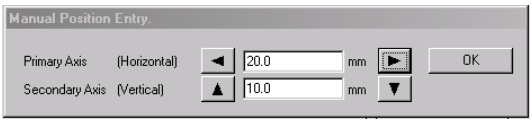
Manual Input - Corrosion Mapping

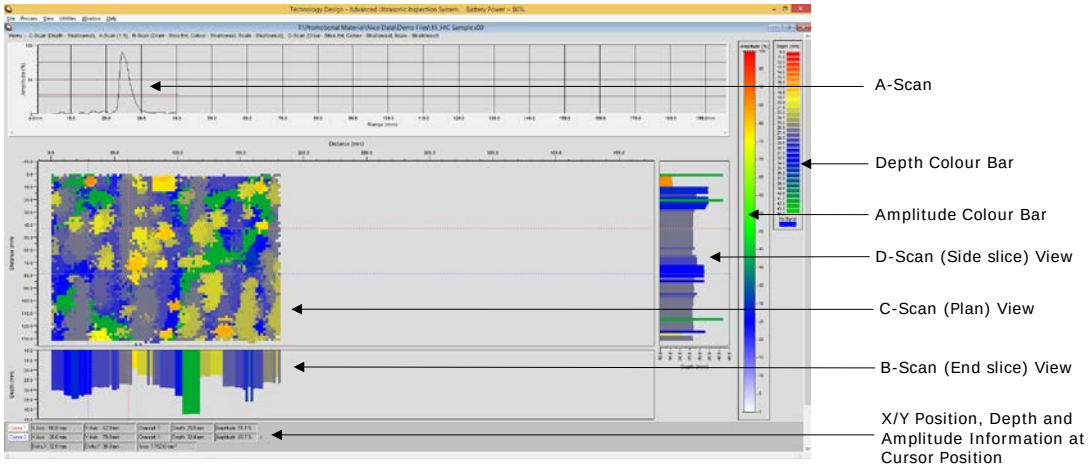
There may be times when a corrosion mapping C-scan is required when an encoded scanner or video tracking system is not available or the test item geometry precludes the use of scanners. An effective C-scan may be achieved by manually capturing the data at discreet gauge points plotted on the test surface.

a) Draw a grid onto the test surface corresponding to the desired collection step interval.
b) Switch Super View® off.
c) Setup and calibrate a 0° probe.
d) Select the **Manual Input** tab from the **Scanner Setup** menu. Enter the appropriate start and end positions
e) Enter the desired collection step for both X and Y axis.
f) Start the scan. When the scan window opens, the **Manual Position Entry** control window appears. Clicking the arrows allows you to tab through the grid reference points (collection steps) defined previously.
g) Place the probe on the grid position corresponding to the co-ordinates shown in the **Primary** & **Secondary Axis** text boxes.
h) Click **OK** to execute data capture for that grid position.
Repeat steps F to H for other grid positions. In this way you can manually

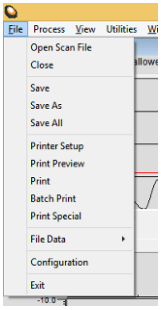


PE/Corrosion Mapping - Offline Analysis. (Original software)

Typical PE/Corrosion map display



PE/Corrosion Mapping Offline Analysis - File menu options

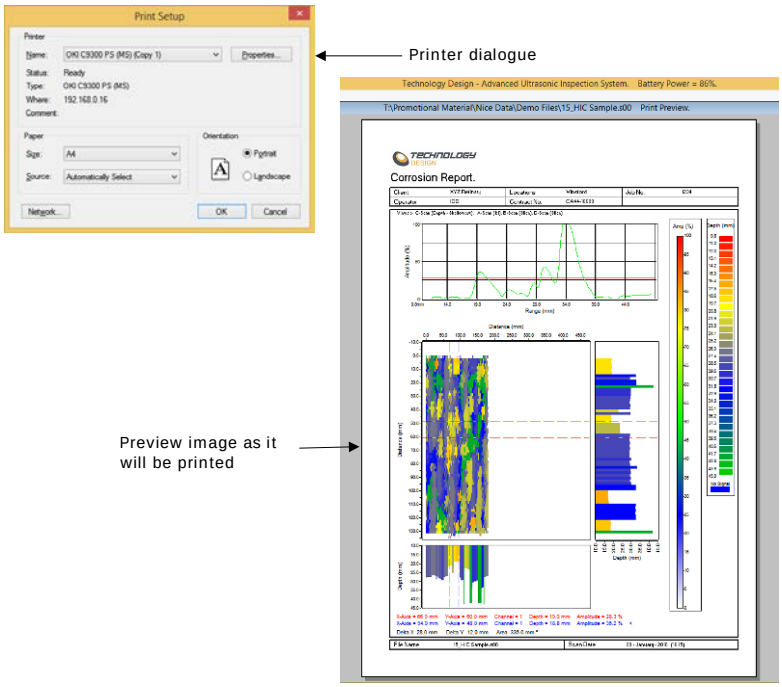


Open Scan File	Opens the **Select Scan File(s)** dialogue	Allows a any data file to be opened using Windows® Open File features
Close	Closes the file that is currently in the foreground	
Save	Saves the file that is currently in the foreground	
Save as	Opens the **Select Scan File(s)** dialogue	Allows the file that is currently in the foreground to be saved with a different name and folder location.
Save all	Saves all files that are currently open	
Printer Set-up	Opens the **Print Setup** dialogue	Allows selection and configuration of a printer and its settings
Print Preview	Print preview provides a graphical view of the printout prior to initiating the print	
Print	Selected file is printed.	The print out is presented in a simple report format that includes any annotation, user entered header and certain measurement information. Useful for producing quick simple reports.
Batch Print	Selection of multiple files allows unattended printouts	
Print Special	Allows data images larger than the display area to be printed over multiple pages.	
File Data	Allows user to change certain key parameters off-line, data is then automatically re-calculated	
Configuration	Opens the *Configuration Editor* window.	System configuration parameters including printout formats may be edited **NB**- *System* Configuration settings are not saved as part of the setup file or data file.
Exit	Exit Software	

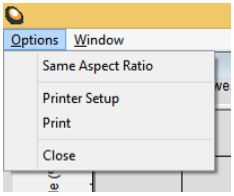
Print Preview and Print excerpts

Print Preview allows the user to view an image before printing the image on paper. The *Print Preview* window will look similar to the image below.

The logo and document heading are defined in **Configuration-Report**. The heading is inherited from **Configuration** if saved during analysis and can be changed by opening the configuration editor from the **File** menu when the file is subsequently opened for analysis.

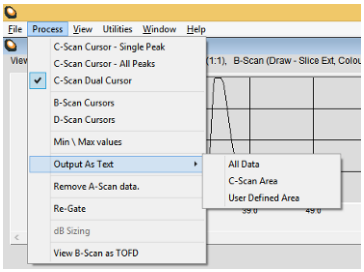


Options Menu



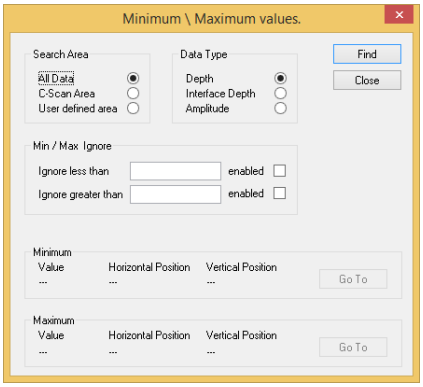
Same Aspect Ratio	Alters the aspect ratio of the image.	Clicking this control alternates between keeping the same aspect ratio as the original data and stretching the data to fit into the available space.
Print Setup	Displays the **Print Setup** dialogue.	
Print	Sends the document to the printer selected in *Print Setup*.	
Close	Closes the print preview window.	

PE/Corrosion Mapping Offline Analysis - Process menu options



C-Scan Cursor - Single Peak	Enables a single cross-hair cursor. Values for depth, amplitude, location etc, are taken from the data displayed in the C-Scan area for the position of the cross-hair.	Allows the user to position a cursor over data in the C-Scan area,
C-Scan Cursor – All Peaks	Enables a single cross-hair cursor and peak list. If multiple peaks are at the cross-hair position, they are show in the peak list window.	Allows the user to position a cursor over data within the C-Scan area.
C-Scan Cursor – Dual Cursor	Enables 2 cross-hair cursors. Values for depth, amplitude, location, area & difference between cursors etc. are displayed in the C-Scan area.	Allows the operator to place 2 cursors over the C-Scan data.
B-Scan Cursors	Enables 2 cross-hair cursors. Depth or amplitude and surface location values are displayed in flags & difference between cursors is displayed on the info bar.	Could also be described as an end or side view of a slice through the material at the location of the cursor.
D-Scan Cursors	Enables 2 cross-hair cursors. Depth or amplitude and surface location values are displayed in flags & difference between cursors is displayed on the info bar.	Could also be described as an end or side view of a slice through the material at the location of the cursor.
Min/Max Values	Opens the Minimum \ Maximum values dialogue.	See below for further details.
Output As Text • **All data** • **C-Scan Area** • **User Defined area**	Output data in comma separated format for export to spreadsheets and statistical packages such as Excel®.	**User Defined** area allows the operator to drag a hatched box over the C-Scan data to define the area of interest.
Remove A-Scan data	Removes the raw A-Scan data from the file.	• File size will be reduced. • A-scan will not be available for display.
Re-Gate	Allows the operator to re-gate the data.	See below for further details.
dB Sizing	Currently not available	

Min / Max Values

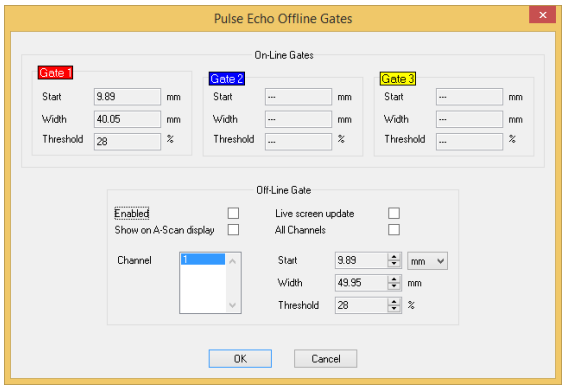


To use the *Min/Max depth/amplitude analysis* feature, select **Process - Min / Max** from the main menu. The minimum and maximum depth, interface depth or signal amplitude values are automatically determined. By pressing the Go To buttons, the cursor will be automatically positioned at the position of the min/max value. The min/max ignore feature allows you to ignore spurious or unwanted depth/amplitude readings.

Search Area • **All Data** • **C-Scan Area** • **User defined area**	Select how the system determines the area to search.	**User Defined** area allows the operator to drag a hatched box over the C-Scan data to define the area of interest.
Data Type • **Depth** • **Interface** • **Amplitude**	Select what type of Min/Max data to process.	
Min / Max Ignore		
Ignore less than	Disregards the data below this value.	
Ignore greater than	Disregards data greater than this value.	
Enable	Enables or disables the control	
Minimum	Displays the *value* and *horizontal & vertical* position of the value that matches the *minimum* search criteria.	
Maximum	Displays the *value* and *horizontal & vertical* position of the value that matches the *maximum* search criteria.	
Go To	Displays a black crosshair cursor on the C-Scan display at the *minimum* or *maximum* position.	

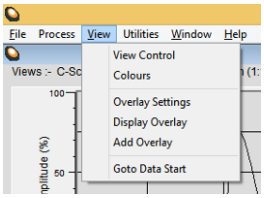
Re-Gate

Data may be re-gated off-line however; the gate can only be adjusted within the original time/depth gate position.



Enabled	Enables the offline gate.	
Show on A-Scan display	Shows the modified gate on the A-Scan display.	
Channel	Allow the selection of a channel. The gate for this channel is modified.	
Live screen update	When enabled, modifications are shown in real time.	
Start	The new gate start.	
End	The new gate end.	
Threshold	The new gate threshold.	

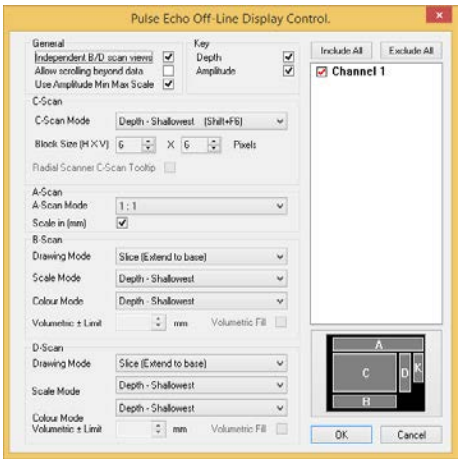
PE/Corrosion Mapping Offline Analysis - View menu options



View Control	Opens the view control dialog box. Allows selection of A -scan, C-scan, end/side views, turns channels on/off, view amplitude / depth, etc.	See next section for detailed explanation.
Colours	Opens the Pulse Echo colour editor.	See the step-by-step explanation in *Appendix B*
Overlay Settings	Sets the default setting for text & graphic overlays.	
Display Overlay	Enables/disables text & graphic overlay displays.	
Add Overlay	Allows the operator to insert text & graphic overlays into the data.	Useful for annotating data.
Goto Data Start	Sets the top left of the C-Scan area to the top left of the scan area.	

View Control

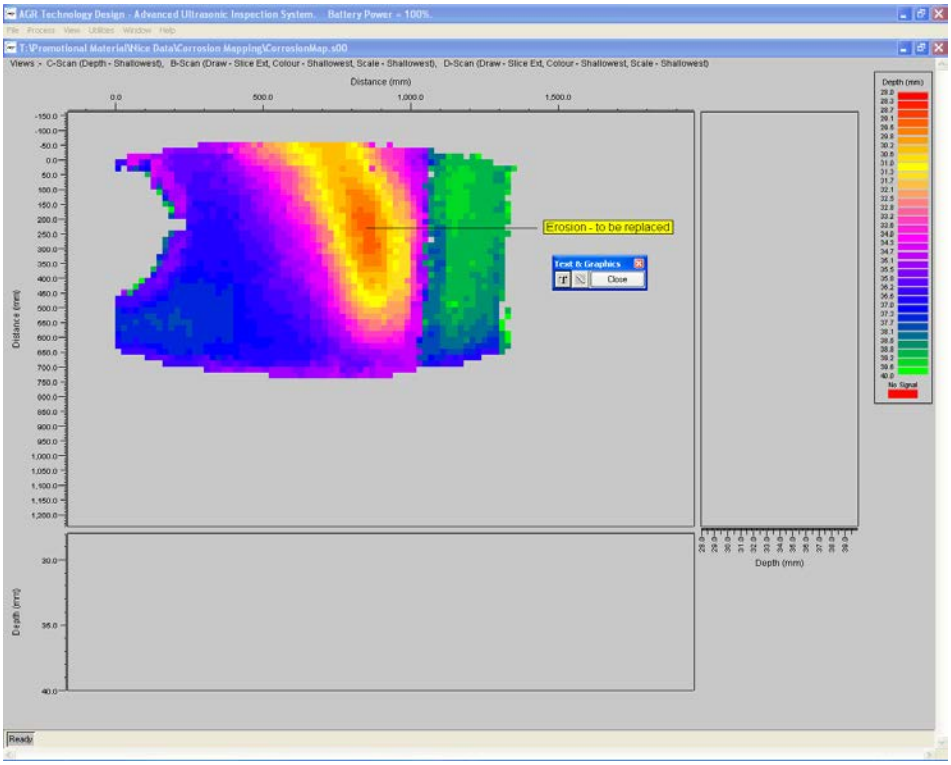
To change the PE/Corrosion Map view, select **View Control** from the main menu or *right-click* the mouse. The following dialogue box appears which allows you to configure the display modes.

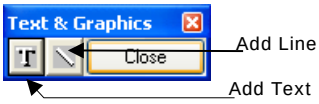


General:		
Independent B/D scan views	Allows the end/side view images to be viewed as different data types to the C scan image. e.g. The C-Scan image may be displaying depth data, whilst the B and/or D scan image(s) display amplitude data.	
Allow scrolling beyond data	Allows scrolling the C-Scan image beyond the data collection area.	
Use Amplitude Min Max Scale	Uses the colour bar min max values to define the B, B & A scan scales.	Only useful when data is viewed as amplitude. Also known as 'Soft gain'.
Key:		
Depth	Shows the Depth colour key.	
Amplitude	Shows amplitude colour bar.	
C-Scan:		
C-Scan Mode • **Depth – Deepest** • **Depth – Shallowest** • **Depth – Interface** • **Amplitude – Largest** • **Amplitude – Smallest**	Deepest peaks only (Shift + F5) Shallowest peaks only (Shift + F6) Depth to the Interface Echo (Shift + F7) Maximum amplitude peak of collected data (Shift + F8) Minimum amplitude peak of collected data (Shift + F9)	Data to be displayed is evaluated according to the criteria chosen independently for each encoder step.
Block Size (HxV)	Defines pixel size for each positional step (1 x 1, 2 x 2, 4 x 4, etc.)	Zoom the data image in or out. The x & y values are applied independently.
A-Scan:		

A-Scan Mode • **Off** • **1:1** • **Best Fit**	 Turns the A-Scan display off. Shows each sample at one horizontal pixel position. If the whole A-Scan does not fit into the display area width, the scroll bar under the A-Scan display may be used to scroll the A-Scan left and right. If the A-Scan contains more samples than the A-Scan display area contains pixels (width), the A-Scan data is intelligently decimated to fit the width.	 Fills the 'white' space. This means that the A-Scan may be zoomed in or out horizontally
Scale in (mm)	Toggles the A-Scan scale between microseconds (µs) and millimetres. NOTE: The A-Scan scale is in *range* (beam path) not depth.	For 0° scanning the range and depth values are identical.
B-Scan:		
Drawing Mode • **Off……** • **Slice……** • **Slice (extend to base)……** • **Volumetric (Full Data)……** • **Volumetric (C-Scan area)……** • **Volumetric (User Limits)……** • **A-Scans**	 No data is displayed. A thin bar for each encoder step is displayed representing the range of the signal in the colours represented by the colour scale. Slice with extension to base in the same colour. Volumetric view of all collected data. Volumetric view of C-Scan area only. The volumetric view is made from data at the cursor position ± the Volumetric Limit. Displays A-scans as amplitude. A-scan collection must be enabled or this control is disabled.	 Useful for analysing certain degradation mechanisms in the material volume, e.g. Hydrogen damage with stepwise cracking. Each encoder step is displayed in colours defined by the user in the *Peak Amplitude* colour palette.
Scale Mode	Enabled when Independent *B/D scan views* is enabled, this list box allows the selection of amplitude or depth data to be used for defining the B-Scan scales.	
Colour Mode	Enabled when Independent B/D scan views is enabled, this list box allows the selected amplitude or depth data to be used for defining the B-Scan colours.	
Volumetric ± Limit mm	Sets the area (vertical size) to use for the volumetric view. The tick marks on the vertical member of the crosshair show this dimension.	
Volumetric Fill	Fills the volumetric view.	
D-Scan:		
Drawing Mode • **Off……** • **Slice……** • **Slice (extend to base)……** • **Volumetric (Full Data)……** • **Volumetric (C-Scan area)……** • **Volumetric (User Limits)……** • **A-Scans**	 No data is displayed. A thin bar for each encoder step is displayed representing the range of the signal in the colours represented by the colour scale. Slice with extension to base with same colour Volumetric view of all collected data Volumetric view of C-Scan area only The volumetric view is made from data at the cursor position ± the Volumetric Limit Displays A-scans as amplitude. A-scan collection must be enabled or this control is disabled.	 Useful for analysing certain degradation mechanisms in the material volume, e.g. Hydrogen damage with stepwise cracking. Each encoder step is displayed in colours defined by the user in the *Peak Amplitude* colour palette.
Scale Mode	Enabled when Independent B/D scan views is enabled, this list box allows the selection amplitude or depth data to be used for defining the D-Scan scales.	
Colour Mode	Enabled when Independent B/D scan views is enabled, this list box allows the selection amplitude or depth data to be used for defining the D-Scan colours.	
Volumetric ± Limit mm	Sets the area (Horizontal size) used for the volumetric view. The tick marks on the horizontal member of the crosshair show this dimension.	
Volumetric Fill	Fills the volumetric view.	
Channel List:		
Channel List	This is a list of all enabled Pulse Echo channels at the time the data was collected. Double clicking with the mouse left button, toggles the display state for individual channels.	
Include All	Enables ALL channels for display.	
Exclude All	Disables ALL channels for display.	

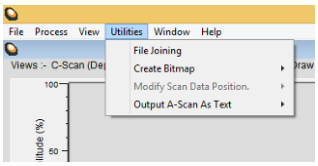
Add Overlay.





On selecting *Add Overlay* from the menu, the Text & Graphics dialog box is displayed. Pressing either the *Add line* , or *Add text* allows that addition of an overlay object.
Once an object has been added, its properties may be modified by placing the mouse cursor over the overlay object and pressing the mouse right button. To keep overlay objects the file must be saved.

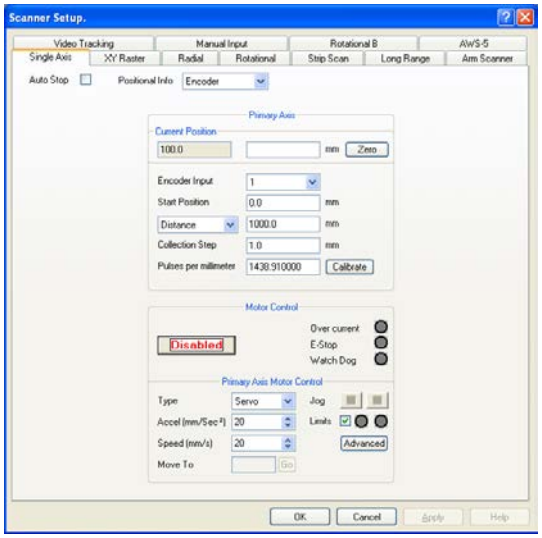
PE/Corrosion Mapping Offline Analysis – Utilities menu options.



File Joining	Automatically join multiple PE/Corrosion mapping files together by using the cursor to select reference points on each selected image	Instructions are provided in Appendix B
Create Bitmap • **Whole Window** • **Data Only**	Creates a graphic image of the entire window in the BMP (bitmap) file format. Creates a bitmap of the data only.	To insert an image of the data into another application (e.g. MS Word®) an alternative method is to use the *copy*, *past* and *crop* features.
Modify Scan Data Position	Currently inactive	
Output A-Scan As Text	Outputs A-Scan data to a delimited text file. There are 3 choices: • **Single A-scan** – outputs data from a single user defined A-scan • **All Channels** – outputs A-scan data from all active channels • **Single Channel** – outputs A-scan data from a single user defined channel	Used for 3rd party post processing of data.

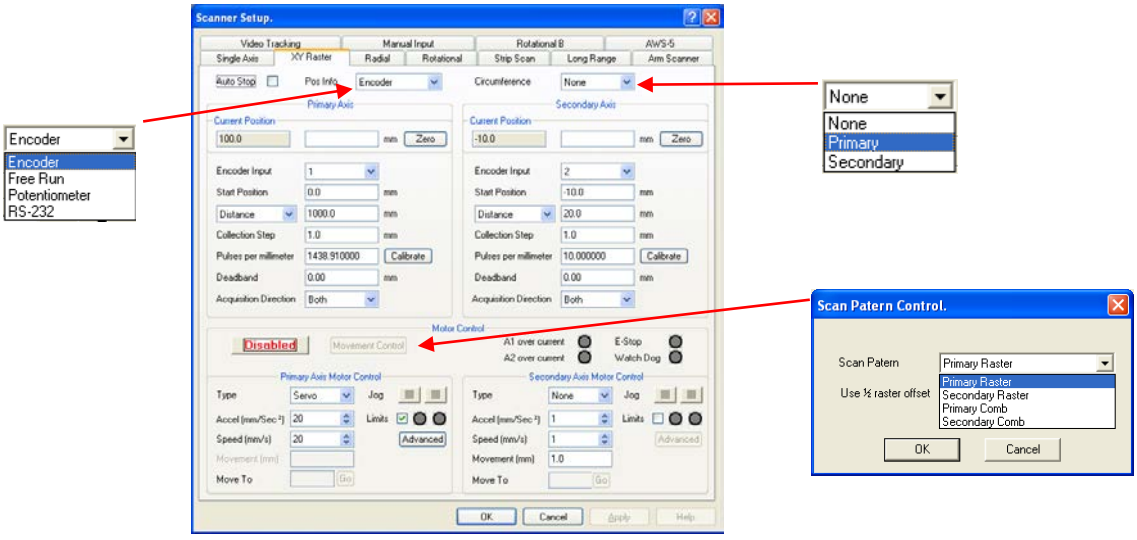
Scanner Set-up

The tabs at the top of the dialog box allow the selection of different scanner types. The scanner interfaces are all variations on the basic single or dual axis setup.

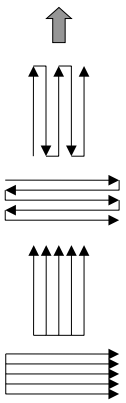


Scanner Set-up – Single or Dual (X-Y Raster) Axis.

When the **Single Axis** tab is chosen, the above scanner interface is displayed. When **XY Raster** is chosen, the interface below is displayed.



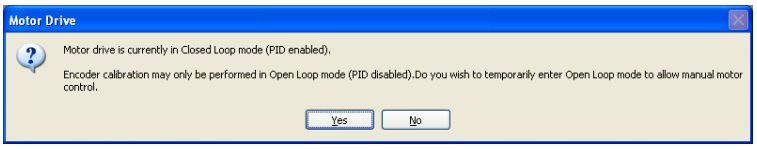
Auto Stop	When enabled, the data collection process is automatically terminated when the scanner reaches the end of the scan.	
Positional Info	Defines how distance information is recorded. There are 3 choices:	
	• **Free Run** (no positional encoder used)	Probes must be moved at a user defined speed. **Note:** it is not recommended that this mode be used where the lengths of indications are to be measured because deviating from the chosen speed will change the displayed lengths of indications.
	• **Encoder** (positional encoder required)	An encoder provides accurate linear positional data that is recorded with the UT data.
	• **Potentiometer** (XY Raster only)	A potentiometer provides accurate linear positional data that is recorded with the UT data.
	• **RS232** (not used - project specific)	

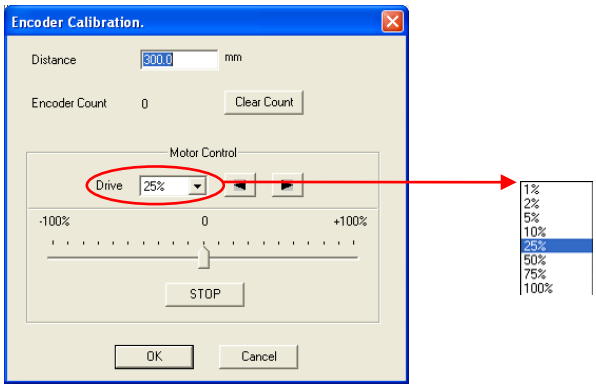
Circumference (XY Raster only)	Defines the axis that will be in the circumferential direction. The choices are: • **None** • **Primary** • **Secondary**	When the positional marker (black line) reaches the scan distance selected during the scanner setup, the marker will automatically revert to the zero position. (In reality the zero point is on the same plane as the 360° point but the data is displayed on a flat plane.)
Primary and Secondary Axes		
Current Position	**Greyed** text field - current position of the encoder in relation to zero.	This value is updated 10 – 100 times per second.
	White text field - Allows the operator to specify the current position of the encoder.	
Zero	Sets the position for the given axis to zero.	
Encoder Input	Specifies which encoder input the encoder for the given axis is connected to.	Either *Input 1* or *Input 2*
Start Position	The start position for the collected data.	The position, in relation to Zero, that the system will start to collect data.
Distance/End Position	Specifies the length of the data collection area in the given axis. There are 2 choices: • **Distance** • **End Position**	• Operator provides the scan distance. • Operator provides the end position of the scan. Useful if the operator does not want to calculate the actual length of the scan. But knows the desired end position.
Collection Step	Ultrasonic data is stored each time the scanner moves by this amount.	
Speed (mm/sec) (Free Run Only)	Sets the scanning speed, in free run only.	This value is user defined.
Pulses per mm (Encoder Only)	Sets the number of pulses per millimetre generated by the encoder. This value may be determined by using the *calibrate* option.	
Calibrate	Opens the encoder calibration dialog box.	**See** *Encoder Calibration* in Appendix B, for detailed instructions.
Motor Control:		
Enabled/Disabled	Enables the motor control software in the remote unit (Motion control board). ALL PARAMETERS MUST BE SET BEFORE ENABLING MOTOR CONTROL. • This option is only enabled in system with an on-board drive control board: currently only the TD Focus-Scan.	Calibrate the integrated encoder/s before attempting to drive the motor/s. Failing to do this may cause incorrect functioning.
Movement Control (XY Scanner only)	Opens the **Scan Pattern Control** dialogue box. The choices are: • **Primary Raster**..... • **Secondary Raster**..... • **Primary Comb**..... • **Secondary Comb**.....	Primary scanner movement 
Over current (A1 & A2)	Warning that an over current has been detected to the scanner	
E-Stop	Warning that the Emergency Stop button has been activated.	The Emergency Stop button is located on the Keypad of the TD-Scan and TD Focus-Scan instruments. Its purpose is to abruptly cut power from the drive control system in order to stop the motion of a scanner connected to the system.
Watch Dog	Warning that the Watchdog safety feature has activated.	The Watchdog is a hardware device in the drive control system that periodically polls the DSP. If no response is received it assumes that the DSP has lost control of the system and automatically shuts the drive control system down.
Primary *or* Secondary Axis Motor Control: ***(NOTE:The motor control area only becomes active when a motor is attached to either the*** Axis1 ***or*** Axis2 ***sockets)***		
Type	Motor Type, currently only servo motors are directly supported.	
Accel	The rate of acceleration/deceleration.	
Speed	The velocity at which the given axis will move.	
Move To...Go	Enter a position to move to, the **Go** button must be pressed before the axis starts to move.	The **Current Position** of the axis is displayed at the top of the dialog box.

Jog	Moves the axis forward/backward by 1 collection step distance.	
Limits	If green; limit is inactive, if red; limit is active. The scanner will not move if a limit is active.	Limit switches are usually located at the extremities of an arm (trombone) scanner. This ensures that the scanner will stop when the limit of the arm extension is reached
Advanced	Opens the **Advanced Motor Control** dialog box (see *Avanced Motor Control* below.	

Scanner Set-up - Encoder Calibration

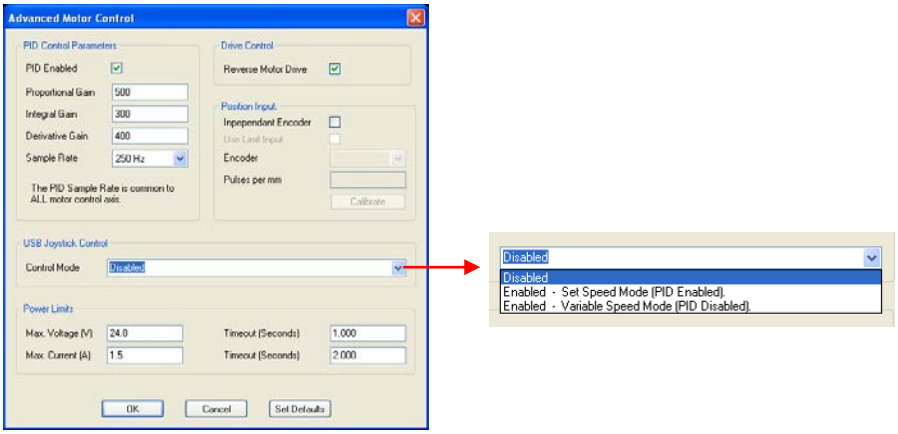
Click the ***Calibrate*** button for either the ***Primary Axis*** or ***Secondary Axis*** to activate the ***Encoder Calibration*** dialogue box. If the PID has been enabled, a dialogue box will appear as follows, warning that the PID will be disabled during calibration.





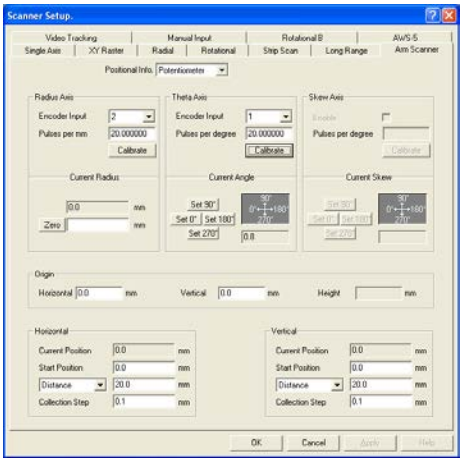
Distance	An arbitrary, measured distance selected by the operator.	The longer the calibration distance, the more accurate the calibration. 300mm is a reasonable distance.
Encoder Count	Displays the pulse count as the encoder wheel is turned	
Clear Count	Sets the encoder pulse counter to zero	Set this value to zero before moving the encoder for calibration.
OK	Ends the calibration procedure and closes the dialogue.	The pulses/mm will then be set in the system.
Motor Control:		
Drive	Applied percentage drive.	There are two methods to manually drive the motor in order to move the encoder for calibration: • Select the % drive from the dropdown list and click the left or right arrow buttons. • Move the slider either left or right. As the slider moves further from the centre (0) the % drive increases. A combination of both methods may be used if desired.
-100%...0...+100%	Applied percentage drive.	
Stop	Cuts power to the motor and brings the slider to the zero position abruptly.	

Scanner Set-up – Advanced Motor Control



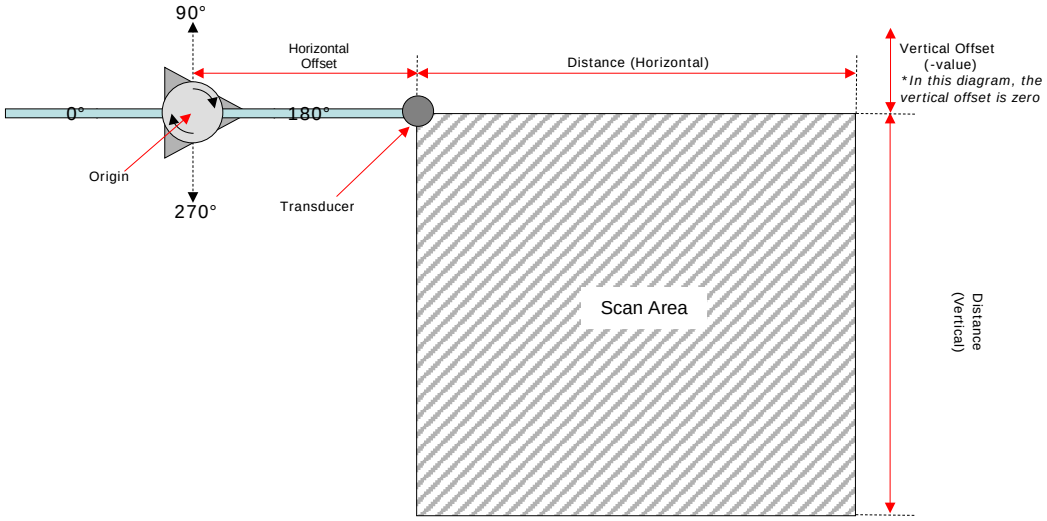
PID Control Parameters:		
PID Enabled	Allows the user to define a PID loop (PID = **P**roportional, **I**ntegral, **D**erivative)	PID is a mathematical method of correcting errors in encoder position and ensuring the accuracy of scanner positioning. Tuning a PID is not an exact science and a measure of experimentation may be required.
Proportional Gain	Gives fast response to sudden load changes and can reduce instability caused by high integral gain. This gain is typically many times higher than the integral gain so that relatively small deviations in speed are corrected while the integral gain slowly moves the speed to the setpoint. Like integral gain, when set too high, proportional gain can cause a "hard" oscillation of a few Hertz in motor speed.	
Integral Gain	Ensures that under steady state conditions that the motor speed (almost) exactly matches the setpoint speed. A low gain can make the controller slow to push the speed to the setpoint but excessive gain can cause 'hunting' around the setpoint speed. In less extreme cases, it can cause overshoot whereby the speed passes through the setpoint and then approaches the required speed from the opposite direction. Unfortunately, sufficient gain to quickly achieve the setpoint speed can cause overshoot and even oscillation but the other terms can be used to damp this out.	
Derivative Gain	Can be used to give a very fast response to sudden changes in motor speed. Within simple PID controllers it can be difficult to generate a derivative term in the output that has any significant effect on motor speed. It can be deployed to reduce the rapid speed oscillation caused by high proportional gain. However, in many controllers, it is not used.	
Sample Rate	Defines the frequency at which the PID control algorithm is executed.	250Hz should be sufficient in most cases.
Drive Control:		
Reverse Motor Drive	Allows the user to reverse the drive motor polarity.	The control software assumes that a positive control voltage moves the motor clockwise. However, due to differences in servo amplifiers and motor wiring, the motor may move in the opposite direction.
Position Input		
Independent Encoder	Allows the use of an encoder that is separate from the motor axis	The motor control software normally uses the same encoder and the axis.
Encoder	The encoder number for the motor control encoder.	
Pulses per mm	Sets the number of pulses generated by the control encoder. This value may be determined by the *calibrate* option.	
Calibrate	Opens the encoder calibration dialog box.	**See** *Encoder Calibration* in Appendix B, for detailed instructions.
USB Joystick Control		
Control Mode	Enables Joystick control. There are three choices: a. **Disabled** b. **Set Speed Mode (PID Enabled)** c. **Variable Speed mode (PID Disabled)**	A USB joystick can be used to control scanner movement. This is convenient, where many small accurate movements of the scanner are required to optimise the setup.
Power Limits		
Max. Voltage (V)	Maximum input voltage of the motor.	24 Volts
Timeout (Seconds)	Maximum time that the motor may be driven at full voltage.	The drive control software will be disabled if the timeout is exceeded.
Max. Current (A)	Maximum input current (amperage) to the motor.	4 Amps peak
Timeout (Seconds)	Maximum time that the motor may be driven at full current	The drive control software will be disabled if the timeout is exceeded. 2 seconds is reasonable.
Set Defaults	Changes the *PID* and *Power Limits* values to the system defaults	The values in the image above are set to default.

Scanner Set-up - Arm Scanner (ρ-theta)



Positional Info	This list box allows selection of either encoder or potentiometer position data inputs.	
Theta (angle) Axis:		
Encoder Input	Specifies the encoder/potentiometer number to be used for the angle (rotary) axis.	
Pulses per degree	This is the pulses per millimetre generated by the encoder.	
Calibrate	The calibrate button opens the encoder/potentiometer calibration dialog box. Here the system measures the number of encoder pulses over a given distance.	
Current Angle	Set 0° -Sets the angle of the arm to 0°. Set 90° -Sets the angle of the arm to 90°. Set 180° -Sets the angle of the arm to 180° Set 270° -Sets the angle of the arm to 270°	Assuming the scanner is placed at the top left of the scan area, the *Current Angle* is 180°. (see sketch below)
Radius Axis:		
Encoder Input	Specifies the encoder/potentiometer number to use for the radius axis.	
Pulses per degree	This is the pulses per millimetre generated by the encoder.	
Current Radius	This is the current value of the radius axis. To set a new value, enter the value and press the apply button.	Assuming the scanner is placed at the top left of the scan area, when the probe is at 0/0 then the *Radius* is the same value as the *Horizontal Origin* but with the opposite sign (+). (see sketch below)
Origin:		
Horizontal	Specifies the Horizontal position of the origin. The origin is defined as the scanner's centre of rotation.	Assuming the scanner is placed at the top left of the scan area the *Horizontal Origin* is the distance from 0/0 to the pivot point of the scanner in the negative direction (-). (see sketch below)
Vertical	Specifies the Vertical position of the origin.	Assuming the scanner is placed at the top left of the scan area the *Vertical Origin* is the distance from 0/0 to the pivot point of the scanner in the negative direction (-). (see sketch below)
Horizontal:		
Current Position	Shows the current Horizontal position at the end of the arm after Polar to Cartesian coordinate conversion.	
Start Position	The Horizontal start position of the scan area.	
Distance	The width of the scan area.	
Collection Step	The Horizontal data resolution.	
Vertical:		
Current Position	Shows the current Vertical position at the end of the arm after Polar to Cartesian coordinate conversion.	
Start Position	The Vertical start position of the scan area.	
Distance	The height of the scan area.	
Collection Step	The Vertical resolution.	

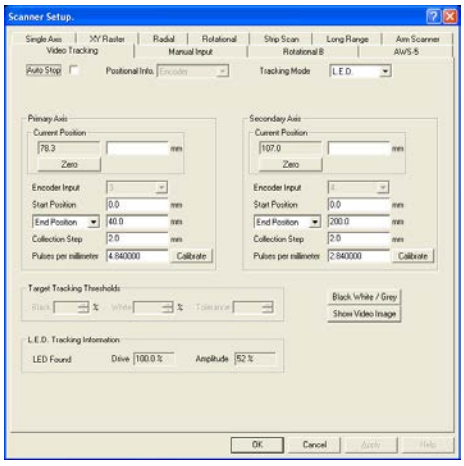
Diagram of arm scanner (ρ-theta) setup.



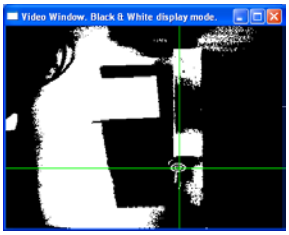
Scanner Set-up - Video Tracking.

Video Tracking is a method of tracking the location of a probe using video camera signals converted into XY positional data. The location of the probe is tracked by attaching a target to a single or twin crystal probe that is recognised by the system through the video camera image. *Video Tracking* is one method of positional tracking that may be used with the TECHNOLOGY DESIGN corrosion mapping software. The **TD Corrosion Mapping Kit** incorporates all the hardware required for *Video Tracking* and may be used with the **TD Pocket-Scan**, **TD Handy-Scan**, **TD-Scan** and **TD Focus-Scan** systems.

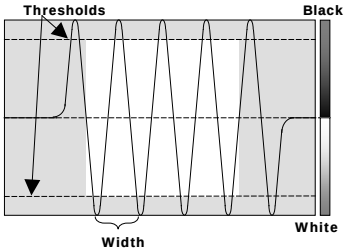
TD Corrosion Mapping Kit connected to a TD Pocket-Scan



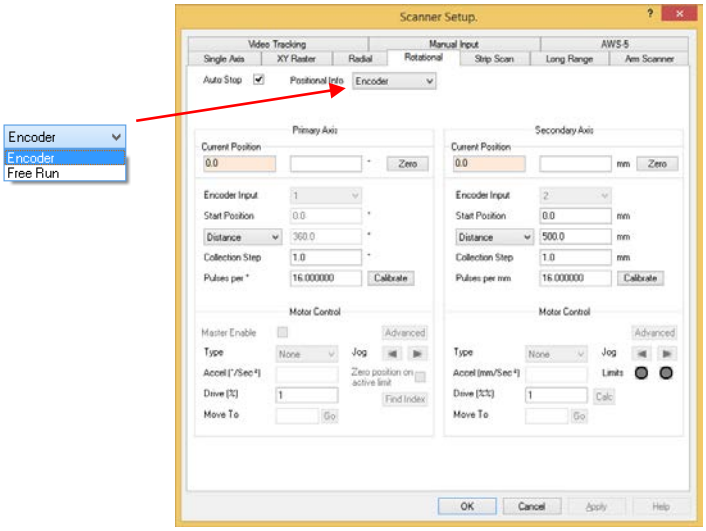
Video image – for LED setup



Black/White/Grey image – for target setup

Auto Stop	When enabled, the data collection process is automatically terminated when the scanner reaches the end of the scan.	Usually unchecked for corrosion mapping.
Position Info	Fixed - always encoder.	
Tracking Mode	Determines the probe tracking method. The choices are: • **L.E.D. Tracking** or • **Target Tracking**	**L.E.D. Tracking** – The target that is used to register the probe position is an infra-red light emitting diode (L.E.D.)  **Target Tracking -** The target that is used to register the probe position is a printed group of concentric black & white circles. A template (*Video Tracking Target2.doc*) is provided in the *Target* folder on the product installation CD.
Primary Axis and Secondary Axis		
Current Position	**Greyed** text field - current position of the L.E.D or target in relation to zero.	This value is updated 10 – 100 times per second.
	White text field - Allows the operator to specify the current position of the L.E.D or target.	
Zero	Sets the position for the given axis to zero.	
Encoder Input	Specifies which input the encoder is connected to for a given axis.	No user adjustment. Primary is always **Input 3** and Secondary is **Input 4**.
Start Position	Start position for the collected data.	The position, in relation to Zero, that the system will start to collect data.
Distance	Width of the scan area.	
Collection Step	Incremental resolution of encoder data.	Collection step refers to the distance between each successive A-scan capture in both the X and Y direction. (i.e. block or 'pixel' size).
Pulses per millimetre	Pulses per millimetre generated by the video tracking hardware.	
Calibrate	Opens the calibrate dialog box. Here the software measures the encoder pulses generated by the video tracking hardware for a measured movement.	
Target Tracking Thresholds:		
Black	The black threshold within the video image may be adjusted.	 As a guide use a black level of about 45%, white level at around 70% and tolerance set at 3. These values will change depending on the ambient light level. Constant good daylight is best. In low light environments use L.E.D tracking.
White	The white threshold within the video image may be adjusted.	
Tolerance	The width tolerance may be adjusted.	
Black white / Grey	When the **video window** is open, the image alternates between a 256 grey scale image or a black, white, & one grey level image. (**See** illustration above)	Click the button to alternate between display modes in the video window. Set the threshold levels for black, white and grey in the *Black* and *White* fields.
Show Video Image	Opens the **Video window**.	Displays the camera image in either a 256 grey scale image or a black, white, & one grey level image.
L.E.D Tracking Information:		
Drive	Shows the percentage drive value used to power the L.E.D.	
Amplitude	Shows the amplitude at which the L.E.D. is being seen by the camera.	

Scanner Set-up - Rotational.

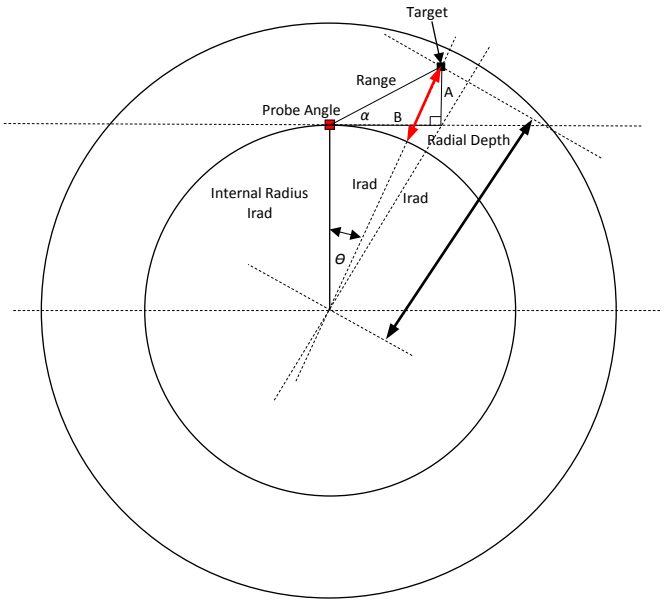


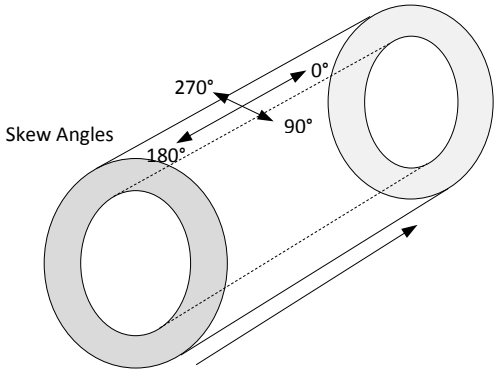
Auto Stop	When enabled, the data collection process is automatically terminated when the scanner reaches the end of the scan.	
Positional Info	Defines how distance information is recorded. There are 2 choices:	
	• **Encoder** (positional encoder required)	An encoder provides accurate linear positional data that is recorded with the UT data.
	• **Free Run** (no positional encoder used)	Probes must be moved at a user defined speed. **Note:** it is not recommended that this mode be used where the lengths of indications are to be measured because deviating from the chosen speed will cause inaccuracies in the displayed lengths of indications.
Primary and Secondary Axes		
Current Position	**Greyed** text field - current position of the encoder in relation to zero.	This value is updated 10 – 100 times per second.
	White text field - Allows the operator to specify the current position of the encoder.	
Zero	Sets the position for the given axis to zero.	
Encoder Input	Specifies which encoder input the encoder for the given axis is connected to.	Either *Input 1* or *Input 2*
Start Position	The start position for the collected data.	The position, in relation to Zero, that the system will start to collect data. • In the *Primary* direction (circumferential) the scan always starts at Zero. The text box is greyed. • In the *Secondary* direction (axial) this value may be manually adjusted.
Distance	Specifies the length of the data collection area in the given axis. In the *Secondary* direction there are two choices: • **Distance** • **End Position**	• In the *Primary* direction (circumferential) the value is fixed at 360°. The text box is greyed. • In the *Secondary* direction (axial) the operator provides either the *scan distance* or the *end position* of the scan. • **End Position** is useful if the operator does not want to calculate the actual length of the scan. But knows the desired end position.
Collection Step	Ultrasonic data is stored each time the scanner moves by this amount.	• *Primary* direction is in degrees • *Secondary* direction is in mm or inches.
Speed (°/sec) or **(mm/sec) (Free Run Only)**	Sets the scanning speed, in *free run* mode only.	• This value is user defined. • *Primary* direction is in degrees • *Secondary* direction is in mm or inches.
Pulses per mm (Encoder Only)	Sets the number of pulses per millimetre, inch or degree generated by the encoder. This value may be determined by using the *calibrate* option.	• *Primary* direction is in degrees • *Secondary* direction is in mm or inches.
Calibrate	Opens the encoder calibration dialog box.	**See** *Encoder Calibration* in Appendix B, for detailed instructions.
Motor Control:		
Master Enabled	Enables the motor control software in the remote unit (motion control board). ALL PARAMETERS MUST BE SET BEFORE ENABLING MOTOR CONTROL.	Calibrate the integrated encoder/s before attempting to drive the motor/s. Failing to do this may cause incorrect functioning.

	• This option is only enabled in systems with an on-board drive control board: currently only the TD Focus-Scan.	
Primary *or* Secondary Axis Motor Control: ***(NOTE: The motor control area only becomes active when a motor is attached to either the*** Axis1 ***or*** Axis2 ***sockets)***		
Type	Motor Type, currently only servo motors are directly supported.	
Accel (°/sec²) or **(mm/sec²)**	The rate of acceleration/deceleration. • **Primary Axis** = °/sec • **Secondary Axis** = mm/sec	
Drive % or **Speed (°/sec)** or **Speed (mm/sec)**	The velocity at which the given axis will move. The text will change depending on the PID settings in **Advanced Motor Control**: • **PID** is disabled = **Drive %** • **PID** is enabled = **Speed (°/sec)** in the **Primary axis** or **Speed (mm/sec)** in the **Secondary axis**	
Move To…Go	Enter a position to move to, the **Go** button must be pressed before the axis starts to move.	The **Current Position** of the axis is displayed at the top of the dialog box.
Jog	Moves the axis forward/backward by 1 collection step distance.	
Zero position on active limit	Re-defines the **Zero** position each time the appropriate limit switch is activated.	The zero position for each scan revolution may migrate over a distance resulting in positional inaccuracy. A limit switch ensures this does not occur by triggering the zero position correctly for each revolution.
Find Index	Currently inactive	
Limits	If green; limit is inactive, if red; limit is active. The scanner will not move if a limit is active.	Limit switches are usually located at the extremities of an arm (trombone) scanner. This ensures that the scanner will stop when the limit of the arm extension is reached
Advanced	Opens the **Advanced Motor Control** dialog box (see *Advanced Motor Control* above).	

Scanner Set-up – Data Display Protocols when using Rotational Scanner

When the **Rotational** scanner tab is selected the TD-Scan software changes the way data is displayed to accommodate the complexity of determining reflector position. The sketch below illustrates how this is achieved.





Each view displays data from 1 channel. A drop-down list at the top left of the C-Scan view facilitates easy changing of displayed channels.

- Channels with skew angles of **90°** and **270°**.
    - B-Scan image:
        - Displayed as a volume corrected.
        - A-Scans at the edge of the image wrap round at 0° & 360°.
        - Vertical scale indicates radial depth.
        - Depth in the status-bar & cursors is the radial depth.
        - Horizontal scale in degrees.
        - The angle displayed in the status-bar and for the cursors is the project angle around the circumference, with 0° being top-dead-centre.
    - C-Scan image:
        - Displayed as a volume corrected.
        - A-Scans at the edge of the image wrap round at 0° & 360°.
        - Vertical scale indicates distance down the length of the bore.
        - Depth in the status-bar & cursors is the radial depth.
        - Horizontal scale is on degrees.

- The angle displayed in the status-bar and for the cursors is the project angle around the circumference, with 0° being top-dead-centre.

  - D-Scan image:
    - This is not volume corrected.
    - Vertical scale indicates distance down the length of the bore.
    - Horizontal scale indicates range.
    - Depth in the status-bar & cursors is the radial depth.

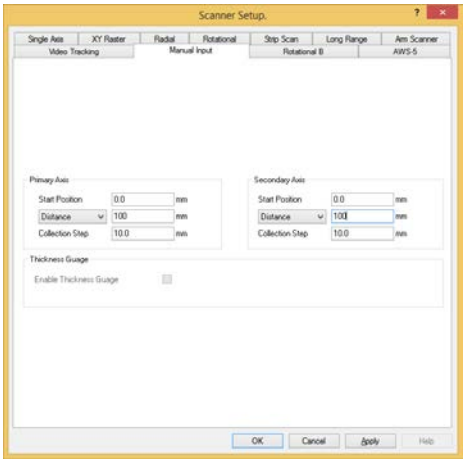
- Channels with skew angles of **0°** and **180°**.

  - B-Scan image:
    - This is not volume corrected.
    - Vertical scale is in range.
    - The status-bar and cursors indicate range not depth.
    - Horizontal scale is in degrees.

  - C-Scan image:
    - Displayed as a volume corrected.
    - A-Scans with a skew angle of 0° are projected vertically in a positive direction down the length of the bore, whilst A-Scans with a 180° skew are projected vertically in a negative direction.
    - Horizontal scale is in degrees.

  - D-Scan image:
    - Displayed as a volume corrected.
    - Vertical scale indicates distance down the length of the bore.
    - Horizontal scale indicates depth.
    - The status-bar & cursors display depth.

Scanner Set-up – Manual Input.



When the **Manual Input** tab is selected there is no encoder feedback therefore multiple A-scans are not recorded. Use this mode for manual 'free-hand' scanning with imaging when a record (snapshot) of the currently displayed data may be required. When the scan is terminated, only the data currently displayed is saved.

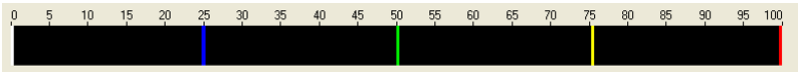
Manual Input may also be used to manually record a series of thickness gauge points on a grid matrix to produce a corrosion map similar in appearance to an X/Y encoded corrosion map. The grid mapping function is only available in the corrosion mapping software, i.e. SuperView disabled (see Appendix B, item xxiii for detailed instructions).

Primary and Secondary Axes		
Start Position	Allows the operator to specify the start position of the data collection grid.	This value is usually 0
Distance	Specifies the length of the data collection area in the given axis. There are two choices: • **Distance** • **End Position**	• **End Position** is useful if the operator does not want to calculate the actual length of the scan. But knows the desired end position.
Collection Step	The size of each block or gauge point on the data collection grid.	The operator places the probe manually in each block to record the thickness

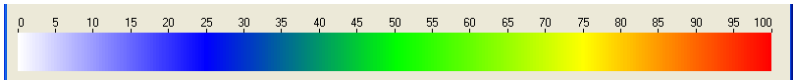
Creating a colour scale

- Press the **Clear** button. This clears the colour bar, and the auto scale points.
-

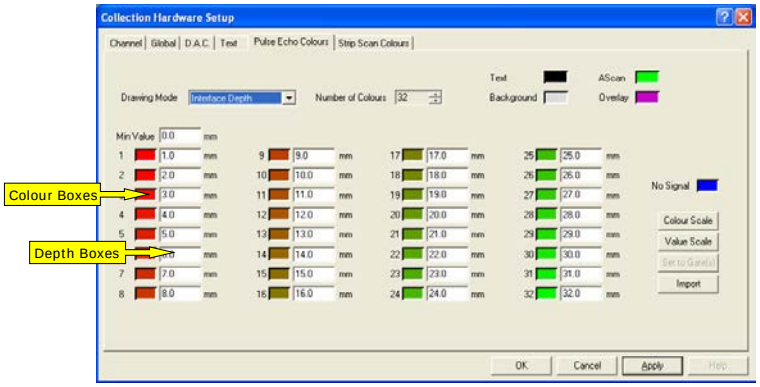
- Next place the mouse over a point on the colour bar you wish to set the colour of and press the mouse left button. This opens the colour edit dialog box.
- Move the RGB sliders until the desired colour is created.
- Repeat point 2 for each colour point. See image below



- When all desired colour points have been entered, press the Scale Auto button to create the colour scales in the colour bar.



Amplitude Colours Page (Interface Depth)



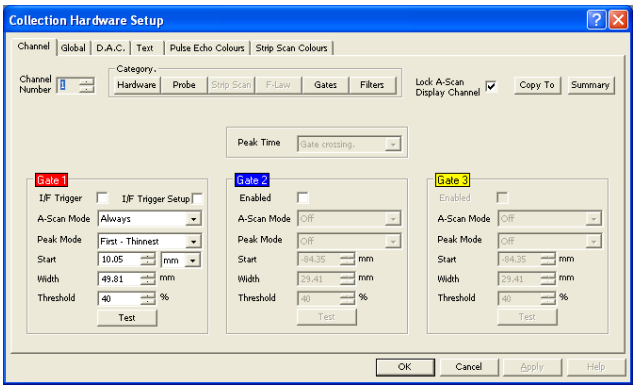
Interface Depth allows the user to measure and view graphically the couplant path when performing emersion techniques and is configured in the same way as *Peak Depth*. (See: *Adjusting Colours & Depth* in Appendix A for guidance on defining depths and colours.)

The advantage of *Interface Depth* is that the near surface topography of a test material may be mapped and could be useful in determining the extent of pipe ovality during internal pipe inspections.

Drawing Mode	Allows the user to select the mode for onscreen colour definition of the data. The TD-Scan software has 3 independent colour tables for converting Pulse Echo and Phased Array data into colour images: • ***Peak Depth*** • **Interface Depth** • **Peak Amplitude**	Colour tables are stored in the ultrasonic data files. Offline each Pulse Echo window retains its own independent colour tables. On selection of the *Drawing Mode*, the data will be redrawn to display the data in the relevant mode.
Number of colours	Up to 32 colours may be selected.	The number of each colour is displayed to the left of its colour box.
Text	Defines the text colour.	
Background	Defines the background colour in the data area.	
AScan	Defines the colour of the A-scan trace.	
Overlay	Defines the colour of the weld overlay.	Weld overlays are defined in the *Superview Display Control.*
Min Value	Depth at which measurement starts for the colour pallet.	Must be less than the depth in position 1
Colour boxes	Allows the user to adjust the colour for each available position based on the **Number of Colours** value.	Click in the box to display an *Edit RGB* control. **See**: *Adjusting Colours & Depth* in Appendix B for guidance on defining a colour pallet.
Depth boxes	Allows the user to adjust the depth for each available position based on the **Number of Colours** value.	Depths may be entered directly into the boxes or arranged automatically. **See**: *Adjusting Colours & Depth* in Appendix B for guidance on defining depths.
R G B	Displays the selected colour numerically	
No Signal	Defines the colour when no signal is detected.	
Colour Scale	Opens the **Select Scale Ends** dialogue.	Allows the user to define a colour scale automatically. **See** *Adjusting Colours & Depth* in Appendix B for detailed usage instructions.
Value Scale	Opens the **Select Scale Ends** dialogue.	Allows the user to define the depth scale automatically. **See** *Adjusting Colours & Depth* in Appendix B for detailed usage instructions.
Set to Gate(s)	Sets the depth scale in even steps from the beginning to the end of the gate.	If multiple gates are enabled, the depth scale will encompass the range of all gates.

Import	Opens the **Select Scan File** dialogue.	Allows the user to import colour & depth settings from an existing scan file.

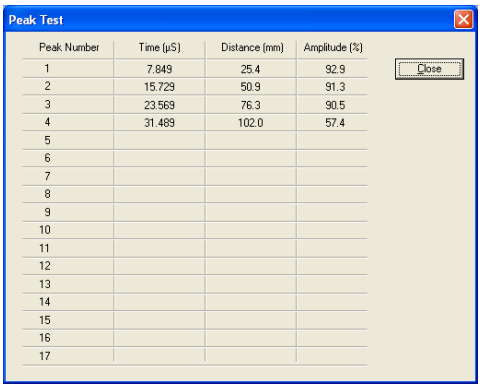
Channel Page – Gates Category - Pulse Echo



Enabled	The enabled check boxes have the same functionality in each gate; it enables/disables the given gate. The gates run sequentially, therefore, if gate 2 is disabled, gate 3 is also disabled.	
I/F Trigger (Gate 1 only)	This places gate 1 into interface trigger mode. Under normal operation (not I/F trigger), all timing is referenced from transducer excitation. However, in I/F trigger mode all time is referenced from the first signal that rises above the detection threshold of gate 1. This affects the timing of gates 2 & 3, plus the start of the DAC curve. I/F trigger is used for immersion system only.	**Note**: The must be a clear separation between the trigger signal and subsequent signals for accurate measurement to be possible. Therefore paint thickness measurement and similar thin coating monitoring may not be possible. **See** '*I/F Trigger Setup*' in Appendix B for procedure.
I/F Trigger Setup	When selected, the couplant velocity is used to convert time to distance. The couplant velocity is entered in the Global page.	Useful for emersion testing: • When the A-scan window is used to measure the distance to the interface signal through the couplant. • When the data views are set to display the interface. This view could be used for measuring tube ovality when a centrally located internal scanner is used. **See** '*I/F Trigger Setup*' in Appendix B for procedure.
A-Scan Mode	This field controls A-Scan data collection: • Off..... A-Scan collection disabled. • Always..... An A-Scan is collected each time the scanner moves by the collection step. • If peak in gate..... An A-Scan is collected each time the scanner moves by the collection step if a signal is breaking the gate's threshold.	
Peak Mode	The peak mode specifies what peak data the gate is to collect: Off..... No peak data is collected. All peaks..... All the peaks in the gate are collected (Max = 16 peaks per gate) First..... The 1st peak in the gate is collected. Subsequent peaks are ignored. First – Thinnest... The system stores peak data at an operator defined distance increment of the scanner (collection step). However, within the collection step, a particular transducer may have been excited many times, and thus many depth readings taken. In this mode, the software only stores 1 depth reading (the thinnest) within a collection step. First – Thickest.... Same as First – Thinnest except the thickest reading is stored. Between..... The difference between the 1st and 2nd peaks in the gate is calculated and stored as the depth/thickness. Between - Thinnest..... The difference between the 1st and 2nd peaks in the gate is calculated and stored as the depth/thickness. (See First – Thinnest).	

	Between - Thickest…….. …….. Loss of signal ……	The difference between the 1st and 2nd peaks in the gate is calculated and stored as the depth/thickness. (See First – Thickest). If there is no signal in the gate, the loss of signal colour is drawn in the B, C, and D scan views. (See Pulse Echo Colours page).	
Start	This is the start of the data collection data. (µS/mm)		
Width	This is the width of the data collection gate. (µS/mm)		
Threshold	To be collected as a peak, the signal must rise above the threshold level.		
Test	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.

Channel Page – Gates Category – Test (Pulse Echo and Phased Array)



The table provides numeric information about the signals that are in the gate and break the threshold.