1.0 Purpose

The purpose of this document is to describe the requirements for the image analysis process.

2.0 Scope

The scope of this document consists of the Analysis Function processes as a whole, no other systems requirements are defined in this document. The initial release of this document addresses only the requirements for the core system, this will be augmented as new requirements are introduced.

3.0 Definitions

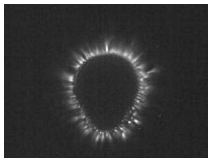
Background Noise Level	This is the pixel intensity (a value between 0 and 255) that represents the point at which we will consider the pixel 'on'. This is used to remove extraneous noise from the image.
Bitmap	A graphic format used by the system. All images captured by the system are stored in this format. The images are all 320 pixels by 240 pixels in size.
Energized Image	The image captured by the scanner showing the release of energy. This image is captured and stored as a bitmap having a width of 320 pixels and a height of 240 pixels and 24 bit color depth. An example of an energized image is show below: 
Calibration Image	An image captured using a probe rather than a human finger. This is used as a baseline in performing some image calculations.
Coefficients	Numerical calculations that describe specific attributes of the

	image.
EPIC Image Analysis Engine (EIAE)	A library of code that processes data contained in an image and produces a set of measurements from the data (coefficients).
EPIC Scoring Engine (ESE)	A library of code that is responsible for processing the coefficients to obtain a response scale value. The response scale value is the value that is reported to the end user.
Filtered Image	A energized image obtained by placing a specially designed filter between the subjects finger and the scanner lens.
Finger Image	The raw image of the finger captured before the voltage is applied to the plate.
Finger Sector	A portion of the finger that image that is analyzed for the calculating the various coefficients. All of the fingers have between 6 and 9 sectors for calculation purposes. The sectors are represented as 'pie slices' emanating from the calculated center of the image.
Fractal	A geometrical or physical structure having an irregular or fragmented shape. In an energized image, the fractal coefficient identifies the presence of a repeated pattern in the image.
Pixel	A graphical component that has the ability to turn on and off and display color and intensity.
Scan	The process of collecting the energized images from the fingers of a subject. A complete scan will consist of 10 filtered and 10 unfiltered images.
Unfiltered Image	An energized image obtained by placing the subject's finger directly on the scanner lens.

4.0 System Requirements

- Image analysis must take place immediately upon request by the user after all of the images are captured.
- Analysis requires a set of 10 filtered and 10 unfiltered images.
- A valid calibration set must be current and available before analysis can begin.
- The system must calculate a noise value which will be referred to as the background noise level. This level should be the pixel intensity below which will be considered 0 or no intensity at all.
- The number of pixels within a sector that are above the noise level should be measured, this coefficient will be known as the sector area.
- The area respective to the size of the sector must be calculated, this coefficient will be known as the normalized area.
- The average intensity of all pixels in a sector must be determined; this coefficient will be called average intensity.
- The measurement of disorganization in a sector should be measured; this coefficient will be known as the entropy.
- Measure the level of continuity along the radii of the sectors, this coefficient will be known as form. The form coefficient will encompass approximately 2/3 of the depth of the sector, a separate coefficient called Form2 will look at the outer 1/3 of the sector.
- Breaks or lines in a sector will be known as Break Coefficient
- A measurement of the fractal dimension in a sector must be calculated, this coefficient will be known as fractal.
- A measurement of the difference between a calibration image and the captured energized image per sector must be reported, this coefficient will be known as NS.
- The general data flow will be as follows:
    - Collect images → Perform coefficients calculations → Store raw data → Run coefficients through analysis algorithm → Result in Response Scale Measurement → store analyzed data → produce a report.
- The raw coefficients should be persisted in their original state in a table in the ClearView database.
- Z Scores will be calculated for each instance of all coefficients.
- A base score will be calculated for each finger sector, this score is a product of the weighting factor (which is unique to each coefficient), the calculated coefficient and the coefficient z-score.
- Specific combinations of high scoring coefficients will be worth more than others. Rules will be put in place to enforce this.
- A scale will then be applied to the score that was created; the scale will reduce the results to a number between 1 and 25.

- Calibration images must be saved with the raw data.
- The final report data must be saved to the ClearView database.
  - The user will have the ability to print a report of the Response Scale measurements.
  - The user will have the ability to view and sort the Response Scale measurements.
  - The user will have the ability to view a graphical representation of the NS coefficient.
  - The user will have the ability to view the energized image sectors in relation to a visual representation of the body.

Document Revision History

Version Number:	Description of Change:	Date:	Updated by:
000	Introduction	5/24/11	A. Mason