



VITREK

Global Leader in Test, Measurement & Turbine Engine Vibration & Balancing

A collection of various test and measurement instruments, including shakers, amplifiers, and data loggers, arranged on a white background.

Test & Measurement Technologies for
Military & Aerospace
Applications

Engine Vibration & Balancing Solutions from MTI Instruments

mti instruments

By **VITREK**

In the aerospace industry, engine balancing is of paramount importance for several reasons. Properly balanced engines minimize vibrations, which can significantly enhance passenger comfort and reduce wear and tear on critical components. This leads to improved engine performance, fuel efficiency, and overall safety.

Unbalanced engines can cause excessive vibrations that may result in mechanical failures, reduced lifespan of engine parts, and even catastrophic failures in extreme cases¹²³. Therefore, maintaining a well-balanced engine is essential for the reliability and efficiency of aircraft operations. Vitrek's MTI Instruments brand of turbine engine vibration and balancing equipment have been the industry standard for over 20 years.

PBS Express for Business & Regional Jets

Perfect for MROs and operators with small to mid-sized corporate jets, the PBS Express provides many of the powerful features that can be found in upmarket portable balancing products, designed to meet the requirements and price point of corporate aviation.

The PBS Express was designed using the PBS-4100+ family DNA – the most respected turbine engine vibration and balancing solution in the market today. The system contains the technology DNA of PBS in a lightweight, easy to learn and use package to provide vibration measurement and engine rotor balancing.



PBS Express Key Features

Simplicity

- Easy to Setup: Pre-Configured engine parameters. Just connect cables and begin testing.
- Intuitive Touch-based User Interface.
- Works with existing cable sets for enhanced migration capabilities.
- Compatible with odd-tooth tachometer sensors (including short/long/offset tooth types.)

Trim Balance Wizard

- Guides even 1st time users to success in as little as two engine runs.
- Configurable balance speed points and associated bias/weighting.
- Transient Balance
- Influence Coefficients

Powerful Visualization

- Vibration Surveys with exceedance limits shown on the plot.
- Order tracking for accessories such as starter generators and fuel pumps.
- Review/Export Saved Data — Create reports with integrated plots and tables.

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PBS 4100+ Series

The Industry Standard for Commercial Jet Applications

The 4th generation of the PBS-4100+ family of products sets the standard in turbine engine vibration analysis and balancing. Using the latest technology, the 4th generation PBS-4100+ products continue to build on the field proven 35-year legacy of the industry's leading vibration analysis and balancing tool.

Designed to quickly isolate engine problems and locate issues, both the 4100+ and the 4100R+ both provide rapid configuration and intuitive user interfaces for quick and easy vibration and balancing surveys.

Available in two form factors — PBS4100+ for on-wing testing, and the 4100R+ for test cell applications — the unit provides accurate “one-shot” balancing solutions for commercial and aviation gas turbine engines.

The 4th generation PBS 4100+ is small, lightweight, fast working and ruggedly built solution contained in a rugged, portable case. To further support mobile operations, the 4th generation features battery power that can provide up to 4 hours of continuous use on a single charge.



The PBS-4100R+ version is designed specifically for rack mounting in test cell applications. The unit provides extensive vibration monitoring and analysis capabilities along with “one-shot” balancing solutions. The PBS-4100R+ is the one system that does it all. Whether you need to test on-wing, or in a test cell, MTI Instruments is the industry's choice for engine vibration and balancing solutions.

PBS 4100+ Series Key Features

Flexibility

- **Portable for On-Wing Testing** — The PBS 4100+ is a portable, battery powered unit with up to 4 hours of battery operation housed in a light, rugged and compact 2-in-1 laptop with clamshell and tablet support.
- **Test Cell Designed** — The PBS 4100R+ has the same full feature design as the portable 4100+, but designed in a rack-mount form factor designed specifically for test cell applications.

Innovative Technology

- **Multi-Channel Capability** — Up to 4 vibration and 3 speed channels ensures a complete picture of the engine's performance, enhancing the accuracy and reliability of your diagnostics.
- **Streamlined** built-in vibration survey & balancing processes with “One-Shot” balancing system.
- **Advanced Diagnostics & Reporting** — Provides detailed graphic insights into the health of the engine, allowing for proactive steps towards maintenance and repair.
- **Highly Compatible** — Designed for use with all commercial and military turboprop, turbojet and turboshaft engines. Compatible with a wide range of sensors offering flexibility in data collection.



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TSC-4800A Tachometer Signal Conditioner System

In today's fast-paced industrial environment, precision and efficiency are paramount. The TSC-4800A Tachometer Signal Conditioner system from MTI Instruments is designed to meet these demands, enhancing your industry operations by providing accurate and reliable engine speed signals.

The TSC-4800A is versatile and capable of working with a wide range of engine types, including turbofan, turboprop, industrial, and power generation equipment. Its advanced signal conditioning algorithms can quickly and accurately resolve long-tooth and short-tooth embedded N1 signals, older high-voltage tachometer generators, and engines with newer offset tooth designs.



This means that whether you're operating in the aerospace sector or running an industrial plant, the TSC-4800A can help you identify engine issues swiftly, reducing unnecessary engine removals and downtime. Its rapid configuration, intuitive operation, and the capability to upgrade with new software make it a practical and future-proof choice for any industry. The state of the art speed resolver/signal conditioning unit capable of working with all types of engine speed signals. Whether you are testing engines with a long tooth or short tooth embedded N1 signal, if you have engines with older high-voltage tachometer generators, or if you are testing engines with the new offset tooth design, the TSC-4800A will condition all of these types of signals. The TSC-4800A conditioning algorithms and web server software can be upgraded with new software supplied by MTI Instruments. It's rapidly configurable out of the box and operational in minutes.

MTI Instruments Series of Charge Amplifiers

At Vitrek, we offer an exceptional range of charge amplifiers that stand out in a sea of alternatives. Our CA1800, 41CA, and 55CA charge amplifiers showcase our commitment to innovation, quality, and performance.

The CA1800 is a highly versatile, precision rack-mount multiple-channel charge amplifier, perfect for advanced applications requiring simultaneous monitoring of multiple signals. Its high-gain, inverting voltage amplifier with a very high input insulation resistance ensures superior performance even in complex setups. Unlike many other charge amplifiers on the market, it offers up to eight channels of precision charge amplification.



This means you can monitor multiple signals simultaneously, making it ideal for complex applications that require comprehensive monitoring and analysis.

With turbine balancing and vibration analysis, the 41CA and 55CA charge amplifiers come into their own. They are specifically designed for commercial and military aviation gas turbine engines, offering rapid configuration and intuitive operation. This stands in contrast to many other amplifiers on the market, which often require time-consuming setup and calibration and may not provide the level of precision necessary for such critical applications.



The 41CA is a dual-channel rugged unit offering the flexibility to handle two signals concurrently, while its robust design ensures durability even in challenging environments. The 55CA is a single-channel rugged charge amplifier that delivers reliable performance with a straightforward, user-friendly interface, making it a preferred choice for many applications.

Our charge amplifiers are engineered to offer accurate and reliable measurements consistently. This reliability is a crucial point of difference, setting our amplifiers apart from many others available today. In industries where precision can impact safety and efficiency, this reliability can make a profound difference.

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1510A/1520 Signal Simulator/Generator

Signal generators are vital in aerospace applications for developing, testing and maintaining electronic systems. The 1510A and 1520 can simulate real-world conditions to test components like radar, communication devices and navigation systems. Additionally, they calibrate instruments such as eddy current probes, strain gauge amplifiers and charge amplifiers, ensuring precision and accuracy.



MTI Instruments 1510A & 1520 portable signal generators are particularly useful for field maintenance and troubleshooting, helping diagnose issues and verify repairs. With their laboratory equipment accuracy, they can generate complex modulated signals, creating realistic scenarios to test the robustness and reliability of military and aerospace systems under various conditions. Whether you choose a 1510A or the 1520, these precision, portable signal generators are a must-have for aerospace engineers and technicians.



GaGe High-Speed Digitizers

In the aerospace industry, digitizers are essential for capturing and analyzing wideband RF/IF signals. They play a crucial role in radar systems by capturing high-frequency radar signals for precise analysis and processing, which is vital for both military and civilian applications.

Additionally, digitizers are used in communication systems to monitor and analyze signals, ensuring clear and reliable transmission for satellite and ground-based communications. In defense applications, they help capture and analyze signals for electronic warfare, enabling the detection and countering of threats.

GaGe's line of high-speed digitizer cards is the worldwide industry leader for the military and aerospace industries. The portfolio offers the highest performance digitizers, PC oscilloscope and spectrum analyzer software. Powerful SDKs are available for custom application development, and turnkey integrated PC based measurement systems.

GaGe Digitizer Key Features

Precision Measurement Solutions

- **Highest ENOB In The Industry** — renowned for sustaining the maximum effective number of bits (ENOB) over a wide signal frequency range with quality signal conditioning and signal fidelity.
- **Digitizer PCI Express (PCIe) Data Streaming** — GaGe PCIe CompuScope Digitizers support streaming of waveform data from their ADC chips through their dual-port onboard memory directly to PC RAM via their PCIe interface at data rates up to 6 GB/s. This allows for creating high-speed real-time signal analysis, processing, and recording systems.
- **Deep Sample Memory** — features the largest available onboard digitizer sample memory, up to 16 GB for select models.
- **eXpert FPGA DSP Routines** — GaGe's eXpert PCIe Data Streaming, Signal Averaging, Optical Coherence Tomography, and FFT FPGA DSP technology provides a fast and efficient means for users to process data onboard CompuScope digitizers and transfer only the data that is of interest to the PC for further analysis
- **Digitizer Spectrum Analyzer, PC Oscilloscope, and SDK Software** — GaGe provides powerful and easy-to-use spectrum analyzer software and PC oscilloscope software for use with CompuScope digitizers and receivers without the need for any programming. A complete library of software development kits (SDKs) for C/C#, LabVIEW, and MATLAB for custom software application development are available.

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Military and Aerospace electronics require similar testing for electrical safety as other electronics, but test to different standards. Vitrek's products are ideal for all of your test and compliance applications.

Vitrek' electrical safety testing equipment supports a variety of product safety certifications for military and aerospace applications. Some tests include:

- MIL-STD-2223 Cable & Wire Harness Testing
- MIL-STD-202G Test Method Standard Electronic & Electrical Component Parts
- AS4373F Testing Aerospace Cables
- Electrical Connector Standards including MIL-DTL-26482, MIL-DTL-32139, MIL-DTL-38999, MIL-DTL-83513, MIL-DTL-83527 and MIL-DTL-83538 to name a few.

To learn more about these standards, visit our industry pages at www.Vitrek.com.

V7X Series Hipot & Ground Bond Testers

Whether you are on a base or a ship, Vitrek's V7X Series electrical safety testers are an important part of safety programs designed to prevent electrical shocks and fires.

The V77 is a six-in-one instrument that is ideal for military and aerospace applications where you do not have the luxury of carrying multiple pieces of equipment. You can perform AC Tests, DC Tests, Insulation Resistance, Continuity, Ground Bond and/or Switching all from the convenience of a single compact, easy-to-use instrument.

The V7X is equipped with a color LCD touchscreen for easy use and programming and sets the standard for price and performance. Compact and rugged, the unit is Made in the USA and meets UL, CSA, TUV and IEC Hipot requirements. The V7X provides unbeatable speed, accuracy, user safety and reliability.

Choose from six low-cost models offering AC & DC Hipot to 5KV, leakage current measurement to 100 nano-amperes, Insulation Resistance to 450 GΩ, ground bond to 30 amperes and built-in switching. Combine all that with USB, RS232 and Digital I/O interfaces, plus a two year warranty, no other Hipot tester can compare.



95X Series Hipot & Ground Bond Testers

Often times, military equipment is large and ruggedized. Therefore, it can also have a higher capacitance. The 95X Series of hipot testers is ideal for this application because it provides the power and versatility you need for your most demanding electrical safety test applications and can be equipped to handle up to 500VA of power. Other testers may not have the current drive to charge and test these larger systems.

The 95X features DSP technology to bring you the safest, fastest, feature rich Hipot tester available. The 95X series combines high output power with a range of AC & DC voltage outputs and extremely low leakage current measurement. The unit is equipped with a 4-wire milli-ohmmeter with dynamic range up to 150K ohms and an overlapping Tera-ohm class Insulation Resistance function. Top that off with an available 40 Amp ground bond capability and you can see that the 95X series is the ideal choice for most electrical safety testing requirements.



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964i High Voltage Switching (Multi-Conductor, Multi-Point Hipot Testing)

One of the highest failure rates in military and aerospace applications is cabling. Vitrek's 964i High Voltage Switching System is the ideal choice for automated multi-conductor, multi-point hipot testing.

You have a job to do – you have to hipot test a cable at 2500V to ensure that each conductor is properly isolated from every other conductor. You have two choices, you can try to do it manually or you can use the Vitrek 964i to automatically route the HV and return signals to the proper test points. The manual method is extremely problematic. Slow, error prone, labor intensive, operator hazardous – and don't even think about recording the test results.

The 964i on the other hand, is purpose built to fully automate all of your high voltage switching needs. The 964i makes the perfect tool for depot repair because it can quickly screen through cables and determine which are bad. When used with QT Enterprise, testing profiles for many different types of cables can be saved and recalled as needed.



QT Enterprise Test Software

QT Enterprise is the most powerful and flexible electrical safety test automation software available on the market today. QT Enterprise software is available for use with Vitrek V7X & 95X Series Hipot testers, 964I HV Switching system, and the 98X Series of IR Testers to streamline your test sequences and record keeping and provide the features you want...and need...for your electrical safety tests.

Procedures stored via QT Enterprise can be recalled via a bar coded scan to enable fast and accurate setup. For complex setups, QT Enterprise can display detailed instructions and images to the operator to ensure proper connections prior to testing.

Data from every test is recorded and can be recalled for auditing purposes or detailed analysis on testing or product performance.



98X Teraohmmeter/IR Tester

The 98X Series Teraohmmeter/IR tester is designed to tackle the toughest high resistance measurement applications that most other IR testers won't measure up to. RF cables, for example, have subtle variations. When matching cables the 98X makes the process easier with IR up to 15 Teraohms. This instrument has been used to replace custom instruments costing over \$250k!



Built upon the same DSP technology that has established Vitrek as a leader in hipot test systems, the 98X devices feature a unique combination of performance features including:

- Multi-Dwell Functionality (multiple steps without having to return to zero between steps)
- High Speed Testing (with dwell times as low as 100 ms)
- Pico-Amp Leakage Measurement (with stable and precise 50 Teraohm IR readings)
- Continuously Variable IR Test Voltage (adjustable over the full output range of the instrument)
- Multi-Mode Insulation Resistance Tests (three test modes - end on time, end on pass, end on fail)
- Capacitance Test Modes (critical for solar panels, cable harnesses and other capacitive loads)

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PA 9xx Series Power Analyzers

Vitrek offers a variety of power analyzers to meet your specific requirements. Our precision harmonic power analyzer, the PA920 is the most accurate power analyzer available on the market today (0.024%). The PA920's modular design can hold up to 4 channels of power measurement in any combination of different channel card types. It is flexible, easy-to-use and provides high-performance — at a price that won't break your budget.



The PA920 is the workhorse of power analyzers. It can be used for testing one and three phase motors and generators, power supplies, inverters and loads. It can operate from μW to MW. It's six test instruments in one: 1) Power Analyzer, 2) Oscilloscope, 3) Data Logger, 4) Conducted Emissions Analyzer, 5) Spectrum Analyzer and 6) Phase Meter. It is also small, light, accurate and easy-to-use. Whether you are testing lasers or railguns, this unit can save the day!

DL Series DC Electronic Load

Vitrek's DL Series of DC Electronic Load devices are the ideal choice in depot repair facilities to emulate the changing of light DC loads that you see in the field. The DL Series is equipped with an easy-to-read color display and is a combined load, four five-digit meters, an oscilloscope and a datalogger in one compact, easy-to-use instrument.

The design utilizes high performance semiconductors with high speed and high accuracy, and wide dynamic range of loading from $10 \mu\text{W}$ to 14.5 kV. The DL Series offers transient and non-linear loading capabilities and sweep feature. The highly accurate (0.035% base voltage and current accuracies) enables use in a wide range of applications from production line settings to the engineering bench.



4700 Series High Voltage Meter

The 4700 Series precision high voltage meter offers the highest level of measurement accuracy when it comes to high voltage measurement equipment. It's color touchscreen is easy to use for set up and display of test results. Vitrek leverages DSP technology to provide outstanding AC & DC high voltage measurement accuracy, stability, repeatability and resolution. The 4700 offers performance that rivals traditional high voltage reference dividers — yet unlike the tedious divider, the 4700 provides instant, direct, high voltage measurements in a highly portable, compact and rugged bench top enclosure.

The 4700 high voltage meter measures up to 10KV DC or rms AC directly and with available HV Smartprobes, the high voltage measurement range can be extended to 35KV, 70KV, 100KV and 140KV.



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To schedule a **FREE Product/Application Review** e-mail info@vitrek.com or schedule a meeting online at www.Vitrek.com/applicationreview



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