**CONTENTS: DVR Operator's Manual**

**DVR Operator's Manual (Beta v1.3.9)**
*(Revised Feb. 7, 2005)*

To open the DVR (Diagnostic Volume Rendering) program, double click on the DVR icon:


This will Open the Program Main menu:

## 1.1 Open Dataset

To get started, you must import a case. The case MUST be in Dicom format (If importing a case from iCAT, make sure to export the case from iCAT in *Dicom 3-Multi File* format). To open, click on the **Open Dataset** button. This will open a browse window where you must select the drive or folder in which the Dicom data for this case is saved.


Select the desired folder or drive and click OK. Then the case will automatically load (see sample on next page).


## 1.2 View Axials

Now that the Dataset has been opened, the first view to display is an *Axial* slice. You will notice that the **View Axials / Axial Functions** section of the Tool Bar is now Enabled. There are 5 tools under Axial Functions.

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

To scroll through each slice, first click on the Radio button next to **Paging** to enable.

Then, with the mouse sitting over the actual axial image, point, click and drag the mouse either UP or DOWN. When dragging up, the axial slices will scroll towards the top of the skull and when dragging down, the axial slices will scroll towards the bottom of the skull.

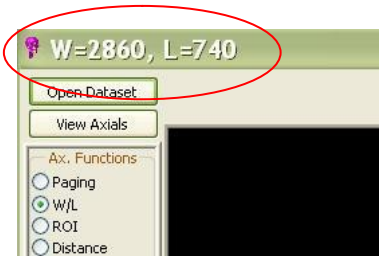
Just release the mouse at the desired axial slice to maintain that slice in the window.

1.2.2 W/L (Window/Level): Window / Level is the tool to adjust Grayscales (Brightness / Contrast).

To adjust the Window / Level, click on the Radio button next to **W/L** to enable.

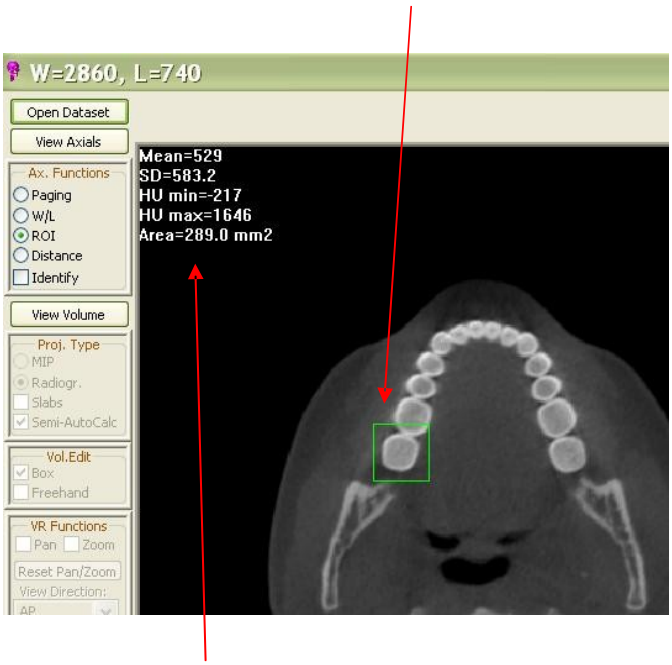

Next, point, click and drag the mouse Left to Right to adjust Window (contrast) and Up and Down to adjust Level (brightness).

When the desired Window / Level is achieved, just release the mouse. You will notice the Window / Level values at the top of the screen. These numbers will change every time the Window/Level is adjusted.




1.2.3 ROI: ROI (Region of Interest) is the tool used for determining Hounsfield Units. To activate this tool, click on the Radio button next to **ROI** to enable.

Now, point, click and drag the mouse to create a box around the area of interest (see below in green) in which you would like to determine the Hounsfield units. When you have achieved the desired area, double click to complete the box.

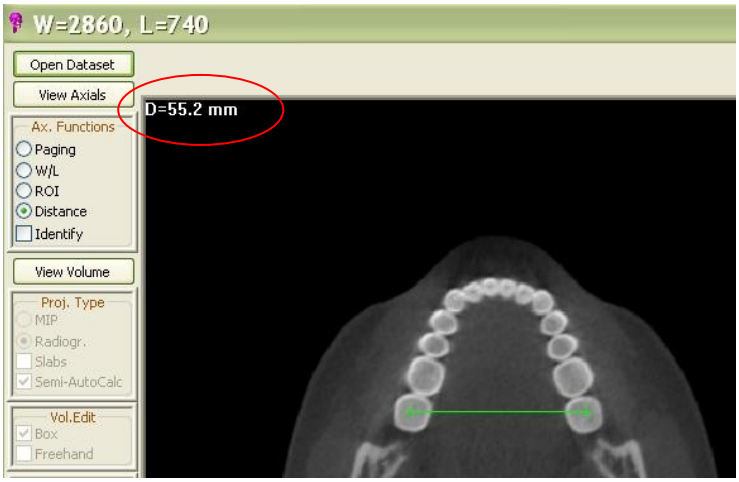



Then the calculated items will appear in the upper left hand corner of the Axial window. The displayed values are:

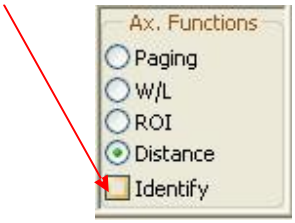
Mean
SD (Standard Deviation)
HU min (minimum Hounsfield units)
HU max (maximum Hounsfield units)
Area

1.2.4 Distance: the distance tool is used to measure a line distance. To activate this tool, click on the Radio button next to **Distance** to enable.

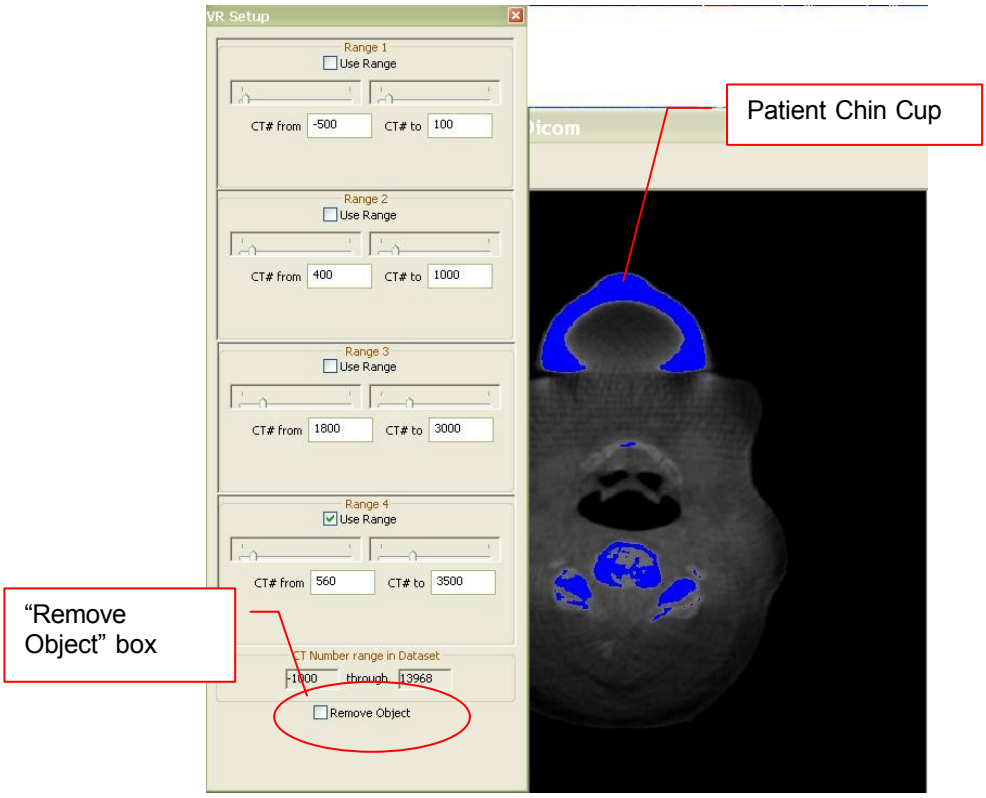
Next, point, click, drag the line, and release to create the line (see below in green). The line measurement will display in millimeters in the upper left hand corner of the axial window.




1.2.5 Identify: The identify tool is used to identify areas of interest at different densities. It is defaulted to detect the most dense anatomy or material. To activate the Identify tool, click on the box next to **Identify**.

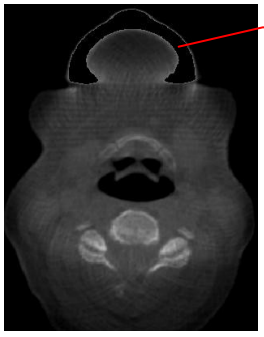



When this box is clicked, the Identify window, called **VR Setup**, will appear displaying ranges, and the dense material in the Axial slice will highlight in blue.




This tool is often used to Remove a desired piece of anatomy from the image. (One major use of this tool is to Remove the patient Chin cup that may show up in the scan. See the sample above. The chin cup is highlighted in blue).

**Remove Object:**
To Remove an object from the image, first click on the **Remove Object** box to enable (checkmark) at the bottom of the VR Setup window. Then, with the mouse, click on the object of interest highlighted in blue. Now close the VR Setup window by clicking on its "X" at the upper right hand corner or the window. Next, start scrolling through the Axial views and you will notice that the object is now removed from the image (it was white and now black).

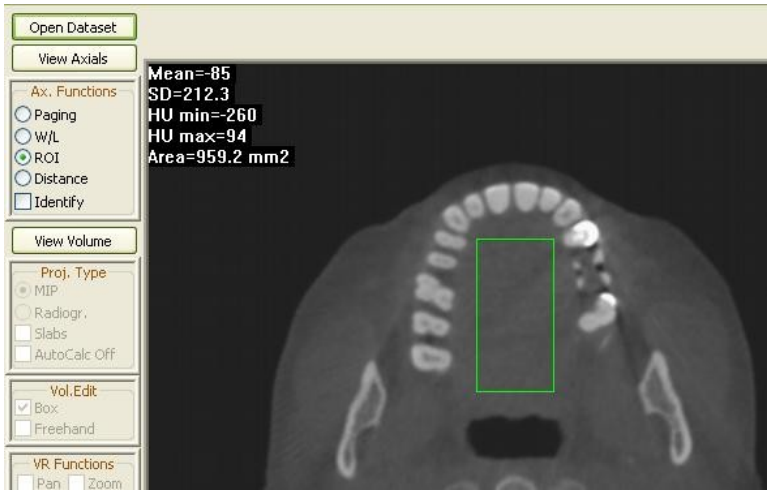



*Note:* please be aware that any adjoining anatomy or material will be removed also. This means that any adjoining material in other 3 dimensional views that might not be visible in the Axial view.

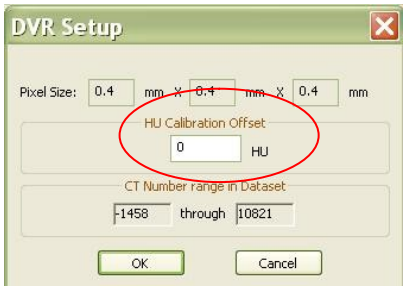
1.2.6 Hounsfield Unit Calibration Offset:

Before Proceeding to the Volume functions of the program, we want to first enter a calculated offset into the General Setup for Hounsfield Units. The value that is required is based on the RIO (Region of Interest) function.

- With the **Paging button enabled**, scroll to the tongue area in the axial view which is just above the maxillary crowns. (we are looking for a region that has relatively even grayscales).
- Once at this location, click on the **ROI** function and then point, click and drag the mouse in the area between the arch, trying not to include any teeth or bone. This will display the Hounsfield data.




- The **MEAN data** is the data of interest in this calculation. It will read 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.
- Now this offset value must be entered into the **General Setup**. At the bottom right menu bar, click on the button called General Setup. This will open the following window.

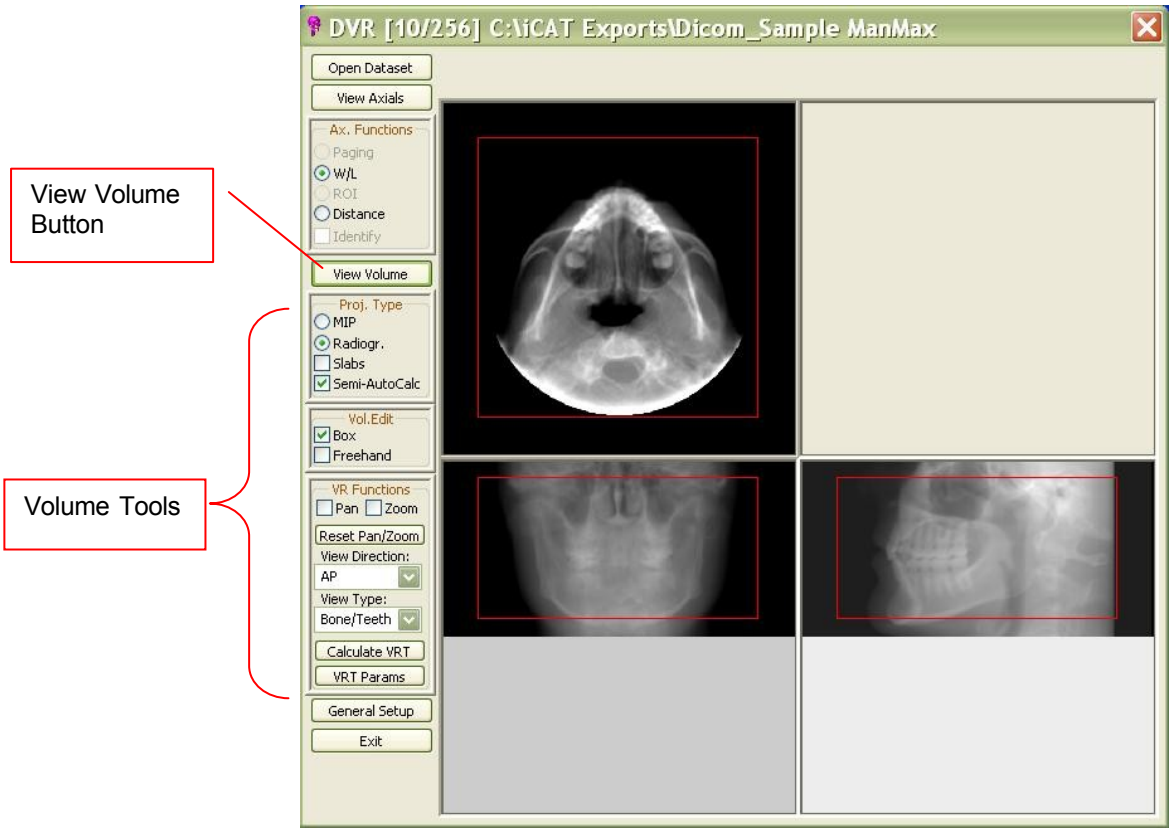



- Enter the Calculation offset into the **HU Calibration Offset Window**, which currently has a value of 0. Then click OK.
- We can now proceed with the creation of the 3D image.

## 1.3 View Volume

The View Volume section allows us to view all 3 views of the 3D data, Axial, Coronal and Sagittal, as well as to create the Volume Renderings.

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



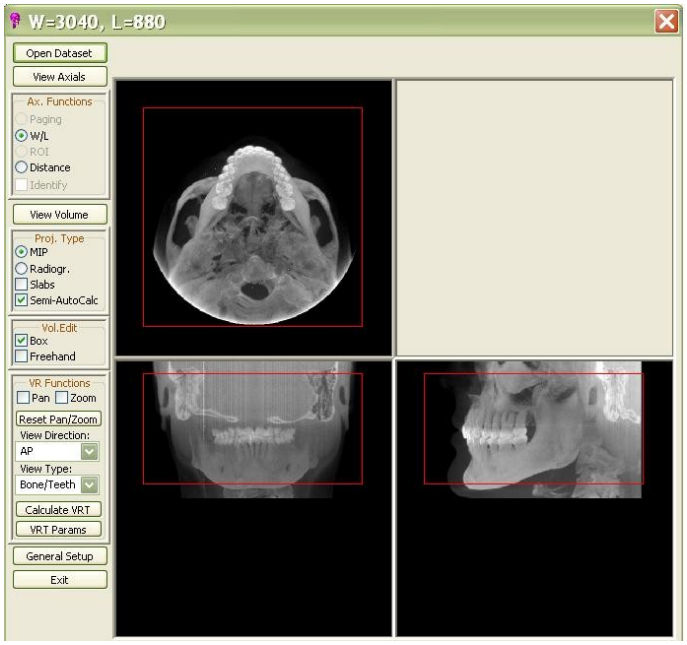

1.3.1 Projection Type: Projection Type allows for viewing the 3D data in 2 different projections or modes; Radiographic and MIP.

To view in *Radiographic Mode*, click the Radio button next to **Radiogr.** to enable.


The above example has Radiographic enabled. This means the Axial, Coronal and Sagittal views are all in Radiographic mode. Please note that at this point, you can adjust the Window/Level in each of these 3 views by point, click and dragging the mouse in each window.

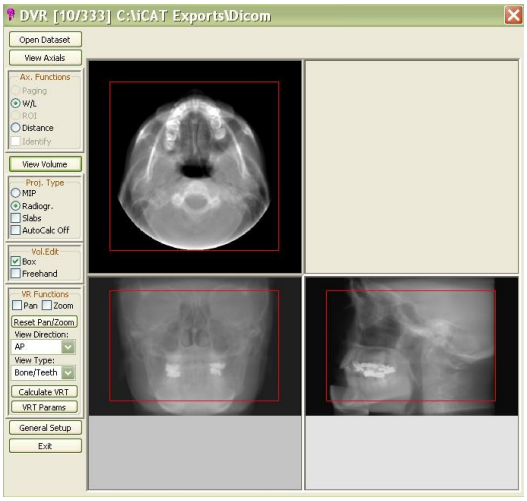
To view in *MIP mode*, click the Radio button next to **MIP** to enable.


When MIP is selected, the views will display as seen below.



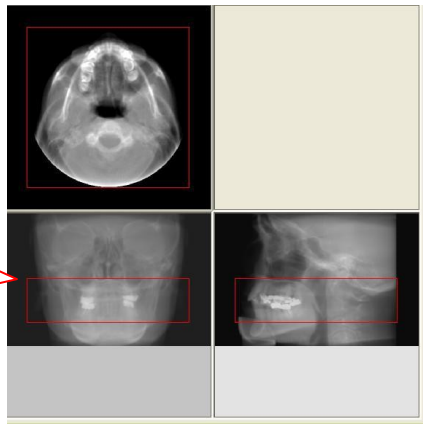
1.3.2 Volume Edit: Volume Editing is to select the area of interest in the volume data that you would like to view in 3D format. There are 2 methods for editing the volume, Box and Freehand. Whatever area is boxed in or drawn via freehand will then be used in creating the 3D image.


**Box:** If the Box option is selected, then each of the 3 views will display with a red box around the data.



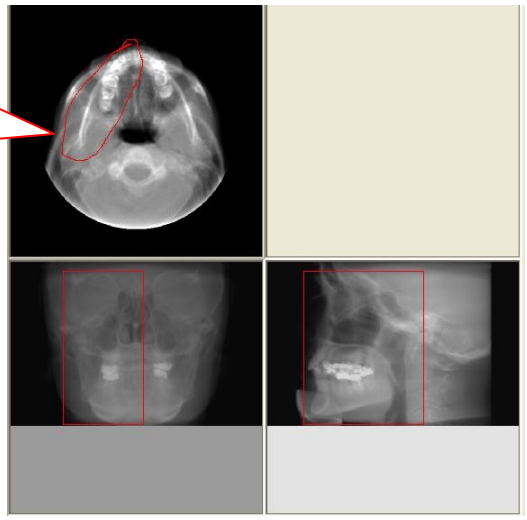

Each of these boxes can be resized to select different areas of interest. Resize the red box by point, clicking and dragging the sides of the box in a desired view. Resize from (see below). The new area of interest will be the data used to create the 3D image.

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 automatically resized the matching area in the Sagittal view.



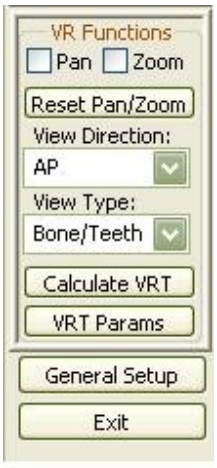
**Freehand:** If the Freehand option is selected, you can point click and drag the mouse around an area of interest in the Axial view (see below). Notice how this will select a new area in the Coronal and Sagittal views. Again, this will be the data used to calculate the 3D image.

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 automatically resized the matching areas in the Coronal and Sagittal views.



Once the area of interest has been determined, the 3D image can now be displayed by utilizing the VR Function tools.

1.3.3 VR Functions: The VR (Volume Rendering) Functions give us the tools for selecting the type of 3D image desired and creating the 3D image.




First, you will want to select the View Direction from the list and then the View Type from the list. Once these are selected, clicking on the Calculate VRT button will create the 3D image.

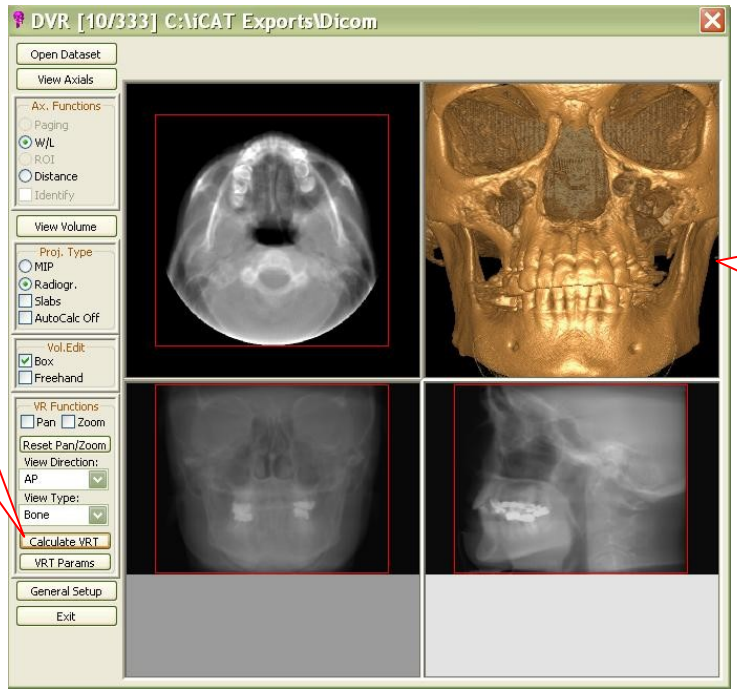
**View Direction:** click on the arrow button down next to View direction to display the choices for *Direction*. They are AP (Anterior Posterior), PA (Posterior Anterior), LL (Left Lateral), RL (Right Lateral), Up, Down.


**View Type:** next click on the arrow button down next to View Type to display the choices for *Type*. They are Bone/Teeth, Bone, Skin, Sinus/Bone.

**Calculate VRT:** Once the desired Direction and Type are selected, click on the Calculate VRT button. This will display the 3D image in the upper right viewing box.

Once View Direction and Type are selected, click on the **Calculate VRT** button.

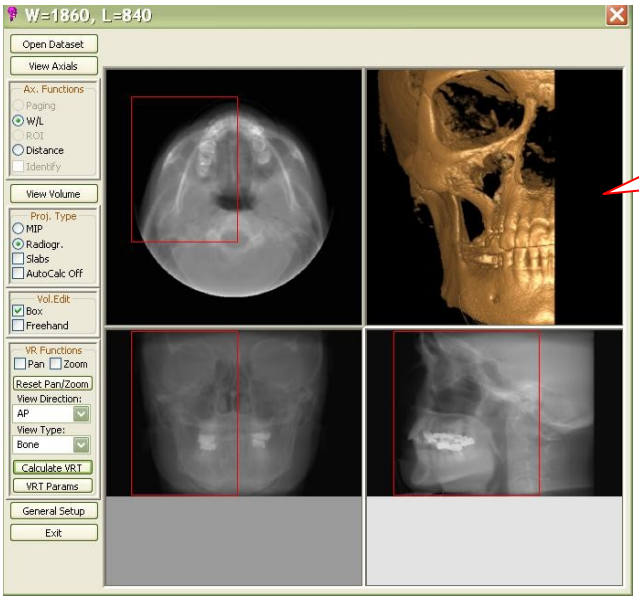
This sample selected the Direction as AP and the Type as Bone.




Once the Calculate VRT button is clicked, the 3D image will display in this viewing box.

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

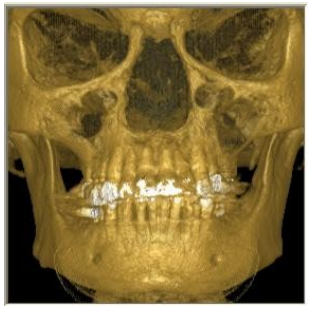
Below is a sample of an 3D image calculated from the selected volume area seen below.




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

Sample 3D options (View Types):

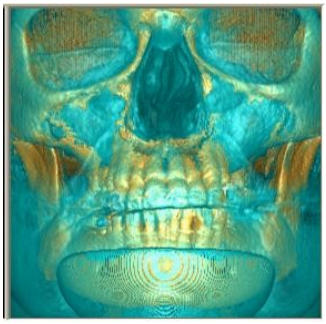
Bone / Teeth:



Bone:

Skin:

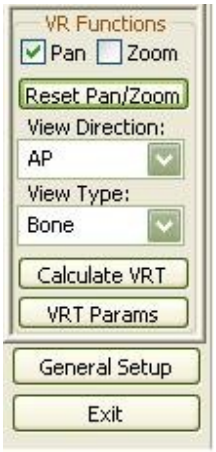
Sinus/Bone:



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

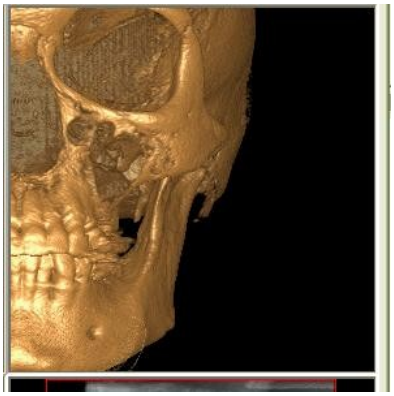
Now that the 3D image is created, the image can be rotated, enlarged or changed to another direction or type. These functions can be performed from the top right corner viewing area or you can choose to enlarge the 3D image to Full Screen (Right click on the 3D image and select View Full Screen. See section 1.3.4 for more details on View Full Screen).

PAN: To **Move the 3D image** within the window, click on the **PAN** box to enable this function.

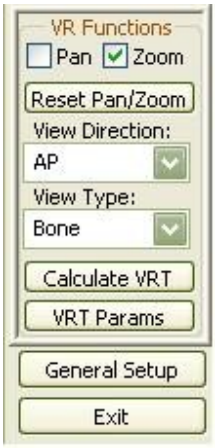



Then point, click and drag the mouse over the 3D image to move it.

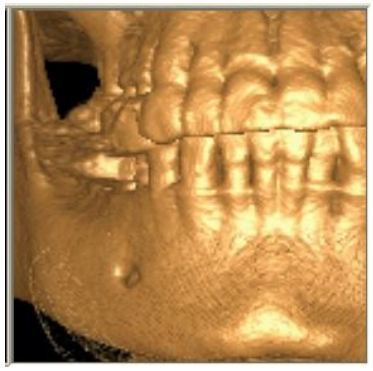
This image was moved from the center of the window to the left side of the window.



Zoom: The **Zoom the image in or out**, click on the **Zoom** button from the VR functions to enable.



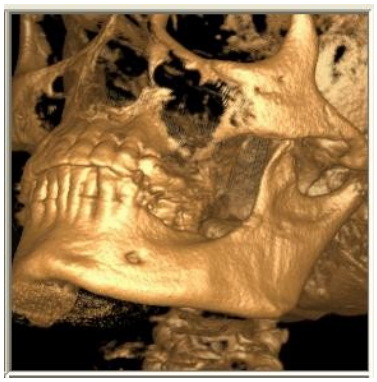

To Zoom the 3D image In **(make larger)**, point click and drag the mouse Down.
To Zoom Out **(make smaller)**, point click and drag the mouse Up.



This sample 3D image was Zoomed In.

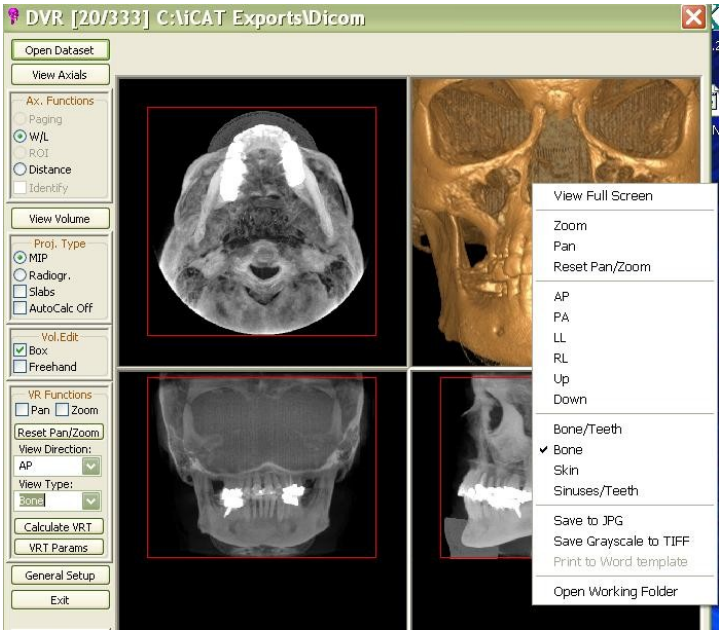
To Re-set the image to its original position and size click on the **Reset Pan/Zoom** button.

Rotate: To **Rotate** the 3D image, both the Pan and Zoom functions need to be disabled (no check marks in the boxes). This leaves the mouse free to rotate the image by point, clicking and dragging the mouse over the 3D image. If you point click and drag to the right, the image will rotate to the right, etc.



This sample 3D image was rotated to the Left and Up.

**Pop Up Menu:**
The Pop Up Menu contains the same items Under VR Functions as well as some additional functions. To access the Pop Up Menu, right click on the 3D image.



Saving 3D images: To save a 3D image currently being viewed on screen, access the Pop Up Menu by right clicking on the 3D image. There are 2 options for saving images:

- Save to JPG
- Save Grayscale to TIFF

To save the 3D image in full color, select the item called **Save to JPG**.


This will automatically save the file to the current working folder (The file names itself with an extension of .jpg). The current working folder is the folder that you opened the dataset from.

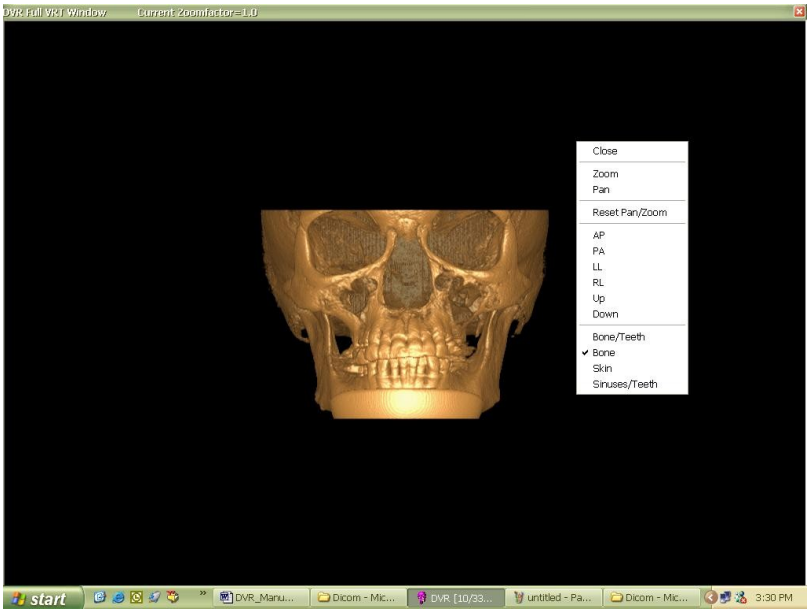
To save the image as just Grayscales, select **Save Grayscale to TIFF**. Again, the file names itself with an extension of .tiff and will save to the current working folder.

To view the Current working folder, select the **Open Working Folder** item from the Pop Up Menu. This will open the file structure. You will notice a file that is the JPG picture file just saved. If you want to change this current working folder you can do so.

### 1.3.4 View Full Screen

If you choose to view the 3D image on the entire computer screen, then Right click over the 3D image to display the Pop Up Menu. Select **View Full Screen**.

Full Screen View will display the 3D image on the entire computer screen. All the same manipulation functions and 3D options can be used in this display format, just Right click again to display the Pop Up menu to utilize all the functions.




To return to the original viewing format, right click to access the Pop Up Menu and select **Close**.

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