



| SHOCK DAYS

A Seminar for Successful Shock Measurement

Who should attend?: Test and design personnel and their managers involved in the acquisition and analysis of valid shock data.



SUCCESSFUL MEASUREMENT OF SHOCK

If data quality is poor when measuring mechanical or pyrotechnic shock, it is common to blame the accelerometer. However, there are other contributors to this lack of success that need to be considered. These include poor mounting surface for the accelerometer, improper accelerometer coupling (surface finish, torque, grease), large transverse acceleration inputs, cable issues (cable tie down, shielding, bend radii, stiffness, connector pin chatter, etc.), improper signal conditioning and data acquisition (over ranging, slew rate limiting, signal/noise, improper grounding, wrong input/output characteristics), extraneous environmental inputs coupling into the measurement system, and many more. In addition, at times the environment that is attempted to be measured may be just too harsh for the accelerometer to operate in reliably.

This workshop is intended to instruct experienced shock test personnel and data analysis engineers with a deeper knowledge on the following topics:

1. Physics and operating characteristics of shock accelerometers and constraints associated with their use
2. How to interface transducers effectively with intended test environments
3. Conditioning transducer signals to maintain their fidelity through selection of appropriate cabling, amplifiers, analog filters, sampling rates, DAQs, etc.
4. Documentation of extraneous measurands (e.g., strain, temperature, ionization products of a detonation, magnetic fields) that superpose as noise on the desired transducer response
5. Apply corrective actions for elimination of these noise levels
6. Validate that final, recorded signals contain only the desired shock data
7. Perform quick calculations to assure the bandwidth of the recording system did not impose constraints on recorded data



PCB Training with Dr. Patrick Walter

Over the past 13 years, PCB® has hosted approximately 3 dozen trainings with Dr. Patrick Walter as the facilitator. Every “Successful Measurement of Dynamic Force, Pressure and Acceleration” training class has filled with nominally 45 attendees. Typically held in Buffalo, NY, Dr. Patrick Walter has drawn attendees from around-the-world including Germany, Turkey, South Africa, UAE, India, Singapore, Norway, Israel, Saudi Arabia, and Canada. This PCB® program has also been presented off site at various U.S. locations, throughout Canada and Japan, and in Brazil. Attendee surveys have rated the class with an overall grade of 3.8, with 4.0 being the highest achievable.



Who is Dr. Patrick Walter?:

Dr. Patrick L. Walter is currently an Engineering Professor at Texas Christian University (TCU) in Fort Worth, TX. His work career and experience in shock measurement spans 50 years, thirty in test and evaluation at Sandia National Laboratory and twenty at TCU. Dr. Walter is the Co-Chair of IEST Recommended Practice RP-DTE011.2 responsible for developing Mechanical Shock and Vibration Accelerometer Selection, issued 2016. While at TCU, he has consulted extensively in shock measurement for industry and government. For the past 15 years, he has concurrently had a contract with PCB Piezotronics, Inc where he holds the position of Senior Measurement Specialist. Within PCB®, his responsibilities have included consultation in shock accelerometer design assessment, calibration, field application, and customer liaison in data interpretation. He has measured shock in environments encompassing flight, field, laboratory, and underground nuclear tests. This experience base includes measuring shocks associated with drop tables, penetrators, projectiles in barrel, metal-to-metal impact, explosive loading, and more. His principal contribution towards assuring successful shock measurement is his systems approach to acquiring data. This approach begins with the careful selection and interface of the shock accelerometer, encompasses the optimization of the entire shock measurement system, incorporates documentation of the system noise floor, and culminates with data acquisition system (DAQ) requirements. He is co-chair of the Institute of Environmental Sciences IEST-RP-DTE011.2, Mechanical Shock and Vibration Accelerometer Selection. He is also a member of the Technical Advisory Group of the Shock and Vibration Exchange (formerly SAVIAC).

Dr. Walter has written and published numerous technical articles, white papers, technical notes, book chapters, and one book. The majority of these publications are on topics relating to shock, blast, ballistics and vibration measurements.

Select Articles Relevant to the Seminar:

- Acceleration Sensing Technologies for Severe Mechanical Shock”
- Placebo Transducers, A Tool for Data Validation”
- Shock Tactics”
- The Shock Spectrum: What is it?”
- Pyroshock Explained”
- Accelerometer Limitations for Pyroshock Measurements”
- Selecting Accelerometers for and Assessing Data from Mechanical Shock Measurements”
- Lessons Learned in Applying Accelerometers to Nuclear Effects Testing”
- How High in Frequency Are Accelerometer Measurements Meaningful?”
- The Instrumentation Cable: Critical but Often Neglected”
- Guidance for the Filtering of Dynamic Force, Pressure, Acceleration (and Other) Signals”
- Acquiring Meaningful Test Data on Purpose”
- The History of the Accelerometer”
- Fifty Years Plus of Accelerometer History for Shock and Vibration (1940-1996)”
- Acceleration Sensing Technologies for Severe Mechanical Shock”
- Evaluation of Accelerometers for Pyroshock Performance in a Harsh Field Environment”
- Validating the Data before the Structural Model”





50 Years of Experience. . .

Over the course of his career, Dr. Patrick Walter has been recognized by prominent organizations and government agencies. A few of his awards and honors are provided below.

- Lifetime Achievement Award In Shock and Vibration, SAVIAC/SAVE
- Base Commander's Coin in Instrumentation (Coin #19), (USAF), Edwards Air Force Base
- Commander's Coin, (U. S. Army), Aberdeen Test Center
- United States Department of Energy Award of Excellence for Significant Contributions to the Nuclear Weapons Program, Presented by DOE Deputy Assistant Secretary for Military Application
- Martin Marietta Meritorious Achievement Award for Valued Contributions through Personal Dedication and Professional Endeavor, Presented by President Martin Marietta

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