Digital Storage Oscilloscope

GDS-1000A Series

September 2009 edition

This manual contains proprietary information, which is protected by copyright. All rights are reserved. No part of this manual may be photocopied, reproduced or translated to another language without prior written consent of Good Will Corporation.

The information in this manual was correct at the time of printing. However, Good Will continues to improve its products and therefore reserves the right to change the specifications, equipment, and maintenance procedures at any time without notice.

Good Will Instrument Co., Ltd.
No. 7-1, Jhongsing Rd., Tucheng City, Taipei County 236, Taiwan,
# Table of Contents

**SAFETY INSTRUCTIONS** .............................................. 7

- Safety Symbols ......................................................................................... 7
- Safety Guidelines ...................................................................................... 8
- Power cord for the United Kingdom ......................................................... 10

**GETTING STARTED** .................................................. 11

- Main Features .......................................................................................... 11
- Panel Overview ........................................................................................ 13
  - Front Panel .............................................................................................. 13
  - Rear Panel .............................................................................................. 17
  - Display .................................................................................................. 18
- Setting up the Oscilloscope ..................................................................... 19

**QUICK REFERENCE** .................................................. 22

- Menu Tree and Shortcuts ......................................................................... 22
  - CH1/2 key .............................................................................................. 23
  - Cursor key 1/2 ...................................................................................... 24
  - Cursor key 2/2 ...................................................................................... 24
  - Display key ............................................................................................ 25
  - Autoset key .......................................................................................... 25
  - Hardcopy key ......................................................................................... 25
  - Help key ................................................................................................ 25
  - Horizontal menu key ............................................................................. 26
  - Math key 1/2 (+/-/x) ............................................................................. 27
  - Math key 2/2 (FFT/FFT rms) ............................................................... 27
  - Measure key .......................................................................................... 28
  - Run/Stop key ......................................................................................... 28
  - Save/Recall key 1/10 ........................................................................... 29
  - Save/Recall key 2/10 ........................................................................... 29
  - Save/Recall key 3/10 ........................................................................... 30
  - Save/Recall key 4/10 ........................................................................... 30
  - Save/Recall key 5/10 ........................................................................... 31
  - Save/Recall key 6/10 ........................................................................... 31
  - Save/Recall key 7/10 ........................................................................... 32
  - Save/Recall key 8/10 ........................................................................... 32
  - Save/Recall key 9/10 ........................................................................... 33
  - Save/Recall key 10/10 .......................................................................... 33
  - Trigger key 1/6 ...................................................................................... 34

**MEASUREMENT** ....................................................... 42

- Basic Measurements ................................................................................ 42
  - Activating a channel .............................................................................. 42
  - Using Autoset ......................................................................................... 43
  - Running and stopping the trigger ............................................................ 44
  - Changing the horizontal position and scale ............................................ 45
  - Changing the vertical position and scale .................................................. 46
  - Using the probe compensation signal ..................................................... 47
- Automatic Measurements ........................................................................ 49
  - Measurement items ................................................................................ 49
  - Automatic measurement gating ............................................................... 51
  - Automatically measuring the input signals .............................................. 52
- Cursor Measurements ............................................................................... 55
  - Using the horizontal cursors .................................................................. 55
  - Using the vertical cursors ...................................................................... 56
- Math Operations ....................................................................................... 58
  - Overview ................................................................................................ 58
  - Adding, subtracting or multiplying signals ............................................ 59
  - Using the FFT function .......................................................................... 60

**CONFIGURATION** ...................................................... 62

- Acquisition ............................................................................................... 62
  - Selecting the acquisition mode ............................................................... 62
  - Selecting Delay mode ............................................................................. 64
  - Real time vs Equivalent time sampling mode .......................................... 66
- Display ...................................................................................................... 67
  - Selecting vector or dot drawing ............................................................... 67
  - Accumulating the waveform .................................................................... 67
TABLE OF CONTENTS

Adjusting the display contrast .................................................. 68
Selecting the display grid ......................................................... 68

Horizontal View .................................................................... 69
Moving the waveform position horizontally .................. 69
Selecting the horizontal scale ................................................. 69
Selecting the waveform update mode .......................... 70
Zooming the waveform horizontally .................................... 71
Viewing waveforms in the X-Y mode .............................. 72
Horizontal Adjustment Menu .............................................. 73

Vertical View (Channel) ....................................................... 75
Moving the waveform position vertically .................. 75
Selecting the vertical scale ................................................... 75
Selecting the coupling mode ................................................. 75
Expand Vertical Scale Center / Ground .................. 76
Inverting the waveform vertically .................................... 77
Limiting the waveform bandwidth ..................................... 78
Probe attenuation level and type ...................................... 78

Trigger .................................................................................. 80
Trigger type ................................................................. 80
Trigger parameter ............................................................. 80
Configuring Holdoff ............................................................ 82
Configuring the edge trigger ................................................. 83
Configuring the video trigger ................................................. 84
Configuring the pulse width trigger ............................... 85
Manually triggering the signal .......................................... 87

USB Port Interface ............................................................. 88
Remote Control Interface .................................................. 89
System Settings ................................................................. 91
Viewing the system information ......................................... 91
Selecting the language .......................................................... 91

SAVE/RECALL .................................................................... 93

File Structures ................................................................... 93
Display image file format .................................................. 93
Waveform file format .......................................................... 93
Setup file format ................................................................. 96
Using the SD card file utilities ........................................... 97

Quick Save (HardCopy) ....................................................... 100
Save .................................................................................... 102
File type/source/destination ............................................. 102
Saving the panel settings .................................................. 103
Saving the waveform .......................................................... 104

 Recall .............................................................................. 109
File type/source/destination .................................................. 109
Recalling the default panel settings .................................. 110
Recalling a reference waveform to the display ............ 111
Recalling panel settings ...................................................... 111
Recalling a waveform .......................................................... 112
Recall Image ............................................................... 114

PRINT ........................................................................... 116
Print (Hardcopy) ............................................................. 116

MAINTENANCE ...................................................... 118
Vertical Resolution Calibration ....................................... 118
Probe Compensation .......................................................... 119

FAQ .................................................................................. 121
The input signal does not appear in the display ........ 121
I want to remove some contents from the display .... 121
The waveform does not update (frozen) ............. 122
The probe waveform is distorted ....................... 122
AutoSet does not catch the signal well .................. 122
I want to clean up the cluttered panel settings ... 122
The saved display image is too dark on the background 122
The accuracy does not match the specifications ... 123
The SD card slot does not accept my card ............... 123
The oscilloscope will not allow a 2M waveform to be saved.... 123

APPENDIX .......................................................... 124

Fuse Replacement ............................................................. 124
GDS-1000A Series Specifications .................................. 125
Model-specific specifications .......................................... 125
Common specifications ..................................................... 126

Probe Specifications .......................................................... 128
GDS-1062A/1102A/1152A Probe ...................................... 128

EC Declaration of Conformity ........................................ 129

INDEX ........................................................................... 130
SAFETY INSTRUCTIONS

This chapter contains important safety instructions that should be followed when operating and storing the oscilloscope. Read the following before any operation to ensure your safety and to keep the oscilloscope in the best condition.

Safety Symbols

These safety symbols may appear in this manual or on the oscilloscope.

⚠️ WARNING

Warning: Identifies conditions or practices that could result in injury or loss of life.

⚠️ CAUTION

Caution: Identifies conditions or practices that could result in damage to the oscilloscope or to other objects or property.

⚠️ DANGER

High Voltage

Attention: Refer to the Manual

Protective Conductor Terminal

Earth (Ground) Terminal

Safety Guidelines

General Guideline

- Make sure the BNC input voltage does not exceed 300V peak.
- Never connect a hazardous live voltage to the ground side of the BNC connectors. It might lead to fire and electric shock.
- Do not place heavy objects on the oscilloscope.
- Avoid severe impact or rough handling that may damage the oscilloscope.
- Avoid discharges of static electricity on or near the oscilloscope.
- Use only mating connectors, not bare wires, for the terminals.
- Do not block the cooling fan vent.
- Do not perform measurements at power sources and building installation sites (Note below).
- The oscilloscope should only be disassembled by a qualified technician.

(Measurement categories) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. The GDS-1000A falls under category II.

- Measurement category IV is for measurement performed at the source of a low-voltage installation.
- Measurement category III is for measurement performed in a building installation.
- Measurement category II is for measurement performed on circuits directly connected to a low voltage installation.
- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply

- AC Input voltage: 100 ~ 240V AC, 47 ~ 63Hz

⚠️ WARNING

- The power supply voltage should not fluctuate more than 10%.
- Connect the protective grounding conductor of the AC power cord to an earth ground.
SAFETY INSTRUCTIONS

Fuse

- Fuse type: T1A/250V
- To ensure fire protection, replace the fuse only with the specified type and rating.
- Disconnect the power cord before replacing the fuse.
- Make sure the cause of fuse blowout is fixed before replacing the fuse.

WARNING

Cleaning the oscilloscope

- Disconnect the power cord before cleaning the oscilloscope.
- Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into the oscilloscope.
- Do not use chemicals containing harsh products such as benzene, toluene, xylene, and acetone.

Operation Environment

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below)
- Relative Humidity: < 80%
- Altitude: < 2000m
- Temperature: 0°C to 50°C

(Pollution Degree) EN 61010-1:2001 specifies pollution degrees and their requirements as follows. The oscilloscope falls under degree 2. Pollution refers to “addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity”.

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Storage environment

- Location: Indoor
- Relative Humidity: < 85%
- Temperature: -10°C to 60°C

Power cord for the United Kingdom

When using the oscilloscope in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:
- Green/ Yellow: Earth
- Blue: Neutral
- Brown: Live (Phase)

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol ⬤ or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.
The Getting started chapter introduces the oscilloscope’s main features*, appearance, and set up procedure. * firmware V1.5.

Main Features

<table>
<thead>
<tr>
<th>Model name</th>
<th>Frequency bandwidth</th>
<th>Input channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDS-1062A</td>
<td>DC – 60MHz (–3dB)</td>
<td>2</td>
</tr>
<tr>
<td>GDS-1102A</td>
<td>DC – 100MHz (–3dB)</td>
<td>2</td>
</tr>
<tr>
<td>GDS-1152A</td>
<td>DC – 150MHz (–3dB)</td>
<td>2</td>
</tr>
</tbody>
</table>

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

Features
- 5.6 inch color TFT display
- Saving and recalling setups and waveforms
- 27 automatic measurements
- Multi-language menu (12 languages)
- Math operation: Addition, Subtraction, multiplication, FFT, FFT RMS
- Edge, video, pulse width trigger
- Compact size: (W) 310 x (D) 140 x (H) 142 mm
- Probe factor from 0.1X~2000X voltage/current

Interface
- SD/SDHC card interface for saving and recalling data
- Calibration output
- External trigger input
- USB slave interface for remote control
- PictBridge Printer compatible
## Panel Overview

### Front Panel

![Front Panel Diagram](image)

#### LCD display
- TFT color, 320 x 234 resolution, wide angle view

#### Function keys:
- F1 (top) to F5 (bottom)
  - Activates the functions which appear in the left side of the LCD display.

#### Variable knob
- Increases or decreases values and moves to the next or previous parameter.

#### Acquire key
- Configures the acquisition mode (page 62).

#### Display key
- Configures the display settings (page 67).

#### Cursor key
- Runs cursor measurements (page 55).

(Continued on next page)

---

### Utility key
- Configures the Hardcopy function (page 100), shows the system status (page 87), selects the menu language (page 91), runs the self calibration (page 118), configures the probe compensation signal (page 119), and selects the USB host type (page 88).

### Help key
- Shows the Help contents on the display (page 41).

### Autoset key
- Automatically configures the horizontal, vertical, and trigger settings according to the input signal (page 43).

### Measure key
- Configures and runs automatic measurements (page 49).

### Save/Recall key
- Saves and recalls images, waveforms, or panel settings (page 93).

### Hardcopy key
- Stores images, waveforms, or panel settings to an SD card (page 100), or prints screen images to a PictBridge compatible printer (page 116).

### Run/Stop key
- Runs or stops triggering (page 44).

### Trigger level knob
- Sets the trigger level (page 80).

### Trigger menu key
- Configures the trigger settings (page 80).

### Single trigger key
- Selects the single triggering mode (page 87).
### GETTING STARTED

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger force key</td>
<td>Acquires the input signal once regardless of the trigger condition at the time (page 87).</td>
</tr>
<tr>
<td>Horizontal menu key</td>
<td>Configures the horizontal view (page 69).</td>
</tr>
<tr>
<td>Horizontal position knob</td>
<td>Moves the waveform horizontally (page 69).</td>
</tr>
<tr>
<td>TIME/DIV knob</td>
<td>Selects the horizontal scale (page 69).</td>
</tr>
<tr>
<td>Vertical position knob</td>
<td>Moves the waveform vertically (page 75).</td>
</tr>
<tr>
<td>CH1/CH2 key</td>
<td>Configures the vertical scale and coupling mode for each channel (page 75).</td>
</tr>
<tr>
<td>VOLTS/DIV knob</td>
<td>Selects the vertical scale (page 75).</td>
</tr>
<tr>
<td>Input terminal</td>
<td>Accepts input signals: 1MΩ±2% input impedance, BNC terminal.</td>
</tr>
<tr>
<td>Ground terminal</td>
<td>Accepts the DUT ground lead to achieve a common ground.</td>
</tr>
<tr>
<td>MATH key</td>
<td>Performs math operations (page 58).</td>
</tr>
<tr>
<td>SD card port</td>
<td>Facilitates transferring waveform data, display images, and panel settings (page 93).</td>
</tr>
<tr>
<td>Probe compensation output</td>
<td>Outputs a 2Vp-p, square signal for compensating the probe (page 119) or demonstration.</td>
</tr>
</tbody>
</table>

### GDS-1000A Series User Manual

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External trigger input</td>
<td>Accepts an external trigger signal (page 80).</td>
</tr>
<tr>
<td>Power switch</td>
<td>Powers the oscilloscope on or off.</td>
</tr>
</tbody>
</table>
Rear Panel

Power cord socket
- Accepts the AC mains, 100 ~ 240V, 50/60Hz.
- The fuse socket holds the AC main fuse, T1A/250V.
- For the fuse replacement procedure, see page 124.

Fuse socket

USB slave port
- Accepts a type B (slave) male USB connector for remote control of the oscilloscope (page 88) or to print directly to a PictBridge compatible printer.

CAL output
- Outputs the calibration signal used in vertical scale accuracy calibration (page 118).

Security lock slot
- Standard laptop security lock slot for ensuring the security of the GDS-1000A.

Display

Waveform marker
- Waveform position
- Trigger status
- Acquisition

Vertical status
- Horizontal status
- Frequency
- Trigger condition

Waveforms

Channel 1: Yellow
- 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 80.

Channel 2: Blue
- 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.
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 40.
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.
8. Press the Autoset key. A square waveform will appear in the center of the display. For details on Autoset, see page 43.
9. Press the Display key, then Type and select the vector waveform type.
10. Turn the adjustment point on the probe to flatten the square waveform edge.
11. Setting up the oscilloscope is complete. You may continue with the other operations.

Measurement: page 42  Configuration: page 62

**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 functionalities.

**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
Acquire

Select acquisition mode
Normal ~ Peak-Detect

Select average number
Average

Turn Delay on/off
Delay On

Sample Rate
500MS/s

Normal
Average
Peak
Detect
Delay
On

CH1/2 key

Turn channel on/off
CH 1/2

Select coupling mode
Coupling

Invert waveform
Invert

Turn bandwidth limit on/off
BW Limit

Select probe type
Voltage ↔ Current

Select probe attenuation
VAR (0.1x–2000x) (1-2-5 step)

Expand type
Expand

Expand key 1/2

Turn cursor on/off
Cursor

Move X1 cursor
X1 → VAR

Move X2 cursor
X2 → VAR

Move both X1 and X2 cursor
X1X2 → VAR

Switch to Y cursor
X → Y

Expand key 2/2

Turn cursor on/off
Cursor

Move Y1 cursor
Y1 → VAR

Move Y2 cursor
Y2 → VAR

Move both Y1 and Y2 cursor
Y1Y2 → VAR

Switch to X cursor
X → Y
### Display key

- **Display**
  - Select waveform type
  - Type

- **Vectors/Dots**
  - Waveform accumulate On/Off

- **Accumulate Off**
  - Refresh accumulation
  - Refresh

- **Contrast**
  - Set display contrast
  - Contrast → VAR

- **Full**
  - Select display grid

### Autoset key

- **Autoset**
  - Automatically find the signal and set the scale
  - Autoset

### Hardcopy key

- **Hardcopy**
  - → See Utility key (page37)

### Help key

- **Help**
  - Turn help mode on/off
  - Help

---

### Horizontal menu key

#### Main
- **Window**
  - Select window mode
  - Window → TIME/DIV

- **Window Zoom**
  - Zoom in window mode

- **Roll**
  - Select window roll mode

- **XY**
  - Select XY mode

- **H Pos Adj**
  - Toggle adjustment mode
  - H Pos Adj

#### Horizontal MENU
- **Fine/Coarse**
  - Reset horizontal marker
  - Reset

- **Set/Clear**
  - Set Horizontal marker/delete horizontal marker.
  - HOR → Set/Clear

#### Hardcopy
- **Previous**
  - Navigate to previous horizontal marker.

- **Next**
  - Navigate to next horizontal marker.
**Math key 1/2 (+/-/x)**

- **Math on/off**
  - Math
- **Math**
  - Select math operation type (+/-/x/FFT/FFT rms)
- **Operation**
  - CH1+CH2
  - CH1-CH2
  - CHxCH2
  - FFT
  - FFT rms
- **Position**
  - -12div ~ +12div
- **Unit/Div**
  - 2mV/div ~ 10V/div

**Math key 2/2 (FFT/FFT rms)**

- **Math on/off**
  - Math
- **Math**
  - Select math operation type (+/-/x/FFT/FFT rms)
- **Operation**
  - CH1+CH2
  - CH1-CH2
  - CHxCH2
  - FFT
  - FFT rms
- **Source**
  - CH1/2
- **Window**
  - Flattop/Rectangular/Blackman/Hanning
- **Position**
  - -12div ~ +12div
- **Unit/Div**
  - 20/10/5/2/1 dB

**Measure key**

- **Measure**
- **Vpp**
  - 1.204mV
  - 2.300mV
- **Vavg**
  - 1.193mV
  - 2.280mV
- **Frequency**
  - 1.000kHz
  - 2.000kHz
- **Duty Cycle**
  - 50.01%
  - 49.88%
- **Rise Time**
  - 1.762us
  - 2.701us

- **View all**
  - Select Measurements (Voltage/Time/Delay)

- **Turn on/off measurement**
  - Measure

- **Select measurement type**
  - Voltage/Time/Delay

- **Select measurement item**
  - VAR or Icon(F3)

- **Go back to previous menu**
  - VAR or Icon(F3)/→ VAR

**Run/Stop key**

- **Run/Stop**
  - Freeze/unfreeze waveform or trigger
### Save/Recall key 5/10

<table>
<thead>
<tr>
<th>Display Refs.</th>
<th>Select other menu</th>
<th>Display Refs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref.A Off</td>
<td>On/Off</td>
<td>Ref.A</td>
</tr>
<tr>
<td>Ref.B Off</td>
<td>On/Off</td>
<td>Ref.B</td>
</tr>
</tbody>
</table>

### Save/Recall key 6/10

<table>
<thead>
<tr>
<th>Save Setup</th>
<th>Select other menu</th>
<th>Save Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory/SD card</td>
<td>Destination</td>
<td>VAR</td>
</tr>
<tr>
<td>Save</td>
<td></td>
<td></td>
</tr>
<tr>
<td>File Utilities</td>
<td>(SD Card only) To File Utilities</td>
<td>File Utilities</td>
</tr>
</tbody>
</table>

### Save/Recall key 7/10

<table>
<thead>
<tr>
<th>Save Waveform</th>
<th>Select other menu</th>
<th>Save Waveform</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH1/2/3/4/5/6</td>
<td>Memory</td>
<td>VAR</td>
</tr>
<tr>
<td>Source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Destination</td>
<td></td>
<td>Source</td>
</tr>
<tr>
<td>Memory</td>
<td>File Utilities</td>
<td>(SD Card only)</td>
</tr>
<tr>
<td>SD Normal/SD</td>
<td>To File Utilities</td>
<td>To File Utilities</td>
</tr>
<tr>
<td>1M SD2/M/Ref.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Save/Recall key 8/10

<table>
<thead>
<tr>
<th>Save Image</th>
<th>Select other menu</th>
<th>Save Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink Saver</td>
<td>On/Off</td>
<td>Ink Saver</td>
</tr>
<tr>
<td>Destination SD Card</td>
<td></td>
<td>SD Card</td>
</tr>
<tr>
<td>Save</td>
<td></td>
<td>Save</td>
</tr>
<tr>
<td>File Utilities</td>
<td>(SD Card only) To File Utilities</td>
<td>File Utilities</td>
</tr>
</tbody>
</table>
### Save/Recall key 9/10

**Save All**
- Select other menu
- Save All

**Ink Saver**
- Turn on/off ink saver
- Ink Saver

**Destination**
- Select destination
- Destination

**File Utilities**
- SD Card only
- To File Utilities

**Save all**
- Go to SD card file utilities

**Save**
- File Utilities

### Save/Recall key 10/10

**File Utilities**
- Enter Character
- Back Space

**Select**
- Select file/folder

**New Folder**
- Create or rename folder/file

**Rename**
- New Folder/Rename

**Delete**
- VAR 
  - Enter character / Backspace
  - Save / Previous menu

**Previous Menu**
- Delete folder/file

**Delete**
- Go to previous menu

**Previous menu**

### Trigger key 1/6

**Trigger Type**
- Type
- Source

**Trigger Holdoff**
- Holdoff
- Mode

**Select Trigger type or Trigger Holdoff menu**

### Trigger key 2/6

**Video Trigger**
- Type
- Source

**Select video trigger type**
- Type

**Select trigger source**
- Source

**Select video standard**
- Standard

**Select video polarity**
- Polarity

**Select video field/line**
- Line

**Line**
- Field 1 / Field 2 / Line

**Field 1 / Field 2 / Line**
- VAR
### Trigger key 3/6

**Edge Trigger**
- **Type**: Edge
- **Source**: CH1/ExtLine
- **Slope/Coupling**: To Slope/Coupling
- **Mode**: Auto

Select edge trigger type
- **Type**: Edge

Select trigger source
- **Source**: CH1

Go to slope/coupling menu (page 36)
- **Slope/Coupling**: Slope/Coupling

Select trigger mode
- **Mode**: Auto

### Trigger key 4/6

**Pulse Trigger**
- **Type**: Pulse
- **Source**: CH1/ExtLine
- **When**: <= 20.0ns
- **Slope/Coupling**: To Slope/Coupling
- **Mode**: Auto

Select pulse trigger type
- **Type**: Pulse

Select trigger source
- **Source**: CH1

Select pulse trigger condition and pulse width
- **When**: <= 20.0ns

Go to slope/coupling menu (page 36)
- **Slope/Coupling**: Slope/Coupling

Select trigger mode
- **Mode**: Auto

### Trigger key 5/6

**Coupling/Slope**
- **Slope**: Slope
- **Coupling**: AC/DC
- **Rejection**: LF/HF/Off
- **Noise Rej**: On/Off
- **Previous Menu**: Previous Menu

Select trigger slope type
- **Slope**: Slope

Select trigger coupling mode
- **Coupling**: AC/DC

Select frequency rejection
- **Rejection**: LF/HF/Off

Turn noise rejection on/off
- **Noise Rej**: On/Off

Go back to previous menu
- **Previous Menu**: Previous Menu

### Trigger key 6/6

**Trigger Holdoff**
- **Holdoff**: 4.000ns
- **Set to Minimum**: 40.0ns

Select Holdoff time
- **Holdoff**: 4.000ns

Set to minimum Holdoff time
- **Set to Minimum**: 40.0ns

Set to Minimum
- **Set to Minimum**: 40.0ns
**Utility key 5/6**

**Hardcopy – Save Image**
- Select Hardcopy function
- Turn on/off Inksaver
- Go to previous menu

**Utility key 6/6**

**Probe compensation**
- Select probe compensation signal
- Set frequency for square wave
- Set duty cycle for square wave
- Go to previous menu

**Default Settings**

Here are the factory installed panel settings which appear when pressing the Save/Recall key 

<table>
<thead>
<tr>
<th>Mode: Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel</strong></td>
</tr>
<tr>
<td>Scale: 2V/Div</td>
</tr>
<tr>
<td>Coupling: DC</td>
</tr>
<tr>
<td>Probe attenuation voltage: x1</td>
</tr>
<tr>
<td>BW limit: Off</td>
</tr>
<tr>
<td>Channel 1 &amp; 2: On</td>
</tr>
<tr>
<td><strong>Cursor</strong></td>
</tr>
<tr>
<td>Source: CH1</td>
</tr>
<tr>
<td>Cursor: Off</td>
</tr>
<tr>
<td><strong>Display</strong></td>
</tr>
<tr>
<td>Type: Vectors</td>
</tr>
<tr>
<td>Accumulate: Off</td>
</tr>
<tr>
<td><strong>Horizontal</strong></td>
</tr>
<tr>
<td>Scale: 2.5us/Div</td>
</tr>
<tr>
<td>H Pos Adj: Fine</td>
</tr>
<tr>
<td>Hor Pos: 0</td>
</tr>
<tr>
<td><strong>Math</strong></td>
</tr>
<tr>
<td>Type: + (Add)</td>
</tr>
<tr>
<td>Position: 0.00 Div</td>
</tr>
<tr>
<td><strong>Measure</strong></td>
</tr>
<tr>
<td>Item: Vpp, Vavg, Frequency, Duty Cycle, Rise Time</td>
</tr>
<tr>
<td><strong>Trigger</strong></td>
</tr>
<tr>
<td>Type: Edge</td>
</tr>
<tr>
<td>Source: Channel1</td>
</tr>
<tr>
<td>Mode: Auto</td>
</tr>
<tr>
<td>Slope: —</td>
</tr>
<tr>
<td>Coupling: DC</td>
</tr>
<tr>
<td>Rejection: Off</td>
</tr>
<tr>
<td>Noise Rejection: Off</td>
</tr>
<tr>
<td><strong>Utility</strong></td>
</tr>
<tr>
<td>Hardcopy: SaveImage, Inksaver Off</td>
</tr>
<tr>
<td>ProbeComp: Square wave, 1k, 50% duty cycle</td>
</tr>
</tbody>
</table>
**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

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire</td>
<td>Display Utility Help</td>
</tr>
<tr>
<td>Run/Stop</td>
<td>Autoset</td>
</tr>
<tr>
<td>CH 1</td>
<td>MATH</td>
</tr>
<tr>
<td>CH 2</td>
<td>MENU</td>
</tr>
<tr>
<td>MENU</td>
<td>SINGLE</td>
</tr>
<tr>
<td>VARIABLE</td>
<td>FORCE</td>
</tr>
</tbody>
</table>

(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.

---

**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.

---

**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 42
- Configurations → from page 62

---

**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.

(Continued on next page)
De-activating a channel

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

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

Procedure

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

2. The waveform appears in the center of the display.

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.

Limitation

Autoset does not work in the following situation.

- Input signal frequency less than 20Hz
- Input signal amplitude less than 30mV

Running and stopping the trigger

Background

In the trigger Run mode, the oscilloscope constantly searches for a trigger condition and updates the signal into 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.
Waveform operation
Waveforms can be moved or scaled in both the Run and Stop mode. For details, see page 69 (Horizontal position/scale) and page 75 (Vertical position/scale).

Changing the horizontal position and scale
For more detailed configurations, see page 69.

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

Changing the vertical position and scale
For more detailed configuration, see page 75.

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

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

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.
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 119.

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 62 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.
4. Press Wave type repeatedly to select the wave type.
5. (For only) To change the frequency, press Frequency and use the Variable knob.
   Range: 1kHz ~ 100kHz
6. (For only) To change the duty cycle, press Duty Cycle and use the Variable knob.
   Range: 5% ~ 95%

Probe compensation
For probe compensation details, see page 119.
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.

Measurement items

<table>
<thead>
<tr>
<th>Overview</th>
<th>Voltage type</th>
<th>Time type</th>
<th>Delay type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vpp</td>
<td>Frequency</td>
<td></td>
<td>FRR</td>
</tr>
<tr>
<td>Vmax</td>
<td>Period</td>
<td></td>
<td>FRF</td>
</tr>
<tr>
<td>Vmin</td>
<td>RiseTime</td>
<td></td>
<td>FRR</td>
</tr>
<tr>
<td>Vamp</td>
<td>FallTime</td>
<td></td>
<td>LRR</td>
</tr>
<tr>
<td>Vhi</td>
<td>+Width</td>
<td></td>
<td>LRF</td>
</tr>
<tr>
<td>Vlo</td>
<td>-Width</td>
<td></td>
<td>LFR</td>
</tr>
<tr>
<td>Vavg</td>
<td>DutyCycle</td>
<td></td>
<td>LFF</td>
</tr>
<tr>
<td>Vrms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROVShoot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOVShoot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPRESHoot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FPRESHoot</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Voltage measurement items

<table>
<thead>
<tr>
<th>Vpp</th>
<th>Difference between positive and negative peak voltage (=Vmax − Vmin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vmax</td>
<td>Positive peak voltage.</td>
</tr>
<tr>
<td>Vmin</td>
<td>Negative peak voltage.</td>
</tr>
<tr>
<td>Vamp</td>
<td>Difference between global high and global low voltage (=Vhi − Vlo)</td>
</tr>
<tr>
<td>Vhi</td>
<td>Global high voltage.</td>
</tr>
</tbody>
</table>

Delay measurement items

<table>
<thead>
<tr>
<th>FRR</th>
<th>Time between: Source 1 first rising edge and Source 2 first rising edge</th>
</tr>
</thead>
</table>
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  

LRR  Time between:  
Source 1 first rising edge and  
Source 2 last falling edge  

LRF  Time between:  
Source 1 first rising edge and  
Source 2 last rising edge  

LFR  Time between:  
Source 1 first falling edge and  
Source 2 last falling edge  

LFF  Time between:  
Source 1 first falling edge and  
Source 2 last falling edge  

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.  

Automatically measuring the input signals  

Viewing the measurement result  1. Press the Measure key.  

2. The measurement results appear on the menu  
bar, constantly updated. 5 measurement slots  
(F1 to F5) can be customized.  

Page 55  

Page 55
3. Press the corresponding menu key (F1~F5) to select the measurement slot to be edited.

4. The editing menu appears

5. Use the Variable knob to select a different measurement item.

6. Press F1 repeatedly to change Source1 from CH1 to CH2 or MATH.
   Range CH1, 2, Math

7. Press F2 repeatedly to change the channel for Source2.
   Range CH1, 2, Math

8. Press F3 to view all measurement items.

9. All the measurements appear in the center of the screen.

10. Press F3 to return.

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

11. Press Previous Menu to confirm the item selection and to go back to the measurement results view.
**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 78).

**Using the horizontal cursors**

**Procedure**

1. Press the Cursor key. The cursors appear in the display.

2. Press X↔Y to select the horizontal (X1&X2) cursor.

3. Press Source repeatedly to select the source channel.

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.

**Moving the horizontal cursors**

- To move the left cursor, press X1 and then use the Variable knob.
- To move the right cursor, press X2 and then use the Variable knob.
- To move both cursors at once, press X1X2 and then use the Variable knob.

**Remove cursors**

Press Cursor to remove the onscreen cursors.

**Using the vertical cursors**

**Procedure**

1. Press the Cursor key.

2. Press X↔Y to select the vertical (Y1&Y2) cursor.

3. Press Source repeatedly to select the source channel.

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).
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.

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.

<table>
<thead>
<tr>
<th>FFT window</th>
<th>Frequency resolution</th>
<th>Amplitude resolution</th>
<th>Suitable for...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanning FFT</td>
<td>Good</td>
<td>Not good</td>
<td>Frequency measurement on periodic waveforms</td>
</tr>
<tr>
<td>Flattop FFT</td>
<td>Not good</td>
<td>Good</td>
<td>Amplitude measurement on periodic waveforms</td>
</tr>
<tr>
<td>Rectangular FFT</td>
<td>Very good</td>
<td>Bad</td>
<td></td>
</tr>
</tbody>
</table>
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

Adding, subtracting or multiplying signals

Procedure
1. Activate both CH1 and CH2.
2. Press the Math key.
3. Press Operation repeatedly to select addition (+), subtraction (–) or multiplication (×).
4. The math measurement result appears in the display.
5. To move the math result vertically, use the Variable knob. The position will be updated in Position.
6. To clear the math result from the display, press the Math key again.

Using the FFT function

Procedure
1. Press the Math key.
2. Press Operation repeatedly to select FFT or FFT RMS.
3. Press Source repeatedly to select the source channel.
4. Press Window repeatedly to select the FFT window type.
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, use the Variable knob. The position will be updated in Position.
7. To select the vertical scale of FFT waveform, press Unit/Div(FFT) or Volt/Div(FFT RMS) repeatedly.
   Range: 1, 2, 5, 10, 20 dB/Div

Voltage Volt/Div
8. To clear the FFT result from the display, press the Math key again.

## CONFIGURATION

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

### 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.

#### Selecting the acquisition mode

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Normal</th>
<th>Average</th>
<th>Peak Detect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Press the Acquire key.</td>
<td>All of the acquired data is used to draw the waveform.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Select the acquisition mode between Normal, Average and Peak Detect.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example:** Select Normal acquisition for general measurements and Peak Detect for transient events.
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.

2. Press the Utility key.

3. Press ProbeComp.

4. Press Wave Type and select the waveform.

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

6. Press the Acquire key.


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

Example

The peak detect mode reveals the occasional glitch.

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.

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

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.
Display

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

Selecting vector or dot drawing

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

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

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
3. Press the Display key.
4. Press Accumulate to turn on the waveform accumulation.
5. To clear the accumulation and start it over (refresh), press Refresh.

Adjusting the display contrast

Procedure
1. Press the Display key.
2. Press Contrast.
3. Turn the Variable knob left to lower the contrast (dark display) or right to raise the contrast (bright display).

Selecting the display grid

Procedure
1. Press the Display key.
2. Press the grid icon repeatedly to select the grid.

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

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

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

Selecting the horizontal scale

Select horizontal scale

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

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.

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 250ms 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).

Selecting the Roll mode manually

1. Press the Horizontal menu key.

2. Press Roll. The horizontal scale automatically becomes 250ms/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).
### Zooming the waveform horizontally

**Procedure/range**

1. Press the Horizontal Menu key.
2. Press `Window`.
3. Use the horizontal position knob to move the zoom range sideways, and TIME/DIV knob to change the zoom range width.

   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.

**Example**

- **Setting the zoom width**
- **Zooming in**

### 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: Channel 1 Position knob
- Horizontal scale: Channel 1 Volts/Div knob
- Vertical position: Channel 2 Position knob
- Vertical scale: Channel 2 Volts/Div knob

**Example**

- **Main mode**
- **XY mode**
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.

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

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.

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

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.

Navigate markers
7. Press Previous to go to the previous marker.

8. Press Next to go to the next marker.
Vertical View (Channel)

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

Moving the waveform position vertically

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

Selecting the vertical scale

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

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

Selecting the coupling mode

**Procedure**
1. Press the Channel key.
2. Press Coupling repeatedly to select the coupling mode.

**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.

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
### Configuration

### Procedure
1. Press the Channel key.

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

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

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

### Inverting the waveform vertically

#### Procedure
1. Press the Channel key.

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

### 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.

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.

#### Example
- BW Limit Off
- BW Limit On

### 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.
2. Press F3 repeatedly to select voltage or current probes.

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

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

Range x0.1~x2000 (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.

---

**Trigger**

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

### 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**
  - (CH1, Edge, Rising edge, DC coupling)

- **Video**
  - (CH1, Video, Positive polarity, NTSC standard)

### Trigger parameter

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

- **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.

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

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>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.</td>
</tr>
<tr>
<td>Holdoff</td>
<td>The holdoff function defines the waiting period before GDS-1000A starts triggering again after a trigger point. The Holdoff function ensures a stable display.</td>
</tr>
</tbody>
</table>

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

**Sync polarity (video trigger)**
- Positive polarity
- Negative polarity

**Video line (video trigger)**
- Selects the trigger point in the video signal.
  - field: 1 or 2

**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**
- Using the trigger level knob moves the trigger point up or down.

### Configuring Holdoff

**Background**
The Holdoff function defines the waiting period before GDS-1000A 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.
2. To set the Holdoff time, use the Variable knob. The resolution depends on the horizontal scale.

<table>
<thead>
<tr>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>40ns ~ 2.5s</td>
</tr>
</tbody>
</table>
Pressing *Set to Minimum* sets the Holdoff time to the minimum, 40ns.

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

### Configuring the edge trigger

**Procedure**

1. Press the Trigger menu key.
2. Press *Type* repeatedly to select edge trigger.
3. Press *Source* repeatedly to select the trigger source.
   - **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.
   - **Range**: Auto, Normal
5. Press *Slope/coupling* to enter into the trigger slope and coupling selection menu.
6. Press *Slope* repeatedly to select the trigger slope, rising or falling edge.
   - **Range**: Rising edge, falling edge

### Configuring the video trigger

**Procedure**

1. Press the Trigger menu key.
2. Press *Type* repeatedly to select video trigger. The video trigger indicator appears at the bottom of the display.
3. Press *Source* repeatedly to select the trigger source channel.
   - **Range**: Channel 1, 2
4. Press *Coupling* repeatedly to select the trigger coupling, DC or AC.
   - **Range**: DC, AC
5. Press *Rejection* to select the frequency rejection mode.
   - **Range**: LF, HF, Off
6. Press *Noise Rej* to turn the noise rejection on or off.
   - **Range**: On, Off
4. Press **Standard** repeatedly to select the video standard. 
   
   **Range**: NTSC, PAL, SECAM

5. Press **Polarity** repeatedly to select the video signal polarity.
   
   **Range**: positive, negative

6. Press **Line** repeatedly to select the video field line. Use the Variable knob to select the video line.
   
   **Field**: 1, 2
   
   **Video line**: NTSC: 1 ~ 262 (Even), 1 ~ 263 (Odd)
   PAL/SECAM: 1 ~ 312 (Even), 1 ~ 313 (Odd)

---

**Configuring the pulse width trigger**

**Procedure**

1. Press the **Trigger menu key**.

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

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

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

5. Press **When** repeatedly to select the pulse condition. Then use the Variable knob to set the pulse width.
   
   **Condition**: >, <, =, ≠
   
   **Width**: 20ns ~ 10s

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

7. Press **Slope** repeatedly to select the trigger slope, which also appears at the bottom of the display.
   
   **Range**: Rising edge, falling edge

8. Press **Coupling** repeatedly to select the trigger coupling.
   
   **Range**: DC, AC

9. Press **Rejection** to select the frequency rejection mode.
   
   **Range**: LF, HF, Off
10. Press Noise Rej to turn the noise rejection on or off. 

   Noise Rej  

   Range  On, Off 

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

   Previous Menu 

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 

---

USB Port Interface 

The USB port can be set to auto detect, however occasionally the USB host type cannot be detected. The USB Port function allows the USB host type to be manually or automatically set. 

<table>
<thead>
<tr>
<th>USB connection</th>
<th>GDS-1000A</th>
<th>Type A, host</th>
<th>Type B, slave</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC / Printer end</td>
<td>GDS-1000A end</td>
<td>1.1/2.0 (full speed)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Procedure 

1. Connect the USB cable to the USB slave port on the GDS-1000A. 

2. Insert the other end of the USB cable into the PC or Printer USB port. 

3. Press the Utility key. 

4. Press More (F5). 

5. Press USB Port repeatedly to set the host device. 

   Range  Printer, PC, Auto Detect
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 GDS-1000A Programming Manual. Note that printing to a PictBridge compatible printer and remote control cannot be supported at the same time as the same USB port is used.

<table>
<thead>
<tr>
<th>USB connection</th>
<th>PC / Printer end</th>
<th>GDS-1000A end</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type A, host</td>
<td>Type B, slave</td>
<td>1.1/2.0 (full speed)</td>
</tr>
</tbody>
</table>

**Procedure**

1. Connect the USB cable to the USB slave port.

2. The USB port may need to be configured if the USB port is not automatically detected.

3. When the PC asks for the USB driver, select dso_cdc_1000.inf (Windows XP) or dso_vista_cdc.inf (Vista 32bit) which are downloadable from the GW website, www.gwinstek.com, GDS-1000A product corner.

4. On the PC, activate a terminal application such as MTTY (Multi-Threaded TTY). To check the COM port No., see the Device Manager in the PC. For WindowsXP, select Control panel → System → Hardware tab.

5. 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.
   GW, GDS-1152A, XXXXXXX, V1.00

6. Configuring the command interface is complete. Refer to the programming manual for the remote commands and other details.
System Settings

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

Viewing the system information

Procedure

1. Press the Utility key.

2. Press System Info. The upper half of the display shows the following information.
   - Manufacturer
   - Model
   - Serial number
   - Firmware version
   - Web address

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

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
The save function allows saving display images, waveform data, and panel settings into the oscilloscope’s internal memory or an external SD card. The recall function allows recalling the default factory settings, waveform data, and panel settings from the oscilloscope’s internal memory or an external SD card.

**File Structures**

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

**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).

**Waveform file format**

- **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 GDS-1000A can recall any of the two formats**

<table>
<thead>
<tr>
<th>Waveform type</th>
<th>CH1, 2</th>
<th>Math</th>
<th>Ref A, B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage location</td>
<td>Internal memory</td>
<td>External SD/SDHC card</td>
<td>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 an SD card, then copy the waveform into the reference waveform slot (A or B), and then recall the reference waveform into the display.</td>
</tr>
</tbody>
</table>

| 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.

A waveform file also includes the following information.
- Memory Length
- Source
- Vertical Units
- Vertical Position
- Horizontal Scale
- Horizontal Mode
- Firmware
- Mode
- Trigger Level
- Probe
- Vertical Scale
- Horizontal Units
- Horizontal Position
- Sampling Period
- Time
- Waveform Data

A setup file saves or recalls the following settings.

<table>
<thead>
<tr>
<th>Format</th>
<th>xxxx.set (proprietary format)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents</td>
<td></td>
</tr>
<tr>
<td>Acquire</td>
<td>• mode</td>
</tr>
<tr>
<td>Cursor</td>
<td>• source channel</td>
</tr>
<tr>
<td></td>
<td>• cursor on/off</td>
</tr>
<tr>
<td></td>
<td>• cursor location</td>
</tr>
<tr>
<td>Display</td>
<td>• dots/vectors</td>
</tr>
<tr>
<td></td>
<td>• grid type</td>
</tr>
<tr>
<td></td>
<td>• accumulation on/off</td>
</tr>
<tr>
<td>Measure</td>
<td>• item</td>
</tr>
<tr>
<td>Utility</td>
<td>• hardcopy type</td>
</tr>
<tr>
<td></td>
<td>• ink saver on/off</td>
</tr>
<tr>
<td></td>
<td>• language</td>
</tr>
<tr>
<td>Horizontal</td>
<td>• display mode</td>
</tr>
<tr>
<td></td>
<td>• scale</td>
</tr>
<tr>
<td></td>
<td>• position</td>
</tr>
<tr>
<td>Trigger</td>
<td>• trigger type</td>
</tr>
<tr>
<td></td>
<td>• source channel</td>
</tr>
<tr>
<td></td>
<td>• video standard</td>
</tr>
<tr>
<td></td>
<td>• video line</td>
</tr>
<tr>
<td></td>
<td>• slope/coupling</td>
</tr>
<tr>
<td></td>
<td>• trigger mode</td>
</tr>
<tr>
<td></td>
<td>• video polarity</td>
</tr>
<tr>
<td></td>
<td>• pulse timing</td>
</tr>
<tr>
<td>Channel (vertical)</td>
<td>• vertical scale</td>
</tr>
<tr>
<td></td>
<td>• vertical position</td>
</tr>
<tr>
<td></td>
<td>• invert on/off</td>
</tr>
<tr>
<td></td>
<td>• voltage/current (probe)</td>
</tr>
<tr>
<td></td>
<td>• coupling mode</td>
</tr>
<tr>
<td></td>
<td>• bandwidth limit on/off</td>
</tr>
<tr>
<td>Math</td>
<td>• operation type</td>
</tr>
<tr>
<td></td>
<td>• source channel</td>
</tr>
<tr>
<td></td>
<td>• unit/div</td>
</tr>
<tr>
<td></td>
<td>• FFT window</td>
</tr>
</tbody>
</table>
Using the SD card file utilities

Background
When an SD card is inserted into the oscilloscope, file utilities (file deletion, folder creation and file/folder renaming) are available from the front panel.

SD Card restriction
The GDS-1000A series accepts the following SD cards:
- Type: SD, SDHC
- Class: 2, 4, 6
- Size: Up to 32GB (SDHC)
- Format: FAT or FAT32

Procedure
1. Insert an SD card into the card slot.
2. Press the Save/Recall key. Select any save or recall function. For example SD card destination in the Save Image function.
3. Press File Utilities. The display shows the SD card contents.
4. Use the Variable knob to move the cursor. Press Select to go into the folder or go back to the previous directory level.

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

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.
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.
3. When editing is complete, press Save. The new/renamed file or folder will be saved.

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.
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.

Quick Save (HardCopy)

**Background**

The Hardcopy key works as a shortcut for printing screen images directly to a printer or to save display images, waveform data, and panel settings onto an SD card.

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

Using the Save/Recall key can also save files with more options. For details, see page 102.

**Functionalities**

- **Save image (.bmp)**: Saves the current display image into an SD card.
- **Save all**:
  - Current display image (.bmp)
  - Current system settings (.set)
  - Current waveform data (.csv)

**SD Card restriction**

The GDS-1000A series accepts the following SD cards:

- **Type**: SD, SDHC
- **Class**: 2, 4, 6
- **Size**: Up to 32GB (SDHC)
- **Format**: FAT or FAT32

**Procedure**

1. Insert an SD card to the slot.
2. Press the Utility key.
3. Press **Hardcopy Menu**.
4. Press Function repeatedly to select Save Image or Save All.

5. To invert the color in the display image, press Ink Saver. This turns Ink Saver on or off.

6. Press Mem Leng repeatedly to select SD Normal or SD 1M/2M. SD Normal and SD 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.

7. Press the Hardcopy key. The file or folder will be saved to the root directory of the SD card.

---

**Save**

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

**File type/source/destination**

<table>
<thead>
<tr>
<th>Item</th>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel setup</td>
<td>• Panel settings</td>
<td>• Internal memory: S1 ~ S15</td>
</tr>
<tr>
<td>(xxxx.set)</td>
<td>• Internal memory: W1 ~ W15</td>
<td>• External memory: SD card</td>
</tr>
<tr>
<td>Waveform data</td>
<td>• Channel 1, 2</td>
<td>• Reference waveform A, B</td>
</tr>
<tr>
<td>(xxxx.csv)</td>
<td>• Math operation result</td>
<td>• External memory: SD card</td>
</tr>
<tr>
<td>Display image</td>
<td>• Display image</td>
<td>• External memory: SD card</td>
</tr>
<tr>
<td>(xxxx.bmp)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Save All</td>
<td>• Display image</td>
<td>• External memory: SD card</td>
</tr>
<tr>
<td></td>
<td>(xxxx.bmp)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Waveform data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(xxxx.csv)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Panel settings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(xxxx.set)</td>
<td></td>
</tr>
</tbody>
</table>

**SD Card restriction**

The GDS-1000A series accepts the following SD cards:
- Type: SD, SDHC
- Class: 2, 4, 6
- Size: Up to 32GB (SDHC)
- Format: FAT or FAT32
Saving the panel settings

Procedure

1. (For saving to an external SD card) Insert the card into the slot.

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

3. Press Save Setup.

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

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

Note: The file will not be saved if the power is turned off or the SD card is disconnected before completion.

Saving the waveform

Procedure

1. (For saving to an external SD card) Insert the card into the slot.

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

3. Press Save Waveform.

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

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

File utilities

To edit SD card contents (create/ delete/ rename files and folders), press File Utilities. For details, see page 97.
<table>
<thead>
<tr>
<th>SAVE/RECALL</th>
<th>GDS-1000A Series User Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SD Normal</strong></td>
<td></td>
</tr>
<tr>
<td>Save to the SD card with a 4k waveform memory length.</td>
<td></td>
</tr>
<tr>
<td><strong>SD 1M</strong></td>
<td></td>
</tr>
<tr>
<td>Save to the SD card with a 1M waveform memory length. For 2 channel operation only.</td>
<td></td>
</tr>
<tr>
<td><strong>SD 2M</strong></td>
<td></td>
</tr>
<tr>
<td>Save to the SD card with a 2M waveform memory length. For single channel operation only.</td>
<td></td>
</tr>
<tr>
<td><strong>Ref</strong></td>
<td></td>
</tr>
<tr>
<td>Internal reference waveform, A/B</td>
<td></td>
</tr>
</tbody>
</table>

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

**Note**
- The file will not be saved if the power is turned off or the SD card is disconnected before completion.
- It takes approximately 1 min to save a 2M waveform to the SD card in fast mode. Detailed mode may take over 10 times longer depending on the speed of the SD card.

File utilities
- To edit SD card contents (create/ delete/ rename files and folders), press **File Utilities**. For details, see page97.

**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. (For saving to an external SD card) Insert the card into the slot.

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

3. Press **Save Image**.

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

5. Press **Destination**.

   **SD card**
   - External card, no practical limitation on the amount of files. When saved, the image file will be placed in the root directory.

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

   **Note**
   - The file will not be saved if the power is turned off or the SD card is disconnected before completion.

File utilities
- To edit SD card contents (create/ delete/ rename files and folders), press **File Utilities**. For details, see page97.
Saving all (panel settings, display image, waveform)

Procedure

1. (For saving to an external SD card) Insert the card into the slot.

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

3. Press Save All. The following information will be saved.
   - 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 the 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.

5. Press Destination.
   - SD Normal: Save to the SD card with a 4k waveform memory length.
   - SD 1M: Save to the SD card with a 1M waveform memory length. For 2 channel operation only.
   - SD 2M: Save to the SD card with a 2M waveform memory length. For single channel operation only.

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

   Note: The file will not be saved if the power is turned off or the SD card is disconnected before completion. It takes approximately 1 min to save a 2M waveform to the SD card in fast mode. Detailed mode may take over 10 times longer depending on the speed of the SD card.

7. Together with the current setup/waveform/image, the last saved waveform file (one from W1 ~ W15) and setup file (one from S1 ~ S15) are also included in the folder.

File utilities
To edit SD card contents (create/delete/rename files and folders), press File Utilities. For details, see page 97.
Recall

File type/source/destination

<table>
<thead>
<tr>
<th>Item</th>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default panel setup</td>
<td>• Factory installed setting</td>
<td>• Current front panel</td>
</tr>
<tr>
<td>Reference waveform</td>
<td>• Internal memory: A, B</td>
<td>• Current front panel</td>
</tr>
<tr>
<td>Panel setup (DSxxxx.set)</td>
<td>• Internal memory: S1 ~ S15</td>
<td>• Current front panel</td>
</tr>
<tr>
<td></td>
<td>• External memory: SD card</td>
<td></td>
</tr>
<tr>
<td>Waveform data (DSxxxx.csv)</td>
<td>• Internal memory: W1 ~ W15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• External memory: SD card</td>
<td></td>
</tr>
<tr>
<td>SD Card restriction</td>
<td>The GDS-1000A series accepts the following SD cards:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type: SD, SDHC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class: 2, 4, 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Size: Up to 32GB (SDHC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Format: FAT or FAT32</td>
<td></td>
</tr>
</tbody>
</table>

Recalling the default panel settings

Procedure

1. Press the Save/Recall key.

2. Press Default Setup. The factory installed setting will be recalled.

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: CH1+CH2
- 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 Off
Recalling a reference waveform to the display

Procedure
1. The reference waveform must be stored in advance. See page 104 for details.
2. Press the Save/Recall key.
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.
5. To clear the waveform from the display, press RefA/B again.

Recalling panel settings

Procedure
1. (For recalling from an external SD card) Insert the card into the slot.
2. Press the Save/Recall key.


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

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

Note The file will not be recalled if the power is turned Off or the SD card is disconnected before completion.

File utilities To edit SD card contents (create/ delete/ rename files and folders), press File Utilities. For details, see page 97.

Recalling a waveform

Procedure
1. (For recalling from an external SD card) Insert the card into the slot.
2. Press the Save/Recall key.
3. Press Recall Waveform. The display shows the available source and destination options.

4. Press Source repeatedly to select the file source, internal memory or external SD card. Use the Variable knob to change the memory location (W1 ~ W15).

   Memory       Internal memory, W1 ~ W15
   SD card      External flash drive, no practical limitation on the amount of files. The waveform file must be placed in the root directory to be recognized.

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

   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.

   The file will not be recalled if the power is turned off or the SD card is disconnected before completion.

---

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 an SD card, see page 105.

Procedure

1. Insert an SD card into the slot to recall from SD memory.

2. Press the Save/Recall key.

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

File utilities To edit the SD card contents (create/ delete/ rename files and folders), press File Utilities. For details, see page 97.

To edit the SD card contents (create/ delete/ rename files and folders), press File Utilities. For details, see page 97.
4. Use the Variable knob to choose a file name (DSXXXX.BMP).
   SD card 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.
6. Press Reference Image to turn on/off the current image.

Note The file will not be recalled if the power is turned off or the SD card is disconnected before completion.

File utilities To edit the SD card contents (create/ delete/ rename files and folders), press File Utilities. For details, see page 97.

PRINT

The GDS-1000A is able to print screen images directly to a PictBridge compatible printer. The printed images can use the “Ink Saver” feature to print onto a white rather than a black background to reduce the amount of ink used. Note that printing and remote control cannot be used at the same time.

Print (Hardcopy)

Background The Hardcopy key works as a shortcut for printing screen images directly to a printer or to save display images, waveform data, and panel settings onto an SD card.

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

Procedure

1. Ensure the USB Port has been configured properly and that the USB cable is connected.
2. Press the Utility key.
4. Press Function repeatedly to select Printer.

5. To invert the color in the display image, press Ink Saver. This turns Ink Saver on or off.

6. To change the default page size, press Page Size.

7. Press the Hardcopy key. The current screen image will be printed to the printer.

Note: If the error message “Printer Not Ready” is displayed, please check to ensure the printer is turned on, the USB cable is properly connected, and that the printer is ready.

The USB port may need to be manually set to Printer, see page 88.

---

**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.

**Vertical Resolution Calibration**

Procedure

1. Press the Utility key.


3. Press Self Cal Menu.

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

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

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

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

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

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

Make sure you have activated the channel by pressing the CH key (page 42).

I want to remove some contents from the display.

To clear the math result, press the Math key again (page 58).
To clear the cursor, press the Cursor key again (page 55).
To clear the Help contents, press the Help key again (page 41).

The waveform does not update (frozen).

Press the Run/Stop key to unfreeze the waveform. See page 44 for details. For trigger setting details, see page 80.
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 119.
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 20Hz. Please operate the oscilloscope manually. See page 43 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 40.

The saved display image is too dark on the background.

Use the Inksaver function which reverses the background color. For details, see page 105.
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 SD card slot does not accept my card.

Make sure the SD card is formatted as FAT or FAT32. Try a different SD card brand if you are still having trouble.

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 93.

For more information, contact your local dealer or GWInstek at www.gwinstek.com / marketing@goodwill.com.tw.

APPENDIX

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
## GDS-1000A Series Specifications

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

### Model-specific specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Bandwidth (–3dB)</th>
<th>Bandwidth Limit</th>
<th>Trigger Sensitivity</th>
<th>External Trigger</th>
<th>Sensitivity</th>
<th>Rise Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDS-1062A</td>
<td>DC coupling: DC – 60MHz</td>
<td>20MHz (–3dB)</td>
<td>0.5div or 5mV (DC – 25MHz)</td>
<td>−50mV (DC–25MHz)</td>
<td>−100mV (25MHz–60MHz)</td>
<td>&lt;5.8ns approx.</td>
</tr>
<tr>
<td></td>
<td>AC coupling: 10Hz – 60MHz</td>
<td></td>
<td>1.5div or 15mV (25MHz–60MHz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDS-1102A</td>
<td>DC coupling: DC – 100MHz</td>
<td>20MHz (–3dB)</td>
<td>0.5div or 5mV (DC – 25MHz)</td>
<td>−50mV (DC–25MHz)</td>
<td>−100mV (25MHz–100MHz)</td>
<td>&lt;3.5ns approx.</td>
</tr>
<tr>
<td></td>
<td>AC coupling: 10Hz – 100MHz</td>
<td></td>
<td>1.5div or 15mV (25MHz–100MHz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDS-1152A</td>
<td>DC coupling: DC – 150MHz</td>
<td>20MHz (–3dB)</td>
<td>0.5div or 5mV (DC – 25MHz)</td>
<td>−50mV (DC–25MHz)</td>
<td>−100mV (25MHz–100MHz)</td>
<td>&lt;2.3ns approx.</td>
</tr>
<tr>
<td></td>
<td>AC coupling: 10Hz – 150MHz</td>
<td></td>
<td>1.5div or 15mV (25MHz–150MHz)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Common specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical</strong></td>
<td>Sensitivity 2mV/div–10V/Div (1-2-5 increments)</td>
</tr>
<tr>
<td></td>
<td>Accuracy ± (3% x</td>
</tr>
<tr>
<td></td>
<td>Bandwidth See model-specific specifications</td>
</tr>
<tr>
<td></td>
<td>Rise Time See model-specific specifications</td>
</tr>
<tr>
<td></td>
<td>Input Coupling AC, DC, Ground</td>
</tr>
<tr>
<td></td>
<td>Input Impedance 1MΩ±2%, −15pF</td>
</tr>
<tr>
<td></td>
<td>Polarity Normal, Invert</td>
</tr>
<tr>
<td></td>
<td>Maximum Input 300V (DC+AC peak), CAT II</td>
</tr>
<tr>
<td></td>
<td>Math Operation +, −, ×, FFT, FFT rms</td>
</tr>
<tr>
<td></td>
<td>Offset Range 2mV/div–50mV/div; ±0.4V</td>
</tr>
<tr>
<td></td>
<td>100mV/div–500mV/div; ±4V</td>
</tr>
<tr>
<td></td>
<td>1V/div–5V/div; ±40V</td>
</tr>
<tr>
<td></td>
<td>10V/div; ±300V</td>
</tr>
<tr>
<td><strong>Trigger</strong></td>
<td>Sources CH1, CH2, Line, EXT</td>
</tr>
<tr>
<td></td>
<td>Modes Auto, Normal, Single, TV, Edge, Pulse</td>
</tr>
<tr>
<td></td>
<td>Coupling AC, DC, LF rej, HF rej, Noise rej</td>
</tr>
<tr>
<td></td>
<td>Sensitivity See model-specific specifications</td>
</tr>
<tr>
<td></td>
<td>Holdoff 40ns – 2.5s</td>
</tr>
<tr>
<td><strong>External trigger</strong></td>
<td>Range DC: ±15V, AC: ±2V</td>
</tr>
<tr>
<td></td>
<td>Sensitivity See model-specific specifications</td>
</tr>
<tr>
<td></td>
<td>Input Impedance 1MΩ±2%, −15pF</td>
</tr>
<tr>
<td></td>
<td>Maximum Input 300V (DC+AC peak), CAT II</td>
</tr>
<tr>
<td><strong>Horizontal</strong></td>
<td>Range 1ns/div–50s/div, 1-2.5-5 increment</td>
</tr>
<tr>
<td></td>
<td>Roll: 250ms/div–50s/div</td>
</tr>
<tr>
<td></td>
<td>Modes Main, Window, Window Zoom, Roll, X-Y</td>
</tr>
<tr>
<td></td>
<td>Accuracy ±0.01%</td>
</tr>
<tr>
<td></td>
<td>Pre-Trigger 10 div maximum</td>
</tr>
<tr>
<td></td>
<td>Post-Trigger 1000 div</td>
</tr>
<tr>
<td><strong>X-Y Mode</strong></td>
<td>X-Axis Input Channel 1</td>
</tr>
<tr>
<td></td>
<td>Y-Axis Input Channel 2</td>
</tr>
<tr>
<td></td>
<td>Phase Shift ±3° at 100kHz</td>
</tr>
<tr>
<td><strong>Signal Acquisition</strong></td>
<td>Real-Time 1G Sa/s maximum</td>
</tr>
<tr>
<td></td>
<td>Equivalent 25G Sa/s maximum</td>
</tr>
<tr>
<td></td>
<td>Vertical 8 bits</td>
</tr>
<tr>
<td></td>
<td>Record Length Maximum; 2M points (1 channel), 1M points (2 channels)</td>
</tr>
<tr>
<td></td>
<td>Acquisition Normal, Peak Detect, Average</td>
</tr>
<tr>
<td></td>
<td>Peak Detection 10ns (500ns/div–50s/div)</td>
</tr>
<tr>
<td></td>
<td>Average 2, 4, 8, 16, 32, 64, 128, 256</td>
</tr>
</tbody>
</table>
Appendix

Cursors and Measurement

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Vpp, Vamp, Vavg, Vrms, Vhi, Vlo, Vmax, Vmin, Rise Preshoot/ Overshoot, Fall Preshoot/ Overshoot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Freq, Period, Rise Time, Fall Time, + Width, – Width, Duty Cycle</td>
</tr>
<tr>
<td>Delay</td>
<td>FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF</td>
</tr>
<tr>
<td>Cursors</td>
<td>Voltage difference (ΔV) and Time difference (ΔT) between cursors</td>
</tr>
<tr>
<td>Auto Counter</td>
<td>Resolution: 6 digits, Accuracy: ±2%</td>
</tr>
<tr>
<td></td>
<td>Signal source: All available trigger source except the Video trigger</td>
</tr>
</tbody>
</table>

Control Panel Function

| Autoset          | Automatically adjust Vertical Volt/div, Horizontal Time/div, and Trigger level                    |
|                  |                                                                                                    |
| Save/Recall      | Up to 15 sets of measurement conditions and waveforms                                            |

Display

| LCD              | 5.6 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)                                       |
| SD Card Slot       | 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             | 18W, 40VA maximum                                                                                  |
| Consumption       |                                                                                                    |
| Fuse Rating       | 1A slow, 250V                                                                                      |

Operation Environment

| Ambient temperature | 0 – 50°C                                                                                           |
| Relative humidity   | ≤ 80% @ 35°C                                                                                        |

Storage Environment

| Ambient temperature | –10°C to 60°C                                                                                     |
| Relative humidity   | ≤ 80% @ 60°C                                                                                        |

Dimensions

| 310(W) x 142(H) x 140(D) mm |

Weight

| Approx. 2.5kg |

Probe Specifications

GDS-1062A/1102A/1152A Probe

<table>
<thead>
<tr>
<th>Applicable model &amp; probe</th>
<th>GDS-1062A GTP-060A-4*</th>
<th>GDS-1102A GTP-100A-4*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position x 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attenuation Ratio</td>
<td>10:1</td>
<td>1:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>DC – 60MHz</td>
<td>DC – 100MHz</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>10MΩ when used with 1MΩ input</td>
<td>10MΩ when used with 1MΩ input</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>23pF approx.</td>
<td>47pF approx.</td>
</tr>
<tr>
<td>Maximum Input Voltage</td>
<td>500V CAT I, 300V CAT II (DC+Peak AC)</td>
<td>500V CAT I, 300V CAT II (DC+Peak AC)</td>
</tr>
<tr>
<td>Derating with frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Cond.</td>
<td>Temperature –10°C – 55°C</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>≤85% @ 35°C</td>
<td></td>
</tr>
<tr>
<td>Safety Standard</td>
<td>EN 61010-031 CAT II</td>
<td></td>
</tr>
</tbody>
</table>

GDS-1152A GTP-150A-2*

<table>
<thead>
<tr>
<th>Applicable model &amp; probe</th>
<th>GDS-1152A GTP-150A-2*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position x 10</td>
<td></td>
</tr>
<tr>
<td>Attenuation Ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>DC – 150MHz</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>10MΩ when used with 1MΩ input</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>17pF approx.</td>
</tr>
<tr>
<td>Maximum Input Voltage</td>
<td>500V CAT I, 300V CAT II (DC+Peak AC)</td>
</tr>
<tr>
<td>Derating with frequency</td>
<td></td>
</tr>
<tr>
<td>Operating Cond.</td>
<td>Temperature –10°C – 55°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>≤85% @ 35°C</td>
</tr>
<tr>
<td>Safety Standard</td>
<td>EN 61010-031 CAT II</td>
</tr>
</tbody>
</table>

* Note: GW Instek reserves the right to change the probe model type (GTP-060A-4, GTP-100A-4, GTP-150A-2) at anytime without notice for probe model types of similar specification.
EC Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
No.7-1, Jhongsing Rd., Tucheng City, Taipei County 236, Taiwan

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
No. 69, Lushan Road, Suzhou New District Jiangsu, China

declares that the below mentioned product

GDS-1062A, GDS-1102A, GDS-1152A

Are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (2004/108/EC) and Low Voltage Equipment Directive (2006/95/EC). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

© EMC

<table>
<thead>
<tr>
<th>EN 61326-1:</th>
<th>EN 61326-2-1:</th>
<th>Electrical equipment for measurement, control and laboratory use — EMC requirements (2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage dips/ Interrupts</td>
<td>Surge Immunity</td>
<td>IEC 61000-4-5: 2005</td>
</tr>
<tr>
<td>Power Frequency Magnetic Field</td>
<td></td>
<td>IEC 61000-4-8: 2001</td>
</tr>
</tbody>
</table>

© Safety

Low Voltage Equipment Directive 2006/95/EC

| Safety Requirements | IEC/EN 61010-1: 2001 |

INDEX

2M memory length limits .......... 94
AC coupling .......................... 76
Accumulating waveform .......... 67
Acquisition ........................... 62
Auto set ................................ 43
Automatic measurement ............ 52
Automatic measurement gating ........................ 51
Average acquisition ................. 63
Average voltage measure .......... 50
Bandwidth limitation ............... 78
Blackman window .................... 59
Calibration ........................... 37
Calibration, vertical resolution ......................... 118
Caution symbol ...................... 7
Channel ................................ 42
Cleaning the instrument .......... 9
Configure remote control .......... 90
Coupling mode ....................... 75
Cursor ................................ 55
DC coupling .......................... 75
Delay measure ....................... 50
Delay mode ........................... 64
Delay Off ............................. 65
Delay On ................................ 64
Display ................................ 68
Dot waveform ........................ 67
Duty cycle measure ................. 50
Edgetrigger .......................... 83
Edge trigger .......................... 83
File format ........................... 93
File format ........................... 93
Recall menu tree ................. 30
Save ................................ 105
Save menu tree .................... 32
SWE measurement category .......... 8
Environment .......................... 127
Pollution degree ..................... 9
Safety requirements .............. 127
<table>
<thead>
<tr>
<th>Feature</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>invert waveform</td>
<td>77</td>
</tr>
<tr>
<td>Memory depth</td>
<td>94</td>
</tr>
<tr>
<td>recall</td>
<td>112</td>
</tr>
<tr>
<td>recall menu tree</td>
<td>30</td>
</tr>
<tr>
<td>roll mode</td>
<td>70</td>
</tr>
<tr>
<td>save</td>
<td>104</td>
</tr>
<tr>
<td>save menu tree</td>
<td>32</td>
</tr>
<tr>
<td>x-y mode</td>
<td>72, 73</td>
</tr>
<tr>
<td>zoom mode</td>
<td>71</td>
</tr>
<tr>
<td>Waveform accumulation</td>
<td>67</td>
</tr>
<tr>
<td>X-Y mode</td>
<td>72, 73</td>
</tr>
<tr>
<td>specification</td>
<td>126</td>
</tr>
<tr>
<td>Zoom waveform</td>
<td>71</td>
</tr>
<tr>
<td>Waveform accumulation</td>
<td>67</td>
</tr>
<tr>
<td>X-Y mode</td>
<td>72, 73</td>
</tr>
<tr>
<td>specification</td>
<td>126</td>
</tr>
<tr>
<td>Zoom waveform</td>
<td>71</td>
</tr>
</tbody>
</table>