

BONDCHECK

PITCH-CATCH, RESONANCE, MIA BOND TESTING MODES



- Multi-mode Bond Testing instrument.
- Unique calibration function for fast and easy set-up.
- Lightweight and portable.
- Dry coupled pitch-catch and MIA probes.
- Automatic Test Frequency Optimisation.
- Ideal for inspection on metallic bonded structures, composite and metallic honeycomb.
- Two year warranty.



The BONDHECK is a multi-mode bond testing flaw detector. It provides high speed inspection in pitch-catch, resonance and MIA bond testing modes, with excellent defect sensitivity.

All functions are housed in a single lightweight instrument with a common user interface between the three modes, delivering a simple and intuitive operator led set up. A great all round asset for inspection in the laboratory or under cover as well as out in the field.

Large, daylight readable, configurable colour screen.

The BONDHECK has a large 14.5cm (5.7 Inches) LCD Colour Screen of 640 x 480 pixels providing the operator with excellent signal resolution and presentation together with the choice of configuring their own colour schemes and display types.

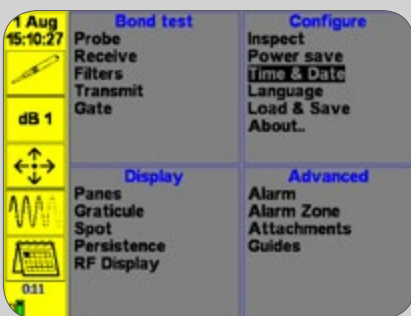
It is easy to optimise the screen presentation regardless of the lighting conditions. A secondary pane can be configured to create a split screen display or an inset window, with a choice of X-Y spot, frequency sweep, RF waveform and Spectrum displays.

Easy to use menus and icon system.

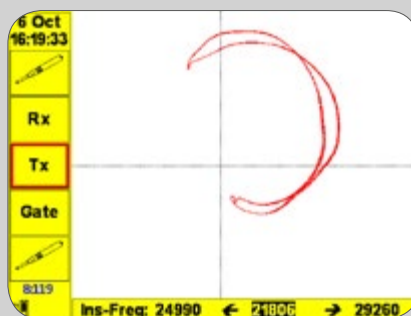
The BONDHECK menu system is simple and fast to navigate. It has the ability to add individually selectable soft key menu items to the sidebar for rapid function access and a “quick-setting menu” for easy set-up, review and adjustment.

With four operator selectable soft keys and a fifth slot for the last menu function used, technicians can quickly modify the system with their preferences. Each saved instrument setting can be associated with a unique, single press set of quick access soft keys. There are also two front panel hard keys that can be readily programmed for rapid single press access to frequently used functions.

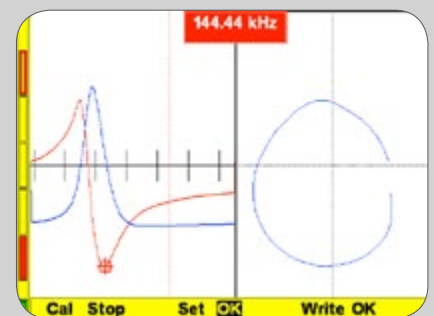
ACCURATE, CLEAR AND SIMPLE BOND TESTING INSPECTION.



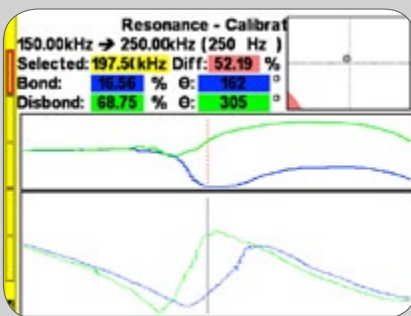
Bond Test Mode Menu System



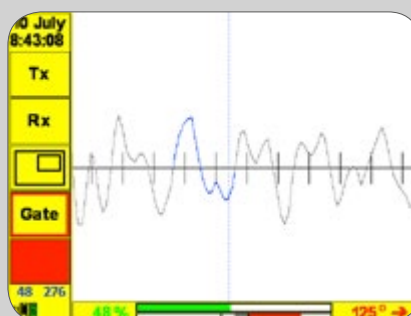
Sweep Mode



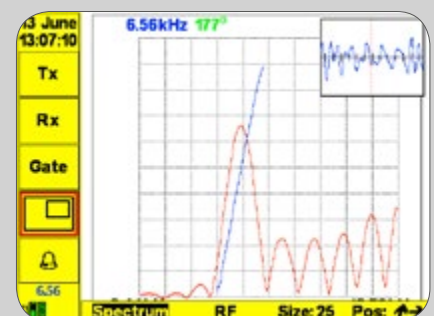
Air calibration for Resonance mode probes.



MIA mode calibration showing bond and dis-bond,



MIA mode inspection phase alarm.



Spectrum view with phase, and RF waveform inset window.

PITCH-CATCH PROBE

Ergonomically designed and manufactured from CNC machined Aluminium with rubber hand grips, the BONDHECK Pitch-Catch probe is both comfortable to use and robust; whilst offering the best in performance and durability.

The probe feet can be positioned by the user to suit the inspection task, and the hard wearing probe tips are interchangeable with rounded and flat tip profiles available. The probe is broad band and is suitable for a wide range of applications.

The stainless steel transmit and receive sensors are positioned close to the edge of the housing, and a smaller probe form factor is also available to allow inspection in tight areas. An alarm LED on the probe can be triggered from the BONDHECK alarm settings. The probe incorporates a digital ID which stores its serial number together with programmable settings.

Pitch Catch Probe Specification	
Operating Frequencies	30kHz (suitable for 10kHz to 50kHz operation)
Transmit - receive probe separation	17mm
Transmit - receive probe linear travel	>5mm
Probe auto-recognition	Yes
Probe alarm LED	Yes
Probe feet	Multiple positions, user changeable.
Probe tips	Rounded end and flat end, replaceable by user.
Probe materials	Anodised aluminium case, with stainless steel probe housings, rubber finger grip.
Probe connector	LEMO:ECG.1B.308.CLV
One-wire integrated memory for serial number and settings.	

Pitch-Catch Probe Application

Thin Fibre Honeycomb with CFRP skin sample Rear Disbonds

The BONDHECK calibration function was used to find an inspection frequency to detect a 60mm x 25mm rectangular, and 15mm diameter circular core to rear skin disbond (simulated by removal of the rear skin). Setting the inspection range to the maximum from 1kHz to 50kHz and the step frequency to 100Hz, the following bond and disbond spectra are obtained, with 34.2kHz determined as the optimum inspection frequency with other potential frequencies of interest around 20kHz.

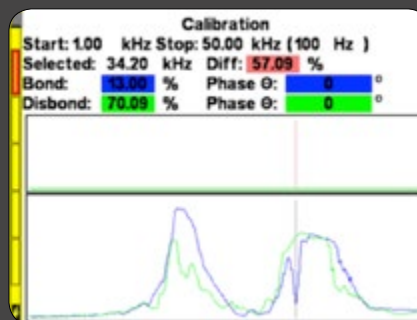


Figure 3: Thin CFRP honeycomb sample with rear surface disbonds.

In RF mode, a difference of ~10% at best is observed at either frequency between the bonded and dis-bonded areas. A swept frequency inspection was configured from 15kHz to 32kHz, responses from the disbonded and bonded rear skin shown below provide a much clearer difference.

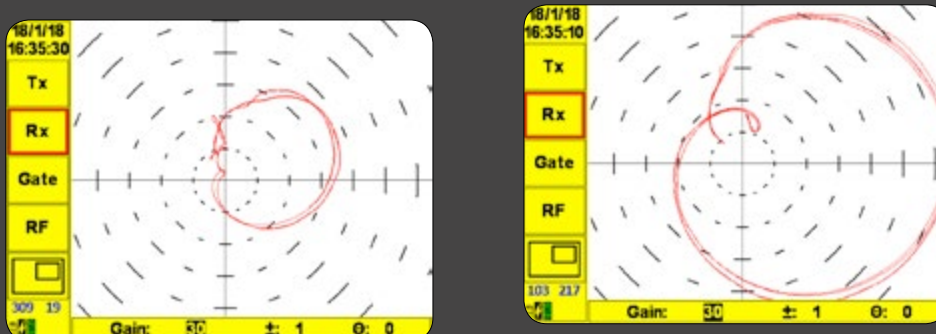


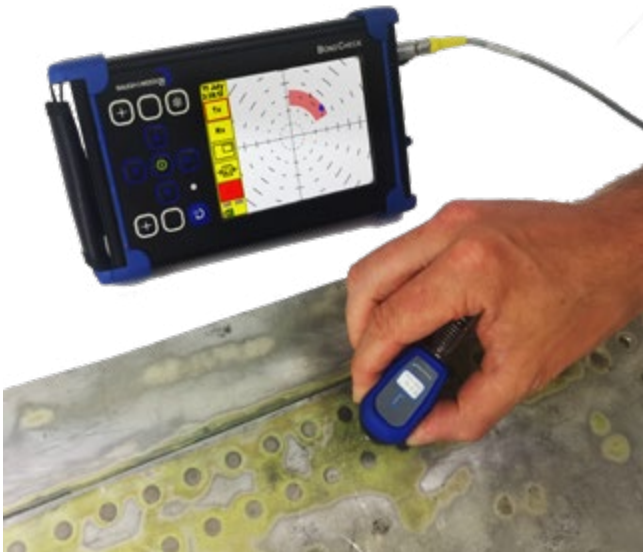
Figure 4: BondCheck frequency sweep response from bonded (left) and disbonded (right) rear surface CFRP skin to 10mm fibre honeycomb core. Rectangular defect 60x25mm.



RESONANCE PROBES

Now available in a number of frequencies (75, 90, 165, 200, 250 and 330kHz) which can be supplied as a 6 probe kit or individually. Ergonomically designed, they can be connected to the instrument using the same cable as the Pitch-Catch probes.

The stainless steel probe with tough polymer hand grip and Alumina wear face provide robust performance. Like all BondCheck probes the Alarm LED and digital ID allow ease of use and for serial number and settings to be stored. The BONDCHECK allows an air calibration to be carried out to determine most sensitive inspection frequency.



Resonance Probe Specification	
Operating Frequencies	75kHz, 90kHz, 165kHz, 200kHz, 250kHz, 330kHz
Transducer face ϕ	15mm for >150kHz 23mm <150kHz
Probe Auto-recognition	Yes
Probe alarm LED	Yes
Probe material	Polymer handgrip, Stainless Steel probe, with alumina wearface..
Probe connector	LEMO:ECG.1B.308.CLV
One-wire integrated memory for storing serial number, air calibration and user settings.	

Resonance Mode

Resonance mode is ideal for inspection of bonded aluminium lap joints commonly found in aerospace structures such as wing and aileron stiffeners, and has good penetration through multi-layered structures and adhesive bond lines. Resonance probes are narrow band with high Q, and are particularly sensitive at their natural resonant frequency. Once the resonance probe is ultrasonically coupled to the structure under test, the impedance spectrum of the probe is modified by the acoustic impedance and geometry of the bonded structure, which allows dis-bonds between layers to be identified.

The bond-line resonant frequency increases in the event of a partial bond, and substantially in the case of a complete dis-bond. Probe frequencies are selected to provide optimum sensitivity to the structure under test, and the range of 6 probes covers the requirements of most applications, although specific frequencies can be accommodated on request.

Application	Pitch-Catch	Resonance	MIA
Carbon honeycomb near surface delamination	Excellent	-	Good
Carbon honeycomb core crush/cut damage	Good	-	Poor
Carbon honeycomb rear surface delamination	Good	-	-
Metallic honeycomb skin disbond / core damage	Good	-	Excellent
Metal bonded lap joint	Good	Excellent	Good
CFRP delamination	OK	Good	Good
Small defect detection	OK	Good	Good
Dry coupling	Yes	No	Yes

MIA PROBES

The MIA technique is particularly useful for small defect detection, using a dry coupled probe with a small contact area. The technique offers excellent near surface defect sensitivity and is particularly suitable for top surface skin to core dis-bond detection for composite as well as metallic honeycomb structures.

With the same ergonomic design features of the pitch-catch and resonance probes, the MIA probe provides a detachable foot, replaceable springs and an adjustable spring pre-load. MIA probes can be connected to the instrument using the same cable as the Pitch-Catch probes.

Software features included in the BONDCHECK instrument are tailored towards the MIA inspection technique with easy calibration and inspection tools to allow the operator to evaluate the phase response of the test material.

The BONDCHECK instrument offers MIA mode in both tone burst and continuous wave options. Thanks to the unique differential probe drive and screened probe tip, signal interference from metallic components is eliminated.



MIA Probe Specification	
Operating Frequencies	2kHz to 10kHz
Probe auto-recognition	Yes
Probe alarm LED	Yes
Probe housing material	Polymer
Probe connector	LEMO:ECG.1B.308.CLV
One-wire integrated memory for serial number and user settings.	

MIA Mode

The MIA technique is sensitive to changes in near surface mechanical stiffness, and is ideally suited to composite and metallic honeycomb skin to core dis-bond detection. It offers potentially smaller defect detection than the Pitch-Catch method, better defect location and extent determination, and unlike resonance mode is dry coupled. MIA mode is also effective for bonded lap joints but limited in effectiveness to the first bond layer.

In the example shown above, dis-bonds between the Titanium honeycomb core and skin create local variations in the mechanical stiffness of the structure. The BondCheck calibration functions allow quick determination of the best inspection frequency to use for dis-bond detection, and poorly bonded areas can be quickly identified and mapped out. The curved surface geometry of the component also makes MIA mode an ideal choice, with a very small dry coupled probe contact area that is tolerant of probe orientation.



Resonance Probes



MIA Probes

Pitch-Catch Probes



BONDCHECK Specification

Display	Type	5.7" (145mm), 18 bit Colour, daylight readable.		
	Viewable Area	115.2mm (Horizontal) x 86.4mm (Vertical). Resolution 640 x 480 pixels		
	Colour Schemes	User configurable Dark, Bright and Black & White.		
	Configurable Screen	Full Screen, Single, Dual Pane with variable size and location and function e.g. XY, Timebase.		
	Display Modes	Pitch-Catch, Resonance & MIA: Spot and Sweep modes. RF Timebase for Pitch-Catch only.		
	Graticules	None, Grid (4 sizes 5, 10, 15 and 20% FSH), Polar (4 sizes 5, 10, 15 and 20% FSH)		
	Offset	Spot Position: Y -50 to +50, X -65 to +65%		
	Flip	Manual or automatic screen orientation change to enable left or right handed use.		
Transmit	Operating Mode	Pitch-Catch, Resonance and MIA.		
	Output Frequency Range	Pitch Catch: 5kHz to 50kHz.	Resonance: 50kHz to 400kHz	MIA: 2kHz to 10kHz
	Output Voltage	Pitch-Catch tone burst: 10 ranges: 1,3,6,8,10,12,18,24,30,36V pk-pk.		
		Pitch-Catch sweep: 3 ranges: 12, 24, 36V pk-pk		
		Resonance: 3 ranges: 12, 24, 36V pk-pk		
		MIA: 3 ranges: 12, 24, 36Vpk-pk (high voltage drive in probe)		
	Minimum Output drive load impedance	300 Ohms		
	Waveform Type: Pitch-Catch/MIA	Tone burst with rectangular or hanning window with chirp.		
		Transmit waveform points maximum: 8192		
		Waveform duration: Maximum 3.2ms / 2.5ms	Waveform output DAC clock rate: 2.5MHz fixed	
Frequency Sweep: Frequency range 5kHz to 50kHz / 2kHz to 10kHz				
Waveform Type: Resonance	Fixed or swept waveform			
	Frequency range 5kHz to 400 kHz			
Receive	Pitch-Catch / MIA Tone Burst	Sample rate: 440kHz / 100kHz	Maximum PRF: 14Hz	
		Sample Bit depth: 12 bit	Gain range: 0 to 60dB	
		Receive bandwidth: 5kHz to 100kHz -6dB points		
		Input voltage saturation: ±400mV		
		Time base range: 100µs to 2ms/ 22ms	Time base delay: 0µs to 1ms	
		Cross Talk: >40dB isolation	Amplitude/phase extraction cursor: position resolution <5µs /10µs	
	Resonance & Pitch-Catch Sweep	Dynamic Range: >150dB		
		Bit depth: 24 bit		
		Gain Range: -30 to 60dB.		
		Receive bandwidth: DC to 20MHz		
	Filtering	Amplitude/phase extraction by QAM demodulation		
		Fixed Hardware High-pass filter for Pitch-Catch to reduce surface scanning noise.		
Fixed Hardware Low-pass filters 100kHz for Pitch-Catch for optimum amplifier SNR.				
Software	Configurable Software High-pass and Low-pass filters for all modes			
	Acquisition Gate in RF Mode	Adjustable gate start, width and threshold.		
	Alarm Gate in Y-T Mode	Multiple box, circle and sector alarm zones.		
	Calibration Mode	Performs frequency sweep of bond and dis-bonded areas. Automatic inspection frequency determination with manual adjustment. Air calibration for resonance mode		
Bond/Dis-bond Alarm	Status on screen and probe LED.			
Physical	Weight	1.2 kg, 2.7 lbs.		
	Size (w x h x d)	237.5mm x 144mm x 52mm / 9.4" x 5.7" x 2.1"		
	Material/Housing	Aluminium alloy Mg Si 0.5 powder-coated		
	Operating/ Storage Temperature	Operating 0 to +40 °C	Storage for up to 12 months -20 to +60 °C. Nominal +20 °C	
	IP Rating	54		
Warranty	2 year Manufacturer's Warranty	Covers all components of the BondCheck, excludes customer damage or misuse. (probes not included)		

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