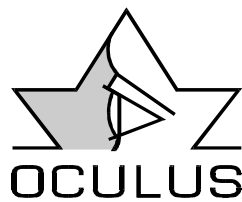


Pentacam/PentacamHR

Service Manual



Version 1.02

Copyright by

SM/70700/0609/e

Foreword

First of all, we want to say thank you for your interest in the OCULUS Pentacam/Pentacam HR. With this instrument, you look to a modern, highly developed product, which has been manufactured and tested according to the highest standards of quality.

The circumference of results and information the Pentacam/Pentacam HR provides after one exam is unique. We, the OCULUS Team, are sure that you will make an excellent profit with this product. It will combine enhanced diagnostic prospects in one instrument, allow a time saving, detailed pre-operative planning, a unique post-operative control and unbeatable patients education. It is designed for the cataract surgeons, the refractive surgeons, the cataract/refractive surgeons as well as for glaucoma screening in the anterior segment.

A product for now and, of course, for the future!

The literature guide was designed to summarize the studies, case reports, advertorials and manuals which are currently available. Of course this guide will never be complete since a lot of studies are currently running or just being published right after the release of this guide. But this is a clear indicator for the strong world wide interest and high acceptance of the Pentacam/Pentacam HR in ophthalmology.

A few words about us:

OCULUS was founded in Berlin in 1895. In 1947, the family-owned company moved to Wetzlar (60 km north of Frankfurt/Main), one of the center of the optical and fine-mechanical industry in Germany.

Today, more then 200 people are working in R&D, production, service and distribution of diagnostic instruments for physicians and optometrists.

Within the last years, the company has changed its profile and introduced innovative versions of traditional products and new technologies.



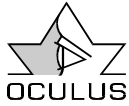
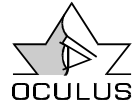


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1. General remarks

- Please read the complete instruction before you do any service on the Pentacam /Pentacam HR
- The service on the Pentacam unit should be done by a person that has received proper service training in the Oculus factory.
- The service should be done by a person who has received the necessary apprenticeship in electronics.
- Make sure that everything mentioned in this manual is well understood.
- Do not loosen any other parts or screws as the one shown and mentioned in the instruction.
- Do not disconnect any connector if it is not mentioned.
- Make sure that you have a anti-static working place.
- Do not touch the boards.
- Do not touch the optics.
- Always use a lint-free towel.
- The repair procedure is your own responsibility

2. Oculus Patient Data Management (Version 6.X) Configuration Settings

PC & Software requirements: Pack 2; MS Framework 2.0; Windows Vista
Windows 2000, Service Pack 4; MDAC 2.8, (32Bit Versions)
MS Framework 2.0; Windows XP, Service

2.1. Basic Device settings

To call up the configuration menu, click on the button  in the Patient-Data-Management, then go to „Devices“:

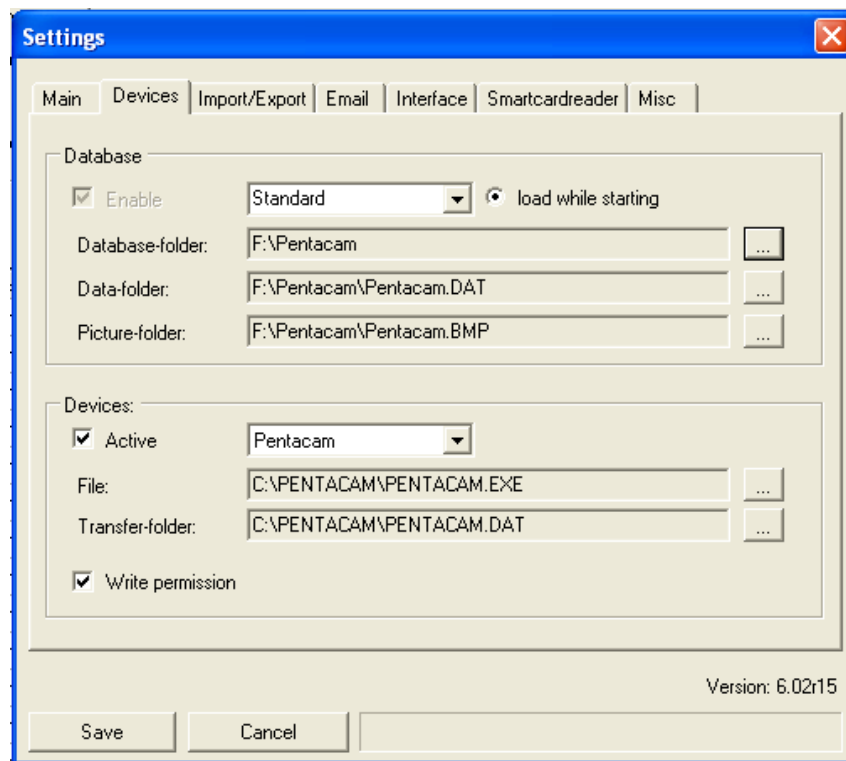



Figure 1, Pentacam patient data management settings

It is also possible to call up the network-directory via UNC-path, for example:

Database-folder: [\\Server\Pentacam](#)

Data-folder: [\\Server\Pentacam\Pentacam.dat](#)

Picture-folder: [\\Server\Pentacam\Pentacam.bmp](#)

Directories will be selected by the Browse -Function. To insert a folder manually is not possible!
Advantage: A directory which does not exist can not be selected.

Database:

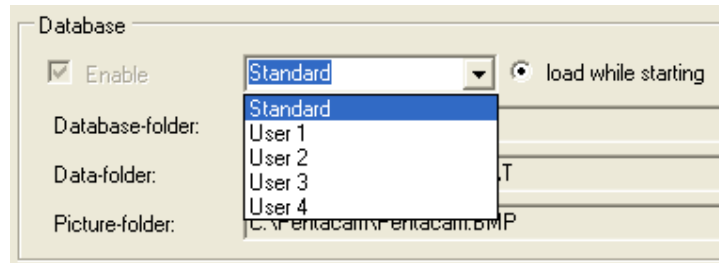


Figure 2; Database settings

Different Databases can be loaded as a source. This can be useful in a medical practice with more then one physician.

Database-folder: A folder in which the database will be saving data in the “Access”-format
 File name: „**catalog.mdb**“.

Data-folder: In this directory all patient and examination data of all instruments are stored.

Picture-folder: In this directory all images from examinations are stored.
 (Pentacam, Pachycam, Keratograph, Easygraph, ImageCam)

Devices:

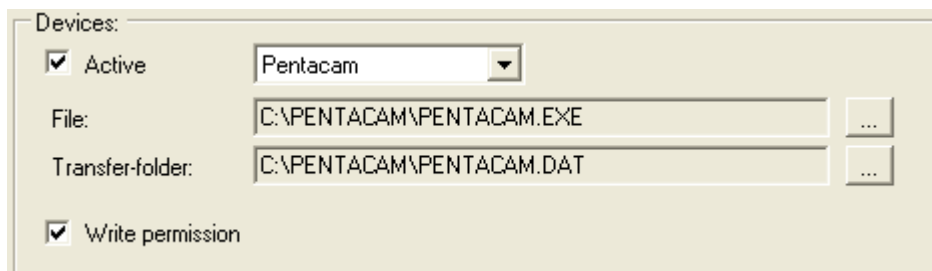


Figure 3, Pentacam Device Settings

All devices can be switched on or off with the function „Active“.

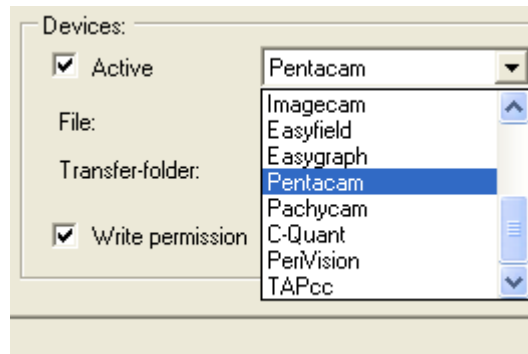



Figure 4; Pentacam device activation

A button will appear for every selected device in the Patient-Data-Management, for example:  to open the examination program.

File: Folder + name of program

Transfer-folder: The path in which the file "TEMP_PAT.DAT" is made available to the examination software. This path must always be "local" to avoid that other work stations can overwrite this temporary file.

Write permission: 1, if the examination software may write data. 0, if not.

2.2. Examples

2.2.1. Stand-alone solution with one instrument, Pentacam

GO Software (Patient-Data-Management) in „C:\PENTACAM“. Examination program in „C:\PENTACAM“

General parameters:	Contents:
Database-folder:	C:\PENTACAM
Data-folder:	C:\PENTACAM\PENTACAM.DAT
Picture-folder:	C:\PENTACAM\PENTACAM.BMP

Pentacam is „Active“:

Device parameters:	Contents:
File:	C:\PENTACAM\PENTACAM.EXE
Data-folder:	C:\PENTACAM\PENTACAM.DAT
Write permission:	1

2.2.2. Stand-alone solution with two instruments, Keratograph/Pentacam

General parameters:	Contents:
Database-folder:	C:\TOPO
Data-folder:	C:\TOPO\TOPO.DAT
Picture-folder:	C:\TOPO\TOPO.BMP

Keratograph is "Active":

Device parameters:	Contents:
File:	C:\TOPO\TOPO.EXE
Transfer-folder:	C:\TOPO\TOPO.DAT
Write permission:	1

Pentacam is "Active":

Device parameters:	Contents:
File:	C:\PENTACAMPENTACAM.EXE
Transfer-folder:	C:\PENTACAMPENTACAM.DAT
Write permission:	1

2.2.3. Network solution for one Pentacam and one read-only computer

→ All PCs must be in a network.

2.2.3.1. Pentacam -PC

GO Software (Patient-Data-Management) in "C:\PENTACAM"

Examination program in „C:\PENTACAM“

Server path e.g.: „F:\“:

General parameters:	Contents:
Database-folder:	F:\PENTACAM
Transfer-folder:	F:\PENTACAMPENTACAM.DAT
Picture-folder:	F:\PENTACAMPENTACAM.BMP

Pentacam has to be “Active”:

Device parameters:	Contents:
File:	C:\PENTACAM\PENTACAM.EXE
Transfer-folder:	C:\PENTACAM\PENTACAM.DAT
Write permission:	1

2.2.3.2. Read-only PC (viewer station)

GO Software in C:\PENTACAM

Examination program in C:\PENTACAM

Server path: “F:\”

General parameters:	Contents:
Database-folder:	F:\PENTACAM
Data-folder:	F:\PENTACAM\PENTACAM.DAT
Picture-folder:	F:\PENTACAM\PENTACAM.BMP

Pentacam has to be “Active”:

Device parameters:	Contents:
File:	C:\PENTACAM\PENTACAM.EXE
Transfer-folder:	C:\PENTACAM\PENTACAM.DAT
Write permission:	0

2.2.3.3. Server PC

Create Directories:

F:\PENTACAM

F:\PENTACAM\PENTACAM.DAT

F:\PENTACAM\PENTACAM.BMP

For Network installations: Important!

Every path in “Devices” parameter has to be local

3. Removing the covers



Figure 5, Power connector

- Switch off the Pentacam.
- Unplug the power cord from the wall outlet.
- Unplug the power cord from the Pentacam.



Figure 8, Remove front cover



Figure 6, Front cover screw



Figure 9, Rear cover screw

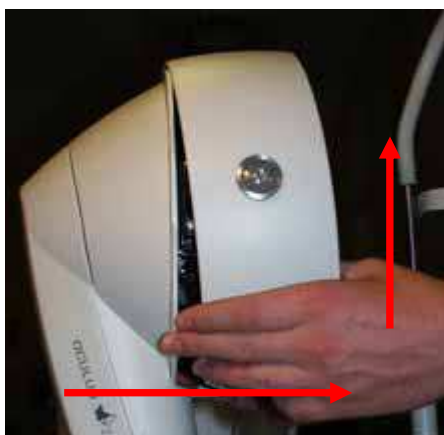


Figure 7, Dismount the front cover

- First move the front cover towards the head and chin rest.
- Secondly push the front cover upwards.



Figure 10, Rear cover

- First move the rear cover backwards.
- Secondly push the rear cover upwards.

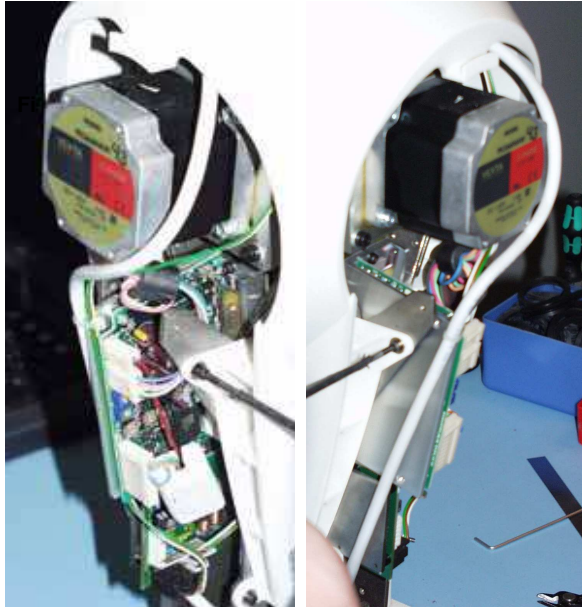


Figure 11, Front shield screws

- Loose the 4 screws of the front shield.



Figure 12, Front shield

- Pull the front shield down.

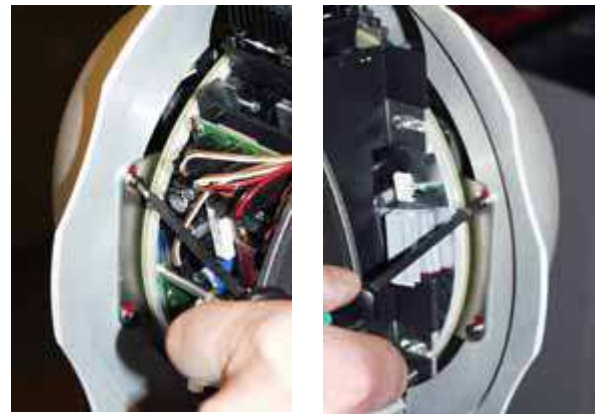


Figure 13, Rear shield cover screws

- Loose the four screws of the rear shield.



Figure 14, Removing the rear cover

- Remove the rear shield.

4. Cleaning of the internal circuit path

- Remove the covers.
- Use a lint-free towel.
- Use high proof alcohol.
- Wrap the towel around a screwdriver.
- Immerse the towel with high proof alcohol.
- Clean the circuit path as shown in **Figure 15**.
- Rotate the shield during the cleaning process into the shown direction.
- Re-assemble the housings in the opposite direction carefully and check its operation well.

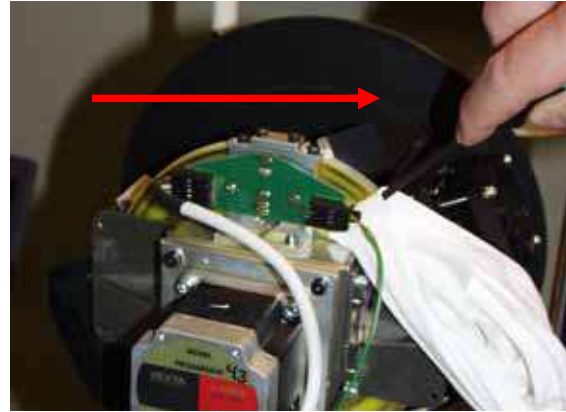


Figure 15, Circuit path

5. Output files

The Pentacam program offers several output files which contain a lot of data and values from the patient examinations. There are different types of files which are explained at the “chamber” files:

- chamber-load.csv
- chamber.csv
- chamber-load.dif
- chamber-load.csv.

The file endings .csv and .dif are necessary because there are different Microsoft Excel™ software versions released. The difference is the separation between the columns, a comma or semicolon. Select the one in which the data

are displayed correctly after opening them in Microsoft Excel™.

The files with the annex “-load” contains the examination data of the patients which were opened once. This means that patients examination data which were imported from another system will be found there after loading them once.

The files without the annex “-load” contains data of patients which were examined with the individual Pentacam. patient data. This means that patients examination data which were imported from another system will never be found there.

6. Test Tool

6.1. Basics

The test tool measurement should be performed to:

- Activate Corneal Wavefront in the Zernike Display
- Check corneal thickness values, corneal curvature and anterior chamber depth

The necessary conditions to perform this measurement are:

- software version 1.17r20 or higher has to be installed
- Pentacam head has to be switched on for at least one hour
- clean the windows on the Pentacam with a paper cloth; please use a local glass cleaner, no acetone or other high proof alcohol



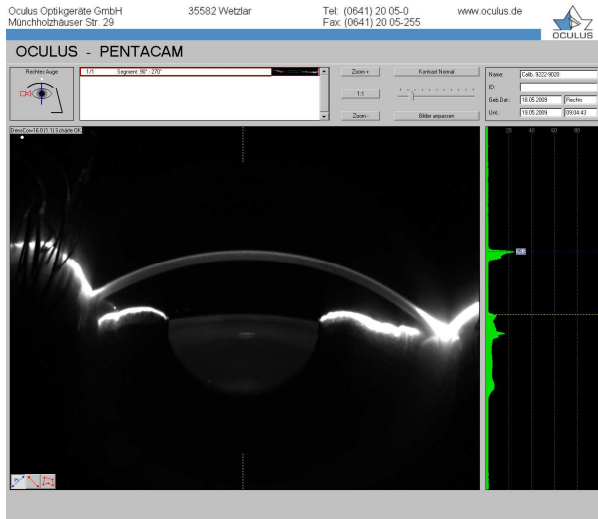
Fixation Camera

Scheimpflug Camera

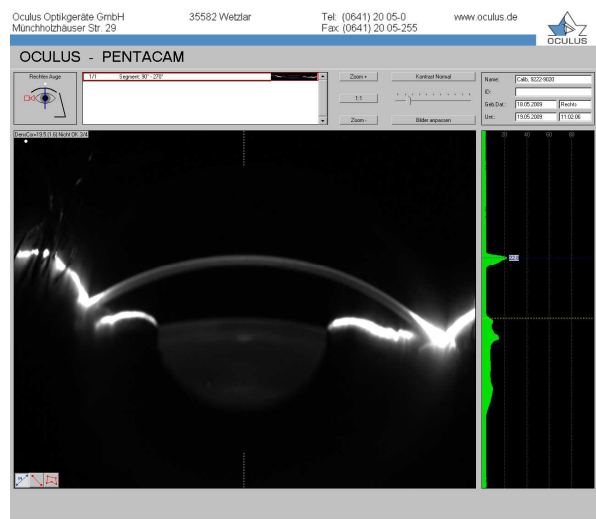
- assure dark environment conditions

Before performing the measurement with the test tool it is essential to control the quality of the Scheimpflug images. If the quality is not sufficient enough the test tool measurement can not be performed. Therefore make a measurement before you perform the adjustment and compare it to the images below:

Pentacam Basic or Classic

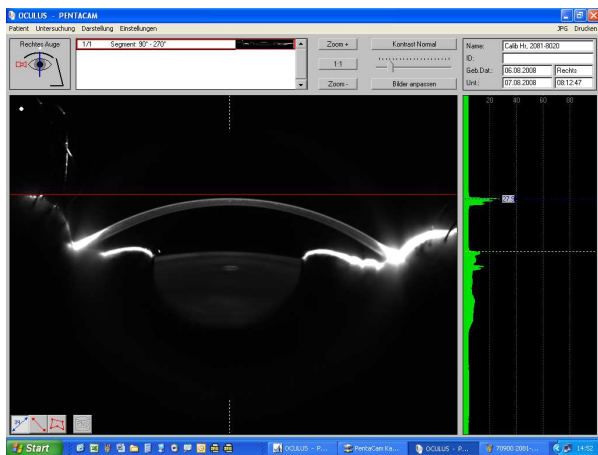


quality is sufficient

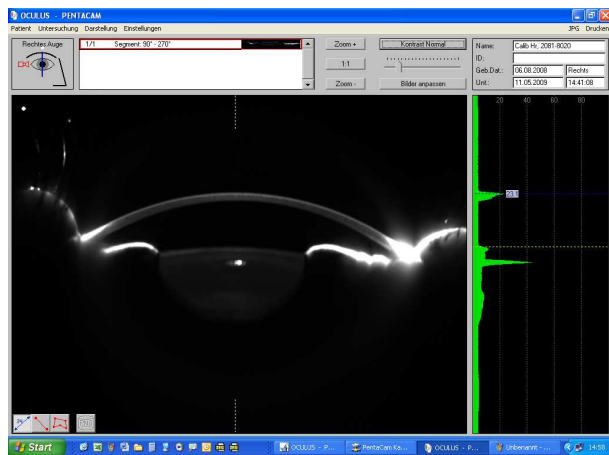


quality is not sufficient

Pentacam HR



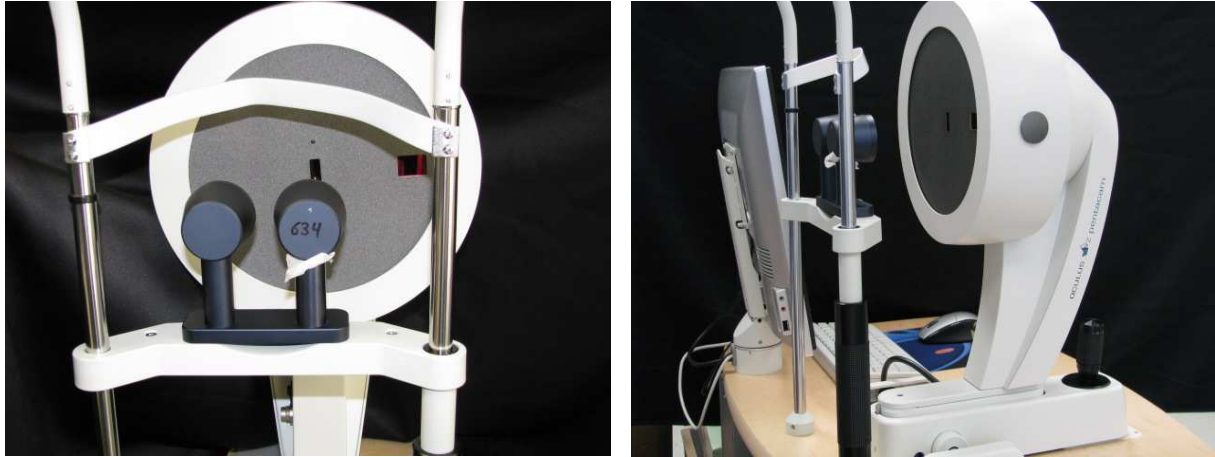
quality is sufficient



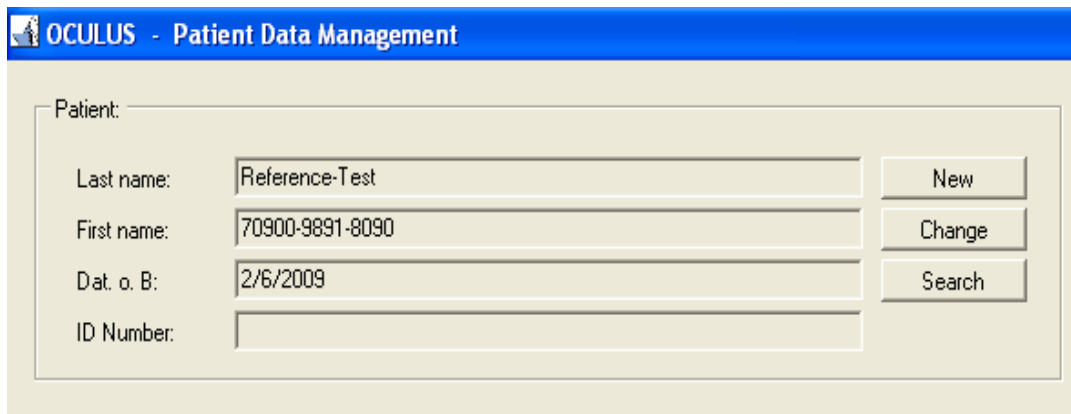
quality is not sufficient

More examples can be found on the Service CD which is handed over after the service training to every participant.

6.2. Alignment of the test tool



- put the test tool on the chin rest
- bring the x-y-z base to its lowest position
- adjust the head and chin rest so that the test tool for pachymetry is at same position as the measuring window
- open the patient data management and create a special patient as suggested below:

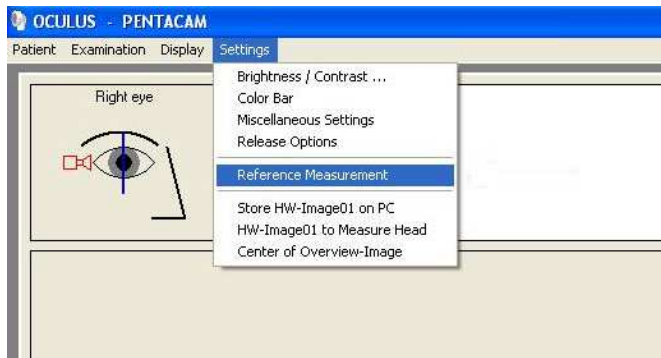


OCULUS - Patient Data Management		
Patient:		
Last name:	Reference-Test	New
First name:	70900-9891-8090	Change
Dat. o. B:	2/6/2009	Search
ID Number:		

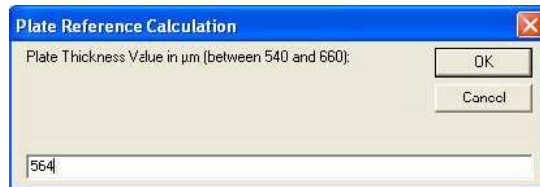
put in the serial number of the Pentacam head and the date you perform this test

- start the Pentacam program while having the above patient selected
- press the F12 button

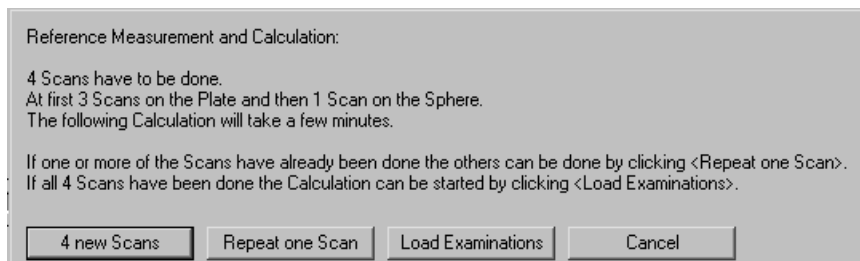
- press the button "settings" and than "reference measurement" (without pressing F12 these options are not available)



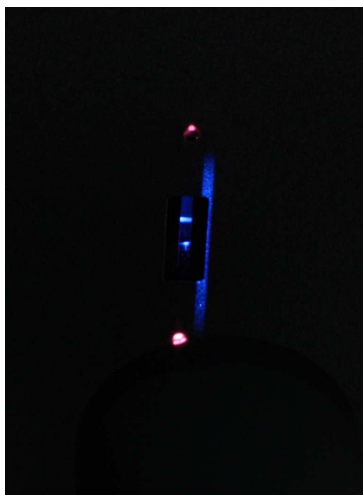
- the software will guide you now:
 - put in the value for the thickness which is individual and can be found on the back side of the test tool



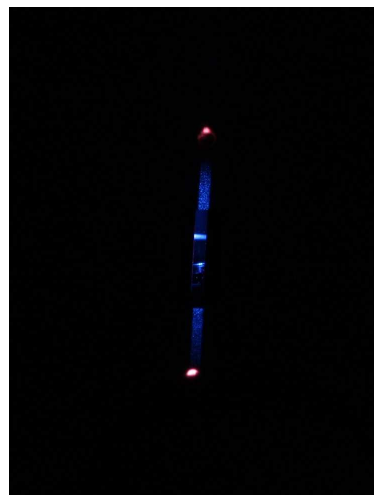
- now the following message will appear:



- align the test toll under dark room conditions using the slit beam while checking the vertical slit reflection:

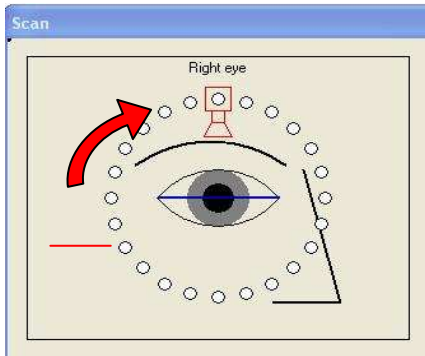


out of range



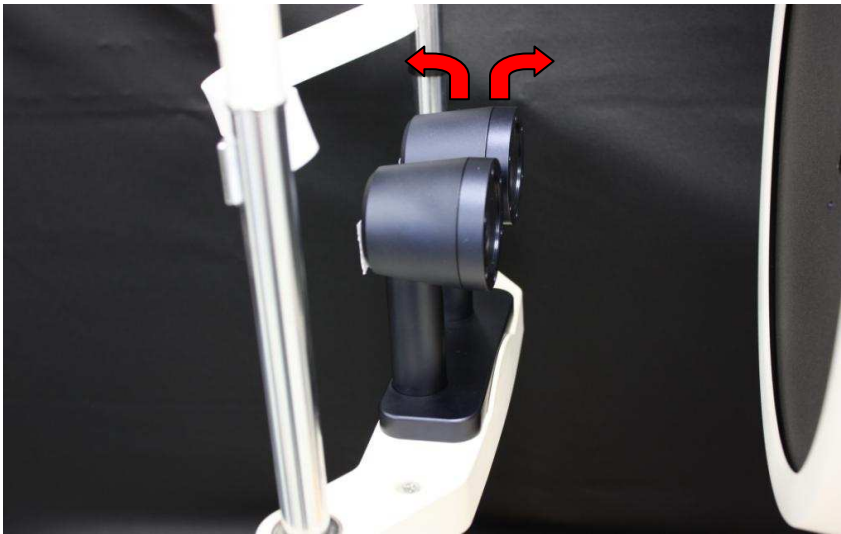
adjustment ok

- align the test toll under dark room conditions using the slit beam while checking the horizontal slit reflection:



adjustment ok

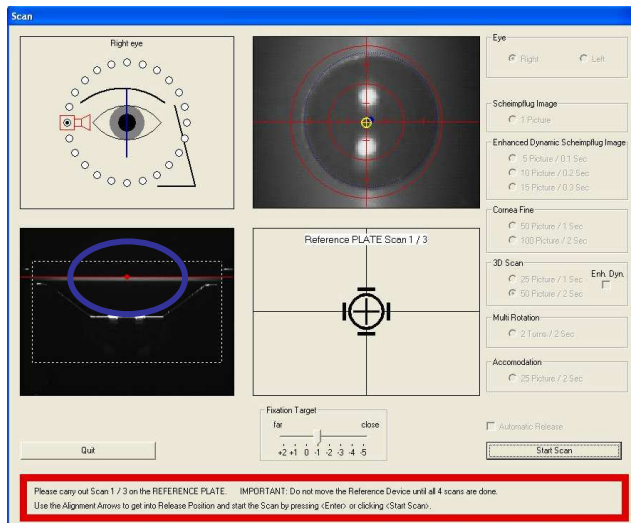
- if the reflected slit beam does not appear as displayed above change the position of the test tool as shown below:



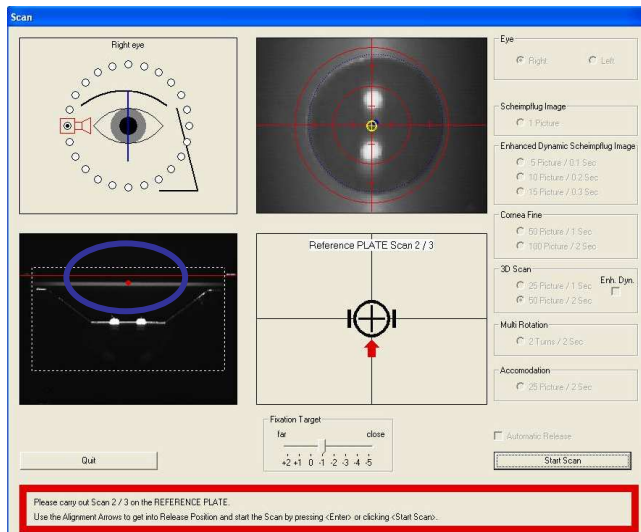
if necessary put some sheets of the chin rest paper under the test tool to compensate for a possible tilt

- double-check the vertical position again
- adjust the release position while moving the Pentacam – not the test tool!! –make sure that the test tool remains in the adjusted position during the test procedure, evtl. While fixing it with tape

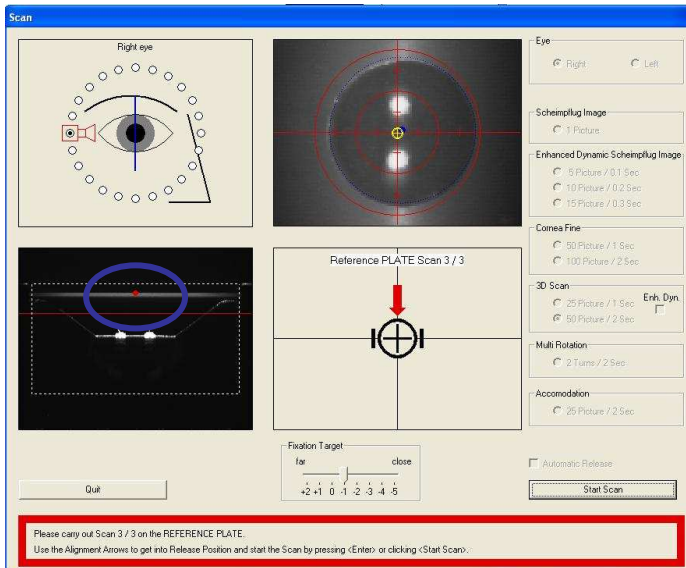
- if it is adjusted as displayed below, start the first scan manually, please refer always to the instructions, framed in red



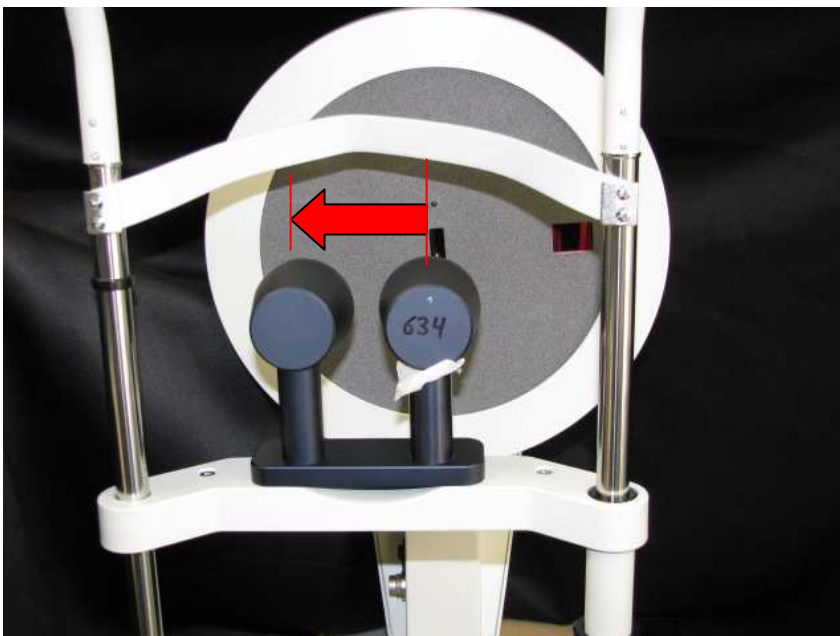
- adjust the Pentacam head again until you got the position as mentioned below and start the second scan manually



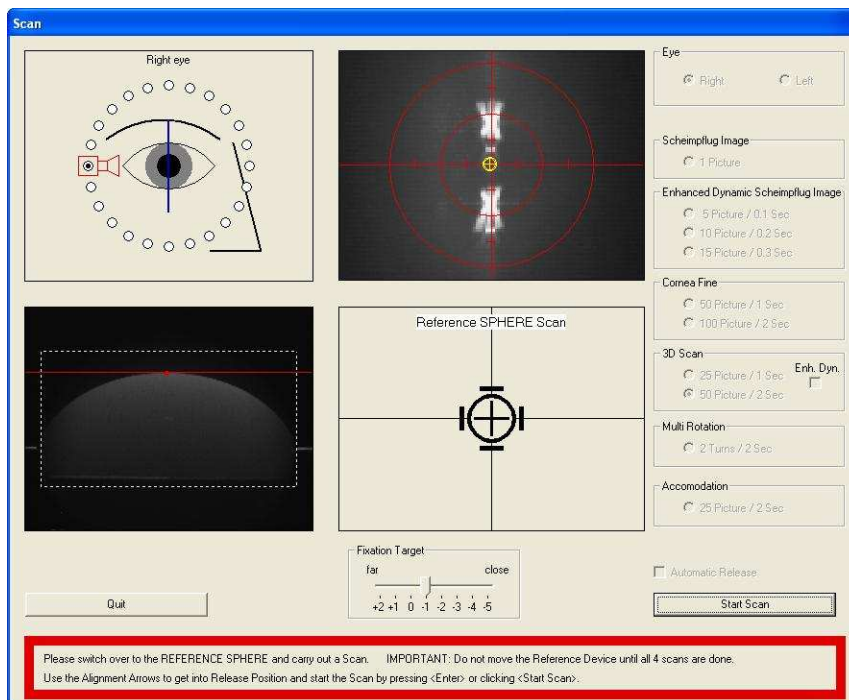
- adjust the Pentacam head again until you got the position as mentioned below and start the third scan manually



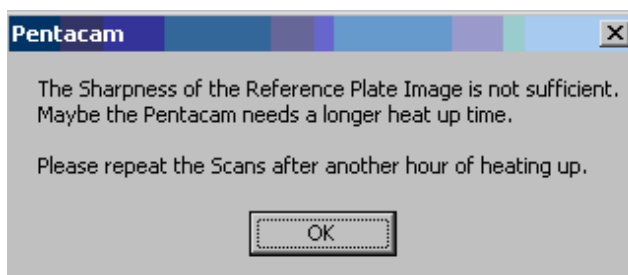
- Move the Pentacam head to the second test eye (sphere) without moving the test tool; the following message appears:



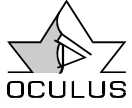
- Adjust the release position as shown below while moving the Pentacam head and release the measurement manually while pressing the start scan button.



- Now the system starts a series of calculation – please do not press any button – it can take some minutes depending on the speed of the connected PC
- If the measurement was performed correctly
 - go to the patient data management, export the examinations which were performed using the u12 export function and sent it to service@oculus.de
 - fill out the adjustment protocol and return the form to service@oculus.de
- If the measurement could not be performed because of an Scheimpflug image which is not sharp enough the following message appears:



- In this case the units has to be returned to Oculus



7. Errors and tests to fix them

7.1. No communication with Pentacam

1. Check all cable and connectors.
2. Check, if you can move the Pentacam face wheel by hand.
3. Yes:
4. Check power supply from P-Cam,
 - a. LED is blinking: internal failure, PWR-board broken, send the unit back to OCULUS
 - b. LED is on, internal failure, PWR broken, send the unit back to OCULUS
 - c. LED is off: check the voltage supply, if that is ok, power Bus supply is damaged, exchange power supply.
5. No:
 - a. Switch off the P-Cam
 - b. Connect only the USB-Hub to the PC/Laptop
 - c. Check the device manager, if under USB-controller the USB-Hub was found, test the USB hub with another USB device.
 - d. Not found, USB-Hub is damaged, replace that part.
6. Yes: USB-Hub is ok, go ahead.
7. Connect all the cables to the USB-Hub and switch on the Pentacam.
8. Check the device manager, if under USB-controller the Oculus Bootloader or the Oculus Pentacam was found. Please refer to **Figure 16**, **Figure 17**.

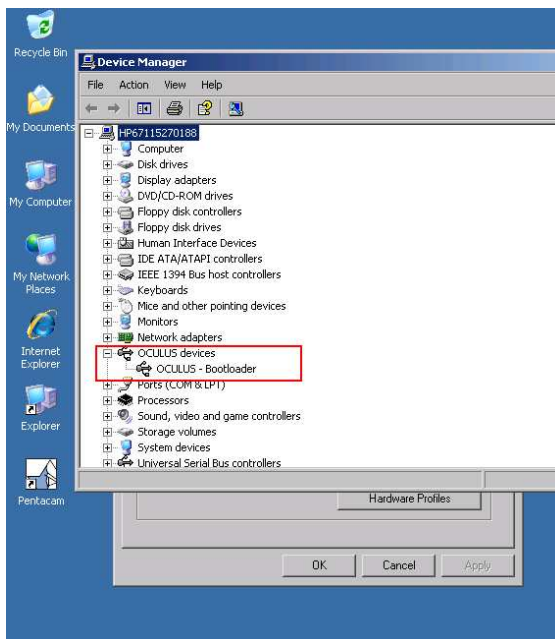


Figure 16, Oculus bootloader

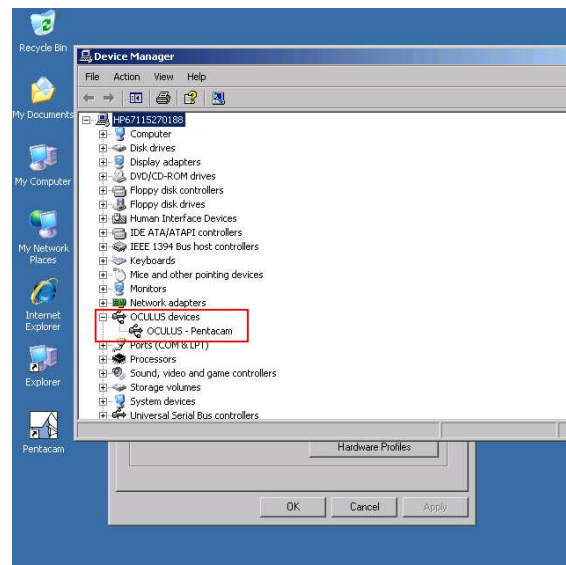


Figure 17, Oculus Pentacam

9. If yes, the Pentacam should work. If the Pentacam is still not working do to step 13.
10. If not, please go ahead.

- a. No communication:
 - b. Switch off the Pentacam.
 - c. Connect the USB-Hub to another USB-port.
 - d. Switch off the Pentacam.
 - e. Rename the Pentacam folder.
 - f. Install the Pentacam software and the drivers as it described in the installation manual.
11. Still no communication
- a. Switch off the Pentacam.
 - b. Call file "ClearDriver" in directory "C:\Pentacam".
The software will uninstall "OCULUS-Bootloader" and "Pentacam device driver".
 - c. During the "SETUP" of "Clear driver, a table will appear where both items must be selected.
 - d. After the Pentacam is switched on, the "Hardware Assistant" of Windows will appear. Follow the Assistant, choose the directory "C:\Pentacam\Driver" for the Driver-path. The "Hardware Assistant" will appear twice for the "Bootloader" and the "Device driver".
12. Still no communication
- a. Check the Y-cable and exchange it if necessary. You can check the y-cable with another Pentacam only. Go back to step 6.
 - b. Check the Pentacam log file in the folder c:\Pentacam which will be created after an error appears. Please sent this file to Oculus so that we may help you with further instructions.
13. Contact the OCULUS Service department.

7.2. Alignment Error

Symptom:

Automatic start of the scan does not work. The pupil center and apex position is not shown in the pupil image.

Procedure:

1. If this error appears the Pentacam has to be sent back to Oculus because all camera problems can not be fixed in the field.
2. The pupil image in the scan menu displays as shown on the right hand side.
3. Send the unit back to Oculus.

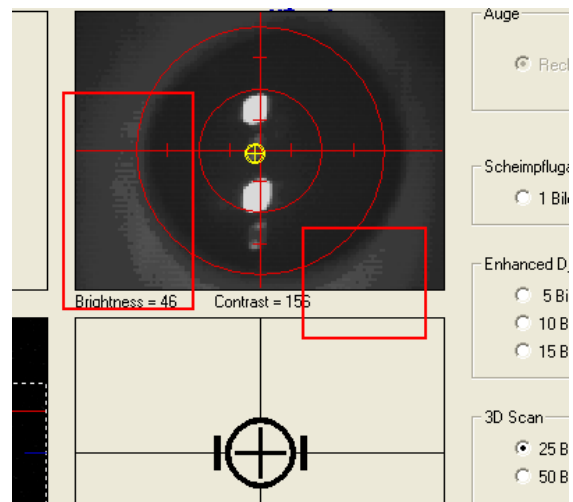


Figure 18, Grained pupil image

7.3. Right / left detection error

Symptom:

No reaction in the scan menu while moving the Pentacam head from left to right and back. The right / left position is not shown in the scan menu too.

Reasons:

- bad connection between Pentacam head and base.
- No magnets mounted under the rails.
- Right/left detection boards are defect.

Procedure:

- switch off the Pentacam,
- disconnect the connector cable,
- disassemble the Pentacam head from the x-y-z base,
- clean the three contact on the contact board mounted on the x-y-z base. Please refer to **Figure 19**, Connector board,



Figure 19, Connector board

- check if the magnets are mounted under the rails,
- check the boards which are mounted under the x-y-z-base, Please refer to chapter 7.2 Alignment Error.

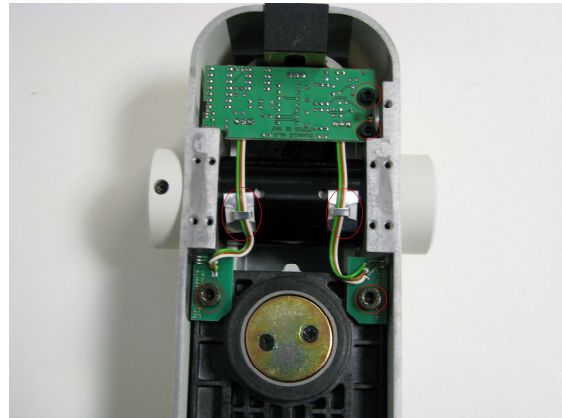


Figure 20, Right/left detection boards

- re-assemble the Pentacam head,
- connect the connector cable,
- switch on the Pentacam,
- check the right / left position detection in the scan menu,
- if it does not work exchange the right/left detection boards. Please refer to chapter 7.4 Exchange the right/left detection boards.

7.4. Exchange the right/left detection boards

1. Switch off the Pentacam,
2. disconnect the connector cable,
3. disassemble the Pentacam head from the x-y-z base,
4. disassemble the x-y-z base from the metal plate or height adjustable table.
5. Loosen the screws which are holding the boards. Please refer to **Figure 20**.
6. Exchange the boards.
7. Adjust the poti to the same position as it was on the old unit before.
8. Reassemble the x-y-z base and the Pentacam head.
9. Connect the power cord and switch on the Pentacam
10. Start the Pentacam program and then the scan program.
11. Move the Pentacam head from the left to the right and backwards and check in which position of the x-y-z- base the indicator for right and left detection switches.



Figure 21, Right/left position detection

12. Using the poti mounted on the left hand side, operator view, of the x-y-z- base the switching position between left/right can be adjusted.



Figure 22, Poti for right/left detection

13. Rotating the poti to the right hand side moves the switching point to the right, please refer to **Figure 21**.
14. There is a hysteresis zone in the center of app. 10mm which has to be considered too.

7.5. Exchanging the internal cooling fan

Symptom:

No fan sound is audible or a very noisy sound is audible after going to the scan menu

Procedure:

1. Remove the housings like it is described in chapter 3 Removing the covers, page 10.
2. Check if the cooling fan is truly the reason while disconnecting the connector cable from the fan from the PWR board.

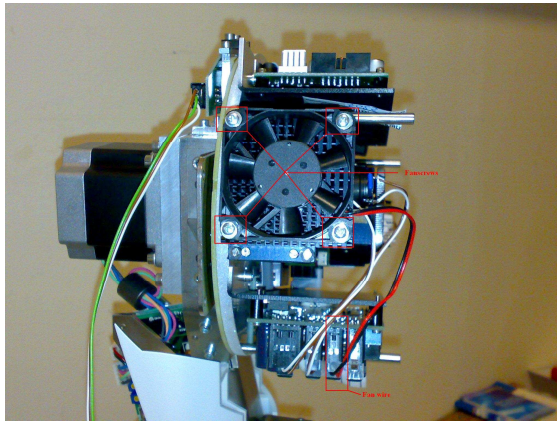


Figure 23, Cooling fan screw position

3. Switch on the Pentacam and go to the scan menu.
4. The noise should be off if not the cooling fan is not the reason but the internal prism motor.
5. If this is the case send the unit back to Oculus.

Caution, it is not allowed to operate the Pentacam longer than 5 seconds without the cooling fan in the scan mode. If it is operated longer the unit will overheat and be damaged. Oculus will not grant any warranty!

7.6. Rotating problems

Symptoms:

- Pentacam moves sometimes fast, sometimes slow.
- Pentacam decreases or increases rotating speed.
- Measurement procedure interrupts.
- Reference process can not be completed.
- Zero position error appears.

Procedure

1. Remove the covers like it is described in chapter 3 Removing the covers, page 10.
2. Unplug all cables from the step motor control board. Please refer to **Figure 25**.
3. Adjustment of the potis and switches have to be done as it was done on the old (damaged) board. Please refer to **Figure 24**.



Figure 24, Poti and switch positions

4. Exchange the defective step motor control board against a new one. Please refer to **Figure 25**.

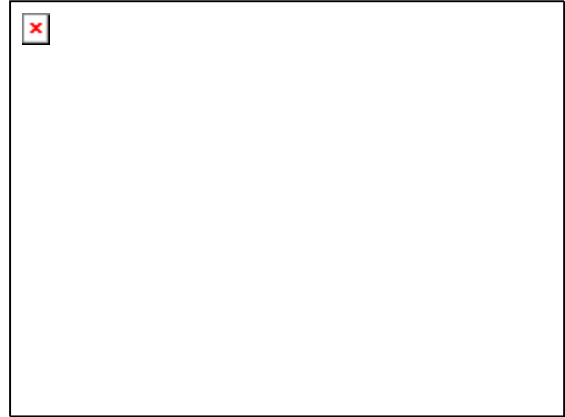


Figure 25, Exchange the step motor control board

5. Check the system. If it does not work.
6. Exchange the Step-Dir Decoder board. Please refer to **Figure 26**.



Figure 26, Step Dir Decoder Board

7. Reassemble the covers, connect the connector cable and check if the system works properly.

7.7. Error Code 90

General error of the software. Rename the directory Pentacam and make a new installation of the Pentacam software. After this

copy the files "PENTACAM.INI and GO.INI resp. GO.XML from the previous renamed Pentacam directory.

7.8. GFA Runtime Error 002

This error appears only with the old patient data management till version 2.73.r19. There are several reasons which may cause this

error message. Please refer to all of the mentioned examples below.

7.8.1. Reason 1, Not enough permissions of the current user

- Allow administrations rights in the current profile
- Approve rights in the current directory, please refer to **Figure 27**.

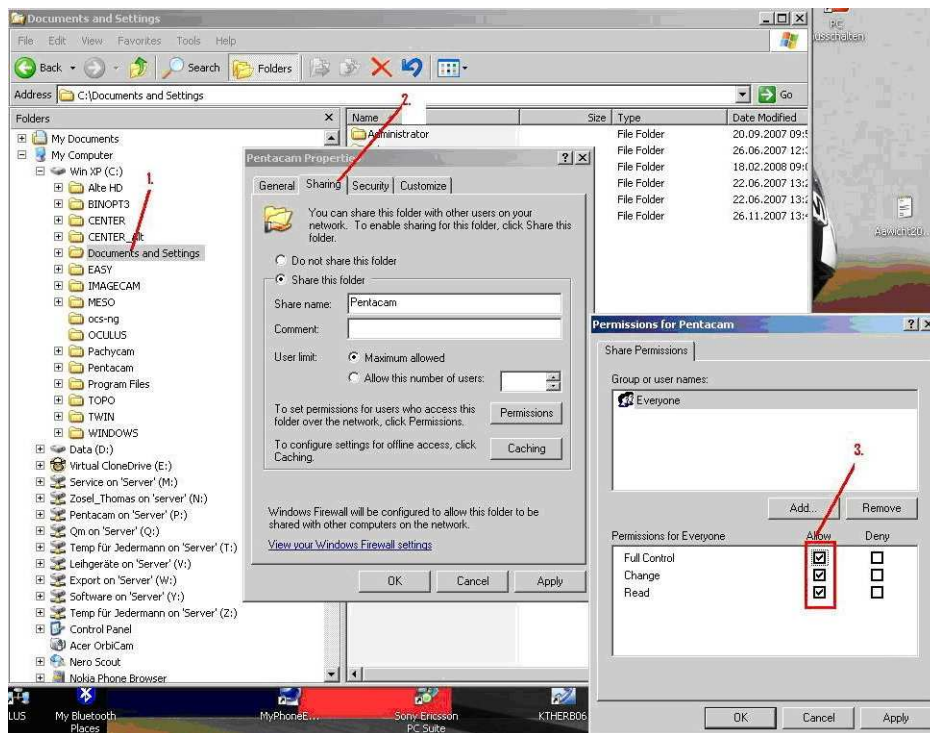


Figure 27, Administration rights

7.8.2. Reason 2, Data and picture path settings are incorrect

The path of the data and pictures in the LUS menu are not correct which means the network drive is blocked or not defined. Make the correct settings in accordance to your local

needs. After a double click on the device, eg Pentacam button type in "lus". The configuration window shown in Figure 28 opens.

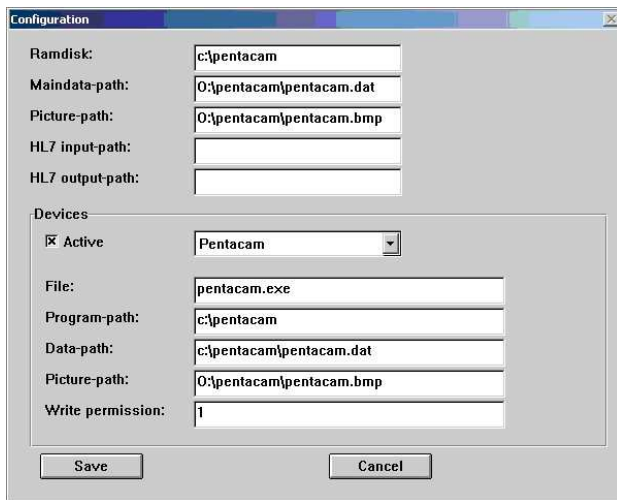


Figure 28, LUS configuration menu

7.8.3. Reason 3, Not enough memory for the application

Reserve memory for the application as it is shown in Figure 29.

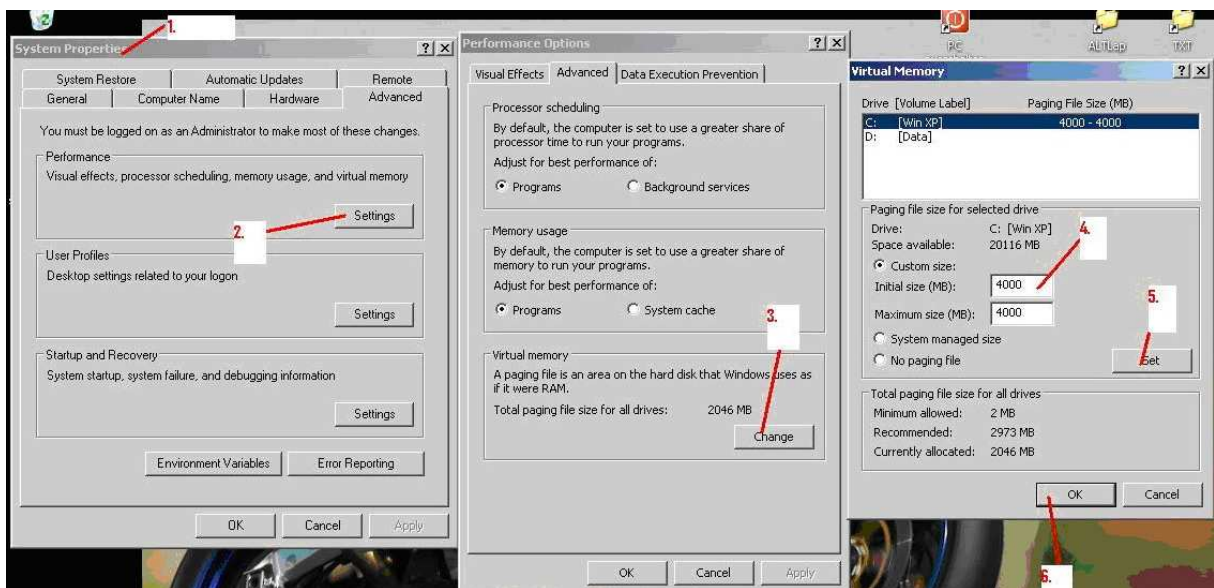


Figure 29, Memory assignment

7.8.4. Reason 4, Graphic card performance

If the image format is very slow the current driver of the graphic card has to be downloaded from the manufacturer homepage and updated. The old driver has to be

deleted/renamed first, see **Figure 30**. Eventually a new installation of the graphic card or restart of the PC is necessary.

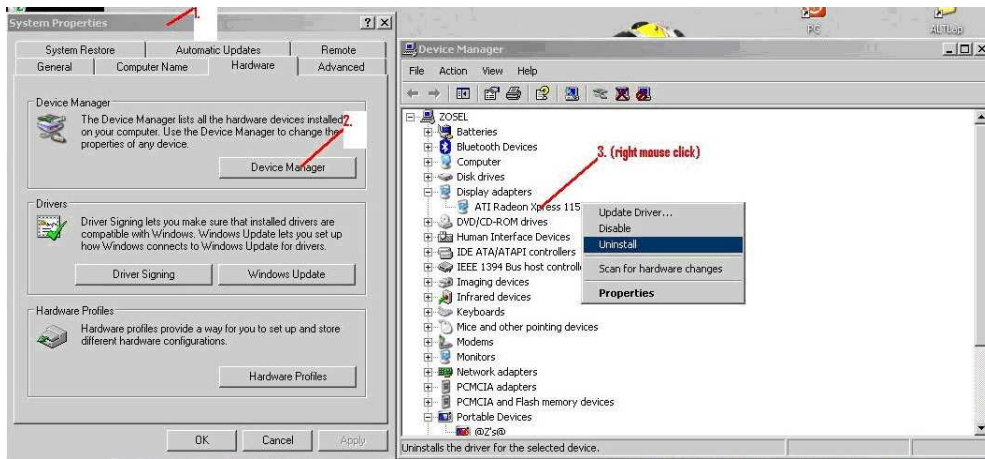
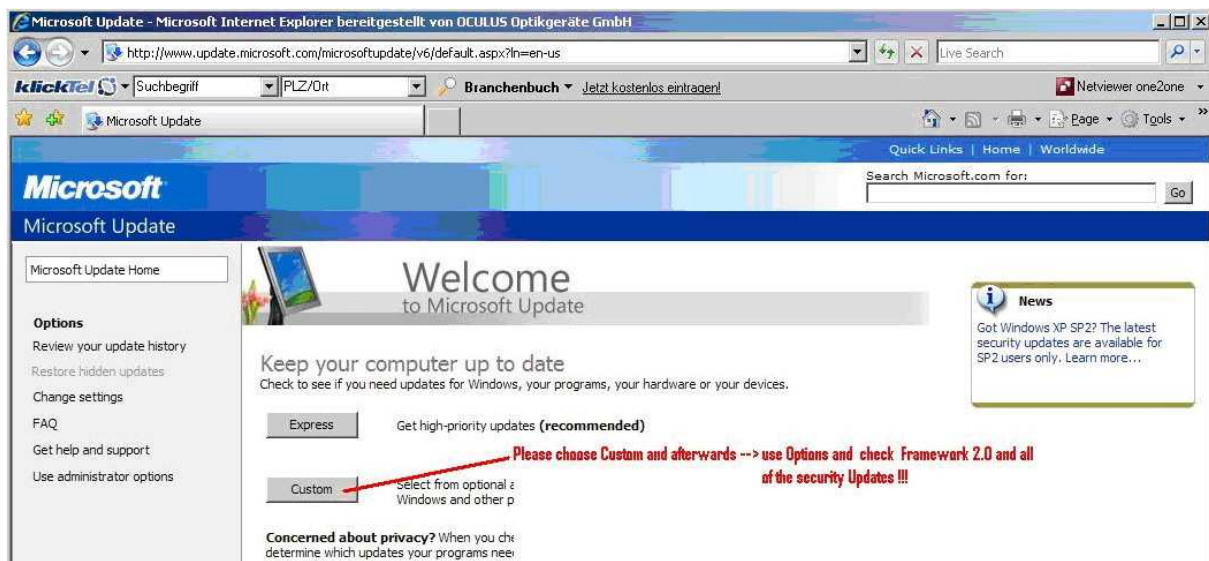


Figure 30, Uninstall the graphic driver

7.8.5. Reason 5, Old software version of the operating system

Please update your operating system. Optional updates as well as hotfixes have to be installed too. This is mandatory for framework 2.0.

Please do not select “express”, select “custom” like it is shown in **Figure 31**.



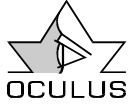


Figure 31, Update of the operating system

7.9. Application error 0142

- Make a shortcut of the explorer.exe in C:\Windows and put it into the Startup-folder
- Restart the computer
- After restart the explorer will open automatically
- Minimize the explorer-window into the taskbar, so that the program runs in the background

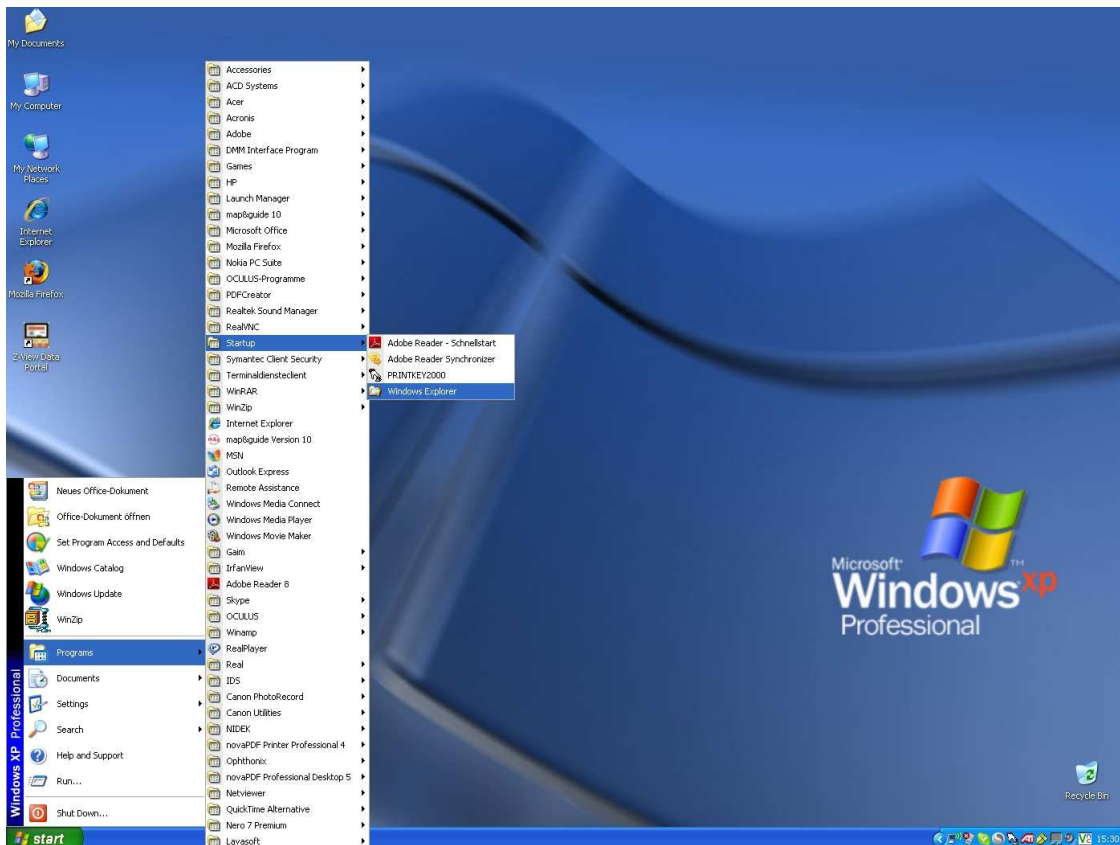


Figure 32, Creating a short cut

7.10. Release creator software

This program is necessary for the release of optional software functions of the Pentacam / Pentacam HR and Oculus-Perimeters. It is useful only if many releases have to be done. For those purposes a special releasing key can be ordered directly from Oculus.

A couple of release codes can be stored on this release key that looks like an USB stick. The software program which is necessary to use this release key comes together with the releasing key.

Please follow the instructions below to use the software:

- plug the release key into a USB port at your PC
- start the ReleaseCodeCreator.exe (software). The window shown below in Figure 33 opens.

- The device code for the contact lens fitting and the pIOL-module can be found after starting the Pentacam software and typing in "lusr".
- The device code can now be entered and the corresponding release code is generated automatically.
- The window shown in Figure 34 is already open and the generated release can now typed in. Of course the Pentacam or USB-license key have to be connected.

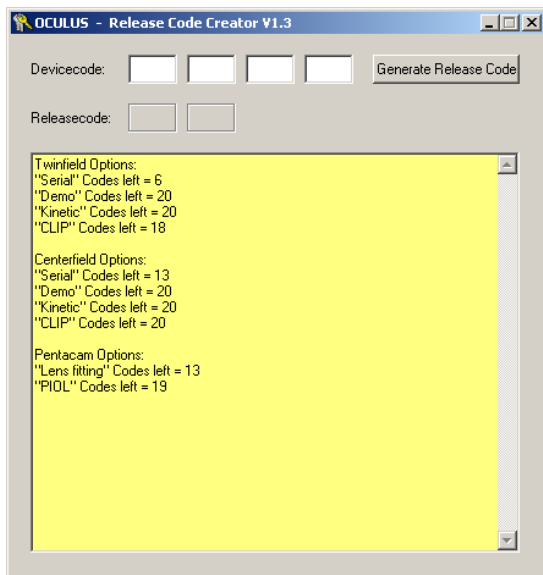


Figure 33, ReleaseCreatorSoftware

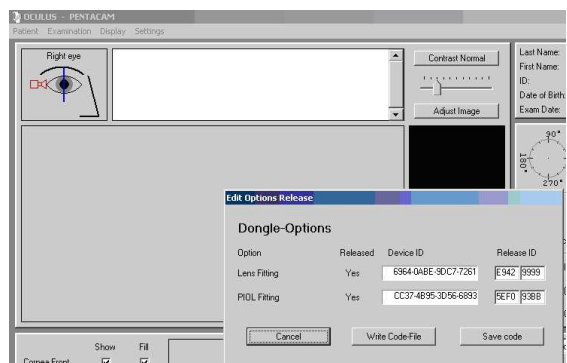


Figure 34, Release of optional software modules

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