Digital Storage Oscilloscope

GDS-2000A Series

OPTIONS USER MANUAL

ISO-9001 CERTIFIED MANUFACTURER

GWINSTEK

July 2013

www.valuetronics.com

Table of Contents

www.valuetronics.com

Getting Started

This chapter gives a brief overview of optional modules and software available for the GDS-2000A, how to install or uninstall any options already installed on the scope.

GDS-2000A Options Overview

The GDS-2000A has a number of options that can be installed to increase the functionality of the base models. Some of the options are hardware only, and some of the options require both hardware modules and software to be installed. Below is a list of options available for the GDS-2000A.

GW Instek will continue to develop modules and optional software. Please see the GW Instek website or see your local distributor for further updates.

Hardware Options

Option Number	Description
DS2-LAN	Ethernet & SVGA output
DS2-GPIB	GPIB Interface
DS2-FGN	DDS Function Generator
DS2-8LA	8-Channel Logic Analyzer Card (GLA-08)with 8-Channel Logic Analyzer Probe (GTL-08LA)
DS2-16LA	16-Channel Logic Analyzer Card (GLA-16)with 16-Channel Logic Analyzer Probe (GTL-16LA)

www.valuetronics.com

Module Installation

Background	The GDS-2000A has a number of optional modules that can be installed into the module slots on the rear panel. These modules must be installed before power up.
⚠ Note	The modules are not hot-swappable. Please ensure the power is off before connecting or disconnecting any of the modules from the rear panel.
Steps	1. Make sure the power is turned off before installing any of the optional modules.

2. Slide the tabs holding the module cover to the unlock position and then remove
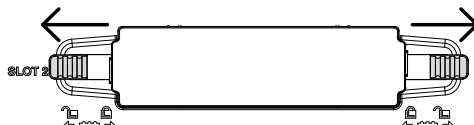
3. Install the optional module. Be sure to make sure that the groves on the module line-up to the slots in the module bay.
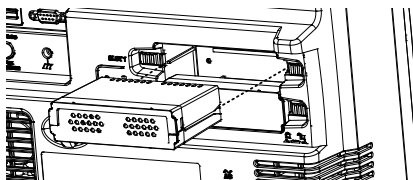
4. Slide the tabs back into the lock position.

5. Install the corresponding optional software, if any. See the next section for installation instructions.

www.valuetronics.com

Software Installation

Background   The GDS-2000A has optional software packages to expand the functionality of the standard GDS-2000A. Optional software may also require optional hardware modules to also be installed. An activation key is required to activate any optional software. A different activation key is required for each optional software package.

For the latest files and information regarding the optional software packages, see the GW Instek website: www.gwinstek.com or contact your nearest distributor.

Steps   1. Install any hardware modules if needed. See page 6 for installation details.

Panel Operation   2. Insert the USB serial key for the desired option into the front panel USB A port.
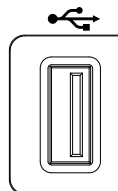
3. Press the *Utility* key then the *File Utilities* soft-key.

Utility
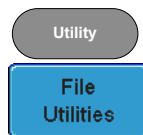
File
Utilities

4. Navigate to the desired file in the USB file path.
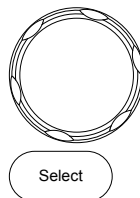
When the desired installation file has been found, press the *Select* key to start the installation.

VARIABLE

Select

www.valuetronics.com

5. The installation will complete in a few seconds.
    When finished a pop-up message will appear
    asking you to restart the GDS-2000A.

6. Restart the GDS-2000A.

Uninstalling Optional Software

Background   Optional software packages such as the Search
                    function can be uninstalled from the system menu.

Panel Operation   1. Press the *Utility* key.

> **Utility**

2. Press *System* from the bottom
    menu.

> **System**

3. Press more *1 of 2* from the side
    menu.

> **more 1 of 2**

4. Press *Option Uninstall* on the side
    menu.

> **Option Uninstall**

5. Select the optional software packages that you
    wish to uninstall from the side menu.

6. Use the *Up* and *Down* arrows on
    the side menu to select an option to
    uninstall.

> ⇧
>
> ⇩

7. Press *Uninstall* to uninstall the
    option.

> **Uninstall**

8

QUICK REFERENCE

This chapter describes the menu tree for the option software.

www.valuetronics.com

Options Menu Tree

Option Key

Accesses the functions in the Option menu.

Option

| Logic Analyzer | Function Gen 1 | Function Gen 2 | DVM | | I/O |

Logic Analyzer	Goes to the Logic Analyzer menu
Function Gen 1	Goes to the Function Generator menu for the GEN 1 output
Function Gen 2	Goes to the Function Generator menu for the GEN 2 output
I/O	Goes to the options I/O menu
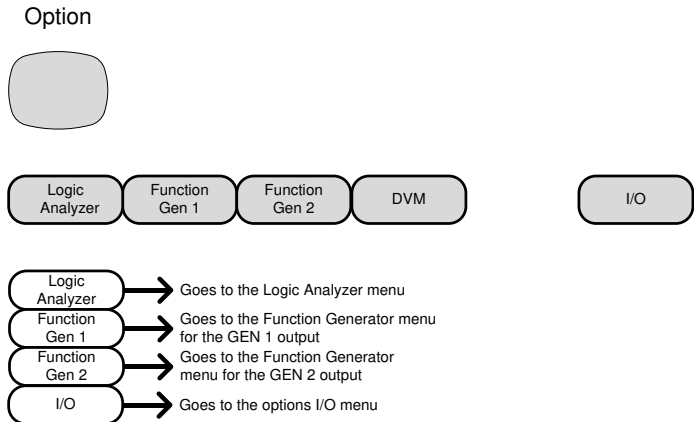
*Note: Any option that is not installed will be grayed-out.

Function Generator

Setup the Function Generator output.

| Sine | Square | Triangle | | -20dB |

Frequency 0.1Hz ~ 5MHz	Frequency 0.1Hz ~ 5MHz	Frequency 0.1Hz ~ 500kHz		ON OFF
Amplitude 30mVpp ~ 3Vpp (into 50Ω)	Amplitude 30mVpp ~ 3Vpp (into 50Ω)	Amplitude 30mVpp ~ 3Vpp (into 50Ω)		
Offset ±1.000V (into 50Ω)	Offset ±1.000V (into 50Ω)	Offset ±1.000V (into 50Ω)		
Dutycycle	Dutycycle 5% ~ 95%	Dutycycle		
Default 1kHz	Default 1kHz	Default 1kHz		

GWINSTEK
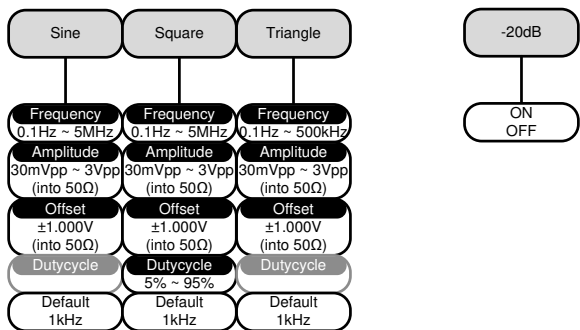
Logic Analyzer

Setup the Logic Analyzer inputs.

D15 – D0 On/Off	Thresholds		Analog Waveform	Height	Sample Rate	Go Back

| Select D0 ~ D15 |
| Display On Off |
| D7~D0 Turn On Turn Off |
| D15~D8 Turn On Turn Off |
| Edit Labels |

| Select D0~D3 D4~D7 D8~D11 D12~D15 |
| Threshold XX~XXV |
| Choose Preset User TTL 5.0V CMOS 3.3V CMOS 2.5V CMOS ECL PECL 0V |

| Select Wave_A1 Wave_A2 |
| Display On Off |
| Vertical 0.1~1.0 X 0.0~8.0 Div |
| Edit Labels |

| S M L |
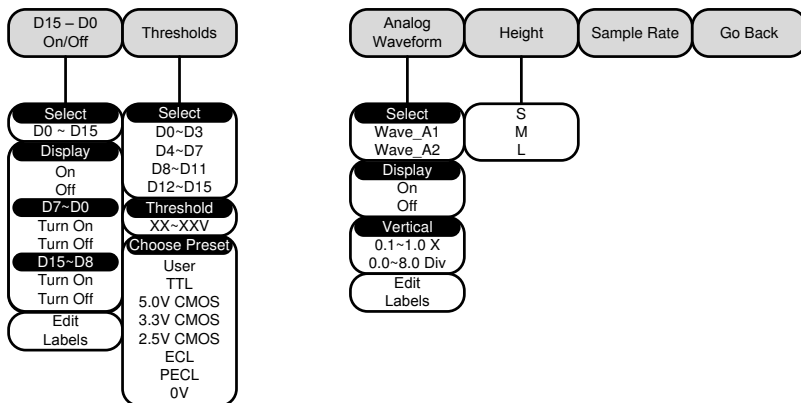
Search - Logic

Set the Search function for logic events.

Search

Search	Search Type		Define Inputs	When	Threshold	Clock Edge

| Search On Off |
| Save All Marks |
| Clear All Marks |
| Copy Search Settings To Trigger |
| Copy Trigger Settings To Search |

| Search Edge Pulse Width Runt Rise/Fall Time Logic Bus |

| Select D0~D15 |
| Clock |
| High (H) |
| Low (L) |
| Don't Care (X) |

Goes True   Goes False

Is True > XXns

Is True < XXns

Is True = XXns
5%

Is True ≠ XXns
5%

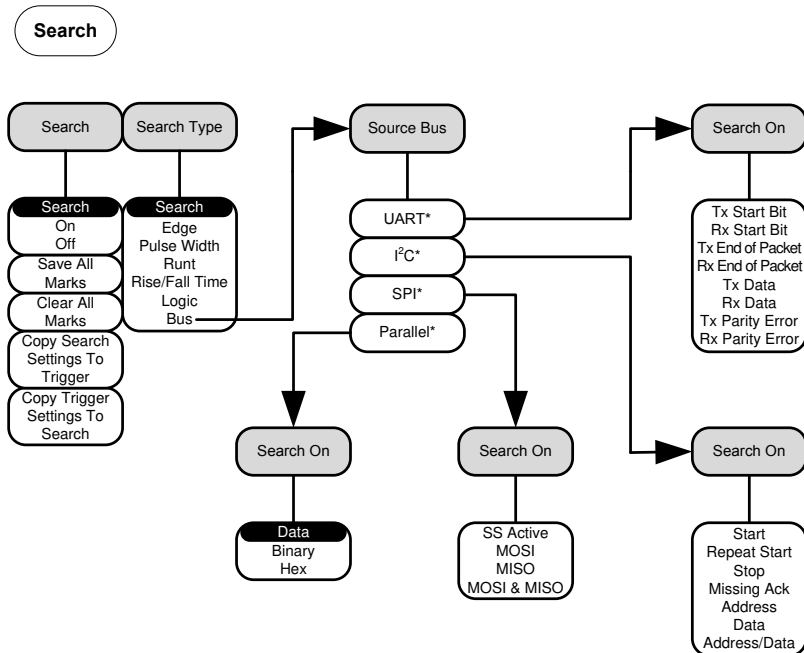| Select D0~D3 D4~D7 D8~D11 D12~D15 |
| Threshold XX~XXV |
| Choose Preset User TTL 5.0V CMOS 3.3V CMOS 2.5V CMOS ECL PECL 0V |

Search - Bus

Set the Search function for bus events.
Note: The source bus is determined from the bus trigger settings.

Search

```
Search ─── Search Type          Source Bus                    Search On

Search          Search                UART*              Tx Start Bit
On              Edge                  I²C*               Rx Start Bit
Off             Pulse Width           SPI*               Tx End of Packet
Save All        Runt                  Parallel*          Rx End of Packet
Marks           Rise/Fall Time                           Tx Data
Clear All       Logic                                    Rx Data
Marks           Bus                                      Tx Parity Error
Copy Search                                              Rx Parity Error
Settings To
Trigger

Copy Trigger
Settings To
Search
                    Search On          Search On          Search On

                    Data               SS Active          Start
                    Binary             MOSI               Repeat Start
                    Hex                MISO               Stop
                                       MOSI & MISO        Missing Ack
                                                          Address
                                                          Data
                                                          Address/Data
```
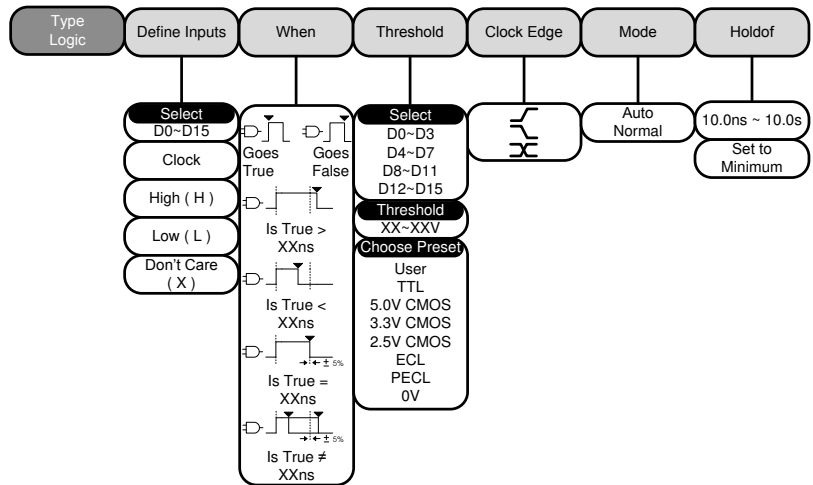
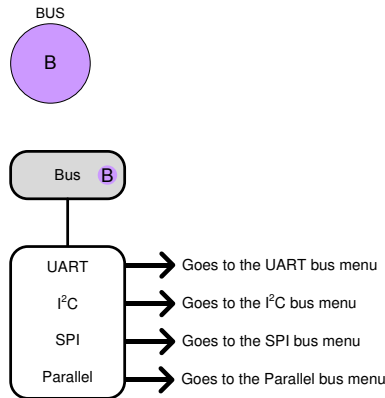*The source bus is determined from the bus trigger settings.

Trigger - Bus

```
┌──────────┐   ┌──────────┐                          ┌──────────┐
│  Type    │   │Source Bus│              ┌──────────▶│ Search On│
│  Bus     │   │          │              │           └──────────┘
└──────────┘   └──────────┘              │
                                         │            Tx Start Bit
                 Ⓑ UART* ────────────────┘            Rx Start Bit
                                                      Tx End of Packet
                 Ⓑ I²C* ──────────────────┐           Rx End of Packet
                                          │            Tx Data
                 Ⓑ SPI*                   │            Rx Data
                                          │           Tx Parity Error
                 Ⓑ Parallel*             │           Rx Parity Error
       ┌──────────┐      ┌──────────┐     │     ┌──────────┐
       │Trigger On│      │Trigger On│     └────▶│Trigger On│
       └──────────┘      └──────────┘           └──────────┘
         Data             SS Active               Start
         Binary           MOSI                    Repeat Start
         Hex              MISO                     Stop
                          MOSI & MISO             Missing Ack
                                                  Address
                                                  Data
                                                  Address/Data
```

*The source bus is set in the bus menu.

www.valuetronics.com

Trigger - Logic

Type Logic	Define Inputs	When	Threshold	Clock Edge	Mode	Holdof

Define Inputs:
- Select D0~D15
- Clock
- High (H)
- Low (L)
- Don't Care (X)

When:
- Goes True / Goes False
- Is True > XXns
- Is True < XXns
- Is True = XXns ±5%
- Is True ≠ XXns ±5%

Threshold:
- Select D0~D3 D4~D7 D8~D11 D12~D15
- Threshold XX~XXV
- Choose Preset
  - User
  - TTL
  - 5.0V CMOS
  - 3.3V CMOS
  - 2.5V CMOS
  - ECL
  - PECL
  - 0V

Mode:
- Auto Normal

Holdof:
- 10.0ns ~ 10.0s
- Set to Minimum

*The source bus is determined from the bus menu.

Bus

BUS

B

Bus B

- UART → Goes to the UART bus menu
- I²C → Goes to the I²C bus menu
- SPI → Goes to the SPI bus menu
- Parallel → Goes to the Parallel bus menu

www.valuetronics.com

Bus - UART

```
┌─────────┐   ┌─────────────┐   ┌───────────┐   ┌───────────┐   ┌─────────────┐   ┌─────────────┐   ┌─────────────┐
│ Bus  B  │   │Define Inputs│   │ Threshold │   │ Configure │   │ Bus Display │   │ Event Table │   │ Edit Labels │
│ UART    │   └─────────────┘   └───────────┘   └───────────┘   └─────────────┘   └─────────────┘   └─────────────┘
└─────────┘
```

Define Inputs	Threshold	Configure	Bus Display	Event Table	Edit Labels
Tx Input D0~D15	**Select** Tx Rx	**Baud Rate** 50, 75, 110, 134, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 15200, 19200, 28800, 19200, 28800, 31250, 38400, 56000, 57600, 76800, 115200, 128000, 230400, 460800, 921600, 1382400, 1843200, 2764800	Hex	**Event Table** On Off	**Label For** B
Rx Input D0~D15	**Threshold** XX~XXV		Binary	**Save** Event Table	**User Preset** ACK AD0 ADDR ANALOG BIT CAS CLK CLOCK CLR COUNT DATA DTACK ENABLE HALT INT IN IRQ LATCH LOAD NMI
Polarity Normal (High = 0)	**Choose Preset** User TTL 5.0V CMOS 3.3V CMOS 2.5V CMOS ECL PECL 0V				
Polarity Inverted (High = 1)		**Data bits** 8			Edit Character
		Parity Odd Even None			**Label Display** On Off
		Packets On Off			Go Back
		End of Packet 00(NULL) 0A(LF) 0D(CR) 20(SP) FF			

Edit Character ──→ Goes to the Keypad menu

www.valuetronics.com

Bus – I²C

Bus – SPI

Bus SPI **B**	Define Inputs	Threshold	Configure	Bus Display	Event Table	Edit Labels

Define Inputs
- SCLK Input — D0~D15
- SS Input — D0~D15
- MOSI Input — D0~D15
- MISO Input — D0~D15

Threshold
- Select
  - SCLK
  - SS
  - MOSI
  - MISO
- Threshold — XX~XXV
- Choose Preset
  - User
  - TTL
  - 5.0V CMOS
  - 3.3V CMOS
  - 2.5V CMOS
  - ECL
  - PECL
  - 0V

Configure
- Yes / No
- SCLK
- SS
  - Active High
  - Active Low
- more 1 of 2
- Word Size — 4~32 bits
- Bit Order — MS First
- Bit Order — LS First
- more 2 of 2

Bus Display
- Hex
- Binary

Event Table
- Event Table
  - On
  - Off
- Save Event Table

Edit Labels
- Label For **B**
- User Preset
  - ACK
  - AD0
  - ADDR
  - ANALOG
  - BIT
  - CAS
  - CLK
  - CLOCK
  - CLR
  - COUNT
  - DATA
  - DTACK
  - ENABLE
  - HALT
  - INT
  - IN
  - IRQ
  - LATCH
  - LOAD
  - NMI
- Edit Character
- Label Display
  - On
  - Off
- Go Back

Edit Character ➝ Goes to the Keypad menu

17

Bus – Parallel

| Bus Parallel B | Define Inputs | Threshold | | Bus Display | Event Table | Edit Labels |

	Select Signal	Select		Hex	Event Table	Label For
	Bit D0~D15	D0~D15			On	B
	Select Ch	Threshold		Binary	Off	User Preset
	D0~D15	XX~XXV			Save	ACK
	Number of Bits	Choose Preset			Event Table	AD0
	1~16	User				ADDR
	Clock Edge	TTL				ANALOG
	Off	5.0V CMOS				BIT
		3.3V CMOS				CAS
		2.5V CMOS				CLK
		ECL				CLOCK
		PECL				CLR
		0V				COUNT
						DATA
						DTACK
						ENABLE
						HALT
						INT
						IN
						IRQ
						LATCH
						LOAD
						NMI

Edit Character → Goes to the Keypad menu

Edit Character

Label Display
On
Off

Go Back

FUNCTION GENERATOR

Function Generator Operation

Overview

Background　　　The DDS Function Generator module allows the GDS-2000A to create basic sine, square and triangle waveforms.

⚠ Note　　　The function generator option can only be used with firmware version 1.13 or later. However it is highly recommended that firmware version V1.16 or later be installed to access the full functionality of the module. The instructions on the following pages are based on V1.16 or later.

Please see the GW Instek website for the latest firmware and the firmware installation procedure.

Function Generator Specifications

Waveforms	Sine, Square, Triangle
Frequency range	0.1Hz ~ 5MHz for sine
	0.1Hz ~ 5MHz for square
	0.1Hz ~ 500KHz for triangle
Frequency Stability	±50ppm
Frequency Accuracy	±50ppm (± 0.25Hz)
Aging	±5ppm/Year
Amplitude Range	60mVpp ~ 6Vpp (into 1MΩ)
	30mVpp ~ 3Vpp (into 50Ω)
Amplitude Accuracy	±10%
Attenuator	-20dB
Impedance	50Ω
DC Offset	±2V (into 1MΩ)
	±1V (into 50Ω)
Duty Control Range	5%(min) ~ 95%(max)
	(Square wave only)
Rise or Fall Time	≤15ns (Square wave only)

Using the Function Generator Option

Background

This section will describe how to use the function generator modules. To use the function generator option, the DS2-FGN function generator module must be installed. Please see page 6 for installation details.

⚠ Note

The GDS-2000A can have two function generator modules installed at the same time. Operating the CDS-2000A using one or two function generator modules is the same.

Connection

1. The function generator signal is output from the GEN 1 or GEN 2 outputs on the front panel. If the function generator module is installed in slot one, then the signal is output from GEN 1, and if the function generator is installed in slot two, then the signal is output from GEN 2.

2. Connect a BNC cable to the appropriate output (GEN 1 or GEN 2).
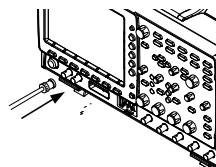
Panel Operation

1. Press the *Option* key.

   Option

2. Press *Function Gen 1* or *Function Gen 2* from the bottom menu.

   Function Gen 1

3. Select *Sine*, *Square* or *Triangle* from the bottom menu.

   Sine

4. Press *Frequency* from the side menu.

    Use the Variable knob to highlight either *User* or a preset frequency base unit.

User	Frequency
100 mHz	User
1 Hz	1.0000MHz
10 Hz	
100 Hz	
1 kHz	
10 kHz	
100 kHz	
1 MHz	
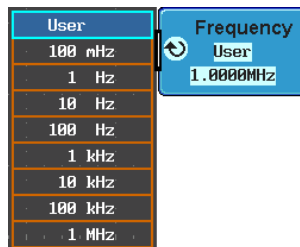
The frequency can now be adjusted using fine adjustment or coarse adjustment:

Range   100mHz ~ 5MHz (500kHz for triangle)

COARSE ADJUSTMENT:
Press the *Frequency* soft-key again to reduce the frequency menu.

• Use the *Variable* knob to adjust the frequency at the selected base unit.

• The adjusted frequency will automatically be saved to the *User* variable.

FINE ADJUSTMENT:
Press the *Select* key. The frequency can now be adjusted one digit at a time.

• Use the *Left* and *Right* soft-keys to select a digit.

• Use the *Variable* knob to adjust the digit.

• Pressing the *Default* soft-key will return the frequency back to the default base unit. (not available for the *User* variable)

• Press *Go Back* when you have finished editing the frequency.

• The adjusted frequency will automatically be saved to the *User* variable.

www.valuetronics.com

Fine adjustment mode

Left and Right soft-keys

Default

Go Back
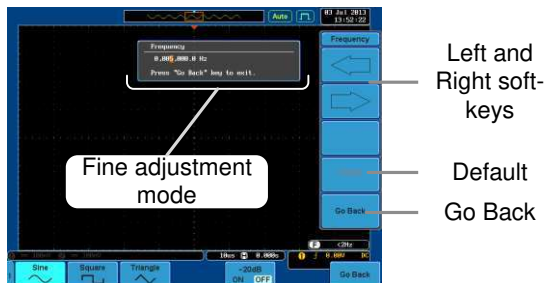
5. Press the *Amplitude* key to set the amplitude.

Amplitude
3.00Vpp
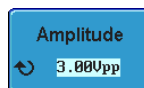
Range	300mVpp ~ 3Vpp (into 50Ω load)*.
	*range depends on attenuation settings.

6. Press the *Offset* key to set the DC offset.

Offset
0.000mV
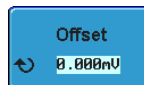
Range	±1.000V (into 50Ω load).

7. Press *DutyCycle* (Square wave only) to set the duty cycle.

Dutycycle
50%
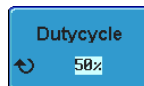
Range	5% to 95%.

8. Press *-20dB* to attenuate the output by 20dB.

-20dB
ON   OFF
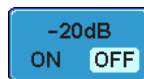
Range	ON, OFF

9. The signal will be output immediately from the GEN 1 or GEN 2 outputs.

Function Generator Calibration

Background	The function generator module can also be calibrated from the System menu. The calibration function is only available for firmware version V1.16 or later.
Connection	Connect the GEN 1 or GEN 2 output (depending on which module slot the function generator is installed in) to CH1 using a BNC cable.

GEN 1
or
GEN 2

˜   CH1
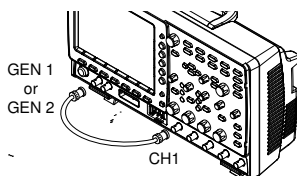
⚠ Note	If two function generator modules are installed, the system will automatically choose to calibrate the function generator in module slot 1. If you wish to calibrate the second function generator, first select it from the Option menu (*Option* key > *Function Gen 2*).

Panel Operation	1. Press the *Utility* key.

Utility

2. Press *System* from the bottom menu.

System

3. Press *More 1 of 2* from the side menu.

more
1 of 2

4. Press *Self CAL* from the side menu.

Self Cal

www.valuetronics.com

5. Press *Function Generator* from the side menu.

Wait a few moments for the calibration to finish. "Complete" will be displayed on the screen when the calibration has completed.

• If the calibration fails, please check the connection and perform the calibration procedure again.

www.valuetronics.com

LOGIC ANALYZER

www.valuetronics.com

www.valuetronics.com

Logic Analyzer Operation

Overview

Background	The Logic Analyzer inputs can only be used when a Logic Analyzer option is installed (GW Instek part no. DS2-8LA or DS2-16LA). Both the 8-chanel and 16-channel models have a sample rate of 500MSa/s with bandwidth of 200MHz.	
	The logic analyzer inputs can be used to measure discrete inputs or can be used to measure values on a parallel or serial bus.	
Supported Logic Thresholds	TTL, CMOS, ECL, PELC, User- defined	The GDS-2000A supports common logic thresholds and supports user-defined thresholds of ± 10V if the in-built threshold levels are unsuitable.
Digital Trigger Types	Edge, Pulse Width, Rise and Fall, Bus, Logic	As standard, the digital channels support basic edge, pulse width, rise and fall as well as bus and logic triggers.

Using the Logic Analyzer Probes

Background   This section will describe how to connect the
digital channels to the device under test. To use the
digital channels the optional logic analyzer module
must be installed. Please see page 6 to install the
logic analyzer module.

Connection   1.   Turn the DUT off to protect it from being short
circuited when the probes are attached.

2.   Insert the Logic
Analyzer probe into
the Logic Analyzer
input.
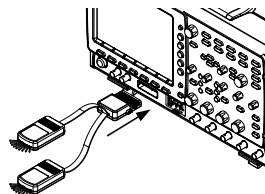
3.   Connect the ground lead from the logic
analyzer probe to the circuit ground on the
DUT.

4.   Connect another probe lead to a point of
interest on the circuit. Make note of which
probe lead is connected to which point.

5.   Repeat step 3 with any remaining probes.
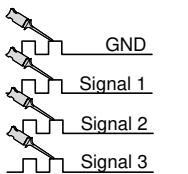
Digital Display Overview

Analog
waveform
indicator

Digital
channel
group

Digital
channel
indicators
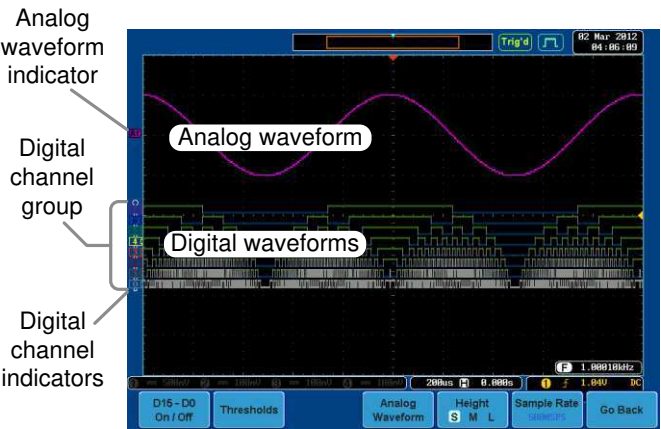
Analog Waveform Indicator	Used to show the position of the analog waveform outputs.

A1 Active analog waveform   **A1** Activated analog waveform

Digital Channel Indicators	Used to show the position and grouping of the digital channels.

7 Active digital channel   **7** Activated digital channel

Digital Channel Group	When digital channels are grouped together, they are shown as being pinned together. When grouped, digital channels can moved as a single group.

www.valuetronics.com

Activating Digital Channels

The digital channels can be initially turned on in groups of 8 or individually.

Activate Digital Channels as a Group

Background	The digital channels can be turned on or off in groups of eight, D0~D7 and D8~D15.

Panel Operation   6. Press the *Option* key.

Option

7. Press *Logic Analyzer* from the bottom menu.

Logic
Analyzer
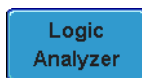
8. Press D15 – D0 On/Off key.

D15 - D0
On / Off
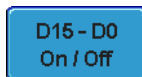
9. Select which group of digital inputs you want turned on or off from the side menu.

Turn Off

Turn On
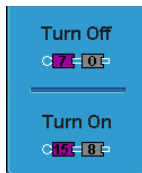
Group1   D0~D7

Group2   D8~D15

10. The digital channels will appear on the graticule.

⚠ Note   When all the digital channels are turned on, they will appear as a single group.

Activate Individual Channels

Background	Each digital channel or group can be turned on or off individually.

Panel Operation   1. Press the *Select* soft-key.
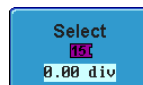
2. Use the variable knob to highlight a channel or a group.

VARIABLE
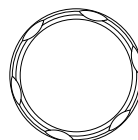
3. A 'tick' next to a particular channel or group indicates that that channel or group is currently on.

Channel 0~2 is off

Channel 3~15 is on
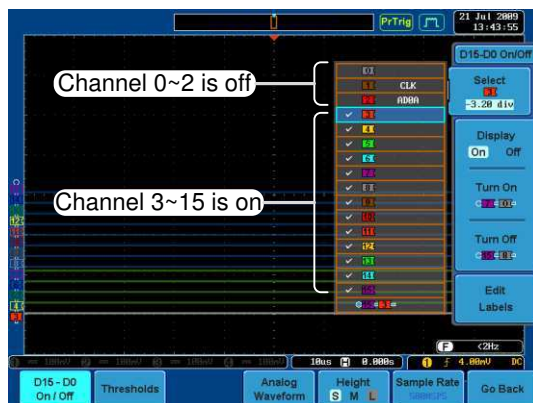
4. Press the *Display* soft-key or the *Select* key to toggle the selected channel or group on or off.

or

Select

www.valuetronics.com
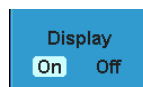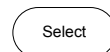
5. Press the *Select* soft-key again to reduce the menu.
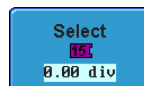
| Select |
| 15 |
| 0.00 div |

⚠ Note   Channels can also be selected just by turning the variable knob when the mode is set to LA move mode. In this mode the selected channel or group will be shown on the Select soft-key. However this method will only show those channels/groups that have already been turned on. See page 33 for details.

Moving the Digital Channels or Creating Digital Channel Groups

⚠ Note   The digital channels must first be activated. See page 31.

Background   The logic analyzer has two basic modes of operation for selecting or moving digital channels.

LA Select mode: This mode is used to select digital channels that have already been activated.

LA Move mode: This mode is used to move the vertical position of the digital channels and to group digital channels into groups.

The Select key is used to toggle between both modes when in the *D15~D0 On/Off* menu.

Panel Operation 1. Press the D15~D0 On/Off key. The scope will initially be in 'LA Select mode'.

| D15 - D0 |
| On / Off |

www.valuetronics.com
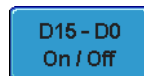
2. Use the variable knob to choose a   VARIABLE
    channel or group. The selected
    channel/group will be shown on
    the Select key. Only channels that
    have been activated can be selected
    this way.
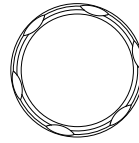
Below, channel 4 is selected.
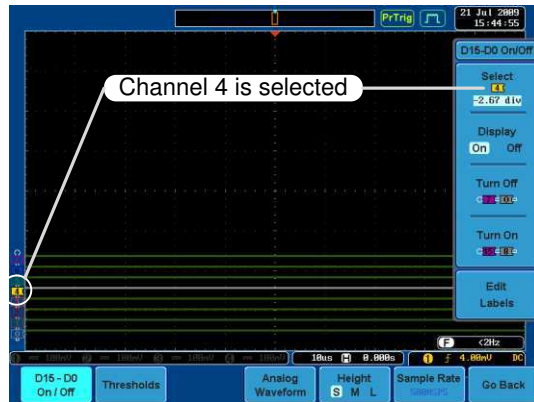
Note: If the Variable knob cannot select a channel,
press the Select key to toggle the scope into 'LA
Select mode'.

3. Press the *Select* key. The mode   Select
    toggles from 'LA Select mode' to
    'LA Move mode'.

A message will indicate which
mode is currently active.

The Move mode is used to move the digital channel position on the graticule as well as to group the channels. If you turned on all the digital channels, you will notice that they are already grouped as a single group.

You can tell when it is in move mode as the selected channel/group flashes and the labels for the other channels/groups become grayed out.

Channel 4 is in the 'Move' mode and the labels for the other channels are grayed out

4. Use the variable knob to position the selected channel/group:

VARIABLE
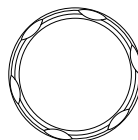
If you position the channel indicator over the next/previous channel, it will split the group into 2.

Split the group above the selected channel:
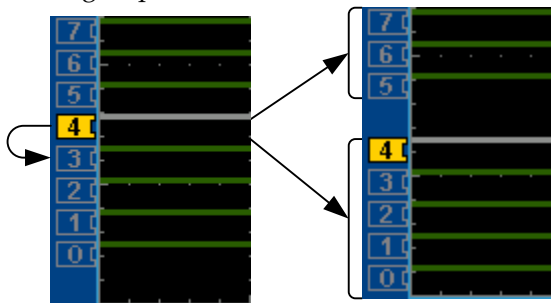
Split the group below the selected channel:
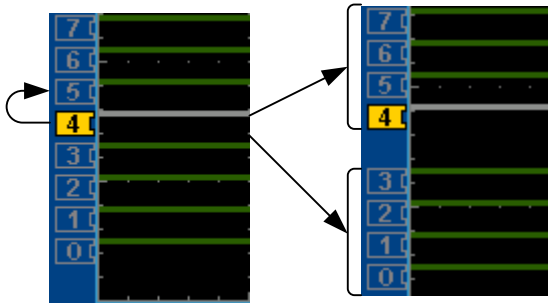
If you continue to move the channel indicator past the next/previous channel, it will move the indicator anywhere within that group.
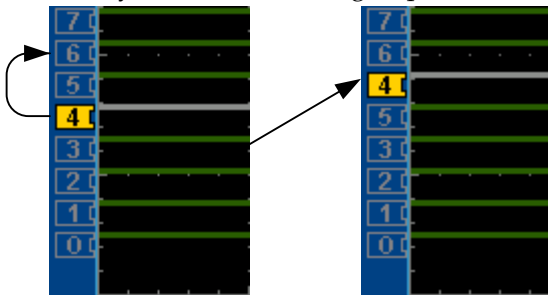
5. If you move the indicator *outside* of the group, it will remove the selected channel from the group.

www.valuetronics.com
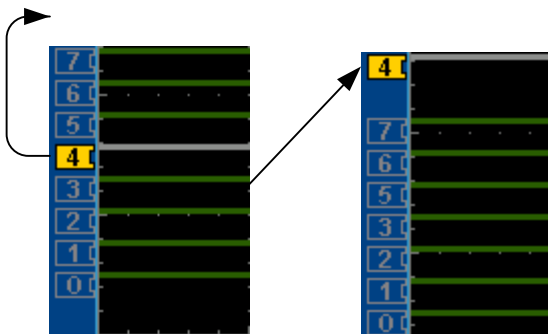
6. Press the *Select* key again. This will
    return you to the LA Select mode.

    Select

    You can tell when it is in the Select
    mode as no channel will be grayed
    out.

www.valuetronics.com

Digital Channel Vertical Scale

Background | The digital channels have 3 preset scales, S, M, L.

Panel Operation | 1. From the *D15~D0 On/Off* menu, press *Height* to toggle the vertical scale of the digital channels.

> Height | S, M, L

⚠ Note | If more than 8 digital channels are active, the large (L) option will be disabled.

Digital Channel Threshold Levels

⚠ Note | Threshold levels can be set to four groups of digital channels: D0~D3, D4~7, D8~D11 and D12~D15. Each group can have a different threshold level.

The GDS-2000A has 4 preset threshold levels and a user-defined threshold. A user-defined threshold level can be set for each group. Any signal over the threshold level corresponds to a high (1), any signal under the threshold level is a low (0).

Panel Operation | 1. From the D15~D0 On/Off menu, press the *Thresholds* soft-key.
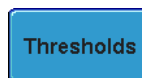
2. Press *Select* from the side menu and choose a group of channels.
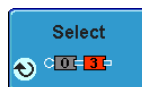
www.valuetronics.com

3. Press *Choose Preset* to select a pre-
    set logic threshold.

Logic Type	Threshold
TTL	1.4V
5.0V CMOS	2.5V
3.3V CMOS	1.65V
2.5V CMOS	1.25V
ECL	-1.3V
PECL	3.7V
0V	0V

4. Press *Threshold* to set a user
    defined threshold for the currently
    selected group.

Range	±10V

www.valuetronics.com
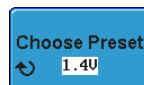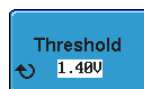
Analog Waveform

Background   The analog waveform function combines the
                  digital channel inputs into two 8-bit analog
                  waveforms. The analog waveforms are created
                  from the digital channel groups D0~7 and D8~15.

Example

Panel Operation   1. Press the *Option* key.   Option

                  2. Press the Analog Waveform key.
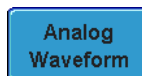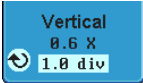
                  3. Press *Select* and select which
                     analog waveform you which to
                     display, Wave_A1 (D7~D0) or
                     Wave_A2 (D15~D8).
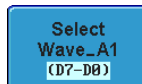
Display on Screen 4. Press *Display* to display the
                     selected waveforms on the screen.
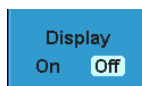
Set Vertical Position	5. Press *Vertical* until div parameter is highlighted. Use the *Variable* knob to set the position.	Vertical 0.6 X 1.0 div
Set Vertical Scale	6. Press Vertical until *X* scale parameter is highlighted. Use the *Variable* knob to set the scale.	Vertical 0.6 X 1.0 div
Edit Labels	7. Press Edit Labels to edit the label for the currently selected analog waveform. See page 41 for details.	Edit Labels

⚠ Note — Only one analog waveform can be displayed at a time.

Adding Labels to Digital Channels

Background	Digital labels can be added to each digital channel or to one of the analog waveforms.

Panel Operation	1. To edit labels for the digital channels, press the *Edit Labels* soft-key from the D15~D0 On/Off menu.	Edit Labels
	To edit labels for the analog waveforms, press the *Edit Labels* soft-key from the *Analog Waveform* menu.	
	2. Press *Label For* and select a channel or waveform.	Label For D0

> Label For   D0~D15
>
>   A1, A2

www.valuetronics.com

G\U+026ANSTEK

3. To choose a preset label, Press *User Preset* from the side menu and choose a label.
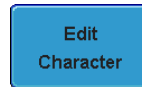
> User Preset
> **ACK**

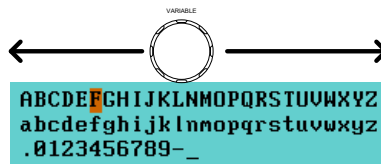| Labels | ACK, AD0, ADDR, ANALOG, BIT, CAS, CLK, CLOCK, CLR, COUNT, DATA, DTACK, ENABLE, HALT, INT, IN, IRQ, LATCH, LOAD, NMI |

Edit Label

4. Press *Edit Character* to edit the current label.

> Edit Character

5. The Edit Label window appears.

6. Use the Variable knob to highlight a character.

www.valuetronics.com

Press *Enter Character* to select a number or letter.

Enter
Character

Press *Back Space* to delete a character.

Back
Space

Press *Editing Completed* to create the new label and return to the previous menu.
Note: this key must be pressed to create a label, even for a preset label.

Editing
Completed

Press *Cancel* to cancel the editing and return to the Edit Label menu.

Cancel

7. The label will appear next to corresponding channel indicator.

Below, the label "LABEL_1" was created for the D0 channel.

D0 is labeled as
LABEL_1

Remove Label   Press *Label Display* to toggle the selected label on or off.

Label Display
On   Off

www.valuetronics.com

Bus Key Configuration

The Bus key is used to configure the Parallel and Serial bus inputs. The Bus menu also features an event tables to track and save your bus data.

Bus Display
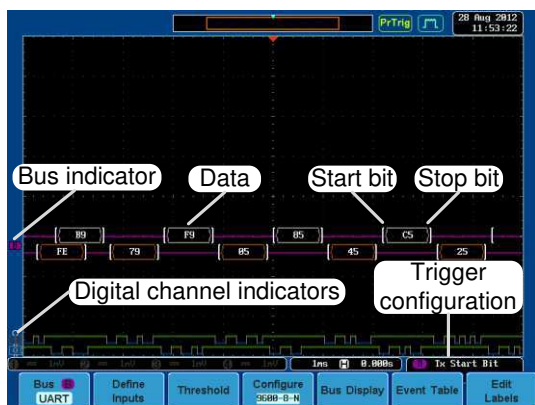
Start Bit	[	The Start bit is shown as a open bracket (Serial bus data only).
Stop Bit	]	The Stop bit is shown as an closed bracket (Serial bus data only).
Data	F9	Data packets can be shown in Hex or Binary. The color of the packet is the same as the channel color.
Error Indicator	⓪	If there is an error in decoding the serial data, an error indicator will be shown.
Bus Indicator		The Bus indicator shows the bus position. The active bus is shown with a solid color. The Variable knob can be used to horizontally position the Bus indicator when it is active.

B⟩ Active bus   B⟩ Activated bus
(solid indicator)   (transparent indicator)

Trigger
Configuration

Shows the bus trigger (B) and the *Trigger On* settings.

Parallel Bus

Input Configuration

Background   The digital channels can be configured as a parallel
                bus. The number of bits that define the bus as well
                as which bit is used as the bus clock can also be
                configured.

⚠ Note   The trigger should also be set to parallel bus.
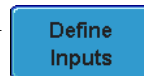   Please see page 74 for details.

Panel Operation   1. Press the *Bus* key.

                                                        BUS

                                                         B

                  2. Press the *Bus* soft-key and select
                      Parallel from the side menu.

                                                    Bus B
                                                    Parallel

                  3. Press *Define Inputs* from the bottom
                      menu.

                                                    Define
                                                    Inputs

                  4. Press *Number of Bits* from the side
                      menu and select the number of bits
                      for the data bus.

                                                    Number of
                                                      Bits
                                                       4

                      By default the bus is assigned bits
                      D0, D1, D2 and so on up to the last
                      bit.

                  5. You may also assign a bit as a
                      clock. This bit will be one of the
                      bits in the bus. To add a clock bit,
                      press *Clock Edge* and select type of
                      clock edge. Selecting *Off* will
                      disable the clock bit.

                                                    Clock Edge
                                                    Off

6. If you wish to define which channels are
   assigned to the bus, press *Select Signal* from the
   side menu and select the bit that wish to assign.

Channel 1 is
currently
assigned to bit 1.

Clock	1	1.40 V
Bit 3	3	1.40 V
Bit 2	2	1.40 V
Bit 1	1	1.40 V
Bit 0	0	1.40 V

Select Signal
Bit 1

7. Next, press *Select Ch* and select
   which channel is assigned to the
   bit selected above.

Select Ch
1

8. Repeat steps 6 and 7 for any remaining bits and
   for the clock, if enabled.

Threshold Configuration

Background   The threshold levels for the parallel bus can be set
              to either a user-defined threshold level or to pre-
              set threshold.

Operation   1. Press *Thresholds* from the bottom
                 menu.
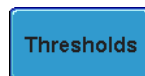
Thresholds

2. Press *Select* from the side menu
   and select a digital channel.

Select
3
Bit 3

3. Press *Choose Preset* to select a pre-
   set logic threshold for the selected
   channel.
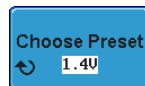
Choose Preset
1.4V

Logic Type	Threshold
TTL	1.4V
5.0V CMOS	2.5V

3.3V CMOS	1.65V
2.5V CMOS	1.25V
ECL	-1.3V
PECL	3.7V
0V	0V

4. Press *Threshold* to set a user defined threshold for the selected input.

Threshold
↻ 1.40V

Range	±10V

⚠ Note   Setting the threshold levels from the Bus menu will also change the threshold levels set in the Logic Analyzer menu (page 38).

Bus Encoding
___

Background   The bus that is displayed on the screen or in the event tables can be set to either hex or binary formats.

Operation   Press *Bus Display* from the Bus menu and choose either Hex or Binary from the side menu.

Bus Display

www.valuetronics.com

Parallel Bus Event Table

Event Table
: The parallel bus event table lists when each data event on the bus occurred. The data is displayed as either hex or binary, depending on the bus display settings.

  Event tables can be saved to disk in a CSV format. The files will be named "Event_TableXXXX.CSV", where XXXX is a number from 0000 to 9999. See page 64 for details.

Operation
: 1. Press Event Table from the bottom menu.

  Event Table

  2. Press Event Table from the side menu to turn the event table on or off.

  Event Table
  On   Off

Event	On, Off

  3. To save the event table, press *Save Event Table*.

  Save Event Table

  Use the variable knob to scroll through the event table.

www.valuetronics.com

Example

Adding a Label to the Parallel Bus

Background   A label can be added to the parallel bus.

Panel Operation 1. To add a label to the bus, press
                     Edit Labels from the Parallel Bus
                     menu.

                                                        Edit
                                                        Labels

                 2. To choose a preset label, Press *User
                     Preset* from the side menu and
                     choose a label.

                                                        User Preset
                                                        ACK

                     Labels   ACK, AD0, ADDR, ANALOG,
                                   BIT, CAS, CLK, CLOCK, CLR,
                                   COUNT, DATA, DTACK,
                                   ENABLE, HALT, INT, IN, IRQ,
                                   LATCH, LOAD, NMI

Edit Label   3. Press *Edit Character* to edit the
                     current label.

                                                        Edit
                                                        Character

4. The Edit Label window appears.

5. Use the Variable knob to highlight a character.

Press *Enter Character* to select a number or letter.

Press *Back Space* to delete a character.

Press *Editing Completed* to create the new label and return to the previous menu.
Note: this key must be pressed to save the label, even for the preset labels.

www.valuetronics.com

Press *Cancel* to cancel the editing and return to the Edit Label menu.

Cancel

6. The label will appear next to the bus indicator.

Below, the label "BUS_1" was created for the parallel bus.

The parallel bus is labeled as BUS_1

Remove Label　　Press *Label Display* to toggle the label on or off.

Label Display
On　Off

www.valuetronics.com

Serial Bus

The Serial Bus for Logic Analyzer software includes support for 3 common serial interfaces, SPI, UART and I²C. Each interface is fully configurable to accommodate variations in the basic protocols.

Each input can be displayed as binary or hexadecimal. An event table can also be created to aid in debugging.

Serial Bus Overview

UART	Universal Asynchronous Receiver Transmitter. The UART bus is able to accommodate a wide range of various common UART serial communications. The UART serial bus software is suitable for a number of RS-232 protocol variants.	
	Inputs	Tx, Rx
	Threshold	Tx, Rx
	Configuration	Baud rate, Parity, Packets, End of packets, Input polarity
	Trigger On	Tx Start Bit, Rx Start Bit, Tx End of Packet, Rx End of Packet, Tx Data, Rx Data, Tx Parity Error, Rx Parity Error
I²C	Inter Integrated Circuit is a two line serial data interface with a serial data line (SDA) and serial clock line (SCLK). The R/W bit can be configured.	
	Inputs	SCLK, SDA
	Threshold	SCLK, SDA
	Configuration	Addressing mode, Read/Write in address
	Trigger On	Start, Repeat Start, Stop, Missing Ack, Address, Data, Address/Data

SPI   The SPI (Serial Interface Peripheral) bus is fully
                    configurable to accommodate the wide variety of
                    SPI interfaces. This bus is only available on 4
                    channel models.

        Inputs   SCLK, SS, MOSI, MISO

        Threshold   SCLK, SS, MOSI, MISO

        Configuration   SCLK edge, SS logic level, Word
                        size, Bit order

        Trigger On   SS Active, MOSI, MISO,
                        MOSI&MISO

UART Serial Bus Configuration

The UART bus menu is designed to decode RS-232 and other
common RS-232 variants such as RS-422, RS-485. The software
configuration is also flexible enough to decode the many
proprietary protocols based on RS-232.

Background   Basic RS-232 protocol uses single-ended data
                    transmissions. The signal voltage levels can be
                    high (±15V)* and employ active low signaling.

                    High speed variants of RS-232, such as RS-422 and
                    RS-485 use differential signaling and commonly
                    employ low voltage differential signals with active
                    high signaling.

                    Universal Asynchronous Receiver / Transmitter
                    (UART) or RS-232 driver/receiver ICs commonly
                    used for embedded applications typically use
                    active high signaling with standard IC signal
                    levels.

                    *Note: the GDS-2000A does not support ±15V
                    signaling for the Logic Analyzer inputs)

www.valuetronics.com

Operation   1. Connect each of the bus signals (*Tx*, *Rx*) to one
                   of the logic analyzer inputs. Connect the
                   ground potential of the bus to the logic
                   analyzer's ground probe line.
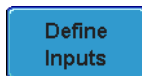

GND

Rx

Tx

               2. Press the *Bus* key.   BUS

                                                            B
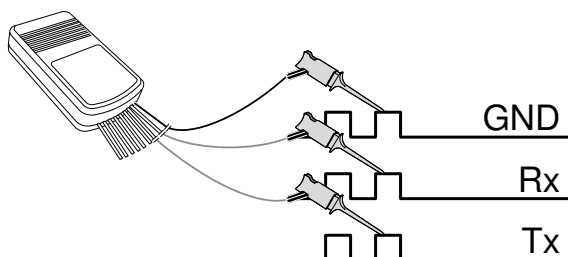
               3. Press *Bus* from the bottom menu   Bus B
                   and choose the *UART* serial bus on   UART
                   the side menu.

Define Inputs 4. Press *Define Inputs* from the bottom   Define
                   menu.   Inputs
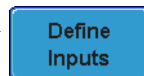
               5. From the side menu choose the *Tx*
                   Input and the *Rx*
                   Input source and the signal
                   polarity.

                   Tx   OFF, D15~D0

                   Rx   OFF, D15~D0

                   Polarity Normal (High = 0), Inverted (High
                             = 1)

Configuration The Configure key sets the baud rate, number of data
               bits and parity.

1. Press *Configure* from the bottom menu.

    Configure
    115200-8-N
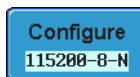
2. From the side menu select the *Baud rate*, *Data bits*, *Parity*, *Packets* and *End of Packet bits*.

Baud Rate	50, 75, 110, 134, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 15200, 19200, 28800, 31250, 38400, 56000, 57600, 76800, 115200, 128000, 230400, 460800, 921600, 1382400, 1843200, 2764800
Data Bits	8 (fixed)
Parity	Odd, Even, None
Packets	On, Off
End of Packet (Hex)	00(NUL), OA(LF), OD(CR), 20(SP), FF

I^{2}C Serial Bus Interface

The I^{2}C bus is a 2 wire interface with a serial data line (SDA) and serial clock line (SCLK). The I^{2}C protocol supports 7 or 10 bit addressing and multiple masters. The decode software will trigger on any of the following conditions: a start/stop condition, a restart, a missing acknowledge message, Address, Data or Address&Data frames. The I^{2}C trigger can be configured for 7 or 10 bit addressing with the option to ignore the R/W bit as well as triggering on a data value or a specific address and direction (read or write or both).

Panel operation 1. Connect each of the bus signals (*SCLK*, *SDA*) to one of the logic analyzer inputs. Connect the ground potential of the bus to the logic analyzer's ground probe line.

2. Press the *Bus* key.

BUS

B
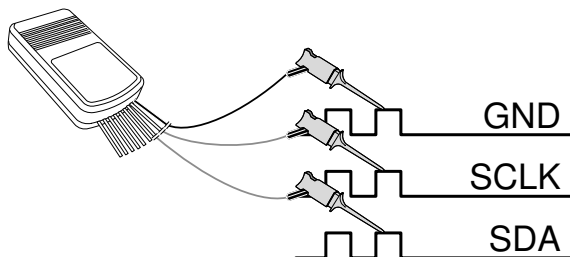
3. Press *Bus* from the bottom menu and choose *I²C* from the side menu.
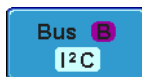
Bus **B**
I²C

Define Inputs

4. Press *Define Inputs* from the bottom menu.

Define Inputs

5. From the side menu choose the *SCLK* input and the *SDA* Input.

SCLK	D15~D0
SDA	D15~D0

Include R/W in address

To configure whether you want the R/W bit to be included in the address, press *Include R/W in address* and set to Yes or No in the side menu.

Include R/W in address
Yes

R/W Bit	Yes, No

SPI Serial Bus Interface

The serial peripheral interface (SPI) is a full duplex 4 wire synchronous serial interface. The 4 signals lines: Serial clock line (SCLK), slave select (SS), Master output/slave input (MOSI, or

www.valuetronics.com

SIMO) and the Master input/slave output (MISO, or SOMI). The word size is configurable from 4 to 32 bits. The SPI triggers on the data pattern at the start of each framing period.

Panel operation   1. Connect each of the bus signals (*SCLK*, *SS*, *MOSI*, *MISO*) to one of the logic analyzer inputs. Connect the ground potential of the bus to the logic analyzer's ground probe line.

GND
SCLK
SS
MOSI
MISO

2. Press the *Bus* key.

BUS

B
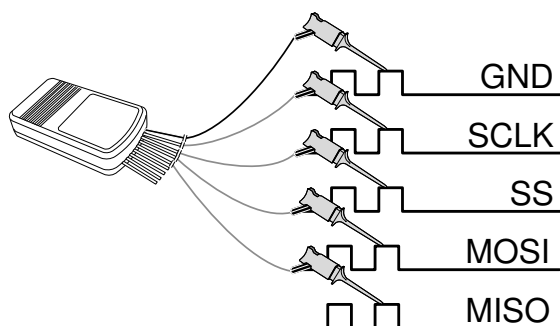
3. Press *Bus* from the bottom menu and choose the *SPI* serial bus.

Bus B
SPI
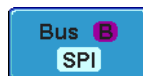
Define Inputs   4. Press *Define Inputs* from the lower menu.

Define
Inputs
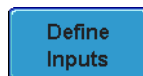
5. From the side menu choose the *SCLK*, *SS*, *MOSI* and *MISO* inputs.

SCLK	D15~D0
SS	D15~D0
MOSI	OFF, D15~D0
MISO	OFF, D15~D0

Configuration   The *Configure* menu sets the data line logic level,
                 SCLK edge polarity, word size and bit order.

                 1. Press *Configure* from the bottom
                    menu.

[Configure]

                 2. From the side menu select SCLK edge, SS logic
                    level, word Size and Bit order.

                    SCLK   rising edge ⌐ , falling edge ⌐

                    SS   Active High, Active Low

                    Word Size   4 ~ 32 bits

                    Bit Order   MS First, LS First

Bus Encoding

Background   The bus that is displayed on the screen or in the
                 event tables can be set to either hex or binary
                 formats.

Operation   Press *Bus Display* from the Bus
                 menu and choose either Hex or
                 Binary from the side menu.

[Bus Display]

Threshold Configuration

Background   The threshold levels for the Serial buses can be set
                 to either a user-defined threshold level or to pre-
                 set threshold.

Set the Threshold 1. Press *Threshold* from the bottom
                     menu.

[Threshold]

www.valuetronics.com

2. Press *Select* from the side menu and choose a one of the serial bus lines.
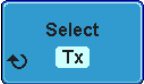
UART	Tx, Rx
I²C	SCLK, SDA
SPI	SCLK, SS, MOSI, MOSI

3. Press *Choose Preset* to select a pre-set logic threshold.

Logic Type	Threshold
TTL	1.4V
5.0V CMOS	2.5V
3.3V CMOS	1.65V
2.5V CMOS	1.25V
ECL	-1.3V
PECL	3.7V
0V	0V

4. Press *Threshold* to set a user defined threshold for the currently selected group.

Range	± 10V

⚠ Note   Setting the threshold levels from the Bus menu will also change the threshold levels set in the Logic Analyzer menu (page 38).

www.valuetronics.com
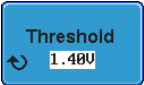
Serial Bus Event Tables

Background	The serial bus event tables list when each data event on the bus occurred. The data is displayed as either hex or binary, depending on the bus display settings.

Event tables can be saved to disk in a CSV format. The files will be named "Event_TableXXXX.CSV", where XXXX is a number from 0000 to 9999. See page 64 for details. |

Operation	1. Press *Event Table* from the bottom menu.

Event Table

2. Press *Event Table* from the side menu to turn the event table on or off.

Event Table
On Off

    Event   On, Off

Use the Variable knob to scroll through the event table.

Data Detail (I^2C only)	3. To view the data at a particular address in more detail, turn *Data Detail* On. This is only available for the I^2C bus.

Data Detail
On Off

    Detail   On, Off

Use the Variable knob to scroll through the Data Detail event table.

www.valuetronics.com

Save Event Table   4.   To save the event table, press *Save Event Table*. The Event table will be saved to the current file path in a CSV format. See page 64 for details.

Save
Event Table

Use the variable knob to scroll through the event table.

Example:
UART Event table
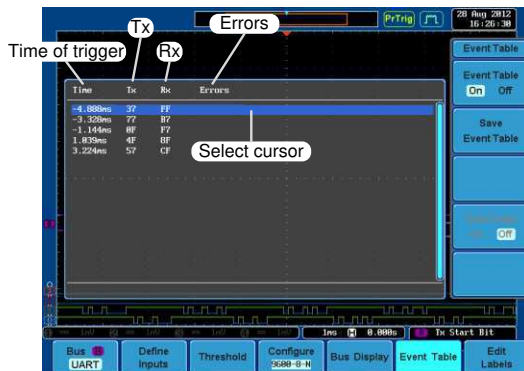
Example:
I²C Event table

www.valuetronics.com
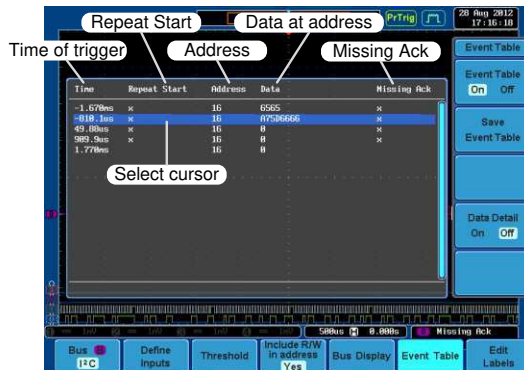
Example:
I²C Data Detail
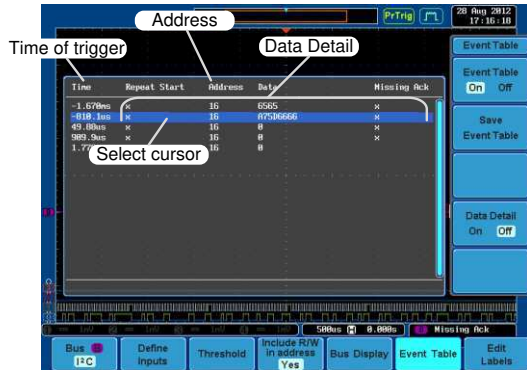
Note   Data Detail is only available with the 1²C bus.

Example:
SPI Event table

www.valuetronics.com

Event Tables Format

Each bus type (Parallel, UART, I²C, SPI) can have an event table saved containing each bus event as a .CSV file. For serial buses, an event is defined as the data on the bus when a Stop or End of Packet (UART) is encountered. For parallel buses, an event depends on the number of bits on the bus. The data associated with each event and the time of each event is recorded.

File Type	Each event table is saved as Event_TableXXXX.CSV into the designated file path. Each event table is numbered sequentially from 0000 to 9999. For example the first event table will be saved as Event_Table0000.CSV, the second as Event_Table0001.CSV, and so on.
Event Table Data	Each event table saves a timestamp of each event relative to the trigger as well as the data in each frame/packet at the time of an event. The frame/packet data is saved in HEX format.

The table below lists in order the data saved for each event table.

UART	Time, Tx frame data, Rx frame data, Errors.
I²C	Time, Repeat Start, Address, Data, Missing Ack.
SPI	Time, MISO frame data, MOSI frame data.

Example

Below shows the data associated with an SPI event table in a spreadsheet.

Time	MOSI	MISO
-11.60us	0D87	0D87
-10.16us	06C0	06C0
-8.720us	8343	343
-7.282us	243	243
-5.840us	0C88	0C88

Adding a Label to the Serial Bus

Background

A Label can be added to the serial buses. This label will appear next to the bus indicator on the left hand-side of the display.

Panel Operation

1. To add a label to the bus, press *Edit Labels* from the Parallel Bus menu.

    Edit
    Labels

2. To choose a preset label, Press *User Preset* from the side menu and choose a label.

    User Preset
    ACK

    Labels   ACK, AD0, ADDR, ANALOG,
                 BIT, CAS, CLK, CLOCK, CLR,
                 COUNT, DATA, DTACK,
                 ENABLE, HALT, INT, IN, IRQ,
                 LATCH, LOAD, NMI

Edit Label

3. Press *Edit Character* to edit the current label.

    Edit
    Character

www.valuetronics.com

4. The Edit Label window appears.

5. Use the Variable knob to highlight a character.

Press *Enter Character* to select a number or letter.

Press *Back Space* to delete a character.

Press *Editing Completed* to create the new label and return to the previous menu.
Note: this key must be pressed to save the label, even for the preset labels.

Press *Cancel* to cancel the editing and return to the Edit Label menu.

Cancel

6. The label will appear next to the bus indicator.

Below, the label "BUS_1" was created for the bus.

B BUS_1   The bus is labeled
                 as BUS_1

| Remove Label | Press *Label Display* to toggle the label on or off. | Label Display On **Off** |

Using Cursors with the Serial Bus

| Background | The cursors can be used to read bus values at any position. |

| ⚠ Note | Ensure that one of the serial buses has been selected and is activated. |

| Panel Operation | 1. Press the *Cursor* key. Horizontal cursors appear on the display. | Cursor |
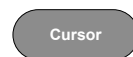
2. Press the *H Cursor* soft-key and select which cursor(s) you wish to position.
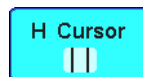
H Cursor

Range	Description
| ┊	Left cursor (❶) movable, right cursor position fixed
┊ |	Right cursor (❷) movable, left cursor position fixed

www.valuetronics.com

| | Left and right cursor (❶+❷)
| | movable together

3. The cursor position information appears on the top left hand side of the screen.

```
❶  1.75us    MOSI:5 MISO:5
❷  11.1us    MOSI:5 MISO:5
△9.34us
```

Example: SPI cursors.

Cursor ❶   Hor. position, Bus value(s)

Cursor ❷   Hor. position, Bus value(s)

4. Use the *Variable knob* to move the movable cursor(s) left or right.

VARIABLE
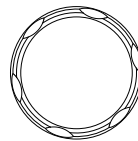
Trigger Settings

Serial Bus Trigger Settings

UART BUS Trigger Settings

The UART bus trigger conditions can be set at any time after the bus settings have been set to *UART*.

Panel Operation	1. Set the Bus to UART in the bus menu.	Page 54
	2. Press the *Trigger Menu* key.	Menu
	3. Press *Type* from the bottom menu.	Type / Edge
	4. Press *Others* from the side menu and select *Bus*.	Pulse Runt / Rise & Fall / Bus / Logic Others / Bus
	5. Press *Trigger On* and select the triggering condition for the UART bus.	Trigger On / Tx Start Bit
	Trigger On Tx Start Bit, Rx Start Bit, Tx End of Packet, Rx End of Packet, Tx Data, Rx Data, Tx Parity Error, Rx Parity Error	
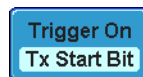
Trigger On – Tx Data, Rx Data	If Tx Data or Rx Data was configured for the Trigger On setting, then the number of bytes and data can also be configured.	
	1. Press *Data* from the bottom menu.	Data

www.valuetronics.com

2. Press *Number of Bytes* from the side menu and choose the number of bytes for the data.

> Number of Bytes
> ↻   1
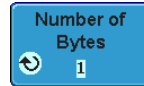
    UART   1~10 Bytes

3. Press *Data* from the side menu to edit the triggering data.
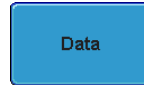
> Data

To edit the data, use the *Variable* knob to highlight a binary or hex digit and press *Select*. Use the *Variable* knob to choose a value for the digit and press *Select* to confirm.

> VARIABLE
> ← ⭕ →
> Binary
> XXXX XXXX
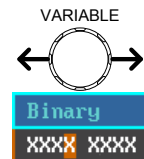
    Binary   0,1,X (don't care)

    Hex   0~F, X (don't care)

    ASCII   ASCII characters for the equivalent Hex characters 00 to FF

The Trigger on settings will be reflected on the Trigger Configuration icon.

> **B**   Tx Start Bit

I²C Bus Trigger Settings

The I²C bus trigger conditions can be set at any time after the bus settings has been set to 1²C.

Panel Operation   1. Set the Bus to I²C in the bus menu.

2. Press the *Trigger Menu* key.
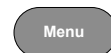
> Menu

3. Press *Type* from the bottom menu.

> Type
> Edge

4. Press *Others* from the side
    menu and select *Bus*.
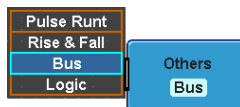
5. Press *Trigger On* and select the
    triggering condition for the
    selected bus.

    Trigger On Start, Repeat Start, Stop, Missing
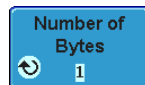   Ack, Address, Data, Address/Data

Trigger On – Data   If Data or Address/Data was configured for
                        the Trigger On setting, then the number of
                        bytes, data and addressing mode (I^2C) can be
                        configured.

6. Press *Data* from the bottom menu.

7. Press *Number of Bytes* from the side
    menu and choose the number of
    bytes for the data.

        I^2C 1~5 Bytes

8. Press *Addressing Mode* to toggle
    between 7 and 10 bit addressing
    modes.

9. Press *Data* from the side menu to
    edit the triggering data.
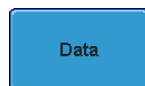
    To edit the data, use the *Variable*
    knob to highlight a binary or hex
    digit and press *Select*. Use the
    Variable knob to choose a value for
    the digit and press *Select* to
    confirm.

                                                                    71
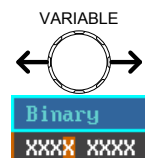
Binary	0,1,X (don't care)
Hex	0~F, X (don't care)

Trigger On - Address

If Address or Address/Data was configured for the Trigger On setting, then the triggering address must be configured.

10. Press *Address* on the bottom menu.

Address

11. Press *Addressing Mode* to toggle between 7 and 10 bit addressing modes.

Addressing Mode
7 bit 10 bit

12. To choose a preset address as the default address, press *Choose Preset* and select a preset address.

Choose Preset
General Call

Address	Description
0000 000 0	General Call
0000 000 1	START Byte
0000 1XX X	Hs-mode
1010 XXX X	EEPROM
0000 001 X	CBUS

Press *Apply Preset* to set the default address to the preset.

Apply Preset

Note

• Presets are not available for *Trigger On Address/Data*.

13. Press *Address* from the side menu to manually edit the triggering address.

Address

To edit the address, use the

Variable knob to highlight a binary or hex digit and press *Select*. Use the *Variable* knob to choose a value for the digit and press *Select* to confirm.

VARIABLE

Binary

000 0000
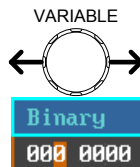
| Binary | 0,1, X (don't care) |
| Hex | 0~F, X (don't care) |

Direction   14. Press *Direction* on the bottom menu and choose the direction from the side menu.

Direction
Write

Direction   Write, Read, Read or Write

SPI Bus Trigger Settings

The SPI bus trigger conditions can be set at any time after the bus setting has been set to SPI.

Panel Operation   1. Set the Bus to SPI in the bus menu.   Page 57

2. Press the *Trigger Menu* key.

Menu

3. Press *Type* from the bottom menu.

Type
Edge

4. Press *Others* from the side menu and select *Bus*.

Pulse Runt
Rise & Fall
Bus
Logic

Others
Bus
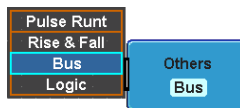
5. Press *Trigger On* and select the triggering condition for the SPI bus.

Trigger On
SS Active

SPI   SS Active, MOSI, MISO, MOSI&MISO

www.valuetronics.com

Trigger On – Data   If MOSI, MISO or MISO/MOSI was configured for the Trigger On setting, then the number of words and the data can be configured.

6. Press *Data* from the bottom menu.

Data

7. Press *Number of Words* from the side menu and choose the number of words for the data.
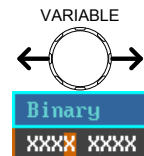
Number of Words
1
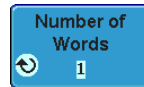
SPI   1~32 Words

8. Press *MOSI or MISO* from the side menu to edit the triggering data.

MOSI

To edit the data, use the *Variable* knob to highlight a binary or hex digit and press *Select*. Use the *Variable* knob to choose a value for the digit and press *Select* to confirm.

VARIABLE

Binary
XXXX XXXX

Binary   0,1,X (don't care)

Hex   0~F, X (don't care)

Parallel Bus Trigger

Background   The parallel bus can be set up to trigger on a specified data pattern.

Panel Operation   1. Press the *Trigger Menu* key.

Menu

2. Press *Type* from the bottom menu.

Type
Edge

www.valuetronics.com

3. Select *Others → Bus* from the side menu. The Bus indicator appears at the bottom of the display.
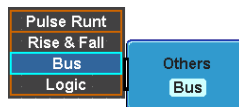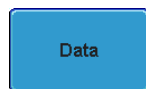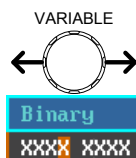
From left: Bus trigger, Data source

4. Press *Data* from the bottom menu.

5. Press *Data* from the side menu to edit the triggering data.

To edit the data, use the *Variable* knob to highlight a binary or hex digit and press *Select*. Use the *Variable* knob to choose a value for the digit and press *Select* to confirm.

Binary   0,1,X (don't care)

Hex   0~F, X (don't care)

6. The bus will now trigger when the specified data appears on the bus.

Common Bus Trigger Settings

Bus Trigger Mode

Trigger Mode   1. Like the other trigger configurations, the Bus Trigger mode can be set to Auto (Untriggered Roll) and Normal.

This applies to the serial and parallel buses.

www.valuetronics.com

2. Press *Mode* from the bottom menu
    to change the triggering mode.

> **Mode**
> **Auto**

3. Use the side panel to select *Auto* or
    Normal triggering modes.

>   Range   Auto, Normal

Logic Trigger

Background   The digital channels can be set up to trigger on
                  specified logic levels and for a specified clock edge.

                  For example the digital channels can be set to
                  trigger on the rising edge of the clock signal when
                  bit 1 (D1) is high and all other channels are
                  ignored.

Panel Operation   1. Press the *Trigger Menu* key.

> **Menu**
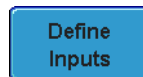
2. Press *Type* from the bottom menu.

> **Type**
> **Edge**

3. Select *Others → Logic* from
    the side menu. The Logic
    indicator appears at the
    bottom of the display.

> **Pulse Runt**
> **Rise & Fall**
> **Bus**
> **Logic**
>
> **Others**
> **Logic**

> XXXX XXXX XXXX XXXX

   From left: Bits D15~D0

4. Press *Define* inputs from the
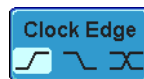   bottom menu.

> **Define**
> **Inputs**

5. Press *Select* on the side menu and select a channel.

6. Next, select a logic level for the selected channel, or set the selected channel as the clock signal.

| Logic | Clock, High (H), Low (L), Don't Care (X) |

7. If *Clock* was selected, press *Clock Edge* from the bottom menu and select a clock transition.

8. Repeat steps 5 to 7 for the remaining channels.

9. The chosen logic levels will be reflected in the trigger indicator at the bottom of the screen. The color of each channel, if active will also be displayed. If a channel is not turned on, it will be grayed-out.

Example

D15 ~ D0

D15 ~ D4 = turned off

D0 clock edge
D1 = High
D2 = don't care
D3 = don't care
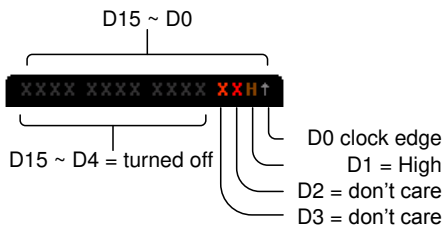
10. The bus will now trigger when the specified logic appears on the bus.

www.valuetronics.com

|	
Trigger Threshold Levels	The trigger threshold levels for the can assigned from a selected number of preset logic levels or a user-defined threshold level can be set.

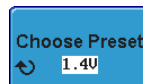|	
⚠ Note	The threshold levels set with the logic bus menu will replace the logic levels that are set in the Logic Analyzer menu (page 38).

1. Press *Thresholds* from the bottom menu.

> **Thresholds**

2. Press *Select* from the side menu and choose a group of channels.
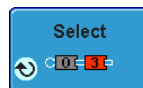
> **Select**

      Group   D0~D3, D4~D7, D8~D11, D12~D15

3. Press *Choose Preset* to select a pre-set logic threshold.

> **Choose Preset**   1.4V

Logic Type	Threshold
TTL	1.4V
5.0V CMOS	2.5V
3.3V CMOS	1.65V
2.5V CMOS	1.25V
ECL	-1.3V
PECL	3.7V
0V	0V

4. Press *Threshold* to set a user defined threshold.

> **Threshold**   1.40V

      Range   ± 10V

Logic Trigger Mode

Background | Like the other trigger configurations, the Logic Trigger can be set to Auto (Untriggered Roll) and Normal.

1. Press *Mode* from the bottom menu to change the triggering mode.

   > Mode
   > Auto

2. Use the side panel to select *Auto* or *Normal* triggering modes.

   > Range   Auto, Normal

Logic Trigger Holdoff

Background | The holdoff function defines the waiting period before the GDS-2000A starts triggering again after a trigger point. Please see the user manual for further details.

1. To set the Holdoff time, press the *Holdoff* menu button on the bottom menu.

   > Holdoff
   > 10.0ns

2. Use the side menu to set the Holdoff time.

   > ↻ 10.0ns

   > Range   10ns~10s

   Pressing *Set to Minimum* sets the Holdoff time to the minimum, 10ns.

   > Set to
   > Minimum

www.valuetronics.com

INDEX

www.valuetronics.com