ST4030
ST4030A

HIOKI

Firmware Version 1.20
Additions and Changes

IMPULSE WINDING TESTER

EN

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1 Overview

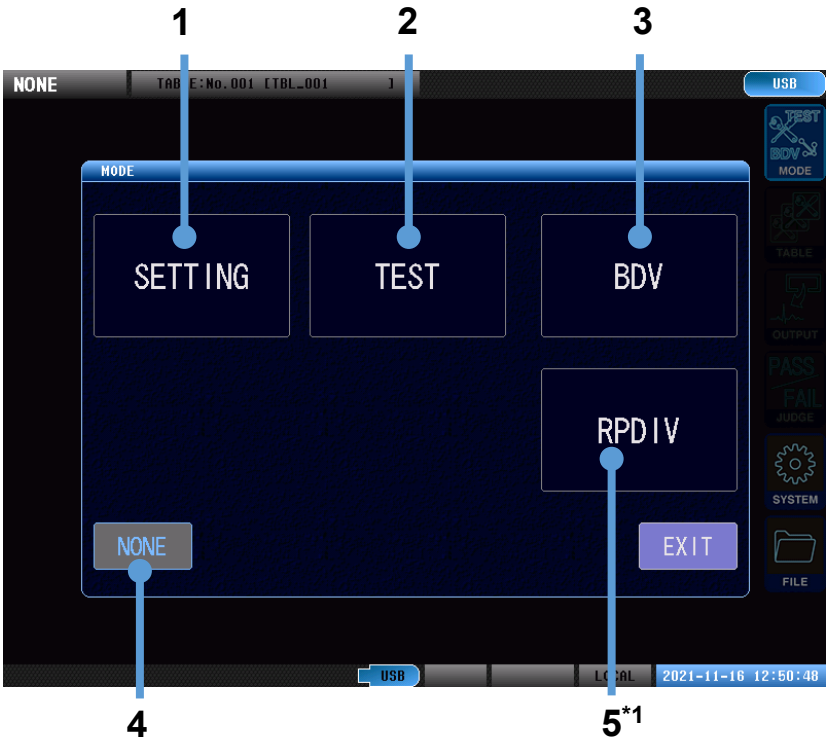
The following functionality has been added to version 1.20 of the firmware:

- Measuring impulse voltage rise time
- Changing the positioning of master and measured waveforms
- Automatically setting waveform judgment scope and threshold values
- Applying voltage pulses continuously
- Performing discharge starting voltage testing that complies with the IEC 61934 procedure
- Changing the screen to a background color that’s easy to see for printing
- Automatically saving only data that is associated with a FAIL judgment
- Reducing voltage variability caused by variations in workpiece characteristics
- Adjusting the applied voltage value during testing without changing the applied voltage value setting
- Determining whether output pulses are degaussing or measurement pulses
- Setting separate upper and lower limit values for area judgment
- Changing the instrument’s operation so that it always starts up in the same mode
- Changing the instrument’s operation so that the interlock function is always enabled (cannot be undone)
- Changing the instrument’s operation to switch the EXT. IO STOP pin from edge operation to level operation (cannot be undone)
- New communication commands
- Other

2 Selecting the Measurement Mode

An RPDIV measurement mode has been added for models equipped with the ST9000 Discharge Detection Upgrade.

Tap **[MODE]** on the measurement screen to display a measurement mode selection window. You can select from five measurement modes.



1	**SETTING**	Selects test conditions settings mode. The instrument will acquire test conditions settings, judgment condition settings, and a master waveform.
2	**TEST**	Selects test mode. The instrument will call up the test conditions set in test conditions settings mode and use them to test workpieces.
3	**BDV**	Selects insulation breakdown testing (BDV) mode. The instrument will perform impulse testing by gradually increasing the voltage applied to the workpiece under test to determine the voltage at which insulation breakdown occurs.
4	**NONE**	Selects no-voltage-application mode. Output from the instrument will be disabled for safety reasons.
5	**RPDIV**	Tests discharge status by performing impulse testing in which the applied voltages comply with the IEC 61934 procedure. *1

*1: Models equipped with ST9000 Discharge Detection Upgrade only.

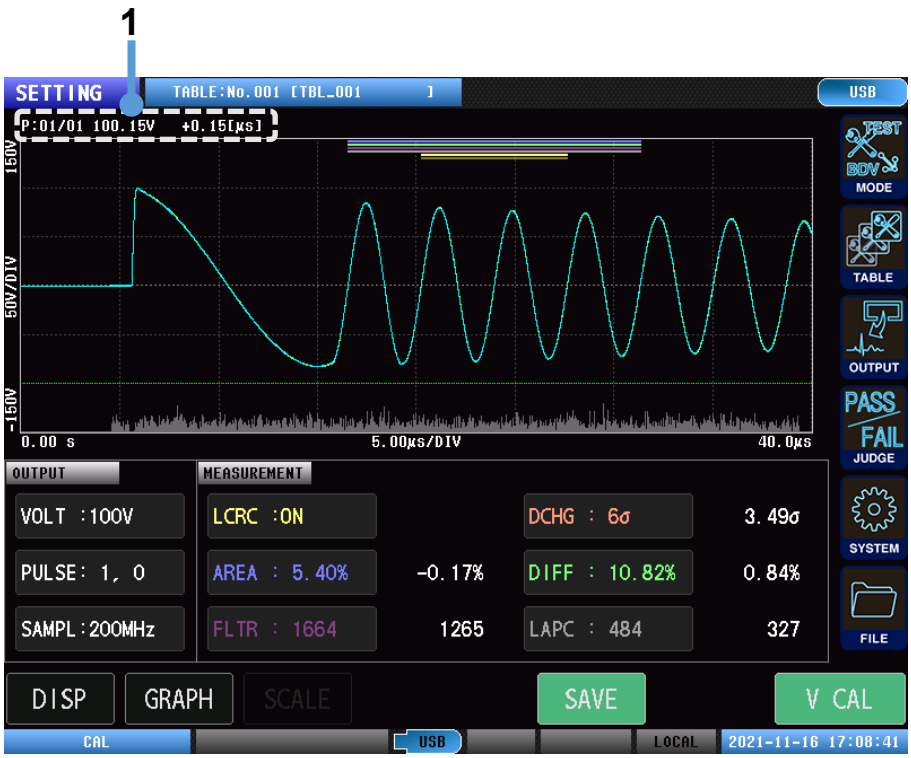
3 Rise Time

This functionality measures rise time.

It has been added to test conditions settings mode, test mode, BDV mode, and RPDIV mode.

3.1 Waveform Graph Display

The rise time is displayed at the top left of the waveform graph.



1	**P:XX/XX**	Number of applied pulse / total number of pulses*1
	xxxV	Maximum peak voltage value for the response waveform
	+X.XX[µs]	Rise time*2

*1: During continuous application, only the number of applied pulses is shown.

*2: The display will switch between crest and tail length depending on the selected calculation formula.

3.2 Setting the Rise Time Calculation Formula

This section describes how to enable/disable display of waveform rise times and set the formula used to calculate them.

Test conditions settings mode	(Measurement screen) **[MODE]** > **[SETTING]** > **[OUTPUT]** > **[RISE TIME]**
BDV mode	(Measurement screen) **[MODE]** > **[BDV]** > **[OUTPUT]** > **[RISE TIME]**
RPDIV mode	(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]** > **[RISE TIME]**

RPDIV mode screen

1. Tap **[RISE TIME]** (rise time display format).

Enable/disable the waveform rise time display and set the calculation formula.

OFF	Disables calculation and display of rise time.
30%to90%	Uses the lightning impulse voltage waveform calculation formula. Displays the crest and tail length.
0%to100%	Uses the switching impulse voltage waveform calculation formula. Displays the crest and tail length.
10%to90%	Uses the lightning impulse current waveform calculation formula. Displays the crest and tail length.
TRANSIENT	Uses the transient response calculation formula. Displays the rise time. In this case, the rise time is the time required for the voltage to increase from 10% to 90% of 0 V to the initial peak voltage.

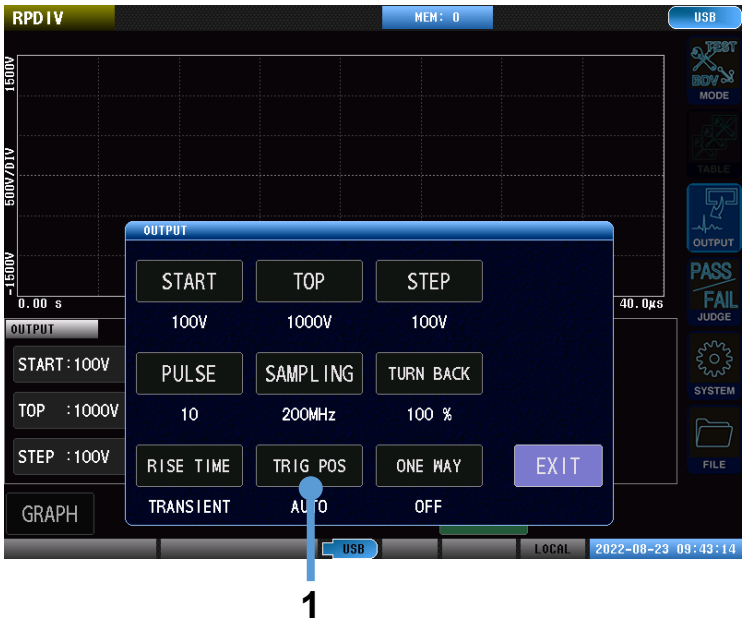
4 Waveform Trigger Position

This functionality allows you to select the method used to position the master waveform and measured waveforms. It has been added to test conditions settings mode, test mode, BDV mode, and RPDIV mode.

4.1 Setting Waveform Trigger Positions

Test conditions settings mode	(Measurement screen) **[MODE]** > **[SETTING]** > **[OUTPUT]** > **[TRIG POS]**
BDV mode	(Measurement screen) **[MODE]** > **[BDV]** > **[OUTPUT]** > **[TRIG POS]**
RPDIV mode	(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]** > **[TRIG POS]**

Example RPDIV mode screen



1. Tap **[TRIG POS]** (trigger position).

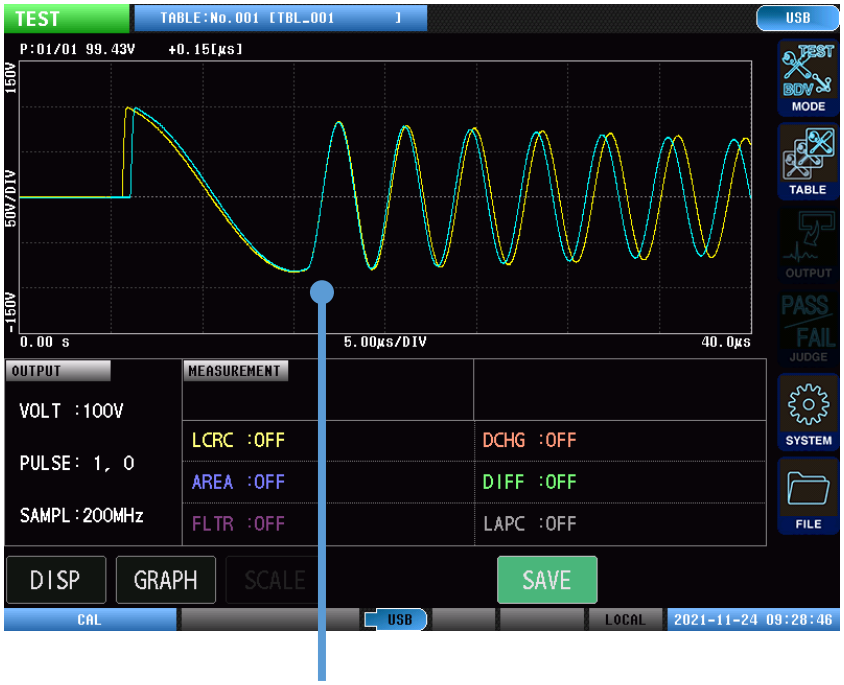
AUTO	Aligns waveforms' display positions based on their second zero-cross position. *1
MINUS	Aligns waveforms just before they approach 0 V from their minimum values *1
FALL	Aligns waveforms' display positions based on their initial zero-cross positions. *1
RISE	Aligns waveforms' display positions based on their rising edges.

*1: If the trigger position cannot be detected due to the condition of the voltage waveform, the setting will be changed automatically to another condition.

To use the same setting as used by firmware older than version 1.10, select **[AUTO]**.

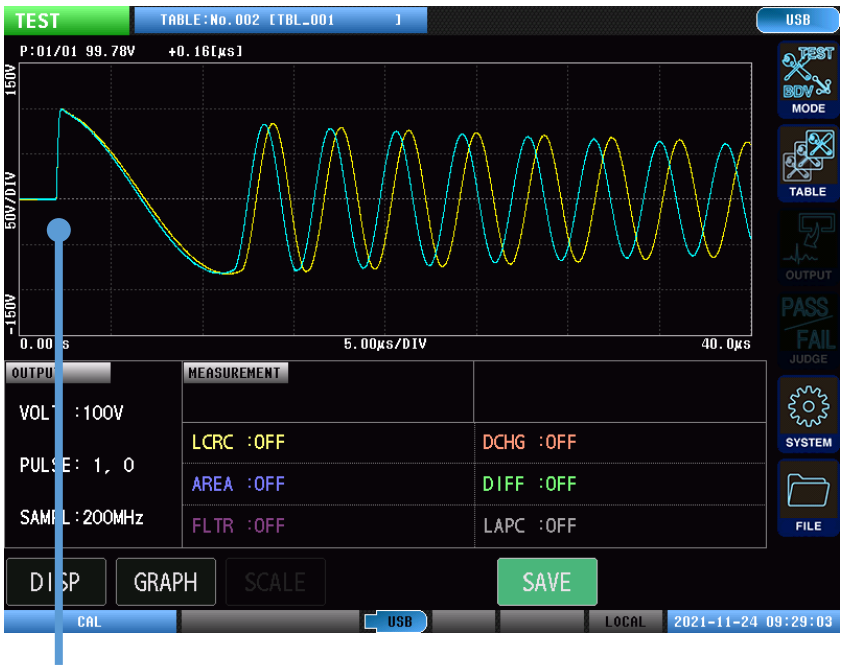
IMPORTANT
Setting the trigger position to any setting other than AUTO will cause the LC and RC values waveform processing scope to diverge from the resonance range.
In such cases, the LC and RC values will differ from values calculated based on the LCR resonance circuit's equivalent circuit, but they can still be used for judgment purposes.

Waveform trigger position: AUTO



The locations of the second zero-cross of the master waveform and measured waveform are aligned on the screen.

Waveform trigger position: RISE



The locations of the rising edges of the master waveform and the measured waveform are aligned on the screen.

5 Automatically Setting the Waveform Judgment Scope and Judgment Threshold Values

The judgment scope and judgment threshold values used during voltage calibration can be set automatically. Automatic configuration can be used to determine provisional settings for use in testing of judgment operation and determining judgment threshold values.

Values can be set separately using the following judgment functions:

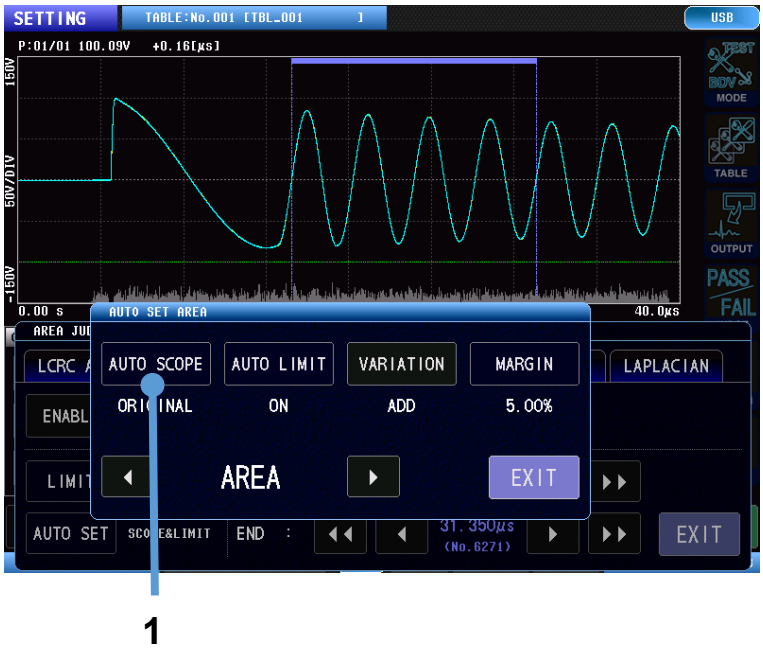
- Surface comparison judgment **[AREA]**
- Differential surface area comparison judgment **[DIFF AREA]**
- Flutter detection judgment **[FLUTTER]**
- Secondary differential detection judgment **[LAPLACIAN]**
- LC and RC values judgment **[LCRC AREA]** *1

*1: The judgment scope for LC and RC values judgment is set automatically.

5.1 Automatically Setting the Waveform Judgment Scope

Surface area comparison judgment, differential surface area comparison judgment, flutter detection judgment, and secondary differential detection judgment

(Measurement screen) **[MODE]** > **[SETTING]** > **[JUDGE]** > **[AREA]**, **[DIFF AREA]**, **[FLUTTER]**, **[LAPLACIAN]** > **[AUTO SET]**



1. Tap **[AUTO SCOPE]**.

OFF	Disables automatic configuration of the judgment scope.
ALL	Includes the entire acquired waveform length in the judgment scope. *1 Enables the judgment function.
ORIGINAL	Sets the judgment scope so that it consists primarily of the self-resonance scope. *2 Enables the judgment function.

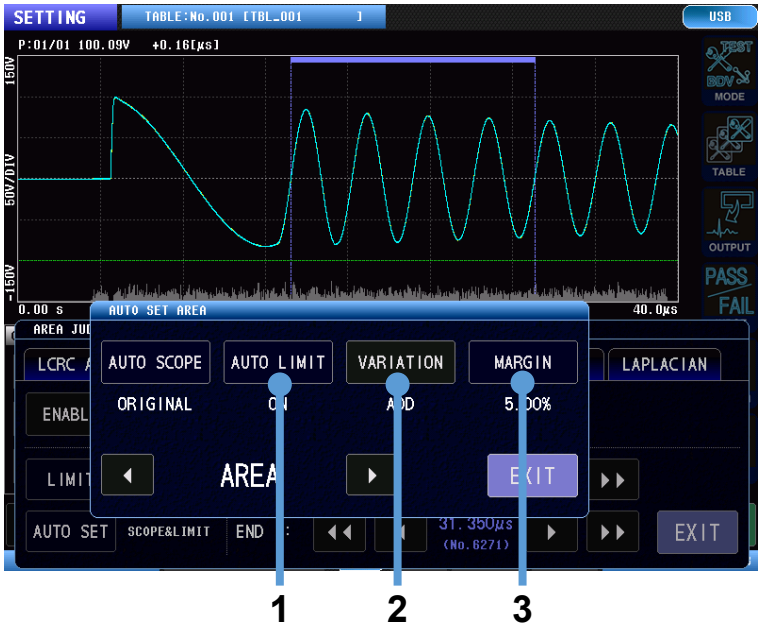
*1: This setting can be used for general judgment.

*2: This is the same scope as used in the firmware prior to version 1.10.

5.2 Automatically Setting the Waveform Judgment Threshold Values

Surface area comparison judgment, differential surface area comparison judgment, flutter detection judgment, and secondary differential detection judgment

(Measurement screen) **[MODE]** > **[SETTING]** > **[JUDGE]** > **[AREA]**, **[DIFF AREA]**, **[FLUTTER]**, **[LAPLACIAN]** > **[AUTO SET]**



1. Tap **[AUTO LIMIT]** and select whether to configure threshold values automatically.

OFF	Disables automatic configuration of threshold values.
ON	Sets threshold values automatically. Enables the judgment function.

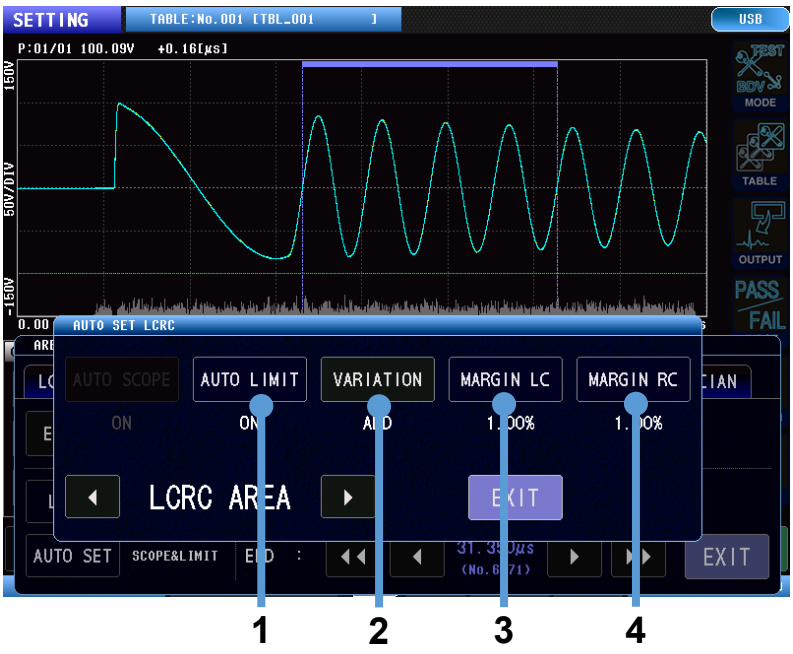
2. If setting threshold values automatically, tap **[VARIATION]** and select whether to add the equivalent of 6 σ of variation in judgment values (as a variability value).

OFF	Does not add variability.
ON	Adds variability.

3. Tap **[MARGIN]** and set the amount of allowance (margin value) to give threshold values when setting them automatically.

LC and RC values judgment

(Measurement screen) **[MODE]** > **[SETTING]** > **[JUDGE]** > **[LCRC AREA]** > **[AUTO SET]**



1. Tap **[AUTO LIMIT]** and select whether to configure threshold values automatically.

OFF	Disables automatic configuration of threshold values.
ON	Sets threshold values automatically. Enables the judgment function.

2. If setting threshold values automatically, tap **[VARIATION]** and select whether to add the equivalent of 6 σ of variation in judgment values (as a variability value).

OFF	Does not add variability.
ON	Adds variability.

3. If setting the LC threshold value automatically, tap **[MARGIN LC]** and set the amount of allowance (margin value) to give the threshold value.

4. If setting the RC threshold value automatically, tap **[MARGIN RC]** and set the amount of allowance (margin value) to give the threshold value.

5.3 Waveform Judgment Threshold Values Formulas

Threshold values are automatically set using the following formulas:

AREA upper limit	+ Average of AREA judgment measured values during voltage calibration[*1] + Margin setting + Variability measured value
AREA lower limit	- Average of AREA judgment measured values during voltage calibration[*1] - Margin setting - Variability measured value
DIFF AREA	+ Average of DIFF AREA judgment measured values during voltage calibration[*1] + Margin setting + Variability measured value
FLUTTER	+ Average of FLUTTER judgment measured values during voltage calibration[*1] + (Average of FLUTTER judgment measured values during voltage calibration) × margin setting + Variability measured value
LAPLACIAN	+ Average of LAPLACIAN judgment measured values during voltage calibration + (Average of LAPLACIAN judgment measured values during voltage calibration) × margin setting + Variability measured value
LCRC AREA LC upper limit	+ Average of LC judgment measured values during voltage calibration + (Average of LC judgment measured values during voltage calibration) × margin setting + Variability measured value
LCRC AREA LC lower limit	- Average of LC judgment measured values during voltage calibration - (Average of LC judgment measured values during voltage calibration) × margin setting - Variability measured value
LCRC AREA RC upper limit	+ Average of RC judgment measured values during voltage calibration + (Average of RC judgment measured values during voltage calibration) × margin setting + Variability measured value
LCRC AREA RC lower limit	- Average of RC judgment measured values during voltage calibration - (Average of RC judgment measured values during voltage calibration) × margin setting - Variability measured value

*1: Under ideal conditions, the average of AREA judgment and DIFF AREA judgment measured values is 0. The average value may be slightly greater than 0 because waveforms acquired during a large number of attempted measurements may diverge slightly from the master waveform.

5.4 Compatibility of Automatically Configured Waveform Judgment Scope and Judgment Threshold Values

Make the following settings to configure firmware version 1.10 for the same operation as **[AUTO SET]** automatic configuration under the firmware prior to version 1.10.

Surface area comparison judgment, differential surface area comparison judgment, flutter detection judgment, and secondary differential detection judgment

AUTO SET	AUTO SCOPE	AUTO LIMIT	VARIATION	MARGIN
OFF	**OFF**	**ON**	**ON**	Set value.
ON	**ORIGINAL**	**ON**	**ON**	Set value.

LC and RC values judgment

AUTO SET	AUTO SCOPE	AUTO LIMIT	VARIATION	MARGIN
No setting	Fixed to **ON**	**ON**	**ON**	Set value.

When a settings file saved using the firmware prior to version 1.10 is loaded, the data will be converted to the above settings.

Since the waveform judgment scope and judgment threshold settings have been expanded, you may encounter changes in control when checking the status of settings using communication commands. For more information, please see the Communication Command Instruction Manual.

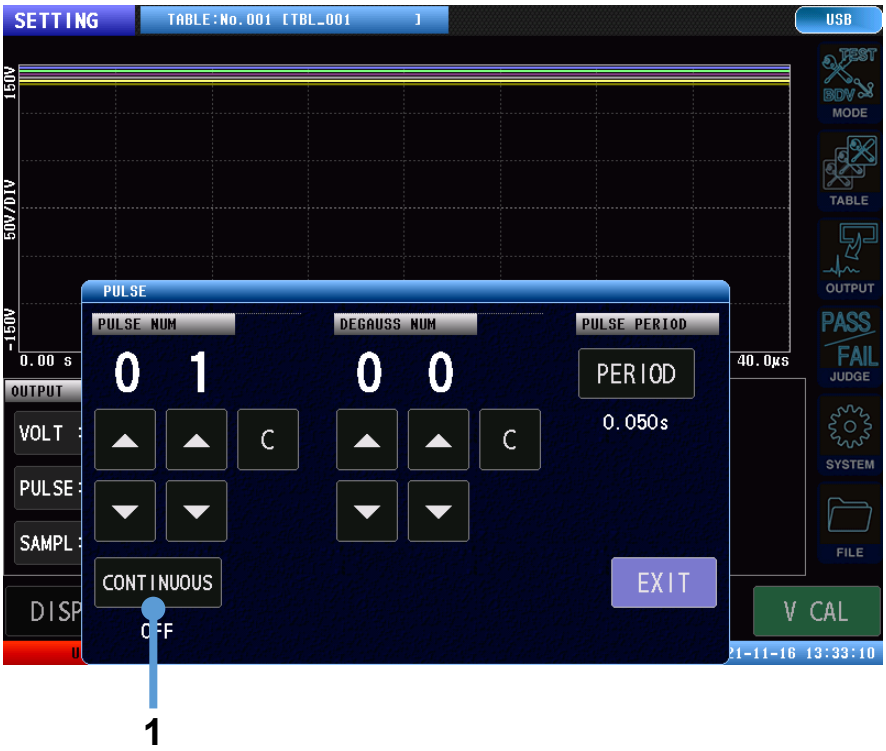
6 Continuous Application

This setting applies voltage pulses continuously from the start of measurement until measurement stops due to **STOP** button input.

Testing can also be started and stopped using communications or the external control terminal.

6.1 Enabling Continuous Application

(Measurement screen) **[MODE]** > **[SETTING]** > **[OUTPUT]** > **[PULSE]**



1. Tap **[CONTINUOUS]** to select the continuous application setting.

OFF	Performs measurement according to the number of applied pulses and the number of degaussing pulses.
ON	Applies voltage pulses continuously.

IMPORTANT

- No degaussing pulses are applied during continuous application.
- During continuous application, the screen will be redrawn after each applied pulse, and the previously applied pulse waveform will be cleared.
- To display multiple previously applied pulse waveforms, enable overlay display of waveforms.
- During continuous application, the instrument will only record waveform data for the last pulse waveform to be applied.
- When judgment is enabled, only the judgment results for the last pulse waveform to be applied will be displayed.

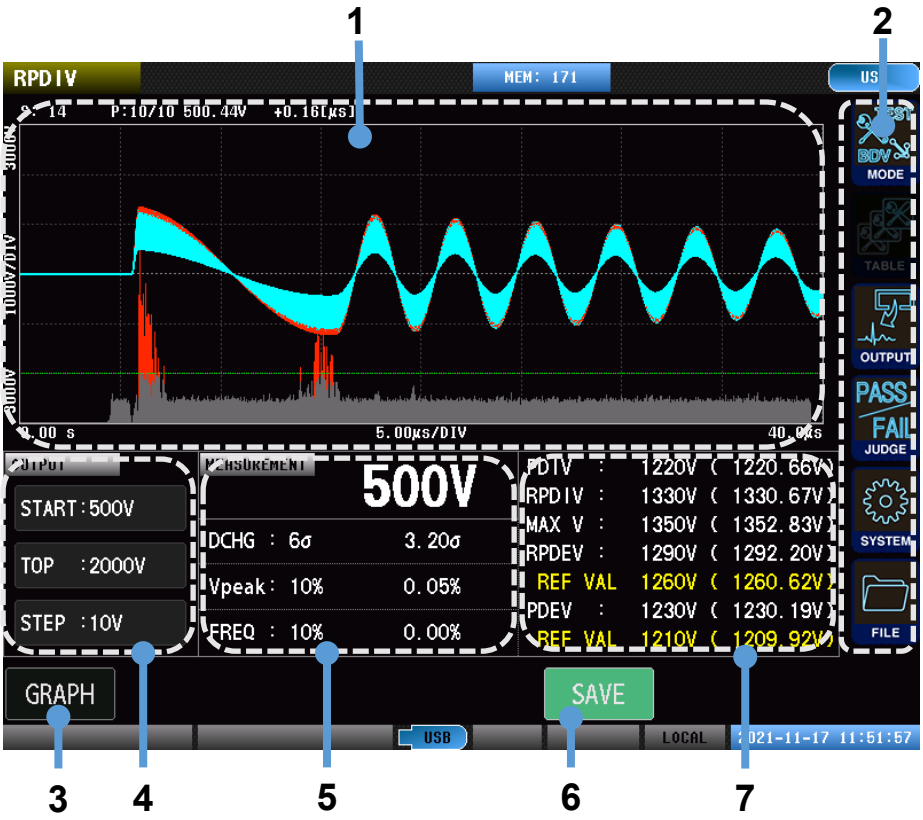
7 Discharge Starting Voltage Testing (RPDIV)

This function tests discharge status by performing impulse testing in which the applied voltages comply with the IEC 61934 procedure. *1

The operation procedure is the same as for BDV mode, but there are differences in the conditions set as part of the testing process.

*1: Models equipped with ST9000 Discharge Detection Upgrade only.

7.1 Screen Configuration



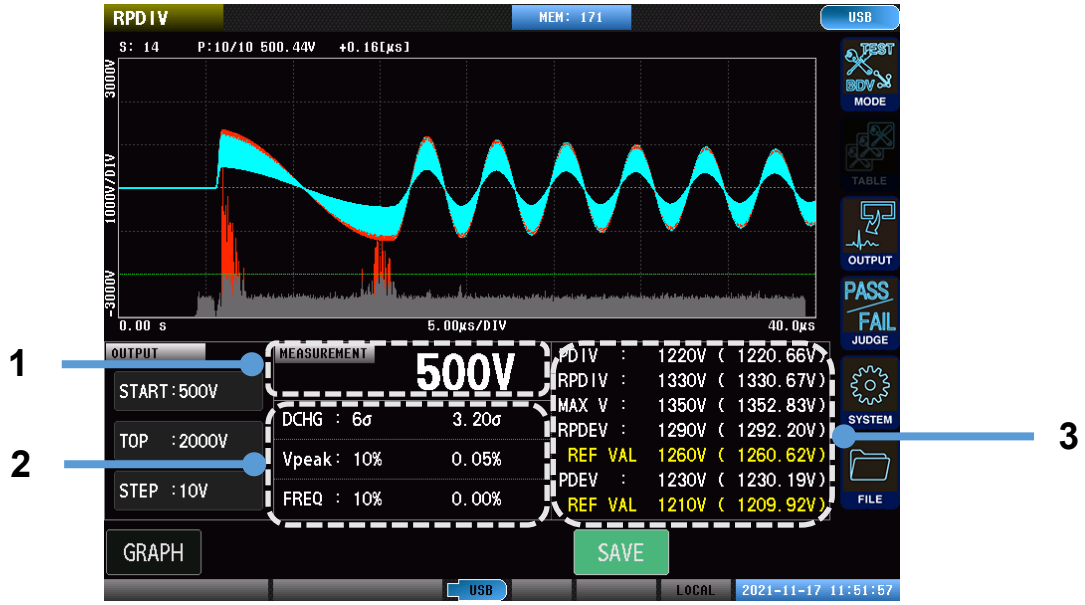
1	Graph display	Displays waveform graphs.
2	Menu icons	**MODE** : Selects the measurement mode. **OUTPUT** : Sets the test conditions. **JUDGE** : Sets the judgment conditions. **SYSTEM** : Configures the system. **FILE** : USB host
3	**[GRAPH]**	Sets the graph display.
4	Test conditions settings display	Displays the settings for the application start voltage, max. voltage, and voltage change width.
5	Judgment value display	Displays the voltage setting and judgment values during testing.
6	**[SAVE]**	Saves the test results to USB flash drive.
7	Measurement results display area	Displays the test results.

7.2 Starting Testing and Checking Test Results

Testing is started by pressing the **START** button on the instrument. (It can also be started using communications or the external control terminal.)

When testing completes, the test results will be output to the screen, communications, and external control terminals (EXT. I/O).

Impulse testing is carried out by incrementing the voltage by the voltage change width, from the set applied voltage to the maximum applied voltage, and recording the incidence of discharge. Once the maximum applied voltage has been reached, impulse testing is applied by decrementing the voltage by the voltage change width and recording the incidence of discharge.



1	Voltage monitor	Displays the current applied voltage value.
2	Judgment values	**DCHG** : XXσ Max. deviation of discharge amount **Vpeak** : XXσ Max. misalignment width from standard of the peak voltage value **FREQ** : XXσ Max. misalignment width from standard of the vibration frequency
3	Measurement results	**PDIV** : XXXXV (XXXXV) Partial discharge inception voltage Test voltage value (measured voltage value) **RPDIV** : XXXXV (XXXXV) Repeated partial discharge inception voltage Test voltage value (measured voltage value) **MAX V**: XXXXV (XXXXV) Return voltage Test voltage value (measured voltage value)*1 **RPDEV** : XXXXV (XXXXV) Repeated partial discharge extinction voltage Test voltage value (measured voltage value) **REF VAL** : XXXXV (XXXXV) RPDEV reference value Test voltage value (measured voltage value)*2 **PDEV** : XXXXV (XXXXV) Partial discharge extinction voltage Test voltage value (measured voltage value) **REF VAL**: XXXXV (XXXXV) PDEV reference value Test voltage value (measured voltage value)*3

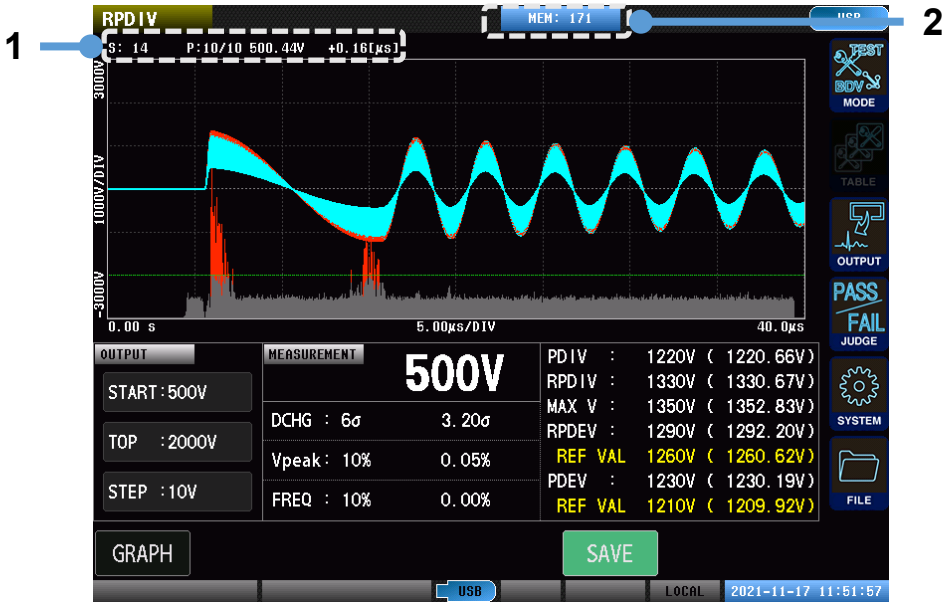
*1: Test voltage after switching from the rising voltage to the falling voltage process.

*2: To take into account variability in discharge incidence, the largest test voltage that does not exceed the test voltage that resulted in a discharge incidence of 50% or more during the falling voltage process is recorded.
The value is not displayed if the voltage is the same as **[RPDEV]**.

*3: To take into account variability in discharge incidence, of the test voltages that resulted in a discharge incidence of 0% during the falling voltage process, the highest voltage value that is less than the **[RPDEV]** reference value is recorded.
The value is not displayed if the voltage is the same as **[PDEV]**.

7.3 Recorded Data Display

This part of the screen displays the number of data points that the instrument has recorded.



1	Pulse information	**S: XX** : Number of waveforms recorded by the instrument*1 **P: XX/XX** : Number of pulses applied at the current applied voltage / total number of pulses **xxxV** : Maximum peak voltage value for the response waveform **+X.XX[µs]** : Rise time*2
2	Internal memory	

*1: Only waveform data for major test voltages such as the measurement start voltage, PDIV, and RPDIV is recorded.
Up to 32 waveforms can be recorded.

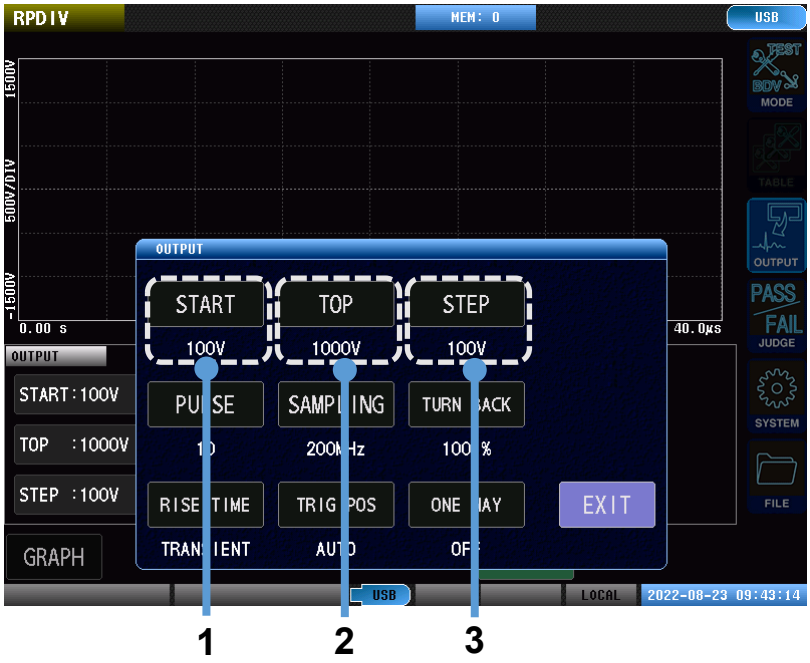
*2: The display will switch between crest and tail length depending on the selected calculation formula.

IMPORTANT

- Although waveform data is not recorded to the instrument's internal memory, judgment values for all applied pulses for all voltages are recorded.
- Data recorded to the internal memory in test mode is cleared when the instrument is switched to RPDIV mode.
- Data recorded to the internal memory in RPDIV mode is cleared when the instrument is switched to another mode.

7.4 Applied Voltages

(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]**



1. Tap **[START]** and set the application start voltage.

Application will start with the set voltage.

ST4030	**100 V** to **3300 V** (resolution: 10 V)
ST4030A	**100 V** to **4200 V** (resolution: 10 V)

2. Tap **[TOP]** and set the maximum applied voltage.

The instrument will perform the test while incrementing the voltage until the set voltage is reached. Once the maximum applied voltage is reached, the instrument will continue testing while decrementing the voltage until the application start voltage is reached.

ST4030	**100 V** to **3300 V** (resolution: 10 V)
ST4030A	**100 V** to **4200 V** (resolution: 10 V)

3. Tap **[STEP]** and set the voltage change width.

ST4030	**10 V** to **100 V** (resolution: 10 V)
ST4030A	**10 V** to **100 V** (resolution: 10 V)

Values greater than 100 V may be entered, but they will be treated as 100 V.

IMPORTANT

When the **[VOLT ERROR]** setting is enabled

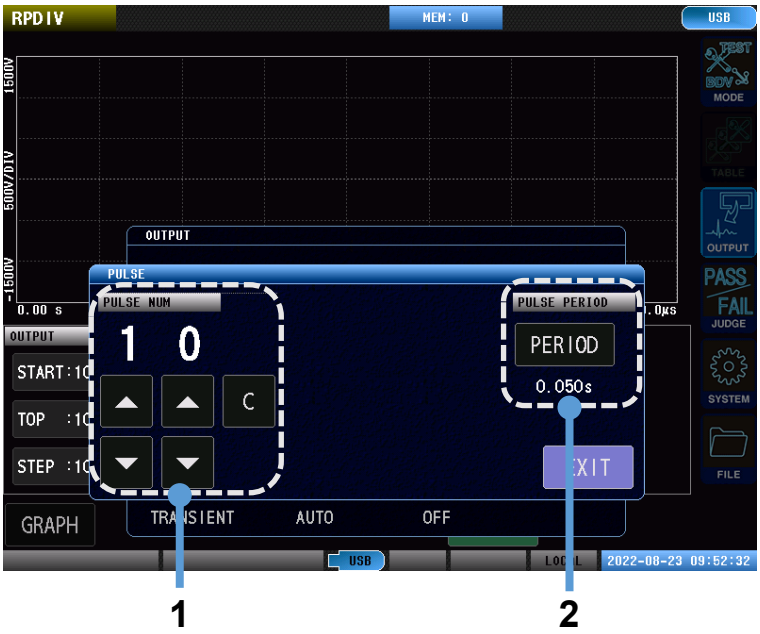
- If a discharge is detected at the application start voltage, the test will terminate with a VOLTAGE ERROR.
- If the measured voltage does not increase to the applied voltage, the test will terminate with a VOLTAGE ERROR.

The BDV and RPDIV modes share the same settings, including for applied voltages.

For example, changing the settings in BDV mode will change the same settings in RPDIV mode.

7.5 Number of Applied Pulses

(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]** > **[PULSE]**



1. Tap the buttons to set the number of test pulses to be applied.

▲	Increases the setting by 1.
▼	Decreases the setting by 1.
C	Reverts the setting to the default value.

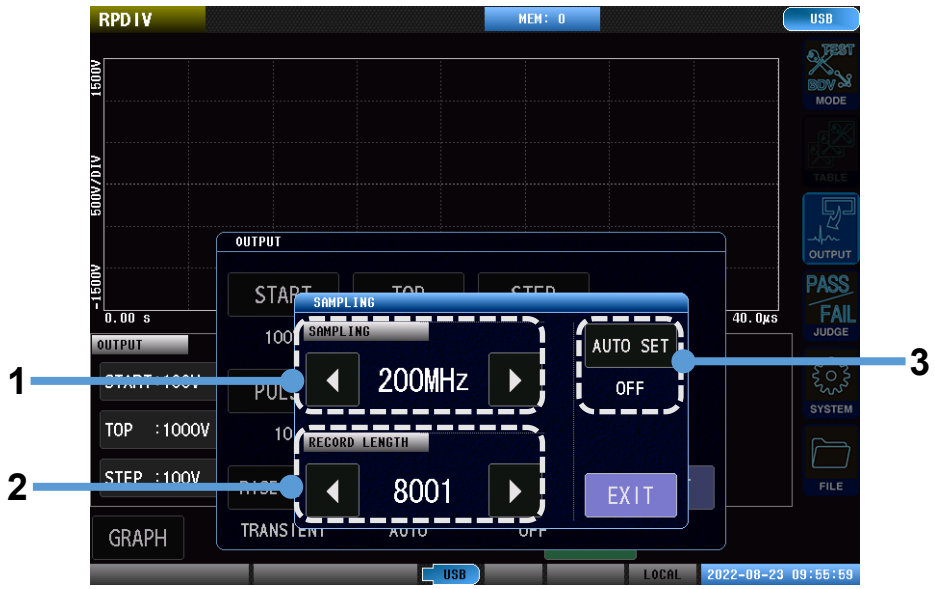
2. Tap **[PERIOD]** to set the pulse application duration interval.

IMPORTANT

There is no degaussing pulse setting in RPDIV mode.

7.6 Sampling Frequency and Number of Sampling Data

(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]** > **[SAMPLING]**



1. Tap the buttons to set the sampling frequency.

If you are unable to acquire the entire response waveform due to its long oscillation period, you can increase the length of the acquired waveform by decreasing the sampling frequency.

Setting range : **10 MHz**, **20 MHz**, **50 MHz**, **100 MHz**, **200 MHz**

◄	Decreases the frequency by 1.
►	Increases the setting by 1.

2. Tap the buttons to set the number of sampling data.

If part of the end of the waveform has an extremely small voltage amplitude after you've determined the length of the acquired waveform by adjusting the sampling frequency, you can decrease the number of sampling data so that unnecessary parts of the waveform are not acquired.

Setting range: **1001** to **8001** points (resolution: 1000 points)

◄	Decreases the setting by 1000.
►	Increases the setting by 1000.

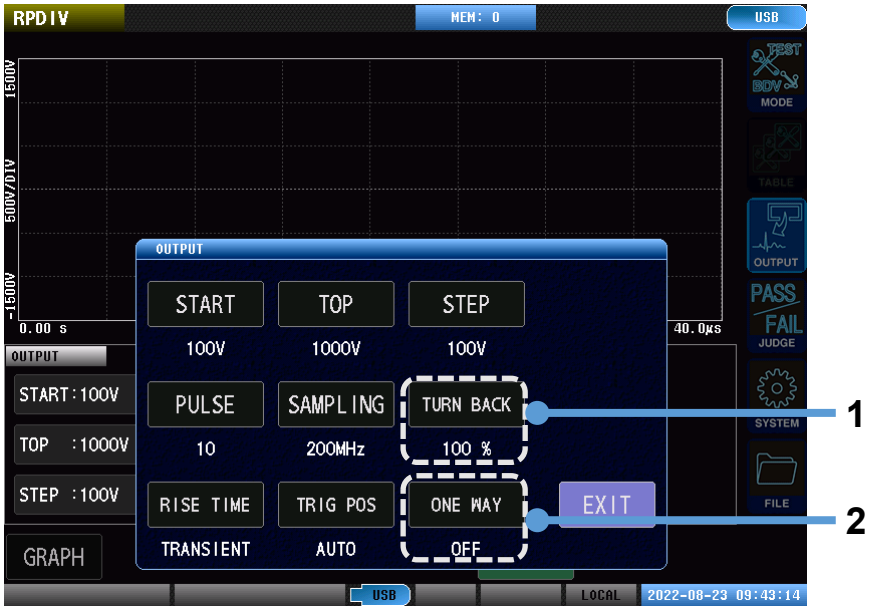
3. Tap **[AUTO SET]** and select automatic configuration of the waveform acquisition range.

Sets the sampling frequency and number of sampling data automatically at the time of voltage calibration to optimize the waveform acquisition range.

OFF	Disables automatic configuration.
ON	Enables automatic configuration.

7.7 Return Conditions

(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]**



1. Tap **[TURN BACK]** and set the return conditions.

Set the conditions used to stop incrementing the applied voltage and start decrementing it.

TOP	Return at the maximum applied voltage.
100 %	Return once the discharge incidence reaches 100%.
90 %	Return once the discharge incidence reaches 90%.
80 %	Return once the discharge incidence reaches 80%.
70 %	Return once the discharge incidence reaches 70%.
60 %	Return once the discharge incidence reaches 60%.
6 sigma	Return once the maximum deviation in the discharge amount reaches 6σ. *1*2
12 sigma	Return once the maximum deviation in the discharge amount reaches 12σ. *1*2
24 sigma	Return once the maximum deviation in the discharge amount reaches 24σ. *1*2

*1: The value of σ varies with discharge judgment threshold values.

*2: Operation will return regardless of whether the discharge incidence has reached 50%.

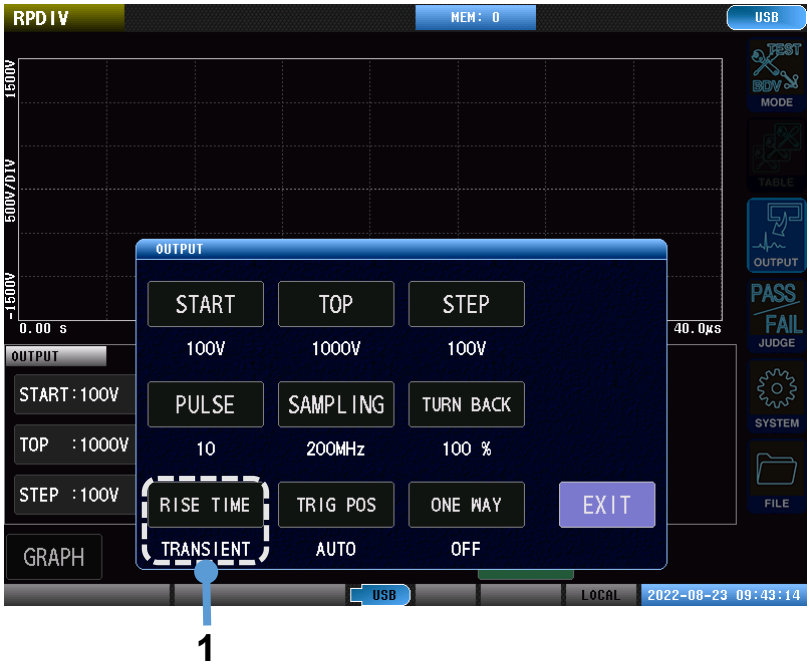
2. Tap **[ONE WAY]** and set whether to make increments only.

The ON setting causes changes in the applied voltage to be limited to increments.

OFF	Both increment and decrement the applied voltage.
ON	Limits changes in the applied voltage to increments.

7.8 Rise Time

(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]**



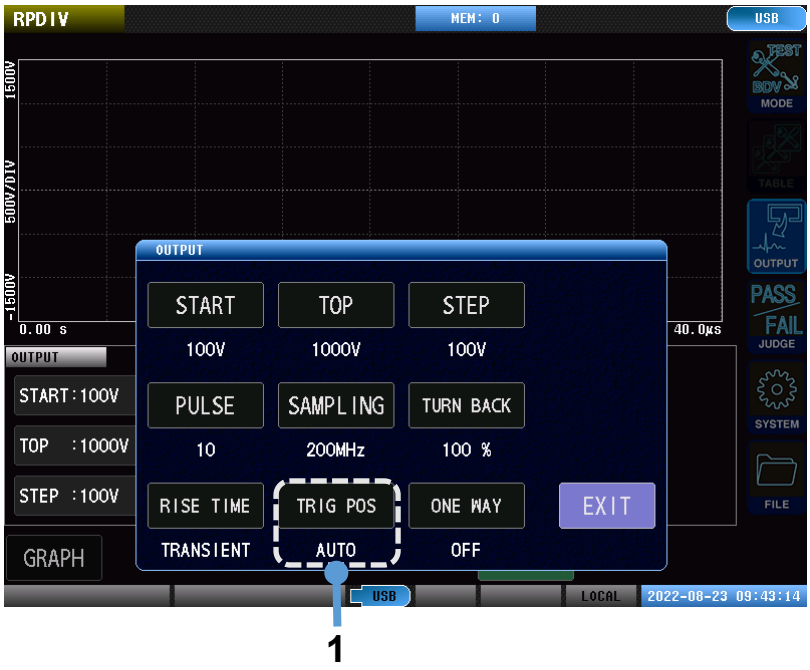
1. Tap **[RISE TIME]** and set the rise time.

Enable/disable the waveform rise time display and set the calculation formula.

OFF	Disables calculation of rise time. Rise time will not be displayed.
30%to90%	Uses the lightning impulse voltage waveform calculation formula to display the crest and tail length.
0%to100%	Uses the switching impulse voltage waveform calculation formula to display the crest and tail length.
10%to90%	Uses the lightning impulse current waveform calculation formula to display the crest and tail length.
TRANSIENT	This rise time is generally used with voltage waveforms. In this case, the rise time is the time required for the voltage to increase from 10% to 90% of 0 V to the initial peak voltage.

7.9 Trigger Position

(Measurement screen) **[MODE]** > **[RPDIV]** > **[OUTPUT]**



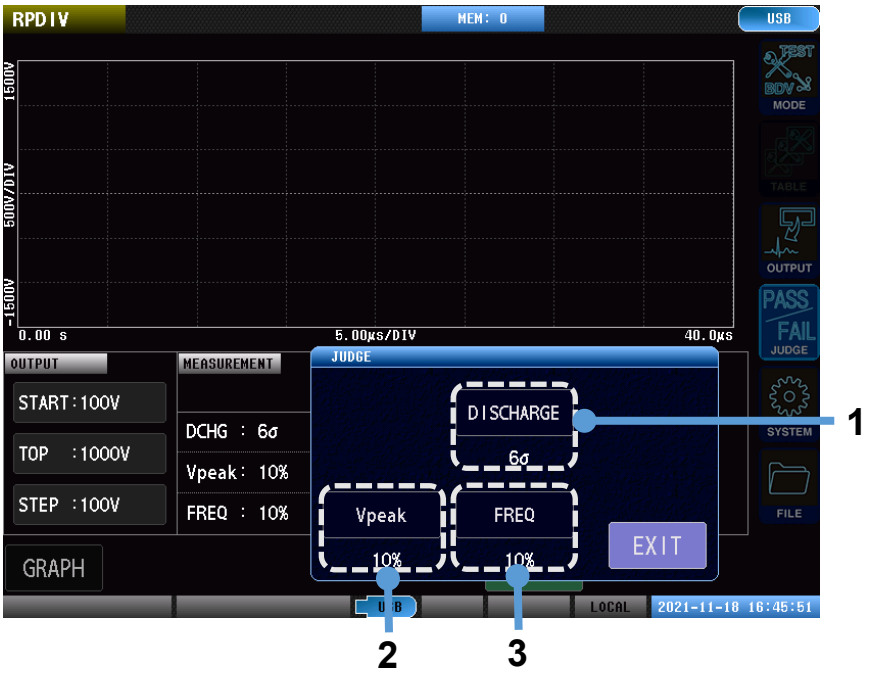
1. Tap **[TRIG POS]** and set the trigger position.

AUTO	Aligns waveforms' display positions based on their second zero-cross position. *1
MINUS	Aligns waveforms just before they approach 0 V from their minimum values. *1
FALL	Aligns waveforms' display positions based on their initial zero-cross positions. *1
RISE	Aligns waveforms' display positions based on their rising edges.

*1: If the trigger position cannot be detected due to the condition of the voltage waveform, the setting will be changed automatically to another condition.

7.10 Discharge Starting Voltage Judgment Conditions

(Measurement screen) **[MODE]** > **[RPDIV]** > **[JUDGE]**



1. Tap **[DISCHARGE]** and set the discharge amount judgment conditions.
Setting range: **OFF**, **3σ** to **100σ** (resolution: 1σ)

2. Tap **[Vpeak]** and set the peak voltage value variability judgment conditions.
A discharge will be determined to have occurred if the instrument detects fluctuations that exceed the product of the peak voltage average value.
Setting range: **OFF**, **0%** to **100%** (resolution: 1%)

3. Tap **[FREQ]** and set the oscillation frequency variability judgment conditions.
Setting range: **OFF**, **0%** to **100%** (resolution: 1%)
A discharge will be determined to have occurred if the instrument detects fluctuations that exceed the product of the average value of waveforms' first period and this setting.

8 Automatic Voltage Adjustment

The voltage applied to workpieces may exhibit variability if there are variations in the workpiece's characteristics. When automatic voltage adjustment is enabled and the number of degaussing pulses is set to 1 or more, the instrument will measure the magnitude of the degaussing pulse voltage and adjust the output voltage so that the voltage that is applied to the workpiece more closely approaches the applied voltage setting.

- The adjustment range is limited to prevent the output voltage from becoming excessively high, for example in the event of an open or short-circuited workpiece.
- The upper limit on the adjustment range can be changed using communication commands. The lower limit is fixed.
- Adjustment can be performed even if there is no master waveform because voltage calibration has not been performed.
- Since multiple degaussing pulses cause adjustment to be repeated for each degaussing pulse, such settings allow the voltage that is applied to workpieces to more closely approach the applied voltage setting.
- Adjustment settings may apply globally to all ST4030A operation or to individual tables. Table settings take precedence.
- You can configure the adjustment process so that either the voltage value at the first waveform peak or the voltage value corresponding to the maximum amplitude of the entire waveform approaches the applied voltage setting.
- Automatic adjustment is performed in test conditions settings mode (**[SETTING]**) and test mode (**[TEST]**).
- The valid adjustment range is -25% to +50%. The upper limit can be lowered to 0% using communication commands.

IMPORTANT

- If the adjustment value exceeds the limits, measurement will be performed without adjusting the output voltage.
- If the adjusted voltage value exceeds the valid output voltage range, measurement will be performed without adjusting the output voltage.
- The fact that measurement was performed without adjusting the output voltage will not cause any change in the measurement status. It is recommended to acquire the magnitude and adjustment status of the waveform voltage using communication commands after measurement and then change processing as necessary based on the results.

8.1 Global Automatic Voltage Adjustment

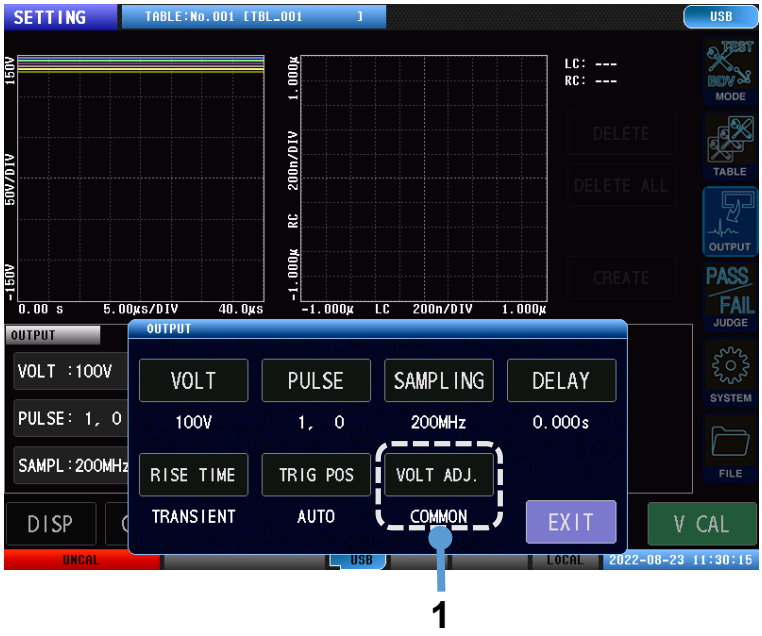
(Measurement screen) **[SYSTEM]**

1. Tap **[AUTO ADJ.]** and configure global automatic voltage adjustment (which applies across all instrument operation).

OFF	Disables automatic adjustment.
TOP	Adjusts the magnitude of the voltage value at the first waveform peak so that it approaches the applied voltage setting.
MAX	Adjusts the magnitude of the voltage value corresponding to the maximum amplitude of the entire waveform so that it approaches the applied voltage setting.

8.2 Table-specific Automatic Voltage Adjustment

(Measurement screen) **[OUTPUT]**



1. Tap **[VOLT ADJ.]** and configure table-specific automatic voltage adjustment.

COMMON	Uses the global automatic voltage adjustment setting (which applies across all instrument operation).
OFF	Disables automatic adjustment.
TOP	Adjusts the magnitude of the voltage value at the first waveform peak so that it approaches the applied voltage setting.
MAX	Adjusts the magnitude of the voltage value corresponding to the maximum amplitude of the entire waveform so that it approaches the applied voltage setting.

8.3 Screen Display

When automatic voltage adjustment is performed, an [A] icon appears in the applied voltage box in the test conditions settings display area at the bottom left of the screen.

A green icon is shown if the number of degaussing pulses is 1 or greater.

A gray icon is used if the number of degaussing pulses is 0.

Automatic voltage adjustment icon

9 Manual Voltage Adjustment

This section describes how to adjust the output voltage by a user-specified amount without changing the applied voltage setting.

- This setting can only be changed using communication commands.
- You can set either a percentage or a voltage value.
- Adjustment can be performed even if there is no master waveform because voltage calibration has not been performed.
- Unlike automatic voltage adjustment, the output voltage is adjusted directly. Adjustment can be performed even if the number of degaussing pulses is zero.
- Unlike automatic voltage adjustment, only a global setting is available.
- Measurement can be performed with both automatic voltage adjustment and manual adjustment enabled.
- Manual adjustment is performed in test conditions settings mode (**[SETTING]**) and test mode (**[TEST]**).
- The valid adjustment range when specifying a percentage is -50% to +50%. The valid adjustment range when specifying a voltage is 100 V to 4200 V (ST4030: 100 V to 3300 V). When specifying a voltage, adjustment is only performed when the specified voltage falls within the range of -50% to +50% of the applied voltage setting.

To ensure safety, automatic voltage adjustment is disabled under the following circumstances:

- When the instrument starts up
- When the applied voltage is changed
- When the measurement mode is changed
- When a table is loaded
- When a settings file is loaded

IMPORTANT

- To ensure safety, manual adjustment cannot be configured using the screen. It can only be configured using communication commands. Enable manual voltage adjustment only when necessary due to the measurement process. Processes and control, including error processing, should be designed so that it is not necessary to enable manual adjustment.
- If the adjusted voltage value exceeds the valid output voltage range, measurement will be performed without adjusting the output voltage.
- The fact that measurement was performed without adjusting the output voltage will not cause any change in the measurement status. It is recommended to acquire the magnitude and adjustment status of the waveform voltage using communication commands after measurement and then change processing as necessary based on the results.

9.1 Screen Display

When manual voltage adjustment is performed, an [M] icon appears in the applied voltage box in the test conditions settings display area at the bottom left of the screen.

The voltage value will change to the post-adjustment value, which will be shown in red.

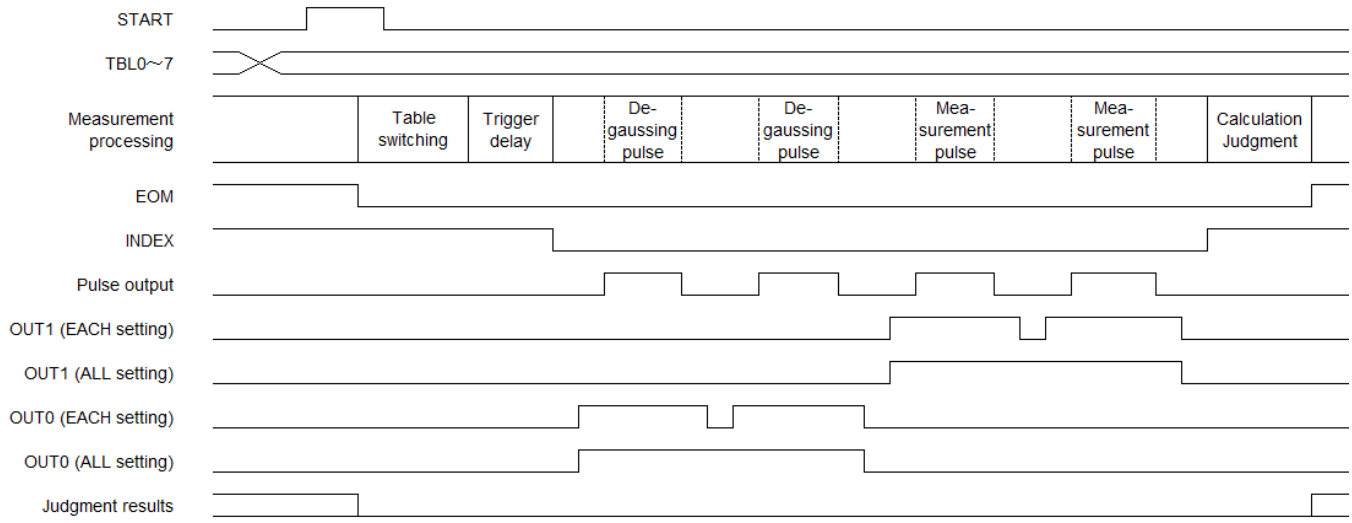
Manual voltage adjustment icon

10 Degaussing Pulse/Measurement Pulse Detection Signal Output

The instrument can output signals for determining whether the impulse voltage output from the voltage output terminal is a degaussing pulse or a measurement pulse.

・This setting can be changed using communication commands.
・A signal indicating degaussing pulse generation is output from EXT. I/O OUT0.
・A signal indicating measurement pulse generation is output from EXT. I/O OUT1.
・The signals are output in test conditions settings mode (**[SETTING]**) and test mode (**[TEST]**).

Example output timing (2 degaussing pulses and 2 measurement pulses)



IMPORTANT

- The output state of EXT. I/O general-purpose output is overwritten.
- The timing of changes to detection signal output and pulse output is not synchronized. This functionality is not suitable for use in applications where the detection signal is used as a trigger to measure the pulse.

11 Extension to Area Detection Threshold Settings

This section describes how to set the upper and lower limit values separately for area comparison detection (**[AREA]**).

Setting the upper limit value for the area comparison judgment (**[AREA]**) threshold value

(Measurement screen) **[MODE]** > **[SETTING]** > **[JUDGE]** > **[AREA]**

1. Tap **[+LIMIT]**.
2. Enter the upper limit value for the area comparison detection threshold using the numeric keypad.
   Setting range: -99.99%～+99.99% (Resolution: 0.01%)

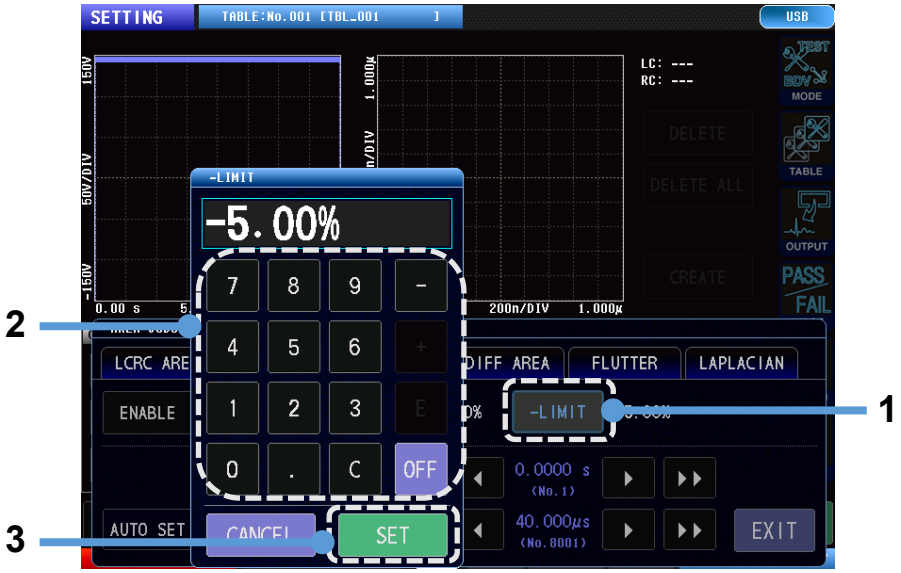
OFF	Disables judgment.

3. Tap **[SET]** to accept the setting.

If you set the upper limit value so that it is lower than the lower limit value, the upper and lower limit values will be reversed.

Setting the lower limit value for the area comparison judgment ([AREA]) threshold value

(Measurement screen) [MODE] > [SETTING] > [JUDGE] > [AREA]



1. Tap [-LIMIT].
2. Enter the lower limit value for the area comparison detection threshold using the numeric keypad.
   Setting range: -99.99%～+99.99% (Resolution: 0.01%)

OFF	Disables judgment.

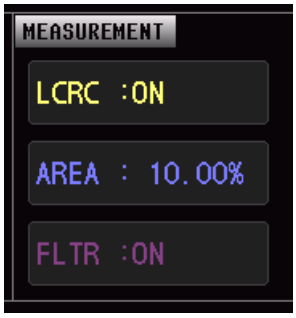
3. Tap [SET] to accept the setting.

If you set the lower limit value so that it is higher than the upper limit value, the upper and lower limit values will be reversed.

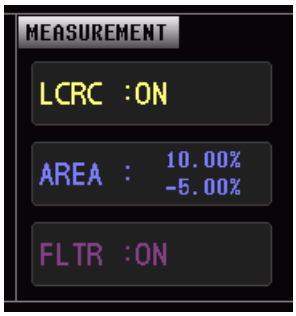
11.1 Screen Display

If the upper and lower limit values are equal, and the upper and lower limit values' signs are reversed, only the upper limit value will be displayed.

This display is the same as that used in firmware version V1.10.



If the upper and lower limit values differ or have the same sign, both the upper and lower limit values will be displayed, with the former above the latter.



12 Fixing Startup Mode

The following settings can be made using communication commands so that the ST4030A always starts up in the same measuring mode when it is powered on.

NORMAL	Same operation as in V1.05 and V1.10 If the instrument was in the key lock state when it was turned off, it will start up in the same mode as when it was turned off. If the instrument was not in the key lock state when it was turned off, it will start up in voltage application disabled mode.
KEEP	Causes the instrument to always start up in the same mode as when it was turned off.
NONE	Causes the instrument to start up in voltage application disabled mode.
SETTING	Causes the instrument to start up in test conditions settings mode.
GENERAL	Causes the instrument to start up in test mode.
BDV	Causes the instrument to start up in break down voltage test (BDV) mode.
RPDIV	Causes the instrument to start up in RPDIV mode. *1

*1: When using the ST9000

Please refer to the Communication Command Instruction Manual for more information.

IMPORTANT

- Performing a full reset will not reset this setting.
- To change this setting, please configure it using communication commands.
- The setting may be initialized when the instrument is repaired or calibrated.
- This setting is not among the test conditions that can be saved to a USB flash drive.
- If you downgrade to firmware earlier than V1.20, the setting will remain, but its functionality will be disabled.

13 Permanently Enabling the Interlock Function

This section describes how to enable the interlock pin permanently with communication commands.
Once set, this function cannot be undone.
If this function is enabled, you will be able to operate the screen and change settings even when the interlock function is engaged.
Please refer to the communication command user manual for more information.

IMPORTANT

- Performing a full reset will not reset this setting.
- The setting is stored in the instrument's nonvolatile memory. You can use communication commands to verify that the setting has not been deleted, for example due to a nonvolatile memory failure.
- If you need to revert the setting to its original value, please contact your authorized Hioki distributor or reseller.
- Please cycle the instrument's power after changing this setting.
- The setting may be initialized when the instrument is repaired or calibrated.
- This setting is not among the test conditions that can be saved to a USB flash drive.
- If you downgrade to firmware earlier than V1.20, the setting will remain, but its functionality will be disabled.

14 Permanently Enabling Level Operation of the EXT. I/O STOP Pin

Although the EXT. I/O STOP pin is set to edge operation in the instrument's standard configuration, it can be set to level operation using communication commands.
Once set, this setting cannot be undone.
Please refer to the Communication Command Instruction Manual for more information.

IMPORTANT

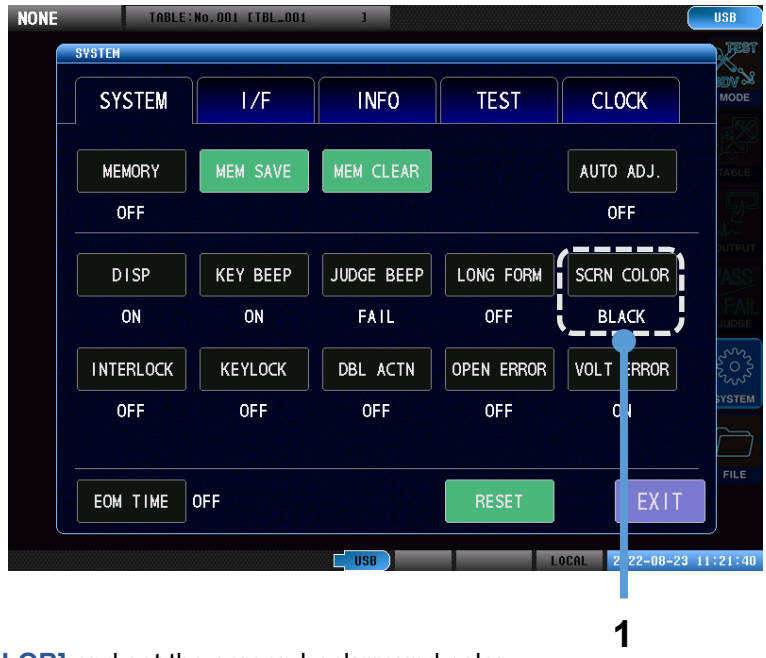
- Performing a full reset will not reset this setting.
- The setting is stored in the instrument's nonvolatile memory. You can use communication commands to verify that the setting has not been deleted, for example due to a nonvolatile memory failure.
- If you need to revert the setting to its original value, please contact your authorized Hioki distributor or reseller.
- Please cycle the instrument's power after changing this setting.
- The setting may be initialized when the instrument is repaired or calibrated.
- This setting is not among the test conditions that can be saved to a USB flash drive.
- If you downgrade to firmware earlier than V1.20, the setting will remain, but its functionality will be disabled.

15 Background Color

You can set the background color of the waveform display area to white.

This setting makes it easier to see waveforms when image data is saved as a file.

(Measurement screen) **[SYSTEM]**



1. Tap **[SCRN COLOR]** and set the screen background color.

BLACK	Selects black as the background color.
GRAPH (1)	Selects white as the background color for the waveform display area only.
GRAPH (2)	Selects white as the background color for the waveform display area only. The waveform color will be changed to facilitate easy viewing.
WHITE (1)	Selects white as the background color for the entire waveform screen.
WHITE (2)	Selects white as the background color for the entire waveform screen. The waveform color will be changed to facilitate easy viewing.

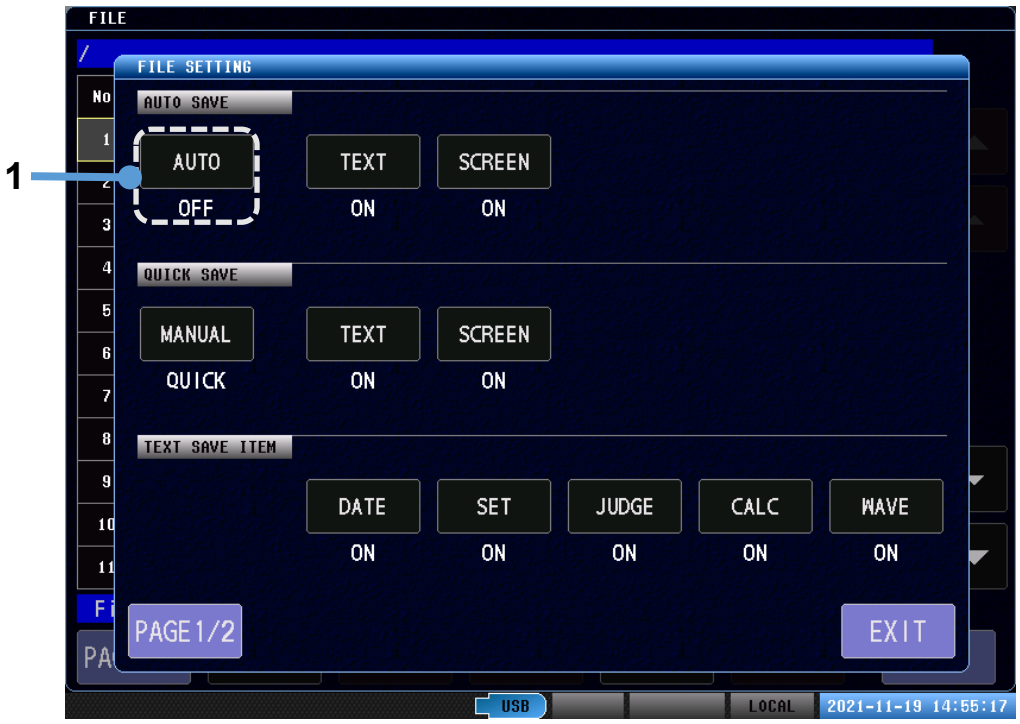
IMPORTANT

Change settings before measurement. Changing settings after measurement starts may cause the waveform display to be cleared.

16 Auto Saving of Files

This setting configures whether to automatically save measurements that generated a FAIL judgment to the USB flash drive.

(Measurement screen) **[FILE]** > **[SETUP]**



1. Tap **[AUTO]** to enable auto saving.

OFF	Disables automatic saving of data after measurement completes.
ON	Enables automatic saving of data after measurement completes.
FAIL	Enables automatic saving of only data with a FAIL judgment after measurement completes.

17 Extension to the Voltage Error Setting

The voltage error setting has been extended.

(Measurement screen) **[SYSTEM]** > **[SYSTEM]**

1. Tap **[VOLT ERROR]** to configure the voltage error setting.

OFF	Disables voltage errors.
ON	Enables voltage errors.
ONORSTOP	Enables voltage errors in the **[SETTING]** and **[TEST]** modes. In the **[BDV]** and **[RPDIV]** modes, measurement will complete with no error having occurred even if the instrument is unable to apply the voltage up to the test voltage.

18 Expansion of System Information

System information shown for the instrument has been expanded.

(Measurement screen) **[SYSTEM]** > **[INFO]**

Serial No.	Indicates the serial number.
Software Version	Indicates the firmware version.
FPGA Main	Indicates the main FPGA version.
FPGA Receive	Indicates the sub-FPGA version.
MAC Address	Indicates the instrument's MAC address.
USB ID	Indicates the USB ID.
Interface Board	Indicates the name of the optional interface board in use. [--]: No interface board in use
EXT. I/O Mode	Indicates the external control terminal (EXT. I/O) output mode. NPN: Current sink output mode PNP: Current source output mode
Option	Indicates whether the ST9000 Discharge Detection Upgrade (option) is present.
ALWAYS INTERLOCK	Indicates whether the interlock function has been permanently enabled.
STARTUP MODE	Indicates whether the startup mode has been fixed.
EXT. I/O STOP	Indicates the STOP pin (EXT. I/O) operating mode.
INTERNAL CAPACITY	Indicates the capacity of the instrument's internal discharge capacitor.

19 Other Changes

19.1 Communication Commands

A number of new communication commands have been added. Please see the Communication Command Instruction Manual for more information.

19.2 BDV Mode

It is now possible to perform measurements up to the maximum voltage in BDV mode, even if the test voltage is set for more than 32 steps.
In this case, waveform data is thinned so that it fits into 32 steps before being saved by the instrument.

19.3 File Screen

When attempting to overwrite an existing file with the same name, you can now choose whether to do so.
Write-protected files and folders cannot be deleted or renamed.

19.4 STOP Button

To improve safety, it is no longer possible to start measurement using the external control terminal (EXT. I/O) or communication commands while the **STOP** button on the instrument is being pressed.

19.5 Downgrading

If you downgrade the instrument's firmware from V1.20 to a version released prior to V1.20, please initialize the instrument by performing a full reset as described in Section 14.2 of the Instruction Manual. The instrument will not start up until this step is performed.

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