



## AT2035

Portable Accelerometer  
Calibrator



## AT2040

Portable Transducer  
Test Set

## Operator Manual

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Introduction

This manual is intended to inform the operating user on product specifications, setup, troubleshooting, and operation procedures for the AT2035 and AT2040. This shaker is designed to be a rugged, completely self-contained, battery-powered, vibration sensor test set. The shaker is meant for use in the field or laboratory, for the verification of control room working conditions, or to verify the performance of vibration transducers.

Product Technical Support

For technical support for the AT2035 and AT2040, call us at 951-719-1032 or email us at [help@agatetechnology.com](mailto:help@agatetechnology.com). Training webinars are also available; contact technical support for more information.

2-Year Limited Warranty

Agate Technology LLC warrants this product against defects in material and workmanship for normal use following published product documentation for a period of TWO (2) years following the date of purchase. The limited warranty includes drift/accuracy. Product documentation includes, but is not limited to, the product manual, datasheet, technical specifications, and communication with our service department. This warranty does not cover damage caused by operator negligence, misuse, abuse, accident, use inconsistent with product documentation, or unauthorized repair or modification by anyone other than Agate Technology and its authorized service providers. Any defective product meeting the above limited warranty requirements will be repaired or replaced at no charge.

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Safety information

Please keep this manual in a safe location for reference.



**WARNINGS**



- The shaker is designed for vertical use. Operating in the horizontal position is possible as the shaker element has linear bearings for support, but the load should not exceed 400 grams.
- This instrument may shake violently at high amplitude and low frequency. Always make sure to keep the unit secure and operate on a stable surface.
- When amplitude or frequency have exceeded their acceptable ranges, the unit will issue a warning or shutdown, depending on the operating conditions.
- Even when closed, this instrument is not waterproof. Never use near water.
- Failure to hold the accelerometer with the short-handle wrench when attaching and removing transducers can cause permanent damage to the shaker.

Primary functions

- 1. **Shake or excite a transducer under test**  
In shake mode, the shaker can be used as a variable frequency and variable amplitude shaker. In this mode, the frequency and amplitude are set manually by the user while the computer provides high-accuracy measurement signals.
- 2. **Calculate transducer sensitivity**  
By comparing signals sent to the reference accelerometer by the signal generation board and the signals returned by the transducer under test, the shaker can automatically determine the test transducer's sensitivity to a high level of accuracy.
- 3. **Produce a NIST-traceable calibration certificate**  
Once the sensitivity has been calculated and saved across the test transducer's frequency range, the shaker will produce a NIST-traceable certificate and graph in PDF format. This certificate is stored in the computer's memory and may be recalled and exported at any time to a USB memory drive.
- 4. **Simulate a transducer using a precision signal (function) generator (AT2040 only)**  
The shaker is capable of producing signals over a wide amplitude and frequency using its built-in amplifiers to simulate a variety of charge and voltage signals. This allows the user to simulate a working transducer and is the ideal tool for electronics testing, troubleshooting, or calibrating condition monitoring systems.

Maximum weight recommendations

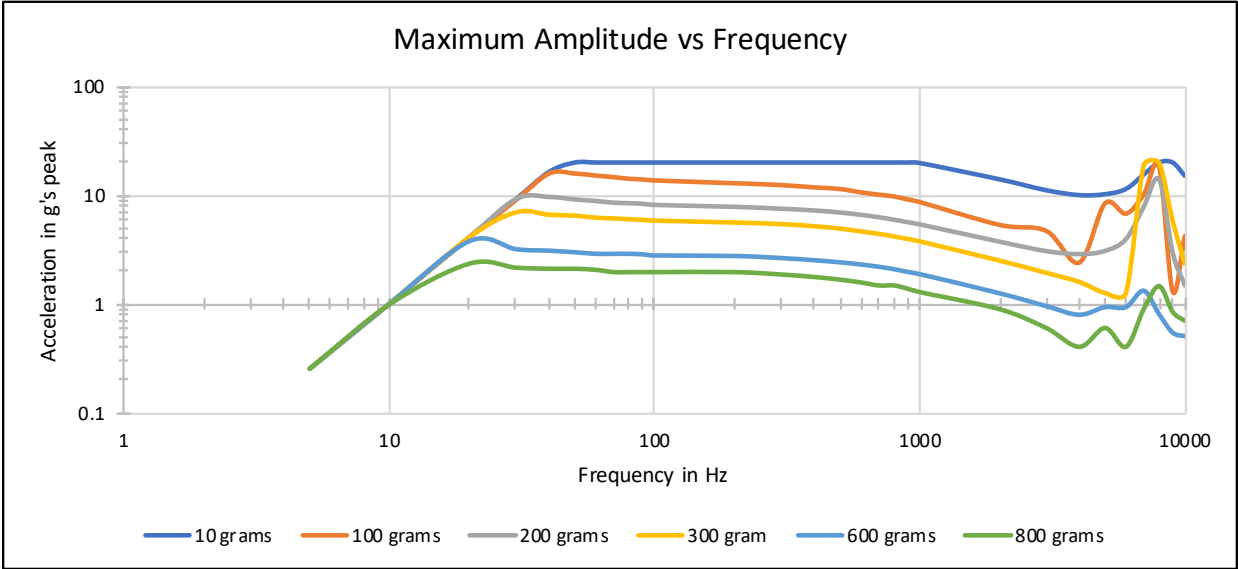


Figure 1. Maximum weight recommendations in grams

Battery operation

The shaker is powered by one 6 amp hour lithium iron phosphate (LiFePO<sub>4</sub>) rechargeable battery as its primary power source. This battery is designed to be continuously charged at a trickle rate once the battery reaches 100%. Battery life will depend on USB plug-ins, payload weight, along with shaker driving force.

In low power conditions, the shaker uses approximately 0.4 amps of power making it possible to achieve 13 hours of battery power. However, the shaker will shut down premature to full discharge preventing damage and ensuring long-term battery life.

During long periods of high power consumption, the shaker may only last up to one hour.

A battery light indicator is located in the top menu bar and turns from green to red as the battery becomes low on energy. Next to the battery bar, is an approximate percentage of battery remaining.

The shaker may be operated with the power plugged in. The AC charger will supply battery charge when plugged in; however, the charge rate will be greatly increased when the shaker is powered off.

**NOTES:**

- Charging time is 1 hour.
- For best results use the shaker when the battery is fully charged.
- Automatic power management will automatically turn off before full battery discharge. This is a protective measure to ensure longer battery operating life.
- If deep discharge occurs, the battery charger is set to recharge over two or more days. This is normal operation to prevent battery damage.
- The battery lifespan is 5,000 cycles at 80% depth of discharge, or up to 10 years.

LiFePO4 Batteries vs Lead-Acid Batteries:

- Are safer, compact, lightweight, and have a greater capacity and longer lifespan.
- Can tolerate temperature extremes and rough conditions.
- Are more structurally stable which means that they are much safer; they will not overheat and, even if mishandled or accidentally punctured, they will not explode or catch fire.
- Are also a better choice for the environment as they are non-toxic, do not contain rare earth or toxic metals, and their components—many of which are recyclable—will not leech into the soil or ground water if improperly disposed.

AT2035 Specifications and performance

Performance		
Frequency Range (operating) <sup>[1]</sup>	5 Hz to 10,000Hz	300 to 600,000 RPM
Maximum Amplitude (100 Hz, with no payload)	20 g pk 15 in/s pk 50 mils p-p	196 m/s² pk 380 mm/s pk 1270 µm p-p
Maximum Payload <sup>[2]</sup>	800 grams	
Sensor Input Connections	IEPE, Charge, and voltage sensors, Limited proximity probe input support	
Sensor Test Method	Automatic sweep or manual operation	
Test Types	Manual sensitivity Automatic sweep, with sensitivity and deviation relative to reference frequency. Includes phase data.	
Sensor Select	Built-in transducer library	
Calibration Sheets	Automatic creation to memory Export to PDF or CSV Certificate includes test point with graph	
Memory	16 GB (internal storage) MicroSD slot for additional storage	

Vibration Signal Accuracy	
Acceleration (5 Hz to 9 Hz)	± 3.2 %
Acceleration (10 Hz to <5 kHz)	± 2.2 %
Acceleration (5 kHz to 10 kHz)	± 3.0 %
Displacement (30 Hz to 150 Hz)	± 2.2 %
Amplitude Linearity (100 gram payload, 100 Hz)	< 1 % up to 10 g pk
Waveform Distortion (100 gram payload, 30 Hz to 2 kHz)	< 1 % THD (typical) up to 5 g pk

Physical		
Sensor Connectors	BNC	
Display	4.3" TFT LCD with 480×272 resolution	
Controls	2 dials with touch screen	
Dimensions (H × W × D)	10.6 × 9.7 × 6.9 in	27 × 24.6 × 17.4 cm
Weight	14.4 lb	6.5 kg
Sensor Mounting Platform Thread Size	¼-28	
Operating Temperature	32–122 °F	0–50 °C
Agency Requirements and Certifications <sup>[4]</sup>	A2LA Accredited NIST Traceable EMC:EN61326-1 LVD:EN61010-1 ISO/IEC17025:2017 RoHS Z540	

Readout		
Acceleration	g pk m/s² pk	g RMS m/s² RMS
Velocity	mm/s pk in/s pk	mm/s RMS in/s RMS
Displacement (peak to peak)	mils p-p	µm p-p
Frequency	Hz	RPM

Power		
Internal Battery	12V DC	6 amp hours
Battery Type <sup>[3]</sup>	LiFePO4	
Battery Charge Time	1 hour	
Battery Life Expectancy	5,000 cycles @ 80% depth-of-discharge, or 10 years	
AC Power (for recharging battery)	100–240V, 50–60Hz, internal, standard plug	
Operating Battery Life 100 gram payload, 100Hz 1 g pk 100 gram payload, 100Hz 10 g pk	10 hours 1 hours	
Charger Type	Internal / Built-in	
Plug Type	Standard PC Wall Plug	

Accessories		
Included Accessories	<ul style="list-style-type: none"><li>Power cable</li><li>Micro dot (10-32)</li><li>¼-28 stud</li><li>2-56 UNC adapter</li><li>Universal Velocity Adapter Disc</li><li>Universal Accelerometer Adapter Disc</li></ul>	
	<ul style="list-style-type: none"><li>Short-handle wrench</li><li>10-32 UNF stud</li><li>6-32 UNC adapter</li><li>10-32 UNF adapter</li><li>USB drive: loaded with setup software for custom sensor</li></ul>	
Optional Accessories <sup>[4]</sup>	<ul style="list-style-type: none"><li>Proximity Probe Adapter Kit (digital or manual micrometer)</li><li>Chadwick-Helmuth Velocimeter Cable</li><li>Triaxial Accelerometer Adapter</li></ul>	
Warranty	2 years (includes drift/accuracy)	
Tech Support	Training webinars, email support	

[1] 100 gram payload.

[2] See *Figure 1*, Maximum Amplitude vs Frequency chart, on page 6 for maximum weight recommendations. Limited at lower frequencies to 0.1 inch (2.54mm) Peak displacement.

[3] Lead-acid battery is an available option.

[4] For comprehensive list, please consult the Product Spec Sheet or contact sales.

AT2040 Specifications and performance

Electrodynamic Shaker Performance		
Frequency Range (operating) <sup>[1]</sup>	5 Hz to 10,000Hz	300 to 600,000 RPM
Maximum Amplitude (100 Hz, with no payload)	20 g pk 15 in/s pk 50 mils p-p	196 m/s² pk 380 mm/s pk 1270 µm p-p
Maximum Payload <sup>[2]</sup>	800 grams	
Waveform Type	Sine or Impulse	
Sensor Input Connections	IEPE, Charge, velocity, voltage, MEMS <sup>[3]</sup> , piezoresistive <sup>[3]</sup> , capacitive <sup>[3]</sup> , 4-20 mA vibration transmitters, proximity probes (AC and DC)	
Sensor Test Method	Manual sensitivity Automatic sweep, with sensitivity and deviation relative to reference frequency. Includes phase data.	
Sensor Select	Built-in transducer library	
Calibration Sheets	Automatic creation to memory Export to PDF or CSV Certificate includes test point with graph	
Memory	16 GB (internal storage) MicroSD slot for additional storage	

Simulation Performance <sup>[4]</sup>	
Frequency Range	1 to 11,000 Hz
Maximum Simulation Amplitude	150 g pk @ 10 mV/g
Test Type	Manual
Waveform Type	Sine or Impulse
Simulator Sensor Types Supported	<ul style="list-style-type: none"><li>Accelerometer:</li><li>Voltage</li><li>Charge</li><li>IEPE</li><li>Velocity</li><li>Proximity probes</li><li>4-20 mA vibration transmitters</li></ul>

Accuracy <sup>[5]</sup>	
Acceleration (5 Hz to 9 Hz)	± 3.2 %
Acceleration (10 Hz to <5 kHz)	± 2.2 %
Acceleration (5 kHz to 10 kHz)	± 3.0 %
Velocity (10 Hz to 1,000 Hz)	± 2.2 %
Displacement (30 Hz to 150 Hz)	± 2.2 %
Amplitude Linearity (100 gram payload, 100 Hz)	< 1 % up to 10 g pk
Waveform Distortion (100 gram payload, 30 Hz to 2 kHz)	< 1 % THD (typical) up to 5 g pk

Input/Output	
Test Sensor Inputs	<ul style="list-style-type: none"><li>Accelerometer:</li><li>Voltage</li><li>Charge</li><li>IEPE</li><li>4-20 mA vibration transmitters</li><li>Velocity</li><li>MEMS <sup>[3]</sup></li><li>Piezoresistive <sup>[3]</sup></li><li>Capacitive <sup>[3]</sup></li><li>Proximity probes</li></ul>
Bias Measurement	Yes
Built-in Excitation Current and Supply Voltages for Transducers	IEPE current source –24 V proximity driver source +24 V 4-20 mA supply Variable voltage supply

[1] 100 gram payload.

[2] See *Figure 1*, Maximum Amplitude vs Frequency chart, on page 6 for maximum weight recommendations. Limited at lower frequencies to 0.1 inch (2.54mm) Peak displacement.

Readout		
Acceleration	g pk m/s² pk	g RMS m/s² RMS
Velocity	mm/s pk in/s pk	mm/s RMS in/s RMS
Displacement (peak to peak)	mils p-p	µm p-p
Frequency	Hz	RPM

Power		
Internal Battery	12V DC	6 amp hours
Battery Type <sup>[6]</sup>	LiFePO4	
Battery Charge Time	1 hour	
Battery Life Expectancy	5,000 cycles @ 80% depth-of-discharge, or 10 years	
AC Power (for recharging battery)	100–240V, 50–60Hz, internal, standard plug	
Operating Battery Life 100 gram payload, 100Hz 1 g pk 100 gram payload, 100Hz 10 g pk	10 hours 1 hours	

Physical		
Sensor Connectors	BNC, DIN, terminal strip	
Display	4.3" TFT LCD with 480×272 resolution	
Controls	2 dials with touch screen	
Dimensions (H × W × D)	10.6 × 9.7 × 6.9 in	27 × 24.6 × 17.4 cm
Weight	14.4 lb	6.5 kg
Sensor Mounting Platform Thread Size	¼-28	
Operating Temperature	32–122 °F	0–50 °C
Agency Requirements and Certifications <sup>[4]</sup>	A2LA Accredited NIST Traceable EMC:EN61326-1 LVD:EN61010-1 ISO/IEC17025:2017 RoHS Z540	

Accessories		
Included Accessories	<ul style="list-style-type: none"><li>Power cable</li><li>Micro dot (10-32)</li><li>¼-28 stud</li><li>2-56 UNC adapter</li><li>Universal Velocity Adapter Disc</li><li>Universal Accelerometer Adapter Disc</li></ul>	
	<ul style="list-style-type: none"><li>Short-handle wrench</li><li>10-32 UNF stud</li><li>6-32 UNC adapter</li><li>10-32 UNF adapter</li><li>USB drive: loaded with setup software for custom sensor</li></ul>	
Optional Accessories <sup>[7]</sup>	<ul style="list-style-type: none"><li>Proximity Probe Adapter Kit (digital or manual micrometer)</li><li>Chadwick-Helmuth® Velocimeter Cable</li><li>Triaxial Accelerometer Adapter</li><li>MEMS Adapter</li></ul>	
Warranty	2 years (includes drift/accuracy)	
Tech Support	Training webinars, email support	

[3] Sensors require a MEMS-100 MEMS Adapter.

[4] Vibration simulator not part of A2LA scope.

[5] Lead-acid battery is an available option.

[6] For comprehensive list, please consult the Product Spec Sheet or contact sales.

Instrumentation and control system

The shaker consists of an internal charger, battery, main power amplifier, charge converter, electrodynamic shaker, NIST-traceable reference accelerometer, internal computer, signal generation board, and LCD display screen (Figure 2).

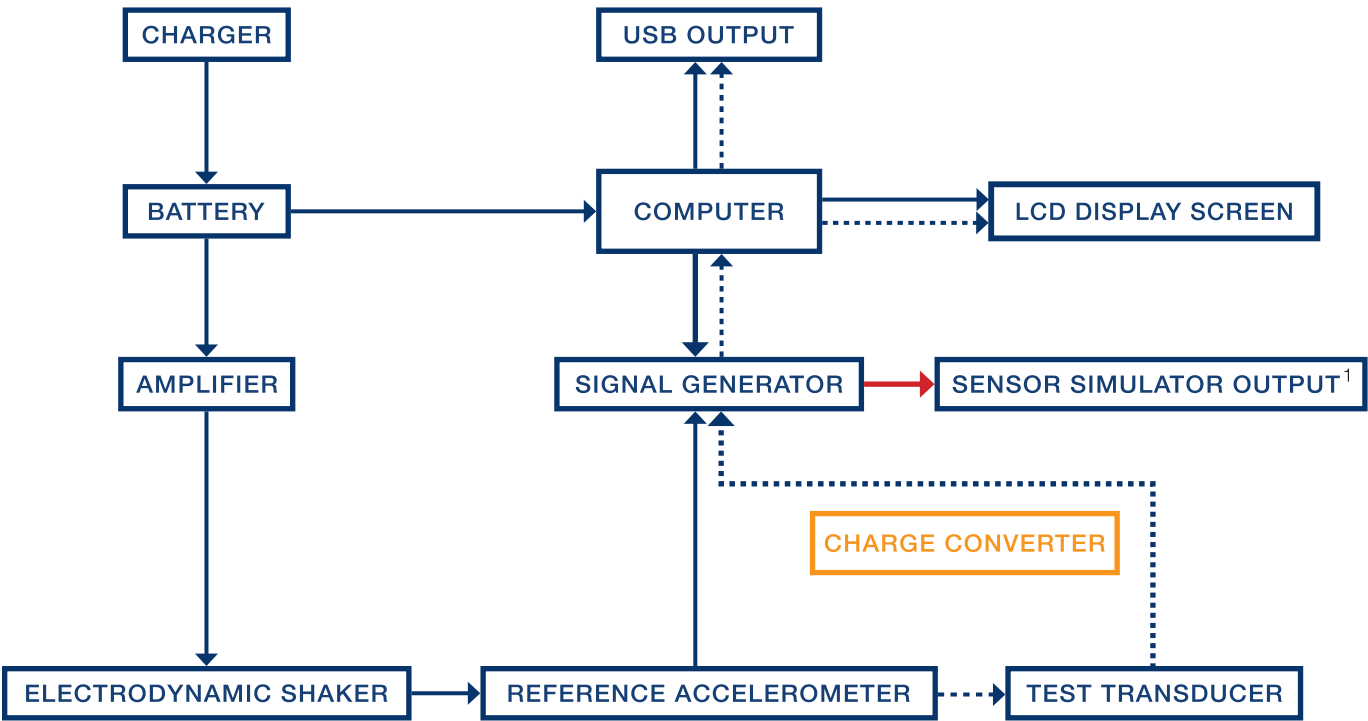


Figure 2. Block diagram

- Charger:** Internal charger which operates between 100 V and 220 V for worldwide power support.
- Battery:** 6 amp hour, sealed lead acid rechargeable battery. FAA-transport approved.
- Power Amplifier:** Takes the input signal from the signal generator and is used to drive the electrodynamic shaker.
- Electrodynamic Shaker:** Produces 4.5 lbf pk of sine force and is made with carbon-fiber composite and isolated linear bearings. This provides low distortion when shaking the transducer load.
- Reference Accelerometer:** NIST-traceable calibration standard accelerometer with ¼-28 tapped mounting hole.
- Test Transducer:** Calculate sensitivity output.
- Signal Generation Board:** Consists of multiple amplifiers and channels selectable by internal relays. This is categorized into three different applications:
- **Power Amplifier Output:** Controls the vibration of the electrodynamic shaker at the amplitude and frequency set by the user.
  - **Input:** Reads the sensitivity of multiple transducer types.
  - **Signal Generator:** Outputs a wide range of simulated voltage and current measurements.
- Charge Converter:** For direct input of charge mode accelerometers.
- Sensor Simulator Output (AT2040 only):** Generate artificial transducer signal.
- Computer:** 1 GHz Cortex-A8 processor, 512 MB DDR3 RAM, 20GB of storage memory included, with USB and network connectivity.
- LCD Display Screen:** Color 4.3" LCD 480x272 resolution display with resistive touchscreen.
- USB Output:** Export previous tests to a USB drive in PDF or CSV format.

1 AT2040 only.

AT2035 Physical overview

See Figure 3:

- A. **On / Off Button:** Press and hold for 1 second to power on. Press and hold for 5 seconds to power off.
- B. **Electromagnetic Shaker and Reference Accelerometer:** Mounting location for transducer under test (TUT). Always use the short-handle wrench provided, otherwise twisting force will be applied directly to the electrodynamic shaker.
- C. **Proximity Probe Mounting Locations (2):** Proximity Probe Kit is sold as an add-on accessory.
- D. **Dual USB Ports (2):** Plug in peripheral devices, such as a network adapter or a USB memory drive, for importing and exporting files, connecting to a network, and factory calibration.
- E. **100–240 V Power Plug Receptacle**
- F. **LCD Display Screen:** 4.3" LCD 480×272 resolution display with resistive touchscreen.
- G. **Frequency Knob:** Turn the knob to adjust frequency. During screen navigation, turn the knob to move up and down through the onscreen options and press the knob to select.
- H. **Amplitude Knob:** Turn the knob to adjust amplitude. During screen navigation, press the knob to go back.
- I. **BNC Sensor Input:** Supports sensitivity testing for charge, IEPE, and voltage sensors.

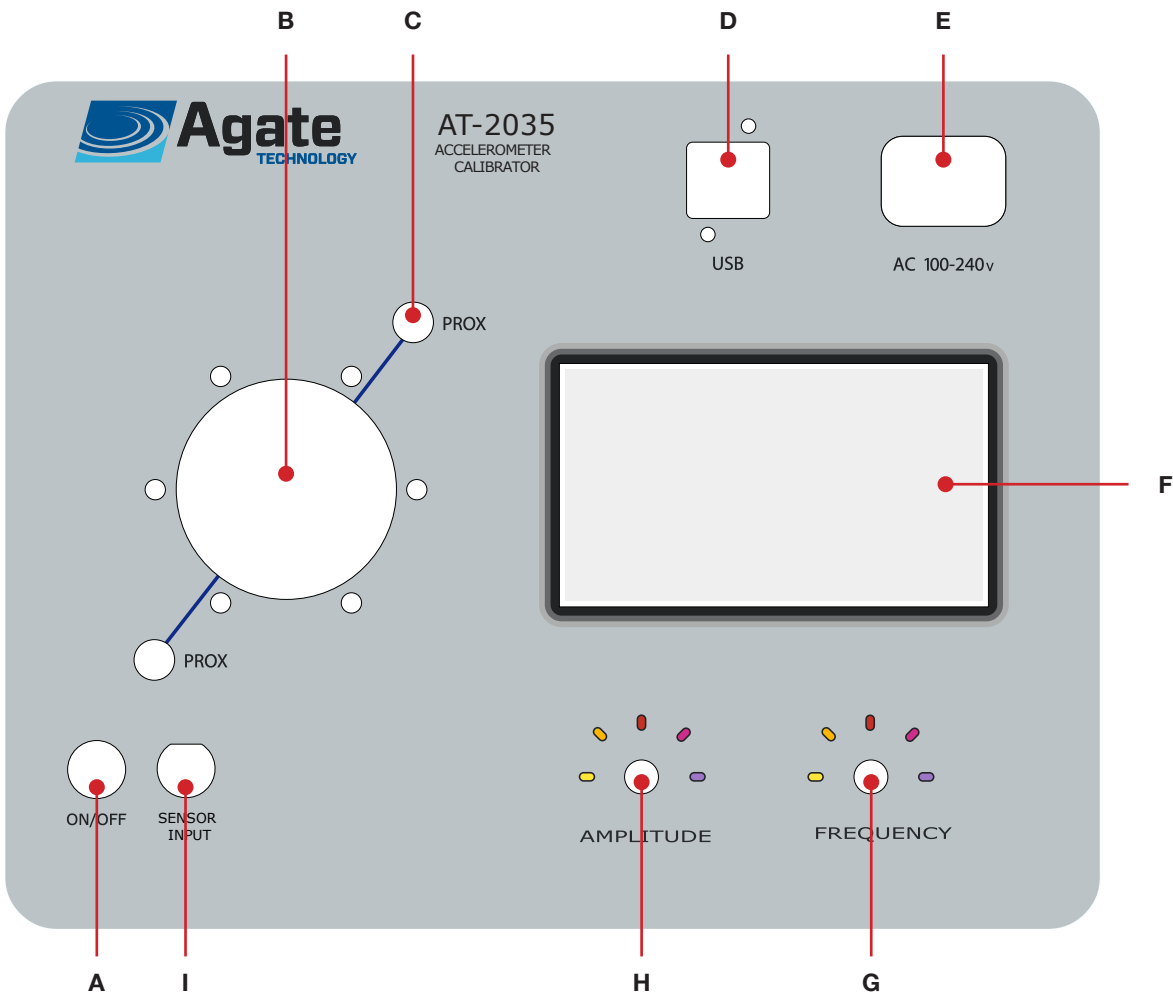


Figure 3. Physical diagram of the AT2035

AT2040 Physical overview

See Figure 4:

- A. **On / Off Button:** Press and hold for 1 second to power on. Press and hold for 5 seconds to power off.
- B. **Electromagnetic Shaker and Reference Accelerometer:** Mounting location for transducer under test (TUT). Always use the short-handle wrench provided, otherwise twisting force will be applied directly to the electrodynamic shaker.
- C. **Proximity Probe Mounting Locations (2):** Proximity Probe Kit is sold as an add-on accessory.
- D. **Dual USB Ports (2):** Plug in peripheral devices, such as a network adapter or a USB memory drive, for importing and exporting files, connecting to a network, and factory calibration.
- E. **100–240 V Power Plug Receptacle**
- F. **LCD Display Screen:** 4.3" LCD 480×272 resolution display with resistive touchscreen.
- G. **Frequency Knob:** Turn the knob to adjust frequency. During screen navigation, turn the knob to move up and down through the onscreen options and press the knob to select.
- H. **Amplitude Knob:** Turn the knob to adjust amplitude. During screen navigation, press the knob to go back.
- I. **BNC Sensor Simulator Output:** Simulates a variety of transducer types using adjustable voltage and supply currents through an on-board signal generator. Data provided by the built-in sensor library includes: charge, IEPE, –24V proximity probe, 4-20mA supply.
- J. **BNC Sensor Input:** Supports sensitivity testing for charge, IEPE, proximity probes, and velocity sensors.
- K. **Custom Sensor In / Out:** See Rear-View Pinout Diagram (Figure 5) on next page.
- L. **Proximity Probe Output Simulator:** Capable of providing a test signal between 0 and –24 volts.
- M. **4-20 mA Sensor Output Simulator:** Capable of providing a test signal between 4 and 20 milliamps.
- N. **4-20 mA Input:** Input for sensitivity test of 4-20ma transducers and vibration transmitters. Also supplies +24 volt power.
- O. **Proximity Probe Driver Input and Power:** Input for radial and axial measurements and built-in –24V power for driver.

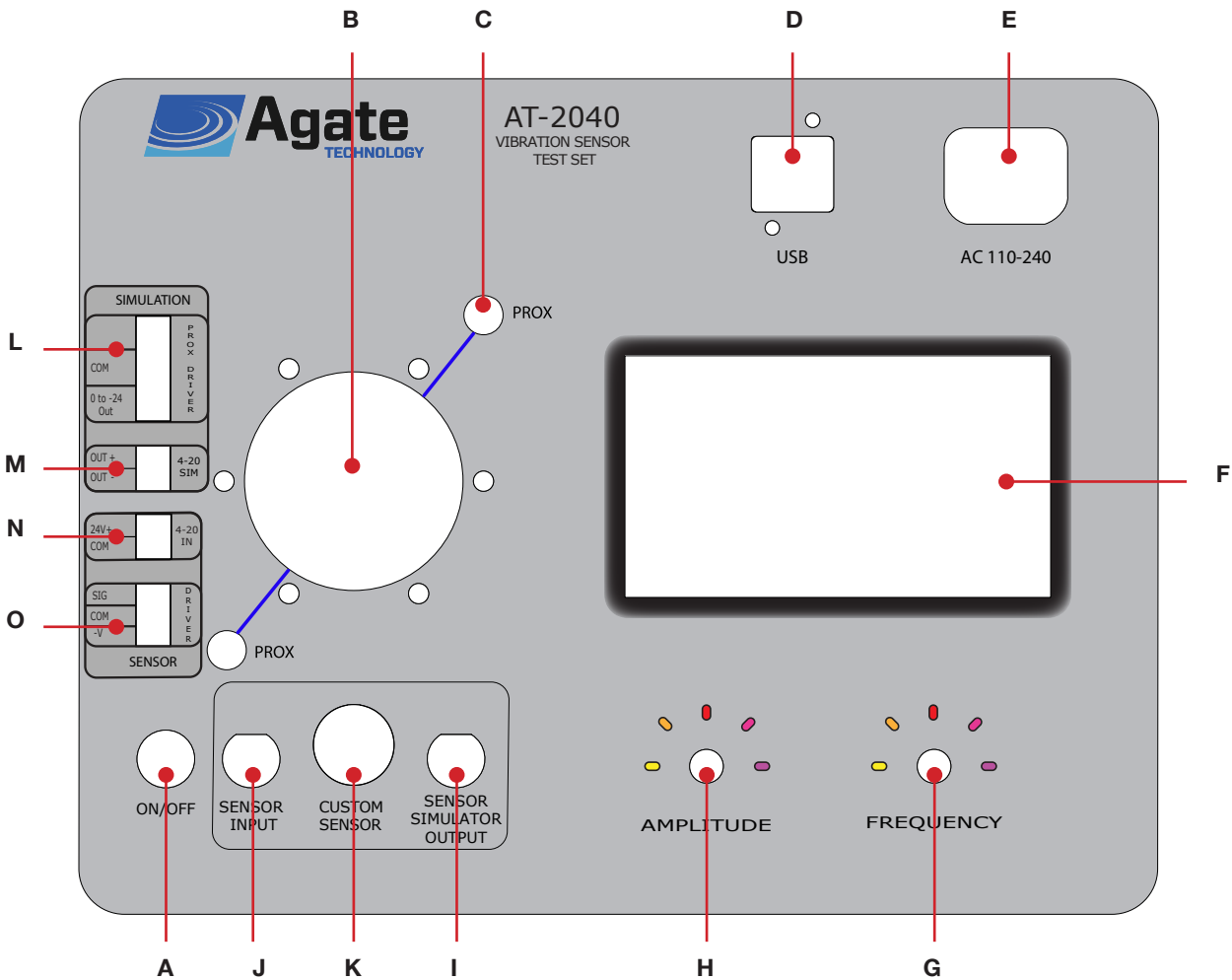
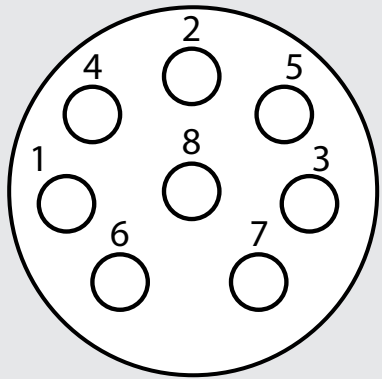


Figure 4. Physical diagram of the AT2040



- |   |                              |
|---|------------------------------|
| 1. <b>Charge</b>  | 5. <b>Channel B:</b> Triax   |
| 2. <b>Ground</b>  | 6. <b>Channel C:</b> Triax   |
| 3. <b>5–10 Volt Output (Adjustable)</b>                                 | 7. <b>Test Signal</b>        |
| 4. <b>Channel A:</b> Input for transducers that provide voltage outputs | 8. <b>Displacement Input</b> |

Figure 5. Rear-view pinout diagram

Accessories

Description	Part No.	Qty
Short-Handle Aluminum Wrench	ACC-100	1
5/32 Hex L-Wrench	ACC-101	1
1/4-28 Stud	MNT-104	1
1/4-28 to 10-32 Stud	MNT-105	1
1/4-28 to 2-56 Adapter	MNT-106	1
1/4-28 to 6-32 Adapter	MNT-107	1
1/4-28 to 10-32 Adapter	MNT-111	1
Universal Velocity Mounting Adapter with 1/4-28 Mounting Hex Screw	MNT-112	1
Universal Accelerometer Mounting Adapter with 1/4-28 Mounting Hex Screw	MNT-113	1
10-32 to BNC Low-Noise Adapter Cable	CAB-101	1
AC Power Cord (120 V or 220–240 V)	PWR-100 or 101	1
USB Memory Drive	N/A	1

Table 1. Standard accessories for all shakers

Description	Part No.	Qty
IEPE Accelerometer 2-Pin Mil to BNC Adapter Cable	CAB-102	1
IEPE Accelerometer 3-Pin Mil to BNC Adapter Cable	CAB-103	1
Chadwick-Helmuth/Honeywell Velocimeter Cable	CAB-107	1
Replacement Studs (3 of each): 1/4-28, 10-32; Adapters: 2-56, 6-32, 10-32	MNT-100	1
1/4-28 Adapter	MNT-108	1
Mounting Stud 1/4-28 to 8-32	MNT-109	1
Adapter 1/4-28M to 3/8-24F	MNT-110	1
Proximity Probe Adapter Kit	PRX-100	1
Proximity Probe Proximity Adapters M6 to 3/8	PRX-101	1
Steel Target (4041)	PRX-102	1

Table 2. Optional accessories for all shakers<sup>2</sup>

Description	Part No.	Qty
3-Position Terminal Block Plug, Female	PL-3-04	1
2-Position Terminal Block Plug, Female	PL-2-05	2
Custom Input DIN Terminal Block Plug, Female	PL-DIN-8M	1

Table 3. AT2040-only accessories

<sup>2</sup> Custom cables or platform mounts can be made to your specifications based on transducer sample or datasheet. Please contact us for more information.

Operation instructions

Powering the shaker on and off:

- Press and hold the red **On/Off button** for 1 second. The shaker will begin its startup sequence.
- Press and hold the red **On/Off button** for 5 seconds to power off. When the screen goes blank, the shaker has powered down.

Main Menu Screen Overview

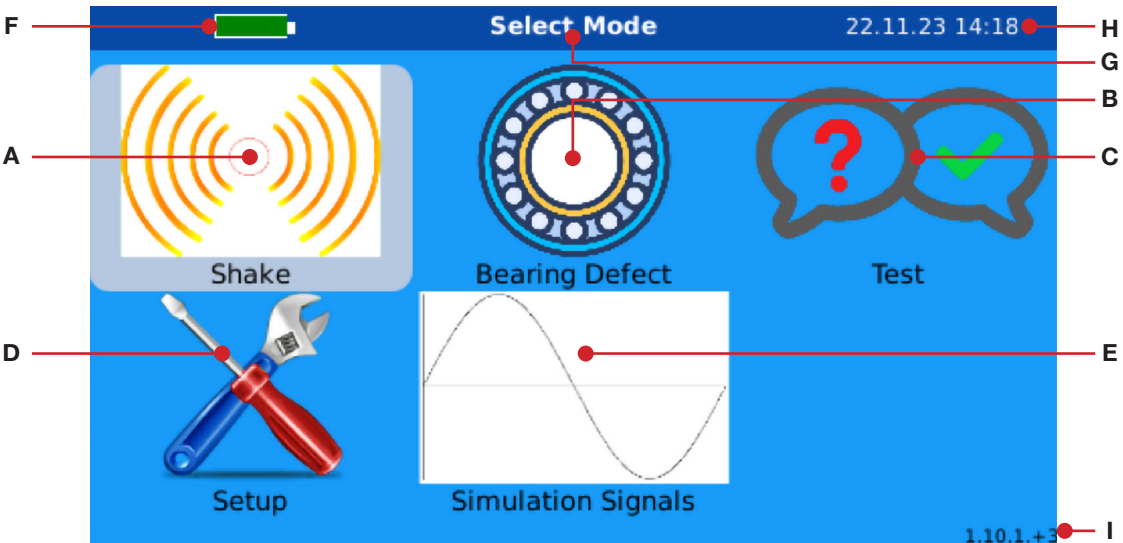


Figure 6. Main menu screen

- A. **Shake Button:** Select to manually test a transducer or equipment using only variable frequency and amplitude.
- B. **Bearing Defect Button (AT2040 only):** Select to simulate a bearing defect.
- C. **Test Button:** Select to test transducer sensitivity, using either manual adjustment or automatic plot.
- D. **Setup Button:** Select to customize the shaker options to your preferences.
- E. **Simulation Signals Button (AT2040 only):** Select to simulate the signal of a transducer.
- F. **Battery Indicator:** Shows remaining battery level. See [Battery Operation](#) on page 7.
- G. **Screen Title:** Indicates action(s) to be performed on the current screen.
- H. **Date / Time:** Shows the current date and time.
- I. **Software Version:** Shows the current software version.

Menu	
Main Menu Screen	Submenu Screens Available
Shake Button	<ul style="list-style-type: none"><li>Run Manual Shake Screen</li></ul>
Bearing Defect Button (AT2040 only)	<ul style="list-style-type: none"><li>Run Bearing Defect Screen</li></ul>
Test Button	<ul style="list-style-type: none"><li>Sensor Type Selection Menu<ul style="list-style-type: none"><li>Manufacturer Selection Menu<ul style="list-style-type: none"><li>Sensor Model Selection Menu<ul style="list-style-type: none"><li>Sensor Profile Screen / Auto or Manual Test Selection<ul style="list-style-type: none"><li>Run Auto Test Screen<ul style="list-style-type: none"><li>Graph View</li><li>Table/List View</li></ul></li><li>Run Manual Test Screen</li></ul></li></ul></li></ul></li></ul></li></ul>
Setup Button	<ul style="list-style-type: none"><li>Previous Test List / Export PDF or CSV to USB Screen</li><li>Location / Time Setup Screen</li><li>Network Configuration Screen</li><li>Import / Export Certification Template Screen</li><li>Unit Configuration Screen</li><li>Unit Information Screen</li></ul>
Simulation Signals Button (AT2040 only)	<ul style="list-style-type: none"><li>Sensor Type Selection Menu<ul style="list-style-type: none"><li>Manufacturer Selection Menu<ul style="list-style-type: none"><li>Sensor Model Selection Menu<ul style="list-style-type: none"><li>Run Simulation Screen</li></ul></li></ul></li></ul></li></ul>

Table 4. Menu and submenus

Navigating the Menu

The shaker interface may be navigated using the touchscreen, the two knobs on the front panel, or a combination of these two methods.

Using the Frequency and Amplitude Knobs

In addition to adjusting the frequency (right knob) and the amplitude (left knob), the two knobs can be used to navigate the onscreen menu:

- Turn the frequency knob to move up or down through the onscreen options.
- Press the frequency knob to choose the currently selected (highlighted) submenu, button, text field, check box, list option, or adjustable display window.
- Press the amplitude knob to go back to the previous screen.

Using the Touchscreen

Tap a submenu, button, text field, check box, list option, or adjustable display on the touchscreen to select it.








Using the Adjustable Displays

Tap the adjustable display on the touchscreen, for example the amplitude display, to bring up the number pad and type in the desired test point.

Editing a Text Field

- Tap the white editable text field you wish to edit, or use the frequency knob to select it.
- Use the keyboard that opens to enter the desired text.

Using the Keyboard and Number Pad

- Tap the  key on the keyboard or the  key on the number pad to clear one character, or tap the  key on the number pad to reset the current entry.
- Tap the  key on the keyboard or the  key on the number pad to save the entry and close the keyboard or number pad.
- Tap the  key on the keyboard or the  key on the number pad to cancel.

Using Toggle Buttons

Toggle buttons have labels which change depending on their state, for example, the "Start/Stop" button. Before a test begins, the button label reads "Start", during a test, the label reads "Stop".

Shake Mode

Shake mode is used to manually test a transducer or equipment using only variable frequency and amplitude control. Shake mode can be used to set up a new system, verify an existing system, or troubleshoot an alarm.

In this mode, the frequency and amplitude are set manually by the operator, while the computer provides high-accuracy measurement signals.

- 1. From the main menu, select **Shake** to open the shake mode screen (Figure 7).

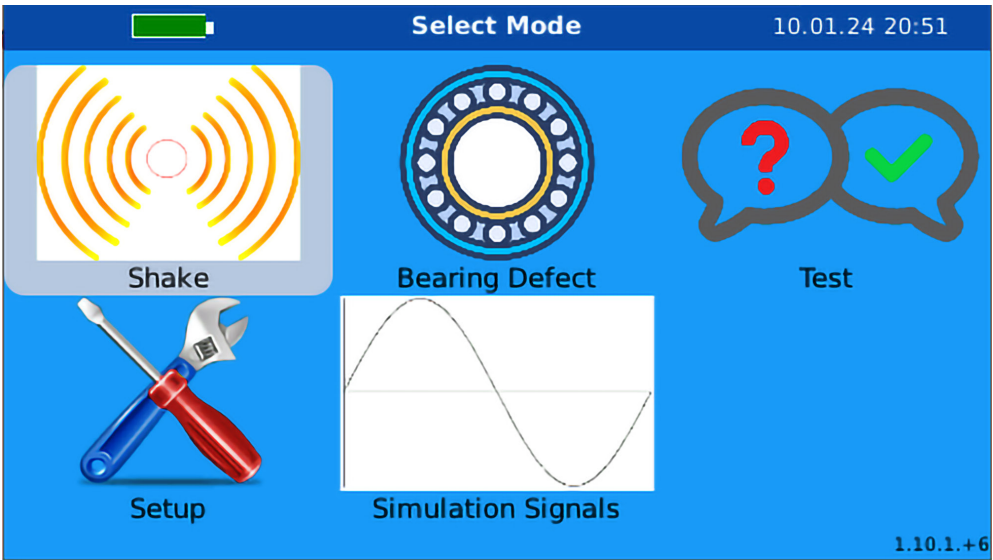


Figure 7. Choose "Shake" from the main menu

- 2. Select your sensor and mount it to the 1/4-28 drill hole in the reference accelerometer.
  - a. Hold the reference accelerometer with the provided short-handle wrench and screw in the sensor at the same time.
  - b. When necessary, use the correct sensor adapter for your size.

Shake Mode Screen Overview

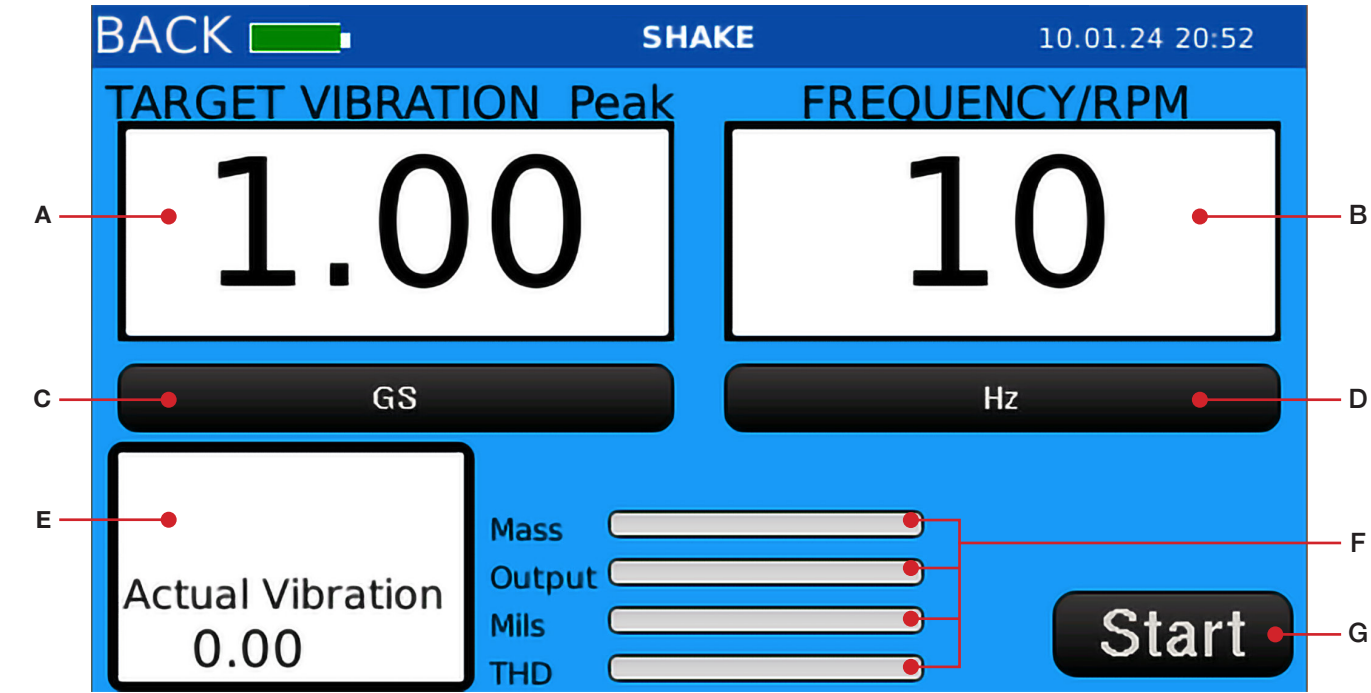


Figure 8. Shake mode screen

- A. **Amplitude Display:** Turn the amplitude knob to adjust, or tap the touchscreen display to bring up the number pad and type in the desired amplitude test point.
- B. **Frequency / RPM Display:** Turn the frequency knob to adjust, or tap the touchscreen display to bring up the number pad and type in the desired frequency or RPM test point.
- C. **Units Button:** Tap the onscreen button to toggle through the units available for the amplitude display: gs, IPS, UM, MM, MILS, MMS, and MSS.
- D. **Hz / RPM Button:** Tap the onscreen button to toggle between the available units for the frequency/RPM display: Hz and RPM.
- E. **RMS / Reference Display:** Displays the RMS value and the reference output (the actual amplitude at which the calibrator is shaking).
- F. **Shaker Output Information:**
  - **Mass:** Automatic mass payload calculation. The shaker uses this value to automatically calculate mass loading correction.
  - **Out:** Percentage of amplifier output capability.
  - **Mils:** Displacement of the electromagnetic shaker in mils.
  - **THD:** Total harmonic distortion.
- G. **Start / Stop Button:** Tap the onscreen button or use the frequency knob to select the button to start or stop the test.

Conducting a Test in Shake Mode

- To begin the test (Figure 8):
  - Turn the frequency knob until the **Start button** is highlighted, then press down on the knob to select the button and begin the test, **OR**
  - Tap the **Start button** on the touchscreen to begin the test.

During the test the amplitude and frequency may be adjusted (Figure 8).

- To adjust the amplitude:
  - Turn the amplitude knob, **OR**
  - Tap the amplitude display on the touchscreen to bring up the number pad and input the desired amplitude.
- To adjust the frequency:
  - Turn the frequency knob, **OR**
  - Tap the frequency/RPM display on the touchscreen to bring up the number pad and input the desired frequency or RPM.

During the test, the values shown in the onscreen amplitude display and frequency/RPM display may be adjusted (Figure 8):

- Tap the **Units button** to toggle though the available units for the amplitude display: gs, IPS, UM, MM, MILS, MMS, and MSS.
- Tap the **Hz/RPM button** to toggle between the available units for the frequency/RPM display: Hz and RPM.
- Tap the **Stop button**, or use the frequency knob to select it to conclude the test.
- At completion of the test, the test data is automatically saved in the on-board memory and can be recalled and exported to the USB drive at a later time.

Purewave™ Overview

Purewave is the distortion compensation algorithm. The status of Purewave is indicated by the color of the Reference data point (Figure 8):

- Orange** = Not ready.
- Blue** = Adjusting.
- Green** = Complete.

Bearing Defect Mode

This mode shakes the unit in a waveform to simulate a bearing defect. Bearing defect mode is available in both simulation and shaker modes. This mode is used for testing impulse or impact signals on transducers or data acquisition systems. The shaker will output a pulse, followed by ringing. These pulses are adjustable in amplitude, frequency, and distance between pulses. The operator may also adjust the failure type and number of balls.

- From the main menu, select **Bearing Defect** to open the bearing defect mode screen (Figure 9).

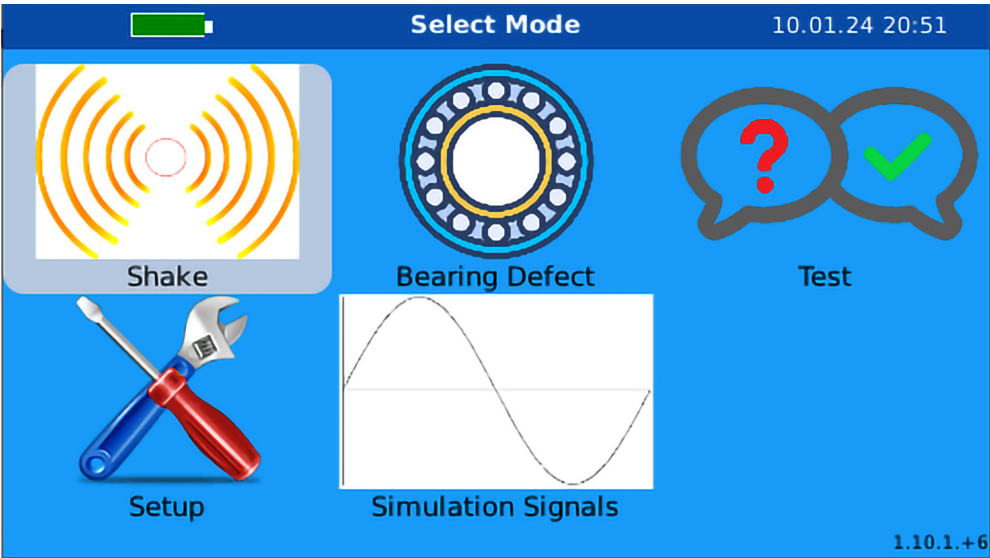


Figure 9. Choose "Bearing Defect" from the main menu

- Select your sensor and mount it to the ¼-28 drill hole in the reference accelerometer.
  - Hold the reference accelerometer with the provided short-handle wrench and screw in the sensor at the same time.
  - When necessary, use the correct sensor adapter for your size.

Bearing Defect Mode Screen Overview

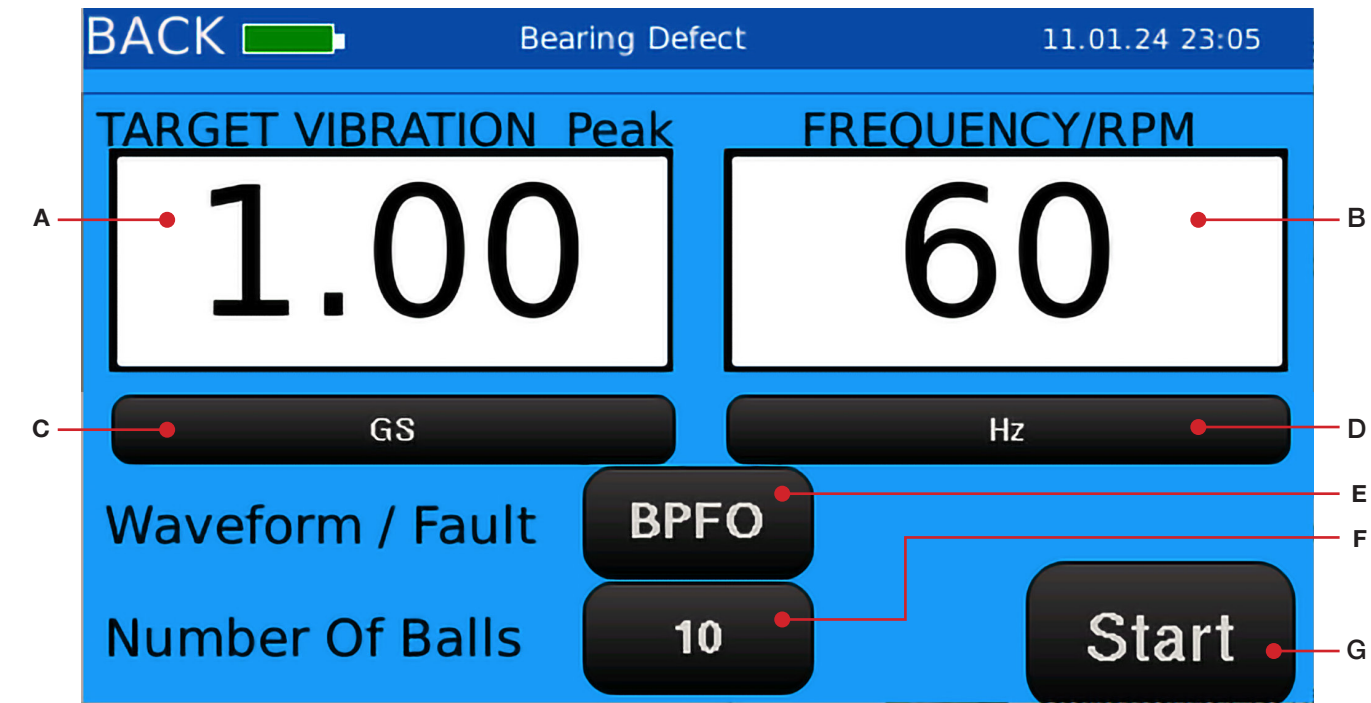


Figure 10. Bearing Defect Mode screen

- A. **Amplitude Display:** Turn the amplitude knob to adjust, or tap the touchscreen display to bring up the number pad and type in the desired amplitude test point.
- B. **Frequency / RPM Display:** Turn the frequency knob to adjust, or tap the touchscreen display to bring up the number pad and type in the desired frequency or RPM test point.
- C. **Units Button:** Tap the onscreen button to toggle through the units available for the amplitude display: gs, IPS, UM, MM, MILS, MMS, and MSS.
- D. **Hz / RPM Button:** Tap the onscreen button to toggle between the available units for the frequency/RPM display: Hz and RPM.
- E. **Waveform / Fault Button:** Tap the button to toggle through the failure type options:
  - **BPFO:** Ball Pass Frequency Outer
  - **BPFI:** Ball Pass Frequency Inner.
  - **FTF:** Fundamental Train Frequency.
- F. **# of Balls Button:** Tap the button to bring up the keyboard and enter the number of balls in the bearing.
- G. **Start / Stop Button:** Tap the onscreen button or use the frequency knob to select the button to start or stop the test.

Conducting a Test in Bearing Defect Mode

Before beginning the test, the failure type, number of balls, amplitude, and frequency may be adjusted (*Figure 10*).

1. To adjust the amplitude:
  - a. Turn the amplitude knob, **OR**
  - b. Tap the amplitude display on the touchscreen to bring up the number pad and input the desired amplitude.
2. To adjust the frequency:
  - a. Turn the frequency knob, **OR**
  - b. Tap the frequency/RPM display on the touchscreen to bring up the number pad and input the desired frequency or RPM.
3. Tap the **Waveform / Fault button** to toggle through the failure types: BPFO, BPFI, or FTF.
4. Tap the **# of Balls button** to bring up the keyboard and enter the number of balls in the bearing.

To begin the test (*Figure 10*):

1. Turn the frequency knob until the **Start button** is highlighted, then press down on the knob to select the button and begin the test, **OR**
2. Tap the **Start button** on the touchscreen to begin the test.

During the test, the values shown in the onscreen amplitude display and frequency/RPM display may be adjusted (*Figure 10*):

- Tap the **Hz/RPM button** to toggle between the available units for the frequency/RPM display: Hz and RPM.
- Tap the **Stop button**, or use the frequency knob to select it to conclude the test.
- At completion of the test, the test data is automatically saved in the on-board memory and can be recalled and exported to the USB drive at a later time.

Any changes made to the failure type, number of balls, frequency, and amplitude will all change the waveform. See the example time spectrum waveform (*Figure 11*). The example uses the following settings: 2g, 1200 RPM, with a ball pass frequency outer (BPFO) failure type, and 30 balls in the bearing. Please note that the output/results will vary depending on your screen brand.

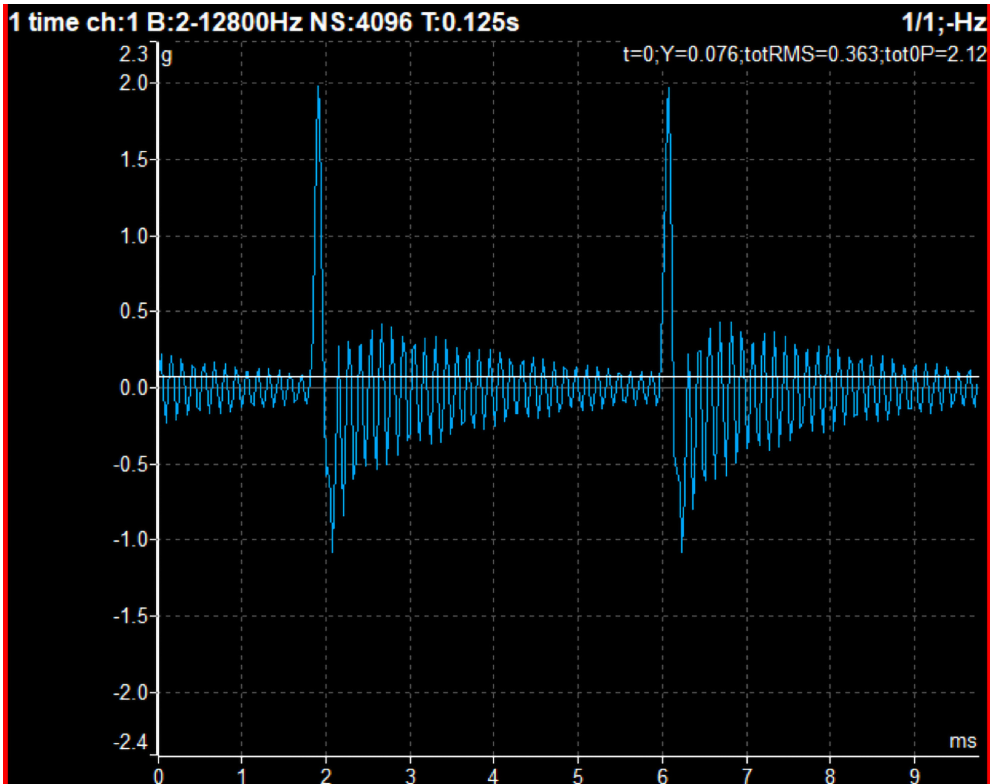


Figure 11. Example time spectrum waveform

Changing the Signal Polarity

The signal polarity of the waveform may be changed in the Setup menu.

- 1. On the Setup menu screen, select Unit Configuration.
- 2. Select the **Defect Polarity button** to toggle between + (positive) and – (negative) (Figure 12).

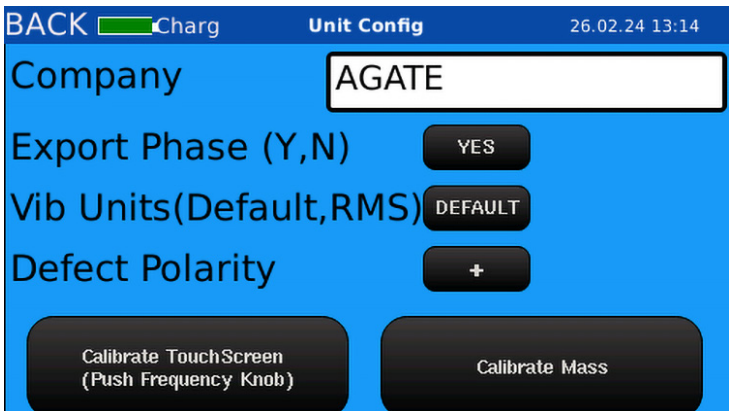


Figure 12. Unit configuration screen

Test Mode

Test mode is used to calculate transducer sensitivity by comparing known accurate signals sent by the internal signal generator board and the signals received by the transducer under test. A sensitivity test can be performed either manually or automatically to a high level of accuracy.

To begin a sensitivity test:

- 1. Select **Test** from the main menu (Figure 13).
- 2. Select the type of transducer you want to test by turning the frequency (right) knob and pressing it to select **OR** by tapping the transducer type on the touchscreen (Figure 14).

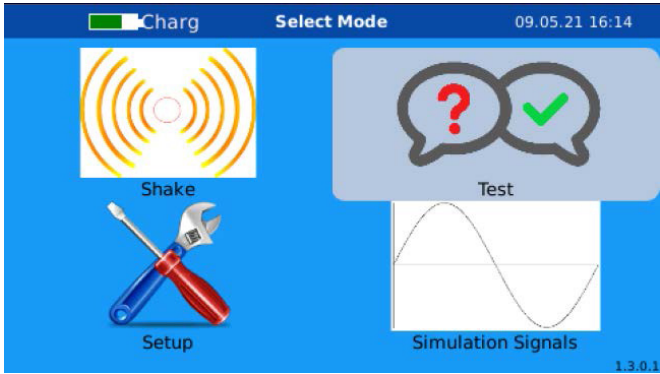


Figure 13. Select "Test"

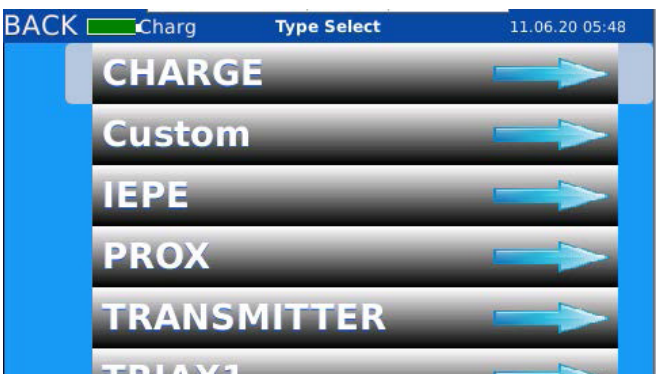


Figure 14. Select sensor type

The shaker uses internal-switching relays to change between channels. All sensor support systems are built into the unit, including a charge amplifier. Sensitivity inputs for the following sensor types are supported:

Supported Sensor Inputs	
Both Shakers	IEPE, Charge, Voltage
AT2040 Only	4-20 mA and Proximity Probe, Triaxial Accelerometer, Channel 1,2,3. <sup>3</sup>

- 3. Select the manufacturer (Figure 15).
- 4. Select the model and sensitivity (Figure 16).



Figure 15. Select manufacturer

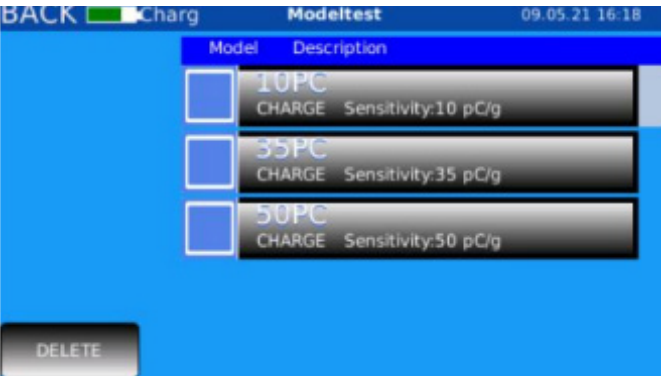


Figure 16. Select model

<sup>3</sup> AT2035 has a single input and requires a break-out adapter.

5. When the model and sensitivity are selected, detailed information about the sensor, called the sensor profile screen, is loaded from the on-board library (Figure 17).

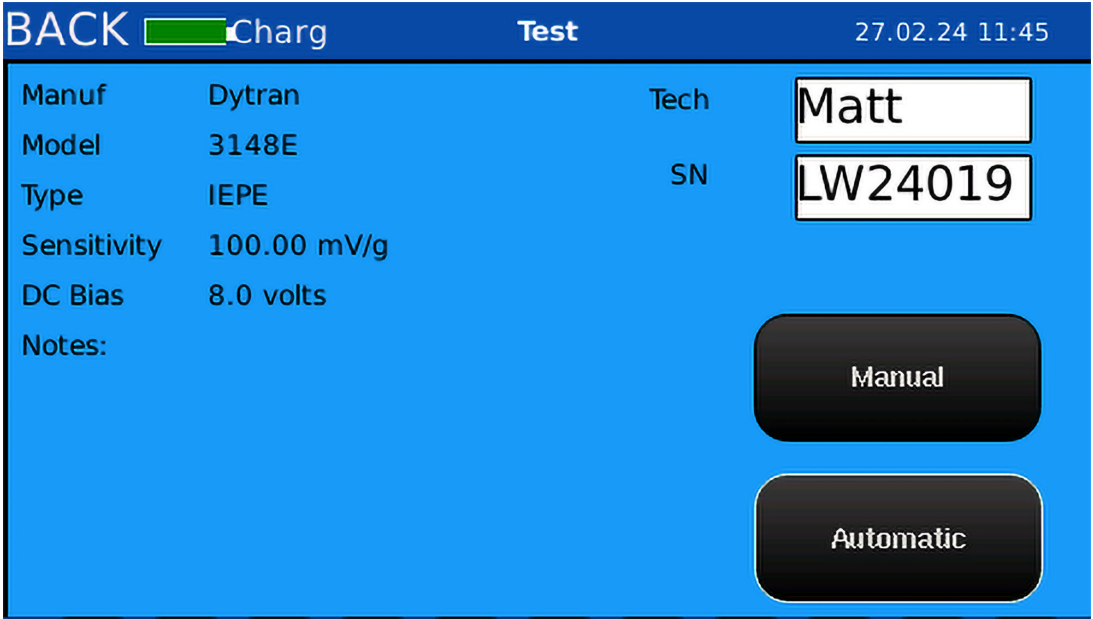


Figure 17. Sensor profile screen

6. Select the white **Tech field** if you wish to change the technician's name. This will bring up the keyboard so you can type in the new technician name (Figure 18).
7. Select the white **SN field** if you wish to change the sensor serial number (Figure 19).

**NOTE:** The tech name and sensor serial number fields are automatically populated into the PDF calibration certificate.



Figure 18. Technician Name



Figure 19. Sensor serial number

8. Tap the **Manual button** or **Automatic button** on the sensor profile screen to select either manual or automatic testing mode (Figure 17). See [Testing in Manual Mode](#) on page 29 and [Testing in Automatic Mode](#) on page 30 for additional instructions.

Testing in Manual Mode

1. Select the **Manual button** on the sensor profile screen.
2. Manually select the amplitude and frequency to perform a sensitivity check (Figure 20):
  - a. Use the left knob to adjust the amplitude or the right knob to adjust the frequency.
  - b. Alternately, tap the amplitude or frequency/RPM display to bring up the number pad where you may type in the desired frequency or amplitude test point.
3. At completion of the test, the test data is automatically saved in the on-board memory and can be recalled and exported to the USB drive at a later time.

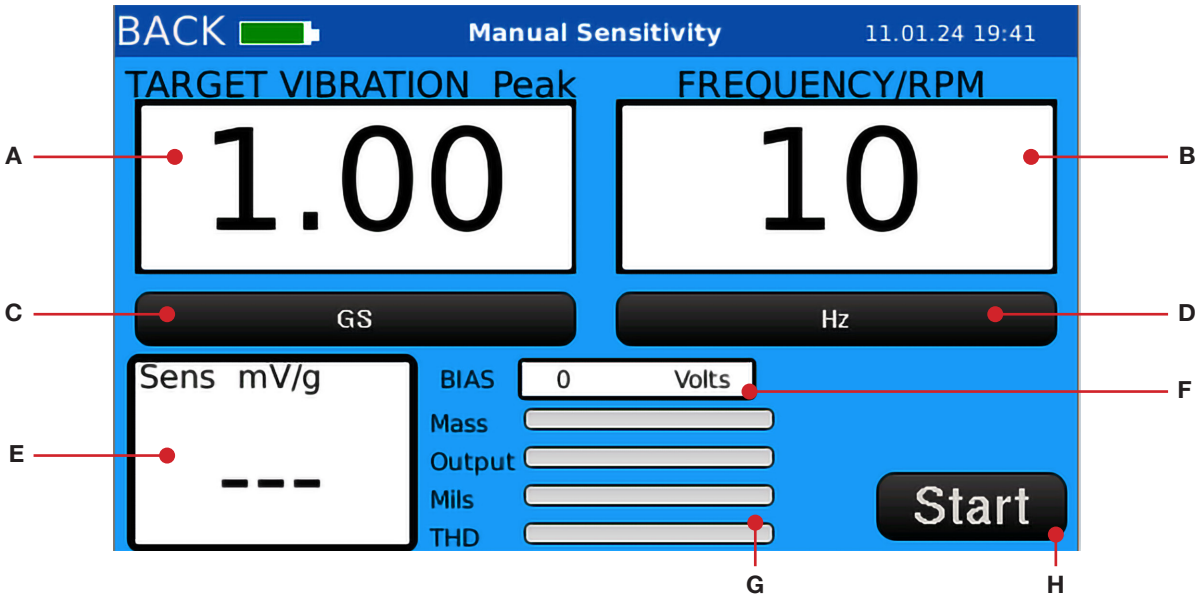


Figure 20. Manual testing screen

- A. **Amplitude Display:** Turn the amplitude knob or tap the display to adjust it.
- B. **Frequency / RPM Display:** Turn the frequency knob or tap the display to adjust it.
- C. **Units Button:** Indicates unit of measurement of the value shown in the amplitude display.
- D. **Hz / RPM Button:** Indicates whether value shown in frequency/RPM display is Hz or RPM.
- E. **Sensitivity Display:** Displays sensitivity in mV/g, pC/g, mV/mils, or IPS/FS.
- F. **Bias / Gap V Display:** Bias or gap voltage of transducer under test.
- G. **Shaker Output Information:**
  - **Mass:** Automatic mass payload calculation. The shaker uses this value to automatically calculate mass loading correction.
  - **Out:** Percentage of amplifier output capability.
  - **Mils:** Displacement of the electromagnetic shaker in mils.
  - **THD:** Total harmonic distortion.
- H. **Start / Stop Button:** Select the button to start or stop the test.

Testing in Automatic Mode

- 1. Select the **Automatic** button on the sensor profile screen. The sensor will automatically perform a sweep of all pre-defined points loaded in the library.
- 2. At completion of the test, the test data is automatically saved in the on-board memory and can be recalled and exported to the USB drive at a later time.

Reviewing Automatic Test Data: Graph View or List View

During an automatic test, the test status bar at the top and the graph (Figure 21) or table (Figure 22) show progress information.

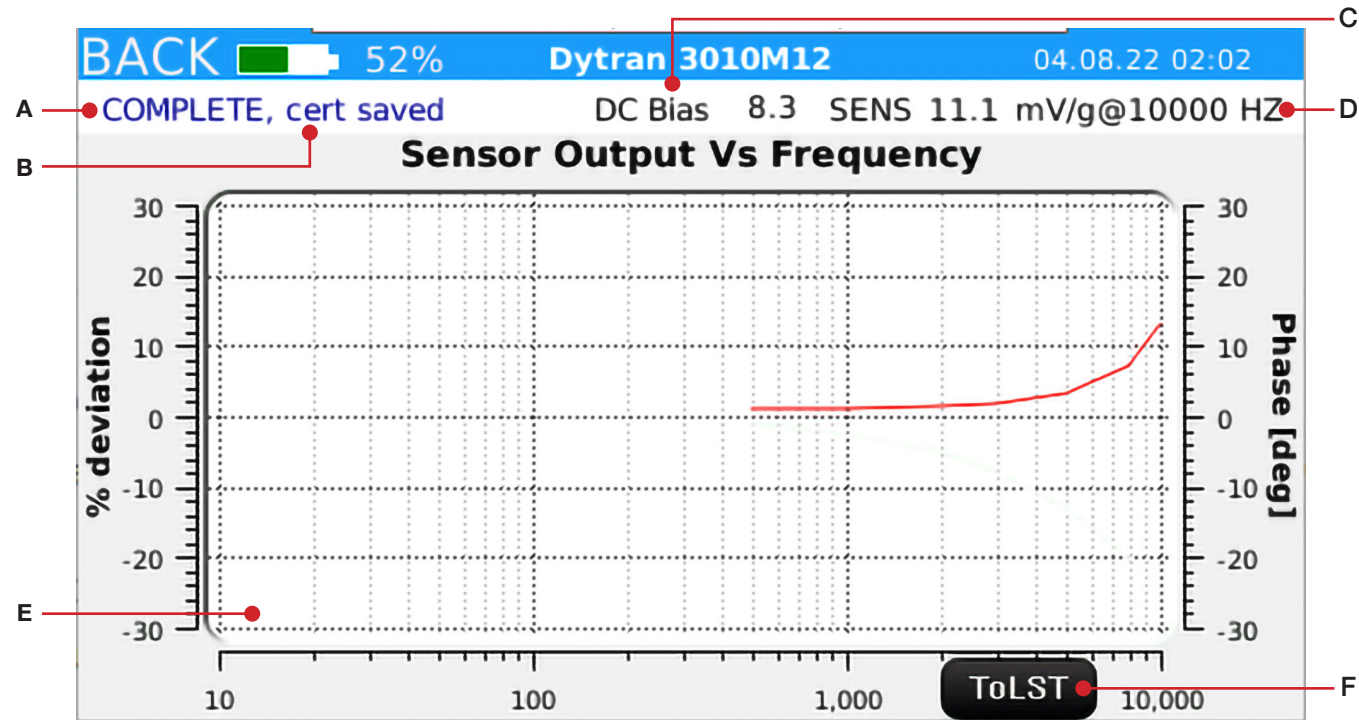


Figure 21. Automatic testing screen – graph view

- A. **Test Status:** Provides information about the test as the calibrator automatically sweeps through pre-defined points.
- B. **Current Measurement:** Shown in frequency and amplitude. Status is indicated by color:
  - Red = Changing frequency and/or amplitude.
  - Blue = Taking measurement.
  - Green = Writing data.
- C. **Bias / Gap V:** Bias or gap voltage of sensor under test.
- D. **REF:** Reference measurement taken at the start of the test.
- E. **Graph:** Shows deviation relative to the reference sensitivity.
- F. **ToLST Button:** Select the button to switch to table view in real time (Figure 22).

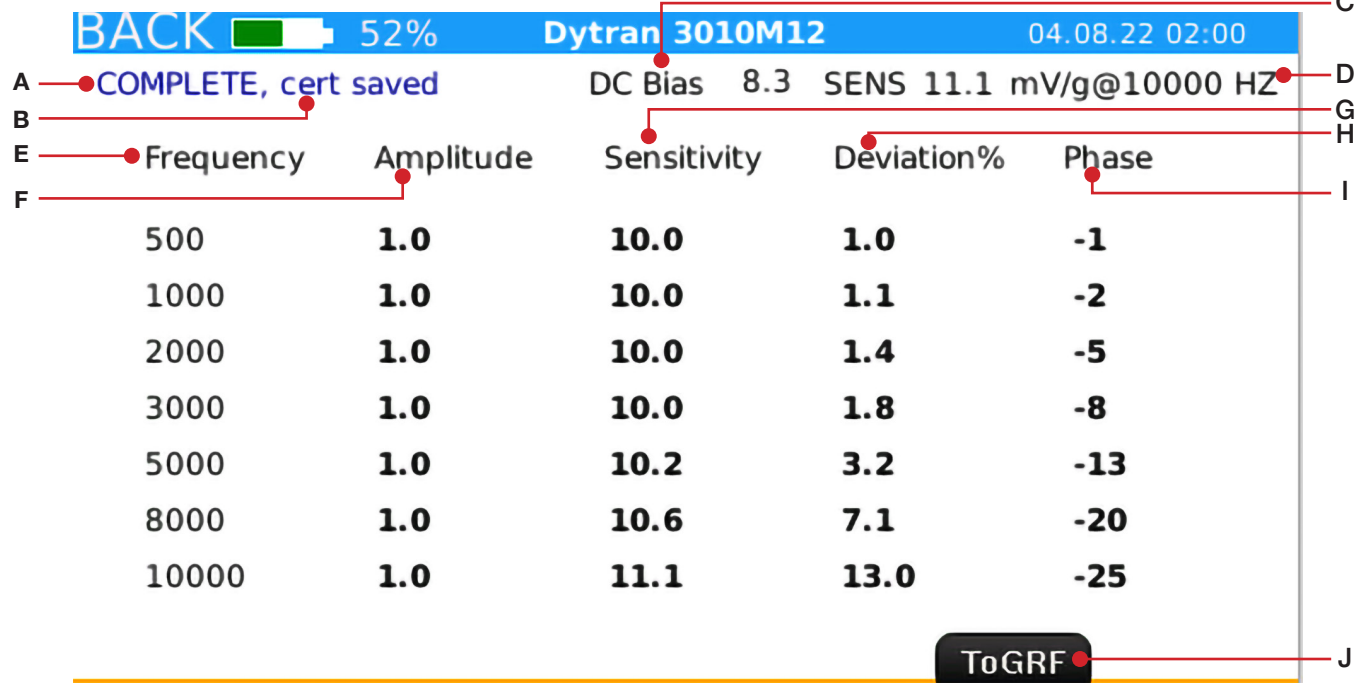


Figure 22. Automatic testing screen – table view

- A. **Test Status:** Provides information about the test as the calibrator automatically sweeps through pre-defined points.
- 2. **Current Measurement:** Shown in frequency and amplitude. Status is indicated by color:
  - Red = Changing frequency and/or amplitude.
  - Blue = Taking measurement.
  - Green = Writing data.
- 3. **Bias / Gap V:** Bias or gap voltage of sensor under test.
- 4. **REF:** Reference measurement taken at the start of the test.
- 5. **Frequency Column:** Test point frequencies.
- 6. **Amplitude Column:** Test point amplitudes.
- 7. **Sensitivity Column:** Test point sensitivities.
- 8. **Deviation Column:** Deviation in percentage relative to the to reference frequency.
- 9. **Phase Column:** Shows polarity and signal delay.
- 10. **ToGRF Button:** Select the button to switch to graph view in real time (Figure 21).

Calibrating IEPE Accelerometers

- 1. Mount the sensor and connect it to the BNC Sensor Input connector.
- 2. In the Test menu, select **IEPE** from the sensor type list (Figure 23).
- 3. Select the manufacturer (Figure 24).
- 4. Select the model and sensitivity (Figure 25).
- 5. Select the **Manual** button or **Automatic** button on the sensor profile screen (Figure 26).



Figure 23. Select sensor type



Figure 24. Select manufacturer

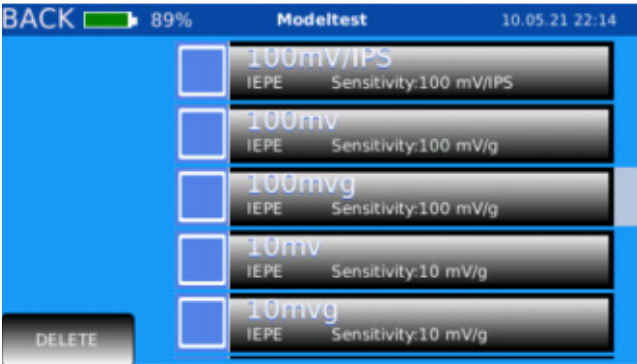


Figure 25. Select model

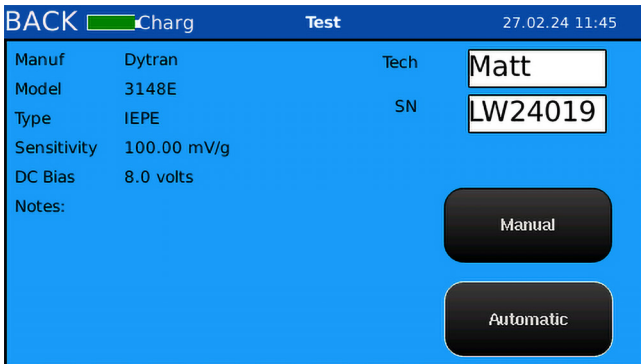


Figure 26. Sensor profile screen

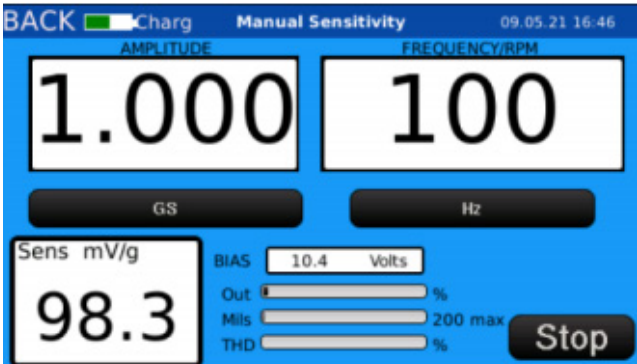


Figure 27. Testing an IEPE sensor in manual mode

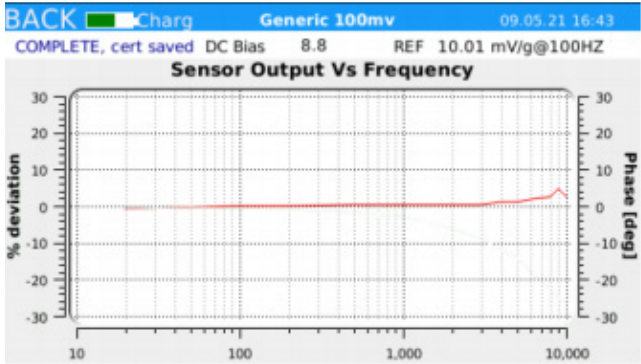


Figure 28. Testing an IEPE sensor in auto mode

Calibrating Charge Accelerometers

- 1. Mount the sensor and connect it to the BNC Sensor Input connector.
- 2. In the Test menu, select **Charge** from the sensor type list (Figure 29).
- 3. Select the manufacturer (Figure 30).
- 4. Select the model and sensitivity (Figure 31).
- 5. Select the **Manual** button or **Automatic** button on the sensor profile screen (Figure 32).

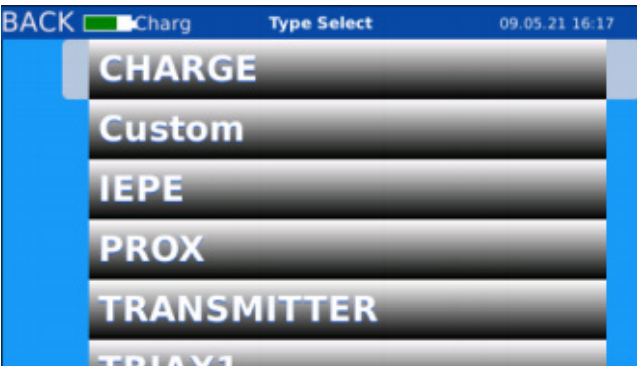


Figure 29. Select sensor type



Figure 30. Select manufacturer

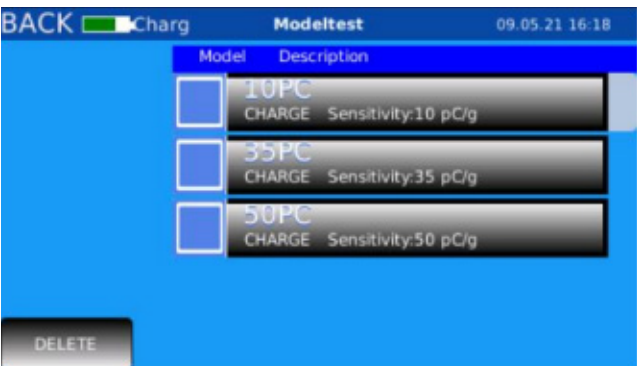


Figure 31. Select model

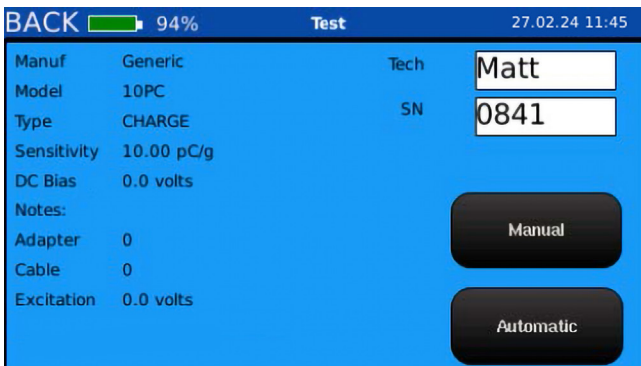


Figure 32. Sensor profile screen

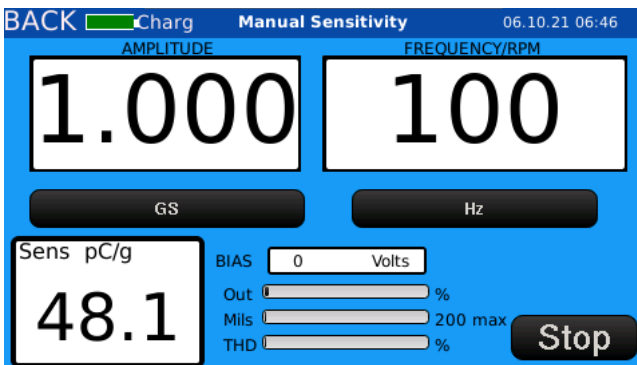


Figure 33. Testing charge sensor in manual mode

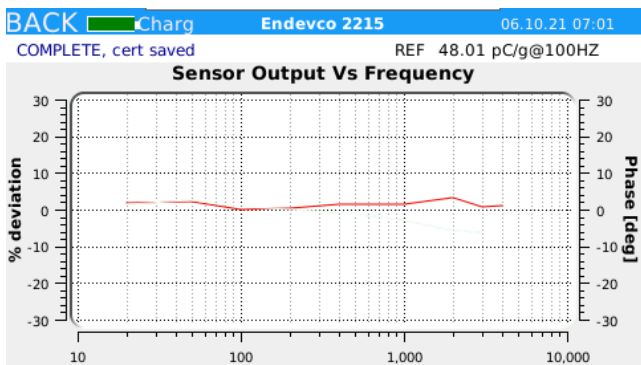


Figure 34. Testing charge sensor in auto mode

Calibrating 4-20mA Transmitters (AT2040 Only)

- 1. Mount the sensor (Figure 35).



Figure 35. Sensor mounted to the AT2040

- 2. Connect the sensor to the **4-20 Input** (the connector labeled "2" in Figure 36):
  - a. Connect +24 volts to "24V+".
  - b. Connect Common to "Com".

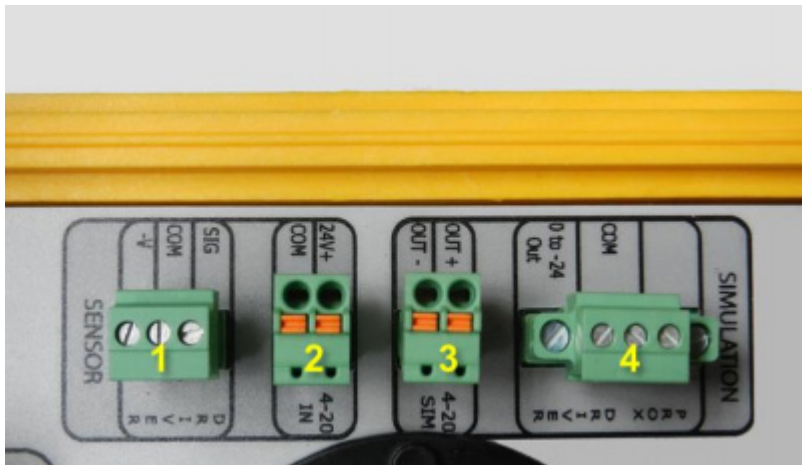


Figure 36. Connect the sensor to connector "2"

- 3. Choose **Test** from the main menu.

- 4. Select **Transmitter** as the sensor type and select the manufacturer (Figure 37 and Figure 38).

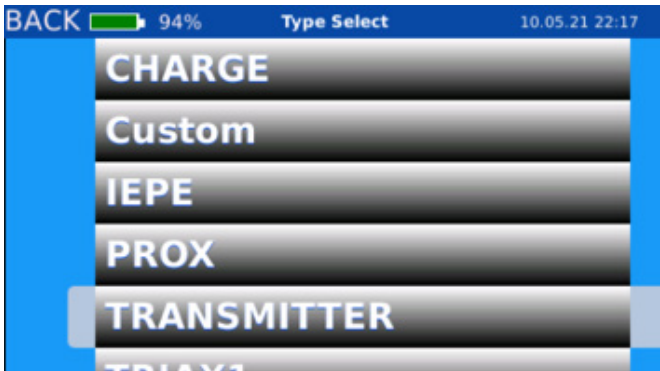


Figure 37. Select sensor type

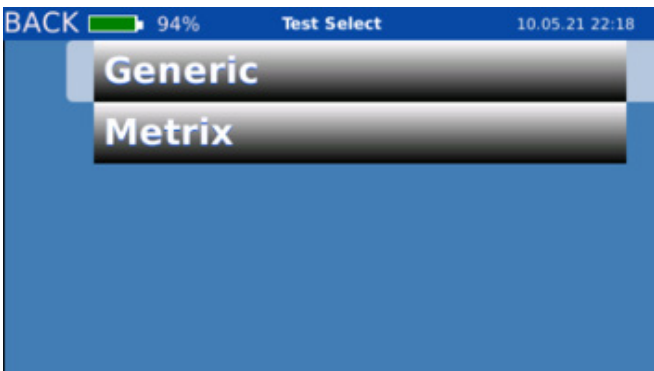


Figure 38. Select manufacturer

- 5. Select the transmitter model and sensitivity (Figure 39).

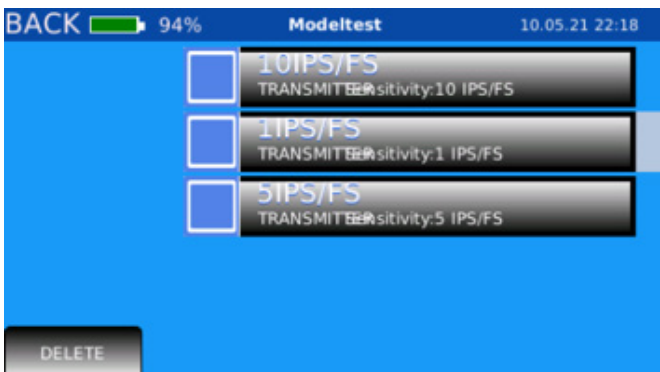


Figure 39. Select model

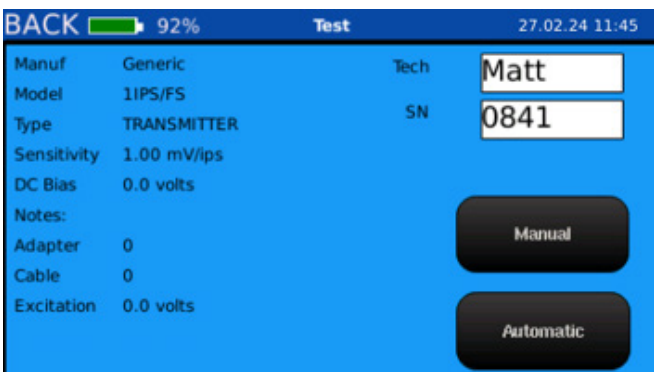


Figure 40. Sensor profile screen

- 6. Select the **Manual button** or **Automatic button** on the sensor profile screen (Figure 40).

AT2040 will provide +24 volts to power the sensor and read back current from the transmitter.

**NOTE:** When connected with no vibration, the transmitter will display 4 mA. If the transmitter is connected and the current reads 0 mA of current, the sensor is faulty or not connected.

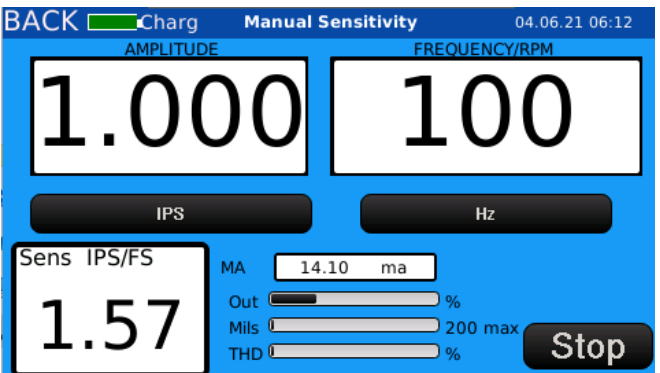


Figure 41. Testing a transmitter in manual mode

Calibrating Triaxial Sensors

Calibrating triaxial sensors is done in the same way as a uniaxial sensor, but the measurements are taken three times on three different axes.

**Recommended method:** Plug the sensor into the 8-pin DIN connector to change between axes using the calibrator's electronics and internal relays. Using this method, the operator only needs to change the positioning of the sensor and not the cable.

**Alternate method:** If the operator would prefer to use BNC breakouts instead of the internal electronics, the shaker supports that as well.

**NOTE:** AT2035 can calibrate triaxial sensors using BNC breakouts.

To calibrate a triaxial accelerometer:

- 1. Mount and connect the accelerometer (*Figure 42*).
- 2. Choose **Test** from the main menu.
- 3. Choose the appropriate channel.
- 4. Select the sensor model and sensitivity.
- 5. Take the first set of readings for the X-axis.
- 6. Rotate the sensor 90-degrees (*Figure 42*) and select the next triaxial channel in the menu screen.

**NOTE:** If using BNC breakouts, the operator must stay on Triax Channel A and change the connector manually instead.

- 4. Take second set of readings
- 5. Repeat step 3.
- 6. Take third set of readings.



Figure 42. Sensor positioning and connection method

Calibrating Proximity Probes  
(AT2040 and Limited Support for AT2035)

Proximity Probe Kit Contents



Figure 43. Proximity probe kit installed on AT2040

Proximity Probe Adapter Kit Contents - Part No. PRX-100			
Description		Quantity	Part No.
Steel Target (AISI 4140)		1	PRX-102
Proximity Probe Adapter Arm	3/8" Clamp	1	PRX-103
	1/4" Clamp	1	PRX-104
	6mm Clamp	1	PRX-105
	8mm Clamp	1	PRX-106
	10mm Clamp	1	PRX-107
Mounting Leg	1.5"	2	PRX-108
	2.0"	2	
	3.0"	2	
Proximity Probe Mounting Bar		1	PRX-109
Micrometer with Non-Rotating Spindle		1	PRX-110
Stainless-Steel Thumbscrew		2	PRX-111
Panel Adapter		2	PRX-112

Table 5. Proximity probe adapter kit contents

Installing the Proximity Probe Kit

To assemble and install the proximity probe kit (Figure 44):

1. Install the AISI-4140 steel target (A) by screwing it into the reference accelerometer.
2. Install the two panel adapters (B) into the screw locations labeled "PROX" on the front panel.
3. Insert the micrometer (C) through the large central hole in the proximity probe mounting bar (D).
4. Loosely tighten the set screw (E) on the rear of the mounting bar to hold the micrometer in place.
5. Find the correct size proximity probe adapter arm (F) and attach it to the end of the micrometer.
6. Loosely tighten the 8-32 set screw (G) on the rear of the adapter arm to secure it to the micrometer.
7. Insert the proximity probe (H) through the mounting bar (D) and into the adapter arm (F).
8. Tighten the clamp around the proximity probe using the 8-32 socket head screw (I) in the adapter arm.
9. Extend the micrometer about halfway and select the correct-size mounting legs (J) based on the distance from the proximity probe tip to the target:
  - a. Measure the probe or check the probe datasheet for sizing.
  - b. Once assembled, the probe must be able to contact the target and move 100 mils away from the target.
10. Screw the mounting legs (J) into the panel adapters (B).
11. Align the proximity probe assembly with the top of the mounting legs.
12. Screw the two stainless-steel thumbscrews (K) through the top of the mounting bar and into the mounting legs.

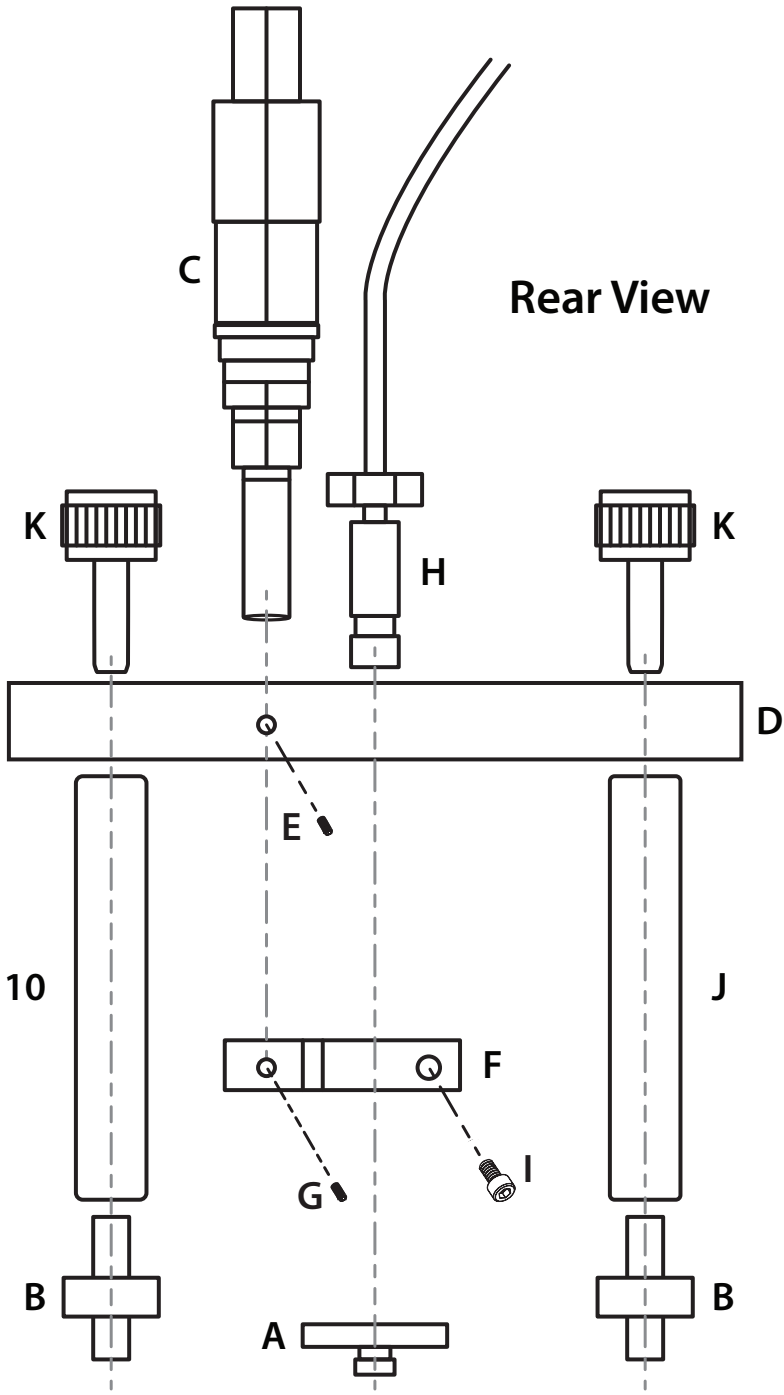


Figure 44. Rear view of the proximity probe kit installation

Connecting the Proximity Probe Driver (AT2040 Only)

1. Connect the driver to the **Proximity Probe Driver Input** (labeled "1" in *Figure 45*), see also *Figure 46*:
  - a. Connect Signal to "Sig".
  - b. Connect Common to "Com".
  - c. Connect -24 volts to "-V".

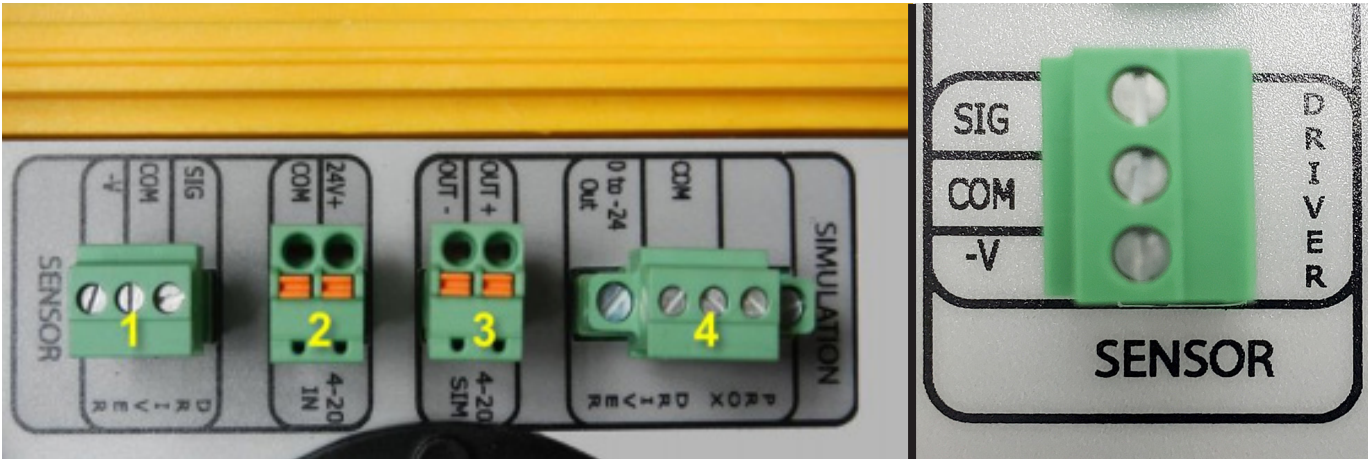


Figure 45. Proximity probe driver input

**NOTE:** The driver receives power from the shaker.

**NOTE:** The shaker reads in both AC and DC voltage from the driver.

Choosing Between a Dynamic and Linear Test

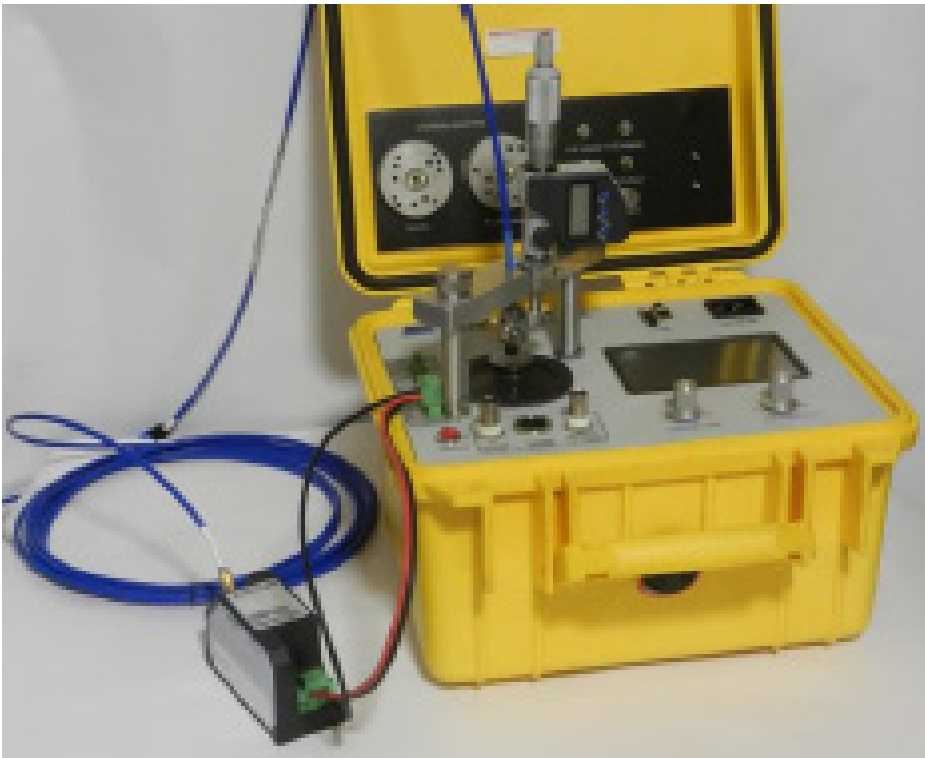


Figure 46. Proximity probe driver connected to AT2040

The shaker provides the needed -24 volts to power output for proximity probe drivers. It also reads in both AC and DC values. This allows the operator to conduct probe/driver tests without any add-on power supplies or external volt meters.

Proximity probes can be checked by conducting a dynamic or linear test:

- A dynamic (AC) test is done by reading in the AC voltage during vibration and performing a sensitivity test at a fixed-gap voltage.
- In a linear (DC) test, the gap voltage is adjusted over a linear range and the Proximity Probe Test Template spreadsheet included on the USB drive is completed showing the incremental scale value. A linear test can be performed with or without vibration from the shaker.

It is recommended to perform a linear test rather than a dynamic test. A linear test will show the ISF over the entire range of a probe/driver, whereas a dynamic test shows increasing amplitude (sine wave size) at a fixed-gap voltage.

Conducting a Linear Test

During a linear (DC) test, the probe is set at the 0 position and adjusted using the micrometer from 0–10–20–30, and so on, covering the entire linear range. Linear tests are done in manual mode and the amplitude is not adjusted.

To conduct a linear test:

1. Assemble and install the proximity probe kit, per instructions in [Installing the Proximity Probe Kit](#) on page 38.
2. Connect the proximity probe driver, per instructions in [Connecting the Proximity Probe Driver](#) on page 40.
3. Choose **Test** from the main menu.
4. Select **Prox** as the sensor type, then select the proximity probe manufacturer and model.
5. Select the **Manual button** on the sensor profile screen.
6. Adjust the probe to 10 mils from the target.
7. Using the Proximity Probe Test Template spreadsheet on the included USB drive (see example spreadsheet on next page), create a test over the span of 10 mil test increments. The Proximity Probe Template in Excel format is provided to assist you with these calculations.
8. Start by filling in "Test 1" data in the Excel spreadsheet at cell 6C (yellow cell in *Table 6*).
9. Rotate the spindle to 20 mils and record the voltage in cell 7C (green cell in *Table 6*).
10. Continue in 10 mil-increments until the upper-end of the linear scale, completing column C in the Excel spreadsheet ("Test 1" column in *Table 6*).
11. Calculate the voltage change by using the spreadsheet to fill in test points H6–H14 ("ISF Test 1 mV/mil" column in *Table 7*)

**NOTE:** It is always a good idea to perform the test a second time, completing column D in the Excel spreadsheet ("Test 2" column in *Table 6*).

12. Log and analyze data by looking for the linear relation between travel and voltage.
13. Locate the ISF and measurement tolerance printed on the proximator and housing. For example, 200 mV over 10 mil-increments results in 2 volt (200 millivolt) changes.
14. Compare the ISF on the driver housing to the results of your test ("ISF Test 1" or "ISF Test 2" columns in *Table 7*).

**NOTE:** Example test data is provided in the two "EXAMPLE" columns in *Table 6* and *Table 7*.

Example Agate Technology Proximity Probe Test Template

	Test 1	Test 2	EXAMPLE
Mils	Volts	Volts	Volts
10			1.000
20			3.000
30			5.000
40			7.000
50			9.000
60			11.000
70			13.000
80			15.000
90			17.000
100			19.000

Table 6. Record test data

Incremental Scale Factor (mV/mil)			
Mils	ISF TEST 1 (mV/mil)	ISF Test 2 (mV/mil)	EXAMPLE ISF (mV/mil)
20	0	0	200
30	0	0	200
40	0	0	200
50	0	0	200
60	0	0	200
70	0	0	200
80	0	0	200
90	0	0	200
100	0	0	200

Table 7. ISF data auto-populates based on test data

Conducting a Dynamic Test

During a dynamic (AC) test, the shaker takes on the role of simulating a rotating shaft. The 4140 steel target will produce the same vibration signals as a steel shaft. In this test, the operator will set the probe gap voltage and adjust the amplitude. With the shaker this can be performed in either manual or automatic mode.

- 1. Choose **Test** from the main menu.
- 2. Select **Prox** as the sensor type.
- 3. Select the proximity probe manufacturer and model.
- 4. Locate the recommended gap setting on the proximity probe driver spec sheet:

Example Driver Spec Sheet (for 200 mV/mil probe/driver combination)

Recommended Gap Setting	1.27mm (50 mils)
-------------------------	------------------

- 5. Determine the exact voltage at the center of the linear range, using the recommended gap setting and the following formula:<sup>4</sup>

(recomm. gap setting in mils\*0.2)-1 = volts DC      [ (50\*0.2)-1 = -9 volts ]

- 6. **If a recommended gap setting is not available**, locate the linear range listed on the driver spec sheet (most probe and driver combinations are 200 mV/mil, where every 10 mils is equal to 2 volts):

Example Driver Spec Sheet (for a 200 mV/mil probe/driver combination)

Linear Range	2 mm (80 mils). Linear range begins at approximately 0.25 mm (10 mils) from the target and is from 0.25 to 2.3 mm (10 to 90 mils) (approximately -1 to -17 Vdc).
--------------	--

- 7. Determine the exact voltage at the center of the linear range, using the following formula:<sup>4</sup>

((range/2+10)\*0.2)-1 = volts DC      [ ((80/2+10)\*0.2)-1 = -9 volts ]

**NOTE:** Always remember that linear range does not begin until the probe is 10 mils from the target.

<sup>4</sup> Both formulas will equate the voltage at the center of the linear range. In both examples shown above, our result is -9 volts DC.

- 8. Assemble and install the proximity probe kit, per instructions in [Installing the Proximity Probe Kit](#) on page 38.
- 9. Connect the proximity probe driver, per instructions in [Connecting the Proximity Probe Driver](#) on page 40.
- 10. Locate the gap voltage, shown as "GAP V", on the sensor profile screen (*Figure 47*). The gap voltage is the DC voltage measurement from the probe/driver and is shown as a negative value.

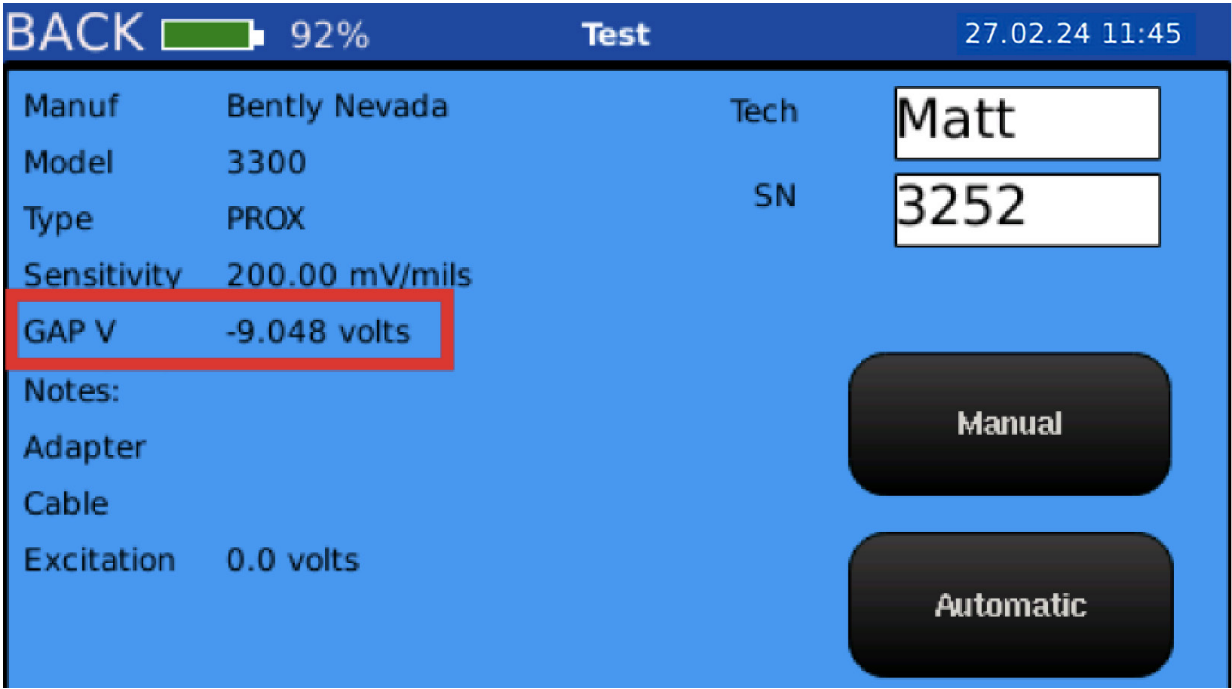


Figure 47. Sensor profile screen for the proximity probe

- 11. Rotate the micrometer clockwise to push the probe all the way down until it contacts the steel target.

**NOTE:** The GAP V (DC voltage value) on your calibrator should read less than -1 volt.

- 12. Rotate the micrometer counterclockwise to retract the probe tip until the GAP V reads the previously calculated value. In our example, we determined a gap voltage of -9 volts.
- 13. Select the **Manual button** or **Automatic button** on the sensor profile screen (*Figure 47*).
- a. In automatic mode, the shaker will conduct the test without the need for further adjustments.
- b. In manual mode, adjust the speed to the same RPM as the driveshaft you would like to simulate. Then, increase the amplitude over a range of 1 to 10 mils.

MEMS-100 Adapter Board

The MEMS adapter board allows an AT2040 to be used with components such as PR and capacitive sensors manufactured by Kistler®, Endevco®, and Dytran®. The adapter plugs into the shaker DIN8 connector for power and signal. 7 to 10 volt power is supplied to the sensor and the adapter board converts the signal from a differential input to a single-ended for sensitivity measurement. The adapter can also be used with 3-wire capacitive sensors by a simple DIP Switch Toggle.

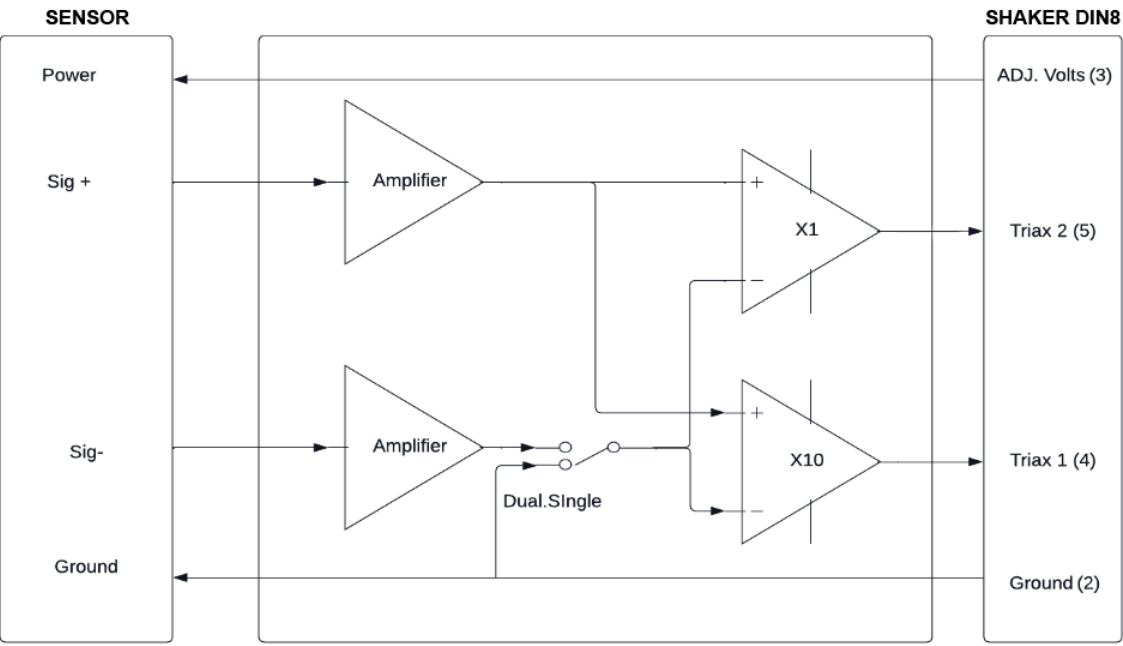


Figure 48. MEMS-100 adapter board diagram

Specifications		
Programmable Supply Voltage	Min 7	Max 20
X1 (For High Sensitivity 500 to 2000 mv/G Sensors)	Gain 10.0 ±0.01% Common mode 0–20 V Common mode rejection 80 dB	
X10 (For 0.1mv to 500 mv/G Sensors)	Gain 1.0 ±0.025% Common mode ±0–11 V Common mode rejection 80 dB	

Figure 49. MEMS-100 specifications

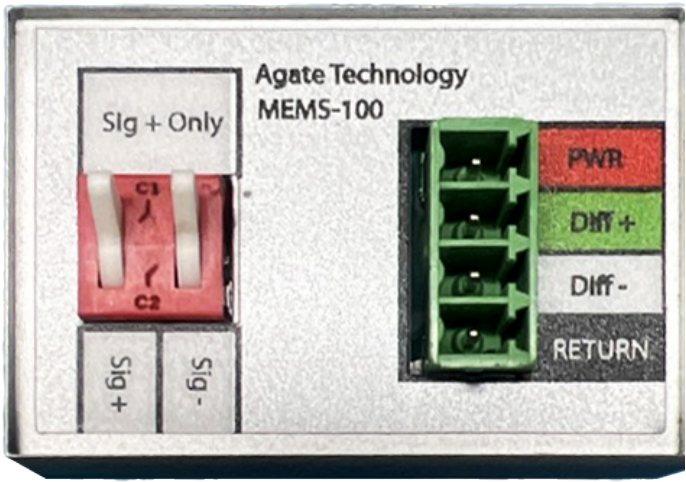


Figure 50. MEMS-100 adapter board

Setup Mode

The Setup menu consists of five submenus to accommodate user preferences (Figure 51):

- 1. **Export Data:** Export previous test(s) to PDF, export all records to CSV, or delete previous test(s).
- 2. **Clock:** Set date, time, location.
- 3. **Network:** Set up the wireless network.
- 4. **Import Cert:** Export default PDF certification template or import operator customized PDF certification template and logo image file.
- 5. **Unit Configuration:** Set company name, change the vibration units, change the signal polarity, change, calibrate the touchscreen, or calibrate the mass load correction.
- 6. **Unit Info:** View the shaker serial number, firmware and FGPA version, and more information.

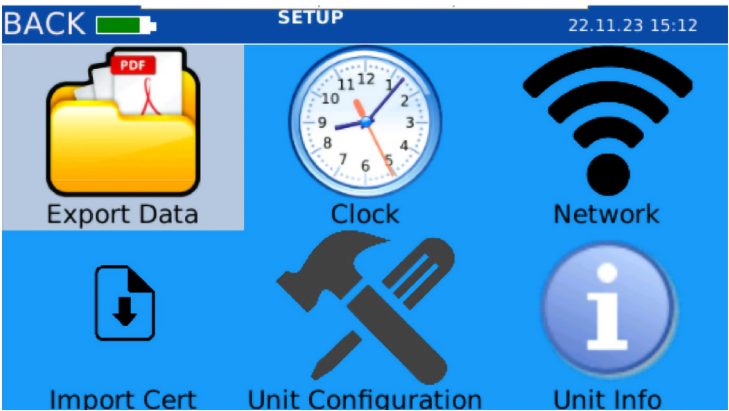


Figure 51. Setup menu screen

Deleting and Saving Previous Test Records

**IMPORTANT:** To export or delete previous test records, the USB memory drive must be inserted into the USB port **BEFORE** the shaker is powered on. Otherwise, the shaker will not be able to load the USB drive.

If the shaker is having problems reading the USB memory drive, restart the device with the USB drive plugged in.

At completion of a test, the test data is automatically saved in the on-board memory and can be recalled and exported to the USB drive at any time. To delete or export saved tests (as PDF or CSV files), the first step is to open a list of the previous tests:

- 1. Power the shaker off.
- 2. Insert the USB drive into the USB slot (Figure 52).



Figure 52. USB memory drive loaded in USB port

- 3. Power on the shaker and select **Setup** from the main menu.
- 4. In the Setup menu, select **Export PDF**.

This will bring up the Test Review screen where previous test records may be exported or deleted.

Export Previous Tests to the USB Drive

To export selected tests:

- 1. Tap the check box to the left of the test record(s) you want to export to the USB drive, or use the frequency knob to select (Figure 53).
- 2. Select the **Save to PDF** button (Figure 53).



Figure 53. Select test records to export

**NOTE:** Alternately, you may select the **Export All to CSV** button to export all saved test records as a CSV file to the USB drive.

- 3. You will be notified of a successful export by the onscreen message "Save Complete".
- 4. Remove the USB drive and review the test(s) on your computer. See the example test record on the next page (Figure 54).

Sample Certification Record

The sample certification shows the following information (Figure 54):

- |  |  |
|--|--|
| A. <b>Company:</b> Company name.                                   | H. <b>Sensitivity (mV/g):</b> Test point sensitivities.  |
| B. <b>Manufacturer:</b> Sensor manufacturer name.                  | I. <b>Deviation Relative to 100 Hz:</b> Deviation in percentage relative to the to reference frequency.        |
| C. <b>Model:</b> Sensor model number.                              | J. <b>Graph:</b> Graph relative to the deviation of the reference frequency (visual representation of item I). |
| D. <b>Serial #:</b> Serial number of the sensor.                   | K. <b>Calibration Tech:</b> Tech name.   |
| E. <b>REF Sensitivity:</b> Sensitivity at the reference frequency. | L. <b>Test Date:</b> Calibration date.   |
| F. <b>Frequency HZ:</b> Test point frequencies.                    |  |
| G. <b>Amplitude (GS):</b> Test point amplitudes.                   |  |

Example:

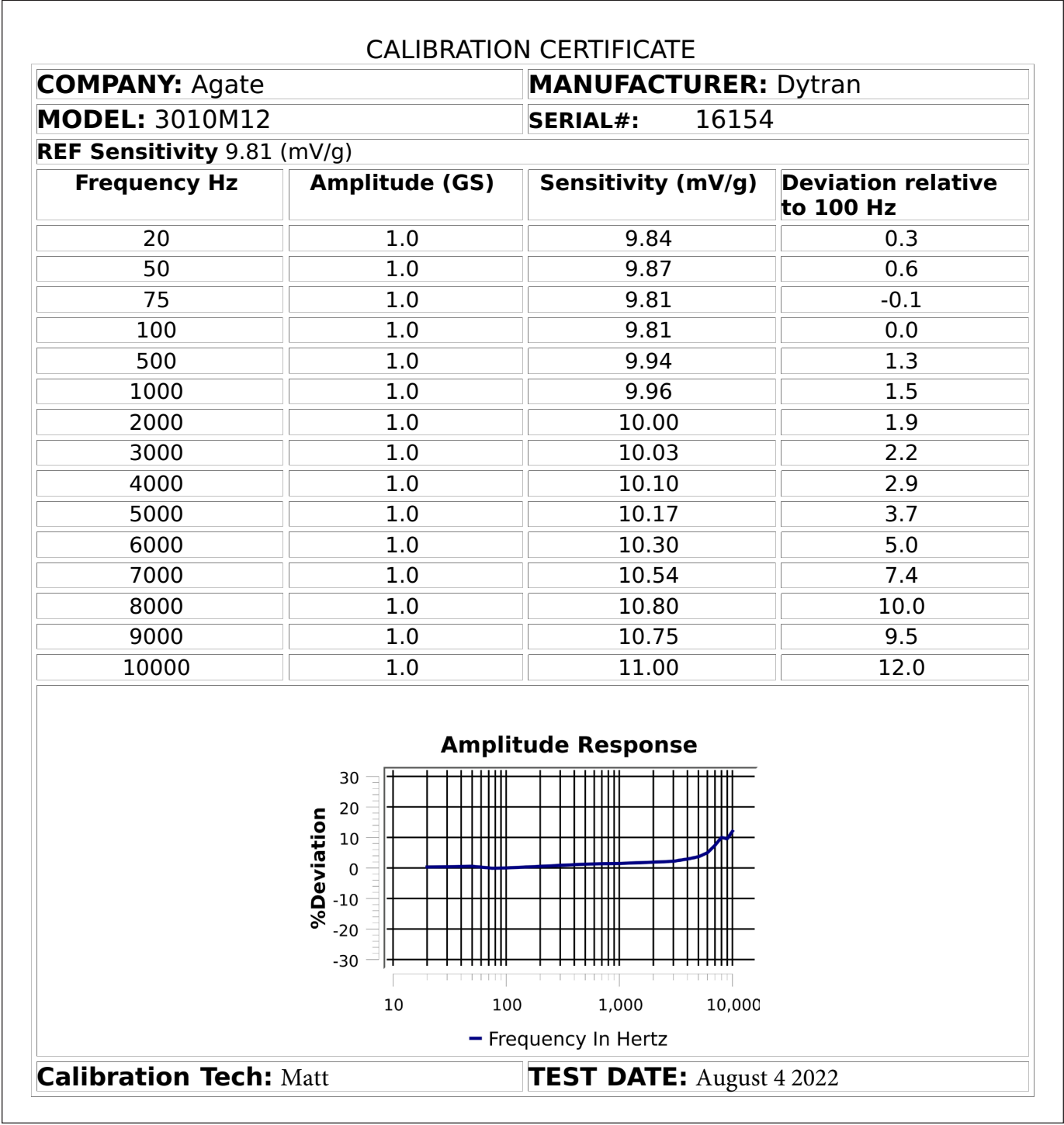


Figure 54. Example exported test record

Delete Previous Tests

- On the Test Review screen, select the test record(s) you want to delete (Figure 55).



Figure 55. Select test records to delete

- Select the **Delete** button (Figure 55) and all selected test records will be deleted from the shaker's on-board memory.

Adjusting Date and Time Zone

- 1. In the Setup menu, select **Clock** (Figure 56).

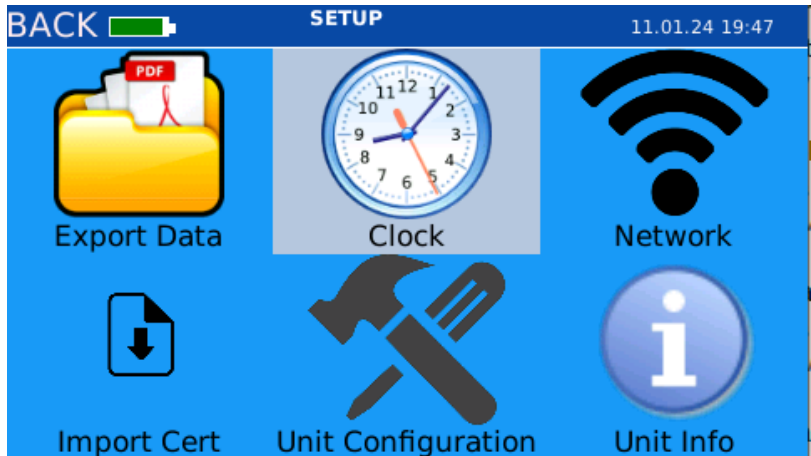


Figure 56. Select "Clock"

- 2. Adjust the time, date, and location, as needed (Figure 57).



Figure 57. Set time, date, and location

- 3. Select the **Save button** when complete.

Network Setup

- 1. In the Setup menu, select **Network** (Figure 58).

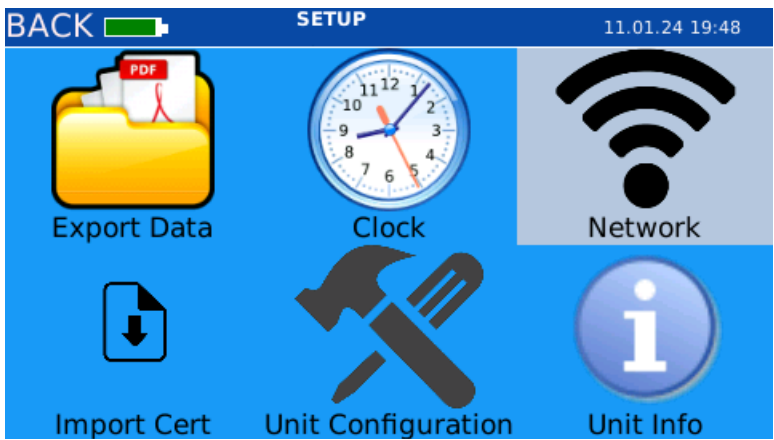


Figure 58. Select "Network"

- 2. Select the **ESSID field** and enter the identifying name of your wireless network (Figure 59).

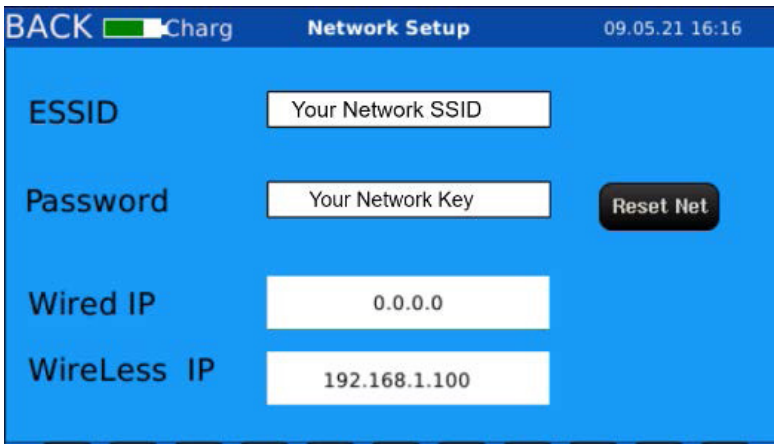


Figure 59. Enter wireless network credentials

- 3. Select the **Password field** and enter the wireless network password (Figure 59).
- 4. Select the **Reset Net button** to reset the network.

Importing and Exporting PDF Certificate Files

The shaker can automatically generate a sensor calibration certificate. The calibration certificate can be customized to specific business needs and branding. To customize the certificate:

- 1. Power the shaker off.
- 2. Insert the USB drive into the USB slot.
- 3. Power on the shaker, and select **Setup** from the main menu.
- 4. In the Setup menu, select **Import Cert** (Figure 60).

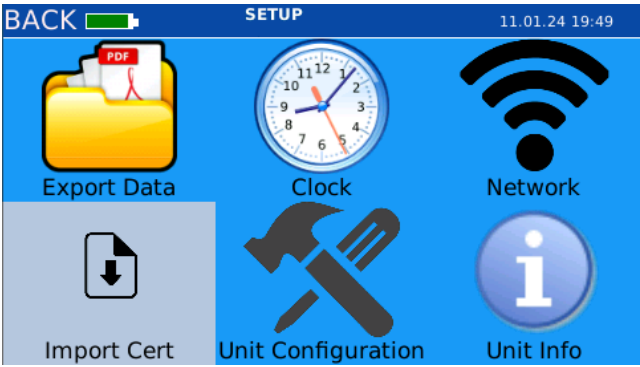


Figure 60. Select "Import Cert"



Figure 61. Import Cert screen options

- 5. Select the **Export Cert** button (Figure 61) to export the shaker's default calibration certificate template files, **seismic\_cert.html** and **logo.png**, to the USB memory drive.
- 6. Plug the USB memory drive into your computer and customize the **seismic\_cert.html** file as desired. See [Customizing the PDF Certificate Format](#) on page 74 for detailed HTML customization information and tips.
- 7. Once the HTML certificate template file has been customized, save it to the USB memory drive. **Do not change the name of the HTML file.**
- 8. Save your company logo to the USB drive. Rename your company logo: **logo.png**.
- 9. If prompted by your computer, choose to replace the old logo.png file with the new logo.png file you are saving now.
- 10. Power the shaker off.
- 11. Insert the USB drive into the shaker's USB slot.
- 12. Power on the shaker. Select **Setup** from the main menu, then select **Import Cert**.
- 13. Select the **Import Cert** button (Figure 61) to import the customized HTML certificate template file, **seismic\_cert.html**, and the company logo file, **logo.png**.

Unit Configuration

- 1. In the Setup menu, select **Unit Configuration** (Figure 62) to open the configuration screen (Figure 63).

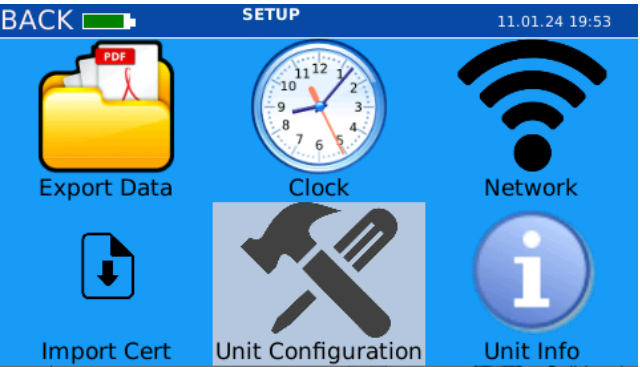


Figure 62. Select "Unit Configuration"

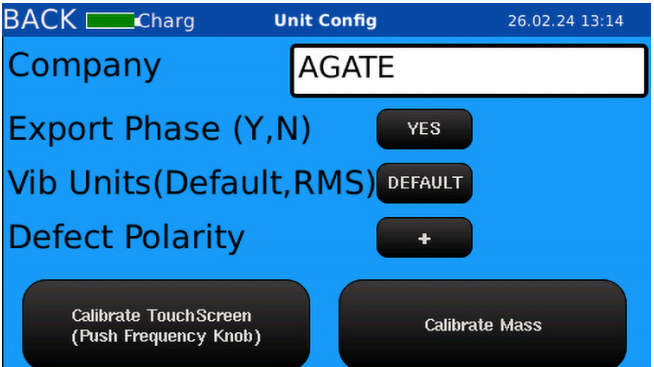


Figure 63. Unit configuration screen options

Change the Company Name

- 1. On the Unit Configuration screen, select the **Company** field and enter the company name (Figure 63).

Export and Collect Phase Data

- 1. On the Unit Configuration screen, select the **Yes** button next to Export Phase (Figure 63) to show phase data in the automatic test table view (Figure 64).
- 2. Select the **No** button next to Export Phase (Figure 63) to hide phase data in the automatic test table view (Figure 65). Phase data is hidden by default. In most situations, it may be best to keep phase data hidden.

BACK 52% Dytran 3010M12 04.08.22 02:00				
COMPLETE, cert saved DC Bias 8.3 SENS 11.1 mV/g@10000 HZ				
Frequency	Amplitude	Sensitivity	Deviation%	Phase
500	1.0	10.0	1.0	-1
1000	1.0	10.0	1.1	-2
2000	1.0	10.0	1.4	-5
3000	1.0	10.0	1.8	-8
5000	1.0	10.2	3.2	-13
8000	1.0	10.6	7.1	-20
10000	1.0	11.1	13.0	-25
ToGRF				

Figure 64. Automatic test – table view with phase data showing

BACK 52% Dytran 3010M12 04.08.22 02:00				
COMPLETE, cert saved DC Bias 8.3 SENS 11.1 mV/g@10000 HZ				
Frequency	Amplitude	Sensitivity	Deviation%	Phase
500	1.0	10.0	1.0	
1000	1.0	10.0	1.1	
2000	1.0	10.0	1.4	
3000	1.0	10.0	1.8	
5000	1.0	10.2	3.2	
8000	1.0	10.6	7.1	
10000	1.0	11.1	13.0	
ToGRF				

Figure 65. Automatic test – table view with phase data hidden

Toggle Vibration Units

Toggle the shaker's output between default and RMS units.

- 1. On the Unit Configuration screen, select the **Default button** next to Vib Units (*Figure 66*) to switch to the default units (*Figure 67*).

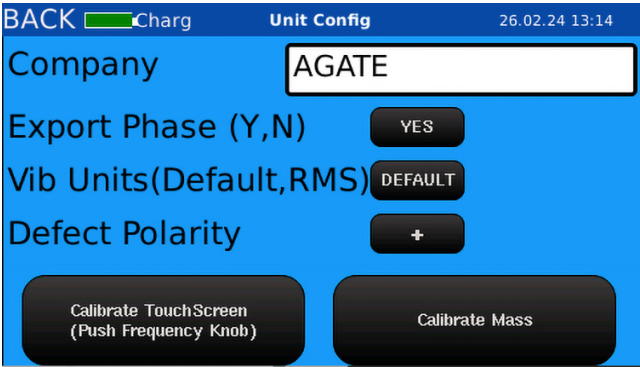


Figure 66. Unit configuration screen



Figure 67. Default units showing on Shake Screen

- 2. Select the **RMS button** next to Vib Units ((*Figure 66*) to choose RMS units (*Figure 68*).

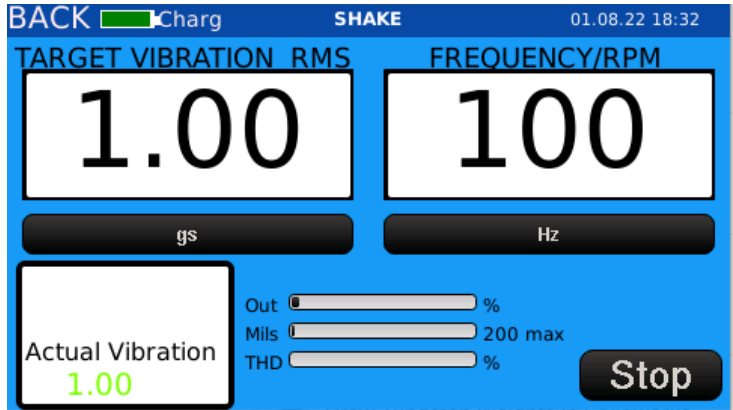


Figure 68. RMS units showing on Shaker Screen

100mv/G sensor		Amplitude G	0-peak Amplitude G	RMS Amplitude G	RMS Voltage on Meter milli-volts	Report or CSV value G	Report or CVS Units
Shake	Unit Configuration RMS OFF	1	1	0.707	70.7	n/a	
Shake	Unit Configuration RMS ON	1	1.414	1	100	n/a	
Manual Sensitivity	Sensor Setup RMS OFF	1	1	0.707	70.7	1	
Manual Sensitivity	Sensor Setup RMS ON	1	1.414	1	100	1	
Auto Sensitivity	Sensor Setup RMS OFF	1	1	0.707	70.7	1	G
Auto Sensitivity	Sensor Setup RMS ON	1	1.414	1	100	1	G RMS
Simulator	Sensor Setup RMS OFF	1	1	0.707	70.7		
Simulator	Sensor Setup RMS ON	1	1.414	1	100		

Table 8. 0-P to RMS example

Change the Polarity Defect

- 1. On the Unit Configuration screen, select the **- button** next to Defect Polarity to change the signal polarity to negative (*Figure 69*).
- 2. Select the **+ button** to change the signal polarity to positive (*Figure 70*).

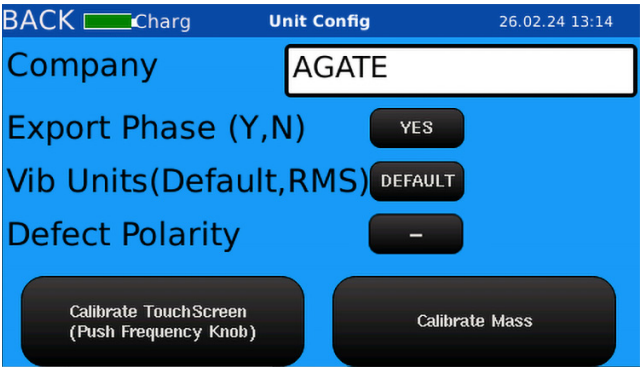


Figure 69. Select the - button

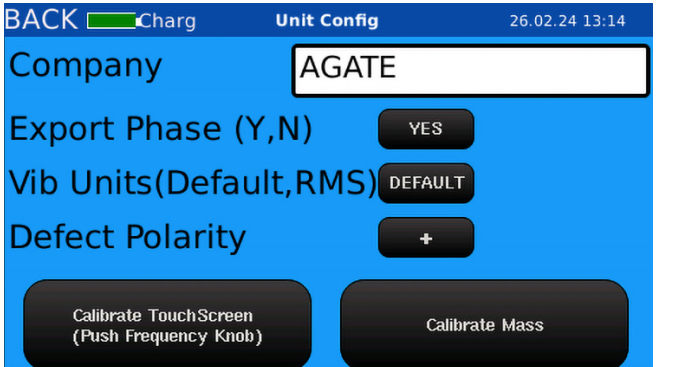


Figure 70. Select the + button

Calibrate the Touchscreen

If the touchscreen is not responding consistently or accurately, it can be re-calibrated:

- 1. On the Unit Configuration screen, select the **Calibrate TouchScreen button** (*Figure 71*)).
- 2. Follow the prompts on the screen to complete the calibration.

Calibrate the Mass Load Correction

Calibrate the shaker to automatically detect payload mass and apply the mass load correction:

- 1. On the Unit Configuration screen, select the **Calibrate Mass button** (Figure 71).

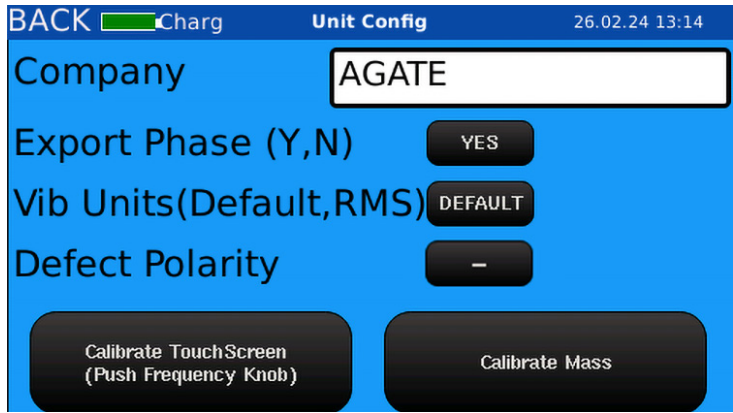


Figure 71. Select the Calibrate Mass button

- 2. A warning screen will open, prompting you to remove any sensor/payload from the shaker head before beginning the calibration. The shaker will calibrate incorrectly if the sensor/ payload is not removed.
- 3. Remove the sensor/payload and press the **Calibrate Mass button** (Figure 72).

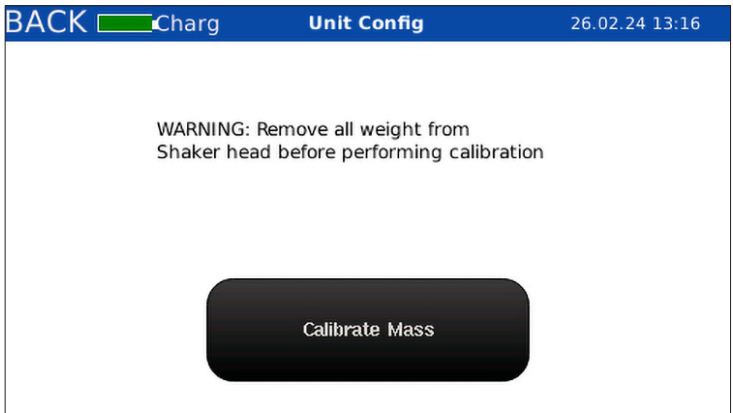


Figure 72. Mass load calibration warning

- 4. The keyboard and a prompt to enter the passcode will open (Figure 73).
- 5. Enter the passcode **555** and then press the **OK button** (Figure 74). The shaker will begin calibration. The screen will show "Calibrating".

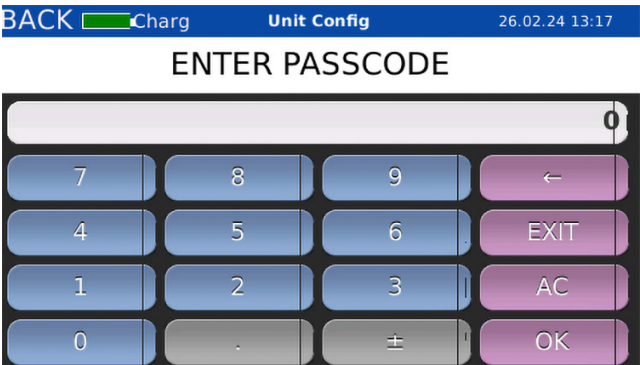


Figure 73. Enter Passcode prompt



Figure 74. Passcode entered, shaker calibrating

- 6. If an incorrect code is entered, the screen will show "Bad Passcode" (Figure 75).



Figure 75. Incorrect passcode entered

Unit Info

- 1. In the Setup menu, select **Unit Info** (Figure 76).

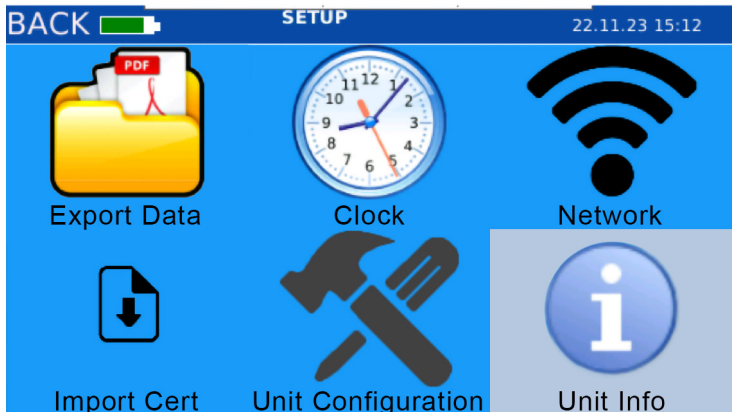


Figure 76. Select "Unit Info"

- 2. The following information is displayed on the Unit Information screen (Figure 73):

- a. **FW Version:** Firmware version
- b. **Unit Serial #:** Unit serial number
- c. **Calibration Date:** Last factory calibration date
- d. **FGPA Version:** FGPA version
- e. **Battery Type:** SLA (sealed lead acid) or LiFePO4 (lithium iron)
- f. **Battery Volts:** Battery voltage
- g. **Ref BIAS Volts:** Internal reference bias voltage. Used for determining any drift in the reference accelerometer's DC bias voltage. The first unit is the measured voltage at calibration, the second unit is the measured value at time of calibration. NOTE: If no measurement was taken at the time of calibration the second unit will show a value of "00".

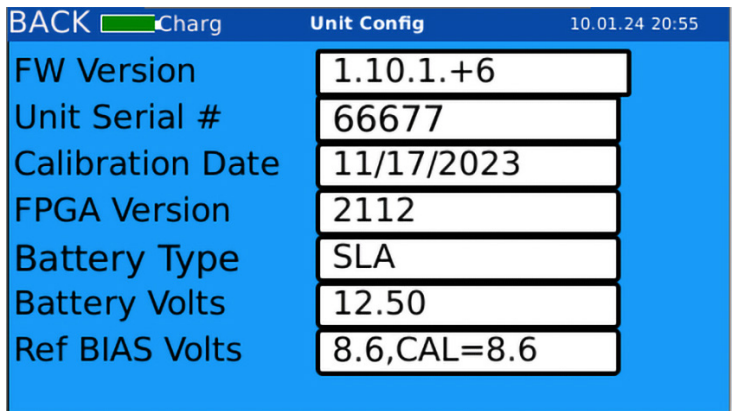


Figure 77. Unit information screen

Simulation Mode (AT2040 Only)

AT2040 has the ability to simulate a transducer signal without the actual sensor being present. The simulator has a significant advantage over the electrodynamic shaker when calibrating analyzers and control equipment because it is not bound by mechanical limitations. The simulator feature can provide high-output signals at low frequency that would otherwise not be possible due to shaker displacement limitations. Similarly, the shaker can provide high-frequency signals that otherwise would not be possible due to weight limitations. The simulator output by itself is far more accurate than using the electrodynamic shaker in combination with an accelerometer. This makes simulation mode the ideal tool for testing, troubleshooting, and calibrating signal conditioners, analyzers, and control room equipment. Simulation mode allows the operator to connect the shaker's simulator directly to control equipment to verify its working conditions.

To begin a simulation:

- 1. Choose **Simulation Signals** from the main menu (Figure 78).
- 2. Select the transducer type to be tested (Figure 79).

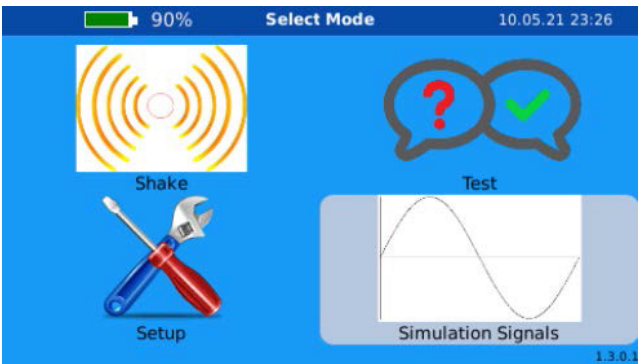


Figure 78. Select "Simulation Signals"

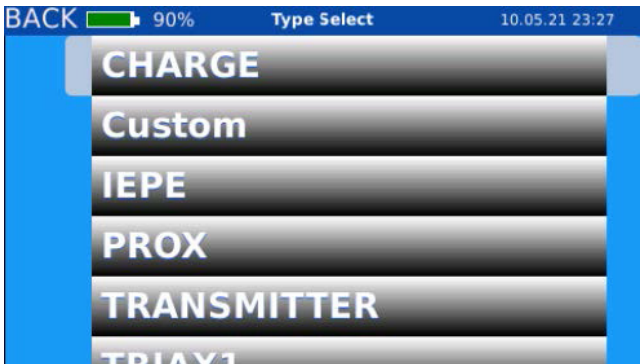


Figure 79. Select sensor type

- 3. Select the sensor manufacturer from the built-in library of manufacturers. (Figure 80).
- 4. Select your sensor model from the list of sensors (Figure 81).



Figure 80. Select manufacturer

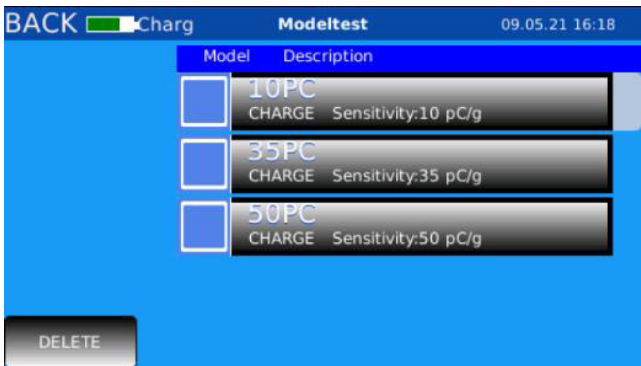


Figure 81. Select model

- 5. Connect your equipment to the sensor simulator output.
  - a. If simulating a IEPE or charge mode accelerometer, use the BNC Sensor Simulation Output jack.
  - b. If simulating a 4-20mA or proximity probe (*Figure 82*):
    - i. Use the 4-20mA Sensor Output Simulator (labeled "3") for a 4-20mA simulator.
    - ii. Use the Proximity Probe Output Simulator (labeled "4") for a prox simulator.



Figure 82. 4-20mA ("3") and proximity probe simulator connectors ("4")

- 6. Select the **Start button** on the Simulation screen to begin the simulation (*Figure 83*).



Figure 83. Simulation screen

- 7. Adjust the amplitude or frequency, as needed, via the amplitude and frequency displays (*Figure 83*).

While the simulation is running, the shaker will precisely mimic a transducer being operated at the chosen amplitude and frequency.

- 8. Select the **Stop button** to conclude the simulation.

# Controlling the shaker remotely

The shaker can be controlled remotely using a wireless-connected or Ethernet-connected computer and VNC Viewer.

## Install and Setup VNC Viewer

- 1. Download and install the VNC Viewer from VNC Connect/Real VNC (*Figure 84*): <https://www.realvnc.com/en/connect/download/viewer>.

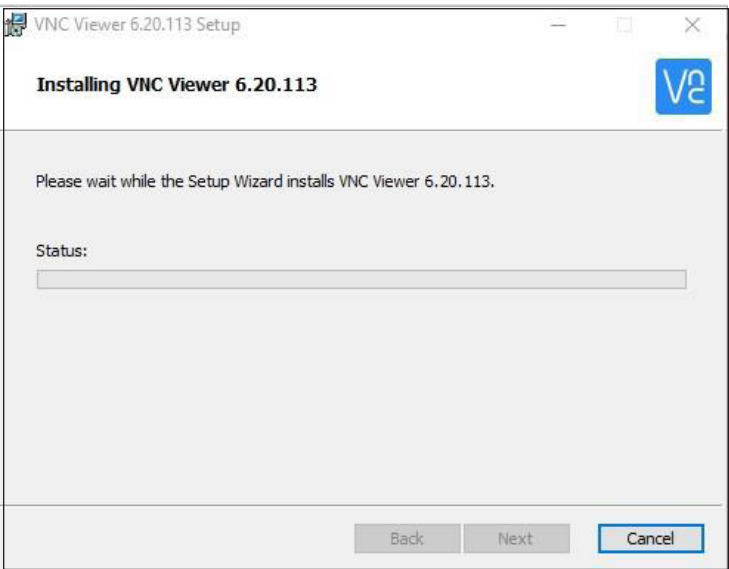


Figure 84. Install VNC Viewer

- 2. Start the VNC Viewer (*Figure 85*).

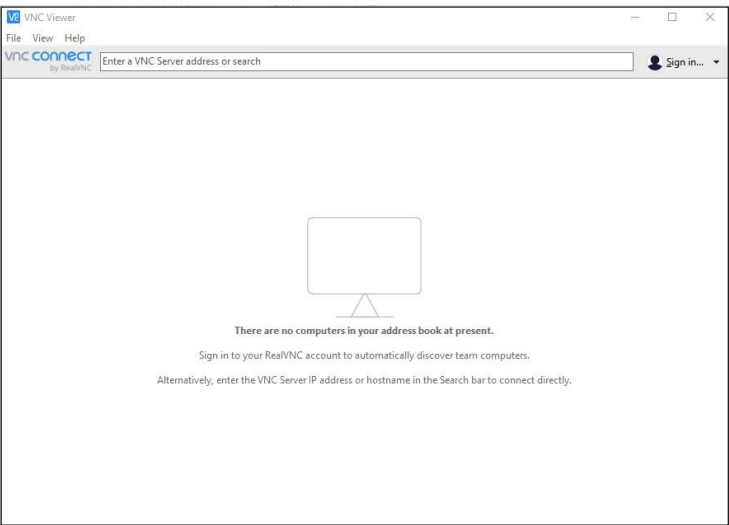


Figure 85. Open VNC Viewer on computer

3. Setup the wireless connection (**optional step**):

**NOTE:** Skip step 3 if you are using a hard-wired Ethernet connection.

- a. In the Setup menu, select **Network**.
- b. Enter the identifying name of the wireless network in the **ESSID field** (*Figure 86*).
- c. Enter the wireless network password in the **Password field** (*Figure 86*).
- d. Plug a wireless network adapter into one of the USB ports and restart the shaker.

ESSID	AGATEGUEST2
Password	AT20402040

Figure 86. Enter wireless network configurations

4. Locate the shaker's IP address ("Wired" or "Wireless", depending on your setup) in the Network submenu (*Figure 87*).

Wired IP	192.168.4.32
WireLess IP	0.0.0.0

Figure 87. Locate device IP address

5. Select **File > New Connection** from the VNC Viewer menu.

6. Enter the shaker's IP address in the **VNC Server field** to complete the login setup (*Figure 88*).

Figure 88. Enter IP address and name

7. Enter an identifying name in the **Name field**, such as "AT2040" or "Shaker" (optional).

**NOTE:** There is no login or password required for the VNC Viewer setup.

VNC Viewer is now connected and the shaker is available to be controlled on remote computer.

8. Right-click on the thumbnail for the shaker and choose **Connect** to open a remote connection to the shaker.

Setting up a custom sensor

Designing a Custom Sensor

- 1. Open the Sensor Setup application (saved on the USB memory drive), on your computer (Figure 89).

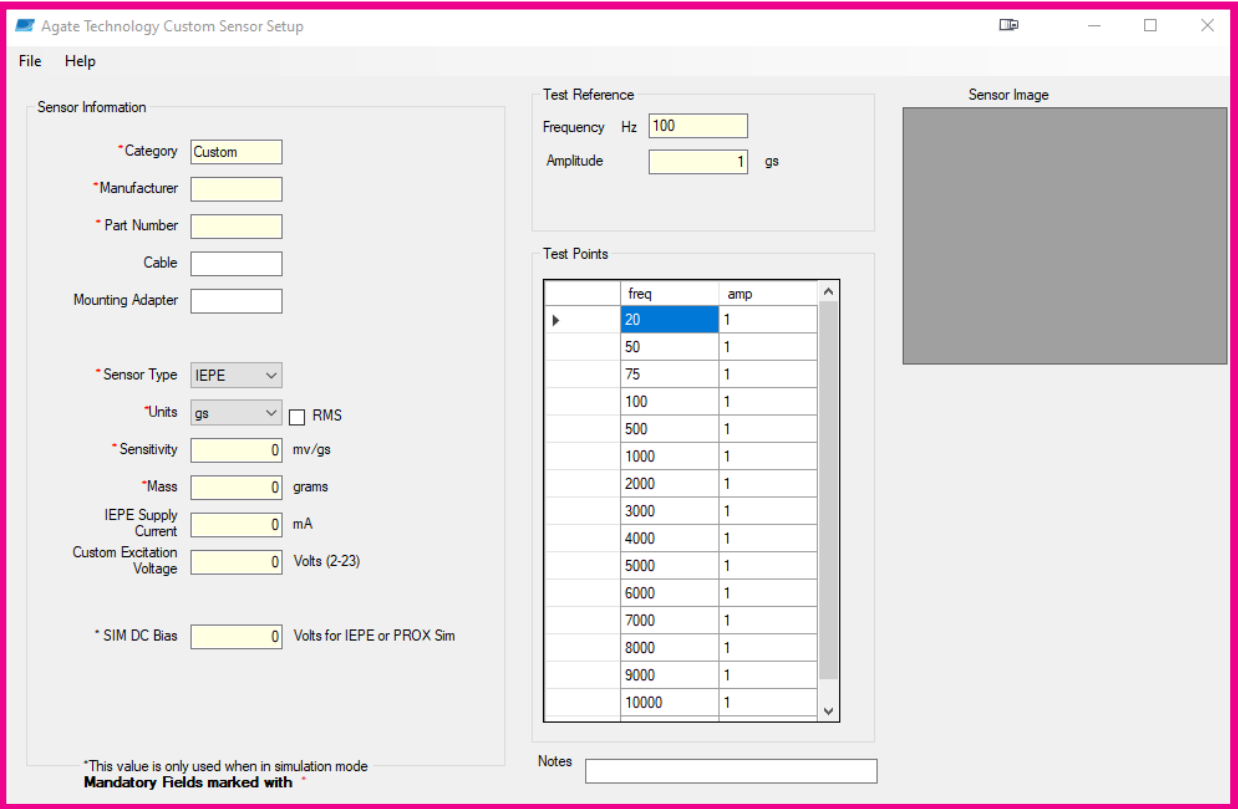


Figure 89. Custom sensor software setup screen *This software is not yet finished being updated*

- 2. Enter the sensor information in the **Sensor Information** section:
  - a. **Category:** User-definable sensor type. Entries are case sensitive (e.g. CHARGE and Charge will appear as two separate categories).
  - b. **Manufacturer:** The manufacturer of the sensor. Entries are case sensitive (e.g. DYTRAN and Dytran will appear as two separate manufacturers).
  - c. **Part Number:** The designated part number for the sensor.

NOTES:

- Fields marked with a red asterisk ( \* ) are required fields and must be filled in.
- Fields marked with a black asterisk ( \* ) are only used in simulation mode.

- d. **Cable:** Enter the part number for any accessory cable(s) required for the sensor.
  - e. **Mounting Adapter:** Enter the part number for any mounting adapter(s) required for the sensor.
  - f. **Sensor Type dropdown list:** Select the sensor type. The dropdown options vary by shaker model:
    - i. **AT2035:** IEPE, Charge, Voltage, Coil.
    - ii. **AT2040:** IEPE, Charge, Voltage, Coil, Prox, Transmitter, Triax 1, Triax 2, Triax 3.
  - g. **Units dropdown list:** Choose the units corresponding to the sensor type: g (standard gravity), ips (inch per second), mss (meter per second squared), mms (millimeter per second), millimeter.
  - h. **RMS checkbox:** Select to change from peak to RMS.
  - i. **Sensitivity:** Enter the sensitivity of the sensor being added. (Only used in simulation mode; not applicable for AT2035.)
  - j. ~~**Mass:** Enter the sensor mass.~~
  - k. **IEPE Supply Current:** Enter the IEPE supply current of the sensor being added.
  - l. **Custom Excitation Voltage:** Enter the excitation voltage of the sensor being added. (Only for sensors that require an external power supply.)
  - m. **SIM DC Bias:** Enter the voltage for the IEPE or proximity probe.
- 3. **Test Reference:** This is the amplitude and frequency that the automatic test will refer to when calculating deviation.
  - 4. **Test Points:** Enter the test points.
  - 5. **Notes:** Enter any notes about the sensor.
  - 6. **Sensor Image:** Click the field to add a photo of the sensor. The sensor image will copy to the shaker so that the user may compare the image to the sensor under test to ensure the correct sensor is selected.

**NOTE:** If a new entry has an identical Category, Manufacturer, and Part Number as a sensor already saved in the database, the newest entry will overwrite the original sensor.

Adding a Test Point

- 1. Enter the new test point values into the blank row at the bottom of the Test Points table (Figure 90).

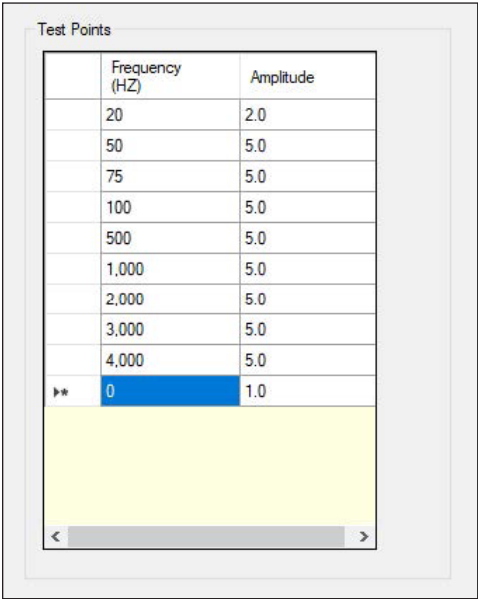


Figure 90. Add new test point values

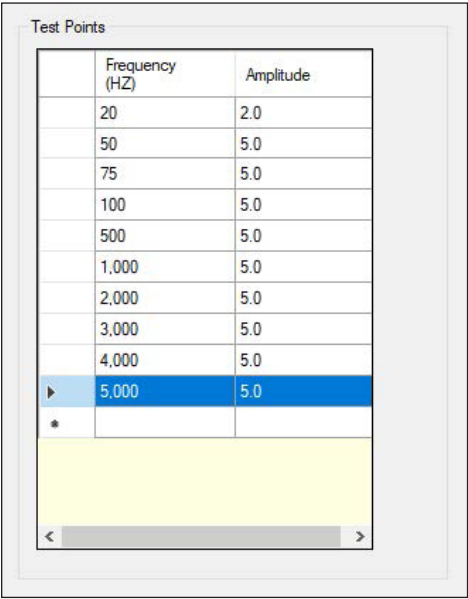


Figure 91. Select a row to delete

Deleting a Test Point

- 1. Select the empty cell in the column to the left of the test point you wish to delete. This will highlight the test point values in that row (Figure 91).
- 2. Press the **Delete key** on your keyboard to delete this row of test point values.

Sample Custom Sensor Setup

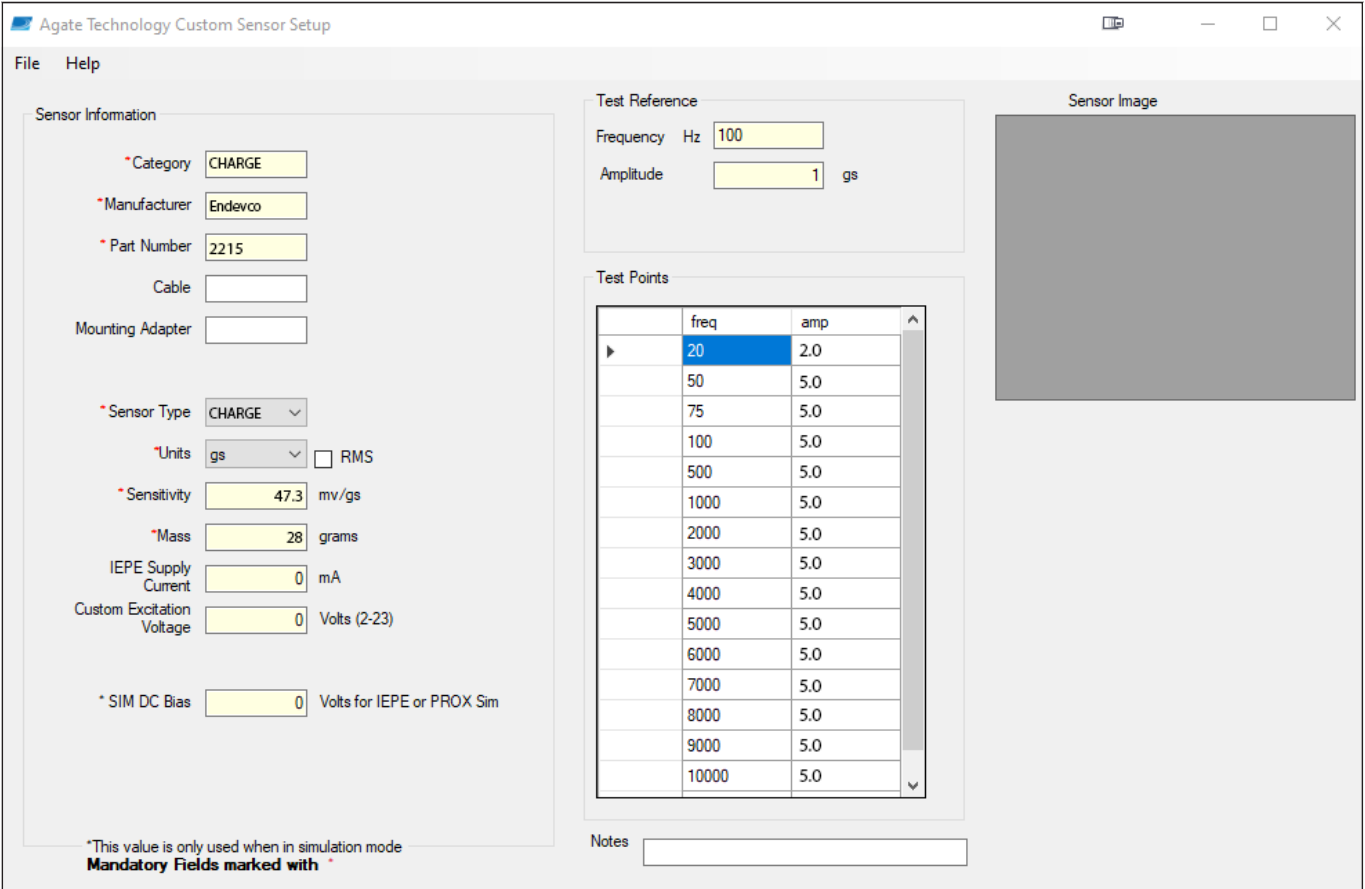


Figure 92. Example custom sensor setup

Saving a Custom Sensor

- 1. When finished setting up a custom sensor, select **File > Save As**.
- 2. Save the custom sensor file to your computer, as well as to the USB drive.
  - a. Save as type: "setup files (\*.json, \*.jsn)"
  - b. Name the file so that it can be distinguished from other custom sensors (Figure 93).


Name	Date modified	Type	Size
 Endevco 2215	3/27/2019 11:43 AM	Adobe Acrobat D...	2 KB

Figure 93. Example of saving a custom sensor setup file to computer

Uploading a Saved Custom Sensor

- 1. Turn off the shaker.
- 2. Insert the USB drive containing the saved custom sensor setup(s) into the USB port.
- 3. Turn on the shaker.
- 4. Select **Test** from the main menu (Figure 94).

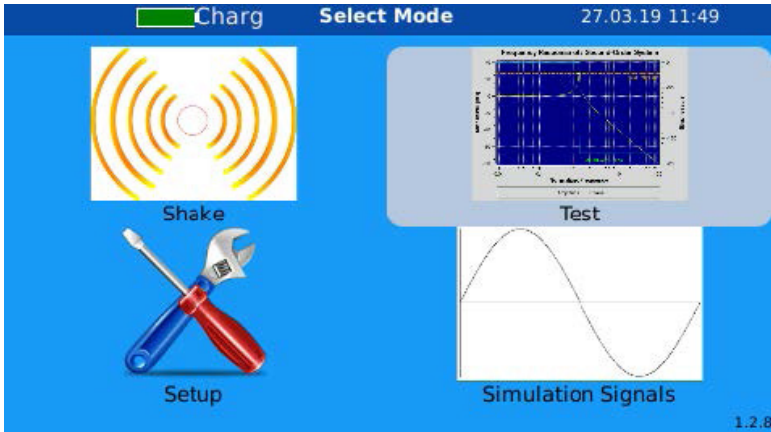


Figure 94. Choose "Test" from the main menu

- 5. An **Import Avail** button will appear in the bottom-left corner of the screen, indicating that an import is available from the USB drive. Select the **Import Avail** button to import the custom sensor(s) (Figure 95).

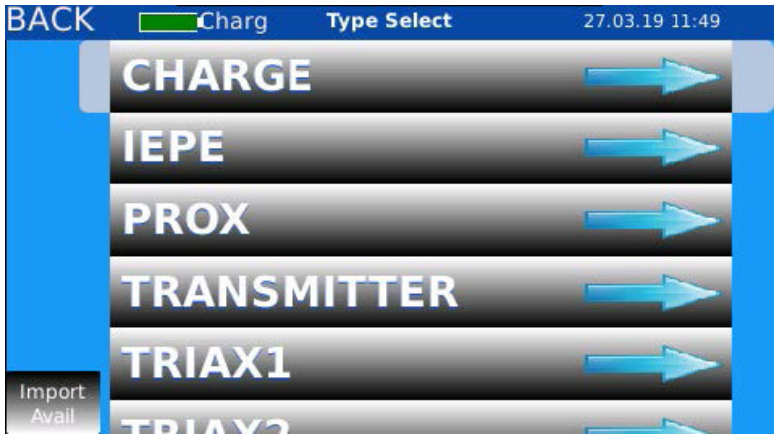


Figure 95. "Import Avail" appears in the bottom-left corner

- 6. Once the import is finished, "Import Done" will appear in the bottom-left corner, indicating that the custom sensor has been imported successfully (Figure 96).
- 7. To select an imported sensor for testing, choose the sensor type (Figure 96).



Figure 96. Choose sensor type after the sensor imports

8. Select the desired manufacturer from the list (Figure 97).



Figure 97. Select the manufacturer

9. Imported sensors belonging to the category and manufacturer selected will appear. Select the check box to the left of a sensor to choose it for testing (Figure 98).

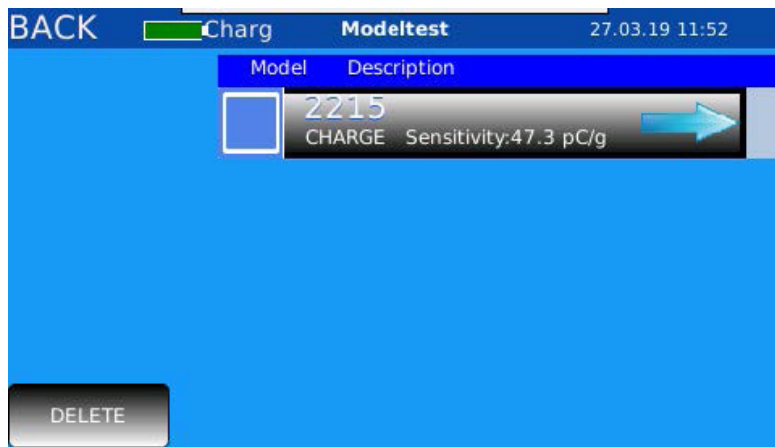


Figure 98. Select the imported sensor

Deleting a Custom Sensor

- 1. To delete a custom sensor from the database, select the check box to the left of its part number.
- 2. Select the **Delete button** in the bottom-left corner (Figure 99).

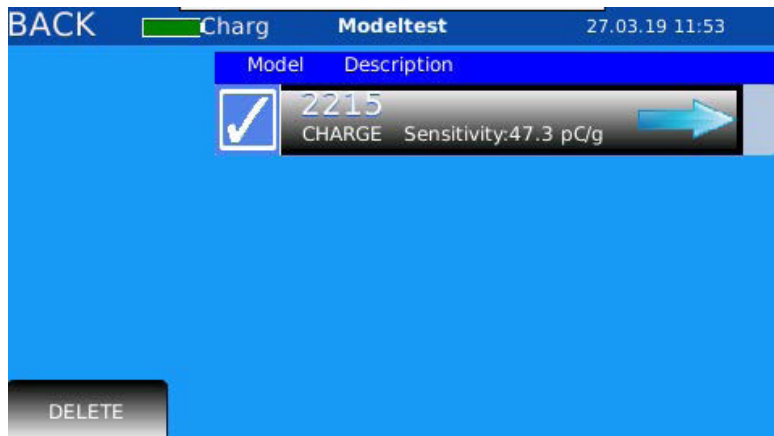


Figure 99. Select the sensor to be deleted

3. The sensor will be deleted from the shaker database (Figure 100) and will no longer appear unless re-imported.

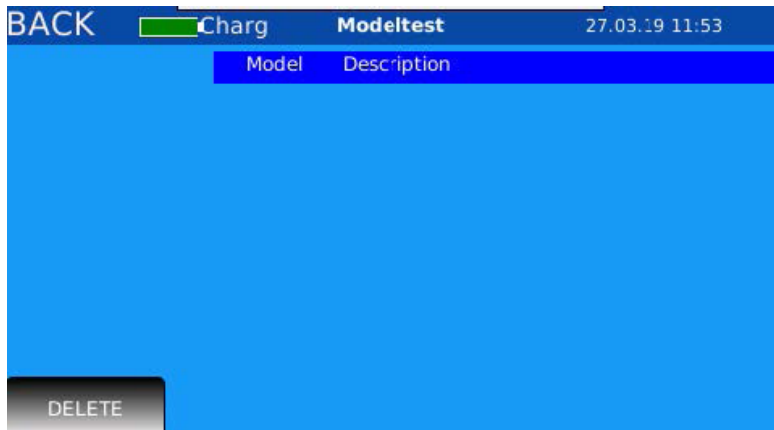


Figure 100. Imported sensor was deleted

Customizing the PDF certificate template

The shaker can automatically generate a sensor calibration certificate. The calibration certificate can be customized to specific business branding and certification needs.

The customizable certificate template is a file written in HTML. The template file name is **seismic\_cert.html**. To customize the calibration certificate contents and layout, the operator will need to download the HTML template, edit it as desired, and upload the customized template to the shaker.

In addition to the customizable HTML file, the shaker supports uploading one image file for your company logo. The logo file, **logo.png**, can be added to the certificate template via the "logo" keywords (e.g. %logox1%, %logox2%). See [HTML Keywords](#) on page 76.

To customize the PDF certificate template:

- Export the HTML template and logo image template from the shaker to the USB memory drive, per instructions in [Importing and Exporting PDF Certificate Files](#) on page 54.
- Customize the HTML template file:
  - The HTML certificate template is made up of:
    - HTML tags** which provide the structure of the certificate PDF. See [HTML Tags](#) on page 75.
    - Keywords** which the shaker will use to populate the certificate with data. See [HTML Keywords](#) on page 76.
    - Static text** which may be added to the template, as needed.
  - HTML files are commonly edited in text editors, such as the default text edit application on your computer, Notepad ++, Atom, or Sublime Text. If you are new to HTML, we recommend using Adobe CC Dreamweaver, CoffeeCupHTML editor, or another visual HTML editor.
  - See the example HTML and keyword structures and example customized certificates on the following pages.
- Save the customized HTML template file and your company logo file to the USB memory drive, per instructions in [Exporting and Importing PDF Certificate Files](#) on page 54.
- Import the customized HTML template file and company logo file to the shaker, per instructions in [Importing and Exporting PDF Certificate Files](#) on page 54.

HTML Tags

HTML tags give an HTML file its structure. Below is a list of common HTML tags you might use to customize your certificate template.

Commonly-Used HTML Tags	
<table></table>	Table
<tr></tr>	Table Row Within a Table
<td></td>	Table Data Cell Within a Table Row
<p></p>	Paragraph of Text
<strong> </strong> OR <b> </b>	Bolded Text
<i></i>	Italicized Text
<u></u>	Underlined Text
 	Line Break
&nbsp;	Non-Breaking Space

Table 9. HTML tags for use in certification template

HTML Tips

- Always make sure HTML tags are paired. An opening tag, such as **<table>**, must have a corresponding closing tag, **</table>**, at the end of the HTML element.
- HTML tags nest within each other. Indenting nested HTML tags will help you keep track of the HTML structure. See *Figure 102* for an example of a simple HTML structure.
- Use the non-breaking space tag, **&nbsp;**, to prevent important information from breaking across lines, for example: Agate**&nbsp;**Technology.
- Further customize your certificate template by adding HTML style attributes. Style attributes allow you to control the color, size, weight, and alignment (center, left, right) of text, the size of margins and padding around text, and more. Style attributes are inserted inside the opening tag (e.g. **<p>**), started with "style=", separated by semicolons ( ; ), and contained in quotation marks ( " ). For example:

```
<p style="color: red; font-size: 125%; font-weight: bold; text-align: center; margin-top: 20px;">This is an example line of text styled in HTML.</p>
```

This is an example line of text styled in HTML.

HTML Keywords

Keywords are added to the HTML document where you would like the shaker to populate data. For example, %F1% will be populated by the shaker with the frequency of the first reading.

Below is a list of keywords, or data, that the shaker will populate as it performs an automatic test.

Keyword	Description	Other
%A1%....%A19%	Test Point Amplitudes	
%biasV%	Test Bias Voltage for IEPE Sensors, Test DC Voltage for Proximity Probes	
%company%	Company Name	
%D1%....%D19%	Test Point Deviation in Percentage Relative to Reference Frequency	
%F1%....%F19%	Test Point Frequencies	
%graph%	Smaller Graph	
%graphx2%	Larger Graph	
%logox1%	Company Logo	Size = 1× original
%logox2%	Company Logo	Size = 2× original
%logox4%	Company Logo	Size = 4× original
%logox8%	Company Logo	Size = 8×original
%manufacturer%	Sensor Manufacturer Name	
%model%	Sensor Model	
%RefFreqHz%	Reference Point Test Frequency	
%RefFreqRPM%	Reference Point Test RPM	
%refSens%	Sensitivity at Reference Frequency	
%S1%....%S19%	Test Point Sensitivities	
%sensorSerial%	Serial Number of Sensor	
%shakerserial%	Serial Number of Shaker	
%tech%	Tech Name	
%testdate%	Calibration Date	MM DD YYYY
%units%	Sensor Units	Gs, IPS, Mils, etc.
%vibunits%	Unit type changes depending on if testing Acceleration, Velocity or Displacement	Gs, IPS, Mils, etc.

Table 10. Supported HTML keywords for populating the certification template

Example 1:

COMPANY: %company%		MANUFACTURER: %manufacturer%	
MODEL: %model%		SERIAL #: %sensorSerial%	
REF SENSITIVITY: %refSens% ( %units%)			
Frequency (HZ)	Amplitude ( %vibunits%)	Sensitivity ( %units%)	Deviation relative to %refFreqHZ% Hz
%F1%	%A1%	%S1%	%D1%
%F2%	%A2%	%S2%	%D2%
%F3%	%A3%	%S3%	%D3%
%F4%	%A4%	%S4%	%D4%
%F5%	%A5%	%S5%	%D5%
%F6%	%A6%	%S6%	%D6%
%F7%	%A7%	%S7%	%D7%
%F8%	%A8%	%S8%	%D8%
%F9%	%A9%	%S9%	%D9%
%F10%	%A10%	%S10%	%D10%
%F11%	%A11%	%S11%	%D11%
%F12%	%A12%	%S12%	%D12%
%F13%	%A13%	%S13%	%D13%
%F14%	%A14%	%S14%	%D14%
%F15%	%A15%	%S15%	%D15%
%graph%			
Calibration Tech: %tech%		Test Date: %testdate%	

Figure 101. Example HTML keyword structure in table format

Example 2A:

```
<html>
  <table>
    <tr>
      <td>COMPANY: %company%</td>
    </tr>
    <tr>
      <td>MANUFACTURER: %manufacturer%</td><td>MODEL: %model%</td>
      <td>SERIAL #: %sensorSerial%</td>
    </tr>
    <tr>
      <td><b>Frequency</b></td><td><b>Sensitivity</b></td><td><b>Amplitude</b></td>
    </tr>
    <tr>
      <td>%F1%</td><td>%S1%</td><td>%A1%</td>
    </tr>
    <tr>
      <td>%F2%</td><td>%S2%</td><td>%A2%</td>
    </tr>
  </table>
</html>
```

Figure 102. Example of a simple HTML table structure

Example 2B:

COMPANY: %company%		
MANUFACTURER: %manufacturer%	MODEL: %model%	SERIAL #: %sensorSerial%
Frequency	Sensitivity	Amplitude
%F1%	%S1%	%A1%
%F2%	%S2%	%A2%

Figure 103. HTML table resulting from sample HTML table structure shown in Figure 98 above

Example 3:

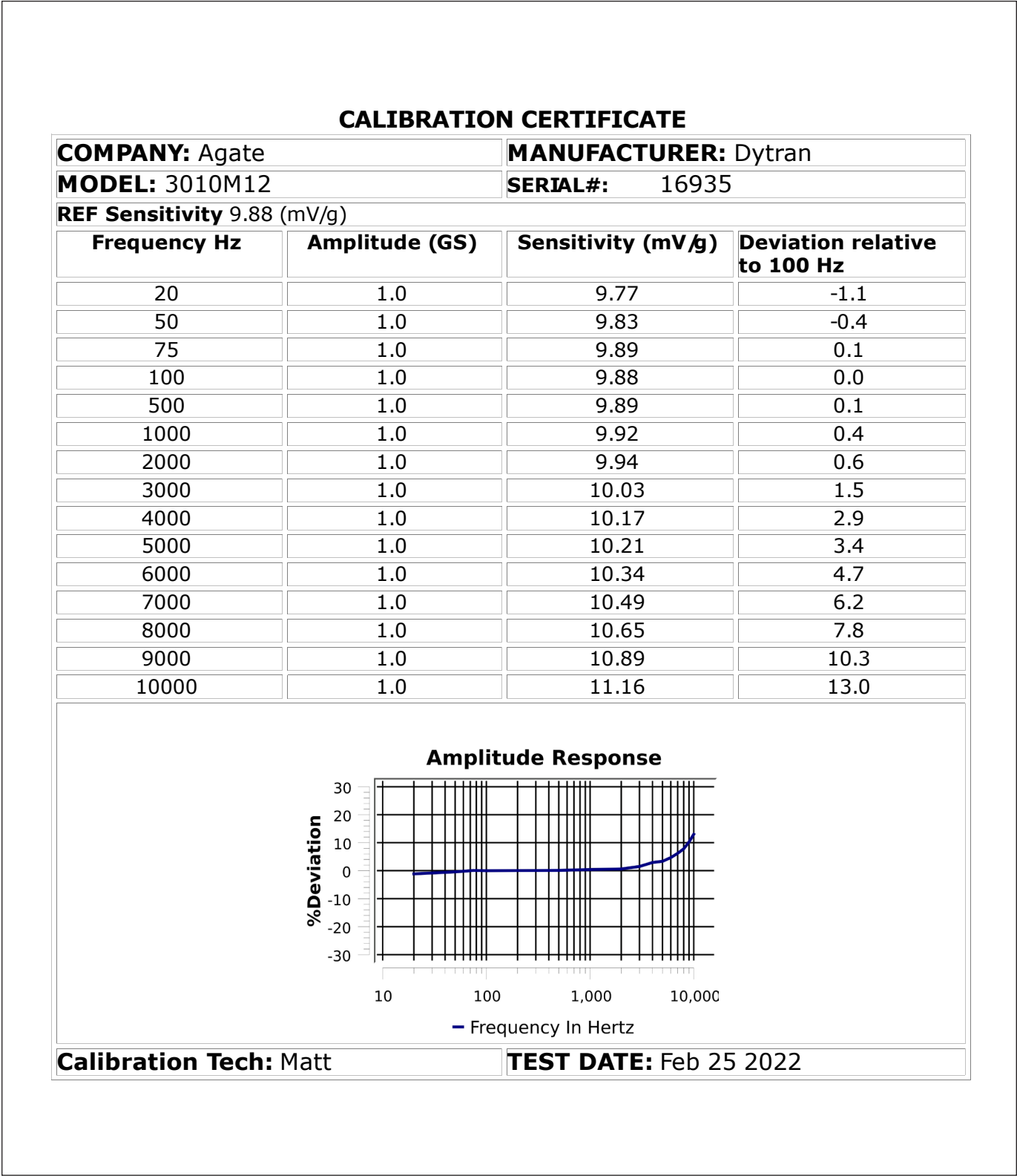


Figure 104. Custom PDF certificate example



# Declaration of Conformity

Application of Council Directive: 2014/35/EU

Standards to which conformity is declared:

EN61010-1:2010

Manufacturer's Name:

Agate Technology

Manufacturer's Address:

41743 Enterprise Circle N, 105B  
Temecula, CA 92592

Equipment Description:

Vibration Sensor Test Set

Equipment Class:

Class II

Model Number:

AT-2040 (Inclusive of AT-2035 & AT-2030)

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s):

Place:

Temecula, California, USA

Full Name (Printed):

Matthew Cornwell

Signature:



Position:

Product Manager



Figure 105. Custom PDF certificate example

Example 5:



# Declaration of Conformity

Application of Council Directive: 2014/30/EU

Standards to which conformity is declared:

EN61326-1: 2013  
EN55011 Class A Group 1  
EN61000-4-2  
EN61000-4-3  
EN61000-4-4  
EN61000-4-5  
EN61000-4-6  
EN61000-4-8  
EN61000-4-11

Manufacturer's Name:

Agate Technology

Manufacturer's Address:

41743 Enterprise Circle N, 105B  
Temecula, CA 92592

Equipment Description:

Vibration Sensor Test Set

Equipment Class:

Electrical Equipment Measurement  
Control & Laboratory Use – Industrial

Model Number:

AT-2040 (Inclusive of AT-2035 & AT-2030)

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s):

Place:

Temecula, California, USA

Full Name (Printed):

Matthew Cornwell

Signature:



Position:

Product Manager



Figure 106. Custom PDF certificate example

Product maintenance

Shaker Recalibration

Recalibration is recommended once per year.

Battery

Battery life averages five years. We will replace the battery for free, as needed, during recalibration. The battery can only be replaced at the Agate Technology factory. Third-party attempts to replace the battery will void the two-year limited warranty.

Service Notes

Service Performed:

☐ Recalibration

☐ Battery Replaced

Date: \_\_\_\_\_

Service Performed:

☐ Recalibration

☐ Battery Replaced

Date: \_\_\_\_\_

Service Performed:

☐ Recalibration

☐ Battery Replaced

Date: \_\_\_\_\_

Service Performed:

☐ Recalibration

☐ Battery Replaced

Date: \_\_\_\_\_

Service Performed:

☐ Recalibration

☐ Battery Replaced

Date: \_\_\_\_\_

Service Performed:

☐ Recalibration

☐ Battery Replaced

Date: \_\_\_\_\_

Operator notes

A2LA accreditation



Figure 107. AL2A accredited laboratory certification for Agate Technology



**AGATE TECHNOLOGY LLC**

41743 Enterprise Circle N. 105B  
Temecula, CA 92590

For the latest product news and insights, visit our website at [agatetechnology.com](https://agatetechnology.com).

For more information, call Agate Technology at 951-719-1032  
or email us at [info@agatetechnology.com](mailto:info@agatetechnology.com).

 [youtube.com/agatetechnology](https://youtube.com/agatetechnology)