Vibration Logger

Logger Software User Guide

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2022.08

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Revision History

Rev. No.	Date	Page	Description
20220308	2022/3/8	ALL	New release
20240226	2024/2/26	P2 P6 P24	Correction of notes Corrected compatible OS Correction of contact information

1. Introduction

1.1. Overview

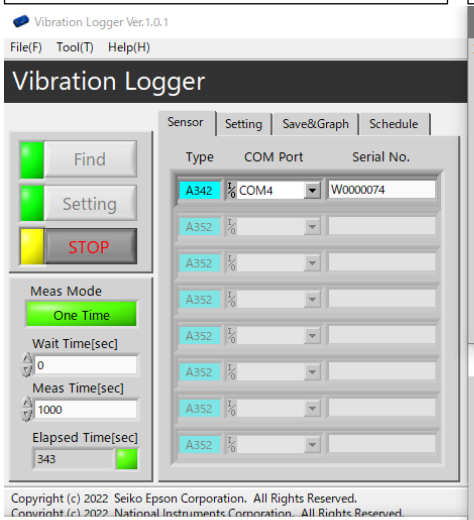
Vibration Logger is a dedicated software to evaluate Seiko Epson acceleration sensor M-A352AD1/M-A552AR1 and vibration sensor M-A342VD1/ M-A542VR1 for various applications. Measurements and confirmation of acceleration/vibration waveforms can easily be performed on a Windows PC. This software is provided to customers for the purpose of evaluating the acceleration/vibration sensors free of charge.

1.2. Key Functions

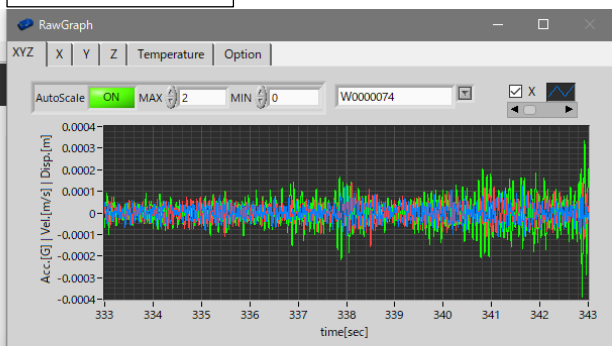
Key functions of this software are as follows.

- Display of a set of measurements on 2D Graphs
  - Raw data plot (3-axis acc/vel/disp data and temperature)
  - Average/RMS data plot（3-axis acc/vel/disp data and temperature, moving average interval setting）
  - FFT amplitude plot (3-axis acc/vel/disp data, peak search, Real-time update and save, FFT parameter settings)
- Saving log data to file (in csv format)
- Two measurement options (one time measurement, scheduled measurement)
- Sensor configuration (FIR filter, sampling rate, output type / physical quantity)
- Up to 8 units of parallel measurement
- Status display (communication error, A342 error flag count)

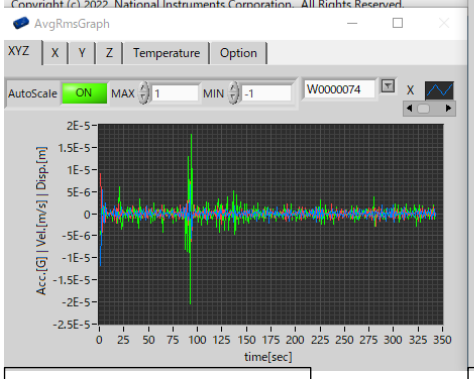
Main Window (configuration, control)



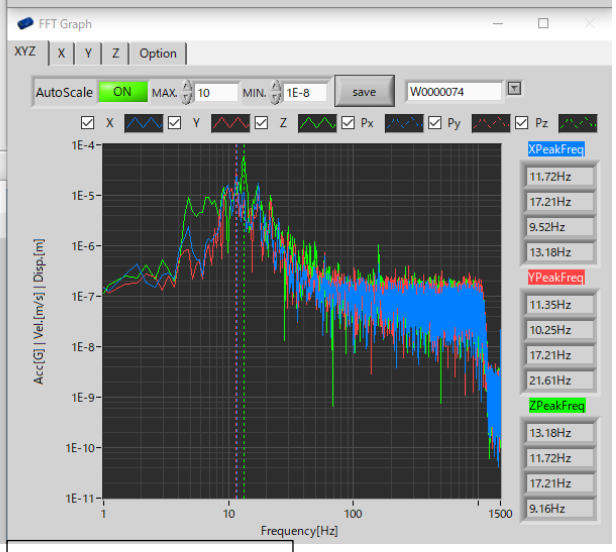
RAW Data Plot



Average/RMS Data Plot



FFT Amplitude Plot



2. Setup

2.1. System Requirements

The recommended system specifications for this software are as follows.

Operating System	Windows11, Windows10 (64-bit) *1
CPU Speed (recommended)	2.5 GHz or higher
Memory (recommended)	8 GB or higher
Strage Space	1 GB free storage space before installation

*1）Operating systems other than Windows11 and Windows10 (64-bit) have not been tested.

Note) If operation abnormality such as a delay in refreshing plots arises when parallel measurements are performed or when using a computer with low specifications, please use a computer with higher specifications.

2.2. Driver for USB to Serial Converter

FTDI USB Serial Converter Driver is required when using the Epson evaluation tool “USB I/F board (M-G32EV041)”. If installation is required, users can choose one of the following options in compliance with the terms and conditions provided by FTDI.

1) Update the driver from Windows Device Manager (automatic update via Internet is recommended).

2) Download the appropriate driver from FTDI's website (http://www.ftdichip.com/Drivers/VCP.htm) for the operating system being used.

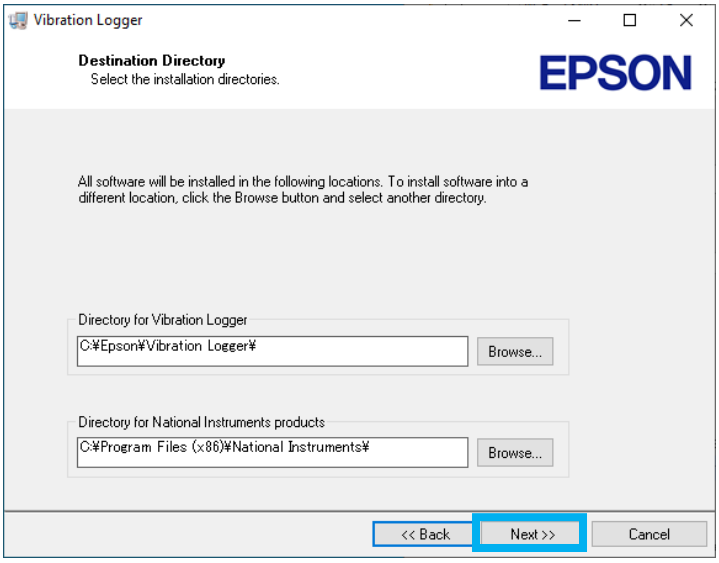
2.3. Vibration Logger Software Installation

Follow the procedure below to install "Vibration Logger" on the PC to be used. Since this software requires NI-VISA by National Instruments, the NI-VISA will be installed at the same time when installing this software.

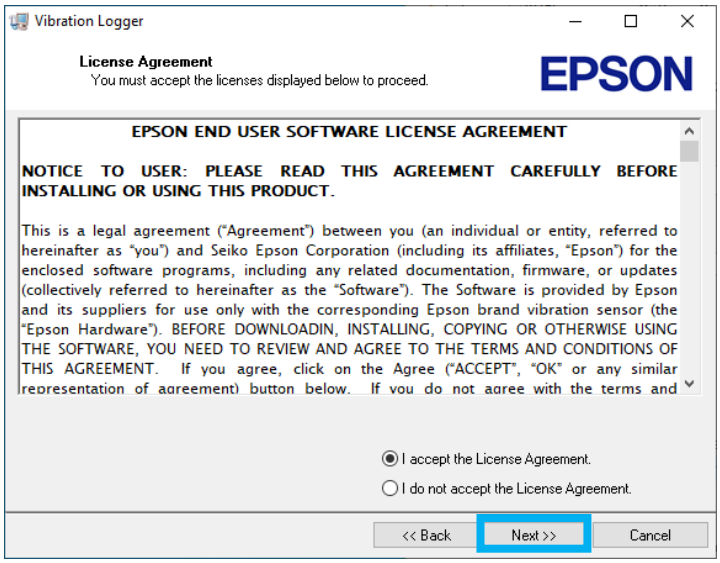
1) Close all other running applications.

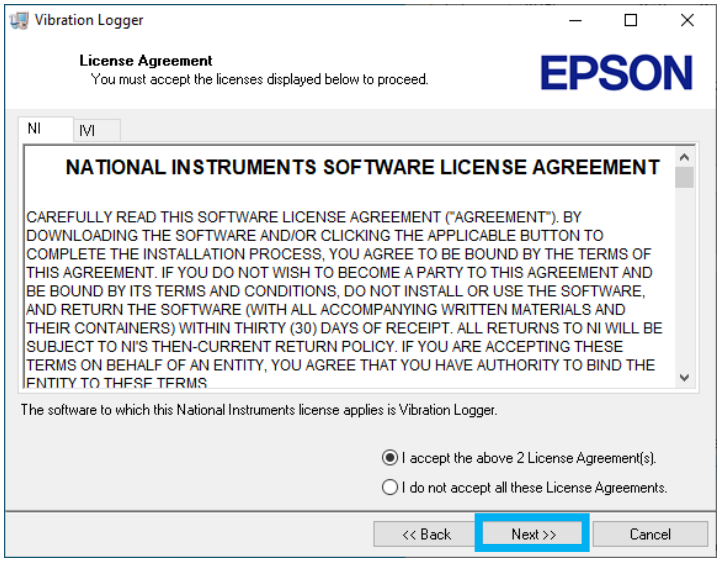
2) Execute "setup.exe" in the folder “Installer\Volume”.

3) Select the destination directory and click "Next".

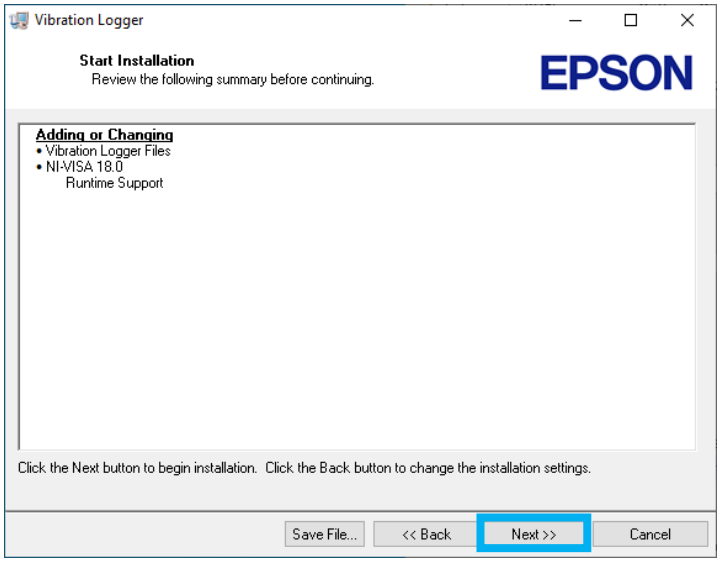


4) Check the contents of the license agreement for this software and National Instruments software, and select "I accept the license agreement(s)" if you agree to the Terms and Conditions, and then click "Next".





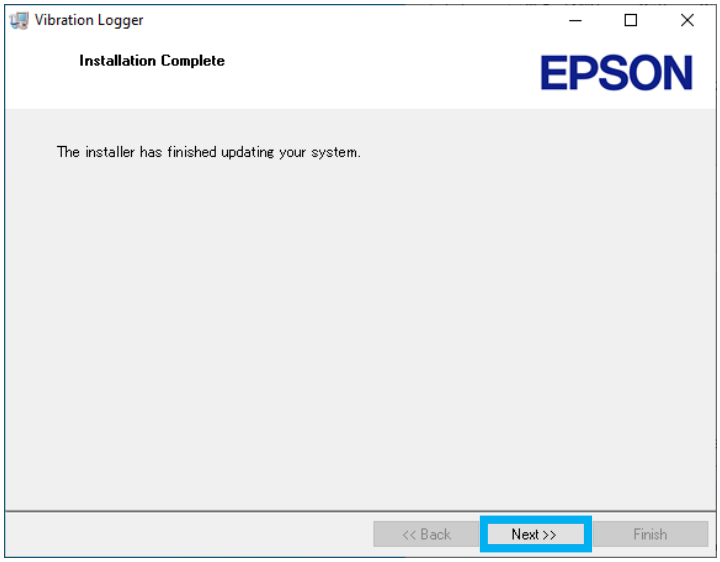
5) When the "Start installation" screen appears, click "Next" to start the installation.

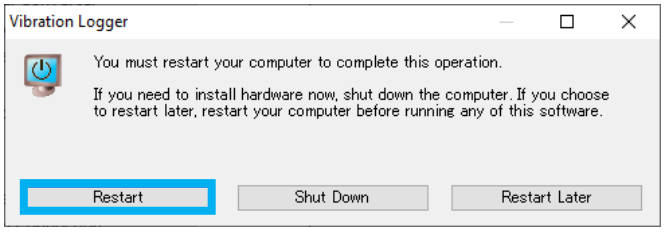


6) When the installation completion screen appears, click "Next".

Follow the screen that prompts you to restart the PC.

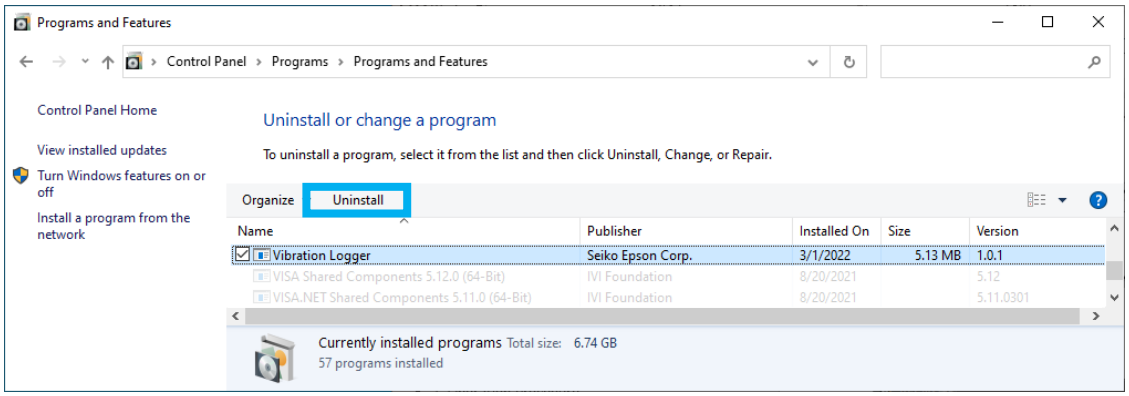
When the restart is complete, the installation is finished.





2.4. Uninstalling the Software

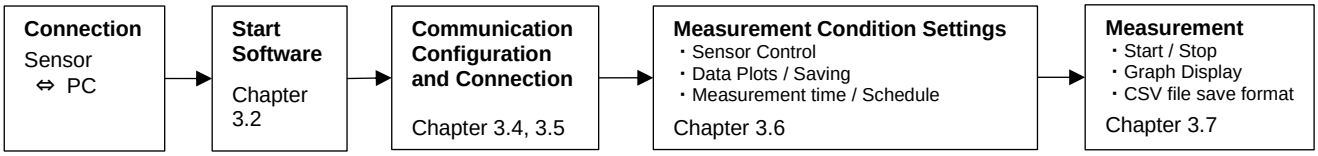
To uninstall this software, go to "Programs and Features" in Control Panel, select "Vibration Logger", and execute the uninstallation.



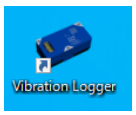
3. Operation Procedure

3.1. Procedures from Launching the Software for Logging

Sequence of procedures from the software launch to the data logging is shown below.



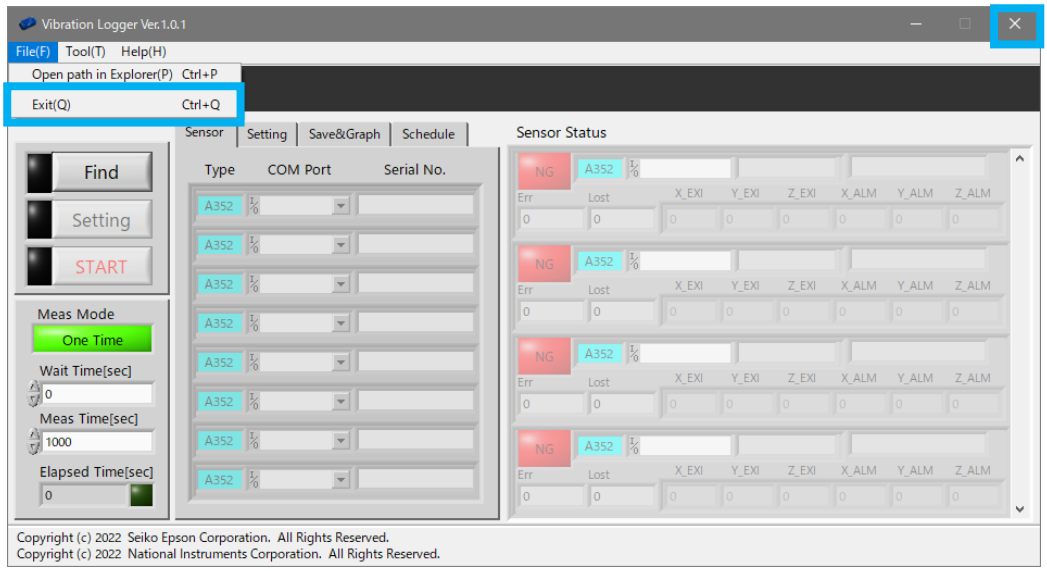
3.2. Start the Software

After connecting the sensor to the PC, execute "Vibration Logger.exe" 

to start the software.

3.3. Exit the Software

Click "Exit" in the "File" menu or click "X" button in the upper right corner of the window to exit this software.



3.4. Configuration of the Serial Communication Port

Click [SerialPort Config] in the [Tool] menu to configure the serial communication port settings.

Precautions (Important)

The factory default communication baud rates are as follows. Set the appropriate communication baud rate according to the model used.

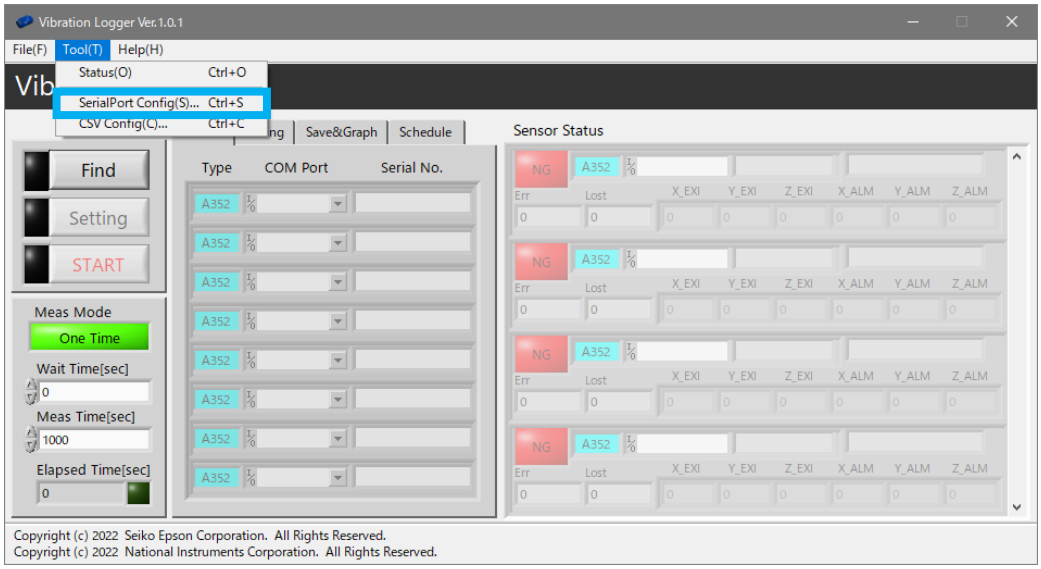
M-A352AD1, M-A342VD1, M-A542VR1 : BaudRate = 460800 *1

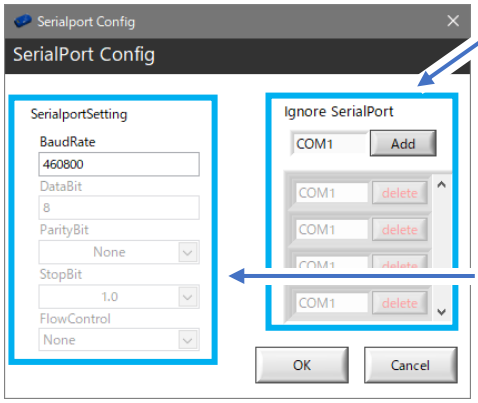
*1) The sensor factory default setting (= 460800) matches the software default setting (= 460800) .

M-A552AR1 : BaudRate = 230400 *2

*2) The sensor factory default setting (= 230400) and the Logger Software default setting (= 460800) are different, so either baud rate setting must be changed.

Note) The setting configuration is stored once the setting is changed. No further configuration is necessary at the next startup.





Ignore SerialPort

To detect the COM ports where sensors are connected, this software sends commands to all open COM ports. If any specific COM ports are to be removed from the detection, add the COM numbers to the Ignore SerialPort list here.

Use this function when it takes a long time to detect sensors, or when there are COM ports that need to avoid sending commands.

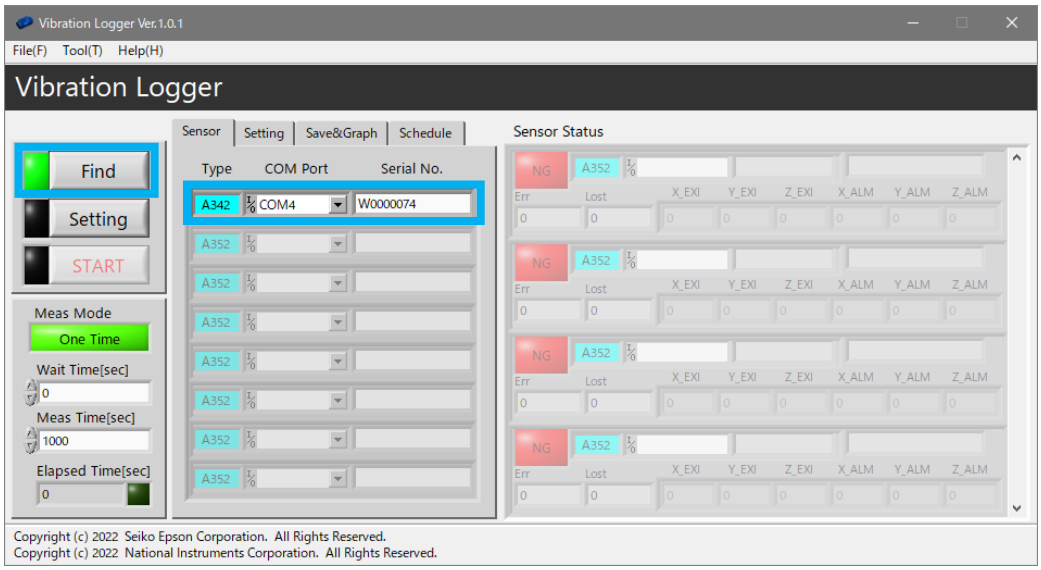
Serial Port Settings

If accessing the UART_CTRL register of the sensor to change the communication settings, please change the settings of this software accordingly.

3.5. Sensor Communication Connection

Click the "Find" button to connect the sensor.

The "Find" button turns green when the connection is completed successfully, and Types (model names), COM Ports, and Serial Nos. of all the connected sensors are displayed.



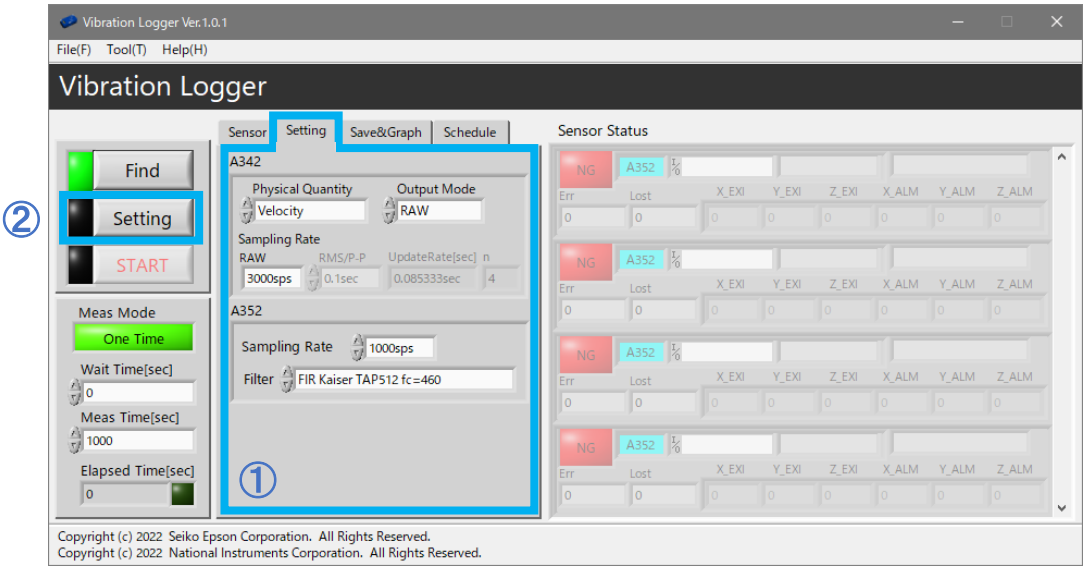
Note) The "Find" button turns red when a connection error occurs, and the type (sensor model), COM Port, and Serial No. of the sensor are not displayed. Please check if there is any problem in the connection between the sensor and the PC or in the serial communication settings.

3.6. Measurement Condition Settings

3.6.1. Sensor Register Settings

① First, click the "Setting" tab, and configure the sensor settings (output physical quantity, output mode, sampling rate, filter) for the corresponding model.

② Next, click the "Setting" button to start writing to a dedicated sensor register. The "Setting" button turns green when the writing is successfully completed.

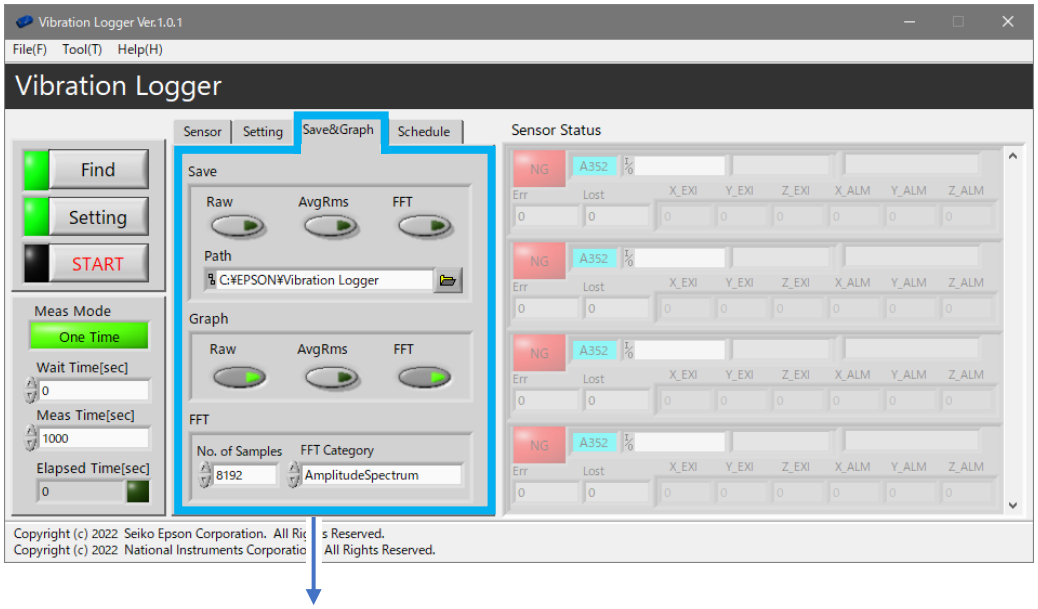


Note) If you change the settings in step ① after step ②, the settings will be unset and the “Setting” button will turn OFF. Click the "Setting" button again to configure the settings.

Note) The above settings are retained when exiting the software, and the settings are reflected at the next startup.

3.6.2. Log Data and Graph Display Settings

Click the "Save & Graph" tab, and set each item that belongs to the Save, Graph, and FFT categories.



Save

"Raw" : Save the sensor output raw data to a csv file.

"AvgRms" : Calculate average per second and RMS data based on the raw data and save them to a csv file.

"FFT" : Calculate FFT amplitude spectrum based on the raw data and save it to a csv file. Only the latest spectrum calculated just before the end of measurement is stored.

"Path" : Specify the csv files saving folder.

Graph

"Raw" : The sensor output raw data is displayed in a graph (Raw Graph).

"AvgRms" : Calculated average per second and RMS data based on the raw data are displayed in a graph (AvgRms Graph).

"FFT" : Calculated FFT amplitude spectrum based on the raw data is displayed in a graph (FFT Graph).

FFT

"No. of Samples" : Select the number of samples for FFT calculation from the following options.
[1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288]

"FFT Category" : Select the FFT category from the following options.
[Amplitude Spectrum, Power Spectrum, Amplitude Spectral Density, Power Spectral Density]

Note) The above settings are retained when exiting the software, and the settings are reflected at the next startup.

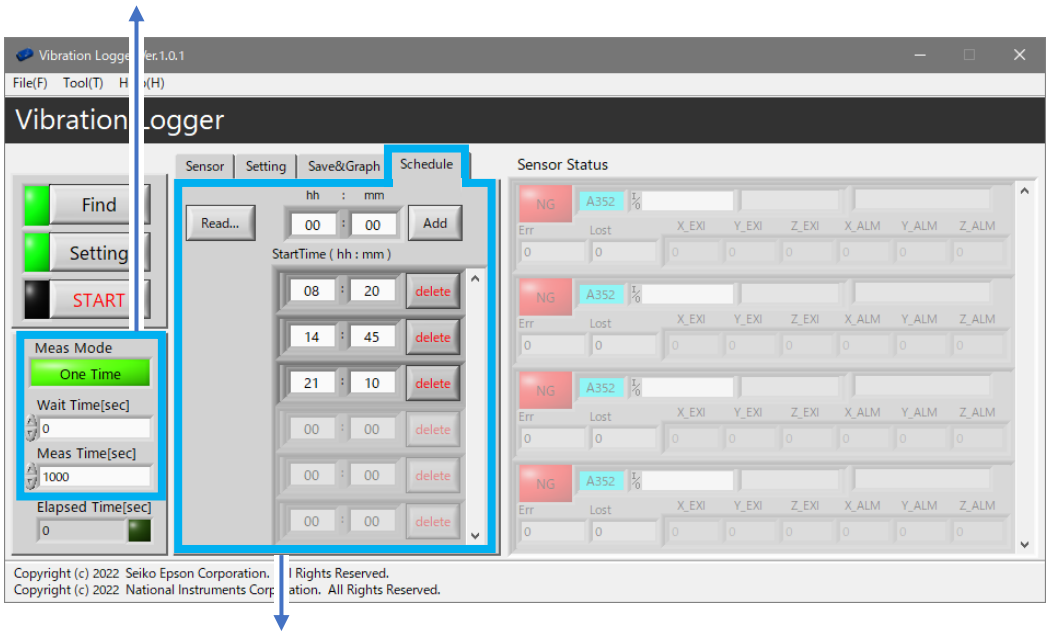
3.6.3. Measurement Mode and Sequence Settings

Configure the measurement mode and sequence, and set the time for scheduled measurement.

“Meas Mode” : Select the measurement mode (One Time: One time measurement, Schedule: Scheduled measurement).

“Wait Time” : Set the wait time (in seconds) from clicking the "START" button to beginning the measurement.

“Meas Time” : Set the duration (in seconds) of the measurement.



Schedule

Set the times for scheduled measurement. Settings can be made in either of the following 1) or 2).

1) Enter the time in 24-hour format as "hh : mm" and click the "Add" button to add it to the time list.

2) Prepare a csv file with the times entered in the "hh:mm" format in advance, and click the "Read" button to add the contents of the csv file to the time list at once.

See "ScheduledMeas.csv" file in the installation folder for a sample csv file.

	A	B	C	D	E	F
1	0	0				
2	0	5				
3	0	10				
4	0	15				
5	0	20				
6	0	25				
7	0	30				

Note) For Preparing a CSV file, there is a restriction on the start time must be in 5minute increments.

Note) Actual measurements are performed based on the PC time clock. The number of samples collected may vary from measurement to measurement and from sensor to sensor.

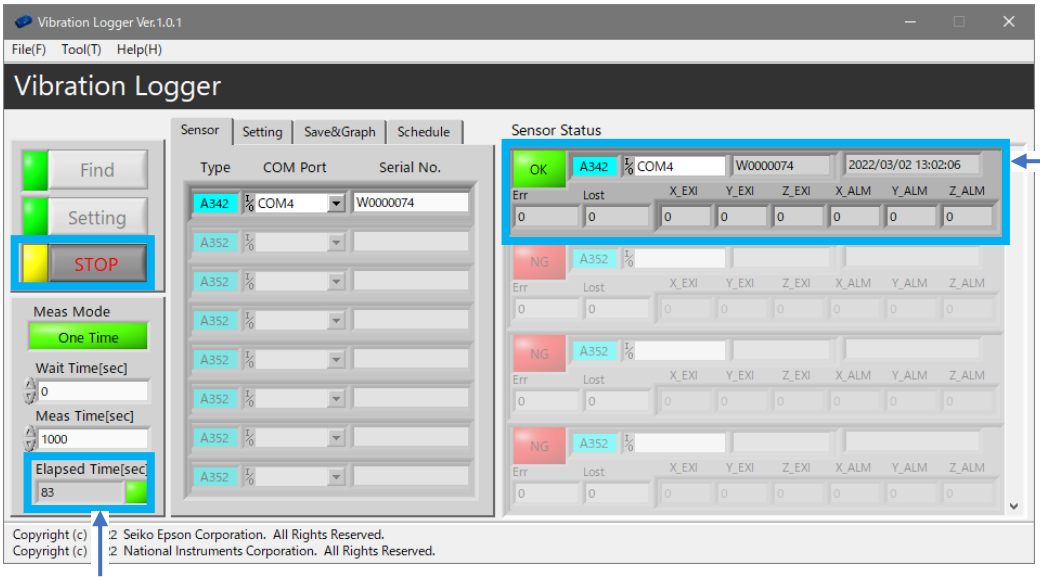
Note) The above settings are retained when exiting the software, and the settings are reflected at the next startup.

3.7. Measurement

3.7.1. Start Measurement

Click the "START" button to start the measurement. During the measurement, the software works as follows.

- The "START" label changes to "STOP", and the yellow blinks repeatedly.
- The elapsed time and sensor status are displayed.
- According to the setting conditions, a graph of the measurement data are plotted, and saved to a csv file.



Sensor Status *1

Updates the sensor status information every second.

[Err] : Communication error

[Lost] : Packet lost *2

[X_EXI, Y_EXI, Z_EXI] : Structural Resonance Warning (FLAG Reg.)

[X_ALM, Y_ALM, Z_ALM] : Threshold Detection (FLAG Reg.)

Elapsed Time

The elapsed time (in seconds) from the start of measurement is displayed.

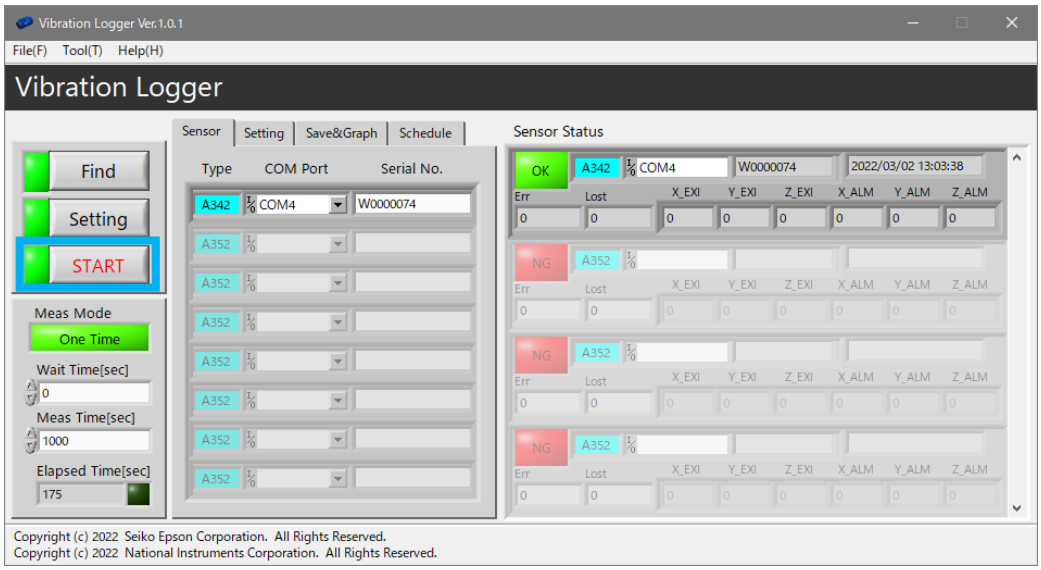
*1) All statuses are reset to zero at the start of measurement, and then the number of flag-raising is counted (one exception: Err status is not reset to zero during scheduled measurement).

*2) Increment values in each packet are monitored.

3.7.2. End Measurement

Click the "STOP" button to end the measurement. The button label changes to "START" and the indicator turns green.

All plot windows are closed, and the measurement data saving is terminated.



3.7.3. Graph Windows

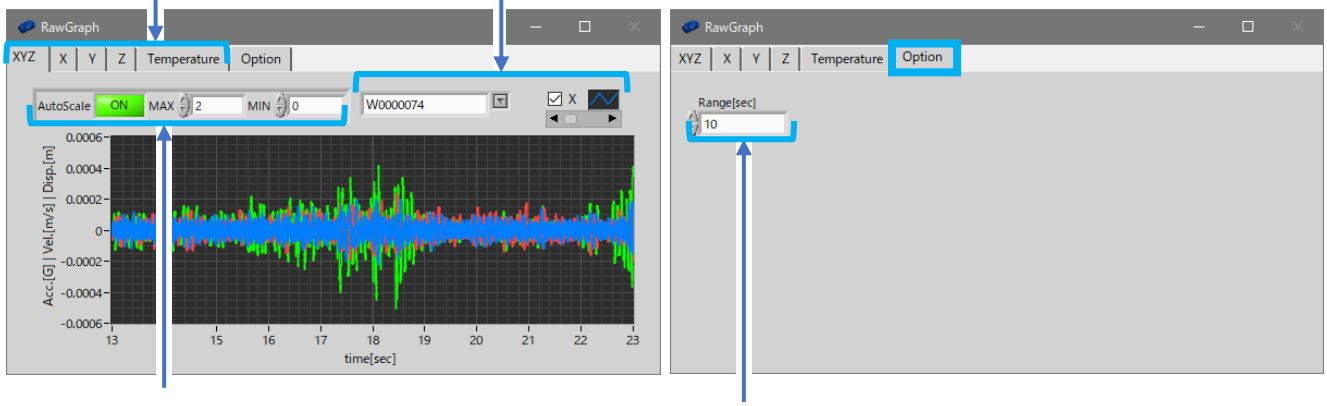
Functions of each graph window are described below.

1）RawGraph

XYZ / X / Y / Z / Temperature

Select the measurement value tab to be displayed.

Select the sample No. and measurement axis to be displayed.



AutoScale, MAX / MIN

Adjust the vertical axis scale range.

Range

Adjust the horizontal axis scale range.

Note) If the sampling interval is longer than the time range of the horizontal axis, measured values are not plotted in the graph.

2）AvgRmsGraph

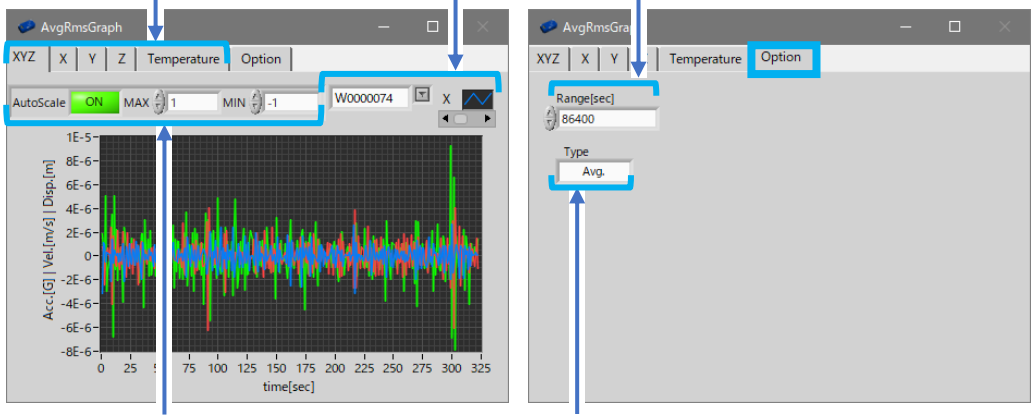
Select the sensor No. and measurement axis to be displayed.

XYZ / X / Y / Z / Temperature

Select the target label tab to be displayed.

Range

Adjust the horizontal axis scale range.



AutoScale, MAX / MIN

Adjust the vertical axis scale range.

Type

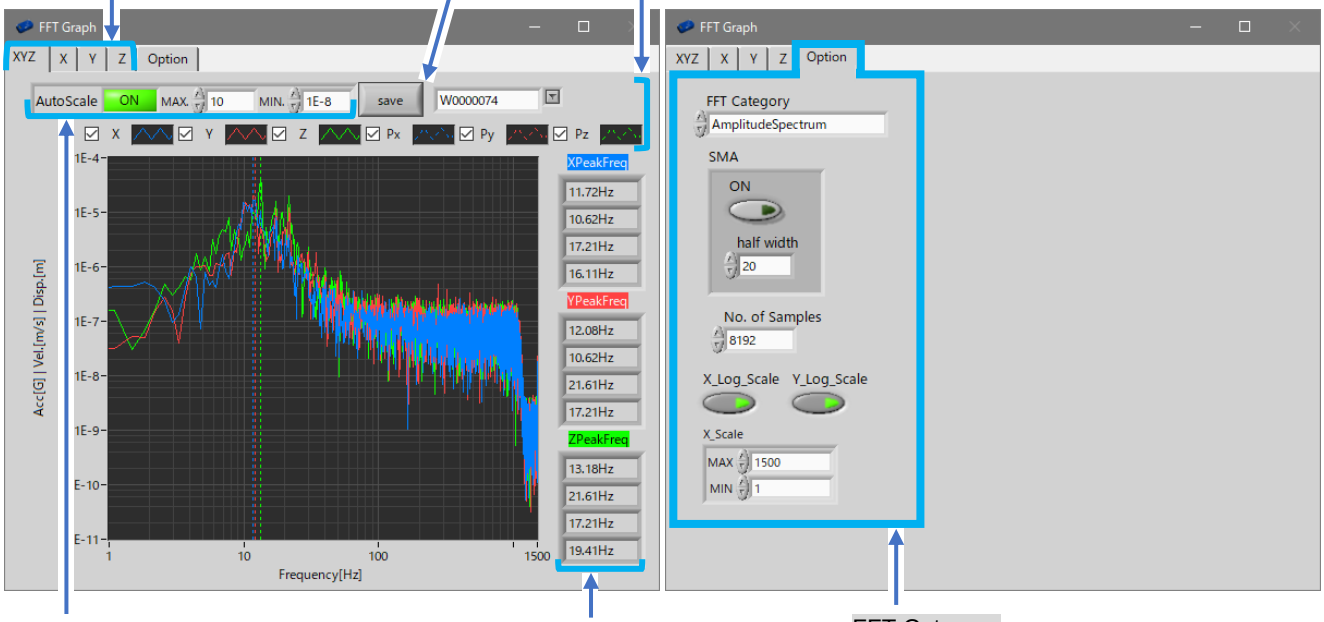
Select the calculation format (Average/RMS) to be displayed.

3）FFT Graph

save
Saves the FFT data in a file at the time when the button is clicked.

XYZ / X / Y / Z
Select the target label tab to be displayed.

Select the sample No., measurement axes, and FFT peak auxiliary lines to be displayed.



AutoScale, MAX / MIN
Adjust the vertical axis scale range.

PeakFreq
Displays the FFT peak frequencies (1st, 2nd, 3rd, and 4th) for each axis.

FFT Category
Select the FFT category.

SMA (Simple Moving Average)
ON: Enables the moving average plot.
Half width[*1]: Set the moving average half width.

No. of Samples
Set the number of FFT points. 1024 - 524288

X_Log_Scale, Y_Log_Scale
Switches between logarithmic scale and linear scale.

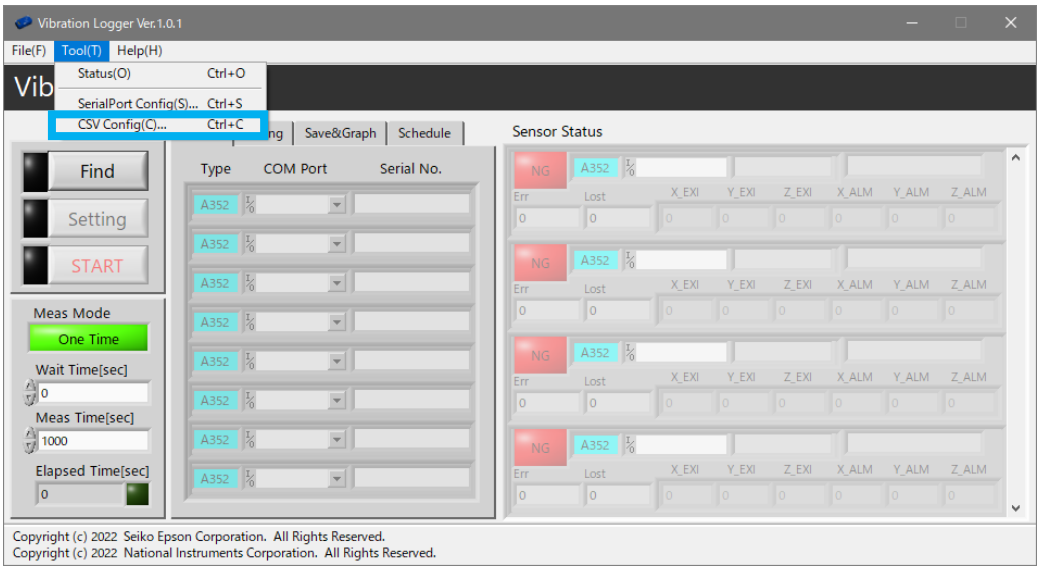
X_Scale (MAX, MIN)
Adjust the x axis (horizontal axis, frequency) scale range.

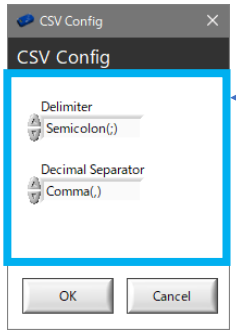
*1) For a half-width of M, the full width of the moving-average filter is N = 1 + 2M samples. Therefore, the full width N is always an odd number of samples.

3.8. CSV File Data Format

3.8.1. Data Delimiter and Decimal Separator

Click "CSV Config" in the "Tool" menu, and select the data Delimiter and decimal separator.





Delimiter

Select the data delimiter.
[Comma (,), Tab (\t), Semicolon (;), Period (.)]

Decimal Separator

Select the data separator.
[Period (.), Comma (,)]

3.8.2. Header Specifications for Generated csv Files

Header specifications for each csv file (Raw, AvgRms, FFT) generated upon one-time and scheduled measurements are described below.

The header specifications are also described in the "Header.xlsx" file in the installation folder.

1）One Time Measurement

1-1）Raw Data

Below describes the csv file data format that is generated when the "Raw" button in the "Save & Graph" tab is enabled.

File name: **A342_xxxxxxxx(S/N)_COMxx_yymmdd_hhmm.csv**

1st column: Sampling index number
2nd column: Increment value for each sampling.
3rd column: Temperature value of the built-in temperature sensor.
4th column: X-axis sensor output. *1
5th column: Y-axis sensor output. *1
6th column: Z-axis sensor output. *1
7th column: Flag register value of the sensor.

*1) The unit corresponds to the output physical quantity (G, m/s, m) configured.

index	counter	temp. [℃]	X [G | m/s | m]	Y [G | m/s | m]	Z [G | m/s | m]	flag
0	1	27.2213936	4.76837E-07	5.05447E-05	-6.46114E-05	0
1	2	27.2213936	2.6226E-06	5.19753E-05	-5.81741E-05	0
2	3	27.2213936	1.3113E-05	5.10216E-05	-5.55515E-05	0
3	0	27.2213936	3.93391E-05	5.17368E-05	-5.57899E-05	0
4	1	27.2213936	3.5286E-05	5.79357E-05	-6.24657E-05	0
5	2	27.2213936	1.71661E-05	4.72069E-05	-7.39098E-05	0

1-2）AvgRms Data per Second

Below describes the csv file data format that is generated when the "AvgRms" button in the "Save & Graph" tab is enabled.

File name: **A342_xxxxxxxx(S/N)_COMxx_AvgRms1s_yymmdd_hhmm.csv**

1st column: Elapsed time (in seconds) from the start of measurement.
2nd column: Temperature value of the built-in temperature sensor.
3rd column: Average value of the X-axis sensor output. *1
4th column: RMS value of the X-axis sensor output. *1
5th column: Maximum absolute value of the X-axis sensor output. *1
6th column: Crest factor (CF = | Max | / RMS) of the X-axis sensor output. *1
7th column: Average value of the Y-axis sensor output. *1
8th column: RMS value of the Y-axis sensor output. *1
9th column: Maximum absolute value of the Y-axis sensor output. *1
10th column: Crest factor (CF = | Max | / RMS) of the Y-axis sensor output. *1
11th column: Average value of the Z-axis sensor output. *1
12th column: RMS value of the Z-axis sensor output. *1
13th column: Maximum absolute value of the Z-axis sensor output. *1
14th column: Crest factor (CF = | Max | / RMS) of the Z-axis sensor output. *1

*1) The unit corresponds to the output physical quantity (G, m/s, m) configured.

time [sec]	temp. [℃]	X Avg [*]	X Rms [*]	|X| Max [*]	X CF [*]	Y Avg [*]	Y Rms [*]	|Y| Max [*]	Y CF [*]	Z Avg [*]	Z Rms [*]	|Z| Max [*]	Z CF [*]
1	27.22139	-2.9E-06	7.14E-05	0.000189	2.652	1.68E-06	4.45E-05	0.000112	2.505349	2.73E-06	8.27E-05	0.000331	4.005779
2	27.22139	8.12E-07	3.92E-05	0.000122	3.112849	-9.8E-07	6.55E-05	0.00017	2.597251	-4.3E-06	8.69E-05	0.000216	2.486008
3	27.22139	2.1E-06	3.41E-05	0.000111	3.266582	-1.2E-06	5.27E-05	0.000179	3.393906	1.65E-06	6.76E-05	0.000167	2.475046
4	27.22139	-1.5E-06	3.39E-05	0.000104	3.071316	1.18E-06	4.32E-05	0.000134	3.102103	-1.1E-06	8.86E-05	0.000277	3.121088
5	27.22139	1.28E-06	3.39E-05	0.000142	4.20167	-1.3E-06	5.45E-05	0.000148	2.707514	2.61E-06	0.000146	0.00037	2.532496

1-3）FFT Data

Below describes the csv file data format that is generated when the "FFT" button in the "Save & Graph" tab is enabled.

File name: **A342_xxxxxxxx(S/N)_COMxx_AS/PS/ASD/PSD*1_yymmdd_hhmm.csv**

1st column: Frequency index.
2nd column: FFT amplitude of the X-axis sensor output. *2
3rd column: FFT amplitude of the Y-axis sensor output. *2
4th column: FFT amplitude of the Z-axis sensor output. *2

*1) AS: Amplitude Spectrum, PS: Power Spectrum, ASD: Amplitude Spectral Density, PSD: Power Spectral Density.
*2) Corresponding Units; AS: (G, ms, m/s), PS: (G, ms, m/s)^2, ASD: (G, ms, m/s)/$\sqrt{}$Hz, PSD: (G, ms, m/s)^2/Hz.

Freq [Hz]	X [*]	Y [*]	Z [*]
0.732422	9.16E-07	1E-06	7.36E-07
1.464844	1.19E-06	9.58E-07	9.34E-07
2.197266	1.15E-06	6.49E-07	7.73E-07
2.929688	2.01E-06	7.7E-07	9.78E-07

2）Scheduled Measurement

2-1）Raw Data

Same as the RAW data format for the one time measurement.

2-2）AvgRms Data per Second

Same as the AvgRms data format for the one time measurement.

2-3）AvgRms Data for Each Scheduled Measurement

Below describes the csv file data format that is generated when the "AvgRms" button in the "Save & Graph" tab is enabled.

For the outputs of all sensor X/Y/Z axes, the respective average values and RMS data over the measurement time for each scheduled measurement are saved. A new csv file is created when scheduled measurements are performed across the month.

File name: **AllSensors_AvgRms_yymm.csv**

1st column: Start time of each scheduled measurement.
2nd column: Temperature value of the built-in temperature sensor.
3rd column: Average value of the X-axis sensor output over the measurement time. *1
4th column: RMS value of the X-axis sensor output over the measurement time. *1
5th column: Maximum absolute value of the X-axis sensor output over the measurement time. *1
6th column: Crest factor (CF = | Max | / RMS) of the X-axis sensor output. *1
7th column: Average value of the Y-axis sensor output over the measurement time. *1
8th column: RMS value of the Y-axis sensor output over the measurement time. *1
9th column: Maximum absolute value of the Y-axis sensor output over the measurement time. *1
10th column: Crest factor (CF = | Max | / RMS) of the Y-axis sensor output. *1
11th column: Average value of the Z-axis sensor output over the measurement time. *1
12th column: RMS value of the Z-axis sensor output over the measurement time. *1
13th column: Maximum absolute value of the Z-axis sensor output over the measurement time. *1
14th column: Crest factor (CF = | Max | / RMS) of the Z-axis sensor output. *1
15th column: If multiple sensors are connected, the corresponding values are added in the same format.

*1) The unit corresponds to the output physical quantity (G, m/s, m) configured.

Date	temp. [℃]	X Avg [*]	X Rms [*]	|X| Max [*]	X CF [*]	Y Avg [*]	Y Rms [*]	|Y| Max [*]	Y CF [*]	Z Avg [*]	Z Rms [*]	|Z| Max [*]	Z CF [*]
2021/12/21 15:35	28.19209	-8.7E-08	3.36E-05	0.000123	3.658382	2.02E-07	4.67E-05	0.000191	4.09287	6.31E-09	8.2E-05	0.000296	3.608631
2021/12/21 15:40	27.36624	-1.5E-07	3.47E-05	0.000121	3.489971	-7.7E-08	4.62E-05	0.000158	3.42023	3.89E-07	6.66E-05	0.000214	3.219931
2021/12/21 15:45	27.22139	-7.3E-08	3.37E-05	0.000127	3.778102	-1.1E-07	4.34E-05	0.000155	3.572203	5.62E-08	7.2E-05	0.000303	4.207293
2021/12/21 15:50	27.22139	-1.2E-07	3.58E-05	0.000133	3.703765	-4.3E-08	4.55E-05	0.000159	3.496568	3.48E-07	7.8E-05	0.000266	3.406786

2-4）FFT Data

Below describes the csv file data format that is generated when the "FFT" button in the "Save & Graph" tab is enabled.

CSV files are generated for each axis. A new csv file is created when scheduled measurements are performed across the month.

File names: **A342_xxxxxxxx(S/N)_COMxx_AS/PS/ASD/PSD*1_X_yymm.csv**

A342_xxxxxxxx(S/N)_COMxx_AS/PS/ASD/PSD*1_Y_yymm.csv

A342_xxxxxxxx(S/N)_COMxx_AS/PS/ASD/PSD*1_Z_yymm.csv

1st column: Frequency index.
2nd column: FFT amplitude of the sensor X- (Y-, Z-) axis output for the 1st scheduled measurement. *2
3rd column: FFT amplitude of the sensor X- (Y-, Z-) axis output for the 2nd scheduled measurement. *2
4th column: FFT amplitude of the sensor X- (Y-, Z-) axis output for the 3rd scheduled measurement. *2
5th column: FFT amplitude of the sensor X- (Y-, Z-) axis output for the 4th scheduled measurement. *2
6th column onwards: A column is appended each time a scheduled measurement is performed.

*1) AS: Amplitude Spectrum, PS: Power Spectrum, ASD: Amplitude Spectral Density, PSD: Power Spectral Density.
*2) Corresponding units; AS: (G, ms, m/s), PS: (G, ms, m/s)^2, ASD: (G, ms, m/s)/√Hz, PSD: (G, ms, m/s)^2/Hz.

Freq [Hz]	1st scheduled measurement [*]	2nd scheduled measurement [*]	3rd scheduled measurement [*]	4th scheduled measurement [*]
Freq(Hz)	2022/3/1 17:25	2022/3/1 17:30	2022/3/1 17:35	2022/3/1 17:40
0.018310547	0.000166625	0.000126593	9.15051E-05	0.000177917
0.036621094	9.01086E-05	7.57014E-05	6.92058E-05	0.000102031
0.054931641	4.46601E-05	5.20665E-05	5.62734E-05	4.66004E-05
0.073242188	3.43613E-05	3.5862E-05	3.88898E-05	3.32815E-05
0.091552734	2.31789E-05	2.0644E-05	2.242E-05	2.03556E-05
0.109863281	1.31738E-05	1.022E-05	1.11681E-05	1.08793E-05
0.128173828	6.20142E-06	6.01953E-06	7.09303E-06	6.2684E-06

4. Evaluation System Configuration Examples

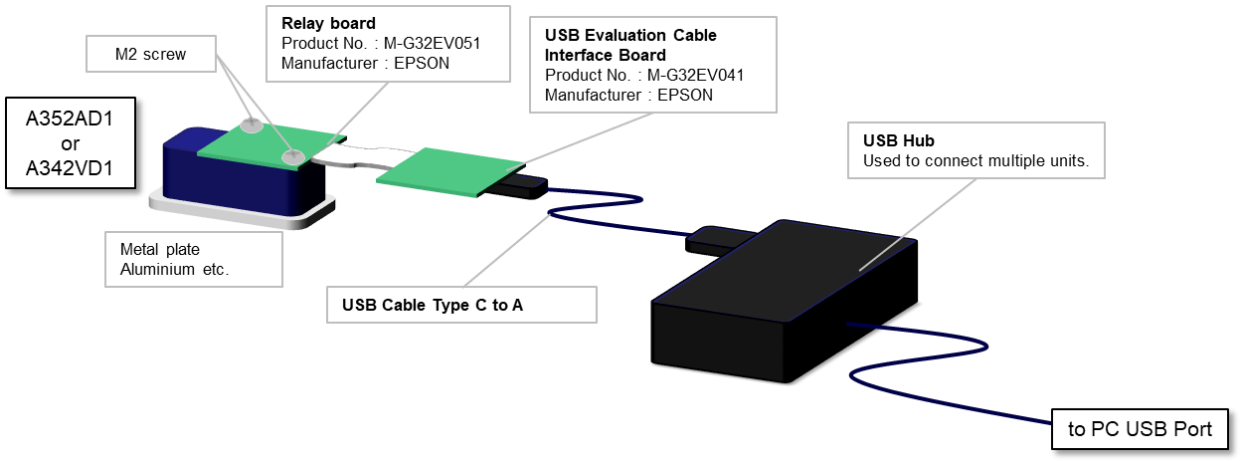
The followings are system configuration examples when connecting the sensors to a PC. Please contact us for EPSON accessories or prepare other manufacturer's accessories by customers.

Accessories marked "Required" in the tables are required to be used. Accessories listed as "Optional" are to be prepared when necessary.

Although the accessories listed have been tested by Epson, they are not guaranteed to work since they are affected by the actual PC specifications.

4.1. A352AD1 / A342VD1

4.1.1. Evaluation System Configuration Example

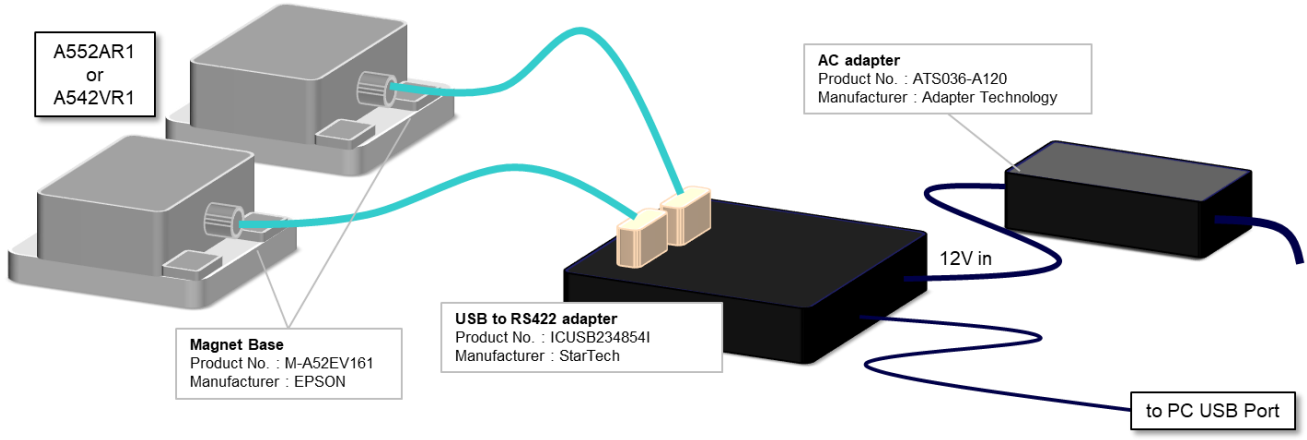


4.1.2. Table of Accessories

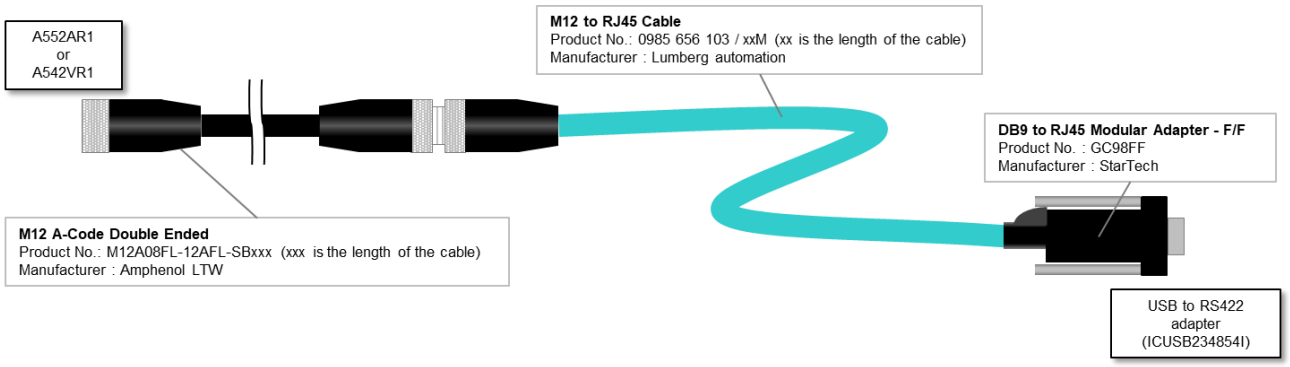
Accessories Tested (model number / manufacturer)	Use Case / Remarks
Relay Board for EPSON Accelerometer / IMU Product No.: M-G32EV051 Manufacturer: EPSON	**Optional** ・ Recommended when the vibration of the USB cable affects measurements. ・ Recommended when measuring small vibration.
USB Evaluation Cable Interface Board for EPSON IMU / Accelerometer Product No.: M-G32EV041 Manufacturer: EPSON	**Required** ・ Convert the sensor output interface (UART) to USB. ・ A dedicated driver may be required to connect to a PC. Please install it in accordance with the enclosed manual.
USB Cable Type C to A (USB 2.0)	**Required** ・ Standard USB cables can be used. ・ The maximum cable length for USB 2.0 is 5 m. ・ A repeater cable may be used to extend the cable length. However, this is not recommended as it may degrade the communication quality. ・ If more than 5m cable length is required, the configuration using the A552AR1 and A542VR1 (Section 4.1.3) is recommended.
USB Hub (USB 2.0)	**Optional** ・ Prepare a USB hub when connecting multiple sensors. ・ A general USB Hub can be used.
Metal Base Plate	**Optional** ・ Co-tightening the sensor with M-G32EV051 or M-G32EV041 can reduce the influence of electrical noise. ・ The sensor is designed to be mounted on a cabinet; however, evaluation can be simplified by preparing a metal base plate. ・ Please prepare the metal plate by customers considering the shape of the sensor and the cabinet. ・ Use the M2 screws supplied with M-G32EV051 or M-G32EV041.

4.2. A552AR1 / A542VR1

4.2.1. Evaluation System Configuration Example



4.2.2. Cable Connection Configuration Example



4.2.3. Table of Accessories

Accessories Tested (model number / manufacturer)	Use Cases / Remarks
USB to RS422 Adapter Product No.: ICUSB234854I Manufacturer: StarTech	**Required** ・ Convert the sensor output interface (RS422) to USB. ・ Up to four sensors can be connected with this product. ・ A dedicated driver may be required to connect to a PC. Please install it in accordance with the enclosed manual. ・ Settings for communication mode, power supply, and termination are required. Please follow the product manual before connecting sensors.
AC Adapter Product No.: ATS036-A120 Manufacturer: Adapter Technology	**Required** ・ For power supply to the sensor. ・ The output voltage of this product is 12V.
M12 A-Code Double Ended Product No.: M12A08FL-12AFL-SBxxx (xxx: Cable length) Manufacturer: Amphenol LTW	**Required** ・ This cable is used to convert an M12 male connector to an M12 female connector. ・ Please refer to the manufacturer's website for the cable length.

M12 to RJ45 Cable Product No.: 0985 656 103 / xxM (xx: Cable length) Manufacturer: Lumberg automation	**Required** ・ For connecting the sensor via RS422. ・ Please refer to the manufacturer's website for the cable length
DB9 to RJ45 Modular Adapter - F/F Product No.: GC98FF Manufacturer: StarTech	**Required** ・ Convert a DB9 male connector into an RJ45 female connector.
Magnet Base Product No.: M-A52EV161 Manufacturer: EPSON	**Optional** ・ If the target cabinet is made of a magnetic material such as iron, this magnet base can be used to mount the sensor.

5. Contact

AMERICA

EPSON AMERICA, INC.
Headquarter:
3131 Katella Ave.
Los Alamitos, CA 90720, USA
Phone: +1-800-463-7766

San Jose Office:
2860 Zanker Road, Suite 204,
San Jose, CA 95134, U.S.A
Phone: +1-800-463-7766

EUROPE

EPSON EUROPE ELECTRONICS GmbH
Riesstrasse 15, 80992 Munich,
GERMANY
Phone: +49-89-14005-0 FAX: +49-89-14005-110

ASIA

EPSON (CHINA) CO., LTD.
4F,Tower 1 of China Central Place,81 Jianguo Street, Chaoyang District, Beijing 100025 CHINA
Phone: +86-400-810-9972 X ext.2
Mail EPSON_MSM@ecc.epson.com.cm

EPSON SINGAPORE PTE. LTD.
438B Alexandra Road, Block B Alexandra TechnoPark, #04-01/04, Singapore 119968
Phone: +65-6586-5500

EPSON TAIWAN TECHNOLOGY & TRADING LTD.
15F, No.100, Song Ren Road,Taipei 110, TAIWAN
Phone: +886-2-8786-6688 Fax: +886-2-8786-6660

EPSON KOREA Co., Ltd.
10F Posco Tower Yeoksam, Teheranro 134 Gangnam-gu, Seoul, 06235 KOREA
Phone: +82-2-558-4270 Fax: +82-2-3420-6699

JAPAN

SEIKO EPSON CORPORATION.
MD SALES & MARKETING DEPT.
https://global.epson.com/products_and_drivers/sensing_system/contact/

Product Information on www server
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