



Pocket AU™: Hand-Held Acousto-Ultrasonic Scanning System

The Pocket AU™ portable scanner system is a computerized Pocket PC operated acousto-ultrasonic (AU) instrument used for the nondestructive inspection of composite materials and other materials/structures that are difficult to inspect with UT and other NDT technologies.

The system is based on the acousto-ultrasonic technology that directs acoustic waveform bursts (a few hundred kHz) into the material being inspected. An AU receiver recognizes these waveforms and Pocket AU™ processes the results and displays them as A-Scan waveforms and C-Scan image maps. The acoustic signal features include gated Amplitude and Time of Flight, as well as Energy and other Acoustic Emission parameters, which change when the acoustic bursts travel through the material and encounter defects and discontinuities, such as cracks, material property changes, delamination and debonding. Defects can be easily identified from the C-Scan images.

The Pocket AU™ system with rolling sensor probe has been successfully used in the quality inspection of thick composite material and bridge and concrete structure rehabilitation with fiber-reinforced concrete polymer. The system also has many distinctive features that make it ideally used in the field and in applications where other traditional NDT methods are not practical or successful.

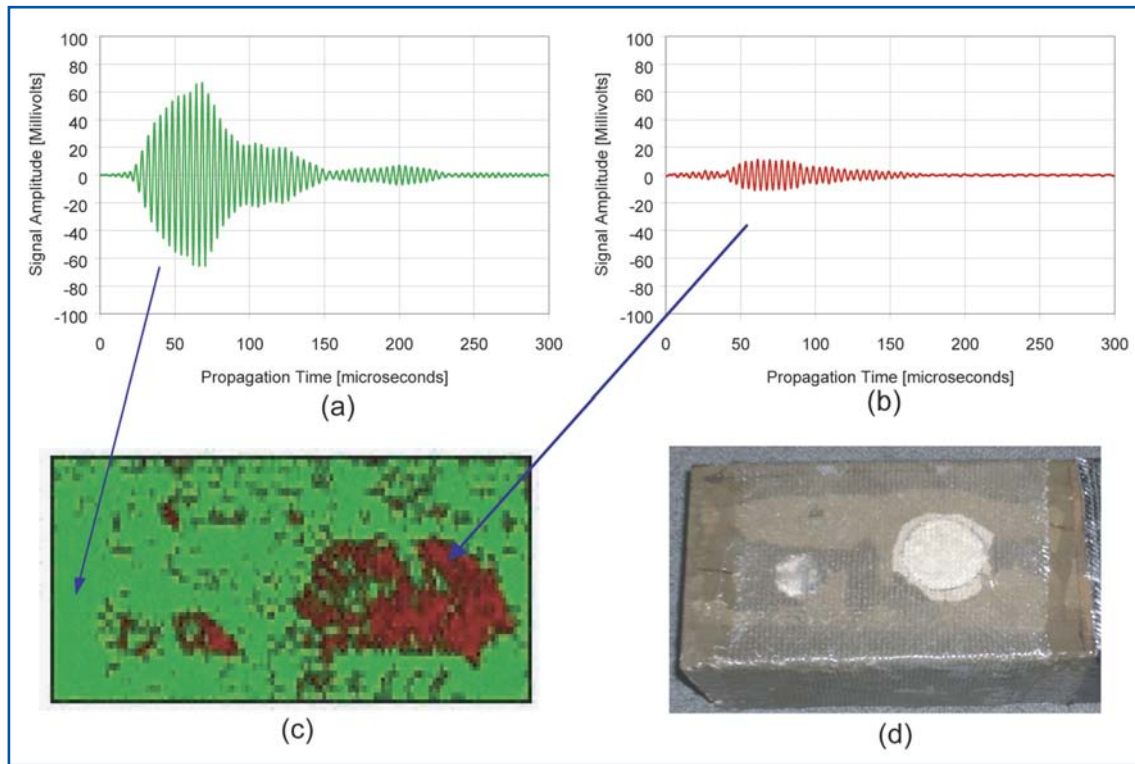
System Components

The Pocket AU™ hand-held unit houses a complete Acousto-Ultrasonic subsystem. It is controlled and operated by a powerful internal Pocket PC computer that uses Microsoft Windows CE portable operating system. All the advantages of a Pocket PC computer are available in this hand-held unit, including a compact Flash card port for securing data files. The system utilizes a programmable square wave burst generator has the capability to output single frequency waveform bursts or swept signal (chirp) bursts MMD, while the sensitive AE receiver circuitry processes the resulting signal through the computer using gated AE feature extraction and waveform processing techniques. A color LCD screen shows the AU waveforms or the resultant C-Scan images from the test.



Key Features

- ◆ Portability for thick composite material and fiber reinforced concrete polymer inspection in the field
- ◆ Integrated battery package lasting up to 4 hours
- ◆ Full color LCD screen for showing inspection results with A-Scan and C-Scan images
- ◆ Numerical keyboard with function key for quick easy setup and control
- ◆ Windows-CE™ software, familiar and easy to operate
- ◆ Rolling sensor guided continuous area scan rather than point reading as with other NDT devices
- ◆ C-Scan resolution up to 1/16"
- ◆ Scan amplitude and TOF adjustable gate processing
- ◆ Permanent digital record of the test results
- ◆ Compact Flash card and USB port for data transfer to laptop or desktop PC
- ◆ Capability to detect defects of 6 mm in diameter



Results of an FRP-concrete sample inspection using the Pocket AU™ System include (a) Good area A-Scan, (b) Debonded Area A-Scan, (c) C-Scan of the sample showing large and small defects, (d) Actual FRP concrete sample showing large and small debonds.

Pocket AU™ 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):** 1.8 lbs. (0.9 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 3 Watts
- **Power Requirements:** External DC adapter OR Internal 7.2V NiMH battery pack, rechargeable in-situ or optional external charger
- **Battery Life:** 4 - 6 hours intermittent use
- **Operating Temperature:** 32° - 115° F (0° - 45° C)
- **Storage Temperature:** -4° - 140° F (-20° - 60° C)
- **Connectors:**
 - **AE Input:** SMB Connector
 - **AU Pulser Output:** SMB Connector
 - **Rolling Sensor:** DB-9 connector
- **Software Selectable Filters:** 4th Order Butterworth filters
 - **High Pass Filters:** 20 kHz, 100 kHz
 - **Low Pass Filters:** 200 kHz, 1.0 MHz
- **AE Channel Description:** Single channel AE Input using SMB connector input. 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:** 10.0 kHz to 1.0 MHz
- **Digitizing:** 16 bit, 20 MSPS ADC
- **Digital Signal Processing:** Performed by dedicated feature extraction processor
- **Extracted AU Features:** Standard AU features include "gated" Peak Amplitude and "Time of Flight" measurements, where the user can set the gate delay and gate width
- **Stress Wave Factor: (AE like features)** Typical AE-AU features (which are also known in the AU industry as "Stress Wave Factor" SWF) include: Rise Time, Peak Amplitude, Signal Strength, Duration, AE Counts, True Energy and RMS
- **AU Pulser Output:** Programmable square wave burst output capable of being programmed for a single or swept frequency output
- **Min/Max Pulser Freq.:** 100 kHz - 1 MHz
- **Maximum Duration:** 250 microseconds
- **Output Voltage:** 20 Volts peak-to-peak

*PAC PK-series low-voltage preamplifiers may be directly connected to system; standard PAC preamplifiers and integral sensors will need an external power source at +28V dc.

AU Pulser Output

Programmable square wave burst output capable of being programmed for a single frequency output or swept frequency.

- Burst Generator
Frequencies: 100 kHz - 1 MHz
- Maximum Duration: 250 microseconds
- Output Voltage: 20 Volts peak-to-peak

AU Rolling Scanner Unit

The AU Rolling Scanner is designed to operate directly with the Pocket AU™ hand-held unit. A spring-loaded, wheeled, rolling Pulser transducer outputs acoustic bursts into the structure. Meanwhile, a second spring-loaded, wheeled, rolling Receiver transducer, one inch away, detects and conditions the structure-modified signals through an on-board AE preamplifier to the Pocket AU™ unit. In addition, an encoder, built into the AU Rolling Scanning unit, measures linear scan motion, while a button built into the unit provides an index input for developing a C-Scan image map of the structure.

- Overall Size: 5.0" L x 2.9" W
x 3.3" H
(127mm x 74mm
x 84mm)
- Weight: 1 lb. (0.45 kg)
- Built-in Preamplifier:
 - Gain: 40 dB
 - Bandwidth: 10 kHz - 1 MHz
- Encoder Resolution: 0.01"

Software

Pocket AU™ comes with a complete working AU software program that uses A-Scan and C-Scan analysis to perform Acousto-Ultrasonic inspection. The program is configured just as any other Microsoft Windows program with a typical menu structure and the familiar menu selections, such as "File," "Edit," "Setup," "Run" and "Help." The "File" menu allows you to Replay, Save, Export or Exit. The "Edit" menu lets you Cut, Copy and Paste just as in any other Windows program.

The "Setup" menu allows the selection of the "Pulser" setup menu for setting up the burst generator, the "A-Scan" mode for setting up the waveform parameters, including the viewable part of the A-Scan interactively (using waveform start and length settings), filtering and gate settings for capturing the Peak Amplitude and Time-of-Flight within the gate. In the "Comments" menu, a text string relating to the test can be entered.



The Pocket AU™ System comes with hand-held, single-channel AU unit, Rolling Scanner, 2 meter cable and a battery-eliminator DC power supply (case not shown).

The "Preferences" menu allows the setting of defaults and control system-wide parameters, such as selecting the "Directory" for data files, waveform "Capture Mode," "Units," "File Export Format" and "AutoSave Settings on Exit." A test is initiated via the "Run" menu. This test can be a C-Scan test or an A-Scan monitoring of the structure. The "Help" menu provides information about the Pocket AU™ system.



The AU Rolling Scanner Unit operates with the Pocket AU™ hand-held unit.

For more information about Pocket AU™, email sales.systems@mistrasgroup.com

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