AGATE TECHNOLOGY AT-2040 OPERATOR MANUAL

PORTABLE TRANSDUCER TEST SET

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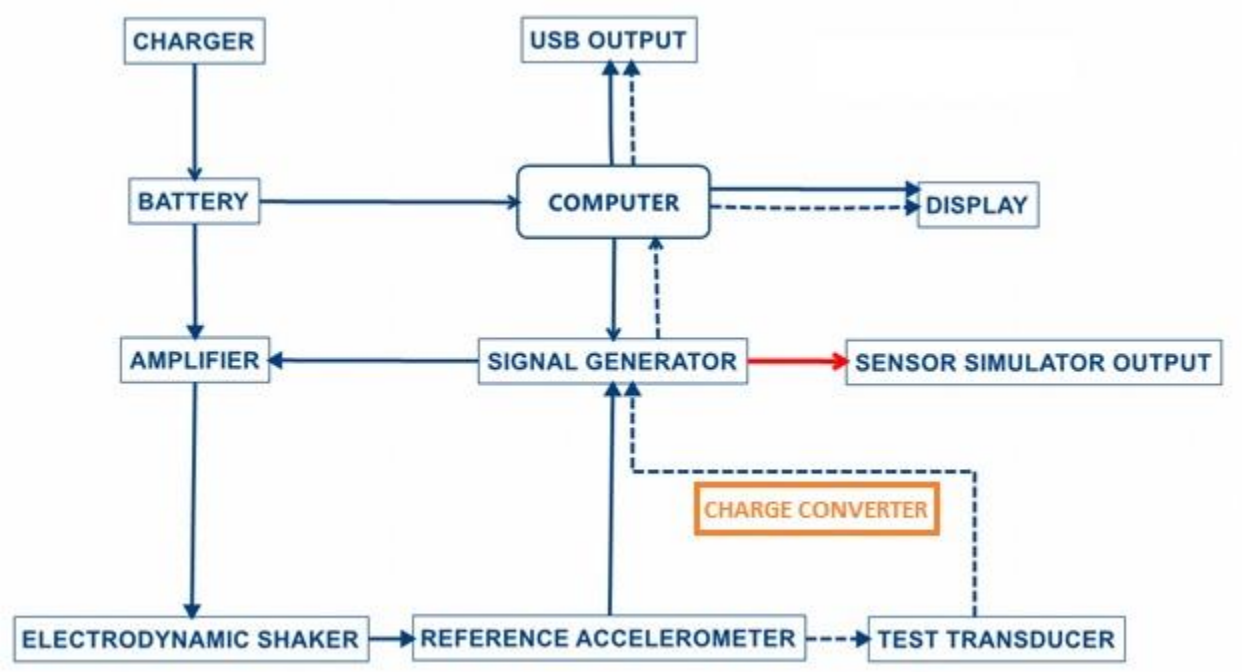
Introduction:

This manual is intended to inform the operating user on product specifications, setup, troubleshooting, and operation procedures on the AT-2040. The AT-2040 is designed as a rugged, completely self-contained, battery powered, vibration sensor test set. The AT-2040 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.

The AT-2040 consists of an internal charger, battery, main power amplifier, charge converter, electrodynamic shaker, NIST traceable reference, internal computer, signal generation board, and LCD screen display.



Block Diagram

Charger: Internal charger which operates between 110v and 220v for worldwide power support.

Battery: 6 Amp Hour, Sealed, Lead Acid 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.

Computer: 1 GHz Cortex-A8 processor, 512 MB DDR3 RAM, 20GB of storage memory included, with USB and network connectivity.

Charge Converter: For direct input of charge mode accelerometers

Signal Generation Board: Consists of multiple amplifiers and channels selectable by internal relays. This is categorized into three different applications.

1. **The Power Amplifier Output:** To control the vibration of the electrodynamic shaker at the amplitude and frequency set by the user.
2. **Input:** To read in sensitivity of multiple transducer types.
3. **Signal Generator:** To output a wide range of simulated voltage and current measurements.

LCD Screen: Color 4.3 inch LCD 480x272 resolution display with resistive touch screen.

Primary Functions of the AT-2040:

- **To shake or excite a transducer under test.**

  In shake mode, AT-2040 can be used as a variable frequency, variable amplitude shaker. In this mode, the frequency and amplitude are set manually by the user, while the computer provides high accuracy measurement signals.

- **To 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 AT-2040 can automatically determine test transducers sensitivity to a high level of accuracy.

- **To produce a NIST traceable calibration certificate.**

  Once the sensitivity has been calculated and saved across the test transducer's frequency range, the AT-2040 will produce a NIST traceable certificate and graph in PDF format. This certificate is stored into the computer's memory, or recalled and exported anytime to USB.

- **To simulate a transducer using a precision signal generator (function generator).**

The AT-2040 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.

Warnings on Shaker Operation

- AT-2040 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 has exceeded their acceptable ranges, the unit will issue a warning or shut down 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 shaker damage.

Note about battery operation:

AT-2040 is powered by one 6 amp hour, sealed lead acid, 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 plugins, payload weight, along with shaker driving force. In low power conditions, AT-2040 uses approximately 0.4 amps of power making it possible to achieve 13 hours of battery power. However, the unit will shut down premature to full discharge preventing damage and ensuring long term battery life. During long periods of high power consumption, AT-2040 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 based on the following voltage chart:

Voltage	State of Charge
12.6+	100%
12.5	90%
12.42	80%
12.32	70%
12.20	60%
12.06	50%
11.9	40%
11.75	30%
11.58	20%
11.31	10%
10.5	0%

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

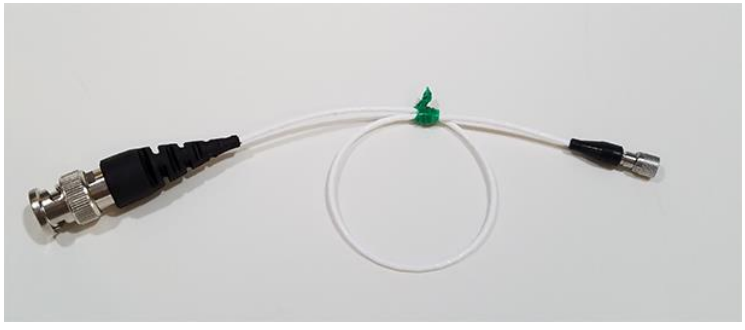
- For best results use the shaker when batteries are fully charged
- Automatic power management will automatically turn off before full battery discharge. This is a protective measure to ensure longer battery operating life.
- If deep discharge occurs, the battery charger is set to recharge over two or more days. This is normal operation to prevent battery damage.

Accessories:

The AT-2040 comes standard with the following accessories (pictured):

Short Handle Aluminum Wrench	(ACC-100)
¼-28 Stud	(MNT-104)
10-32 Stud	(MNT-105)
2-56 Adapter	(MNT-106)
6-32 Adapter	(MNT-107)
10-32 Adapter	(MNT-111)
Universal Velocity Mounting Adapter with ¼-28 mounting hex screw	(MNT-112)
Universal Accelerometer Mounting Adapter with ¼-28 mounting hex screw	(MNT-113)

5/32 Hex L-Wrench (ACC-101)



10-32 to BNC adapter cable for sensitivity measurement (CAB-100)

AC Power Cord 120v (PWR-100)

OR

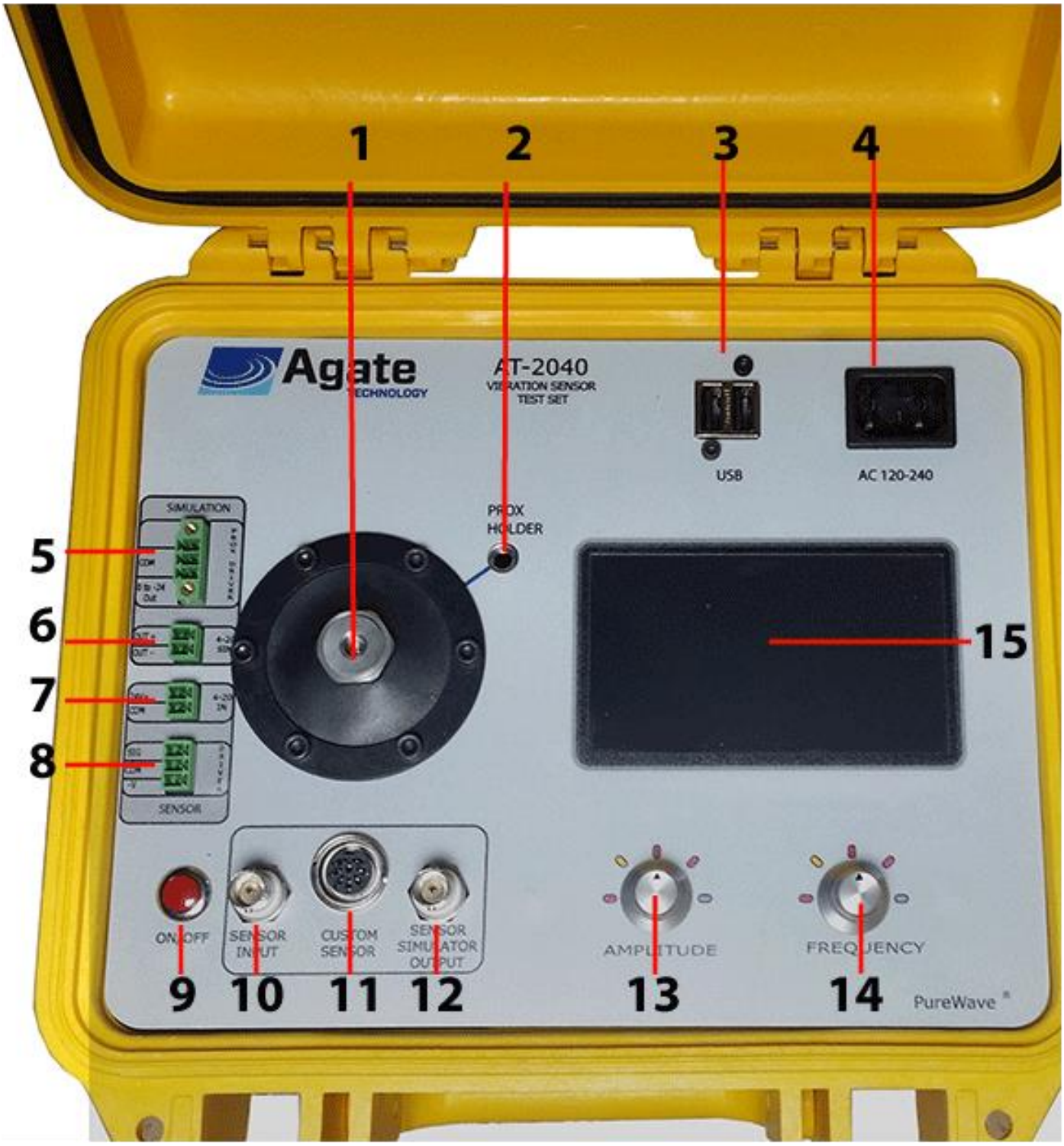
AC Power Cord 220-240v (PWR-101)

Optional Accessories Include:

Chadwick-Helmuth Velocimeter	(CAB-101)
IEPE Accelerometer 2 pin Mil	(CAB-102)
IEPE Accelerometer 3 pin Mil	(CAB-103)
Replacement studs 3 of each: 1/4-28, 10-32. Adapters 2-56, 6-32, 10-32	(MNT-100)
1/4-28 Adapter	(MNT-108)
Mounting Stud 1/4-28 to 8-32	(MNT-109)
Adapter 1/4-28M to 3/8-24F	(MNT-110)
Proximity Probe Adapter Kit	(PRX-100)
Proximity Probe Proximity adapters M6 to 3/8	(PRX-101)
Steel Target	(PRX-102)

**Custom made cables or platform mounts can be made to your specifications based on transducer sample or datasheet, please contact us for more information.*

PHYSICAL OVERVIEW:


1
2
3
4
Agate
TECHNOLOGY
AT-2040
VIBRATION SENSOR
TEST SET
USB
AC 120-240
PROX
HOLDER
SIMULATION
SENSOR
5
6
7
8
15
ON/OFF
SENSOR
INPUT
CUSTOM
SENSOR
SENSOR
SIMULATOR
OUTPUT
AMPLITUDE
FREQUENCY
9
10
11
12
13
14
PureWave

1) Reference adapter and mounting location for test transducers. ***ALWAYS*** use the short handle wrench provided, otherwise twisting force will be applied directly to the electrodynamic shaker.

2) Proximity probe mounting location – Sold as an addon accessory.

3) Dual USB port for data transfer or accessory power.

4) 120-240 plug in for plug provided with the unit.

5) Proximity probe simulation plugin – capable of providing a test signal between 0 and -24 volts.

6) 4-20Ma simulation plugin – capable of providing a test signal between 4 and 20 Milliamps.

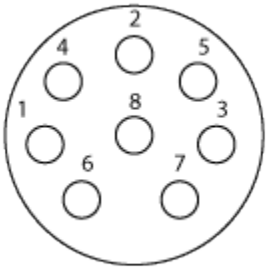
7) Input for sensitivity test of 4-20ma transducers and vibration transmitters.

8) Proximity probe driver input for radial and axial measurement. (Includes built-in -24v power for driver.)

9) Push button On/Off switch.

10) BNC Sensor input sensor for sensitivity test. Supports Charge, IEPE, Proximity Probes and Velocity sensors.

11) Custom Sensor In/Out – See rear view pinout diagram.



1) Charge.
2) Ground.
3) 5-10 Volt output (adjustable).
4) Channel A – Input for transducers that provide voltage outputs.
5) Channel B- Triax.
6) Channel C – Triax.
7) Test Signal.
8) Displacement input.

12) BNC Sensor Simulator Output; Simulates a variety of transducer types using adjustable voltage and supply currents. Types include the following: IEPE charge, -24 Proximity Probe, 4-20ma supply.

13) Amplitude adjustment button, also serves as back button when pressed.

14) Frequency adjustment button, also serves as select button when pressed.

15) Color, resistive touch screen.

Software Update Installation:

AT-2040 features software update support to load in sensor information, custom databases, bug fixes, software add-ons and more.

1) To update your unit to the most current software visit www.agatetechnology.com/upgrade
2) Load the program Agate.up onto your USB drive and insert into the unit with power off.
3) Power on the AT-2040 device and wait for the upgrade prompt.
4) Select “Yes” to upgrade and the software will begin to unpack and install.
5) When completed remove the USB stick and AT-2040 will automatically restart.

Operations:

- Powering the unit on and off:
    - Press and Hold the red On/Off switch for 1 second, the unit will begin its startup sequence.
    - Press and hold the red On/Off switch for 5 seconds. When the screen turns blank, the unit has powered down.

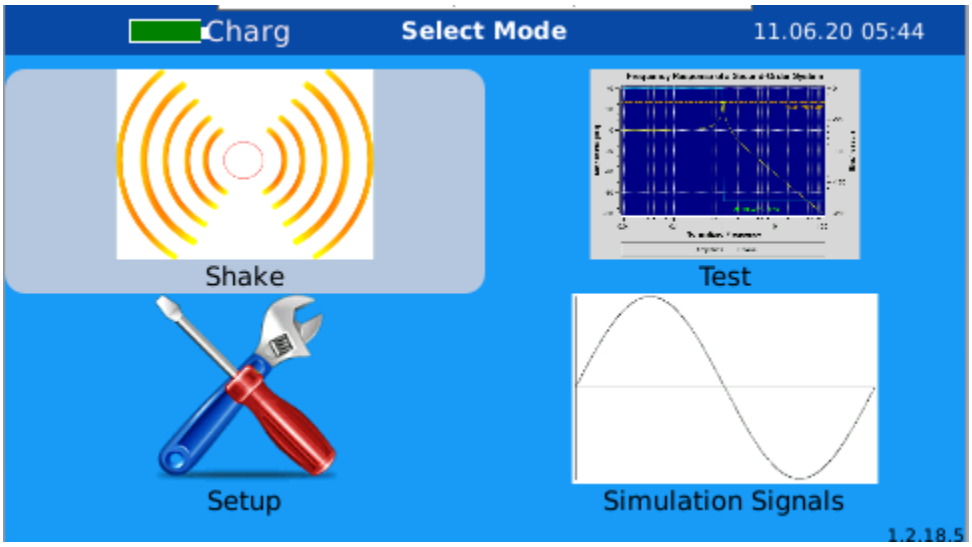
Main Menu:

Main Menu	
Shaker Button	• Manual Shake Screen

Sensitivity Test Button	• Auto or Manual Test Selection Screen
	  ○ Manufacture Selection Menu
	  ○ Sensor Selection Menu
	  ○ Review
	  ○ Auto Test
	  ▪ Graph View
	  ▪ Table View
	  ▪ Shake View
	• Manual Test Screen

Setup Button	• Time and Time Zone • Screen Timeout • User and Company Configuration • Recall Previous Test ○ Export PDF to USB • Impact Sensor Information • Set Screen Contrast • About With Software Disclaimer

Simulation Button	• Manufacture Selection Menu
	  ○ Sensor Selection Menu
	  ○ Review Setup
	  ○ Run



The main selection menu is split into four subsections:

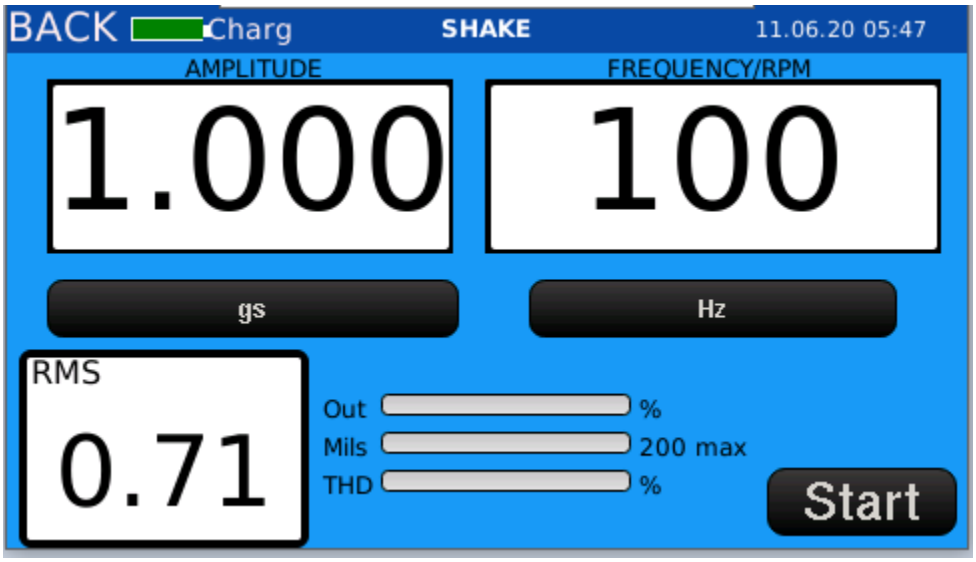
Shake: To manually test a transducer or equipment by only using variable frequency and amplitude.

Test: To test transducer sensitivity, by either manual adjustment or automatic plot.

Setup: Customize AT-2040 options to your preferences.

Simulation: Simulate the signal of a transducer.

Shake:



To manually test a transducer or equipment by only using variable frequency and amplitude:

Step 1) From the main screen: Select “Shake”

Step 2) 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.

From this screen you will be able to adjust frequency and amplitude. Press down on the frequency knob or select from the touch screen to begin.

Tap the units bar on the left side under the amplitude to change units.

Tap on the right side to change between Hz and RPM

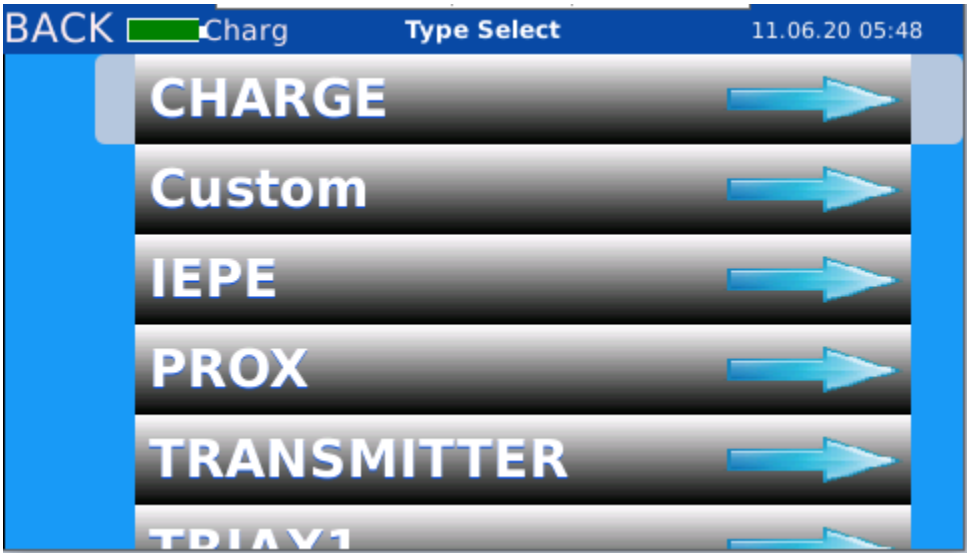
As the AT-2040 is adjusted the three vertical bars will indicate its status.

OUT: The percentage of maximum output supplied by the main amplifier.

THD: Total Harmonic Distortion.

Mils: Displacement range of the electromagnetic shaker in mils.

Test:



To test sensor sensitivity first select manual or automatic mode.

If manual mode is selected, a sensitivity screen is displayed with manual frequency and amplitude adjust. The transducer sensitivity is displayed in the lower right.

If automatic mode is selected, AT-2040 will display the list of included sensor specs from the built in library.

Step 1) Select the Manufacture

Step 2) Select your sensor from the Manufacture list.

Step 3) Review specs such as weight and sensitivity to make sure your sensor matches.

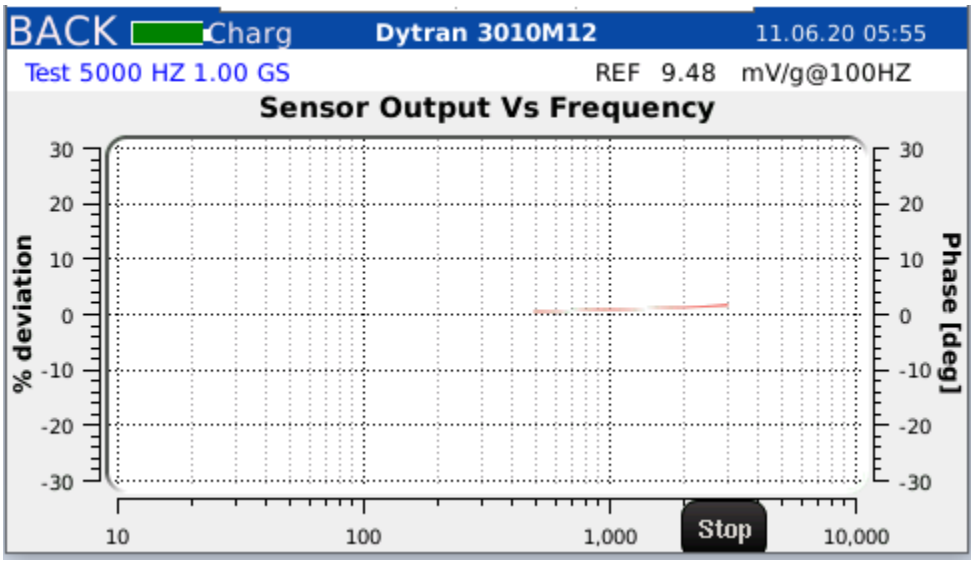
Step 4) Test: From here your sensor will be automatically stepped through the predetermined plot points and graphed. Afterwards, the certification can be saved into memory and exported to USB in PDF format.

While the auto test is running, the shaker will change the test colors from Red to Blue to Green. This signifys the following:

Red: Starting

Blue: Testing

Green: Completed



Setup:

The setup menu consists of multiple options to accommodate user preferences. This is where you will be able to export to USB and select the following:

- Date and Time Zone.
- Screen Time Out.
- User and Company Names.
- Calibrate Touch Screen
- Setup the network

To recall a previous test and save PDF to USB:

***** IMPORTANT NOTE: YOU MUST POWER ON AT-2040 WITH THE USB STORAGE DEVICE INSERTED INTO THE USB HUB TO SAVE A RECORD. OTHERWISE AT-2040 WILL NOT BE ABLE TO LOAD THE USB DRIVER. IF YOU ARE HAVING PROBLEMS WITH AT-2040 READING YOUR DEVICE RESTART THE UNIT WITH THE DEVICE PLUGGED IN.**

1) In setup menu, Select PDF. This will bring you to the Test Review menu where you may delete or export your previous test.

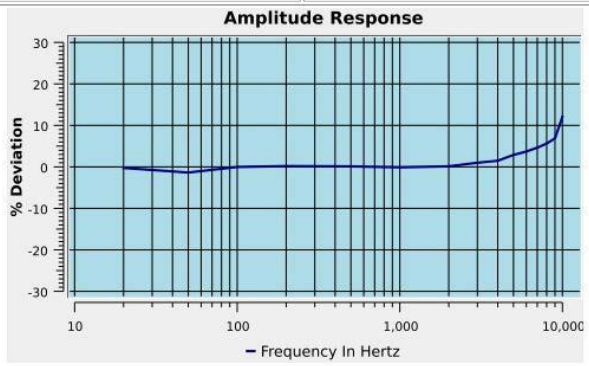
2) Select the test record that you wish to transfer to USB by checking the box to the left of the sensor save. From here, you may export to CSV or create a PDF certificate. If you wish to delete this record, select the delete button.

You will be notified of a successful export by “Save Complete.” You can then remove the USB and review your test.

CALIBRATION CERTIFICATE

ACCELEROMETER

COMPANY: acme inc			
MODEL: 3010M12		SERIAL#: 1233	
FREQUENCY RESPONSE			
FREQUENCY(HZ)	SENSITIVITY (units)	FREQUENCY (HZ)	SENSITIVITY(units)
20	9.9	2000	10.0
50	9.8	3000	10.1
100	10.0	4000	10.1
200	10.0	5000	10.3
500	10.0	6000	10.3
1000	10.0	7000	10.4
REF Sensitivity (units) 9.97077			



CALIBRATION TECH: matt	TEST DATE: Mon Sep 12 03:13:18 2016

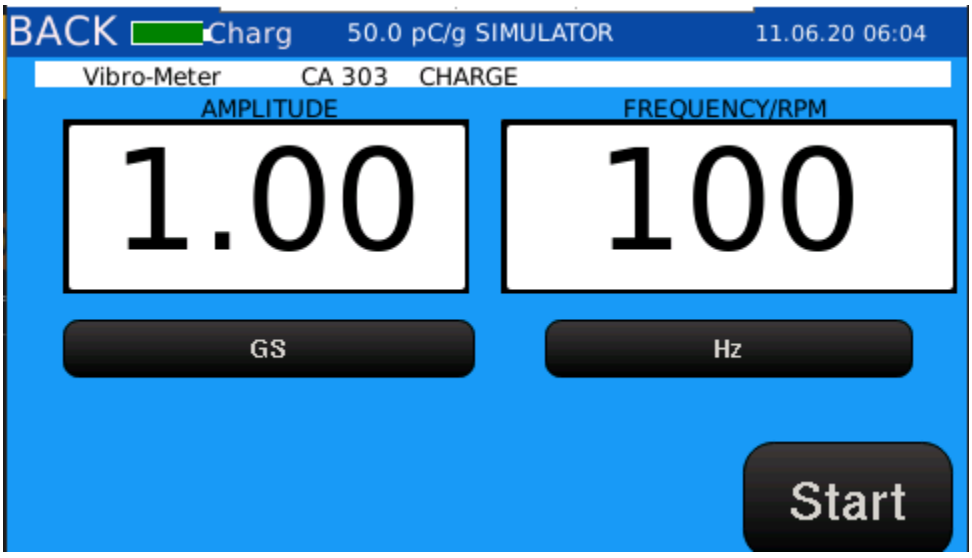
1 – Sample of Generated Report

Simulation:

AT-2040 has the ability to simulate a transducer signal without the actual sensor being present.

Step 1) Select the sensor manufacture from the built in library

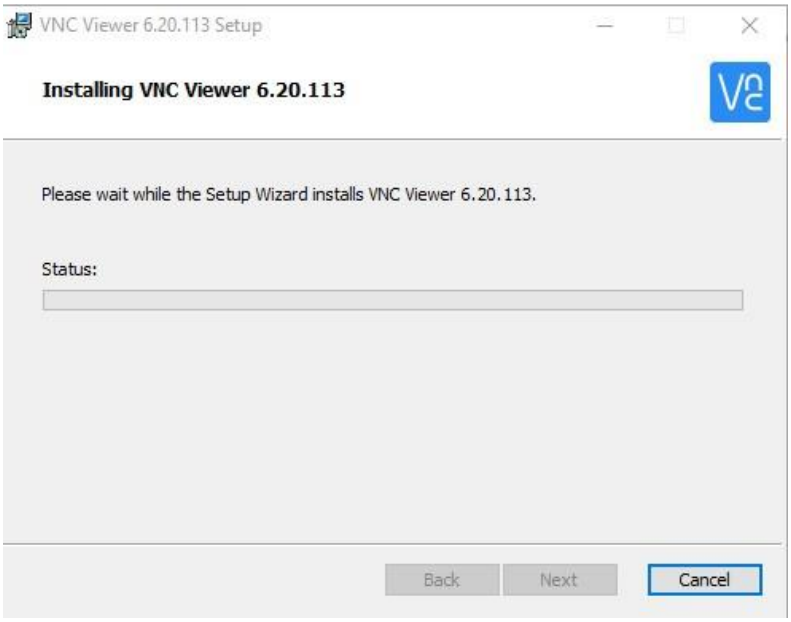
Step 2) Select the transducer to be tested from the manufacture list.



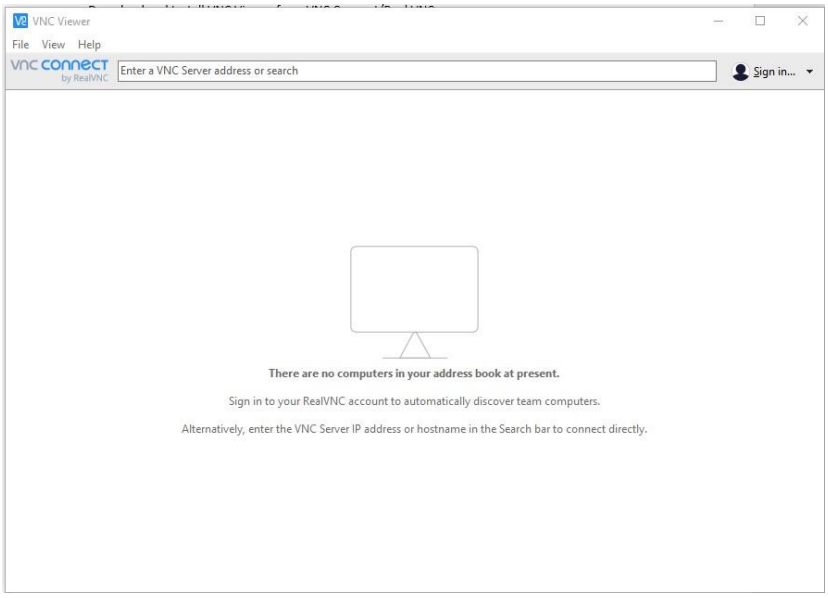
Controlling the shaker from a remote location:

Step 1) Download and Install VNC Viewer from VNC Connect/Real VNC.

https://www.realvnc.com/en/connect/download/viewer/

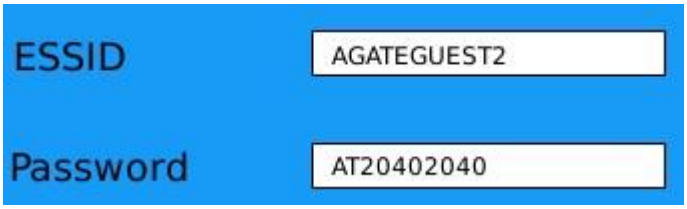


Step 2) Start VNC Viewer



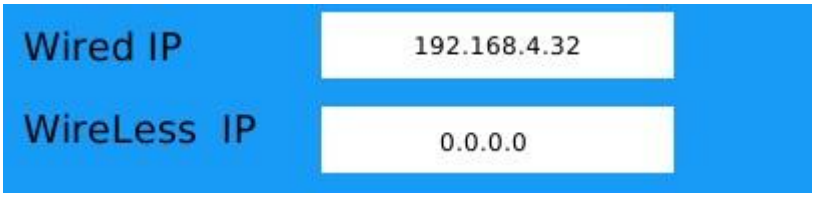
Optional Step When Connecting Wirelessly: Enter the ESSID and Password as shown:

Skip this step if connecting by hard wire ethernet

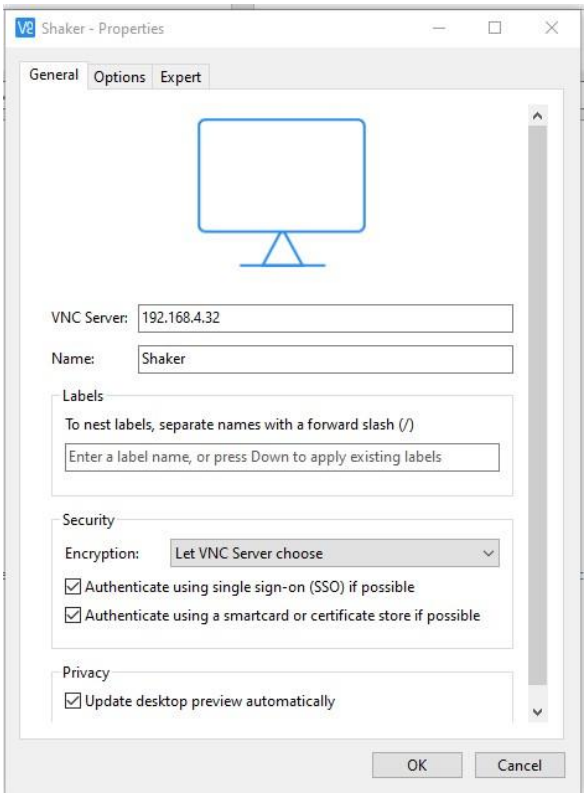


Make sure the wireless adapter is connected and restart the unit.

Step 3) Identify Shaker IP address. This can be found under the network menu as displayed below:



Step 4) From the main menu in VNC viewer, select File -> New Connection



Complete the login setup by filling out the correct IP address.

Note: There is no login or password.

Step 5) VNC is connected and shaker available to be controlled on remote computer.

Additional Information

Maximum weight recommendation chart:

Frequency	0-100 Grams	100-250 Grams	250-500 Grams	500-750 Grams
10-100 Hz	10g's	4g's	2g's	1g
100-1000 Hz	7g's	4g's	2g's	1g
1000-10000 Hz	3g's	1.5g's	0	0

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: _____

Full Name (Printed): _____

Signature: Matt Cornwell

Position: _____

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: _____

Full Name (Printed): _____

Signature: Matt Cornwell

Position: _____