OWON SDS220S

OWON SDS220S-200MHz Desktop Oscilloscope User Manual

Model: SDS220S

1. Introduction

The OWON SDS220S-200MHz is a high-performance dual-channel desktop oscilloscope integrated with a 25MHz waveform generator. This device features a 200MHz bandwidth, 1GSa/s sample rate, and a 20M record length, making it suitable for various electronic measurement and analysis tasks. It supports 30 automatic waveform measurements, FFT Spectrum Analysis, and PC communication via USB for remote control and secondary development using SCPI and LabVIEW. This manual provides essential information for the safe and effective operation of your SDS220S-200MHz oscilloscope.

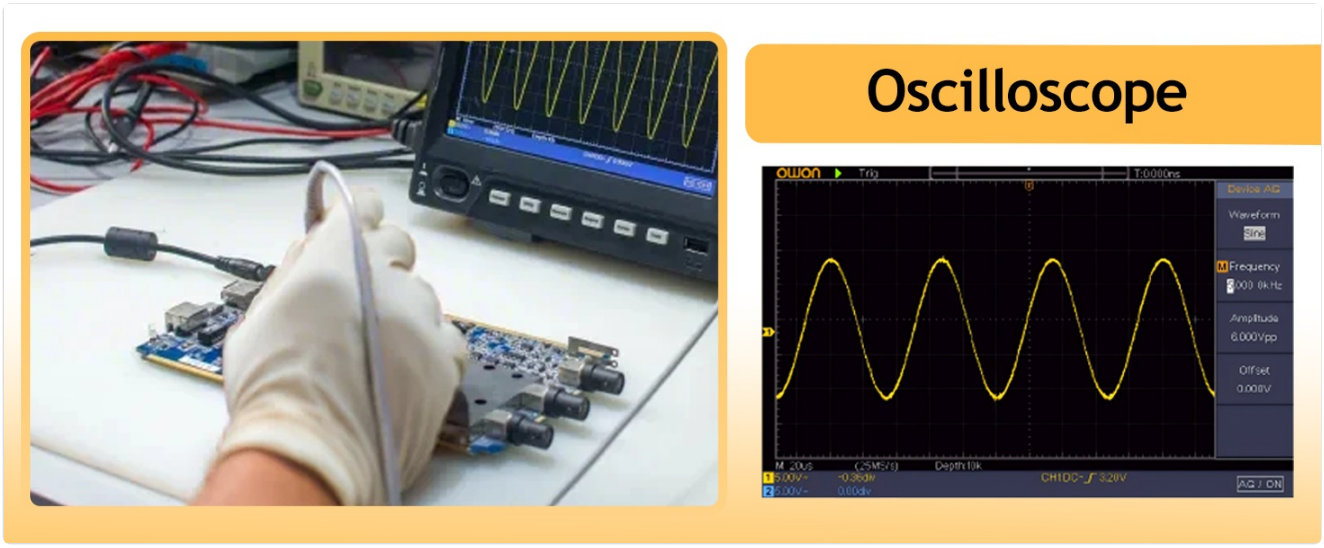


Figure 1.1: OWON SDS220S-200MHz Multifunctional Digital Oscilloscope overview, highlighting its 2 channels, 20M record length, 1GSa/s real-time sample rate, and 25MHz waveform generator.

2. Safety Information

To prevent electric shock or personal injury, and to avoid damage to the oscilloscope or connected equipment, observe the following safety precautions:

- **Proper Grounding:** Ensure the oscilloscope is properly grounded. The instrument is grounded through the power cord's grounding conductor. To avoid electric shock, the grounding conductor must be connected to earth ground.
- **Connect and Disconnect Properly:** Connect the probe output to the oscilloscope input before connecting the probe

to the circuit under test. Disconnect the probe from the circuit under test before disconnecting it from the oscilloscope.

- **Observe All Terminal Ratings:** To prevent fire or shock hazard, observe all ratings and markings on the instrument. Consult the product manual for more information about ratings before making connections to the instrument.
- **Use Proper Probes:** Use only probes supplied with the instrument or recommended by the manufacturer. Ensure probes are rated for the voltage and current being measured. The included P4250 High Voltage Probe has a 100:1 attenuation ratio and is rated for 2KV Working Voltage (Vp-p).
- **Avoid Exposed Circuitry:** Do not touch exposed connections or components when power is present.
- **Do Not Operate with Suspected Failures:** If you suspect damage to the instrument, have it inspected by qualified service personnel.
- **Maintain Dry Conditions:** Do not operate the instrument in wet or damp conditions.
- **Operate in a Well-Ventilated Area:** Ensure proper ventilation to prevent overheating.

3. Product Overview

3.1 Key Features

- 200MHz Bandwidth, Dual Channel
- 1GSa/s Sample Rate (Dual-channel Independent)
- 20M Record Length
- Built-in 25MHz Waveform Generator (1CH AWG, 125MSa/s Real-time Sample Rate, 8K Arbitrary waveform length)
- 7-inch TFT LCD (800*480 pixels resolution)
- Support for 30 Automatic Waveform Measurements
- FFT Spectrum Analysis
- SCPI and LabVIEW support for remote control and secondary development
- USB Device interface for PC communication
- 16 Waveform Storage locations
- Frequency Counter
- Compact and lightweight design (1.1KG / 2.42 lbs)

3.2 Front Panel Components

High Voltage Probe

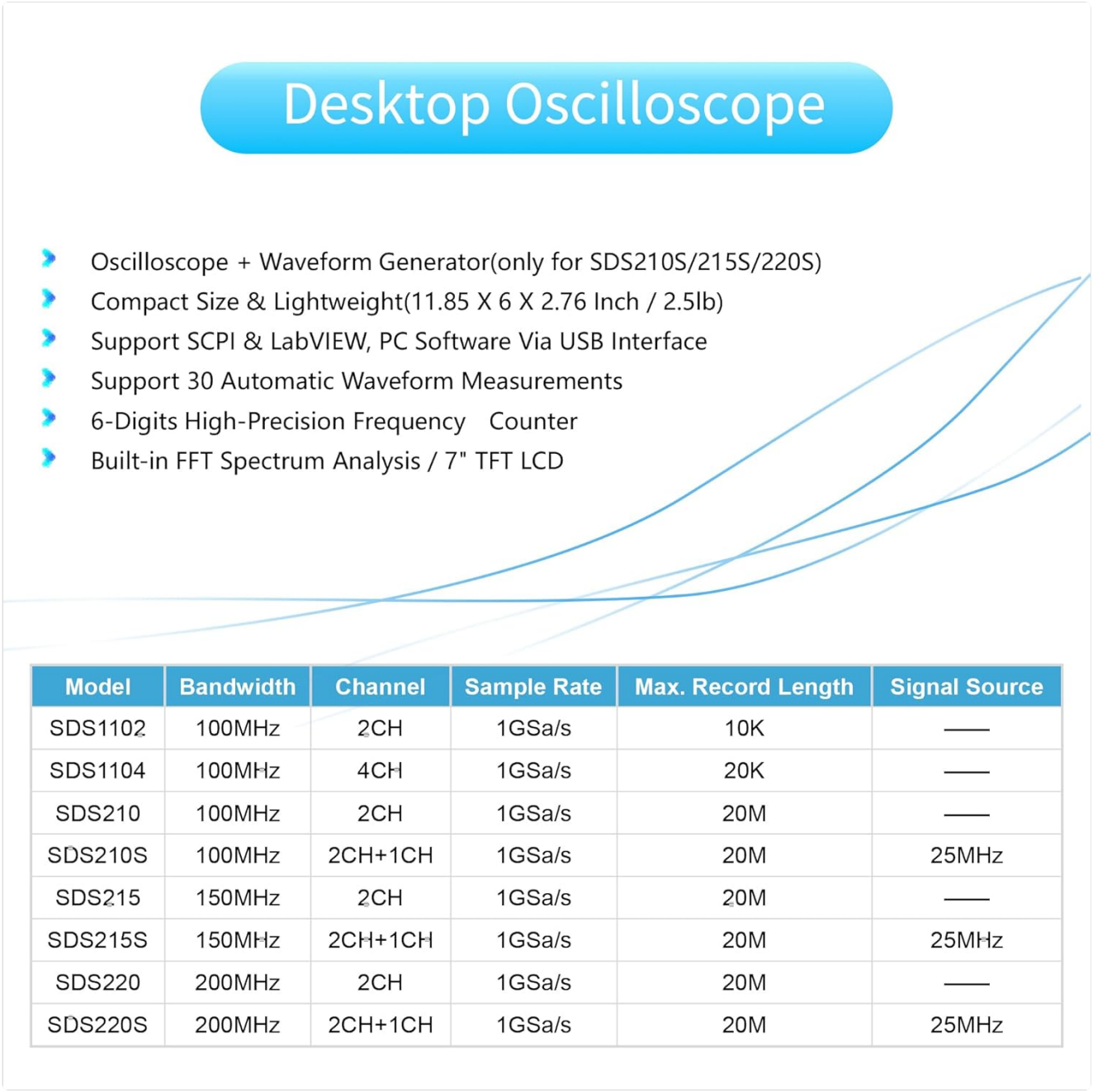
- Extra Accessory

Model : P4250

Bandwidth	250MHz	Attenuation	100:1
Rise Time	1.4ns	Input Resistance	100MΩ ±2%
Input Capacitance	5pF	Compensation Range	10pF-35pF
Max Input Voltage	2KV Working Voltage(Vp~p)		
Temp Operating	-10°C~55°C		
Humidity	-40°C or below ≤90% + 41°C to +50°C ≤60%		
Altitude	Operating 3000m / Non-operating 15000m		

Figure 3.1: Front panel of the SDS220S, showing the display, button and knob control area, power switch, function keys, probe compensation output, oscilloscope signal input ports (CH1, CH2), and signal generator output port.

3.3 Rear Panel Components



Model	Bandwidth	Channel	Sample Rate	Max. Record Length	Signal Source
SDS1102	100MHz	2CH	1GSa/s	10K	——
SDS1104	100MHz	4CH	1GSa/s	20K	——
SDS210	100MHz	2CH	1GSa/s	20M	——
SDS210S	100MHz	2CH+1CH	1GSa/s	20M	25MHz
SDS215	150MHz	2CH	1GSa/s	20M	——
SDS215S	150MHz	2CH+1CH	1GSa/s	20M	25MHz
SDS220	200MHz	2CH	1GSa/s	20M	——
SDS220S	200MHz	2CH+1CH	1GSa/s	20M	25MHz

Figure 3.2: Rear panel of the SDS220S, illustrating the foldable handle, ventilation holes, power socket, USB Device interface for PC connection, and the integrated stand.

3.4 Included Accessories: P4250 High Voltage Probe

The SDS220S includes an extra P4250 High Voltage Probe. This probe is designed for high voltage measurements and features:

- Bandwidth: 250MHz
- Attenuation Ratio: 100:1
- Input Resistance: 100MΩ
- Max Input Voltage: 2KV Working Voltage (Vp-p)

Figure 3.3: The P4250 High Voltage Probe, an included accessory, with its detailed specifications table.

4. Setup

4.1 Unpacking and Inspection

1. Carefully remove the oscilloscope and all accessories from the packaging.
2. Inspect the device for any signs of damage during transit. If damage is found, contact your supplier immediately.
3. Verify that all items listed in the packing list are present.

4.2 Power Connection

1. Connect the provided power cord to the power socket on the rear panel of the oscilloscope.
2. Plug the other end of the power cord into a grounded AC power outlet. Ensure the power supply voltage matches the requirements specified on the device label.

4.3 Initial Power-On

1. Press the power switch located on the front panel to turn on the oscilloscope.

2. The device will perform a self-test and display the startup screen.

4.4 Probe Connection and Compensation

1. Connect the BNC connector of the oscilloscope probe to one of the input channels (CH1 or CH2) on the front panel.
2. Attach the probe tip to the probe compensation output (5V/1kHz signal) on the front panel.
3. Adjust the compensation trimmer on the probe until a flat-top square wave is displayed on the screen. This ensures accurate measurements.

5. Operating Instructions

5.1 Basic Oscilloscope Operation

The SDS220S allows for precise visualization and analysis of electrical signals.

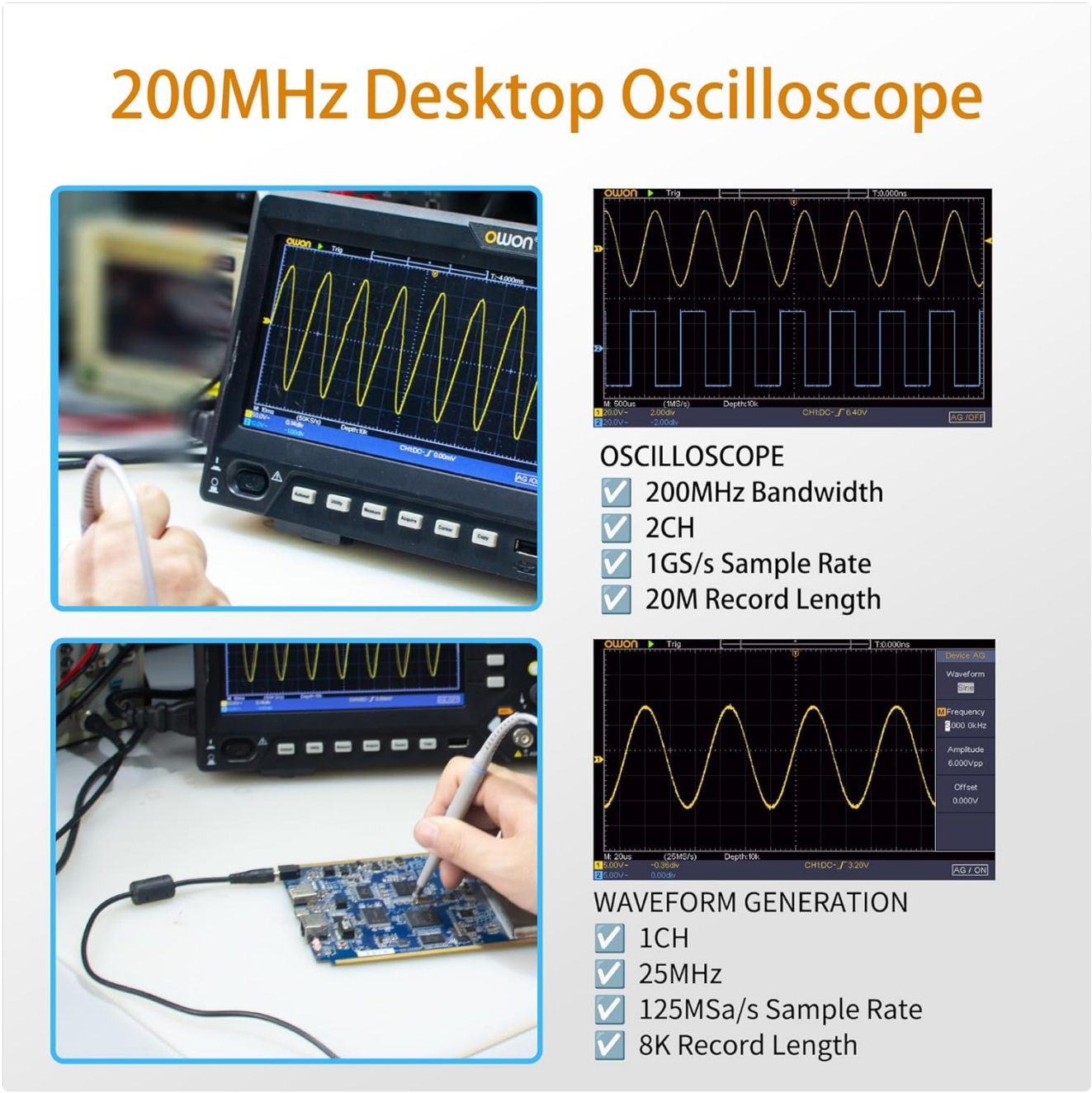


Figure 5.1: The SDS220S oscilloscope in operation, displaying a waveform on its screen while connected to a circuit.

1. **Connecting to a Circuit:** Connect the compensated probe to the desired test point on your circuit.
2. **Vertical Scale (Volts/Div):** Use the **Vertical** knob to adjust the vertical sensitivity, changing the voltage scale per

division on the display.

3. **Vertical Position:** Use the **Position** knob in the Vertical section to move the waveform up or down on the screen.
4. **Horizontal Scale (Time/Div):** Use the **Horizontal** knob to adjust the time base, changing the time scale per division.
5. **Horizontal Position:** Use the **Position** knob in the Horizontal section to shift the waveform left or right.
6. **Triggering:** The **Trigger** section controls when the oscilloscope starts acquiring data. Adjust the trigger level to stabilize the waveform. The SDS220S supports Edge and Video trigger types.
7. **Automatic Measurements:** Press the **Measure** button to access the automatic measurement menu. The SDS220S supports 30 types of automatic measurements (e.g., Period, Frequency, Vpp, Vmax, Vmin, Rise Time, Fall Time).

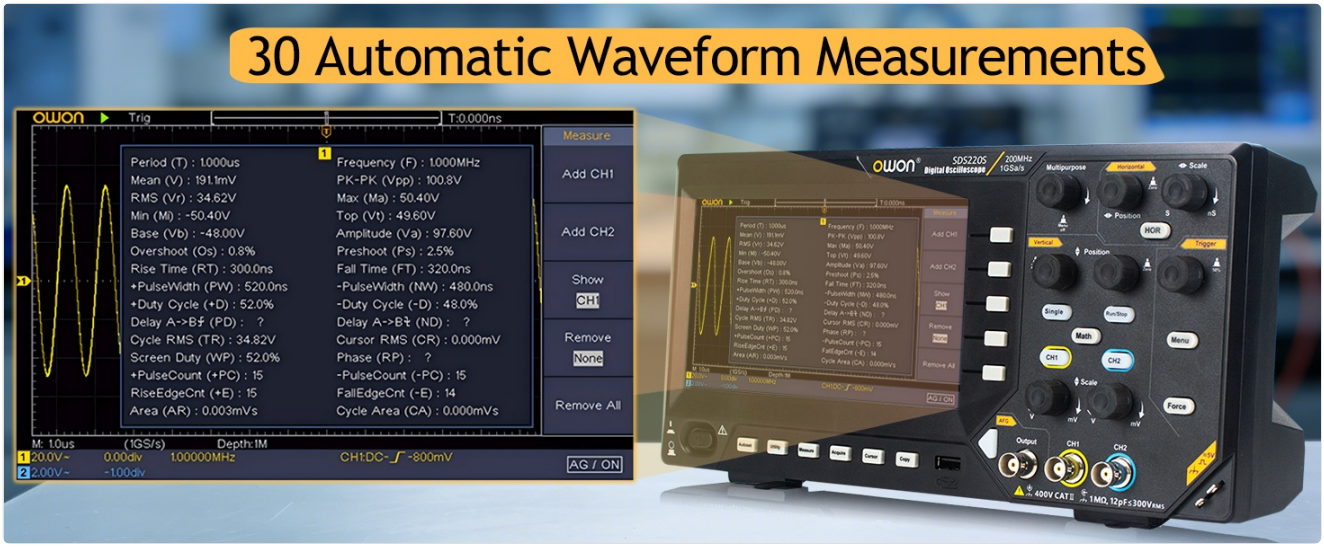


Figure 5.2: The SDS220S displaying the menu for 30 automatic waveform measurements, allowing for detailed signal analysis.

5.2 Waveform Generator Operation

The built-in 25MHz waveform generator can produce various standard and arbitrary waveforms.

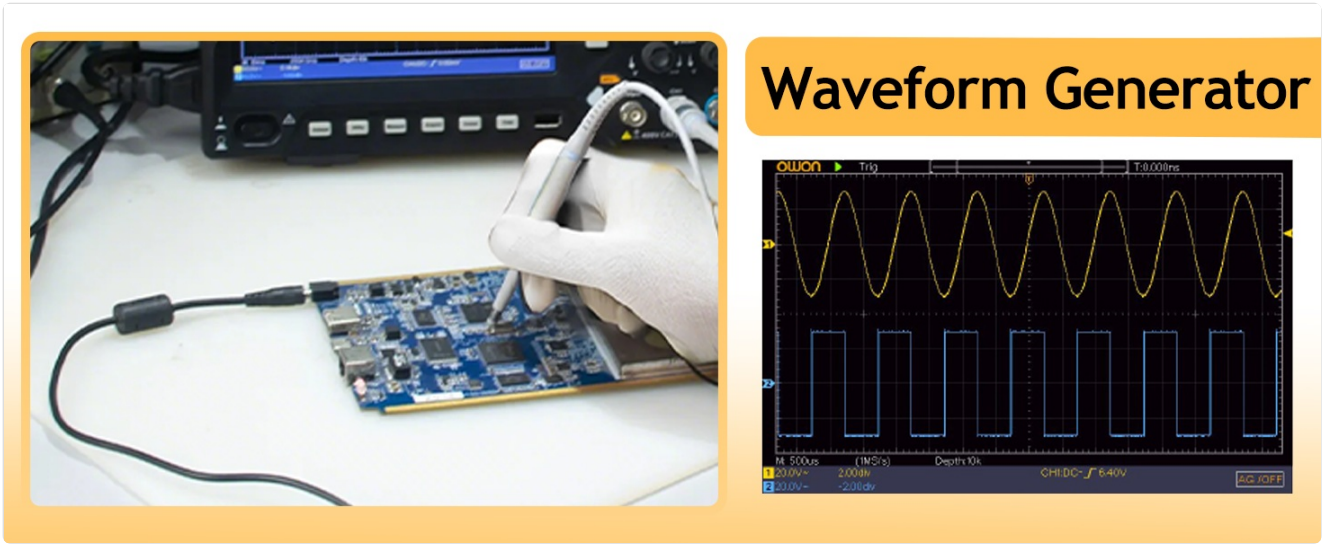


Figure 5.3: The SDS220S functioning as both an oscilloscope (left) and a waveform generator (right), demonstrating its dual capabilities.

1. **Connect Output:** Connect the signal generator output port to the desired input of your circuit or to an oscilloscope channel for monitoring.
2. **Select Waveform:** Use the function keys to select the desired waveform type (Sine, Square, Ramp, Pulse, Arbitrary). The SDS220S offers 5 standard waveforms and over 160 kinds of arbitrary waveforms.
3. **Adjust Parameters:** Use the control knobs and menu options to set the frequency (up to 25MHz), amplitude (5mVpp to 3Vpp), and DC offset of the generated waveform.

5.3 Advanced Features

- **FFT Spectrum Analysis:** Press the **Math** button and select FFT to analyze the frequency components of a signal.
- **X-Y Mode:** This mode is used to display the relationship between two signals, often for phase comparison.
- **Save/Recall:** The oscilloscope allows saving and recalling up to 16 waveforms for later analysis or comparison.
- **PC Connectivity:** Connect the oscilloscope to a PC via the USB Device interface for remote control and data transfer. The device supports SCPI commands and LabVIEW for custom applications.

Figure 5.4: The SDS220S connected to a laptop via USB, demonstrating its capability for remote control and secondary development using SCPI and LabVIEW software.

6. Maintenance

6.1 Cleaning the Device

To maintain the performance and appearance of your oscilloscope:

- Disconnect the power cord before cleaning.
- Use a soft cloth dampened with a mild detergent solution to clean the exterior surfaces. Do not use abrasive cleaners or solvents.
- For the display, use a soft, lint-free cloth specifically designed for screens.
- Ensure no liquid enters the device through ventilation holes or ports.

6.2 Probe Care

- Store probes carefully to prevent damage to the tips or cables.
- Regularly check probe cables for cuts or damage. Replace damaged probes immediately.
- Recalibrate probes periodically, especially after significant temperature changes or if measurements appear inaccurate.

7. Troubleshooting

This section provides solutions to common issues you might encounter.

Problem	Possible Cause	Solution

Problem	Possible Cause	Solution
No power	Power cord not connected; Power outlet faulty; Device fuse blown	Check power cord connection; Test power outlet; Contact service for fuse replacement.
No waveform displayed	Probe not connected; Input signal too small/large; Trigger settings incorrect; Channel turned off	Ensure probe is connected to input and circuit; Adjust Vertical Scale (Volts/Div); Adjust trigger level and mode; Ensure channel is enabled.
Distorted waveform	Probe compensation incorrect; Probe bandwidth insufficient; Signal integrity issues	Perform probe compensation; Use a probe with appropriate bandwidth (e.g., P4250 for high frequency); Check signal source.
Waveform unstable	Trigger level or mode incorrect; Noise in signal	Adjust trigger level and mode; Use averaging mode to reduce noise.
Waveform generator output not working	Output cable not connected; Output enabled setting incorrect; Parameters set to zero	Connect output cable; Ensure waveform generator output is enabled in menu; Check frequency and amplitude settings.

8. Specifications

8.1 Oscilloscope Parameters

Parameter	Specification
Analog Bandwidth	200MHz
Channels	2
Sampling Rate	1GSa/s
Max Record Length	20M
Input Coupling	DC, AC, Ground
Vertical Sensitivity Range	2 mV/div ~ 10 V/div
Vertical Resolution	8 bits (2 Channels Simultaneously)
Waveform Storage	16 Waveforms
Trigger Type	Edge, Video
Time Base Range	2ns/div ~ 1000s/div, Step by 1-2-5
Waveform Math	+, -, ×, ÷, FFT
Input Impedance	1MΩ±2%, In Parallel with 20 pF±5 pF
Scan Modes	Normal, Peakdetect, Averaging
Communication Interface	USB Host and Device

8.2 Waveform Generator Parameters

Parameter	Specification
Max Frequency Output	25MHz
Channels	1CH AWG
Sample Rate	125MSa/s
Arbitrary Waveform Length	8K
Output Amplitude	5mVpp to 3 Vpp (50Ω)
Vertical Resolution	14bits
Standard Waveforms	Sine, Square, Ramp Wave, Pulse Wave, Arbitrary Wave
Arbitrary Waveforms	Sinc, Exponential Rise, Exponential Decline, Gaussian, more than 160 kinds
DC Offset	±(3V) (High Resistance)

8.3 General Specifications

Parameter	Specification
Display	7-inch TFT LCD (800*480 pixels)
Product Dimensions	11.85 x 2.76 x 6 inches (301 x 70 x 152 mm)
Item Weight	2.42 pounds (1.1 KG)
Operating Temperature	-10°C ~ 55°C
Operating Humidity	≤90% (41°C) to ≤60% (50°C)
Operating Altitude	3000m

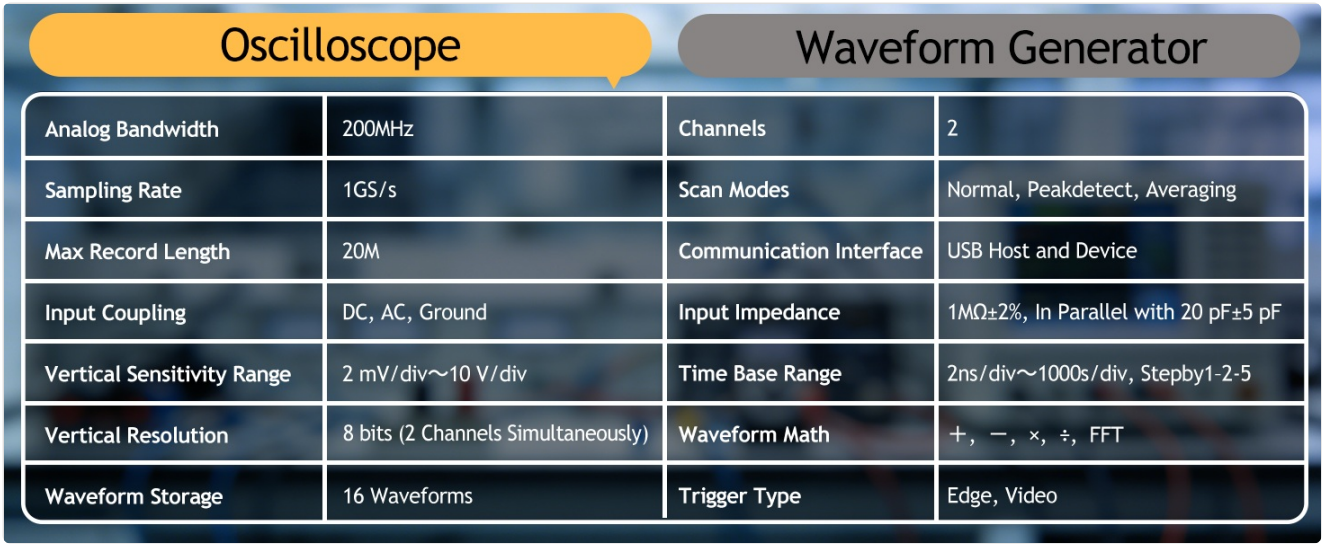


Figure 8.1: A comprehensive table detailing the specifications for both the oscilloscope and waveform generator functions of the SDS220S.

Figure 8.2: The physical dimensions of the OWON SDS220S, highlighting its compact and ultra-thin body design.

9. Warranty and Support

9.1 Warranty Information

OWON products are manufactured under strict quality standards. This product is covered by a limited warranty against defects in materials and workmanship. The specific warranty period and terms may vary by region and retailer. Please retain your proof of purchase for warranty claims.

9.2 Technical Support

For technical assistance, troubleshooting, or service inquiries, please contact your local OWON distributor or refer to the official OWON website for support resources and contact information. When contacting support, please have your product model (SDS220S) and serial number available.