

# MultiScope with Oscilloscope Module V2.0

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Cat.No.: 22-321

5B2



Printed in Germany



**Owner's Manual**

Please read before using this equipment

**WARNING:** To reduce the risk of fire or shock hazard, do not expose this product to rain or moisture.

	<b>CAUTION</b> RISK OF ELECTRIC SHOCK. DO NOT OPEN.	
<b>CAUTION:</b> TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER OR BACK. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.		



This symbol is intended to alert you to the presence of uninsulated dangerous voltage within the product's enclosure that might be of sufficient magnitude to constitute a risk of electric shock. Do not open the product's case.



This symbol is intended to inform you that important operating and maintenance instructions are included in the literature accompanying this product.

**Pollution Degree 2:** You can use your scope in environments where non-conductive pollution normally occurs. However, you might experience temporary conductivity caused by condensation in these environments.

Firmware.....Vertical/Horizontal Cursors, All Parameters selectable by Scope or with PC Attached, Numerical Measurement, Trigger/Zero Level Cursors, Select Keyboard Click, Cursors, Grid, Display Backlight, Store Recorded Data.

PC Software.....On 3.5" Disk, Running Under Windows95/98/NT, Internet Remote-Control, Function With Internet, Printing Recorded Data, Serial Data Protocol Published

Signal Probe..... Cat. No. 22-321, 2 Included, 1:1/10:1 Selectable, 4 Ft, Max. 400V

Module Dimesions.....2.75 x 2.75 x 1.06 Inches (70 x 70 x 27 mm)

Operating Environment.....Full Accuracy from 32 to 104°F (0 to 40°C) and 80% RH (Non-condensing) at 86°F (30°C)

Storage Environment ..... 32 to 104°F (0 to 40°C)

Certifications.....UL Control No: 90MA, IEC1010

Specifications are typical; individual units might vary. Specifications are subject to change and improvement without notice.

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## □ Oscilloscope Module Specifications

Channel.....2, Independently Floating Isolated

Sampling Rate Channel 1 ..50 ns (20 MSa/s) to 20 ms

Sampling Rate Channel 2 ..50 ns (20 MSa/s) to 20 ms  
Second Sampling Rate on Channel 2 to Magnify  
Recorded Signal on Channel 1

Coupling .....AC/DC Channel 1 and 2

Input Impedance  
Probe set to 1:1 ..... 1 MW/60 pF  
Probe set to 1:10 .....10 MW/30 pF

Sensitivity .....2 mV to 40V, (100 mV to  
5 V/div in [1,2,5] Steps)

Max. Input Voltage  
Without Probe ..... 40Vpk/DC  
With Probe 1:10 .....400Vpk/DC

ADC-Resolution .....8 Bit

Max. vertical Move .....+/-4 Divisions

Scope Modes .....Normal and Single Shot

True Sampling Rates (Normal/Single Shot) ... 0.5 $\mu$ s to  
200 ms/div

Sampling Rate Accuracy .....>+/-0.5%

Horizontal Move .....25 Divisions

Trigger .....Free Run or on Trigger

Trigger Source .....On Channel 1, Negative  
and Positive Transition

Trigger Level .....8-bit Resolution

Trigger Delay .....16 Steps

Memory Depth .....128, 256, 512 or 8 KB  
Samples/Channel, Selectable

Auto Setting .....For Sampling Rate Channels 1  
and 2, Input Voltage Channels 1 and 2

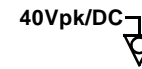
## PANEL MARKINGS

We have placed the following special markings on your scope and oscilloscope module to remind you of the measurement limitations and ensure your safety.

**CAT II** This equipment is rated for installation category II.



This equipment is protected by double insulation.



**WARNING: Never exceed a maximum voltage of 40Vpk/DC between the signal tip and ground when the signal probe's attenuator switch is set to X1 (1:1). Never exceed a maximum voltage of 400Vpk/DC between the signal tip and ground when the signal probe's attenuator switch is set to X10 (10:1).**

**Caution:** Your scope's display might darken if exposed to direct sunlight. To protect the scope's display, do not operate or store it in direct sunlight for an extended period of time.

## Important Information

### PASSWORD

The default password is: **22-321**

### SERIAL INTERFACE

The Serial Interface is optical-isolated to the PC COM port. The length of the communication cable connecting the hardware to the PC is limited to 2m.

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## □ Contents

<b>Features</b> .....	7
System Requirements .....	9
<b>Preparation</b> .....	9
Installing the Software .....	9
Connecting Power .....	10
Using the Stand .....	12
Connecting the Scope to a Computer .....	12
Resetting the Scope .....	12
Connecting the Signal Probe .....	13
Channel Isolations .....	14
<b>Operation</b> .....	15
Using The Oscilloscope Hardware .....	15
Functions on the Main Screen .....	15
Functions on the Menu Screen .....	18
<b>Care</b> .....	24
<b>Scope Specifications</b> .....	25
<b>Oscilloscope Module Specifications</b> .....	26

## SAFETY INSTRUCTIONS

**Warning:** Use extreme caution in the use of this device. Improper use of this device can result in injury or death. Follow all the safeguards suggested in this owner's manual in addition to normal safety precautions in dealing with electrical circuits. Do not use this device if you are unfamiliar with electrical circuits and testing procedures.

**This is not an operator-serviceable product.**

This MultiScope is designed to ensure the safest operation possible. However, safe operation depends on you, the operator. Make sure you follow these simple safety rules:

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## □ Scope Specifications

Display Resolution .....	128 × 64 Dots Monochrome
Display Backlight .....	LED, Green
Serial Interface .....	RS232, Opto-Isolated, 56K Baud, 8 Data
Serial Cable .....	Supplied, 6 feet
Keyboard .....	25 Function Silicone Keys
Power Supply	
Batteries .....	6 × 1.5V AA
Battery Life (Alkaline, Typical) .....	6 to 16 Hours (Depending on Module, Usage and Display Backlight Switched Off)
AC Adapter .....	Supplied
Dimensions	
Scope without case ..	7.87 × 3.54 × 2.16 Inches (200 × 90 × 55 mm)
Weight .....	1.65 lb (750 g)
Operating Environment .....	Full Accuracy from 32° to 104° F (0 to 40°C)
Full Accuracy to 80% RH (Non-condensing) at 86° F (30°C)	
Storage Environment .....	32° to 104° F (0 to 40°C)
Certifications .....	CE, IEC1010, UL
Supplied Items .....	Carrying Case Oscilloscope Module (described below) Rubber Protection Boot, Serial Cable, AC Adapter, Software Diskette, Probe

Sampling Rates on Channel 1 or 2	
50mS/Div	200 samples per second
0.1S/Div	100 samples per second
0.2S/Div	50 samples per second

**Note:** Changing the sampling rate for channel 1 automatically changes the sampling rate for channel 2. Channel 2 cannot be set to a sampling rate slower than channel 1.

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## **□ Care**

Keep the oscilloscope dry; if it gets wet, wipe it dry immediately. Use and store the oscilloscope only in normal temperature environments. Handle the oscilloscope carefully; do not drop it. Keep the oscilloscope away from dust and dirt, and wipe it with a damp cloth occasionally to keep it looking new.

Modifying or tampering with the oscilloscope's internal components can cause a malfunction and might invalidate its warranty. If your oscilloscope is not performing as it should, take it to Wittig Technologies or authorized partners for assistance.

- Read all of these instructions carefully, and save them for your reference.
- Follow all warnings and instructions marked on the scope.
- When making voltage measurements, never touch the scope's probe tip or a hot wire in AC wiring circuits. If you do, you could receive an electric shock.
- Use only test leads and test lead adapters supplied with the scope.
- Remove all test leads that are not in use.
- Always discharge filter capacitors in the circuit under test before you attach the scope. If the scope touches an undischarged capacitor, it could damage it. If you touch an undischarged capacitor, you could receive an electric shock.
- Always turn off power and disconnect the scope before you change power sources.
- Because many AC/DC sets have a potentially hot chassis, be sure the top of your workbench and the floor underneath it are made of nonconductive materials.
- Unplug the scope before cleaning it. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning and then wipe it dry immediately.
- Do not use the scope near water (for example, a bathtub, washbowl, kitchen sink, laundry tub, wet basement, or swimming pool).
- Do not use unapproved attachments.
- The scope should be operated from a 7 to 15V DC power source, such as a battery or a 12V DC power supply.

- Do not allow anything to rest on the power cord. Do not locate the power supply where people might walk on the cord.
- If your scope doesn't operate normally, in particular if any unusual sounds or smells come from it, immediately unplug it and contact Wittig Technologies or authorized Partners for assistance.
- Do not attempt to service the scope yourself. Opening or removing the cover can expose you to dangerous voltage or other hazards.
- Unplug the scope from the DC power source and refer servicing to qualified service personnel under the following conditions:
  - if the power cord is damaged or frayed
  - if the scope has been exposed to rain or water
  - if the scope does not operate normally and you are following the operating instructions
  - if the scope has been dropped or damaged
  - if the scope exhibits a distinct change in performance

This scope is fully calibrated and tested. Under normal use, no further internal adjustment should be necessary. Adjust only those controls covered by the operating instructions. Improper adjustment of other controls might result in damage and might require extensive work by a qualified technician to restore the scope to normal operation. If the scope should require repair, do not try to repair it yourself. Take it to Wittig Technologies or authorized Partners for assistance.

- Remove all test leads that are not in use.
- Never try to measure an AC peak-to-peak or a DC voltage that exceeds 40 volts if the attenuation switch on the probe is set to X1.
- Never try to measure an AC peak-to-peak or a DC voltage that exceeds 400 volts, if the attenuation switch on the probe is set to X10.

Press the up or down arrow keys to select the sampling rate.

<b>Sampling Rates on Channel 1 or 2</b>	
<b>.5<math>\mu</math>S/Div</b>	20 million samples per second
<b>1<math>\mu</math>S/Div</b>	10 million samples per second
<b>2<math>\mu</math>S/Div</b>	5 million samples per second
<b>5<math>\mu</math>S/Div</b>	2 million samples per second
<b>10<math>\mu</math>S/Div</b>	1 million samples per second
<b>20<math>\mu</math>S/Div</b>	500,000 samples per second
<b>50<math>\mu</math>S/Div</b>	200,000 samples per second
<b>.1mS/Div</b>	100,000 samples per second
<b>.2mS/Div</b>	50,000 samples per second
<b>.5mS/Div</b>	20,000 samples per second
<b>1mS/Div</b>	10,000 samples per second
<b>2mS/Div</b>	5,000 samples per second
<b>5mS/Div</b>	2,000 samples per second
<b>10mS/Div</b>	1,000 samples per second
<b>20mS/Div</b>	500 samples per second

Menu Item	Description
<b>AC/DC</b>	Press the up or down arrow keys to switch AC/DC coupling on channel 1 or 2. Press 1 or 2 to select the channel.
<b>MEM 128</b>	Press the up or down arrow keys to select the real time memory depth per channel of the oscilloscope module. <b>Note:</b> <i>The higher you set the memory depth, the slower the refreshing time is in displaying the recorded signals. When disconnected from PC, this function is not available and automatically set to 256.</i>

#### F4 Functions on the Menu Screen

Press the up or down arrow keys to select the input voltage on channel 1 or channel 2, depending on the menu cursor focus.

Input Voltage on Channel 1 or 2	
<b>0.1V/Div</b>	100mV per division
<b>0.2V/Div</b>	200mV per division
<b>0.5V/Div</b>	500mV per division
<b>1V/Div</b>	1V per division
<b>2V/Div</b>	2V per division
<b>5V/Div</b>	5V per division

#### Cautions:

- Use only the test leads and test lead adapters supplied with the scope.
- If you do not know the level of the voltage to measure in manual range control, always start at the highest range: **5V/div** with the signal probe set to **X10**.

## Features

Together with its supplied oscilloscope module, your MultiScope is a microprocessor-controlled dual channel storage oscilloscope with a backlit display. The scope has an optical isolated serial interface that lets it communicate with any personal computer running on Windows. All oscilloscope parameters are menu-driven, letting you select them using either the scope's keys or a connected PC.

By replacing the supplied oscilloscope module with other modules (available at Wittig Technologies or authorized Partners, soon), your scope can also function as a logic analyzer, frequency counter, function generator, bit pattern generator, multimeter, signal generator/analyzer, spectrum analyzer, long-term temperature analyzer, or pressure analyzer.

Your scope includes these features.

**Dual Channel** — lets you display two channels simultaneously on the display or on the screen of a connected PC.

**Optical and Galvanic Isolation** — lets you safely operate the unit when measuring voltages above 42V through galvanic isolation of both channels and optical isolation to the serial communication line.

**Second Sampling Rate on Channel 2** — lets you magnify signals when the trigger event occurs due to different sampling rate on channels 1 and 2.

**Auto Setting** — lets you display signals without manually changing the input voltages or sampling rates for channels 1 and 2.

**18 Selectable Sampling Rates** — let you record signals from once every 2.7 min. to once every 50 ns.

**Flexible Triggering** — lets you trigger on a negative or positive signal transition on channel 1.

**Selectable Trigger Levels** — let you select 255 different trigger levels in the range of the input voltage selected.

**Trigger Delay** — lets you display the measuring signal before a trigger event occurs.

**Selectable Input Ranges** — let you select the range of the measuring signal for the most accurate readings.

**Selectable Input Coupling** — lets you select whether a signal to be measured is DC or AC, and provides a zero reference for zero adjustment on channel 1 or 2.

**Signal Ground Line** — lets you easily reference the incoming signals.

**Multiple Input Power Sources** — let you connect 7 to 15V of external power from an AC adapter.

**Dual Power** — you can power the scope using six AA batteries or with the supplied AC adapter.

**Software Interface** — lets you use your computer to display, save, load, print, and control the recorded measurements with the optical isolated serial PC interface.

**Selectable Display Colors** — lets you change the oscilloscope display colors for easier viewing of dual signals when using a computer monitor.

**Carrying Case** — lets you store all of your scope's accessories.

**Rubber Protection Cover** — protects your scope.

### F3 Functions on the Menu Screen

Menu Item	Description
A trigger source selection determines how a received pulse or signal is to be monitored or measured. The three selectable trigger sources are:	
<b>FREERUN</b>	No trigger source is defined: The MultiScope continuously measures and records signals regardless of whether a trigger occurs or not.
<b>+TRG 1</b>	Trigger channel 1, positive change: The scope records signals only when the defined trigger event occurs. The signal is recorded when the trigger level is equal to the incoming signal and the signal is rising.
<b>-TRG 1</b>	Trigger channel 1, negative change: The scope records signals only when a defined trigger event occurs. The signal is recorded when the trigger level is equal to the incoming signal and the signal is falling.
The trigger mode determines when a new measurement is to be taken and displayed. The two available trigger modes are:	
<b>SINGLE/RUN</b>	<b>SINGLE:</b> The scope records a new signal each time you activate the trigger by pressing <b>F1</b> in the main screen and the defined trigger event occurs. Use this mode to measure or monitor a signal that occurs only once, such as the noise heard when you turn on an electronic device. <b>RUN:</b> The scope records a new signal every time the defined trigger event occurs. Use this mode to measure or monitor a continuously running signal.



## F2 Functions on the Menu Screen

Menu Item	Description
<b>MANUAL/AUTO</b>	<p>Press the up or down arrow keys to set the parameters in manual or automatic mode.</p> <p><b>AUTO:</b> In this mode the input voltage and the sampling rate are set automatically. It takes several recordings of repetitive signals to set the correct parameters.</p> <p><b>MANUAL:</b> In this mode, all parameters such as input voltage and sampling rate have to be set manually.</p>
<b>SAVE/LOAD</b>	<p><b>SAVE s1/s2:</b> Press the up or down arrow keys to select one of the two memory locations to save the recorded signal. Press <b>ENTER/MENU</b> to save.</p> <p><b>SAVE pa1/pa2/pa3/pa4:</b> Press the up or down arrow keys to select one of the four memory locations to save the parameter settings only. Press <b>ENTER/MENU</b> to save.</p> <p><b>LOAD s1/s2:</b> Press the up or down arrow keys to select a signal to load from one of the memory locations. Press <b>ENTER/MENU</b> to load.</p> <p><b>LOAD pa1/pa2/pa3/pa4:</b> Press the up or down arrow keys to select parameter settings to load from one of the memory locations. Press <b>ENTER/MENU</b> to load.</p>
<b>BEEPER ON/OFF</b>	Press the up or down arrow keys to turn the beeper on and off.
<b>DUAL</b>	Enables both channels on the display
<b>CH 1</b>	Press the up or down arrow keys to select channel 1 and disable channel 2.

## SYSTEM REQUIREMENTS

- IBM, PC Pentium or compatible with Microsoft Windows, 95 or later
- 80386 CPU
- 1.2MB of available hard disk storage space

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### Preparation

Follow these instructions to prepare and operate the scope using either the scope's display or your computer's monitor.

The supplied computer software offers additional help screens that can guide you through the scope's functions, modes, and available options.

## INSTALLING THE SOFTWARE

1. Insert the supplied software setup disk into your floppy disk drive.
2. Click **Start** on the task bar, then click **Run**.
3. In the **Run** dialog box, type **a:\install**, then click **OK**.
4. Click **Continue** in the Setup window to define the directory where you want to install the software. **C:\MSCOPE** (the suggested path) appears in the *Path* box.
5. Click **Continue** to install the software in the suggested directory, or enter the desired directory name then click **Continue**.
6. When the application has been successfully installed on your hard disk and **Setup Complete** appears in the *Setup* box, click **OK**. Then remove the disk from your floppy disk drive and store it in a safe place.

## CONNECTING POWER

You can power the scope using six AA batteries or the supplied AC adapter.

### Using Batteries

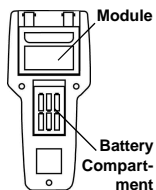
Your scope requires 6 AA batteries (not supplied) for power. For the best performance and longest life, we recommend alkaline batteries.

#### Cautions:

- Use only fresh batteries of the required size and recommended type.
- Do not mix old and new batteries, different types of batteries (standard, alkaline, or rechargeable), or rechargeable batteries of different capacities.

Follow these steps to install batteries.

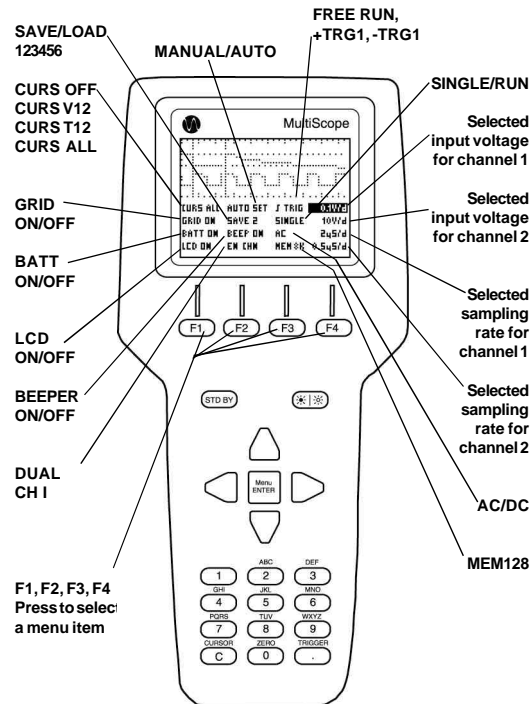
1. Set **On/Off** on the side of the scope to **Off**.
2. Remove the rubber protection cover, then open the battery compartment cover by pressing down the latch at the top of the cover.
3. Place the batteries in the compartment as indicated by the polarity symbols (+ and -) marked inside.
4. Replace the cover.



## F1 Functions on the Menu Screen

Menu Item	Description
<b>CURS OFF</b>	Lets you disable all cursors to measure voltages and delta time.
<b>CURS V12</b>	Lets you enable horizontal cursors to measure delta voltages.
<b>CURS T12</b>	Lets you enable vertical cursors to measure delta time.
<b>CURS ALL</b>	Lets you enable all cursors to measure voltages and delta time.
<b>GRID ON/OFF</b>	Press the up or down arrow keys to turn the display grid on and off.
<b>BATT ON/OFF</b>	Press the up or down arrow keys to turn the battery gauge on and off.
<b>LCD ON/OFF</b>	Press the up or down arrow keys to turn the display backlight on and off.  <b>Note:</b> When the display backlight is switched on and you run the scope without an external AC adapter, the batteries will run out much sooner than when the display backlight switched off.

## FUNCTIONS ON THE MENU SCREEN



When the scope stops operating properly, replace the batteries.

**Warning:** Dispose of old batteries promptly and properly. Do not burn or bury them.

**Caution:** If you do not plan to use the scope with batteries for a month or longer, remove the batteries. Batteries can leak chemicals that can destroy electronic parts.

## Using the AC Adapter

You can power the scope using the supplied 12V, 500mA AC adapter.

### Cautions:



You must use a Class 2 power source that supplies between 7V and 15V DC and delivers at least 750 mA. Its center tip must be set to positive and its plug must fit the scope's **12VDC 500mA** jack. The supplied adapter meets these specifications. Using an adapter that does not meet these specifications could damage the scope or the adapter.

- Always connect the AC adapter to the scope before you connect it to AC power. When you finish, disconnect the adapter from AC power before you disconnect it from the scope.
1. Set **On/Off** on the side of the scope to **Off**.
  2. Insert the adapter's barrel plug into the **12VDC 500mA** jack on the side of the scope.
  3. Connect the AC adapter to a standard AC outlet.

## USING THE STAND

The stand on the back of the supplied rubber protection cover makes it easier to see the scope's display while you use it. To use the stand, simply pull it down into place until it stops. When you finish using the scope, fold the stand back against the rubber protection cover and store the scope flat on its base.

## CONNECTING THE SCOPE TO A COMPUTER

1. Plug the supplied serial cable's 9-pin female connector into your computer's 9-pin male serial port connector.

**Note:** If your computer has a 25-pin serial port connector, you can use a 9-pin to 25-pin adapter cable.

2. Insert the supplied serial cable's telephone plug into **Serial Port** on the side of the scope.



## RESETTING THE SCOPE

If the scope malfunctions, follow these steps to reset it and save a new copy of the firmware to the scope.

1. Set **On/Off** on the side of the scope to **Off**.
2. Plug the supplied serial cable's 9-pin female connector into your computer's 9-pin male serial port connector.
3. Insert the supplied serial cable's telephone plug into **Serial Port** on the side of the scope, then start the scope's application software.

## Moving the Vertical Cursors, Horizontal Cursors, and Zero Lines

1. Press **C** to activate the cursors or **0** to activate the zero lines before moving them on the main screen.
2. Press **1** or **2** to select vertical and horizontal cursors 1 or 2, or to select zero line 1 or 2.
3. Move the cursors using the arrow keys or move the zero line using the up and down arrow keys.

The difference in seconds between the two vertical cursors is displayed on the right side of the display as **Dt**. The difference in Volts between the two horizontal cursors is displayed on the right side of the display as **DV1**.

If a measured signal is higher than the oscilloscope's display can show, **OV** (overvolt) appears. If a measured signal is lower than the oscilloscope's display can show, **UV** (undervolt) appears. You can only move the vertical and horizontal cursors from the main screen.

## Setting Trigger Position and Trigger Level

The trigger level corresponds to the trigger source selected on the menu screen. When the trigger is set to **FREE RUN**, the trigger symbol is not displayed and the trigger positioning is not processed.

1. If the trigger is not set to **FREE RUN**, press **TRIGGER** (**.**) to activate trigger movement before positioning the trigger.
2. Position the trigger and the trigger level using the arrow keys.

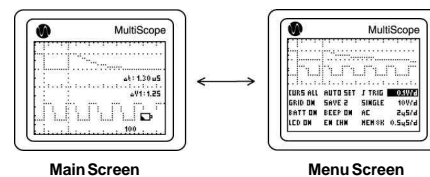
**Note:** The trigger position range is in the first 256 samples on the display.

## Shortcut Keys on the Main Screen

Key	Description
<b>CURSOR (C)</b>	Press <b>C</b> before moving the horizontal and vertical cursors using the arrow keys.
<b>ZERO (0)</b>	Press <b>0</b> before moving the zero lines using the up and down arrow keys.
<b>TRIGGER (.)</b>	Press <b>.</b> before using the arrow keys to move the trigger line.
<b>3</b>	Press <b>3</b> to switch between recording triggered by positive ( <b>+TRG 1</b> ) and negative ( <b>-TRG 1</b> ) signal changes and <b>Free Run</b> , which records signals constantly.
<b>4, 7</b>	Press <b>4</b> or <b>7</b> to change the input voltage on Channel 1.
<b>5, 8</b>	Press <b>5</b> or <b>8</b> to change the input voltage on Channel 2.
<b>6, 9</b>	Press <b>6</b> or <b>9</b> to change the sampling rate.

## Switching Between the Main and Menu Screens

Press **MENU/ENTER** to switch between the main and menu screens.



- Open the Scope Window (shortcut key is **CTRL+U**), select the **COM** port, then select the firmware in the Download window.
- Hold down **ENTER/MENU** on the scope as you turn on the scope, then click **Download** in the Download window. The firmware begins downloading.
- The scope sounds a steady tone to indicate the download is complete. Turn off the scope.

If the scope still malfunctions after resetting it, try again or contact Wittig Technologies or authorized partner for assistance.

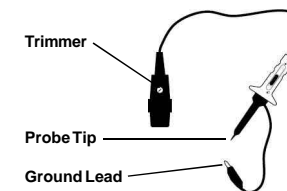
## CONNECTING THE SIGNAL PROBE

**WARNING:** Never exceed a maximum voltage of 40Vpk/DC between the signal tip and ground when the signal probe's attenuator switch is set to **X1** (1:1). Never exceed a maximum voltage of 400Vpk/DC between the signal tip and ground when the signal probe's attenuator switch is set to **X10** (10:1).

The supplied signal probe is a passive high-impedance oscilloscope probe designed and calibrated for use on instruments having an input impedance of 1 M $\Omega$  shunted by 20 pF. However, it may be compensated for use with instruments having an input capacitance of 10–35 pF. The probe has a two-position slide switch in the head that selects an attenuation of **X1** (1:1) or **X10** (10:1).

Follow these steps to connect the probe:

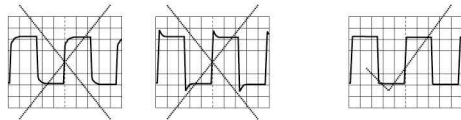
- Connect the supplied black signal cable to CH 1 or CH 2 on the top of the oscilloscope module.



2. Connect the ground lead with the alligator clip to ground (0 Volt).
3. Select the probe's attenuation using the switch in the head of the probe.

### Compensation Adjustment

In order to obtain the correct division ratio with each oscilloscope, you must adjust the attenuation network. To compensate the probe to your oscilloscope, apply a 1KHz square wave to the probe tip, display a few cycles of the waveform, then use a flat screwdriver to adjust the trimmer located in the signal probe's connector for a flat topped square wave.



### CHANNEL ISOLATIONS

Channel 1 and 2 are independently isolated to make the scope as safe as possible for the user.

The oscilloscope module has two completely independently floating channels, which means each channel has its own separate ground lead. **Each channel must be grounded individually to accurately measure and record waveforms.**

The scope's serial interface is optically isolated as well to prevent damage to a PC attached to its serial interface. This is necessary to compensate for future modules that might not have separate isolations inside the module as the oscilloscope module does.

## Operations

### USING THE OSCILLOSCOPE HARDWARE

**Important:** Never turn on the scope without a module installed.

Turn on the scope by sliding On/Off on the side of the scope to On. A title screen appears, identifying the module that is plugged in and displaying the serial and firmware version number.

### FUNCTIONS ON THE MAIN SCREEN

