OmniSense™ User Manual

Zephyr™ Performance Systems

Medtronic

CONTENTS (1/4)

CONTENTS (2/4)

CONTENTS (3/4)

CONTENTS (4/4)

ABOUT THIS MANUAL

About This Manual

This manual provides comprehensive instructions on all aspects of setup, configuration and operation of Zephyr™ Performance Systems PSM (physiological status monitoring) training hardware and Zephyr™ OmniSense™ software.

This is an interactive PDF document.

When viewing online, use the panel on the left to navigate.

The section titles will expand to show sub-topics when you click on them. The section currently viewed is highlighted in blue and you will be relocated to the selected section.

The table of contents and index entries are also hyper linked - just click on them to relocate.

When browsing, you may find it easier to use the **View > Page Display > Two Page Scrolling** view.

Note

For brevity, some operations within the software are **not** explicitly described; for example, **Save**, **Cancel** and **OK** buttons where they are used. Their function is widely understood, and need not be described repeatedly. Any **Delete** operation is preceded by a dialog confirming that the user does want to delete an item.

What's In The Box

Items which will be shipped:

- Shipping List
  Match all items on the shipping list with those physically received.

Item	Description
	Medtronic USB Drive

- Contains the OmniSense™ Software Installer and soft copies of documents, including the Reference Manual (this manual).

Item	Description
	BioModule(s)

Item	Description
	Garment - compression shirt/ sports bra
	Garment - Zephyr™ strap

- Optional, multiple sizes available.

Item	Description
	GPS Receiver

- Optional

Item	Description
	BioModule charge cradle, 5 devices

- Single charge cradles also available.

Item	Description
	BioModule charge case, 50 devices

- USB connector and internal battery charge cable included.

Item	Description
	GPS charge cradle, 5 devices

- Wall charger and USB connector included.

GETTING STARTED
WHAT'S IN THE BOX (2/2)

Item	Description
	LoRa Gateway

Includes the following:

- External power supply adapter
- 2.4 GHz dipole antenna
- 5 GHz dipole antenna
- 915 MHz dipole antenna
- Ethernet cable

GETTING STARTED
Software Installation (1/13)

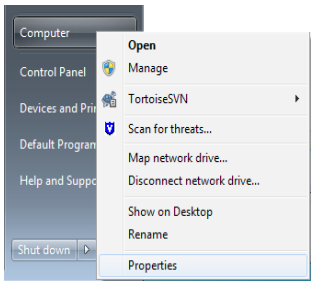
Applicable Version

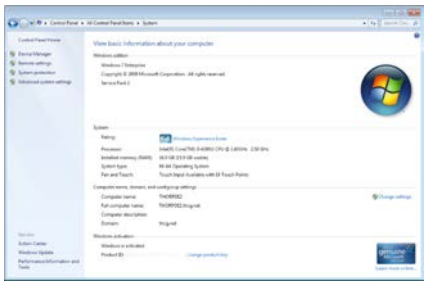
This manual describes operations for version 6.0 of the OmniSense™ software.

Recommended System Requirements

To check PC specifications:

1. Select **Start > Computer**
2. Right-click **Computer**
3. Select **Properties**





System Component	Description
Operating system	Windows 10
CPU	64 bit 2.8 GHz dual core or higher
RAM	Greater than 8 GB; 16 GB recommended
Hard drive	500 GB SSD recommended
USB ports	Three ports, or one port able to support a USB hub If using 50-Bay: Seven ports, or one port able to support a USB hub All ports USB 2.0 or higher
Graphics card	NVIDIA™* or Radeon™*
Screen resolution	1024 x 768 Touchscreen recommended
Bluetooth™*	v2.1 + EDR or later
Framework	Microsoft™* .NET 4.x

Warning

Do not connect any Zephyr™ hardware to your PC until after the driver files are installed automatically as part of the OmniSense™ software installation.

Warning

Do not install any Zephyr™ software on an Apple™* computer using a virtual PC interface, and then connect a BioModule to the computer via USB. The device may behave unpredictably during subsequent operations.

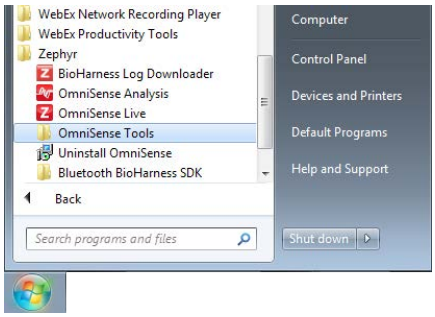
Installed Components

The following components will be installed.

System Component	Description
Microsoft™* .NET3.5/SP1 & 4.0	Program framework required to operate the application software (already embedded in Microsoft™* Windows™* 7)
Zephyr™ USB Driver	Files needed to communicate with Zephyr™ hardware when they are connected directly to a PC
Firebird Database	Database for storing recorded physiological data (this doesn't show up in the Add/ Remove programs page in Microsoft™* Windows™*)
Zephyr™ OmniSense™ Live Module	Zephyr™ Application Software
Zephyr™ OmniSense™ Analysis Module	Zephyr™ Application Software
Zephyr™ Configuration Tool	Configuration Tool for Zephyr™ BioModules (to be used only after consultation with Zephyr™ or distributor)
Zephyr™ Downloader	A utility for importing log files from multiple BioModules simultaneously. Data can be sent to the OmniSense™ database and/or external csv files
ZUSBUpdater	Tool for updating BioModule firmware

Shortcuts for OmniSense™ Live and OmniSense™ Analysis will be installed on the PC desktop.

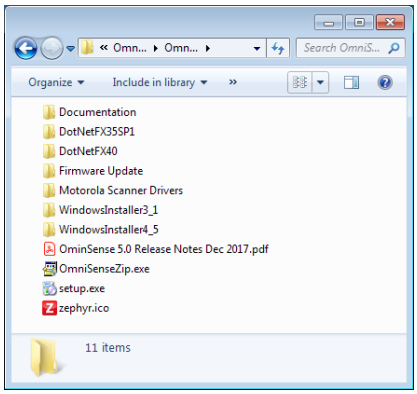
Tools can be accessed from the Start Menu.



Software Installation (3/13)

Installation Procedure

1. Browse the installation files at their location – either on CD, removable storage or on the PC itself.

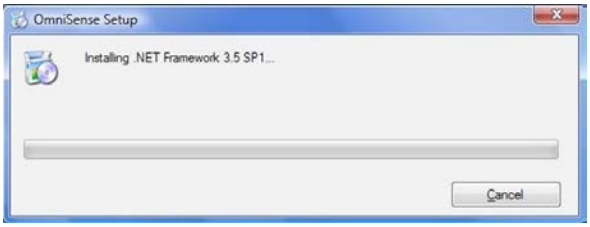


2. Double-click the **Setup.exe** file to start the installation. Do not click any other file, as setup.exe initiates Microsoft™*.NET, Zephyr™ USB driver and OmniSense™ software installation.

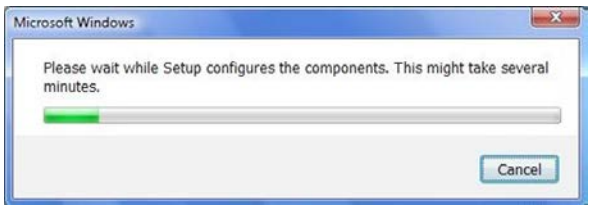
3. A Microsoft™*.NET Install dialog will display if you do not already have this component installed on your PC. (If using Microsoft™* Windows™* 7, you will not see this dialog as Microsoft™*.NET is already embedded).

4. Click **Accept** to continue.

5. Some copying file dialogs will briefly display, followed by a progress bar. You may see a User Account Control dialog to approve the installation.

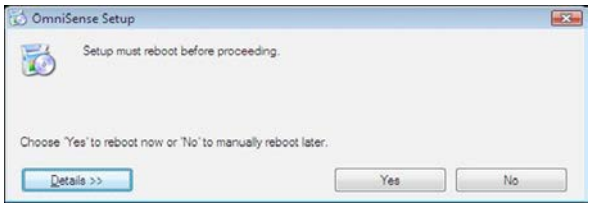


6. This will be followed by another dialog.

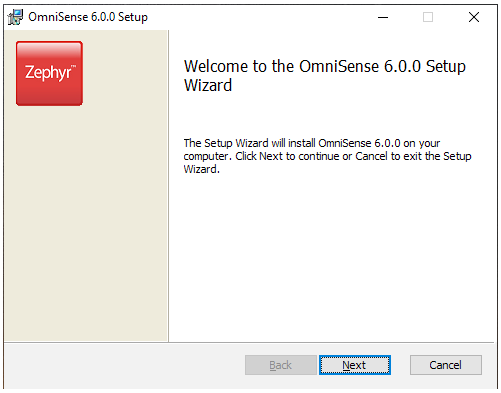


Software Installation (4/13)

7. You may be asked to reboot your PC before proceeding.

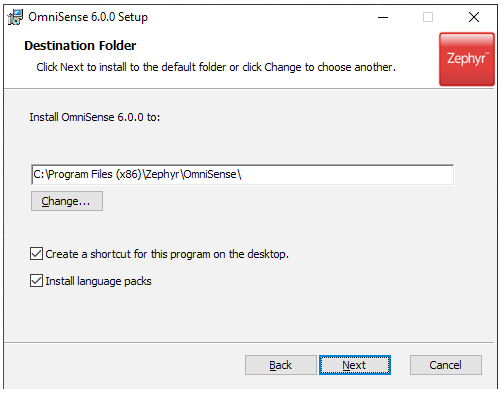


8. Select **Yes**. Reboot your PC and the install process will continue automatically. The OmniSense™ installer dialog will display automatically.



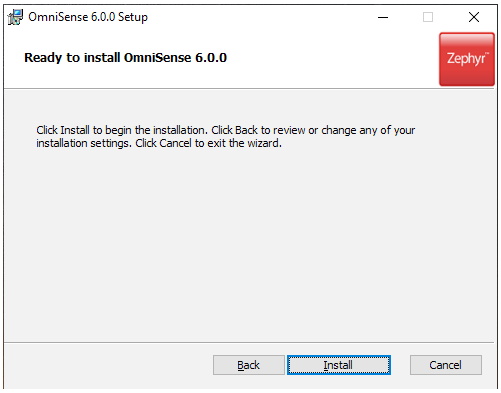
9. Select **Next** to continue. An end-user license agreement will display. Check the **'I accept...**' box and select **Next** to continue.

10. Browse and select an alternative location for the files if needed.

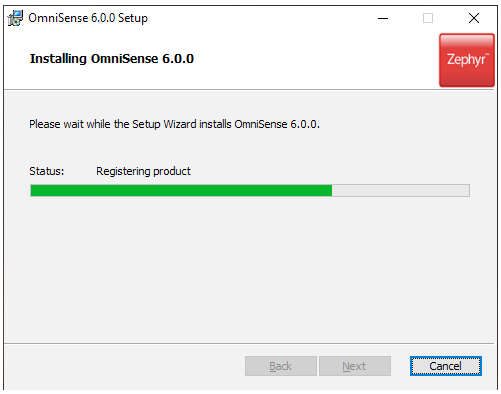


Software Installation (5/13)

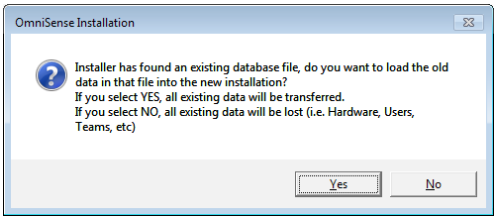
11. Click Next to continue, unless a location other than the default is preferred. Record where this alternate location is for future reference. A dialog will indicate the installer is ready to start. Click **Install** to continue.



12. A progress bar will display during installation. There may be a short delay before it initiates.

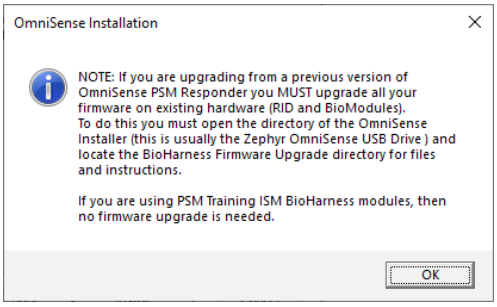


13. If an existing OmniSense™ database file (from a previous installation) is detected, a dialog will ask whether you want to add the data from this existing file into the new database. If you select **No**, the old database file will be overwritten. If this is done in error, contact Zephyr™ for information on recovering the overwritten data.

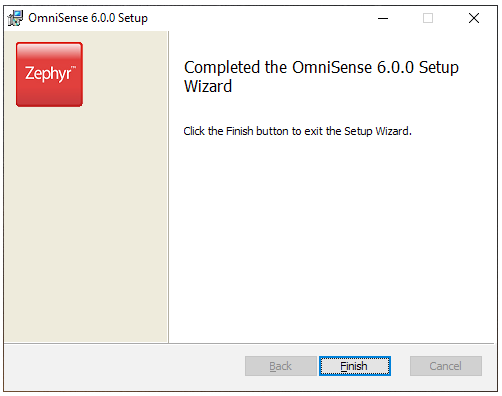


14. A firmware upgrade may be required for BioModules and Motorola™* XTS™* Speaker Microphones.

    An additional directory [**BioModule Firmware Upgrade**] supplied on the CD or download contains all the files needed for the user to perform the upgrade themselves. Firmware upgrade instructions are also included in an **Appendix** at the end of this manual.

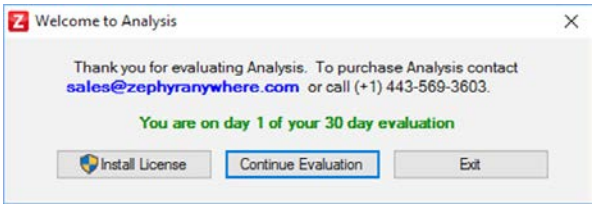


15. Click **Finish** to complete the installation.



16. Shortcuts for OmniSense™ Live and OmniSense™ Analysis will be placed on your desktop.

17. Install your license key when requested on first operation of the software. This key will be valid for subsequent updates.

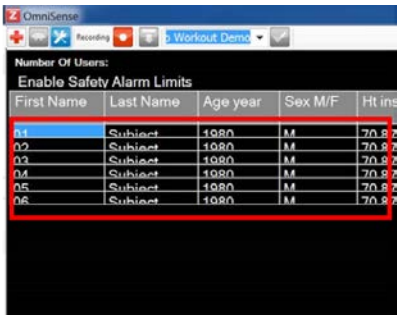


Note:

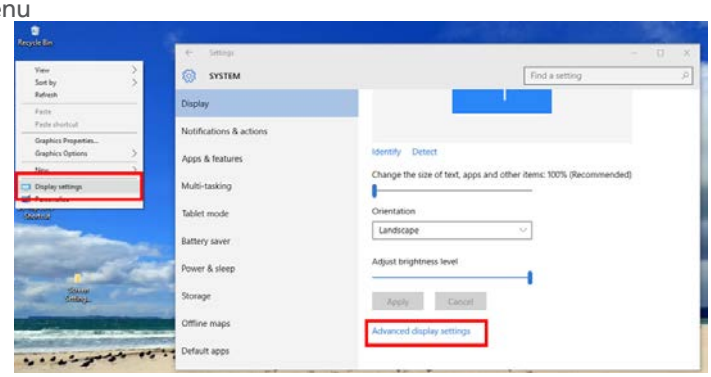
Customers are **advised to keep a record of the license key**, should they need to install the software on a different computer at any time in the future.

Troubleshooting

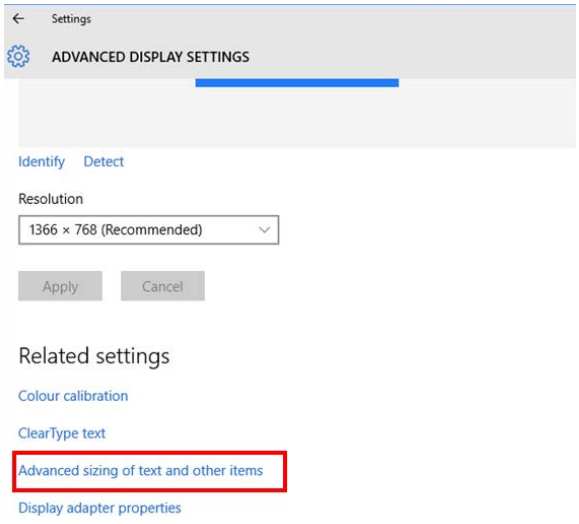
After install, some users may see overlapping of screen components:



1. Right-click on the desktop and select **Display Settings** from the context menu

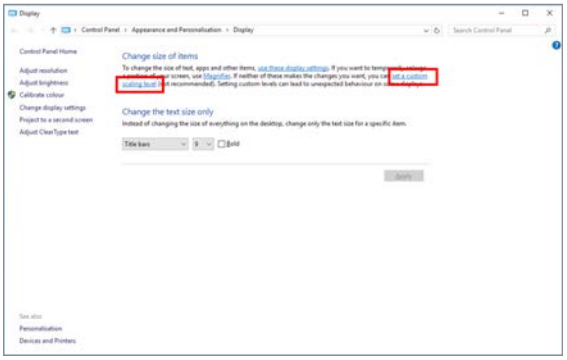


2. In **Advanced Display Settings**, select **Advanced sizing of text and other items.**

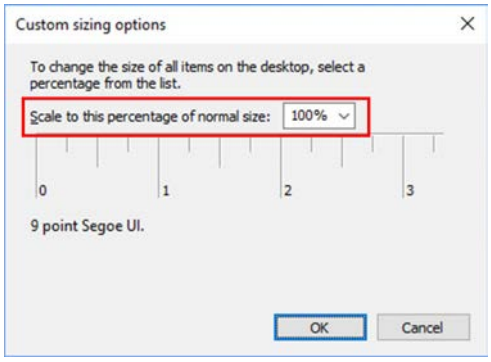


Software Installation (8/13)

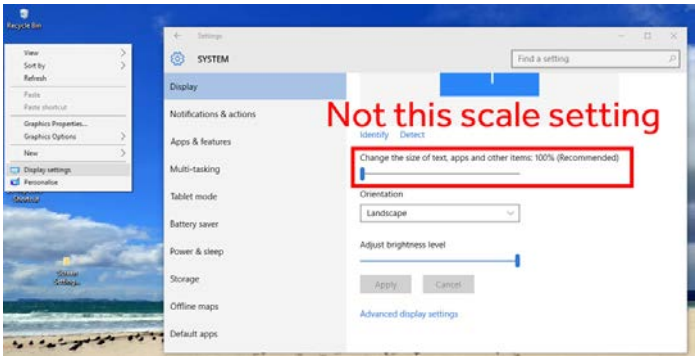
3. In the **Advanced Sizing...** dialog, select **Set a custom sizing level**



4. In the **Scaling Level** dialog, set **Scale to this percentage of normal size** to **100%**

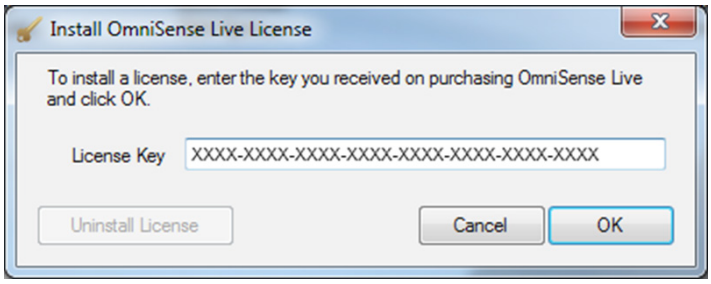


5. Note that the above scaling factor is **not** the same as that set in the initial **Display Settings** dialog.



License Key

For OmniSense™ 4.x, 5.x, and 6.x a license key must be purchased with the software. A license key dialog will appear the first time you run **OmniSense™ Live** or **Analysis**.



A 32-character license key will be supplied for all new instances of OmniSense™, or upgrades, purchased.

Note

Licenses purchased for a specific iteration of OmniSense™, e.g. 6.x, are not valid for any of the other iterations.

Note

Use of the OmniSense™ Web Portal, and connecting the PC software to the portal, is a subscription service which will be administered by the user's Account Administrator. The license will need to be renewed annually.

End-users wishing to use the portal must be created by the Account Administrator or a user with appropriate permissions.

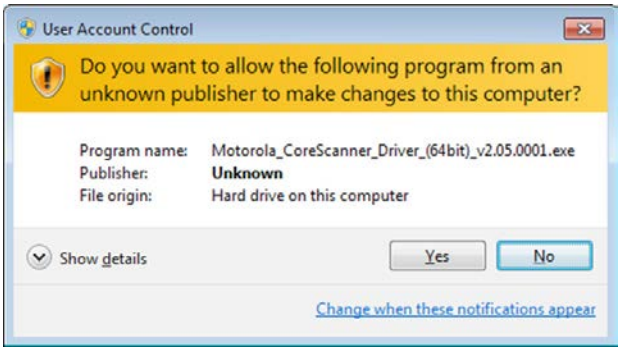
The creation process will send an automatic email to the end-user's nominated email address, through which they can log in to the portal and validate their membership. See the **OmniSense™ Web Portal** section for more information.

Motorola™* Barcode Scanner Support

Support is included for optional Motorola™*Barcode scanners for rapid deployment of teams, subjects and components. Driver files for these scanners must be installed independently.

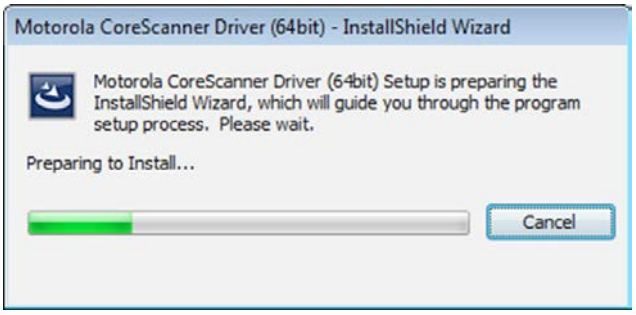
Motorola™* DS4208

1. Browse the OmniSense™ installation files to locate the Motorola™* Scanner Drivers directory, and then the driver file installer (32 bit or 64 bit) appropriate for your system. Double-click the installer file to initiate.



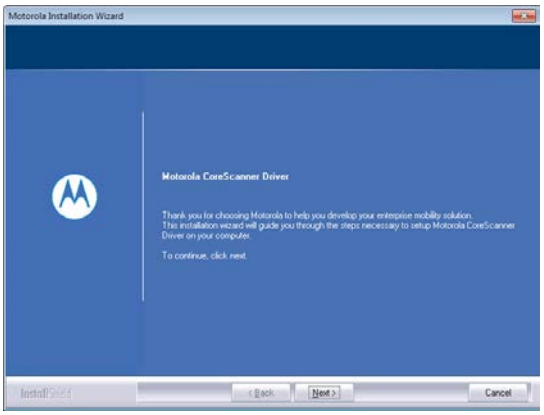
If a User Account Control dialog displays, select **Yes** to continue.

2. The installation wizard will start.

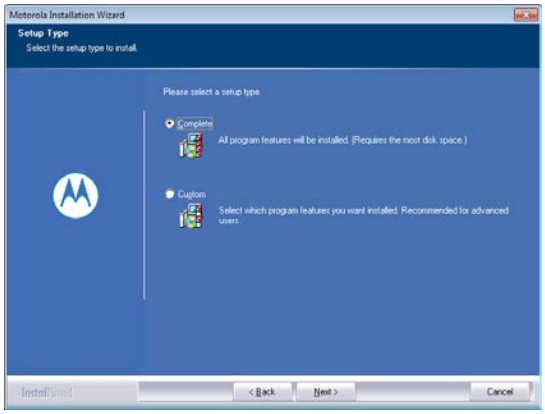


Software Installation (11/13)

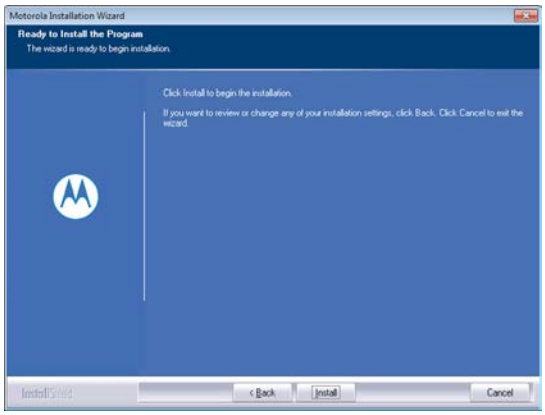
3. Select **Next** to continue.



4. Leave **Complete** checked. Select **Next** to continue.

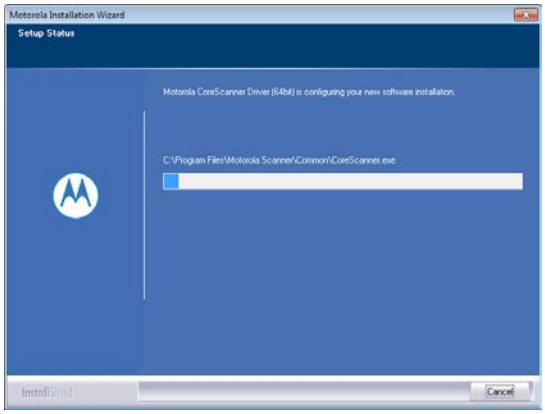


5. Select **Install** to continue.

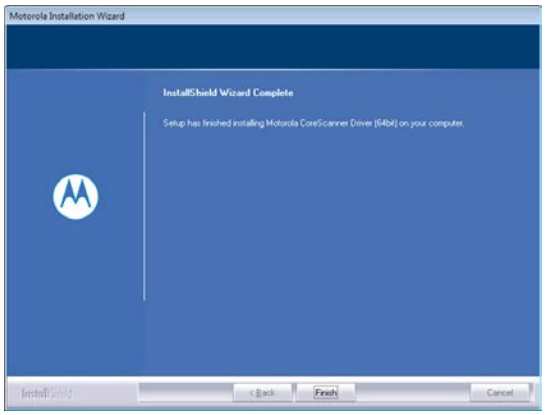


Software Installation (12/13)

6. The installation will proceed automatically.



7. Select **Finish** to complete the install.

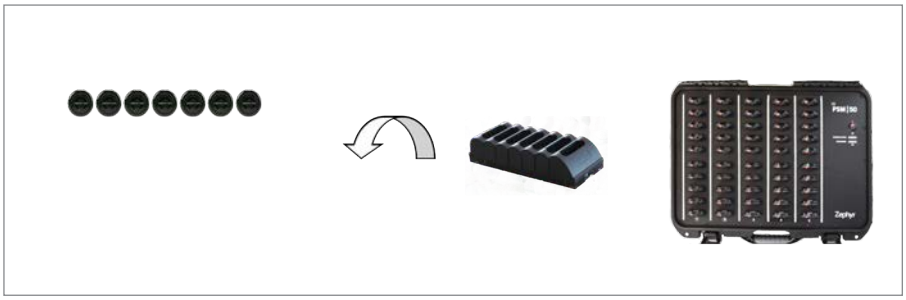


Hardware Installation

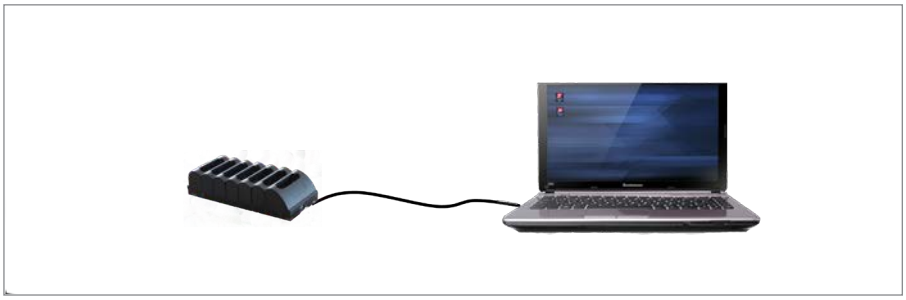
A PSM Training system is supplied with a charging and configuration cradle capable of holding one, five or fifty BioModules.

In order to communicate with and download logs from each BioModule to the PC platform, driver files must be installed for **each** of these devices. The best way to do this is to remove **ALL** BioModules from the cradle before its first connection to the PC, and relocate them one at a time, pausing for device driver files to load for each.

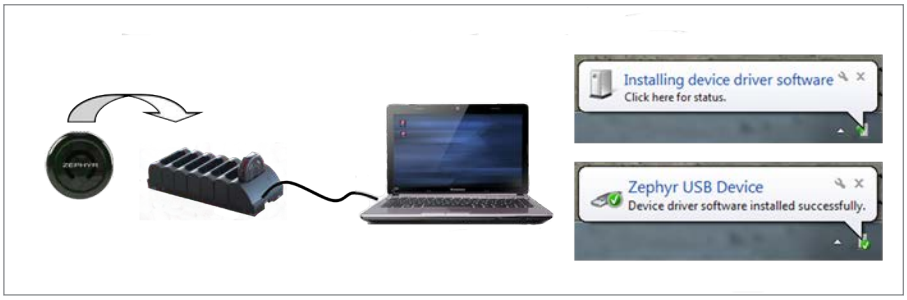
1. Install OmniSense™, and remove all devices from the USB charge cradle or system case.



2. Connect the empty cradle case to the PC by USB connector.



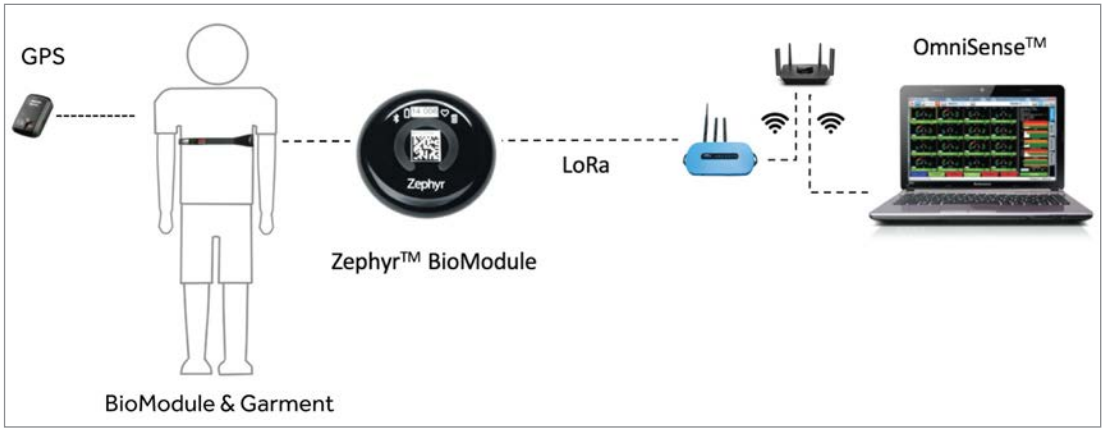
3. Replace the devices **one at a time** and allow the drivers to load.



The PSM System

- The PSM System transmits live physiological data from up to 240 subjects via a radio link to a remote PC station.
- Subjects can also transmit to and view data on a mobile device application.
- OmniSense™ Live and Analysis PC modules can receive and analyze transmitted data.
- Users with subscriptions to an OmniSense™ web account can view and analyze data from either a connected PC using the OmniSense™ cloud portal or mobile device session.
- BioModules can also log data during an offline session, for later upload to a PC via OmniSense™ Analysis
- Live data is displayed in OmniSense™ Live on a configurable BioGauge, including:
  - Heart Rate
  - Activity Level
  - Breathing Rate
  - Estimated Core Temperature
  - Orientation
  - Training Intensity

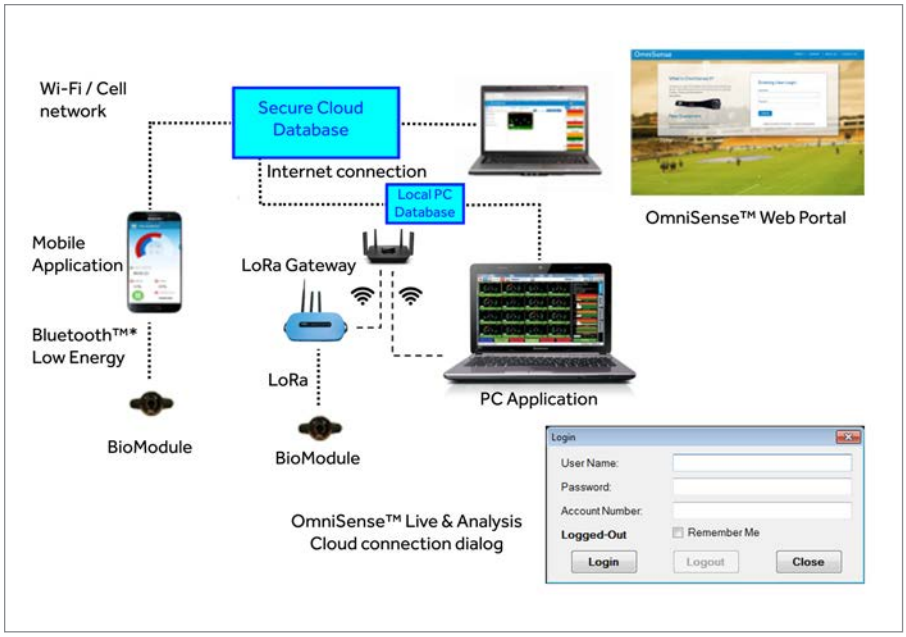
SYSTEM OVERVIEW
The PSM System (2/2)



Zephyr™ PSM Training features:

- Remote relay of multiple physiological & biomechanical parameters, including
  - Heart Rate
  - Breathing Rate
  - Activity Level
  - Estimated Core Temperature
  - Subject Orientation
- Support of up to 240 subjects
- Range of up to 10 miles
- Optional GPS Speed & Distance, and Map display with supported Bluetooth™* GPS
- OmniSense™ Live streaming data display
- Visual sweep scale and color-coded display, fully configurable
- Red/Orange/Green subject status algorithms
- Full data recording and display using OmniSense™ Analysis
- Fitness and Training Reports
- Baseline fitness tests
- Training Plan Workouts, pushed automatically to mobile devices
- Offline data logging on the BioModule

OmniSense™ Web Portal



OmniSense™ 6 now includes access to a web portal, and secure storage of data in a cloud database.

- Connection to the portal and cloud server is available via a toolbar button in either Live or Analysis.
- Customers must be members of an account and have a login and account number supplied by their Account Administrator.
- Data is uploaded automatically from a connected Live session.
- Data **cannot** be downloaded from the Cloud server to a local PC database – upload only is permitted.
- Data can be viewed and analyzed via a web version of OmniSense™ Analysis.
- Data is uploaded automatically from the OmniSense™ Mobile Application to the cloud server.

If a user wants to withdraw from acceptance of terms or wants their own user profile and data permanently deleted from the database for any reason, they can send a written request by email to support (zephyrperformancesupport@medtronic.com) originating from the email address associated with the user account. If the user profile is shared between multiple customer accounts, it must be specified which account's data (or all) should be deleted or retained. The support team will complete the action and send a reply email to the user to confirm completion.

OmniSense™ Cloud Account Definitions

Term	Description
Account	Client name for each customer.
Subscription Fee	Each account will have an affiliated monthly fee for each System, Administrator and Subject.
Subjects	Number of users of the system that are being monitored. Subjects can only view their own data, unless granted permissions. Some user types have wider permissions (e.g. Coaches).
Administrators	Number of back-end Admins who will have access to the data and who will be able to define who actually sees all, some or none of the data.
Reports	Customized or standardized graphs, spreadsheets or trends which are downloaded from the customer's data and sent to customer based upon their viewing contract. For example - five reports pulled for training loads weekly.
Hardware	Medtronic product such as the straps, BioModules, gateways, etc. that make up the performance monitoring solution.
OmniSense™ Local	Local version of OmniSense™ running on a host PC.
SLA	Service level agreement that is based on a per hour or annual basis.
Training	On-site Zephyr™ professional support for new customers learning the system.

For a complete description on how to use the web portal, refer to the **OmniSense™ Web Portal** section.

Hardware Components (1/5)

BioModule and Zephyr™ Strap

- Connectivity
  - LoRa transmitter module
  - Bluetooth™* + Bluetooth™* Low Energy transmitter module
  - USB for PC configuration
- Internal data logging, up to 450 hours*
- Log download by USB or Bluetooth™*
- Battery duration up to 35 hours
- 3 hour battery charge time
- IP67 water resistant
- Configurable firmware
- Internal algorithms for
  - Subject ROG (Red/Orange/Green) status
  - Estimated Core Temperature
  - Jump & Dash Tests
  - Heart Rate Variability
- 250 Hz ECG
- 100 Hz 16g 3-axis accelerometer
- Capacitive breathing detection
- Supports Bluetooth™* GPS
- Barcode labelling for rapid deployment

*Dependent on log format

Hardware Components (2/5)

Garment Options

Zephyr™ Strap

- Left side BioModule location
- Integrated ECG & capacitive breathing sensors
- Adjustable, elasticized
- Fabric-based
- Detachable shoulder strap
- Machine washable (replace after ~80 washes)

Loose Shirt

- Left side BioModule location
- Integrated Zephyr™ strap with low profile buckle
- Flame resistant
- Semi-fitted athletic style
- Quick Dry
- Machine washable
- Male & female options

Compression Shirt Front Mount

- Center chest BioModule location
- Integrated ECG sensor only
- Tight fit
- Polyester Lycra body
- Integrated GPS pocket

Compression Shirt or Sports Bra Rear Mount

- Rear facing BioModule between shoulder blades for protection
- Compression top
- Stretchable, protected internal wiring
- Compression shirt
- Unisex design
- Polyester/Spandex body
- Neoprene pad behind BioModule cup
- Stainless steel rivets & snaps

LoRa Gateway

LoRa Gateway

LoRa Gateway

- External power supply adapter for power
- 10 mile range (line of sight)
- Indoor and outdoor setup options

50 BioModule Charge Case

50 BioModule Charge Case

- 50 BioModule capacity
- USB connectivity to PC, 10 BioModules at a time
- BioModule configuration
- Log download via USB or Bluetooth™*
- External power or internal rechargeable battery
- Tough, durable storage and transportation for BioModules

Charge Cradle

- 5 BioModule capacity
- USB mini connectivity to PC
- BioModule configuration
- Log download via USB or Bluetooth™*
- External power pack supplied

External Sensors

GPS

QSTARZ 818XT

Charge Cradle

- Add sensor by Bluetooth™* in OmniSense™ Live
- Speed, distance travelled and location
- Supports streaming map display in OmniSense™ Live
- KML file export from OmniSense™ Analysis

Note:

When using the OmniSense™ Mobile application, speed and location data is acquired via the GPS module native to the mobile device.

Hardware Components (5/5)

Barcode Scanner

Motorola™* DS4208 wired scanner

OmniSense™ Live Rapid Deployment Tool

- Assign BioModules & GPS to subjects
- Assign subjects to teams
- Start Live operations
- Integrated tool in OmniSense™ Live
- Use device labels or printed sheets
- Wired (DS4208) scanner support

Setup Checklist

Prior to Live operations, the following tasks should be completed using the OmniSense™ Live Setup screens, and Live Preferences.

Task	Description
Charge devices	▪ Ensure BioModules & GPS units have sufficient battery charge.
Radio Network Type	▪ Set **Radio Network Type** in Live Preferences. ▪ Set **LoRa Mode**.
Configure BioModules	▪ Set log format to **Summary + Waveform** or **Enhanced Summary + Waveform** if GPS devices are to be used, or waveform data is required.
Subjects	▪ Add subjects to database.
Hardware	▪ Add BioModules & GPS devices to database. ▪ Assign hardware to subjects.
Teams	▪ Create teams. ▪ Populate teams with subjects. ▪ Deploy teams to live when ready.

Default BioModule Configuration

The default settings for newly shipped BioModules are:

Setting	Value
Bluetooth™*	Enabled
LoRa	Enabled
Bluetooth™* Low Energy (BLE)	Enabled
Log Format	Enhanced Summary

LoRa Network Address

BioModules in a LoRa system each have a unique LoRa Network Address. There must be **no duplicate addresses** in any one system. When adding additional BioModules to an existing system, it may be necessary to change the LoRa Network Address.

Addresses are usually in sequences (1, 2, 3...), but may be any values in the range limit for the system (1-240), as long as there are no duplicates.

Note:

When configuring a LoRa system, it is good practice to label the BioModules with a sticker indicating the LoRa Network Address.

Zephyr™ production BioModule labelled 24-001. LoRa Network Address is 001.

Log Format

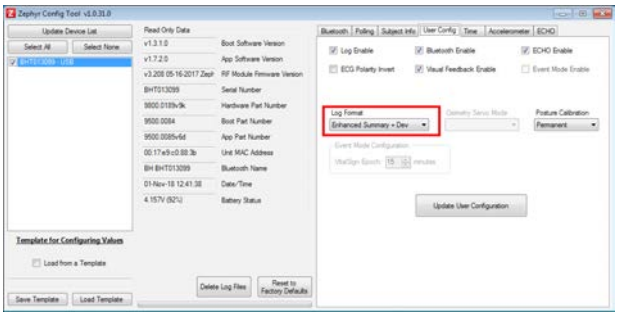
The default log format is **Enhanced Summary**. For a detailed description of all log formats and parameters, refer to Appendix 3 **BioModule Log Data Descriptions.**

GPS Data

To log GPS data internally in the BioModule, the log format must be changed to **Summary & Waveform,** or **Enhanced Summary & Waveform**.

Note:

To change BioModule default configurations, refer to the **OmniSense™ Tools > Zephyr™ Config Tool section.**

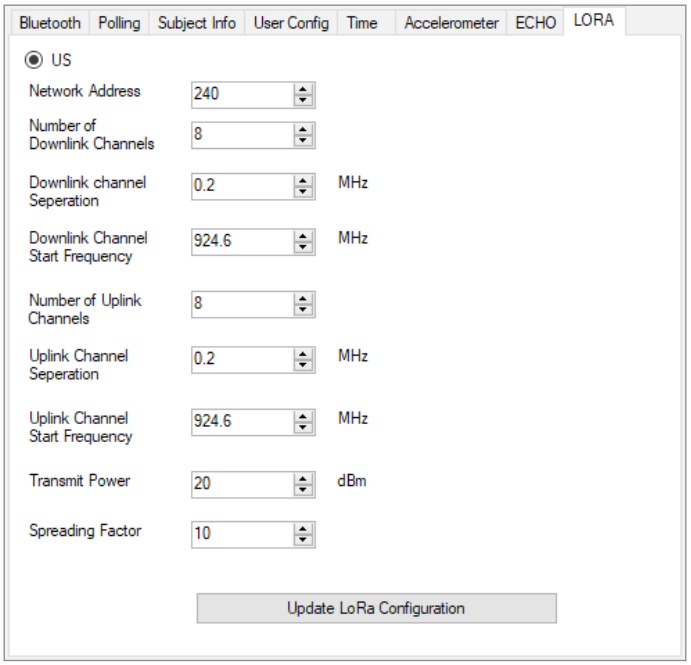


LoRa Transmission Power Level

Transmission power level is preset according to the destination region for the device. These settings are required to comply with local regulations.

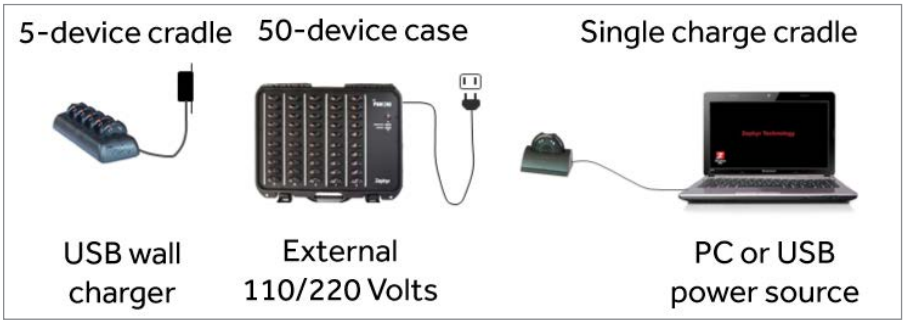
Region	Maximum LoRa RF Power Level (dB)
US	20

LoRa transmission power level is set using the Zephyr™ Config Tool.



Charge Devices

LoRa gateways are powered by an external power supply adapter.



A 50 BioModule Charge Case with its internal battery can charge BioModules for two charge cycles.

Device	50-Device Charge Case Internal Battery	BioModules
Charge Times	1 hr to 90% 3 hrs to 100%	1 hr to 90% 3 hrs to 100%

Battery Care

For all batteries - BioModules, 50-Device Charge Case Internal Battery

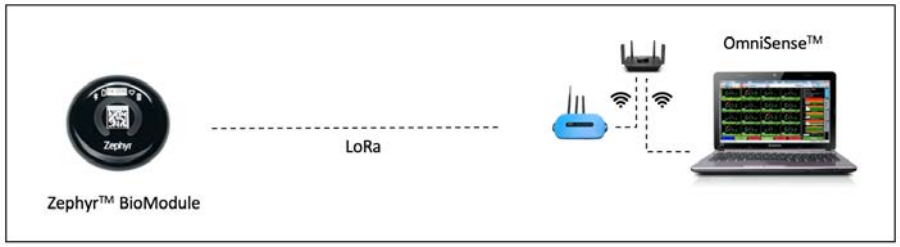
- Top-up charge when not in use, around once per month.
- Top-up charge BioModules after use. Repeated shallow charges will maintain battery condition better than less frequent deep charge cycles.
- Charge and store the devices in a cool place.

BioModule Battery Duration

Mode	Typical Battery Duration (new battery)
Transmitting	20 hrs
Logging	35 hrs

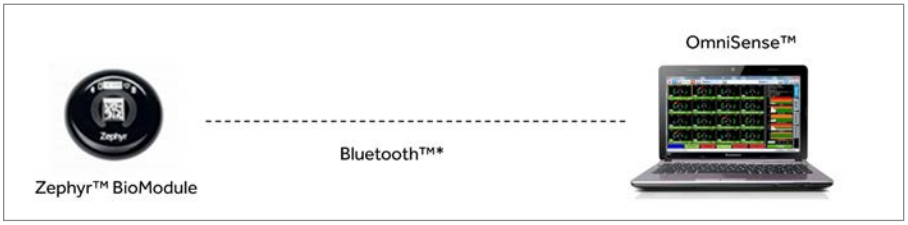
Radio Network Options

LoRa



Range: 10 miles. 1 to 240 subjects, 15 second data update rate.

Bluetooth™* Direct



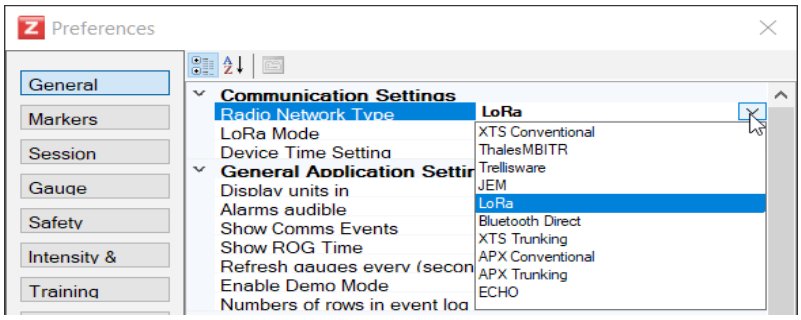
Range: up to 100 feet. 7 subjects. 1 second data update rate .

Set Radio Network Type

1. Start OmniSense™ Live using the desktop shortcut created when the software was installed.

2. Open the **Preferences** dialog using the **Preferences** button on the Live Toolbar.

3. Set the **Radio Network Type** using the pull down.



Radio Network Type	Description
Bluetooth™* Direct	Bluetooth™* communication direct to BioModules from host PC.
LoRa	Zephyr™ LoRa system using LoRa gateway

Set Radio Network Type (2/2)

Set LoRa Mode

If **Radio Network Type** is set to **LoRa**, set the **LoRa Mode**.

1. In the **Preferences** dialog, select the **LoRa Mode** option using the pull-down menu.

LoRa Mode	Description
240x15	Up to 240 devices; 15 second data reporting

Caution:

LoRa Network Addresses configured into BioModules must be appropriate for use in LoRa mode. Thus, for LoRa Mode 240x15, addresses must be in the range from 1 to 240, with no duplicates.

Note:

Data is logged internally in the BioModules once per second (more often for waveforms).

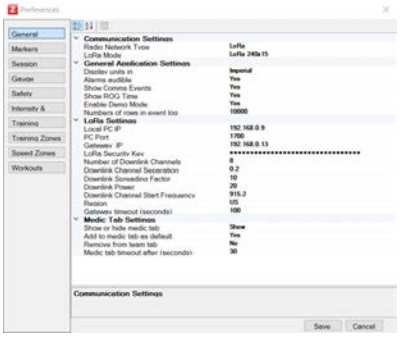
OmniSense™ General Preferences (1/2)

General Preferences

Preferences other than **General Settings** are described in other sections.

Click on the **Preferences** button in the Live toolbar.

The **Preferences** dialog will display.



Communication Setting	Description
Radio Network Type	Varies according to Radio Network Type
Comms Counter retries	How many data packets are missed before Comms Error (Blue Subject Status) is displayed
Polling Cycle (ms)	Leave at default 2400 - ECHO network only. Leave at default 1000 - MotorolaXTS network only
LoRa Mode	240x15 – 240 BioModules at 15 s refresh rate
Slot Time (ms)	Leave at default 40 - ECHO network only Leave at default 1800 - MotorolaXTS network only

General Application Settings	
Display Units in	Imperial or metric (Height, weight, temperature)
Alarms Audible	ROG Status change audible alerts
Show Comms Events	Comms events recorded in notification area
Show ROG Time	Time in ROG-state displayed on subject status bar in BioGauge
Refresh gauges every (seconds)	How often default gauges are repainted. Default of 0 means after each cycle of device querying
Enable Demo Mode	Enables Demonstration Mode.
Numbers of rows in Event Log	Max. no. of lines displayed in notification area

OmniSense™ General Preferences (2/2)

LoRa Setting	
Local PC IP	The IP address of the computer running the OmniSense PC software. The PC may be connected to network though both wired and wire-less connection and hence will have multiple IP addresses to choose from the list.
PC Port	The port on which the UDP (User Datagram Protocol) communication happens with the LoRa Gateway. Valid range is 1024 to 65535. Default value is 1700.
Gateway IP	IP address of the LoRa gateway. The PC application shall process UDP packets from the configured Gateway IP address and ignore any other packets.
LoRa Security Key	Security key for the LoRa communication. Used to decrypt the data packets sent by BioModules and encrypt the OTA messages sent by Omnisense PC application. It is 16 characters long.
Gateway timeout (seconds)	The time PC app should wait if communication between the Gateway and PC application fails in the middle of an active session before displaying an error message to the user saying unable to connect to gateway and connection status is changed to COMMS ERROR. Valid range between 5 to 1000.
Number of Downlink Channel	Default value is 8. Valid range is 8 to 64.
Downlink Channel Separation	Default value is 0.2.
Downlink Spreading Factor (SF)	Default value is 10. Valid range is 6 to 12.
Downlink Power	Default value is 10. Valid range is 0 to 20.
Region	Set to US by default.

Heart Rate Recovery Algorithm Settings	
Upper Activity threshold	The maximum activity level allowed during recovery phase (stationary approx.) for the HRR algorithm to auto-calculate HRR
Lower Activity Threshold	The minimum activity level needed (running approx.) before HRR algorithm can auto-calculate HRR
HRR detection time	Duration during which Upper Activity Threshold must not be exceeded e.g. sit or lie down during recovery, for auto-detection of HRR

Medic Tab Settings	
Show or hide Medic tab	Makes medic tab accessible during Live Mode
Add Medic Tab as default	Sets whether subjects whose status changes to Red are automatically moved to the Medic tab.
Remove from Team Tab	Automatically move BioGauge to Medic tab after time-out. 'No' means BioGauge will be displayed in both Team and Medic tabs
Medic Tab time-out	Time delay in seconds of Red status before subjects are automatically transferred to Medic tab

Additional parameters are configurable, dependent on the Radio Network Type set.

OmniSense™ Live Setup Overview (1/2)

Database Setup Overview

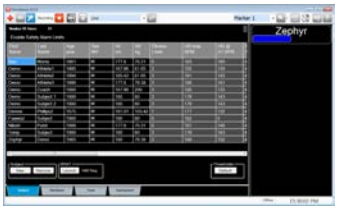
Database setup is performed in the setup screens, accessed by the setup button in the OmniSense™ Live toolbar.

Navigate through the screens using the tabs below each screen.

The process of setting up an OmniSense™ database involves the following tasks:

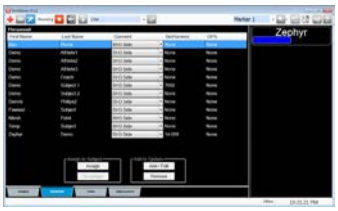
1. Add subjects
2. Add devices (BioModules, GPS)
3. Assign devices to subjects
4. Create & populate teams
5. Deploy teams

Subject



- Add subjects, basic physiological thresholds and baseline fitness values, or leave defaults set as is pending fitness testing.

Hardware



- Add BioModules (by USB connection) and optional GPS devices (by Bluetooth™*).

Note:

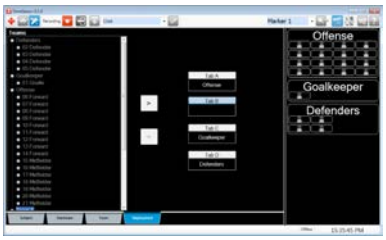
A new system supplied by Zephyr™ may include a file which will allow all hardware to be added to the system in a single operation. Refer to the **Add Hardware** section for details.

OmniSense™ Live Setup Overview (2/2)

Teams

- Assign BioModules & GPS devices to subjects, either in setup screen or using barcode rapid deployment tool (BRAT).
- Add subjects to Teams, either in setup screens or using BRAT.

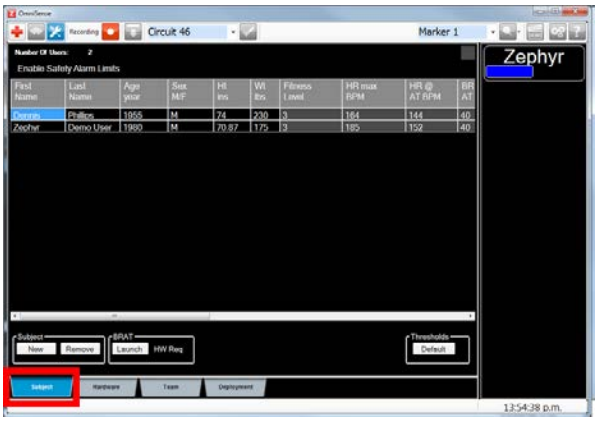
Deployment



- Deploy Teams to live operations in setup screens or using BRAT.

Add New Subject

In the **Subject** tab of the **Setup** screens, click the **New** subject button.



Edit the new subject fields created.

First Name	Last Name	Age year	Sex M/F
New	Subject	1980	M

Note:

There is no Save Changes button - each value is automatically saved as the field is exited. The same applies when updating values for any existing subject.

Subject Parameters are described in the next section.

Subject Parameters

When a new subject is created, some fields are populated by default values. These can be left as is, deleted, or edited.

Parameter		Description
Name		Names in the database must be unique
Age		Used to auto-calculate default HR_{max}
Sex		Used to auto-calculate default HR_{max}
Height		Used for BMI calculations
Weight		Used for BMI calculations
Fitness Level		1 - 10 10 = elite athlete Used in Estimated Core Temperature algorithm
HR_{max} (maximum heart rate)		Default is auto-calculated. Determined and saved when analyzing the results of a ramped maximal fitness (treadmill or beep) test in OmniSense™ Analysis. Used to determine Physiological Load weightings and Training Thresholds.
Safety Alarm Limits	HR (Heart Rate) @ AT (Anaerobic Threshold)	Default is 80% of HR_{max}. Determined and saved by analyzing ramped fitness test results in OmniSense™ Analysis Used to calculate Training Zone Thresholds
	BR (Breathing Rate) @ AT	Determined and saved by analyzing ramped fitness test results in OmniSense™ Analysis
	HR High Red	Threshold for subject status = Red
	HR High Orange	Threshold for subject status = Orange
	HR Low Red	Threshold for subject status = Red
	BR High Red	Threshold for subject status = Red
	BR Low Red	Threshold for subject status = Red
	Core Temperature Red	Threshold for subject status = Red
	Idle Timeout	Time in seconds of an inactive subject before subject status changes to Red. Designed for First Responder systems. Disabled by default

Note:

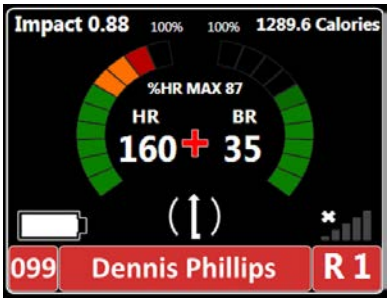
Any single parameter with a safety alarm limit - **Heart Rate**/**Breathing Rate**/**Estimated Core Temperature** which crosses a safety threshold, will cause the subject status to change.

Subject Parameters (continued)

Parameter	Description
HR Resting	Determined by an orthostatic hypotension (Readiness) test
HR Standing	Determined by an orthostatic hypotension (Readiness) test
HRV Rest SDNN	Heart Rate Variability (Standard deviation in milliseconds) Determined by an orthostatic hypotension (Readiness) test
HRV RMSSD	Heart Rate Variability (Standard deviation in milliseconds) Determined by an orthostatic hypotension (Readiness) test
Web Email	'Activated' when subject has logged in to the web portal with password sent to their nominated email account by their account administrator, and validated their account.

Safety Alarm Limits

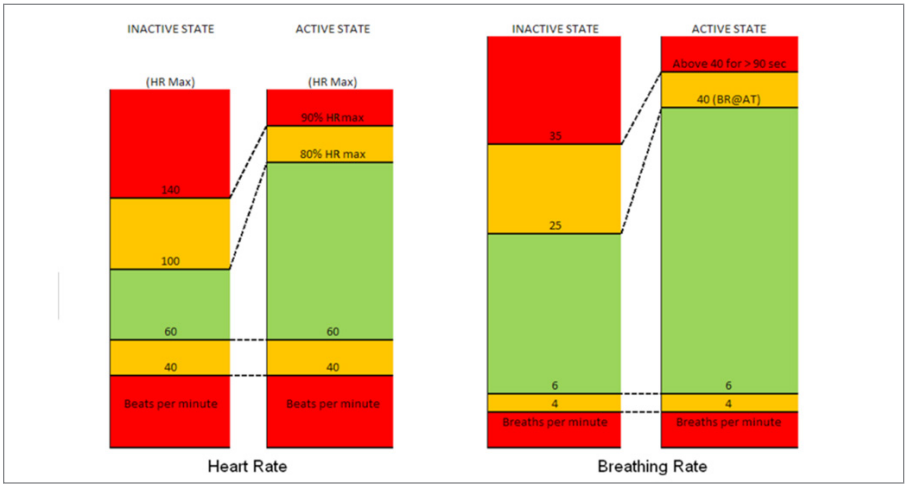
Safety Alarm limits are also called **ROG Subject Status** Thresholds. They are indicated by the color (red, orange, or green) of the subject name panel in each OmniSense™ Live BioGauge.



Upper and lower limits can be set for **Heart Rate** and **Breathing Rate**. An upper rate can be set for **Estimated Core Temperature**.

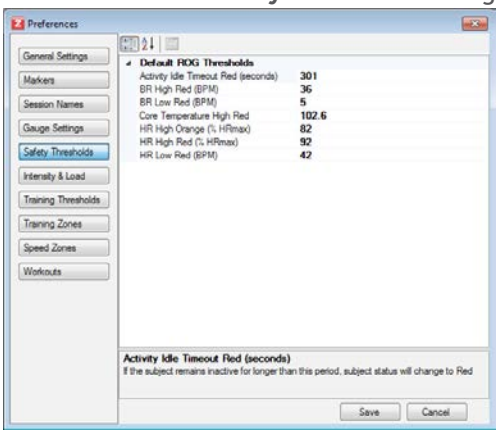
If any one threshold is crossed, the color of the subject name background in the BioGauge will reflect this.

Proprietary Zephyr™ ROG algorithm will adjust the thresholds automatically if the subject is detected as active, based on accelerometer data.



Safety Alarm Limit Defaults

Default values are assigned when a new subject is created. The default values can be set in the Live **Preferences > Safety Thresholds** dialog.



Add/Edit BioModules by USB connection

1. Connect BioModule to PC in charge cradle.

2. Select the **Setup** button on the OmniSense™ Live toolbar.

3. Select the **Hardware** tab.

4. Select the Add/Edit button.

5. Select **Add** or **Edit** in the Hardware Setup Wizard when it displays and then select **Next.**

6. Select **Zephyr™**, then **Next.**

7. Select **Connection to PC,** and **Next.**

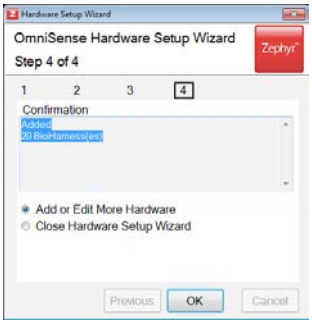
8. OmniSense™ will normally auto-detect the BioModule in a few seconds, and populate the pull-down item with the device serial# (BHTxxxxx). Use the **Detect** button to retry manually if necessary. If more than one BioModule is connected, select the appropriate device from the pull-down list of identifiers.

Enter a value for **Choose Device name** - this will be the identifier for your BioModule in OmniSense™ Live. It will appear on the subject BioGauge. If editing a BioModule already in the database, then the name field will contain the existing name. Click **Next**.

Note:

When assigning an identifier to a BioModule, the best practice is to use any preexisting Zephyr™ label (for example, label number 9154-009 indicating LoRa Start Frequency-Network Address). Alternatively, attach a label to the front of the BioModule, so that it can be readily identified when attached to a strap or garment.

9. The final dialog will confirm that the device has been added.



Select **Add...** or **Close...** as necessary, and **OK** to complete the process.

10. Repeat as required for additional BioModules.

Note:

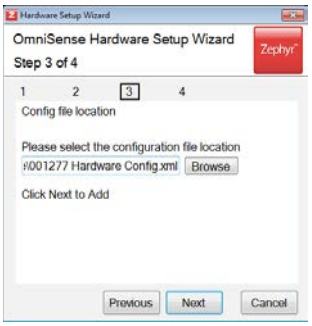
The LoRa security key for encryption of BioModule data sent to the application via LoRa is loaded to the BioModule when the BioModule is added to the system via the USB connection. If the security key is changed in the application preferences, apply the new security key to each BioModule by placing it in the charging cradle and following the connection procedure above. The updated security key is configured as soon as the BioModule is detected over the USB connection.

Add BioModules from an XML File

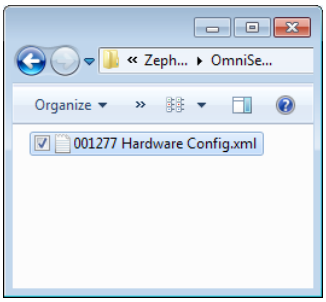
This method may be used to add multiple new BioModules to an existing system. This saves the effort of adding multiple devices manually.

1. In the 3rd dialog of the Hardware Setup Wizard, select **Config File**, and **Next**.

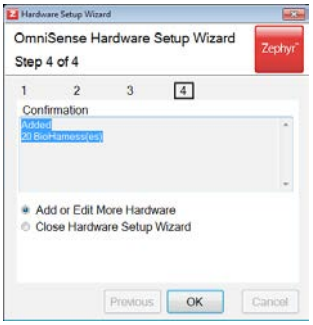
2. The next dialog allows you to browse to the (optional) xml config file supplied with the system.



3. Browse and select the file.



4. Confirmation of the added devices will display.



5. Select **Add** ...or **Close...** and **OK** to continue or exit.

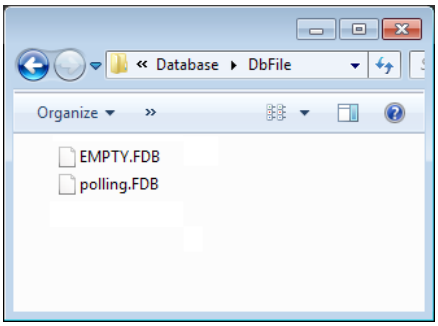
Add BioModules from a Database .FDB File

A completely new system may be supplied with a database file which contains all information on devices included with the system. OmniSense™ software should be installed first, and then the installed database file replaced by the pre-configured file.

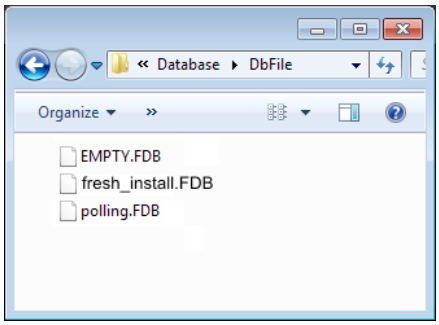
1. Install OmniSense™ software for the system.
2. Without OmniSense™ Live or OmniSense™ Analysis running, browse to the location

   C:\Program Files (x86)\Zephyr\OmniSense\Database\DbFile

   This directory contains two files - **EMPTY.FDB** is a surplus empty database created with all fresh installs, and **polling. FDB** which is the active database file. It contains Demo data only, in sessions dated year 2001. Set to 2001 the **From** field in the **Filter Session List** pane in OmniSense™ Analysis to access this data.



3. Rename the existing **polling.FDB** to fresh_install.FDB or similar. It can remain in the same directory, and can be recovered if needed.
4. Rename the pre-configured database file to **polling.FDB** and save it to the directory shown.

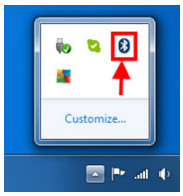


5. When using OmniSense™ Live to set up your system, all the shipped BioModules are now in the database and are available to assign to subjects. They may be edited as if they had been added manually.

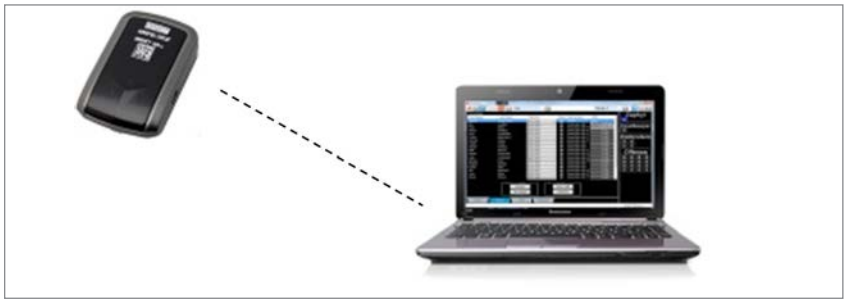
Add GPS Devices

GPS devices are added by Bluetooth™* connection to the PC. QStarz 818XT are the only GPS devices supported at this time.

Bluetooth™* must be enabled in the host PC. If enabled, then the Bluetooth™* symbol will show in the PC System Tray.



1. Power on the GPS.



2. Select the **Add/Edit** button to start the **Hardware Setup Wizard**, as for BioModules. Select **Add Hardware**...and **Next**.

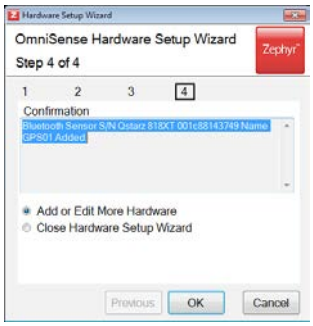
3. Select **GPS Devices**.

4. Wait while the GPS is detected. The Wizard will populate with GPS details. Use the manual **Detect** button to try again if necessary. Power cycle the GPS between attempts. A blue LED on the GPS will indicate that Bluetooth™* is active.

Note:

The GPS need **not** be Bluetooth™* paired to the PC to communicate. The GPS passkey of 0000 is entered automatically. The GPS cannot be paired to the PC by USB connection.

5. Label the GPS device according to the identifier you have selected for it. Label the device accordingly.



6. A confirmation message will display. Repeat as necessary.

   The 12-character string which is part of the serial number is the Bluetooth™* MAC Address of the device, normally displayed in the format XX:XX:XX:XX:XX:XX. The characters are hexadecimal, 0-9, a-f.

   The letters are not case sensitive.

Assign Devices to Subject

When BioModules and GPS units have been added to the system, they are available for assignment to subjects.

Warning

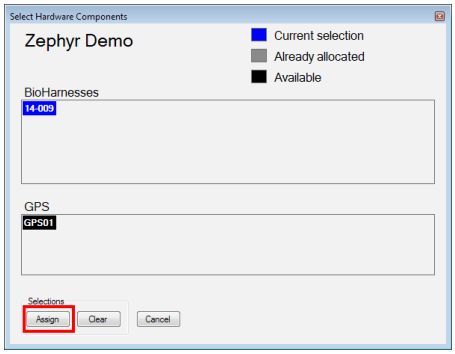
Once devices have been assigned in the software, ensure that the correct subject is given the devices. If not, then the data in the system may be assigned to the wrong subject. BioModules and GPS units cannot simply be swapped in the field, without first reassigning them in OmniSense™ Live.

1. In the **Hardware** tab, select the subject to be assigned. They will highlight blue.

First Name	Last Name	Garment	BioHarness	GPS
Zephyr	Demo	BH3 Side	None	None

2. Click the Assign button.

3. A dialog will display. Select the BioModule and GPS to be assigned to the subject and click the **Assign** button in the dialog. Available devices are highlighted black as shown in the legend in the dialog.



4. The assigned devices will display in the personnel listing. No GPS was assigned in this example.

First Name	Last Name	Garment	BioHarness	GPS
Zephyr	Demo	BH3 Side	14-009	None

Note

The device fields in the screen are manually editable if the device identifiers are known.

Caution

The same device can be assigned to two different subjects, as long as they are not members of the same team, or in separate teams deployed at the same time. When another member of a team is selected, devices already assigned to existing members of the team will be greyed out for any assigned to existing members of the team.

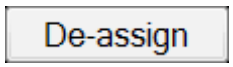
If two subjects allocated the same device are assigned to a team **after** they have been assigned devices, a warning message will display, indicating an equipment conflict.

De-assign Devices from Subject

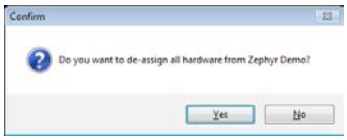
1. In the **Hardware** tab, select the subject.

First Name	Last Name	Garment	BioHarness	GPS
Zephyr	Demo	BH3 Side	14-009	GPS01

2. Click the **De-assign** button.



3. A **Confirm** dialog will display. Select **Yes** or **No** as required.



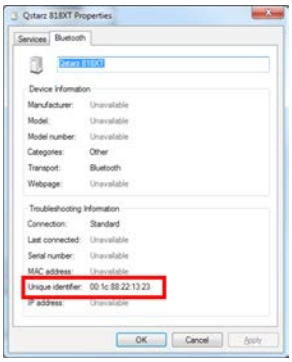
Manually Pair a GPS

A BioModule can be manually configured to communicate with a GPS. The GPS MAC address is required. This is stored in the BioModule after it is powered off, unless updated manually or used in a LoRa system with no GPS (or a different GPS) assigned.

Get GPS MAC Address

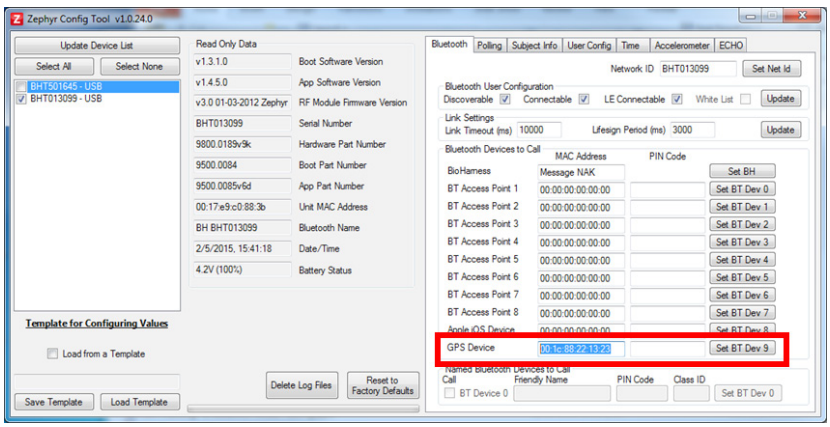
When the GPS is added using the **Add Hardware** Wizard in Live, the detection dialog shows this address.

You can also detect the GPS using a PC from **Start > Devices and Printers > Add Device**, and show device Properties after it has been added.



The Address in this example is 00:1c:88:22:13:23. MAC Addresses are not case sensitive. Adding a device in Microsoft™* Windows™* does **not** add the device into OmniSense™.

Then, using the Zephyr™ Config Tool, enter the MAC Address in the **GPS Device** field and Save.



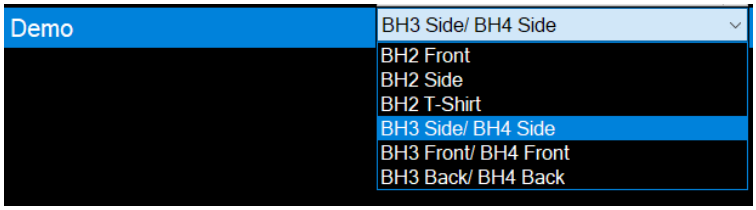
Set Garment Type

Garment type must be set in OmniSense™ Live so that the orientation of the BioModule on the subject is known and posture can be properly interpreted.

1. Select the **Setup** button on the OmniSense™ Live toolbar

2. Select the **Hardware** tab

3. For each subject the garment type must be selected when assigning a BioModule. These are available from a pull-down list.



4. The front/side/back option refers to BioModule location. Select according to the garment type.

Example Garment Type Settings

Side | Side | Front | Back | Back

Add /Edit/Remove Team

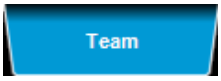
Subjects may exist autonomously in the OmniSense™ database. In OmniSense™ Analysis, subjects are listed on a node labeled '**No Team Assigned**'.

For OmniSense™ Live to receive transmitted data, they must be a member of a deployed team.

- A maximum of 4 teams may be deployed live.
- The maximum number of team members available per team is limited by the radio network and mode selected.
- The more members in a team, the smaller the subject BioGauges will become on-screen.

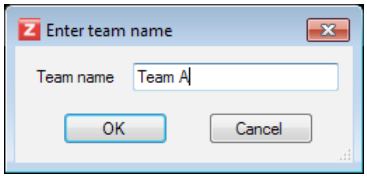
1. Select the **Setup** button on the OmniSense™ Live toolbar.

2. Select the **Team** tab.

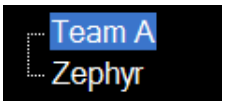


3. Select the **New** button.

4. Enter the team name in the dialog displayed.



5. A new entry ('**Team A**' below, highlighted in blue) will be created in the right hand panel.



6. To edit a team name, select the team in the right-hand panel, and click the **Edit** button.

7. To remove the team, select it and click the **Remove** button.

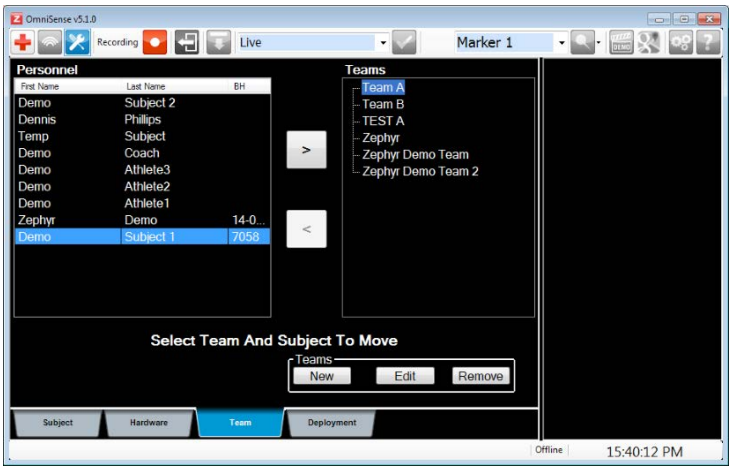
Note:

When a team is removed from the system, all members are returned to the personnel pool. No subject data is lost. In OmniSense™ Analysis, subjects are then listed under the node '**No Team Assigned**'

Populate Teams

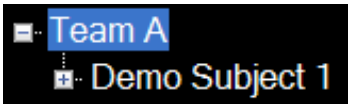
Add Subject

1. In the Team tab, select **both** the subject in the left panel, and the team in the right. They will highlight blue when selected.



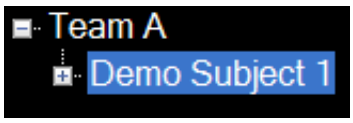
2. Click the arrow button pointing to the **Team** panel.

3. The subject will be added to the selected team node.



Remove Subject

1. Select the subject.



2. Use the reverse arrow to remove the subject.

3. The subject will return to the **Personnel** panel on the left.

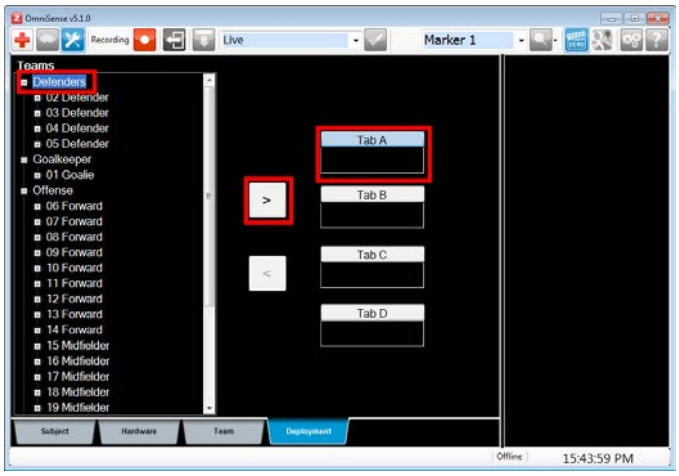
Deploy Team

The final stage in preparing for a Live session is to deploy a team or teams.

1. Select the **Setup** button on the OmniSense™ Live toolbar

2. Select the **Deployment** tab

3. Select the team(s) to be deployed from the Teams pane, and a vacant tab from the Tab A/B/C/D array. A maximum of four teams can be deployed.

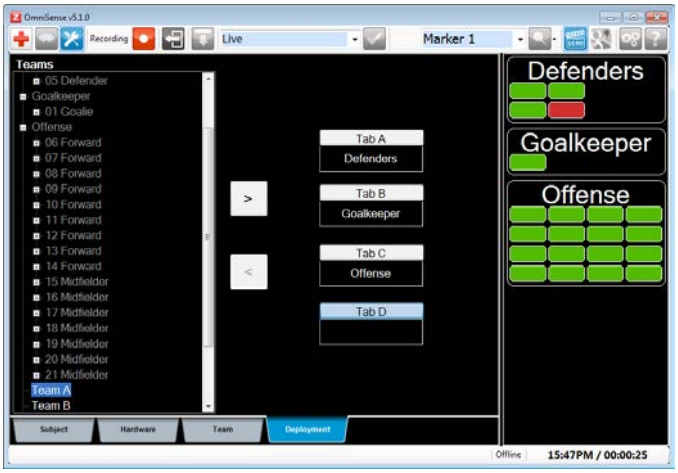


4. Click the arrow button pointing to the team array.

5. The **A/B/C/D** tabs will populate with the deployed teams. In addition, a series of Team and player tiles will display on the right-side panel.

6. Tiles displayed to the right of the setup tab will appear black until radio communication with the deployed BioModules has been established. To establish communication, click the Live button. Once connected, tiles will display subjects' red/orange/green status.

7. Once radio communication and subject status have been established, the subject tiles will be active.



8. The purpose of the right-hand tiles is to allow a user to maintain some oversight of subject status while using the **Setup** tab to make changes.

Un-deploy a Team

1. To un-deploy a team, select the team tab and use the arrow button pointing back to the **Teams** pane.

2. The team will re-display as available in the **Teams** pane.

Barcode Scanner Operations (1/3)

Print Pick Lists

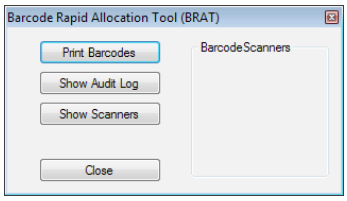
Using a supported Motorola™* Barcode scanner, devices can be rapidly assigned to subjects in the field by scanning barcode labels on the devices, or from printed pick lists which can be generated by OmniSense™. The host PC will need to be connected to a printer to generate these. All subjects and devices must already exist in the OmniSense™ database.

1. In OmniSense™ Live **Settings > Subject** tab, click on the BRAT (Barcode Rapid Assignment Tool) **Launch** button.

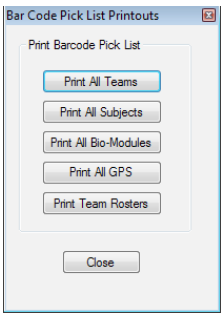
Note

The BRAT items will only be visible in the Setup Subject screen if the Motorola™* Drivers have been installed. Refer to **Getting Started > Software Installation**.

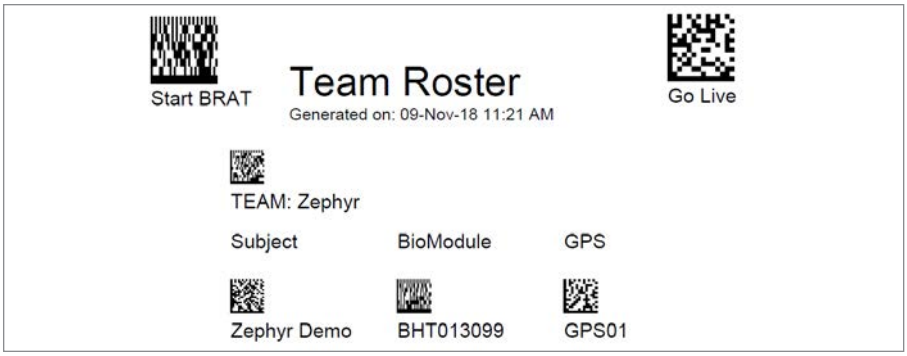
2. Select **Print Barcodes** from the displayed dialog.



3. Choose from the options. Each button press will generate a letter-size PDF file which can then be printed.



4. The **Print Team Rosters** button will generate a listing of all teams (separate page for each team), with subject and currently assigned devices adjacent.



Scanning Operations

1. Connect the barcode scanner to the host PC.

2. Start OmniSense™ Live and select the **Setup > Subject** screen.

3. Scan the Start BRAT code on any of the printed pick lists.

Start BRAT

4. The BRAT dialog will launch.

As codes are scanned for team, subject and devices, the fields will populate. To change an assignment, simply re-scan with another barcode.

Each time a new subject is scanned, the device fields will empty.

Note
Consult the scanner User Manual for correct operation and troubleshooting.

Barcode Scanner Operations (3/3)

5. Scan the team, subject and device code in succession..

6. Approved DoD ID cards are supported.

The fields in the BRAT dialog on screen will populate as components are scanned successfully. If a wrong code is scanned in error, just re-scan the correct code.

7. When all scanning is complete, scan the Go Live code on any pick list, or select the Live button in OmniSense™.

BioModule Operation (1/4)

Power On/Off

Power On

1. Press the center of the BioModule to power on; this will operate a microswitch inside the device.

2. LEDs will illuminate according to the BioModule configuration.
3. Snap the BioModule into its receptacle in the Zephyr™ strap or garment. The orientation of the contact studs in the receptacle will confirm correct orientation.

Note

Best practice is to power the BioModule on while it is being worn by the subject. This avoids invalid data being transmitted by or logged on the device.

Caution

Long-term use of the BioModule may cause the contact springs on the rear of the device to become slightly depressed. This can cause poor contact with the garment receptacle contacts, particularly when the subject is active. A regular visual inspection is recommended.

If a spring becomes depressed, **very carefully** lift it up. When this is done, check that the spring does not protrude excessively, and that the BioModule can be inserted into a charge cradle without damaging the contacts. Take care when doing this, to avoid damaging the spring contact.

Power Off

1. Press and hold the center of the BioModule until all four LEDs illuminate briefly. The device will power off.

BioModule LED Indications

BioModule on Garment

	Constant	Flashing	Unlit
Blue	Cannot connect to configured GPS	Transmitting	Transmit not enabled
Orange	More than 30% battery	Transmitting, less than 30% battery	Less than 10% battery
Red	Garment worn, no HR detected	HR detected	Not worn
Green	Error	Logging	Logging not enabled

BioModule Charging

	Constant	Flashing	Unlit
Blue	**Error**	**Connected (possible if OmniSense™ Live is running)**	**Disabled**
Orange	**Battery fully charged**	**Battery charging**	**No power connected**
Red	**Always off**	**Always off**	**Always off**
Green	**Error**	**Downloading a log**	**No records/ finished downloading**

Note

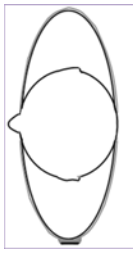
During upgrades, red and green LEDs will flash alternately while device application software is being updated; blue and orange LEDs will flash alternately while LoRa module firmware is being updated. Not all upgrades include a LoRa module firmware update.

Zephyr™ Strap Fitting

1. Fasten at front and adjust tension for a snug fit.

2. Rotate strap so device is under left arm.

3. For optimum breathing detection, device should be located at the apex of rib curvature.



4. Tension indicator loop at rear should be flush when subject inhales fully. It is shown un-tensioned here.

5. Adjust shoulder strap for minimal tension if used. Its function is to prevent strap slippage when worn under equipment which makes it awkward to access the strap.

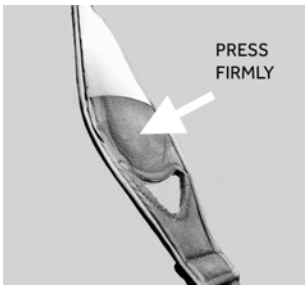
BioModule Removal

The Zephyr™ strap receptacle is designed for a very firm fit - this prevents the BioModule from becoming dislodged accidentally.

There is a specific technique to removing the BioModule from its receptacle easily, which involves pressure from the front **and** the rear of the receptacle simultaneously.

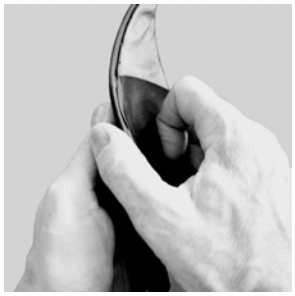
1. Grip holder by edge of flat surround next to the notch. Pull the BioModule gently by the notch - the greater pressure is applied to the **rear**.

2. Press the holder **firmly** from the rear to pop the BioModule out.



3. Use thumbs both to grip holder and pull on the BioModule.

4. Press rear of strap with the knuckle of index finger.



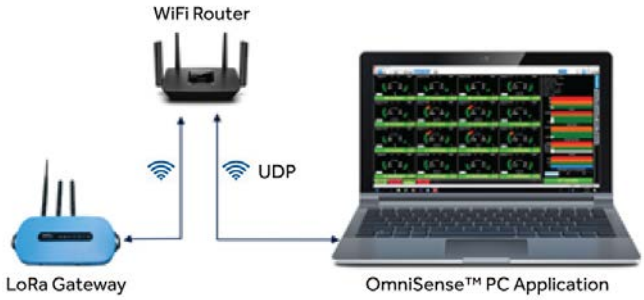
Startup Sequence (1/2)

System Startup

1. Power on all BioModules.

2. Power on all GPS units, if used.

3. Connect gateway to PC via WiFi router.

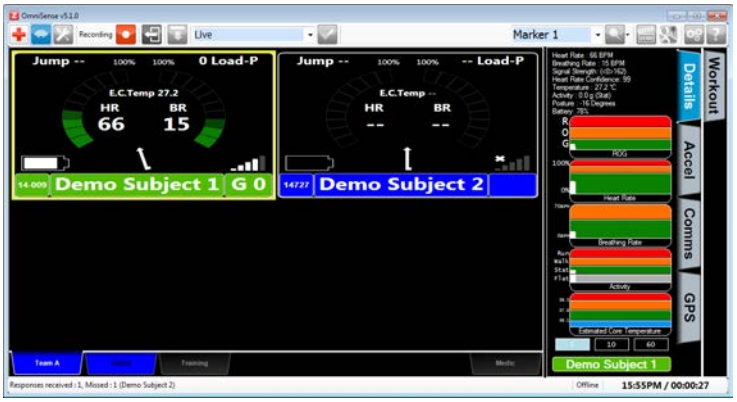


4. Start OmniSense™ Live.

- Subject details and GPS MAC addresses are sent to each BioModule when Live starts up.

OmniSense™ Live Startup Sequence

Immediately on startup, BioGauges will display for each subject, with subject status indicated by the background color of their subject name pane.



The subject status will change through a color sequence prior to any valid data becoming visible, as communications are established.

Subject Status Color	Description
Alpha Bravo	No data yet received - BioModules are being initialized
Alpha Bravo	Waiting on LoRa connection - Comms Error if persists
Alpha Bravo	Data received - **Not Worn** indication
Alpha Bravo	Valid data
Alpha Bravo	Valid data
Alpha Bravo	Valid data

Startup Times

Feature	Approximate Time To Validity
LoRa Connection	1 to 10 minutes, dependent on number of BioModules deployed
Heart Rate	30 seconds
Breathing Rate	30 seconds
Posture/Activity	5 seconds
Estimated Core Temperature	5 seconds
Heart Rate Variability (Configurable using the Zephyr™ Config Tool)	~5 minutes (300 heart beats) for SDNN ~15 seconds for RMSSD

Live Screen Overview (1/5)

Live Screen Components

#	Component	Notes
1	Toolbar	▪ Constant on all screens.
2	Subject BioGauge array	▪ BioGauge size reduces as number of BioGauges increases.
3	Team/Medic/Training /Safety tabs	▪ A separate tab for each deployed team (maximum of 4). Tab colors reflect highest level of subject status on tab; Red = highest. ▪ Training BioGauges on the Training tab. ▪ Red status subjects shown on Medic tab. ▪ Subject ROG shown on Safety tab.
4	Comms Message notification area	▪ Toggle on or off from the toolbar.
5	Details/Accel/ Comms/GPS/ Workout tabs	▪ Additional information relevant to the selected BioGauge.

OMNISENSE™ LIVE OPERATIONS

Live Screen Overview (2/5)

Side Tabs

Accel	Comms	Map	Workout
Raw accelerometer data	Graphic indication of comms errors	Streaming GPS location	Target training zone and elapsed time/time remaining

Safety Tab

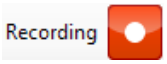
Training Tab

Medic Tab

Subject BioGauges are shown on Medic tab after their status is Red for a configurable period (default 30 seconds). They must be removed manually by toolbar button.

Live Screen Overview (3/5)

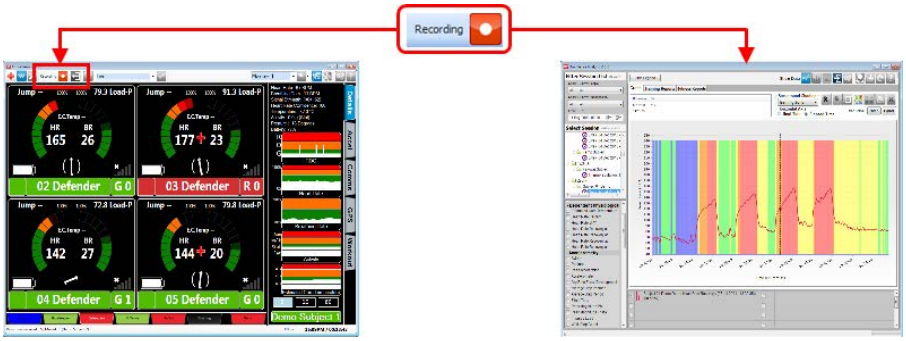
Live Toolbar

Item	Function
	Add subject to/Remove subject from Medic tab. Subject with Red status for longer than 30 seconds (default, configurable in Preferences) are moved to Medic tab automatically.
	Switch to Live mode - start communications.
	Switch to Setup mode - communications (if started) will continue in the background.
	Start/stop recording to OmniSense™ database. Default is recording. Text indicates status.
	Offline (left)/online (right) - connection status to Web portal and cloud database. Registered subject's live data will be uploaded to the portal automatically. Text indicates status.
	Display comms notification area beneath BioGauge array. Hidden by default.
	Session name and activate button. The name will be displayed in Analysis. Useful for filtering sessions in Analysis. Tick button must be used whenever name is changed. Default '**Live**'
	Marker name and place marker button. Markers will be displayed in OmniSense™ Analysis graphs. Set for Individual/Team/All subjects using pull down list next to button.
	Activate Demo mode. Virtual data will populate BioGauges. If any real subjects are deployed, they will display simultaneously.
	Show location data in a Google™* map window.
	Show Preferences (Settings) dialog.
	Show offline Help window.

Live Screen Overview (4/5)

Recording Logic

- Data must be recorded in Live for later display in OmniSense™ Analysis.
- Recording is the default state when Live mode is engaged

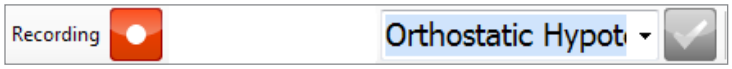


- Live and Analysis modules can be run simultaneously, but data must be refreshed manually in the Analysis module using the **Refresh** button.

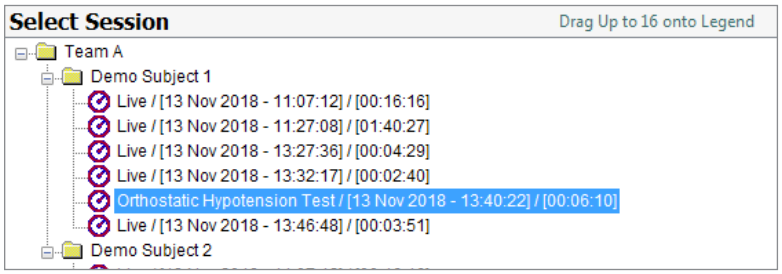
Session Names

In OmniSense™ Analysis, the session name will be the name assigned to the session in Live, using the session name button. Sessions default to 'Live',

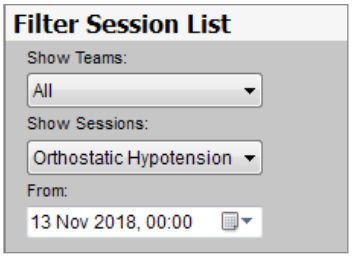
1. Set the session name in the Live toolbar.



2. The session name will appear in the **Select Session** pane in OmniSense™ Analysis.



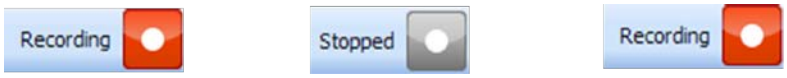
3. For fast access in OmniSense™ Analysis, the session name can be selected in the **Filter Session List**.

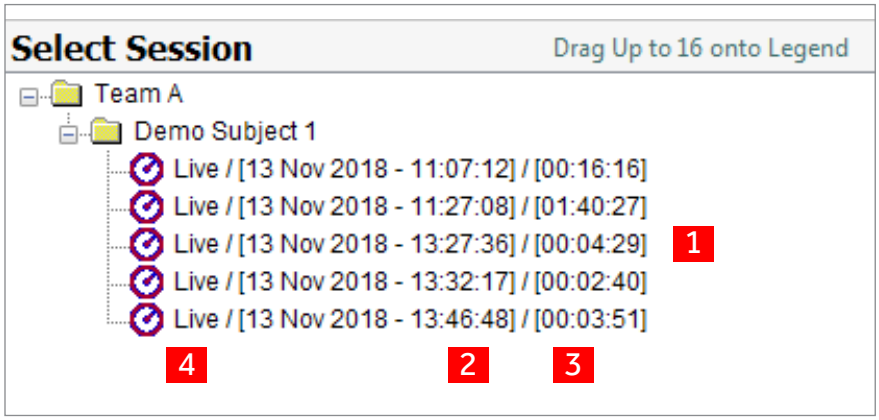


Live Screen Overview (5/5)

Multiple Recordings

- Each time the **Record** button is pressed in a continuous session in the Live Module, a new individual subject session is created in the database for each subject deployed.



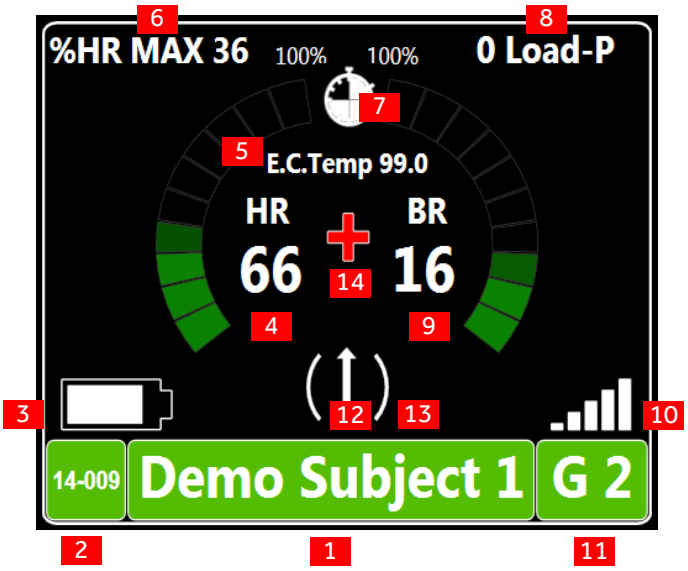


#	Description
1	Multiple sessions created by repeated Stop/Start recording in OmniSense™ Live
2	Session Start Time in hh:mm:ss format
3	Session Duration in hh:mm:ss format
4	Session Name

- Sessions can be renamed in OmniSense™ Analysis

BioGauge (1/4)

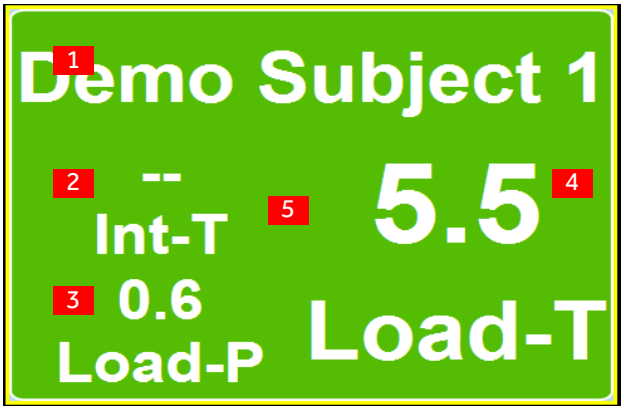
Standard BioGauge



The standard BioGauge displays a number of subject physiological parameters, and updates at 15-second intervals.

#	Description
1	Subject name. Background color shows subject ROG status.
2	BioModule identifier as stored in database.
3	BioModule battery level.
4	Configurable sweep scale & numeric value, defaults to heart rate.
5	Configurable field 1.
6	Configurable field 2.
7	No data stopwatch icon 4 x 1 minute quadrants.
8	Configurable field 3.
9	Configurable sweep scale & numeric value, defaults to breathing rate.
10	Radio Signal Strength indicator.
11	Time in current ROG Status in minutes. Resets when status changes.
12	Posture indication. ↑ = upright subject.
13	Activity Level. (↑) = walking equivalent, ((↑)) = running equivalent.
14	Red cross indicates BioGauge also displayed in Medic tab.

Training BioGauge



#	Description
1	Subject Name.
2	Configurable field 1.
3	Configurable field 2.
4	Configurable field 3.
5	Tile background color shows the subject's current **Training Zone.**

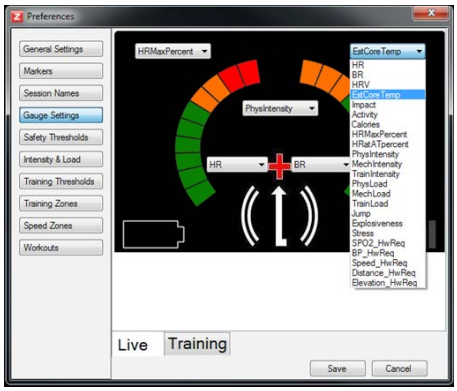
- The Training BioGauge is used in the context of a Workout. Once a Workout has been enabled using Live Preferences, and then selected from the **Session Name** list, it becomes active.
- In the **Workout** side tab, two **Training Zone** segments are displayed - the current and next segment.
- The subject should work out as prescribed by their coach, and attempt to match their training zone color with the target zone color in the **Workout** tab.
- Training Zone color is determined by the subject's heart rate. The zone thresholds are configured in Live **Preferences**.

Configure BioGauge

Configure Standard BioGauge

- To configure the BioGauge, display OmniSense™ Live **Preferences** using the toolbar button.

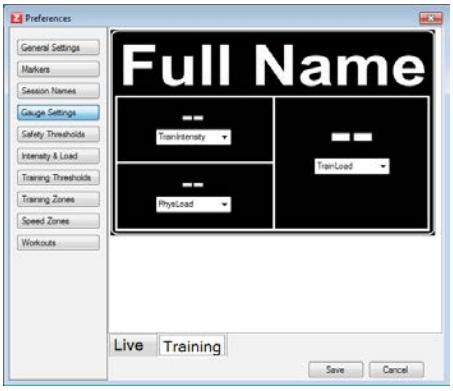
- In the **Preferences** dialog, select the **Gauge Settings** button.



- The dialog defaults to the standard BioGauge. Each configurable field has an associated pull-down menu. Select from the options (listed next page)
- **Save** when configuration is complete.

Configure Training BioGauge

- In the same dialog, select the **Training** tab. Three configurable fields are available.



- **Save** when configuration is complete.

Note

BioGauges can be reconfigured while a Live session is running. The fields displayed on the BioGauges do not affect what data is sent to the database.

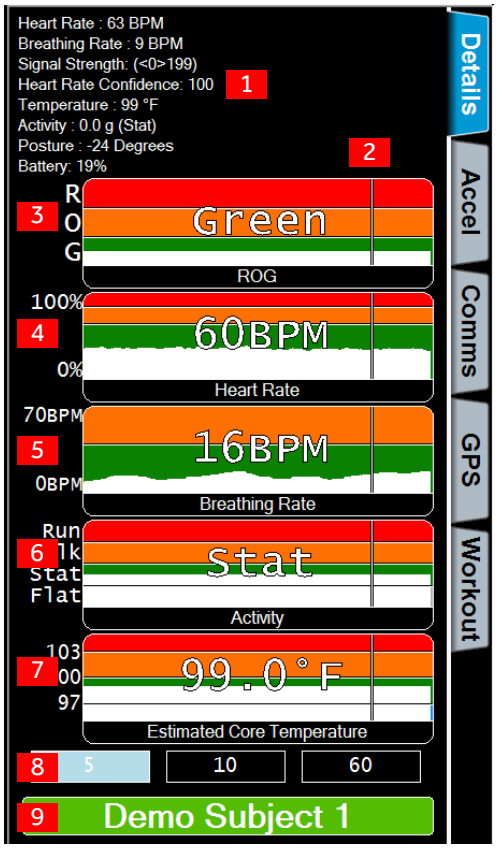
BioGauge Parameters

A variety of parameters are available for configurable fields in BioGauges.

List Item	Description
HR	Heart Rate
BR	Breathing Rate
HRV	Heart Rate Variability
EstCoreTemp	Estimated Core Temperature
Impact	Peak g of impact event
Activity	Peak activity VMU (g)
Calories Burned	Calories Burned (Heart Rate based)
HRMaxPercent	Percent of subject maximum heart rate
HRatATPercent	Percent of heart rate at Anaerobic Threshold
PhysIntensity	Physiological Intensity
MechIntensity	Mechanical Intensity
TrainIntensity	Training Intensity
PhysLoad	Cumulative physiological load
MechLoad	Cumulative mechanical load
TrainLoad	Cumulative training load (Avg. Phys + Mech)
Jump	Jump event peak g
Explosiveness	Dash event peak g
Stress	Stress Level 1 -10
Speed_HwReq	GPS Speed over ground
Distance_HwReq	GPS total distance traveled
Elevation_HwReq	GPS elevation above mean sea level
ImpulseLoad	Cumulative impulse load
WalkStepCount	Count of walking steps
RunStepCount	Count of running steps
BoundCount	Count of bounding steps
JumpCount	Count of jump events
MinorImpacts	Count of minor impacts
MajorImpacts	Count of major impacts
AvgForceDevRate	Average force development rate of step impulses
AvgStepImpulse	Average step impulse
AvgStepPeriod	Average time between steps
FlightTime	Time in air during a jump event
PeakMagniPhi	Peak magnitude phi angle of impact (from vertical)
PeakMagniTheta	Peak magnitude theta angle of impact (heading)

Side Tabs (1/14)

Details Tab



- Values are for the selected BioGauge

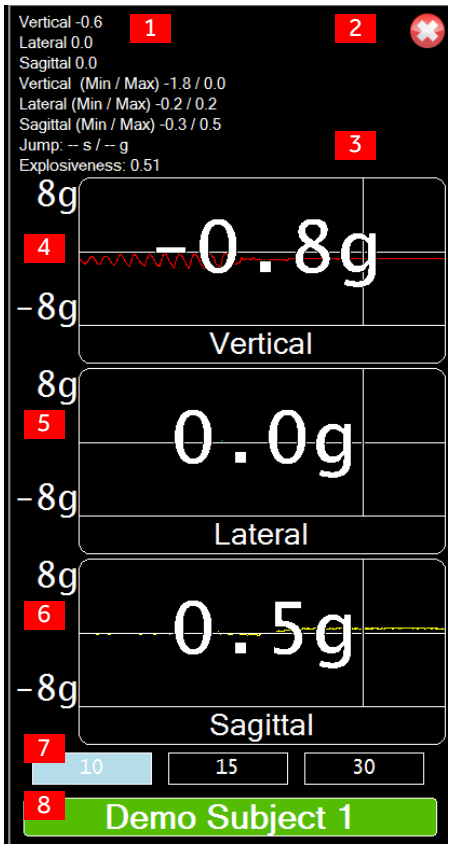
#	Description
1	Subject/BioModule Parameters.
2	Cursor values on graph. Mouse over the graphs for numeric value.
3	Subject ROG Status.
4	Heart rate 0- 100% HR_{max} of subject.
5	Respiration rate 0 - 70 breaths per minute fixed scale.
6	Activity Level. Cursor value = Flat/Stat/Walk/Run.
7	Estimated Core Temperature. Set °C/°F in **Preferences.**
8	Buttons set graph horizontal scale to 5/10/60 minutes.
9	Subject name and ROG status.

Note

The **Heart Rate Confidence** level in the **Subject Parameters section** is a useful indication of the validity of the HR data. If this value drops below 20% the heart rate is considered invalid and will show '--'.

Check strap tension, that the strap sensor pads and skin are adequately moist, and the BioModule spring contacts have not become depressed. Any of these factors may cause poor conductivity, resulting in a noisy ECG signal. This will cause the HR to be invalid.

Acceleration Tab



- Values are for the selected BioGauge

#	Description
1	Raw accelerometer values. Min/Max are values from previous 1 second epoch.
2	Buttons to enable and disable accelerometer data for the selected subject.
3	Cursor values - float cursor over graphs to display numerical values.
4	Vertical acceleration. This value will include gravity of -1g.
5	Lateral (side to side) acceleration.
6	Sagittal (front to rear) acceleration.
7	Buttons set graph horizontal scale to 5/10/60 minutes
8	Subject name and ROG Status.

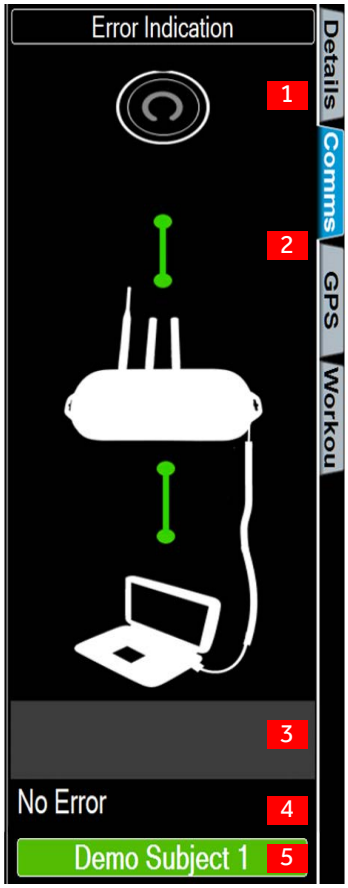
Note

The vertical acceleration data is not filtered to remove gravity. If gravity appears not to be exactly -1 g, it may be that the subject standing or seated posture does not result in the BioModule being oriented to absolute vertical.

If the subject is lying down, the effects of gravity will manifest in the sagittal axis.

Side Tabs (3/14)

Communications Tab

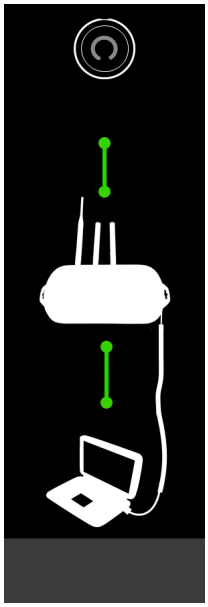


- Values are for the selected BioGauge

#	Description
1	BioModule/Gateway/PC icons. External sensor icon not shown, For **Bluetooth™* Direct** systems, only the BioModule and host PC are represented.
2	Link indicator. Green = working link, Red X = broken link
3	Error message icon area
4	Error message text
5	Subject name and ROG status

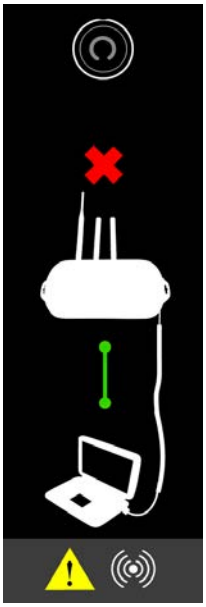
Communications Error Indications

No Error



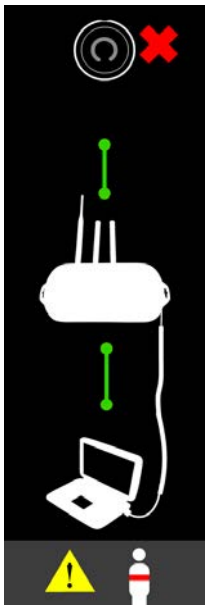
- System operating normally

No Response from Device



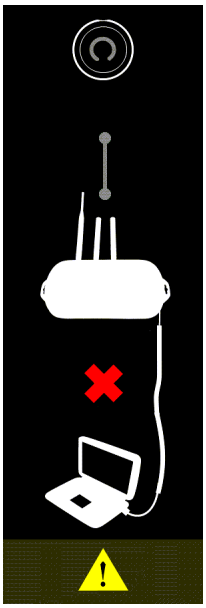
- BioModule powered off
- BioModule out of battery
- Out of range
- Signal blockage or interference
- Wrong device on subject
- Hardware fault
- Duplicated LoRa Network Address

Device Not Worn



- BioModule not in garment
- Sensor pads dry
- Depressed spring contacts on BioModule
- BioModule or garment fault

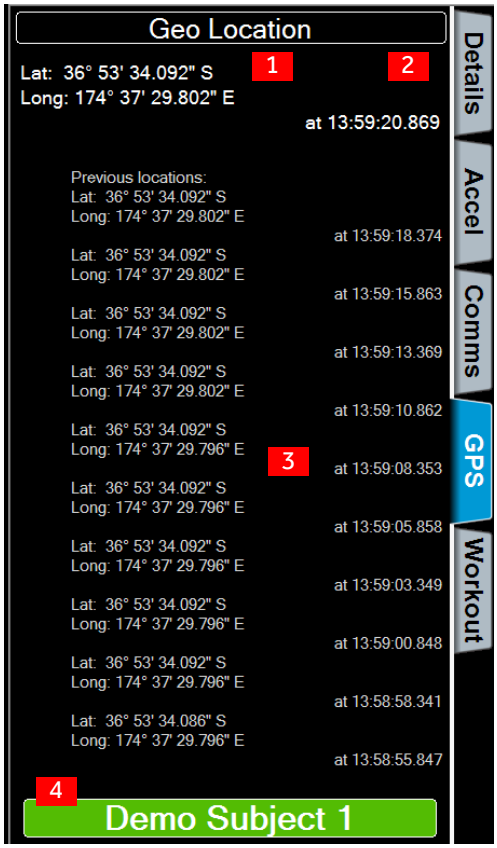
Gateway Error



- Gateway not connected
- USB connector fault (replace)

Side Tabs (5/14)

GPS Tab



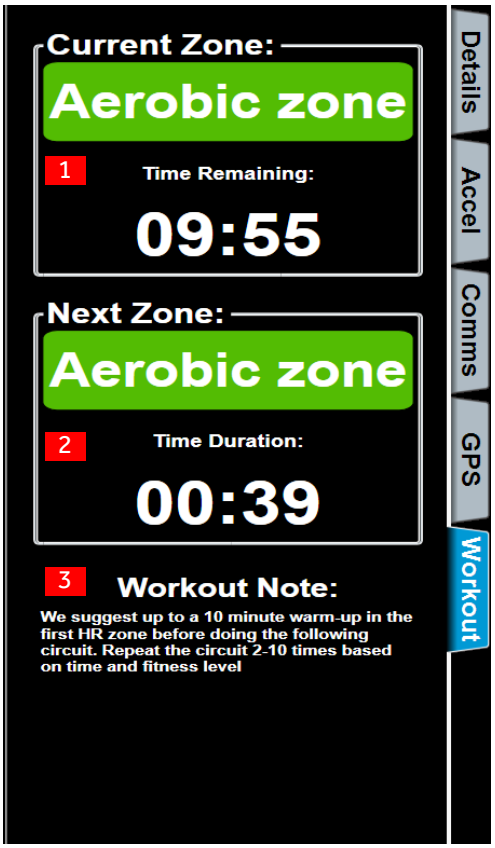
- Values are for the selected BioGauge

#	Description
1	Current location Latitude and Longitude
2	Timestamp of current location values
3	Historical location values
4	Subject name and ROG status

- Supported GPS and subject assignment is required
- BioModule must be configured to log in **Summary and Waveform** or **Enhanced Summary and Waveform** format

Side Tabs (6/14)

Workout Tab



#	Description
1	Current Training Zone and time remaining
2	Next Training Zone and duration of next session segment
3	Workout note

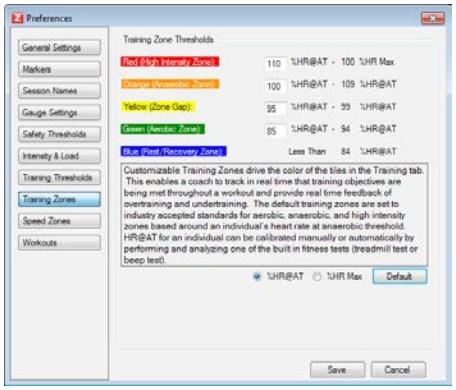
- See the next section for workout operation.

Managing Workouts

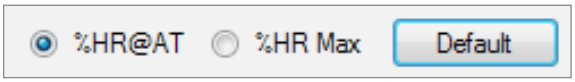
A **Workout** is a prescribed activity session in OmniSense™ Live with color HR indications based on **Training Zones**.

Training Zones are levels of exertion defined by heart rate thresholds. They are configured in Live **Preferences**.

1. Open the **Preferences** dialog using the Live toolbar button, and select the **Training Zones** button



2. Select the Heart Rate parameter used to determine the thresholds.



	Description
%HR@AT	Percentage of subject's HR at Anaerobic Threshold, as saved in database (default value, or saved from Fitness Test analysis).
%HR Max	Percentage of subject's maximum HR , as saved in database (default value, or saved from Fitness Test analysis).
Default	Return thresholds to their default settings

Default Training Zone Thresholds

%HR@AT

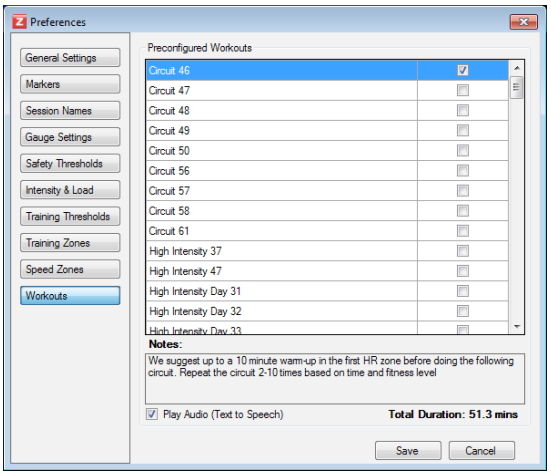
Zone	Lower Threshold %HR@AT	Upper Threshold %HR@AT
High Intensity	110	HR max
Anaerobic	100	109
Zone Gap	95	99
Aerobic	85	94
Rest/Recovery	Less than 84	84

%HR Max

Zone	Lower Threshold %HR Max	Upper Threshold %HR Max
High Intensity	90	100
Anaerobic	80	89
Zone Gap	75	79
Aerobic	60	74
Rest/Recovery	Less than 84	59

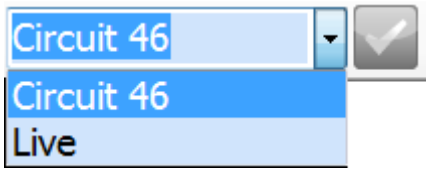
Lower Zone thresholds are editable; when a lower threshold is edited, the upper threshold of the zone below is adjusted automatically.

3. To enable Workouts, select the **Workouts** button in the Preferences dialog.



Check the boxes for those workouts to be enabled.

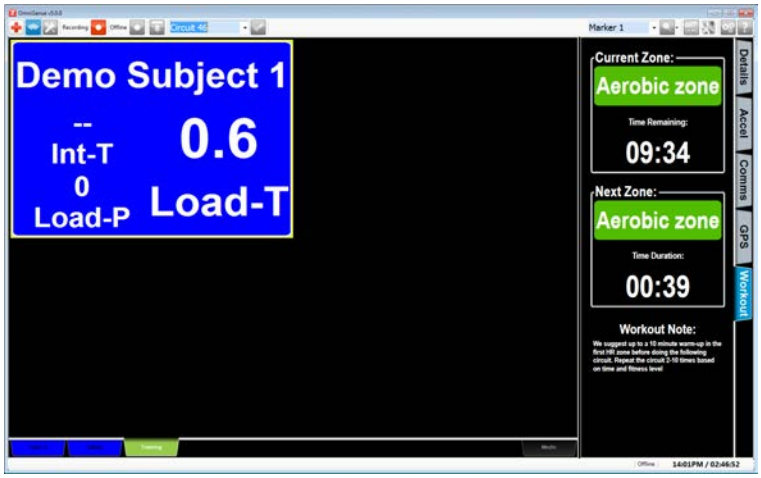
4. When a Workout has been enabled, it becomes available in the **Session Name** field in the Live toolbar.



5. To activate the Workout, select it in the **Session Name** field, and click the adjacent button.

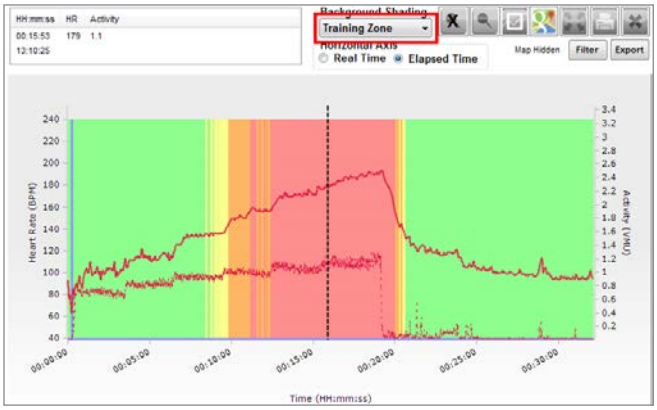
Side Tabs (9/14)

6. Select the **Training** tab at the bottom of the OmniSense™ Live screen. This displays subject Training BioGauges.



7. The aim of the workout is to engage in activity, which matches the background color of the subject Training BioGauge to the background color of the **Current Zone** in the Workout tab.

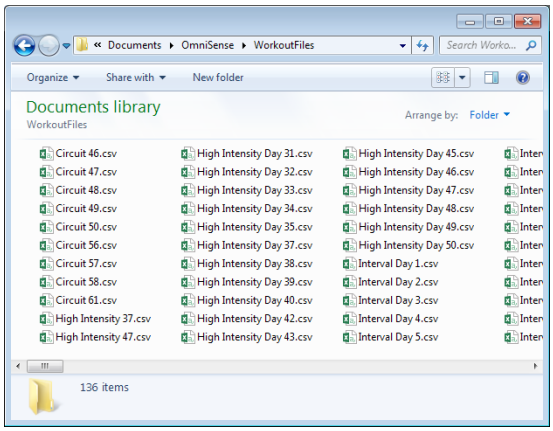
8. In OmniSense™ Analysis, Training Zones may be displayed as background shading to a displayed session.



Workout Files

OmniSense™ workouts are based on the **Paul Robbins Periodization System**.

Workout files are stored at C:\...\Documents\OmniSense\WorkoutFiles in the form of csv (comma separated values) files which will open automatically in Microsoft™* Excel™*.



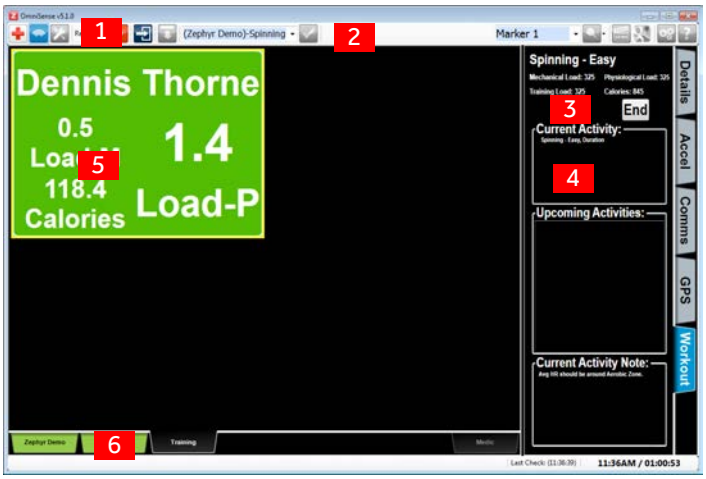
There are 136 separate workout files.

Send Team Workouts from Web Portal

A coach can send a Team Workout from the web portal, as a single workout, or as part of a training plan.

No color-matching of BioGauge against workout tile is involved - athletes can see the target loads for the workout displayed, and should attempt to match those loads.

If a Team Workout has been assigned, it will be available in the **Session Names** pull down list on the scheduled date.



#	Description
1	Connect the PC application to the web portal.
2	Select the assigned team activity from the **Session Name** field, and enable using the **Change Session Name** button.
3	Use the **Start** / **End** buttons to manage the activity. Target load parameters (configured in the web portal as **Threshold Settings**) are displayed.
4	The workout tab displays information on current and upcoming activities.
5	Configure the BioGauge or Training BioGauge to show one or more of the target load parameters shown in the **Workout** tab.
6	Select the **Team** tab to show standard BioGauge, or **Training** tab for the training BioGauge as preferred.

Note

The PC session must be connected to the cloud database for workouts assigned from the portal to become available.

Safety Tab

The safety tab displays tiles showing the subject name and time-in-current-ROG status only, plus the ROG status itself as a background color.

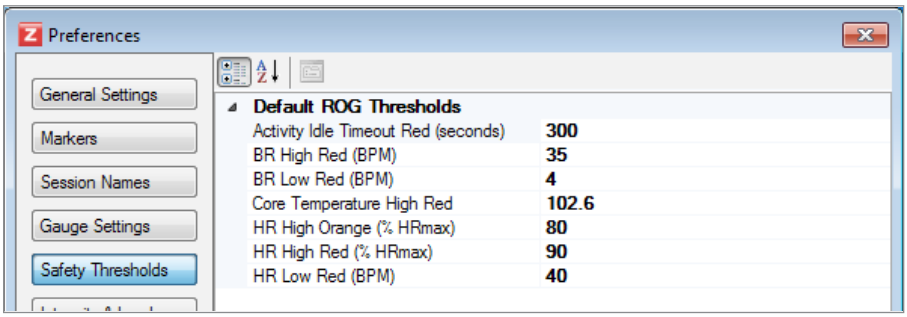
- The color of the tab itself reflects the highest ROG status of any of the subject's displayed parameters.

- If any subject status remains red for greater than the time limit (configurable in **Preferences**, default 30 seconds), a red cross appears on the tile, and the subject's BioGauge displays on the **Medic** tab. The cross persists after Red status has downgraded, until the subject is manually removed from the Medic tab using the toolbar button.

Safety Thresholds

Safety thresholds are set in the user's record in the **Setup > Subject** screen.

Default thresholds are set in **Preferences > Safety Thresholds**.



Medic Tab

In Live **Preferences > General Settings** are Medic tab settings.

Medic Tab Settings	
Show or hide medic tab	**Show**
Add to medic tab as default	**Yes**
Remove from team tab	**No**
Medic tab timeout after (seconds)	**30**

The default settings are

- The Medic tab is displayed.
- Subjects whose status remains Red beyond the time limit are also displayed on the Medic tab.
- The BioGauge remains in the Team tab.
- The time threshold for Red status is 30 seconds.

The Medic tab displays the standard subject BioGauge.

A red cross displays in the center of the subject BioGauge to indicate the BioGauge is also displayed on the Medic tab.

To remove a subject from the Medic tab when the subject status is no longer red, use the **Remove** button on the Live toolbar.

OMNISENSE™ LIVE OPERATIONS
Side Tabs (14/14)

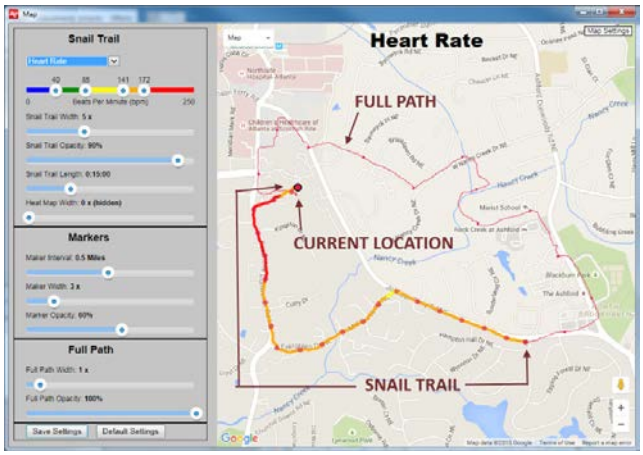
Training Tab

- The training tab displays Training BioGauges.
- There are three configurable fields on each BioGauge. Refer to the **Subject BioGauge** section for details.
- The background color for theTraining BioGauge shows Blue/Yellow/Green/Orange/Red and is **not** the Red/Orange/Green subject status indication.
- Training BioGauge background color reflects the **Training Zone** of the subject, which is a heart rate dependent metric, configured in Live **Preferences**. Training Zones are explained in the **Workout Tab** section.
- As the workout progresses, subjects attempt to match the color of their training BioGauge with the color of the current segment of the workout, indicated in the **Current Zone** section of the Workout tab.

Map Window

- An internet connection is required.
- Subjects must be assigned GPS devices.
- A separate map window is enabled by a toolbar button.

- The Map/Satellite view can be adjusted by dragging the cursor in any direction.
- Use the +/- buttons at lower right, or mouse wheel, to zoom in/out on the map or satellite view.



- In the window above, non-default settings are used to emphasize trail features.

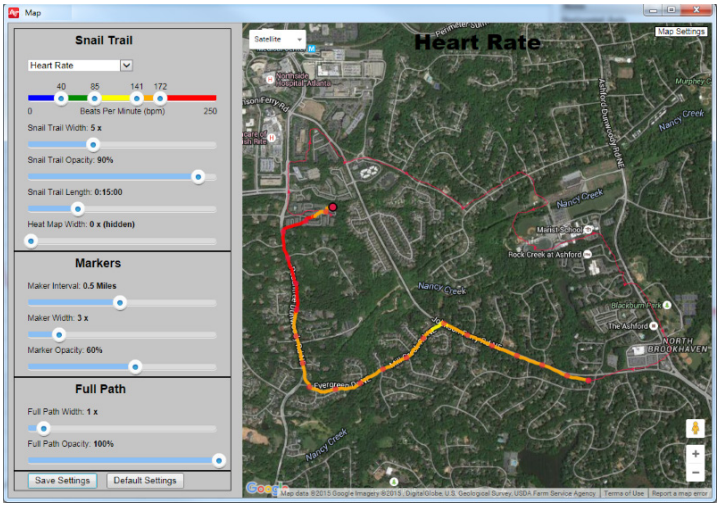
Snail Trail

Snail Trail Parameter	Description
Parameter Pull-down	Select from HR (shown), %HR Max, %HR@AT, Physiological or Mechanical Intensity, Speed or Altitude zone, ROG Status or path only.
Color Thresholds	Slide buttons to set coloring of snail trail.
Width	Slide button for snail trail width. Extreme left = trail hidden.
Opacity	Slide button for % opacity.
Length	Slide button for time duration [hh:mm:ss] of snail trail, **preceding** current location.
Location Heat Map Width	Slide button to set background color behind snail trail. The color will turn from green to red as a location becomes prevalent. In a circuit run, Heat Map is always green unless the runner stops and holds location.
Marker Interval	Slide button to add distance markers at fixed intervals
Marker Width	Slide button to set marker width. Extreme left = markers hidden

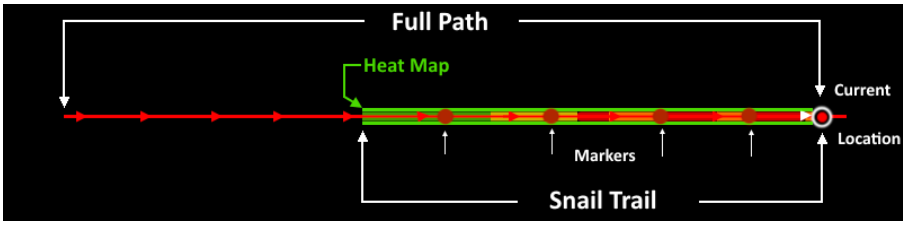
Map Window (2/2)

Snail Trail Parameter	Description
Marker Opacity	Slide button to set marker opacity
Full Path Width	Slide button to set width of path preceding snail trail. Extreme left = full path hidden.
Full Path Opacity	Slide button to set full path opacity
Save Settings	Save a preferred setting for repeated use.
Default Settings	Return to default settings.

Use the selector on the map to toggle between map and satellite view.



Heat Map



A heat map is an additional wider color trace surrounding a subject's snail trail.

A heat map is an indication of historical persistence at a location. If a subject remains stationary at the same location, then their heat map indication will progress from green to red.

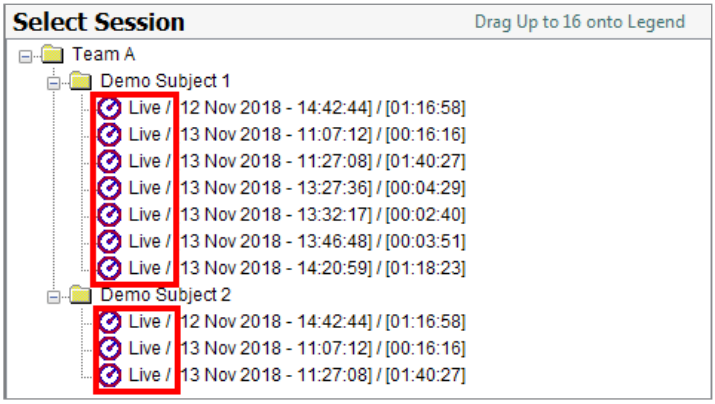
On a sports field, if a subject moves returns to the same location repeatedly, then that location's heat map indication will progress from green to red over time.

Session Names

Sessions can be named in OmniSense™ Live using the toolbar Session Name field pull-down, and adjacent **Change Session Name** button to activate the selection.

Their main purpose is to make it easier to identify and locate specific sessions in the **Select Session** pane of OmniSense™ Analysis. Sessions can be renamed in Analysis if needed.

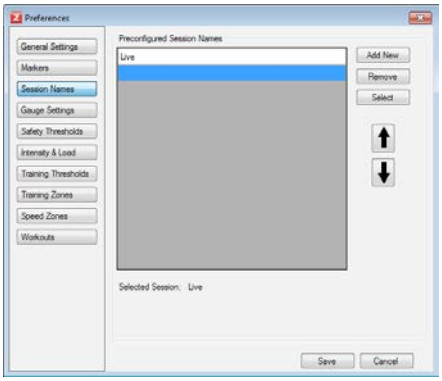
The default Session Name is 'Live', but if all sessions are set to this, then the session time stamp becomes the only means of identifying a specific session.



Create Session Name

1. Open the **Preferences** dialog in OmniSense™ Live using the toolbar button.

2. Select the **Session Names** button, then the **Add New** button.



3. Enter the session name in the new (blue) session name entry, and click **Save**.

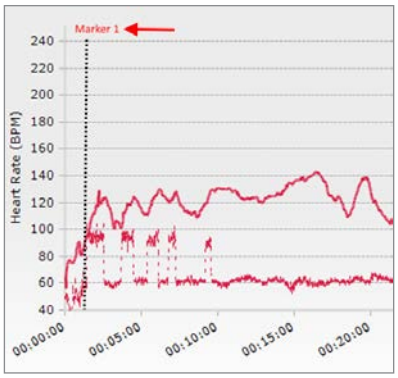
Caution

Prescribed **Workouts** are displayed in the same field as **Session Names**. If you create a new session with the same name as a pre-existing workout, then the workout of that name will be activated when you click on the **Change Session Name** button.

Session Markers

Named markers can be added to sessions using the toolbar **Marker** field and adjacent **Add Marker** button.

The purpose of markers is to indicate specific events (start and stop of notable activities or tests during a session, etc) in the data displayed in OmniSense™ Analysis.

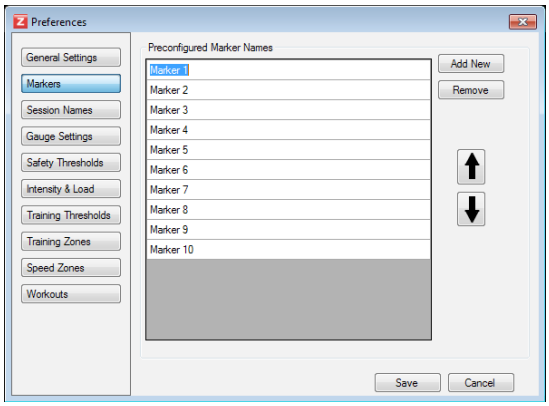


The markers are not exported when the data is exported from Analysis as a csv file, though they will appear in graphs exported as image files.

Create Marker

1. Open the **Preferences** dialog in OmniSense™ Live using the toolbar button.

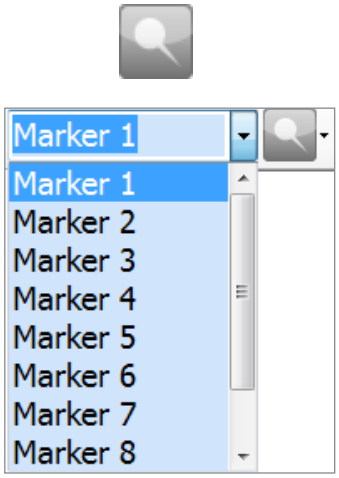
2. There are ten default markers. You can **Remove** these, retain them, edit by selecting them, or **Add New**.



Save the new or edited marker when done.

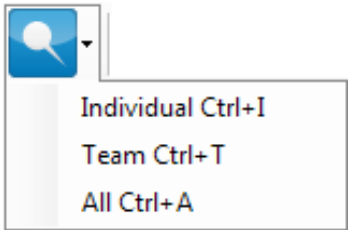
Session Names & Markers (3/3)

3. The order of the markers in the dialog is significant. Each time the **Add Marker** button is clicked to add a marker to a session, the list automatically increments to the next marker on the list.



4. In order to re-use the same marker on the list, you must re-select it from the pull down menu before adding it.

5. There are three options when adding a marker:



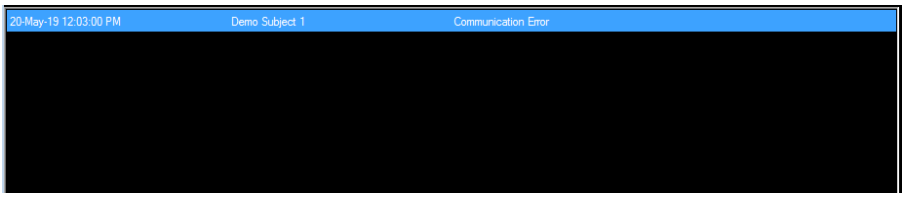
Select Individual (selected BioGauge), Team or All (' and ') all subjects in all teams - before clicking on the actual **Add Marker** button.

6. The elapsed time component of the clock at bottom right of the OmniSense™ Live window is reset to 00:00:00 each time a marker is placed.

Notification Area

The notification area is displayed using the **Show/Hide Bottom Panel** button on the Live toolbar.

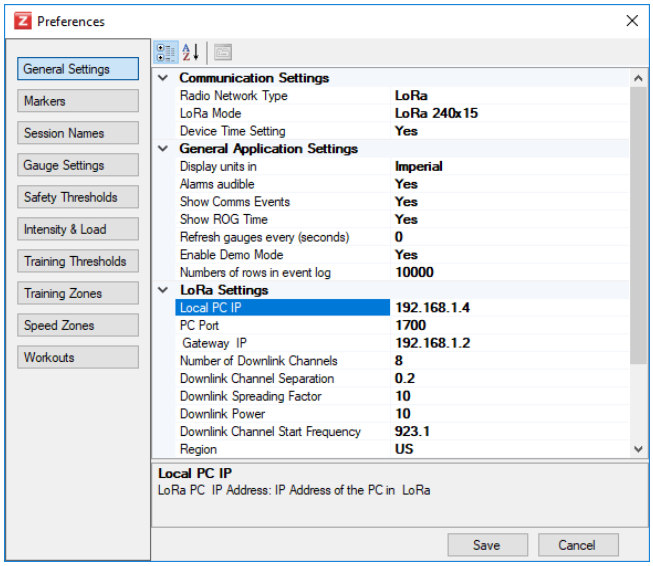
The Notification Area displays a variety of notifications which can confirm the system is operating correctly, or may help in analyzing system errors.



Preferences

The settings described in the following section do not include those listed in the table below.

The table shows the section of this manual where they are described.



Setting	Described in Section
General Settings	System Setup > OmniSense General Preferences
Markers	Live Operations >Markers
Session Names	Live Operations > Session Names
Gauge Settings	Live Operations > Subject BioGauge > Configure BioGauge
Safety Thresholds	Live Operations > Safety Tab
Training Zones	Live Operations > Workout Tab > Managing Workouts
Workouts	Live Operations > Workout Tab > Managing Workouts

Which preferences are available may vary according to the Radio Network type selected.

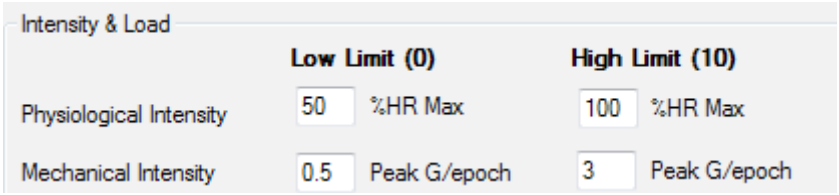
Intensity & Load

Intensity is an instantaneous measure of effort.

- Physiological Intensity is a measure of cardiovascular output, based on heart rate.
- Mechanical Intensity is a measure of musculoskeletal output, based on accelerometer data.
- Training Intensity is the arithmetic mean (average) of physiological and mechanical intensities

Equivalent Loads (Physiological, Mechanical, Training) are cumulative totals of intensity values, and reflect the total effort over an activity session.

Intensity is measured on a scale of 1 -10, with no units. These values indicate zones between absolute **Low** and **High** limits which are configurable in **Preferences > Intensity & Load**.



Physiological Intensity

Default Physiological Intensity Zone Thresholds

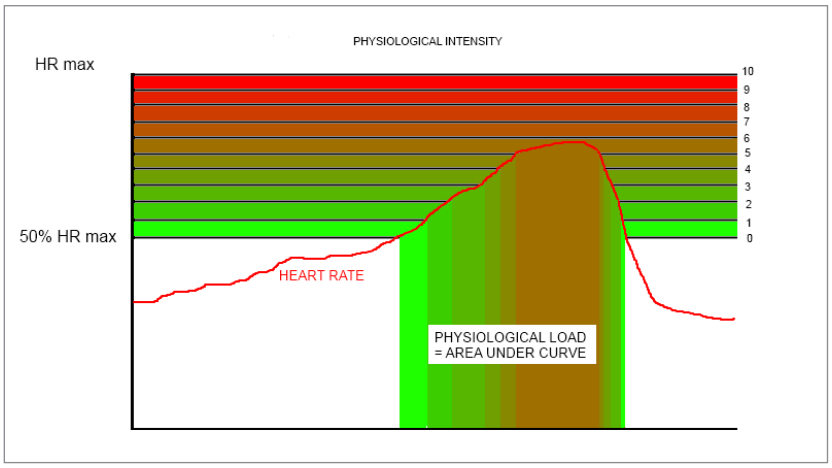
Intensity	Low (%HR max)	High (%HR max)
Null (no value)	Below 50	
1	50	54
2	55	59
3	60	64
4	65	69
5	70	74
6	75	79
7	80	84
8	85	89
9	90	94
10	95	100 or above

Intensity values inside a zone are calculated arithmetically. For example, a %HR max value of 52 equals an Intensity of 1.5.

If **Low** and **High** Limits are changed, then Intensity zone limits will adjust to allow 10 equal intensity zones between the new low and high limits.

Preferences (3/5)

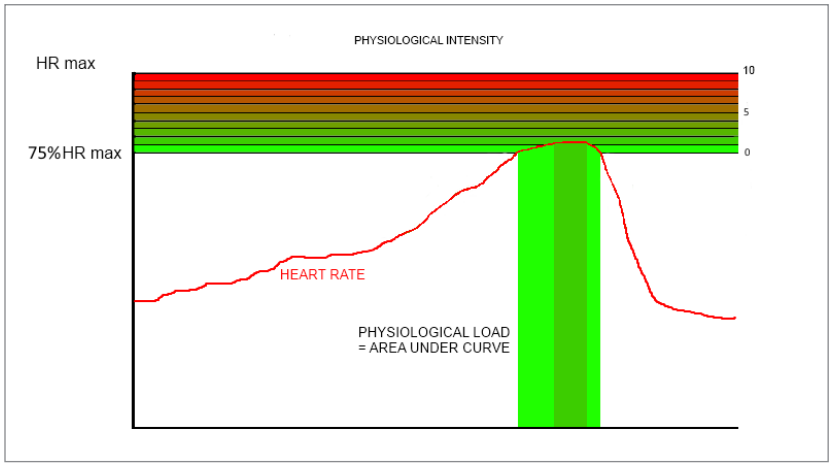
The graph below shows the default Low and High Physiological Intensity limits and how the ten intensity level zones are distributed between these limits.



Physiological Load is the per-second accumulation of the **Physiological Intensity** values, and can be represented by the colored area under the intensity/heart rate curve.

Note that for these limits, a heart rate of below 50% HR max - uncolored - has no (null) intensity value, and will not contribute towards a load value. The load value is the total colored area below the trace.

The second graph shows the effect of increasing the lower Physiological Intensity limit to 75% HR max. The ten zones are narrower.



The corresponding Physiological Load is also reduced, as the same heart rate trace results in lower assigned Physiological Intensity values.