

OPS Analysis User Manual

LEKAM MEDICAL Limited

OPS Analysis User Manual

by LEKAM MEDICAL Limited

version 2.8.3 Edition

Published 07/05/2003

Copyright © 2003 by KK Technology

Table of Contents

1. Introduction.....	1
2. Step by step guide	1
2.1. Step 1	1
2.2. Step 2	1
2.3. Step 3	2
2.4. Step 4	4
3. Installation.....	8
3.1. Matrox Meteor II.....	8
3.2. Imagenation PX610	8
3.3. Matrox Pulsar.....	8
3.4. IMAGENATION PX610A.....	9
4. Magnification Calibration.....	10
5. Velocity Measurement	12
5.1. Theory	12
5.2. Making Velocity Measurements	14
5.2.1. Measurement Line	14
5.2.2. Movement	15
5.3. Calculation parameters.....	16
5.3.1. Calculate cbv.....	16
5.3.2. Subtract scans.....	16
5.3.3. Set sample rate	16
5.3.4. CBV calculation parameters	17
5.3.4.1. cbv method from linescan	17
5.3.4.2. Number of correlations to smooth	17
5.3.4.3. Linescan sample periods between correlations.....	17
5.3.4.4. Correlation coeficient lower acceptable limit	18
6. Movement Correction.....	19
6.1. Introduction.....	19
6.2. Automatic Movement Correction	19
6.3. Manual Movement Correction	19
6.3.1. Tracking	19
6.3.2. Dragging	20
6.4. Reset movement correction offsets	21

7. User Reference	22
7.1. Menu Commands	22
7.1.1. File Menu commands.....	22
7.1.1.1. New command (File menu)	22
7.1.1.2. Open command (File menu)	22
7.1.1.3. Close command (File Menu)	22
7.1.1.4. Save command (File Menu).....	22
7.1.1.5. Save As command (File menu).....	23
7.1.1.6. Export (Dimension List)	23
7.1.1.7. Export (Image).....	23
7.1.1.8. Export as avi	24
7.1.1.8.1. AVI Output compression.....	24
7.1.1.9. Import avi.....	25
7.1.1.9.1. AVI Output compression.....	26
7.1.1.10. Import Image.....	28
7.1.1.11. Open Cytoscan file.....	28
7.1.1.12. Print Preview command (File menu)	28
7.1.1.13. Exit command (File menu)	28
7.1.2. Edit menu	29
7.1.2.1. Cut command (Edit menu).....	29
7.1.2.2. Copy commad (Edit menu).....	29
7.1.2.3. Paste command (Edit menu)	29
7.1.2.4. Clear All Dimensions.....	29
7.1.2.5. Notes	30
7.1.2.6. Smooth Selection Menu	30
7.1.3. View Menu	30
7.1.3.1. View Toolbar command	30
7.1.3.2. Video Input Control	30
7.1.3.3. Show Crosshair	30
7.1.3.4. Grid	30
7.1.3.5. 2D View Menu	31
7.1.3.5.1. Always on Top	31
7.1.4. Settings menu.....	31
7.1.4.1. Calibrate Magnification	31
7.1.4.2. Magnification	31
7.1.4.3. Units.....	31
7.1.4.4. Timer.....	32

7.1.4.5. Grid Settings	32
7.1.5. Tools Menu	32
7.1.5.1. Pan Image.....	32
7.1.5.2. Region of Interest (ROI)	33
7.1.5.3. Origin	33
7.1.5.4. Counting.....	33
7.1.5.5. Dimension Lines	33
7.1.5.6. Freehand dimension lines	33
7.1.5.7. Grab Live Video.....	33
7.1.5.8. Freeze Video Input.....	33
7.1.5.9. Start Timer	34
7.1.6. Window Menu.....	34
7.1.6.1. New command (Window menu)	34
7.1.6.2. Cascade command (Window menu)	34
7.1.6.3. Tile command (Window menu)	34
7.1.6.4. Window Arrange Icons Command.....	34
7.1.6.5. Dimension List.....	35
7.1.7. Help Menu	35
7.2. Toolbar	35
7.3. Status Box	36
7.4. Introduction to charts	36
7.5. Axes	37
7.5.1. Using the mouse.....	37
7.6. Using the Keyboard	37
7.7. Traces.....	38
7.7.1. Trace Properties	38
7.7.2. Selecting Trace Data	38
7.7.3. Adding a Trace to a File.....	38
7.8. Display Rate.....	39
7.9. Edit.....	39
7.9.1. Edit Copy command	39
7.9.2. Edit Cut command	39
7.9.3. Edit Delete Command.....	40
7.9.4. Edit Paste command.....	40
7.10. Markers	40
7.10.1. Event Markers	40
7.10.2. Edit Marker Dialog	41

7.10.3. Edit New Marks	42
7.10.4. Marker Mode	42
7.10.5. Image Markers	42
7.11. Export data	43
7.11.1. TEXT	43
7.11.2. BINARY.....	43
7.12. FIR filter.....	44
7.13. Import data	45
7.14. Keyboard.....	45
7.15. Remove Pulse.....	46
7.16. Selecting Data	47
7.17. Smoothing Dialog	47
7.18. Status Box	47
7.18.1. Active Trace Name	47
7.19. ToolBar	48
7.20. Calculating Averages	48
7.21. Hide Trace.....	49
7.22. Increase Brightness	49
7.23. Decrease Brightness.....	49
7.24. Smooth trace	50
7.25. Trace properties.....	50
7.25.1. Trace Name	50
7.25.2. Y units.....	51
7.25.3. X units.....	51
7.25.4. Sample Rate	51
7.25.5. Trace length.....	51
7.25.6. Axes X scale	51
7.25.7. Trace Start Position.....	51
7.25.8. Screen Y scale.....	51
7.25.9. Screen Y offset.....	52
7.25.10. Y scaling factor	52
7.26. Trace Selection Dialog.....	52
7.27. View	52
7.27.1. Colour / mono Doppler spectrum	52
7.27.2. Inverse Colours	52
7.27.3. Minimum to background.....	53
7.28. Advanced Menu	53

7.29. Artifact Filter Dialog.....	53
7.29.1. Artifact Limit	54
7.29.1.1. Absolute Value	54
7.29.1.2. Percent.....	54
7.29.2. Filter Action.....	54
7.29.2.1. No Action.....	54
7.29.2.2. Repeat last valid value	54
7.29.2.3. Set to zero & skip.....	55
8. Troubleshooting.....	56
8.1. CapiScope does not start.....	56
8.2. No video signal	57
8.3.	57
9. References	59
Index.....	60

List of Tables

7-1. Analysis of compressors for AVI file output using 128 frame test file (.mve filesize=56,231,940 bytes)	24
7-2. Velocity results after video compression	26
7-3. Export data Header Format.....	44
7-4. FIR 1 second RC filter	44
7-5. Keyboard commands and shortcuts	45

List of Figures

2-1. Simple Video clip of Velocity measurement. Actual video footage is 256 colours and at full frame rate.	5
2-2. Example of output following previous steps	6

Chapter 1. Introduction

The OPS Image Acquisition and Analysis software provides a simple and uncomplicated means to read image data directly from a Cytoscan or, with one of the supported frame grabbers, to capture and store capillaroscopy images from video. The video source can be a live signal direct from the Cytoscan, CAM1, VCS, any camera, or a pre-recorded signal from a VCR. Live video can be displayed on the computer screen. Video data can also be imported from avi files.

A simple three button control allows easy measurement of several diameters and velocities within the image.

The optical magnification can be calibrated seperately for the x axis and y axis. Dimensions can then be shown in either calibrated units or pixels.

Chapter 2. Step by step guide

2.1. Step 1

Launch CapiScope by clicking on the CapiScope executable icon. When the program has loaded, click on File - Open C ytoscan file... and the following dialog box will be displayed:



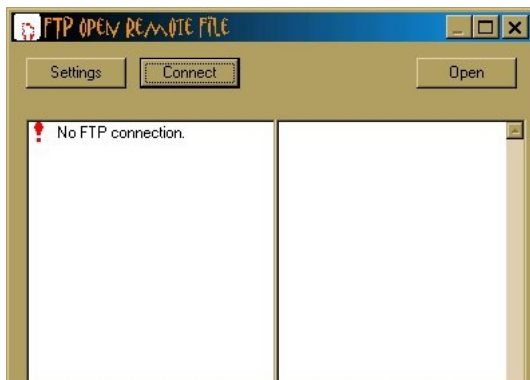
2.2. Step 2

Clicking on "On My Computer or Network Neighborhood" and pressing OK will bring up a standard file dialog box:



Clicking once on any of the header files will display information about that file. As many of the video files are large in file size this information is useful in determining the correct video to be analysed. Click Open and the video file will be loaded. You can now proceed to step 4. If you are uploading a file using FTP then continue with step 3.

2.3. Step 3

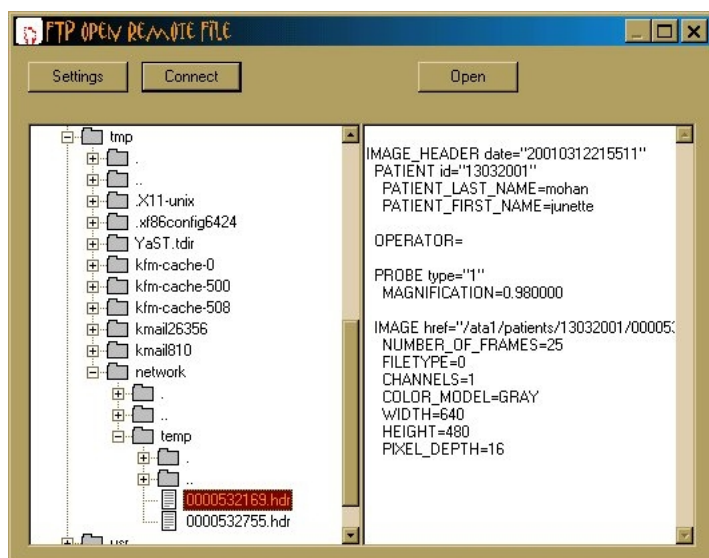


Clicking on "On Cytoscan (using FTP)" and pressing OK will bring up the

following dialog box. For FTP file downloading and analysis a network connection is required. Either the Cytoscan can be connected to a network which can be accessed from the PC, or a direct PC-Cytoscan connection using a "twisted" CAT 5 ethernet cable. In the dialog box are the following buttons: *Settings* will bring up information concerning the FTP configuration on the system. *Connect* will connect the user to the FTP file location site using the settings previously entered. *Open* will load the selected file displayed in the lower part of the window.



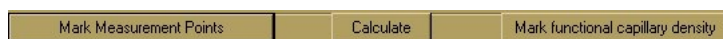
Under "IP address or URL of remote machine" the cytoscan default IP address is *192.168.1.200*. This needs to be set to the same IP address as on the Cytoscan system. The PC network settings (in the Network section of Control Panel) need to be set up as described in the Cytoscan and Microsoft documentation. Under "path on remote machine" enter the path under which the video file is stored. Under "Port" the default setting is *21*, if described otherwise in the Cytoscan manual use whatever number is given. Under "user name on remote machine" and "password" use whatever details you are given to log on to the system. Press OK when all the details have been filled.



If the settings have been correctly entered press *Connect* and folders on the Cytoscan system will be displayed in the left window (similar to the shot on the right). Navigate to the location of the video files in the OPS system and press *Open*. Notice that when you click on the header file that you can see the header information in the right hand window pane. This information is the same as the header information given during standard file viewing like in step 2.

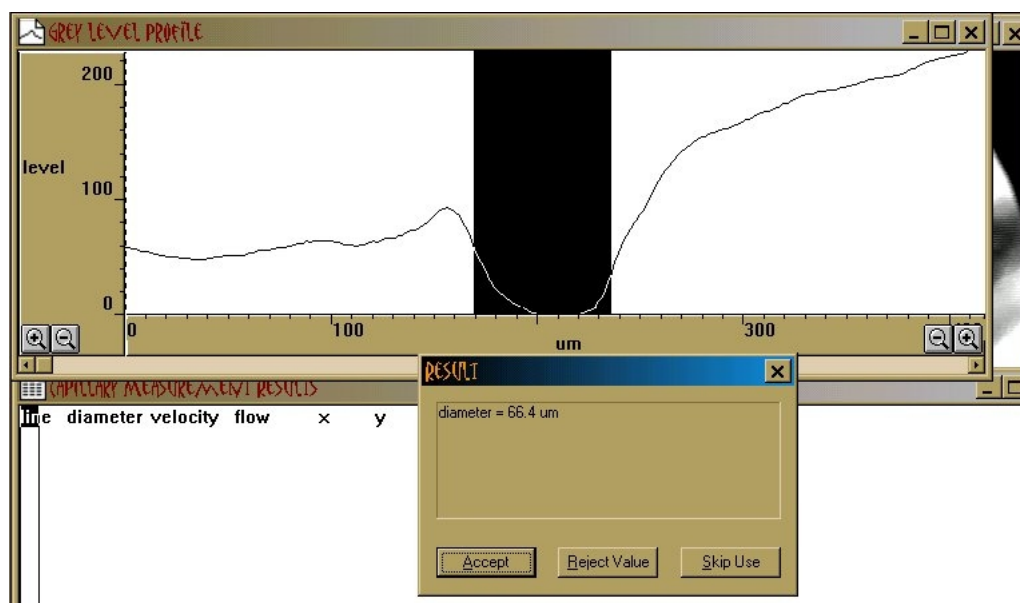
2.4. Step 4

The video file should be displayed in the same way no matter which method the file was obtained. Be aware that video files are usually have a large file size so it may take a while to open depending on the type of machine running the Capiscope program. To analyse the file use any of the buttons at the top of the program.

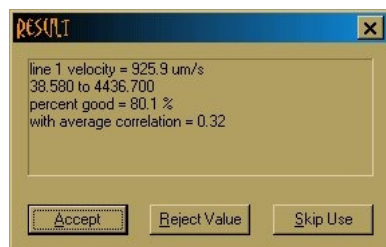


Mark Measurement Points is drawn on to the video file with two points. The start point will be placed on the first click and the end point placed on the second click. To see which direction the blood flow is travelling watch the video file with the play (▶) button. It is important that the two points are placed in the *same* direction as the blood flow as the calculation functions will be incorrect capillary velocity results. You can place as many number of lines on the video file as required. Once

all the required amount of points are placed on the video image then press *Calculate*. If you make any mistakes whilst drawing the lines then just click on the first point of the line and press the Del key on the keyboard.

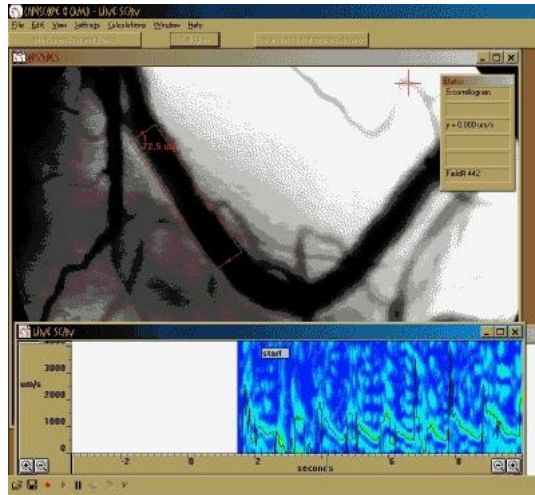


The first calculation will determine the diameter of the capillary, then press **Accept** to run the secondary (velocity) calculation. If you only wish to find the diameter of the capillary then press **Skip Use**.

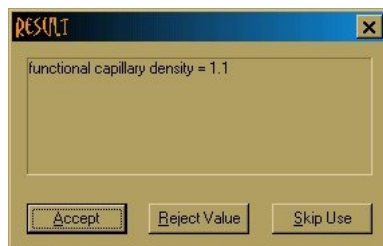


The velocity calculation will bring up a few windows displaying various results from the video file. One of the most useful is the "Line Scan" which identifies the correlation of the velocity data and the velocity itself. The Capillary Velocity (cbv) is identified by a black line with the height of the line displaying the velocity. The correlation of the velocity is given by the background colour (blue meaning low correlation and red meaning high correlation). After the video file has finished, a dialog box like the one above will display information about the calculation which has just run.

Figure 2-1. Simple Video clip of Velocity measurement. Actual video footage is 256 colours and at full frame rate.



Note that after the calculation has taken place, the results of the test will be displayed along side the selected line for easy reference. If more than one measurement point was placed onto the line then the calculation will be run again on the next line. Simply repeat the last few stages and more results will be gained from the video file. All information from this can be viewed from the "Capillary Measurement Results" window.



Pressing "Mark functional capillary density" will allow you to draw "freehand" onto the video image. Simply hold down the mouse button and trace on one of the capillaries. When you have finished marking the capillaries press *Calculate* and a dialog box similar to the right should be displayed. Simply press Acept, Reject Value or Skip Use. If you make any mistakes whilst drawing a line then just click on the first point of the line and press the Del key on the keyboard.

Chapter 3. Installation

3.1. Matrox Meteor II

1. Install Frame Grabber. When Windows boots, the 'Add new hardware wizard' should automatically run.
2. Search for best driver.
3. Click on search location, and enter drive of CDROM. e.g. D:\
4. This should install drivers for the 'Meteor II PCI frame grabber'.
5. Reboot computer.
6. Insert the KK Technology CDROM. The KKCD program should run. Select 'Software'.
7. Select 'Install CapiScope Capillaroscopy Analysis'
8. Select 'Matrox Meteor II'

3.2. Imagenation PX610

1. Insert the KK Technology CDROM. The KKCD program should run. Select 'Software'.
2. Select 'Install CapiScope Capillaroscopy Analysis'
3. Select 'PX610'

3.3. Matrox Pulsar

1. Insert the KK Technology CDROM. The KKCD program should run. Select

'Software'.

2. Select 'Install CapiScope Capillaroscopy Analysis'
3. Select 'Matrox Pulsar'

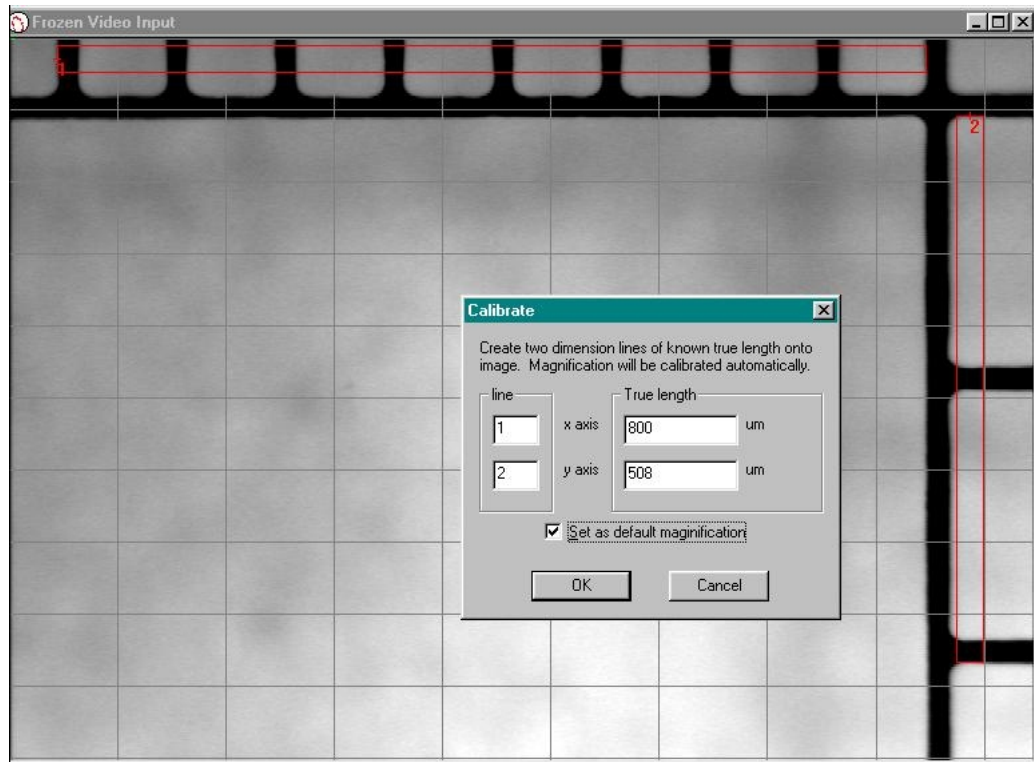
3.4. IMAGENATION PX610A




Warning

This frame grabber is not recommended because it tends to lock up the computer when used with a VCR input.

1. Install PX610A into computer
2. Switch on.
3. When Windows detects new hardware, press ok for all questions. (No drivers will be installed).
4. Run Setup.exe from the \PX610A directory on the CD.

Chapter 4. Magnification Calibration



Line up Graticule with Capiscope video output and focus as usual. Move the Graticule so as much of the 1/10 mm scale (x-axis) and the 1/100-inch scale (y-axis) is displayed on the output window. Freeze the video output with the  icon; click on the  button (Measurement) and then on the  button (Dimension line).

Click on the start of the furthest left black line on the mm (x-axis) scale and then on the start of the furthest right black line on the mm scale. This will be dimension line number 1. Then click on the bottom of the topmost black line on the inch (y-axis) scale and then on the bottom of the lowest black line on the inch scale. This will be dimension line number 2.

Click Calibrate Magnification to bring up the Calibration dialog box. The box should have the 2 lines with the measurements for the true length alongside them. Adjust the settings for each line so that the length corresponds to that on the Graticule (Note that the default units for each axis is um so each division in the inch

scale (y-axis) can be approximated to 254 um each). Tick Set as default magnification and press OK.

You can check the validity of the calibration from Settings Magnification where the x scale and y scale measurements should be as close as possible.

Chapter 5. Velocity Measurement

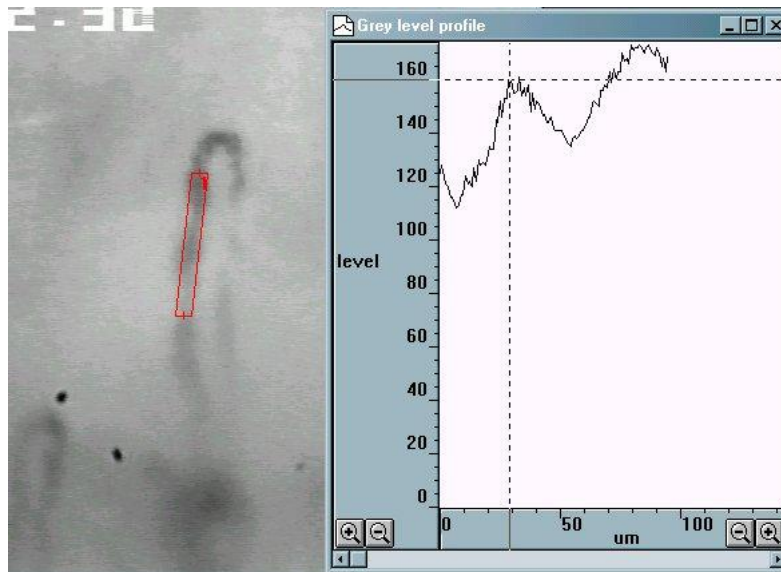
5.1. Theory

The dynamic capillaroscopy option enables capillary blood cell velocity to be measured from live or recorded video using a spatial correlation technique.

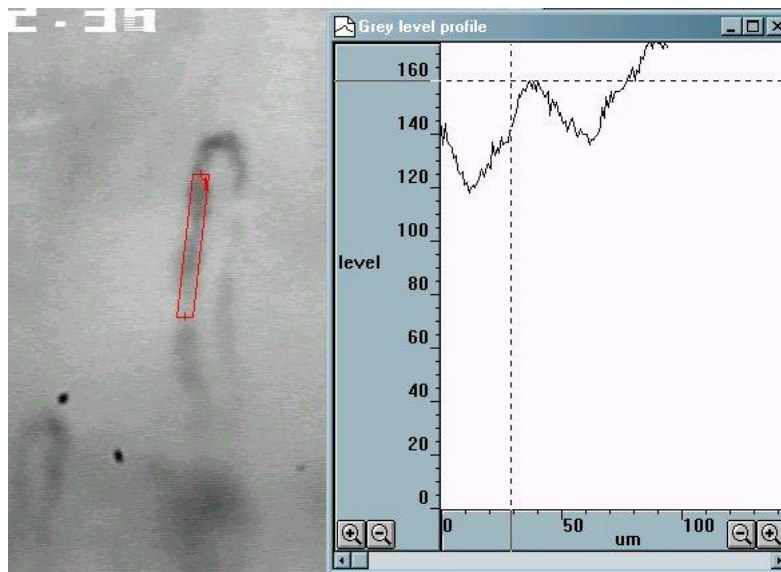
Measurements can be made in real time, directly from the subject. However, it is usually more convenient to record onto good quality video tape or, for best quality, directly into the computer memory, or for longer sequences, directly to the hard disk. This also allows more than one vessel to be measured from the same image sequence. Note that the digitised video is not compressed, and will use about 10 Mbyte per second for a full frame.

Velocity is measured by using the mouse to draw a line along the vessel. The vessel can have any orientation, and does not even need to be straight, although straight vessels are more likely to give good results. The line thickness can be adjusted so that it covers the width of the capillary. This gives an average of the pattern over the whole width. i.e. the image of the vessel is projected onto a 1 pixel thick line. Note that the image itself has already effectively projected 3D into a 2D image (thicker vessels appear darker), and the averaging across the width of the vessel reduces the 2D information down to 1 dimension.

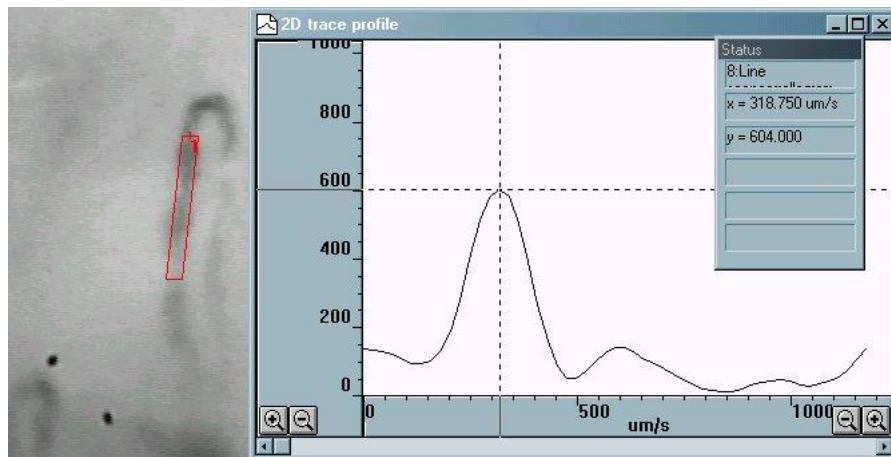
The grey level profile along the line is taken for each field every 1/50th of a second (1/60th second for NTSC based systems). Note that standard video formats have 25 (or 30) frames per second, but each frame is made from 2 interlaced fields. Even numbered lines make the even field, and odd numbered lines make the odd field. Usually, each field is captured separately and then sent whilst the next field is being captured.



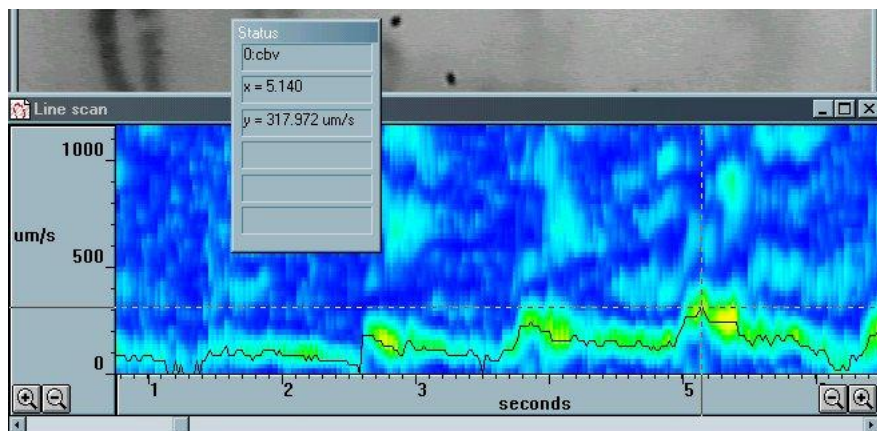
The grey level pattern along each line is compared to the pattern from the next field (or several fields later for very low velocities).



The comparison is performed by calculating the correlation coefficient for every possible shift of the previous grey level profile relative to the new profile. The shift which produces the highest correlation, and which can be seen as the peak in the correlation (the y scale is multiplied by 1000) in the following figure, indicates the distance that the pattern travelled between the two grey level profile measurements.



Since the time laspe between the two grey level profiles is known (ie 1/50th second) the velocity is easily calculated. CapiScope displays the correlation, along with the velocity trace (cbv) as a colour map, showing red for a high correlation through to blue for low correlation. If the correlation is below a preset limit then it is rejected, and a zero cbv value is set at that point.



5.2. Making Velocity Measurements

See capistep.xml of the Step by Step Chapter, for a quick tutorial on making velocity measurements.

5.2.1. Measurement Line

The velocity calculation requires a measurement line. Most of the time, CapiScope can determine which line to use, but in the case of several dimension lines, or several video sequences open at the same time, you will need to specify which line to use.

Right click on the first node of the line. This should open a small menu. Click on "measurement line" to make this line the current measurement line.

Warning

All data in the linescan window will be lost *without warning* when switching to another line.

There are a few points to consider when creating measurement lines.

- Maximum velocity is half the line length multiplied by number of fields per second (i.e. 50 or 60). This is reduced if the sample rate or number of linescan samples between correlations are not both 1.
- A straight line avoids the distortions which occurs at bends.
- Horizontal lines have twice the resolution as vertical lines.
- Using a line which is wider than the vessel, might help when there are movement artifacts, but the signal, and hence correlation will be poorer, since it will be averaged with useless background information.

If the vessel is large ($> 30 \mu\text{m}$) then make the line cover only the central third of the vessel, otherwise the correlation will tend to pick out the slower rolling leukocytes along the vessel wall.

- The line needs to be at least twice as long as typical pattern (erythrocyte gap or leukocyte). Note that the resolution of the cbv velocity measurement is half the length of the measurement line.

5.2.2. Movement

It is important to have no movement in the video sequence. If the subject moves, it is possible to reposition the line by dragging the first node of the measurement line using the mouse and left mouse button. This can be done whilst the sequence is running, or by stopping the video sequence, repositioning the measurement line, then resuming the sequence by clicking on the play button.

5.3. Calculation parameters

There are several settings which control and effect the velocity correlation measurements. These are found in the Settings menu whilst the Linescan window is active.

5.3.1. Calculate cbv

This menu item needs to be checked to enable cbv calculation in the linescan window. If it off, then only the grey level pattern along the line is recorded.

5.3.2. Subtract scans

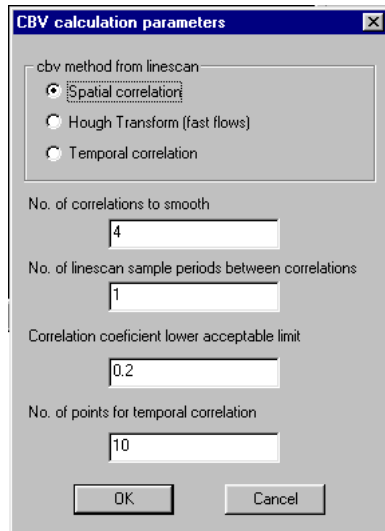
This is required to be on for most measurements except very slow flows. When checked each grey level profile is subtracted from the grey level profile of the previous field. This removes any static pattern which might give an overwhelming zero velocity correlation.

5.3.3. Set sample rate

The grey level profile along the line is, by default, sampled on every field of the video sequence. This setting allows a lower sampling rate for lower velocity measurements. It is recommended to leave this at the default value of 1 unless you are measuring for a long period (eg directly from the "live video" window with

truly live video or from video tape) and so need to reduce the memory requirements of the linescan window.

5.3.4. CBV calculation parameters



This dialog box enables fine tuning of the velocity measurement.

5.3.4.1. cbv method from linescan

This contains some experimental options. Please leave at the default "Spatial Correlation" setting

5.3.4.2. Number of correlations to smooth

This provides a smothing function to the correlations. Without smoothing, the cbv trace would have many intermittent short spikes. Increasing the number of corleations smoothed, reduces the peak correlation coefficient. Therefore the correlation coefficient limit will need to be adjusted to a lower value.

5.3.4.3. Linescan sample periods between correlations

Increase this value for lower velocities, to improve resolution.

5.3.4.4. Correlation coefficient lower acceptable limit

Use this parameter to remove noise from low correlations. Values below this limit will give a zero cbv value. Note that zero values are not included in the average calculations (but this can be changed see artifact filter).

Chapter 6. Movement Correction

6.1. Introduction

Movement artifacts in video sequences can be corrected either automatically, or manually by dragging the mouse. Individual images, selected images, or the whole video sequence can be corrected. These functions can be accessed using the Tools menu when a video sequence window is active.

Although good results can be obtained, it is always much better to try and make sure there is no movement in the first place, especially if velocity measurements are going to be made. For fast movements it will probably be better to split the images from frame into fields. There will still be blurring of the image, but this can be reduced beforehand by increasing the shutter speed on the CCD and increasing the light level to compensate.

6.2. Automatic Movement Correction

This function will try to automatically correct any movements in the video sequence. It uses a least squares fit pixel by pixel so it can take quite some time processing full frame video. It is best to experiment on a short (say 5 second) video sequence to get a feel for the performance on your computer. When selected, a dialog box allows some parameters to be adjusted so that you can trade off between processing time and correction accuracy.

6.3. Manual Movement Correction

There are two methods of manually correcting movement, "Tracking" and "Dragging"

6.3.1. Tracking

This function allows you to track an identifying feature on the image using the left mouse button. It is better than the Dragging function for manually correcting movement in video sequences.

You may also want to slow down the playback speed to make it easier to react.

Move the video to your desired start position, then click down the left mouse button on some feature in the image that you can follow with the mouse. If you want to correct a sequence of images, keep the left button down, so that the total correction so far is remembered for following images, then press the 'P' key to play the sequence. Follow the movement with the left mouse button down as the video plays. Release the left mouse button as soon as you want to stop corrections. If the image has stopped moving around, you will probably still want to keep the left button depressed until you reach the end of the video so that the remaining images are corrected too.

Note that this method uses the distance of the mouse from the position of the left button click as an offset to adjust to the current image's offset. When the button is released, no offset is applied. When you click again, a new offset correction is started.

6.3.2. Dragging

This function allows you to drag the image into the correct position using the left mouse button. It is probably most useful for correcting individual images, but can be used on sequences. If using on a sequence, it helps to have a dimension mark or line marking a feature than then be dragged back to the marking dimension line.

You may also want to slow down the playback speed to make it easier to react.

Move the video to your desired start position, then click down the left mouse button and drag the image to its corrected position. If you want to correct a sequence of images, keep the left button down, so that the total correction so far is remembered for following images, then press the 'P' key to play the sequence. Drag the image into position as the video plays. Release the left mouse button as soon as you want to stop corrections. If the image has stopped moving around, you will probably still

want to keep the left button depressed until you reach the end of the video so that the remaining images are corrected too.

Note that this method uses the distance of the mouse from the position of the left button click as an offset to adjust to the current image's offset. When the button is released, no offset is applied. When you click again, a new offset correction is started.

6.4. Reset movement correction offsets

Use the "Reset offsets" function in the "Edit" menu to clear all offsets back to zero. This works whether the offsets were created by the automatic or manual methods.

To clear just a range of images, first set the start and end image numbers in the "Edit", "Select images...".

Chapter 7. User Reference

7.1. Menu Commands

7.1.1. File Menu commands

7.1.1.1. New command (File menu)

Use this command to create a new Image, Video or Chart document in CapiScope. You can open an existing document with the Open Command.

Shortcuts Toolbar: Keys: CTRL+N

7.1.1.2. Open command (File menu)

Use this command to open an existing document in a new window. You can create new documents with the New Command.

Shortcuts Toolbar: Keys: CTRL+O

7.1.1.3. Close command (File Menu)

Use this command to close all windows containing the active document. CapiScope suggests that you save changes to your document before you close it. If you close a document without saving, you lose all changes made since the last time you saved it. Before closing an untitled document, CapiScope displays the Save As dialog box and suggests that you name and save the document.

7.1.1.4. Save command (File Menu)

Use this command to save the active document to its current name and directory. When you save a document for the first time, CapiScope displays the Save As dialog box so you can name your document. If you want to change the name and/or

directory of an existing document before you save it, choose the Save As Command. By default the image will be saved with the same name as the CapiScope document, but with a kkg extension (a KK Technology format). If you want the image to be saved with a different filename and/or format then use the Edit, Notes... function to change the image filename before saving the document. Note only the kkg format is supported for saving the ROI.

See Export.

To always save in a different format, edit the profile(s) (ini files in the program folder) using notepad. Add the following line:

```
imagetype=.bmp
```

Currently, the available formats are kkg (default KK Technology), bmp (windows bitmap), and tif (tagged image format).

Video sequence data is saved with a .mve extension (a KK Technology format). To save in an avi format use the Export as avi command (File menu)

Shortcuts Toolbar:  Keys: CTRL+S

7.1.1.5. Save As command (File menu)

Use this command to save and name the active document. CapiScope displays the Save As dialog box so you can name your document. To save a document with its existing name and directory, use the Save command. To save an image in a different format see the Save command and the Export command.

7.1.1.6. Export (Dimension List)

Use this function to save the dimension list as a TAB separated text file which can be easily opened as an Excel spreadsheet. see Also Export Image

7.1.1.7. Export (Image)

Use this function to save either the whole image, or if you currently have a Source ROI, just part of the image to disc. You will be prompted for a filename for the new

image file. Only the kkg format image files are fully supported at present. TIFF and BMP files are only supported as whole images, NOT the ROI. If the currently active window is a chart or Dimension list, then the data from that will be exported. See Export Dimensions

7.1.1.8. Export as avi

Use this function to export the video sequence as an avi format file. You will be prompted to select one of the available CODECs (Compressor/DECompressor) available on your computer. Note that not all CODECs can compress, some are just decompressors, and also, some may not be available on other computers; they may have been installed with another application. For uncompressed output, click on cancel.

7.1.1.8.1. AVI Output compression

Table 7-1. Analysis of compressors for AVI file output using 128 frame test file (.mve filesize=56,231,940 bytes)

CODEC	Compression Quality	Filesize (bytes)	Subjective Quality
VDOnet™ VDOWave	all	FAILED TO COMPRESS	
Cinepak Codec by Radius™	all	786,432	(2/10)
Intel™Indeo® Video R3.2	all	FAILED TO COMPRESS	
Intel™Indeo®IYUV	all	FAILED TO COMPRESS	
Intel™ 4.2.0 Video	all	FAILED TO COMPRESS	
Microsoft™ Video 1	lowest	508,928	(1/10)
Microsoft™ Video 1	highest	35,151,872	(7/10)
Microsoft™ RLE	all	56,789,504	(8/10)

CODEC	Compression Quality	Filesize (bytes)	Subjective Quality
Microsoft™ H263	0 - 100	FAILED TO COMPRESS	
Microsoft™ H261	0 - 100	FAILED TO COMPRESS	
Intel™Indeo® Video 5.04	lowest	292,352	(5/10)
Intel™Indeo® Video 5.04	highest	7,201,280	(10/10)
Intel™Indeo® 4.5	lowest	2,600,960	(4/10)
Intel™Indeo® 4.5	highest	14,127,104	(10/10)
Intel™Indeo® Video 5.10	lowest	2,473,984	(8/10)
Intel™Indeo® Video 5.10	highest	11,022,336	(9/10)
Divx MPEG4 Low Motion	lowest (1)	7,680	(0/10)
Divx MPEG4 Low Motion	highest (6000)	1,200,128	(10/10)
Divx MPEG4 High Motion	lowest (1)	7,680	(0/10)
Divx MPEG4 High Motion	highest (6000)	353,792	(7/10)
MainConcept™ DV Codec 2.0.4	N/A	FAILED TO COMPRESS	
Brooktree™ YUV 411 Raw(16)	N/A	84,352,512	(10/10)
Full Frames (uncompressed)	N/A	56,231,940	(10/10)

7.1.1.9. Import avi

Use this to import avi files into a video sequence. The CODEC used to create the avi file needs to have been installed on the computer. If it runs in the Microsoft

Mediaplayer, then it should load. Some avi files with compressed video may have incorrect headers and will not be decompressed. Mediaplayer probably guesses in these cases, but CapiScope will only correctly formatted files.

7.1.1.9.1. AVI Output compression

Velocity and quality comparison of a good quality video sequence (Demo.mve, 300 images, File Size: 86,020,804 bytes) using various video codecs. Tested with a 20um wide line from (304.8,116) to (296,199.2)

Table 7-2. Velocity results after video compression

CODEC name	Quality of image	Velocity (um)	% GOOD	Velocity error (%)	% of Uncompressed file size
Cinpak Codec by Radius™	Lowest	650.45	32	76.546	1.677
Cinpak Codec by Radius™	Highest	650.45	32	76.546	1.677
Microsoft™ Video 1	Lowest	0	0	-100	0.862
Microsoft™ Video 1	Highest	337.69	87	-8.344	62.506
Microsoft™ RLE	Lowest	368.43	93	0	100.452
Microsoft™ RLE	Highest	368.43	93	0	100.452
Intel™ Indeo® Video 4.5	Lowest	197.98	64	-46.264	0.676
Intel™ Indeo® Video 4.5	Highest	177.39	61	-51.853	16.555

CODEC name	Quality of image	Velocity (um)	% GOOD	Velocity error (%)	% of Uncompressed file size
Intel™ Indeo® Video 5.04	Lowest	299.59	97	-18.685	0.593
Intel™ Indeo® Video 5.04	Highest	349.76	91	-5.067	14.545
Intel™ Indeo® Video 5.1	Lowest	209.5	84	-43.137	12.812
Intel™ Indeo® Video 5.1	Highest	162.96	60	-55.769	14.545
Divx MPEG4 Low Motion	Lowest	0	0	-100	0.014
Divx MPEG4 Low Motion	Highest	512.92	96	39.218	3.0127
Divx MPEG4 High Motion	Lowest	0	0	-100	0.014
Divx MPEG4 High Motion	Highest	526.81	91	42.988	1.494
Brooktree™ YUV 411 Raw(16)	Lowest	368.12	92	-0.084	149.993
Brooktree™ YUV 411 Raw(16)	Highest	368.12	92	-0.084	149.993
Full Frames (uncompressed, no codec)	Lowest	368.43	93	0	100

CODEC name	Quality of image	Velocity (um)	% GOOD	Velocity error (%)	% of Uncompressed file size
Full Frames (uncompressed, no codec)	Highest	368.43	93	0	100

7.1.1.10. Import Image

Use this function to import an image into the currently active image. If the ROI is not empty, then it is possible to import into the destination ROI. The image size is not changed, or clipped by the destination ROI, but its top left corner is aligned with the destination ROI top left hand corner.

7.1.1.11. Open Cytoscan file

See the OPS Analysis User Guide for details.

7.1.1.12. Print Preview command (File menu)

Use this command to display the active document as it would appear when printed. When you choose this command, the main window will be replaced with a print preview window in which one or two pages will be displayed in their printed format. The print preview toolbar offers you options to view either one or two pages at a time; move back and forth through the document; zoom in and out of pages; and initiate a print job. Note the image will usually be printed with much better colour resolution than shown in preview mode.

7.1.1.13. Exit command (File menu)

Use this command to end your CapiScope session. You can also use the Close

command on the application Control menu. CapiScope prompts you to save documents with unsaved changes.

Shortcuts Keys: ALT+F4

7.1.2. Edit menu

7.1.2.1. Cut command (Edit menu)

NOT IMPLEMENTED YET FOR IMAGES - only available for charts. Use this command to remove the currently selected data from the document and put it on the clipboard. This command is unavailable if there is no data currently selected. Cutting data to the clipboard replaces the contents previously stored there.

Shortcuts Toolbar: . Keys: CTRL+X

7.1.2.2. Copy command (Edit menu)

NOT IMPLEMENTED YET - only available for charts. Use this command to copy selected data onto the clipboard. This command is unavailable if there is no data currently selected. Copying data to the clipboard replaces the contents previously stored there.

Shortcuts Toolbar:  Keys: CTRL+C

7.1.2.3. Paste command (Edit menu)

NOT IMPLEMENTED YET - only available for charts. Use this command to insert a copy of the clipboard contents at the insertion point. This command is unavailable if the clipboard is empty.

Shortcuts Toolbar:  Keys: CTRL+V

7.1.2.4. Clear All Dimensions

Use this command to clear all dimensions from the current document.

7.1.2.5. Notes

Use this to add notes to your CapiScope document. Also allows the image filename to be changed. The notes are printed with the image.

7.1.2.6. Smooth Selection Menu

Use this command to smooth the resulting Resistance Index trace

7.1.3. View Menu

7.1.3.1. View Toolbar command

Use this command to display and hide the Toolbar, which includes buttons for some of the most common commands in CapiScope. A check mark appears next to the menu item when the Toolbar is displayed. See Toolbar for help on using the toolbar.

7.1.3.2. Video Input Control

Use this command to Hide/Show the video input control.

7.1.3.3. Show Crosshair

Use this command to Hide/Show the Target Crosshair. (Used for marking the CAM1 laser beam position). To reposition the target crosshair, double click the right mouse button.

7.1.3.4. Grid

Use this to toggle the grid on or off. See Grid Settings to adjust spacing, style and colour of the grid.

7.1.3.5. 2D View Menu

7.1.3.5.1. Always on Top

Use this to make CapiScope always visible, even if another application is active.

7.1.4. Settings menu

7.1.4.1. Calibrate Magnification

Use this to calibrate the total optical magnification. Before calling this, create two straight dimension lines. Using something of a known length, create one horizontal line to calibrate the x axis, and one vertical line to calibrate the y axis. (You can use the same object, rotating it 90 degrees after marking one of the lines). In the Calibrate Magnification dialog box, enter the line numbers for the x axis and y axis calibration lines, and also their known true length, using your preferred user units. The magnification scaling will then be calculated. To see the resulting values, use the Magnification... option in the Settings menu.

7.1.4.2. Magnification

This opens a dialog box showing the current magnification scaling factors for the x and y axis. Usually these are set automatically using the Calibrate Magnification function.

7.1.4.3. Units

This allows one to choose between using calibrated user defined units, or pixels. All dimensions will be displayed using the current setting. The label for the user units is just a text label and has no other significance. It is recommended to use units so that dimensions and cursor position etc will be in the range of 1 to 1000. This is so that significant digits are displayed in the dimension list, and status bar. See Calibrating Magnification.

7.1.4.4. Timer

Use this to open the Timer Dialog and alter the timer settings. Number of images and time between images can be set. Also the base filename can be set. Each image will be saved using the base name plus two digits for the number in the sequence. If a file with the same name already exists, it will be overwritten without warning. The Start Timer button is disabled until the number of images has been set. TIP: a quick way to view the saved images is to open the Windows Explorer, and position it next to the CapiScope window. Then the image files can be dragged onto CapiScope from the Windows Explorer using the left mouse button.

7.1.4.5. Grid Settings

Use this to set the Grid style (lines or points), colour and spacing. The Grid always passes through the Origin. Use the Grid command to hide/show the grid.

7.1.5. Tools Menu

7.1.5.1. Pan Image

Use this to pan the image in its window, by dragging with the left mouse button. Note that it not possible to pan when the window is maximised. Also it is not possible to pan the image beyond the actual screen area. e.g. the top left corner of the image cannot be panned beyond the top left of the screen, even though it cannot be seen because it is outside the CapiScope window.

7.1.5.2. Region of Interest (ROI)

Use this to create a region of interest (ROI). Click and drag with the left mouse button to create the ROI. To move the ROI drag by holding down the left mouse button. To remove the ROI, select this function and just click the left mouse button.

7.1.5.3. Origin

Use this to set the origin (0, 0) in the image. All dimension starting points are relative to the origin. Also the Grid passes through the origin.

7.1.5.4. Counting

Use this mode to count capillaries by clicking with the left mouse button. A cross will mark each capillary counted, and the dimension list will show the location of each count. A count of the number of dimensions is shown on the status bar.

7.1.5.5. Dimension Lines

Use this to create straight dimension lines. Click with the left mouse button to add another node, double click or press escape key to end the line. The start position and total calibrated, or pixel length is shown in the dimension list.

7.1.5.6. Freehand dimension lines

Use this to create freehand dimension lines. Click with the left mouse button and drag whilst holding the left mouse button. The start position and total length in calibrated units or pixels is shown in the dimension list.

7.1.5.7. Grab Live Video

Use this to start and stop live video. The current image will be destroyed if it has not been saved. **WARNING:** there is no prompt to warn about losing the current image if it has not already been saved!

7.1.5.8. Freeze Video Input

Use this to freeze and capture the video image. The image is NOT automatically saved to disc.

7.1.5.9. Start Timer

Use this to start the capture and saving of a timed sequence of images. It is disabled until a valid number of images has been set. See Timer... for setting the timer.

7.1.6. Window Menu

7.1.6.1. New command (Window menu)

Use this command to open a new window with the same contents as the active window. You can open multiple document windows to display different parts or views of a document at the same time. If you change the contents in one window, all other windows containing the same document reflect those changes. When you open a new window, it becomes the active window and is displayed on top of all other open windows.

7.1.6.2. Cascade command (Window menu)

Use this command to arrange multiple opened windows in an overlapped fashion.

7.1.6.3. Tile command (Window menu)

Use this command to arrange multiple opened windows in a non-overlapped fashion.

7.1.6.4. Window Arrange Icons Command

Use this command to arrange the icons for minimized windows at the bottom of the main window. If there is an open document window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this document window.

7.1.6.5. Dimension List

Use this to Show/Hide the Dimension List.

7.1.7. Help Menu

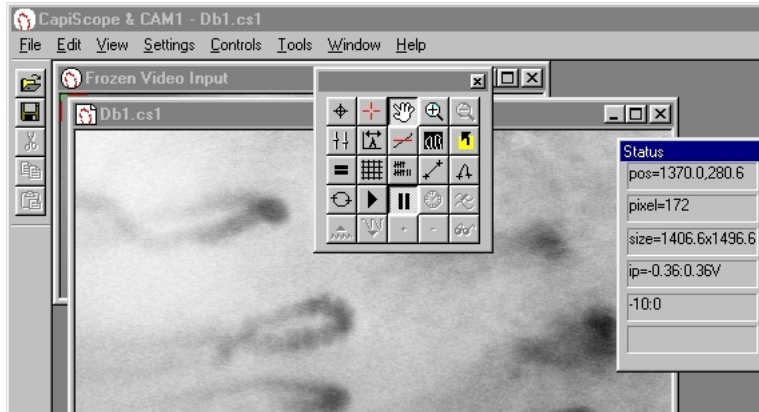
Click on Help to open this User Guide.

Click on About... to see what the current version of CapiScope you are using.

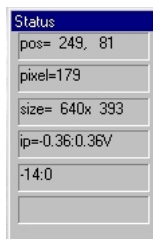
7.2. Toolbar



To hide or display the Toolbar, choose Toolbar from the View menu (ALT, V, T). The toolbar can be moved to any edge of the CapiScope window, or dragged away to become a floating toolbar. Click on the toolbar background with the left mouse button and drag to its new position. A floating toolbar can be resized by dragging its edge or corner.



7.3. Status Box



The status box displays information on the currently active window.

The indicators show (in order from top to bottom):

The cursor position in the currently selected coordinates. If not in pixels, then the coordinates will be in calibrated units.

Grey Level Image grey level (0-255) at current cursor position.

Object size, Image size, or ROI size in calibrated units or pixels.

Input voltage range. (black 0 to white 255).

Approximate Frame rate in frame per second.

7.4. Introduction to charts


Charts are documents that contain data in the form of traces. A chart can contain many traces. Traces can be moved between charts or duplicated, via the clipboard.

To copy a section of a trace to another chart, first select a section of the trace, copy to the clipboard, then paste into the other chart.

Traces can be smoothed (low pass filtered) and averaged. The results of average calculations are placed in *Results* documents. These can be saved to disc. Selected results from a Results document can be copied to a spreadsheet such as Excel via the clipboard.

7.5. Axes

7.5.1. Using the mouse

The x and y scales can be altered by clicking on the  or  buttons on the respective axes.

The view of the data can be scrolled along the x axis by using the ScrollBar on the bottom of the Trace window.

The left and right arrow buttons on the scroll bar scroll all the traces by one pixel.

Clicking with the left button on either side of the scroll box, the traces are scrolled 3/4 of the visible view. Dragging the scroll box scrolls the traces accordingly.

The y scale can be offset by clicking on the y axis with the left mouse button and dragging up or down. The y axis controls only effects the traces in the same Y group as the currently active trace.

7.6. Using the Keyboard

The x axis scale can be increased or decreased by using the '+' and '-' keys.

Use the up and down cursor keys for the y axis scale.

Use the Page Up, Page Down, Home, End, cursor left and right keys to scroll along the x axis.

See Keyboard below.

7.7. Traces

A trace window or file can contain more than one trace. Each trace has its own y axis, but only one y axis is visible at any one time. To activate a trace click on it using the left mouse button, or use the TAB key to activate the next trace. The currently active trace is indicated by its name displayed in the Status

7.7.1. Trace Properties

The trace properties can be altered by clicking the trace with the right mouse button or using the Trace Properties command in the edit menu. A Trace Properties Dialog box allows properties such as the trace name and trace colour to be altered. Note that some colours may not be printed on non-colour printers.

7.7.2. Selecting Trace Data

Click on the trace to select data by using the left mouse button. Drag the mouse whilst holding the left button down. Selected data will be highlighted.

Use the Copy Tool Bar button, <CTRL><Insert> keys or <CTRL>C keys to copy the data into the clipboard. In the current version this is stored in a private format which can only be used by CapiScope.

Use the '=' Tool Bar button to calculate averages etc. the results will be appended to the last activated Results window, or if no results windows are open then a new results file will be created.

7.7.3. Adding a Trace to a File

Use the Paste Tool Bar button or <SHIFT><Insert>, or <CTRL>V keys to insert data from the clipboard into the currently active trace window. If the window

contains a marked selection then the data will be copied to that location, otherwise it is copied to the start.

7.8. Display Rate

Data can be displayed at any rate independent of the data rate. Additionally two or more windows can be used to show the data at different rates. For example use Window|Duplicate Window to produce two views of the CAM1 monitor window. One could be set to a slow display rate to show long term trends whilst using the other window at a fast display rate to show the pulsatile component.

Display rate is controlled by using the x axis magnify/minify buttons.

7.9. Edit

7.9.1. Edit Copy command

Use this command to copy selected data from the active trace onto the clipboard. This command is unavailable if there is no data currently selected.

Copying data to the clipboard replaces the contents previously stored there.

Note that when copying large 2D colour traces, there will be two copies in memory. Also if this is then pasted into another document, there could be three copies in memory. This could cause the system to become very sluggish. It is a good idea to copy a small section of a line trace into the clipboard to release at least one copy from memory.

Shortcuts: Tool Bar  ; Keys: CTRLC, CTRLInsert

7.9.2. Edit Cut command

Use this command to remove the currently selected data from the active trace or the

whole active trace if there is no data currently selected and put it on the clipboard.

The 'cut' data is set to zero in the trace if a selection was used (ie memory is still used).

The active trace is removed from the chart if no selection was made.

Cutting data to the clipboard replaces the contents previously stored there.

Shortcuts: Tool Bar  .Keys: CTRLX; ShiftDelete

7.9.3. Edit Delete Command

Use this command to remove the currently active trace from the chart.

If part of a trace is selected, then the selection is set to zero, no memory is freed.

All unsaved data will be lost forever.

Not available in the monitor window.

7.9.4. Edit Paste command

Use this command to insert a copy of the clipboard contents at the insertion point or the beginning of the Chart (t=0) if there is no selection. This command is unavailable if the clipboard is empty.

Traces cannot be pasted into the Monitor window.

Shortcuts: Tool Bar:  Keys: CTRLV,SHIFTInsert

7.10. Markers

7.10.1. Event Markers

Event Markers are small flags which can be used to mark events, artifacts, or

Captured Images using CapiScope during a recording. Markers can also be added later to highlight a feature.

An Event Marker contains a label, which is shown on the flag, and a notelet, which can contain more detailed information. Event Markers are stored with the Chart, and are also Copied / Pasted to/from the clipboard together with the active trace.

Image Markers contain the filename of the captured image in the notelet.

Markers are added to a recording by pressing the space bar. This will generate a marker with a sequential number for the label, and will add the time and date to the notelet.

Alternatively, a marker can be created by pressing any key, the character from that key will be used for the label, and the time and date will be added to the notelet.

Image markers are added by pressing the F4 function key.

Markers can be added to a Chart by switching to Marker Mode and then clicking with the left mouse button to place a marker at the current cursor position.

Any marker can be edited by clicking on it with the right mouse button. This will open the Edit Marker box.

Markers can be edited as soon as they are created by enabling the Edit New Marks option in the Settings menu.

7.10.2. Edit Marker Dialog



This dialog allows the properties of the selected Event Marker to be edited.

The first line is the text displayed on the Event Marker flag, and the large edit box allows more descriptive notes to be added and saved with the marker. (Use <Ctrl> <Return> to add a newline to the note).

The marker is not updated until the Update button is clicked.

The dialog will show the properties of any newly selected marker if a different marker is selected whilst the Edit Marker Dialog is open. This makes it quicker to view the contents of many markers.

7.10.3. Edit New Marks

Enable this option to always open up the Edit Markers dialog box whenever a new marker is created. This is particularly useful if descriptive markers are required during recording. The suggested procedure is:

- (i) Press the spacebar to create the new marker. The markers position is set to the time at which the spacebar is pressed.
- (ii) Type in the label for the new marker and press return.

The only disadvantages using this method are that one or two data points may be lost whilst Windows creates the Edit Markers dialog box, and that the Doppler Spectrum trace is not redrawn when the dialog box is closed (WCAM1 disables the Doppler trace redrawing whilst recording to minimise lost data).

Note the new marker is not redrawn with the new label until recording is stopped.

7.10.4. Marker Mode

Use this to enable/disable the marker mode. When enabled, clicking the left mouse button will add an Event Marker to that position in the Chart.

7.10.5. Image Markers

If the KK Technology CapiScope™ imaging software is running, then images can be captured and saved to disc automatically from CAM1. A marker is also saved in the CAM1 chart, along with the unique filename of the captured image. Clicking on the marker with the left mouse button will reload the image into CapiScope automatically.

To create an image marker press the F4 function key.

The image will be saved in the current working directory of CapiScope.

The filename is created from the system clock which only has a resolution of 1 second. Therefore attempts to save more than one image in quick succession will result in the second image overwriting the first image.

7.11. Export data

Outputs trace data to a file in either binary or ASCII text. The ASCII text file can be loaded directly into Excel, the binary format is for users who wish to write their own data analysis programs.

7.11.1. TEXT

1. Output is in rows, each row corresponding to one pixel on the display x axis.
2. Each trace is output in a separate column(s).
3. Each Doppler spectrum is output in 256 columns (one column for each frequency)
4. Warning: Doppler spectrums will produce very large text files!
5. If 'no selection' is chosen, then data from left to right of the active view is used (even if the trace ends part way through).

7.11.2. BINARY

1. Every point (within selection if applicable) is output irrespective of the x axis scale.
2. If a trace is not in the selection (if applicable) then it will not be output.
3. Each complete trace is output one after the other.
4. Data is always output as 'raw' values.
5. File Format: [HEADER] DATA [HEADER] DATA [HEADER] DATA

6. HEADER FORMAT (total 128 bytes):

Table 7-3. Export data Header Format

type	bytes	description
long	4	no. of x points
long	4	no. of y points
int	2	no. of bytes per element
int	2	'?' (reserved for future versions)
double	8	x scaling factor
double	8	x offset
double	8	y scaling factor
double	8	y offset
double	8	z scaling factor
double	8	z offset
char[]	68	trace name (NULL terminated)

7. DATA FORMAT For line traces, the data consists of sequential array of elements, the first being the oldest point, the last is the youngest.

For 2D traces, the data is a sequential array of 256 or 64 point arrays.

Each 256/64 point array being one spectrum (0Hz - bandwidth).

7.12. FIR filter

Enables multi-tapped filtering of the current selection. A dialog box allows to enter the filename containing the weights for each tap.

For unity gain, the sum of the weights should equal 1.

For example, the following filter is similar to a 1 second RC filter but without the phase lag:

Table 7-4. FIR 1 second RC filter

WEIGHT
0.06
0.09
0.1
0.15
0.2
0.15
0.1
0.09
0.06

This command destroys the original data in the selection of the trace!

7.13. Import data

Enables a new trace to be created from an arbitrary ASCII or binary source file. Once the data has been imported, use the Trace Properties editor to enter the correct scalings.

See also Export Data.

7.14. Keyboard

The following list shows keyboard commands and shortcuts for using CapiScope.

Table 7-5. Keyboard commands and shortcuts

F1	Help
shiftF1	Context Help
F2	Increase bandwidth
shiftF2	Decrease Bandwidth

F4	Capture Image and save to disc
F6	Next window
shift F6	Previous window
F8	Calculate Average
F9	Laser ON/OFF
F10	Start/Stop recording
TAB	Activate next trace
up cursor	magnify y scale (halve full scale)
down cursor	minify y scale (double full scale)
+	magnify x scale
-	minify x scale
left cursor	scroll one pixel right
right cursor	scroll one pixel left
page up	scroll left 3/4 screen
page down	scroll right 3/4 screen
Home	move to start of active trace
End	move to end of active trace
ctrlN	File New
ctrlO	File Open
ctrlS	File Save
ctrlP	File Print
ctrlC	edit copy
ctrlInsert	edit copy
ctrlV	edit paste
shiftInsert	edit paste
ctrlX	edit cut
shiftdelete	edit cut

7.15. Remove Pulse

Use this function to filter the currently active line trace. (Does not work for Doppler

spectrums). Designed to remove the pulsatile component. Does not introduce any phase lag.

This command destroys the original data in the selection of the trace!

7.16. Selecting Data

Select data for Averaging or copying to the clipboard, or for Smoothing, or other calculations, by pressing down the left mouse button and dragging, whilst holding down the left button. Selected data will be highlighted.

If the active trace changed when the left button was pressed, switch back to the desired active trace using the TAB key. Switching traces using the TAB key preserves the selection.

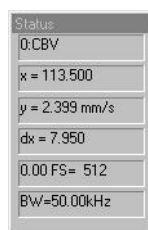
7.17. Smoothing Dialog

Set the time constant of the single pole rc filter to apply to the currently active trace.

Four common time constants are provided, or any other value can be set in the 'other' edit control.

Zero is a valid value. (No filtering will be applied, but the conditions set in the Artifact Filter Dialog will still apply.)

7.18. Status Box



7.18.1. Active Trace Name

The name of the currently active trace is shown here on the status box. Use the TAB key to change the active trace. Use the Trace Properties box to change the name

7.19. ToolBar



The Tool Bar is a feature common to many Windows applications. It allows quick access to most of the more commonly used menu commands.

The tool bar is displayed across the top of the application window, below the menu bar. The tool bar provides quick mouse access to many tools used in CAM1,

Sometimes some of the Tool Bar buttons will be inactive (dimmed). Usually this is when the button is not applicable to the currently active window.

To hide or display the Tool Bar, choose Toolbar from the View menu (ALT, V, T).

7.20. Calculating Averages

Use this command to recalculate averages. This command is only available when data is selected.

Averages, minimum and maximum are entered into the most recently active Results file. If no result file is open then a new one is created automatically. Each new

average calculation is appended to the Result file.

Data is taken from the active trace, from the leftmost selected point up to the rightmost point. Zero points are excluded from the average, but this can be changed using the Artifact Filter.

Dropout and noise artifacts can be excluded from the result by using the Artifact Filter.

Data can be selected from the result file and copied to any other Windows application. Perhaps the primary use will be to copy results into a spreadsheet application such as Excel.

7.21. Hide Trace



Use this command to hide the currently active trace. The trace remains active although it is hidden from view. Activating a hidden trace automatically reveals it.

7.22. Increase Brightness



Use this command to increase the 'brightness' of the currently active Doppler spectrum.

This actually reduces the value associated with the brightest colour of the current palette.

This only effects the displaying of the spectrum in the current view, it does not alter the actual data.

7.23. Decrease Brightness



Use this command to reduce the 'brightness' of the currently active Doppler spectrum.

This actually increases the value associated with the brightest colour of the current palette.

This only effects the displaying of the spectrum in the current view, it does not alter the actual data.

7.24. Smooth trace



Use this command to apply a single pole RC filter to the selection of the currently active trace.

The Smoothing box allows the time constant to be selected.

The Artifact Filter controls the action to take for signal dropouts and noise spikes.

This command destroys the original data in the selection of the trace!

7.25. Trace properties

Trace Properties

Labels

Name:

Y units:

X units:

OK Cancel Colour...

Data Properties

X units per data point: (sample interval)

Y scaling factor: Y zero adjust:

length: 2400 samples

Display Properties

X scale: X units/pixel Y scale: Y units/pixel

start position: X units Y offset: pixels

Y group:

This dialog allows properties of the currently active trace to be altered.

This dialog can be invoked from the edit menu, or by clicking the right mouse button over a trace.

7.25.1. Trace Name

Name used to describe the active trace. Displayed in the Status Box.

7.25.2. Y units

Y units of the active trace. This is a text string which can be edited by the user.

7.25.3. X units

The x units label. This is a text string which can be edited by the user.

7.25.4. Sample Rate

This shows the interval between samples in x units. Normally this should not be altered since it would have been set when the trace was recorded. (Or in the original trace from which this trace has been derived).

See also Data Rate.

7.25.5. Trace length

This shows the number of samples in the active trace.

7.25.6. Axes X scale

The scaling of the x units to screen pixels.

7.25.7. Trace Start Position

Alter this to shift the trace start position. Don't change the start positions of traces in the Monitor window.

7.25.8. Screen Y scale

The scaling of y units to screen pixels. Note that the Doppler spectrum y scale has to result in the trace being displayed as a power of 2 pixels high.

7.25.9. Screen Y offset

The offset used to shift the active trace in the y axis, in screen pixels. This value does not change with y scale changes. Easier to change by clicking the left mouse button on the y axis and dragging. (Set Y Group to -1 to offset just this trace.)

7.25.10. Y scaling factor

The scaling factor used to scale the stored data to the y axis scale.

7.26. Trace Selection Dialog

Select desired trace from list of all traces available. Some traces may be empty (have been deleted using Edit command) and some may not be appropriate for the operation. The command should fail safely if you make a bad choice.

7.27. View

7.27.1. Colour / mono Doppler spectrum

Use this command to switch all Doppler traces in all views between colour and monochrome display.

Remember to switch to mono before printing onto a mono printer.

7.27.2. Inverse Colours

This function reverses the colour coding of the Doppler spectrum. Useful for printing out onto non-colour printers, either to save ink or toner, or to improve the visual appearance.

7.27.3. Minimum to background

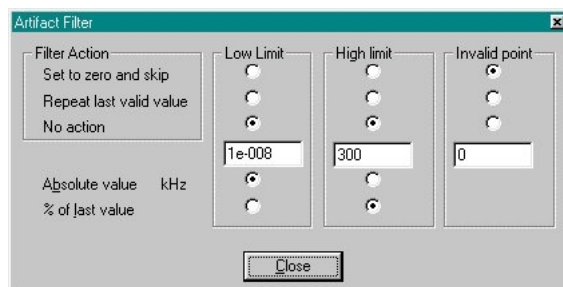
Use this set the colour of the lowest values to the same colour as the background. This is sometimes useful for printouts in order to either improve the appearance, or to conserve printer ink or toner.

7.28. Advanced Menu

This menu provides advanced functions, some of which are primarily for development purposes. To access this menu press [Ctrl]A.

WARNING: some of the undocumented functions do not have full error checking. Make sure important data is saved before using any of these commands.

7.29. Artifact Filter Dialog



The Artifact Filter dialog controls the action (if any) to take when the signal is above or below the specified levels. Used by the Average and Smoothing commands.

The low limit is primarily used for excluding dropout signals from average calculations. The default value, and 'Set to zero and skip' should be suitable for many cases. The dropouts may be from loss of signal due to tissue movement or gaps in the erythrocytes passing through the capillary.

The high limit is primarily used for excluding noise spikes generally caused by laser reflections from the tissue surface. This is not as effective as the low level filter, since it is difficult to distinguish between the sharp rise from the cardiac pulse and noise. Using an absolute value on small sections at a time may be most appropriate.

To apply only the artifact filter to a trace, Smooth the trace using a zero time constant.

7.29.1. Artifact Limit

Enter a value here for the limit of acceptable values. Either absolute values or percent of the last valid value can be used.

7.29.1.1. Absolute Value

Set the limit to an absolute value. Units of the currently active trace in the current view are used. Any values above or below this will be considered as artifact. Action to be taken is set by the Filter Action.

7.29.1.2. Percent

The percentage of the last valid value is used as the artifact limit. All values above or below this level are treated as artifact.

7.29.2. Filter Action

7.29.2.1. No Action

Ignore this artifact limit and calculate all points.

7.29.2.2. Repeat last valid value

The last value within the artifact limits is substituted for points falling outside the artifact limits.

7.29.2.3. Set to zero & skip

If the output of the operation is a trace then the result for any points falling above or below the limits will be set to zero.

In the Smoothing operation the artifact value is ignored and does not influence the smoothed trace. (No compensation for the missing time is made).

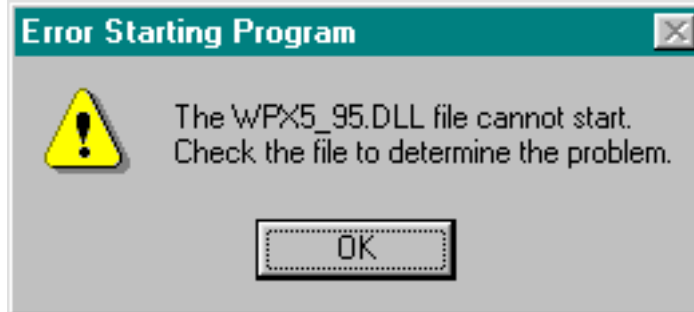
For the Average calculations the point is simply ignored.

Chapter 8. Troubleshooting

8.1. CapiScope does not start

- Check that that CAM1 has not been enabled in the ini profile file when there is no CAM1 interface card fitted. Edit all .ini files in the program directory (usually `c:\Program Files\KK Technology\CapiScope`). Change the line: `camEN=1` to `camEN=0`.
- If CapiScope does not terminate normally, the frame grabber may be not be freed properly. For the PX610, use the PXCclear program in the PX5 program group on the start menu. For the Matrox, you may need to shutdown the computer.
- The Matrox and Microsoft DLL files have been installed correctly, in either the CapiScope directory or the Windows, or Windows\System directory.
- The correct SuperPro software key has been fitted.
- If using the USB superpro key, or WindowsNT with the parallel port key, install the superpro drivers. Select "Run..." from the start menu, and enter:
D:\legacy\setup.exe /USB(replace 'D:' with your CDROM drive name).
- You are entering the correct codes when evaluating demo versions. A new code is required every month, and there are two codes: one to enable the demo version of the basic CapiScope then a second code to enable the optional dynamic features.
- Check enough memory has been reserved for the Imagination drivers. Select "Run.." from the windows start menu, and type **regedit** and edit the key "HKEY_LOCAL_MACHINE\system\currentControlSet\services\Vxd\PX5_95\memory size". This should be set to 0x200000 (hexdecimal). You will need to reboot the computer for any changes to take effect. Alternatively, reinstall CapiScope, and make sure the default 0x200000 memory is set in the Imagination setup program.
- For the Matrox MetroerII check memory allocation by right click on the "My computer" icon on the desktop. Select "properties", "Device Manager" tab. Select the MeteorII and click on Properties. In the Driver tab, it is possible to change the memory setting. Make sure it is at least 0x200000.

- If you get the following:



this is probably because of an old version of WPX5_95.DLL in the CapiScope folder. Copy the newer file from `c:\PX5\bin\WPX5_95.DLL` into `C:\KK Technology\CapiScope\`.

•

8.2. No video signal

- If no video is visible, check the frames per second indicator on the status box. It should give a value fluctuating around $\text{fps}=25.0$ (PAL European system) or $\text{fps}=30.0$ (NTSC US system).
- The video input is connected to the right input. For the ImagenationPX610, there are two BNC connectors. The lowest BNC is a trigger input, the top BNC (closest to the multipin 'D' connector) is the video input.
- The video source has been switched on. i.e. the IPS Isolator/Power supply (mains switch is on rear panel) and VCR.
- If using an LCD monitor, check the brightness and contrast settings. Sometimes the low contrast when out of focus just gives the impression of no video signal.

•

8.3.

.

Chapter 9. References

CapiScope User Guide

>>> CAM1 User Guide

VCS User Guide

Index

- 2D View menu, 31
 - always on top, 31
- Average, 48
- avi, 24
 - CODEC, 24
 - CODEC comparison, 26
 - compression, 24
- Brightness, 49
- Calculation parameters, 16
- Calibration Validity, 11
- Capiscope
 - status box, 36
 - toolbar, 35
- Cbv
 - calculation, 16
- Charts
 - Axes, 37
 - introduction, 36
 - scales, 37
- Data
 - export, 43
 - export (binary), 43
 - export (text), 43
 - import, 45
 - selecting, 47
- Dialog
 - artifact filter, 53
 - smoothing, 47
- Display rate, 39
- DLL missing, 56
- Doppler
 - spectrum brightness, 49
- Edit
 - copy, 39
 - cut, 39
 - delete, 40
 - paste, 40
- Edit menu, 29
 - clear dimensions, 30
 - copy, 29
 - cut, 29
 - notes, 30
 - paste, 29
 - smooth selection, 30
- Export
 - avi, 24
 - data, 43
 - dimension list, 23
 - image, 23
- File menu, 22
 - close, 22
 - exit, 28
 - export avi, 24
 - export dimension list, 23, 23
 - import avi, 25
 - import image, 28
 - new, 22
 - open, 22
 - print preview, 28
 - save, 22
 - save as, 23
- FIR filter Dialog, 44
- Help menu, 35
- Import
 - avi, 25
 - data, 45
- Ini files, 56
- Installation
 - Drivers, 8
- Keyboard
 - shortcuts, 45

- using in charts, 37
- LCD monitor, 56
- Magnification Calibration, 10
- Markers, 40
 - edit dialog, 41
 - edit new, 42
 - enable and disable, 42
 - event, 40
 - image, 41
 - image create, 42
- Menu
 - advanced, 53
 - edit, 39
 - tools, 32
- Movement, 16
 - movement correction
 - automatic, 19
 - dragging, 20
 - Introduction, 19
 - manual, 19
 - resetting offsets, 21
 - tracking, 20
- OPS
 - introduction, 1
 - step by step guide, 1
- Remove pulse, 46
- Sample Rate
 - Trace Properties dialog, 51
- Settings menu, 31
 - calibrate, 31
 - grid, 32
 - magnification, 31
 - timer, 32
 - units, 32
- Status Box, 47
- Superpro key, 56
- Toolbar, 48
 - Tools menu
 - counting, 33
 - dimension lines, 33
 - freehand dimension lines, 33
 - freeze video input, 34
 - grab live video, 33
 - origin, 33
 - pan image, 32
 - region of interest, 33
 - timer, 34
 - Trace
 - adding, 38
 - copying, 37
 - dialog, 50
 - hide, 49
 - length, 51
 - name, 51
 - properties, 50
 - properties dialog, 38
 - selecting data, 38
 - selection dialog, 52
 - smoothing, 50
 - start position, 51
 - view, 52
 - window, 38
 - troubleshooting, 56
 - Using
 - keyboard, 37
 - mouse, 37
 - Velocity
 - making measurements, 14
 - measurement theory, 12
 - View menu, 30
 - display toolbar, 30
 - input control, 30
 - show crosshair, 30
 - show grid, 31

Window menu, 34
 arrange, 35
 cascade, 34
 dimension list, 35

 new, 34
 tile, 34
WPX5_95.DLL, 56