CRY5820

Professional Data Acquisition System

User Manual

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Revision History

Revision Number	Description	Revision Data
1.0	● Initial version	2025/09/30

01 Introduce

SonoDAQ Pro is a modular data acquisition mainframe, consisting of a display, six slots, and a rear panel. The figure below shows the overall appearance of the SonoDAQ.

With different acquisition modules installed, SonoDAQ Pro can operate as a standalone acquisition unit or be integrated with multiple devices into the same network, expanding into a system with more than 1000 channels. Sampling synchronization is achieved through Precision Time Protocol (PTP) and GPS, enabling the construction of a distributed data acquisition system composed of multiple mainframes.

The SonoDAQ Pro can operate as a standalone offline data recorder or work with OpenTest to perform online data acquisition and analysis. It also supports software data interfaces such as ASIO, OpenDAQ, and other open API.

Application

- Real-time multi-channel acoustic and vibration data acquisition
- Laboratory and field measurements
- Excitation output for acoustic or vibration measurement systems
- Standalone recorder
- NVH testing

02 Features

Flexible Configuration

- Single-mainframe acquisition unit (4 ~ 24 channels)
- Multi-mainframe acquisition system (1000+ channels)
- Distributed acquisition system (multi-site networking)

In multi-mainframe acquisition mode, daisy-chain, star, or hybrid connection topologies are supported.

High-precision data synchronization

When SonoDAQ forms a distributed acquisition system, the system supports both PTP synchronization and GPS synchronization simultaneously.

Three Data Transmission Methods

SonoDAQ supports real-time data transmission via Gigabit Ethernet, USB, or Wi-Fi, greatly expanding the options for data transfer.

Adapted for Harsh Environments

Operating temperature: -10℃ to 50℃; operating humidity: 20% RH to 95% RH. SonoDAQ is rated IP43, meeting the requirements of most industrial and laboratory application.

Outstanding Performance

- The structure is made of aluminum alloy, with some parts using carbon-fiber injection molding, ensuring robustness while reducing weight;

- Each module is isolated with 1000 V, preventing electromagnetic interference. Additionally, upon startup, the input module performs self-calibration to ensure data accuracy;
- Modules adopt a plug-and-play design, and each slot supports independent and flexible sampling rate: 10 Hz to 204.8 kHz;
- It adopts a fanless silent design, eliminating noise interference introduced by cooling fans.;
- Equipped with a standard 256 GB MicroSD card, supporting up to 2 TB MicroSD capacity, with MicroSD-based recording capability;
- Configurable for AC/DC coupling and single-ended/differential input. Equipped with channel status indicators to display various acquisition states such as overload and underload;
- Provides a web-based configuration interface with multi-platform API compatibility.

Multiple Channel Types

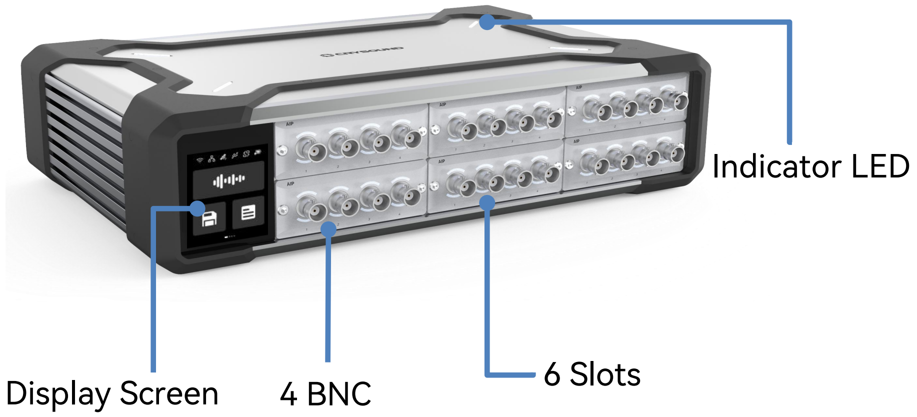
Supports IEPE power supply, TEDS, analog output/Class-D, CAN FD, tachometer signal or digital I/O, PDM, IIS/TDM, HDMI, LE Audio, A^2B bus, strain gauge measurement, charge input, thermocouple/RTD, and voltage/current.

03 Functional Description

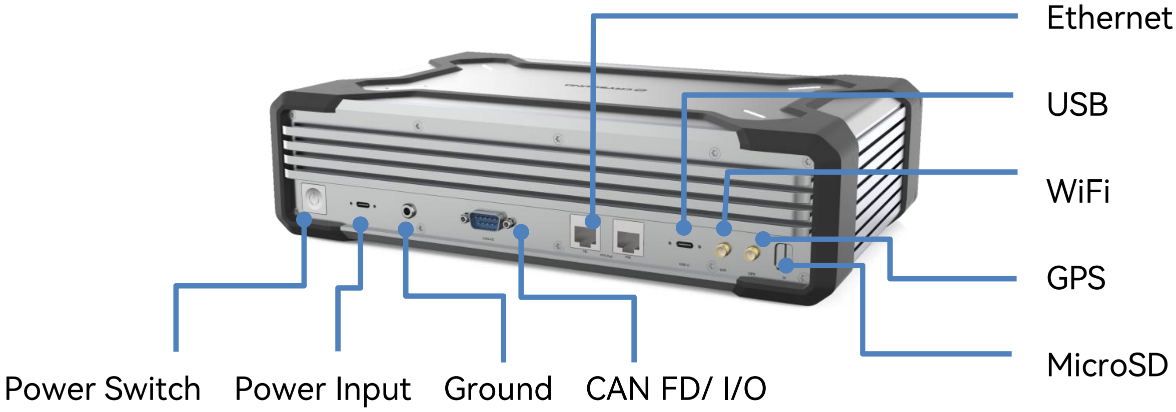
3.1 External Interfaces

The SonoDAQ Pro contains 6 slots, each of which can function as either an input module or an output module depending on the type of module installed。

Front panel

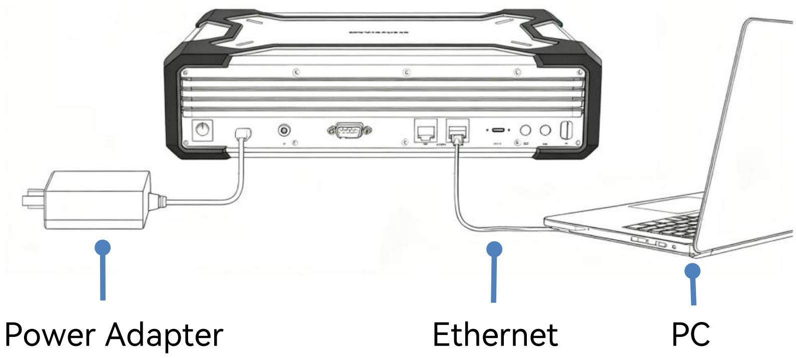


Rear panel



3.2 Usage

Connect the data acquisition device as shown in the figure below, then switch on the power to begin operation.



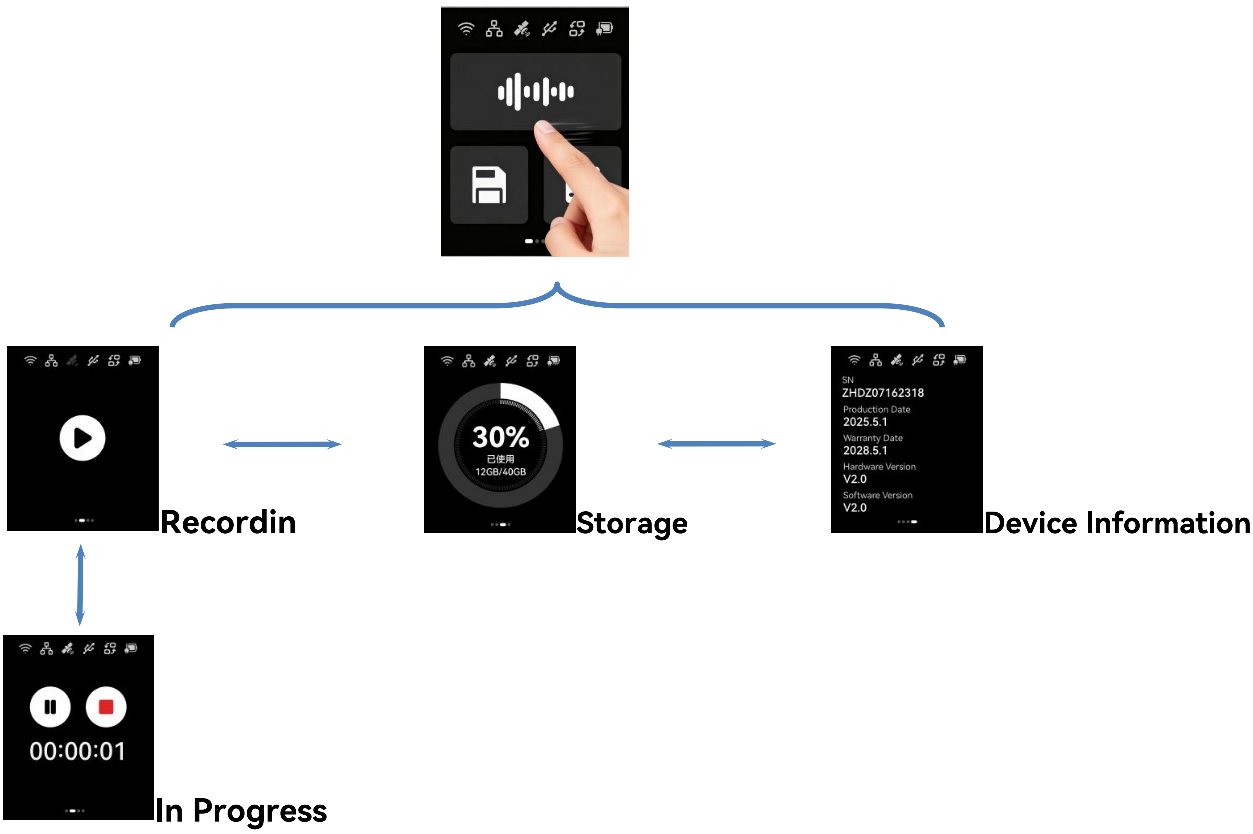
Power Supply Methods

SonoDAQ supports three power supply methods: power adapter, PoE, and battery (slots 1 and 2 support battery modules). The priority order of power supply is: Power Adapter > PoE > Battery.

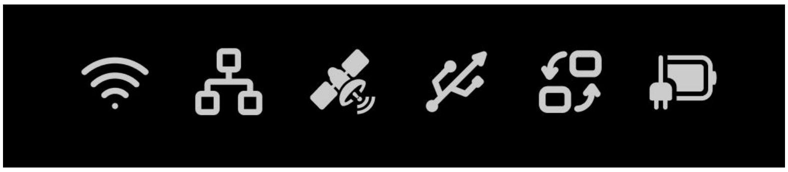
When an external power source (adapter/PoE) coexists with the battery, the system automatically charges the battery. Hot-swappable batteries are supported, ensuring uninterrupted data acquisition during battery replacement. When two batteries are present, the system prioritizes the one with the higher voltage. The display screen shows the real-time power level of the active battery.

Display Screen

The display supports touch operation. Users can swipe left or right to switch between the “Home,” “Recording,” “Storage,” and “Device Information” pages, or directly tap the corresponding icons on the Home page to jump to these interfaces.



Icon Definitions:



WIFI Ethernet GPS USB PTP Battery

Configuration Modes

The data acquisition mainframe offers high connection flexibility and can be configured into systems ranging from 2 channels to more than 1000 channels, depending on requirements.

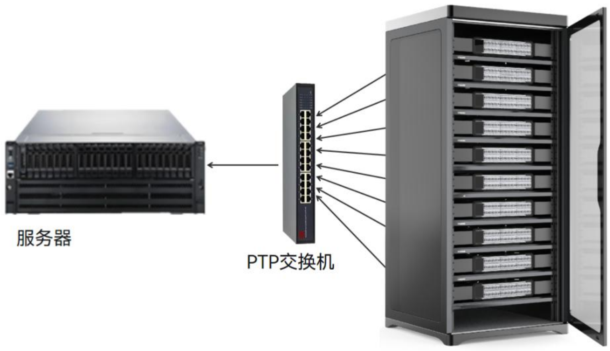
Five Operating Modes:

1. Offline Recording: On the display screen, tap the record button in the Recording interface to start recording. The recorded files are stored on the MicroSD card;

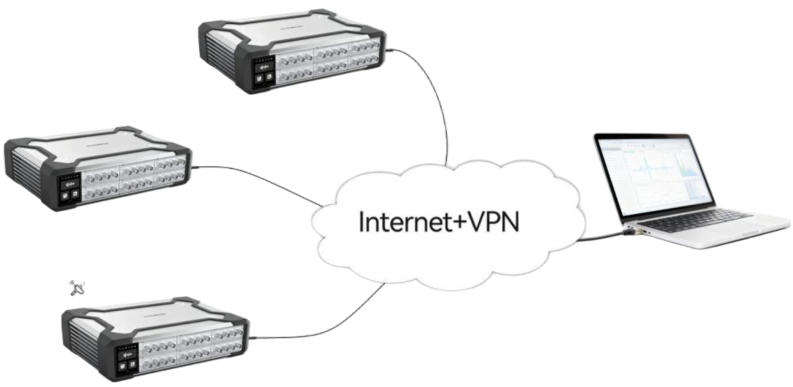
2. Online Single-Mainframe Acquisition: Connect the computer to the mainframe via Ethernet, USB, or Wi-Fi. Ensure that the computer's IP address is set to the same subnet as the DAQ mainframe (the IP address of the mainframe can be found on the device label).

3. Small-Scale Networked Acquisition: Connect the computer to one mainframe via Ethernet, USB, or Wi-Fi, while the other mainframes are connected to this unit through daisy-chain links.

4. Large-Scale Networked Acquisition: Connect the server mainframe to a PTP switch via Ethernet, and then connect the switch to multiple acquisition units. This configuration can support systems with more than 1000 channels.



5. Remote Multi-Site Synchronized Acquisition: Different site mainframes can be connected via a VPN service to achieve synchronized acquisition, with synchronization between devices maintained through GPS.



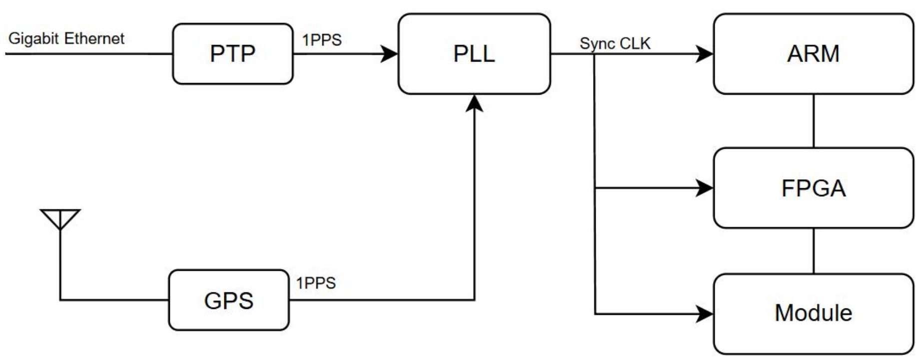
04 Technical Details

4.1 Sampling Synchronization

In electroacoustic and NVH testing, "time alignment" is extremely critical: even µs-level deviations between channels can reduce signal correlation, leading to distortions in frequency response, sound power, and other results.

The system features a built-in global clock bus, allowing all mainframes (including distributed nodes) to share a ns-level time base. This eliminates the need for additional synchronization cables and ensures channel-to-channel sampling skew of less than ±100 ns, with cumulative drift under 1 µs over 1000 hours of testing. With true plug-and-play operation, cascaded units maintain long-term amplitude and phase consistency, fully supporting high-precision order tracking, acoustic holography, and other demanding applications.

The diagram below illustrates the hardware logic of the device's data synchronization. The ARM processor, FPGA controller, and module clocks within the acquisition system are all derived from a single synchronized clock, which originates from either the PTP reference clock or the GPS reference clock. Therefore, the overall acquisition synchronization accuracy depends on the precision of the PTP or GPS clock source.



4.2 PTP(IEEE 1588 V2)

The IEEE 1588 V2 standard, also known as the Precision Time Protocol (PTP), is designed to measure and compensate for delays between PTP-enabled devices. This enables accurate determination of end-to-end latency and alignment of these delays during transmission, ensuring that all device clocks are precisely synchronized to the same time.

The objective is to maintain sub-microsecond synchronization accuracy between all nodes and the master clock within a distributed network.

4.3 GPS Time Synchronization

In distributed acquisition systems where deploying a local area network is impractical, or where existing networks lack PTP-capable switches, GPS can be used to provide satellite time as the synchronization reference between devices.

Furthermore, in LAN systems already equipped with precise PTP synchronization, GPS can be introduced as the master clock. This allows the entire acquisition system to be aligned with an absolute time reference, ensuring extremely high accuracy. All acquisition channels in the network can then be synchronized and timestamped based on the GPS absolute time.

4.4 Daisy-chain

For small-scale acquisition scenarios, the system supports daisy-chain connections, allowing 2 to 4 devices to be linked in series using Ethernet cables.

Each device in the “chain” is equipped with a built-in mini switch that forwards incoming Ethernet frames. Logically, this still forms a single broadcast domain, though physically it is a linear chain. The mini switch learns source MAC addresses and forwards frames based on destination MAC lookups; if the destination is not found in the forwarding table, the frame is flooded to the opposite port. This behavior complies with the IEEE 802.1D Ethernet bridging standard. In addition, this implementation transparently passes PTP packets, eliminating the need for dedicated PTP switches in the network, thereby reducing system complexity and cost.

However, the system does not employ RSTP, MSTP, or ERPS ring protocols; therefore, users must avoid creating network loops. The daisy-chain topology has inherent limitations: a single point of failure can interrupt all downstream devices, and excessive chain length can lead to accumulated latency and bandwidth constraints.

4.5 PoE

The device supports Power over Ethernet (PoE) in compliance with IEEE 802.3bt (PoE++/UPoE), delivering approximately 90 W at the output port, with 71 W available to powered devices. In daisy-chain + PoE mode, the 54 V supply is cascaded downstream through the Ethernet cable, effectively reducing the need for multiple external power supplies at the site.

The first-level device can be powered either by an external power adapter or by a PoE switch. When each device powers on, it communicates over the network to query the remaining power from the upstream device, compares it with its own requirements, and, if sufficient, activates all its modules; otherwise, it enters standby mode. Similarly, if after activating its modules the remaining power falls below 10 W, the device will disable downstream power delivery to prevent exceeding the PoE power limit.

4.6 Power Adapter

Input：AC100V~240V，50Hz/60Hz;

Input Plug：CN、US、EU、KR、UK、AU;

Output：5V/3A, 20V/5A, up to 100 W, supporting PD fast-charging protocol;

Output Plug：USB-C.

05 Module

5.1 Battery

The CRY5001 BAT module contains six 18650 lithium-ion cells, providing an output voltage of 12.6 V with a capacity of 83 Wh. A USB-C port is located at the rear of the module for charging, and charging is also supported when the module is inserted into slot 1 or slot 2 of the acquisition mainframe.

5.2 Analog in Medium

The CRY5011 AIM is primarily designed for multi-channel acoustic and vibration measurements.

Technical Specifications

General	
Channel	4
ADC Resolution	32bit

General	
Sampling Rate	(8/16/24/32/48/96/192/25.6/51.2/102.4/204.8) kHz，Configurable
Dynamic Range	170 dB
Coupling Mode	AC/DC，Configurable

Analog Input	
Signal Type	Differential/Single-ended
Frequency Accuracy	±2 ppm (-10 ℃ ~ 50 ℃)
Amplitude Accuracy	±0.35%（15 ℃ ~ 30 ℃） ±0.58%（0 ℃ ~ 45 ℃ ±1.2%（-10 ℃ ~ 50 ℃）
Frequency Response Flatness	DC: ± 0.008 dB (0 Hz~20 kHz) ± 0.030 dB(20 kHz~50 kHz) ± 0.1 dB(50 kHz~80 kHz) AC: ±0.008 dB(20 Hz~20 kHz)
THD+N	≤-105 dB(20 Hz ~ 20 kHz)@1 kHz
Cross Talk	< -130 dB@1 kHz
Noise Floor	≤1.3uV(20 Hz ~ 20 kHz)
Maximum Input Voltage	31.4Vpk
Input Impedance	≥100 kΩ
TEDS	Supported
IEPE	4mA / 24V
Module Isolation	1000V
Indicator LED	White: No Signal Green: Normal Signal Red: Overload Blue: IEPE ON
Channel-to-Channel Delay	±100 ns
Mainframe to Mainframe Delay	±100 ns（network stable / GPS signal good)

Analog Input	
Maximum Power	3W

5.3 Analog out + Class D

The CRY5085 AOD is designed for multi-channel acoustic and vibration measurements.

Technical Specifications

General	
Channel	2
ADC Resolution	32bit
Sampling Rate	(48/96/192) kHz, Configurable
Output Mode	Signal / Class-D Amplifier, Configurable
Coupling Mode	DC
Output Signal Type	Differential
Frequency Accuracy	±2 ppm(-10 ℃ ~ 50 ℃)
Analog Output	
Amplitude Accuracy	±0.35% (15 ℃ ~ 30 ℃) ±0.58% (0 ℃ ~ 45 ℃) ±1.2% (-10 ℃ ~ 50 ℃)
Frequency Response Flatness	±0.008 dB(0 Hz ~ 20 kHz) ±0.030 dB(20 kHz ~ 50 kHz) ±0.1 dB(50 kHz ~ 80 kHz)

Analog Output	
THD + D	≤-105 dB(20 Hz ~ 20 kHz)@1 kHz
Cross Talk	< -147 dB@1 kHz
Noise Floor	≤1.3uV(20 Hz ~ 20 kHz)
Maximum Output Voltage	30Vpk
DC Offset Error	≤0.25% of Vrms + 100uV
Output Impedance	40 Ω
Class D Mode	
Output Power	10W @ <0.2% THD + N (8Ω load) 6W @ <0.3% THD + N (4Ω load)
Frequency Response Flatness	±0.2 dB(10 Hz ~ 20 kHz)@8Ω load
Cross Talk	< -1470 dB@1 kHz
Noise Floor	≤0.1mV (20 Hz ~ 20 kHz)
Maximum Output Voltage	9.475Vrms @8Ω load
Impedance Measurement	Supported
Measurement Accuracy	≤ 0.5% (20 Hz ~ 20 kHz)
Measurement Range	4Ω ~ 600Ω