



# OmniScan Setup for a Weld Inspection Using the COBRA Scanner Getting Started Guide

Software Version 2.0

DMTA-20009-01EN — Revision B

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# Setting Up the OmniScan for a Weld Inspection Using the COBRA Scanner

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The purpose of this document is to show you how to quickly set up and use the OmniScan to perform a weld inspection using the COBRA scanner. This document includes the procedures used to prepare for the inspection, perform the inspection, analyze the data, and produce a report.



Figure 1 The OmniScan MX and the COBRA scanner

## Required Material and Software

The procedures in this document describe the inspection of a weld using the COBRA scanner with 7.5CCEV35-A15 probes.

The inspected weld used as an example in the procedures is on a 14 mm thick, mild steel pipe. You can easily adapt the procedures to the scan plan of your inspected pipes by changing the values of a few parameters.

You need the following items to perform the procedures contained in this document:

- A COBRA scanner (including two 7.5CCEV35-A15 phased array probes)
- A Y-adaptor (P/N: OMNI-A-ADP05) to connect two phased array probes to the OmniScan
- An OmniScan MX with a 16:128 or 32: 128 phased array module (P/N: OMNI-P-PA16128 or OMNI-P-PA32128)
- The OmniScan MXU 2.0 software with Multigroup option (P/N: OMNI-SO-MGROUP) and wedge update
- A manual water pump (WTR-SPRAYER-4L or 8L) for irrigation

## Related Documents

For more information concerning the COBRA Scanner, the OmniScan instrument, and the OmniScan software, refer to the following Evident documents:

- *COBRA Scanner: User's Manual* (P/N: DMTA-20006-01EN)
- *OmniScan MXU Software: User's Manual* (P/N: DMTA011-01EN)
- *OmniScan MX: User's Manual* (P/N: DMTA071-01EN)

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## Preparing for an Inspection

After defining your scan plan, use the procedures contained in this section to set up the OmniScan for a weld inspection using the COBRA scanner. The setup requires you to define two groups, one for each phased array probe.


Perform the following procedures in the order that they appear:

- “Starting the OmniScan” on page 7
- “Defining the First Group with the Group Wizard” on page 8
- “Calculating the Focal Laws with the Focal Law Wizard” on page 11
- “Calibrating the OmniScan with the Calibration Wizard” on page 11
- “Configuring Various Parameters” on page 12
- “Configuring the Second Group for the Second Probe” on page 15

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### TIP

To reduce the setup time, load an existing COBRA scanner OmniScan setup file that you created for a similar inspection, and then make the necessary adjustments.

Press  or choose **File > File > Open** to open an existing setup file.


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## Starting the OmniScan

The following procedure describes how to start the OmniScan with the MXU 2.0 software and to validate that the required components are installed.

### To start the OmniScan

1. Ensure that the OmniScan storage card contains the OmniScan MXU 2.0 software.
2. To be sure to have the COBRA probe and wedge definition on the storage card:
  - a) Visit the software download section of the EvidentScientific.com Web site and download the latest Wedge Update.
  - b) Install the wedge update on the OmniScan storage card.
3. Insert the storage card into the OmniScan instrument.
4. Connect the phased array probe located on the encoder side of the scanner, to the P1 (channels 1 to 64) connector of the Y-adaptor.

5. Connect the other phased array probe to the other connector of the Y-adaptor.
6. Connect the Y-adaptor to the OmniScan MX instrument.
7. Start the OmniScan unit by pressing the Power key (  ) at the lower-right corner of the OmniScan front panel.  
The instrument displays the OmniScan logo.
8. When more than one application is installed on the storage card, a screen presents corresponding buttons in order for you to choose which application you want to start. Choose **OmniScan [MXU - 2.0]**.  
The OmniScan MXU software starts.
9. To verify that the Multigroup software option is installed:
  - a) Choose **Preferences > Service > System Info**.
  - b) In the **OmniScan MX System Information** report that appears, use the Scroll knob to scroll down to the **Acquisition Module** section.
  - c) Verify that **Yes** appears in the **Enabled** column for the **Multigroup support [OMNI-SO-MGROUP]** option.
  - d) Choose **Close** to close the report.
10. If the Multigroup option is not enabled, contact Evident to purchase the option.

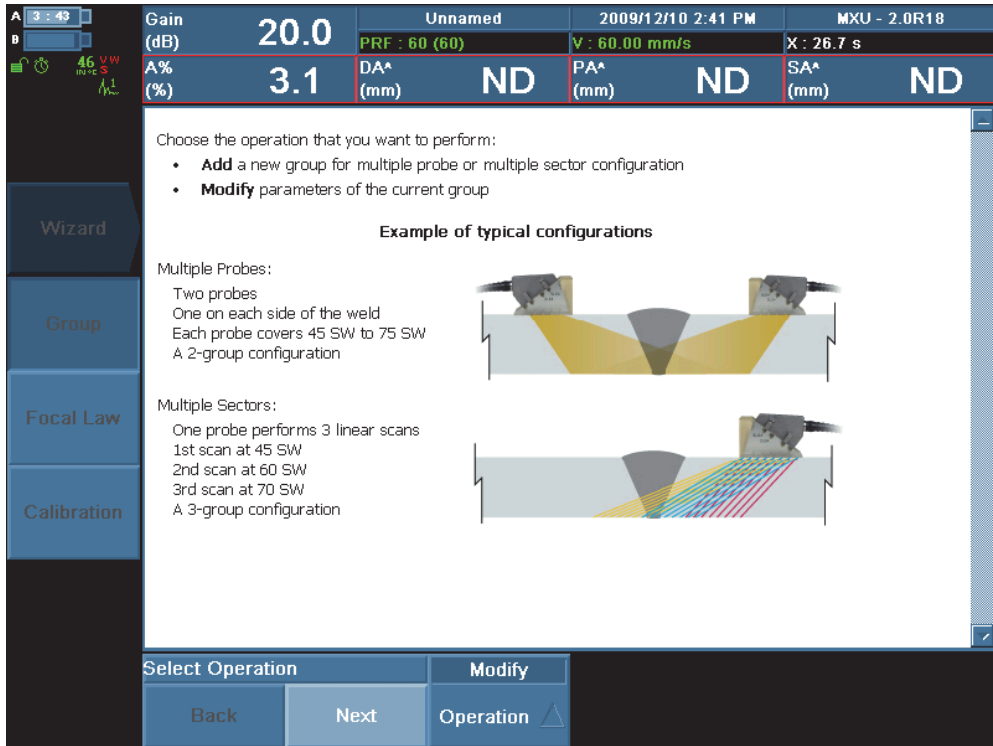
## Defining the First Group with the Group Wizard

The following procedure describes how to set up the group for the first COBRA scanner phased array probe (located on the encoder side of the scanner) using the **Group** wizard.

### To define the first group with the Group wizard


1. On the OmniScan, choose **Wizard > Group > Start** to begin defining the setup.  
The first wizard step help appears, showing you how to proceed with the **Select Operation** step (see Figure 2 on page 9).





**Figure 2 The Select Operation step of the Group wizard**

### TIP

Press Cancel (  ) at any time if you need to quit the wizard.

2. In the **Select Operation** step, select **Operation = Modify**, and then choose **Next**.
3. In the **Validate Material** step:
  - a) Select **Geometry = Plate**.
  - b) Choose **Thickness**, and according to your scan plan, enter the value corresponding to the thickness of the number of skips required to cover the entire weld. For this example, two skips times 14 mm equals 28 mm.

<b>NOTE</b>
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You will change the thickness back to the real inspected pipe thickness after the calibration.

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- c) Select **Material = STEEL, MILD**, and then choose **Next**.  
Adapt this choice if it is different from your inspected pipe.
4. In the **Select Group Type** step, select **Group Mode = PA**, and then choose **Next**.
5. In the **Select Connection** step, for the first group, **Connection P** is always set to **1**.  
Choose **Next**.
6. In the **Select Probe** step:
  - a) Select **Select = Select Tx/Rx**.
  - b) Select **Auto Detect = OFF**.
  - c) Choose **Probe**.
  - d) In the dialog box that appears, select **A15** in the list on the left, **7.5L16-A15** in the list on the right, and then choose **Select** to close the dialog box.
  - e) Choose **Next**.
7. In the **Select Wedge** step:
  - a) Select **Select = Tx/Rx**.
  - b) Choose **Wedge**.
  - c) In the dialog box that appears, select **SA15** in the list on the left, **SA15-N60S-IH** in the list on the right, and then choose **Select** to close the dialog box.
  - d) Choose **Next**.
8. In the **Set Position** step:
  - a) Set **Scan Offset = 0 mm**.
  - b) For this example, set **Index Offset = -22 mm**.  
For your inspected pipe, adapt this value according to your scan plan.
  - c) Set **Skew = 90°**, and then choose **Next**.
9. In the **Accept** step, choose **Finish** to complete the Group wizard.
10. Save your setup (.ops format):
  - a) Choose **File > Save Setup As**.
  - b) In the file manager that appears, select an existing setup file.  
OR  
Choose **File name**, and then enter the desired file name.

- c) Choose **Save** to save the setup file and close the file manager.  
The file is saved on the storage card in the \User\Setup folder.

## Calculating the Focal Laws with the Focal Law Wizard

Once the group is defined, calculate the focal laws for the first COBRA scanner phased array probe using the **Focal Law** wizard.

### To calculate focal laws with the Focal Law wizard


1. Choose **Wizard > Focal Law**, and then choose **Start** in the **Law Wizard** step.
2. In the **Select Law Configuration** step, select **Law Config. = Sectorial**, and then choose **Next**.
3. In the **Set Wave Type** step, select **Wave Type = SW**, and then choose **Next**.
4. In the **Select Probe Elements** step:
  - a) Set **Element Qty. = 16**.
  - b) Set **First Element = 1**, and then choose **Next**.
5. In the **Set Beam Angle** step, set the following parameters according to your scan plan. For this example:
  - a) Set **Min. Angle = 40°**.
  - b) Set **Max. Angle = 70°**.
  - c) Set **Angle Step = 0.5**. Consider increasing this value when using higher scan speeds.
  - d) Set **Focus Depth = 28 mm** (as in step .3.b in section “Defining the First Group with the Group Wizard” on page 8).
  - e) Choose **Next**.
6. In the **Generate Law** step, choose **Generate**.
7. Choose **File > Save Setup as** to save your setup.

## Calibrating the OmniScan with the Calibration Wizard

With the group defined and the focal laws calculated, you now need to calibrate the instrument sensitivity, the ultrasound velocity, and the wedge delay, as well as define a sizing curve. You can easily do this using the Calibration wizard.

Refer to the *OmniScan MXU Software: User’s Manual* (P/N: DMTA011-01EN) for more details on the calibration procedures.

## To calibrate the OmniScan with the Calibration wizard





1. Detach the encoder-side probe/wedge assembly from the scanner.
2. Press the Calibration key ().  
OR  
Choose **Wizard > Calibration** to access the **Select Calibration** step.
3. Calibrate the ultrasound propagation velocity within the material of the inspected pipe:
  - a) Select **Type = Ultrasound**.
  - b) Select **Mode = Velocity**.
  - c) Choose **Start**, and then follow the other wizard steps.
4. Calibrate the sound propagation delay within the material of the wedge:
  - a) Select **Type = Ultrasound**.
  - b) Select **Mode = Wedge Delay**.
  - c) Choose **Start**, and then follow the other wizard steps.
5. Calibrate the sensitivity of the instrument to ensure the detection of a small reference reflector:
  - a) Select **Type = Ultrasound**.
  - b) Select **Mode = Sensitivity**.
  - c) Choose **Start**, and then follow the other wizard steps.
6. Define a sizing curve:
  - a) Select **Type = Ultrasound**.
  - b) Select **TCG**, time-corrected gain, and perform the calibration to cover the depth of the reflectors encountered during the inspection.
7. Choose **File > Save Setup as** to save your setup.

## Configuring Various Parameters

Following the completion of the wizard steps, you need to configure some other ultrasonic, gate, display, part, scan, and encoder parameters.

### To configure various parameters

1. Set **Probe/Part > Parts > Thickness = 14 mm**, the real pipe thickness for this example.  
Adapt this value to the real thickness of your inspected pipe.


2. Choose **UT Settings > General**, or press the appropriate shortcut keys to verify the other settings:
  - a) Set **Gain** = 18.4 ().
  - b) Set **Start** = 0 ().
  - c) Set **Range** = 50 () to cover the thickness for all focal laws.
  - d) Set **Wedge Delay** = 0.
3. Choose **UT Settings > Pulser**:
  - a) Select **Voltage** = High.
  - b) Select **PW** = Auto.
  - c) Select **PRF** = Optimum.
4. Choose **UT Settings > Receiver**:
  - a) Select **Filter** = 7.5 MHz.
  - b) Select **Rectifier** = FW.
  - c) Select **Video Filter** = On.
  - d) Select **Averaging** = 1.
5. Choose **Gate/Alarm > Gate**, or press  to set the gate parameters:
  - a) Select **Parameters** = Position.
  - b) Select **Gate** = A, and then adjust the gate parameters so that gate A covers the entire inspected section according to the scan plan (two skips equal two times the thickness). For this example:
    - (1) Set **Start** = 3 mm.
    - (2) Set **Width** = 30 mm.
    - (3) Set **Threshold** = 25%.
  - c) Select **Gate** = B, and then adjust the gate parameters so that gate B covers the middle of the weld, without detecting the geometry reflectors. For this example:
    - (1) Set **Start** = 16 mm.
    - (2) Set **Width** = 10 mm.
    - (3) Set **Threshold** = 10%.
  - d) Select **Gate** = I, and then adjust the gate parameters to hide gate I:
    - (1) Set **Start** = 0 mm.
    - (2) Set **Width** = 0.05 mm.

- (3) Set **Threshold = 10%**.
6. Choose **Display > Overlay**:
  - a) Select **UT Unit = True Depth**.
  - b) Select **Grid = Off**.
  - c) Select **Sizing Curves = On**.
  - d) Select **Gate = On**.
  - e) Select **Cursor = On**.
  - f) Select **Overlay = On**.
7. Choose **Display > Properties**, select **Source = Highest (%)**, and then choose **Yes** in the dialog box that appears.
8. Choose **Scan > Inspection**:
  - a) Select **Type = One-Line Scan**.
  - b) Select **Scan = Encoder 1**.
  - c) Set **Max. Scan Speed** to the maximum accepted value (**98 mm/s** for this example).
9. Choose **Scan > Encoder**:
  - a) Select **Polarity = Normal**.
  - b) Select **Type = Quad**.
  - c) Set **Resolution = 32 Step/mm**.
  - d) Set **Origin = 0**.
10. Choose **Scan > Area**:
  - a) Set **Scan Start = 0 mm**.
  - b) Set **Scan End = 400 mm**.  
Adapt this value to the length of your inspected pipe circumference.
  - c) Set **Scan Resolution = 1 mm**.  
With the COBRA scanner, you can set the scan resolution value to as low as 1/32 mm. However, a small scan resolution value leads to a slower inspection.
11. Choose **File > Save Setup as** to save your setup.

## Configuring the Second Group for the Second Probe

If you performed all the previous procedures, the settings and calibrations are done for the first group; that is, for the probe on the encoder side of the scanner. You now need to configure the second probe. You can do this quickly by copying the parameters of the first group (including calibration) and making adjustments to a few parameters.

### To configure the second group for the second probe

1. Select **Probe/Part > Select > Group = Add**.
2. In the dialog box that appears, which asks if you want to copy the settings from the current group, choose **Yes**.  
The OmniScan creates Group 2.
3. Choose **Wizard > Group**.
4. In the **Group Wizard Step**, choose **Start**.
5. In the **Select Operation** step, select **Operation = Modify**, and then press **Next**.
6. In the **Select Group** step, select **Group = 2**, and then choose **Next**.
7. Choose **Next** until you reach the **Select Connection** step, and then select **Connection P = 65**.
8. Choose **Next** until you reach the **Set Position** step, and then:
  - a) For this example, set **Index Offset = 22 mm**.  
Adapt this value to your inspected pipe according to the scan plan.
  - b) Select **Skew deg = 270°**.
9. Choose **Next** until you reach the **Accept** step, and then choose **Finish**.
10. Press , or choose **Display > Selection** to set the display:
  - a) Select **Display = A-S-(C)**.
  - b) Select **C-Scan = A%**.
  - c) Select **Group = All**.

Both groups now appear as in the example shown in Figure 3 on page 16.

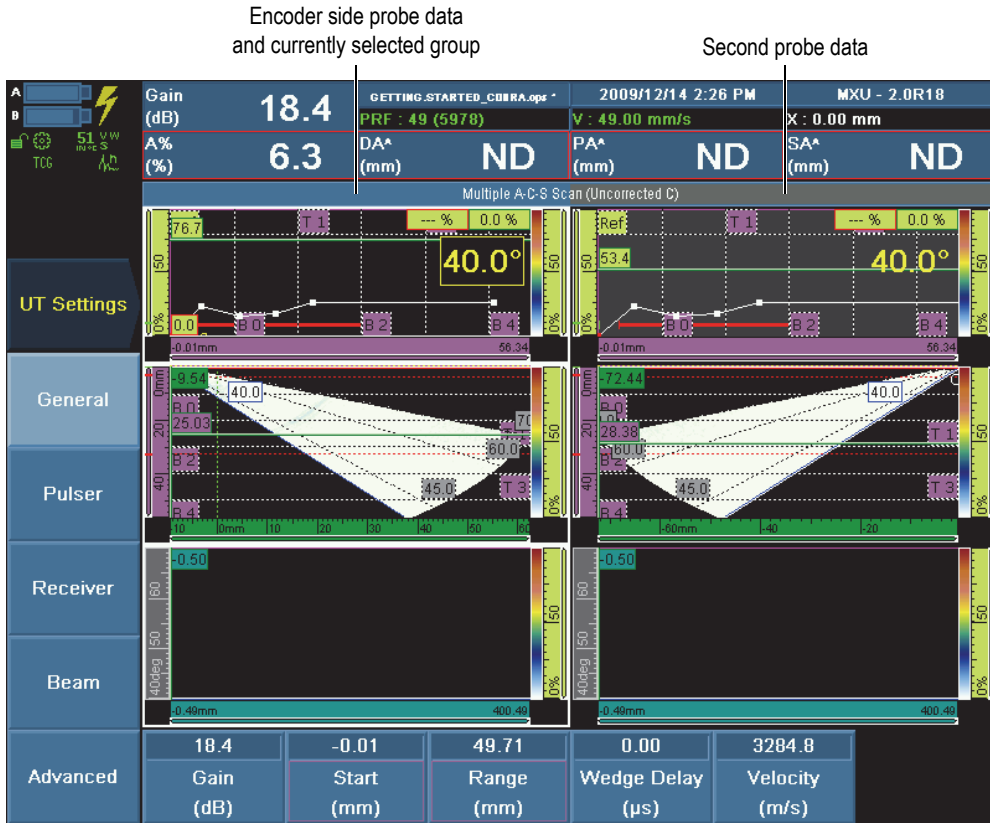


Figure 3 Both groups appear with a completed setup



11. Choose **File > Save Setup as** to save your setup.



## Performing Inspections

Once you have completed the preparation procedures (see “Preparing for an Inspection” on page 7), you are ready to inspect your weld.

### To inspect your weld

1. Referring to the *COBRA Scanner: User’s Manual* (P/N: DMTA-20006-01EN) for details:
  - a) Configure the scanner for the pipe diameter.
  - b) Adjust the distance between the two scanner probes according to your scan plan (22 mm on each side of the weld centerline for this example).
2. Install the scanner on the pipe with the weld centered between the two probes.
3. If needed, use the Gain key () to adjust the gain so that the weld geometry appears on the S-scan.
4. Ensure that couplant liquid is fed to the scanner.
5. When ready to acquire data in the C-scan, press the Start/Stop key () and then manually rotate the COBRA scanner over the complete circumference. The acquired data appears in the C-scan view for each probe.

## Analyzing Data

Once you have acquired data (see “Performing Inspections” on page 17), switch to the OmniScan Analysis mode to find and characterize the indications.


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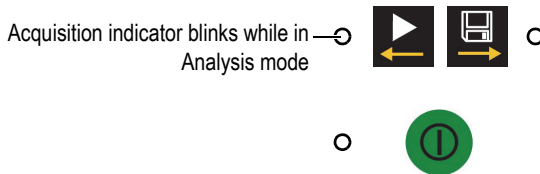
<b>NOTE</b>
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You can also use the TomoView software to analyze the inspection data acquired with the OmniScan.

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## To analyze data with the OmniScan

1. Press the Freeze key () to enter the Analysis mode.  
The data view freezes in the current state, and the orange acquisition indicator blinks (see Figure 4 on page 18).





**Figure 4 The acquisition indicator**

2. To save your data for later analysis:
  - a) Select **File > File > Save mode = Inspection Data**.
  - b) Choose **File > File > File Name**, and then type the desired name.

### TIP

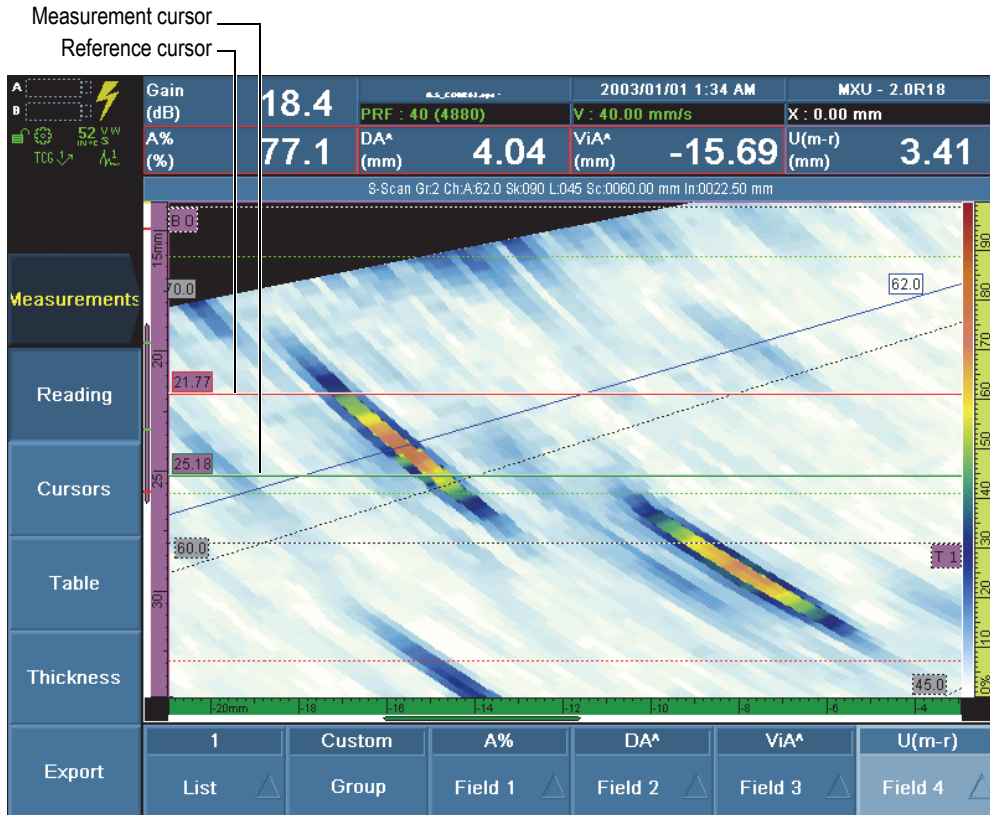
Use “#” characters in the file name to include an automatically increasing number. For example Data#### becomes Data0001, Data0002, etc... Refer to the *OmniScan MXU Software: User’s Manual* (P/N: DMTA011-01EN) for details on other special characters.

- c) Choose **File > File > Save Data**.  
The inspection data is saved on the storage card in the \User\Data folder.
3. To look for an indication:
  - a) Press and hold the Group Selector key () to select the desired group.  
The A-scan background of the currently unselected group appears in grey (see Figure 7 on page 22).
  - b) Use the Data cursor to scan the slices for an indication:
    - (1) Press the Cursor key () , or choose **Measurement > Cursors > Selection**, and then select **Data**.
    - (2) Set **Measurement > Cursors > Scan = 0 mm**.

- (3) While looking at the S-scan view and still editing the **Measurement > Cursors > Scan** parameter value, turn the Scroll knob clockwise to scan the data slices until you find an unusual reflector.
4. Find the maximum signal using the Angle cursor:
  - a) Choose **Measurement > Cursors > Angle** to select the angle cursor.
  - b) Turn the Scroll knob until the angle cursor in the S-scan is over the reflector with a maximized signal amplitude signal in the A-scan.
5. To zoom on the reflector in the C-scan:
  - a) Select **Display > Zoom > Display = Uncorrected C-Scan**.
  - b) Set **Start Scan** where you want the zoom to start on the C-scan.
  - c) Set **End Scan** where you want the zoom to end on the C-scan.
6. To size the indication using the reference (red line) and the measurement (green line) cursors (see Figure 5 on page 20):
  - a) Select **Display > Overlay > Cursor = On** to ensure the cursors appear on the screen.
  - b) Select **Display > Selection > Display = S**.
  - c) Choose **Display > Zoom**, and then set the **Start Index**, **End Index**, **Start USound**, and **End USound** parameters to zoom closer to the indication.
  - d) Select **Measurements > Cursors > Selection = Measure**, and then set the position of **UT** cursor on each side of the indication.
  - e) Select **Measurements > Cursors > Selection = Reference**, and then set the **UT** cursor position on each side of the indication.
  - f) To display appropriate readings, select **Measurements > Readings**, and then:
    - (1) Set **List = 1**.
    - (2) Select **Field 1 = A%**, the maximum amplitude of the signal.
    - (3) Select **Field 2 = DA<sup>^</sup>**, the depth of the indication in the part.
    - (4) Select **Field 3 = ViA<sup>^</sup>**, the volumetric position of the indication detected in the gate.
    - (5) Select **Field 4 = U(m-r)**, the distance on the ultrasonic axis obtained by subtracting the position of the reference cursor from the position of the measurement cursor.
  - g) Consult the readings above the data to get the size and the position values for the indication.

<b>NOTE</b>
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If you want, you can display many other readings available with the OmniScan.



**Figure 5 Zooming and positioning the cursors around an indication**

7. To include the indication in the indication table (see Figure 6 on page 21):
  - a) Select **Measurement > Table > Display Table = On**.
  - b) Choose **Measurement > Table > Add Entry** to add the indication to the indication table.

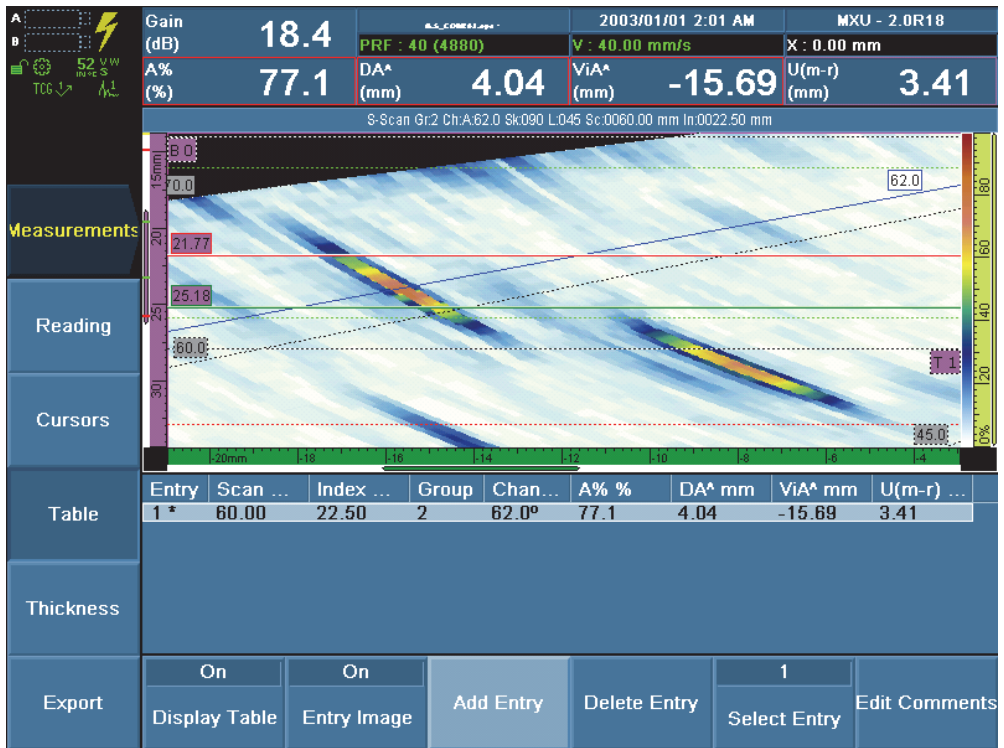



Figure 6 Adding an indication to the indication table

8. You can also measure the indication length on the C-scan:
  - a) Select **Display > Selection > Display = C**.
  - b) Press the Cursor key ().
  - c) Select **Measurements > Cursors > Selection = Measure**.
  - d) Choose **Measurements > Cursors > Scan** to set the start position on the scan axis.
  - e) Select **Measurements > Cursors > Selection = Reference**.
  - f) Choose **Measurements > Cursors > Scan** to set the end position on the scan axis.
  - g) Consult the readings above the data to get the size and the position values for the indication.

9. Choose **Measurement > Table > Add Entry** to add the indication to the indication table.
10. Select **Measurement > Table > Display Table = Off** to hide the indication table.
11. Select **Display > Selection > Display = A-S-(C)** to display the A-scan, S-scan, and C-scan for both groups, as shown in the example in Figure 7 on page 22.



Figure 7 View of A-Scan, S-Scan, and C-Scan for both groups in Analysis mode

## Creating a Report

With the OmniScan MXU software, you can easily create an inspection report. You can configure, create, review, print, and save the report from the OmniScan. The report is saved in the HTML format.

The report can include a report header, up to ten user defined information fields, probe characterization parameters, setup parameters, user notes, a layout view, and the indication table content.

### To create a report

1. While still in the Analysis mode, choose **File > Format** to select which elements you want to appear in the report:
  - a) Select **File > Format > User Field = On** to include user-field information.
  - b) Select **File > Format > Probe = On** to include probe parameters.
  - c) Select **File > Format > Setup = On** to include setup parameters.
  - d) Select **File > Format > Note = On** to include notes.
  - e) Select **File > Format > View = Current Layout** to include an image of the current data display.  
OR  
Select **Table** to include, rather, the indication table content.  
OR  
Select **Off** to include neither.
2. If you chose to include user fields, define them as follows:
  - a) Choose **File > User Field > Select**, and then select the number corresponding to one of the ten possible user fields.
  - b) Select **File > User Field > Enable = On**.
  - c) Choose **File > User Field > Label**, and then type the label for the field (for example: Inspector).
  - d) Choose **File > User Field > Content**, and then type the value for the field (for example: *<your name>*).
  - e) Repeat steps 2.a to 2.d for other user fields.
3. If you chose to include notes, define them as follows:
  - a) Choose **File > Notes > Edit Notes**.
  - b) In the dialog box that appears, type the desired note text, choose **Close**, and then choose **Yes** when asked to save changes.  
The note text appears at the beginning of the last section of the report.
4. If you want to include a report header, define it as follows:
  - a) Choose **File > Notes > Edit Header**.
  - b) In the dialog box that appears, type the desired report header text, choose **Close**, and then choose **Yes** when asked to save changes.  
The report header text appears at the beginning of the report, below the logo.

5. To change the logo that appears at the top of the report, refer to the *OmniScan MXU Software: User's Manual* (P/N: DMTA011-01EN).
6. If you want to save the report to a device other than the storage card:
  - a) Connect your USB storage device to one of the OmniScan USB ports.
  - b) Choose **File > File > Storage**, and then select the desired device.
7. Choose **File > Report > Build** to display the HTML file of the report on the OmniScan screen (see Figure 8 on page 24 and Figure 9 on page 25).
8. Use the Scroll knob to scroll the screen and to see the complete report.
9. Choose **Save and Close** at the bottom of the report screen to save the report and to close the report viewer.  
The report is saved on the selected storage device in the \User\Report folder.
10. Choose **File > File > Save Data** to save the inspection data to an .opd file.



## OmniScan Report

Report Date	Report Version	Setup File Name	Inspection Date	Inspection Version	Save Mode
2003 / 01 / 01	MXU - 2.0R18	G_S_COBRA3.opd	2009 / 12 / 15	MXU - 2.0R18	Inspection Data
OmniScan Type	OmniScan Serial #	Module Type	Module Serial #	Calibration Due	Data File Name
OmniScan MX	OMNI-1854	OMNI-M-PA16128	OMNI-2447	2009 / 10 / 22	G_S_COBRA#

### Group 1

#### Probe Characterization

Probe Model	Probe Serial #	Wedge Model	Wedge Angle	Probe Aperture	
7.5L16-A15	7.5L16-A15				
Probe Frequency	Peak Frequency	Higher Frequency	Center Frequency	Bandwidth (MHz)	Bandwidth (%)
7.50 MHz	N/A	SA15-N60S-IH	38.5°	8.00 mm	
	Lower Frequency	Higher Frequency	Center Frequency	Bandwidth (MHz)	Bandwidth (%)
-6 dB	N/A	N/A	N/A	N/A	N/A
-20 dB	N/A	N/A	N/A	N/A	N/A
Date	Time	Procedure	Calibration Block	Characterization Gain	A%
N/A	N/A	N/A	N/A	N/A	N/A

Figure 8 Example of an HTML report (part 1 of 2)



Table

Entry #	Scan (mm)	Index (mm)	Group	Channel	A% (%)	DA^ (mm)	VIA^ (mm)	U(m-r) (mm)	A% (%)	DA^ (mm)	VIA^ (mm)	V3A^ (mm)
1*	60.00	22.50	2	62.5°	72.0	12.89	0.31	4.46	72.0	12.89	0.31	60.00
Entry #	Scan (mm)	Index (mm)	Group	Channel	A% (%)	S(r) (mm)	S(m) (mm)	S(m-r) (mm)	A% (%)	DA^ (mm)	VIA^ (mm)	V3A^ (mm)
2*	256.00	22.50	2	62.5°	70.8	254.50	258.00	3.50	70.8	4.83	-15.18	256.00

Entry #	Scan	Index	Group	Channel	A%	DA^	VIA^	U(m-r)	A%	DA^	VIA^	V3A^
1	60.00 mm	22.50 mm	2	62.5°	72.0 %	12.89 mm	0.31 mm	4.46 mm	72.0 %	12.89 mm	0.31 mm	60.00 mm
Comments												
-												

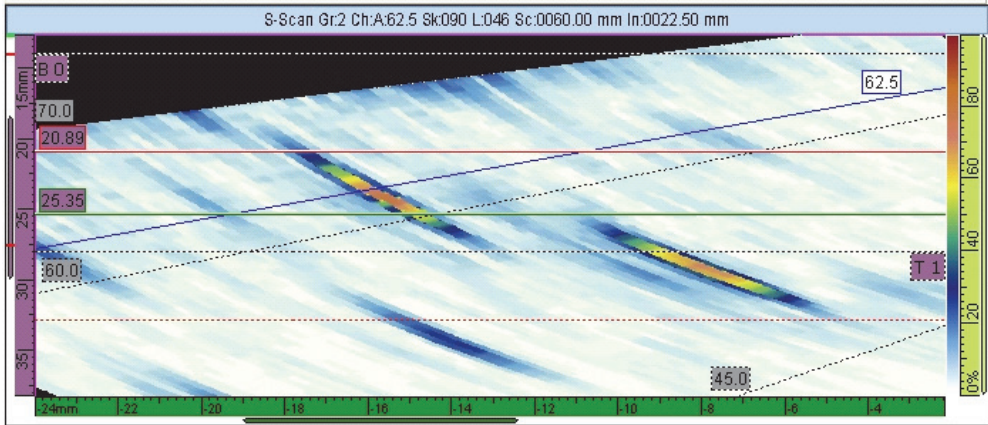


Figure 9 Example of an HTML report (part 2 of 2)

