SDAQ-204

Standalone Ethernet DAQ for
Distributed Machine Condition Monitoring

User's Manual



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Part No:	50M-00119-1000

LEADING EDGE COMPUTING

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Revision History

Revision	Release Date	Description of Change(s)
1.0	2023-03-14	Initial Release

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Preface

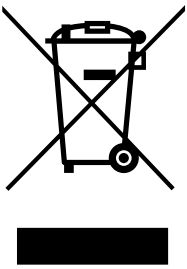
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Battery Labels (for products with battery)



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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.

NOTE: Additional information, aids, and tips that help users perform tasks.

CAUTION: Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.

WARNING: Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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Table of Contents

Preface ..... **iii**

List of Figures ..... **vii**

1 Introduction **1**
- 1.1 Features 2
- 1.2 Applications 2
- 1.3 Specifications 3
- 1.4 Mechanical Drawings 6
- 1.5 I/O Connectors 13

2 Getting Started **17**
- 2.1 Unpacking the SDAQ-204 17
- 2.2 Connecting to I/O 17
- 2.3 Connecting/Disconnecting Power 18
- 2.4 Checking Device Status 18
- 2.5 Usage Scenarios 18

3 DAQPilot **21**
- 3.1 DAQPilot ACE 21
- 3.2 iApp Development and Device Management 22

4 Web Console **35**
- 4.1 Web Console Login 35
- 4.2 Web Console Menu 37
- 4.3 DAQ Mission 47

5 DAQ Missions **53**
- 5.1 Usage Behaviors 53
- 5.2 Custom Filtering Algorithms 56

Important Safety Instructions **59**

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Getting Service 61

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List of Figures

Figure 1-1: Front View 6
Figure 1-2: Top View 7
Figure 1-3: Left Side View 8
Figure 1-4: Right Side View 9
Figure 1-5: DIN Rail Mount Dimensions 10
Figure 1-6: Wall Mount Dimensions 11
Figure 1-7: Wall Mount Assembly 12
Figure 1-8: BNC Connector Polarity 13
Figure 4-1: Get IP Address from DAQPilot ACE 35
Figure 4-2: Web Console Login Page 36
Figure 4-3: Disabling DAQPilot Setting 37
Figure 4-4: Web Console Welcome Page 38
Figure 4-5: Menu Icon 38
Figure 4-6: System Information 39
Figure 4-7: Peripheral Devices 40
Figure 4-8: Data History 41
Figure 4-9: Mission Management 42
Figure 4-10: Change Password 42
Figure 4-11: Account Management 42
Figure 4-12: Network Settings 43
Figure 4-13: System Settings 44
Figure 4-14: Upload Customization/Firmware Files 45
Figure 4-15: TCP Socket 46
Figure 4-16: Device Configuration 47
Figure 4-17: DataType 48
Figure 4-18: Add Condition 50
Figure 4-19: Data Capture 51
Figure 4-20: Device Settings 51
Figure 4-21: Apply a New Mission 52
Figure 5-1: Operational Modes 54
Figure 5-2: RESTful API 54
Figure 5-3: DAQPilot Setting 55

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1 Introduction

With the advent of IoT, more field devices are connecting to the Internet. Instead of being distributed at each field site, systems can be monitored and managed from a central control room. In this scenario, machine condition monitoring systems play a crucial role. Monitoring devices are typically deployed at the OT site, but by using an Ethernet-based data acquisition system (DAQ), machine conditions can be monitored remotely by IT staff.

The ADLINK SDAQ-204 is a standalone Ethernet DAQ that acquires vibration signals from a monitored machine and transforms this signal from raw data into filtered data. By capturing data such as FFT, power spectrum, overall value (OA), etc., with a standalone DAQ, the SDAQ-204 plays a critical role in pre-processing at the edge. Continuous high-volume data generated in the field can be converted to filtered data, significantly reducing its size. This in turn dramatically reduces network bandwidth traffic as well as the backend server’s computing burden.

The SDAQ-204 is designed for on-site process automation in the field. When recovering from a power failure, the system will automatically resume its previous running state. The SDAQ-204's compact size also makes it easy to install in the limited confines of an electrical control cabinet.

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1.1 Features

- Standalone Ethernet DAQ for edge computing
- RESTful API reports machine conditions to IT system
- DAQPilot SDK for continuous data acquisition
- Built-in web console for easy configuration and to facilitate its use as a portable DAQ
- Supports custom filtering algorithms for edge data
- 4-channel, 24-bit simultaneous sampling analog input up to 128 kS/s
- System automatically resumes its previous running state upon power recovery
- Supports IEPE 4mA excitation current output on each analog input to drive accelerometer
- 4-channel programmable isolated digital input/output (software selectable)
- Two 1 Gb Ethernet ports for cascading

1.2 Applications

- Distributed machine condition monitoring
- Vibration detection
- Acoustic measurement
- Environmental noise analysis

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1.3 Specifications

1.3.1 General Specifications

System Specifications	
Ethernet (1 Gb)	2x RJ-45 Ethernet ports (1 IP, Ethernet cascade when powered on)
MCU	ARM Cortex A9 1.0 GHz
NAND Flash (eMMC)	32 GB
Memory	DDR3 RAM 1 GB
USB	2x USB 2.0 (for Wi-Fi dongle and USB storage only)
Power Supply	9 to 30 VDC power input (optional: 40W AC-DC adapter, P/N 31-62138-0000)
Power Consumption	8.8 W max.
Communication Interfaces	Web console, RESTful API, DAQPilot SDK, TCP socket (client mode)
Digital Temperature Sensor (TI LMT01)	-50°C to 150°C (with 3 meter cable)

1.3.2 Analog Input

Analog Input Specifications	
Number of Channels	4 (simultaneous, BNC type)
Resolution	24-bit
Maximum Sampling Rate	128 kS/s and can be adjusted to 1 kS, 2 kS, 4 kS, 8 kS, 16 kS, 32 kS, 64 kS
Input Range (voltage)	±10 V, ±1.25 V
Input Configuration	Pseudo-differential
Input Coupling	DC/AC
IEPE	4 mA, compliance voltage +24 V
Sensor Type	IEPE sensor (vibration detection)
Offset Error	±0.1 mV
Gain Error	±0.05% of FSR
-3dB Bandwidth	0.43 x sampling rate
Flatness	±0.01 dB (10 Hz to 10 kHz)

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Analog Input Specifications	
AC Cut-off Frequency (-3dB)	0.4 Hz
AC Cut-off Frequency (-0.1dB)	2.4 Hz
Trigger Sources	Software, digital trigger, analog trigger, built-in button
Overvoltage Protection	±50 V
Input Impedance	200 kΩ between positive input and negative input 115 Ω between negative input and analog ground 1.5 kVdc between analog ground and chassis ground
Crosstalk	-100 dB
Dynamic Range	95 dB
THD (1kHz)	-100 dB
THD+N (1kHz)	-95 dB

1.3.3 Isolated Digital I/O

Isolated Digital I/O Specifications	
Number of I/O	4-ch DI/O (digital input and output can be configured)
Digital Type	TTL input: 0-5 V for DI / Open drain for DO
Input Logic Level	Logic low: VIL = 0.8 V max., IIL = 0.2 mA max. Logic high: VIH = 2.0 V min., IIH = 0.2 mA max.
Overvoltage Protection	±50 V
Supported Modes	• Static digital input/output • Tachometer support (DI 0 only; range: 0.6 Hz~500 kHz; 500 kHz for 1 microsecond) • External digital trigger in

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1.3.4 Mechanical

Mechanical Specifications	
Dimensions	110.5 (L) x 40 (W) x 126.5 (H) mm
Connectors	4x BNC + 2x 6-pin spring-type terminal block
Front Panel LEDs	4
Housing	Metal, IP30
Mounting	DIN rail mount kit (optional: wall mount kit, P/N 34-51112-0000)

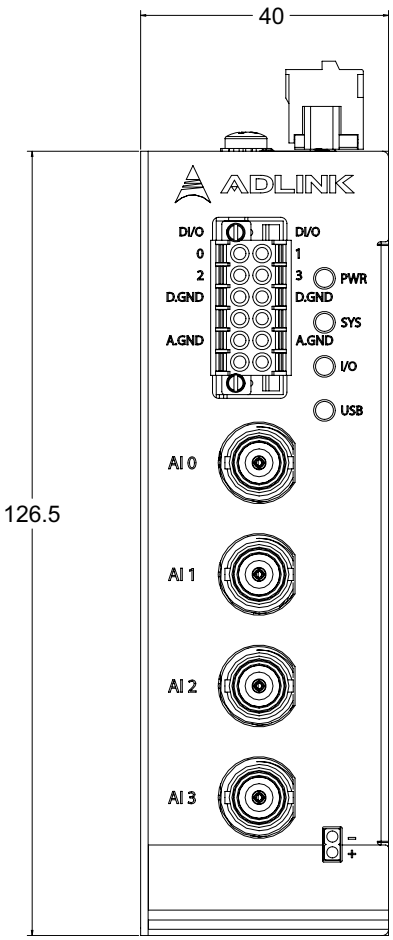
1.3.5 Environmental

Environmental Specifications	
Operating Temperature	0°C to 50°C (32°F to 122°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	Approx. 95% @ 40°C (non-condensing)
Vibration	Operating: 5 Grms, 5-500 Hz, 3 axes
Shock	Operating: 100 G, half sine 11 ms duration
EMC	EN61000-6-4/EN61000-6-2
EMI	FCC Part 15B Class A, CISPR 32
EMS	IEC 61000-4-2 ESD: Contact: 4 kV; Air: 8 kV IEC 61000-4-3 RS: 80 MHz to 1.0 GHz, 10 V/m IEC 61000-4-4 EFT: Power: 2 kV; Signal 2 kV IEC 61000-4-5 Surge: Power 0.5 kV; Signal 1 kV IEC 61000-4-6 CS: 0.15 MHz to 80 MHz, 10 V IEC 61000-4-8 PFMF
Safety	IEC 61010-1, IEC 61010-2-201 (pending)

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1.4 Mechanical Drawings

1.4.1 Dimensions



Units: mm

Figure 1-1: Front View

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Units: mm

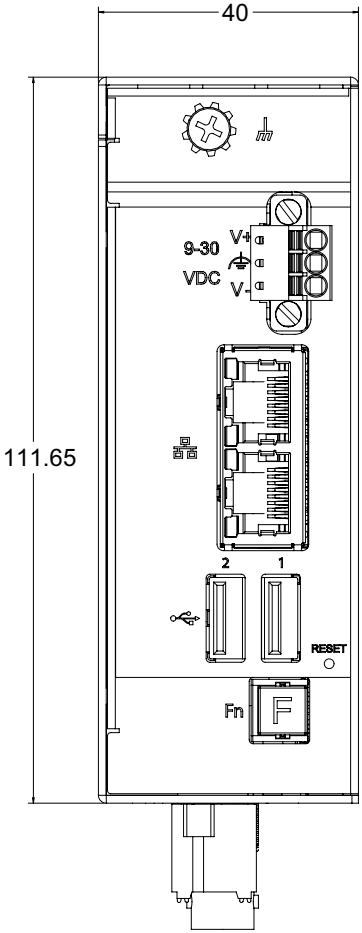


Figure 1-2: Top View

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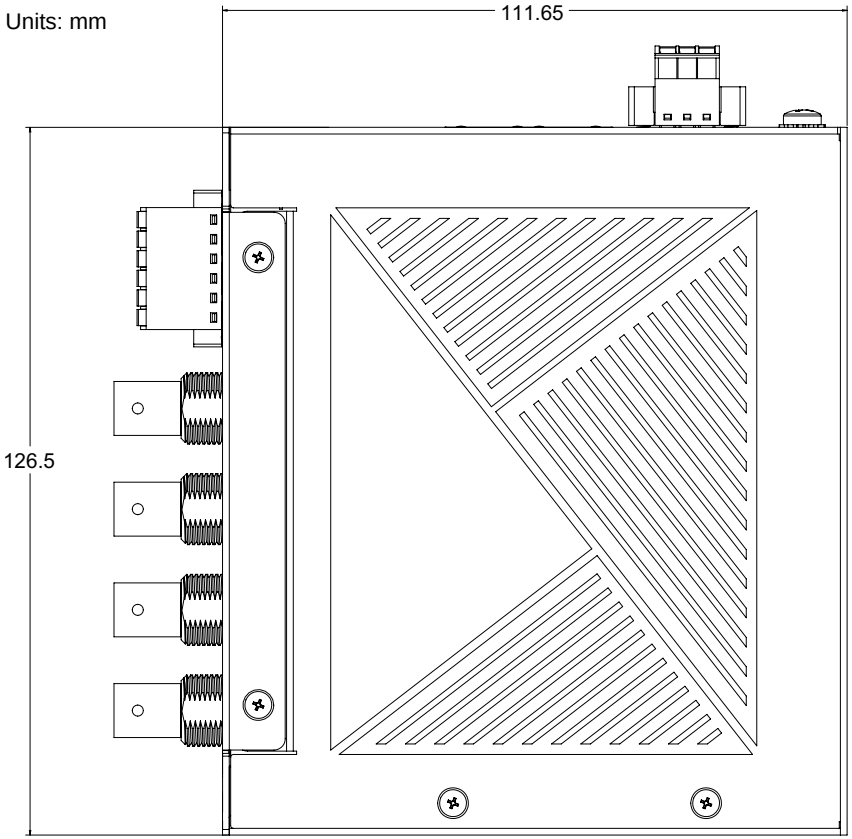


Figure 1-3: Left Side View

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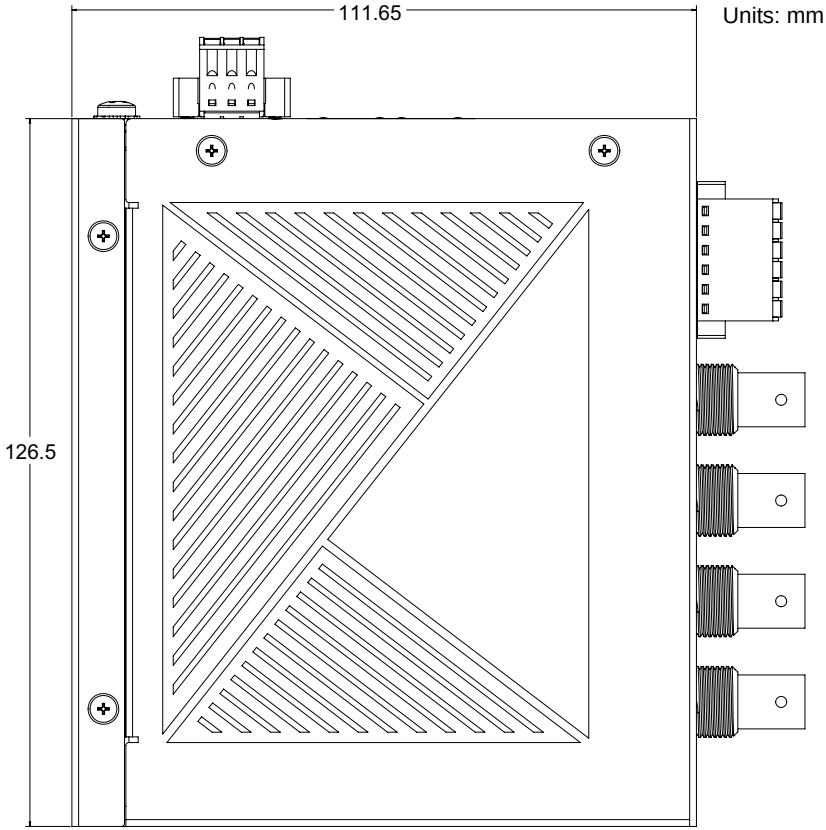


Figure 1-4: Right Side View

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1.4.2 DIN Rail Mount

The DIN rail mount may be attached to the SDAQ-204 using two flat head screws (included).

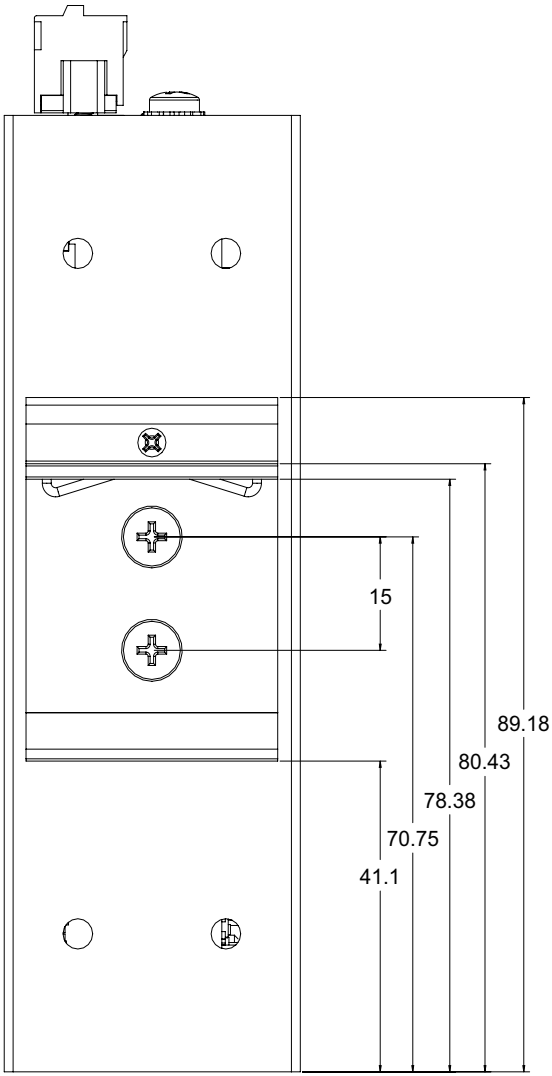


Figure 1-5: DIN Rail Mount Dimensions

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1.4.3 Wall Mount

The optional wall mount bracket may be attached to the SDAQ-204 via four pan head screws (included with wall mount kit, P/N 34-51112-0000; see also Figure 1-7 on page 12).

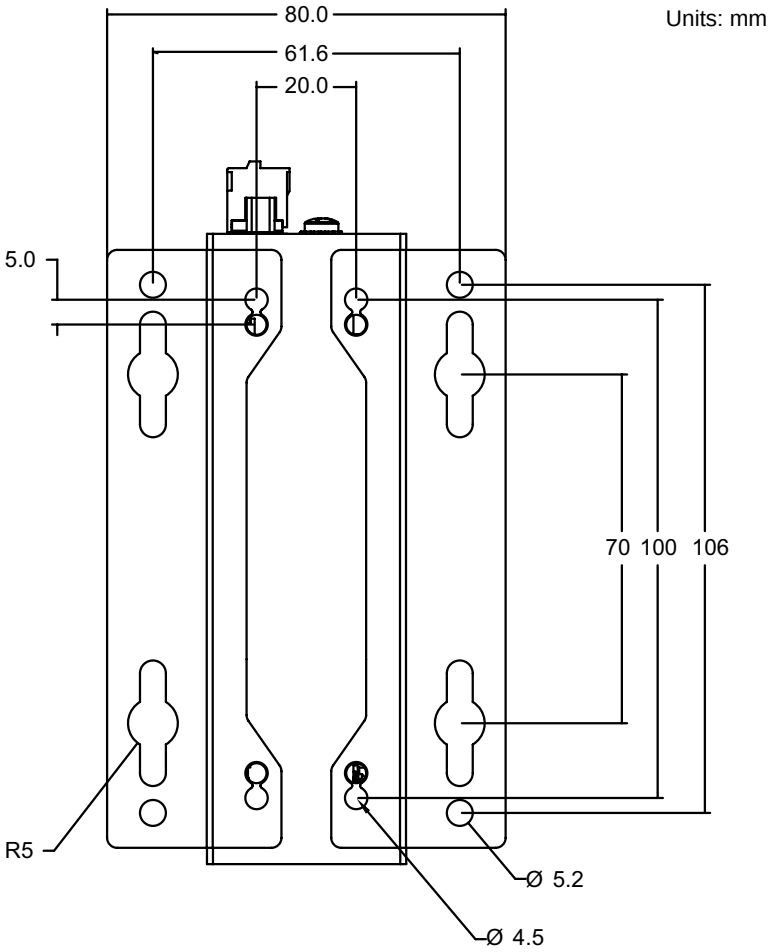


Figure 1-6: Wall Mount Dimensions

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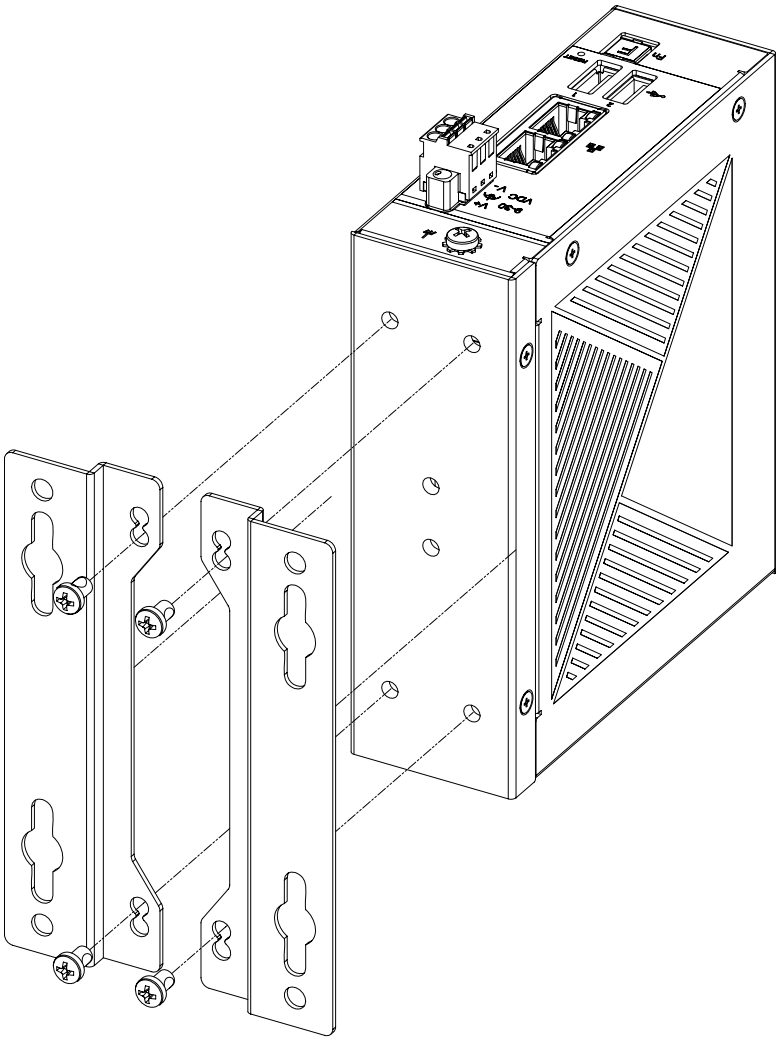


Figure 1-7: Wall Mount Assembly

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1.5 I/O Connectors

The SDAQ-204 provides rich peripherals, including:

- 4 analog inputs
- 4 digital input and output connections
- 1 temperature sensor input
- 2 USB 2.0 (for Wi-Fi dongle and USB storage only)
- 1 hotkey for triggering
- 1 reset pin for restoring the device to factory default settings
- 2 Ethernet ports for host connection and cascading
- 4 LED indicator lights

1.5.1 Analog Input BNC Connector

The SDAQ-204 module is equipped with four BNC connectors to receive voltage signals from various sources. For sensors requiring excitation, such as accelerometers or microphones, the IEPE excitation current can be enabled to reduce the wiring effort.

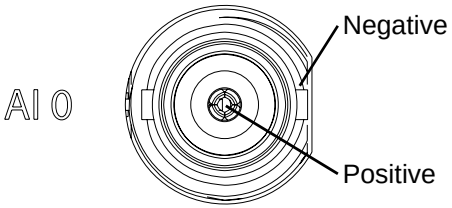
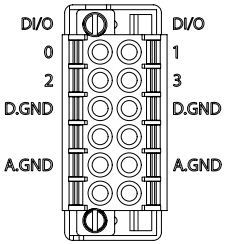


Figure 1-8: BNC Connector Polarity

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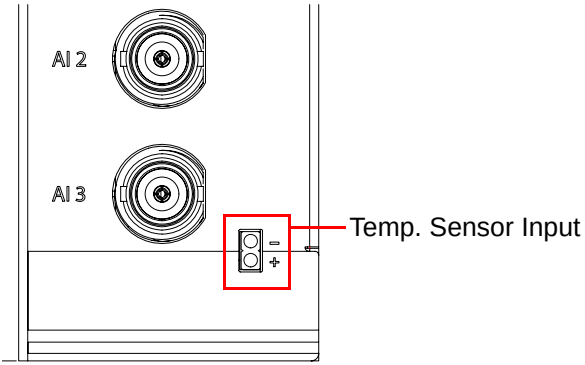
1.5.2 Digital Input and Output

The SDAQ-204 provides 4 digital input/output channels labeled 0, 1, 2, and 3. Each channel can be set for input or output modes independently through the web console. Use **D.GND** for signal grounding with digital input/output. Use **A.GND** for signal grounding with analog input.



1.5.3 Temperature Sensor Input

The SDAQ-204 allows you to monitor the temperature of a target device or environment between -50 to 150°C using the temperature sensor provided. Connect the temperature sensor leads to the connector as shown.



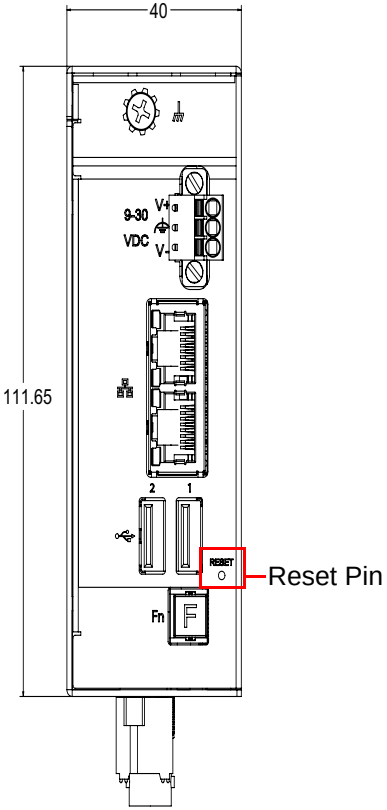
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1.5.4 Reset Pin for Factory Default

Restore the SDAQ-204 to its factory default settings using a paper clip or similar item inserted into the reset pin hole button and pressing the reset button for three seconds until the device reboots.

NOTE: Users can optionally configure the SDAQ-204 to retain its current network settings rather than restoring the factory defaults. See “Web Console” on page 35.

Units: mm



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1.5.5 Ethernet Ports

The SDAQ-204 has two GbE ports with one MAC address. Either port can be used for connecting to a host PC, leaving the second port available for cascading. The default static IP address is 169.254.1.1.

LED1 (Amber)	LED2 (Green)	Link/Activity
OFF	OFF	Link off
OFF	ON	1000 Link/Activity (Tx, Rx)
ON	OFF	100 Link/Activity (Tx, Rx)
ON	ON	10 Link/Activity (Tx, Rx)

1.5.6 LED Indicators

The SDAQ-204 has four LEDs located on the front panel.

LED	Function	Description
PWR	Power input	▶ OFF: Device is not powered ▶ Steady red: Device is powered
SYS	Boot up and system status	▶ OFF: Powered off ▶ Flashing red, then steady red for about 35 seconds: Booting up ▶ Steady green: System ready ▶ Steady red: System error **Note**: Connect the SDAQ-204 to a host PC via Ethernet cable before powering it on to bypass the three minute boot up process.
I/O	Analog input	▶ Flashing: Analog data is being captured ▶ OFF: No data is being captured from FPGA
USB	USB Device	▶ Slow flashing green: A USB device is detected and ready to use. ▶ Fast flashing green: Data read/write activity

1.5.7 USB Ports

USB ports can be used to add a Wi-Fi dongle. Contact your ADLINK sales representative for more information.

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2 Getting Started

2.1 Unpacking the SDAQ-204

Ensure that the following items are included in the package. If any items are missing, contact your sales representative for assistance.

- SDAQ-204
- DIN rail mount kit with 2x flat head screws
- Temperature sensor with 3 meter cable
- Quick Start Guide
- Optional accessories (if applicable):
  - Wall mount kit with 4x pan head screws
  - 40W AC-DC adapter



Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK.

2.2 Connecting to I/O

1. For analog input, plug in the accelerometer with a BNC type connector.
2. For digital input or output, insert the signal wires into the terminal block.
3. Use a CAT 5 type Ethernet cable to connect a host PC to one of the Ethernet ports on the top panel. To create a daisy chain of multiple SDAQ-204 devices, use the second Ethernet port to cascade them together. Cascading reduces the number of ports needed to connect devices.



If connecting SDAQ-204 devices in a daisy chain, only use a sequence configuration: do **not** use a ring configuration. A ring configuration will cause network communications to fail.

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4. For temperature measurement, plug a two-pin temperature sensor connector into the front panel ports before attaching the temperature sensor to the target area to be measured.

2.3 Connecting/Disconnecting Power

1 Before turning on the power source, connect the positive and negative wires from a 9 to 30 VDC power source to the terminal block.

2. Turn on the power source. If the power was connected correctly, the front panel red PWR LED will light up.

If the SDAQ-204 needs to be shut down, turn off the power source.

To remove the power wires, use a flat head screwdriver to push the orange slots on the terminal block and then pull out the wires.



Ensure the power source is turned off before connecting or removing the power wires.

2.4 Checking Device Status

1 When power is supplied, the PWR LED will be red. The SYS LED will initially blink red, then turn to a steady red for about 35 seconds, then change to a steady green indicating the device has successfully booted up.

2. Log into the device's web console for additional status information and configuration options. see "Web Console Login" on page 35.

2.5 Usage Scenarios

The SDAQ-204 is designed for distributed machine condition monitoring and can be used in many kinds of scenarios. Choose the most suitable scenario depending on the system infrastructure, data type, and frequency of data retrieval.

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2.5.1 Deploy User-Developed Analytics Apps

The DAQPilot ACE software allows users to easily manage Smart DAQ devices and deploy user-developed applications on them.

DAQPilot ACE provides the following features:

- IDE for Python programming, allowing users to develop and debug iApp remotely
- Provides a dashboard widget to show the data immediately
- Auto-discovers all supported devices on the local network
- Tags function allows users to identify or group multiple devices
- Deploys iApp to device via one-click function

For more information, see “DAQPilot” on page 21.

2.5.2 Configuration / Portable DAQ

Use the web console to configure device information, system settings, network settings, and test measurement analog input settings. For portable DAQ usage, the SDAQ-204 has a built-in dashboard to show the results of acquired data. The web-based console is also a convenient tool for users unfamiliar with DAQ behavior or programming. see “Web Console” on page 35.

2.5.3 Periodic Polling (REST API)

Many distributed machine condition monitoring applications acquire device status periodically, for example, every minute, or hourly. The SDAQ-204 retains captured data in the REST data format. Especially in IT systems, user applications frequently adopt REST APIs because they are intuitive. The SDAQ-204 emulates all functions supported by REST APIs, and the SDAQ-204 embedded middleware executes related operations and transfers the filtered data in JSON format. All queries from a REST command are handled by the SDAQ-204 and reply accordingly. see “DAQ Missions” on page 53.

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2.5.4 Continuous Data (DAQPilot SDK)

Some applications need to acquire streaming data continuously. To transmit high volumes without data loss, raw data without any transformation is best. For users needing to access the DAQ library directly, the DAQPilot SDK is the proper method. By using the streaming API, all queried raw data may bypass the SDAQ-204's middleware and route directly to the host PC via Ethernet. see "Continuous Data" on page 55.

2.5.5 Passive Data (TCP Socket)

For passively retrieving data, it is suitable to use a TCP socket with the SDAQ-204 in client mode. Whenever data is generated, the SDAQ-204 will be triggered to establish a TCP connection with the host PC and actively transmit the data. see "Web Console" on page 35.

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3 DAQPilot

DAQPilot is a software package for ADLINK DAQ products. It provides an integrated management utility that includes device management, iApp creation and allows deployment of user-defined data analytics to DAQ devices for enhanced smart capabilities and provides a unified SDK that allows users to stream continuous time-series data. The SDK is task-oriented and optimized for typical DAQ applications.

It available for download on the SDAQ-204 product web page:

https://www.adlinktech.com/Products/Data_Acquisition/SmartDAQ/SDAQ-204

3.1 DAQPilot ACE

DAQPilot ACE is able to auto-discover all supported devices on the local network and features an intuitive user interface for providing device management functionalities including displaying device information, iApp deployment to devices and setting Tags to identify or group multiple devices. Tags are a convenient way for mass iApp deployment to grouped devices.

3.1.1 Installation

For optimal performance, make sure that the ACE software is properly installed on a client system computer that is properly linked with all ACE devices on the same LAN.

1. Install ACE devices.
2. Connect each ACE device to the same LAN with an Ethernet cable.
3. Power on each ACE device.

Note: It can take up to 2 minutes for the devices to link-up.

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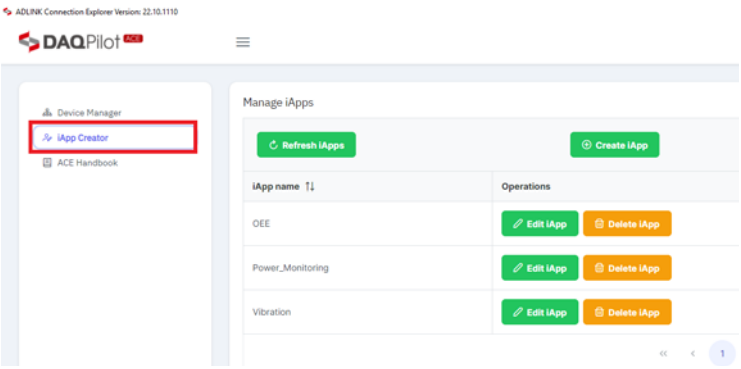
3.2 iApp Development and Device Management

ACE contains two major parts, iApp development and device management. This section includes a tutorial on how to create an iApp before deployment. iApps are saved in a repository and can be deployed to devices through the device management function.

3.2.1 iApp Development

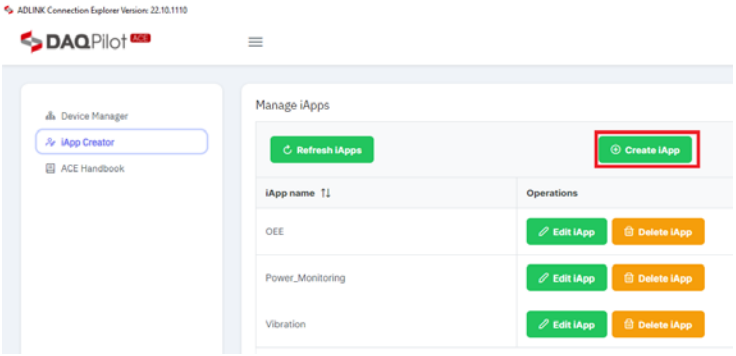
Follow these steps to create a Python-based iApp.

1. Click **iApp Creator** from the left sidebar.

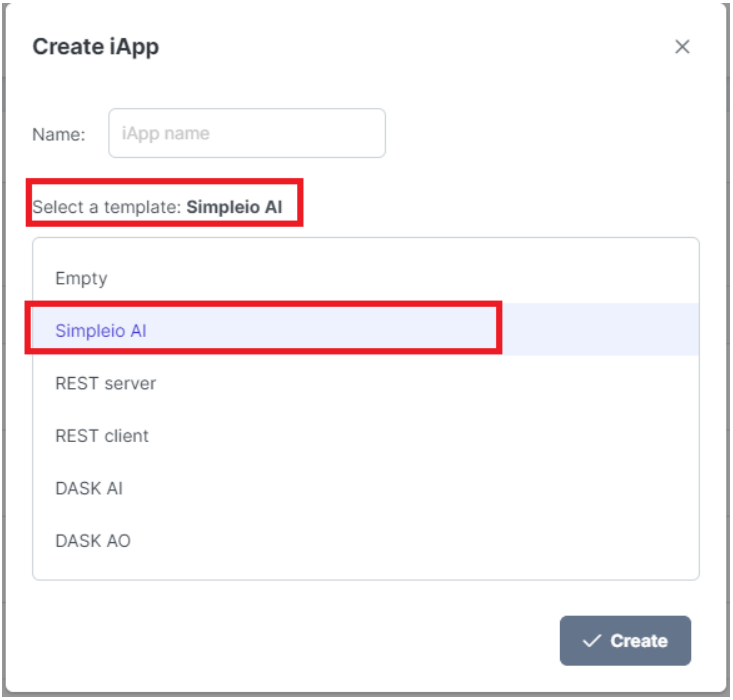


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2. Click **Create iApp** to create a new iApp.

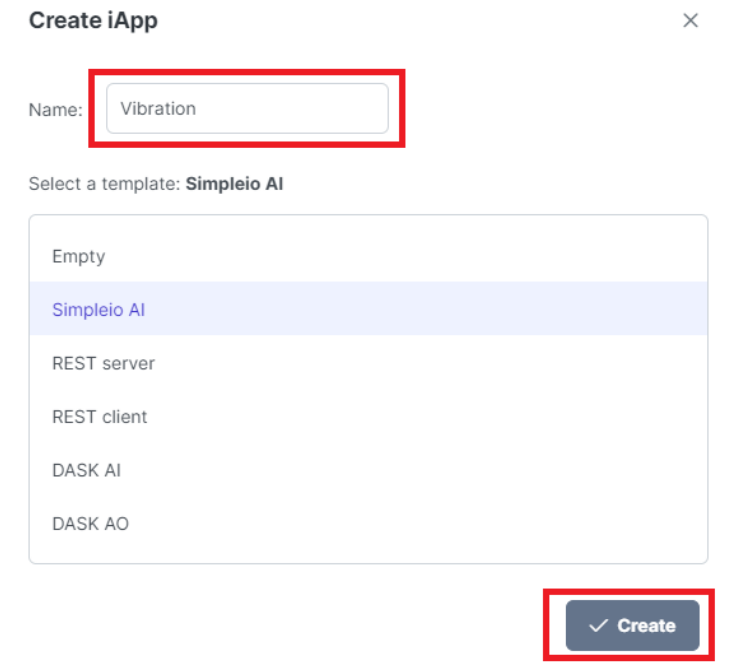


3. Select an iApp template to start from.

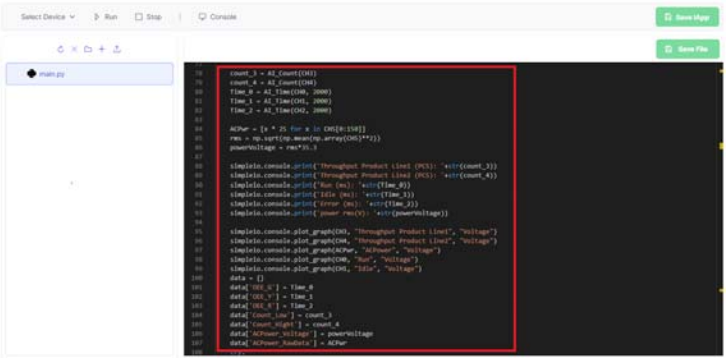


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4. Enter a name for the iApp and then click **Create**.

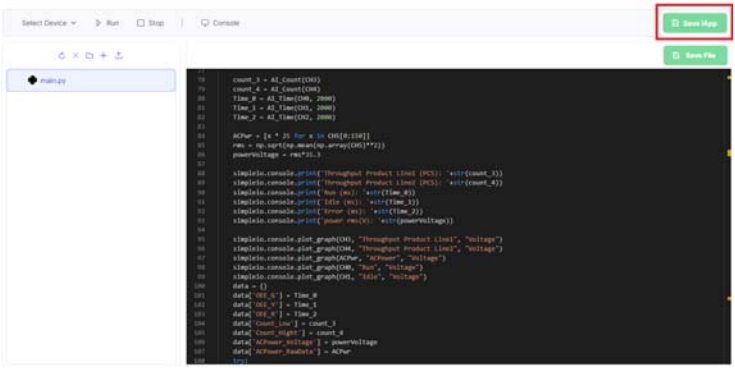


5. A new iApp will be automatically loaded into the editor where it can be edited as necessary.



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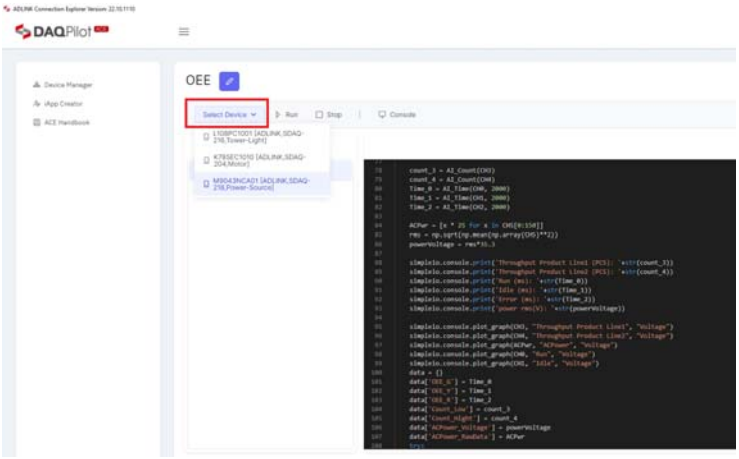
6. Click **Save iApp** when editing is completed.



3.2.2 iApp Deployment

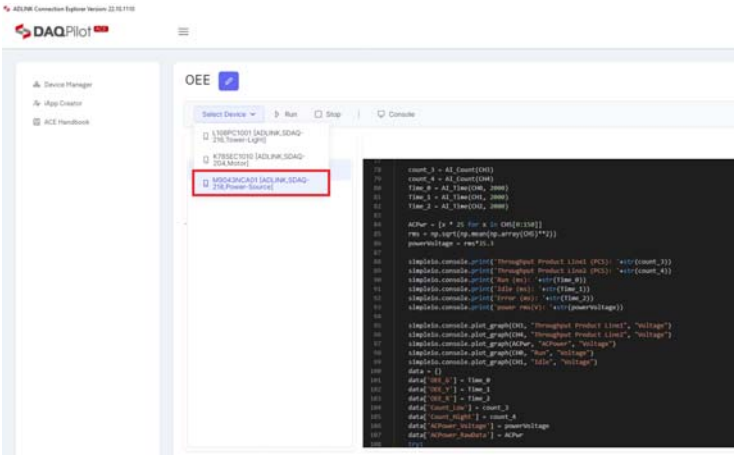
Follow these steps to deploy an iApp.

1. Click **Select Device** on the menu bar.

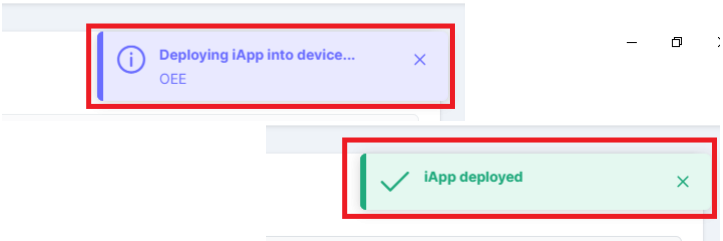


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2. Select the target device to be deployed.

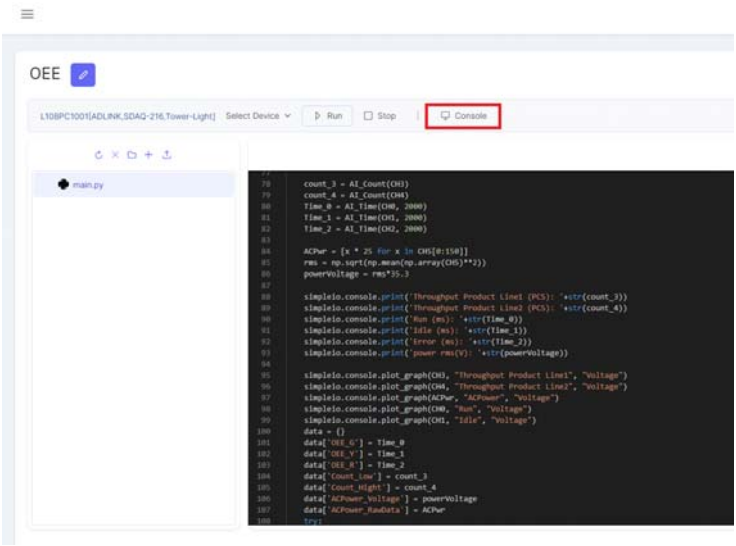


3. Click **Run** and wait for the deployment to finish.

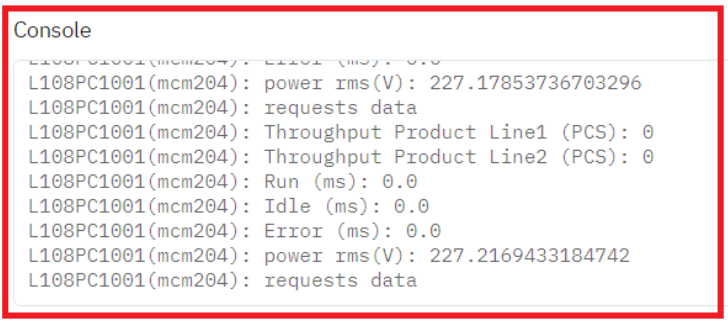


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4. Click **Console** on the menu bar.



5. Console view shows that the iApp deployed to the remote device is running.

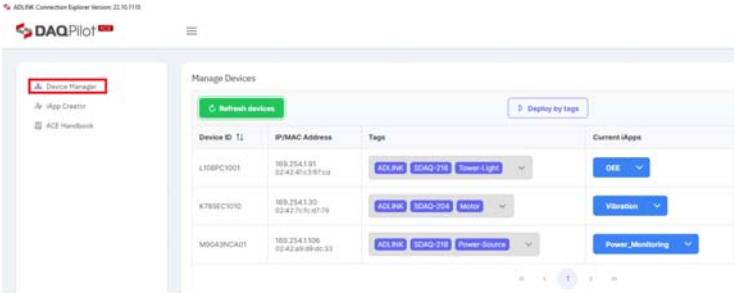


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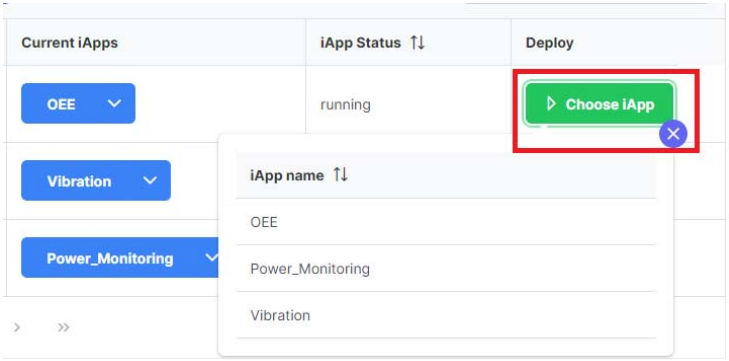
3.2.3 Device Management

Follow these steps to deploy an iApp to a single device.

1. Click **Device Manager** on the the left sidebar.

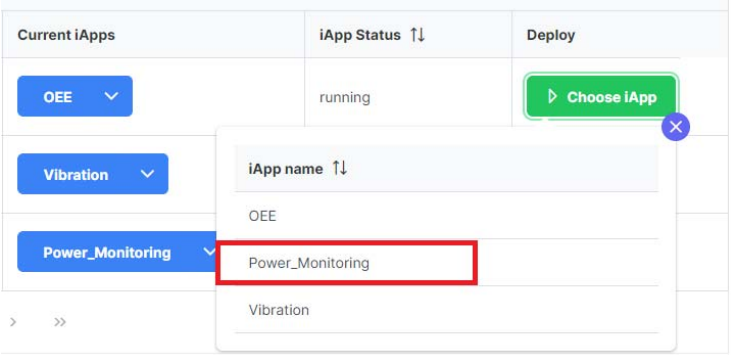


2. For a targeted device, click **Choose iApp**.



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3. Select a target iApp to deploy to start deployment.

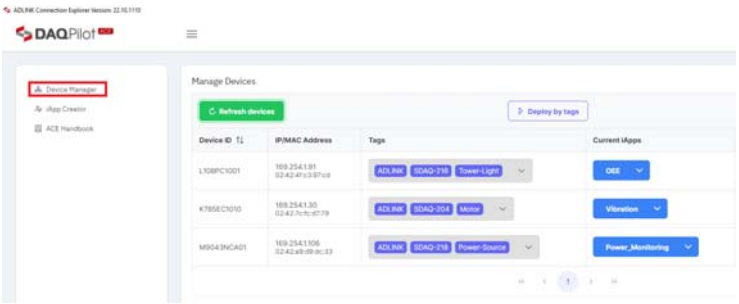


4. The selected iApp is deployed to the target device.

3.2.4 Assign Tags to Devices

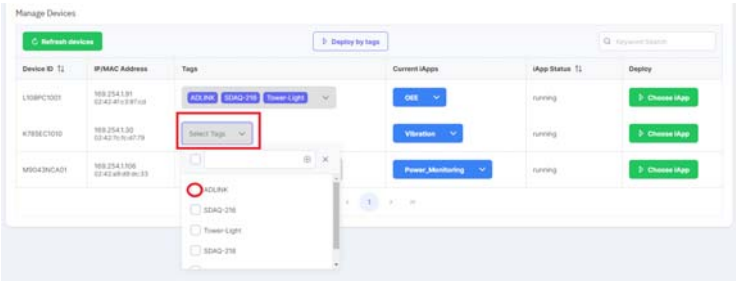
Tags can be assigned to devices for device naming or mass deployment. Follow these steps to assign a name to a device.

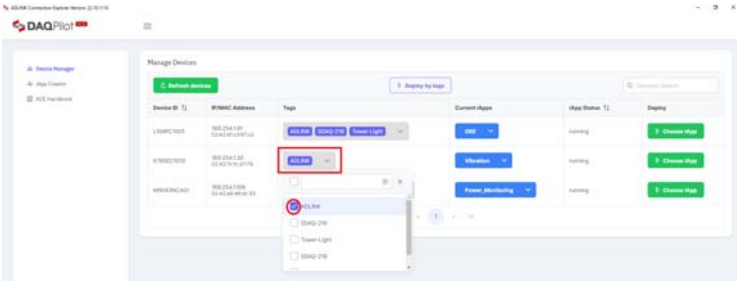
1. Click **Device Manager** on the left sidebar.



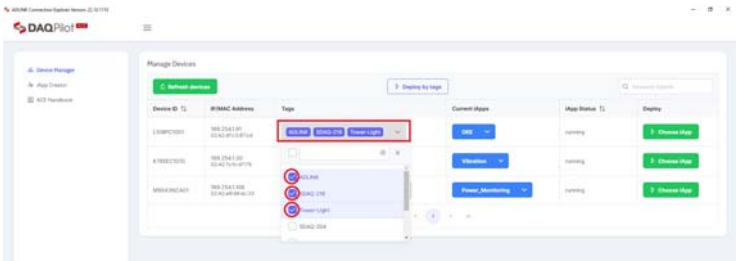
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2. To select a targeted device, click the dropdown menu under Tags.



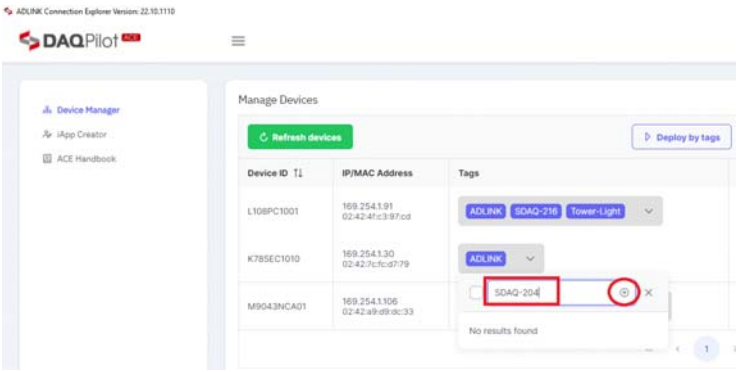


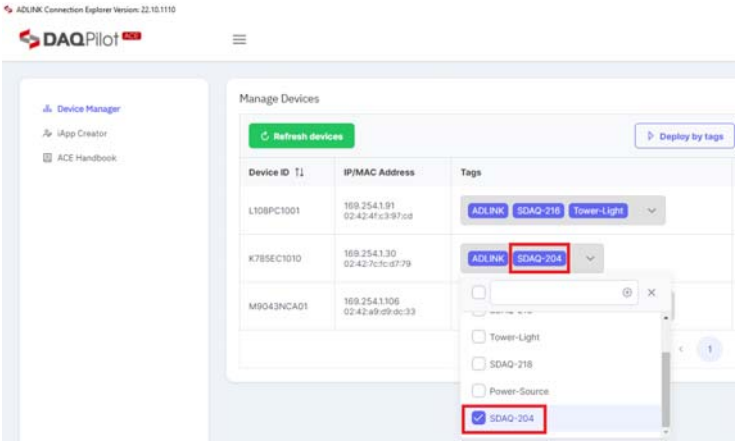
3. Select a tag to list the devices.

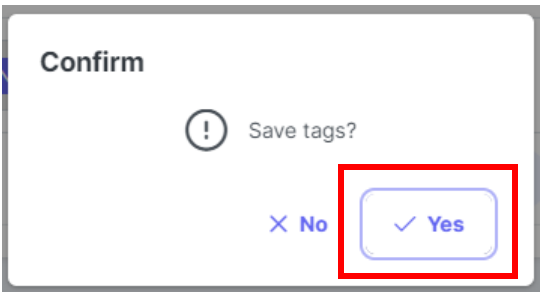


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4. To create new tag, click **+**, and then save it.





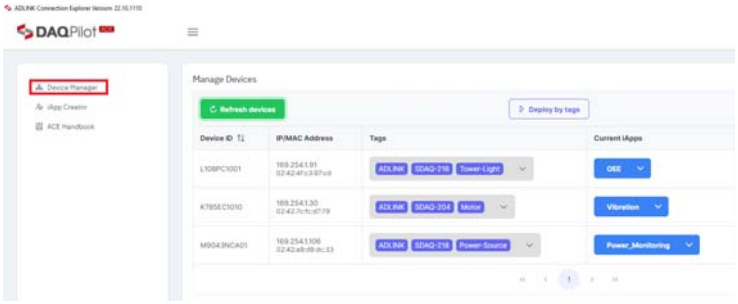


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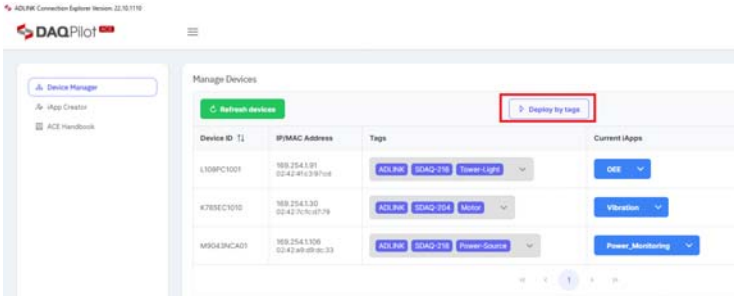
3.2.5 Deploy an iApp to Multiple Devices with Tags

Follow these steps to deploy an iapp to multiple devices with tags.

1. Click **Device Manager** on the left sidebar.

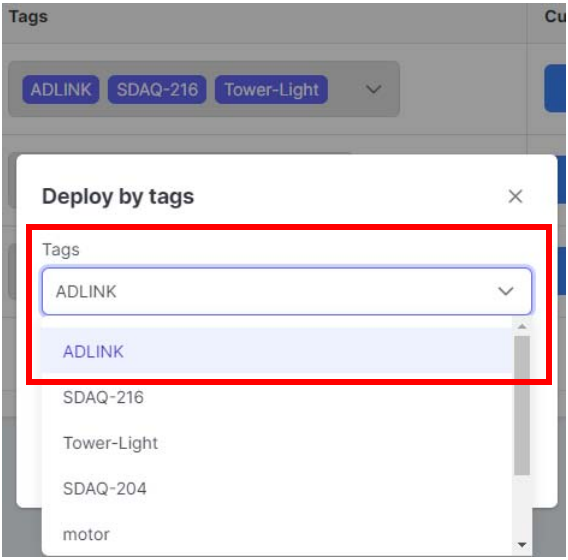


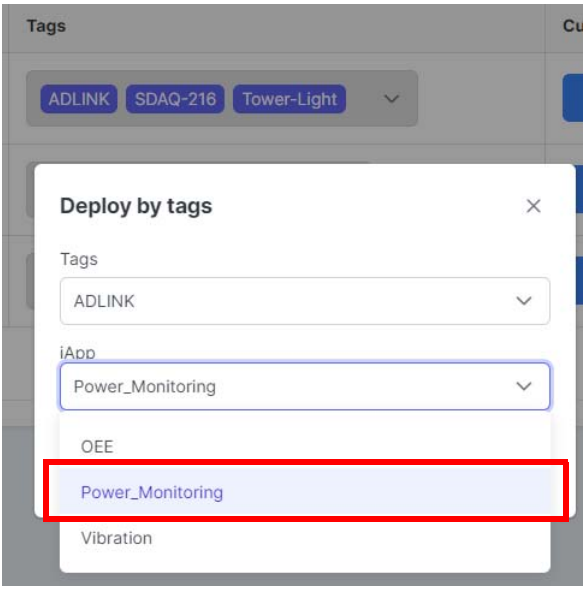
2. Click **Deploy by tags**.



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Select a tag and a target iApp to deploy and click **Deploy**. The target iApp will be deployed to the target device.





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4 Web Console

This chapter describes how to use the built-in web console to configure the SDAQ-204 and view captured data.

4.1 Web Console Login

After the SDAQ-204 has been successfully powered on and a host PC has been connected to it, do one of the following: (1) set the PC's network setting to either DHCP mode or link local mode; or (2) modify the PC's IP address to be on the same network segment as the device (169.254.x.x). Next, open a web browser on the PC (Google Chrome is recommended) to access the web console via one of the following options.

Option 1: IP Address

1. Get the IP address from DAQPilot ACE (available for download on the SDAQ-204 product web page: https://www.adlinktech.com/Products/Data_Acquisition/SmartDAQ/SDAQ-204)

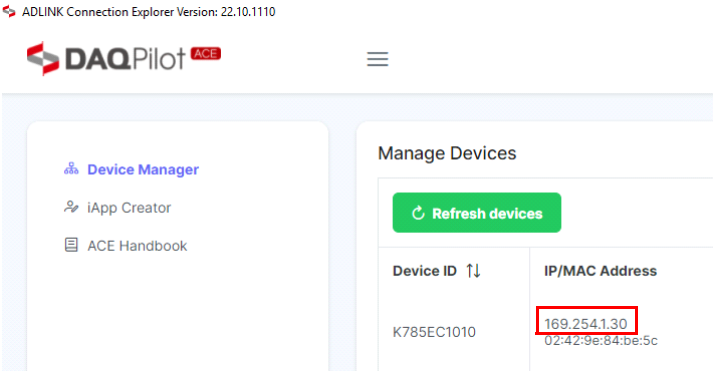


Figure 4-1: Get IP Address from DAQPilot ACE

2. In your web browser's address bar, enter the IP address from above (e.g., http://169.254.1.30).

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Option 2: Hostname

Connect the SDAQ-204 to a network component (switch/router) with DNS functionality, then enter the SDAQ-204's hostname in the address bar of the host PC's web browser, prefaced by http:// (e.g., http://mcm204-j801ns1001). A unique default hostname is generated for each SDAQ-204 device and can be found on the label of the box it was shipped in. The hostname can be changed within the web console.

After using either method, the web console will display within roughly 30 seconds, presenting the user with a login screen (see Figure 4-2).

The default username is **administrator** and the default password is **Adlink6166**.

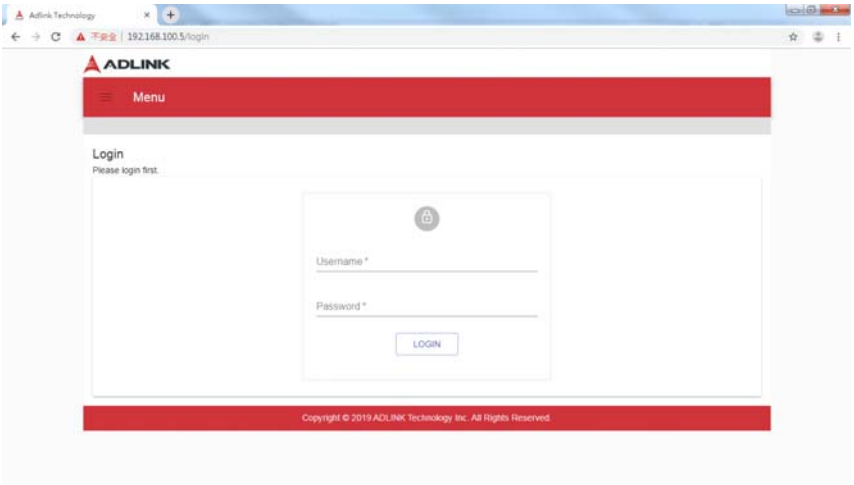


Figure 4-2: Web Console Login Page

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After logging into the web console, **DAQPilot Setting** must be disabled immediately before continuing (see Figure 4-3).

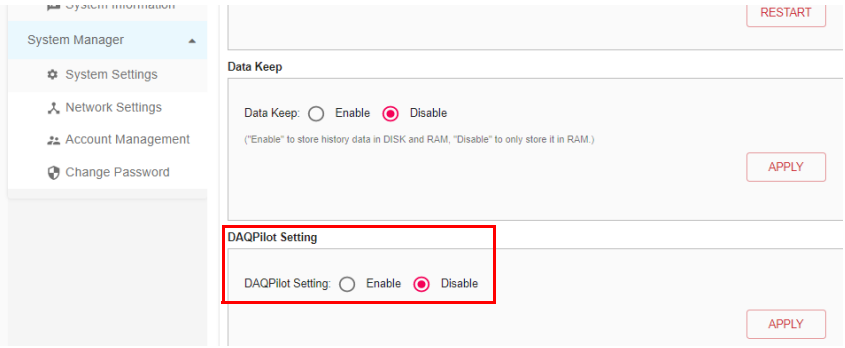


Figure 4-3: Disabling DAQPilot Setting

4.2 Web Console Menu

The web console menu bar includes the following items.

- System Information
- Device Setting
- Data Capture
- Peripheral
- Data History
- Data Condition
- Mission Management
- Change Password
- Account Management
- System Setting
- TCP Socket

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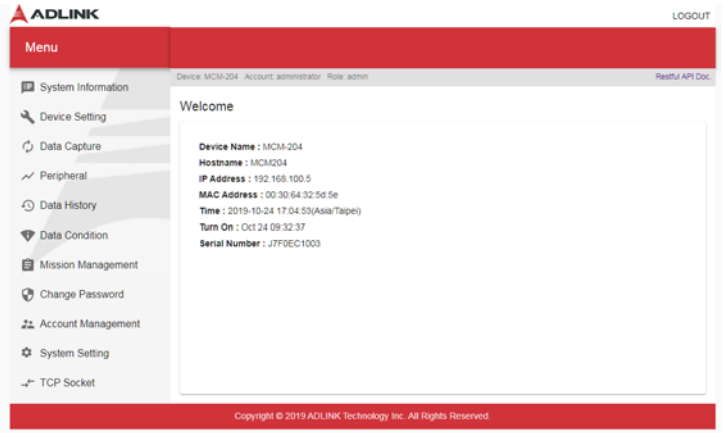


Figure 4-4: Web Console Welcome Page

Depending on the host PC screen size and resolution, the menu list might be collapsed. Click the menu icon to expand the menu.

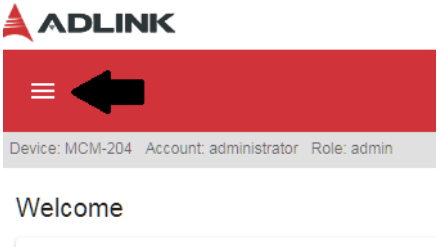


Figure 4-5: Menu Icon

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4.2.1 System Information

The System Information page shows the device software version, general information, I/O channel status, and network status.

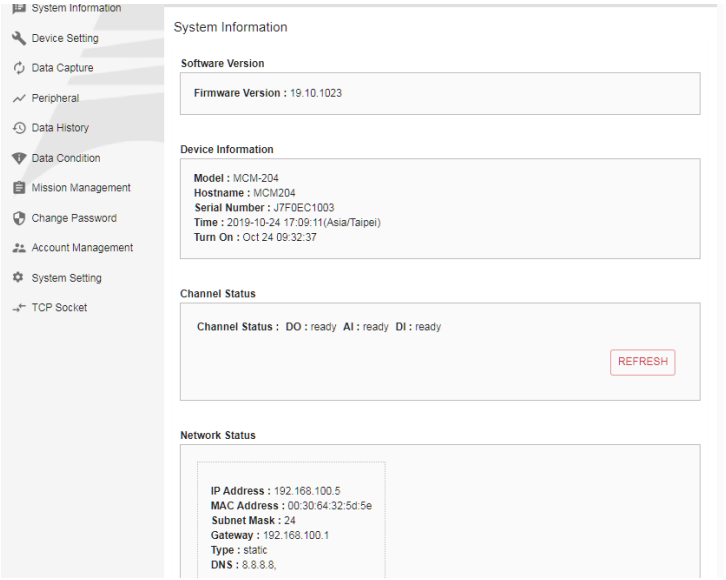


Figure 4-6: System Information

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4.2.2 Peripheral

Peripheral digital input/output and temperature sensor information is shown on this page. The Status area shows the current status of the peripherals. Select **REFRESH** to update the status.

Four digital input/output devices can be used. Each can be adjusted for either input or output mode. To enable/disable digital input/output, mark the appropriate check boxes as necessary.

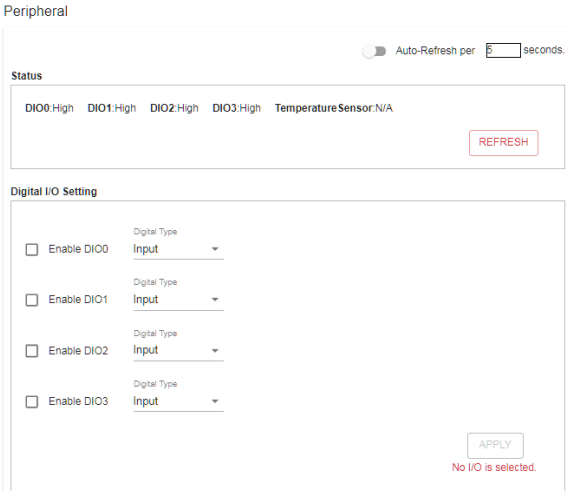


Figure 4-7: Peripheral Devices

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4.2.3 Data History

Historical data can be retrieved in this page. Choosing a specific time period will speed up the data search.

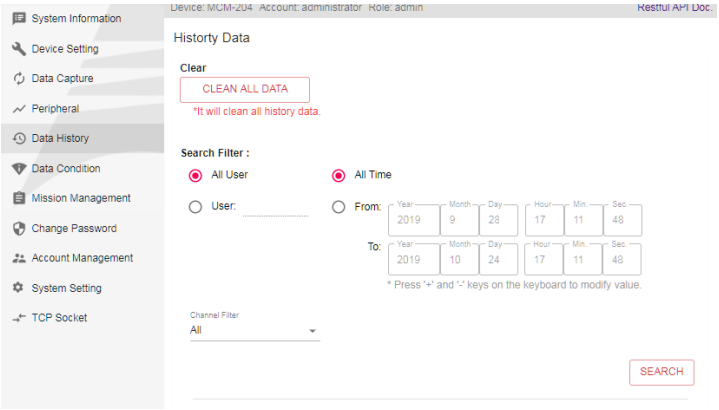
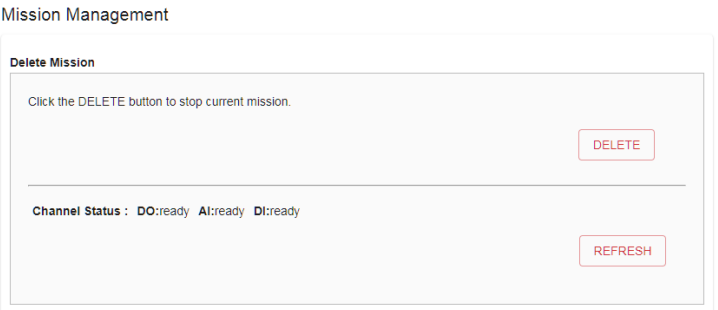


Figure 4-8: Data History

4.2.4 Mission Management

A mission is a setting of I/O parameters with an intended output method. The SDAQ-204 will execute the same settings even after a reboot, so if Repeat Times is set to 0 (endless data capture), the SDAQ-204 will run its previous mission after reboot. To configure the I/O parameters for another mission, delete the current mission.

Channel Status shows if the AI and DI/O are running a mission or are ready to be assigned a new mission.



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Figure 4-9: Mission Management

4.2.5 Change Password

This page is used to change the password of each SDAQ-204, whether there is a single device or multiple daisy chained devices. It is recommended that each device have a unique password since the default password for every SDAQ-204 is identical.

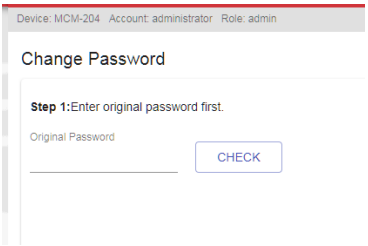


Figure 4-10: Change Password

4.2.6 Account Management

This page manages user accounts and access privileges.

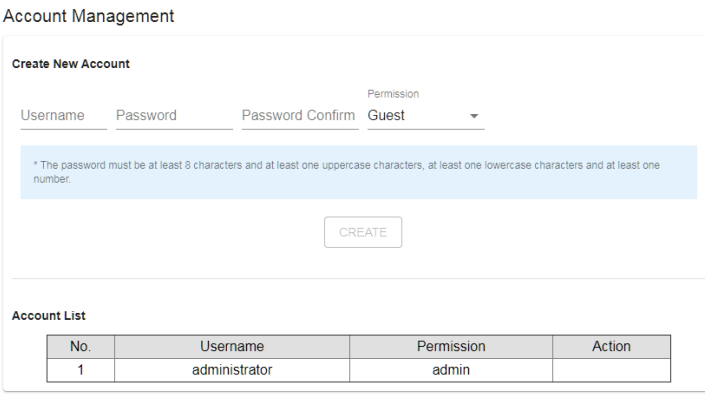


Figure 4-11: Account Management

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4.2.7 System Setting

This page manages various system settings.

Hostname: The device's hostname can be modified by entering a new hostname here and clicking the **APPLY** button. A hostname can be used instead of an IP address to access a specific device's web console. See "Web Console Login" on page 35 for details.

Keep Network Setting: Select **Enable** to retain network settings even after the device has been reset to factory defaults.

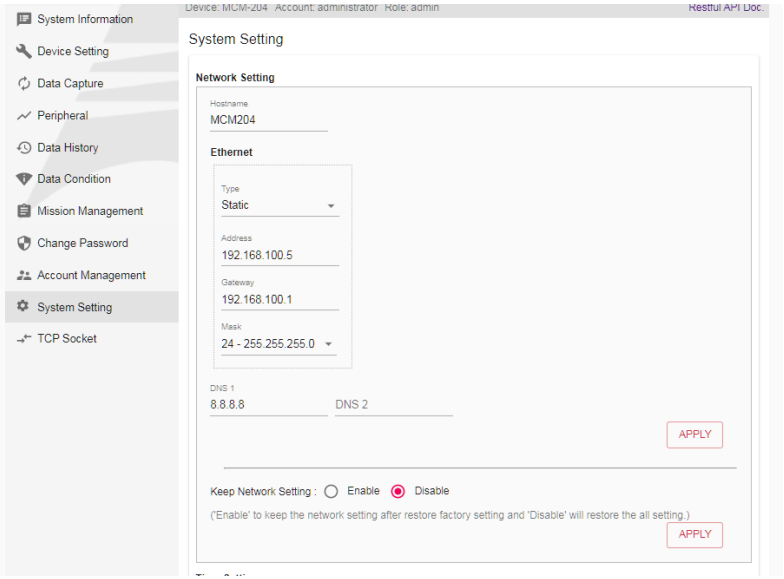


Figure 4-12: Network Settings

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Data Keep: By default, the SDAQ-204 stores history data only in RAM and the data is lost when the system reboots. Select **Enable** to also save history data to internal storage. The amount of disk space allocated for this purpose is 300MB. When that limit is reached, data that has gone for the longest period of time without being accessed will be overwritten first, thus preserving the data that has been accessed most recently.

Device Calibration: The SDAQ-204 can be recalibrated if necessary. Though the SDAQ-204 is factory-calibrated before shipment and associated calibration constants are written to the on-board EEPROM, it is possible that, over time or depending on temperature conditions, recalibration may become necessary.

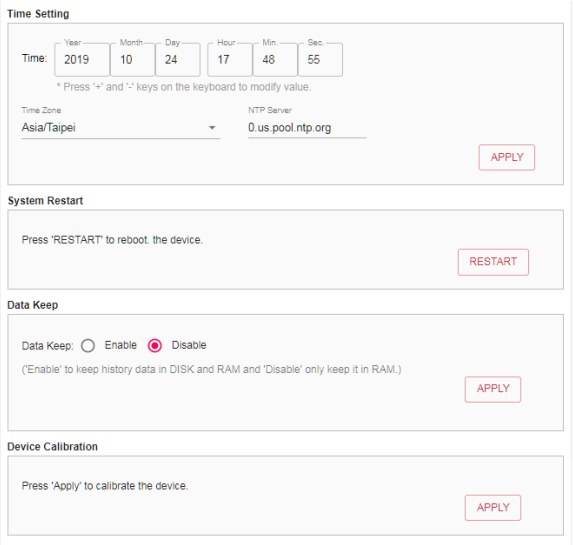


Figure 4-13: System Settings

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Customization Library Upload: This function runs custom formulas on the SDAQ-204 according to a given file. See “Custom Filtering Algorithms” on page 56.

Firmware Upgrade: A firmware upgrade file can be uploaded to the SDAQ-204 through this feature. These files will periodically be provided through the product web page:

https://www.adlinktech.com/Products/Data_Acquisition/SmartDAQ/SDAQ-204

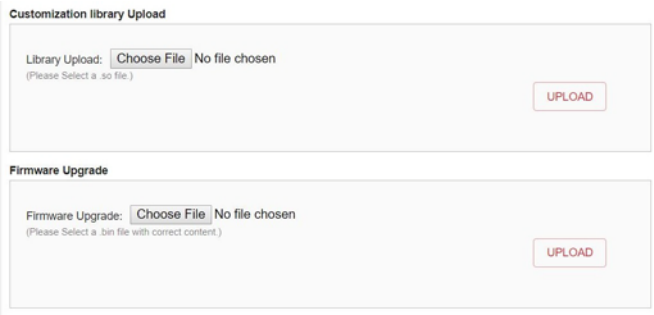


Figure 4-14: Upload Customization/Firmware Files

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4.2.8 TCP Socket

The SDAQ-204 supports TCP socket communication as a socket client. Enter the IP address and port number of the remote TCP socket server. Different analog input channels can be mapped to different ports. Select **ADD RULE** to add the TCP server to the Socket Connection List.

The Status column shows the communications status with the corresponding TCP socket server. If the socket is disconnected, select **RE-CONNECT ALL** to re-establish the connection.

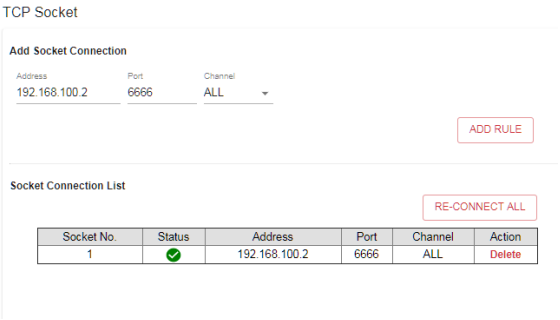


Figure 4-15: TCP Socket

After setting the TCP socket connection and creating a DAQ mission, data generated by the SDAQ-204 will immediately begin transmitting to the TCP server side.

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4.3 DAQ Mission

The SDAQ-204 performs excellent vibration detection with an analog IEPE accelerator connected. Related parameters can be set via the **Device Setting** page.

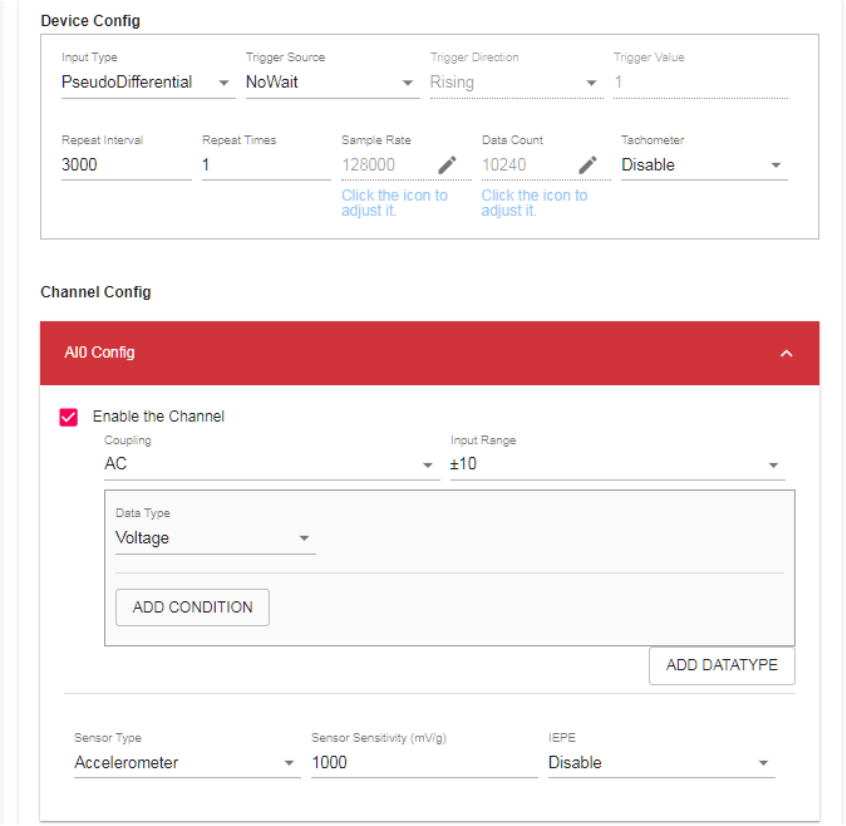


Figure 4-16: Device Configuration

Trigger Source allows the data capture function to be triggered from a particular source via analog and digital triggers.

Repeat Interval is the interval between data captures, in milliseconds. Each data query consists of data capture via FPGA plus data filtering via MCU. The time required for data filtering may vary according to the complexity of the filtering algorithm.

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Repeat Times is the total number of times the data is to be captured. For endlessly repeating data capture, set to 0.

WARNING:

Warning! If you are using a customized algorithm as your **Data Type**, it is strongly recommended to set **Repeat Times** to 1 for the first attempt, then to 10 for a limited data capture test. Once you have confirmed the algorithm is running as intended, you can set **Repeat Times** to 0 for repeated data capture.

Set **Sample Rate** and **Data Count** accordingly. Selecting the pen icon to display a convenient sliding tool with fine-tuned (+/-) adjustments.

For each analog input channel, click **DataType** to choose which data type to use for the output.

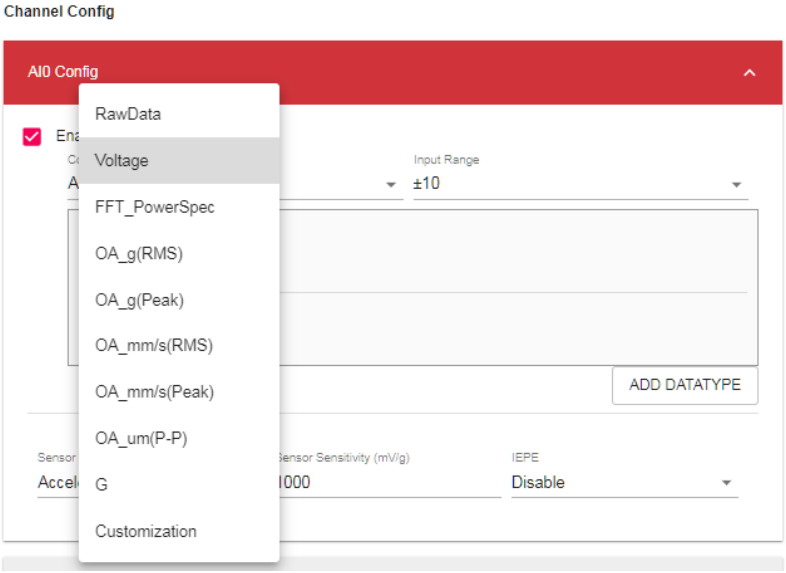


Figure 4-17: DataType

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The SDAQ-204 has built-in functionality for several common data types and also supports user-customized data types, as detailed in the table below. If two or more data types are required for an analog input channel, select **ADD DATATYPE** for each additional data type.

Data Type	Description
Raw Data	The raw data generated by ADC (24 bit, 2's complement)
Voltage	Transferred from raw data
FFT_PowerSpec	Power spectrum transferred by fast Fourier transform (FFT)
OA_g(RMS)	Overall value in the format of g(RMS)
OA_g(Peak)	Overall value in the format of g(Peak)
OA_mm/s(RMS)	Overall value in the format of mm/s(RMS)
OA_mm/s(Peak)	Overall value in the format of mm/s(Peak)
OA_um(P-P)	Overall value in the format of um(P-P)
G	Acceleration transferred from sensor sensitivity
Customization	Customized data type set by user

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ADD CONDITION provides an event warning mechanism. When a given condition is triggered, a warning message will display on the **Data Condition** page.

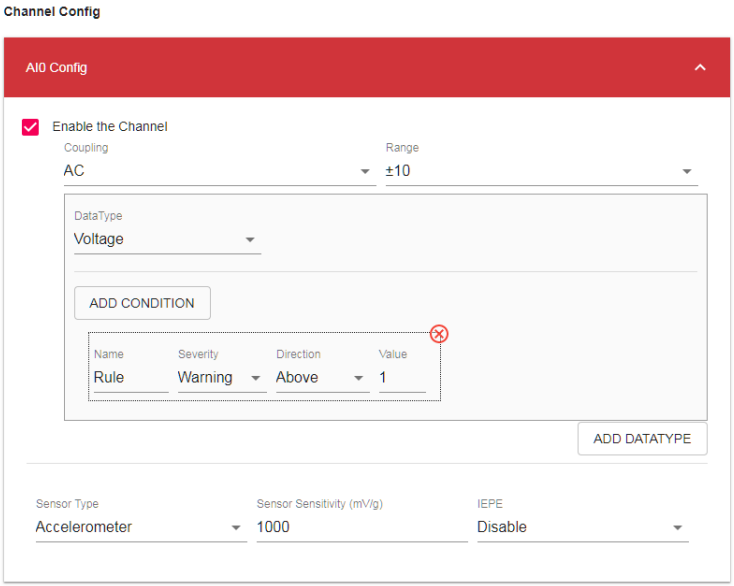


Figure 4-18: Add Condition

After the desired settings have been configured, click **APPLY** to activate your changes.

The **Data Capture** page displays DAQ results in real time. You can use the data capture function in lab testing or as a portable DAQ device. Raw data and Voltage can be converted to charts for troubleshooting.

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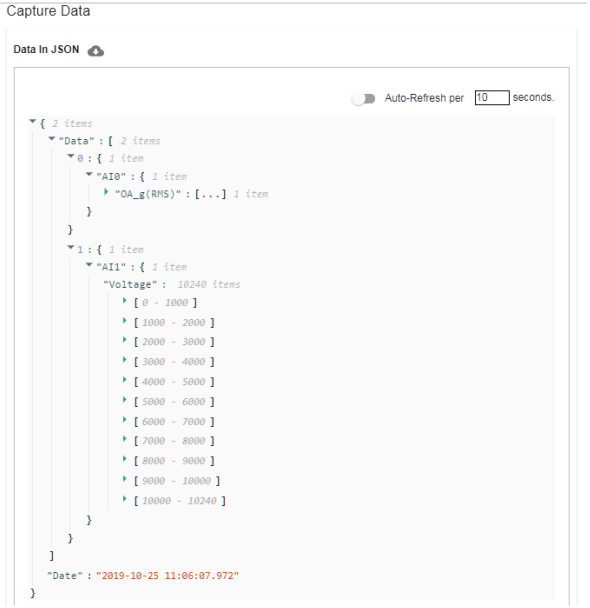


Figure 4-19: Data Capture

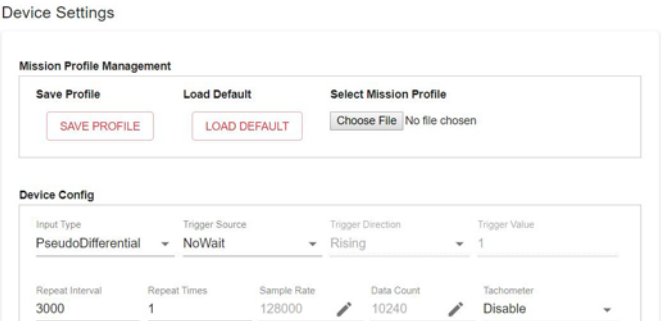


Figure 4-20: Device Settings

Settings may be saved as a Mission Profile (JSON file) for backup or for convenient duplication on other SDAQ-204 devices. Click **SAVE PROFILE** to download the file to your PC. To import a Mission Profile to an SDAQ-204 device, click **Choose File** under **Select Mission Profile** and select the desired configuration file.

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All settings will change according to that file. Alternatively, clicking **LOAD DEFAULT** will restore all settings to their default values. After any change to device settings, the **APPLY** button must be clicked in order to activate the changes.

If a mission is already running while attempting to apply new changes, a confirmation window will appear. If you're ready for the SDAQ-204 to cancel its previous mission and start running the new mission, click **YES**.

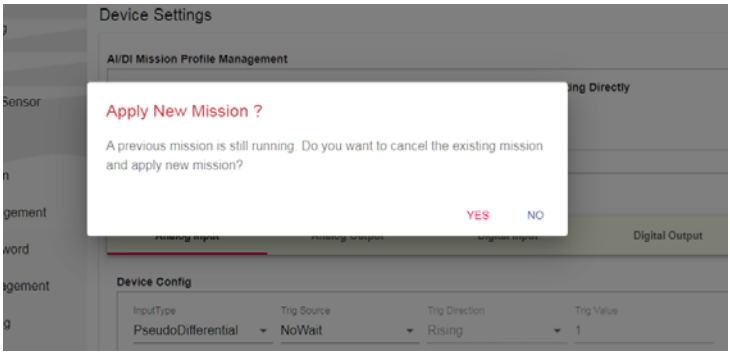


Figure 4-21: Apply a New Mission

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5 DAQ Missions

The SDAQ-204 supports various modes of operation that users can choose from to quickly integrate into their systems.

5.1 Usage Behaviors

IEPE sensors transmit raw data to the SDAQ-204 which can then be filtered to other kinds of data types that are more application appropriate, such as overall vibration values (ISO 10816) for mechanical vibration data. The overall vibration value data size is greatly reduced in comparison to raw data, so the backend server receives much less data for analysis. Data filtering is best suited to applications requiring continual information updates at a given time interval, such as every minute, which the user can then review periodically.

In contrast to data filtering, some applications, such as lab testing, require continuous raw data for analysis. However, continuous transmission of large amounts of raw data places a heavy burden on the backend server and takes up more network bandwidth. Evaluate your bandwidth and application requirements carefully in order to adopt the most suitable programming method for your needs.

There are three major usage behaviors: Periodic Polling, Continuous Data, and Passive Data. Choosing between them depends on how frequently data must be retrieved. Figure 5-1 on page 54 can serve as a guide for selecting the appropriate usage behavior for system integration based on polling data frequency.

For the periodic polling mode, SDAQ-204 provides a REST API and sample code in C#, Python, and JavaScript. Alternatively, for continuous data mode, SDAQ-204 provides a DAQPilot SDK and associated C/C++ sample code.

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5.1.1 Web Console

The SDAQ-204 has a built-in, easy-to-use web console that implements all device functionalities. By logging into the web console through a connected host PC, users can see all of the device's current settings, each feature it provides, and any vibration data it has collected. See "Web Console" on page 35.

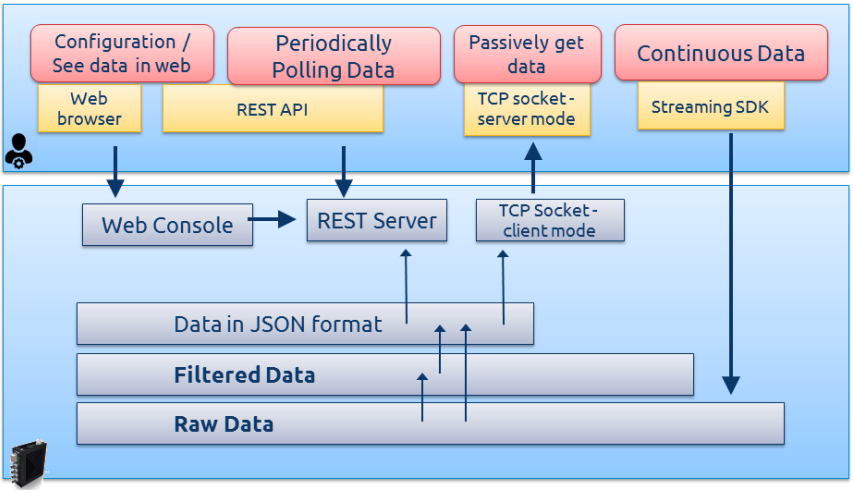


Figure 5-1: Operational Modes

5.1.2 Periodic Polling

A RESTful API is provided to facilitate periodic data polling. The REST document can be found on the web console's menu bar.

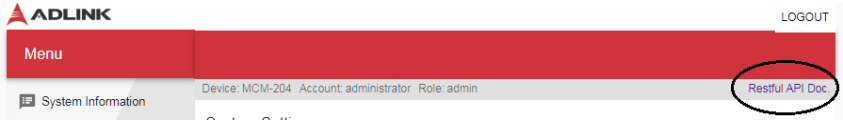


Figure 5-2: RESTful API

Using this API, functionalities shown in the web console can be implemented in your own custom software. Function references and sample code in Python, JavaScript, and C# are available for download on the SDAQ-204 product web page:

https://www.adlinktech.com/Products/Data_Acquisition/SmartDAQ/SDAQ-204

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5.1.3 Continuous Data

To use continuous data mode, first install the DAQPilot SDK, available for download on the SDAQ-204 product web page:

https://www.adlinktech.com/Products/Data_Acquisition/SmartDAQ/SDAQ-204

After installation, sample code and function references can be found in the C:\Program Files\ADLINK\DAQPilot folder.

Before using the DAQPilot SDK, DAQPilot Setting must be enabled via the SDAQ-204 web console.

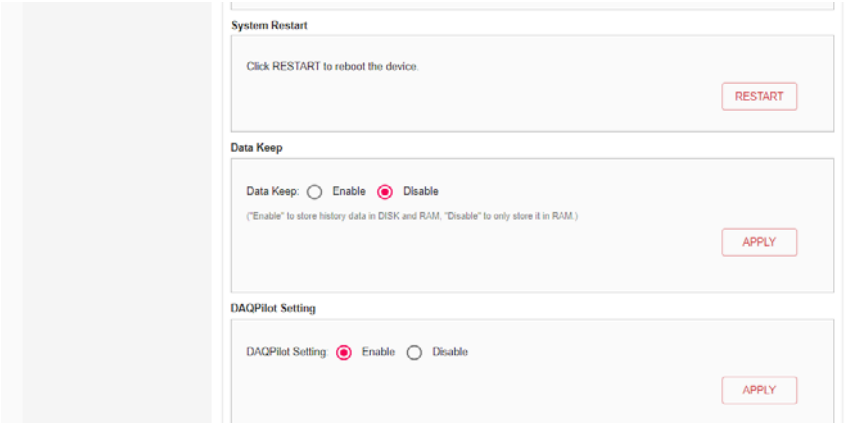


Figure 5-3: DAQPilot Setting

WARNING:

- When using DAQPilot, the host server and SDAQ-204 **must** be deployed to the same network segment.
- It is strongly recommended **not** to use the REST API for querying continuous data.

5.1.4 Passive Data

The conventional message exchange pattern of the SDAQ-204 for Periodic Polling and Continuous Data modes is request-response, with the SDAQ-204 serving as responder. After receiving a query from the host, the SDAQ-204 responds with the requested data. However, for some applications it's desirable for the host server to

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passively wait for data from the client. In such cases, a TCP socket function can instruct the SDAQ-204 to automatically send data to the host server whenever data is generated. See “TCP Socket” on page 46.

5.2 Custom Filtering Algorithms

The SDAQ-204 offers flexible support options for custom filtering algorithms. Users can easily import their own domain-knowledge algorithms to the SDAQ-204. Custom filtering algorithms must be written in C or C++ and compiled under Linux.

Use the following steps to create a custom filtering algorithm.

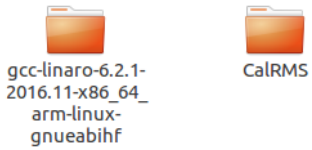
1. Download and extract the Linux toolchain:

   https://releases.linaro.org/components/toolchain/binaries/6.2-2016.11/arm-linux-gnueabihf/gcc-linaro-6.2.1-2016.11-x86_64_arm-linux-gnueabihf.tar.xz

2. Download CustomizedAlgo.zip from the SDAQ-204 web page and extract the CalStatistic (C++) and CalRMS (C) sample program folders.

   https://www.adlinktech.com/Products/Data_Acquisition/SmartDAQ/SDAQ-204

3. Place the extracted CalRMS and Linux toolchain folders in the same file path.

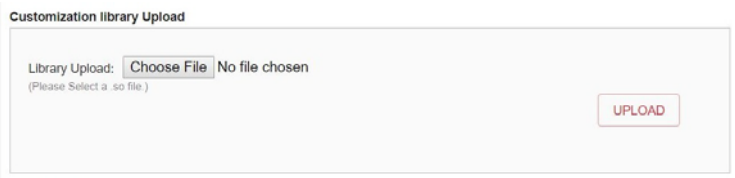


4. Run the “make” command from within the CalRMS folder to generate a customAlgo.so file.

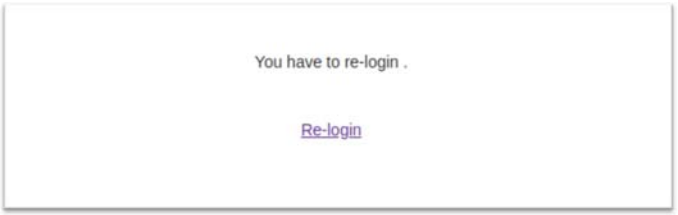


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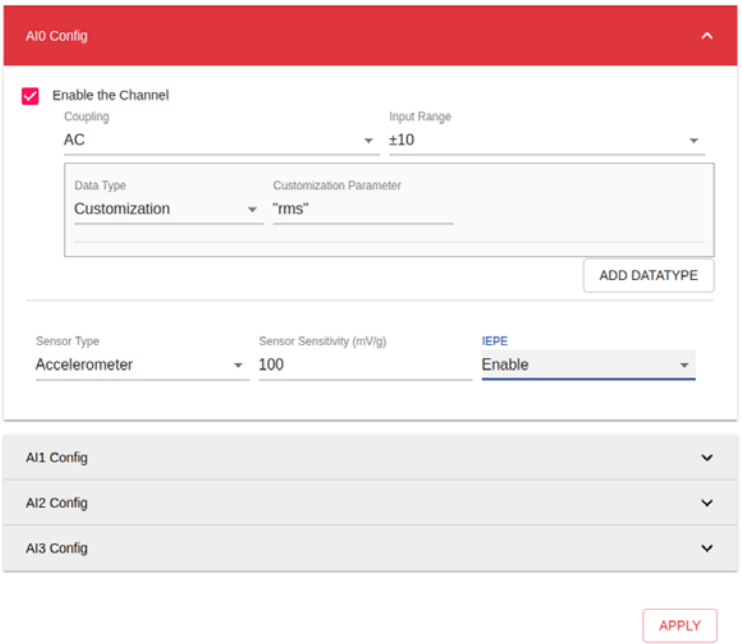
5. Upload customAlgo.so to the SDAQ-204 from the web console System Setting page.



6. After it uploads, log back into the web console.



7. After logging in, choose Customization as the data type, set parameters as needed, then click **APPLY** to apply the task to the SDAQ-204.



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8. Check the results on the data capture page.



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Important Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil , pour éviter des blessures ou des dommages.

- Read these safety instructions carefully.
- Keep the User's Manual for future reference.
- Read the Specifications section of this manual for detailed information on the recommended operating environment.
- The device can be operated at an ambient temperature of 50ºC.
- When installing/mounting or uninstalling/removing device, or when removal of a chassis cover is required for user servicing:
  - Turn off power and unplug any power cords/cables.
  - Reinstall all chassis covers before restoring power.
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources.
  - Keep device away from high heat or humidity.
  - Keep device properly ventilated (do not block or cover ventilation openings).
  - Always use recommended voltage and power source settings.
  - Always install and operate device near an easily accessible electrical outlet.
  - Secure the power cord (do not place any object on/over the power cord).
  - Only install/attach and operate device on stable surfaces and/or recommended mountings.
- If the device will not be used for long periods of time, turn off and unplug it from its power source
- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools

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- A Lithium-type battery may be provided for uninterrupted backup or emergency power.

CAUTION:

Risk of explosion if battery is replaced with one of an incorrect type; please dispose of used batteries appropriately.
Risque d'explosion si la pile est remplacée par une autre de type incorrect. Veuillez jeter les piles usagées de façon appropriée.

- The device must be serviced by authorized technicians when:
  - The power cord or plug is damaged.
  - Liquid has entered the device interior.
  - The device has been exposed to high humidity and/or moisture.
  - The device is not functioning or does not function according to the User's Manual.
  - The device has been dropped and/or damaged and/or shows obvious signs of breakage.
- Disconnect the power supply cord before loosening the thumbscrews and always fasten the thumbscrews with a screwdriver before starting the system up.
- It is recommended that the device be installed only in a server room or computer room where access is:
  - Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefor, and any precautions required.
  - Only afforded by the use of a tool or lock and key, or other means of security, and controlled by the authority responsible for the location.

	**BURN HAZARD** Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching. ***RISQUE DE BRÛLURES*** *Ne touchez pas cette surface, cela pourrait entraîner des blessures.* *Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*

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Getting Service

Ask an Expert: http://askanexpert.adlinktech.com

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