Hantek DSO2D50

Hantek DSO2D50 Digital Storage Oscilloscope User Manual

Model: DSO2D50

1. INTRODUCTION

The Hantek DSO2D50 is a high-performance digital storage oscilloscope designed for precise signal analysis and measurement. It features a 500MHz bandwidth, 2GSa/s real-time sampling rate, and an 80K memory depth. This instrument also integrates a 25MHz arbitrary waveform generator, making it a versatile tool for various electronic testing and development applications.

This manual provides essential information for the safe and effective operation of your DSO2D50 oscilloscope. Please read it thoroughly before use and retain it for future reference.

Figure 1.1: Front view of the Hantek DSO2D50 Digital Storage Oscilloscope.

Key Features:

- 2 Analog Channels + 1 External Trigger Channel
- 500 MHz Bandwidth
- 2 GSa/s Real-time Sampling Rate
- 80K Memory Depth
- Built-in 25MHz Arbitrary Waveform Generator
- 32 Automatic Measurement Functions
- 9 Triggering Modes
- Supports 1MΩ/50Ω Impedance Switching
- Multiple Data Storage Options (CSV, images, waveforms)
- 7-inch LCD Display

2. SAFETY INFORMATION

WARNING:

- To prevent electric shock, do not open the instrument casing. Refer all servicing to qualified personnel.
- Do not operate the oscilloscope in wet or damp conditions.
- Ensure the power supply voltage matches the instrument's requirements.
- Use only the power cord and accessories specified by the manufacturer.
- Before making any connections, ensure the instrument is powered off.
- Always connect the ground lead of the probe to the circuit ground before connecting the probe tip to the test point.
- Observe all terminal ratings to prevent fire or electric shock.

Figure 2.1: Rear panel showing power input and safety warning.

Hazardous voltage inside, do not remove the cover unless by specified personnel.

3. PACKAGE CONTENTS

Verify that your package contains the following items:

- 1 x Hantek DSO2D50 Bench Digital Storage Oscilloscope

- 2 x Passive Probes (typically 1:1/10:1 switchable)

- 1 x Power Cord

- 1 x USB Cable

- 1 x User Manual (this document)

- 1 x Calibration Certificate (may vary)

If any items are missing or damaged, please contact your dealer or Hantek customer support immediately.

4. PRODUCT OVERVIEW

4.1 Front Panel Controls and Connectors

The front panel of the DSO2D50 features the display, control buttons, knobs, and input connectors for channels and the arbitrary waveform generator output.

Figure 4.1: Detailed view of the control panel and input connectors.

Key areas include:

- **Display Area:** 7-inch TFT LCD for waveform display and menu navigation.
- **Function Buttons (F0-F6):** Context-sensitive buttons along the right side of the display.
- **Menu Buttons:** Buttons like DEFAULT SETUP, UTILITY, CURSOR, DISPLAY, SAVE TO USB, DECODE, HELP.
- **Vertical Controls:** VOLTS/DIV knobs and CH1 MENU, CH2 MENU, MATH MENU buttons for adjusting vertical scale and channel settings.
- **Horizontal Controls:** SEC/DIV knob and HORIZ MENU, ZOOM buttons for adjusting horizontal scale and time base.
- **Trigger Controls:** TRIGGER LEVEL knob and TRIG MENU, FORCE TRIG buttons for setting trigger conditions.
- **Arbitrary Waveform Generator (AWG) Controls:** WAVE GEN button and EXT TRIG/GEN OUT connector.
- **Channel Inputs:** CH1 and CH2 BNC connectors.
- **External Trigger/AWG Output:** EXT TRIG/GEN OUT BNC connector.
- **USB Host Port:** For connecting USB storage devices.

4.2 Rear Panel Connectors

The rear panel includes the power input and ventilation.

- **AC Power Input:** For connecting the power cord.
- **Ventilation Fan:** For cooling the instrument.

5. SETUP

5.1 Power Connection

1. Ensure the oscilloscope's power switch is in the OFF position.
2. Connect the provided power cord to the AC power input on the rear panel of the oscilloscope.
3. Plug the other end of the power cord into a grounded AC power outlet.

5.2 Probe Connection and Compensation

1. Connect a passive probe to one of the CH1 or CH2 BNC input connectors.
2. Set the probe attenuation switch (if applicable) to 10X.
3. Connect the probe ground clip to the oscilloscope's ground terminal (usually a dedicated terminal or the ground ring of the BNC connector).
4. Connect the probe tip to the probe compensation output (usually a square wave test signal output on the front panel).
5. Power on the oscilloscope.
6. Press the **AUTO SET** button. The oscilloscope will automatically adjust settings to display the compensation signal.
7. Adjust the compensation screw on the probe until a flat-top square wave is displayed on the screen. This ensures accurate measurements.

6. OPERATING INSTRUCTIONS

6.1 Basic Waveform Display

1. Power on the oscilloscope.

2. Connect a compensated probe to CH1.

3. Connect the probe tip to the signal source you wish to measure.

4. Press the **AUTO SET** button. The oscilloscope will automatically adjust the vertical, horizontal, and trigger settings to display a stable waveform.

5. Use the **VOLTS/DIV** knob to adjust the vertical scale (amplitude).

6. Use the **SEC/DIV** knob to adjust the horizontal scale (time base).

7. Use the **POSITION** knobs to move the waveform vertically or horizontally.

6.2 1MΩ/50Ω Impedance Switching

The DSO2D50 supports switching between 1MΩ (high impedance) and 50Ω (low impedance) input impedance. This is crucial for adapting to different measurement scenarios and ensuring signal integrity, especially for high-frequency signals or when matching transmission lines.
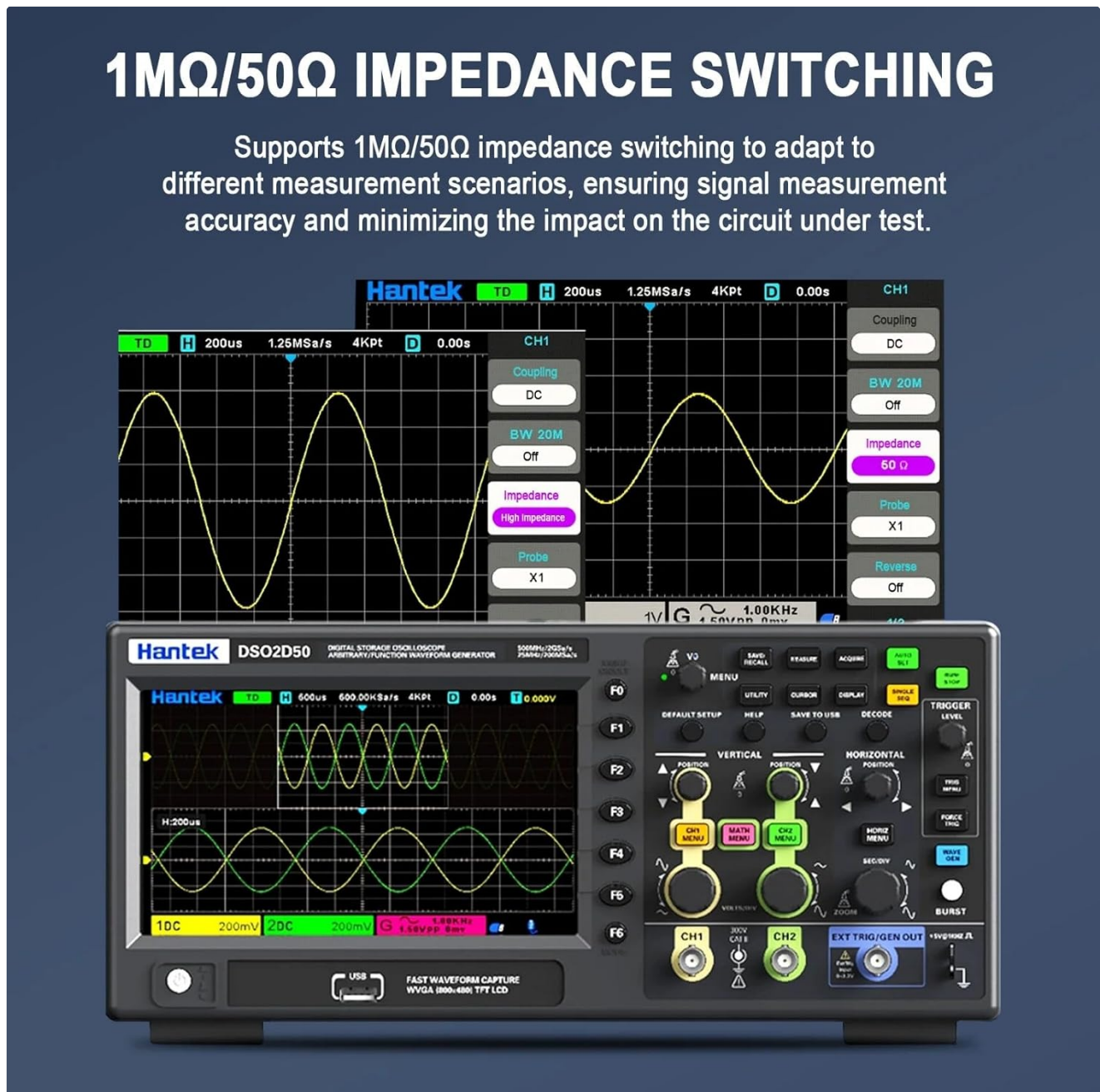

Figure 6.1: Menu for selecting input impedance.

To switch impedance:

1. Press the **CH1 MENU** or **CH2 MENU** button for the desired channel.
2. Navigate through the menu options using the function buttons (F0-F6) until you find the "Impedance" setting.
3. Select either **1MΩ** or **50Ω** as required for your measurement.
4. *Note:* When using 50Ω impedance, ensure your signal source is also 50Ω terminated to prevent reflections.

6.3 Measurement and Statistical Functions

The oscilloscope provides 32 automatic measurement functions and threshold measurement functions. These tools support statistical analysis, allowing you to display five measurement values: current value, average value, maximum value, minimum value, and standard deviation.
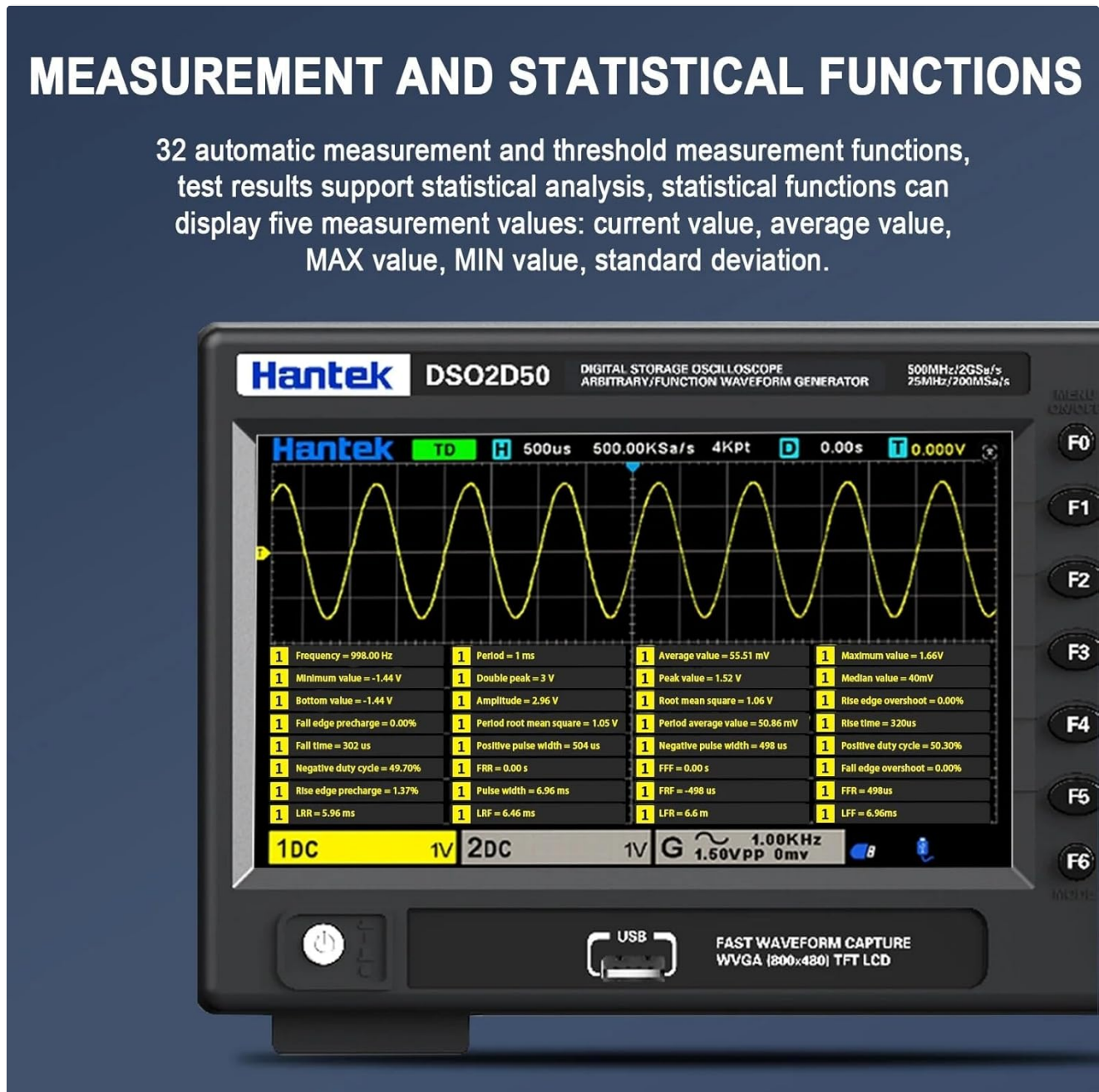

Figure 6.2: Example of automatic measurement display.

To access measurement functions:

1. Press the **MEASURE** button.
2. Use the function buttons to select the desired measurement type (e.g., Frequency, Period, Vpp, Vmax, Vmin,

Rise Time, Fall Time).

3. The selected measurements will appear on the screen.

4. To view statistical values, navigate to the statistical menu within the MEASURE options.

6.4 Built-in Arbitrary Waveform Generator (AWG)

The DSO2D50 includes a 25MHz arbitrary waveform generator capable of outputting five standard waveforms: sine wave, square wave, triangle wave, exponential wave, noise, and DC. It also supports custom arbitrary waveform output.
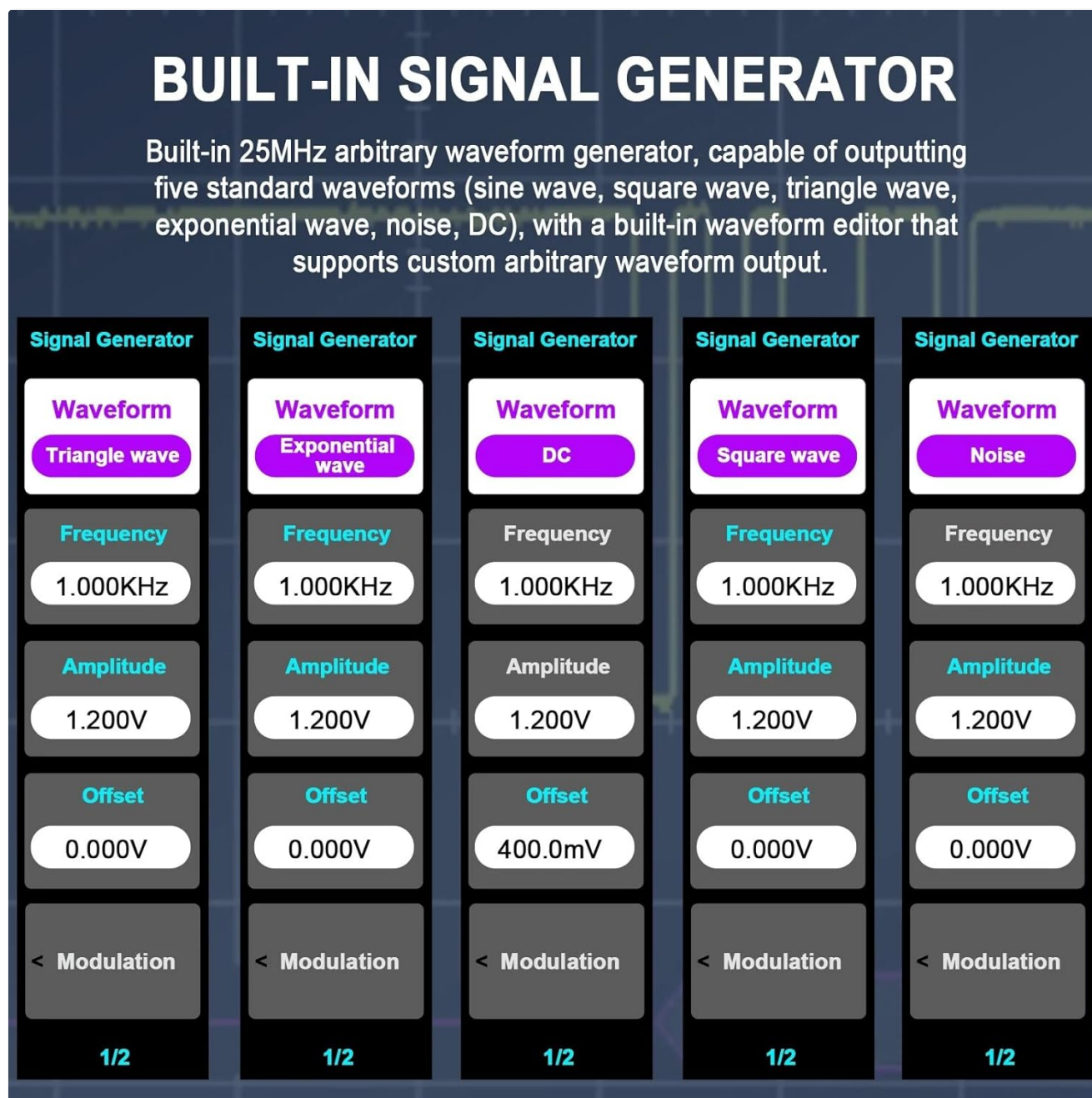

Figure 6.3: Arbitrary Waveform Generator settings interface.

To use the AWG:

1. Connect a BNC cable from the **EXT TRIG/GEN OUT** connector to the input of the device under test or an oscilloscope channel.

2. Press the **WAVE GEN** button.

3. Use the function buttons to select the desired waveform type (Sine, Square, Triangle, etc.).

4. Adjust parameters such as Frequency, Amplitude, and Offset using the corresponding menu options and

knobs.

5. Ensure the AWG output is enabled within the menu.

6.5 Triggering Modes

The oscilloscope offers 9 triggering modes to stabilize and capture specific events in your waveform. Common modes include Edge, Pulse, Video, Slope, and more advanced options for serial bus decoding.
To set up a trigger:

1. Press the **TRIG MENU** button.

2. Select the desired trigger type (e.g., Edge, Pulse).

3. Adjust the trigger source (CH1, CH2, EXT), slope (rising/falling edge), and level using the **TRIGGER LEVEL** knob and menu options.

4. The trigger level is indicated by a horizontal line on the display.

6.6 Data Storage and Recall

The DSO2D50 allows you to save and recall various data types, including CSV files, images, reference waveforms, and waveform data, to a USB storage device.
To save data:

1. Insert a USB flash drive into the USB Host port on the front panel.

2. Press the **SAVE TO USB** button.

3. Select the desired save type (e.g., Image, Waveform, CSV) and file format from the menu.

4. Confirm the save operation.

6.7 Advanced Functions

- **Math Functions:** Perform waveform arithmetic operations (e.g., A+B, A-B, A*B, A/B, FFT) and support cursor measurements for detailed analysis.

- **FFT Scale Display:** Provides a clear display for frequency domain analysis, making it easier to read results.

- **XY Mode:** Use XY mode to analyze the phase relationship between two signals. This is useful for Lissajous figures.

- **Serial Protocol Triggering and Decoding:** Supports protocols such as UART, LIN, CAN, SPI, and IIC, enabling easy analysis of serial bus data.

- **SCPI Remote Control:** Standard SCPI commands are supported for easy system setup and remote control via USB.

7. MAINTENANCE

7.1 Cleaning

- Clean the instrument's exterior with a soft cloth dampened with mild detergent and water.

- Do not use abrasive cleaners or solvents that may damage the casing or display.

- Ensure no liquid enters the instrument.

7.2 Storage

- When not in use for extended periods, store the oscilloscope in a dry, dust-free environment.

- Avoid extreme temperatures and humidity.

- Disconnect all probes and the power cord before storage.

7.3 Calibration

The DSO2D50 is factory calibrated. For continued accuracy, periodic calibration by qualified service personnel is recommended, typically every 1-2 years depending on usage.

8. TROUBLESHOOTING

Problem	Possible Cause	Solution
No display after power on.	Power cord not connected, power switch off, or power supply issue.	Check power cord connection. Ensure power switch is ON. Verify power outlet functionality.
No waveform displayed.	Probe not connected, signal source off, vertical/horizontal scale incorrect, or trigger not set.	Check probe connection. Ensure signal source is active. Press **AUTO SET**. Adjust VOLTS/DIV and SEC/DIV. Check trigger settings.
Unstable waveform.	Incorrect trigger settings.	Adjust trigger level. Change trigger type (e.g., from Auto to Normal). Check trigger source.
Measurements are inaccurate.	Probe compensation incorrect, probe attenuation setting mismatch, or incorrect impedance.	Perform probe compensation. Ensure probe attenuation (1X/10X) matches oscilloscope setting. Verify input impedance (1MΩ/50Ω).
USB storage not recognized.	Incompatible USB drive, drive not formatted correctly, or drive issue.	Try a different USB drive. Ensure drive is formatted to FAT32.

9. SPECIFICATIONS

The following table outlines the key specifications for the Hantek DSO2D50 Digital Storage Oscilloscope.

Parameter	Specification
Model	DSO2D50
Channels	2 Analog Channels + 1 External Trigger Channel
Bandwidth	500 MHz
Sampling Rate	2 GSa/s (Real-time)
Memory Depth	80 Kpts
Arbitrary Waveform Generator	25 MHz (Sine, Square, Triangle, Exponential, Noise, DC)
Vertical Sensitivity	500 µV/div - 10 V/div
Input Impedance	1 MΩ ±2% || 15 pF ±5 pF; 50 Ω ±2%
Max Input Voltage	300 V CAT II (1MΩ)
Display	7-inch TFT LCD

Parameter	Specification
Trigger Modes	Edge, Pulse, Video, Slope, Overtime, Window, Pattern, Interval, UART, LIN, CAN, SPI, IIC
Automatic Measurements	32 types, with statistical analysis
Interface	USB Host, USB Device
Power Supply	100-240V AC, 50/60Hz
Power Consumption	< 50W
Dimensions	(Refer to package dimensions, typically 5.91 x 3.94 x 0.79 inches for package, actual unit size will be larger)
Weight	12.1 pounds (Item Weight)

Note: Specifications are subject to change without notice. For the most current specifications, please refer to the manufacturer's official website.

9.1 Model Comparison

The Hantek DSO2D50 is part of a series of oscilloscopes. The following table provides a comparison with other models in the series, highlighting key differences.

MODEL COMPARISON

Model	Channels	Bandwidth	Sampling Rate	Storage Depth	Signal Source (AFG)	Screen Size
DSO2C10	2 CH	100 MHz	1GSa/S	8M	-	7-inch LCD display
DSO2C15	2 CH	150 MHz	1GSa/S	8M	-	7-inch LCD display
DSO2D10	2 CH + 1CH	100 MHz	1GSa/S	8M	Yes	7-inch LCD display
DSO2D15	2 CH + 1CH	150 MHz	1GSa/S	8M	Yes	7-inch LCD display
DSO2C20	2 CH	200 MHz	2GSa/S	80K	-	7-inch LCD display
DSO2C35	2 CH	350 MHz	2GSa/S	80K	-	7-inch LCD display
DSO2C50	2 CH	500 MHz	2GSa/S	80K	-	7-inch LCD display
DSO2D20	2 CH + 1CH	200 MHz	2GSa/S	80K	Yes	7-inch LCD display
DSO2D35	2 CH + 1CH	350 MHz	2GSa/S	80K	Yes	7-inch LCD display
DSO2D50	2 CH + 1CH	500 MHz	2GSa/S	80K	Yes	7-inch LCD display

Figure 9.1: Model comparison table for Hantek oscilloscopes.

This table helps to understand the DSO2D50's position within the product line, specifically noting its 500MHz bandwidth, 2GSa/s sampling rate, 80K storage depth, and integrated arbitrary function generator (AFG).

10. WARRANTY AND SUPPORT

10.1 Warranty Information

Hantek products are typically covered by a limited warranty against defects in materials and workmanship. The specific warranty period and terms may vary by region and product. Please refer to the warranty card included with your product or visit the official Hantek website for detailed warranty information.
Keep your purchase receipt as proof of purchase for warranty claims.

10.2 Customer Support

For technical assistance, troubleshooting, or service inquiries, please contact Hantek customer support:

- **Manufacturer:** Qingdao Hantek Electronic Co., Ltd

- **Address:** #35 Building, No. 780 Baoyuan Road, High-tech Zone, Qingdao, Shandong, China 266114
- **Website:** (Please refer to the official Hantek website for contact forms or email addresses)

When contacting support, please have your product model (DSO2D50) and serial number ready.