USER'S GUIDE

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subsurface imaging solutions

Sensors & Software Inc.
1040 Stacey Court
Mississauga, ON L4W 2X8 Canada

Tel: (905) 624-8909
Fax: (905) 624-9365

E-mail: sales@sensoft.ca
Website: www.sensoft.ca

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Sensors & Software Inc.
1040 Stacey Court
Mississauga, Ontario
Canada L4W 2X8
Tel:(905) 624-8909
Fax:(905) 624-9365
E-mail: radar@sensoft.ca

1 Introduction

The ConquestView PC software is designed to parallel the display that you are already familiar with from collecting and viewing data using the Conquest system. ConquestView will permit you to further analyze Grid Scan data, print and save colour images and reprocess and display the data with different Concrete Type values. For Conquest systems with Power Cable Detector (PCD) capability, ConquestView also displays PCD images.

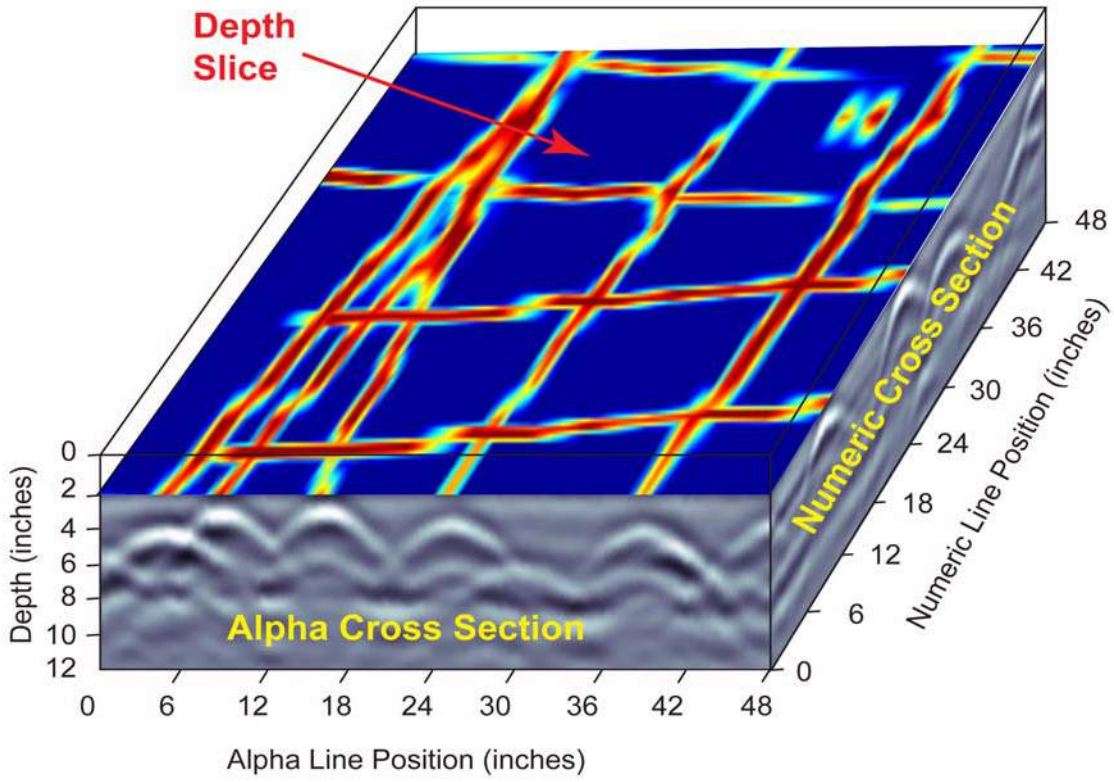


Figure 1-1: A conceptual Conquest Grid Scan image to understand the relationship between depth slice images, Alpha cross section images and Numeric cross section images.

2 Overview

2.1 ConquestView Main Screen

The ConquestView main screen consists of several sections. The main display windows mimic top and side views of a three-dimensional cube of data (see **Figure 1-1**).

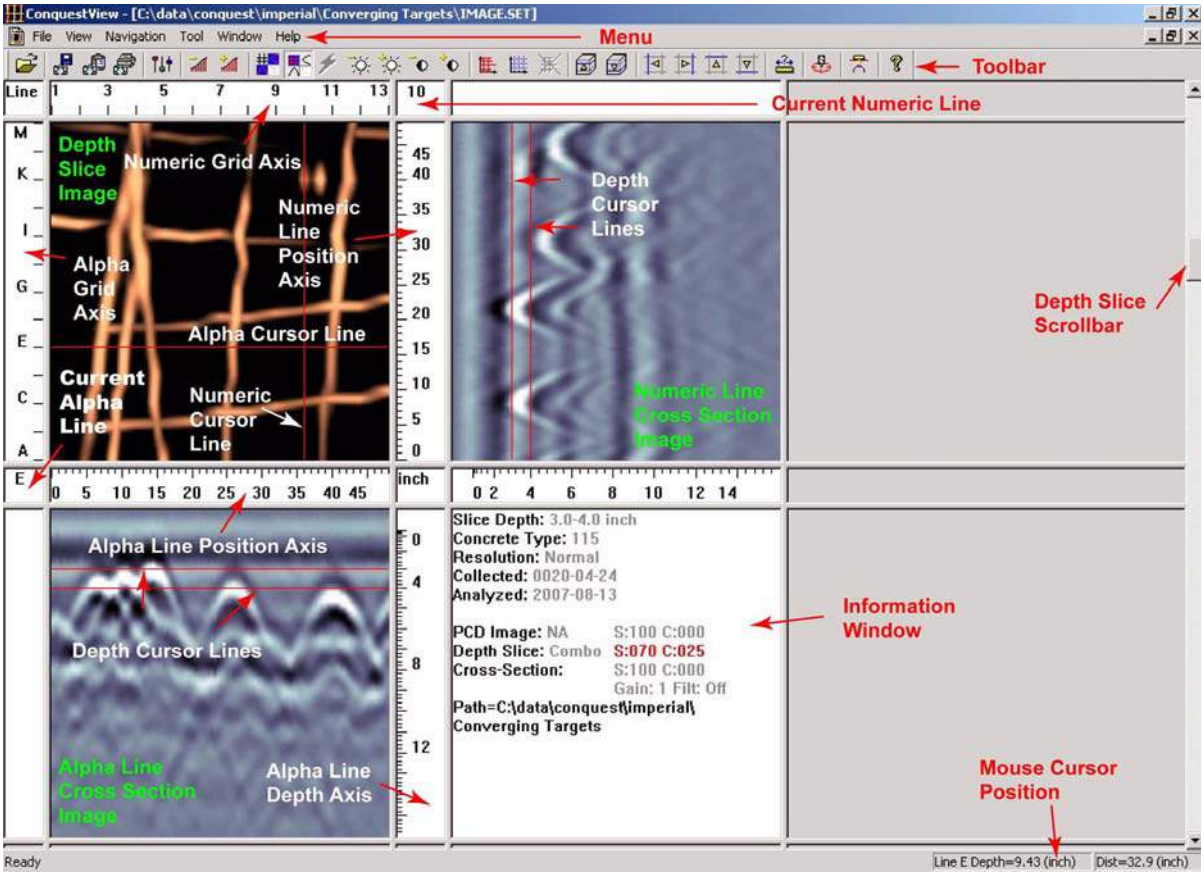


Figure 2-1: The ConquestView main screen with a depth slice image displayed in the Plan View window.

The upper left portion of the screen is the **Plan View** displaying the depth slice images or the PCD image. This image is like looking down on the top of the 3D cube of Conquest data (see **Figure 1-1**).

Below and to the right of the depth slice window are the **Cross Section Images** for the particular Alpha or Numeric lines indicated by the **Alpha and Numeric Cursor Lines** (cross-hairs) on the depth slice. These images are like looking on the sides of the 3D cube of Conquest data (see **Figure 1-1**).

The depth range of the current depth slice displayed is indicated by the **Depth Cursor Lines** on the cross-sections. Each depth image represents a finite thickness of concrete; 1 inch or 25 millimeters (depending on the units during data collection of the Grid Scan).

The **Depth Slice Scrollbar** on the right hand side of the screen allows the user to scroll up and down through the depth slices. As the scroll bar moves, the depth slice image changes and the **Depth Cursor Lines** on the cross-section images move up or down depending on the scroll direction.

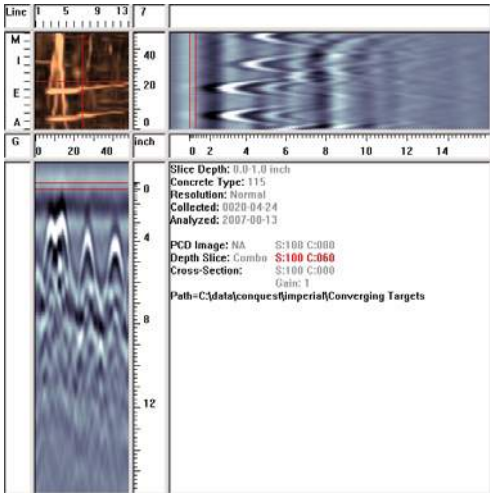
The **Information Window** in the bottom right provides details of the current display images including the start and end depths of the current depth slice, the **Concrete Type** and the **Contrast**, **Sensitivity** and **Gain** applied to the images.

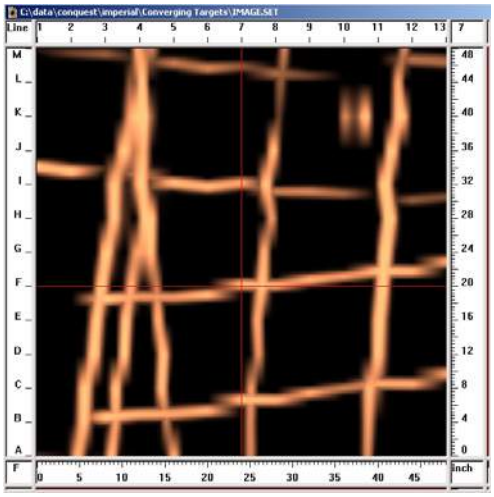
The **Menus** and buttons on the **Toolbar** allow the user to further modify and customize the images, and when satisfied with the results, produce hard copy output or graphics file output.

2.1.1 Changing Window Sizes

The Plan View image always retains the correct aspect ratio of the Conquest data regardless of how the size of the Plan View window is changed. For example, square grids will always appear square on the screen and rectangular grids will always appear rectangular.

To change the size of the Plan View window, click and drag the bottom frame, right frame or the bottom right corner of the window. As the size of the depth slice window changes, the size of the cross section images also change to maintain the correct aspect ratio. It is possible to make the Plan View window large enough that the cross section windows close completely. This is handy when the user wants to print or save to a graphics file the largest possible depth slice or PCD image.





2.2 Plan View Window

The plan view window displays the various depth slice images associated with the current grid scan data and the current **Concrete Type** value. It can also display the **PCD Image**.

Axes corresponding to the Alpha and Numeric Lines numbers appear on the left and top of the depth slice image respectively. The **Information Window** on the lower right indicates the depth range that is represented in the current Depth Slice.

The user can scroll through all the depth slices by using:

1) the **Depth Slice Scrollbar** on the right of the screen,

2) clicking on the **Move Depth Slice Up** and **Move Depth Slice Down** buttons on the **Toolbar**

3) using the Mouse Wheel (if present),

4) pressing the **Page Up** and **Page Down** keys on the keyboard, or

5) selecting **Navigation > Depth Slice Up** or **Depth Slice Down** from the menus.

Each depth slice image represents a finite thickness of concrete; either 1 inch or 25 millimeters (depending on the units during data collection of the Grid Scan).

The **Depth Slice / PCD Image Colour Map** can be changed under the **View > Settings** options from the menu or by selecting the **Settings** button from the **Toolbar**.

Lines corresponding to all the data lines collected during the Grid Scan can be superimposed on the depth slice/PCD image using the **Show Collected Lines** option available under **View** or by selecting the **Toggle Collected Lines** button from the **Toolbar**.

The **Collected Lines Colour** can be changed under **View > Settings**.

Grid lines corresponding to the major position labels can be superimposed on the depth slice/PCD image. The **Show Grid** option is available by selecting **View > Show Grid** from the menu or by selecting the **Toggle Show Grid** button from the **Toolbar**.

The **Grid Colour** can be changed under **View > Settings**.

The **Drill Locator** is used to superimpose a hole of a user-determined diameter onto the depth slice/PCD image. The Drill Locator can be turned on by selecting **Tool > Drill Locator** from the menu or by selecting the **Toggle Drill Locator** button from the **Toolbar**.

The **Drill Locator Diameter** of the hole (in mm or inches) can be changed under **View > Settings**.

The two lines that make up the crosshair that is superimposed over the depth slice/PCD image are called the **Position Cursor Lines**. These lines are the grid locations of the cross-sections that are currently being displayed directly below and to the right of the depth slice image.

2.2.1 PCD Image

The Plan View window can be toggled from displaying a depth slice image to the PCD (Power Cable Detector) image by depressing the PCD button.

The PCD data are displayed two ways:

1) as a plan map image in the plan view window and

2) as individual profiles superimposed on the cross-section images.

On the cross-section images, the scale of the PCD Profile goes from zero (0) at the bottom to the maximum PCD value for the entire grid scan at the top. The Max PCD value is listed in the **Information Window**.

If the Grid Scan was collected with a Conquest system without PCD capability or if the PCD option was turned off on the Conquest system, the PCD button on the toolbar will be greyed out and not accessible.

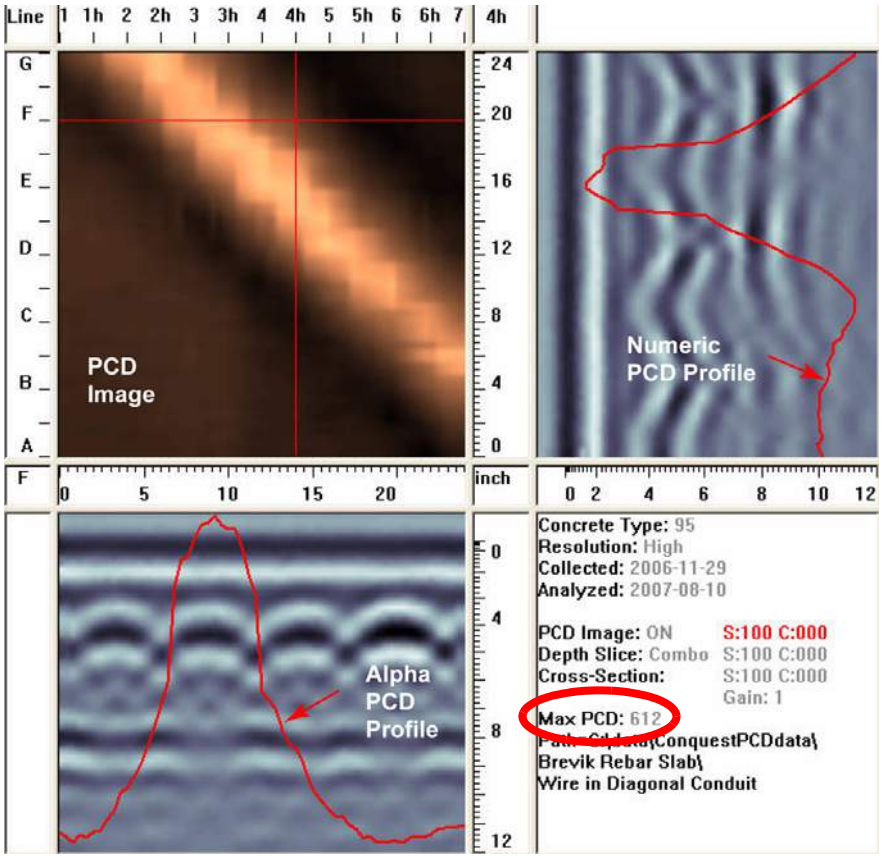


Figure 2-2: The ConquestView main screen with a PCD Image displayed in the Plan View window and PCD Profiles superimposed on the cross-section images. The maximum PCD data value in the entire grid is displayed in the Information Window.

Unlike depth slice images, the PCD image is a single image that is NOT associated with a specific depth range so when the PCD image is displayed, the Depth Slice Scrollbar is disabled.

The **Depth Slice / PCD Image Colour Map** can be changed under the **View > Settings** options from the menu or by selecting the **Settings** button from the **Toolbar**.

2.3 Depth Slice Scrollbar

The scrollbar on the right of the ConquestView window allows the user to scroll up and down through the depth slices. As the arrow buttons on either the top or bottom of the scrollbar are clicked, the **depth slice image** is incremented by a single depth slice. The scrollbar can also be dragged to select a depth slice.

As the Depth Slice image is updated, the **Depth Cursor Lines** superimposed over the Alpha and Numeric **cross-section images** change in depth. In this way the user can see exactly what data on the Alpha and Numeric survey lines are being used to create the current depth slice.

The user can quickly move to a particular Depth Slice by clicking on the depth level in either of the Alpha and Numeric cross sections. The Depth Slice image will change to the one that includes that depth point.

Unlike depth slice images, the PCD image is a single image that is NOT associated with a specific depth range so when the PCD image is displayed, the Depth Slice Scrollbar is disabled.

2.4 Cross Section Images

The image that appears to the right of the plan view (depth slice or PCD image) is the current **Numeric Line cross section** and the image that occurs immediately below the plan view image is the current **Alpha Line cross section**.

There are two **Depth Cursor Lines** superimposed on each cross section images. These lines represent the depth range that is being displayed in the current Depth Slice. This is particularly useful for understanding how features that appear in the cross sections correspond to the depth slice images.

The **Cross Section Colour Map** can be changed under the **View > Settings** options from the menu or by selecting the **Settings** button from the **Toolbar**.

Gain is the amplification applied to the cross sectional images. It varies from 0 (lowest gain) to 9 (highest gain) and can be changed by pressing the “+” or “-” keys on the keyboard, selecting **View > Gain Decrease and Gain Increase** or by using the **Increase Gain** and **Decrease Gain** buttons on the **Toolbar**.

Cross section images are displayed with the **Filter** Off but turning the Filter On removes flat-lying responses in the cross section to enhance hyperbolas from targets like rebar, conduits, cables and pipes. The Filter can be turned on or off by pressing the “F” key on the keyboard, selecting the **View > Filter** option or selecting the **Filter** checkbox in the **View > Settings** dialog. The current Filter setting is displayed in the **Information Window**.

Lines corresponding to the major position and depth labels can be superimposed on the cross sections. The **Show Grid** option is available by selecting **View > Show Grid** from the menu or by selecting the **Toggle Show Grid** button from the **Toolbar**.

The **Grid Colour** can be changed under **View > Settings**.

The **Units of Display** can be changed under **View > Settings**.

2.5 Moving through Cross Sections

The user can move to different cross section images by selecting **Alpha Line: Next and Previous** or **Numeric Line: Next and Previous** under the **Navigation** menu option.

The user can quickly change the Alpha and Numeric cross sections by clicking anywhere on the depth slice image. The crosshairs will move to the closest intersection point of the mouse click location and the corresponding alpha and numeric line cross sections will be displayed.

2.6 Information Window

The Information Window appears on the bottom right of the screen and displays information about the grid scan:

1) **Slice Depth**: The start and end depths for the current depth slice image. These are also the depth values of the Depth Cursor Lines on the cross-section images.

   If the PCD Image is displayed in the Plan View window, the slice depths do not appear because the PCD image does not have a depth range associated with it.

2) **Concrete Type**

3) **Drill Location**: The position of the centre of the drill locator (if ON). The **diameter** is also listed.

4) **Resolution**: Specifies whether the grid scan was collected in **Normal** or **High** resolution.

5) **Grid Scan collection date**.

6) **Analyzed date**.

7) **PCD Image**: Specifies whether the PCD image is turned ON or OFF and displays the current **Contrast** and **Sensitivity** settings are for the PCD image. If the PCD button

is currently depressed (ON), these values are red to indicate that they are active and can be edited by pressing the Contrast and Sensitivity Increase and Decrease buttons.

8) **Depth Slice Image**: Displays which data lines are being used to generate the image (see **Alpha, Numeric and Alpha & Numeric Combo Lines**). This line also displays the current **Contrast** and **Sensitivity** settings for the depth slice image. If the Depth Slice button

is currently depressed (ON), these values are red to indicate that they are active and can be edited by pressing the Contrast and Sensitivity Increase and Decrease buttons.

9) **Cross-Section Image**: Displays the current **Contrast** and **Sensitivity** settings for the cross-section image(s). If the Cross-Section button

is currently depressed (ON), these values are red to indicate that they are active and can be edited by pressing the Contrast and Sensitivity Increase and Decrease buttons. This line also displays the **Gain** from 1-9 applied to the cross-section images and lists whether the **Filter** is on or off.

10) **Max PCD**: If the PCD Image is displayed in the Plan View window, the maximum PCD value in all the cross-section data is listed. The PCD Profiles superimposed on the cross-sections are scaled so the Max PCD value is at the top of the cross-section image.

11) Complete **file path** of the Grid Scan data.

2.7 Toolbar

Most operations can be performed using the toolbar. The Toolbar is made visible by checking it under **View > Toolbar**.

A brief description of the function of a button is displayed by holding the mouse cursor on the button for about 1 second.

There is also a longer description of the button on the **Status Bar** on the bottom of the screen.

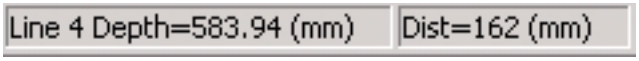
2.8 Status Bar

The status bar is visible on the bottom of the screen when the **View > Status Bar** option is checked.

As the mouse cursor is moved over buttons on the toolbar, the status bar, at the bottom of the screen, provides helpful descriptions of the purpose of the particular button. For example, holding the mouse over the **Settings** button will display the following on the Status Bar:

The right side of the status bar displays information about the position of the mouse cursor when it is located on the depth slice or PCD image:

or the cross sections:



3 Menus

3.1 File

3.1.1 Open

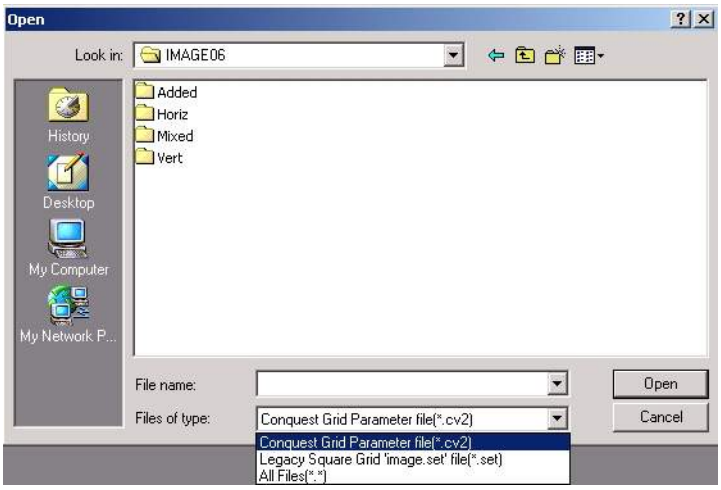
The **File > Open** option allows the user to select the Conquest Grid Parameter file for the Conquest Grid Scan data to be displayed.

Conquest Grid Parameter files take two forms:

1) The current Conquest hardware generates a file with a .CV2 extension. This file defines square and rectangular grid scans.

2) The original Conquest hardware generates a file called IMAGE.SET. This file defines square grid scans only.

The dropdown list in the **Open** dialog allows the user to list and select files with a .CV2 or a .SET extension.



The grid parameter file is always saved in the same folder as the grid scan data files.

The File Open option can also be access from the **Toolbar** by clicking the **Open** button:

3.1.1.1 Conquest Grid Parameter (.CV2) File Definition

The name for the Conquest Grid Parameter file with the .CV2 extension is in the form:

MMDD_NNG.CV2

where MM is the month 01 – 12

DD is day 00 – 31

NN is grid number. Currently 01 – 99, and 00 for demo

G is the Grid size indicated by the following letters:

A = 2x2ft or 600x600mm

B = 4x4ft or 1200x1200mm

C = 8x8ft or 2400x2400mm

D = 2x4ft or 600x1200mm

E = 2x8ft or 600x2400mm

The **Open** dialog looks for all files with a .CV2 extension so this file can be renamed by the user if desired.

3.1.1.2 Exporting Data from Conquest

Before Conquest data can be viewed in ConquestView, it must be exported from the Conquest system onto the Compact Flash card provided. The data is then copied from the Compact Flash card onto the PC where the ConquestView software is installed.

Conquest Grid Scan folders are contained in the Export folder on the Compact Flash card, i.e. \EXPRT005\GRIDS\CONQ001. The folder names correspond to the grid number on the Conquest unit when the data were collected. See the Conquest User's Guide for more details.

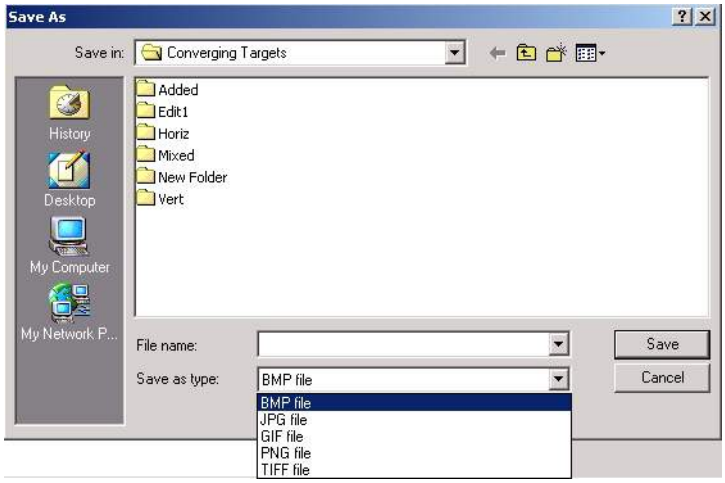
3.1.2 Close

The **File > Close** option closes the current Conquest Grid Scan.

3.1.3 Save Screen to File

The **File > Save Screen to File** option allows the user to save an electronic copy of the current ConquestView screen. The plot can be saved in BMP, JPG, GIF, PNG or TIFF graphics file formats.

Select the graphics format file type from the drop-down list. Then input a filename and folder to save the image to.



In general, the BMP file is the largest while the JPG image is quite small and good for e-mailing.

If you do not wish to have the cursor lines to be visible in the depth slice image, make them black (see **Cursor Lines Colour**) and move them to a corner.

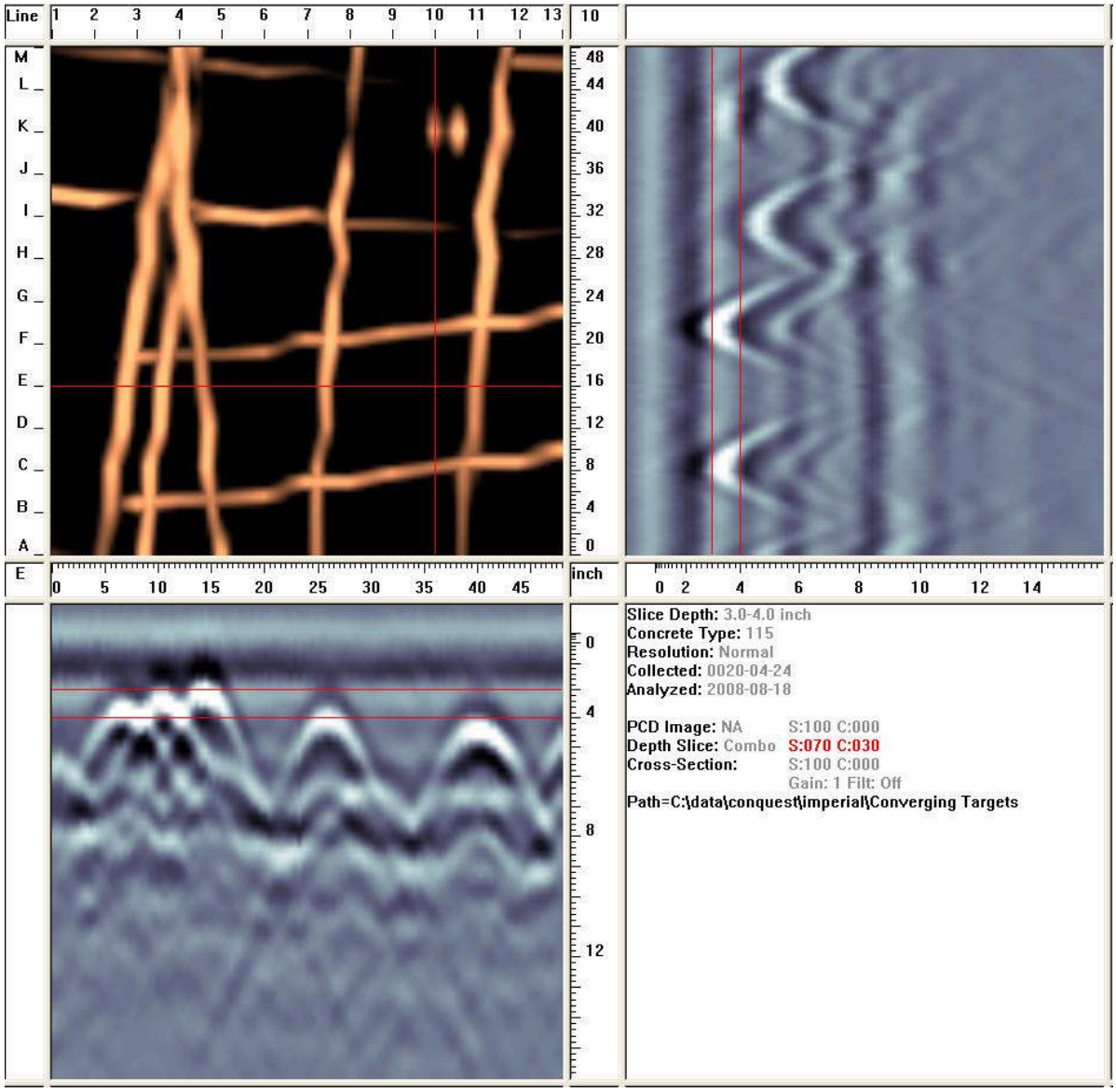
This option can also be access from the **Toolbar** by clicking on the **Save Screen to File** button:

3.1.4 Copy Screen to Clipboard

The **File > Copy Screen to Clipboard** option copies the current screen image to the Clipboard so it can be pasted into other documents like a Word document.

This option can also be accessed from the **Toolbar** by pressing the **Ctrl+C** keys or by clicking on the **Copy Screen to ClipBoard** button.

The screen image will look similar to:

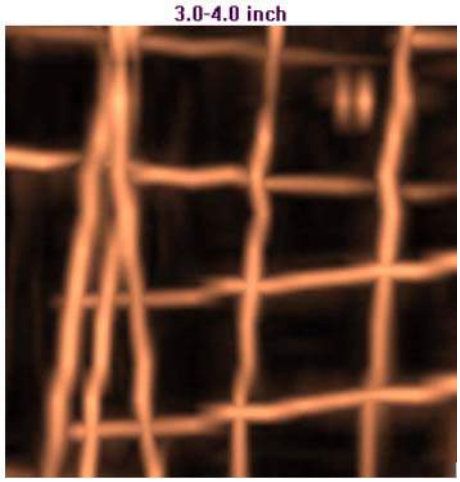


If you do not wish to have the cursor lines to be visible in the depth slice image, make them black (see **Cursor Lines Colour**) and move them to a corner.

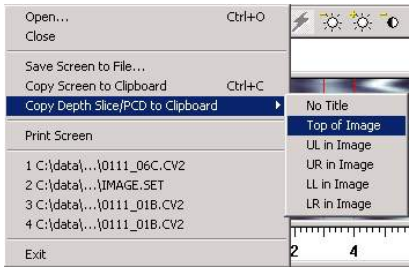
3.1.5 Copy Depth Slice/PCD to Clipboard

The **File > Copy Depth Slice/PCD to Clipboard** option copies the current Depth Slice or PCD image, without axes, to the Clipboard so it can be pasted into other documents like a Word document.

This option is useful if you want to add your own axes or annotations using a graphics program or if you want to tile several individual images together into one larger image.



When **Copy Depth Slice / PCD to Clipboard** is selected from the menu, the user has the option of adding a title to the image.



For Depth Slice images, the title is the Depth Slice range. For PCD images the title is “PCD”. The user can select the position where the title will appear on the image. The choices are: Top of Image, UL (upper left), UR (upper right), LL (lower left) LR (lower right).

3.1.6 Export 3D Data to File...

The **File > Export 3D Data to File** option allows the user to export the current grid survey data to an HDF (Hierarchical Data Format) or CSV (Comma Separate Values) file for use with third-party processing and visualization software like Golden Software's Voxler (available from Sensors & Software).

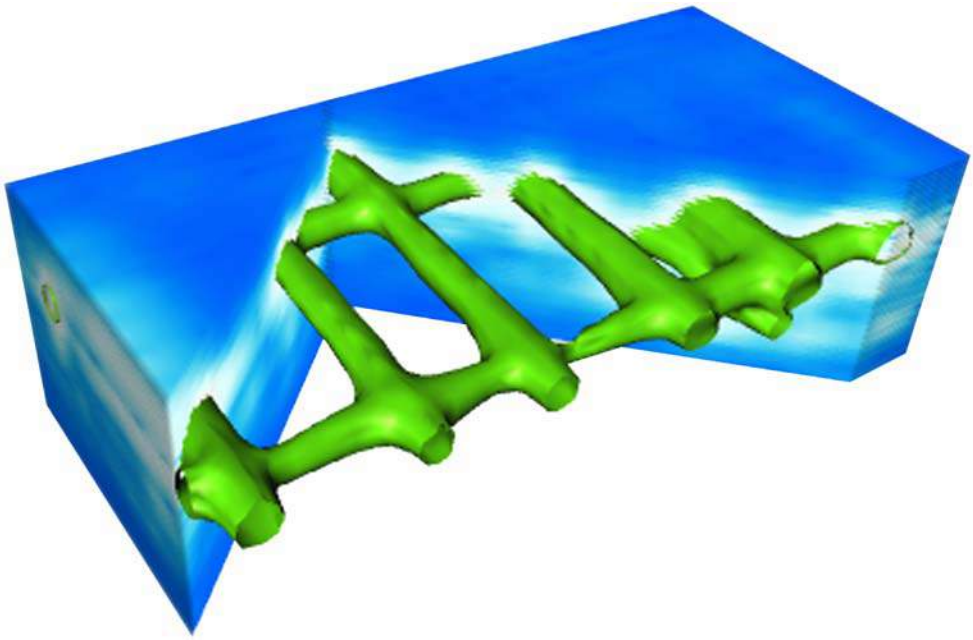


Figure 3-1: Conquest data displayed in Golden Software's Voxler program after exporting from ConquestView.

3.1.6.1 HDF File

HDF files are a binary format that cannot be easily viewed without software that imports this format.

When a grid scan from Conquest is exported to HDF, the HDF file has the same name as the CV2 file, for example 0111_08A.HDF.

When a grid scan from a Conquest with the PCD option is exported to HDF, the PCD data is automatically exported in a separate HDF file with “PCD” appended to the file name, for example 0111_08APCD.HDF. Both the GPR and PCD data sets can be opened and displayed at the same time in Voxler.

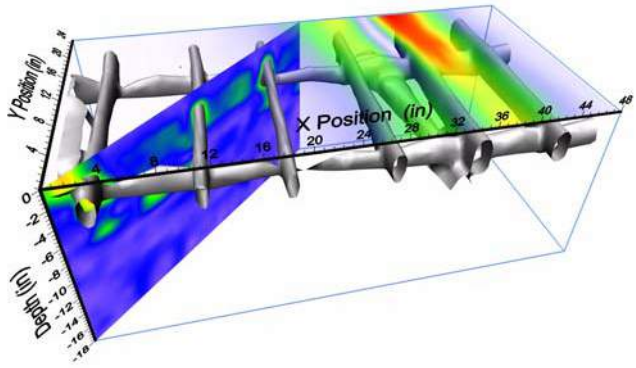


Figure 3-2: Conquest GPR data displayed in 3D using Voxler with PCD data superimposed on top.

3.1.6.2 CSV File

CSV files can be imported into many programs like Microsoft’s Excel and Golden Software’s Voxler.

The header line indicates the X, Y, Z and depth columns with the half-width of the voxel (or cell) in that direction. The X and Y voxel dimensions are the lateral distance between sample points (usually 1 cm or 0.39 inches for Conquest) while the Z voxel dimension is always 1 inch or 25 mm. Therefore, the X, Y, Z values are the center of the voxel (or cell).

The header line also lists the total number of samples in the CSV file.

The format of the CSV file is X Y Z Depth Amplitude. The Amplitude values are the average signal strength in the thickness of the depth slice.

The Z values (column 3) are elevation values with the surface at elevation zero (0.0) so the values are negative. The Depth values (column 4) are the same as the Z values but positive.

X ± 4.92mm	Y ± 4.92mm	Z ± 12.5mm	Depth ± 12.5mm	58176 Values
4.92	4.92	-12.5	12.5	2801
4.92	14.75	-12.5	12.5	4432
4.92	24.59	-12.5	12.5	4195
4.92	34.43	-12.5	12.5	3826
4.92	44.26	-12.5	12.5	3315
4.92	54.10	-12.5	12.5	2465
4.92	63.93	-12.5	12.5	2698

When a grid scan from a Conquest with the PCD option is exported to CSV, the PCD data is automatically exported in a separate CSV file with “PCD” appended to the file name, for example 0111_08APCD.CSV. The format of the file is very similar to the GPR CSV file shown above except there are no Z or Depth columns. For example:

X ± 0.20mm	Y ± 0.20mm	14641 Values
0.20	0.20	26883
0.20	0.60	26861
0.20	0.99	26845
0.20	1.39	26819

3.1.7 Print Screen

The **File > Print Screen** option allows the user to produce hard copies of the Conquest data images. After selecting this option, a standard print dialog opens which allows the user to select the printer they wish to print to as well as customize other printing parameters. For example, the user can select to print the Conquest data image to a Landscape rather than a Portrait orientation.

The image can be sent directly to the default printer by clicking the **Print** button from the **Toolbar**:

3.1.8 Recent Files

If the desired Conquest Grid Scan is one of the last four (4) Grid Scans opened, rather than using the **File > Open** option, it can be opened by selecting it from list under **File**.

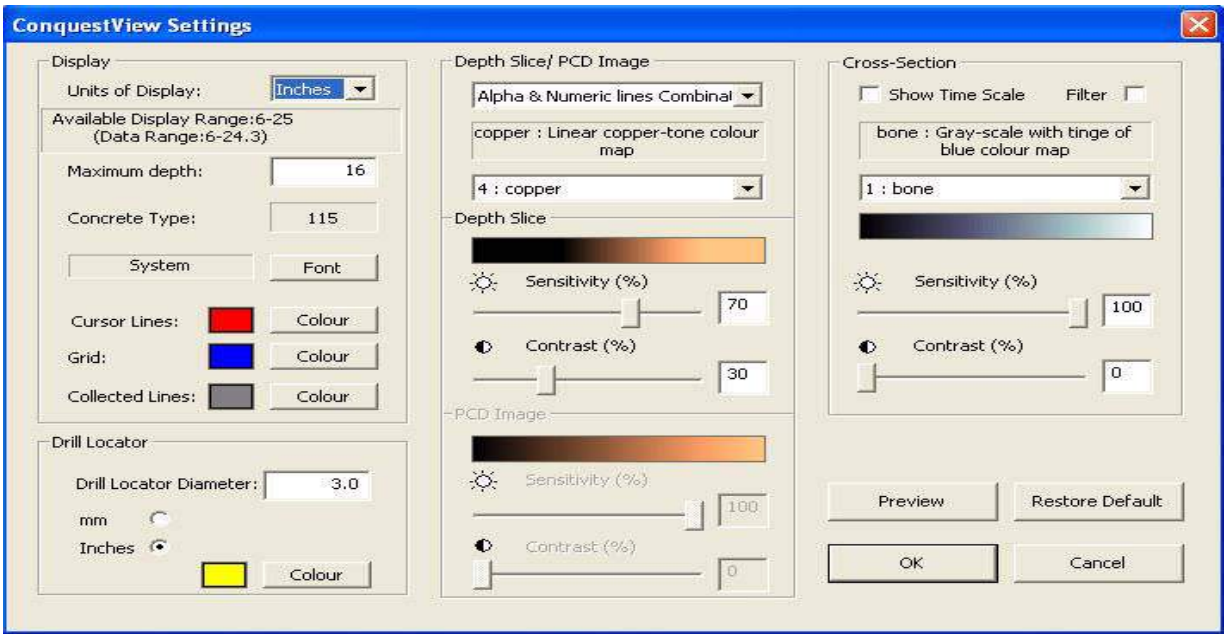
3.1.9 Exit

Selecting this option will close all windows that are open as part of the current ConquestView session and exit the application.

3.2 View

3.2.1 Settings

The **View > Settings** option allows the user to change various aspects of the display including units and colors, depth slices, PCD image, cross sections and the drill locator.



The Settings option can also be accessed from the **Toolbar** by clicking on the **Settings** button:

3.2.1.1 Display

Units of Display

The distance and depth units displayed on the axes around the depth slice and cross section images can be displayed in millimeters or inches. The units default to those used during the original grid scan data collection but can be converted and displayed in either millimeters (mm) or inches.

Note that position and depths are the same regardless of the display units but are reported in the requested units. This means that data collected in millimeters will always have 25 mm thick depth slices or 0.984 inches, if the displayed units are changed to inches. Similarly, data collected in inches will always have depth slices 1 inch thick or 25.4 mm if the displayed units are changed to millimeters.

Maximum Depth

The Conquest system actually collects data deeper than the depth value set during data collection. This allows the operator to look at deeper data, if desired.

The **Maximum Depth** specifies the depth displayed on the bottom of the cross section images and the bottom depth slice image. The maximum depth value must be in the **Available Range** displayed above the box. The maximum depth defaults to the depth setting used when the original grid scan was collected.

Reducing the maximum depth reduces the number of depth slice images. It also allows the user to "zoom in" on the shallow data on the shallow part of the cross section images.

Concrete Type

An accurate Concrete Type is necessary for creating the best depth slice images. A poor value for the Concrete Type may result in fuzzy images that are difficult to interpret and inaccurate depth estimates.

The Concrete Type value displayed in Settings is informational only and cannot be changed. The Concrete Type value is changed by selecting **Tool > Concrete Type Calibration** or the **Concrete Type Calibration** button from the **Toolbar**:

Concrete Type is calibrated by fitting a curve to hyperbolas from rebar or other targets in the cross section images.

The Concrete Type default value is the one set during data collection. A value around 100 is typical but the value can vary.

Font

The Font option determines the font used for the position and depth axes as well as the text in the Information Window. When selected, the standard Windows font dialog opens allowing the user to select the Font, Font Style and Size. Changing the font type and size can increase the available screen area to display data images on and improve the readability of printed images or graphics image files.

Cursor Lines Colour

The two lines that make up the crosshair that is superimposed over the depth slice/PCD image and the two parallel lines superimposed on the cross-section images are called the **Cursor Lines** (see **Figure 2-1**).

The colour of the lines can be changed in this option under **View > Settings**.

The cursor lines colour is also used for two other lines that can appear in ConquestView: the PCD Profiles (see **PCD Image**) and Uncollected lines (see **Show Uncollected Lines**).

It is recommended to choose a colour that provides high cursor line visibility on the depth slices and cross sections.

Grid Colour

Lines corresponding to the major position and depth labels can be superimposed on the depth slice/PCD image and the cross sections. The **Show Grid** option is available by selecting **View > Show Grid** from the menu or by selecting the **Toggle Show Grid** button from the **Toolbar**:

The colour of the lines can be changed in this option under **View > Settings**.

Collected Lines Colour

Lines corresponding to all the data lines collected during the Grid Scan can be superimposed on the depth slice/PCD image. The **Show Collected Lines** option is available under **View** or by selecting the **Toggle Collected Lines** button from the **Toolbar:**

The colour of the lines can be changed in this option under **View > Settings**.

3.2.1.2 Drill Locator

Drill Locator Diameter

The **Drill Locator** appears on the depth slice/PCD image with a certain diameter in millimeters or inches. This option allows the user to change the diameter of the drill locator circle.

The maximum size of the drill locator diameter is the maximum dimension of the Grid Scan. For example, a grid scan of 24 x 48 inches allows a maximum drill locator diameter of 48 inches.

Drill Locator Colour

The colour of the **Drill Locator** can be changed by selecting the **Drill Locator Colour** button in the **View > Settings** option.

3.2.1.3 Depth Slice / PCD Image

Alpha, Numeric and Alpha & Numeric Combo Lines

The depth slice/PCD image is generated based on the Alpha data lines, Numeric data lines or a Combination of both Alpha and Numeric lines. This option allows the user to change the lines used to create the depth slice/PCD image(s). The default setting and the one recommended for most users is **Alpha & Numeric Lines Combination**.

When **Alpha & Numeric Lines Combination** is selected, the Alpha line cross section appears below the depth slice/PCD image and the Numeric line cross section appears to the right of the depth slice/PCD image, as shown below.

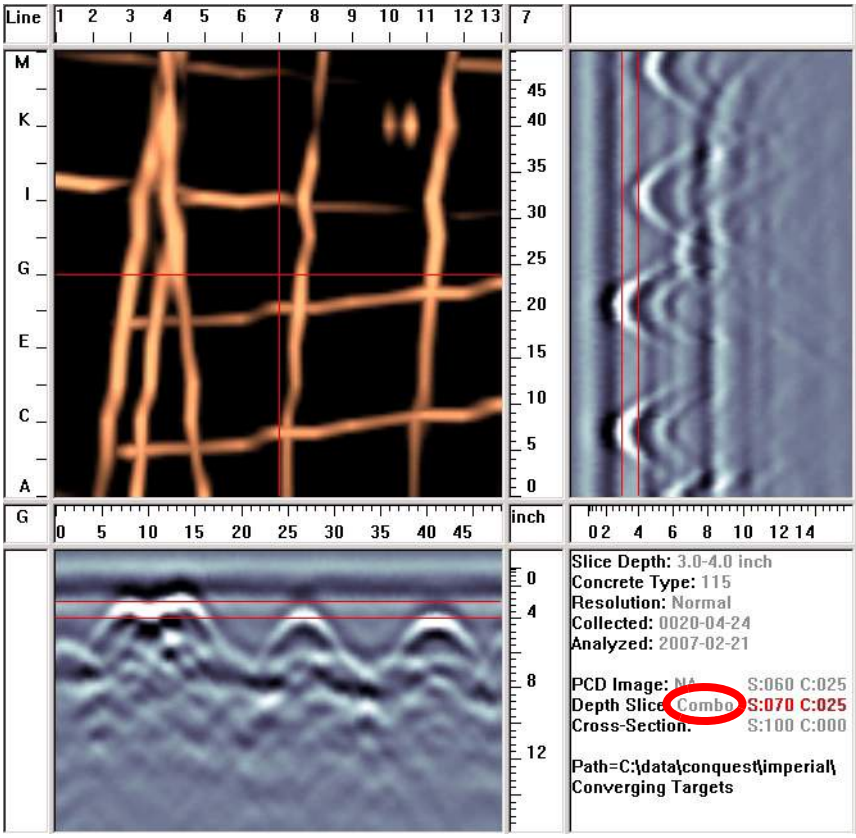


Figure 3-3: Depth slice/PCD image based on a combination of Alpha and Numeric Lines.

When the **Alpha Lines Only** option is selected, the Numeric cross section to the right of the depth slice/ PCD image disappears since only the Alpha lines are used for the depth slice/PCD image, as shown below.

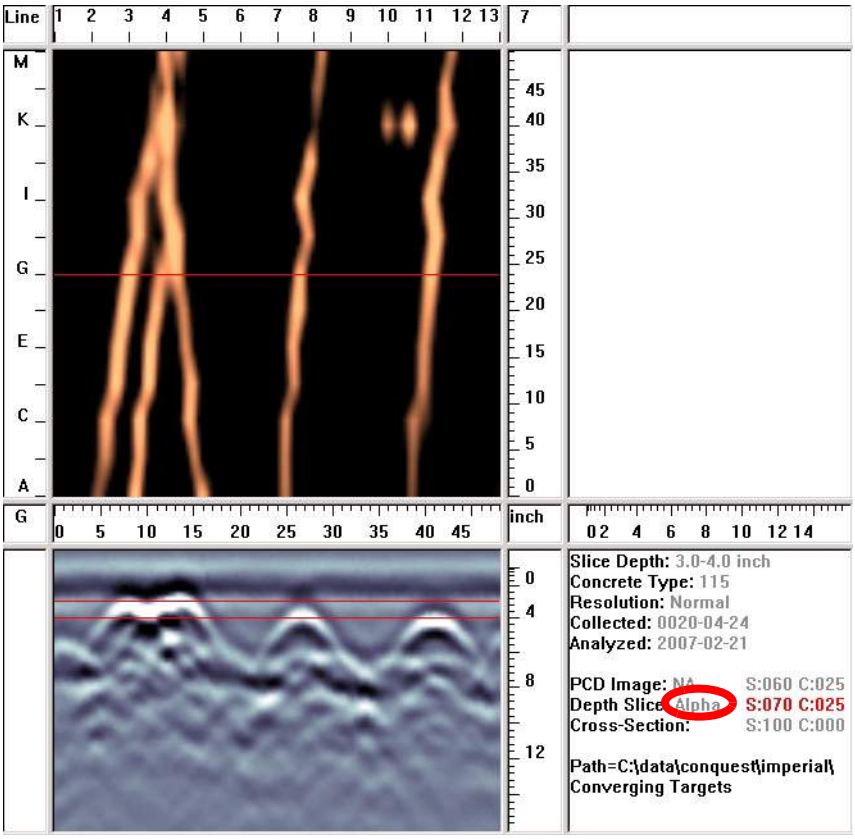


Figure 3-4: Depth slice/PCD image based on Alpha Lines only. Notice that Numeric lines are not visible and the depth slice/PCD image emphasizes targets perpendicular to the Alpha line direction.

When the **Numeric Lines Only** option is selected, the Alpha cross section below the depth slice/PCD image disappears since only the Numeric lines are used for the depth slice/PCD image, as shown below.

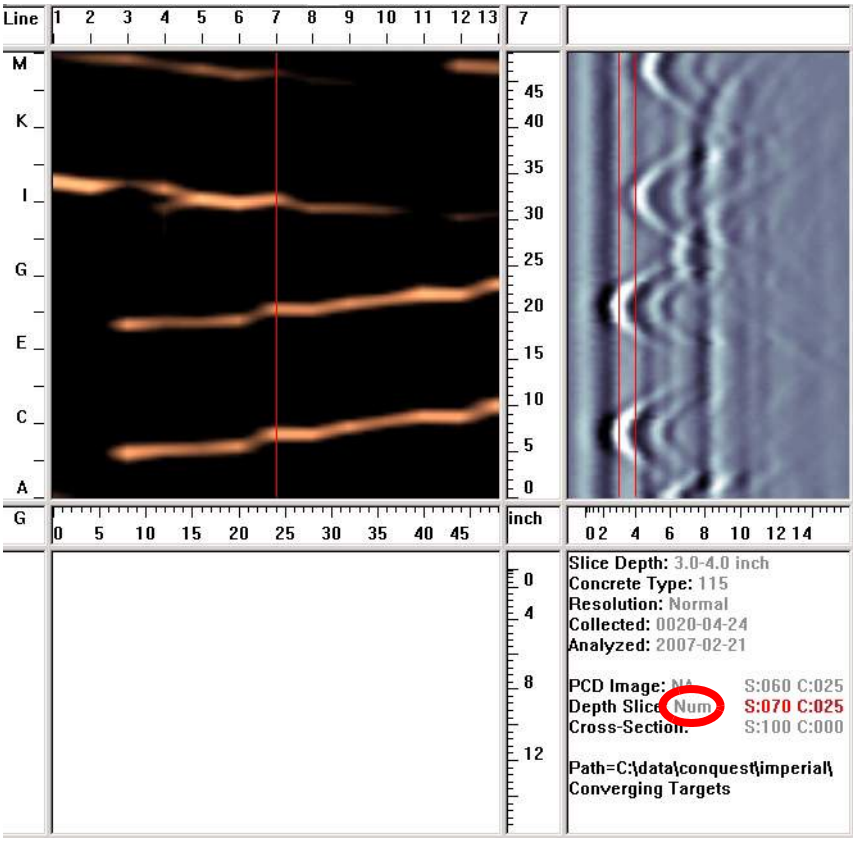


Figure 3-5: Depth slice/PCD image based on Numeric Lines only. Notice that Alpha lines are not visible and the depth slice/PCD image emphasizes targets perpendicular to the Numeric line direction.

Selecting to display Alpha or Numeric lines only can help to emphasize targets perpendicular to the line direction. In the figures above, rebar are actually running in two directions but the rebar parallel to the Alpha lines have been eliminated. Selecting to display Numeric lines only would do the opposite, that is, show the rebar perpendicular to the Numeric lines and eliminate the rebar parallel to that direction. Compare the depth slice images above to see this effect.

Depth Slice / PCD Image Colour Map

Depth Slice and PCD data are displayed as images in colors corresponding to the colour map.This option allows the user to choose from a number of predefined colour maps for the depth slice/PCD image. Quite often one colour map may bring out features in a data set better than others so some experimentation may be required to determine the optimal colour map for a particular grid scan data set.

The CnG colour map displays data on the screen in colour and prints well to a black and white printer.

Sensitivity

The Sensitivity setting controls how sensitive the image is to small signal variations. For more details on Sensitivity, see **Sensitivity**.

Contrast

The Contrast setting controls how much of the image area is at the extremes of the colour map. For more details, see **Contrast**.

3.2.1.4 Cross Section

Show Time Scale

If the **Show Time Scale** option is checked, a time axis appears beside the cross section images. For the Alpha lines cross section, the time axis appears on the left and for the Numeric lines cross section, it appears on the top.

Conquest data are actually collected in time (in nanoseconds) and converted to depth using the **Concrete Type** number. Displaying the time scale can be beneficial to advanced users familiar with looking at data images in time rather than just depth.

Filter

If the **Filter** option is checked, a background subtraction filter is applied to the cross section data to remove flat-lying reflectors. The filter enhances the hyperbolic responses from typical targets like rebar, conduits, cables and pipes.

This filter is especially useful for very shallow targets where the hyperbolas are interfered with by the airwave and ground wave.

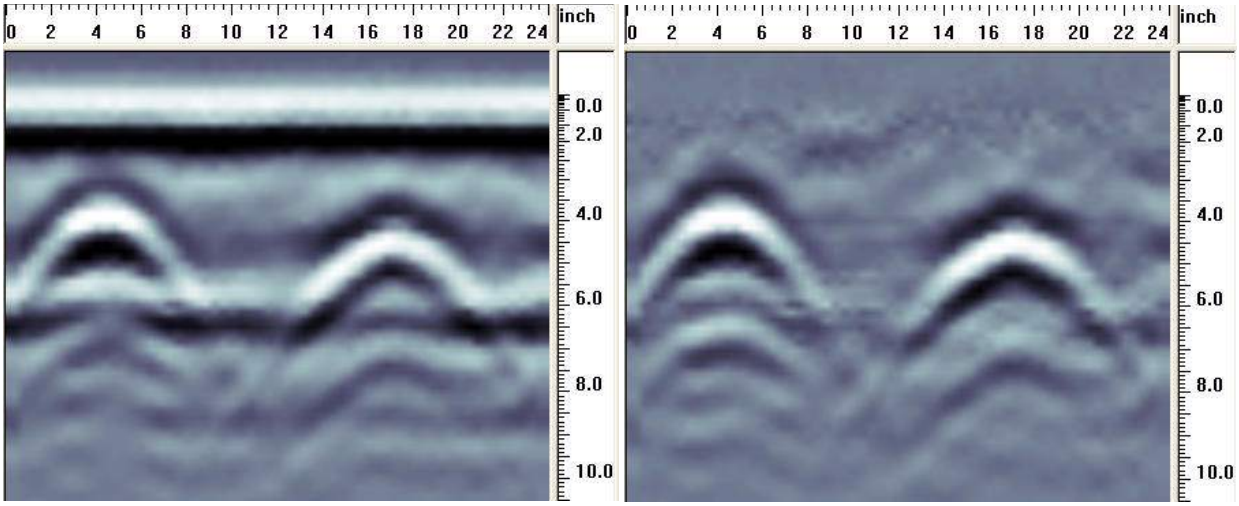


Figure 3-6: The raw data (left) shows flat-lying features like the airwave/groundwave on the top of the cross section and the bottom of concrete reflector at 6 inches depth. When the Filter is applied (right), flat-lying reflectors are removed to enhance the hyperbolic responses from targets like rebar.

Do not use the Filter when the target of interest is flat-lying, for example, the bottom of concrete.

The filter can also be access by pressing the “F” key on the keyboard or under **View > Filter**.

The current setting for the Filter is indicated in the **Information Window**.

Cross Section Colour Map

Cross sections displayed as images in colors corresponding to the colour map. This option allows the user to choose from a number of predefined colour maps for the cross section images. Quite often one colour map may bring out features in a data set better than others so some experimentation may be required to determine the optimal colour map for a particular grid scan data set.

Sensitivity

The Sensitivity setting controls how sensitive the image is to small signal variations. For more details on Sensitivity, see **Sensitivity**.

Contrast

The Contrast setting controls how much of the image area is at the extremes of the colour map. For more details, see **Contrast**.

3.2.1.5 Restore Default

Clicking on **Restore Default** resets all the values in the Settings dialog to “factory” default values.

3.2.1.6 Preview

Clicking on the **Preview** button from the **Settings** dialog allows the user to see the effect of changes they have made to the Settings before permanently applying those changes by clicking on the OK button.

3.2.2 Gain Decrease and Gain Increase

Gain is used to "amplify" the strength of the Conquest data signals in the Alpha and Numeric cross section images. The strongest signals come from shallow targets while typically deeper targets have weaker signal strength. Applying gain is similar to adjusting the "volume" knob on a music stereo. The gain values vary from 0 to 9 with 0 providing the raw data with no amplification and 9 providing the most amplification.

The current gain value is displayed in the **Information Window**.

The gain value is increased by selecting **View > Gain Increase** or clicking the following button on the **Toolbar**:

The gain value is decreased by selecting **View > Gain Decrease** or clicking the following button on the **Toolbar**:

Gain can also be increased by pressing the “+” key and decreased by pressing the “-” key on the numeric key pad on standard keyboards.

Low gain values from 0 to 3 are typically used but higher values may help to improve the imaging of deeper targets. Try to use the lowest gain value possible as the data can be "overgained" making it more difficult to understand.

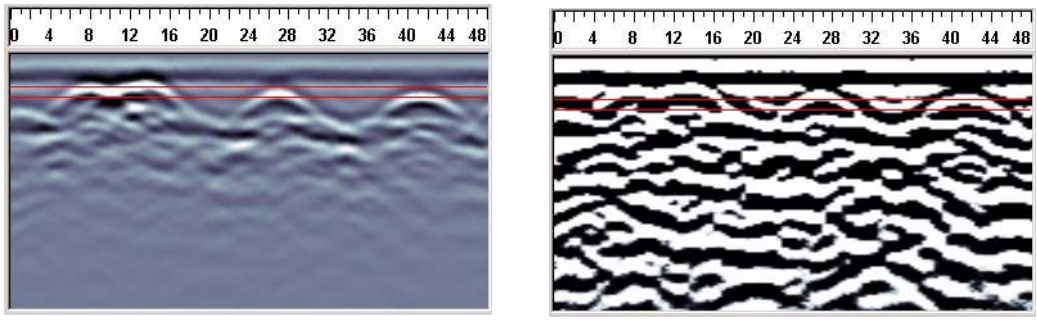


Figure 3-7: A gain of 1 makes the cross section image look good (left) while a gain of 9 overgains the data, in this case (right).

The gain setting is only applied to the display of the cross section images. Changing the gain setting has no effect on depth slice images.

3.2.3 Depth Slice

When the Depth Slice option is checked, either by depressing the Depth Slice button on the Toolbar:

or by checking it under **View > Depth Slice**, the depth slice image will appear in the Plan View window (see **ConquestView Main Screen**).

As well, selecting the Depth Slice option makes it “active” and connected to the Contrast and Sensitivity buttons on the **Toolbar**, in the **Settings** dialog box or under the **View** menu. This connection is also indicated by the Contrast and Sensitivity values beside “Depth Slice” in the **Information Window** turning red.

Editing the Contrast and Sensitivity values results in changes to the look of the depth slice image (see **Contrast** and **Sensitivity**).

3.2.4 Cross-Section

When the Cross-Section option is checked, either by depressing the Cross-Section button on the Toolbar:

or by checking it under **View > Cross-Section**, the cross section images become “active” and connected to the Contrast and Sensitivity buttons on the **Toolbar**, in the **Settings** dialog box or under the **View** menu. This connection is also indicated by the Contrast and Sensitivity values beside “Cross-Section” in the **Information Window** turning red.

Editing the Contrast and Sensitivity values results in changes to the look of the cross section image (see **Contrast** and **Sensitivity**).

3.2.5 PCD Image

When the PCD Image option is checked, either by depressing the PCD button on the Toolbar:

or by checking it under **View > PCD Image**, the PCD image will appear in the Plan View window (see **PCD Image**).

As well, selecting the PCD Image makes it “active” and connected to the Contrast and Sensitivity buttons on the **Toolbar**, in the **Settings** dialog box or under the **View** menu. This connection is also indicated by the Contrast and Sensitivity values beside “PCD Image” in the **Information Window** turning red.

Editing the Contrast and Sensitivity values results in changes to the look of the PCD image (see **Contrast** and **Sensitivity**).

If the Conquest system does not have the PCD option or the grid scan was collected with the PCD option OFF, the PCD button on the Toolbar and PCD Image option under the View menu will be greyed out and not accessible.

3.2.6 Contrast

The Contrast setting controls how much of the image area is at the extremes of the colour map. The contrast ranges from 0 to 100%, less contrast to more contrast. The default setting is 0% (no contrast) for cross-sections and 25% for depth slice and PCD images.

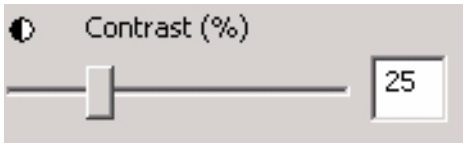
The Contrast is increased by one percent (1%) by selecting **View > Contrast Increase** or clicking the following button on the **Toolbar**:

The Contrast is decreased by one percent (1%) by selecting **View > Contrast Decrease** or clicking the following button on the **Toolbar**:

Pressing the “Shift” key while increasing or decreasing the contrast will cause the value to increase or decrease by 5% rather than 1%.

Contrast can also be increased by 1% by pressing the “/” key and decreased by 1% by pressing the “.” key on the keyboard.

The Contrast can also be changed by using the appropriate slider bars in the **Settings** dialog box.



As Contrast increases, more and more of the data is displayed at the extreme value of the colour map. Contrast can be useful for making weak targets more visible in the image.

Cross-section images: Cross-section signals vary from extreme negative values to extreme positive values with the zero signal in the middle. As the Contrast setting increases, the colors associated with the high positive and negative signal levels at the ends of the colour map widen, resulting in the weaker signals looking stronger in the image.

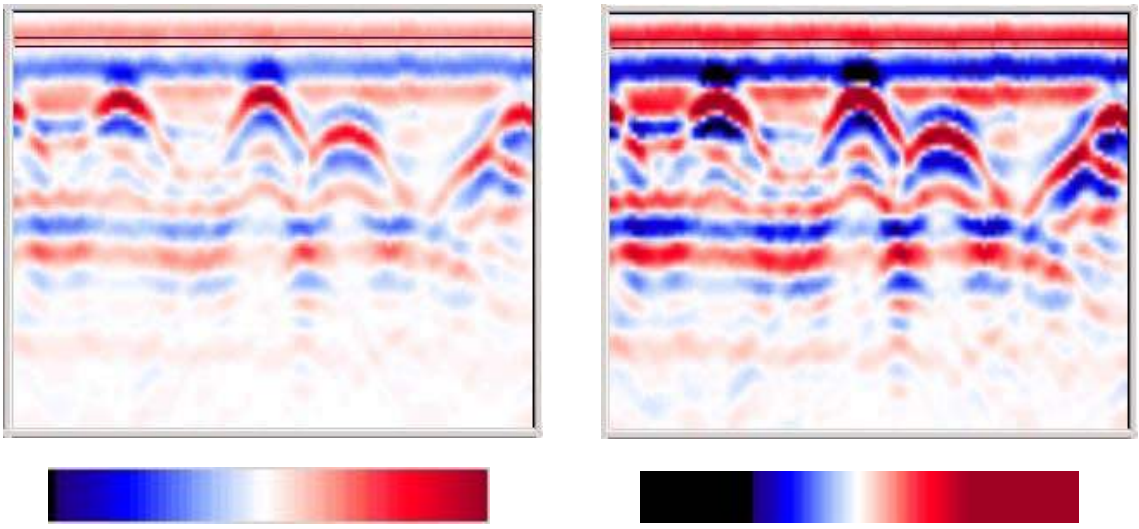


Figure 3-8: For cross sections, the Contrast value defaults to 0% meaning no contrast is added to the image (left, Contrast=0). As Contrast is increased on cross section images, the colors on the left and right of the colour bar associated with the strongest signals, widen into the middle, resulting in weaker signals looking stronger in the image (right, Contrast=50).

Depth Slice/PCD images: Depth Slice and PCD signals vary from zero to extreme positive values. As the Contrast setting increases, the colour associated with the extreme positive signal level on the right side of the colour map widens to the left, resulting in the weaker signals looking stronger in the image.

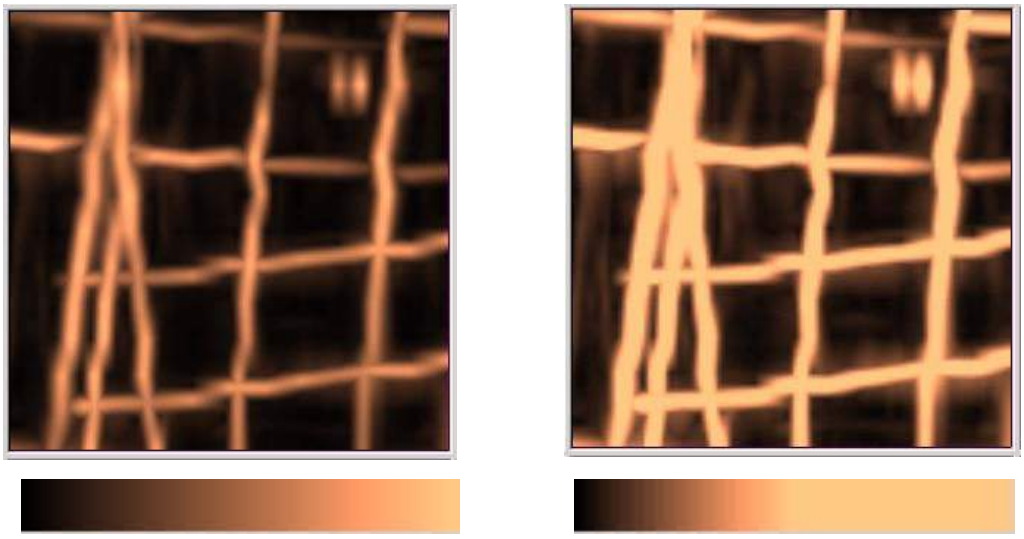


Figure 3-9: For Depth Slice/PCD images, the Contrast value defaults to 25% (left). As Contrast is increased on depth slice and PCD images, the colors on the right of the colour bar associated with the strongest signals, widen to the left, resulting in weaker signals looking stronger in the image (right, Contrast=50%).

3.2.7 Sensitivity

The Sensitivity setting controls how sensitive the image is to small signal variations. The sensitivity value is from 0 to 100%, least sensitive to most sensitive. The default setting is 100% for cross-sections, 70% for depth slice images and 60% for PCD images.

The Sensitivity is increased by one percent (1%) by selecting **View > Sensitivity Increase** or clicking the following button on the **Toolbar**:

The Sensitivity is decreased by one percent (1%) by selecting **View > Sensitivity Decrease** or clicking the following button on the **Toolbar**:

Pressing the “Shift” key while increasing or decreasing the sensitivity will cause the value to increase or decrease by 5% rather than 1%.

Sensitivity can also be increased by 1% by pressing the “]” key and decreased by 1% by pressing the “[” key on the keyboard.

The Sensitivity can also be changed by using the appropriate slider bars in the **Settings** dialog box.

Decreasing the Sensitivity from 100% widens the colour map around the zero signal level, removing the weaker signals in the image so only the strongest signals are visible.

Cross-section images: Cross-section signals vary from extreme negative values to extreme positive values with the zero signal in the middle. As the Sensitivity setting decreases, the colour associated with the zero signal level in the middle of the colour map widens, resulting in the weaker signals being removed from the image.

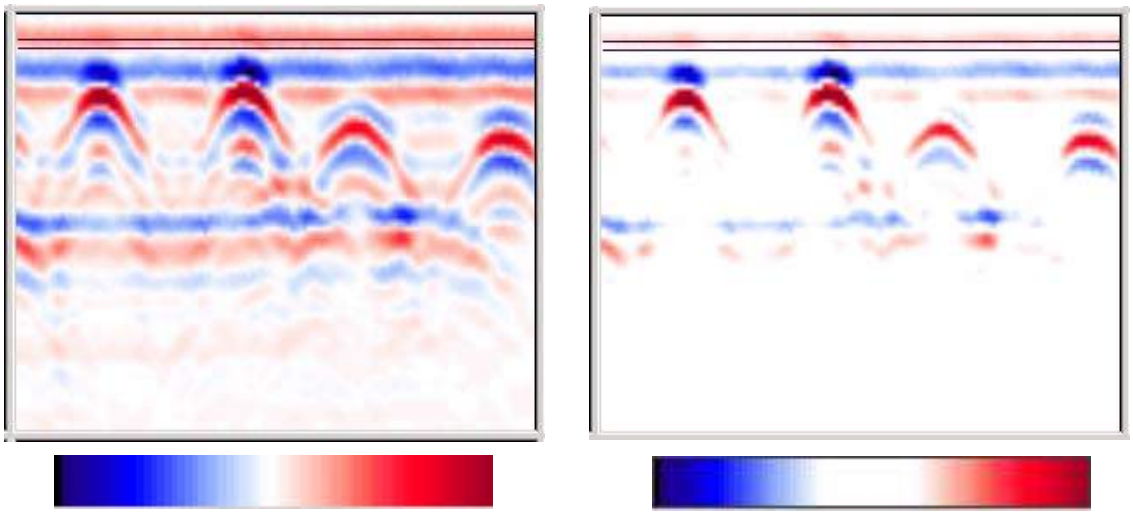


Figure 3-10: For cross sections, the Sensitivity value defaults to 100% (left) meaning the image is most sensitive to weak signals. As Sensitivity is decreased on cross section images, the colour in the middle of the colour bar associated with weaker signals around zero, widens, removing weaker signals from the image (right, Sensitivity=80).

Depth Slice/PCD images: Depth Slice and PCD signals vary from zero to extreme positive values. As the Sensitivity setting decreases, the colour associated with the zero signal level on the left side of the colour map widens to the right, resulting in the weaker signals being removed from the image.

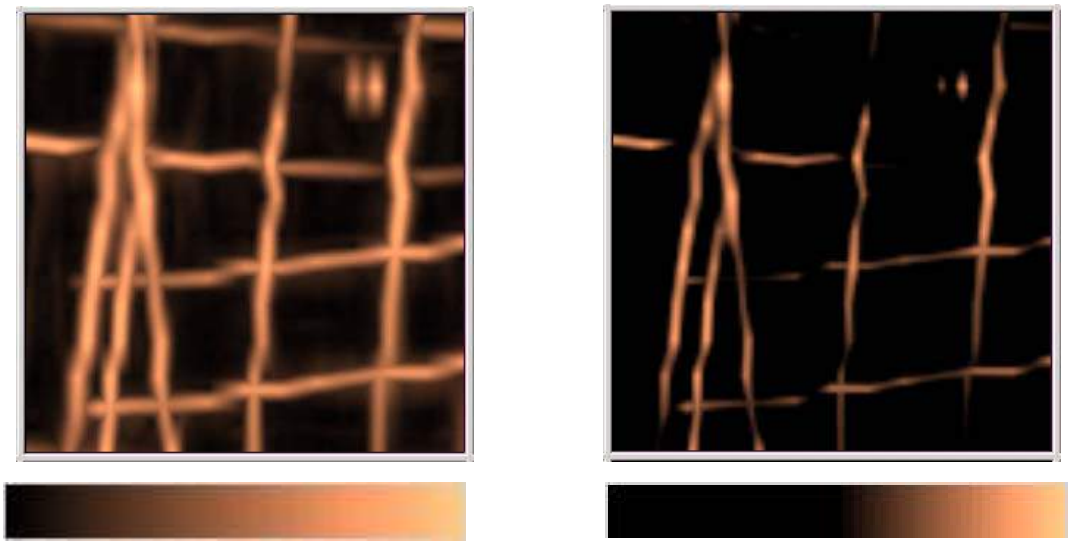
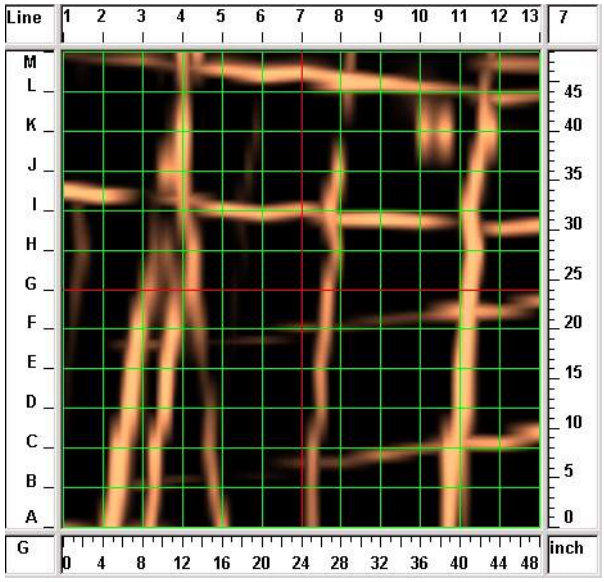


Figure 3-11: For depth slice images, the Sensitivity value defaults to 70% (left). As Sensitivity is decreased on depth slice and PCD images, the colour in the left of the colour bar associated with weaker signals around zero, widens to the right, removing weaker signals from the image (right, Sensitivity=50%).

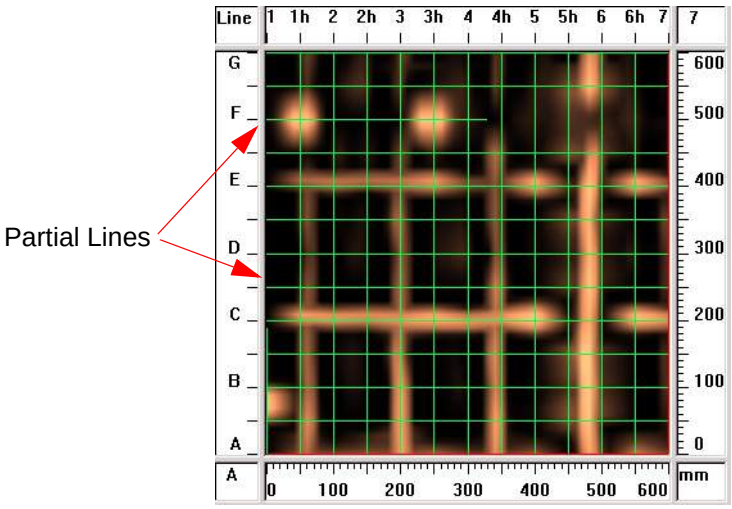
3.2.8 Show Collected Lines

Checking the **Show Collected Lines** option superimposes lines onto the depth slice/PCD image to show where data lines were collected during the Grid Scan.



The **Show Collected Lines** option is available under **View** or by selecting the **Toggle Collected Lines** button from the **Toolbar**:

This feature is especially useful when only a partial grid or partial lines were collected in a Grid Scan so the operator does not interpret a target in an area where no data were collected.



In normal operation the collected lines are turned off because they add clutter to the depth slice/PCD image. We recommend leaving the collected lines off unless you need detailed positioning information to assist with the interpretation.

The colour of the collected lines can be changed by selecting the **View > Settings > Collected Lines Colour** button.

3.2.9 Show Uncollected Lines

Checking the **Show Uncollected Lines** option superimposes dashed lines onto the depth slice/PCD image to show where data lines were NOT collected during the Grid Scan.

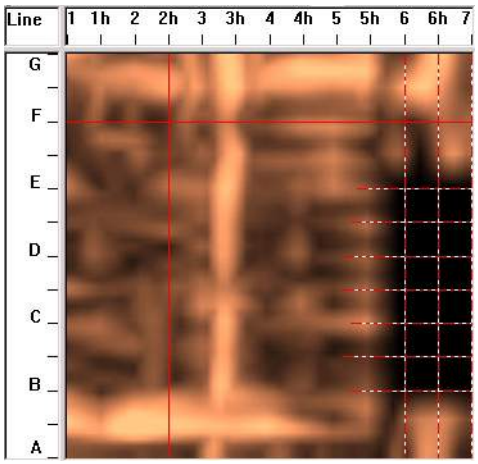


Figure 3-12: Depth Slice image showing dashed lines where Conquest data were not collected.

The **Show Uncollected Lines** option is available under **View** or by selecting the **Toggle Uncollected Lines** button from the **Toolbar**:

If there are uncollected lines in the grid, the uncollected lines button will default to ON.

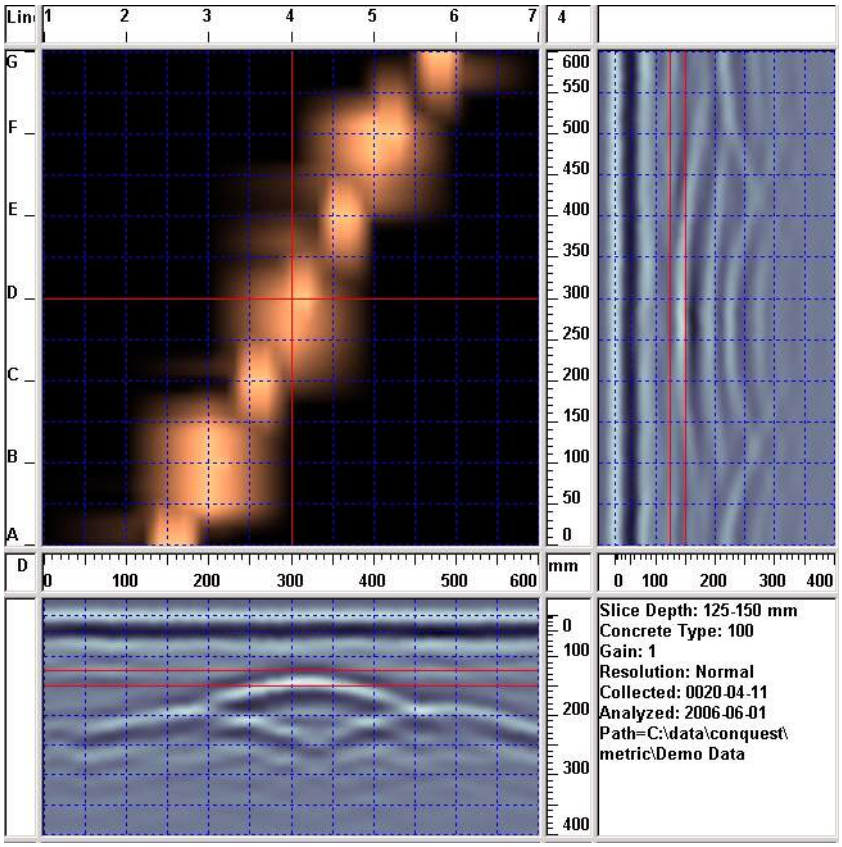
If all the lines in a grid scan were collected and there are no uncollected lines, the Show Uncollected Lines menu option and button will be disabled.

This feature is especially useful when only a partial grid or partial lines were collected in a Grid Scan so the operator does not interpret where no data were collected.

The colour of the uncollected lines is set under **View > Settings > Cursor Lines Colour**.

3.2.10 Show Grid

Checking the **Show Grid** option superimposes a dashed lined grid onto the depth slice/PCD and cross-section images. Horizontal and vertical grid lines appear at major positions and depths as indicated on the position and depth scales.



The **Show Grid** option is available by selecting **View > Show Grid** from the menu or by selecting the **Toggle Show Grid** button from the **Toolbar**:

The **Grid Colour** of the grid lines can be changed under **View > Settings**.

3.2.11 Image Enhancement Process (IEP)

The Image Enhancement Process (IEP) option improves the data images by automatically correcting any lines collected with a poor system calibration. The IEP option ensures that ConquestView always displays the most accurate images.

The IEP option is automatically checked on in the **View** menu and it is highly recommended that it be applied.

The IEP only works with data collected with the second-generation Conquest system with the large color screen. It cannot be applied for data collected with the first-generation Noggin 1000-based Conquest system. If older Conquest data are opened in ConquestView, the IEP option is greyed out and not accessible.

3.2.12 Filter

The Filter removes flat-lying reflectors to enhance the hyperbolic responses from typical targets like rebar, conduits, cables and pipes. For more details, see **Filter**.

3.2.13 Toolbar

If **Toolbar** is checked, the Toolbar appears below the menu bar.

The Toolbar can be dragged to other locations on the screen, if desired.

3.2.14 Status Bar

If **Status Bar** is checked, the Status Bar appears along the bottom of the ConquestView Window.

3.3 Navigation

3.3.1 Depth Slice Up and Depth Slice Down

These options allow the user to scroll up and down through the depth slices. When **Navigation > Depth Slice Up** or **Navigation > Depth Slice Down** is selected, the depth slice image is incremented up or down by a single depth slice.

The same actions can be performed by pressing the **Page Up** and **Page Down** keys on the keyboard, using the wheel on the mouse or by clicking on the following **Toolbar** buttons to move the depth slice up or down respectively:

When the highest or lowest depth slice is reached, the depth slice image does not change even if the user continues to try moving higher or lower.

Moving up and down through the depth slice can also be done using the **Depth Slice Scrollbar** on the right edge of the ConquestView window.

Stepping Up and Down through the image provides insight into the depth of various features in the three dimensional volume.

Since the PCD image is a single image that is NOT associated with a specific depth range, when viewing a PCD Image the Depth Slice Up and Depth Slice Down menu items are disabled.

3.3.2 Alpha Line: Next and Previous

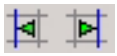
The horizontal **Alpha Cursor Line** (**Figure 2-1**) on the depth slice image is the grid position of the current alpha line cross section displayed below the depth slice image. The user can move through the various alpha line cross section images one at a time by using the **Up Arrow** and **Down Arrow** on the keyboard or by selecting **Navigation > Alpha Line: Next** or **Navigation > Alpha Line: Previous** from the menu. The user can also move through the alpha line cross sections by clicking on the following buttons on the toolbar:

When any of these buttons are pressed, the position cursor line will move to the new position on the depth slice and the corresponding Alpha line cross-section will be displayed.

These buttons are active when using an Alpha line for **Concrete Type Calibration**.

3.3.3 Numeric Line: Next and Previous

The vertical **Numeric Cursor Line** (**Figure 2-1**) on the depth slice image is the grid position of the current numeric line cross section displayed to the right of the depth slice image. The user can move through the various numeric line cross section images one at a time by using the **Left Arrow** and **Right Arrow** on the keyboard or by selecting **Navigation > Next Numeric Line** or **Navigation > Previous Numeric Line** from the menu. The user can also move through the numeric line cross sections by clicking on the following buttons on the toolbar:



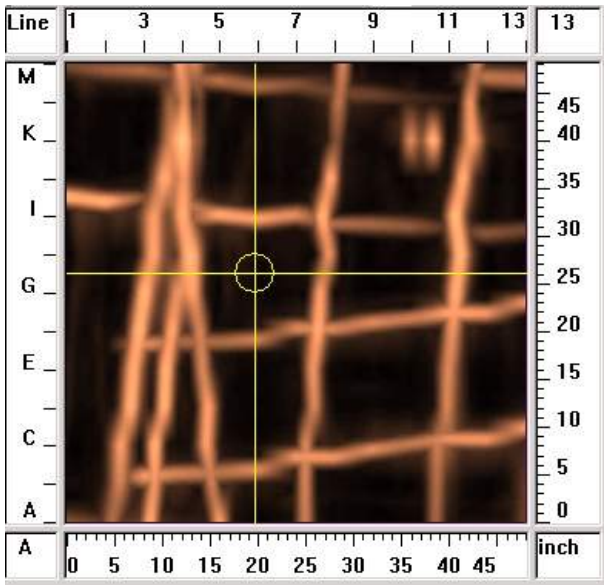
When any of these buttons are pressed, the position cursor line will move to the new position on the depth slice and the corresponding Numeric line cross-section will be displayed.

These buttons are active when using a Numeric line for **Concrete Type Calibration**.

3.4 Tool

3.4.1 Drill Locator

The **Drill Locator** draws a circular "hole" on the depth slice image for the purpose of finding a location to drill on the grid that is clear of any objects in the concrete.



The **Drill Locator** can be turned on under the **Tool > Drill Locator** from the menu or by selecting the **Toggle Drill Locator** button from the **Toolbar**:

The Drill Locator can be moved to any position in the grid by dragging the cross (+) in the centre of the circle. The current position of the centre of the circle within the grid is displayed in the **Information Window**. The first number refers to the distance in the Alpha line direction while the second number is the distance in the Numeric line direction.

The drill locator hole remains visible even as the depth slice image changes. This allows the user to select a drill location and then scroll up and down through the depth slices to confirm that no objects are located at that position at any depth.

The maximum size of the drill locator diameter is the maximum dimension of the Grid Scan. For example, a grid scan of 24 x 48 inches allows a maximum drill locator diameter of 48 inches.

The **Drill Locator Diameter** can be changed under **View > Settings**.

The **Drill Locator Colour** can be changed under **View > Settings**.

3.4.2 Concrete Type Calibration

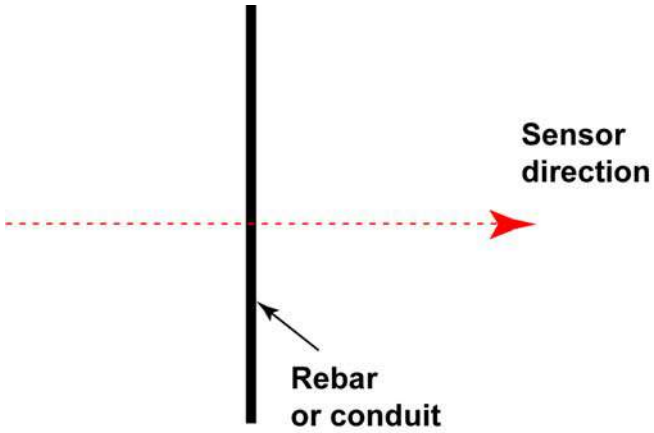
The correct **Concrete Type** is necessary for generating the clearest depth slice images and accurately determining the depth of an object from the cross section images.

The Concrete Type is automatically calculated after a Grid Scan is collected with Conquest while processing the depth slice images. This Concrete Type value is exported with the Conquest data when the data is transferred to a computer and ConquestView will use the exported Concrete Type value. If the Concrete Type was not determined after collecting the data with Conquest, the default Concrete Type of 100 will be used.

Concrete Type calibration in ConquestView is not necessary if the current Concrete Type value is acceptable.

The Concrete Type Calibration in ConquestView allows the user to recalculate the current Concrete Type value using the hyperbola-fitting method. This method requires the user to fit a typical response curve (a hyperbola) to the raw data to extract the Concrete Type.

It is very important that hyperbola fitting only be performed on target responses where the Conquest sensor crossed the target perpendicularly. Hyperbola-fitting on a target that was crossed at an angle will result in a poor Concrete Type value, fuzzy depth slice images and inaccurate depth measurements.



The Concrete Type Calibration is accessed by selecting **Tool > Concrete Type Calibration** from the menu or by selecting the **Toggle Hyperbola Concrete Type Calibration** button from the Toolbar:

Note that this button toggles the Concrete Type Calibration window on and off so it must be clicked again after calibration is completed. The Concrete Type Calibration window can also be closed by clicking the “X” box in the upper-right corner of the window but the user is prompted to Yes or No to any change in the Concrete Type value.

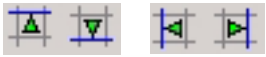
3.4.2.1 Concrete Type Calibration Window

When Concrete Type Calibration is selected, a new window opens with the current Alpha cross section displayed. This window has a separate toolbar to assist with the calibration process.

The window always first displays the current Alpha cross section. This is indicated on the toolbar by the following button being depressed:

The user can switch to the current Numeric cross section image by clicking the following button:

When the Concrete Type Calibration window is open, several menu items on the main ConquestView Toolbar are disabled. However, the **Toolbar** buttons for moving to different Alpha and Numeric cross sections are still enabled depending on which type of cross section is currently selected:



These buttons allow the user to move through the different cross sections to find one with a good hyperbolic response in the image to calibrate on.

The hyperbola in the cross section may be enhanced by turning the **Filter** on to remove flat-lying reflectors in the data.

The user can change the gain value using the **Gain Decrease and Gain Increase** buttons that are still enabled on the main **Toolbar**:

The user also has access to the **Contrast** and **Sensitivity** buttons for the cross section but note that the Contrast and Sensitivity values are not saved when the Concrete Type Calibration window is closed.

3.4.2.2 Hyperbola Fitting

The objective for hyperbola fitting is to move the hyperbola superimposed over the data on top of a hyperbola in the cross section image and match the shape by dragging the handles on the end of the hyperbola tails.

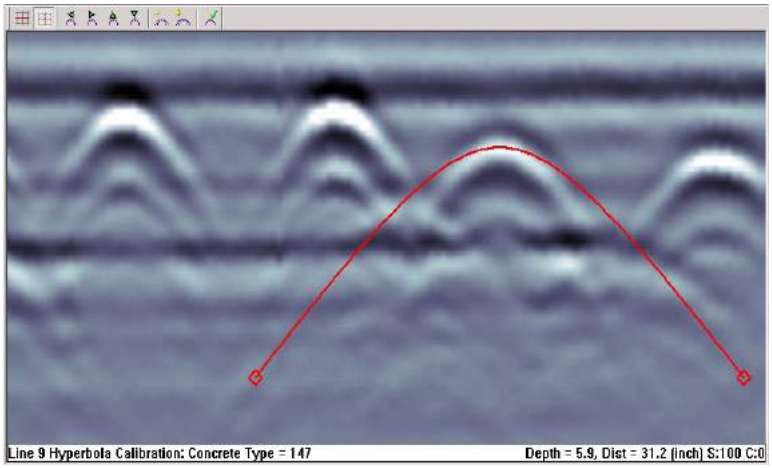
To determine the Concrete Type, the superimposed hyperbola should be placed on the middle of the highest (usually also the strongest) white band of the hyperbola. In general, this white band has the longest tails and looks the most complete.

The superimposed hyperbola can be moved by:

1) Clicking and dragging onto the position on the cross section image where you want the apex (top) of the hyperbola to go. The hyperbola will immediately jump to this location.

2) Using the following buttons on the Concrete Type toolbar:

These buttons move the hyperbola only a tiny bit, so it is better to use them to "fine tune" the position of the hyperbola rather than using them to move the hyperbola a long distance on the screen.



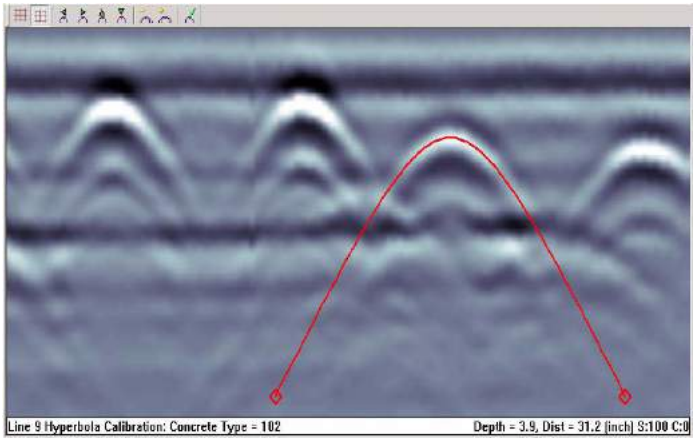
After the hyperbola has been positioned in the middle of the white band on the hyperbola in the cross section image, the next step is to match the shape. The shape of the hyperbola can be changed by:

1) Click on either diamond-shaped handle on the ends of the hyperbola tails and drag it to the position that best matches the shape of the image hyperbola.

2) Use the Mouse wheel (if present) to change the hyperbola width.

3) Click on the following buttons on the toolbar to make the hyperbola wider or narrower:

These buttons widen and narrow the hyperbola only a tiny bit, so it is better to use them to "fine tune" the width of the hyperbola.



Once the desired fit has been achieved, press the following button on the Concrete Type toolbar to accept the new Concrete Type value:

The Grid Scan data will automatically be reprocessed using the new value. Depending on the size of the Grid Scan, the reprocessing may take a minute or two. The depth slice images and depth axes in the main ConquestView window will update.

The bottom of the Concrete Type Calibration window displays information including the name of the cross section, the Concrete Type, the depth and line position of the hyperbola. As the hyperbola shape is changed, the Concrete Type and depth also change. The depth value is always for the apex (top) of the hyperbola.

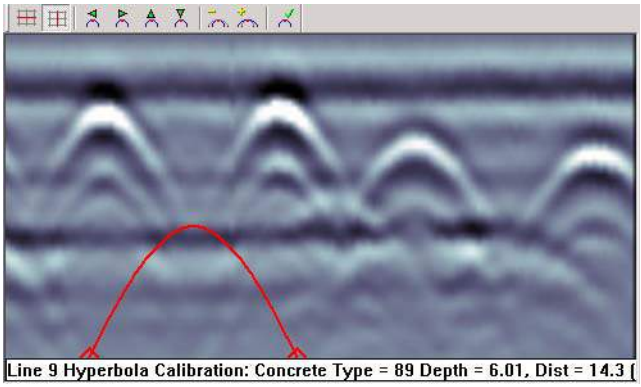
To exit from the Concrete Type Calibration window, click on the **Toggle Concrete Type Calibration** button on the main toolbar again:

If the Concrete Type Calibration window is closed using the X button in the upper right corner, the user is asked whether or not to accept the change in Concrete Type value.

The Concrete Type Calibration window will automatically close if the Grid Scan data in the main ConquestView window is closed.

Target of Known Depth

The Concrete Type Calibration window can also be used to determine the Concrete Type using a target at a known depth.



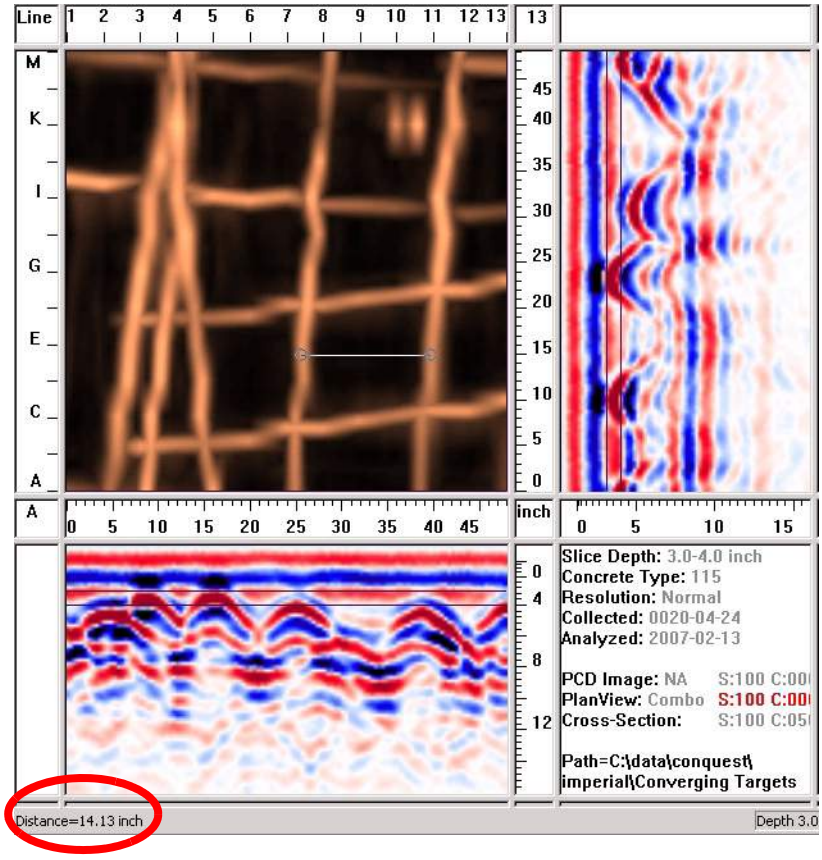
For example, if the reflection from the bottom of the concrete is visible in the cross section image and the thickness of the concrete is known, the apex of the hyperbola can be positioned on that reflection and the Concrete Type changed until the depth value displayed on the bottom of the window matches the known thickness.

3.4.3 Measure

The measure tool allows the user to measure the straight-line distance between any two points on a depth slice, PCD image or cross section image.

The Measure tool is accessed by selecting **Tool > Measure** from the menu or by selecting the **Toggle Measure Tool** button from the Toolbar:

To measure the distance between two points, click the mouse at the start position and drag and drop the mouse cursor at the end position. The distance between the two points (in the current units) will be displayed on the Status Bar at the bottom of the screen.



It is important to understand that measurements made on cross sections are based on the Concrete Type value so an accurate Concrete Type value is critical for an accurate measurement.

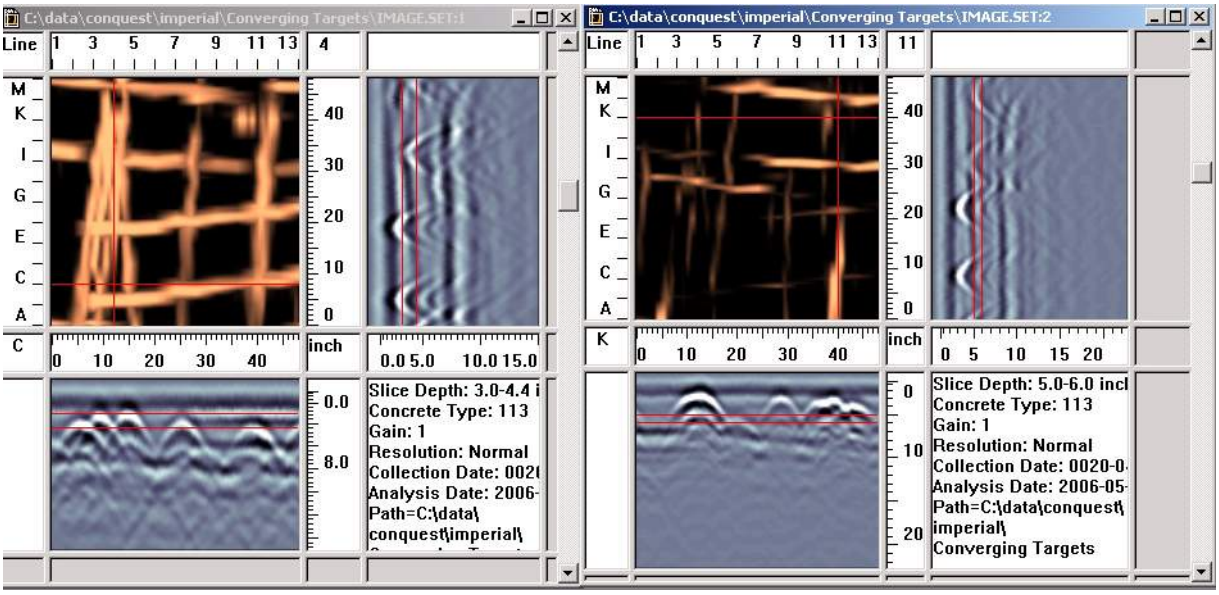
To cancel the Measure tool, click on the **Toggle Measure Tool** button on the main toolbar again.

3.5 Window

3.5.1 New Window

Selecting **Window > New Window** opens another window (instance) of the current Conquest Grid Scan.

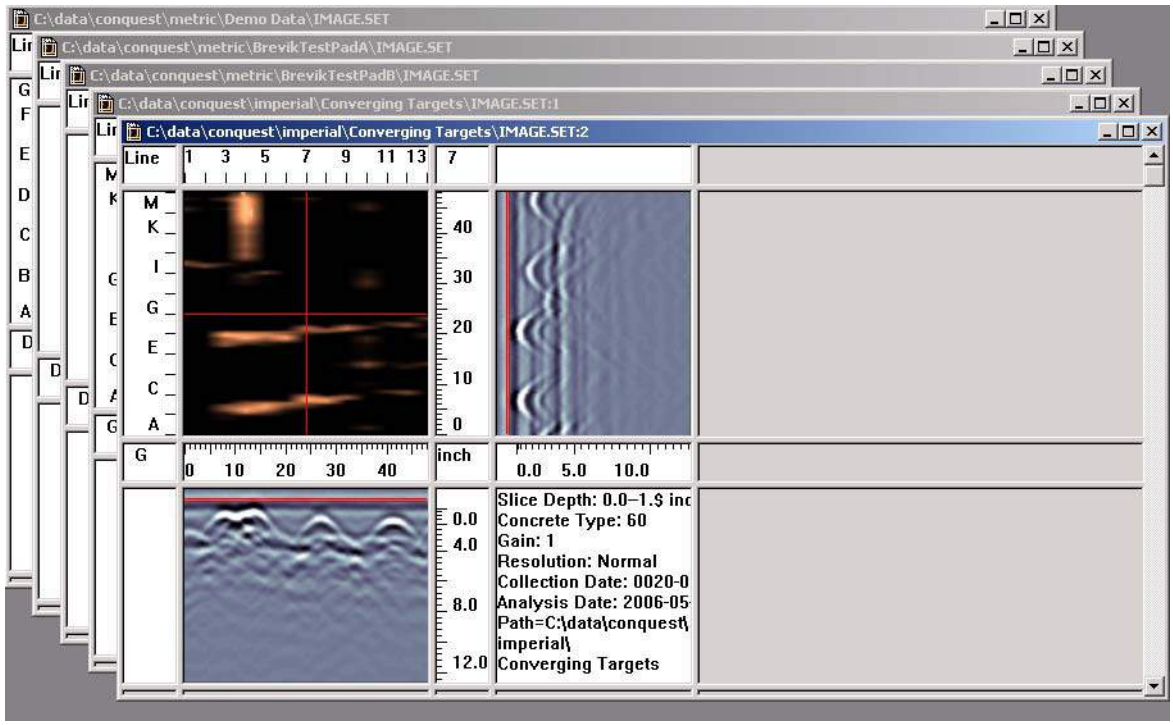
This is especially useful for looking at different depth slices or cross section images.



When there are multiple windows on the screen, only one is active at a time. Changing some variables such as Gain, Concrete Type and Drill Locator location changes the values for all instances of a grid scan. Other variables, such as Colour Map, do not change.

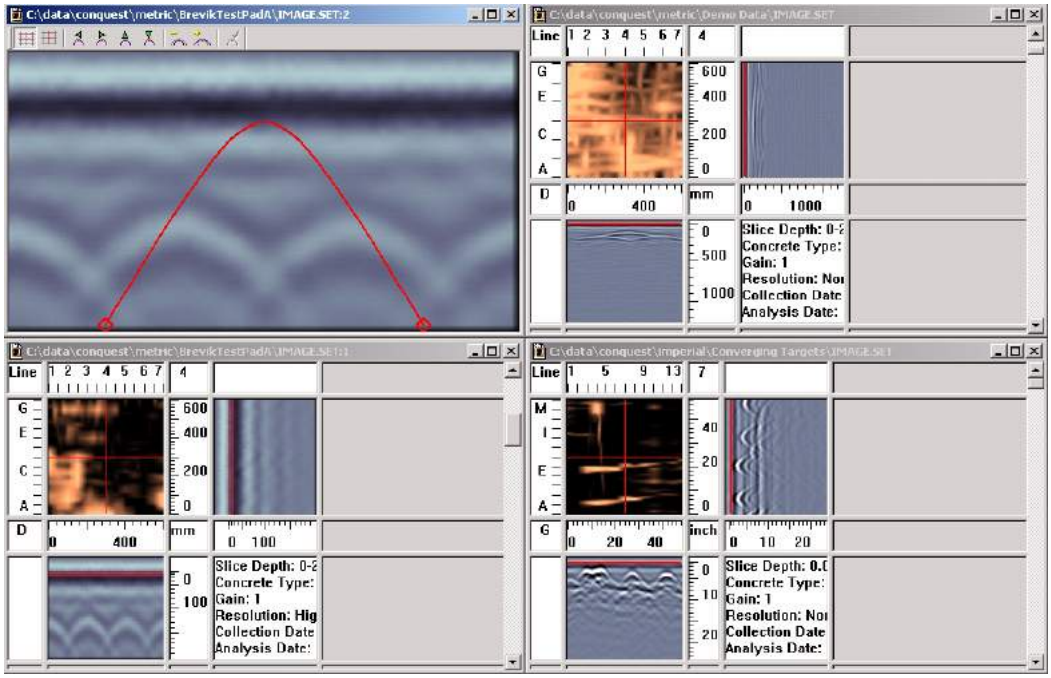
3.5.2 Cascade

Selecting **Window > Cascade** will rearrange open sections so they cascade on the screen, that is, the front section is completely visible and the title lines from the other sections are visible and accessible.



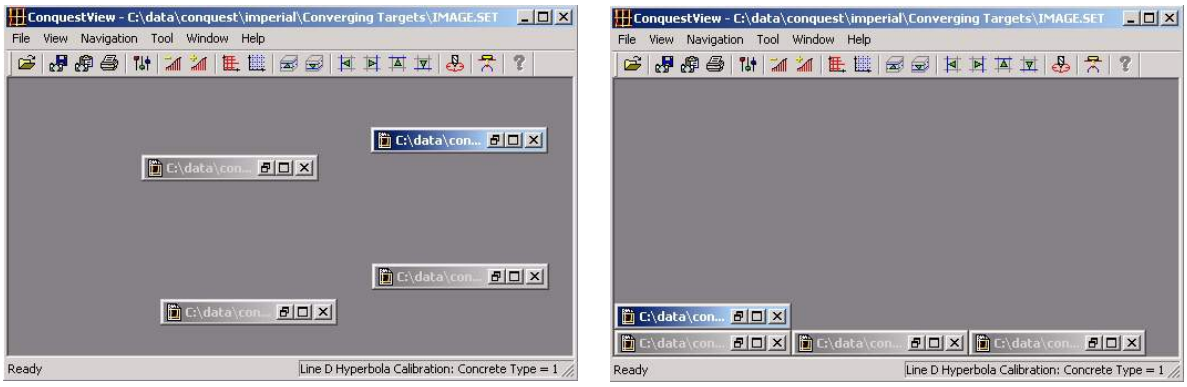
3.5.3 Tile

Selecting **Window > Tile** will rearrange all open sections so they are tiled on the screen, that is, all sections are resized so they are all visible and accessible.



3.5.4 Arrange Icons

Selecting **Window > Arrange Icons** will order all the icons (minimized windows).



3.6 Help

3.6.1 Contents

The Contents option opens this document in PDF for viewing.

The Adobe Acrobat Reader program must be installed on the PC to open this document. If not, the user is prompted to download it from the Adobe website.

3.6.2 Sensors & Software contact information...

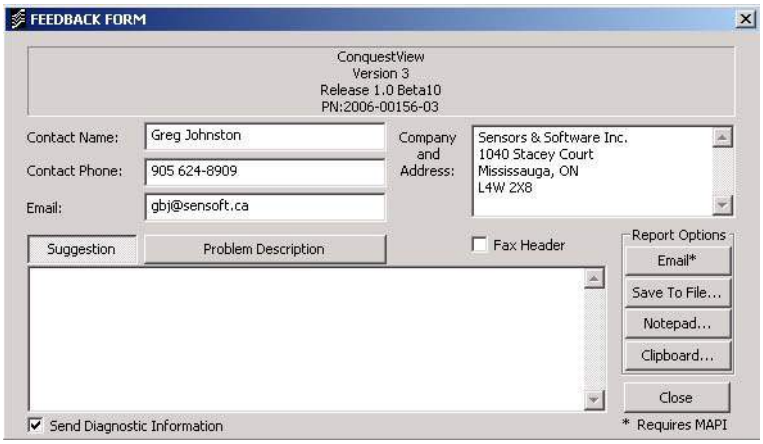
Displays contact information for Sensors & Software including mailing address, e-mail addresses, phone and fax numbers.

3.6.3 Feedback Form

The Feedback Form allows the user to document a problem about or suggestion for the ConquestView software and report it to Sensors & Software by e-mail, fax or letter.

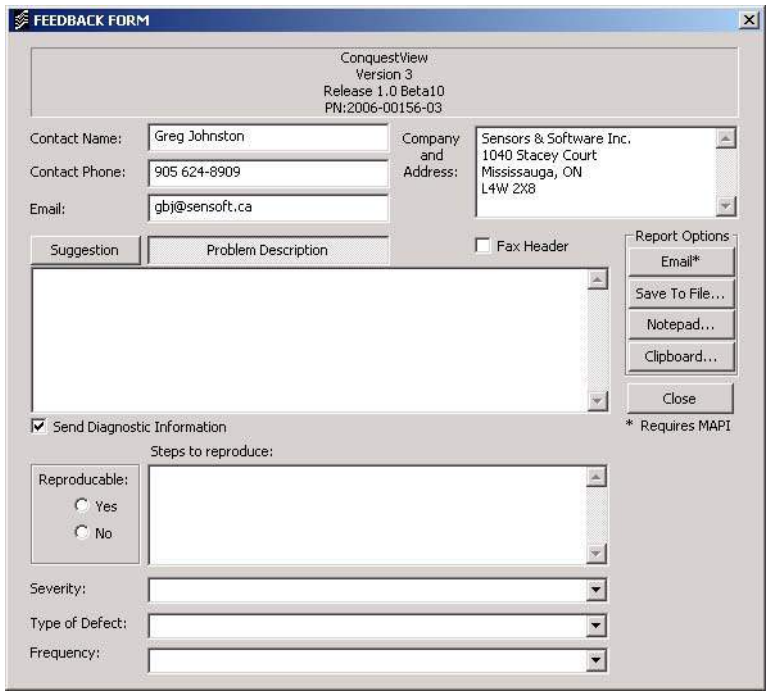
3.6.3.1 Suggestions

To send a suggestion for the ConquestView software, select the Suggestion button.



3.6.3.2 Problems

To report a problem with the ConquestView software, select the Problem Description button



The more information you include about the problem, the better chance we have of solving it. If the error is reproducible, list the steps that generate it. You must also fill-in the **Severity**, **Type of Defect** and **Frequency** descriptions from the drop down lists.

Checking the **Send Diagnostic Information** checkbox will scan a log file saved with the ConquestView software on your PC and add additional text to your message that may help Sensors & Software to diagnose why the problem is occurring.

To help us troubleshoot the problem, you can ZIP the grid scan data files and attach them to your email message.

3.6.3.3 Contact Information

The upper part of the form is your contact information. Any information filled in here will be included in the report sent to Sensors & Software. You are not required to fill in these fields but remember that, if you want us to contact you about the report you send, we need your contact information.

Clicking the **Fax Header** checkbox will automatically add Sensors & Software's fax information to the top of the e-mail or text file.

After writing the suggestion or problem description in the field provided, select one of the report options.

Email

Clicking on the Email option will automatically generate an e-mail to Sensors & Software as long as your system is MAPI-enabled. MAPI is short for ***M****essaging* ***A****pplication* ***P****rogramming* ***I****nterface,* a system built into Microsoft Windows applications like Outlook.

If selecting the Email option does not open your e-mail application program, contact your IT department or consider using one of the other methods below.

Save to File

This option prompts the user to save the report as a text file. This text file can be attached to an email or printed out and faxed or mailed to Sensors & Software.

Notepad...

The Notepad option opens the Notepad program and automatically writes the report text into the program. The report can then be saved as a text file can be attached to an email or printed out and faxed or mailed to Sensors & Software.

Clipboard

The Clipboard open writes the report text to the clipboard so it can be quickly pasted into an email and sent or pasted into any word processing software like Microsoft Word. The report can then be saved and attached to an email or printed out and faxed or mailed to Sensors & Software.

3.6.4 About ConquestView

This option displays a description, version number and product number of the ConquestView program currently in use.

4 Data Interpretation

4.1 Accurately Determining Target Depth

Conquest has been optimized in terms of the time zero setting and polarity so that when displaying cross section images using the grey color map, metallic objects, like rebar, will produce hyperbolas with black-white-black bands.

If cross section images are plotted using the grey colour map where negative signal amplitudes are displayed in black and positive signal amplitudes are displayed in white, the following procedure should give the best estimate of the depth of metallic targets.

1) Select **Concrete Type Calibration** and find a cross section with well defined hyperbolas.

2) Use the Concrete Type computed by Conquest or get the Concrete Type using the hyperbola-fitting method.

3) Set the Gain to 3-4 or so. The higher gain gives better contrast and more sharply defined edge.

4) Use the mouse to move the apex of the hyperbola to the top of the first black band as shown below to give the target depth. If the first black band is not visible, estimate its location by shifting the hyperbola above the top of the white band by the thickness of the white band.

5) The best estimate of the depth of this target is now displayed on the bottom of the window.

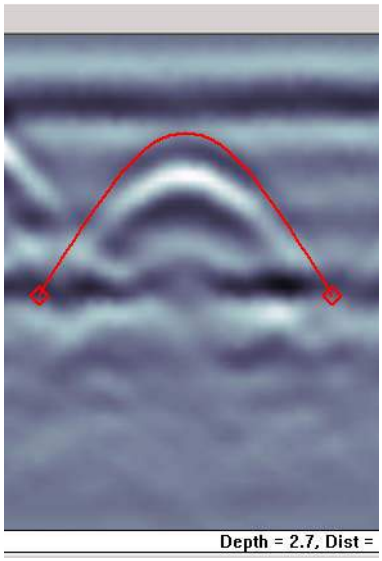


Figure 4-1: The best estimate of the depth of a metallic object is to plot the cross section image using the grey colour map, fitting the hyperbola to get the correct Concrete Type and then moving the hyperbola to the top of the black band. The depth will be displayed on the bottom of the window (2.7 inches in this case).