# SIAMETRICS™

User Guide

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1. Installing SIAMETRICS

Place the SIAMETRICS installation CD into a CD drive on the computer.

☞ **Note**

> If the CD does not run automatically navigate to My Computer and **Double Click** on the CD icon.

The first screen to be displayed is the **Select Setup Language**. Select from the list the language to be displayed for the set up then **Left Click** on the **OK** button.
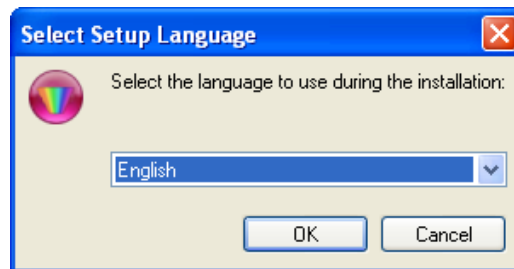
On the next screen either **Left Click** on **Next** button to continue or **Cancel** to exit the setup.
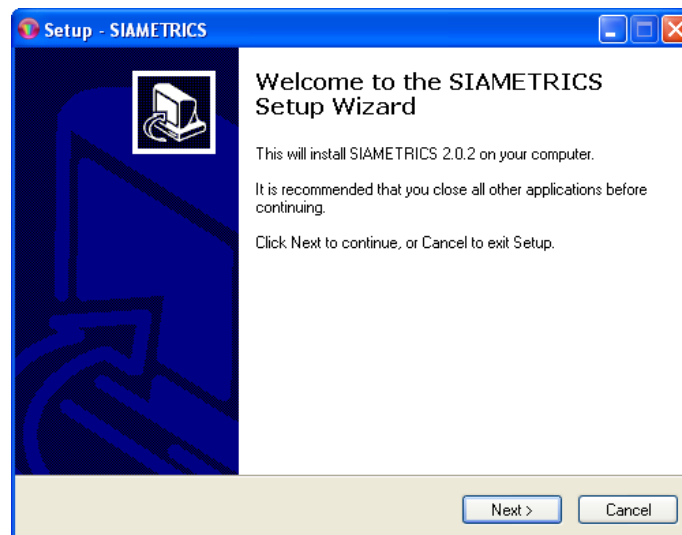
Please read the license agreement. To accept the license agreement **Left Click** on the **I accept the agreement** button and then to continue with the installation **Left Click** on the **Next** button.
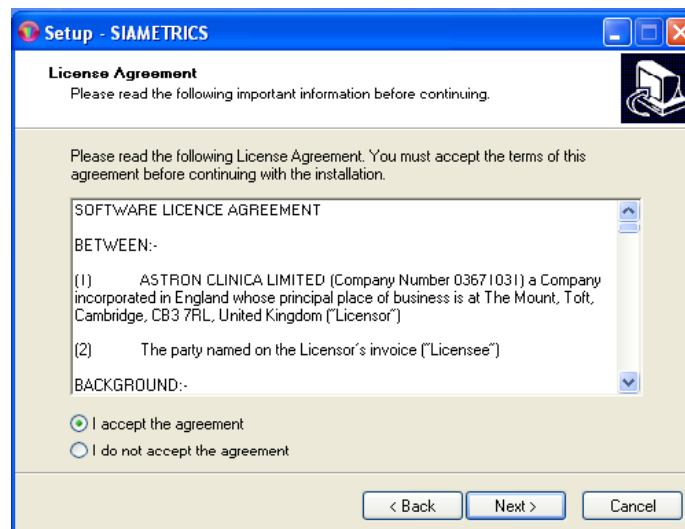
The next screen shows the default destination location for the installation. Unless you are an experienced user please accept the default setting and **Left Click** on the **Next** button.

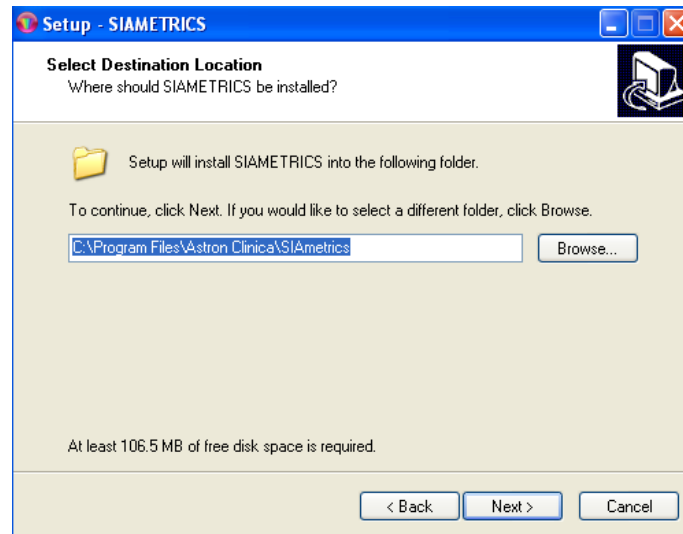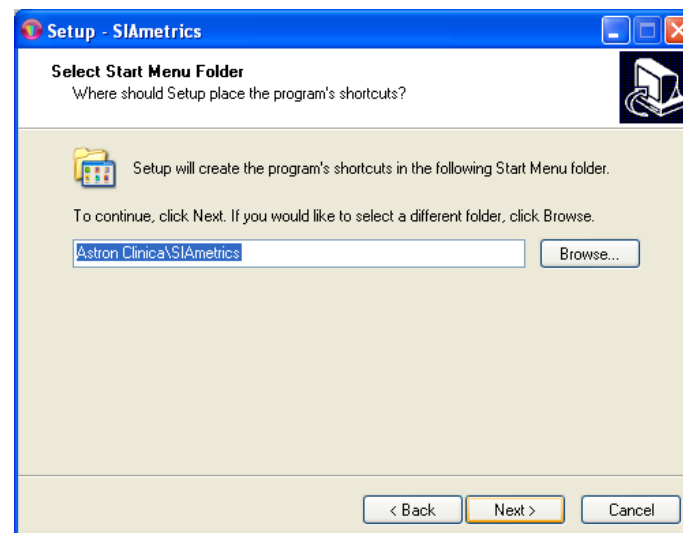The next screen shows the default destination location for the start menu shortcut. Unless you are an experienced user please accept the default setting and **Left Click** on the **Next** button.

When you **Left Click** on the **Next** button, a setup window will be shown that explains the need to determine your operating system. This is required because different setup files are required for different operating systems. **Left Click** on the **OK** button to continue.

☞   **Note**

There will be a short delay to allow for relevant files to be copied. Please wait for this step to complete.
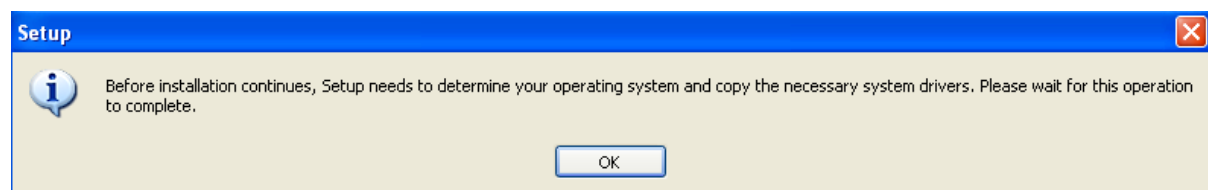
The next screen is a summary of the settings chosen. Please **Left Click** on the **Install** button to continue.
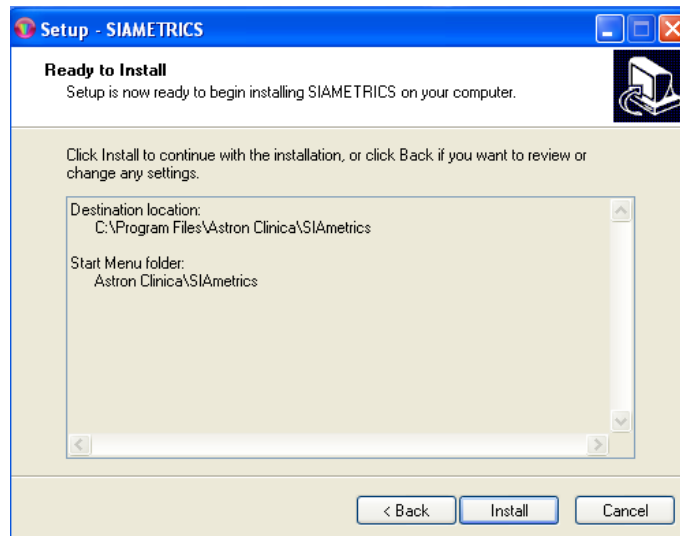
SIAMETRICS will begin to install itself on your computer. The progress bar will indicate the progress made.
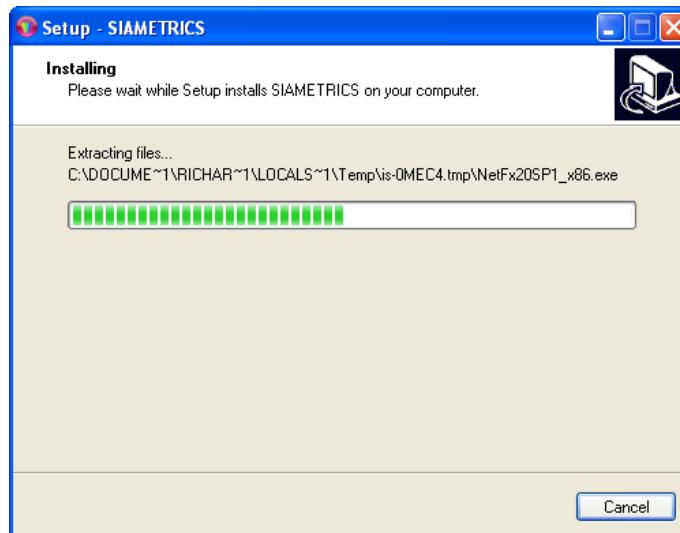
The next screen is to install the drivers for the license key. **Left Click** on the **Next** button.
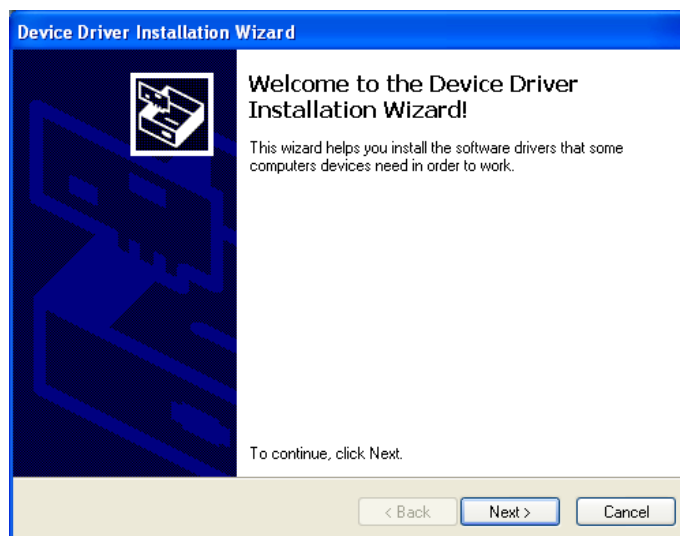
The drivers will be installed for the license key.
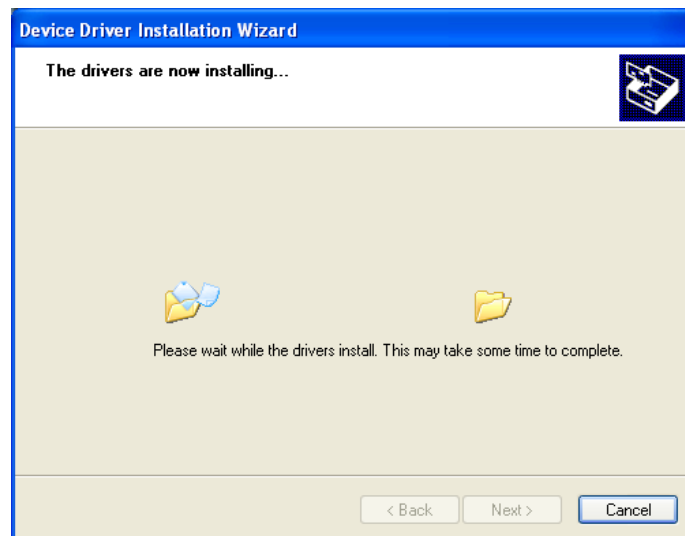
When complete please **Left Click** on the **Finish** button.

The next screen is to install the drivers for the handset. **Left Click** on the **Next** button.
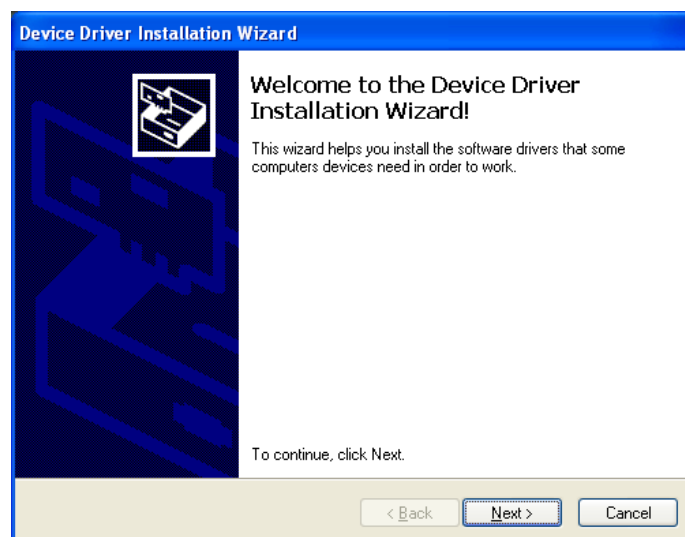
The drivers will be installed for the handset.
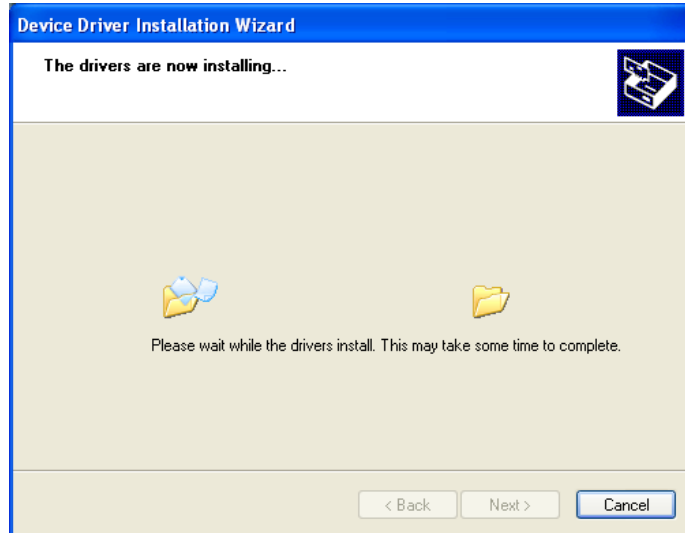
When complete please **Left Click** on the **Finish** button.

The installation is now complete. Please **Left Click** on the **Finish** button to exit the setup.
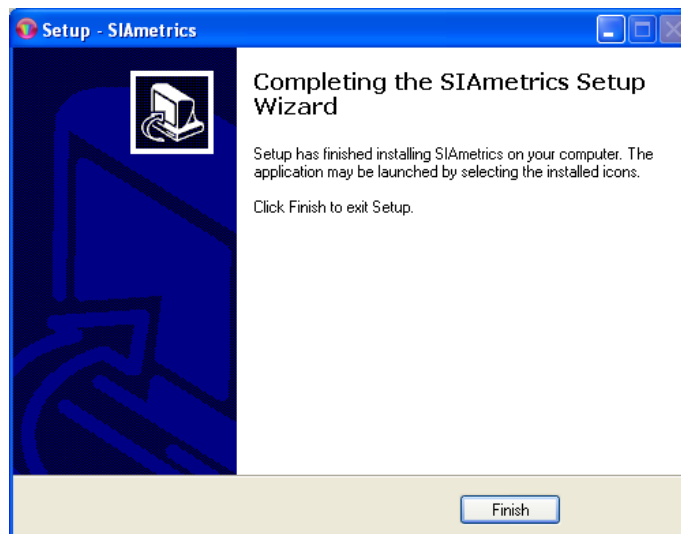
2. Connecting SIAscope and license key

2.1. Connecting the license Key

Remove the cap from the license key and then put the license key into a spare USB port on the computer.

The end of the license key will light up green to indicate it is connected. A message will be displayed in the bottom right hand corner of the screen to indicate that the key has been successfully installed.

2.2. Connecting the SIAscope

Plug the USB 2.0 cable into the SIAscope and into an available USB 2.0 port on your computer

Connect this end of the cable to the SIAscopeV.

Connect this end of the cable to the computer.
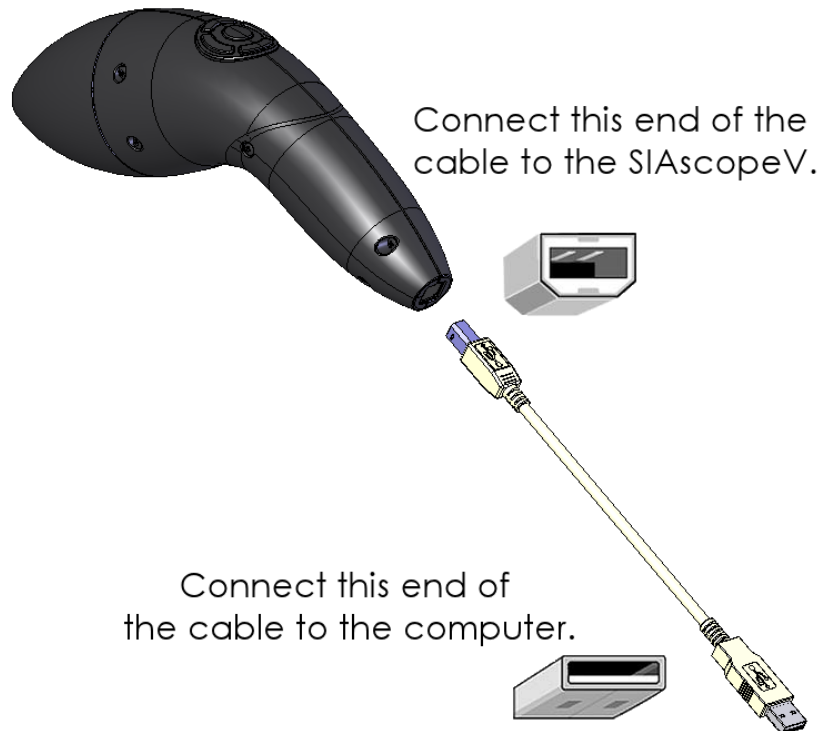
The button on top of the handset will be illuminated blue to indicate the handset is connected and has power.

The new hardware wizard will be displayed on the computer screen.

Left Click on the button **Yes, this time only** and **Left Click** on the **Next** button.
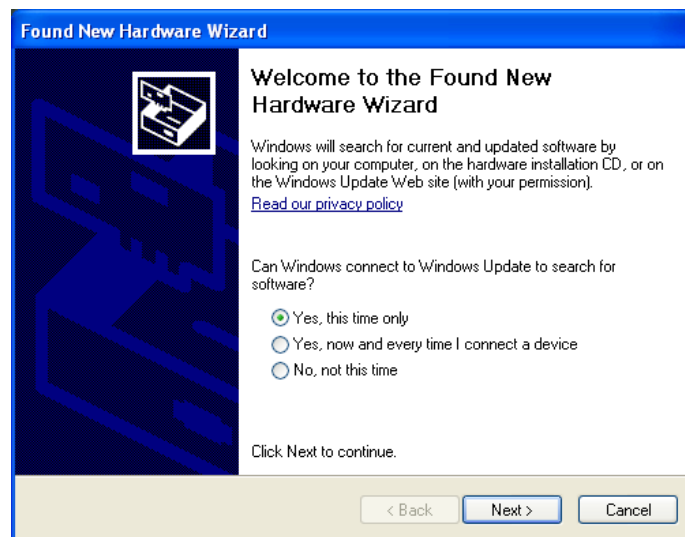
On the next screen **Left Click** on the button **Install the software automatically (Recommended)** and **Left Click** on the **Next** button.
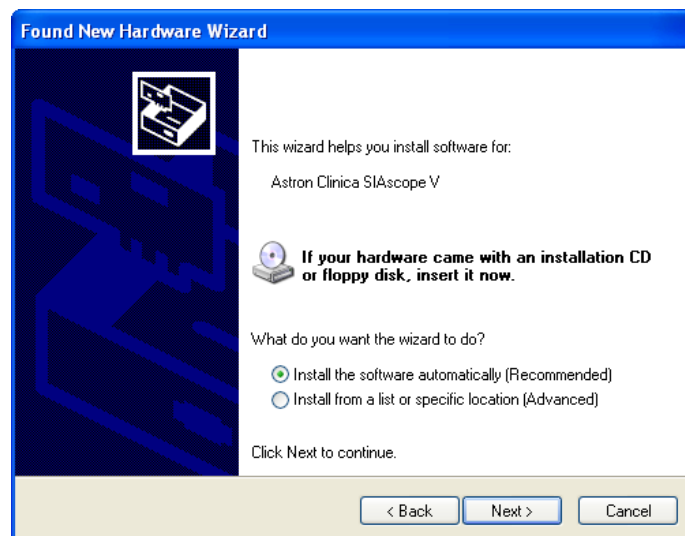
The wizard will now automatically look for the best driver for the SIAscope.
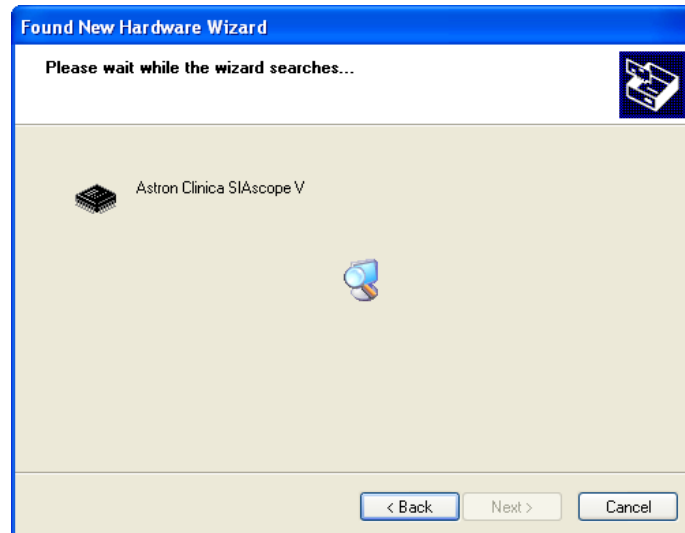
If you are presented with the wizard window shown below please **Left Click** on the SIAscope V description and **Left Click** on the **Next**
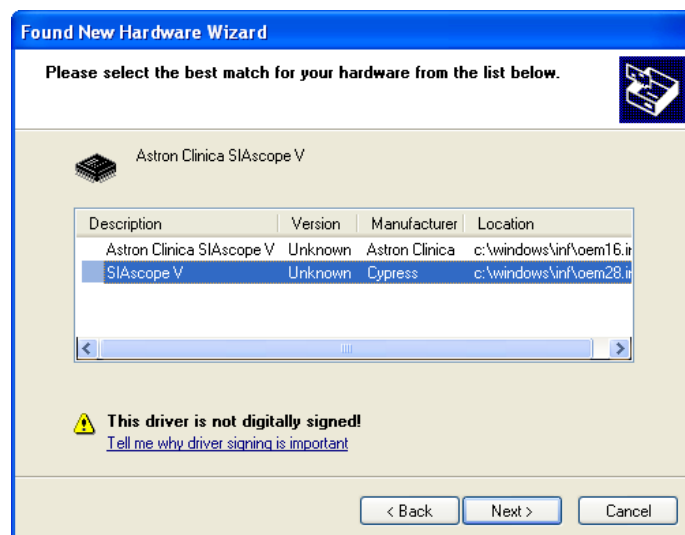
When the **Hardware Installation** window is displayed for the SIAscope V, **Left Click Continue Anyway** to proceed.

The installation will continue and the progess bar will indicate the progress made.

When the wizard has finished **Left Click** on the **Finish** button.

The handset is installed. The final step is to load the calibration data for the SIAscope V - please refer to **section 4. Starting SIAMETRICS and loading calibration data**.

3. Loading calibration data

To load the SIAscope calibration data you will need to to start the SIAMETRICS software. Do this by **Double Clicking** on the SIAMETRICS desktop icon located on the computer screen.

SIAMETRICS desktop Icon

After a few seconds the SIAMETRICS Start Screen will be displayed.
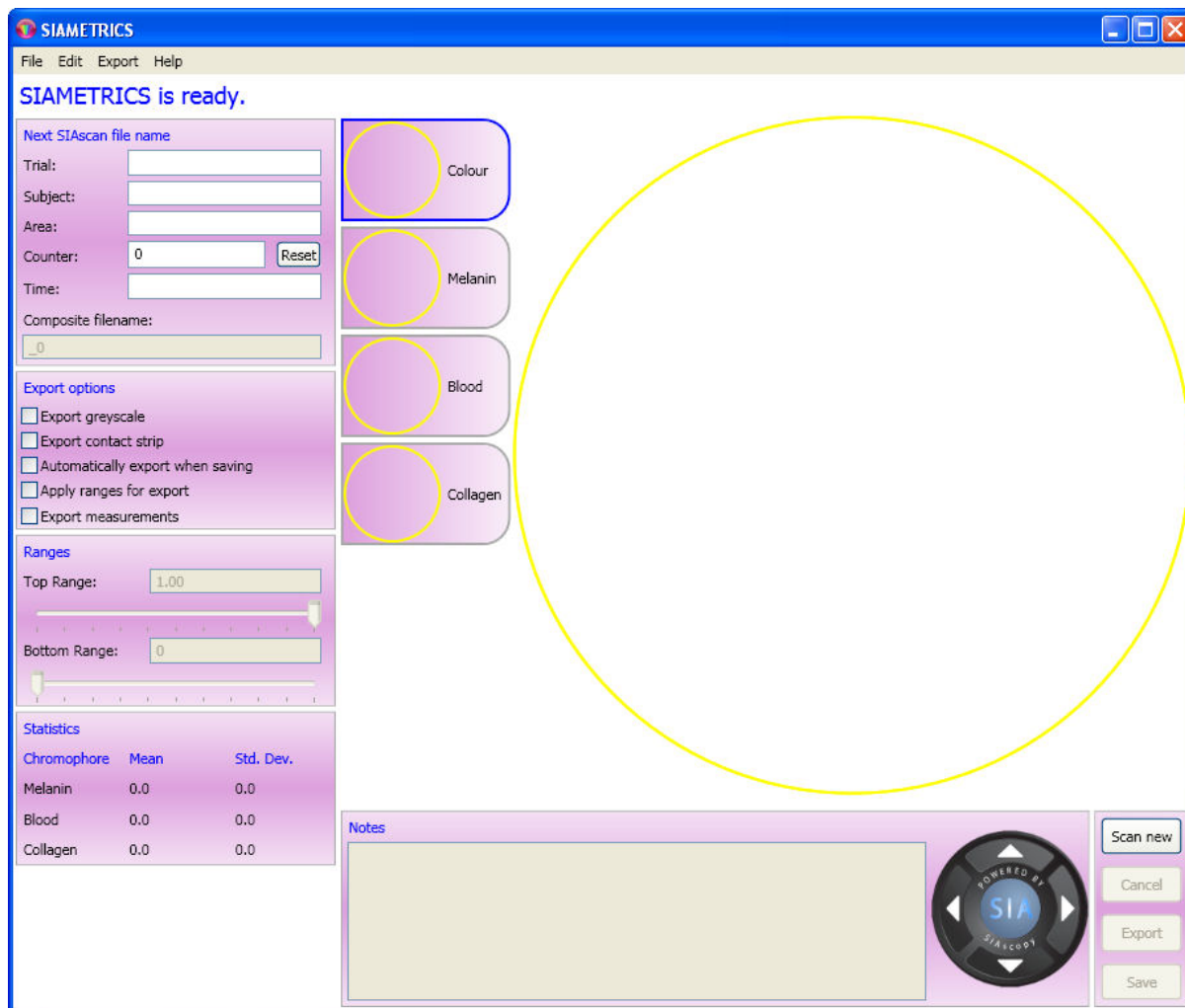
SIAMETRICS Start Screen

ⓐ Note

If this is the first time you have used the software you will have to load the calibration data for the handset. Once this has been done once it will not need to be repeated unless a new handset is connected to the software.

To load calibration data for your SIAscope place the calibration CD supplied with your SIAscope into your computers CD drive. Next **Left Click** on the **File** menu item and select **Import SIAscope Calibration** from the menu items.
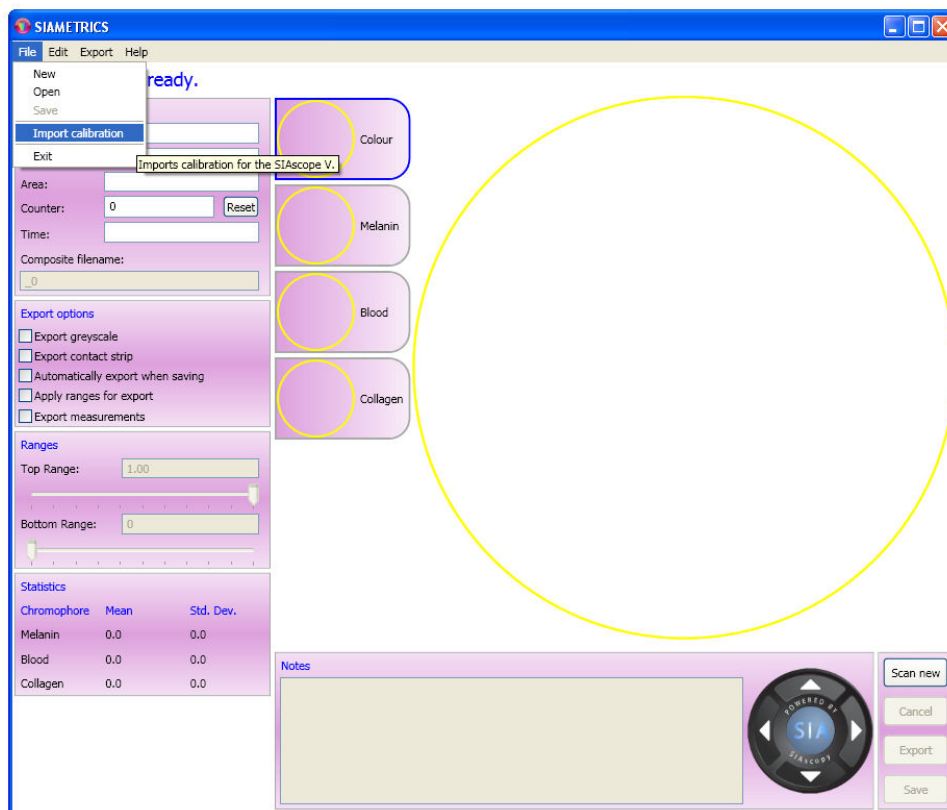
Now use the **Browse for Folder** dialog to locate the calibration data for your SIAscope. Once located simply select the calibration folder for your SIAscope and **Left Click** on **Open**. **Left Click** on the calibration.xml file inside and then **Left Click** on **Open**.

When the calibration data has been imported the message on screen will display **Importing calibration Done**.

The SIAscope has been set up and you can begin to capture SIAscans. It is recommended that you read the section How to capture a good SIAscan

4. How to capture a good SIAscan

The process of scan acquisition begins with the application of matching fluid to the clean scan area. Matching fluid is required to prevent the reflectance of light by the stratum corneum. Especially infrared light used for the measurement of collagen is reflected by the stratum corneum. This is of great importance as the measurements of haemoglobin and melanin depend on the correct measurement of collagen which effectively acts as a baseline for the other two measurements.

Useful matching fluids are: the 20% ethanol in water solution provided with the SIAscope V, distilled water or clear oils used for dermoscopy. However, the use of oil can be troublesome as the skin becomes very slippery which makes it hard to keep the SIAscope in position during the scanning process.

After the matching fluid is applied the SIAscope is placed onto the skin and the SIAscope is moved gently in a circular motion to spread the matching fluid and release any air bubbles in the matching fluid which would lead to pockets of incorrectly measured collagen. See image 2 below.

Scanning is initiated by pressing the SIA button on the SIAscope. During the scanning process light of different wavelengths is shone into the skin sequentially and the reflectance is captured sequentially by the camera inside the SIAscope. The whole process takes about 4 seconds.

During this period is of utmost importance to hold the SIAscope as still as possible. The camera will capture 4 individual images of haemoglobin, melanin, collagen and a colour photograph. Only if the images are aligned properly, i.e. only if the camera was allowed to take 4 images of the exact same area, will the scan result in useful images and hence accurate measurements of melanin, haemoglobin and collagen concentrations (see Figures 1-4).

The new user of the SIAscope is advised to practice holding the SIAscope in a position which is comfortable and allows the user to press the button to activate the scanning process without causing sliding or movement of the SIAscope.

A further point which requires special mention is the pressure which is applied by the instrument on the skin during scanning. The SIAscope V is required to be in contact with the skin to assure the exact path length of the reflected light is captured by the camera within the SIAscope. This is only assured if the SIAscope is in direct contact with the skin. However if too much pressure is applied during the scanning process the superficial vascularity which is responsible for the haemoglobin measurement will be cut off, leading to blanching of the skin (Figure 5). The correct pressure to be applied is a compromise between too much pressure which causes blanching and too little pressure which would result in the SIAscope not being in contact with the skin which allows air bubbles to creep into the matching fluid.

Holding the SIAscope steady and applying consistent pressure may sound difficult. However after the user has familiarised himself with the SIAscope and after some practicing, very good reproducibility can be achieved with variance in the region of #2.5% for melanin and collagen and #5% for haemoglobin measurements.

Consistency is not only the key to reproducible measurements with regards to pressure, but also all other parameters such as room temperature etc. Of particular importance are also the lighting conditions, as SIAscopy is based on the measurement of light. Collagen measurements in particular are sensitive towards light conditions with infrared light penetrating window glass. For consistency of lighting and exclusion of outside interference it is therefore advised to scan using artificial light in a room with blacked out windows.

4.1. Scan Examples
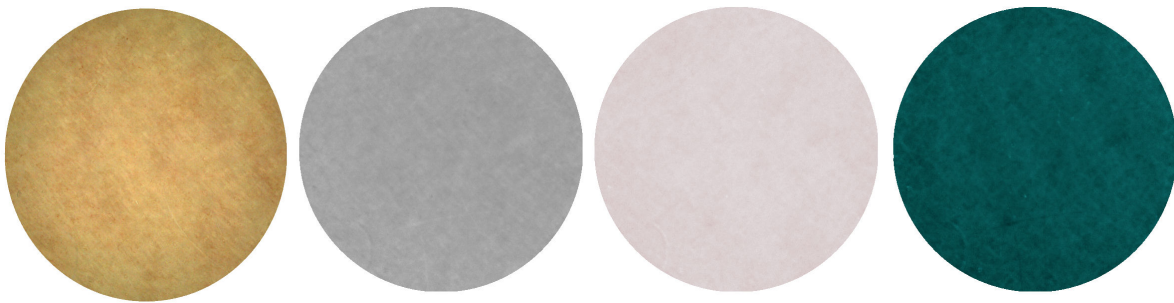
Figure 1

Figure1: These images show from left to right the high resolution colour photograph, the melanin image, haemoglobin image and collagen image. Noteworthy is the smoothness of all images which show almost no features. This is what a good scan of unblemished skin should look like.
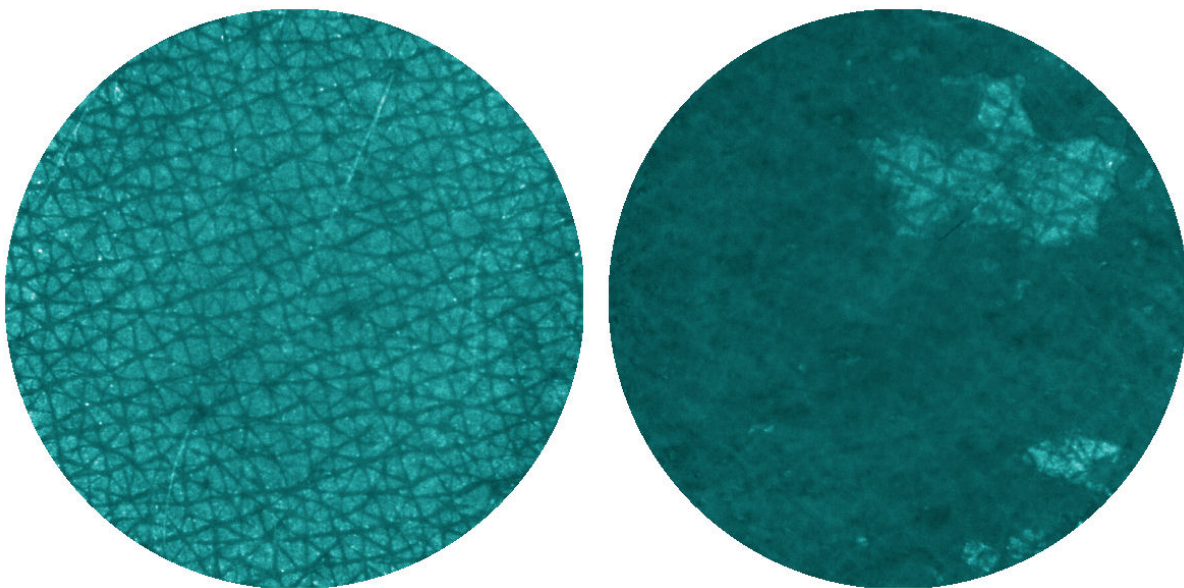
Figure 2

Figure 2: These scans show collagen images which highlight problems. The left image results from scanning using no matching fluid. As explained above this results in the reflection of the stratum corneum showing the lines on the surface of the skin. The right hand image indicates use of insufficient matching fluid or that the SIAscope was not moved in a circular motion to distribute the matching fluid, resulting in trapped air bubbles.
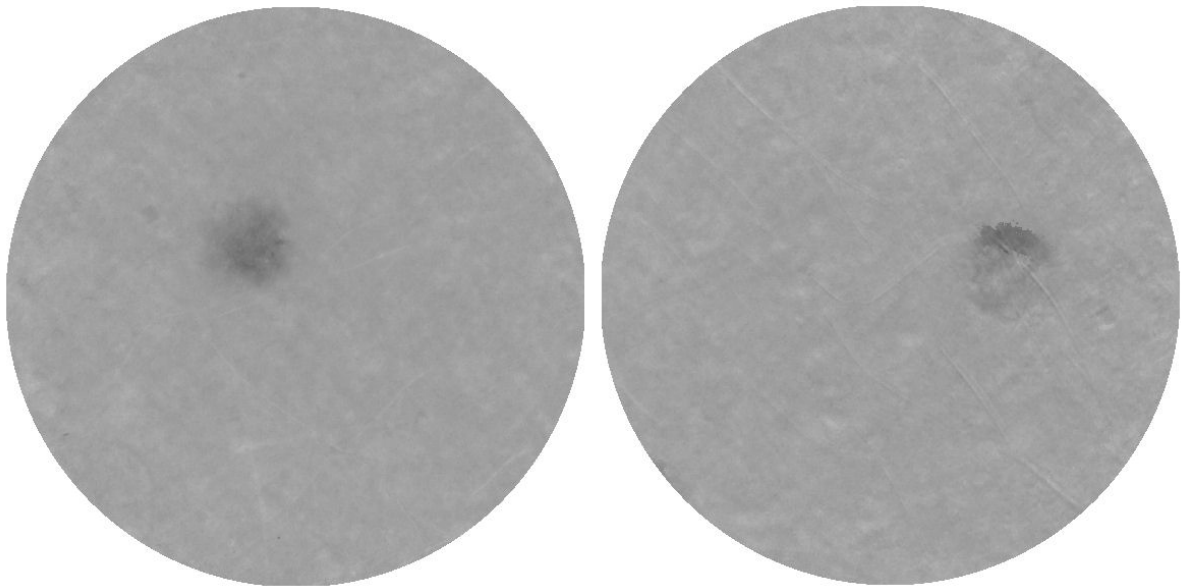
Figure 3

Figure 3: The images above are two melanin images of the same skin area. The image on the left is the result of a good scan, the image on the right shows that the SIAscope has been moved during the scanning process. Tell tale signs are the mottled appearance as well as the appearance of shadows to the hairs on the skin (top left corner of the image).
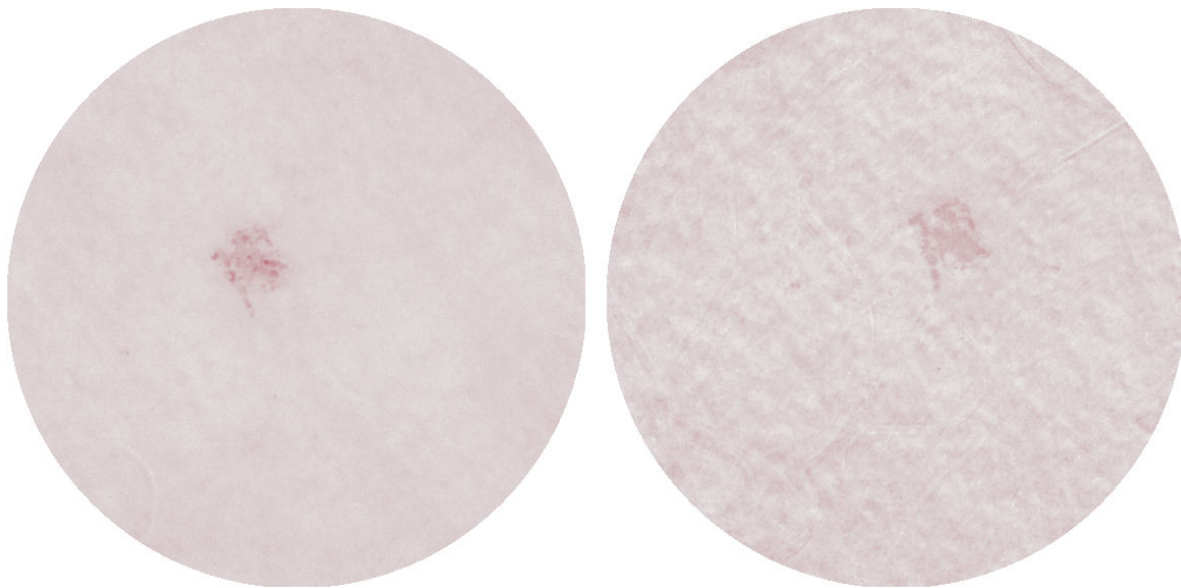
Figure 4

Figure 4: Theses two images are the result of two scans of the same area of skin. The image on the left is a good image showing a smooth distribution of haemoglobin and a haemangioma (essentially blood vessels close to the surface of the skin) in the centre of the scan. The image on the right hand side is a bad image of the same scan area. It indicted that the SIAscope was moved slightly during the scan acquisition resulting in the characteristic mottled, almost 3D appearance of the scan.

Figure 5

Figure 5: The two images above show the same area of skin scanned, note the melanin blotches which are identical in the images. Because of great variation in the pressure applied (very little on the left, fairly high pressure on right) the blood in the right image was displaced by the pressure giving quite different scan results, ie higher haemoglobin concentration on the left, lower haemoglobin concentration on the right.

5. Capturing a SIAscan

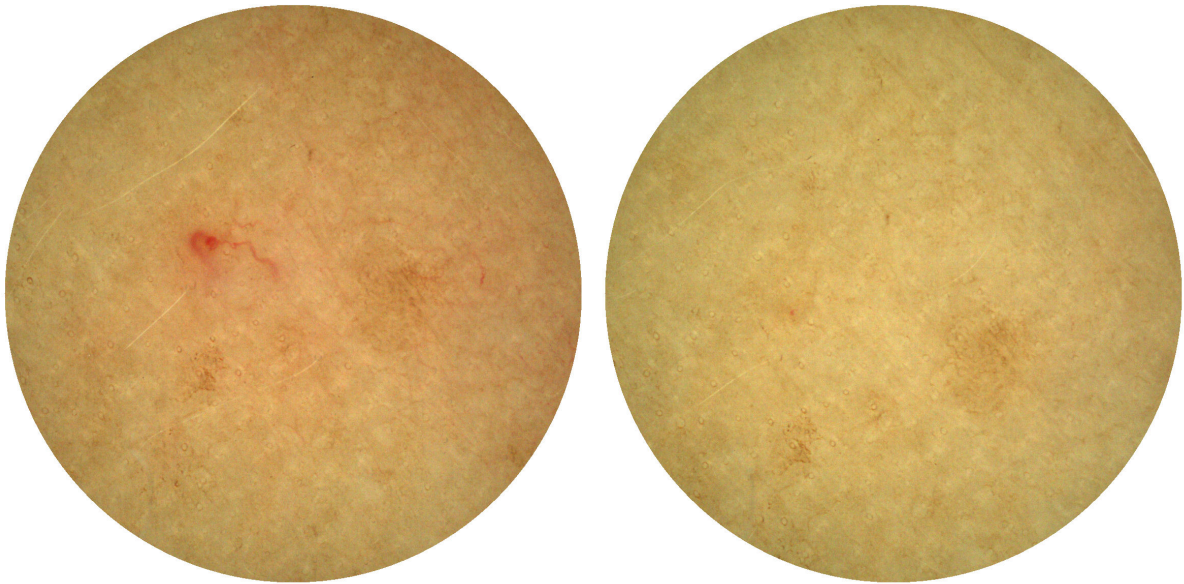Before capturing a SIAscan check that the SIAscope is connected and available. A visual indication of the SIAscopes status can be seen by looking at the "Powered by SIAscopy" logo in the Notes area. If the centre of the logo is Blue then the handset is connected and ready, if it is not blue then the handset is either not connected or is not available. The handset may not be available if multiple SIAMETRICS windows are open, see the section Loading a saved SIAscan for more information.
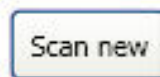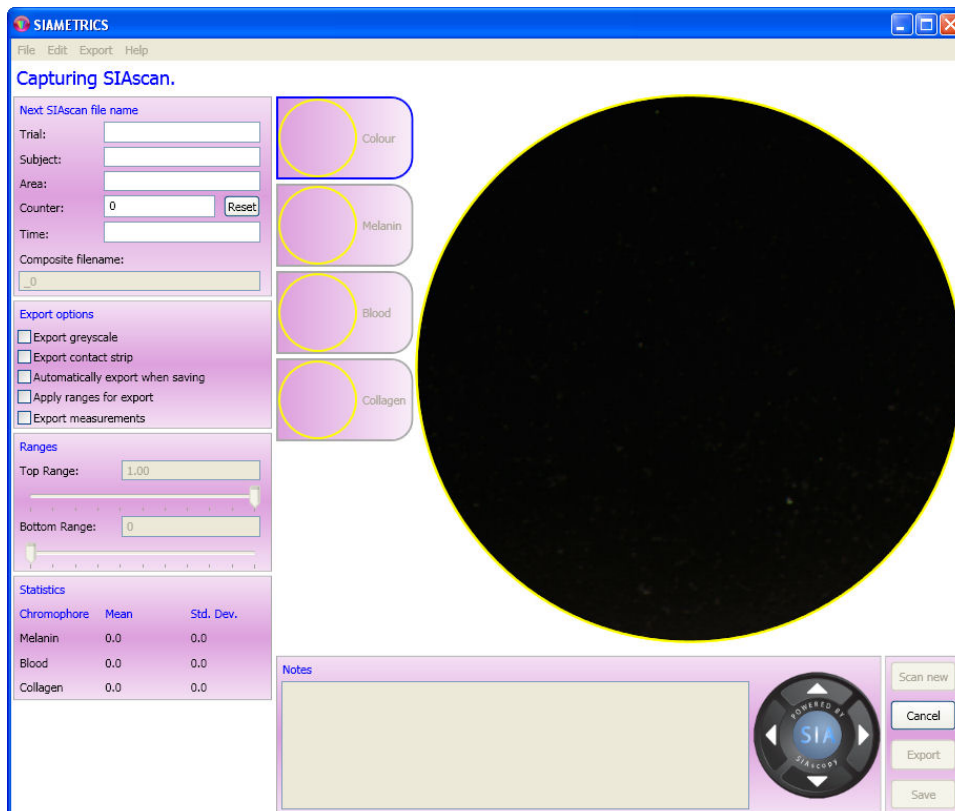

SIAscope ready

SIAscope not available

To begin the process of capturing a SIAscan, **Left Click** on the **Scan new** button.
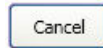

Scan New button

The SIAscope will be enabled and the LEDs inside it will begin to flash. A live view will be displayed in the view area on the screen.

Live View

Note

The scan process can be halted at this point by **Left Clicking** on the **Cancel** button.

Cancel button

Once the SIAscope V has been positioned correctly on the volunteers skin **Press** the button marked **SIA** on top of the handset.

During the capture process a series of audible indications will help you to identify at what stage the capture process is at. The first sound after pressing the SIA button indicates that scaning is underway, the second sound indicates that the processing has finished and the image is being displayed. In conjunction with this the messages on the screen will also update to indicate at what stage the scanning is at.

SIAMETRICS will now capture the SIAscan and after processing the SIAscan will be displayed on the screen.
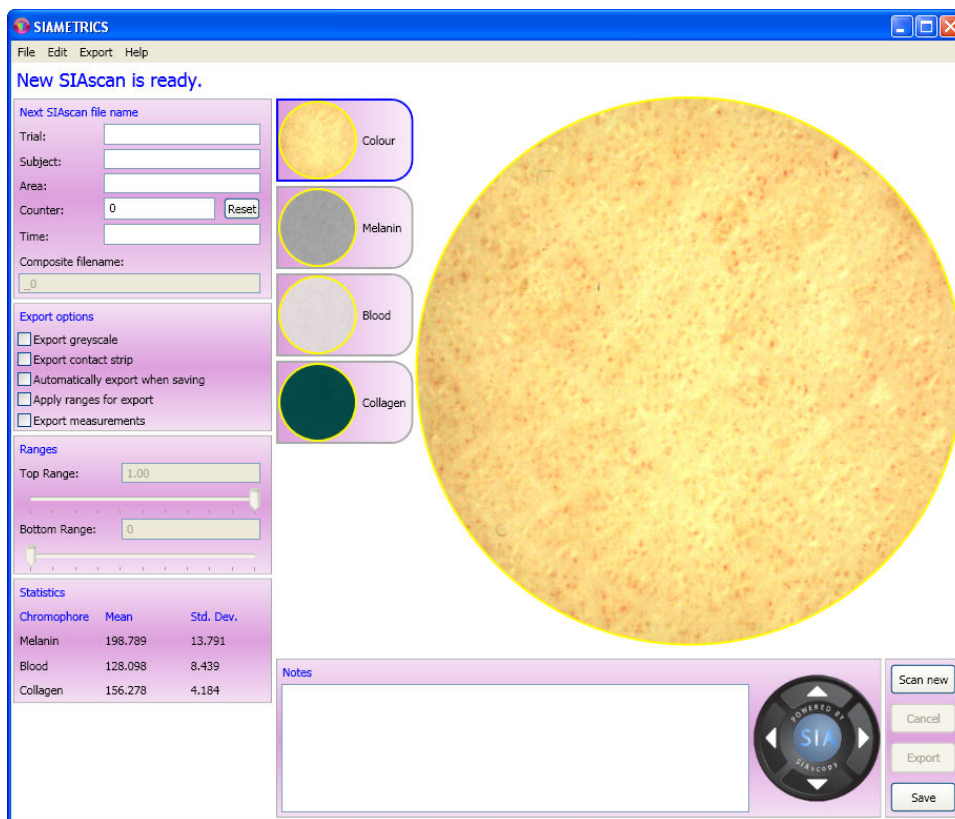
Captured scan

Note

If the SIAscan is unsatisfactory, you can capture another SIAscan by **Left Clicking** on the **Capture New** button. SIAMETRICS will display a window to confirm that the SIAscan is to be deleted. **Left Clicking** on **Yes** will save the SIAscan, **Left Clicking** on **No** will initialise the handset ready for another scan. **Left Clicking** on **Cancel** returns to the scan window without any actions on the scan.

Each of the chromophores can be displayed in the larger view by **Left Clicking** on the chromophore button of interest.

Colour button

Melanin button
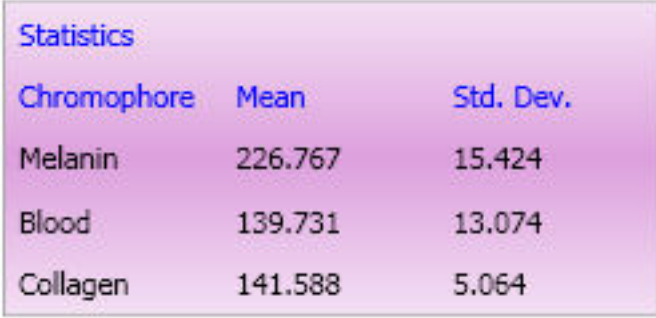
Blood button
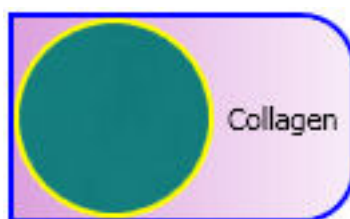
Collagen button

6. Statistics

After a SIAscan has been captured it is possible to view the values for each of the chromophores by looking at the Statistics panel located in the bottom left of the screen.

Statistics		
Chromophore	Mean	Std. Dev.
Melanin	226.767	15.424
Blood	139.731	13.074
Collagen	141.588	5.064

Statistics panel

The Mean value of each chromphore represents the average of the individual measurements taken across the scanned area.

The standard deviation is the variance of all the measurements taken across the scan area.

The chromphore values can also be exported in a xml file along with the images for further analysis. Please see the section Exporting the SIAscans for further information.

7. Notes

You can add notes to the acquired SIAscan by clicking inside the the Notes box at the bottom of the screen and typing your text.
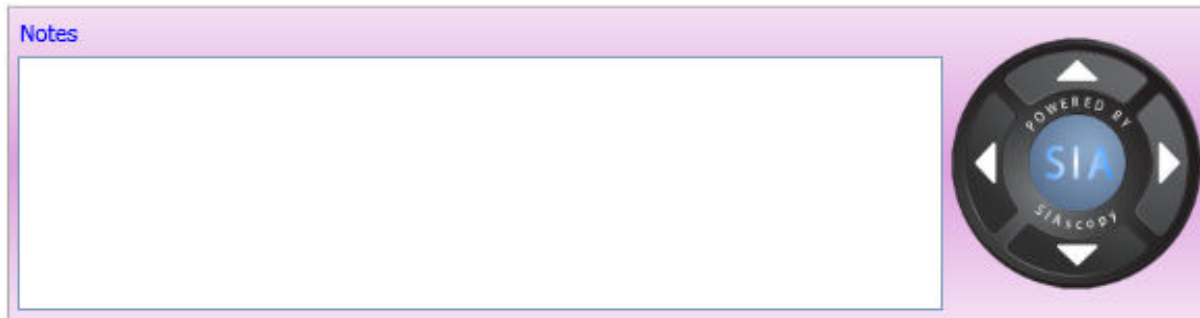
Notes box

These notes will be saved with the SIAscan for future reference.

The notes will also be exported with the chromophore values. Please see the section Exporting the SIAscans for further information.

8. Ranges

The contrast of the SIAscan can be adjusted by changing the range settings. These can be found on the left hand side of the screen.

These settings will be stored and applied to each SIAscan viewed so that the contrast for multiple scans is consistent.

☞ Note

When loading a saved SIAscan, the range values saved with the scan will be applied.

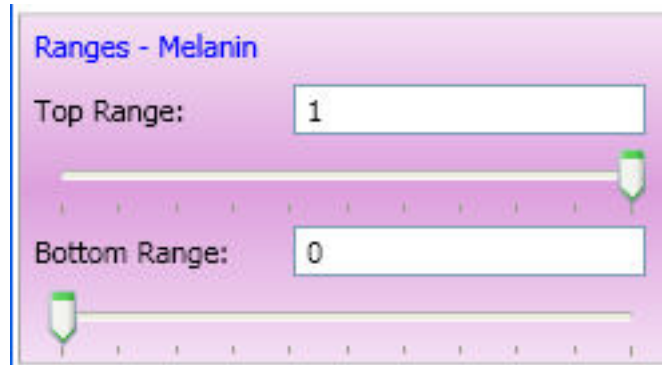To enable the Range adjustment scales select the from either the melanin, blood or collagen view so that it is displayed in the main viewing window.

☞ Note

Only melanin, blood and collagen ranges can be adjusted.

To adjust the contrast of the chromophore being viewed **Left Click** on the top or bottom range slide bar pointer and move it until the image displays the desired effect.
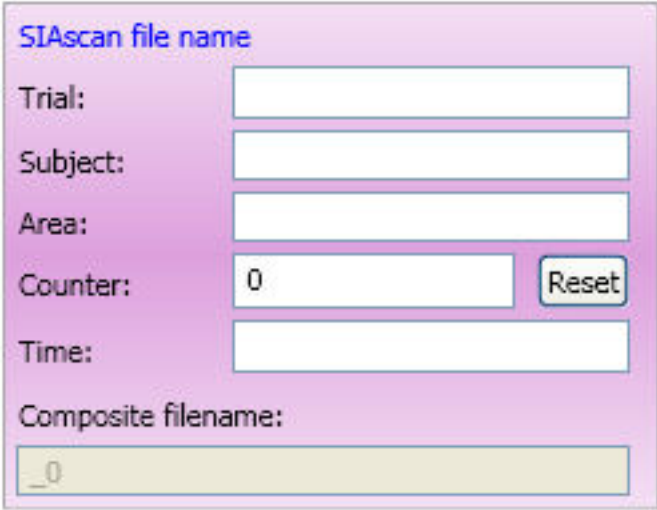
☞ Note

The minimum and maximum range values are 0 and 1 respectively.

The range values will also be exported with the chromphore values. Please see the section Exporting the SIAscans for further information.

9. Saving the SIAscan

The options available when saving a SIAscan can be seen on the SIAscan file name panel.

SIAscan file name panel

The text boxes in this panel allow you to construct a file name that will be used for saving the SIAscan.

The text boxes define the file name in the following way:

- **Trial** - Enter the name of the trial you have chosen to use. This will help to identify the data in the future.

- **Subject** - This field is to record the name of the volunteer being scanned. This will need to be updated each time a new volunteer is scanned.

- **Area** - This field is to record the location of the scan on the volunteers body i.e forearm, cheek etc.

- **Counter** - The counter automatically increments each time a scan is saved. This ensures that each saved SIAscan is unique. You can set the counter back to zero by **Left Clicking** on the **Reset** button.

- **Time** - This text field is for a time period designator such as T0 or T1 that the trial is in. It is not meant to represent the time the SIAscan was taken.

- **Composite file name** - The text entered into the above fields are automatically linked together by the software using the "_" character to create a **composite filename**. The "_0" is an incremental suffix that is automatically appended to the filename. This is beneficial because once you have setup the filename, the software will automatically increase the file number for you thus speeding up the file saving process.

Once you have defined your file name you can save the SIAscan by **Left Clicking** on the **Save** button.

10. Exporting the SIAscan

10.1. How to Export

⚠ Important

Before an export is made you must ensure you have defined the export properties. Refer to the section Export Options for further information.

SIAmetrics offers three ways in which to export data -

Manually after saving - Once a SIAscan has been saved you can export the data by clicking on the Export button on the screen.
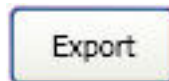

Export button

The exported data will be saved alongside the originally saved SIAscan in accordance to your export options.

Automatically with saving - If "Automatically export when saving" has been selected from the export options the data for the SIAscan will automatically be exported according to your export options when the Save button is clicked.

Processing a complete folder - This allows the export feature to be run on a folder containing any number of SIAscans. To use this feature **Left Click** on the **Export** menu item at the top of the screen and choose the **Folder Export** menu item.
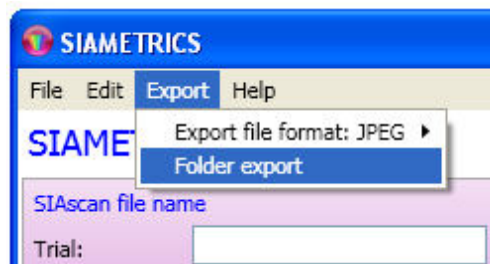
Folder export menu item

As default the last saved to folder will be displayed. If this is not required navigate to the correct folder and then **Left Click** on **Open**. The window will close and the export process will begin. The text on the screen will update as the export proceeds and will indicate when it is finished.

You can view the exported data by navigating to the folder that the export was carried out on. In addition to the .sia file you will find additional files, the number and type of files will depend on your export criteria.

10.2. Export Options

A number of export options can be set before exporting the SIAmetrics data so that it can be analysed independently. The options can be seen in the Export Options panel.

- **Export greyscale** - If this option is selected then the images will be exported in greyscale and not colour.

- **Export Contact Strip** - Selecting this option will collate the images into a strip of images rather than seperate image files.

- **Automatically export when saving** - If this option is chosen the export will be carried out automatically when the image is saved. Any export options chosen will be implemented and the exported files will be created next to the saved SIAscan.

- **Apply ranges for export** - If the contrast has been adjusted using the range settings then it is possible to apply these ranges to the exported images. As default the images are exported without any range adjustments. The underlying measurements obtained will not change.

- **Export Measurements** - Selecting this option will export the float data for the chromophores.

10.3. Setting the export image format

SIAMETRICS allows you to select from three different types of image format when exporting. The formats available are PNG, JPG and TIFF.

To set the image format you would like to use **Left Click** on the **Export** menu item at the top of the screen and then select **ExportFileFormat:**.
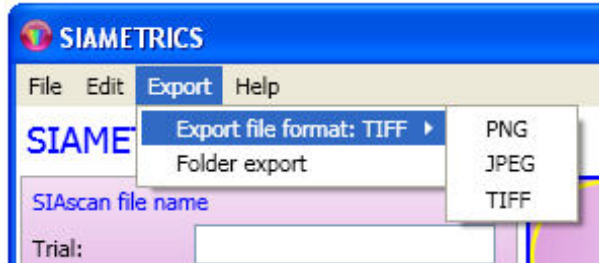
The current file format is shown at the end of the ExportFileFormat menu item, in the image above you can see that it is TIFF.

To switch the format move your mouse over the list of formats and **Left Click** on either PNG, JPG or TIFF, the current type will be updated.

10.4. Identifying the exported files

Depending on the configuration you have defined for your export options you will see different files when exporting. Each of the files is described here so that you identify the information you require.

- **Measurements folder** - This folder contains float data for the blood, melanin and collagen images. Inside the folder you will find three bin files under the relevent chromophore file name.

- **XML file** - The xml file contains the blood, melanin and collagen measurements from the scanned area and any notes that have been added to this SIAscan.

- **Image strip** - The images will have the text strip appended to them if you have selected to export the images as a strip, otherwise they will be seperate image files in the specified format.

It is possible to load and view a SIAscan previously saved by the application.

Two methods exist for opening a previously saved SIAscan:

Directly from the .SIA file

You can open a previously saved SIAscan by simply **Double Clicking** on the required .sia file from the saved location.

⚠ Important

If more than one .sia file is opened SIAMETRICS will open multiple windows to display the SIAscans. In this instance only one SIAMETRICS window will provide the ability to capture a new SIAscan. You can identify which SIAMETRICS window it is by checking the "Powered by SIAscopy" logo located in the notes area. Additional information on checking the SIAscope status can be seen in the section Capturing a SIAscan.

Once processed the required SIAscan will be reloaded into the software. You can use the features of the software to make any required changes such as adding notes or adjusting the ranges. These changes can then be saved if needed.

From the SIAMETRICS menu items

To load in a SIAscan, select **Load SIAscan** from the **File** menu.
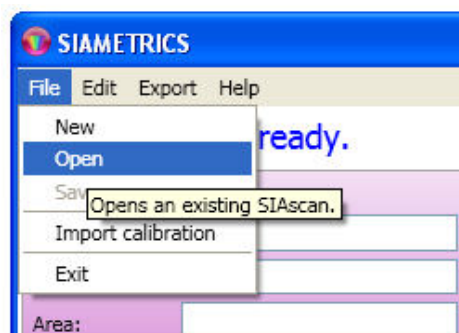
The open window will be displayed.

Navigate to the location of the SIAscan and **Left Click** on the required scan. This will highlight it in blue.

Now **Left Click** on the **Open** button - the chosen SIAscan will be loaded and displayed on the screen.
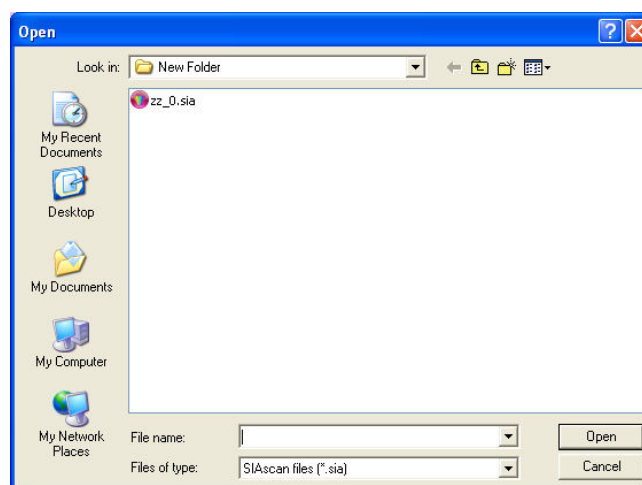
Once processed the required SIAscan will be reloaded into the software. You can use the features of the software to make any required changes such as adding notes or adjusting the ranges. These changes can then be saved if needed.

When you have finished with the chosen SIAscan, you can either load another SIAscan or capture a new SIAscan by **Left Clicking** on the **New Scan** button.

12. Menu Options

Some of the features covered are also available from the menu items located at the top of the screen.

File menu item

- **New** - Starts the process of capturing a new scan. An alternative to clicking on scan new.

- **Open** - Opens a selected saved SIAscan file. This is covered in the section Loading a saved SIAscan.

- **Save** - Saves a captured SIAscan or changes made to an existing scan.

- **Import calibration** - Imports the specified calibration data.

- **Exit** - Selecting this option closes the SIAMETRICS software.

Edit menu item

- **Copy image** - This feature allows you to copy the SIAscan images directly from SIAMETRICS to another software application such as Word, Powerpoint or Microsoft Paint. To do this select copy image from the menu items and then **Left Click** on either the small colour, melanin, blood or collagen image. The open the required application and paste the image into it. You will need to repeat this for each image.

- **HQ Colour** - Allows you to set the quality of the colour image. HQ represents high quality and should be used if you are intending to use the colour view for any analysis or presentations. Not selecting HQ reduces the time required to save the SIAscan.

- **Natural Colour** - This feature allows you to switch the colour view between a natural view or a dermatoscopic view.

Export menu item

- **Export file format** - Allows you to specify the format of the images to be exported.

- **Folder export** - Allows you to export an entire folder directory containing saved SIAscans.

Help menu item

- **About** - Displays version information about SIAMETRICS.

13. Acknowledgements and Notices

14. Revisions

Table 1. Revisions

Revision No	Revision Description	Date
Revision 1.0	Final Version	10.07.08

15. Third Party Software Licenses

SIAMETRICS dynamically links the following libraries:

ZedGraph ZedGraph Class Library - A Flexible Line Graph/Bar Graph Library in C# Copyright (C) 2004 John Champion This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details. You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA ATLAS Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: 1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. 2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution. 3. The name of the ATLAS group or the names of its contributers may not be used to endorse or promote products derived from this software without specific written permission. THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS ``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE ATLAS GROUP OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. libmba Copyright (c) 2003 Michael B. Allen mba2000 ioplex.com The MIT License Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.