

Digitizing Oscilloscope

GDS-830

Operation Manual

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GW Part No: 82DS-83000MB

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Due to continuous improvements in the GDS-830 Digitizing Oscilloscope, information contained in this manual is subject to change without notice. Contact GW, for revisions and corrections.



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1. Usage Precautions and Recommendations

The following precautions are recommended to insure your safety and to provide the best condition of this instrument.

Safety Terms and Symbols

These terms may appear in this manual or on the product:



WARNING: Warning statements identify condition or practices that could result in injury or loss of life.



CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

The following symbols may appear in this manual or on the product:



DANGER
High Voltage



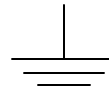
ATTENTION
refer to
Manual



**Protective
Conductor
Terminal**



**Frame
or Chassis
Terminal**



**Earth (ground)
Terminal**

FOR UNITED KINGDOM ONLY

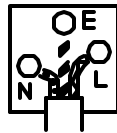
NOTE: This lead / appliance must only be wired by competent persons




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 engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

Use and Wear



CAUTION

- ? Do not exceed $300V_{\text{peak}}$ into the channel BNC **INPUTs**
- ? Do not place any heavy object on the instrument.
- ? Avoid severe impacts or rough handling that could damage the GDS-830.
- ? Use electrostatic discharge precautions while handling and making connections to the GDS-830.
- ? Do not place wires into the connectors of the GDS-830, only mating connectors and adapters.
- ? Do not block or obstruct cooling fan vent opening on side panels or on the rear panel of unit.

1) Disassembly of the Instrument

- ? Do not disassemble the instrument; refer the instrument to a factory approved service facility only.

2) AC Power Input

CAUTION



- ? AC input should be within the range of selected line voltage $\pm 10\%$.
- ? Insure the correct fuse is installed prior to applying voltage for the first time -

100 V ~ 240 VAC input : T 2A / 250V

3) Grounding



WARNING

- ? To avoid electrical shock, the power cord protective grounding conductor must be connected to earth ground.

4) Fuse Replacement



WARNING

- ? For continued fire protection, replace the fuse with the specified type and rating only.
- ? Disconnect power cord before replacing fuse.
- ? Open cover of AC socket with flat blade screwdriver.
- ? If the fuse is blown, there is something wrong with the instrument. Repair the cause of fault before replacing fuse.
- ? Replace the fuse.

5) Cleaning

- ? Disconnect AC Power Cord from the instrument before cleaning.
- ? Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into the unit.
- ? Do not use chemicals or cleaners containing benzene, toluene, xylene, acetone or other harsh chemicals.

6) Operating Environment

? The following conditions are recommended for optimum use of the instrument -

Indoor Use Altitude < 2000 m Temperature 0° to 50° C
Relative Humidity < 80% No direct sunlight No strong magnetic fields
Dust Free

? Installation Category: II

? Pollution degree: 2

7) Storage Environment

? The following conditions are recommended for optimum storage of the instrument -

Indoor Temperature -20° to 70° C Relative Humidity < 80%



WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

2. General Description and Features

The GDS-830 is a useful, 2 channel digitizing oscilloscope with following features:

- 100MHz bandwidth and 100MSa/s sample rate
- Two input channels, each with a record length of 125k dots and 8 bits vertical resolution. Both channel acquire waveforms simultaneously.
- Time base: 2ns/div~5s/div
- Auto-setting for quick setup and hands-free operation
- Four Acquisition mode: Sample, peak detect, average, accumulate
- Cursors and 15 continuously update, automatic measurements: V_{hi} , V_{lo} , V_{max} , V_{min} , V_{pp} , $V_{average}$, V_{rms} , V_{amp} , rise time, fall time, duty cycle, frequency, period, positive width, negative width.
- 15 sets memory for front panel setting save & recall
- 2 sets memory for waveform trace save & recall
- RS-232, parallel port and VGA output are included. GPIB interface module is also available

The microprocessor controlled GDS-830 Digitizing Oscilloscope has been designed for a wide multitude of applications in service and industry. For ease of operation the "Autoset" function allows for signal related automatic setup of measuring parameters. On-screen readout and cursor functions for voltage, frequency measurement provide extraordinary operational convenience. Fifteen different user defined instrument settings can be saved and recalled without restriction. The built-in RS-232 serial interface allows for remote controlled operation by a PC.

The instrument offer the right combination of triggering control, frequency response, and time base versatility to facilitate measurements in a wide range of applications in laboratory as well as in field service use. It is another example of our dedication to engineering excellence.

3. First Time Operation

The following text assumes that the “SAFETY” section of this manual has been read carefully and understood.

Each time before the instrument is put into operation check that the oscilloscope is connected to protective earth. For that reason the power cable must be connected to the oscilloscope and the power outlet. Then the test lead(s) must be connected to the oscilloscope input(s). Check that the device under test is switched off and connect the test lead(s) to the test point(s). Then switch on the instrument and afterward the device under test.

The oscilloscope is switched on by depress the orange **ON** pushbutton (***Before depress the orange ON pushbutton of front panel, the main power switch of rear panel have to be switched on***). After a few second the system initiated, the instrument will revert to its last used operating mode.

Probe calibration

To display an undistorted waveform on an oscilloscope, the probe must be matched to the individual input impedance of each vertical amplifier.

For this purpose a square wave signal with a very fast rise time and minimum overshoot should be used, as the sinusoidal contents cover a wide frequency range.

The build-in calibration generator provides a square wave signal with a very fast rise time, and frequency of approx. 1kHz from the output socket below the CRT screen. As the square wave signals are used for probe compensation adjustment, neither the frequency accuracy nor the pulse duty factor are of importance and therefore not specified.

The output provides $2V_{pp} \pm 3\%$ for 10:1 probe. When the Y deflection coefficient is set to 50mV/div, the calibration voltage corresponds to a vertical display of 4 divisions (10:1 probe).

User checks the waveform indicated correct compensation (see Figure 3-1). If the waveform indicates over or under compensation, use the alignment tool to adjust the compensation.

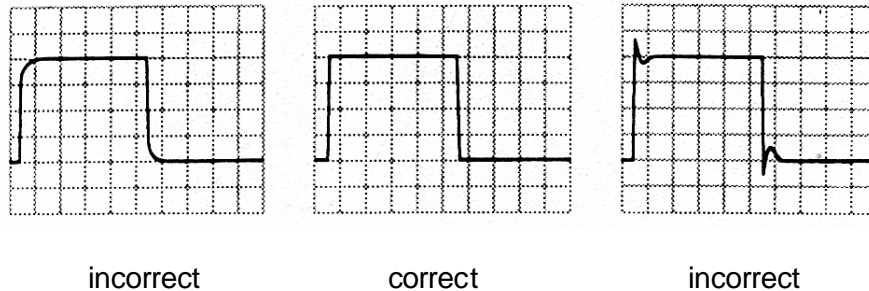


Figure 3-1: Probe compensations

AUTOSET

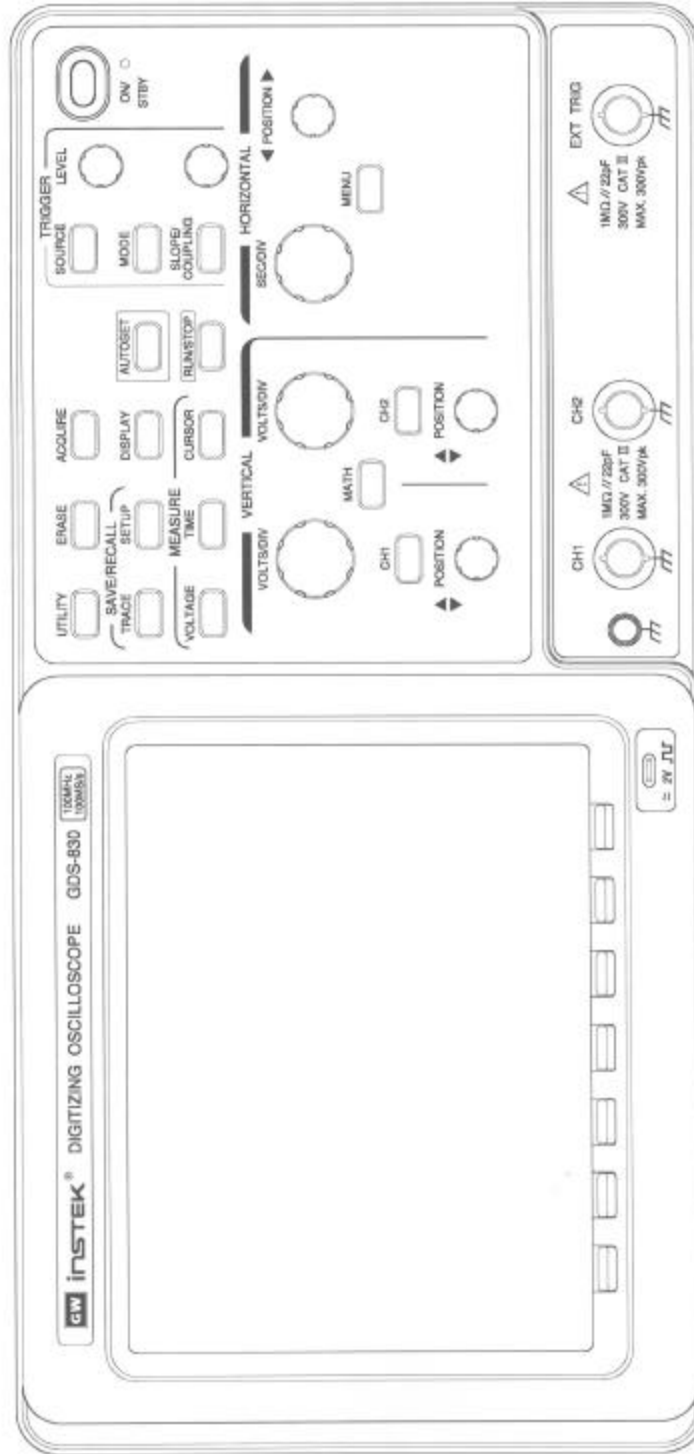
The “Autoset” function provides a stable, triggered display of any input signal (almost). User can connect a signal to either the channel 1 or channel 2 input BNC connector and press **AUTOSET** button. Table 3-1 shows the defaults of “Autoset” function

Table 3-1: Defaults of “Autoset” function

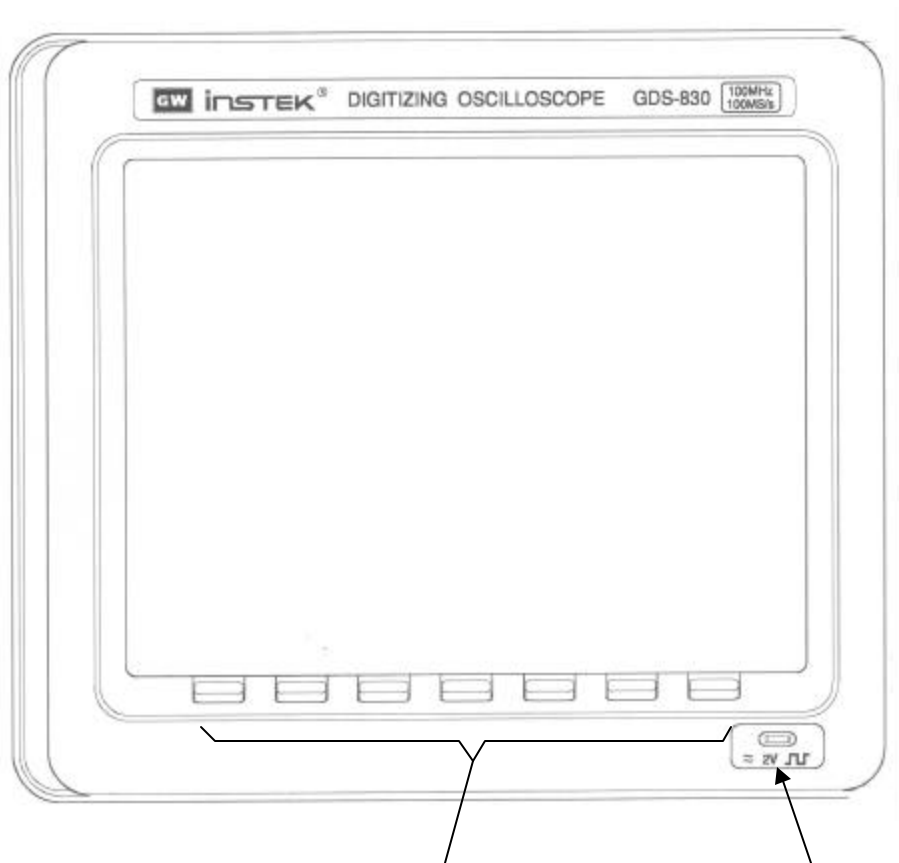
Control	Modified by Autoset
Acquire	Sample
Acquire stop after	RUN/STOP button only
Display style	Vectors
Display format	YT
Horizontal position	Centered within the graticule windows
Horizontal Scale	As determined by the signal frequency
Trigger coupling	DC
Trigger level	Midpoint of data for the trigger source
Trigger position	Center
Trigger slope	Positive
Trigger source	Highest frequency if both channel available
Trigger type	Edge
Vertical bandwidth	Full
Vertical coupling	DC only
Vertical offset	0 V
Vertical scale	As determined by the signal level

4. Panel Description

Front Panel



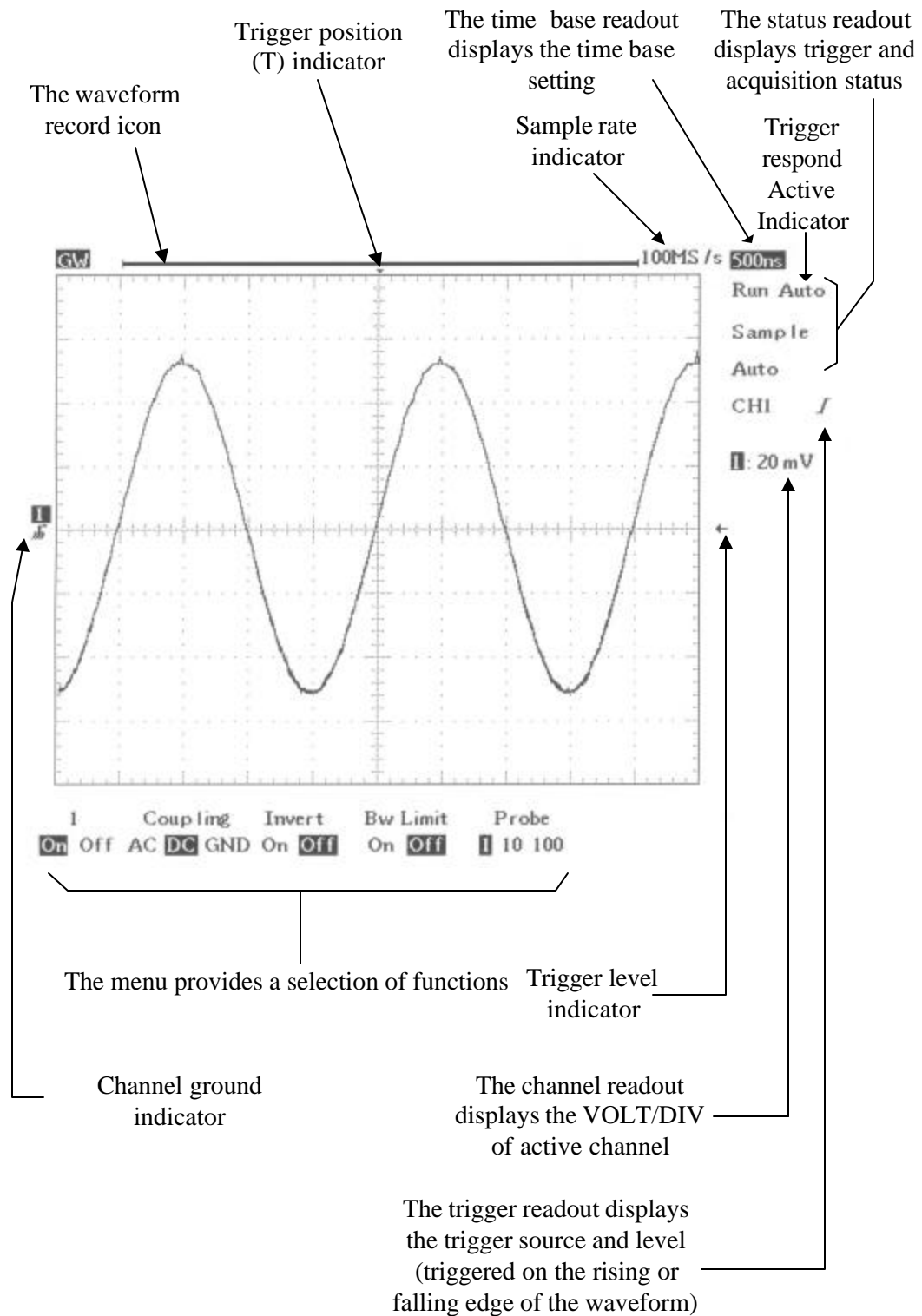
Display



The function-selection buttons
provide access to menu selections

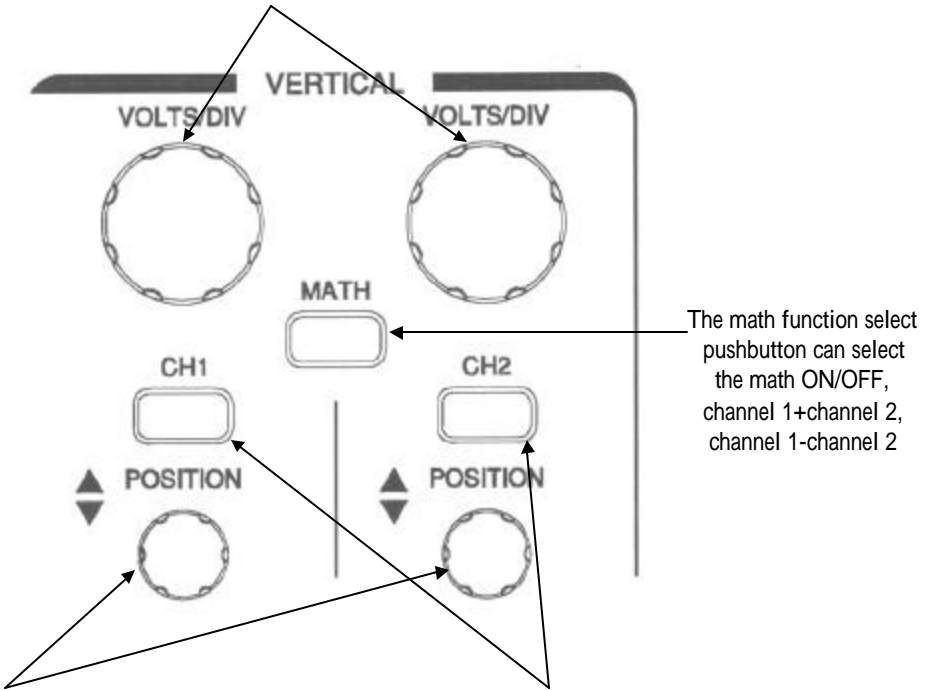
Probe calibration
output

Display map



Vertical controls

The VOLTS/DIV knobs adjust the vertical scale of the selected waveforms (channel 1 and channel 2)



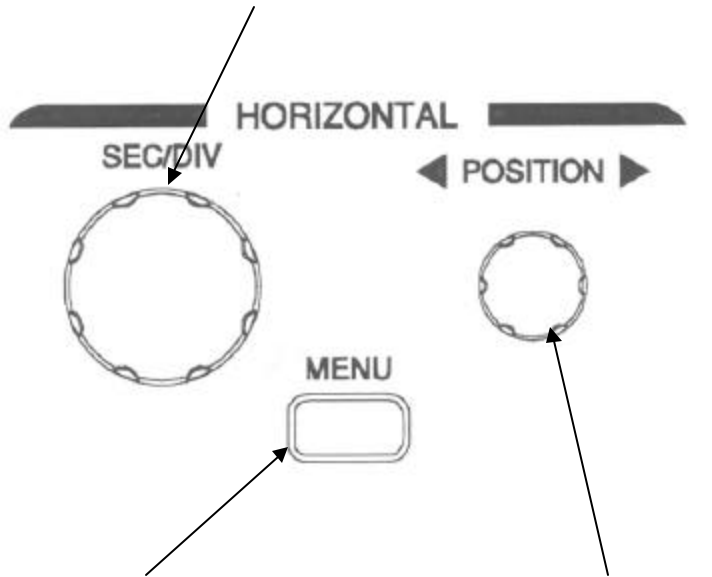
The math function select pushbutton can select the math ON/OFF, channel 1+channel 2, channel 1-channel 2

The position control knobs adjust the vertical position of the channel 1 & 2 waveforms

The waveforms function select pushbuttons can select the different functions of waveform (CH1 or CH2 ON/OFF, Coupling AC/DC/GND, Invert ON/OFF, Bw Limit ON/OFF, Probe 1/10/100)

Horizontal controls

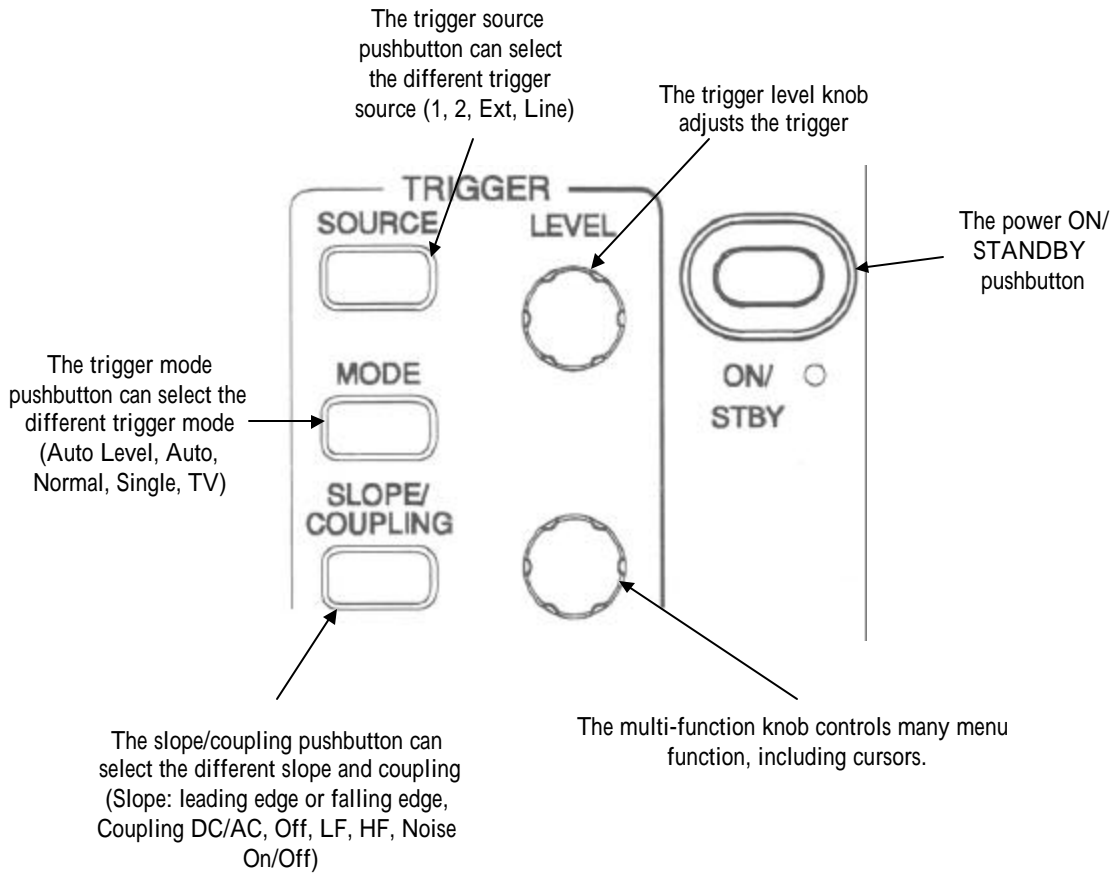
The SEC/DIV knob adjusts the horizontal scale of selected waveform



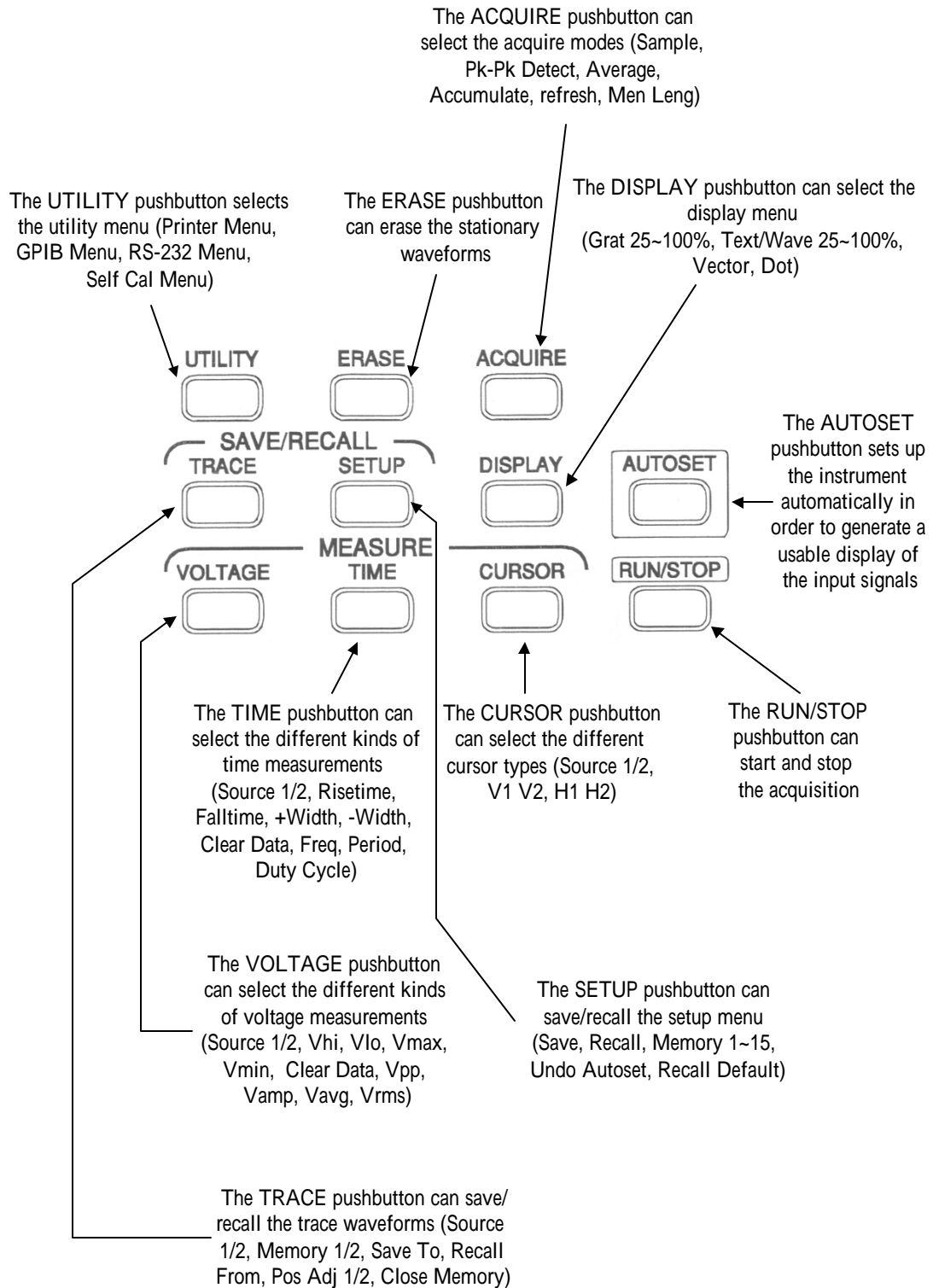
The horizontal MENU pushbutton can select the horizontal operations menu (Main, Windows, Windows Zoom, Roll, XY)

The horizontal position knob adjusts all waveforms' horizontal position

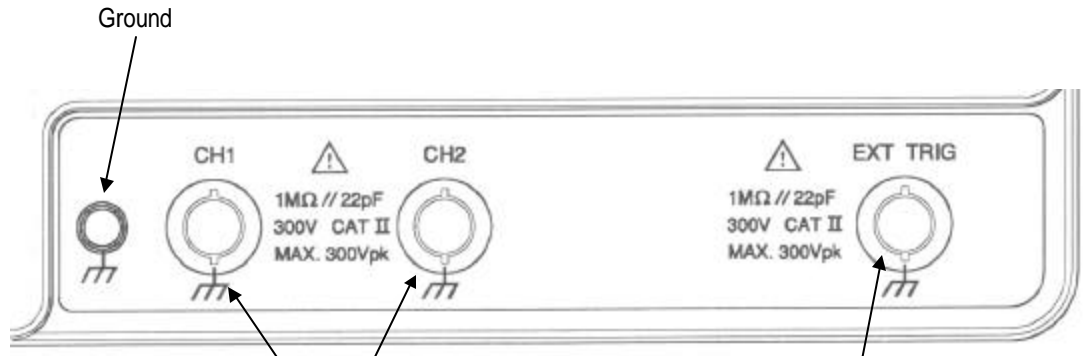
Trigger controls



Miscellaneous controls



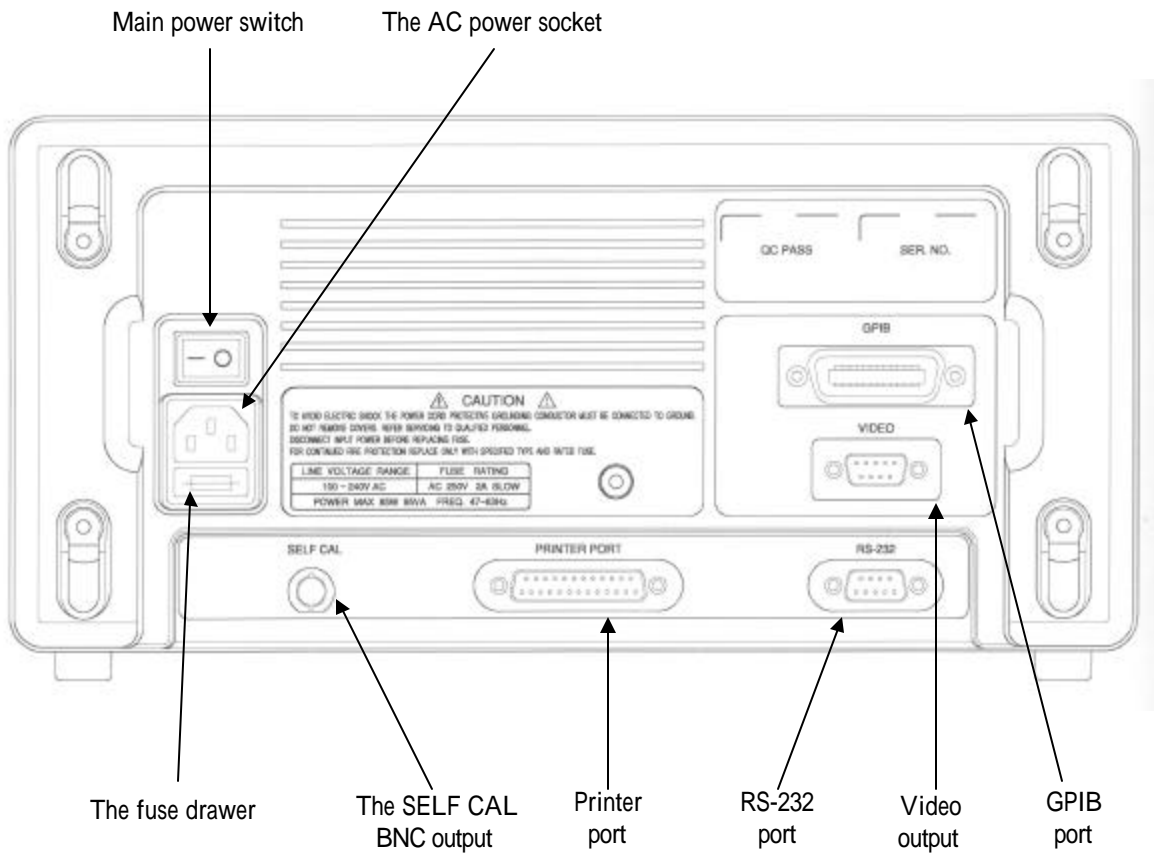
BNC inputs



The channel 1 and channel 2
BNC inputs receive
electrical signals for display

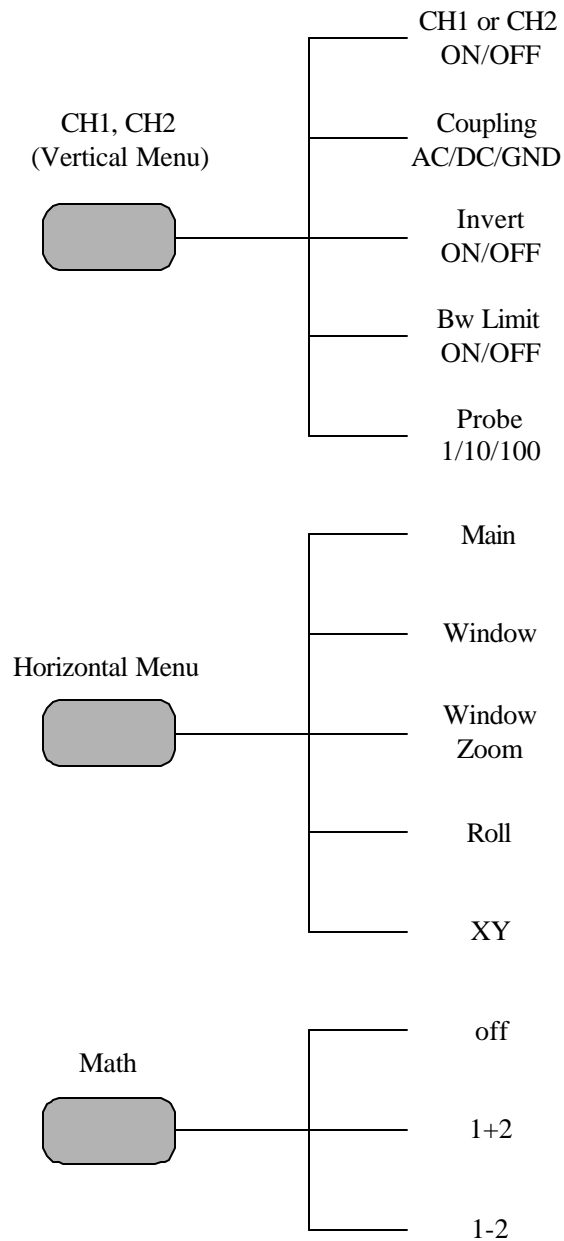
The external trigger BNC inputs

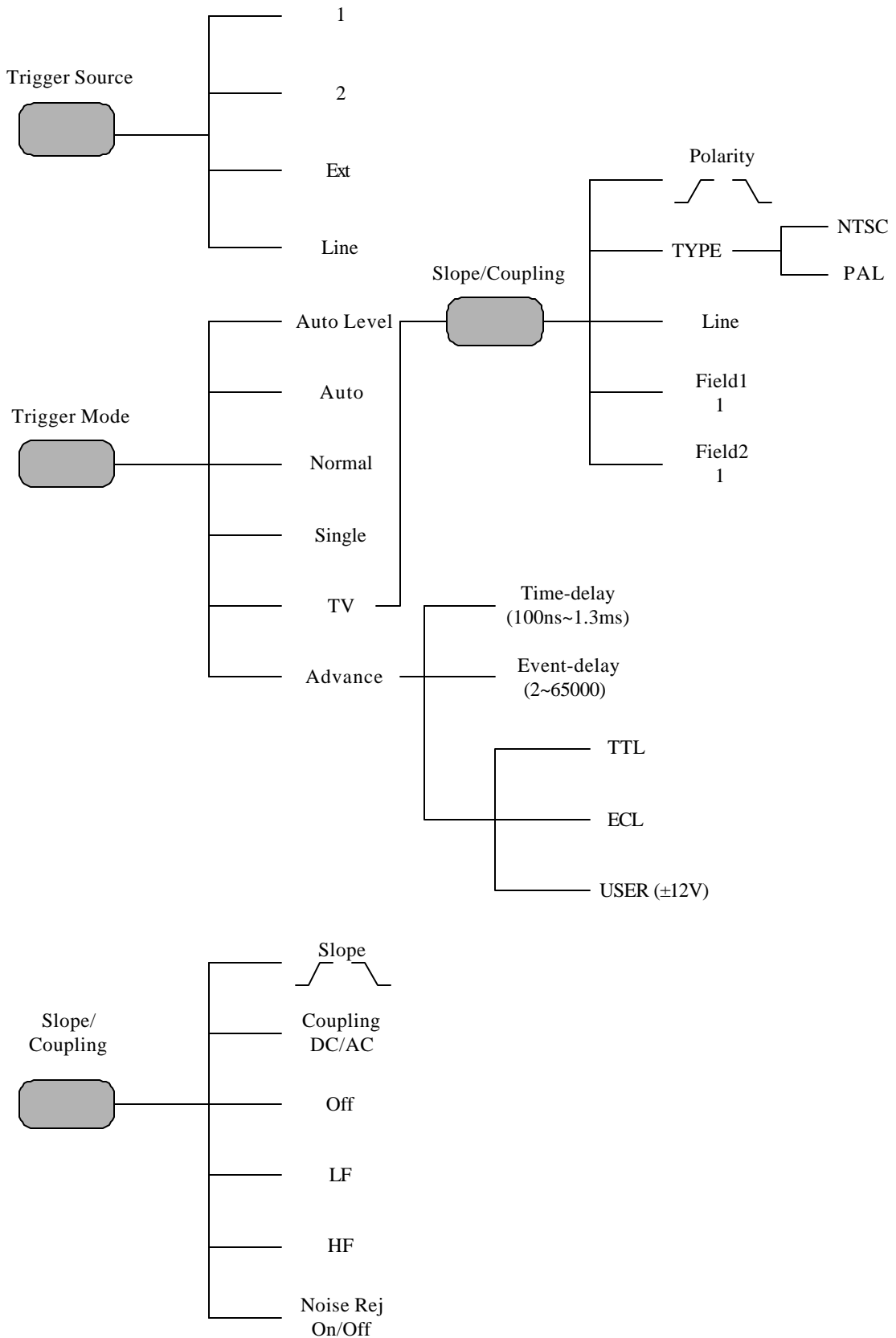
Rear Panel

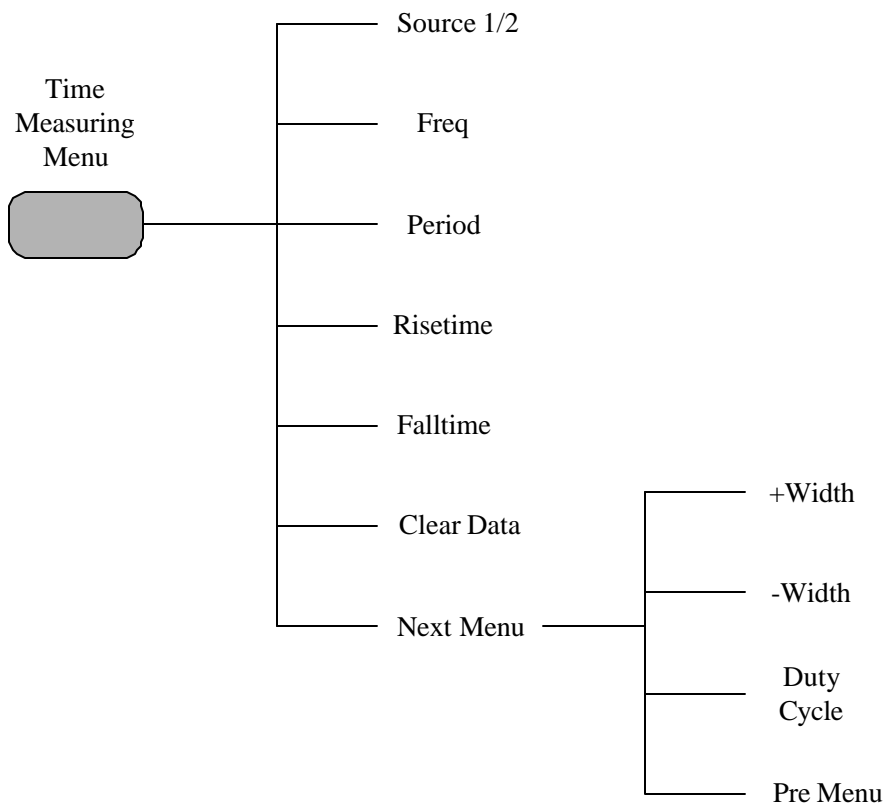
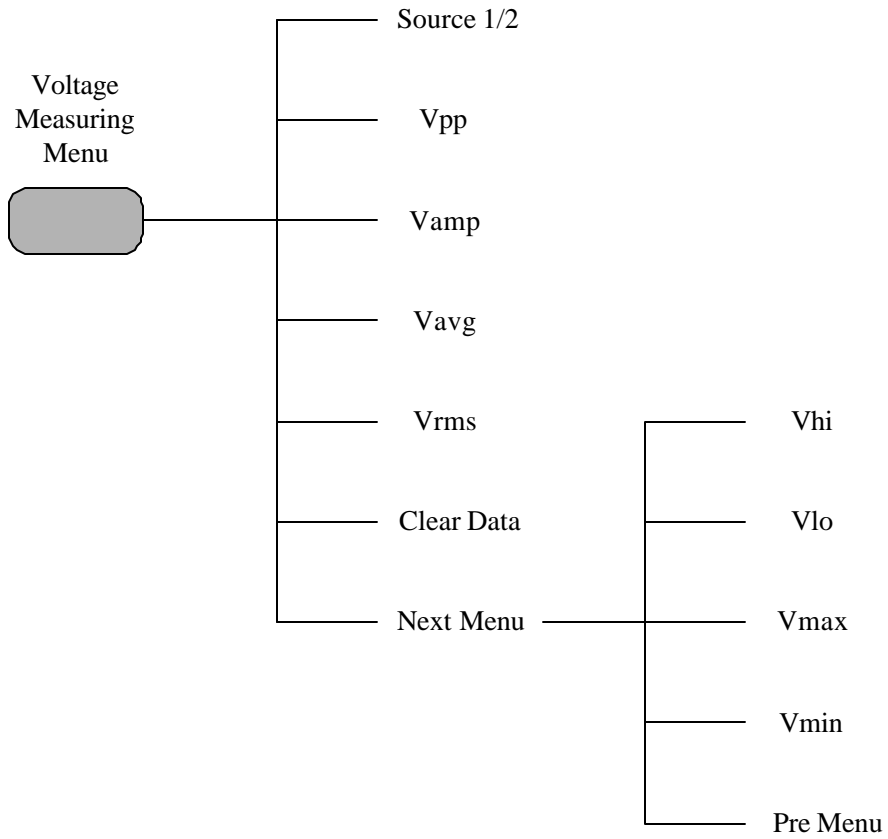


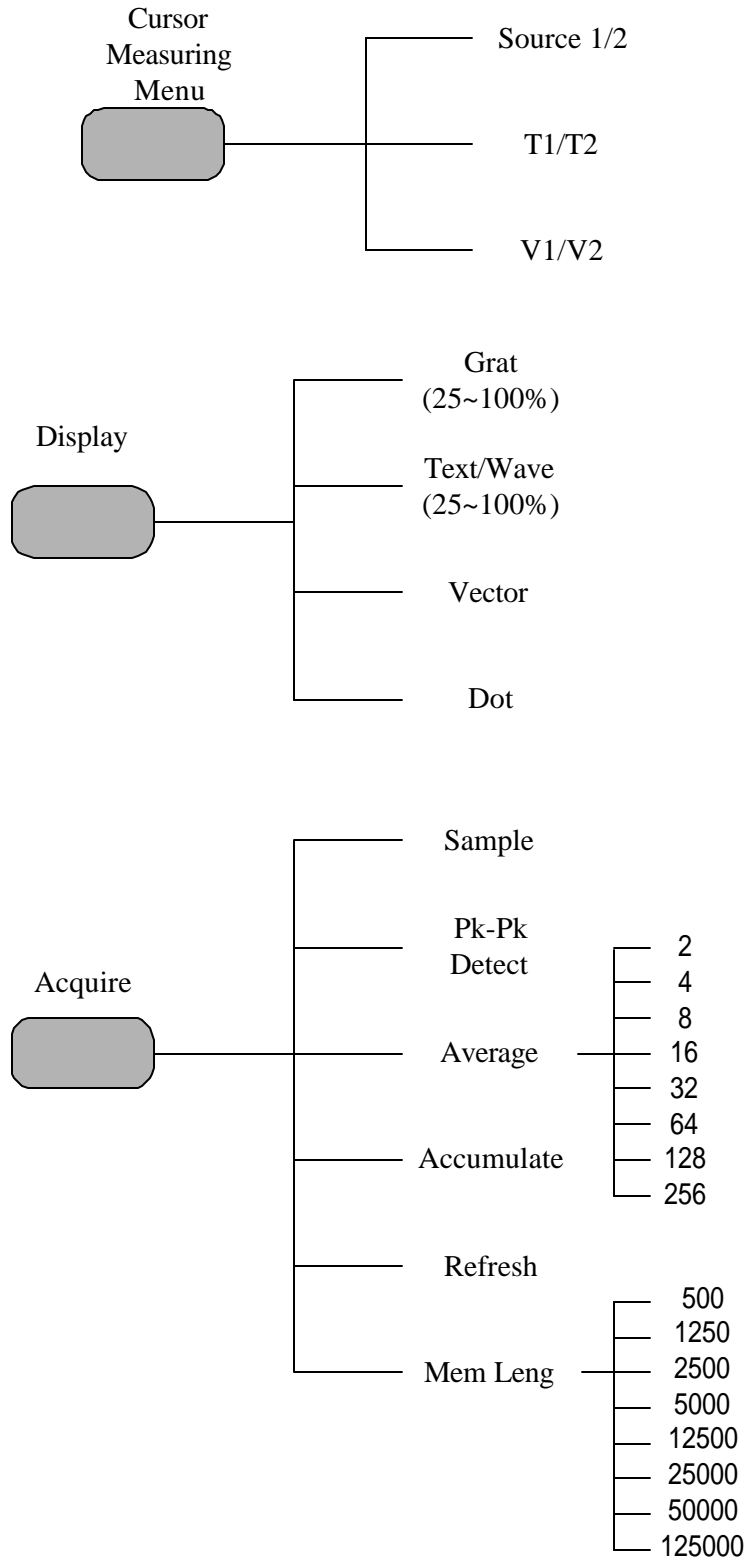
5. Menu Path

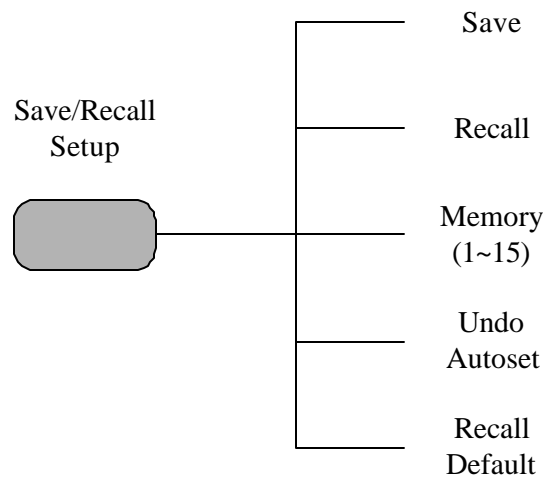
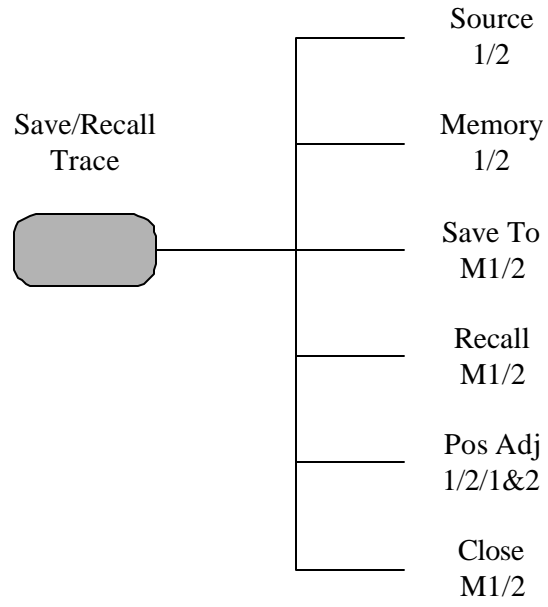
Most GDS-830 functions are menu driven. After push button pressed, the bottom of CRT display will show the corresponding menu functions. User can press the adjacent push button in order to activate the related function. This chapter contains several menu paths: vertical, horizontal, triggering, acquisition, measure, display, and utility menu.

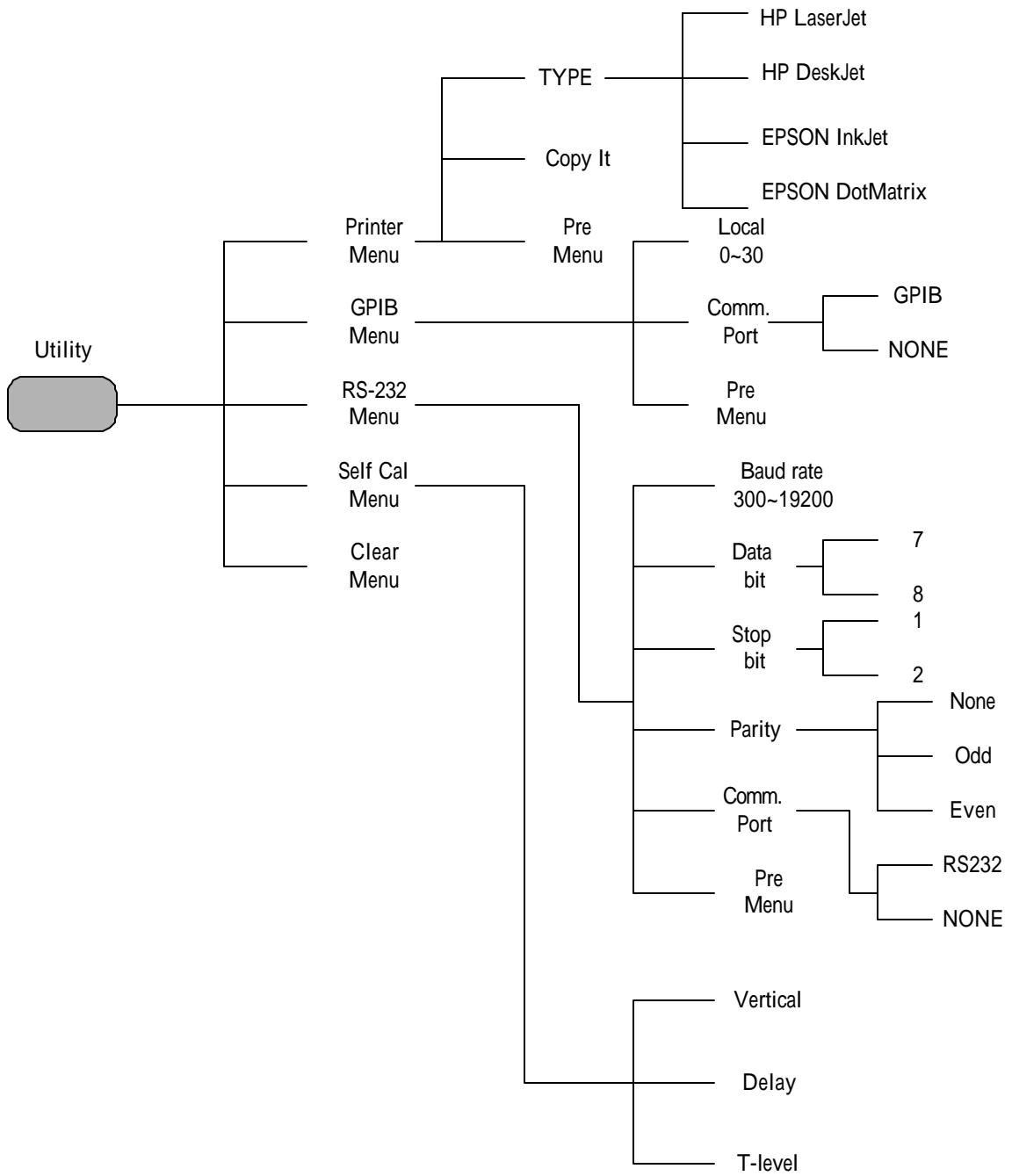












6. Operation

This chapter contains useful information about the operation of GDS-830.

Vertical Control

All vertical operations affect the selected waveform. Press the **CH1**, **CH2**, or **MATH** pushbutton to select the waveform.

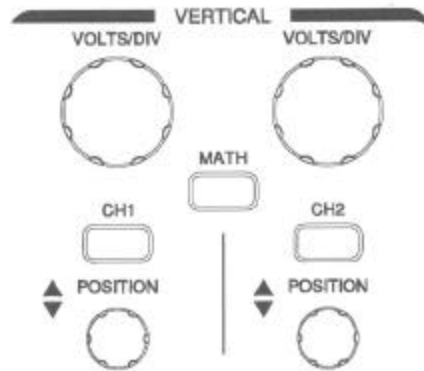


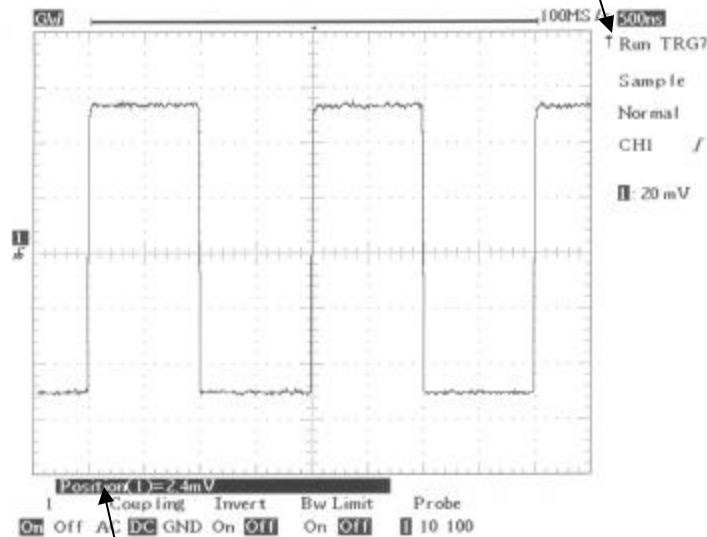
Figure 6-1: The vertical controls panel

VOLTS/DIV: The VOLTS/DIV knobs adjust the vertical scale (in a 1-2-5 sequence) of the selected waveforms (channel 1 and channel 2).

POSITION: The position control knobs adjust the vertical position of the channel 1 & 2 waveforms. When the vertical position is adjusted, the trigger level indicator “ ” (located on the right side of the CRT graticule) will change the position simultaneously. Besides, the vertical position reached to the vertical border of CRT graticule, the trigger level indicator “ ” will change the shape to the “ ” or “ ” (shown in Figure 6-2).

If the trigger level indicator "?" reached to the border of CRT graticule, the trigger level indicator "?" will change the shape to the "?" or "?". In the meantime, the vertical position still can adjust.

For the offset range, please refer to specification.



If the position knob is adjusted, the "vertical DC offset" will show on here temporarily.

Depend on the trigger level settings, rotate the position knob clockwise, the vertical DC offset will be the positive value; rotate the position knob counter-clockwise, the vertical DC offset will be the negative value.

Figure 6-2: Operating the position knob

CH1, CH2: The vertical menu contains the following items when channel 1 or channel 2 is the selected waveform.

- **1 or 2 On/Off:** Switching the channel 1 or channel 2 on or off.
- **Coupling AC/DC/GND:** Press the adjacent pushbutton to select **AC**, **DC**, or ground (**GND**) coupling.
- **Invert On/Off:** Press the adjacent pushbutton to turn (waveform) invert on

or off

- **Bw Limit On/Off**: Press the adjacent pushbutton to switch between 20MHz or full bandwidth.
- **Probe 1/10/100**: Press the adjacent pushbutton to select the probe's $\times 1$, $\times 10$, or $\times 100$ attenuation.

MATH: Select a formula from the math menu: **Off**, **1+2**, **1-2**. The vertical menu contains the following items when channel 1 or channel 2 is the selected waveform.

- **Off**: Switching off the math function.
- **1+2**: Waveform of channel 1 + Waveform of channel 2.
- **1-2**: Waveform of channel 1 - Waveform of channel 2.

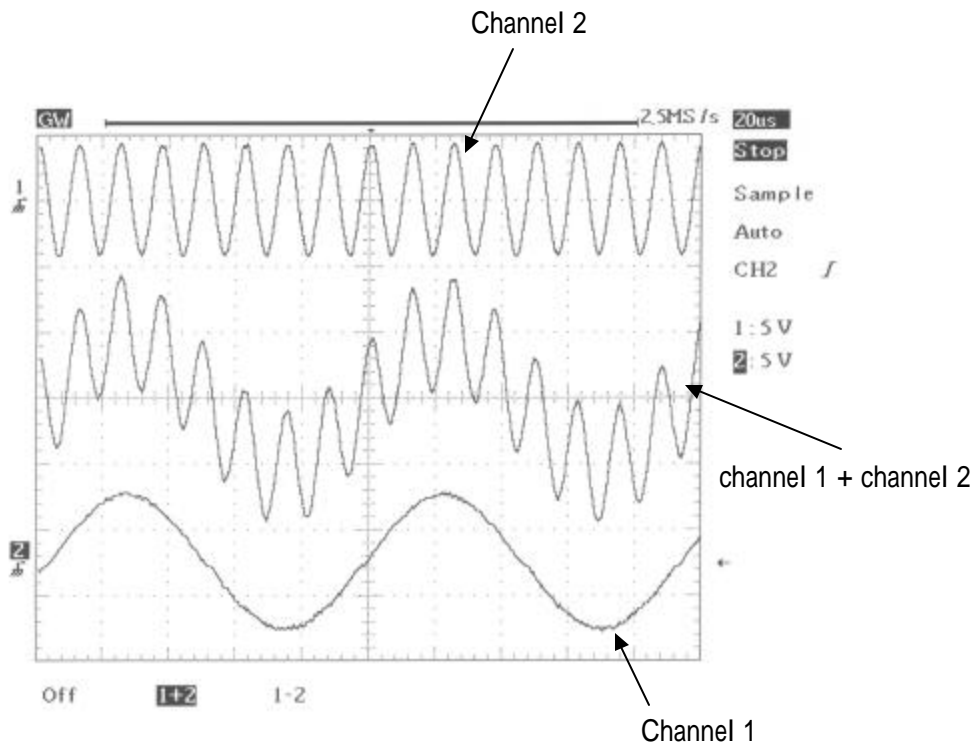


Figure 6-3: Operating the math function (ADD)

Horizontal Control

To select the horizontal controls, press the **MENU** pushbutton to select the features.

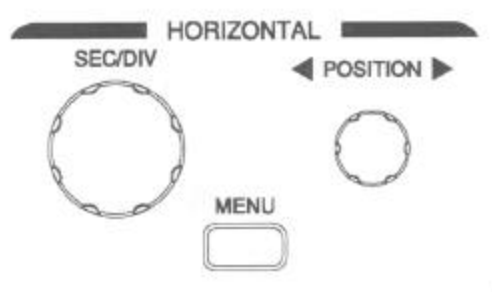


Figure 6-4: The horizontal controls panel

SEC/DIV: The SEC/DIV knobs adjust the horizontal scale (in a 1-2-5 sequence) of the selected waveforms (channel 1 and channel 2).

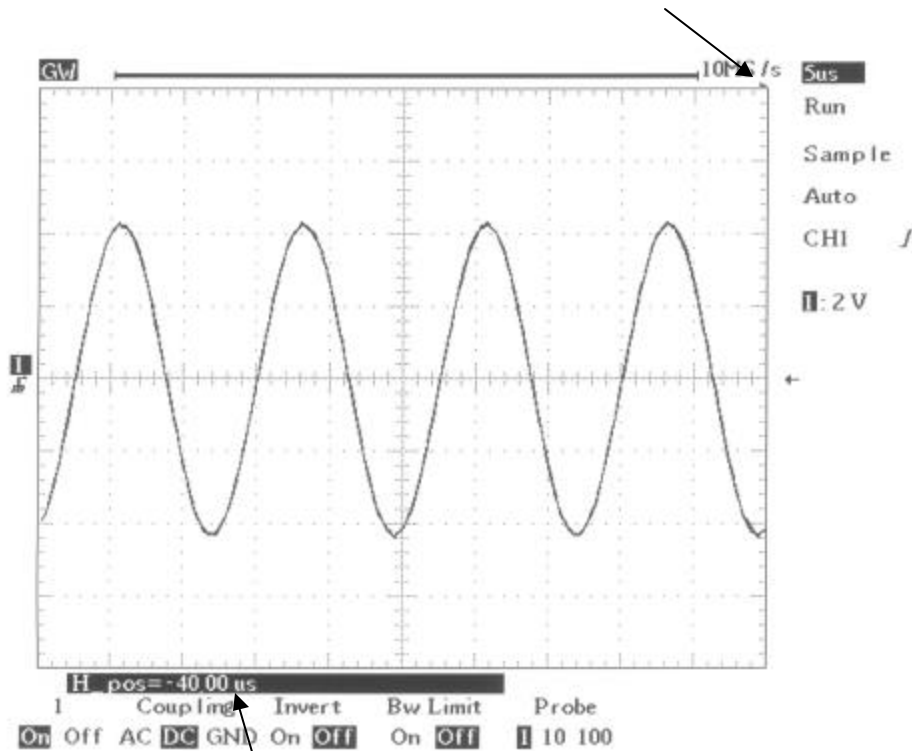
POSITION: The position control knobs adjust the horizontal position of the channel 1 & 2 waveforms. When the horizontal position is adjusted, the trigger position indicator “ ” (located on the upper side of the CRT graticule) will change the position simultaneously. Besides, the horizontal position reached to the horizontal border of the CRT graticule, the trigger level indicator “ ” will change the shape to the “◀” or “▶” (shown in Figure 6-5).

MENU: Select a control to modify the timebase, horizontal position, and horizontal magnification of selected waveform.

- **Main**: Display the main timebase only.
- **Window**: To switch between the normal and zoomed display, Press the adjacent pushbutton to display both main and delayed timebase. Two vertical cursors will appear. Use the **SEC/DIV** knob to change the length (windows frame time: from 2ns to one more faster timebase than the desired timebase. For example, if the 1ms timebase is selected, the window frame timebase will be 500 μ s) of the zone and the **POSITION**

knob to change the position.

If the trigger position indicator " " reached to the border of CRT graticule, the trigger level indicator " " will change the shape to the "◀" or "▶". In the meantime, the horizontal position still can be adjusted.



If the position knob is adjusted, the "trigger position" will show on here temporarily. Rotate the position knob clockwise, the "trigger position" will be the positive value; rotate the position knob counter-clockwise, the "trigger position" will be the negative value.

Figure 6-5: Operating the horizontal position knob

- **Window Zoom**: Press the adjacent pushbutton to zoomed the selected waveform.

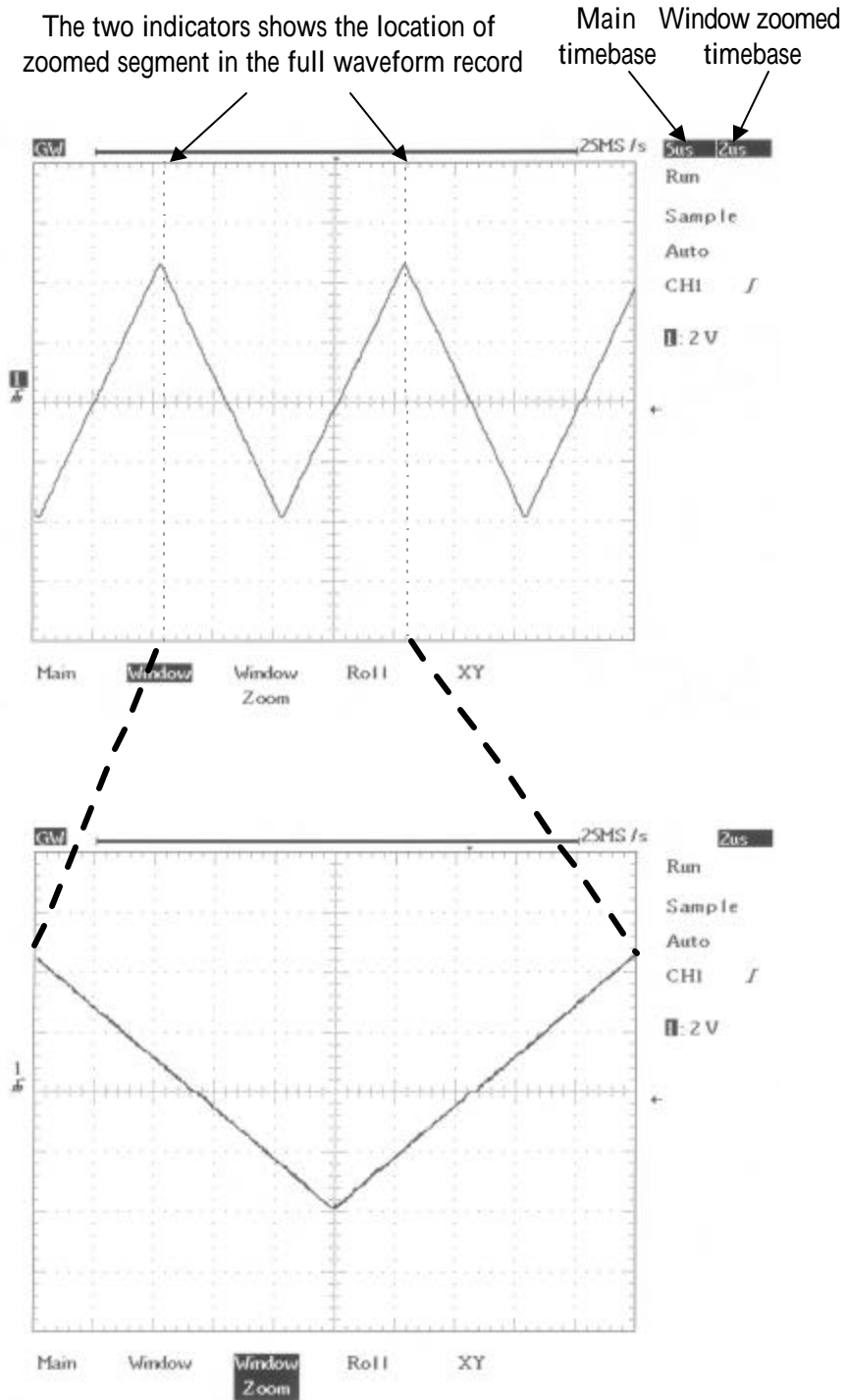


Figure 6-6: Operating the zoom function

- **Roll**: Press the adjacent pushbutton to obtain a rolling display similar to a strip-chart recorder. In the meantime, the system will select the roll mode from “Acquisition Mode” and the timebase of 200ms/div upper limited automatically.
- **XY**: Select XY display format if user want to show channel 1 in horizontal axis and channel 2 in vertical axis. The XY display controls as following:
 - The channel 1 **VOLTS/DIV** knob and vertical **POSITION** knob controls the horizontal scale and position.
 - The channel 2 **VOLTS/DIV** knob and vertical **POSITION** knob controls the vertical scale and position.

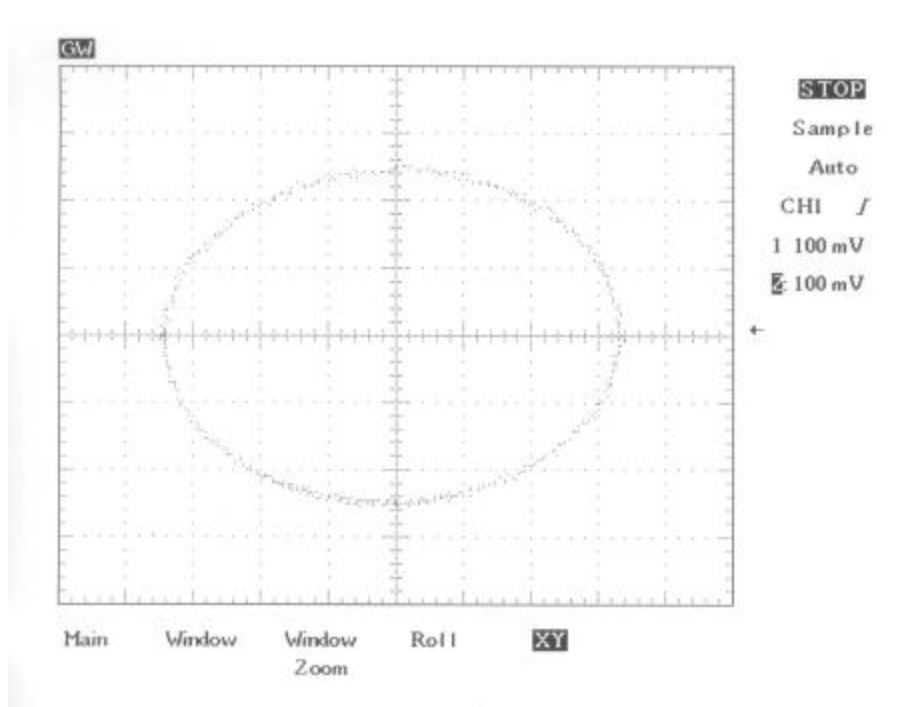


Figure 6-7: Operating the XY display function

Trigger Control

When the instrument starts acquiring and display a waveform, “trigger” help create meaningful waveforms from unstable jumbles or blank screen. To access the triggering controls, press the **SOURCE**, **MODE**, or **SLOPE/COUPLING** pushbutton to select the features, shown in Figure 6-8.

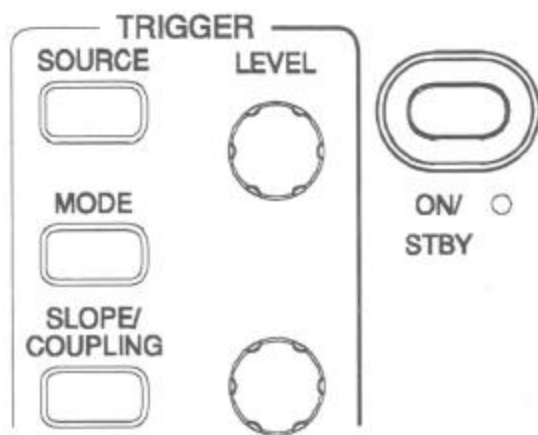


Figure 6-8: Trigger controls

SOURCE: Select the trigger source.


- **1**: Select channel 1 as trigger source.
- **2**: Select channel 2 as trigger source.
- **Ext**: Select EXT TRIG input as trigger source. Note this instrument can trigger on external trigger signals, but cannot display them.
- **Line**: Select AC line voltage signal as trigger source.

MODE: Select a trigger mode.

- **Auto Level:** Press the adjacent pushbutton to enable the auto level triggering; the instrument will shift the “trigger level indicator” to the central part of waveform automatically.
- **Auto:** In this mode, the instrument will generate an internal trigger in the absence of other trigger events. Also, select Auto trigger mode when you want an un-triggered, rolling waveform at 500ms/div or slower timebase settings. This mode is able to continuously observe low speed phenomena in real time down to a speed of 5s/div.
- **Normal:** Normal trigger mode enables the instrument to acquire a waveform only when instrument is triggered. If no trigger occurs, the instrument will not acquire waveform.
- **Single:** Press the adjacent pushbutton to trigger on the next valid trigger event and then stop. If a trigger is required again, just press the **RUN/STOP** pushbutton. Signal shot events are waveforms that happen only once or infrequently. In order to capture a signal shot events, user needs to have knowledge of the waveform, which is trying to capture. Before user can setup the trigger, vertical, and horizontal controls to capture and display event, user must know the approximate amplitude, duration, and DC offset of the signal.

Note: If “Single” trigger mode is selected, the sample rate will be 100MSa/s on the timebase of 500ns/div.

- **TV:** The video trigger gives user a variety of selections for triggering on video signals: polarity, the selection of NTSC or PAL video signal, line, field 1, field 2. After select the TV trigger mode, press the **SLOPE/COUPLING** pushbutton, you can access those functions as following:

- **Polarity** : The video trigger can trigger on the negative-going sync pulses (default). If need to trigger on positive-going sync of a signal, simply invert the signal by pressing this pushbutton again.
- **Type NSTC/PAL**: Press the adjacent pushbutton to select predefined setups (NSTC or PAL). NSTC has a line rate of 525 lines per frame and a field rate of 60Hz. PAL has a line rate of 625 lines per frame and a field rate of 50Hz.
- **Line**: Press the adjacent pushbutton to trigger on all lines of the video signal
- **Field1 1**: Press the adjacent pushbutton to trigger on field 1 of the video signal. Rotate the multi-function knob to display the specific line. (The adjustable line range for NSTC: 1~263; for PAL: 1~313)
- **Field2 1**: Press the adjacent pushbutton to trigger on field 2 of the video signal. Rotate the multi-function knob to display the specific line (The adjustable line range for NSTC: 1~262; for PAL: 1~312)

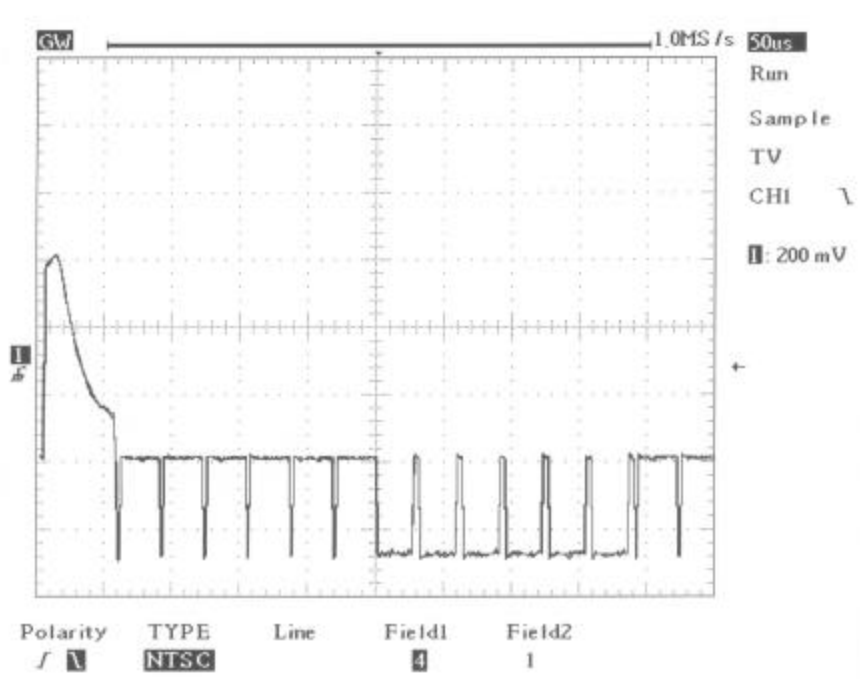


Figure 6-9: Vide trigger mode - odd field scan (line 1)

- **Advance**: The advance trigger system includes a start trigger signal and a 2nd trigger source (main trigger). The start trigger signal generated from external trigger. When using the advance trigger system, user can delay the acquisition of a waveform for a user-defined time or a user-defined number of delayed trigger events after a start trigger signal. Press the adjacent pushbutton to select next three advance trigger settings: **Time-delay**, **Event-delay**, and **TTL/ECL/USER**.
- **Time-delay**: After the specified user-defined delay time passed, system should be asked to wait for the next delayed trigger event, and acquires. Rotate the multi-function knob to select the specific delay time. (The adjustable delay time range: 100ns~1.3ms).

After the external trigger has been applied, the true trigger will be applied by the CH1 (or CH2) trigger after the elapse of set time. This function can be used to check the phenomenon caused first after the elapse of a given time after a control signal has been generated in a control system using a microprocessor

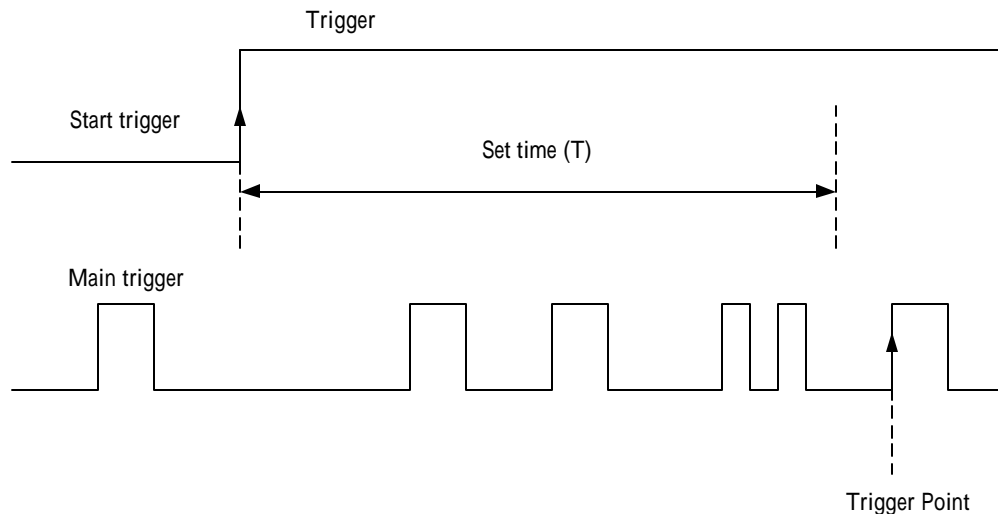


Fig 6-10: The start trigger signal is ignored during the set time interval (T); the start trigger signal caused first after elapse of the set time (T) becomes a trigger point.

If start trigger signal is selected, the DELAY time can be set by the multi-function knob.

If the main trigger is selected, press the **TTL/ECL/USER** pushbutton and to select the start trigger signal level from the following three levels.

TTL: This is the mode for the TTL signal measurement and start trigger signal are set to +1.4V.

ECL: This is the mode for the ECL signal measurement and start trigger signal are set to -1.3V.

USER: Select USER mode and rotate the multi-function knob to define the specific start trigger signal level. (The adjustable start trigger signal level range: $\pm 12V$)

- **Event-delay**: Waits the user-defined delay trigger events and then acquires. Rotate the multi-function knob to select the specific delay event. (No. of events: 2~65000)

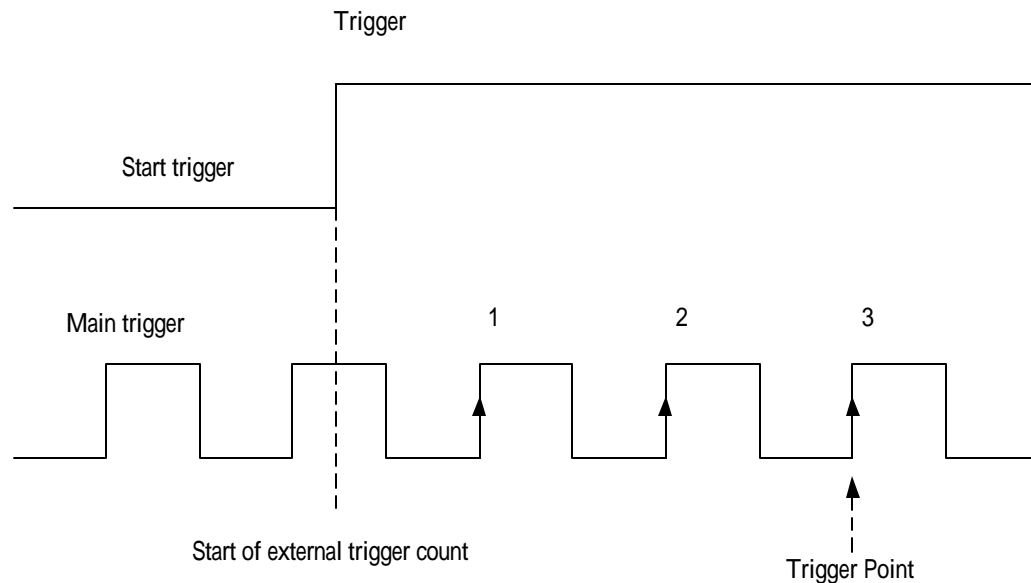


Fig 6-11: Event delay trigger. Number of set event: In case of three.

If start trigger signal is selected, the number of events can be set by the multi-function knob.


If the main trigger is selected, press the **TTL/ECL/USER** pushbutton and to select the start trigger signal level from the following three levels.

TTL: This is the mode for the TTL signal measurement and start trigger signal are set to +1.4V.

ECL: This is the mode for the ECL signal measurement and start trigger signal are set to -1.3V.

USER: Select USER mode and rotate the multi-function knob to define the specific start trigger signal level. (The adjustable start trigger signal level range: $\pm 12V$)

SLOPE/COUPLING: Change trigger slope and select trigger coupling.

- **Slope** : Press the adjacent pushbutton to select the triggering slope; the instrument will change the “trigger slope” to the rising or falling edge.
- **Coupling DC/AC**: Press the adjacent pushbutton to select DC coupling or AC coupling.
- **Off**: Press the adjacent pushbutton to switch off the frequency reject mode.
- **LF**: Press the adjacent pushbutton to enable low frequency reject mode. Low frequency reject mode removes the low frequency portion of the triggering signal. That allows only the high frequency components to pass on to the triggering system and start an acquisition afterward. Low frequency rejection attenuates signals below 50kHz.
- **HF**: High frequency reject mode does the opposite of low frequency reject mode. High frequency rejection attenuates signals above 50kHz.
- **Noise Rej On/Off**: Press the adjacent pushbutton to enable noise reject mode. Noise reject mode provides lower DC sensitivity. It requires additional signal amplitude for stable triggering, reducing the change of falsely triggering on noise.

Miscellaneous Controls

To select the miscellaneous controls, press these pushbutton to select specific features (see Figure 6-12).

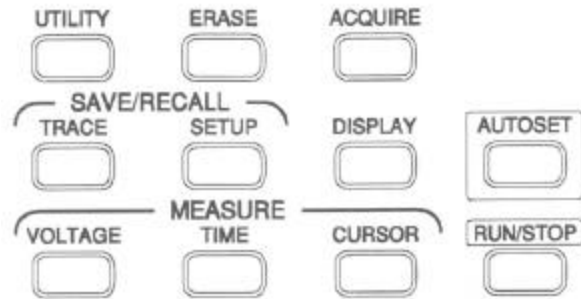


Figure 6-12: Miscellaneous controls

MEASURE

The GDS-830 provides with various automatic measurements. Automatic measurements are taken over the entire waveform record, or the area specified by cursors.

VOLTAGE: Select the different voltage measurement. Maximum three measurements can be displayed simultaneously.

- **Source 1/2:** Select the waveform signal of channel 1 or channel 2 to be measured.
- **Vpp:** $V_{max} - V_{min}$ (over the entire waveform).
- **Vamp:** $V_{hi} - V_{lo}$ (over the entire waveform).
- **Vavg:** Average voltage of the first cycle of the signal.
- **Vrms:** The true Root Mean Square voltage over the entire waveform or specified area.
- **Clear Data:** Clear current voltage measuring displays.

- **Next Menu**: Switch to next menu. **Vhi**, **Vlo**, **Vmax**, and **Vmin**.
- **Vhi**: Voltage of the global high value.
- **Vlo**: Voltage of the global low value.
- **Vmax**: Voltage of the maximum amplitude. The positive peak voltage measured over the entire waveform.
- **Vmin**: Voltage of the minimum amplitude. The negative peak voltage measured over the entire waveform.
- **Pre Menu**: Switch to previous menu

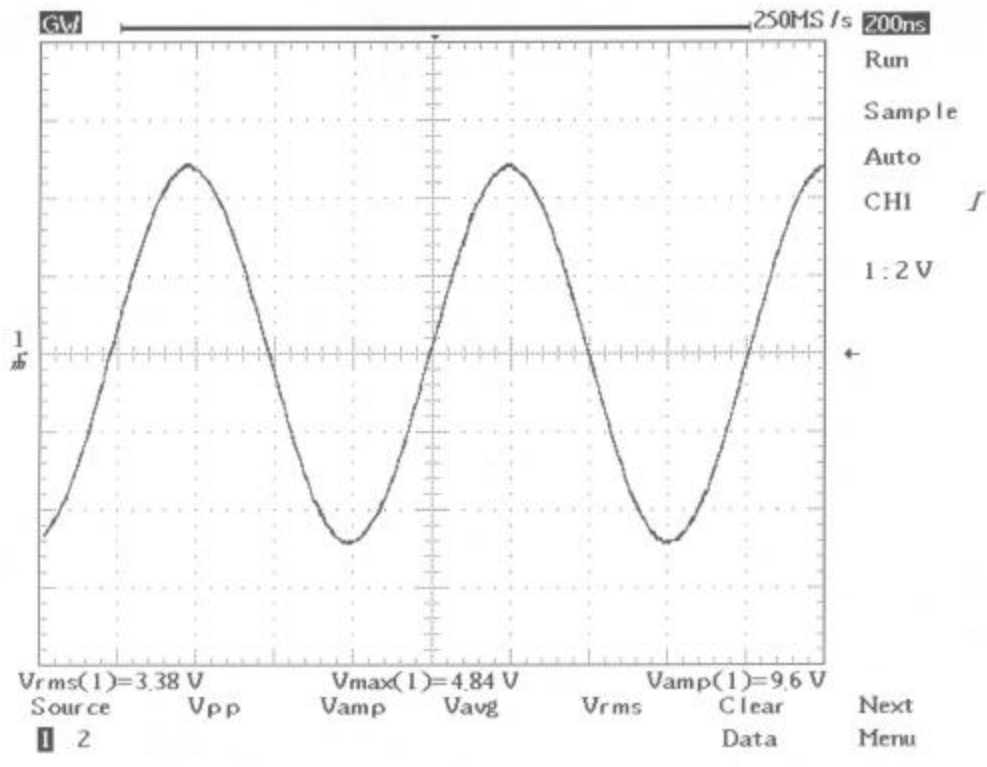


Figure 6-13: Voltage measurements

TIME: Select the different timing measurement. Maximum 3 measurements can be displayed simultaneously.

- **Source 1/2**: Select the waveform signal of channel 1 or channel 2 to be measured.
- **Freq**: Frequency measurement for the first cycle in the waveform or specified area. The frequency is reciprocal of the period and measured in Hertz (Hz).
- **Period**: Timing measurement takes for the first complete signal cycle to happen in the waveform or specified area. The period is reciprocal of the frequency and measured in seconds.
- **Risetime**: Timing measurement taken for leading edge of the first pulse in the waveform.
- **Falltime**: Timing measurement taken for falling edge of the first pulse in the waveform.
- **Clear Data**: Clear current time measuring displays.
- **Next Menu**: Switch to next menu. **+Width** , **-Width** , **Duty Cycle**.

- **+Width**: Measurement of the first positive pulse in the waveform or specified area. The time is between the 50% amplitude points.
- **-Width**: Measurement of the first negative pulse in the waveform or specified area. The time is between the 50% amplitude points.
- **Duty Cycle**: Timing measurement for the first cycle in the waveform or specified area. The ratio of pulse width of the signal period expressed as a percentage. $DutyCycle=(Width/Period)\times 100\%$
- **Pre Menu**: Switch to previous menu.

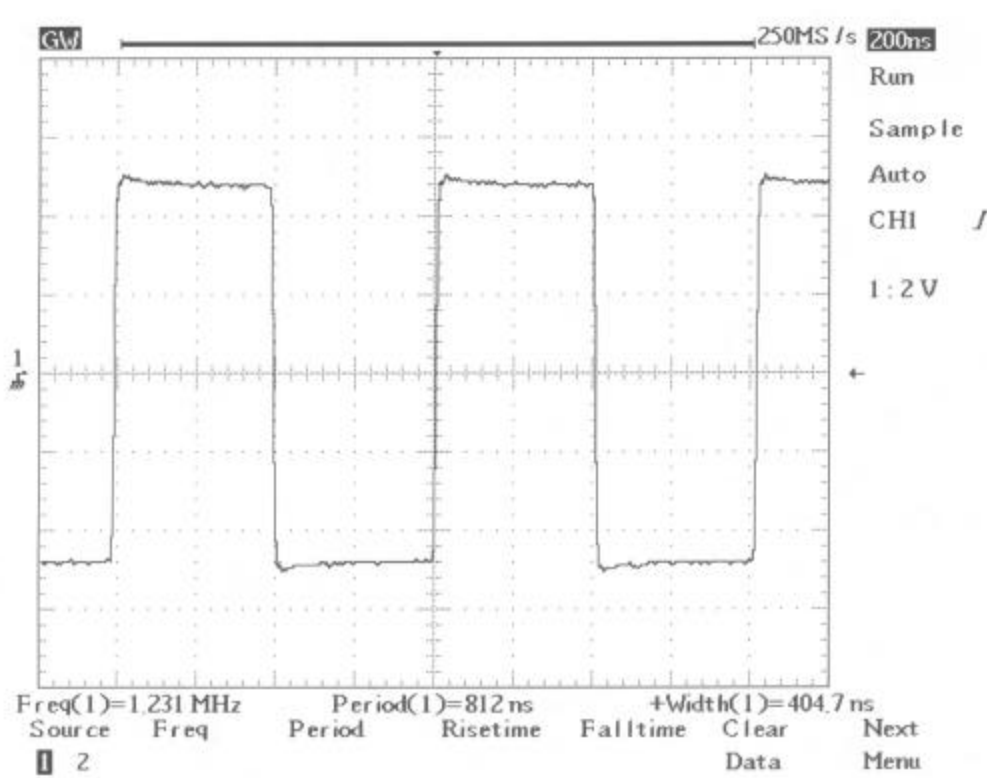


Figure 6-14: Timing measurements

CURSOR: Select the different cursor measurement. Vertical cursors measure time; horizontal cursors measure voltage. For both vertical and horizontal cursors, the cursor readout T1 and T2 (V1 and V2) show the selected cursor relative to the center horizontal (or vertical) CRT graticule; the readout symbol indicates the distance (time or voltage) between of two cursors (see Figure 6-13).

- **Source 1/2:** Press the adjacent pushbutton to select the waveform signal of channel 1 or channel 2 to be measured.
- **T1 T2:** Press the adjacent pushbutton continually to switch two cursor modes: independent and tracking.

User can move only one cursor at a time using the multi-function knob in independent mode. The T1 cursor is a solid line; the T2 cursor is a dot line.

In tracking mode, both cursors move in tandem by using the multi-function knob. The two cursors remain a fixed distance for each other.

- **V1 V2:** Press the adjacent pushbutton continually to switch two cursor modes: independent and tracking.

User can move only one cursor at a time using the multi-function knob in independent mode. The V1 cursor is a solid line; the V2 cursor is a dot line.

In tracking mode, both cursors move in tandem by using the multi-function knob. The two cursors remain a fixed distance for each other.

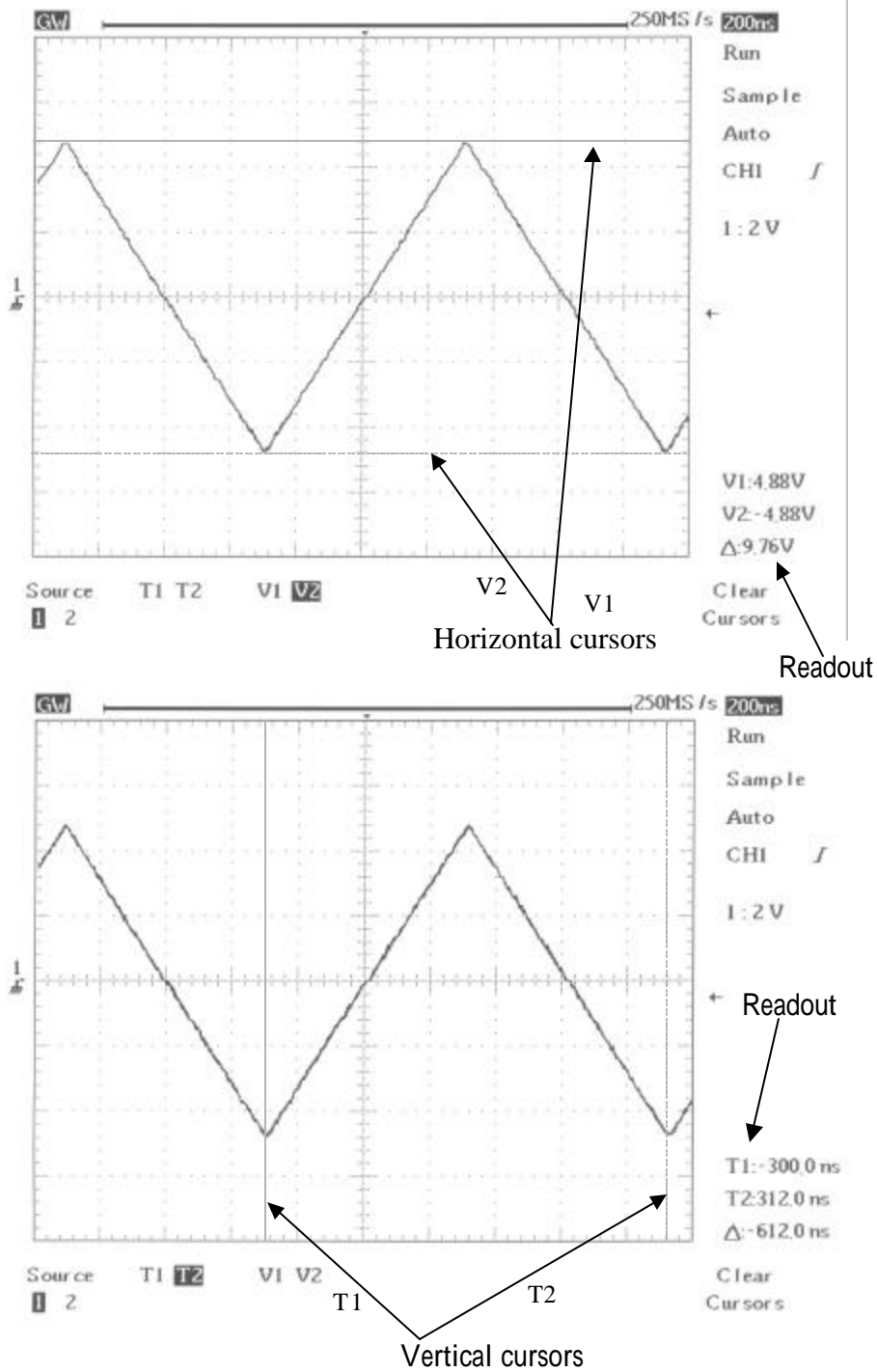


Figure 6-15: Cursors measurements

SAVE/RECALL

User can save any waveform in one of two internal memories of the GDS-830. These waveforms will be kept even the instrument turned off.

TRACE: The instrument can display up to four waveforms simultaneously. That includes the two input channels (CH1 and Ch2), and two stored waveforms.

- **Source 1/2:** Press the adjacent pushbutton to select the waveform signal of channel 1 or channel 2 to be saved/recalled.
- **Memory M1/M2:** Selects the memory 1 or memory 2 to save/recall waveform.
- **Save To M1/M2:** After **Memory M1/M2** selected, press the adjacent pushbutton to save the waveform at present. Waveform position and scale factors are saved with each waveform.
- **Recall From M1/M2:** After **Memory M1/M2** selected, press the adjacent pushbutton to recall the waveform.
- **Pos Adj M1/M2:** Press the adjacent pushbutton and use the multi-function knob to adjust the vertical position of saved waveform(s). There are two adjust modes: independent and tracking.

User can move only one saved waveform at a time using the multi-function knob in independent mode. In tracking mode, both saved waveforms move in tandem by using the multi-function knob. The two saved waveform remain a fixed distance for each other

- **Close M1/M2:** Clear the CRT display of memory 1 or memory 2 saved waveform.

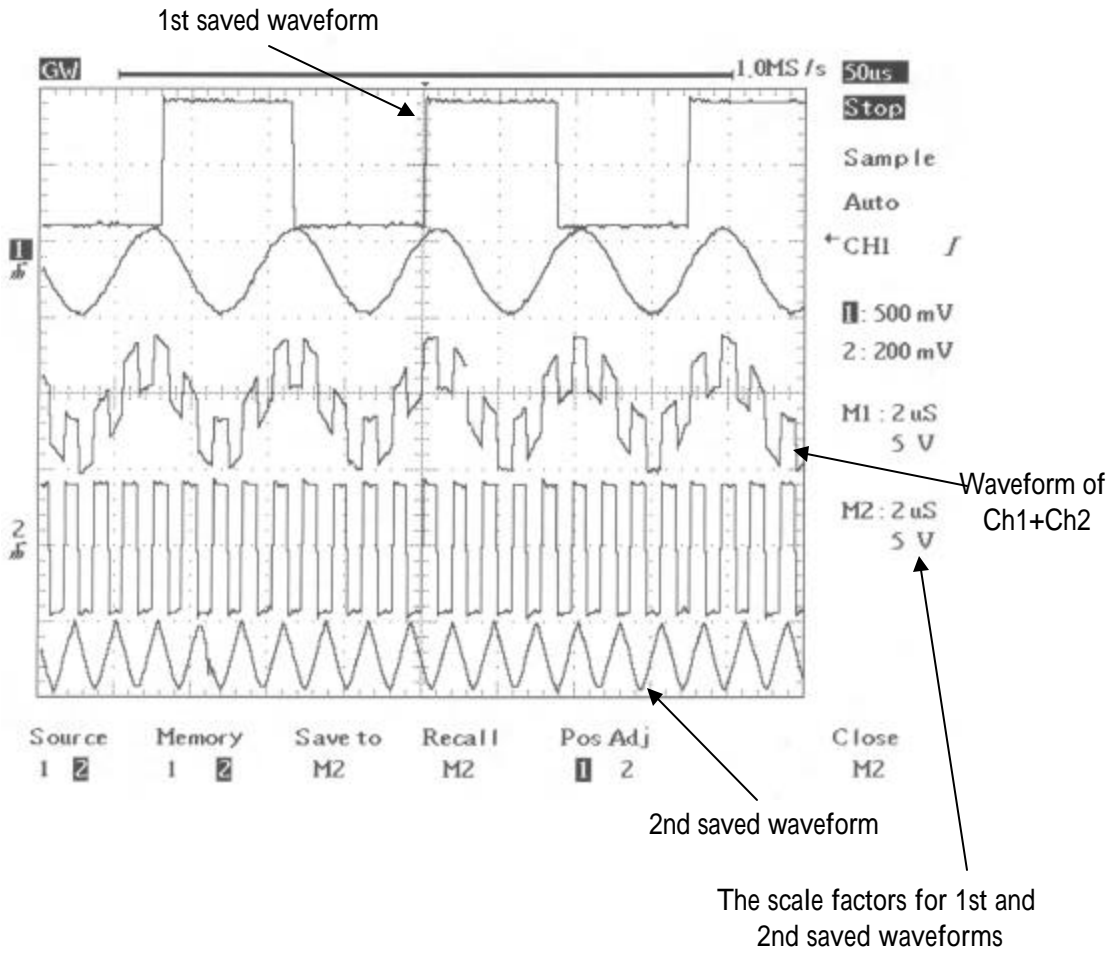


Figure 6-16: Save and recall

SETUP: The instrument can save its complete front panel setups in the nonvolatile memory (15 sets totally).

- **Save**: After **Memory 1~15** selected, press the adjacent pushbutton to save current setup.
- **Recall**: After **Memory 1~15** selected, press the adjacent pushbutton to recall the specified setup.
- **Memory 1~15**: Press the adjacent pushbutton and select a destination setup memory location (GDS-830 provides 15 sets memory) to save current setup.
- **Undo Autose**: User may find situations where user has pressed the **AUTOSET** pushbutton unintentionally. When this happens, user can press **Undo Autose** pushbutton to return the instrument to the settings prior to pressing the **AUTOSET** pushbutton. User can select the undo Autose function by pressing the adjacent pushbutton.
- **Recall Default**: Press the adjacent pushbutton to recall the factory setup.

DISPLAY: Press the DISPLAY pushbutton to change the appearance of the display and select how waveforms are presented.

Note: Always 50 points plotted to screen on each acquisition.

- **Grat 25~100%**: Press the adjacent pushbutton to adjust the brightness of graticule. Use the multi-function knob to vary screen brightness.
- **Text/Wave 25~100%**: Press the adjacent pushbutton to adjust the brightness of text and waveform. Use the multi-function knob to vary screen brightness.
- **Vector**: Press the adjacent pushbutton to select vector display style. The instrument draws a vector between each pair of waveform points.
- **Dot**: Press the adjacent pushbutton to display only the individual sample points.

UTILITY: The utility menu provides four sub menus: Printer menu, GPIB menu, RS-232 menu and self-cal menu.

- **Printer Menu:** If a printer is connected and properly configured, GDS-830 can print a hard copy of the CRT display. Press the adjacent pushbutton to select printer. The oscilloscope supports the following printers:

HP LaserJet: Hewlett-Packard LaserJet laser printers supported.

HP DeskJet: Hewlett-Packard DeskJet inkjet printers supported.

Epson InkJet: Epson Inkjet printers supported.

Note: Only ESP/P-based printers (including ESC/P and ESC/P2) supported.

Epson DotMatrix: Epson Dot matrix printers supported.

Note: Only 24-pin dot matrix printers supported.

Press the adjacent pushbutton of **CopyIt** to start printing.

Press the adjacent pushbutton of **Pre Menu** to go back utility menu.

Note: The GDS-830 does not support GDI printers.

- **GPIB Menu:** GDS-830 can transfer data between the scope and other instrument over the GPIB. Press the adjacent pushbutton to select the GPIB location.

Location: The location pushbutton sets the address of the oscilloscope; therefore, the oscilloscope can selectively talk or listen to external devices. The address range is from 0 to 30. The default address is 0.

Comm Port: Press the adjacent pushbutton to turn on/off and select the communication port (RS-232 or GPIB) of the oscilloscope.

Press the adjacent pushbutton of **Pre Menu** to go back utility menu.

- **RS232 Menu**: The RS-232 port is setup in this RS-232 menu. Press the adjacent pushbutton to configure the RS-232 setup.

Baud rate: Transmission rate in characters per second. Transmission rate selections are: 300, 1200, 2400, 4800, 9600, 19200.

Data bit: Press the adjacent pushbutton to select “7” or “8” bits.

Stop bit: Press the adjacent pushbutton to select “1” or “2” bits.

Parity: Press the adjacent pushbutton to select “Odd”, “Even”, or “None” .

Comm Port: Press the adjacent pushbutton to turn on/off and select the communication port (RS-232 or GPIB) of the oscilloscope.

Press the adjacent pushbutton of **Pre Menu** to go back utility menu.

- **Self Cal Menu**: The self-cal menu is typically used for performing service work on the oscilloscope. The GDS-830 calibration could be done through semi-automatic procedures. The advanced digital circuit design of GDS-830 has made the calibration procedures easy & simple

Environment

The calibration should be performed under room temperature 26 ± 5 °C, and humidity should be less than RH 80%.

The instrument should be power on for at least 30 minute warm before performing calibration.

Calibration Equipments

1. Well-calibrated high-performance 4 1/2 digits Multimeter.
2. Precision coaxial cable-A, 32 inch long, 50 O impedance, banana male to BNC male connector.
3. Precision coaxial cable-B, 32 inch long, 50 O impedance, male to male BNC connector.

Calibration Procedures

The calibration procedures could be done through activating its calibration routines.

1. Press **UTILITY** pushbutton on the front panel and a row of main menu selection will be shown at the lower part of the CRT display.
2. Press five times the soft key of blank main menu button (second right soft key under CRT display) and the menu CRT display will change to the next layer.
3. Connect the precision coaxial cable-A from rear panel calibration output to Multimeter.
4. Press **DAC#** soft key to select DA ch.3 shown on the right lower part of CRT display.
5. Press the main menu **std Lev** soft key, and a calibration signal indicator will be shown on the right lower part of CRT display.
6. Turn the multi-function knob on the front panel to adjust standard out put level until the voltage reading of Multimeter coincide with the reading of calibration signal indicator on the CRT display. A “step” soft key could be adjusted to change the calibration resolution and adjustment time.

7. Repeat continually step 5 & step 6 to complete the calibration of all 17 levels of standard output voltage of GDS-830.
 8. Disconnect the coaxial cable-A & connect cable-B from rear panel calibration output terminal to channel 1 input.
 9. Press **UTILITY** pushbutton again then press "**self cal menu**" soft key and "**vertical**" soft key. Select the vertical calibration mode, and press the right-most soft key under CRT display. GDS-830 will start the automatic calibration on channel 1 vertical system.
 10. When the channel 1 calibration is completed, the CRT display will show the message of "set signal to Chan 2, then press last soft key".
 11. Disconnect the cable-B at the channel 1 input end and connect it to the channel 2 input.
 12. Press right-most soft key under CRT display to continue automatic calibration of channel 2 vertical system.
 13. When the calibration of channel 2 is completed, the CRT display will show the message of press last soft key".
 14. Press the right-most soft key under CRT display and GDS-830 will leave the calibration mode.
- **Clear Menu**: Press the adjacent pushbutton to clear the utility menu.

ERASE: Press the pushbutton to erase all waveform data from the graticule area, clears waveform math functions. If the oscilloscope is stopped, the display remains empty of waveform data until the trigger circuit is rearmed and oscilloscope is triggered. Then, the new data is displayed and measurements are recalculated.

ACQUIRE: Press the pushbutton to select the different acquire mode: Sample, Pk-Pk detect, Average, Accumulate. Acquisition is the process of sampling the analog input signal, and converting it into digital format afterward, assembling it into a waveform record finally.

- **Sample:** Press the adjacent pushbutton to select the “sample” acquisition mode. In sample mode, the instrument generates a record point by saving the first sample during each acquisition interval.
- **Pk-Pk Detect:** The “Peak-detect” mode stores the minimum and maximum values (pairs) for each time bucket.
- **Average:** The average mode selects the number of waveform acquisitions that are averaged to generate the display waveform. The range for the averaging is from 2 to 256 in powers of 2.

Note: The number select of “average” only effectiveness on the record lengths of 500.

Average mode reduces displayed signal noise significantly. As the number of averages increases from 2 to 256, the display becomes less responsive to changes in the input signal. Using more averages reduces the effects of displayed signal noise and improves resolution.

If any of the record lengths (**except record lengths of 500**) and average number been selected (**for this moment, the selection of average number is ineffective**), the instrument will use the resolution improved technology to average entire waveform by different acquisition intervals automatically. Therefore, user can get an average result in a higher sample rate, and better resolution waveform.

Note: The different between record lengths of 500 and the rest is the “sampling”. If the “record lengths” is select to 500, the sampling is triggered individually. If “record lengths” is the rest number, the sampling is triggered for once.

- **Accumulate**: The “Accumulate” mode can acquire and display a waveform record that shows the totally variation over entire acquisitions.
- **Refresh**: Press the adjacent pushbutton to refresh the waveforms of graticule.
- **Men Leng**: The number of points that make up the waveform record is defined by record length. The instrument provides record lengths of 500, 1250, 2500, 5000, 12500, 25000, 50000, and 125000. For the relationship between memory length, timebase, and sample rate, please refer to Table 6-1. To ensure a full screen display of 500 points on the slower timebase ranges, as the timebase is slowed down the sample rate is also slowed down.

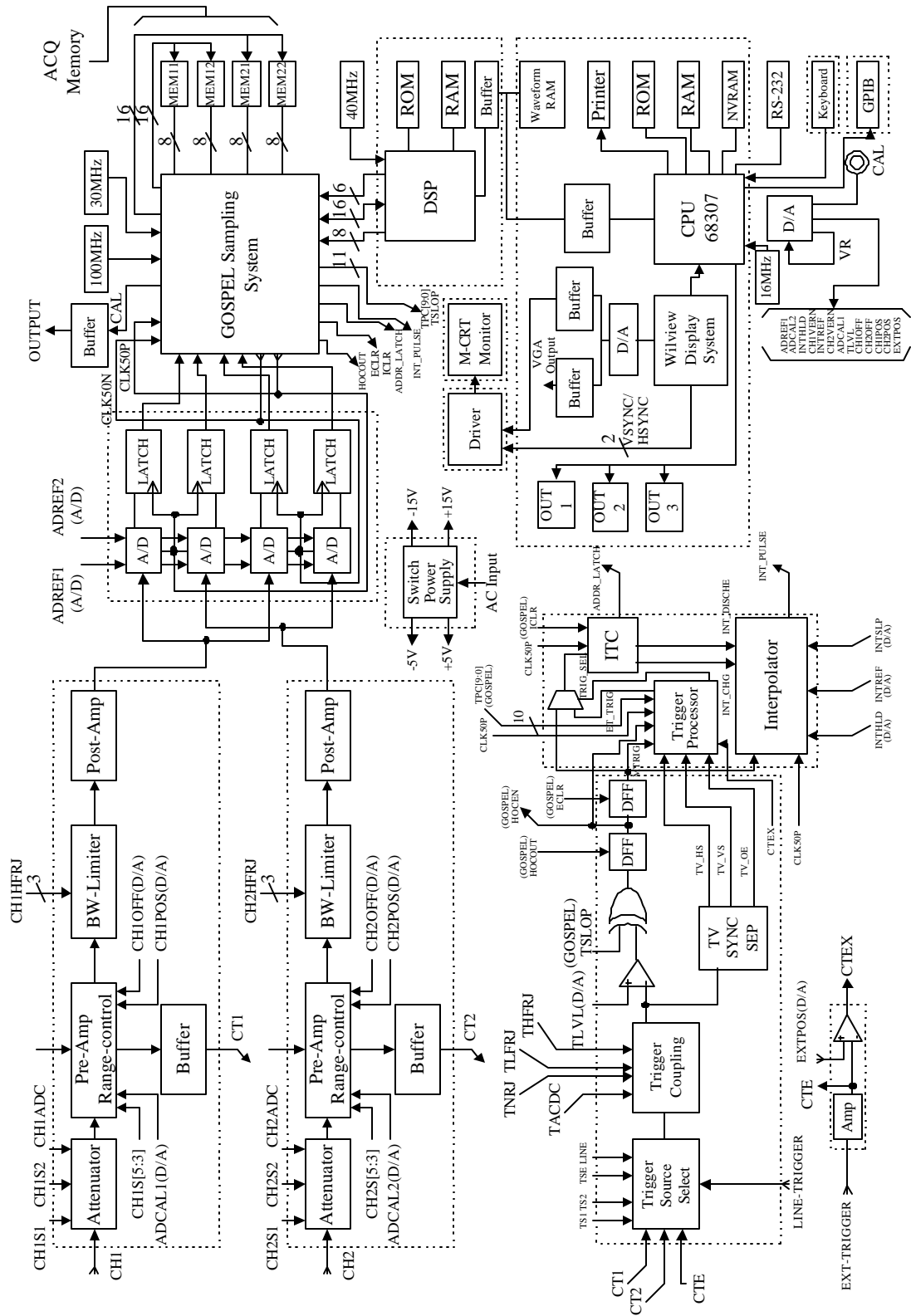
Memory length Timebase	500	1250	2500	5000	12500	25000	50000	125000
	2ns/div	ET25Gsa/s	NA	NA	NA	NA	NA	NA
5ns/div	ET10Gsa/s	NA	NA	NA	NA	NA	NA	NA
10ns/div	ET5Gsa/s	NA	NA	NA	NA	NA	NA	NA
20ns/div	ET2.5Gsa/s	NA	NA	NA	NA	NA	NA	NA
50ns/div	ET1Gsa/s	NA	NA	NA	NA	NA	NA	NA
100ns/div	ET500Msa/s	NA	NA	NA	NA	NA	NA	NA
200ns/div	ET250Msa/s	NA	NA	NA	NA	NA	NA	NA
500ns/div	100MSa/s	NA	NA	NA	NA	NA	NA	NA
1μs/div	50MSa/s	NA	NA	NA	NA	NA	NA	NA
2μs/div	25MSa/s	50MSa/s	NA	NA	NA	NA	NA	NA
5μs/div	10MSa/s	25MSa/s	50MSa/s	NA	NA	NA	NA	NA
10μs/div	5MSa/s	10MSa/s	25MSa/s	50MSa/s	NA	NA	NA	NA
20μs/div	2.5MSa/s	5MSa/s	10MSa/s	25MSa/s	50MSa/s	NA	NA	NA
50μs/div	1MSa/s	2.5MSa/s	5MSa/s	10MSa/s	25MSa/s	50MSa/s	NA	NA
100μs/div	500kSa/s	1MSa/s	2.5MSa/s	5MSa/s	10MSa/s	25MSa/s	50MSa/s	NA
200μs/div	250kSa/s	500kSa/s	1MSa/s	2.5MSa/s	5MSa/s	10MSa/s	25MSa/s	50MSa/s
500μs/div	100kSa/s	250kSa/s	500kSa/s	1MSa/s	2.5MSa/s	5MSa/s	10MSa/s	25MSa/s
1ms/div	50kSa/s	100kSa/s	250kSa/s	500kSa/s	1MSa/s	2.5MSa/s	5MSa/s	10MSa/s
2ms/div	25kSa/s	50kSa/s	100kSa/s	250kSa/s	500kSa/s	1MSa/s	2.5MSa/s	5MSa/s
5ms/div	10kSa/s	25kSa/s	50kSa/s	100kSa/s	250kSa/s	500kSa/s	1MSa/s	2.5MSa/s
10ms/div	5kSa/s	10kSa/s	25kSa/s	50kSa/s	100kSa/s	250kSa/s	500kSa/s	1MSa/s
20ms/div	2.5kSa/s	5kSa/s	10kSa/s	25kSa/s	50kSa/s	100kSa/s	250kSa/s	500kSa/s
50ms/div	1kSa/s	2.5kSa/s	5kSa/s	10kSa/s	25kSa/s	50kSa/s	100kSa/s	250kSa/s
100ms/div	500Sa/s	1kSa/s	2.5kSa/s	5kSa/s	10kSa/s	25kSa/s	50kSa/s	100kSa/s
200ms/div	250Sa/s	500Sa/s	1kSa/s	2.5kSa/s	5kSa/s	10kSa/s	25kSa/s	50kSa/s
500ms/div	100Sa/s	250Sa/s	500Sa/s	1kSa/s	2.5kSa/s	5kSa/s	10kSa/s	25kSa/s
1s/div	50Sa/s	100Sa/s	250Sa/s	500Sa/s	1kSa/s	2.5kSa/s	5kSa/s	10kSa/s
2s/div	25Sa/s	50Sa/s	100Sa/s	250Sa/s	500Sa/s	1kSa/s	2.5kSa/s	5kSa/s
5s/div	10Sa/s	25Sa/s	50Sa/s	100Sa/s	250Sa/s	500Sa/s	1kSa/s	2.5kSa/s

Table 6-1: The available sample rate between different timebase and memory length.

AUTOSET: Press the pushbutton to analyze the unknown signal quickly. Then, the instrument sets up the vertical, horizontal, and trigger to best display that signal. For the detail, please refer to page 11.

RUN/STOP: Press the pushbutton to start or stop acquiring data. The status area of the screen shows the message “RUN” or “STOP”. If the instrument is stopped, it starts acquiring data on the next trigger event.

7. Block Diagram



8. RS-232 Configuration and Remote Control

The GDS-830 contains a DB 9-pin, male RS-232 connector for serial communication with a computer or terminal. The GDS-830 RS-232 interface is configured as an RS-232 “**Data Terminal Equipment**” so that data is sent from pin 3 and received on pin 2. For remote controls, the RS-232 interface has to be connected with a computer or terminal.

Pin Assignments

The pin assignments for RS-232 interface of GDS-830 are listed below.

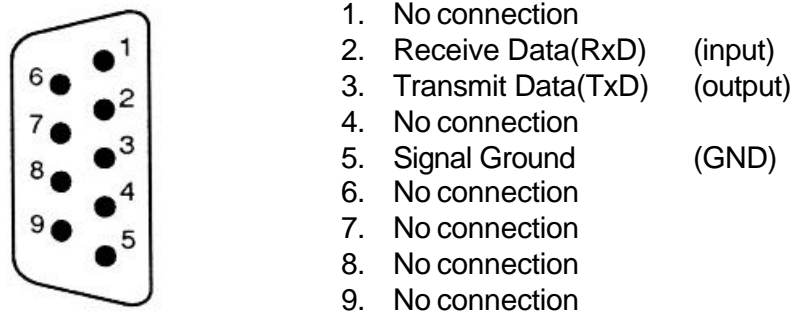


Figure 8-1. Pin assignments for the GDS-830's RS232 connector

DB9 to DB9 Wiring

The wiring configuration is used for computer with DB9 connectors that configured as Data Terminal Equipment.

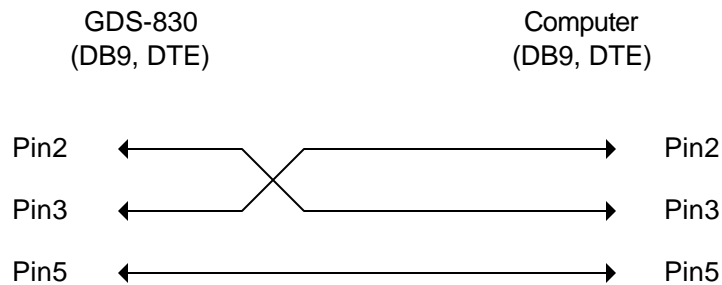


Figure 8-2. DB9 to DB9 wiring

When the GDS-830 is set up with a RS232 interface, please check the following points:

- ***Do not connect the output line of one DTE device to the output line of the other.***
- ***Many devices require a constant high signal on one or more input pins.***
- ***Ensure that the signal ground of the equipment is connected to the signal ground of the external device.***
- ***Ensure that the chassis ground of the equipment is connected to the chassis ground of the external device.***
- ***Do not use more than 15m of cable to connect devices to a PC.***
- ***Ensure the same configurations are used on the device as the one used on PC terminal.***
- ***Ensure the connector for the both side of cable and the internal connected line are met the demand of the instrument.***

Computer's Connection

A personal computer with a COM port is the essential facilities in order to operate the digitizing oscilloscope via RS232 interface.

The connections between GDS-830 and computer are as follows:

- I. Connect one end of a RS232 cable to the computer.
- II. Connect the other end of the cable to the RS232 port on the GDS-830.
- III. Turn on the GDS-830.
- IV. Turn on the computer.

The RS232 connection testing

If you want to test whether the RS232 connection is working or not, you can send a command from computer. For instance, using a terminal program send the query command

```
*idn?
```

should return the Manufacturer, model number, serial number and firmware version in the following format:

```
GW , GDS-830 , 0 , V.1.18
```

If you do not receive a proper response from the GDS-830, please check if the power is on, the RS232 configurations are the same on both sides, and all cable connections are active.

RS-232 Remote Control

The GDS-830 can be operated from terminal or computer via the RS-232 port.

The commands of GDS-830 are compatible with IEEE-488.2 and SCPI standards partially.

The commands receive buffer and return message buffer of GDS-830 are 256 bytes individually.

Command Syntax

If you want to transfer any of the instructions to an instrument, and comply with SCPI, there are three basic elements must be included.

- Command header
- Parameter (if required)
- Message terminator or separator

Command Header

The command header has a hierarchical structure that can be represented by a command tree (Figure 8-3).

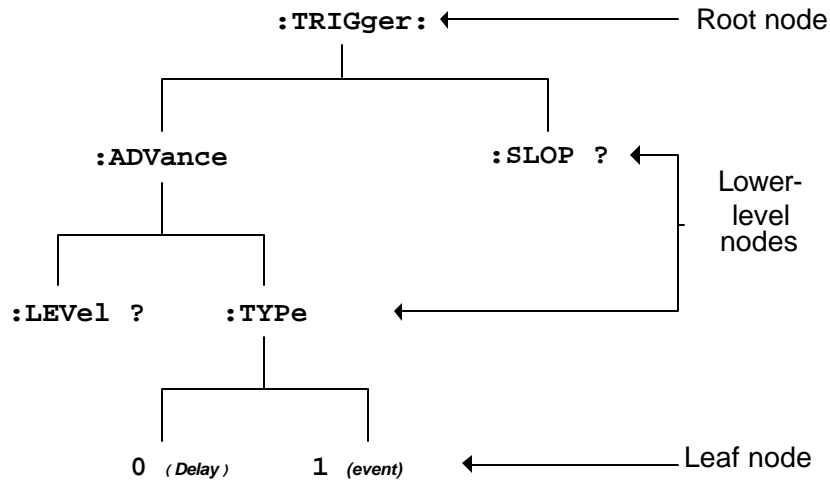


Figure 8-3: Tree hierarchy

The top level of the tree is the root level. A root node is located at the root level. A root node and one or more lower-level nodes form a header path to the last node called the leaf node.

The command header is configured by header path and leaf node. Figure 8-4 shows the command header for the leaf node indicated in Figure 8-3.

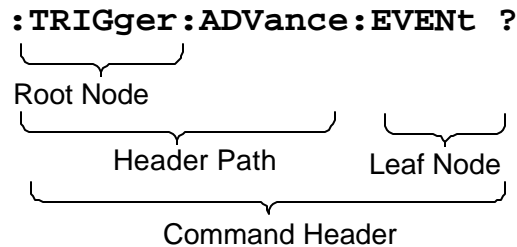


Figure 8-4: Command header

Parameter

If the command has parameters, the values have to be included. In this manual, when we expressed the syntax of the command, the < > symbols are used for enclosing the parameter type. For instance, the syntax of the command in Figure 8-5 includes the Boolean parameter type

NOTE: Do not include the <, >, or | symbols when entering the actual value for a parameter.

:TRIGger:ADVance:MODE <Boolean>
↑
Space
└───
Parameter
Type

Figure 8-5: Command Header with Parameter

Table 8-1 defines the Boolean and other parameter types for the GDS-830.

Parameter Type	Description	Example
Boolean	Boolean numbers or values	1 0
NR1	Integers	0, 1, 18
NR2	Decimal numbers	1.5, 3.141, 8.4
NR3	Floating point numbers	4.5E-1, 8.25E+1
NRf	NR1, NR2, or NR3	1, 1.5, 4.5E-1

Table 8-1: Parameter Types for Syntax Descriptions

For the actual value of the parameter type <Boolean>, you have to enter 0 instead of "OFF" or enter 1 instead of "ON".

The following example includes both the header and a value for the parameter type:

```
:TRIGger:NREJ 0
```

Parameter values that appeared in this manual are often separated by a vertical line. This vertical line means the same thing as the word "or," For example, values for the parameter <Boolean> are

0 | 1

This is the same thing as saying "0 (off) or 1 (on)" Any single value is a valid parameter.

Message Terminator and Message Separator

As there is no signal of end message on RS232 bus, therefore use LF (0 x0A) as message terminator. When a series of commands are sent to the instrument, it must add a LF to be a judgment for message terminator. As for query command, the return message of the instrument is also added a LF for PC to judge message terminator.

A semicolon separates one command from another when the commands appear on the same line.

Entering Commands

The standards that govern the command set for the GDS-830 allow for a certain amount of flexibility when you enter commands. For instance, you can abbreviate many commands or combine commands into one message that you send to the GDS-830. This flexibility, called friendly listening, saves programming time and makes the command set easier to remember and use.

Command Characters

The GDS-830 is not sensitive to the case of command characters. You can enter commands in either uppercase or lowercase.

You can precede any command with white space characters. You must, however, use at least one space between the parameter and the command header.

Abbreviating Commands

Most commands have a long form and a short form. The listing for each command in this section shows the abbreviations in upper case. For instance, you can enter the query

```
:TIMEbase:SCALE ?
```

simply as

```
:TIM:SCAL ?
```

Combining Commands

You can use a semicolon (;) to combine commands and queries. The GDS-830 executes coherent commands in the order it receives them. When you coherent queries, the GDS-830 combine the responses into a single response message. For example, if the frequency and amplitude of the signal are equal to 100kHz and 1V, the command

```
:MEASure:FREQuency?;:MEASure:VAMPlitude?
```

returns the message

```
100kHz 1v
```

Note: A message terminator of LF (0 x0A) will be added to the end of each return message by GDS-830.

Details of Command Reference

Each command in this chapter will give a brief description. The examples of each command will be provided and what query form might return.

***CLS (no query form)**

Clears all event status data register. This includes the Output Queue, Operation Event Status Register, Questionable Event Status Register, and Standard Event Status Register.

Syntax

*CLS

Examples

*CLS clears all event registers.

***ESE**

Sets or returns the bits in the Event Status Enable Register (ESER). The ESER enables the Standard Event Status Register (SESR) to be summarized on bit 5 (ESB) of the Status Byte Register (SBR).

Syntax

*ESE<NR1>

*ESE?

Arguments

<NR1> is a number from 0 to 255. The binary bits of the ESER are set according to this value.

Returns

<NR1> is a number from 0 to 255 that indicates the decimal value of the binary bits of the ESER.

Examples

*ESE 65 sets the ESER to binary 0100 0001.

If the ESER contains the binary value 1000 0010, the *ESE? will return the value of 130.

*ESR? (query only)

Returns and clears the contents of the Standard Event Status Register (SESR).

Syntax

*ESR?

Returns

<NR1> is a number from 0 to 255 that indicates the decimal value of the binary bits of the ESER.

Examples

If the ESER contains the binary value 1100 0110, the *ESR? will return the value of 198.

*IDN? (query only)

Returns the unique identification code of the GDS-830.

Syntax

*IDN?

Examples

*IDN?

Returns GW,GDS-830,0,<Firmware version>

***LRN? (query only)**

Returns the string that the GDS-830 settings will be listed.

Syntax

*LRN?

***OPC?**

The command form (*OPC) sets the operation complete bit (bit 0) in the Standard Event Status Register (SESR) when all pending operations finish.

The query form (*OPC?) tells the GDS-830 to place an ASCII 1 in the Output Queue when the GDS-830 completes all pending operations.

Syntax

*OPC

*OPC?

Returns

1

***RCL**

Recall the setting data from memory which previous saved.

Syntax

*RCL <NR1>

Arguments

0~15

Examples

*RCL 0 recalls the setting data which located at first position of memory address.

***RST (no query form)**

Sets all control settings of GDS-830 to their default values but does not purge stored setting.

Syntax

*RST

***SAV**

Saves the setting data to memory.

Syntax

*SAV <NR1>

Arguments

0~15

Examples

*SAV 1 saves the setting data to the second position of memory queue.1

***SRE**

Sets the contents of the Service Request Enable Register (SRER). The query form returns the contents of the SRER. Bit 6 of the SRER is always zero. The bits on the SRER correspond to the bits on the SBR.

Syntax

*SRE <NR1>

*SRE?

Arguments

<NR1> is an integer from 0 to 255.

Returns

<NR1>

Examples

*SRE 7 sets bits of the SRER to 0000 0111.

If the *SRE? returns 0000 0011, the setting of *SRE is 3.

***STB? (query only)**

Query of the Status Byte register (SBR) with *STB? will return a decimal number representing the bits that are set (true) in the status register.

Syntax

*STB?

Returns

<NR1>

Examples

*STB? returns 81 if SBR contains the binary value 0101 0001.

***WAI (no query form)**

WAI prevents the programming instrument from executing further commands or queries until all pending operations finish.

Syntax

*WAI

:ACQuire:AVERage

Select the average number of waveform acquisition. The range for averaging is from 2 to 256 in powers of 2.

Syntax

```
:ACQuire:AVERage {1|2|3|4|5|6|7|8}
```

```
:ACQuire:AVERage?
```

Arguments

- | | | | |
|---|-----------------------|---|-----------------------|
| 1 | Average number is 2 | 2 | Average number is 4 |
| 3 | Average number is 8 | 4 | Average number is 16 |
| 5 | Average number is 32 | 6 | Average number is 64 |
| 7 | Average number is 128 | 8 | Average number is 256 |

Returns

<NR1>

:ACQUIRE:LENGTH

Select the number of record length. The GDS-830 provides record length of 500, 1250, 2500, 5000, 12500, 25000, 50000, and 125000.

Syntax

```
:ACQUIRE:LENGTH {0|1|2|3|4|5|6|7}
```

```
:ACQUIRE:LENGTH?
```

Arguments

- | | | | | | |
|---|------------------------|---|-------------------------|---|------------------------|
| 0 | Record length is 500 | 1 | Record length is 1250 | 2 | Record length is 2500 |
| 3 | Record length is 5000 | 4 | Record length is 12500 | 5 | Record length is 25000 |
| 6 | Record length is 50000 | 7 | Record length is 125000 | | |

Returns

<NR1>

:ACQUIRE:MODE

Select the waveform acquisition mode. There are four different acquisition mode: sample, peak detection, average and accumulate.

Syntax

```
:ACQUIRE:MODE {0|1|2|3}
```

```
:ACQUIRE:MODE?
```

Arguments

- | | | | |
|---|-------------------------|---|--------------------------------|
| 0 | Select the sample mode | 1 | Select the peak detection mode |
| 2 | Select the average mode | 3 | Select the accumulate mode |

Returns

<NR1>

Note: Please select the specific acquire mode before implement any acquisition.

:ACQuire<X>:POINt

Transfer waveform data (always 500 points data totally) from GDS-830. Each point is composed by two bytes (the integer value of 16 bits). The high byte (MSD) will be prior transferred.

Syntax

:ACQuire<X>:POINt

Arguments

<X> Specify the channel number (1|2)

Returns

The string of data is following.

#	Data size digit	Data size	Sample rate	Waveform data size	Waveform data
---	-----------------	-----------	-------------	--------------------	---------------

#: Begin a transmission of data string.

Data size digit: Indicate the digits of following data string amount (1 digit).

Data size: the amount of current data string (4 digits).

Sample rate: the corresponding sample rate of received waveform data (4 bytes). The sample rater is indicated by floating point format which compatible with IEEE 754 standards.

Waveform data size: The total amounts indicator of waveform data (4 bytes).

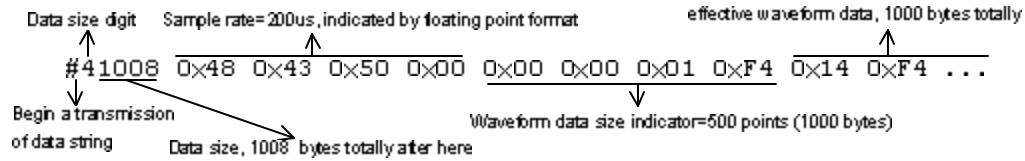
Waveform data: The effective waveform data which covers 500 points (1000 bytes) totally

Example

Transfer the waveform data of channel 1 at 200 μ s per division:

```
:ACQuire1:POINt
```

The GDS-830 should return the following messages:



AUTOset

Perform an automatic setup in order to optimize the acquisition parameters.

Syntax

:AUTOset

:CHANnel<X>:BWLimit

Enable or disable the bandwidth limit function.

Syntax

:CHANnel<X>:BWLimit {0|1}

:CHANnel<X>:BWLimit?

Arguments

<X> Specify the channel number (1|2)

0 Disable bandwidth limit 1 Enable bandwidth limit

Returns <NR1>

:CHANnel<X>:COUPling

Select the different coupling states for GDS-830.

Syntax

:CHANnel<X>:COUPling {0|1|2}

:CHANnel<X>:COUPling?

Arguments

<X> Specify the channel number (1|2)

0 Place scope in AC coupling state 1 Place scope in DC coupling state

2 Place scope in grounding state

Returns

<NR1>

:CHANnel<X>:DISPlay

Enable or disable the channel's display.

Syntax

```
:CHANnel<X>:DISPlay {0|1}
```

Arguments

<X> Specify the channel number (1|2)

0 Disable channel <X> display 1 Enable channel <X> display

Returns

<NR1>

:CHANnel<X>:INVert

Enable or disable the waveform invert function.

Syntax

```
:CHANnel<X>:INVert {0|1}
```

```
:CHANnel<X>:INVert?
```

Arguments

<X> Specify the channel number (1|2)

0 Disable invert function 1 Enable invert function

Returns

<NR1>

:CHANnel<X>:MATH

Set the math expression.

Syntax

:CHANnel<X>:MATH {0|1|2}

Arguments

<X> Specify the channel number (1|2)

- 0 Disable math operation
- 1 Select the add operator
- 2 Select the subtract operator

Returns

<NR1>

:CHANnel<X>:OFFSet

Sets or query the offset voltage.

Syntax

:CHANnel<X>:OFFSet <NR3>

:CHANnel<X>:OFFSet?

Arguments

<X> Specify the channel number (1|2)

<NR3> is the desired offset value in volts. The range is dependent on the scale and the probe attenuation factor. The offset ranges are following:

<u>Offset Range:</u>	
2mV/div ~ 50mV/div	±0.5V
100mV/div ~ 500mV/div	±5V
1V/div ~ 5V/div	±50V

Returns

<NR3>

:CHANnel<X>:PROBe

Select the different probe attenuation factor.

Syntax

:CHANnel<X>:PROBe {0|1|2}

:CHANnel<X>:PROBe?

Arguments

<X> Specify the channel number (1|2)

0 1X 1 10X 2 100X

Returns

<NR1>

:CHANnel<X>:SCALe

Sets or queries the vertical gain of the specified channel.

Syntax

:CHANnel<X>:SCALe <NR3>

:CHANnel<X>:SCALe?

Arguments

<X> Specify the channel number (1|2)

<NR3> is the desired gain value in volts per division. The range is 2mV/div to 5V/div (with 1X probe).

Returns

<NR3>

:CURSor:C<X>Position

Select the cursors position.

Syntax

```
:CURSor:C<X>Position <NR1>
```

```
:CURSor:C<X>Position?
```

Arguments

<X> Specify the cursor (1|2)

<NR1> is the desired position. For x-axis operation, the range is 0 to 500; for y-axis operation, the range is 0 to 400.

Returns

<NR1>

:CURSor:DELTA? (query only)

Return the time or voltage diversity between the two vertical or horizontal cursors.

Syntax

```
:CURSor:DELTA?
```

Returns

<NR3>. If the vertical cursors (T1 and T2) enabled, the return value will be the time diversity. If the horizontal cursors (V1 and V2) enabled, the return value will be the voltage diversity.

:CURSor:DISPlay

Enable or disable the cursors display.

Syntax

```
:CURSor:DISPlay {0|1}
```

Arguments

0 Disable cursors display 1 Enable cursors display

Returns

<NR1>

:CURSor:MODe

Select the different cursors mode.

Syntax

```
:CURSor:MODe {0|1}
```

```
:CURSor:MODe?
```

Arguments

0 Enable vertical cursors measurement 1 Enable horizontal cursors measurement

Returns

<NR1>

:CURSor:SOURce

Select which channel cursors is active for front panel control.

Syntax

```
:CURSor:SOURce {0|1}
```

```
:CURSor:SOURce?
```

Arguments

- 0 Select channel 1 for cursors measurement
- 1 Select channel 2 for cursors measurement

Returns

<NR1>

:DISPlay:BRIGhtness:DATA

Select brightness level of CRT screen for data readout and waveform displays.

Syntax

```
:DISPlay:BRIGhtness:DATA <NR1>
```

```
:DISPlay:BRIGhtness:DATA?
```

Arguments

<NR1> is the desired brightness level. The range is from 25 to 100.

Returns

<NR1>

:DISPlay:BRIGhtness:GRATicule

Select brightness level of CRT screen for graticule display.

Syntax

```
:DISPlay:BRIGhtness:GRATicule <NR1>
```

```
:DISPlay:BRIGhtness:GRATicule?
```

Arguments

<NR1> is the desired brightness level. The range is from 25 to 100.

Returns

<NR1>

:DISPlay:WAVeform

Select the dots (or vectors) display for data.points.

Syntax

```
:DISPlay:WAVeform <NR1>
```

Arguments

0 Enable vectors display 1 Enable dots display

Returns

<NR1>

:MEASure:FALL? (query only)

Return the value of timing measurement that taken for falling edge of the first pulse in the waveform or specified area.

Syntax

```
:MEASure:FALL?
```

Returns

<NR3>.

:MEASure:FREQuency? (query only)

Return the value of Frequency measurement.

Syntax

:MEASure:FREQuency?

Returns

<NR3>.

:MEASure:NWIDth? (query only)

Return the value of timing measurement of the first negative pulse in the waveform or specified area.

Syntax

:MEASure:NWIDth?

Returns

<NR3>.

:MEASure:PDUTy? (query only)

Return the ratio of the positive pulse width to the signal period.

Syntax

:MEASure:PDUTy?

Returns

<NR2>. is the percentage of ratio. The range is from 1 to 99.

:MEASure:PERiod? (query only)

Return the timing value of period measurement.

Syntax

:MEASure:PERiod?

Returns

<NR3>.

:MEASure:PWIDth? (query only)

Return the value of timing measurement of the first positive pulse in the waveform or specified area.

Syntax

```
:MEASure:PWIDth?
```

Returns

<NR3>.

:MEASure:RISe? (query only)

Return the value of timing measurement that taken for rising edge of the first pulse in the waveform or specified area.

Syntax

```
:MEASure:RISe?
```

Returns

<NR3>.

:MEASure:SOURce

Select the measured channel (channel 1 or 2).

Note: Please select the specific channel before implement any measurement.

Syntax

```
:MEASure:SOURce {1|2}
```

Arguments

- 1 Enable the measurement functions for channel 1
- 2 Enable the measurement functions for channel 2

Returns

<NR1>.

:MEASure:VAMplitude? (query only)

Return the voltages of high value minus the low value.

Syntax

:MEASure:VAMplitude?

Returns

<NR3>.

:MEASure:VAverage? (query only)

Return the average voltages.

Syntax

:MEASure:VAverage?

Returns

<NR3>.

:MEASure:VHI? (query only)

Return the value of global high voltage.

Syntax

:MEASure:VHI?

Returns

<NR3>.

:MEASure:VLO? (query only)

Return the value of global low voltage.

Syntax

:MEASure:VLO?

Returns

<NR3>.

:MEASure:VMAX? (query only)

Return the value of maximum amplitude.

Syntax

:MEASure:VMAX?

Returns

<NR3>.

:MEASure:VMIN? (query only)

Return the value of minimum amplitude.

Syntax

:MEASure:VMIN?

Returns

<NR3>.

:MEASure:VPP? (query only)

Return the value of V_{\max} minus V_{\min} .

Syntax

:MEASure:VPP?

Returns

<NR3>.

:MEASure:VRMS? (query only)

Return the value of true Root Mean Square voltage.

Syntax

:MEASure:VRMS?

Returns

<NR3>.

:PRINT

Begin a hardcopy to a specified printer.

Syntax

:PRINT

:REFResh

Refresh the waveform data of CRT screen and re-display the waveform data.

Syntax

:REFResh

:RUN

Controls the RUN state of trigger system. The acquisition cycle will follow each qualified trigger in the RUN state.

Syntax

:RUN

:STOP

Controls the STOP state of trigger system. The acquisition cycle only triggered when the :RUN command is received.

Syntax

:STOP

:SYSTem:UNLock

The front panel keyboards and knobs of GDS-830 will be disabled after any one of the remote control command received. Use this command in order to re-activate the front panel keyboards and knobs.

Syntax

:SYSTem:UNLock

:TIMebase:DELay

Sets the horizontal position (delay timebase) parameter.

Syntax

:TIMebase:DELay <NR3>

:TIMebase:DELay?

Arguments

<NR3> is the desired delay time.

Returns

<NR3>

:TIMebase:SCALE

Sets the horizontal timebase scale per division (SEC/DIV).

Syntax

:TIMebase:SCALE <NR3>

:TIMebase:SCALE?

Arguments

<NR3> is the desired timebase scale per division.

Returns

<NR3>

:TIMEbase:SWEep

Selects the horizontal timebase sweep mode. This command is equivalent to setting the horizontal menu.

Syntax

```
:TIMEbase:SWEep <NR1>
```

```
:TIMEbase:SWEep?
```

Arguments

- 0 Main timebase
- 1 Window
- 2 Window Zoom
- 3 Roll mode
- 4 XY mode

Returns

<NR1>

:TIMEbase:WINDow:DELay

Sets and query the position (delay time) of two vertical cursors for zoomed display.

Syntax

```
:TIMEbase:WINDow:DELay <NR3>
```

```
:TIMEbase:WINDow:DELay?
```

Arguments

<NR3> is the desired position (delay time).

Returns

<NR3>

:TIMebase:WINDow:SCALe

Sets and query the scale (length) of the windows zoomed timebase.

Syntax

:TIMebase:WINDow:SCALe <NR3>

:TIMebase:WINDow:SCALe?

Arguments

<NR3> is the desired scale (length) of the windows zoomed timebase.

Returns

<NR3>

:TRIGger:ADVance:DELay

Sets and query the user-defined delay time.

Syntax

:TRIGger:ADVance:DELay <NR3>

:TRIGger:ADVance:DELay?

Arguments

<NR3> is the desired user-defined delay time. The range is from 100ns~1.3ms.

Returns

<NR3>

:TRIGger:ADVance:EVENT

Sets and query the user-defined delay trigger events.

Syntax

```
:TRIGger:ADVance:EVENT <NR1>
```

```
:TRIGger:ADVance:EVENT?
```

Arguments

<NR1> is the desired user-defined delay trigger events. The range is from 2~65000.

Returns

<NR1>

:TRIGger:ADVance:LEVel

Sets and query the user-defined start trigger signal level.

Syntax

```
:TRIGger:ADVance:LEVel <NR3>
```

```
:TRIGger:ADVance:LEVel?
```

Arguments

<NR3> is the desired user-defined start trigger signal level. The range is ± 12 .

Returns

<NR3>

:TRIGger:ADVance:MODE

Select and query the different start trigger signal level.

Syntax

```
:TRIGger:ADVance:MODE <NR1>
```

```
:TRIGger:ADVance:MODE?
```

Arguments

0 TTL

1 ECL

2 USR

Returns

<NR1>

:TRIGger:ADVance:TYPE

Select and query the different advance trigger settings.

Syntax

```
:TRIGger:ADVance:TYPE <NR1>
```

```
:TRIGger:ADVance:TYPE?
```

Arguments

0 Time setting

1 Event setting

Returns

<NR1>

:TRIGger:COUPle

Select and query the type of trigger coupling.

Syntax

```
:TRIGger:COUPle <NR1>
```

```
:TRIGger:COUPle?
```

Arguments

0 AC

1 DC

Returns

<NR1>

:TRIGger:LEVel

Select and query the trigger level.

Syntax

```
:TRIGger:LEVel <NR3>
```

```
:TRIGger:LEVel?
```

Arguments

<NR3> is the desired trigger level voltage.

Returns

<NR3>

:TRIGger:MODE

Select and query the trigger mode.

Syntax

:TRIGger:MODE <NR1>

:TRIGger:MODE?

Arguments

0 Auto Level

1 Auto

2 Normal

3 Single

4 TV

5 Advance

Returns

<NR1>

:TRIGger:NREJ

Switch and query the noise rejection mode.

Syntax

:TRIGger:NREJ <NR1>

:TRIGger:NREJ?

Arguments

0 OFF

1 ON

Returns

<NR1>

:TRIGger:REJect

Select and query the noise rejection mode.

Syntax

```
:TRIGger:REJect <NR1>
```

```
:TRIGger:REJect?
```

Arguments

- 0 OFF
- 1 Low frequency reject mode
- 2 High frequency reject mode

Returns

<NR1>

:TRIGger:SLOP

Switch and query the rising or falling trigger slope.

Syntax

```
:TRIGger:SLOP <NR1>
```

```
:TRIGger:SLOP?
```

Arguments

- 0 Rising slope
- 1 Falling slope

Returns

<NR1>

:TRIGger:SOURce

Select and query the trigger source.

Syntax

```
:TRIGger:SOURce <NR1>
```

```
:TRIGger:SOURce?
```

Arguments

- 0 Channel 1
- 1 Channel 2
- 2 External trigger
- 3 AC line voltage

Returns

<NR1>

:TRIGger:TV:FIEld

Select and query the field on which the video trigger mode will be triggered.

Syntax

```
:TRIGger:TV:FIEld <NR1>
```

```
:TRIGger:TV:FIEld?
```

Arguments

- 0 Even frame (Field 1)
- 1 Odd frame (Field 2)

Returns

<NR1>

:TRIGger:TV:LINE

After :TRIGger:TV:FIELD command is specified, you can select and query the specified line.

Syntax

```
:TRIGger:TV:LINE <NR1>
```

```
:TRIGger:TV:LINE?
```

Arguments

<NR1> is the desired line.

For NTSC system, the range of line is from 1~263 for Odd frame, 1-262 for even frame.

For PAL system, the range of line is from 1~313 for Odd frame, 1-312 for even frame.

Returns

<NR1>

:TRIGger:TV:POLarity

Select and query the input video polarity.

Syntax

```
:TRIGger:TV:POLarity <NR1>
```

```
:TRIGger:TV:POLarity?
```

Arguments

0 Positive-going sync pulses

1 Negative-going sync pulses

Returns

<NR1>

:TRIGger:TV:TYPe

Select and query the TV broadcast system.

Syntax

```
:TRIGger:TV:TYPe <NR1>
```

```
:TRIGger:TV:TYPe?
```

Arguments

0 PAL

1 NTSC

Returns

<NR1>

:WMEMory<X>:DISPlay

Select whether the stored waveform will be displayed after being saved.

Syntax

```
:WMEMory<X>:DISPlay <NR1>
```

Arguments

<X> Specify the location of memory (1|2)

0 OFF

1 ON

:WMEMory<X>:ERASe

Select whether the stored waveform will be erased after being saved.

Syntax

```
:WMEMory<X>:ERASe
```

Arguments

<X> Specify the location of memory (1|2)

:WMEemory<X>:LOCate

Set the position of stored waveform.

Syntax

```
:WMEemory<X>:LOCate <NR1>
```

Arguments

<X> Specify the location of memory (1|2)

<NR1> is the desired position. The range is from -200 to +200.

:WMEemory<X>:OFFSet

After :WMEemory<X>:LOCate command is specified, you can adjust the position up or down by this command.

Syntax

```
:WMEemory<X>:OFFSet <NR1>
```

Arguments

<X> Specify the location of memory (1|2)

<NR1> is the desired offset position. The range is from -200 to +200.

:WMEemory<X>:SAVe

Select whether the memory set will be saved.

Syntax

```
:WMEemory<X>:SAVe <NR1>
```

Arguments

<X> Specify the location of memory (1|2)

1 Channel 1

2 Channel 2

9. Specifications

Performance Condition: The electrical specifications found in these tables of warranted specifications apply when the oscilloscope has been adjusted at an ambient temperature between +20 and +30 , has had a warm-up period of at least 30 minutes, and is operating at an ambient temperature between +0 and +50 .

Vertical system :

Channel 1(CH1) and Channel 2(CH2)	2mV/div to 5V/div
Accuracy	$\pm 3\% \times \text{Readout} + 0.05 \text{ div} \times \text{Volts/div}$
Bandwidth	DC ~ 100MHz (- 3dB) AC couple, 10Hz~100MHz (- 3dB)
Rise time	3.5ns Approx.
Input Coupling	AC, DC & Ground
Input Impedance	1M $\pm 2\%$, ~22pF
Polarity	Normal & Invert
Maximum Voltage Between Signal and Common at input BNC	300V (DC + AC peak) , CATII
Waveform Signal Process	CH1 - CH2 , CH1 + CH2
Offset Range:	
2mV/div ~ 50mV/div	$\pm 0.5V$
100mV/div ~ 500mV/div	$\pm 5V$
1V/div ~ 5V/div	$\pm 50V$
Bandwidth Limit	20MHz (- 3dB)

Trigger :

Sources	CH1 , CH2 , LINE , EXT.
Modes	Auto-Level , AUTO , NORMAL , SINGLE , TV , Time-delay , Event-delay
Time Delay Range	100ns to 1.3ms
Events Delay Range	2 to 65000
Start Trigger Level (For USER Mode)	±12V adjustable
Coupling	AC , DC , LFrej , HFrej , Noise rej
Sensitivity	
DC ~ 25MHz	Approx. 0.35div or 3.5mV
25MHz ~ 100MHz	Approx. 1div or 10mV
TV	TV trigger sensitivity: 0.5 division of synch signal

External Trigger :

Range	±12V
Sensitivity	
DC ~ 30MHz	~ 50mV
30MHz ~ 100MHz	~ 100mV
Input Impedance	1M ±2% , ~ 22pF
Maximum Input	300V (DC + AC peak) , CATII

Horizontal :

Range	2ns/div ~ 5s/div (1-2-5 increments)
Modes	MAIN, WINDOW, WINDOW ZOOM, ROLL, X-Y
Accuracy	±0.01 %
Delay Range	
Pre-trigger	10 div maximum
Post-trigger	500 div

X-Y mode :

X-Axis Input	Channel 1 (CH1)
Y-Axis Input	Channel 2 (CH2)
Phase shift	±3 ° at 100kHz

Signal Acquisition System :

Real-time Sample Rate	100MSa/s maximum
Equivalent Sample Rate	25GSa/s maximum
Vertical Resolution	8 Bits
Record Length / Channel	125k Dots
Single Shot Record Length	125k Dots
Single Shot Bandwidth	10MHz
Acquisition Mode	Sample, Peak Detect, Average, Accumulate
Peak Detection	20ns (10 μ s/div ~ 5s/div)
Average	2 , 4 , 8 , 16 , ... , 256

Cursors and Measurement :

Automated Voltage Measurement	V_{pp} , V_{amp} , V_{avg} , V_{rms} , V_{hi} , V_{lo} , V_{max} , V_{min}
Automated Time Measurement	Freq, Period, Rise Time, Fall Time, Positive Width, Negative Width , Duty Cycle
Cursors Measurement	Voltage difference between cursors (V) Time difference between cursors (T)

Control Panel Functions :

Autoset	“Autoset” adjust Vertical VOLT/DIV, Horizontal SEC/DIV, and Trigger level automatically
Save/Recall	Up to 15 sets of measurement conditions can be saved and recalled
Waveform Trace Save/Recall	2 sets of waveform can be saved and recalled

Display System :

CRT Type	7-inch diagonal, magnetic deflection; horizontal raster scan; green phosphor
Video Display Resolution	480 (Vertically) \times 640 (Horizontally) Dots
Waveform Display Graticule	8 \times 10 divisions
Intensity Levels	Adjustable overall intensity and contrast

Power Source :

Line Voltage Range	100V ~ 240V AC, auto selection
Line Frequency	48Hz ~ 63Hz
Power Consumption	85Watts , 95VA maximum, with Fan
Fuse Rating	2 Ampere Slow, 250V,

Miscellaneous :

Parallel port	Standard A 25-pin IBM PC type, parallel printer interface
Printer Compatibility	
HP LaserJet with HP PCL5	Black & white @150 x150dpi
HP DeskJet	Black & white @150 x150dpi
Epson InkJet with ESC/P2	Black & white @180 x180dpi
Epson Dot Matrix Printer	Black & white @180 x180dpi
RS-232 Interface	A DB 9-pin male DTE RS-232 interface
GPIO Interface	Optional Fully programmable with IEEE488.2 compliance
Video Signal Output	DB-15 rear panel Video connector; non-interlaced with VGA compatible
Probe Calibration Output	$2V_{pp} \pm 3\%$
Probe	2 sets
Overall Dimensions	330(W) x155(H) x385(D) mm
Weight	~ 7 kg

Atmospherics :

Ambient Temperature

Operating 0 ~ 50

Storage - 20 ~ 70

Relative Humidity

Operating 80 % R.H @ 35

Storage 80 % R.H. @ 70

EC Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.

- (1) No. 95-11, Pao-Chung Rd., Hsin-Tien City, Taipei Hsien, Taiwan
- (2) Plot 522, Lorong Perusahaan Baru 3, Prai Industrial Estate, 13600 Prai, Penang, Malaysia

declare, that the below mentioned product

GDS-830, 100MHz Digitizing Oscilloscope

are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (89/366/EEC, 92/31/EEC, 93/68/EEC) and Low Voltage Equipment Directive (73/23/EEC).

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

EMC Directive 89/366/EEC amended by 92/31/EEC; 93/68/EEC	
EN 50081-2: 1993 Electromagnetic Compatibility- Generic Emission Standard. Part 2: Industrial environment.	EN 50082-1: 1997 Electromagnetic Compatibility- Generic Immunity Standard. Part 2: Industrial environment.
EN 55011 Class A: 1991	EN 61000-4-2: 1995
EN 61000-3-2 + A12: 1996	EN 61000-4-3: 1996
EN 61000-3-3: 1995	EN 61000-4-4: 1995
	EN 61000-4-5: 1995
	EN 61000-4-6: 1996
	EN 61000-4-8: 1993
	EN 61000-4-11: 1994
EN61326-1: 1998 Electrical Equipment for Measurement, Control and Laboratory Use-EMC Requirements	
IEC 1000-4-2: 1995	IEC 1000-4-5: 1995
IEC 1000-4-3: 1995	IEC 1000-4-6: 1996
IEC 1000-4-4: 1995	IEC 1000-4-11: 1994

Low Voltage Equipment Directive 73/23/EEC & amended by 93/68/EEC
Safety Requirements EN 61010: 90+A1:92+A2:95