

# Echomac<sup>®</sup> FD-4E<sup>\*</sup>

Ultrasonic Instrument for Flaw Detection, Thickness, and Dimensional Measurement in Tube & Bar



**Echomac FD4E - UT Instrumentation Setup Display**

The Echomac FD-4E Scan screen, shown above, displays detection of an OD surface notch 0.3 mm deep using shear waves that also detect ID defects. The horizontal bars indicate gate thresholds. The strip chart display in the lower portion of the screen, shows the peak amplitude of the signal within the gate.

\* An enhanced FD-4 which includes Band Pass Filters and software selectable Through-Transmission, or Pulse Echo operation.

# Features of Echomac<sup>®</sup> FD-4E Electronics

- ❑ Up to thirty-two independent test channels in a single computer chassis.
- ❑ User configured flaw detection or thickness gauging for each channel for any combination of wall thickness and flaw detection.
- ❑ Simultaneous A-scan and strip chart display for all channels.
- ❑ Adjustable pulse firing sequence to avoid crosstalk in multi-channel applications.
- ❑ Four independent flaw gates in each channel
- ❑ Pulse Echo or Through Transmission mode .
- ❑ Sixteen-segment distance-amplitude correction (DAC).
- ❑ Summary reports can be generated for each production run.
- ❑ Full network support for remote desktop view -and control.



Echomac Instrument housed in a CAB 002  
Environmental Cabinet

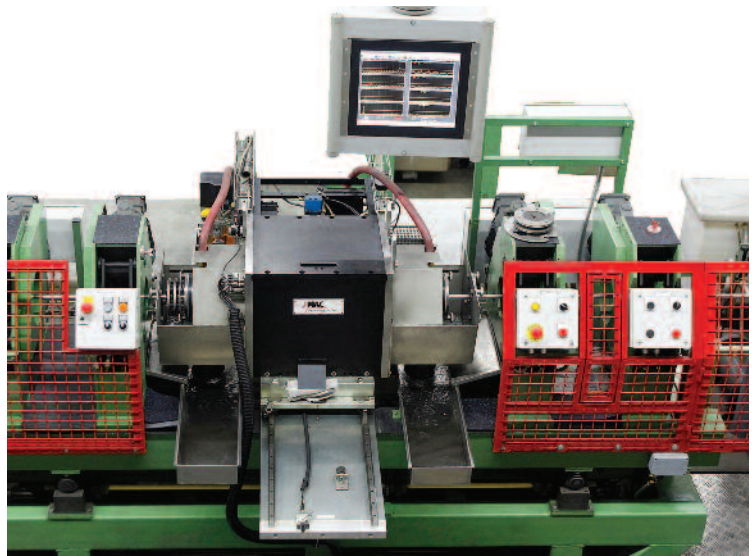


## Versatile, Intuitive Operation

- ❑ Operating parameters for each channel are displayed on one screen and are adjusted using the convenient mouse.
- ❑ A simple “copy and paste” sequence lets you transfer parameter settings from one channel to another, where appropriate.
- ❑ An unlimited number of setups can be named, saved, and recalled, using the hard drive, or they can be archived to a CDR, DVD-R, or USB flash device.
- ❑ High resolution color printing of setups, wave forms or strip chart recordings can be done with ease.
- ❑ Summary reports of the total number of pieces or length tested, number of rejects, date of test, material and customer data, are shown at the end of each run.

# Echomac® FD-4E Applications

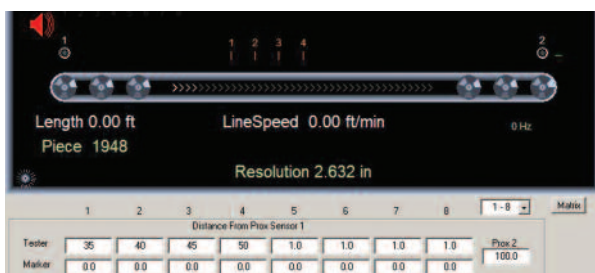
- ❑ Inspect carbon, duplex, or stainless steels, aluminum, titanium, copper and other metal tube and bar.
- ❑ Detect ID and OD flaws and measure dimensions and wall thickness.
- ❑ Test tube & bar for internal defects and inclusions.
- ❑ Inspect for tube ovality and eccentricity.
- ❑ Inspect strip before welding.
- ❑ Upgrade and/or replace older ultrasonic testers & systems.
- ❑ Use with rotary, spin-the-tube, squirter, and bubbler installations.



-Echomac® electronics installed with an Echomac® rotary transducer unit to test stainless steel and titanium alloy tube used in heat exchangers.

## Echohunter® Software

The convenient Echohunter® software package comes with multi-channel A-scan viewer/recorder, test signal recorder, end suppression, tracking system, strip chart viewer, production logging, data compression, storage, color printing, and remote network interface.



### Tracking System - Track Screen

The Tracker Panel, in conjunction with an encoder or simulated timer clock, is used to set up the end suppression and production tracking system for defect marking and accept/reject sorting. The Track screen provides control for all the parameters relating to the production line, alarm matrix routing, output control and sorting criteria.



### Multi Channel View - Multi Screen

Multi Channel display shows A-scan and strip chart for up to 32 individual channels simultaneously. The strip chart shows the peak captured signal levels in color highlighted outlines, along with the numerical peak values within each gate. Custom controls to conveniently edit visual devices such as gate, DAC, and scope position are included.

## SPECIFICATIONS

### PULSER

Type of pulser:	Spike pulser.
Pulse amplitude:	500 V, adjustable
Pulse damping:	Hi and Low settings, 50 ohms or 200 ohms.
Rise time:	10 ns or less.
Pulse repetition frequency (PRF):	0.6 to 15 kHz, adjustable in 0.1 kHz steps.
Pulse delay:	1 to 1000 $\mu$ s, adjustable in 1 steps.

### RECEIVER

Gain:	0 to 60 dB, adjustable in 0.25 dB steps.
Differential gain:	Adjustable in the full gain range for each gate interval.
Frequency range:	0.4 to 30 MHz.
Oscilloscope display:	FW, PHW, NHW, and RF.
Band Pass Filters:	Full BW, 2MHz, 5MHz, 10MHz
Linear Reject	Digital, adjustable from 0 to 50% in 1% steps.
Modes of operation:	Pulse-echo, or Through Transmission.

### GATE

Number of gates:	Four gates, plus interface.
Gate synchronization:	Internal pulse (IP) or interface (IF).
Minimum delay after interface:	20 ns.
Gate start range:	0.02 to 1000 $\mu$ s, adjustable in 0.02 us steps.
Gate width:	0.02 to 1000 us, adjustable in 0.02 us steps.
Defect evaluation:	Alarm threshold adjustable from 0% to 100% in 1-% steps.
Alarm output:	Opto-isolated logic and AC solid state relays.
Alarm logic:	Positive or negative, independently selectable for each gate.
Peak and valley detection:	For positive alarm mode the largest signal within the gate is held until it is recorded on strip chart. In negative alarm mode the smallest signal is held in a similar manner.

### DISTANCE-AMPLITUDE(DAC) CORRECTION

DAC curve:	16-segment, no width limitations, any segment can be increasing or decreasing, mouse drag adjustment.
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### THICKNESS CIRCUIT

Thickness Resolution:	2.5 ns, approximately 0.0003 inch for steel
Thickness Modes:	Average, and min/max capture for rotary
Error Detection Circuit	An adjustable measuring gate restricts thickness measurement to a specific location, prohibiting false readings in case of missing echoes. Slew rate control restricts measurements from rapidly changing from previous measurement.
Alarm Thresholds:	Independently settable for minimum and maximum deviations from nominal value.

### DIMENSIONAL MEASUREMENT

Three-transducer mode of operation for simultaneous measurement of OD, ID and wall thickness of tubes. Two transducers are located on opposite sides of the tube, the third transducer has a fixed artificial target for water velocity compensation due to temperature change.

### A-SCAN DISPLAY

Digitization:	100 MHz, 8-bit, independent for each channel
Depth:	500 points
Range:	1 us. or greater
Sync:	IP or IF with delay.
Processing:	Each channel has a dedicated ADC, processor, and DMA engine for capturing and displaying consecutive traces. Specialized peak capture mode of operation is implemented in both hardware and software.
Persistence/Decay:	Previous traces can be displayed in decaying intensities to hold infrequent events. DIB processing mode allows much longer and infinite hold.

### STRIP-CHART PRESENTATION AND RECORDING

General:	Strip-charts are presented on the monitor in combination with the A-scan and setup parameters or individually.
Number of traces:	Any and all gates up to 32 channels.
Recording:	There are 32 recording channels and 4 gates.
Reporting:	Summary reports are given at the end of production run containing total number of pieces or length tested, number of rejects, date of test, material and customer information.

### TUBE & BAR TRACKING

Implemented in hardware, end suppression and defect marking is fast and high precision.

### COMPUTER

Industry standard IBM compatible standard rack mount computer with Windows® platform

### NETWORK

10/100 Ethernet, TCP/IP. Remote application can control test parameters and view all signal waveforms.

### OPERATING CONDITIONS

AC power requirement:	Under 800 VA from a 115 V or 230 V, 50 or 60 Hz line for an eight-channel installation.
Enclosure:	Standard 19" rack-mount computer enclosure and rack mount monitor. These units typically operate in air-conditioned cabinets.
Weight:	55 lbs. (24.75 kg)
Operating temperature range:	0 to 50 degree C (32 to 122 degrees F).