aerosensor

SC-01

8-Channel Differential Pressure Scanner

Hardware, Software and User Programming Manual

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Contents

Hardware

Overview

The SC-01 is a high-speed pressure scanner measuring true differential pressure across 8 channels. The device measures the pressure difference between the common **Reference (Ref)** port and each individual channel port **(1–8)** at rates up to 1000 Hz.

Device Interface

1) **USB-C Port**
2) **Ethernet Port**
3) **Status LED**
4) **Reference Port**
5) **1-8 Channel Ports**

Power & Connections

Power Requirements

The scanner is powered **exclusively via the USB-C port** (5V @ 210mA).

- **USB Operation:** Connect directly to a PC.
- **Ethernet (TCP) Operation:** You must still connect the USB-C port to a power source (PC, USB wall adapter etc.) to power the scanner. The Ethernet port does not provide Power-over-Ethernet (PoE).

Status LED Codes

The multi-coloured LED indicates the current scanner status.

LED Colour	Status	Action Required
Green	Ready/Active	Device is powered and operating normally.
Red	System Fault	Internal error. Disconnect and reconnect power to reset.
Yellow	Bootloader Mode	Device is waiting for firmware update. If stuck in this state, contact Aerosensor support.

Software

This section contains information on how to use a SC01.025.08 or SC01.125.8 pressure scanner with our AeroDAQ software.

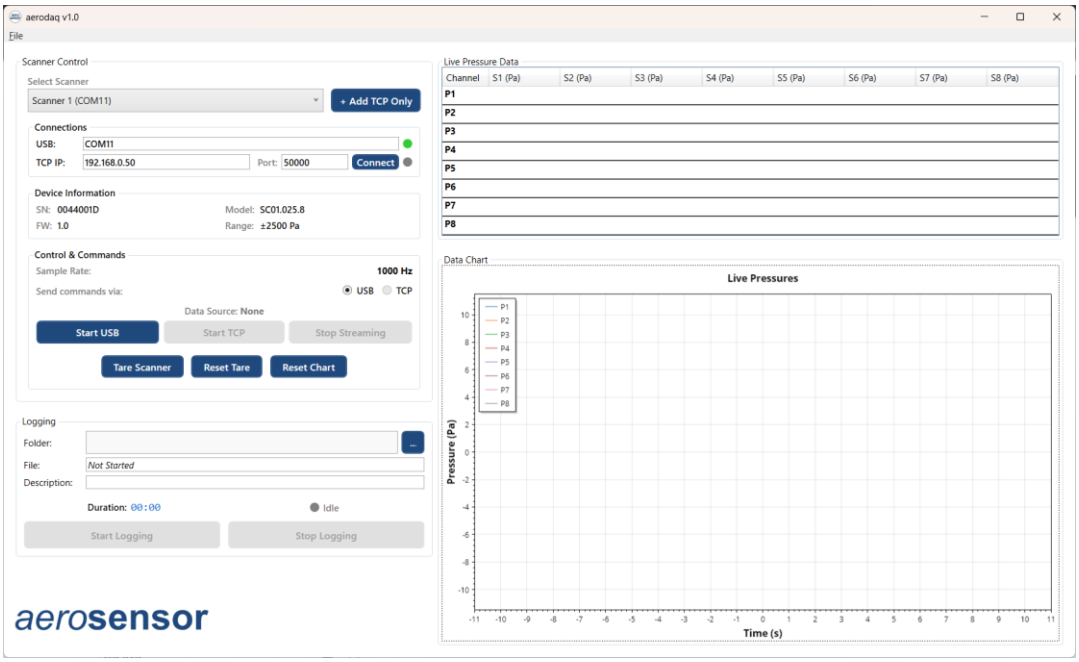
Software Installation

1. Download the AeroDAQ Installer from: https://info.aerosensor.tech/docs/start/downloads/pressure-scanner/
2. Run the installer.
3. Follow the on-screen prompts to complete installation.
4. Launch the application via the desktop shortcut or by searching for “AeroDAQ” in the Windows Start Menu.

Connection via USB

Open AeroDAQ and connect the scanner to your PC using a USB-C data cable. The software is designed to automatically detect and connect to the scanner.

When connected successfully, the **USB** indicator in the **Connections** panel will turn **Green**, and the **Device Information** panel will auto-populate with the scanner’s details (Serial Number, Firmware Version, Model and Range).



Troubleshooting

If AeroDAQ is unable to find your scanner via USB, please try the following steps:

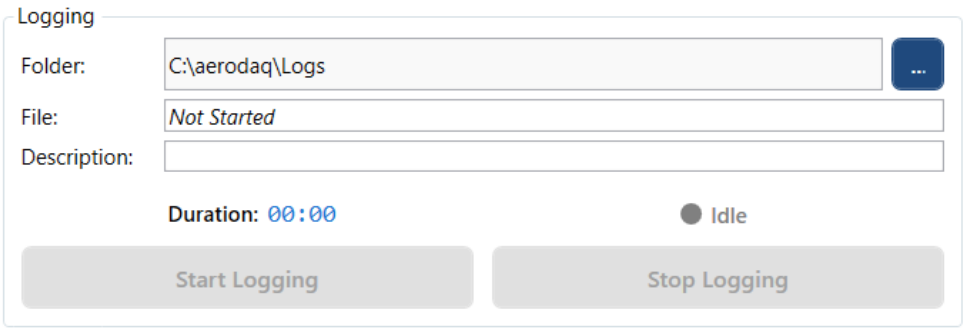
- Disconnect and reconnect the cable.
- Restart the application.
- Ensure your cable supports data transfer and is not a “charge-only” cable.
- Check that no other software has the COM port open.
- Restart your computer.

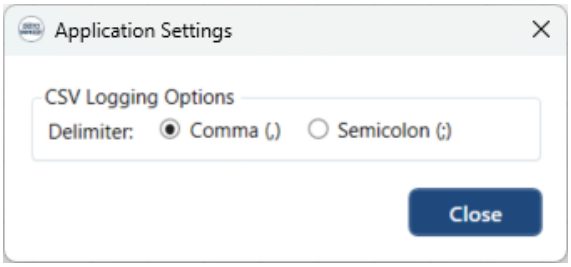
Configuration

Logging Setup

To setup recording pressure data to a file:

1. In the **Logging** section, click the browse button (…) to select a destination folder.
2. The selected path will appear in the **Folder** text box.
3. (Optional) To change the CSV delimiter (comma or semicolon), go to **File > Settings.**





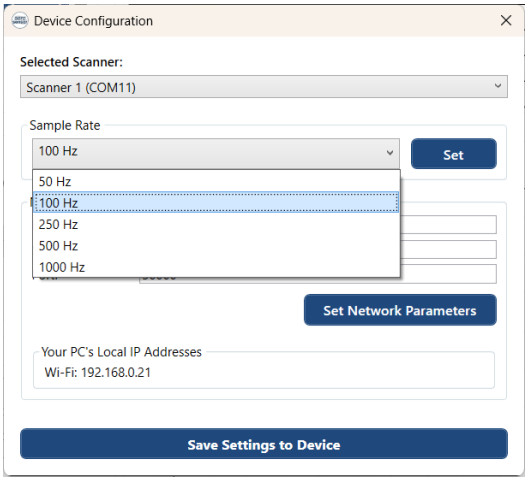
Note: Directory and delimiter preferences are saved locally and will persist after restarting the application.

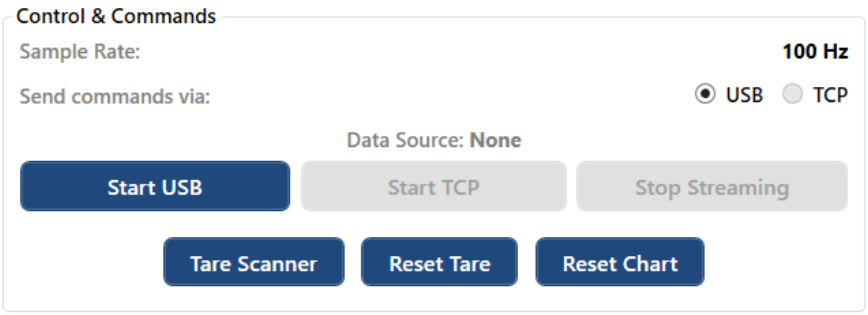
Setting Sample Rate

To change the data acquisition speed:

1. Go to **File > Configure Device.**
2. Locate the **Sample Rate** section.
3. Select the desired frequency (50Hz – 1000Hz) from the dropdown.
4. Click **Set** to apply the change.
5. (Optional) Click **Save Settings to Device** to write this configuration to the scanner's internal memory, ensuring it persists after a power cycle.

You can verify the active sample rate in the **Control & Commands** section on the main dashboard.





Setting Network Parameters

Network parameters can only be modified while connected via USB. These settings cannot be changed over a TCP connection.

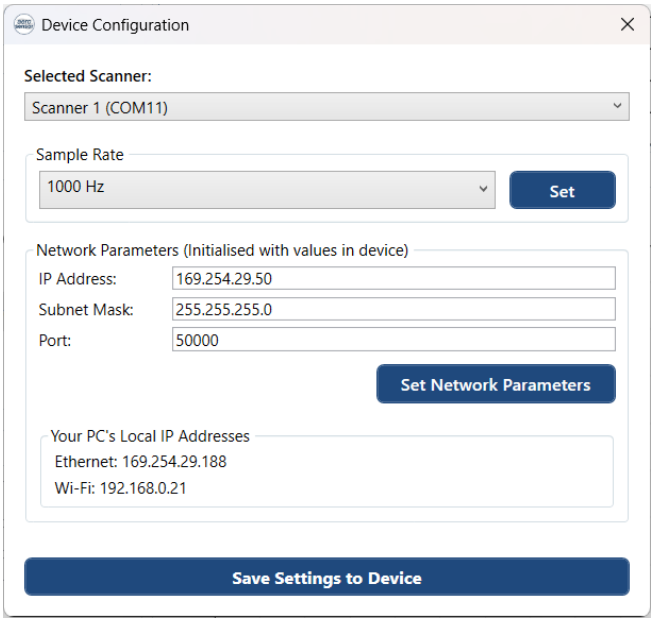
1. Go to **File > Configure Device**.
2. Locate the **Network Parameters** section.
3. Enter the desired **IP Address, Subnet Mask**, and **Port.**
4. Click **Set** to apply the changes temporarily.
5. Click **Save Settings to Device**.

Important: After changing network parameters, it is recommended to **Save Settings to Device** and then **Power Cycle** the scanner (disconnect/reconnect USB cable). This ensures the device re-initialises the Ethernet stack with a clean slate.

Network Configuration Guide:

- **IP Address:** This must be unique on your network. It acts as the device's identifier (**Default: 192.168.0.50**).
- **Subnet Mask:** Determines the local network range. For direct communication, this must match your PC's subnet mask (**Default: 255.255.255.0**).
- **Port:** The specific port number used for the data connection. (**Default: 50000**).

Tip: The application displays your PC's current Local IP Addresses at the bottom of the window. To ensure a direct connection, set the Scanner's IP to the same range as your PC (e.g., if subnet mask is 255.255.255.0 and your PC is 192.168.0.5, set Scanner to 192.168.0.x).



Connection via Ethernet (TCP)

To allow streaming data over a network, the scanner must be powered via USB-C and connected to your network (or directly to your PC) via an Ethernet cable.

Prerequisites

Before attempting to connect:

- Ensure the scanner's **Network Parameters** (IP, Subnet, Port) are correctly configured (See Setting Network Parameters)
- Ensure the scanner is on the same Local IP range (Subnet) as your PC.
- Ensure the Ethernet cable is securely connected to both the device and the network/PC.

Assisted Connection (with USB)

If you are already connected to the scanner via USB, AeroDAQ simplifies the TCP connection process:

1. Find the **Connections** panel.
2. The **TCP IP** and **Port** text boxes will automatically populate with the settings currently stored in the device.
3. Click the **Connect** button in the **TCP** row.
4. The application will attempt to connect for 3 seconds.
5. Upon success, the **TCP** status indicator will turn **Green.**

Manual Connection (Remote Device)

If the scanner is powered externally (e.g., via a power bank or wall adapter) and is *not* connected to this PC via USB:

1. Locate the **Select Scanner** dropdown at the top of the window.
2. Click the **+ Add TCP Only** button next to it.
3. Manually enter the scanner's **IP Address** and **Port** into the text boxes in the **Connections** panel.
4. Click **Connect**.

To terminate the connection at any time, click the **Disconnect** button.

IMPORTANT: Connection Troubleshooting

While the SC01 supports Ethernet hot plugging (connecting the cable after the device is powered), changing subnets or network switches while the device is running may occasionally prevent a connection.

If the application fails to connect (timeout):

1. Ensure the Ethernet cable is plugged into a valid network source.
2. **Power Cycle the device:** Make sure the Ethernet cable is plugged in, unplug the USB-C power cable, wait 2 seconds, and plug it back in.
3. Wait for the device to boot (**Green LED**) and try connecting again.

Streaming data

Command Routing

In the **Control & Commands** section, you will find a setting labelled **Send commands via** with radio buttons **USB** and **TCP.**

- If you are connected via **USB** & **TCP**, this allows you to set which connection path is used to send control messages (such as Start, Stop, or Configuration commands) to the device.

Starting/Stopping Acquisition

To begin streaming, locate the streaming control buttons in the **Control & Commands** panel.

- **For USB:** Click **Start USB.**
- **For Ethernet:** Click **Start TCP.**

To stop data streaming, click the **Stop Streaming** button.

Extra Information:

- The application supports streaming from only **one source at a time.** You cannot stream via USB and TCP simultaneously.
- The **Data Source** indicator in the centre of the panel will update to show the active stream (e.g., **Data Source: TCP**).

Data Visualisation

Once streaming begins you can view pressure data in two places:

- **Live Grid:** The latest pressure readings for all 8 channels appear in the **Live Pressure Data** grid. These values are updated four times a second.
- **Chart:** The **Data Chart** plots the last 30 seconds of pressure history in real time.

Live Controls

While streaming, you can manipulate the data using the following buttons:

- **Tare Scanner:** Captures pressure readings for **one second**, calculates the average value for each channel, and sets this as the new zero baseline.
- **Reset Tare:** Clears the active zero offset and reverts the display to the raw values reported by the device.
- **Reset Chart:** Clears all plotted data from the graph and resets the time axis to zero.

Data Logging

Prerequisites & Setup

To start logging, the following conditions must be met:

1. **Select Directory:** A valid **Folder** must be selected in the Logging section (See Logging Setup)
2. **Active Stream**: All connected scanners must be actively streaming data (via **USB** or **TCP**)
3. **Sample Rate Synchronization**: If multiple scanners are connected, they must all be set to the **same sample rate.**

Optional Configuration:

- **Tare:** If you wish to record zero-corrected data, perform a **Tare Scanner** operation *before* starting the log. The pressure values in the CSV will include this offset.
- **Description:** You can enter a string in the **Description** text box. This will be saved in the CSV header.
- **CSV Delimiter**: Ensure your preferred delimiter (Comma or Semicolon) is selected in **File > Settings**.

Recording Data

To begin recording, click the **Start Logging** button.

- The status indicator changes from **Grey "Idle"** to **Green "Logging"**.
- The **Duration** counter tracks how long the log has been active.
- A new filename is generated and displayed in the **File** text box.
- The **Data Chart** will automatically reset to align with the start of the log.

To stop recording, click the **Stop Logging** button, and your file will be saved.

During recording, you will not be able to: tare, configure the device, or add new devices. Logging will **automatically stop** if any device disconnects.

File Structure & Naming

File naming convention

Files are named "Log_File_{n}.csv" where {n} is an auto-incrementing number based on existing files in the selected directory.

CSV Header

The top section of the file contains some metadata:

1. **System Time**: The Date and Time the log started
2. **Description**: The user-defined text (if provided).
3. **Device Information**: A summary for each connected scanner including Serial Number, Firmware, Model, Sample Rate, Pressure Range, and Output Mode (USB/TCP).

Data Columns

Following the header, the data is organized as follows:

- **SysTime_ms:** A calculated timestamp starting at **0 milliseconds** and incrementing based on the sample rate (e.g. at 100Hz, rows are 0, 10, 20, 30…).
- **S{X}_P1…P8:** Pressure readings for each channel. If multiple scanners are used, {x} represents the scanner index (e.g. S1_P1…8, S2_P1…8). AeroDAQ automatically aligns time-series data for multiple devices.

WARNING: File Size & Excel Limits

High sample rates generate significant amounts of data, resulting in large file sizes.

- At **1000Hz**, logging generates 1000 rows of data per second.
- Microsoft Excel has a hard limit of **1,048,576 rows.**
- If logging at 1000Hz, you will reach the Excel row limit in approximately **16 minutes.**

For long-duration high-speed testing, consider using data analysis tools capable of handling large CSVs.

User Programming Guide

This section details the binary protocol used to communicate with the SC01 Pressure Scanners over USB (Virtual COM) and TCP.

Protocol Overview

- **Byte Order**: Little Endian (LSB First) for all multi-byte data fields, unless otherwise specified.
- **Network Fields**: IPv4, Netmask, and MAC addresses are sent in **Network Byte Order** (Big Endian).
- **CRC**: CRC-16 CCITT (False).
- **Device**
  - **VID:** 0x1915
  - **PID:** 0x1998
- **DFU**
  - **VID:** 0x0483
  - **PID:** 0xDF11
- **Pressure Output Rate:** The device outputs pressure data packets at 100Hz, unless the sample rate is set to 50Hz, in which case it will output at 50Hz. This means above 100Hz there will be multiple *pressure readings* within one *pressure data packet*. All pressure readings have an associated timestamp of when the reading was taken.

Commands (Host to Device)

All commands include a 16-bit identifier and a 16-bit CRC. The reply is sent on the same interface the command was received on.

Basic Commands

Structure: [ID: **0x0010** : 2 Bytes] [Sub-ID: 2 Bytes] [CRC: 2 Bytes] (Total: 6 Bytes)

Sub-ID	Command Name	Description	Response On Success
0x0001	Start TCP Stream	Begin data output via ethernet	Mirror Packet
0x0011	Start USB Stream	Begin data output via USB	Mirror packet
0x0002	Stop Stream	Stop data output.	Mirror packet
0x0003	Get Timestamp	Request device uptime. ms since boot.	Timestamp Packet (0x1003)
0x0004	Get Device Info	Request Serial, MAC, FW Ver.	Device Info Packet (0x1004)
0x0005	Get Status	Request Connection/Config status.	Device Status Packet (0x1005)

Example: Start USB Stream

Byte Index	0	1	2	3	4	5
Description	ID (LSB)	ID (MSB)	Sub-ID (LSB)	Sub-ID (MSB)	CRC (LSB)	CRC (MSB)
Hex Value	0x10	0x00	0x11	0x00	0x25	0xAF

Configuration Commands

Structure: [ID: 2 Bytes] [Payload: Variable Bytes] [CRC: 2 Bytes]

ID	Command Name	Payload	Total Length (Including ID + CRC)	Response On Success
0x0020	Set Sample Rate	[Rate Index: 1 Byte] (See Lookup Tables)	5 Bytes	Mirror Packet
0x0030	Set Pressure Range	[Range Index: 1 Byte] (See Lookup Tables)	5 Bytes	Mirror packet
0x0050	Set Network Params **(USB Only)**	[IP: 4 Bytes] [Netmask: 4 Bytes] [Port: 2 Bytes]	14 Bytes	Mirror packet
0x0099	Save Settings	None	4 Bytes	Mirror Packet
0x0200	Enter DFU **(USB ONLY)**	None	4 Bytes	None (Device Resets)

Example: Set Rate to 100Hz (0x01)

Byte Index	**0**	**1**	**2**	**3**	**4**
Description	ID (LSB)	ID (MSB)	Rate Index	CRC (LSB)	CRC (MSB)
Hex Value	0x20	0x00	0x01	0x7B	0x5A

Data & Response Packets (Device to Host)

Pressure Data Packet

Pressure data is sent in batches.

- **Header:** [ID: 0xAABB] [Count: 1 Byte]
- **Payload:** [Reading_1] … [Reading_n] (Count * 36 Bytes)
- **Footer:** [CRC: 2 Bytes]

Single Reading Structure (36 Bytes)

Byte Offset	Type	Description
0	uint32	Timestamp (Milliseconds since boot)
4	float32	Channel 1 Pressure
8	float32	Channel 2 Pressure
…	…	…
32	float32	Channel 8 Pressure

Device Info Packet

- **Identifier:** 0x1004
- **Length:** 35 Bytes

Byte Offset	Type	Description
0	uint16	ID: 0x1004
2	uint8[12]	Serial Number (LSB First)
14	uint8[6]	MAC Address (Network Order)
20	uint8[4]	IP Address (Network Order)
24	uint8[4]	Netmask (Network Order)
28	uint16	TCP Port
30	uint8	Scanner Model ID (See Lookup Tables)

31	uint8	FW Major
32	uint8	FW Minor
33	uint16	CRC16-CCITT (False)

Device Status Packet

- **Identifier:** 0x1005
- **Length:** 8 Bytes

Byte Offset	Type	Description
0	uint16	ID: 0x1005
2	uint8	Is Device Streaming? (1 = True, 0 = False)
3	uint8	Is TCP Connected? (1 = True, 0 = False)
4	uint8	Current Sample Rate Index (See Lookup Tables)
5	uint8	Current Pressure Range Index (See Lookup Tables)
6	uint16	CRC

Lookup Tables

Sample Rate Indices

Index	Rate (Hz)
0x00	50
0x01	100
0x02	250
0x03	500
0x04	1000

Scanner Model IDs

ID	Scanner Model Name
0x01	SC01.025.8
0x02	SC01.125.8

Pressure Range Indices

Index	**SC01.025.8** (±cmH2O)	**SC01.125.8** (±cmH2O)
0x00	5	80
0x01	7.5	90
0x02	10	100
0x03	15	110
0x04	20	120
0x05	25	130

Appendix A: Specification

Power and Electrical

Power supply	5V (USB)
Current	210mA

Environmental

Compensated range	0 to 50°C
Operational range	-20 to +85°C
Humidity	0 to 95%
Vibration	15g

Pressure measurement performance

Pressure ranges	+/-2.5kPa, +/-12.5kPa
Proof pressure	10kPa, 100kPa,
Resolution	24-bit
Accuracy	+/-0.05% FS
Total error band	+/-0.10% FS
Total error band after zero	+/-0.05% FS
Measurement rate	50-1000Hz (per channel)

Mechanical

Pneumatic connectors	1.59mm tubulations
Dimensions	124 x 78 x 32mm
Weight	135g

Appendix B: Technical Drawing