	Outputs amp type
0	None
1	***HRDC*** (AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC*** (AP11-103)
4	***ACST*** (AP11-104)
5	***EV*** (AP11-105)
6	***TCDC*** (AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST*** (AP11-110)

A2	Outputs unit No. (Unit of default value)
In the case of ***HRDC***, ***HSDC***	
0	V
1	mV
In the case of ***TCDC***, ***TDC***	
0	°C [°F (Fahrenheit)], V
1	mV
In the case of ***FFT***, ***RMS***	
0	V[rms], k m/s^2, kG
1	mV[rms], m/s^2, G
In the case of ***EV***	
0	0

In the case of ***FV***	
0	kHz
1	Hz
In the case of ***ACST***, ***DCST***	
0	μ ε
1	k μ ε

A3	Outputs decimal point location n
	* Obtains a value that is 10^n of actual value

MEMO

Pn and An are in ASCII code.
Values that can be specified with P2 and P3 vary depending on the settings of block divisions of memory and the memory capacity per CH.
(UP DATAn): Data upper byte
(LOW DATAn): Data lower byte

Description

P1 is used to read the data in a specified channel.
When P2 and P3 are input, the number of words specified by P3 are read from the address indicated by P2.
When both P2 and P3 are omitted, it depends on the setting value of the RA1000. (The same range as memory copy)
Neither P2 nor P3 can be omitted.
After the status of the input unit is output by A1 to A3, the STX] (02h) code is output as a start mark of data, followed by the output of data of the specified number of words in binary format.
A delimiter is not included in the data string. In the case of GP-IB, [EOI] is output for the last byte of data.
A 1-word integer is expressed using 2 bytes of data, and output is performed in the order of upper and lower.
Since the decimal point location is output by header answer A3 = n, in order to obtain the actual value, the received data is required to be divided by 10n .
In the case of input units other than ***EV***, a measured value is expressed by signed (2's complement number) 16 bits.
Example 5V····5000 = 1388h (Unit : mV, Decimal Point Location : 0)
-5V····-5000 = EC78h

In the case of ***EV***, **the** upper data is always 0, and the lower 8 bits express the signal status.
Bit 0 corresponds to signal 8, and bit 7 to signal 1.
Example Upper Lower
00000000(00h) 00110101(35h)
Signal 3, 4, 6, 8 = H Signal 1, 2, 5, 7= L
The setting/scale settings of special units are not supported.
This command is not executed while the RA1000 is executing another command.
It is necessary to finish the command under execution before executing this command.
When there is no valid data in memory, an error occurs. Execute this command after checking the memory status with the IMS command.

If a readout is performed exceeding the measurement area, [0000h] is output.
The data writing command has no function to set the user scale.
When the data must be rewritten, do not change the scale.

Example : Reading 5 data from Address 0 of CH1

Transmission Command

RDB 1, 0, 5 (Delimiter)

Answer 1, 1, 2 (Delimiter) [STX] (13h)(88h)(0Fh)(A0h)(0Bh)(B8h)(07h)(D0h)(03h)(E8h)

d0 d1 d2 d3 d4

DC amp, unit mv, Decimal Point Location = 2

d0 (Address 0) = (13h)(88h) : 1388h = 5000 (50.00mV)

d1 (Address 1) = (0Fh)(A0h) : 0FA0h = 4000 (40.00mV)

d2 (Address 2) = (0Bh)(B8h) : 0BB8h = 3000 (30.00mV)

d3 (Address 3) = (07h)(D0h) : 07D0h = 2000 (20.00mV)

d4 (Address 4) = (03h)(E8h) : 03E8h = 1000 (10.00mV)

RDD (Read Data Direct) <RS-232C><GP-IB>

Function	Outputs data in memory by internal memory format (binary)
Input Format	RDD P1, P2, P3 (Delimiter)
Output Format	A1, A2 (Delimiter) [STX] (UP DATA1)(LOW DATA1)・・・・・・ ・・・(UP DATAn)(LOW DATAn)

Parameter

P1	Sets readout channel
1 | 16	1-A CH | 8-B CH

P2	Sets starting address of readout data
0 | 262143 | 2097151	0 | 262143 (256kW/CH) | 2097151 (2MW/CH)

P3	Sets the number of readout data
1 | 262144 | 2097152	1 | 262144 (256kW/CH Max.) | 2097152 (2MW/CH Max.)

Answer

A1	Outputs amp type
0	None
1	***HRDC***(AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC***(AP11-103)
4	***ACST***(AP11-104)
5	***EV*** (AP11-105)
6	***TCDC***(AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST***(AP11-110)

Voltage measurement mode of ***HRDC, FFT*** Voltage measurement mode of ***HSDC, RMS*** and RMS converter mode		
A2	Input range	Data range
1	500V	500 to -500
2	200V	200 to -200
3	100V	100 to -100
4	50V	50 to -50
5	20V	20 to -20
6	10V	10 to -10
7	5V	5 to -5
8	2V	2 to -2
9	1V	1 to -1
10	500mV	500 to -500
11	200mV	200 to -200
12	100mV	100 to -100

*In the RMS range, the input range is 350 Vrms (350 Vrms to -350 Vrms)

Oscillation sensor mode of ***FFT, RMS***		
A2	Input range	Data range
13	5k m/s^2	5 to -5
14	2k m/s^2	2 to -2
15	1k m/s^2	1 to -1
16	500 m/s^2	500 to -500
17	200 m/s^2	200 to -200
18	100 m/s^2	100 to -100

In the case of ***FV***		
A2	Input range	Data range
1	10kHz	10 to 0
2	5kHz	5 to 0
3	2kHz	2 to 0
4	1kHz	1 to 0
5	500Hz	500 to 0
6	200Hz	200 to 0
7	100Hz	100 to 0

In the case of ***TDC***		
A2	Input range	Data range
1	R 1600°C	1600 to 0
2	R 800°C	800 to 0
3	T 400°C	400 to -200
4	T 200°C	200 to -200
5	J 1000°C	1000 to -200
6	J 200°C	200 to -200
7	K 1200°C	1200 to -200
8	K 200°C	200 to -200
9	R 3000° F	2912 - 32
10	R 1500° F	1472 - 32
11	T 800° F	752 to -328
12	T 400° F	392 to -328
13	J 2000° F	1832 to -328
14	J 400° F	392 to -328
15	K 2500° F	2192 to -328
16	K 400° F	392 to -328

17	50 V	50 to -50
18	20 V	20 to -20
19	10 V	10 to -10
20	5 V	5 to -5
21	2 V	2 to -2
22	1 V	1 to -1
23	500 mV	500 to -500
24	200 mV	200 to -200
25	100 mV	100 to -100
26	50 mV	50 to -50
27	20 mV	20 to -20
28	10 mV	10 to -10

In the case of ***ACST***		
A2	Input range	Data range
1	20k μ ε	20 to -20
2	10k μ ε	10 to -10
3	5k μ ε	5 to -5
4	2k μ ε	2 to -2
5	1k μ ε	1 to -1

In the case of ***DCST***		
A2	Input range	Data range
1	50k μ ε	50 to -50
2	20k μ ε	20 to -20
3	10k μ ε	10 to -10
4	5k μ ε	5 to -5
5	2k μ ε	2 to -2
6	20k μ ε	20 to -20
7	8k μ ε	8 to -8
8	4k μ ε	4 to -4
9	2k μ ε	2 to -2
10	800 μ ε	800 to -800
11	50 mV	50 to -50
12	20 mV	20 to -20
13	10 mV	10 to -10
14	5 mV	5 to -5
15	2 mV	2 to -2

In the case of ***TCDC***		
A2	Input range	Data range
1	R 1800°C	1760 to 0
2	T 400°C	400 to -200
3	J 1200°C	1100 to -200
4	K 1400°C	1370 to -200
5	K 500°C	500 to -200
6	W 2400°C	2300 to 0
7	R 3200° F	3200 to 32
8	T 800° F	752 to -328
9	J 2000° F	2012 to -328
10	K 2500° F	2498 to -328
11	K 1000° F	932 to -328
12	W 4200° F	4172 to 32
13	50 V	50 to -50
14	20 V	20 to -20

	15 | 10 V | 10 to -10 16 | 5 V | 5 to -5 17 | 2 V | 2 to -2 18 | 1 V | 1 to -1 19 | 500 mV | 500 to -500 20 | 200 mV | 200 to -200 21 | 100 mV | 100 to -100 MEMO Parameters (Pn) and Answers (An) are in ASCII code. Values specifiable with P2 and P3 vary depending on the settings of the block divisions of memory and the memory capacity per CH. (LOW DATAn): Data lower byte, (UP DATAn): Data upper byte
Description	P1 is used to read data on the specified channel by the internal format. The handling of P2 and P3 is the same as the RDB command. After the status of the input unit is output by A1 to A3, the [STX](02h) code is output as a start mark of data, followed by the output of data of the specified number of words in binary format. A delimiter is not included in the data string. In the case of GP-IB, [EOI] is output for the last byte of data. In the case of input units other than ***EV***, data is expressed by signed (2's complement number) 16 bits with a full-scale of ±32000. Example In the case of 5V・FS Range 5 V・・・・・・・・・・32000=7D00h -5 V・・・・・・・・・-32000=8300h 0 V・・・・・・・・・・ 0000=0000h 1 V・・・・・・・・・・ 6400=1900h In the case of ***EV***, **the** upper data is not fixed, and the lower 8 bits express the signal status. Bit 0 corresponds to signal1, and bit 7 to signal 8. Example upper not fixed lower 35h XXXXXXXX 00110101 Signal 1,3,5,6=H Signal 2,4,7,8=L Even when the settings of special units and scale are being performed, data is output with the effective sensitivity of the input unit. Since data is not converted internally, high-speed data transmission is possible. MEMO Note that the RDD command, reading data directly from memory, has a different format from other commands. This command is not executed while this product is executing another command. It is necessary to finish the command under execution before executing this command.

Example: Reading 3 data from address 0 of CH1

Transmission Command

RDD 1, 0, 3 (Delimiter)

Answer 1, 7 (Delimiter) [STX] (7Dh)(00h)(64h)(00h)(4Bh)(00h)

d0 d1 d2

DC, unit 5V・FS

d0(Address 0) = (7Dh)(00h):7D00h = 32000 (32000/32000 x 5 = 5.00V)

d1(Address 1) = (64h)(00h):6400h = 25600 (25600/32000 x 5 = 4.00V)

d2(Address 2) = (4Bh)(00h):4B00h = 19200 (19200/32000 x 5 = 3.00V)

RDA (Read Data Ascii) <RS-232C><GP-IB>

Function	Outputs data in memory using ASCII code.
Input Format	RDB P1, P2, P3 (Delimiter)
Output Format	A1, A2 (Delimiter) DATA1 (Delimiter) DATA2 (Delimiter) ・・・・・・・・・・・・・・ DATAn (Delimiter)

Parameter

P1	Sets readout channel
1 | 16	1-A CH | 8-B CH

P2	Sets starting address of readout data
0 | 262143 | 2097151	0 | 262143 (256kW/CH) | 2097151 (2MW/CH)

P3	Sets the number of readout data
1 | 262144 | 2097152	1 | 262144 (256kW/CH Max.) | 2097152 (2MW/CH Max.)

Answer

A1	Outputs amp type
0	None
1	***HRDC***(AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC***(AP11-103)
4	***ACST***(AP11-104)
5	***EV*** (AP11-105)
6	***TCDC***(AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST***(AP11-110)

A2	Outputs unit No. (Unit of default value)
In the case of ***HRDC***, ***HSDC***	
0	V
1	mV
In the case of ***TCDC***, ***TDC***	
0	°C [°F (Fahrenheit)], V
1	mV
In the case of ***FFT***, ***RMS***	
0	V[rms], km/s^2, kG
1	mV[rms], m/s^2, G
In the case of ***EV***	
0	0
In the case of ***FV***	
0	kHz
1	Hz

In the case of ***ACST***, ***DCST***	
0	μ ε
1	kμ ε

DATAn: Output data (data is signed and with decimal points)
Values specifiable with P2 and P3 vary depending on the block divisions of memory and the memory capacity per CH.

P1 is used to read data on a specified channel.
When P2 and P3 are input, the number of words specified by P3 are read from the address indicated by P2.
When special units or scale are set, converted values are output depending on the units or scale. In this case, the numerical value of Answer A2 and the No. of special units match.
In the case of ***EV***, 8 columns of data correspond to 8 input signals.
With 1 = H and 0 = L, the highest column corresponds to signal 1 and the lowest column to signal 8.

Example 10101100 Signal 1, 3, 5, 6 = H Signal 2, 4, 7, 8 = L
A delimiter is output as the separator of data on each output.

9.2. Writing Data

◆ Data can be directly written to the internal memory of the RA1000 using equipment such as an external computer. The written data can be recorded by the "copy command" as in the case of normal data.

WDB (Write Data Binary) <RS-232C><GP-IB>

Function	Inputs data in binary format.
Input Format	WDB P1, P2, P3, P4, P5, P6 (Delimiter) [STX] (UP DATA1) (LOW DATA1)・・・・・・・・(UP DATAn)(LOW DATAn)

Parameter

P1	Sets write channel
1 | 16	1 - A CH | 8 - B CH

P2	Sets starting address of write data
0 | 262143 | 2097151	0 | 262143 (256kW/CH) | 2097151 (2MW/CH)

P3	Sets the number of write data
1 | 262144 | 2097152	1 | 262144 (256kW/CH Max.) | 2097152 (2MW/CH Max.)

Voltage measurement mode of ***HRDC, FFT***
Voltage measurement mode of ***HSDC, RMS***
and RMS converter mode

P4	Input range	Data range
1	500 V	500 to -500
2	200 V	200 to -200
3	100 V	100 to -100
4	50 V	50 to -50
5	20 V	20 to -20
6	10 V	10 to -10
7	5 V	5 to -5
8	2 V	2 to -2
9	1 V	1 to -1
10	500 mV	500 to -500
11	200 mV	200 to -200
12	100 mV	100 to -100

*In the RMS range, input range is 350 Vrms (350 Vrms to -350 Vrms)

Oscillation sensor mode of ***FFT, RMS***

P4	Input range	Data range
13	5k m/s^2	5 to -5
14	2k m/s^2	2 to -2
15	1k m/s^2	1 to -1

16	500 m/s^2	500 to -500
17	200 m/s^2	200 to –200
18	100 m/s^2	100 to -100

In the case of ***FV***		
P4	Input Range	Data Range
1	10 kHz	10 to 0
2	5 kHz	5 to 0
3	2 kHz	2 to 0
4	1 kHz	1 to 0
5	500 Hz	500 to 0
6	200 Hz	200 to 0
7	100 Hz	100 to 0

In the case of ***TDC***		
P4	Input range	Data range
1	R 1600°C	1600 to 0
2	R 800°C	800 to 0
3	T 400°C	400 to -200
4	T 200°C	200 to -200
5	J 1000°C	1000 to -200
6	J 200°C	200 to -200
7	K 1200°C	1200 to -200
8	K 200°C	200 to -200
9	R 3000° F	2912 to 32
10	R 1500° F	1472 to 32
11	T 800° F	752 to -328
12	T 400° F	392 to -328
13	J 2000° F	1832 to -328
14	J 400° F	392 to -328
15	K 2500° F	2192 to -328
16	K 400° F	392 to -328
17	50 V	50 to -50
18	20 V	20 to -20
19	10 V	10 to -10
20	5 V	5 to -5
21	2 V	2 to -2
22	1 V	1 to -1
23	500 mV	500 to -500
24	200 mV	200 to -200
25	100 mV	100 to -100
26	50 mV	50 to -50
27	20 mV	20 to -20
28	10 mV	10 to -10

In the case of ***ACST***		
P4	Input range	Data range
1	20k μ ε	20 to -20
2	10k μ ε	10 to -10
3	5k μ ε	5 to -5
4	2k μ ε	2 to -2
5	1k μ ε	1 to -1

In the case of ***DCST***		
P4	Input range	Data range
1	50k με	50 to -50
2	20k με	20 to -20
3	10k με	10 to -10
4	5k με	5 to -5
5	2k με	2 to -2
6	20k με	20 to -20
7	8k με	8 to -8
8	4k με	4 to -4
9	2k με	2 to -2
10	800 με	800 to -800
11	50 mV	50 to -50
12	20 mV	20 to -20
13	10 mV	10 to -10
14	5 mV	5 to -5
15	2 mV	2 to -2

In the case of ***TCDC***		
P4	Input range	Data range
1	R 1800°C	1760 to 0
2	T 400°C	400 to -200
3	J 1200°C	1100 to -200
4	K 1400°C	1370 to -200
5	K 500°C	500 to -200
6	W 2400°C	2300 to 0
7	R 3200° F	3200 to 32
8	T 800° F	752 to -328
9	J 2000° F	2012 to -328
10	K 2500° F	2498 to -328
11	K 1000° F	932 to –328
12	W 4200° F	4172 to 32
13	50 V	50 to -50
14	20 V	20 to -20
15	10 V	10 to -10
16	5 V	5 to -5
17	2 V	2 to -2
18	1 V	1 to -1
19	500 mV	500 to -500
20	200 mV	200 to -200
21	100 mV	100 to -100

P5	Specifies amp type
0	None
1	***HRDC*** (AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC*** (AP11-103)
4	***ACST*** (AP11-104)
5	***EV*** (AP11-105)
6	***TCDC*** (AP11-106)

	7 ***TDC*** (AP11-107) 8 ***FV*** (AP11-108) 9 ***RMS*** (AP11-109) 10 ***DCST*** (AP11-110) P6 can be specified with RMS only. Values not specified with RMS are ignored. MEMO Parameters (Pn) are in ASCII code. Values specifiable with P2 and P3 vary depending on the settings of the block divisions of memory and the memory capacity per CH. (UP DATAn): Data upper byte (LOW DATAn): Data lower byte
Description	P1 is used to write data to a specified channel. When P2 and P3 are input, the number of words specified by P3 are read from the address indicated by P2. When both P2 and P3 are omitted, writing starts from the address set by the RA1000. (The address matches the starting address when copying) Neither P2 nor P3 can be omitted. P4 is not necessary with ***EV***. In other cases, if P4 is omitted, the interpretation is data that corresponds to the setting range of the input unit P5 is used to check the type of input unit and can be omitted. A 1-word integer is expressed by 2 bytes of data, and input is performed in the order of upper and lower. Input firstly the status of the input unit by P1 to P5, secondly the [STX](02h) code as a start mark of data, and thirdly the specified number of words in binary format. In the case of ***EV***, upper data is always 0, and the lower 8 bits express the signal status. Bit0 corresponds to signal 8, and bit 7 to signal1. Example Upper 00h Lower 35h 00000000 00110101 Signal 3, 4, 6, 8 = H Signal 1, 2, 5, 7 = L MEMO Special units and changing the scale setting are not supported in data writing. The data to be written must correspond to the P4-specified amp sensitivity. If the special units and scale have been set on the RA1000 side, make the setting back in the internal unit in accordance with the parameters, and then write.

P6	RMS/DC setup of ***RMS***
1	RMS range
2	DC range

Example: Writing three 5 V data to CH1's ***HRDC*** from address 0

Transmission Command

WDB 1, 0, 3, 7, 1 (Delimiter)[STX](13h)(88h)(0Fh)(A0h)(0Bh)(B8h)

Write data d0 d1 d2

d0(Address 0) = (13h)(88h):1388h = 5000 (5000 = 5.00V)
d1(Address 1) = (0Fh)(A0h):0FA0h = 4000 (4000 = 4.00V)
d2(Address 2) = (0Bh)(B8h):0BB8h = 3000 (3000 = 3.00V)

WDD (Write Data Direct) <RS-232C><GP-IB>

Function	Inputs data to memory by the internal memory format (binary)
Input Format	WDD P1, P2, P3, P4, P5, P6(Delimiter)[STX](UP DATA1) (LOW DATA1)·····(UP DATAn)(LOW DATAn)

Parameter

P1	Setsf write channel
1 | 16	1-A CH | 8-B CH

P2	Sets starting address of write data
0 | 262143 | 2097151	0 | 262143 (256kW/CH) | 2097151 (2MW/CH)

P3	Sets the number of write data
1 | 262144 | 2097152	1 | 262144 (256kW/CH Max.) | 2097152 (2MW/CH Max.)

Voltage measurement mode of ***HRDC, FFT***
Voltage measurement mode of ***HSDC, RMS***
and RMS converter mode

P4	Input range	Data range
1	500 V	500 to -500
2	200 V	200 to -200
3	100 V	100 to -100
4	50 V	50 to -50
5	20 V	20 to -20
6	10 V	10 to -10
7	5 V	5 to -5
8	2 V	2 to -2
9	1 V	1 to -1
10	500 mV	500 to -500
11	200 mV	200 to -200
12	100 mV	100 to -100

*In the RMS range, input range is 350 Vrms (350 Vrms to -350 Vrms)

Oscillation sensor mode of ***FFT, RMS***

P4	Input range	Data range
13	5k m/s^2	5 to -5
14	2k m/s^2	2 to -2
15	1k m/s^2	1 to -1
16	500 m/s^2	500 to -500
17	200 m/s^2	200 to -200
18	100 m/s^2	100 to -100

In the case of ***FV***		
P4	Input range	Data range
1	10 kHz	10 to 0
2	5 kHz	5 to 0
3	2 kHz	2 to 0
4	1 kHz	1 to 0
5	500 Hz	500 to 0
6	200 Hz	200 to 0
7	100 Hz	100 to 0

In the case of ***TDC***		
P4	Input range	Data range
1	R 1600°C	1600 to 0
2	R 800°C	800 to 0
3	T 400°C	400 to -200
4	T 200°C	200 to -200
5	J 1000°C	1000 to -200
6	J 200°C	200 to -200
7	K 1200°C	1200 to -200
8	K 200°C	200 to -200
9	R 3000° F	2912 to 32
10	R 1500° F	1472 to 32
11	T 800° F	752 to -328
12	T 400° F	392 to -328
13	J 2000° F	1832 to -328
14	J 400° F	392 to -328
15	K 2500° F	2192 to -328
16	K 400° F	392 to -328
17	50 V	50 to -50
18	20 V	20 to -20
19	10 V	10 to -10
20	5 V	5 to -5
21	2 V	2 to -2
22	1 V	1 to -1
23	500 mV	500 to -500
24	200 mV	200 to -200
25	100 mV	100 to -100
26	50 mV	50 to -50
27	20 mV	20 to -20
28	10 mV	10 to -10

In the case of ***ACST***		
P4	Input range	Data range
1	20k μ ε	20 to -20
2	10k μ ε	10 to -10
3	5k μ ε	5 to -5
4	2k μ ε	2 to -2
5	1k μ ε	1 to -1

In the case of ***DCST***		
P4	Input range	Data range
1	50k μ ε	50 to -50
2	20k μ ε	20 to -20
3	10k μ ε	10 to -10
4	5k μ ε	5 to -5

5	2k με	2 to -2
6	20k με	20 to -20
7	8k με	8 to -8
8	4k με	4 to -4
9	2k με	2 to -2
10	800 με	800 to -800
11	50 mV	50 to -50
12	20 mV	20 to -20
13	10 mV	10 to -10
14	5 mV	5 to -5
15	2 mV	2 to -2

In the case of ***TCDC***		
P4	Input range	Data range
1	R 1800°C	1760 to 0
2	T 400°C	400 to -200
3	J 1200°C	1100 to -200
4	K 1400°C	1370 to -200
5	K 500°C	500 to -200
6	W 2400°C	2300 to 0
7	R 3200° F	3200 to 32
8	T 800° F	752 to -328
9	J 2000° F	2012 to -328
10	K 2500° F	2498 to -328
11	K 1000° F	932 to –328
12	W 4200° F	4172 to 32
13	50 V	50 to -50
14	20 V	20 to -20
15	10 V	10 to -10
16	5 V	5 to -5
17	2 V	2 to -2
18	1 V	1 to -1
19	500 mV	500 to -500
20	200 mV	200 to -200
21	100 mV	100 to -100

P5	Specification of amp type
0	None
1	***HRDC*** (AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC*** (AP11-103)
4	***ACST*** (AP11-104)
5	***EV*** (AP11-105)
6	***TCDC*** (AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST*** (AP11-110)

P6	RMS/DC setting of ***RMS***
1	RMS range
2	DC range

P6 can be specified with RMS only.
Values not specified with RMS are ignored.

	MEMO Parameters (Pn) are in ASCII code. (DATAn): Data with code and decimal point (Except ***EV***) : 8-column event data (***EV***) Values that can be specified with P2 and P3 vary depending on the settings of the block divisions of memory and the memory capacity per CH.
Description	P1 is used to write data to memory in a specified channel. When P2 and P3 are input, the number of words specified by P3 are written from the address indicated by P2. When both P2 and P3 are omitted, writing is done to the address set by the RA1000. (The address matches the starting address when copying) Neither P2 nor P3 can be omitted. P4 is not necessary (or 1) with ***EV*** In the case of a waveform amp, if P4 is omitted, the interpretation is data that corresponds to the setting range of the amp. Input firstly the status of the input unit by P1 to P5, secondly the [STX](02h) code as a start mark of data, and thirdly the specified number of words in binary format. 1 word of internal data is expressed by 2 bytes of data, and input is performed in the order of upper and lower. P5 is used to check the type of amp and can be omitted. In the case of a waveform amp, data are expressed by signed (2's complement number) 16 bits with a full-scale of ±32000. Example In the case of ***DC*** 5V･FS range 5V･･････････32000=7D00h -5V･････････-32000=8300h 0V･･････････0000=0000h 1V･･････････6400=1900h In the case of ***EV***, the upper data is always 0, and the lower 8 bits express the signal status. Bit 0 corresponds to signal 1, bit 7 to signal 8, 0 to H, and 1 to L. Example Upper 00h Lower 35h 00000000 00110101 Signal 1, 3, 5, 6=H Signal2, 4, 7, 8=L Since data is not converted internally, high-speed data transmission is possible. The WDD command has the same data format as the RDD command. Special units and changing the scale setting are not supported for data writing. If the special units and scale have been set on the RA1000 side, make the setting back in the internal unit in accordance with the parameters, and then write. The data to be written must correspond to the P4-specified input range.

Example: Writing three 5V･FS data to CH1's ***HRDC*** from address 0

Transmission Command

WDD 1,0,3,7,1(delimiter)[STX](7Dh)(00h)(64h)(00h)(4Bh)(00h)

d0 d1 d2

write data

d0 (Address 0) = (7Dh)(00h):7D00h = 32000 (32000/32000 x 5 = 5.00V)
d1 (Address 1) = (64h)(00h):6400h = 25600 (25600/32000 x 5 = 4.00V)
d2 (Address 2) = (4Bh)(00h):4B00h = 19200 (19200/32000 x 5 = 3.00V)

WDA (Write Data Ascii) <RS-232C><GP-IB>

Function	Inputs data to memory by using ASCII code.
Input Format	WDA P1,P2,P3,P4,P5,P6 (Delimiter) (DATA1) (Delimiter), ･･･････(DATAn) (Delimiter)

Parameter

P1	Sets write channel
1 | 16	1-A CH | 8-B CH

P2	Sets starting address of write data
0 | 262143 | 2097151	0 | 262143(256kW/CH) | 2097151(2MW/CH)

P3	Sets the number of write data
1 | 262144 | 2097152	1 | 262144(256kW/CH Max.) | 2097152(2MW/CH Max.)

Voltage measurement mode of ***HRDC, FFT***
Voltage measurement mode of ***HSDC, RMS*** and RMS converter mode

P4	Input range	Data range
1	500 V	500 to -500
2	200 V	200 to -200
3	100 V	100 to -100
4	50 V	50 to -50
5	20 V	20 to -20
6	10 V	10 to -10
7	5 V	5 to -5
8	2 V	2 to -2
9	1 V	1 to -1
10	500 mV	500 to -500
11	200 mV	200 to -200
12	100 mV	100 to -100

*In the RMS range, input range is 350 Vrms (350 Vrms to -350 Vrms)

Oscillation sensor mode of ***FFT, RMS***		
P4	Input range	Data range
13	5k m/s^2	5 to -5
14	2k m/s^2	2 to -2
15	1k m/s^2	1 to -1
16	500 m/s^2	500 to -500
17	200 m/s^2	200 to -200
18	100 m/s^2	100 to -100

In the case of ***FV***		
P4	Input range	Data range
1	10 kHz	10 to 0
2	5 kHz	5 to 0
3	2 kHz	2 to 0
4	1 kHz	1 to 0
5	500 Hz	500 to 0
6	200 Hz	200 to 0
7	100 Hz	100 to 0

In the case of ***TDC***		
P4	Input range	Data range
1	R 1600°C	1600 to 0
2	R 800°C	800 to 0
3	T 400°C	400 to -200
4	T 200°C	200 to -200
5	J 1000°C	1000 to -200
6	J 200°C	200 to -200
7	K 1200°C	1200 to -200
8	K 200°C	200 to -200
9	R 3000° F	2912 to 32
10	R 1500° F	1472 to 32
11	T 800° F	752 to -328
12	T 400° F	392 to -328
13	J 2000° F	1832 to -328
14	J 400° F	392 to -328
15	K 2500° F	2192 to -328
16	K 400° F	392 to -328
17	50 V	50 to -50
18	20 V	20 to -20
19	10 V	10 to -10
20	5 V	5 to -5
21	2 V	2 to -2
22	1 V	1 to -1
23	500 mV	500 to -500
24	200 mV	200 to -200
25	100 mV	100 to -100
26	50 mV	50 to -50
27	20 mV	20 to -20
28	10 mV	10 to -10

In the case of ***ACST***		
P4	Input range	Data range
1	20k μ ε	20 to -20
2	10k μ ε	10 to -10
3	5k μ ε	5 to -5
4	2k μ ε	2 to -2
5	1k μ ε	1 to -1

In the case of ***DCST***		
P4	Input range	Data range
1	50k μ ε	50 to -50
2	20k μ ε	20 to -20
3	10k μ ε	10 to -10
4	5k μ ε	5 to -5
5	2k μ ε	2 to -2
6	20k μ ε	20 to -20
7	8k μ ε	8 to -8
8	4k μ ε	4 to -4
9	2k μ ε	2 to -2
10	800 μ ε	800 to -800
11	50 mV	50 to -50
12	20 mV	20 to -20
13	10 mV	10 to -10
14	5 mV	5 to -5
15	2 mV	2 to -2

In the case of ***TCDC***		
P4	Input range	Data range
1	R 1800°C	1760 to 0
2	T 400°C	400 to -200
3	J 1200°C	1100 to -200
4	K 1400°C	1370 to -200
5	K 500°C	500 to -200
6	W 2400°C	2300 to 0
7	R 3200° F	3200 to 32
8	T 800° F	752 to -328
9	J 2000° F	2012 to -328
10	K 2500° F	2498 to -328
11	K 1000° F	932 to -328
12	W 4200° F	4172 to 32
13	50 V	50 to -50
14	20 V	20 to -20
15	10 V	10 to -10
16	5 V	5 to -5
17	2 V	2 to -2
18	1 V	1 to -1
19	500 mV	500 to -500
20	200 mV	200 to -200
21	100 mV	100 to -100

P5	Specification of amp type
0	None
1	***HRDC*** (AP11-101)
2	***FFT*** (AP11-102)
3	***HSDC*** (AP11-103)
4	***ACST*** (AP11-104)
5	***EV*** (AP11-105)
6	***TCDC*** (AP11-106)
7	***TDC*** (AP11-107)
8	***FV*** (AP11-108)
9	***RMS*** (AP11-109)
10	***DCST*** (AP11-110)

P6	RMS/DC setup of ***RMS***
1	RMS range
2	DC range

P6 can be specified with RMS only. Values not specified with RMS are ignored.

MEMO

Parameters (Pn) are in ASCII code.
(DATAn): Data with code and decimal point (Except ***EV***)
: 8-column event data (***EV***)
Values that can be specified with P2 and P3 vary depending on the settings of the block divisions of memory and the memory capacity per CH.

Description

P1 is used to write data to memory in a specified channel.
When P2 and P3 are input, the number of words specified by P3 are written from the address indicated by P2.
P4 is not necessary with ***EV***. In other cases, if P4 is omitted, the interpretation is data that corresponds to the setting range of the input unit
In the case of units other than ***EV***, write data (DATAn) is signed and has decimal points.
In the case of ***EV***, 8 columns of data correspond to 8 input signals.
With 1 = H and 0 = L, the highest column corresponds to signal 1 and the lowest column to signal 8.
It is necessary to add a delimiter or a separator [,] between two data items.
Special units and changing the scale setting are not supported in data writing.
If the special units and scale have been set on the RA1000 side, make the setting back in the internal unit in accordance with the parameters, and then do write.
The data to be written must correspond to the sensitivity of the input unit.

10. Data

10.1 Program Example (N88BASIC)

10.1.1. RDA (Read Data Ascii) Program Example

RDA (Read Data Ascii) RS232C Sample Software Program

```
100    MAD=1
110    OPEN "COM1:N81"AS #MAD
120    DIM DAT(100)
130    DIM DA0$(100)
140    PRINT#MAD,"RDA 1,200,100"
150    INPUT#MAD,A,B
160    IF A=5 GOTO 230
170    IF B=0 THEN VMV$="V" ELSE VMV$="mV"
180    FOR I=0 TO 99
190       INPUT#MAD,DAT(I)
200       PRINT DAT(I);VMV$,
210    NEXT I
220    GOT 270
230    FOR I=0 TO 99
240       INPUT#MAD,DAT$(I)
250       PRINT DAT(I),
260    NEXT I
270    PURINT#MAD,CHR$(&H1B)+"Z";
280    END
```

Description

100:Circuit number

110:COM1=File name、Circuit number
N81=Parity、Data Bit,Stop Bit

120 - 130:DIM Setting

140:Transfers commands to the RA1000.
(CH.1, Start Address 200, Lead Data Number 100)

150:Reads input unit type A and input range B

160: If input unit type is the event amp unit, go to line 230.

170 - 210: Reads and outputs DC amp unit's data

230 - 260: Reads and outputs event amp unit's data

270: Returns to local mode

280: End

* Operates when measurement is completed with a memory or transient recorder.

RDA (Read Data Ascii) GP-IB Sample Software Program

```
100    ADRS=5
110    ISET IFC : ISET REN
120    DIM DAT(100)
130    DIM DA0$(100)
140    PRINT@ADRS;"RDB 1,200,100"
150    INPUT@ADRS;"A,B
160    IF A=5 THEN 230
170    IF B=0 THEN VMV$="V" ELSE VMV$="V"
180    FOR I=0 TO 99
190      INPUT@ADRS;DAT(I)
200      PRINT DAT(I);VMV$,
210    NEXT I
220    GOTO 270
230    FOR I=0 TO 99
240      INPUT@ADRS;DAT$(I)
250      PRINT DAT$(I),
260    NEXT I
270    WBYTE &H25,1;
280    END
```

Description

100: Address of the RA1000.

110: Sends out interface clear, and makes remote enable true.

120 - 130:DIM Setting

140:Transfers commands to the RA1000.
(CH.1, Start Address 200, Lead Data Number 100)

150:Reads input unit type A and input range B

160: If input unit type is event amp unit, go to line 230.

170 - 210: Reads and outputs DC amp unit's data

230 - 260: Reads and outputs event amp unit's data

270: Returns to local mode

280: End

* Operates when measurement is completed with a memory or transient recorder.
When starting N88BASIC, make sure that theGPIB.EXE file exists, and specify the GP-IB option.

- Starting when GP-IB option is specified N88BASIC/E:GPIB[CR]

10.1.2. RDB (Read Data Binary) Program Example

RDB (Read Data Binary) RS232C Sample Program

```
100    MAD=1
110    OPEN "COM1:N81"AS #MAD
120    DIM DAT(100)
130    DIM DA0%(100)
140    DIM DA1%(100)
150    PRINT#MAD,"RDB 1,200,100"
160    INPUT#MAD,A,B,DP
170    IF DP=0 THEN DP=1 ELSE DP=10^DP
180    ST=ASC(INPUT$(1,#MAD))
190    IF ST<>2 THEN 180
200    FOR I=0 TO 99
210       DA0%(I)=ASC(INPUT$(1,#MAD))
220       DA1%(I)=ASC(INPUT$(1,#MAD))
230       IF DA0%(I) > 127 GOTO 250
240       DAT(I)=(256*DA0%(I)+DA1%(I))/DP : GOTO 260
250       DAT(I)=((256*DA0%(I)+DA1%(I))-65536!)/DP
260    NEXT I
270    IF A=5 GOTO *RDBEVENT
280    IF B=0 THEN VMV$="V" ELSE VMV$="mV"
290    FOR I=0 TO 99
300       PRINT DAT(I);VMV$,
310    NEXT I
320    GOTO 410
330   *RDBEVENT
340    FOR I=0 TO 99
350       B=DAT(I) : C=128
360       IF B>=C THEN PRINT "1"; : B=B-C : GOTO 380
370       PRINT "0";
380       C=C/2 : IF C>=1 THEN 360
390       PRINT ,
400    NEXT I
410   PRINT#MAD,CHR$(&H1B)+"Z";
420    END
```

Description

100: Circuit number

110: COM1=File name, Circuit number
N81=No parity, Data 8 bits, Stop bit 1

120 - 140:DIM Setting

150: Transfers commands to the RA1000. (CH.1, Start Address 200, Lead Data Number 100)

160: Reads input unit type A, input range B, and decimal point location DP.

170: Identifies decimal point location.

180 - 190:Identifies start byte.

200 - 260:Reads input unit type.

270: Identifies input unit type.

280 - 310: Prints out data of DC amp unit.

340 - 400: Converts event amp unit's data from decimal number to binary number and prints out the result.

410: Returns to local mode

420: End

* Operates when measurement is completed with a memory or transient recorder.

RDB (Read Data Binary) GP-IB Sample Program

```
100    ADRS=5 : MYAD=IEEE(1) AND &H1F
110    ISET IFC : ISET REN
120    DIM DAT(100)
130    DIM DA0%(100)
140    DIM DA1%(100)
150    PRINT@ADRS;"RDB 1,200,100"
160    INPUT@ADRS;A,B,DP
170    IF DP=0 THEN DP=1 ELSE DP=10^DP
180    RBYTE &H20+MYAD,&H40+ADRS;ST
190    IF ST<>2 THEN 180
200    FOR I=0 TO 99
210       RBYTE ;DA0%(I),DA1%(I)
220       IF DA0%(I) > 127 GOTO 240
230       DAT(I)=(256*DA0%(I)+DA1%(I))/DP : GOTO 250
240       DAT(I)=((256*DA0%(I)+DA1%(I))-65536!)/DP
250    NEXT I
260    IF A=5 GOTO *RDBEVENT
270    IF B=0 THEN VMV$="V" ELSE VMV$="mV"
280    FOR I=0 TO 99
290       PRINT DAT(I);VMV$,
300    NEXT I
310    GOTO 400
320   *RDBEVENT
330    FOR I=0 TO 99
340       B=DAT(I) : C=128
350       IF B>=C THEN PRINT "1"; : B=B-C : GOTO 370
360       PRINT "0";
370       C=C/2 : IF C>=1 THEN 350
380       PRINT ,
390    NEXT I
400    WBYTE &H25,1;
410    END
```

Description

100: Address of the RA1000 and personal computer

110: Sends out interface clear, and makes remote enable true.

120 - 140:DIM Setting

150: Transfers commands to the RA1000. (CH.1, Start Address 200, Lead Data Number 100)

160: Reads input unit type A, input range B, and decimal point location DP.

170: Identifies decimal point location.

180 - 190: Defines personal computer as listener, this unit as talker, and identifies start byte.

200 - 250:Reads input unit type.

260: Identifies type of input unit.

270 - 300: Outputs input data.

330 - 390: Converts event amp unit's data from decimal number to binary number and prints out the result.

400: Returns to local mode

410: End

* Operates when measurement is completed with a memory or transient recorder.
  When starting N88BASIC, make sure that the GPIB.EXE file exists, and specify the GP-IB option.

- Starting when GP-IB option is specified N88BASIC/E:GPIB[CR]

10.1.3. WDA (Write Data Ascii) Program Example

WDA (Write Data Ascii) RS-232C Sample Software Program (DC amp unit)

```
100    MAD=1
110    OPEN "COM1:N81"AS #MAD
120    PRINT#MAD,"WDB 1,200,100,5,1"
130    FOR I=0 TO 98
140       PRINT#MAD,STR$(DAT(I))
150    NEXT I
160    PRINT#MAD,STR$(DA0(I))
170    PRINT#MAD,CHR$(&H1B)+"Z";
180    END
```

Description

100: Circuit number

110: COM1=File name, Circuit number
N81 = Sets parity, data bit, and stop bit

120: Transfers commands to the RA1000.
(CH.1, Start address 200, Write data number100, Range20V･FS, DC amp unit)

130 - 160: Transfers data to the RA1000.

170: Returns to local mode

180: End

* Before execution, reserve the data area (DA0()) and prepare data.
When memory does not have measurement data, input starts from address 0 regardless of the specified address.

WDA (Write Data Ascii) GP-IB Sample Software Program (DC amp unit)

```
100    ADRS=5
110    ISET IFC : ISET REN
120    PRINT@ADRS;"WDB 1,200,100,5,1"
130    FOR I=0 TO 98
140       PRINT@ADRS;STR$(DAT(I))+","
150    NEXT I
160    PRINT@ADRS;STR$(DAT(I))
170    WBYTE &H25,1;
180    END
```

Description

100: Address of the RA1000.

110: Sends out interface clear, and makes remote enable true.

120: Transfers commands to the RA1000.
(CH.1, Start address 200, Write data number100, Range20V･FS, DC amp unit)

130 - 160: Transfers data to the RA1000.

170: Returns to local mode

180: End

* Before execution, reserve the data area (DA0%(), DA1%()) and prepare data.
When memory does not have measurement data, input starts from address 0 regardless of the specified address.

10.1.4. WDB (Write Data Binary) Program Example

WDB (Write Data Binary) RS-232C Sample Program (HSDC amp unit)

```
100    MAD=1
110    OPEN "COM1:N81"AS #MAD
120    PRINT#MAD,"WDB 1,200,100,5,1"
130    PRINT#MAD,CHR$(2);
140    FOR I=0 TO 99
150      PRINT#MAD,CHR$(DA0%(I));
160      PRINT#MAD,CHR$(DA1%(I));
170    NEXT I
180    PRINT#MAD,CHR$(&H1B)+"Z";
190    END
```

Description

100: Circuit number

110: COM1=File name, Circuit number
N81=Sets parity, data bit, and stop bit

120: Transfers commands to the RA1000.
(CH.1, Start address 200, Write data number100, Range20V・FS, DC amp unit)

130: Transfers start mark [STX] (02h) to the RA1000.

140 - 170: Transfers data to the RA1000.

180: Returns to local mode

190: End

* Before execution, reserve the data area (DA0%(), DA1%()) and prepare data.
When memory does not have measurement data, input starts from address 0 regardless of the specified address.

WDB (Write Data Binary) **GP-IB** Sample Program (HSDC amp unit)

```
100    ADRS=5 : MYAD=IEEE(1) AND &H1F
110    ISET IFC : ISET REN
120    PRINT@ADRS;"WDB 1,200,100,5,1"
130    WBYTE &H40+MYAD,&H20+ADRS;&H2
140    FOR I=0 TO 99
150      WBYTE ;DA0%(I),DA1%(I)
160    NEXT I
170    WBYTE &H25,1;
180    END
```

Description

100: Address of the RA1000 and personal computer

110: Sends out interface clear, and makes remote enable true.

120: Transfers commands to the RA1000.
(CH.1, Start address 200, Write data number100, Range20V・FS, DC amp unit)

130: Defines personal computer as talker and RA1000 as listener, and transfers start mark [STX] (02h) to RA1000.

140 - 160: Transfers data to the RA1000.

170: Returns to local mode

180: End

* Before execution, reserve the data area (DA0%(),DA1%()) and prepare data.
When memory does not have measurement data, input starts from address 0 regardless of the specified address.

WDB (Write Data Binary) **RS-232C** Sample Program (EV amp unit)

```
100    MAD=1
 110    OPEN "COM1:N81"AS #MAD
 120    PRINT#MAD,"WDB 1,200,100,0,2"
 130    PRINT#MAD,CHR$(2);
 140    FOR I=0 TO 99
 150       PRINT#MAD,CHR$(DA0%(I));
 160       PRINT#MAD,CHR$(DA1%(I));
 170    NEXT I
 180    PRINT#MAD,CHR$(&H1B)+"Z";
 190    END
```

Description

100:Circuit number

110:COM1=File name, Circuit number
N81=Sets parity, data bit, and stop bit

120:Transfers commands to the RA1000.
(CH.1, Start address 200, Write data number100, Event amp unit)

130: Transfers start mark [STX] (02h) to RA1000.

140 - 170: Transfers data to the RA1000.

180: Returns to local mode

190: End

* Before execution, reserve the data area (DA0%(),DA1%()) and prepare data.
When memory does not have measurement data, input starts from address 0 regardless of the specified address.

WDB (Write Data Binary) GP-IB Sample Program (EV amp unit)

```
100    ADRS=5 : MYAD=IEEE(1) AND &H1F
110    ISET IFC : ISET REN
120    PRINT@ADRS;"WDB 1,200,100,0,2"
130    WBYTE &H40+MYAD,&H20+ADRS;&H2
140    FOR I=0 TO 99
150       WBYTE ;DA0%(I),DA1%(I)
160    NEXT I
170    WBYTE &H25,1;
180    END
```

Description

100: Address of the RA1000 and personal computer

110: Sends out interface clear, and makes remote enable true.

120:Transfers commands to the RA1000.
(CH.1, Start address 200, Write data number100, Event amp unit)

130: Defines personal computer as talker and RA1000 as listener, and transfers start mark [STX] (02h) to RA1000.

140 - 160: Transfers data to the RA1000.

170: Returns to local mode

180: End

* Before execution, reserve the data area (DA0%(),DA1%()) and prepare data.
When memory does not have measurement data, input starts from address 0 regardless of the specified address.

10.2 List of Character Codes

8 bits

		Upper 4 bits・・・hexadecimal display											
		0	1	2	3	4	5	6	7	A	B	C	D
Lower 4 bits ・ ・ ・ Hexa-decimal display	0	NUL		SP	0	@	P	`	p		ー	タ	ミ
	1	SOH	Xon	!	1	A	Q	a	q	。	ア	チ	ム
	2	STX		”	2	B	R	b	r	「	イ	ツ	メ
	3	ETX	Xoff	#	3	C	S	c	s	」	ウ	テ	モ
	4	EOT	DC4	$	4	D	T	d	t	、	エ	ト	ヤ
	5	ENQ	NAK	%	5	E	U	e	u	・	オ	ナ	ユ
	6	ACK		&	6	F	V	f	v	ヲ	カ	ニ	ヨ
	7	BEL		’	7	G	W	g	w	ァ	キ	ヌ	ラ
	8	BS	CAN	(	8	H	X	h	x	ィ	ク	ネ	リ
	9	HT		)	9	I	Y	i	y	ゥ	ケ	ノ	ル
	A	LF	EOF	*	:	J	Z	j	z	ェ	コ	ハ	レ
	B	VT	ESC	+	;	K	[	k	{	ォ	サ	ヒ	ロ
	C	FF		,	<	L	¥	l	|	ャ	シ	フ	ワ
	D	CR		-	=	M	]	m	}	ュ	ス	ヘ	ン
	E	SO		.	>	N	^	n	¯	ョ	セ	ホ	゛
	F	SI		/	?	O	_	o	DEL	ッ	ソ	マ	゜

11. Specifications

11.1 RS-232C Unit

11.1.1. RS-232C Functional Overview

The RS-232C allows connection with a host computer and a fax modem, control of the OMNIACE Ⅱ using commands, and transmission of waveform data to a fax machine. Also, the auto transmission function allows automatically sending of calls to telephone lines or fax transmission.

11.1.2. Standard/Connector /Pin Allocation

● **Standard: JIS X5101 (ex, C6361) based**

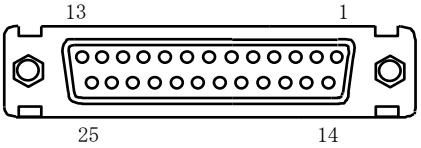
Data Format	Bit Serial
Transmission Speed	38400, 19200, 9600, 4800, 2400 [bps]
Transmission Format	Start-stop Synchronization, Full Duplex Communication Method
Start Bit	1 [bit]
Data Bit	7, 8 [bit]
Stop Bit	1, 2 [bit]
Parity Bit	No Parity Bit, EVEN, ODD
Electrical Characteristics	JIS X5101 based

RD (Receive Data)	SD (Send Data)
True -3 to -15V	True -3 to -8V
False +3 to +15V	False +3 to +8V

CS (Sending Allowed)	RS (Require Sending)
ON +3 to +15V	ON +5 to +8V
OFF -3 to -15V	OFF -5 to -8V

DR, CD	ER
ON +3 to +15V	ON +5 to +8V
OFF -3 to -15V	OFF -5 to -8V

● **D Sub Connecter 25 Pins (Sockets on recorder: DBLC-J25SAF-13L9F)**



● **Pin Allocation**

Pin No.	Signal Name	Signal Direction
1	FG (Frame Gnd)	
2	SD (Transmitted Data)	Output
3	RD (Received Data)	Input
4	RS (Request to Send)	Output
5	CS (Clear to Send)	Input
6	DR (Data to Ready)	Input
7	SG (Signal Gnd)	
8	CD (Carrier Detect)	Input
9 - 19	N.C (No Connect)	
20	ER (Data Terminal Ready)	Output
21 - 25	N.C (No Connect)	

11.2 GP-IB Unit

11.2.1. GP-IB Function Overview

The GP-IB allows connection with computers and control of the OMNIACE Ⅱ with commands.

11.2.2. Standard/Connector/Pin Allocation

● **Standard: IEEE488 based**

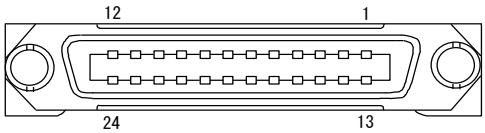
Data Format	8 Bit Parallel
Transmission Format	3-line Handshake
Address Setting	0 to 30 (31 types)
Delimiter	CR･LF, CR, LF, EOI (4 types)
Signal Logic	Negative Logic
Interface	Function List

Function	Descriptions
SH1	With all Source Handshake Functions
AH1	With all Acceptor Handshake Functions
T6	With Basic Talker Function
	With Serial Pole Function
	With Talker Release Function specified by MLA
L4	With Basic Listener Function
	With Listener Release Function specified by MLA
SR1	With All Service Request Functions
RL1	With Remote Control / All Local Functions
PPO	With Parallel Pole Function
DC1	With All Device Clear Functions
DT1	With All Device Trigger Functions
C0	Without Controller Function

Timeout Specification OFF, 1 to 60 seconds
If there is no communication response when the specified timeout occurs, communication is terminated.
When timeout is set to OFF, the status is wait even if there is no response. (Can be reset with the local switch.)

Electrical Characteristics	Driver …… V_{OL} = 0.5 V or less V_{OH} = 2.5 V or more Receiver … V_{IL} = 0.8 V or less V_{IH} = 2.0 V or more

● **Connecter - Amphenol 24 Pins RC10(F)-24R-LNA**



Pin No.	Signal Name
1	DIO1
2	DIO2
3	DIO3
4	DIO4
5	EOI
6	DAV
7	NRFD
8	NDAC
9	IFC

Pin No.	Signal Name
10	SRQ
11	ATN
12	SHIELD
13	DIO5
14	DIO6
15	DIO7
16	DIO8
17	REN
18-24	GND

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