BondCheck

Multi-mode bond inspection flaw detector

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BondCheck Introduction

Multi-mode bond testing instrument

- Pitch-catch
- Resonance
- MIA (Mechanical Impedance)

Built on established AeroCheck+ EC instrument architecture
Additional dedicated hardware to support signals from bond testing probes

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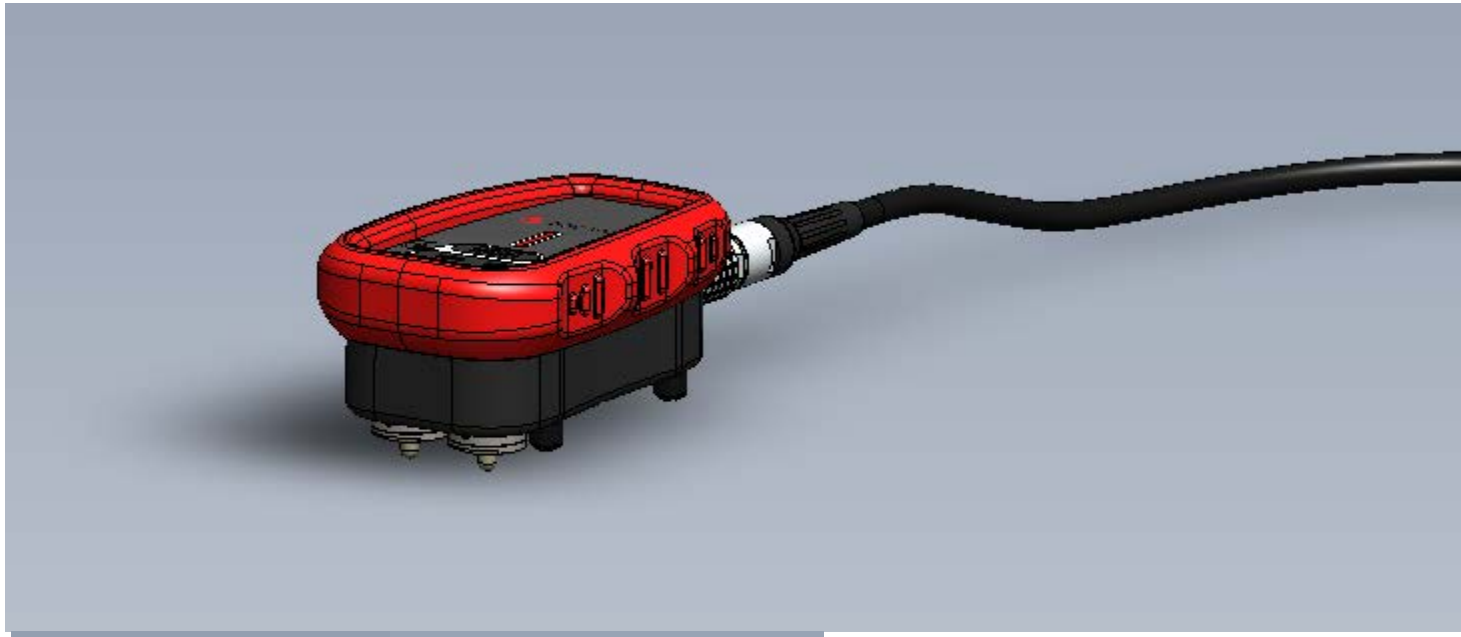
BondCheck - Pitch Catch mode probe

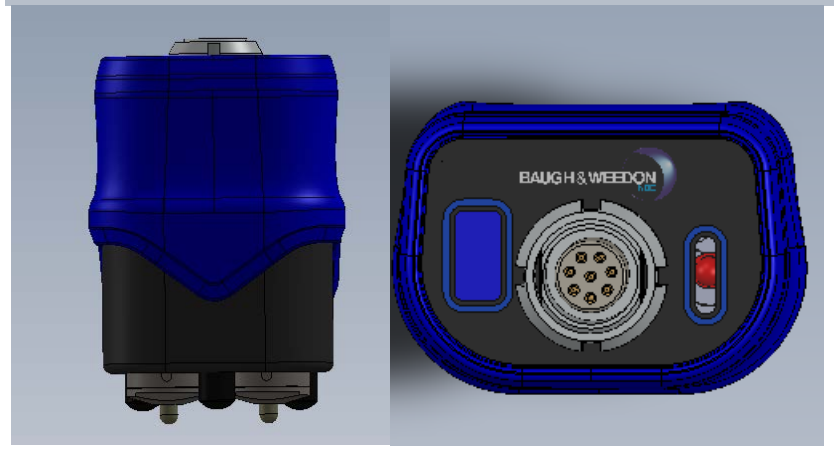
Standard model

Domed and Flat probe tips
Rubber hand grip
CNC machined body
Configurable guide feet
Alarm LED



Small footprint model

Same core design
Improved inspection access



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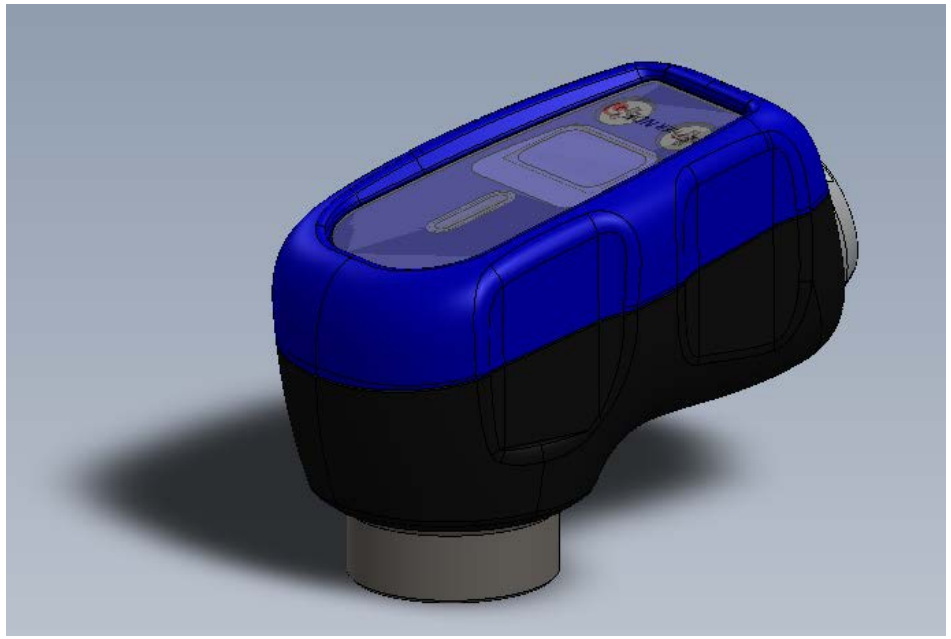
BondCheck - Resonance mode probe



6 standard inspection frequencies
75, 90, 165, 200, 250, 330kHz

Ergonomic polymer casing
Stainless steel probe housing
Hard wearing Alumina front face

Alarm LED in top cover
Probe memory holds serial number, default and preferred settings, ***and air calibration data***.

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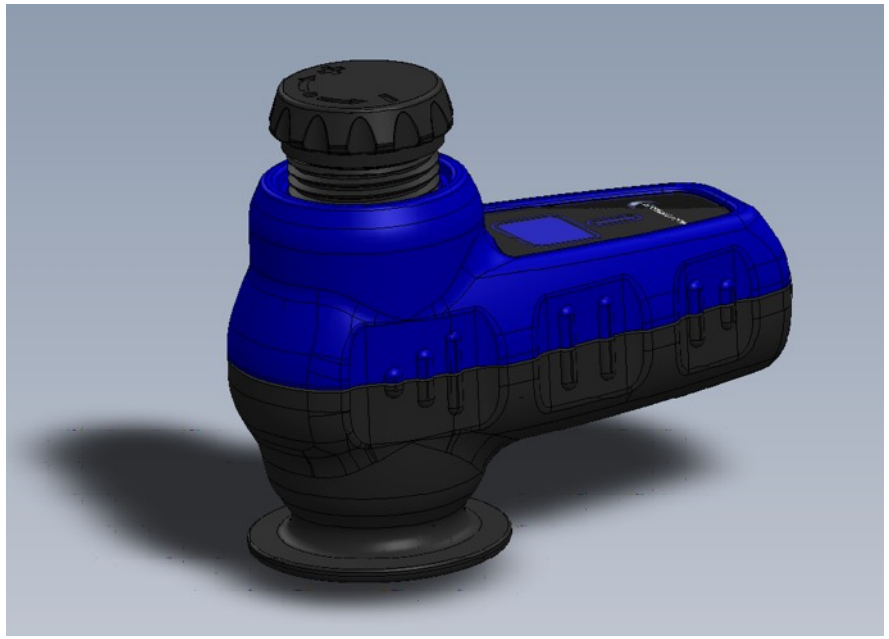
BondCheck - MIA mode probe

General purpose probe
Operation 2kHz to 10kHz
Ergonomic polymer casing
Brass probe tip
Spring loaded coupling mechanism
Integrated electronics to optimise signal



Alarm LED in top cover
Probe memory holds serial number, default and preferred settings.

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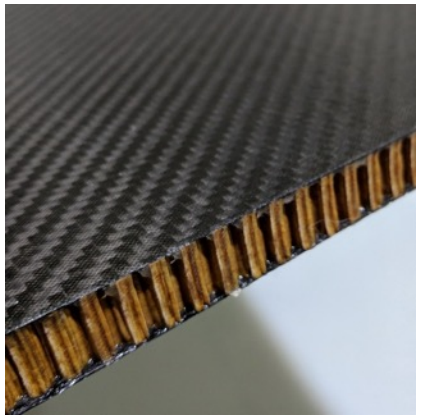
BondCheck Applications

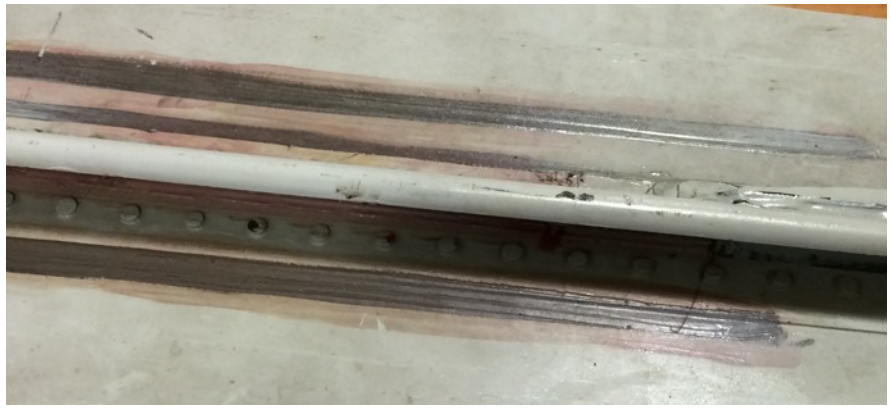
Honeycomb sandwich materials

- FRP/Aluminium/Titanium skins
- Aluminium/Nomex core



Metallic bonded lap joints

- Stringers/stiffeners



CFRP components

- Delaminations, stringer bonding

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BondCheck Applications and Modes

Methods tend to be application specific
Material construction varies considerably in skin thickness/stiffness, core thickness/density, skin surface roughness.
Can have a very significant influence on which method works well

	FRP Honeycomb		Al/Ti Honeycomb		Bonded aluminium	CFRP
	Near surface	Far surface	Near surface	Far surface		
Pitch-Catch						
Resonance						
MIA						

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BondCheck Applications and Modes

Suitability for scanning applications (automated or wide area manual)
Considerations are coupling, contact area, minimum defect sensitivity

	Wide area scanning	Defect size resolution	Ease of coupling
Pitch-Catch	Lower resolution than MIA	Tip spacing 17mm	Dry coupling dual contact
Resonance	Difficult to couple	Resonant frequency determines piezo diameter	Liquid coupling required
MIA	Point measurement, easy coupling,	Smallest probe contact	Dry coupling

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BondCheck Modes and Presentation

Pitch-catch mainly amplitude based method
Resonance is combined phase and amplitude method
MIA is phased based method only
Frequency spectrum analysis generally less established

	RF "A-Scan"		Flying dot X-Y Plane		Frequency Spectrum	
	Amplitude	Phase	Fixed Freq	Freq Sweep	Amplitude	Phase
Pitch-Catch						
Resonance						
MIA						

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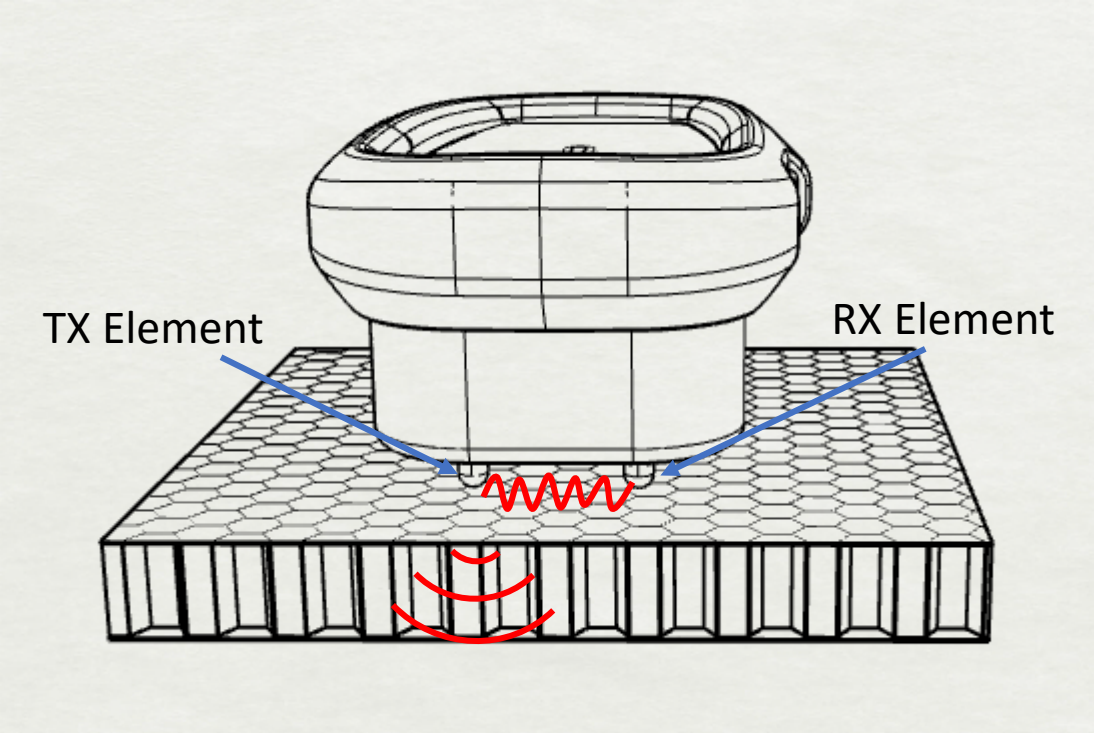
BondCheck Methods explained: Pitch-catch



Pair of probe tips to transmit and receive.
Surface wave transmitted from tx to rx

Well bonded structure absorbs acoustic energy, reducing energy in surface wave received

Dis-bonds in structure absorb less energy, surface wave with higher amplitude received

Bond / Dis-bond damping occurs at different frequencies and time base posit-on depending on geometry and defect location

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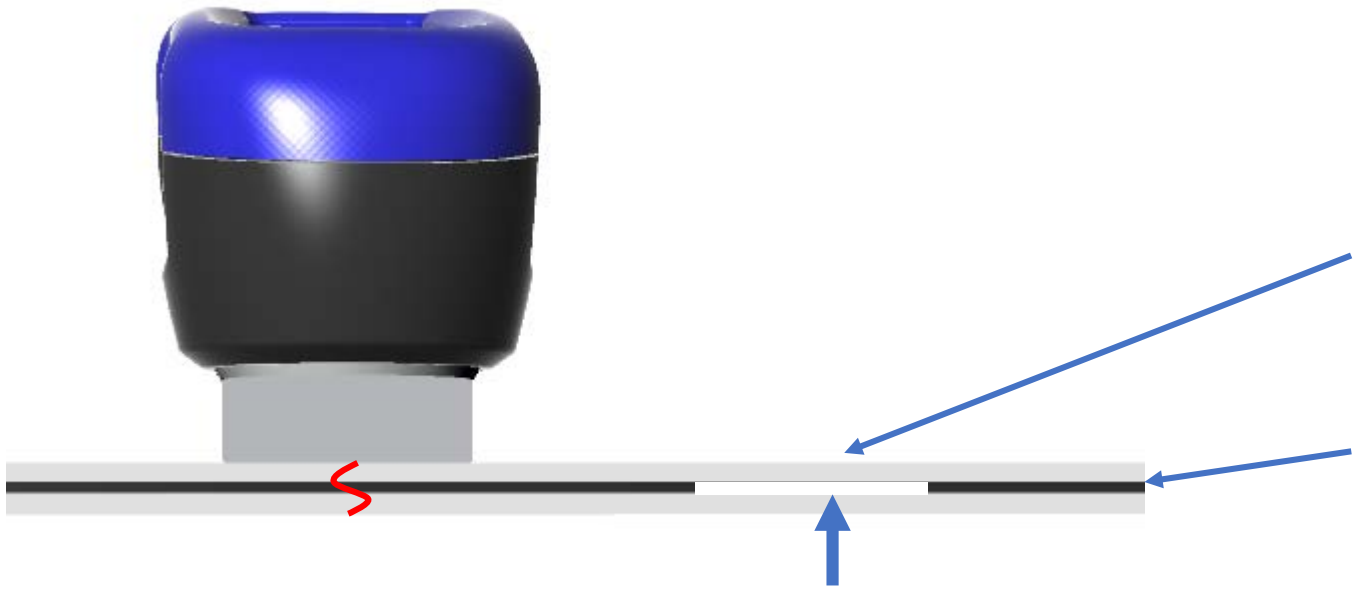
BondCheck Methods explained: Resonance



Disbond changes effective thickness

Transducer operated at Air resonant frequency

Resonance modified by coupling to material

Disbond introduces air gap under top substrate

Reduces effective material thickness

Adhesive also adds damping to structure

Modifies amplitude and phase response of probe

Common misconception, the inspection frequency is not the resonant frequency of the bonded layer !

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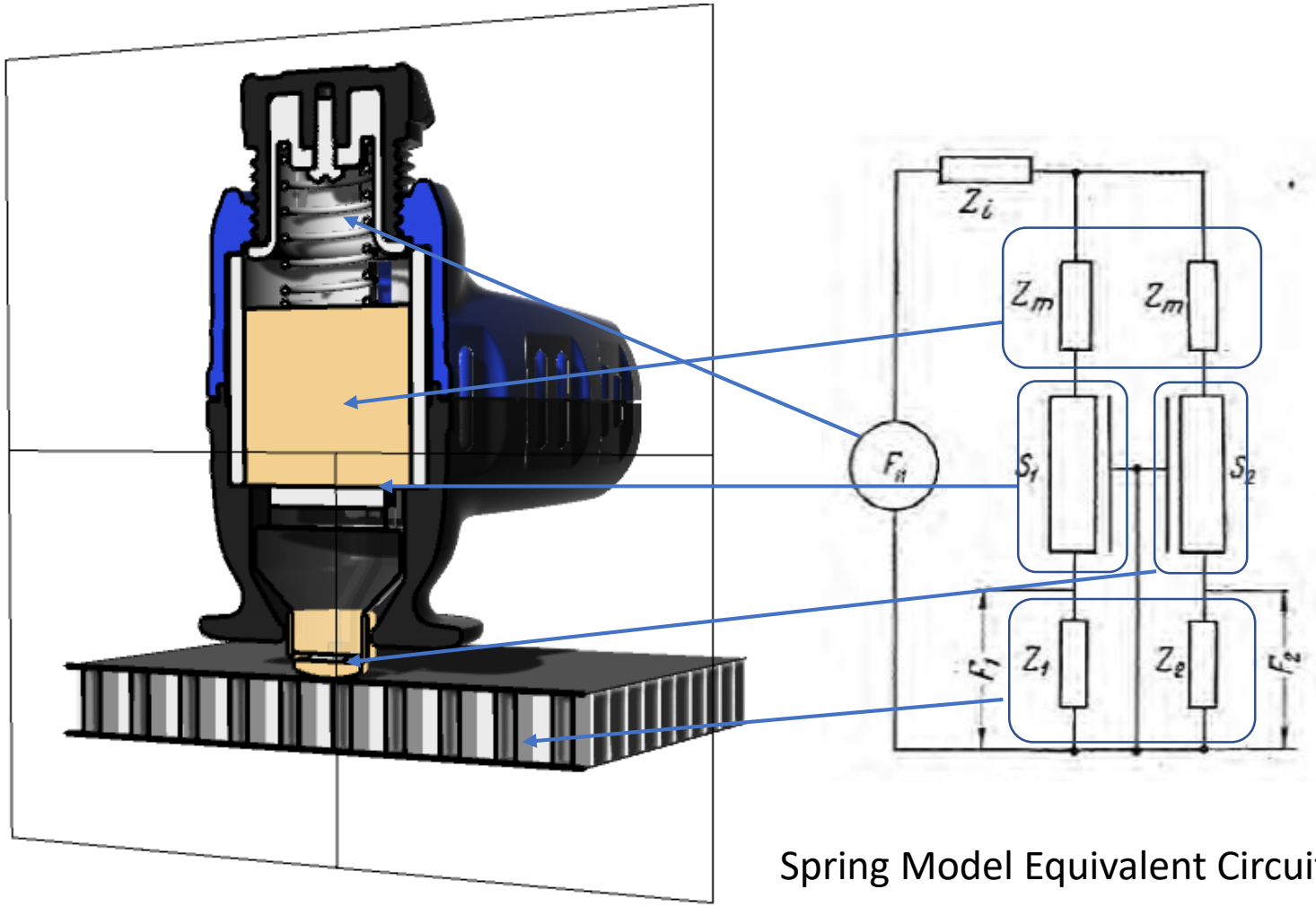
BondCheck Methods explained: MIA



Spring Model Equivalent Circuit

Operate near to mechanical resonant frequency of material surface (honeycomb skin).

Surface stiffness of material determines mechanical damping of receive element.

Phase of mechanical vibrations at receive element sensitive to damping/stiffness.

Disbonded area low stiffness
Bonded area high stiffness

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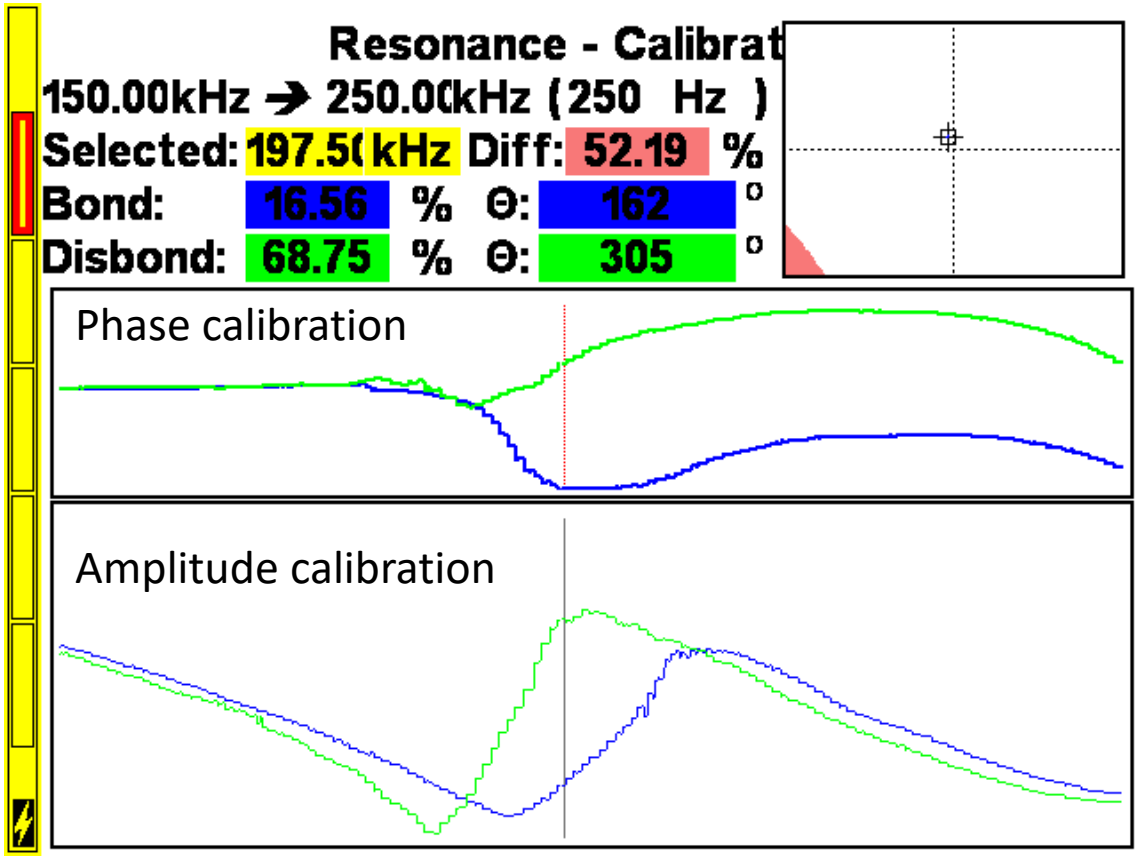
BondCheck Product Highlights

Bond-Disbond calibration for resonance mode probes



Narrow band sweep around resonant frequency of selected probe

Frequency shift due to dis-bond clearly visible in Amplitude and Phase responses

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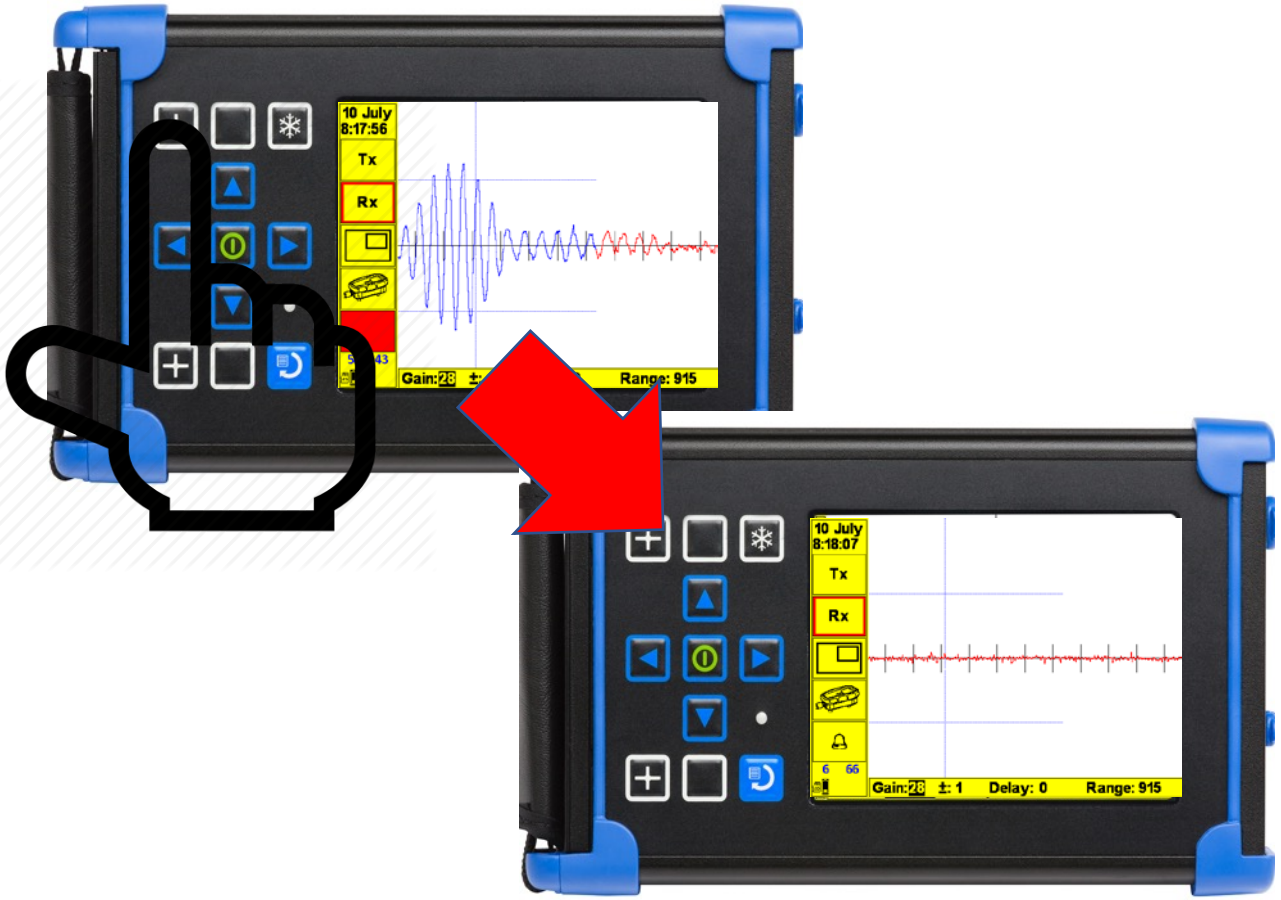
BondCheck Product Highlights

RF Waveform NULL Unique Feature



Allows reference waveform to be subtracted from response.

Works best in pitch-catch mode

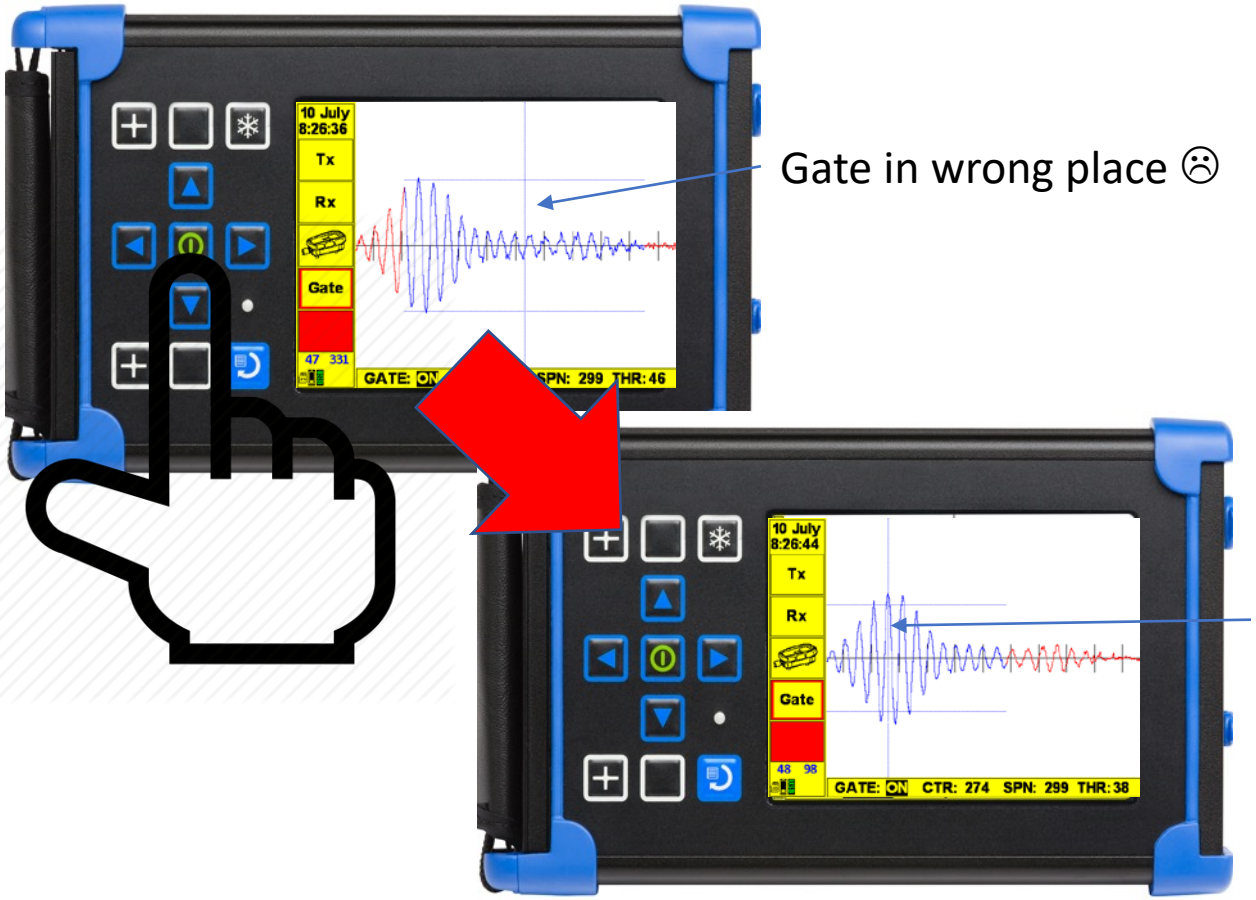
Easier to spot defect areas and setup gates

Press  when the RF signal is live.

Remember to press again in order to return to normal waveform view

BondCheck Product Highlights

Auto Gate Position



Gate in wrong place ☹

Gate in right place ☺

Automatically positions waveform Gate to highest amplitude position, thresholds to 80% of signal height.

Saves time setting up inspections

Press select key on GATE: ON

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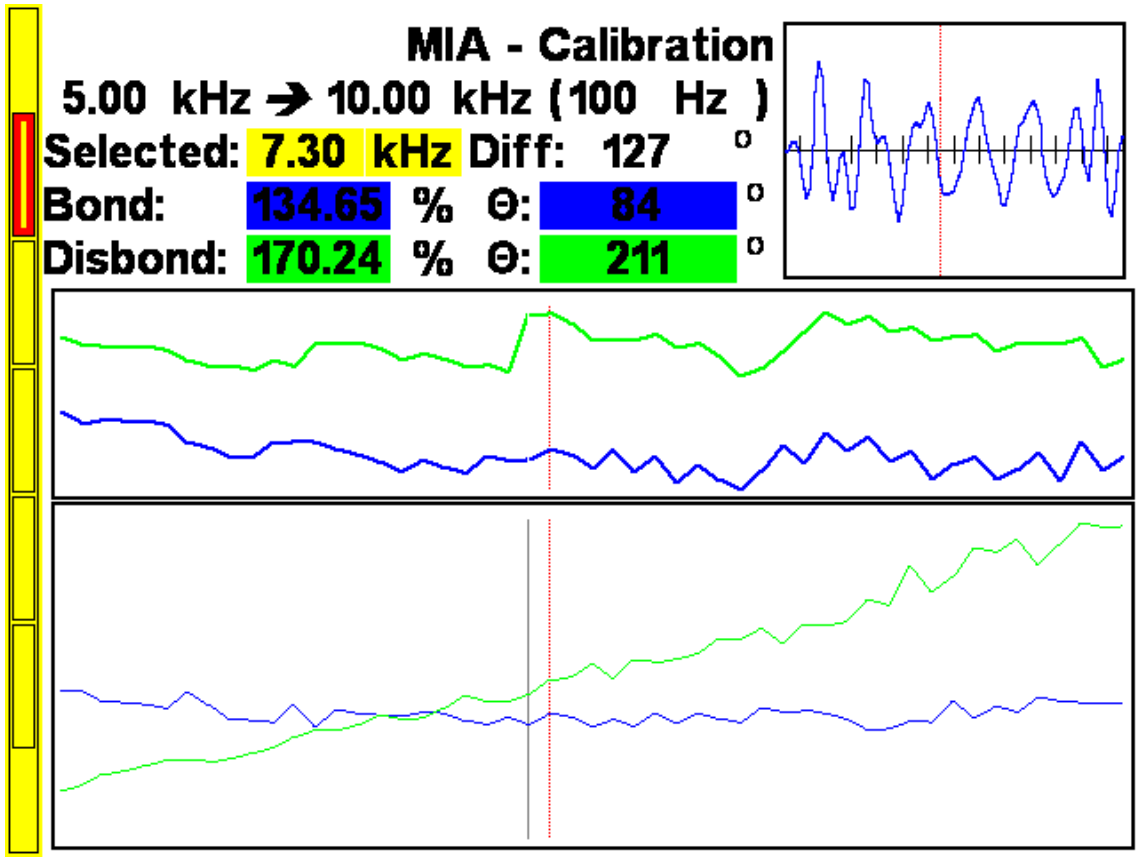
BondCheck Product Highlights

Easy to use calibration functions – reduce wasted time, improve POD



Quick frequency scan on bonded and dis-bonded Sections.

Software identifies best frequency for inspection

Amplitude and phase responses displayed

- For pitch-catch / resonance use amplitude
- For MIA must **only** use phase

Accept automatic frequency or adjust manually

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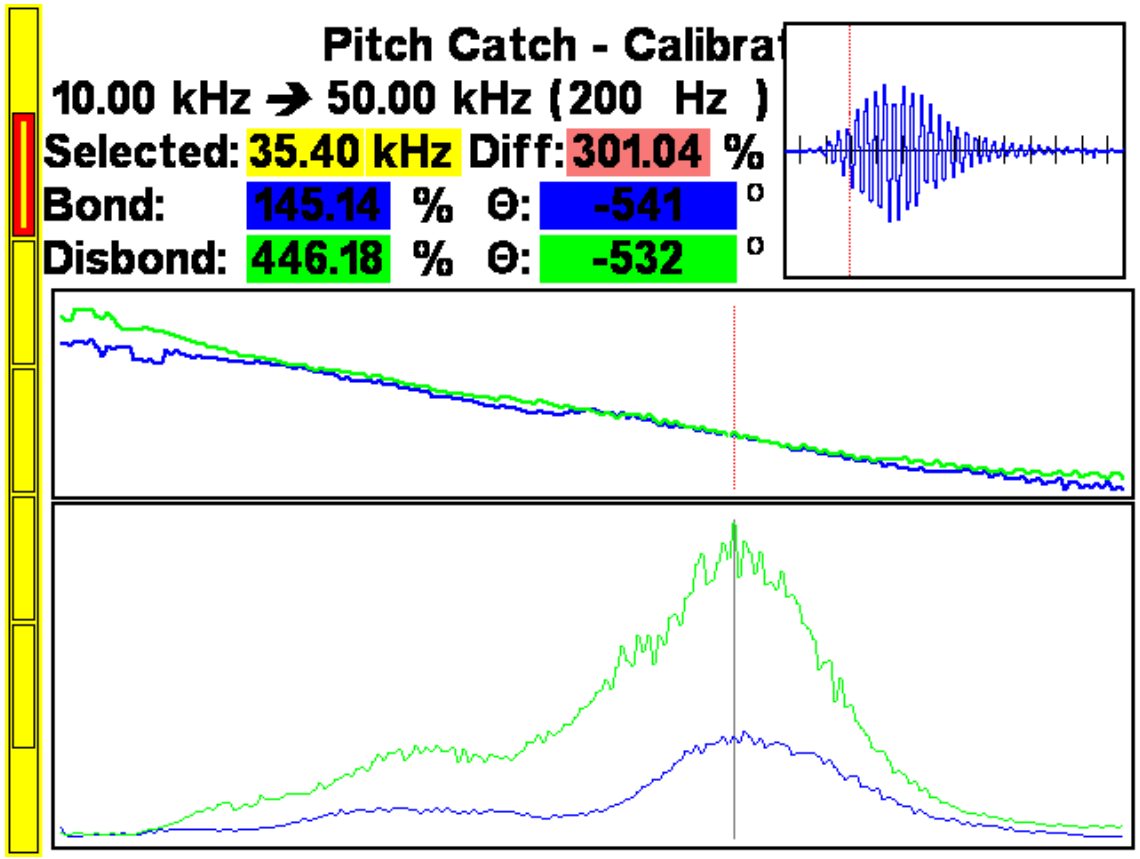
BondCheck Product Highlights

Calibration auto-gain feature explained



For wide frequency calibration sweeps difficult to know what gain setting to use.

Too much gain causes saturation, calibration not valid

Too little gain and poor readings taken

Select **Auto gain: ON** and gain is continuously optimised for each frequency in calibration process to keep measurement in range.

As gain is applied, the amplitude data is corrected.

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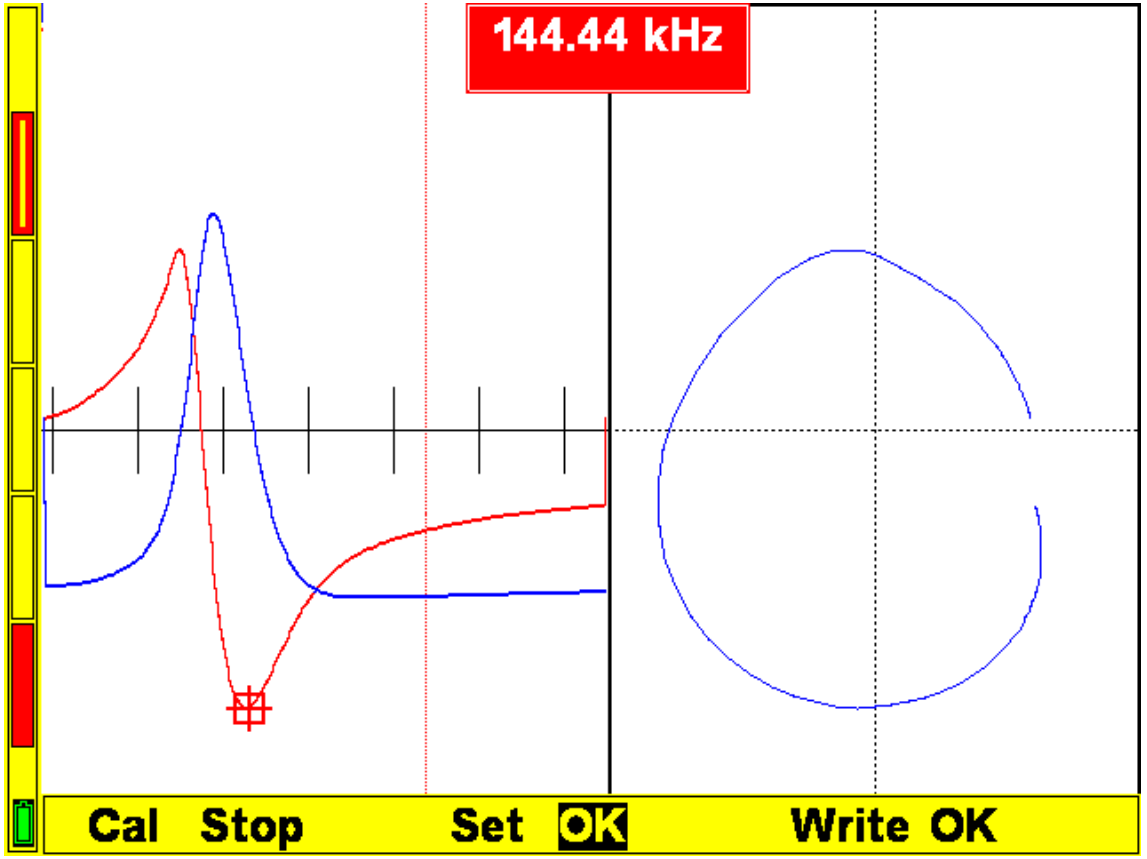
Air calibration for resonance mode probes



Optimum resonant frequency varies slightly from one probe to another.

Operating at exact resonant frequency vastly increases measurement sensitivity

Hold probe in air and BondCheck identifies the most sensitive inspection frequency.

Store air calibration in the probe memory

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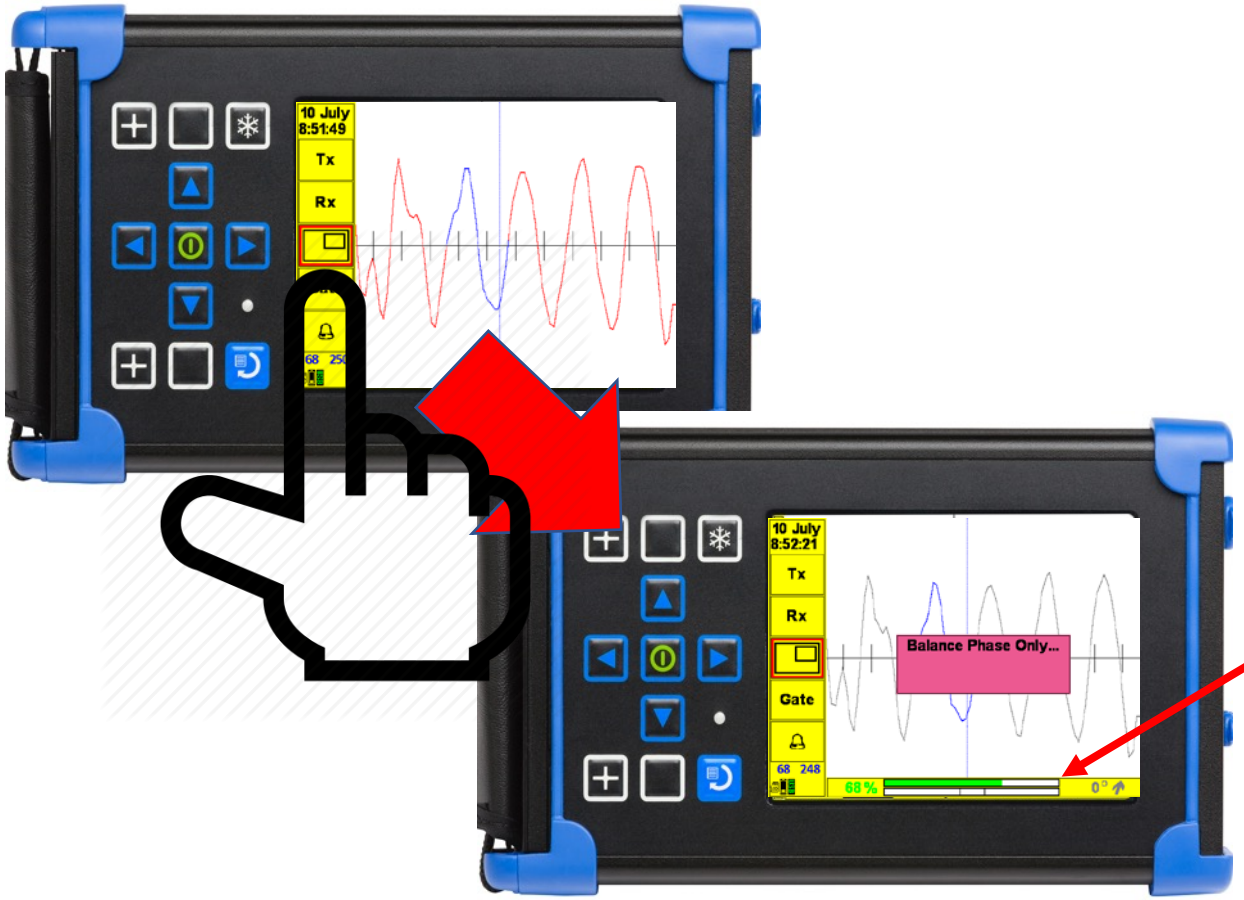
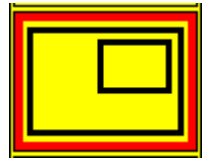
BondCheck Product Highlights

Phase Bar Chart for MIA Mode



Press  on side bar menu in MIA mode

Enables bar chart showing Amplitude and Phase
Phase trigger thresholds shown as defined in Gate menu.

Press balance key  to centre bar graph and set phase thresholds

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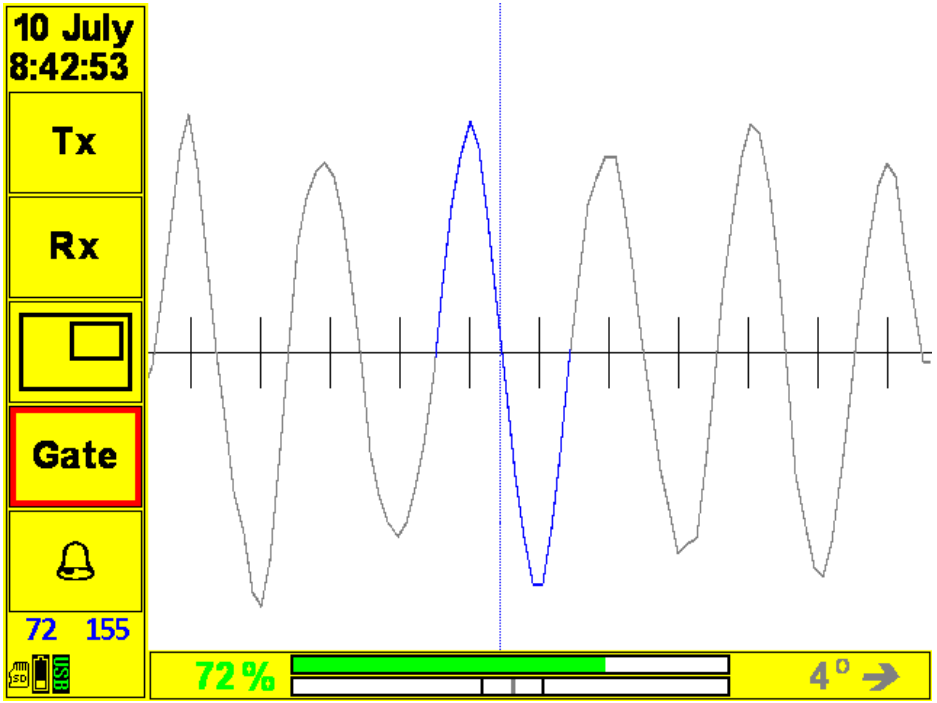
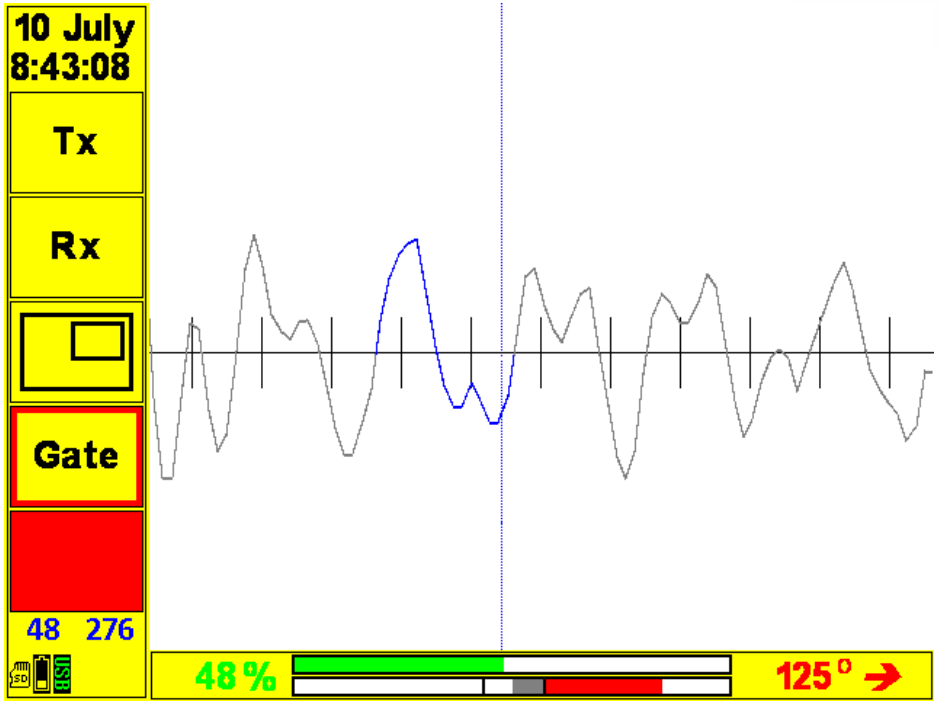
BondCheck Application Examples
Inspection of Titanium Honeycomb



Bonded Region, phase bar chart at zero



Un-bonded Region, bar chart shows large phase shift

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ETherCheck

- Also available an EC and Pitch Catch mode only instrument from EThер NDE
- “Two instruments in one”.
- The leading features of the best in class AeroCheck+ Eddy Current Flaw Detector combined with excellent Pitch-Catch functionality.
- Pitch-Catch dry coupled bond testing mode allows rapid detection of defects in laminate, bonded and sandwich structures.

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Come and see us at our Booth in the exhibit Hall or tonight in the Carribean Room where we will be serving Prime Rib, European Antipsati and beverage

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Any Questions

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