

# RA3100

## Omniace

### Communication command

## Instruction Manual

ANALOG  
DIGITAL



ADM Messtechnik GmbH & Co. KG · Zum Wartturm 9 · 63571 Gelnhausen  
Tel. (06051) 916557-1 · sales@adm-messtechnik.de · www.adm-messtechnik.de

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ADM Messtechnik GmbH & Co. KG

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# Introduction

We thank you for your purchase of our data acquisition product OMNIACE RA3100 (hereinafter "the RA3100" or "this product").

This instruction manual explains how to use the communication interface and the communication commands when controlling communication using the LAN interface or the RS-232C interface.

Please read this manual carefully to use this product correctly before using this product.

Please read this instruction manual, which is provided on the included CD, as it gives details of the functions and operations of the input module and the RA3100. Concerning the operation of the host computer connected to the interface, please read the corresponding manual that should be provided with the host computer.

If you have questions or are unsure of the instructions given in this manual, please contact us.



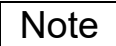






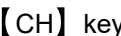
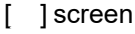

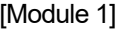


## <Instruction manual>

Name	Descriptions
RA3100 instruction manual	Operations and settings of parameters for RA3100 are described.

## Symbols in This Manual

Terms and symbols used in this manual denote as follows.

 <b>WARNING</b>	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.
 <b>CAUTION</b>	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.
 <b>Note</b>	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, as well as measurement limitations and additional explanations.
	Reference page
	A tap is the act of lightly touching an item such as a key displayed on the screen with a finger. Example: Used for selecting or setting screen keys.
 key	Enclosed characters represent a key name on the operation panel. Example:  key
 key	Text enclosed in  indicates touch panel keys displayed on the screen. Example:  key
 screen	Text enclosed in  indicates the text of items on the screen. Example: 
k (lower case) K (upper case)	Example: 1 kg = 1000 g 1 KB = 1024 bytes

# Contents

Introduction .....	3
<Instruction manual> .....	3
Symbols in This Manual.....	3
1. Communication settings.....	6
1.1. Preparing the product.....	6
1.1.1. Connections of communication ports .....	6
1.1.2. Network setup for LAN port.....	7
1.1.3. Communication parameters of RS-232C (COM port ) .....	9
2. Overview of communication commands .....	10
2.1. Communication format.....	10
2.1.1. Command format.....	10
2.1.2. ACK and NAK.....	10
2.1.3. Communication protocol.....	12
2.2. Command List .....	13
2.2.1. Command groups .....	13
2.2.2. Command List .....	13
3. Details of command .....	15
3.1. Settings of main unit ( S commands) .....	15
3.1.1. S01: Setting common recording format .....	15
3.1.2. S02: Setting recording format using memory .....	17
3.1.3. S03: Setting recording format using SSD .....	19
3.1.4. S04: Setting recording format using printer .....	20
3.1.5. S21: Setting start-trigger format ( using analog input signal) .....	21
3.1.6. S22: Setting start-trigger format ( using digital input signal) .....	22
3.1.7. S24: Setting memory-trigger format ( using analog input signal) .....	23
3.1.8. S25: Setting memory-trigger format ( using logical input signal) .....	24
3.1.9. S26: Setting format of memory-trigger mode.....	25
3.1.10. S30: Setting format of channel display .....	26
3.1.11. S31: Setting display format of logical input signal .....	28
3.1.12. S32: Setting format of physical quantity conversion .....	30
3.1.13. S33: Setting format of unit list.....	31
3.1.14. S34: Setting recoding name .....	32
3.1.15. S35: Setting thumbnail monitor.....	33
3.1.16. S36: Setting parameters to print out.....	34
3.1.17. S37: Setting header, footer and annotation .....	35
3.1.18. S38: Setting speed to feed recording paper .....	36
3.1.19. S39: Setting Y-T waveform monitor .....	37
3.1.20. S40: Setting X-Y waveform.....	38
3.1.21. S41: Setting X-Y waveform channel .....	39
3.1.22. S42: Setting FFT analysis.....	40
3.1.23. S43: Partition settings of waveform monitor .....	43
3.1.24. S44: Setting field length .....	44
3.1.25. S45: Setting recording information XML file output .....	44
3.1.26. S46: Setting number of partitions .....	45

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3.2.	Module setting ( M commands).....	46
3.2.1.	M01: Module setting two channel voltage (RA30-101).....	46
3.2.2.	M02: Module setting four channel voltage (RA30-102).....	47
3.2.3.	M03: Module setting two channel high-speed voltage (RA30-103).....	48
3.2.4.	M05: Module setting 16 channel logic (RA30-105).....	49
3.2.5.	M06: Module setting two channel temperature (RA30-106).....	50
3.2.6.	M12: Module setting remote control (RA30-112).....	52
3.3.	Reading information ( I commands).....	54
3.3.1.	I00: Reading information of main unit, type, serial No.....	54
3.3.2.	I04: Reading board information of input module.....	54
3.3.3.	I05: Reading the status of main unit.....	55
3.4.	Execution process ( E commands).....	56
3.4.1.	E01: Execute canceling the input offset ( zero-cancel).....	56
3.4.2.	E07: Execute start and end recording.....	56
3.4.3.	E15: Execute adjust paper feed.....	57
3.4.4.	E16: Execute print header, footer and annotation.....	57
4.	Specifications of hardware.....	58
4.1.	LAN port.....	58
4.2.	COM port.....	58

# 1. Communication settings

The RA3100 is equipped with an interface with a LAN port and a COM port (RS-232C), which are used to connect to peripherals.

LAN port is 1000BASE-T, 100BASE-TX and 10BASE-T in accordance with IEEE802.3.

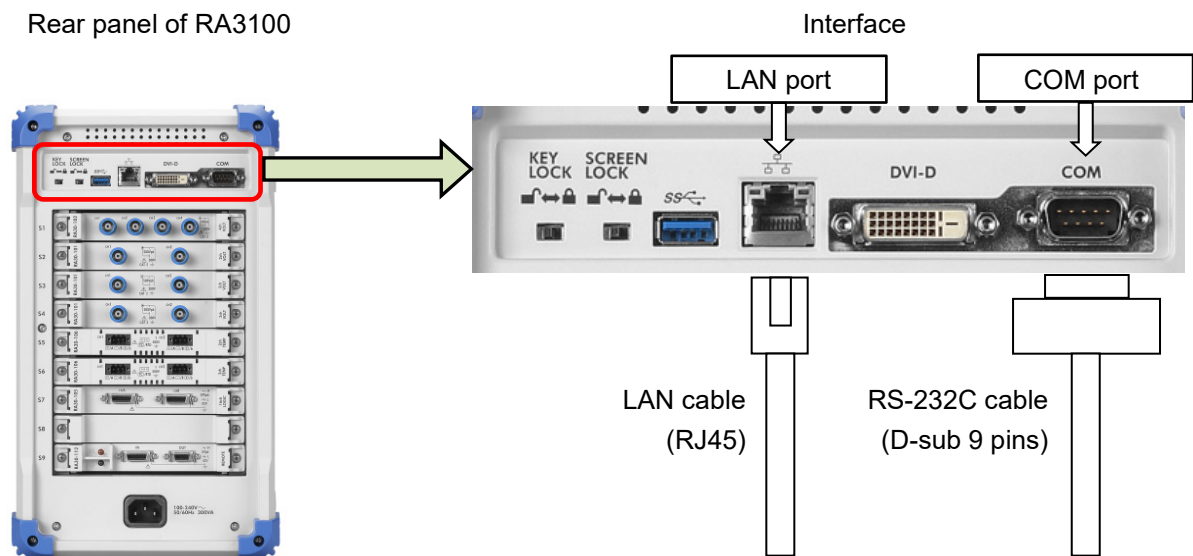
Cables conforming to the relevant standards of the connections should be used.

Use crossover cables when directly connecting to a computer using RS-232C.

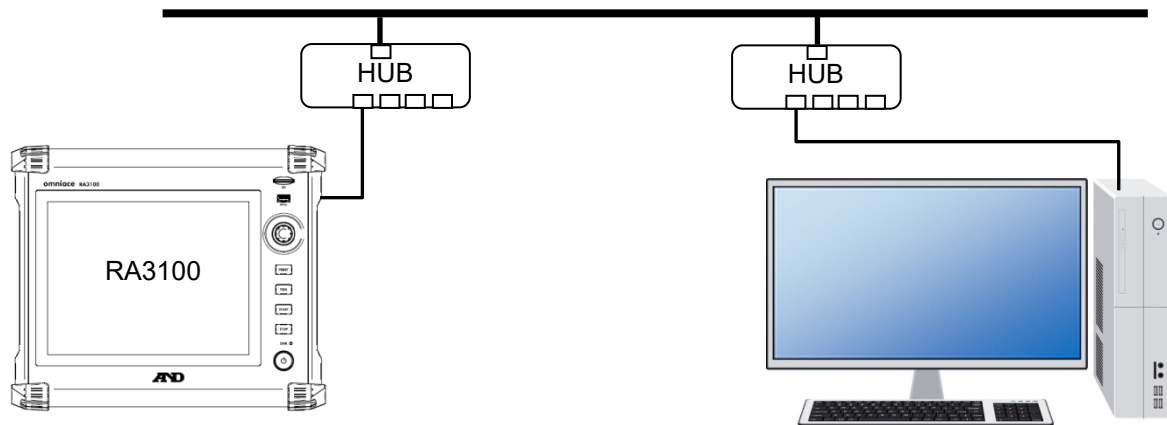
## 1.1. Preparing the product

### 1.1.1. Connections of communication ports

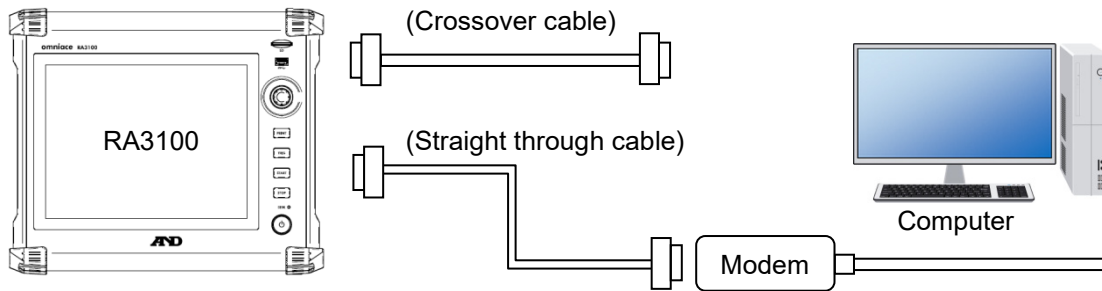
The interface is mounted on the rear panel of the RA3100. Connect a cable to the LAN port when using ethernet. Connect a cable to the RS-232C when using COM port.



### Connection using LAN cable



## Connection using RS-232C cable



Use crossover cable when connecting to computer, DTE device and others using RS-232C.  
Use straight through cable when connecting to DCE device.

### 1.1.2. Network setup for LAN port

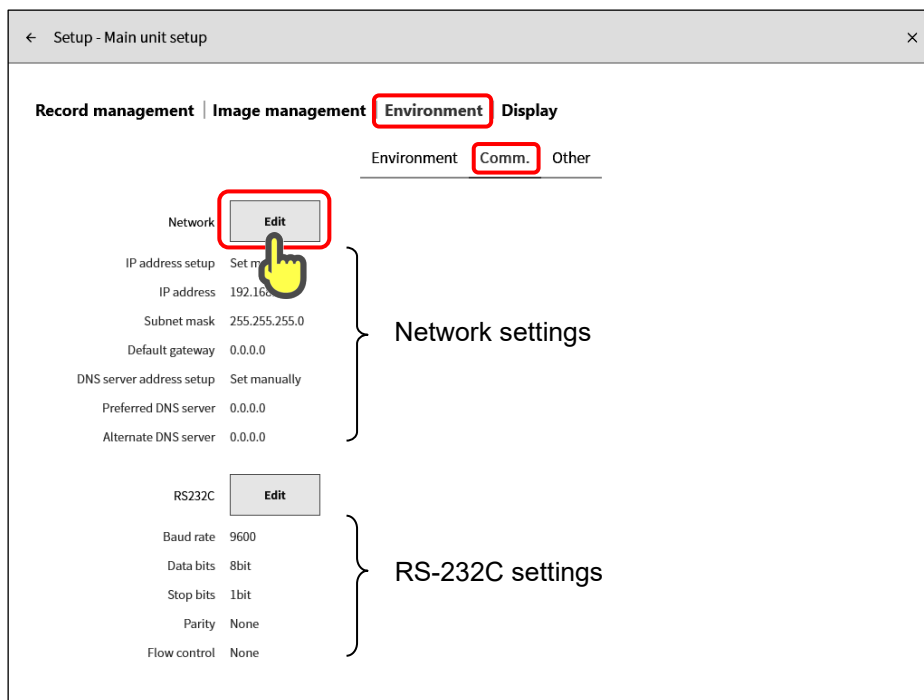
This section describes for setup of LAN port.

The current settings are displayed by the following procedure.

Step 1 Tap **[ Setup ]** key of the "side menu" on the display block.

Step 2 Tap **[ Environment ]** key of "Main unit setup" item of the [Setup] screen.

Step 3 Tap the network **[ Edit ]** key on the [Comm.] setup screen.



When tapping the network **[ Edit ]** key, the network setup dialog box is displayed.  
Consult a network manager for the settings when connecting to an ethernet network.

(1) IP address setup:

Select whether to "obtain automatically" or "set manually".

When "obtain automatically" is selected, IP address is set automatically by the DHCP server on the network. Then, the address of the DNS server is set automatically because automatic setup of the DNS server is enabled.

When "set manually" is selected, IP address, subnet mask, gateway and DNS server address needs to be set manually.

(2) IP address:

Specify an IP address that is a unique number on the network and consists of a network address + device address if "obtain automatically" is selected.

Example:

IP address of the RA3100 is set to "192.168.0.1". IP address of computer is set to "192.168.0.10".

(3) Subnet mask:

The value that defines the IP address range (subnet).

In the case of "192.168.0.1", the subnet mask should be set to "255.255.255.0".

(4) Default gateway:

Sets the IP address of the gateway device for connecting the network that the product is connected to with external networks.

(5) Preferred DNS server:

Sets the IP address of the preferred DNS server on the network. The DNS server converts automatically domain name to IP address.

(6) Alternate DNS server:

Sets the IP address of the alternate DNS server on the network.

Network setup dialog box

**Network**

(1) IP address setup

(2) IP address

(3) Subnet mask

(4) Default gateway

(5) DNS server address setup

(6) Preferred DNS server

Alternate DNS server

**Note**

Specify port number "3000" when using the LAN port to communicate with an external device.



### 1.1.3. Communication parameters of RS-232C (COM port )

The current settings are displayed by the following procedure.

Step 1 Tap **【 Setup】** key of the "**side menu**" on the display block.

Step 2 Tap **【 Environment】** key of "**Main unit setup**" item of the [Setup] screen.

Step 3 Tap the [RS-232C] **【 Edit】** key on the [Comm.] setup screen.

When using the RS-232C port of this product to communicate with an external device, match the RS-232C settings with those of the host device.

(1) Baud rate:

Sets the RS-232C data transmission speed.

300 / 600 / 1200 / 2400 / 4800 / 9600 / 14400 / 19200 /  
38400 / 57600 / 115200 / 230400 / 460800 bps

(2) Data bits:

The number of bits in one byte of data. Fixed to 8 bits.

(3) Stop bits:

The stop bits in one byte of data. Select 1 or 2 bits.

(4) Parity:

The parity bit for one byte of data.

None, odd, even, mark, or space

(5) Flow control:

The flow control of communication using CTS/RTS.

None, Xon/Xoff, or Hardware

RS-232C setup dialog box

The screenshot shows a dialog box titled "RS232C" with the following settings:

- (1) Baud rate: 9600
- (2) Data bits: 8bit
- (3) Stop bits: 1bit
- (4) Parity: None
- (5) Flow control: None

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

## 2. Overview of communication commands

When this product is connected to a host machine via LAN or RS-232C and receives a command from the host machine, it executes the process according to the command. LAN is TCP/IP socket communication, and RA3100 communicates as a server.

<b>⚠ CAUTION</b>
<ul style="list-style-type: none"> <li>❑ When communicating, there is no particular distinction between LAN or RS-232C communication ports, and processing is performed when a command is received. However, if commands are received from both ports at the same time, it may cause malfunctions to occur, so only one of the communication ports should be used.</li> <li>❑ Use ASCII and UTF-8 codes for communication of the RA3100. Characters of JIS, SJIS, EUC codes and others become a garbled text.</li> </ul>

### 2.1. Communication format

#### 2.1.1. Command format

The string of the command consists of 3-character command, parameter strings and delimiter.

Command and parameter strings are separated with a space [0x20].

Multiple parameters are separated with comma "," [0x2C].

Place CR [0x0D] and LF [0x0A] delimiters at the end of a command.

Enclose the string parameter of a signal name etc. with STX [0x02] and ETX [0x03].

Use ASCII and UTF-8 codes for the string parameter of a signal name etc.

Place a comma "," [0x2C] when omitting a parameter.

Place CR [0x0D] and LF [0x0A] delimiters when omitting a parameter and the strings after that parameter.

Exponential, decimal and integer notation can use when exponential notation is used in a parameter description.

#### Format:

Command (3-characters)	(SP)	Parameters P1, P2, ...	Delimiter (CR)(LF)
------------------------	------	------------------------	--------------------

**Example:** S01(SP)0,1,0,60000(CR)(LF)

S30(SP)1,1,(STX)SIG-NAME(ETX),1,50,50,-100,100,1(CR)(LF)

#### 2.1.2. ACK and NAK

When command is received and is performed correctly, ACK [0x06] (Acknowledgement) is responded.

When an error occurs in receiving or performing command, NAK [0x15] (Negative Acknowledgement) is responded.

#### ACK (Normal response)

##### Format1: Standard ACK

ACK (3-characters)	(SP)	Command (3-characters)	Delimiter (CR)(LF)
--------------------	------	------------------------	--------------------

Command name is responded if correct process.

**Format2: ACK with data**

ACK	(SP)	Command	(,)	Reponse1, response2, ...	(CR)(LF)
-----	------	---------	-----	--------------------------	----------

Processing with output information returns that information as response output.

Multiple outputs are separated using a comma ",".

**Format3: ACK with binary data**

ACK	(SP)	Command	(,)	Size	(,)	Binary data	(CR)(LF)
-----	------	---------	-----	------	-----	-------------	----------

When output data is binary, data size (byte length of data) is added to output response data.

Serial communication of RS-232C does not output binary data.

**NAC (Error response)**

When a command can be received correctly but cannot be performed, NAK is responded.

**Format:**

NAK(3-characters)	(SP)	Command	(,)	Error number	(,)	Parameter number	(CR)(LF)
-------------------	------	---------	-----	--------------	-----	------------------	----------

The first three characters are the NAK of the error response, then the separator (SP) is placed, and then the three characters of the command name, error number, and parameter number where the error occurred are output. Each item is separated by a comma (,).

When a command cannot be identified, an alternative header is output instead of a command name.

**Alternative header:**

Header	Descriptions
HAD	3-character command could not be recognized.
DEL	Delimiter could not be recognized within default length of receiving data.
FMT	Syntax error.
BSY	Command busy status.

**Error number:**

Error number and descriptions are as follows:

When an error occurs, the following error numbers are replied as a parameter of NAK.

( ) means system error inside of the RA3100.

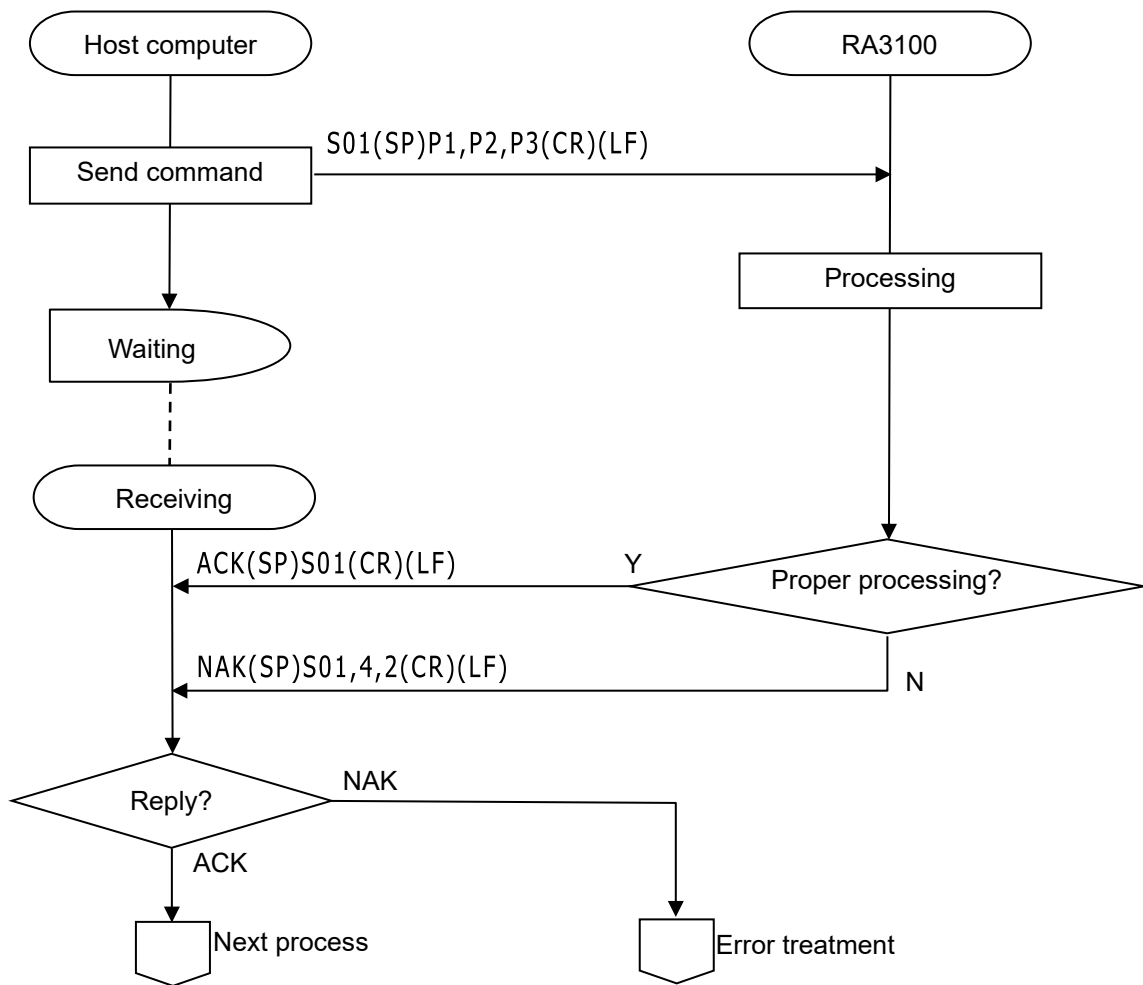
Error number	Descriptions
1	Command busy.
2	Settings cannot be changed because recording is continued.
3	Unknown command.
4	Parameter is out of range.
5	Number of parameters is incorrect.
6	Time out.
7	(Unknown device)
8	(Common memory error)
9	Deficiency of required parameter.
10	Storage device has been filled.
11	Full memory.
12	(Internal bus error)
13	Execution failure.

**Parameter number:**

Parameter number shows which parameter in receiving command has failed.  
 "-1" is replied to parameter number if it cannot be identified.

**2.1.3. Communication protocol**

When the host computer sends a command and the RA3100 has received, ACK or NAK is replied to the computer. Send next command from the host computer after receiving and confirming them.



## 2.2. Command List

First character of 3-character command shows type of command. Other characters show content of command.

Example : S04

S : S command

04 : Settings of recording printer

### 2.2.1. Command groups

Types of command are as follows:

First character	Descriptions	Details
S	S command : Settings of main unit	<a href="#">3.1. Settings of main unit</a>
M	M command : Settings of modules	<a href="#">3.2 Settings of modules</a>
I	I command : Reading information	<a href="#">3.3 Reading informations</a>
E	E command : Execution process	<a href="#">3.4 Execution peocess</a>

### 2.2.2. Command List

#### Settings of main unit ( S commands)

Command	Descriptions	Details
S01	Setting common recording format	<a href="#">S01</a>
S02	Setting recording format using memory	<a href="#">S02</a>
S03	Setting recording format using SSD	<a href="#">S03</a>
S04	Setting recording format using printer	<a href="#">S04</a>
S21	Setting start-trigger format ( using analog input signal)	<a href="#">S21</a>
S22	Setting start-trigger format ( using digital input signal)	<a href="#">S22</a>
S24	Setting memory-trigger format ( using analog input signal)	<a href="#">S24</a>
S25	Setting memory-trigger format ( using logical input signal)	<a href="#">S25</a>
S26	Setting format of memory-trigger mode	<a href="#">S26</a>
S30	Setting format of channel display	<a href="#">S30</a>
S31	Setting display format of logical input signal	<a href="#">S31</a>
S32	Setting format of physical quantity conversion	<a href="#">S32</a>
S33	Setting format of unit list	<a href="#">S33</a>
S34	Setting recoding name	<a href="#">S34</a>
S35	Setting thumbnail monitor	<a href="#">S35</a>
S36	Setting parameters to print out	<a href="#">S36</a>
S37	Setting header, footer and annotation	<a href="#">S37</a>
S38	Setting speed to feed recording paper	<a href="#">S38</a>
S39	Setting Y-T waveform monitor	<a href="#">S39</a>
S40	Setting X-Y waveform	<a href="#">S40</a>
S41	Setting X-Y waveform channel	<a href="#">S41</a>
S42	Setting FFT analysis	<a href="#">S42</a>
S43	Setting for partition of waveform monitor	<a href="#">S43</a>
S44	Setting field length	<a href="#">S44</a>
S45	Setting recording information XML file output	<a href="#">S45</a>
S46	Setting number of partitions	<a href="#">S46</a>

## Module setting ( M commands)

Command	Descriptions	Details
M01	Module setting two channel voltage (RA30-101)	<a href="#">M01</a>
M02	Module setting four channel voltage (RA30-102)	<a href="#">M02</a>
M03	Module setting two channel high-speed voltage (RA30-103)	<a href="#">M03</a>
M05	Module setting 16 channel logic (RA30-105)	<a href="#">M05</a>
M06	Module setting two channel temperature (RA30-106)	<a href="#">M06</a>
M12	Module setting remote control (RA30-112)	<a href="#">M12</a>

## Reading informations ( I commands)

Command	Descriptions	Details
I00	Reading information of main unit, type, serial No. etc.	<a href="#">I00</a>
I04	Reading board information of input module	<a href="#">I04</a>
I05	Reading the status of main unit	<a href="#">I05</a>

## Executions process ( E commands)

Command	Descriptions	Details
E01	Execute cancel input offset ( zero-cancel)	<a href="#">E01</a>
E07	Execute start and end recording	<a href="#">E07</a>
E15	Execute adjust paper feed	<a href="#">E15</a>
E16	Execute print header, footer and annotation	<a href="#">E16</a>

## 3. Details of command

### 3.1. Settings of main unit ( S commands)

#### 3.1.1. S01: Setting common recording format

Command	S01	
Syntax	S01 P1,P2, • • • ,P13(CR)(LF)	P7 is omitted always
ACK	Standard ACK	
NAK	Standard NAK	
Remarks	The common settings for recording of main unit. Refer to " <b>8.1 Recording Setup</b> " in the instruction manual of the RA3100.	

#### Parameters

P1	Recording mode	
Data range	0 to 8 0 : Basic 1 : Start time 2 : START trigger 3 : Interval time 4 : Start time + START trigger 5 : START trigger + Interval time 6 : Start time + Interval time 7 : Start time + START trigger + Interval time 8 : Window record	
Remarks		

P2	Record number of interval time mode	
Data range	1 to 10000	
Remarks	Available number of settings is different due to recording time, type of recording media and remaining capacity of SSD.	

P3	Maximum recording time	
Data range	0 or 1 0 : Invalid 1 : Effective	
Remarks	If effective, recording time is maximum time that can be used remaining capacity of SSD at starting time. In this case, maximum time is calculated with remaining capacity, "sampling rate" and "number of recordings". If invalid, value of recording time is used.	

P4	Recording time	
Data range	1 to 8640000000 Specify each recording time in unit of millisecond.	
Remarks	Range of recording time varies by remaining capacity, "sampling rate" and "number of recordings". Maximum recording time is 100 days. If recording time beyond the maximum time is specified, it becomes error.	

P5	Point number of recording using external sampling				
Data range	0 to 16 0 : 2 k      4 : 50 k      8 : 1 M      12 : 20 M      16 : 500 M 1 : 5 k      5 : 100 k      9 : 2 M      13 : 50 M 2 : 10 k      6 : 200 k      10 : 5 M      14 : 100 M 3 : 20 k      7 : 500 k      11 : 10 M      15 : 200 M      Unit is number of points				
Remarks	When EXT (external sampling) is used to SSD recording, recording time is used this number of points.				

### 3.Details of commands – 3.1.Settings of main unit ( S commands)

---

P6	Interval time
Data range	1 to 86400 Specify interval time in unit of seconds.
Remarks	1 day = 86400 sec      1 hour = 3600 sec      1 minute = 60 sec

P7	(Internal reservation)
Data range	Omit always

P8	Start time: Year
Data range	0 to 99
Remarks	Year from 2000 to 2099

P9	Start time: Month
Data range	Month from 1 to 12

P10	Start time: day
Data range	Days from 1 to 31

P11	Start time: Hour
Data range	Hours from 0 to 23

P12	Start time: Minute
Data range	Minutes from 0 to 59

P13	Start time: Second
Data range	Seconds from 0 to 59



### 3.1.2. S02: Setting recording format using memory

Command	S02
Syntax	S02 P1,P2, • • • ,P8(CR)(LF) <span style="float:right">P3 and P7 are omitted always</span>
ACK	Standard ACK
NAK	Standard NAK
Remarks	The settings for memory recording. Refer to " <b>8.1 Recording Setup</b> " in the instruction manual of the RA3100.

#### Parameters

P1	Management of memory recording
Data range	0 to 2 0 : Memory recording OFF 1 : Memory recording ON <span style="float:right">Overwrite mode OFF</span> 2 : Memory recording ON <span style="float:right">Overwrite mode ON</span>

P2	Sampling speed of memory recording
Data range	0 to 25
Remarks	Refer to " <a href="#">Table of sampling speed</a> " concerning of relationship between parameter number and sampling speed.

P3	(Internal reservation)
Data range	Omit always

P4	Number of memory block
Data range	1 to 200
Remarks	Specify number to divide memory

P5	Block size of memory recording (number of points)
Data range	0 to 18 0 : 2 k      4 : 50 k      8 : 1 M      12 : 20 M      16 : 500 M 1 : 5 k      5 : 100 k      9 : 2 M      13 : 50 M      17 : 1 G 2 : 10 k      6 : 200 k      10 : 5 M      14 : 100 M      18 : 2 G 3 : 20 k      7 : 500 k      11 : 10 M      15 : 200 M      Unit is number of points
Remarks	Block size is number of recording data for each channel.

P6	Pre-trigger
Data range	0 to 99
Remarks	Specify position of pre-trigger in unit of %.

P7	(Internal reservation)
Data range	Omit always

P8	Synchronization control trigger for monitor
Data range	0 or 1 <span style="float:right">0 : Disabled</span> <span style="float:right">1 : Enabled</span>
Remarks	Specify synchronization trigger (TRIG SYNC) to monitor waveform stored in memory.

**Table of sampling speed for memory recording**

P2	Sampling
0	6 s
1	3 s
2	1.2 s
3	1 s
4	500 ms
5	200 ms
6	100 ms

P2	Sampling
7	50 ms
8	20 ms
9	10 ms
10	5 ms
11	2 ms
12	1 ms
13	500 $\mu$ s

P2	Sampling
14	200 $\mu$ s
15	100 $\mu$ s
16	50 $\mu$ s
17	20 $\mu$ s
18	10 $\mu$ s
19	5 $\mu$ s
20	2 $\mu$ s

P2	Sampling
21	1 $\mu$ s
22	500 ns
23	200 ns
24	100 ns
25	50 ns



### 3.1.4. S04: Setting recording format using printer

Command	S04	
Syntax	S04 P1,P2, • • • ,P5(CR)(LF)	P3 is always omitted.
ACK	Standard ACK	
NAK	Standard NAK	
Remarks	The settings for printer recording. Refer to " <b>8.1 Recording Setup</b> " in the instruction manual of the RA3100.	

#### Parameters

P1	Management of printer recording	
Data range	0 or 1	0 : OFF                      1 : ON

P2	Paper feed speed	
Data range	0 to 12, 63	
Remarks	Refer to " <b>Table of paper feed speed</b> " concerning relationship between parameter number and paper feed speed. When paper feed speed is set to EXT (external synchronization), SSD recording memory and recording become OFF.	

P3	(Internal reservation)	
Data range	Omit always	

P4	Real time printing of waveform	
Data range	0 or 1	0 : OFF                      1 : ON
Remarks	When real time printing is used, waveform is printed at the same time as printer recording (SSD recording).	

P5	Sheet number of printing	
Data range	1 to 3	Sheet number of real time waveform printing

#### Table of paper feed speed

P2	Paper feed speed
0	1 mm/min
1	2 mm/min
2	5 mm/min
3	6 mm/min
4	12 mm/min
5	30 mm/min

P2	Paper feed speed
6	1 mm/s
7	2 mm/s
8	5 mm/s
9	10 mm/s
10	20 mm/s
11	50 mm/s
12	100 mm/s

P2	Paper feed speed
63	EXT



### 3.1.6. S22: Setting start-trigger format ( using digital input signal)

Command	S22
Syntax	S22 P1,P2, • • • ,P7(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	The settings of start trigger in case that trigger source is logical input. Refer to " <b>5.4 Start Trigger</b> " in the instruction manual of the RA3100.

#### Parameters

P1	Management of start trigger (Logical input channel)
Data range	0 or 1                      0 : Invalid                      1 : Effective
Remarks	Logical input is specified to start trigger of recording mode. If analog input is selected, set analog input to invalid previously.

P2	Slot number
Data range	1 to 9
Remarks	Specify an input slot number of logical channel to use as start trigger source.

P3	Channel number
Data range	1 to 2                      1 : CHA                      2 : CHB
Remarks	Specify channel number of trigger source.

P4	Logic channel for trigger detection
Data range	0 to 255
Remarks	Specify logical input channel to detect trigger input. A parameter value is summed up values of CHn to be used trigger input. CH1 : 1      CH2 : 2      CH3 : 4      CH4 : 8      CH5 : 16      CH6 : 32 CH7 : 64      CH8 : 128

P5	Bit pattern
Data range	0 to 255
Remarks	Specify H/L level to detect trigger for each logical channel. A parameter value is summed up values of CHn that detects trigger at H level. CH1 : 1      CH2 : 2      CH3 : 4      CH4 : 8      CH5 : 16      CH6 : 32 CH7 : 64      CH8 : 128

P6	Trigger detection
Data range	0 to 1                      0 : OR                      1 : AND

P7	Filter time
Data range	1 to 10000000 (10 s)                      Specify it in unit of $\mu$ s
Remarks	Filter time is the same as filter time of analog start trigger.



### 3.1.8. S25: Setting memory–trigger format ( using logical input signal)

Command	S25
Syntax	S25 P1,P2, ••• ,P8(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	The settings of start trigger in case that trigger source is analog input channel. Refer to " <b>5.2 Memory trigger</b> " in the instruction manual of the RA3100.

#### Parameters

P1	Trigger source
Data range	1 to 18                      1 : T1    2 : T2    •••    18 : T18    Selection of source

P2	Management of trigger source
Data range	0 or 1                                      0 : Invalid                                      1 : Effective
Remarks	Specify either invalid or effective of trigger source (T1 to T18) selected at P1.

P3	Slot number
Data range	1 to 9
Remarks	Specify an input slot number used as trigger source.

P4	Channel number
Data range	1 to 2                                      1 : CHA                                      2 : CHB
Remarks	Specify a channel number used as trigger source.

P5	Logic channel
Data range	0 to 255
Remarks	Specify channel used to trigger detection. A parameter value is summed up values of CHn to be used trigger input. CH1 : 1            CH2 : 2            CH3 : 4            CH4 : 8            CH5 : 16            CH6 : 32 CH7 : 64            CH8 : 128

P6	Bit pattern
Data range	0 to 255
Remarks	Specify H/L level to detect trigger for each logical channel. A parameter value is summed up values of CHn that detects trigger at H level. CH1 : 1            CH2 : 2            CH3 : 4            CH4 : 8            CH5 : 16            CH6 : 32 CH7 : 64            CH8 : 128

P7	Trigger detection
Data range	0 to 1                                      0 : OR 1 : AND
Remarks	Specify trigger detection either OR or AND for each channel of CH1 to CH8.

P8	Filter time
Data range	1 to 10000000 (10 s)                                      Specify it in unit of $\mu$ s
Remarks	Filter time is the same as filter time of analog start trigger.





### 3.1.10. S30: Setting format of channel display

Command	S30
Syntax	S30 P1,P2, • • • ,P9(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Don't eliminate parameters using delimiter. Refer to "9.1. Two Channel Voltage Module (RA30-101)" in the instruction manual of the RA3100.

#### Parameters

P1	Slot selection
Data range	1 to 9, F
Remarks	Specify slot number that the target module is installed. If F is specified, all modules are target.

P2	Channel selection
Data range	1 to 9, F 16 Channel Logic Module (RA30-105)    1 : CHA    2 : CHB, F
Remarks	Specify target channel. If F is specified, all channels of modules specified with P1 are target.

P3	Signal name
Data range	Maximum length : 40 characters of UTF-8 code.
Remarks	Insert strings between (STX) [0x02] and (ETX) [0x03].

P4	Color
Data range	1 to 18 1 : Light blue    2 : Pink    3 : Yellow    4 : White 5 : Light green    6 : Purple    7 : Blue    8 : Light yellow-green 9 : Red    10 : Dark gray    11 : Reddish purple    12 : Bright blue 13 : Olive green    14 : Pale yellow-green    15 : Orange    16 : Pale purple 17 : Pale pink    18 : Green
Remarks	Specify waveform color of target channel. When logic module is used, 8 CH of CHA and CAB become the same color.

P5	Display position
Data range	0 to 100
Remarks	Specify the display position of target waveform in unit of percentage.

P6	Display range
Data range	0 to 100
Remarks	Specify the display range of target waveform in unit of percentage.



### 3.1.11. S31: Setting display format of logical input signal

Command	S31
Syntax	S31 P1,P2, • • • ,P20(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Don't eliminate parameters using delimiter. Refer to "9.4. 16 Channel Logic Module (RA30-105)" in the instruction manual of the RA3100.

#### Parameters

P1	Slot selection
Data range	1 to 9, F
Remarks	Specify slot number that the target module is installed. If F is specified, all modules are target.

P2	Channel selection
Data range	A, B, F                      A : CHA      B : CHB      F : All channels
Remarks	Specify target channel.

P3	Signal amplitude
Data range	0.0 to 100.0
Remarks	Unit is percentage.                      Round off at second decimal place.

P4	Signal unit
Data range	0 to 1                      0 : 8CH                      1 : 1CH
Remarks	

P5	Graph number CH1
Data range	1 to 18
Remarks	Specify graph number of CH1. ✘ When specified channel is OFF, NAK is responded. ✘ When slot or channel is F, even if channel is OFF, ACK is responded. (Settings are not reflected.)

P6	Display signal CH1
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Specify display signal of CH1. ✘ When specified channel is OFF, NAK is responded. ✘ When slot or channel is F, even if channel is OFF, ACK is responded. (Settings are not reflected.)

3.Details of commands - 3.1.Settings of main unit ( S commands)

P7 ~ P20	Graph number and display signal from CH2 to CH8.
Data range & Remarks	Refer to data range and remarks of graph number and display signal for CH 1. Graph number for each channel and parameters of display signal are as follows:

	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Graph number	P5	P7	P9	P11	P13	P15	P17	P19
Display signal	P6	P8	P10	P12	P14	P16	P18	P20

### 3.1.12. S32: Setting format of physical quantity conversion

Command	S32
Syntax	S32 P1,P2, ••• ,P10(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	P1 and P2 required always. Refer to "8.1.2. Channel List" – "Conversion (Physical Quantity Conversion)" in the instruction manual of the RA3100.

#### Parameters

P1	Slot selection
Data range	1 to 9, F
Remarks	Specify slot number that the target module is installed. If F is specified, all modules are target.

P2	Channel selection
Data range	1 to 4, F
Remarks	Specify channel of module specified with P1. If F is specified, all channels of modules specified with P1 are target.

P3	Conversion method
Data range	0 to 2                      0 : Not used                      1 : compensation                      2 : 2 points
Remarks	Specify conversion method. Refer to the instruction manual of the RA3100.

P4	Compensation : Gain
Data range	-7.922816E+20 ~ 7.922816E+20
Remarks	Specify offset when conversion method of P3 is selected "1 : Gain".

P5	Compensation : Offset
Data range	-7.922816E+20 to 7.922816E+20
Remarks	Specify offset when conversion method of P3 is selected "1 : Compensation".

P6	2 points : Pre-conversion 1
Data range	-7.922816E+20 to 7.922816E+20
Remarks	Specify value of pre-conversion 1 when conversion method of P3 is selected "2 points".

P7	2 points : Post-conversion 1
Data range	-7.922816E+20 to 7.922816E+20
Remarks	Specify value of post-conversion 1 when conversion method of P3 is selected "2 points".

P8	2 points : Pre-conversion 2
Data range	-7.922816E+20 to 7.922816E+20
Remarks	Specify value of pre-conversion 2 when conversion method of P3 is selected "2 points".

P9	2 points : Post-conversion 2
Data range	-7.922816E+20 to 7.922816E+20
Remarks	Specify value of post-conversion 2 when conversion method of P3 is selected "2 points".

P10	Unit
Data range	0 to 11
Remarks	Specify unit from unit list. 0 is default unit of module.

### 3.1.13. S33: Setting format of unit list

Command	S33
Syntax	S33 P1,P2, • • • ,P11(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Insert strings between (STX) [0x02] and (ETX) [0x03]. Use characters of UTF-8 code. Don't eliminate parameters using delimiter. Refer to "8.1.2. Channel List" – "Conversion (Physical Quantity Conversion)" in the instruction manual of the RA3100.

### Parameters

P1	Unit 1
Data range	10 characters in maximum.
Remarks	Define unit 1 of unit table.

P2	Unit 2
Data range	10 characters in maximum.
Remarks	Define unit 2 of unit table.

– Abbreviation –

P11	Unit 11
Data range	10 characters in maximum.
Remarks	Define unit 11 of unit table.





**3.1.15. S35: Setting thumbnail monitor**

Command	S35
Syntax	S35 P1,P2,P3(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Specify the settings off thumbnail waveform. Refer to " <b>8.2.1. Record management</b> " in the instruction manual of the RA3100.

**Parameters**

P1	Slot selection
Data range	1 to 9
Remarks	Specify slot number of the target module that thumbnail waveform is displayed.

P2	Channel selection
Data range	1 to 4
Remarks	Specify channel of the module specified at P1.

P3	Ratio of display scale
Data range	0 to 3                      0 : 1/10      1 : 1/20      2 : 1/50      3 : 1/100
Remarks	Specify display magnification of thumbnail waveform.

### 3.1.16. S36: Setting parameters to print out

Command	S36
Syntax	S36 P1,P2, • • • ,P8(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Specify parameters of printer. Refer to " <b>8.1.4. Printer</b> " in the instruction manual of the RA3100.

#### Parameters

P1	Header
Data range	0 to 3      0 : OFF      1 : Text      2 : Signal name      3 : Text & signal name
Remarks	Specify header contents that is printed upper waveform.

P2	Annotation
Data range	0 to 1      0 : OFF      1 : Text
Remarks	Specify annotation that is printed together with waveform.

P3	Footer
Data range	0 to 3      0 : OFF      1 : Text      2 : Scale value      3 : Text & scale value
Remarks	Specify footer contents that is printed under waveform.

P4	Grid
Data range	0 to 4 0 : OFF      1 : 10 mm STD      2 : 10 mm      3 : 5 mm STD      4 : 5 mm
Remarks	Specify grid pattern of waveform printing.

P5	Date / data name
Data range	0 to 3      0 : OFF      1 : Date      2 : Recording name      3 : Date & recording name
Remarks	Select whether to print date and recording name.

P6	Line number of date / data name
Data range	1 to 86
Remarks	Specify line number that date and recording name are printed.

P7	Trigger / mark
Data range	0 to 1      0 : OFF      1 : ON
Remarks	Specify whether to print trigger/mark or not.

P8	Line number of trigger / mark
Data range	1 to 86
Remarks	Specify line number that trigger/mark is printed.

P9	Time axis
Data range	0 to 1      0 : OFF      1 : ON
Remarks	Select whether to print time axis or not.

P10	Line number of time axis
Data range	1 to 86
Remarks	Specify line number that time axis is printed.

P11	Recording speed
Data range	0 to 2            0 : OFF            1 : Sampling speed            2 : Chart speed
Remarks	Specify printing contents of recording speed.

P12	Line number of recording speed
Data range	1 to 86
Remarks	Specify line number that recording speed is printed.

### 3.1.17. S37: Setting header, footer and annotation

Command	S37
Syntax	S37 P1,P2,P3(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Input printing text. Insert strings between (STX) [0x02] and (ETX) [0x03]. Use characters of UTF-8 code. Don't omit parameters. Refer to " <b>8.1.4. Printer</b> " in the instruction manual of the RA3100. Header, footer and annotation can print using command of " <a href="#">3.4.4. E16: Printing Header, footer and annotation</a> ".

### Parameters

P1	Type of this text
Data range	0 to 2            0 : Header            1 : Annotation            2 : Footer
Remarks	Select P1 before text. It cannot omit.

P2	Line number
Data range	1 to 86
Remarks	Specify line number of this text. It cannot omit.

P3	Text
Data range	60 characters in maximum.
Remarks	Text is printed at line number specified with P2.

Example of command input : Annotation text is printed at 10th line.

S37 1,10,(STX)Title:(ETX)

### 3.1.18. S38: Setting speed to feed recording paper

Command	S38
Syntax	S38 P1,P2, • • • ,P6(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Sets the speed table for the user-set paper feed rate used in Pen Recording Mode. Speed index used with parameter and feeding speed are as follows of " <a href="#">Table of speed to feed paper</a> " : Refer to " <a href="#">8.1.4. Printer</a> " in the instruction manual of the RA3100.

#### Parameters

P1	User 1
Data range	0 to 12, 26
Remarks	Sets the user settings configuring the paper feed rate for User 1.

P2	User 2
Data range	0 to 12, 26
Remarks	Sets the user settings configuring the paper feed rate for User 2.

– Parameters P3 to P5 use the same data ranges but for Users 3 to 5. –

P6	User 6
Data range	0 to 12, 26
Remarks	Sets the user settings configuring the paper feed rate for User 6.

#### Table of speed to feed paper

Pn	Speed of feeding paper
0	1 mm/min
1	2 mm/min
2	5 mm/min
3	6 mm/min
4	12 mm/min
5	30 mm/min
6	1 mm/s

Pn	Speed of feeding paper
7	2 mm/s
8	5 mm/s
9	10 mm/s
10	20 mm/s
11	50 mm/s
12	100 mm/s
26	EXT. (0.1 mm/pulse)

### 3.1.19. S39: Setting Y-T waveform monitor

Command	S39
Syntax	S39 P1,P2,P3, ••• ,P7(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Specify the display settings concerning of Y-T waveform. Refer to " <b>8.2.6. Display Setup</b> " in the instruction manual of the RA3100.

#### Parameters

P1	Grid
Data range	0 to 2                      0 : OFF                      1 : Dark                      2 : Bright
Remarks	Specify grid display of monitor.

P2	Trigger
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Specify trigger detection line display of monitor.

P3	Mark
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Specify mark line display of monitor.

P4	Interlocked waveform to cursor position
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Specify whether to interlock the display position of waveform at cursor position or not.

P5	Search result line
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Specify whether to display search result or not.

P6	Notation of X axis
Data range	0 to 2                      0 : OFF                      1 : date                      2 : Point
Remarks	Specify tick notation of X axis.

P7	TSP/BSP
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	When upper part (TSP) and lower part (BSP) of recording paper are extended in Y-T waveform area, select OFF. Refer to " <b>8.2.6. Display Setup</b> " in the instruction manual of the RA3100.

### 3.1.20. S40: Setting X-Y waveform

Command	S40
Syntax	S40 P1,P2,P3(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Specify the display settings concerning of X-Y waveform. Refer to " <b>7.3. X-Y Waveform</b> " in the instruction manual of the RA3100.

#### Parameters

P1	Dot/Line switching
Data range	0 to 1                      0 : Dot                      1 : Line
Remarks	Switches between rendering the X-Y waveform with dots and rendering it with lines.

P2	Grid display
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Specify grid display of the X-Y waveform.

P3	Display scale
Data range	1 to 4
Remarks	Select scale of the X-Y waveform from X-Y1 to X-Y4.

### 3.1.21. S41: Setting X-Y waveform channel

Syntax	S41
ACK	S33 P1,P2, • • • ,P5(CR)(LF)
NAK	Standard ACK
NAK	Standard NAK
Remarks	Specify input channel of X axis and Y axis of X-Y waveform. Refer to "7.3. X-Y Waveform" in the instruction manual of the RA3100.

#### Parameters

P1	X-Y channel
Data range	1 to 4
Remarks	Specify target X-Y channel. Cannot be omitted.

P2	Slot number of Z axis channel
Data range	1 to 9
Remarks	Specify slot number installed module of input channel that is used to X axis.

P3	Input channel of X axis
Data range	1 to 4
Remarks	Specify channel used to X axis. Same channel as Y axis cannot be selected.

P4	Slot number of channel of Y axis
Data range	1 to 4
Remarks	Specify slot number installed module of input channel that is used to Y axis.

P5	Input channel of Y axis
Data range	1 to 4
Remarks	Specify channel used to Y axis. Same channel as X axis cannot be selected.





3.Details of commands – 3.1.Settings of main unit ( S commands)

P8	Analysis 1 : Y axis		
Data range	0 to 5	0 : Linear 1 : Lin-Rel 2 : Lin-Img	3 : Lin-Amp 4 : Log-Amp 5 : Phase
Remarks	Specify Y axis of analysis 1.		

P9	Analysis 1 : Manual scale		
Data range	0 to 1	0 : OFF	1 : ON
Remarks	Specify scale of Y axis for analysis 1 manually.		

P10	Analysis 1 : Maximum value of manual scale		
Data range	-7.922816E+28 ~ 7.922816E+28		
Remarks	Specify maximum value of manual scale of analysis 1.		

P11	Analysis 1 : Minimum value of manual scale		
Data range	-7.922816E+28 ~ 7.922816E+28		
Remarks	Specify minimum value of manual scale of analysis 1.		

P12	Analysis 1 : Slot number of signal analysis CH1		
Data range	0 to 9		
Remarks	Specify slot number of module of input signal 1 used to analysis 1.		

P13	Analysis 1 : Channel of signal analysis CH1		
Data range	0 to 4		
Remarks	Specify channel number of input signal used to analysis 1		

P14	Analysis 1 : Slot number of signal analysis CH2		
Data range	0 to 9		
Remarks	Specify slot number of module of input signal 2 used to analysis 1.		

P15	Analysis 1 : Channel of signal analysis CH2		
Data range	0 to 4		
Remarks	Specify channel number of input signal 2 used to CH2 analysis in analysis 1		

P16	Analysis 1 : Peak value		
Data range	0 to 1	0 : Maximum value	1 : Local maximum value
Remarks	Specify as peak value either maximum value or local maximum value of analysis result of analysis 1.		

P17	Analysis 2 : Analysis function		
Data range	0 to 9	0 : Time scale waveform 1 : Linear spectrum 2 : RMS spectrum 3 : Power spectrum 4 : Power spectrum density	5 : 1/1 octave analysis 6 : 1/3 octave analysis 7 : Cross power spectrum 8 : Transfer function 9 : Coherence function
Remarks	Specify function of analysis 2.		







**3.1.26. S46: Setting number of partitions**

Command	S46
Syntax	S46 P1(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	Refer to " <b>8.1.3. Sheet Setup</b> " in the instruction manual of the RA3100.

**Parameters**

P1	Number of graph division
Data range	1 to 18
Remarks	Division of waveform display is number of graph division of P1. The definition of graph division is specified at " <b>3.1.23. S43: Partition settings of waveform monitor</b> ".

## 3.2. Module setting ( M commands)

### 3.2.1. M01: Module setting two channel voltage (RA30–101)

Command	M01
Syntax	M01 P1,P2, • • • ,P7(CR)(LF)
ACK	Standard ACK
NAK	Standard NAK
Remarks	The settings of RA30–101. Refer to "9.1 Two Channel Voltage Module (RA30–101)" in the instruction manual of the RA3100.

### Parameters

P1	Slot number
Data range	1 to 9, F
Remarks	Specify slot number that the target module is installed. When F is selected, all modules of the same type are target.

P2	Channel
Data range	1 to 2, F
Remarks	Specify channel of target module. When F is selected, all channels are target.

P3	Measurement
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Select whether to measure with specified channel or not.

P4	Range
Data range	0 to 11                      0 : 500 V                      4 : 20 V                      8 : 1 V 1 : 200 V                      5 : 10 V                      9 : 500 mV 2 : 100 V                      6 : 5 V                      10 : 200 mV 3 : 50 V                      7 : 2 V                      11 : 100 mV
Remarks	Specify input range.

P5	Input coupling
Data range	0 to 2                      0 : GND                      1 : DC                      2 : AC
Remarks	Switch the input signal coupling.

P6	Low pass filter
Data range	0 to 4                      0 : OFF                      1 : 3 Hz                      2 : 30 Hz                      3 : 300 Hz                      4 : 3 kHz
Remarks	Select low pass filter of the input channel.

P7	Anti-aliasing filter
Data range	0 to 1                      0 : OFF                      1 : ON
Remarks	Select whether to use the anti-aliasing filter of the input channel or not. When ON is selected, it synchronizes with sampling speed of SSD.



















**3.3.3. I05: Reading the status of main unit**

Command	I05
Syntax	I05(CR)(LF)
ACK	ACK with data (Command example)                      ACK I05,A1(CR)(LF)
NAK	Standard NAK
Remarks	The status of recorder is read.

**ACK response**

A1	Status
Content of response	0 to 9                      0 : In processing to turn the recorder on 1 : In processing to prepare display 2 : In displaying (input or output) 3 : In processing to finish display 4 : Waiting (stand-by of starting time or stand-by of interval) 5 : Waiting of start trigger 6 : In preparation of recording 7 : In recording 8 : In processing to finish recording 9 : In processing to turn the recorder off
Remarks	







## 4. Specifications of hardware

### 4.1. LAN port

Items	Specifications
Adaptable standards	IEEE802.3 complied with standards (100BASE-T, 100BASE-TX, 10BASE-T)
Connector	RJ-45
Port	1

### 4.2. COM port

Items	Specifications
Adaptable standards	EIA-574 complied with standards
Communication speed	300 to 460800 bps
Data length	8 bit fixed
Stop bit	1 bit, 2 bit selection
Parity bit	None, odd, even, mark, space selection
Flow control	None, Xon/Xoff, Hardware (CTS/RTS) selection
Connector	D-sub 9 pin
Port	1

### Pin assignment :

Pin No.	Name	IN/OUT	Functions
1	N.C.	-	
2	RxDATA	IN	Receive data
3	TxDATA	OUT	Transmit data
4	N.C.	-	
5	GND		GND
6	N.C.	-	
7	RTS	OUT	Request to send
8	CTS	IN	Clear to send
9	N.C.	-	

Omniace  
RA3100

Communication command

1WMPD4004790

1st Edition



### **A&D Company, Limited**

3-23-14 Higashi-Ikebukuro, Toshima-ku, Tokyo 170-0013, JAPAN  
Telephone: [81] (3) 5391-6132 Fax: [81] (3) 5391-1566

### **A&D ENGINEERING, INC.**

47747 Warm Springs Blvd, Fremont, California 94539, U.S.A.  
Tel: [1] (800) 726-3364 Weighing Support:[1] (888) 726-5931 Inspection Support:[1] (855) 332-8815

### **A&D INSTRUMENTS LIMITED**

Unit 24/26 Blacklands Way, Abingdon Business Park, Abingdon, Oxfordshire OX14 1DY United Kingdom  
Telephone: [44] (1235) 550420 Fax: [44] (1235) 550485

### **A&D AUSTRALASIA PTY LTD**

32 Dew Street, Thebarton, South Australia 5031, AUSTRALIA  
Telephone: [61] (8) 8301-8100 Fax: [61] (8) 8352-7409

### **A&D KOREA Limited**

한국에이.엔.디(주)  
서울특별시 영등포구 국제금융로6길33 (여의도동) 맨하탄빌딩 817 우편 번호 07331  
( 817, Manhattan Bldg., 33. Gukjegeumyung-ro 6-gil, Yeongdeungpo-gu, Seoul, 07331 Korea )  
전화: [82] (2) 780-4101 팩스: [82] (2) 782-4264

### **ООО A&D RUS**

### **ООО "ЭЙ энд ДИ РУС"**

Почтовый адрес:121357, Российская Федерация, г.Москва, ул. Вереysкая, дом 17  
Юридический адрес: 117545, Российская Федерация, г. Москва, ул. Дорожная, д.3, корп.6, комн. 86  
( 121357, Russian Federation, Moscow, Vereyskaya Street 17 )  
тел.: [7] (495) 937-33-44 факс: [7] (495) 937-55-66

### **A&D Instruments India Private Limited**

### **ऐ&डी इन्स्ट्रुमेंट्स इण्डिया प्रा० लिमिटेड**

509, उद्योग विहार , फेस -5, गुडगांव - 122016, हरियाणा , भारत  
( 509, Udyog Vihar, Phase-V, Gurgaon - 122016, Haryana, India )  
फोन : [91] (124) 4715555 फैक्स : [91] (124) 4715599

### **A&D SCIENTECH TAIWAN LIMITED. A&D台灣分公司 艾安得股份有限公司**

台灣台北市中正區青島東路5號4樓  
( 4F No.5 Ching Tao East Road, Taipei Taiwan R.O.C. )  
Tel : [886](02) 2322-4722 Fax : [886](02) 2392-1794

### **A&D INSTRUMENTS (THAILAND) LIMITED**

### **บริษัท เอ แอนด์ ดี อินสตรูमेंท์ (ไทยแลนด์) จำกัด**

168/16 หมู่ที่ 1 ตำบลรังสิต อำเภอธัญบุรี จังหวัดปทุมธานี 12110 ประเทศไทย  
( 168/16 Moo 1, Rangsit, Thanyaburi, Pathumthani 12110 Thailand )  
Tel : [66] 20038911