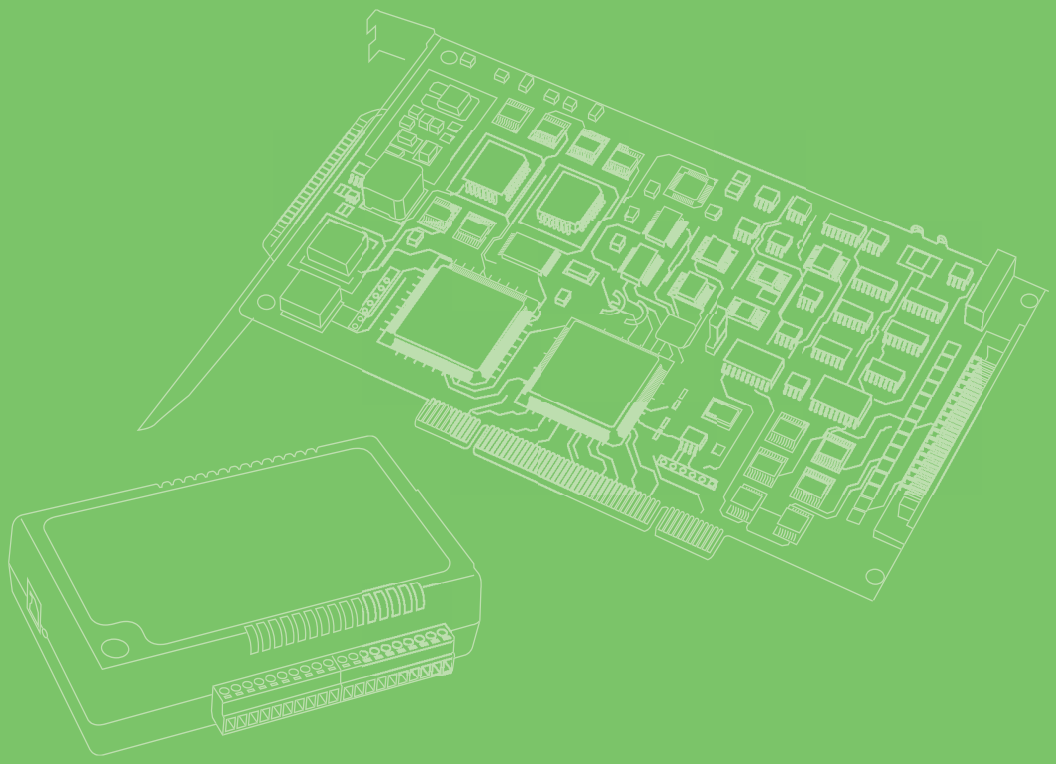

User Manual

WISE-2460

Modbus Smart Vibration Sensor(10KHz@1-axis)

ADVANTECH

Enabling an Intelligent Planet

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5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Part No. Edition 1

Printed in Taiwan December 2023

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electro-static discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
- Disconnect the power before making any configuration changes. A sudden rush of power after connecting a jumper or installing a module may damage sensitive electronic components.

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Chapter 1

Hardware Profile

WISE-2460 is a robust RS-485 smart vibration sensor integrated with an ARM Cortex-H7 processor, 10KHz@1-axis high detection range accelerometer and temperature sensor. This powerful computing device balances the bandwidth between edge devices and the application service on the user side.

WISE-2460 builds-in several measurements of vibration, such like velocity RMS, acceleration RMS, acceleration Peak, displacement and so on. By using Advantech WISE Studio utility, users can easily config all the settings, like ISO 10816 alarm threshold setting, customize the 10 detection ranges between 5 ~ 10,000Hz and others.

1.1 Common Specification

1.1.1 General

- **Power Input:** 10 ~ 30 VDC
- **LED Indicator:** Status, TX, RX
- **Configuration Interface:** RS-485 (Modbus/RTU)
- **IP Class:** IP68
- **Mounting:** Stud mount, mounting pad and adhesives
- **Dimension (W x H x D):** 58.4 x 36.7 x 40 mm
- **Certification:** FCC, CE

1.1.2 Environment

- **Operating Temperature:** -20 °C ~ 105 °C
- **Operating Humidity:** 10% ~ 95% RH
- **Storage Temperature:** -25 °C ~ 120 °C
- **Storage Humidity:** 5% ~ 95% RH

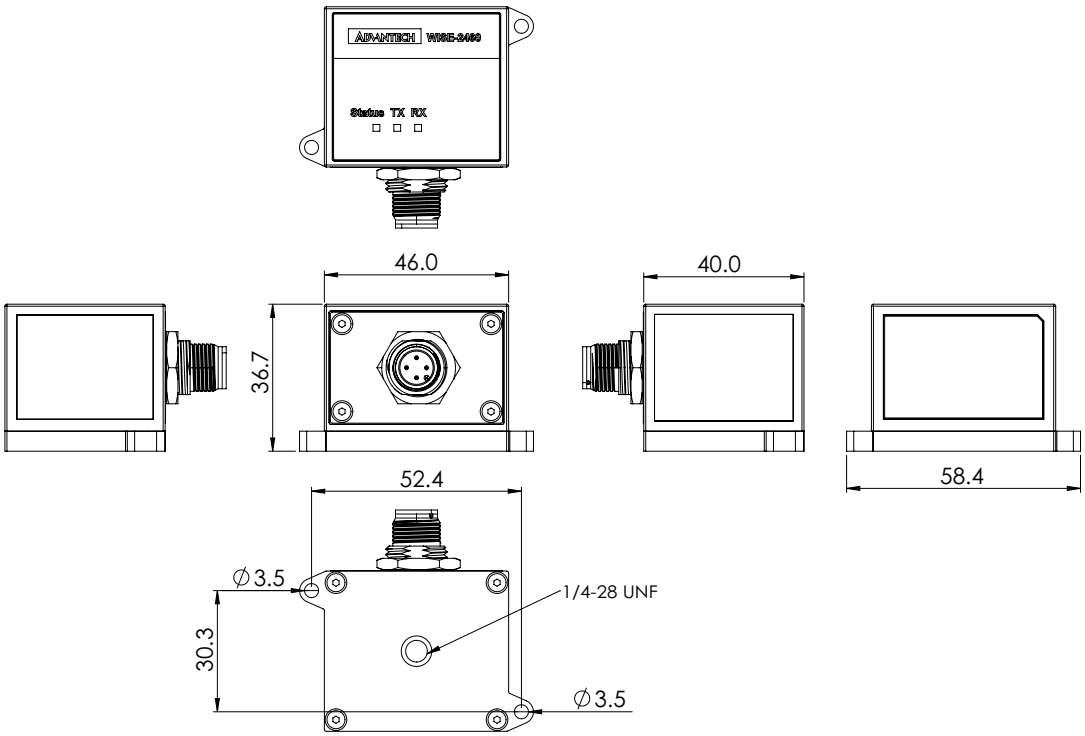
1.1.3 1-Axis Accelerometer Sensor

- **Axis:** Z
- **Frequency Range:** 5~10000 Hz
- **Amplitude Range:** ±50 g
- **Statistical Time-Domain:** Velocity RMS
- **Output Data Rate:** 32768Hz
- **Accuracy:** 5-4000 Hz (5%); 4001~10000Hz (35%)
- **Noise:** 25 μg/√Hz in ±50 g range
- **Sensitivity Change Due to Temperature:** ±5%

1.2 Led Behavior

Table 1.1: Led Behavior		
LED	**Behavior**	**Reason**
Status	Quick blink GREEN	Initialing
	Slow blink GREEN	Initial success
	Quick blink RED	Initial fail
TX	Quick blink YELLOW	Receive data
RX	Quick blink GREEN	Send data

1.3 Dimension



1.4 M12 Connector Pin Define

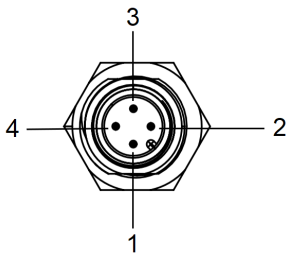


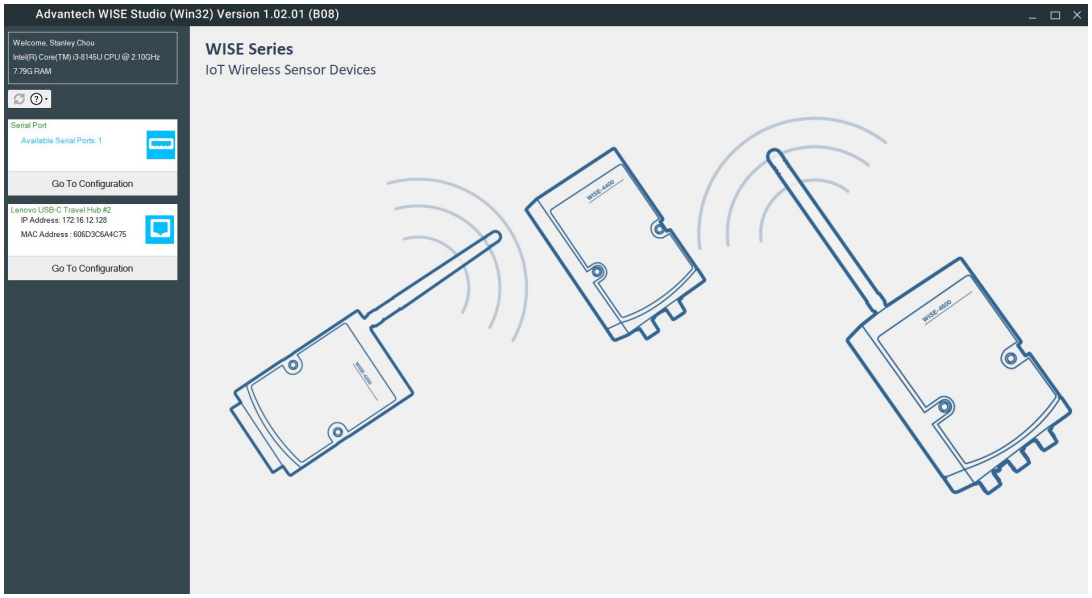
Table 1.2: M12 Connector Pin Define	
Pin Number	**Pin Name**
1	+VS
2	Data+
3	-VS
4	Data-

Chapter 2

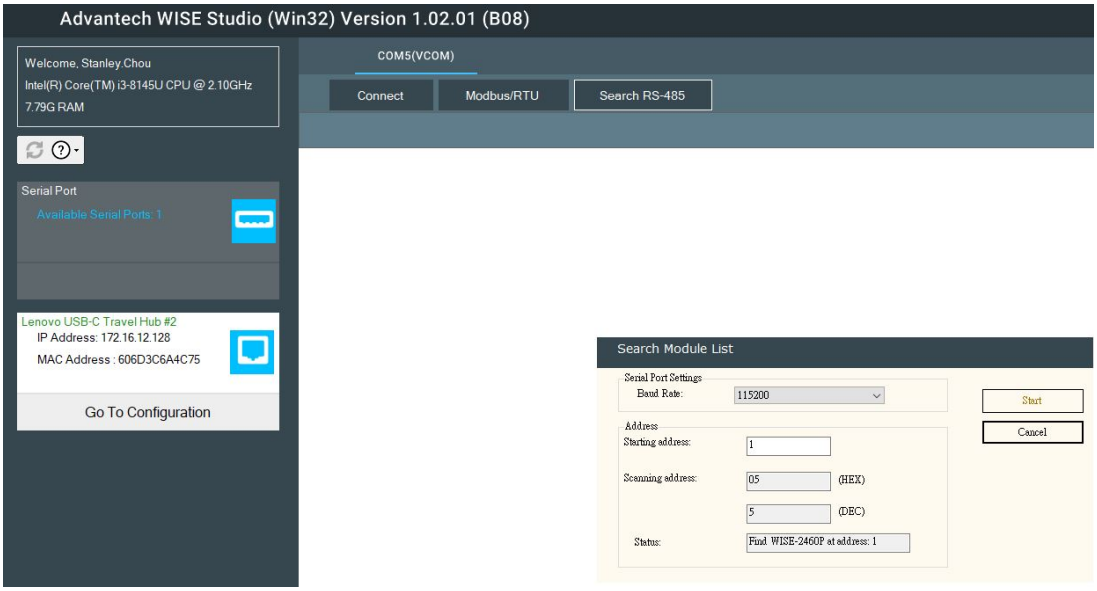
Software Settings

2.1 Build the Connection Between WISE-2460 and PC

1. Go to WISE-2460 website, and download, install WISE Studio software on user's PC
2. Connect WISE-2460 to PC via a RS-485 to USB converter, and open WISE Studio software.
3. If user's serial port on the left side is active, please click "Go to Configuration"



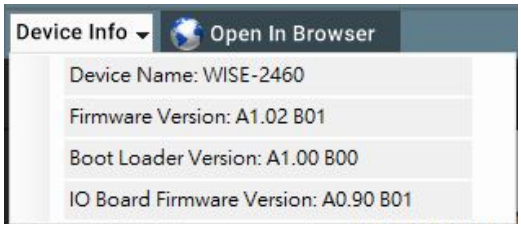
4. Click "Search RS-485" button on the top of screen, and click start. If the status shows "Find WISE-2460", it means that the connection works and user can close the Search Module List window next by click "Cancel" button



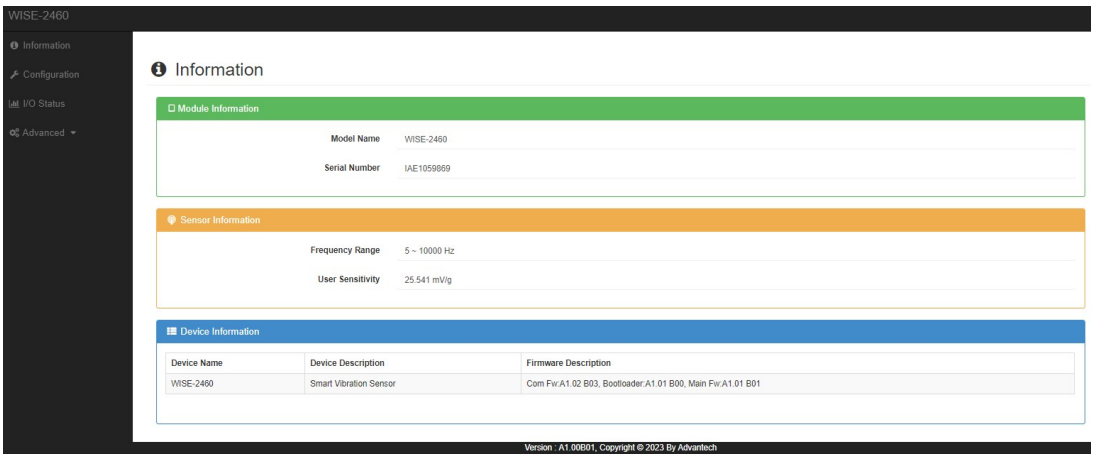
5. WISE Studio will shows the connected WISE-2460 at the top. The example below shows WISE-2460(01h). Please click the one that user want to check. The web will jump to another page after user click the WISE-2460.

2.2 WISE-2460 Device information

1. User can click the “Device Info” on the top to check the Device Name, Firmware version, Boot loader Version and I/O Board firmware version.



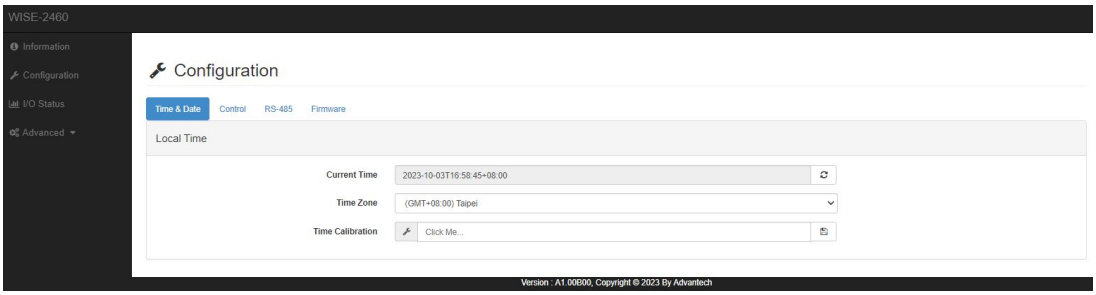
2. User can also goes to the information page and check more device information in detail, like serial number of this device, sensitivity setting of this WISE-2460, etc.



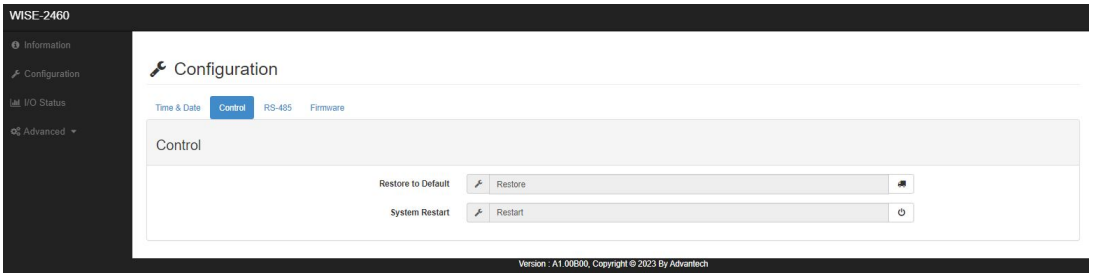
2.3 WISE-2460 Device System Configuration

WISE-2460 has 4 sub-pages for device configuration setting, which are Time, Control, RS-485 and Firmware.

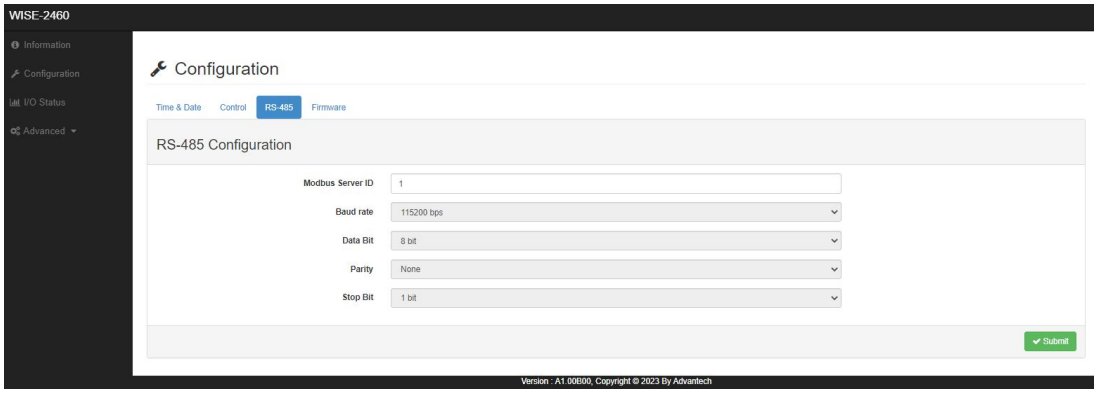
1. Time & Date: setting the RTC on WISE-2460



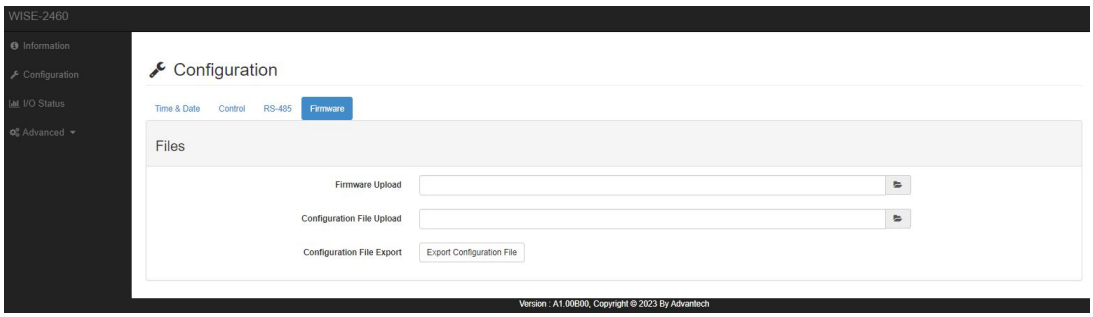
2. Control: can reset the WISE-2460 back to default or force reboot it.



3. RS-485: Serial settings of WISE-2460.



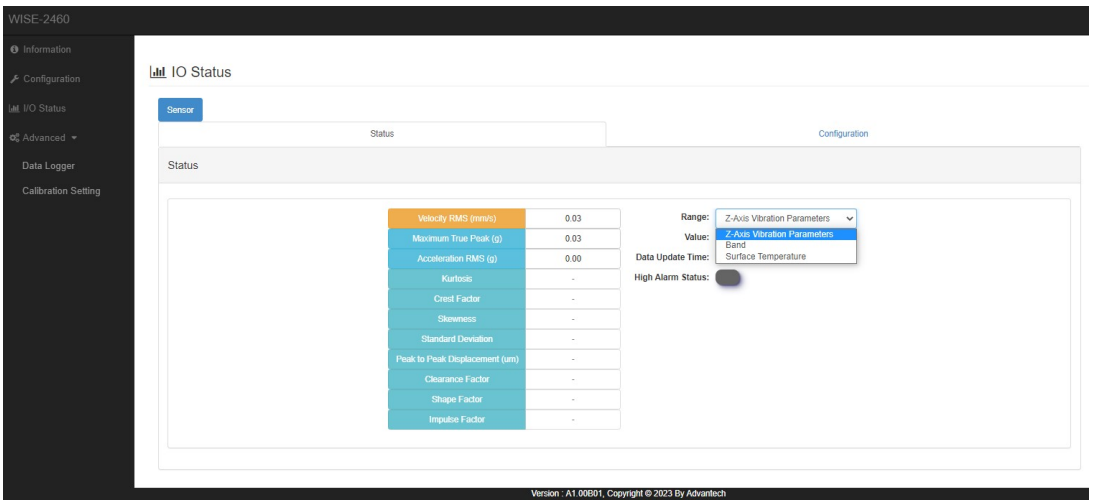
4. Firmware: Can upgrade the firmware here or even import/export the configuration file of WISE-2460



2.4 WISE-2460 Sensor configuration and value output verification

WISE-2460 has 2 sub-pages for sensor setting, which are Status and Configuration.

1. Status: check the output value from WISE-2460. Detail values definition and default settings are below for reference.



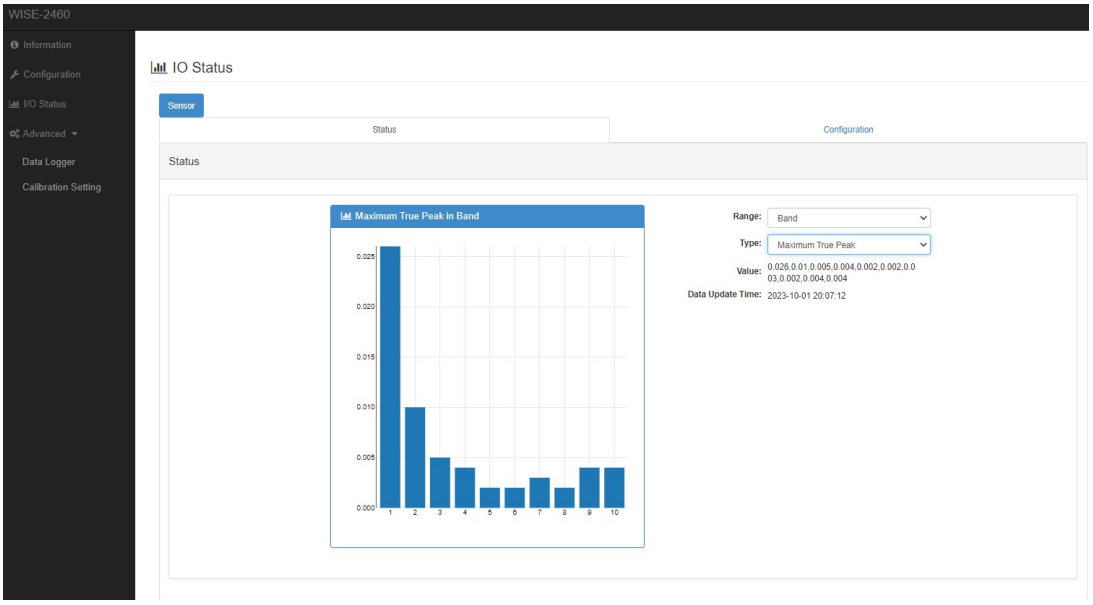
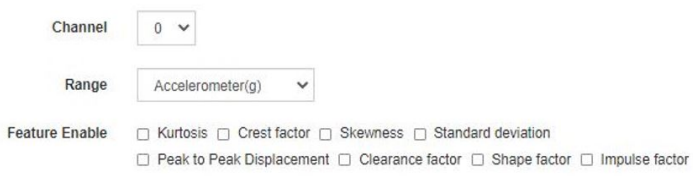
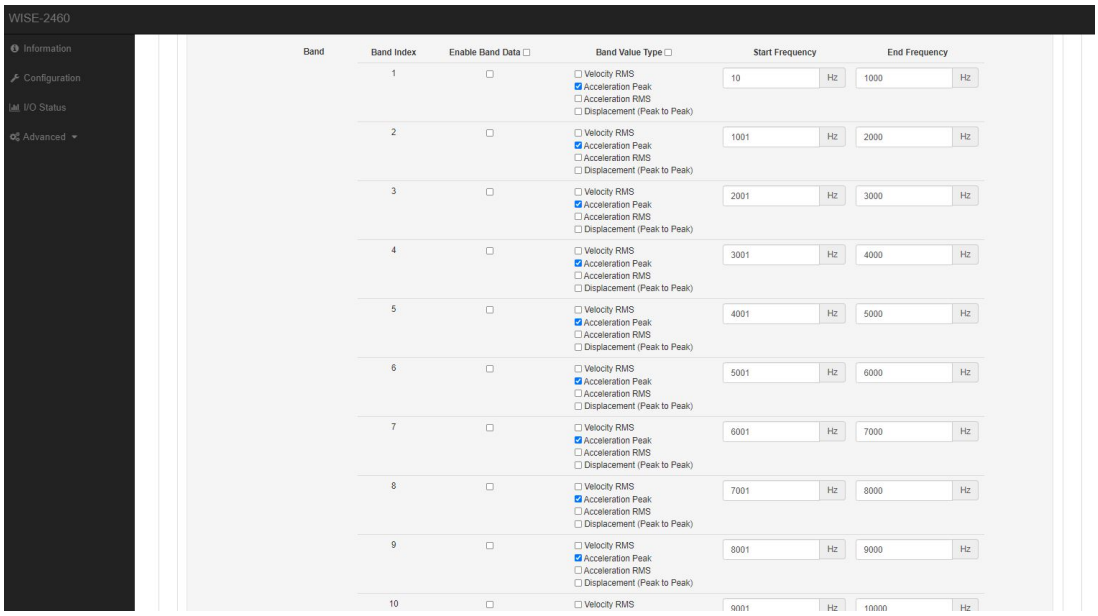


Table 2.1: Status	
Value (unit)	**Description**
Overall (mm/s)	Overall(Velocity RMS) value between 10~1,000Hz frequency range, can cross match this value with ISO 10816 table for inspection.
Maximum True Peak (g)	Maximum acceleration peak value between 5~10,000Hz frequency range
Acceleration RMS (g)	Acceleration RMS is the RMS value between 5~10,000Hz frequency range
Kurtosis	Kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to a normal distribution, base is time-domain raw data
Crest Factor	Ratio of peak values to the effective value(Acceleration RMS), base is time-domain raw data
Skewness	Skewness is a measure of the asymmetry of the data around the sample mean. If skewness is negative, the data spreads out more to the left of the mean than to the right. If skewness is positive, the data spreads out more to the right, base is time-domain raw data
Standard Deviation	A standard deviation (or σ) is a measure of how dispersed the data is in relation to the mean. Low, or small, standard deviation indicates data are clustered tightly around the mean, and high, or large, standard deviation indicates data are more spread out, base is time-domain raw data
Peak to Peak Displacement (um)	Maximum peak to peak between 10~1,000Hz frequency range
Clearance Factor	The clearance factor is equal to the peak value divided by the squared mean of the square roots of the absolute amplitude, base is time-domain raw data
Shape Factor	RMS divided by the mean of the absolute value, base is time-domain raw data
Impulse Factor	Ratio of peak value to mean value, base is time-domain raw data
Velocity RMS (mm/s) in Band	The value (Velocity RMS) in specific frequency band, define by users.
Acceleration Peak (g) in Band	The value (Acceleration Peak) in specific frequency band, define by users.
Acceleration RMS (g) in Band	The value (Acceleration RMS) in specific frequency band, define by users.
Peak to Peak Displacement (um) in Band	The power (Peak to Peak Displacement) in specific frequency band, define by users.
Temperature (ºC)	Internal system temperature value

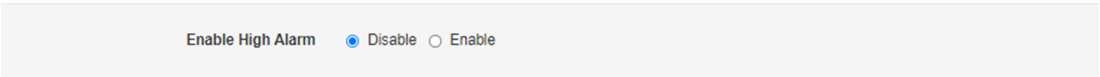
2. Configuration: WISE-2460 has 4 main settings for sensors, 3 for vibration sensor, 1 for temperature sensor.
   - Range and feature enable settings for vibration data(Channel 0)



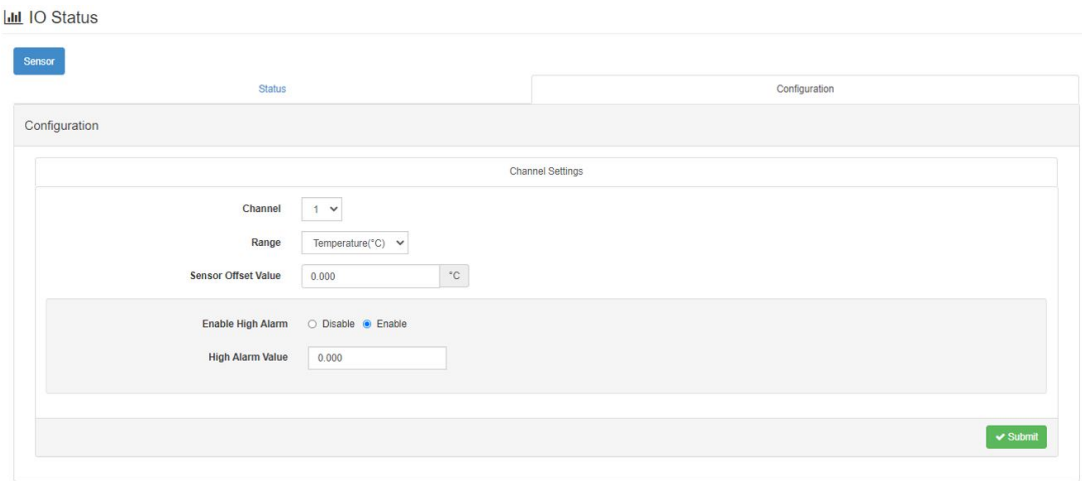
II Max 10 frequency detection range settings in band, default is disable and all the range setting is 1kHz. If user has specific detection range for their equipment, they can directly change the range here and get the specific values from WISE-2460.



III Vibration alarm setting: warning limit setting of Overall(Velocity RMS) value between 10~1,000Hz range. WISE-2460 will cross checking this value when the measurement interval arrives.



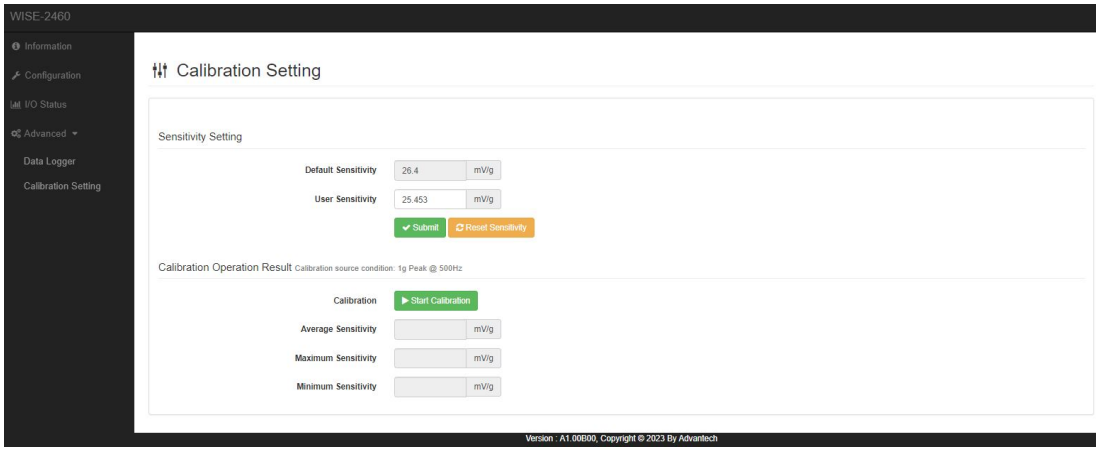
IV Range, offset and alarm settings for temperature data (Channel 1).



2.5 WISE-2460 Sensor Calibration Mode

WISE-2460 builds-in calibration mode and allow users to calibrate the sensor by themselves. There are few things need to check before using this function.

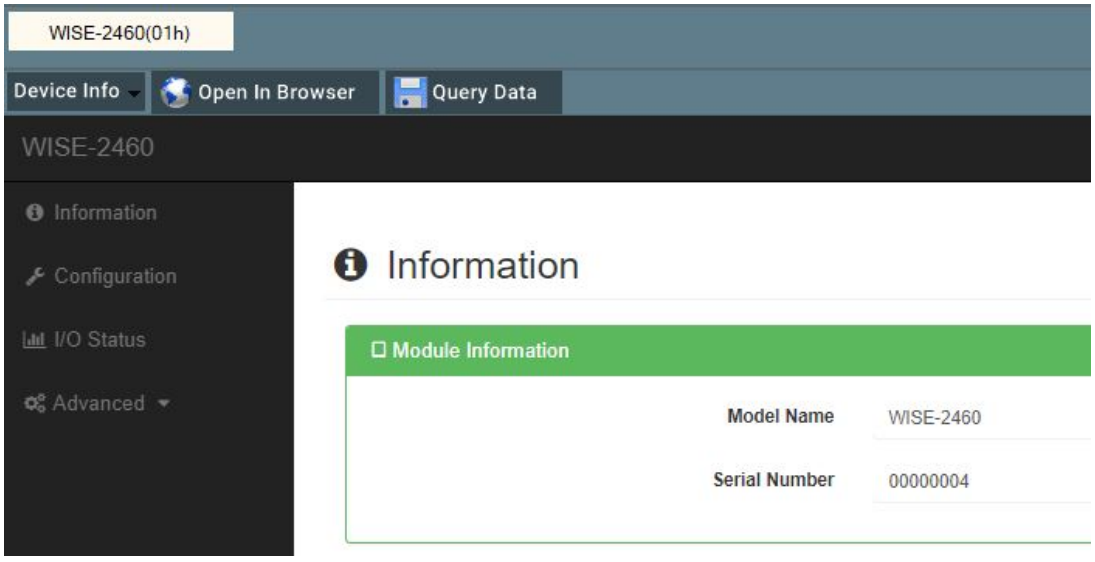
1. Need to make sure the values from your shaker are correct.
2. Fix your WISE-2460 on shaker.
3. Set your shaker output in **1g@500Hz condition**.
4. Click "**Start Calibration**" button on WISE Studio and wait around 5 seconds for data processing.
5. Check "**Average Sensitivity**" value, and copy the "**Average Sensitivity**" value to "**User Sensitivity**" box, and click "**Submit**" for writing this value into your WISE-2460.
6. User can also restore default sensitivity by click "**Reset Sensitivity**" button.



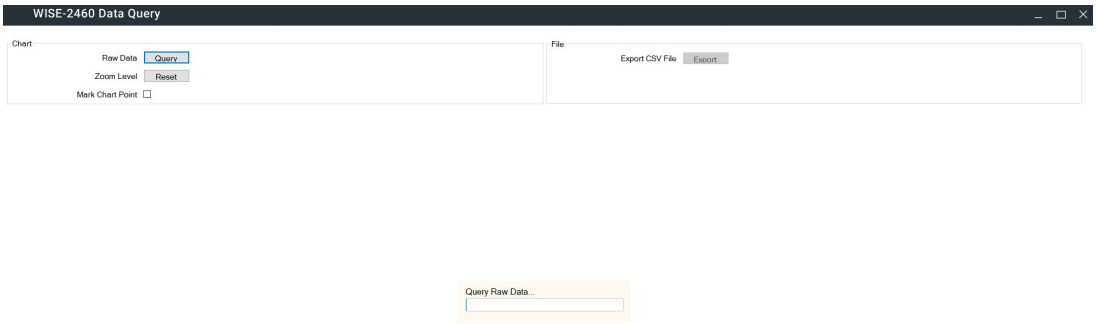
2.6 Get time-domain raw data from WISE-2460

User can get the real time time-domain raw data from WISE-2460 directly. It will take around 40s for getting one raw data from WISE-2460. User can refer following process for getting the data on WISE Studio.

1. Click "**Query Data**" from WISE Studio, and WISE-2460 Data Query window will pops up.



2. Click “Query” button and wait for the process done.



3. The time-domain raw data will show directly on WISE Studio. 2 things user can play with here.
   I **Export** to CSV file on user’s PC
   II **Zoom in** directly on the dashboard. Can reset the zoom level via **zoom reset** button.
   III User can enable “**Mark Chart Point**” function. It’s more easier for reading the data on WISE Studio dashboard

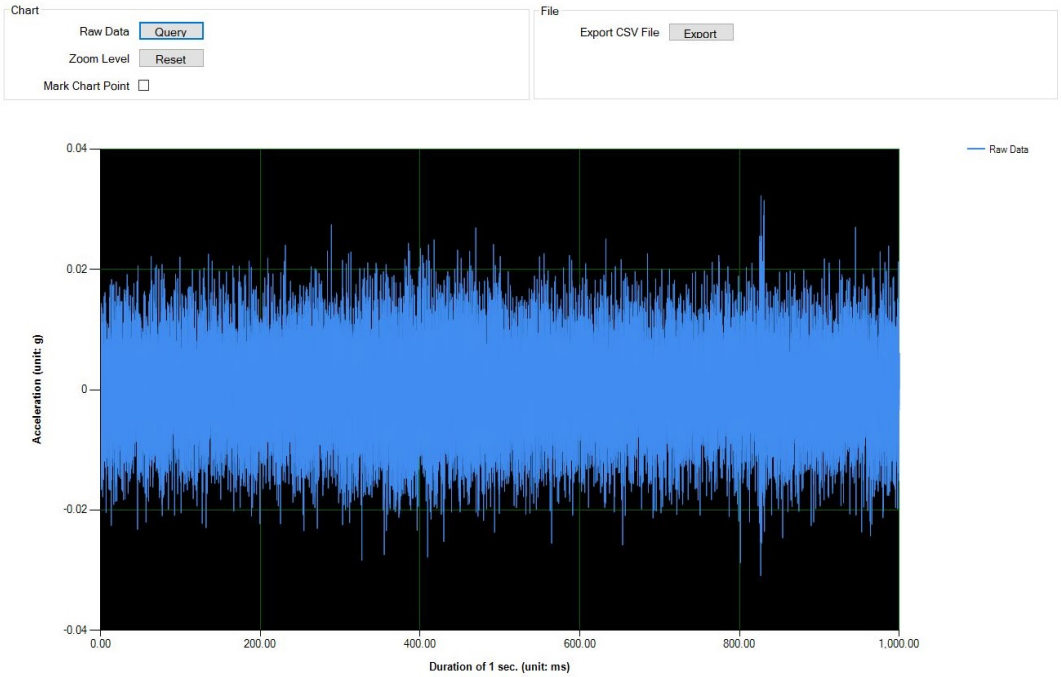


Figure 2.1 Get raw data - dashboard

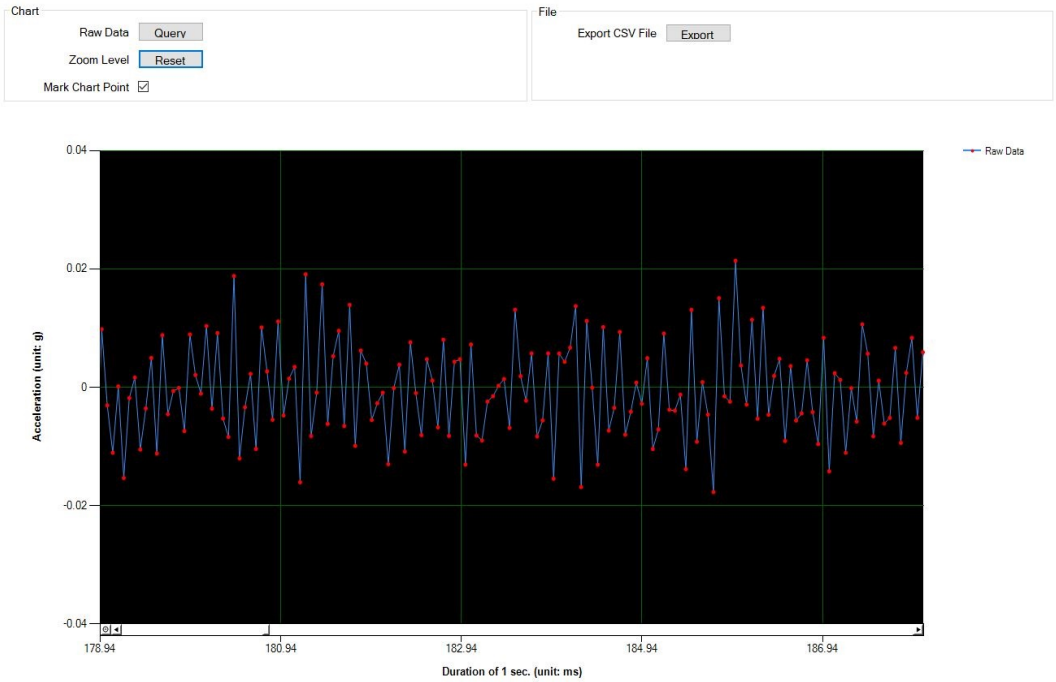


Figure 2.2 Get raw data - dashboard with mark

Chapter 3

Modbus Table of WISE-2460

Table 3.1: Data Modbus Address			
Address 4X	**Channel**	**Description**	**Attribute**
40001~40002	0 (Z)	Velocity RMS (0.001 mm/s)	Read
40003~40004	0 (Z)	Acceleration Peak (0.001 g or 0.001 m/s2)	Read
40005~40006	0 (Z)	Acceleration RMS (0.001 g or 0.001 m/s2)	Read
40007~40008	0 (Z)	Kurtosis (0.001)	Read
40009~40010	0 (Z)	Crest factor (0.001)	Read
40011~40012	0 (Z)	Skewness (0.001)	Read
40013~40014	0 (Z)	Standard deviation (0.001)	Read
40015~40016	0 (Z)	Displacement Peak to Peak (um)	Read
40017~40018	0 (Z)	Clearance factor (0.001)	Read
40019~40020	0 (Z)	Shape factor (0.001)	Read
40021~40022	0 (Z)	Impulse factor (0.001)	Read
40023~40024	0 (Z) / Band 1	Velocity RMS (0.001 mm/s)	Read
40025~40026	0 (Z) / Band 2		Read
40027~40028	0 (Z) / Band 3		Read
40029~40030	0 (Z) / Band 4		Read
40031~40032	0 (Z) / Band 5		Read
40033~40034	0 (Z) / Band 6		Read
40035~40036	0 (Z) / Band 7		Read
40037~40038	0 (Z) / Band 8		Read
40039~40040	0 (Z) / Band 9		Read
40041~40042	0 (Z) / Band 10		Read
40043~40044	0 (Z) / Band 1	Acceleration Peak (0.001 g or 0.001 m/s2)	Read
40045~40046	0 (Z) / Band 2		Read
40047~40048	0 (Z) / Band 3		Read
40049~40050	0 (Z) / Band 4		Read
40051~40052	0 (Z) / Band 5		Read
40053~40054	0 (Z) / Band 6		Read
40055~40056	0 (Z) / Band 7		Read
40057~40058	0 (Z) / Band 8		Read
40059~40060	0 (Z) / Band 9		Read
40061~40062	0 (Z) / Band 10		Read
40063~40064	0 (Z) / Band 1	Acceleration RMS (0.001 g or 0.01 m/s2)	Read
40065~40066	0 (Z) / Band 2		Read
40067~40068	0 (Z) / Band 3		Read
40069~40070	0 (Z) / Band 4		Read
40071~40072	0 (Z) / Band 5		Read
40073~40074	0 (Z) / Band 6		Read
40075~40076	0 (Z) / Band 7		Read
40077~40078	0 (Z) / Band 8		Read
40079~40080	0 (Z) / Band 9		Read
40081~40082	0 (Z) / Band 10		Read

Table 3.1: Data Modbus Address			
40083~40084	0 (Z) / Band 1	Displacement Peak to Peak (um)	Read
40085~40086	0 (Z) / Band 2		Read
40087~40088	0 (Z) / Band 3		Read
40089~40090	0 (Z) / Band 4		Read
40091~40092	0 (Z) / Band 5		Read
40093~40094	0 (Z) / Band 6		Read
40095~40096	0 (Z) / Band 7		Read
40097~40098	0 (Z) / Band 8		Read
40099~40100	0 (Z) / Band 9		Read
40101~40102	0 (Z) / Band 10		Read
40103~40104	1	Temperature (0.001ºC)	Read
40105~40106	0 (Z)	Sensor status	Read
40107~40108	1	Crest factor (0.001)	Read
40109~40110		Measuring Timestamp	Read

Table 3.2: WISE-2460 Configuration settings Modbus address			
Address 4X	**Channel**	**Description**	**Attribute**
40201	0 (Z)	Range code	R/W
40202	1		R
40221	All channels	Channel enable mask	R/W
46001	All bands	Band enable mask	R/W
46002	0 (Z)	Feature Enable Mask	R/W
46003	All channels	Alarm enable mask	R/W
46004~46005	0 (Z)	Alarm value	R/W
46006~46007	1		R/W
46008~46009	1	Temperature Offset (0.001 ºC)	R/W
46010	0 (Z) / Band 1	Data Type Mask	R/W
46011~46012		Start Frequency (Hz)	R/W
46013~46014		End Frequency (Hz)	R/W
46015	0 (Z) / Band 2	Data Type Mask	R/W
46016~46017		Start Frequency (Hz)	R/W
46018~46019		End Frequency (Hz)	R/W
46020	0 (Z) / Band 3	Data Type Mask	R/W
46021~46022		Start Frequency (Hz)	R/W
46023~46024		End Frequency (Hz)	R/W
46025	0 (Z) / Band 4	Data Type Mask	R/W
46026~46027		Start Frequency (Hz)	R/W
46028~46029		End Frequency (Hz)	R/W
46030	0 (Z) / Band 5	Data Type Mask	R/W
46031~46032		Start Frequency (Hz)	R/W
46033~46034		End Frequency (Hz)	R/W
46035	0 (Z) / Band 6	Data Type Mask	R/W
46036~46037		Start Frequency (Hz)	R/W
46038~46039		End Frequency (Hz)	R/W
46040	0 (Z) / Band 7	Data Type Mask	R/W
46041~46042		Start Frequency (Hz)	R/W
46043~46044		End Frequency (Hz)	R/W
46045	0 (Z) / Band 8	Data Type Mask	R/W
46046~46047		Start Frequency (Hz)	R/W
46048~46049		End Frequency (Hz)	R/W
46050	0 (Z) / Band 9	Data Type Mask	R/W
46051~46052		Start Frequency (Hz)	R/W
46053~46054		End Frequency (Hz)	R/W
46055	0 (Z) / Band 10	Data Type Mask	R/W
46056~46057		Start Frequency (Hz)	R/W
46058~46059		End Frequency (Hz)	R/W
46060~46061		Measurement interval (Sec)	R
45011~45012		Timestamp	R/W

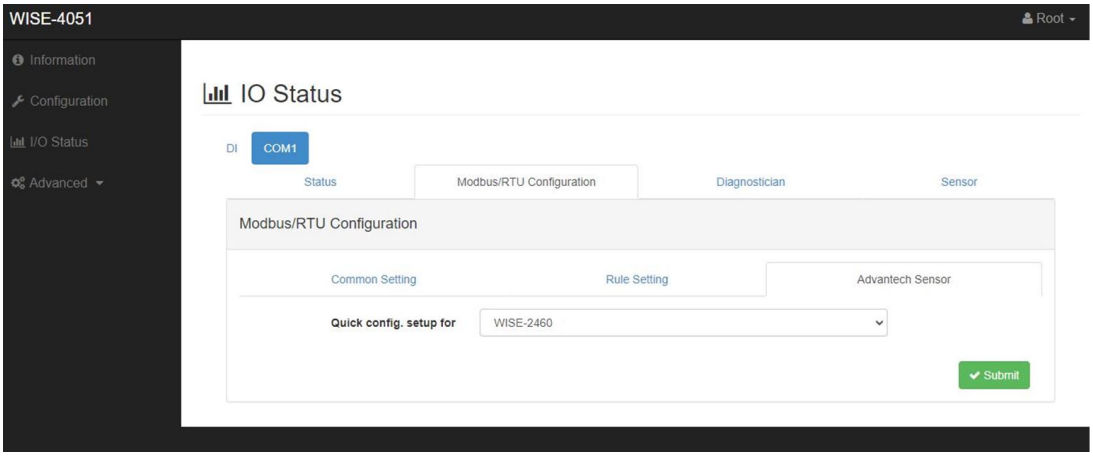
Chapter 4

WISE-4051 & WISE-2460 Wireless Package Solution Settings

4.1 Basic Setting on WISE-4051

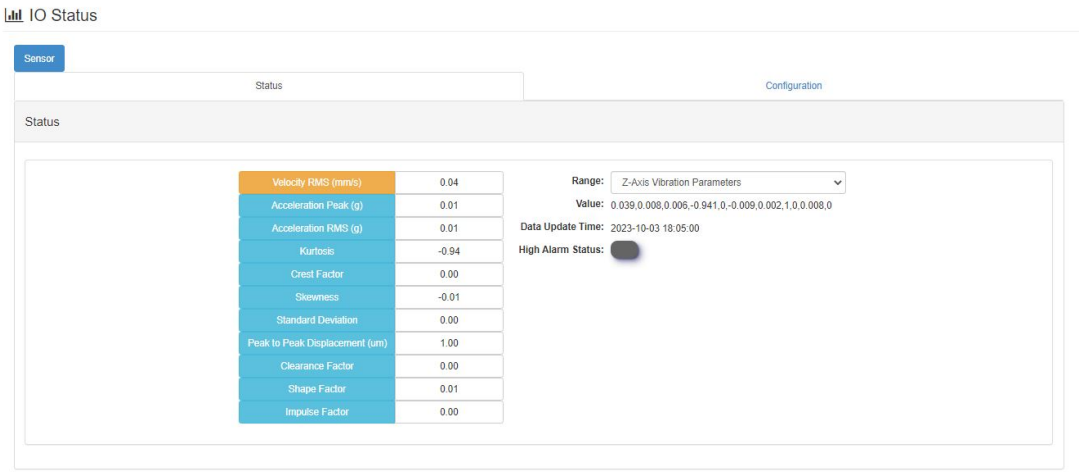
Advantech pairs WISE-2460 with WISE-4051 as a package for wireless applications. Once user finished the physical connection between WISE-2460 and WISE-4051. They can login WISE-4051 web and go to "**Advantech Sensor**" page for quick configuration setup.

1. Please go to **IO Status > COM1 > Modbus/RTU Configuration > Advantech Sensor**. And select **WISE-2460** in this case then submit.

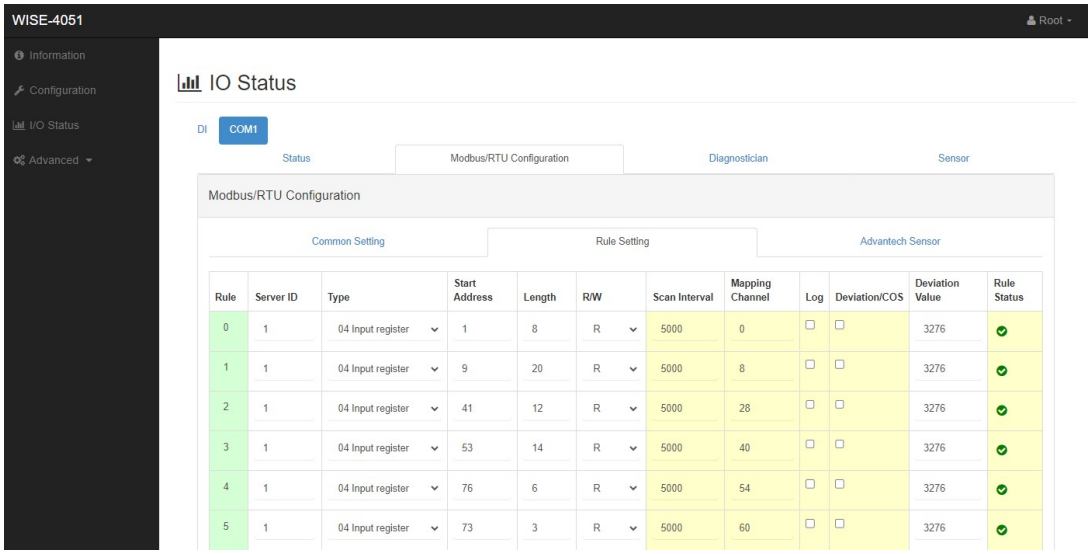


The **Quick config. setup** function will help user finish both Modbus communication setting and rule, address settings directly, no extra setting needed for WISE-2460.

2. Once user submit this function, they can go to **IO Status > COM1 > Sensor** to check the data from WISE-2460 directly.

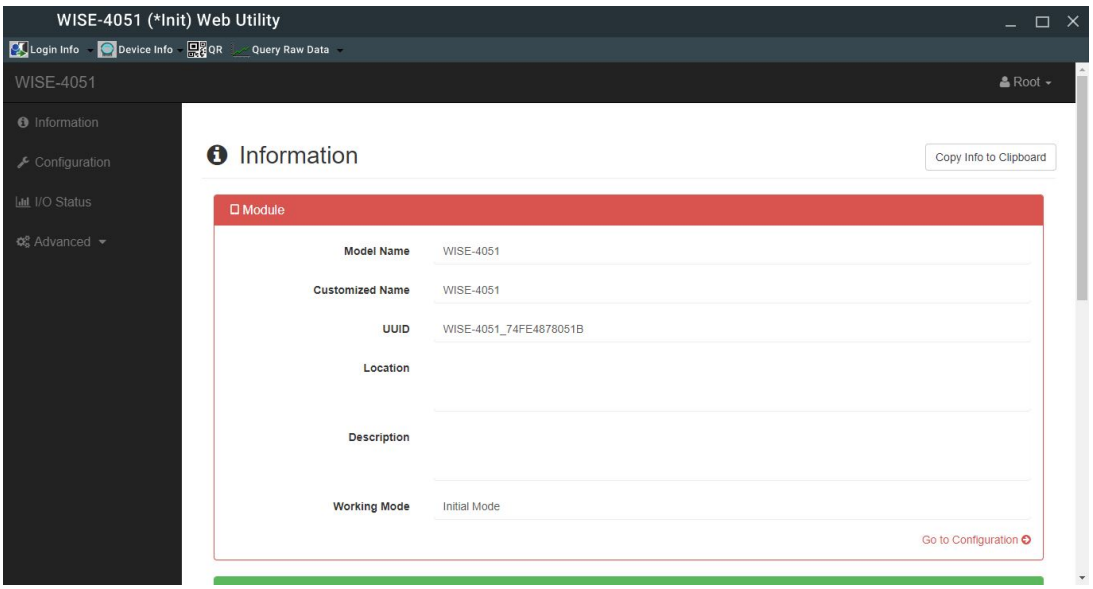


3. All the WISE-2460 settings can be changed directly on WISE-4051. Please go to **IO Status > COM1 > Modbus/RTU Configuration > Rule Setting** to setup your own WISE-2460 profile.



4.2 Get WISE-2460 Time-domain Raw data from WISE-4051

Besides common vibration data, user can get time-domain raw data from WISE-2460 via WISE-4051 remotely. User can open WISE Studio and click "**Query Raw Data**" button on the top side to initial this function.



The rest operation process are as same as WISE-2460. User can refer "**Get time-domain raw data from WISE-2460**" session for more detail.

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