TOPAZ™

TOPAZ is one of the most efficient and versatile non-destructive testing (NDT) instrument. Simply brilliant!

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1. PaintBrush Scanner Support

NDT PaintBrush™ is a hand held scanner with dual encoder design that allows free motion on a scan-index inspection canvas. Not bounded by single axis motion, it allows you to freely paint over the surface to examine for enhance wall thickness measurements. *NDT PaintBrush* features were integrated to the TOPAZ™ and now available in UltraVision through the *touch* interface.

To create an inspection configuration with your *PaintBrush* scanner:

1. Start-up your TOPAZ
2. Connect the encoder feedback cable of the *PaintBrush* scanner to your TOPAZ; A window will pop-up showing the detection process.
3. Define your specimen;
4. To define your *PaintBrush* inspection sequence, go to the **Mechanical** menu:
   a. In the **Sequence** tab, select PaintBrush;
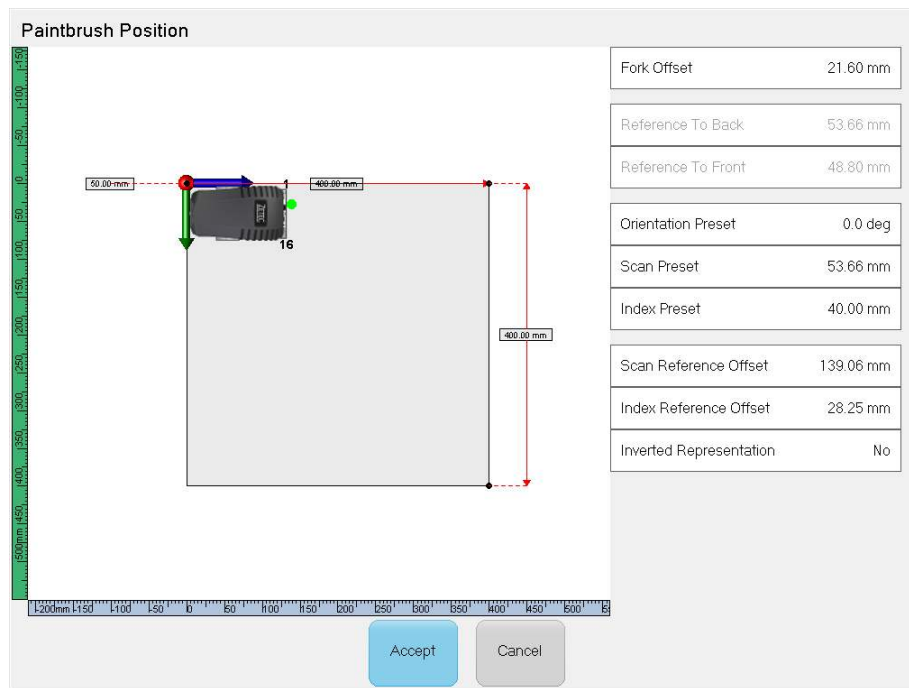
Figure 1-1 PaintBrush Sequence Selection
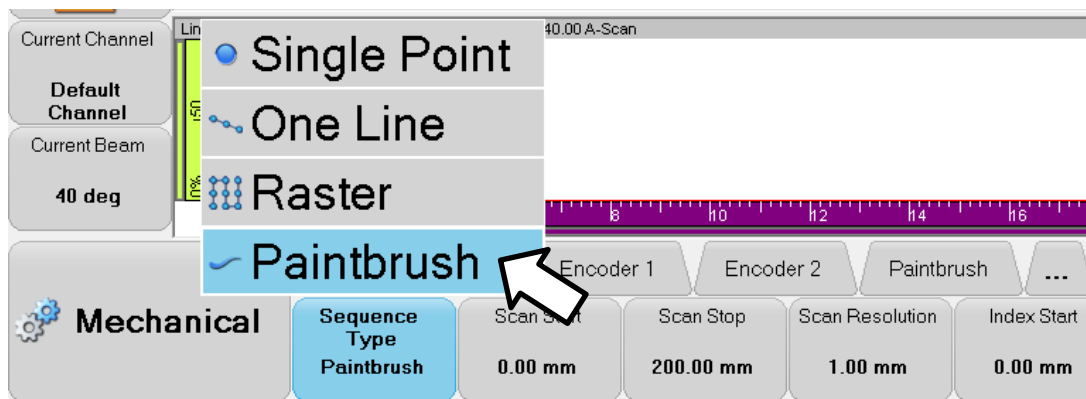
   b. For the **Scan** and **Index**-axis, define the **Start**, **Stop** and **Resolution** of the inspection sequence;
   c. In the **PaintBrush** tab, click **Position**

   The **PaintBrush Position** window appears.

Figure 1-2 PaintBrush Position Window

d. In the **PaintBrush Position** window (refer to **Figure 1-3**):
    i. Define the **Fork Offset** if different than default.
        When PaintBrush is connected, the Fork Offset value is set automatically. The **Fork Offset** value is the length of the probe holder (from the front of the scanner to the rotation point of the wedge).
    ii. Define the **Orientation Preset**.
        Orientation of the scanner according to the **scan** and **index** axes
    iii. Define the Scan **Preset**.
        Distance between the scanner reference point and the origin of **scan**/**index** coordinate system along the **scan** axis.
    iv. Define the Index **Preset**.
        Distance between the scanner reference point and the origin of **scan**/**index** coordinate system along the **index** axis.
    v. You can also move the PaintBrush on the display by tapping on any corner or rotate it by tapping directly on it.

Figure 1-3 PaintBrush Position - Parameters Definition

	It is important that your defined positioning is exactly where you will start your inspection for your data to be properly mapped on your specimen. **Scan Reference Offset** and **Index Reference Offset** are automatically defined from the values above. These values are defined per the probe/wedge assembly reference point (green dot on the front of the scanner).
IMPORTANT	

      e. Click **Accept** once the start location and orientation are correctly defined.

5. Complete the definition of your inspection configuration.

For more information see your *PaintBrush* scanner user manual.

2. Auto-Crossing Gates

Gates are used to extract information from an A-scan signal in order to create C-scan data, turn ON or OFF an alarm signal, obtain information (signal amplitude, location...) or set a signal synchronization. The trigger parameter allows you to define if the detection gate data will take into account the crossing threshold location (**Crossing**) or the maximum peak location (**Maximum**) within the gate.

Two new triggering modes have now been added: **Crossing (-6dB)** and **Crossing (-12dB)**.

In these two modes, the detection threshold changes according to the maximum amplitude of the signal within the gate. Threshold is automatically adjusted at -6dB or -12dB from the live maximum signal amplitude.

This feature is useful to compensate signal response variations due to uneven surfaces caused by corrosion or pitting.

To implement auto-crossing gates:

1. In the **UT Settings** menu, go in the **Gates** tab.

Figure 2-1 UT Settings menu - Gates Tab
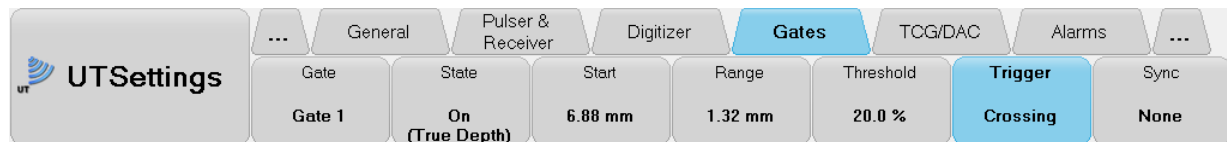
2. Click **Trigger**.
3. Select **Crossing (-6dB)**.
   To adjust the automatic threshold setting to -6dB from the maximum signal amplitude.
   OR
   Select **Crossing (-12dB)**.
   To adjust the automatic threshold setting to -12dB from the maximum signal amplitude.

Your detection is now set in auto-crossing mode.

3. Probe Position Marker

The probe position marker is a live cursor that displays the probe's position in real time during the inspection. It provides a reliable and constant visual feedback for encoded scanning sequences and is the perfect tool to ensure complete examination coverage when using your *PaintBrush™* scanner.

The probe cursor is displayed as a pink marker in your volumetric views (Top, Side and End).

Figure 3-1 Probe Cursor on VC-Top (C) Display for a Focal Law at 60°
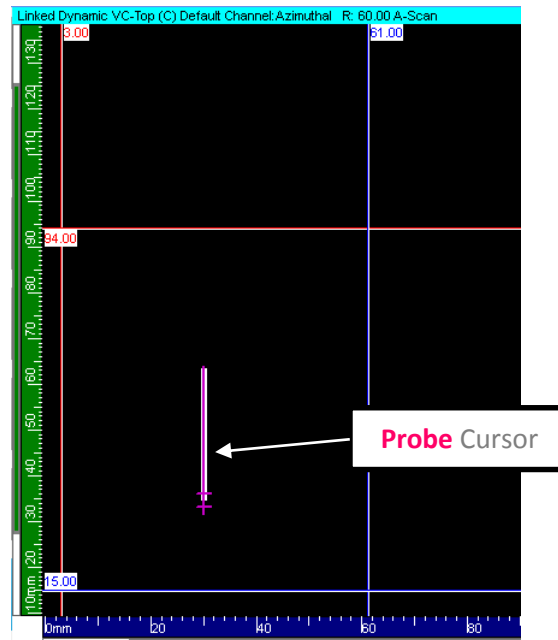
The orientation and length of the **Probe** cursor, in the displayed view, is computed based on the selected focal law beam orientation (refracted and skew angles). By default, the probe cursor is always displayed in your Top, Side and End views.

To change the **Probe** cursor properties:

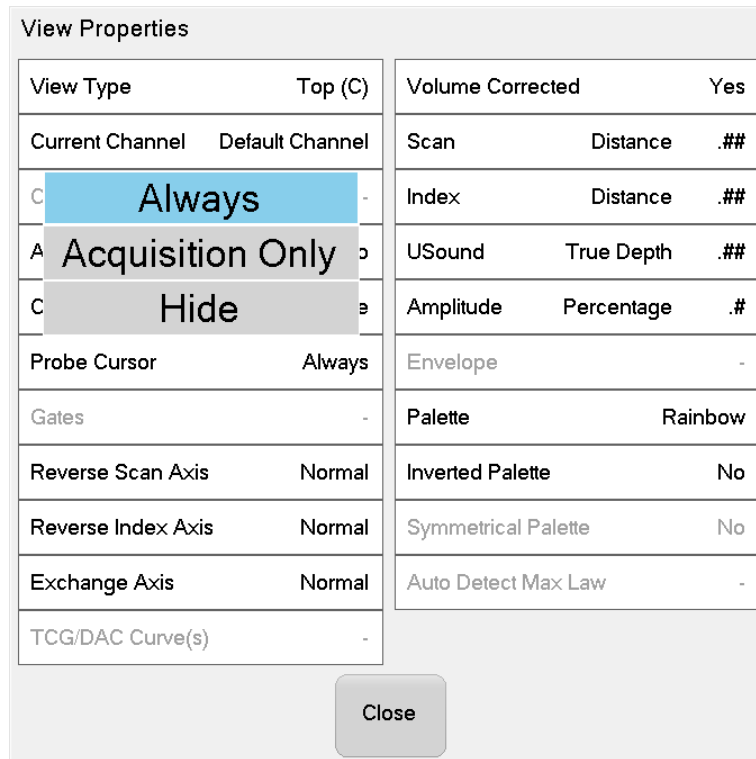1. Click on the desired view (Top, Side or End) to display the View Settings toolbar.

2. Click **View Properties**.

   The **View Properties** window appears

3. Select **Probe Cursor** to display the different parameter options.

Figure 3-2 View Properties Window - Probe Cursor Options

4. Select **Always**.
   To always display the **Probe** cursor (in setup and acquisition mode).
   OR
   Select **Acquisition Only**.
   To display the **Probe** cursor only during data acquisition (acquisition mode).
   OR
   Select **Hide**.
   To hide the **Probe** cursor.

You can now adjust the **Probe** cursor settings to better fit your application.

4. Interpolation for Volumetric Merge

The volumetric **Merge** function now includes the use of sectorial interpolation, which fills the empty spaces in merged views. Those empty spaces are a typical result when performing volumetric merges of data acquired with azimuthal focal laws (multiple refracted angles).

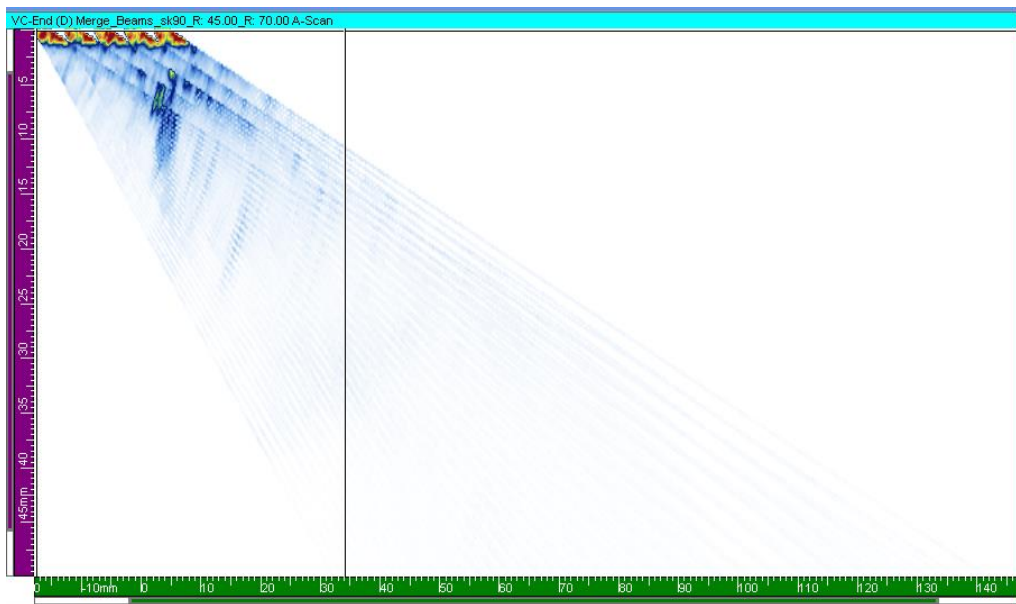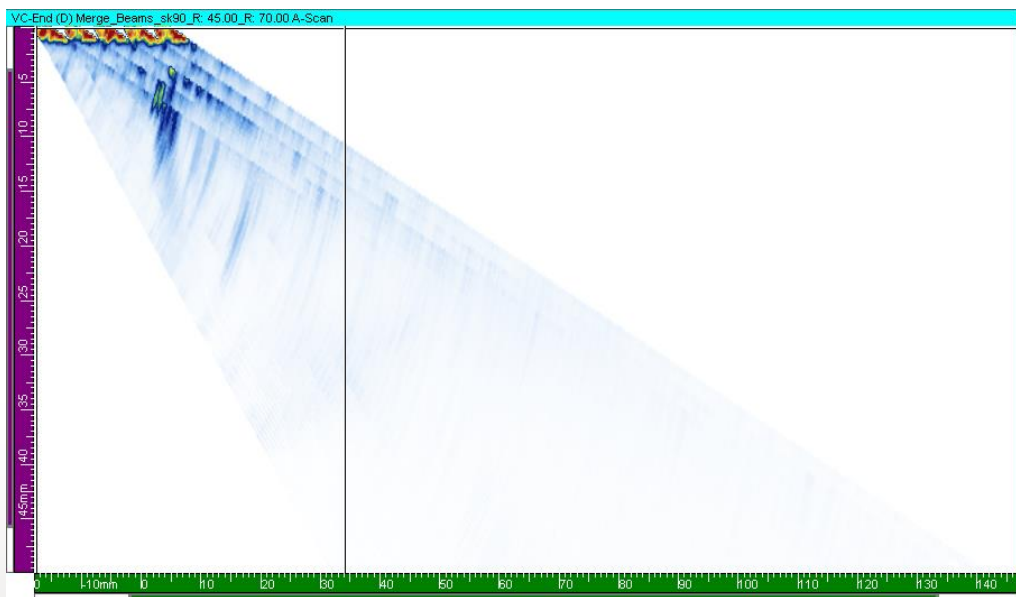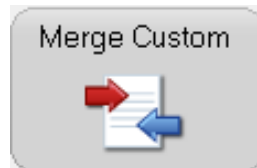*Figure 4-1 Volumetric Merge without Interpolation*

Figure 4-2 Volumetric Merge with Interpolation

This interpolation is applied by default to the volumetric merge process.

To modify the use of the interpolation option:

1. In the **Analysis** menu, go to **Processing** tab.
2. Click **Merge Custom**.

The **Merge Custom** window appears.

Figure 4-3 Merge Custom Window

3. Click Use Interpolation to select:

   Yes
   To use the interpolation during the volumetric merge processing.
   OR
   No
   To disable the interpolation during the volumetric merge processing.

5. Compound Scan

Compound scanning is a combination of azimuthal and linear focal laws in one channel configuration. The end result is to create a sweep that has a greater coverage than what traditional linear or azimuthal scans are able to offer. With compound focal laws, the refracted angle of the beam changes from one aperture to the next within your phased array transducer.

The following figure shows an example of compound scanning.

Figure 5-1 Compound Scan Example

Aperture Motion
(Linear Scanning)

70°

40°

Refracted Angle Sweep
(Azimuthal Scanning)
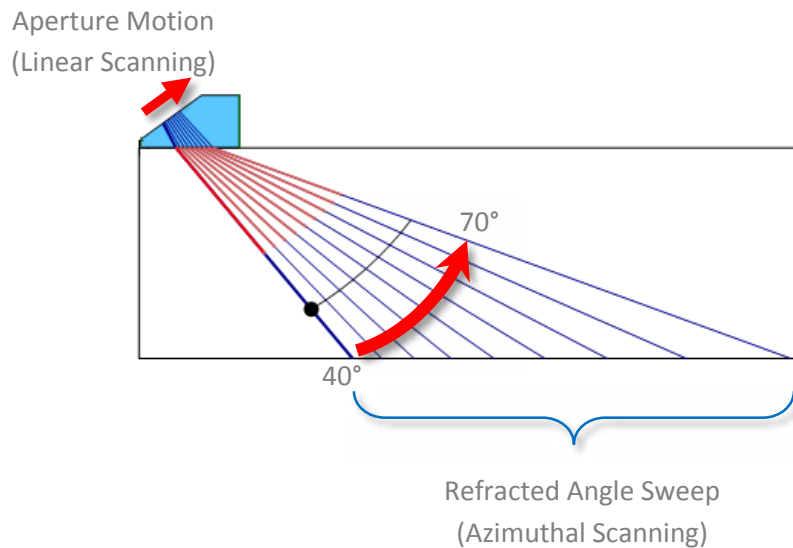
As illustrated, the desired refracted angles are distributed on the different apertures defined by the linear focal laws parameters and therefore defines the angular resolution between each beam.

To define a compound scan:

1. Define your specimen (see **Specimen** menu).
2. In the Channel menu, go to the **Configuration** tab.
3. Ensure that the right probe and wedge combination is selected.
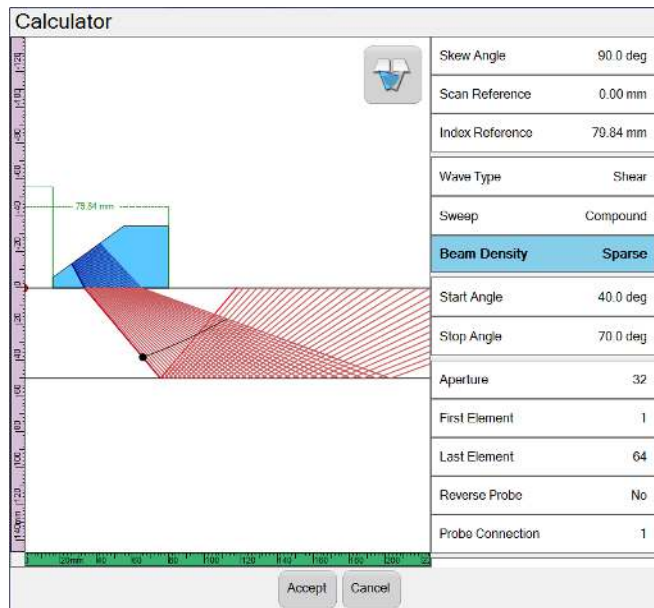4. Click **Calculator**.

5. In the **Calculator** Window, define your **Skew Angle**, **Scan Reference**, **Index Reference** and **Wave Type**.
6. Click **Sweep** and select **Compound**.

Figure 5-2 Setting Sweep Parameter to Compound
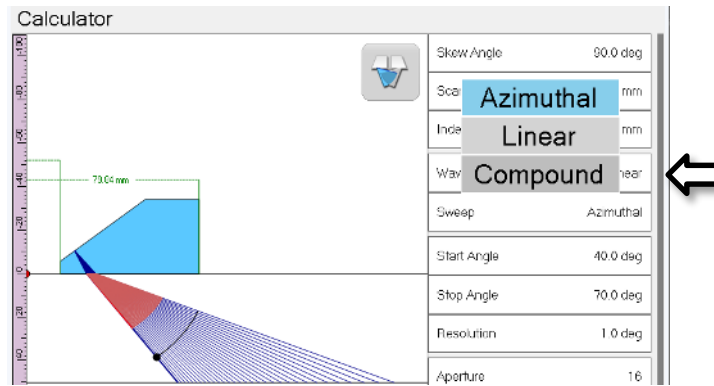
The parameter list of the Calculator window is adjusted.

Figure 5-3 Calculator Window for Compound Focal Laws (Sparse)

7. Define **Beam Density**:

   Sparse

   (See Figure 5-3) Each law is an increment on the linear sweep and on the angle sweep. This means that the exit point moves and the refracted angle changes between each laws. The angle range, defined by **Start Angle** and **Stop Angle**, is evenly distributed over all exit points. Therefore the angular resolution is automatically set by dividing the angular range by the total number of apertures.

   Motion of the aperture is defined by the **Aperture**, **First Element** and **Last Element** parameters.

OR
Dense
Each law is an increment on the linear sweep or on the angle sweep in alternation. This means that the exit point move or the refracted angle change between each laws. This creates a sweep that is denser than the sparse compound sweep. It also provides a sweep with density similar or better than traditional Azimuthal or linear sweep. The total number of focal laws is two times higher when **Sparse**.
Motion of the aperture is defined by the **Aperture**, **First Element** and **Last Element** parameters.

Figure 5-4 Calculator Window for Compound Focal Laws (Dense)
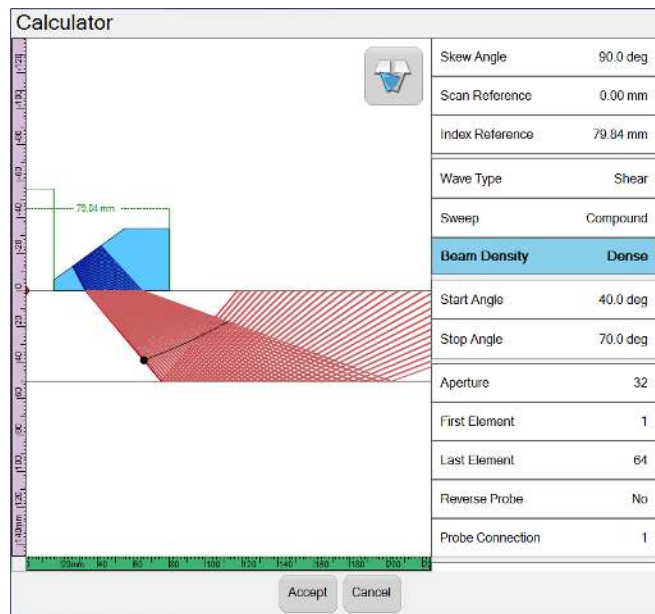
8. Set all others **Calculator** parameters.
9. Click **Accept**.

Focal law specification example for **Compound** sweep:

Start Angle	40 deg.
Stop Angle	70 deg.
Aperture	16
First Element	1
Last Element	19

When **Beam Density** is set to **Sparse**, the focal laws are defined as follows:

Focal Law Id	Aperture	Refracted Angle
1	1 to 16	40.00°
2	2 to 17	50.00°
3	3 to 18	60.00°
4	4 to 19	70.00°

When **Beam Density** is set to **Dense**, the focal laws are defined as follows:

Focal Law Id	Aperture	Refracted Angle
1	1 to 16	40.00°
2	1 to 16	47.50°
3	2 to 17	47.50°
4	2 to 17	55.00°
5	3 to 18	55.00°
6	3 to 18	62.50°
7	4 to 19	62.50°
8	4 to 19	70.00°

6. Path Correction for Pitch-&-Catch Configuration

When using a Pitch-&-Catch inspection configuration with 0 degree linear sweep, the ultrasound true depth scale has now a correction that takes into account your probe separation and probe configuration (wedge and roof angle, etc.). This new ultrasound axis scale, **True Depth PC**, is available for the A-scan, VC-Side (B) and VC-End(D) display.

This feature is available for linear focal laws in pitch-&-catch configuration with a 0°LW inspection angle.

To display the **True Depth PC** ruler:

1. Click on the desired view (Top, Side or End) to display the View Settings toolbar.

2. Click **View Properties**.

   The **View Properties** window appears

3. Click **Usound** and Select **True Depth PC**.
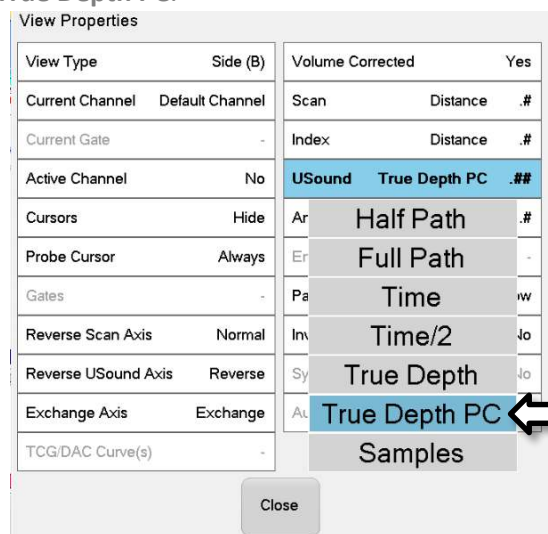
4. Click **Close**.
   The selected view's ultrasound axis is now set to **True Depth PC**.
   The **True Depth PC** ruler is **purple** and the scale reflects the depth correction.

Figure 6-1 True Depth PC Ruler Example
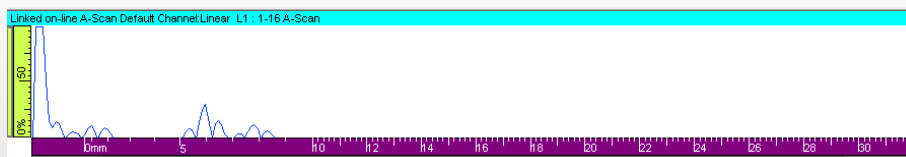
7. TCG Auto Calibration

The **TCG Auto** calibration allows you to create multiple TCG points in one single scan, using one detection gate with the appropriate start and range to cover all reflectors.

To create a TCG using the **TCG Auto** feature:

1. Go to the **Calibration** menu and select **TCG Auto**.

   The **TCG Auto Calibration** menu appears.

2. In **Parameters** tab, set:
   a. **Reflector Type**
   b. Detection gate **Threshold**
   c. Signal amplitude **Target**
   d. Verification **Tolerance** for signal amplitude
   e. **Detection Blanking**
      It defines the minimum distance between the reflectors in true depth.
3. In **Calibrate** tab, set:
   a. Set Sector
   b. Set **Start** and **Range** of the detection gate.
      Ensure that these values allows the detection gate to cover all reflectors
4. Scan the reflectors by moving your probe over your calibration specimen.
5. Click **Compute**.

All your TCG point are now created.

*Figure 7-1 TCG Auto Calibration*
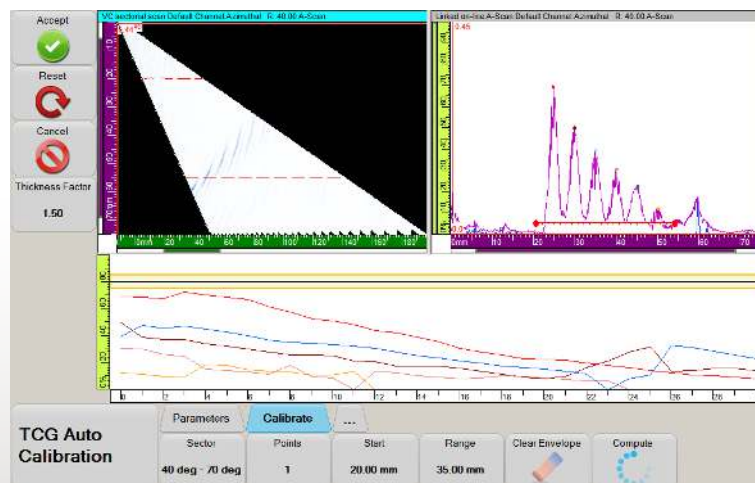
8. C-Scan Stitching

When performing the examination of large surfaces, it is sometimes useful to divide your zone coverage in several inspection patches, i.e. creating multiple data files, for a more efficient site deployment. When acquiring C-scan data you can merge those signals into one consolidated file and easily reconstruct the entire inspection, i.e. creating a complete mapping of the examined surface.

The **C-Scan Stitching** feature allows you to adjust the position of the data on the surface and correct angular misalignment that might have occurred during the scanning process.

To perform **C-Scan Stitching**:

1. Perform a **File Merge**:
    a. In the **Analysis** menu, click **File Merger**.
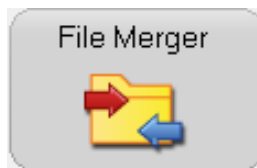
    b. In the **File to merge** window, click **Add**.
    c. In the **Select file to merge** window, identify the files to merge.
    d. Select one file and click **Accept**.
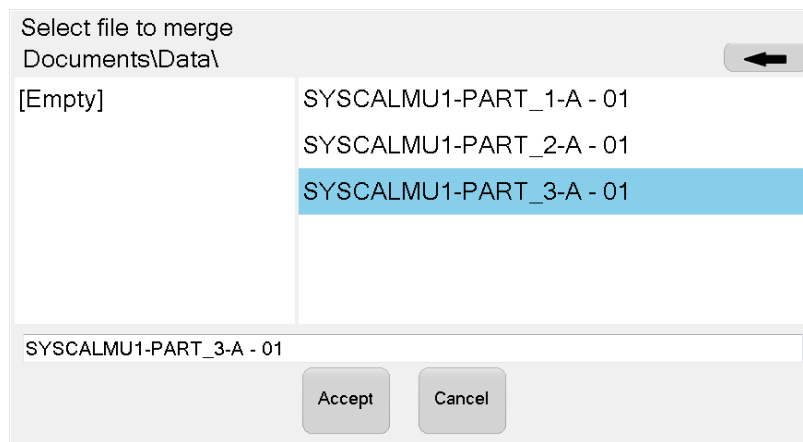
    e. Repeat steps 1.b to 1.d until all relevant files are selected.
    f. In the **File to merge** window, review the selected file names.
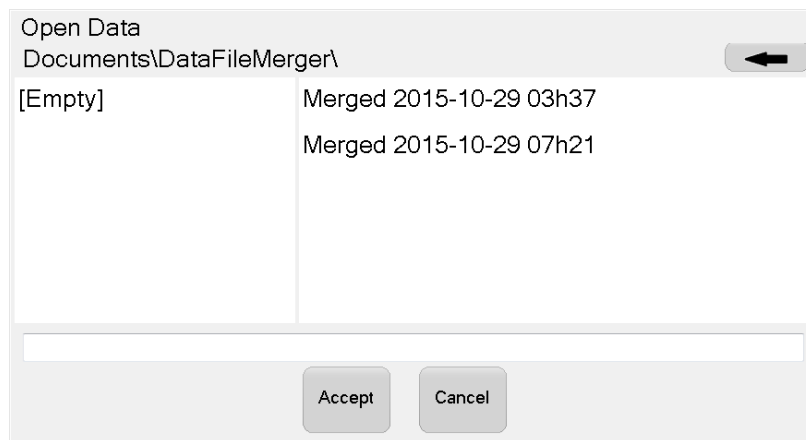   g. Click **Merge**.

h. In the **File Merger** window, enter a name for the merged data file.
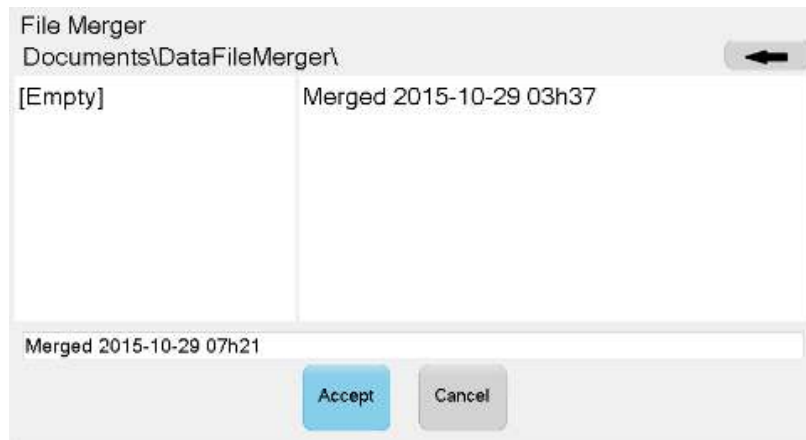

i. Click **Accept**.
   The merged file is now created with the different original files being divided in different channels in the new file. The next step is to perform the stitching process.
2. In the **File** menu, click **Open Data**.
3. In the Open Data window, browse to find the **DataFileMerger** directory.


4. Select the appropriate merged file and click **Accept**.
5. In the **Analysis** menu, click **C-Scan Stitching**.
   The **C-Scan Stitching** window appears.

Figure 8-1 C-Scan Stitching Window
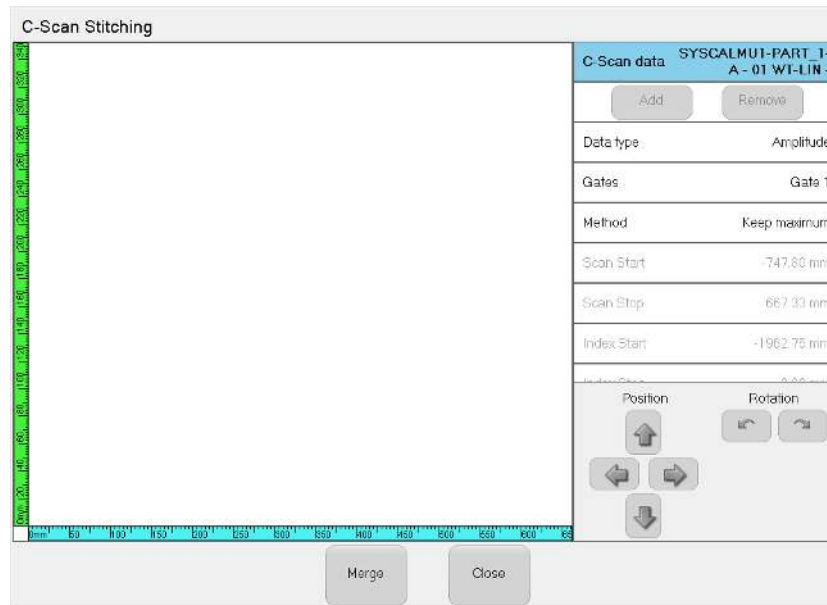
6. On the right side of the window, the **C-Scan data** shows the available c-scan data channels available in the merged file. Select a c-scan data channel to include in the stitching.
7. For the selected data, define the **Data type** (**Amplitude** or **Position**).
8. In **Gates**, select the detection gate of the C-scan data you wish to stitch.
9. In **Method**, define if you want to **Keep minimum** or **Keep maximum** values of the c-scan data in the case of data overlap.
10. Click **Add**.
    The C-scan data is now added to the c-scan display on the left.

Figure 8-2 C-Scan Stitching Window with C-Scan Data Added
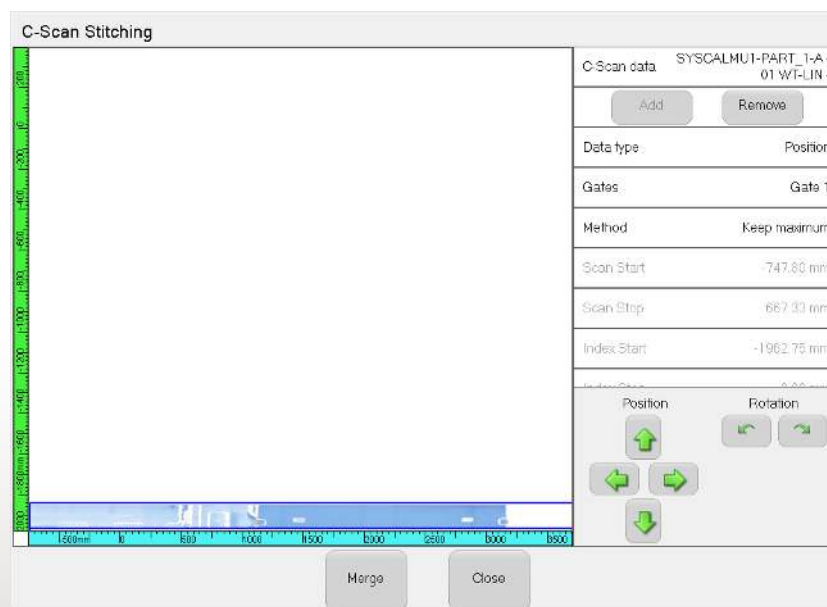
To visualize the data, you might have to move the display by clicking and dragging (up/down and/or left/right) and zoom/unzoom the display.

The **Scan Start**, **Scan Stop, Index Start** and **Index Stop** show the actual location of the data.

11. You can now modify the location and orientation of the selected c-scan data.
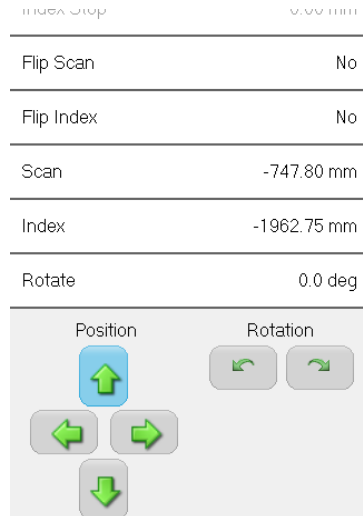
a. Specify if you need to flip the data along the scan-axis or index-axis (**Flip Scan** and **Flip Index**).
b. Change the start location of the selected c-scan along the scan and index axes by modify the **Scan** and **Index** parameters.
   To modify the location of the data, you can use the **Position** direction-pad to move the data up/down and left/right or use your finger to move the selected c-scan on the display.

c. Change the orientation of the c-scan data by modifying the **Rotate** parameter (in degrees).
   To modify the orientation of the data, you can use the Rotation pad to turn the selected data clockwise or counter-clockwise.
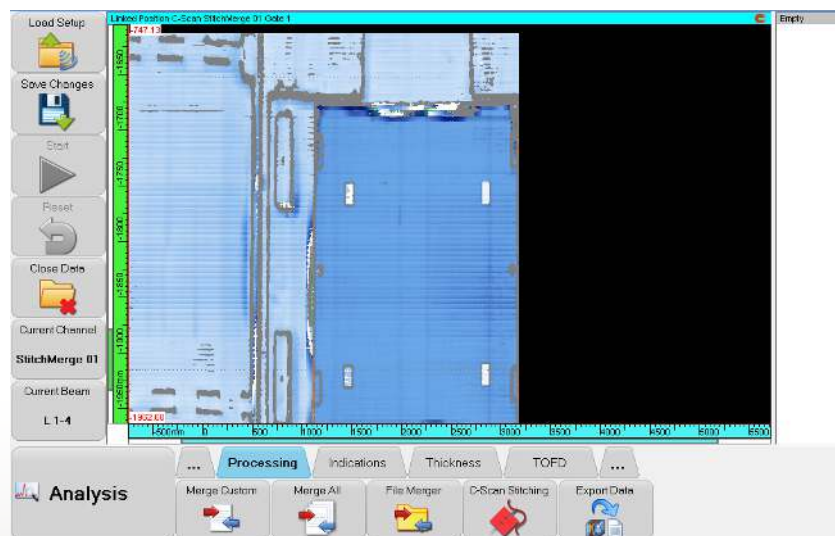
Figure 8-3 C-Scan Data Rotation Example
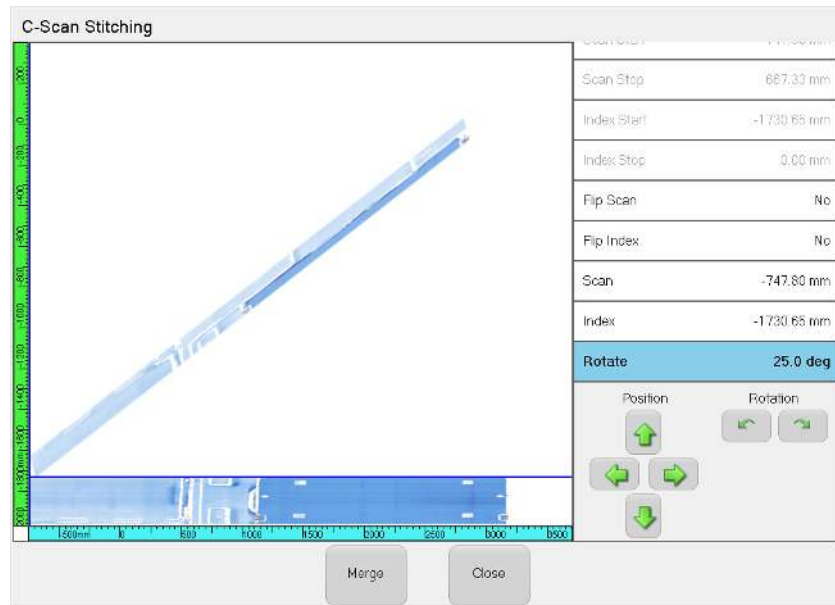
12. Repeat steps 6 to 11 for all c-scan channels to be stitched.
13. Click **Merge**.
14. The **New stitching name** window appears, enter a name for the new channel with the stitched data.
15. Click **Accept**.
    Your C-scan data is now merged.

*Figure 8-4 C-scan Stitching Result Example*

The resulting data is saved in the extension file (.UVExtension).

9. Wedge Definition Mode

When defining your wedge characteristics, you now have two different modes available:

- **Legacy**:
  This mode allows you to define the height of the first element using the **back left corner** of the wedge as the reference. Historically, this mode was the one used in previous software release.

Figure 9-1 Legacy Wedge Definition Example - Height of First Element
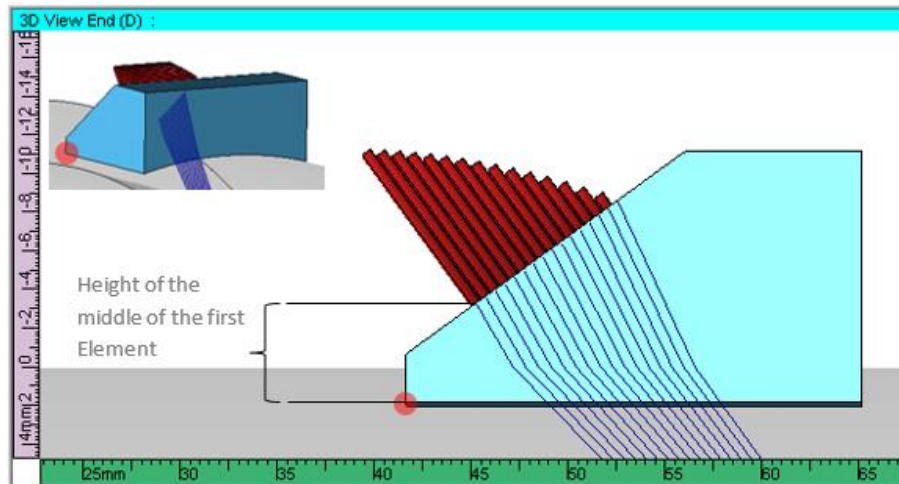
- **Default**:
  This new mode allows you to define the height of the first element using **the middle of the wedge front edge** as the reference.

Figure 9-2 Default Wedge Definition Example - Height of First Element
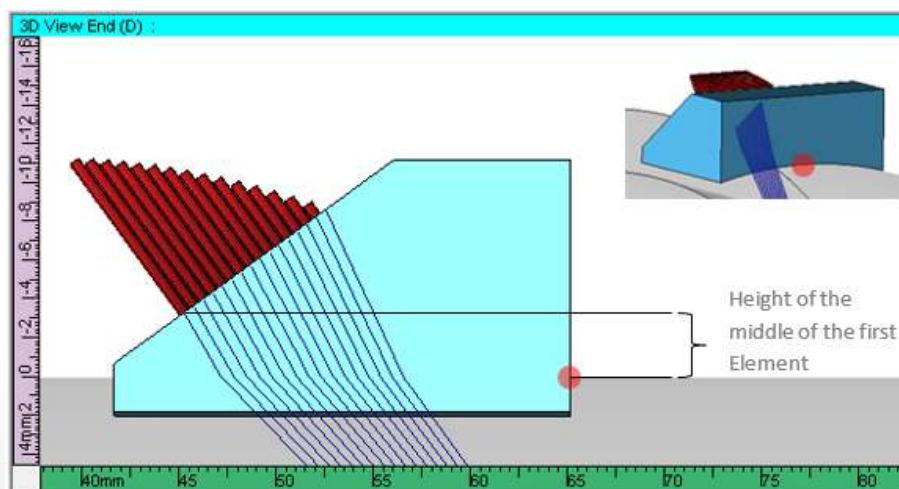
For plate examination, there is no difference between the two modes, this only affects wedge definition for pipe-like or curved surface specimens.
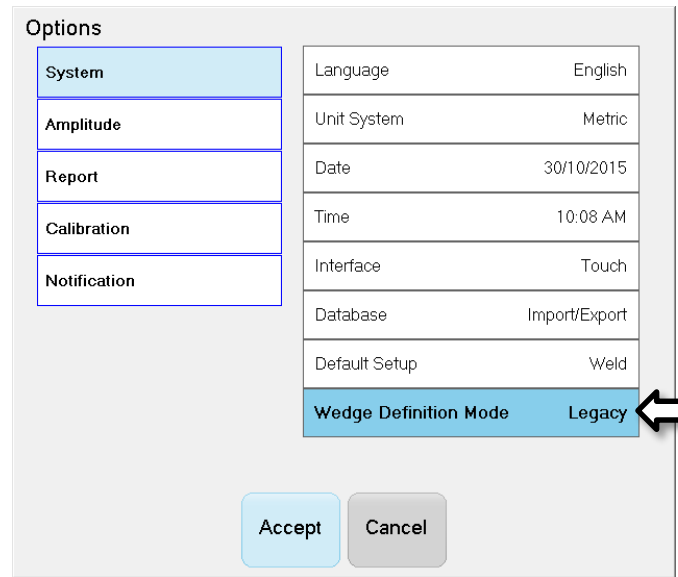
To set the wedge definition mode:

1. In the **Tools** menu, select **Options**.

2. In the **Options** window, set the Wedge Definition Mode to **Legacy** or **Default**.

Figure 9-3 Options Window

3. Click **Accept**.

The **Wedge Definition Mode** is defined and will now on be used in the Wedge Editor.