

Digital Storage Oscilloscope

GDS-3000 Series

SERIAL DECODE MANUAL

GW INSTEK PART NO.



ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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S SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to insure your safety and to keep the instrument in the best possible condition.

Safety Symbols

These safety symbols may appear in this manual or on the GDS-3000.



WARNING

Warning: Identifies conditions or practices that could result in injury or loss of life.



CAUTION

Caution: Identifies conditions or practices that could result in damage to the GDS-3000 or to other properties.



DANGER High Voltage



Attention Refer to the Manual



Protective Conductor Terminal



Earth (ground) Terminal



Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline



CAUTION

- Make sure the BNC input voltage does not exceed 300V peak.
- Never connect a hazardous live voltage to the ground side of the BNC connectors. It might lead to fire and electric shock.
- Do not place any heavy object on the GDS-3000.
- Avoid severe impact or rough handling that leads to damaging the GDS-3000.
- Do not discharge static electricity to the GDS-3000.
- Use only mating connectors, not bare wires, for the terminals.
- Do not block the cooling fan opening.
- Do not perform measurement at a power source or building installation site (Note below).
- Do not disassemble the GDS-3000 unless you are qualified.
- Ensure a proper ground is used at all times with the instrument.

(Measurement categories) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. the GDS-3000 falls under category II.

- Measurement category IV is for measurement performed at the source of low-voltage installation.
- Measurement category III is for measurement performed in the building installation.
- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.
- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply



WARNING

- AC Input voltage: 100 ~ 240V AC, 48 ~ 63Hz, auto selection
- Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.

Cleaning the GDS-3000

- Disconnect the power cord before cleaning.
- Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid.
- Do not use chemical containing harsh material such as benzene, toluene, xylene, and acetone.

Operation Environment

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below)
- Relative Humidity: < 80%
- Altitude: < 2000m
- Temperature: 0°C to 50°C

(Pollution Degree) EN 61010-1:2001 specifies the pollution degrees and their requirements as follows. The GDS-3000 falls under degree 2.

Pollution refers to “addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity”.

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Storage environment

- Location: Indoor
- Temperature: -20°C to 70°C

Disposal



Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

GETTING STARTED

This chapter describes how to install the serial decode software or trial demonstration.



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Activating Optional Software

Background The GDS-3000 has Power Analysis software and Serial bus decoding software (17) as optional extras. An activation key is required to activate the software. An activation key is required for each optional software package.

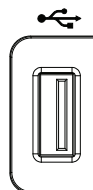
If the serial decode software has not been purchased, a time trial demonstration is available for a 1 month period. Before activating the time trial demonstration, ensure the date and time has been set. Changing the system date will not have an effect on the time trial period. The time trial demonstration software can only be used once.

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

Activation key filenames	Serial bus decode activation keys	BusEnableTrial.LIS BusEnable.LIS
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Steps 1. Ensure the date and time has been set. See the user manual for details.

2. Insert a USB stick into front panel USB port with the activation keys located in the root directory.



3. Press the *Utility* key.



4. Press *File Utilities* from the bottom menu.



5. The file system appears.



6. Use the Variable knob and Select key to select the activation key from the USB root directory. When prompted to continue, press the *Select* key again.

Files: BusEnableTrial.LIS
 BusEnable.LIS

Confirm
 Activation key

Press *B1* on the front panel to see if the Serial Bus decode activation worked.



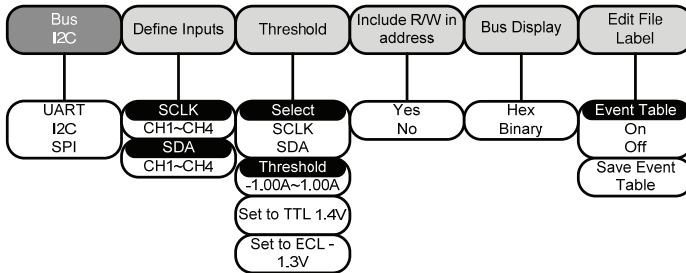
QUICK REFERENCE

This chapter depicts the power analysis menu tree. Use them as a handy reference to get quick access to the functionality.

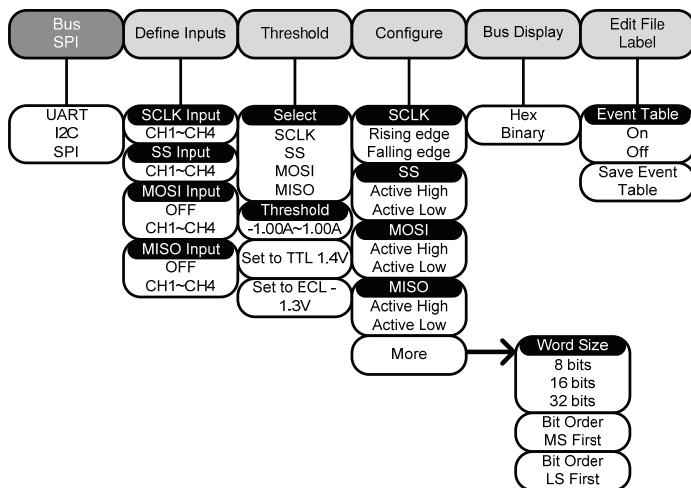
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Menu Tree / Operation Shortcuts

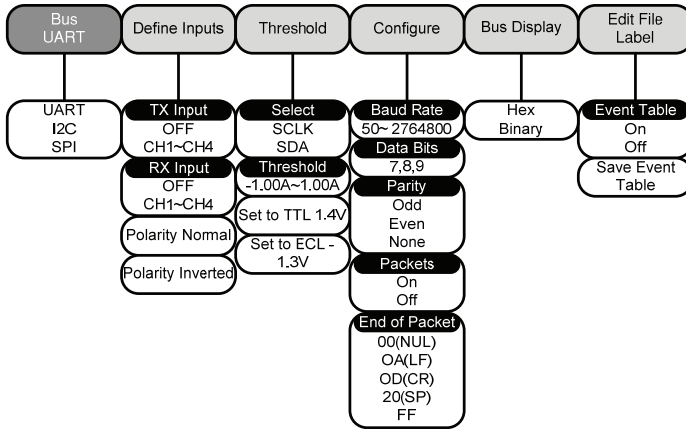
BUS – I2C



BUS – SPI



BUS – UART



M EASUREMENT

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Serial Bus

The serial bus trigger and decode software includes support for 3 common serial interfaces, SPI, UART and I2C. Each interface is fully configurable to accommodate a wide range of protocol variation. Up to two different UART or I2C buses can be used at the same time. Only 1 SPI bus can be used at a time.

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

Note that the Serial bus trigger and decode software is an optional extra. An activation key is required to activate the software. A month trial demonstration is also available. For details please see page 10.

Serial Bus Overview

UART	<p>Universal Asynchronous Receiver Transmitter. The UART bus is able to accommodate a wide range of various common UART serial communications.</p> <p>The UART serial bus software is suitable for a number of RS-232 protocol variants.</p> <p>Inputs Tx, Rx, Polarity</p> <p>Threshold Tx, Rx ($\pm 10V$)</p> <p>Configuration Baud Rate, Data Bits, Parity, Packets</p>
I2C	<p>Inter Integrated circuit is a two line serial data interface with a serial data line (SDA) and serial clock line (SCL). The R/W bit can be configured.</p> <p>Inputs SCLK, SDA</p> <p>Threshold SCLK, SDA ($\pm 10V$)</p> <p>Configuration Read, Write in address</p>

SPI The SPI (Serial Interface Peripheral) bus is fully configurable to accommodate the wide variety of SPI interfaces.

Inputs SCLK, SS, MOSI, MISO

Threshold SCLK, SS, MOSI, MISO ($\pm 10V$)

Configuration SCLK edge, SS logic level, MOSI logic level, MISO logic level, word size, bit order

UART Serial Bus Interface

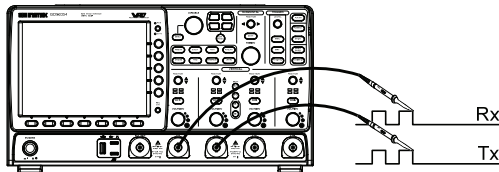
The UART serial bus software is designed to decode RS232 and other common RS-232 variants such as RS-422, RS-485. The software configuration is also flexible enough to decode the many proprietary protocols based on RS-232.

Background Basic RS-232 protocol uses single-ended data transmissions. The signal voltage levels can be high ($\pm 15V$) 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.

Panel operation 7. Insert each of the bus signals (*Tx*, *Rx*) to one of the oscilloscope channels.




8. Press the corresponding bus key, *B1* or *B2*.



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



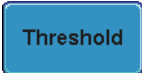
Define Inputs 10. Press *Define Inputs* from the bottom menu. 

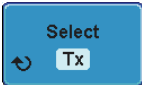
11. From the side menu choose the *Tx Input* and the *Rx Input* source and the signal polarity.

 Tx OFF, CH1~4

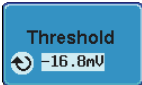
 Rx OFF, CH1~4

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

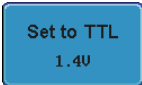
Set the Threshold 12. Press *Threshold* from the bottom menu. 

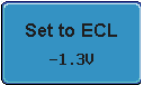
13. Press *Select* from the side menu. Choose Tx or Rx line thresholds. 

 Range Tx, Rx

14. Press *Threshold* from the side menu and configure the threshold. 

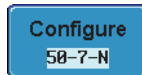
 Threshold -10V~10V

To set to TTL levels (1.4V), press TTL. 

To set to ECL levels (-1.3V), press ECL. 

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

15. Press *Configure* from the bottom menu.



16. 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, 76000, 115200, 128000, 230400, 460800, 921600, 1382400, 1843200, 2764800

Data Bits 7,8,9

Parity Odd, Even, None

Packets On, Off

End of Packet 00(NUL), OA(LF), OD(CR), 20(SP), FF (Hex)

Bus Display

Press *Bus Display* from the bottom menu and Hex or Binary from the side menu.



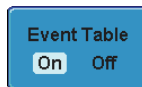
Range Hex, Binary

Event Table

17. Press *Event Table* from the bottom menu.



18. Press *Event Table* from the side menu to toggle the event table On or Off.



Event On, Off

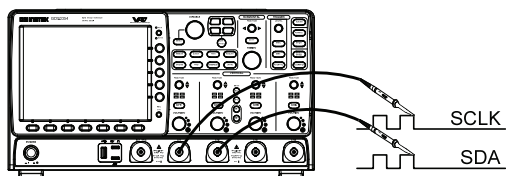
19. To save the event table, press *Save Event Table*.



I2C Serial Bus Interface

The I2C (I²C) is a single-ended transmission protocol using a serial data line (SDA) and serial clock line (SCL). The decode software will trigger on any of the following conditions: a start/stop condition, a restart, a missing acknowledge message, EEPROM reads, and read/write frames. The I2C trigger can be configured for 7 or 10 bit addressing with the option to ignore the R/W bit.

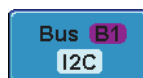
- Panel operation 20. Insert each of the bus signals (*SCLK*, *SDA*) to one of the oscilloscope channels.



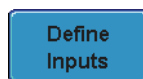
21. Press the corresponding bus key, *B1* or *B2*.



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



- Define Inputs 23. Press *Define Inputs* from the lower menu.

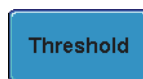


24. From the side menu choose the *SCLK* input and the *SDA* Input.

SCLK CH1~4

SDA CH1~4

- Set the Threshold 25. Press *Threshold* from the bottom menu.

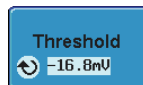


26. From the side menu Press *Select* to choose SCLK or SDA thresholds.



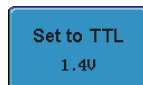
Range SCLK, SDA

27. Press *Threshold* from the side menu and configure the threshold.

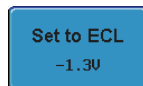


Threshold -10V~10V

To set to TTL levels (1.4V), press *Set to TTL*.



To set to ECL levels(-1.3V), press *Set to ECL*.



Include R/W in address

28. Press *Include R/W in address* from the bottom menu.



29. From the side menu select Yes or No.

R/W in Address Yes, No

Bus Display

30. Press *Bus Display* from the bottom menu.



31. Choose to display Hex or Binary data on screen.

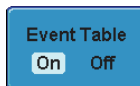
Range Hex, Binary

Event Table

32. Press *Event Table* from the bottom menu.



33. Press *Event Table* from the side menu to toggle the event table On or Off.



Event On, Off

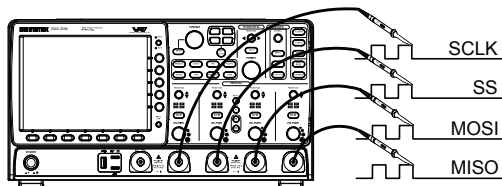
34. To save the event table, press *Save Event Table*.



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 SIMO) and the Master input/slave output (MISO, or SOMI). The word size is configurable from 8~32 bits. The SPI triggers on the data pattern at the start of each framing period.

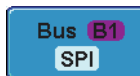
Panel operation 35. Insert each of the bus signals (*SCLK, SS, MOSI, MISO*) to one of the oscilloscope channels.



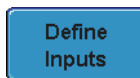
36. Press the corresponding bus key, *B1* or *B2*.



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



Define Inputs 38. Press *Define Inputs* from the lower menu.



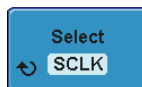
39. From the side menu choose the SCLK, SS, MOSI and MISO inputs.

- SCLK CH1~4
- SS CH1~4
- MOSI OFF, CH1~4
- MISO OFF, CH1~4

Set the Threshold 40. Press *Threshold* from the bottom menu.

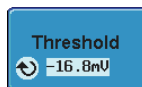


41. Press *Select* from the side menu. Choose SCLK, SS, MOSI or MISO line thresholds.



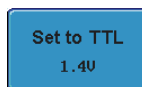
Range SCLK, SS, MOSI, MISO

42. Press *Threshold* from the side menu and configure the threshold.

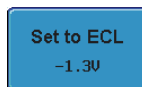


Threshold -10V~10V

To set to TTL levels (1.4V), press *Set to TTL*.



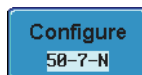
To set to ECL levels (-1.3V), press *Set to ECL*.





Protocol Configuration


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

43. Press *Configure* from the bottom menu.




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

SCLK	rising edge  , falling edge 
SS	Active High, Active Low
MOSI	Active High, Active Low
MISO	Active High, Active Low
Word Size	8 bits, 16 bits, 32 bits
Bit Order	MS First, LS First


Bus Display Press Bus Display from the bottom menu and Hex or Binary from the side menu. 

Range Hex, Binary

Event Table 45. Press *Event Table* from the bottom menu. 

46. Press *Event Table* from the side menu to toggle the event table On or Off. 

Event On, Off

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

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