

Program Basics – Digital Image Files

General Information

Digital Imaging Files are available in several different [formats](#).

Tiops4 is able to use [.jpg](#), [.bmp](#) and [DICOM](#) files.

In addition to the image data these files also contain a header. If the image files have been correctly formatted the file carries information about the following:

- Image **Size** indicated in [Pixels](#) (##### x #####).
- Image [Resolution](#) indicated in Pixels/Measurement Units (inches or cm)

The resolution in Tiops4 is in Pixels per Inch (PPI)

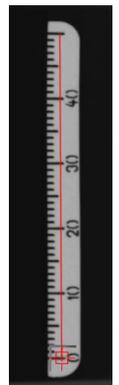
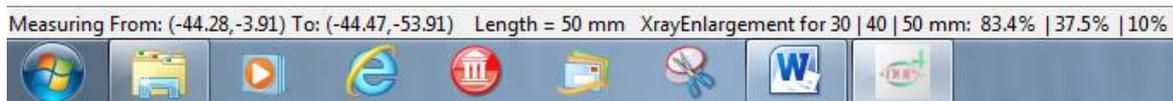
If the resolution of the image is known the physical size of the image can be calculated in the horizontal and vertical aspect as follows:

$$\text{Print Size} = \text{Image Size} / \text{Resolution}$$

On the other hand, if the print size is known (scan size), normally indicated in the specifications of the Xray equipment, the resolution can be calculated as:

$$\text{Resolution} = \text{Image Size} / \text{Print Size}$$

Note: None of the above issues are associated with the **Xray Enlargement Factor**. Typically you can find information about Xray enlargement in the equipment specifications. In some of the newer Xray equipment a ruler, located according to the midline of the subjects face, has been included. This makes it possible, if the picture resolution is known, by using the **MeasureLength** function in Tiops4, to calculate the Xray enlargement factor:



In order to get precise measurement values it is important to know both the Resolution and the Enlargement of the image.

The Tiops4 program can interpret the common headers for .jpg files (JFIF) and EXIF) and .bmp files (DIP) adhere to the rules and frequently information about the resolution is missing in the header or the values are incorrect.

It is important to know that in all digital cameras that routinely store the images in .jpg format the convention is a Resolution of 72 for all images. This means that if you record high resolution images the better quality will be indicated in terms of Image size. This may seem logical as in nature photography, for instance, where it is difficult to determine the actual size of the object.

Under normal circumstances the images have square pixels, however, imaging processing programs often use the concept of Pixel Aspect Ratio (**PAR**) and in that case the Header contains information as to the vertical and horizontal Resolution. The Normal value for PAR=1. In case an image has a PAR value different from 1, and if attention is not paid to this difference, the image will appear distorted. As an example the horizontal dimension may be increased too much.

A dedicated Regimen called **Calibrate** and an associated variable file may ease the task of analyzing these intricate problems.

The Tiops4 Image Files

To perform an analysis of a digital Xray, it must be available as either a .jpg or .bmp image file. All digital Xray systems are capable of exporting images in either format.

Tiops4 has some built in possibilities for adjustment of the image. You can adjust brightness and contrast by using the Tiops4 **Xray Filters**.

You can also make adjustments by using the digital X-ray program that came with the digital x-ray equipment to make more elaborated corrections of specific features and then export the improved image in either jpg or .bmp format.

Imaging programs such as Photoshop™ can also be used to create and improve an image if you are scanning a conventional headfilm.

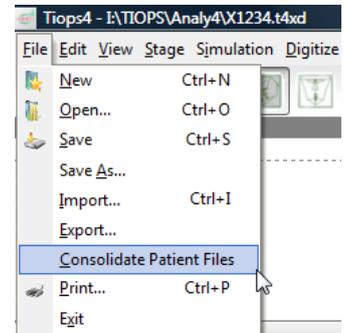
Lateral	
Date	10-01-08
Xray	
Filename	I:\TIOPS\Analy4\Xray\X123
Mirror	False
ResolutionX	204
ResolutionY	204
Enlargement	5.6
Filters	
Invert	False
Brightness	-32
Contrast	40
SharpenPercent	0

All image files of a patient should be stored in the Xray subfolder depending upon the pathways defined under Environment Options/Data in the ...Analy4 directory where they can be accessed by the program.

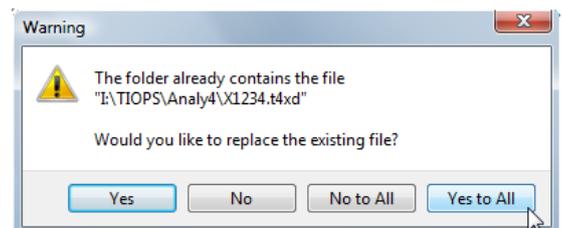
Consolidate Patient Files

In Tiops4 it is simple to create the folders needed to contain the X-Ray images and place the images accordingly for each patient. The image files can be brought together from wherever they may be located and copied by choosing the function File/Consolidate Patient Files or pressing the icon 

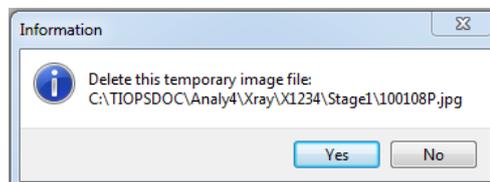
This automatically generates image folders depending upon the pathways defined under Environment Options/Data. The images will then automatically be copied to this new folder and the correct pathway incorporated in the file so they can be retrieved again. In addition to this folder each patients file will be saved as a .t4xd file: When the procedure is completed, this message will be displayed:



When using this procedure repeatedly for a particular patient analysis, this message will be displayed. The best response to this dialog is to select **YesToAll** button.

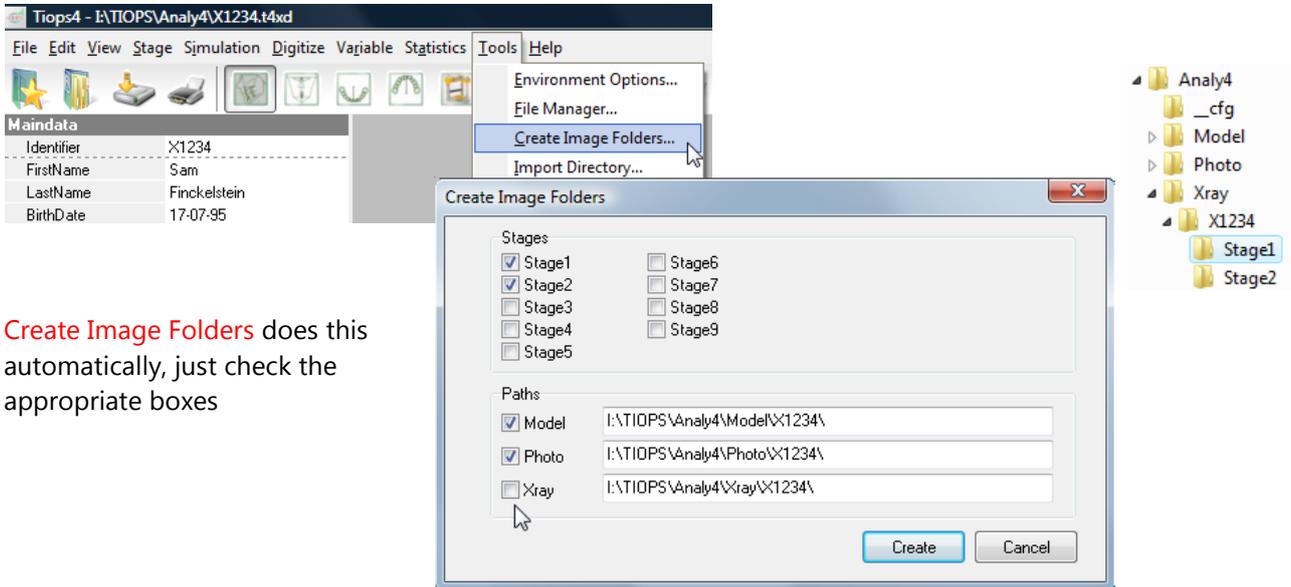


The Consolidate procedure is terminated by clicking **Yes** which will delete the temporary X-Ray file.



Create Image Folders

The Consolidate procedure can also be performed semiautomatically. If you have several Xrays of the same patient as well as images of the study casts and photos, you may find it more convenient to make sub folders for organizing your image files of the individual patient.



Create Image Folders does this automatically, just check the appropriate boxes