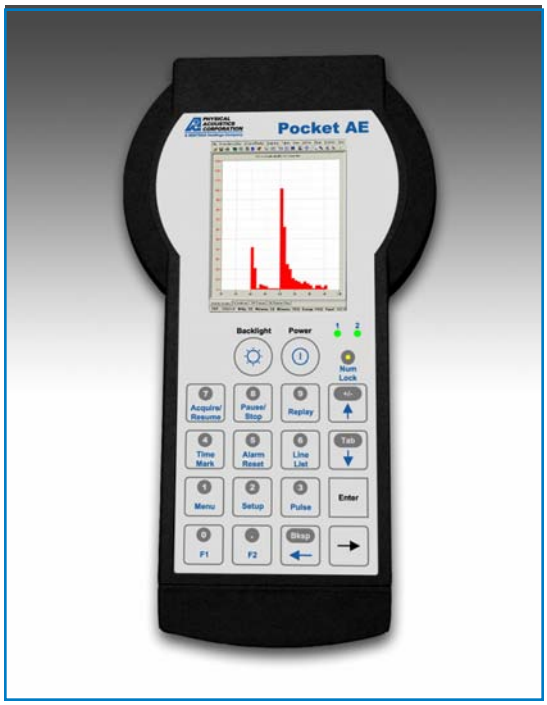
MISTRAS
A World of NDT Solutions
Products & Systems Division

PHYSICAL ACOUSTICS CORPORATION

Pocket ACM2: Portable 2-Channel Active Corrosion Monitoring Acoustic Emission System

The **Pocket ACM** is a high performance, computerized, dual channel Acoustic Emission (AE) system that is packaged in a rugged, portable hand held unit. Designed from inputs from companies such as Shell, Dow and NDT Service companies for pre-screening Active Corrosion which is needed to prioritize and reduce inspection costs. The Pocket ACM offers all the performance features of larger, more expensive AE systems, including wide bandwidth, speed, AE features, sampling rates and waveform processing capabilities, all in a compact, battery-operated package. The system can perform any AE inspection application that our larger AE systems can and is an excellent field survey tool, especially in situations where power is not readily available.



The Pocket ACM hand-held unit with protective rubber boot for reliable operation in any environment.

Key Features

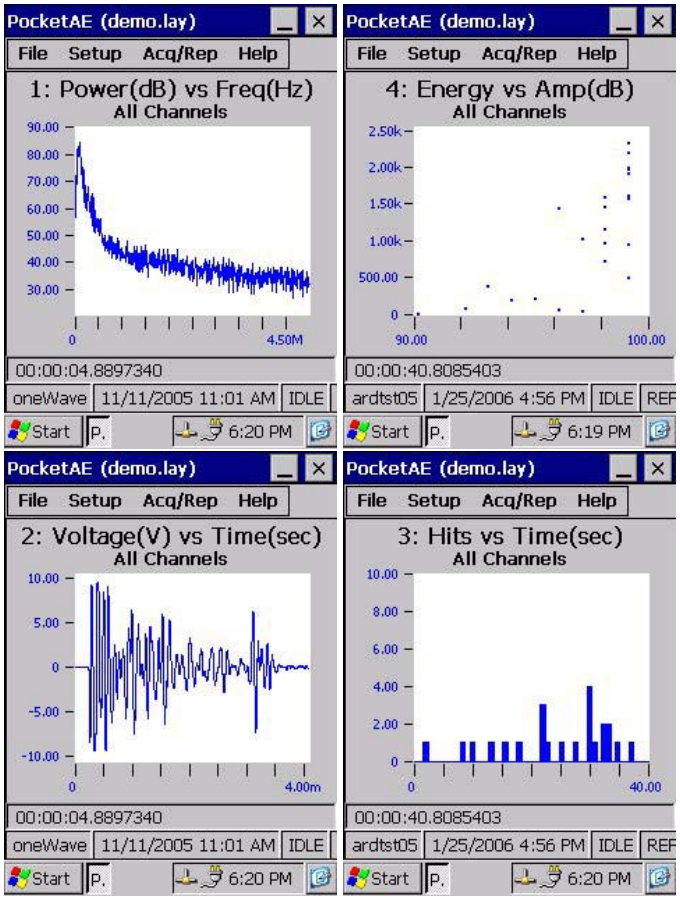
- All the standard performance features as in PAC's PCI based multi-channel AE instruments.
- Hand-held portability for quick, efficient testing in the field.
- PDA type computer that uses Microsoft™ Windows-CE™ compact operating system, familiar and easy to use.
- Utilizes PAC standard low cost passive AE sensors or our new low power line of sensors with an internal AE preamplifier.
- Two AE channels with one high performance 18 bit A/D for each channel, allowing AE data processing at up to 10 MSPS.
- 16 bit A/D waveform capture and AE signal processing offers wide system dynamic range without the need for gain controls.
- 16 bit A/D parametric input to correlate AE to other process sensors.
- Integrated rechargeable battery package lasting 4 hours (continuous) or more. Batteries are easily changed and can be charged outside of the system (with optional charger).
- Numerical keyboard with function keys for quick, easy setup and control.
- Internal flash memory for storing setups and data files.
- Permanent digital record of the test results in standard DTA, PAC data files, compatible with AEwin™ Software for detailed data analysis and data visualization.
- Compact Flash card and USB port for data transfer to laptop or desktop PC.

Equally useful in the laboratory, the system carries out lab tests by utilizing its 2 channel AE capability and 1 channel parametric input for correlating load or stress with AE activity. In addition, linear location and spatial filtering capabilities are built-in to provide even more versatility in the lab and field. There is even a 16 bit parametric input channel to measure cause and effect relationship between AE status and other sensors.

The Pocket ACM performs traditional AE feature extraction based AE signal processing as well as advanced waveform based acquisition and processing. Text and graphic results are displayed on the Quarter-VGA (240 wide x 320 high pixels) sized color LCD screen, with the ability to display up to 8 AE graphs including waveforms, FFT's, histograms, line plots, point plots and linear location and event detection. AE data files are saved in traditional PAC, DTA files and can be transferred to a desktop or notebook computer via compact flash cards and/or USB, for full data analysis, using PAC's optional, AEwin™ software.

Pocket ACM - Portable, Two Channel Acoustic Emission System

The system uses an architecture much like that used in a hand-held PDA (Portable Data Assistant) and utilizes Microsoft Windows-CE™ operating system. Win-CE is a compact version of Microsoft Windows™ with most of the same features and graphical user interface for instant familiarity.



Examples of screen shots from Pocket AEwin™. From top left FFT, Point Plot, Waveform and Histogram Plots. not shown).

Other Applications

Capable of performing any AE testing where two channels of Acoustic Emission monitoring are required, the portability of this instrument makes it ideal for field testing in applications such as leak detection, AE characterization of materials and processes, and screening tests to determine if further action needs to be taken using a larger AE system. Additionally, with the Pocket ACM built-in parametric processing circuitry, AE can be correlated with other sensors and process stresses.

Software Description

The Pocket ACM comes with a complete working AE software program to perform a variety of AE tests. This program is configured just like any other Microsoft Windows program with a typical menu structure and the familiar menu selections such as “File,” “Setup,” “Acq/Rep” and “Help.”

The end-user configures the unit in preparation for an AE test via the user screen, with 200 x 200 pixel resolution for clear, sharp graphs. Included in the software is the ability to view waveforms, histograms, line graphs and point plots in the traditional anything versus anything style. In addition an event detection capability for linear location capability, delta-T filtering and guard channel capability is built into the system as standard. During acquisition or replay, the user can scroll through the graphs, viewing one graph at a time. The data is saved in a standard PAC defined DTA file for further analysis with AEwin™ or software programs.

System Components

The Pocket AE-2 comes complete with the hand-held 2-channel unit, two R15α (Alpha) passive AE sensors, two 1 meter sensor cables, one 2 meter parametric cable with BNC connector, a 1GB CF card, and a battery eliminator DC power supply, all inside a foam-lined plastic carrying case with user documentation. Optionally, an external battery charger, extra battery packs, and AEwin™ Replay Software for desktop or notebook based analysis are available at an additional cost.

Sensors for Pocket ACM Products:

The Pocket AE products have an internal AE preamplifier and also have the capability for powering a low power line of external preamplifiers and Integral Preamplifier sensors. The user can select between the use of the internal and external preamplifier via software. When in Internal preamplifier mode, standard, passive (non-amplified sensors) can be attached directly to the AE inputs of the Pocket AE system. The Pocket ACM is shipped with R15α (Alpha) sensors and a cable for connecting the

The Pocket AE-2 System comes with hand-held, dual-channel AE unit, two R15α AE sensors, two1 meter sensor cables, one 2 meter parametric cable with BNC connector and a battery eliminator DC power supply (case not shown).

sensors to the system. Our line of Alpha sensors are low cost, general purpose sensors and come in many frequency ranges for any application including R3α, R6α, and R15α,. These sensors are single ended, high sensitivity sensors.

Additionally, the Pocket AE products can be switched to external preamplifier mode. When in this mode, phantom power (at low voltage) is supplied on the center conductor of the AE input connectors for providing power to the external preamplifier. This is the typical phantom power arrangement which provides power to the external preamplifier, the amplified AE signal back to the AE system, and AST trigger pulses to initiate the AST (Auto sensor test) function. However, due to the fact that the Pocket AE product runs on batteries, it is important to use lower power preamplifiers and Integral Preamp Sensors. We have therefore developed a new line of low power, integral preamplifier sensors called the PK series which have the AST function and are explicitly made for the Pocket ACM products. These go under the name of PK3I, PK6I, PK15I.

Pocket ACM Hand-held Unit Specifications

- **Size:** 9.5" H x 3.5" W x 1.4" D (241 mm x 89 mm x 36 mm)
- **Weight (with batteries):** 2.5 lbs. (1.13 kg)
- **Display:** 3.52" Color LCD, QVGA portrait mode, 240 pixels wide x 320 high transflective with LED backlight
- **Display Touchpad:** Built-in touchpad on screen for use with stylus and on-screen processing
- **Storage Memory:** 128 Mbytes Flash for OS and data storage
- **External Interfaces:** Compact Flash port, USB 2.0 Port
- **Power Consumption:** Approximately 4 Watts
- **Power Requirements:** External DC adapter (12 V @ 1A) OR Internal 7.2V NiMH battery pack, rechargeable in-situ or optional external charger
- **Battery Life:** 4 – 6 hours intermittent use
- **Operating Temperature:** 23° to 115° F (-5° to 45° C)
- **Storage Temperature:** -4° to 140° F (-20° to 60° C)
- **Connectors:**
  - **AE Input** 2 - SMB (Plug) connectors
  - **Parametric Input** 1 - SMB (Receptacle) connector
- **AE Channel Description:** Dual channel AE Input using SMB Connector inputs. Low voltage (5 Volt). Phantom power is available on the AE input connector for powering an external low voltage preamplifier or integral preamplifier sensor
- **AE Frequency Response:** 1.0 kHz to 1.0 MHz +/- 1.5 dB
- **Software Selectable Filters:** The Pocket ACM system comes with multiple digitally synthesized High and Low Pass filters in addition to software-selectable High Pass analog filters, providing exceptional filtering characteristics for maximum noise rejection and optimal signal to noise ratio.
- **Digitizing:** 18 bit, 20 MSPS ADC
- **Digital Signal Processing:** Real time FIR low pass filter. Each extracted feature processed by a dedicated real-time pipeline processor
- **Extracted Hit Features:** Typical AE features including Time of 1st Threshold Crossing (Time of Hit), Counts to Peak, Peak Amplitude, Envelope Strength, Duration, Rise Time, Counts, True Energy, RMS, ASL, Parametric Input
- **Parametric Input:** Single parametric input via an SMB (Receptacle) connector, ±10Volts input range, sampled by a 100kSPS, 16 bit A/D converter

AST:

- **Internal Preamplifier:** Pulse-Through, pulsing to crystal with programmable tone burst.
- **External Preamplifier:** Trigger for external preamplifiers available on Phantom power.

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