



GPS-800X / 1000X series

Handheld Digital Oscilloscopes

100 and 200 MHz · 2 channels · 6000-count multimeter · recorder

GPS-810X · GPS-820X · GPS-1102X · GPS-1202X

Quick Start Guide

Issue 1

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1 Safety

Read this section before using the instrument, and use the instrument only as this guide and its technical datasheet specify, to avoid injury and to avoid damage to the instrument and to anything connected to it.

Symbols

Symbol	Meaning	Symbol	Meaning
	Warning		Power switch
	Hazardous voltage		Equipment protected by double or reinforced insulation
	Earth (ground)		Indoor use only
	Lithium battery failure		EU mark for separate collection of electrical and electronic equipment

Terms

Term	Meaning
DANGER	An injury or hazard that may happen directly
WARNING	A potential injury or hazard
CAUTION	Potential damage to the instrument or other property

Measurement categories

IEC 61010-2-030 defines measurement categories, which rate an instrument's ability to withstand short transient overvoltages above its working voltage. Use the instrument and its accessories only within their rated measurement category.

Category	For measurements on
No rated category (CAT I)	Circuits not directly connected to the mains, such as a circuit board powered by a battery, or a secondary circuit with special protection
CAT II	Circuits directly connected to the low-voltage mains installation, such as household appliances and portable tools
CAT III	Measurements in the building installation, such as junction boxes, circuit breakers, distribution boards, and equipment permanently connected to the fixed installation
CAT IV	Measurements at the source of the low-voltage installation, such as electricity meters and primary overcurrent protection devices

Input ratings

Input	GPS-800X (810X, 820X)	GPS-1000X (1102X, 1202X)
Scope input, BNC signal to earth	CAT II 300 Vrms	CAT III 600 Vrms, CAT II 1000 Vrms
Scope input, BNC ground to earth	CAT II 30 Vrms	CAT III 600 Vrms, CAT II 1000 Vrms
Scope input, BNC signal to BNC ground	CAT II 300 Vrms	CAT III 300 Vrms
Multimeter inputs	CAT III 300 Vrms, CAT II 600 Vrms	CAT III 600 Vrms, CAT II 1000 Vrms
Multimeter, through a current adapter	CAT III 60 Vrms	CAT III 60 Vrms

A voltage above 30 Vrms is hazardous. Take the necessary precautions, and keep within the input ratings above. On the GPS-800X, the oscilloscope inputs are not isolated: the BNC ground is rated CAT II 30 Vrms to earth.

On the 6 A and 10 A multimeter ranges, measure for less than 10 seconds at a time, and allow more than 15 minutes between measurements.

2 Introduction

The GPS-800X and GPS-1000X series are two-channel handheld digital storage oscilloscopes in 100 and 200 MHz bandwidths, each with a 6000-count true RMS multimeter and a recorder built in. The GPS-1000X models isolate the two oscilloscope channels, the multimeter, the power adapter and the USB port from one another, for floating measurements.

This guide covers getting the instrument ready, the controls and the screens. The technical datasheet gives the complete specification; section 12 summarises it.

3 Getting started

Fitting the battery

To protect the battery from over-discharging, it may be delivered separately. Fit it before use:

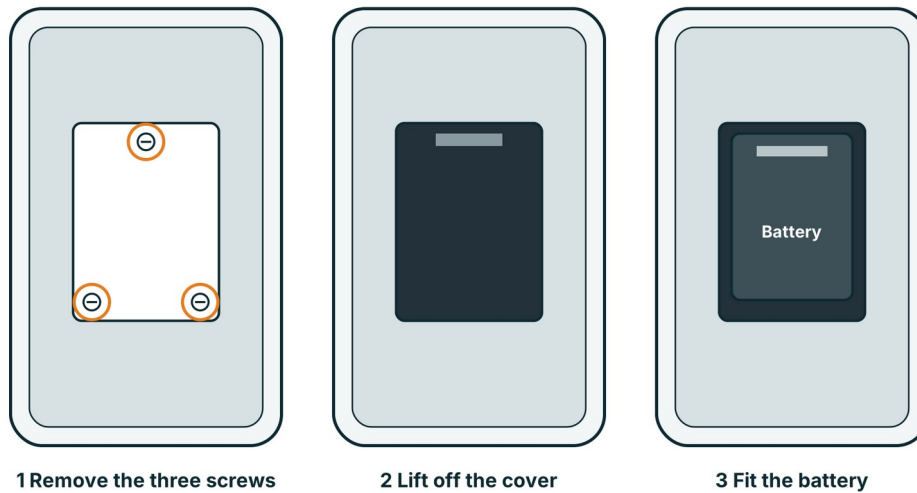


Figure 1 Fitting the battery, at the rear

1. Remove the three screws in the battery cover with a screwdriver (Figure 1, 1).
2. Lift off the battery cover (2).
3. Put the battery into the battery slot (3).
4. Refit the cover and tighten the three screws, then switch the instrument on to check that the battery is fitted correctly.
5. Connect the power adapter to the charging socket on the left side (section 7), and charge the battery fully the first time the instrument is used.

Charging

The battery charges whenever the power adapter is connected. A full charge takes 4 hours with the instrument switched off, and the battery runs the instrument for up to 5.5 hours (GPS-800X) or 4 hours (GPS-1000X). The battery icon is green while it charges and red when it is low. The charging protection operates at a battery temperature of 55 °C or more.

4 Connecting for measurement

The measurement accessories are the oscilloscope probes, the multimeter test leads and the current adapters.

Oscilloscope probes

Compensate every oscilloscope probe before its first use with the instrument:

1. Connect the probe to the CH1 input, and to the probe compensation output and ground terminal on the right side panel (section 7).
2. Compare the waveform displayed with Figure 2.
3. Adjust the probe until the waveform matches the correctly compensated one.

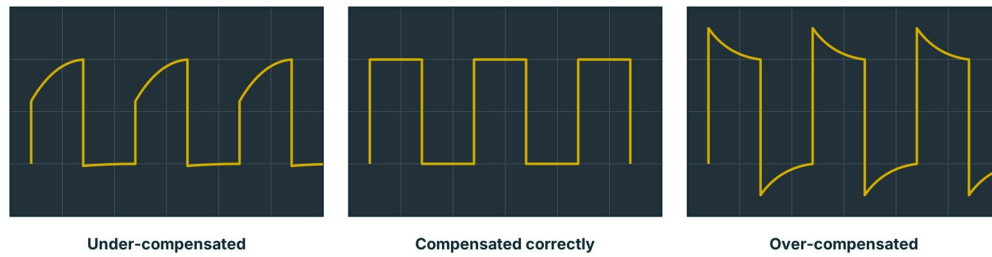


Figure 2 Probe compensation

Multimeter test leads

Select the measurement first. Then plug the red lead and the black (common) lead into the inputs as marked on the front panel. To measure current, choose the current adapter that suits the current.

Current adapters

To measure current, fit a current adapter between the multimeter inputs and the test leads. Two are supplied, each with a built-in shunt resistor and fuse: the 600 mA adapter for the 60 mA and 600 mA ranges, and the 10 A adapter for the 6 A and 10 A ranges.

5 The front panel

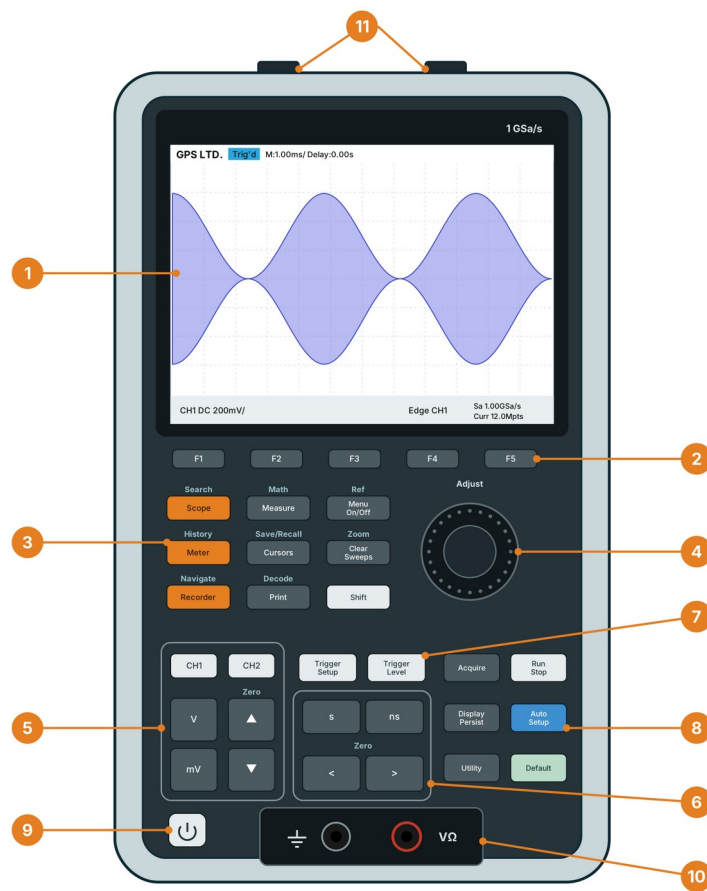


Figure 3 The front panel

Item	Description	
1	Display	The oscilloscope, multimeter and recorder screens, sections 8 to 10
2	Softkeys F1 to F5	Select the menu items shown along the bottom of the screen
3	Multifunction keys	Scope, Meter and Recorder modes, and the measurement, cursor and other functions, section 6
4	Universal knob (Adjust)	Selects menu items and changes values, section 6
5	Vertical controls	Channel selection, vertical scale and offset, section 6
6	Horizontal controls	Timebase and horizontal position, section 6
7	Trigger controls	The trigger menu and the trigger level, section 6
8	Single-function keys	Acquire, Display/Persist, Utility, Auto Setup, Default and Run/Stop, section 6
9	Power key	Switches the instrument on and off
10	Multimeter inputs	The black common input and the red VΩ input, section 9
11	Oscilloscope inputs	The two analogue channel inputs, on the top edge

6 The keys

Vertical controls

Key	What it does
CH1, CH2	Switches the channel on or off, or selects it for adjustment
V	Increases the vertical scale of the selected channel
mV	Decreases the vertical scale
▲	Increases the vertical offset of the selected channel
▼	Decreases the vertical offset
Shift, then ▲	With Shift lit, sets the offset to zero

Horizontal controls

Key	What it does
s	Increases the timebase
ns	Decreases the timebase
<	Moves the waveform to the left
>	Moves the waveform to the right
Shift, then <	With Shift lit, sets the delay to zero

Trigger controls

Key	What it does
Trigger Setup	Opens the trigger menu. The trigger types are edge, slope, pulse width, video, window, interval, dropout, runt and pattern, and serial trigger on I ² C, SPI, UART, CAN and LIN
Trigger Level	Lights the key; the universal knob then sets the trigger level

Universal knob

While the light at the top left of the knob is on, turn the knob to move through the items of the current menu, and press it to select an item. The knob also changes values and enters file names.

Multifunction keys

With the Shift light off, these keys open the functions printed on them. Press Shift to light it, and they open the functions printed above them instead. Pressing a key again leaves its function.

Key	Shift off
Scope	Enters oscilloscope mode
Meter	Enters multimeter mode, with eight measurement types, section 9
Recorder	Enters recorder mode: the sample logger and the measurement logger, section 10
Measure	Opens the measurements and measurement statistics
Cursors	Opens the cursors, in manual or track mode

Key	Shift off
Print	Saves a picture of the screen, to a USB memory stick if one is fitted, otherwise to the internal storage
Menu On/Off	Shows or hides the on-screen menu
Clear Sweeps	Clears the measurement statistics and the persistence, refreshes the waveform, and clears other accumulated displays

Key	Shift on
Search	Searches the acquired data for an event you specify; each event found is marked with a black triangle
History	Opens history mode, which records up to 80,000 frames
Navigate	Moves through the record by time, by search event or by history frame
Math	Add, subtract, multiply, divide, FFT, integral, differential and square root
Save/Recall	Saves setups, reference waveforms, pictures and CSV files, and runs the file converter; recalls setups and reference waveforms
Decode	Decodes up to two serial buses, 1 and 2, from the analogue channels: I ² C, SPI, UART, CAN and LIN
Ref	Saves a reference waveform
Zoom	Opens the zoom window

Single-function keys

Key	What it does
Acquire	Opens the acquisition menu: the acquisition mode (normal, peak detect, average or enhanced resolution), the interpolation (sin(x)/x or linear) and the memory depth. X-Y and sequence mode are switched on here too
Display/Persist	Switches persistence on quickly, and sets the grid, intensity, graticule and transparency
Utility	System settings, such as sound, language, self calibration and firmware update
Auto Setup	Sets the display automatically to suit the frequency and amplitude of the signal
Default	Returns the oscilloscope to its default settings
Run/Stop	Starts or stops acquisition

7 The side panels

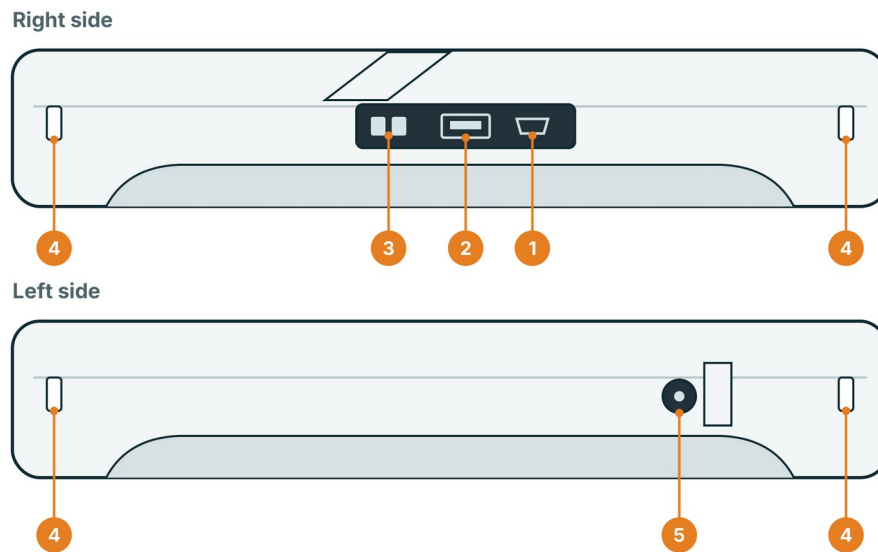


Figure 4 The right and left side panels

Item	Description	
1	USB device	Connects to a computer, for remote control
2	USB host	For a USB memory stick
3	Probe compensation and ground	The compensation signal and its ground, used in section 4
4	Hand strap slots	One at each end of both sides
5	Charging socket	For the power adapter, section 3

8 The oscilloscope display

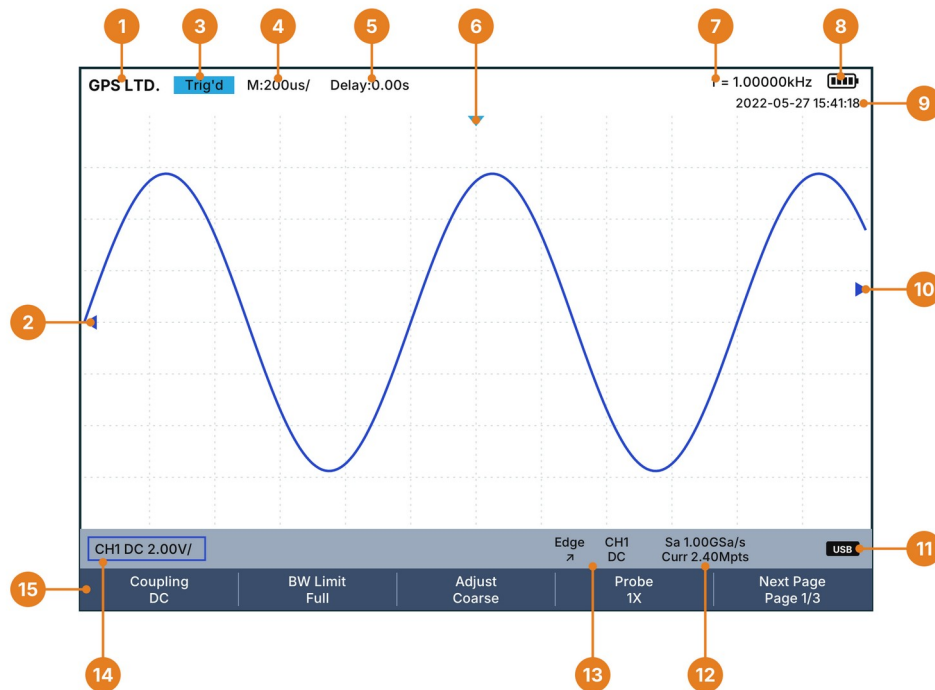


Figure 5 The oscilloscope screen

Item	Description	
1	GPS LTD. mark	
2	Channel marker and waveform	Each channel has its own colour, and its waveform is drawn in the same colour
3	Working state	Arm, Ready, Trig'd, Stop, FStop, Auto or Roll
4	Timebase	The time each horizontal division represents, 200 μs here
5	Delay	The time of the centre of the screen relative to the trigger point
6	Trigger position	Moved left or right with the < and > keys
7	Frequency	The frequency of the trigger source
8	Battery	Green while the battery is charging, red when it is low
9	Date and time	The real-time clock
10	Trigger level	Set with the Trigger Level key and the universal knob
11	USB memory	Shown while a USB memory stick is connected
12	Sample rate and memory depth	The current sample rate and memory depth
13	Trigger settings	The trigger source (here CH1), coupling (DC) and type (a rising edge). The colour of this area follows the trigger source
14	Channel settings	The channel (CH1, on), its coupling (DC) and its scale per division (2 V)
15	Softkey menu	The items F1 to F5 select

9 Multimeter mode

Press Meter to enter multimeter mode. The multimeter measures DC and AC voltage, DC and AC current, resistance, diode, continuity and capacitance, through the inputs at the foot of the front panel.

Keys in multimeter mode

Key	What it does
Meter	Enters multimeter mode
F1 to F5	The measurement type, relative measurement, auto or manual ranging, the range, and the measurement logger
Universal knob	Switches between ranges and between meter functions; in manual ranging, pressing it changes the range
Run/Stop	Holds the reading: HOLD appears at the top left of the screen

The multimeter screen

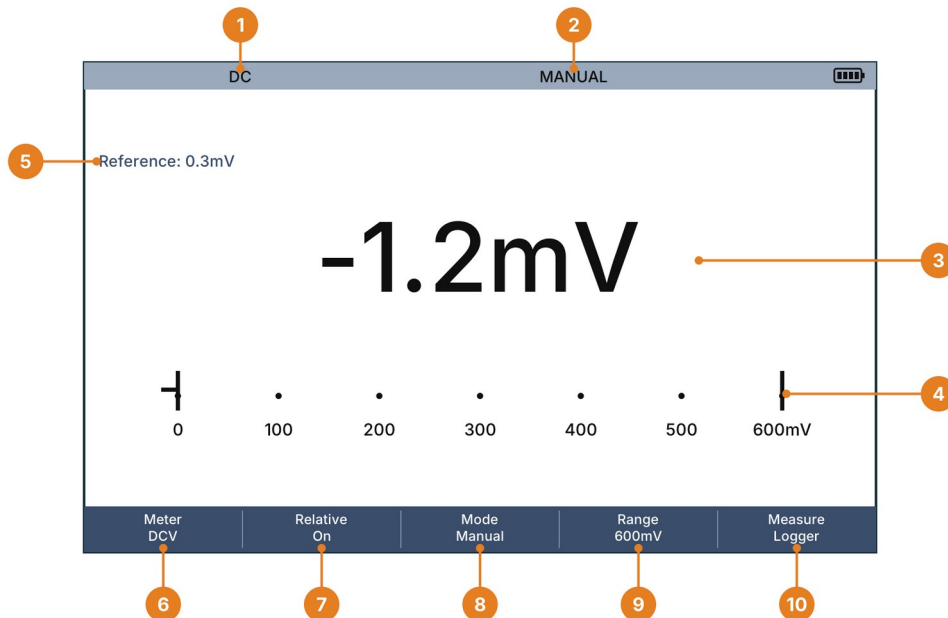


Figure 6 The multimeter screen

Item	Description
1	Coupling DC here
2	Ranging MANUAL when the range is set manually
3	Reading The measured value
4	Range scale The range in use, as a bar scale
5	Reference The reference value, when relative measurement is on
6	Measurement type (F1) DC or AC voltage, DC or AC current, resistance, diode, continuity or capacitance
7	Relative (F2) When on, takes the input at that moment as the reference and measures from it: actual input = reference + displayed value. When off, actual input = displayed value

Item		Description
8	Auto or manual (F3)	Automatic or manual ranging
9	Range (F4)	Selects the range in manual ranging
10	Measurement logger (F5)	Starts the measurement logger on the meter reading, section 10

Keep within the multimeter input ratings in section 1. Through a current adapter, the rating is CAT III 60 Vrms.

10 Recorder mode

Press Recorder to enter recorder mode. It has two loggers: the sample logger records the waveform itself, at up to 25 kSa/s; the measurement logger records up to four measured values at intervals from 0.1 s to 10 minutes.

Keys in recorder mode

Key	What it does
Recorder	Enters recorder mode
F1 to F5	Select the sample logger or the measurement logger, and their menus
Universal knob	Sets the recording interval in either logger

The sample logger screen

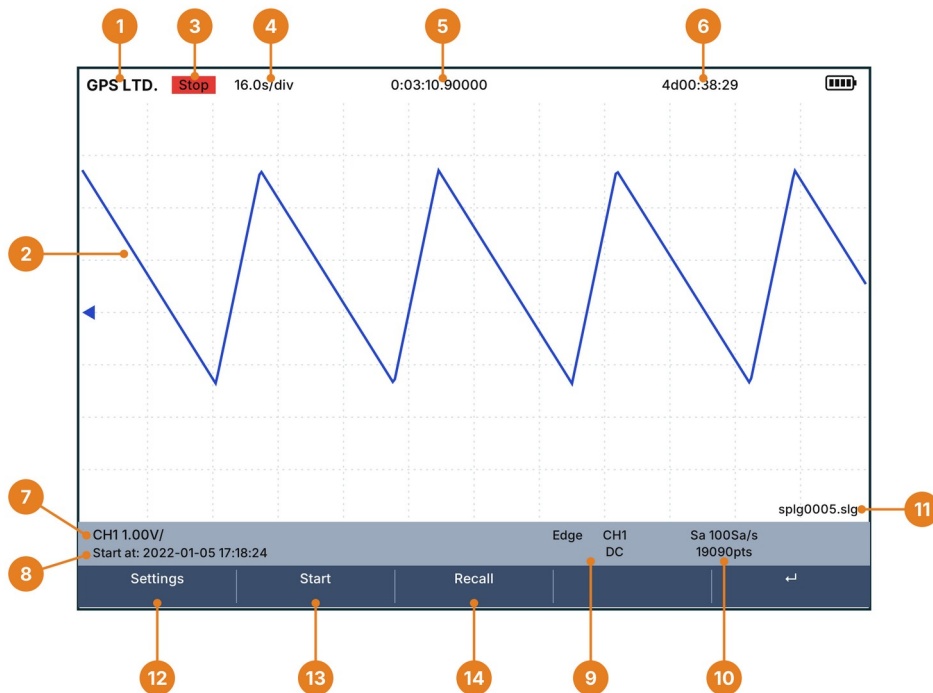


Figure 7 The sample logger screen

Item		Description
1	GPS LTD. mark	
2	Waveform	The samples recorded
3	Recorder state	Stop when not recording, Run while recording
4	Time per division	16 s here

Item	Description	
5	Time recorded	How long the data has been recording
6	Time remaining	How long the remaining storage will record at the current sample rate. In playback, the total time of the data
7	Source	The state of the data source
8	Start time	When recording started
9	Trigger state	The trigger state of the data source
10	Sample rate and samples	The sample rate and the total number of samples
11	File name	The file saved or recalled
12	Settings menu	The sample rate and where the data is stored
13	Start/Stop menu	Starts and stops recording
14	Recall menu	Recalls recorded data

The measurement logger screen

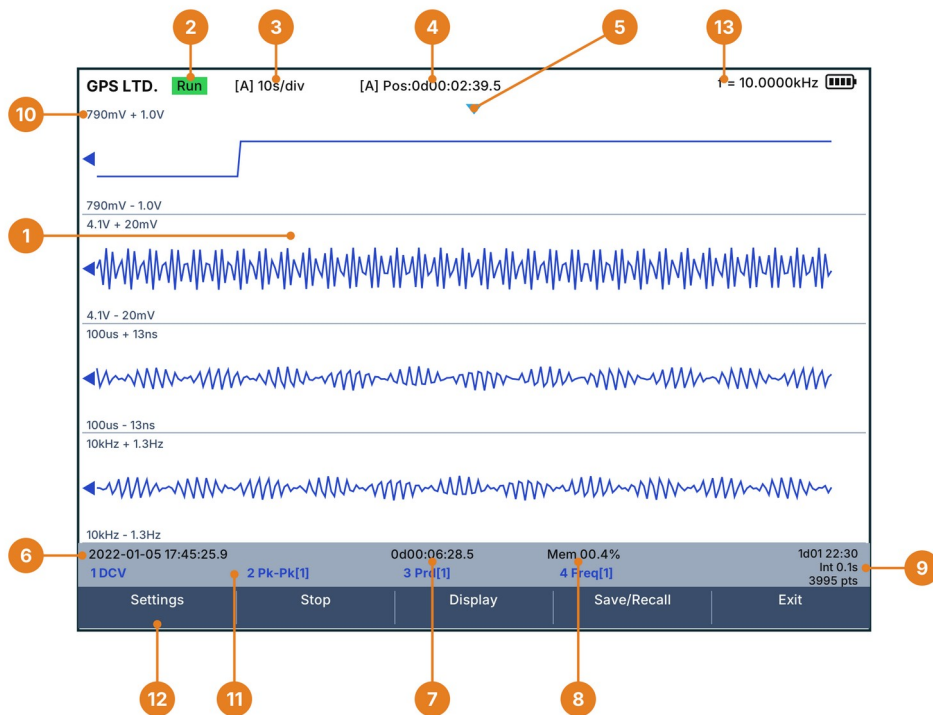


Figure 8 The measurement logger screen

Item	Description	
1	Trend charts	Up to four parameters, recorded at the same time
2	Recorder state	Stop when not recording, Run while recording
3	Time per division	10 s here
4	Position	The time of the start point relative to the reference position
5	Horizontal reference	The reference position
6	Start time	When recording started

	Item	Description
7	Time recorded	How long the data has been recording
8	Memory used	The proportion of the memory in use
9	Capacity	First line, the time the remaining storage will record; second, the recording interval; third, the number of samples recorded
10	Trend label	The value at the centre of the chart (790 mV here) and the range shown either side of it (± 1 V)
11	Measured parameters	The parameters being logged
12	Menu	The measurement logger menu
13	Frequency	The frequency of the trigger source

11 Troubleshooting

If a problem below persists after these checks, contact GPS.

The screen stays dark after switching on

1. Check that the battery or the power adapter is connected correctly.
2. Check whether the power key is faulty.
3. Check whether the fuse has blown. If it needs replacing, contact GPS: the instrument must be returned for repair by authorised service personnel.
4. Switch the instrument on again after these checks.

A signal is connected but no waveform appears

1. Check that the probe is connected correctly to its lead.
2. Check that the lead is connected correctly to the BNC input.
3. Check that the probe is connected correctly to the item under test.
4. Check that the item under test is producing a signal.
5. Acquire the signal again.

The amplitude measured is too high or too low

Check that the attenuation set for the channel matches the probe's attenuation ratio.

A waveform appears but is not stable

1. Check the trigger source: the source in the trigger menu should be the channel in use.
2. Check that the waveform is real: with a high-frequency signal it is easy to take a false waveform for the real one, so make sure the timebase suits the signal.
3. Check the trigger type: edge suits general signals and video suits video signals. The waveform is stable only with the right trigger type.
4. Change the trigger holdoff.

Nothing is displayed after pressing Run/Stop

Check whether the trigger mode is Normal or Single and the trigger level is outside the waveform. If so, set the trigger level to the middle of the waveform, or set the trigger mode to Auto. Auto Setup makes these settings automatically.

The waveform looks like a staircase

1. The timebase may be too slow: a faster timebase improves the horizontal resolution.
2. With the display type set to vectors, the lines between sample points can look like steps. Set the display type to dots.

A USB memory stick is not recognised

1. Check that the memory stick works.
2. Check that the USB host port works.
3. Use a USB memory stick: the USB host port supports memory sticks only.
4. Switch the instrument off and on again, then fit the memory stick again.

12 Key specifications

Item	Specification
Bandwidth	100 MHz (GPS-810X, GPS-1102X) • 200 MHz (GPS-820X, GPS-1202X)
Channels	2 analogue • 1 multimeter
Isolation	GPS-800X: the multimeter • GPS-1000X: both channels, the multimeter, the power adapter and the USB port
Sample rate	1 GSa/s with one channel on • 500 MSa/s each with two
Memory depth	12 Mpts with one channel on • 6 Mpts each with two
Waveform capture rate	Up to 100,000 wfm/s normal • 400,000 wfm/s sequence
Display	5.6 inch TFT LCD, 640 × 480
Multimeter	6000 counts, true RMS
Battery	6900 mAh • 5.5 hours (GPS-800X), 4 hours (GPS-1000X) • 4 hours to charge with the instrument off
Operating temperature	0 °C to 40 °C
Ingress protection	IP51
Dimensions and mass	276 × 168 × 68 mm • 1.75 kg with battery

The technical datasheet gives the complete specification.

13 Supplied with the instrument

- The oscilloscope, with the 6900 mAh battery
- Two passive probes, matched to the model
- Two multimeter test leads
- The 600 mA and 10 A current adapters
- The power adapter and a USB cable
- A carrying bag
- This guide and a certificate

Models

Model	Bandwidth	Part number
GPS-810X	100 MHz	180810
GPS-820X	200 MHz	180820
GPS-1102X	100 MHz, fully isolated	180860
GPS-1202X	200 MHz, fully isolated	180890

14 Warranty and service

One year from the date of purchase, subject to product registration with GPS at www.gpslimited.com/register-product. Service and calibration are available from GPS.

For service, calibration or technical support contact GPS at sales@gpslimited.com or +44 (0) 203 093 0914. Please quote the model, the part number and the serial number.