Henson Perimeter User Manual

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Henson 9000

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Welcome

Henson 9000 Perimeter

To find out more about the Henson range of perimeters visit:

http://www.elektron-healthcare.com

or scan the QR code opposite.
1.1 Elektron company notices

The Henson 9000 is manufactured in the United Kingdom by
Elektron Technology Uk Ltd.,
Broers Building,
J.J. Thompson Avenue,
Cambridge.
CB3 0FA

The Henson unit must be used in accordance with the operating instructions.
Please read the instructions before attempting operation.
The instructions in this guide are to be viewed as an accompaniment to correct training on this equipment.
Contact your sales agent for details of on-site training or contact the manufacturer for details of training videos and webinar training sessions.
The results of a test are only to be analysed by a suitable qualified person, and it is the responsibility of the practice manager/owner to ensure that only suitably trained personnel are operating this equipment.
The only warranties for Elektron Technology UK Ltd. products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty.

This symbol on the product or on its packaging indicates that to preserve the environment, this product must be recycled after its useful life as required by law and must not be disposed of with your household or commercial waste. It is your responsibility to dispose of your waste electrical and electronic equipment by handing it over to a designated collection point for the proper recycling of such equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about the authorized collection location nearest to you, please contact your local city office, your household waste disposal service or the agent from whom you purchased the product.
1.2 Important warnings

This unit must be connected to an earthed mains supply

Hazardous voltages are present inside this unit.
No user-serviceable parts inside

No modification of this equipment is allowed

This equipment is not suitable for use in an oxygen rich environment

The instrument is not suitable for operation in environments where handling of fluids is normal use.

This equipment should be kept dry at all times

Backing up your data

It is strongly recommended that you regularly back up the database of patient records on a USB memory stick, or other suitable removable media, to avoid any possibility of data loss.

This simple procedure is described later in this manual in Database Backup™.

Allergy advice

The chin and head rest pads are made from a low allergy Silicone, but you should check with the patient that they do not have an allergy to silicone before allowing them to touch the Henson.
1.3 Revision history

<table>
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<th>Release</th>
<th>Date</th>
<th>Change</th>
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<td>Version 1.0</td>
<td>30/08/13</td>
<td>New version for V2.0 software</td>
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<tr>
<td>Version 1.1</td>
<td>May 2014</td>
<td>For version 2.1 onwards software</td>
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<tr>
<td>Version 1.2</td>
<td>July 2014</td>
<td>Additional Installation Information added</td>
</tr>
<tr>
<td>Version 1.5</td>
<td>November 2015</td>
<td>Added Progression information to coincide with Version 3.4 Software release</td>
</tr>
<tr>
<td>Version 1.6</td>
<td>April 2017</td>
<td>Changes for Version 3.5 Software release - addition of integration, changes to Database images, additional language support.</td>
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To determine the version of installed software, click ABOUT on the main menu.

**Information for the Version 3.5 release**

The release version of software called 3.5 contains some important changes to the way the software operates. These may not affect your operation of the instrument if you do not use the database or have any practice management integration, but it is important that you understand them if you do.

The previous versions of the software stored a PDF copy of the printout alongside the database in an images folder and this has now changed to a jpeg picture file. The database will operate in the same way as before except that the 2 eyes plots (threshold tests) are shown on different tabs.

The quality of the jpeg picture file can be set in the options program.
If you currently use the PDF file for another reason, and the Jpeg file cannot be substituted then an additional PDF file can still be created when saving. The location for this can be set in the options program (PDF tab).
1.4 Help/Manual information

Many of the images in this manual have 'hot spots'. If you place the cursor over one of these and click then you will jump to a new page giving further information on a topic.

Some of the screen shots in this manual may differ slightly from the software installed on your machine.

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Elektron Technology UK Ltd. shall not be liable for technical or editorial errors or omissions contained herein.

The following symbols are used in the manual and on the instrument.
1.5 Acknowledgements

Microsoft, Windows, Windows 7 and Windows 8 and Windows 10 are registered trademarks of Microsoft Corporation.

Adobe and Acrobat (R) reader(R) are registered trademarks of Adobe systems.
2 Quick start

To start a visual field test or one of the menu bar items click over that item on the start-up screen.

To get more help on an item in the start-up screen click that item on the image below.

See Appendix 3 for installing and setting up the software.
2.1 Single stimulus test

After selecting the test, and entering the patient's date of birth, you will be presented with the Single stimulus supra-threshold test screen below.

To get more help on a test screen item click over the item in the image below.
2.2 Multiple stimulus test

After selecting the test, and entering the patient’s date of birth, you will be presented with the Multiple stimulus supra-threshold test screen below.

To get more help on a test screen item click over the item in the image below.
2.3 ZATA threshold test

After selecting the test, you will be asked whether this is a new or an existing patient. Depending on your response you will then either need to enter the patient’s date of birth or select a patient from the database. Once this has been done you will be presented with the ZATA test screen below.

To get more help on a test screen item click over the item in the image below.
2.4 Drivers test

After selecting a Drivers test you will be presented with the Drivers test screen below.

To obtain more help on a test screen item click over the item in the image below.
3 Visual field tests

The following visual field tests are available with the Henson 9000:

- **Multiple Stimulus Supra-Threshold**: Choose this if speed is important. It is approximately twice as fast as the Single Stimulus supra-threshold strategy in patients with little or no defect. This is a Semi-Automated test.

- **Single Stimulus Supra-Threshold**: Choose this test to screen large numbers of patients. This is a fully automated test where the patient presses a response button every time they see a stimulus.

- **ZATA** (Zippy Adaptive Threshold Algorithm): This strategy replaces the classic Full threshold algorithm. It is much faster than the Full and Fast Threshold programs and will normally be the program of choice for monitoring visual field loss. The ZATA program uses a Bayesian algorithm and adaptive terminating criteria to make the best use of prior data. This is a fully automated test where the patient presses a response button every time they see a stimulus.

- **Drivers**: The Drivers Test program is designed to see whether or not a patient meets the UK DVLA visual field requirements for Group 1 and Group 2 driving. Again, this is a fully automated test where the patient presses a response button every time they see a stimulus.
3.1 Supra-threshold tests

There are two different supra-threshold tests provided with the Henson 9000 software, single and multiple stimulus:

- Both incorporate several levels of testing.
- Both can be run in an age-related or threshold-related mode.

The flow chart below gives the different stages of a supra-threshold test.

See also:
- Fixation targets
- Default threshold setting
- Establishing the test intensity
- Test Status indicator (single stimulus only)
- Analysing the results
3.1.1 Multiple stimulus

Multiple stimulus supra-threshold tests are used to rapidly screen the visual field. Multiple stimulus tests are approximately twice as fast as a single stimulus test. The multiple stimulus tests are semi-automated and require more perimetrist involvement than the single stimulus tests. With a skilled perimetrist this can result in more reliable results with less variability.

Each presentation is composed of a pattern of 2, 3 or 4 stimuli.

1. The patient tells the perimetrist how many stimuli they saw.
2. If they give the wrong number then the perimetrist should repeat the presentation.
3. If on the second presentation the patient still reports the wrong number, the perimetrist asks the patient where the stimuli they saw were. Any missed stimuli are then marked as misses. It is often useful when trying to establish which stimuli were missed to ask the patient to report the clock hour positions of the seen stimuli.
4. If on the second presentation the patient reported the correct number then the perimetrist should proceed to the next pattern. In this case it is assumed that the error in the first presentation was a false one.
5. If there is some doubt, the perimetrist can re-present the pattern. There is no limit to the number of times it can be presented.

Missed locations can be tested at higher intensity levels to quantify the depth of any defect.

At the beginning of the test the threshold is determined. Stimuli are then initially presented at 5dB above this threshold estimate.

The test has 3 levels, it starts testing just 26 points. It can be extended to 68 and 136 locations.

The test can be customised with the addition of extra stimulus locations.

To get more help on a test screen item click over the item in the image below.
3.1.1.1 **Patient Instructions**

It is important that the patient understands what they need to do during the test.

Below is a set of instructions that we have found to work well.

The eye not being tested should be occluded and the test eye must be correctly aligned with the patient sitting comfortably.

**Threshold set by age**

- The test is going to take about 2 minutes.
- You must look at the central red light and keep your eye as still as possible
- The technician is going to present patterns of 2, 3 or 4 light spots.
- After each presentation he/she will ask you how many you saw.
- The technician may ask you where you saw the lights.

**Add when setting the threshold by measurement**

- To begin with the lights will be fairly bright.
- They will then get dimmer and dimmer until they cannot be seen.
- You should not guess. If unsure it is advisable to say "none".
3.1.1.2 Presenting and selecting different multiple stimulus patterns

The currently selected multiple stimulus pattern is displayed on the screen by the red circles.

- To present this pattern to the patient click Present or press the space bar.
- To go onto the next pattern click Fwd or press right arrow key on keyboard.
- To go back click Bwd or press left arrow key on keyboard.

All the patterns within the current test level are represented by a line of buttons along the bottom of the screen:

```
34323434
```

To go to a specific pattern click the pattern button.

Each of the pattern buttons gives the number of stimuli in the pattern. This number starts off in green and goes to black once the pattern has been presented. If there is a missed stimulus in the selected pattern then the number is shown in red.

When extending the test to a higher level 34, additional pattern buttons will appear.
3.1.1.3 Missed stimuli in multiple stimulus suprathreshold test

It is not unusual for a patient with no visual field loss to miss the occasional stimulus. To differentiate between these and misses due to genuine field loss, the pattern should be presented a second time.

If the incorrect number is given twice then establish which stimuli were missed by:

1. Asking the patient where they saw stimuli. It is often helpful at this stage to tell the patient to consider the bowl as a clock face and to give the hour positions of the stimuli.

2. With the Miss button selected (down) click over the location of the missed stimulus, or click the right mouse button when the cursor is over the missed location.

To correct mistakes (i.e. remove stimuli marked as missed) make sure the Rmv button is selected (down) and touch or click over the mistake.

Stimuli missed at a 5dB increment should be tested at a higher intensity level.
3.1.2 Single stimulus

The Single Stimulus Supra-threshold test is ideal for screening the visual field. The test is fully automated and requires no intervention other than to instruct the patient on what to do, ensure that they have the correct refractive correction in front of their eye and that they are correctly positioned and comfortable.

The initial test intensity is set to 5dB above the patient's threshold. The threshold is derived either from the patient's age or from a measurement taken at the beginning of the test.

- Stimuli that are not seen by the patient are presented a second time at the same intensity.
- If missed on both occasions, the stimulus is marked as a miss and presented at 8dB above the threshold estimate.
- If missed at 8dB it will be presented at 12dB above the estimate. A gray scale indicates the depth of defect (5, 8 or 12dB).

The patient responds to each seen presentation by pressing their response button.

This test incorporates a number of false positive catch trails. These help to discourage the patient from predicting the next presentation.

The test can be customised the with the addition of extra stimulus locations. To get more help on a test screen item click over the item in the image below.
3.1.2.1 Patient Instructions

It is important that the patient understands what they need to do during the test.

Below is a set of instructions that we have found to work well.

The eye not being tested should be occluded and the test eye must be correctly aligned with the patient sitting comfortably.

Threshold set by age

- The test is going to take about 2 minutes.
- You should press the response button when you see a light flash.
- Some presentations are deliberately blank so do not press the button unless you are sure you saw a light flash.
- You must keep looking at the central red light and keep your eye as still as possible.
- If you want to take a break, you can hold down the response button. The test will pause until the response button is released.
- The first few presentations are a demonstration, so do not worry if you make a mistake at the beginning.

Add when setting the threshold by measurement

- At the beginning of the test the light will be very dim.
- Do not worry if you do not see many lights
- Only press the button when you are sure.
- The lights will brighten up later on.
3.1.3 Setting the test intensity

The Supra-threshold tests present stimuli at intensities that are above the patients estimated threshold. It uses one of 2 techniques to establish a patients threshold:

- **Age related.** The level is simply set by the age of the patient. This is the fastest method but can lead to errors when a patient's threshold departs from the average value for their age, e.g. when there are media opacities.

- **Threshold related.** The level is set by a series of measurements taken at the onset of the test. The algorithm is different for Single and Multiple stimulus tests.

When your machine was installed one of these techniques would have been set as the default method, i.e. the method first selected when a supra-threshold test is undertaken. You can change the default method within the Options program.

You can also opt to change the method at the onset of a test. For example, you might want to regularly use the age setting method but then for a particular patient, maybe one who has a cataract, want to set it according to their threshold.

To select a different method at the onset of a test:

1. Click on the tool bar.
2. Select a method from the popup screen, see below, and then click OK.

![Threshold selection popup](image)

**Notes:**
- You can set the threshold to a given value. You might want to do this to match a previous setting.
- The perimeter will revert to the default method when swapping to the next eye or starting a new patient.
3.1.3.1 Single stimulus algorithm

This algorithm is used to set the single stimulus test intensity when the Threshold Related option is selected.

- The threshold sensitivity is measured at four test locations, one in each quadrant. The locations are displaced 9 degrees from the vertical and horizontal meridians.

- At each location the algorithm starts off 1dB brighter than the expected threshold for the patient's age. It uses a repetitive bracketing procedure with 1dB steps until six presentations have been made at all four locations.

- The average intensity of the last four presentations, at each of the four test locations, is then taken as the threshold. To guard against the inclusion of data from locations where the threshold is abnormally depressed, the algorithm excludes data from locations where the average of the last four presentations is below the 95% confidence limits of the expected age setting. If all test locations are excluded, the threshold is set at 4dB below the age setting.

- Ten demonstration presentations are made prior to the collection of Heart data.
3.1.3.2 Multiple Stimulus algorithm

This algorithm is used in the multiple stimulus test to set the test intensity when the Threshold Related option is selected.

What the perimetrist needs to do.

1. Present the current pattern by clicking Present.

2. Ask the patient how many stimuli they saw, the pattern can be repeated if necessary.

3. Click either Yes or No depending on whether or not they saw any stimuli.

4. Keep repeating 1-3 until the threshold has been established when the test will automatically jump to the supra-threshold testing mode.

Notes:

The algorithm starts by presenting a pattern that should be easily seen. At each subsequent presentation it reduces the intensity until the patient reports (twice) that none are seen.

If none were seen on the first presentation then the algorithm increases the test intensity. This is repeated until some are seen.

It is important to tell the patient what is going to happen, i.e. that the patterns are going to get dimmer and dimmer until they cannot see any of the stimuli. This helps to put the patient at ease when they get too dim to see.
3.1.4 Test status indicator

All single stimulus supra-threshold tests have a status message at the top of the test window, it indicates the current status of the test:

The following are the possible statuses.

- **Ready**
  - Ready to begin testing; Click Go to Start.

- **Stopped**
  - Paused; Click Go to resume.

- **Demonstrating**
  - At the start of single stimulus tests a series of presentations are made where the responses of the patient are not saved.
  - Display when establishing the threshold in a threshold related supra-threshold test.

- **Testing**
  - Testing in the supra-threshold mode.

- **Finished**
  - The test has finished.

- **Moving Fixation**
  - This is displayed during the test sequence in a Drivers test to show that the fixation target is moving.
3.1.5 **Extending the test**

Each Supra-Threshold test is composed of three levels.

- The first level is a quick screening test.
- The second level is used when the first level gives a suspicious result, or when there is some other reason why the clinician feels that more data is needed (e.g. there is a family history of glaucoma).
- The third level can be used to more accurately map the extent of any visual field loss.

To go to the next level click [button] on the tool bar.

The figure below shows the distribution of stimuli in the three levels of the central visual field test (26, 68 and 136 Locations).

Additional stimuli can be presented manually.

One of the important benefits of having a multi-level test is that the perimetrist does not have to decide on how many stimuli to test at the onset of the examination. They can start off with a simple screening test and then Extend if necessary.

If the auto-extend property is set in the **Options** program the test will automatically extend if there is a non-blind spot miss.
3.1.6 Adding and correcting presentations

In the supra-threshold tests it is possible to add extra test locations, re-test locations, mark a location as missed or re-classify a missed location as seen.

This can be done at any stage of the test.

First, select the action you wish to perform by clicking the appropriate button, see below.

Then simply click the location where you wish to make the change within the displayed chart.

Add allows you to add or re-test a location.
Miss allows you to mark an already tested location as missed.
Rmv allows you to re-classify a location marked as Missed.

With the Miss and Rmv actions the level post click is dependent upon the supra-test increment (5, 8 or 12dB). The current value is given by the button that appears down, (5dB on the figure below). This can be changed by clicking over the required button.

Examples:

If the Miss and 8dB buttons are down the location will be marked as an 8dB miss.
If the Rmv and 5dB buttons are down the location will change to a seen location.
If the Rmv and 8dB buttons are down it will change to a 5dB miss (the level below 8dB).
3.1.7 Changing the supra-threshold increment

There are 3 different Supra-threshold test increments, 5, 8 and 12dB.

![Increment Buttons](image)

Each of the test increments has a button on the icon bar (see above). The button that appears to be down gives the currently selected increment. The increment can be changed by clicking over the required button or with the up/down arrow keys.

**Single stimulus**

In the Single stimulus supra-threshold test the increment is adjusted automatically. If a stimulus is missed the program will come back to the location and re-test it at the same intensity. If it is missed a second time it will come back to test it at 8dB above threshold and if missed at 8dB then at 12dB above threshold.

**Multiple stimulus**

In the multiple stimulus supra-threshold test the program starts off testing at 5dB above the threshold estimate. If the patient reports less than the correct number of stimuli then the pattern should be repeated. If they still report less than the correct number then the patient is asked to report where they saw the stimuli. The perimetrist then marks the location(s) they missed. The perimetrist should then alter the supra-threshold increment in order to measure the depth of the defect.
3.1.8 Analysing the results

The supra-threshold tests give the number of seen/missed stimuli in the status bar at the bottom of the screen, see below.

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Number missed</th>
<th>Number Prevented</th>
<th>Test Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>1</td>
<td>26</td>
<td>0:58</td>
</tr>
</tbody>
</table>

The supra-threshold tests also give a measure of the probability that the result comes from a normal eye. This is given in the form of a horizontal scale (see below) divided into 3 regions, normal, suspect and defect. The borders correspond to 10% (normal/suspect) and 0.1% (suspect/defect) probability values. The length of the blue bar represents the confidence of the estimate. The length is dependent upon the number of tested locations, it shortens as the number increases.

This calculation is based on a scoring system applied to the visual field data. The score increases with the number, depth and clustering of any missed stimuli. The score is then compared to a normal database of scores to derive a probability value.
3.1.9 Toolbar

Exit the program and return to main menu.

Save current visual field data (both eyes).

Print results (both eyes).

Start new Patient (same test).

Open the help file (context-sensitive).

Swap eyes (without losing data).

Select method for establishing the threshold.

Extend test to the next level.

Fixation targets.

Action when clicking over chart area of screen.

Add point, mark as Miss, Remove previous mark

Supra-threshold increment.

Patient Response button pressed (Single Stimulus tests).
3.2 Zata threshold test

ZATA (Zippy Adaptive Threshold Algorithm) is a new threshold program that is faster and more accurate than earlier threshold tests (Full Threshold, Fast Threshold). Shorter test times are important in perimetry, as patients find it hard to maintain their attention much beyond three minutes and loss of attention is associated with increased variability.

When possible the ZATA program uses the data from a previous visual field result to seed starting values. When no prior data is available it starts from age-dependent normal values. Starting from prior threshold estimates not only makes the test faster but also improves the accuracy of the threshold estimates.

The ZATA test can use either the 30-2, 24-2 or 10-2 pattern of test stimuli. ZATA Fast and ZATA Standard. ZATA Fast differs from ZATA Standard in that it has looser terminating criteria. The terminating criteria dictate how accurate the threshold estimate must be before the program stops testing each location. Looser terminating criteria mean that the ZATA Fast test will be quicker than ZATA Standard, although the accuracy of each threshold estimate will be reduced by a small amount. ZATA Fast is appropriate for patients where less accurate estimates are acceptable, i.e. those with no established loss.

The ZATA program presents one stimulus at a time and the patient responds to each seen presentation by pressing a response button. At the end of the test the results can be viewed in a variety of different ways.

The standard printout includes, threshold values (numeric and gray scale), defect values (age and pattern related), probability values (age and pattern related) along with a series of global indices (MD, PSD, Hemifield), test details and patient demographics.

To get more help on a test screen item click over the item in the image below.
Henson Perimeter User Manual

 Threshold dB (S=3183cd/m²)

Demo test

Beep Volume

Response Time

Patient Name
Birth Date
Rec Num
False Pos
False Neg
Fix losses
Test Time
Foveal Thresh

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3.2.1 Blind spot

At the beginning of a ZATA test the Henson 9000 searches for the eye's blind spot.

It starts off by presenting a Supra-Threshold stimulus at the most likely location of the blind spot. If this is not seen, this location is stored as the blind spot. If it is seen then a stimulus is presented at the next most likely location. This is repeated until either the patient does not see one of the stimuli or until all the potential blind spot locations have been tested.

The blind spot location is used throughout the test as a check of fixation. Every now and again a stimulus is presented at the established blind spot location, and if the patient sees this stimulus (presses the Response button) it is assumed that they were not fixating accurately. The number of blind spot tests and the number of times the stimulus was seen in the blind spot are displayed as fixation losses on the status bar (see below) and printed.

In a reliable patient fixation losses should not exceed 20%.

Occasionally, the perimeter may fail to find the patient's blind spot, i.e. the patient presses the response button for every potential blind spot location. This is usually the result of a false positive response by the patient (they pressed the response button in error when the stimulus was presented in their blind spot).

When this occurs, a message will ask if you want to repeat the search (relocate) or to continue without blind spot checks.

Click one of these options to continue testing.

It is possible to repeat a search for the blind spot during the test by clicking the button.

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Birth Date</th>
<th>Rec Num</th>
<th>False Pos</th>
<th>False Neg</th>
<th>Fix losses</th>
<th>Test Time</th>
<th>Foveal Thresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST EXAMPLE</td>
<td>12/12/1955</td>
<td>0002</td>
<td>0/1</td>
<td>0/3</td>
<td>1:12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.2.2 Fovea measurement

In the ZATA threshold tests it is possible to measure the sensitivity of the eye at the fovea. For this measurement the patient fixates the centre of a four-point pattern of fixation lights positioned below the normal central fixation light.

The software uses a 4-2 staircase algorithm to obtain three measurements of the foveal threshold, and then takes the average of these three readings to give the final estimate. The 3 measurements are intertwined to avoid any obvious sequences.

1. Click ![image](image.png) and then Yes in the following pop up window.

2. Instruct the patient to look at the centre of the four lights, and to press their response key when they see a light flash at the centre of the pattern. Emphasize that many of the presentations will be too dim. If they are not sure they should not press their key.

3. Click Go to start testing.
3.2.3 **Global Indices**

Global indices are single numbers that characterise the whole visual field. They are used to monitor the extent of loss over time.

There are 3 provided with the ZATA test:

- Mean Defect.
- Standard Deviation.
- Hemifield Test.
3.2.3.1 Mean Defect

The Mean Defect score (which is given on the printout) gives the clinician an estimate of the extent of damage.

A more negative value indicates a less sensitive eye. Mean Defect values are sensitive to both scotomata and media opacities. The value will go down if a patient has a glaucomatous field defect and if they have a cataract.

As the name implies, the Mean Defect score is based on the average of all the defect \( \Delta \) values, excluding those from the blind spot area. However, as some test locations are more variable than others, it is weighted to give more importance to the less variable locations (those nearer the centre of the tested field).

A P-value is given when the probability of the MD value coming from a normal patient is below 10% (possible outputs are <10%; <5%; <2%; <1%; <0.5%). When it is above 10% then the message *Within Normal Limits* will be displayed.

The figure above shows the global indices as appear on the standard print out.
3.2.3.2 Standard Deviation

The Standard Deviation of the defect values is a measure of their variability. Large values are indicative of localised scotoma. This global index can be used to monitor progression where increases in the index indicate a deepening or enlargement of localised loss.

The index is insensitive to overall shifts in sensitivity that may occur due to cataract etc.

The index is, however, particularly sensitive to lens rim artifacts and droopy lids.

A P-value is given when the probability of the SD value coming from a normal patient is below 10% (possible outputs are <10%; <5%; <2%; <1%; <0.5%). When it is above 10% then the message *Within Normal Limits* will be displayed.

The figure above shows the global indices as appear on the standard print out.
3.2.3.3 Hemifield Test

The Hemifield test compares the defect values in the superior hemifield to those in the inferior hemifield. It then tells you whether the difference is within normal limits.

The test is very sensitive to the early changes that occur in glaucoma which are often restricted to either the superior or inferior hemifields. The output from this analysis is either Within Normal Limits, Borderline or Outside Normal Limits. In cases where it is Borderline or Outside Normal Limits it also give a p-value (<10, <5%, <2%, <1% <0.5%).

The figure above shows the global indices as appear on the standard print out.
3.2.4 Outputs

At the end of a ZATA test the following 3 buttons will appear on the menu bar.

The currently displayed format is represented by the button that appears to be down (Defect). By clicking one of the alternative buttons you can change the displayed format.

- Gray displays the results in a gray scale format.
- Thresh displays the threshold values (dB).
- Defect displays the defect values (dB).
3.2.4.1 Threshold

Threshold values are displayed on a chart. The value is given in decibels of attenuation where 0 corresponds to 3183 cd/m² (10000 asb).

The above figure shows the Threshold (left) and Gray Scale (right) values from a 24-2 field test as seen in the standard printout.
3.2.4.2 Gray Scale

The Gray Scale chart gives an interpolated plot of the threshold values which makes it easier to see where there are areas of reduced sensitivity (dark areas).

The above figure shows the Threshold (left) and Gray Scale (right) results of the standard printout.
3.2.4.3 Defect

Defect values are the difference between the measured threshold and that expected from an age-matched normal eye.

They are presented in two different forms:

- Absolute values in decibels (dB).
- Symbols representing the probability that the threshold measure comes from a normal eye. The probability values take into account the variability in threshold estimates at each test location.

Positive values indicate a higher than average sensitivity.

![Defect values](image.png)

The above figure shows the Defect (left) and Pattern defect (right) values as seen in the standard printout. Absolute values at the top and probability symbols below.

Example:

If the measured threshold was 25dB in a person of 40 years of age and the normal value for that location was 30dB, then the defect value would be -5dB.

Defect values appear on the standard printout and can be displayed on the screen at the end of the test by pressing the defect button.
3.2.4.4 Pattern defect

Pattern defect values remove the effect of overall shifts in sensitivity to better expose the pattern of any field loss.

At the end of each test the Henson software first calculates, for each test location, the Defect values (the differences between the test result and that of an age-matched normal). To then derive the Pattern defect values it offsets the defect values according to the overall height of the patient’s hill of vision. If the patient has a less sensitive eye than that of an age-matched normal (maybe they have some media opacities) then the Pattern Defect values will be lower than the Total Defect values.

The offset is calculated from an analysis of the most sensitive regions of the visual field and has a maximum amplitude of 6dB in either direction.

When there is a particularly large amount of visual field loss, the Pattern Defect calculations become inaccurate and are not displayed.

The Pattern Defect values are presented in two different forms:

- Absolute values in decibels (dB).
- Symbols representing the probability that the threshold measure comes from a normal eye. The probability values take into account the variability in threshold estimates at each test location.
The above figure shows the Defect (left) and Pattern defect (right) values as seen in the standard printout. Absolute values at the top and probability symbols below.
3.2.5 Print Out

Below is a copy of a print out from a ZATA threshold test.

Patient demographics and details of the Field test are given at the top of the chart.

You can get further help on the different elements of the print out by clicking over that item in the image below.
3.2.6 Progression: Rate of change

You can monitor the rate of change in the visual field through the Database program.

Below is an example of what can be obtained through this route.

The progression screen below shows 2 graphs (one for each eye) that display the global indices Mean Defect and Standard Deviation versus the age of the patient. Each data point represents a visual field record (collected or imported). When there are 4 or more data points a best fitting (least squares linear regression) line is drawn through the points. As a visual field defect gets worse the Mean Deviation will become more negative and the Standard Deviation more positive.

The Mean Defect rate of change (dB/year) is given below the plots along with its 95% confidence limits. In the example shown the rate of change is -0.49dB/year in the RE while the confidence limits are +/-0.36dB/year. As the rate is higher than the confidence limits the progression is significant at the 95% limit.

The 3 vertical lines on each plot represent the time points that correspond to the 3 gray scale images shown above each graph. When first entering the analysis these will be the last 3 visits. You can move to different visits by clicking the left/right arrows to either side of the gray scales.

Outliers in the data series can have a large effect upon the gradient of the regression lines. Outliers can, therefore, be removed from the regression analysis by simply clicking over the data point. Clicking a second time reintroduces the data point.

The data can also be presented on a Glaucoma Staging System II (GSS) chart by clicking . The GSS2 chart plots Mean Defect versus Standard Deviation and divides the plotted area into 7 stages (Normal, Borderline and 5...
levels of loss).

You can exit the progression analysis and return to the database by clicking the exit button.

On return to the database the normal visual field chart on the right hand side of the screen will be replaced by an image of the last progression screen. This can then be printed as per a visual field chart by pressing the print button.

Clicking any other record will revert the right hand display to a visual field chart.
3.2.6.1 GSS2

It is often helpful when reviewing visual field data to have a means to scale the extent of loss. There are many scaling systems that have been proposed over the years since computerised perimeters were developed. Some are highly complex while others are simple.


The GSS II system is a relatively simple staging system that was developed by Paolo Brusini. It is based upon the Mean Defect and Defect Standard Deviation and simply plots these 2 global measures against each other. It then divides the plot area into 7 regions, Normal, Borderline and 5 stages of loss. Stage 1 being early loss while stage 5 is advanced loss.

Using both Mean Defect and Defect Standard Deviation has advantages over using either index in isolation. Defect Standard Deviation is more sensitive than Mean Defect to early localised loss while Mean Defect is more sensitive when defects become advanced. By combining the 2 we have a grading system that is both sensitive to early and advanced loss.

The progression software plots each visual field result as a point on a GSS chart and connects the points together with a line. The first records point is coloured blue while the last one is coloured red. In this way you can see how the patient is changing over time. Ideally you would like to see all the points clustered together indicating that there has been very little change, see example below. Movement towards the lower right hand corner (towards stage 5) indicates progressive loss.
3.2.6.2 Printing

A print of the progression analysis can be obtained for your records.

On exiting the progression analysis the normal image shown to the right of the list of records is replaced by one showing the results of the progression analysis.

The image shows a maximum of 6 gray scale images. When there are more than 6 data points the gray scales from the first 2 and last 3 will be displayed.

Any changes made while in the progression analysis (e.g. excluding an outlier) will be duplicated in the image which will display either the line plot or GSS2 plot depending on which was active on exit.

To Print click the Printer symbol on the toolbar and the currently displayed results will be opened as a PDF in your PDF reader ready for printing.
3.2.7 Patient Instructions

It is important that the patient understands what they need to do during the test.

Below is a set of instructions that we have found to work well.

The eye not being tested should be occluded and the test eye must be correctly aligned with the patient sitting comfortably.

- The test is going to take about 4 minutes.
- Press the response button when a light flash is seen.
- Some presentations are deliberately blank.
- Do not guess. You must ONLY press when you are sure.
- You must keep looking at the central red light and keep your eye as still as possible.
- If you want to take a break you can hold down the response button. The test will pause until you release the response button.
- The first few presentations are a demonstration so do not worry if you make a mistake at the beginning.
- As the test proceeds, fewer and fewer lights can be seen; this is normal.
3.2.8  Stimulus locations

The ZATA test can use either the 30-2, 24-2 or 10-2 patterns of test stimuli. The 30-2 and 24-2 test pattern presents stimuli on a 6 degree square matrix displaced 3 degrees from the vertical and horizontal mid-lines and covers an area of either 30 or 24 degrees (the 30-2 is an extension of the 24-2 test that can be selected during or at the end of a 24-2 test). The 10-2 pattern presents stimuli on a 3 degree square matrix within the central 10 degrees.

3.2.9 Using existing patient details

All ZATA threshold tests start by asking the perimetrist if it is a new or existing patient.

If you select Existing Pt the software will display a table of records within your database.

1. Scroll through the table to find the patient, or use the Find buttons.
2. Highlight the required record (usually the last record for the patient) and then click Load.
3. The patient's name, record number, date of birth etc. will be loaded and, if the selected test is a threshold test with the same distribution of stimuli, the threshold data will be loaded ready to start testing from prior values.

If you select a new patient the following data entry form will appear. You must enter the patient's name, date of birth and record number before clicking Enter to continue.
The entered values will appear on any printed charts and will automatically be added to the database entry form when saving the data.

Notes:

There are two important parameters of threshold tests:

- The time they take to perform an examination
- The precision of their threshold estimates.

Clearly, the objective of perimetric programs is to make the test as accurate and as fast as possible.

One way of reducing the number of presentations is to start off close to the patient’s threshold. For a new patient, the best estimate of their threshold is based on their age. However, when the patient has already been examined with a Threshold test the Prior values provide a much better estimate particularly when they have a visual field defect.

In addition to speeding up the test, using prior values also increases the accuracy of the result.
3.2.10 ZATA toolbar

- **Exit** the test program and return to main menu.

- **Save** current visual field data (both eyes).

- **Print** results (both eyes).

- **Video** camera settings.

- Open the **help file** (context-sensitive).

- Repeat this eye (start again).

- **Swap** eyes (can be done at any time without losing data).

- **Blind Spot** re-locate.

- Extend test to the next **level**.

- Test **fovea**.

- **Fixation targets**.

- **Display** format.

- Indicates when patient **Response** button is pressed.
3.3 Drivers tests

The Henson 8000/9000 provides 2 visual field tests for drivers. The first, Group 1, meets the standard set by the UK Licensing Authority for drivers of cars and motorcycles. The second, Group 2, is for drivers of lorries and buses. The group 2 test is more stringent than the group 1 test and tests further into the periphery.

Both Drivers Tests are binocular with a fixed intensity stimulus (10dB, 318.4cd/m²) with the Goldmann equivalent background intensity (10cd/m²).

When performing a Drivers Test the patient's forehead should be placed in the middle of the head rest and they should be allowed to turn their head slightly to either side to follow the fixation point comfortably.

The Drivers Tests are single stimulus tests and the patient responds to each seen presentation by pressing a response button.

The drivers tests incorporate a number of false positive and false negative Catch Trials. These are used to give a measure of reliability.

To get more help on a test screen item click over the item in the image below.
3.3.1 Patient Instructions

It is important that the patient understands what they need to do during the test.

Below is a set of instructions that we have found to work well.

- The test is going to take about 4 minutes.
- Press the response button when a light flash is seen.
- Some presentations are deliberately blank and you will not see a flash. If you repeatedly press the response button when there is no flash you will fail the test.
- Keep looking at the central red light.
- On occasions the red light will move to a new position; you must follow it with your eyes, turning your head slightly if necessary.
- You must keep your eyes as still as possible.
- If you want to take a break hold down the response button. The test will pause until the button is released.
- The first few presentations are a demonstration only and do not form part of the final result.
3.3.2 Options

The options program has a Drivers Tests tab with an option to have a minimum value for the beep volume. (Min volume On). The UK DVLA require a beep so this option should be selected when testing patients within the UK. For use in countries where there is no such requirement leave the check box empty. This will allow the beep to be turned off when set to the extreme left.
3.3.3 Stimulus locations

The patterns of the stimuli in the Group 1 and group 2 Drivers Tests are shown below:

Group 1-120 point test     Group 2-124 point test
4 General information

The Henson visual field tests are very fast:

The **Multiple Stimulus Supra-threshold** test takes ~2 minutes to test both eyes of most patients.

The **Single Stimulus Supra-threshold** test takes a little longer.

The **ZATA Threshold** test is one of the fastest threshold tests available due to its use of prior data and variable terminating criteria.

The Supra-threshold tests use test locations that have been optimised to detect early glaucoma to reduce the total number of presentations needed when screening for glaucoma.

Other perimeter actions

The overall speed of a visual field test is further improved with:

A fast start-up time. The Henson uses LEDs which do not need to be warmed up.

The printing and storage of both eyes as a single record. You do not need to print and/or store each eye individually.

The use of multiple stimulus presentations in its Supra-threshold tests.

Rapid response times to operator commands.

Rapid access to records in its Database, with hot key options, a vertical slider and a find facility.

Click and touch screen operation with hot keys.

Most commands requiring a single click not a whole series of selections, e.g. when you have finished a test and wish to start a new test just click

---

Windows™ operating system

Henson perimeters use the latest Windows™ operating system. This means that most operators are already familiar with many of the screen layouts and operations. It also means that printing of records can be handled by any Windows enabled printer and provides unrivaled well understood networking facilities.

External PC

By having an external PC you are not confined to having the operator on one side of the perimeter.
Wi-Fi enabled

Hensons can be networked wirelessly using the wifi capabilities of the attached PC/laptop.

Extendable tests

All tests can be extended. You do not need to start a new test when early results look suspicious. Supra-threshold tests can be extended from 26 to 68 to 136 stimulus locations. The Zata 24-2 test can be extended to a 30-2 test.

Repeating/adding new test locations

The supra-threshold tests allow stimuli to be re-presented to confirm a response. You can also add new locations by placing the cursor over the location you wish to test and clicking the mouse button. Existing presentations can be modified in the same way.

On-line Help

Advanced context sensitive help facility that gives fast feedback to users when needed.

Advanced analysis routines

The results from a Supra-threshold test are continually analysed in a way that tells you the likelihood of the result coming from a normal patient. The analysis takes into account the number, depth and clustering properties of the currently missed stimuli.

The ZATA Threshold test includes Total Defect, Pattern Defect and Probability maps that match those of the Humphrey Perimeter. It also includes the global indices, Mean Defect and Standard Deviation that again match those of the Humphrey Perimeter. It includes a Hemi-field analysis for the early detection of glaucomatous loss that gives a continuous output with probability measures.
When you have a series of threshold tests from a patient, either collected or imported, these can be analysed to see if there is any progression. An example of this analysis is given below.
4.1 **Preparing the patient**

Before undertaking a visual field test the patient needs to be carefully instructed on what the test is about and how they need to respond. They need to have the correct refractive correction in front of the test eye and an occluder in front of the other eye.

![Eye with occluder](image)

The patient also needs to be carefully positioned at the instrument.
4.1.1 Aligning the patient

The patient should be seated comfortably with their head as shown below.

The patient should be positioned so that they are seated upright comfortably, their eye is centered on the fixation monitor and they are touching the brow bar. The chin rest should then be raised to support their chin using the on-screen up/down buttons (see below). Do not try to lift a patient's head with the chin rest as this can cause excessive loading of the mechanism.

The correct positions for Binocular (left picture) and Monocular test (of right eye) are shown below.

NOTE: On single stimulus tests, the chin rest buttons are disabled when the test is running.
4.1.2 Patient Instructions

It is important that the patient fully understands what they need to do during the test.

Suggested instructions for the different tests can be found by following the links below:

a. Multiple stimulus supra-threshold\textsuperscript{23}.

b. Single stimulus supra-threshold\textsuperscript{28}.

c. ZATA\textsuperscript{59}.

d. Drivers\textsuperscript{65}.
4.1.3 Refractive correction

It is important that the patient wears the correct refractive correction (suitable for a 25cm test distance) during the visual field test.

The Henson 8000/9000 is designed to be used with a special perimetric lens set. This uses large diameter lenses, which attach to a special frame. This set overcomes the problem of lens rim artifacts that are common when trial case lenses are used with a lens holder attached to the perimeter.

An occluder is placed in front of the eye not being tested.

Recommended additions (lens power to be added to the patient's current distance prescription) are given in the table below.

<table>
<thead>
<tr>
<th>Patient's age</th>
<th>Add</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-44</td>
<td>+1.50</td>
</tr>
<tr>
<td>45-49</td>
<td>+2.00</td>
</tr>
<tr>
<td>50-54</td>
<td>+2.50</td>
</tr>
<tr>
<td>55-59</td>
<td>+3.00</td>
</tr>
<tr>
<td>60-64</td>
<td>+3.50</td>
</tr>
<tr>
<td>&gt;65</td>
<td>+4.00</td>
</tr>
</tbody>
</table>
4.2 **Auto timing**

When the Auto timing box is checked (see below) the speed of presentations will change according to how fast the patient presses the response button.84.

- If the patient responds quickly, the inter-stimulus interval will be reduced (the speed of presentations increases).
- If they respond slowly, the inter-stimulus interval will increase (the speed of presentations will decrease).

The perimetrist can manually adjust the speed of presentations at any stage of the examination by dragging the Response Time slider or clicking the arrows at either end.

The Auto timing can also be turned on or off at any stage of the examination by clicking the Auto check box.
4.3 Catch Trials

The Single stimulus tests incorporate catch trials to give the clinician an estimate of the patient’s reliability.

- **False positives**: when no stimulus is presented.

- **False negatives (only in threshold tests and drivers tests)**: when a repeat presentation is made at an already seen location.

Catch trials occur at random intervals throughout an examination and the results are given during the examination on the status bar at the bottom of the test screen and on the printout.

<table>
<thead>
<tr>
<th>Threshold dB</th>
<th>False Positives</th>
<th>Number missed</th>
<th>Number Presented</th>
<th>Test Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>3/10</td>
<td>2</td>
<td>68</td>
<td>1:49</td>
</tr>
</tbody>
</table>

The results are given as a fraction, the top number representing the number of errors and the bottom number the number of catch trials. For example, False positives 3/10 would indicate that the test had made 10 false positive catch trials and the patient had, in error, responded to 3 of them.

Normally the number of false positives should be less than 15% and the number of false negatives less than 30% of the total number of trials. False negatives increase if there is a visual field defect. This is due to the increased variability of the patient in areas of reduced sensitivity.

The relationship between catch trial responses and test-retest variability is not very good and the results from these trials should only act as a guide. Perimetrists can provide a more accurate estimate of the patient’s reliability by simply observing them during the test. Perimetrists should, therefore, be encouraged to make comments on the visual field chart concerning the reliability of the result, e.g. Fixation excellent, Fixation poor etc.

It is possible to display the catch trials as a percentage by setting the option in the options tests section.

<table>
<thead>
<tr>
<th>Threshold dB</th>
<th>False Positives</th>
<th>Number missed</th>
<th>Number Presented</th>
<th>Test Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>3/10 (30%)</td>
<td>2</td>
<td>68</td>
<td>1:49</td>
</tr>
</tbody>
</table>

This will then display the fraction as a percentage.
4.4 Changing eyes

You can change eyes at any time by clicking the eye button on the tool bar. The icon shows which eye is currently being tested.

- Right eye being tested (Left eye is Occluded)
- Left eye being tested (Right eye is Occluded)

Note: Swapping from one eye to the other during a test will not result in any loss of data.

This facility is particularly useful when screening the visual field with supra-threshold stimuli. If the first eye was OK and the second eye showed up a defect then it is possible to go back to the first eye and test some more locations now that the suspicion of a defect has been raised by the result from the second eye.
4.5 Demonstrating the test

All the single stimulus tests begin with a demonstration. This consists of series of presentations where the responses of the patient are not saved. During the demonstration stage the test status indicator will show **Demonstrating**.

It is a good idea to tell the patient not to be concerned if they make some errors at the beginning of the test as the first few presentations do not count.

If further demonstration is required then the perimetrist should stop the test and start again after re-instructing the patient.
4.6 Entering the patient's date of birth

The Henson 9000 requires the operator to enter the patient’s Date of Birth at the beginning of each test. Click over the correct day, month and year using the vertical sliders when necessary and then click Enter.

The date of birth is used to establish the age normal threshold values.
4.7 Fixation targets

The Henson 9000 has two fixation targets:

- A small central red spot.
- Four peripheral spots located 6 degrees from the central point along the 0, 90, 180 and 270 meridians. The four peripheral spots are provided for patients who have lost central vision. The patient should be instructed to look at the centre of the four-point pattern.

You can switch between fixation targets at any stage of the examination by clicking the image below:

The appearance of the button represents the current fixation target.
4.8 Help facility

Clicking opens up the on-line help where you can get context sensitive help while a program is running.

Opening and closing the Help facility will not affect the Henson program and you can keep the help program open while continuing with a field test.

An example of a help page is shown below. On many pages clicking over an item within an image will jump to a new help page where additional information will be available.
4.9 Printing the results of a field test

Henson perimeters enable the recording of field data by producing a PDF document that you can then print, save (locally or to cloud storage) or email. You have the option to enter the patient details on the PDF for printing, but if this is not selected the PDF will be produced with spaces for you to write the information in after printing.

1. To print the results of a field test click Print on the toolbar.
2. If you have not tested both eyes, you will be prompted to continue.
3. If you have the options set to enter patient information on the printout then you will be presented with the window below where you can enter the details.
4. Press print to continue or cancel to print without patient details.

5. The print will be generated as a PDF file which will be opened in your default PDF viewer.
6. From here you have all of the common options available in the PDF viewer, you can print, save locally, save to cloud or attach to email.

7. Depending upon the PDF viewer and option chosen there may be additional dialogs to complete the chosen task.

**Notes:**

Results for both eyes are printed at the same time.

In the Supra-Threshold tests, results for the right and left eyes are placed side by side.

The Zata test results are printed one eye to a page.

The Practice name and address will appear on the printout, along with any patient details entered when saving the visual field data in the database.
4.10 **Response button**

The Patient Response Button is used in the single stimulus tests.

The patient is instructed to click the response button each time they see a stimulus.

When pressed and held down, the response button will pause further stimulus presentations. This is useful if the patient needs to temporarily pause testing.

During a test, the status of the response button is given in the toolbar by the indicator shown below. It appears next to the Help icon when the button is pressed.

![Response button down](image1)

![Response button up](image2)
4.11 Saving visual field data

Visual field data is saved in a powerful Windows database.

The Henson saves both eyes as a single database record. You should, therefore, test both eyes before clicking save unless you are intending to test only one eye. The Estermann Drivers test is binocular and can only be saved after completion.

**Note:** If you save just one eye and then wish to test and save the other eye you will need to start a new test by clicking New.

Clicking Save (or Edit within the database program) opens up the database entry form, see below, in which you can Enter/edit the record.

![Database Entry Form]

Family name, record number and date of birth are required fields (these are used for sorting and filing the data).

Other fields are optional.

Only use the following characters in the family name or record number—Letters A-Z, Numbers 0-9 and hyphen -

Visual acuities are selected from Drop-Down boxes, refractive errors from Scroll boxes (Sphere, Cylinder and Axis).

If working from prior data some of this information will be entered automatically although it can still be edited/changed.

**Notes:**

- The date of test, time of test, date of birth and type of test are automatically entered by the software. The date and time of test come from the PCs internal clock, which needs to be correctly set via the Windows Control Panel.
- The Henson software saves a pdf file of the printout that can be used by practice management systems. For details on the coding of file names please contact your supplier.
4.12 Video camera

The Henson 9000 is fitted with a video camera for monitoring a patient's fixation.

To adjust the camera settings:

1. Click to display controls (Shown above with blue background).
2. Drag the brightness and contrast sliders to the desired level.
3. Click to remove controls.

The settings are saved for future use.

The settings can also be adjusted within the Video tab of the Options program.
5 Options program

The Options program allows you to set certain parameters of the visual field test and the associated programs.

First of all you need to close ALL Henson programs, including the Start-up screen.

Run the Options program from the Windows desktop icon.

You will then be presented with the tabbed Options entry form shown below. You can change as many items on different tabs as you wish and all of the changes will be made when you click SAVE.

To get more help on an Options item click over that item on the image below.
5.1 Address

In the Options program you can enter your practice name and address. This will then appear at the bottom of any printed charts.

Use the on-screen keyboard or an external keyboard to make changes.

Note: Clicking Save will save all the changes you have made in this session (not just those on the current tab).
5.2 Tests

In the Options program there is a tests tab that allows you to set certain characteristics of the tests.

You can select:

Supra threshold

- Whether the threshold is set by age or by measurement (you can override this at the onset of a test).
- Whether the program starts off at level 1 (26 points) or 2 (68 points).
- Whether the program auto extends after level 1.

Drivers test

In the Drivers section of the tests tab there is a check box 'Min volume on'.

All test programs have an on-screen volume slider that allows the operator to control the volume of the beep that occurs with each stimulus presentation. The minimum setting is normally off. However, the UK DVLA requires Drivers Visual Field tests to have an audible beep, i.e. you should not be able to turn it off. To accommodate the DVLA requirements we have added a check box that when checked meets this requirement. The minimum setting will be a quiet beep rather than off.

Checking this box has no effect on the volume settings for other tests.

If you tick the Display percentage for catch trials box, it will give the catch trial information as a percentage as well as a fraction. See the catch trials page for more information.
5.3 Computer

In the Computer tab of the options program you can customize certain operations. This is where you select the perimeter’s USB device. A list of devices will appear in the box. Normally there will only be one device. If there are multiple devices then click on the Hensons USB serial device.

When the software only box is ticked the software will no longer send messages to the bowl. This facility is available for those who wish to access the database on a separate computer and to allow training and demonstration of the software.

You can also change the displayed language here, select from the drop down box.

Additional language files may be available to download, check the website www.elektron-healthcare.com/support for more details.
5.4 Database

In the options program this tab specifies the name and path of the default database. This is where:

- Visual field records will be stored when you click Save at the end of a visual field examination.
- Records will be recalled when you open the database program from the start-up screen.
- Records for the selection of prior data will be recalled when opting to start from existing data in the ZATA program.

By default the database will be set to store JPEG images, but if you require Dicom images then you can select it here. Selecting Dicom will require additional licensing. Please contact Info@elektroneyetechnology.com for details.

To set the database path name:

1. Select the Drive letter. This will normally be the internal C: drive of the computer, but could be any other drive to which the computer has access, e.g. a file server.
2. The directories available on the selected drive will be displayed in the Directories list box. Select the one you wish to use.
3. Any database files within that directory will be listed in the Files list box. Select the one you wish to use.
4. The selected path and file name will be displayed in the 'Selected Database' box.
5. If you wish to reset to the default database, (C:\Henson9000\data \fd8.db), press the Reset Default button.
The quality of the stored Jpeg image can be set. It can be any value between 75 and 300. The higher the number the better the image quality but it also means the filesize is larger.

If you do not use the database and only print test results then the software has the ability to allow you to enter a patient’s details on the printout.

If the "record details on printout" box is ticked, you will be prompted to enter details when you press the print button.

The VA format used in the database record screen can be set here.

There is a setting for touch screen users that displays an on-screen keyboard when the database search function is activated.

There is an option to auto create any image files that are missing. This is useful if you have upgraded to this version of software and already had entries in the database. The versions prior to 3.5 stored PDF files with the database and from 3.5 it stores Jpeg images, which can be auto created for you.
5.5 Backup

In the Options program you can specify the database backup path. This is where your database files are backed up. Normally this will be a network or removable drive fitted to your computer.

If you have access to a network, then the backup location can be a mapped drive on another computer/server.

The backup folder must be on a different drive to the default database and can be any type of drive, except a CD-Rom drive.

For example:

E:\Henson_backups\

Only the location needs to be specified, the database name will be the same as the current database.

You set the location by choosing the drive and folder in the boxes at the bottom of the screen.

The database is automatically backed every time you save a visual field record.

There is an option to include a copy of the image file(s) with the backup. This used to be done by default, but if you do not want to do this due to space requirements on the backup drive, you can untick the box and it will not backup the image, only the database itself.

(The images can always be re-created at a later date from the database information.)

When clicking Save within a test the software will try to access the backup device, and if it is not present a warning will be displayed.

This warning is to tell you that the result was saved in the database but no backup of the database was made.
A full backup will be made the next time you save a record and the backup drive is available.

**NOTE:** From version 3.5 the backup system now uses a rolling 10 copy backup. The backup file will be called `<database name>_BKUPN.db` where the N is an increasing number from 1 to 10. After the 10th backup is made then the first one will be overwritten. This means that any fault in the database that occurs when saving will not propagate to the previous backups.

You can make additional copies of the database using the **Utilities** program.
5.6 Video Setup

In the Options program the video tab allows you to select the Henson camera and optimise the image.

If the displayed image is not from the Henson camera then it will be necessary to select the correct video device from the Video Input Device drop-down menu.

You can use the In/Out buttons to adjust the image zoom factor (note: this is a digital zoom, so image quality is reduced at high magnification).

Use the up/down/left/right buttons to position the image in the video window.

Adjust the Brightness and Contrast sliders to optimise the video image display (these can also be adjusted when running a test program).
5.7 Integration

The integration tab lets you set the options for practice management integration.(PMI)

PMI lets your practice management software start and run the Henson tests taking patient data (name date of birth etc) from your practice management system directly.

There are 2 methods of integration, passing parameters using programmable buttons and text files.

The passing of parameters does not have any options and the test programs will respond to the parameters if they are used.

The options program informs you of the date format that should be used when passing the parameters - this is read from the regional settings of the PC that the software is installed on.

The text file section lets you set the location and name of the text file that the practice management software will write the patient details into. See Appendix for details of the required contents of the file.

You should browse to the location where the Practice Management software will place the text file. The folder will be shown in the path box.

Click on the filename box and using the keyboard that appears on screen (or a real keyboard if you have one fitted) type the name of the file - remembering it must end in ".txt"

See Appendix 8 - Practice management Integration for more details.
If your practice management or archiving software requires a PDF copy of the printout to be saved then this can be achieved by setting a path in the PDF section.

Use the drive and folder boxes at the bottom of the screen to browse to the path required.

The path will be displayed in the box at the top of the screen.

You do not need to set the file name as this will be based on the patient details.
5.9 **Save/Cancel**

In the Options program each tab has a Save and Cancel button.

Once you have made the required changes click on any of the tabbed pages. The changes made to all of the pages will be saved and the options program will close.

To return without saving any changes click

To obtain help at any time regarding the options program, press the Help button
6 Database program

To access the Database program, and the records you have saved, exit any test programs back to the main menu and click the Database button on the menu bar.

You will then see the Database Screen below.

The database has 2 views available, one is the traditional list view as in previous versions of the software, the other is a tree view, where records are grouped by patient surname.

The default view can be set in the options program and the view can be changed by pressing the listview or treeview headings at the top of the list.

The Listview shows a list of records on the left hand side and a chart of the currently selected record (Shown by an arrow > in the left-hand column) on the right hand side.

Clicking over a record within the list will automatically select it for display. You can move up and down the list with the arrow keys, page keys and by dragging the vertical slider bar.

The treeview shows a list of surnames and by clicking on one will display all the patient's first names. clicking on a first name will display all of the available tests performed.

Where a ZATA test is selected, the data for each eye is shown on a separate tab. You can swap images by clicking on the tabs at the top of the image.

Current database= C:\HENSON

Right eye Left eye

To get more help on a Database item click over that item on the image below.
The Treeview display can be seen below

The location of the database files are defined in the options file. The default database that is set up at installation will be used unless it is changed in options.

To print a chart, first select the record you wish to print then press the PRINT button located on the toolbar at the top of the screen. The selected image will be opened in your PDF viewing software ready for printing (or emailing/archiving/etc).

If you wish to zoom into the image for a closer look, just left mouse click and hold on the area you wish to see and it will be displayed double size. Release the mouse to return to normal view.

Previous versions of the software relied on Adobe reader to integrate with the database and display the stored PDF files alongside the patient record.

From version 3.5 this has changed to Jpeg image files. If required a PDF file can still be stored when saving if your practice management system imports this. The location for this can be set in the OPTIONS program.

The database program has the ability to recreate stored images. By default it can be set to do this for you automatically if you select a record that does not have a corresponding image stored, (see options program) or you can press the Create image button on the toolbar (shown below) to create them.
create image button you will be prompted to create an image for just this one selected record or for all records without an image.

**Note**: To print records you will need to have a PDF viewer installed on the computer.
6.1 Backup copy of the database

When you click Save at the end of a visual field examination the data is saved in a database, the location of which is defined in the Options file.

The default location is:

C:\Henson9000\data\fld8.db

The Henson 9000 also saves a backup copy. This backup copy must be on a different storage device (e.g. external disc or network drive). The location of backup copy is also defined in the Options file. If your backup location is not available (e.g. USB pen drive not attached) then you will get a warning message when you save. You will have saved but without a backup copy.

This backup will ensure that you do not lose your data in the unlikely event of a hard drive failure.

The backup uses a rolling 10 copy system. Each successive backup is appended with an increasing number from 1 to 10 before it goes back and overwrites backup 1.

**Important:**

You should periodically make an additional copy of the database and store it in a safe location away from the Henson. This will ensure that if the Henson is destroyed (e.g. a fire) you still have a copy of the database. To make an additional copy go to the Copy facility of the Utilities program.
6.2 Changing the active database

The Henson 9000 can access and use many different database tables. Each one might contain data from a specific study, or a group of patients. On start-up, the database program displays data stored in the file defined in the options program.

Use the method below to view data from a different database. (To save future records into a different database, you will need to make it the default database using the Options program.)

To view data stored in a different database:

1. Click to see the Window (below).

2. Select the drive, folder and database name, then click OK or double click the database name.

Note:

When you next collect and save visual field data, the program will revert to the default database specified in the Options program.
6.3 Deleting a record from the database

To delete a record from a database:
Select the record to be deleted by clicking it within the list of records.

1. Click
2. When prompted, click OK to confirm.
3. the database will be updated and a backup of the new database will be made.

Once deleted, a record can only be retrieved by recovering it from the previously numbered backup file.
6.4 Editing data in the database

Occasionally you may need to edit the data stored in the database. For example, a patient's name may have been misspelt, or a record number may contain an error.

To edit a record:

Click the EDIT button to see the edit screen below.

Use either the on-screen keyboard or an external keyboard to edit the data in the fields.

Once you have made your changes click SAVE.

**Note:**

You cannot use the following characters ( / \ : ; & ) in patient name or record number (as these are used for the file name of the PDF printout).

To correct the stored PDF file after modifying a record you will need to click **PDF**.
6.5 Finding a record in the database

You can search for a record in the database using family name or record number.

By default the database is sorted alphabetically by family name.

To sort the database by record number or date of test, click on one of the column headings for rec number or DOT.

<table>
<thead>
<tr>
<th>FamName</th>
<th>FstName</th>
<th>RecNum</th>
<th>DoB</th>
<th>Test</th>
<th>DoT</th>
<th>Tof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examplea</td>
<td>First</td>
<td>002</td>
<td>12/12/1985</td>
<td>MGSA 25</td>
<td>10/08/02</td>
<td>12:00:00</td>
</tr>
</tbody>
</table>

1. The displayed database will re-order to display the chosen sort.
2. To find a family name or record number click into the respective search box on the toolbar (below)

Search family name | Search Record Number

A keyboard will appear if the option is set in the OPTIONS program.

As you type, (on this keyboard or the computer keyboard), the database will find the nearest match to the text in the search box.

To close the keyboard, press the enter or ESC buttons or press the keyboard toggle button on the toolbar.

Notes:

- The system searches for the nearest match as you type. For example, if you search on Family name and press H, you will see the first record that begins with H. Enter more letters to narrow the search.

- Searching also sorts the database on the basis of the search box you are typing in. For example, if you are searching on Record number, the database will be sorted by record number (lowest number first).

- NOTE: the database has the microsoft bug where numbers are taken from the left hand side e.g. 1, 10, 11, 12 -19, 2, 20, 21, 22-29, 3, 30, etc.
6.6 Moving through the database

Before long you will find that the number of records in your database exceeds the number that can be displayed on the Database Screen.

When this occurs you can move through the list by:

- Pressing the up/down arrow or Page keys.
- Dragging the vertical slider up or down.
- searching for the record you need by name or number (see previous section)

Note:

The order of records is initially sorted by family name (FamName). You can sort by record number (RecNum) or test date (DoT) by clicking on the appropriate column header.
6.7 Image files

The Henson 9000 creates a copy of the printout when a record is saved.

The format of this image file will depend on the options set. The default is Jpeg but DICOM images can also be stored.

The directory where the image files are stored is a sub directory of your database directory and its name will be your database name plus 'images'.

In the example below you can see the Henson9000 directory with a sub-directory 'Data' where the database files are normally placed. You can also see 2 further sub-directories, 'FLD8images' and 'MoreImages'.

It is in these sub-directories where the image files can be found. In this case there are 2 sub-directories because there are 2 databases, 'FLD8' and 'More'.

The database has a facility to recreate missing image files, if for example a database is restored from a backup or a merge. Press the image button on the toolbar and you will be asked whether to create an image for the currently selected record or all missing images.

Note:

On some of the early Henson perimeters the PDF files were stored in a sub-directory simply called 'images'. In these cases you need to rename this directory by adding the name of the database, e.g. if your database is FLD8 then the PDF directory should be renamed 'FLD8images'.
6.8 Printing a database record

To print a record from the Database:

a. Select the patient who's record you wish to print by clicking over it in the list.

b. Press the print button on the toolbar.

c. The currently displayed image will be opened as a PDF in whatever software is installed for viewing PDFs from where it can be printed.

Click the Print icon on the toolbar and follow the on-screen prompts to select your printer.
6.9 Saving records in database

When you save a new record, the raw data is stored in the database and a copy of the printout is created as an image file and is displayed in the database.

This image file can also be used for future printing and use by practice management systems.

If the backup drive/ location is available then a backup of the entire database will be made (with a copy of the latest image if selected in options).

An additional PDF copy of the printout can also be made to a separate location if used by other applications (such as Practice management software).
6.10 Progression Analysis

In 2015 a new version of the Henson 9000 database software introduced an option to plot any change that may have occurred in a patient visual field. To undertake a change analysis you first need to select the patient. You should select the earliest record for the patient and the progression analysis will then display all records. Selecting a later record will truncate the analysis to dates including and after the date of the selected record.

Once you have selected a start record click to see the progression page. The progression analysis is only for the ZATA test and the progression button will not be displayed when other tests are selected.
6.10.1 Progression Screen

The progression screen below shows 2 graphs (one for each eye) that display the global indices Mean Defect and Standard Deviation versus the age of the patient. Each data point represents a visual field record (collected or imported). When there are 4 or more data points a best fitting (least squares linear regression) line is drawn through the points. As a visual field defect gets worse the Mean Deviation will become more negative and the Standard Deviation more positive.

The Mean Defect rate of change (dB/year) is given below the plots along with its 95% confidence limits. In the example shown the rate of change is -0.49dB/year in the RE while the confidence limits are +/-0.36dB/year. As the rate is higher than the confidence limits the progression is significant at the 95% limit.

The 3 vertical lines on each plot represent the time points that correspond to the 3 gray scale images shown above each graph. When first entering the analysis these will be the last 3 visits. You can move to different visits by clicking the left/right arrows to either side of the gray scales.

Outliers in the data series can have a large effect upon the gradient of the regression lines. Outliers can, therefore, be removed from the regression analysis by simply clicking over the data point. Clicking a second time reintroduces the data point.

The data can also be presented on a Glaucoma Staging System II (GSS) chart by clicking . The GSS2 chart plots Mean Defect versus Standard Deviation and divides the plotted area into 7 stages (Normal, Borderline and 5 levels of loss).

You can exit the progression analysis and return to the database by clicking the
exit button

On return to the database the normal visual field chart on the right hand side of the screen will be replaced by an image of the last progression screen. This can then be printed as per a visual field chart by pressing the print button.

Clicking any other record will revert the right hand display to a visual field chart.
6.10.2 Glaucoma Staging System: GSS II

It is often helpful when reviewing visual field data to have a means to scale the extent of loss. There are many scaling systems that have been proposed over the years since computerised perimeters were developed. Some are highly complex while others are simple.


The GSS II system is a relatively simple staging system that was developed by Paolo Brusini. It is based upon the Mean Defect and Defect Standard Deviation and simply plots these 2 global measures against each other. It then divides the plot area in to 7 regions, Normal, Borderline and 5 stages of loss. Stage 1 being early loss while stage 5 is advanced loss.

Using both Mean Defect and Defect Standard Deviation has advantages over using either index in isolation. Defect Standard Deviation is more sensitive than Mean Defect to early localised loss while Mean Defect is more sensitive when defects become advanced. By combining the 2 we have a grading system that is both sensitive to early and advanced loss.

The progression software plots each visual field result as a point on a GSS chart and connects the points together with a line. The first records point is coloured blue while the last one is coloured red. In this way you can see how the patient is changing over time. Ideally you would like to see all the points clustered together indicating that there has been very little change, see example below. Movement towards the lower right hand corner (towards stage 5) indicates progressive loss.
6.10.3 **Printing**

A print of the progression analysis can be obtained for your records. On exiting the progression analysis the normal image shown to the right of the list of records is replaced by one showing the results of the progression analysis.

The image shows a maximum of 6 gray scale images. When there are more than 6 data points the gray scales from the first 2 and last 3 will be displayed.

Any changes made while in the progression analysis (e.g. excluding an outlier) will be duplicated in the image which will display either the line plot or GSS2 plot depending on which was active on exit.

To Print click the Printer symbol on the toolbar and the currently displayed results will be opened as a PDF in your PDF reader ready for printing.
6.11 Import from spreadsheet

If you have field data in a Henson formatted spreadsheet you can import it into the database by pressing the Import button.

You will be prompted to browse for the file -

and the records will then be imported - you will be shown a dialog when it has completed.
The Utilities program contains a number of routines to help with the management of your visual field database.

It starts by displaying a list of the records in the current database (specified in the Options file).

To get more help on a utilities screen item click over that item on the image below.
7.1 Opening an existing visual field database

When you first enter the Utilities program the displayed database will be the one defined within the options program. To view records from a different database:

1. Click on the Utilities toolbar.
2. Select the drive, directory and database from the drop-down menus.
3. Click OK.

Once a database is opened you will be able to perform all the other utility routines, e.g. copy, merge edit.

When you exit the Utilities program the Henson software will revert back to the database defined within your Options file.
7.2 Creating a new visual field database

In the Utilities program you can create a new database. Once it has been created you can select it as your default database within the Options program.

To create a new Henson database:

1. Click on the Utilities toolbar.

2. Select the drive and directory where you want to create the database from the drop-down menus.

3. Enter the file name for your new database (it must end with .db) in the text box, top right of the form.

4. Click OK.

Notes:

- You can use the on-screen or external keyboard to enter the file name.
- The file name must end in .db

- If you want to create a new folder, click then enter the name of the folder in the displayed box and select OK.
- When the database is created, a folder will be created to hold the visual field chart images (PDF files).
- When you exit the Utilities program the Henson software will revert to the default database defined within your Options file.
7.3 Copying a visual field database

The copy button allows you to make an additional copy of the database on a removable drive.

Connect a removable drive/pen to an available USB port.

1. Click on the Utilities toolbar.
2. Select the removable drive and directory from the drop-down menus.
3. Click OK.
4. When the copy has been completed, store the removable drive in a safe place. Ideally this should be at a remote location so that if there is an event, such as a fire, that damages your perimeter you will still have a copy of your data.

Notes:

- The database name will remain the same as the original.
- This function copies all the database files along with the sub-directory '***images' which contains the PDF image files.
7.4 Deleting a record

To delete a record within the database:

a. Select the record to be deleted by clicking it within the list of records.

b. Click 

c. When prompted, click OK to confirm.

Once deleted, a record cannot be retrieved.
7.5 Merging databases

Within the Utilities program you can merge the data from another database into the currently selected database.

This can be useful if you want to restore from a backup file or if you have more than one Henson perimeter and you want to add the data you have collected on one instrument to that collected on the other. (if networking them is not possible)

To merge the data from another database to the current database:

1. Click on the Utilities menu bar.
2. Select the drive location of the database that you want to merge in from the drop-down menu.
3. Select the directory and then the name of the database itself (only valid database files will be shown)
4. Click OK.

Depending on the size of the database this operation may take a few moments.

The merge function copies all of the records into the default database and will recreate the image files.

The current database would normally be the default database, i.e. the one defined within the options program.

Alternative databases can be used by first opening them before the merge.
7.6 Transferring records between databases

Within the Utilities program it is possible to transfer records from one Henson visual field database to another. You may want to do this in order to keep a separate database of patients who are in a particular study.

In the instructions below, The Source database contains the records you want to transfer and the Target is the database into which you are transferring records.

To transfer records:

1. **Open** the Target database.
2. Click on the Utilities toolbar.
3. Select the Source drive, directory and database from the drop-down menus.
4. Click OK.
5. Both sets of database records are now listed in the Utilities windows.
6. In the right-hand panel, double-click each record you want to transfer.
7.7 Importing data from a Henson 5/6000 Database

Databases attached to earlier Henson perimeters (5/6000) were a little different to those in current use.

To import data from a Henson 5/6000 into the current database:

1. Insert a USB pen drive containing the data to be imported and wait for windows to recognise it.

2. Click on the Utilities toolbar.

3. Select the USB drive and any sub directory to find the file of the data you want to import.

4. Click OK.

The current database would normally be the default database, i.e. the one defined within the options program. Alternative databases can be used by first opening them and then proceeding to the import.
Appendix 1 - 9000 Technical specification

The Henson 9000 is a Central field Perimeter which is controlled from a PC running a Windows™ compatible Operating system. It includes a series of visual field tests, a Database program, a Utilities program and an Options program.

1. TYPE

Computerised perimeter capable of measuring the visual field out to an eccentricity of 80 degrees (with relocation of central fixation).

Chart distance: 25 cm.

2. STIMULI

LEDs with broad spectral output ranging from 400-740nm (3dB down).

Round with an angular subtence of 0.5 degrees (Goldmann III).

Luminance 0.05–3184 cd/m² (0.16-10000 asb).

Presentation time is 200ms.

Background is controlled with additional LED's with broad spectral output ranging from 400-740nm (3dB down).

Background luminance is 10cd/m² (31.5 asb)

3. FIXATION MONITOR

Heijl-Krakau technique in ZATA program.

On-screen image of eye presented via CCD camera located below the central fixation LED.

4. FIXATION TARGETS

Red LED or cross pattern of red LED's with broad spectral output of 625–670nm.

5. COMPUTER

The unit can be controlled from any PC meeting the minimum specification and running a compatible operating system.

6. INPUTS / OUTPUTS

2 off USB 2 compatible Ports (one for control and one for camera)

Mains Inlet Connector (IEC 320)

Patient Response Button socket.

7. DIMENSIONS

449x 400 x 300 mm (L x D x H)
8. WEIGHT

14 kg

9. ELECTRICAL SPECIFICATION

Mains Input Voltage: 100-240 VAC; universal input.
Fuses: 2 off 20 x 5mm IEC 60127-2 Time delay.
Fuse rating: T2AH 250V (all voltages)
Frequency 50/60 Hz
Power consumption: 60 VA
Input Connector filtered IEC 320 socket.

10. CLASSIFICATION

Mains operated Class 1, Type B Applied Part (Headrest, Chin rest and Patient Response Button)
Continuous operation
Equipment not suitable for use in presence of flammable anesthetic mixtures with air or oxygen or nitrous oxide.
Ordinary equipment without protection against ingress of water

11. ENVIRONMENT

Temperature:
Operating ............... 5° to 35°C (41° to 95°F)
Storage..................–20° to 50°C (~4° to 122°F)
Relative humidity.......... 10% to 90% (non condensing)

Maximum vibration:
Operating ............... 0.9 GRMS using a random-vibration spectrum that simulates shipment by air
Storage.................. 1.3 GRMS using a random-vibration spectrum that simulates shipment by truck

Maximum shock:
Operating ............... 1.52 m/sec (60 inches/sec) (less than or equal to a pulse width of 2 ms)
Storage.................. 2.03 m/sec (80 inches/sec) (less than or equal to a pulse width of 2 ms)

Altitude:
Operating ............... 0 to 3048 m (0 to 10,000 ft)
Storage.................. 0 to 12,192 m (0 to 40,000 ft)
12 BIO-COMPATIBILITY
The chin rest and headrest pads are made from hypo-allergenic SILICONE rubber.

13. ACCESSORIES AND DETACHABLE PARTS
The Henson is supplied with the following accessories and detachable parts:

- Quick start guide.
- Patient response button and cable assembly
- Mains lead for Henson. (Country specific)
- Installation software on a USB flash drive.
- Occluder (eye patch)
- Dust Cover
- Dual USB cable.

14. OPTIONAL EXTRAS
- Electric Table
- Perimeter Trial Lens set.

15. LIST OF SPARE PARTS
- Mains Fuses: T2AH250V
- Occluder
- Patient Response Button
- Dust Cover
- Replacement head and chin rest pad set.
- Twin USB Cable.
- Mains cable (country specific)
9 Appendix 2 - 9000 Connection details

The picture below shows the rear panel and connections of the Henson 9000.

The fuses are located in a drawer under the mains power plug on the left hand side of the rear panel.

The USB B type connectors are on the right hand side.

The patient response button is plugged into the jack socket in the middle of the rear panel.

It has been discovered that some computers do not have powerful USB ports and combined with the 2M USB cable do not power the camera properly, resulting in a blank picture when testing.

In these cases the use of a POWERED usb hub is advised. This can also neaten the installation by making all cable connections from the Hub.
10 Appendix 3 - Installation

1. LOCATION
The Henson should be placed on a suitable flat surface, with no part of the unit over hanging the edge of the surface.

The patient aperture should be positioned away from direct light.

The electrical installation of the room where the Henson Perimeter is to be operated must comply with the "Regulation for the electrical equipment of buildings" published by the Institution of Electrical Engineers. The unit and any ancillary parts must be protected from ingress of liquids and flammable anaesthetic mixtures.

2. MAINS SUPPLY
The mains supply required is 250 VA (maximum, depending on instrument) 110-240 Vac.

The supplied mains lead must be used and, if faulty, must be replaced by an IEC approved* mains lead with conductors of at least 0.75 mm² cross sectional area. Replacement mains leads are available from the manufacturer, see the replacement parts section.

Access to the mains supply plug and socket must be maintained at all times as this is the means of isolating the device from the mains supply.

*For USA/Canada - The supplied Hospital grade mains cable must be used but grounding reliability can only be achieved when the equipment is connected to an equivalent receptacle marked "Hospital Only" or "Hospital Grade". Outside of the hospital environment the Hospital grade mains cable must be used and connected to a grounded (Earthed) outlet to maintain grounding of the equipment.

3. INTERCONNECTING
Connect the supplied mains lead from the mains input connector on the instrument to the mains supply (either direct from the wall socket or via the electric table).

Plug the patient response button jack plug into the socket on the rear panel of the unit.

4. ACCESSORIES
If the unit is located on an electric table, the table should be connected to the mains supply using a suitable mains connection lead and the Henson should be powered from the power outlet at the top of the table.

5. SAFETY
Ensure the connected leads do not trail on the floor and are not subject to abrasion on sharp edges. Use only computers, printers, computers and monitors that conform to EN60950.
6. EMC

The Henson range of perimeters conform to European Directive 2004/108 for EMC. If emitted radiation causes interference with other items of equipment, position it further away or try a different orientation. Do not operate transmitters or mobile telephones in close proximity to the equipment.

7. AMBIENT TEMPERATURE AND HUMIDITY

For use the equipment should only be operated if the ambient temperature is between 10 and 40 degrees Celsius and the humidity is between 30% and 75% non condensing and pressure between 700 and 1060 m bar.

8. COMPUTER EQUIPMENT

The attached computer should be approved to EN60950 and meet the following minimum specification:

- CPU : 1GHz (minimum) Memory : 1 Gb (minimum)
- Screen Resolution : 1024 x 768 (minimum -1280 x 1024 recommended)
- Operating System : Windows™ (various versions are supported)
- Network : Wired or Wireless network adapter if networking is required.
- Connectivity : TWO Free USB ports (or a suitable powered USB hub) to connect to the Henson9000

9. Installing the software

- Ensure all other USB devices are unplugged from the computer.
- Insert the supplied USB flash drive into the computer and wait for the prompt.
- Select Open folder to view files.
- Open the folder called Software and double-click on the software .EXE file.
- Follow the on-screen instructions to install the software.
- Once the software is installed, connect the USB cables between the perimeter and the computer and switch on the Henson using the rear mounted power switch.
- Wait for the Henson to complete its start up sequence. (approx 30-40 seconds)

- Open the Henson Options program by double-clicking on the computers desktop
- Click on the Computer tab and check that there is a Device listed in the list box on the page.
- Click the Address tab and fill in the practice address/Phone number details.
Click the Video setup tab and ensure you can see the camera picture from the Henson. If not click the Video selection drop down box and choose the USB 2.0 Webcam.

Check that the message "Default settings downloaded from Henson..." is displayed. This is the setup information for the internal camera.

Click Save.

Open the Henson software by double-clicking the desktop icon.

To automatically run the Henson software when the computer is started add this shortcut to the windows STARTUP folder.

A menu screen showing the available tests is now visible.

- **NOTE:** If using a touch screen PC it is advisable to check that the touch screen is in Mouse mode and not Digitiser mode as this affects the performance of the chin rest controls

- **Note:** To print records you will need to have a PDF viewer installed on the computer.
11 Appendix 4 - Maintenance and warranty

**Warning:** Mains isolation - The mains cable to the device should be isolated from the mains supply by removing it from the wall socket before any inspection, maintenance or cleaning is undertaken.

If the unit is supplied with power from an electric table/stand, then the mains cable to the table / stand should be isolated from the wall socket instead.

- **Regular Inspection**
  - Changing the fuses, replacing the head and chin rest pads.
- **Cleaning**
- **Preventative Maintenance**
- **Replacement Parts**
- **Repairs and Re-calibration**
- **Warranty**
11.1 Regular inspection and maintenance

Before any maintenance or cleaning is undertaken, it is important that the mains cable is removed from the wall socket, isolating the unit from any power. The equipment can also be isolated from the mains by removing the mains cable from the instrument.

**Inspect the equipment casings and all cables before use.**

If any damage is found the equipment should not be used before it has been inspected by a competent person.

Particular attention should be paid to the mains cable at the back of the instrument and the cable of the patient response button.

**To change the Fuses**

The fuses are housed in a small drawer located in the mains connector which is located on the rear panel of the Henson.

1. To change the fuses remove the mains lead from the wall socket and then from the socket on the rear of the Henson.

2. Use a small screwdriver to lever the fuse drawer out of the socket.

3. Withdraw the fuse drawer.

4. The fuses can be removed and replaced.

6. Push the drawer back into the mains inlet before reconnecting the mains lead.

7. Finally, reconnect the mains lead to the wall socket and switch on.
The head rest and chin rest pads are attached with an industrial hook and loop type fastener and can be replaced without any tools.

**To change the headrest pad**

1. Prise up one end of the headrest pad.
2. Peel it off to reveal the attached fastening strip.
3. Align the headrest pad with the moulding indentation and lay it flat.
4. Starting from the centre, press the pad into place and work across pressing constantly. The head rest will snap into place.
To Replace the chin rest pad

NOTE: Ensure the chin rest is in its lowest position before changing the pad

1. With fingers, prise up one end of the pad and
2. Pull it upwards to reveal the chin rest top fastening strip.
3. Align the new pad with the rear edge and one end of the chin rest top.
4. Starting in the middle, press firmly down towards the edges and listen for the fastener to snap into place.
11.2 Upgrading the software

Upgrades of the software and documentation are available to download from the support section of the Elektron healthcare web site http://www.elektron-healthcare.com

If the software is upgraded, up-to-date operational instructions can be found in the online help, which can be accessed by clicking Help.
11.3 Cleaning

**Housing**

The housing may be kept clean by wiping with a damp cloth. This should be done with the unit disconnected from the supply. Do not use abrasive cleaners. Do not allow liquid to enter the unit.

**Stimulus Display Screen**

Dust and small deposits on the stimulus display screen can be “blown clear” with a clean supply of air. An aerosol can air duster, designed for this purpose is preferable to blowing by mouth. A soft lens brush can also be used to remove deposits.

**Headrest Pad**

The headrest pad should be wiped between patients with a suitable sterilising wipe.

**Chin rest Pad**

The chin rest pad should be wiped with a suitable sterilising wipe. The chin rest and headrest pads are available as replacement parts from the dealer.

**Patient Response Button**

The response button should be wiped clean with a suitable, sterilising wipe. The cable should be checked for cracks and splits regularly.
11.4 Preventative maintenance

Every six months it is recommended that the mains lead is inspected and replaced if there is any sign of damage to the insulation etc.

The connected computer should be maintained in accordance with the manufacturer’s instructions.

This includes hardware and software maintenance.

The Computer operating system should be kept up to date with any patches and software upgrades.

The Henson Software should be kept up to date with any patches and upgrades.

Upgrades will be made available from the manufacturer and sales agent’s websites.

www.Elektron-healthcare.com
## 11.5 Replacement parts

There are NO user serviceable parts in the Henson device. The following replacement spare parts are available from the supplier:

<table>
<thead>
<tr>
<th>Item</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust cover</td>
<td>PA0112-DP-030</td>
</tr>
<tr>
<td>T1.6AH250V HBC fuse.</td>
<td>TNFUS1217</td>
</tr>
<tr>
<td>T2AH250V HBC fuse.</td>
<td>TNFUS1218</td>
</tr>
<tr>
<td>Mains cable (country specific)</td>
<td>Quote country for part number</td>
</tr>
<tr>
<td>Patient Response Button</td>
<td>PRB001</td>
</tr>
<tr>
<td>Occluder</td>
<td>TNSUN1294</td>
</tr>
<tr>
<td>USB Lead (Twin lead)</td>
<td>PA0112-DP-057</td>
</tr>
<tr>
<td>Headrest pad</td>
<td>PA0112-DP-003</td>
</tr>
<tr>
<td>Chin rest pad</td>
<td>PA0112-DP-005</td>
</tr>
</tbody>
</table>

* The software part number will change with later versions of software. Contact the supplier for the latest part number.
11.6 Repairs and recalibration

The Henson 9000 contains no user serviceable parts except for replaceable external items (fuses).

The unit must only be serviced by an appropriately qualified person.

The Manufacturer will make available, on request and at its discretion, circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist Service Personnel to repair those parts of the Henson 9000 that are designated by the Manufacturer as repairable by Service Personnel.

Calibration

It is recommended that the unit has a calibration check once a year to ensure it is within acceptable limits.

Please contact the supplier for more details of this.

In case of difficulty please contact info@elektron-healthcare.com
11.7 Warranty

If, within 24 months from the date of installation, any defect is discovered in the instrument in respect of material or workmanship and reasonably within our control, we undertake to make good the defect at our own expense, provided notice is given to us as soon as it is discovered and that the instrument is immediately forwarded to our works, carriage paid, in the original packaging and with security seals unbroken.

If the original packaging is not available, then please contact the service representative to request packaging.

Please note that Elektron Technology reserves the right to alter the specification of the hardware or software at any time without notification.
12 Appendix 5 - Troubleshooting

Every effort has been made to make sure your Henson perimeter works without error for many years. However, if things do go wrong here are some checks that you can do before contacting your distributor for help.

**Perimeter fails to start**
Check the cables and fuses.

**Cannot find the software on the desktop**
Re-install the software

**On screen error messages**
There are several error messages that you may see when operating your Henson. Many of these are just warnings that are self explanatory, e.g. 'You have only tested one eye' when you select print or save. More information on these can be obtained by simply clicking the Help button attached to the message.

Other messages inform you that the hardware is not working properly and need further investigation.

Some of these messages are listed below

- **Background out of Tolerance**
- **Bowl Error**
- **LED error**
- **Key violation**
- **Chin rest**
12.1 Background out of tolerance

The Henson 9000 incorporates special sensors within the bowl which continually maintain the background luminance at the correct level.

- If this intensity cannot be maintained at the beginning of an examination, an error message will be displayed.
- The most likely cause for this error is the room illumination being too bright. If this is the case, turn down the room illumination and press the Restart button.
- The error may also be caused by a failure of one of the bowl illuminators.
- Clicking continue will proceed with the test. Data collected will not, however, be valid.
- If problem continues, contact a service engineer.
12.2 Bowl error

A Bowl error message will appear when the communications with the bowl do not appear to be working.

Check that the USB cables(s) between the Henson and computer are plugged in and that the Henson is powered up.

If problem continues, contact a service engineer.
12.3 LED error

At the beginning of each examination, LED operation is checked automatically. If a fault is detected, an error message will be displayed.

- Press Continue to proceed with the test, but note that data collected may be subject to error.
- If the problem continues, contact a service engineer.
12.4 Chinrest

If the chin rest will not respond to the buttons, check that the message below the buttons does not state that it has reached a limit (upper or lower).

If you are using a touch screen check that it is configured for mouse operation (i.e. it will replicate mouse buttons correctly) some touchscreens invoke a right mouse click if the touch screen is pressed for several seconds.

Try operating the on-screen buttons using a left click from a physical mouse instead of the touch screen and if it works, then the touch screen settings need changing.

If the chin rest is still not working then contact the service agent.

If the chin rest does not stop when releasing the on-screen button when using a touch screen, check the settings of the touch screen to ensure they are replicating a mouse.
12.5 Key violation

A key violation message will appear when trying to save a record in the database using the same family name, record number and date and time of test of a record that already exists.

This usually occurs if a test for this patient has already been saved.
12.6 **Database errors**

The Henson Database program is where your saved visual field records are kept.

The Database program has a specific set of error messages related to the workings and limitations placed upon its operation.

In most cases the error message will have an associated help facility that can be accessed by clicking the help button attached to the message. Some further detail on some of these messages is given through the following links:

- [Test not recognised](#)
- [Database warning](#)
12.6.1 Test Not recognised

One of the facilities available in the Henson Database is to import records from earlier Henson perimeters (6000 and Pro).

During the import process the Database will check that the data comes from a test that is supported by the Database software. In cases where the test is not supported (e.g. a peripheral test from a Humphrey perimeter) you will get a message stating that the test type is not recognised.
12.6.2 Database Backup not available

Every time a perimetrist saves or edits a visual field record the result is saved within the database and a second copy is made at the backup location.

The default location of the Database Backup is a removable drive (e.g. pen drive) or a network address.

If the Database Backup locations is not available (e.g. the pen drive has been removed) then you will get this warning message. Continuing will save the data in the database but, obviously, not in the backup.

When you re-establish the backup (e.g. re-insert the pen drive) and save/edit another record the backup will be restored.

The location of Database Backup is set within the Options program.
13 Appendix 6 - License file

Clicking on the Start-up screen opens up a window that shows the version number of the current software.

In addition it gives a link to the web site of Elektron Technology - the manufacturers of the Henson range of perimeters and a second link to a file that gives details of the software License.

Click OK to close this window.
14 Appendix 7 - Networking

The Henson can be networked to enable:

- Multiple machines to access the same database,
- Multiple machines to access a network printer,
- Server backup (the database must reside on the server).

The options for networking the Henson will depend on what computer equipment is used. Most Computers will have a network connector and many laptops will also include a wireless adaptor. Refer to the computer's manual for details of networking options.
Appendix 8 - Practice management Integration

It may be possible for your Practice management software (PMS) to directly control the Henson software.

If the computer running your Practice Management software is directly connected to the Henson 9000 and has the facility for programmable buttons. It can use them to run the Henson tests directly without exiting the practice management software or using the Henson main menu. This type of control is called passing parameters as the patient details are passed directly to the Henson software.

If the computer with PMS is not connected to the Henson it may still be possible to pass the patient details to the Henson software. This would be done by programming the PMS to generate a text file containing the patient details and saving this somewhere. The Henson software when next operated would look for and read in this text file if it existed and use the details inside it to set up the test for the patient.

In both cases the PMS software will have to be set up to generate the information required and pass this to the Henson software.

Passing Parameters

Each of the Henson test strategies is a separate program and can be run individually.

After the filename, there are a number of items (called parameters) that should be passed.

The following list gives the path and filename that must be programmed into the button in the practice management software.

**Single stimulus supra threshold test**

C:\Henson9000\Sssp.exe

**Multiple stimulus supra threshold test**

C:\Henson9000\Msspl.exe

**Drivers test**

C:\Henson9000\Driv.exe

**Zata test**

C:\Henson9000\Zata.exe

If no parameters are passed then the test program will open normally as if opened from the main menu.

When passing parameters the patient details are added to the end of the filename above - all separated by spaces - and the software reads them in.
For example to run the single stimulus supra threshold test you would send

C:\Henson9000\Sssp.exe <surname> <firstname> <record_number>
<Date_of_Birth> <DATA>

The patient details above are self explanatory and all must be provided.

The <DATA> entry is only used on the Drivers and Zata tests. On the drivers test you must enter a 1 or 2 to denote group 1 or 2 test. If it is omitted then a group 1 test will be run.

On a Zata test you must enter the data text from the following:

<table>
<thead>
<tr>
<th>Test strategy</th>
<th>Data text to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard 24-2</td>
<td>S24</td>
</tr>
<tr>
<td>Fast 24-2</td>
<td>F24</td>
</tr>
<tr>
<td>Standard 10-2</td>
<td>S10</td>
</tr>
<tr>
<td>Fast 10-2</td>
<td>F10</td>
</tr>
</tbody>
</table>

The last item <PDF_Path> is the option to specify a location for a copy of the printout in PDF format to be saved. Should you wish to specify this location - for example if your PMS system has patient specific folders then this path should be included as the last parameter. If omitted then any setting from the options program will be used (if set).

Your practice management software manual / supplier can tell you how to program the buttons to send these parameters.

Text files.

If your practice management software does not support passing parameters, you may be able to use text files to transfer the parameters.

The Henson software is operated normally from the Henson main menu, but instead of entering details, the patient details are read in from a text file which is accessible to the Henson software (usually across a network: the location is set in the options program).

Once the details are read in the file is deleted.

The format for the text file is as follows: Each item must be on a separate line - punctuation such as hypens(-) and underscores (_) can be used in names but no other punctuation should be used.

The date of birth format should match that used by the Computer’s regional settings - this can be viewed by looking at the integration tab in the options program.

The format for Data is the same as for parameter passing.

<surname>
<first name>
<record number>
<date of birth>
<Data>
<path to a folder to place the PDF> (this is optional but if used will override any setting for copy PDF in options)

The path to the text file and its name are set in the options program.

The integration tab shows you the date format required (read in from the computer’s regional settings) and has a path and filename box. To set the path browse to it using the drive and directory boxes at the bottom of the screen. To set the filename, click in the filename box and an onscreen touch keyboard will appear. You can use this or a regular keyboard to type in the name of the file – making sure it ends in .txt This file should be created by the PMS and will be deleted once read in by the Henson software.
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