Digital Storage Oscilloscope

GDS-3000 Series

QUICK START GUIDE

GW INSTEK PART NO. 82DS-33040MD1

ISO-9001 CERTIFIED MANUFACTURER

Good Will Instrument Co., Ltd. No. 7-1, Jhongsing Rd., Tucheng Dist., New Taipei City 236, Taiwan.

SAFETY INSTRUCTIONS

This section contains the basic safety symbols that may appear on the accompanying User Manual CD or on the instrument. For detailed safety instructions and precautions, please see the Safety Instructions chapter in the user manual CD.

Safety Symbols

These safety symbols may appear in the user manual or on the instrument.

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 instrument or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Earth (ground) Terminal
	Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Power Cord for the United Kingdom

When using the instrument 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.

GETTING STARTED

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

Main Features

Model name	Frequency bandwidth	Input channels
GDS-3152	150MHz	2
GDS-3252	250MHz	2
GDS-3352	350MHz	2
GDS-3502	500MHz	2
GDS-3154	150MHz	4
GDS-3254	250MHz	4
GDS-3354	350MHz	4
GDS-3504	500MHz	4

Performance	• High sampling rate: up to 5GSa/s real-time (4GSa/s GDS-350X), 100GSa/s equivalent-time. • Deep memory: 25k points record length. • Minimum 2ns peak detection.
Features	• 2 and 4 channel models. • Bandwidth up to 500 MHz. • 5GSa/s (200ps resolution) real-time sampling rate (4GSa/s, 250ps resolution for GDS-350X). • 100GSa/s equivalent sample rate. • VPO waveform processing. • Large 8'' 800 x 600 high-resolution TFT LCD. • Unique split window function. • Flexible application modules. • Three standard input impedances (50Ω/75Ω/1MΩ). • Optional power measurement functions are available for fast analysis of power quality tests. • Optional analysis software for I2C, SPI and UART serial signal triggering and decoding. • 2 and 4 channel models available up to 500 MHz. • Large 8" color TFT LCD, supporting a large 8 x 10 graticule. • On-screen Help. • 64 MB internal flash memory. • FreeWave remote control software (free download).
Interface	• USB host port: front and rear panel, for storage devices. • USB slave port(Optional GPIB to USB), RS-232C port: for remote control. • Calibration output. • Go-No Go output. • Trigger output. • Ethernet port.

Package Contents and Accessories

Standard Accessories

Item	Part Number
User Manual CD	
Quick Start Guide (this document)	
Power Cord x1	Region Dependent

Optional Accessories

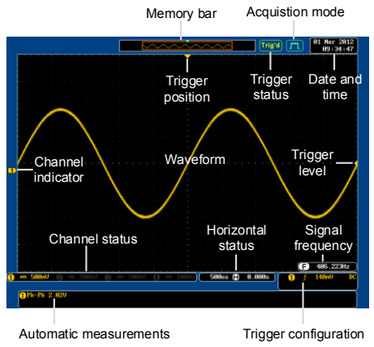
Item	Part Number
Instrument cart, 470(W) x 430(D)mm (U.S. type input socket)	GTC-001
Instrument cart, 330(W) x 430(D)mm (U.S. type input socket)	GTC-002
test lead, BNC to BNC heads	GTL-110
RS-232C cable, 9-pin Female to 9-pin female, Null modem for computer	GTL-232
USB cable, USB2.0A-B type cable 4P	GTL-246
Demoboard for the GDS-3000 Series DSO	GDB-03
25MHz high voltage differential probe	GDP-025
50MHz high voltage differential probe	GDP-050
100MHz high voltage differential probe	GDP-100
5A/ 40Hz~1kHz current probe	GCP-005
200A/40Hz~10kHz current probe	GCP-020
100A/DC~100kHz current probe	GCP-100
50MHz/ 30A current probe	GCP-530
100MHz/ 30A current probe	GCP-1030
Power supply for current probe (2 input channels)	GCP-206P
Power supply for current probe (4 input channels)	GCP-425P
Passive probe; 150 MHz,10X with readout	GTP-151R
Passive probe; 250 MHz, 10X with readout	GTP-251R
Passive probe; 350 MHz, 10X with readout	GTP-351R
Passive probe, 500MHz, 10X with readout	GTP-501R

Driverss

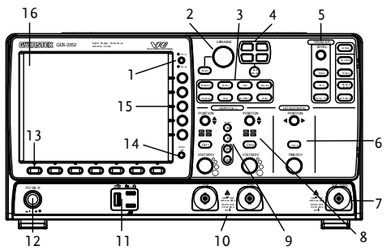
USB driver	LabVIEW driver

Display and Panel Overview

Display Overview



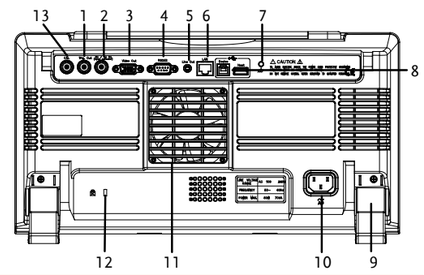
Front Panel



Description

1. Print /Save key	2. Variable knob and Select key
3. Function keys	4. Split window cluster
5. Trigger controls	6. Horizontal controls
7. EXT trigger input (2CH only)	8. Vertical controls
9. Math, Reference & Bus keys	10. CH1~4 input
11. USB Probe compensation, Ground port	12. Power button
13. Bottom menu keys	14. Menu key
15. Side menu keys	16. LCD

Rear Panel



Description

1. Trigger output	2. Go-NoGo output
3. Video out	4. RS232 Output
5. Line out	6. LAN port
7. Ground strap connector	8. USB Device/Host port

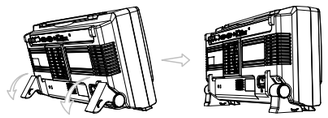
9. Rear stand	10. Power input socket
11. Fan	12. Key lock
13. Calibration output	

Setting up the Oscilloscope

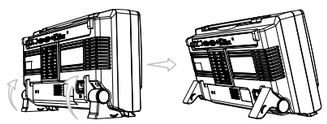
This section describes how to set up the oscilloscope properly including setting the stand, installing the optional modules and compensating the probe.

Tilting the Stand

Upright — Turn the legs under the casing as shown below to have the instrument sit upright.



Tilt — To tilt, tilt the legs back behind the casing, as shown below.



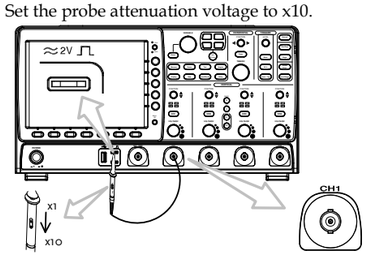
First Time Use

This section describes how to connect a signal, adjust the scale, and compensate the probe. Before operating the GDS-3000 in a new environment, run these steps to

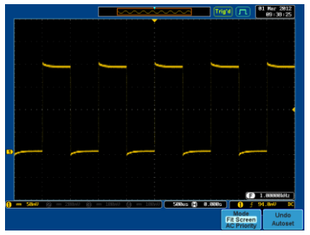
make sure the instrument performs at its full potential.

1. Power the GDS-3000 on.
2. Set the date and time.
3. Reset the system by recalling the factory settings. Press the *Default* Setup key on the front panel.

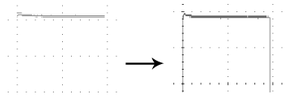
4. Install optional software. The optional software packages (Power Analysis, Serial Bus Decode) can be activated.
5. Connect the probe to the CH1 input terminal and probe compensation signal output (2Vp-p, 1kHz square wave).
6. Set the probe attenuation voltage to x10.



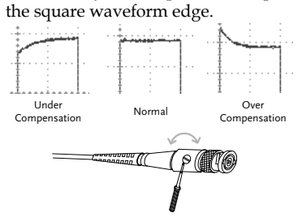
7. Press the Autoset key. A square waveform appears on the center of the screen.



8. Press the *Display* key and select the Vector waveform type from the bottom menu.



9. Turn the adjustment point on the probe to flatten the square waveform edge.



10. Setting up the oscilloscope is complete. You may start to use the oscilloscope.

SPECIFICATIONS

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

Model Specific Specifications

GDS-3152 & GDS-3154

Bandwidth	DC ~ 150MHz (-3dB)
Channels	2 + EXT (GDS-3152) 4 + EXT (GDS-3154)
Rise Time	2.3ns

GDS-3252 & GDS-3254

Bandwidth	DC ~ 250MHz (-3dB)
Channels	2 + EXT (GDS-3252) 4 + EXT (GDS-3254)
Rise Time	1.4ns

GDS-3352 & GDS-3354

Bandwidth	DC ~ 350MHz (-3dB)
Channels	2 + EXT (GDS-3352) 4 + EXT (GDS-3354)
Rise Time	1ns

GDS-3502 & GDS-3504

Bandwidth	DC ~ 500MHz (-3dB)
Channels	2 + EXT (GDS-3502) 4 + EXT (GDS-3504)
Rise Time	700ps

The bandwidth of the 75Ω input impedance is limited to 150MHz only.

Common Specifications

Vertical

Resolution	8 bit
Sensitivity	@1MΩ: 2mV~5V/div @50/75Ω: 2mV~1V/div
Input Coupling	AC, DC, GND
Input Impedance	1MΩ// 15pF
DC Gain Accuracy	±3% full scale
Polarity	Normal & Invert
Maximum Input Voltage	@1MΩ: 300Vrms, CAT I @50/75 Ω: 5 Vrms max
Offset Position Range	2mV/div ~ 100mV/div : ±0.5V 200mV/div ~ 5V/div : ±25V
Waveform Signal Process	Add, subtract, multiply, and divide waveforms, FFT, FFTrms, Integration*, Differentiation* *: App installation required. FFT:Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS, and FFT Window to Rectangular, Hamming, Hanning, or Blackman-Harris.
Bandwidth Limit	Dependent on the oscilloscope bandwidth (BW. BW=150: Full/20MHz BW=250: Full/20MHz/100MHz BW=350: Full/20MHz/100MHz /200MHz BW=500: Full/20MHz/100MHz /200MHz/350MHz

Trigger

Source	CH1 ,CH2, CH3, CH4, Line, EXT
Mode	Auto (supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence

Type	Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, Event-Delay(1~65535 events), Time-Delay(Duration)(10ns~10s), I2C*, SPI*, UART* *optional Runt:Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. SPI (optional):Trigger on SS, MOSI, MISO, or MOSI and MISO on SPI buses. I²C (optional):Trigger on Start, Repeated Start, Stop, Missing ACK, Address (7 or 10 bit), Data, or Address and Data on I2C buses. UART (optional): Trigger on Tx Start Bit, Rx Start Bit, Tx End of Packet, Rx End of Packet, Tx Data, Rx Data, Tx Parity Error, and Rx Parity Error.
Holdoff range	10ns to 10s
Coupling	AC, DC, LF rej., Hf rej., Noise rej.
Sensitivity	GDS-31XX ~ GDS-33XX: DC~50MHz Approx. 1div or 10mV 50MHz~150MHz Approx. 1.5div or 15mV 150MHz ~ 350MHz Approx. 2div or 20mV GDS-350X: DC ~ 50MHz Approx. 1div or 1.0mV 50MHz ~ 150MHz Approx. 1.5div or 15mV 150MHz ~ 350MHz Approx. 2div or 20mV 350MHz ~ 500MHz Approx. 2.5div or 25mV

External Trigger

Range	±15V
Sensitivity	GDS-31XX ~ GDS-33XX: DC ~ 150MHz Approx. 100mV 150MHz ~ 250MHz Approx. 150mV 250MHz ~ 350MHz Approx. 150mV 350MHz ~ 500MHz Approx. 200mV
Input Impedance	1MΩ±3% ~ 16pF

Horizontal

Time base Range	GDS-31XX, GDS-32XX, GDS-33XX: 1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div GDS-350X: 1ns/div ~ 100s/div (1-2.5-5 increments); ROLL : 100ms/div ~ 100s/div
Pre-trigger	10 div maximum
Post-trigger	1000 div maximum. The number of divisions depends on the time division.
Time base Accuracy	±20 ppm over any ≧1 ms time interval

X-Y Mode

X-Axis Input	Channel 1; Channel 3
Y-Axis Input	Channel 2; Channel 4
Phase Shift	±3° at 100kHz

Signal Acquisition

Real Time Sample Rate	150/250/300MHz models: 5GSa/s (MAX) 150/250MHz models with 2CH: 2.5GSa/s 500MHz models: 4GSa/s (MAX), 2GSa/s per channel
ET Sample Rate	100GSa/s maximum for all models

Record Length	25k points / channel
Acquisition Mode	Normal, Average, Peak Detect, High Resolution, Single Sequence
Peak (Glitch) Detection	2ns (MAX) Normal: Acquire sampled values. Average: From 2 to 256 waveforms included in average. Peak Detect: Captures glitches as narrow as 2 ns at all sweep speeds Hi Res: Real-time boxcar averaging reduces random noise and increases vertical resolution

Cursors and Measurement

Cursors	Amplitude, Time, Gating available
Automatic Measurement	28 sets: Vpp, Vamp, Vavg, Vrms, Vhi, Vlo, Vmax, Vmin, Rise Preshoot/Overshoot, Fall Preshoot/Overshoot, Freq, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle, and nine different delay measurements (FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase)
Cursors measurement	Voltage difference between cursors (ΔV) Time difference between cursors (ΔT)
Auto counter	6 digits, range from 2Hz minimum to the rated bandwidth

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Cursors	Amplitude, Time, Gating available
Automatic Measurement	28 sets: Vpp, Vamp, Vavg, Vrms, Vhi, Vlo, Vmax, Vmin, Rise Preshoot/Overshoot, Fall Preshoot/Overshoot, Freq, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle, and nine

different delay measurements (FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase)

Cursors measurement	Voltage difference between cursors (ΔV) Time difference between cursors (ΔT)
Auto counter	6 digits, range from 2Hz minimum to the rated bandwidth

Power Measurements (Option)

Power Quality Measurements	V RMS, I RMS, True Power, Apparent Power, Reactive Power, Frequency, Power Factor, Phase Angle, V Crest Factor, I Crest Factor, (+)V Peak, (-)V Peak, (+)I Peak, (-)I Peak, DC Voltage, DC Current, Impedance, Resistance, Reactance
Harmonics	Frequency (Hz), Magnitude (%), Mag. RMS (A), Phase (°), Limit (A), Limit (%), Pass | Fail, Max all , Windows (A), 200% Limit, POHC Limit, THD-F, THD-R, RMS, Overall, POHC, POHL, Input Power, Power Factor, Fundamental Current, Harmonic 3, Harmonic 5
Ripple Measurements	Ripple, Noise
In-rush current	First peak, Second peak

Control Panel Function

Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo autoset
Auto-Range	allow you to quickly move from test point to test point without having to reset the oscilloscope for each test point

Save Setup	20set
Save Waveform	24set

Display

TFT LCD Type	8" TFT LCD SVGA color display
Display Resolution	800 horizontal × 600 vertical pixels (SVGA)
Interpolation	Sin(x)/x & Equivalent Time Sampling
Waveform Display	Dots, vectors, variable persistence, infinite persistence
Waveform Update Rate	3500 waveforms per second maximum
Display Graticule	8 x 10 divisions
Display Mode	YT, XT

Interface

USB Port	2 sets USB 2.0 High-speed host port 1 set USB High-speed 2.0 device port
Ethernet Port (LAN)	RJ-45 connector, 10/100Mbps
RS232C	DB-9 male connector
SVGA Video Port	DB-15 female connector, monitor output for display on SVGA monitors
GPIB	GPIB to USB adapter (Option)
Internal flash disk	64MB
Go-NoGo BNC	5V Max, 10mA CMOS open collector output
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock.
Line output	3.5mm stereo jack for Go/NoGo audio alarm

Power Source

Line Voltage Range	AC 100V ~ 240V , 48Hz ~ 63Hz , Auto selection

Power Consumption	96VA

Miscellaneous

Multi-language menu	Available
On-line help	Available
Time clock	Time and Date ,Provide the Date/Time for saved data
Dimensions	400mm x 200mm x 130mm
Weight	Approx. 4kg