RA 1000 Series
Waveform judgement unit (RA11-753)
Operation Manual

Foreword

The present manual relates to the RA1000 Series optional functions for the OmniAce II Thermal Dot Recorder. Thank you very much for procuring the RA11-753 Waveform Judgement Unit. Please read this operation manual carefully in order to properly use the equipment.

Refer to the operation manual when using the RA11-753 Waveform Judgement Unit. The manual was compiled in order to use the equipment properly and safely. Keep the manual together with the unit for ready reference at all times.

Related operation manuals：

Manual name	Issue	Description
Instruction Manual Mainframe For RA1000 Series	95691-2074-0000	RA1000 functions and operation are described
Instruction Manual RS-232C, GP-IB For RA1000 Series	95691-2075-0000	Reference when using the RS-232C and GP-IB functions. Interface commands and other information are provided for control by a personal computer.
Instruction Manual Amplifier Units For RA1000 Series	95691-2076-0000	Describes amplifier unit operation and setting.

■ Before using

－Notice－

- In event of abnormality, immediately cut off the power. If the difficulty cannot be corrected, please contact the company or its representative. (Please provide a description of the phenomenon and conditions in as much detail as possible.)
- The contents of this manual are subject to change without prior notice.
- Unauthorized transfer or copying of this manual in whole or in part is prohibited.
- Although careful attention was given to completeness, in event there are unclear points, errors, spoiled pages or opinions, please contact the company.

■ Safety warnings and cautions

● **To use this product safety:**

This product conforms to IEC (International Electrotechnical Commission) safety ratings Class I.
Although the product has been manufactured with attention to safety, mishandling or misoperation by the user poses risk of serious incident. In order to avoid such hazards, be sure to read this manual carefully so as to gain a thorough understanding of the contents. The following types of notices appear on the product and in the manual in order to use the product safely. These are defined below.

Failure to heed this notice poses risk of serious and possibly fatal physical injury.

Failure to heed this notice poses risk of physical injury and damage to the equipment.

Be sure to observe the following items when using this product. The maker assumes no liability for loss or damage related to actions contrary to the caution notices.
Also, the operation manual cannot mention every possible prohibited or unwise action. Therefore, it is recommended to assume that an action not specifically mentioned in the manual is outside the capability of the product.

■ Warranty scope

The company products pass through rigid quality control at every process from design to manufacture. In event of suspected malfunction during use, before requesting service, first check for a possibly simple cause, such as operating error, correct power supply voltage, cables and connections. If service or temperature calibration is needed, please consult the company business office or representative. Mention model name (RA1100, RA1200, RA1300), serial number and a detailed description of the difficulty. The company standard warranty period and terms are indicated below.

■ Standard warranty period and terms

1. Warranty period : Effective for one year after date of delivery
2. Warranty terms : In event of failure during the warranty period, the company will bear the cost of repair. However, repair costs will be charged in the following types of cases.
   - ① Damage or failure due to improper handling
   - ② Damage or failure due to fire, earthquake, transportation accident or natural disaster
   - ③ Damage or failure resulting from repair or modification by other than the company or persons authorized by the company
   - ④ Failure due to use or storage under environmental conditions exceeding the specifications
   - ⑤ Periodic calibration
   - ⑥ Damage or failure resulting from transporting or moving the product after delivery
3. Warranty limitation : The company bears no liability in regard to equipment not manufactured by the company.

■ Symbols used in this manual

Following is a list of symbols used in this manual together with their definitions.

Symbol	Meaning
	Failure to heed this notice poses risk of serious and possibly fatal physical injury.
	Failure to heed this notice poses risk of physical injury and damage to the equipment.
	Failure to heed this notice poses risk of operating error and loss of data.
	Setting limitations or supplementary description
	See reference page
Equipment	RA1000 Series unit
Memory	Refers to RA1000 Series unit internal memory. Measurement data are stored in this memory when measuring in the Memory and Transient modes.
< >	Refers to operation panel key. Example: <Start> key
〈 〉	Refers to touch panel key appearing on screen. Example: 〈Realtime〉
[ ]	Refers to screen indication when operation panel key is pressed.
Disk	The following types recording media can be used with this equipment. ・FD: 3.5 inch floppy disk, 2HD type (double sided, high density) ・MO: 3.5 inch magneto-optical disk (230 MB or 640 MB) ・PD: 12 cm phase change optical disk The term Disk used in this manual refers to these media.
PC card	The following types of PC card can be used as recording media for this equipment. ・IC memory card (SRAM card): 64 KB to 4 MB ・Flash memory card: 2 MB to 640 MB The term PC card used in this manual refers to these media.
k (lower case) K (upper case)	・Lower case k refers to ×1000 numerical units, e.g., 10 kg = 10,000 grams. ・Upper case K refers to ×1024 units of data, e.g., 4 K = 4096 bytes of data.

CONTENTS

1. Waveform Judgement Unit (RA11-753)

1.1 Waveform judgement function

1.1.1. Outline

The waveform judgement function compares data stored beforehand in memory with a reference area. Whether the data are or are not within the range is sent to the output.

Data stored in each memory block are detected. If a memory block is empty, detection proceeds in parallel to the data stored in another block.

Detection results are shown on the monitor screen and sent to the remote connector. Detection results are capable of data output control for file and chart recording.

NOTE

- Modes other than memory cannot be used.
- If the waveform judgement option is not installed, menus related to waveform detection are not shown.
- Memory block divisions are 2 or less. A new waveform detect setting is automatically divided into 4. Previously stored data are lost.
  If set to more than 4 divisions, when the reference area is created for detection, the data of the final 2 blocks are lost.
  When needed, save the data to disk or other medium.
- Cannot be used together with another memory secondary process, such as math.
- The judgement reference area does not have battery back up. When needed, save to file.

- After creating the reference area, the area can be lost if the recording mode is set to other than memory.

- The judgement trigger position is a reference. Multiple trigger sources cannot be properly detected.
  The trigger and phase are independent signals and cannot be detected.

- Waveform detection cannot be used for X-Y recording.

1.1.2. Judgement operating systems

◆ Waveform detect modes are ⟨Trigger Judge⟩ and ⟨Sequence⟩.

・ Trigger Judge

Waveform detection starts after the trigger is detected and automatically stored in the memory block. Standby state while the trigger is not detected.

・ Sequence

Data are sent to the memory block each time the trigger is detected. When the storage time for one memory block elapses, but the trigger is not detected, operation starts by default. The mode has an added intermittent function. This enables detection for comparatively low frequency waveforms such as the power line.

NOTE

・ At the ⟨Sequence⟩ mode setting, data are not stored during the memory block switching time (about 16 ms) and these are not detected.

In the ⟨Sequence⟩ mode, the minimum intermittent detection time per block is about 5 ms. Detection is thus in 5 ms units.

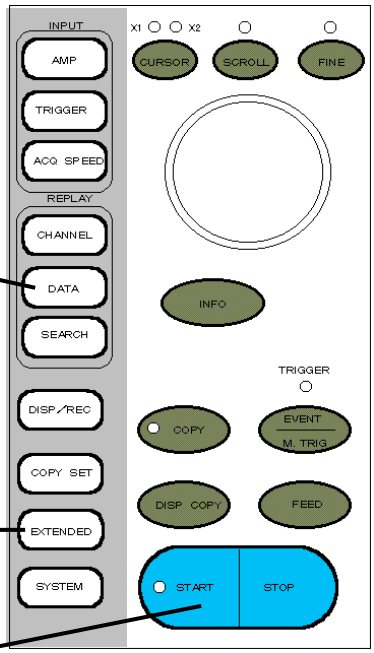
・ When the data storage time is shorter than the detect processing time required per block, the

memory block increments and detection completes. New data storage and detection are interrupted until a vacant block is produced.
Similarly, during copy output of the data within a block, if the block increments but a vacant block is absent, new data storage and detection are interrupted until the output process completes.

Refer to the specifications regarding the detect processing time.

1.1.3. Related section names and functions

Operation panel



<DATA> key

Data are displayed, plus detection results and reference area can be checked.

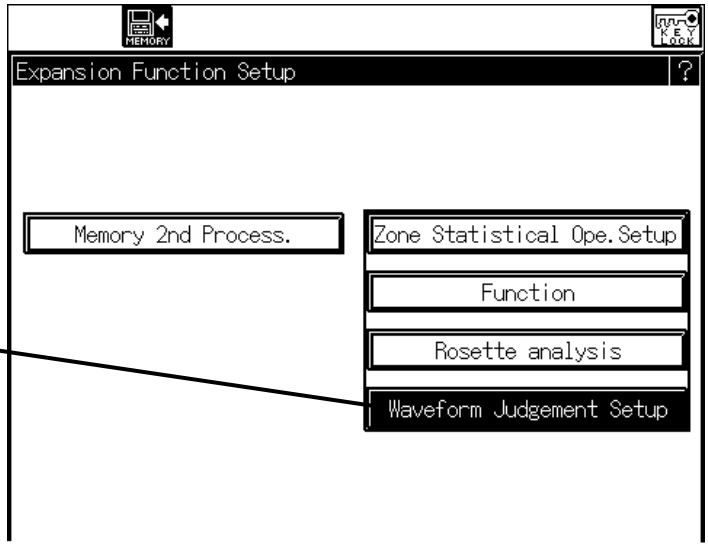
<EXTENDED> key

Waveform detect on/off and mode setting

<Start> key

Begin data storage and waveform detection

<EXTENDED> screen



〈Waveform Judgement Setup〉 key

Opens waveform detect menu

T I P S

This screen is not shown in measuring modes other than memory.

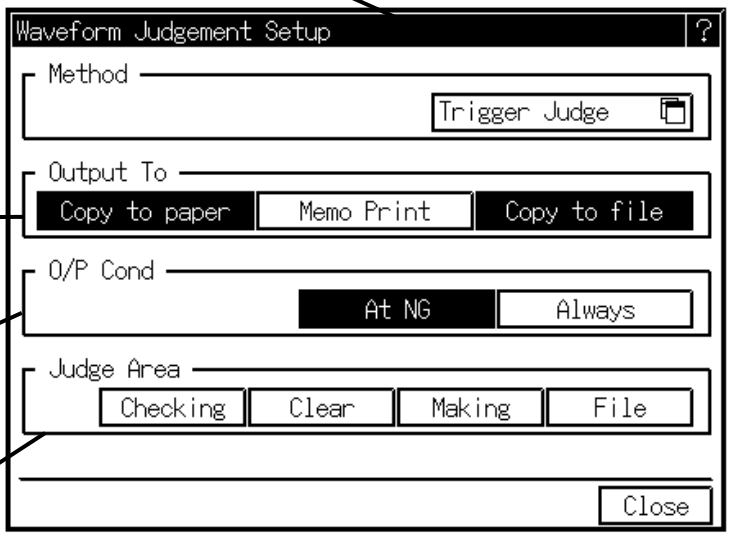
Waveform judgement menu

〈Pressing the Waveform Judgement Setup〉 key opens this window.

Judgement system setting

Sets the waveform judgement mode.

Sequence and Trigger Judge can be selected.



Results output

Selects judged memory data output destination.

Output conditions

Memory data output condition controlled by judgement results.

Judge area

Waveform judgement reference area operating menu

1. 2 Operating procedure

◆ Waveform judgement operates by the following procedure.

1 : Waveform judgement setting
Set the waveform judgement system, results output destination and output conditions.

2 : Set storage conditions
Set the amplifier sensitivity, trigger conditions, sampling rate, block divisions and other conditions according to the object being measured.

3 : Create judgement reference area
Create judgement reference area on the basis of reference data.
This determines the judgement channel and margin.

4 : Begin judgement
Press the <START> key to begin waveform judgement at each data storage.

5 : Judgement results
Results are reflected at the screen display and remote connector. Judgement results can also control the file and chart outputs.

1.2.1 Waveform judgement setting

◆ Press the <EXTENDED> key to open the 〈Waveform Judgement Setup〉 window.

1 : Select judgement system
Select 〈Sequence〉 for detecting a continuous waveform such as a power supply and 〈Trigger Jude〉 for an irregularly occurring phenomenon.

2 : Set results destination

〈Copy to paper〉	Copy sent to chart after end of judgement (except RA1100)
〈Memo Print〉	Storage start time and judgement results are printed on chart (except RA1100)
〈Copy to file〉	After end of judgement, the compiled data are saved to file

T I P S

〈Copy to paper〉 and 〈Copy to file〉 settings are coupled to the memory mode 〈Auto copy〉 and 〈Backup filing〉 settings.

3 : Output condition setting

Set to <Always> for data output regardless of judgement results and to NG for data output only when results are unacceptable.

T I P S

If the results output destination is not selected, these are not sent to the chart or file even if the output condition has been set.

1.2.2. Set storage conditions

◆ Waveform judgement requires the following conditions.

・ A single trigger source channel

Judgement reference is the trigger point regardless of 〈Trigger Judge〉 or 〈Sequence〉 detect settings. Since the reference point deviates with multiple trigger sources, correct judgement is disabled.

・ For 〈Sequence〉 judgement, set the pretrigger to 0% and memory storage operation to endless.

If the pretrigger amount is too large, the data number prior to the trigger changes, unnecessarily using up memory.

・ Set the sampling rate and memory block divisions according to the frequency and compiling time of the signal to be measured.

1.2.3 Create judgement area

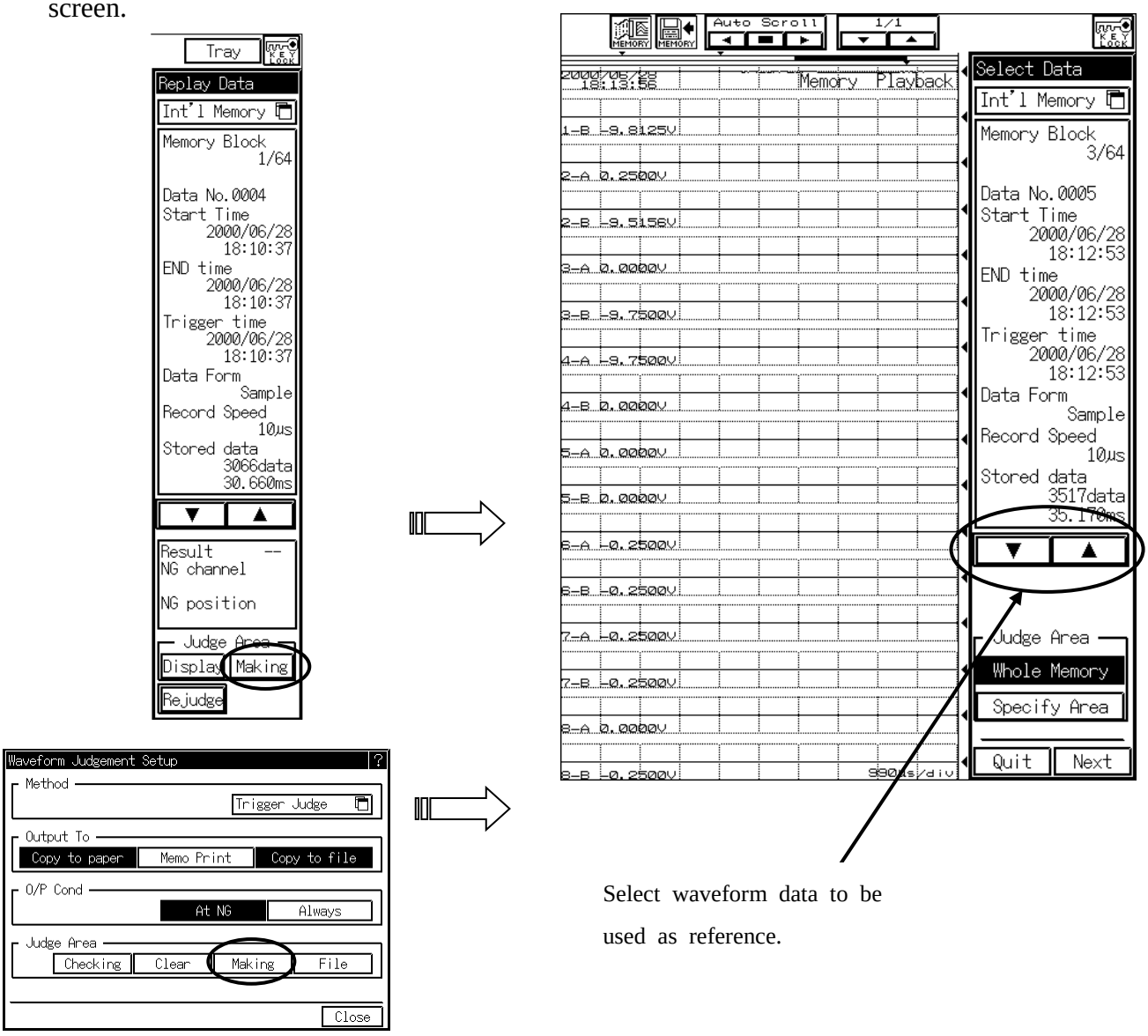
◆ The judgement reference area is created on the basis of the reference waveform data.
The direct judgement area on the screen cannot be entered.

1 : Compile the reference data under the same conditions as the actual judgement.

T I P S

If the judgement area is absent, pressing the <START> key stores only the data.

2 : Press the <DATA> key screen Judge area 〈Making〉 key or the <EXTENDED> key screen 〈Waveform Judgement Setup〉 〈Making〉 key to open the 〈reference waveform data select〉 screen.



Select waveform data to be used as reference.

If the entire memory block is to be used for waveform detection, select 〈Whole Memory〉, if only a portion is to be used, select 〈Designate range〉.

Click Next to display the next screen.

TIPS

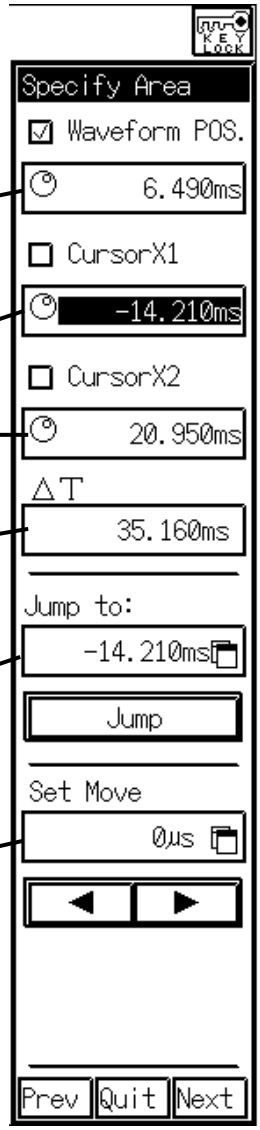
〈Specify Area〉 cannot be selected in the 〈Sequence〉 mode.

Select 〈Specify〉 or 〈Whole Memory〉, then press the 〈Next〉 key to change the screen.

3 : Designate judgement range (Specify Area only)

The judgement range is bounded by cursors.

The judgement area is created in this range.



Presently displayed waveform position

Cursor positions. When check is inserted, the cursors shift at ⟨Jump to⟩.

Time difference between cursors.

Indicates shift position when ⟨Jump⟩ is pressed. Shift designation can be changed when window opens.

Step shift width, can be changed when window opens.

After setting the range, press the ⟨Next⟩ key to shift to detect channel setting.

TIPS

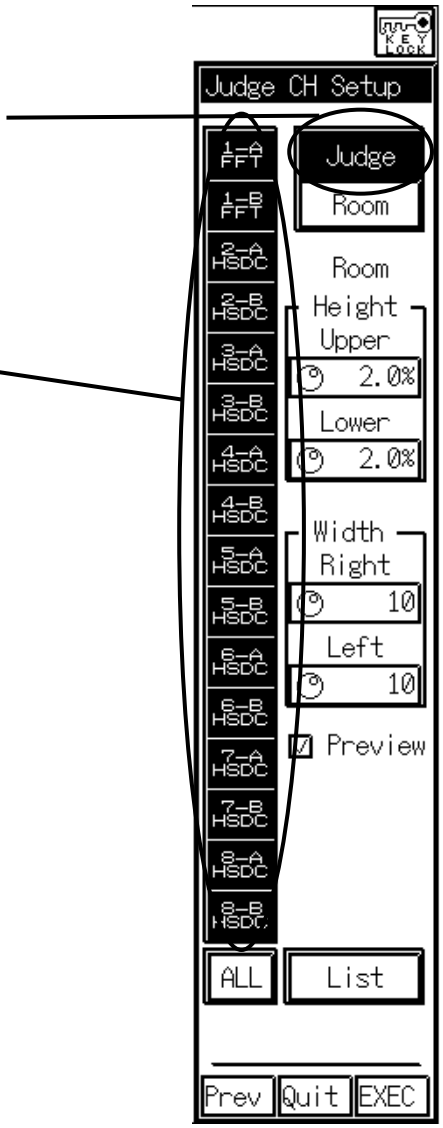
Waveform judgement is referenced to the trigger point. If trigger is absent from the designated range, the data cannot be used as the judgement reference area.

When the screen indication is highlighted, the cursor and waveform positions can be set by Jog or directly touching the screen.

4 : Select judge channel

When ⟨Judge⟩ is selected, the detection channel can be selected by pressing the channel key.

The selected channel is the object of detection.



TIPS

On the reference waveform, only the channel actually compiling data can be selected.

If ⟨Specify Area⟩ is not designated, pressing ⟨Next⟩ at the [Select Data] screen displays this screen.

5 : Set judgement reference area margins

Select ⟨Room⟩ and press the channel key to select the channel for setting the margins.

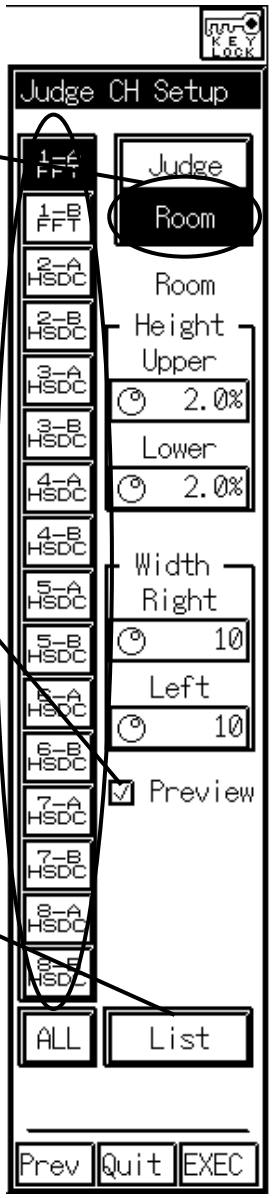
After selecting the channel, set the margins with ⟨Height⟩ and ⟨Width⟩.

Check ⟨Preview⟩ to shoe the presently set detect reference area margin status.

The margin Height can be set to ±1 to 200% (compared to amp range) and the time axis width left and right can be set from 1 to 100 samples.

To change all channel margins simultaneously, press the ⟨All⟩ key.

Press the ⟨List⟩ key to list the setting status of all channels.
The settings in the screen can be changed by touching and using the jog dial.



7 : Press the ⟨EXEC⟩ key to create the judgement reference area.

TIPS

If the judgement area needs to be saved, save to file at this point.
Press the ⟨File⟩ key at ⟨Waveform Judgement Setup⟩ of the <EXTENDED> screen.

NOTE

The judge area data include ⟨Reference waveform⟩ and ⟨Room⟩ settings at the point of saving. Since the saved waveform becomes the ⟨Reference waveform⟩, if it is changed at the ⟨Data select⟩ or other screen, the waveform differs from the reference at the time of judgement area creation, thus preventing accurate reproduction.

If the ⟨EXEC⟩ key is not pressed, not creating the judgement reference area, the settings are invalidated.

1.2.4. Judgement execute

While the judgement reference area is present, press the <START> key to begin waveform storage. At the end of each storage, the waveform is automatically judged.

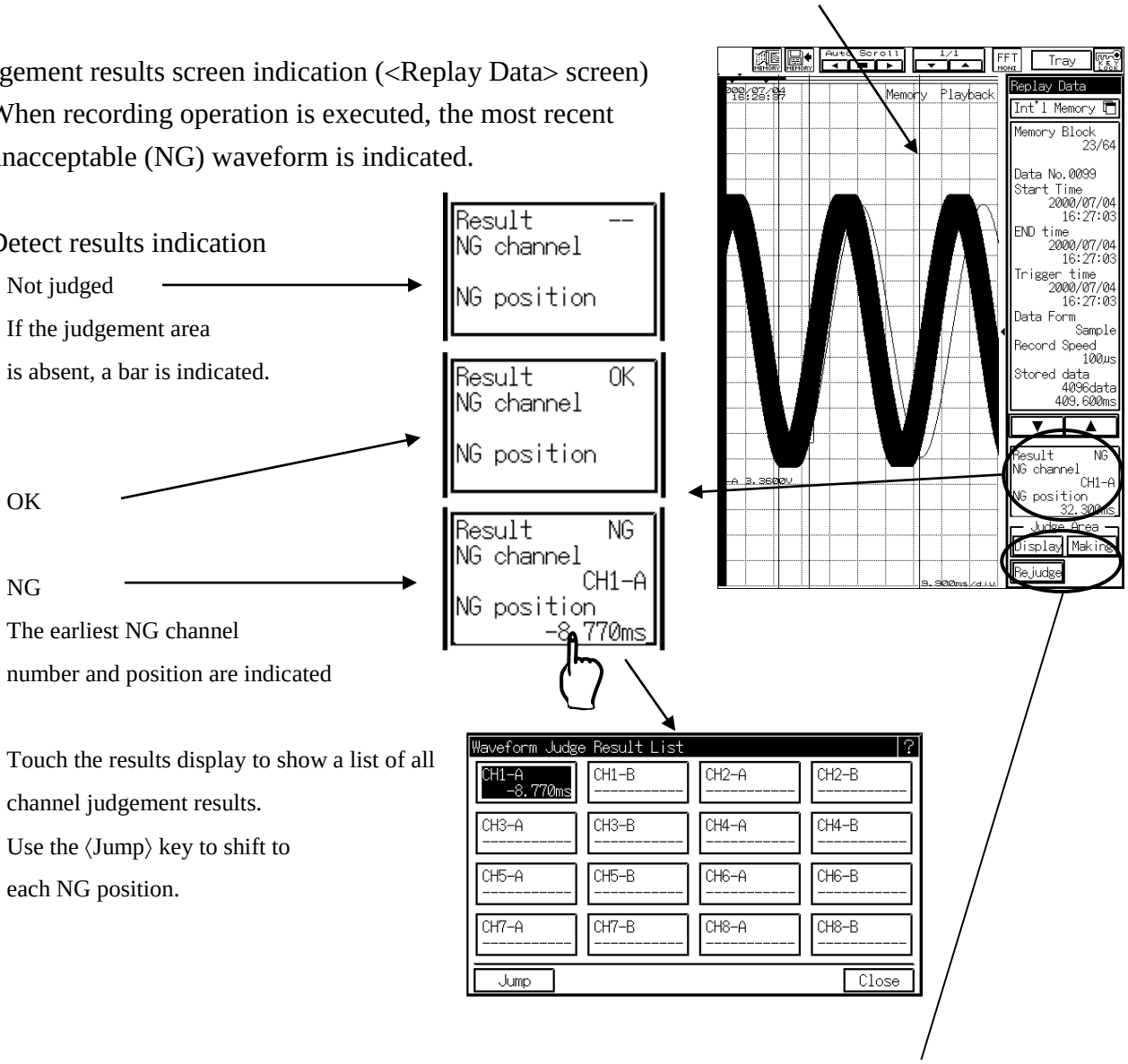
1.2.5 Check results

Waveform judgement results are reflected in the following items.

- Screen indication
- Remote connector
- Chart copy operation
- File save operation

Judgement results screen indication (<Replay Data> screen)

When recording operation is executed, the most recent unacceptable (NG) waveform is indicated.



The overlapped waveform and judgement reference area can be displayed by using the judgement reference area 〈Display〉 key.

Use the 〈Rejudge〉 key for manual judge processing.

Judgement results remote output

Judgement results are sent to the remote connector.

・ OK: pin 13

・ NG: pin 14

(Ground: pins 1, 17 and 18)

Open collector Collector current less than 25mA, voltage between collector and emitter less than 50V.

Remote connector state changes are as follows.

Before recording start (waveform judgement operation not conducted)

OK : OFF

↓ NG : OFF

Recording start

↓ OK : OFF

NG : OFF

Recording in progress (until next judgement)

↓ NG detected	OK detected
OK : OFF	OK : ON
NG : ON	NG : OFF

Recording end OK: Hold final state

NG: Hold final state

NOTE

During memory block continuous recording, the connector hold time differs according to the

storage time per block. The state hold time is essentially the data storage time after trigger detect.

Judgement results chart output (except RA1100)

When < Copy to paper > is designated, following the normal system annotation, the judgement results data are printed.

When < Memo Print > is designated, at the start of recording a block with detected NG, the NG channel data are printed on one line and the waveform is not printed.

NOTE

The earliest results printed are the NG detected channel data.
The judgement reference area and NG location cursors are not printed on the chart.

When the copy size is set to standard, the judgement results are not printed.

TIPS

The copy time necessary when a waveform is copied. When a memory block vacancy is absent during this period, storage and judgement are not conducted. If NG yes/no only is required, use < Memo Print >.

Judgement results file save

Judged memory data are saved to file.
The saved format is according to the normal memory backup filing.

NOTE

Judgement results are not stored in the data file. If needed for checking, save in accordance with the judgement area data. After recalling the area and data, use manual Rejudge.

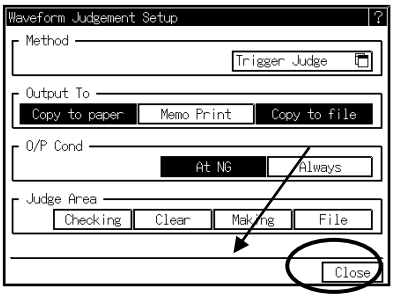
1.2.6 Setting file save and recall

◆ By saving the judgement area data to file, waveforms can always be judged under the same conditions.

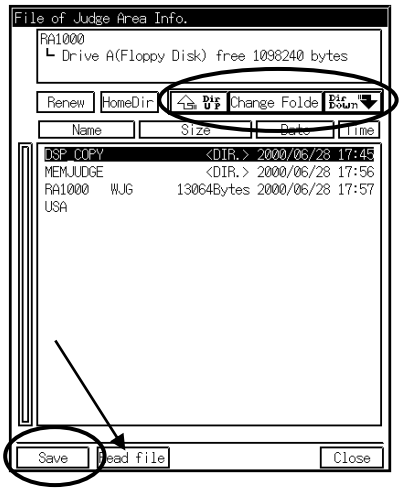
Since the data are stored in the form of reference waveform and setting values, the settings can be adjusted after recall, while recall automatically creates the judgement reference area.

Judgement area data save

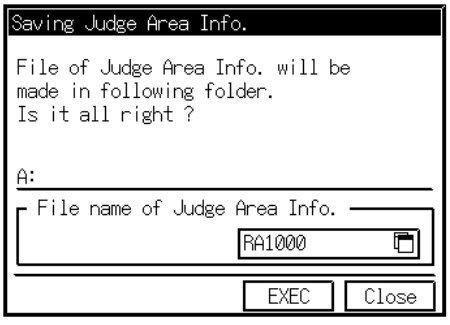
From the [Waveform Judgement Setup] screen of the <EXTENDED> key, press the File key to open the [File of Judge Area Info.].



Shift to the save destination drive and folder.
Press the ⟨Save⟩ key.



At the [Saving Judge Area Info.] screen,
check the file name and press the ⟨EXEC⟩ key to save the file.



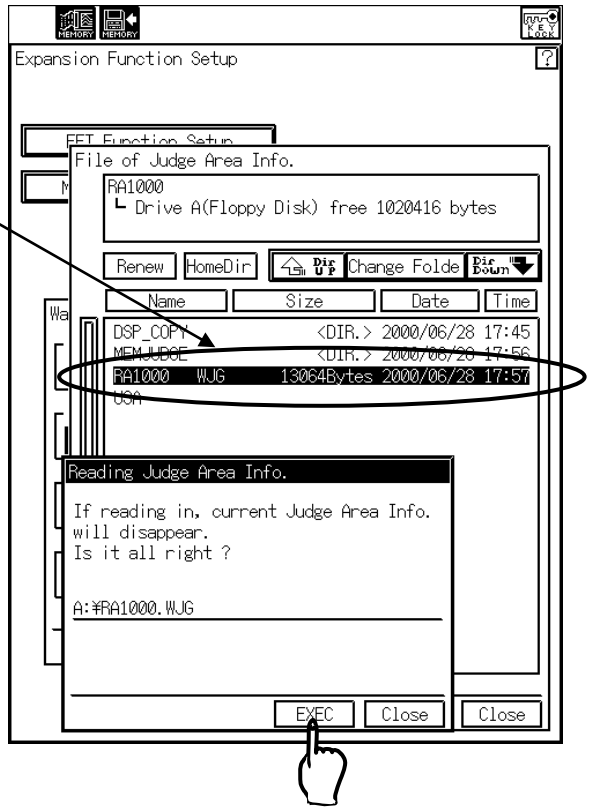
TIPS

The detect area data file extension is .WJG.

Judgement area data recall

In the same manner as save, open [File of Judge Area Info.] and shift to drive and folder.

Touch to select the required file (.WJG).



Press Read file to show the [Reading Judge Area Info.] window.

Press the 〈EXEC〉 key.

After the detect area setting data and reference waveform are loaded, the judgement area is automatically created.

NOTE

The reference waveform is stored in the memory block of the presently indicated <DATA> key screen.

If the memory size differs between detect area data save and recall, the judgemet reference area cannot be reproduced accurately.

Use together with the environment setting file, for example, so that setting conditions are always the same.

1.2.7. Operation hints

・NG occurs frequently

Judgement reference area and stored data are completely unmatched and deviate from the start.

・Attributed to a signal with a large noise component with deviation of the trigger point. Inversion may occur in the edge direction.

A trigger filter can be used to stabilize trigger detection. The filter is also recommended when obtaining the waveform for creating the judgement reference area.

・Is the signal entirely independent from the trigger source?

The trigger point forms a reference for detection. When a signal with phase different from the trigger is detected, NG results.

In continuous mode, the judgement area deviates at the final of block data.

・Possibly unstable signal frequency.

The continuous mode is synchronized by the trigger at the block start. Sensitivity to frequency fluctuation increases with the block size. This sensitivity can be reduced by such measures as reducing the block size and increasing the pretrigger amount.

・NG not reliably detected

NG is not produced when the waveform peak level is reduced.

・Margin too large in the time direction?

When the time direction margin is increased for improved noise stability, detection sensitivity loses sharpness at the waveform peak components.

Use a trigger filter to improve trigger stability and reduce the time direction margin.

When the judgement reference area is overlapped in the display, the margin contains “Full screen” components.

・Attributed to insufficient reference waveform data when creating the area.

The area and actual data are compared with the trigger reference for detection. If the area is shorter than the data, since sensitivity is completely absent outside the area, a full area overlapped indication results.

Also, time direction insensitivity is indicated at the data start and end components.

・Signal quality poor and stable judgement reference area cannot be created.

Use a filter with the amplifier when compiling data. Use these for creating a more stable judgement reference area. Afterwards, switch the filter off and conduct detection with higher sensitivity with respect to noise.

・View judgement results to readjust the judgement area

Compile a new reference waveform, reset the margins and create a new judgement area.

For strict reproduction, save the reference data to file and edit.

2. Specifications

2.1 RA11-753 Waveform Judgement Unit Specifications

Operating mode	Memory	
Judgement system	Sequential comparison of data stored in memory with the judgement reference area with the trigger position as reference	
Judgement channels	Maximum 16 channels, except event amplifier Limited to sources with signal phase synchronized to the trigger point	
Memory divisions	Block 4 to 128 Of these, 2 are for judgement area storage and cannot be used	
Sequence judgement	Memory switching time	Less than 16 ms
	Undetected trigger auto end time	More than 5 ms
Judgemnet time	16 channels 4096 data units within 500 ms, average approx. 350 ms (except detection results output time)	
Judgement area create	Set width and time margins of compiled reference waveform	
Judgement results output	Screen display (<DATA> screen) Remote connector (OK and NG independent, open collector) Detection results chart output (except RA1100) File copy control according to detection results	

Reference: Memory sampling rate enabling continuous detection at Sequence judgement
(neglecting loss due to block switching time and results output wait time)

Judgement channels	Sampling rate	Compiling time (4 KW)	Judgement time (4 KW reference value)
16	150 μs	614 ms	Approx. 350 ms
8	80 μs	327 ms	Approx. 180 ms
4	45 μs	184 ms	Approx. 100 ms
2	30 μs	122 ms	Approx. 60 ms
1	20 μs	82 ms	Approx. 35 ms

※ Estimated when data quantity is 16 × 4 KW and detection time is approx. 350 ms, the compiling rate does not exceed this range.

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