



Enhanced Inspection Productivity with On-Device Guided Workflows

A4A NDT Forum

San Francisco, CA

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GE Measurement & Control

Imagination at work.

Today, NDT inspections
are more critical than ever.



More demanding inspections require advanced NDT procedures...including...

- ❗ Improved inspection efficiency
- ❗ Better inspection repeatability
- ❗ Digital capabilities for data storage



New NDT industry realities...

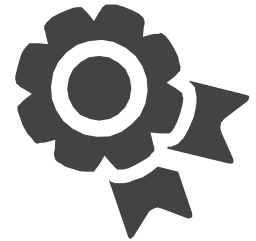
AGING WORKFORCE

High degree of expertise loss across industry.



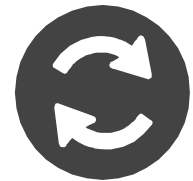
INCREASED COMPLIANCE

Enhanced safety regulations.



MORE PRODUCTIVITY

Increased requirements and expectations for output.



Weighed down by legacy inspection processes...

Detailed, paper-based inspection procedures



Inconsistent results



Hard-to-use inspection devices



- Hundreds of inspection procedures
- Periodic updates
- PC based print outs
- Difficult to keep up and maintain

- Translation of lab PoD to field PoD
- Need for multiple inspector levels to review data

- Complex interfaces
- Hard to maneuver
- Difficult for non-experts



Weighed down by legacy inspection processes...

Detailed, paper-based inspection procedures

Inconsistent results

Hard-to-use inspection devices

Unique Challenge Within Aerospace Applications... Version Control, Distribution and Control of Inspection Procedures/AWD's...

- procedures
 - Periodic updates
 - PC based print outs
 - Difficult to keep up and maintain
- Need for multiple inspector levels to review data
- Difficult for non-experts



Mentor EM

Eddy current expertise with guided on-device inspection workflows



THE POWER OF WORKFLOW



On-device workflow procedures

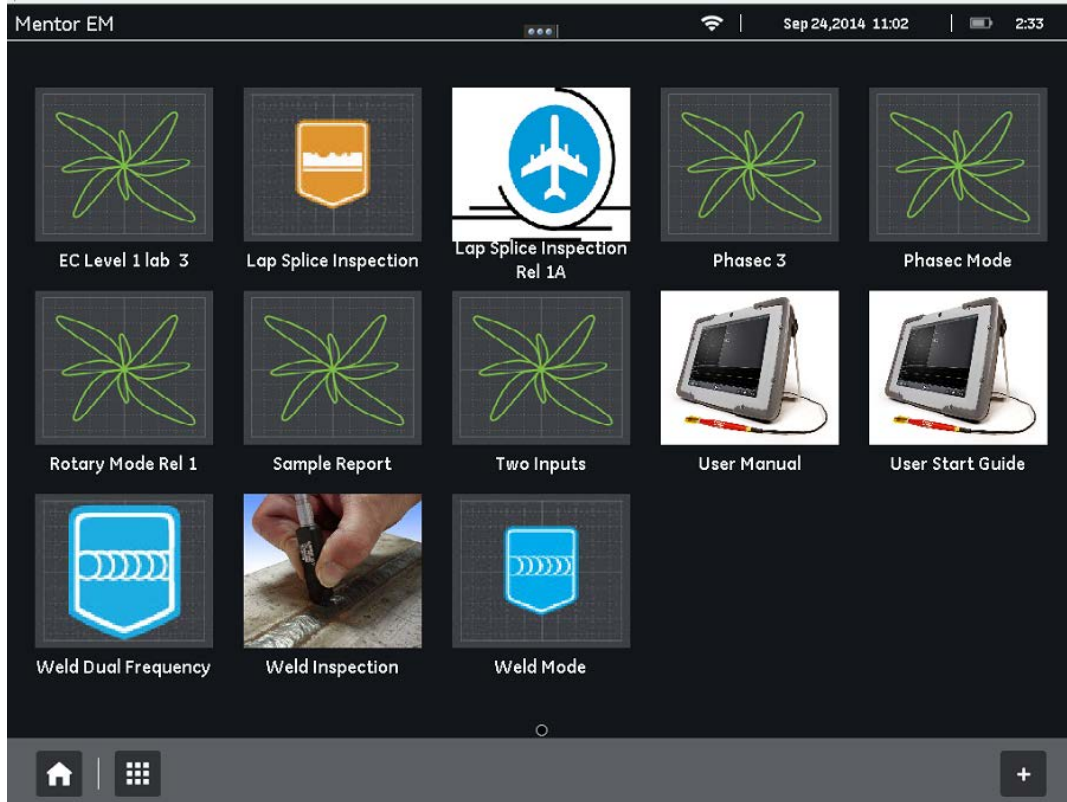
Assist the inspection (and the inspector)

Compliment paper procedures



THE POWER OF WORKFLOW

Simply Select the Workflow



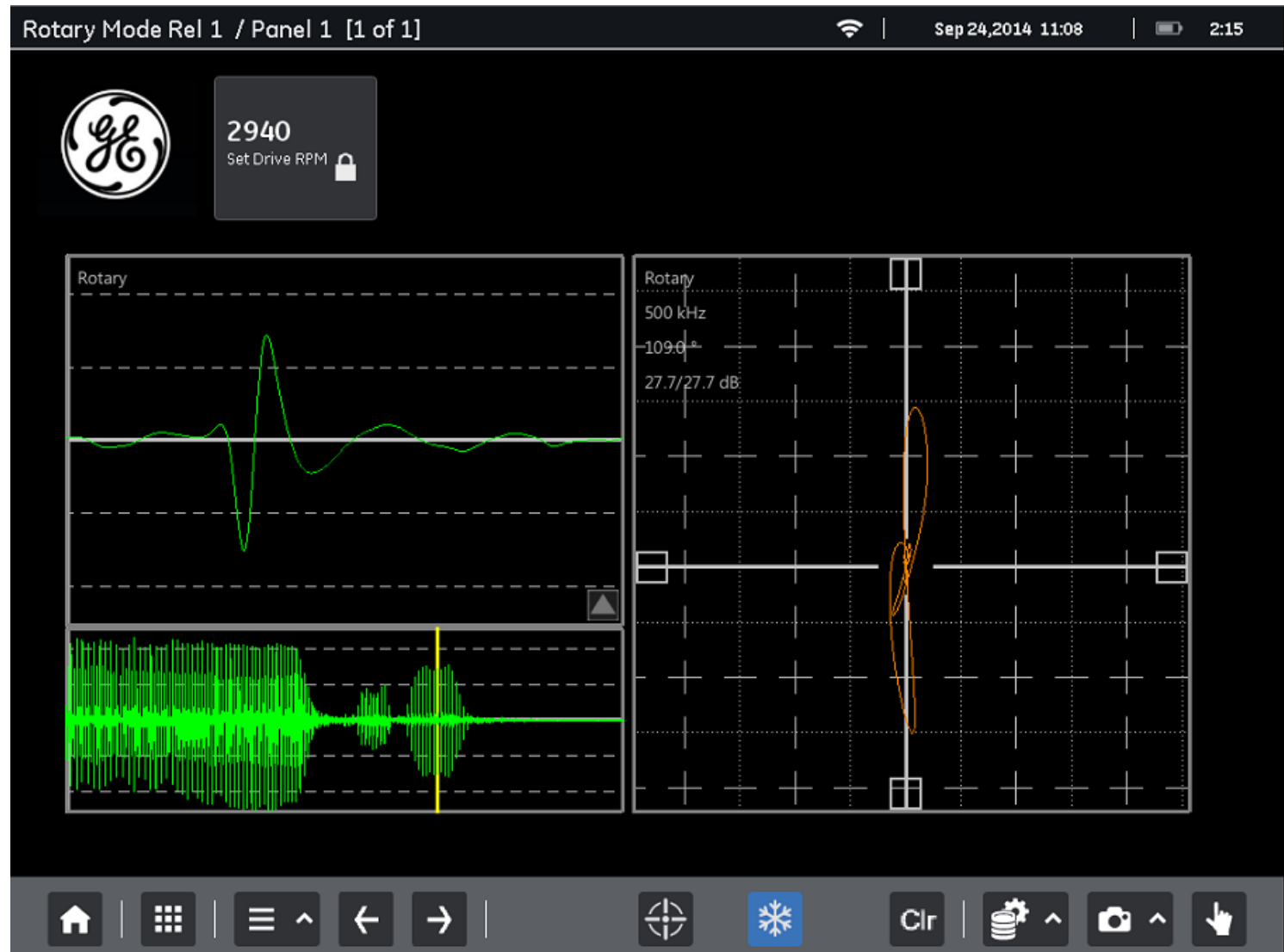
Easy customization
of the user
interface

Assist NDT training

Simplify complex
inspections



Easy Customization of the User Interface



Easy Customization of the User Interface

Lap Splice Inspection Rel 1A / Lift Off Cal - High Freq [4 of 13]



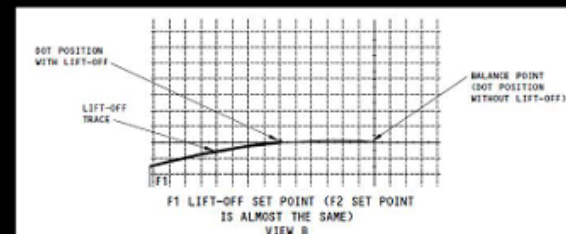
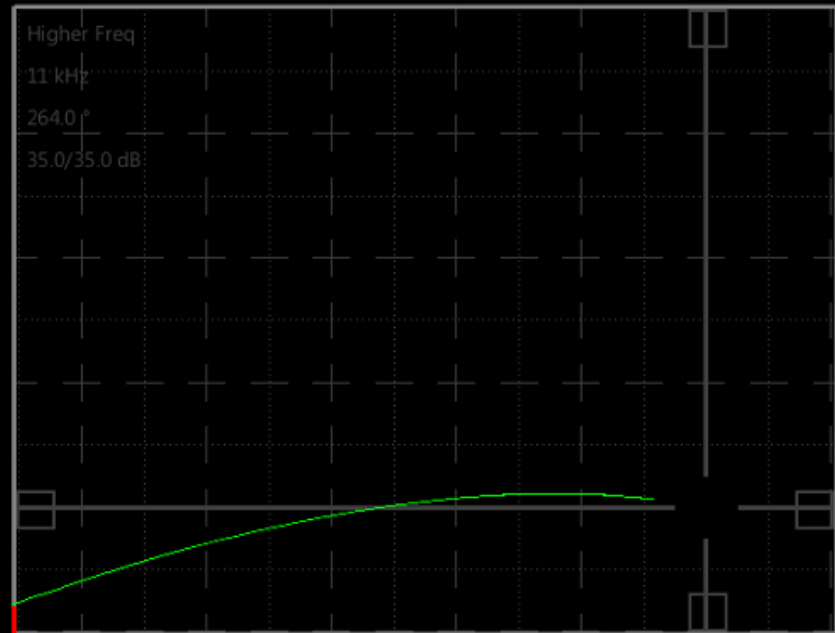
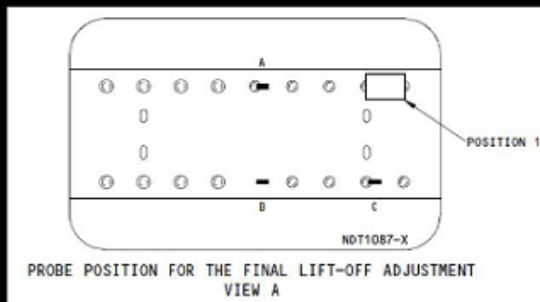
Sep 24, 2014 11:13



2:17

1. Put probe in position 1
2. Set balance point to 30% FSH and 80% FSW
3. Rotate LO horizontal left
4. Use 0.024" to 0.032" shim
5. Adjust gain & phase until signal with and without shims is the same screen height

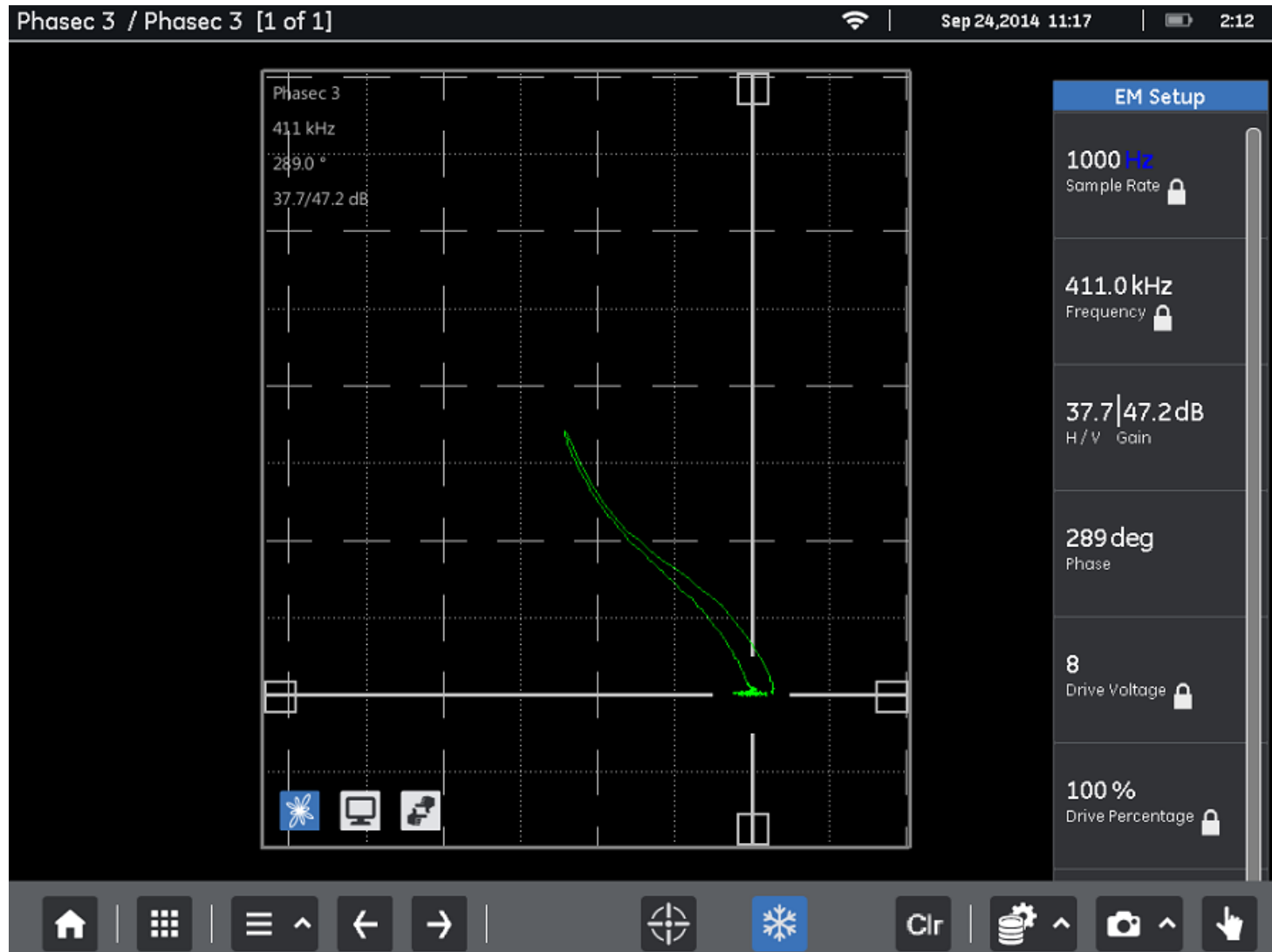
GO TO INSPECTION PROCEDURE



Clr



Easy Customization of the User Interface



THE POWER OF WORKFLOW

Assist NDT Training

Increase Inspector Confidence

Guided NDT Training

- Compliment lecture with guided hands-on practical training

The screenshot shows a software interface for NDT training. On the left, a text box titled "Setting Up the Mentor for Crack Detection" lists four steps: 1. Balance the probe on 'clean' metal using menu or finger gestures... 2. Rotate phase so lift-off signal is at 9 o'clock position. 3. Move probe zero to bottom right of screen; 20% full screen height (FSH) and 20% full screen width (FSW). 4. Set 0.040" crack signal to 80% full screen height (FSH); use independent X and Y Gain controls if required. Below the text is a "Go to Video" button. The main display area shows a Lissajous pattern on a grid. Below the pattern is a diagram of a coordinate system with X and Y axes. A blue curve labeled "lift-off" starts at the origin and moves towards the top-left. Two blue arrows labeled "A" and "B" point to the curve, with the text "crack signals" next to them. The interface includes a top status bar with the date "Aug 18, 2014 4:33 PM" and a zoom level of "200". At the bottom, there is a navigation bar with various icons and a "Clr" button.

- Step-by-step directions with Live Lissajous to validate set-up and calibration
- Figures to illustrate probe positioning & signal response
- Videos to illustrate probe scanning and experiential knowledge
- Links to training documents ¹³




Assist NDT Training

EC Level 1 lab 3 / Introduction [1 of 7] Sep 24, 2014 11:21 2:05

Lab Exercise # 3

Manual crack detection with absolute pencil probe



Home | App Drawer | Back | Forward | Settings | Camera | Pointer

EC Level 1 lab 3 / Set Up [2 of 7] Sep 24, 2014 11:24 2:04

You will need the following items:

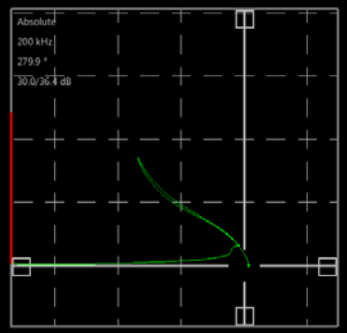
- Mentor EM
- Absolute probe
- Microdot - Lemo probe cable
- 3 notch Aluminum test block

Connect the probe to the Mentor EM


Click on Lissajous icon on right to adjust parameters

Adjust Mentor parameters to meet the probe specifications

Set inspection frequency to 200 kHz



Probe Connector



Home | App Drawer | Back | Forward | Zoom | Settings | Clear | Camera | Pointer

EC Level 1 lab 3 / Lab Procedure Video [7 of 7] Sep 24, 2014 11:33 1:53



Set up crack detection calibration on aluminum blocks with 3 notches (125", 200" and 240") using an absolute probe. Frequency to be approximately 200 kHz.

1. Adjust the phase to manually rotate the lift-off signal to approximately 9 o'clock position
2. Set largest crack signal to 80% of the vertical direction (use independent X and Y Gain controls)

Stopped 00:20 / 00:20

Return to Set Up Panel

Home | App Drawer | Back | Forward | Settings | Camera | Pointer

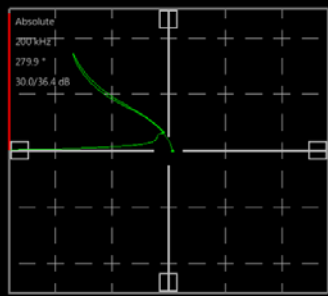
EC Level 1 lab 3 / Setting Phase and Gain [3 of 7] Sep 24, 2014 11:27 2:01

Setting Up the Mentor for Crack Detection

1. Balance the probe on 'clean' metal

Using menu or finger gestures...

2. Rotate phase so lift-off signal is at 9 o'clock position
3. Move probe zero to bottom right of screen; 20% full screen height (FSH) and 20% full screen width (FSW)
4. Set 0.040" crack signal to 80% full screen height (FSH); use independent X and Y Gain controls if required



lift-off

A B crack signals

Y X

Go to Video

Home | App Drawer | Back | Forward | Zoom | Settings | Clear | Camera | Pointer



Simplify Complex Inspections

Convert Lengthy Procedure to Guided

Sliding Probe Inspection of Lap Splice

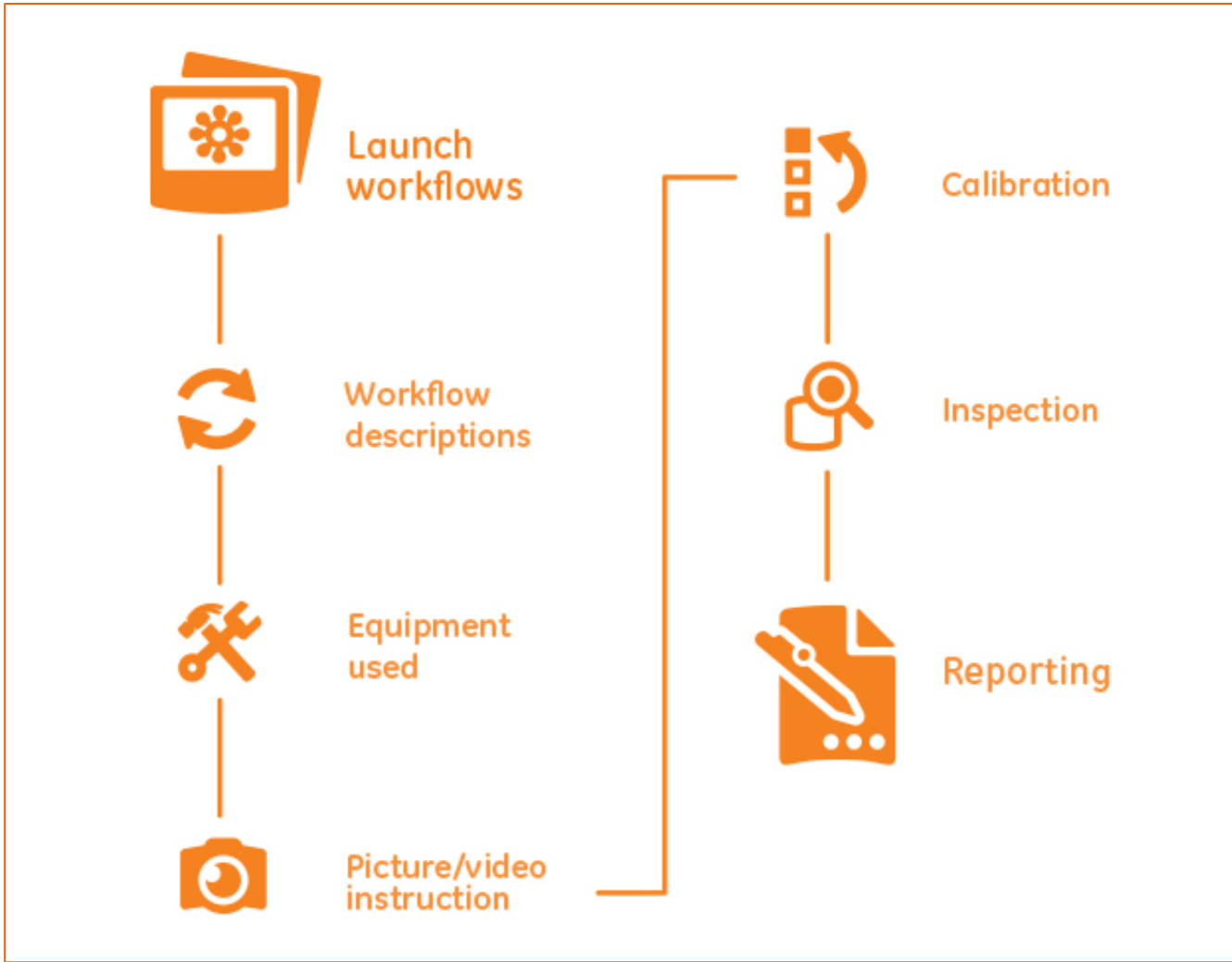
- Dual frequency eddy current with sliding probe
- Mix to 'remove' fastener signal

The screenshot shows a software interface for a guided inspection procedure. The title bar reads "Lap Splice Inspection Rel 1A / Lift Off Cal - High Freq [4 of 13]". The interface is divided into several sections:

- Procedure List:** A numbered list of five steps: 1. Put probe in position 1; 2. Set balance point to 30% FSH and 80% FSW; 3. Rotate LO horizontal left; 4. Use 0.024" to 0.032" shim; 5. Adjust gain & phase until signal with and without shims is the same screen height.
- Action Button:** A button labeled "GO TO INSPECTION PROCEDURE".
- Diagram:** A schematic diagram of a probe array with a callout for "POSITION 1". Below it, text reads "PROBE POSITION FOR THE FINAL LIFT-OFF ADJUSTMENT VIEW A".
- Graphs:** A large graph on the right shows a signal response curve. Below it, a smaller graph shows a "LIFT-OFF TRACK" with annotations for "NEW POSITION WITH LIFT-OFF" and "BALANCE POINT (NEW POSITION WITH LIFT-OFF)". Text below the graphs reads "IF LIFT-OFF SET POINT IS SET POINT IS ALMOST THE SAME VIEW B".
- Header:** "Higher Freq" with values "11 kHz" and "254.07", and "35.0/25.9 dB".
- Footer:** A navigation bar with icons for home, menu, back, forward, zoom, and other controls.

- Guided inspection
- Live Lissajous with step-by-step directions
- Figures to illustrate probe positioning and signal response
- Simplify challenging dual frequency Mix set-up and calibration





TRANSFORMING INSPECTION TECHNOLOGIES



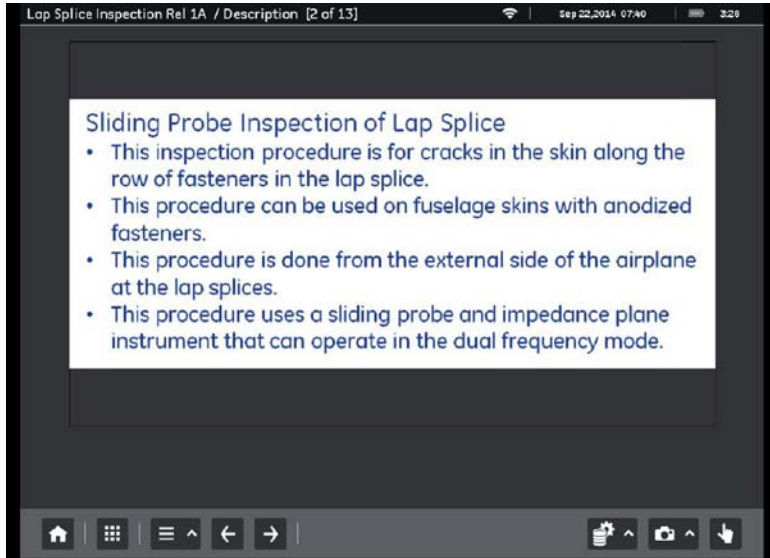
Simplify Complex Inspections

Description of Inspection and Required Tools

Lap Splice Inspection Rel 1A / Description [2 of 13] Sep 22, 2014 07:40 3:28

Sliding Probe Inspection of Lap Splice

- This inspection procedure is for cracks in the skin along the row of fasteners in the lap splice.
- This procedure can be used on fuselage skins with anodized fasteners.
- This procedure is done from the external side of the airplane at the lap splices.
- This procedure uses a sliding probe and impedance plane instrument that can operate in the dual frequency mode.

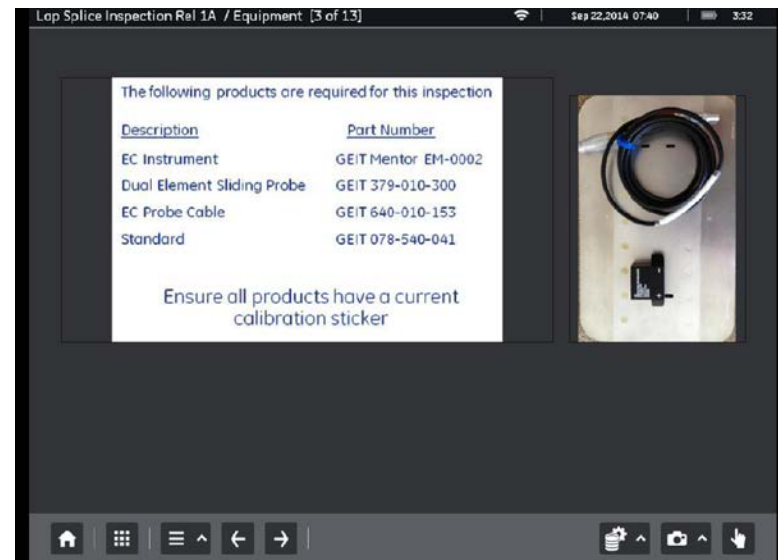


Lap Splice Inspection Rel 1A / Equipment [3 of 13] Sep 22, 2014 07:40 3:32

The following products are required for this inspection

<u>Description</u>	<u>Part Number</u>
EC Instrument	GEIT Mentor EM-0002
Dual Element Sliding Probe	GEIT 379-010-300
EC Probe Cable	GEIT 640-010-153
Standard	GEIT 078-540-041

Ensure all products have a current calibration sticker



Simplify Complex Inspections

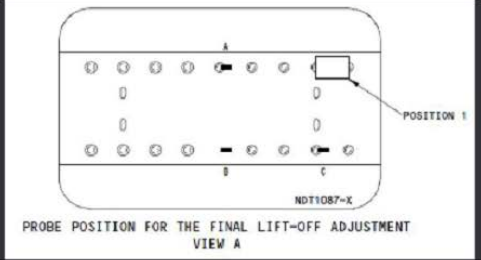
Step-by-Step Procedure with Live Lissajous

Quick Link
to
Procedure
Figures for
Probe
Positioning
and
Reference

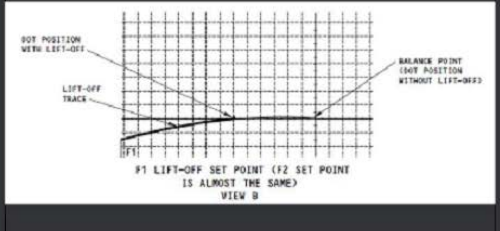
Lap Splice Inspection Rel 1A / Lift Off Cal - High Freq [4 of 13] Sep 22, 2014 07:41 3:30

1. Put probe in position 1
2. Set balance point to 30% FSH and 80% FSW
3. Rotate LO horizontal left
4. Use 0.024" to 0.032" shim
5. Adjust gain & phase until signal with and without shims is the same screen height

[GO TO INSPECTION PROCEDURE](#)



PROBE POSITION FOR THE FINAL LIFT-OFF ADJUSTMENT
VIEW A



BOT POSITION WITH LIFT-OFF

BALANCE POINT (DOT POSITION WITHOUT LIFT-OFF)

F1 LIFT-OFF SET POINT (F2 SET POINT IS ALMOST THE SAME)
VIEW B

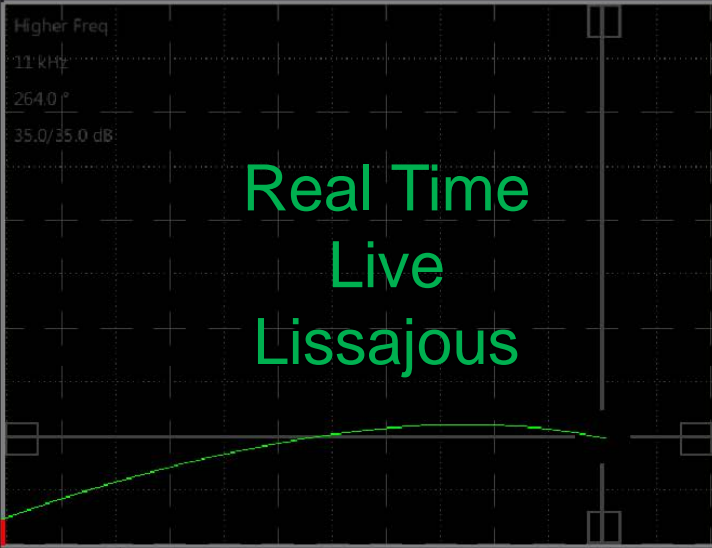
Higher Freq

11 kHz

264.0°

35.0/35.0 dB

Real Time Live Lissajous



Home Grid Menu Up Left Right Target Freeze Clr Settings Up Camera Up Hand

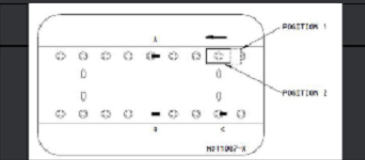


Simplify Complex Inspections

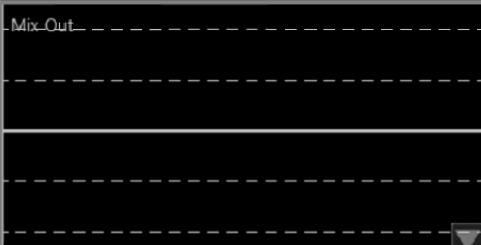
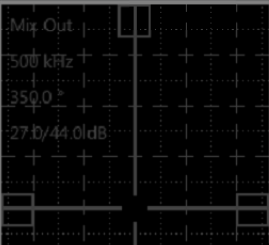

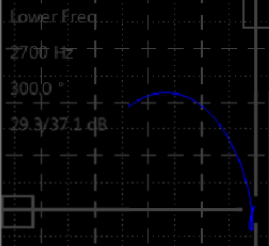
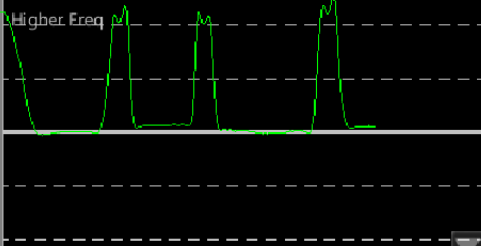
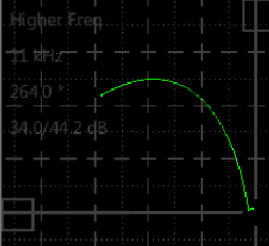
Optimize Screen and User Interface for

Lap Splice Inspection Rel 1A / Mix Setup [8 of 13] Sep 22, 2014 07:47 3:16

1. Put probe in position 1, BAL
2. Slide the probe slowly left along the rivet line to position A
3. Freeze, then use pinch and swipe gestures on one of the strip charts to zoom in on the indication from a good rivet - not the rivet at position A. Indication should appear similar to the reference below
- 4.) Tap CAL



cal



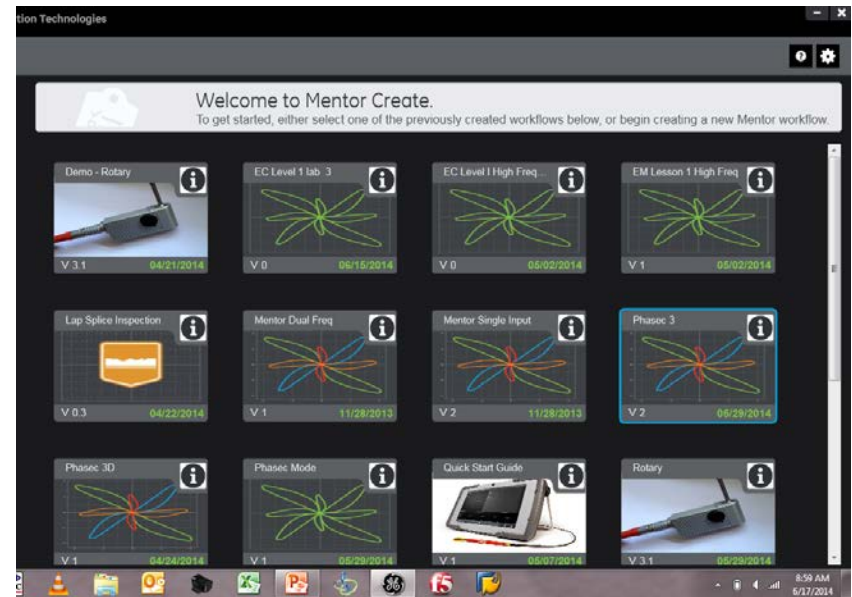
Navigation icons: Home, App Store, Menu, Back, Forward, Zoom, Freeze, Clear, Settings, Camera, Pointer.



THE POWER OF WORKFLOW

Mentor Create Software

- PowerPoint type tool to generate on-device inspection workflows
- Insert photos, procedures, and videos on device for reference while setting up, acquiring data, or analyzing data
- Limit range of adjustments available to the operator, minimizing error opportunities



Use as a conventional EC flaw detector in Expert Mode, or switch to Workflow On-Device mode for guided procedures



THE POWER OF WORKFLOW

Mentor Create for Rapid Generation of Workflows

The screenshot displays the Mentor Create software interface, which is powered by GE Inspection Technologies. The interface is divided into several sections:

- Top Bar:** Shows the GE logo, the text "Create powered by GE Inspection Technologies", and navigation tabs for "Phase 3", "Manage", "Design" (the active tab), and "Build".
- Left Panel (Panels):** Contains a list of panels including "Spot", "Layout", "Settings", "Channel Configuration", "Spot & Timebase", and "Cusotmer".
- Central Canvas (Layout):** Displays a Lissajous figure on a grid. The figure is a complex, multi-lobed shape formed by overlapping red, green, and yellow lines. A white rectangular box is drawn around the figure. The canvas includes a zoom level of 75.4% and a timestamp of "Jun 19, 2014 6:59 AM".
- Right Panel (Controls):** Lists various control types: "Goto", "Image", "RichText", "VideoPlayer", and "Pdf Viewer".
- Bottom Panel (Properties):** Shows the properties for the selected "Lissajous View" control. The properties include:

Lissajous View Lissajous_1	
Search	
Control	
Caption	
Locked	<input type="checkbox"/>
Position	
Height	500
Width	500
XCoord	40.31
YCoord	35

The bottom of the screen shows a Windows taskbar with various application icons and a system tray displaying the time "6:59 AM" and date "6/19/2014".

How Do We Value Workflows and Remote Collaboration within Your Aerospace Applications ?

Detailed, paper-based inspection procedures

Inconsistent results

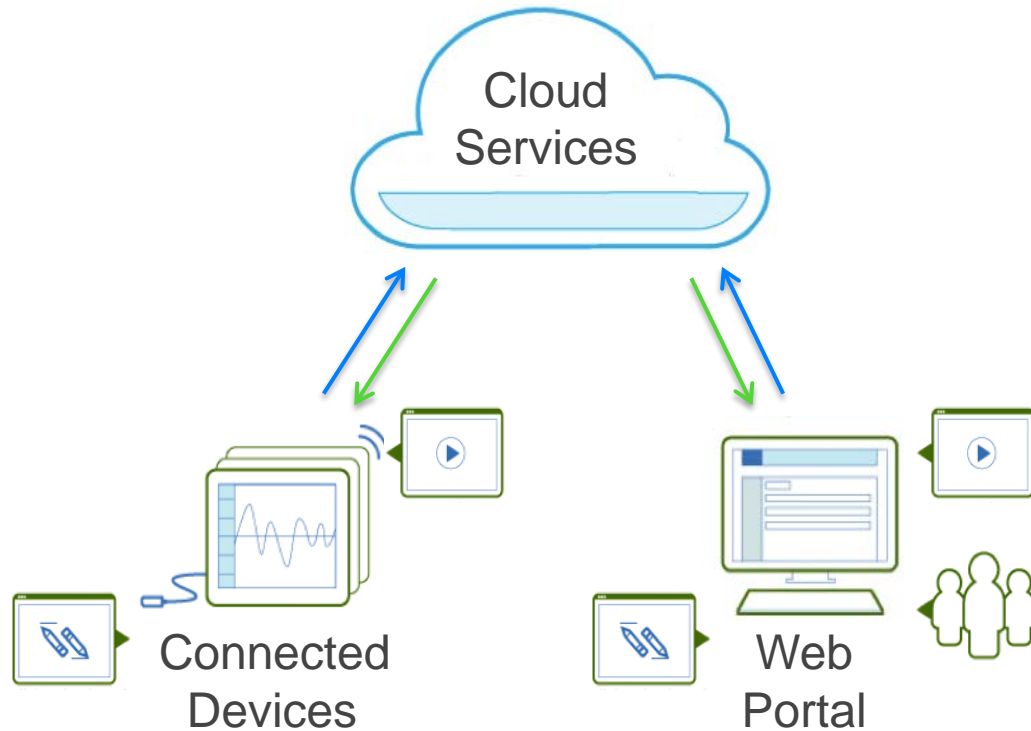
Hard-to-use inspection devices

Unique Challenge Within Aerospace Applications... Version Control, Distribution, Control and Disposal of Inspection Procedures/AWD's...

- procedures
 - Periodic updates
 - PC based print outs
 - Difficult to keep up and maintain
- Need for multiple inspector levels to review data
- Difficult for non-experts



INSTANT COLLABORATION WITH INSPECTION WORKS



Real-time access
to knowledge from
off-site experts

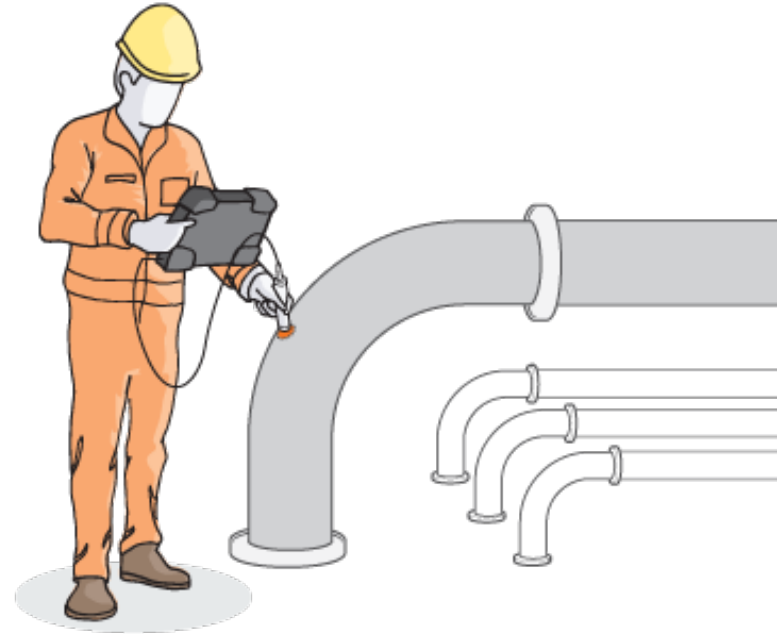
More accurate and
efficient inspections

Real-time sharing of
inspection data



INSTANT COLLABORATION WITH INSPECTION WORKS

- Connect with experts in real-time using a wireless network
- Share screens to make calls, add comments, annotate screens and more
- Troubleshoot issues with complex inspections on the spot, without leaving the inspection site



NDT Solution Center

- An online library of custom workflow applications created by experts for specific applications and companies
- Ensure everyone has access to the latest inspections
- Workflows available for purchase and download
- Easy upgrade process



Mentor EM: The solution for accurate inspections

INDUSTRY KNOWLEDGE



Access to expert knowledge (on-device workflows, collaboration)

IMPROVED ACCURACY



Improved PoD, and consistent inspection procedures

PEACE OF MIND



Conduct consistent inspections with less risk/failure

MORE PRODUCTIVITY



Less-skilled people can conduct inspections—with less setup/configuration time

CUTTING-EDGE TECHNOLOGY



An innovative technology with remote collaboration and Predictivity™







Backed by a history of
excellence and innovation



GE Measurement & Control

- Largest supplier of Nondestructive Testing (NDT) products and services worldwide
- Made up of trusted heritage companies
- Only company offering solutions for all NDT technologies:
 - Eddy Current
 - Remote Visual Inspection (RVI)
 - Ultrasound
 - Radiography
 - Metrology



Addendum



Mentor EM: The highlights

- Industry defining signal-to-noise ratio improves Probability of Detection (PoD)
- Customize on-device workflows to optimize inspection
- Instantly connect with other NDT experts
- Immediately access your service bulletins
- High-resolution display for easy signal interpretation
- Industrial touchscreen for rapid inspection setup
- Use the touchscreen while wearing gloves



The details: Product Specifications

- Two probes with independent generators
- Multiple frequencies for each probe input
- Frequency range of 10 Hz to 6 MHz
- Compatible with GEIT/Hocking and other manufacturer's eddy current probes
- High-resolution display with touchscreen controls
- Wi-Fi enabled with "Remote Desktop" capability
- 6 Bluetooth ports, plus USB and LAN ports
- Screen and user interface fully customizable using Mentor Create software

