

## ACCELEROMETER CALIBRATION WORKSTATION



9155 system shown with Rack Integration option (9155D-100), Signal Conditioning options (9155D-443, -445, -478) and Air-bearing Shaker System (9155D-830)

The Accelerometer Calibration Workstation Model 9155 features accurate back-to-back comparison calibration of ICP® (IEPE), and charge mode piezoelectric accelerometers in accordance with ISO 16063-21 (2003). The 9155 system can also calibrate piezoresistive, capacitive, and velocity sensors via available options. Other configurations offer automated TEDS sensor updating, linearity checking, low frequency calibration down to 0.1 Hz, shock calibration, and a host of shaker options.

Benefits of the Model 9155 form in two areas: conformance to existing standards and automation of the calibration task under ISO 16063-21. Hardcopy printed calibration certificates fulfill the requirements of ISO 17025 (2005).

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 accelerometer. This makes for 'hands-off' operation once the sensor is mounted.

The 9155's use of a dedicated exciter provides a high quality vibration environment for accurate calibrations. ISO 16063-21 outlines the back-to-back configuration in which the Sensor Under Test (SUT) and the Standard Reference Accelerometer are subjected to identical input accelerations. 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.

The 9155 system is a turnkey solution, providing all necessary components 'out-of-the-box'. Principal components of the 9155D system are the Windows PC controller, automated user software, printer, and data acquisition hardware. Additional options configure the system with proper accelerometer signal conditioning, calibration grade shaker, power amplifier and reference accelerometer.

### BENEFITS:

- Assures accurate, NIST and/or PTB traceable calibrations
- Calibration typically performed in under a minute per axis
- Turnkey system includes all necessary components
- Windows PC supplies familiar, intuitive user interface
- Setup tests, acquire data, save results, and print reports quickly with precision and automation
- Define multiple pass/fail criteria for each test and automatically recall them from the internal database
- Prints customizable ISO compliant certificates
- Automates calibration procedures
- Customizable system fits any application or need
- Calibrates up to 200 frequencies

## FLEXIBLE AND SIMPLE SOFTWARE SOLUTION

As a crucial part of the Model 9155 Accelerometer Calibration Workstation, the Windows XP® or Vista® compatible control software has been designed to provide accurate calibrations and an easy-to-use graphical user interface, based on the 40+ years of accelerometer manufacturing experience and over 1,000,000 calibrations performed at PCB Piezotronics.

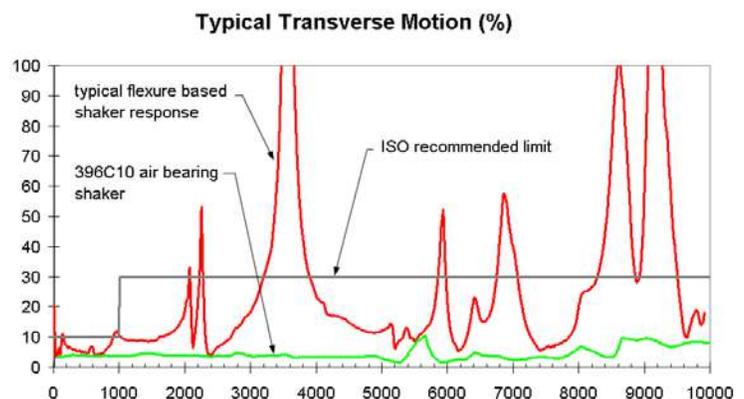


### FEATURES:

- Clearly defines Pass/Fail criteria for each sensor type
- Database of sensor specifications and test requirements automate system setup
- Printed calibration certificates comply with ISO 17025 and ISO 16063-21 requirements and can be customized to user's requirements
- Software automatically updates TEDS sensors with new calibration data (option 9155D-400)
- Phase measurement calibration provides additional confidence in sensors
- Retrieve and archive calibration data in SQL compliant database
- Export calibration data for third party systems (MET/TRACK, etc.)
- Reports calibration data in English or metric units
- User definable reference frequencies

## STATE-OF-THE-ART CALIBRATION EXCITER: OPTION 9155D-830/831

- Ensures conformance to ISO 16063 recommendations on transverse motion
- Reduces uncertainty due to transverse resonance
- Many flexure based exciters add 2% additional uncertainty at resonance
- Drastically improves over calibration shakers with flexure designs
- Simplifies sensor mounting & increases reliability over competitive air bearing designs



# OPTIONS AVAILABLE

## **Air-bearing Exciter** MODEL 9155D-830/831



- Porous ceramic air-bearing eliminates transverse motion
- Internal reference accelerometer mounted resonance > 70 kHz
- 9155D-830 5 Hz to 15 kHz,  
9155D-831 5 Hz to 20 kHz

## **Ultra-low Frequency** MODEL 9155D-779



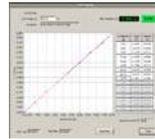
- Extends low frequency calibration data to 0.1 Hz
- Adds precision air-bearing long stroke shaker

## **Resonance Test** MODEL 9155D-550



- Accurate, automated resonance search testing up to 50 kHz
- Requires either 9155D-830 or 9155D-831 air-bearing shaker

## **Linearity Check** MODEL 9155D-501



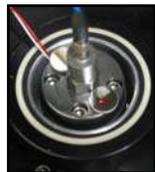
- Up to 40 g<sub>pk</sub> with air-bearing shaker
- Seamless and efficient transition from frequency sweep to linearity check

## **Shock Calibration** MODEL 9155D-525



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

## **Laser Primary Calibration** MODEL 9155D-575



- Provides primary calibration capability meeting the performance requirements specified in ISO 16063-11(1999) Method 3
- Direct demodulation of doppler laser signal assures low measurement uncertainty

## SENSOR SIGNAL CONDITIONING OPTIONS

### **TEDS Sensor Support** MODEL 9155D-400

- Provides seamless, automatic updates to TEDS sensor upon calibration, supporting both IEEE 1451.4 and P1451.4 formats (requires 9155D-443)

### **Basic ICP Signal Conditioning** MODEL 9155D-442

- Integrates PCB model 442A102 ICP® sensor signal conditioner

### **Dual-mode Charge Amplifier** MODEL 9155D-443

- Integrates PCB model 443B101, laboratory-style precision charge amplifier for automated computer controlled gain

### **Capacitive Sensor Signal Conditioning** MODEL 9155D-445

- Integrates PCB Model 445A101 capacitive sensor signal conditioner with selectable gain of x1, x10 and x100

### **Piezoresistive Signal Conditioning** MODEL 9155D-478

- Integrates PCB Model 478A30 with simple push button controls to support 1/4, 1/2 and full bridge piezoresistive accelerometers



# MODEL 9155

## 9155 SPECIFICATIONS:

Frequency Range	5 Hz - 15 kHz with 9155D-830 Air-Bearing Shaker Option 5 Hz - 20 kHz with 9155D-831 Air-Bearing Shaker Option 0.5 Hz - 500 Hz with 9155D-771 Low Frequency Shaker Option 0.1 Hz - 500 Hz with 9155D-779 Low Frequency Shaker Option
Typical Measurement Uncertainty <sup>1,2</sup>	2.0% (5-10 Hz) 1.2% (10 - 100 Hz) 0.8% (100 Hz) 1.0% (100 - 1,000 Hz) 1.4% (1,000 - 5,000 Hz) 1.9% (5,000 - 10,000 Hz) 2.2% (10,000 - 15,000 Hz) 2.8% (15,000 - 20,000 Hz)
Calibration Run Time	<90 seconds <sup>3</sup>
Calibration Method	Back-to-back comparison per ISO 16063-21
Measurements	Sensitivity, Amplitude, Phase, Bias, Resonance <sup>6</sup> , Linearity <sup>6</sup> , Shock <sup>6</sup> , DC Offset, Bridge Resistance, DC Sensitivity
Accelerometers Supported	ICP <sup>8</sup> , Charge, Voltage, Capacitive <sup>4</sup> , Piezoresistive <sup>5</sup> , CVLD
Sensors Supported	Acceleration, Velocity <sup>6</sup>
TEDS Sensor Support	IEEE 1451.4 <sup>6</sup> , IEEE P1451.4 <sup>6</sup>
Excitation Type	Stepped Sine, Multi-sine
Acceleration Levels <sup>7</sup>	0.1 to 10 g <sub>pk</sub>
Calibration Data Management	Yes
Automatic pass/fail Classification	Yes
Measurement Units	English, Metric
Input Power	100 - 120V or 220 - 240V at 48 to 62 Hz

<sup>1</sup> random component estimates significantly affected by shaker selection and environmental conditions <sup>5</sup> Piezoresistive sensors supported in base s/w. Signal conditioning available as -478 option  
<sup>2</sup> best measurement uncertainty available with option -C83XP <sup>6</sup> optional features  
<sup>3</sup> 10 Hz to 20 kHz at 1/3 octaves <sup>7</sup> shaker dependent, limited by stroke and load capacity. -501 option supports 40 g<sub>pk</sub> sinusoid, -525 option with PneuShock actuator supports impulse to 10 kg<sub>pk</sub>.  
<sup>4</sup> Capacitive sensors supported in base s/w. Capacitive sensor signal conditioning available as -445 option

<u>REFERENCE ACCELEROMETER:</u>	<u>-830 AIR-BEARING SHAKER OPTION</u>	<u>-831 AIR-BEARING SHAKER OPTION</u>
Type	ICP <sup>8</sup>	ICP <sup>8</sup>
Sensitivity	10 mV/g	10 mV/g
Frequency Range	5 Hz - 15 kHz	5 Hz - 20 kHz
Resonant Frequency	> 70 kHz	> 70 kHz
Test Sensor Mounting Hole	1/4-28 UNF (10-32 optional)	1/4-28 UNF (10-32 optional)

## SUPPLIED ACCESSORIES:

9155 Calibration software	PC w/ keyboard, mouse, monitor, printer	System verification sensor	Uncertainty budget procedure
Data acquisition hardware	Various mounting adapters & cables	Database software	Onsite installations and training

## OTHER OPTIONS AVAILABLE:

9155D-100	<b>19" Rack Integration.</b> Approx. 36.5"H x 21.75"W x 26"D [93cm x 55cm x 66cm]. Integrates components in 19" rack.
9155D-120	<b>Shaker Mount.</b> Provides wood pedestal to support calibration shaker. Requires user to fill with sand (not included).
9155D-160	<b>Tool Kit.</b> Includes torque wrench, screwdrivers, crescent wrenches, toolbox, etc.
9155D-350	<b>Calibration Label Printing.</b> Provides automatic calibration label printing using a Zebra thermal transfer label printer.
9155D-400	<b>TEDS Sensor Support.</b> Provides for automatic update of TEDS sensors. Requires 9155D-443 option.
9155D-442	<b>Basic ICP Signal Conditioning.</b> Adds signal conditioner for ICP and charge mode sensors.
9155D-443	<b>Dual-mode Charge Amplifier.</b> Computer control and automated switching between ICP and charge mode sensors.
9155D-445	<b>Capacitive Sensor Signal Conditioning.</b> Adds signal conditioner for capacitive sensors.
9155D-478	<b>Piezoresistive Signal Conditioning.</b> Adds support for piezoresistive sensors. Includes PCB 478A30 signal conditioner.
9155D-501	<b>Linearity.</b> Provides for multipoint sensor linearity checks via sinusoidal vibration up to 40g.
9155D-525	<b>Shock Calibration.</b> Provides for verification of shock accelerometers from 20g to 10,000g.
9155D-550	<b>Resonance Check.</b> Provides for resonance check of accelerometers up to 50 kHz.
9155D-575	<b>Laser Primary Calibration.</b> Adds primary calibration capability as specified in ISO 16063-11.
9155D-600	<b>Velocity Sensor Calibration.</b> Allows calibration of velocity sensors. Reports data in velocity units.
9155D-771	<b>Low Frequency (0.5Hz-500Hz).</b> Long stroke shaker with SmartStroke™ technology and accelerometer reference sensor.
9155D-779	<b>Low Frequency (0.1Hz-500Hz).</b> Long stroke shaker with SmartStroke™ technology, accelerometer and optical reference sensors.
9155D-830	<b>K394B30 Air-Bearing Shaker.</b> Adds precision air-bearing shaker 5 Hz - 15 kHz.
9155D-831	<b>K394B31 Air-Bearing Shaker.</b> Adds precision high-frequency air-bearing shaker 5 Hz - 20 kHz.
9155D-913	<b>Impulse Calibration.</b> Allows dynamic impulse calibration of pressure transducers from 200 to 20,000 psi.
9155D-961	<b>Hammer Calibration.</b> Allows calibration of instrumented impact hammers, includes 9961C cal fixture.
9155D-SC	<b>Service Contract.</b> Provides 1 year software upgrades & on-site system component calibration

**The Modal Shop** 3149 E Kemper Road, Cincinnati, OH 45241 USA  
**Toll free 800-860-4867 / Phone 513-351-9919 / Fax 513-458-2172**  
**E-mail info@modalshop.com Web site www.modalshop.com**



© 2012 PCB Group, Inc. In the interest of constant product improvement, specifications are subject to change without notice.  
 PCB and ICP are registered trademarks of PCB Group, Inc. All other trademarks belong to their respective holders.