

OWON SDS210

Owon SDS210 Digital Oscilloscope User Manual

Model: SDS210

1. INTRODUCTION

The Owon SDS210 is a high-performance 100 MHz, 2-channel digital oscilloscope designed for accurate signal analysis. With a real-time sampling rate of 1 GS/s and a 20M record length, it provides comprehensive waveform capture and analysis capabilities. This manual provides essential information for setting up, operating, and maintaining your SDS210 oscilloscope.

- **100 MHz Bandwidth:** Capable of analyzing signals up to 100 MHz.
- **2 Channels:** Allows simultaneous analysis of two signals.
- **1 GS/s Real-time Sampling Rate:** Ensures detailed capture of transient events.
- **20M Record Length:** Provides extensive waveform storage for in-depth analysis.
- **7-inch TFT LCD Display:** Clear visualization of waveforms and measurement data.
- **30 Automatic Measurements:** For quick and precise waveform parameter analysis.
- **FFT Spectrum Analysis:** Advanced signal analysis in the frequency domain.
- **USB Connectivity:** Supports USB Host and USB Device interfaces for data transfer and PC control.

2. SAFETY INFORMATION

Please read and understand all safety instructions before operating the device. Failure to follow these instructions may result in injury or damage to the instrument.

- Use only the power adapter supplied with the instrument.
- Do not operate the oscilloscope in wet or damp conditions.
- Ensure proper ventilation to prevent overheating.
- Do not attempt to repair or modify the instrument yourself. Refer all servicing to qualified personnel.
- Always connect the probe ground lead to earth ground before connecting the probe tip to the circuit under test.
- Observe all voltage ratings and input limits specified for the oscilloscope and probes.

3. PRODUCT OVERVIEW

3.1 Front Panel

The front panel features the main display, control buttons, and input connectors.

Model	SDS210/SDS210S	SDS215/SDS215S	SDS220/SDS220S
Bandwidth	100MHz	150MHz	200MHz
Sample Rate	Max 1GS/s		
Acquisition Mode	Normal, Peak detect, Averaging		
Input Coupling	DC, AC, Ground		
Input Impedance	1M Ω +2%, in parallel with 20 pF \pm 5 pF		
Probe Attenuation Factor	1X, 10X, 100X, 1000X		
Record length	20M		
Horizontal Scale (s/div)	2 ns/div-1000 s/div, step by 1-2-5		
Vertical Sensitivity	2 mV/div~10 V/div		
Automatic Measurement	Period, Frequency, Mean, PK-PK, RMS, Max, Min, Top, Base, Amplitude, Overshoot, Preshoot, Rise Time, Fall Time, +PulseWidth, -PulseWidth, +Duty Cycle, -Duty Cycle, Delay A \rightarrow B $\overline{\uparrow}$, Delay A \rightarrow B $\overline{\downarrow}$, Cycle RMS, Cursor RMS, Screen Duty, Phase, +PulseCount, -PulseCount, RiseEdgeCnt, FallEdgeCnt, Area, and Cycle Area.		
Waveform Math	+, -, x, \div , FFT		
Waveform Storage	16 waveforms		
Lissaiou's Figure	Bandwidth	full bandwidth	
	Phase Difference	\pm 3 degrees	
Trigger Type	Edge, Video		
Communication Interface	USB Host and Device		
Frequency Counter	available		
Waveform Generator Specifications (only for SDS210S, SDS215S, SDS220S)			
Standard Waveforms	Sine wave, square wave, ramp wave, pulse wave, arbitrary wave		
Arbitrary Waveforms	Sinc, exponential rise, exponential decline, Gaussian more than 160 kinds		
Sine wave	0.1Hz~25MHz		
Square wave	0.1Hz~ 5MHz		
Ramp wave	0.1Hz~1MHz		
Pulse wave	0.1Hz~5MHz		
Arbitrary Waveform	0.1Hz~5MHz		
Sample rate	125MSa/s		
Amplitude(50 Ω)	0.005Vpp ~3Vpp		
DC Offset Range	\pm (3V)(high resistance)		
Channel	1		
Waveform Length	8k		
Vertical Resolution	14 bit		
Load Impedance	50 Ω		

Figure 3.1: Front and Rear Panel Layout with Key Components. This image shows the Power Switch, Function Keys, Button and Knob Control Area, Oscilloscope Signal Input Ports (CH1, CH2), Probe Compensation Output, USB Host Interface, Foldable Handle, Ventilation Holes, Power Socket, and USB Device Interface.

- **Power Switch:** Turns the oscilloscope on or off.
- **Function Keys:** Access various menus and settings.
- **Button and Knob Control Area:** Includes controls for vertical, horizontal, trigger, and menu navigation.
- **Oscilloscope Signal Input Port (CH1, CH2):** BNC connectors for connecting probes to input signals.
- **Probe Compensation Output:** 5V/1kHz signal output for probe calibration.
- **USB Host Interface:** For connecting USB storage devices to save or retrieve data.

3.2 Rear Panel

The rear panel includes the power input and additional connectivity options.

- **Foldable Handle:** For easy portability.
- **Ventilation Holes:** Essential for heat dissipation.
- **Power Socket:** Connects to the AC power supply.
- **USB Device Interface:** Used to connect the oscilloscope to a PC for data transmission and remote control.

4. SETUP

4.1 Unpacking

Carefully remove the oscilloscope and all accessories from the packaging. Verify that all components listed in the packing list are present and undamaged. Keep the original packaging for future transport or storage.

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.

4.3 Probe Connection

Connect the oscilloscope probes to the CH1 and CH2 BNC input ports on the front panel. Ensure the connectors are securely twisted into place.

4.4 Probe Compensation

Before taking measurements, it is crucial to compensate your probes to ensure accurate readings. This process matches the probe's capacitance to the oscilloscope's input capacitance.

1. Set the probe attenuation to 10X.
2. Connect the probe tip to the Probe Compensation Output terminal (5V/1kHz) on the front panel.
3. Connect the probe's ground clip to the ground terminal next to the compensation output.
4. Press the AUTO button to automatically adjust the waveform.
5. Observe the square wave displayed on the screen. Adjust the trimmer capacitor on the probe until the square wave corners are flat, without overshoot or undershoot.

4.5 PC Connection (USB Device Interface)

To connect the oscilloscope to a computer for remote control or data transfer:

1. Use a standard USB cable to connect the USB Device Interface port on the rear panel of the oscilloscope to a USB port on your computer.
2. Install the necessary drivers and software provided by OWON for your specific operating system.

5. BASIC OPERATION

5.1 Powering On/Off

Press the Power Switch on the front panel to turn the oscilloscope on. Press it again to turn it off.

5.2 Display Overview

The SDS210 features a 7-inch TFT LCD display that provides a clear view of waveforms, measurement results, and instrument settings.

7-inch TFT LCD display

All signals and screen information can be clearly viewed. It has the same-screen display function, which can zoom in and observe signal details.

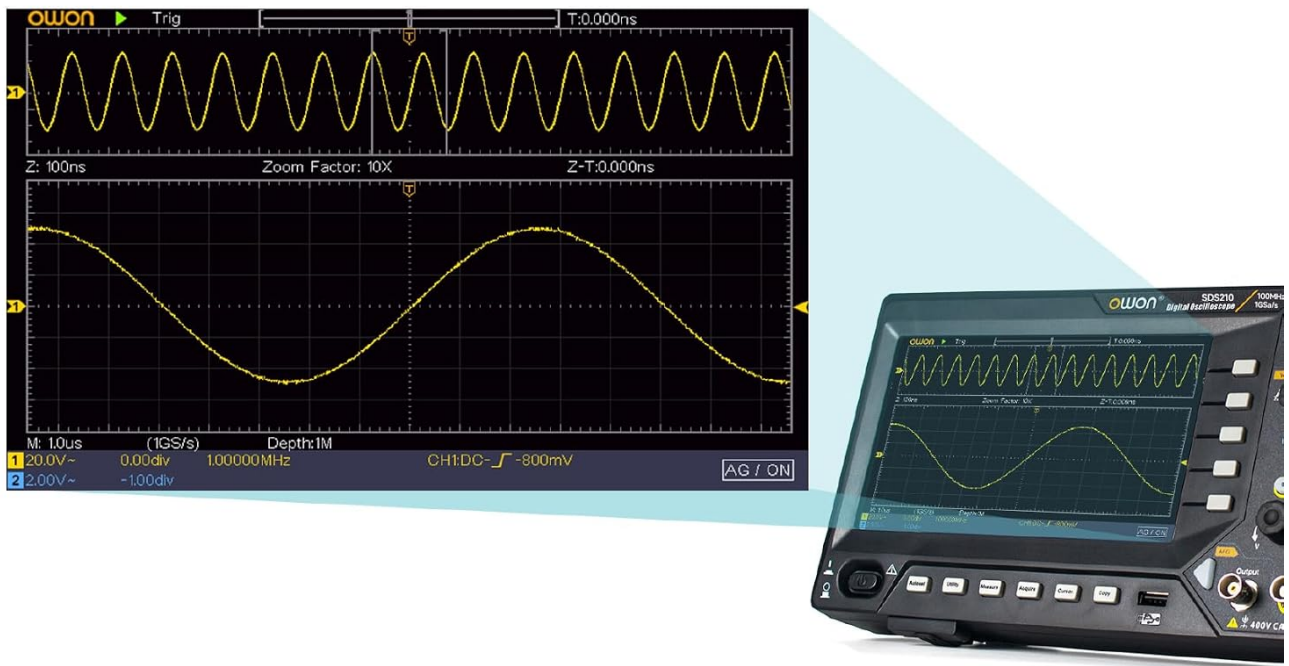


Figure 5.2: 7-inch TFT LCD Display. All signals and screen information can be clearly viewed. It has a same-screen display function, which can zoom in and observe signal details.

5.3 Basic Waveform Display

After connecting a signal to an input channel, press the AUTO button. The oscilloscope will automatically adjust the vertical, horizontal, and trigger settings to display a stable waveform.

5.4 Vertical Controls

The vertical controls adjust the amplitude and position of the waveform.

- **Vertical Position Knob:** Moves the waveform up or down on the screen.
- **Vertical Scale Knob (V/div):** Adjusts the vertical sensitivity (volts per division).
- **CH1/CH2 Buttons:** Selects the active channel for adjustments or turns channels on/off.

5.5 Horizontal Controls

The horizontal controls adjust the time base and position of the waveform.

- **Horizontal Position Knob:** Moves the waveform left or right on the screen.
- **Horizontal Scale Knob (s/div):** Adjusts the time base (seconds per division).

5.6 Trigger Controls

The trigger controls stabilize repetitive waveforms and capture single-shot events.

- **Trigger Level Knob:** Sets the voltage level at which the trigger occurs.
- **Trigger Menu Button:** Accesses trigger settings such as edge, pulse, video, and slope.
- **Force Button:** Forces a trigger event.

6. ADVANCED FEATURES

Support remote control and secondary development

Communicate with PC via USB Device interface, support SCPI and LabVIEW functions, provide free computer software and some programming development demos, so you can remotely control the instrument and conduct secondary development

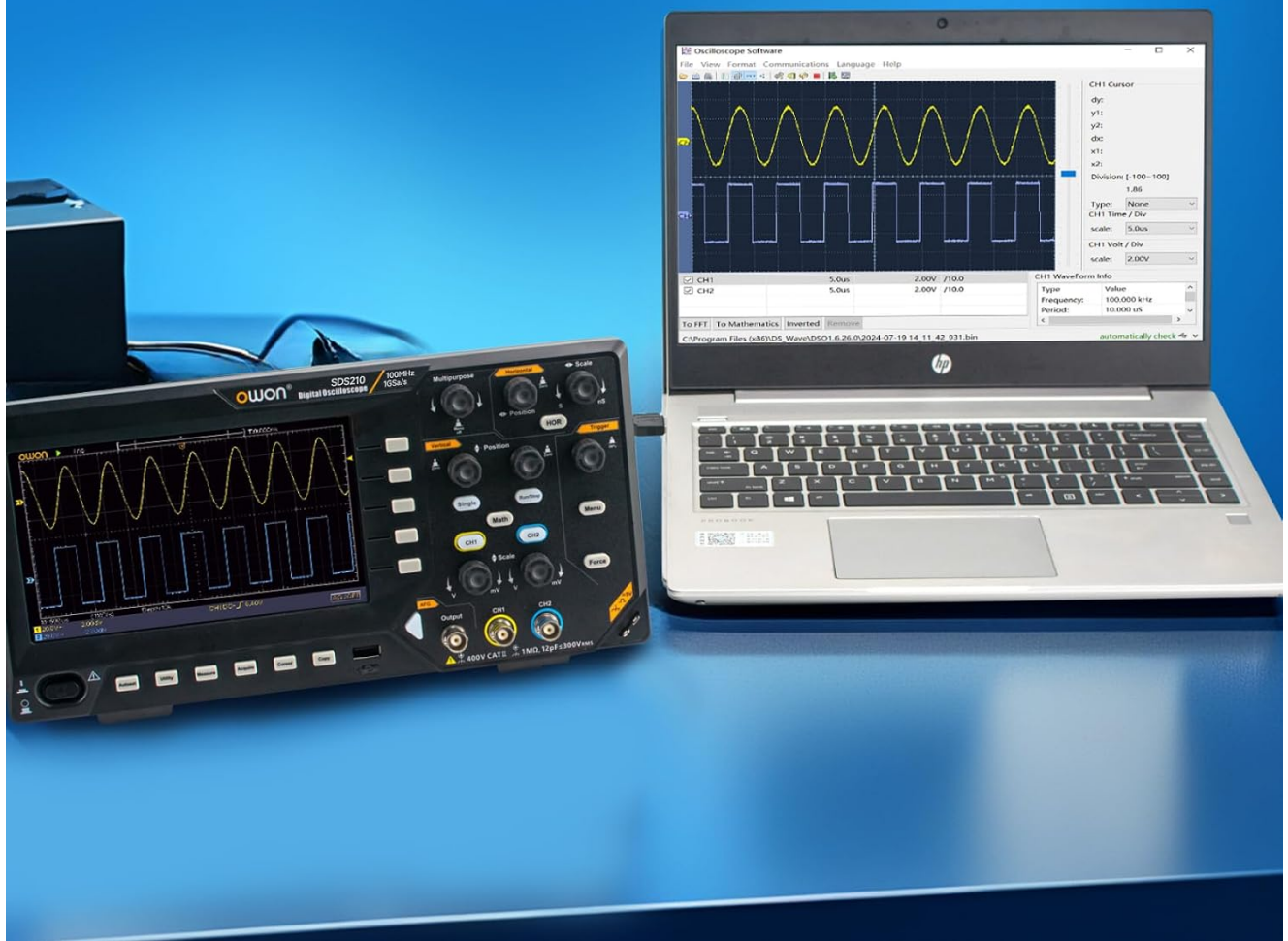


Figure 6.0: Advanced Measurement and Analysis Modes. This image illustrates the 6-digit High-precision Frequency counter, FFT Spectrum Analysis, Cursor Measurements, 30 Automatic Waveform Measurements, Save/Recall functions, and X-Y mode.

6.1 Automatic Measurements

The SDS210 offers 30 types of automatic waveform measurements for quick and accurate analysis of signal parameters. Press the MEASURE button to access the automatic measurement menu.

- Common measurements include Period, Frequency, Mean, Peak-PK, RMS, Max, Min, Top, Base, Amplitude, Overshoot, Preshoot, Rise Time, Fall Time, Pulse Width, Delay, Duty Cycle, and more.

6.2 FFT Spectrum Analysis

Perform Fast Fourier Transform (FFT) to analyze signals in the frequency domain. This is useful for identifying harmonics, distortion, and noise components.

1. Press the MATH button.
2. Select 'FFT' from the Math menu.
3. Adjust the FFT settings such as source, window type, and display format.

6.3 Cursor Measurements

Use cursors to manually measure specific points on a waveform. Press the CURSOR button to activate and control the cursors.

- **Voltage Cursors:** Measure voltage differences (ΔV).
- **Time Cursors:** Measure time differences (ΔT).

6.4 Save/Recall Waveforms

The oscilloscope allows you to save and recall waveform data and instrument settings to internal memory or a connected USB drive.

1. Press the SAVE button to access saving options.
2. Select the desired save type (waveform, setup, image) and destination (internal, USB).

6.5 X-Y Mode

X-Y mode is used to display the relationship between two signals, often for phase comparison or Lissajous figures.

1. Ensure signals are connected to CH1 and CH2.
2. Access the Display menu and select X-Y mode.

6.6 Remote Control and Software

The SDS210 supports remote control and secondary development via its USB Device Interface, utilizing SCPI (Standard Commands for Programmable Instruments) and LabVIEW functions. Free computer software and programming development demos are available to facilitate remote instrument control.



Figure 6.6: Remote Control and Secondary Development. Communicate with a PC via the USB Device interface, supporting SCPI and LabVIEW functions. Free computer software and programming development demos are provided for remote control and secondary development.

7. MAINTENANCE

7.1 Cleaning

To clean the instrument, use a soft cloth dampened with a mild detergent. Do not use abrasive cleaners or solvents that could damage the casing or display. Ensure the instrument is powered off and disconnected from the power

source before cleaning.

7.2 Storage

When not in use for extended periods, store the oscilloscope in a dry, dust-free environment. Use the original packaging for protection during storage or transport.

7.3 Ventilation

The oscilloscope is equipped with ventilation holes on the rear panel to prevent overheating. Ensure these holes are not obstructed during operation to allow for proper airflow.

8. TROUBLESHOOTING

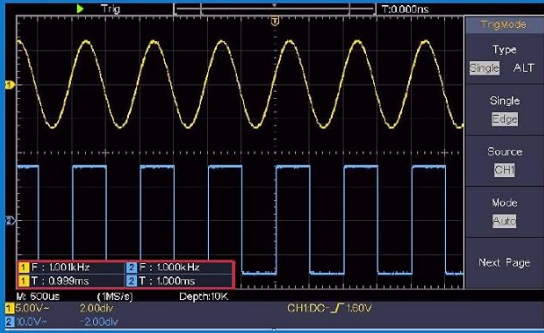
This section provides solutions to common issues you might encounter.

- **No Power:** Check the power cord connection and the power outlet. Ensure the power switch is in the 'ON' position.
- **No Waveform Display:** Verify that a signal is connected to the input channel. Check probe connections and ensure the channel is enabled. Press the AUTO button to automatically adjust settings.
- **Unstable Waveform:** Adjust the trigger level and trigger settings (e.g., edge, slope). Ensure the trigger source is correctly selected.
- **Inaccurate Measurements:** Perform probe compensation as described in Section 4.4. Check the probe attenuation setting on both the probe and the oscilloscope.
- **USB Connection Issues:** Ensure the correct drivers are installed on your PC. Try a different USB cable or port.

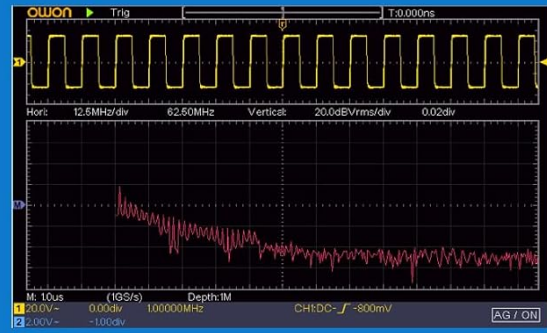
If the problem persists, contact OWON customer support or your local distributor for assistance.

9. SPECIFICATIONS

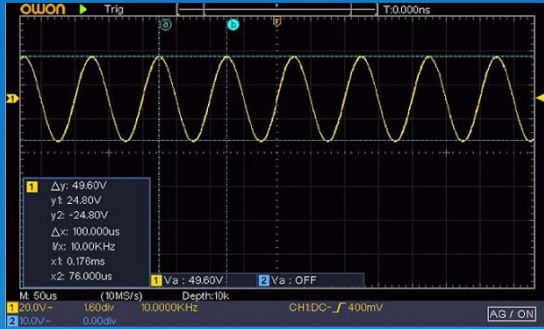
The following table details the technical specifications for the Owon SDS210 Digital Oscilloscope.



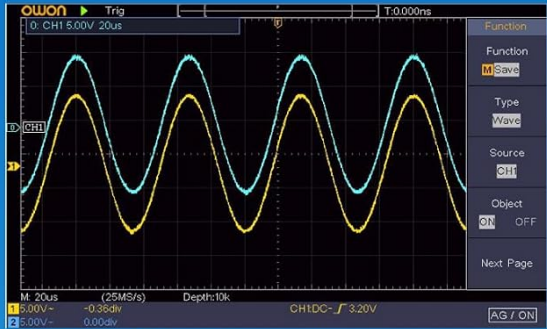
• 6-digit High-precision Frequency counter



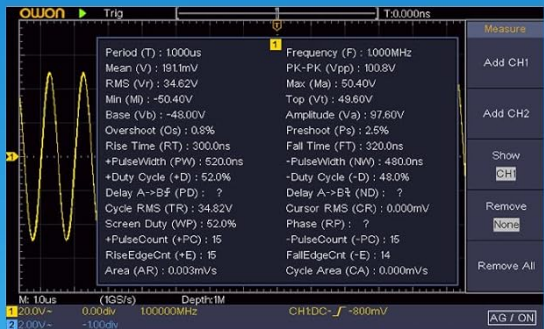
• FFT Spectrum Analysis



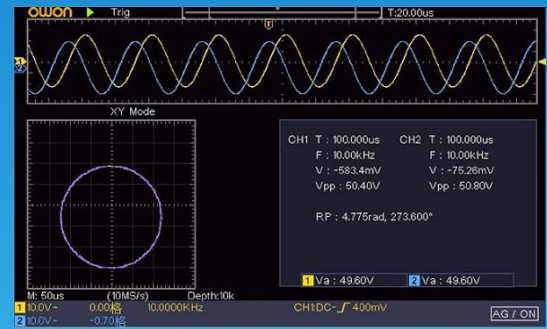
• Cursor Measurement



• Save / Recal



• 30 Automatic Waveform Measurements



• X-Y mode

Figure 9.0: Owon SDS210 Series Oscilloscope Specifications. This table provides detailed specifications including Bandwidth, Sample Rate, Acquisition Mode, Input Coupling, Input Impedance, Probe Attenuation Factor, Record Length, Horizontal Scale, Vertical Sensitivity, Automatic Measurement types, Waveform Math functions, Waveform Storage, Lissajous Figures, Trigger Type, Communication Interface, Frequency Counter, and Waveform Generator Specifications (for SDS210S, SDS215S, SDS220S models).

Feature	Specification (SDS210)
Manufacturer	OWON
Model Number	SDS210-OW
Bandwidth	100 MHz
Channels	2 CH
Sample Rate	1 GS/s
Record Length	20M

Feature	Specification (SDS210)
Acquisition Mode	Normal, Peak detect, Averaging
Input Coupling	DC, AC, Ground
Input Impedance	1MΩ±2%, in parallel with 20 pF±5 pF
Probe Attenuation Factor	1X, 10X, 100X, 1000X
Horizontal Scale (s/div)	2 ns/div-1000 s/div, step by 1-2-5
Vertical Sensitivity	2 mV/div-10 V/div
Automatic Measurement	Period, Frequency, Mean, PK-PK, RMS, Max, Min, Top, Base, Amplitude, Overshoot, Preshoot, Rise Time, Fall Time, +PulseWidth, -PulseWidth, +Duty Cycle, -Duty Cycle, Delay A→B↑, Delay A→B↓, Cycle RMS, Cursor RMS, Screen Duty, Phase, +PulseCount, -PulseCount, RiseEdgeCnt, FallEdgeCnt, Area, and Cycle Area.
Waveform Math	+, -, ×, ÷, FFT
Waveform Storage	16 waveforms
Lissajous's Bandwidth	full bandwidth
Lissajous's Figure Phase Difference	±3 degrees
Trigger Type	Edge, Video
Communication Interface	USB Host and Device
Frequency Counter	available
Product Dimensions (L x W x H)	29.97 x 7.01 x 15.24 cm (11.8 x 2.76 x 6 inches)
Product Weight	1.1 kilograms (38.8 ounces)

10. WARRANTY AND SUPPORT

10.1 Warranty Information

For detailed warranty information, please refer to the warranty card included with your product or contact your authorized OWON dealer or the manufacturer directly. Warranty terms and conditions may vary by region and retailer.

10.2 Customer Support

If you require technical assistance, have questions about your product, or need to report an issue, please contact OWON customer support. Contact information can typically be found on the manufacturer's official website or through your product's documentation.