

# **StripScan**

**Zonal Discrimination Software**

**from**

**Technology Design Ltd.**

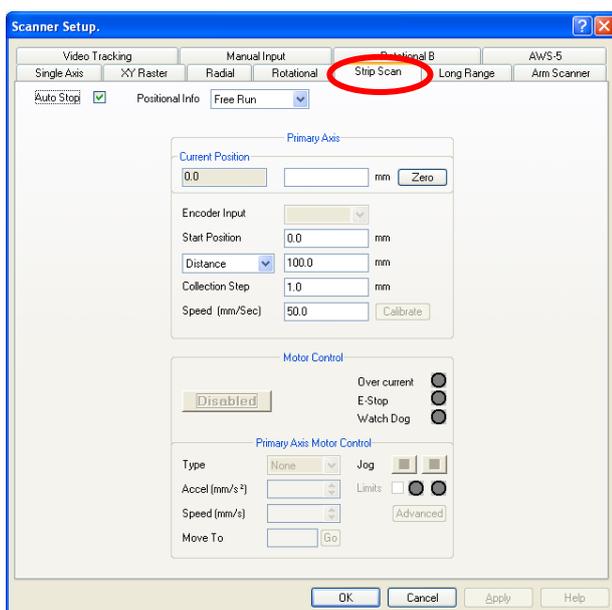
## What is StripScan

StripScan is a software module incorporated into the TD-Scan Advanced Ultrasonic Software. The purpose of StripScan is to enable the operator to setup the software to collect and display data for the **zonal discrimination** technique.

Zonal discrimination is used primarily for, but not limited to, the inspection of pipeline girth welds. It was developed in Canada with the aim of improving girth weld inspection time as an alternative to radiography and conventional ultrasonic techniques. The technique relies on the use of multiple ultrasonic beams, directed individually from a fixed offset at defined zones through the weld volume. Visual accept or reject information can be obtained instantaneously from the **strip chart** display and additional software tools are provided for determining accurate amplitude and positional information.

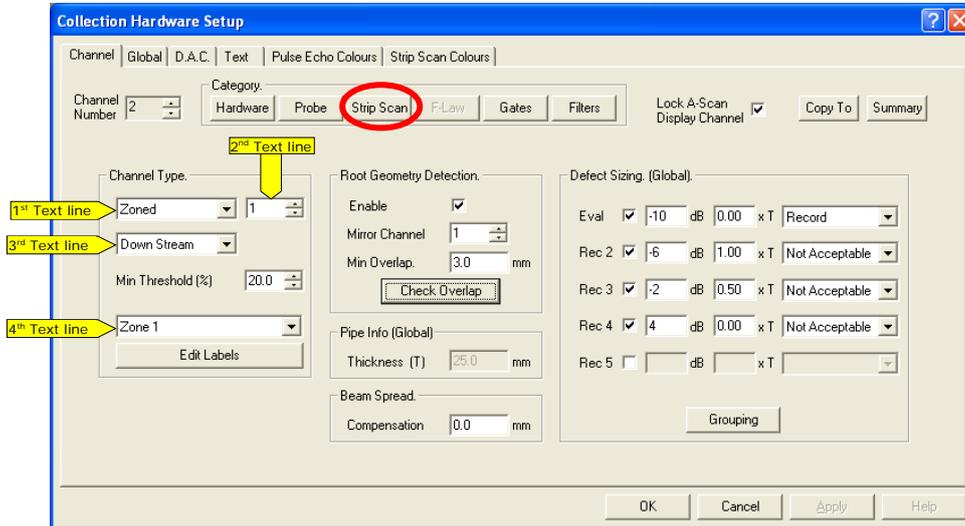
## Setting up StripScan in the TD-Scan Software

- 1) To enable StripScan, click **Scanners** and select the **StripScan** tab then click **OK**. The scanner can be setup in detail later. This action will enable the StripScan tab in **Collection Hardware Setup**.
- 2) The basic ultrasonic setup may be executed in one of two ways:
  - a) **Manually** using the normal TD-Scan software controls for Phased array, ToFD and/or Pulse echo.
  - b) **ESBeamTool Zonal®** import – after defining individual beams in ESBeamtool® the scan plan can be imported directly into the TD-Scan software.
- 3) Once the UT channels have been setup then the zonal setups can be established using the StripScan controls. To enable StripScan the **StripScan** tab must be selected in the **Scanner Setup** window.

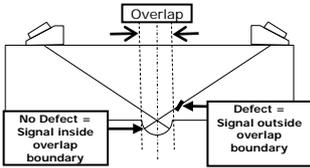


4) The **StripScan** controls are located in **Setup-Collection Hardware** and click the **StripScan** button on the **Channel** tab. Each control is explained below:

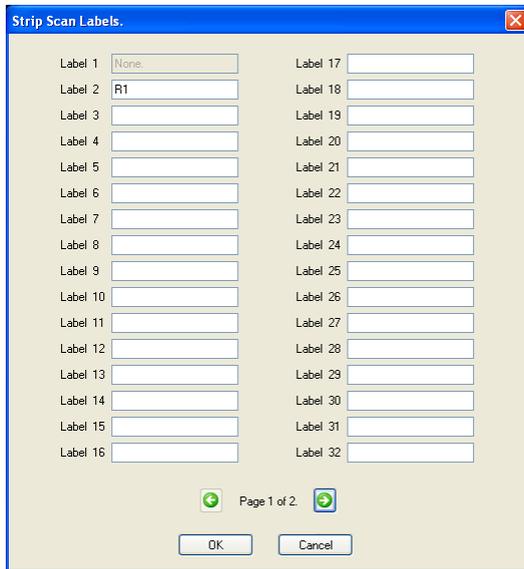
### Collection Hardware setup



Strip Scan:		<ul style="list-style-type: none"> <li>• PHASED ARRAY &amp; PULSE ECHO CHANNELS ONLY.</li> <li>• Activated by selecting the <i>Strip Scan</i> tab in <i>Scanner Setup</i>.</li> </ul>
<b>Channel Type</b>		
<b>1<sup>st</sup> Text Line (Zone Type)</b>	Selects what the channel is used for: <ul style="list-style-type: none"> <li>• <b>Zoned</b></li> <li>• <b>Volumetric</b></li> <li>• <b>Couplant Check</b></li> </ul>	<b>Zoned:</b> Displays strip data as either Time and Amplitude or Map view. <b>Volumetric:</b> Displays strip data as an amplitude B-scan - usually an unfocussed view of all zones. <b>Couplant check:</b> Displays data in additional strips as contrasting colours representing adequate or poor probe contact.
<b>2<sup>nd</sup> Text Line (Zone)</b>	Zone number. Only applicable when the channel type is <i>zoned</i> . Each channel can only have one associated zone.	Each zone could however have multiple associated channels
<b>3<sup>rd</sup> Text Line (Stream)</b>	Selects the location of data relative to the weld <ul style="list-style-type: none"> <li>• <b>Up Stream</b></li> <li>• <b>Down Stream</b></li> </ul>	<b>Stream</b> = Direction of product flow
<b>Min Threshold (%)</b>	Minimum threshold that triggers drawing of <i>time</i> (TOF) data in Time/Amplitude strips.	
<b>4<sup>th</sup> Text Line (Label)</b>	Each zoned channel may have a user defined label that describes which part of the weld the channel is collecting data from.	Examples of zone names: Cap, Root, F1, HP, LCP etc.
<b>Edit Labels</b>	Allows the operator to edit the table of label text.	
<b>Root Geometry Detection</b>		
<b>Enable</b>	Enables/Disables root geometry detection.	*This procedure does not have to be used and can be ignored Root geometry detection is effected by following the operator defined <b>Minimum Overlap</b> rule. The probe positions of the current channel and its mirror are fixed.
<b>Mirror Channel</b>	Specifies an identical channel that is aimed at the same zone from the opposite direction.	

<b>Min Overlap</b>	<p>The distance by which the beam centre crosses the weld centre. Any signal that appears before or after the entered value is regarded as a defect</p>	
<b>Check Overlap</b>	<p>This button activates the <i>Root Geometry Overlap Check</i> dialogue box. (See <i>Root Geometry Overlap Check</i> subcategory below)</p>	
<b>Pipe Info (Global)</b>		
<b>Thickness (T)</b>	<p>Material wall thickness. May be automatically entered by the system or manually entered by the user.</p>	<p>If a Skip Correction value is entered in the Global tab, then this value is automatically displayed &amp; the text box greyed. If not then the value may be entered manually. The manually entered value affects <i>all</i> channels.</p>
<b>Beam Spread</b>		
<b>Compensation</b>	<p>Specifies the defect <i>length</i> oversize value in millimetres. Defect length will be reduced by this value. <i>Specifying a value is optional.</i></p>	<p>Only used for evaluation by the auto-sizing software. The oversize must be determined by the user: it is the difference between a known length defect and its measured length at the highest threshold.</p>
<b>Defect Sizing (Global)</b>		
<b>Eval</b>	<p>Enables an automatic data <b>recording</b> threshold to be established, expressed as: <i>Indication lengths relative to wall thickness then signal attenuation relative to an amplitude reference level (gate threshold).</i></p>	
<b>REC x (x = 2 to 5)</b>	<p>Enables automatic data <b>evaluation</b> thresholds to be established expressed as: <i>Indication lengths relative to wall thickness then signal attenuation relative to an amplitude reference level.</i> The result of the evaluation may be designated <b>Record</b> or <b>Not Acceptable</b>.</p>	<p>This table facilitates the defining of a recording and acceptance hierarchy according to Code Acceptance Criteria or Engineering Critical Assessment (ECA).</p>
<b>Grouping</b>	<p>This button activates the <i>Strip-Scan Indication Grouping</i> dialogue box. (See <i>Strip-Scan Indication Grouping</i> subcategory below)</p>	

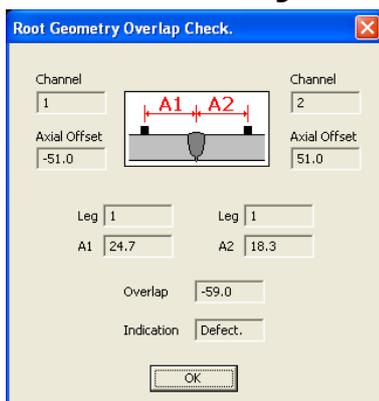
## Edit Labels



The 'Strip Scan Labels' dialog box contains 32 input fields for labels, arranged in two columns. Label 1 is set to 'None' and Label 2 is set to 'R1'. All other labels (3-32) are empty. At the bottom, there are 'Page 1 of 2' navigation arrows, 'OK', and 'Cancel' buttons.

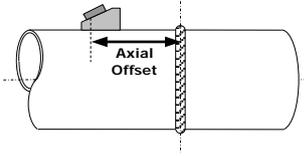
<b>Label x</b>	Enter zone labels	<i>If X = Page 1, labels are numbered 1 to 32. If X = Page 2, labels are numbered 33 to 64.</i>
<b>OK</b>	Stores the labels for use in the zone setup	<i>Click the 3<sup>rd</sup> text line in the <b>Strip Scan</b> page to view labels.</i>
<b>Cancel</b>	Cancels the operation & closes the dialogue.	

## Root Geometry Overlap Check

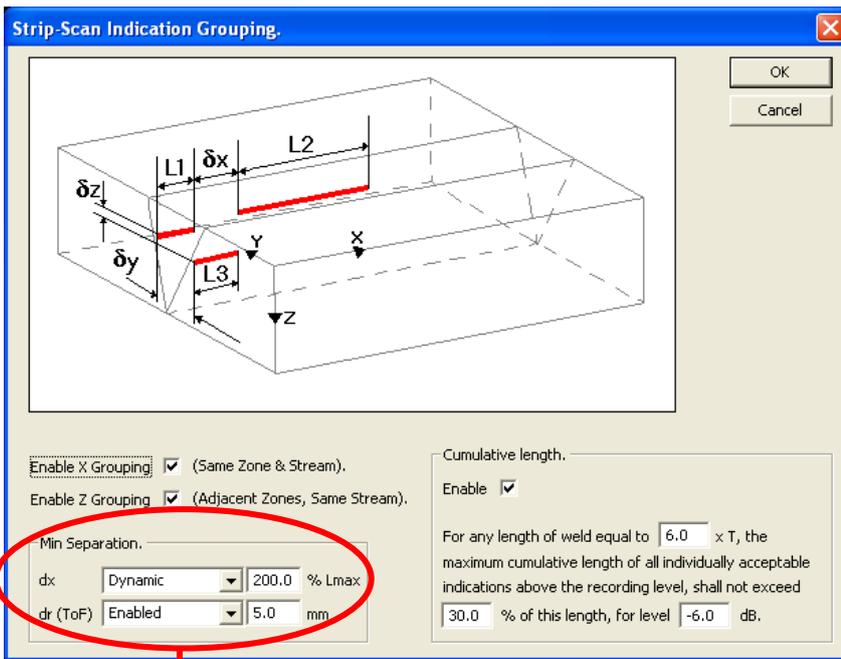


The 'Root Geometry Overlap Check' dialog box features a central diagram of a root geometry with dimensions A1 and A2. Input fields include: Channel 1 (1), Channel 2 (2), Axial Offset 1 (-51.0), Axial Offset 2 (51.0), Leg 1 (1), Leg 2 (1), A1 (24.7), A2 (18.3), Overlap (-59.0), and Indication (Defect.). An 'OK' button is at the bottom.

This procedure does not have to be used and may be ignored.

<b>Channel</b>	The channel and its mirror that are being checked.	
<b>Axial Offset</b>	The distance from the test piece datum to the TX probe datum.	<ul style="list-style-type: none"> <li>• <b>Pulse echo probe datum</b> = the sound emission point</li> <li>• <b>Phased Array probe datum</b> = position of the element at the lowest point on the wedge (either 1<sup>st</sup> or Last).</li> </ul> 
<b>Leg</b>	Displays the reflected skip in which the signal is located	
<b>A1, A2</b>	Displays the range to the signal for each probe	
<b>Overlap</b>	Displays the distance of the amount by which the two opposite beams overlap.	
<b>Indication</b>	Displays either <b>Defect</b> or <b>Root</b> , based on the overlap criteria.	

### Strip-Scan Indication Grouping



Strip-Scan Indication Grouping.

Enable X Grouping  (Same Zone & Stream).

Enable Z Grouping  (Adjacent Zones, Same Stream).

Min Separation.

dx: Dynamic 200.0 % Lmax

dr (ToF): Enabled 5.0 mm

Cumulative length.

Enable

For any length of weld equal to 6.0 x T, the maximum cumulative length of all individually acceptable indications above the recording level, shall not exceed 30.0 % of this length, for level -6.0 dB.



Min Separation.

dx: Absolute 200.0 mm

dr (ToF): Enabled 5.0 mm

<b>Enable X Grouping</b>	Enables defect grouping in length evaluated within the same weld zone and on the same side of the weld.	
<b>Enable Z Grouping</b>	Enables defect grouping in length evaluated in adjacent weld zones and on the same side of the weld.	

Min Separation		
<b>dx</b>	Evaluates grouping criteria based on defect proximity using: <ul style="list-style-type: none"> <li>•Dynamic</li> <li>•Absolute</li> </ul>	<b>Dynamic:</b> Distance between adjacent defects based on a % of the length of the defects (% Lmax). <b>Absolute:</b> Distance between adjacent defects based on a fixed length (mm).
<b>dr (ToF)</b>	Evaluates grouping criteria based on defect proximity using beam path distance.	
Cumulative Length		
<b>Enable</b>	Enables/Disables cumulative length evaluation.	The acceptance criteria are entered into the three text boxes based on the <i>amplitude</i> and <i>length</i> of defect in a given length of <i>weld</i> .

- StripScan Gate controls is accessed from **Setup-Collection Hardware** and click the **Gates** button on the **Channel** tab. There are different gate controls depending on the type of zone (Zoned, Volumetric or Couplant check).

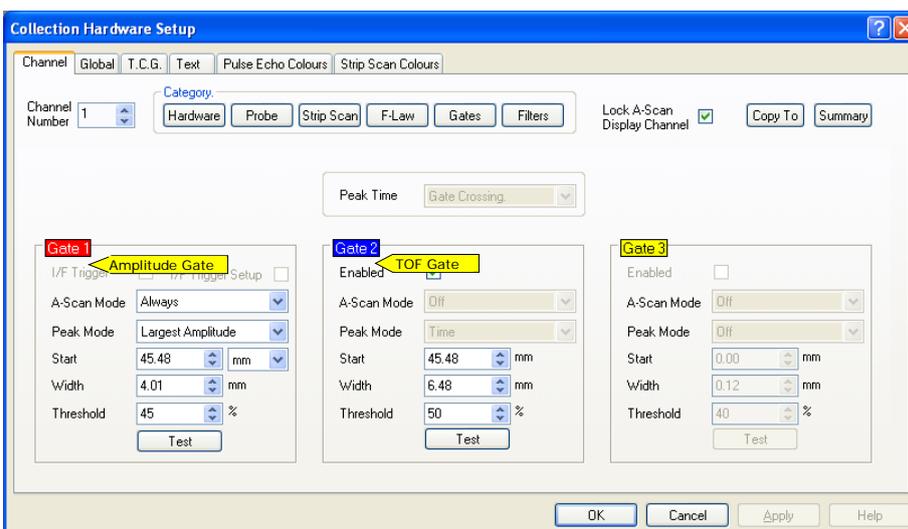
### 5.1. Zoned Channels

#### Dual Gate

A 'Dual Gate' system may be used in StripScan if the user wishes. The purpose of the dual gate is to provide a mechanism to define separate display criteria for the amplitude trace and time (TOF) bar in the T&A strips. It is not necessary to use a dual gate if the time and amplitude gate length are identical. Usually the dual gates are only used in channels that are collecting data from the weld root. To limit the display of spurious signals generated by reflections from the root bead, the amplitude gate is adjusted to end before the root bead. The TOF gate is set to end beyond the root bead so that operational and root anomalies may be monitored, e.g. excess penetration, low root bead, meandering root and variations in axial stand-off caused by a poorly positioned band.

#### Single Gate

A single gate (Gate 1) is used for channels where the time and amplitude collection length is identical; usually all zones except root zones.

The screenshot shows the 'Collection Hardware Setup' dialog box, specifically the 'Gates' tab. The 'Channel Number' is set to 1. The 'Category' is 'Hardware'. The 'Lock A-Scan Display Channel' checkbox is checked. The 'Gates' button is highlighted. The dialog box contains three gate configurations:

Gate	Type	Enabled	A-Scan Mode	Peak Mode	Start (mm)	Width (mm)	Threshold (%)
Gate 1	Amplitude Gate	<input type="checkbox"/>	Always	Largest Amplitude	45.48	4.01	45
Gate 2	TOF Gate	<input type="checkbox"/>	Off	Time	45.48	6.48	50
Gate 3		<input type="checkbox"/>	Off	Off	0.00	0.12	40

Buttons at the bottom: OK, Cancel, Apply, Help.

<b>Amplitude Gate</b>	Provides all time and amplitude data.	Provides time and amplitude data regardless of whether the TOF gate is enabled.
<b>TOF Gate</b>	Limits displayed time (TOF) data to the <b>Gate 2</b> position and length.	Use only if there is a requirement to display time and amplitude data from different gate lengths.

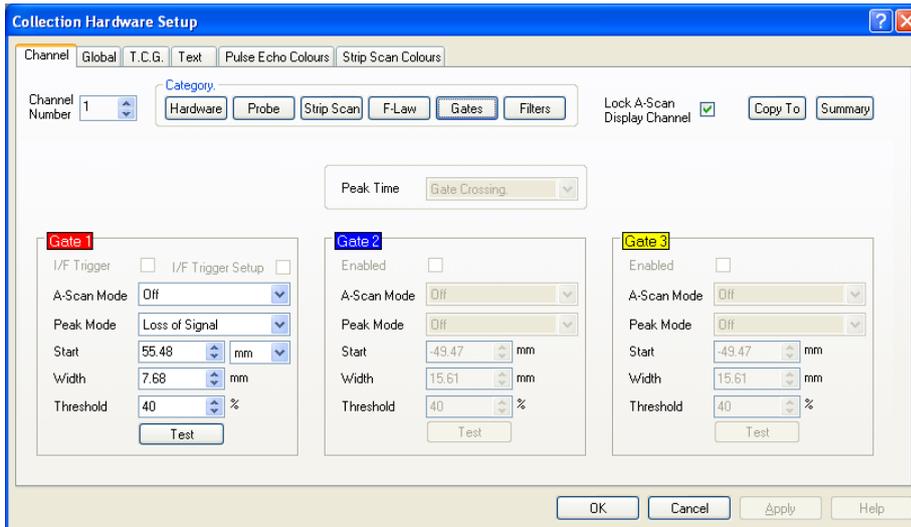
<b>Enabled</b>	Enables/disables the gate <b>Gate 2</b> and places the channel in 'Dual Gate' mode.		Only enable <b>Gate 2</b> when dual gate is required. This gate is the TOF gate.
<b>I/F Trigger</b>	<i>*Not used in StripScan mode*</i>		
<b>I/F Trigger Setup</b>	<i>*Not used in StripScan mode*</i>		
<b>A-Scan Mode</b>	<ul style="list-style-type: none"> <li>• Off</li> <li>• Always</li> </ul>	A-Scan collection disabled. An A-Scan is collected each time the scanner moves by the collection step.	Collects the A-Scan regardless of its amplitude.
<b>Peak Mode</b>	<b>Largest Amplitude</b> is the only choice.		
<b>Start</b>	This is the start of the data collection data. ( $\mu$ S or mm)		
<b>Width</b>	This is the width of the data collection gate. ( $\mu$ S or mm)		
<b>Threshold</b>	Vertical position of the gate expressed as a percentage of A-scan screen height.		The height of the gate is not taken into account for any measurement or display.
<b>Test</b>	The test button opens the gate test dialog box.		Provides a table that displays Time, Distance & amplitude for each peak in the gate that breaks the threshold for reference only.

## 5.2. Volumetric Channels

A single gate (Gate 1) is used for channels designated as volumetric. The gate control is identical to *single gate* in the zoned channel section above, i.e. **Gate 1** enabled and all other gates disabled.

## 5.3. Couplant Check Channels

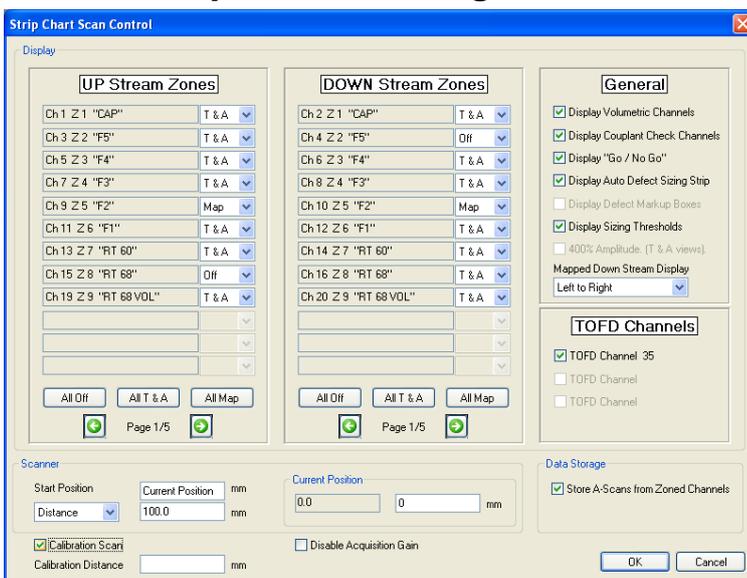
Channels designated as **couplant check** display data in additional strips as contrasting colours representing adequate or poor probe contact. The gate is adjusted to cover the reference reflector.



<b>I/F Trigger</b>	<i>*Not used in StripScan mode*</i>	
<b>I/F Trigger Setup</b>	<i>*Not used in StripScan mode*</i>	
<b>A-Scan Mode</b>	<b>Off</b> is the only choice. No A-Scans are stored.	
<b>Peak Mode</b>	<b>Loss of Signal</b> is the only choice.	
<b>Start</b>	This is the start of the data collection gate. ( $\mu$ S or mm)	
<b>Width</b>	This is the width of the data collection gate. ( $\mu$ S or mm)	
<b>Threshold</b>	Vertical position of the gate expressed as a percentage of A-scan screen height.	Signals above the threshold amplitude will be displayed as a different colour to signals below the threshold.
<b>Test</b>	The test button opens the gate test dialog box.	Provides a table that displays Time, Distance & amplitude for each peak in the gate that breaks the threshold for reference only.

6. Further controls specific to the current scan are accessed after the **Start** scan control is activated. These controls are described below:

### 5.4. Strip Scan Drawing Control.



Display		
<b>UP Stream Zones / DOWN Stream Zones</b>	Allows selection of viewing options for Up/Down stream zoned channels. The options are: <b>Off</b> - Data for this channel is not displayed. <b>T&amp;A</b> - Time & Amplitude view. <b>Map</b> - Data is displayed as a D-scan. Only available to channels with A-Scan data collection enabled.	<b>T&amp;A</b> view displays data as: <ul style="list-style-type: none"> <li>a continuous line representing signal amplitude and distance along weld length.</li> <li>Shaded vertical bar. The height of the bar represents TOF. The shading colours are a visual representation of the amplitude of the signal.</li> </ul> <b>Map</b> view displays the strip as a D-scan image (side view along length of weld) usually focussed at the fusion face of the selected zone.
<b>All Off</b>	Sets all channels to display no data.	
<b>All T &amp; A</b>	Sets all channels to display Time and Amplitude data.	
<b>All Map</b>	Sets all channels to Map View if the A-Scan data is available.	To ensure A-Scans are collected, set the <b>A-Scan Mode</b> to <i>Always</i> in the Gates Page during initial setup.
General		
<b>Display Volumetric Channels</b>	When selected, volumetric channels (if any) are displayed.	Displays strip data as an amplitude D-scan - usually an unfocussed view of the full volume of the weld.
<b>Display Couplant Check Channels</b>	Displays couplant check channels (if any).	Displays data in additional strips as contrasting colours representing coupling go/no-go.
<b>Display Go / No Go</b>	Displays the go/no go strip.	Displays data in additional strips as contrasting colours representing signal amplitude above or below the gate amplitude.
<b>Display Auto Defect Sizing Strip</b>	Displays the auto sizing strip.	Automatic data evaluation is performed when sizing rules are defined by the user on the <b>StripScan</b> tab in the <b>Collection Hardware</b> window. Data is evaluated and colours displayed after the collection is completed.
<b>Display Defect Markup Boxes</b>	Displays defect mark-up boxes (if any).	Defect mark-up boxes are defined manually by the user.
<b>Display Sizing Thresholds</b>	Displays thresholds as dashed lines.	Thresholds are determined by the user defined sizing rules on the <b>StripScan</b> tab in the <b>Collection Hardware</b> window.
<b>400% Amplitude (T&amp;A views)</b>	Displays T&A strips with an upper amplitude limit of 400% FSH.	Only available when the digitiser control is set to 14bits per sample. Signals will saturate at 400% FSH.
<b>Mapped Down Stream Display</b>	Displays the down-stream <b>Mapped</b> strips in either a 'Left-to-Right' or 'Right-to-Left' orientation.	The up-stream strips remain in the 'Left-to-right' (surface nearest the left) orientation. Up-stream strip orientation may be changed to suit the users' preference.
TOFD Channels		
<b>TOFD Channel xx</b>	Displays the TOFD channel designated.	Up to 3 ToFD channels may be displayed.
Scanner		
<b>Start Position</b>	The start position of the scan. (online only).	Only available at the start of a scan before data collection. Greyed out after data collection.
<b>Current Position</b>	The length of the scan. (online only).	Only available at the start of a scan before data collection. Greyed out after data collection.

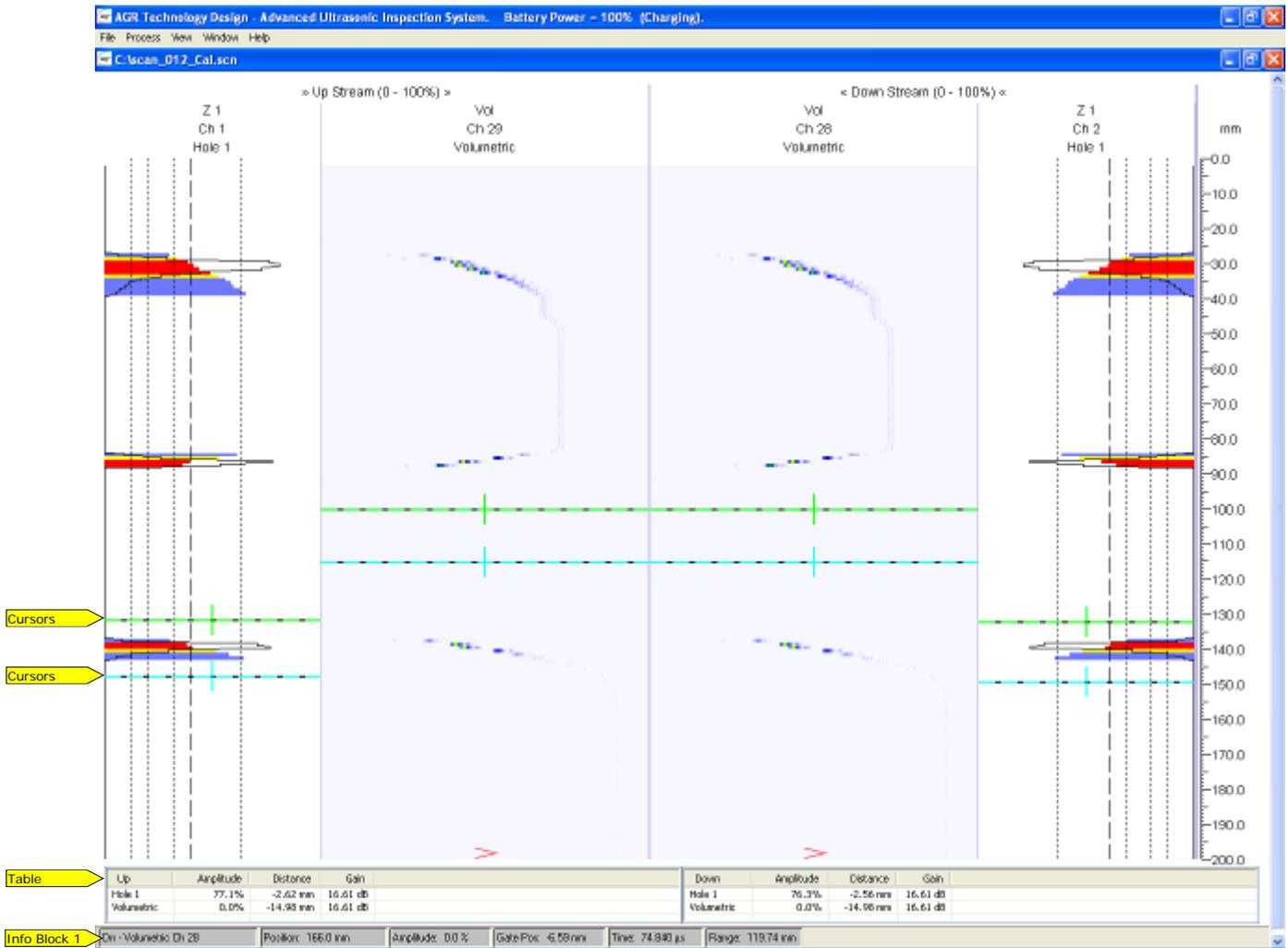
Data Storage		
<b>Store A-Scans From Zoned Channels</b>	*This control is obsolete and awaiting removal*	
Other Controls		
<b>Calibration Scan</b>	Enables Calibration mode (online only)	<ul style="list-style-type: none"> <li>• Switches controls on in the file for fine adjustment of gain when analysing the calibration</li> <li>• Appends the word 'cal' to the end of the file name.</li> <li>• Identifies the file as a calibration file – can be included or excluded from auto reports.</li> </ul>
<b>Calibration Distance</b>	Length of calibration scan	
<b>Disable acquisition gain</b>	Disables the <b>Acquisition Gain</b> control for a calibration scan.	The <b>Acquisition Gain</b> control can be used to apply a transfer correction when a scan is started. This control excludes this correction from calibration scans.

6) Calibration adjustment tools are provided when a designated calibration scan is opened for analysis.

### **Strip Scan Calibration Control.**

Calibration scans may be analysed and adjusted using special sensitivity controls that allow fine gain adjustments of +2dB to -2dB in 0.1dB steps that may be applied to the channel gain. To enable these controls, open a calibration scan and click the **Process** drop-down menu, select **Check Calibration**. Two individual horizontal cursors for each strip will appear that can be moved to encompass signals. A table will also appear at the bottom of the page with a list of each upstream and downstream zone or volumetric<sup>†</sup> channel with columns for *amplitude*, *gain* and *distance*. The values displayed in the columns are for the highest amplitude signal between each set of cursors. Double clicking a line in the table will activate a control window allowing the channel gain to be adjusted.

<sup>†</sup>**Note**(in current release 19.00, volumetric channels are not yet included)



<b>Cursors</b>	Used to define calibration signals	Move cursors by dragging with the mouse pointer. Placing a cursor on either side of a signal displays the <i>amplitude</i> , <i>distance</i> from gate centre and <i>gain</i> values of the highest amplitude point between cursors in the calibration table.
<b>Table</b>	Displays a table of values for the highest amplitude signal between the dual cursors.	<ul style="list-style-type: none"> <li>Only available in <i>calibration</i> scans.</li> <li>Activated by clicking the <b>Process</b> menu and selecting <b>Check Calibration</b></li> <li>Double click any line to display a gain adjustment control window for that zone.</li> </ul>
<b>Info Block 1</b>	Values at the position of the mouse pointer (not used for calibration adjustment)	

**Hole 1**

Modify Channel Gain

Amplitude:  %

Gain Modification:  dB

Target Amplitude:  %

**INFORMATION**

About to modify gain by: 0.02 dB

<b>Modify Channel Gain</b>		
<b>Amplitude</b>	Amplitude of Signal	Changes with gain adjustment
<b>Gain Modification</b>	Fine controls the channel gain	Channels gain can be adjusted in 0.1dB steps to a maximum of +2dB to -2dB from the gain set for the calibration scan
<b>Target Amplitude</b>	% Screen height of calibration reference.	
<b>Calculate</b>	Calculates the required channel gain adjustment	Displays a second <b>Information</b> window with this value.
<b>Information</b>		
<b>Info Block 1</b>	Displays amount by which channel gain will be adjusted.	
<b>OK</b>	Executes gain adjustment	Channel gain (Hardware setup) will be adjusted by the amount displayed in Info Block 1