

Appendix C11

Performing and Analyzing an Infant Whole Body Scan

This appendix provides the procedures to perform an Infant Whole Body scan and analysis on a QDR system.

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The Infant Whole Body Examination

Important: At no time during the examination should the infant be left unattended on the scanner table. The infant should be monitored at all times to prevent the infant from rolling or falling off the table. To ensure the infant's safety, the operator may need assistance during this examination.

The Infant Whole Body examination includes all activities that begin when the infant arrives at the exam room and ends when a report is generated and printed. The activities involved in performing the exam include:

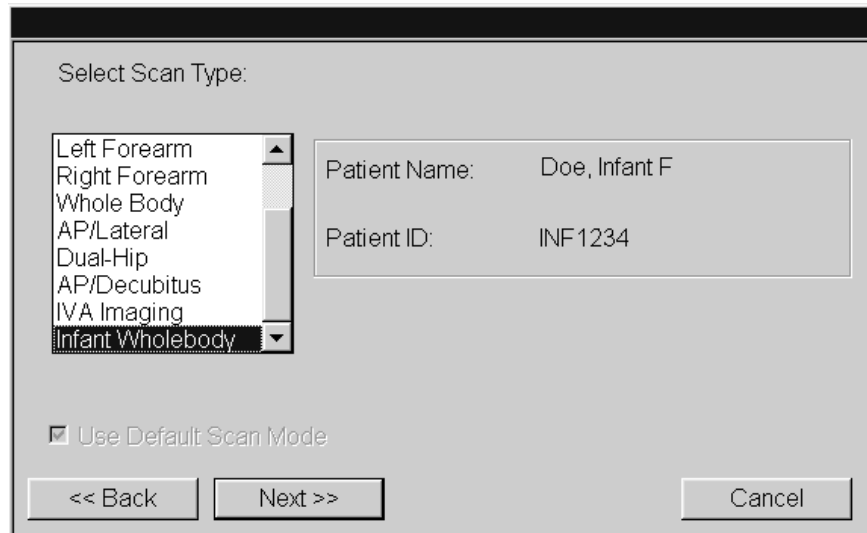
- Preparing the Infant
- Creating/Retrieving a Patient Biography
- Selecting the Scan Type and Mode
- Positioning the Infant and the C-arm
- Performing the Examination
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- Performing the Analysis
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Creating/Retrieving a Patient Biography

If this is a new patient, create a new patient biography (refer to *Creating a Patient Record*, in Chapter 6 of the *QDR for Windows XP Reference Manual*, for detailed instructions). If this patient already has a biography, retrieve it now (refer to *Retrieving a Patient Record* in Chapter 6 of the *QDR for Windows XP Reference Manual*).

Selecting the Scan Type and Mode

After a patient biography has been created, or retrieved, the Select Scan Type window displays.



The scan type for the Infant Whole Body scan is **Infant Whole Body**.

Choosing the Scan Mode

Alternate scan modes:

***Note:** The **Use Default Scan Mode** check box is grayed and cannot be unchecked.*

There are no alternate scan modes for the Infant Whole Body examination.

To choose the scan mode:

Step	Action
1	Click on Infant Whole Body in the scan type list. <i>The scan type is highlighted.</i>
2	Click the Next >> button. <i>The Scan Parameters window displays.</i>

Confirming Scan Parameters

***Note:** Typically, it should not be necessary to adjust the scan length.*

The only scan parameter that can be modified is the scan length. The scan length for an Infant Whole Body exam is approximately 32 inches (81 cm). The scan width is approximately 26.4 inches (67 cm). The system may change the number entered to match the pre-programmed step size of the scanning mechanism.



To verify scan parameters:

Step	Action
1	Verify the patient name and scan type in the upper right corner.
2	To change scan length, place the cursor in the Scan Length field and type the new length.
3	Stop here and position the patient and the C-arm.

Note: Typically, it should not be necessary to adjust the scan length.



Positioning the Patient and C-Arm

Important: At no time during the examination should the infant be left unattended on the scanner table. The infant should be monitored at all times to prevent the infant from rolling or falling off the table. To ensure the infant’s safety, the operator may need assistance during this examination.

This section provides information for positioning the patient, the table, and the C-arm for an Infant Whole Body exam. It is important to follow each set of directions carefully since they are designed to help acquire an ideal scan by describing:How to maximize patient comfort and safety. How to assist the patient onto the table for proper alignment.Suggestions for correct positioning techniques.

- How to maximize patient comfort and safety.
- How to assist the patient onto the table for proper alignment.
- Suggestions for correct positioning techniques.

Preparing the Infant

You may swaddle the infant in a thin cotton blanket to minimize movement and to protect the infant. However, the lean and fat equivalent mass of the portion of the blanket above and below the infant is included in the tissue composition results.

Diapers should be removed from the infant as they may introduce a significant offset in the tissue composition results. Metal objects, such as snaps, pins and identification tags must be removed from the infant as they will adversely affect both the bone mineral and body composition measurements.

Placing the Patient on the Table

Note: Refer to Chapter 7 of the QDR for Windows XP Reference Manual for a detailed description of placing the patient on the table.

Press the **Patient On/Off** switch on the Control Panel and place the infant on the table between the scan field indicators on the table pad.

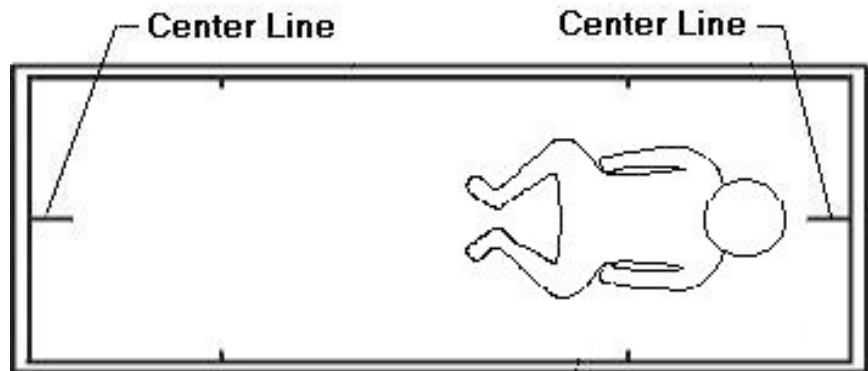
A flat thin layer of cloth or plastic material that covers the entire scan field may be used to protect the table. Otherwise, the scan field should be free of extraneous objects. Blankets used on the infant should not extend into the free air space of the scan any more than necessary.

Continue with positioning the patient below.

Positioning the Patient

Positioning the patient for a Infant Whole Body scan involves aligning the infant's body with the center lines at the right (head) and left (foot) sides of the table pad (see Figure C11-1).

Figure C11-1.
Infant Whole Body
Patient Positioning Goal



To position the infant:

Step	Action
1	Lay the infant prone or supine with the head at the right end of the table.

- 2 Press the **Center Table** button on the Control Panel.
The table and C-arm move to the center.
- 3 Check the infant's position on the table pad (see Figure C11-1), ensuring that the following conditions are met:
 - Body straight on the table pad using the center lines at the head and foot ends of the table pad as the gauge.
 - Body, including the feet, are positioned entirely within the scan limit border line.
 - Arms are at the infant's sides, separated from the thighs, and within the scan limit border.

Performing the Examination

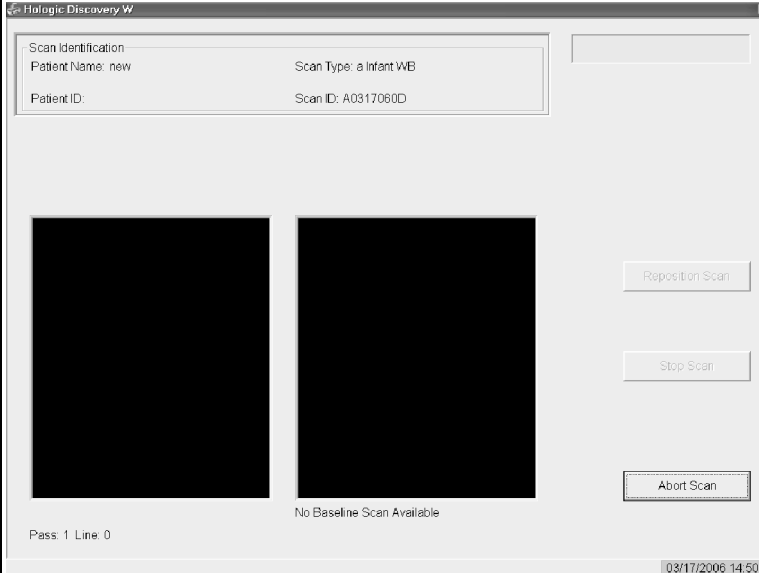
An acceptable infant whole body scan includes the entire body, arms and legs.

Starting the Infant Whole Body Scan

At this time, the Scan Parameters window should be displayed.


To start the Infant Whole Body scan:

Note: If the Control Panel X-ray lamp fails to extinguish within 10 seconds after the end of the scan, press the red **Emergency Stop** button on the Control Panel immediately. Then call Hologic Customer Service before resuming operation.

Step	Action
1	<p>Click the Start Scan button.</p> <p><i>The Scan window displays with the image appearing in the left scan box. The baseline scan, if available, appears in the right box. Flashing X-rays On indicator, at the top of the window, continues until the scan stops.</i></p> 

- 2 | Make sure the patient's arms are included in the scan on the first and last pass of the C-arm.
- 3 | Allow the scan to complete.
When the scan completes, the Exit Exam window displays.

While the scan is being acquired the operator has two options:

Option	Description
(let the scan complete)	The scan completes the length designated on the Scan Parameters window and then the Exit Exam window displays.
 Abort Scan button	Exits the scan immediately. An exit window displays then proceeds to the main window.

Exiting the Examination

After acquiring an acceptable image, the Exit Exam window displays. To perform the analysis of the scan just completed, click the **Analyze Scan** button in the Exit Exam window. Refer to *Exiting the Examination* in Chapter 7 of the *QDR for Windows XP Reference Manual* for detailed instructions.

Performing the Analysis

*Note: If the analysis of the scan is to be postponed to a later time, the scan can be searched for after clicking **Analyze Scan**.*

The Infant Whole Body analysis includes all activities that begin with a satisfactory image and ends with the calculation and summary of the results of the scan. After completing a scan, the system automatically saves the scan in the Scan Drawer. The three parts of analysis include:

- Choosing the analysis method.
- Performing the analysis.
- Generating a report.

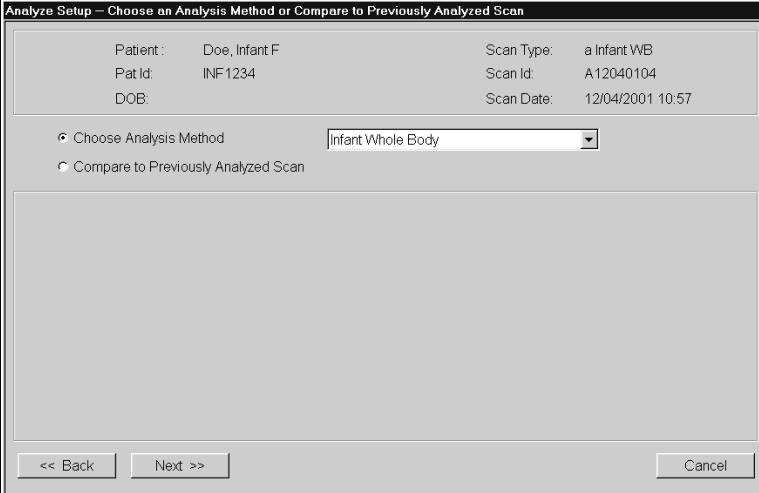
Choosing the Method of Analysis

The first analysis activity involves selecting the Method of Analysis. The analyze setup determines the method that the system uses to perform the analysis. It can perform the analysis either as a single new scan, or as a comparison to one that was previously performed.

If this scan is the patient's first visit, select the default method (Infant Whole Body) Method of Analysis and the system presents a single scanned image for analysis.

To select analyze setup for a first visit:

*Note: The Analyze Setup window displays with the **Choose Analysis Method** radio button selected as the default. Comparison is covered in detail in Chapter 13 of the QDR for Windows XP Reference Manual.*

Step	Action
1	<p>From the Exit Exam window, click the Analyze Scan button.</p> <p><i>The Analyze Setup window displays.</i></p> 
2	<p>Click the Next >> button.</p> <p><i>The Analysis window displays.</i></p>

Choosing the Compare to Previous Analysis

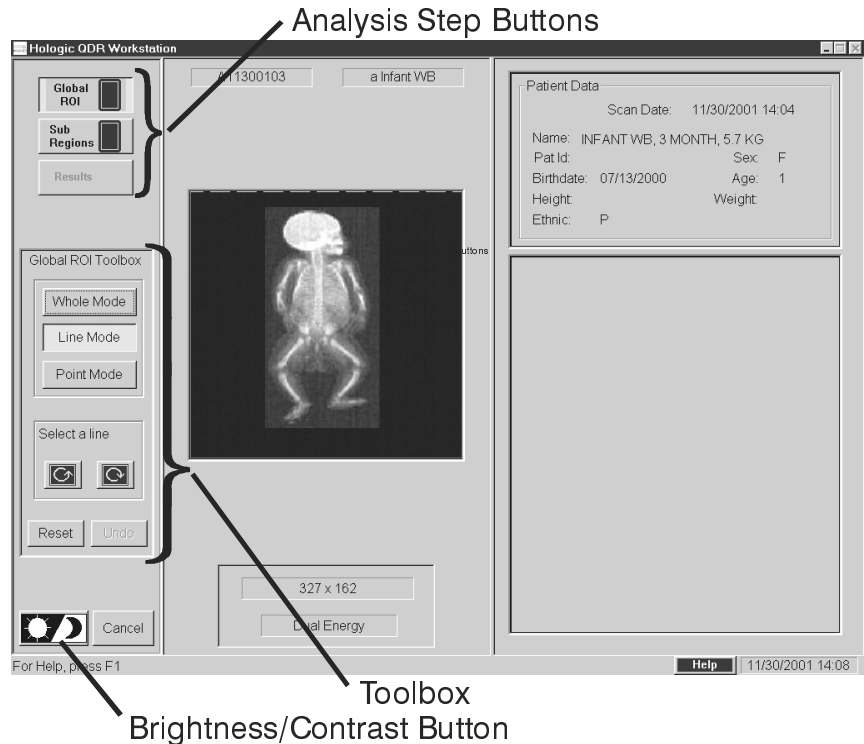
If this scan is a follow-up visit, select the **Compare to Previously Analyzed Scan** radio button. The system then presents two images. The left image is the unanalyzed scan, and the right image is a previous scan with the region of interest (ROI) defined. This allows the system to perform the new analysis on the same ROI as the previous scan and maximize accurate reporting of changes. Follow-up visits are discussed in detail in Chapter 13 of the *QDR for Windows XP Reference Manual*.

Performing the Infant Whole Body Analysis

Once the setup method has been selected, continue to the Analysis window to adjust the quality of the image and properly define the area of analysis called the region of interest (ROI).

A specific set of tools called the Analysis Step Buttons, located on the left side of the window (see Figure C11-2), allow the operator to proceed step-by-step through each task. These tools can maximize image quality and accuracy, preventing the need for re-scanning.

Figure C11-2.
Infant Whole Body
Analysis Window



The steps to analyze the Infant Whole Body scan include:

1. Adjusting the image display brightness and contrast (**Brightness/Contrast** button).
2. Defining the Global Region of Interest (**Global ROI** button).
3. Defining one or more subregions of interest (**Sub Regions** button).
4. Viewing analysis results (**Results** button).
5. Exiting the Analysis window (**Close** button).

Note: This step is optional.

Adjusting the Image Display



The contrast and brightness of the image can be adjusted to obtain the best definition of important anatomical features. Adjusting the contrast and brightness has no effect on calculations; it is used to optimize the display and for visual adjustments only. Refer to *Contrast and Brightness*, in Chapter 7 of the *QDR for Windows XP Reference Manual*, for detailed instructions.

Defining the Global Region of Interest

The global ROI refers to the defined boundaries of the image that is being analyzed. The ROI appears on the image as a box: dashed

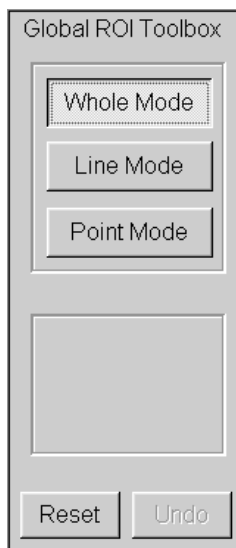
lines are active and can be adjusted; solid lines are inactive and cannot be adjusted.

Figure C11-3.
Global ROI Image in
the Analysis Window



Note: Altering the global ROI is not recommended. The most reliable results are obtained with the global ROI set to its maximum size. The following instructions are provided so that artifacts in the image can be excluded by reducing the size of the global ROI.

Global ROI Toolbox



The Global ROI Toolbox includes tools to help define the regions of interest. Use the Global ROI Toolbox to change the size and shape of the Global ROI and position the ROI in the image.

- **Whole Mode**
When selected, the entire ROI box initially displays as a dashed yellow line. This allows the entire box to be moved.
- **Line Mode**
When selected, one line on the ROI box initially displays as a dashed yellow line. Any of the ROI box lines can be selected and then moved. Top or bottom (horizontal) lines can be moved up or down. Side (vertical) lines can be moved left or right.
- **Point Mode**
When selected, a plus sign displays in each corner of the ROI box, as well as at the center of the top and bottom lines. These end points can be moved in any direction. A corner or center point can be selected to angle the top and bottoms lines.

To define the ROI in Line Mode:

Step	Action
1	Click the Global ROI button in the top left corner of the window, if not already selected. <i>The ROI box displays in the image area.</i>

Note: Dashed yellow lines are active and can be edited. Solid red lines are inactive.

Note: The top line remains dashed until the bottom line is clicked.

- | | |
|---|--|
| 2 | The Line Mode button is the default and should be active (click if not already selected).
<i>The top line of the ROI box displays as an active line (dashed yellow).</i> |
| 3 | Click and drag the top line to the desired position. |
| 4 | Click and drag the bottom line to the desired position. |
| 5 | Click and drag the left line to the desired position. |
| 6 | Click and drag the right line to the desired position. |

To define the ROI in Whole Mode:

Step	Action
1	Click the Global ROI button in the top left corner of the window, if not already selected. <i>The ROI box displays in the image area.</i>
2	Click the Whole Mode button in the Global ROI Toolbox. <i>The ROI box displays as active lines (dashed yellow).</i>
3	Position the cursor arrow anywhere within the ROI box. <i>The crossed arrows cursor displays.</i>
4	Center the ROI box over the desired area by clicking and dragging it to the correct position.

To define the ROI in the Point Mode:

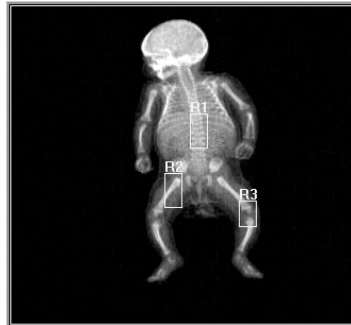
Step	Action
1	Click the Global ROI button in the top left corner of the window, if not already selected. <i>The ROI box displays in the image area.</i>
2	Click Point Mode in the Global ROI Toolbox. <i>Plus signs display at the end of each line and in the middle of the top and bottom lines of ROI. The top left point displays as an active plus sign (yellow); all other points display as inactive (red).</i>

- 3 Position the cursor on the point (plus sign) to move.
The cursor changes to crossed arrows.
- 4 Click and drag the point to its new position.
When dragging an end point, both the horizontal and vertical lines attached to the selected point move. When dragging a middle point, the top horizontal line angles upward left or right; the bottom angles downward left or right.

Defining Sub Regions of Interest

Sub Regions refers to defined sub-boundaries within the global ROI of the image that is being analyzed. Sub regions appears on the image as a box: the dashed line is active and can be adjusted; the solid lines are inactive and cannot be adjusted.

Figure C11-4.
Sub Regions Image in
the Analysis Window



Note: Placing subregions is optional and will not effect the global results.

Sub Regions Toolbox



The SubRegion Toolbox includes tools to help define up to seven areas of interest (subregions) anywhere in the global ROI of the image.

- **Whole Mode**
When selected, one subregion box initially displays with dashed yellow lines. This allows the entire box to be moved.
- **Line Mode**
When selected, one line on the subregion box initially displays as a dashed yellow line. Any of the subregion box lines can be selected and then moved. Top or bottom (horizontal) lines can be moved up or down. Side (vertical) lines can be moved left or right.
- **Point Mode**
When selected, a plus sign displays in each corner of the subregion box. Center points can be added to and deleted from any subregion box line. Center points can be added between two end points, an end point and a center point, and between two center points. A subregion can contain up to eight points. A corner point can be selected to angle both the horizontal and vertical lines attached to the point in any direction. A center point can be selected to angle the associated line in any outer direction.
- **One Region**
When selected enables selection of one subregion box.
- **All Regions**
When selected enables selection of all subregion boxes (enabled only in Whole Mode).
- Buttons used to add, select, size, shape, flip and remove subregions in the global ROI.

To add and position a subregion box:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>If any subregions are defined, one box displays as active (dashed yellow).</i>
3	Click the plus sign button. <i>If any subregions are defined, the active box becomes inactive (solid red) and the new subregion box appears superimposed over that subregion box as an active box (dashed yellow). If no subregions are defined, the box appears in the center of the Global ROI as an active box.</i>
4	Click in the subregion box and drag it to the desired position.

To remove a subregion box:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>If any subregions are defined, one box displays as active (dashed yellow).</i>
3	Click in the subregion box to be removed. <i>The subregion box displays as an active box (dashed yellow).</i>
4	Click the minus sign button. <i>The subregion box is removed from the image.</i>

To move one subregion box:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>

- | | |
|---|--|
| 2 | The Whole Mode and One Region buttons are the default and should be active (click if not already selected).
<i>If any subregions are defined, one box displays as active (dashed yellow).</i> |
| 3 | Click and drag the desired subregion box to its new position.
<i>The subregion box displays as an active box (dashed yellow).</i> |

To move all subregion boxes:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default. <i>One subregion box displays as active (dashed yellow).</i>
3	Click the All Regions button. <i>All subregion boxes display as active boxes (dashed yellow).</i>
4	Click and drag any subregion box and all subregion boxes move as a unit.

To flip one subregion box:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>One subregion box displays as active (dashed yellow).</i>
3	Click in the subregion box to be flipped. <i>The subregion box displays as an active box (dashed yellow).</i>
4	Click the Flip Horizontal (double arrow horizontal line) or the Flip Vertical (double arrow vertical line) button. <i>The subregion box flips horizontally or vertically in its same position.</i>

To flip all subregion boxes:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default. <i>One subregion box displays as active (dashed yellow).</i>
3	Click the All Regions button. <i>All subregion boxes display as active boxes (dashed yellow).</i>
4	Click the Flip Horizontal (double arrow horizontal line) or the Flip Vertical (double arrow vertical line) button. <i>All subregion boxes flip horizontally or vertically within the image.</i>

To position subregion box lines in Line mode:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>One subregion box displays as active (dashed yellow).</i>
3	Select the subregion box whose line(s) are to be moved by clicking in it. <i>The subregion box displays as an active box (dashed yellow).</i>
4	Click the Line Mode button. <i>The top line of the selected subregion box displays as active (dashed yellow).</i>
5	Position the cursor on the line to move. <i>The cursor changes to a double arrow horizontal or vertical line.</i>
6	Click and drag the line to its new position. Drag top and bottom (horizontal) lines up or down; side (vertical) lines left or right. <i>The line displays as an active line (dashed yellow).</i>

To position subregion box lines in Point mode:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>One subregion box displays as active (dashed yellow).</i>
3	Select the subregion box whose line(s) are to be moved by clicking in it. <i>The subregion box displays as an active box (dashed yellow).</i>
4	Click the Point Mode button. <i>Plus signs display at the end of each line of the selected subregion box. If center points have been added, they also display. The top left point displays as an active plus sign (yellow); all other points display as inactive (red).</i>
5	Position the cursor on the point (plus sign) to move. <i>The cursor changes to crossed arrows.</i>
6	Click and drag the point to its new position. <i>When dragging an end point, both the horizontal and vertical lines attached to the selected point move.</i>

To add center points to a subregion box line:

Note: When adding two or more center points to the same straight line, you must add the first point and position it before adding the second point. Continue positioning each point you add before adding another point.

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>One subregion box displays as active (dashed yellow).</i>

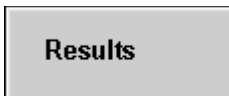
- 3 Select the subregion box for which you want to add center point(s) by clicking in it.
The subregion box displays as an active box (dashed yellow).
- 4 Click the **Point Mode** button.
Plus signs display at the end of each line of the selected subregion box. The top left point displays as an active plus sign (yellow); all other points display as inactive (red). If center points have been added, they also display.
- 5 Click on a point (end or center) of the line at which you want to add a center point. You can also use the **Clockwise** and **Counter-clockwise** buttons to select a point.
The point displays as an active plus sign (yellow).
- 6 Click the **Plus Sign** button just below the Point Mode button.
A new point displays as an active plus sign (yellow) centered between two points on the line clockwise from the selected point.

To delete center points from a subregion box line:

Step	Action
1	Click the Sub Regions button in the top left corner of the window, if not already selected. <i>The SubRegion toolbox appears.</i>
2	The Whole Mode and One Region buttons are the default and should be active (click if not already selected). <i>One subregion box displays as active (dashed yellow).</i>
3	Select the subregion box whose center point(s) you want to delete by clicking in it. <i>The subregion box displays as an active box (dashed yellow).</i>
4	Click the Point Mode button. <i>Plus signs display at the end of each line of the selected subregion box. The top left point displays as an active plus sign (yellow); all other points display as inactive (red). If center points have been added, they also display.</i>

- 5 Click on the center point (plus sign) you want to delete. You can also use the clockwise and counter-clockwise buttons to select a point.
The point displays as an active plus sign (yellow).
- 6 Click on the Minus Sign button just below the Point Mode button.
The point is removed.

Viewing Results



Results of the analysis display in the lower right portion of the Analysis window (see Figure C11-5).

The infant whole body results area of the Analysis window shows:

Pertinent Statistical Information

The headings of the results section are used in maintaining accuracy and diagnostic precision for this machine, and are set at the factory.

Regions

Indicates individual regions included in the analysis and points to the results.

Area

Bone area expressed in cm² (centimeters squared).

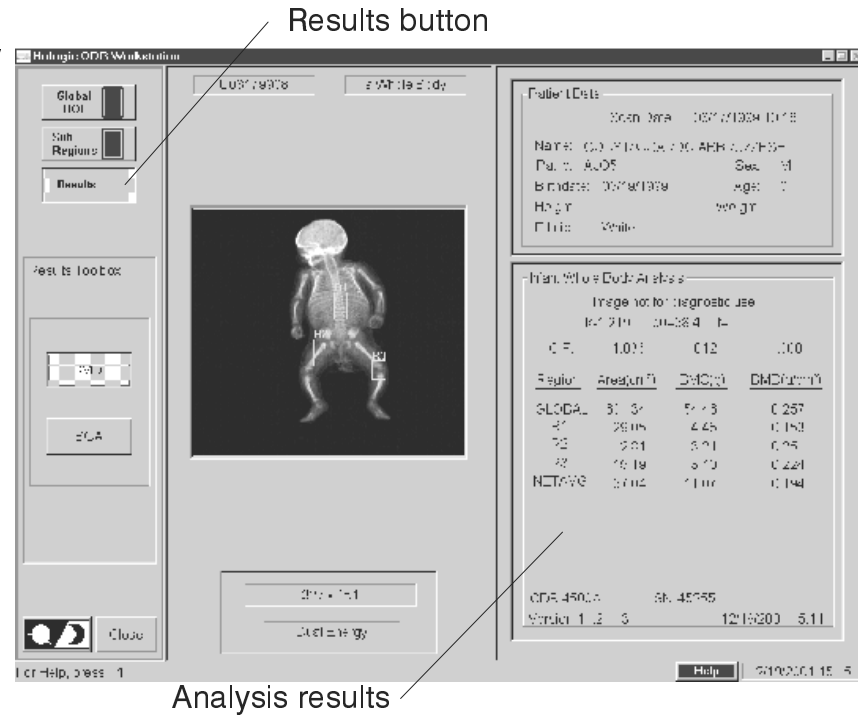
BMC

Bone mineral content expressed in grams.

BMD

Bone mineral density expressed in g/cm² (grams per centimeter squared).

Figure C11-5.
Analysis Window



To view results:

Step	Action
1	<p>Click the Results button.</p> <p><i>The results display in lower right corner of the Analysis window.</i></p>

Infant Whole Body Analysis

Image not for diagnostic use
k=1.219 d0=58.4 t=

C.F. 1.036 1.012 1.000

Region	Area(cm²)	BMC(g)	BMD(g/cm²)
GLOBAL	601.34	154.46	0.257
R1	29.05	4.45	0.153
R2	12.81	3.21	0.251
R3	15.19	3.40	0.224
NETAVG	57.04	11.07	0.194

QDR 4500A SN: 45255
Version 11.2 :3 12/19/2001 15:11

Note: If the Body Composition Analysis (BCA) option is installed on your QDR system then a BCA can be generated (see Appendix C).

To reanalyze the current scan with different settings:

Note: Once an Analysis Step Button is modified, each subsequent analysis step must be performed or results will not be accurate.

Step	Action
1	Click the appropriate Analysis Step Button (see Figure C11-2) and modify.
2	Repeat for each subsequent Analysis Step Button in the Global ROI and SubRegion toolboxes.

To reanalyze the current scan from the QDR main window:

Step	Action
1	Click the Analyze Scan button.
2	Click on the Analyzed Scans tab.
3	Select the desired scan.
4	Click the Next >> button.
5	Continue with analysis as described earlier in this appendix.

Exiting the Analysis

After performing the analysis, the Exit Analysis window displays. To select a report type to print, click on the **Report** button in the Exit Analysis window. Refer to *Exiting the Analysis* in Chapter 7, of the *QDR for Windows XP Reference Manual*, for detailed instructions.

Generating and Printing Reports

A variety of reports can be generated from the results of the analysis, customized to fit the needs of the examination. Generate and print the desired report. Refer to *Generating and Printing Reports* in Chapter 7, of the *QDR for Windows XP Reference Manual*, for more information.