ETHER NDE

Eddy Current Solutions

ETherCheck – User Manual

ETherCheck - General Purpose Eddy Current and Bond Testing Instrument

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1. Contents

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2. Introduction

2.1 About the ETherCheck

The ETherCheck is a dual method instrument; it combines the Eddy current functions of the Aerocheck+ instrument with Pitch-Catch ultrasonic bond-testing capability suitable for composite materials.

The ETherCheck instrument is a dual frequency eddy current inspection instrument with conductivity. It is designed for flaw detection and evaluation using the Eddy Current non-destructive testing (NDT) inspection method particularly for use in aircraft inspection.

ETherCheck can perform a great many eddy current inspection tasks including surface defect detection, high-speed rotary inspection of holes and low frequency inspection of non-ferrous material. The dual channel/frequency capability means that the instrument can perform, in addition to single frequency, applications that require dual frequency. Examples of dual frequency are the suppression of unwanted signals by mixing or dual test with one probe (typically simultaneous absolute and differential testing) or dual probe testing where one probe must be absolute but the other could be any of the types the instrument can used with.

The ETherCheck is equally applicable to testing products either during manufacture or once in-service.

Due to its 10Hz-12.8MHz-frequency range it is able to detect surface and subsurface defects in components made from non-ferrous metals and their alloys and on ferrous materials can detect surface breaking defects.

Always refer to the applicable inspection and operator certification procedures and national and international standards before undertaking a test particularly those referring to certification of operators.

The instrument may be used with nearly all eddy current probes including:

- Absolute single element probes
- Absolute bridge connected probes
- Absolute reflection connected probes (e.g. Spot Absolute Probes)
- Differential bridge connected probes (e.g. ID Probes)
- Differential reflection connected probes
- Sliding transmit receive reflection probes
- Rotary drives. Directly compatible with both ETher and GE/Hocking rotary drives and by means of an adapter with Rohmann drives MR1, SR1 and SR2.

In Bond Testing mode the ETherCheck is suitable for detection of disbond/unbond conditions in typical composite materials of both monolithic and cored sandwich construction, as well as metallic bonds. The wide frequency range and selection of available probes make it suitable for a wide variety of material types.

The User Manual of the ETher NDE ETherCheck portable inspection instrument (referred to as the "instrument") is intended to explain the operation principles of the instrument.

Note that this version of the manual refers to a pre-release version of the software. It is to be expected that this manual, and the instrument to which it refers, will be modified over the next few months as various features are added and improved.

Please contact ETher NDE, or your distributor, to ensure you have the latest version of instrument firmware and documentation.

2.2 A first look at the instrument.

This section gives an overview of the various external features of the instrument.

Fig. 1– ETherCheck Front panel

Pop out Side Bar

Keypad

Accessory flap

Front Panel Power/ Charge

Display Pane 2

Display Pane 1

Probe and charging connectors
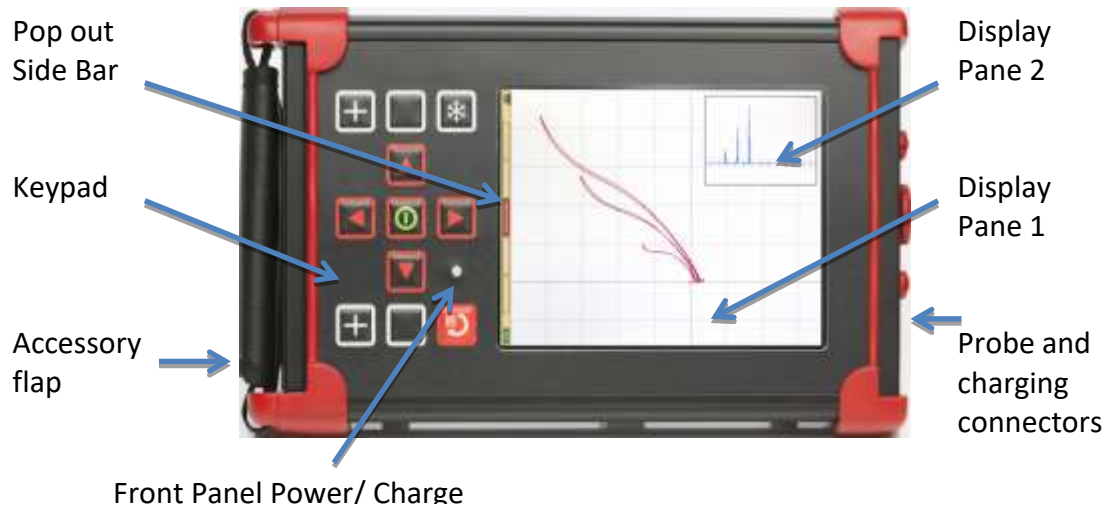
Pressing the MENU/BACK key toggles to the Main Menu.
To Select Eddy current or Bond Test Mode select the *Inspect* option in the Configure Tab

Main Menu (Eddy Current Mode)

Main Menu (Bond Test Mode)

Repeatedly pressing the LEFT & RIGHT cursor key changes the side bar on the left of the operating screen changes between Small, Normal and Quick-Menu CH1, and if dual frequency is selected then CH2 and Mix modes.

2.3 Keypad

2.3.1 Cursor keys

Long press (greater than 3 seconds) on the centre/enter key switches the instrument on. The 4 red arrow keys are cursor keys and the centre key acts as both the on/off key and the enter key.

In the operating screen pressing the right cursor key changes the side bar from the default setting of the user programmable quick access icons to the quick setting menu for channel 1, 2 or mix. Press the left cursor key to exit the quick-menu display.

In the operating screen pressing the left cursor key changes the side bar from the default setting to a smaller version; this allows a full screen view of the Main Pane. Press the right cursor key to expand the menu once again.

In the menu screens the direction keys move the cursor/selection point Left, Right, Up, Down. The centre key is used first to select a menu item. Once a menu item is selected its various values can be highlighted using the UP and DOWN keys. Pressing OK will then allow the individual highlighted value to be modified. Pressing Enter again
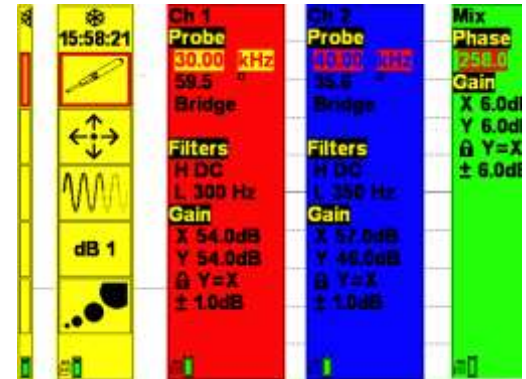
will accept the value and return to having the sub menu highlighted. Press the Back Key to accept all values and return to the Main Menu.

Long press (greater than 3 seconds) on the centre/entre key switches the instrument off if a setting has been changed the operator will be prompted to save the current setting or not.

2.3.2 Menu/Back Key

The menu/back key gives quick access to the main Menu as well as going back to the previous item.

Eddy current signal balance (1 top one bottom of unit). Long Press (greater than 3 seconds) activates Auto Phase (see 5.2.5.6).

Bond test signal balance in X-Y mode. In RF mode the waveform is captures as a reference and subtracted from the displayed live waveform. To cancel, press and hold the key.

2 Independent User programmable blank soft keys, one top one bottom. A 3 second push on either of these will show a list of the programmable options. Up Down to select and centre key to Enter. Once programmed use a short press to activate key function. Functions selectable from:

- None
- Clear Screen – clear whole screen
- Clear Pane 1 – clear only pane 1

- Clear Pane 2 – clear only pane 2
- Screen Shot – Save bitmap of the current screen display. Note that Screen Shots are saved to the SD card and appear in a folder along with the currently selected settings.
- Auto Phase [Eddy current Mode only] – Activates the Auto Phase setting function see 5.2.5.6.
- Balance Load [Eddy current Mode only] – in absolute mode automatically optimises the balance load using one of the internal loads. See 5.2.2.1
- Screen Flip – toggles the screen orientation from right handed to left handed.
- Loop – records a short section (equal to persistence time) of data and displays it repetitively. This allows easy setting of gain, phase, filters, display and other parameters.
- Trace – Stores the current displayed trace in Pane 1 to the Graticule layer of the image. Second press erases this trace from the Graticule layer. Good for making comparative tests.

In addition, this key is used to start the Bond-Test calibration process from the Transmit menu.

Each key may be programmed separately allowing two different functions to be programmed. Programmed key settings are saved in a setting file so each setting can have the most useful function programmed.

Press to Freeze Display/Long press to Thaw.

LED indicator Green indicates external power applied, amber indicates power applied and charging in progress. Green indicates charging complete and instrument on external power.

2.4 Connector Side of the instrument (probe and charger connector):

Probe Connectors – There are three different probe connectors:
Note please avoid connecting Bond Testing probes and Eddy Current probes to the EtherCheck at the same time.

a) Bond Test Probe connector (10-way Lemo) Connects Pitch-catch Bond Testing Probes

b) Co-axial Lemo 00 connector to connect absolute probes. This connector is selected in the Menu Eddy Current /Probe Function as Absolute-00. To use our standard microdot absolute probes then use part number ALLCX-M02-015A and for BNC absolute probes use part number ALLCX-B02-015A. To connect Absolute probes with a cable terminated with a BNC connector at the instrument end then use adapter part number AALCX-B02S.

c) Eddy current Probe Connector (12-way Lemo) connects Bridge, Reflection and Rotary Drives. For Bridge probes using a 4 pin Lemo connector (e.g. disconnect weld probes) use part number ALL12-L04-015B. For Reflection probes (e.g. spot faced probes such as PUS13) use ALL12-L04-015R. By using adapter part number AAL12P-B02S then absolute probe with cables terminated with a BNC connector may be connected.
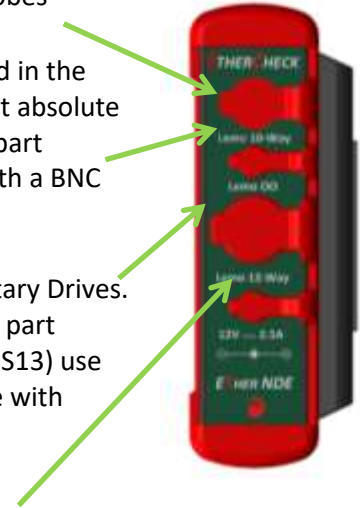
Power Connector - Only use the factory supplied charger/power supply.

2.5 Flap Side of the instrument (accessory connectors under flap)

Open the flap by gripping the flap firmly, whilst pushing from the back and then rotate the flap open as shown below.

NOTE: Do not use tools to open, as this will damage the instrument.

VGA - for video output using a monitor, projector or head up display

Micro SDHC Card - can add up to 32GB of removable memory

USB - used to connect to a PC for data transfer and remote operation.
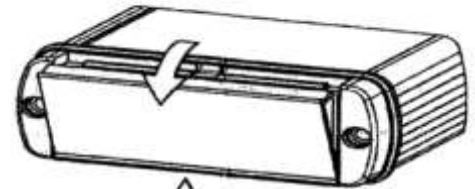
To Open Flap
1 Press centrally on hinge axis
2 Simultaneously pry open cap

3. Standard Package and recommended accessories

3.1 Standard Package

Description	Part. No.	Qty.
KIT, ETherCheck, Combined Bond Tester & Dual Frequency Eddy Current Portable Flaw Detector. Including:	KIETH001	1
ETherCheck Instrument including USB Stick with manual	IETH001	1
Accessory, ETherCheck, Power Adapter + Input Plugs (UK, EU, US & Australia)	AWEL002	1
Accessory, Adjustable Padded Shoulder Strap Quick-Release Clips	AWEL003	1
Accessory, Instrument Soft Carry Case , (AeroCheck/Vantage)	AC006	1
USB CABLE - A to MINI B, 1m	A090	1
Quick Reference Card	40722	1

3.2 Recommended Packages

KIT, Eddy current Surface Inspection. Including: KASUR001

Probe, Unshielded, 500kHz, Fe/NFe, Plastic Handle, Straight, 100mm Long	PU500PSFE/NFE	1
Probe, Shielded, 2MHz, Plastic Handle, Straight, 28mm Tip Length (Total Length 114mm, 4.5") (Straight Shank)	PS002PS028-114N	1
Probe, Shielded, 2MHz, Plastic Handle, Straight, 28mm Tip Length (Total Length 114mm, 4.5") (Straight Shank)	PS500PD064-114N	1
Probe, Shielded, 2MHz, Plastic Handle, Double Crank, 6.4 (0.25") Tip Length (Total Length 114mm, 4.5") (15deg Crank, 90deg tip Shank)	PS002PD064-114N	1
Probe, Knife, 65 deg, 2MHz, NFe, Unshielded	PK065002NFE	1
Cable Lemo 00 Coaxial to Microdot Plug Absolute cable 1.5m	ALLCX-M02-015A	1
Test Block, Ferrous (Steel EN1A), 0.2, 0.5, 1.0mm slots	ATBF	1
Accessory. Test Block, Ferrous (Steel EN1A), 0.2, 0.5, 1.0mm slots	ATBA	1
Accessory, Butterfly PTFE Tape (Pack of 30)	AW003	1
Accessory, Deluxe Probe Case	AC002	1

Kit, Rotary Drive (Note requires probes and calibration standard)	KAROT001	
Accessory, Rotating Drive, Small, Lemo 12-Way (MERCURY)	ARD002	1
Accessory, Lead, Lemo 12-Way - Lemo 12-Way, 2.0m (Rotating Drive)	ALL12-L12-020M	1
Accessory, Deluxe Case PHDC1	AC002	1

Kit, Sub-surface Inspection Low Frequency. Including:	KASUBS001	1
Probe, Surface, Straight, Dia 16mm,, 300Hz - 100KHz, Plastic, Lemo 4-Way	PUS16	1
Probe, Surface, Right Angled, Dia 11mm, , 300Hz - 100KHz, Plastic, Lemo 4-Way	PUR11	1
Accessory, Lead, Lemo 12-Way - Lemo 4-Way, 1.5m (Reflection)	ALL12-L04-015R	1
Accessory, Test Block, Aluminium 7075-T6, , 1.6mm Thick, x4 Flat Bottom Holes 75%(1.2mm), 50%(0.8mm), 25%(0.4mm), 12.5%(0.2mm) Deep.	ATB001	1

KIT, Weld, Probes + Accessories. Including:	KAWEL001	
Probe, Weld, Dia 16.00mm (Medium) 100kHz , Straight, Disconnect	PWM100S000	1
Probe, Unshielded, Broad Band, 100k , (35kHz-250kHz), BNC	PUB100K	1
Accessory. Test Block, Weld Probe, Ferrous , (Steel EN1A) + x4 0.5mm Shims, , 0.5, 1.0, 2.0mm slots	ATBW	1
Accessory, Lead, Lemo 12-Way - Lemo 4-Way, 1.5m (Bridge)	ALL12-L04-015B	1
Accessory, Lead, Lemo 00 to BNC, 1.5m	ALLCX-B02-015A	1
Accessory, Butterfly PTFE Tape (Pack of 30)	AW003	1
Accessory, Deluxe Probe Case PHDC1	AC002	1

KIT, Tube Inspection Probes including the following accessories;	KATUB001	
Probe, Internal Diameter, Differential, Dia 13.80mm, Disconnect, 18kHz.	PID138D0018K	1
Accessory, ID Lead, 12-Way Lemo, Flexible, 3.0m	CIDL03F	1
Accessory, Test Block, Tube, Brass, OD 5/8" , (15.87mm) x 20swg, Calibration Tube	ATBTB1587	1
Accessory, Test Block, ID Probe Support Ring, OD 25.4 x ID 16.6 x 20.00mm Long	ATB010	1

KIT, Pitch-Catch Bond Testing Probes + Accessories. Including:	KAETH001	
Probe, Pitch-Catch for Bond Testing (ETherCheck)	PETH001	1
Accessory, Lead, Lemo 10-Way - Lemo 8-Way, 1.5m , (To Fit Pitch - Catch Bond Tester Probe PETH001)	ALL10-L08-015PC	1
Accessory, Deluxe Probe Case PHDC1	AC002	1

3.3 Optional Accessories

Description	Part. No.
Accessory, Lead, Lemo 00 to Microdot, 1.5m	ALLCX-M02-015A
Accessory, Lead, Lemo 12-Way - BNC Plug, , 1.5m (Absolute)	ALL12-B02-015A
Accessory, Lead, Lemo 12-Way - Lemo 4-Way, , 1.5m (Bridge)	ALL12-L04-015B
Accessory, Lead, Lemo 12-Way - Lemo 4-Way, , 1.5m(Reflection)	ALL12-L04-015R
Accessory, Lead, Lemo 12-Way - Lemo 12-Way, 2.0m (Rotating Drive)	ALL12-L12-020-020M
Accessory, Lead, Lemo 12-Way to x2 Micro Plug, 1.5m (RX TX) (Reflection)	ALL12-M02-M02-015AR
Accessory, Lead, Lemo 10-Way - Lemo 8-Way, 1.5m , (To Fit Pitch - Catch Bond Tester Probe PETH001)	ALL10-L08-015PC

Accessory, Hard Transit Case with Padded Dividers Internal Size 432 x 280 x 153mm (ETherCheck + Vantage	AWEL004
PROBE TIPS (PAIR) - Dome - To fit Pitch-catch probe PETH001	A282
PROBE TIPS (PAIR) - Flat - To fit Pitch-catch probe PETH001	A281
PROBE FEET (BAG OF x5) - To fit Pitch-catch probe PETH001	A283
Accessory, Adapter Lemo 00 Coaxial to BNC Socket	AALCX-B02S
External 8*AA Dry Cell External Battery Pack	AWEL006
Wrist Strap	AWEL007
In car power adapter/charger	AWEL008
Tripod Bracket - To fit 1/4" Camera Tripod Mount with Male Screw	40470
Accessory, In Car 12V Power Adapter (12V, 5.5 x 2.5mm Plug)	AWEL008

4. Getting Started

4.1 Battery Charging

1. Connect the instrument's AC/DC supply to the DC power socket. When DC power is connected, the green or amber DC LED will stay on. NOTE: DO NOT CONNECT AN AC/DC POWER PACK other than one's supplied by ETher NDE otherwise the warranty will be void and irreparable damage will occur to the instrument. Options are AWEL002 (AC Charger), AWEL006 (Dry Cell Pack) and In-car charger (AWEL008).
2. As soon as the DC power is connected, the battery will start to be charged. With the instrument powered down the battery will charge fully within 2 hours.
3. During Charging the front panel LED is Amber, when charging is complete the LED colour changes to Green. If the instrument is powered up and used during charging the battery will charge more slowly than if the unit was not powered up.
4. Note the instrument may be used whilst charging is taking place.

4.2 Switching the instrument on

1. Press the POWER key until the display turns on (should be within 3 seconds).
2. The instrument will first display the product splash screen for 3 seconds

4.3 The opening screen

The first screen the user will see once the equipment is powered up is the splash screen. Following the splash screen one of two screens will be displayed.

1) If favourites have been set then a Welcome Screen is displayed.

- Previous Settings – instrument will return to the settings used last time the equipment powered down Load Favourite – select from one of the favourites on the right of the screen
- Load & Save – short cut directly to the Load & Save Menu
- Guide – the instrument can display guides. This item will only appear if a favourite selected in the right pane has a guide associated with it e.g. along with the Default

Favourite there is an associated Guide called ETherCheck, which is a quick guide to operating the instrument. On the left there are three functions.
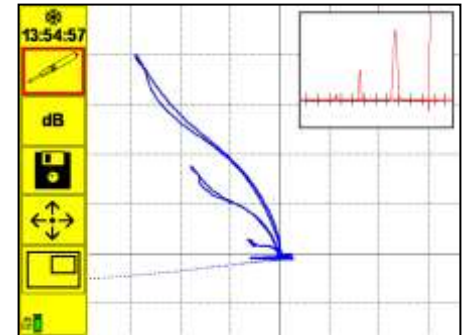
2) Otherwise the operating screen is shown. On the left on the side bar are 4 icons that are user programmable soft keys, plus the lower Icon is the last function used by the user from the Main Menu or the alarm if the alarm is set active.

3) In the Operating screen pressing the right cursor key reveals the Quick Menu on the side bar. The Quick Menu provides a convenient, quick and simple way to make adjustments during a test. Use up down cursor keys to change the item selected and then press enter to adjust and up/down cursor keys now adjusts the parameter and enter.

4) One left press then returns to the Icon Side Bar.

5) A further Left cursor press shrinks the side bar as shown to the right. In this mode, all menu items are still usable. A further Right cursor press reveals the Icon Side Bar Again.

6) Pressing then Menu/Back Key reveals the main menu. Pressing the Menu/Back Key then returns to the Real Time display.
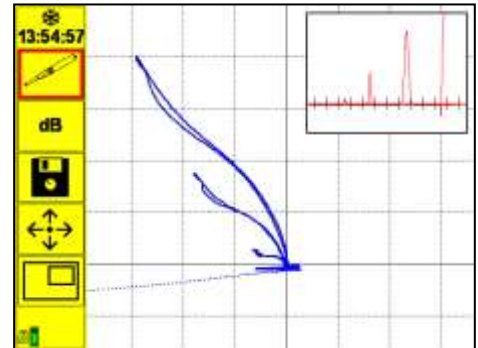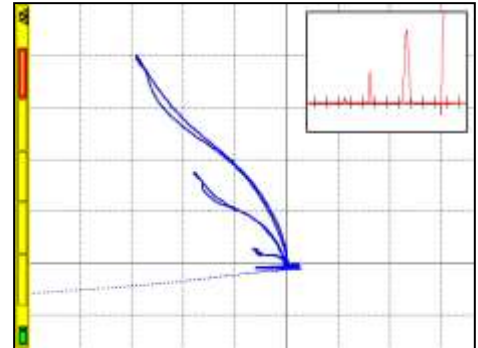
4.4 Switching the Instrument Off

Press the On/Off Enter key in the centre of the cursor keys for 3 seconds and release.

5. Operation in Eddy Current Mode

Once the Instrument has powered up then the Operating screen is displayed if no favourites are selected (otherwise see 3.3).

5.1 Operating screen

The Operating screen has to the left a Side Bar.
There is a Snowflake icon at the top of the Side Bar to indicate if the display is frozen (note a frozen display will not show live data). Usually the Date will be visible here. To unfreeze a short press on the freeze button and a long press clears the screen. The time is shown below.

The top four icons are user programmable. See 5.2.1 for how to programme these icons.

The Fifth Icon slot is automatically the last item used on the Menu if it is not already programmed as an Icon unless the alarm is in use.
SD card present Icon, Battery Level (or a lightning icon indicates that external power is present) and a Spinning Replay Icon shows that a replayed signal is being displayed.

Select an Icon and then press the Enter Key to display a summary menu at the bottom of the screen. Use the right left key to highlight an item and Cursor Up/Down to increase and decrease the item. Press the Menu/Back Key to exit the summary menu.
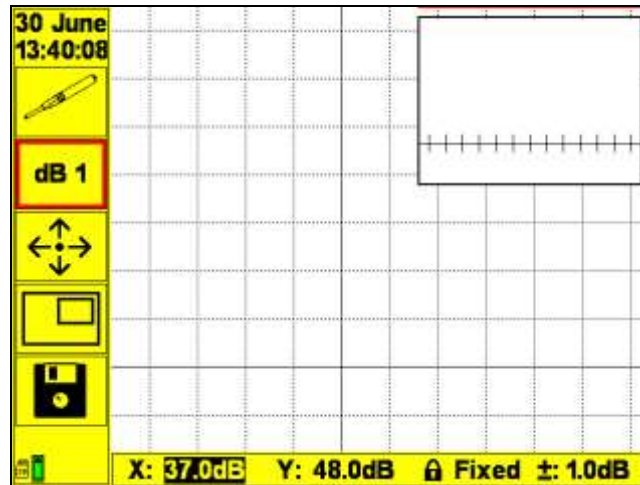
5.2 Main Menu

Press the Menu/Back Key to reveal the Main Menu. Depending on operation mode the screen may look different:
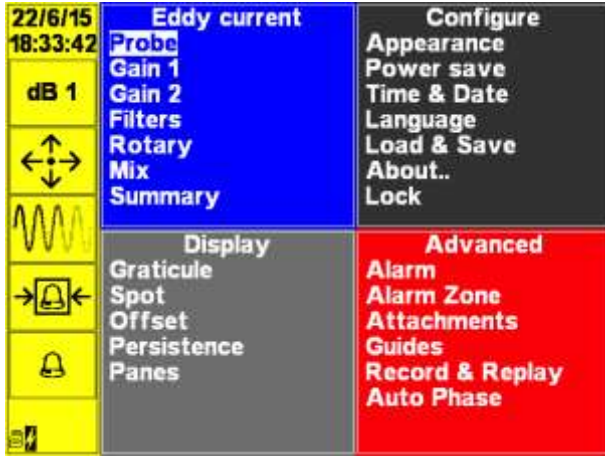
Dual Channel	Single Channel
22/6/15 18:33:42 dB 1 — **Eddy current**: Probe, Gain 1, Gain 2, Filters, Rotary, Mix, Summary — **Configure**: Appearance, Power save, Time & Date, Language, Load & Save, About.., Lock — **Display**: Graticule, Spot, Offset, Persistence, Panes — **Advanced**: Alarm, Alarm Zone, Attachments, Guides, Record & Replay, Auto Phase	22/6/15 18:33:27 dB 1 — **Eddy current**: Probe, Gain 1, Filters, Rotary, Summary — **Configure**: Appearance, Power save, Time & Date, Language, Load & Save, About.., Lock — **Display**: Graticule, Spot, Offset, Persistence, Panes — **Advanced**: Alarm, Alarm Zone, Attachments, Guides, Record & Replay, Auto Phase

The Menu is divided into several panes for ease of use. The Right/Left Cursor Keys select the pane and the up/down cursor key select individual items. Then press the Enter Key to select and the Menu/Back to leave the item. Then press the Enter Key to adjust the parameter and the Enter to leave the parameter. Pressing the Menu/Back key again to return the user to the Operating screen.

5.2.1 Side Bar Programming Pane

Programming of the Side Bar icons is done in the Menu Screen. To remove one of the top 4 icons, select the unneeded icon and perform a long press (3 seconds) on the Back/Menu Key.

To add a Menu Item, there needs to be an empty icon slot, select the item on the Menu and then perform a long press (3 seconds) on the Back/Menu Key.

The 5th slot is always the last Menu Item that was viewed, assuming that this is not already one of the top 4 or the alarm is activated.

5.2.2 Eddy Current Pane

Parameters that can be adjusted are:

5.2.2.1 Probe

- Mode = Single or Dual
- Freq 1: Channel 1 frequency adjustable from 20Hz-20MHz.
- Phase 1: Channel 1 phase adjustable from 0.0-359.9 degrees with 0.1 degree precision
- Freq 2: Channel 2 frequency adjustable from 20Hz-20MHz. *
- Phase 2: Channel 2 phase adjustable from 0.0-359.9 degrees with 0.1 degree precision*
- * = only visible if Mode set to dual.
- Type: Sets how the probe is connected. Selectable from

  a. Absolute-12= Absolute single element probe using 12 way Lemo Connector
  b. Absolute-00 = Absolute single element probe using Lemo 00 coaxial Connector
  c. Bridge = Bridge probes using 12 way Lemo Connector
  d. Reflection = Reflection (Transmit-Receive or Transformer) probes using 12 way Lemo Connector
  e. Rotary = Special mode for use with Rotary drives using the 12 way Lemo connector.

  f. Abs1/Diff2 = Dual Probe mode with Lemo 00 for Absolute on Channel 1 and Differential/Bridge on the Lemo 12 way on Channel 2

  g. Abs1/Refl2 = Dual Probe mode with Lemo 00 for Absolute on Channel 1 and Reflection on the Lemo 12 way on Channel 2

  h. Abs&Diff IntL = simultaneous Dual Differential and Absolute mode on the same probe using an internal balance load.

  i. Abs&Diff ExtL = simultaneous Dual Differential and Absolute mode on the same probe using an external balance load connected to the Lemo 00 connector. Must match the probe type and cable used.

- Load: Used to match single element absolute probes. Settable from Auto and from 2.2uH-82uH in 15 increments.

To use the Auto Load selection feature; Select the Probe Menu Item Load and then change the value to Auto. Then set one of the Soft keys (long press) to Balance Load. With the probe required connected and preferably in contact with the test surface then Press the assigned key momentarily to perform Auto Balance Load selection.

5.2.2.2 Gain 1

Channel 1 gain parameters;

- Gain X: Horizontal gain in dB -18 to + 82 dB Range Settable to 0.1dB resolution.
- Gain Y: Vertical gain in dB -18 to + 82 dB Range Settable to 0.1dB resolution.

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- Gain Lock: which may be set off (X and Y Gain are individually adjustable), Y=X; both gain values are equal and Fixed: where the dB ratio between the X/Y values is kept a constant difference (and hence the X/Y signal ratio remains constant).
- Increment: Sets the gain adjustment precision to either 0.1, 1 or 6dB
- Drive: Set the drive level at 0, 6 or 10dB
- Input Gain: sets the input Gain 0 or 12 dB

5.2.2.3 Gain 2

Channel 2 gain parameters;
- Gain X: Horizontal gain in dB -18 to + 82 dB Range Settable to 0.1dB resolution.
- Gain Y: Vertical gain in dB -18 to + 82 dB Range Settable to 0.1dB resolution.
- Gain Lock: which may be set off (X and Y Gain are individually adjustable), Y=X; both gain values are equal and Fixed: where the dB ratio between the X/Y values is kept a constant difference (and hence the X/Y signal ratio remains constant).
- Increment: Sets the adjustment precision to either 0.1, 1 or 6dB
- Drive: Set the drive level at 0, 6 or 10dB
- Input Gain: sets the input Gain 0 or 12 dB

5.2.2.4 Filters

- High Pass: Settable from DC= Off, 6 slow balance drift compensation filters from 0.01 Hz to 0.5 Hz and then conventional filters from 1 -2000Hz. Used to reduce unwanted low frequency signals.
- Low Pass Filter: Settable from 5-2000Hz. Used to reduce unwanted high frequency noise. Default value for manual inspection is 300Hz.
- Filter Lock: Off = both filters may be adjusted separately and Ratio: where the filters stay a fixed ratio apart.
- Increment: Sets the precision of the adjustment adjustable from 0.10 to 100.

5.2.2.5 Rotary

Sets the required rotation speed for the drive.

- RPM: may be set from 600 – 3000 rpm in 100 rpm increments for ETher NDE Drive.
- Rotary: Set to match drive type. NB ETherNDE will operate Hocking/GE 33A100 with no adapter. Also options that require a special cable are Zetec (ALL12-L08-020M) and Rohmann (ALL12-F08-020METH). For the non-ETher drives the drive speed is expressed in %.

5.2.2.6 Mix

The mix channel is the output of the subtraction of Channel 2 from Channel 1. The parameters allow that signal to be adjusted as required.

- Phase: Mix Channel phase adjustable from 0.0-359.9 degrees with 0.1 degree precision
- Gain X: Horizontal gain in dB -18 to + 82 dB Range Settable to 0.1dB resolution.
- Gain Y: Vertical gain in dB -18 to + 82 dB Range Settable to 0.1dB resolution.
- Gain Lock: which may be set off (X and Y Gain are individually adjustable), Y=X; both gain values are equal and Fixed: where the dB ratio between the X/Y values is kept a constant difference (and hence the X/Y signal ratio remains constant).
- Increment: Sets the adjustment precision to either 0.1, 1 or 6dB

5.2.2.7 Summary

This item shows a single screen view of all the instruments current settings.

5.2.3 Configure Pane

5.2.3.1 Appearance

- Backlight: 10-100% lower backlight setting gives substantially longer battery life.
- Scheme: Bright = Good for outdoor use, Dark=Good for indoor use and Black & White
- Font: Bold or Italic Text
- Screen Flip: Right Handed, Left Handed or Auto (uses internal sensor to set orientation)

5.2.3.2 Power Save

- Auto Power Off: Off, 5-60 mins.
- Auto Screen Dim: Off, 5-60 mins
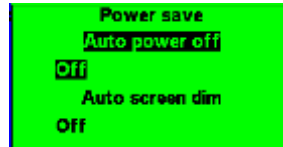
5.2.3.3 Time and Date

- Time/Date- adjust as per other parameters
- Format- Allows selection of date format from DD/MM/YY, MM/DD/YY or DD MM

5.2.3.4 Language

Selectable from English, French, Spanish, Russian, Chinese, Japanese and Turkish

5.2.3.5 Load & Save.

Select this function by highlighting the item and pressing Enter.
The main screen shows the saved settings (each blue square represents a save attachment). Use the up down cursor keys to change which saved setting is highlighted (red box) and press Enter to see a brief summary of the settings and press Enter a second time to Load.
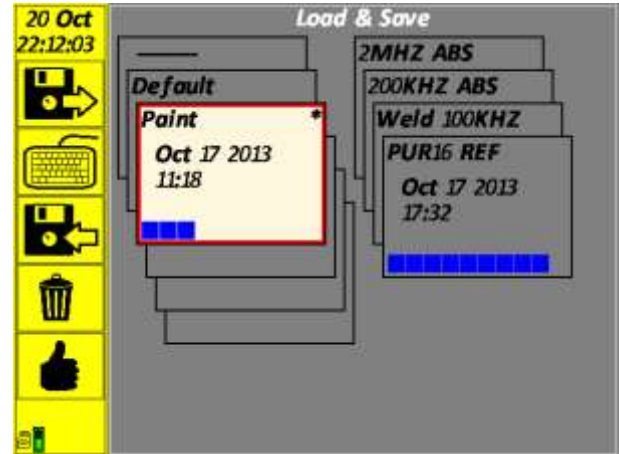
The functions of the icons are as follows:

Recall from memory

Rename setting slot

Save current settings to memory slot

Delete current settings slot

Make current Settings slot a favourite. Up to five settings may be set as favourites.

To create a new setting select the empty setting (with no name) and press enter.

A setting that has been selected as a favourite has an asterisk (*) in the top right hand corner. Favourite settings will appear on the opening screen and provide a convenient way of quickly using the most commonly used settings.

If no favourites are set then the instrument when powered up will start up in the Operating screen and use the last settings used.

The blue squares on the Setting Item indicate that there are screen shots associated with this setting. Red squares indicate that there are data recordings.

5.2.3.6 About

Important information about the instrument, including: Firmware Version, Current Slot, Manufactured Date and Instrument ID

5.2.3.7 Lock

The ETherCheck has the ability to restrict access to any menu item. Any menu item that has a picture of a Padlock after its name is locked.

This means that its value can be read but not adjusted.

Some menu items such as Load/Save can still be entered but if locked then files can only be loaded and not saved or deleted.

Locking and Unlocking Process

- **Entering Lock Mode** - First, to change the locked status of a Menu Item the instrument must be in LOCK mode. To enter this mode, first select the Menu Item LOCK within the CONFIGURE Menu Group. The user will now be prompted to enter the LOCK code. This code is entered by using the **U**p, **D**own, **L**eft, **R**ight keys. By default the code **is L, L, U, D, L**. Once entered correctly the Lock Menu will display the instructions to Lock and Unlock Menu items, which are repeated below.

- **Locking/Unlocking** - Once in Lock Mode the Lock status of a Menu Item is toggled by highlighting the Menu Item and then holding down the Menu/Back key. Once the desired Menu Items have been set the machine must be rebooted to leave Lock Mode.

5.2.4 Display Pane

5.2.4.1 Graticule

Settings for the display graticule for pane 1 and pane 2

- Type: None, Grid, Polar, Timebase or Meter (context sensitive).
- Size: 5 – 50 % in 5%

5.2.4.2 Spot

Settings for how the spot is drawn to the screen in Pane 1 and Pane 2

- Size: To enhance the spot visibility choice of 1*1, 2*2 or 3*3 pixels
- Colour: Sets spot colour
- Co-ordinates: Displays numeric position of spot None, X,Y or Theta, R

5.2.4.3 Offset

- Offset: Spot position offset for pane 1 and 2 in %.

5.2.4.4 Persistence

Persistence and Time-base settings for Pane 1 and Pane 2

- Persistence – Time in Seconds that a point is visible in X-Y mode.

- Sweep – Time taken for a single sweep across the screen in Timebase mode.
- TB Sweeps – Number of continuous Sweeps that are visible before being removed in Timebase mode.
- Steps – The number of Steps that are visible in Waterfall mode.

5.2.4.5 Panes

Each Pane can have different Sources and Different type

- Pane 1: XY, Time-base, Waterfall and Meter with peak hold and percentage.
    - Source = Ch1, Ch2 or Mix with two sources possible
- Pane 2: Off, XY, Time-base, Waterfall and Meter with peak hold and percentage
    - Source = None, Ch1, Ch2 or Mix with only one source possible. Note: If Pane 1 has two sources then Pane 2 cannot be on.
    - Size: Size 5-50%
      Note: 50% = Equal sized left and right displays
    - Location: Up/Down to move Pane 2 position. Selectable from Top right, Bottom Right, Bottom Left, Top Left.

5.2.5 Advanced Pane

The advanced pane is where all the special functions of the instrument are located.

5.2.5.1 Alarm

Alarm: Audio and Visual Alarm

- Source:
    - 1&2 – Acts on both channels with alarm output logically OR
    - 1- channel 1
    - 2- channel 2
    - Mix- mix channel
- Action: Audio Alarm, Freeze, Audio Alarm and Freeze, LED only (no freeze or audio)
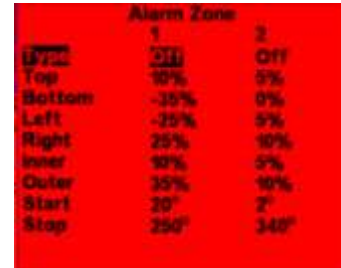- Stretch: Time alarm stays on after activation from 500ms to 10s.

5.2.5.2 Alarm Zones

- Type: Off, Sector, Box

If Sector then:

- Inner
- Outer
- Start
- Stop

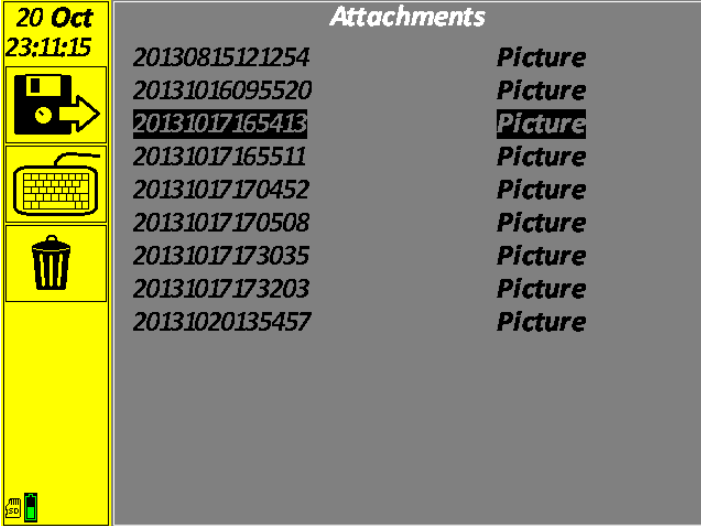If Box then:
- Top
- Bottom
- Left
- Right

5.2.5.3 Attachments

Attachments are either screen shots (Picture) or recordings. By default a screenshots file name is a date and time stamp with the date in reverse numerical order, this ensures that files are displayed in chronological order.

Load selected screen shot or recording

Rename selected attachment

Delete selected screenshot or recording

Attachments	
20130815121254	Picture
20131016095520	Picture
20131017165413	Picture
20131017165511	Picture
20131017170452	Picture
20131017170508	Picture
20131017173035	Picture
20131017173203	Picture
20131020135457	Picture

20 Oct 23:11:15

Note: Screen shots and Recordings are saved to the SD card in order to appear on the Attachments Menu they must be saved with the setting they are associated with.

To return to the Operating screen after recalling a screen shot press any key.

5.2.5.4 Guide Tool

The Guide Tool allows presentations uploaded to the instrument using ETher Realtime Software to be viewed on the instrument whilst performing an inspection.

Once entering the Guide Tool a menu showing all the available guides is shown. The Asterisk (*) denotes that this is the previously selected favourite for the currently recalled settings. Up/Down cursor keys highlight different guides. Pressing OK will show a description in the red box at the bottom of the screen.

Select this Icon and press OK to display the guide as a slide show.

Select this Icon and press OK if you need to display individual files in the Guide.

Use this icon to make the currently highlighted Guide a favourite.

When a Guide is being displayed pressing OK will make the control bar appear.
Use the left/right cursor to highlight an icon and then press OK to activate.

Select the play icon to begin guide play back.

The symbol will then toggle to the pause play back.
Whilst a recording is playing there are several functions that can be used to view the recording.

= Return to start

= Advance one slide (same as right cursor key)

= Go back one slide (same as left cursor key)

= Go to end

= Exit Guide temporarily

To exit a Guide permanently press the Back/Menu Key.

= Select and then cursor up/Down alters duration between each slide in a guide being displayed.

If a Guide is exited temporarily then the Guide Icon appears in the Menu Side Bar.

Selecting the Guide Icon (Book) then causes a lower tool bar to appear that gives the option of returning to the Show or Exiting the Show.
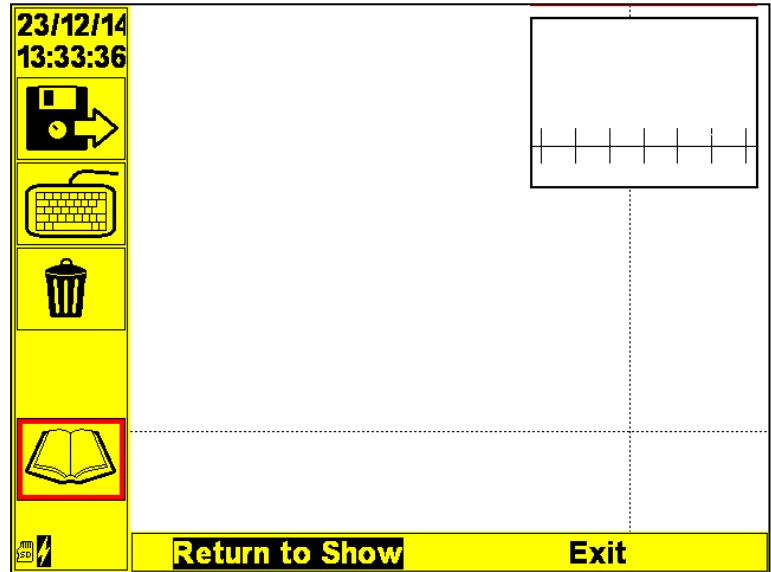
5.2.5.5 Record & Replay Function

The Record & Replay Function allows data to be captured for up to 150s. This data may then be saved on the instrument, replayed either on the instrument or transferred to a PC and analysed using the utility ETherAnalyser. Captured data can be analysed in greater detail by zooming in on the collected data and also a recording can be used to optimise the equipment settings such as Filter, Gain and Phase in a consistent matter.

1. To use this sequence first place the Record & Replay Icon on the Side Bar (see 5.2.1)

2. Then return to the operating screen and select the Record & Replay Icon (camera).

3. A special tool bar will be displayed at the bottom of the screen. Top right is the data sample rate used for the data recording. During the recording a grey cursor moves across the screen and the time display on the right is updated. The Grey cursor width indicates the time duration of the on screen persistence). The activity symbol (lower right) is

animated to indicate activity.
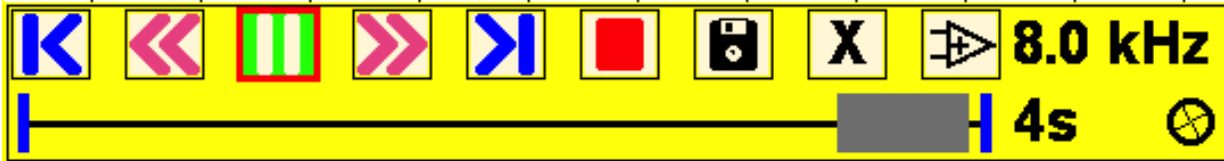
4. Using the cursor keys and the Enter Key select the item required. A red box surrounds the symbol selected.

The Record Item Symbol toggles between the record state and the stop state. Select to record (note when selected the Icon Colours Reverse to denote the symbol is selected.

When the symbol is selected it changes to the Stop Symbol and the recording continues until is selected again. Should the recording length be exceeded the recording is always of the last 150 seconds.

Select the play icon to begin data replay.

The symbol will then toggle to the pause symbol.

Whilst a recording is playing there are several functions that can be used to view the recording.

 = Return to start

 = Slow down replay

 = Speed up replay

 = Fast Forward to end

You can also leave the recording function using the Back Key and the recording will continue running. This then allows settings to be altered and the result viewed. This can be useful when calibrating a rotary probe setup or other dynamic tests. To return to the Record & Replay function then select the Record & Replay Icon.

To zoom in on a specific part of the recording move the blue cursor bars at each end of the recording. Press the down cursor key and the left or right to select a cursor. The selected cursor turns red when selected. Then press the Enter key and the cursor turns green. Use the left and right keys to move the cursor. The display on the right shows the cursor position in time. When in the correct position press the Enter key again and the colour of the

highlighted cursor changes from green to red. Use the cursor keys to move the selection focus to the required cursor. Then press Enter and use the Left and Right cursor keys to select the other cursor.

= Save recording. The User is prompted for a file name. Saved record may be replayed at any time by loading the item in the Attachments function see 5.2.5.3 Recordings are saved to the SD card in order to appear on the Attachments Menu they must be saved with the setting they are associated with.

= Exit Record & Replay Function and return to the Operating screen.

= Auto mix function. Record a signal to suppress and press the centre enter key for the instrument to automatically derive the optimal mixing coefficients.

5.2.5.6 Auto Phase

This provides an automatic means of setting the phase in any required orientation.

- o Angle: the required angle measured from the usual 9 o'clock lift off position as zero degrees and then rotating clockwise.
- o Radius: Sets the threshold crossing for the phase setting to be triggered at.
- o Set one of the user programmable soft keys to activate this function.

6. Setting the ETherCheck to perform an Eddy Current inspection

6.1 With a configuration file

If you have a configuration file for the probe, load the setting file as described in section 5.4. It is a recommended practice to validate that the settings loaded by the software are correct for the probe type. To do so press MENU, go on the Probe and Frequency tab, and verify the settings. Then following this ensure that the response from the calibration reference standard is as per the procedure the inspection is being performed to. Press MENU when finished.

6.2 With no configuration files

1. First press the MENU,
2. Set the gain to about 40 dB. Make sure the Gain Lock is set do Y=X.
3. Set the Probe; set the Type. Load and Frequency as required.
4. Set the filters for manual inspection as High Pass = DC and Low Pass = 300Hz
5. Set the display type you require to use with the Display configuration.
6. Adjust the gain and phase to obtain the response required by the inspection procedure.

6.3 Sample application setup

By default the instrument has a number of factory settings.

These may be reviewed in the Load & Save function
- 2MHz Absolute – using the Lemo 00 for Surface defect detection
- 200kHz Absolute – using the Lemo 00 for Surface defect detection
- 500kHz Absolute – using the Lemo 12 way for Surface defect detection
- PUR16 Reflection – Low Frequency 10kHz for sub-surface testing on non-ferrous material
- Rotary – 500kHz setting for Rotary Inspection of Holes
- Weld – 100kHz setting for weld inspection
- Paint – 100kHz using Lemo 00 for paint coating assessment as in Weld Inspection
- Weld Dual Probe - 100kHz settings for Weld and Paint Inspection
- ID Probe-Mix -21kHz and 18kHz ID Tube inspection mix

The above settings may be used as a starting point for a wide range of inspections using.

6.3.1 High Frequency Surface Inspection

These notes are offered as a guide to help carry out a test for surface inspection using High Frequency Eddy Currents. There are three high frequency surface inspection tests on the instrument;

- 2MHz Absolute – using the Lemo 00
- 200kHz Absolute – using the Lemo 00
- 500kHz Absolute – using the Lemo 12 way

6.3.1.1 Equipment Required:

Probes and cables;

- 200kHz Absolute - PS200PD064-114N and Lead, Lemo 00 to Microdot - ALLCX-M02-015A
- 500kHz Absolute – PS500PC195-114N and Lead, Lemo 12-Way to Microdot – ALL12-M02-015A
- 2MHz Absolute – PS002PS066-152N and Lead, Lemo 00 to Microdot - ALLCX-M02-015A

Test Blocks;

- Aluminium 7075-T6 with 3 slots 0.2, 0.5, 1.0mm – ATBA
- Titanium with 3 slots 0.2, 0.5, 1.0mm – ATBT
- Stainless Steel with 3 slots 0.2, 0.5, 1.0mm – ATBS
- Ferrous Steel (EN1A) with 3 slots 0.2, 0.5, 1.0mm – ATBF
- Magnesium with 3 slots 0.2, 0.5, 1.0mm – ATBM
- Steel with 3 slots 0.5, 1.0, 2.0mm and 4 off 0.5 mm shims (Weld Inspection)- ATBW

6.3.1.2 Setup

1. Connect probe to cable and connect to the instrument.
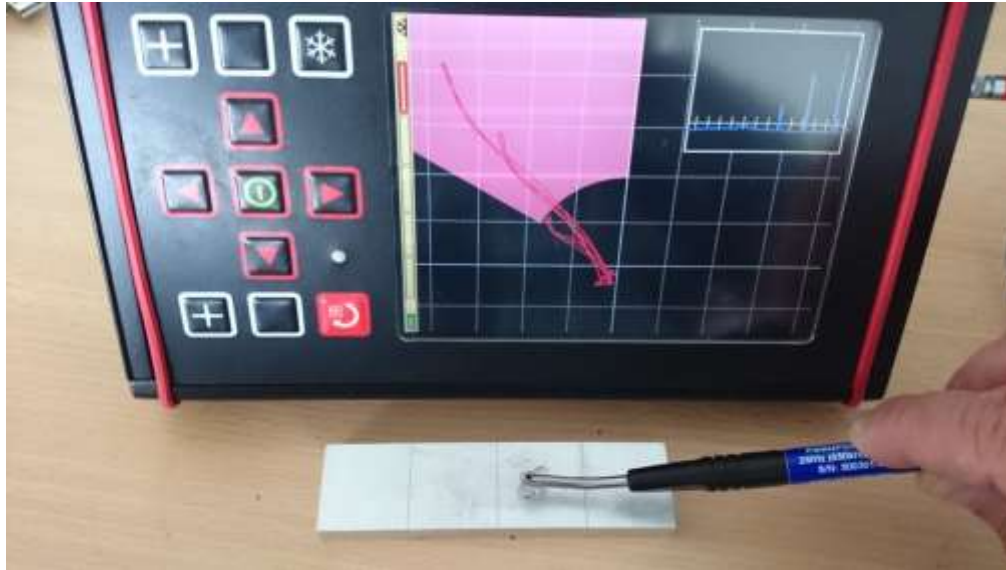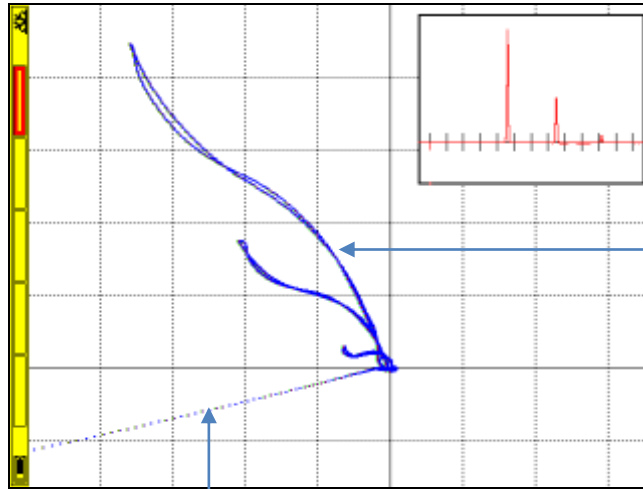

2. Switch instrument on.
3. Press Menu.

4. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select Required Setup, select the load icon and press Enter
5. The main Operating screen will appear as soon as the setup has been recalled.
6. Place the probe on the Reference Standard (away from EDM notches) normal (90°) to the surface
7. First set the load using the Auto Load Option in the Probe Menu and assign one of the soft keys (see 2.3.2)
8. Then carry out Balance/Lift off function setting Auto Phase under advanced at 0 degrees and radius 50%. Then press the soft key to Auto Phase.
9. Scan the probe over the 0.5 mm EDM notch and note signal response.
10. If more or less sensitivity is required, use the Gain (dB key) or Quick-Menu to increase or decrease signal amplitude as required.
11. Adjust the phase to set the lift off horizontal by either using the Auto Phase Key (assigned above) or Probe Phase Item or the Quick-Menu Phase Item.
12. Carry out scan of the component.

Note:

1. If you use a different Frequency probe remember to adjust Frequency setting on the instrument to match the probe. The balance load will also need to be set to match the probe see 5.2.2.1
2. Where possible always use a Reference Standard, which is a similar material to that which is to be inspected.
3. Always try and keep the probe normal (90°) to the surface of inspection, especially if scanning in a radius.

Three
Notch

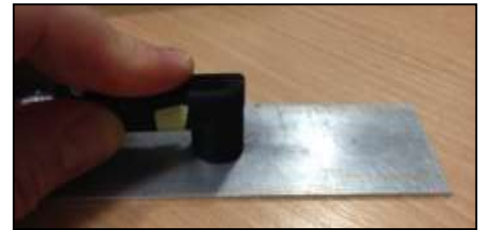Lift off

6.3.2 Low Frequency Sub-Surface Inspection

These notes are offered as a guide to help carry out a test for low frequency sub-surface inspection using Low Frequency Eddy Currents.

6.3.2.1 Equipment Required

Probes   = 300Hz – 100kHz Reflection Probe – PUR16
Cable   = Lead, Lemo 12-Way to Lemo 4-Way Reflection Type – ALL12-L04-015R
Test Piece   = Aluminium Thin Plate – ATB001

6.3.2.2 Setup

1. Connect probe to cable and connect to the instrument.
2. Switch instrument on.
3. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select PUR16 REF, select the load icon and press Enter
4. The main Operating screen will appear as soon as the setup has been recalled.
5. Place the probe on the Reference Standard with the flat-bottomed holes facing downwards.

6. First set the load using the Auto Load Option in the Probe Menu and assign one of the soft keys (see 2.3.2)
7. Then carry out Balance/Lift off function setting Auto Phase under advanced at 0 degrees and radius 50%. Then press the soft key to Auto Phase.
8. Scan the probe over the defects and note signal response.
9. If more or less sensitivity is required, use the Gain (dB key) or Quick-Menu to increase or decrease signal amplitude as required.
10. Adjust the phase to set the lift off horizontal by either using the Probe Phase Item or the Quick-Menu
11. Carry out scan of component.
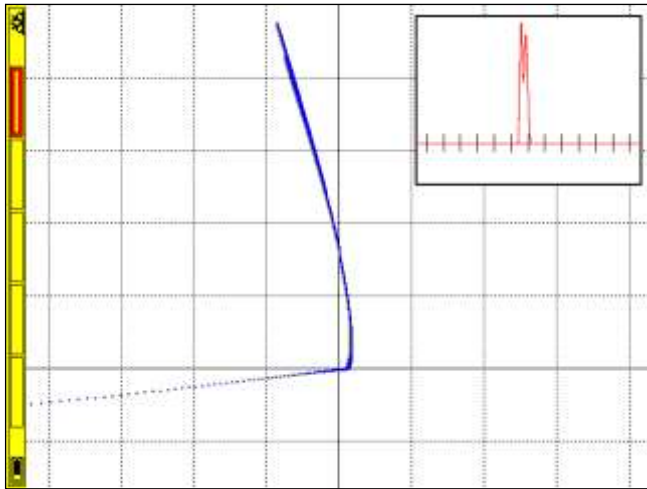
Note:

1. Use your finger as a guide along the edge of the test piece. This will help maintain the same probe to edge distance.
2. Always try and keep the probe normal (90°) to the surface of inspection.
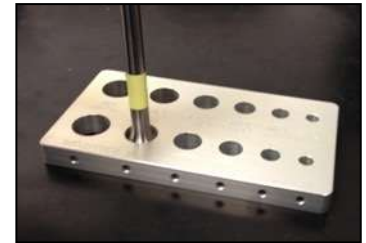
6.3.3 Rotary Setting

These notes are offered as a guide to help carry out a hole inspection using a rotary drive.

6.3.3.1 Equipment Required
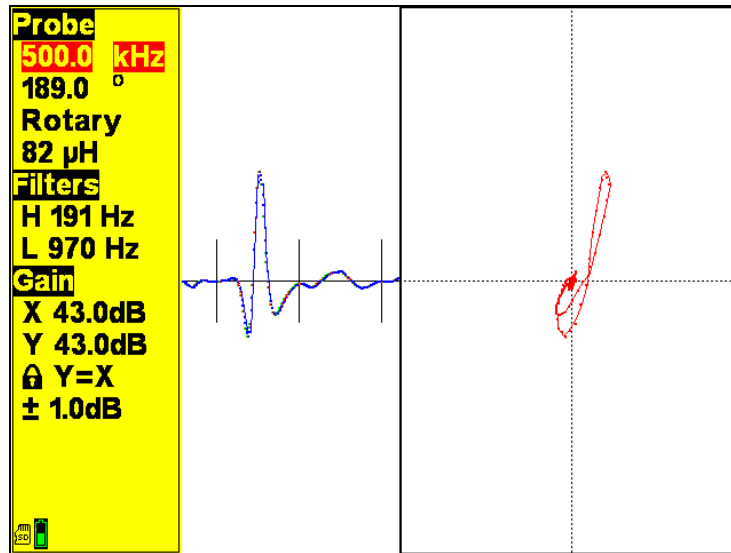
Cable   = Lead, Lemo 12-Way to Lemo 12-Way – ALL12-L12-020M
Probes   = Rotating Drive – ARD002
                   = Rotating Probe – PRR1111-065
Test Piece   = Aluminium Hole Test Block - ATB005

6.3.3.2 Setup

1. Connect probe to cable and connect to the instrument.
2. Switch instrument on.
3. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select ROTARY, select the load icon and press Enter
4. The main Operating screen will appear as soon as the setup has been recalled.
5. Press Balance
6. Start the drive rotating by pressing the key on the drive.
7. Pass the probe through the hole with the defect.
8. If more or less sensitivity is required, use the Gain (dB key) or Quick-Menu to increase or decrease signal amplitude as required.

9. Adjust the phase to set the defect signal vertical by either using the Probe Phase Item or the Quick-Menu
10. Adjust the High and Low Pass filters to get the appropriate signal.
11. Carry out scan of component.

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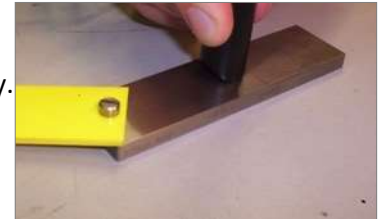
6.3.4 Weld Probe Single Setting

These notes are offered as a guide to help carry out a Weld Probe Inspection.
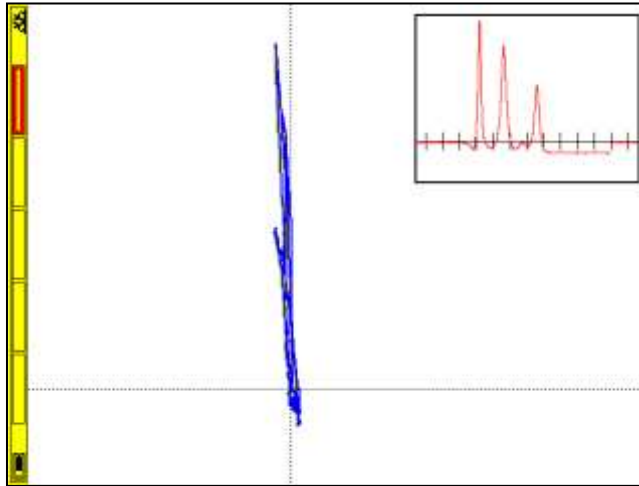
6.3.4.1 Equipment Required

Cable   = Lead, Lemo 12-Way to Lemo 4-Way Bridge Type – ALL12-L04-015B
Probe   = 100kHz Weld Probe Bridge – PWM100S000
Test piece   = Steel Test Block with 3 slots 0.5, 1.0, 2.0mm and 4 - 0.5 mm shims - ATBW

6.3.4.2 Setup

1. Connect probe to cable and connect to the instrument.
2. Switch instrument on.
3. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select Weld 100kHz, select the load icon and press Enter
4. The main Operating screen will appear as soon as the setup has been recalled.
5. Place the probe on the test block and Press Balance
6. Move the probe over the defects.
7. If more or less sensitivity is required, use the Gain (dB key) or Quick-Menu to increase or decrease signal amplitude as required.
8. Adjust the phase to set the defect signal vertical by either using the Probe Phase Item or the Quick-Menu
9. Carry out scan of component.
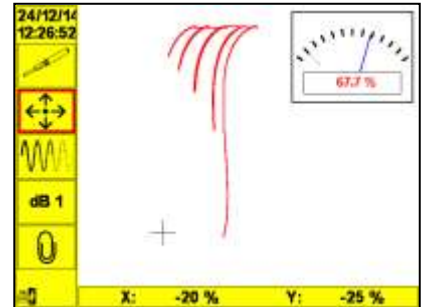
6.3.5 Paint Probe (Weld Setting)

These notes are offered as a guide to help carry out a dual channel Weld Probe Inspection.

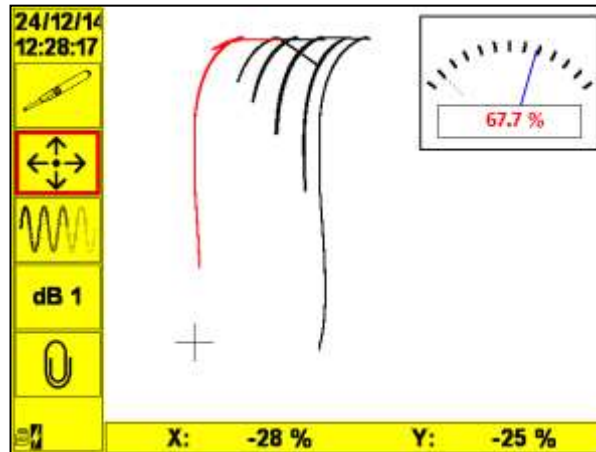## 6.3.5.1 Equipment Required

Probe   = Unshielded, Broad Band, 100k - PUB100K
Cable   = Accessory, lead. Lemo 00 to BNC, 1.5m - ALLCX-B02-015A
Test piece   = Steel Test Block with 3 slots 0.5, 1.0, 2.0mm and 4 - 0.5 mm shims - ATBW

6.3.5.2 Setup

1. Connect probe to cable and connect to the instrument.
2. Switch instrument on.
3. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select PAINT WELD, select the load icon and press Enter.
4. The main Operating screen will appear as soon as the setup has been recalled.
5. Place the probe on the test block and Press Balance.
6. Select the offset Icon on the front panel.
7. Adjust gain and phase as required to set the lift off vertical by either using the Probe Phase Item or the Quick-Menu.

8. Then moving the X Offset create the trace for the 4 shims.
9. Set Trace function on and store trace (this gives a black version of the image) to enable easy comparison.

6.3.6 Weld Inspection with two probes

These notes are offered as a guide to help carry out a dual channel Weld Probe Inspection using 2 probes. This allows the operator to set the instrument for Weld Inspection

6.3.6.1 Equipment Required

Cable   = Lead, Lemo 12-Way to Lemo 4-Way Bridge Type – ALL12-L04-015B
                 = Accessory, Lead. Lemo 00 to BNC, 1.5m - ALLCX-B02-015A
Probe   = 100kHz Weld Probe Bridge – PWM100S000
                 = Unshielded, Broad Band, 100k - PUB100K
Steel Test Block with 3 slots 0.5, 1.0, 2.0mm and 4 - 0.5 mm shims - ATBW

6.3.6.2 Setup

1. Connect probes to cable and then connect both to the instrument.
2. Switch instrument on.
3. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select Weld Dual, select the load icon and press Enter
4. The main Operating screen will appear as soon as the setup has been recalled.
5. Place the probe on the test block and Press Balance
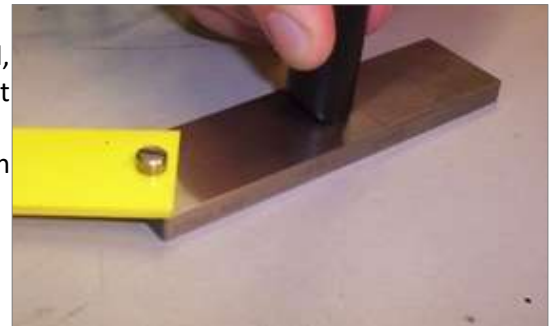
6. Move the probe over the defects.
7. If more or less sensitivity is required, use the Gain (dB key) or Quick-Menu to increase or decrease signal amplitude as required.
8. Adjust the phase to set the defect signal and lift off signal vertical by either using the Probe Phase Item or the Quick-Menu
9. Carry out scan of component. NOTE: Left pane shows differential channel 2 and right pane absolute channel 1.
10. Alternatively you may set the weld probe to be both Differential (normal flaw detection) and coating thickness assessment by changing the probe type to ABS&DIFF INTERNAL. NOTE: the load setting for the 100kHz WeldProbe to work in absolute is 12uH.
11. Further if more convenient Pane 2 can be set to Meter or Time and made to occupy a smaller part of the screen e.g. 30%
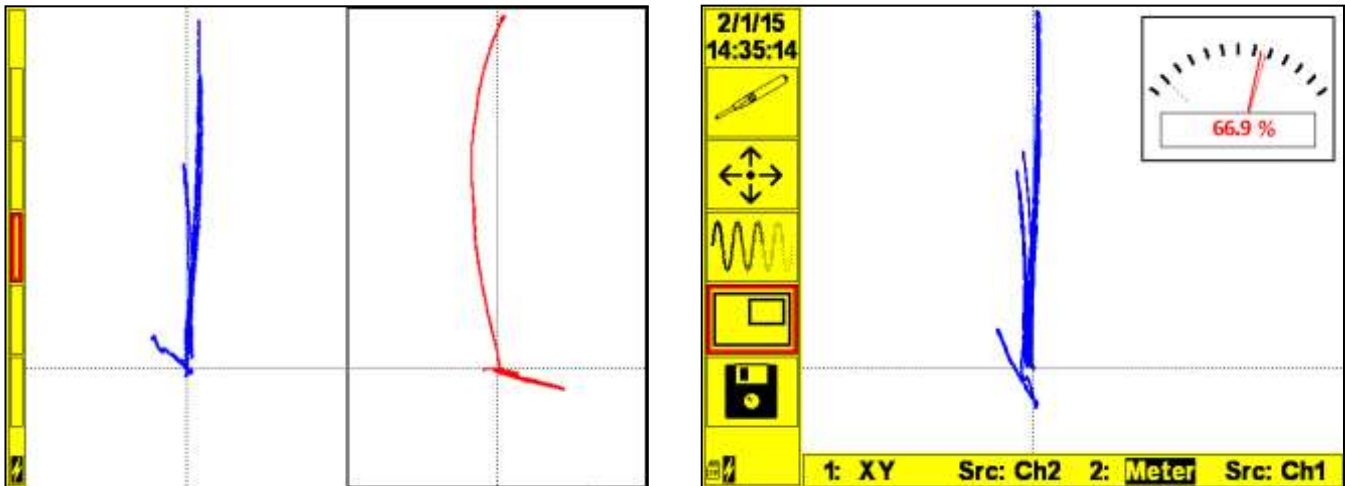
6.3.7 Dual Frequency Mixing

6.3.7.1 Principle of mixing

The principle of dual frequency mixing is that that at different frequencies different signal indications (e.g. lift off and defect) have a different relative phase and amplitude response. By means of phase rotation and Gain change of the X Y signal components one of these indications can be manipulated to be nearly the same in phase and amplitude as the other and then by subtraction (mixing) the unwanted component is minimised giving an improved detection of the unwanted signal. Channel 1 is the primary channel and as such is not manipulated in the Auto Mix process whereas Channel 2 is the secondary channel. It is good practise for the secondary channel to be set so that it is relatively more sensitive to the unwanted signal than the wanted signal.

Although this example is for a low frequency mix this is equally applicable to other absolute probe mixes and the procedure and principles are widely applicable.

NOTE: mixing inevitably causes an increase in the electronic noise (grass).

6.3.7.2 Example of mixing

The conventional example of mixing is to use a non-ferrous tube and minimise the effect of a ferrous support ring however here we demonstrate mixing out lift off on a low frequency test. This test uses 5kHz on Channel 1 and 20kHz on Channel 2.

6.3.7.3 Equipment Required:

Probes   = 300Hz – 100kHz Reflection Probe – PUR16
Cable   = Lead, Lemo 12-Way to Lemo 4-Way Reflection Type – ALL12-L04-015R
Test Piece   = Aluminium Thin Plate – ATB001

6.3.7.4 Setup

1. Connect probe to cable and connect to the instrument.
2. Switch instrument on.
3. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select DUAL SPOT MIX, select the load icon and press Enter
4. The main Operating screen will appear as soon as the setup has been recalled.
5. Place the probe on the Reference Standard with the flat-bottomed holes facing downwards.
12. First set the load using the Auto Load Option in the Probe Menu and assign one of the soft keys (see 2.3.2)
13. Then carry out Balance/Lift off function setting Auto Phase under advanced at 0 degrees and radius 50%. Then press the soft key to Auto Phase.
6. Scan the probe over the defects and note signal response.
7. If more or less sensitivity is required, use the Gain (dB key) or Quick-Menu to increase or decrease signal amplitude as required.
8. Set the panes to display channel 1 and channel 2 as shown.
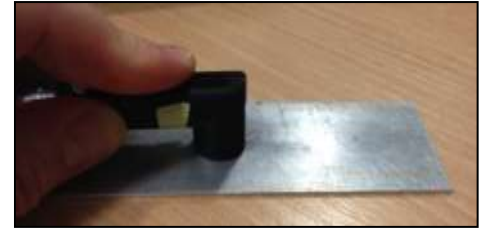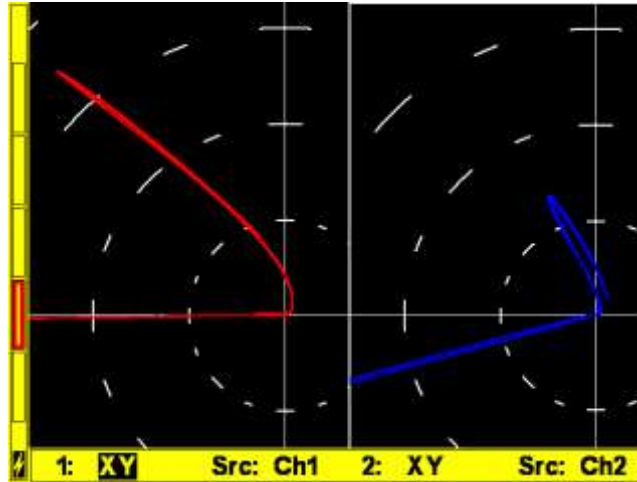
9. Repeat the setting for channel 2 so that the display looks similar to that above.
10. Now in the Record function record the lift off whilst gently rocking the probe. Press Stop to complete.

11. Then select the Auto Mix function

12. Once the message "Auto Mix Complete" is displayed return to the operating screen by selecting Exit

13. The display will now look like this:
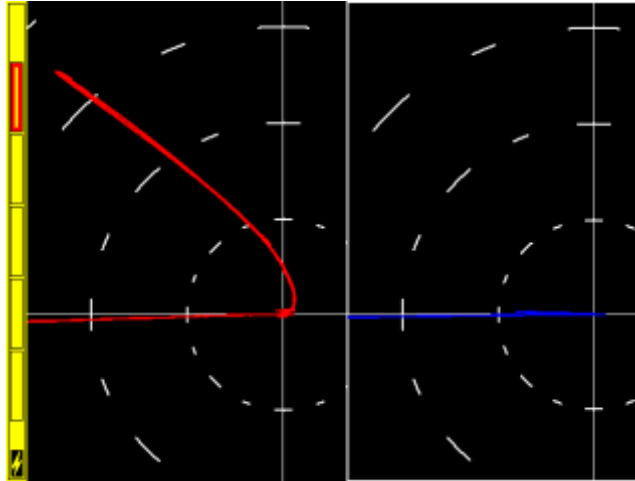
14. Now adjust the Pane setting to show the Mix channel in pane 2.
15. Adjust the Mix phase to set the signal as required by either using the Probe Phase Item or the Quick-Menu.
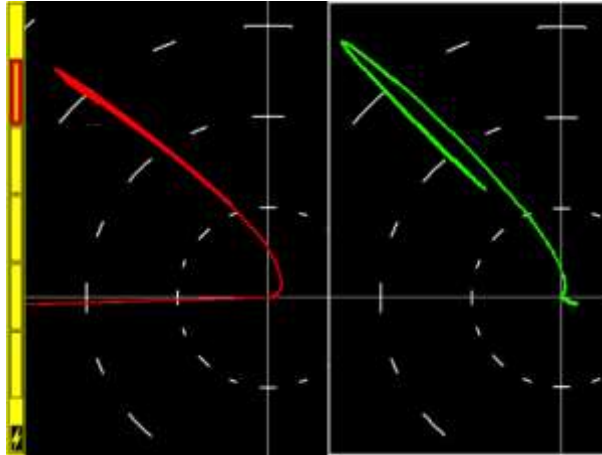
16. The mix is now complete

Note:

1. Use your finger as a guide along the edge of the test piece. This will help maintain the same probe to edge distance.
2. Always try and keep the probe normal (90°) to the surface of inspection.

6.3.8 Conductivity

These notes are offered as a guide to help carry out a conductivity inspection using probe PCON001. The probe has an internal memory that stores the probe characteristics for calculating conductivity. Only one test frequency can be applied to a probe.

6.3.8.1 Equipment Required

Probe   = Conductivity, 60kHz, Dia 13.00mm, Straight, Lemo 7-Way (AeroCheck Plus) – PCON001
Cable   = Accessory, Lead, 12-Way Lemo to 7-Way Lemo, 0.7m, Conductivity – ALL12-L07-007-CON
               = Accessory, Dual Conductivity Reference Standard – ASIG010
REFERENCE HOLDER - Dual Conductivity Standard, (Thermal Bridge for Stability) - 40517

6.3.8.2 Setup:
1. Switch instrument on.
2. Connect probe to cable and connect to the instrument.
3. Instrument will auto detect the probe and go into conductivity mode, as shown:
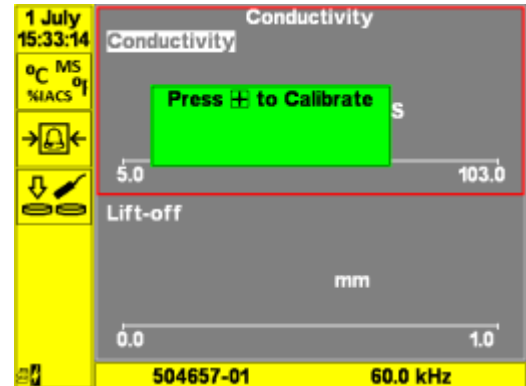
4. Press OK key to calibrate if the message box is shown, otherwise press left arrow and select the calibrate icon:

    Scroll down and enter CB1 and CB2 %IACS values as shown on Dual Conductivity Reference Standard, press the back button, the unit will then go back to the main calibration screen.

5. Press OK and calibrate the probe by following the on screen prompts.

6. Once calibrated carry out measurement, example measurement shown:

7. Disconnect the probe cable and the conductivity mode will exit and the instrument will return to its normal operation mode.
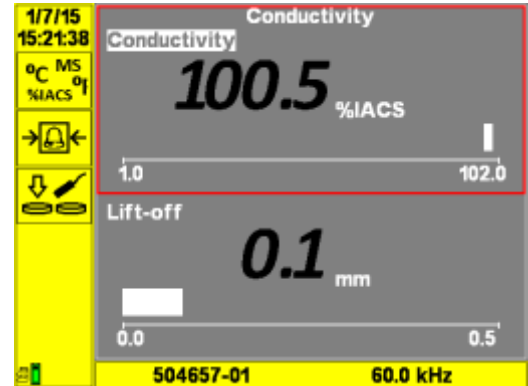
I. Additional Features

To Set display panes cursor right then up down to select pane to change then cursor right each key press changes display from Conductivity, Metal Sort, Minimum Thickness at measured conductivity and Lift Off/Non-conductive Coating thickness.
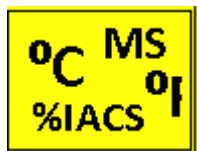
 To set Units (both type and resolution) and Metal Sort select this icon with the cursor Key and press enter to open menu to set units display precision. Move up down left column to select Unit, Press Enter and then left right to select digit or item, up down to change and then enter to validate.

 Sets the alarm range for both conductivity value and lift-off. First select the required display panes as the two displayed panes. Then select this icon with the cursor keys and press enter to select. The numeric value at the left end of the scale is highlighted press enter to edit the value. The Up Down Cursor Keys edit a digit and left right change the digit selected. Press enter to confirm selection. Press the right cursor key to move the selected numeric value and repeat the above procedure for each value to be edited.

Press the Back Key to exit this function.

II. Tips for Accurate Measurements

Always ensure that Probe, Dual Reference and Material to be tested are at the same temperature.

Re-calibrate the instrument every 15 minutes. There is a visual warning that the calibration needs to be repeated. Frequent calibration is the key to accurate measurement.

Try not to hold the face of the probe, dual reference or material to be tested in your in your as this will change the temperature.

III. Specification

Accuracy

0.5%-10% IACS better than +/- 0.05% IACS

10%-25% IACS better than +/- 0.25% IACS

25%-60% IACS better than +/-0.5% IACS

60%-110% IACS better than +/- 1% IACS

Lift off corrected to 1.0 mm

No temperature compensation

All Errors at 90% Confidence Level

Resolution

3 decimal points max

Auto resolution mode AutoS= Legacy Instrument, Auto= SigmaCheck.

7. Operation in Bond Test Mode

The EtherCheck provides operation with pitch-catch probes for bond testing. Once the instrument starts up, the user is presented with the operating screen.

7.1 Operating screen

The Operating screen has to the left a Side Bar.
There is a Snowflake icon at the top of the Side Bar to indicate if the display is frozen (note a frozen display will not show live data). Usually the Date will be visible here. To unfreeze a short press on the freeze button and a long press clears the screen. The time is shown below.

The top four icons are user programmable. See 7.2.1 for how to programme these icons.

The fifth icon slot is automatically the last item used on the Menu if it is not already programmed as an icon unless the alarm is in use.

SD card present icon, Battery Level (or a lightning icon indicates that external power is present USB port connected).

Select an Icon and then press the Enter Key to display to display a summary menu at the bottom of the screen. Use the right left key to highlight an item and Cursor Up/Down to increase and decrease the item. Press the Menu/Back Key to exit the summary menu.

7.2 Main Menu

Press the Menu/Back Key to reveal the Main Menu. Depending on operation mode the screen may look different:

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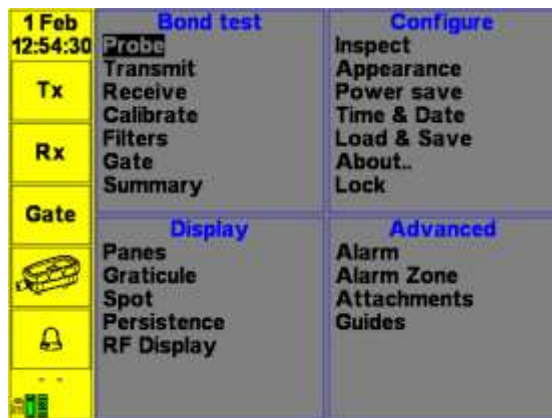
The Menu is divided into several panes for ease of use. The Right/Left Cursor Keys select the pane and the up/down cursor key select individual menu items. Then press the Enter Key to select and the Menu/Back to leave the item. Then press the Enter Key to adjust the parameter and the Enter to leave the parameter. Press the Menu/Back key again to return the user to the Operating screen.

From the Operating screen press the Right/Left Cursor Keys to show and hide the side bar. The red summary menu bar can be viewed by pressing Right twice.
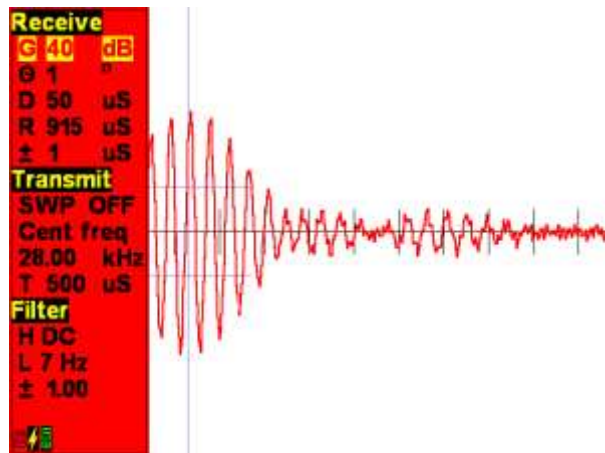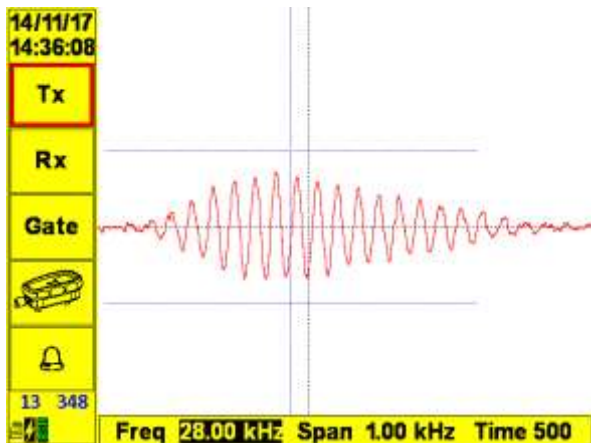
7.2.1 Side Bar Programming Pane

Programming of the Side Bar icons is done in the Menu Screen. To remove one of the top 4 icons, select the unneeded icon and perform a long press (3 seconds) on the Back/Menu Key.

To add a Menu Item, there needs to be an empty icon slot, select the item on the Menu and then perform a long press (3 seconds) on the Back/Menu Key.

The 5th slot is always the last Menu Item that was viewed, provided that this is not already one of the top 4 or the alarm is activated.
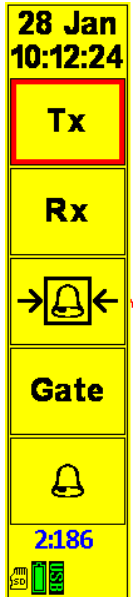
7.2.2 Bond Test Pane

Parameters that can be adjusted are:

7.2.2.1 Probe

- Mode of attached probe
- 'Apply stored probe data?' press to load the default settings for this probe and to switch inspection mode
- SN: – Reports serial number of the probe

Displayed probe data – shows default settings:

Pitch-Catch
Centre Frequency (kHz)
Frequency Span (kHz)
Tone Burst duration (us)
Hanning window (%)
Drive Voltage (V)

7.2.2.2 Transmit

Sets Transmitter – Frequency and Drive parameters.

Sweep – Toggles frequency sweep mode between ON (bi-directional) or OFF.

In Tone Burst mode:

- Centre Frequency: Sets the centre of the frequency sweep range used, adjustable from 1kHz to 50kHz for pitch-catch probes.
- Frequency Span: can be set to Zero (single frequency test) or to set up a 'chirp' tone burst, range adjustable to 10kHz in 50 Hz steps.
- Time: Tone burst period, adjustable to 3.2ms maximum. The number of cycles is shown for information.
- Hanning: Applies a Hanning window to the drive signal to reduce unwanted harmonics, normally set to 50%.
- Drive Volts: Peak to peak voltage applied to transmit probe: 6V, 8V, 10V, 12V, 18V, 24V, 30V, 36V for pitch-catch probes.

In Frequency Sweep mode:

In frequency sweep mode, the EtherCheck instrument scans continuously over a range of frequencies.

Either the Inspection, Mininum or Maximum frequency may be adjusted depending on operator preference.

- Inspection Frequency – Frequency midway between Minimum and Maximum
- Minimum frequency – Start of the Frequency sweep.
- Maximum frequency – End of the frequency sweep.

- Drive Volts: Peak to peak voltage applied to transmit probe depending on the inspection mode.
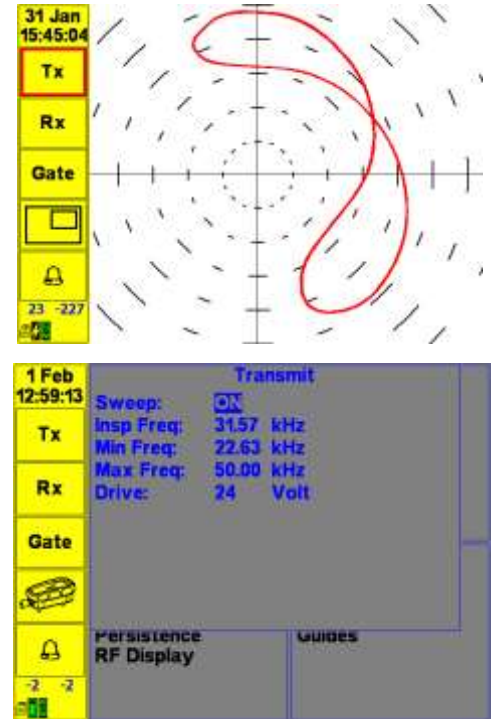
7.2.2.3 Transmit Lower Menu Operation

Pressing the Select key to view the Transmit Lower Menu allows the inspection frequency to be adjusted live whilst viewing the response. Pressing the Top User Key from this menu starts the frequency calibration function.

In Pitch-Catch Tone Burst mode:
Freq: Displays the inspection frequency adjusted using the up/down keys. The Time will be adjusted to keep the same number of cycles.
Time: Displays the duration of the tone burst, adjusted using the up/down keys. The Frequency will be adjusted to keep the same number of cycles.
Sweep: Switches between OFF, ON. The display pane is switched between RF and XY automatically

In Pitch-Catch Frequency Sweep mode:
<- and ->: Adjust the minimum and maximum range allowing coarse and fine adjustment of the Inspection Frequency.
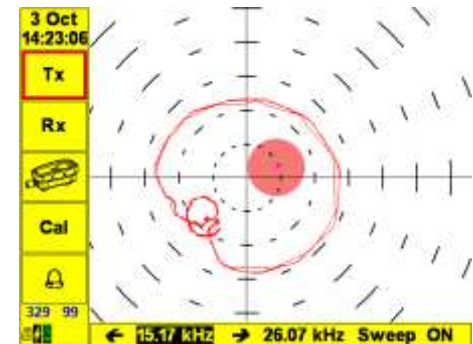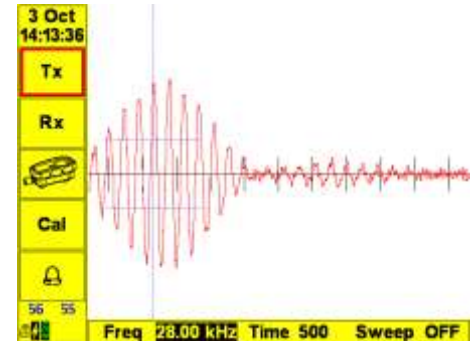
7.2.2.4 Receive

The EtherCheck uses a waveform digitizer to record the response from the pitch-catch probe in tone-burst mode. The waveform is displayed on the screen, and the waveform gate is used to generate amplitude and phase information. In sweep mode, a continuous waveform is applied to the probe, and QAM demodulator is used to receive the signal and provide amplitude and phase information.

Receive parameters:

- Input Gain (dB) Amplifier gain in dB from 0dB to 60dB for Pitch-Catch tone burst mode, and from -30dB to 60dB for Pitch-Catch sweep mode.
- Gain Inc: Adjustment increment for Input Gain, can be set to 1, 3 or 6 dB
- Phase Rotation, in 1 degree steps
  In Pitch-Catch tone burst mode only:
- Time base Start, adjustable from zero to 1000us. Press left or right arrows to change increment size.
- Time base Range, adjustable from 100us to 2000us. Press left or right arrows to change increment size.

7.2.2.5 Calibrate

The calibrate menu allows the operator to find the inspection frequency most sensitive to dis-bonds. Using a pitch-catch probe the tone-burst method is automatically selected when phase collection is enabled, and the phase is calculated from the response at the current cursor position. Otherwise continuous wave mode is used. Auto gain adjusts the gain during the calibration process to improve the dynamic range of the measurement.

- Start frequency – The lowest frequency in the calibration range
- Stop frequency – The highest frequency in the calibration range
- Frequency step – A smaller step size gives more accurate results but will take longer to complete
- Phase – Record phase as well as amplitude during calibration.
- Auto gain – Varies the gain dynamically during calibration and applies gain correction to results. Useful for large frequency ranges where there are significant changes in amplitude response

7.2.2.6 Filters

- High Pass: Fixed to DC in Tone-Burst Mode, and in Frequency Sweep mode settable from DC, 6 slow balance drift compensation filters from 0.01Hz to 0.5Hz and then conventional filters from 1 -2000Hz.
- Low Pass Filter: Selectable from 1 to 7Hz in Tone Burst mode and from 5-2000Hz in Sweep mode.
- Filter Lock: In Sweep Mode only, OFF = both filters may be adjusted separately and Ratio: where the filters stay a fixed ratio apart.
- Increment: Sets the step size for frequency adjustment.
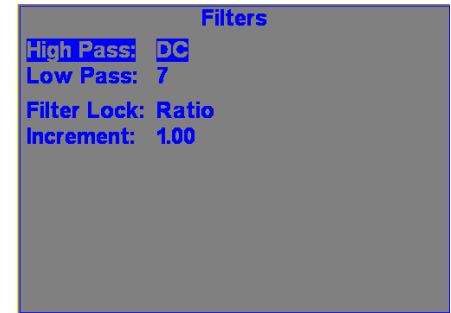
7.2.2.7 Gate

Configures the A-Scan (RF Display) Gate in Tone Burst mode.

- Status – Switch ON or OFF
- Centre: Position (us) of the centre of the gate at which phase measurements are made.
- Span: Active duration (us) of gate on either side of the centre over which amplitude measurements are made.
- Threshold: Signal Level (%) at which gate is triggered for the alarm. Amplitudes are measured if the gate is triggered or un-triggered.
- Alarm Trigger: Triggers alarm if signal is above (Normal) or below the threshold (Inverted)

7.2.2.8 Summary

This menu item shows a single screen view of all the instruments current settings. Selecting a category heading and pressing the Select button will show the appropriate menu. Selecting an Alarm heading will display an expanded view of the alarm settings.

- RX -			Summary - Filters -		- Alarm 1 -	
Gain	39	dB	Low	163	Type	Circle
Start	50	uS	- RF Display -		(17,17,57,56)	
Range	915	uS	Mode: RF		- Alarm 2 -	
Phase	5	°	- Gate -		Type	Off
- TX -			Status	ON	(0,0,0,0)	
Sweep	On		Centre	301	- Alarm 3 -	
I-Freq	28.56 kHz		Span	99	Type	Off
Min	27.26 kHz		Thres	20	(0,0,0,0)	
Max	29.99 kHz		Trig	Normal	- Alarm 4 -	
Drive:	12	V	- Alarm Setup -		Type	Off
- Calibrate -			Source	XY	(0,0,0,0)	
Start	500	Hz	Action	●		
Stop	50.00 kHz		Stretch	2.0s		
Step	500	Hz				
Phase	Off					

- RX -			Summary - Filters -		- Alarm 1 -	
Gain	21	dB	Low	50	Type	Circle
Start	50	uS	- RF Display -		Height	17
Range	915	uS	Mode: RF		Width	17
Phase	5	°	- Gate -		X Loc	57
- TX -			Status	ON	Y Loc	56
Sweep	On		Centre	301	- Alarm 2 -	
I-Freq	184.52kHz		Span	99	Type	Off
Min	149.03kHz		Thres	20	(0,0,0,0)	
Max	250.0kHz		Trig	Normal	- Alarm 3 -	
Drive:	12	V	- Alarm Setup -		Type	Off
- Calibrate -			Source	XY	(0,0,0,0)	
Start	500	Hz	Action	●	- Alarm 4 -	
Stop	50.00 kHz		Stretch	2.0s	Type	Off
Step	500	Hz			(0,0,0,0)	
Phase	Off					

7.2.3 Configure Pane

7.2.3.1 Inspect

- Select between Eddy Current and Bond Test modes.

  It is possible to program the side bar to switch between Inspection modes for convenience, the 'E<>B' side menu item will appear.
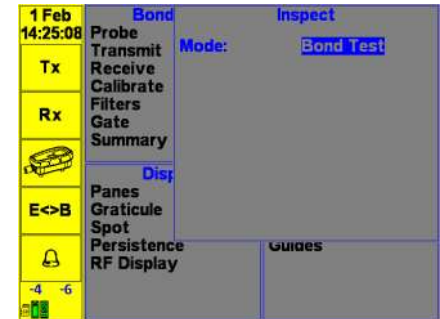
7.2.3.2 Appearance

- Backlight: 10-100%. Lower backlight settings give substantially longer battery life.
- Screen Flip: Right Handed, Left Handed or Auto (uses internal sensor to set orientation)
- Scheme: Bright = Good for outdoor use, Dark=Good for indoor use and Black & White

7.2.3.3 Power Save

- Auto Power Off: Off, 5-60 mins.
- Auto Screen Dim: Off, 5-60 mins

7.2.3.4 Time and Date

- Time/Date- adjust as per other parameters
- Format- Allows selection of date format from DD/MM/YY, MM/DD/YY or DD Mmm

7.2.3.5 Language

- Allows selection of user interface language between English, French, Spanish, Italian, Portuguese, Russian, Turkish, Czech, Chinese and Japanese

7.2.3.6 Load & Save

Select this function by highlighting the item and pressing enter.
The main screen shows the saved settings (each blue square represents a save attachment).
Use the up down cursor keys to change which saved setting is highlighted (red box) and press Enter to see a brief summary of the settings and Enter a second time to Load.
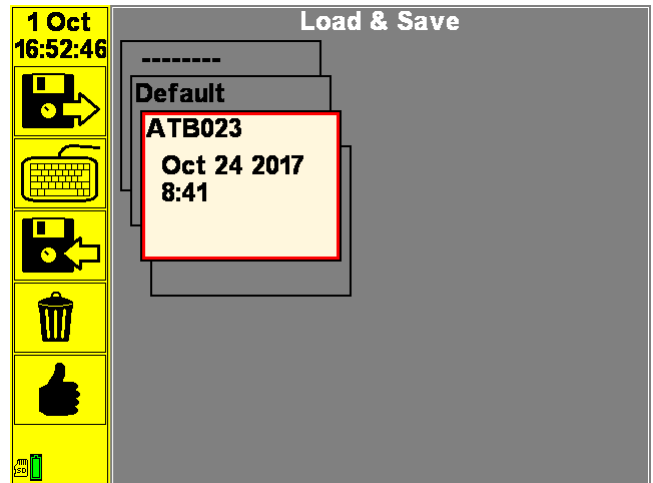
The functions of the icons are as follows;

Recall from memory slot

Rename setting slot

Save current settings to memory slot

Delete current settings slot

Make current Settings slot a favourite. Up to five settings may be set as favourites.

To create a new setting select the empty setting (with no name) and press enter.

A setting that has been selected as a favourite has an asterisk (*) in the top right hand corner. Favourite settings will appear on the opening screen and provide a convenient way of quickly using the most commonly used settings.

If no favourites are set then the instrument when powered up will start up in the Operating screen and use the last settings used.

The blue squares on the Setting Item indicate that there are screen shots associated with this setting. Red squares indicate that there are data recordings.

7.2.3.7 About

Important information about the instrument, including: Firmware Version, Current Slot, Manufactured Date and Instrument ID
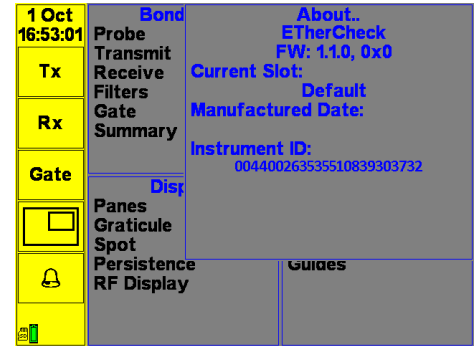
7.2.3.8 Lock

The ETherCheck has the ability to restrict access to any menu item. Any menu item that is locked has a picture of a Padlock after its name in the main menu, and in the side bar.

A locked menu item value can be read but not adjusted.
Some menu items such as Load/Save can still be entered, but if locked then files can only be loaded and not saved or deleted.

Locking and Unlocking Process

- **Entering Lock Mode** - First, to change the locked status of a Menu Item the instrument must be in LOCK mode. To enter this mode, first select the Menu Item LOCK within the CONFIGURE Menu Group. The user will now be prompted to enter the LOCK code. This code is entered by using the **U**p, **D**own, **L**eft, **R**ight keys. By default, the code **is L, L, U, D, L**. Once entered correctly the Lock Menu will display the instructions to Lock and Unlock Menu items, which are repeated below.

- **Locking/Unlocking** - Once in Lock Mode the Lock status of a Menu Item is toggled by highlighting the Menu Item and then holding down the Menu/Back key. Once the desired Menu Items have been set the machine must be rebooted to leave Lock Mode

7.2.4 Display Pane

7.2.4.1 Panes

Each Pane can show a different waveform view type.

In Pitch-Catch Tone Burst mode, RF, XY and Spectrum views are supported. The XY view
is of the flying dot type.

In Pitch-Catch Frequency Sweep mode, only the XY view is supported and the Pane feature is not available.

- Pane 1: XY, RF or Spectrum
- Pane 2: Off, XY, RF or Spectrum.
    - Size: Size 5-50%
      Note: 50% = Equal sized left and right displays
    - Location: Up/Down to move Pane 2 position. Selectable from Top right, Bottom Right, Bottom Left, Top Left.

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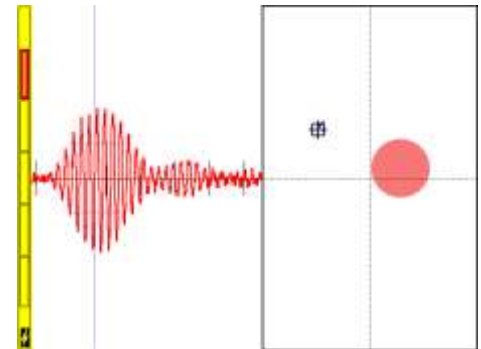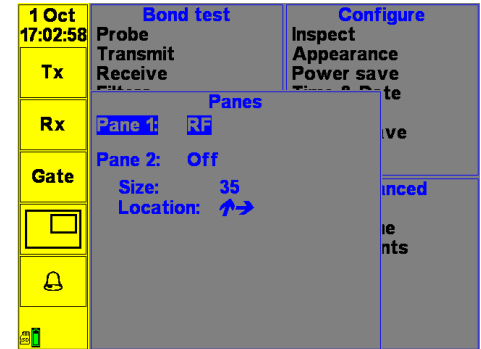
7.2.4.2 Graticule

Settings for the display graticule for pane 1 and panel 2
For Pitch-Catch Tone-burst waveform views, only Time base Graticule is supported.
For Pitch-Catch Tone-burst and Frequency Sweep modes, the XY plane views the Grid and Polar graticules are supported.
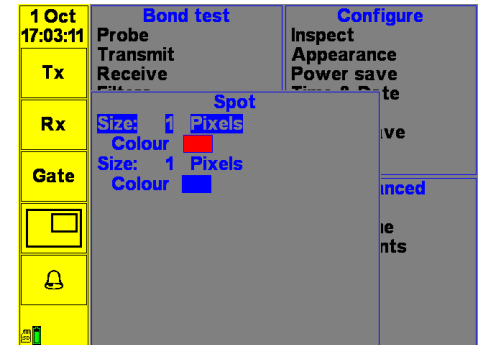For Tone-burst spectrum views, only the Frequency graticule is supported.
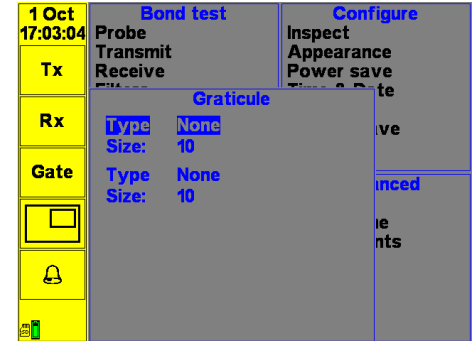
7.2.4.3 Spot

Settings for how the spot is drawn to the screen in Pane 1 and Pane 2.

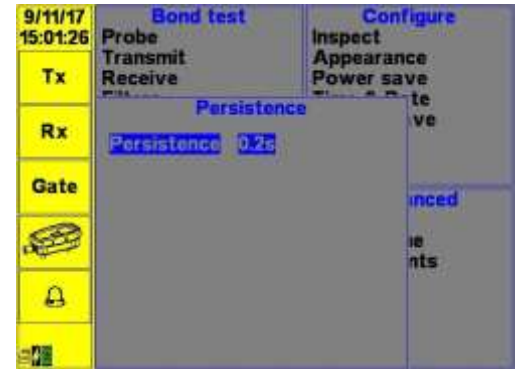The setting also affects the line width in RF display modes.

- Size: To enhance the spot visibility choice of 1*1, 2*2 or 3*3 pixels
- Colour: Sets spot or line colour

7.2.4.4 Persistence

Persistence and Time-base settings for Pane 1 and Pane 2 available in Sweep Mode only.

- Persistence – Time in Seconds that a point is visible in X-Y mode.

7.2.4.5 RF Display

- Rectification settings for A-Scan Display in Tone Burst mode
  - RF – unrectified RF waveform
  - FW – Full wave Rectification
  - HWP - Half wave Rectified – Positive Half-cycle only
  - HWN - Half wave Rectified – Negative Half-cycle only
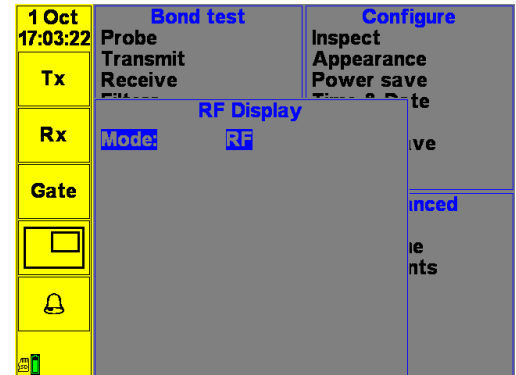
7.2.5 Advanced Pane

The advanced main menu pane is where all the special functions of the instrument are located.

7.2.5.1 Alarm

Alarm: Audio and Visual Alarm

- Source:
    - XY - Alarm Zones from X-Y phase display
    - RF – Alarm Gate on A-Scan in Tone Burst mode
    - Both – Alarm derived from either

- Action: audio alarm, freeze, audio alarm and freeze, visual only

- The LED on Bond Testing probes follow the audio alarm setting.

- Stretch: Time alarm stays on after activation from 500ms to 10s.
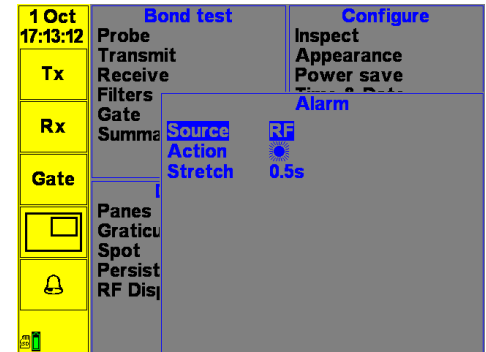
7.2.5.2 Alarm Zones

- Type: Off, Sector, Circle Box
- Up to 4 alarm zones may be added
- Any mixture of alarm zone types is permitted

If Sector then:
- Origin (%)
- Width (%)
- Angle (°)
- Span (°)
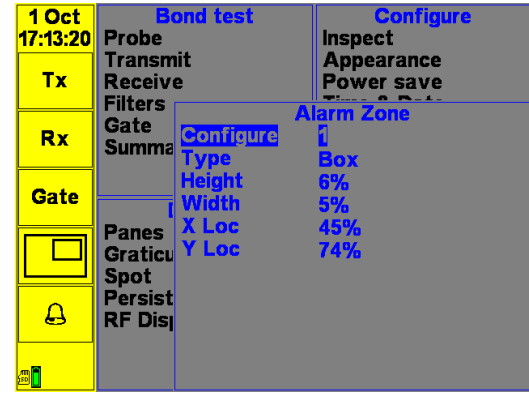
If Circle then:
- Height/Width (%)
- X location (%)
- Y location (%)

If Box then:
- Height/Width (%)
- X location (%)
- Y location (%)

Note:

Alarm Zones may be added or edited in this menu as well as during live operation as shown in Section 8.3.4
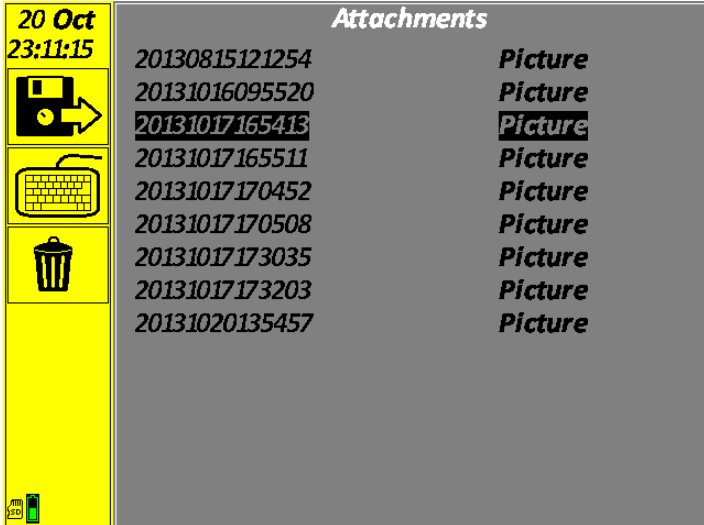
7.2.5.3 Attachments

Attachments are either screen shots (Picture) or recordings. By default, a screenshots file name is a date and time stamp with the date in reverse numerical order; this ensures that files are displayed in chronological order.

Load selected screen shot or recording

Rename selected attachment

Delete selected screenshot or recording

20 Oct 23:11:15	Attachments	
	20130815121254	Picture
	20131016095520	Picture
	20131017165413	Picture
	20131017165511	Picture
	20131017170452	Picture
	20131017170508	Picture
	20131017173035	Picture
	20131017173203	Picture
	20131020135457	Picture

Note: Screen shots and Recordings are saved to the SD card in order to appear on the Attachments Menu they must be saved with the setting they are associated with.

To return to the Operating screen after recalling a screen shot press any key.

7.2.5.4 Guide Tool

The Guide Tool allows presentations uploaded to the instrument using ETher Realtime Software to be viewed on the instrument whilst performing an inspection.

Once entering the Guide Tool a menu showing all the available guides is shown. The Asterisk (*) denotes that this is the previously selected favourite for the currently recalled settings. Up/Down cursor keys highlight different guides. Pressing OK will show a description in the red box at the bottom of the screen.

Select this Icon and press OK to display the guide as a slide show.

Select this Icon and press OK if you need to display individual files in the Guide.

Use this icon to make the currently highlighted Guide a favourite.

8. Setting the ETherCheck to perform a Bond Testing inspection

8.1 With a configuration file

If you have a configuration file for the probe, load the setting file as described in section 7.2.3.6 It is a recommended practice to validate that the settings loaded by the software are correct for the probe type. To do so press MENU, go on the Probe and Frequency tab, and verify the settings. Then following this ensure that the response from the calibration reference standard is as per the procedure the inspection is being performed to. Press MENU when finished.

8.2 With no configuration files

1. First press the MENU,

2. Ensure that the probe is plugged into the instrument, and in Probe Menu check that the probe type is correct. Optionally select to Apply Stored Probe Data in order to set up probe defaults.

3. Transmit settings will depend on the application, suggested starting point Sweep OFF (tone burst mode), Centre Frequency 25kHz, Drive Volts 24V.
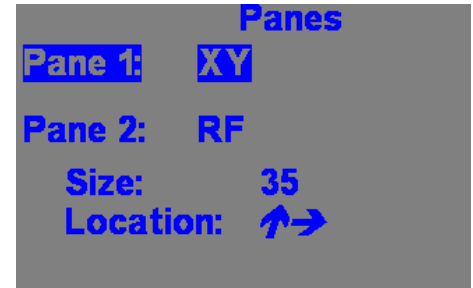
4. In Receive Menu set Gain to approx 20 dB. Set Delay to zero, set range to 1000us

5. In Filters set High Pass to DC, Set Low Pass to 6Hz

6. Gate settings will depend on the application, suggested starting point Start 150us, width 200us, threshold 20%

7. Set the display type you require to use with the Display configuration.
   RF is recommended for tone burst mode,

8. Adjust the gain and phase to obtain the response required by the inspection procedure.

8.3 Sample application setup

By default the instrument has a number of factory settings.
These may be reviewed in the Load & Save function

- ATB023 - Pitch Catch – Sweep OFF – ETher Delrin Sample
- ATB023 SMODE – Pitch Catch - Sweep ON – Ether Delrin Sample

The above settings may be used as a starting point for a wide range of inspections using, a specially machined test coupon with a machined window of reduced stiffness to simulate a near surface disband.

8.3.1 Using the default factory settings with ETher Delrin Sample:

Equipment Needed
Instrument: IETH001
Probe: PETH001
Lead: ALL10-L08-015PC
Test Block: ATB023

Procedure

1. Plug yellow end of lead into the instrument and the black into the probe as shown above.
2. Power on instrument with a long press on the green power button.
3. Press the red menu button; use the right arrow button to scroll to "Inspect" under the Configure window, press OK, select Bond Test mode, and press OK.
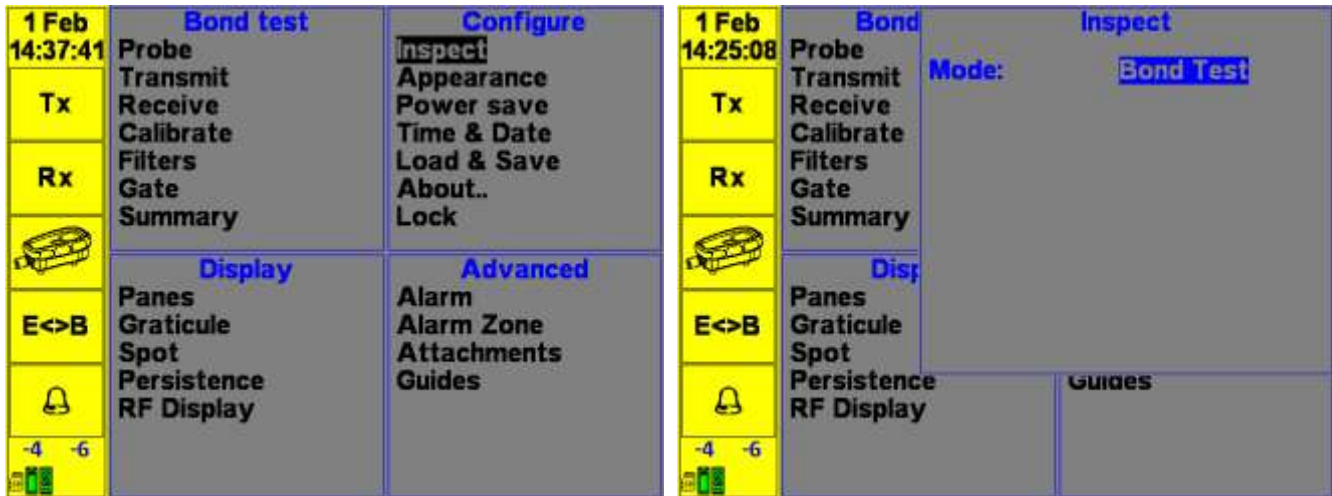
4. Using the down arrow button scroll to "Load & Save" under the Configure window, press OK, select "**ATB023**" folder, and press OK then press OK again.

```
                    Summary
        - RX -        - Gate -          - Alarm 2 -
Inp gain 40      Status  ON        Type    Off
Start    50      Start   478          - Alarm 3 -
Range    915     Width   299       Type    Off
Phase    0°      Thres   35           - Alarm 4 -
        - TX -       - Alarm Setup -  Type   Off
Sweep  Off       Source  RF
C-Freq  28000    Action  🔔
Span    0        Stretch 0.5s
Time    500         - Alarm 1 -
D Volts 12V      Type    Box
       - Filters -   Height  16
Low     7        Width   10
     - RF Display -  X Loc   45
Mode:   RF       Y Loc   74
```

5. Scroll to "Probe" under the Bond test window, press OK. In Probe menu ensure that the probe type is detected and default settings are correct, as shown below:

6. Press the menu button twice.

7. Position Pitch-Catch probe on area away from the simulated defect area (as shown below), applying light pressure so that the guide feet touch the test coupon, the expected response is low amplitude (<5%) as shown below.

Photo of pitch-catch probe positioned away from the defect (left) and expected response (right)

8. Position Pitch-Catch centrally probe on area over the simulated defect area, the expected response is a high amplitude echo as shown below. It should be possible to achieve an echo amplitude of 25%-30%. **Ensure that the Alarm LED comes on when the gate is broken.**
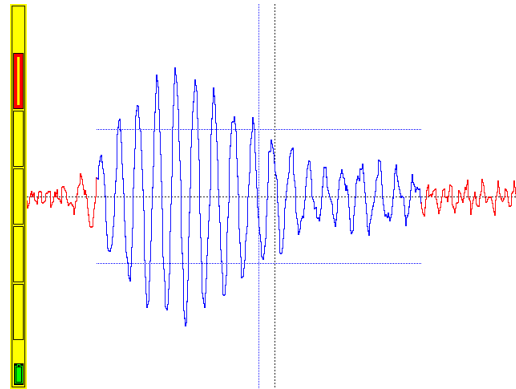
Photo of pitch-catch probe positioned on defect (left) and expected response (right)
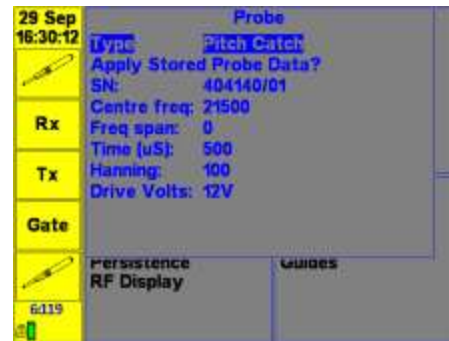
9. Press the menu button, using the down arrow button scroll to "Load & Save" under the Configure window, press OK, select "**ATB023 SMODE**" folder, and press OK then press OK again. (**Settings can be found in Appendix 2**)

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10. Scroll to "Probe" under the Bond test window, press OK. In Probe menu ensure that the probe type is detected and default settings are correct, as shown below:

11. Press the menu button twice.
12. Position Pitch-Catch probe on area away from the simulated defect area (as shown below), applying light pressure so that the guide feet touch the test coupon, the expected response is as shown below:
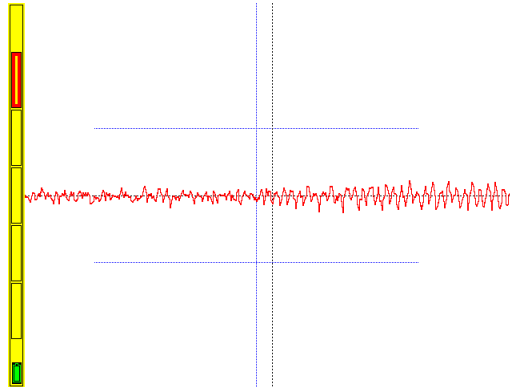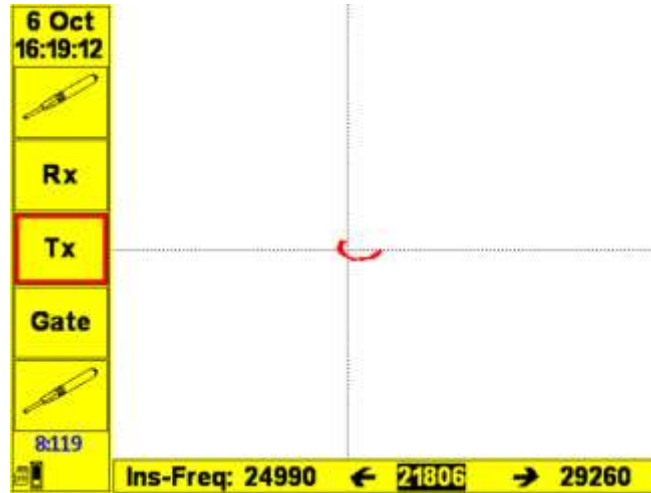

Photo of pitch-catch probe positioned away from the defect (left) and expected response (right)

13. Position Pitch-Catch centrally probe on area over the simulated defect area, the expected response is a high amplitude echo as shown below:
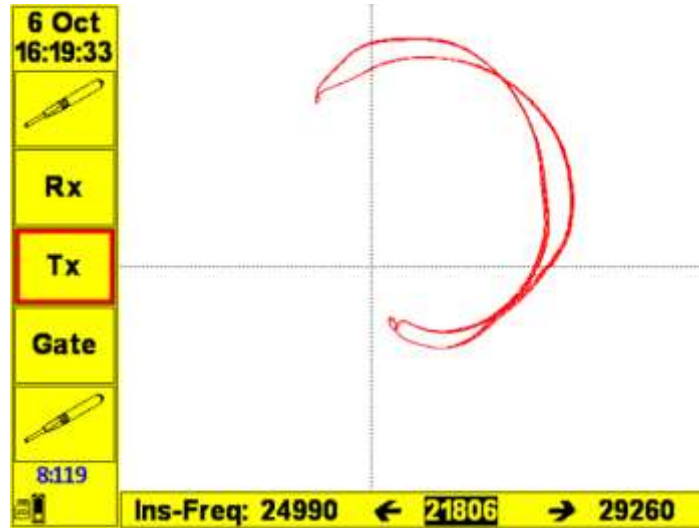
Photo of pitch-catch probe positioned on defect (left) and expected response (right)

8.3.2 Honeycomb bond inspection – fixed frequency, manual calibration.

These notes are offered as a guide to help carry out a test for top surface dis-bonding. This uses the RF Display, with a simple A-Scan gate. This test is set up to operate at 25 kHz, which can be considered as a typical frequency for this type of test. On the first generation instruments using this principle (1970's) it was the only frequency available. Typically it will be suitable for sandwich structure with skin thicknesses of the order of 0.5 to 2mm or so. Optimal frequency for thin materials will be higher,for thick skins will be lower

Probes and cables:
- ETherCheck Pitch-Catch Probe type PETH001
- ETherCheck Pitch Catch Cable ALL10-L08-015PC

Test Blocks:
- Standard composite honeycomb test block as appropriate

8.3.2.1 Setup

1. Connect probe to cable and connect to the instrument.
2. Switch instrument on.
3. Press Menu.
4. Use the cursors to scroll the menu until Load & Save is highlighted, press Enter key. Use the up down cursor to select Required Setup,(BT MAN-25k) select the load icon and press Enter
5. The main Operating screen will appear as soon as the setup has been recalled.
6. Place the probe on the Reference Standard in a 'good' area. Hold the probe firmly down against the surface so that the probe tip springs are compressed slightly
7. A relatively low amplitude signal should be seen
8. The A scan should not go outside the gate region (blue lines). Move around the part and check that (away from the edges and programmed defects) this remains the case
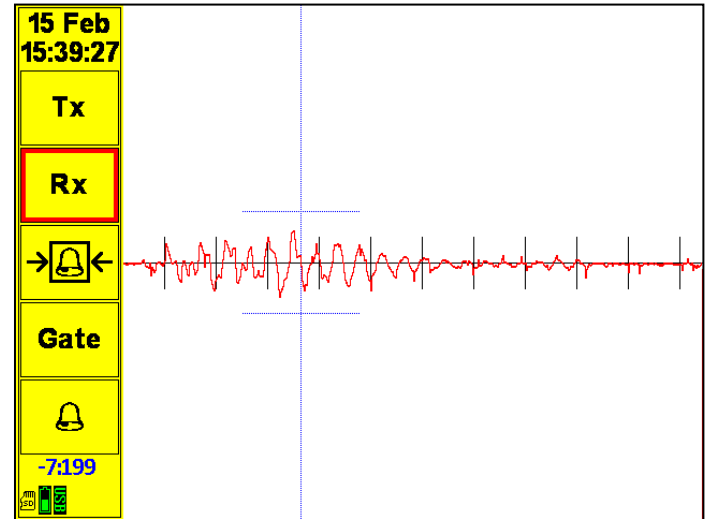
9. Scan the probe over the Top skin defect and note signal response. The trace should go well above the gate threshold.
10. If more or less sensitivity is required, use the Gain (Rx key) or Quick-Menu to increase or decrease signal amplitude as required.
11. Carry out scan of the reference sample, ensuring that the gate is reliably triggered by the relevant programmed defects.
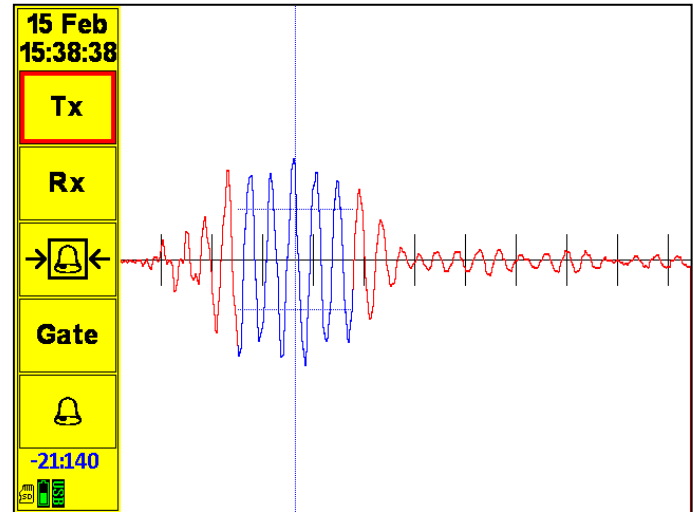
Notes:

- Where possible always use a Reference Standard, which is a similar material to that which is to be inspected.
- Always try and keep the probe pressure on the surface consistent.
- Scan in a regular pattern and at an even speed.

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8.3.3 Using the XY Display

1. Set up as above
2. Press the menu key and select 'Panes'
3. Set Pane1 to 'XY' and Pane2 to 'RF'
4. Place the probe on a defect-free area of the Test Panel.
5. Press the upper balance Button
6. The Instrument will display 'Balancing Ch1' after a few seconds it should stabilise near the centre of the screen.
7. Move the probe over the dis-bond. The spot should move.
8. Rotate the Phase control to place the spot in the desired position.
9. Set up Box / Area gates as desired. (see next section)
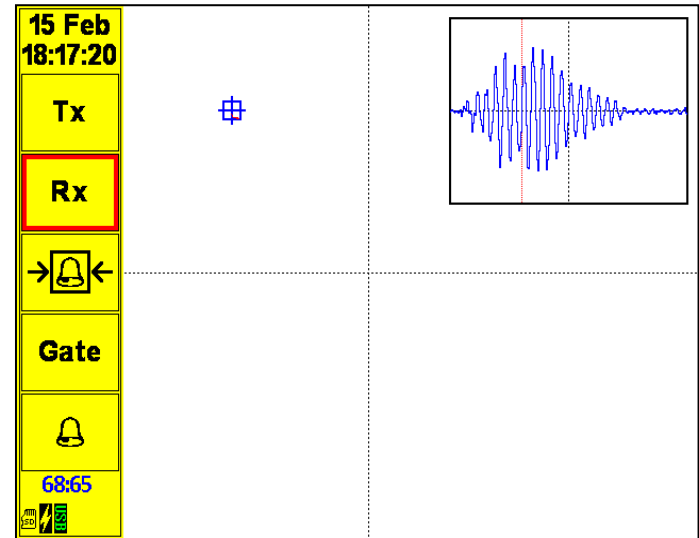
8.3.4 Alarm Configuration

In Bond Test mode the XY display of the ETherCheck allows up to 4 Box, Circular or Sector Gates to be configured.

8.3.4.1 To set an Alarm

1. Select the Alarm Zone icon and press select.

2. The menu bar will show selected Alarm number, Alarm type and Arrow keys.

3. Select the Alarm number (up / down arrow key).

4. Select the desired alarm type (e.g. Box), select the Arrow key group and press the 'UP' key, a + symbol will appear in the middle of the alarm box.

5. Use the arrow keys to position the box.

6. To resize the box press the upper balance button. ⊞   The + symbol in the box will change to an X. The arrow keys can then be used to change the size of the box around the same centre position.

7. Once the alarm box is positioned and sized press the select key. To take the alarm zone back to the centre of the screen, long Press (greater than 3 seconds) the upper or lower balance button. ⊞
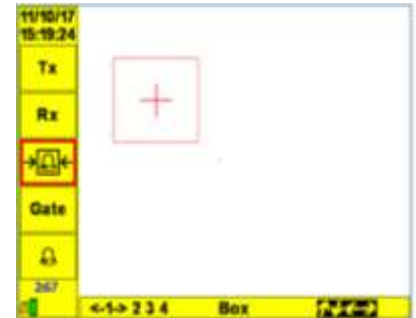
8. To create another alarm box, select the Alarm number and choose the type (note that only one is shown at a time in set up mode). The new Alarm zone can be positioned and re-sized as above once Gate sizing and positioning is complete press select, the + or X will disappear.

To delete an alarm zone, select the Alarm number and turn it OFF.

Once alarms are set up press the MENU / Back button. All Gates will now show on screen as coloured regions.

Note:

Alarm zones may also be added or edited in the Advanced main menu pane as explained in Section 7.2.5.2

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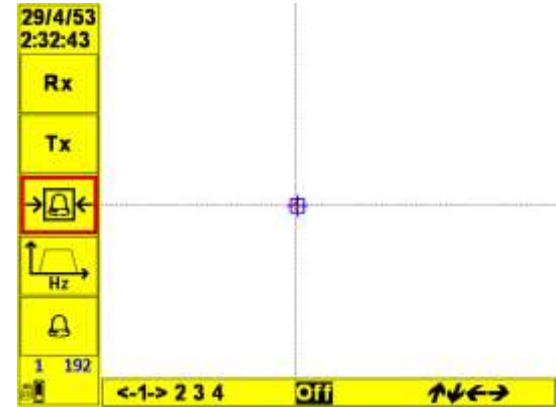
Sector Gates or Circular Gates may be set up in exactly the same way.
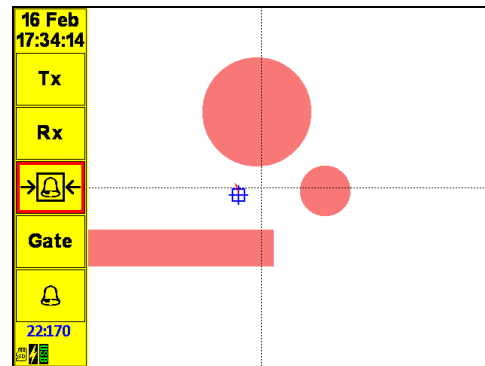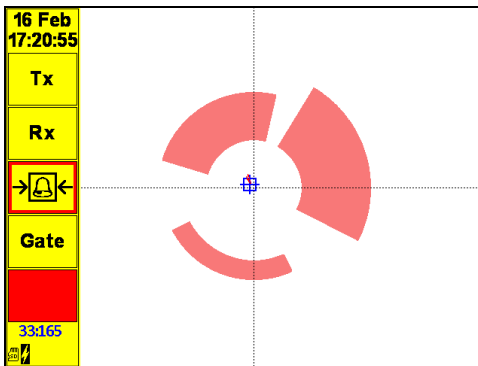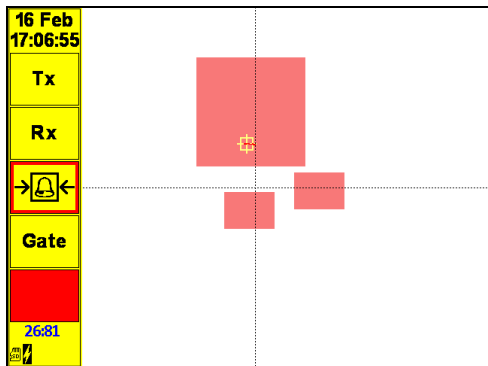
8.4 Using Automatic Frequency Optimisation

The ETherCheck can automatically scan through a range of frequencies to select the optimal choice for a given application. To use this feature:

1. Select the Calibrate menu in the left menu bar
2. Set a suitable frequency range in the calibration menu section (for example 5kHz to 50kHz)
3. Set the step size, a smaller step size will result in a longer calibration time but a more accurate frequency selection
4. Start the calibration process from the menu, or from the Transmit menu shortcut as shown in Section 7.2.2.3
5. The instrument will provide a live display and prompt "Place Probe on bond"
6. Press the Up/Down keys to switch between calibration in continuous mode (θ = OFF) and tone burst mode with phase plot (θ = ON). In continuous mode the average waveform amplitude is recorded, in tone burst mode the amplitude and phase measurement are made at the gate position.
7. Press the probe firmly on to a region of the part away from the defect and press the soft key again
8. The instrument will run through the available range of frequencies and log the results.
9. The instrument will provide a live display and prompt "Place Probe on disbond"

10. Press the probe firmly on to a region of the part away from the defect and press the soft key again
11. The instrument will run through the available range of frequencies and log the results. Ensure that as the frequency sweep takes place, that the signal displayed does not exceed 100%. Reduce the gain and repeat as necessary.
12. The instrument will then show the frequency at which there is the greatest difference in amplitude between the bond and disbond conditions as a suggested inspection frequency. This can be modified using the left / right arrow keys, the absolute amplitude and phase recorded together with the amplitude difference is shown
13. In Tone burst mode (θ = ON), amplitude and phase measurements will be shown. In continuous mode (θ = OFF) only the amplitude measurement is shown
14. Press select to accept the selected frequency
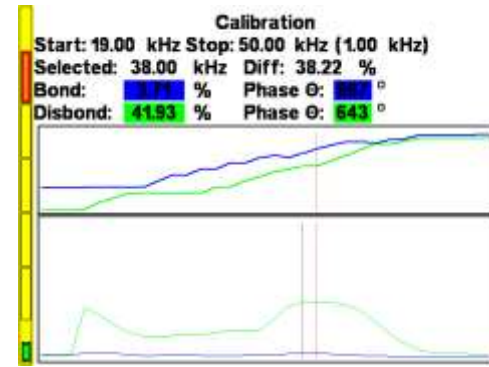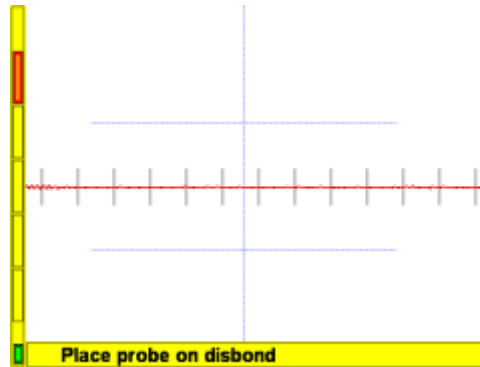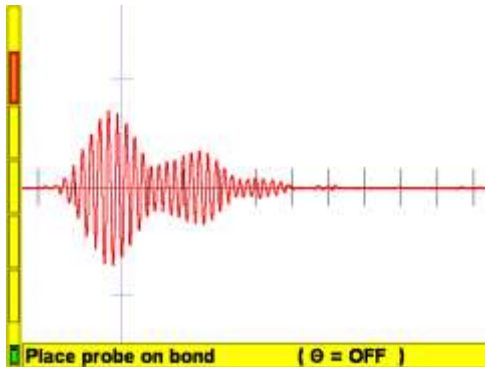
9. Connectors

Connector 1 (12 way Lemo)
Model: Socket 12 Way Panel Mounted LEMO EEG2B312CNN (PCB PINS) –CLN
Mating Connector: Plug 12 way Free Lemo FGG2B312CLAD52Z

Pin	Name	Description	Note
1	FG0V	Generator 0v	
2	FGO/P	Generator output	
3	+VB	Battery Supply	
4	Motor –	Motor drive current return.	
5	Motor +	Motor drive current feed.	
6	0VD	Electrical ground (analogue).	
7	Diff+	Pick-up signal terminal. Positive.	
8	Diff–	Pick-up signal terminal. Negative.	
9	ENC	Encoder signal from rotating probe, one tick per turn.	
10	Gunsw/sck	Dual Use Gun Switch On/Off and also I2C bus clock	
11	Gun sda	GUN I2C bus data	
12	Gunalarm	Output of instrument flaw alarm	

Using the Voltage free alarm contact; there is a V-MOS FET connected between pin 6 (0VD) and 12 (Gunalarm). You will need to pull up pin 12 to a Power Supply (e.g. but not necessarily pin 3 (+VB)) with say a 10k resistor. You can also use an external supply but must make sure that its 0v is connected to Pin 6. **Note:** the maximum rating for the Transistor is 50v dc at 10mA.

Connector 2 (Lemo Coaxial)
Model: LEMO ERN.00.250.CTL
Mating connector: LEMO PCA.00.250.CTLC29Z

Pin	Name	Description	Note
1	0V	Ground (electrical connected to mechanical)	
2	SIGNAL	Bridge signal	

Connector3 (8-way Lemo) pitch-catch
Model: LEMO: ECG.1B.310.CLL
Mating Connector:LEMO FGG.1B.310.CLAD52Z
Probe Connector: LEMO FGG.1B.308.CLAD52Z

Pin	Name	Description	Note
1	Probe Drive 1	Connection to transmit piezo	
2	Probe Drive 2	Connection to transmit piezo	
3	RX+	Connection to receive piezo	
4	RX-	Connection to receive piezo	

Pin	Name	Description	Note
5	Data I/O	1 wire serial comms for probe ID	
6	GND		
7	LED output	Open drain LED output drive	
8	+5V		

10. Software Update and System Recovery

10.1 Updating ETherCheck software

1. To update the ETherCheck software, the new file must be present on the micro SD Card in the instrument; this is accessible under the flap on the side of the instrument. The file is in the format ETherCheckv0000.hex.
2. There are 2 methods of getting the file on to the microSD Card:
   - Remove the card and place it in a micros Card Reader connected to a PC. Then use the PC to copy the file on to the card. The file MUST be in the **\ETherCheck** directory!!

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- o Use the PC package ETherRealtime that is available from ETherNDE for controlling and communicating with an ETherCheck. See the section below on using ETherRealtime to copy the file on to the micro SD card, again, ensuring that it is in the **\ETherCheck** directory.
3. Now that the file is present on the card and in the **\ETherCheck** directory:
    - o Power OFF the ETherCheck.
    - o Hold the LEFT key and turn the ETherCheck ON using the POWER key. This will start the Boot Loader software and the screen will display "Searching for files…"
    - o Below this, a list of compatible files in the \ETherCheck directory will be displayed. If there are more than 1, the UP and DOWN arrows will move the highlight. Once the desired file is highlighted, press Enter.
    - o First, the ETherCheck will erase the existing software from the flash, this will take approx. 10 seconds.
    - o Now the new version will be installed. Its progress in percent is shown. It will take approx. 1.5 minutes.
    - o When instructed to Reboot, hold the power key until the screen goes BLACK, this will take approx. 10s. Now release the key.
    - o Installation is now complete and the instrument can be used as normal. If there was a problem during installation the ETherCheck may be unusable as an Eddy Current Instrument until a successful installation has occurred. If this was due to a corrupt version of the firmware on the micros Card (this is the usual cause) then a valid version will need to be copied on to the card, see removing the micros Card in 2) above.

10.2   Default Mode

In the Load Save Menu there is a DEFAULT setting that cannot be altered by the user. Use this to put the instrument into a pre-defined state.

10.3   ETherRealtime PC Package

To connect to the ETherCheck from a PC, the ***ETherRealtime*** package must be used. This package is freely available from ETherNDE and is present on the supplied USB Memory Stick, or downloadable from our Website.
ETherRealtime PC allows remote control of the ETherCheck instrument, displays real-time values from the instrument and allows files (Settings, Screenshots and Software Update files) to be taken from and loaded on to the instrument micro SD Card. ***ETherRealtime*** PC main screen:

Description of components:
1. 11-key Keypad. This is the same as the keypad on the instrument. Clicking on a key here has the same effect as pressing the real key on the instrument, with the exception of the PowerEnter key.
2. ALARM indicator. If the instrument has an alarm configured this button will glow RED in sync with that of the instrument.
3. Progress Bar. If a file transfer is in progress, this bar shows the progress.
4. 5 Tabs offering different information on the connected instrument, Connection, Data Logging, File System, Phase Plane, Settings. See below for a description of each.
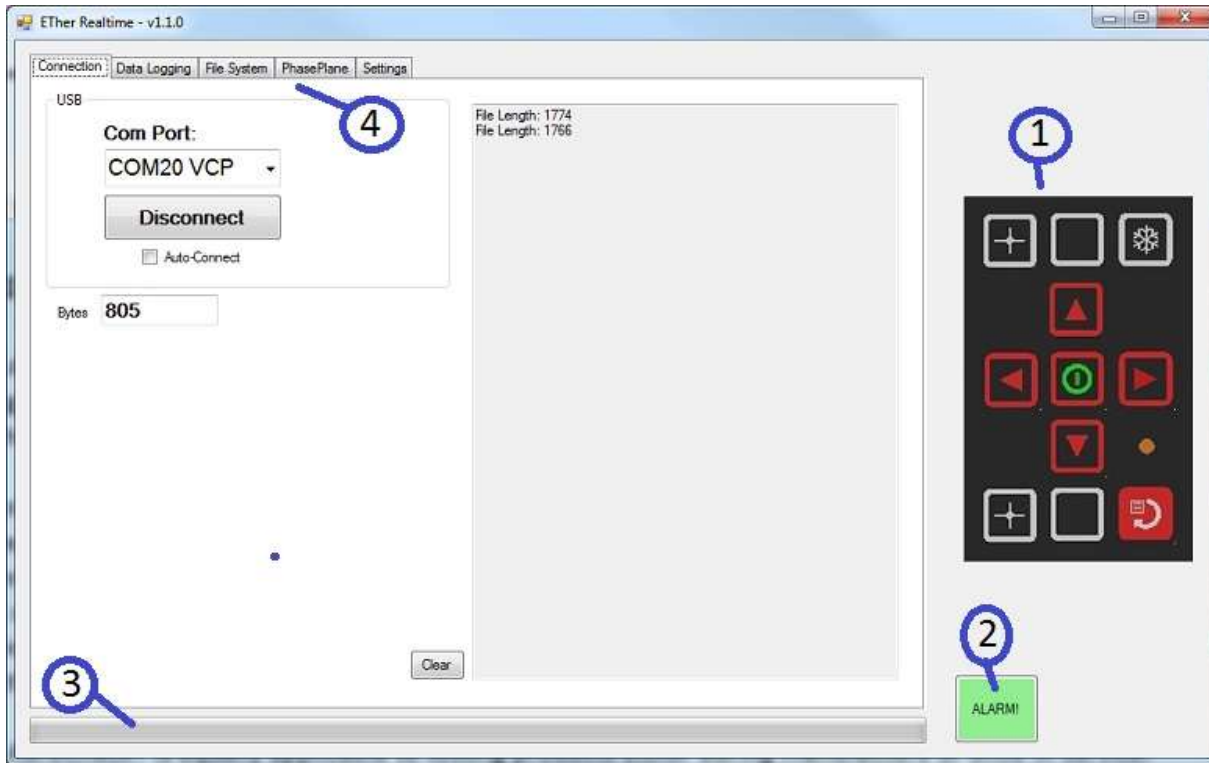
10.3.1　ETherCheck Tabs

10.3.1.1　Connection

When an ETherCheck is connected to the PC via USB its COM port will automatically be displayed in the drop down. Click **Connect** to connect to the instrument or check Auto-Connect to do exactly that when an instrument is plugged in.

10.3.1.2　Data Logging

The 6 radio buttons select what sort of data is to be transmitted by the instrument:

- Conductivity – Only use when the instrument is in Conductivity Mode. The Conductivity and Lift-Off are shown, along with the other technical values of Radius and Theta.
- Non-Realtime – The values of X & Y for channel 1, 2 & Mix and Radius & Theta of Channel 1 are shown. The data rate is slower and not suitable for automated systems but more than sufficient for use by a person.
- Single Channel Post – This is post-processed data that has been offset to show actual screen coordinates. This setting must be used for the PhasePlane tab to show data.
- Post Process – This shows realtime post processed data for Channels 1, 2 & Mix.
- Raw – Raw Eddy Current data from the probe for channels 1 & 2.
- None – Shows nothing.

10.3.1.3 File System
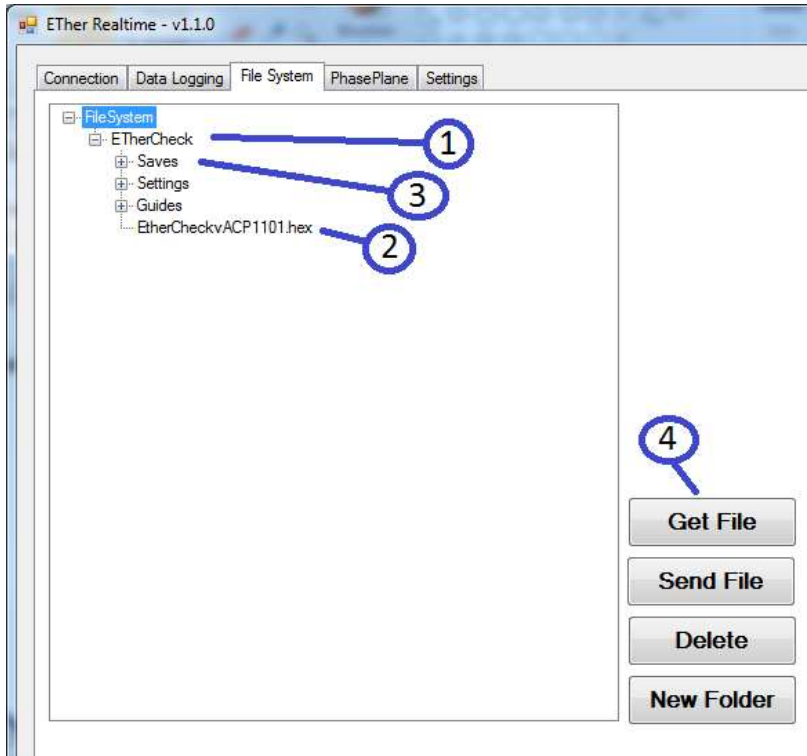
When an ETherCheck is connected to CheckPC and the **File System** Tab is selected **ETherRealtime** will download the file system that is present on the micro SD card, accessible under the flap. The file system is displayed in a window. Each folder can be expanded or collapsed by clicking on the + or – symbol. An example screen shot is shown below:

Description of components:
1. This is a Folder. It can be expanded and collapsed using the + and – icon to the left of the text.
2. This is a Software update file (ends in .hex). These MUST be in the Ether Check folder to be recognised by the Boot Loader.
3. In the Saves folder are the Settings folders and files that are used by the instrument. Several are present by default on a new machine. Users create others. They can be retrieved or sent to an ETherCheck (see below).
4. File action buttons; Delete (File or Folder), Get File, Send File and New Folder. These buttons, are only available once a file or folder is highlighted. See below for detailed explanation of the use.
   a. Deleting a File (or Folder)
   - If a File or Folder is highlighted, clicking on **Delete File** will delete the specified file. BE VERY CAREFUL when doing this, deleted files cannot be undeleted afterwards. A folder MUST be empty before it can be deleted.
   b. Get File (getting a file FROM the ETherCheck):
   - Click on a file so that it is highlighted. Click on **Get File**. The file will upload to the PC; its progress will be shown on the progress bar on the main screen. Once complete, a file save dialog window will appear. Use this to choose a location and filename of the uploaded file.
   c. Send File (Sending a file FROM the PC to the Weld Check) :

Click on a folder (or file within a folder) that will receive the file. Click on Send File. A File Open dialog window will appear, find and choose the file to send TO the ETherCheck. Click Enter. The file will begin downloading; its progress will be shown on the progress bar on the main screen. Once complete, the File System window will refresh and the new file should be visible.

      d. New Folder.

- With an existing folder highlighted, click on this button to create a new folder within the highlighted one. A new window will appear requesting the name of the new folder to be created.

10.3.1.4   Phase Plane

This tab attempts to mimic the realtime display of the instrument. For this to work the ***Single Channel Post*** button must be selected on the previous Tab.

10.3.1.5   Settings

This displays a full set of the instruments settings that it is currently using. Please note, these values are not all human readable but are what the instrument requires should commands need to be sent by automated equipment.

11. Specification

11.1 Eddy Current

Probe	Connectors	12 Way Lemo 2b (Absolute, Bridge and Reflection) and Connection Lemo 00 (for single element absolute probes). Simultaneous probe operation possible using Lemo 12 way and Lemo 00.
	Rotary	600-3000 rpm - ETher Mercury Drive (ADR002) and Saturn (ARD001), Hocking 33A100, Rohmann MR3, SR1 and SR2 Drive (special adapter needed)
	Conductivity	Option becomes active with use of AeroCheck + conductivity probe and cable
Frequency	Dual Freq.	10 Hz to 12.8 MHz
Gain	Overall	-18 to + 104 dB, 0.1, 1 and 6dB steps
	Input	0dB or 12dB
	Drive	0dB, 6dB and 10dB (0dB reference 1mW into 50 ohm)
	Max X/Y Ratio	+/-100.0 dB
Phase	Range	0.0-359.9°, 0.1° steps
Filters	High Pass	DC to 2kHz or Low Pass Filter, which ever is the lower in 1 Hz steps. Plus variable adaptive balance drift compensation 0.01 - 0.5 Hz (6 steps).

	Low Pass	1Hz to 2KHz or a quarter of the lowest test frequency whichever is lower in 1 Hz steps.
Balance Load	Manual	14 internal balance loads; 2.2µH, 5.0µH, 6.0µH, 6.5µH, 7.0µH, 7.5µH, 8.2µH, 12µH, 15µH, 18µH, 22µH, 30µH, 47µH, 82µH,
	Automatic	Optimised balance load selection.
Mix Channel	Frequency	Full frequency range available on both channels
	Probe Mode	Simultaneous reflection / bridge and absolute including simultaneous two probe Differential and Absolute
	Mix Gain	X/Y -18 to +18dB
	Mix Phase	0.0-359.9°, 0.1° steps
Alarms Gates	Box	Fully configurable, Freeze, Tone or visual.
	Sector	Fully configurable, Freeze, Tone or visual.
Display	Flip	Manual or automatic screen orientation change to enable left or right handed use.
	Colour Schemes	User configurable Dark, Bright and Black & White
	Configurable Screen	Full Screen, Single, Dual Spot or Dual Pane with variable size and location and function e.g. XY, Timebase, Waterfall and Meter.
	Display Modes	Spot, Time base (0.1-20 seconds x 1-200 sweeps and up to 55 seconds), Waterfall and Meter with peak hold and % readout.

	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%
	Digital Spot Position Readout	Display in X,Y or R, θ
	Summary	Display of all settings in Legacy Format
Advanced Features	Data logging	Real-time recording of signal data and Replay on instruments and desktop PC up to 164 seconds
	Guides	Create and display a slide show containing instructions, tutorials and procedures using Microsoft PowerPoint.
	Attachments	Screenshots and Data Recordings are saved in a folder with the name of the Settings.
	Loop	Capture a live repetitive signal and then optimise the instrument settings (Phase, Gain, Filters) to simplify optimising the parameters
	Trace	Allows a calibration reference signal to be stored on the screen and then compared with the live signal
	Auto Phase	Allows phase response to be automatically set to a preset angle

11.2 Bond testing

Pitch-Catch Probe	Connector	10w Lemo 1B series
	Identification	Probe type and serial number automatically recognised by instrument
	Alarm	LED indicator in probe triggered by Alarm/Gate
	Frequency	Wide band, 30kHz nominal
	Frequency range	500Hz – 50kHz, PRF: 14Hz
Transmit		
Tone Burst	Output Voltage	1, 3, 6, 8, 10, 12, 18, 24, 30, 36V_{pk-pk}
	Load Impedance	Minimum load impedance 300Ω
	Waveform Type	Configurable tone burst/chirp with variable Hanning window Transmit waveform points maximum: 8192 Waveform duration: Maximum 3.2ms
Sweep	Output Voltage	12, 24, 36V_{pk-pk}
	Frequency range	5kHz to 50kHz
	Load Impedance	Minimum load impedance 300Ω
	Waveform Type	Continuous sinusoidal bi-directional waveform sweep

Receive			
Tone Burst	Sample rate	440kS/s	
	Bit depth	16 bit	
	Gain	0 to 60dB	
	Bandwidth	5kHz to 100kHz (-6dB points)	
	Time base range	100us to 2ms	
	Time base delay	0us to 1ms	
	Rectification	RF, full wave, half wave negative, half wave positive	
Sweep	Gain	-30 to 60dB	
	Bandwidth	DC – >1MHz	
	Filtering	Adjustable high and low pass filters	
Display	Display modes	A-Scan (pitch catch only), XY single frequency and sweep, and Spectrum	
	Configurable Screen	Full Screen or Dual Pane with variable size and location and function	
	Live read-out	Amplitude and phase at gate position	
	Alarms/Gates	Up to 4 Box, Circle or Sector region alarms in XY mode Gate in RF mode: With adjustable position and amplitude.	

11.3 General specifications

Display	Type	5.7" (145mm), 18 bit Colour LCD, daylight readable.
	Viewable Area	115.2mm (Horizontal) x 86.4mm (Vertical)
	Resolution	640 x 480 pixels
Outputs	Digital volt free Alarm	On Lemo 12 way Open collector transistor (36v dc at 10mA max).
	VGA	Full 15 way VGA output (EC screens only)
Encoder support		For Rotary drive and 1-D plots as applicable to mode
Languages		English, French, Spanish, Russian, Japanese, Chinese, Turkish.
Verification Level		The system includes on delivery a 2 year validity Verification Level 2 detailed functional check and calibration as as per ISO 15548-1:2013
Power on self test		The system performs a self test on start up of external RAM, SD RAM, accelerometer, Micro SD card, LCD screen buffer.
Power	External	100-240 v 50-60Hz 30 Watts
	Battery	Internal 7.2V nominal @ 3100mAh = 22.32 watt.hr
	Running Time	Up to 8 hours with a 2MHz Pencil Probe 30% Back Light and up to 6 hours with a Rotary Drive 50% duty cycle, up to 6 hours in Bond Testing mode.

	Charging Time	2.5 hrs. charge time, Simultaneous charge and operation
Physical	Weight Including Internal Battery	1.3 kg, 2.9 lbs.
	Size (w x h x d)	237 x 146 x 53 mm / 9.3 x 5.7 x 2.1 inches
	Material	Aluminium alloy Mg Si 0.5 powder-coated epoxy
	Operating Temperature	-20 to +60 °C
	Storage Temp	Storage for up to 12 months -20 to +35 °C Nominal +20 °C
	IP Rating	IP54

Removable Data Storage	Setup Storage	microSDHC up to 32GB, holding over 10,000 settings
	Stored Screen Shots	micro SD up to 32GB, holding over 10,000 screen shots
	Recorded Data	micro SD up to 32GB, holding over 500 2.5 minute long data recordings
	Guides	micro SD up to 32GB, holding 10,000 Slides

12. System Self-Test Codes

Error	Name	Description
2	External RAM Initialisation	Configures the internal RAM IO lines.
8	SDRAM Initialisation	If SDRAM config. times out, report ERROR.
32	Memory Tests	Required memory configured and cleared.
512	Accelerometer Initialisation	Configuration over I2C. I2C Comms error returned.
1024	uSD Disk Initialisation	If disk not present or failure, error returned.
8192	LCD Screen Buffer test.	Write and read a coloured pixel. Error if different.

13. Safety and Environmental

Safety: Even classified as lithium ion batteries UN3480 or UN3481 (Contained in Equipment or Packed with Equipment), the product is handled as Non-Dangerous Goods by meeting the UN Recommendations on the Transportation of Dangerous Goods Model Regulations Special Provision SP188 and IATA Dangerous Goods Regulations Packing Instruction 965-967 General Requirement and Section Ⅱ (Excepted) is applied for air transportation, IMDG Code SP188 is applied for marine transportation. Battery has passed the UN T1-T8 tests and may be shipped as excepted from these regulations. Battery MSDS sheet available on request.

CE EC Declaration of Conformity - this product is CE marked; CE marking signifies that the product conforms with all EU directives or EU regulations that apply to it.

Environmental Protection: This product should not be disposed of with household waste. Please recycle where facilities exist. Check with your local Authority or retailer for recycling advice.

13.1   EC Declaration of Conformity

We

ETherNDE Ltd

Of

ETher NDE Ltd.

Endeavour House,
Unit 18, Brick Knoll Park,
Ashley Road,
St Albans,
Hertfordshire,
AL1 5UG
    United Kingdom

Hereby declare that:

    Equipment: ETherCheck Eddy Current Flaw Detector

    Model Number: IAER002 + IAER002m

Meet the intent of Directive 89/336/EEC for Electromagnetic Compatibility.

Compliance tested to:

Test Specification: EN 61326-1:2006
Title: Electrical equipment for measurement, control and laboratory use.

Test Specification: EN 55011:2009 + A1:2010

Title: Industrial, scientific and medical (ISM) radio frequency equipment.

- Radio disturbance characteristics

Test Specification: EN61000 Part 4

Title: Electromagnetic compatibility (EMC)

- Part 4. Testing and measurement techniques.

Sections: EN61000-4-2: 2009 - Electrostatic discharge immunity test.

EN61000-4-3: 2006+A2:2010- Radiated radio frequency electromagnetic field immunity test.