Digital Storage Oscilloscope

GDS-2000E Series

QUICK START GUIDE

GW INSTEK PART NO. 82DS-2KE00MB1

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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-2072E	70MHz	2
GDS-2102E	100MHz	2
GDS-2202E	200MHz	2
GDS-2074E	70MHz	4
GDS-2104E	100MHz	4
GDS-2204E	200MHz	4

Features

- 8 inch, 800 X 480 TFT WVGA display.
- Models available from 70MHz to 200MHz.
- Real-time sampling rate of 1GSa/s (2 channel models), Max. 1GSa/s (4ch model).
- Deep memory: 10M points record length.
- Waveform capture rate of 120,000 waveforms per second.
- Vertical sensitivity: 1mV/div~10V/div.

Features (continued)

- Segmented Memory: Optimizes the acquisition memory to selectively capture only the important signal details. Up to 29000 successive waveform segments can be captured with a time-tag resolution of 4ns.
- Waveform Search: Allows the scope to search for a number of different signal events.
- On-screen Help.
- 32 MB internal flash disk.

Interface

- USB host port: front panel, for storage devices.
- USB device port: rear panel, for remote control or printing.
- Probe calibration output with selectable output frequency (1kHz ~ 200kHz).
- Ethernet port as standard.
- Calibration output.

Package Contents and Accessories

Standard Accessories

Item	Part Number
User Manual CD	82DS-2KE00Ex1
Quick Start Guide (this document)	82DS-2KE00Mx1
Passive Probe; 70 MHz for GDS-2072E, GDS-2074E	GTP-070B-4
Passive Probe; 100 MHz for GDS-2102E, GDS-2104E	GTP-100B-4
Passive Probe; 200 MHz for GDS-2202E, GDS-2204E	GTP-200B-4
Power Cord x1	Region Dependent

Optional Accessories

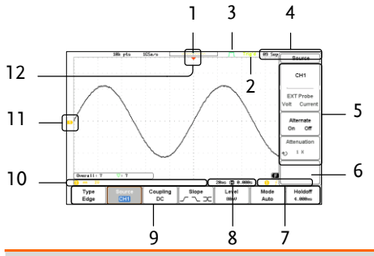
Item	Part Number
Instrument cart, 470(W) x 430(D)mm (U.S. type input socket)	GTC-001
Instrument cart, 330(W) x 430(D)mm (U.S. type input socket)	GTC-002
test lead, BNC to BNC heads	GTL-110
USB cable, USB2.0A-B type cable 4P	GTL-242

Standard Apps

Name	Description
Go-NoGo	Go-NoGo testing app.
DataLog	Waveform or image data logging app.
DVM	Digital Volt Meter app.
Digital Filter	High or low pass digital filter for analog inputs.
Remote Disk	Allows the scope to mount a network share drive.

Display and Panel Overview

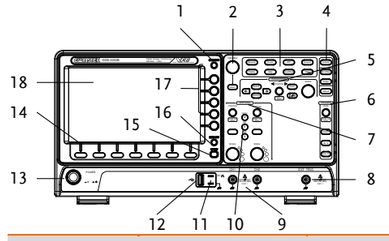
Display Overview



Description

1.	Memory Bar	2.	Trigger Status
3.	Acquisition Status	4.	Date and Time
5.	Side Menu	6.	Waveform Frequency
7.	Trigger Configuration	8.	Horizontal status
9.	Bottom Menu	10.	Channel Status
11.	Channel/Bus/ Reference/Math Indicators	12.	Horizontal Position

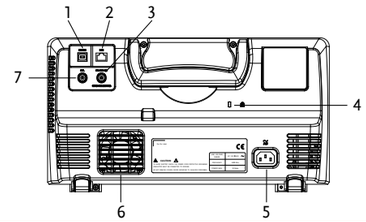
Front Panel



Description

1.	Hardcopy key	2.	Variable knob and Select key
3.	Function keys	4.	Autoset, Run/Stop, Single & Default keys
5.	Horizontal and Search controls	6.	Trigger controls
7.	Vertical controls	8.	EXT trigger input (2CH only)
9.	Analog channel inputs	10.	Math, Reference & Bus keys
11.	Probe calibration output	12.	USB Host port
13.	Power button	14.	Bottom menu keys
15.	Option key	16.	Menu off key
17.	Side menu keys	18.	LCD

Rear Panel



Description

1.	USB device port	2.	LAN port
3.	Go-NoGo output	4.	Key lock slot
5.	Power input socket	6.	Fan
7.	Calibration output		

Setting up the Oscilloscope

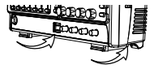
This section describes how to set up the oscilloscope properly including setting the stand, installing the optional modules and compensating the probe.

Tilting the Stand

The GDS-2000E has two adjustable tabs at the front that can be used to position the instrument into two preset orientations.

1. Pull the tabs out to lean the scope back.

2. Push the tabs under the casing to stand upright.

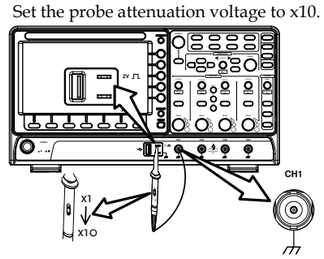


Probe Compensation

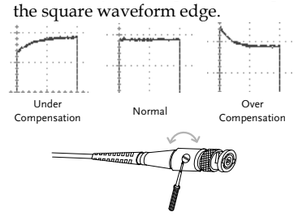
This section describes how to connect a signal, adjust the scale, and compensate the probe. Before operating the GDS-2000E in a new environment, run these steps to make sure the instrument performs at its full potential.

1. Press the Default key to reset the system to the factory settings.
2. Connect the probe to the Channel 1 input and to the probe compensation output. This output provides a 2Vp-p, 1kHz square wave for signal compensation by default.

3. Set the probe attenuation voltage to x10.



4. Press the Autoset key.
5. A square waveform will appear in the center of the display.
6. Press the Display key and select the Vector waveform type from the bottom menu.
7. Turn the adjustment point on the probe to flatten the square waveform edge.



8. 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-2072E & GDS-2074E

Bandwidth (–3dB)	DC coupling: DC ~ 70MHz
Channels	2 + EXT (GDS-2072E) 4 (GDS-2074E)
Rise Time	5ns
Bandwidth Limit	20MHz

GDS-2102E & GDS-2104E

Bandwidth (–3dB)	DC coupling: DC ~ 100MHz
Channels	2 + EXT (GDS-2102E) 4 (GDS-2104E)
Rise Time	3.5ns
Bandwidth Limit	20MHz

GDS-2202E & GDS-2204E

Bandwidth (–3dB)	DC coupling: DC ~ 200MHz
Channels	2 + EXT (GDS-2202E) 4 (GDS-2204E)
Rise Time	1.75ns
Bandwidth Limit	20MHz/100MHz

Common Specifications

Vertical

Resolution	8 bit :1mV~10V/div.
Input Coupling	AC, DC, GND

Input Impedance	1MΩ// 16pF approx
DC Gain Accuracy	1mV: ±5% full scale ≥2mV: ±3% full scale
Polarity	Normal & Invert
Maximum Input Voltage	300Vrms, CAT I
Offset Position Range	1mV/div ~ 20mV/div: ±0.5V 50mV/div ~ 200mV/div: ±5V 500mV/div ~ 2V/div: ±25V 5V/div ~ 10V/div: ±250V
Waveform Signal Process	+, -, ×, ÷, FFT, FFTrms, User defined expression. FFT: Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS, and FFT Window to Rectangular, Hamming, Hanning, or Blackman-Harris.

Trigger

Source	CH1 ,CH2, CH3*, CH4*, Line, EXT *4 channel models only
Trigger Mode	Auto (supports Roll Mode for 100 ms/div and slower), Normal, Single
Trigger Type	Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Timeout, Alternate, Event-Delay (1~65535 events), Time-Delay (Duration, 4nS~10S), Bus
Holdoff range	4ns to 10s
Coupling	AC, DC, LF rej., Hf rej., Noise rej.
Sensitivity	1 div

External Trigger

Range	±15V
Sensitivity	DC ~ 100MHz Approx. 100mV 100MHz ~ 200MHz Approx. 150mV
Input Impedance	1MΩ±3% ~ 16pF

Horizontal

Time base Range	1ns/div ~ 100s/div (1-2-5 increments) ROLL: 100ms/div ~ 100s/div
Pre-trigger	10 div maximum
Post-trigger	2,000,000 div maximum
Time base Accuracy	±50 ppm over any ≥ 1ms time interval
Real Time Sample Rate	1GSa/s (2CH models); Max. 1GSa/s (4CH models).
Record Length	Maximum 10Mpts
Acquisition Mode	Normal, Average, Peak Detect, Single
Peak Detection	2ns (typical)
Average	Selectable from 2 to 256

X-Y Mode

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

Cursors and Measurement

Cursors	Amplitude, Time, Gating available;Unit:seconds(s), Hz(1/s), Phase(degree), Ration(%).
Automatic Measurement	36 sets: Pk-Pk, Max, Min, Amplitude, High, Low, Mean,

	Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPREShoot, FPREShoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, 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

Control Panel Function

Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset
Save Setup	20set
Save Waveform	24set

Display

TFT LCD Type	8" TFT LCD WVGA color display
Display Resolution	800 horizontal × 480 vertical pixels (WVGA)
Interpolation	Sin(x)/x
Waveform Display	Dots, vectors, variable persistence (16ms~4s), infinite persistence
Waveform Update Rate	120,000 waveforms per second, maximum
Display Graticule	8 x 10 divisions
Display Mode	YT, XT

Interface

USB Port	USB 2.0 High-speed host port X1, USB High-speed 2.0 device port X1
Ethernet Port	RJ-45 connector, 10/100Mbps with HP Auto-MDIX
Go-NoGo BNC	5V Max/10mA TTL open collector output
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock

Miscellaneous

Multi-language menu	Available
Operation Environment	Temperature: 0°C to 50°C. Relative Humidity ≤ 80% at 40°C or below; ≤ 45% at 41°C ~ 50°C.
On-line help	Available
Time clock	Time and Date, provides the Date/Time for saved data.
Dimensions	380mm x 208mm x 127.3mm
Weight	2.8kg

EC Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
No.7-1, Jhongsing Rd., Tucheng Dist., New Taipei City 236, Taiwan
GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
No. 69, Lushan Road, Suzhou New District Jiangsu, China
declares that the below mentioned product
GDS-2072E, GDS-2074E, GDS-2102E, GDS-2104E, GDS-2202E, GDS-2204E
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

EN 61326-1: EN 61326-2-1:	Electrical equipment for measurement, control and laboratory use — EMC requirements (2013)
Conducted & Radiated Emission EN 55011: 2009+A1: 2010	Electrostatic Discharge EN 61000-4-2: 2009
Current Harmonics EN 61000-3-2: 2006+A1: 2009+A2: 2009	Radiated Immunity EN 61000-4-3: 2006+A1: 2008 +A2 : 2010
Voltage Fluctuations EN 61000-3-3:2013	Electrical Fast Transients EN 61000-4-4: 2012
----------	Surge Immunity EN 61000-4-5: 2006
----------	Conducted Susceptibility EN 61000-4-6: 2009
----------	Power Frequency Magnetic Field EN 61000-4-8: 2010
----------	Voltage Dip/ Interruption EN 61000-4-11: 2004

◎ Safety

Low Voltage Equipment Directive 2006/95/EC
Safety Requirements EN 61010-1: 2010 (Third Edition); EN 61010-2-030: 2010 (First Edition)