USER’S MANUAL

Hantek1008
(Version 1.0.0)
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General Safety Summary

Review the following safety precautions carefully before operating the device to avoid any personal injuries or damages to the device including any products connected to it. To avoid any potential hazards use the device as specified by this user’s guide only.

■ To Avoid Fire or Personal Injury.

■ Use Proper Power Cord. Use only the power cord specified for this product and certified for the correct country of use.

■ Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

■ Connect and Disconnect Properly. Connect the probe output to the measurement device before connecting the probe to the circuit under test. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement device.

■ Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

■ Use Proper Probe. To avoid shock hazard, use a properly rated probe for your measurement.

■ Avoid Circuit or Wire Exposure. Do not touch exposed connections and components when power is on.

■ Do Not Operate With Suspected Failures. If suspected damage occurs to the device, have it inspected by qualified service person before further operations.

■ Provide Proper Ventilation. Refer to the installation instructions for proper ventilation of the device.

■ Do Not Operate in Wet/Damp Conditions.

■ Do Not Operate in an Explosive Atmosphere.

■ Keep Product Surfaces Clean and Dry.
Chapter 1 Getting Started

The oscilloscope is small, compact, portable oscillo-scopes! The oscilloscope is ideal for production test, research and design and all of the applications involving analog circuits test and troubleshooting, as well as education and training.

In addition to the list of general features on the next page, this chapter describes how to do the following tasks:

■ System requirement
■ Install software
■ Install driver
■ General features
■ General check
■ Probe compensation
■ Function check
■ Self calibration
■ Accessories
**System Requirement**

To run oscilloscope software, the needs of computer configuration are as follows:

**Minimum System Requirement**

- **Operating System**
  Window NT/2000/XP/VISTA/Win7

- **Processor**
  Upwards of 1.00G processor

- **Memory**
  256M byte

- **Disk Space**
  500M disk free space

- **Screen Resolution**
  800 x 600 pixel

**Recommended Configuration**

- **Operating System**
  Windows XP SP3 System

- **Processor**
  2.4G Processor

- **Memory**
  1G Byte

- **Disk Space**
  80G Disk Space

- **Screen Resolution**
  1024 x 768 or 1280 x 1024 pixel

- **DPI Setting**
  Normal Size (96DPI)
Install Software

Note: Do not connect the USB connection until the software installation is complete.

1. While in Windows, insert the installation CD into the CD-ROM drive.

2. The installation should start up automatically. Otherwise in Windows Explorer, switch to the CD-ROM drive and run Setup.exe.

3. The software Installation is started. Click 'Next' to continue.
4. Choose a destination directory. Click 'Next' to continue.

Setup will install HANTEK1008 Ver1.0.8 in the following folder:

To install into a different folder, click Browse, and select another folder.

You can choose not to install HANTEK1008 Ver1.0.8 by clicking Cancel to exit Setup.

Destination Folder
\Program Files\HANTEK1008

Installation Wizard?
5. Check the setup information. Click Next to start copying files.
6. This Status dialog is displayed during files copying.

7. Updating Your System Configuration.
8. The installation is completed.

HANTEK1008 Ver1.0.8 has been successfully installed.

Click the Finish button to exit this installation.
Install Driver

1. Connect the A-Type Plug of USB cable to your PC’s USB port.

2. Connect the B-Type Plug of USB cable to the device’s USB port.

3. New hardware is found.
4. New hardware search wizard starts.

This wizard helps you install software for:
Hantek 1008 DRIVER

If your hardware came with an installation CD or floppy disk, insert it now.

What do you want the wizard to do?
- Install the software automatically (Recommended)
- Install from a list or specific location (Advanced)

Click Next to continue.
5. Select the specific location.

**Found New Hardware Wizard**

Please choose your search and installation options.

- **Search for the best driver in these locations:**
  - Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
  - [ ] Search removable media (Floppy, CD-ROM...)
  - [x] Include this location in the search:
    - `<C:\Program Files\HANTEK1008\Driver>`
  - [ ] Don't search. I will choose the driver to install.
    - Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.

[Back]  [Next]  [Cancel]
6. New hardware search wizard starts to search the driver.
7. New hardware wizard installs "DRIVER".

8. The wizard has finished installation of "DRIVER".
General Feature

Product features:

■ 8 channel
■ Maximum real-time sample rate
  2.4MSa/s
■ Max memory depth
  4K points
■ Built-in fast fourier transform function (FFT)
■ 20 Automatic measurements;
■ Automatic cursor tracking measurements;
■ Waveform storage, record and replay dynamic waveforms;
■ User selectable fast offset calibration;
■ Add, subtract, multiply and division mathematical functions;
■ Adjustable waveform intensity, more effective waveform view;
**General Check**

Please check the instrument as following steps after receiving the oscilloscope:

**Check the shipping container for damage:**
Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness. Ensure and the instrument has been checked mechanically and electrically.

**Check the accessories:**
Accessories supplied with the instrument are listed in "Accessories" in this guide. If the contents are incomplete or damaged, please notify the franchiser.

**Check the instrument:**
In case there is any mechanical damage or defect, or the instrument does not operate properly or fail performance tests, please notify the franchiser.

**Probe Compensation**

Perform this function to match the characteristics of the probe and the channel input. This should be performed whenever attaching a probe to any input channel at the first time.

- From the “Probe” menu, select attenuation to 1:10. Set the switch to “X10” on the probe and connect it to CH1 of the oscilloscope. When using the probe hook-tip, insert the tip onto the probe firmly to ensure a proper connection.

- Attach the probe tip to the Probe Compensator and the reference lead to the ground connector, select CH1, and then adjust the timebase and Volt/Div in sidebar.

- Check the shape of the displayed waveform.
Correct Compensated

Over compensated
If necessary, use the supplied non-metallic tool to adjust the trimmer capacitor of the probe for the flattest square wave being displayed on the oscilloscope.

Repeat if necessary.

**WARNING:** To avoid electric shock while using the probe, be sure the perfection of the insulated cable, and do not touch the metallic portions of the probe head while it is connected with a voltage source.

### Function Check

Perform this functional check to verify that your oscilloscope is operating correctly.

**Connect the oscilloscope**

You should connect the A-Type Plug of USB cable to your PC USB port and connect the B-Type Plug of USB cable to oscilloscope USB port.
Input a signal to a channel of the oscilloscope

The oscilloscope is equipped with eight channels.

Please input signal in the following steps:

1. Set the attenuation switch on the probe as 10X and connect the probe on the oscilloscope with CH1. Aim the slot in the probe connector at the faucet on BNC of CH1 and insert, then, turn right to lock the probe. Finally, attach the tip of probe and ground nip to the Connector of Probe compensator.

2. Set the CH1 probe attenuation of the oscilloscope to X10. (The default is X1).
3. Attach the tip of probe and ground tab to the Connector of Probe compensator. Click the button. A square wave will be displayed in several seconds. (Approximately 1 kHz, 2V, peak-to-peak).

4. Inspect CH2-CH8 with the same method. Repeat step 2 and 3.

**Self Calibration**

The self calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. You can run the routine at any time but you should always run the routine if the ambient temperature changes by 5 deg or more. For accurate calibration, power on the oscilloscope and wait twenty minutes to ensure it is warmed up. To compensate the signal path, disconnect any probes or cables from the input connectors. Then, access the “Utility -> Calibration” option and follow the directions on the screen. The self calibration routine takes about several minutes.
Accessories

All the accessories list below are standard accessories for the oscilloscope:

- Four Test Cables
- An Auto Ignition Probes
- A USB Cable
- A PC software of the oscilloscope
Chapter 2 Operating Basics

- The User’s Interface
- The Menu System
- The Vertical System
- The Horizontal System
- The Trigger System
- Input Connectors
The User’s Interface

Click the software icon on the desk after you finished the software installation and equipment connecting. Then a user interface will be showed as follows:

In addition to displaying waveforms, the display area is filled with many details about the waveform and the oscilloscope control settings.

1. The Main Menu
   All settings can be found in the main menu.

2. The Toolbar

3. It shows the trigger information
   It shows the edge trigger slope, source and level.
4. It shows the main time base setting.

5. The Horizontal Panel
   The user can change Time/DIV, format in the panel.

6. The Vertical Panel
   The user can turn on/off the CH1/.../CH8. Also the user can change the CH1/.../CH8 volt/div, coupling and probe attenuation.

7. The Trigger Panel
   In this panel, the user can change the trigger mode, sweep, source and slope.

8. It shows the system time.

9. Marker shows edge trigger level.

10. It shows the CH1-CH8 information
    Readouts show the coupling of the channels.
    Readouts show the vertical scale factors of the channels.
    A “B” icon indicates that the channel is bandwidth limited.

11. The software status indicates it connected via USB.

12. The markers show the reference points of the displayed waveforms. If there is no marker, the channel is not displayed.

13. A window that shows the display waveform in buffer position.

14. Marker shows horizontal trigger position.

15. Trigger status indicates the following:
    AUTO: The oscilloscope is in auto mode and is acquiring waveforms even no triggers have been found.
    Trig'D: The oscilloscope has found a trigger and is acquiring the post trigger data.
    WAIT: All pretrigger data has been acquired and the oscilloscope is ready to accept a trigger.
    STOP: The oscilloscope has stopped acquiring waveform data.
    RUN: The oscilloscope is running.
    PLAY: The oscilloscope is displaying the record waveforms.
The Menu System

The Main Menu

File  View  Setup  Display  Cursor  Measure  Acquire  Utility  Window  Help

1. **File**: load or save data, setup

   ![File Menu]

2. **View**: Change the user interface

   ![View Menu]
3. **Setup**: Setup setting

<table>
<thead>
<tr>
<th>Setup</th>
<th>Ctrl+R</th>
<th>Ctrl+M</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigger</td>
<td>Ctrl+T</td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td>Ctrl+V</td>
<td></td>
</tr>
<tr>
<td>Horizontal</td>
<td>Ctrl+H</td>
<td></td>
</tr>
</tbody>
</table>

4. **Display**: Change wave display type

<table>
<thead>
<tr>
<th>Display</th>
<th>Ctrl+G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Grid</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td></td>
</tr>
<tr>
<td>Grid Background Color</td>
<td></td>
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</tbody>
</table>

5. **Cursor**: Set Cursor measure type

<table>
<thead>
<tr>
<th>Cursor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
</tr>
<tr>
<td>Type</td>
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</tbody>
</table>

6. **Measure**: Set measurement parameters

<table>
<thead>
<tr>
<th>Measure</th>
<th>Ctrl+H</th>
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</thead>
<tbody>
<tr>
<td>Source</td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td></td>
</tr>
<tr>
<td>Horizontal</td>
<td></td>
</tr>
<tr>
<td>Clear Measure</td>
<td></td>
</tr>
</tbody>
</table>
7. **Acquire**: Run, stop or other operation setting

<table>
<thead>
<tr>
<th>Acquire</th>
<th></th>
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<tbody>
<tr>
<td>Run</td>
<td>Ctrl+R</td>
</tr>
<tr>
<td>Stop</td>
<td>Ctrl+O</td>
</tr>
<tr>
<td>Zoom Out</td>
<td></td>
</tr>
<tr>
<td>Zoom In</td>
<td></td>
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<tr>
<td>Buffer Length</td>
<td></td>
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<tr>
<td>Acquisition</td>
<td></td>
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<tr>
<td>Interpolation</td>
<td></td>
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<tr>
<td>Autoset</td>
<td></td>
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</tbody>
</table>

8. **Utility**: Utility setting

<table>
<thead>
<tr>
<th>Utility</th>
<th></th>
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<tbody>
<tr>
<td>Pass/Fail</td>
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<tr>
<td>F/C</td>
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<tr>
<td>Calibration</td>
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<tr>
<td>Factory Setup</td>
<td></td>
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<tr>
<td>Language</td>
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</tbody>
</table>

9. **Window**: Window setting

<table>
<thead>
<tr>
<th>Window</th>
<th></th>
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<tbody>
<tr>
<td>Cascade</td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td></td>
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<tr>
<td>Horizontal</td>
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<tr>
<td>Arrange Icons</td>
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<tr>
<td>1 Scope1</td>
<td></td>
</tr>
</tbody>
</table>
10. **Vehicle**: Vehicle setting

- **Vehicle**
  - Diagnosis Setup
  - Clear reference waveform

11. **Help**: Turn on help file

- **Help**
  - Contents F1
  - About... F3
The Vertical System

Click “Setup”-> “Vertical”

The following figure shows the vertical parameters setting in the vertical Setup window.

1. Select channel: User can select the channel by clicking the Combo Box.
2. **ON/OFF**: Turn on or off the selected channel.

3. **VOLTS/DIV**: Set the selected channel voltage range.

4. **Coupling**: DC

5. **Probe**: Set the Select one according to the probe attenuation factor to ensure correct vertical scale reading

6. **Invert**: Invert the selected wave.
The Horizontal System

Click "Setup"->"Horizontal"

The following figure shows the horizontal parameters settings in the Horizontal System window.

1. **Time/DIV**: lead the setting of the time base parameters

   ![Time/DIV Setting](image)

   **Time / DIV** 5.000us

2. **Format**: lead the setting of the horizontal format parameters

   ![Format Setting](image)

   **Format** Y - T

---

[Image of Horizontal System window]

**X - Y Setting**

- **X - Coordinate** CH1
- **Y - Coordinate** CH2
The Trigger System

Click “Setup” -> “Trigger”

The following figure shows the trigger system control.

1. **Trigger Mode**: Sets the trigger mode
2. Trigger Sweep: Select the trigger sweep mode to AUTO, NORMAL or SINGLE

3. Trigger Source: Select the trigger source to CH1-CH8.

4. Trigger Slope: Select the edge trigger slope to Positive or Negative slope
Input Connector

CH1/.../CH8: Input connectors for waveform display.

CAL: Probe compensation output.

Other Connector:

USB Port: Connect the B-Type Plug of USB cable to this port.

Power Supply

D0 - D7: Built in waveform generator.

GND.: A ground terminal- not installed in this version.
Chapter 3 Understanding Oscilloscope Functions

- Set Oscilloscope
- Set Vertical System
- Set Horizontal System
- Set Trigger System
- Save/Load
- Utility Function
- Measure Signal
- Print
Setup the Oscilloscope

Save Setup

The oscilloscope software saves the current setup before you close the oscilloscope software. The oscilloscope recalls this setup the next time you run the software. You can use the "Save Setup" menu to permanently save several different setups.

Load Setup

The oscilloscope can recall the last setup—any saved setups or the factory setup—before the oscilloscope software was running. You can use the "Load Setup" menu to permanently recall a setup.

Factory Setup

The oscilloscope software is set up for normal operation when it is shipped from the factory. This is the factory setup. To recall this setup, push the "Factory Setup" menu.
Set Vertical System

Set Channel

Click “Vertical” in “Setup” Menu.

The Channel Selection

The Channel Control Panel in sidebar.

The Vertical function:

- **Turn ON/Off**: Turn on/off the channel.
- **Volt/DIV**: Select the channel voltage/div.
- **Coupling**: DC
- **Probe**: Select the channel probe attenuation
- **Invert**: Turn on/off the invert function.

Change Volt/DIV

You can click “Volt/DIV” in “Vertical Setup” window to select the voltage.
The attenuation factor \( x_1 \), \( x_{10000} \) and 20:1 changes the vertical scale of the oscilloscope so that the measurement results reflect the actual voltage levels at the probe tip.

**Current Clamp.**
The attenuation factor CC65-CC1100 is used for current measurement work with AC/DC.

You can also change the selected channel voltage in sidebar.

![Vertical Setting](image)

You can left click and drag the mouse on the knob to change the voltage.

**Probe Attenuation Setting**
Select the attenuation factor for the probe. To check the probe attenuation setting, toggle the probe menu to match the attenuation factor of the probe.

This setting remains in effect before you change again.

Click “**Probe**” in Vertical Setup window to select the probe attenuation.

![Probe Setting](image)

The probe setting window in the sidebar

**Note:** The attenuation factor \( x_1 \) - \( x_{10000} \) and 20:1 changes the vertical scale of the oscilloscope so that the measurement results reflect the actual voltage levels at the probe tip. The attenuation factor CC65-CC1100 is used for current measurement work with AC/DC Current Clamp.
Invert

The invert function turns the displayed waveform 180 degrees, with respect to the ground level. When the oscilloscope is triggered on the inverted signal, the trigger is also inverted.

Click “Invert” in Vertical window

The following picture shows the waveform before inversion:
The following picture shows the waveform of inversion:
Set Math

Click "MATH" in Channel menu to set MATH channel.
The MATH Setup window

ON/OFF: Turn On/Off the MATH Channel.
Source A/B: Set the source of the math channel.
Operate: Set operation type of the math channel.
Volt/DIV: Set the resolution of the math channel.
Probe: Set the math channel probe attenuation.
Invert: Turn on/off the invert function.

The mathematic functions include addition, subtract, multiply, division and FFT for CH1-CH8.

Source A/B
Operate

Four Types:

A + B        Add source A and source B
A - B        Subtract source B from source A
A × B        Multiply source A by source B
A / B        Divided source A by source B
FFT          Convert a time-domain signal into its frequency components (spectrum).

In this function, use the addition, subtraction, multiplication, division and FFT function to operate and analyze the waveform.

Select the operate type in the Operate menu. Select source A and B. Then adjust the vertical scale and offset to view the math channel clearly. The mathematic result can be measured by the measure window and the cursor.

The Math Function Display
Set Reference

Click “REF” in “Setup” menu to set REF channel.

The Reference Channel Function:

On/Off: Turn on/off the reference channel.
Volt/DIV: Change the resolution of the reference channel.
Load: Load the reference waveform from the “.rfc” file from your computer.
Save: Save the current reference waveform to your computer as “.rfc” format.
Save Reference: Save the current reference waveform to your computer as “.rfc” format.

You can change the vertical scale of a waveform. The waveform display will zoom in or zoom out according to the reference level.

Load

Click “Load” to load the “.rfc” file that was selected. And then a load file window will appear.

Save
Click "Save" to save the waveform to *.rfc file. Then a saved source window appears.

The save file window will appear after you select the saved source.

The Reference Waveform Display Window:

Note: If you turn on the “Reference” channel, the load file window will appear.
Setup Horizontal System

Change Time/DIV

The “Time/DIV”

Select the horizontal Time/DIV (scale factor) for the main time base or for the window time base.

The Horizontal Panel

Click the blue knob can change Time/DIV.

If the waveform acquisition is stopped, Time/DIV control expands or compresses the waveform.

Change Format

Click “Time/DIV” you can set the time base in Horizontal Setup window.

In the “Format” item, set the waveform display format (Y-T, X-Y).

Y – T: Show the relative relation between vertical voltage and horizontal time.
X – Y: Show CH1 value at X axis; CH2 value at Y axis.
Change Horizontal Position

Double click the channel button to set the trigger point to the horizontal center of the screen.

Horizontal position changes the displayed waveform position, relative to the trigger point.

The user can drag on screen to change the horizontal position.
Set Trigger System

Set Edge Trigger

The trigger determines when the oscilloscope starts to acquire data and display a waveform. When a trigger is set up properly, it can convert unstable displays or blank screens into meaningful waveforms.

If the oscilloscope wants to acquire a waveform, it collects enough data so that it can draw the waveform to the left of the trigger point. The oscilloscope continues to acquire data while waiting for the trigger condition to occur. The oscilloscope continues to acquire enough data so that it can draw the waveform to the right of the trigger point after it detects a trigger.

The **Edge** trigger determines whether the oscilloscope finds the trigger point on the rising or the falling edge of a signal. Select **Edge** trigger mode to trigger on **Rising** edge or **Falling** edge.

**Mode**: Select the trigger mode.

![Trigger Mode](edge)

**Sweep**: Set the sweep mode to **Auto**, **Normal** or **Single**.

![Trigger Sweep](auto)

- **Auto**: Acquire waveform even no trigger occurred.
- **Normal**: Acquire waveform when trigger occurred.
- **Single**: Acquire waveform when trigger occurred then stop.

**Source**: You can use the trigger source options to select the signal that the oscilloscope uses as a trigger.

![Trigger Source](ch1)
CH1: Select CH1 as trigger signal
CH2: Select CH2 as trigger signal
CH3: Select CH3 as trigger signal
CH4: Select CH4 as trigger signal
CH5: Select CH5 as trigger signal
CH6: Select CH6 as trigger signal
CH7: Select CH7 as trigger signal
CH8: Select CH8 as trigger signal

Slope: Set the slope to Rising (+) or Falling (-).

Rising: Trigger on rising edge
Falling: Trigger on falling edge

The user can also change the trigger setting on trigger panel in sidebar.
Save/Load

Save

Click "File" in main menu to save data, setup and image.

1. Save Data

Save waveform data as one of type file under Save Data.

2. Save Setup

Save the current oscilloscope setup to file.

3. Save Image

Save the software display window in a .bmp or .jpg format file.
Load

Click “File” in main menu to recall saved waveform and setup.

<table>
<thead>
<tr>
<th>File</th>
<th></th>
<th>Ctrl+X</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td></td>
<td>Ctrl+X</td>
</tr>
<tr>
<td>Close</td>
<td></td>
<td>Ctrl+L</td>
</tr>
<tr>
<td>Load Data</td>
<td>Ctrl+D</td>
<td></td>
</tr>
<tr>
<td>Load Setup</td>
<td>Ctrl+L</td>
<td></td>
</tr>
<tr>
<td>Save Data</td>
<td>Ctrl+S</td>
<td></td>
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<tr>
<td>Save Setup</td>
<td>Ctrl+S</td>
<td></td>
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<tr>
<td>Save Image</td>
<td></td>
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<tr>
<td>Print...</td>
<td>Ctrl+P</td>
<td></td>
</tr>
<tr>
<td>Print Preview</td>
<td>Ctrl+P</td>
<td></td>
</tr>
<tr>
<td>Print Option</td>
<td>Ctrl+P</td>
<td></td>
</tr>
<tr>
<td>Exit</td>
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</tr>
</tbody>
</table>

1. **Load Data**

Load the waveform that had saved.

2. **Load Setup**

Load the instrument that had saved.
Click "Utility" in main menu.

**Utility/Function**

The self calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. You can run the routine at any time but you should always run the routine if the ambient temperature changes by 5 deg or more. For accurate calibration, power on the oscilloscope and wait twenty minutes to ensure it is warmed up. To compensate the signal path, disconnect any probes or cables from the input connectors. Then, access the "Utility -> Calibration" option and follow the directions on the screen. The self calibration routine takes about several minutes.
Factory Setup

Click “Factory Setup” in “Utility” menu to load default setups.

When you click the Factory Setup in Utility menu, the oscilloscope displays the CH1 -CH8 waveforms and removes all waveforms.

The oscilloscope set up for normal operation when it is shipped from the factory and can be recalled at anytime by user.

The Factory Setup function does not reset the following settings:

■ Language option
■ Date and time
Language

Click “Language” in “Utility” menu.

There are two languages in “Language” menu. The default language is English.
Measure Signal

Cursor Menu

Click “Cursor” in main menu.

This method allows you to take measurements by moving the cursors.

1. Source

The user can set the source to CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8, and MATH. When you use cursors, be sure to set the Source to the waveform on the display that you want to measure.

2. Type

There are four types of cursors: Cross, Trace, Vertical and Horizontal.
1) **Cross**

The Cross cursors appear as cross lines on the display and measure the vertical and horizontal parameters.

The Cross cursor display window

![Cross cursor display window](image)

The Cross measure result displays on status bar.

| Freq: 6.590kHz | Time: 152μS | Volt: 2.00V |

2) **Trace**

The Trace cursors appear as vertical lines on the display and measure the waveform amplitude at the point the waveform crosses the cursor.
The **Trace** cursor display window

The **Trace** cursor measure result display on status bar.

![Trace cursor display window](image)

3) **Vertical**

The **Vertical** cursors appear as vertical lines on the display and measure the vertical parameters.
The **Vertical** cursor measure result display on status bar.

![Graph showing vertical cursor measurement](image)

**Freq:** 6.552kHz  
**Time:** 153μs

4) **Horizontal**

The **Horizontal** cursors appear as horizontal lines on the display and measure the horizontal parameters.
The **Horizontal** cursor measure result display on status bar.

**Measure Menu**

Click "**Measure**" in main menu.

The oscilloscope provides 20 parametric auto measurements (12 voltage and 8 time measurements).
1. Source

The user can use the "Source" menu to select a measure source.

2. Vertical

<table>
<thead>
<tr>
<th>Source</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Peak to Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical</td>
<td>Top</td>
<td>Base</td>
<td>Middle</td>
</tr>
<tr>
<td>Horizontal</td>
<td>RMS</td>
<td>Amplitude</td>
<td>Cycle Mean</td>
</tr>
<tr>
<td>Clear Measure Ctrl+M</td>
<td>Positive Overshoot</td>
<td>Negative Overshoot</td>
<td></td>
</tr>
</tbody>
</table>

**Maximum**: Voltage of the absolute maximum level, measured over the entire waveform.

**Minimum**: Voltage of the absolute minimum level, measured over the entire waveform.

**Peak To Peak**: Peak-to-peak = Max – Min, measured over the entire waveform.

**Top**: Voltage of the statistical maximum level, measured over the entire waveform.

**Base**: Voltage of the statistical minimum level, measured over the entire waveform.

**Middle**: Voltage of the 50% level from base to top.
RMS: The Root Mean Square voltage over the entire waveform.

Amplitude: Amp = Base – Top, measured over the entire waveform.

Mean: The arithmetic mean over the entire waveform.

Cycle Mean: The arithmetic mean over the first cycle in the waveform.

Preshoot: Positive Overshoot = (Max - Top)/Amp x 100 %, measured over the entire waveform.

Overshoot: Negative Overshoot = (Base - Min)/Amp x 100 %, measured over the entire waveform.

3. Horizontal

<table>
<thead>
<tr>
<th>Source</th>
<th>Vertical</th>
<th>Horizontal</th>
<th>Period</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Clear Measure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Period: Time to take for the first signal cycle to complete in the waveform.

Frequency: Reciprocal of the period of the first cycle in the waveform.

Rise Time: Time taken from lower threshold to upper threshold.

Fall Time: Time taken from upper threshold to lower threshold.

+Duty Cycle: Positive Duty Cycle = (Positive Pulse Width)/Period x 100%, measured of the first cycle in waveform.

-Duty Cycle: Negative Duty Cycle = (Negative Pulse Width)/Period x 100%, measured of the first cycle in waveform.
+**Pulse Width**: Measured of the first positive pulse in the waveform. The time between the 50% amplitude points.

-**Pulse Width**: Measured of the first negative pulse in the waveform. The time between the 50% amplitude points.

4. **Clear Measure**

Clear all measure items on display screen.

The **Measure Display Window**

**Note**: The results of the automatic measurements will be displayed on the bottom of the screen. Maximum 8 results could be displayed at the same time. When there is no room, the next new measurement result will make the previous results moving left, out of screen.
The Display System

Display Type

Click "Type" in "Display" menu.

The following figure shows the type parameters setting.

<table>
<thead>
<tr>
<th>Display</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl+G</td>
<td>Grid</td>
</tr>
<tr>
<td>Grid</td>
<td>Intensity</td>
</tr>
<tr>
<td>Intensity</td>
<td>Grid Background Color</td>
</tr>
</tbody>
</table>

If the Vectors type mode is selected, the waveform will be displayed as following figure.
If the Dots type mode is selected, the waveform will be displayed as following figure.

Display Grid

Click “Display” in main menu.
The grid shows:
The grid not shows:

Intensity
Click “Display->Intensity” in main menu.
The following figure shows the intensity dialog, which shows the display parameters setting.

You can change the grid and waveform color intensity in this dialog.
Grid Background Color

Click Grid Background Color in Display. You can change the background color.

Display

<table>
<thead>
<tr>
<th>Type</th>
<th>Ctrl+G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td></td>
</tr>
<tr>
<td>Grid Background Color</td>
<td></td>
</tr>
</tbody>
</table>

Click the black box and you can set the background color.
1. Click “Print” in “File” menu to set the printer to print the current waveform.

2. Click the “Print Preview” in “File” menu to get into the Preview window.

In “Print Preview” window, use the “Zoom In” button and the “Zoom Out” button to change the size of the waveform graph. Click the “Close” button to turn this window off and click the “Print” button to print the report.
Test Report

Date = 22-10-2022   Time = 10:34:12

CH1 :  CH2 :  CH3 :  CH4 :  CH5 :  CH6 :  CH7 :  CH8 :

NOTE: ______________________
_____________________________
Chapter 4 Application Example

- Simple Measurement
- Capturing a Single-Shot Signal
- The Application of the X-Y
- Taking Cursor Measurement
Simple Measurement

User can adjust the controls to meet your measurement to optimize the waveform display.

To measure the frequency and “Vpp”, you can do these steps as follows:

1. Click the “Measure->Horizontal->Frequency” button, the frequency of the signal display on the bottom of the waveform interface.

2. Click the “Measure->Vertical->Peak-to-Peak” button, the “Vpp” of the signal will also display on the bottom of the waveform interface.

3. To clear the measurement on the waveform interface, click the “Measure->Clear Measure” button.
Capturing a Single-Shot Signal

To capture a single event, it needs to gather some pre-test knowledge of the signal in order to set up the trigger level and slope correctly. For example, if the event is derived from 3.3V COMS logic, a trigger level of 1.2 or higher Volts should work on a rising edge.

Do these steps as follows:

1. Set the probe and the channel attenuations to X 10.
2. Set up the trigger in the Trigger Menu, or in the Trigger Setting window.
   1) Adjust the Trigger Mode to Edge.
   2) Set the Trigger Sweep to Single.
   3) Set the Trigger Source to CH1.
   4) Set the Trigger Slope to “+” which means you select the rising edge.
   5) Adjust the Volts/DIV and the time base in a proper range for the signal.
   6) Drag the trigger level sign on the waveform display screen to proper position. It’s usually higher a little above the normal level.
   7) Click START button to start capturing. When the trigger conditions are met, data appears on the display representing the data points that the oscilloscope obtained with one acquisition.

This function helps to capture the signal occurrence easily, such as the noise with large amplitude; set the trigger level higher a little above the normal level and press and wait. When noise occurs, the instrument will record the waveform before and after the trigger.
**The Application of the X-Y Operation**

X-Y Plot acts to analyze correlation of data of two channels. Lissajous diagram is displayed in the screen when you use X-Y Plot, which enables to compare frequencies, amplitudes and phases of counterpart waveform against the reference waveform. This makes it possible to compare and analyze frequency, amplitude and phase between input and output.

Do these steps as follows:

1. Set the probe attenuation to "x10". Set the switch to "x10" on the probes.

2. Connect the CH1 probe to the input of the circuit, and connect the CH2 probe to the output of the circuit.

3. Adjust the vertical scale and offset to display approximately the same amplitude signals on each channel.

4. Select X-Y format at Horizontal window. The oscilloscope will display a Lissajous pattern representing the input and the output characteristics of the circuit.

5. Adjust the scale and offset of the horizontal and vertical to a desirable waveform display. The following picture shows a typical example.

6. Apply the Ellipse Method to observe the phase difference between the two channels.
Signal in X-Y Format:
Sinθ = A/B or C/D, where θ = phase shift (in degrees) between the two signals.

From the formula above:

θ = ±arcsine (A/B) or ±arcsine (C/D)

If the main axis of the ellipse is between I and III quadrant, θ must be in the range of (0~π/2) or (3π/2~2π).
If the main axis is at II and IV quadrant, θ must be in the range of (π/2~π) or (π~3π/2).
Taking Cursor Measurements

Use cursors to make time and amplitude measurements on a waveform quickly.

**Measure the Peak Frequency or Time of the First Sine Waveform**

Do these steps:

1. Click "Cursor->Source", select CH1 (select CH2-CH8 if you want measure CH2-CH8).
2. Click "Cursor->Type", select Vertical.
4. Drag the mouse button to the point you want to measure.
5. Release the left mouse button, the frequency difference and time difference will be shown at the status bar.

**Measure the Frequency and Time:**

![Waveform Image]
Read the details showing in the status bar.

```
Freq: 9.913kHz  Time: 101us
```

**Measure the Amplitude of the First Waveform Peak of the Waveform**

Do these steps:

1. Click “**Cursor->Source**”, select CH1 (select CH2 if you want measure CH2).
2. Click “**Cursor->Type**”, select Horizontal.
4. Drag the mouse button to the point you want to measure.
5. Release the left mouse button, the voltage difference will be shown at the status bar.

**Measure the Amplitude:**

![Waveform Measurement Diagram]
Read the details showing in the status bar.

**Volt**: 1.98V

**Trace the Amplitude of a fixed position on X-axis in a Waveform**

Do these steps:

1. Click “**Cursor->Source**”, select CH1 (select CH2 if you want trace CH2).
2. Click “**Cursor->Type**”, select Trace.
3. Click the cursor at the position that you want to trace the wave in the waveform window.

**Trace the Amplitude**: 

![Waveform Image]
Read the details showing in the status bar.

\[
\text{Volt: 677mV}
\]

**Note:** Click “Cursor->Type”, select “Cross”, you can measure time and amplitude at the same time.
Chapter 5 Appendix

- Appendix A: Specifications
- Appendix B: General Maintenance
## Appendix A: Specifications

### Specifications Table:

<table>
<thead>
<tr>
<th>Acquisition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Mode</strong></td>
<td>Real-Time Sample</td>
</tr>
<tr>
<td><strong>Sample Rate</strong></td>
<td>2.4MSa/s(Single channel)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Coupling</strong></td>
<td>DC</td>
</tr>
<tr>
<td><strong>Input Impedance</strong></td>
<td>Resistance: 1MΩ</td>
</tr>
<tr>
<td><strong>Supported Voltage</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Attenuation Factors</strong></td>
<td>1X, 10X, 100X, 1000X, 10000X, 20:1</td>
</tr>
<tr>
<td><strong>Input Protection</strong></td>
<td>400Vpk(DC + AC peak)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Horizontal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scanning Speed Range(Sec/Div)</strong></td>
<td>1ns/div ~ 20000s/div(1-2-5 sequences)</td>
</tr>
<tr>
<td><strong>Time Base Accuracy</strong></td>
<td>± 50ppm</td>
</tr>
<tr>
<td><strong>Memory Depth(Sample Points)</strong></td>
<td>Max. 4k (Single channel)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vertical</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog channel</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>Vertical Resolution</strong></td>
<td>12 bit</td>
</tr>
</tbody>
</table>
| **Vertical Scale(Volt/div) Range** | 10mV ~ 5V/div @ x1 probe(1,2,5 sequence)  
100mV ~ 50V/div @ x10 probe  
1V ~ 500V/div @ x100 probe  
10V ~ 5000V/div @ x1000 probe  
100V ~ 50000V/div @ x10000 probe  
200mV ~ 100V/div 20:1 probe |
### Trigger

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Source</td>
<td>CH1, CH2, CH3, CH4, CH5, CH6, CH7 and CH8</td>
</tr>
<tr>
<td>Trigger Mode</td>
<td>Auto, Normal and Signal</td>
</tr>
<tr>
<td>Trigger Type</td>
<td>Edge</td>
</tr>
<tr>
<td>Trigger Sensitivity</td>
<td>0.02 div increments</td>
</tr>
<tr>
<td>Trigger Level Accuracy</td>
<td>±4 division</td>
</tr>
</tbody>
</table>

### Measurement

<table>
<thead>
<tr>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cusor</td>
<td>Amplitude difference between cursors ((\Delta V))</td>
</tr>
<tr>
<td></td>
<td>Time difference between cursors ((\Delta t))</td>
</tr>
<tr>
<td></td>
<td>Reciprocal of (\Delta t) in Hertz (1/(\Delta t))</td>
</tr>
<tr>
<td></td>
<td>(Cross, Trace, Horizontal, Vertical)</td>
</tr>
<tr>
<td>Auto Measure</td>
<td>Voltage Measurement</td>
</tr>
<tr>
<td></td>
<td>Vp-p, Vmax, Vmin, Vmean, Vamp, Vtop, Vbase, Vmid, Vrms, Vcrms, Preshoot, Overshoot</td>
</tr>
<tr>
<td></td>
<td>Time Measurement</td>
</tr>
<tr>
<td></td>
<td>Frequency, Period, Rise Time(10%~90%), Fall Time(10%~90%), Positive Width, Negative Width, Duty Cycle</td>
</tr>
</tbody>
</table>

### Programmable Generator

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel</td>
<td>8(D0-D7)</td>
</tr>
<tr>
<td>Output Level</td>
<td>LV TTL</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>0-250kHz</td>
</tr>
</tbody>
</table>

### Mechanical

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Width 185mm</td>
</tr>
<tr>
<td></td>
<td>Height 150mm</td>
</tr>
<tr>
<td></td>
<td>Depth 27mm</td>
</tr>
<tr>
<td>Heavy</td>
<td>Withoput package 0.35kg</td>
</tr>
</tbody>
</table>
Appendix B: General Maintenance

General Care
Do not store or leave the oscilloscope where the device will be exposed to direct sunlight for long periods of time.

Caution
To avoid damages to the device or probes, do not expose them to spray, liquids or solvents.

To avoid damages to the surface of the device or probes not use any abrasive or chemical cleaning agents.

Cleaning
Inspect the device and probes as often as operating conditions require. Make sure the device disconnect from all power sources.

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the oscilloscope and probes with a lint-free cloth. Use carefully to avoid scratching the glass display.

2. Use a soft semi-dry cloth to clean the device.