ONE MONITORING SOLUTION TO MEASURE MORE

Zephyr™ Performance Systems
for academics and researchers

Medtronic

Vital signs and accelerometry. Tracking both is integral to your research. But many monitoring systems measure only one.

That's why we developed Zephyr™ performance systems. To assess both physiological and biomechanical data. It also lets you:

- Monitor your subjects for stress and fatigue
- Export raw data files with accelerometry and impact processor metrics into .csv and DADiSP formats for MatLab™* or FalconView™* software

Our BioModule technology with OmniSense software lets you evaluate teams or individuals — up to 100 at a time.

It's a single solution to measure more.

CONSIDER
THE BENEFITS

Here are some of the ways clinical and research scientists, kinesiologists, sports performance directors, and human performance personnel monitor their subjects.

Researchers can access raw data logged in the Zephyr™ system BioModule device.

You can configure the logging format with the Zephyr™ system tool available as a free download from zephyranywhere.com. There are nine researcher logging formats. The more comprehensive log formats use more device memory, reducing the total hours of data that can be contained in the device. You can configure the device to suit your parameter resolution, data fidelity, and total log duration needs.

The Zephyr™ system BioHarness log downloader outputs files in multiple formats, according to user needs:

- **.csv (comma separated values)** — This can be opened using Microsoft Excel™* application, Notepad, or similar, or imported into many data processing applications.
- **.dat/.hed file pairs** — These files are designed for input of large data sets into a third-party data processing application such as DaDISP.
- **.kml files** — This applies if the BioModule device is used in conjunction with a supported Bluetooth GPS device.

The Zephyr™ system OmniSense software PC application analysis module can import logged data from the BioModule device directly into the OmniSense software database for:

Graphical display
- Analysis
- Report generation

A SINGLE SOLUTION.
A RANGE OF APPLICATIONS.

An inside look at what most people thought the human body couldn't do

Zephyr™ performance systems provide a single solution that measures, streams, and logs a variety of physiological and biomechanical data. Measure and analyze both teams and individuals using the market-leading BioModule technology with OmniSense software.

A customized and tailored approach to training can lead to optimal results. So you can consistently achieve maximum performance.

OmniSense Live software

Real-time data on athletes lets you:

- Record and analyze conditioning, effort, stress, and exertion
- Use physiological and biomechanical output to help players close the gaps
- View intensities and loads
- Customize speed zones and training zones
- Track specific individuals

OmniSense Analysis software

Create reports and comparisons of athletes so you can:

- Help fine-tune practices to achieve individual and team goals
- Customize reports in summary spreadsheets, radar plots, and bar graphs
- Export data in .csv and DADiSP formats for MatLab™* and LabView™* software

FROM SPORTS TO SPACE

Our performance monitoring has been used to measure subjects' vital signs in more than 500 published research papers — as well as by:

- Professional and collegiate sports teams
- Defense organizations
- Academics and researchers
- First Responders
- National governing bodies in countries including England, South Africa, Netherlands, Brazil, and the U.S.

To learn more about organizations that use Zephyr™ performance systems, visit **zephyranywhere.com.**

A CLOSER LOOK AT
WHAT OUR PRODUCTS MEASURE

Zephyr™ performance systems report on more than two dozen physiological and biomechanical parameters based on six inputs. Collectively, this information yields insights into key biomarkers in the monitored subjects.

Here's a look at the data the system gathers and reports on to provide insights.

Six inputs	Physiological and biomechanical measurements		Biomarker indicators
Straps and shirts, BioModules and GPS units provide these six inputs:	Based on the six inputs, Zephyr™ OmniSense software reports these biometrics:		The combination of the biometrics yields insight into these biometric markers:
• ECG • Respiration • Estimated core body temperature • Accelerometry • Time • Location	• Heart rate (HR) • Breathing rate • HR variability (HRV) • HR confidence • Estimated core body temperature • Impact • Activity • Posture • Caloric burn • % Heart rate (max) • % Heart rate anaerobic threshold (AT) • Accelerometry	• Physiological and mechanical intensity and loads • Training loads and intensity • Jump • Explosiveness • Peak force • Peak acceleration • GPS speed • GPS distance • GPS elevation	• Fatigue — HR recovery • Readiness — HR variability (HRV) • Safety — max HR, core body temperature, location • Over-training and under-training evaluation — intensity and load • Fitness improvement — VO_2 max, HR @AT • Caloric expenditure and burn • Agility — accelerometry, speed, and distance • Athlete management — intensity and load • Stress — HRV

OmniSense Live Software

The dashboard enables the user to:

- Customize the view by name, unit, and exercise
- Display up to 100 live subjects at one time
- Set alerts for safety, mechanical loads, core temp, HRV, location, and other parameters

BENEFITS THAT ARE **IMPOSSIBLE TO IGNORE.**

Here's why the Zephyr™ family of performance products is the top choice for many scientists and researchers.

FEATURE	BENEFIT
Live monitoring of large groups	• Provides configurable thresholds in real-time monitoring to allow concurrent management of training intensity and loads for each subject • Allows real-time insight into the potential for conditions such as fatigue, over- or under-training, and heat stress
Team and individual training and fitness reports	• Shows baseline metrics such as anaerobic threshold, HR recovery, and VO_2 max • Lets human performance resources compare and contrast personnel, and ascertain improvements
Measurements of kinematic and physiological variables	• Measures explosiveness from a dash or sprint start • Supports customizable speed and training zones
Detection and monitoring of anaerobic threshold	• Provides a method of monitoring fitness • Allows breathing rate-triggered monitoring of anaerobic threshold for intensity-based training
Monitoring of personnel in situations for signs of heat stress or fatigue	• Uses estimated core body temperature, HR recovery, resting HR, and HR variability • Monitors training intensity and load over time to assist in training customization and ultimately improve athlete management
Comprehensive analysis capabilities	• Detailed analysis of an individual's training and performance • Trend analysis of individuals or teams over multiple practices or sub-sessions • Quick and easy comparisons between players
GPS and player positioning	• Provides GPS logging data that works with Google Maps™* and FalconView™* software
Eliminate artifact issues	• OmniSense software algorithms and mechanical design address noise and movement artifact issues that affect other systems
Transmission range	• Provides an ECHO transmission range suitable for in-arena use or outside use across multiple training fields
Extended range	• Offers available antenna repeaters to extend coverage to an area of approximately 4 million square feet with no dead zones

GARMENTS.
SENSORS.
DISPLAY.
COMMUNICATION.

Details of the Zephyr™ Performance Systems workflow

Garments, sensors, display capabilities, and communication devices, along with robustsoftware.

Spotlight on BioModule compact physiological monitoring module

This BioModule device enables the capture and transmission of comprehensive physiological data on the wearer via mobile and fixed data networks. It enables genuine remote monitoring of human performance and condition in the real world.

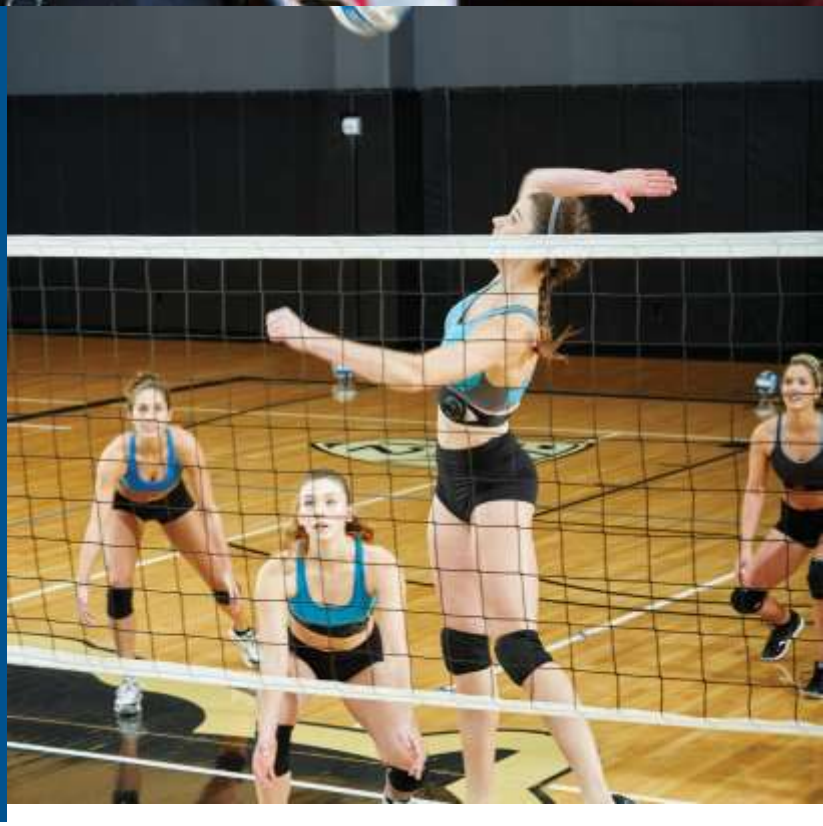
Here's a look at the key product features and specifications:

Connectivity	Uses ECHO to provide heart rate, RR interval, speed, and distance
Strap, shirt, or BioPatch HP	Machine washable straps, compression and flame-resistant moisture wicking loose fit shirts, and patches offer comfort and accuracy
Garment washes	80
Water resistance	Up to 1 meter: IP67 certified
Data capacity	Logs and stores up to 20 days of data
Heart rate range	25–240 BPM
Breathing rate range	4–70 BPM
Accelerometry range	±16g, 100 Hz
Battery type	Rechargeable lithium polymer
Battery life	24 hours per full charge
Charge cycles	300
Transmit range	Up to ~300 feet; extending to up to ~1000 feet with antenna and amplifier
Frequency	2.4–2.4835GHz
Operating limits	Temp: -10° C – 60° C Humidity: 5% – 95%

READY TO LEARN MORE?

For a closer look at performance monitoring and the products profiled here, visit **zephyranywhere.com**.

REINVENTING WHAT'S HUMANLY POSSIBLE



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