



OmniScan MXU Software

User's Manual

Software Version 5.0.0

10-001244-01EN — Rev. 2
September 2020

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

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This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

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List of Abbreviations

| | |
|------------|-------------------------------------|
| Acq. | acquisition |
| AIM | acoustic influence map |
| AWS | American Welding Society |
| BP | band pass |
| CSC | curved-surface correction |
| DAC | distance-amplitude correction |
| DC | direct current |
| DGS | distance gain size |
| DHCP | Dynamic Host Configuration Protocol |
| DIN | digital input |
| DNS | Domain Name System |
| ERS | equivalent reflector size |
| FMC | full matrix capture |
| FSH | full-screen height |
| FW | full wave |
| HP | high pass |
| HW- | half wave negative |
| HW+ | half wave positive |
| ID | inside diameter |
| IP | internet protocol |
| L Velocity | longitudinal velocity |
| LED | light-emitting diode |
| ML | material loss |
| ND | no detection (of signal) |

| | |
|------------------|---|
| NS | no synchronization |
| OD | outside diameter |
| P/C | pitch-catch |
| P/E | pulse-echo |
| PA | phased array |
| PCS | probe center separation |
| PRF | pulse repetition frequency |
| pts/ λ L | points per wavelength for longitudinal wave |
| pts/ λ T | points per wavelength for transversal wave |
| PW | pulse-width |
| RF | radio frequency |
| RGD | red, green, blue |
| SDH | side-drilled hole |
| T Velocity | transversal velocity |
| TCG | time-corrected gain |
| TFM | total focusing method |
| TOFD | time-of-flight diffraction |
| USB | Universal Serial Bus |
| UT | ultrasonic testing |
| VPA | virtual probe aperture |
| WD | wedge delay |

Important Information — Please Read Before Use

Intended Use

OmniScan MXU 5.0.0 software is for the OmniScan X3 flaw detector, which is used in nondestructive inspections on industrial and commercial materials.



WARNING

Do not use the OmniScan X3 flaw detector for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

Instruction Manual

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of components and software images in this manual may differ from your instrument's components or software display. However, the principles remain the same.

Instrument Compatibility



CAUTION

Always use equipment and accessories that meet Olympus specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

Safety Symbols

The following safety symbols might appear on the instrument and in the instruction manual:



General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.



Shock hazard caution symbol

This symbol is used to alert the user to potential electric shock hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety signal words might appear in the documentation of the instrument:



DANGER

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.



WARNING

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.



CAUTION

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following note signal words could appear in the documentation of the instrument:

IMPORTANT

The IMPORTANT signal word calls attention to a note that provides information that is important or essential to the completion of a task.

NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, that requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or that provides hints on how to effectively use the capabilities of the product.

Safety

Before turning on the instrument, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the instrument, which are described under “Safety Symbols.”

Warnings



WARNING

General Warnings

- Carefully read the instructions contained in this instruction manual and in the *OmniScan X3 User's Manual* prior to turning on the instrument.
- Keep this instruction manual in a safe place for further reference.
- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the instrument and in the instruction manuals.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.

Warranty Information

Olympus guarantees your Olympus product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the *Olympus Scientific Solutions Americas Inc. Terms and Conditions* available at <http://www.olympus-ims.com/en/terms/>.

The Olympus warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Olympus for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Olympus product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Olympus makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Olympus reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Olympus is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page at: <http://www.olympus-ims.com>.

Introduction

The OmniScan MXU 5.0.0 software runs on the innovative, portable OmniScan X3 flaw detector. Its ultrasonic inspection functions make it suitable for numerous nondestructive testing applications. The software combines conventional ultrasonic testing (UT), phased array (PA), and total focusing method (TFM) operation modes.

Other Relevant Olympus Documents

In addition to this document, several other Olympus documents are relevant to the OmniScan X3 flaw detector operation:

OmniScan X3 – User’s Manual

Provides a detailed description of the OmniScan X3 flaw detector. Refer to this document for operating instructions, maintenance, connections, specifications, and typical accessories.

OmniScan X3 – Getting Started

A short leaflet containing essential information on how to quickly start operating the OmniScan X3 flaw detector.

1. Instrument Overview

The OmniScan X3 flaw detector features front panel controls for easy and efficient operation of the OmniScan MXU software. Figure 1-1 on page 10 shows the OmniScan X3 front panel and the available controls and indicators.

| |
|-------------|
| NOTE |
|-------------|

In this document, hardware controls that you press to activate are referred to as *keys*. The term *button* is reserved for software controls.



Figure 1-1 Front panel controls of the OmniScan X3 flaw detector

Table 1 Front control panel controls description

| Item Number | Description |
|-------------|---|
| 1 | Display touch screen |
| 2 | Alarm indicator lights |
| 3 | Help key |
| 4 | Main controls: Accept key, Cancel key, and scroll knob |
| 5 | Zoom key |
| 6 | Play key |
| 7 | Pause key |
| 8 | Save key |

Table 1 Front control panel controls description (continued)

| Item Number | Description |
|-------------|-----------------------------|
| 9 | Power key |
| 10 | Power indicator key |
| 11 | Acquisition indicator light |

1.1 Turning On and Off the OmniScan X3

This section explains how to turn on and off the OmniScan X3 flaw detector. The OmniScan MXU software shuts down automatically when you turn off the OmniScan X3 flaw detector.

To turn on the OmniScan X3

1. Press and hold the Power key () for one second.

The system starts up, performs a memory check, and the launch screen appears (Figure 1-2 on page 12).

NOTE

If the system encounters a problem during the start-up phase, the power indicator light indicates the nature of the problem using a color code (for details, refer to the *OmniScan X3 User's Manual*).

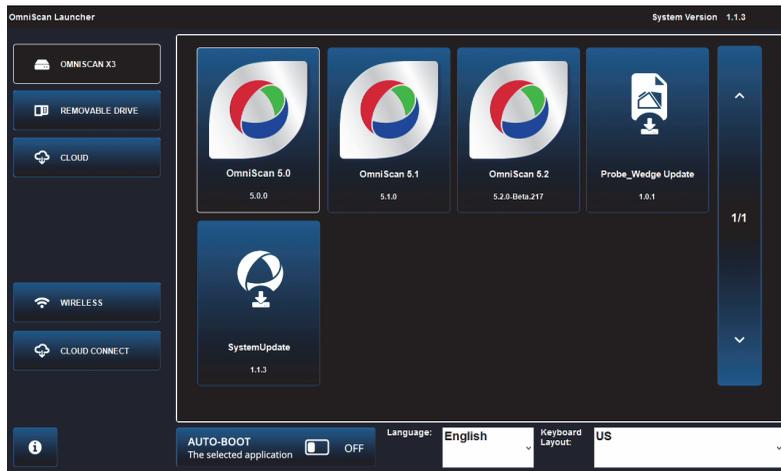


Figure 1-2 Launcher screen example

2. Tap to start the desired application and/or to configure the following:
 - **OmniScan Launcher** (applications)—if more than one application is available. The compatible file type has the .wrp file extension.
 - **OMNISCAN X3** (hard drive)—a series of buttons appears on the screen. To delete an application, tap and hold it until a message confirms the deletion. Applications must be on the hard drive to be executed.
 - **REMOVABLE DRIVE**—displayed only if a USB key or SD card is connected. Tap on an application to transfer it to the hard drive.
 - **CLOUD**—displayed only if the **CLOUD CONNECT** is configured. This option gives you access to the official version of the system (MXU, System Update and Probe_Wedge Update). Tap on an application to transfer it to the hard drive.
 - **WIRELESS**—To activate the **WIRELESS** function, you need to plug the wireless LAN dongle into the instrument and, in the Wireless Properties, check the Wireless Enabled option and select and configure your wireless Internet network.
 - **CLOUD CONNECT**—To activate **CLOUD CONNECT**, you must enable the **WIRELESS** option. Tap **CLOUD CONNECT**, check

Enable in the Cloud Settings, and make sure that the **Ready** and **Enable** statuses are **Yes**.

- **i** – The information button shows the installed versions of the Platform Compatibility, Low Level, and System.
- **AUTO-BOOT** – This toggle ON/OFF sets the OmniScan X3 flaw detector to automatically boot up using the selected application (OmniScan X.X) on subsequent start-ups.
- **Language** – This option enables you to change the language of the software. You must change the language before starting the application.
- **Keyboard Layout** – This option enables you to change the keyboard language of the software. You must change the keyboard language before starting the application.

If you always choose the same application, you can skip the application selection step for future restarts by selecting **Always boot the selected application** below the software buttons.

To regain the ability to choose the application at start-up, select  **Preferences > System**, and then **Manual boot**.

To turn off the OmniScan X3

1. Press and hold the Power key () for 3 seconds.
2. Tap the Shut Down button on the confirmation window to turn off the OmniScan X3 flaw detector.

IMPORTANT

If the OmniScan X3 does not react after a short press of the Power key () (or after selecting Shut Down), press and hold the Power key () for at least five seconds. This initiates a power-down sequence. However, your setup will NOT be saved with this method.



CAUTION

Never attempt to turn off the OmniScan X3 flaw detector by removing all power sources, because this could cause a faulty start-up the next time you turn it on.

1.2 Installing Software

The OmniScan MXU software can easily be updated. You can download the latest MXU software version at: <https://www.olympus-ims.com/en/service-and-support/downloads/> or by using the  **CLOUD** option. From the Internet, extract the contents of the *.zip file on a USB key or SD card, and then insert it into the OmniScan X3 instrument. From the  **CLOUD**, select the application to copy to the instrument. On the launcher screen, tap the inserted media folder and select the application to copy to the instrument. After the copying has been completed, the newly installed software appears in the OmniScan X3 main folder.

1.3 Preferences

Set your system preferences on the  >  **Preferences** menu. For example, you can set the date and time (recorded along with acquired data), length measurement units (millimeters or inches), and digital inputs (DIN keys assigned to inputs).

1.4 Main Controls

The three main controls shown in Table 2 on page 14 enable full operation of the OmniScan MXU software.

Table 2 Main controls for OmniScan X3 flaw detector

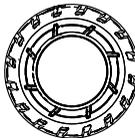
| Image | Name | Description |
|---|-------------|--|
|  | Scroll knob | Rotate the scroll knob clockwise or counterclockwise to select a desired software button, or change a parameter value. |
|  | Accept key | Press the Accept key to activate the current selection, and move to the next level in the menu hierarchy. In an alphanumeric parameter value field, pressing the Accept key twice (or tapping the parameter twice) opens the software keyboard. |

Table 2 Main controls for OmniScan X3 flaw detector (continued)

| Image | Name | Description |
|---|------------|---|
|  | Cancel key | Press the Cancel key to cancel the current selection, and return to the previous level in the menu hierarchy. |

1.5 Function Keys

The function keys are located on the keypad on the right side of the OmniScan X3 front panel (Figure 1-1 on page 10). Table 3 on page 15 summarizes how to use the function keys to activate different software functions.

Table 3 Key functions for OmniScan X3 flaw detector

| Image | Name | Function |
|---|-------|---|
|  | Zoom | Used to enter and exit Zoom mode. For details, see “Using the Zoom, Pan, Gates, and Print Screen” on page 29. |
|  | Play | Used to restart the inspection data acquisition, and/or the encoders, depending on the configuration on the Scan > Inspection menu. |
|  | Pause | Used to toggle between the inspection and analysis modes. |
|  | Save | Used to save the report, data, or image, depending on the configuration on the File name menu. |

1.6 Indicators

There are three types of LED indicators on the instrument front panel that turn on, off, and flash different colors (Figure 1-1 on page 10):

- Power LED—green if instrument is “on”, but flashes red during a critical power situation. (Refer to the *OmniScan X3 User’s Manual* for full status descriptions, for example, orange states during charging.)
- Acquisition LED—turns orange during analysis mode and off during inspection.
- Alarm LEDs (3)—turn red when an associated (gate) alarm is triggered (see “Configuring the Indication Table” on page 121).

2. OmniScan Interface

The main components of the OmniScan MXU software user interface are shown in Figure 2-1 on page 17.

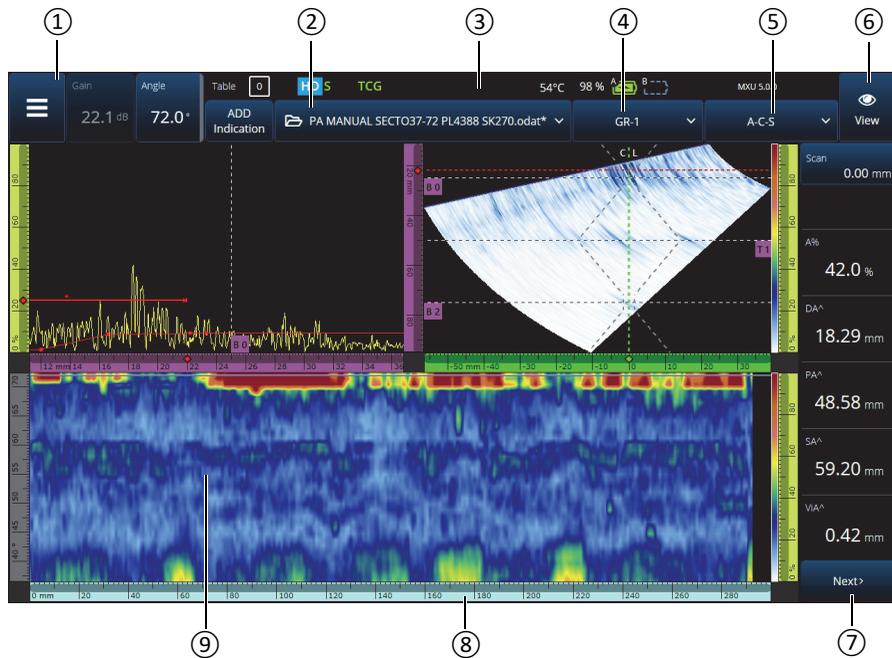


Figure 2-1 OmniScan MXU interface components

Table 4 OmniScan MXU interface components

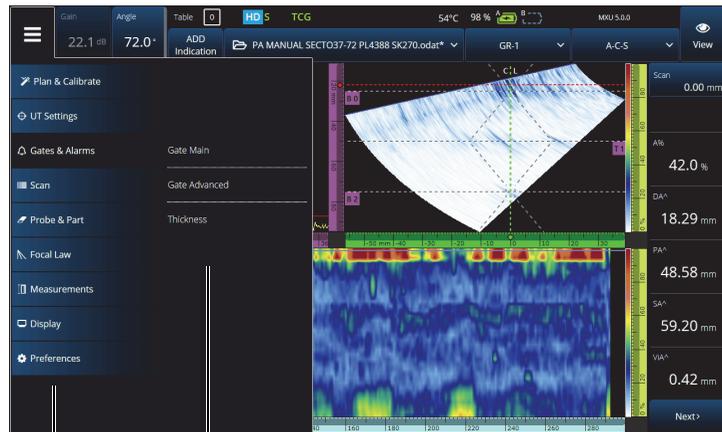
| Item Number | Description |
|-------------|---------------------------------|
| 1 | Main menu |
| 2 | File menu |
| 3 | Status indicator |
| 4 | Layout menu |
| 5 | Focal law groups menu |
| 6 | View menu |
| 7 | Readings menu (scroll for more) |
| 8 | Ruler (scale) |
| 9 | Data screen |

NOTE

In this manual, the OmniScan MXU software screen images are displayed using the default color scheme, which is designed for indoor use. However, an alternative color scheme is available for outdoor operations in version 5.1 (see “Preferences” on page 14).

2.1 OmniScan MXU Software Navigation

Figure 2-2 on page 19 shows the three menu levels of the OmniScan MXU software, and describes the syntax used throughout this manual to systematically select the menu and submenu, and to optionally enter or select a parameter value. For example, **☰ > ⚙ Gates & Alarms > Gates Position > Start** signifies that you first select the **☰** Main menu, then **⚙ Gates/Alarms** menu, followed by **Gates Position** submenu, and finally the **Start** parameter.



Menu > Submenu > Parameter value

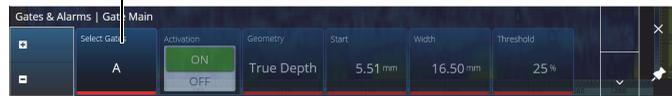


Figure 2-2 Menu hierarchy and identification syntax

The menu temporarily appears horizontally over the data screen area, with submenu selections to the right. When selected, the parameter submenu appears over the data screen. It is possible to scroll to another submenu using the arrow buttons (▲ ▼). The submenu can be hidden by tapping the close button (✕), or it can be pinned (📌) to the side of the screen (Figure 2-3 on page 20).

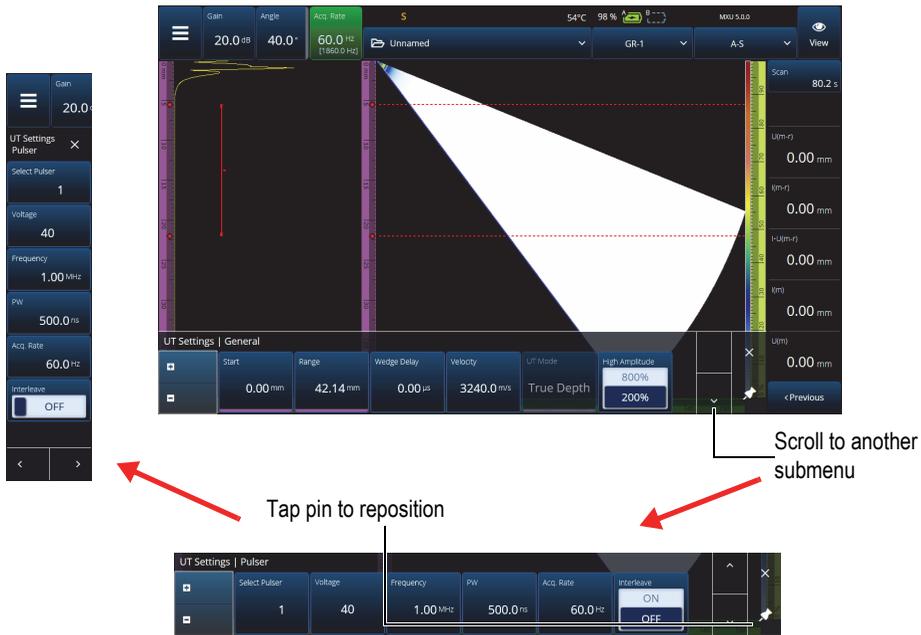


Figure 2-3 Scroll and reposition a parameter submenu

2.2 Gain

The gain value that is applied to the signal is an important parameter. The gain value applied to all focal laws appears in the upper-left corner of the screen. Figure 2-4 on page 20 shows the information displayed in the **Gain** value field.



Figure 2-4 Gain value field

The **Gain** value field presents two values after the **UT Settings > Advanced > Reference dB** parameter is turned **On**. Setting **Reference dB** to **On** freezes the current gain value as the reference gain. An adjustment gain value appears in order to show gain value changes. With an active reference, the gain applied to all focal laws is the total of the reference gain plus the adjustment gain.

2.3 Status Indicators

The current status of the OmniScan X3 flaw detector is indicated at the top of the screen (Figure 2-5 on page 21). Table 5 on page 21 provides a list of the status indicators and their meanings.



Figure 2-5 An example of the status indicators

Table 5 The status indicators and their meanings

| Indicator | Meaning |
|---|--|
|  | The number of data points on the inspected area exceeds the number of available pixels (see “Compression (TOFD Only)” on page 87). |
|  | High definition: Used to see the data scale and ruler on the instrument correctly with the resolution of the screen (1280 × 768). Seeing the HD icon ensures that there is no compression in the scan axis (in the case of one-line scans) or both the scan axis and index axis (in the case of raster scans). |
| TCG (green) | The time-corrected gain (TCG) is enabled (“TCG Calibration” on page 111). |
|  | The acquisition synchronization is set to clock mode. |
| [52]°C | The OmniScan X3 flaw detector’s internal temperature in degrees Celsius. |

Table 5 The status indicators and their meanings (continued)

| Indicator | Meaning |
|---|---|
|  | Warning |
|  | The wireless LAN is active. |
|  | Connected to the cloud (with notifications). |
| S (orange) | The sensitivity is not calibrated. |
| S (green) | The sensitivity is calibrated. |
| W (yellow) | The wedge delay is not calibrated. (Only visible on the Calibration menu.) |
| W (green) | The wedge delay is calibrated. |

2.4 Battery Status Indicators

The battery status indicators at the top of the screen indicate the amount of power remaining in the batteries:

- The percentage of remaining power is displayed next to the indicators. The OmniScan X3 flaw detector must be turned on for approximately 15 minutes before it is able to accurately display this information.
- The bar length in the battery status indicator represents the approximate amount of power remaining in each battery (for example, 70 % .

IMPORTANT

The maximum ambient temperature for OmniScan X3 battery discharging is 45 °C (the maximum OmniScan X3 operating temperature).

NOTE

If you attempt to turn on the OmniScan X3 with one or two batteries that are too low for operation, the power indicator light blinks red rapidly for about three seconds. Replace the battery or batteries or plug in the DC power adaptor to operate the OmniScan X3 flaw detector.

Figure 2-6 on page 23 provides details about the variations of the battery charge indicator.

| | |
|--|---|
|  | Missing or incorrectly installed battery |
|  | Fully charged (disconnected from the DC power adaptor) |
| 32 %  | Battery level (combined remaining charge percentage) Level increments in 1 % steps (0–100 %) |
|  | Charging (interior blinking) with percentage of charge attained |
|  | Fully charged (connected to the DC power adaptor) |
|  | Too hot to charge |
|  | Too hot to operate, or critical temperature (rapid blinking) |

Figure 2-6 Battery indicator variations

2.5 Data Screen

The data screen area displays the various ultrasonic data views and layouts.

Scans, Views, and Layouts

A scan is a 2-D graphical representation of ultrasonic data with a ruler or scale corresponding to the horizontal and vertical axis (see “Rulers/Scales” on page 84). For example, an A-scan and a C-scan are two different types of scans.

A view is a volumetric representation of a part, which includes signal overlays. Like a scan, a view has two axes. However, instead of being related to a specific group of ultrasonic probe beams that use the same parameters (also referred to as a “beam set”), a view is linked to the part. A signal that originates from a single group or from multiple groups can be displayed without affecting the view dimensions.

Table 6 on page 24 lists the basic ultrasonic scan views, which are illustrated in Figure 2-7 on page 25.

Table 6 Basic ultrasonic scan views

| View | Point of view | Axis content |
|-------------|------------------------------|-----------------------------|
| A-scan | Looking down on the material | Amplitude versus ultrasound |
| B-scan | Side | Ultrasound versus scan |
| C-scan | Top | Scan versus index |
| S-scan | End | Ultrasound versus index |

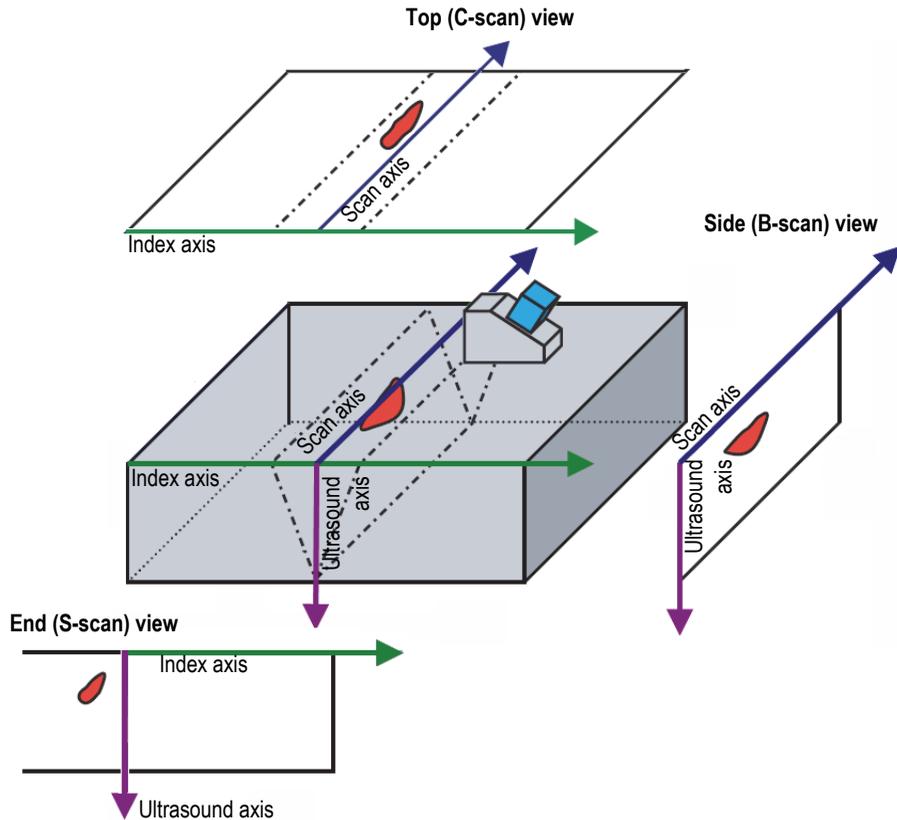


Figure 2-7 Example of ultrasonic scan views

The scans and views, which are available on the Layout menu, can be further described as follows:

A-scan

The scan on which all other scans are based. An A-scan is a representation of the received ultrasonic pulse amplitude versus time-of-flight (ultrasound path), or a waveform. A peak in the signal corresponds to the echo of a reflector or a discontinuity in the part. In TFM, the A-scan is constructed from the TFM grid and is not generated by a single beam like in standard PA.

B-scan (side view)

2-D side representation of the part showing ultrasonic data with the scan length on one axis and the ultrasound path on the other axis.

C-scan (top view)

2-D top representation of the part showing gated ultrasonic data with the scan length on one axis and the index length on the other axis. One of the available parameters (for example, the maximum amplitude) is projected on the index-scan plan for each point (pixel).

S-scan (PA group only)

2-D representation of ultrasonic data presenting all the A-scans generated by the focal laws in an angular sector or sweep range in order to create a cross section of the part. The A-scans are represented by lines on which the amplitude is color-coded, and they are corrected for delay and true depth so that their positions are accurate relative to the ultrasound axis.

End view (TFM group only)

2-D representation of the ultrasonic data acquired with TFM. This view displays the amplitude color-coded on a ultrasound-index plan. The size of each axis is defined by the **Zone** parameters.

Your layout selection can combine the most useful views (Figure 2-8 on page 26).

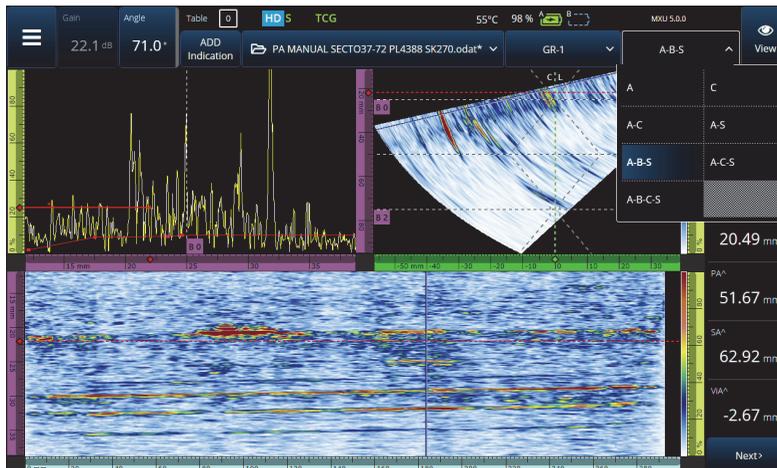


Figure 2-8 Layouts

To select a layout

1. Tap the Layout menu.
2. Select the layout(s) to be displayed.

When one group is displayed, the layout combinations can include the following views:

- A (A-scan)
- B (B-scan)
- C (C-scan)
- S (S-scan)

When multiple groups are displayed, combinations of the above-mentioned layouts are possible.

| |
|-------------|
| NOTE |
|-------------|

Groups are displayed in the layout according to the actual scanner configuration and the offsets.

| |
|------------|
| TIP |
|------------|

If you have a multiple group setup, you may want to rename the groups in the Scan Plan.

2.6 Using the Touch Screen

You can interact with the OmniScan MXU software using the touch screen, but it is also possible to connect a mouse and/or a keyboard through the USB ports.

There is no added value of using a mouse and keyboard, other than convenience.

To use the touch screen

- Simply tap once on the touch screen to do a left click.

- Tap and hold your finger on the touch screen to do a right click. Many shortcuts (Table 44 on page 89) are available using a tap and hold (or right-click).

Instead of using the virtual keyboard or numerical keypad, you can simply input values using a physical keyboard connected to the instrument.

IMPORTANT

In some cases, gate or cursor selection zones overlap. If you attempt to select a cursor or gate at the point where they overlap, they will be selected in this order of priority: Reference cursor, Measurement cursor, Data cursor, gate A, gate B, and gate I.

2.6.1 Entering or Editing Values

You can use the virtual keyboard, arrows, or scroll knob to enter or edit numerical parameter values.

To enter or edit values

1. Tap the parameter (Figure 2-9 on page 29).
2. Rotate the scroll knob to change the value, and then press the Accept key (✓).

OR

Tap  to display the numerical keypad, then enter the value, and tap the Accept button ✓.

Alternatively to accept, press another key or button, or tap any layout view.

To revert to the previous value, press the Cancel key (↶) on the instrument or the Cancel button (✕) on the virtual keyboard.

TIP

You can display the numerical keypad by tapping twice on the numerical parameter you wish to change. Also, you can change the scroll knob increment using the  and .



Figure 2-9 Parameter adjustment using up/down arrows or keypad

2.6.2 Using the Zoom, Pan, Gates, and Print Screen

To use the zoom

1. Press the Zoom key () to turn on (or off) zoom mode (Figure 2-10 on page 30).
2. Adjust the zoom:
 - ◆ Tap the screen twice at the corners of the area you want to zoom.
 - OR
 - Tap and drag to precisely place a corner.
 - OR
 - Tap the view location you wish to zoom, and then use the scroll knob to create a concentric zoom that is centered on the tapped position.

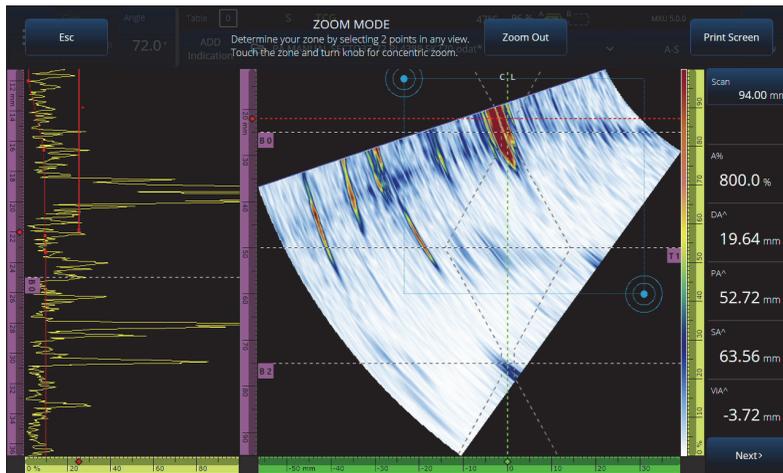


Figure 2-10 Zoom example

To pan within a zoomed view

- ◆ Drag and drop the zoomed axis to move the zoomed area.

To use the gates

1. To adjust the gate **Start**, tap the left end of the gate.
2. To adjust the gate **Threshold**, tap the middle of the gate.
3. To adjust the gate **Width**, tap the right end of the gate.

NOTE

When a gate is short, it might be impossible to tap a specific zone. In this case, gate **Start** and **Width** controls are almost at the same position on the screen. Use the Gate menu to adjust a gate if tapping a specific zone is too difficult. (Figure 2-11 on page 31).

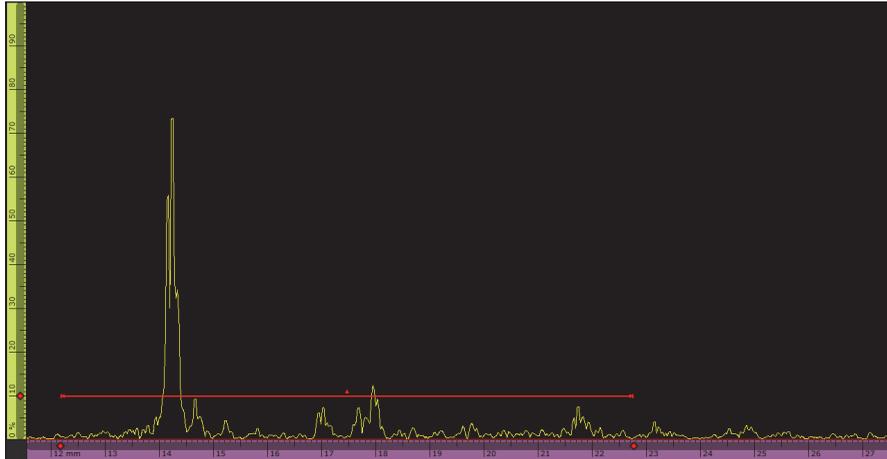


Figure 2-11 The visual reference on the gate

To use Print Screen

- ◆ Press the Zoom key (⌘) to turn on zoom mode (Figure 2-10 on page 30), and then tap **Print Screen** on the display.

NOTE

After tapping **Print Screen**, you have two to three seconds to make any screen adjustments or to open any temporary menus before the screen image is taken.

2.6.3 Pop-Up Buttons and Menus

Some buttons or menus enable pop-ups, for example for parameter values, file names or probe/wedge library items (Figure 2-12 on page 32).

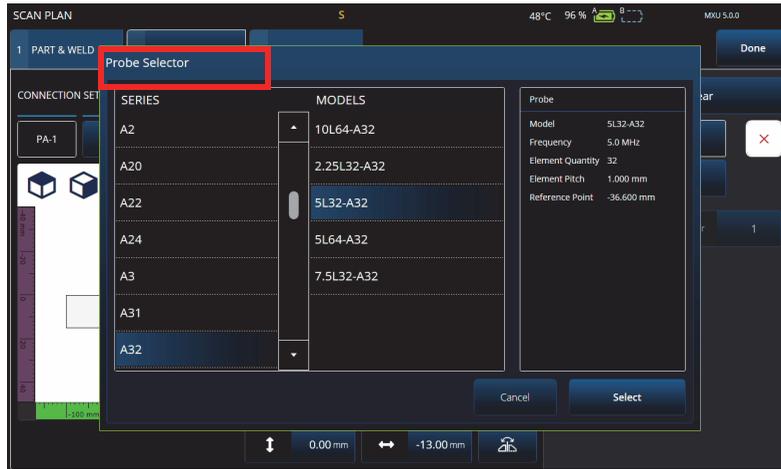


Figure 2-12 Pop-up menu example

2.7 Main Menu Organization

The  Main menu provides a range of submenus for inspection configuration (Figure 2-13 on page 33 and Table 7 on page 33).

NOTE

Depending on your chosen configuration, the menu can change from  UT Settings to  TFM Settings.

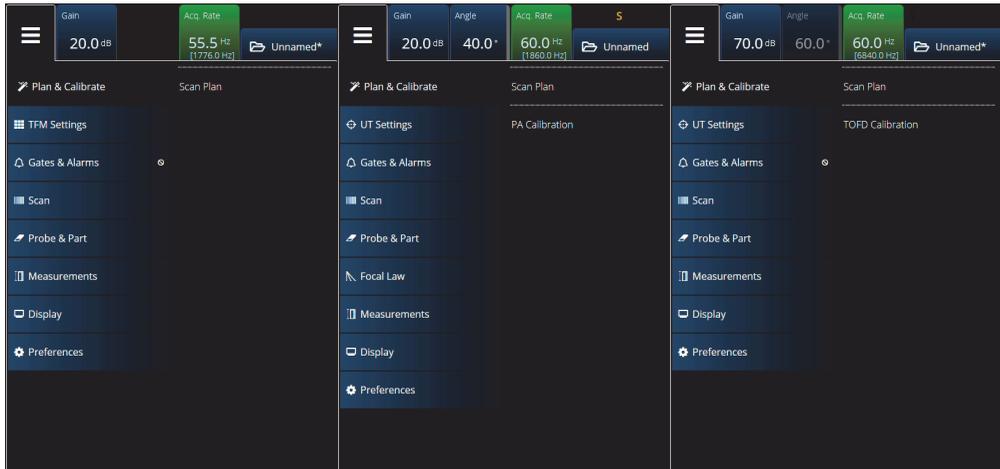


Figure 2-13 Main menu

Table 7 Main menu options

| Menu | Description |
|---|--|
|  Plan & Calibrate | Use this menu to create a complete application setup. The Scan Plan and Calibration wizards guide you in creating your setup. |
|  UT Settings | This menu contains the parameters regularly modified during inspection, such as the gain and pulser/receiver parameters. (Available only for PA/UT inspections.) |
|  TFM Settings | This menu provides settings for the total focusing method and full matrix capture. (Available only for TFM inspections.) |
|  Gates & Alarms | This menu contains parameters for configuring gates, alarms, and output signals. |
|  Scan | Use this menu to set the parameters related to the scanning, such as encoders and the area to scan. |

Table 7 Main menu options (*continued*)

| Menu | Description |
|---|--|
|  Probe & Part | Use this menu to define probes and wedges, and to adjust the parameters related to the probe position or part thickness previously defined with the Scan Plan . |
|  Focal Laws | Use this menu to adjust the parameters related to the focal laws originally defined with the Focal Law wizard. |
|  Measurements | This menu contains the parameters related to various measurement tools. |
|  Display | This menu contains the parameters related to the data views and the information visible on screen. |
|  Preferences | Use this menu to set instrument configuration parameters when you start using the instrument. For example, the measurement unit (millimeters or inches) and the date and time. |

2.7.1 UT Settings

This menu enables you to access the **General**, **Pulser**, **Receiver**, **Beam**, and **Advanced** parameters.

2.7.1.1 General

With this parameter, you can see and modify the **Start**, **Range**, **Wedge Delay**, **Velocity**, **UT Mode**, and **High Amplitude** options. To access these options, go to **UT Settings > General** (Figure 2-14 on page 34 and Table 8 on page 35).



Figure 2-14 UT Settings – General

Table 8 UT Settings — General

| Option | Description |
|-----------------------|---|
| Start | PA: Used to set the starting location of the ultrasound axis (expressed in mm or in.). TOFD: Used to set the starting location of the ultrasound axis (expressed in μ s (microseconds)). |
| Range | PA: Used to set the maximum distance you can see on screen (expressed in mm or in.). TOFD: Used to set the maximum distance you can scan (expressed in μ s (microseconds)). |
| Wedge Delay | PA/TOFD: Used to set the delay applied to all focal laws in the group (expressed in μ s (microseconds)). |
| Velocity | PA/TOFD: Used to set the velocity of ultrasound in the material (expressed in m/s (meter per second)). |
| UT Mode | PA/TOFD: Used to change the ultrasound axis representation: Uncorrected , Sound Path , and True Depth . For now, only True Depth is available. |
| High Amplitude | PA/TOFD: Used to switch between 200 % and 800 % mode. Data is encoded on 16 bits, so 200 % yields more precision, while 800 % provides greater tolerance to high amplitude variations. |

2.7.1.2 Pulser

With this parameter, you can see and modify the **Select Pulser**, **Voltage**, **Frequency**, **Velocity**, **PW**, **Acq. Rate**, and **Interleave** options. To access these options, go to **UT Settings > Pulser** (Figure 2-15 on page 36 and Table 9 on page 36).

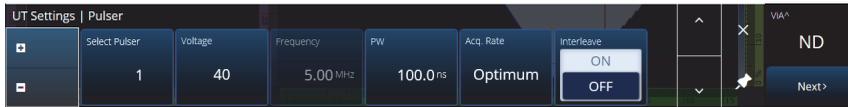


Figure 2-15 UT Settings – Pulsar

Table 9 UT Settings – Pulsar

| Option | Description |
|----------------------|---|
| Select Pulsar | PA/TOFD: Displays the number of your starting pulser. |
| Voltage | PA: Used to set the voltage of the pulser and you'll have the choice between 40 (default value), 80 or 115. TOFD: Used to set the voltage of the pulser and you'll have the choice between 85, 155 or 295 (default value). |
| Frequency | Displays the probe-frequency value. If you want to modify this setting, you will have to do it by selecting Probe & Wedge manager. |
| PW | PA/TOFD: Used to select the pulse-width (PW) value. Select (Auto) to automatically adjust the pulse width according to the probe frequency. Select (Edit) to modify the value manually. |

Table 9 UT Settings – Pulsar (continued)

| Option | Description |
|------------------|--|
| Acq. Rate | <p>PA/TOFD: Used to set the value of the acquisition rate (Acq. Rate). The Acq. Rate value is defined for all groups and defines the repetition frequency of all channels. The product of Acq. Rate × Scan Resolution is equal to the scan speed if the inspection is set to Time, and is equal to the Max. Scan Speed for an inspection set to Encoder mode. If the scanning movement is faster than the Max. Scan Speed, data could be missed, which will be indicated by black lines. With encoders, the Acq. Rate features an energy-saving mode whereby the Acq. Rate is lowered when the encoder is not moving. Enter a value, which will be the requested value. The software will use this value as the target to attain.</p> <p>You can also choose one of the following presets:</p> <p>Auto Max.: Uses the maximum available Acq. Rate value. An acquisition rate that is too high may generate ghost echoes in some specimen.</p> <p>Optimum (default value): Calculates the recommended value for the current configuration (default value).</p> <p>Edit: You can enter a value manually.</p> <hr/> <div style="border: 1px solid black; padding: 5px; text-align: center; width: fit-content; margin: 10px auto;"> NOTE </div> <p>The pulse repetition frequency (PRF) is the frequency at which pulses are emitted, whereas the acquisition rate (Acq. Rate) is the frequency at which all pulses (the total number of pulses) are emitted. The PRF and Acq. Rate are based on the inverse of the time interval between the emission of pulses. Acq. Rate is the inverse of TTotal and PRF is the inverse of TBeam, which are expressed in the following calculation: $\text{Acq. Rate} = 1/\text{TTotal}$. With a multiple group configuration, the acquisition rate takes into account the emission of pulses for all groups.</p> <hr/> |

Table 9 UT Settings – Pulsar (continued)

| Option | Description |
|-------------------|---|
| Interleave | PA/TOFD: Set this parameter to ON to enable (OFF is the default) interleaving of the focal law firing sequence, which delays the appearance of ghost echoes. |

2.7.1.3 Receiver

With this parameter, you can see and modify the **Filter**, **Rectifier**, **Video Filter**, **Averaging**, and **Reject** options. To access these options, go to **UT Settings > Receiver** (Figure 2-16 on page 38 and Table 10 on page 39).

**Figure 2-16 UT Settings – Receiver**

Table 10 UT Settings — Receiver

| Option | Description | | | |
|---------------|--|-----------------|-----------------|------------------|
| Filter | Used to select the appropriate filter value, such as TOFD or LP (low pass), HP (high pass), and BP (band pass). | | | |
| | None (1 - 17.8) MHz | LP 10 MHz | BP 8 MHz | HP 6 MHz |
| | None (0.6 - 12.2) MHz | BP 2.25 MHz | BP 10.5 MHz | HP 8 MHz |
| | LP 2 MHz | BP 4.25 MHz | BP 11.9 MHz | HP 10 MHz |
| | LP 4 MHz | BP 5.25 MHz | HP 4 MHz | LP 8 MHz |
| | None (0.25 - 25) MHz | BP 4.25 MHz | HP 6 MHz | LP 10 MHz (TOFD) |
| | None (1 - 25) MHz | BP 5.25 MHz | HP 8 MHz | LP 7 MHz |
| | LP 2 MHz | BP 8 MHz | HP 10 MHz | LP 8 MHz |
| | LP 4 MHz | BP 10.5 MHz | None (TOFD) | LP 12.5 MHz |
| | LP 10 MHz | BP 13 MHz | LP 2 MHz (TOFD) | LP 16.5 MHz |
| BP 2.25 MHz | HP 4 MHz | LP 4 MHz (TOFD) | LP 20 MHz | |

Table 10 UT Settings – Receiver (continued)

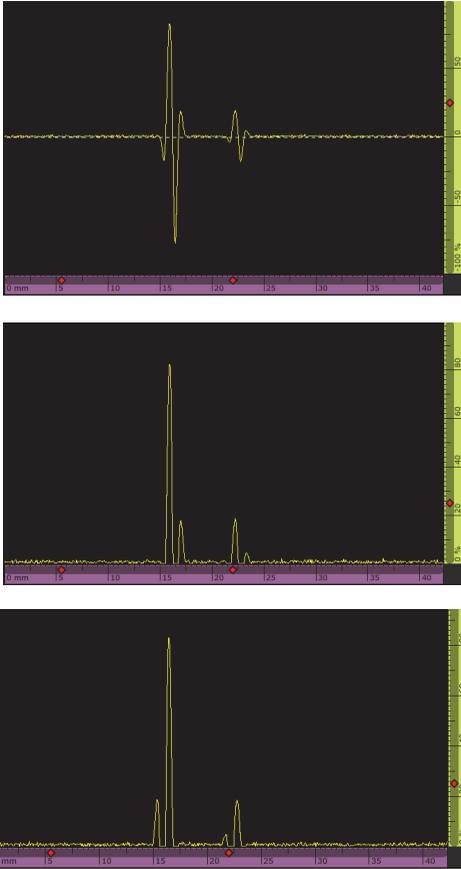
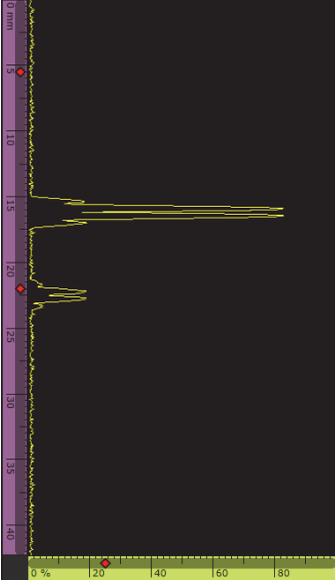
| Option | Description |
|-------------------------|--|
| <p>Rectifier</p> | <p>PA/TOFD: Used to set rectification for the A-scan for reading. RF (radio frequency) mode is only available for TOFD. The following three images represent the HW+ (half wave positive), HW- (half wave negative), and FW (full wave) respectively.</p>  <p>The figure displays three A-scan waveforms stacked vertically, each showing a signal on a black background with a horizontal axis labeled '0 mm' to '140' and a vertical axis labeled '0%' to '100%'. The top waveform (HW+) shows a positive half-wave pulse. The middle waveform (HW-) shows a negative half-wave pulse. The bottom waveform (FW) shows a full-wave pulse. Each waveform has a red dot on the horizontal axis at approximately 120 mm.</p> |

Table 10 UT Settings – Receiver (*continued*)

| Option | Description |
|---------------------------------|---|
| Rectifier (continued) |  |
| Video Filter | PA/TOFD: When activated, this parameter enables the video-smoothing filter. It is set according to the probe frequency and the rectification mode. The video filter is always available, except in RF mode. |
| Averaging | PA/TOFD: Used to select an averaging value (1, 2, 4, 8 and 16) for the current group. The averaging value divides the PRF value. For example, changing the averaging value from 1 to 4 causes an original PRF value of 1 kHz to drop to 250 Hz. The hardware still pulses at 1 kHz, but echo signals from all four pulses are averaged to produce a unique signal. Averaging is useful for reducing the noise on the echo signals. An averaging value of 1 corresponds to no averaging. (For TOFD add 32 and 64). |
| Reject | PA/TOFD: The signal amplitude inferior to the specified value is forced to 0 %. The default value is set to 0 %. This setting is typically used with a UT group only. It can cause excessive PRF reduction with PA groups. |

2.7.1.4 Beam

With this parameter, you can see and modify the **Scan Offset**, **Index Offset**, **Skew**, **Beam Delay**, **Gain Offset**, and **Refracted Angle** options. To access these options, go to **UT Settings > Beam** (Figure 2-17 on page 42 and Table 11 on page 42).

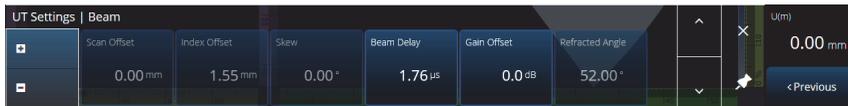


Figure 2-17 UT Settings – Beam

Table 11 UT Settings – Beam

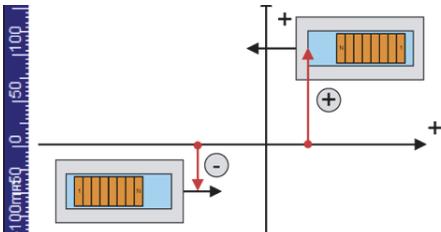
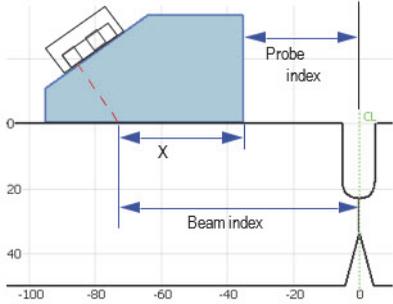
| Option | Description |
|--------------------|---|
| Scan Offset | <p>PA/TOFD: The Scan Offset is the difference between the 0-position marked on the part for inspection and the real start position for the probe center on the scan axis (expressed in mm or in.)</p>  |

Table 11 UT Settings – Beam (continued)

| Option | Description |
|------------------------|---|
| Index Offset | <p>PA/TOFD: The beam Index Offset is the difference between the 0-position marked on the part for inspection and the beam exit point on the index axis. The beam index offset is negative for a probe in the skew 90 position and positive for a probe in the skew 270 position.</p>  |
| Skew | <p>PA: Orientation of the ultrasonic beam relative to the scan axis. Skew 90 and skew 270 are typically used to define a two-sided, two-probe inspection.</p> |
| Beam Delay | <p>PA: Used to set the wedge delay for the selected focal law. Use the wedge delay calibration wizard to calculate the beam delay value for all beams. This parameter should only be used if you need to fine-tune the beam delay for the current focal law (expressed in μs (microseconds)).</p> |
| Gain Offset | <p>PA: Displays the calculated gain offset applied to the current focal law. Values are typically created through the sensitivity calibration wizard, and they can be adjusted manually if needed (expressed in dB (decibels)).</p> |
| Refracted Angle | <p>PA/TOFD: Displays the angle of the ultrasonic beam in the wedge.</p> |

2.7.1.5 Advanced

With this parameter, you can see and modify the **Ref. Amplitude**, **Auto 80 %**, **Reference dB**, **Point Quantity**, **Compression**, and **Effective Digitizing Frequency** options. To access these options, go to **UT Settings > Advanced** (Figure 2-18 on page 44 and Table 12 on page 44).



Figure 2-18 UT Settings — Advanced

Table 12 UT Settings — Advanced

| Option | Description |
|-----------------------|---|
| Ref. Amplitude | PA/TOFD: Used to specify the A-scan full-screen height of the reference amplitude. The value is expressed as a percentage of the A-scan full-screen height. The default value is 80.0 %. The value modifies the value for Auto XX % gain adjustment and also sets the height of the reference line if activated. |
| Auto (80 %) | PA/TOFD: Used to read the Ref. Amplitude . |
| Reference dB | PA/TOFD: When turned on, this function freezes the current gain as the reference gain and adds an adjustment gain value (initially 0.0) to the Gain value field. The gain applied (to all focal laws in PA) is the total of the reference gain and the adjustment gain. The Reference dB parameter is useful for inspections requiring the establishment of a reference gain, and the addition or subtraction of an adjustment gain. |

Table 12 UT Settings – Advanced (continued)

| Option | Description |
|---------------------------------------|--|
| Point Quantity | <p>PA: Used to set the number of A-scan points to be stored. This parameter can also be set to automatic mode (Auto). The parameter automatically adjusts the point quantity and compression factor according to the inspection range to ensure the number of points remains between 320 and 640. The inspection range is determined in UT Settings > General > Range.</p> <p>The number of points in the A-scan and the scale factor, or compression, are directly related to file size.</p> <p>TOFD: Displays the number of A-scan points to be stored. This parameter can also be set to automatic mode (Auto). The parameter automatically adjusts the point quantity and compression factor according to the inspection range to ensure the number of points remains between 320 and 640. The inspection range is determined in UT Settings > General > Range.</p> <p>The number of points in the A-scan and the scale factor, or compression, are directly related to file size.</p> |
| Compression | <p>PA/TOFD: Displays the value of the A-scan compression. Depending on the inspection range and number of points, a compression value greater than 1 may be required. For example, a value of 6 will keep the maximum value of every 6 consecutive acquisition points in time. No maxima are missed.</p> |
| Effective Digitizing Frequency | <p>PA/TOFD: The Effective Digitizing Frequency is set to 100 MHz, which means that a data point is acquired at every 0.01 μs of the analog waveform. This value cannot be changed by the user.</p> |

2.7.2 TFM Settings

This menu enables you to access the **General, Pulser, Zone, and Advanced** parameters.

2.7.2.1 General

With this parameter, you can see and modify the **L Velocity**, **T Velocity**, **Reference dB**, and **Envelope** options. To access these options, go to **TFM Settings > General** (Figure 2-19 on page 46 and Table 13 on page 46).

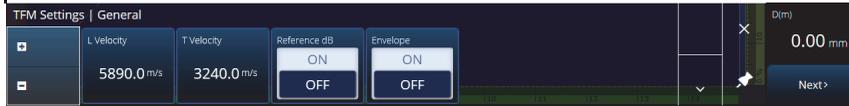


Figure 2-19 TFM Settings — General

Table 13 TFM Settings — General

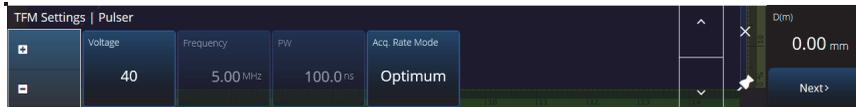
| Option | Description |
|---------------------|---|
| L Velocity | <p>Velocity of longitudinal waves in the material of the inspected part.</p> <p>The material type and longitudinal wave velocity are normally set during the group creating as part of the scan plan process, although a custom velocity value can be entered manually.</p> |
| T Velocity | <p>Velocity of transversal waves in the material of the inspected part.</p> <p>The material type and transversal wave velocity are normally set during the group creating as part of the scan plan process, although a custom velocity value can be entered manually.</p> |
| Reference dB | <p>When turned on, this function freezes the current gain as the reference gain and adds an adjustment gain value (initially 0.0) to the Gain value field.</p> <p>The gain applied is the total of the reference gain and the adjustment gain. The Reference dB parameter is useful for inspections requiring the establishment of a reference gain, and the addition or subtraction of an adjustment gain.</p> |

Table 13 TFM Settings – General (continued)

| Option | Description |
|-----------------|---|
| Envelope | Used to turn the Envelope ON or OFF (by default). The TFM envelope is produced by combining and extracting the norm of two signals: the real component of the elementary A-scan acquired through FMC and the Hilbert-transform imaginary component. The processing removes the signal oscillations in the TFM image and enables a more robust maximum amplitude measurement. While calculating the envelope increases the computation burden on the software, it enables you to decrease the grid resolution and, as a result, increase the maximum Acq. Rate . |

2.7.2.2 Pulser

With this parameter, you can see and modify the **Voltage**, **Frequency**, **PW**, and **Acq. Rate Mode** options. To access these options, go to **TFM Settings > Advanced** (Figure 2-20 on page 47 and Table 14 on page 47).

**Figure 2-20 TFM Settings – Pulser****Table 14 TFM Settings – Pulser**

| Option | Description |
|------------------|---|
| Voltage | Voltage of the pulser. You can choose between 40 (default value), 80, or 115. |
| Frequency | Probe-frequency value. To modify the frequency, select the Probe & Wedge Manager . |

Table 14 TFM Settings –Pulser (continued)

| Option | Description |
|-----------------------|---|
| PW | Pulse-width (PW) value. The pulse width is automatically adjusted according to the probe frequency. You can also change the pulse-width value manually by selecting the Probe & Wedge manager . |
| Acq. Rate Mode | <p>Used to set the value of the acquisition rate (Acq. Rate). The Acq. Rate value is defined for all groups and defines the repetition frequency of all channels. The product of Acq. Rate × Scan Resolution is equal to the scan speed if the inspection is set to Time, and is equal to the Max. Scan Speed for an inspection in Encoder mode. If the scanning movement is faster than the Max. Scan Speed, data could be missed as indicated by black lines. With encoders, the Acq. Rate features an energy saving mode, whereby the Acq. Rate is lowered when the encoder is not moving. Enter a value, which will be the requested value. The software will use this value as the target to be reached. You can also choose one of the following presets:</p> <p>Auto Max. Uses the maximum available Acq. Rate value.</p> <p>Optimum (default value) Calculates the recommended value for the current configuration (default value).</p> <p>Edit You can enter a value manually.</p> |

2.7.2.3 Zone

With this parameter, you can see and modify the **Min. Index**, **Max. Index**, **Min. Depth**, and **Max. Depth** options. To access these options, go to **TFM Settings > Zone** (Figure 2-21 on page 49 and Table 15 on page 49).



Figure 2-21 TFM Settings – Zone

Table 15 TFM Settings – Zone

| Option | Description |
|-------------------|---|
| Min. Index | Used to set the limit for the left side of the TFM zone (orange outline in the Scan Plan representation). For weld inspections, zero is in the middle of the weld. |
| Max. Index | Used to set the limit for the right side of the TFM zone (orange outline in the Scan Plan representation). For weld inspections, zero is in the middle of the weld. |
| Min. Depth | Used to set the upper limit for the TFM zone (orange outline in the Scan Plan representation). |
| Max. Depth | Used to set the lower limit for the TFM zone (orange outline in the Scan Plan representation). |

2.7.2.4 Advanced

With this parameter, you can see and modify the **Resolution**, **pts/λL**, **pts/λT**, and **Amplitude Fidelity** options. To access these options, go to **TFM Settings > Advanced** (Figure 2-22 on page 49 and Table 16 on page 50).

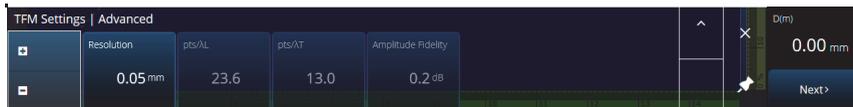
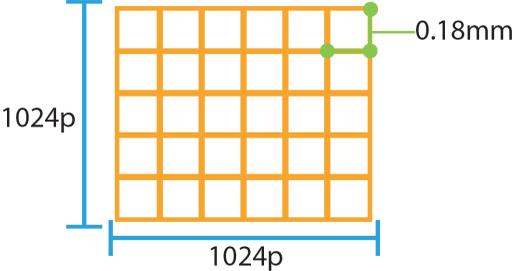


Figure 2-22 TFM Settings – Advanced

Table 16 TFM Settings — Advanced

| Option | Description |
|----------------------------------|---|
| Resolution | <p>Used to set the distance between two pixels inside of the TFM zone. Adjust the grid resolution to obtain a code-compliant Amplitude Fidelity.</p>  |
| pts/λL | Displays the number of points per longitudinal wavelength, which is determined by the grid resolution setting. |
| pts/λT | Displays the number of points per transversal wavelength, which is determined by the grid resolution setting. |
| Amplitude Fidelity | Displays the maximum possible amplitude variation (in dB) caused by the grid resolution itself. This model is based on empirical observations and takes into account the horizontal and vertical axes. |

2.7.3 Gates & Alarms PA

This menu enables you to access the **Gate Main**, **Gate Advanced**, and **Thickness** parameters.

2.7.3.1 Gate Main

With this parameter, you can see and modify the **Select Gates**, **Activation**, **Geometry**, **Start**, **Width**, and **Threshold** options. To access these options, go to **Gate & Alarms > Gate Main** (Figure 2-23 on page 51 and Table 17 on page 51).



Figure 2-23 Gates & Alarms PA – Gate Main menu

Table 17 Gates & Alarms PA – Gate Main menu

| Option | Description |
|---------------------|--|
| Select Gates | Used to set the gate. You can choose between A , B , or I . |
| Activation | Used to set the gate on the screen ON or OFF . |

Table 17 Gates & Alarms PA – Gate Main menu (*continued*)

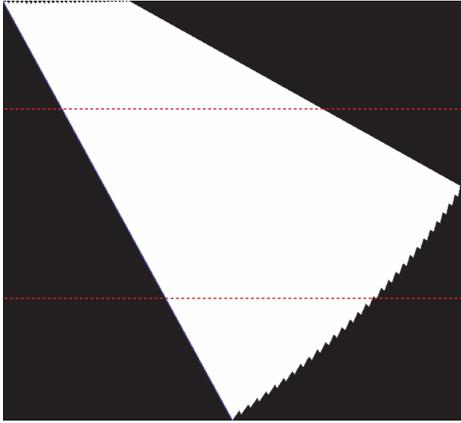
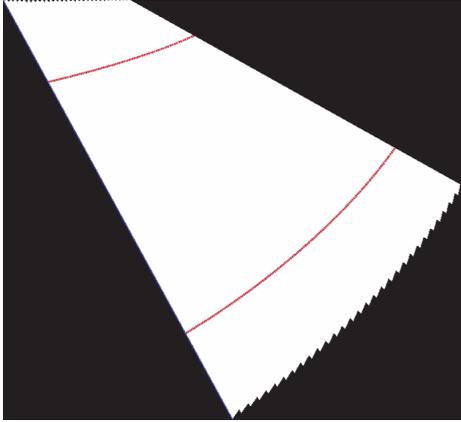
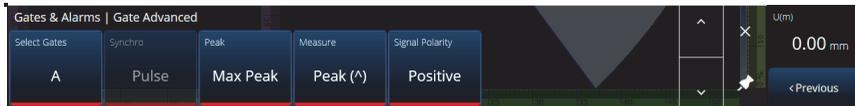
| Option | Description |
|--|---|
| <p data-bbox="225 228 350 256">Geometry</p> | <p data-bbox="447 228 1110 256">Used to set the type of gate: True Depth or Sound Path.</p> <div data-bbox="447 272 908 695">  </div> <p data-bbox="447 716 1085 773">True Depth sets the gate according to the depth in the material.</p> <div data-bbox="447 792 908 1214">  </div> <p data-bbox="447 1235 1040 1292">Sound Path sets the gate according to the distance traveled in the material.</p> |
| <p data-bbox="225 1317 287 1344">Start</p> | <p data-bbox="447 1317 1110 1442">Used to set the starting position of the selected gate. This position is related to the gate synchronization. The real position of the gate is the synchronization position plus the gate start position.</p> |

Table 17 Gates & Alarms PA – Gate Main menu (continued)

| Option | Description |
|------------------|--|
| Width | Used to set the width of the gate (expressed in mm or in.). |
| Threshold | Used to set the height of the gate in the A-scan. This parameter determines the amplitude of a signal in the gate for detection. |

2.7.3.2 Gate Advanced

With this parameter, you can see and modify the **Select Gates**, **Synchro**, **Peak**, **Measure**, and **Signal Polarity** options. To access these options, go to **Gate & Alarms > Gate Advanced** (Figure 2-24 on page 53 and Table 18 on page 53).

**Figure 2-24 Gates & Alarms – Gate Advanced****Table 18 Gates & Alarms – Gate Advanced**

| Option | Description |
|---------------------|--|
| Select Gates | Used to set the gate. You can choose between A , B , or I . |

Table 18 Gates & Alarms – Gate Advanced (continued)

| Option | Description |
|----------------|--|
| Synchro | <p>Used to specify the synchronization type of the selected gate (for Gate A or B):</p> <p>Pulse: Synchronizes at the beginning of the pulse. It is the only selection available when using a group type other than Linear at 0°.</p> <p>I/: Synchronizes where the signal crosses gate I. If the signal does not cross gate I, then it is synchronized at the end of gate I.</p> <p>A^: Synchronizes at the position of the amplitude peak of gate A. If the signal does not cross gate A, it is synchronized at the end of gate A. If, for gate A, you have selected Measure = Peak, A^ appears in the gate B synchronization.</p> <p>A/: Synchronizes where the signal first crosses gate A. If the signal does not cross gate A, then it is synchronized at the end of gate A. If, for gate A, you have selected Measure = Edge, A/ appears in the gate B synchronization.</p> |
| Peak | <p>Used to set the Max Peak or First Peak.</p> <p>When Max Peak is selected for a specific gate (A, B, or I), the data, readings, and parameters displayed correspond only to the highest (or maximum) peak crossing this particular gate.</p> <p>When First Peak is selected for a specific gate (A, B, or I), the data, readings, and parameters displayed correspond only to the first peak crossing this particular gate.</p> |

2.7.3.3 Thickness

With this parameter, you can see and modify the **Source**, **Minimum**, **Maximum**, and **Echo Quantity** options. To access these options, go to **Gate & Alarms > Thickness** (Figure 2-25 on page 55 and Table 19 on page 55).

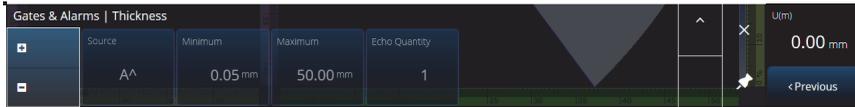


Figure 2-25 Gates & Alarms – Thickness

Table 19 Gates & Alarms PA – Thickness

| Option | Description |
|----------------------|---|
| Source | Selects the gates combination used to measure thickness. |
| Minimum | The minimum thickness of the color scale for thickness C-scan. |
| Maximum | The maximum thickness of the color scale for thickness C-scan. |
| Echo Quantity | Displays the number of echoes registered in the Source . |

2.7.4 Scan

This menu enables you to access the **Inspection** and **Area** parameters.

2.7.4.1 Inspection

With this parameter, you can see and modify the **Type**, **Scan**, and **Encoder** options. To access these options, go to **Scan > Inspection** (Figure 2-26 on page 55 and Table 20 on page 56).



Figure 2-26 Scan – Inspection

Table 20 Scan – Inspection

| Option | Description |
|---------------|---|
| Type | Used to select the desired type of inspection. The following choices are available: Time Data acquisition at precise time intervals. One-Line Scan In one-line scanning, the acquisition is based on an encoder. Raster Scan When the phased array probe is moving on both the scan and index axes, the ultrasound data is acquired in a bidirectional or unidirectional scanning pattern. |
| Scan | Used to specify the source of the data positioning for the scan axis. Time Data acquisition at precise time intervals. Not available for Type = Raster Scan. Encoder 1 Encoder 1 is the source used for data positioning for the scan axis. Encoder 2 Encoder 2 is the source used for data positioning for the scan axis. |

Table 20 Scan – Inspection (continued)

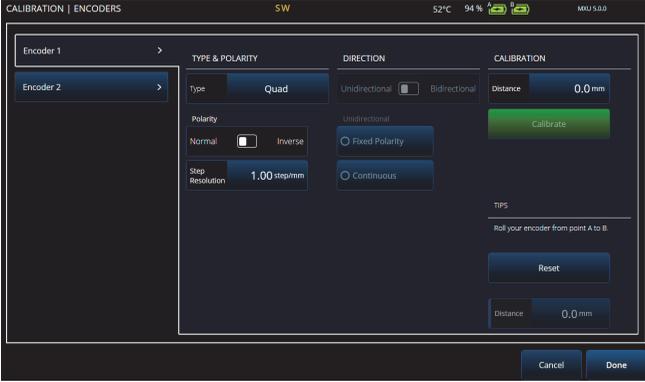
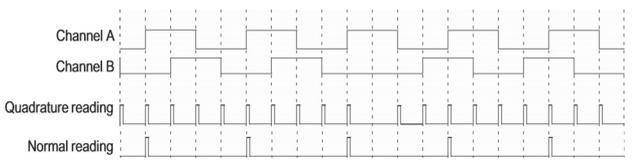
| Option | Description |
|---------|---|
| Encoder | <p>Used to configure the encoder settings.</p>  <p>Type & Polarity:</p> <p>Type Used to select the type of the currently selected encoder. There are two encoder hardware inputs that can be configured independently. Each encoder input has two channels, A and B, enabling a dual-channel encoder for quadrature readings of the resolution.</p> <p>Clock/Dir Select this item when you use a stepper controller, and its documentation specifies that the position output signal is a clock/direction type (5 V pulse for the position/speed and 5 V signal for the direction).</p> <p>Quad Select this item when the attached encoder (5 V TTL output) is a dual-channel output encoder. The channels are generally designated A and B. When the encoder is rotating clockwise (from left to right in the figure below), channel B follows channel A with a 90-degree delay.</p> |

Table 20 Scan – Inspection (continued)

| Option | Description |
|--------|---|
| | <p>When the encoder is rotating counterclockwise, channel A follows channel B with a 90-degree delay. In this way, you can determine if the rotation is clockwise or counterclockwise. The decoder counts one step each time it detects a rising or falling edge on channel A or channel B. This means that if the real encoder resolution is 1000 steps/revolution, the final resolution with the quadrature reading is 4000 steps/revolution.</p>  <p>The diagram shows four signals over time: Channel A (a square wave), Channel B (a square wave shifted 90 degrees relative to Channel A), Quadrature reading (a series of narrow pulses corresponding to the edges of both channels), and Normal reading (a series of wider pulses corresponding to the edges of either channel).</p> <p>Polarity: Normal / Inverse Used to reverse the count of the encoder if the probe is only able to scan in the opposite direction.</p> <p>Step resolution Used to set the number of counts per unit for the selected encoder. Expressed in Step/mm or Step/Rotation.</p> <p>Direction: Unidirectional Sets the encoder to move only in one direction. You can set the polarity by selecting Fixed Polarity, or select Continuous to let the scanner chose the polarity.</p> <p>Bidirectional Sets the encoder to move in two directions or more.</p> <p>Calibration Distance: Used to set the distance for the calibration. Calibrate: Used to confirm the distance for the calibration. Reset: Reinitializes the distance of the encoder to 0. Distance (bottom): Displays the actual distance that the encoder traveled.</p> |

2.7.4.2 Area

With this parameter, you can see and modify the **Scan Start**, **Scan End**, and **Scan Res.** options. To access these options, go to **Scan > Area** (Figure 2-27 on page 59 and Table 21 on page 59).



Figure 2-27 Scan — Area

Table 21 Scan — Area

| Option | Description |
|-------------------|---|
| Scan Start | PA/TOFD: Used to set the starting location of the scan (expressed in mm or in.). |
| Scan End | PA/TOFD: Used to set the maximum distance you can scan (expressed in mm or in.). |
| Scan Res. | PA/TOFD: Used to set the step (resolution) at which the points will be acquired on the scan (expressed in mm or in.). |

2.7.5 Probe & Part

This menu enables you to access the **Position** and **Part** parameters.

2.7.5.1 Position

With this parameter, you can see and modify the **Skew**, **Scan Offset**, and **Index Offset** options. To access these options, go to **Probe & Part > Position** (Figure 2-28 on page 60 and Table 22 on page 60).

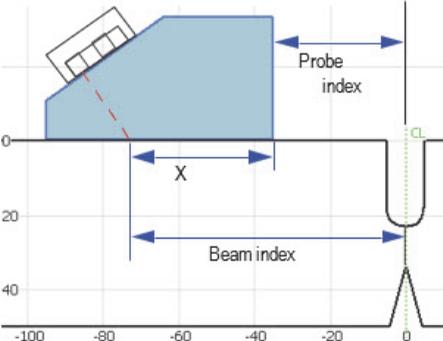


Figure 2-28 Probe & Part – Position

Table 22 Probe & Part – Position options

| Option | Description |
|--------------------|---|
| Skew | Orientation of the ultrasonic beam relative to the scan axis. Skew 90 and skew 270 are typically used to define a two-sided, two-probe inspection. |
| Scan Offset | <p>The Scan Offset is the difference between the 0 position marked on the part for inspection and the real start position for the probe center on the scan axis.</p> |

Table 22 Probe & Part – Position options (continued)

| Option | Description |
|---------------------|---|
| Index Offset | <p>PA/TOFD: The beam index offset is the difference between the 0 position marked on the part for inspection and the real start position for the probe front edge on the index axis. The beam index offset is negative for a probe in the skew 90 position and positive for a probe in the skew 270 position.</p>  |

2.7.5.2 Part

With this parameter, you can see and modify the **Thickness** option. To access this option go to **Probe & Part > Part** (Figure 2-29 on page 61 and Table 23 on page 61).

**Figure 2-29 Probe & Part – Part****Table 23 Probe & Part – Part**

| Option | Description |
|------------------|--|
| Thickness | Used to set the thickness of the part you will scan. |

2.7.6 Focal Laws

This menu enables you to access the **Aperture** and **Beam** parameters.

2.7.6.1 Aperture

With this parameter, you can see and modify the **Element Qty**, **First Element**, and **Last Element** options. To access these options, go to **Focal Laws > Aperture** (Figure 2-30 on page 62 and Table 24 on page 62).



Figure 2-30 Focal Laws — Aperture

Table 24 Focal Laws — Aperture

| Option | Description |
|----------------------|--|
| Element Qty | Used to set the number of elements in the aperture. |
| First Element | Used to set the first element in the aperture. |
| Last Element | Used to see the element step in the aperture when the Linear scan type is chosen. |

2.7.6.2 Beam

With this parameter, you can see and modify the **Min. Angle**, **Max. Angle**, **Angle Step**, and **Focus** options. To access these options, go to **Focal Laws > Beam** (Figure 2-31 on page 62 and Table 25 on page 63).

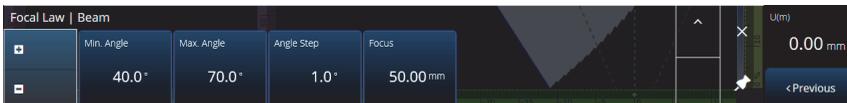


Figure 2-31 Focal Laws — Beam

Table 25 Focal Laws – Beam

| Option | Description |
|-------------------|--|
| Min. Angle | Used to set the minimum angle of the beam (Sectorial law configuration). |
| Max. Angle | Used to set the maximum angle of the beam (Sectorial law configuration). |
| Angle Step | Used to set the step value between each angle (Sectorial law configuration). |
| Focus | Used to set the focusing depth of the part to be inspected. |

2.7.7 Measurements

This menu enables you to access the **Cursors** parameter.

Cursors

With this parameter, you can see and modify the **Cursor Category**, **Moving Mode**, **%(r)**, **%(m)**, **U(r)**, and **U(m)** options. To access these options, go to **Measurements > Cursor** (Figure 2-32 on page 63 and Table 26 on page 64).

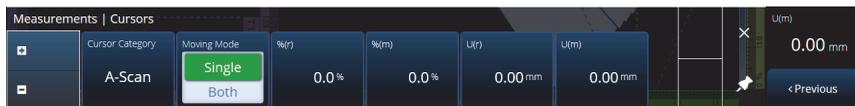
**Figure 2-32 Measurements – Cursors**

Table 26 Measurements – Cursors

| Option | Description |
|------------------------|---|
| Cursor Category | Used to select the view for the current layout in which you want to move the cursor positions. The choice of available views (A-scan , B-scan , C-scan , D-scan , End View , S-scan , or Data) depends on the current layout selected using Display > Selection > Layout . The parameters appearing to the right of Category apply to the selected view. |
| Moving Mode | Used to determine whether the Reference and Measurement cursors are moved individually (Single) or simultaneously (Both). This parameter affects the parameters in the Measurements > Cursors submenu and the pop-up button for the cursor parameter. |
| %(r) | The position on the amplitude axis of the Reference cursor. |
| %(m) | The position on the amplitude axis of the Measurement cursor. |
| U(r) | The position on the ultrasound axis of the Reference cursor. |
| U(m) | The position on the ultrasound axis of the Measurement cursor. |

2.7.8 Display

This menu enables you to access the **A-Scan**, **Grid**, and **Cursors** parameters.

2.7.9 A-Scan

With this parameter, you can see and modify the **Data Source** option. To access this option go to **Display > A-Scan** (Figure 2-33 on page 65 and Table 27 on page 65).



Figure 2-33 Display – A-Scan

Table 27 Display – A-Scan

| Option | Description |
|--------------------|--|
| Data Source | Used to choose which A-scan or combination of A-scans (the source data) to display on the A-Scan view. When the PRF value is above the display refresh rate, not all acquired A-scans are displayed on the screen. This may cause you to miss an important signal. The following options (Grid and Cursors) enable you to choose how the A-scans appear on the display. |

2.7.10 Grid

With this parameter, you can see and modify the **Ultrasound Cell Qty**, **Amplitude Cell Qty**, and **Color** options. To access these options, go to **Display > Grid** (Figure 2-34 on page 65 and Table 28 on page 65).



Figure 2-34 Display – Grid

Table 28 Display – Grid

| Option | Description |
|----------------------------|---|
| Ultrasound Cell Qty | Used to set the number of grid cells for the ultrasound axis. |

Table 28 Display – Grid (continued)

| Option | Description |
|---------------------------|--|
| Amplitude Cell Qty | Used to set the number of grid cells for the amplitude axis. |
| Color | Used to set the color of the grid. |

2.7.11 Cursors

With this parameter, you can see and modify the **Values** option. To access this option go to **Display > Cursors** (Figure 2-35 on page 66 and Table 29 on page 66).

**Figure 2-35 Display – Cursors****Table 29 Display – Cursors**

| Option | Description |
|---------------|---|
| Values | Used to display the values (expressed in mm or in.) on the various cursor by tapping the Values button to turn it ON or OFF (default). |

2.7.12 Preferences

This menu enables you to access the **Date & Time**, **Regional**, **Data**, **Network**, **System**, and **About** parameters.

2.7.12.1 Date & Time

With this parameter, you can see and modify the **Time Zone**, **Clock Format**, and **Date Format** options. To access these options, go to **Preferences > Date & Time** (Figure 2-36 on page 67 and Table 30 on page 67).



Figure 2-36 Preferences — Date & Time

Table 30 Preferences — Date & Time

| Option | Description |
|---------------------|---|
| Time Zone | Used to set the time zone of your instrument. <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 5px 0;">IMPORTANT</div> The instrument might not be able to connect to the CLOUD if the time zone is not set correctly. |
| Clock Format | Used to set the format of the clock. You have the choice between 12h or 24h . |
| Date Format | Used to set the date format. You have the choice between: YYYY/MM/DD YYYY-MM-DD MM-DD-YYYY MM/DD/YYYY DD-MM-YYY DD/MM/YYYY |

2.7.13 Regional

With this parameter, you can see and modify the **Units**, **Decimal Separator**, **Thousands Separator**, **Adjust Time**, and **Adjust Date** options. To access these options, go to **Preferences > Regional** (Figure 2-37 on page 68 and Table 31 on page 68).

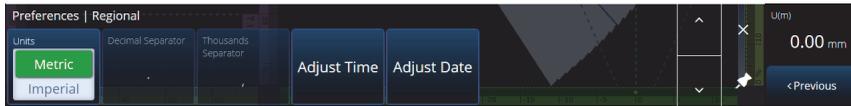


Figure 2-37 Preferences — Regional

Table 31 Preferences — Regional

| Option | Description |
|----------------------------|---|
| Units | Used to set the length measurement units to either metric (millimeters) or US customary (inches). |
| Decimal Separator | Used to see the decimal separator. |
| Thousands Separator | Used to see the thousands separator. |
| Adjust Time | Used to set the time of your instrument. |
| Adjust Date | Used to set the date of your instrument. |

2.7.14 Data

With this parameter, you can see the **Storage** and **Scan Storage** options. To access these options, go to **Preferences > Data** (Figure 2-38 on page 68 and Table 32 on page 69).



Figure 2-38 Preferences — Data

Table 32 Preferences — Data

| Option | Description |
|--------------|--|
| Storage | Used to see in which hard drive the file is saved. |
| Scan Storage | Used to see which scan can be saved. |

2.7.15 Network

With this parameter, you can see and modify the **Wireless Enabled**, **Security**, **Password**, **Show Password**, **Advanced Options**, **Add Network**, **Refresh**, **Done**, and **Connect** parameters. To access these options, go to **Preferences > Network** (Figure 2-39 on page 69 and Table 33 on page 70).

In the **Wireless Properties** window, the security level of your selected network is automatically detected.

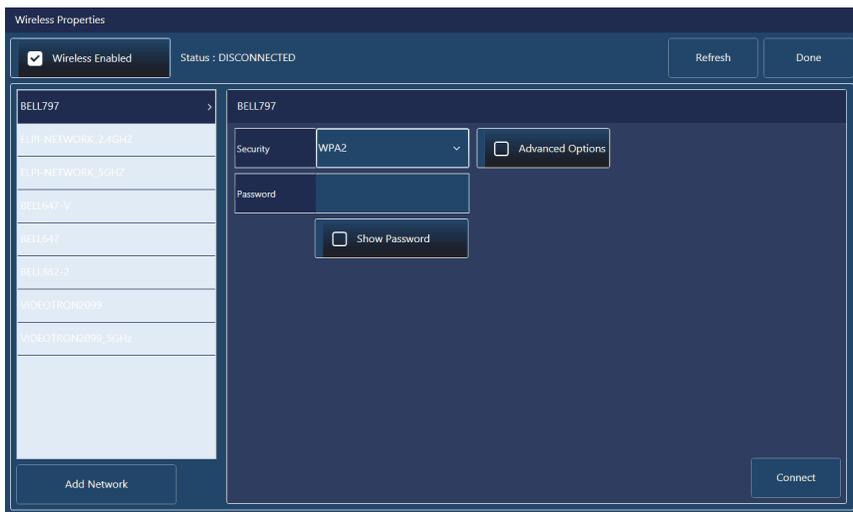
**Figure 2-39 Preferences — Wireless Properties window**

Table 33 Preferences – Network

| Option | Description |
|-------------------------|--|
| Wireless Enabled | The check box used to turn the Wireless Enabled on. A check mark means that it is enabled. |
| Security | Used to indicate the security level of the chosen wireless network, such as WEP, WPA, WPA2, and EAP . |
| Password | Used to enter the password of the chosen network. |
| Show Password | Used to reveal or hide the password. |
| Advanced Options | Used to set different options, such as enable the DHCP , enter the IP Address manually, enter the Subnet Mask manually, enter the Gateway manually, enter the DNS Server 1 manually, and enter the DNS Server 2 manually (for the WPA2). |
| Add Network | Used to manually add a wireless network with different options, such as Security and Network Name . |
| Refresh | Used to refresh the available wireless networks. |
| Done | Used to close and confirm. |
| Connect | Used to connect to the chosen wireless network. |

2.7.16 System

With this parameter, you can see and modify the **Calibrate** and **Boot Launcher** options. To access these options, go to **Preferences > System** (Figure 2-40 on page 71 and Table 34 on page 71).



Figure 2-40 Preferences – System

Table 34 Preferences – System

| Option | Description |
|-------------------------|---|
| Calibrate Screen | Used to calibrate the screen. This option is not available in the 5.0.0 software version. |
| Boot Launcher | Used to set the start-up of the OmniScan X3 flaw detector to either Manual (accesses the launcher) or Automatic (continues to the MXU software automatically). This option is not available in the 5.0.0 software version. |

2.7.17 About

With this parameter, you can verify the **System Information**, **Legal Information**, **Licenses**, and **FCC** information. To access these options, go to **Preferences > About** (Figure 2-41 on page 72 and Table 35 on page 72).



Figure 2-41 Preferences — About window

Table 35 Preferences — About

| Option | Description |
|---------------------------|--|
| System Information | Displays the Model, Software Version, Manufacturer, and Details. |
| Legal Information | Displays the legal information, such as the patent rights protection. |
| Licenses | Displays the different license agreements from Olympus NDT. |
| FCC | Displays the Federal Communications Commission (FCC) Supplier's Declaration of Conformity. |
| Done | Used to confirm the terms of this section and exit this window. |

2.8 View Menu

The  **View** menu provides a range of submenus for inspection configuration (Figure 2-13 on page 33 and Table 36 on page 73).

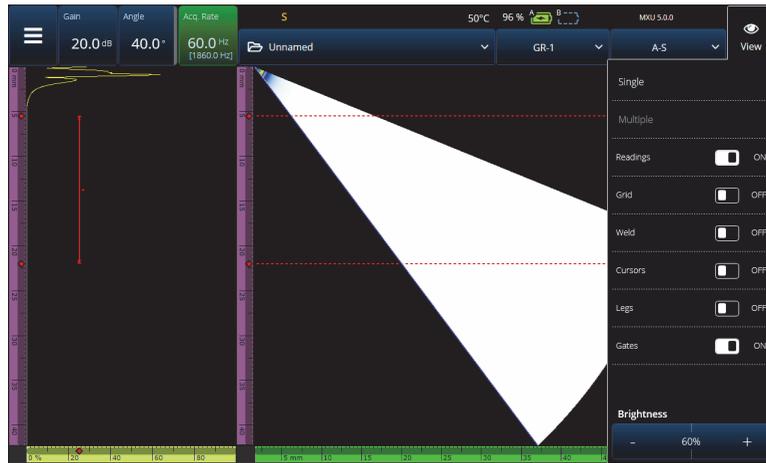


Figure 2-42 View menu window

Table 36 View menu options

| Option | Description |
|--|---|
| Single or Multiple (NA) groups | The View menu enables you to display the current group (Single) or multiple groups (Multiple). You can toggle the visibility of the cursors and the associated parameter values. |
| Readings | To display the readings on the right of the screen, tap the Readings toggle button (ON/OFF) to rapidly activate or deactivate the Readings display. |
| Grid | To display the grid on the A-scan, tap the Grid toggle button (ON/OFF) to rapidly activate or deactivate the Grid display. |

Table 36 View menu options(continued)

| Option | Description |
|-------------------|--|
| Weld | To display the overlay of the weld on the S-scan, tap the Weld toggle button (ON/OFF) to rapidly activate or deactivate the Weld display. |
| Cursor | To display the cursors on every scan view, tap the Cursor toggle button (ON/OFF) to rapidly activate or deactivate the Cursor display. |
| Legs | To display the legs on every scan view, tap the Legs toggle button (ON/OFF) to rapidly activate or deactivate the Legs display. |
| Gates | To display the gates using the View menu, tap the Gates toggle button to rapidly activate or deactivate the gates display. At least one gate should be activated to enable the display. Make sure that the required inspection gates are activated in Gates & Alarms > Gates Main . |
| Brightness | Tap the minus button to decrease the screen brightness or tap the plus button to increase the screen brightness (expressed in a percentage). |

NOTE

The  **View** menu enables or disables the display of the gates, but the gates can still be used for your setup. However, if the **Activation** is set to **OFF** (under **Gates & Alarms > Gates Main**), the gates are disabled and cannot be used for your setup.

If your inspected part includes a weld, you can toggle the visibility of the weld geometry overlay. The weld geometry overlay is a drawing of the weld geometry superimposed on the S-scan view that helps visualize where indications are located relative to the weld (Figure 2-43 on page 75 and Table 37 on page 75).

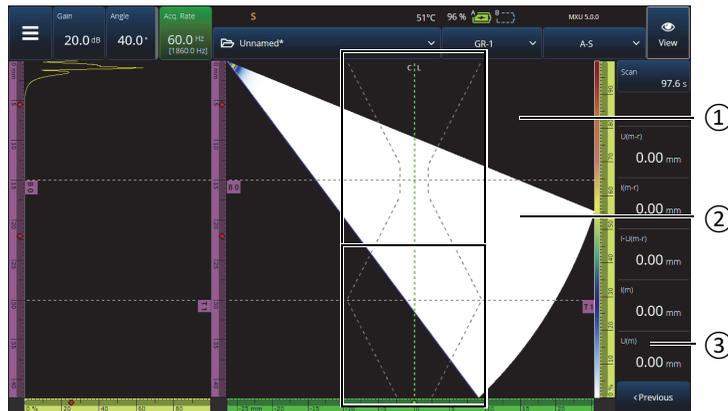


Figure 2-43 Example of a V-Offset weld geometry overlay

Table 37 S-Scan view description

| Item Number | Description |
|-------------|---|
| 1 | Weld geometry overlay |
| 2 | Weld geometry overlay reflection for the second leg |
| 3 | Color palette ruler/scale |

2.9 Changing the Color Palettes

You can change the color palettes for the amplitude (B-scan, C-scan or S-scan for PA/UT or End, Side or Top view for TFM) or thickness C-scan.

To change a color palette

- ◆ Tap and hold the color palette (the ruler/scale shown on the right side of Figure 2-43 on page 75), and then select **Load**. Review the available color palettes, and tap **Open** to change the palette (Figure 2-44 on page 76).

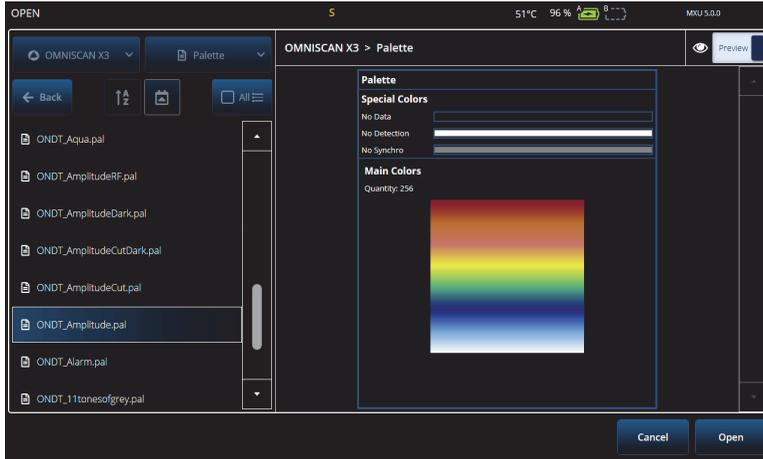


Figure 2-44 Color palette selector

2.10 Files

Tap the **File** menu to load a setup file (inspection mode) or data file (analysis mode), to preview a report, or to manage other options (Figure 2-45 on page 77 and Table 38 on page 77).

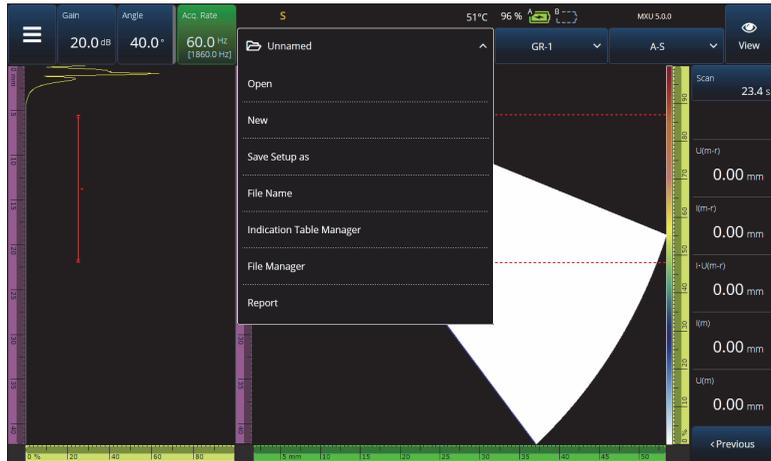


Figure 2-45 File menu

Table 38 File menu options

| Option | Description |
|---------------------------------|---|
| Open | Tap to open a setup file for acquisition or a data file for analysis. |
| New | Used to start a new file by loading the default setup. |
| Save Setup As | Used to save the current setup with a different name. |
| File Name | Used to rename the file of the session. |
| Indication Table Manager | Used to set up the Indication Table during your live analysis. |
| File Manager | Used to manage files by deleting, renaming, or transferring them. |
| Report | Used to create a report from the Indication Table Manager . |

2.11 Readings

All ten readings displayed on the right-hand side of the screen are included in a generated report and saved with a setup file. You can easily switch which UT parameters are displayed in the readings, either individually or as a list. A description for each parameter is provided in the readings **Select** menu when it is highlighted (Figure 2-46 on page 78).

To select the reading list to be displayed

1. Tap and hold your finger on any of the readings to open a contextual menu.
2. Choose between **Select Reading List** (changes all the displayed parameters form a predefined list) or **Select Reading** (edits one reading at a time).
 - a) With **Select Reading List**, you get the choice between a list of preconfigured readings (Figure 2-46 on page 78).



Figure 2-46 Selecting the Reading List

NOTE

This option is used to set a **Reading List** (applied on the ten readings) for different applications such as **PA+TOFD**, **TOFD**, **Manual Weld** and **Automated Weld**.

- b) With **Select Reading**, you can replace one specific reading with any of the available readings (Figure 2-47 on page 79).

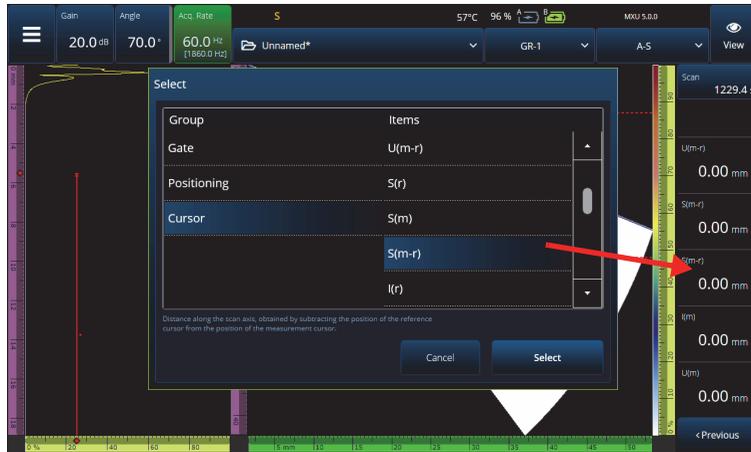


Figure 2-47 Reading selection example

NOTE

This option is used to change the reading you have selected. You can change it for different groups, such as **Gate**, **Positioning**, and **Cursor**.

2.11.0.1 Gate Category Reading

Table 39 on page 80 shows the **Gate** category reading codes and their descriptions.

Table 39 Gate reading code descriptions

| Category | Description |
|----------|---|
| A% | Peak amplitude of the signal detected in gate A . |
| B% | Peak amplitude of the signal detected in gate B . |
| I% | Peak amplitude of the signal detected in gate I . |
| A^ | Position of the signal peak value in gate A . The measurement taken depends on the gate mode that is selected. |
| B^ | Position of the signal peak value in gate B . The measurement taken depends on the gate mode that is selected. |
| I/ | Position of the signal when it crosses gate I . The measurement taken depends on the gate mode that is selected. |

2.11.0.2 Positioning Category Reading

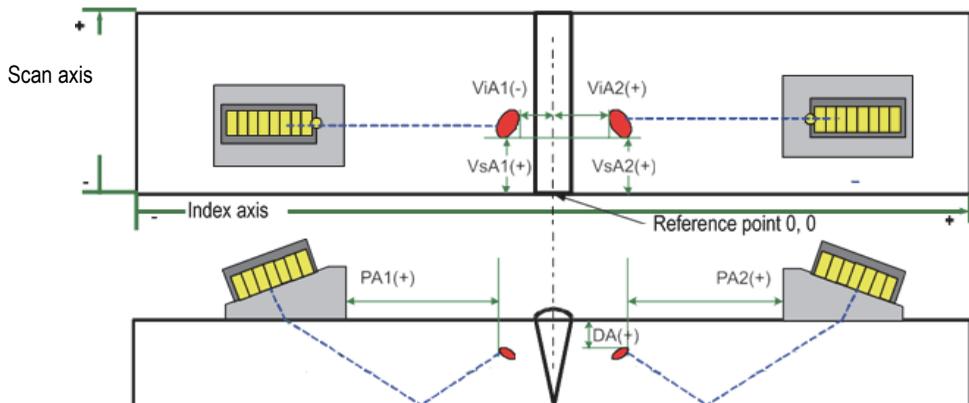
Table 39 on page 80 shows the **Positioning** category reading codes and their descriptions.

Table 40 Positioning reading code descriptions

| Category | Description |
|----------|--|
| PA^ | Distance on the part surface between the wedge (or probe) front face and the indication detected in gate A . |
| PB^ | Distance on the part surface between the wedge (or probe) front face and the indication detected in gate B (see the PA^ definition). |
| DA^ | Depth in the part of the reflector producing the indication detected in gate A . |
| DB^ | Depth in the part of the reflector producing the indication detected in gate B . |

Table 40 Positioning reading code descriptions (continued)

| Category | Description |
|------------------|---|
| SA [^] | Sound path from the part entry point to the indication detected in gate A . |
| SB [^] | Sound path from the part entry point to the indication detected in gate B . |
| VsA [^] | Volumetric position of the indication detected in gate A in relation to the scan axis. |
| VsB [^] | Volumetric position of the indication detected in gate B in relation to the scan axis. |
| ViA [^] | Volumetric position of the indication detected in gate A on the index axis. |
| ViB [^] | Volumetric position of the indication detected in gate B on the index axis. |

**Figure 2-48 Diagram of the PA, DA, ViA, and VsA readings**

2.11.1 Cursor Category Readings

Table 41 on page 82 shows the **Positioning** category reading codes and their descriptions.

Table 41 Cursor reading code descriptions

| Category | Description |
|------------------------|---|
| %<i>(r)</i> | Amplitude value at the Reference-cursor position. |
| %<i>(m)</i> | Amplitude value at the Measurement-cursor position. |
| %<i>(m-r)</i> | Amplitude value obtained by subtracting the amplitude of the Reference cursor from the amplitude of the Measurement cursor. |
| U<i>(r)</i> | Position of the Reference cursor on the ultrasound axis. |
| U<i>(m)</i> | Position of the Measurement cursor on the ultrasound axis. |
| U<i>(m-r)</i> | Distance along the ultrasound axis, obtained by subtracting the position of the Reference cursor from the position of the Measurement cursor. |
| S<i>(r)</i> | Position of the Reference cursor on the scan axis. |
| S<i>(m)</i> | Position of the Measurement cursor on the scan axis. |
| S<i>(m-r)</i> | Distance along the scan axis, obtained by subtracting the position of the Reference cursor from the position of the Measurement cursor. |
| I<i>(r)</i> | Position of the Reference cursor on the index axis. |
| I<i>(m)</i> | Position of the Measurement cursor on the index axis. |
| I<i>(m-r)</i> | Distance along the index axis, obtained by subtracting the position of the Reference cursor from the position of the Measurement cursor. |
| I•U<i>(m-r)</i> | Distance along the diagonal of the rectangle formed by the intersection of the Measurement and the Reference cursors. |
| %<i>(U(r))</i> | Signal amplitude at the position of the Reference cursor on the ultrasound axis. This value is not computed in analysis mode. |
| %<i>(U(m))</i> | Signal amplitude at the Measurement cursor position on the ultrasound axis. This value is not computed in analysis mode. |

Table 41 Cursor reading code descriptions (continued)

| Category | Description |
|-------------------|--|
| TOFD(r) | Corresponding depth in the part along the ultrasound axis for the Reference cursor (calibrated TOFD group only). |
| TOFD(m) | Corresponding depth in the part along the ultrasound axis for the Measurement cursor (calibrated TOFD group only). |
| TOFD(m-r) | Corresponding depth in the part along the ultrasound axis, obtained by subtracting the depth of the Reference cursor from the Measurement cursor (calibrated TOFD group only). |
| D(r) | Corresponding depth in the part along the ultrasound axis for the Reference cursor. |
| D(m) | Corresponding depth in the part along the ultrasound axis for the Measurement cursor. |
| I•D(m-r) | Corresponding depth in the part along the ultrasound axis, obtained by subtracting the depth of the Reference cursor from the Measurement cursor. |
| S(m-r) CSC | Scan distance between the Reference and Measurement cursors, corrected for the part curvature and flaw depth. |

2.11.2 Generic Reading Codes

Table 42 on page 83 shows the **Generic** reading codes that appear when abnormal conditions occur and no value can be displayed.

Table 42 Generic reading code descriptions

| Category | Description |
|--------------|--|
| ND | No signal detected. This code appears when no signal has crossed the gate. |
| - - - | No data acquired. This code appears if any portion of the scan area was not covered during the inspection. |

Table 42 Generic reading code descriptions (continued)

| Category | Description |
|----------|--|
| NS | No synchronization. This code appears when a gate is synchronized with another gate (or synchronization gate), but the synchronization cannot be established because no signal has crossed the synchronization gate. |

2.12 Rulers/Scales

Rulers/scales on the vertical or horizontal sides of the data views are associated with various axes. Figure 2-49 on page 84 provides an example of multiple views with rulers/scales.

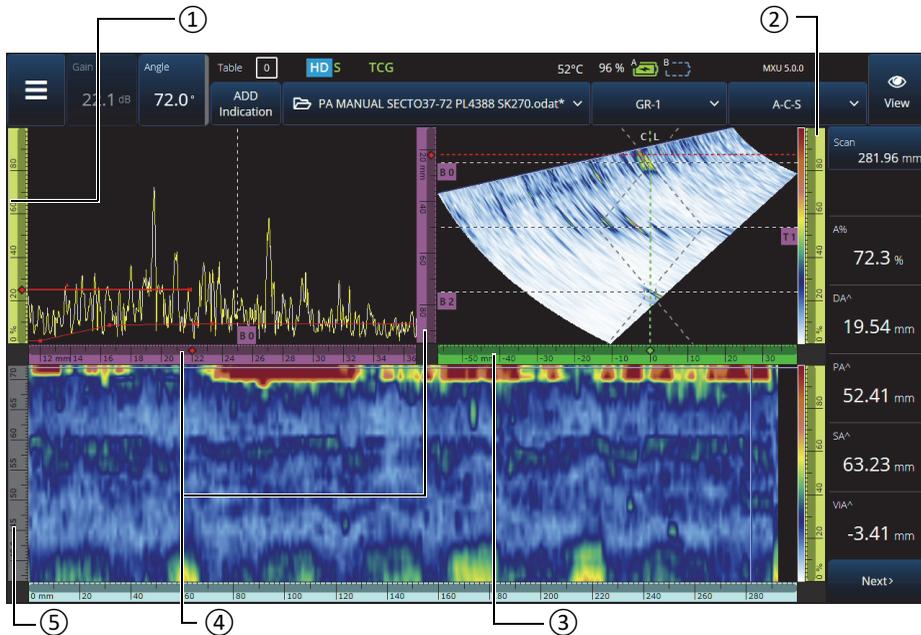


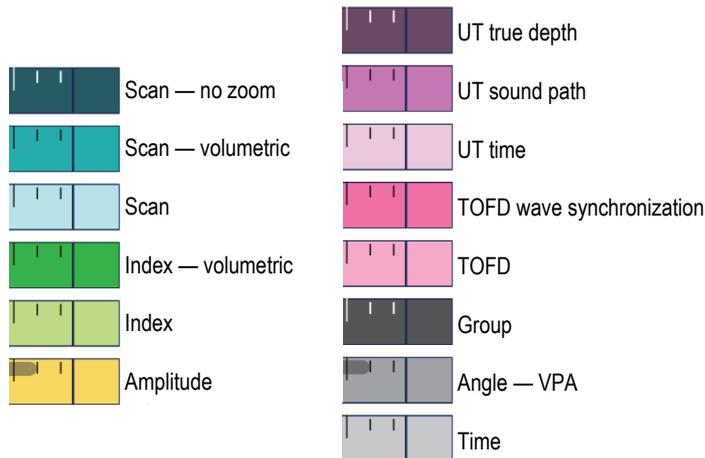
Figure 2-49 Example of multiple views with various rulers/scales

Table 43 Rulers/scales multiple views

| Item Number | Description |
|-------------|---------------------------|
| 1 | Amplitude axis |
| 2 | Color palette ruler/scale |
| 3 | Index axis |
| 4 | Ultrasound axis |
| 5 | Angle axis |

Each ruler/scale is filled with a dedicated color to help you identify the axis on the various views. Figure 2-50 on page 85 provides examples of rulers/scales with colors and functions.

A basic color is attributed to each axis. The axis appears in various tints of this basic color. The lightest tint corresponds to the raw data representation. Progressively darker tints correspond to increasing data correction complexity relative to the axis. A darker tint is also used for an axis that appears as a reference, in which case, the zoom bar is not available.

**Figure 2-50 Examples of rulers/scales**

2.13 Acquisition Mode

The OmniScan X3 flaw detector features two modes: inspection mode and analysis mode. Figure 2-51 on page 86 illustrates the basic operations of each mode and switching between modes.

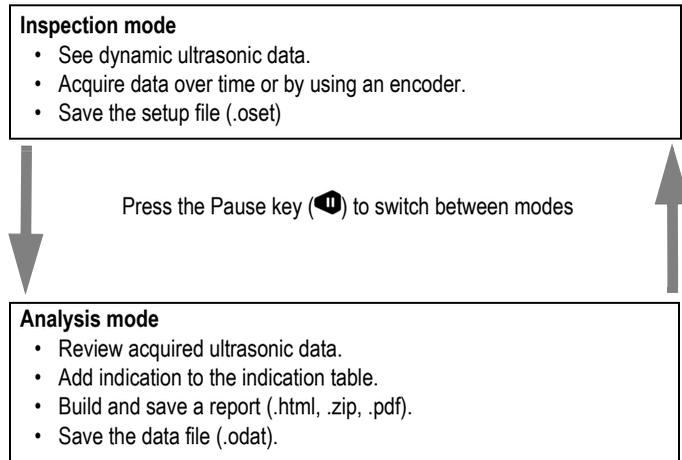


Figure 2-51 Acquisition modes

2.13.1 Inspection Mode

Inspection mode is the default acquisition mode when the OmniScan X3 flaw detector is turned on. Inspection mode has the following characteristics:

- The instrument continuously produces ultrasonic beams and dynamically displays ultrasonic data.
- Pressing the Play key (▶) starts data recording for a scanned area (using an encoder) or for a predetermined period of time.
- Pressing the Pause key (⏸) pauses the data acquisition and activates analysis mode.

2.13.2 Analysis Mode

Analysis mode is used to analyze recorded data after an inspection. Analysis mode has the following characteristics:

- The instrument stops acquiring data, and the recorded data is available for analysis.
- The acquisition indicator illuminates solid orange.

2.14 Outline Colors on Parameter Buttons

In certain submenus, some or all of the parameter buttons are outlined in colors that indicate the interface element to which the parameter applies.

Three colors refer to the gates:

- Red: The parameter applies to gate **A**.
- Green: The parameter applies to gate **B**.
- Yellow: The parameter applies to gate **I**.

2.15 Compression (TOFD Only)

The Compression feature is available (Figure 2-52 on page 88) to support corrosion mapping and composite inspection applications.

Compression is included on the B-scan and C-scan to ensure that the most relevant information in a pixel is displayed at all times. For an amplitude C-scan or B-scan, the pixel color is determined by the data point of highest amplitude. For a time-of-flight or position C-scan, the pixel color is determined by the data point of shortest time-of-flight (thinnest). If the inspected area has more data points than pixels, the Compression feature will be turned on automatically in order to select which data

will be displayed for each pixel, and the “C” icon () is displayed on the status indicator.

If a zoom is performed on the C-scan, and all the data points are displayed, the Compression symbol and the Compression indicator will no longer be displayed. This function is always active, and does not require configuration.

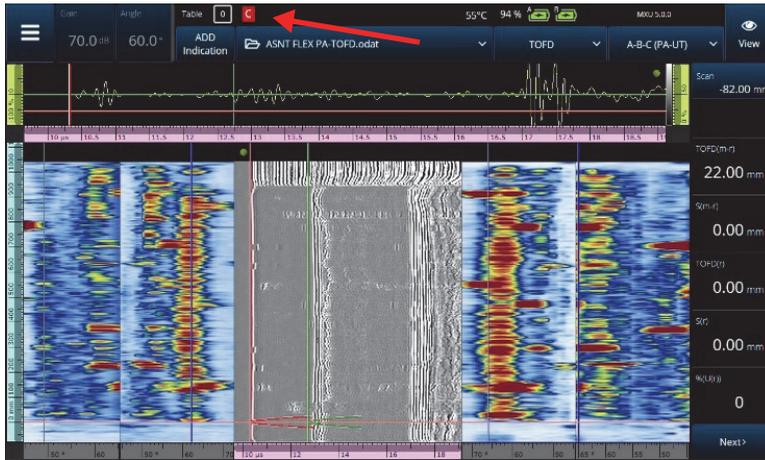


Figure 2-52 Compression example

2.16 High Definition (PA-UT Only)

The High Definition “HD” icon () (Figure 2-53 on page 89) feature indicates that each point of data is represented by at least one pixel. A larger scan area may contain too many data points to be represented by one pixel, so a compression will be applied (keeping the maximum amplitude) and the HD icon will not be displayed.

This icon may appear by zooming on a section. If the HD icon appears, it means that all the data points are represented in the view and are not compressed.

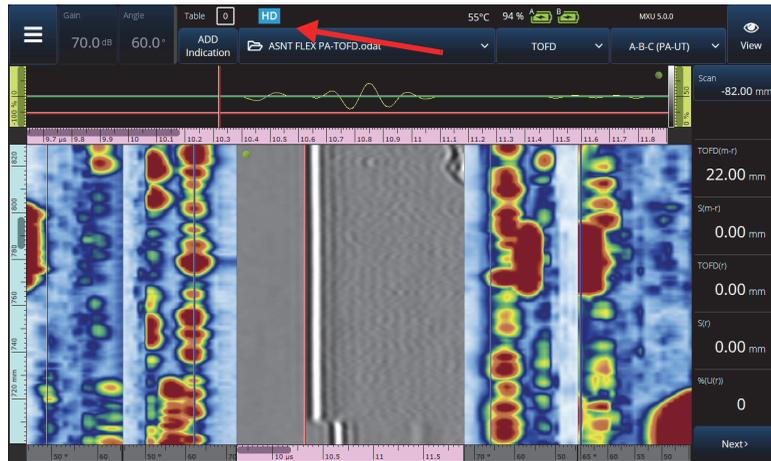


Figure 2-53 High definition example (PA-UT only)

2.17 Shortcuts

Some operations that are done frequently have a shortcut available directly in the views. To access the shortcut, tap and hold (right-click) on the screen to view the list of shortcuts.

Table 44 Shortcuts

| View | Shortcut name | Description |
|------|-------------------------------|--|
| All | Set Reference Cursor | Positions the cursor where you tapped. This is a shortcut for Measurements > Cursors . |
| | Set Measurement Cursor | Positions the cursor where you tapped. This is a shortcut for Measurements > Cursors . |

Table 44 Shortcuts (*continued*)

| View | Shortcut name | Description |
|------------------|--------------------------------|--|
| A-scan | Enable/Disable Envelope | Turns ON or OFF the A-scan envelope, which keeps track of the maximum amplitude recorded at each position in the A-scan. |
| | Clear Envelope | Only available when the envelope is ON. This resets the envelope. |
| S-scan | Index Offset | Modifies the Index Offset directly without going in Probe & Part > Position . |
| | Skew Left (90°) | Flips the probe orientation. |
| | Skew Right (270°) | Flips the probe orientation. |
| | Set Data Cursor | Selects the focal law where you tapped. |
| C-scan | A%, B%, I%, I/ | Depending on which gates are active, these shortcuts might there or not. Changes the data source of the C-scan. |
| | Scan Offset | Modifies the Scan Offset directly without going in Probe & Part > Position . |
| | Set Data Cursor | Selects the focal law where you tapped. This is a shortcut for Measurements > Cursors . |
| B-scan | Set Data Cursor | Selects the focal law where you tapped. This is a shortcut for Measurements > Cursors . |
| Top or side view | Scan Offset | Modifies the Scan Offset directly without going in Probe & Part > Position . |
| Any ruler | Zoom Out | Resets the zoom. |

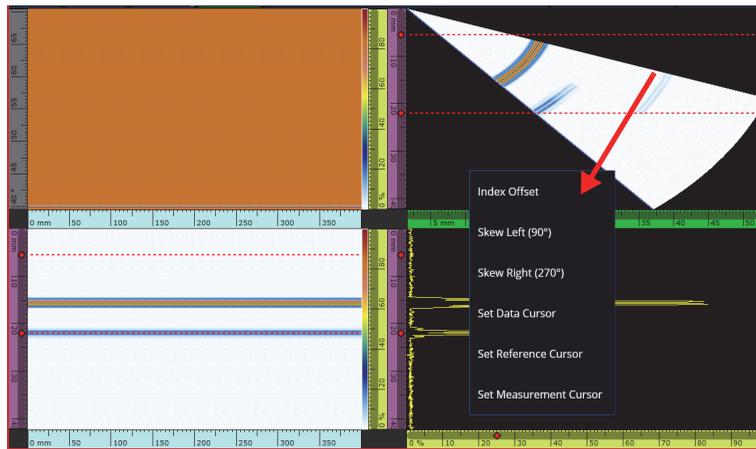


Figure 2-54 Shortcuts contextual menu example

3. Scan Plan

The **Scan Plan** wizard is used to create or modify the required parameters for inspecting a part.

Select  >  **Wizard (Plan & Calibrate)** > **Scan Plan** for tools that help you quickly and easily create a complete setup for your application (Figure 3-1 on page 94). The **Scan Plan** wizard contains three main tabs:

- **1 Part & Weld**
- **2 Probes & Wedges**
- **3 Groups**

After setting all parameters on a tab, tap the next tab to continue the **Scan Plan** wizard. The workflow is always from top to bottom and left to right. Set all parameters before changing tabs.

| |
|------------|
| TIP |
|------------|

You can exit the **Scan Plan** wizard menu at any time by tapping **Done** at the top right of the screen.

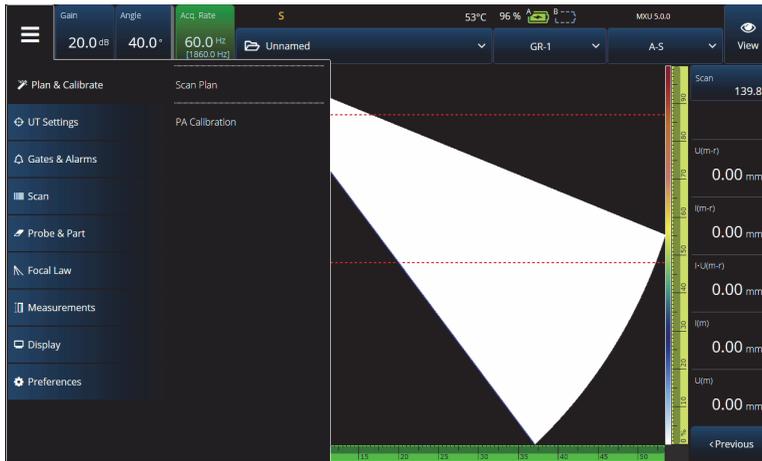


Figure 3-1 Plan & Calibrate

3.1 Part and Weld

Use this tab to define the material, geometry, and weld for the part to be inspected (Figure 3-2 on page 94).

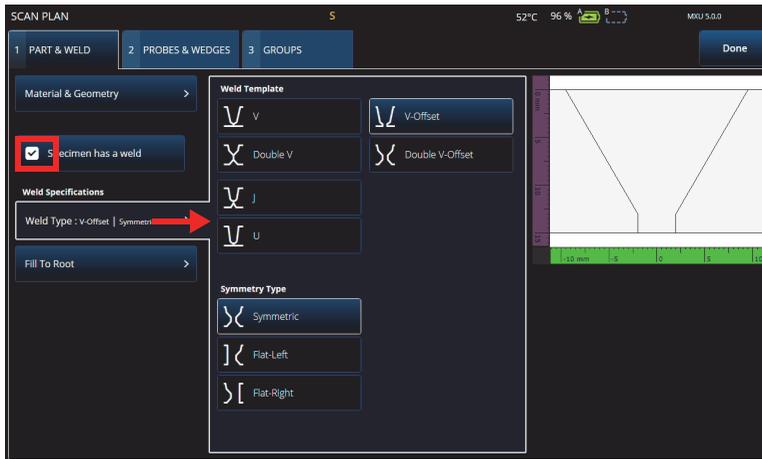


Figure 3-2 Scan Plan > Part & Weld > Weld specifications

Table 45 Part & Weld options

| Option | Description |
|--------------------------------|--|
| Material & Geometry | <p>Material: Choose the material of the inspected part from the list (set to Steel, Mild by default).</p> <p>LW: Velocity of the longitudinal wave in the material. This value is automatically set when choosing a material from the list. This value can be edited manually.</p> <p>SW: Velocity of the shear wave in the material. This value is automatically set when choosing a material from the list. This value can be edited manually.</p> <p>Type: Used to select the geometry of the part from one of three choices, Plate , Tube , or Bar .</p> <p>Thickness: Used to set the Thickness of the part.</p> <p>Length: Used to set the Length of the part.</p> <p>Width: Used to set the Width of the part.</p> |
| Specimen has a weld | Check this box if the part has a weld. |
| Weld Specification | <p>Weld Type: Used to set the Weld Template and Symmetry Type.</p> <p>Weld Template: V, V-Offset, Double V, Double V-Offset, J, and U.</p> <p>Symmetry Type: Symmetric, Flat-Left, Flat-Right.</p> |

Table 45 Part & Weld options (*continued*)

| Option | Description |
|---------------------|--|
| Fill to Root | <p>Fill Height: Displays the height fill of the weld. Angle: Used to set the angle fill of the weld.</p> <p>Hot Pass Height: Used to set the height of the Hot Pass. Angle: Used to set the angle of the Hot Pass.</p> <p>Land Height: Used to set the height of the Land. Offset: Used to set the offset of the Land.</p> <p>Root Height: Used to set the height of the Root. Angle: Used to set the angle of the Root.</p> |

To define the part to be inspected

1. Select the material to be inspected by tapping the drop-down list.
2. Select the geometry of the part to be inspected (**Plate** , **Tube**  or **Bar** ) with the thickness, scan orientation, and diameter (if necessary).
3. Select the **Specimen has a weld** check box, if applicable, and select the type of weld.
4. Define the weld to your specifications using the **Fill to Root** tab.

3.2 Probes and Wedges

Use this tab to define the probes and wedges used for the inspection (Figure 3-3 on page 97). At the top, set the different physical connections (up to eight). On the right, set the probe and wedge configuration related to the selected group.

The OmniScan X3 flaw detector automatically detects and loads the characteristics of an Olympus PA probe when you connect one to the flaw detector with an OmniScan connector. When you use an OmniScan splitter connector or a different brand of probe, you need to manually select the probe from the predefined list (Figure 3-4 on page 99).

You also need to select a predefined wedge or define the wedge that you want to use for your inspection.

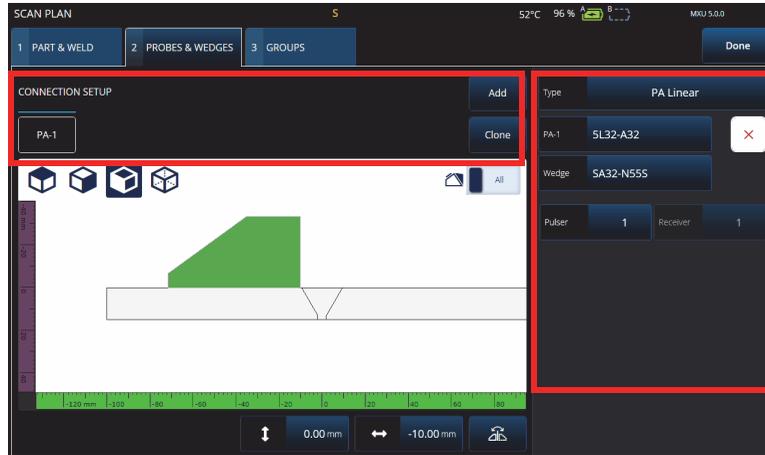


Figure 3-3 Scan Plan > Probes & Wedges

Table 46 Probes & Wedges options

| Option | Description |
|-------------------------|---|
| Connection Setup | Add: Used to assign a connector, PA-1 or P1R1 , to a new probe with the default parameters. Clone: Used to create a copy of an existing probe and wedge configuration. |
| Type | PA-1: PA Linear, PA Dual Linear P1R1: TOFD |
| PA1 | Probe selection based on the Probe & Wedge library. |
| P1R1 | Probe selection based on the Probe & Wedge library. |
| Wedge | Wedge selection based on the Probe & Wedge library. |

Table 46 Probes & Wedges options (continued)

| Option | Description |
|---|--|
| Pulser | <p>PA-1: Used to choose the first pulser of the probe. For a single probe on the PA connector, the Pulser value should be 1. The Pulser value should be higher when configuring the second probe on a splitter (according to the splitter wiring).</p> <p>TOFD: Displays 1 if P1R1 is selected and displays 2 if P2R2 is selected (future update).</p> |
| Receiver | Displays the receiver that is set according to the probe configuration and the Pulser value. |
| PCS | Used to set the probe center separation (PCS). This is the distance between the exit points of the two probes. Only available for the TOFD group. |
| Focus % | Used to set the focus in depth of the beam in % (only available for the TOFD group). |
| Focus mm or inch | Used to set the focus of the beam depth in mm or in. (only available for the TOFD group). |
|  | Used to set the focus of the beam depth in mm or in. (only available for the TOFD group). |
|  | <p>PA-1: Used to set the Index Offset.</p> <p>TOFD: Used to see the Index Offset.</p> |
|  | PA-1: Used to set the skew to either 90 or 270. |
|  | Tap to display the top view of the 3D viewer. |
|  | Tap to display the front view of the 3D viewer. |
|  | Tap to display the side view of the 3D viewer. |
|  | Tap to display the perspective view of the 3D viewer. |
|  | Tap to display the wedges or only the one selected. |

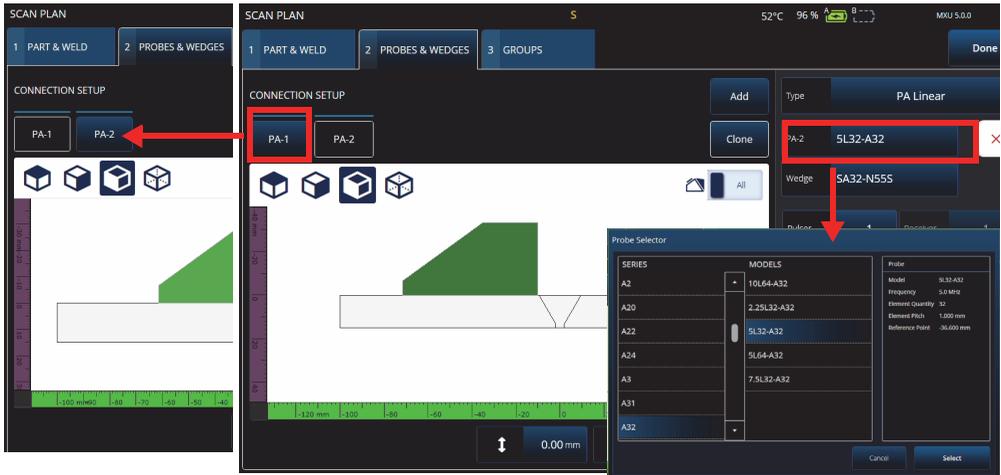


Figure 3-4 Scan Plan > Probes & Wedges > Add — Example probe selection

If your probe or wedge is not available in the predefined list, you can define a new one (see “Probe & Wedge Manager” on page 126).

NOTE

In phased array mode, only the wedges that are dedicated to the probe are available by default. The list of dedicated wedges speeds up the wedge selection process. However, if you need to view the complete list, you can use the **Show Dedicated / Show All** button to toggle between the full and the dedicated lists of wedges.

3.3 Groups

In this tab, we define the groups based on the probe configuration defined previously. One group per probe is created by default, you can edit them using the menu on the right side. To create more than one group on a probe, use the **Add** or **Clone** button. A group is a set of beams, or focal laws, defined by the **Law Config**.



Figure 3-5 Scan Plan > Groups

The parameters for each group can have multiple pages, which you can scroll through using the **Previous** and **Next** buttons at the bottom right of the screen (Figure 3-6 on page 100).

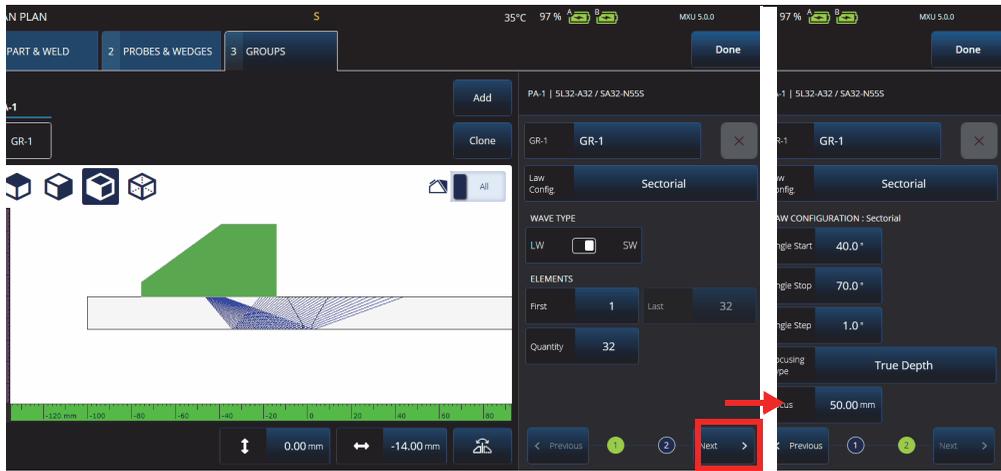


Figure 3-6 Scan Plan > Groups > New Set – Configuration

NOTE

It is not possible to have fewer than one or more than eight groups. The maximum number of focal laws is 1024. Each defined probe must have at least one group assigned.

Table 47 Groups new set configuration options

| Option | Description |
|-------------|--|
| GR-1 | Used to set the name of the group. |
| Law Config. | <p>Sectorial: Provides a multiple-angle scan using the same elements for every angle of the scan.</p> <p>Linear: Provides a linear scan at a configurable angle. You can use this mode at a zero-degree angle if you do not need overlapping scans.</p> <p>Compound: Provides a multiple-angle scan using different elements (with the same aperture across the length of the probe) for every angle of the scan.</p> <p>TFM: Provides a TFM scan over the selected area based on a reconstruction of the FMC acquired data. The TFM uses all elements of the probe.</p> |
| Wave Type | <p>Used to set the toggle between LW and SW.</p> <p>LW: Longitudinal wave</p> <p>SW: Shear wave</p> |
| Elements | <p>First: Displays the first element on the probe.</p> <p>Last: Displays the last element on the probe.</p> <p>Quantity: Used to set the number of elements used in the focal law (the size of the aperture).</p> <p>Step: Used to set the spacing between the consecutive focal laws (for linear scan and zero-degree law configuration).</p> |

Table 47 Groups new set configuration options (continued)

| Option | Description |
|---------------------------------------|--|
| Law Configuration: (Sectorial) | <p>Angle Start: Used to set the angle of the first beam angle in the material.</p> <p>Angle Stop: Used to set the angle of the last beam angle in the material from the wedge.</p> <p>Angle Step: Used to set the angular step between each focal law.</p> <p>Focusing Type</p> <p>True Depth: The focus is at the same depth for all beams.</p> <p>Half Path: The focus is at the same sound path for all beams.</p> <p>Focus: Used to set the focusing depth distance.</p> |
| Law Configuration: (TFM) | <p>Wave Set: Select between Pulse Echo or Self Tandem to display the proper wave set selection. Choose the wave set that fits the inspection. Appropriate wave set selection is crucial for a good TFM inspection. Use the AIM to facilitate wave set selection.</p> <p>AIM Acoustic Influence Map: No impact on the acoustic configuration, this option is used to select the type of defect used in the AIM tool. Proper selection of the model (Spherical or Planar) will help you select the best Wave Set.</p> <p>Min/Max Index: Used to set the bounds of the TFM zone in the index axis.</p> <p>Min/Max Depth: Used to set the bounds of the TFM zone in the depth axis. The Maximum Depth is currently limited to the depth of the sample.</p> |

4. Calibration

Depending on your requirements, before starting an inspection, you can perform several calibration procedures using a probe, wedge, and calibration block composed of the same material as the part to be inspected.

To perform calibration

1. Select  >  **Plan & Calibrate** > **Calibrate** to access the **PA** or **TOFD Calibration** wizard (Figure 4-1 on page 104). Like the **Scan Plan** wizard, the **PA** or **TOFD Calibration** wizard's workflow is separated into several tabs or sections (for different types of calibration).
2. On the **Group** tab (Figure 4-1 on page 104), select the group you wish to calibrate.
3. Navigate through the other tabs to calibrate the group. On each tab after the **Group** tab, the calibration parameters are on the right and the views are on the left.
4. Set your parameters, then move your probe to adjust the signal according to the calibration type.
5. Subsequently tap either **Get Position** or **Calibrate**. When you are satisfied with your adjustment, tap **Accept Calibration**.
6. You can then either continue to another tab in the **PA** or **TOFD Calibration** wizard, or exit by tapping **Done**.

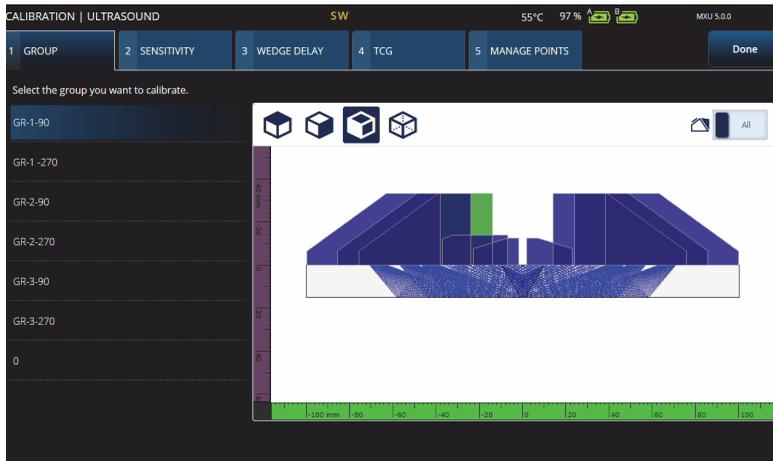


Figure 4-1 Calibration > Group

IMPORTANT

If an ultrasonic velocity calibration and a wedge delay calibration are required, perform the ultrasonic velocity calibration before the wedge delay calibration. The OmniScan X3 flaw detector uses the ultrasonic velocity determination for the wedge delay calibration. If you attempt to calibrate the wedge delay first, you will receive a message warning you that the wedge delay calibration will be lost when you perform the ultrasonic velocity calibration.

TIP

You can exit a Calibration wizard at any time by pressing the Cancel key (⏹). When exiting the wizard, the signal goes back to its original state (as it was before the calibration).

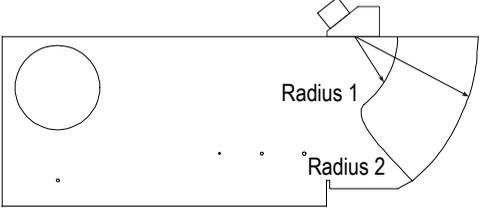
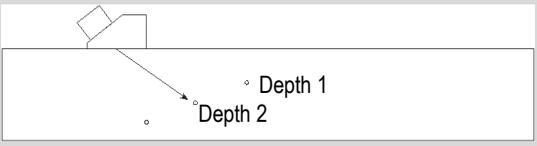
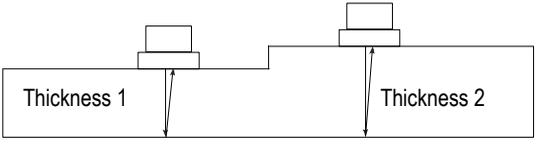
NOTE

The Calibration indicators (icons) turn green after calibration (Table 5 on page 21).

4.1 Reflector Types

Calibration procedures are performed using calibration blocks with different types of known reflectors. Table 48 on page 105 illustrates the types of probes, wedges, and calibration blocks used for each type of reflector.

Table 48 Reflector, probe, and calibration block types

| Reflector type | Probe type | Probe, wedge, and calibration block |
|----------------|------------|--|
| Radius | Angle beam |  |
| Depth | Angle beam |  |
| Thickness | 0 degree |  |

4.2 Ultrasonic Calibration

You can calibrate several ultrasonic aspects using the Calibration wizard.

Velocity

Used to calibrate the velocity of the sound propagation in the material of the inspected part (Figure 4-2 on page 106). The calibration block must have two known reflectors and be made of the same material as the part to be inspected.

NOTE

The **Velocity** feature is only available in the 5.1.0 software version.

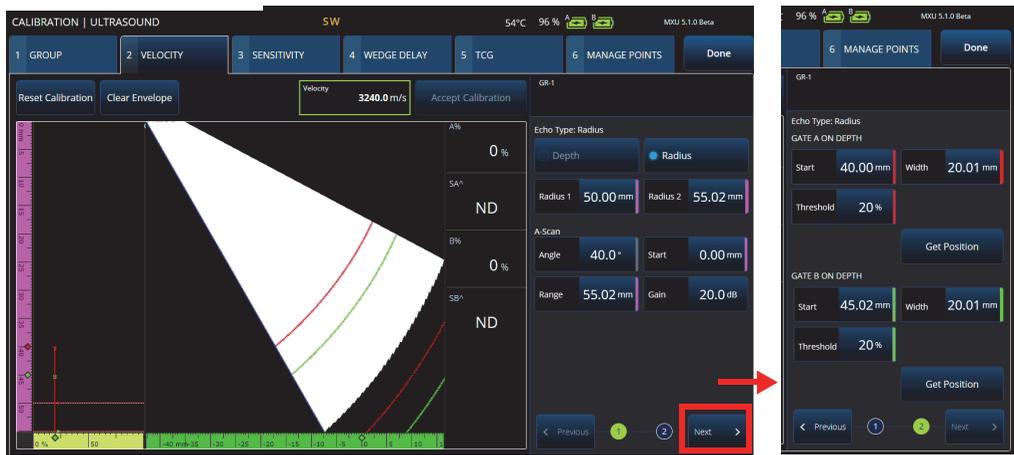


Figure 4-2 Calibration > Velocity

Sensitivity (PA group only)

Used to calibrate the sensitivity for detecting a reference reflector (Figure 4-3 on page 107 and Table 49 on page 107). The sensitivity calibration for a PA group normalizes the gain for all focal laws to ensure that all focal laws produce a similar amplitude signal for the reference reflector. The calibration procedure requires a calibration block with one known reflector.

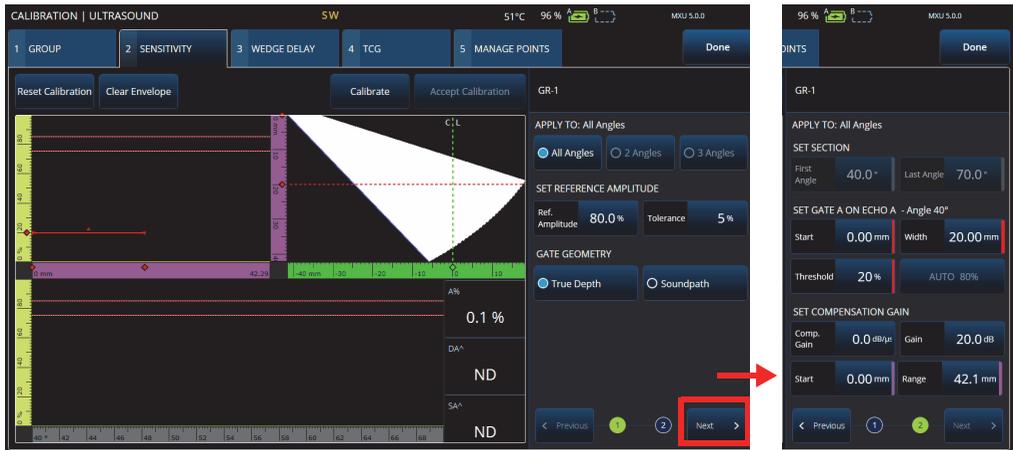


Figure 4-3 Calibration > Sensitivity

Table 49 Sensitivity tab options

| Option | Description |
|---------------------------|---|
| Reset Calibration | Resets the sensitivity calibration. The “S” at the top of the screen turns orange. |
| Clear Envelope | Clears the envelope on the bottom view. The green line disappears. |
| Calibrate | Applies a beam gain for each focal law so that the amplitude over the reference defect is compensated. |
| Accept Calibration | Accepts and saves the sensitivity calibration. The “S” at the top of the screen turns green. |
| GR-1 | Identification of the name of the group. |
| Apply to | <p>All Angles: The calibration applies to all angles of the sectorial scan (available when in sectorial mode).</p> <p>2 Angles: The calibration applies to two angles of the sectorial scan.</p> <p>3 Angles: The calibration applies to three angles of the sectorial scan.</p> |

Table 49 Sensitivity tab options (*continued*)

| Option | Description |
|--|---|
| Set Reference Amplitude | <p>Ref. Amplitude: Displays a horizontal white-dotted and red line on the A-scan at the height of the reference-amplitude value (80 % by default).</p> <p>Tolerance: Increase the size of the Ref. Amplitude (both horizontal white-dotted and red lines).</p> |
| Gate Geometry | <p>True Depth: Sets the gate according to the depth in the material for the sensitivity calibration.</p> <p>Sound Path: Sets the gate according to the distance traveled in the material for the sensitivity calibration.</p> |
| Set Section | <p>First Angles: Used to see the All Angles method: First Angles of the sensitivity calibration.</p> <p>Last Angles: Used to see the All Angles method: Last Angles of the sensitivity calibration.</p> |
| Set Gate A on Echo A - Angle 40 ° | <p>Start: Used to set where the gate can start in reference to the origin (can be expressed in mm or in.).</p> <p>Width: Used to set the width of the gate (the bottom points red lines of the S-scan and the largest of the continuous red line on the A-scan).</p> <p>Threshold: Used to set the height of the gate.</p> <p>Auto 80 %: Automatically sets the maximum signal inside the gate at 80 %.</p> |
| Set Compensation Gain | <p>Comp Gain: Used to set the compensation gain value that makes the focal law amplitude profile fully visible in the sensitivity graph.</p> <p>Gain: Used to set the signal gain value for the sensitivity calibration.</p> <p>Start: Used to set the start of the displayed A-scans.</p> <p>Range: Used to set the range of the displayed A-scans.</p> |
| Previous Next | Used to alternate between the parameters on the first and second pages. |

Table 49 Sensitivity tab options (continued)

| Option | Description |
|--------|---|
| Done | Select Done to apply and close the sensitivity calibration settings. |

NOTE

You can validate your **Sensitivity** calibration by clearing the envelope, redo the manipulation, and check that the amplitude from all focal laws are within tolerance.

Wedge Delay

Used to calibrate the delay corresponding to the sound propagation within the wedge (Figure 4-4 on page 109 and Table 48 on page 105). A wedge delay calibration is a process that enables you to identify the face of the wedge contacting the part. This establishes a zero position for the entry surface of the part. The calibration procedure requires a calibration block with one known reflector.

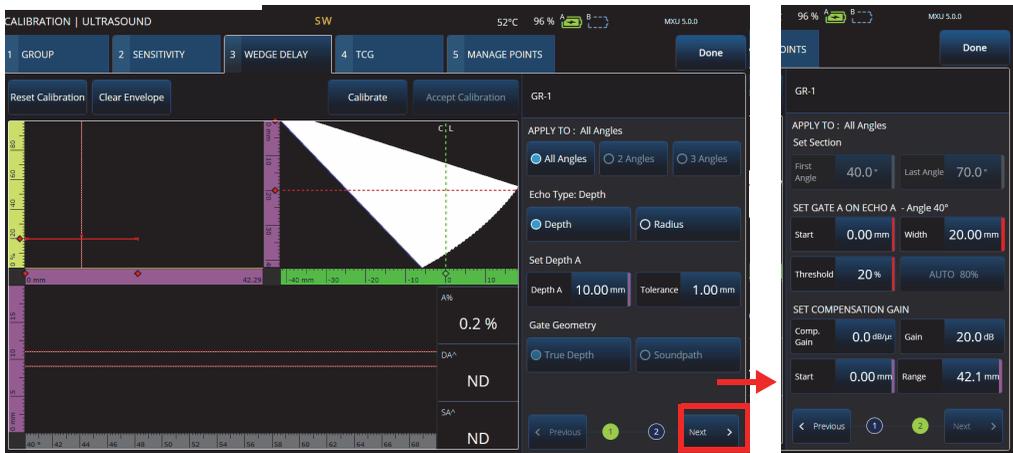


Figure 4-4 Calibration > Wedge Delay

WD & PCS (TOFD group only)

Used to calibrate (with a single wizard) both the delay of the sound propagation within the wedge and the probe center separation.

Velocity & WD (UT group only)

Used to calibrate (with a single wizard) both the sound propagation in the material of the inspected part and the delay corresponding to the sound propagation within the wedge.

Table 50 Wedge tab options

| Option | Description |
|---------------------------|---|
| Reset Calibration | Resets the wedge delay calibration. The “W” at the top of the screen turns orange. |
| Clear Envelope | Clears the envelope on the bottom view. The green line disappears. |
| Calibrate | Calibrates the wedge delay by automatically applying beam delays to each focal law so that the reference is seen at the same distance for all beams. |
| Accept Calibration | Accepts and saves the sensitivity calibration. The “S” at the top of the screen turns green. |
| GR-1 | Identification of the name of the group. |
| Apply to | <p>All Angles: The calibration applies to all angles of the sectorial scan (available when in sectorial mode).</p> <p>2 Angles: The calibration applies to two angles of the sectorial scan.</p> <p>3 Angles: The calibration applies to three angles of the sectorial scan.</p> |
| Echo Type | <p>Depth: Used to set to depth or thickness reflector types, herein referred to as the reflector.</p> <p>Radius: Used to set to radius reflector types, herein referred to as the reflector.</p> |
| Set | <p>Depth A: Used to set the nominal depth of the reflector.</p> <p>Tolerance: Used to set the tolerance.</p> |

Table 50 Wedge tab options (*continued*)

| Option | Description |
|--|--|
| Set Section | <p>First Angles: used to see the All Angles method: First Angles of the sensitivity calibration.</p> <p>Last Angles: used to see the All Angles method: Last Angles of the sensitivity calibration.</p> |
| Set Gate A on Echo A - Angle 40 ° | <p>Start: Used to set where the gate can start in reference to the origin (can be expressed in mm or in.).</p> <p>Width: Used to set the width of the gate (the bottom points red line of the S-scan and the largest of the continuous red line on the A-scan).</p> <p>Threshold: Used to set the height of the gate.</p> <p>Auto 80 %: Automatically sets the maximum signal inside the gate at 80 %.</p> |
| Set Compensation Gain | <p>Comp Gain: Used to set the compensation gain value that makes the focal law amplitude profile fully visible in the sensitivity graph.</p> <p>Gain: Used to set the signal gain value for the sensitivity calibration.</p> <p>Start: Used to set the start of the displayed A-scans.</p> <p>Range: Used to set the range of the displayed A-scans.</p> |
| Previous Next | Used to alternate between the parameters on the first and second pages. |
| Done | Select Done to apply and close the wedge delay calibration settings. |

4.3 TCG Calibration

The OmniScan X3 flaw detector offers TCG (time-corrected gain). Sizing functions let you evaluate the size of a reflector anywhere in the part by measuring or compensating for the signal attenuation.

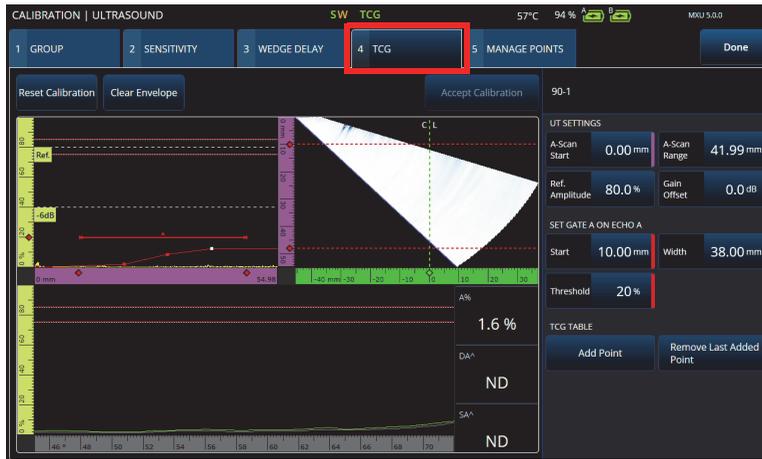


Figure 4-5 Calibration > TCG

TCG

The time-corrected gain (TCG) function increases the gain applied to the signal as a function of the time the echoes take to return. The result is that the echo peaks (from same-sized reference flaws) appear at the same screen height, independently of their position in the part. The TCG uses the same factors as DAC (distance-amplitude correction).

Table 51 TCG tab options

| Option | Description |
|---------------------------|--|
| Reset Calibration | Resets the sensitivity calibration. The “TCG” at the top of the screen turns orange. |
| Clear Envelope | Clears the envelope on the bottom view. The green line disappears. |
| Accept Calibration | Accepts and saves the sensitivity calibration. The “TCG” at the top of the screen turns green. |
| GR-1 | Identification of the name of the group. |

Table 51 TCG tab options (*continued*)

| Option | Description |
|-----------------------------|---|
| UT Settings | <p>A-Scan Start: The start of the digitized range for calibration.</p> <p>A-Scan Range: The length of the digitized range for calibration.</p> <p>Ref. Amplitude: The target amplitude for calibration. When adding a point, a TCG point will be automatically applied so that the amplitude of the reference defect is equal to the Ref. Amplitude.</p> <p>Gain Offset: Used to read the calculated gain offset applied to the current focal law. Values are typically created through the sensitivity calibration wizard, and they can be adjusted manually if needed.</p> |
| Set Gate A on Echo A | <p>Start: Used to set where the gate can start in reference to the origin (can be expressed in mm or in.).</p> <p>Width: Used to set the width of the gate (the bottom points red line of the S-scan and the largest of the continuous red line on the A-scan).</p> <p>Threshold: Used to set the height of the gate.</p> |
| TCG Table | <p>Add Point: After manually scanning a reference target over all focal laws, clicking on Add Point will add a TCG point for each focal law. The point will be created at the position of the maximum echo in the gate. The gain for each point will be set so that the amplitude for each focal law is equal to Ref. Amplitude.</p> <p>Remove Last Added Point: Removes only the last TCG point created. To correct an invalid TCG point, remove it before using Add Point on the same reflector.</p> |
| Previous Next | Used to alternate between the parameters on the first and second pages. |
| Done | Select Done to apply and close the TCG calibration settings. |

4.4 Manage Points

The **Manage Points** tab (Figure 4-6 on page 114) is used to verify the TCG points value or to manually create or edit TCG points, bypassing the TCG calibration wizard.

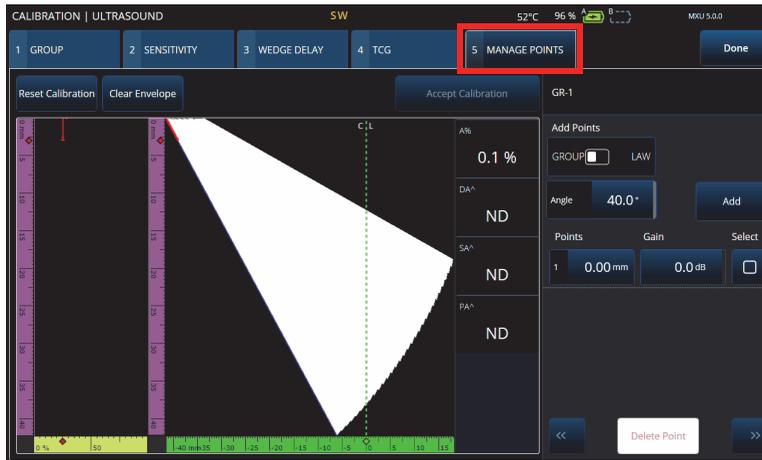


Figure 4-6 Calibration > Manage Points

Table 52 Manage Points tab options

| Option | Description |
|---------------------------|---|
| Reset Calibration | Resets the sensitivity calibration. The “TCG” calibration indicator disappears. |
| Clear Envelope | Clears the envelope on the bottom view. The green line disappears. |
| Accept Calibration | Accepts and saves the sensitivity calibration. The “TCG” turns green. |
| GR | Identification of the name of the group. |

Table 52 Manage Points tab options (continued)

| Option | Description |
|-----------------------|--|
| Add Points | To create or edit TCG points only for the selected Angle (or VPA), use the Law option. If you want to applied TCG points for all focal laws at the same time, use the Group option. |
| Angle | When using the Law option, select on which angle (VPA) the TCG point will be modified. |
| Add | Used to add a point for the TCG calibration. |
| Points | Used to set the position on the ultrasound axis. |
| Gain | Used to set the gain on the point. |
| Select | Used to select a point. You can then delete it by tapping Delete Point . |
| A % | The peak amplitude of the signal detected in gate A . |
| DA[^] | The depth in the part of the reflector producing the indication detected in gate A . |
| PA[^] | The distance on the part surface between the wedge (or probe) front face and the indication detected in gate A . |
| SA[^] | The sound path from the part entry point to the indication detected in gate A . |
| Done | Select Done and close the manage points calibration settings. Do not forget to click Accept Calibration before closing the tab. |

4.5 TOFD Calibration

4.5.1 WD & PCS

In this section, you can see and modify the **Type (WD & PCS)**, **Target 1**, **Target 2**, **Calibrate**, **Wedge Delay**, and **PCS** options. To access these options, go to **Plan & Calibrate > TOFD Calibration** (Figure 4-7 on page 116 and Table 53 on page 116).



Figure 4-7 TOFD Calibration – WD & PCS

Table 53 TOFD Calibration – WD & PCS type options

| Option | Description |
|---------------------------|--|
| Type: WD & PCS | Wedge delay & probe center separation: Used to calibrate, with one wizard, both the delay of the sound propagation within the wedge and the distance between the exit points of the two probes. Use the correct velocity to get an accurate calibration. |
| Target 1 | Used to set the nominal depth of the first target (a value of 0 can be used to target the lateral wave at the surface). |
| Target 2 | Used to set the nominal depth of the second target. |
| Calibrate | Before clicking on Calibrate , make sure that both cursors are positioned on the echoes corresponding to the targets. When both cursors are correctly positioned, the Calibrate option will adjust the Wedge Delay and PCS values. |
| Wedge Delay | Used to set the delay corresponding to the sound propagation within the wedge. This value is automatically modified when using the Calibrate option. |
| PCS | Used to set the probe center separation (PCS). This is the distance between the exit points of the two probes (only available for the TOFD group). This value is automatically modified when using the Calibrate option. |

4.5.2 Wedge Delay

In this section, you can see and modify the **Type (Wedge Delay)**, **Target 1**, **Calibrate**, and **Wedge Delay** options. To access these options, go to **Plan & Calibrate > TOFD Calibration** (Figure 4-8 on page 117 and Table 54 on page 117).

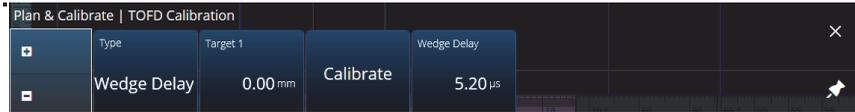


Figure 4-8 TOFD Calibration – Wedge Delay

Table 54 TOFD Calibration – Wedge Delay type options

| Option | Description |
|--------------------------|--|
| Type: Wedge Delay | Used to calibrate the delay of the sound propagation within the wedge. The PCS and velocity must be correct for the calibration to be accurate. |
| Target 1 | Used to set the nominal depth of the first target (a value of 0 can be used to target the lateral wave at the surface). |
| Calibrate | Before clicking on Calibrate , make sure that the reference cursor is positioned on the echo corresponding to the target. When the cursor is correctly positioned, the Calibrate option will adjust the Wedge Delay . |
| Wedge Delay | Used to set the delay corresponding to the sound propagation within the wedge. This value is automatically modified when using the Calibrate option. |

4.5.3 Velocity and Wedge

In this section, you can see and modify the **Type (Vel. & WD)**, **Target 1**, **Target 2**, **Calibrate**, **Wedge Delay**, and **Velocity** options. To access these options, go to **Plan & Calibrate > TOFD Calibration** (Figure 4-9 on page 118 and Table 55 on page 118).

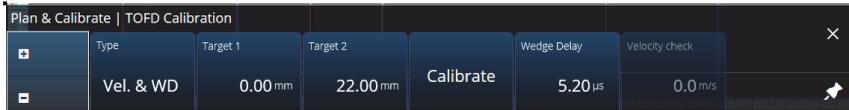


Figure 4-9 TOFD Calibration – Velocity and Wedge

Table 55 Plan & Calibrate – Velocity and Wedge options

| Option | Description |
|----------------------------|---|
| Type: Vel. & WD | Velocity and wedge delay: Used to calibrate the delay of the sound propagation within the wedge. |
| Target 1 | Used to set the nominal depth of the first target (a value of 0 can be used to target the lateral wave at the surface). |
| Target 2 | Used to set the distance (expressed in mm or in.) of the second target for the calibration. |
| Calibrate | Used to set Target 1 and accept the calibration. |
| Wedge Delay | Used to calibrate the delay corresponding to the sound propagation within the wedge. This value is automatically set after Calibrate . |
| Velocity Check | Displays the velocity in the material of the inspected part after the calibration has been confirmed. |

5. Inspection

The OmniScan MXU software interface is designed to be intuitive: you can familiarize yourself with its operation by navigating through the interface and testing various functions and buttons. For more details, see “OmniScan Interface” on page 17.

The basic inspection parameters are available in the  **UT Settings > General** submenu (see “UT Settings” on page 34).

5.1 Setting the Reference Gain

Auto (80 %) reference gain

The suggested, default reference gain value can be selected by tapping and holding the **Gain** area of the screen, and then selecting **Auto (80 %)**. This setting adjusts the gain so that the reflector signal inside gate A reaches the reference level of 80 % of the full-screen height.

| |
|-------------|
| NOTE |
|-------------|

The default reference amplitude value is 80 %. To modify this value, select  **UT Settings > Advanced > Ref. Amplitude**, and then enter the new reference value.

To set the reference gain

- ◆ Select **UT Settings > Advanced > Reference dB > ON** to activate the reference gain.

5.2 Setting Up for an Inspection Using an Encoder

NOTE

Before setting up for an inspection that uses encoders, an X or XY encoder must be properly connected to the I/O connector.

To set up for an inspection using an encoder

- ◆ In the **Scan > Inspection > Type** list, choose the type of scan to be used to scan the part, and choose the encoder that is to be used for the scan axis. The other encoder is automatically linked to the index axis. Select **Scan > Inspection > Encoders** to access the encoder setup screen, and set the encoder parameters according to your specifications (Figure 5-1 on page 120).

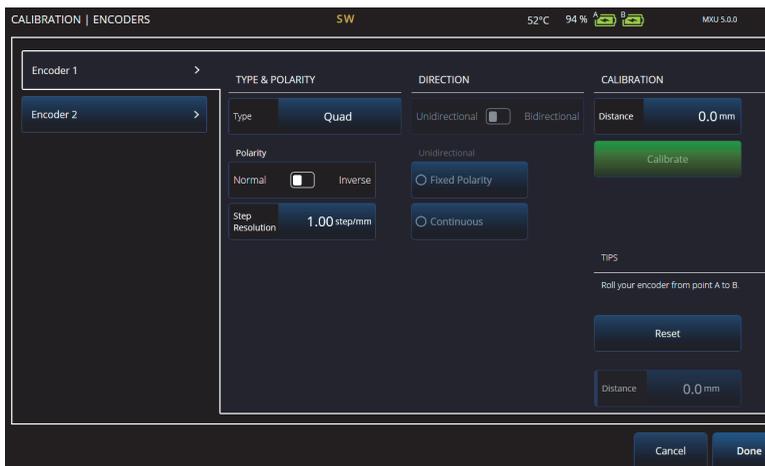


Figure 5-1 Encoders setup

If necessary, calibrate the encoder using the **Encoder Calibration** tool available on the right side of the encoder setup screen.

The scan area parameters are available in the **Scan > Area** menu.

When you are ready to scan, press the Play key (▶).

5.3 Configuring the Indication Table

The indication table displays detailed information on reflectors identified and recorded during an inspection. This information is used to create an inspection report.

To configure the indication table

1. Add an indication to the table by first setting your layout and cursors on an indication (in Analysis mode), and then tapping **Add Indication** (Figure 5-2 on page 121 on the left). Repeat for every indication you want to add.



Figure 5-2 Indication Table Manager window

2. Tap **File > Indication Table Manager** to access the indication table (Figure 5-2 on page 121 on the right).
3. Move through the list to review indications, add reference numbers and comments, and delete indications as required.

Table 56 Indication Table Manager options

| Item Number | Description |
|--------------------|--------------------|
| 1 | Reference number |
| 2 | Comments |
| 3 | Delete |
| 4 | Scrolling controls |

6. Managing Files, Probes, Wedges, and Reports

Inspection setups and data are kept and organized using files, and presented in reports. You can use the **File** menu to access multiple file parameters, the **Report** tool, and the **File Manager** (Figure 6-1 on page 123).

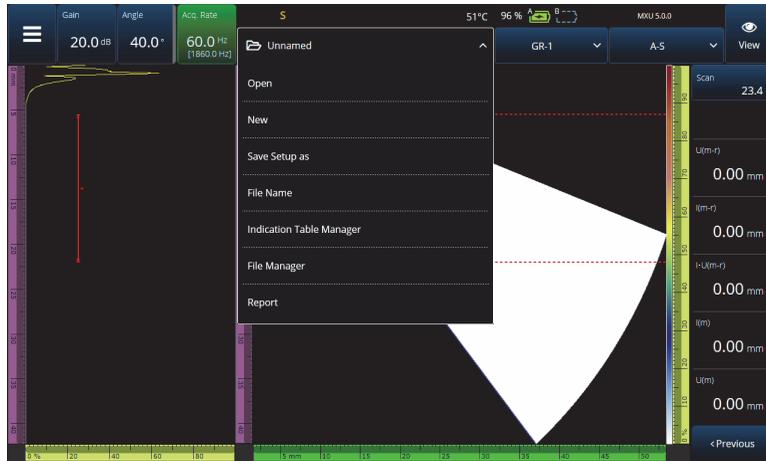


Figure 6-1 File menu

6.1 Saving, Naming, and Opening Files

It is recommended that you regularly save your setup and data files to prevent accidental data loss.

- To save your setup file, select **Save Setup As** on the **File** menu (Figure 6-1 on page 123).

- To name your data file, select **File Name** on the **File** menu. You can subsequently save the file by pressing the Save key (⏏) located just above the Power key (⏻).
- To open a file, select **Open** on the **File** menu (Figure 6-1 on page 123), and then choose the directory in which the file is located. You can filter to display only the type of file you want to browse, and preview the selected file (Figure 6-2 on page 124).

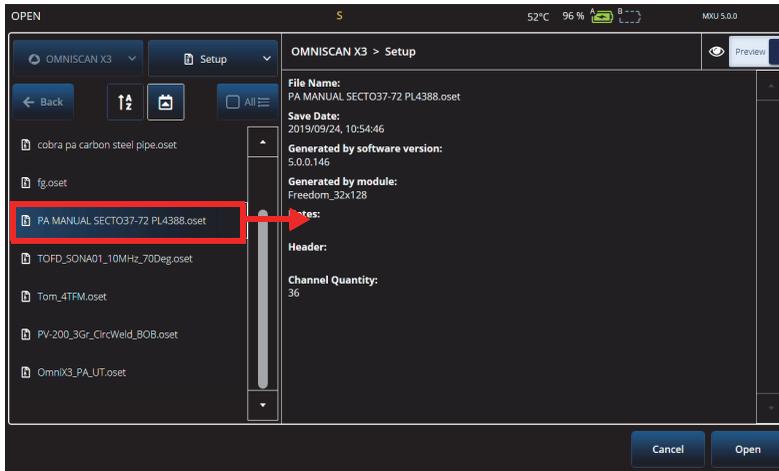


Figure 6-2 Open menu

6.2 Using the File Manager

To access various options for managing your files, select **File Manager** on the **File** menu (Figure 6-3 on page 125).

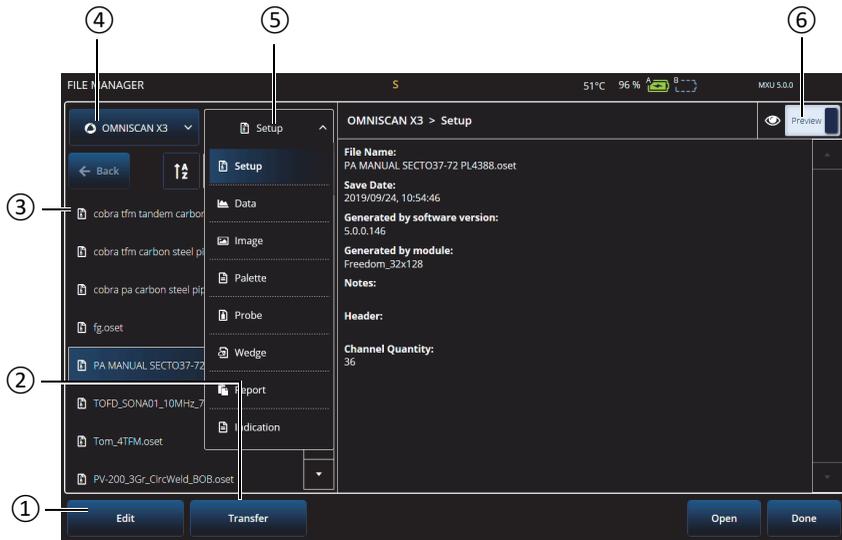


Figure 6-3 File Manager window options

Table 57 File Manager options

| Item Number | Description |
|-------------|--|
| 1 | Rename or delete files or folders. |
| 2 | Transfer files and folders from one drive to another. |
| 3 | Navigate to folders on the selected drive. |
| 4 | Select the drive: OmniScan X3 hard drive, USB, SD card, or Olympus Scientific Cloud. |
| 5 | Select (filter) the desired file type: setup, data, image, report, etc. |
| 6 | Preview your files or set the parameters of your edits and transfers. |

6.3 Probe & Wedge Manager

Use the **Probe & Wedge Manager** if you want to create custom probe and wedge configurations that are not in the default list provided by Olympus (Figure 6-4 on page 126).

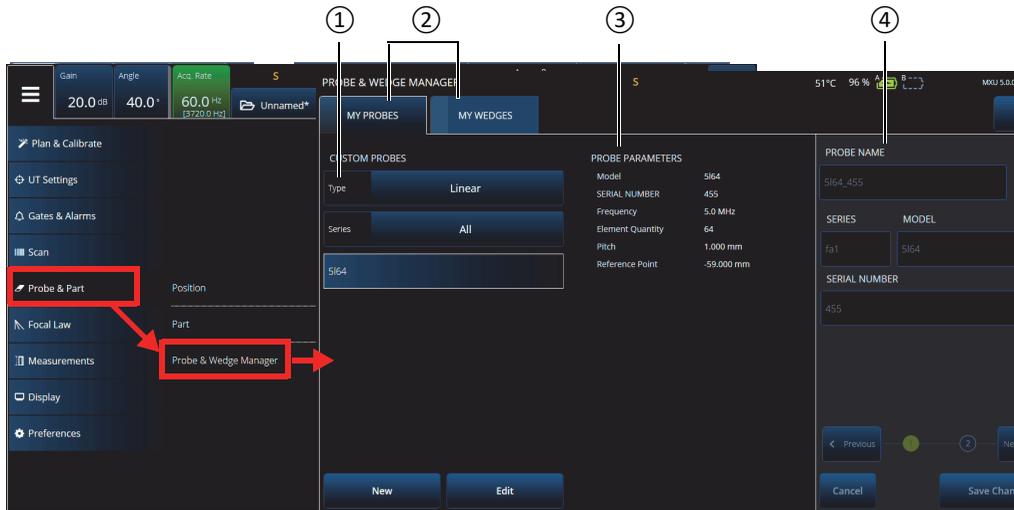


Figure 6-4 Probe & Wedge Manager window

Table 58 Probe & Wedge Manager window options

| Item Number | Description |
|-------------|---|
| 1 | Select the probe or wedge type. |
| 2 | Define either a custom probe or a custom wedge. |
| 3 | Overview of the characteristics |
| 4 | Edit the characteristics. |

IMPORTANT

By default, the OmniScan MXU software establishes the phased array (PA) probe's **Reference Point** at the position of the first element. To set the **Reference Point** at the front edge of the probe, enter the distance between the front edge of the probe and the position of the first element. The value must be negative.

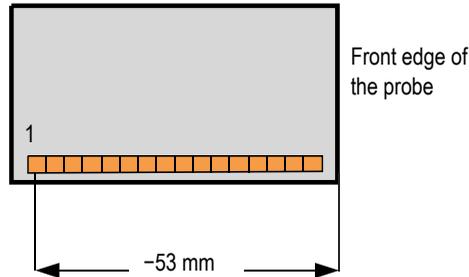


Figure 6-5 The PA probe reference point measurement

IMPORTANT

The wedge's **Reference Point** is for the UT group only. It is used to set the probe and wedge assembly reference point, which is the distance between the front of the wedge and the beam exit point (Figure 6-6 on page 128). The beam exit point is usually marked by a line on the wedge.

This value is negative because the OmniScan MXU software establishes the wedge **Reference Point** by default at the beam exit point. To place the **Reference Point** at the front edge of the wedge, you must measure the distance between the front edge of the wedge and the beam exit point, and then subtract it from the default 0-reference point (UT group only).

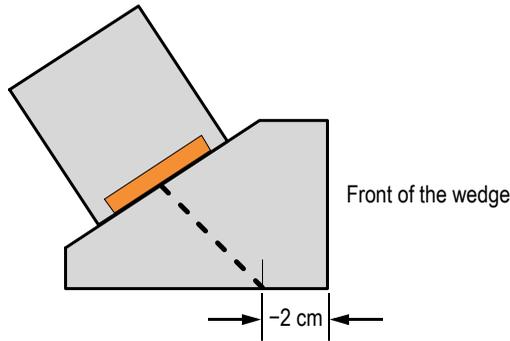


Figure 6-6 The UT wedge reference point measurement

IMPORTANT

By default, the OmniScan MXU software establishes the phased array wedge's **Primary Offset** point at the position of the first element. To set this reference point at the front edge of the wedge, in **Primary Offset**, enter the distance between the front edge of the wedge and the position of the first element. The value must be negative (Figure 6-7 on page 128).

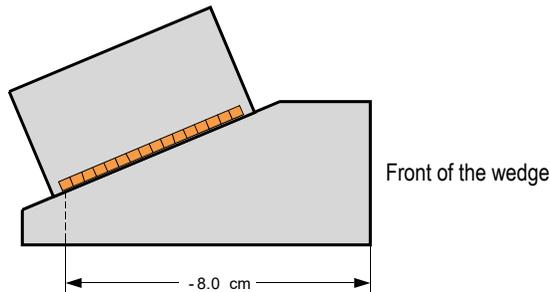


Figure 6-7 The primary offset measurement

IMPORTANT

A **Secondary offset** of 0 indicates that the probe is centered on the wedge on the secondary axis. If the probe is not centered on the wedge, enter the appropriate value (Figure 6-8 on page 129).

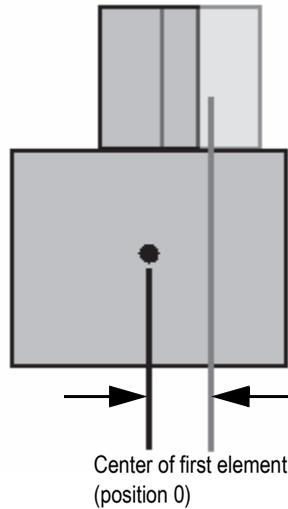


Figure 6-8 The secondary offset

6.4 Reports

In the **File** menu, select **Generate Report** to configure and print reports using the **Report Manager** (Figure 6-9 on page 130).

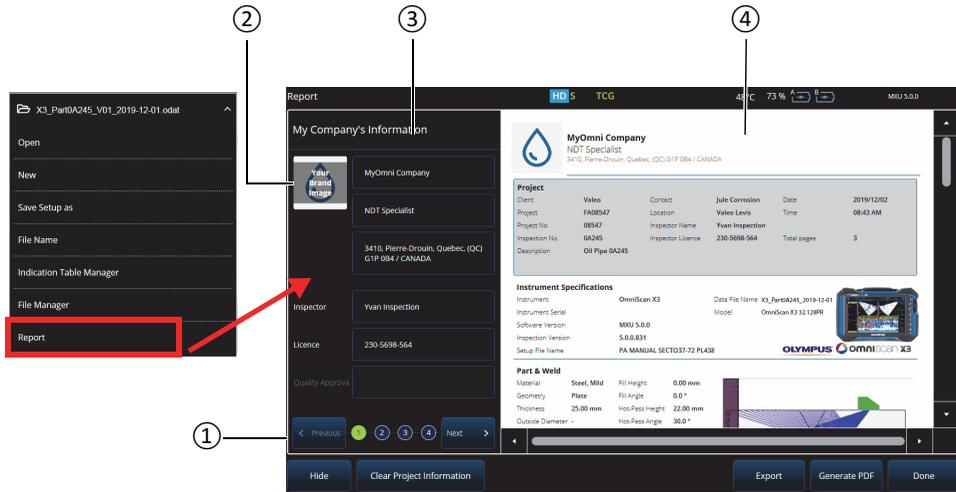


Figure 6-9 Report Manager window

Table 59 Report Manager window options

| Item Number | Description |
|-------------|---|
| 1 | Scroll multiple configuration pages. |
| 2 | Add your company logo or other images. |
| 3 | Edit the fields in this section to configure your report. |
| 4 | Report preview section |

7. Total Focusing Method (TFM)

You can set up and use a TFM group on the OmniScan X3 flaw detector.

To set up a TFM law configuration

1. Select  >  **Wizard (Plan & Calibrate)** > **Scan Plan**.
2. Set up the **Part & Weld**, and the **Probes & Wedges**.
3. On the **Groups** tab, select **Law Config.** > **TFM**, and complete your desired TFM law configuration (Figure 7-1 on page 131).

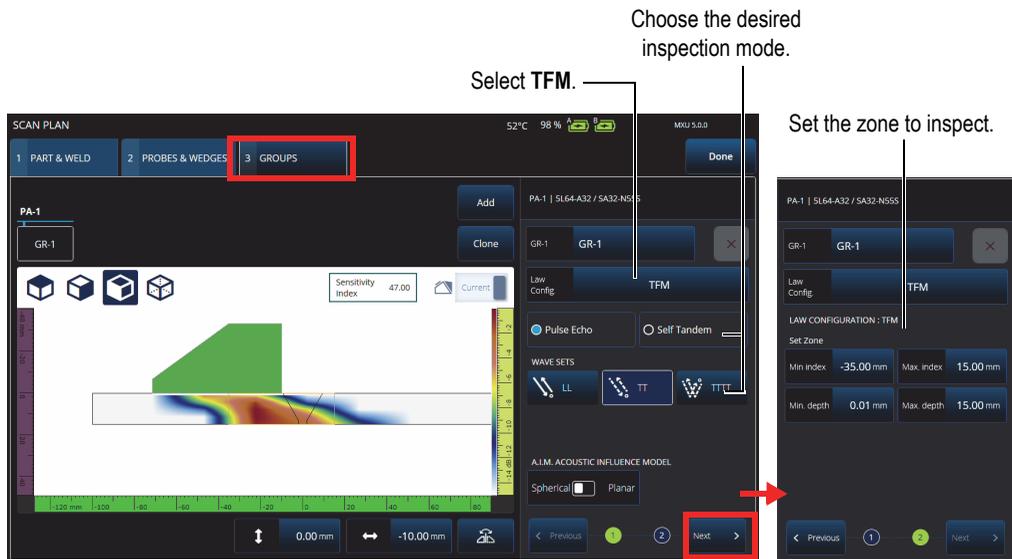


Figure 7-1 TFM on the Groups tab

7.1 Acoustic Influence Map (AIM)

The Acoustic Influence Map (AIM) modeling tool can help you select the correct propagation mode (or wave set) for a given flaw. On the OmniScan X3 flaw detector, you can use this tool to create a model that represents an amplitude map in the material. Each pixel of the AIM represents the theoretical amplitude that could be obtained if a reflector was at this position. The map is coded using different colors that each represent a specific 3 dB range.

For example, the red color indicates that the ultrasonic response is very good and varies between 0 and -3 dB with respect to the maximum amplitude. Orange indicates a range from -3 dB to -6 dB, yellow from -6 dB to -9 dB, etc. When configuring the AIM model, you can choose either a **Spherical** (volumetric) type flaw, such as porosity, or a **Planar** type flaw, such as a crack (Figure 7-2 on page 132).

When you adjust the defect type, the AIM model is automatically updated to show the predicted amplitude response of the selected wave set (propagation mode) for that flaw. This will help you select the wave set that is best suited for your inspection.



Figure 7-2 AIM Acoustic Influence Map tool

7.2 TFM Settings

After you exit the **Scan Plan** wizard menu, the TFM settings have replaced the **UT Settings** under the Main menu  >  **TFM Settings**. Figure 7-3 on page 133 shows the **Advanced** parameters under  **TFM Settings**.

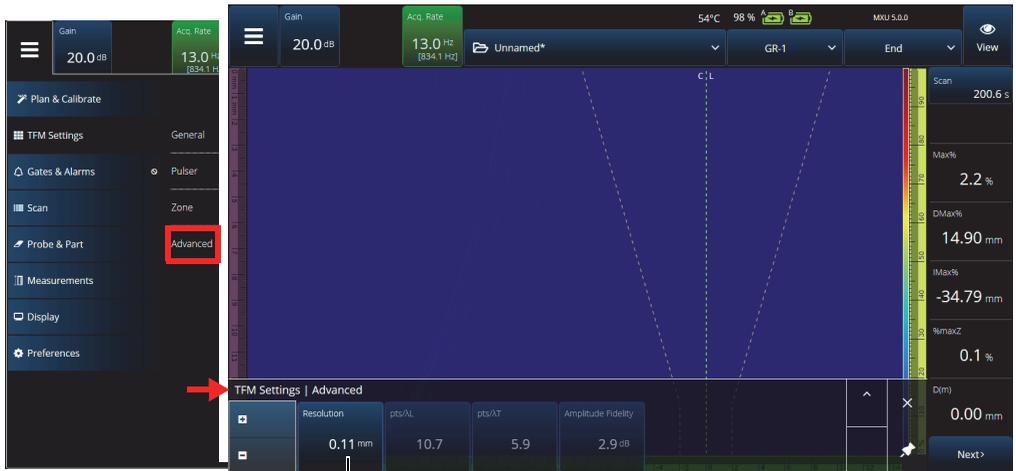


Figure 7-3 TFM Settings > Advanced parameters

See “TFM Settings” on page 45 for more information on TFM settings.

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