



Optical Path Difference Scanning System

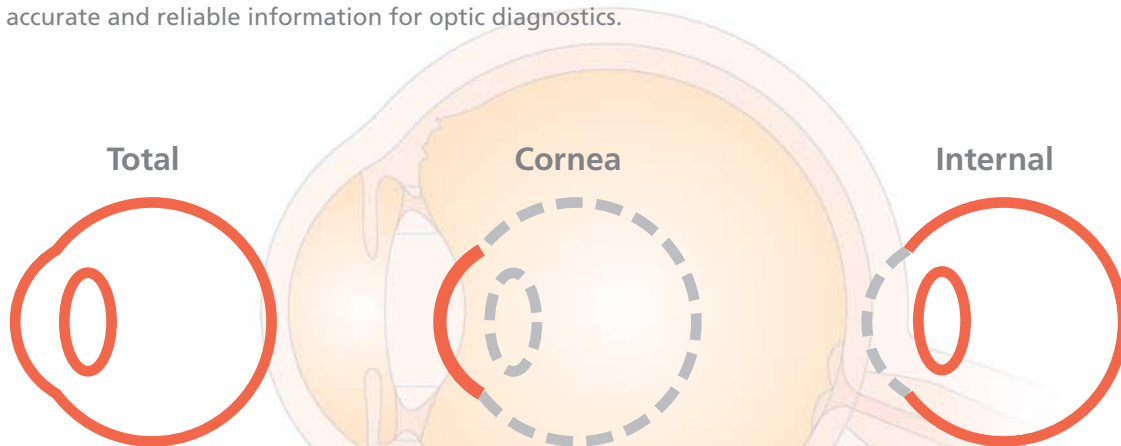
# OPD-Scan II ARK-10000



# Optical Path Difference Scanning System OPD-Scan II ARK-10000

## ■ Accurate and Reliable Data for Optic Diagnostics

The OPD-Scan II provides information on corneal topography, wavefront, autorefractometry and pupillometry in one unit, utilizing state-of-the-art imaging and analysis technology developed specifically to measure normal to highly aberrated eyes. The system offers a variety of data maps to provide information on the total refractive error, wavefront, corneal shape, internal aberrations and visual quality of the eye, allowing highly accurate and reliable information for optic diagnostics.



The OPD-Scan II utilizes the principle of skiascopic phase difference for refractive error map measurement. The retina is scanned with an infrared light slit beam, and the reflected light is captured by an array of rotating photo detectors over a 360° area.

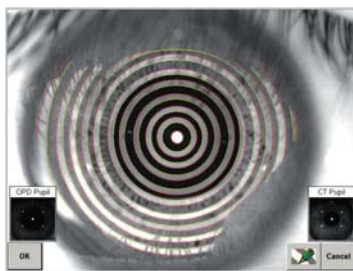


Measurement Screen

### Aberrometry Maps:

- OPD Map
- Wavefront Map
- Zernike Graph
- PSF

The corneal topography function utilizes Placido disc technology. The system captures the image of reflected rings of light from the cornea and analyzes thousands of data points to plot the corneal contour, shape and refractive power.

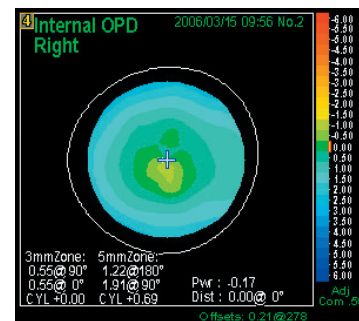


Placido Ring Image

### Corneal Topography Maps:

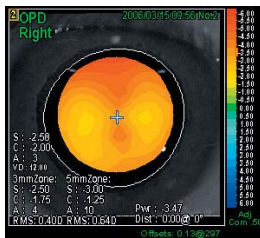
- Axial Map
- Instantaneous Map
- "Refractive" Map
- Elevation Map

The OPD-Scan II measures corneal refractive power by corneal topography, and total refractive error as the OPD map. The Internal OPD Map plot is created by subtracting the corneal refractive power from the total OPD to display in diopters the distribution of refractive error contained in the internal eye.



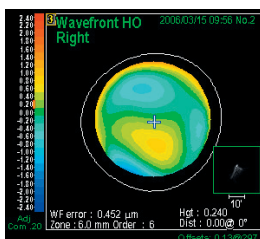
Internal OPD Map

# Data Maps



## OPD Map

The OPD (Optical Path Difference) map plots the refractive error distribution of total eye aberrations, lower and higher order, in Diopters. This map allows the clinician to easily determine the refractive status and visual quality of the eye with one quick look. **This map is unique to the OPD-Scan II.**



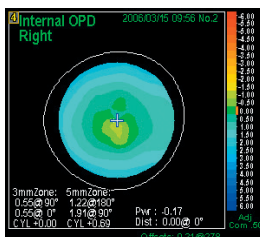
## Wavefront High Order Aberration Map

This map shows specific high-order aberration components only, extracted from the total wavefront map. Plotted in microns, this map illustrates the location and degree of high-order aberrations in the eye.

Zernike	Graph No. 2 Right Zone: 6.0 Order: 6	Total	-1.00	-0.80	0.00	0.80	1.00
1. Tilt						0.124	1.047
2. Tilt							
3. Coma					-0.27%		
4. Coma							4.21%
5. Trefoil			-1.360				
6. Trefoil						0.005	
7. Coma							0.005
8. Coma							0.005
9. Trefoil							0.005
10. Trefoil							0.005
11. Astigm							0.124
12. Spher							0.258
13. Spher							0.258
14. Spher							0.258
15. Spher							0.258
16. Spher							0.258
17. Coma							0.015
18. Coma							0.015
19. Trefoil							0.048
20. Trefoil							0.048
21. Hexafoli							0.009
22. Hexafoli							0.009
23. Hexafoli							0.009
24. Astigm							0.040
25. Astigm							0.040
26. Trefoil							0.000
27. Hexafoli							0.000

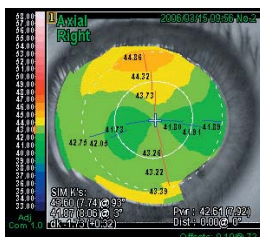
## Zernike Graph

This graph plots the magnitude of each aberration components such as spherical aberration, coma and trefoil that makes up the total aberration of the eye. The graph is used to determine which components (s) dominate the aberration structure of the eye and to what degree. This information may be connected to visual symptoms.



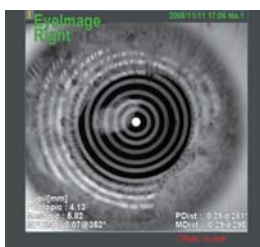
## Internal OPD Map

This map shows the internal aberrations of the eye. It can be used to distinguish between the effects of internal aberrations and corneal or surface aberrations. For normal corneas, the map indicates the presence of internal astigmatism (especially, lenticular astigmatism), and shows the direct refractive effect of an IOL (such as tilt and haptic torque). **This map is also unique to the OPD-Scan II.**



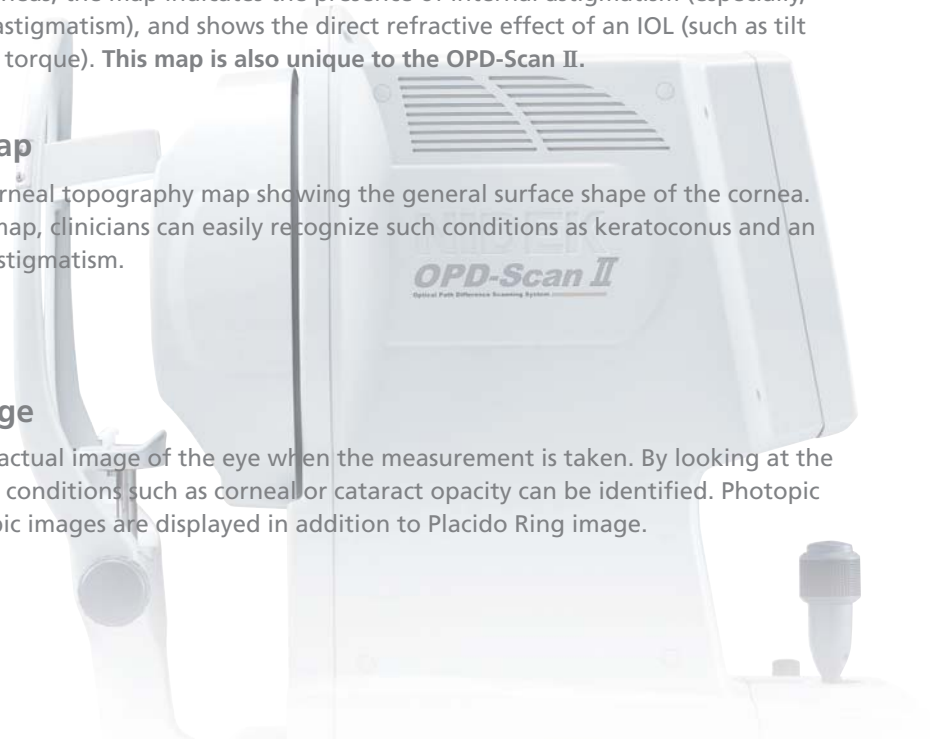
## Axial Map

This is a corneal topography map showing the general surface shape of the cornea. With this map, clinicians can easily recognize such conditions as keratoconus and an irregular astigmatism.



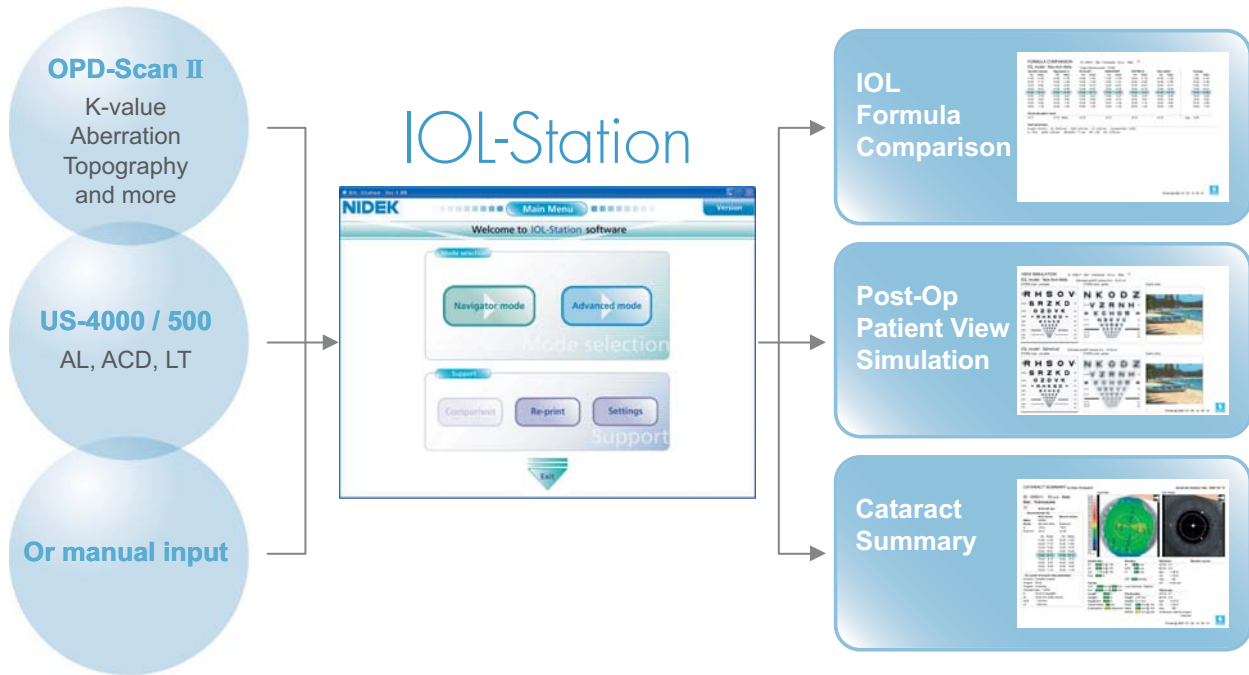
## Eye Image

This is the actual image of the eye when the measurement is taken. By looking at the actual eye, conditions such as corneal or cataract opacity can be identified. Photopic and Mesopic images are displayed in addition to Placido Ring image.



# Optional Software

## ■ The IOL-Station for Wavefront Assisted Cataract Surgery

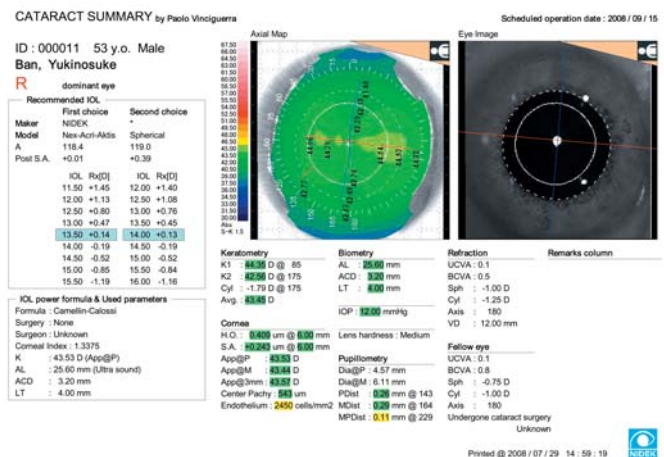


The IOL-Station software is a powerful tool for cataract surgeon. The IOL-Station is software for Wavefront assisted Cataract Surgery, including multiple IOL calculations, average IOL calculation, aspheric IOL selection, post-op patient view simulation and cataract summary developed in cooperation with Dr. Paolo Vinciguerra.

The IOL-Station features Navigator Mode for quick and accurate calculation, as well as detailed Advanced Mode, which provides much more detailed information for precise consideration of a surgery.

Selecting an aspheric IOL is now easy with the IOL-Station by utilizing the OPD-Scan II's data on aberration of the eye and appointing target spherical aberration of the eye after an IOL implantation.

The IOL-Station's Post-Op Patient View Simulation is a useful tool for selection of an Aspheric IOL, as well as informed consent.



## Average Pupil Power (APP)

By utilizing the IOL-Station's Average Pupil Power (APP), calculation for selection of an IOL is now safer and more accurate.

## Post-Op Patient View Simulation

By selecting an IOL, Post-Op Patient View is simulated on screen with chart.

The IOL-Station's Post-Op Patient View Simulation is a useful tool for selection of an Aspheric IOL, as well as informed consent.

## Flexible selection of IOL formula

Popular IOL formulas such as BINKHORST, HOFFER Q or HOLLADAY formula are available.

## Post LASIK calculation available

Camellin-Calossi IOL formula is applicable for a patient who underwent refractive surgery (RK, AR, CK, PRK, LASIK, PTK, LK, etc.). Also, Non-History method IOL formula is selectable for a patient with unknown history of refractive surgery.

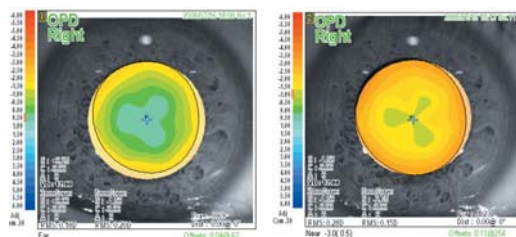
## Formula Comparison Screen

Up to six results of IOL calculation with different formulas can be compared or be averaged with Formula Comparison Screen. For a patient with unknown history of refractive surgery, comparing calculation result with Camellin-Calossi formulas and Non-History method is beneficial.

## One-Click data import

Connecting the IOL-Station PC with the OPD-Scan II Optical Path Difference Scanning System and the US-4000 / US-500 Echoscanner by network enables one-click import of such data like K-Value, Aberration, Corneal Topography, Axial Length, Anterior Chamber Depth, Lens Thickness, Corneal Thickness.

## Accommodation Measurement Function



far vision

near vision

Accommodation Measurement Function is available as an add-on to the built-in function of the OPD-Scan II.

The distribution of refractive power is measured on far vision and near vision with specific accommodation. The function benefits in confirming correct function of accommodative IOL. Accommodation amount is variable within the range of -10 D to 0.0 D.

# Optional Software

## ■ *Corneal Navigator*

Corneal Navigator can be used as a integrated function of the OPD-Station or can be integrated separately into the OPD-Scan II.

Utilizing various corneal parameters from topography, the Corneal Navigator automatically determines corneal features and shows by percentage the possibility of having a condition of normal (NRM), astigmatic (AST), keratoconus suspects (KCS), keratoconus (KC), pellucid marginal degeneration (PMD), myopic refractive surgery (MRS), hyperopic refractive surgery (HRS), and penetrating keratoplasty (PKP). Instant analysis by the Corneal Navigator helps improve the quality of examination / diagnosis.

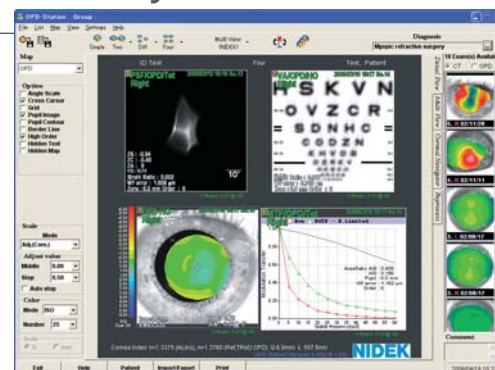
\*The Corneal Navigator is developed in collaboration with Stephen D. Klyce, PhD & Michael K. Smolek, PhD.



## ■ *The OPD-Station Corneal / Refractive Analysis Software*

The OPD-Station software makes a variety of corneal / refractive analysis possible using advanced, unique and intelligent functions including the Holladay Summary and Corneal Navigator (optional).

The OPD-Station provides various maps such as the OPD HO Map, PSF, MTF, MTF Graph and Visual Acuity Chart in addition to the OPD-Scan II maps. For wavefront maps such as the PSF and MTF, clinicians can select the target (OPD, Cornea, Internal) and also the type (Total, HO, Group) according to their needs.



OPD-Station Screen

### Holladay Summary\*

The "Holladay Summary" shows the patient where the aberrations are located and how they affect the quality of vision using the Wavefront, MTF, PSF and VA-chart simulations.

\*Developed in cooperation with Jack T. Holladay, MD.

### PSF Simulation

Calculates the Point Spread Function (PSF) based on the OPD data, and displays in simulation the distribution of the point spread. The Strehl Ratio serving as a metric of the visual quality of the eye is also displayed.

### Retinal Image Simulation

Calculates the distortion of incoming light based on the results of PSF analysis, and displays the simulated retinal image of the projected chart. This simulation can be used in explanations to patients for informed consent.

### OPD HO Map

Displays in diopters the high order aberrations and shows the refractive errors which cannot be corrected with glasses.

### Averaging Multiple Exams

The OPD-Station creates an exam data average from multiple exams. Noise components such as tear film and fixation disparity are excluded, providing more stable and reliable data.

## Features of the OPD-Scan II

### ■ **Measurement Selection for Improved Reliability**

The OPD-Scan II offers increased reliability of examination by automatically selecting the best measurement from multiple measurements, allowing a more reliable clinical decision

### ■ **Fast Processing Speed**

The OPD-Scan II offers fast processing speed, minimizing stress in daily clinical use.

### ■ **Improved Accessibility to a Patient Eye**

With the improved forehead rest, it is easier to reach and keep the patient's eyelids open.

### ■ **Wide Measurement Range**

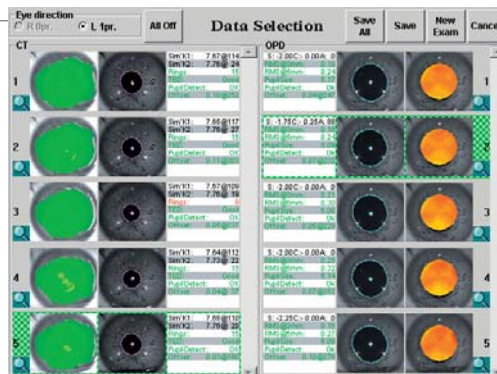
Has the ability to measure high power Cylinder providing accuracy in irregular aberration measurements. (Sphere -20.0 to +22.0 D and Cylinder 0.0 to  $\pm 12.0$  D)

### ■ **Easy Data Maintenance with a Detachable Hard Drive**

Patient data is saved to a detachable Hard Drive, allowing quick and easy data transfer.

### ■ **Network Capabilities**

Data from the OPD-Scan II may also be analyzed at a remote location using the OPD-Station.



Measurement Selection Screen



Improved Accessibility



"The OPD-Scan II is the instrument that couples Wavefront, Topography and Refraction into one unit. This allows the isolation of any optical problem to cornea or crystalline lens making it easy to decide if lensectomy or corneal surgery is the procedure of choice. It also provides the best data for Customized Corneal Refractive Surgery."

**Jack T. Holladay, M.D., M.S.E.E., F.A.C.S.**

"I see for the future the coupling of wavefront sensors with corneal topography devices for the optimal correction of aberrations in a patient's eye. "

**Stephen D. Klyce, Ph.D.**

Professor of Ophthalmology and Anatomy, Louisiana State University  
Recipient of ASCRS 2000 Innovator's Award for contributions to the field of corneal topography and refractive surgery



## OPD-Scan II (ARK-10000) Specifications

Power mapping	
Spherical power range	-20.00 to +22.00 D
Cylindrical power	0.00 to ±12.00 D
Axis	0 to 180°
Measurement area	2.0 to 6.0 mm diameter (4 zone measurement)
Measurement points	1,440 points (4 x 360)
Measuring time	< 0.4 seconds
Measurement method	Automated objective refraction (dynamic skiascopy)
Mapping methods	OPD, Internal OPD, Wavefront maps, Zernike graph, PSF
Corneal topography	
Measurement rings	19 vertical, 23 horizontal
Measurement area	0.5 to 11.0 mm dia. (r=7.9)
Dioptric range	10 to 100 D
Axis range	0 to 359°
Measurement points	More than 6,800
Mapping methods	Axial, Instantaneous, "Refractive", Elevation
Working distance	75 mm
Auto tracking	X-Y-Z directions
Observation area	14 x 8 mm
Operating system	Windows XP embedded*1
Display	10.4-inch color LCD touch panel
Printer	Built-in thermal type line printer for data print External color printer (optional) for map print
Power supply	100 / 120, 220 / 240 Vac 50 / 60 Hz
Power consumption	170 VA
Dimensions / Weight	290 (W) x 524 (D) x 520 (H) mm / 25 kg 11.4 (W) x 20.6 (D) x 20.4 (H) " / 55 lbs.

## OPD-Station Specifications

Analysis and map display	
Corneal topography	Axial, Instantaneous, "Refractive", Elevation, Topoclassifier*2
OPD	OPD, OPD HO, Zonal refraction
Wavefront	Wavefront, Zernike graph, PSF, MTF, MTF graph, Visual acuity
Others	Internal OPD, Target refractive, Differential, Eye image, Asphericity index (Q, e, S)
Corneal navigator (optional)	8 kinds of corneal classification, Statistics
Pupillometry	Diameters, Distances, Contours (photopic / mesopic condition)
Computer requirements	
CPU	Pentium III 1200 MHz or higher
Free disk space	30 GB or more
Memory	256 MB or more (above 512 MB recommended)
Graphic	1024 x 768 pixels, 32 bit true color or more
LAN port (RJ-45)	1 or more
CD-ROM drive	12 x or more
USB port	1 or more
OS	Windows VISTA 32 bit SP1*1

## IOL-Station Specifications

Computer requirements	
CPU	Pentium 4 1.3 GHz or higher
Hard disk space	1 GB or more
Memory	512 MB or more
Graphic	1024 x 768 pixels, 32 bit true color or more
Monitor	Compatible with graphic mode as specified above
LAN port	1 or more
USB port	1 or more
RS-232C port	1 (For US-4000 / 500 connection*3)
OS	Windows VISTA 32 bit SP1*1

\*1 Windows is a trademark of Microsoft Corporation U.S.A.

\*2 Topoclassifier is available with corneal navigator only.

\*3 LAN port connection is also available for US-4000/500.

Specifications and design are subject to change without notice.



**HEAD OFFICE**  
34-14 Maehama, Hiroishi  
Gamagori, Aichi, 443-0038, Japan  
Telephone : +81-533-67-6611  
Facsimile : +81-533-67-6610  
URL : <http://www.nidek.co.jp>  
[Manufacturer]

**TOKYO OFFICE**  
(International Div.)  
3F Sumitomo Fudosan Hongo Bldg.,  
3-22-5 Hongo, Bunkyo-ku, Tokyo,  
113-0033, Japan  
Telephone : +81-3-5844-2641  
Facsimile : +81-3-5844-2642  
URL : <http://www.nidek.com>

**NIDEK INC.**  
47651 Westinghouse Drive  
Fremont, CA 94539, U.S.A.  
Telephone : +1-510-226-5700  
                  : +1-800-223-9044 (US only)  
Facsimile : +1-510-226-5750  
URL : <http://usa.nidek.com>

**NIDEK S.A.**  
Europarc  
13, rue Auguste Perret  
94042 Créteil, France  
Telephone : +33-1-49 80 97 97  
Facsimile : +33-1-49 80 32 08  
URL : <http://www.nidek.fr>

**NIDEK TECHNOLOGIES Srl**  
Via dell'Artigianato, 6 / A  
35020 Albignasego (Padova), Italy  
Telephone : +39 049 8629200 / 8626399  
Facsimile : +39 049 8626824  
URL : <http://www.nidektechnologies.it>

