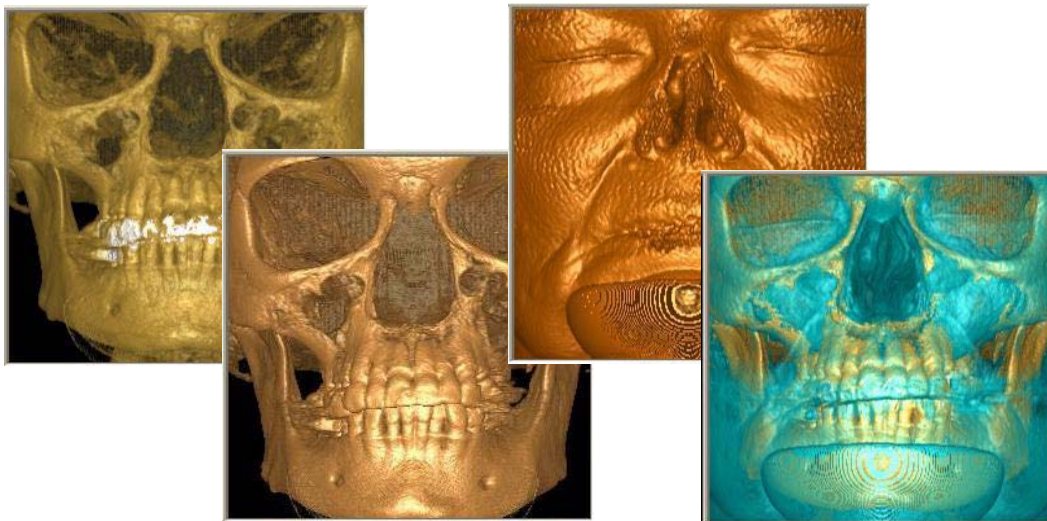


3DVR

3 Dimensional Volume Rendering Operator's Manual



Cone Beam Volumetric Tomography and Panoramic Dental Imaging System





Published by Imaging Sciences International

Imaging Sciences International

1910 North Penn Road

Hatfield, PA 19440

USA

215.997.5666

215.997-5665/5667 (FAX)

TABLE OF CONTENTS

<i>Open Database</i>	1
<i>Axial Functions</i>	3
<i>Paging</i>	3
<i>W/L (Window/Level)</i>	3
<i>ROI (Region of Interest)</i>	4
<i>Distance</i>	5
<i>Identify</i>	6
<i>Remove Object</i>	7
<i>Hounsfield Unit Calibration Offset</i>	8
<i>View Volume</i>	9
<i>Projection Type</i>	10
<i>Volume Edit</i>	11
<i>VR Functions</i>	12
<i>Sample of View Types</i>	13
<i>PAN</i>	14
<i>Zoom</i>	14
<i>Reset Pan/Zoom</i>	14
<i>Rotate 3D Image</i>	14
<i>Pop Up Menu</i>	15
<i>Save to JPG</i>	15
<i>Save Grayscale to TIFF</i>	15
<i>Open Working Folder</i>	15
<i>View Full Screen</i>	16

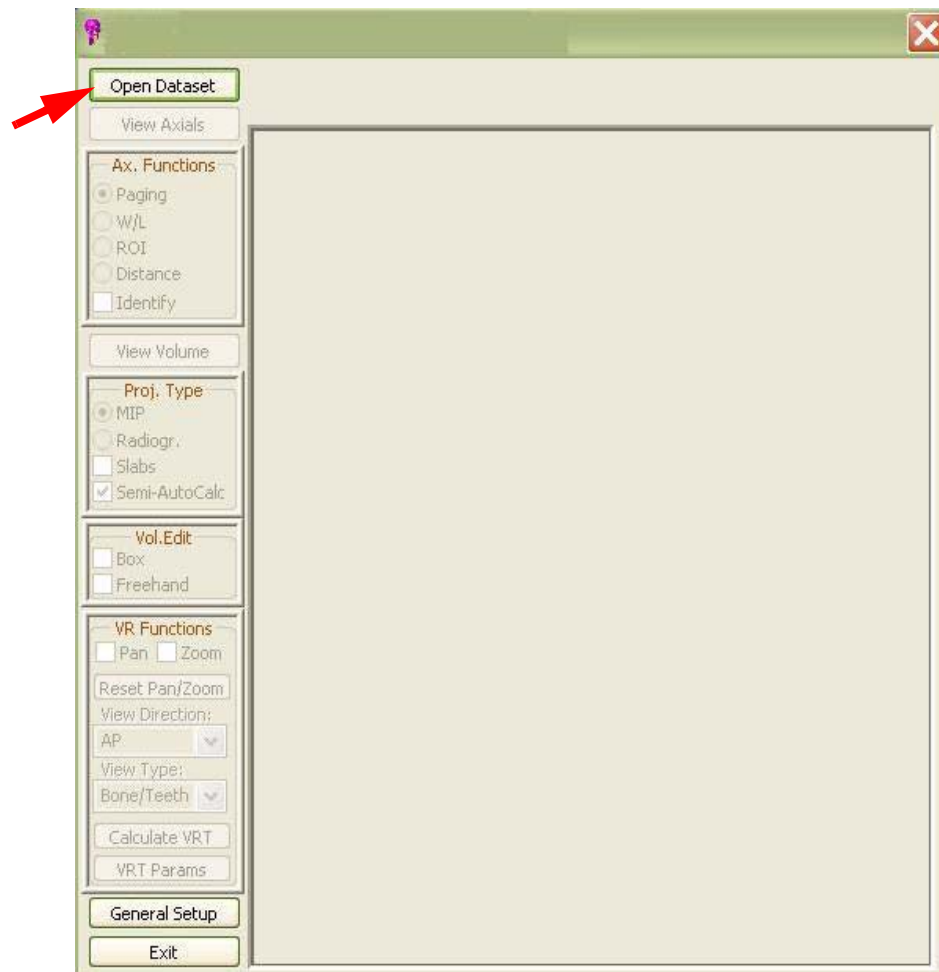
Three Dimensional Volume Rendering (3DVR)

Open Database

3 DVR is a standalone program which runs independently and is not part of iCATVision.

1. To open DVR (Diagnostic Volume Rendering,) double click the DVR icon.

The Program Main menu is displayed.



To get started, an image dataset must be loaded. The case **MUST** be in DICOM format.

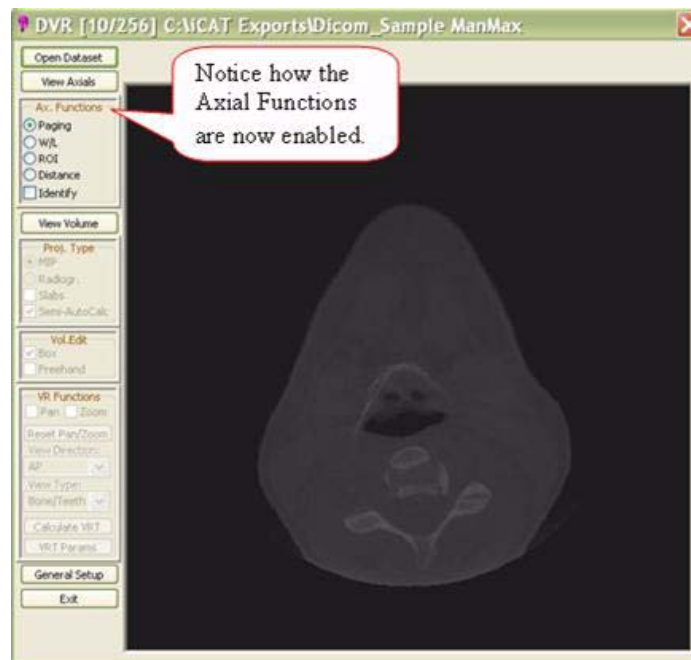
If importing a case from iCATVision, make sure to export the case in *DICOM3-Multi File* format.

2. Click **Open Dataset**, a browse window is displayed.
3. Select the drive/folder for the DICOM dataset and click **OK**.



The first view displayed is an *Axial* slice.

The **Axial Functions** menu, under the *View Axial* button, is enabled.



Axial Functions

There are 5 tools under Axial Functions.

- Paging
- W/L (Window Level)
- ROI (Region of Interest)
- Distance
- Identify

Paging

Paging is the tool that allows for scrolling through all the axial slices of the dataset. Notice at the top of the DVR window, the axial slice number currently displayed is next to the word DVR. In this sample it is slice 10 of 256.

To scroll through each slice:

1. Click **Paging** Radio button.
2. Drag the cursor either UP or DOWN to scroll through the axial slices.

Dragging the cursor upward scrolls towards the top of the skull and dragging downward scrolls towards the bottom of the skull.

W/L (Window/Level)

W/L is a tool to adjust Grayscales (Brightness / Contrast).

To adjust Brightness/Contrast:

1. Click **W/L** Radio button.
2. Drag cursor Left/Right to adjust Contrast and Up/Down for Brightness.

The W/L values are displayed at the top of screen.

ROI (Region of Interest)

ROI is a tool used for determining Hounsfield Units.

To activate the ROI tool:

1. Click **ROI** Radio button.
2. Drag cursor to create a box around region of interest. Release the mouse button to move box, then click again to complete the box.

Calculated items are displayed (upper left corner.) The displayed values are:

- Mean
- SD (Standard Deviation)
- HU min (minimum Hounsfield Units)
- HU max (maximum Hounsfield Units)
- Area



Distance

The distance tool measures linear distance.

To activate Distance tool:

1. Click **Distance** radio button.
2. Drag cursor from point to point to create a measurement line (see below in green).

Linear measurement is displayed in millimeters (upper left corner.)



Identify

The Identify tool identifies areas of interest at different densities. It is defaulted to detect the most dense anatomy or material.

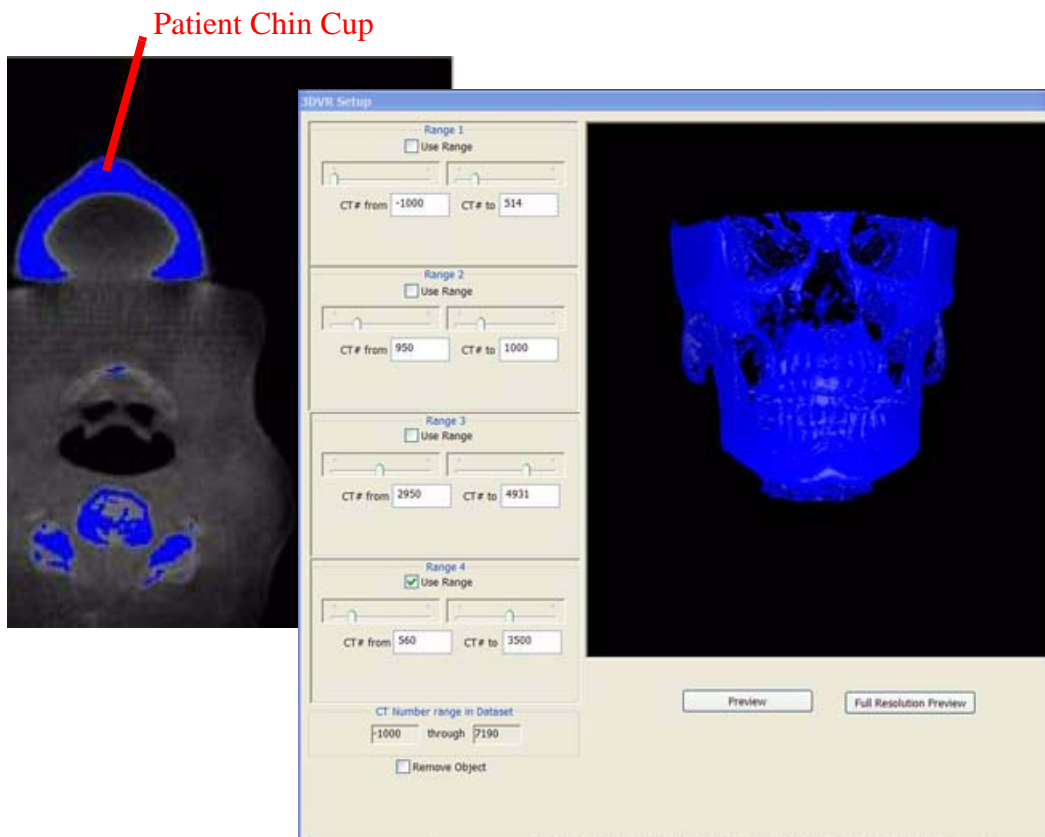
This tool is often used to remove a piece of anatomy from the image. One major use is to remove the Patient Chin Cup that may appear in the scan. See the sample below (Patient Chin Cup highlighted in blue.)

To activate Identify tool:

1. Click **Identify** Box.

The 3DVR Setup window is displayed and the dense material in the Axial window is highlighted in blue.

2. Click **Preview** or **Full Resolution Preview** to display a 3D image in the 3DVR Setup window.
 - **Preview** - reduced resolution, but faster VR rendering
 - **Full Resolution Preview** - full resolution, but slower
3. Drag cursor on 3D image to rotate.



Display the slice range of interest:

4. On the Axial screen, drag the cursor either UP or DOWN to scroll through the axial slices.

Dragging the cursor upward scrolls towards the top of the skull and dragging downward scrolls towards the bottom of the skull.

or

On the 3DVR Setup screen, select a CT Range (1 to 4). Ranges are adjusted by using the slide bars or type a new range number in the box.

Remove Object**To remove a piece of anatomy from image:**

1. Click the **Remove Object** box to enable (checkmark).
2. Then click the object of interest highlighted in blue.
3. Close 3DVR Setup window by clicking **X** (upper right corner of window).
4. Scroll through the Axial views to verify that the object is removed from the image (was white, now black).

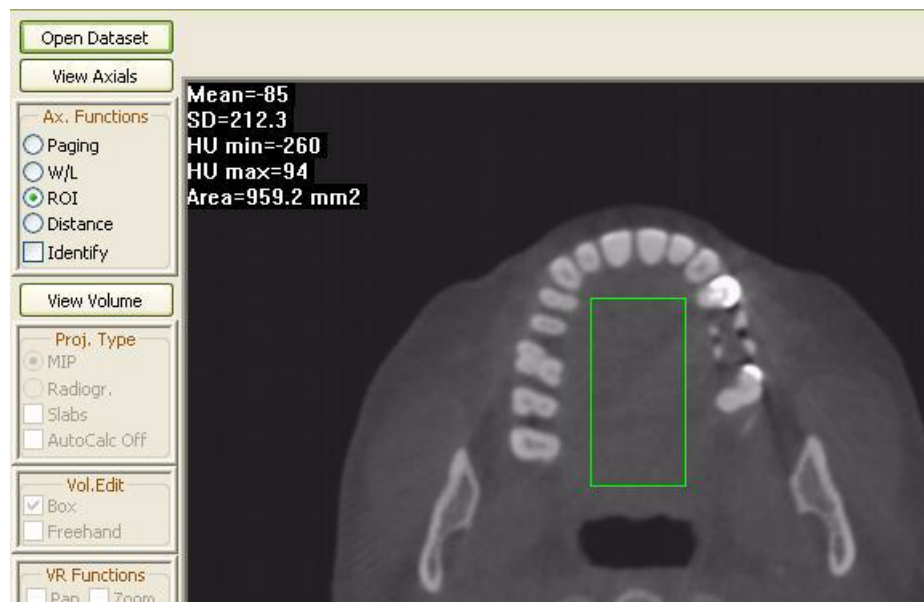
NOTE: Please be aware that any adjoining anatomy or material will also be removed, if there is continuity, or “leakage”. This includes any adjoining tissue in the rest of the volume that is not necessarily visible in this particular axial view.



Hounsfield Unit Calibration Offset

Before proceeding to the View Volume functions, first enter a calculated offset into the General Setup for Hounsfield Units. The value that is required is based on the RIO function.

1. Enable the **Paging** button.
2. Scroll to the tongue area in the axial view which is just above the maxillary crowns. (look for a region that has relatively even grayscales).
3. At this location, enable the **ROI** function.
4. Drag the cursor in the area between the dental arch, making sure not to include any teeth or bone. This displays the Hounsfield data.



The **MEAN** value is the data of interest in this calculation. It reads a value (most likely a negative value). Whatever this number is, we want to add a value that will result in the Mean being around positive 50. In this example, the Mean reads -85 and we want the Mean to be +50, therefore the offset calculation will be +135.

5. Click the **General Setup** button on the menu bar.

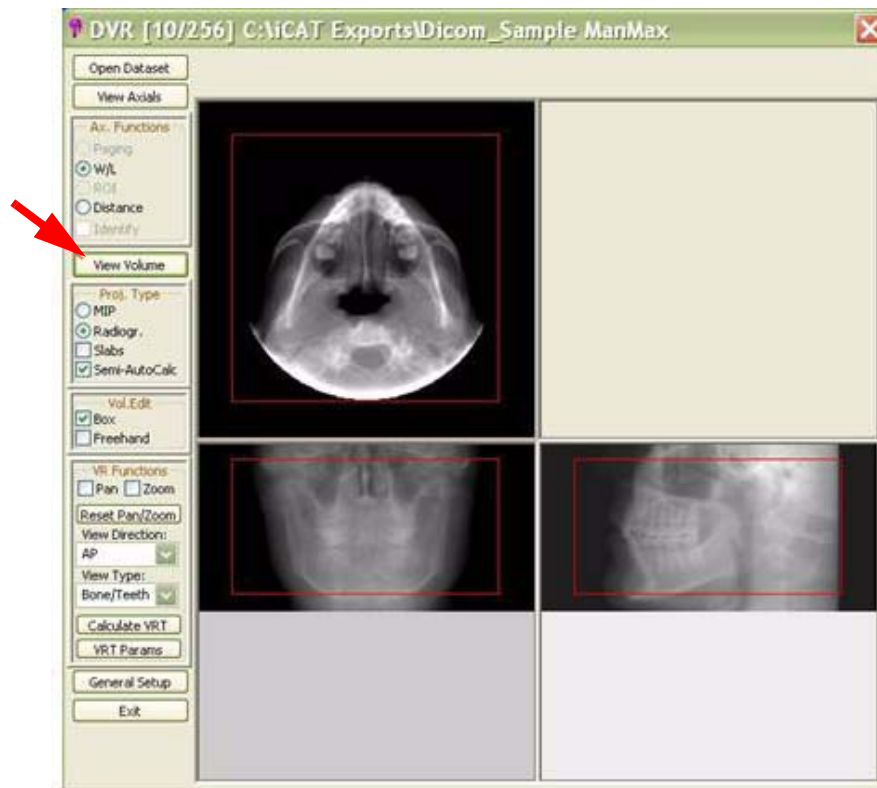
6. Enter Calculation Offset which currently has a value of 0.
7. Click **OK**.



View Volume

View Volume allows viewing all 3 projections of the 3D data: Axial, Coronal and Sagittal. Also enables the creation of 3D Renderings.

Enable View Volume Tools, click the **View Volume** button.



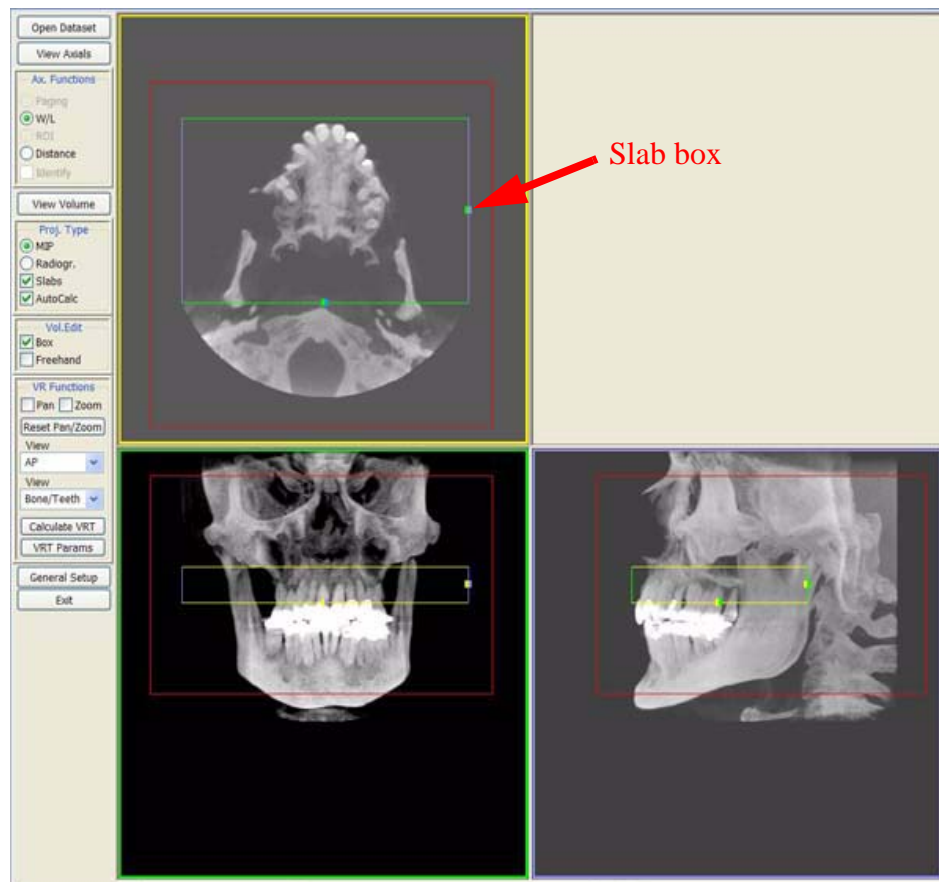
Projection Type

Projection Type enables viewing 3D data in 2 different projections or modes: **Radiographic** and **MIP**.

- **Radiographic** mode - The above example has Radiographic mode enabled. The Axial, Coronal, and Sagittal views are all in Radiographic mode.

NOTE: Window/Level can be adjusted in each of the 3 views by dragging the cursor in each window.

- **MIP** mode - Maximum Intensity Projection (views displayed below.)
- **Slabs** - Displays an additional box in each window which can be sized and moved to change the areas of interest in the other windows.
- **Auto/Semi Auto Calc** - calculates the image displays as the Slab boxes are adjusted.



Volume Edit

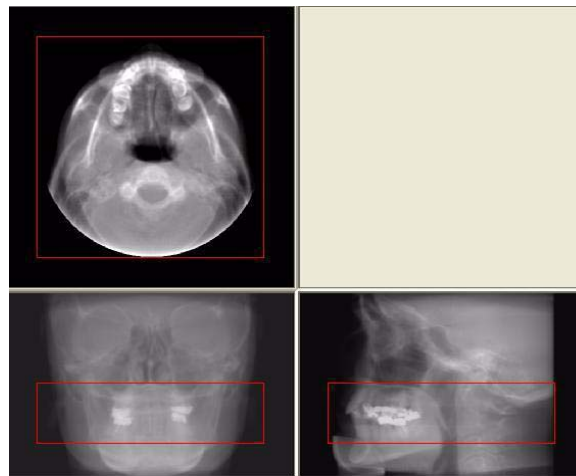
Volume Editing is used to select an area of interest to create a 3D rendering. The two methods used are **Box** and **Freehand**.

- **Box** - with this option, each of the 3 views are displayed with a red box around the data. Boxes can be resized to select different areas of interest.
- **Freehand** - drag the cursor around an area of interest in the Axial view (see below). This selects a new area of interest in the Coronal and Sagittal views.

Again, the selected data is used to calculate the 3D image. Once the area of interest is determined, the 3D image can be displayed by utilizing the VR Function tools.

Box Editing

In this sample, we resized the box from the Coronal view to include only a portion of the upper and lower jaw. Note how this resized the matching area in the Sagittal view.



Freehand Editing

In this sample, we used the Freehand tool to draw an area of interest in the Axial view of only the right side of the jaw. Notice how the boxes resized the matching areas in the Coronal and Sagittal views.



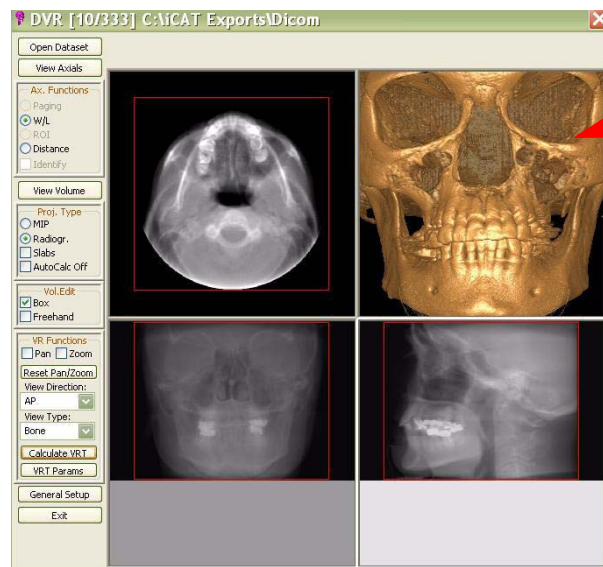
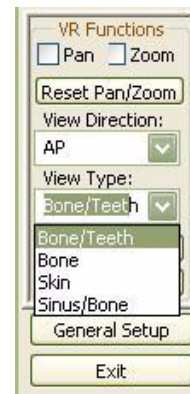
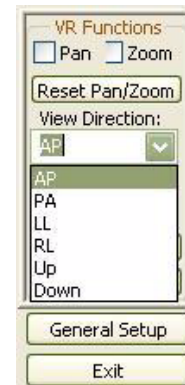
VR Functions

VR Functions (Volume Rendering) is a tool used for selecting the type of 3D image to create.

To Create a 3D Image:

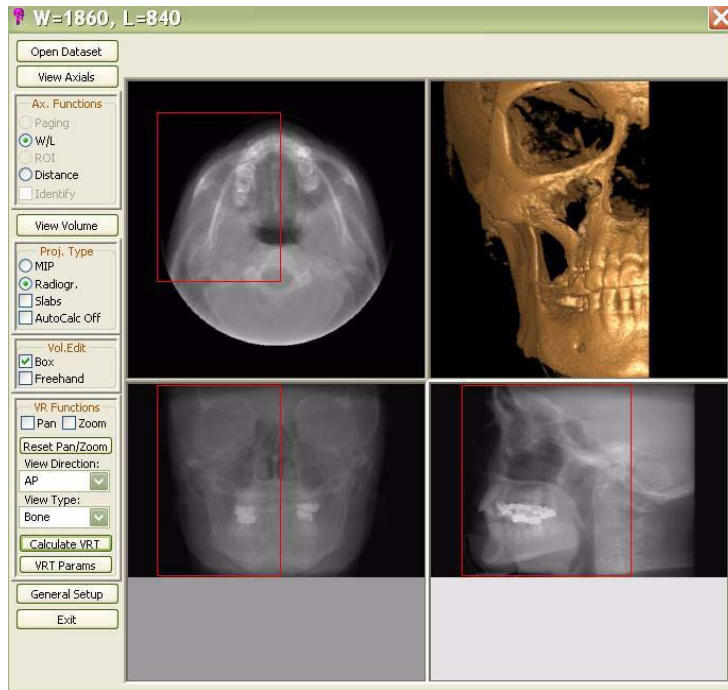
- From the first **View** drop-down menu select a direction to display. The choices are:
 - AP (Anterior Posterior)
 - PA (Posterior Anterior)
 - LL (Left Lateral)
 - RL (Right Lateral)
 - Up
 - Down
- From the second **View** drop-down menu select the type of display. The choices are:
 - Bone/Teeth
 - Bone
 - Skin
 - Sinus/Bone
- Click the **Calculate VRT** button.

This displays the 3D image (upper right box.)



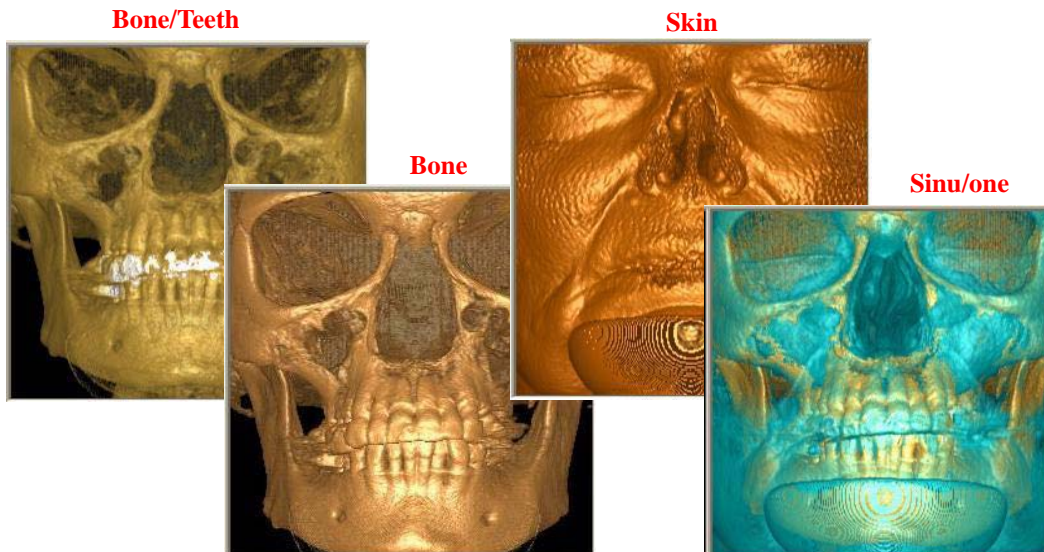
NOTE: Remember that the 3D data is calculated using the boxed or freehand selected areas of interest in the Axial, Coronal & Sagittal views. In this sample, the entire volume data is selected in all 3 views.

Below is a sample of a 3D image calculated from the selected volume area seen below.



In this sample, only a portion of the volume data is boxed, which is reflected in the 3D image

Sample of View Types



Each View Type has its own Parameters, which can be viewed by clicking the **VRT Params** button.

The 3D image can be rotated, enlarged or changed to another direction or type. These functions can be performed from the top right corner viewing area or you can choose to enlarge the 3D image to Full Screen (Right click on the 3D image and select **View Full Screen**).

PAN

Move the 3D image within the window by dragging cursor on image.

Zoom

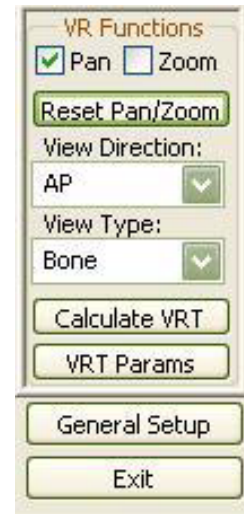
Zoom 3D image. Drag cursor on image.
UP to Zoom OUT / Down to Zoom IN.

Reset Pan/Zoom

Resets 3D image to original position and size.

Rotate 3D Image

To **Rotate** the 3D image, both the Pan and Zoom functions must be disabled (unchecked). Drag the cursor on the 3D image in the desired rotation direction.



Pop Up Menu

Pop Up Menu contains the same VR Functions and also some additional functions. To access the Pop Up Menu, right click the 3D image.

Save to JPG

Saves full color 3D image in current working folder (adds .jpg extension). The current working folder is the folder opened from the *Open Dataset*.

Save Grayscale to TIFF

Saves 3D image in current working folder (adds .tiff extension). The current working folder is the folder opened from the *Open Dataset*.

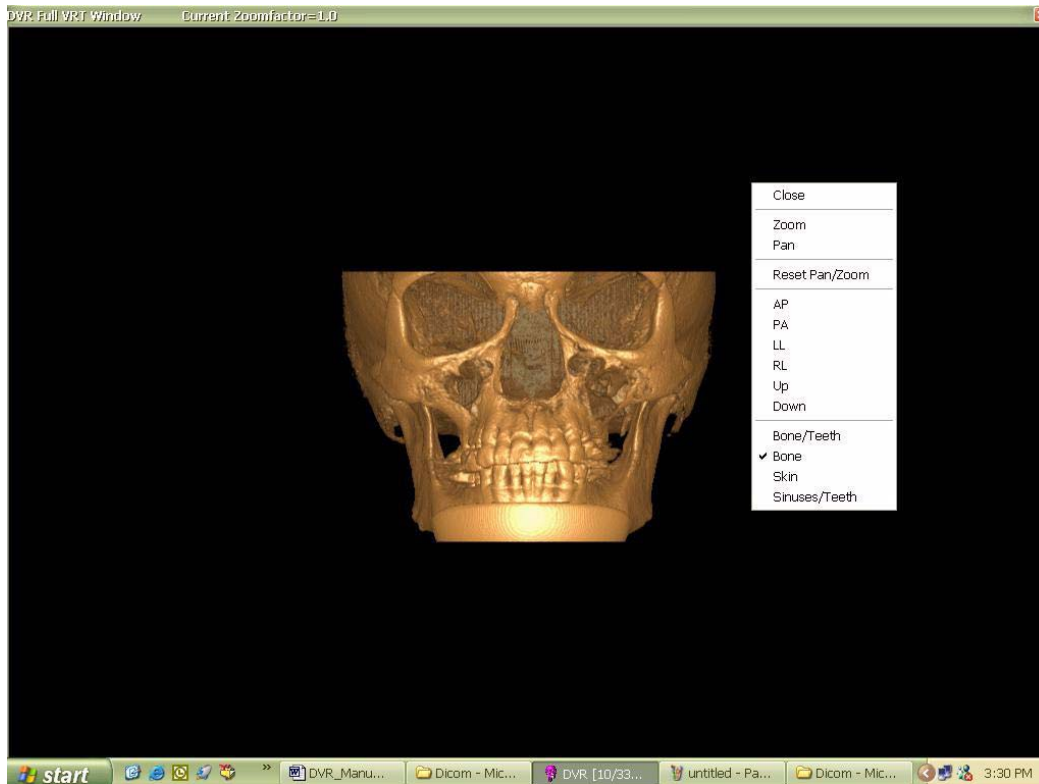
Open Working Folder

Opens the file structure where the JPG and TIFF picture files are saved. The current working folder can be changed.



View Full Screen

Full Screen displays the 3D image on the entire computer screen. All the same manipulation functions and 3D options are used in this display. Right click to display Pop Up menu to utilize functions.



To return to the original viewing format, press <Esc> or select Close from the popup menu.

To close the DVR software, click the **EXIT** button at the bottom of the Menu Bar