Digital Oscilloscope & Multimeter

GDS-122

USER MANUAL

GW INSTEK PART NO.

ISO-9001 CERTIFIED MANUFACTURER

October 2007 edition

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SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you should follow when operating the instrument and when keeping it in storage. Read the following before any operation to ensure your safety and to keep the instrument in best condition.

Safety Symbols

These symbols may appear in this 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

Safety Guidelines

General Guidelines

⚠ CAUTION

- Do not place heavy objects on the instrument.
- Avoid severe impacts or rough handlings that may damage the instrument.
- Avoid discharges of static electricity onto or near the instrument.
- Do not insert bare wires or metal objects into the terminals.
- Do not apply input voltage more than 42V peak (30Vrms) to the instrument.

- Do not perform measurements at a power generating source or building installation site (see note below).
- The instrument should only be disassembled by a qualified technician.

(Measurement categories) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. This instrument falls under category I. Measurement category IV is for measurement performed at the source of low-voltage installation. Measurement category III is for measurement performed in the building installation. Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation. Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply

⚠ WARNING

- AC Input voltage: 100 to 240V, 50/60Hz
- The power supply voltage should not fluctuate more than 10%.
- Always use the AC adaptor included in the package.
- Always connect the AC adaptor to the mains line first, then to the instrument.

Cleaning the instrument

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

Operation Environment

- Location: Indoor, no direct sunlight, dust free, most non-conductive pollution (see note below)
- Relative Humidity: < 75%
- Altitude: < 2000m
- Temperature: 0°C to 40°C

(Pollution Degree) EN 61010-1:2001 specifies the pollution degrees and their requirements as follows. This instrument 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: < 75%
- Temperature: −10°C to 70°C

Power cord for the United Kingdom

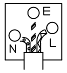
When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.

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 colours 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 the letter E or by the earth symbol ⏚ or coloured Green or 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, 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 moulded mains connector that requires removal /replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if a engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

GETTING STARTED

This chapter gives you an overview of what the GDS-122 is about, what items are included in the package, and how the user manual is organized. After opening the GDS-122 package, check the contents referring to the *Package Contents* section, then learn the features and interface reading the *Main Features* and *Front Panel and Keys Overview* section. The Manual Overview section gives you an overall picture of what each chapter is about, helping you directly jump to the relevant location.

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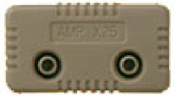
Package Contents

Soft carrying case	GDS-122
AC-DC adaptor	Oscilloscope probe x 2 + probe adjustment tools
1kHz square wave output cable	Multimeter test lead x 2
Extension module for large current measurement 	Extension module for small capacitance measurement
USB communication cable	CD-ROM (software)
User Manual (this document)	RS-232C communication cable (optional item – contact Good Will)

Main Features

Oscilloscope

- Dual channel
- 20MHz bandwidth
- 100MS/s real-time sampling rate
- ≤ 17.5ns rising time
- 5ns to 5s/div horizontal scale
- 5mV to 5V/div vertical scale
- 6k memory points per channel
- Isolated inputs between oscilloscope and multimeter
- Autoset function
- Trigger mode: Auto, Free run, Single shot, Edge, Video
- 2 cursors
- 5 automatic measurements
- 4 display image memories
- Auto-calibration

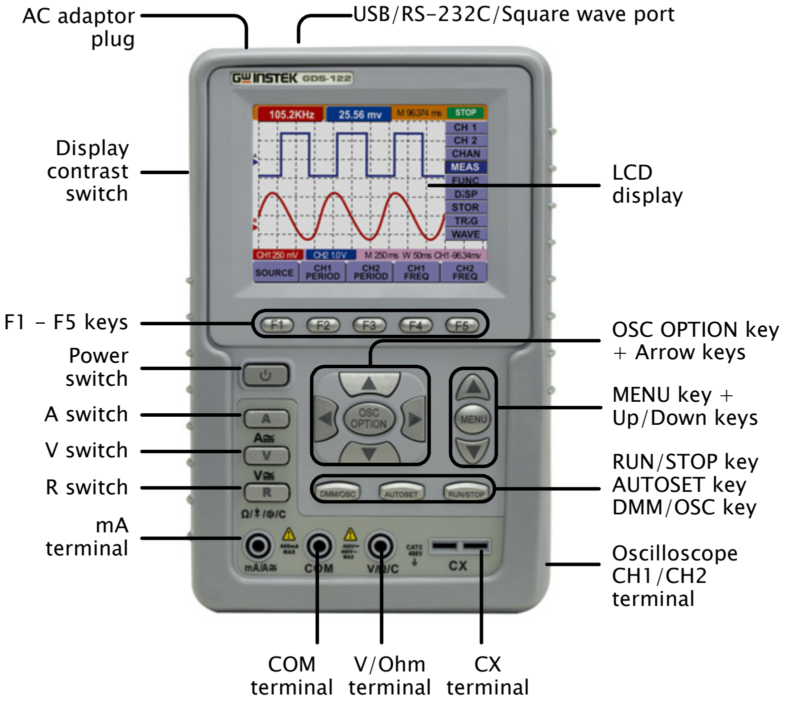
Multimeter

- Volts, Amps, Ohms, Continuity, Diode, Capacitance measurement
- 20A maximum amplitude
- True RMS measurement
- Isolated inputs between oscilloscope and multimeter

Common

- USB interface
- RS-232C interface
- 1kHz square wave output
- 3.8 inch color LCD display, 320 x 240 resolution
- 6 hours running time Li-ion battery
- 180mm x 113mm x 40mm compact size
- 690g light weight

Front Panel and Keys Overview


AC adaptor plug
USB/RS-232C/Square wave port
Display contrast switch
LCD display
F1 – F5 keys
OSC OPTION key + Arrow keys
Power switch
MENU key + Up/Down keys
A switch
V switch
R switch
RUN/STOP key AUTOSET key DMM/OSC key
mA terminal
Oscilloscope CH1/CH2 terminal
COM terminal
V/Ohm terminal
CX terminal

DSO : Oscilloscope function DMM : Multimeter function

AC adaptor plug	Accepts the AC adaptor cord. DC 8.5V, 1500mA.
USB port	Accepts the USB cable for PC connection.
RS-232C port	Accepts the optional RS-232C cable for PC connection.
Square wave output	Outputs a 1kHz square wave for probe compensation and other general purposes.
LCD display	3.8 inch, 320 x 240 resolution, color LCD display.
OSC OPTION key + Arrow keys	DSO Sets the following parameters: vertical level and scale (page22), horizontal level and scale (page25), trigger level (page25), and cursor position (page42).

MENU key + Up/Down keys	DSO	Activates the side menu and selects the menu items.
RUN/STOP key	DSO	Manually turns on (run) or off (stop) the trigger. For details, see page25.
RUN/STOP key	DMM	Freezes (stop) or unfreezes (run) the measurement.
AUTOSET key	DSO	Automatically selects the horizontal scale, vertical scale, and trigger level according to the input signal. See page18 for details.
	DMM	Switches the measurement mode. For details, see page87(current), page85(voltage), and page89(impedance).
DMM/OSC key		Switches the operation mode between the oscilloscope and multimeter.
CH1/2 terminal	DSO	Accepts the CH1 and CH2 input signal.
CX terminal	DMM	Accepts the test leads for capacitor measurement.
V/Ω terminal	DMM	Accepts the red lead for voltage, small capacitance, and impedance measurements.
COM terminal	DMM	Accepts the black (ground) lead.
mA terminal	DMM	Accepts the red lead for current measurement.
R switch	DMM	Selects the following measurement: impedance (page89), diode (page91), continuity (page92), capacitance (page93).
V switch	DMM	Selects voltage measurements (page85).
A switch	DMM	Selects current measurements (page87).
Power switch		Turns on or off the GDS-122 power.
F1 – F5 keys		Selects the menu item at the bottom of the display.
Disp contrast sw		Selects the display contrast.

Manual Overview

Overview	This user manual is comprised of seven chapters. If you want to jump start using the GDS-122, go directly to the *Using Oscilloscope* or *Using Multimeter* chapter.
Safety Instructions (page6)	The *Safety Instructions* gives you an overview of important safety-related issues which you should be aware of before, during, and after operations.
Getting Started (page9)	The *Getting Started* chapter provides you with the overview of the GDS-122: main features, package contents, front panel, and user manual (this section).
Using the Oscilloscope (page15)	The *Using the Oscilloscope* chapter describes in detail how to use the GDS-122's oscilloscope functionalities, including the PC software. The chapter starts with simple, basic operations toward more complex measurements and settings. If you are new to the GDS-122, start with the Basic Operations section. For advanced users, the *Menu Tree / Shortcuts* section shows the menu structures and all operations shortcuts.
Using the Multimeter (page83)	The *Using the Multimeter* chapter describes how to use the GDS-122's multimeter functionalities. The most commonly used Voltage, Current, and Resistance sections are listed in the front.
Faq (page95)	The *Faq* chapter lists major problems you might encounter during operations and how to fix or avoid them. Most issues are also listed in the relevant chapters throughout the document.
Specifications (page97)	The GDS-122 specifications are separated in oscilloscope, multimeter, and general parts.
Declaration of conformity (page100)	The *Declaration of Conformity* chapter lists the safety and EMI/EMC standards to which the GDS-122 conforms.
Index (page101)	The *Index* chapter lists most of the keywords used in this manual in an alphabetical order.

USING THE OSCILLOSCOPE

This chapter describes the oscilloscope functionalities in the GDS-122: setting it up and measuring simple waveforms, using advanced measurement functions, and configuring the system settings. The menu tree section at the end gives you an overview of all functionalities and a quick access to each of them. For the multimeter functionalities, see page83.

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Basic Operations

Operation flow

The *Basic Operations* section describes how to set up the GDS-122 and observe an input signal, step-by-step.

1. Powering up the GDS-122
2. Connecting an input signal
3. Using the Autoset / Introducting the display
4. Adjusting the scales
5. Adjusting the waveform position

Advanced operations

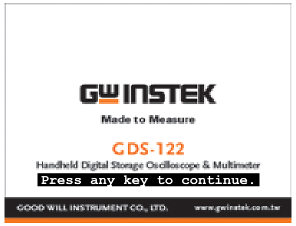
For more advanced or detailed operations, see the following chapters.

- *Configurations* (page22)
- *Measurements* (page39)
- *Advanced Viewings* (page45)
- *Calibrations* (page51)

1. Powering up the GDS-122

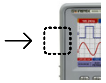
1. Pressing the power switch

Press the power switch. The welcome screen with the corporate logo appears on the display.



GW INSTEK
Made to Measure
GDS-122
Handheld Digital Storage Oscilloscope & Multimeter
Press any key to continue.
GOOD WILL INSTRUMENT CO., LTD. www.gwinstek.com.tw

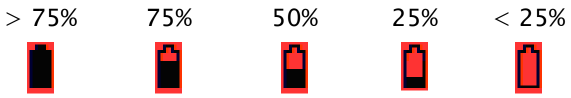
To adjust the display brightness, press the switch on the side. The backlight turns on and off.



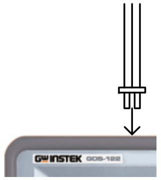
2. Activating the oscilloscope

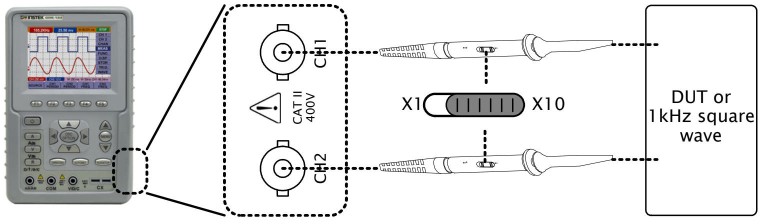
Press any key (for example the MENU key) to enter the oscilloscope mode. See the battery level icon at the top left corner of the display and connect the

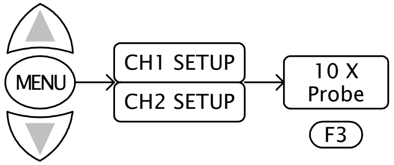
(Example) MENU

	power cord if the level is < 25%. 
Switching the operation mode	If the multimeter screen appears, press the DMM/OSC key and change the mode to oscilloscope. DMM/OSC
Tilt standing the GDS-122	Use the bar at the back to tilt stand the GDS-122 on a horizontal plane.
Note	If pressing the power switch does not turn on the GDS-122, the battery may need recharging. Connect the GDS-122 to the AC adaptor and recharge it for at least 15 minutes.

2. Connecting an input signal

1. Connecting the probe	Connect the probe(s) between the DUT (Device Under Test) and the CH1/2 inputs on the GDS-122. Alternately, you may use the GDS-122's own 1kHz square wave output signal. Insert the signal cable (included in the package) to the output terminal. 
2. Setting the probe attenuation	To prevent excessive input voltage, we recommend you to set the probe attenuation level to the X 10 position to prevent excessive voltage.



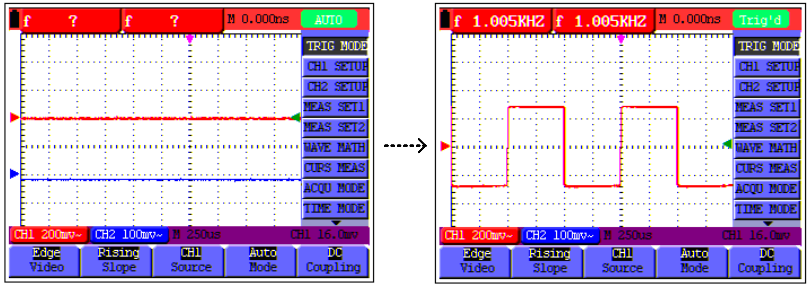
3. Setting the display magnification	1. After attenuating the probe level by x10, you also need to magnify the display level by x10 to match the displayed amplitude with the real amplitude. Open the CH1 or CH2 SETUP menu by pressing the MENU key and using the Up/Down keys. 2. Select the probe attenuation level (10X) by pressing F3 (Probe) repeatedly. The CH1/CH2 vertical scale indicator at the bottom left corner of the display changes accordingly. 

3. Using the Autoset function

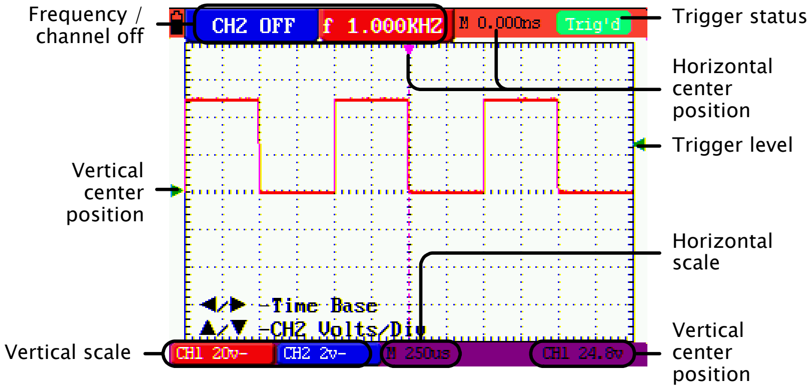
Overview	The Autoset function automatically configures the following parameters according to the input signal. • CH1/CH2 on/off • Vertical scale/level • Horizontal scale/level • Trigger level
Using the Autoset function	Press the AUTOSET key. The input signal appears in the best display condition. AUTOSET

(Continued on next page)

Example


Before
After
f ? f ? M 0.000ns AUTO
f 1.005KHZ f 1.005KHZ M 0.000ns Trig'd
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
CH1 200mv~ CH2 100mv~ M 250us CH1 16.0mv
Edge Video
Rising Slope
CH1 Source
Auto Mode
DC Coupling

4. Introducing the display contents


Frequency / channel off
CH2 OFF
f 1.000KHZ
M 0.000ns
Trig'd
Trigger status
Horizontal center position
Trigger level
Vertical center position
Horizontal scale
◀/▶ -Time Base
▲/▼ -CH2 Volts/Div
Vertical scale
CH1 20v~
CH2 2v~
M 250us
CH1 24.8v
Vertical center position

Trigger status

- Updating the signal (auto mode) AUTO
- The signal is triggered Trig'd
- Waiting for trigger conditions Ready
- Triggering is stopped STOP

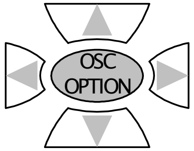
Press the RUN/STOP key to control trigger on/off (run/stop). RUN/STOP

---

5. Adjusting waveform scales

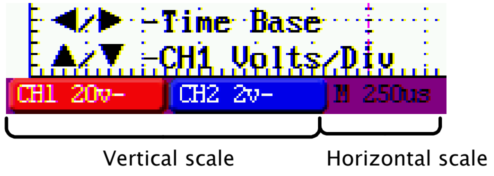
Selecting the menu

Press the OSC OPTION key repeatedly until the following menu appears on the display.



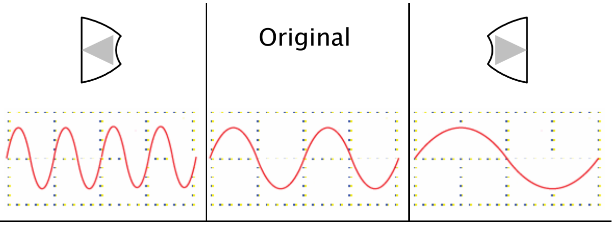
◀/▶ – Time Base

▲/▼ – CH1 (or CH2) Volts/Div


◀/▶ -Time Base
▲/▼ -CH1 Volts/Div
CH1 20v~
CH2 2v~
M 250us
Vertical scale
Horizontal scale

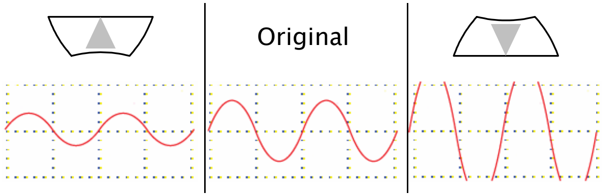
Adjusting the horizontal scale

Use the Left/Right key to change the horizontal scale.



Adjusting the vertical scale

Use the Up/Down key to change the vertical scale.



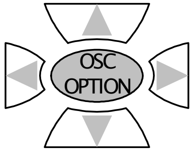
6. Adjusting waveform positions

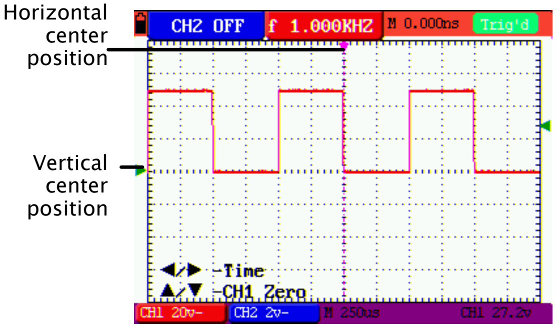
Selecting the menu

Press the OSC OPTION key repeatedly until the following menu appears on the display.

◄/► – Time

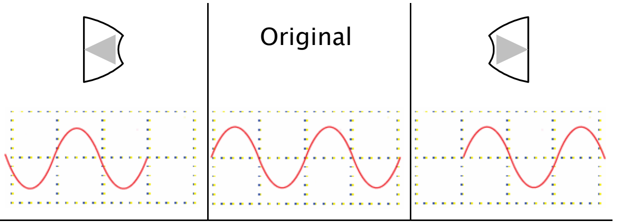
▲/▼ – CH1 (or CH2) Zero





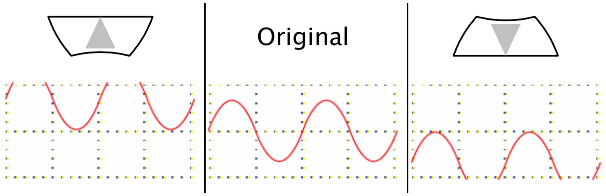
Adjusting the horizontal position

Use the Left/Right key to change the horizontal position.



Adjusting the vertical position

Use the Up/Down key to change the vertical position.



Configurations

Overview

The configuration chapter describes how to change various GDS-122 internal parameters for allowing better measurement condition.

Configuration items

Channel (vertical) settings	page22
Horizontal settings	page25
Trigger settings	page25
Acquisition modes	page30
Display settings	page36
System status (only for viewing)	page37

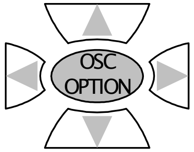
Configuring channel (vertical) settings

Overview

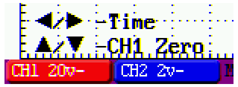
The channel settings configure how the waveform appears in terms of vertical or voltage scale.

Position	Sets the vertical position of the waveform.
Scale	Sets the vertical scale (volts per graticule). Range: 5mV/div to 5V/div
CH on/off	Turns the channel on or off.
Coupling	Selects AC or DC coupling. The DC coupling shows all signal elements, while the AC coupling filters out the DC component from the waveform.
Inversion	Flips the waveform upside down.
Magnifica-tion	Magnifies the displayed units (does not magnify the real signal). The magnification function is useful to align the displayed with probe attenuation (page17), especially X10.

Setting the vertical position

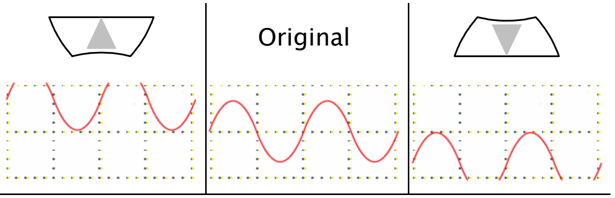


1. Press the OSC OPTION key repeatedly until the following menu appears on the display.
   ◀/▶ – Time
   ▲/▼ – CH1 (or CH2) Zero

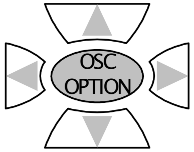


◀/▶ -Time
▲/▼ -CH1 Zero
CH1 20v- CH2 2v-

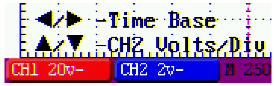
2. Use the Up/Down key to change the vertical position.



Setting the vertical scale

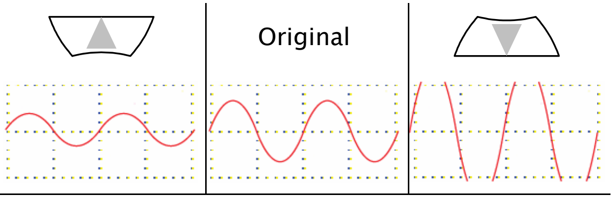


1. Press the OSC OPTION key repeatedly until the following menu appears on the display.
   ◀/▶ – Time Base
   ▲/▼ – CH1 (or 2) Volts/Div



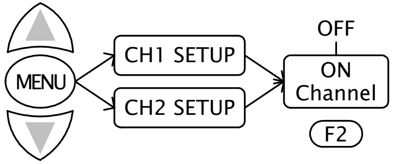
◀/▶ -Time Base
▲/▼ -CH2 Volts/Div
CH1 20v- CH2 2v- M 250

2. Use the Up/Down key to change the vertical scale.



Turning the channel on/off

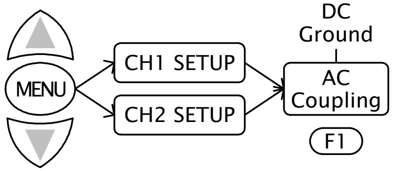
1. Press the MENU key and use the Up/Down keys to select the CH1(CH2) SETUP menu.
2. Press F2 (Channel) repeatedly to turn on or off the channel.



Note that when using the Autoset function (page18), channels are automatically turned on or off.

Selecting the coupling mode

1. Press the MENU key and use the Up/Down keys to select the CH1(CH2) SETUP menu.
2. Press F1 (Coupling) repeatedly to select DC, AC, or Ground coupling.



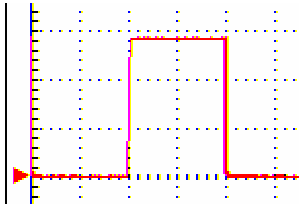
The DC coupling shows both DC and AC signal.

The AC coupling only shows the AC signal.

The Ground coupling shows the ground line.

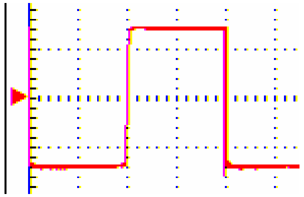
DC coupling

(center point is at the bottom due to DC offset)



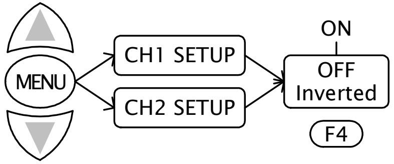
AC coupling

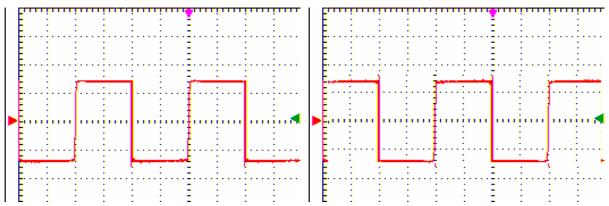
(center point is at the middle since the DC offset is being removed)



Inverting the channel

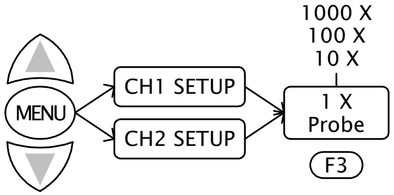
1. Press the MENU key and use the Up/Down keys to select the CH1(CH2) SETUP menu.
2. Press F4 (Inverted) to invert the waveform.


MENU
CH1 SETUP
CH2 SETUP
ON
OFF
Inverted
F4


Invert off Invert on

Selecting the magnification

1. Press the MENU key and use the Up/Down keys to select the CH1(CH2) SETUP menu.
2. Press F3 (Probe) repeatedly to select the probe magnification ratio.


MENU
CH1 SETUP
CH2 SETUP
1000 X
100 X
10 X
1 X
Probe
F3

Configuring horizontal settings

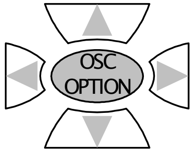
Overview

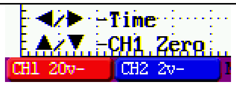
The horizontal settings configure how the waveform appears in terms of horizontal or time scale.

Position	Sets the horizontal position of the waveform.
Scale	Sets the horizontal scale (time per graticule). Range: 100ms/s to 10s/s

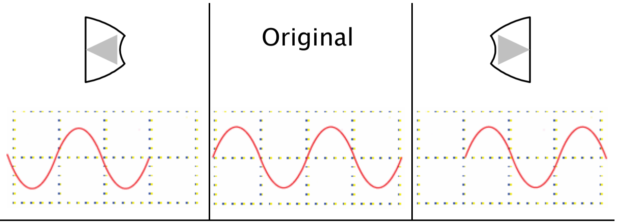
Setting the horizontal position

1. Press the OSC OPTION key repeatedly until the following menu appears on the display.
◄/► – Time



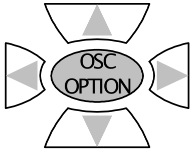

◄/► –Time
▲/▼ –CH1 Zero
CH1 20v- CH2 2v-

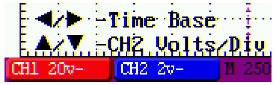
2. Use the Left/Right key to change the horizontal position.



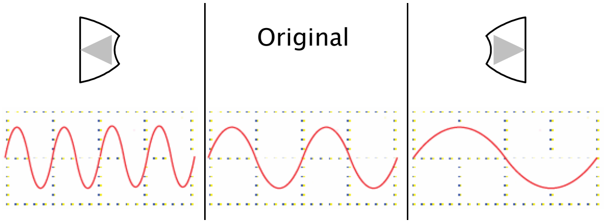
Selecting the horizontal scale

1. Press the OSC OPTION key repeatedly until the following menu appears on the display.
◄/► – Time Base




◄/► –Time Base
▲/▼ –CH2 Volts/Div
CH1 20v- CH2 2v- M 250

2. Use the Left/Right key to change the horizontal scale.



Configuring trigger settings: general settings

Overview

The trigger settings configure how the incoming signal is triggered. The general settings section describes how to start and stop triggering, adjust the level, and change the trigger mode.

- For edge triggering details, see page30.
- For video triggering details, see page33.

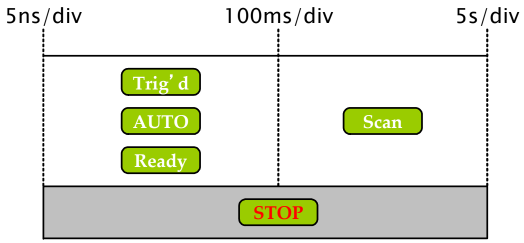
Status	Shows the triggering status in the icon appearing in the upper right corner of the display.
Run/Stop	Controls starting and stopping the trigger.
Level	Adjusts the vertical and horizontal level on which the waveforms are triggered.

Trigger status

The trigger status icon is located at the top right corner of the display.

Trig' d	The trigger condition is met.
AUTO	The GDS-122 is showing the input signal waveform regardless of trigger condition. Available in the Auto trigger mode in edge triggering (page30).
Ready	The trigger condition is not met, and the GDS-122 is waiting for the next condition. Available in the Normal trigger mode in edge triggering (page30).
Scan	The GDS-122 is showing the input signal waveform regardless of trigger condition. The waveform is gradually updated from the left side of the display. The GDS-122 automatically switches to the Scan when the horizontal scale is at 100ms/div or longer.
STOP	Triggering is stopped regardless of the trigger condition. In order to restart triggering, you have to press the RUN/STOP key again (in single trigger mode) or switch to another trigger mode.

Horizontal scale vs. trigger status



Run/Stop

Pressing the Run/Stop key once stops triggering at most situations and changes the trigger icon to STOP.

RUN/STOP

STOP

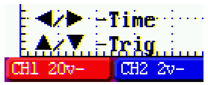
In the single trigger mode in edge triggering (page30), pressing the RUN/STOP key works as both activating and deactivating trigger.

Trigger level

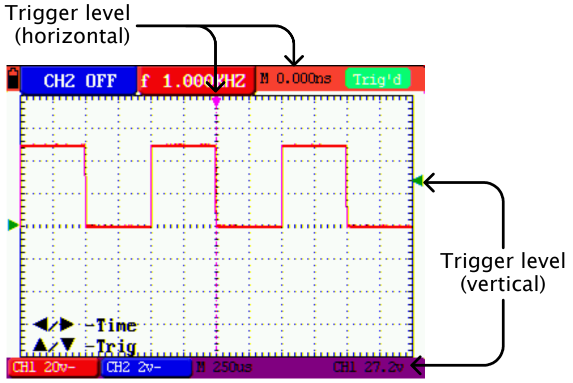
Press the OSC OPTION key repeatedly until the following menu appears on the display.

OSC OPTION

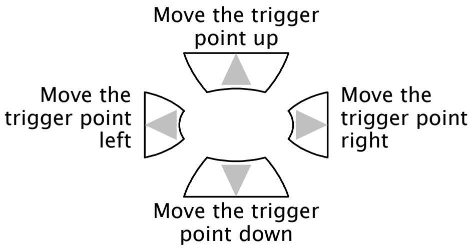
◀/▶ – Time
▲/▼ – Trig



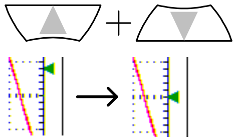
Trigger level indicators



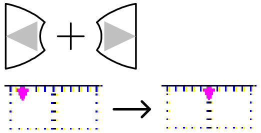
Use the arrow keys to change the triggering position.


Move the trigger point up
Move the trigger point left
Move the trigger point right
Move the trigger point down

Pressing the Up and Down key together resets the vertical trigger level to zero.



Pressing the Left and Right key together resets the horizontal trigger level to zero.



Configuring trigger settings: edge triggering

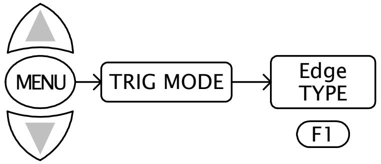
Overview

The edge trigger type triggers on the incoming signal edge. Use the edge trigger for all signals except for video related ones.

- For general trigger settings, see page27.
- For video triggering details, see page33.

To select edge triggering, follow these steps.

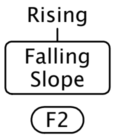
1. Press the MENU key and use the Up/Down keys to select TRIG MODE menu.
2. Press F1 (Type) to select the Edge trigger type.


MENU
TRIG MODE
Edge TYPE
F1

Slope	Selects the slope, rising or falling, on which the GDS-122 triggers the input signals.
Source	Selects the signal source channel, CH1 or CH2.
Mode	Selects the triggering mode, Auto (acquires signal continuously), Normal (acquires signal when trigger conditions are met), and Single (manually triggers the signal).
Coupling	Selects the DC or AC coupling and rejection filters: high frequency or low frequency.

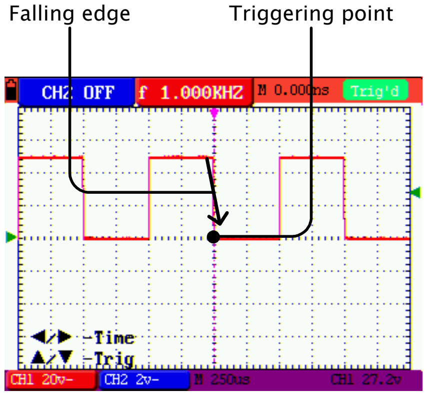
Selecting the trigger slope

Press F2 (Slope) repeatedly to select the rising or falling slope.


Rising
Falling Slope
F2

(Continues to the next page)

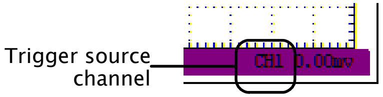
Example: falling edge



Selecting the source channel

Press F3 (Channel) repeatedly to select the trigger source channel, CH1 or CH2. The trigger channel indicator at the bottom right corner of the display changes.

CH2
CH1
Source
F3



Selecting the trigger mode

Press F4 (Mode) repeatedly to select the trigger mode. The trigger status icon in the upper right corner of the display changes accordingly. For the overview of trigger status in general, see page27.

Auto
Normal
Single
Mode
F4

Auto mode

In the auto mode, input signals are constantly acquired and shown in the display regardless of trigger condition.

Horizontal scale (/div)	5ns	100ms	5s
Status icon when triggered	Trig' d	Scan	
Status icon when not triggered	AUTO	Scan	

Normal mode

In the normal mode, input signals are shown in the display only if the trigger condition is met.

Horizontal scale (/div)	5ns	100ms	5s
Status icon when triggered	Trig' d	Scan	
Status icon when not triggered	Ready	Scan	

Single mode

In the single mode, you manually trigger the GDS-122 by pressing the RUN/STOP key each time you need to observe the waveform. Once the waveform is captured, the GDS-122 stops triggering and waits for the next trigger command.

Horizontal scale (/div)	5ns	100ms	5s
Status icon when triggered	STOP	STOP	
Status icon when not triggered	AUTO ↕ Ready	Scan	

Selecting the coupling mode

Press F5 (Coupling) repeatedly to select the trigger coupling.

- AC: triggers only on the AC portion of the waveform.
- DC: triggers on the whole waveform (AC + DC).
- LF Rjc: filters out the lower frequency when triggering.
- HF Rjc: filters out the higher frequency when triggering.

AC
LF Rjc
HF Rjc
DC
Coupling
F5

Configuring trigger settings: video triggering

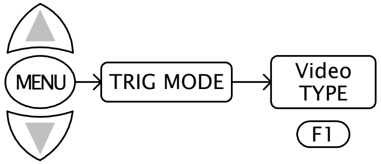
Overview

The video trigger type is designed to capture the video signal format, NTSC, PAL, or SECAM. For any other signal type, use the edge trigger.

- For general trigger settings, see page27.
- For edge triggering details, see page30.

To select edge triggering, follow these steps.

1. Press the MENU key and use the Up/Down keys to select TRIG MODE menu.
2. Press F1 (Type) to select the video trigger type.

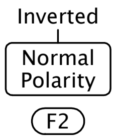

MENU
TRIG MODE
Video
TYPE
F1

Polarity	Selects the polarity of synchronization signal. Normal means the black level is low. Invert means the black level is high.
Source	Selects the signal source channel, CH1 or CH2.
Sync	Selects the part of the video signal used for synchronization: line or field.

Selecting the trigger polarity

Press F2 (Polarity) repeatedly to select the polarity of synchronization signal.

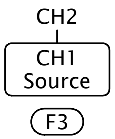
- Normal: the black level is low.
- Inverted: the black level is high.

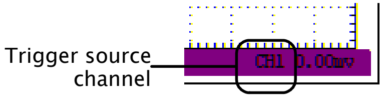

Inverted
Normal
Polarity
F2

(Continues to the next page)

Selecting the source channel

Press F3 (Channel) repeatedly to select the trigger source channel, CH1 or CH2. The trigger channel indicator at the bottom right corner of the display changes.

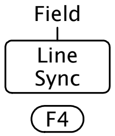

CH2
CH1
Source
F3


Trigger source
channel
CH1 0.00mv

Selecting the sync

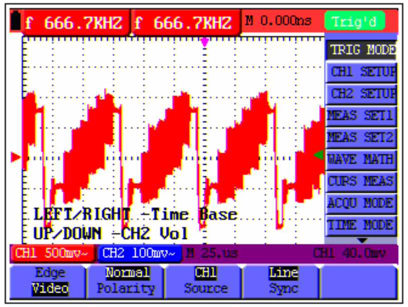
Press F4 (Polarity) repeatedly to select the synchronization point.

- Line: the video line is used for triggering.
- Field: the video field is used for triggering.

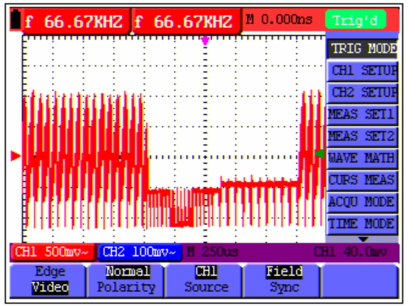

Field
Line
Sync
F4

Example

Video line trigger


f 666.7KHZ
f 666.7KHZ
M 0.000ns
Trig'd
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
LEFT/RIGHT -Time Base
UP/DOWN -CH2 Vol
CH1 500mv~
CH2 100mv~
M 25.us
CH1 40.0mv
Edge
Video
Normal
Polarity
CH1
Source
Line
Sync

Video field trigger


f 66.67KHZ
f 66.67KHZ
M 0.000ns
Trig'd
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
CH1 500mv~
CH2 100mv~
M 250us
CH1 40.0mv
Edge
Video
Normal
Polarity
CH1
Source
Field
Sync

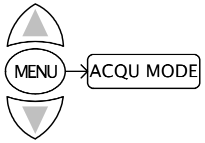
Selecting the acquisition mode

Overview The acquisition mode specifies how the incoming analog signal is digitally sampled by the GDS-122.

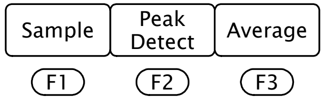
Sample	The waveform data is sampled at an equal time interval. The sample mode accurately reconstructs the waveform, but cannot respond to rapid changes and sudden peaks.
Peak detect	The maximum and minimum data in the sampling interval are picked up. The peak detect mode captures rapid changes and sudden peaks, but the waveform becomes noisy.
Average	Multiple samples are averaged together. The average mode reduces the noise level, but the waveform must be repetitive. The number of averaging are 4, 16, 64, and 128.

Panel operations

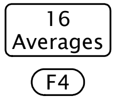
1. Press the MENU key and select the ACQU MODE menu using the Up/Down keys.



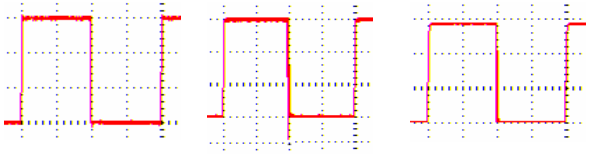
2. Select the acquisition mode from F1 (Sample) to F3 (Average).



For the Average mode, also press F4 (Averages) repeatedly to select the number of averaging: 4, 16, 64, or 128.



Example



Sample Peak detect Average (16)

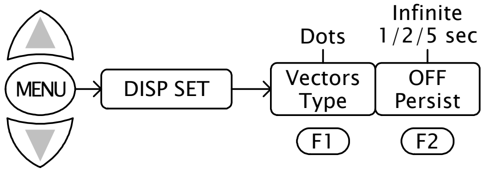
Configuring display settings

Overview The display settings configure how the waveforms are drawn in the display.

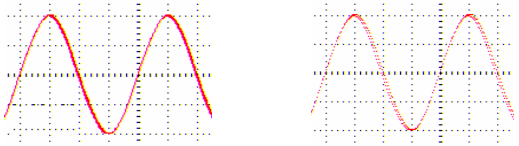
vector drawing	The vector drawing mode shows the waveform as a smooth line, connecting each data point.
dot drawing	The dot drawing mode shows the waveform as a collection of independent data points.
persistence	The persistence setting sets how long the old waveforms remain in the display, useful for observing the waveform variations.

Panel operations

1. Press the MENU key and use the Up/Down keys to select the DISP SET menu.
2. Press F1 (Type) or F2 (Persist) repeatedly to select vector drawing, dot drawing, and persistence time.

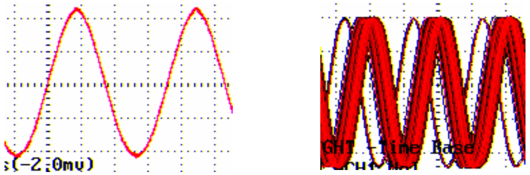


Vector/dot drawing example



Vector Dot

Persistence example



Persistence off Persistence infinite

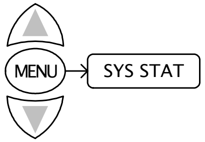
Viewing the system status

Overview

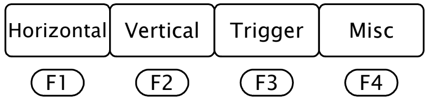
The system status menu shows the GDS-122 system settings.

Panel operations

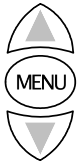
1. Press the MENU key and select the SYS STAT menu using the Up/Down keys.



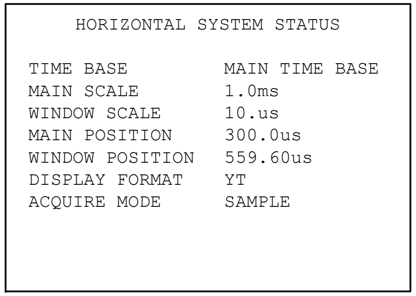
2. Select the status menu from F1 (Horizontal) to F4 (Misc) and press it. The status information appears in the display.



3. To close the system status screen, select different menus using the MENU key followed by Up/Down keys.



Horizontal status (F1)



```
HORIZONTAL SYSTEM STATUS

TIME BASE          MAIN TIME BASE
MAIN SCALE         1.0ms
WINDOW SCALE       10.us
MAIN POSITION      300.0us
WINDOW POSITION    559.60us
DISPLAY FORMAT     YT
ACQUIRE MODE       SAMPLE
```

For details of each item, see the following pages.

Time base: page25

Main/window scale: page45

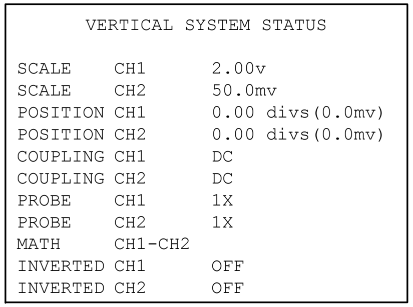
Main/window position: page45

Display format: page47 (XY)

Acquire mode: page35

(Continues to the next page)

Vertical status (F2)



```
VERTICAL SYSTEM STATUS

SCALE    CH1       2.00v
SCALE    CH2       50.0mv
POSITION CH1       0.00 divs(0.0mv)
POSITION CH2       0.00 divs(0.0mv)
COUPLING CH1       DC
COUPLING CH2       DC
PROBE    CH1       1X
PROBE    CH2       1X
MATH     CH1-CH2
INVERTED CH1       OFF
INVERTED CH2       OFF
```

For details of each item, see the following pages.

CH1/CH2 scale: page22

CH1/CH2 position: page22

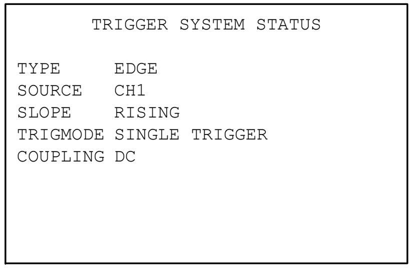
CH1/CH2 coupling: page22

CH1/CH2 probe: page22

Math mode: page39

CH1/CH2 invert: page22

Trigger status (F3): Edge trigger



```
TRIGGER SYSTEM STATUS

TYPE     EDGE
SOURCE   CH1
SLOPE    RISING
TRIGMODE SINGLE TRIGGER
COUPLING DC
```

For details of each item, see the following pages.

Trigger type: page30

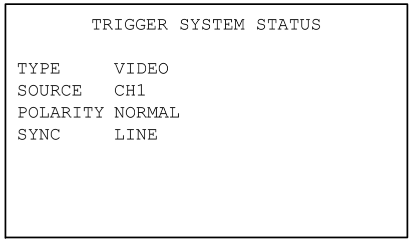
Trigger source: page30

Trigger slope: page30

Trigger mode: page30

Trigger coupling: page30

Trigger status (F3): Video trigger



```
TRIGGER SYSTEM STATUS

TYPE     VIDEO
SOURCE   CH1
POLARITY NORMAL
SYNC     LINE
```

For details of each item, see the following pages.

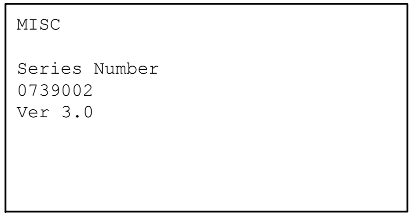
Trigger type: page33

Trigger source: page33

Trigger polarity: page33

Trigger sync: page33

Misc status (F4)



```
MISC

Series Number
0739002
Ver 3.0
```

The Misc status shows the serial number and firmware version.

Measurements

Overview The advanced measurement functions allow you to automatically measure various parameters in a waveform.

Measurement items

Waveform math	page39
Automatic measurements	page41
Time cursor measurement	page42
Voltage cursor measurement	page43

Running waveform maths

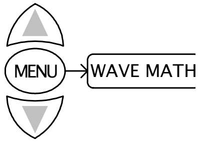
Overview The waveform math function runs mathematical operations between CH1 and CH2 waveform, and then shows the result in the display.

Math type

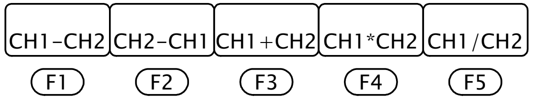
- CH1 – CH2 (subtract CH2 from CH1)
- CH2 – CH1 (subtract CH1 from CH2)
- CH1 + CH2 (add CH1 and CH2)
- CH1 * CH2 (multiply CH1 and CH2)
- CH1 / CH2 (divide CH1 by CH2)

Panel operations

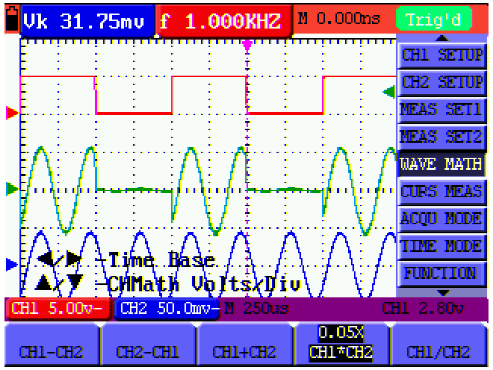
1. Make sure that both CH1 and CH2 waveforms are shown in the display.
2. Press the MENU key and select the WAVE MATH menu using the Up/Down keys.


MENU
WAVE MATH

3. Select the math operation from F1 (CH1 – CH2) to F5 (CH1 / CH2) and press it.


CH1-CH2
CH2-CH1
CH1+CH2
CH1*CH2
CH1/CH2
F1
F2
F3
F4
F5

4. The math result appears in the display (example: adding two square waveforms)

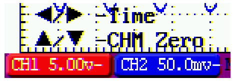

Vk 31.75mv
f 1.000KHZ
M 0.000ns
Trig'd
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
FUNCTION
◀/▶ -Time Base
▲/▼ -CHMath Volts/Div
CH1 5.00v-
CH2 50.0mv-
M 250us
CH1 2.80v
0.05X
CH1-CH2
CH2-CH1
CH1+CH2
CH1*CH2
CH1/CH2

5. To cancel the math result, press the function key (F1 to F5) again.

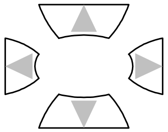
Changing the math result position

1. Press the OSC OPTION key. Make sure the following menu appears on the display.

◀/▶ – Time
▲/▼ – CHM Zero


◀/▶ -Time
▲/▼ -CHM Zero
CH1 5.00v-
CH2 50.0mv-

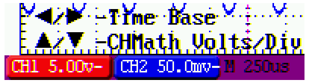
2. Use the arrow keys to move the math result position.



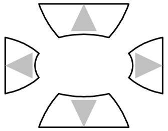
Changing the math result scale

1. Press the OSC OPTION key repeatedly until the following menu appears on the display.

◀/▶ – Time Base
▲/▼ – CHMath Volts/Div


◀/▶ -Time Base
▲/▼ -CHMath Volts/Div
CH1 5.00v-
CH2 50.0mv-
M 250us

2. Use the arrow keys to change the math result scale.



Saving or recalling the math result The math result waveform can be saved into or recalled from one of the four GDS-122 internal memories. See page53 for details.

Running automatic measurements

Overview The automatic measurement function measures the input signal's characteristics and lists them in the top left corner of the display.

Source signal CH1, CH2

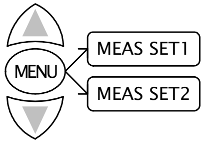
Measurement set SET1, SET2

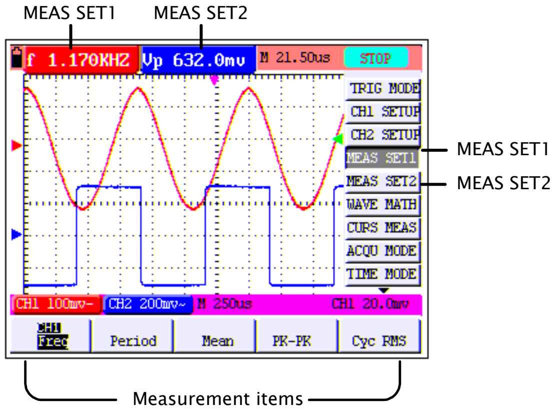
Measurement items The following measurement items are available.

- Frequency
- Period
- Mean voltage
- Peak-to-peak voltage
- Cycle voltage (true RMS)

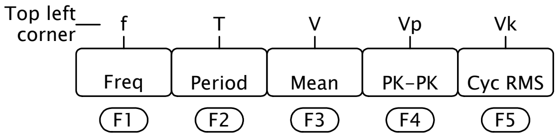
Panel operations

1. Make sure that the waveform appears.
2. Press the MENU key and select the MEAS SET1 or SET2 menu using the Up/Down keys. SET1 and SET2 correspond to the results in the upper left corner of the display.


MENU
MEAS SET1
MEAS SET2


MEAS SET1
MEAS SET2
f 1.170KHZ
Vp 632.0mv
M 21.50us
STOP
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
MEAS SET1
MEAS SET2
CH1 100mv~
CH2 200mv~
M 250us
CH1 20.0mv
CH1 Freq
Period
Mean
PK-PK
Cyc RMS
Measurement items

3. Select the measurement type from F1 (Freq) to F5 (Cyc). Press it repeatedly to select CH1 or 2.


Top left corner
f
T
V
Vp
Vk
Freq
Period
Mean
PK-PK
Cyc RMS
F1
F2
F3
F4
F5

4. The measurement result appears in the top left corner of the display.

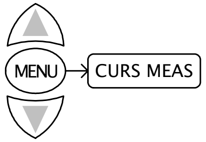
Running time cursor measurements

Overview The time cursor function measures and updates the following three types of time difference.

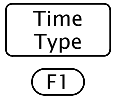
- Between cursor 1 and cursor 2
- Between cursor 1 and center (zero) point
- Between cursor 2 and center (zero) point

Time cursor panel operations

1. Make sure that the waveform appears.
2. Press the MENU key and select the CURS MEAS menu using the Up/Down keys.

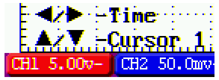

MENU
CURS MEAS

3. Press F1 (Type) repeatedly to select the Time cursor. The cursors appear as vertical purple lines located at the center of the display.

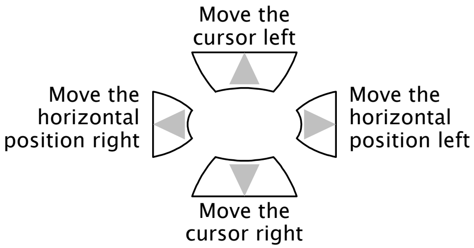

Time Type
F1

4. Press the OSC OPTION key repeatedly until the following menu appears.

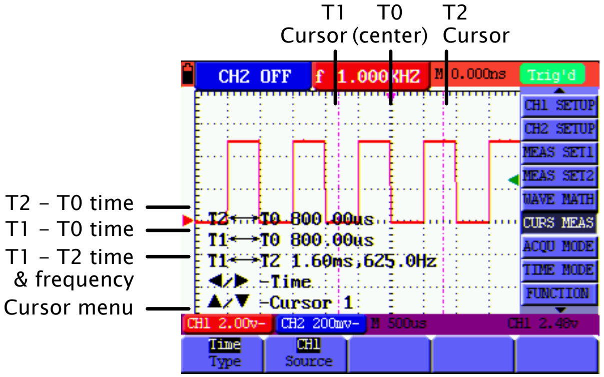
◀/▶ - Time
▲/▼ - Cursor 1(or 2)


◀/▶ -Time
▲/▼ -Cursor 1
CH1 5.00v~
CH2 50.0mv

5. Use the arrow keys to move the cursor or horizontal position.


Move the cursor left
Move the horizontal position right
Move the horizontal position left
Move the cursor right

Display overview (CH1, cursor 2)


T1 Cursor
T0 (center)
T2 Cursor
T2 – T0 time
T1 – T0 time
T1 – T2 time & frequency
Cursor menu
CH2 OFF
f 1.000KHZ
M 0.000ms
Trig'd
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
FUNCTION
CH1 2.00v-
CH2 200mv-
M 500us
CH1 2.48v
Time Type
CH1 Source

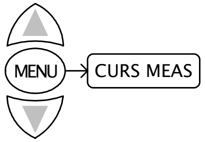
T2←→T0 800.00us
T1←→T0 800.00us
T1←→T2 1.60ms,625.0Hz
◀/▶ -Time
▲/▼ -Cursor 1

Running voltage cursor measurements

Overview	The voltage cursor function measures and updates the following five types of voltage difference. • Between cursor 1 and cursor 2 • Between cursor 1 and CH1 center point • Between cursor 2 and CH1 center point • Between cursor 1 and CH2 center point • Between cursor 2 and CH2 center point
Source signal	CH1 input, CH2 input

Voltage cursor panel operations

1. Make sure the waveform appears.
2. Press the MENU key and select the CURS MEAS menu using the Up/Down keys.


MENU
CURS MEAS

---

3. Press F1 (Type) repeatedly to select the Voltage cursor. The cursors appear as horizontal purple lines located at the center of the display.

Voltage Type
F1

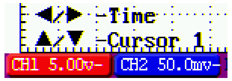
4. Press F2 (Source) repeatedly to select the source channel.

CH1 Source
F2

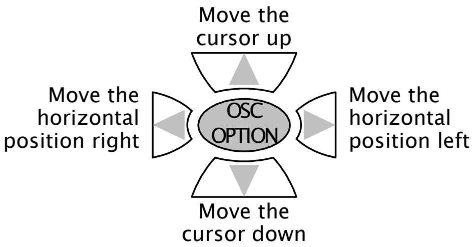
5. Press the OSC OPTION key repeatedly until the following menu appears.

OSC OPTION

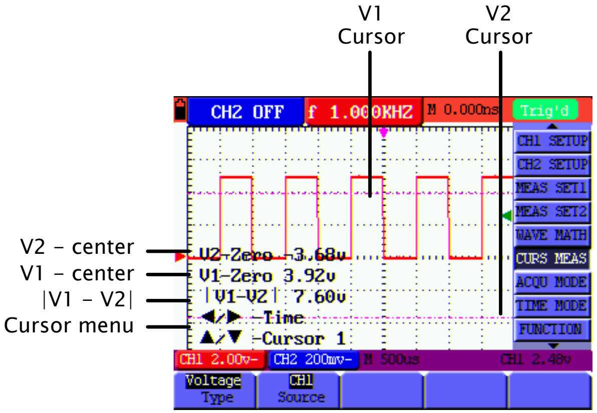
◀/▶ - Time
▲/▼ - Cursor V1 (or V2)


◀/▶ -Time
▲/▼ -Cursor 1
CH1 5.00v-
CH2 50.0mv-

6. Use the arrow keys to move the cursor or horizontal position.


Move the cursor up
Move the horizontal position right
OSC OPTION
Move the horizontal position left
Move the cursor down

Display overview (CH1, cursor 2)


V1 Cursor
V2 Cursor
V2 – center
V1 – center
|V1 – V2|
Cursor menu
CH2 OFF
f 1.000KHZ
M 0.000ns
Trig'd
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
FUNCTION
CH1 2.00v-
CH2 200mv-
M 500us
CH1 2.48v
Voltage Type
CH1 Source

V2-Zero -3.68v
V1-Zero 3.92v
|V1-V2| 7.60v
◀/▶ -Time
▲/▼ -Cursor 1

Advanced Viewings

Overview The advanced viewing functions allow you to clearly observe specific type of waveforms and/or particular characteristics in a waveform.

Viewing items

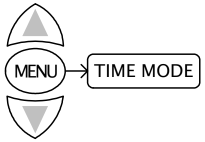
• Waveform zoom	page45
• X-Y format	page47
• Signal peaks	page48
• Noisy signals	page48
• Variations in a signal	page49

Zooming waveforms horizontally

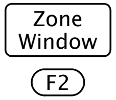
Overview By using the zoom function, you can magnify the waveform in the horizontal direction.

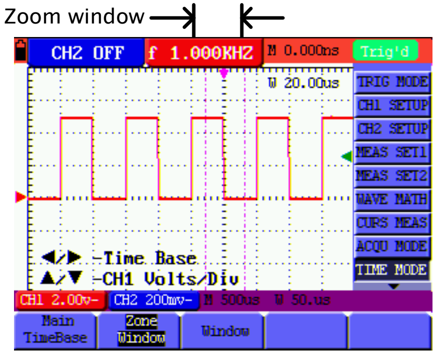
Panel operations

1. Make sure that the waveform appears in the display.
2. Press the MENU key and select the TIME MODE menu using the Up/Down keys.


MENU
TIME MODE

3. Press F2 (Set Window). A set of cursors appears in the center of the display.

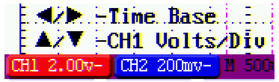

Zone Window
F2


Zoom window
CH2 OFF
f 1.000KHZ
M 0.000ns
Trig'd
W 20.00us
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
◀/▶ -Time Base
▲/▼ -CH1 Volts/Div
CH1 2.00v~
CH2 200mv~
M 500us
W 50.us
Main TimeBase
Zone Window
Window

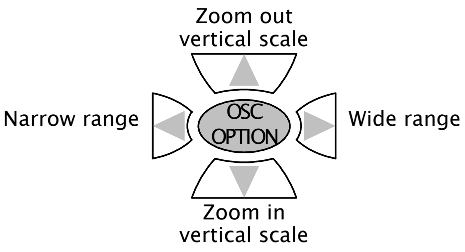
---

4. Press the OSC OPTION key repeatedly until the Time Base menu appears.

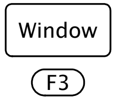
◀/▶ - Time
▲/▼ - Cursor V1
(or Cursor V2)


◀/▶ -Time Base
▲/▼ -CH1 Volts/Div
CH1 2.00v~
CH2 200mv~
M 500

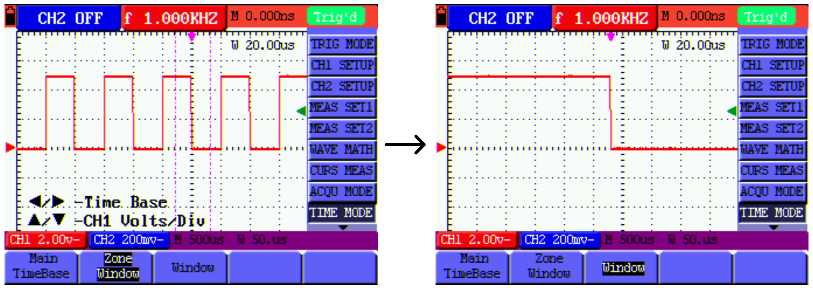
5. Use the arrow keys to change the zoom width.


Zoom out vertical scale
Narrow range
OSC OPTION
Wide range
Zoom in vertical scale

6. Press F3 (Window) to zoom into the window.



Example


CH2 OFF
f 1.000KHZ
M 0.000ns
Trig'd
W 20.00us
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
◀/▶ -Time Base
▲/▼ -CH1 Volts/Div
CH1 2.00v~
CH2 200mv~
M 500us
W 50.us
Main TimeBase
Zone Window
Window

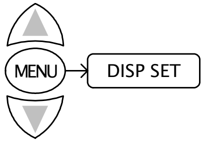
Viewing waveforms in X-Y format

Overview

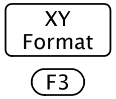
The X-Y format plots the CH1 input as X-axis and CH2 input as Y-axis. This display mode is convenient for viewing the phase relationship between CH1 and CH2.

Panel operations

1. Make sure that both CH1 and CH2 waveforms appear in the display.
2. Press the MENU key and select the DISP SET menu using the Up/Down keys.

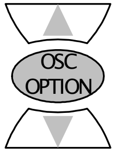


3. Press F3 (Format) and select XY. The display mode switches into the X-Y format.



Changing the scale and position

Press the OSC OPTION key repeatedly to access the menu listed below. In the X-Y mode, all scales and positions are controlled by the Up/Down keys.



- CH1 Zero: horizontal position
- CH2 Zero: vertical position
- CH1 Vol: horizontal scale
- CH2 Vol: vertical scale

Functions not applicable in the X-Y format

The following functions do not work in the X-Y format.

- Cursor measurement (page42, page43)
- Automatic measurement (page41)
- Window zoom (page45)
- Trigger settings configuration (page25)

Viewing signal peaks

Overview

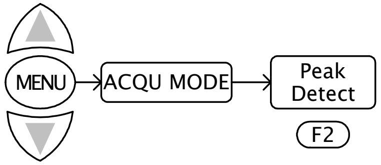
Using the peak detect acquisition mode, the maximum and minimum data in the sampling interval are displayed, capturing the rapid changes and sudden peaks that might spontaneously occur in a waveform.

Note

Since the peak detect mode picks up the most extreme data, the waveform becomes noisier than the normal acquisition mode (sampling mode).

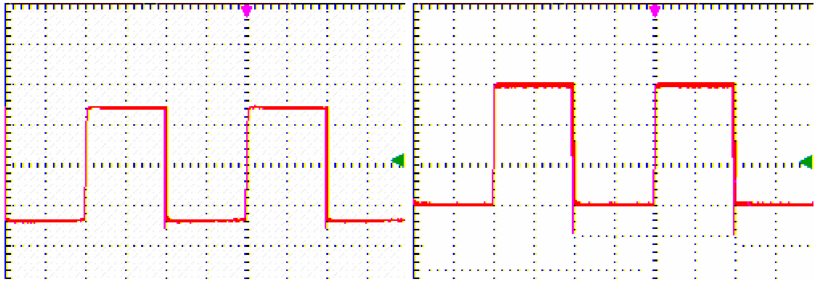
Panel operations

1. Press the MENU key and use the Up/Down keys to select ACQU MODE menu.
2. Press F2 (Peak Detect) to activate the peak detect mode.



For other acquisition settings details, see page30.

Example



Peak detect off

Peak detect on

Viewing noisy signals

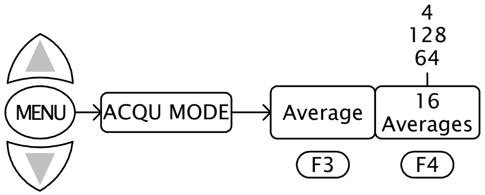
Overview Using the Average acquisition mode, you can smooth out the displayed waveform by averaging multiple data samples. The number of averaging is selectable from 4, 16, 64, and 128.

Note

- In order for the average mode to work in the best way, the waveform must be repetitive.
- As the number of averaging increases, the slower the waveform update becomes.

Panel operations

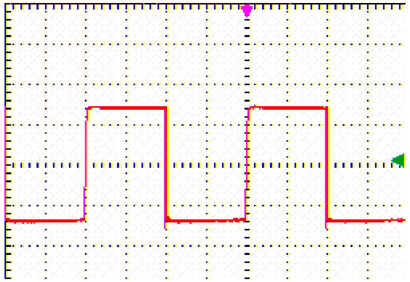
1. Press the MENU key and use the Up/Down keys to select ACQU MODE menu.
2. Press F3 (Average) to activate the average mode.
3. Press F4 (Averages) repeatedly to select the number of averaging.


4
128
64
MENU
ACQU MODE
Average
16
Averages
F3
F4

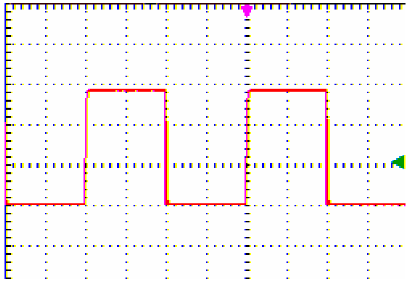
For other acquisition settings details, see page30.

Example

Average off



Average 16

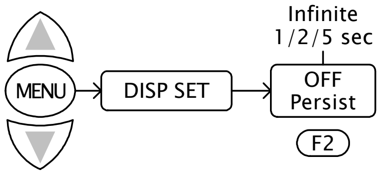


Viewing variations in a signal

Overview Using the persistence display function, you can define sets how long the old waveforms remain in the display, allowing observation of waveform variations. You can select the persistence time from 1, 2, and 5 sec. When choosing the Infinite mode, the GDS-122 keeps all past traces of the displayed waveform.

Panel operations

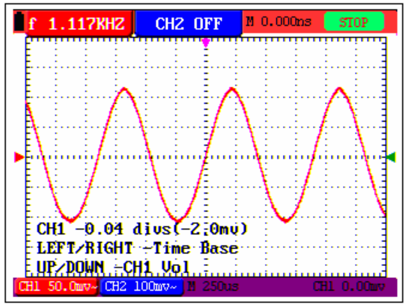
1. Press the MENU key and use the Up/Down keys to select DISP SET menu.
2. Press F2 (Persist) repeatedly to select the persistence time.


Infinite
1/2/5 sec
MENU
DISP SET
OFF
Persist
F2

For other display settings details, see page36.

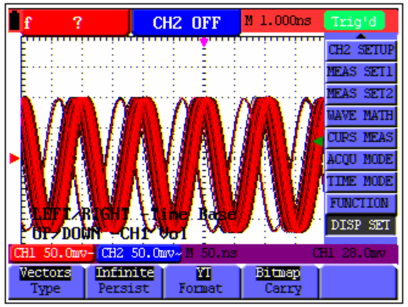
Example

Persistence off


f 1.117KHZ
CH2 OFF
M 0.000ns
STOP
CH1 50.0mv~
CH2 100mv~
M 250us
CH1 0.00mv

CH1 -0.04 divs(-2.0mv)
LEFT/RIGHT -Time Base
UP/DOWN -CH1 Vol

Persistence infinite


f ?
CH2 OFF
M 1.000ns
Trig'd
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
FUNCTION
DISP SET
CH1 50.0mv~
CH2 50.0mv~
M 50.ns
CH1 28.0mv
Vectors
Type
Infinite
Persist
YT
Format
Bitmap
Carry

LEFT/RIGHT -Time Base
UP/DOWN -CH1 Vol

Calibration

Overview The self calibration automatically adjusts the GDS-122 internal parameters. The probe calibration adjusts the probe capacitance. You should run both whenever using the GDS-122 in a new environment.

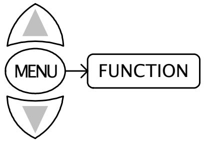
Running the self calibration

Overview The self calibration function automatically configures internal parameters to maintain the sensitivity and accuracy. Run the self calibration in the following cases.

- When the temperature fluctuates more than 5 degrees Celsius during operations
- When operating the GDS-122 in a new benchtop or field environment

Procedure

1. Press the MENU key and select the FUNCTION menu using the Up/Down keys.


MENU
FUNCTION

2. Press F2 (Autocalibration). A message appears on the display, asking you to remove all cables and probes from the GDS-122.

Autocalibration
F2

3. After removing all cables, press F2 (Autocalibration) again. The self-calibration automatically starts and a message appears, showing that the calibration is ongoing.

Autocalibration
F2

4. When the message disappears in 5 minutes, the calibration is completed.

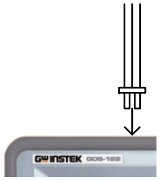
To interrupt calibration Press any key during the calibration.

Running the probe calibration

Overview The attached probe contains a calibration point at the end to adjust the waveform.

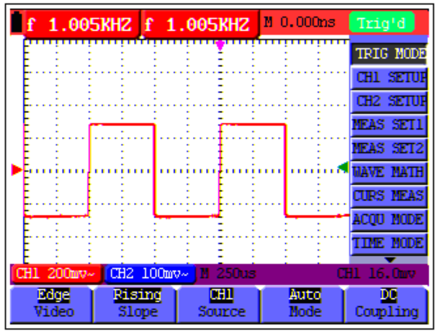
Procedure

1. You may use the GDS-122's own 1kHz square wave output signal. Insert the signal cable (included in the package) to the output terminal.

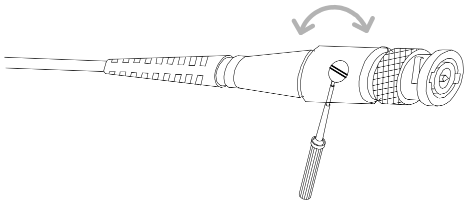

GW INSTEK GDS-122

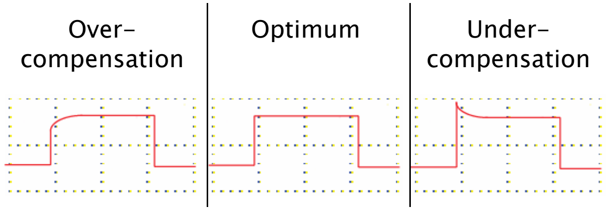
2. Use the Autoset function to put the waveform in the middle of the display.

AUTOSET


f 1.005KHZ
f 1.005KHZ
M 0.000ns
Trig'd
TRIG MODE
CH1 SETUP
CH2 SETUP
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
CH1 200mv~
CH2 100mv~
M 250us
CH1 16.0mv
Edge Video
Rising Slope
CH1 Source
Auto Mode
DC Coupling

3. Adjust the probe calibration point to make sure that the waveform edge remains flat.




Over-compensation
Optimum
Under-compensation

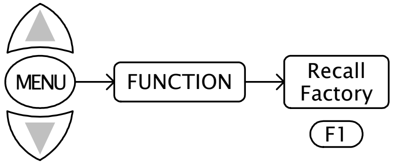
Saving/Recalling Waves and Settings

Overview	The GDS-122 can save or recall four sets of waveforms using its internal memory. When you need to reset the system, recall the default (factory installed) settings.

Save/recall items
- Recalling default settings page53
- Saving waveforms page54
- Recalling waveforms page55

Recalling the default settings

Recalling the default settings	You can recall the default factory settings by pressing the MENU key, then selecting FUNCTION → F1 (Recall Factory).



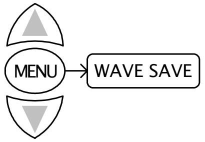
Trigger	Type: Edge Source: CH1 Coupling: AC	Slope: Rising Mode: Auto
CH1 & CH2	Coupling: AC Probe scaling: 1 X	Channel: ON Invert: OFF
Measurement 1	Item: CH1 frequency	
Measurement 2	Item: CH2 frequency	
Cursor	Cursor: OFF	Channel: CH1
Acquisition	Mode: Sample	Average number: 16
Time mode	Mode: Main timebase	
Display	Type: Vector Format: YT	Persistence: OFF Carry: Bitmap
Wave Save	Source: CH1 Display: OFF	Waveform: A

Saving waveforms

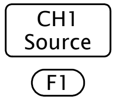
Overview	Up to four waveforms can be stored in and recalled from the GDS-122 internal memory. The stored waveform can be used for reference, comparison, or analysis.
Memory	Four memories: waveform A, B, C, and D.
Source	CH1, CH2, Math waveform

Panel operations

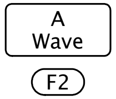
1. Make sure the waveform you want to save (CH1, CH2, or Math result) appears in the display.
   For Math operations details, see page39.
2. Press the MENU key and select the WAVE SAVE menu using the Up/Down keys.



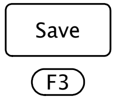
3. Press F1 (Source) repeatedly and select the waveform source.



4. Press F2 (WAVE) repeatedly and select the memory location from A to D.



5. Press F3 (Save) to confirm saving the waveform into the specified memory location. Make sure that the message "WAVE SAVED" appears in the display.



WAVE SAVED

Recalling waveforms

Overview	Up to four waveforms can be stored in and recalled from the GDS-122 internal memory. The stored waveform can be used for reference, comparison, or analysis.
Memory	Four memories: waveform A, B, C, and D.
Source	CH1, CH2, Math waveform

Panel operations

1. Press the MENU key and select the WAVE SAVE menu using the Up/Down keys.

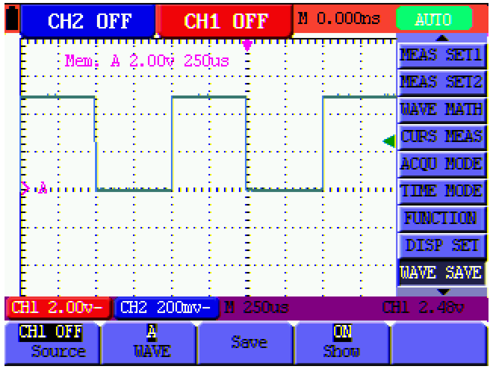
   MENU → WAVE SAVE

2. Press F2 (Wave) repeatedly and select the waveform you want to recall.

   A Wave (F2)

3. Press F4 to turn on the waveform. The waveform appears in the display.

   OFF Show (F4)

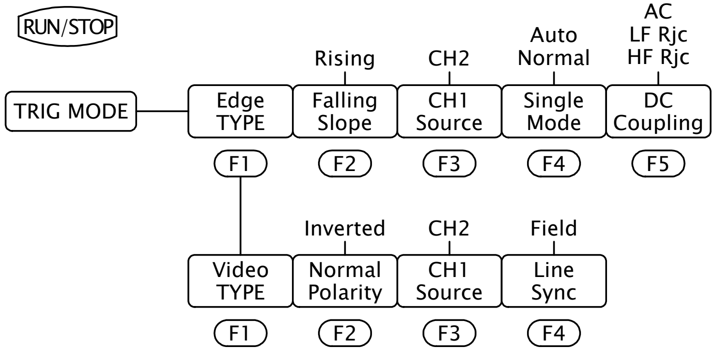

CH2 OFF
CH1 OFF
M 0.000ns
AUTO
Mem: A 2.00v 250us
MEAS SET1
MEAS SET2
WAVE MATH
CURS MEAS
ACQU MODE
TIME MODE
FUNCTION
DISP SET
WAVE SAVE
CH1 2.00v~
CH2 200mv~
M 250us
CH1 2.48v
CH1 OFF Source
A WAVE
Save
ON Show

Note	The recalled waveform maintains its original horizontal scale and vertical scale, which are shown in the top left corner of the display. Changing the current scale does not affect the recalled waveform's shape.

Menu Tree / Operation Shortcuts

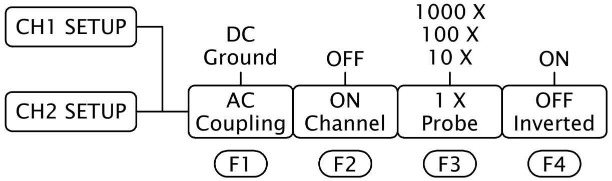
Accessing menus	The following menu trees are accessible by pressing the MENU key followed by Up/Down keys, except for the OSC OPTION key (page60).

Trigger


RUN/STOP
TRIG MODE
Edge TYPE
Rising
Falling Slope
CH2
CH1 Source
Auto
Normal
Single Mode
AC
LF Rjc
HF Rjc
DC Coupling
F1
F2
F3
F4
F5
Video TYPE
Inverted
Normal Polarity
CH2
CH1 Source
Field
Line Sync
F1
F2
F3
F4

Select run or stop mode	RUN/STOP key
Select edge or video trigger	TRIG MODE→F1(TYPE)
Select trigger slope	TRIG MODE→F1(edge)→F2(Slope)
Select trigger source	TRIG MODE→F1→F3(Source)
Select trigger mode	TRIG MODE→F1(edge)→F4(Mode)
Select trigger coupling	TRIG MODE→F1(edge)→F5(Coupling)
Select video polarity	TRIG MODE→F1(video)→F2(Polarity)
Select video line sync	TRIG MODE→F1(video)→F4(Sync)

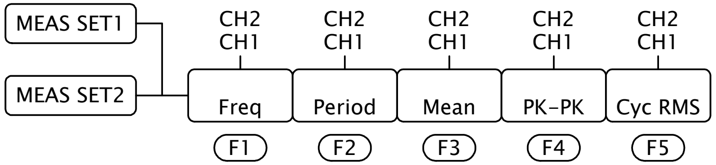
CH1/CH2 Setup


CH1 SETUP
CH2 SETUP
DC
Ground
AC Coupling
OFF
ON Channel
1000 X
100 X
10 X
1 X Probe
ON
OFF Inverted
F1
F2
F3
F4

Select AC, DC, or Ground coupling	CH1/2 SETUP→F1(Coupling)

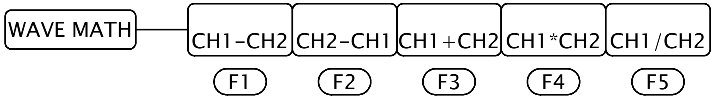
Turn CH1 on or off	CH1/2 SETUP→F2(Channel)
Select probe scaling	CH1/2 SETUP→F3(Probe)
Turn inversion on or off	CH1/2 SETUP→F4(Inverted)

Measurement Setup 1/2


MEAS SET1
MEAS SET2
CH2 CH1
Freq
Period
Mean
PK-PK
Cyc RMS
F1
F2
F3
F4
F5

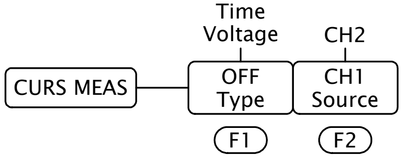
Measure CH1/CH2 frequency	MEAS SET1/2→F1(Freq)
Measure CH1/CH2 period	MEAS SET1/2→F2(Period)
Measure CH1/CH2 mean value	MEAS SET1/2→F3(Mean)
Measure CH1/CH2 peak to peak time	MEAS SET1/2→F4(PK-PK)
Measure CH1/CH2 cycle	MEAS SET1/2→F5(Cyc RMS)

Wave Math


WAVE MATH
CH1-CH2
CH2-CH1
CH1+CH2
CH1*CH2
CH1/CH2
F1
F2
F3
F4
F5

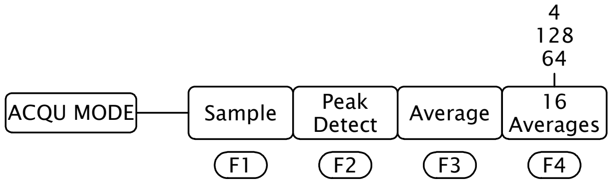
Subtract CH2 from CH1	WAVE MATH→F1(CH1-CH2)
Subtract CH1 from CH2	WAVE MATH→F2(CH2-CH1)
Add CH2 to CH1	WAVE MATH→F3(CH1+CH2)
Multiply CH2 with CH1	WAVE MATH→F4(CH1*CH2)
Divide CH1 by CH2	WAVE MATH→F5(CH1/CH2)

Cursor Measurement


CURS MEAS
Time
Voltage
OFF
Type
CH2
CH1
Source
F1
F2

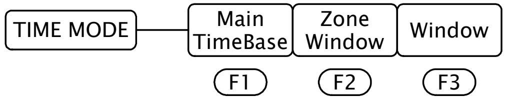
Activate cursor measurement	CURS MEAS→F1(Type)
Select source channel	CURS MEAS→F2(Source)

Acquisition Mode


ACQU MODE
Sample
Peak Detect
Average
4
128
64
16
Averages
F1
F2
F3
F4

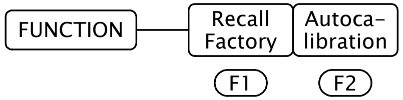
Select sampling mode	ACQU MODE→F1(Sample)
Select peak detect mode	ACQU MODE→F2(Peak Detect)
Select average mode	ACQU MODE→F3(Average)
Select average number	ACQU MODE→F3→F4(Averages)

Time Mode


TIME MODE
Main TimeBase
Zone Window
Window
F1
F2
F3

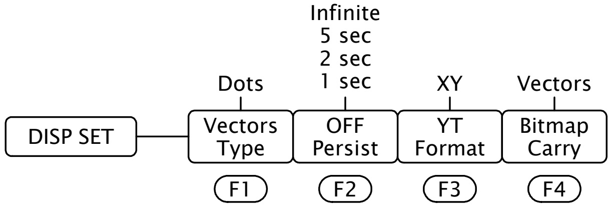
Select main timebase	TIME MODE→F1(Main TimeBase)
Set window zoom width	TIME MODE→F2(Zone Window)
Zoom window	TIME MODE→F3(Window)

Function


FUNCTION
Recall Factory
Autoca-libration
F1
F2

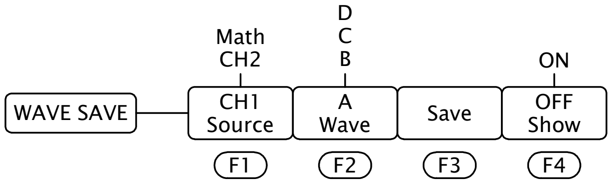
Recall factory settings	FUNCTION→F1(Recall Factory)
Run self calibration	FUNCTION→F2(Autocalibration)

Display


DISP SET
Dots
Vectors
Type
Infinite
5 sec
2 sec
1 sec
OFF
Persist
XY
YT
Format
Vectors
Bitmap
Carry
F1
F2
F3
F4

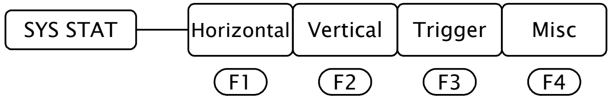
Select line display	DISP SET→F1(Type)
Select persistency	DISP SET→F2(Persist)
Select display format	DISP SET→F3(Format)
Select display save format	DISP SET→F4(Carry)

Wave Save



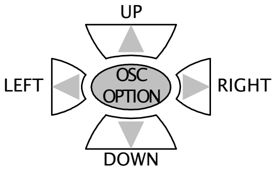
Select source channel	WAVE SAVE→F1(Source)
Select waveform ID	WAVE SAVE→F2(Wave)
Save waveform	WAVE SAVE→F3(Save)
Turn waveform display on or off	WAVE SAVE→F4(Show)

System Status

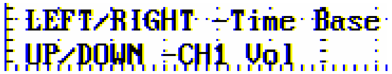


Show horizontal settings	SYS STAT→F1(Horizontal)
Show vertical settings	SYS STAT→F2(Vertical)
Show trigger settings	SYS STAT→F3(Trigger)
Show serial number	SYS STAT→F4(Misc)

OSC OPTION key



Press the OSC OPTION key repeatedly. The menu message appears in the lower half of the display and the functionalities of four keys, UP, DOWN, RIGHT, LEFT, change accordingly.



LEFT/RIGHT -Time Base
UP/DOWN -CH1 Vol

LEFT/RIGHT – Time UP/DOWN – CH1 Zero	◀/▶: CH1/CH2 horizontal position ▲/▼: CH1 vertical position
LEFT/RIGHT – Time UP/DOWN – CH2 Zero	◀/▶: CH1/CH2 horizontal position ▲/▼: CH2 vertical position
LEFT/RIGHT – Time UP/DOWN – Trig	◀/▶: CH1/CH2 horizontal position ▲/▼: Trigger vertical position
LEFT/RIGHT – Time Base UP/DOWN – CH1 Volts\Div	◀/▶: horizontal scale ▲/▼: CH1 vertical scale
LEFT/RIGHT – Time Base UP/DOWN – CH2 Volts/Div	◀/▶: horizontal scale ▲/▼: CH2 vertical scale
(Math mode) ◀/▶ – Time ▲/▼ – CHMath Volts/Div	(Math mode) ◀/▶: Math horizontal position ▲/▼: Math vertical position
(Cursor mode) ◀/▶ – Time ▲/▼ – Cursor 1/2	(Cursor mode) ◀/▶: CH1/CH2 horizontal position ▲/▼: Cursor 1/2 vertical position

Using the Software

Overview

The GDS-122 PC software, included in the CD-ROM, allows you to view the waveforms in your familiar PC environment – large display and mouse operation. Multiple cursors provide flexible waveform measurements.

Software functionalities

The PC software can run the following measurement and actions.

- Viewing real-time updated waveforms
- Running up to 6 cursor measurements
- Measuring period/frequency/pk-pk voltage
- Printing out waveform images
- Saving and recalling waveform shape and data

Software operations

The following is the list of software operations described in this chapter.

- Installing the software page62
- Modifying, reinstalling, or uninstalling the software page64
- Connecting the GDS-122 page65
- Configuring the screen page68
- Viewing waveforms page69
- Measuring waveforms page75
- Saving waveforms page75
- Recalling waveforms page77
- Printing out waveforms page80
- Accessing the Help page82

Note

The PC software is intended for oscilloscope operations only; it does not include multimeter operations.

Installing the software

PC requirements

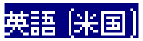
- Windows 2000 or XP
- 20MB hard drive space
- USB host port x 1

Installation steps

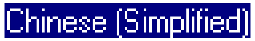
1. Activate the Setup.exe file in the CD-ROM.

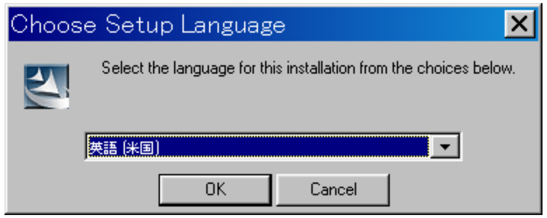
2. The language selection window appears. Select the software language and click *OK* (you can later change the language manually).

English



Simplified Chinese

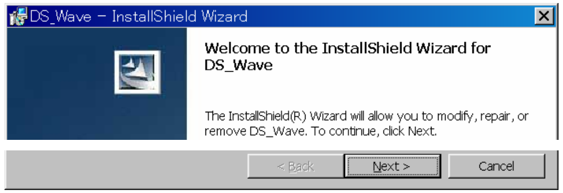



Choose Setup Language

Select the language for this installation from the choices below.

英語 (米国)

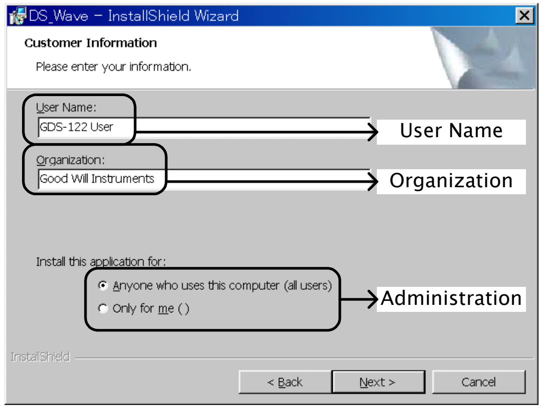
3. The software starts preparing the installation. When the welcome window is displayed, click *Next* and start installing the software to your PC.


DS_Wave – InstallShield Wizard

Welcome to the InstallShield Wizard for DS_Wave

The InstallShield(R) Wizard will allow you to modify, repair, or remove DS_Wave. To continue, click Next.

4. The customer information window will appear. Enter the user name and organization name. Select which user will hold the right to access the software and click *Next*.


DS_Wave – InstallShield Wizard

Customer Information

Please enter your information.

User Name: GDS-122 User

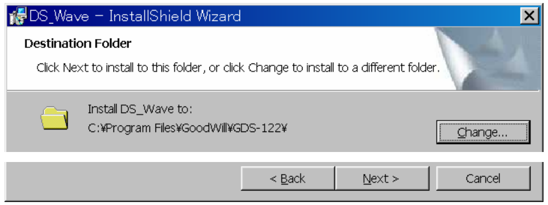
Organization: Good Will Instruments

Install this application for:

● Anyone who uses this computer (all users)

○ Only for me ( )

5. Change the installation directory if necessary and click *Next*.

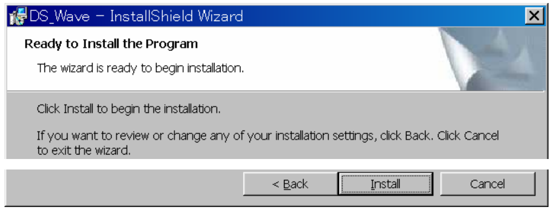

DS_Wave – InstallShield Wizard

Destination Folder

Click Next to install to this folder, or click Change to install to a different folder.

Install DS_Wave to:
C:¥Program Files¥GoodWill¥GDS-122¥

6. Click *Install* to start installing the software.


DS_Wave – InstallShield Wizard

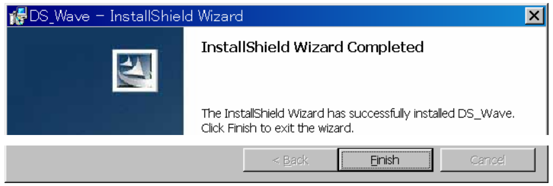
Ready to Install the Program

The wizard is ready to begin installation.

Click Install to begin the installation.

If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.

7. The software installation automatically starts and ends. Click *Finish* to complete installation.


DS_Wave – InstallShield Wizard

InstallShield Wizard Completed

The InstallShield Wizard has successfully installed DS_Wave. Click Finish to exit the wizard.

Installing the software is completed

Modifying/Reinstalling/Uninstalling the software

Overview

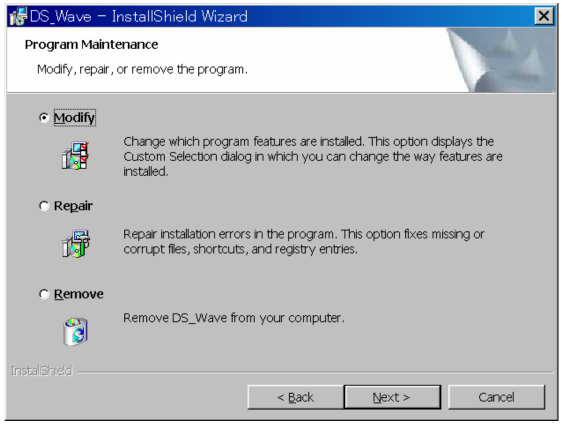
After installing the software, you can do the followings using the same setup file.

- Modifying the software components
- Repairing the software
- Uninstalling the software

Steps

1. Activate the Setup.exe. Follow the same procedures as installing the software until the *Program Maintenance* window appears.

setup.exe


DS_Wave – InstallShield Wizard

Program Maintenance

Modify, repair, or remove the program.

● Modify

Change which program features are installed. This option displays the Custom Selection dialog in which you can change the way features are installed.

○ Repair

Repair installation errors in the program. This option fixes missing or corrupt files, shortcuts, and registry entries.

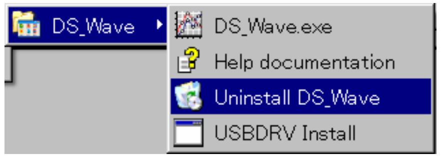
○ Remove

Remove DS_Wave from your computer.

2. Select the action – *Modify* the software components, *Repair* the software, or *Remove* (uninstall) the software – and click *Next*. Proceed according to the instructions.

Shortcut for uninstall

Alternatively, you can select the Uninstall DC_Wave from the program startup menu to uninstall the software.



Activating the software and connecting the GDS-122

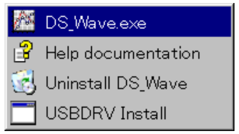
Overview

Activate the software and connect the GDS-122 to it properly by going through these steps, described in the paragraphs that follow.

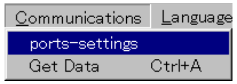
1. Activating the software and configuring the communication port
2. Activating the GDS-122 and configuring the data format
3. Connecting them together and if necessary, installing the USB driver
4. Acquiring waveform data to confirm that the communication is being secured

Activating the software

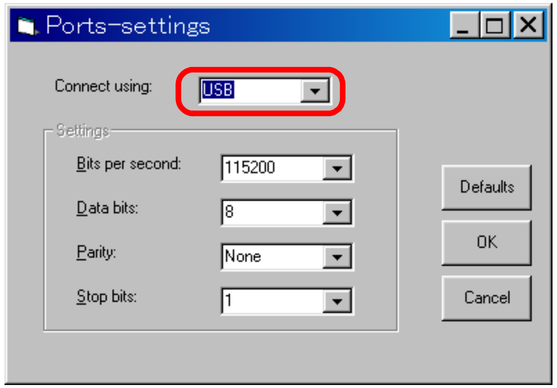
1. Open the software by selecting DS_Wave.exe from the startup menu.


DS_Wave.exe
Help documentation
Uninstall DS_Wave
USBDRV Install

2. Select Communications – Ports Settings from the menu or click the Ports-settings icon on the Toolbar.


Communications
Language
ports-settings
Get Data Ctrl+A

Make sure that USB connection is being selected. The baud rate, stop bit, data bit, and parity settings are fixed.


Ports-settings

Connect using: USB

Settings

Bits per second: 115200

Data bits: 8

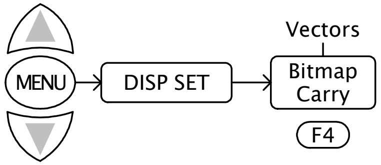
Parity: None

Stop bits: 1

Defaults
OK
Cancel

Activating the GDS-122

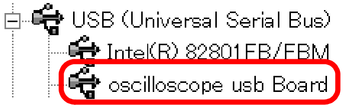
1. Power up the GDS-122 and activate the oscilloscope screen.
2. Connect an input signal to CH1 and make sure that the waveform is shown appropriately on the GDS-122 display.
3. Open the DISP SET menu and press F4 (Carry) to select the format of the waveform data sent from the GDS-122 to the software.


MENU
DISP SET
Vectors
Bitmap
Carry
F4

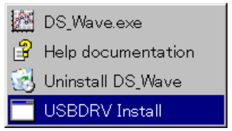
Vectors	Vectored data of the waveform. Always select the vector format when viewing the waveform in the software.
Bitmap	Bitmap image of the display. Select the Bitmap format only when taking the bitmap snapshot of the GDS-122 hardware screen.

Connecting the cable

1. Connect the GDS-122 to the PC (software) via the USB cable.
2. Make sure that the USB driver is installed in your PC by accessing the Device Manager (Control Panel -> System -> Hardware tab). The GDS-122 should be recognized as a USB hub.


USB (Universal Serial Bus)
Intel(R) 82801FB/FBM
oscilloscope usb Board

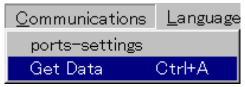
3. If the driver has not been recognized, install it manually by selecting USBDRV Install from the startup menu.


DS_Wave.exe
Help documentation
Uninstall DS_Wave
USBDRV Install

The driver file is located in the USBDRV folder in the software directory.

Acquiring data

In the software, select Communications – Get Data from the menu. Alternatively, you may click the Get data icon, or press the Ctrl + A key.


Communications
Language
ports-settings
Get Data Ctrl+A

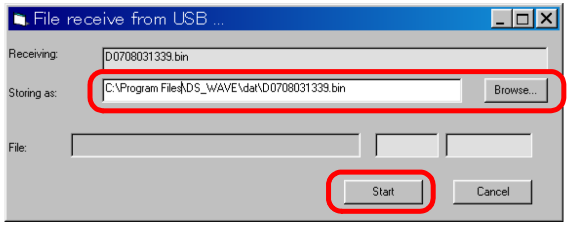
Acquiring the GDS-122 display snapshot

When the “Bitmap” format is selected in the GDS-122 display carry setting, the software acquires the display snapshot (*.bmp) at the moment. Save the file in the local folder and use a graphic software to open and edit it.

Acquiring the GDS-122 waveform

When the “Vectors” format is selected in the GDS-122 display carry setting, the software acquires the waveform data (*.bin) at the moment.

1. The waveform data will be stored in the PC memory to allow to be recalled later (page79). Edit the location and click Start.

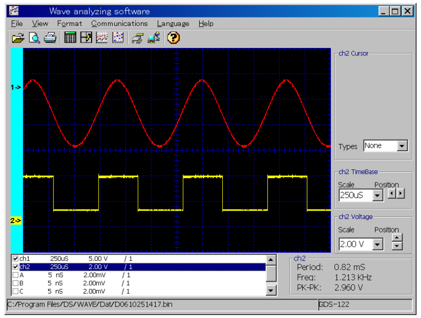

File receive from USB ...

Receiving: D0708031339.bin

Storing as: C:\Program Files\DS_WAVE\dat\D0708031339.bin

Browse...
File:
Start
Cancel

2. The waveform appears in the software screen.


Wave analyzing software
File View Format Communications Language Help
ch2 Cursor
Types None
ch2 TimeBase
Scale Position
250uS
ch2 Voltage
Scale Position
2.00 V
1->
2->

ch1 250uS 5.00 V / 1
ch2 250uS 2.00 V / 1
A 5 nS 2.00mV / 1
B 5 nS 2.00mV / 1
C 5 nS 2.00mV / 1

ch2
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 2.960 V

C:/Program Files/DS/WAVE/Dat/D0610251417.bin
GDS-122

Connecting the GDS-122 to the software is completed

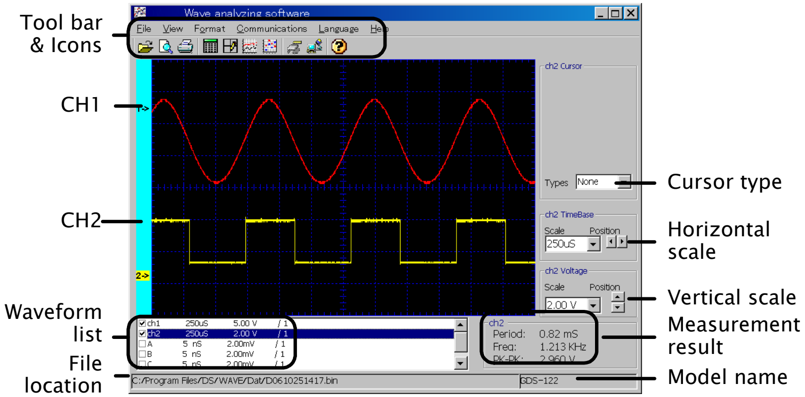
Configuring the screen

Overview

This section introduces how to configure the following parameters in the software screen (waveform viewing mode) to optimize the user interface.

- Background color
- Grid color
- Grid on/off
- Drawing format
- Language
- Closing the software

Screen overview


Tool bar & Icons
CH1
CH2
Waveform list
File location
Cursor type
Horizontal scale
Vertical scale
Measurement result
Model name
Wave analyzing software
File View Format Communications Language Help
ch2 Cursor
Types None
ch2 TimeBase
Scale Position
250uS
ch2 Voltage
Scale Position
2.00 V
1->
2->

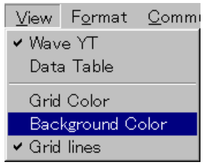
ch1 250uS 5.00 V / 1
ch2 250uS 2.00 V / 1
A 5 nS 2.00mV / 1
B 5 nS 2.00mV / 1
C 5 nS 2.00mV / 1

ch2
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 2.960 V

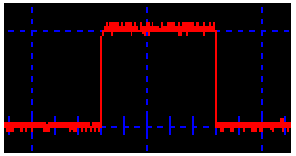
C:/Program Files/DS/WAVE/Dat/D0610251417.bin
GDS-122

Changing the background color

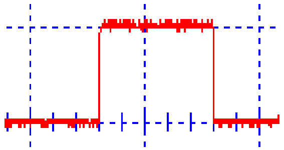
To change the background color, select View > Background Color from the menu and select the new color from the color palette that appears. Alternatively, you can also double click inside the screen to call the color palette.


View
Format
Comm
✓ Wave YT
Data Table
Grid Color
Background Color
✓ Grid lines

Black background

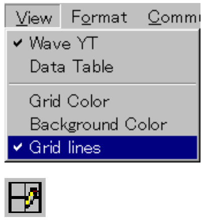


White background

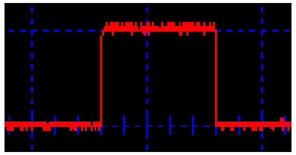


Turning the grid on or off

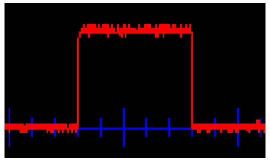
To turn on or off the grid, select View > Grid lines from the menu or click the Gridlines icon.


View
Format
Comm
✓ Wave YT
Data Table
Grid Color
Background Color
✓ Grid lines

Grid on

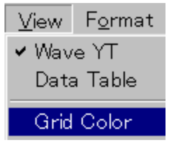


Grid off

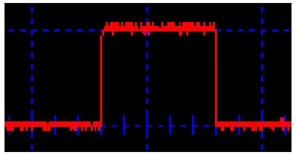


Changing the grid color

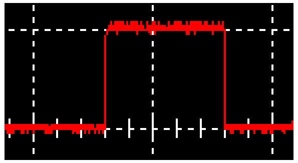
Make sure the grid is already turned on. Select View > Grid Color from the menu and select the new color from the color palette that appears.


View
Format
✓ Wave YT
Data Table
Grid Color

Blue grid



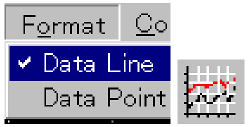
White grid



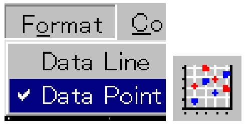
Changing the waveform drawing format

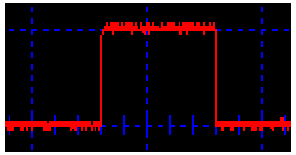
You can select how the waveform is being drawn from two formats, line and dots. Select Format > Data Line (Point) from the menu or click the icons.

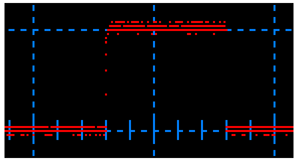
Line


Format
Co
✓ Data Line
Data Point

Point


Format
Co
Data Line
✓ Data Point

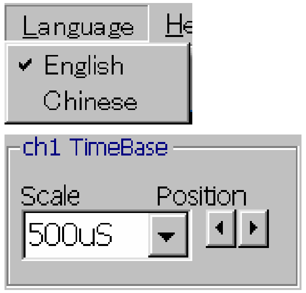




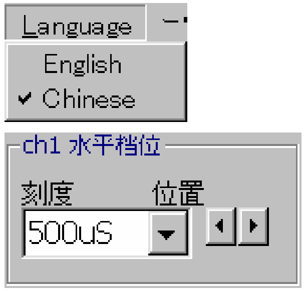
Changing the language

You can select the language from English (default) or Simplified Chinese. Select Language > English (Chinese) from the menu. The Language menu itself always stays as English.

English


Language
He
✓ English
Chinese
ch1 TimeBase
Scale
Position
500uS

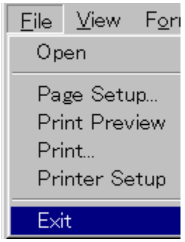
Chinese


Language
English
✓ Chinese
ch1 水平档位
刻度
位置
500uS

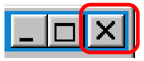
Closing the software

You can close the software in one of the following ways. The screen configurations will be retained the next time you open the software.

- Pressing the Alt + F4 keys
- Selecting File > Exit from the menu


File
View
For
Open
Page Setup...
Print Preview
Print...
Printer Setup
Exit

- Clicking the Close icon at the top right corner of the software



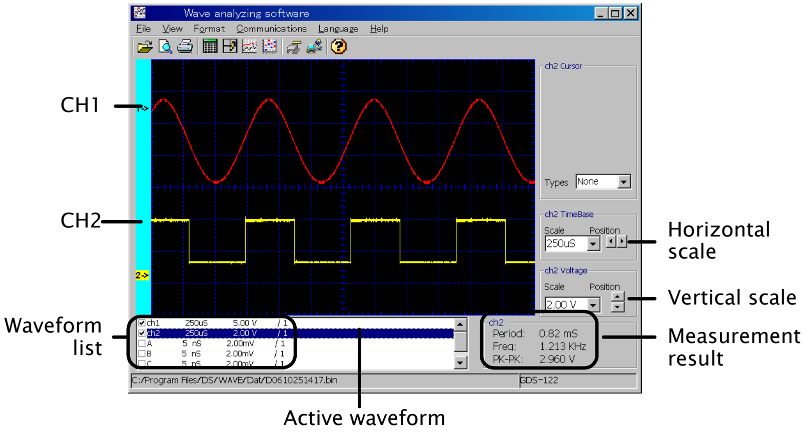
Viewing the waveforms

Overview

This section introduces how to modify the waveform settings for better viewings.

- Selecting the displayed waveforms
- Refreshing the waveforms
- Selecting the active waveform
- Changing the waveform positions
- Changing the waveform scales
- Viewing the automatic measurement results

Screen overview


Wave analyzing software
File View Format Communications Language Help
CH1
CH2
Waveform list
Horizontal scale
Vertical scale
Measurement result
Active waveform
ch2 Cursor
Types None
ch2 TimeBase
Scale Position
ch2 Voltage
Scale Position

☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1
☐ B	5 nS	2.00mV	/ 1
☐ C	5 nS	2.00mV	/ 1

ch2 TimeBase Scale: 250uS

ch2 Voltage Scale: 2.00 V

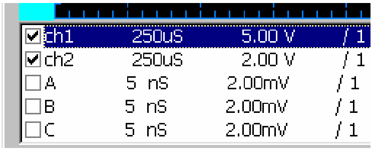
ch2
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 2.960 V

C:/Program Files/DS/WAVE/Dat/D0610251417.bin GDS-122

Selecting the displayed waveforms

In the left bottom corner of the screen, put a checkmark in the waveform that needs to appear. Maximum six waveforms are available: CH1, CH2, A, B, C, D. Waveforms A to D have to be stored in the GDS-122 hardware beforehand (see page54 for details).

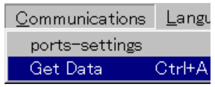
(CH1, CH2 selected)



☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1
☐ B	5 nS	2.00mV	/ 1
☐ C	5 nS	2.00mV	/ 1

Refreshing the waveforms

In the software, select Communications – Get Data from the menu. Alternatively, you may click the Get data icon, or press the shortcut keys, Ctrl + A.

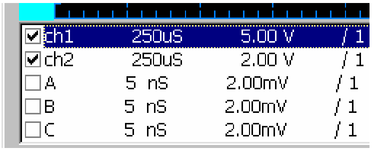

Communications
Langu
ports-settings
Get Data Ctrl+A

Selecting the active waveform

Waveform scale settings and automatic measurements are done on the active waveform.

1. Click on the waveform name in the bottom left corner of the screen.

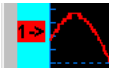
   (CH1 selected as the active waveform)



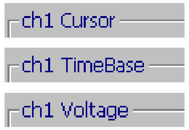
☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1
☐ B	5 nS	2.00mV	/ 1
☐ C	5 nS	2.00mV	/ 1

2. The following locations changes into the selected channel (example: CH1).

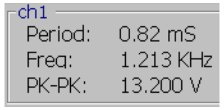
- Colored channel label (at the left side of the screen)



- Cursor, Time base, Voltage settings (at the right side of the screen)


ch1 Cursor
ch1 TimeBase
ch1 Voltage

- Automatic measurement results (at the bottom right corner of the display)

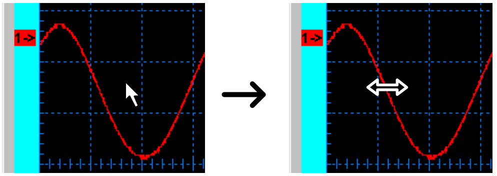


ch1
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 13.200 V

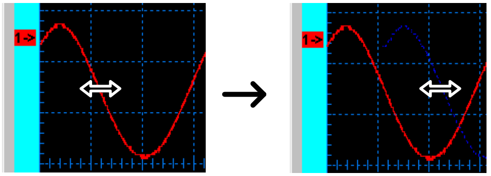
Changing the waveform positions

Changing the horizontal position

1. Move the mouse over the waveform until the mouse icon changes into a left-right arrow.

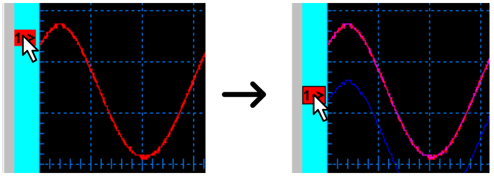


2. Hold the mouse and drag the waveform sideways.



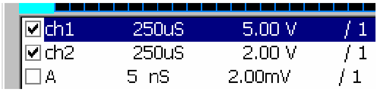
Changing the vertical position

Click the channel label at the left side of the waveform and drag the waveform up or down.



Changing the waveform scales

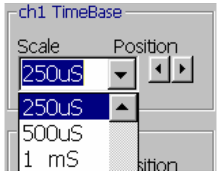
Before changing the scales, make sure that the correct waveform is selected (highlighted) in the lower left corner of the screen (example: CH1).

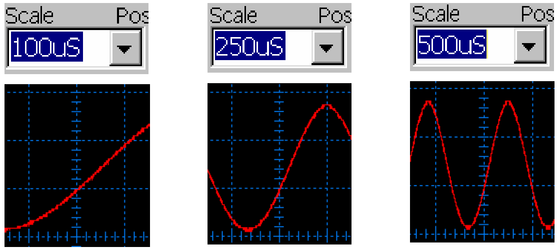


☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1

Changing the horizontal scale

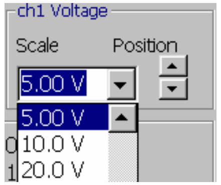
Select the horizontal scale using the list at the right side of the screen. You can select the scale either by searching in the Scale column or by clicking the Position arrows.

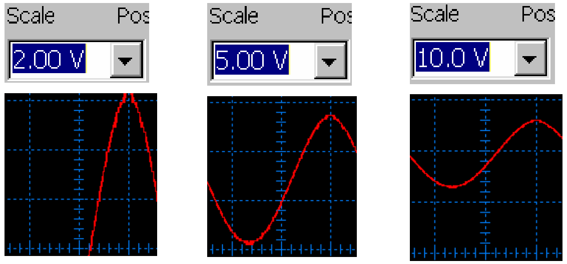

ch1 TimeBase
Scale
Position
250uS
250uS
500uS
1 mS
sition


Scale
Pos
100uS
Scale
Pos
250uS
Scale
Pos
500uS

Changing the vertical scale

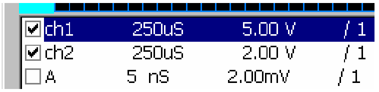
Select the vertical scale using the list at the right side of the screen. You can select the scale either by searching in the Scale column or by clicking the Position arrows.


ch1 Voltage
Scale
Position
5.00 V
5.00 V
10.0 V
20.0 V


Scale
Pos
2.00 V
Scale
Pos
5.00 V
Scale
Pos
10.0 V

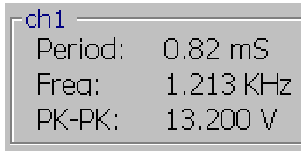
Viewing the automatic measurement results

Before viewing the measurement results, make sure that the correct waveform is selected (highlighted) in the lower left corner of the screen (example: CH1).



☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1

The measurement result is updated in the lower right corner of the screen. Three parameters are listed.



ch1
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 13.200 V

- Period: measures the waveform period in ms.
- Freq: measures the waveform frequency in kHz.
- PK-PK: measures the peak to peak voltage in V.

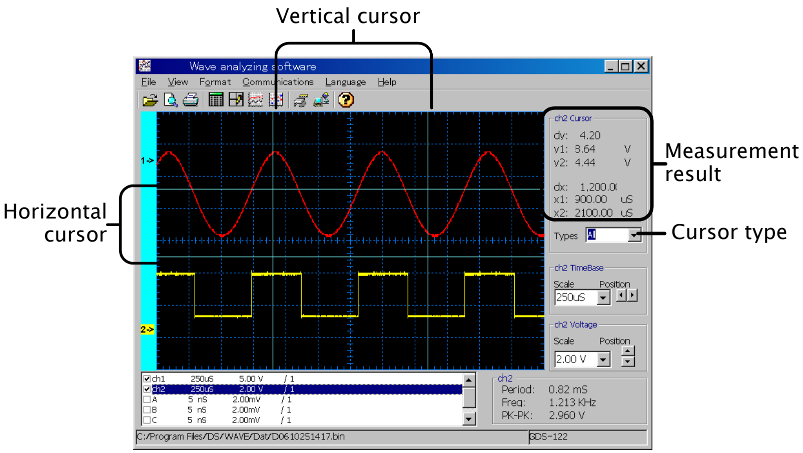
Using the cursor measurements

Overview

This section introduces how to use cursor measurements in the software screen.

- Activating the cursors
- Viewing the cursor measurement results
- Moving the cursors

Screen overview


Vertical cursor
Measurement result
Horizontal cursor
Cursor type
Wave analyzing software
File View Format Communications Language Help
1->
2->
ch2 Cursor
Types
ch2 TimeBase
Scale Position
ch2 Voltage
Scale Position
GDS-122

ch2 Cursor

dy: 4.20
y1: 3.64 V
y2: 4.44 V

dx: 1,200.0(
x1: 900.00 uS
x2: 2100.00 uS

Types All

ch2 TimeBase Scale 250uS

ch2 Voltage Scale 2.00 V

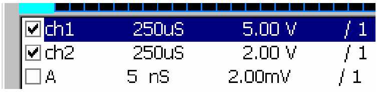
☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1
☐ B	5 nS	2.00mV	/ 1
☐ C	5 nS	2.00mV	/ 1

ch2
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 2.960 V

C:/Program Files/DS/WAVE/Dat/D0610251417.bin

Activating the cursors

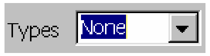
Before activating the cursors, make sure that the correct waveform is selected (highlighted) in the lower left corner of the screen (example: CH1).



☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1

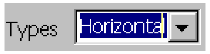
Select the cursors from the list in the right side of the screen.

- None: the cursor is turned off.



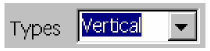
Types None

- Horizontal: the horizontal cursors appear.



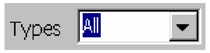
Types Horizontal

- Vertical: the vertical cursors appear.



Types Vertical

- All: both the horizontal and vertical cursors appear.

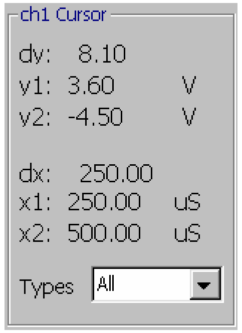


Types All

Viewing the cursor measurement results

The cursor measurement results are updated in the right side of the screen.

- dy: the voltage difference between y1 and y2 cursors
- y1, y2: voltage cursors 1 and 2
- dx: the time difference between x1 and x2 cursors
- x1, x2: time cursors 1 and 2

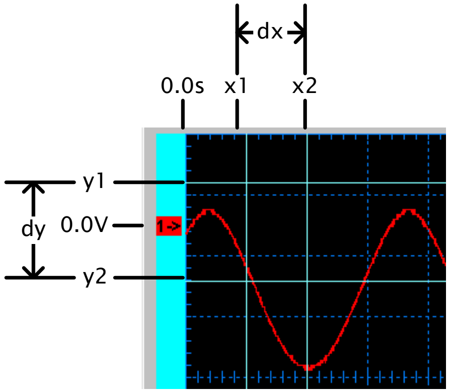


ch1 Cursor

dy: 8.10
y1: 3.60 V
y2: -4.50 V

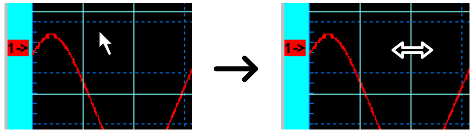
dx: 250.00
x1: 250.00 uS
x2: 500.00 uS

Types All


dx
0.0s
x1
x2
y1
dy
0.0V
y2
1->

Moving the cursors

Move the mouse over the cursor until the mouse icon changes into a left-right arrow. Hold the mouse and drag the cursor sideways (horizontal cursor) or vertically (vertical cursor).



The cursor measurement result changes accordingly.

Saving waveforms

Overview

You can save the waveforms into the PC in two ways. For details of recalling them, see page79.

- Storing waveform data (*.bin file, for viewing in the software)
- Storing data points (*.txt file, for data analysis such as in graphs and maps)

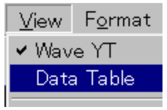
For details of storing waveforms into the GDS-122 hardware, see page54.

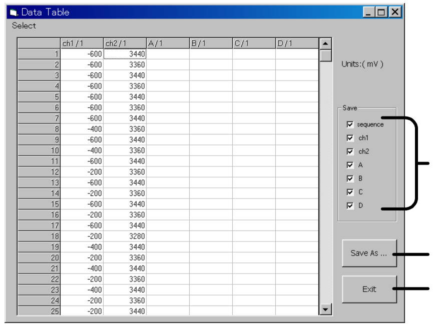
Storing waveform data

When retrieving waveform data from the GDS-122, the waveform data (*.bin format) is automatically stored. For details, see page69.

Storing data point

1. Make sure that the waveform is being displayed in the screen. To recall waveforms that are stored in the PC, see page79.
2. Select View > Data Table from the menu, or click the Data Table icon on the Toolbar. The Data Table dialogue appears.

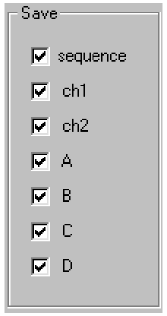

View
Format
✓ Wave YT
Data Table


Data Table
Select
Units:(mV)
Save
☑ sequence
☑ ch1
☑ ch2
☑ A
☑ B
☑ C
☑ D
Save As ...
Exit
Save option
Save data
Close window

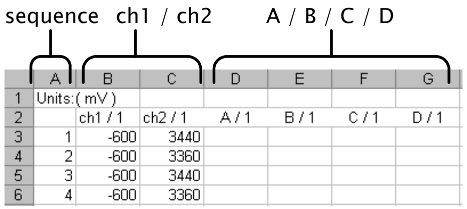
	ch1 / 1	ch2 / 1	A / 1	B / 1	C / 1	D / 1
1	-600	3440				
2	-600	3360				
3	-600	3440				
4	-600	3360				
5	-600	3440				
6	-600	3360				
7	-600	3440				
8	-400	3360				
9	-600	3440				
10	-400	3360				
11	-600	3440				
12	-200	3360				
13	-600	3440				
14	-200	3360				
15	-600	3440				
16	-200	3360				
17	-600	3440				
18	-200	3280				
19	-400	3440				
20	-200	3360				
21	-400	3440				
22	-200	3360				
23	-400	3440				
24	-200	3360				
25	-200	3440				

3. Select the data to be saved from the Save column.

- sequence: the identification number for each data point
- ch1/ch2: CH1 and CH2 waveform data
- A/B/C/D: the waveforms stored in the GDS-122 hardware memory


Save
☑ sequence
☑ ch1
☑ ch2
☑ A
☑ B
☑ C
☑ D

Data points stored in an Excel sheet (example)

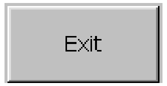

sequence
ch1 / ch2
A / B / C / D

	A	B	C	D	E	F	G
1	Units:(mV)						
2		ch1 / 1	ch2 / 1	A / 1	B / 1	C / 1	D / 1
3	1	-600	3440				
4	2	-600	3360				
5	3	-600	3440				
6	4	-600	3360				

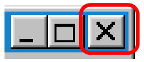
4. Click the Save As… button to save the data into a directory. The standard Save dialog appears.

5. To close the Data Point dialogue, do one of the following actions.

- Press the Ctrl + Alt key
- Click the Exit icon



- Click the Close icon at the top right corner of the dialogue



Recalling waveforms

Overview

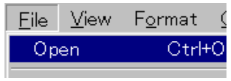
You can recall the waveforms from the PC in two ways. For details of saving them, see page77.

- Recalling waveform data (*.bin file, for viewing in the software)
- Recalling data points (*.txt file, for data analysis such as in graphs and maps)

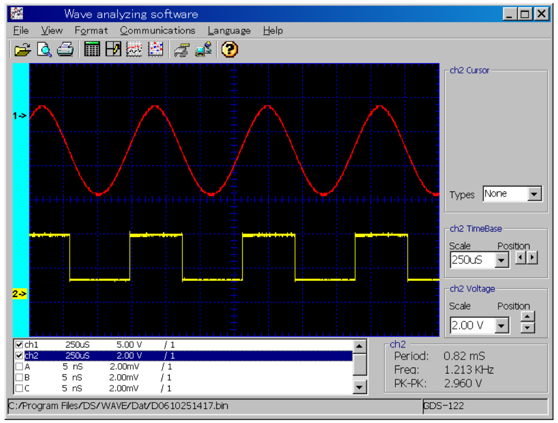
For details of recalling waveforms into the GDS-122 hardware, see page55.

Recalling the waveform data

1. Select File > Open from the menu or press the shortcut key, Ctrl + O.


File
View
Format
Open
Ctrl+O

2. The File Open dialogue opens. Select one of the SPB bin file (*.bin) and click OK.
3. The waveform(s) will be recalled in the screen.


Wave analyzing software
File
View
Format
Communications
Language
Help
1->
2->
ch2 Cursor
Types
None
ch2 TimeBase
Scale
Position
ch2 Voltage
Scale
Position

ch2 TimeBase Scale: 250uS

ch2 Voltage Scale: 2.00 V

☑ ch1	250uS	5.00 V	/ 1
☑ ch2	250uS	2.00 V	/ 1
☐ A	5 nS	2.00mV	/ 1
☐ B	5 nS	2.00mV	/ 1
☐ C	5 nS	2.00mV	/ 1

ch2
Period: 0.82 mS
Freq: 1.213 KHz
PK-PK: 2.960 V

C:/Program Files/DS/WAVE/Dat/D0610251417.bin
GDS-122

Recalling the data points

1. For recalling the data points, you need to open a text editor or a spreadsheet program like Excel, in which you can organize the data and create graphs and maps for advanced analysis.
2. Open the saved *.txt file from the application.

Printing out waveforms

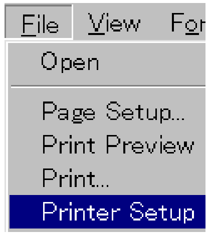
Overview

You can print out the screen contents to a printer connected to the PC. When you are printing the waveform for the first time, follow all the steps in the following order.

1. Setting up the printer
2. Setting up the page format
3. Printing out

Setting up the printer

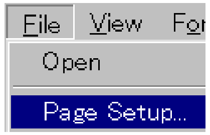
1. Select File > Printer Setup from the menu. The standard printer setting dialogue opens.

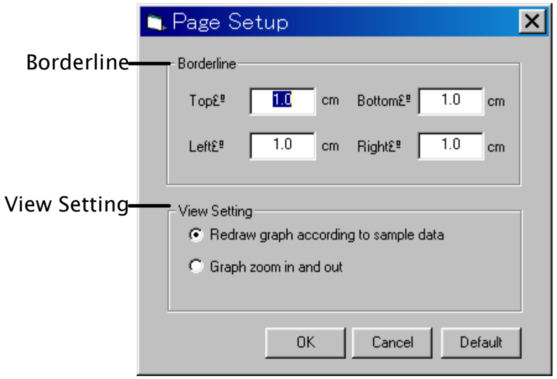

File
View
For
Open
Page Setup...
Print Preview
Print...
Printer Setup

2. Select the printer and its properties, paper size, and orientation.

Setting up the page format

1. Select File > Page Setup from the menu. The Page Setup dialog window opens.


File
View
For
Open
Page Setup...


Page Setup
Borderline
View Setting
OK
Cancel
Default

Borderline

Top£º 1.0 cm Bottom£º 1.0 cm

Left£º 1.0 cm Right£º 1.0 cm

View Setting

● Redraw graph according to sample data

○ Graph zoom in and out

2. Set the borderlines (print margins). The range is 0 to 10.0cm each.

3. Select the View Setting.

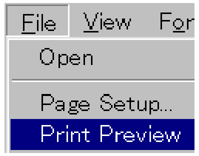
Redraw graph according to sample data:

The GDS-122 refreshes the waveform and adjust its scale before printing. The most recent data can be taken, but might take time for refreshing.

Graph zoom in and out

The existing waveform is used with its scale adjusted. Since retrieving the data is not involved, fast printing is ensured.

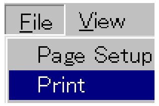
4. Open the print preview by selecting File > Print Preview from the menu or clicking the Print Preview icon on the toolbar. Make sure that the waveforms are placed appropriately.


File
View
For
Open
Page Setup...
Print Preview

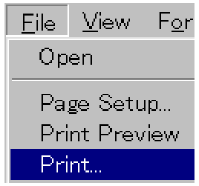
Printing out

Print out the waveform in one of the following ways.

- Selecting File > Print in the Print Preview screen menu


File
View
Page Setup
Print

- Selecting File > Print from the software menu


File
View
For
Open
Page Setup...
Print Preview
Print...

- Pressing the shortcut keys, Ctrl + P
- Clicking the Printer icon on the Toolbar

Accessing the Help

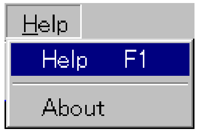
Overview

The Help file describes how to install and use the software. The About screen shows the software version.

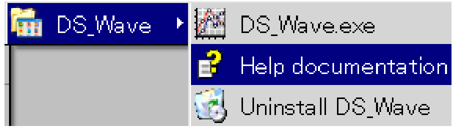
Opening the Help

Open the Help in separate file using one of the following methods.

- Selecting Help > Help from the menu

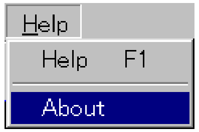

Help
Help F1
About

- Clicking the Help icon on the Toolbar
- Pressing the shortcut key, F1
- Selecting the Help documentation from the startup menu


DS_Wave
DS_Wave.exe
Help documentation
Uninstall DS_Wave

Software version

To view the software version, select Help > About from the menu. The software version screen appears.


Help
Help F1
About

USING THE MULTIMETER

This chapter describes the multimeter functionalities in the GDS-122. Functionalities includes three major items (Voltage, Current, Impedance) and three additional items (Diode, Continuity, Capacitance). The current measurement and capacitance measurement use extension modules to deal with large current and small capacitance, respectively. Delta measurement and automatic range switching features offer flexibility and convenience.

Activating the Multimeter 84
Measuring Voltage 85
Measuring Current 87
Measuring Impedance 89
Measuring Diode 91
Measuring Continuity 92
Measuring Capacitance 93

Activating the Multimeter

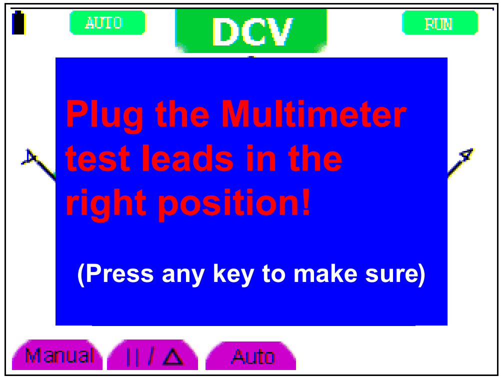
Panel operations

1. Press the power switch. The welcome screen with the corporate logo appears on the display. ⏻
2. To adjust display brightness, use the switch on the side: up (bright) or down (dark).

3. Press any key (example: MENU key) to activate the display. The battery icon at the top left corner of the display shows the battery level. (Example) MENU

> 75%	75%	50%	25%	< 25%
🔋	🔋	🔋	🔋	🔋

4. Press A (current), V (voltage), or R (impedance, diode, continuity, capacitance) switch to proceed. A warning message might appear to remind you of correct connections. A V R



Plug the Multimeter test leads in the right position!

(Press any key to make sure)

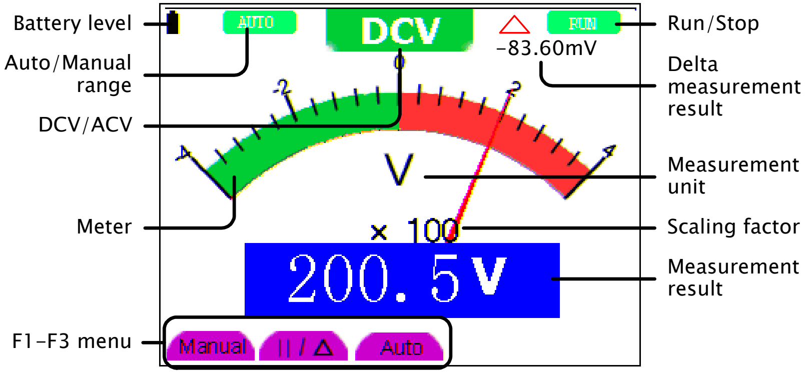
5. Press any key to cancel the warning message and resume the measurement.

Measuring Voltage

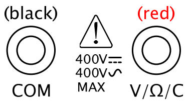
DC voltage specifications (details: page98)	Range	400mV, 4V, 400V
	Accuracy	±(1% + 1 digit)
	Max input	400V
AC voltage specifications (details: page98)	Range	4V, 40V, 400V
	Accuracy	±(1% + 3 digits)
	Max input	400V
	Frequency	40Hz to 400Hz

Panel operations

1. Press the V switch to select the Voltage measurement. If a warning message appears, press any key to resume measurement. V V≅
2. The voltage measurement screen appears.

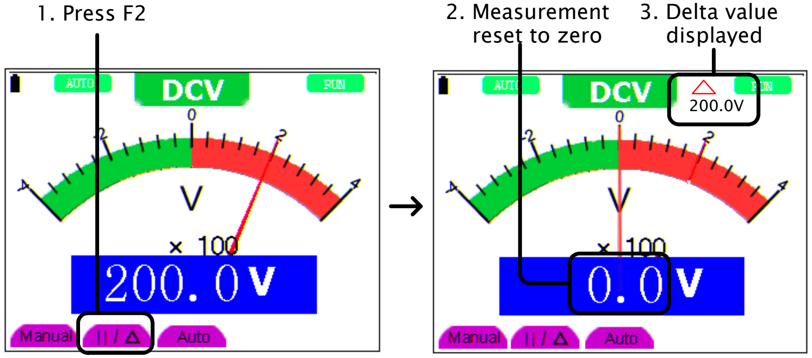

Battery level
Auto/Manual range
DCV/ACV
Meter
F1–F3 menu
AUTO
DCV
RUN
-83.60mV
V
× 100
200. 5V
Manual
II/Δ
Auto
Run/Stop
Delta measurement result
Measurement unit
Scaling factor
Measurement result

3. Press the AUTOSET key repeatedly to select DC or AC voltage measurement. AUTOSET
4. Connect the test leads to the terminals:
   COM for the black lead
   V/Ω/C for the red lead


(black)
(red)
COM
400V⎓
400V∿
MAX
V/Ω/C

5. The measurement result will be constantly updated in the display. For more detailed settings, see the following instructions.

Auto ranging	To let the GDS-122 select the voltage range automatically, press F3 (Auto). The indicator at the top left corner of the display changes to AUTO.	Auto F3 AUTO
Manual ranging	To select the voltage range manually, press F1 (Manual). The indicator at the top left corner of the display changes to MANUAL.	Manual F1 MANUAL
Freezing the measurement	To freeze the measurement, press the RUN/STOP key. The measurement result will be retained and the indicator at the top right corner of the display changes to STOP. To unfreeze, press the RUN/STOP key again.	RUN/STOP RUN ↕ STOP
Measuring delta voltage	To measure the delta value, press F2 (II/Δ). The measurement result at the moment moves to the top right corner of the display, and the measurement result becomes the difference between the original result.	II/Δ F2


1. Press F2
2. Measurement reset to zero
3. Delta value displayed
AUTO
DCV
RUN
V
× 100
200. 0V
Manual
II/Δ
Auto
→
200.0V
0. 0V

Measuring Current

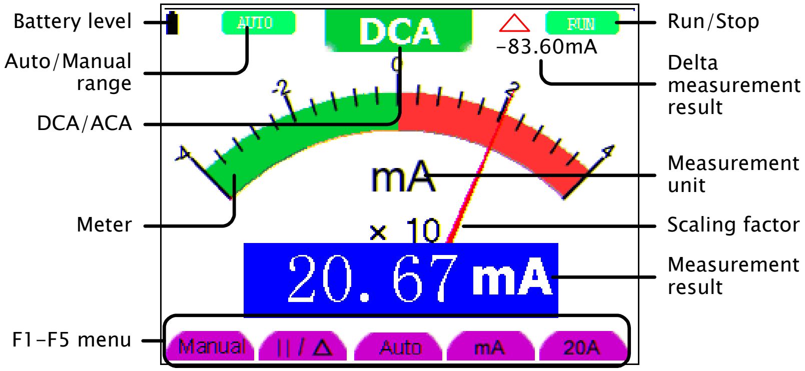
DC current specifications (details: page98)	Range & Accuracy	40mA ±(1% + 1 digit) 400mA ±(1.5% + 1 digit) 20A ±(3% + 3 digits)
	Max input	400mA (direct input) 20A (via the extension module)
AC current specifications (details: page98)	Range & Accuracy	40mA ±(1.5% + 3 digits) 400mA ±(2% + 1 digit) 20A ±(5% + 3 digits)
	Max input	400mA (direct input) 20A (via the extention module)

Panel operations

1. Press the A switch to select the current (Ampere) measurement. If a warning message appears, press any key to resume measurement.

A

A≃

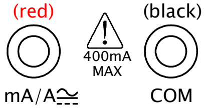

Battery level
Auto/Manual range
DCA/ACA
Meter
F1–F5 menu
AUTO
DCA
RUN
-83.60mA
mA
× 10
20. 67 mA
Manual
II / Δ
Auto
mA
20A
Run/Stop
Delta measurement result
Measurement unit
Scaling factor
Measurement result

2. Press the AUTOSET key repeatedly to select DC or AC current measurement.

AUTOSET

Measuring 0mA to 400mA

1. Connect the test leads to the terminals:
COM for the black lead
mA/A for the red lead


(red)
400mA MAX
(black)
mA/A≃
COM

If the range is set at 20A, press F4 (mA) and change it to mA range.

mA

F2

20A⟶mA

---

2. Select automatic range by pressing F3 (Auto) or manual by F1 (Manual). The indicator at the top left corner of the display changes accordingly.

Manual Auto

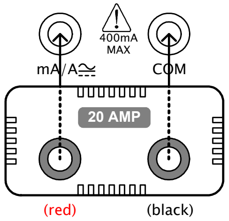
F1 F3

MANUAL AUTO

Measuring 400mA to 20A

⚠

1. Connect the Current Extension module to the COM & mA/A terminals. Then, connect the test leads to the extension module.


400mA MAX
mA/A≃
COM
20 AMP
(red)
(black)

2. Press F5 (20A) and select the 20A range. The MANUAL range indicator activates. (Auto range is not available)

20A

F5

MANUAL

Freezing the measurement

To freeze the measurement, press the RUN/STOP key. The measurement result will be retained and the indicator at the top right corner of the display changes to STOP. To unfreeze, press the RUN/STOP key again.

RUN/STOP

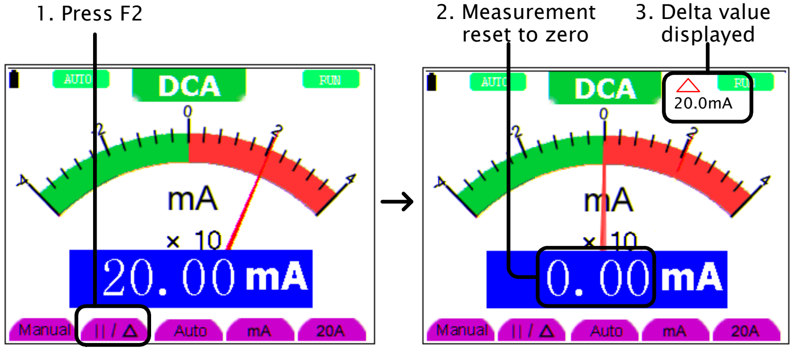
RUN ↕ STOP

Measuring delta current

To measure the delta value, press F2 (II/Δ). The measurement result at the moment moves to the top right corner of the display, and the measurement result becomes the difference between the original result.

II/Δ

F2


1. Press F2
2. Measurement reset to zero
3. Delta value displayed
AUTO
DCA
RUN
mA
× 10
20. 00 mA
20.0mA
0. 00 mA
Manual
II / Δ
Auto
mA
20A

Measuring Impedance

Impedance specifications (details: page98)	Range & Resolution	400Ω ±(1% + 3 digits) 4k, 40k, 400k, 4MΩ ±(1% + 1 digit) 40MΩ ±(1.5% + 3 digits)

Panel operations

1. Press the R switch. If a warning message appears, press any key to resume measurement.

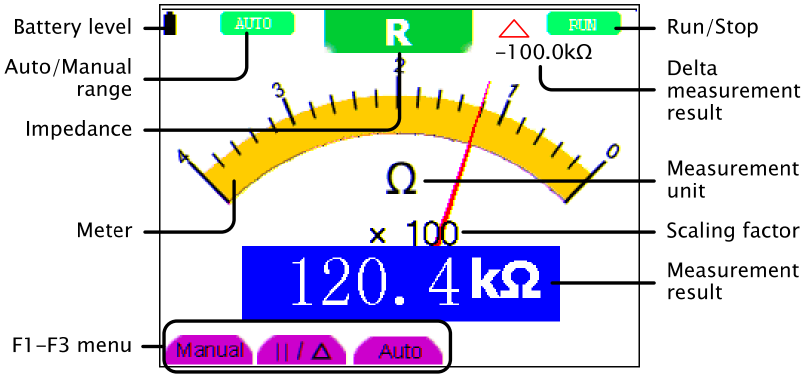
R

Ω/⯆/🕪/C

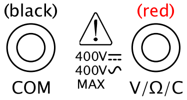
2. Press the AUTOSET key repeatedly to select the impedance measurement.

AUTOSET

3. The impedance screen appears.


Battery level
Auto/Manual range
Impedance
Meter
F1–F3 menu
AUTO
R
RUN
–100.0kΩ
Ω
× 100
120. 4 kΩ
Manual
|| / Δ
Auto
Run/Stop
Delta measurement result
Measurement unit
Scaling factor
Measurement result

4. Connect the test leads to the terminals:
COM for the black lead
V/Ω/C for the red lead


(black)
(red)
COM
400V⎓
400V∿
MAX
V/Ω/C

5. The measurement result will be constantly updated in the display. For more detailed settings, see the following instructions.

Auto ranging

To let the GDS-122 select the voltage range automatically, press F3 (Auto). The indicator at the top left corner of the display changes to AUTO.

Auto

F3

AUTO

Manual ranging

To select the voltage range manually, press F1 (Manual). The indicator at the top left corner of the display changes to MANUAL.

Manual

F1

MANUAL

Freezing the measurement

To freeze the measurement, press the RUN/STOP key. The measurement result will be retained and the indicator at the top right corner of the display changes to STOP. To unfreeze, press the RUN/STOP key again.

RUN/STOP

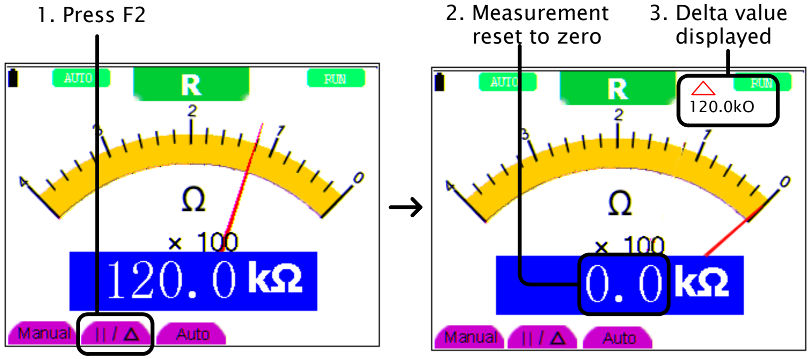
RUN ↕ STOP

Measuring delta impedance

To measure the delta value, press F2 (II/Δ). The measurement result at the moment moves to the top right corner of the display, and the measurement result becomes the difference between the original result.

II/Δ

F2

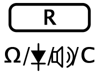

1. Press F2
2. Measurement reset to zero
3. Delta value displayed
AUTO
R
RUN
Ω
× 100
120. 0 kΩ
Manual
|| / Δ
Auto
120.0kΩ
0. 0 kΩ

Measuring Diode

Range 0V to 1.5V

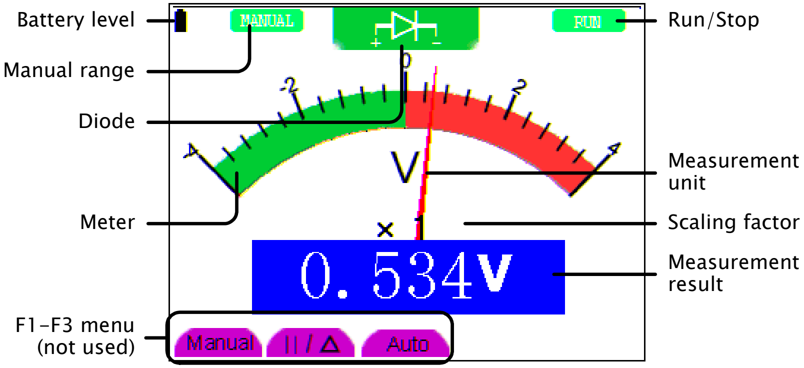
Panel operations

1. Press the R switch. If a warning message appears, press any key to resume measurement.

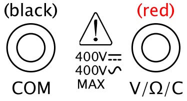


2. Press the AUTOSET key repeatedly to select the diode measurement.

3. The diode measurement screen appears.


Battery level
Manual range
Diode
Meter
F1–F3 menu
(not used)
MANUAL
RUN
Run/Stop
-2
0
2
4
V
Measurement unit
×
Scaling factor
0. 534V
Measurement result
Manual
|| / Δ
Auto

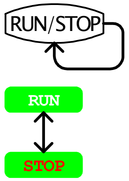
4. Connect the test leads to the terminals:
   COM for the black lead
   V/Ω/C for the red lead


(black)
(red)
COM
400V⎓
400V∿
MAX
V/Ω/C

5. The measurement result will be constantly updated in the display.

Freezing the measurement

To freeze the measurement, press the RUN/STOP key. The measurement result will be retained and the indicator at the top right corner of the display changes to STOP. To unfreeze, press the RUN/STOP key again.

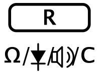

RUN/STOP
RUN
STOP

Measuring Continuity

Conditions < 50Ω (beeping)

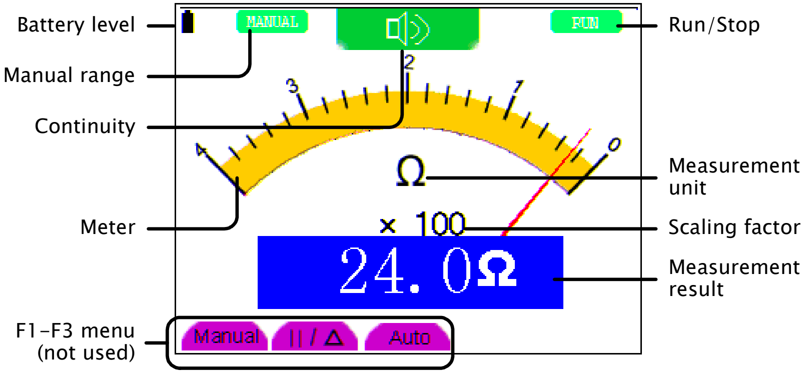
Panel operations

1. Press the R switch. If a warning message appears, press any key to resume measurement.

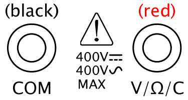


2. Press the AUTOSET key repeatedly to select the continuity measurement.

3. The continuity measurement screen appears.


Battery level
Manual range
Continuity
Meter
F1–F3 menu
(not used)
MANUAL
RUN
Run/Stop
3
2
1
0
Ω
Measurement unit
× 100
Scaling factor
24. 0Ω
Measurement result
Manual
|| / Δ
Auto

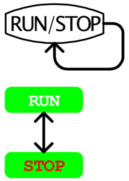
4. Connect the test leads to the terminals:
   COM for the black lead
   V/Ω/C for the red lead


(black)
(red)
COM
400V⎓
400V∿
MAX
V/Ω/C

5. If the GDS-122 confirms continuity (the impedance is less than 50Ω), the beeper sounds.

Freezing the measurement

To freeze the measurement, press the RUN/STOP key. The measurement result will be retained and the indicator at the top right corner of the display changes to STOP. To unfreeze, press the RUN/STOP key again.


RUN/STOP
RUN
STOP

Measuring Capacitance

Continuity specifications Range 51.2nF to 100uF ±(3% + 3 digits)

Panel operations

1. Press the R switch. If a warning message appears, press any key to resume measurement.

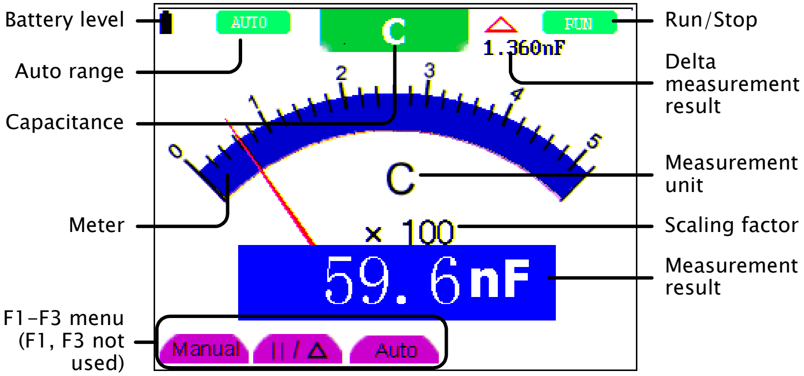
   R

   Ω/⯆/◁))/C

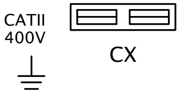
2. Press the AUTOSET key repeatedly to select the capacitance measurement.

   AUTOSET

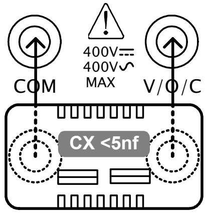
3. The capacitance screen appears.


Battery level
Auto range
Capacitance
Meter
F1-F3 menu (F1, F3 not used)
Run/Stop
Delta measurement result
Measurement unit
Scaling factor
Measurement result
AUTO
C
RUN
1.360nF
0
1
2
3
4
5
C
× 100
59.6nF
Manual
II / Δ
Auto

Measuring 5nF and above Connect the test leads to the CX terminals.


CATII
400V
CX

Measuring less then 5nF ⚠ Connect the Capacitance Extension module to the COM & V/Ω/C terminals. Then, connect the test leads to the extension module. The measurement result will be constantly updated in the display.


400V⎓
400V∿
MAX
COM
V/Ω/C
CX <5nf

Freezing the measurement To freeze the measurement, press the RUN/STOP key. The measurement result will be retained and the indicator at the top right corner of the display changes to STOP. To unfreeze, press the RUN/STOP key again.

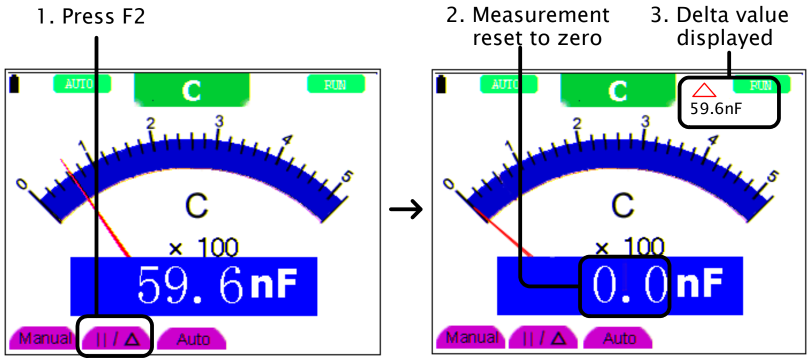
RUN/STOP

RUN ↕ STOP

Measuring delta capacitance To measure the delta value, press F2 (II/Δ). The measurement result at the moment moves to the top right corner of the display, and the measurement result becomes the difference between the original result.

II/Δ

F2


1. Press F2
2. Measurement reset to zero
3. Delta value displayed
AUTO
C
RUN
0
1
2
3
4
5
C
× 100
59.6nF
Manual
II / Δ
Auto
→
AUTO
C
RUN
59.6nF
0
1
2
3
4
5
C
× 100
0.0nF
Manual
II / Δ
Auto

FAQ

Power	Q	• The GDS-122 does not power up. • The GDS-122 stopped working after a short period of time.
	A	The battery may need recharging. Connect the GDS-122 to the AC adaptor and recharge it for at least 15 minutes. Then try powering up.
ERR mode in the multimeter	Q	In the multimeter mode, the measurement type at the top of the display says "ERR" which looks like an error message.
	A	The "ERR" sign appears when none of the measurement switch is pressed. Select one from the V, A, or R switch and press it.
Amplitude mismatch in the oscilloscope	Q	The measured voltage is 10 times smaller than the real value.
	A	The attenuation ratio on the probe is set at x10. If you switch it to x1, make sure that the input voltage does not surpass the maximum 400V.
	Q	The measured voltage is 10/100/1000 times larger than the real value.
	A	The probe ratio in the CH1 or CH2 setup menu is set at X10, X100, or X1000. See page22 for details.
Unstable waveform in the oscilloscope	Q	The waveform appears in the display but is not stable.
	A	Configuring the trigger might help you. See page30 for details. • Make sure the trigger source channel matches the input signal. • Make sure the correct trigger type, edge or video, is selected. • Try changing the HF and LF repression in the trigger coupling mode and filtering out high or low frequency noise.
No waveform in the oscilloscope	Q	The waveform does not appear at all in the display.
	A	• The trigger level might be out of the waveform range. Press the AUTOSET key so that the GDS-122 automatically adjusts the trigger level. • If the trigger mode is Single, press the RUN/STOP key to trigger the waveform or switch the trigger mode to Normal. See page30 for trigger details.
Slow update in the multimeter	Q	It takes 30 to 40 seconds for the multimeter to update the capacitor measurement.
	A	It takes longer time to measure small capacitors. 30 to 40 seconds are normal for measuring 5nF or smaller capacitors. See page93 for capacitance measurement details.
Slow update in the oscilloscope	Q	The display response to the waveform change is unusually slow.
	A	Slow response is normal in the following cases. • Average sampling mode is being selected (page22) • Display persistence is being selected (page36)

SPECIFICATIONS

Conditions for specifications

The following specifications are applicable when these two conditions are met:

- The GDS-122 has been powered up for at least 30 minutes, during which temperature fluctuation is no more than 5 degrees Celsius.
- The probe attenuation is set to X 10.

Oscilloscope specifications

Sampling	Mode	Normal, Peak detection, Average
	Rate	100 MSa/s
Input	Coupling	DC, AC
	Impedance	1MΩ±2% in parallel with 20pF±3pF
	Probe	1X, 10X, 100X, 1000X
	Max. Input	400V (peak)
	Channel delay	150ps (typical)
Horizontal	Sampling rate	10S/s~100mS/s
	Interpolation	（sin x） /x
	Record length	6K points on each channel
	Scanning speed	5ns/div~5s/div, 1-2.5-5 step
	Sampling rate / relay time accuracy	±100ppm (time interval ≥ 1ms)
	Interval (△T) accuracy (full bandwidth)	Single: ±(1 interval time +100ppm× reading+0.6ns) Average >16 : ±(1 interval time +100ppm×reading+0.4ns)
Vertical	A/D converter	8 bits resolution (2CH simultaneously)
	Sensitivity	5mV/div~5V/div（at input）
	Displacement	±50V(500mV~5V),±1V(5mV~200mV)
	Bandwidth	20M
	Single	Full bandwidth
	Low frequency	≥5Hz（at input, AD coupling, -3dB）
	Rise time	≤17.5ns (at input, typical)
	DC accuracy	±5% (DC gain)
	DC accuracy (avg)	Avg >16: ±(5% rdg + 0.05 div) for △V
Trigger	Sensitivity	CH1 and CH2: 1div(DC~full bandwidth) DC coupling: ≥ 50Hz.
	Trigger level	±6 divisions from the screen center
	Level accuracy	±0.3 div (typical, rise/fall time ≥ 20ns)
	Displacement	655div (pre-trigger), 4div (post- trigger)
	50% level setting	Input signal frequency ≥ 50Hz (typical)
	Trigger sensitivity	2 div of peak-to-peak (video trigger)
	Signal system	NTSC, PAL, SECAM (any frequency)
Measurement	Cursor	△V and △T between cursors
	Automatic	Peak-to-peak, average, root mean square, frequency, and cycle

Probe		1X position	10X position
	Bandwidth	≤ 6 MHz (DC)	Full bandwidth (DC)
	Attenuation rate	1: 1	10: 1
	Compensation	10pf~35pf	10pf~35pf
	Input impedance	1MΩ±2%	10MΩ±2%
	Input impendence	85pf~115pf	14.5pf~17.5pf
	Input voltage	150 V DC	300V DC

Multimeter specifications

VDC	Input impedance	10MΩ
	Max input	1000V (DC or AC peak-to-peak value)
	Accuracy	±1%±1 digit
	Resolution	400mV range: 100uV 4V range: 1mV 40V range: 10mV 400V range: 100mV
VAC	Input impedance	10MΩ
	Max input	750V(AC, virtual value)
	Frequency range	40Hz~400Hz
	Display	Virtual value of sine wave
	Accuracy	±1%±3 digits
	Resolution	4V range: 1mV 40V range: 10mV 400V range: 100mV
DCA	Accuracy	40mA range: ±1%±1 digit 400mA range: ±1.5%±1 digit 20A range: ±3%±3 digits
	Resolution	40mA range: 10uA

		400mA range: 100uA 20A range: 10mA
ACA	Accuracy	40mA range: ±1.5%±3 digit 400mA range: ±2 %±1 digit 20A range: ±5%±3 digits
	Resolution	40mA range: 10uA 400mA range: 100uA 20A range: 10mA
Resistance	Accuracy	400Ω range: ±1%±3 digits 4kΩ~4MΩ range: ±1%±1 digit 40MΩ range: ±1.5%±1 digit
	Resolution	400Ω range: 0.1Ω 4kΩ range: 1Ω 40kΩ range: 10Ω 400kΩ range: 100Ω 4MΩ range: 1kΩ 40MΩ range: 10kΩ
Capacitance	Accuracy	±3%±3 digits
	Resolution	51.2nF range: 10pF 512nF range: 100pF 5.12uF range: 1nF 51.2uF range: 10nF 100uF range: 100nF
Diode	Reading range	0V~1.5V
Continuity	Threshold	< 30Ω

General specifications

Display	Type	3.8" color liquid crystal display
	Resolution	320 (horizontal) ×240 (vertical) pixels
	Color	4096 colors
Power	Consumption	< 6W
	Supply	100V~240V AC, 50/60Hz
	DC input	8.5VDC, 1500mA
Environment	Operating	Temperature: 0 to 40 °C(32 to 104 °F) Relative humidity: < 75%
	Storage	Temperature: -20 to 60 °C(-4 to 140 °F) Relative humidity: < 75%
Mechanical	Dimension	18 cm×11.5cm×4cm
	Weight	690g

DECLARATION OF CONFORMITY

We

GOOD WILL INSTRUMENT CO., LTD.

(1) No.7-1, Jhongsing Rd., Tucheng City, Taipei County, Taiwan

(2) No. 69, Lu San Road, Suzhou City (Xin Qu), Jiangsu Sheng, China

declare, that the below mentioned product

Type of Product: Handheld Digital Storage Oscilloscope & Multimeter

Model Number: GDS-122

is 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 (89/336/EEC) and Low Voltage Directive (73/23/EEC).

For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:

◎ **EMC**

EN 61326-1: Electrical equipment for measurement, control and laboratory use — EMC requirements (1997 + A1:1998 + A2:2001 + A3:2003)	
Current Harmonics EN 61000-3-2: 2000 + A2:2005	Voltage Fluctuations EN 61000-3-3: 1995 + A1:2001
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◎ **Safety**

Low Voltage Equipment Directive 73/23/EEC
Safety Requirements IEC/EN 61010-1: 2001 (2nd Edition)

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