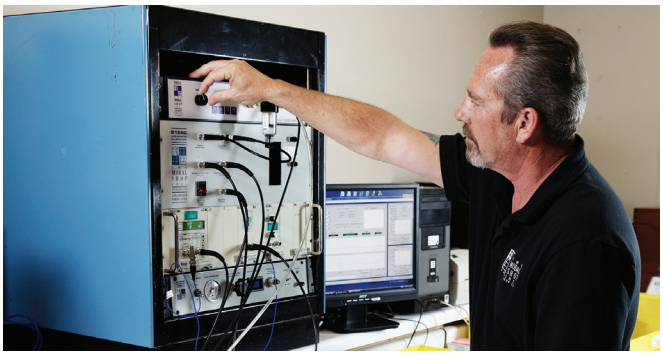
THE MODAL SHOP
AN AMPHENOL COMPANY



MODEL **9155**

PRECISION SENSOR CALIBRATION WORKSTATION

- Assures accurate, NIST and/or PTB traceable calibrations
- Stepped sine controller optimized for precision and throughput
- Turnkey system includes all necessary components
- Setup tests, acquire data, save results, and print reports quickly
- Define multiple pass/fail criteria for each test and automatically recall them from the internal database
- Print customizable ISO compliant certificates
- Configurable system fits range of applications
- Calibrate up to 200 frequencies
- Local language software via languages database

PRECISION, RELIABILITY, USABILITY

The Precision Sensor Calibration Workstation Model 9155 delivers accurate back-to-back comparison calibration of ICP® (IEPE), charge mode, and piezoelectric accelerometers in accordance with ISO 16063-21: 2003 (accelerometers), ISO 16063-22: 2005 (shock accelerometers) and/or IEC 61094-5 (microphones). Options to calibrate piezoresistive, capacitive, velocity, 4-20 mA, visual output (meters), and dynamic pressure sensors are also available. A range of acoustic, vibration, and shock exciter options bring you a wide scope of capabilities. Each system provides all the necessary components 'out-of-the-box' – from precision actuators to state-of-the-art data acquisition hardware paired with a Windows® PC software controller.

Benefits of the Model 9155 form in two areas: conformance to existing standards and automation of the calibration task under ISO 16063-21 and/or IEC 61094-5. Hardcopy printed calibration certificates fulfill the requirements of ISO 17025. The automation afforded by the easy-to-use Windows software provides for simplified calibration procedures, as test parameters are stored and recalled automatically for each sensor under test (SUT). This makes for 'hands-off' operation once the sensor is mounted. With a typical cycle time of one minute per axis, the 9155 System is an efficient and reliable tool. Use of a dedicated exciter provides a high quality vibration environment for accurate calibrations. ISO 16063-21 outlines the back-to-back configuration for vibration sensors and IEC 61094-5 the comparison method for microphones. In these the SUT and the reference accelerometer or microphone are subjected to identical input accelerations or sound pressure levels. Consequently, the ratio of the two transducers' sensitivities is simply the ratio of their measured outputs. A comparison is performed by the control software, while obtaining the measured outputs at every frequency.

CE

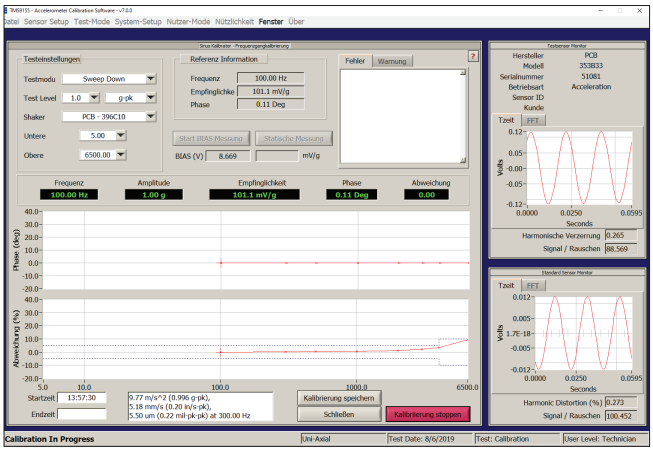
ELEGANT USABILITY

SOFTWARE TO AUTOMATE AND MANAGE DATA

The 9155 software serves as the central hub of each 9155 Calibration System. It controls system hardware and acquires data for the wide range of SUT's. This common user interface reduces customer training costs by providing a familiar experience for test setup, data management, and report generation. This familiar interface also allows operators to focus on the intricate details of SUT mounting and operation, reducing the risk of procedural errors.

- Clearly defines Pass/Fail criteria for each sensor type
- Database of sensor specifications (including free field and random field corrections for microphones) and test requirements automate system setup
- Customizable printed calibration certificates comply with ISO 17025 and ISO 16063-21 requirements
- Retrieve and archive calibration data in SQL compliant database
- Reports calibration data in English or metric units
- User definable reference frequencies
- Extensive language database for local language support

In addition, the vibration sine controller in the 9155 software has been optimized for the particular stepped sine test technique. Rather than modifying a general purpose shaker controller algorithm, the 9155 has been optimized for calibration precision and increased throughput.

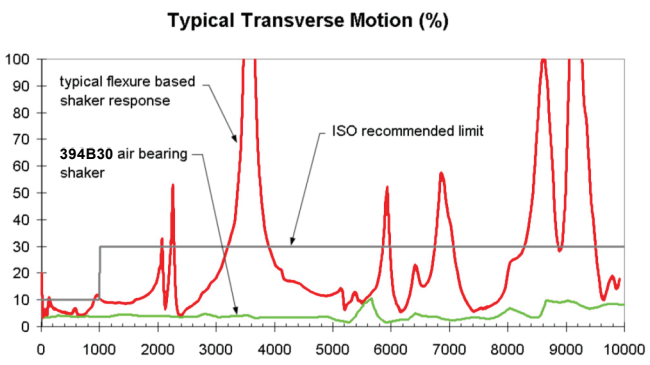


9155 software interface is localized for translation in any language/character set.

PRECISION, RELIABILITY, AND USABILITY IN VIBRATION CALIBRATION

Over 20 years ago, PCB realized that our accelerometers were only as good as their calibration after manufacturing. We committed to implementing air bearing shakers for sensor calibration – seeking the benefits of reduced transverse motion, repeatability, and precision. PCB experimented with the best air bearing shakers available. We quickly learned the tedious adjustments required by those shakers' elastomer suspension bands were suited for research experiments, rather than regular day-to-day use. The only solution was to develop our own calibration shaker.

A Ph.D led design team at PCB developed and introduced the Lorentz force DC coil for static suspension of the shaker armature. After deploying the design to our production line, we committed to countless redesign iterations as every facet of the shaker was exposed unprecedented usage. The result is a well vetted, highly reliable solution used around the globe. The 9155 System offers vibration calibration to 15 kHz with the 9155D-830 and to 20 kHz with the 9155D-831.



SYSTEM OPTIONS TO SIMPLIFY TESTING

HIGH FREQUENCY VIBRATION
MODEL 9155D-830/831

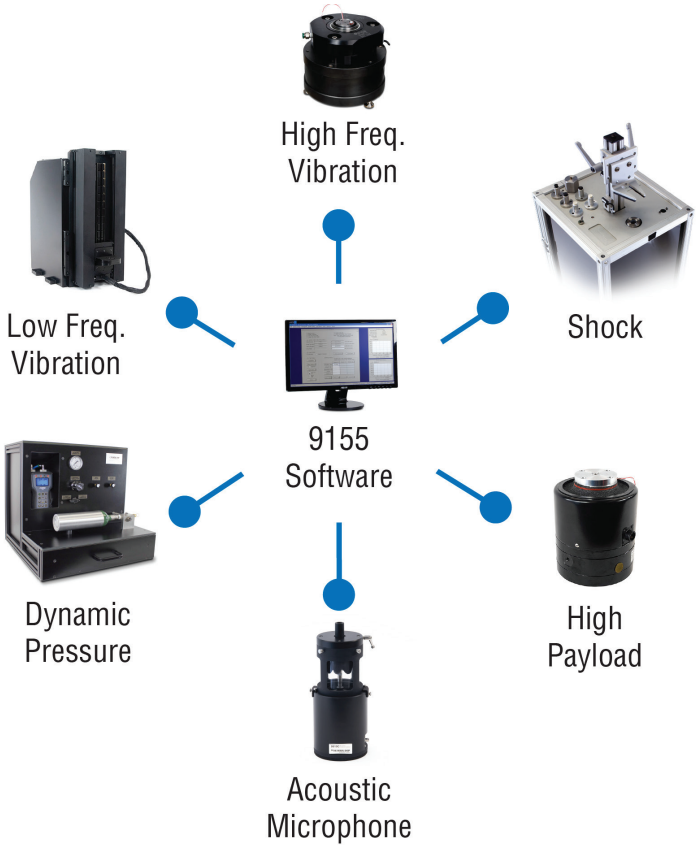
- Air-bearing exciter eliminates transverse motion
- Internal reference accelerometer mounted resonance > 70 kHz
- 9155D-830 5 Hz to 15 kHz
  9155D-831 5 Hz to 20 kHz

LOW FREQUENCY VIBRATION
MODEL 9155D-779

- Extends low frequency calibration data to 0.1 Hz
- Adds precision air-bearing long stroke shaker

DYNAMIC PRESSURE
MODELS 9155D-903, -907, -913, -905

- Low (150 psi, 1 MPa), Medium (1000 psi, 6.8 MPa), High (15 000 psi, 103 kPa), and Ultra High (80 000 psi, 550 MPa) pressure versions available
- Reproduce PCB factory calibration techniques



ACOUSTIC MICROPHONES
MODEL 9155D-919

- Comparison Calibration per IEC 61094-5
- Calibrate from 20 Hz to 20 kHz
- Calibrates both condenser and array microphones with or without removing grid cap

VISUAL OUTPUT METERS
MODEL 9155D-680

- Calibration of sensors with visual output, such as vibration meters
- Supports both velocity and acceleration

SHOCK
MODEL 9155D-525

- Provides calibration and linearity check from 20 g to 10,000 g^{pk}
- Pneumatically actuated exciter provides controlled and consistent impacts
- Stand-alone version available as Model 9525C PneuShock™

A PARTNER IN YOUR CALIBRATION

While a reliable product ensures its longevity as part of your process, usability makes it a tool rather than a hindrance. From software designed to simplify calibrations axis after axis, to a typical cycle time of one minute, the 9155 Calibration System is an ideal calibration solution.

At the core, our sister company PCB Piezotronics is a sensor company focused on delivering the very best accelerometers, microphones, and pressure sensors available. With high-powered users of our own systems in PCB Piezotronics facilities across the globe, utilizing The Modal Shop's systems each day, we've been able to maintain a high standard of user friendly functionality with regular feedback from technicians and engineers. This, coupled with the vetting by use in our high-volume production facilities, allows us to deliver a proven system and the best possible user experience to you.

SPECIFICATIONS

Performance	
Frequency Range, Accelerometers	5 Hz - 15 kHz with 9155D-830 Air-Bearing Shaker 5 Hz - 20 kHz with 9155D-831 Air-Bearing Shaker 0.5 Hz - 500 Hz with 9155D-771 Low Frequency Shaker 0.1 Hz - 500 Hz with 9155D-779 Low Frequency Shaker 20 g – 10 000 g with 9155D-525 PneuShock
Pressure Range, Dynamic Pressure	Up to 150 psi with 9155D-903 Low Pressure Up to 1000 psi with 9155D-907 Medium Pressure Up to 15 000 psi with 9155D-913 High Pressure Up to 80 000 psi with 9155D-905 Ultra High Pressure
Frequency Range, Acoustic Microphones	20 Hz to 20 kHz with 9155D-919 Calibrator
Sensors Supported	Acceleration, Velocity, Dynamic Pressure, Acoustic Microphones, Visual Output Meters, Impact Hammers
TEDS Sensor Support	IEEE 1451.4, IEEE P1451.4
Calibration Data Management	Yes
Automatic pass/fail Classification	Yes
Measurement Units	English, Metric

Core System - Choose Options from Sections A and B to Complete the System	
9155D	Calibration software, Data acquisition hardware, PC, keyboard, mouse, monitor, printer, Various mounting adaptors, System verification sensor, Database software, Uncertainty budget procedure, On-site installations and training

A - Signal Conditioning Options	
9155D-442	**Basic ICP Signal Conditioning.** Adds signal conditioner for ICP and charge mode sensors.
9155D-443	**Dual-mode Charge Amplifier.** Computer control and automated switching between ICP and charge mode sensors.
9155D-445	**Capacitive Sensor Signal Conditioning.** Adds signal conditioner for capacitive sensors.
9155D-478	**Piezoresistive Signal Conditioning.** Adds support for piezoresistive sensors. Includes PCB 478A30 signal conditioner.

B - Vibration, Shock, Acoustic, and Pressure Exciter Options	
9155D-525	**Shock Calibration.** Provides for verification of shock accelerometers from 20 g to 10 000 g.
9155D-575	**Laser Primary Calibration.** Adds primary calibration capability as specified in ISO 16063-11.
9155D-771	**Low Frequency (0.5 Hz – 500 Hz).** Long stroke shaker with SmartStroke™ technology and accelerometer reference sensor.
9155D-779	**Low Frequency (0.1 Hz – 500 Hz).** Long stroke shaker with SmartStroke™ technology, accelerometer and optical reference sensors.
9155D-830	**K394B30 Air-Bearing Shaker.** Adds precision air-bearing shaker 5 Hz – 15 kHz.
9155D-831	**K394B31 Air-Bearing Shaker.** Adds precision high-frequency air-bearing shaker 5 Hz – 20 kHz.
9155D-875	**High Payload Calibration Shaker.** Offers a useable frequency range of 5Hz to 10kHz for heavy payload transducers.
9155D-903	**Low Pressure**. Step function pulse calibrator to dynamically calibrate pressure transducers up to 150 psi (1 MPa).

SPECIFICATIONS (CONTINUED)

9155D-905	**Ultra High Pressure**. For dynamic pressure measurements up to 80 000 psi (550 MPa).
9155D-905 +AUTO	**Automated Ultra High Pressure**. Auto drive/valve control function offers dynamic pressure measurements up to 80 000 psi (550 MPa).
9155D-907	**Medium Pressure**. Aronson step pressure calibrator for dynamic pressure calibrations up to 1000 psi (6.9 MPa).
9155D-910	**Acoustic Microphone Support.** Provides IEC 61094-5 Comparison Method With Acoustic Field Correction (Free Field, Random Incidence)
9155D-913	**High Pressure**. Impulse calibrator for dynamic pressure calibrations up to 15 000 psi (100 MPa).
9155D-919	**Acoustic Microphones.** IEEE 61094-5 comparison calibration of microphones from 20 Hz to 20 kHz.

Additional Options	
9155D-100	**19 in Rack Integration.** Approx. 36.5 in H x 21.75 in W x 26 in D [93 cm x 55 cm x 66 cm]. Integrates components in 19 in rack.
9155D-120	**Shaker Mount.** Provides wood pedestal to support calibration shaker. Requires user to fill with sand (not included).
9155D-160	**Tool Kit.** Includes torque wrench, screwdrivers, crescent wrenches, toolbox, etc.
9155D-350	**Calibration Label Printing.** Provides automatic calibration label printing using a Zebra thermal transfer label printer.
9155D-400	**TEDS Sensor Support.** Provides for automatic update of TEDS sensors. Requires 9155D-443 option.
9155D-501	**Linearity.** Provides for multipoint sensor linearity checks via sinusoidal vibration up to 40 g.
9155D-550	**Resonance Check.** Provides for resonance check of accelerometers up to 50 kHz.
9155D-600	**Velocity Sensor Calibration.** Allows calibration of velocity sensors. Reports data in velocity units.
9155D-650	**4-20 mA Velocity Sensor Calibration.**
9155D-680	**Visual Output Sensor Calibration.** Software only option supporting sensors with visual output, such as vibration meters.
9155D-901	**Environmental Monitoring Option.** Includes calibrated external temperature, humidity and pressure gauge.
9155D-961	**Hammer Calibration.** Allows calibration of instrumented impact hammers, includes 9961C cal fixture

GLOBAL CALIBRATION SUPPORT TEAM

- Amphenol Advanced Sensors, St. Marys Pennsylvania
- PCB Headquarters, Depew, New York
- TMS Headquarters, Cincinnati, Ohio
- Worldwide PCB and Distributor Locations

For information on offices in your region, visit modalshop.com/sales

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