

# VESTIBULAR TECHNOLOGIES



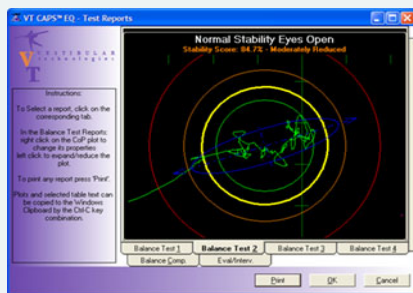
## PRODUCT CATALOG AND INFORMATION

HELPING PEOPLE REGAIN THEIR BALANCE ... FOR LIFE®



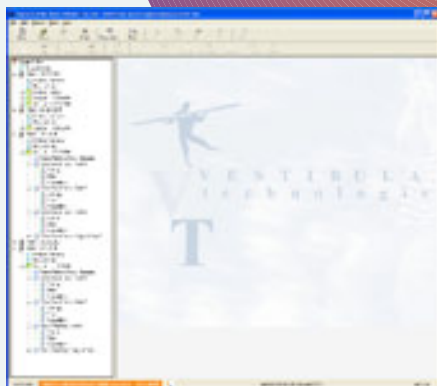
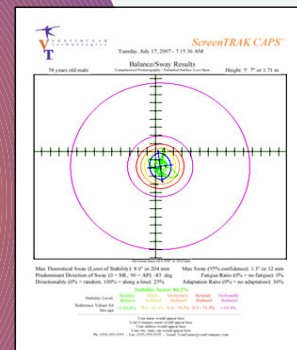
# VESTIBULAR technologies

HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®



## CAPS™

the posturography  
line of products



# Posturography

## What it is

Posturography is a general term that covers all the techniques used to quantify postural control in an upright stance, in either static or dynamic conditions.

Among those techniques is computerized dynamic posturography (CDP), also called test of balance (TOB). CDP is a non-invasive specialized clinical assessment technique used to quantify the central nervous system adaptive mechanisms (sensory, motor and central) involved in the control of posture and balance, both in normal (such as in physical education and sports training) and abnormal conditions (particularly in the diagnosis of balance disorders and in physical therapy and postural re-education).

Due to the complex interactions among the sensory, motor, and central processes involved in posture and balance, CDP requires different protocols to differentiate among the many defects and impairments, which may affect a subject's postural control system. CDP challenges that system by using several different combinations of visual and support surface stimuli and parameters and has been proven effective in assessing vestibular as well as some neuromuscular disorders affecting balance.

## How it works

Static posturography is carried out by placing a subject in a standing posture on a fixed instrumented platform (force plate) connected to sensitive detectors (force and movement transducers), which are able to detect the tiny oscillations of the body.

Dynamic posturography differentiates from static posturography in that it usually involves perturbing the subject's posture by means of a foam cushion or a special apparatus with a movable horizontal and tilting platform. As the subject makes small movements, the sensitive detectors transmit this time-varying information in real time to a computer. Thus, the dynamic posturography test protocols can quantify the ability of a subject to maintain balance in non-static conditions. Usually coupled with the ability to test the subject either with or without visual references (eyes open or closed) or with a moving environment that gives conflicting visual information, dynamic posturography makes it possible to quantify a subject's vestibular functions. This is because, in certain testing conditions, the visual and proprioceptive systems cannot be used, and the subject must rely only on the vestibular system to maintain balance.



# THE CAPS™

The CAPS™ (Comprehensive Assessment of Postural Systems) is the essential tool for any clinician who wants to offer balance disorder screenings, diagnosis and rehabilitation to his/her patient population as well as implement an effective, profitable fall prevention program.

The CAPS™ combines very user friendly, yet very powerful software applications with exciting new cutting-edge technology: our unique, self-leveling, three-component force platforms that are powered only by the computer via a USB connection. And when used with a laptop computer, the CAPS™ becomes a completely portable solution.

## CAPS™ Lite

A complete solution designed for ultimate portability, usability, compactness and low cost, the CAPS™ Lite is our entry-level computerized posturography balance and fall risk assessment line of products.

The CAPS™ Lite is the perfect tool for clinicians who only need to screen and test for falls-risk, measure therapy progress, and document treatment outcomes.

## CAPS™ Professional

Many providers need to be able to do more than just evaluate a subject's balance in static conditions and in a "feet-together" or "feet at shoulder-width" positions as can be done with the CAPS™ Lite or other products on the market. This is why we manufacture the CAPS™ Professional, our unique and advanced computerized posturography balance and fall risk assessment and treatment line of products. But the CAPS™ Professional is not just a posturography product: it is also an extremely advanced physical performance testing and rehabilitation tool that can be used for a variety of applications besides assessing balance and dizziness, and for fall prevention.

In fact, in addition to what you can do with the CAPS™ Lite, the CAPS™ Professional allows you to obtain a subject's detailed medical history, with special emphasis on falls, balance disorders, hearing and tinnitus; to test your subject's balance in every possible combination of head, arm, leg, body and force platform positions; to get sit-to-stand analysis data far superior to anything else available anywhere else; to test the explosive strength of leg and arm muscles of subjects of all ages; to test your subject's Limit of Stability (LoS) in eight (not just four) positions; and to improve your subjects' lower extremity strength, reaction time, stamina and more with our unique "body saccades" targeting modality.



V E S T I B U L A R  
t e c h n o l o g i e s

HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

## **CAPS™ Lite System**

(U.S. Patent 7,163,516)

**The CAPS™ Lite System  
offers you the perfect solution for  
providing your patients with  
balance screenings and  
assessments**

Although there are other systems on the market today, none are as truly portable as our CAPS™ Lite system – not even our own CAPS™ Professional system.

But the best feature of all is the patented 60 second falls-risk identification and objective quantification of that risk that you get with our proprietary CAPS™ software.



# Applications

## CLINICAL

Remember - most persons are unaware of their risk of falling, and even if they are aware they will not report their symptoms to their physician. That is why experts recommend the routine screening of patients.

With the CAPS™ Lite you can:

- Screen your own patient population and also perform community screenings to identify the large number of subjects with abnormal balance who are at higher risk of falling. A large percentage of them will be candidates for further assessment, testing or treatment.
- Evaluate and document in “real time” the results of your interventions with the patient, allowing you to get the information you need in order help you make the proper treatment decisions for every patient.
- Replace your old scale because the CAPS™ Lite gives you the patient's weight and BMI at the same time our specialized software is evaluating their ability to maintain their balance and avoid a dangerous fall.
- Obtain useful diagnostic information as well as objective and documented evidence to help establish medical necessity for further testing and for treatment.
- Effectively document treatment outcomes with objective textual and graphical results that can facilitate reimbursement.

## ATHLETIC/SPORT

In addition to being an exceptional clinical tool, the CAPS™ Lite has many applications in athletics and sports medicine.

The CAPS™ Lite allows you to easily identify the effect balance has on the physical performance of your patients, then accurately track their training progress.



## Packages

### PKCL-St: the Screening Package

Our ScreenTRAK™ software makes this the perfect system for basic balance screenings and assessments, as well as weight and BMI calculations. It is designed for clinicians who just need to know whether or not their patient's balance is affected in any way. It also simplifies compliance with the Medicare requirements applicable to new enrollees, as well as with the practice guidelines issued by medical experts and respected professional associations.

### PKCL-Eq: the Testing Package

This system is ideal for practitioners who want to delve a little deeper into their patients' balance problems. With this system you receive not only the basic testing capabilities of ScreenTRAK™ but also the more extensive testing protocols found in our new CAPS™ EQ software.

#### NOTE:

**CAPS™ packages include the CAPS™ Lite Hardware (force platform, perturbing foam cushion, carrying case) and the indicated software applications:**

	ScreenTRAK™	CAPS™ EQ
PKCL-St	✓	
PKCL-Eq	✓	✓







V E S T I B U L A R  
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HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

## CAPS™ Professional System

(U.S. Patents 6,510,749; 7,163,516; and D447,968)



### Your “all-in-one” solution for screening, assessment and treatment

Whether you are a Primary Care Physician, Chiropractor, Physical Therapist or Audiologist, it is the best piece of equipment you could ever own.

With the CAPS™ Professional, not only you can identify new balance disorder/falls-risk patients with our patented screening process, but you can also thoroughly assess and treat them.

- Quick easy, patented process
- Accurate, objective results
- Age-based reference values
- Unique, specialized assessment protocols



# Applications

## CLINICAL

The CAPS™ Professional's unique patented hardware design and versatile, flexible software make it possible to perform a number of different tests - for screening, assessment/diagnostics and treatment.

The CAPS™ Professional lets you obtain essential information about your patient's balance system, neuromuscular control and physical performance that has never before been available to you.

The CAPS™ Professional allows you to easily document diagnostic testing, treatment progress and outcomes using a large variety of metrics that are applicable not only to balance disorders but also to a large number of neurological and neuromuscular pathologies.

With the CAPS™ Professional you can observe and evaluate in "real time" the effects of the treatments you provide.

## ATHLETIC/SPORT

In addition to being an exceptional clinical tool, the CAPS™ Professional has many applications in athletics and sports medicine.

The CAPS™ Professional allows you to easily identify many different performance limiting factors and their effects on physical performance, then accurately track your patient's therapy progress.

And because the CAPS™ Professional is both portable and rugged, you can use it on or off the field.

# Packages

## PKCP-Bs: the Base Package

Our basic system for balance screenings and assessments, this package includes not only our patented ScreenTRAK™ screening software, but also our more flexible CAPS™ EQ testing software.

## PKCP-Ch: the Carrick Package

The system best suited for most Chiropractors. In addition to the basic package, it includes three of our advanced testing, rehabilitation and therapy software modules: BalanceTRAK® static balance, limit of stability and targeting. With these software modules you can see immediate results from your interventions with your patients, allowing you to be much more effective in helping them and in properly documenting your efforts.

## PKCP-Pt: the Therapy Package

Physical therapists will get the most benefit from this package because it includes the Sit to Stand and Power tests that allow them to perform specialized assessments not possible with any other product.

## PKCP-Cp: the Complete Package

This package is geared towards those who want to do everything, from screening to assessment to therapy and rehabilitation. This "ultimate" package includes:

- Our ScreenTRAK™ screening software
- Our CAPS™ EQ intermediate testing software
- Our BalanceTRAK® advanced testing, rehabilitation and therapy software

**And if you can't find a package that really suits your needs, we'll gladly create a customized solution for you!**

### NOTE:

**CAPS™ packages include the CAPS™ Professional Hardware (force platform, perturbing foam cushion, carrying case) and the indicated software applications:**

	ScreenTRAK™	CAPSTM EQ	BalanceTRAK®							
			Medical History	Static Balance	Limit of Stability	Targeting	Sit to Stand	Power	Evaluations	Interventions
PKCP-Bs	✓	✓								
PKCP-Ch	✓	✓		✓	✓	✓				
PKCP-Pt	✓	✓		✓			✓	✓		
PKCP-Cp	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓





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HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

## CAPS™ Lite Hardware



The CAPS™ Lite force platform is the perfect tool for fall risk assessments and balance disorder screenings.



- Lightweight
- Portable
- Highly accurate
- When combined with CAPS™ software, an indispensable tool for every clinician



# CAPS™ Lite Three-Component Force Platform

## SENSITIVE

- You can see forces as little as 0.1 N (0.4 oz f). That means you can see your weight change as your heart beats!
- Signal to Noise Ratio of 106 dB or four parts per million
- Electronics are low power and provide truly simultaneous data acquisition of all three load cells, eliminating timing errors
- The digital signals go directly to the computer for processing through the USB connection

## LIGHTWEIGHT AND PORTABLE

- Lightweight
- Will not rust or corrode
- Maximum static load capacity of 1.5 kN (350 lbf)
- Because the calibration matrix and other parameters are stored in the electronics, you can always be certain to have the right calibration matrix, even if you have multiple CAPS™ force platforms or use multiple computers with one CAPS™ force platform

## ACCESSORIES

- Foam Cushion - Used as a non-compliant surface for testing
- Carrying Case - Used to store and transfer the force platform and its accessories

## SAFE

- It cannot conduct electricity, making it intrinsically safe from electrical shocks

## CONVENIENT AND EASY TO USE

- Measures the vertical force and the two horizontal moments from which the Center of Pressure and the sway are calculated
- The unique triangular shape limits the contact with the ground to only three points, making it self-leveling, with no need for an adjustable foot to prevent rocking
- Because it is USB powered, it requires no external power adapter, so you can even use CAPS™ Lite with your battery powered laptop
- Truly Plug-&-Play
- Requires no lengthy warm-up
- Designed to be used on any hard surface

## TECHNICAL SPECIFICATIONS

Property	Typical Value
Mass	4.7 kg [~10 lb]
Overall dimensions	0.457x0.508 x0.045 [18 x20x1.75"]
First natural frequency	60.2 Hz
Overload capacity in Fz	2.2 kN [500 lbf]
Range in Fz	0-1.5 kN [0~350 lbf]
Resolution in Fz	0.1 N [0.02 lbf]
Accuracy	2 N [0.45 lbf]
Linearity	0.2%





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HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

## **CAPS™ Professional Hardware**

(U.S. Patents 6,510,749 and D447,968)

As with our CAPS™ Lite,  
the CAPS™ Professional  
lets you quickly screen  
your patients for balance  
and equilibrium disorders  
and assess their  
risk of falling.



**But it doesn't stop there!**



With the CAPS™ Professional  
force platform you can  
perform much more advanced  
testing and assessments.

PLUS, you can provide highly  
beneficial rehabilitation and  
therapy services using the  
same CAPS™ equipment you  
use for screening.

# CAPS™ Professional Three-Component Force Platform

## CONVENIENT AND EASY TO USE

- Measures the vertical force and the two horizontal moments from which the Center of Pressure and the sway are calculated
- The triangular shape limits the contact with the ground to only three points, making it self-leveling, with no need for an adjustable foot to prevent rocking
- USB powered, it requires no external power adapter, making it possible to use it with your battery powered portable computer
- Truly Plug-&-Play
- Requires no lengthy warm-up before use
- Designed to be used on a hard surface
- **Provides a larger surface for positioning the subject's feet in a variety of configurations, including the standard Romberg heel-to-toe stance as well as wide feet stances**
- **Can be used with wobble boards, stools, steps and other devices for testing and rehabilitation purposes**
- **The perfect match for our advanced testing and rehabilitation software BalanceTRAK®**

## SAFE

- It cannot conduct electricity, making it intrinsically safe from electrical shocks

## SENSITIVE

- You can see forces as little as 0.1 N (0.4 oz f). That means you can see your weight change as your heart beats!
- Has a Signal to Noise Ratio of 106 dB or four parts per million
- Electronics are low power and provide for truly simultaneous data acquisition of the three load cells, eliminating timing errors
- The digital signals go directly to the computer for processing through the USB connection

## STRONG, DURABLE AND PORTABLE

- Lightweight
- **Made with composite material so it is splash-proof and can be used outside**
- Will not rust or corrode
- **Maximum static load capacity of 10 kN (2250 lbf) (over one ton!)**
- **Rugged design makes it well suited for moving it from location to location**
- Because the calibration matrix and other parameters are stored in the electronics, you can always be certain to have the right calibration matrix, even if you have multiple CAPS™ force platforms or use multiple computers with one CAPS™ force platform

## TECHNICAL SPECIFICATIONS

Property	Typical Value
Mass	7.3 kg [16 lb]
Overall dimensions	0.746x0.850x0.038m [29.4x3.5x.5"]
First natural frequency	92 Hz
Overload capacity in Fz	20 kN [4500 lbf]
Range in Fz	0-10 kN [0-2250 lbf]
Resolution in Fz	0.1 N [0.02 lbf]
Accuracy	2 N [0.45 lbf]
Linearity	0.2%

## ACCESSORIES

- Foam Cushion - Used as a non-compliant surface for testing
- Carrying Case - Used to store and transfer the force platform and its accessories

The differences between the CAPS™ Lite and the CAPS™ Professional Hardware are shown in **Bold**.

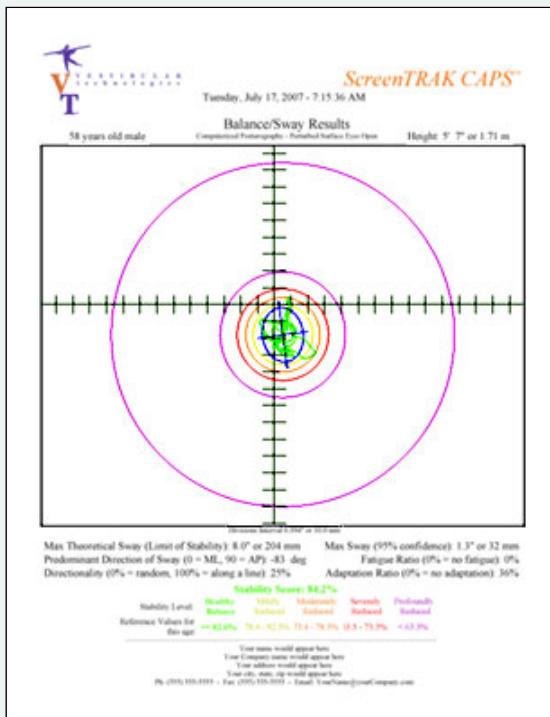




# VESTIBULAR technologies

HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

## ScreenTRAK™ software (U.S. Patent 7,163,516)



The unique software that replaces conventional subjective balance assessment protocols with a patented, fast and easy test that can be done by entry level personnel

- A powerful, easy to use, flexible software for basic balance screenings using any CAPS™ force platform
- All that has to be entered in order to perform the tests are the subject's height, age and gender
- So simple to use that the entire process can be controlled via a palm size remote control (included with any CAPS™ system)
- ScreenTRAK™ simplifies compliance with HIPAA because no subject's or test data are saved. Record keeping is accomplished by sending test results to a printer or to a file



# Applications

## CLINICAL

- ScreenTRAK™ was designed to let you quickly and easily screen subjects to identify who has abnormal balance and who is at higher risk of falling
- For in-patient facilities, clinics and medical offices, ScreenTRAK™ makes it easy to perform tests in less than a minute so that you can establish a fall risk evaluation and fall prevention program in compliance with JCAHO and other regulations
- ScreenTRAK™'s detailed, easy to understand reports make a great tool to explain balance impairment to a person, especially to those who have abnormal balance. The reports also provide the objective, documented evidence that many health insurers now require
- ScreenTRAK™ is a valuable treatment aid, since the ability to quickly perform additional tests lets you evaluate in "real time" the effect of the interventions you use with your patients
- ScreenTRAK™ can also be used to document outcomes, providing insurers with objective results that can facilitate reimbursement

## ATHLETICS/SPORTS

- A quick ScreenTRAK™ balance test can be used to evaluate athletes on the spot by comparing their results with their previously established baselines, letting you quickly detect sub-par performance - or dangerous concussions ... even directly on the sidelines
- With ScreenTrak™ you can make instantaneous decisions regarding training or tactics. You can also quickly see if an athlete has suffered any trauma from a violent contact or other event that might have caused neurological or physical injuries, even if those injuries are not readily apparent

# Screening Protocols

## Balance

The balance screening protocol measures the subject's sway by means of a computerized posturography test lasting just 20 s. The standard test is conducted on a perturbed surface (foam cushion) with eyes closed, since tests performed in these conditions have been statistically shown to have the best correlation with conventional fall risk (subjective) assessment protocols.

## Multi-Balance

The Multi-Balance option allows you to test in any of the four mCTSIB conditions (eyes open or closed; with or without perturbing foam cushion). The testing protocol is always the same, you just select the test condition you want, and the appropriate age-based reference values are automatically incorporated into the reports.

## Weight/BMI

Effectively replacing a standard physician's scale, the subject's weight and body mass index (BMI) can be automatically calculated while doing the balance screening.

No additional, time wasting steps are needed!

## Vision

Maybe you routinely test your patients' far (6 m or 20') and near (30 cm or 14") vision, but those tests don't tell you whether your patients can see what is under their feet when they take a step. That is why ScreenTRAK™'s special "tumbling E" Snellen test modality gives you a

much more effective tool to detect your patients' risk of falling because it lets you test their intermediate distance (2 m or 6') vision, scoring the results in the customary fashion.







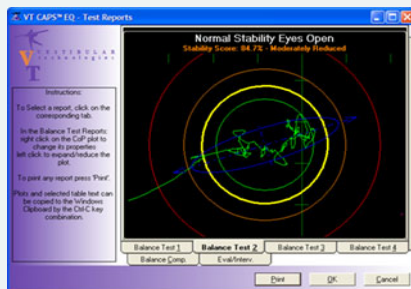
# VESTIBULAR technologies

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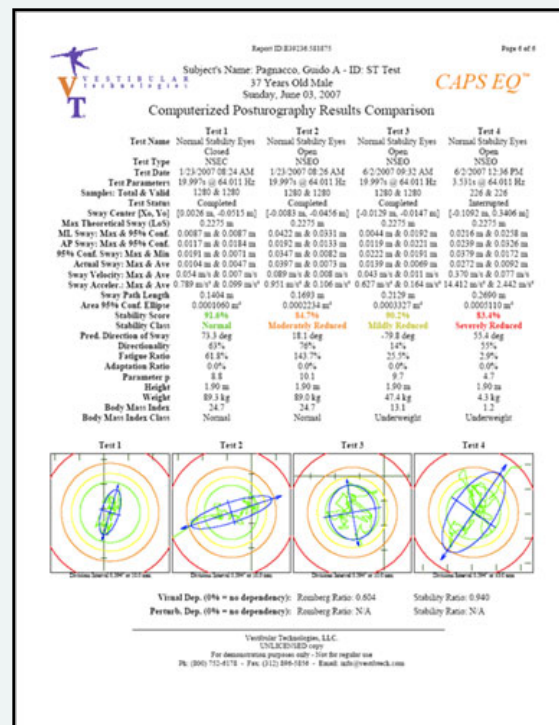
## CAPS™ EQ software

(U.S. Patent 7,163,516)

The unique, specialized software that pairs with the CAPS™ hardware to make it simple and easy to test static balance and equilibrium.



The easy to use CAPS™ EQ software gives you the flexibility to select different testing protocols (either predefined or user-defined), to perform extensive data analysis, to generate and print customized reports and to automatically print additional documents (such as referral forms, flyers, brochures or letters).

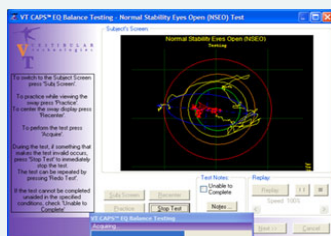


## Testing

The CAPS™ EQ interface for performing vision and balance testing.

The CAPS™ EQ's many features include:

- Selecting the testing template you want to use
- The ability to print up to four different test results so that the results of different tests may be easily viewed and compared

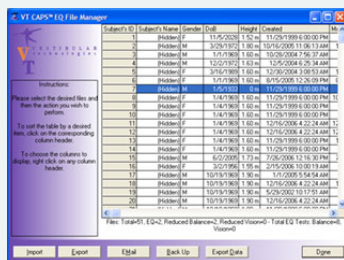


- Automatic generation of internal, external and patient reports
- Entry of evaluation and intervention notes
- Saving all test data for later viewing and comparison
- Choosing the order in which tests are done
- Instantly replaying the test to better view and analyze it
- Automatically printing additional documents such as advertisements, brochures or flyers whenever specified test results are obtained
- "Just click Enter" simplicity of conducting the mCTSIB test battery
- File compatibility with BalanceTRAK®, eliminating double entry of data

## Subject File Management

The CAPS™ EQ uses a unique "Patient-Centric" way of handling data files – one file per patient. Among its many features are:

- Easy export of CAPS™ EQ data files
- Easy import of CAPS™ EQ and BalanceTRAK® data files
- Simple email of CAPS™ EQ data files

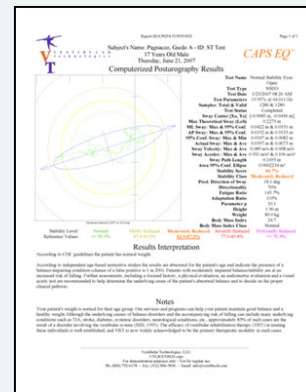
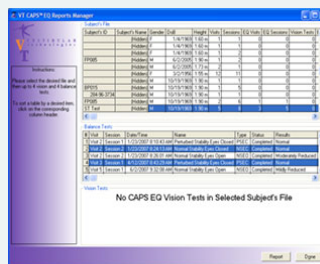


- Auto backup of CAPS™ EQ data files by just clicking your mouse
- Sort data by over 100 different criteria
- Quickly view a snapshot summary of the persons tested and cumulative data about the number who passed and failed the tests

## Report Reprinting

With CAPS™ EQ there is no need to print the test report immediately - you can do it at your convenience by using the Report Reprinting interface.

Included features are:



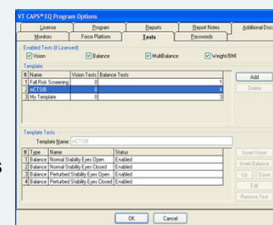
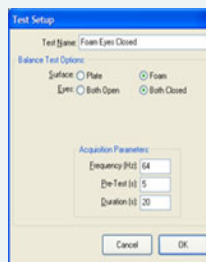
- Automatically generate internal, external and subject reports
- Print additional documents such as ads, brochures, flyers or referral forms depending on the test results

- Review and compare tests from different sessions, so you can easily monitor therapy progress and document outcomes

## Options

CAPS™ EQ lets you take full advantage of its many features by allowing you to customize it according to your needs, including:

- Changing the acquisition parameters to better fit your patients and your testing protocols
- Using a separate monitor for you and your patients
- Customizing testing templates
- Customizing the notes and comments on the printed reports
- Selecting additional documents to be printed with the reports, depending on specific test results
- Using two level password protection to restrict access to the software and data



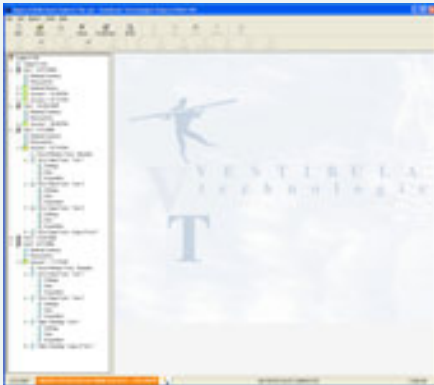


V E S T I B U L A R  
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HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

## BalanceTRAK® software

(U.S. Patent pending)



User friendly but extremely powerful, BalanceTRAK® offers you the latest in cutting edge technology for

- advanced balance testing
- physical performance testing and treatment

Using the CAPS™ Professional Force Platform, BalanceTRAK® lets you perform several specialized tests with unparalleled flexibility and control of test parameters, allowing you to obtain essential information about your subject's balance system and physical performance that was never before available to you.



# Applications

## CLINICAL

BalanceTRAK® lets you easily document diagnostic testing, therapy progress and treatment outcomes.

It facilitates compliance with JCAHO and other bodies regarding fall prevention and provides the objective and documented evidence that many health insurers are now requiring.

Because BalanceTRAK® lets you test subjects in an unprecedented variety of test conditions, it can be a very beneficial tool for you to use in the diagnosis of balance and other disorders.

Remember, too, that BalanceTRAK® and the CAPS™ Professional Force Platform can be used not only with fully ambulatory subjects, but also with subjects using support aids such as canes or walkers – even with subjects that are completely unable to stand.

## ATHLETICS/SPORTS

Although originally conceived as clinical tools, the various BalanceTRAK® modules have many applications in athletics/sports medicine.

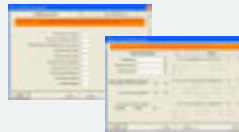
With BalanceTRAK® you can not only identify and evaluate factors limiting the subject's balance, you can also put the subject through a number of specialized physical performance tests, then measure, quantify and document the subject's progress while engaging in valuable biofeedback exercises tailored to the individual subject.

*Plus*, BalanceTRAK®'s rugged portability lets you use it not only in well controlled environments, but also directly on the sidelines.

# Modular Configuration

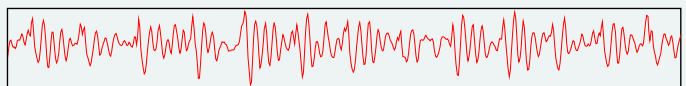
Although BalanceTRAK® consists of a collection of different modules working in a single unified framework, each module operates independently so you can purchase only the modules you need for your particular setting.

Available modules include:



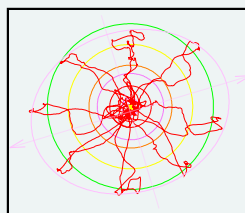
## Medical History

To get all the crucial medical information with special emphasis on dizziness, balance disorders, falls, near-falls, hearing and tinnitus



## Static Balance

To perform static balance/sway tests

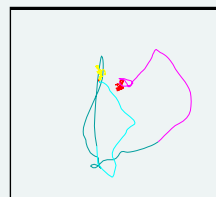


## Limit of Stability

To perform limit of stability tests

## Targeting

To perform sway targeting testing and exercises

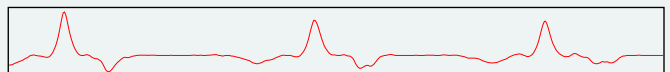


## Sit-to-Stand

To evaluate physical performance using the classic sit-to-stand test

## Power

To perform a variety of physical performance tests







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(U.S. Patent pending)

# BalanceTRAK® software

## Medical History Module

It is designed to quickly collect a subject's medical history, focusing on the factors that are often present in connection with balance disorders, hearing loss, dizziness, tinnitus, falls and near-falls.

Unlike any other product on the market, this module allows a complete medical history to be taken by entry level personnel who have had only minimal training. Intuitive instructions guide the user through the simple interface screens where a series of questions are presented in a logical and comprehensive way, with immediate checks to ensure that all important information has been collected before proceeding to the next screen.

Because it is tailored to health problems like dizziness and balance disorders and is designed to be used by untrained personnel, it is much more comprehensive than any general medical history collection software or paper product.



# Applications

## CLINICAL

BalanceTRAK® Medical History Module simplifies and streamlines the often complex process of obtaining an effective anamnesis from a subject.

Based on the subject's responses, the module uses an intelligent built-in decision tree to dynamically present only those questions that are appropriate for that specific subject's medical history and symptoms.

After all information has been recorded, a detailed summary of the data gives the health care provider a comprehensive picture of the health and well-being of the subject, allowing the clinician to better formulate appropriate diagnosis and treatment.

Since BalanceTRAK® supports multiple visits, it is possible to use this module not only to collect the medical history as part of an intake visit, but also

to collect the initial history during subsequent visits. It is also possible to collect and update an old history or to collect and record changes at various stages of the subject's treatment.

The fact that the medical history information is stored in the same file as the subject's BalanceTRAK® test results simplifies record-keeping. It also allows clinicians to easily transfer all the subject's information to other medical personnel for consults or for treatment without having to transmit numerous paper forms and without incurring the risk that some important information might be lost.

## ATHLETICS/SPORTS

Although originally designed as a clinical tool, this module also has athletics and sports applications since it allows personnel to collect an athlete's medical history to identify possible causes of poor performance or to identify conditions that might be a counter-indication to the practice of some sports.

### General information

- Subject's Information
- Clinical Contacts
- Physical Information
- Preliminary Screening
- General Information
- Dietary and Other Habits

### General health and medical history

- Family Health History
- Personal Health Problems
- Symptoms
- Risk Factors

### Summaries

- Pathologies
- Surgeries
- Hospitalizations
- Doctors
- Medications

### Additional Questionnaires

- Falls/Near Falls History and Description
- Fear of Falling
- Hearing Loss Questionnaire
- Tinnitus Questionnaire
- Dizziness Questionnaire
- Lifestyle Questionnaire

### Reports

It is possible to generate a comprehensive report that includes all the information collected with this module or to generate condensed reports containing only the information contained in specific questionnaires.





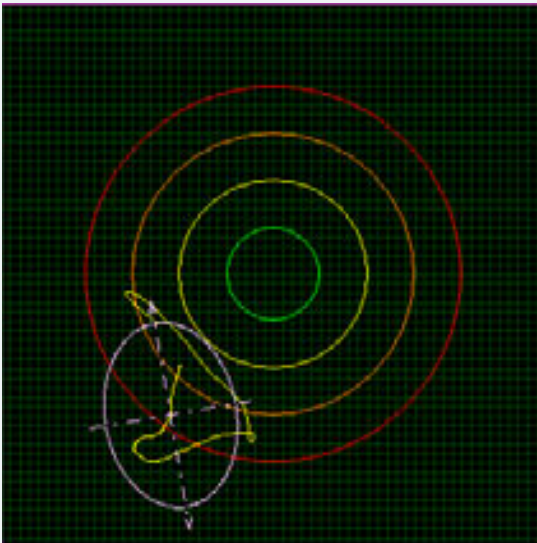
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(U.S. Patent pending)

# BalanceTRAK® software

## Static Module



It is designed to quickly quantify the subject's ability to minimize and control his/her sway as well as the symmetry of weight-bearing.

Unlike any other product on the market, this module not only allows you to perform a standard static balance test, but offers you unparalleled flexibility and control of test parameters.

The effects of vision, stance, head and arm positions, footwear, gaze, mental tasking, and breathing regimen on the subject's ability to minimize and control his/her sway can all be assessed using this module.



# Applications

## CLINICAL

The primary objective of the Static Test is to establish and document if a subject is at increased risk of falling.

The Static Test can also be used to monitor in real time and record the dynamic balance of a subject while he/she is performing a specific movement in slow motion, allowing the clinician to determine if the subject's balance is worse in any specific position. This can be of great help in identifying balance problems triggered by specific positions/activities and that would otherwise go undetected.

Once the diagnostic determination has been made, customized rehabilitation protocols may be employed to improve the subject's balance, and this module, as well as other BalanceTRAK® modules, can be used to monitor the subject's progress.

The real-time capabilities of this module can also be used to provide biofeedback weight-bearing training in subjects with pathologies, whether neurological or of other origin, affecting the symmetry of weight-bearing, as is often the case with subjects suffering from stroke or peripheral neuropathies.

## ATHLETICS/SPORTS

Balance is an important aspect of many sports. This module allows you to observe, in real time, what is happening to the stability of a subject while he/she is performing a specific maneuver in slow motion, making it very useful for testing athletes whose performance has been below par when they were in a specific body configuration.

# Testing Protocol

## The Test

The test can be performed on the force platform alone, or with any specialized surface that will fit onto the force platform (wobble board, foam cushion, etc.).

The force platform is zeroed and the subject steps onto the force platform or other surface (perturbing foam may also be used) and assumes the position specified in the test settings.

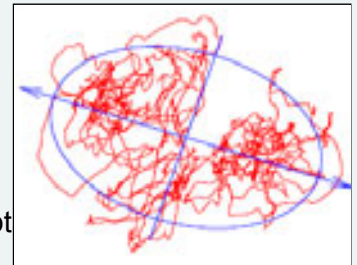
Clinicians interested in the effect of a transient movement may give the subject the command to execute the movement in question (for example, to open or close his/her eyes) at the end of the pre-test sequence.

If performing the test in static conditions, the subject maintains the specified position for the entire duration of the test. If performing the test in dynamic conditions, the subject does the desired movement in slow motion while the operator observes the real time screen, to identify the positions in which the sway significantly increases.

## The Numerical Results

These are some of the numerical results available:

- Average Vertical Force (weight):
- Average Center of Pressure Location
- Predominant Direction of Sway
- Directionality
- Length of the Sway Path
- Sway Velocity
- Fatigue and Adapt
- Stability Score





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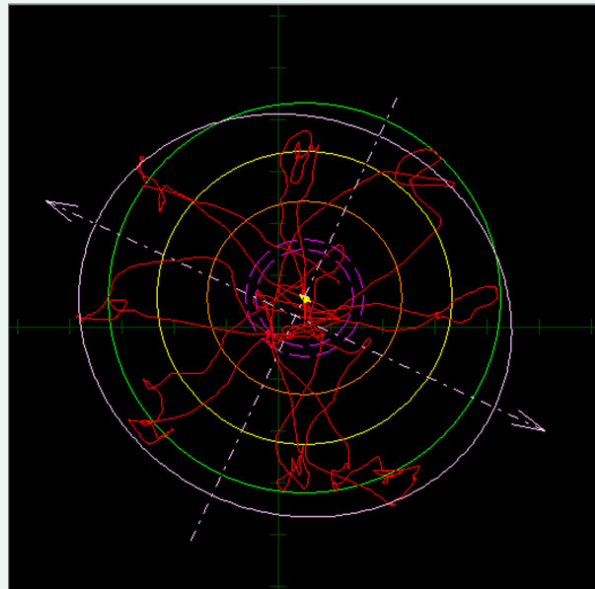
HELPING PEOPLE REGAIN THEIR BALANCE...FOR LIFE®

(U.S. Patent pending)

# BalanceTRAK® software

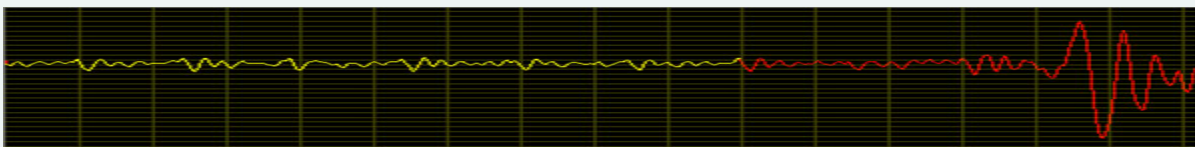
## Limit Of Stability Module

It is designed to quickly quantify the subject's usable area of support, i.e. his/her ability to sway in any direction



Limit of Stability (LoS) test results are extremely important because a person's risk of falling depends not only on his/her ability to control sway (as tested using the BalanceTRAK® Static Module) but also on how large the usable area of support is.

This module allows you to perform a test that measures the actual maximum possible excursion of the subject's sway, not just the ability of the subject to sway a predetermined amount.





# Applications

## CLINICAL

Muscular strength in the legs and feet, somatosensory feedback from the feet regarding the actual position of the center of pressure, as well as psychological aspects related to fear of falling, are all important factors affecting the ability of a person to sway in any direction.

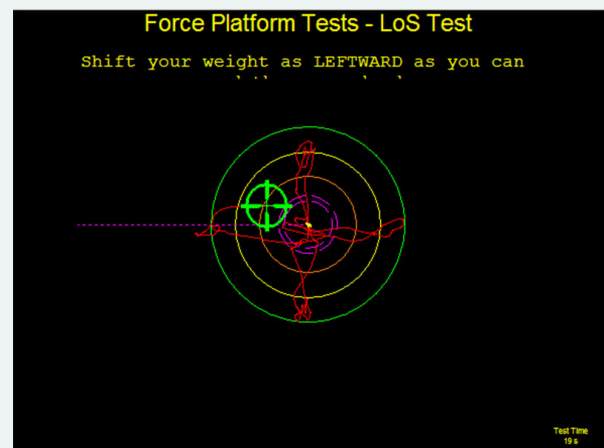
With the Limit of Stability module you can:

- Evaluate the effects of drugs, orthoses, neurological stimulations, manipulations and others
- Use it as a biofeedback rehabilitation tool for subjects with pathologies affecting somatosensory feedback (such as stroke, peripheral neuropathies and others) to improve proprioception by giving them feedback about the location of their center of pressure and how they can affect its position by shifting their entire body weight
- Show the difference between using an ankle strategy or a hip strategy to maintain balance
- Use it to get biofeedback from exercises involving ankle strategy in order to increase the muscle tone in the lower extremities
- Use it to reduce a subject's fear of falling
- Improve weight-bearing symmetry and posture
- Determine progress during the exercise as the subject increases his/her range of sway in the desired direction

## ATHLETICS/SPORTS

The BalanceTRAK® Limit of Stability Module makes it possible to identify deficits in a subject's ability to fully use his/her available area of support. This is important because such balance deficiencies can reduce their ability to withstand the perturbations to their balance that are an inherent part of their sport.

Once eventual deficits are identified, the biofeedback functions of this module can be used in conjunction with a customized training or rehabilitation regimen to improve the subject's ability to fully use his/her area of support, which will result in better overall athletic performance.



## Testing Protocol

The subject is instructed to lean as far as he/she can in a specific direction (four orthogonal or eight 45° angle directions, with the eight directions providing the more complete and accurate results), without losing his/her balance.

Visual feedback can be provided so the subject sees on the screen the direction in which to move, four limit of stability thresholds, a marker representing his/her current position and a trace following the movements already done.







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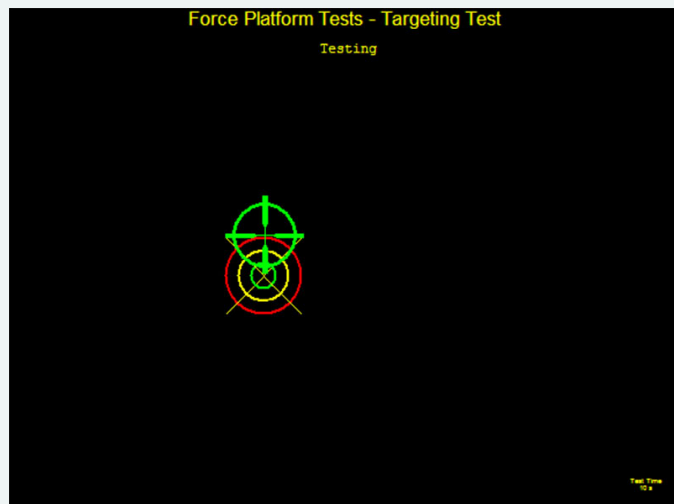
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(U.S. Patent pending)

# BalanceTRAK® software

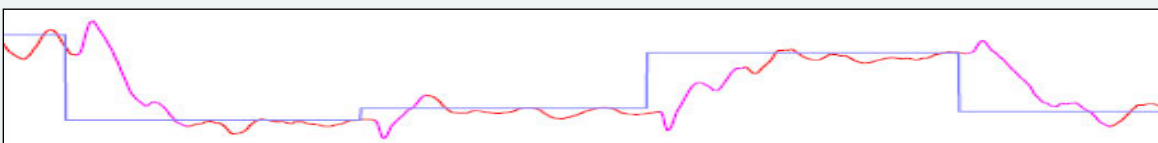
## Targeting Module

It is designed to quantify the subject's ability to quickly and accurately shift his/her body weight to the desired position.



Unlike any other product on the market, the timing and geometry of the movement can be completely randomized to prevent the subject from using a preprogrammed movement strategy to reach the target, making it possible to evaluate not only the subject's weight-shifting abilities, but also his/her reaction time.

This module is a great tool for those who work with athletes because an athlete's ability to shift his/her body quickly and on cue is essential in almost all sports.



# Applications

## CLINICAL

This test can be used to identify the subject's ability to control his/her center of pressure while doing a weight shifting movement.

It can be used to aid in the detection and diagnosis of motor coordination as well as neuromuscular pathologies. The ability to present targets whose movements is constrained in specific directions also makes it possible to use this module for vestibular and neurological disorders that tend to manifest themselves as a reduced ability to control movements in specific directions.

Because of its interactive nature, this module is a great rehabilitation/exercise tool to improve the subject's ability to perform weight-shifting movements, with an increased level of difficulty both in range of motion (larger movements) and in time (faster movements).

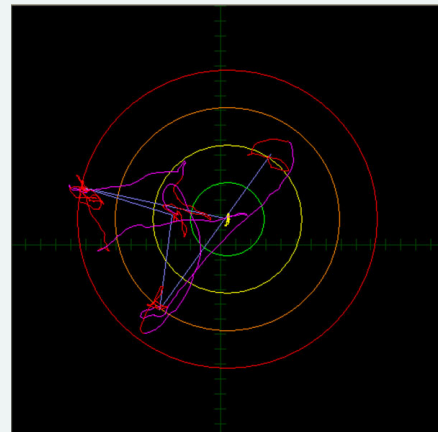
Progress during exercises is easily determined as the subject should be able to increase his/her speed, reaction time, accuracy of movement and range of sway in the desired directions if the exercises are done correctly and are actually effective for that subject.

## ATHLETICS/SPORTS

Performance requiring fast and accurate movements is essential in many activities. The BalanceTRAK® Targeting module makes it possible to evaluate a subject's weight-shifting abilities. Movement reaction time and accuracy are then used to score this ability.

The BalanceTRAK® Targeting module is very useful in identifying unilateral weaknesses or conditions that limit an athlete's performance in only certain directions or conditions.

And it can be successfully used as part of customized training or rehabilitation regimens to improve weight shifting and reaction time performance, as well as to monitor the subject's progress during treatment.



## Testing Protocol

A series of targets are shown to the subject who has to shift his/her center of pressure to match the position of the target (the process is similar to the Saccade test that is done with the eyes, but because of the inertia involved, the timing and amplitude are much larger).

The position of the targets is defined with respect to the theoretical limit of stability of the subject, making the test more or less difficult depending on how far from the center of the limit of stability the targets appear.

Biofeedback is provided in real time by showing on the screen both the target and the instantaneous center of pressure of the subject (identified by a specific marker).





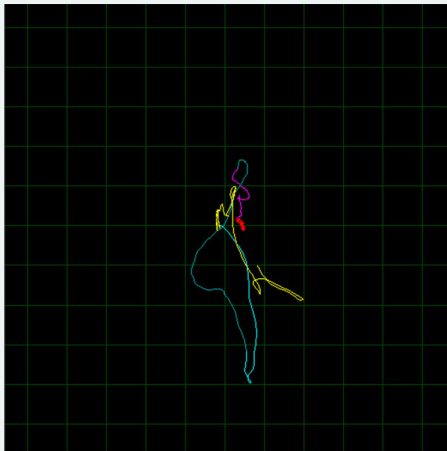
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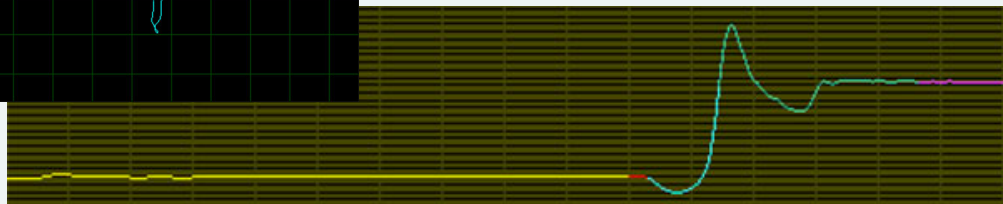
(U.S. Patent pending)

# BalanceTRAK® software

## Sit to Stand Module



It is designed to provide a computerized, vastly improved version of the classic sit to stand maneuver.



The use of a force platform and specialized software allows clinicians to obtain not only an accurate and objective measurement of the time it takes a subject to perform the movement, but also provides a great deal of additional information that would otherwise be unavailable.

Biofeedback is provided in real time by showing on the screen the trace of the subject's center of pressure during the entire movement – an invaluable tool for clinicians treating elderly patients or patients with a muscular pathology.

# Applications

## CLINICAL

Because the sit to stand maneuver is recognized as a valid and useful measure of physical performance as it relates to daily living activities, this module can be invaluable in helping to objectively measure and document all the parameters of the standard sit to stand maneuver. It can also establish if the subject is at risk of losing his/her balance once he/she reaches a fully erect position after rising from a sitting position.

As a rehabilitation tool, it can be used to improve the subject's ability to perform a controlled sit to stand maneuver that is accompanied by a stable upright posture.

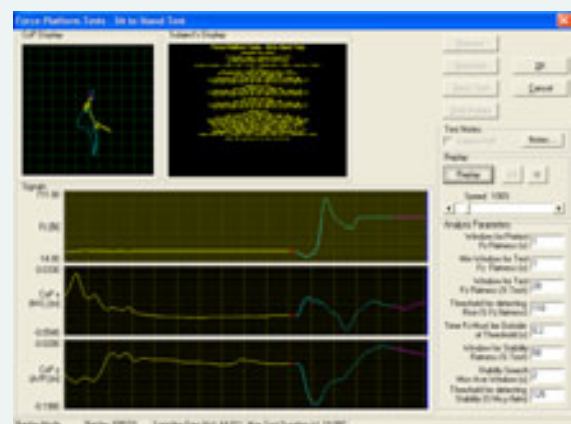
With this tool you can also teach different strategies to perform the sit to stand motion. Sit to stand is a common, very simple daily task, yet one that can often result in a fall, strained muscles, or increased pain from osteoarthritis or other muscular or joint pathologies.

As a biofeedback rehabilitation tool it can provide invaluable training in terms of optimizing the maximum load on the subject's lower extremities during this common daily activity.

## ATHLETICS/SPORTS

Although not particularly geared for these kinds of applications, this module can be used to measure the subject's whole body reaction time, and as a low intensity physical performance test, measuring such quantities as the maximum force generated, maximum vertical acceleration, movement time and stabilization time. These measures can be used to monitor the effects of training regimens and subject's progress because, in general, smaller values directly correlate with improved performance.

Where this module excels is in determining if the subject is suffering from conditions such as postural hypotension or other conditions whose onset is triggered by large postural changes that can cause temporarily reduced performance and poor balance.



## Testing Protocol

The test is performed by placing a chair as close as possible to the CAPS™ Professional force platform without touching it. The subject then sits on the chair with his/her feet resting comfortably on the force platform. Then when instructed by the BalanceTRAK® software, the subject stands up, reaching the upright position and holding it until the end of the test. The subject should maintain the upright position without losing balance or needing to take a step to stabilize him/herself after the sit to stand maneuver. This allows BalanceTRAK® to calculate where the sit to stand maneuver ends and to accurately measure and quantify the subject's subsequent stability.





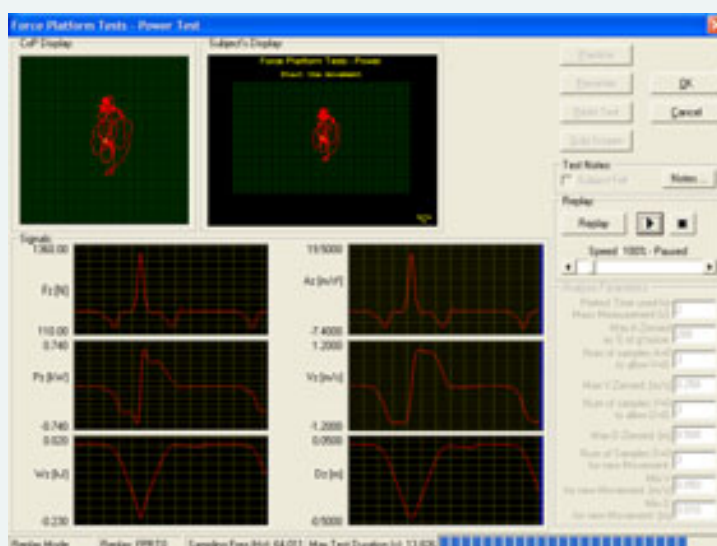
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(U.S. Patent pending)

# BalanceTRAK® software

## Power Module



This module is an  
**absolute necessity**  
for anyone working with athletes.

This module is designed to quickly estimate force, power, and energy, as well as acceleration, velocity and displacement for any movement in the vertical direction that a subject positioned on the CAPS™ Professional force platform is able to perform, from squatting to jumping (landing outside the force platform), and from push-ups to weightlifting.



# Applications

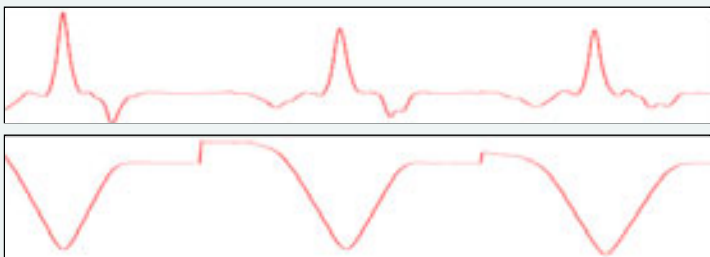
## ATHLETICS/SPORTS

This module is uniquely suited for athletics/sports applications. The ability to measure force, power, and energy, as well as acceleration, velocity and displacement of various movements makes this a great training tool as well as an invaluable aid for monitoring and evaluating exercise and training regimens.

The ability to evaluate multiple repetitions of the same movement makes it possible to determine important aspects like fatigue thresholds that let you optimize the training regimen for the subject's condition, avoiding the risk of over-training and its negative consequences.

The subject's progress during training can be easily quantified by repeating testing over time, allowing you to detect when the training is no longer improving performance, so you can make a decision regarding the usefulness of altering the training regimen.

The unique ability to show in real time not only the movement's variables, but also the center of pressure and the sway, are also very useful as a biofeedback training tool to improve the subject's technique in a variety of movements such as power squats, weightlifting and jumps (landing outside the force platform).



## CLINICAL

This module can be used to evaluate non-isometric muscular activities of the lower limbs as well as of the torso or upper extremities. Limbs can be evaluated together or the movement and the set-up can be altered so that each side of the body can be tested separately. The results may then be compared in order to uncover unilateral weaknesses.

It can also be used as a rehabilitation tool to monitor rehabilitation progress while restoring the subject's ability to perform specific movements in the vertical direction after injury, surgery or illness. This is done by checking to see if the subject is able to generate increasing power, energy or force, and can perform the movement faster or with an increased range of motion. As such, it can also be used to document functional progress and outcomes.

## Testing Analysis

Comparing the same value for different repetitions can give an indication of the repeatability of the movement (how well the subject is able to perform the same movement over and over again), as well as whether there is any effect of fatigue (the movements are slowing down, or becoming smaller, or the subject is exerting less force, power, or energy) or training (the movements are becoming faster, larger or stronger, or the subject is exerting more force, power, or energy).

All the measured variables, as well as the subject's sway can be monitored in real time, allowing the use of this module not only for testing but also for advanced training.



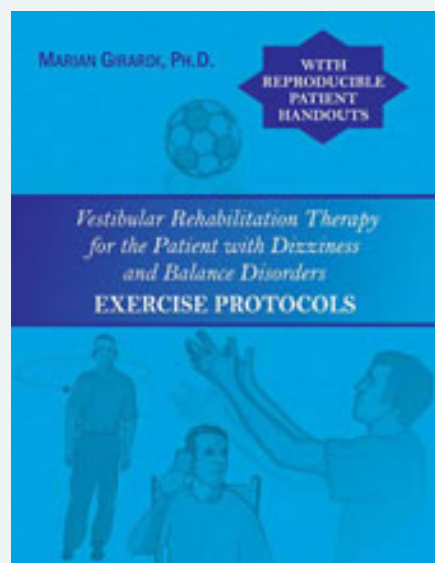
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## Literature

**Are you interested  
in providing  
balance therapy?**

**Are you already providing  
balance therapy?**



Either way, you'll really appreciate the book we publish:  
it's been called "the best book ever written on the subject"!

***"Vestibular Rehabilitation Therapy  
for the Patient with Dizziness  
and Balance Disorders"***

*by Marian Girardi, Ph.D.*

(ISBN 0-9767593-8-1)

## What the book is all about

Every clinician who deals with patients who have dizziness and balance disorders will find this book to be an invaluable aid not only in the diagnosis of dizziness and balance disorders, but in the treatment of those conditions as well.

Features include:

- A brief summary of the anatomy and physiology of the vestibular system
- How to identify the patient with vestibular problems
- Assessment tools for vestibular diagnosis
- Risk and safety factors for falls
- An overview of Vestibular Rehabilitation Therapy (VRT)
- VRT treatment protocols
- Eye, head and body exercises to both improve balance and gait and then maintain them throughout life
- 22 reproducible patient handouts that include exercises and easy to follow procedures your patients can use to continue their therapy at home *(copyright has been waived on the patient handouts so they may be freely reproduced and distributed to your patients. The 22 patient handout pages are perforated to facilitate removal from the book for copying.)*

This is the one reference work that everyone who is interested in diagnosing dizziness and balance disorders or providing effective treatment for those conditions should have.

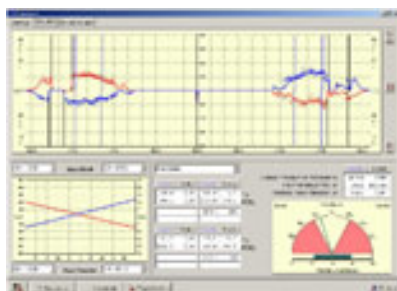
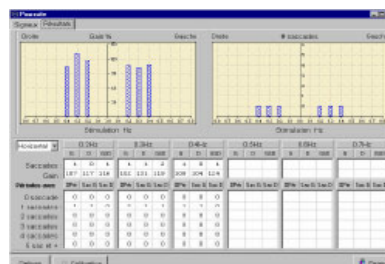
### About the Author

Marian Girardi tested and successfully treated many thousands of dizzy and balance disorder patients during her distinguished career. It was her fondest wish to share her knowledge with others through the publication of this book. Unfortunately, she did not live to see her dream come true. She passed away suddenly in January 2005, shortly after approving the cover design for her book. She will be sadly missed by all who knew her.



# VENG 20/20®

## the nystagmography line of products





## Nystagmography

### What it is

Nystagmography is a diagnostic test battery that measures eye movements in response to vestibular and visual stimuli. The vestibular system provides the brain with information about our motion and positioning. Vestibular information is integrated with sensory input from the visual and somatosensory systems in order to stabilize our gaze, head, and trunk, and coordinate the movements of the lower body to maintain balance. The responses of the eyes are measured and interpreted to diagnose the causes of vertigo, dizziness, and balance problems.

Based on the technology used to record the eye movements, it is called Electronystagmography (ENG) or Videonystagmography (VNG).

### How it works

With electronystagmography, the test is performed by attaching electrodes around the eye and measuring the movements of the eye in relation to the ground electrode. With videonystagmography, infrared video systems are used to detect the eye movements, allowing for a more detailed observation of those movements.

The standard nystagmographic test battery consists of 3 parts:

- oculomotor evaluation (spontaneous nystagmus, saccades, pursuit and gaze testing, optokinetic)
- positioning/positional testing
- caloric stimulation of the vestibular system

The comparison of results obtained from various nystagmographic sub-tests assists in determining whether a disorder is central or peripheral. In peripheral vestibular disorders, the side of lesion can be inferred from the results of caloric stimulation and, to some degree, from positional findings.

While nystagmography is the most widely used clinical laboratory test to assess vestibular function, normal test results do not necessarily mean that a patient has typical vestibular function. A clinical history and otologic examination are also vital in formulating a diagnosis and treatment plan for a patient presenting with dizziness or vertigo.

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## THE VENG 20/20®

The VENG 20/20® allows you the flexibility to use both technologies (video and electrodes) integrated in the same system!!! It is the ideal system for clinicians wanting to offer the best diagnostic and therapeutic care to their patients with dizziness, vertigo and balance problems.

The VENG 20/20® combines a very user friendly, yet very powerful software application with exciting new cutting-edge technology, a four channel ENG, monocular or binocular VNG, an optokinetic stimulator as well as caloric irrigators into one completely integrated system.

### VENG 20/20® Lite

The entry level systems for those who want to observe the movement of the eyes and provide basic nystagmus testing, but still want state of the art infrared video technology.

### VENG 20/20® Professional

The essential tool for performing the entire nystagmographic test battery. You can choose the configuration that best suits your needs, either electrode or video-based nystagmography. Systems may also be upgraded to add technology at a later date.

And the VENG 20/20® is the only FDA registered videonystagmographic system in the U.S. market that measures the torsional movements of the eyes!

### Caloric Irrigators

Choose between three different caloric irrigators depending on your preferences and needs:

- the AirStar, air caloric irrigator
- the AquaStar, water caloric irrigator
- the CoolStar, cooling air caloric irrigator – the only air irrigator that can cool the air irrigation medium below ambient temperature!



**Vestibular Technologies, LLC.**  
205 Co. Rd. 128A Ste. 200  
Cheyenne WY 82007-1831  
www.vestibtech.com

## VENG 20/20® Lite

The entry level systems for those who want to observe the movement of the eyes and provide basic nystagmus testing, but still want state of the art infrared video technology.

With the VENG 20/20® Lite, you can observe (and optionally record) the spontaneous nystagmus and perform the following vestibular testing:

- Positional testing
- Caloric testing
- Rotary testing



## Packages

### PKVL-Mf – Monocular Video Frenzels

The ideal package for the clinicians who want to get “their feet wet” and provide only basic vestibular testing.



The package consist of:

- Monocular Video Frenzels (goggles, 1 infrared camera, and video/audio converter)
- Optional TV/VCR-DVR to see the eye image on a TV screen and record the same image on video tape or DVD for later review
- Optional Video to USB adapter to send the signal to a computer where the video can be recorded and stored

The goggles also feature an internal microphone to record your test descriptions and comments, and Calibration LEDs, to allow you to also perform saccades testing.

### PKVL-Bf – Binocular Video Frenzels

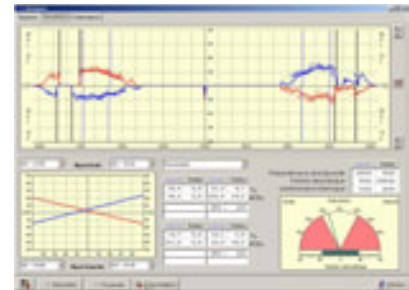
Similar to the Monocular Video Frenzels package, but allows you to see and record the movement of both eyes simultaneously.

### PKVL-Le – Limited Edition

The ideal package for the clinicians who want to provide only Spontaneous nystagmus, Positional nystagmus, and Caloric testing. With this package you can not only record the eye movements, but also analyze them using the very versatile analysis software DiSoft. And if you are using a DIFRA caloric irrigator for your caloric testing, you can record the caloric stimulation simultaneously with the eye response.

The package consist of:

- Monocular EyeTracker 50 Limited Edition (Monocular goggles, 1 EyeTracker PCI card, external PCI enclosure, DiSoft software)
- Optional laptop computer
- Optional NAC to USB adapter (to connect a DIFRA caloric irrigator to the laptop)



**NOTE: these packages cannot be upgraded to the VENG 20/20® Professional**

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# VENG 20/20® Professional

## The most flexible nystagmography system that ever existed on the market!

Depending on the configuration of your package, with the VENG 20/20® Professional you can:

- Use electrodes or infrared video to record the eye movements
- Visualize and **measure** the torsional nystagmus (the ONLY FDA approved system currently available that allows you to do so)
- Perform all vestibular tests:
  - ✓ Spontaneous nystagmus
  - ✓ Gaze
  - ✓ Saccades
  - ✓ Smooth pursuit
  - ✓ Optokinetics
  - ✓ Positional testing
  - ✓ Caloric testing
  - ✓ Rotary testing
- You can also define your own testing protocols, customize the acquisition and analysis parameters, and create your own reports. You can even define your own tests!





## Packages

### PKVP-E4 – ENG 4 Channels

The basic electronystagmographic package to perform Saccades, Smooth Pursuit, Optokinetics, Gaze, Spontaneous nystagmus, Positional nystagmus, and Caloric testing using electrode-based technology.

The package contains:

- IDEAS III (4 channels ENG, 1 NAC bus to USB adapter, Visiostar, external PCI enclosure, DiSoft software)
- Optional laptop computer
- Optional LCD projector
- Optional LCD projector ceiling mount



### PKVP-MV – VNG Monocular

The basic videonystagmographic package to perform Saccades, Smooth Pursuit, Optokinetics, Gaze, Spontaneous nystagmus, Positional nystagmus, and Caloric testing using infrared video-based technology.



The package contains:

- Monocular EyeTracker 50 (Monocular goggles, 1 EyeTracker PCI card, 1 NAC network card, Visiostar, external PCI enclosure, DiSoft software)
- Optional laptop computer
- Optional LCD projector
- Optional LCD projector ceiling mount

### PKVP-MT – VNG Monocular Torsion

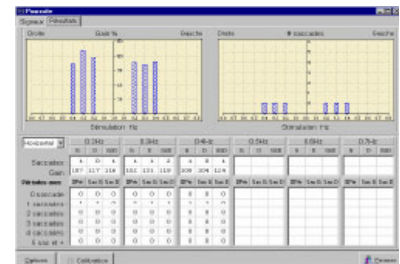
Similar to the VNG Monocular package, but allows you to watch, record and **measure** the torsional movement of the eye.

### PKVP-BV – VNG Binocular

Similar to the VNG Monocular package, but allows you to watch, record, and measure the movement of both eyes simultaneously.

The package contains:

- Binocular EyeTracker 50 (Free field goggles, 2 EyeTracker PCI cards, 1 NAC network card, Visiostar, external PCI enclosure, DiSoft software)
- Optional laptop computer
- Optional LCD projector
- Optional LCD projector ceiling mount



### PKVP-BT – VNG Binocular Torsion

Similar to the VNG Binocular package, but allows you to watch, record and measure the torsional movement of the eye.



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# VIDEOSCOOP



## Monocular or Binocular Video Frenzels

The VideoScoop constitutes the essential tool for the doctors or the ancillary medical professions which are interested in the problems of unsteadiness and instability.

The VideoScoop makes it possible to very precisely observe the ocular movements in all the situations with a great comfort for the patient.

The VideoScoop also makes it possible to record the ocular movements to show the patient his/her eyes movements to better understand their pathology, to better formulate their diagnosis and their course of treatment as well as to monitor their rehabilitation progress.



The VideoScoop is the ideal starting nystagmographic tool for the clinicians who want to get “their feet wet” and provide only basic vestibular testing.

It is designed to perform these clinical tests:

- Calibration
- Spontaneous nystagmus
- Saccades
- Positional Testing
- Caloric Testing
- Rotary Testing

A monitor with either a SCART or an optional CVBS input permits “real time” display of the patient's eye.

The monocular VideoScoop goggles are fitted with one I.R. camera to record the eye movement and an internal microphone to record your test descriptions and comments. Calibration LEDs are mounted in the spectacles to allow you to perform calibration, saccades and spontaneous nystagmus tests.

An optional video recorder can be connected to record the test on a DVD or video tape for later review.

The binocular VideoScoop includes a second camera, allowing you to select either the right or the left eye to view on the monitor.

An optional third “field” camera can be also mounted to allow you to monitor the movements the patient performs.

An optional “Quadravision” display can be added to allow the system to simultaneously display both eyes on the same screen in real time. Video recording of all video inputs will then allow you to review test results as follows:

- four video inputs in the same screen, or
- any one of the four video inputs in full screen (selectable)

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# VIDEO GOGGLES



## Monocular or Binocular

Our lightweight, comfortable video goggles to perform videonystagmography

Two models are available:

- a monocular model that has only one camera to visualize and record the movement of either the left or the right eye. It utilizes a standard Bollé Chronosoft goggle frame that has had the lens replaced with a custom made housing to accommodate the infrared video camera
- a binocular model that has two cameras, allowing the user to simultaneously visualize and record the movements of both of the patient's eyes. It is a "free-field" mask in the sense that the peripheral vision of the patient is minimally obstructed by the goggles!



## Technical Specifications

### IR video camera

- standard black and white infrared EIA,
- resolution of 768x494 pixels,
- sampling frequency of 60Hz, and 0.2Lux/F2.0
- IR LED illumination of the eye

### Monocular Goggles

- The IR LED (type TSU5400) illumination of the eye is built into the camera
- The illumination level is <4mW Radiant Power at 950nm
- The distance between eye and LED is +/- 25mm

### Binocular Goggles

- 4 LEDs (2 per eye) provide the illumination
- The illumination level per LED is <4mW Radiant Power at 950nm, and the illumination per eye is <8mW Radian Power
- The distance between eye and LED is +/- 45mm

The goggles also include a fixation light.

In the monocular goggles, the fixation light is housed in the small box (the same size as the camera) that is used to occlude the goggles opening not covered by the camera.

In the binocular goggles, 2 separate LEDs are used.

The fixation light(s) is/are turned ON/OFF by the software.

Power Supply	Supplied by the PC
Number of Channels	1 (Monocular) 2 (Binocular)
Sampling frequency	50Hz
Accuracy	0.1%
Resolution	501x388 pixels
Interface with PC	EyeTracker card
Weight	220gr (Monocular) 400gr (Binocular)
Sizes	190x140x105 mm (Monocular) 190x140x120 mm (Binocular)

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# IDEAS III



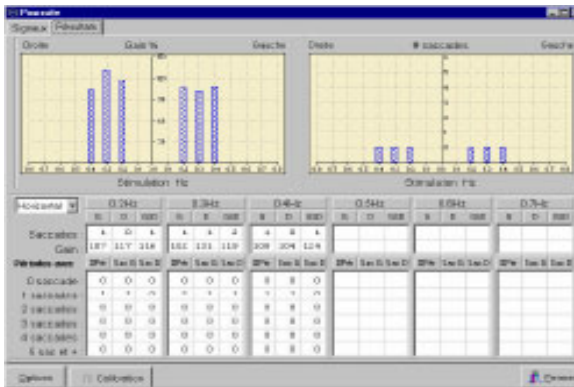
## Electronystagmography (ENG)

The IDEAS III ENG system is an essential tool in diagnostic study of the vestibular system, including:

- Oculomotor functions (fields of gaze, smooth pursuit, saccadic tracking, optokinetic tracking)
- Vestibular functions (spontaneous nystagmus, positional nystagmus, and caloric responses).

IDEAS III is an ideal tool to use in place of Videonystagmography (VNG) or as a supplement for patients that cannot be tested with VNG. These patient may include those wearing makeup, with disconjugate eye movements, single eyes, and other conditions that require electrodes for more accurate testing. It is also suitable to use with claustrophobic patients who cannot tolerate the “closed in” feeling that may accompany the use of VNG goggle.





# Visiostar



## Pursuit and Optokinetics Stimulator

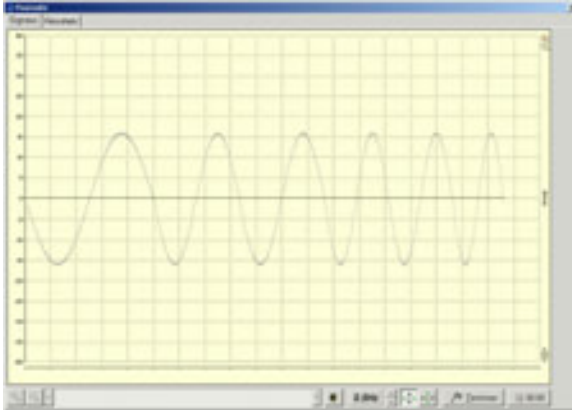
The Visiostar is an extremely sophisticated visual stimulus generator. It can provide eye position calibration stimuli and as well as sophisticated and complex visual stimuli that make it possible to easily obtain very accurate results in the following tests:

- Saccades
- Smooth pursuit
- Optokinetic

To present the stimuli, a user-supplied external TV monitor or an optional LCD projector can be used. The stimuli are controlled via software from the system computer and can be recorded along with the test results.

Unlike the visual stimuli generated by all other nystagmography systems on the market that use light bar or computer-generated images, the visual stimuli generated by the Visiostar are completely free of artifacts, i.e. flickers and irregular and jerky movements that create poor quality test recordings.





The Visiostar visual stimulator is designed to interface with the DiSoft software. All Visiostar stimuli displayed on the monitor are directly controlled by the DiSoft software.

The Visiostar allows you to do the three following tests:

- **Smooth pursuit:** the Visiostar provides the continuously moving target light that the patient tries to fixate on during the test.
- **Saccades:** the Visiostar provides the randomly moving target light that jumps from one position to another (with adjustable frequency and range of motion) to stimulate the patient's saccadic eye movements.
- **Optokinetics:** the Visiostar provides the stimulus needed to elicit the optokinetic reflex. To provide an effective stimulus, the Visiostar generates a field of moving black stripes superimposed on a still image of a panoramic view.

The Visiostar works with a user-provided color TV monitor with an auxiliary video input. It contains the electronics to provide the interface between the TV and the computer generating the ENG or VNG test sequences.

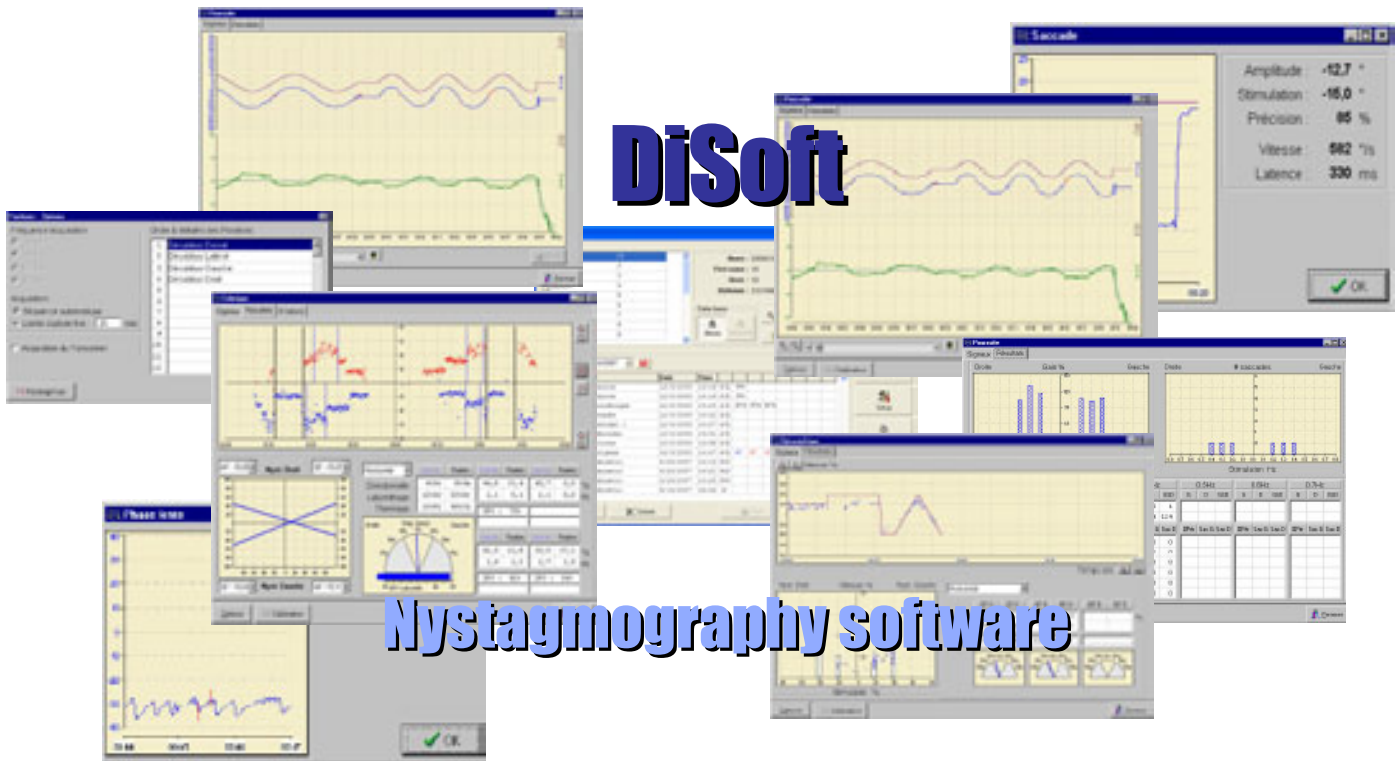
### Technical Specification

- Input voltage: 120V - 60Hz / 230V – 50Hz
- Power supply: 20W
- Opening angle: max.  $\pm 30^\circ$
- Saccades: amplitude 0 to  $\pm 30^\circ$ ; frequency 0.2 to 50 Hz
- Pursuit: amplitude 0 to  $\pm 30^\circ$ ; frequency 0.2 to 0.7 Hz
- Optokinetic: speed  $\pm 10$  to  $60^\circ/\text{s}$
- Sampling frequency: 10 Hz
- Computer interface : NAC BUS

The Visiostar meets the actual IEC-601-1 standards Class I type B.

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Difra Instrumentation is the most experienced company in the world for nystagmography. Built on this experience, the DiSoft software provides proven algorithms for slow phase velocity, saccade and tracking analyses.

Results can be graphically compared to reference values validated through statistical samples as well as years of clinical use.

Comprehensive, customized reports are automatically produced in a format that is readily understood by knowledgeable clinicians.

This Windows-based software is designed for easy use. Set-up options allows you to define test sequences, results display, analyses criteria, and so much more.

All results can be exported over network (intranet or Internet) to a global medical data base. And the software can be linked to an external data base for automatic patient record selection.

Totally flexible, the DISOFT software can also be use for research. A dedicated test can record simultaneously 16 EMG channels, 4 VNG channels, and 4 ENG channels.

Also, special analysis and results are included in the software like OVAR (vertical off axis rotation) or Minicentrifuge.





“The unique DISOFT software constantly captures an image of the pupil to record and analyze eye movements. This allows real-time visualization and analysis of test data

Both the analysis and the test results may be configured to reflect each individual user's preferences, and each user may also configure how he/she prefers reports to be presented and printed.

The DiSoft software facilitates management of patient test data by allowing:

- easy configuration of test sequencing, acquisition screens, time of acquisition, speed of stimulation, presentation of results, printing, and many other parameters
- creation of multiple databases
- automatic archiving of all test data
- simple comparison of test results

The DiSoft software includes the following types of tests:

## Vestibular Tests

**Caloric Tests:** the analysis of the nystagmus responses provoked by thermal stimuli. You can define the order of the four caloric tests. The system analyses the trace in an automatic way during the acquisition or in a manual way after acquisition, as well as the peak of the caloric response. A spontaneous nystagmus can be recorded before the four caloric tests or before every test. Results can take into account this spontaneous nystagmus. You can completely customize the analysis of the nystagmus by working on the raw trace or on the results. The registration of the torsion movements is available according to the chosen device configuration.

**Rotational and Pendular Tests:** the analysis of the nystagmus response provoked by rotational movements of the entire body by means of rotational chairs. The system analyzes in real time and automatically the slow phase velocity of the nystagmus, calculates the gain, the nystagmus preponderances, and culmination.

**Spontaneous and Positional Nystagmus:** the analysis of nystagmus, whether spontaneous or induced by changes in position. In this latter case, you define the positions as well as the order in which they are attained.

**Free Test:** a user-definable “free test” that allows you to record any type of nystagmus

## Oculomotor Tests

**Saccadic Tests:** the software automatically controls the visual stimulator, causing the target light to jump from one position to another (with adjustable frequency/range of motion) to stimulate the patient's saccadic eye movements. The displayed results are: the precision of saccades done by the patient, the latency, the speed, and the amplitude. Different types of stimuli are possible.

**Smooth Pursuit Tests:** the analysis of the response to a foveal stimulation. The software compares the movement of the eye and the movement of the target. An automatic detection of catching up saccades is displayed during the acquisition. The test is divided in different periods and the gain on velocity is calculated for every sense and for every period. The number of saccades is calculated and is represented in a graphic. Movements can take different forms, sinusoidal, triangular or linear movements.

**Optokinetics Tests:** the analysis of the nystagmus triggered by peripheral stimulation of the eyes. A «free field» camera, with a sampling rate of 50 Hz, is available as an optional to record the stimulus or the patient. To provide an effective stimulus, a field of moving black stripes superimposed on a still image of a panoramic view.

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# AIRSTAR

## Air Caloric Irrigator

The AIRSTAR:

- is the irrigator of choice when water irrigation cannot be performed because of the patient's medical condition or when water is not available in the vestibular testing room
- is **VERY EASY TO USE**: it comes fully programmed with four irrigation temperatures and five irrigation times, but you can override these default values and program your own. Furthermore, timing the procedure is very easy as audible tones signal the start and end of the irrigation and ocular fixation
- is equipped with an otoscope with an integrated light and a small magnifying lens to better visualize the eardrum without obstructing the air flow during the irrigation

With AIRSTAR, you can have both – the convenience of air and the accurate testing that is only possible with a precisely controlled stimulus!



## Easy Operation and Setup

The AIRSTAR air irrigator has been designed to be easy to use: just plug it in, follow a few simple setup instructions and you are ready to go.

Its micro-controller based technology makes it very flexible and provides the highest possible accuracy in regulating the temperature of the air media.

### TEMPERATURE

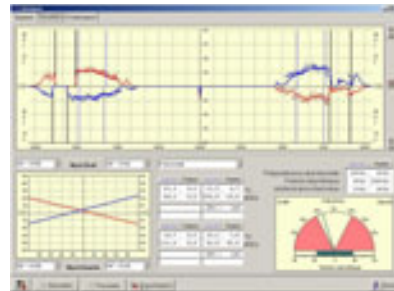
Temperature setup for the AIRSTAR is done by means of a rotary switch on the front panel. There are four default settings (27°C, 30°C, 44°C, 47°C) or it can be manually set from 0 to 48°C. However, the lowest achievable temperature is only 2°C above room temperature. The set air temperature is reached within one to three minutes and is shown on the digital display.

### IRRIGATION TIME

Irrigation time is also easily controlled by means of a rotary switch on the front panel and can be set at intervals of 40, 60, 80, 100, or 120 seconds. When the irrigator handle is removed from the holder, you have a 9 second delay before the first beep. This beep indicates that irrigation has started.

After the allotted time period, a second beep will sound to mark the end of the irrigation. A third and fourth beep will sound to mark the beginning and end of ocular fixation.

### SOFTWARE (OPTIONAL)



Do you want an easier way to control the AIRSTAR and the ability to get printable patient reports? The optional DISOFT software allows you to control the irrigator from your computer. The AIRSTAR air irrigator comes equipped with the connectors for the NAC network, allowing it to interface with the DISOFT software (purchased separately) for the caloric tests.

## Technical Specifications

- Input voltage: 230V or 115V / 50-60HZ
- Output air temperature: from 2°C above room temperature to 48°C
- Temperature accuracy:  $\pm 0.5^{\circ}\text{C}$
- Flow: 10 l/min.
- Connection: NAC
- Weight: 5 kg
- Size: 300 x 250 x 110 mm (W x D x H)

The AIRSTAR is CE marked and meets the IEC-601-1 standards for Class I type B devices.

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# COOLSTAR

## THE ONLY Cooling Air Caloric Irrigator

The COOLSTAR:

- is the **ONLY** air irrigator that allows you to use precisely cooled air for caloric irrigations, eliminating the “ambient air temperature” problem of other air irrigators that lack the ability to cool the air below room temperature
- is **VERY EASY TO USE**: it comes fully programmed with four irrigation temperatures and five irrigation times, but you can override these default values and program your own. Furthermore, timing the procedure is very easy as audible tones signal the start and end of the irrigation and ocular fixation
- is equipped with an otoscope with an integrated light and a small magnifying lens to better visualize the eardrum without obstructing the air flow during the irrigation

With COOLSTAR, you can have both – the convenience of air and the accurate testing that is only possible with a precisely controlled stimulus!



## Easy Operation and Setup

The COOLSTAR air irrigator has been designed to be easy to use: just plug it in, follow a few simple setup instructions and you are ready to go.

It is ideally suited for procedures when the irrigation cannot be performed with water due to medical reasons or when no water is available in the examination/testing room.

Its micro-controller based technology makes it very flexible and provides the highest possible accuracy in regulating the temperature of the air media.

### TEMPERATURE

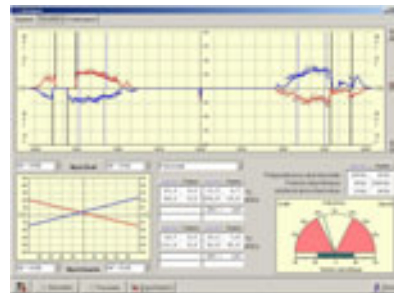
Temperature setup for the COOLSTAR is done by means of a rotary switch on the front panel. There are four default settings (20°C, 30°C, 44°C, 47°C), or it can be manually set from 8°C to 48°C. The set air temperature is reached within two minutes and is shown on the digital display.

### IRRIGATION TIME

Irrigation time is also easily controlled by means of a rotary switch on the front panel and can be set at intervals of 40, 60, 80, 100, or 120 seconds. When the irrigator handle is removed from the holder you are given a 9 second delay before the first beep.

This beep indicates that irrigation has started. After the allotted time period, a second beep will sound to mark the end of the irrigation. A third and fourth beep will sound to mark the beginning and end of ocular fixation.

### SOFTWARE (OPTIONAL)



Do you want an easier way to control the COOLSTAR and the ability to get printable patient reports? The optional DISOFT software allows you to control the irrigator from your computer. The COOLSTAR air irrigator comes equipped with the connectors for the NAC network, allowing it to interface with the DISOFT software (purchased separately) for the caloric tests.

## Technical Specifications

- Input voltage: 230V or 115V / 50-60HZ
- Output air temperature: from 8°C to 48°C
- Temperature accuracy:  $\pm 0.5^{\circ}\text{C}$
- Flow: 8 l/min.
- Connection: NAC
- Weight: 5 kg
- Size: 300 x 380 x 165 mm (W x D x H)

The COOLSTAR is CE marked and meets the IEC-601-1 standards for Class I type B devices.

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# AQUASTAR

## Water Caloric Irrigator

The AQUASTAR:

- is ideally suited for irrigations when water stimulation can safely be used to perform caloric testing in settings where fresh clean water and proper drainage are available
- is **VERY EASY TO USE**: it comes fully programmed with four irrigation temperatures and five irrigation times, but you can override these default values and program your own. Furthermore, timing the procedure is very easy as audible tones signal the start and end of the irrigation and ocular fixation

AQUASTAR - the water caloric irrigator that sets a new standard with its constant flow rates and precisely accurate temperature!



## Easy Operation and Setup

The AQUASTAR water irrigator has been designed to be easy to use: just plug it in, follow a few simple setup instructions and you are ready to go.

Its micro-controller based technology makes it very flexible and provides the highest possible accuracy in regulating the temperature of the water media.

### TEMPERATURE

Temperature setup for the AQUASTAR is done by means of a rotary switch on the front panel. There are four default settings (27°C, 30°C, 37°C, 44°C), or it can be manually set from 0°C to 48°C. However, the lowest achieved temperature is only 1°C above inlet water temperature. The water temperature is stabilized within one minute and is shown on the digital display.

### IRRIGATION TIME

Irrigation time is also easily controlled by means of a rotary switch on the front panel and can be set at intervals of 20, 30, 40, 50, or 60 seconds. When the irrigator handle is removed from the holder, you are given a 9 second delay before the first beep.

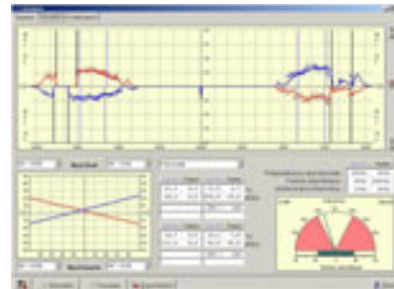
This beep indicates that irrigation has started. After the allotted time period, a second beep will sound to mark the end of the irrigation. A third and fourth beep will sound to mark the beginning and end of ocular fixation.

### WATER FLOW

Thanks to the pressure reducer on the front panel, the irrigation flow can be easily set and locked by means of its security systems. The pressure can be set from 0.5 bar to 3 bar. The flow is regulated to be 350ml/min at 1.5 bar.

### SOFTWARE (OPTIONAL)

Do you want an easier way to control the AQUASTAR and the ability to get printable patient reports? The optional DISOFT software allows the irrigator to be controlled from your computer. The AQUASTAR water irrigator comes equipped with the connectors for the NAC network, allowing it to interface with the DISOFT software (purchased separately) for the caloric tests.



## Technical Specifications

- Input voltage: 230V or 115V / 50-60HZ
- Output water temperature: from 1°C over inlet water temperature to 48°C
- Temperature accuracy:  $\pm 0.5^{\circ}\text{C}$
- Flow at 1.5bar : 350 ml/min
- Pressure range: from 0.5 bar to 3.0 bar
- Connection: NAC
- Weight: 5 kg
- Size: 300 x 250 x 110 mm (W x D x H)

The AQUASTAR is CE marked and meets the IEC-601-1 standards for Class I type B devices.

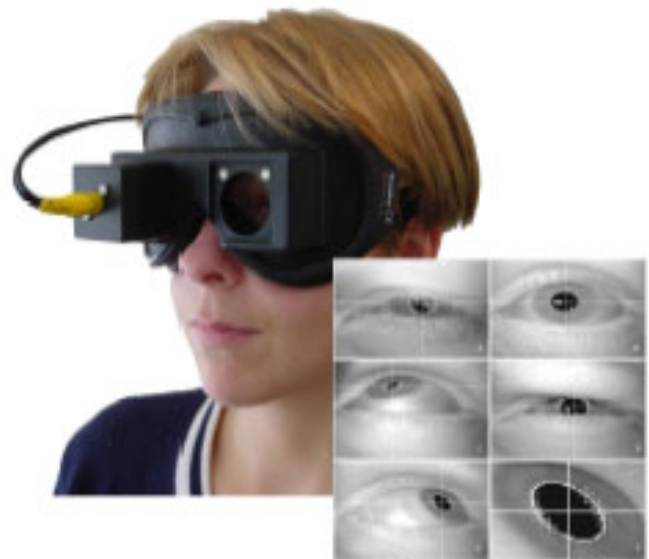
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# VNG/ENG Comparison



The two different technologies used by the VENG 20/20® to record the eye movements (video camera and electrodes) are equivalent in terms of recording the eye movement, letting you decide with technology best suits your needs (see next page for a detailed explanation).

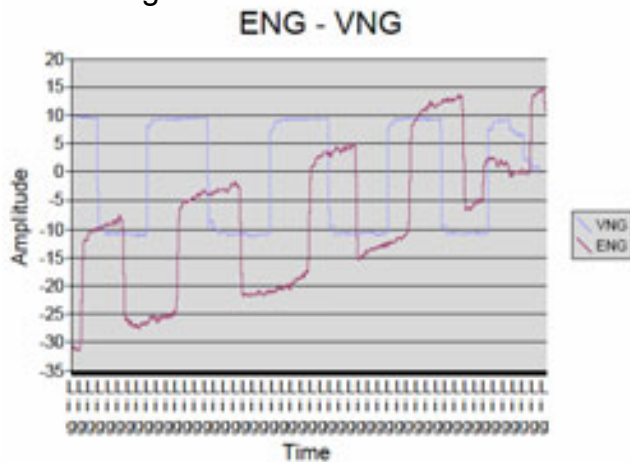
Furthermore, the following table provides a quick comparison of the two technologies:

	ENG (AC-DC time constant)	VNG monocular	VNG with Freefield helmet
Drift	Yes, with old system No, with new digital amplifier	NO	NO
Artifacts	Yes, but digitally filtered	NO (due to Difra's Frame grabber)	NO (due to Difra's Frame grabber)
Electrodes	YES : Solid gel electrodes	Infra-red camera	Infra-red camera
Sampling rate	From 50Hz up to 1000Hz	60 Hz	60Hz
Patient with blind eye	No problem	Oculomotor test not possible	No problem
Children	No problem	Yes, due to helmet size	Yes, due to helmet size



Using the VENG 20/20®, it is possible to compare the two types of technologies to perform nystagmography: video- and electrode-based.

Since the acquisition system and the post-processing software are the same, to show the equivalence of the two technologies actual eye movement measurements were taken with both technologies.



A typical saccade test was performed: a target was projected 1 meter in front of a subject seated on a chair and with the head restrained, to ensure that only eye movements could be made to follow the target. The stimulus was a series of horizontal movements of the target with an amplitude of  $20^\circ$  ( $\pm 10^\circ$  with respect to the midline position of the eyes of the subject).

From the recording it is immediately evident that the video-based system tracks the eye movements very well: the total amplitude of the saccades is approximately

$20^\circ$ ,  $\pm 10^\circ$  with respect to the zero line (midline position of the eyes of the subject), they are repeatable one stimulus after the other, and are consistent over time.

Analyzing the trace obtained with the electrode-based system, at first it seems that it is inferior to video system, while in reality this is not true. Analyzing each individual eye movement, the amplitude is again approximately  $20^\circ$ , it is just not centered around the midline position of the eyes of the subject. Given the different technology used to record the eye movement, the electrodes have an intrinsic drift due to capacity build-up that creates the apparent drift of the signal: instead of having square waves centered around the zero line of the graph, they are superimposed to a linear trend, which is a constant characteristics of the electrode system. De-trending the signal will bring the saccadic movement of the eyes in synch with that measured with the video-based system.

Furthermore, the apparent time shift of the two signals is due to the different time constants of the two systems. These are given by the time it takes to the eye movement to be recorded by either the video camera or the electrodes and then to be post-processed by the software to yield the traces on the screen. Again this time delay is a constant for each system and can be easily removed, aligning the two traces to coincide in time.

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