INSTRUCTION MANUAL

DIGITAL STORAGE OSCILLOSCOPE
DCS-7500 SERIES
DCS-7507A   DCS-7510A   DCS-7515A

■ **About a trademark, a registered trademark**

A company name and the brand name mentioned in this instruction manual are the trademark or the registered trademark of each company or group in each country and region.

■ **About this instruction manual**

When copying the part or all of contents of this instruction manual, seek the copyright holder.
In addition, the specifications of the product and the contents of this instruction manual are subject to change without notice for improvement. Please check to our website for the latest version.

■ **About export**

When export or ship the product to overseas, please confirm laws and regulations about the export.

■ **About firmware version**

This instruction manual corresponds to the firmware Ver1.14 or higher. Please note that the printer function is Ver1.13 or less.

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USING THE PRODUCT SAFELY

■ **Preface**

To use the product safely, read this instruction manual to the end.
Before using this product, understand how to correctly use it.

If you read this manual but you do not understand how to use it, please
ask us or your local dealer. After you read this manual, save it so that you
can read it, anytime as required.

■ **Pictorial indication**

This instruction manual and product show the warning and caution items
required to safely use the product. The following pictorial indication and
warning character indication are provided.

<Pictorial indication>	
⚠	Some part of this product or the instruction manual may show this pictorial indication. In this case, if the product is incorrectly used in that part, a serious danger may be brought about on the user's body or the product. To use the part with this pictorial indication, be sure to refer to this instruction manual.
⚠ **WARNING**	If you use the product, ignoring this indication, you may get killed or seriously injured. This indication shows that the warning item to avoid the danger is provided.
⚠ **CAUTION**	If you incorrectly use the product, ignoring this indication, you may get slightly injured or the product may be damaged. This indication shows that the caution item to avoid the danger is provided.

Please be informed that we are not responsible for any damages to the user
or to the third person, arising from malfunctions or other failures due to wrong
use of the product or incorrect operation, except such responsibility for
damages as required by law.

USING THE PRODUCT SAFELY

WARNING **CAUTION**

- ■ **Do not remove the product's covers and panels**
  Never remove the product's covers and panels for any purpose.
  Otherwise, the user's electric shock or fire may be incurred.
- ■ **Warning on using the product**
  Warning items given below are to avoid danger to user's body and life and
  avoid the damage or deterioration of the product.
  Use the product, observing the following warning and caution items.
- ■ **Warning items on power supply**
  - ● Power supply voltage
    The rated power supply voltages of the product are 100, 120, 220 and
    240VAC. The rated power supply voltage for each product should be
    confirmed by reading the label attached on the back of the product or
    by the "rated" column shown in this instruction manual.
    The specification of power cord attached to the products is rated to
    125VAC for all products which are designed to be used in the areas
    where commercial power supply voltage is not higher than 125VAC.
    Accordingly, you must change the power cord if you want to use the
    product at the power supply voltage higher than 125VAC. If you use
    the product without changing power cord to 250VAC rated one,
    electric shock or fire may be caused.
    When you used the product equipped with power supply voltage
    switching system, please refer to the corresponding chapter in the
    instruction manuals of each product.

  - ● Power cord
    **(Important)   The attached power cord set can be used for this
    device only.**
    If the attached power cord is damaged, stop using the product and call
    us or your local dealer. If the power cord is used without the damage
    being removed, an electric shock or fire may be caused.

  - ● Protective fuse
    If an input protective fuse is blown, the product does not operate. For a
    product with external fuse holder, the fuse may be replaced. As for
    how to replace the fuse, refer to the corresponding chapter in this
    instruction manual.
    If no fuse replacement procedures are indicated, the user is not
    permitted to replace it. In such case, keep the case closed and
    consult us or your local dealer. If the fuse is incorrectly replaced, a fire
    may occur.

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■ **Warning item on Grounding**
   If the product has the GND terminal on the front or rear panel surface, be
   sure to ground the product to safely use it.

■ **Warnings on Installation environment**
   ● Operating temperature and humidity
      Use the product within the operating temperature indicated in the
      "rating" temperature column. If the product is used with the vents of the
      product blocked or in high ambient temperatures, a fire may occur.
      Use the product within the operating humidity indicated in the "rating"
      humidity column. Watch out for condensation by a sharp humidity
      change such as transfer to a room with a different humidity. Also, do
      not operate the product with wet hands. Otherwise, an electric shock or
      fire may occur.
   ● Use in gas
      Use in and around a place where an inflammable or explosive gas or
      steam is generated or stored may result in an explosion and fire. Do
      not operate the product in such an environment.
      Also, use in and around a place where a corrosive gas is generated or
      spreading causes a serious damage to the product. Do not operate the
      product in such an environment.
   ● Installation place

      Avoid installing the product on inclined places or on places subject to
      vibration. Otherwise, the product may slip or fall down to cause
      damages or injury accidents.

■ **Do not let foreign matter in**

   Do not insert metal and inflammable materials into the product from its
   vent and spill water on it. Otherwise, electric shock or fire may occur.

■ **Warning item on abnormality while in use**
   In abnormal situations, such as "smoke", "fire", "abnormal smell" or
   "irregular noise" occur from the product while in use, stop using the
   product, turn off the switch, and remove the power cord plug from the
   outlet. After confirming that no other devices catch fire, ask us or your
   local dealer.

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■ Warning Item for the Measurement

- When you measure a part of a high voltage, be careful not to touch a hand to a measurement part directly. There is a risk of an electric shock.
- Be sure to connect the probe or the cable and the ground side of the input connector to the ground potential (ground) of the substance measured. Since the chassis of this instrument is connected to the ground of the input block, connecting the earth lead of the probe to the potential floating from the ground potential may result in the following:
  - Electric shock
  - A high current flows and damages the substance measured, this instrument, and other connected device.

  The following parts are connected to the chassis:
  - Probe for each channel and ground side of the input BNC connector
  - Grounding conductor of the accessory 3-core power cord
  - Ground pin for an interface signal

"Bad example"　　**Prohibition**
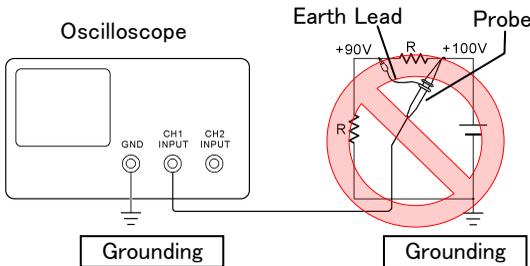
At connecting as Bad Example, +90V and chassis are shorted, and damages substance a measured. Therefore do not make such connection.
If the instrument is not grounded, a potential of the chassis is +90V.
Ground a chassis, in order to prevent an electric shock accident.

When measuring the floating potential, a differential method of measurement is recommended (refer to the figure below).

"Good example"
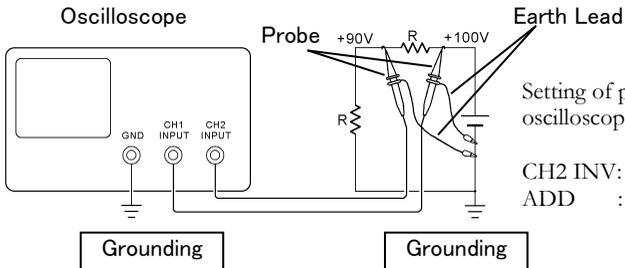
Setting of panel switches of an oscilloscope

CH2 INV: ON (CH2 inverted)
ADD　　: ON (CH1+CH2)

USING THE PRODUCT SAFELY

■ **Input / Output terminals**

Maximum input to terminal is specified to prevent the product from being damaged. Do not supply input, exceeding the specifications that are indicated in the "Rating" column in the instruction manual of the product.

Also, do not supply power to the output terminals from the outside. Otherwise, a product failure is caused.

■ **Calibration**

Although the performance and specifications of the product are checked under strict quality control during shipment from the factory, they may be deviated more or less by deterioration of parts due to their aging or others. It is recommended to periodically calibrate the product so that it is used with its performance and specifications stable.

For consultation about the product calibration, ask us or your local dealer.

■ **Daily Maintenance**

When you clean off the dirt of the product covers, panels, and knobs, avoid solvents such as thinner and benzene. Otherwise, the paint may peel off or resin surface may be affected.

To wipe off the covers, panels, and knobs, use a soft cloth with neutral detergent in it. During cleaning, be careful that water, detergent, or other foreign matters do not get into the product.

If a liquid or metal gets into the product, an electric shock and fire are caused. During cleaning, remove the power cord plug from the outlet.

Use the product correctly and safely, observing the above warning and caution items. Because the instruction manual indicates caution items even in individual items, observe those caution items to correctly use the product.

If you have questions or comments about the instruction manual, ask us or E-Mail us.

1. GETTING STARTED

The Getting started chapter introduces the oscilloscope's main features, appearance, and set up procedure.

1-1. Main Features

Model name	Frequency bandwidth	Input channels
DCS-7507A	DC – 70MHz (–3dB)	2
DCS-7510A	DC – 100MHz (–3dB)	2
DCS-7515A	DC – 150MHz (–3dB)	2

Performance	
Performance	• 1 GSa/s real-time sampling rate
	• 25GSa/s equivalent-time sampling rate
	• 2M points record length
	• Up to 10ns peak detection
	• 2mV~10V vertical scale
	• 1ns ~ 50s time scale

Features	• 5.7 inch color TFT display
	• Saving and recalling setups and waveforms
	• 27 automatic measurements
	• Multi-language menu
	• Math operation: Addition, Subtraction, multiplication, FFT, FFT rms
	• Data logging
	• Go-NoGo testing
	• Edge, video, pulse width trigger
	• Size: (W) 310 x (D) 140 x (H) 142 mm
	• Probe factor from 0.1X~2000X voltage/current
Interface	• USB 2.0 full-speed interface for saving and recalling data
	• Calibration output
	• External trigger input
	• USB slave interface for remote control

1-2. Panel Overview

1-2-1. Front Panel
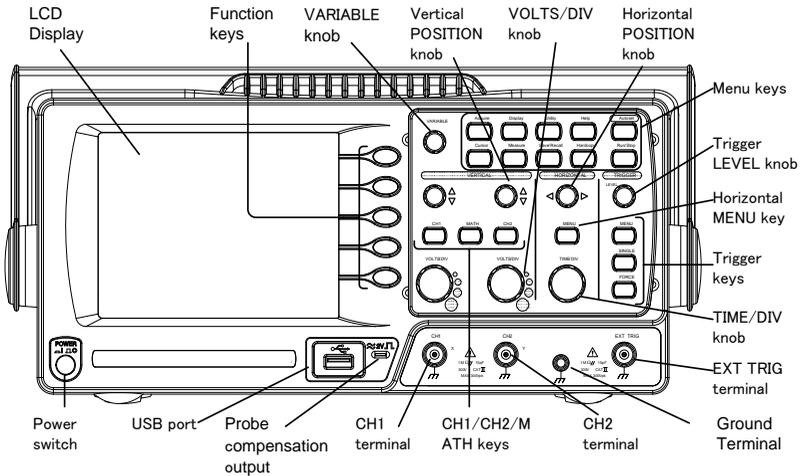
LCD display	TFT color, 320 x 234 resolution, wide angle view LCD display.
Function keys: F1 (top) to F5 (bottom)	Activates the functions which appear in the left side of the LCD display.
Variable knob	VARIABLE — Increases or decreases values and moves to the next or previous parameter.
Acquire key	Acquire — Configures the acquisition mode (page 57).
Display key	Display — Configures the display settings (page 60).
Cursor key	Cursor — Runs cursor measurements (page 42).
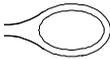
Utility key	Utility	Configures the Hardcopy function (page 93), shows the system status (page 87), selects the menu language (page 87), runs the self calibration (page 105), configures the probe compensation signal (page 106).
Help key	Help	Shows the Help contents on the display (page 29).
Autoset key	Autoset	Automatically configures the horizontal, vertical, and trigger settings according to the input signal (page 31).
Measure key	Measure	Configures and runs automatic measurements (page 37).
Save/Recall key	Save/Recall	Saves and recalls images, waveforms, or panel settings (page 88).
Hardcopy key	Hardcopy	Stores images, waveforms, or panel settings to USB (page 93).
Run/Stop key	Run/Stop	Runs or stops triggering (page 32).
Trigger level knob	TRIGGER LEVEL	Sets the trigger level (page 72).
Trigger menu key	MENU	Configures the trigger settings (page 72).
Single trigger key	SINGLE	Selects the single triggering mode (page 78).
Trigger force key	FORCE	Acquires the input signal once regardless of the trigger condition at the time (page 78).
Horizontal menu key	MENU	Configures the horizontal view (page 62).
Horizontal position knob	◁ ▷	Moves the waveform horizontally (page 62).
TIME/DIV knob	TIME/DIV	Selects the horizontal scale (page 63).

Vertical position knob	△▽	Moves the waveform vertically (page 67).
CH1/CH2 key	CH 1	Configures the vertical scale and coupling mode for each channel (page 67).
VOLTS/DIV knob	VOLTS/DIV	Selects the vertical scale (page 68).
Input terminal	CH1	Accepts input signals: 1MΩ±2% input impedance, BNC terminal.
Ground terminal		Accepts the DUT ground lead to achieve a common ground.
MATH key	MATH	Performs math operations (page 44).
USB port	←	Facilitates transferring waveform data, display images, and panel settings (page 88).
Probe compensation output	≈2V⎍	Outputs a 2Vp-p, square signal for compensating the probe (page 106) or demonstration.
External trigger input	EXT TRIG	Accepts an external trigger signal (page 72).
Power switch	POWER ⏻	Powers the oscilloscope on or off.

1-2-2. Rear Panel
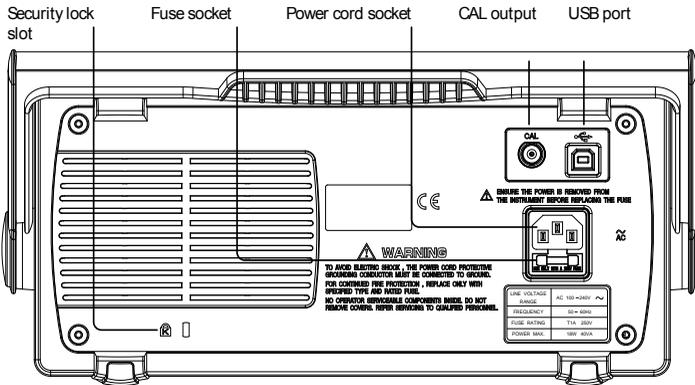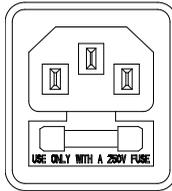
Power cord socket		Power cord socket accepts the AC mains, 100 ~ 240V, 50/60Hz.
Fuse socket		The fuse socket holds the AC main fuse, T1A/250V.
		For the fuse replacement procedure, see page 108.
USB slave port		Accepts a type B (slave) male USB connector for remote control of the oscilloscope
Calibration output	CAL	Outputs the calibration signal used in vertical scale accuracy calibration (page 105).
Security lock slot		Standard laptop security lock slot for ensuring the security of the DCS-7500A.

1-2-3. Display
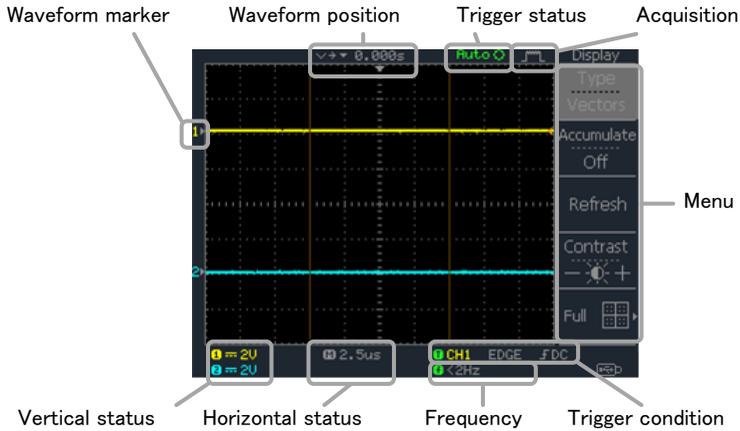
Waveforms	Channel 1: Yellow	Channel 2: Blue
Trigger status	Trig'd	A signal is being triggered
	Trig?	Waiting for a trigger condition
	Auto	Updating the input signal regardless of trigger conditions
	STOP	Triggering is stopped
	For trigger setting details, see page 72.	
Input signal frequency	Updates the input signal frequency (the trigger source signal) in real-time.	
	"< 2Hz" Indicates that the signal frequency is less than the lower frequency limit (2Hz) and thus not accurate.	
Trigger configuration	Shows the trigger source, type, and slope. In case of the Video trigger, shows the trigger source and polarity.	
Horizontal status Vertical status	Shows the channel configurations: coupling mode, vertical scale, and horizontal scale.	

1-3. Setting up the Oscilloscope

Background	This section describes how to set up the oscilloscope properly including adjusting the handle, connecting a signal, adjusting the scale, and compensating the probe. Before operating the oscilloscope in a new environment, run these steps to make sure the oscilloscope is functionally stable.
Procedure	1. Pull both bases of the handle out slightly.
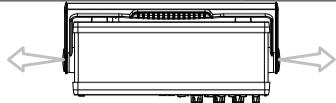
2. Turn to one of the three preset positions.
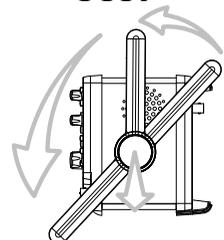
3. Connect the power cord.
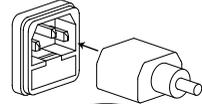
4. Press the power switch. The display will become active in approximately 10 seconds.

5. Reset the system by recalling the factory settings. Press the Save/Recall key, then *Default Setup*. For details regarding the factory settings, see page 28.
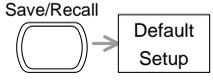
6. Connect the probe between the Channel1 input terminal and probe compensation signal output (2Vp-p, 1kHz square wave).

7. Set the probe attenuation voltage to x10.

$\approx 2V \sqcap$

x1
x10

CH1
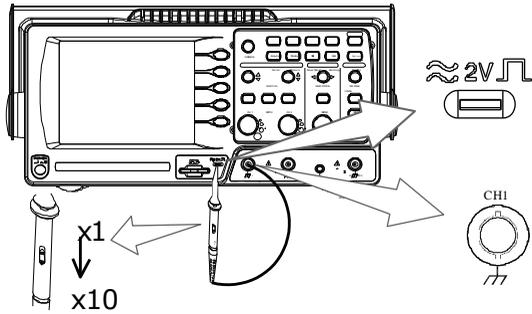
8. Press the Autoset key. A square waveform will appear in the center of the display. For details on Autoset, see page 31.

Autoset

9. Press the Display key, then *Type* and select the vector waveform type.

Display

Type
Vectors
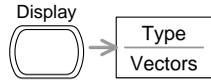
10. Turn the adjustment point on the probe to flatten the square waveform edge.
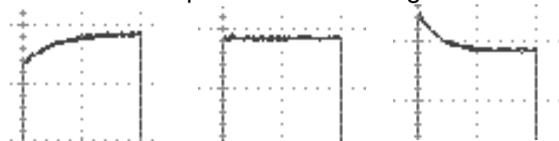
Over Compensation   Normal   Under Compensation
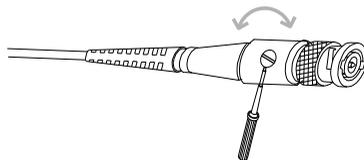
11. Setting up the oscilloscope is complete. You may continue with the other operations.
Measurement: page 30   Configuration: page 57

2. QUICK REFERENCE

This chapter lists the oscilloscope menu tree, operation shortcuts, built-in help coverage, and default factory settings. Use this chapter as a handy reference to access the oscilloscope functions.

2-1. Menu Tree and Shortcuts

Conventions	Examples
Normal	= Press the functional key for "Normal"
Average ⇄	= Repeatedly press the functional key for "Average"
Normal ~ Average	= Select a menu from "Normal" to "Average" and press its functionality key
Normal→VAR ◯	= Press the functionality key for "Normal", and then use the Variable knob

2-1-1. Acquire key
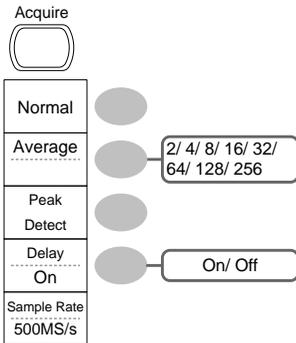
Select acquisition mode

Normal ~ Peak-Detect

Select average number

Average ⇄

Turn Delay on/off

Delay On ⇄

2-1-2. CH1/CH2 key

CH 1		Turn channel on/off
		CH 1/CH 2⏎
Coupling ∿	∿ / ⎓ / ⏚	Select coupling mode
		Coupling⏎
Invert Off	On/ Off	Invert waveform
BW Limit Off	On/ Off	Invert⏎
		Turn bandwidth limit on/off
Voltage x1	Voltage/Current	BW Limit⏎
Expand Center	Center/Ground	Select probe type
		Voltage↔Current
		Select probe attenuation
		VAR ◯ (0.1x~2000x) (1-2-5 step)
		Expand type
		Expand⏎
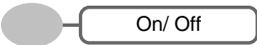
2-1-3. Cursor key 1/2

Cursor		Turn cursor on/off
		Cursor⏎
Source CH1	CH1/ 2/ MATH	Move X1 cursor
		X1→ VAR ◯
X1 -5.000uS 0.000uV		Move X2 cursor
X2 5.000uS 0.000uV		X2→ VAR ◯
X1X2 Δ : 10.00uS f : 100.0kHz 0.000uV		Move both X1 and X2 cursor
		X1X2→ VAR ◯
X↔Y		Switch to Y cursor
		X↔Y

2-1-4.　Cursor key 2/2

Cursor		Turn cursor on/off
		Cursor⏎
Source CH1	CH1/ 2/ MATH	Move Y1 cursor Y1→ VAR ○
Y1 123.4mV		Move Y2 cursor Y2→ VAR ○
Y2 12.9mV		Move both Y1 and Y2 cursor Y1Y2→ VAR ○
Y1Y2 10.5mV		
X↔Y		Switch to X cursor X↔Y

2-1-5.　Display key

Display		Select waveform type
		Type⏎
Type Vectors	Vectors/ Dots	Waveform accumulate On/Off Accumulate⏎
Accumulate Off	On/ Off	Refresh accumulation Refresh
Refresh		
Contrast − ☼ +		Set display contrast Contrast→VAR ○
Full ▦ ►	▦ / ⊞ / ▢	Select display grid ▦⏎

2-1-6. Autoset key
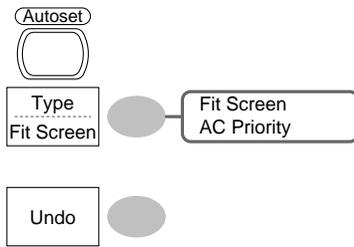
(Autoset)		Automatically find the signal and set the scale
		Autoset
Type / Fit Screen	Fit Screen / AC Priority	Change the Type of Autoset mode.
Undo		Type ⇄ (available for a few seconds)
		Undo Autoset
		Undo ⇄
		(available for a few seconds)

2-1-7. Hardcopy key

Hardcopy	→ See Utility key (page 24)

2-1-8. Help key

Help	Turn help mode on/off
	Help ⇄
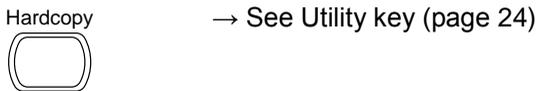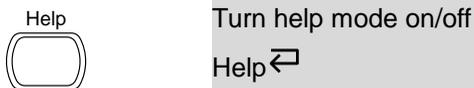
2-1-9. Horizontal menu key
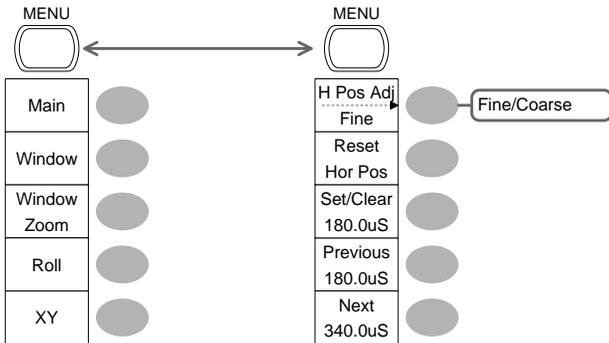
Switch from Horizontal Menu to Horizontal Position Menu.	Horizontal MENU ⇄
Select main (default) display	Main
Select window mode	Window→TIME/DIV ◯
Zoom in window mode	Window Zoom
Select window roll mode	Roll
Select XY mode	XY
Toggle adjustment mode	H Pos Adj ⇄
Reset horizontal marker	Reset
Set Horizontal marker/delete horizontal marker.	HOR ◯→Set/Clear
Navigate to previous horizontal marker.	Previous
Navigate to next horizontal marker.	Next

2-1-10. Math key 1/2 (+/-/x)
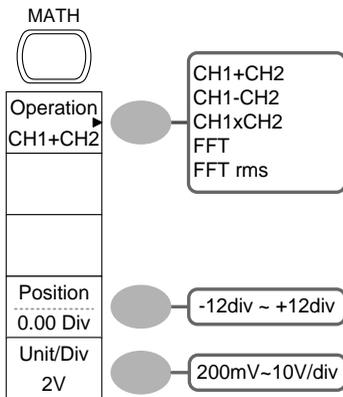
MATH	Math on/off
	Math⇄
Operation CH1+CH2 → CH1+CH2 / CH1-CH2 / CH1xCH2 / FFT / FFT rms	Select math operation type (+/–/x/FFT/FFT rms)
	Operation⇄
Position 0.00 Div → -12div ~ +12div	Set result position
	Position→VAR ◯
Unit/Div 2V → 200mV~10V/div	Math result Volt/Div
	Unit/Div→VOLTS/DIV ◯

2-1-11. Math key 2/2 (FFT/FFT rms)
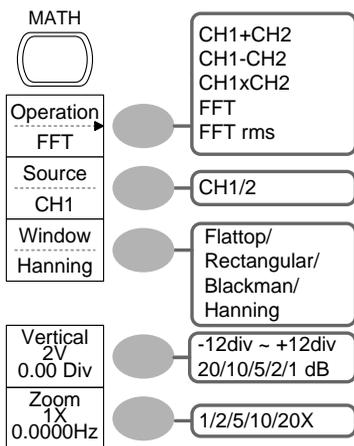
MATH	Math on/off
	Math⇄
Operation FFT → CH1+CH2 / CH1-CH2 / CH1xCH2 / FFT / FFT rms	Select math operation type (+/–/x/FFT/FFT rms)
	Operation⇄
Source CH1 → CH1/2	Select FFT source channel
	Source⇄
Window Hanning → Flattop/ Rectangular/ Blackman/ Hanning	Select FFT window
	Window⇄
Vertical 2V 0.00 Div → -12div ~ +12div 20/10/5/2/1 dB	Select FFT result position
	Vertical→VAR ◯
Zoom 1X 0.0000Hz → 1/2/5/10/20X	Select vertical scale
	Vertical→VOLTS/DIV ◯
	Select vertical units
	Vertical⇄
	Select Zoom level
	Zoom(X)→VAR ◯
	Select Horizontal position
	Zoom(Hz)→VAR ◯

2-1-12. Measure key
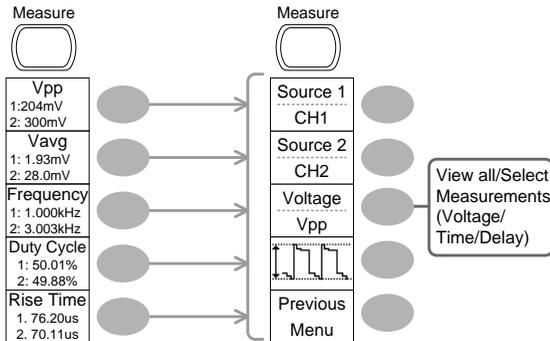
Turn on/off measurement	Measure ⏎
Select measurement type	Voltage/Time/Delay ⏎
Select measurement item	VAR ⏀ or Icon(F3) ⏎ / → VAR ⏀
Go back to previous menu	Previous Menu

2-1-13. Run/Stop key

Run/Stop	Freeze/unfreeze waveform or trigger
	Run/Stop ⏎

2-1-14. Save/Recall key 1/10

Save/Recall	Save/Recall
Default Setup	Save Setup → To Save Setup
Recall Setup → To Recall Setup	Save Waveform → To Save Waveform
Recall Waveform → To Recall Waveform	Save Image → To Save Image
Recall Image → To Recall Image	Save All → To Save All
Display Refs. → To Display Refs	CSV Format / Fast → Fast/ Detail
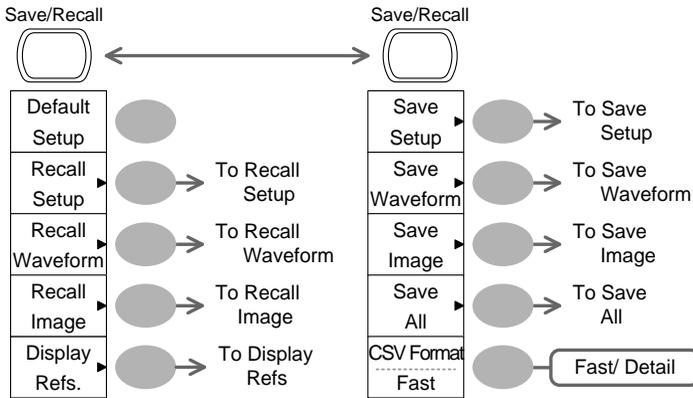
Switch to Save or Recall menu	Save/Recall ⇄
Recall default setup	Default Setup
Change CSV format	CSV Format ⇄

2-1-15. Save/Recall key 2/10

Recall Setup

Recall Setup →		Select other menu
		Recall Setup ⇄
Source Memory → Memory/USB		Select setup source
		Source ⇄ →VAR ○
		Recall setup
Recall		Recall
File Utilities → (USB only) To File Utilities		Go to USB file utilities
		File Utilities

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2-1-16. Save/Recall key 3/10

Recall Waveform

Recall ▸ Waveform	
Source ⋯⋯ Memory	Memory/USB
Destination	RefA/B
Recall	
File Utilities	→ (USB only) To File Utilities

Select other menu

Recall Waveform⇄

Select waveform source

Source⇄→VAR ◯

Select waveform destination

Destination→VAR ◯

Recall waveform

Recall

Go to USB file utilities

File Utilities

2-1-17. Save/Recall key 4/10

Recall Image

Recall ▸ Image	
Source ⋯⋯ USB	
Ref Image ⋯⋯ Off	On/Off
Recall	
File Utilities	→ (USB only) To File Utilities

Select other menu

Recall Image⇄

Turn reference image on/off

Ref image⇄

Recall waveform

Recall

Go to USB file utilities

File Utilities

2-1-18. Save/Recall key 5/10

Display Refs.

Display Refs. ▸	⬯ ←————————→
Ref.A Off	⬯——[On/ Off]
Ref.B Off	⬯——[On/ Off]

Ref.A On
1V
2.5ms
⬯
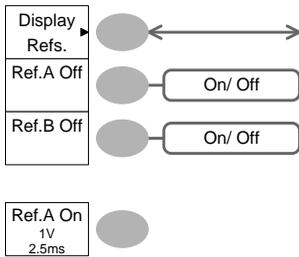
Select other menu

Display Refs.⇄

Turn ref. waveform A on/off

Ref.A⇄

Turn ref. waveform B on/off

Ref.B⇄

2-1-19. Save/Recall key 6/10

Save Setup

Save Setup ▸	⬯ ←————————→

Destination Memory	⬯——[Memory/USB]
Save	⬯
File Utilities	⬯ → (USB only) To File Utilities
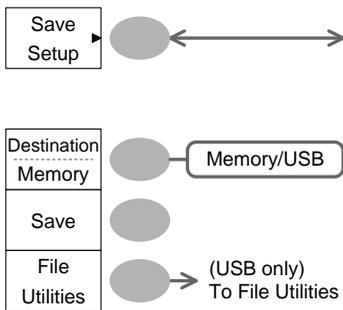
Select other menu

Save Setup⇄

Select destination

Destination⇄→VAR ◯

Save setup

Save

Go to USB file utilities

File Utilities

2-1-20. Save/Recall key 7/10

Save Waveform

Save Waveform	⬯ ←————————→
Source	⬯——[CH1/2/Math Ref A/B]
Destination Memory	⬯——[Memory / USB Normal / USB 1M / USB 2M/Refs.]
Save	⬯
File Utilities	⬯ → (USB only) To File Utilities
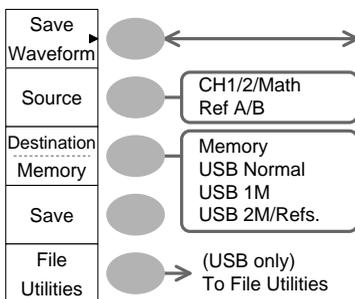
Select other menu

Save Waveform⇄

Select source

Source⇄→VAR ◯

Select destination

Destination⇄→VAR ◯

Save waveform

Save

Go to USB file utilities

File Utilities

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2-1-21. Save/Recall key 8/10

Save Image

Save Image ▶	⬭ ⟵⟶	
Ink Saver Off	⬭ —[On/ Off]	
Destination USB		
Save	⬭	
File Utilities	⬭ ⟶ (USB only) To File Utilities	

Select other menu

Save Image ⇄

Turn on/off ink saver

Ink Saver ⇄

Save image

Save

Go to USB file utilities

File Utilities

2-1-22. Save/Recall key 9/10

Save All

Save All ▶	⬭ ⟵⟶	
Ink Saver Off	⬭ —[On/ Off]	
Destination USB	⬭ —[USB Normal USB 1M/ USB 2M]	
Save	⬭	
File Utilities	⬭ ⟶ (USB only) To File Utilities	

Select other menu

Save All ⇄

Turn on/off ink saver

Ink Saver ⇄

Select destination

Destination ⇄→VAR ◯

Save all

Save

Go to USB file utilities

File Utilities

2-1-23. Save/Recall key 10/10
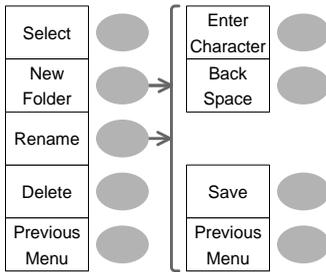
				Select file/folder
File Utilities				VAR ⟳→Select
Select	○	Enter Character	○	Create or rename folder/file
New Folder	○	Back Space	○	New Folder/Rename
Rename	○			VAR ⟳→Enter character /
Delete	○	Save	○	Backspace / Save / Previous menu
Previous Menu	○	Previous Menu	○	Delete folder/file
				Delete
				Go to previous menu
				Previous menu

2-1-24. Trigger key 1/6

Trigger Type
MENU

Type
Edge
Source
CH1

Slope /
Coupling
Mode
Auto

Trigger Holdoff
MENU
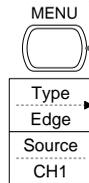
Holdoff
40.0ns
Set to
Minimum
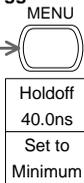
Select Trigger type or Trigger Holdoff menu

Type ⇄
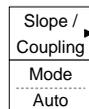
2-1-25.　Trigger key 2/6

Video Trigger

Type	
Video	
Source	CH1/2
CH1	
Standard	NTSC/SECAM/PAL
NTSC	
Polarity	⎍⎍ / ⎍⎍
Line	Field 1/ Field 2/ Line
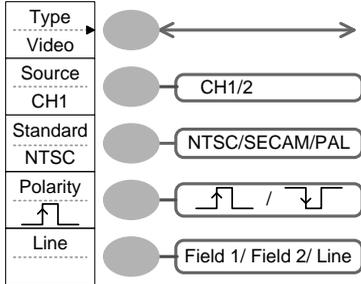
Select video trigger type

Type⏎

Select trigger source

Source⏎

Select video standard

Standard⏎

Select video polarity

Polarity⏎

Select video field/line

Line⏎→VAR ◯

2-1-26.　Trigger key 3/6

Edge Trigger

Type	
Edge	
Source	CH1/2/Ext/Line
CH1	

Slope /	To Slope/Coupling
Coupling	
Mode	Auto/ Normal
Auto	
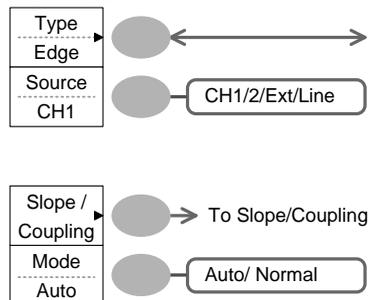
Select edge trigger type

Edge⏎

Select trigger source

Source⏎

Go to slope/coupling menu (page 23)

Slope/Coupling

Select trigger mode

Mode⏎

2-1-27. Trigger key 4/6

Pulse Trigger

Type
Pulse
Source
CH1
When <
20.0ns
Slope /
Coupling
Mode
Auto

CH1/2/Ext/Line

>/ </ =/ ≠
20ns~10s

To Slope/Coupling

Auto/ Normal

Select pulse trigger type

Type ⏎

Select trigger source

Source ⏎

Select pulse trigger condition and pulse width

When ⏎→VAR ◯

Go to slope/coupling menu (page 23)

Slope/Coupling

Select trigger mode

Mode ⏎

2-1-28. Trigger key 5/6

Coupling/Slope

Slope
⟋
Coupling
AC
Rejection
Off
Noise Rej
Off
Previous
Menu

⟋ / ⟍

AC/ DC

LF/ HF/ Off

On/ Off

Select trigger slope type
Slope ⏎
Select trigger coupling mode
Coupling ⏎
Select frequency rejection
Rejection ⏎
Turn noise rejection on/off
Noise Rej ⏎
Go back to previous menu
Previous Menu

2-1-29. Trigger key 6/6

Trigger Holdoff

Holdoff
40.0ns
Set to
Minimum

40ns~2.5s

Select Holdoff time

VAR ◯

Set to minimum Holdoff time

Set to Minimum ⏎

2-1-30. Utility key 1/10 (Utility #1)
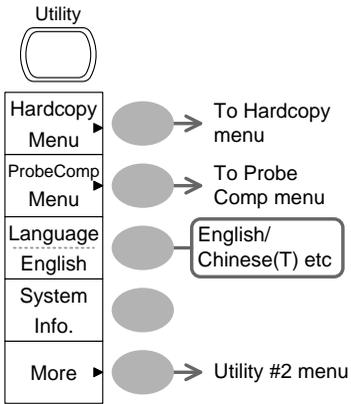
Go to hardcopy menu	
Hardcopy	
Go to probe compensation menu	
ProbeComp	
Select language	
Language⇄	
Show system information	
System Info.	
Go to the next Utility menu	
More	

2-1-31. Utility key 2/10 (Utility #2)
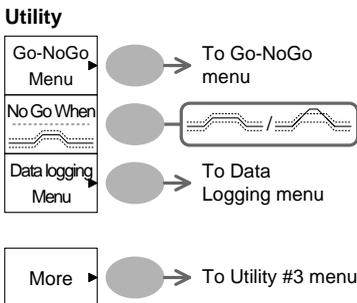
Go to the Go-NoGo menu	
Go-NoGo	
Set the NoGo conditions to inside ⌒/outside ⌒limits	
No Go When⇄	
Go to the Data Logging Menu	
Data Logging	
Go to the next Utility menu	
More	

2-1-32. Utility key 3/10 (Utility #3)
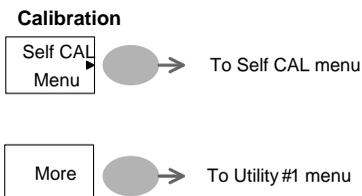
Enter self calibration	
Self CAL	
Go to the first Utility menu	
More	

2-1-33.   Utility key 4/10 (Hardcopy -Save All)

Hardcopy – Save All

Function Save All	
Ink Saver Off	On/ Off
Mem Leng USB 1M	USB Normal USB 1M/2M
CSV Format Fast	Fast/ Detail
Previous Menu ▶	
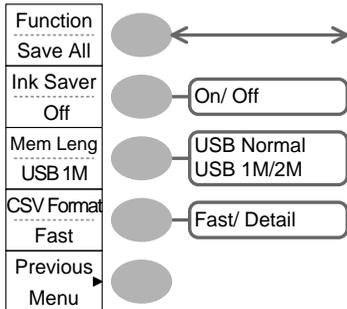
Select Hardcopy function

Function ⇄

Turn on/off Ink saver

Ink Saver ⇄

Set the memory length

Mem Leng ⇄

Change CSV format

CSV Format ⇄

Go to previous menu

Previous Menu ⇄

2-1-34.   Utility key 5/10 (Hardcopy -Save Image)

Hardcopy – Save Image

Function Save Image	
Ink Saver Off	On/ Off
Previous Menu ▶	
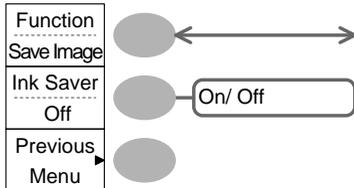
Select Hardcopy function

Function ⇄

Turn on/off Inksaver

Ink Saver ⇄

Go to previous menu

Previous Menu ⇄

2-1-35.   Utility key 6/10 (Probe compensation)
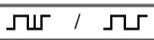
		Select probe compensation signal
Probe compensation		
Wave Type ⊓⊔	○ — ⊓⊔ / ⊔⊓	Wave Type ⇆
Frequency 1 K	○ — (⊔⊓ only) 1k ~ 100k	Set frequency for square wave
		Frequency→VAR ○
Duty Cycle 50%	○ — (⊔⊓ only) 5% ~ 95%	Set duty cycle for square wave
		Duty Cycle→VAR ○
Default 1kHz	○	Go to previous menu
Previous ▸ Menu	○	Previous Menu

2-1-36.   Utility key 7/10 (Go-NoGo)

		Switch between templates
Edit		
Template ▸ Max	○ — Max/Min/Auto	Template ⇆
Source W 01	○ — Auto: CH1, CH2 Max|Min: Ref A/ Ref B, W01~W15	Select the template source
		Source ⇆
Tolerance 0.4%	○ — 0.4%~40% 0.4DIV~40DIV	Set the tolerance (% or Divisions)
		Tolerance ⇆→VAR ○
Save & Create	○	Save the template
		Save & Create
Previous Menu	○ → To previous menu	Go back to previous menu
		Previous Menu

2-1-37. Utility key 8/10 (Data Logging 1/2)

Data logging

Data logging Off	⬤── On/Off	
Source CH1	⬤── CH1/CH2	
Setup	⬤──→ To the Edit menu	
File Utilities	⬤──→ (USB only) To File Utilities	
Previous Menu	⬤──→ To previous menu	

Turn Data Logging On/Off

Data logging ⇄

Set the logging source

Source ⇄

Go to the Data Logging Edit menu

Setup

Go to the File Utilities menu

File Utilities

Go back to previous menu

Previous Menu

2-1-38. Utility key 9/10 (Data Logging 2/2)

Edit

Save Waveform	⬤── Waveform/Image	
Interval 2 secs	⬤── 2 secs~30 mins	
Duration 5 mins	⬤── 5 mins~100 hrs	

Previous Menu	⬤──→ To previous menu	

Save the logs as waveform data or as image files

Save ⇄

Set the logging interval

Interval→VAR ◯

Set the duration of the record log

Duration→VAR ◯

Go back to previous menu

Previous Menu

2-1-39. Utility key 10/10 (Self CAL Menu)

Self Cal.

Vertical ▶	⬤──→ Start Vertical Calibration	

Start Vertical Calibration

Vertical

2-1-40. Default Settings

Here are the factory installed panel settings which appear when pressing the Save/Recall key→ *Default Setup*.

Save/Recall → Default Setup
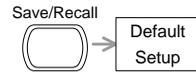
Acquisition	Mode: Normal	
Channel	Scale: 2V/Div	Invert: Off
	Coupling: DC	Probe attenuation voltage: x1
	BW limit: Off	Channel 1 & 2: On
Cursor	Source: CH1	Cursor: Off
Display	Type: Vectors	Accumulate: Off
	Grid: Full	
Horizontal	Scale: 2.5us/Div	Mode: Main Timebase
	H Pos Adj: Fine	Hor Pos: 0
Math	Type: + (Add)	Position: 0.00 div
	Unit/Div: 2V	
Measure	Item: Vpp, Vavg, Frequency, Duty Cycle, Rise Time	
Trigger	Type: Edge	Source: Channel1
	Mode: Auto	Slope:
	Coupling: DC	Rejection: Off
	Noise Rejection: Off	
Utility	Hardcopy: SaveImage, InkSaver On	ProbeComp: Square wave, 1k, 50% duty cycle
Go-NoGo	Go-NoGo: Off	Source: CH1
	When:	Violating: Stop
Data Logging	Data logging: Off	Source: CH1
	Setup: Waveform	Interval: 2 secs
	Duration: 5 mins	

2-2.   Built-in Help

The Help key shows the contents of the built-in help support. When you press a function key, its descriptions appear in the display.

Applicable keys
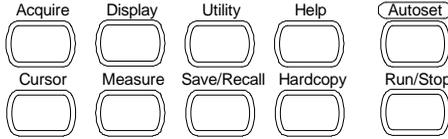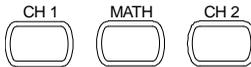
(Vertical)   (Horizontal) (Trigger)
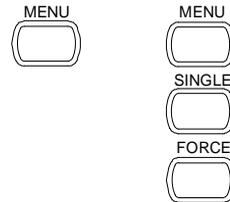
Procedure   1. Press the Help key. The display changes to the Help mode.

                       2. Press a functional key to access its help contents. (example: Acquire key)

                       3. Use the Variable knob to scroll the Help contents up and down.

                       4. Press the Help key again to exit the Help mode.

3. MEASUREMENT

The Measurement chapter describes how to properly observe a signal using the oscilloscope's basic functions, and how to observe a signal in a detailed manner using some of the advanced functions such as:

Automatic measurements, cursor measurements, and math operations.

3-1. Basic Measurements

This section describes the basic operations required in capturing and viewing an input signal. For more detailed operations, see the following chapters.

- Measurements → from page 30
- Configuration → from page 57

3-1-1. Activating a channel

Activating a channel

To activate an input channel, press the Channel key, CH1 or CH2. The channel indicator appears at the left side of the display and the channel icon changes accordingly.

Channel 1 off

Channel 1 on

Channel indicator

Channel icon
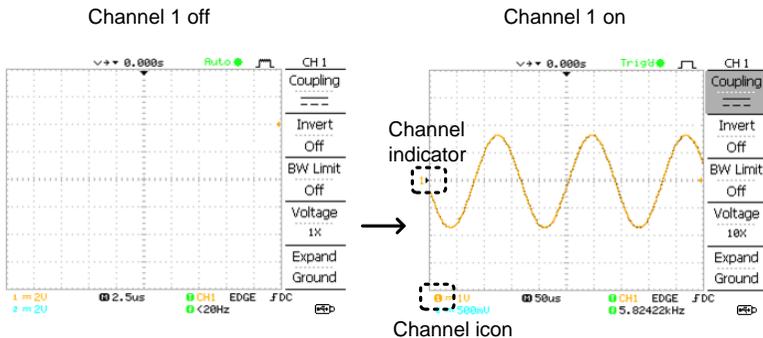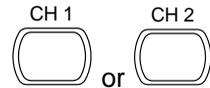
De-activating a channel

To de-activate the channel, press the Channel key twice (once if the channel menu is already selected).

3-1-2. Using Autoset

Background	The Autoset function automatically configures the panel settings to the best viewing conditions, in the following way.

- Selecting the horizontal scale
- Positioning the waveform horizontally
- Selecting the vertical scale
- Positioning the waveform vertically
- Selecting the trigger source channel
- Activating the channels

Autoset can be configured into two types of modes, AC Priority Mode or Fit Screen Mode.

AC Priority mode will scale the waveform to the screen removing any DC component.

Fit Screen Mode will fit the waveform to the best scale, including any DC components (offset).

Procedure	1. Connect the input signal to the oscilloscope and press the Autoset key.

2. The waveform(s) appears in the center of the display.

Before Autoset

After Autoset

Type Option

Undo option
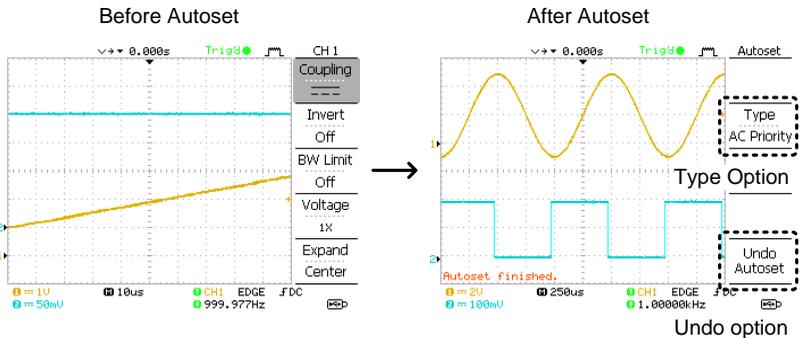
Undoing the Autoset	To undo the Autoset, press *Undo* (available for a few seconds).
Adjusting the trigger level	If the waveform is still unstable, try adjusting the trigger level up or down by using the Trigger Level knob.
Change Modes	To change the type of mode, press *Type* (available for a few seconds). The Type icon will change to next type.

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Type   Fit Screen, AC Priority

The next time the Autoset key is pressed, the new mode will be activated.

Fit Screen   AC Priority
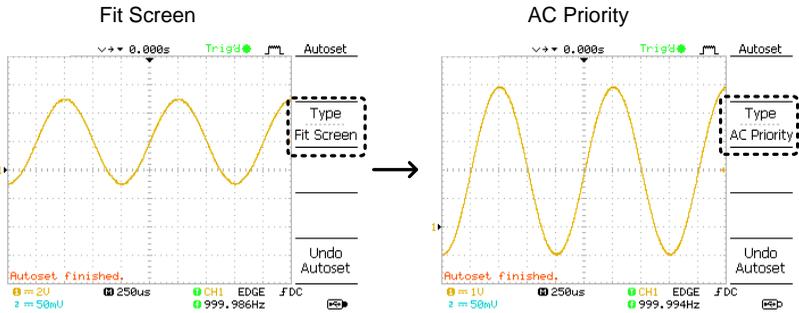
Limitation   Autoset does not work in the following situation.

- Input signal frequency less than 2Hz
- Input signal amplitude less than 30mV

3-1-3. Running and stopping the trigger

Background   In the trigger Run mode, the oscilloscope constantly searches for a trigger condition and updates the signal onto the display when the condition is met.

In the trigger Stop mode, the oscilloscope stops triggering and thus the last acquired waveforms stay in the display. The trigger icon at the top of the display changes into Stop mode.

Pressing the Trigger Run/Stop key switches between the Run and Stop mode.

Run/Stop

Trigger Run mode   Trigger Stop mode

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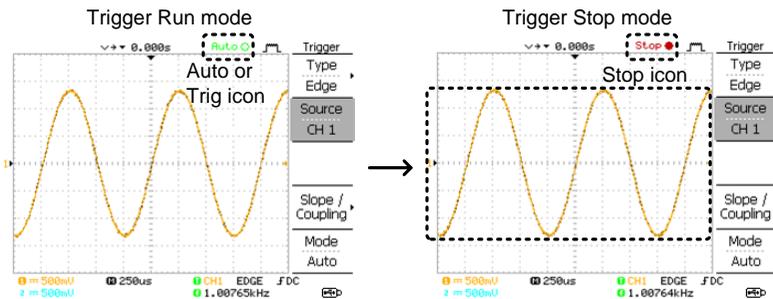
| Waveform operation	Waveforms can be moved or scaled in both the Run and Stop mode. For details, see page 62 (Horizontal position/scale) and page 67 (Vertical position/scale).

3-1-4. Changing the horizontal position and scale

For more detailed configurations, see page 62.

| Setting the horizontal position	The horizontal position knob moves the waveform left or right.
	The position indicator moves along with the waveform and the distance from the center point is displayed as the offset in the upper side of the display.
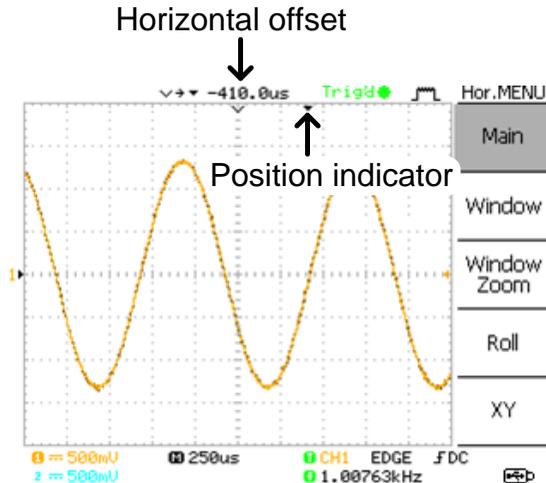
Horizontal offset

Position indicator

Selecting the horizontal scale	To select the timebase (scale), turn the TIME/DIV knob; left (slow) or right (fast).
	Range 1ns/div ~ 10s/div, 1-2.5-5 increment

| Horizontal scale: 50us/div | ⟷ | Horizontal scale: 250us/div |
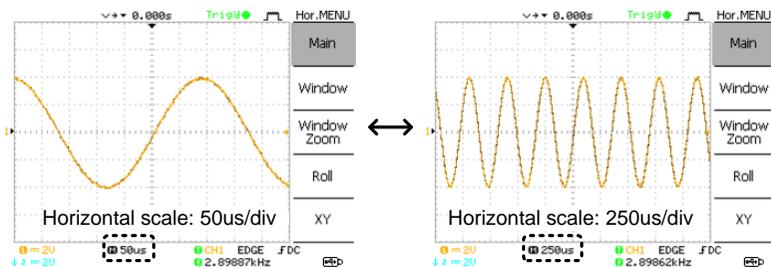
3-1-5. Changing the vertical position and scale

For more detailed configuration, see page 67.

Set vertical position	To move the waveform up or down, turn the vertical position knob for each channel.	
	As the waveform moves, the vertical position of the cursor appears at the bottom left corner of the display.	
	Run/Stop mode	The waveform can be moved vertically in both Run and Stop mode.
Select vertical scale	To change the vertical scale, turn the VOLTS/DIV knob; left (down) or right (up).	VOLTS/DIV
	Range	2mV/div ~ 10V/div, 1-2-5 increments
	The vertical scale indicator for each channel on the bottom left of the display changes accordingly.	

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3-1-6. Using the probe compensation signal

|	
Background	This section introduces how to use the probe compensation signal for general usage, in case the DUT signal is not available or to get a second signal for comparison. For probe compensation details, see page 106.
⚠	Note: The frequency accuracy and duty factor are not guaranteed. Therefore the signal should not be used for reference purposes.

Waveform type	⎍	Square waveform used for probe compensation. 1k ~ 100kHz, 5% ~ 95%.
	⎍	Demonstration signal for showing the effects of peak detection. See page 57 for peak detection mode details.

View the probe compensation waveform

1. Connect the probe between the compensation signal output and Channel input.

2. Press the Utility key.

3. Press *ProbeComp*.

ProbeComp
Menu ▶

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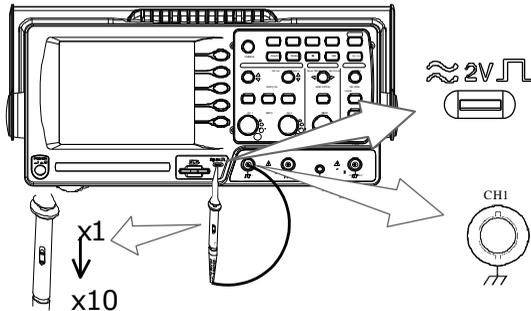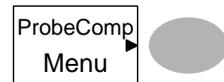
4. Press Wave type repeatedly to select the wave type.

| Wave Type |
| ⎍ |
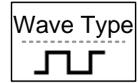
5. (For ⎍ only) To change the frequency, press *Frequency* and use the Variable knob.

| Frequency |
| 1 K |
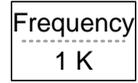
VARIABLE

Range   1kHz ~ 100kHz

6. (For ⎍ only) To change the duty cycle, press *Duty Cycle* and use the Variable knob.

| Duty Cycle |
| 50% |
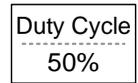
VARIABLE

Range   5% ~ 95%

Probe compensation   For probe compensation details, see page 106.

3-2. Automatic Measurements

The automatic measurement function measures input signal attributes and updates them in the display. Up to 5 automatic measurement items can be updated at any one time on the side menus. All automatic measurement types can be displayed on screen if necessary.

3-2-1. Measurement items

Overview	Voltage type	Time type	Delay type
	Vpp	Frequency	FRR
	Vmax	Period	FRF
	Vmin	RiseTime	FFR
	Vamp	FallTime	FFF
	Vhi	+Width	LRR
	Vlo	-Width	LRF
	Vavg	Dutycycle	LFR
	Vrms		LFF
	ROVShoot		
	FOVShoot		
	RPREShoot		
	FPREShoot		
Voltage measurement items	Vpp		Difference between positive and negative peak voltage (=Vmax − Vmin)
	Vmax		Positive peak voltage.
	Vmin		Negative peak voltage.
	Vamp		Difference between global high and global low voltage (=Vhi − Vlo)
	Vhi		Global high voltage.
	Vlo		Global low voltage.
	Vavg		Averaged voltage of the first cycle.
	Vrms		RMS (root mean square) voltage.

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	ROVShoot		Rise overshoot voltage.
	FOVShoot		Fall overshoot voltage.
	RPREShoot		Rise preshoot voltage.
	FPREShoot		Fall preshoot voltage.

Time measurement items	Freq		Frequency of the waveform.
	Period		Waveform cycle time (=1/Freq).
	Risetime		Rising time of the pulse (~90%).
	Falltime		Falling time of the pulse (~10%).
	+Width		Positive pulse width.
	–Width		Negative pulse width.
	Duty Cycle		Ratio of signal pulse compared with whole cycle =100x (Pulse Width/Cycle)

Delay measurement items	FRR		Time between: Source 1 first rising edge and Source 2 first rising edge
	FRF		Time between: Source 1 first rising edge and Source 2 first falling edge
	FFR		Time between: Source 1 first falling edge and Source 2 first rising edge
	FFF		Time between: Source 1 first falling edge and Source 2 first falling edge

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| LRR		Time between:
		Source 1 first rising edge and Source 2 last rising edge
LRF		Time between:
		Source 1 first rising edge and Source 2 last falling edge
LFR		Time between:
		Source 1 first falling edge and Source 2 last rising edge
LFF		Time between:
		Source 1 first falling edge and Source 2 last falling edge

3-2-2. Automatic measurement gating

Background   Automatic measurements can be restricted to a specific area (gating). When cursors are turned on, the area between the cursors is used for automatic measurements. When cursors are turned off, measurements are derived from all the points that are displayed on screen.

Turn gating on
1. Turn on cursors to enable gated automatic measurements.

2. Press the Measure key.

Measure

3. The measurement results appear on the menu bar, constantly updated. All measurements are derived from the cursor positions. See A*utomatically measuring the input signals* for more details (page 40).

Horizontal Cursor

X_1 X_2
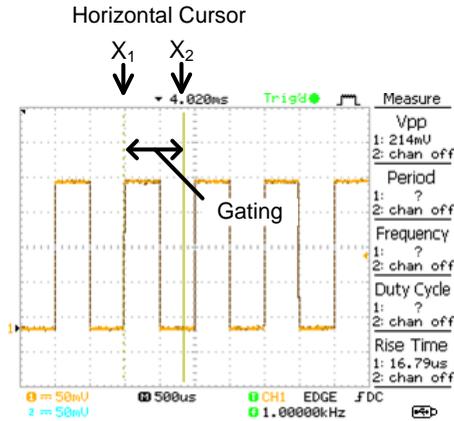
Gating

| Turn gating off | 4. Turn off cursors to turn off gated automatic measurements. | |

### 3-2-3. Automatically measuring the input signals

| Viewing the measurement result | 1. Press the Measure key. | Measure |
| | 2. The measurement results appear on the menu bar, constantly updated. 5 measurement slots (F1 to F5) can be customized. | |

| Editing a measurement item | 3. Press the corresponding menu key (*F1~F5*) to select the measurement slot to be edited. | Voltage ----- Vpp |
| | 4. The editing menu appears | |
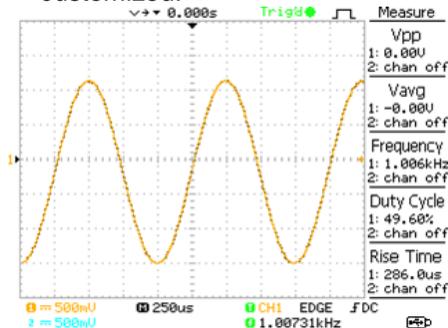
40
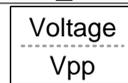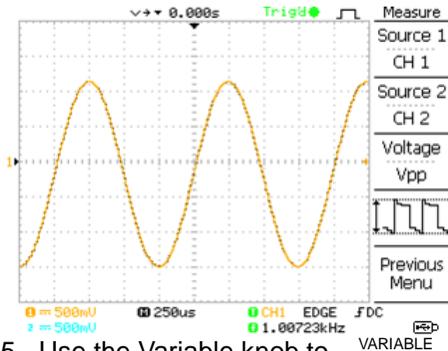
Change measurement item	5. Use the Variable knob to select a different measurement item.
Change measurement source	6. Press *Source 1* repeatedly to change Source1 from CH1 to CH2 or MATH. Range CH1, CH2, MATH
	7. Press *Source 2* repeatedly to change the channel for Source2. Range CH1, CH2, MATH
View all measurements	8. Press *F3* to view all measurement items.
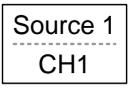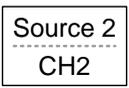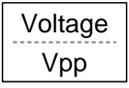
9. All the measurements appear in the center of the screen.
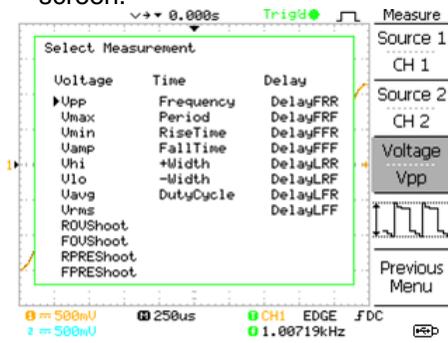
10. Press *F3* again to return.

⚠ Note: All the editing operations can still be performed when viewing all the measurement items.

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11. Press *Previous Menu* to confirm the item selection and to go back to the measurement results view.

| Previous Menu | ⬤ |
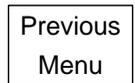
3-3. Cursor Measurements

Cursor lines, horizontal or vertical, show the precise position of the input waveforms or the math operation results. The horizontal cursors can track time, voltage/current* and frequency, whilst the vertical cursors can track voltage/current*. All measurements are updated in real-time. *probe type dependant (page 71).

3-3-1. Using the horizontal cursors

Procedure	1. Press the Cursor key. The cursors appear in the display.	Cursor
	2. Press *X↔Y* to select the horizontal (X1&X2) cursor.	X↔Y ⬤
	3. Press *Source* repeatedly to select the source channel.	Source CH1 ⬤
	Range CH1, CH2, MATH	
	4. The cursor measurement results will appear in the menu, F2 to F4.	
Parameters	X1 Time position of the left cursor. (relative to zero)	
	X2 Time position of the right cursor. (relative to zero)	
	X1X2 The difference between the X1 and X2.	
	Δ: us The time difference between X1 and X2.	
	f: Hz The time difference converted to frequency.	
	V/A The voltage/current difference from X1 and X2.	
	M1:dB Position of the left cursor in dB.	
	M2:dB Position of the right cursor in dB.	
	Δ: dB The dB difference between M1 and M2.	
	Div: The frequency per division.	
Moving the horizontal cursors	To move the left cursor, press *X1* and then use the Variable knob.	X1 -5.000uS 0.000uV ⬤
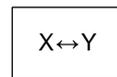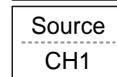
42
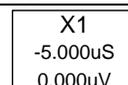
	To move the right cursor, press *X2* and then use the Variable knob.	X2 5.000uS 0.000uV
	To move both cursors at once, press *X1X2* and then use the Variable knob.	X1X2 Δ : 10.00uS f : 100.0kHz 0.000uV
Remove cursors	Press Cursor to remove the onscreen cursors.	Cursor
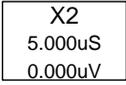
3-3-2. Using the vertical cursors

Procedure	1. Press the Cursor key.	Cursor
	2. Press *X↔Y* to select the vertical (Y1&Y2) cursor.	X↔Y
	3. Press *Source* repeatedly to select the source channel.	Source CH1
	Range CH1, CH2, MATH	
	4. The cursor measurement results will appear in the menu.	
Parameters	Y1 Voltage level of the upper cursor	
	Y2 Voltage level of the lower cursor	
	Y1Y2 The difference between the upper and lower cursor	
	V/A The voltage/current difference (Y1-Y2).	
Moving the vertical cursors	To move the upper cursor, press *Y1* and then use the Variable knob.	Y1 123.4mV
	To move the lower cursor, press *Y2* and then use the Variable knob.	Y2 12.9mV
	To move both cursors at once, press *Y1Y2* and then use the Variable knob.	Y1Y2 10.5mV
Remove cursors	Press Cursor to remove the onscreen cursors.	Cursor
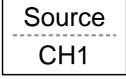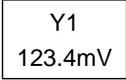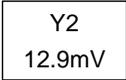
3-4. Math Operations

The Math operations can add, subtract, multiply or perform FFT/FFT RMS on the input waveforms. The resulted waveform can be measured using the cursors, and saved or recalled just like normal input signals.

3-4-1. Overview

Addition (+)	Adds the amplitude of CH1 & CH2 signals.	
Subtraction (–)	Extracts the amplitude difference between CH1 & CH2.	
Multiplication (✕)	Multiplies CH1 and CH2.	
FFT	Performs a FFT calculation on a signal. Four types of FFT windows are available: Hanning, Flattop, Rectangular, and Blackman.	
FFT RMS	Performs a FFT RMS calculation on a signal. RMS is similar to FFT, however the amplitude is calculated as RMS and not dB. Four types of FFT windows are available: Hanning, Flattop, Rectangular, and Blackman.	
Hanning FFT window	Frequency resolution	Good
	Amplitude resolution	Not good
	Suitable for....	Frequency measurement on periodic waveforms
Flattop FFT window	Frequency resolution	Not good
	Amplitude resolution	Good
	Suitable for....	Amplitude measurement on periodic waveforms
Rectangular FFT window	Frequency resolution	Very good
	Amplitude resolution	Bad
	Suitable for....	Single-shot phenomenon (this mode is the same as having no window at all)
Blackman FFT window	Frequency resolution	Bad
	Amplitude resolution	Very good
	Suitable for....	Amplitude measurement on periodic waveforms

3-4-2. Adding, subtracting or multiplying signals

Procedure

1. Activate both CH1 and CH2.

CH 1   CH 2
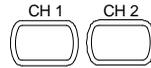
2. Press the Math key.

MATH

3. Press *Operation* repeatedly to select addition (+), subtraction (−) or multiplication (×).

Operation ▶
CH1+CH2
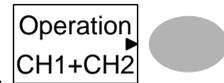
4. The math measurement result appears in the display.

Unit/Div
2V

VARIABLE

5. To move the math result vertically, use the Variable knob. The position will be displayed in *Position.*

Position
0.00 Div
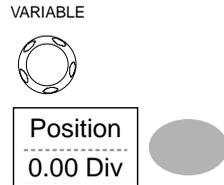
6. To clear the math result from the display, press the Math key again.

MATH

3-4-3. Using the FFT function

Procedure

1. Press the Math key.

   MATH

2. Press *Operation* repeatedly to select FFT or FFT RMS.

Operation
FFT ▸

3. Press *Source* repeatedly to select the source channel.

Source
CH1
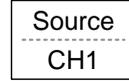
4. Press *Window* repeatedly to select the FFT window type.

Window
Hanning

5. The FFT result appears. The horizontal scale changes from time to frequency, and the vertical scale from voltage to dB or RMS.

6. To move the FFT waveform vertically, press *Vertical* repeatedly until Div is selected. Use the Variable knob to change the vertical scale.

Vertical
2V
0.00 Div

   VARIABLE

   Range   −12.00 div ~ +12.00 div

7. To select the vertical scale of an *FFT waveform*, press *Vertical* repeatedly until dB is selected. Use the Variable knob to change the vertical scale.

Vertical
1 dB
0.00 Div
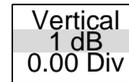
   VARIABLE

   Range   1, 2, 5, 10, 20 dB/Div

8. To select the vertical scale of an *FFT rms waveform*, use the VOLTS/DIV knob to change the vertical scale. The scale will be shown in the *Vertical* soft-key.

   VOLTS/DIV

   Range   Volts/Div

9. To zoom in on the FFT/FFT rms waveform, press *Zoom* repeatedly until X is selected. Use the Variable knob to change the Zoom level.
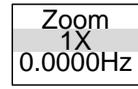
Zoom
1X
0.0000Hz

VARIABLE

Range   1/2/5/10/20X

10. To move the FFT/FFT rms waveform horizontally, press *Zoom* repeatedly until Hz is selected. Use the Variable knob to change the horizontal position.

Zoom
1X
0.0000Hz
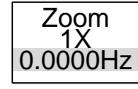
VARIABLE

Range   0~50.000MHz

11. To clear the FFT result from the display, press the Math key again.

MATH

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3-5. Go No-Go Testing

3-5-1. Overview

Background   Go-NoGo testing checks if a waveform conforms to
               a user-specified maximum and minimum boundary
               (template). The testing can be set to stop or
               continue each time the template has or has not
               been violated by the input waveform.

Settings	Item	Default	Details
	NoGo criteria: When inside or outside the boundary	Inside	Page 48
	Source	Channel 1	Page 49
	Test continue or stop when NoGo occurs	Stop	Page 49
	Boundary (template) – selects the minimum and maximum boundaries (template) from a single waveform	Auto (0.4%)	Page 50
	Run Tests		Page 53

3-5-2. Edit: NoGo When

Procedure   1. Press the Utility key.

Utility

2. Press the *More* key.

More ▶

3. Press *No Go When*
   repeatedly to select the
   NoGo conditions.
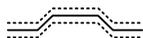
No Go When

NoGo when the waveform is
inside the boundary (template)

NoGo when the waveform is
outside of the boundary
(template)

3-5-3. Edit: Source

Procedure   1. Press the Utility key.   Utility

                2. Press the *More* key.
                                                          [More ▶]

                3. Press the *Go-NoGo Menu*   [Go-NoGo ▶]
                   key.   [Menu]

                4. Press *Source* repeatedly   [Source]
                   to select the source   [CH1]
                   channel (CH1 or CH2).

3-5-4. Edit: NoGo Violation Conditions

Procedure   1. Press the Utility key.   Utility

                2. Press the *More* key.
                                                          [More ▶]

                3. Press the *Go-NoGo Menu*   [Go-NoGo ▶]
                   key.   [Menu]

                4. Press *Violating* repeatedly   [Violating]
                   to select the NoGo   [Stop]
                   conditions.

                   Stop   Stops the test when the NoGo
                               conditions have been met.
                   Continue   The tests continue even when the
                               NoGo conditions have been met.

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3-5-5. Edit: Template (boundary)

| Background | The NoGo template sets the upper and lower amplitude boundary. Two methods are available: Min/Max and Auto. |
| | Min/Max | Selects the upper boundary (Max) and lower boundary (Min) as separate waveforms, from the internal memory. The upper boundary is saved to Ref A, the lower boundary is saved to Ref. B. Advantage: The template shape and distance (allowance) between the source signal are fully customizable. Disadvantage: The waveforms (templates) have to be stored internally prior to this selection. |
| | Auto | Creates the upper and lower boundary (template) from the source signal, not from an internally stored waveform. Advantage: No need to store the waveforms prior to this selection. Disadvantage: The template shape is proportional to the source signal. The distance (allowance) between the source signal and the upper and lower template is the same. |

Max/Mix	1. The template is based on the source signal. Ensure the source signal appears on the display.
	2. Press the Utility key. *Utility*
	3. Press the *More* key. More ▶
	4. Press the *Go-NoGo Menu* key. Go-NoGo Menu
	5. Press the *Template Edit* key. Template Edit ▶

6. Press *Template* repeatedly to select the upper (Max) or lower (Min) boundaries.
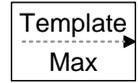
| Template |
| Max |

7. Press *Source* and use the Variable knob to select the waveform template.

| Source |
| W 01 |
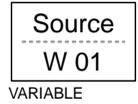
VARIABLE

Max   Waveform A: Ref A, W01~W15
Min   Waveform B: Ref B, W01~W15

8. Press *Position* and use the Variable knob to set the waveform amplitude.

| Source |
| W 01 |

VARIABLE
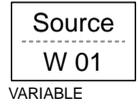
9. Repeat steps 5-7 for the other template setting (Max or Min).

10. When both Max and Min templates have been configured, press *Save & Create* to save the templates.
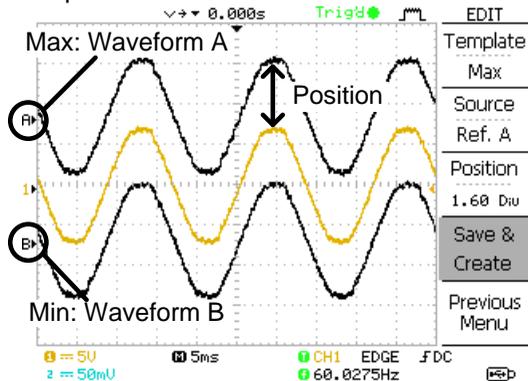
| Save & |
| Create |

Max: Waveform A

Position

Min: Waveform B

EDIT
Template
Max
Source
Ref. A
Position
1.60 Div
Save & Create
Previous Menu

Auto
1. The template is based on the source signal. Ensure the source signal appears on the display.

2. Press the Utility key.

Utility

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3. Press the *More* key.

| More ▶ |

4. Press the *Go-NoGo Menu* key.

| Go-NoGo Menu ▶ |

5. Press the *Template Edit* key.

| Template Edit ▶ |
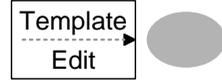
6. Press *Template* repeatedly to select the Auto template.

| Template Auto ▶ |
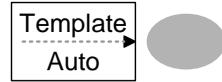
7. Press *Source* and use the Variable knob to select the template source.

| Source CH1 |
VARIABLE
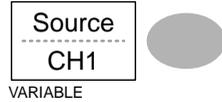
Source   CH1, CH2

8. Press *Tolerance* repeatedly to choose the tolerance units, % or Div. Use the Variable knob to set the tolerance. The tolerance is for both the horizontal and vertical axis.

| Tolerance 0.4% |
VARIABLE
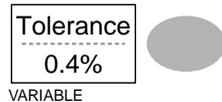
%   0.4% ~ 40.0%
Div   0.04 div ~ 4.0 div

9. When the Auto template has been configured, press *Save & Create* to save the template.

| Save & Create |

Auto template

Tolerance

Source waveform

```
300s       Trig'd●  ⌐⌐⌐     EDIT
                            Template
                              Auto
                            Source
                             CH 1
                            Tolerance
                             6.8 %
                            Save &
                            Create
                            Previous
                             Menu
❶ = 5V      ❿ 5ms     ❶ CH1  EDGE  ⨍DC
2 = 50mV              ❶ 60.0599Hz      ▣⯈▷
```
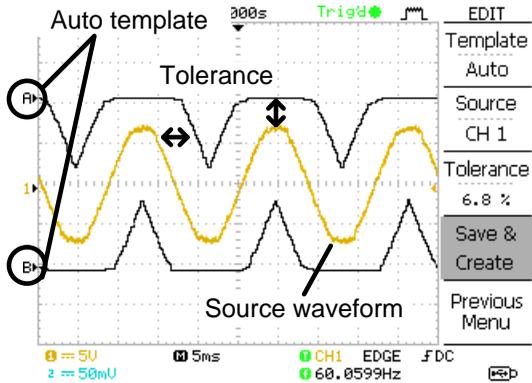
3-5-6. Run Go-NoGo Tests

Procedure

1. Press the Utility key.

   Utility

2. Press the *More* key.

   More ▶

3. Press the *Go-NoGo Menu* key.

   Go-NoGo
   Menu ▶

   Ensure the source signal and boundary templates appear on the screen.

4. Press *Go-NoGo.* The test starts and stops according to the conditions set on page 48, 49. To stop the test that has already started, press *Go-NoGo* again.

   Go-NoGo

   On

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5. The test results appear in the Ratio soft-key. The numerator denotes the total number of failed tests. The denominator denotes the total number of tests.

```
Ratio:
        2 BMP
        9 BMP
```
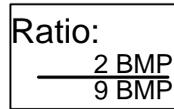
Numerator   Number of "failed" tests.

Denominator   Total number of tests.

3-6. Data Logging

3-6-1. Overview

Background   The Data logging function allows you to log data or a screen image over timed intervals for up to 100 hours to a USB flash drive.

The data or images are stored to a USB flash drive in a directory named LogXXXX. LogXXXX is incremented each time the data logging function is used.

The files saved in the LogXXXX directory are named DSXXXX.CSV, or DSXXXX.BMP for data or image files, respectively. At each timed interval data or an image file is saved and the file number incremented. For example, DS0000 is the first logged data, DS0001 is the second and so on.

3-6-2. Edit: Source

Procedure

1. Press the Utility key.

Utility

2. Press the *More* key.

More ▶

3. Press the *Data logging Menu* key.

Data logging Menu

4. Press *Source* repeatedly to select the source channel (CH1 or CH2).

Source
CH1
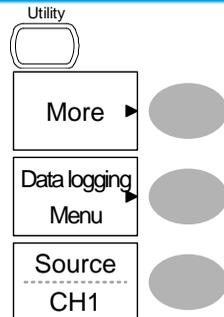
3-6-3. Edit: Setup Parameters

Background	The logging function must set the type of data that will be logged (waveform/image), the capture interval time and the duration of the data logging.
Procedure	1. Press the Utility key.

Utility

2. Press the *More* key.

More ▶

3. Press the *Data logging Menu* key.

Data logging
Menu ▶

4. Press the *Setup* key.

Setup ▶

5. Press *Save* repeatedly to log data or screen images.

Save
Waveform

6. Press *Interval* and use the Variable knob to select the interval time.

Source
W 01
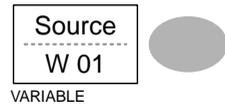
VARIABLE

Interval time	2 secs~ 2min (duration = 5 min)
	2 secs~ 5 min (duration 5~ 30 min)
	2 secs~ 30 min (duration 30+ min)

7. Press *Duration* and use the Variable knob to set the duration time.

Duration
5 mins

VARIABLE

Duration	5 mins ~ 100 hours

8. Press Previous menu to return to the Data logging menu. Data logging is now ready to begin.

Previous
Menu
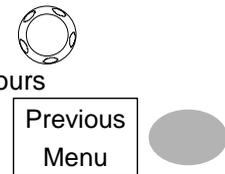
3-6-4. Run Data logging

Background   Ensure the data source (page 54) and data logging
               setup has been set (page 55).

Procedure   1. Insert a USB flash drive
                     into the USB front panel
                     port.
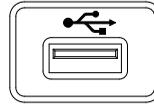
                 2. Press the Utility key.

                 3. Press the *More* key.

                 4. Press the *Data logging
                     Menu* key.

             5. Press *Data logging* to turn
                 data logging On.
                 Data/image files start
                 logging to the USB flash
                 drive automatically. To stop
                 the Data logging, press the
                 Data logging key again.

4. CONFIGURATION

The Configuration chapter describes how to configure panel settings to make measurements and observations suited to the application needs.

4-1. Acquisition

The acquisition process samples the analog input signals and converts them into digital format for internal processing. You may select the normal, average, or peak detect acquisition mode.

4-1-1. Selecting the acquisition mode

Procedure	1. Press the Acquire key.	
	2. Select the acquisition mode between *Normal*, *Average* and *Peak Detect*.	Normal Average Peak Detect
Range	Normal	All of the acquired data is used to draw the waveform.
	Average	Multiple data is averaged to form a waveform. This mode is useful for drawing a noise-free waveform. To select the number, press *Average* repeatedly. Average number: 2, 4, 8, 16, 32, 64, 128, 256
	Peak detect	To activate the Peak detect mode, press *Peak-Detect*. Only the minimum and maximum value pairs for each acquisition interval (bucket) are used. This mode is useful for catching abnormal glitches in a signal.
Peak detect effect using the probe comp. waveform	1. One of the probe compensation waveforms can demonstrate the peak detection mode. Connect the probe to the probe compensation output.	
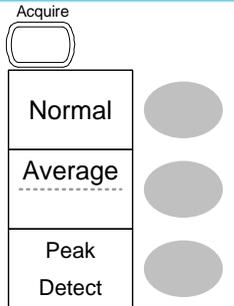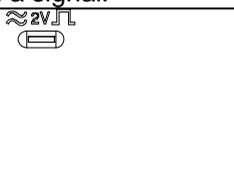
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2. Press the Utility key.

3. Press *ProbeComp*.

ProbeComp
Menu ▶
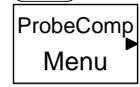
4. Press *Wave Type* and select the ⎍ waveform.

Wave Type
⎍
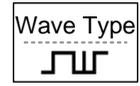
5. Press the Autoset key. The oscilloscope positions the waveform in the center of the display.

Autoset

6. Press the Acquire key.

Acquire

7. Press *Normal*.

Normal
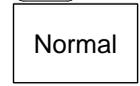
8. Press *Peak-Detect* and see that a spike noise is captured.
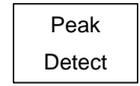
Peak
Detect

Example   The peak detect mode reveals the occasional glitch.

Normal mode   Peak detect mode
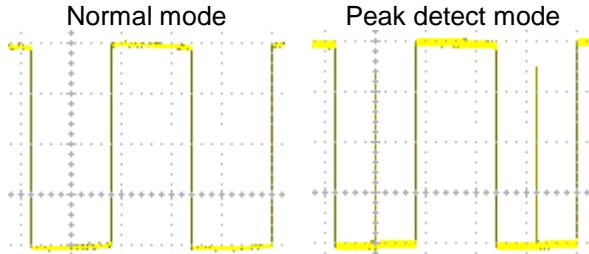
4-1-2. Selecting Delay mode

Background   When delay time is ON, the displayed output is delayed for a defined amount of time from the trigger point. Using the delay function is useful for observing an area of the waveform that occurs some time after the trigger point.

Delay On

With Delay On the expansion point and trigger point become separated by the amount of delay time. As the delay time is increased the trigger point moves left from the expansion point. When the horizontal scale is adjusted, the waveform expands from the expansion point, not the trigger point.
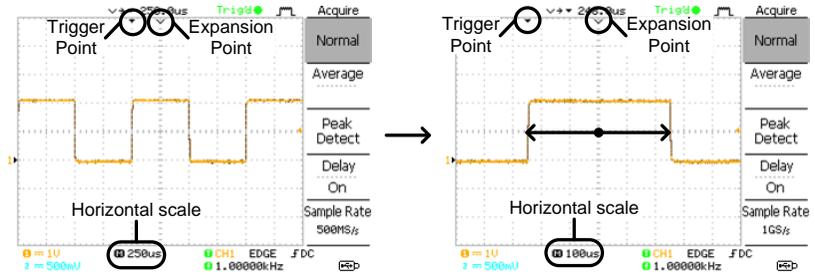
Delay Off

With Delay Off the expansion point and trigger point are always in the same position. Thus when the horizontal scale is adjusted, the waveform expands from the trigger point.
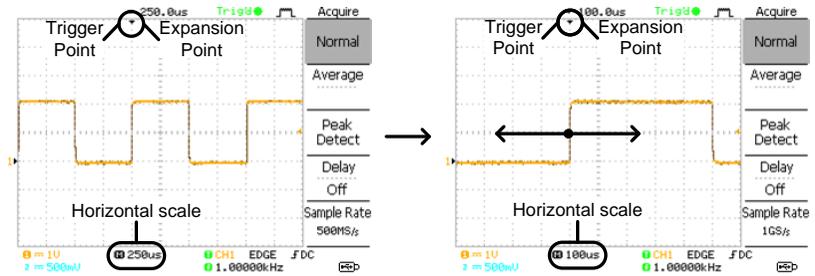
Procedure

1. Press the Acquire key.

2. Press *Delay* On/Off to toggle Delay On/Off.
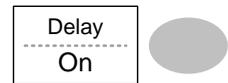
3. Use the Horizontal Position knob to increase or decrease the delay time when Delay is set to On.

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4. Adjust the horizontal scale to zoom into the waveform.

TIME/DIV

4-1-3. Real time vs Equivalent time sampling mode

Background	The oscilloscope automatically switches between two sampling modes, Real-time and Equivalent-time, according to the number of active channels and sampling rate.
Real-time sampling	Once sampled data is used to reconstruct a single waveform. Short-time events might get lost if the sampling rate gets too high. This mode is used when the sampling rate is relatively low (1GSa/s or lower).
Equivalent-time sampling	Multiple numbers of sampled data are accumulated to reconstruct a single waveform. ETS restores more waveform detail but takes longer to update the waveform. This mode is used when the sampling rate becomes higher than 1GSa/s. The maximum equivalent-time sampling rate is 25GSa/s.

4-2. Display

The Display section describes how to configure the display settings: drawing type, waveform accumulation, contrast adjustment, and grid settings.

4-2-1. Selecting vector or dot drawing

Procedure	1. Press the Display key.	Display
	2. Press *Type* repeatedly to select the waveform drawing.	Type · · · · · Vectors

Types	Dots	Only the sampled dots are displayed.
	Vectors	The sampled dots are connected by lines.

4-2-2. Accumulating the waveform

Background   Accumulation preserves the old waveform
                    drawings and overwrites new waveforms on top of
                    it. It is useful for observing waveform variation.

Procedure   1. Press the Display key.

                    Display

                    2. Press *Accumulate* to turn
                       on the waveform
   accumulation.
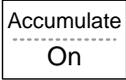
Accumulate
On

                    3. To clear the accumulation
                       and start it over (refresh),
                       press *Refresh*.

Refresh

Example   Accumulation off   Accumulation on
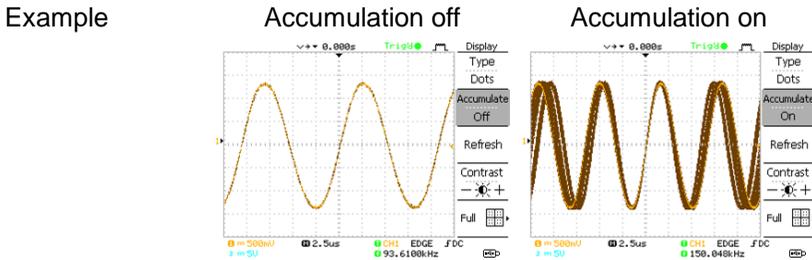
4-2-3. Adjusting the display contrast

Procedure   1. Press the Display key.

                    Display

                    2. Press *Contrast*.

Contrast
— ☼ +

                    3. Turn the Variable knob left   VARIABLE
                       to lower the contrast (dark
                       display) or right to raise
   the contrast (bright
                       display).

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Procedure	1. Press the Display key.	

2. Press the grid icon repeatedly to select the grid.
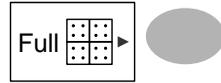
Full ▶

Parameters		Shows the full grid.
		Shows the outer frame and X/Y axis.
		Shows only the outer frame.

4-3. Horizontal View

The Horizontal view section describes how to configure the horizontal scale, position, waveform update mode, window zoom, and X-Y mode.

4-3-1. Moving the waveform position horizontally

Procedure   The horizontal position knob moves the waveform left or right. The position indicator at the top of the display shows the center and current position.
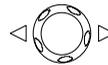
Center position   Moving right

⌄→▾ 0.000s   ⌄→▾ -92.00us
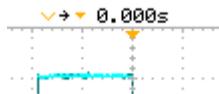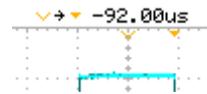
4-3-2. Selecting the horizontal scale

|		
Select horizontal scale	To select the timebase (scale), turn the TIME/DIV knob; left (slow) or right (fast).	TIME/DIV

Range	1ns/div ~ 50s/div, 1-2.5-5-10 increment

The timebase indicator at the bottom of the display updates the current horizontal scale.

1 ⎓ 5V
2 ⎓ 20V   Bᵂ   **M 100us**

4-3-3. Selecting the waveform update mode

Background	The display update mode is switched automatically or manually according to the horizontal scale.
Main mode	Updates the whole displayed waveform at once. The main mode is automatically selected when the horizontal scale (timebase) is fast.
	Horizontal scale ≤100ms/div
	Trigger All modes available
Roll mode	Updates and moves the waveform gradually from the right side of the display to the left. The Roll mode is automatically selected when the horizontal scale (timebase) is 50ms or slower.
	When in the Roll mode, an indicator appears at the bottom of the display. When in roll mode the record length is 2M (1 channel) or 1M (2 channel).

Main mode	Roll mode
M 100us	M 50ms ROLL

Timebase	≥50ms/div (≤1.25MS/s)
Trigger	Auto mode only

Selecting the Roll mode manually	1. Press the Horizontal menu key.	MENU

2. Press *Roll*. The horizontal scale automatically becomes 50ms/div and the waveform starts scrolling from the right side of the display (If the oscilloscope is already in the Roll mode, there will be no change).

Roll

### 4-3-4. Zooming the waveform horizontally

Procedure/ range

1. Press the Horizontal Menu key.

MENU

2. Press *Window*.

Window

3. Use the horizontal position knob to move the zoom range sideways, and TIME/DIV knob to change the zoom range width.

TIME/DIV
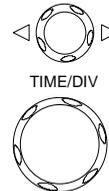
The width of the bar in the middle of the display is the actual zoomed area.

Zoom range   1ns ~ 25s

4. Press *Window Zoom*. The specified range gets zoomed.

Window Zoom

Example

Setting the zoom width	Zooming in

Zoom width
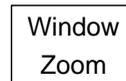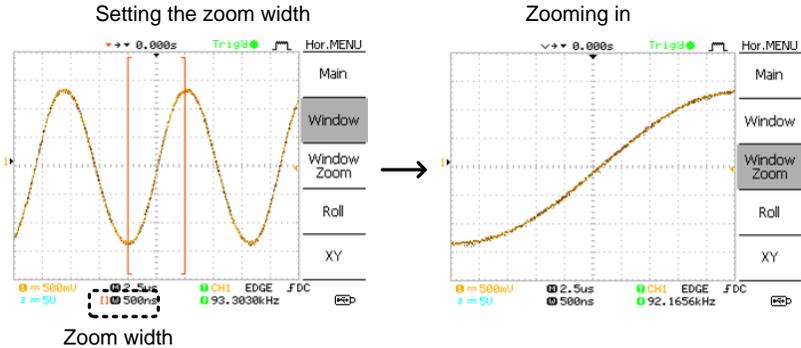
4-3-5. Viewing waveforms in the X-Y mode

Background	The X-Y mode compares the voltage of Channel 1 and Channel 2 waveforms in a single display. This mode is useful for observing the phase relationship between the two waveforms.

Procedure	1. Connect the signals to Channel 1 (X-axis) and Channel 2 (Y-axis).	
	2. Make sure both Channel 1 and 2 are activated.	
	3. Press the Horizontal key.	
	4. Press *XY*. The display shows two waveforms in X-Y format; Channel 1 as X-axis, Channel 2 as Y-axis.	
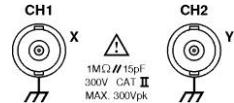
Adjusting the X-Y mode waveform	Horizontal position	CH1 Position knob
	Horizontal scale	CH1 VOLTS/DIV knob
	Vertical position	CH2 Position knob
	Vertical scale	CH2 VOLTS/DIV knob

Example

Main mode   XY mode

XY mode
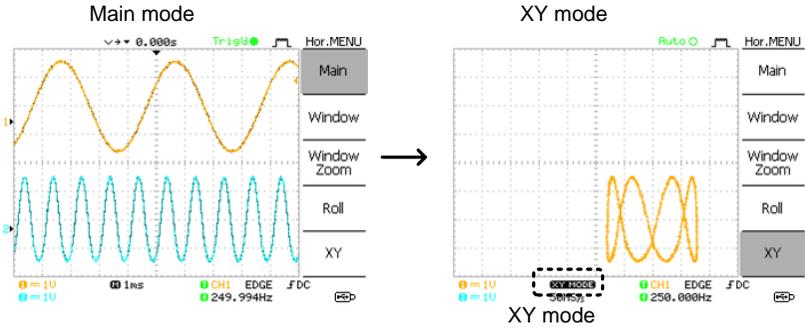
4-3-6. Horizontal Adjustment Menu

Background   The horizontal adjustment menu allows markers to
              be set at different times relative to the Horizontal
              position marker at 0 seconds. Each marker is
              linked to the mark directly before and after (in
              time). There can be up to 30 markers linked
              together.

1. Press the Horizontal
   menu key twice to enter
   the horizontal adjustment
   menu

   | MENU | MENU |

2. Press *H Pos Adj* to toggle
   between coarse and fine
   adjustments.

   H Pos Adj
   Fine

3. Adjust the horizontal
   position with the
   horizontal position knob.

Set marker   4. Press *Set/Clear* to create
                   a marker at the current
                   horizontal position.

                   Set/Clear
                   180.0uS

Delete marker   5. If there is already a
                   marker at the current
                   horizontal position press
                   Set/Clear to delete the
                   current marker.

                   Set/Clear
                   180.0uS

|		
Reset horizontal position	6. Press Reset to reset the horizontal position to 0 seconds when the trigger is running, or to the last position before the trigger was stopped.	Reset Hor Pos
Navigate markers	7. Press *Previous* to go to the previous marker.	Previous 180.0uS
	8. Press *Next* to go to the next marker.	Next 340.0uS

Position Indicator   Marker
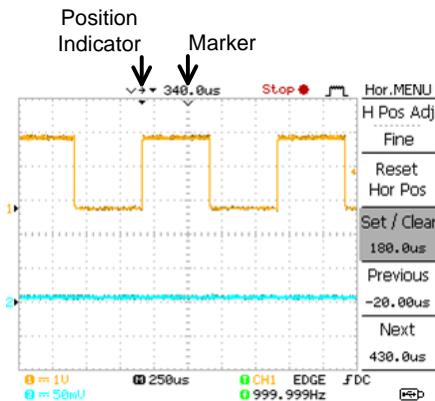
4-4. Vertical View (Channel)

The Vertical view section describes how to set the vertical scale, position, bandwidth limitation, coupling mode, and attenuation.

4-4-1. Moving the waveform position vertically

Procedure   To move the waveform up or down, turn the vertical position knob for each channel.

4-4-2. Selecting the vertical scale

Procedure	To change the vertical scale, turn the VOLTS/DIV knob; left (down) or right (up).

VOLTS/DIV

Range	2mV/div ~ 10V/div, 1-2-5 increments

4-4-3. Selecting the coupling mode

Procedure	1. Press the Channel key.

CH 1

2. Press *Coupling* repeatedly to select the coupling mode.
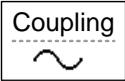
Coupling

|	
Range	DC coupling mode. The whole portion (AC and DC) of the signal appears on the display.
	Ground coupling mode. The display shows only the zero voltage level as a horizontal line. This mode is useful for measuring the signal amplitude with respect to the ground level.
	AC coupling mode. Only the AC portion of the signal appears on the display. This mode is useful for observing AC waveforms mixed with DC components.

4-4-4. Expand Vertical Scale Center / Ground

Background

Normally when the vertical scale is increased, the scaled image is centered from ground. However a signal with a voltage bias could be obscured when the vertical scale is increased. The Expand Center function expands the image from the center of the signal, rather than ground.

Expand Ground
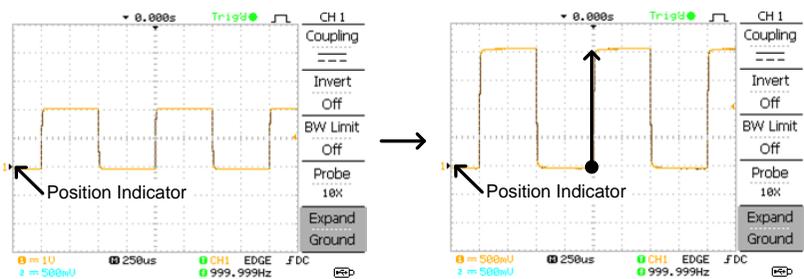
Expand Center
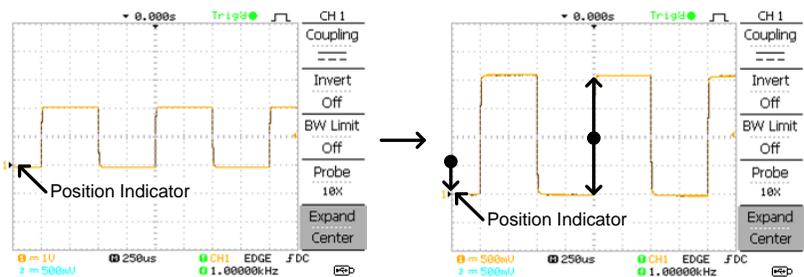
Procedure

1. Press the Channel key.

2. Press F5 to toggle between Expand Center and Expand Ground.

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3. To change the vertical scale, turn the VOLTS/DIV knob; left (down) or right (up).

VOLTS/DIV

The vertical scale indicator on the bottom left of the display changes accordingly.

4-4-5. Inverting the waveform vertically

Procedure
1. Press the Channel key.

CH 1

2. Press *Invert*. The waveform becomes inverted (upside down) and the Channel indicator in the display shows a down arrow.

Invert
Off

Original	Inverted
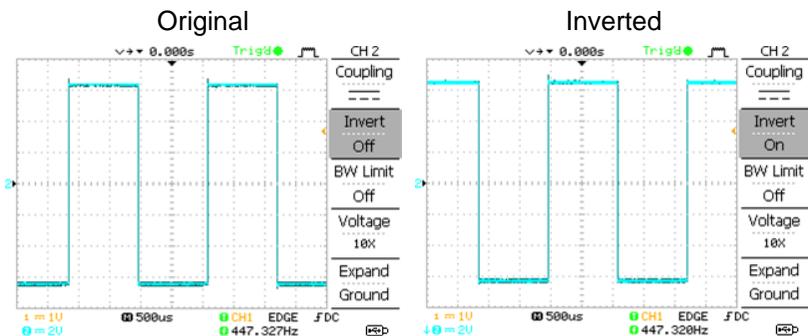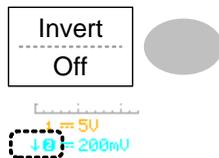
4-4-6. Limiting the waveform bandwidth

Background	Bandwidth limitation puts the input signal into a 20MHz (−3dB) low-pass filter. This function is useful for cutting off high frequency noise to see the clear waveform shape.

Procedure   1. Press the Channel key.

CH 1

2. Press *BW Limit* to turn on or off the limitation. When turned on, the BW indicator appears next to the Channel indicator in the display.

BW Limit
Off

1 = 5V
2 = 200mUB^w
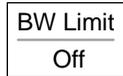
Example   BW Limit Off   BW Limit On
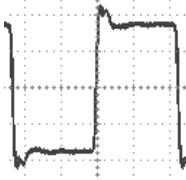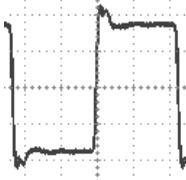
4-4-7. Probe attenuation level and type

Background	The probe can be set to either voltage or current.
	A signal probe has an attenuation switch to lower the original DUT signal level to the oscilloscope input range, if necessary. The probe attenuation selection adjusts the vertical scale so that the voltage or current level on the display reflects the real value, not the attenuated level.

Procedure   1. Press the Channel key.

CH 1

2. Press *F4* repeatedly to select voltage or current probes.
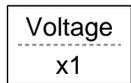
Voltage
x1

3. Use the variable knob to edit the voltage or current attenuation.   VARIABLE

4. The voltage/current scale in the channel indicator changes accordingly. There is no change in the waveform shape.

Range	0.1X~2000X (1-2-5 steps)

⚠ Note: The attenuation factor adds no influence on the real signal; it only changes the voltage/current scale on the display.

4-5. Trigger

The Trigger function configures the conditions by which the oscilloscope captures the incoming signals.

4-5-1. Trigger type

Edge	Triggers when the signal crosses an amplitude threshold in either a positive or negative slope.
Video	Extracts a sync pulse from a video format signal and triggers on a specific line or field.
Pulse	Triggers when the pulse width of the signal matches the trigger settings.
Indicators	Edge/Pulse	Video
	CH1 EDGE ƒDC 2.65210kHz	CH1 VIDEO P NTSC <20Hz
	(CH1, Edge, Rising edge, DC coupling)	(CH1, Video, Positive polarity, NTSC standard)

4-5-2. Trigger parameter

Trigger source	CH1, 2	Channel 1, 2 input signals
	Line	AC mains signal
	Ext	External trigger input signal **EXT TRIG**

Trigger mode	Auto	The oscilloscope updates the input signal regardless of the trigger conditions (if there is no trigger event, the oscilloscope generates an internal trigger). Select this mode especially when viewing rolling waveforms at a slow timebase.
		The Auto trigger status appears in the upper right corner of the display.

	Single	The oscilloscope acquires the input signals once when a trigger event occurs, then stops acquiring. Pressing the Single key again will repeat the process.

SINGLE

The Single trigger status appears in the upper right corner of the display.

(Searching) (Triggered)

	Normal	The oscilloscope acquires and updates the input signals only when a trigger event occurs.

The Normal trigger status appears in the upper right corner of the display.

(Searching) (Triggered)

Holdoff	The holdoff function defines the waiting period before the DCS-7500A starts triggering again after a trigger point. The Holdoff function ensures a stable display.

Video standard (video trigger)	NTSC	National Television System Committee
	PAL	Phase Alternative by Line
	SECAM	SEquential Couleur A Mémoire

Sync polarity	⌐‾⌐	Positive polarity

(video trigger)	⊐⊓⊏	Negative polarity
Video line (video trigger)	Selects the trigger point in the video signal.	
	field	1 or 2
	line	1~263 for NTSC, 1~313 for PAL/SECAM
Pulse condition (pulse trigger)	Sets the pulse width (20ns ~ 10s) and the triggering condition.	
	> Longer than	= Equal to
	< Shorter than	≠ Not equal to
Trigger slope	⌐⌐	Triggers on the rising edge.
	⌐⌐	Triggers on the falling edge.
Trigger coupling	AC	Triggers only on AC component.
	DC	Triggers on AC+DC component.
Frequency rejection	LF	Puts a high-pass filter and rejects the frequency below 50kHz.
	HF	Puts a low-pass filter and rejects the frequency above 50kHz.
Noise rejection	Rejects noise signals.	
Trigger level	LEVEL	Using the trigger level knob moves the trigger point up or down.

4-5-3. Configuring Holdoff

Background	The Holdoff function defines the waiting period before DCS-7500A starts triggering again after the trigger point. The holdoff function is especially useful for waveforms with two or more repetitive frequencies or periods that can be triggered.

Panel operation	1. Press the Trigger menu key twice.	MENU MENU
	2. To set the Holdoff time, use the Variable knob. The resolution depends on the horizontal scale.	VARIABLE Short ↙ ↘ Long
	Range 40ns~2.5s	
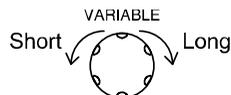
Pressing *Set to Minimum* sets the Holdoff time to the minimum, 40ns.

Holdoff
40.0ns

Note: The holdoff function is automatically disabled when the waveform update mode is in Roll mode.

4-5-4. Configuring the edge trigger

Procedure

1. Press the Trigger menu key.

MENU

2. Press *Type* repeatedly to select edge trigger.

Type
Edge

3. Press *Source* repeatedly to select the trigger source.

Source
CH1
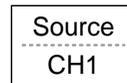
Range   Channel 1, 2, Line, Ext

4. Press *Mode* repeatedly to select the Auto or Normal trigger mode. To select the single trigger mode, press the Single key.

Mode
Auto

SINGLE
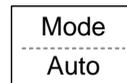
Range   Auto, Normal

5. Press *Slope/coupling* to enter into the trigger slope and coupling selection menu.
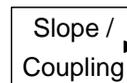
Slope /
Coupling

6. Press *Slope* repeatedly to select the trigger slope, rising or falling edge.

Slope
⟋

Range   Rising edge, falling edge

7. Press *Coupling* repeatedly to select the trigger coupling, DC or AC.

Coupling
AC

Range   DC, AC

8. Press *Rejection* to select the frequency rejection mode.

Rejection
Off

Range   LF, HF, Off

9. Press *Noise Rej* to turn the noise rejection on or off.

Noise Rej
Off

Range   On, Off

10. Press *Previous* menu to go back to the previous menu.

Previous
Menu

4-5-5.   Configuring the video trigger

Procedure

1. Press the Trigger menu key.

MENU

2. Press *Type* repeatedly to select video trigger. The video trigger indicator appears at the bottom of the display.

Type
Video ▶

3. Press *Source* repeatedly to select the trigger source channel.

Source
CH1

Range   Channel 1, 2

4. Press *Standard* repeatedly to select the video standard.

Standard
NTSC

Range   NTSC, PAL, SECAM

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5. Press *Polarity* repeatedly to select the video signal polarity.

Polarity
⤒⌐
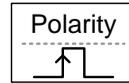
Range   positive, negative

6. Press *Line* repeatedly to select the video field line. Use the Variable knob to select the field.

Line
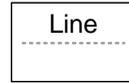
VARIABLE

Field   NTSC: 1 ~ 262 (Field 2), 1 ~ 263 (Field 1) PAL/SECAM: 1 ~ 312 (Field 2), 1 ~ 313 (Field1)

4-5-6. Configuring the pulse width trigger

Procedure

1. Press the Trigger menu key.

MENU

2. Press *Type* repeatedly to select pulse width trigger. The pulse width trigger indicator appears at the bottom of the display.

Type
Pulse
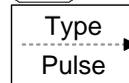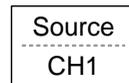
3. Press *Source* repeatedly to select the trigger source.
    Range   Channel 1, 2, Ext

Source
CH1

4. Press *Mode* repeatedly to select the trigger mode, Auto or Normal. To select the Single trigger mode, press the Single key.
    Range   Auto, Normal

Mode
Auto

SINGLE

5. Press *When* repeatedly to select the pulse condition. Then use the Variable knob to set the pulse width.

When <
20.0ns
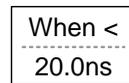
VARIABLE

Condition > , < , = , ≠
Width   20ns ~ 10s

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6. Press *Slope/Coupling* to set trigger slope and coupling.

Slope / Coupling ►

7. Press *Slope* repeatedly to select the trigger slope, which also appears at the bottom of the display.

Range　　Rising edge, falling edge

Slope

8. Press *Coupling* repeatedly to select the trigger coupling.

Range　　DC, AC

Coupling AC

9. Press *Rejection* to select the frequency rejection mode.
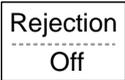
Range　　LF, HF, Off

Rejection Off

10. Press *Noise Rej* to turn the noise rejection on or off.
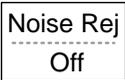
Range　　On, Off

Noise Rej Off

11. Press *Previous* menu to go back to the previous menu.

Previous Menu
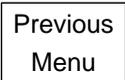
4-5-7.　Manually triggering the signal

⚠️ Note: This section describes how to manually trigger the input signals when the oscilloscope does not capture them. This section applies to the Normal and Single trigger mode, since in the Auto trigger mode, the oscilloscope keeps updating the input signal regardless of the trigger conditions.

To acquire the signal regardless of trigger conditions	To acquire the input signal regardless of the trigger condition, press the Force key. The oscilloscope captures the signals once.	FORCE
In the Single trigger mode	Press the Single key to start waiting for the trigger condition. To break out of the Single mode, press the Run/Stop key. The trigger mode changes to the Normal mode.	SINGLE Run/Stop

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4-6. Remote Control Interface

The Remote control interface section describes how to set up the USB interface for PC connection. Remote control command details are described in the DCS-7500A Programming Manual.

USB connection	PC end	Type A, host (Windows7 or higher)
	DCS-7500A end	Type B, slave
	Speed	1.1/2.0 (full speed)
	USB CLASS	USB-CDC

Procedure	1. Connect the USB cable to the USB slave port.
	2. When the PC asks for the USB driver or 'Unknown device' listed in Device Manager, install TEXIO_CDC.inf attached CD.
	3. On the PC, activate a terminal application such as Realterm or PuTTY. To check the COM port No., see the Device Manager in the PC.
	4. Run this query command via the terminal application. *idn? This command should return the manufacturer, model number, serial number, and firmware version in the following format. TEXIO, DCS-7515A, XXXXXXX, V1.00
	5. Configuring the command interface is complete. Refer to the programming manual for the remote commands and other details.
⚠ CAUTION:	If there is no response, please confirm a device driver, COM port number or the connection of the cable and so on.
⚠ CAUTION:	If you change the setting of the USB port in the connection with the PC, May not be able to communicate. Please restart your PC in this case.

4-7. Control with the "FreeWave"

It is possible to control from PC by using the application the FreeWave attached CD.

It is also possible to control the application by using GUI and the command. For details about commands, see the DCS-7500A programming manual.

4-7-1. System requirements

|	
OS	Microsoft Windows 7 (32bit/64bit) or higher
Required software	Microsoft .NETFramework ver4.0 full Microsoft Visual C++2010 Redistributable Package

Before you install the FreeWave ,Check the required software by "Control panel > Add or remove program". Please install required software If you can't find.

You must have administrator account to install software.

This application features and display may change to allow for the upgrade.

4-7-2. Icon

Each screen is switched by selecting icon in the upper part of the screen. The function of the button of each icon is as follows.

Connect

Image

Data

Command

Long memory
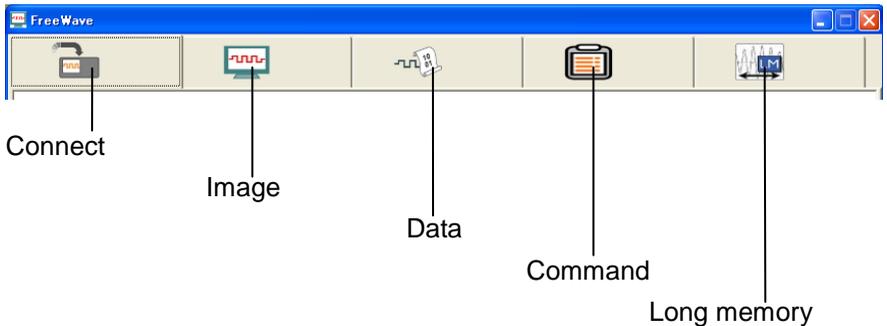
4-7-3. Connect screen

It is screen to select the model that controls from the Free Wave.
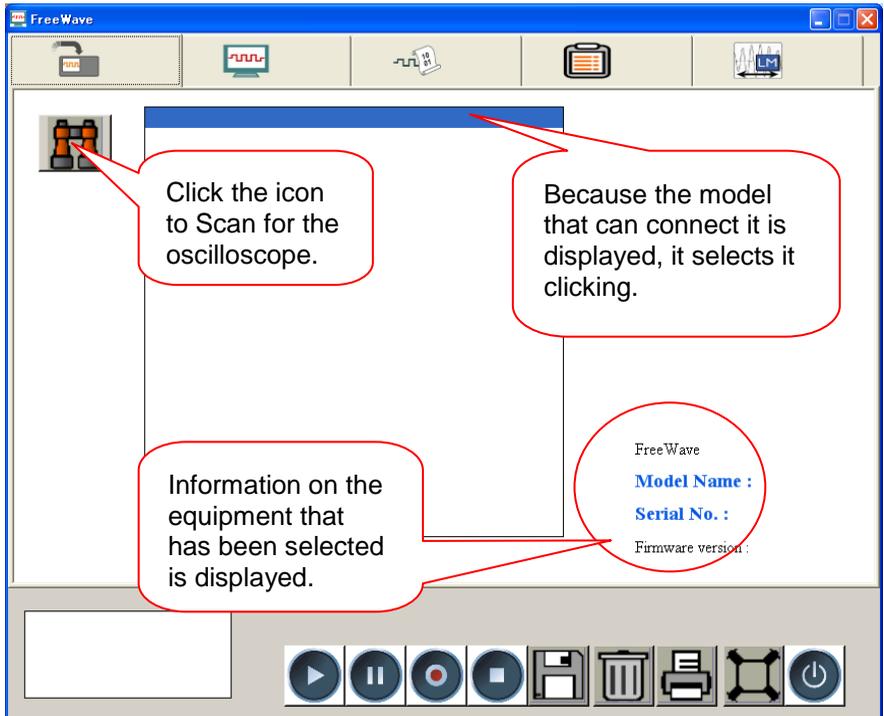
Click the scan icon to Scan for the oscilloscope.
Depending on the environment of the PC may take a minute to startup and update.

4-7-4. Image screen 1

When the $\triangleright$ button under the screen is pushed, the display is in real time displayed.

The displayed image can be preserved as data in the printout and PC.

The image screen is two kinds, and changes into another type if the button on the left is pushed.


The display changes into "Image2" if the button is pushed.

Full-screen is displayed.

The animation record begins.

A real-time display starts.

The display is preserved as still picture data.

A real-time display stops.

The display is printed out.

The Free Wave is ended.

4-7-5.　Image screen 2
The main body can be operated by clicking the switch part of the
panel, and turning mouse's wheel on the switch.

The main body
can be operated
by clicking each
button.

The value changes if
mouse's wheel is
turned on each knob.

The display
changes into
"Image1" if the
button is pushed.
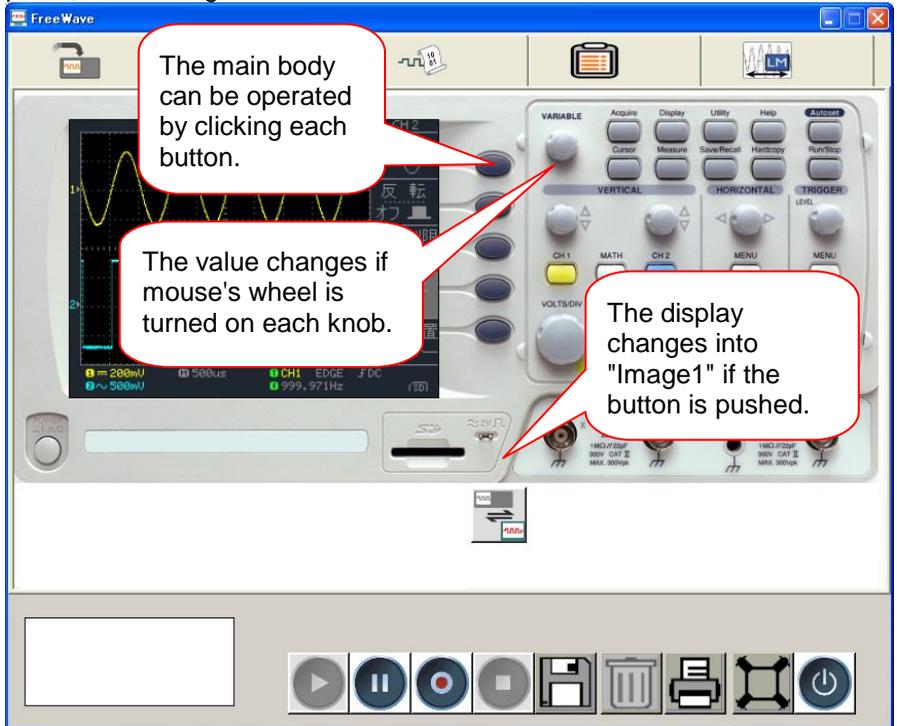
The screen can be preserved as a still picture or animation, and be
printed out.

・How to operate the knob.
　When you operate a knob with a mouse, movement is different from
　the left half of the knob in the right half.

When you click left side,
the oscilloscope is
operated in the same
way as when turning the
knob **counterclockwise**.

When you click right
side, the oscilloscope is
operated in the same
way as when turning the
knob **clockwise**.
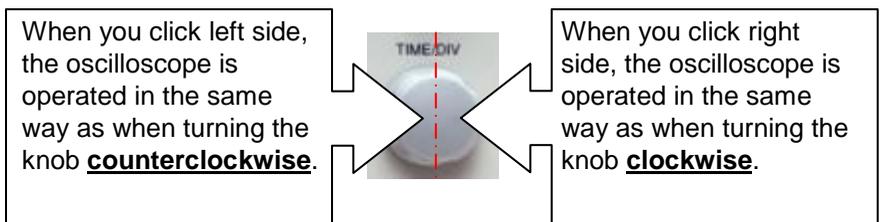
4-7-6. Data screen

When the ▷ button under the screen is pushed, a waveform data (4k/ch) is taken into the Free Wave and displayed.
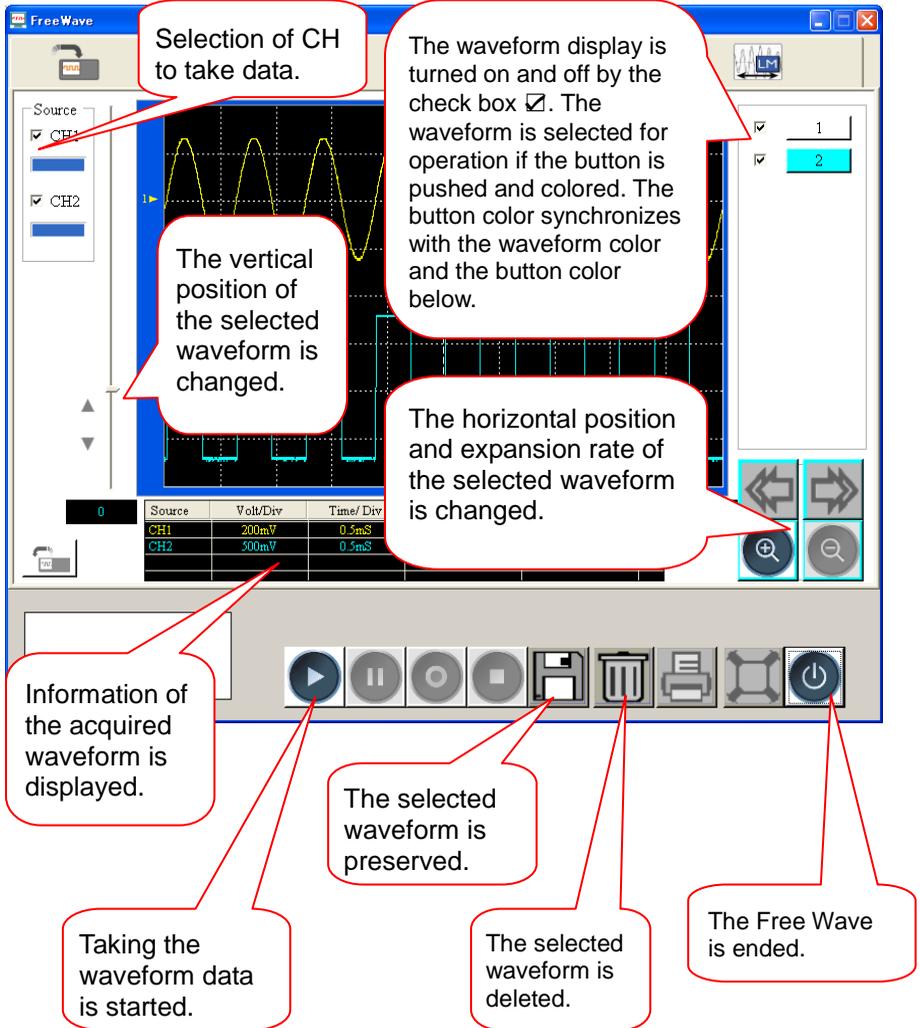
Selection of CH to take data.

The waveform display is turned on and off by the check box ☑. The waveform is selected for operation if the button is pushed and colored. The button color synchronizes with the waveform color and the button color below.

The vertical position of the selected waveform is changed.

The horizontal position and expansion rate of the selected waveform is changed.

Information of the acquired waveform is displayed.

The selected waveform is preserved.

Taking the waveform data is started.

The selected waveform is deleted.

The Free Wave is ended.

4-7-7. Command screen

The commands are displayed as the command tree at the left of the screen, and the command list can be made by selecting the command from the tree and moving to the command list in the right of the screen. After the command is listed, the command is sequentially executed from top of the list window when the ▷ button is pushed

The command is selected from the command tree, then the ⇒button is pushed, and the command is moved to the command list of the right window. Because the commands are displayed as a tree, when the + part is clicked, the lower command is displayed.

The response is displayed in query. Except query, double click and set a setting value.

The command is selected.

The command is selected from a right and left table, and moved, or deleted.

Query or the execution command is selected by double clicking.

The preserved command list is called.

The command list is preserved.

The command list is executed.

The command list is deleted.

The Free Wave is ended.

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4-7-8. Long memory screen

When the ▷ button under the screen is pushed, a waveform data (1M/ch or 2M/ch) is taken into the Free Wave and displayed.
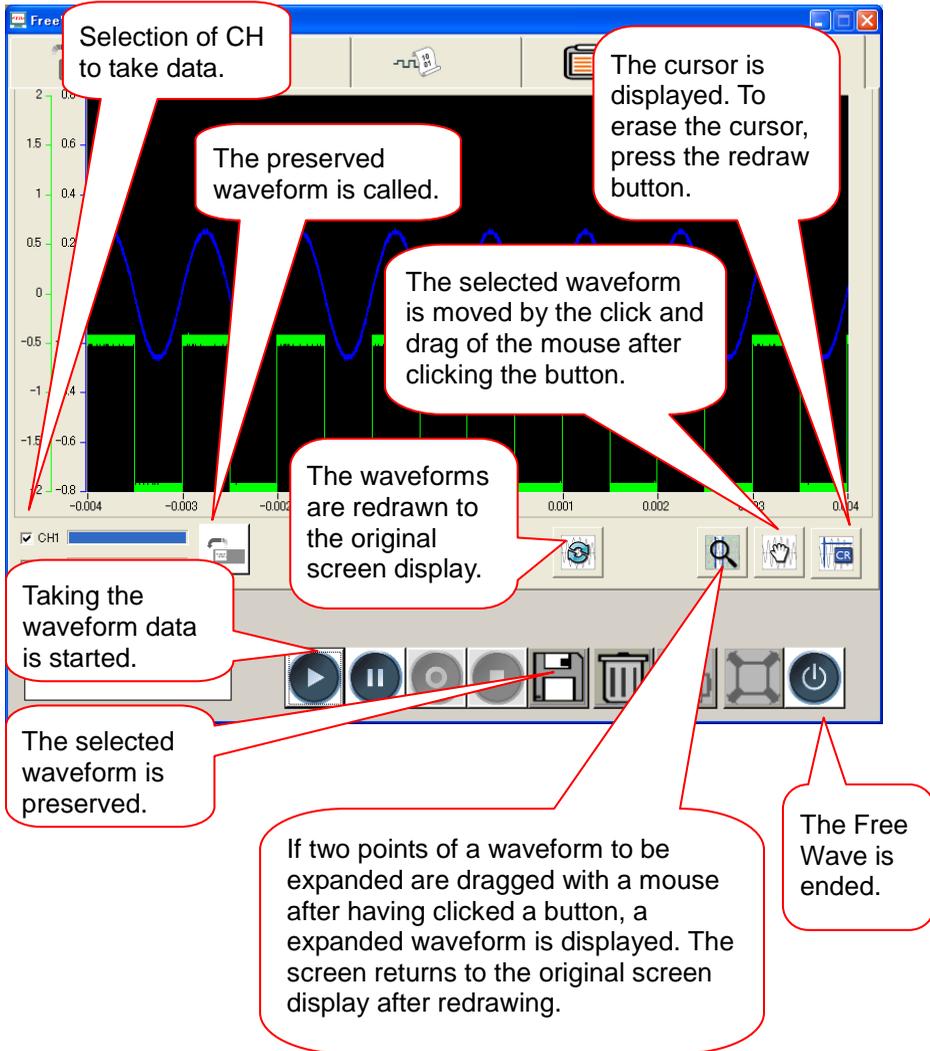
Selection of CH to take data.

The preserved waveform is called.

The cursor is displayed. To erase the cursor, press the redraw button.

The selected waveform is moved by the click and drag of the mouse after clicking the button.

The waveforms are redrawn to the original screen display.

Taking the waveform data is started.

The selected waveform is preserved.

If two points of a waveform to be expanded are dragged with a mouse after having clicked a button, a expanded waveform is displayed. The screen returns to the original screen display after redrawing.

The Free Wave is ended.

4-8. System Settings

The system settings show the oscilloscope's system information and allow changing the language.

4-8-1. Viewing the system information

Procedure	1. Press the Utility key.

 Utility

2. Press *System Info*. The upper half of the display shows the following information.

 System Info.
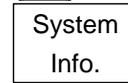
   • Model   • Serial number
   • Firmware version   • Web address

3. Press any other key to go back to the waveform display mode.

 More ▶

4-8-2. Selecting the language

Parameter	Language selection differs according to the region to which the oscilloscope is shipped.

   • English   • Chinese (traditional)
   • Chinese (simplified) • Japanese
   • Korean   • French
   • German   • Russian
   • Portuguese   • Italian
   • Polish   • Spanish

Procedure	1. Press the Utility key.

 Utility

2. Press *Language* repeatedly to select the language.

 Language English

5. SAVE/RECALL

The save function allows saving display images, waveform data, and panel settings into the oscilloscope's internal memory or to the front panel USB port. The recall function allows recalling the default factory settings, waveform data, and panel settings from the oscilloscope's internal memory or from USB.

5-1. File Structures

Three types of file are available: display image, waveform file, and panel settings.

5-1-1. Display image file format

Format	xxxx.bmp (Windows bitmap format)
Contents	The current display image in 234 x 320 pixels, color mode. The background color can be inverted (Ink saver function).

5-1-2. Waveform file format

CSV Format	xxxx.csv (Comma-separated values format which can be opened in spreadsheet applications such as Microsoft Excel) Files can be saved as two different types of CSV formats. The DCS-7500A can recall any of the two formats	
	Detail	Contains the waveform amplitude and time of each point (4k/1M/2M) relative to the trigger point.(Floating point)
	Fast	Only contains the waveform amplitude data for each point (4k/1M/2M).
Waveform type	CH1,CH 2	Input channel signal
	Math	Math operation result (page 44)
Storage location	Internal memory	The oscilloscope's internal memory, which can hold 15 waveforms.
	External USB Flash drive	A USB flash drive (FAT or FAT32 format) can hold practically an unlimited number of waveforms.

	Ref A, B	Two reference waveforms are used as a buffer to recall a waveform in the display. You have to save a waveform into internal memory or to USB, then copy the waveform into the reference waveform slot (A or B), and then recall the reference waveform into the display.
Waveform Memory Depth	The memory depth is limited to 1 M points when both channels are activated or 2M points when only a single channel is activated. The signal must be triggered /stopped to have access to the full memory depth. Therefore when a signal is saved the waveform will be automatically stopped if it is not manually triggered /stopped first.	
	There are a number of conditions when all of the available memory is not utilized due to a limited number of different sample rates. This can be caused by an un-triggered signal, or a time/div setting that is too fast to display all the points on screen.	
⚠NOTE	2M point memory lengths are only available for time bases slower than 10ns/div on a single channel, and 1 M point memory lengths are only available for time bases slower than 25ns/div on two channels.	
	When in the 100us/div slower time base, the saved data corresponding to the time of 16div.	
	The midpoint of the memory is the center of the screen. When in the Roll mode, 10div at the end of the waveform memory is displayed.	
	The vertical data is 25point in 1division, and starts from GND level (0).	
Waveform file contents: other data	A waveform file also includes the following information.	
	• Memory Length	• Trigger Level
	• Source	• Probe
	• Vertical Units	• Vertical Scale
	• Vertical Position	• Horizontal Units
	• Horizontal Scale	• Horizontal Position
	• Horizontal Mode	• Sampling Period
	• Firmware	• Time
	• Mode	• Waveform Data

5-1-3. Setup file format

Format	xxxx.set (proprietary format)	
	A setup file saves or recalls the following settings.	

Contents	Acquire	• mode	
	Cursor	• source channel • cursor location	• cursor on/off
	Display	• dots/vectors • grid type	• accumulation on/off
	Measure	• item	
	Utility	• hardcopy type • language • Data Logging settings	• ink saver on/off • Go-Nogo settings
	Horizontal	• display mode • position	• scale
	Trigger	• trigger type • trigger mode • video polarity • pulse timing	• source channel • video standard • video line • slope/coupling
	Channel (vertical)	• vertical scale • coupling mode • bandwidth limit on/off	• vertical position • invert on/off • voltage/current (probe)
	Math	• operation type • vertical position • FFT window	• source channel • unit/div

5-1-4. Using the USB file utilities

Background	When a USB flash drive is inserted into the oscilloscope, file utilities (file deletion, folder creation and file/folder renaming) are available from the front panel.

Procedure	1. Insert a USB flash drive into the front panel USB port.

2. Press the Save/Recall key. Select any save or recall function. For example USB Destination in the Save image function.

Save/Recall

(Example)

Save Image ▶

Destination
USB

3. Press *File Utilities*. The display shows the USB flash drive contents.

File Utilities

4. Use the Variable knob to move the cursor. Press *Select* to go into the folder or go back to the previous directory level.

VARIABLE

Select

USB flash drive indicator	When a USB flash drive is inserted into the oscilloscope, an indicator appears at the right bottom corner of the display. (The USB flash drive shouldn't be removed when a file is saved or retrieved from USB).

USB

ꝼDC

Creating a new folder / renaming a file or folder	1. Move the cursor to the file or folder location and press *New Folder* or *Rename*. The file/folder name and the character map will appear on the display.	New Folder Rename
	2. Use the Variable knob to move the pointer to the characters. Press *Enter Character* to add a character or *Back Space* to delete a character.	VARIABLE Enter Character Back Space
	3. When editing is complete, press *Save*. The new/renamed file or folder will be saved.	Save
Deleting a folder or file	1. Move the cursor to the folder or file location and press *Delete*. The message "*Press F4 again to confirm this process*" appears at the bottom of the display.	Delete
	2. If the file/folder still needs to be deleted, press *Delete* again to complete the deletion. To cancel the deletion, press any other key.	Delete
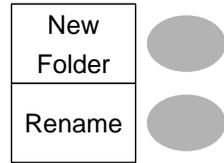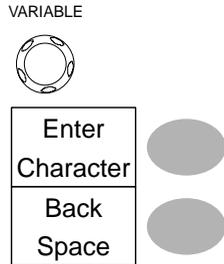
5-2. Quick Save (HardCopy)

Background	The Hardcopy key works as a shortcut for printing screen images directly to save display images, waveform data, and panel settings onto a USB flash drive card.	Hardcopy

The Hardcopy key can be configured into three types of operations: save image, save all (image, waveform, setup).

Using the Save/Recall key can also save files with more options. For details, see page 94.

Save/Recall

Functionalities	Save image (*.bmp)	Saves the current display image into a USB flash drive.
	Save all	Saves the following items into a USB flash drive.
		• Current display image (*.bmp)
		• Current system settings (*.set)
		• Current waveform data (*.csv)

Procedure	
	1. Insert a USB flash drive into the front panel USB port.
	2. Press the Utility key.
	Utility
	3. Press *Hardcopy Menu*.
	Hardcopy Menu ▶
	4. Press *Function* repeatedly to select *Save Image* or *Save All*.
	Function Save All
	5. To invert the color in the display image, press *Ink Saver.* This turns Ink Saver on or off.
	Ink Saver Off

6. If *Save Image* was selected, press *Mem Leng* repeatedly to select *USB Normal* or *USB 1M/2M*. USB Normal and USB 1M/2M sets the waveforms to a 4k and 1M/2M memory length when saving, respectively. 1M memory length is available when both CH1 and CH2 are active; 2M memory length is available when a single channel is active only.

Mem Leng
USB 1M

7. Press the Hardcopy key. The file or folder will be saved to the root directory of the USB flash drive.

Hardcopy

5-3. Save

This section describes how to save data using the Save/Recall menu.

5-3-1. File type/source/destination

Item	Source	Destination
Panel setup (xxxx.set)	• Panel settings	• Internal memory: S1 ~ S15 • External memory: USB
Waveform data (xxxx.csv)	• Channel 1, 2 • Math operation result • Reference waveform A, B	• Internal memory: W1 ~ W15 • Reference waveform A, B • External memory: USB
Display image (xxxx.bmp)	• Display image	• External memory: USB
Save All	• Display image (xxxx.bmp) • Waveform data (xxxx.csv) • Panel settings (xxxx.set)	• External memory: USB

5-3-2. Saving the panel settings

Procedure

1. (For saving to USB flash drive) Insert the USB flash drive into the front panel USB port.
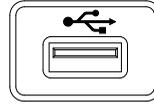
2. Press the Save/Recall key twice to access the Save menu.
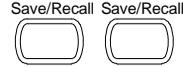
3. Press *Save Setup*.

   Save
   Setup ▶

4. Press *Destination* repeatedly to select the saved location. Use the Variable knob to change the internal memory location (S1 ~ S15).

   Destination
   Memory

   VARIABLE

   Memory   Internal memory, S1 ~ S15

   USB   USB, no practical limitation for the amount of files. When saved, the setup file will be placed in the root directory.

5. Press *Save* to confirm saving. When completed, a message appears at the bottom of the display.

   Save

   Note ⚠   The file will not be saved if the power is turned off or the USB flash drive is removed before completion.

File utilities   To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91.

   File
   Utilities

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5-3-3. Saving the waveform

Procedure	
	1. (For saving to USB flash drive) Insert the USB flash drive into the front panel USB port.

2. Press the Save/Recall key twice to access the Save menu.

Save/Recall   Save/Recall
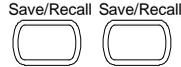
3. Press *Save Waveform*.

Save
Waveform ▶

4. Press *Source*. Use the Variable knob to select the source signal.

Source
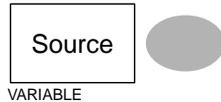
VARIABLE

CH1 , CH2	Channel 1 , Channel 2
Math	Math operation result (page 44)
RefA, B	Internally stored reference waveforms A, B

5. Press *Destination* repeatedly to select the file destination. Use the Variable knob to select the memory location.
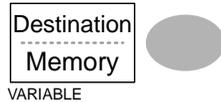
Destination

Memory

VARIABLE

Memory	Internal memory, W1 ~ W15
USB Normal	Save to the USB flash drive with a 4k waveform memory length.
USB 1M	Save to the USB flash drive with a 1M waveform memory length. For 2 channel operation only.
USB 2M	Save to the USB flash drive with a 2M waveform memory length. For single channel operation only.
Ref	Internal reference waveform, A/B

6. Press *Save* to confirm saving. When completed, a message appears at the bottom of the display.

Save

Note ⚠	The file will not be saved if the power is turned off or the USB flash drive is removed from the USB port. It takes approximately 1 min to save a 2M waveform to the USB drive in fast mode. Detailed mode may take over 10 times longer depending on the speed of the USB flash drive.
File utilities	To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91. `File Utilities`

5-3-4. Saving the display image

Background	Saving the display image can be used as a screen capture or it can be used as a reference waveform.
Procedure	1. Insert the USB flash drive into the front panel USB port. (Image files can only be saved to USB) 2. Press the Save/Recall key twice to access the Save menu. Save/Recall Save/Recall 3. Press *Save Image*. `Save Image ▶` 4. Press *Ink Saver* repeatedly to invert the background color (on) or not (off). `Ink Saver Off` 5. Note: *Destination* is set as USB. This cannot be changed. `Destination USB` 6. Press *Save* to confirm saving. When completed, a message appears at the bottom of the display. `Save`
Note ⚠	The file will not be saved if the power is turned off or the USB flash drive is removed before completion.

| File utilities | To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91. | File Utilities ⬤ |

5-3-5. Saving all

| Procedure | 1. (For saving to USB flash drive) Insert the USB flash drive into the front panel USB port. | |

2. Press the Save/Recall key twice to access the Save menu.
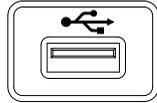
Save/Recall   Save/Recall
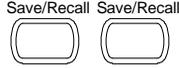
3. Press *Save All*. The following information will be saved.

| Save All ▶ ⬤ |

Setup file (Axxxx.set)	Two types of setups are saved: the current panel setting and the last internally saved settings (one of S1 ~ S15).
Display image (Axxxx.bmp)	The current display image in bitmap format.
Waveform data (Axxxx.csv)	Two types of waveform data are saved: the currently active channel data and the last internally saved data (one of W1 ~ W15).

4. Press *Ink Saver* repeatedly to invert the background color (on) or not (off) for the display image.

| Ink Saver
Off ⬤ |

5. Press *Destination*.

| Destination
USB 1M |

USB Normal	Save to the USB flash drive with a 4k waveform memory length.
USB 1M	Save to the USB flash drive with a 1M waveform memory length. For 2 channel operation only.
USB 2M	Save to the USB flash drive with a 2M waveform memory length. For single channel operation only.

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6. Press *Save* to confirm saving. When completed, a message appears at the bottom of the display.

Save

Note ⚠️ The file will not be saved if the power is turned off or the USB flash drive is removed from the USB port. It takes approximately 1 min to save a 2M waveform to the USB drive in fast mode. Detailed mode may take over 10 times longer depending on the speed of the USB flash drive.

7. The current waveform(s) (*.CSV), setup file (*.SET) and display image (*.BMP) are saved to a directory (ALLXXXX).

File utilities	To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91.	File Utilities
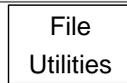
5-4. Recall

5-4-1. File type/source/destination

Item	Source	Destination
Default panel setup	• Factory installed setting	• Current front panel
Reference waveform	• Internal memory: A, B	• Current front panel
Panel setup (DSxxxx.set)	• Internal memory: S1 ~ S15 • External memory: USB flash drive	• Current front panel
Waveform data (DSxxxx.csv)	• Internal memory: W1 ~ W15 • External memory: USB flash drive	• Reference waveform A, B

5-4-2. Recalling the default panel settings

Procedure	1. Press the Save/Recall key.	Save/Recall
	2. Press *Default Setup*. The factory installed setting will be recalled.	Default Setup

Setting contents	The following is the default panel setting contents.	
Acquisition	Mode: Normal	
Channel	Coupling: DC	Invert: Off
	BW limit: Off	voltage: x1
Cursor	Source: CH1	Horizontal: None
	Vertical: None	
Display	Type: Vectors	Accumulate: Off
	Graticule:	
Horizontal	Scale: 2.5us/div	Mode: Main Timebase
	H Pos Adj: Fine	Hor Pos: 0
Math	Type: + (Add)	Channel: OFF
	Position: 0.00 div	Unit/div: 2V
Measure	Item: Vpp, Vavg, Frequency, Duty cycle, Rise Time	
Trigger	Type: Edge	Source: Channel1
	Mode: Auto	Slope: ⎽⎽⎽⏋
	Coupling: DC	Rejection: Off
	Noise Rejection: Off	
Utility	SaveImage, InkSaver On, Probe squarewave 1kHz 50% duty.	

5-4-3. Recalling a reference waveform to the display

Procedure

1. The reference waveform must be stored in advance. See page 96 for details.

2. Press the Save/Recall key.

   Save/Recall

3. Press *Display Refs*. The reference waveform display menu appears.

   Display Refs. ▶

4. Select the reference waveform, *Ref A* or *Ref B*, and press it. The waveform appears on the display and the period and amplitude of the waveform appears in the menu.

   Ref.A Off

   ↓

   Ref.A On
   200mV
   250uS

5. To clear the waveform from the display, press *RefA/B* again.

   Ref.A Off
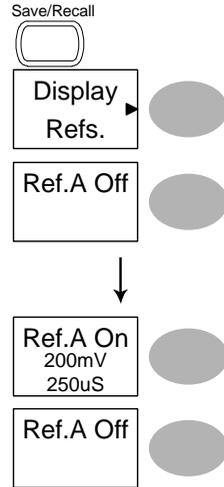
5-4-4. Recalling panel settings

Procedure

1. (For recalling to USB) Insert the USB flash drive into the front panel USB port.

2. Press the Save/Recall key.

   Save/Recall

3. Press *Recall Setup*.

   Recall Setup ▶

4. Press *Source* repeatedly to select the file source, internal or external memory. Use the Variable knob to change the memory.

   Source
   Memory

   VARIABLE
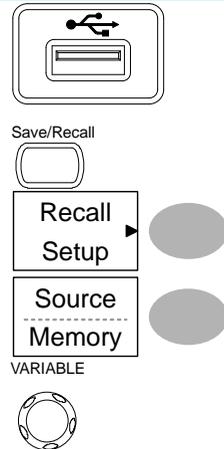
   Memory   Internal memory, S1 ~ S15
   USB   USB flash drive, DSXXXX.SET. The setup file(s) must be placed in the root directory to be recognized.

5. Press *Recall* to confirm recalling. When completed, a message appears at the bottom of the display.

Recall

Note ⚠ The file will not be recalled if the power is turned off or the USB flash drive is removed before completion.

| File utilities	To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91.	File Utilities

5-4-5. Recalling a waveform

Procedure	1. (For recalling to USB) Insert the USB flash drive into the front panel USB port.	
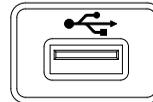
2. Press the Save/Recall key.

Save/Recall

3. Press *Recall Waveform*. The display shows the available source and destination options.

Recall Waveform ▶

4. Press *Source* repeatedly to select the file source, internal memory or USB. Use the Variable knob to change the memory location (W1 ~ W15)/DSXXXX.CSV.

Source
Memory

VARIABLE

Memory	Internal memory, W1 ~ W15
USB	USB flash drive, DSXXXX.CSV. The waveform file(s) must be placed in the root directory to be loaded.

5. Press *Destination*. Use the Variable knob to select the memory location.

Destination

VARIABLE

RefA, B	Internally stored reference waveforms A, B

6. Press *Recall* to confirm recalling. When completed, a message appears at the bottom of the display.

Recall

Note ⚠ The file will not be recalled if the power is turned off or the USB flash drive is removed before completion.

File utilities   To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91.

File Utilities

5-4-6. Recall Image

Background   Recall Image is useful for recalling reference images that would not be possible using the Recall Waveform function, such as in X-Y mode. Using the Recall Image function will superimpose the reference image on the screen.
Before recalling an image, an image must first be saved to USB, see page 97.
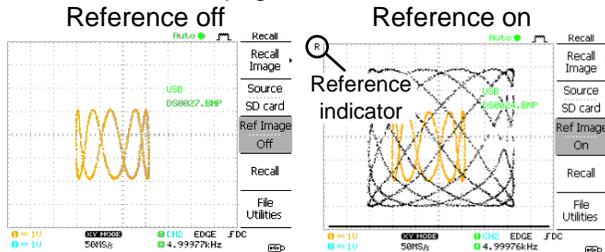
Reference off   Reference on

Reference indicator

Procedure   1. Insert the USB flash drive into the front panel USB.

2. Press the Save/Recall key.

Save/Recall

3. Press *Recall Image*. The display shows the available source and destination options.

Recall Image ▶

4. Use the Variable knob to choose a file name (DSXXXX.BMP).

VARIABLE

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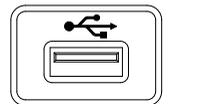
	USB	The image file must be placed in the root directory to be recognized.
	5. Press *Recall* to confirm recalling. When completed, a message appears at the bottom of the display.	Recall
	6. Press *Reference Image* to turn on /off the current image.	Ref Image Off
	Note ⚠	The file will not be recalled if the power is turned off or the USB flash drive is removed before completion.
File utilities	To edit the USB drive contents (create/ delete/ rename files and folders), press *File Utilities*. For details, see page 91.	File Utilities

6. MAINTENANCE

Two types of maintenance operations are available: calibrating the vertical resolution, and compensating the probe. Run these operations when using the oscilloscope in a new environment.

6-1. Vertical Resolution Calibration

Procedure

1. Press the Utility key.

Utility

2. Press the More key twice.

More ▶

x2

3. Press Self Cal Menu.

Self CAL Menu ▶

4. Press Vertical. The message "Set CAL to CH1, then press F5" appears at the bottom of the display.

Vertical

5. Connect the calibration signal between the rear panel CAL out terminal and the Channel1 input.

Rear   Front
CAL   CH1

→
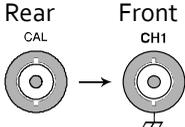
6. Press F5. The calibration automatically starts.

7. The Channel1 calibration will complete in less than 5 minutes.

```
Ch1 calibration 1/3

●●●●●●●○○○○○
```
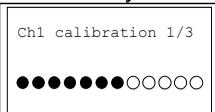
8. When finished, connect the calibration signal to the Channel 2 input and repeat the procedure.

```
Done!!

●●●●●●●●●●●●
```

9. When the calibration is complete the display will go back to the previous state.

6-2. Probe Compensation

Procedure

1. Connect the probe between the Channel1 input and the probe compensation output (2Vp-p, 1kHz square wave) on the front panel. Set the probe voltage attenuation to x10.
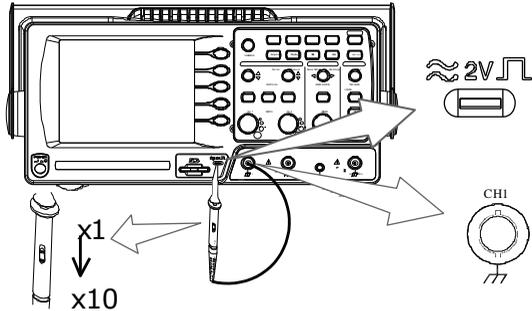
2. Press the Utility key.

3. Press *ProbeComp*.
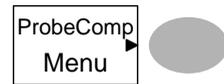
4. Press *Wavetype* repeatedly to select the standard square wave.
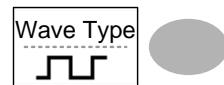
5. Press the Autoset key. The compensation signal will appear in the display.

6. Press the Display key, then *Type* to select the vector waveform.
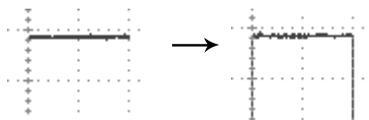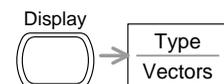
7. Turn the adjustment point on the probe until the signal edge becomes sharp.

| Over Compensation | Normal | Under Compensation |
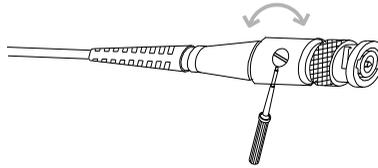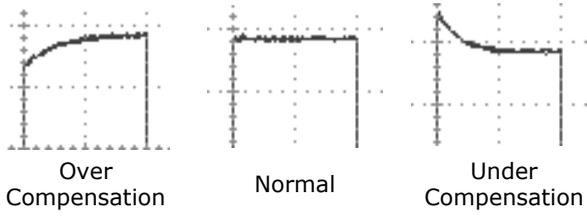
7. APPENDIX

7-1. Fuse Replacement

Procedure   1. Remove the power cord and remove the fuse socket using a minus driver.
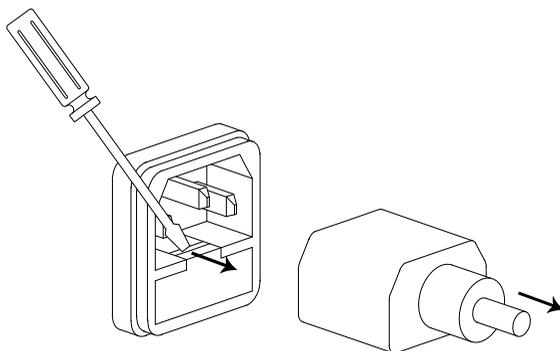
    2. Replace the fuse in the holder.
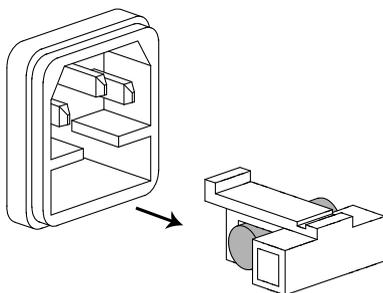
Ratings   T1A, 250V

7-2. DCS-7500A Series Specifications

The specifications apply when the oscilloscope is powered on for at least 30 minutes under +20°C~+30°C.

7-2-1. Model-specific specifications

DCS-7507A	Bandwidth (–3dB)	DC coupling: DC ~ 70MHz AC coupling: 10Hz ~ 70MHz
	Bandwidth Limit	20MHz (−3dB)
	Trigger Sensitivity	0.5div or 5mV (DC ~ 25MHz) 1.5div or 15mV (25MHz~70MHz)
	External Trigger Sensitivity	~ 50mV (DC~25MHz) ~ 100mV (25MHz~70MHz)
	Rise Time	< 5.8ns approx.
DCS-7510A	Bandwidth (–3dB)	DC coupling: DC ~ 100MHz AC coupling: 10Hz ~ 100MHz
	Bandwidth Limit	20MHz (−3dB)
	Trigger Sensitivity	0.5div or 5mV (DC ~ 25MHz) 1.5div or 15mV (25MHz~100MHz)
	External Trigger Sensitivity	~ 50mV (DC~25MHz) ~ 100mV (25MHz~100MHz)
	Rise Time	< 3.5ns approx.
DCS-7515A	Bandwidth (–3dB)	DC coupling: DC ~ 150MHz AC coupling: 10Hz ~ 150MHz
	Bandwidth Limit	20MHz (−3dB)
	Trigger Sensitivity	0.5div or 5mV (DC ~ 25MHz) 1.5div or 15mV (25MHz~150MHz)
	External Trigger Sensitivity	~ 50mV (DC~25MHz) ~ 100mV (25MHz~100MHz)
	Rise Time	< 2.3ns approx.

7-2-2. Common specifications

Vertical	Sensitivity	2mV/div~10V/div (1-2-5 increments)	
	Accuracy	± (3% x |Readout|+0.1div + 1mV)	
	Bandwidth	See model-specific specifications	
	Rise Time	See model-specific specifications	
	Input Coupling	AC, DC, Ground	
	Input Impedance	1MΩ±2%, ~15pF	
	Polarity	Normal, Invert	
	Maximum Input	300V (DC+AC peak), CAT II	
	Math Operation	+, −, x, FFT, FFT rms	
	Offset Range	2mV/div ~50mV/div : ±0.4V	
		100mV/div ~ 500mV/div : ±4V	
		1V/div ~5V/div : ±40V	
		10V/div : ±300V	
Trigger	Sources	CH1, CH2, Line, External	
	Modes	Auto, Normal, Single, TV, Edge, Pulse	
	Coupling	AC, DC, LF rej, HF rej, Noise rej	
	Sensitivity	See model-specific specifications	
	Holdoff	40ns ~ 2.5s	
External trigger	Range	DC: ±15V, AC: ±2V	
	Sensitivity	See model-specific specifications	
	Input Impedance	1MΩ±2%, ~15pF	
	Maximum Input	300V (DC+AC peak), CATII	
Horizontal	Range	1ns/div~50s/div, 1-2.5-5 increment	
		Roll: 50ms/div ~ 50s/div	
	Modes	Main, Window, Window Zoom, Roll, X-Y	
	Accuracy	±0.01%	
	Pre-Trigger	8 div maximum	
	Post-Trigger	100 div	
X-Y Mode	X-Axis Input	Channel 1	
	Y-Axis Input	Channel 2	
	Phase Shift	±3° at 100kHz	
Signal Acquisition	Real-Time	1G Sa/s maximum	
	Equivalent	25G Sa/s maximum	
	Vertical Resolution	8 bits	
	Record Length	Normal; 4000 points	
		Maximum; 2M points (1 channel),	
		1M points (2 channels)	
	Acquisition	Normal, Peak Detect, Average	
	Peak Detection	10ns (500ns/div ~ 50s/div)	
	Average	2, 4, 8, 16, 32, 64, 128, 256	

Cursors and Measurement	Voltage	Vpp, Vamp, Vavg, Vrms, Vhi, Vlo, Vmax, Vmin, Rise Preshoot/ Overshoot, Fall Preshoot/ Overshoot
	Time	Freq, Period, Rise Time, Fall Time, + Width, – Width, Duty Cycle
	Delay	FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF
	Cursors	Voltage difference (ΔV) and Time difference (ΔT) between cursors
	Auto Counter	Resolution: 6 digits, Accuracy: ±2% Signal source: All available trigger source except the Video trigger
Control Panel Function	Autoset	Automatically adjust Vertical Volt/div, Horizontal Time/div, and Trigger level The Autoset function does not catch signals well under 30mV or 2Hz.
	Save/Recall	Up to 15 sets of measurement conditions and waveforms
Display	LCD	5.7 inch, TFT, brightness adjustable
	Resolution (dots)	234 (Vertical) x 320 (Horizontal)
	Graticule	8 x 10 divisions
	Display Contrast	Adjustable
Interface	USB Slave Connector	USB1.1 & 2.0 full speed compatible (flash disk not supported)
	USB Host connector	Image (BMP) and waveform data (CSV)
Probe Compensation Signal	Frequency range	1kHz ~ 100kHz adjustable, 1kHz step
	Duty cycle	5% ~ 95% adjustable, 5% step
	Amplitude	2Vpp±3%
Power Source	Line Voltage	100V~240V AC, 47Hz~63Hz
	Power Consumption	18W, 40VA maximum
	Fuse Rating	T1A, 250V
Operation Environment	Ambient temperature 0 ~ 50°C Relative humidity ≤ 80%, 40°C or below ≤ 45%, 41°C~50°C	
Storage Environment	Storage Temperature: -10°C~60°C, no condensation- Relative humidity 93% @ 40°C or below 65% @ 41°C~60°C	
Dimensions	341.5(W) x162.3(H) x 159(D) mm	
Weight	Approx. 2.5kg	

Accessory	AC Power cord	x1
	Probe (See Probe Specifications)	x2
	ACCESSORY CD-ROM	x1
	USING THE PRODUCT SAFTY	x1

7-2-3. Probe Specifications

DCS-7507A Probe

Model		GTP-070A-4* (for DCS-7507A)
Position x 10	Attenuation Ratio	10:1
	Bandwidth	DC ~ 70MHz
	Input Resistance	10MΩ when used with 1MΩ input
	Input Capacitance	28pF~32pF
	Maximum Input Voltage	≤600Vpk, Derating with frequency
Position x 1	Attenuation Ratio	1:1
	Bandwidth	DC ~ 6MHz
	Input Resistance	1MΩ when used with 1MΩ input
	Input Capacitance	120pF~220pF
	Maximum Input Voltage	≤200Vpk, Derating with frequency
Operating Cond.	Temperature	–10°C ~ 50°C
	Relative Humidity	≤85%
Safety Standard	EN 61010-031 CAT II	

DCS-7510A Probe

Model		GTP-100A-4* (for DCS-7510A)
Position x 10	Attenuation Ratio	10:1
	Bandwidth	DC ~ 100MHz
	Input Resistance	10MΩ when used with 1MΩ input
	Input Capacitance	14.5~17.5pF approx.
	Maximum Input Voltage	≤600Vpk, Derating with frequency
Position x 1	Attenuation Ratio	1:1
	Bandwidth	DC ~ 6MHz
	Input Resistance	1MΩ when used with 1MΩ input
	Input Capacitance	85~115pF approx.
	Maximum Input Voltage	≤200Vpk, Derating with frequency
Operating Cond.	Temperature	–10°C ~ 50°C
	Relative Humidity	≤85% @35°C
Safety Standard		EN 61010-031 CAT II

DCS-7515A Probe

| Model		GTP-150A-2* (for DCS-7515A)
Position x 10	Attenuation Ratio	10:1
	Bandwidth	DC ~ 150MHz
	Input Resistance	10MΩ when used with 1MΩ input
	Input Capacitance	17pF approx.
	Maximum Input Voltage	500V CAT I, 300V CAT II (DC+Peak AC)Derating with frequency
Position x 1	Attenuation Ratio	1:1
	Bandwidth	DC ~ 6MHz
	Input Resistance	1MΩ when used with 1MΩ input
	Input Capacitance	47pF approx.
	Maximum Input Voltage	300V CAT I, 150V CAT II (DC+Peak AC)Derating with frequency
Operating Cond.	Temperature	–10°C ~ 55°C
	Relative Humidity	≤85% @35°C
Safety Standard		EN 61010-031 CAT II

* Note: TEXIO TECHNOLOGY reserves the right to change the probe model type (GTP-070A-4, GTP-100A-4, GTP-150A-2) at anytime without notice for probe model types of similar specification.

7-3. Dimensions

FRONT
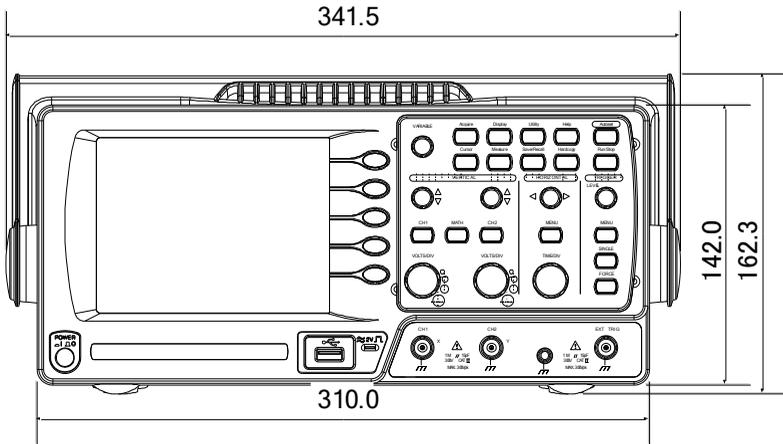
SIDE
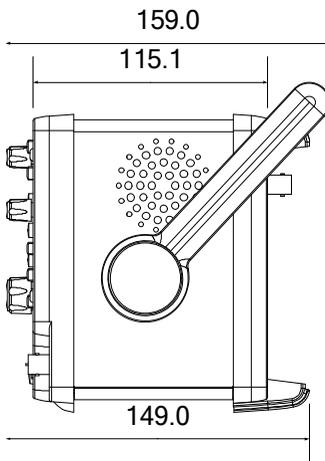
7-4. FAQ

- **The input signal does not appear in the display.**
- **I want to remove some contents from the display.**
- **The waveform does not update (frozen).**
- **The probe waveform is distorted.**
- **Autoset does not catch the signal well.**
- **I want to clean up the cluttered panel settings.**
- **The accuracy does not match the specifications.**
- **The oscilloscope will not allow a 2M waveform to be saved.**

● **The input signal does not appear in the display.**

Make sure you have activated the channel by pressing the CH key (page 30).

● **I want to remove some contents from the display.**

To clear the math result, press the Math key again (page 44).
To clear the cursor, press the Cursor key again (page 42).
To clear the Help contents, press the Help key again (page 29).

● **The waveform does not update (frozen).**

Press the Run/Stop key to unfreeze the waveform. See page 32 for details. For trigger setting details, see page 72.
If this does not help, press the CH key. If the signal still does not appear, press the Autoset key.

● **The probe waveform is distorted.**

You might need to compensate the probe. For details, see page 106. Note that the frequency accuracy and duty factor are not specified for probe compensation waveforms and therefore it should not be used for other reference purposes.

● **Autoset does not catch the signal well.**

The Autoset function does not catch signals well under 30mV or 2Hz. Please operate the oscilloscope manually. See page 31 for details.

- **I want to clean up the cluttered panel settings.**

Recall the default settings by pressing the Save/Recall key→Default Setting. For default setting contents, see page 28.

- **The saved display image is too dark on the background.**

Use the Inksaver function which reverses the background color. For details, see page 97.

- **The accuracy does not match the specifications.**

Make sure the device is powered on for at least 30 minutes, within +20°C~+30°C. This is necessary to stabilize the unit to match the specification.

- **The oscilloscope will not allow a 2M waveform to be saved.**

Make sure that only 1 channel is active. Make sure that the signal has been triggered and that the STOP or Single key has been pressed. Ensure the time base is slower than 10 ns/div. See page 88.

For more information, contact your local dealer or TEXIO TECHNOLOGY at www.texio.co.jp / info@texio.co.jp.

TEXIO TECHNOLOGY CORPORATION

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