RA3100
File Converter

Instruction Manual

A&D Company, Ltd.

1WMPD4004500B

CAUTION

(1) Turn off the power when the operation is abnormal.
If it is impossible to trace the causes of an abnormal operation, please contact our sales representative.

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Introduction

"File Converter" is software for converting recorded data exported to external media from our data acquisition product OMNIACE RA3100 to a CSV or ASAM MDF (Ver. 4.1) file on a computer.

RA3100

Symbols in This Manual

Terms and symbols used in this manual denote as follows.

NOTE	This indicates a condition or practice that could result in a converted file being overwritten 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. ExampleUsed for selecting or setting screen keys.
☐ key	Enclosed characters represent a key name on the operation panel. Example OK key
【 】key	Text enclosed in 【 】 indicates touch panel keys displayed on the screen. Example【CH】 key
[ ] screen	Text enclosed in [ ] indicates the text of items on the screen. Example[Main] screen

CONTENTS

1. Environment

This section describes the system requirements and installation procedure.

1.1. System Requirements

Item	Description
Operating System	Windows 10 x86 (32-bit)/x64 (64-bit) English (Ver. 1507 or later) .NET Framework 4.6 or later
CPU	Intel Core i series
Memory	4 GB (32-bit version)/8 GB or more (64-bit version)
Display	Resolution 1366 x 768 or higher

1.2. Installation and Setup

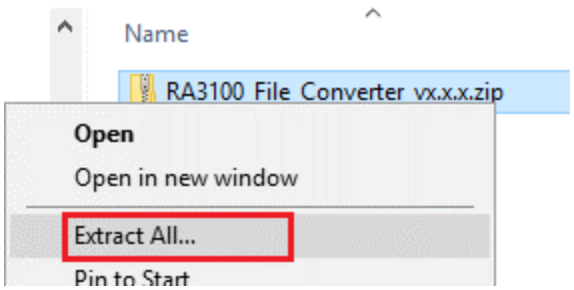
When the zip file is extracted, the following files and folders are created. Copy the following files and folders in RA3100_File_Converter (the root folder) to a location of your choice.
It is convenient to paste a shortcut to the executable file to a location such as the desktop.
Also perform the procedure in "1.2.3 Installing the Microsoft Visual C++ Redistributable".
Download the zip file from our website.
Japan: https://www.aandd.co.jp/support/soft_download/industrial.html
Overseas: https://www.aandd.jp/support/industrial/soft_download.html

1.2.1. Zip File

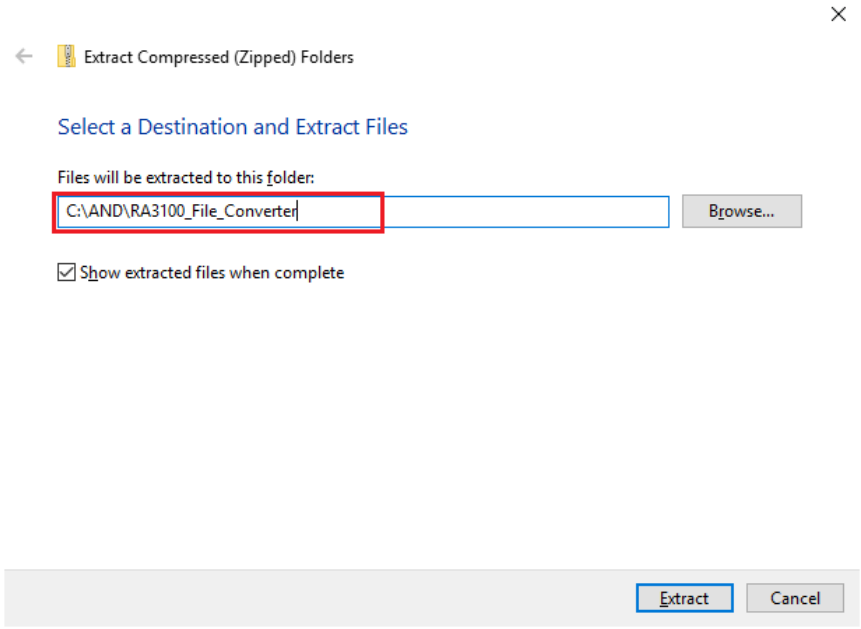
VC_redist.x86.exe（Microsoft Visual C++ Redistributable）
RA3100_File_Converter (root folder)
　├ RA3100_File_Converter.exe
　├ RA3100_File_Converter.exe.config
　├ AND_MDF4Writer.dll
　├ def (definition file folder)
There are also five language folders.

1.2.2. Extracting the Zip File

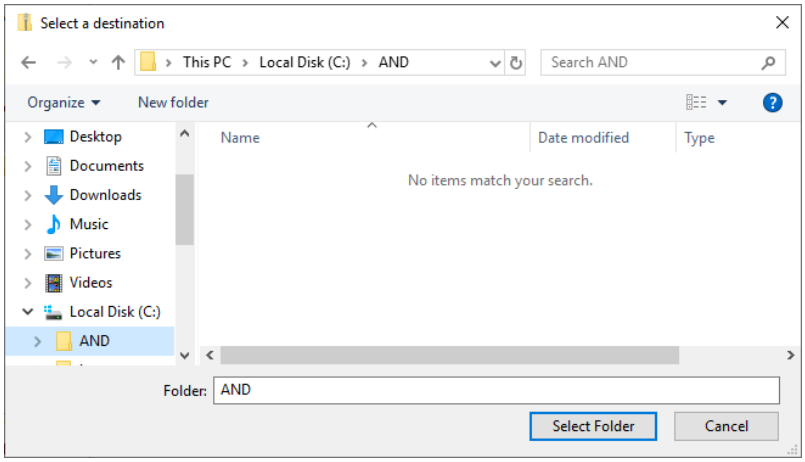
Use the standard software of Windows 10 or your favorite zip file compression/extraction software to extract the file.
The procedure for using the standard software of Windows 10 is indicated below.
Right-click the zip file in Explorer and select [Extract All].



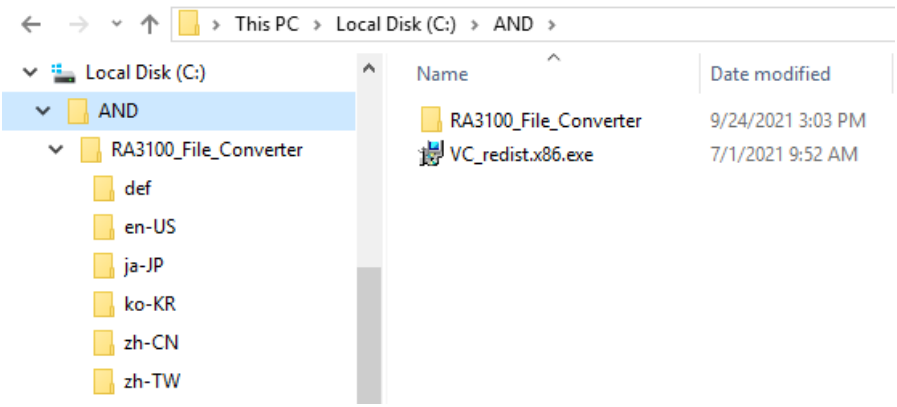
The [Extract Compressed (Zipped) Folders] screen is displayed.



Enter a path in the area indicated by the red box or click the [Browse] button to specify the destination.



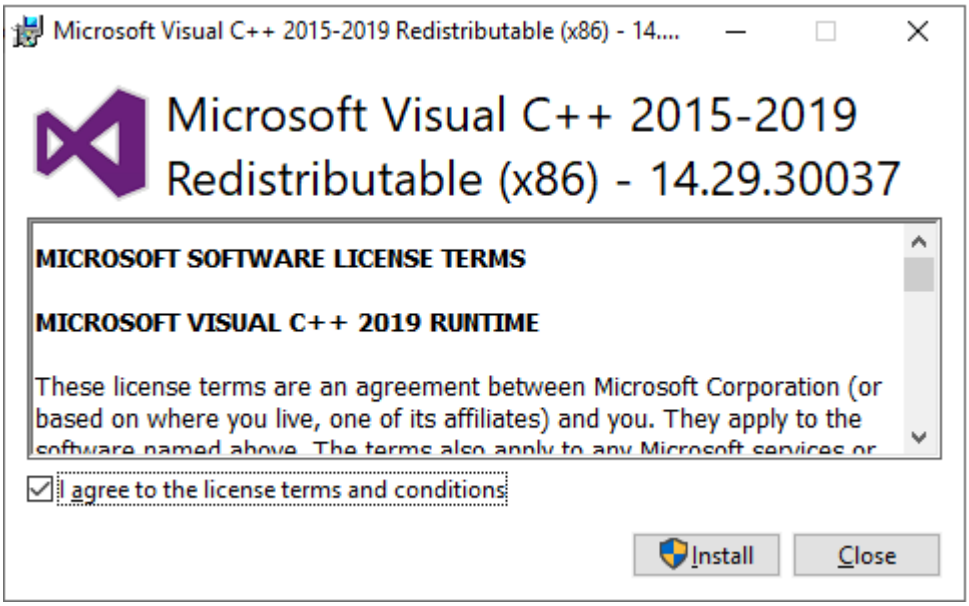
Click [Extract] to extract the file.



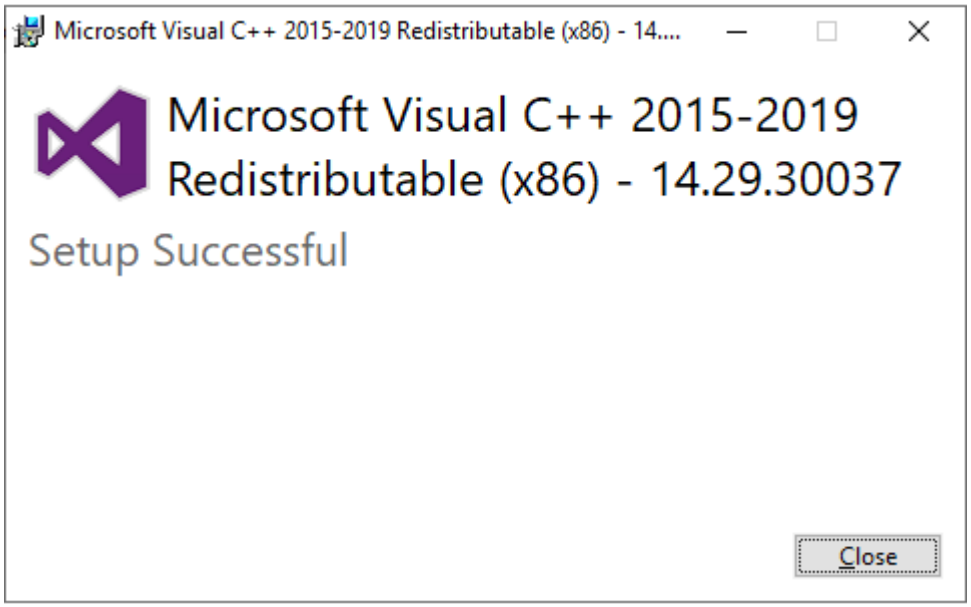
1.2.3. Installing the Microsoft Visual C++ Redistributable

Double-click the "VC_redist.x86.exe" file.
The exe file is included in the zip file. See "1.2.1 Zip File" and "1.2.2 Extracting the Zip File".

Select [I agree to the license terms and conditions] and click the [Install] button.



The program installation starts. Wait until the installation is complete.
Click the [Close] button to conclude the installation process.



2. Function

The software converts a recorded data file of the RA3100 (in dedicated binary format) into the CSV file (text) or ASAM MDF (Ver. 4.1) format.
The conversion process is performed on multiple data files in multiple recording folders specified for a single conversion execution command. You can specify a sampling range instead of processing all the recorded data, perform decimation, and merge PRINTER, SSD recording, and MEMORY recorded data.

2.1. Decimation Process

The decimation point is determined from the "PRINTER/SSD/MEMORY start point", "PRINTER/SSD/MEMORY end point", and "PRINTER/SSD/MEMORY decimation factors" settings.

For information on the settings and procedure, see "3. Usage Method".

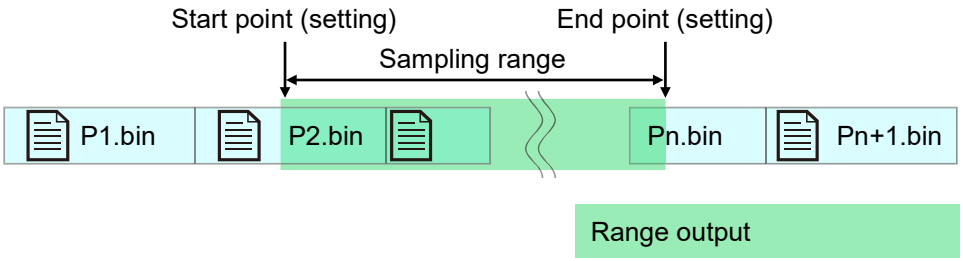
The points where triggers occur may not be output because Status (Trigger, Mark) is also decimated in a simple manner.
Antialiasing filtering is not performed with this process.
An example of the decimation process is indicated in the table below. Cells with "x" are not output to the conversion file.

	Measurement value	Decimation factor 1	Decimation factor 3
Start point	1	1	1
	2	2	x
	3	3	x
	4	4	4
	5	5	x
	6	6	x
	7	7	7
End point	8	8	x

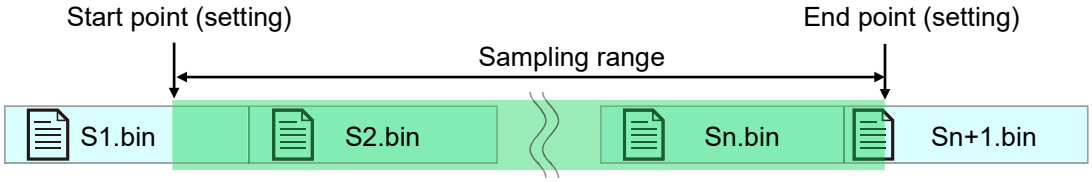
2.2. Date Range Sampling Process

The printer recording and SSD recording process of the RA3100 automatically divides recorded files into multiple files when recording is performed for an extended period of time, but a range can be specified as a start point and end point from the start of recording, even if the range spans over multiple files.

PRINTER Recording

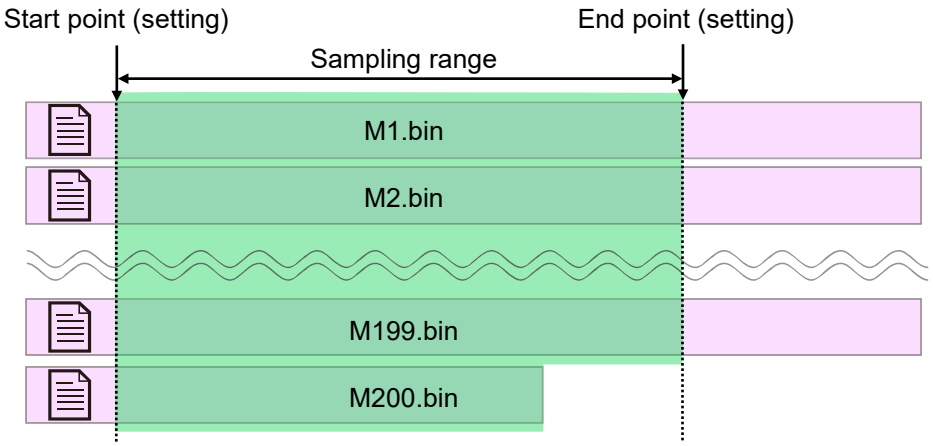


SSD Recording



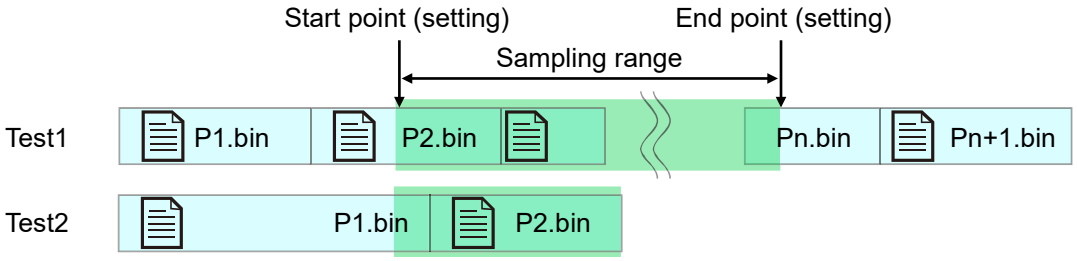
MEMORY Recording

For memory recording, a file is created for each block division.



Regarding the sampling range when multiple recording folders of different recording times are specified

The example below is for PRINTER, but the same applies for SSD and MEMORY.

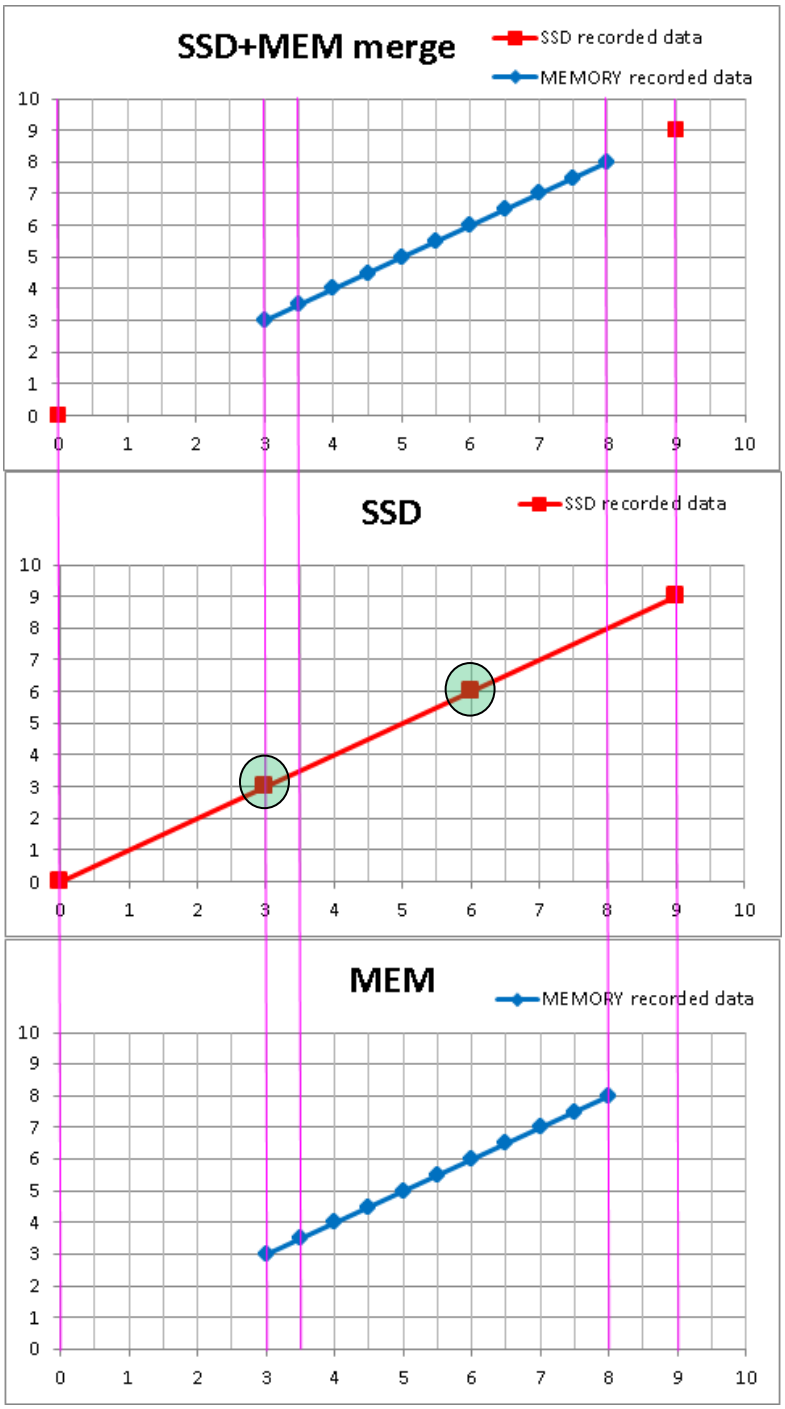


Test3 No recorded data (only header output)

2.3. Data Merging Process

This function merges MEMORY recording with SSD recording or PRINTER recording into single channel of data.
If only one of the recording files to merge exist, regular conversion (without data merging) is performed.
The data is merged after the decimation process.

The simplest analog channel data is indicated in the figure.

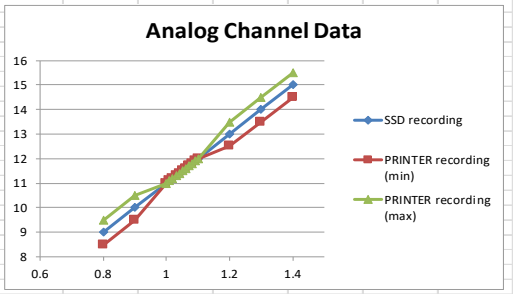


A sample of the analog data. (When the conversion range is 0 to 10 and SSD+MEMORY data merging is performed) The top waveform is the merged data after file conversion, the middle is the SSD recorded data, and the bottom is the MEMORY recorded data. With SSD recording (Normal), the data that is discarded has the same values as the data for MEMORY recording.

2.3.1. Analog Channel (Normal/P-P) Data Merging

SSD recording	PRINTER recording (min)	PRINTER recording (max)	MEMORY recording
1	0.5	1.5	
2	1.5	2.5	
3	2.5	3.5	
4	3.5	4.5	
5	4.5	5.5	
6	5.5	6.5	
7	6.5	7.5	
8	7.5	8.5	
9	8.5	9.5	
10	9.5	10.5	
11	10.5	11.5	11
			11.1
			11.2
			11.3
			11.4
			11.5
			11.6
			11.7
			11.8
			11.9
12	12.4	13.4	12
13	12.5	13.5	
14	13.5	14.5	
15	14.5	15.5	
16	15.5	16.5	
17	16.5	17.5	
18	17.5	18.5	
19	18.5	19.5	

Time	SSD recording	PRINTER recording (min)	PRINTER recording (max)
0	1	0.5	1.5
0.1	2	1.5	2.5
0.2	3	2.5	3.5
0.3	4	3.5	4.5
0.4	5	4.5	5.5
0.5	6	5.5	6.5
0.6	7	6.5	7.5
0.7	8	7.5	8.5
0.8	9	8.5	9.5
0.9	10	9.5	10.5
1	11	11	11
1.01	11.1	11.1	11.1
1.02	11.2	11.2	11.2
1.03	11.3	11.3	11.3
1.04	11.4	11.4	11.4
1.05	11.5	11.5	11.5
1.06	11.6	11.6	11.6
1.07	11.7	11.7	11.7
1.08	11.8	11.8	11.8
1.09	11.9	11.9	11.9
1.1	12	12	12
1.2	13	12.5	13.5
1.3	14	13.5	14.5
1.4	15	14.5	15.5
1.5	16	15.5	16.5
1.6	17	16.5	17.5
1.7	18	17.5	18.5
1.8	19	18.5	19.5

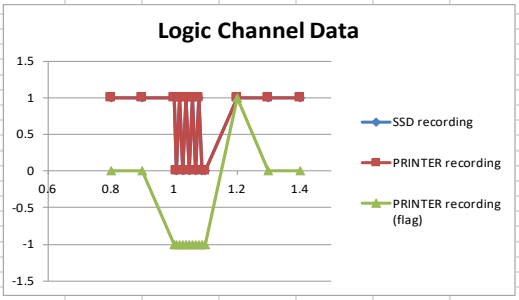


An example of merging Normal and P-P (Min/Max). For P-P, the same MEMORY recorded data is merged for both Min and Max.

2.3.2. Logic Channel (Normal/P-P) Data Merging

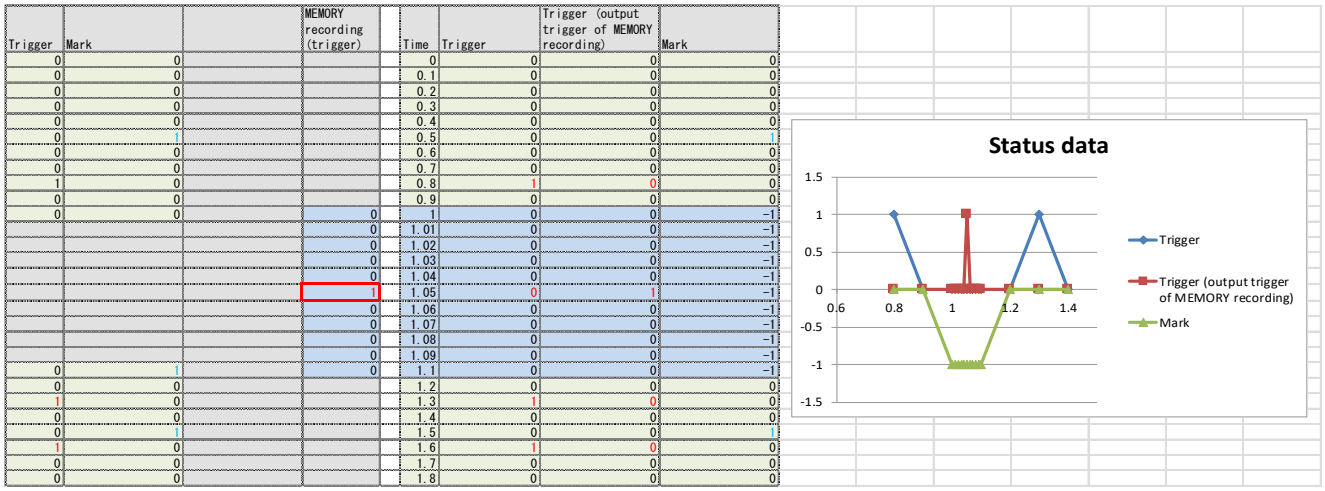
SSD recording	PRINTER recording	PRINTER recording (flag)	MEMORY recording
0	0	0	
0	0	0	
0	0	0	
0	0	0	
0	0	0	
1	1	1	
1	1	0	
1	1	0	
1	1	0	
1	1	0	
1	1	0	1
			0
			1
			0
			1
			0
			1
			0
			1
			0
1	1	1	0
1	1	1	
1	1	0	
1	1	0	
1	1	0	
1	1	0	
0	0	0	
0	0	0	

Time	SSD recording	PRINTER recording	PRINTER recording (flag)
0	0	0	0
0.1	0	0	0
0.2	0	0	0
0.3	0	0	0
0.4	0	0	0
0.5	1	1	1
0.6	1	1	0
0.7	1	1	0
0.8	1	1	0
0.9	1	1	0
1	1	1	-1
1.01	0	0	-1
1.02	1	1	-1
1.03	0	0	-1
1.04	1	1	-1
1.05	0	0	-1
1.06	1	1	-1
1.07	0	0	-1
1.08	1	1	-1
1.09	0	0	-1
1.1	0	0	-1
1.2	1	1	1
1.3	1	1	0
1.4	1	1	0
1.5	1	1	0
1.6	1	1	0
1.7	0	0	0
1.8	0	0	0



An example of merging Normal and P-P (Level/Flag). For P-P, the value of MEMORY recording is copied to Level and Flag is set to -1 (undefined).

2.3.3. Status (Trigger/Mark) Data Merging



Trigger	Mark		MEMORY recording (trigger)	Time	Trigger	Trigger (output trigger of MEMORY recording)	Mark
0	0			0	0	0	0
0	0			0.1	0	0	0
0	0			0.2	0	0	0
0	0			0.3	0	0	0
0	0			0.4	0	0	0
0	1			0.5	0	0	1
0	0			0.6	0	0	0
0	0			0.7	0	0	0
1	0			0.8	1	0	0
0	0			0.9	0	0	0
0	0		0	1	0	0	-1
			0	1.01	0	0	-1
			0	1.02	0	0	-1
			0	1.03	0	0	-1
			0	1.04	0	0	-1
			1	1.05	0	1	-1
			0	1.06	0	0	-1
			0	1.07	0	0	-1
			0	1.08	0	0	-1
			0	1.09	0	0	-1
0	1		0	1.1	0	0	-1
0	0			1.2	0	0	0
1	0			1.3	1	0	0
0	0			1.4	0	0	0
0	1			1.5	0	0	1
1	0			1.6	1	0	0
0	0			1.7	0	0	0
0	0			1.8	0	0	0

The value is 1 when a trigger occurs or 0 otherwise.
PRINTER, SSD, and MEMORY recorded data includes data on triggers that occur.
If the sampling speed of the MEMORY recorded data differs from that of the SSD recorded (PRINTER recorded) data, the time that the recorded Status (Trigger) occurs may differ.
You can switch between outputting the Status (Trigger) of the SSD recording (PRINTER recording) data or MEMORY recording data.

The data will all be set to -1 (undefined) because MEMORY recording does not have Mark data.

2.4. Windows Illegal Character Replacement

Illegal characters in Windows (/ ? < > \ : * | ") that are contained in recording names on RA3100 are replaced with those specified in the "Replacing characters of illegal characters" setting on the [Setup] screen (3.5.5. Setup button (display [Setup] screen)).

<Character replacement>

Setting	Replacement character
Double-byte character	UTF-8 double-byte character (as shown in the following <Double-byte character replacement> table)
Space	Single-byte space
Delete	Deletes illegal characters

<Double-byte character replacement>

Illegal character	UTF-8 double-byte character	UTF-8 code
/	／	EF BC 8F
?	？	EF BC 9F
<	＜	EF BC 9C
>	＞	EF BC 9E
\	￥	EF BF A5
:	：	EF BC 9A
*	＊	EF BC 8A
|	｜	EF BD 9C
"	＂	EF BC 82

3. Usage Method

3.1. Flow of Operations

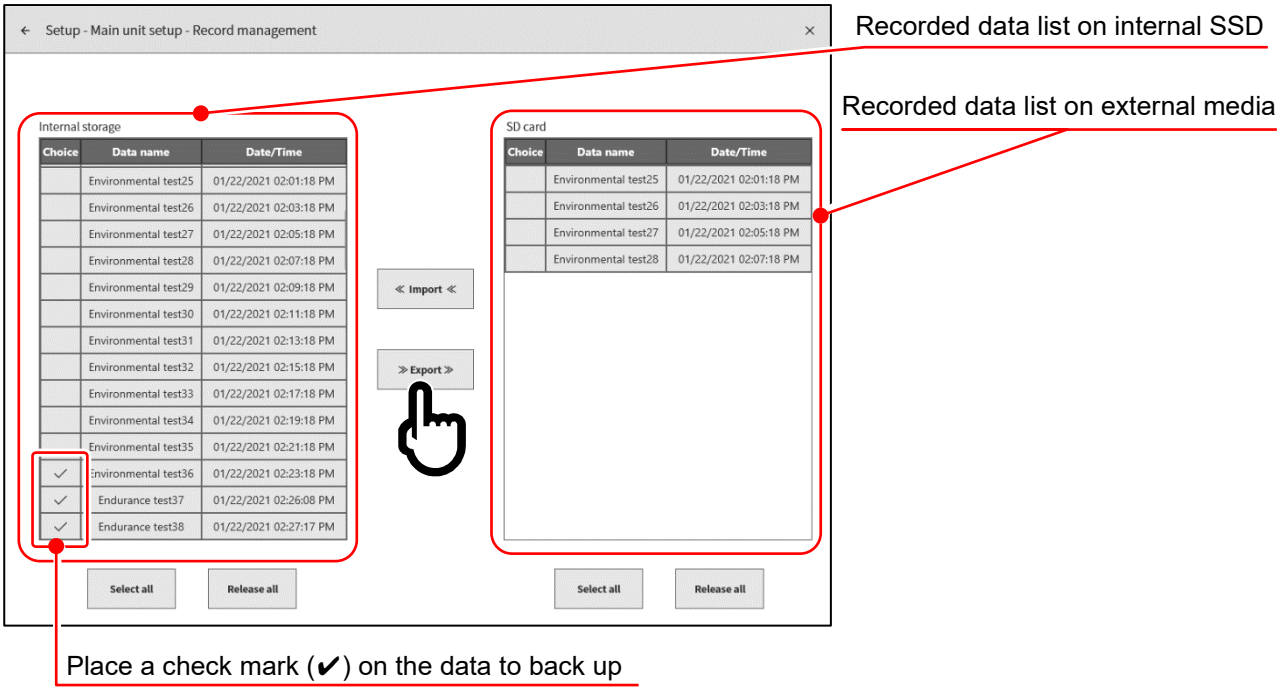
	Overview	Reference
Operation (1)	Copy the specified recording folder to USB memory or an SD memory card on the dedicated operation screen.	"3.2. Copying Recorded Data from the RA3100 to USB Memory"
Operation (2)	The operator inserts USB memory or an SD memory card into a Windows computer and manually copies the RA3100 folder in Explorer. Conversion can also be performed directly from the USB memory without copying the folder.	"3.3. Copying Recorded Data on USB Memory to a Windows Computer"
Operation (3)	Start the software and perform the various setting operations.	"3.4. Starting the Software"
Operation (4)	Execute conversion. After conversion, a sub folder with the name "recording folder + date/time recorded" is created in the destination root folder specified by the operator, and all files are output to that folder.	"3.5. Configuring Settings and Executing File Conversion"

3.2. Copying Recorded Data from the RA3100 to USB Memory

Connect the external media (SD memory card or USB memory, etc.) to "3.2.1. RA3100 main unit".

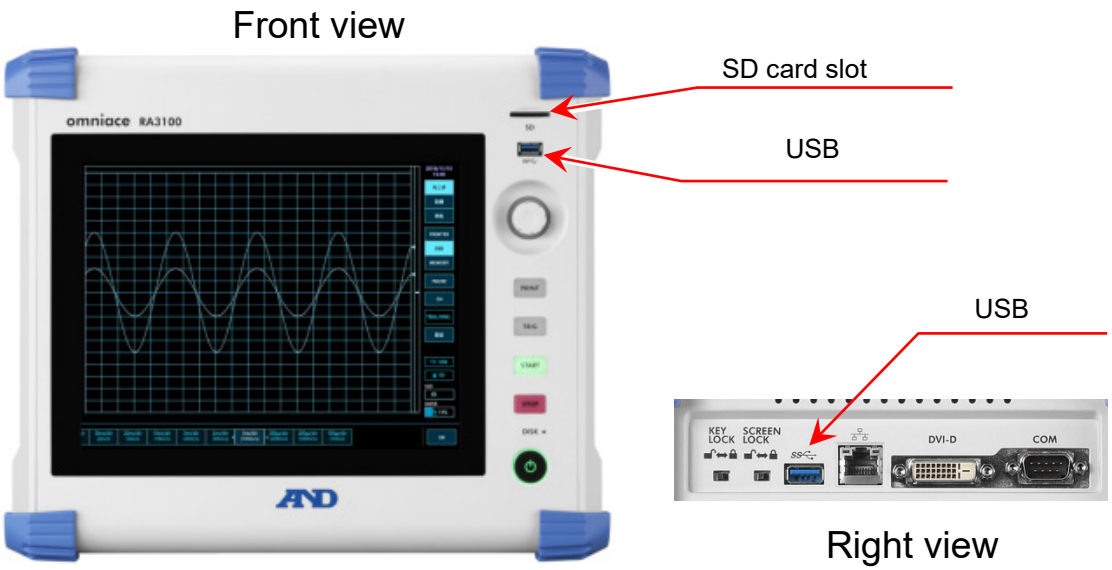
Tap the 【Import】/【Export】 key on the bottom right of the [Records management] screen to display the external media selection dialog and select the target external media.

Tap 【OK】 to switch to the [Import/Export] screen.



Place a check mark (✔) in the selection field of the data to back up and tap the【Export】key in the center to export the recorded data.

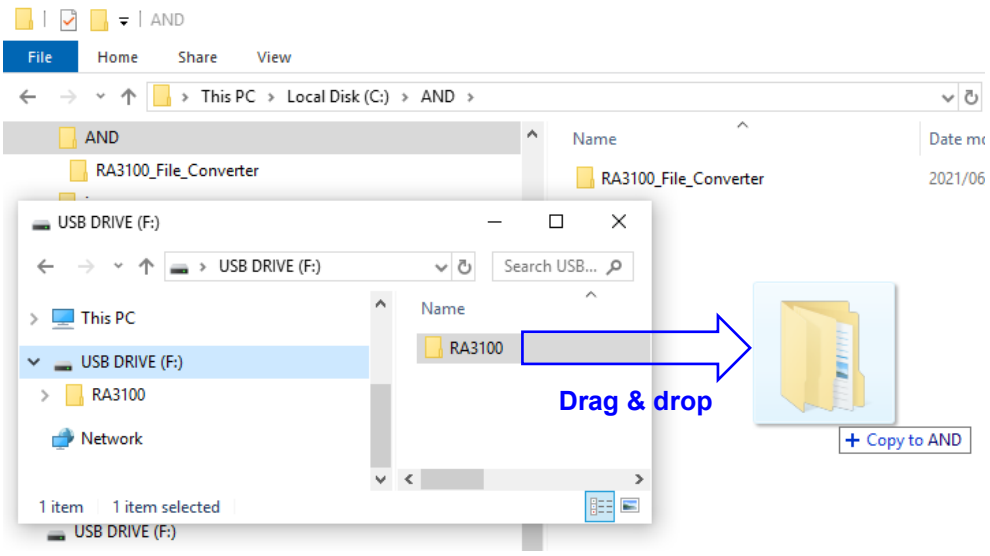
3.2.1. RA3100 main unit



3.3. Copying Recorded Data on USB Memory to a Windows Computer

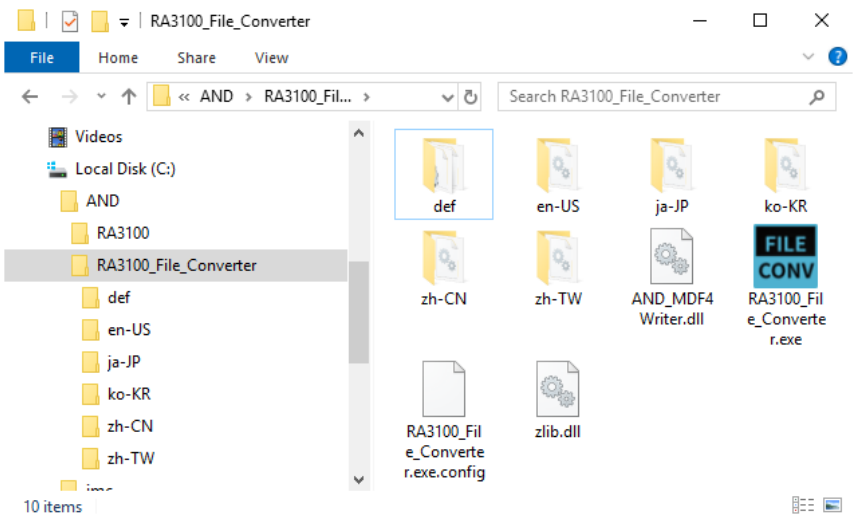
Connect the USB memory or SD card copied to in "3.2. Copying Recorded Data from the RA3100 to USB Memory" to a Windows computer.

Copy the **entire "RA3100" folder** on the USB memory or SD card to the local disk in Explorer.

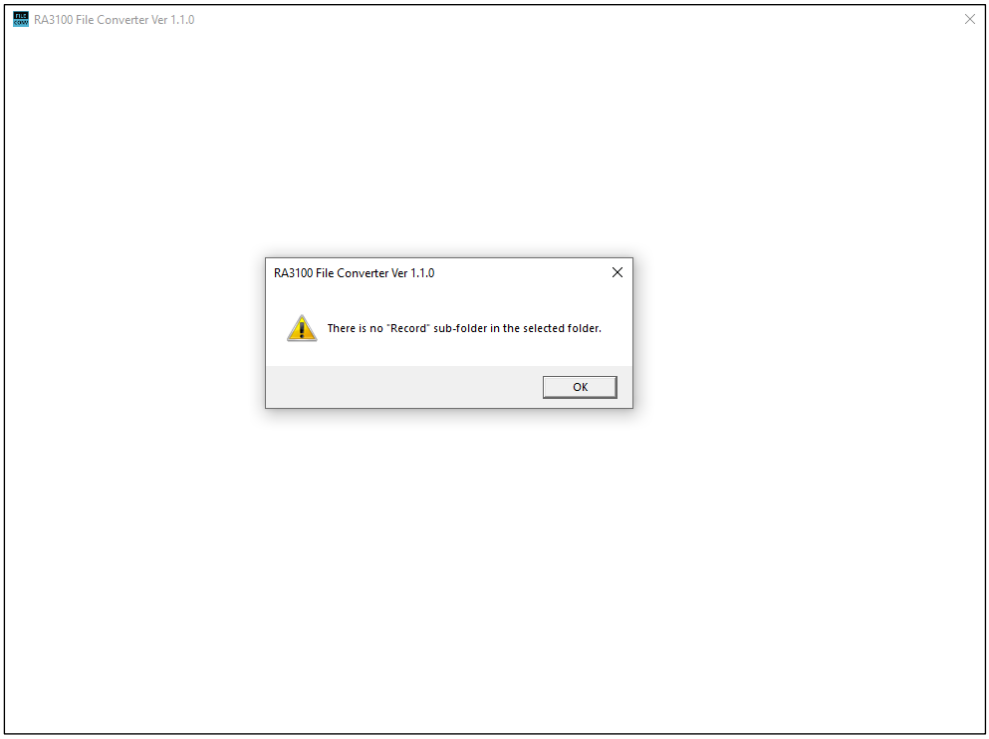


3.4. Starting the Software

Double-click the "RA3100_File_Converter.exe" icon copied in "1.2. Installation and Setup".



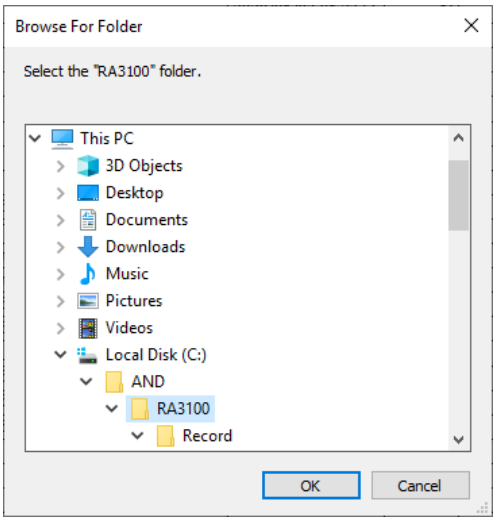
The [Main] screen is displayed. When a recording folder is not selected (when starting the software for the first time), the [There is no "Record" sub-folder in the selected folder.] dialog is displayed. Press the OK button.



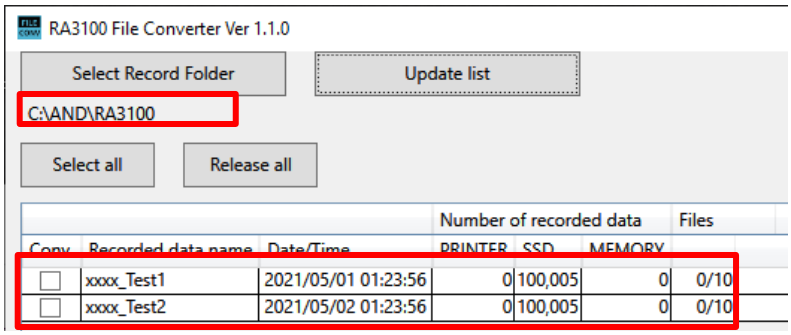
3.5. Configuring Settings and Executing File Conversion

3.5.1. Select Record Folder Button

Press the Select Record Folder button to display the dialog for selecting a folder.

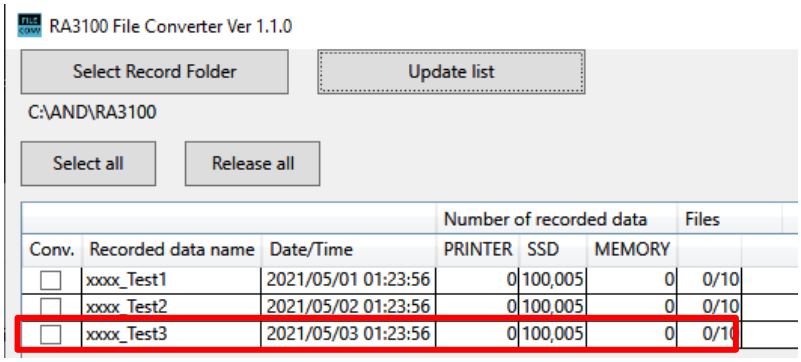


Select the RA3100 folder, and press the OK button. The selected path is displayed below the Select Record Folder button, and the name and date/time of the recorded data in the Record sub folder are displayed in a list.



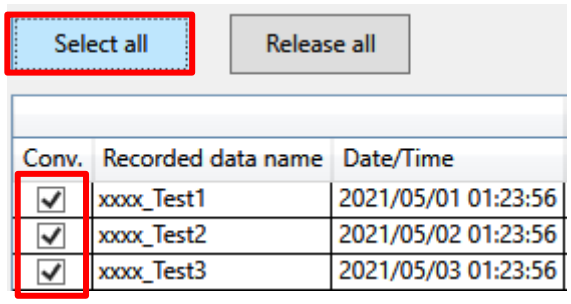
3.5.2. Update list button

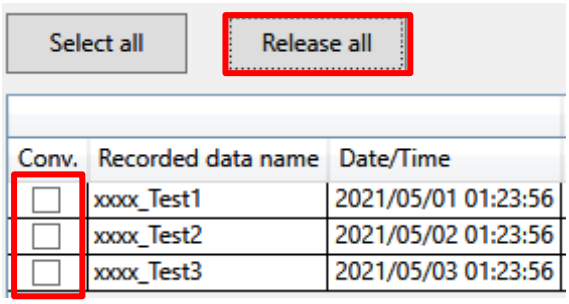
Press the Update list button after adding or deleting a recording folder in Explorer to update the list. The image below indicates the result after adding the "202105030123560001" folder (with recording name "xxxx_Test3").



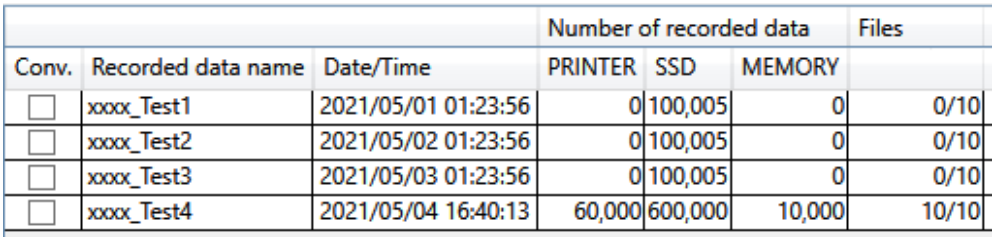
3.5.3. Select all button and Release all button

Press the Select all button to select [Conv.] and the Release all button to deselect [Conv.].





3.5.4. Recording List View and Recorded Data Conversion Settings



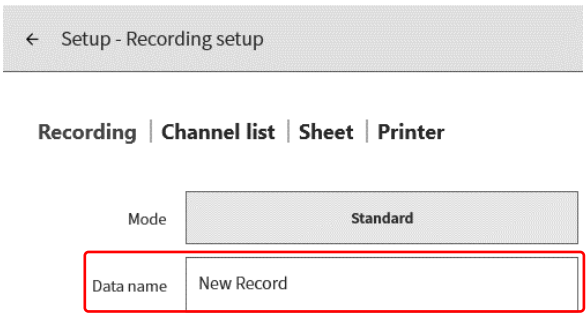
			Number of recorded data			Files
Conv.	Recorded data name	Date/Time	PRINTER	SSD	MEMORY	
☐	xxxx_Test1	2021/05/01 01:23:56	0	100,005	0	0/10
☐	xxxx_Test2	2021/05/02 01:23:56	0	100,005	0	0/10
☐	xxxx_Test3	2021/05/03 01:23:56	0	100,005	0	0/10
☐	xxxx_Test4	2021/05/04 16:40:13	60,000	600,000	10,000	10/10

Conv.

Processing is performed for all items with this check box selected when the [Conversion] button is pressed on the [Main] screen.

Recorded data name

Displays the recording name (indicated in red in the image below) set when recording with the RA3100. However, if the recording name contains any Windows illegal characters, it is modified as described in "Windows Illegal Character Replacement".



Date/Time

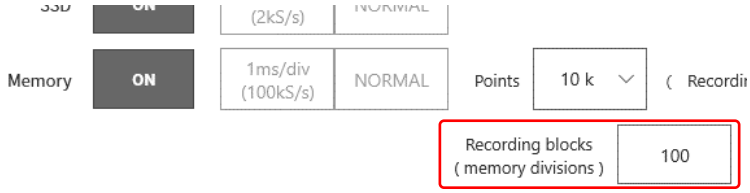
Displays the recorded date/time. This display function is for the purpose of assisting data selection.

Number of recorded data

Displays the number of points recorded for PRINTER/SSD/MEMORY. 0 indicates that the recording setup is OFF.

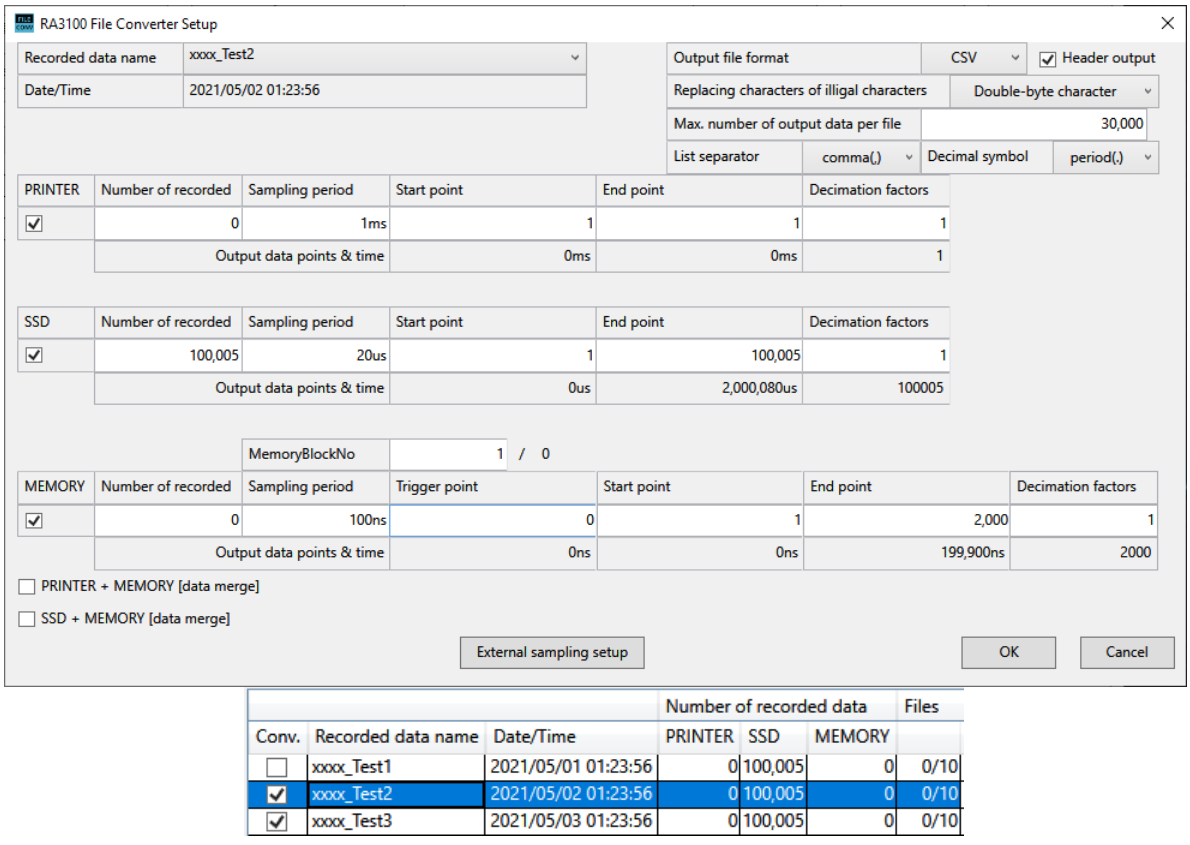
Files

The number of files (blocks) for MEMORY. The numerator indicates the number of recorded blocks and the denominator indicates the maximum number of recording blocks.



3.5.5. Setup button (display [Setup] screen)

Press the Setup button to open the [Setup] screen. The item selected in the recording list on the [Main] screen is set in the [Recorded data name] combo box of the [Setup] screen.



OK button

Closes the [Setup] screen with the setting values retained.

Cancel button

Closes the [Setup] screen with the setting values discarded.

External sampling setup button

Displays the [External sampling setup] screen.

See "3.5.6. External sampling setup".

Recorded data name

All the items displayed in the recording list on the [Main] screen are combo box choices here. When the recording name is switched, the recording date/time, recorded data count, sampling period, sampling time, output data count, and memory block count information is updated.

Output file format

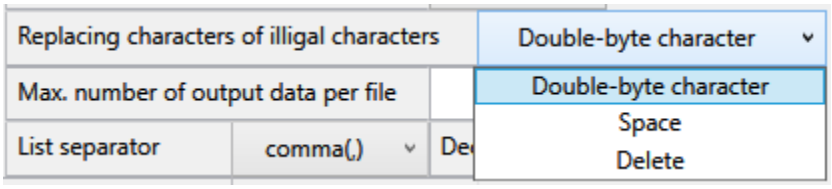
Select CSV or MDF. MDF is ASAM MDF version 4.1.

Header output

The [Header output] check box is displayed if [Output file format] is set to [CSV]. If the check box is selected (header output is enabled), the recording conditions, module setting conditions, and other information are output to the file. See "4.1 Output Format".

Replacing characters of illegal characters

Names of files such as CSV are derived from the recording name on RA3100. If the recording name contains any Windows illegal characters, they are replaced with the selected characters. See "2.4. Windows Illegal Character Replacement for RA3100 recording names".

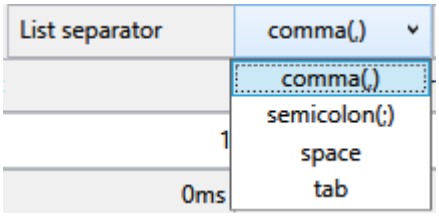


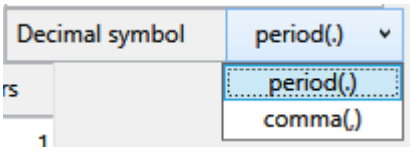
Max. number of output data per file

Set the upper limit for the data (number of lines) to output to the CSV file.

List separator / Decimal symbol

Set the list separator and decimal symbol if the file is a CSV file.





List separator	Decimal symbol	Example
comma(,)	period(.)	1.23456E+00,1.23456E+00
semicolon(;)	comma(,)	1,23456E+00;1,23456E+00

PRINTER/SSD/MEMORY check box

Select the target to process. File conversion is not performed if the selected recorded data does not exist.

PRINTER/SSD/MEMORY start point

Set the start point for the data to output to the CSV file. The first point recorded to the file is point 1.

PRINTER/SSD/MEMORY end point

Set the end point for the data to output to the CSV file.

PRINTER/SSD/MEMORY decimation factors

The data from the start point to the end point is decimated by the value set here. A decimation factor of 1 means that decimation is not performed.

See "2.1. Decimation Process".

MemoryBlockNo and Trigger point

Displays the trigger point of the set MemoryBlockNo.

Sampling period and Output data points & time

The time is displayed below the various points (such as the start point) and the output data count is displayed below the decimation factor.

PRINTER + MEMORY [data merge] check box

Select to merge PRINTER data and MEMORY data. File conversion is not performed if the selected recorded data does not exist.

See "2.3. Data Merging Process".

SSD + MEMORY [data merge] check box

Select to merge SSD data and MEMORY data. File conversion is not performed if the selected recorded data does not exist.

See "2.3. Data Merging Process".

Trigger info

Select [MEMORY] or [PRINTER/SSD] as the trigger information to output when merging data.
[MEMORY] generates Status(Trigger) from the trigger information of MEMORY recording and [PRINTER/SSD] outputs Status(Trigger/Mark) of PRINTER recording or SSD recording to a file.

Output file format

Select CSV or MDF. MDF is ASAM MDF version 4.1.

3.5.6. External sampling setup

Press the External sampling setup button on the [Setup] screen to display the [External sampling setup] screen.
This setting converts the output values of the X axis data for external sampling to a time, angle, and distance.

See "3.5.5. Setup button (display [Setup] screen)".

ΔX

Set the sampling interval. For external sampling data, X data is generated and output with this setting.
The Index X axis type is disabled.

X axis unit

Enter the unit name. Maximum 10 characters. MDF supports a maximum of 8 bytes. The extra characters are discarded during MDF conversion.
This setting is output for external sampling data. The Index X axis type is disabled.

X axis type

Select Index, Time, Angle, or Distance. This is used for external sampling data. The signal name is "Point" when Index and CSV are selected.

OK button

Closes the screen with the setting values retained.

Cancel button

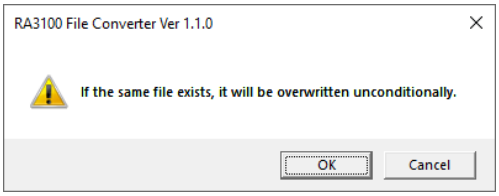
Closes the screen with the setting values discarded.

3.5.7. Conversion button

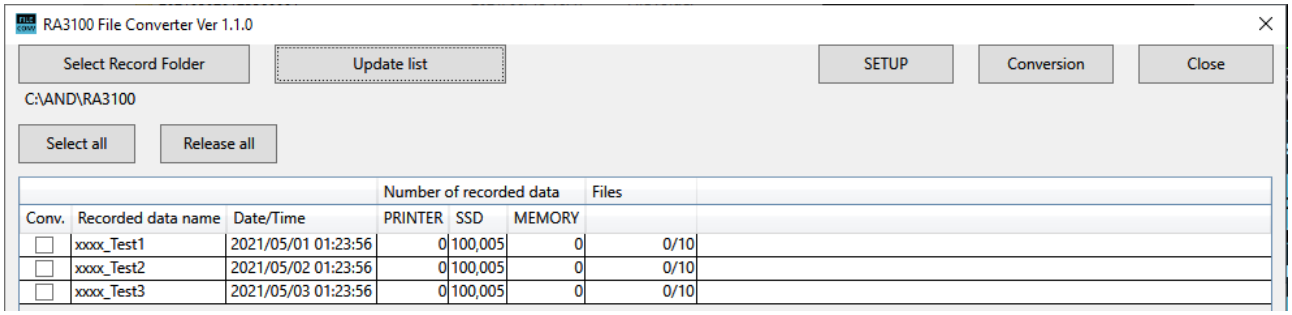
File conversion is performed by performing "2.2. Date Range Sampling Process" and "2.1. Decimation Process" on all the recorded data for conversion (with Conversion selected on the [Main] screen) according to the settings in "3.5.5. Setup button (display [Setup] screen)". The [Progress] screen (progress indicator) is displayed while processing. Press the Stop button to stop processing. Press the OK button to open Explorer After Conversion (the parent folder of the output file).

NOTE

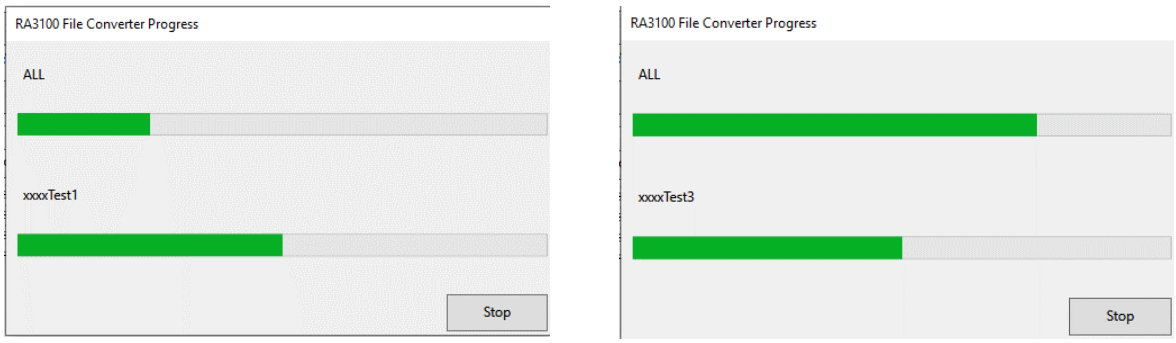
- If a folder with the same name exists in the destination, the file overwrite confirmation screen is displayed. Press the OK button to overwrite. This cannot be undone.



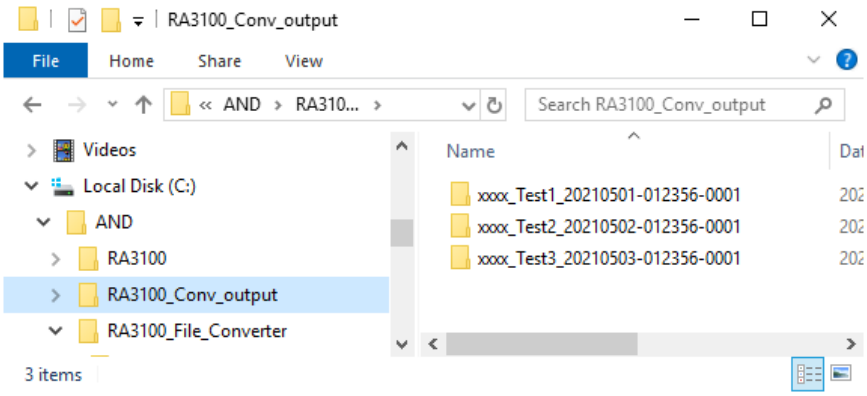
In the example below, three items of recorded data are set for conversion.



[Progress] screen



Explorer After Conversion



3.5.8. Stop button

Closes the [Main] screen. The last setting values are saved to the settings file. A separate settings file is saved for each Windows login user.

4. CSV File Format

4.1. Output Format

The output format differs depending on the [Header output] setting. CH names and recorded data are output. If header output is enabled, the header is added.

		Header output enabled	Header output disabled
Header	Record info (fixed to 10 lines)	○	×
	CH info (fixed to 37 lines)	○	×
Data	CH names (fixed to 1 line) Recorded data (number of lines equal to the sample count)	○	○

4.2. Recorded information ([Recorded Info] category)

Index	Recording info	Output name	Example output value
1	Computer name (set by default)	Name	RA3100-01
2	Serial number (set by default)	S/N	3600000
3	Software version when recorded	Version	Ver.1.1.0
4	Recording name	Record Title	xxxx_Test1
5	Recording date/time	Record Time	2021/05/01 15:44:38
6	MEMORY, SSD, PRINTER, SSD+MEMORY, PRINTER+MEMORY	Record Type	MEMORY
7	Sampling period	Sampling	50ns
8	Normal or P-P	Data Type	Normal
9	Trigger time from start of recording However, blank for PRINTER and SSD.	TriggeredTime	20000ns

4.2.1. Example output

[Record Info]
Name,RA3100-01
S/N,3600000
Version,1.0.0
Record Title, xxxx_Test1
Record Time, 2021/05/01 15:44:38
Record Type,MEMORY
Sampling,50ns
Data Type,Normal
TriggeredTime,20000ns

4.3. Channel information ([CH Info] category)

Fixed to 4 channels per slot and output fixed to an area with a total of 36 lines x 5 columns

Format: "S1-CH1", type, signal name, ON/OFF, module (CH) specific information
(1) (2) (3) (4) (5)

Column number	Item name	Column number
(1)	Channel number	***Sm-CHn*** ***m***-: 1 to 9 (slot number) ***n***: 1 to 4 (channel number)
(2)	Module type	Example: RA30-101
(3)	Signal name	Example: Signal 1
(4)	ActiveCh	OFF, ON (Active)
(5)	Module (CH) specific information	Output to one cell

(2) to (5) are blank for a channel that does not exist.

Example output

[CH Info]
S1-CH1,RA30-101,SIG-AA,ON, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF] [A.A.F.=OFF]
S1-CH2,RA30-101,SIG-AB,OFF, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF] [A.A.F.=OFF]
S1-CH3,,,
S1-CH4,,,
S2-CH1,RA30-102,SIG-BA, OFF, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=200V] [COUPLING=DC] [L.P.F.=OFF]
S2-CH2,RA30-102,SIG-BB, ON, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=200V] [COUPLING=DC] [L.P.F.= 30Hz]
S2-CH3,RA30-102,, ON, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=200V] [COUPLING=DC] [L.P.F.= 30Hz]
S2-CH4,RA30-102,, ON, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=200V] [COUPLING=DC] [L.P.F.= 30Hz]
S3-CH1,RA30-103,SIG-AA,ON, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF]
S3-CH2,RA30-103,SIG-AB,OFF, [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF]
S3-CH3,,,
S3-CH4,,,
S4-CH1, RA30-105,L1, ON,[FORM=VOLT] [THRESHOLD=2.5V]
S4-CH2, RA30-105,, OFF,[FORM=CONTACT] [THRESHOLD=5kOhm]
S4-CH3,,,OFF
S4-CH4,,,OFF
S5-CH1,RA30-106,SIG-AA,ON, [GAIN=1] [OFFSET=0] [WaveINV=ON] [TYPE=K] [RANGE=HIGH] [UPDATE=NORMAL] [RJC=INT] [OpenDetect=OFF]
S5-CH2,RA30-106,SIG-AB,OFF, [GAIN=1] [OFFSET=0] [WaveINV=ON] [TYPE=K] [RANGE=HIGH] [UPDATE=NORMAL] [RJC=INT] [OpenDetect=OFF]

S5-CH3,,,
S5-CH4,,,
S9-CH1,RA30-112,,OFF,[RESP=NORMAL] [LIMIT=LOW] [OSC=INT] [TRIG=START]
[TRIG/EXT.1=TRIG] [OSC/EXT.2=EXT.2] [EXT.1=---] [EXT.2=7]
S9-CH2,,,
S9-CH3,,,
S9-CH4,,,

4.3.1. Module specific information

Product number	Output text	
RA30-101	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Waveform inversion***] [***Measurement range***] [***Coupling***] [***Low pass filter***] [***Antialiasing filter***] Example: [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF] [A.A.F.=OFF]	
	GAIN [physical value conversion]	Physical value conversion factor
	OFFSET [physical value conversion]	
	WaveINV [Waveform inversion]	ON, OFF
	RANGE [measurement range]	100 mV to 500 V (1-2-5 step)
	COUPLING [coupling]	DC, GND, AC
	L.P.F. [low-pass filter]	3 Hz, 30 Hz, 300 Hz, 3 kHz, OFF
	A.A.F. [anti-aliasing filter]	ON, OFF
RA30-102	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Waveform inversion***] [***Measurement range***] [***Coupling***] [***Low pass filter***] Example: [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=200V] [COUPLING=DC] [L.P.F.=OFF]	
	GAIN [physical value conversion]	Physical value conversion factor
	OFFSET [physical value conversion]	
	WaveINV [Waveform inversion]	ON, OFF
	RANGE [measurement range]	1 mV to 200 V (1-2-5 step)
	COUPLING [coupling]	DC, GND
	L.P.F. [low-pass filter]	3 Hz, 30 Hz, 300 Hz, 3 kHz, OFF
RA30-103	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Waveform inversion***] [***Measurement range***] [***Coupling***] [***Low pass filter***] Example: [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=200V] [COUPLING=DC] [L.P.F.=OFF]	
	GAIN [physical value conversion]	Physical value conversion factor
	OFFSET [physical value conversion]	
	WaveINV [Waveform inversion]	ON, OFF
	RANGE [measurement range]	100 mV to 500 V (1-2-5 step)
	COUPLING [coupling]	DC, GND, AC
	L.P.F. [low-pass filter]	5 Hz, 50 kHz, 500 kHz, OFF

Product number	Output text	
RA30-104	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Waveform inversion***] [***Measurement range***] **[*Bridge voltage*]** [***Coupling***] [***Low-pass filter***] **[*CALvalue*]** Example:[GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500με] [B.V.=2Vrms] [COUPLING=STRAIN] [L.P.F.=OFF] [CAL=0με]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	WaveINV [Waveform inversion]	ON, OFF
	RANGE [Measurement range]	[If B.V.=2Vrms] 500, 1000, 2000, 5000, 10000, 20000με [If B.V.=0.5Vrms] 2000, 4000, 8000, 20000, 40000, 80000με
	B.V. [Bridge voltage]	0.5Vrms, 2Vrms
	COUPLING [Coupling]	STRAIN, GND
	L.P.F. [Low-pass filter]	10Hz, 30Hz, 100Hz, 300Hz, OFF
	CAL[CAL value]	CAL value

Product number	Output text	
RA30-105	[***Input format***] [***Threshold***] Example: [FORM=VOLT] [THRESHOLD=2.5V]	
	FORM [Input format]	VOLT, CONTACT
	THRESHOLD [Threshold]	1.4 V, 2.5 V, 4.0 V, 2 kOhm, 5 kOhm, 9 kOhm

For the "4.3. Channel information ([CH Info] category)" of the RA30-105, CHA is output to CH1 and CHB is output to CH2.

Product number	Output text	
RA30-106	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Waveform inversion***] [***Type***] [***Measurement range***] [***Data update***] [***Reference junction compensation***] [***LFD***] Example: [GAIN=1] [OFFSET=0] [WaveINV=ON] [TYPE=K] [RANGE=HIGH] [UPDATE=NORMAL] [RJC=INT] [OpenDetect=OFF]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	WaveINV [Waveform inversion]	ON, OFF
	TYPE [Type]	K, E, J, T, N, R, S, B, C, Pt100/0.5 mA, Pt100/1 mA, Pt1000/0.1 mA
	RANGE [Measurement range]	LOW, MIDDLE, HIGH
	UPDATE [Data update]	LOW, NORMAL, HIGH
	RJC [Reference junction compensation]	INT, EXT Blank for RTD.
	OpenDetect [LFD]	ON, OFF Blank for RTD.

Product number	Output text	
RA30-107	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Waveform inversion***] [***Measurement range***] [***Coupling***] [***Low-pass filter***] [***Measurement mode***] [***Response speed***] Example: [GAIN=1] [OFFSET=0] [WaveINV=ON] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF] [MeasMode=DC] [RMS=---]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	WaveINV [Waveform inversion]	ON, OFF
	RANGE [Measurement range]	[If MeasMode=RMS] 2Vrms to 1000Vrms (1-2-5step) [If MeasMode=DC] 2V to 1000V (1-2-5step)
	COUPLING [Coupling]	GND, DC, AC
	L.P.F. [Low-pass filter]	3Hz, 30Hz, 300Hz, 3kHz, 30kHz, OFF
	MeasMode[Measurement mode]	DC, RMS
	RMS[Response speed]	[If MeasMode=RMS] SLOW, MID, FAST [If MeasMode=DC] – – –

Product number	Output text	
RA30-108	For CH3 and CH4	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Coupling***] [***Low-pass filter***] [***THRESHOLD***] [***HYSTERESIS***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Voltage] [RANGE=500V] [COUPLING=DC] [L.P.F.=OFF] [THRESHOLD=5V] [HYSTERESIS=1%]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Voltage
	RANGE [Measurement range]	1V to 500V (1-2-5step)
	COUPLING [Coupling]	GND, DC, AC
	L.P.F. [Low-pass filter]	3Hz, 30Hz, 300Hz, 3kHz, 30kHz, OFF
	THRESHOLD[THRESHOLD]	threshold (V)
	HYSTERESIS[HYSTERESIS]	1 to 10%

Product number	Output text	
RA30-108	For CH1 and CH2 in period measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Period] [RANGE=1ms] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Period
	RANGE [Measurement range]	1ms to 100s (1-2-5step)
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms

Product number	Output text	
RA30-108	For CH1 and CH2 in frequency measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Frequency] [RANGE=200kHz] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Frequency
	RANGE [Measurement range]	2Hz to 200kHz (1-2-5step)
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms

Product number	Output text	
RA30-108	For CH1 and CH2 in rotation speed measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] [***Number of pulses per revolution***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Rotation speed] [RANGE=200krpm] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms] [Pulse/rev=2]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Rotation speed
	RANGE [Measurement range]	10rpm to 1000krpm (1-2-5step)
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms
	Pulse/rev[Number of pulses per revolution]	1 to 100

Product number	Output text	
RA30-108	For CH1 and CH2 in pulse width measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] [***Pulse polarity***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Pulse width] [RANGE=2ms] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms] [PulsePolarity=Positive]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Pulse width
	RANGE [Measurement range]	1ms to 100s (1-2-5step)
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms
	PulsePolarity[Pulse polarity]	Positive, Negative

Product number	Output text	
RA30-108	For CH1 and CH2 in duty cycle measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] [***Pulse polarity***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Duty cycle] [RANGE=100%(20kHz)] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms] [PulsePolarity=Positive]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Duty cycle
	RANGE [Measurement range]	100%(20Hz), 100%(200Hz), 100%(2kHz), 100%(20kHz)
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms
	PulsePolarity[Pulse polarity]	Positive, Negative

Product number	Output text	
RA30-108	For CH1 and CH2 in power frequency measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Power freq.] [RANGE=50Hz] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Power freq.
	RANGE [Measurement range]	50Hz, 60Hz, 400Hz
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms

Product number	Output text	
RA30-108	For CH1 and CH2 in frequency deviation measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Smoothing***] [***Averaging***] [***Response speed***] [***Center frequency***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Freq. deviation] [RANGE=50%] [Smoothing=OFF] [PulseAve=4096] [RESP=0ms] [CenterFreq=10000Hz]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Freq. deviation
	RANGE [Measurement range]	20Hz to 20kHz (1-2-5step)
	Smoothing[Smoothing]	OFF or the smoothing count (if ON)
	PulseAve[Averaging]	OFF or the average number of pulses (if ON)
	RESP[Response speed]	0 to 1000ms
	CenterFreq[Center frequency]	6.6 to 13200Hz

Product number	Output text	
RA30-108	For CH1 and CH2 in pulse count measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Response speed***] [***Pulse polarity***] [***Gate time***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Pulse count] [RANGE=40000] [RESP=0ms] [PulsePolarity=Positive] [GateTime=200ms]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Pulse count
	RANGE [Measurement range]	40000
	RESP[Response speed]	0 to 1000ms
	PulsePolarity[Pulse polarity]	Positive, Negative
	GateTime[Gate time]	200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 30s, 60s

Product number	Output text	
RA30-108	For CH1 and CH2 in pulse integration measurement mode	
	[***Physical value conversion gain***] [***Physical value conversion offset***] [***Measurement mode***] [***Measurement range***] [***Response speed***] [***Pulse polarity***] [***Pulse counter restart***] Example: [GAIN=1] [OFFSET=0] [MeasMode=Pulse integ.] [RANGE=500k] [RESP=0ms] [PulsePolarity=Positive] [PulseCountRestart=Start&Over]	
	GAIN [Physical value conversion]	Physical value conversion factor
	OFFSET [Physical value conversion]	
	MeasMode[Measurement mode]	Pulse integ.
	RANGE [Measurement range]	500k to 2000M (1-2-5step)
	RESP[Response speed]	0 to 1000ms
	PulsePolarity[Pulse polarity]	Positive, Negative
	PulseCountRestart[Pulse counter restart]	OFF, Start, Over, Start&Over

<table>
<tr><th>Product number</th><th colspan="2">Output text</th></tr>
<tr><td rowspan="11">RA30-109</td><td colspan="2">[Physical value conversion gain] [Physical value conversion offset] [Waveform inversion] [Measurement range] [Coupling] [Low pass filter] [Antialiasing filter] [Senser] [sensitivity of transducer] [Gain of charge-converter] [Calculation mode]
Example: [GAIN=1] [OFFSET=0] [WaveINV=ON] [MeasMode=ACCL] [RANGE=50km/s²] [COUPLING=AC] [L.P.F.=OFF] [A.A.F.=OFF] [Senser=Preamp] [Sensitivity=10mV/(m/s²)] [ChargeConvGain=---] [CalcMode=RMS(FAST)]</td></tr>
<tr><td>GAIN [Physical value conversion]</td><td rowspan="2">Physical value conversion factor</td></tr>
<tr><td>OFFSET [Physical value conversion]</td></tr>
<tr><td>WaveINV[Waveform inversion]</td><td>ON, OFF</td></tr>
<tr><td>MeasMode[Measurement mode]</td><td>---, ACCL, VELO, DISP
--- : OFF</td></tr>
<tr><td>RANGE [measurement range]</td><td>[If MeasMode=ACCL]
1m/s² to 50km/s² (1-2-5step)
[If MeasMode=VELO]
10mm/s to 500m/s (1-2-5step)
[If MeasMode=DISP]
100µm to 5m (1-2-5step)</td></tr>
<tr><td>COUPLING [coupling]</td><td>GND, AC</td></tr>
<tr><td>L.P.F. [low-pass filter]</td><td>20Hz, 200Hz, 2kHz, 20kHz, OFF</td></tr>
<tr><td>A.A.F. [anti-aliasing filter]</td><td>ON, OFF</td></tr>
<tr><td>Senser[Senser]</td><td>Preamp, ChargeConv</td></tr>
<tr><td>Sensitivity[sensitivity of transducer]</td><td>[If Senser=Preamp]
mV/(m/s²)
[If Senser=ChargeConv]
pC/(m/s²)</td></tr>
<tr><td>ChargeConvGain[Gain of charge-converter]</td><td>[If Senser=Preamp]

[If Senser=ChargeConv]
0.1mV/pC, 1mV/pC, 10mV/pC</td></tr>
<tr><td>CalcMode[Calculation mode]</td><td>OFF, Envelope, RMS(SLOW) , RMS(MID) , RMS(FAST)</td></tr>
</table>

<table>
<tr><th>Product number</th><th colspan="2">Output text</th></tr>
<tr><td rowspan="10">RA30-112</td><td colspan="2">[Response speed] [External sampling restriction period] [OSC] [TRIG] [TRIG/EXT.1] [OSC/EXT.2] [EXT.1] [EXT.2]
Example: [RESP=NORMAL] [LIMIT=LOW] [OSC=INT] [TRIG=START] [TRIG/EXT.1=TRIG] [OSC/EXT.2=EXT.2] [EXT.1=---] [EXT.2=7]</td></tr>
<tr><td>RESP [response speed]</td><td>LOW, NORMAL, HIGH</td></tr>
<tr><td>LIMIT
[External sampling restriction period]</td><td>LOW, HIGH</td></tr>
<tr><td>OSC</td><td>INT, EXT</td></tr>
<tr><td>TRIG</td><td>OFF, START, MEMORY</td></tr>
<tr><td>TRIG/EXT.1</td><td>TRIG, EXT.1</td></tr>
<tr><td>OSC/EXT.2</td><td>OSC, EXT.2</td></tr>
<tr><td>EXT.1</td><td rowspan="2">[If TRIG/EXT.1=EXT.1], [If OSC/EXT.2=EXT.2]
Output bitwise logical OR as a decimal number.
Bit2: Overrange ON/OFF
Bit1: Printer error ON/OFF
Bit0: System error ON/OFF
[If TRIG/EXT.1=TRIG], [If OSC/EXT.2=OSC]
---</td></tr>
<tr><td>EXT.2</td></tr>
</table>

For the "4.3. Channel information ([CH Info] category)" of the RA30-112, output to CH1.

4.4. Data part ([DATA] category)

The data is structured with channels as columns and samples as lines.
Two values (two columns) are output for each channel when Sampling Data Format (Normal/P-P) is "P-P" and one value (one column) is output for each channel when it is "Normal". The output data count and the meaning of the data also differ according to the recording device (PRINTER, SSD, or MEMORY).

Sampling Data Format (Normal/P-P)

The data formats corresponding to each recording device of the RA3100 are indicated in the table below. "No" indicates that the data format is not supported by the RA3100. SSD is a setting when recording to the RA3100 main unit.

Recording device	Sampling data format	
	Normal	P-P
PRINTER	No	Yes
SSD	Yes	Yes
MEMORY	Yes	No

See "4.4.1. Structure of Data Output".

The first line is the item name, and the subsequent lines are the physical values or voltage values (temperature values).

See "4.4.3. Recorded data name (first line)" and "4.4.4. Output Format of Recorded Data".

Example CSV File

For SSD (Normal) with three items of analog channel data

```
[DATA]
TIME[ms],voltage[V],temperature[°C],pressure[Pa],Trigger,Mark
0,-4.37500E+01,2.12500E+01,0.00000E+00,1,0
5,-3.82813E+01,2.12500E+01,5.15625E+00,0,1
....
```

For PRINTER with one item of analog channel data

```
[DATA]
TIME[ms],voltage[V]-Min,voltage[V]-Max,Trigger,Mark
0,-4.37500E+01,2.12500E+01,1,0
5,-3.82813E+01,2.12500E+01,0,1
....
```

For MEMORY with one item of logic channel data [16ch]

```
[DATA]
TIME[us],DA[1],DA[2],DA[3],DA[4],DA[5],DA[6],DA[7],DA[8],DB[1],DB[2],DB[3],DB[4],DB[5],DB[6],DB[7],DB[8]
0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0
....
```

4.4.1. Structure of Data Output

The output data count (data columns) differ according to the RA30-xxx module configuration, measurement enabled/disabled setting, recording device (PRINTER, SSD, or MEMORY), and sampling data format (Normal/P-P).

See "4.4.2. Data Types and Data Order".

MEMORY

Contains Time Data, Analog Channel Data (Normal) and Logic Channel Data [16ch] (Normal).

SSD (Normal)

Contains Time Data, Analog Channel Data (Normal), Logic Channel Data [16ch] (Normal), and Status.

PRINTER or SSD (P-P)

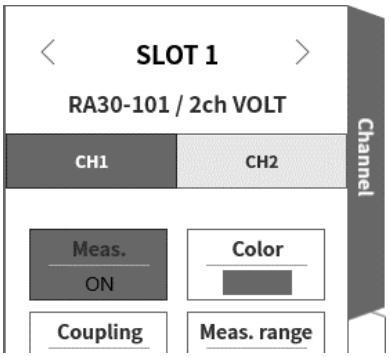
Contains Time Data, Analog Channel Data (P-P), Logic Channel Data [16ch] (P-P), and Status.

4.4.2. Data Types and Data Order

The six data types are Time Data, Analog Channel Data (Normal), Logic Channel Data [16ch] (Normal), Analog Channel Data (P-P), Logic Channel Data [16ch] (P-P), and Status.

The order of the data is time data first, channel data next, then Status last.
Channel data (Analog Channel Data (Normal), Logic Channel Data [16ch] (Normal), Analog Channel Data (P-P), and Logic Channel Data [16ch] (P-P)) is output for channels with measurement enabled (indicated in red in the image below). The data is sorted with lower slot numbers first.

RA3100 channel settings sub menu (for RA30-101)



Time Data

See "Time Data Format".

Analog Channel Data (Normal)

The values of converting the sampling data of the RA30-101, RA30-102, RA30-103, RA30-106, etc. to physical values or voltage values/temperature values, or waveform inversion values. See "Analog Channel Data Format".

Logic Channel Data [16ch] (Normal)

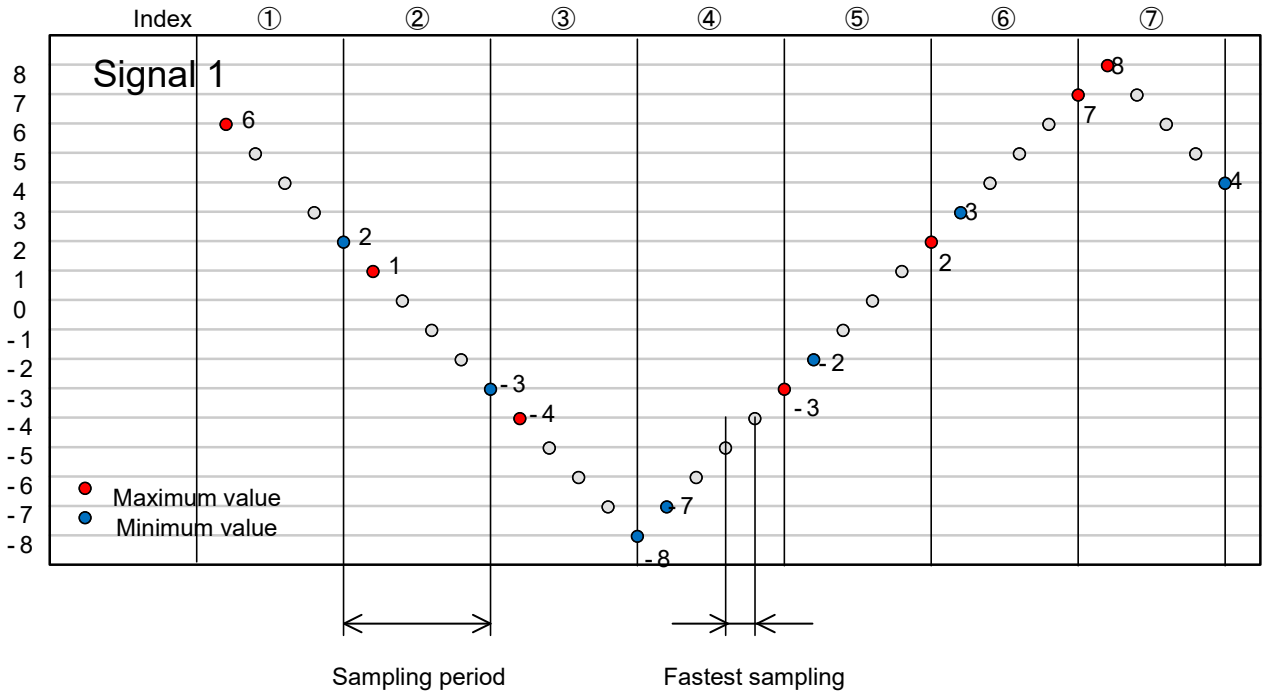
The RA30-105 has channel groups A and B, with each group having 8 channels, for a total of 16 data items. The order of the 16 data items is indicated in the table below.

Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Channel data	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]	A[7]	A[8]	B[1]	B[2]	B[3]	B[4]	B[5]	B[6]	B[7]	B[8]

Analog Channel Data (P-P)

Primary processing is performed on the fastest sampled results for each period of the sampling period to generate two items of data. One is the maximum value and the other is the minimum value. The result is the values converted to physical values or voltage values/temperature values, or waveform inversion values. See "Analog Channel Data Format".

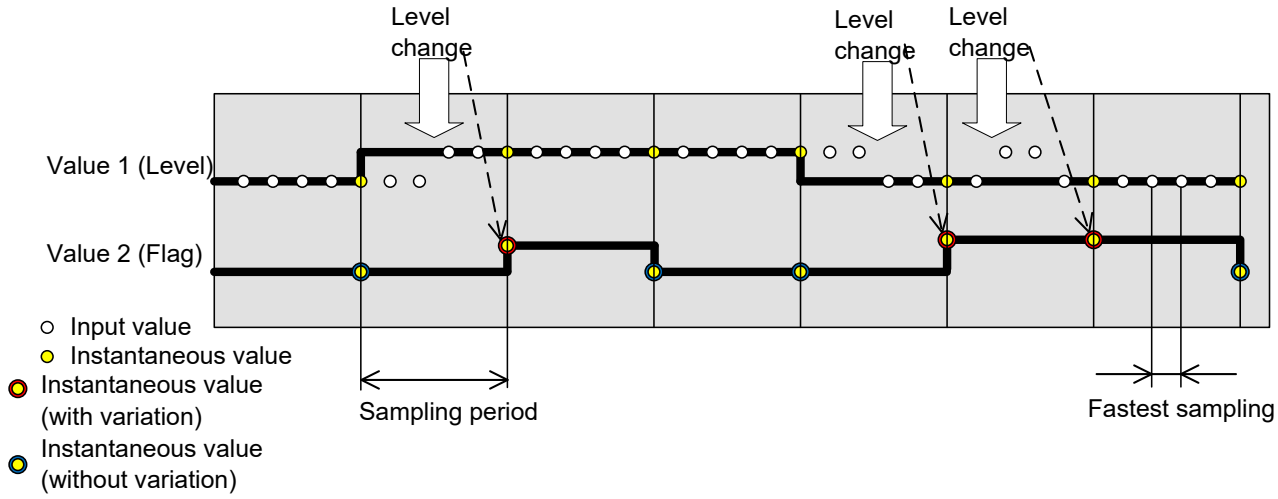
Sample data is used for an explanation.
The image below divides the "Signal 1" data and primary processing result by color. The table below indicates the values when that data is output to a CSV file.



Index	Signal 1-Min	Signal 1-Max
(1)	2	6
(2)	-3	1
(3)	-8	-4
(4)	-7	-3
(5)	-2	2
(6)	3	7
(7)	4	8

Logic Channel Data [16ch] (P-P)

Primary processing is performed on the fastest sampled results for each period of the sampling period to generate two items of data. They are Value 1 (Level) and Value 2 (Flag). See the image below.
The RA30-105 has channel groups A and B, with each group having 8 channels, for a total of 32 (2 x 16) data items.



Value 1 (Level): 0 (Low) or 1 (High)
Value 2 (Flag): 0 (without change during period) or 1 (with change during period)
The order of the data is indicated in the table below. Value 1 (Level) is the even number Index in the table below and Value 2 (Flag) is the odd number Index in the table below.

Index	0	1	2	3	4	5		14	15	16	17		28	29	30	31
Channel data	A[1]	A[1]-Flag	A[2]	A[2]-Flag	A[3]	A[3]-Flag	...	A[8]	A[8]-Flag	B[1]	B[1]-Flag	...	B[7]	B[7]-Flag	B[8]	B[8]-Flag

Status

The Trigger and Mark.

Signal name	Value	Conditions where the value is 1
Trigger	0: Without trigger 1: With trigger -1: Undefined	The value is "1" when the Trig input signal (display) of the RA30-112 is High or when the trigger conditions are met.
Mark	0: Low 1: High -1: Undefined	The value is "1" when the Mark input signal (display) of the RA30-112 is High.

-1: Undefined is output to the MEMORY recorded data area when data coupling is performed.

4.4.3. Recorded data name (first line)

Output to the first line of the category with [DATA] as the signal name and unit name. The table below indicates example values for the signal name and unit name.

Type	Signal name	Unit name	Example
Time data	TIME or Point	Sampling period unit of Sampling Period Table	TIME [ns] Point
Analog (Normal)	Signal name set in RA3100 main unit	Physical quantity unit set in RA3100 main unit	Channel 1 [με]
Analog (P-P)	Signal name set in RA3100 main unit-Min Signal name set in RA3100 main unit-Max	Physical quantity unit set in RA3100 main unit	Channel 1-Min [με] Channel 1-Max [με]
Logic (Normal)	Signal name set in RA3100 main unit A Signal name set in RA3100 main unit B	A: 1 to 8, B: 1 to 8 The number is the channel number	Logic Group1 A[1] Logic Group1 B[8]
Logic (P-P)	Signal name set in RA3100 main unit A Signal name set in RA3100 main unit A-Flag Signal name set in RA3100 main unit B Signal name set in RA3100 main unit B-Flag	A: 1 to 8, B: 1 to 8 The number is the channel number	Logic Group1 A[1] Logic Group1 A-Flag[1] Logic Group1 B[8] Logic Group1 B-Flag[8]
Status	Trigger		Trigger
	Mark		Mark

See "Example CSV File".

NOTE

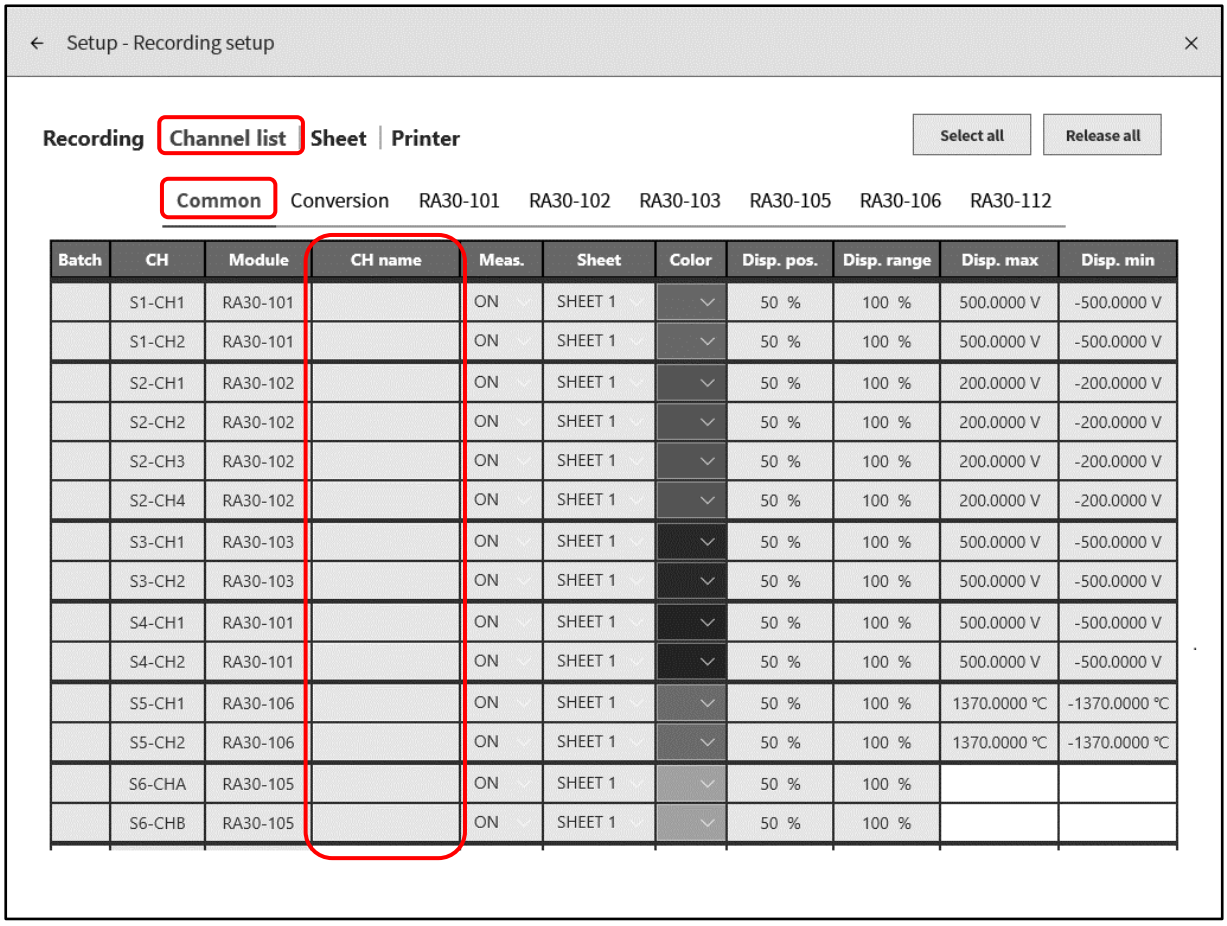
- If the signal name is blank in the RA3100, only the unit name is output. To add a signal name, it is necessary to directly edit the CSV file that was output.

Sampling Period Table

Index	Sampling period	Sampling period unit	Sampling speed
0	6	[s]	10 S/min
1	3	[s]	20 S/min
2	1.2	[s]	50 S/min
3	1	[s]	1 S/s
4	500	[ms]	2 S/s
5	200	[ms]	5 S/s
6	100	[ms]	10 S/s
7	50	[ms]	20 S/s
8	20	[ms]	50 S/s
9	10	[ms]	100 S/s
10	5	[ms]	200 S/s
11	2	[ms]	500 S/s
12	1	[ms]	1 kS/s
13	500	[us]	2 kS/s
14	200	[us]	5 kS/s
15	100	[us]	10 kS/s
16	50	[us]	20 kS/s
17	20	[us]	50 kS/s
18	10	[us]	100 kS/s
19	5	[us]	200 kS/s
20	2	[us]	500 kS/s
21	1	[us]	1 MS/s
22	500	[ns]	2 MS/s
23	200	[ns]	5 MS/s
24	100	[ns]	10 MS/s
25	50	[ns]	20 MS/s
63	1	*None	External sampling

Signal name set in RA3100 main unit

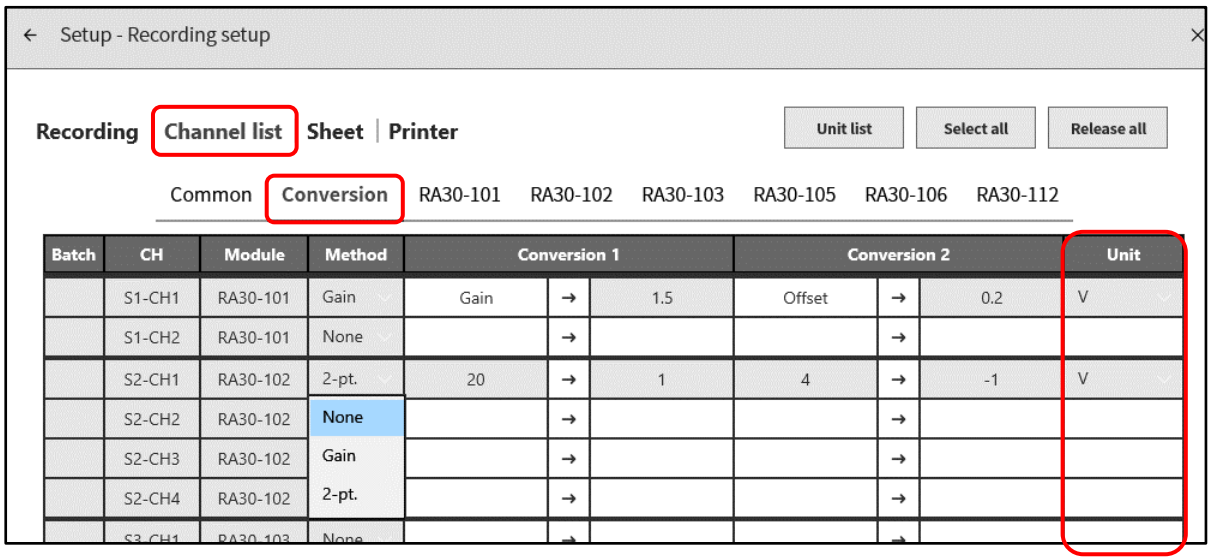
The signal name set in [Channel list] - [Common] in the recording setup of the RA3100.
It is blank when the signal name is not set.



Batch	CH	Module	CH name	Meas.	Sheet	Color	Disp. pos.	Disp. range	Disp. max	Disp. min
	S1-CH1	RA30-101		ON	SHEET 1		50 %	100 %	500.0000 V	-500.0000 V
	S1-CH2	RA30-101		ON	SHEET 1		50 %	100 %	500.0000 V	-500.0000 V
	S2-CH1	RA30-102		ON	SHEET 1		50 %	100 %	200.0000 V	-200.0000 V
	S2-CH2	RA30-102		ON	SHEET 1		50 %	100 %	200.0000 V	-200.0000 V
	S2-CH3	RA30-102		ON	SHEET 1		50 %	100 %	200.0000 V	-200.0000 V
	S2-CH4	RA30-102		ON	SHEET 1		50 %	100 %	200.0000 V	-200.0000 V
	S3-CH1	RA30-103		ON	SHEET 1		50 %	100 %	500.0000 V	-500.0000 V
	S3-CH2	RA30-103		ON	SHEET 1		50 %	100 %	500.0000 V	-500.0000 V
	S4-CH1	RA30-101		ON	SHEET 1		50 %	100 %	500.0000 V	-500.0000 V
	S4-CH2	RA30-101		ON	SHEET 1		50 %	100 %	500.0000 V	-500.0000 V
	S5-CH1	RA30-106		ON	SHEET 1		50 %	100 %	1370.0000 ℃	-1370.0000 ℃
	S5-CH2	RA30-106		ON	SHEET 1		50 %	100 %	1370.0000 ℃	-1370.0000 ℃
	S6-CHA	RA30-105		ON	SHEET 1		50 %	100 %		
	S6-CHB	RA30-105		ON	SHEET 1		50 %	100 %		

Physical quantity unit set in RA3100 main unit

The unit set in [Channel list] - [Conversion] in the recording setup of the RA3100.
When the conversion method is "None", the standard unit (voltage and temperature) is output.



Batch	CH	Module	Method	Conversion 1			Conversion 2			Unit
	S1-CH1	RA30-101	Gain	Gain	→	1.5	Offset	→	0.2	V
	S1-CH2	RA30-101	None		→			→		
	S2-CH1	RA30-102	2-pt.	20	→	1	4	→	-1	V
	S2-CH2	RA30-102	None		→			→		
	S2-CH3	RA30-102	Gain		→			→		
	S2-CH4	RA30-102	2-pt.		→			→		
	S3-CH1	RA30-103	None		→			→		

4.4.4. Output Format of Recorded Data

Time Data Format

The time data in the first column is the result of multiplying the sample point Index by the sampling period of "Sampling Period Table". With external sampling, it is the sample point. Output as an integer or fixed point with the start of the recording file as 0 (s, ms, us, or ns).

Example of time data value

The table below indicates the time data value of the sampling period (representative).

Sample point Index	Sampling period				
	500 ns	5 us	10 ms	1.2 s	External sampling
0	0	0	0	0.0	0
1	**500**	5	10	1.2	1
2	1000	10	20	2.4	2
3	1500	15	30	3.6	3
4	2000	20	40	4.8	4
5	2500	25	50	6.0	5
6	3000	30	60	7.2	6

Analog Channel Data Format

Analog channel data is output in index format.

Index notation format: (sign) #.#####E±##

Conditions	Example
Positive number	1.23456E+00
	1.23456E-01
Negative number	-1.23456E+00
	-1.23456E-01

The sixth floating point digit of the fixed-point part is rounded off.

1.234554E-07 → 1.23455E-07

1.234555E-07 → 1.23456E-07

5. MDF File Format

The format complies with ASAM MDF Version 4.1.
Generally, only the format differs from CSV. This section is specific to MDF.

See "4. CSV File Format".

5.1. Characteristics

Contains IDBLOCK, HDBLOCK, FHBLOCK, MDBLOCK, TXBLOCK, DGBLOCK, CGBLOCK, CNBLOCK, CCBLOCK, and DZBLOCK.
The date/time information is output with the local time.
In CNBLOCK, which defines the sample data structure, cn_type is 2: MASTER (X axis data) or 0: VALUE (channel data, Status).
The sample data type is integer (rather than the commonly used double type) because it results in a smaller file size. The voltage conversion factor or physical quantity conversion factor is output to CCBLOCK. The file size is further reduced via zip compression.

5.2. Relationship between MDF and RA3100 Recorded Data

5.2.1. Conversion Data

The table below indicates the kinds of data and their data type.
All recorded channel data is converted. The channel data is in the order of lower slot number first. X axis data is appended before the channel data.

Conditions cn_type of CNBLOCK	Kind of data	Type	Remarks
2: MASTER (X axis data)	For time data or external sampling: Time, Angle, or Distance	double	Output in seconds. However, it is a setting for external sampling (see "3.5.6. External sampling setup"). Not output when the X type is "Index". Example) When ΔX (the input value on both sides) is 0.1 and at the start of the file: 0, 0.1, 0.2, ...
0: VALUE (channel data)	Analog data	int16	A/D count value
	Logic data	uint8	0 (L), 1 (H) For P-P recording, Flag is 0 (without change), 1 (with change), or -1 (undefined).
	Status (Trigger/Mark)	uint8	0 (L), 1 (H), or -1 (undefined) For Trigger, it is 1 if a trigger has occurred. It does not exist for MEMORY recording.

5.2.2. cg_tx_acq_name (recording name)

The recording name is output to tx_data of the TXBLOCK referenced by cg_tx_acq_name of the CGBLOCK.
See "Recorded data name".

5.2.3. cg_md_comment (comment on recording name)

The comment on the recording name is output to tx_data of the TXBLOCK referenced by cg_md_comment of the CGBLOCK.

Format: A_B_C_D (see the table below for information on ABCD)
Example) RecordingName_RA3100_SSD_Normal

Symbol	Description
A	Value of "5.2.2. cg_tx_acq_name (recording name)"
B	RA3100 (fixed string)
C	Five types: PRINTER, SSD, MEMORY, PRINTER+Memory, SSD, or MEMORY
D	Normal or P-P

5.2.4. cn_tx_name (name of X axis data)

The value output differs according to the conditions, as indicated in the table below. Also specify "5.2.5. cn_md_unit (unit name of X axis data)" and "5.2.6. cn_sync_type (data type of X axis)".

Recording conditions	Setup conditions	MDF		
		cn_tx_name (name of X axis data)	cn_md_unit (unit name of X axis data)	cn_sync_type (data type of X axis)
Not external sampling		Time	sec	1: Time
External sampling	Index	This item cannot be output because CNBLOCK(Master) is not output.		
	Time	Time	"3.5.6. External sampling setup"	1: Time
	Angle	Angle		2: Angle
	Distance	Distance		3: Distance

5.2.5. cn_md_unit (unit name of X axis data)

See "5.2.4. cn_tx_name (name of X axis data)".

5.2.6. cn_sync_type (data type of X axis)

See "5.2.4. cn_tx_name (name of X axis data)".

5.2.7. cn_tx_name (name of channel data)

The signal name is output to tx_data of the TXBLOCK referenced by cn_tx_name of the CNBLOCK.
"Signal name set in RA3100 main unit" (same as "4. CSV File Format").

5.2.8. cn_md_unit (unit name of channel data)

The unit is output to tx_data of the TXBLOCK referenced by cn_md_unit of the CNBLOCK.
"Physical quantity unit set in RA3100 main unit" (same as "4. CSV File Format").

5.2.9. cn_md_comment (comment of channel data)

The channel information is output to tx_data of the TXBLOCK referenced by cn_md_comment of the CNBLOCK.
"Channel information ([CH Info] category)" ("4. CSV File Format").

Example:
S1-CH2,RA30-101,AD1_signal name,OFF,[GAIN=1] [OFFSET=0] [RANGE=1V] [COUPLING=DC] [L.P.F.=30Hz] [A.A.F.=ON]

5.2.10. cn_tx_name (name of channel data physical value)

(same as "5.2.7. cn_tx_name (name of channel data)").

5.2.11. cc_unit_name (unit name of channel data physical value)

(same as "5.2.8. cn_md_unit (unit name of channel data)").

5.2.12. cc_md_comment (comment of channel data physical value)

(same as "5.2.9. cn_md_comment (comment of channel data)").

5.2.13. cc_val[0] (physical quantity conversion offset of channel data)

cc_val[]	Value	Conditions
5.2.14. cc_val[1] (physical quantity conversion gain of channel data)	Voltage conversion factor	When the conversion method is set to "None"
	Physical quantity conversion factor	When the conversion method is set to "Gain" or "2-pt."
5.2.13. cc_val[0] (physical quantity conversion offset of channel data)	Voltage conversion offset	When the conversion method is set to "None"
	Physical quantity conversion offset	When the conversion method is set to "Gain" or "2-pt."

Conversion method setting: See "Physical quantity unit set in RA3100 main unit."

5.2.14. cc_val[1] (physical quantity conversion gain of channel data)

See "5.2.13. cc_val[0] (physical quantity conversion offset of channel data)".

MEMO

File Converter
RA3100

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