PSM Training ECHO

OmniSense Live

PSM Training Modules

These training modules are one component of the PSM Training System Documentation:

OmniSense Live Training

1. Setup
2. Database Setup
3. Live Operations
4. Pebble Watch & Application
5. Base Line Fitness Testing

OmniSense Analysis Training

1. Analysis Overview
2. Analysis Graph Options
3. Analysis Log Data
4. Analysis Reports
5. Fitness Considerations
6. Analysis Impacts
7. Readiness
8. Software Utilities

See also the PSM Training User Guide for a general overview of the system, components and software.

Support: support@zephyrtech.zendesk.com

PSM Training Modules

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PSM Training Modules

Setup

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PSM Training Modules

System Diagram

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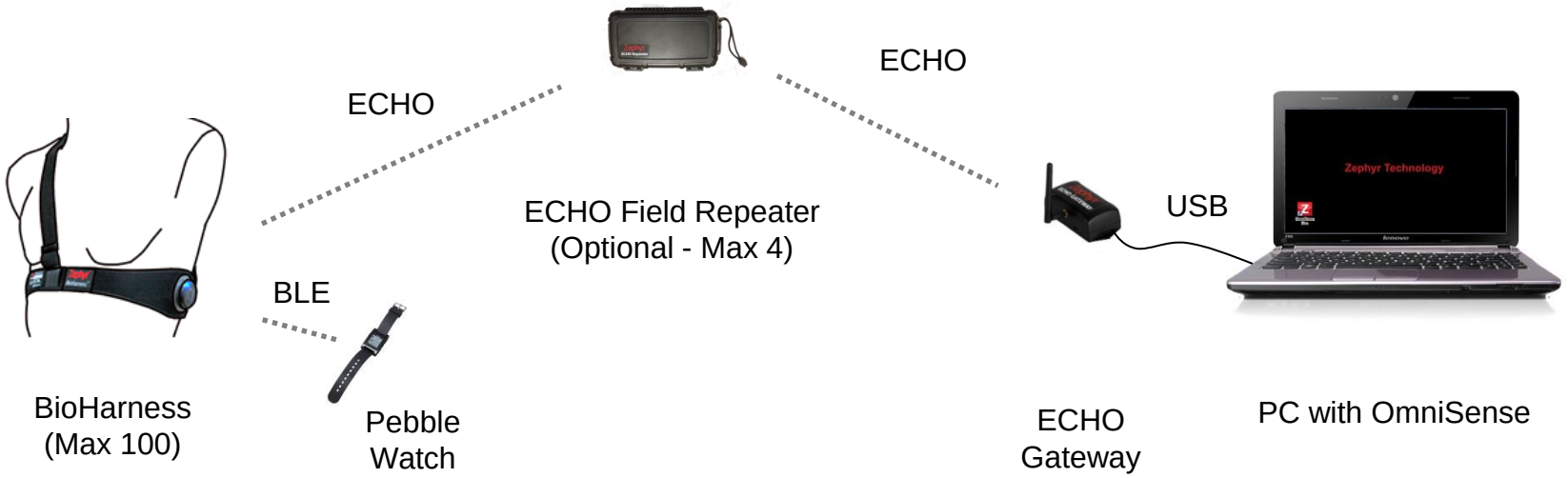

- Up to a maximum of 100 BioHarnesses, dependent upon system configuration.
- Optional 4 Field Repeaters, within 300 yards of the Gateway.
- Optional Pebble watch per subject. Operates independently of ECHO system, using Bluetooth Low Energy (BLE)

PSM Training Modules

Charge Devices

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Field Repeater
Connect to USB
wall charger

5-device cradle
Connect to USB
Wall Charger

System Case
Internal Battery
Connect to external
110/220 Volts

Single cradle
Connect to PC or
USB power source

PC

- ECHO Gateways are powered by USB from the host PC
- A system case with its internal battery can charge BioModules for two cycles. Charge time below is for the system case internal battery.

Device	Repeater	System Case	BioModules
Charge Times	1 hr to 90% 3 hrs to 100%	1 hr to 90% 3 hrs to 100%	1 hr to 90% 3 hrs to 100%

Network Selection

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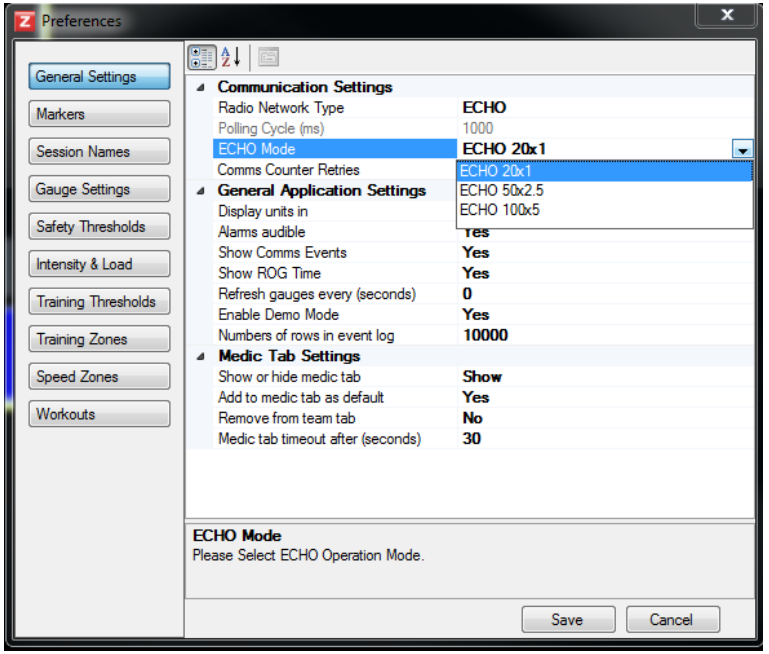

- Set ***Radio Network Type*** as ECHO
- Set desired ***ECHO mode***: 20 devices @ 1 sec update rate / 50 devices @ 2.5 sec / 100 devices @ 5 sec

ECHO Network Options

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ECHO Mode	No of BioModules supported simultaneously	Data Update Rate (seconds)
20x1	20	1
50x2.5	50	2.5
100x5	100	5

Data bandwidth on the ECHO connection determines how often data will be refreshed. Data is logged internally on the BioModule once per second (more often for waveforms) regardless of how many BioModules are deployed over ECHO

PSM Training Modules

Database Setup

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PSM Training Modules

Overview

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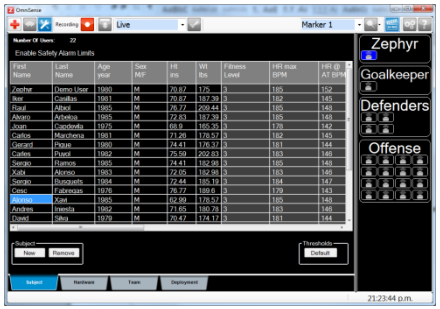
Database setup is performed in the setup screens, accessed by the setup button  in the OmniSense Live toolbar.



Subject

Hardware

Teams

Deployment

Tasks necessary for database setup:

- Add subjects, basic physiological thresholds and baseline fitness values, or leave defaults pending fitness testing
- Add BioModules (by USB connection) and optional GPS devices (by Bluetooth)
- 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 BRAT
- Deploy Teams to live operations in setup screens or BRAT

Add New Subject

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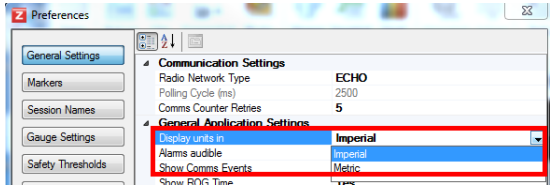
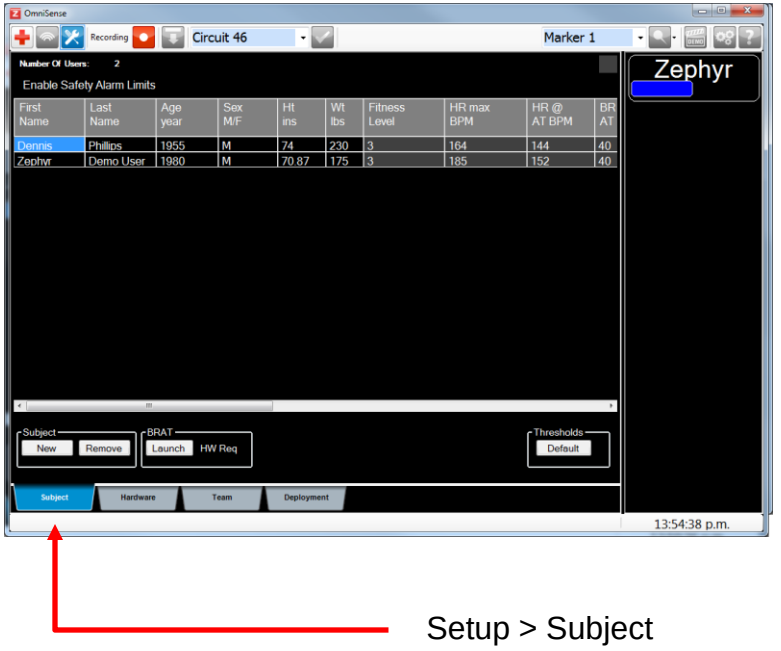
1. Set units as metric/imperial in the Preferences dialogue:



2. Use the New Subject button:

3. Edit the New Subject fields created

The subject parameters are described in the next section.



PSM Training Modules

Subject Parameters

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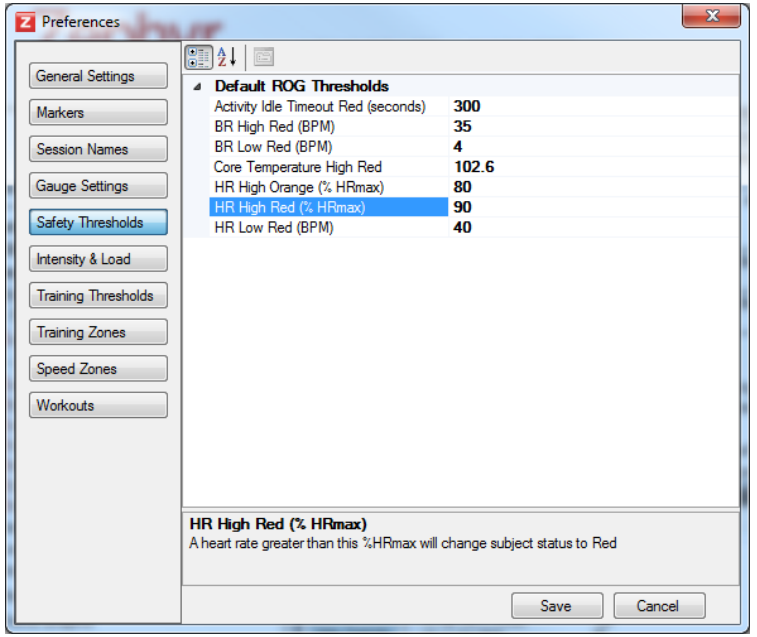
Name	Names in the database must be unique
Age	Used to auto-calculate default HR_{max}
Sex	Used to auto-calculate default HR_{max}
Height	Used for BMI calculations
Weight	Used for BMI calculations
HR_{max}	Default is auto-calculated
HR @ AT	Default is 80% of HR_{max}. Used to calculate Training Zone Limits
Fitness Level	Used in Est. Core Temp. Algorithm
Safety Alarm Thresholds	Used to calculate subject R / O / G status
Idle Timeout	To indicate an inactive subject; used in First Responder scenarios
HR Resting	Determined by Resting & Standing HR Test
HR Standing	Determined by Resting & Standing HR Test



Safety threshold defaults are set in Preferences  .

They will determine the subject's red / orange / green status displayed in OmniSense Live.

Safety Thresholds

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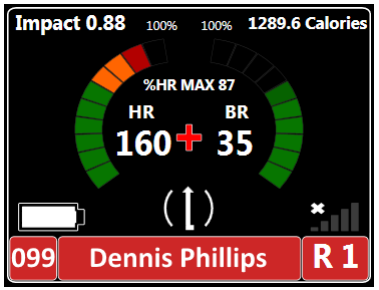
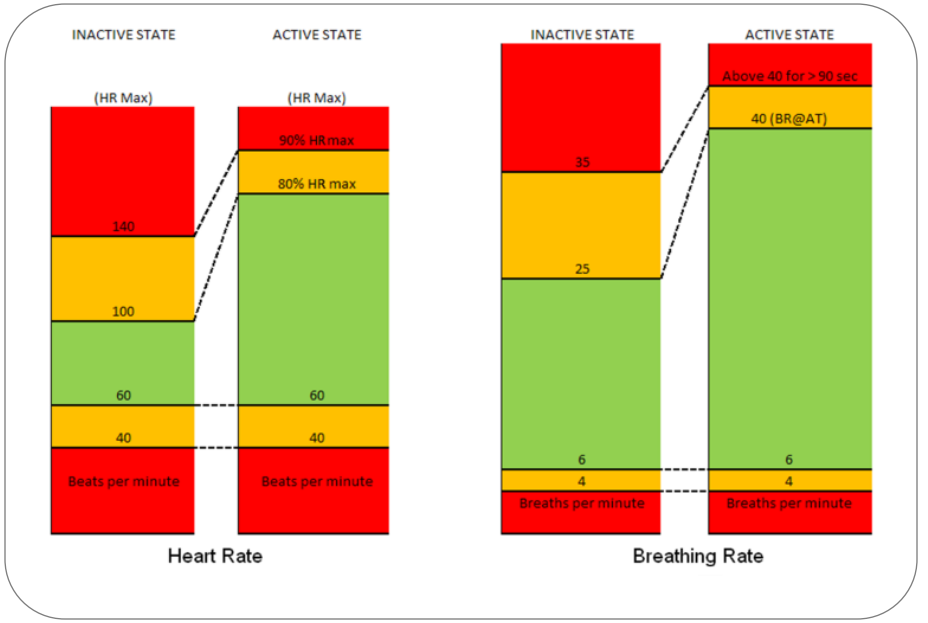
Upper and lower limits cab be set for Heart Rate and Breathing Rate. An upper rate can be set for Est. Core Temperature.

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



Zephyr's proprietary ROG algorithm will adjust the thresholds automatically if the subject is detected to be active, based on accelerometer data.



Add BioModules by USB

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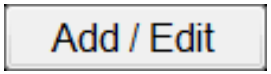
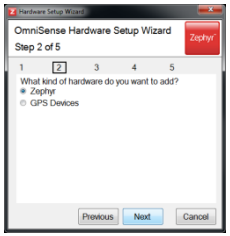
Go to the Live Toolbar Setup  button, Hardware tab 

, Add/Edit 

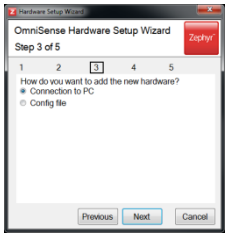
button to start Wizard

Connect BioModule to PC in cradle or case

Select *Add HW*



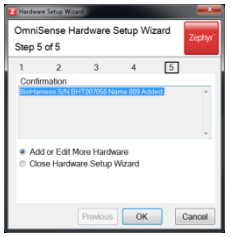
Select *Zephyr*



Select *Connection to PC*

Select *Detect*

Enter device name or #



Repeat or Exit

- The device name entered should be marked on the front of the BioModule for assignment to the subject in the field
- Production BioModules are pre-labelled with ECHO channel and Short Address e.g. 14 006. Use the Short Address 006

A new PSM Training System may be shipped with a database pre-configured with all hardware. If this is the case, the above procedure is not needed.

Add BioModules by Config file

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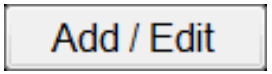
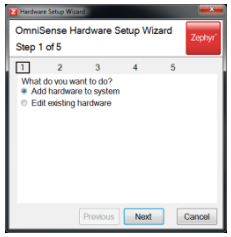
Go to the Live Toolbar Setup  button, Hardware tab 

, Add/Edit 

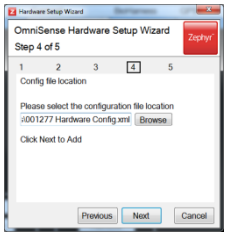
button to start Wizard



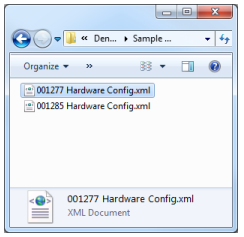
Select *Add HW*

Select *Zephyr*

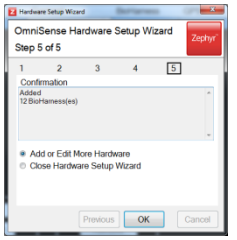
Select *Config File*



Browse to .xml config file location



Select Config file



Added BioModules confirmed

- If a large number of Biomodules are shipped, a .XML config file can be requested which will allow all BioModules to be added to the OmniSense database without connecting them individually to the PC – though this must still be done to load drivers for each device.
- The .XML config file has Device Serial #, Label, ECHO Short Address and equired ECHO parameters for each BioModule

Add GPS Devices

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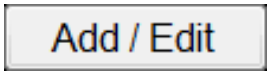
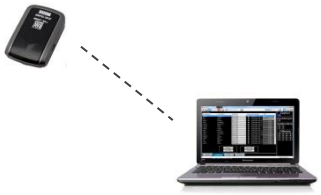
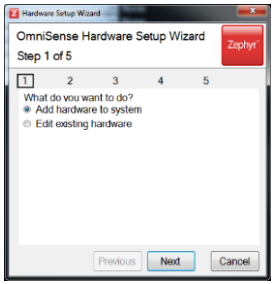
Go to the Live Toolbar Setup  button, Hardware tab 

, Add/Edit 

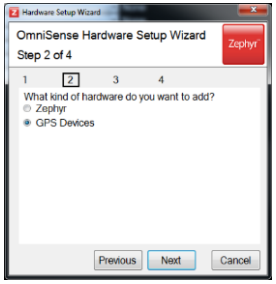
button to start Wizard



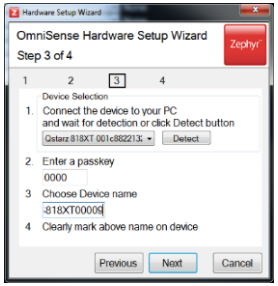
Power on GPS



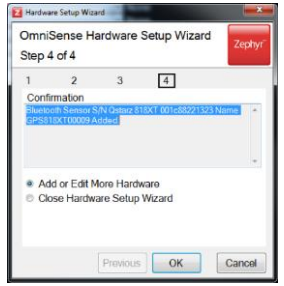
Select *Add HW*



Select *GPS Devices*



Wait for detection. Retry if necessary



Added GPS confirmed

- QSTARZ 818XT and QSTARZ BT Q1300ST are supported
- Add over-the-air by Bluetooth, NOT by USB connection
- GPS BT PIN of 0000 is entered automatically
- The GPS does not need to be Bluetooth-paired to the PC

- The host PC must have Bluetooth enabled (either native Bluetooth, or a Bluetooth USB dongle).
- If BT is active, the logo will show in the PCs taskbar/system tray:

Add Teams

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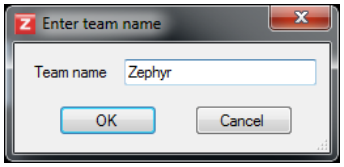
Go to the Live Toolbar Setup  button, Team tab 

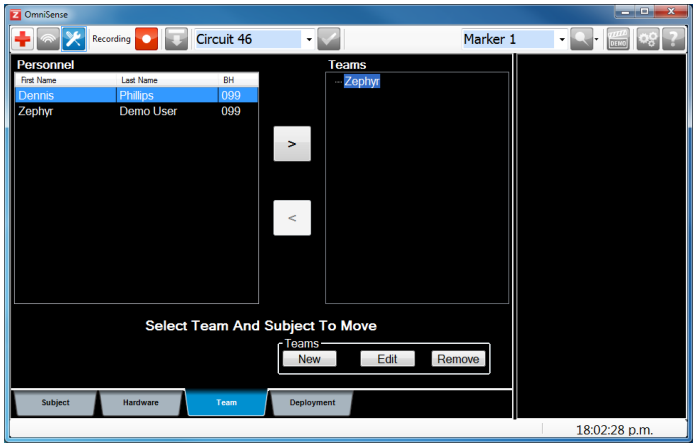
, New 

button



Enter Team name

To populate Teams, select Subject and Team and use arrow buttons



- There is no limit to the number of Teams the OmniSense database can store
- The maximum number of subjects supported can all be in the same team (but this will shrink the BioGauge size proportionately in OmniSense Live)
- Only four teams can be deployed simultaneously
- When a Team is removed, all members are automatically moved back to the personnel list

Garment Types

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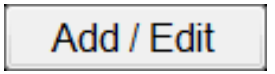
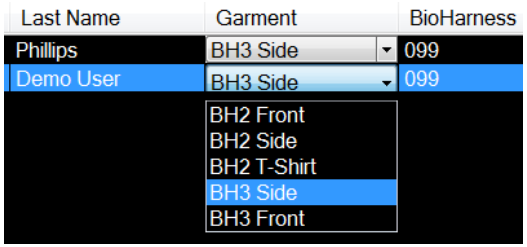
Go to the Live Toolbar Setup  button, Hardware tab 

, Add/Edit 

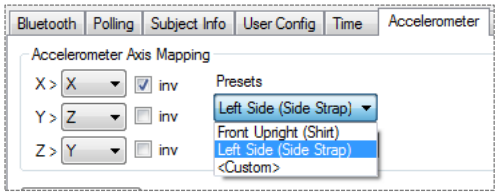
button to start Wizard

BH3 Side

BH3 Front



Use the pulldown to select the correct garment type



The BioModule should be configured for the garment

- BioModules are configured for a side orientation (strap or loose shirt) by default
- BioModules must be reconfigured manually for the front shirt location if used.

Assign Devices

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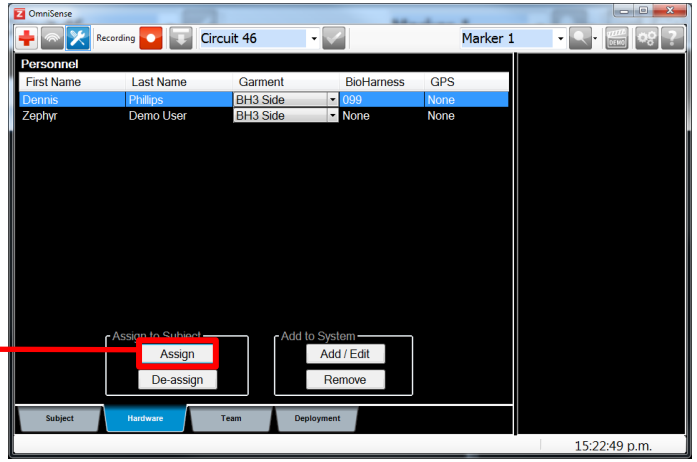
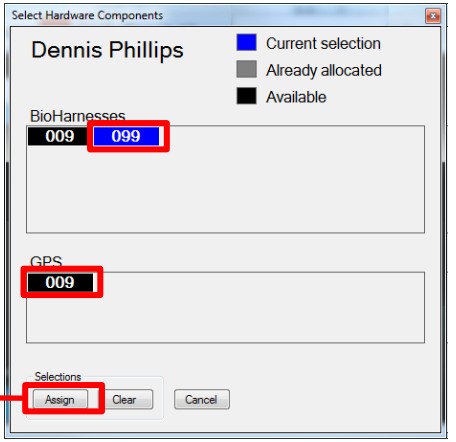
Go to the Live Toolbar Setup button, Hardware tab, Assign button

Select Subject, & *Assign* to display dialogue



Select BioModule and GPS from those available, and select *Assign*



- The same components can be deployed to two different subjects, but they cannot be deployed at the same time – a warning message will display

Ensure that subjects are issued with the devices they are assigned, otherwise their data will be saved to the wrong subject in the OmniSense database

Deploy Teams

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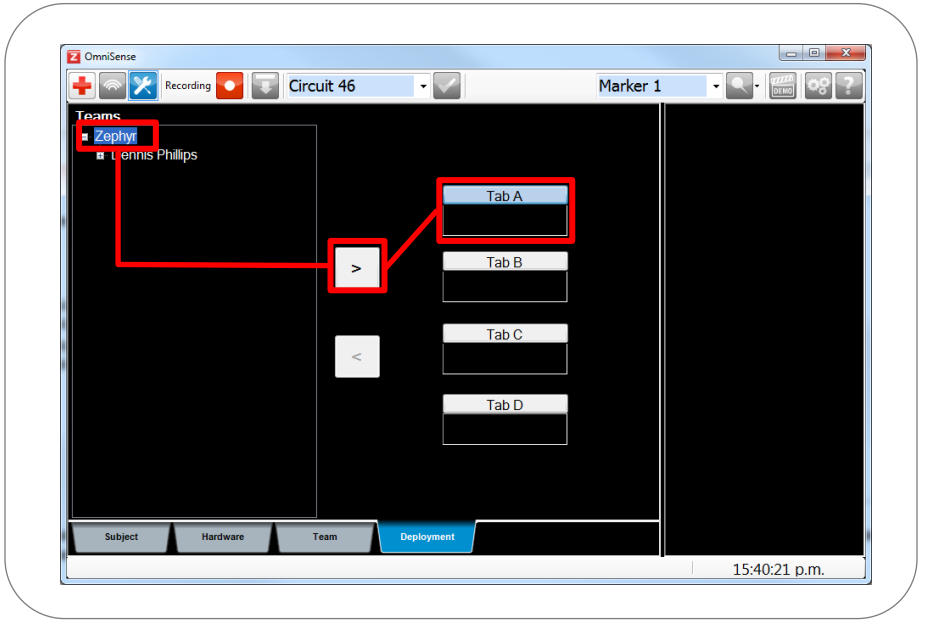
Go to the Live Toolbar Setup button, Deployment tab 

Select Team & Tab, use arrows to deploy and un-deploy Teams to Live.

As soon as the Live button is used, OmniSense live will start to communicate with deployed BioModules.



PSM Training Modules

Live Operations

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Checklist

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Prior to Live Operations, the following tasks should have been completed using OmniSense Live setup :

Subjects	added to database, with relevant personal and physiological details entered. Use defaults for physiological values e.g. maximum heart rate, if not yet established by Fitness Testing.
Components	added to the database
Teams	Added to database

- The following can be done from the Setup screens, or using the Barcode Rapid Allocation Tool 

Assign Components	Assign and issue BioModules and GPS devices to subjects
Teams	Assign subjects to Teams

All devices – BioModules, GPS devices, optional Field Repeaters should have batteries sufficiently charged.

Component Overview

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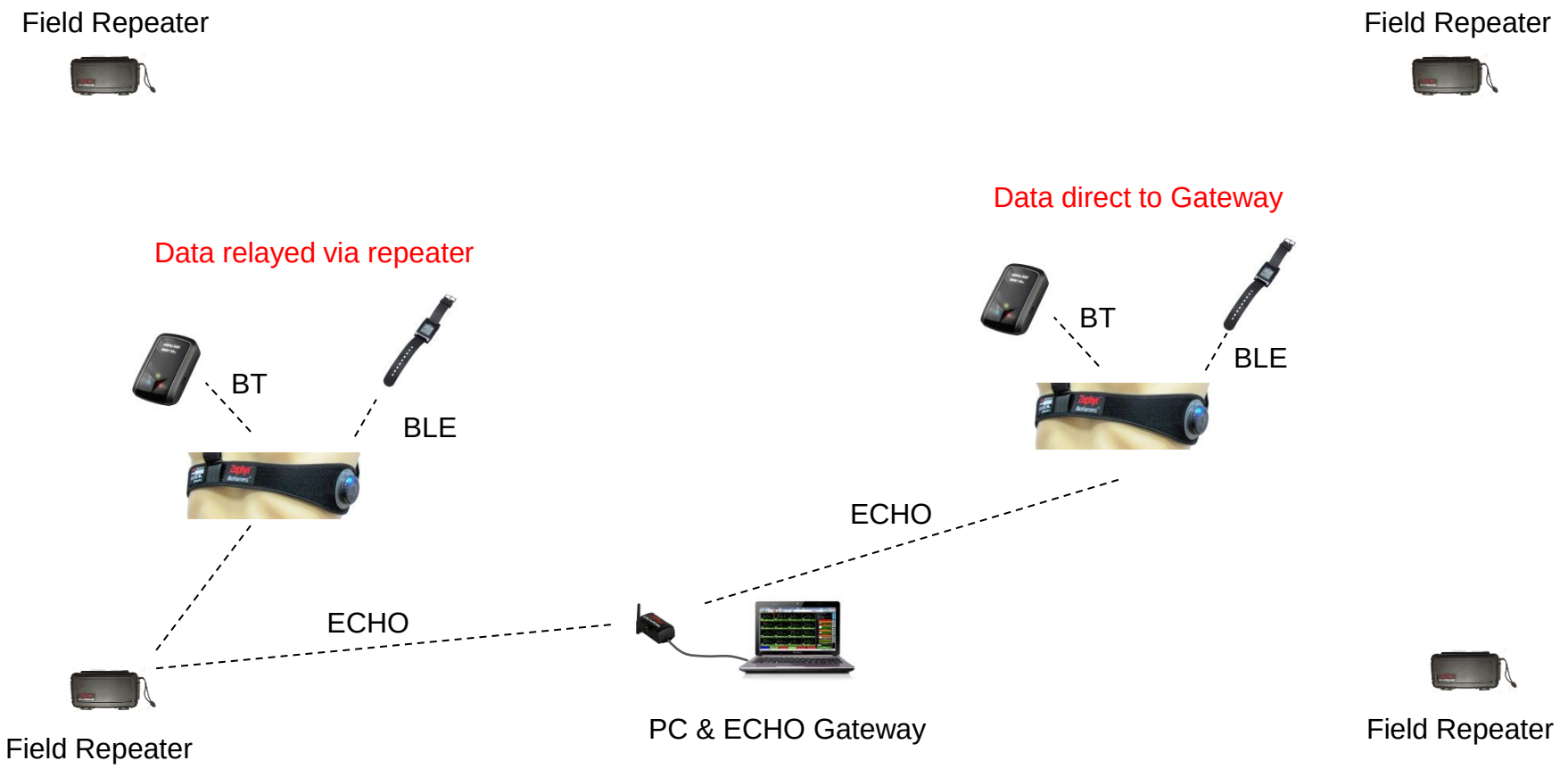

- All field erpeaters should be located within 300 yards of the ECHO Gateway

Barcode Operations – Print Pick Lists

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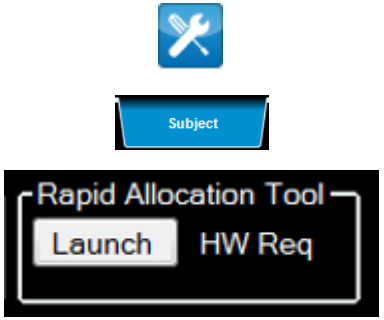
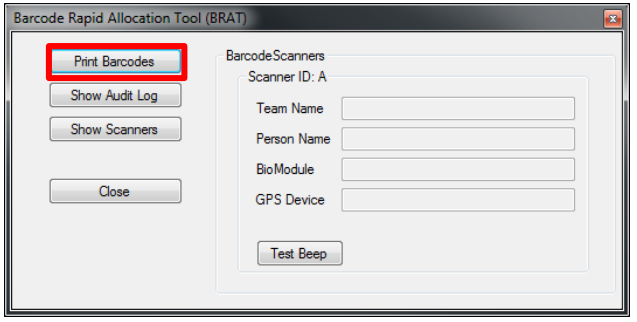
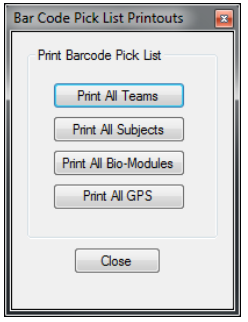
- A Barcode Scanner License Key is required for OmniSense
- Subjects & components must pre-exist in the OmniSense database



Setup
Subject Tab
Launch BRAT



Print Barcodes



Print as
needed

Printed Pick List
(A4/Letter)

- Subjects and components can be associated by scanning the devices themselves, or using a pre-printed Pick List

Barcode Operations – Assign Components

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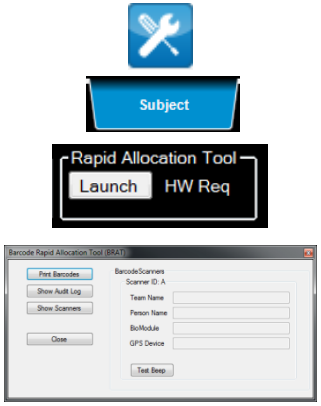
- A Barcode Scanner License Key is required for OmniSense
- Subjects & components must pre-exist in the OmniSense database



Setup
Subject Tab
Launch BRAT

Team

Subject

BioModule

GPS

Scan Pick lists or barcode labels in any order to populate the Barcode dialogue

Scan Pick List or use Live button

- To change a wrong entry, or assign a different component, just re-scan as necessary
- Approved DoD ID cards are supported

Confirm components are physically issued to those subjects they are assigned to, otherwise data received through the ECHO Gateway will be associated with the wrong subject in the OmniSense database.

Fit Strap

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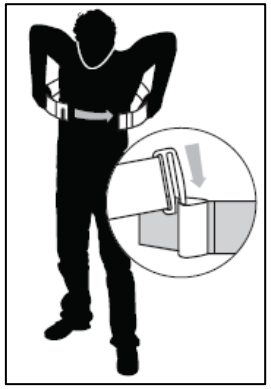
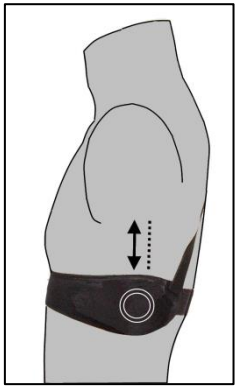
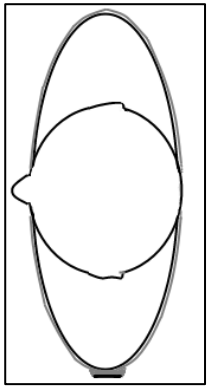


Fasten at front and adjust tension for a snug fit



Rotate strap so device is under left arm



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

Tension indicator loop at rear should be flush when subject inhales fully. Shown un-tensioned here.

Adjust shoulder strap for minimal tension if used.

BioModule LED Behaviour

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	Constant	Flashing	Unlit
Blue	Error	Transmitting	Transmit not configured
Orange	>30% Battery	Transmitting, < 30% battery	> 10% battery
Red	Strap worn, no heart rate detected	Heart Rate Detected	Not worn
Green	Error	Logging	Logging not configured

- LED brightness dims after 30 seconds to reduce current consumption

BioModule LED Behaviour in charge cradle

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In a System Case the two rightmost columns of bays are used for log downloads.

All columns will charge BioModules.

	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

- If a firmware upgrade has been started, red and green LEDs will flash alternately while the upgrade takes place. This pattern shows the device is in bootloader mode.

PSM Training Modules

Startup Sequence - System

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Power on all BioModules

Power on all GPS if used

Locate & power on all Field Repeaters

Attach Gateway to PC

Start OmniSense Live

- Suggested repeater locations are described on each unit. Five feet above ground level is optimal.
- Subject details and GPS addresses are sent to each BioModule when Live starts up

Startup Sequence - OmniSense

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BioGauge subject status indications

	Alpha Bravo	Alpha Bravo	Alpha Bravo	Alpha Bravo Alpha Bravo Alpha Bravo
Start OmniSense Live	No data received – BioModules are being initialized	Waiting ECHO connection / Comms Error	Not worn indication	Valid Data

ECHO Connection Establishment Time	10 – 90 seconds, depending on number of BioModules deployed
Data Stabilization Times (from BioModule Power-on)	
Heart Rate	30 seconds
Breathing Rate	30 seconds
Posture/Activity	5 seconds
Est. Core Temperature	30 seconds

Comms Errors

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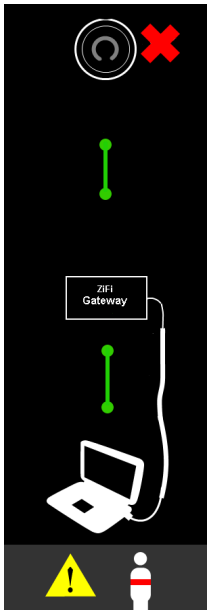
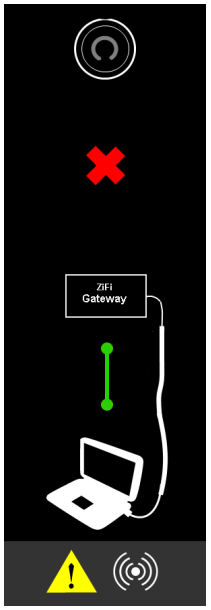
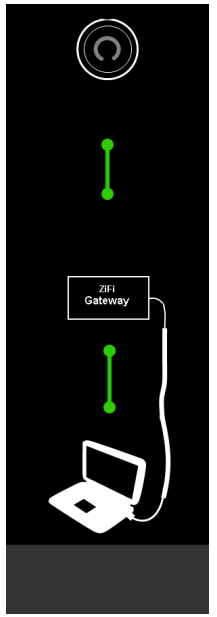
Gateway Error
- Check/exchange USB connector



Device not worn
- Device not on strap
- Sensor pads dry
- Device or strap fault



No response from device
- Device powered off
- Battery flat
- Out of range
- Signal blockage or interference
- Wrong device on subject
- Hardware fault
- Duplicated ECHO short address



No error

PSM Training Modules

Live Screen Components

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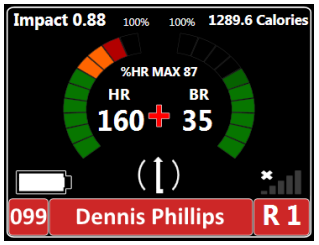
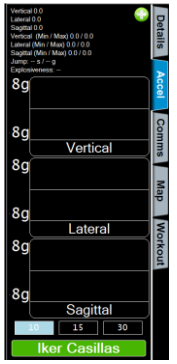
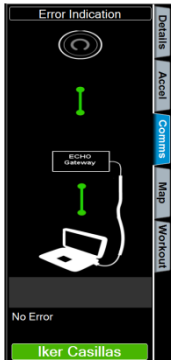
Toolbar



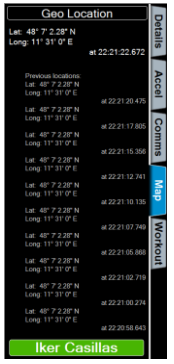
Subject BioGauge



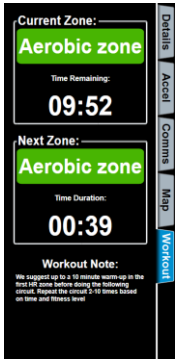
Accel



Comms



Map



Workout

Safety

Training

Medic

PSM Training Modules

Live BioGuage

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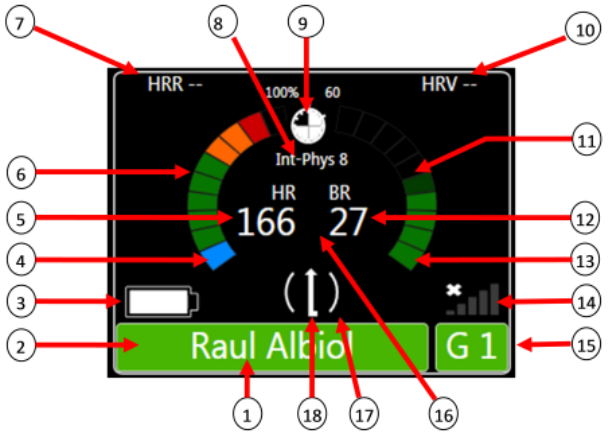

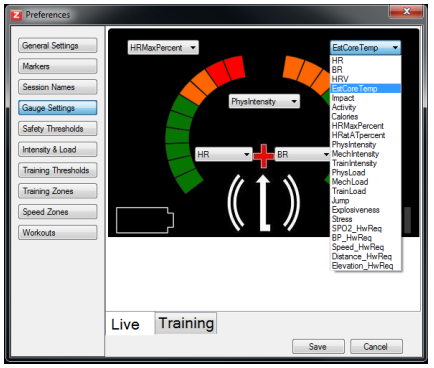

In Preferences  five BioGauge fields can be configured

1. Subject Name
2. ROG status
3. BioHarness battery level
4. Configurable Heart Rate scale 0 -100% subject max
5. HR value
6. HR standing & resting marks (not displayed)
7. Configurable field (Preferences)
8. Configurable Field (Preferences)
9. No data display – 4x1min quadrants
10. Configurable Field (Preferences)
11. BR Orange at AT threshold
12. Breathing Rate value
13. Configurable BR scale 0 – 40 bpm
14. Device signal strength indication
15. Time-in-current ROG status in minutes
16. Red cross indicates BioGauge also displayed in Medic tab (not visible)
17. Activity level (↑) – walking equivalent, ((↑)) – running equivalent
18. Posture indication ↑=upright

PSM Training Modules

Training BioGuage

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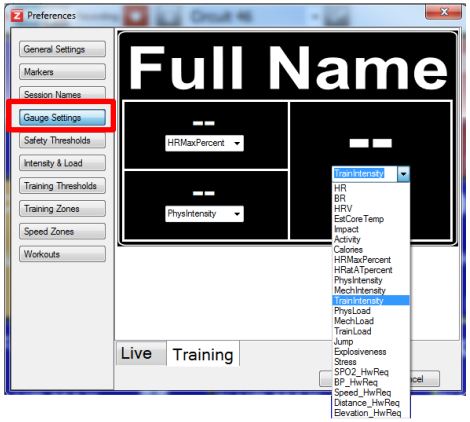
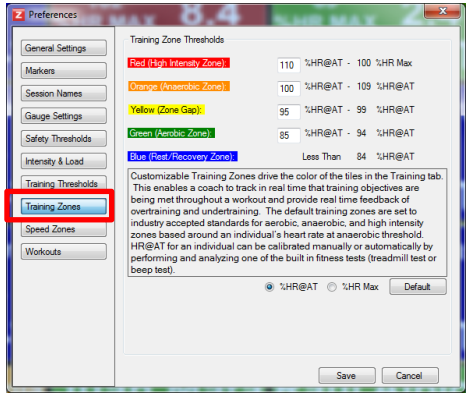
- Displayed in the Live Training tab
- Used in conjunction with Workout tab

- 3 configurable fields
- Color reflects Training Zone, configured in Preferences





Training BioGauge Color	Default Training Zone Limits
Red (High Intensity Zone)	110% HR@AT - 100%HR_{max}
Orange (Anaerobic Zone)	100% HR@AT - 119%HR@AT
Yellow (Zone Gap)	95% HR@AT - 99%HR@AT
Green (Aerobic Zone)	85% HR@AT - 94%HR@AT
Blue (Rest/Recovery Zone)	Less than 84% HR @ AT

Live Toolbar

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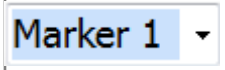
	Display selected BioGauge in the Medic tab		Use button to change a session name when a new name is selected rom the pulldown
	Switch to Live mode – ECHO communications will start		Marker name as it will be displayed in OmniSense Analysis. Populate the pulldown list from Preferences > Markers – Add New as needed
	Switch to Setup Mode – ECHO communications will continue in the background		Use button to place a Marker. This will show as a vertical line with a label in OmniSense Analysis Time graphs.
	Start/Stop recording to OmniSense database. Default is recording. Text indicates status		Activate Demo mode. Virtual data will populate BioGauges. If a real subject is also deployed, then a Gateway must be connected to the PC.
	Display notification area beneath BioGauges showing system messages		Display Preferences Dialogue
	Session name as it will be recorded in OmniSense Analysis. Populate the pulldown list from Preferences > Session Names – Add New as needed.		Display html Help for OmniSense Live

PSM Training Modules

Safety Tab

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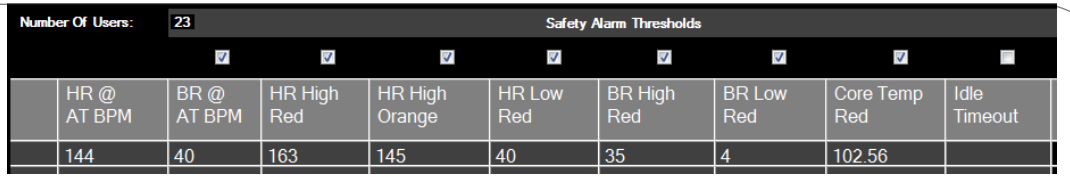
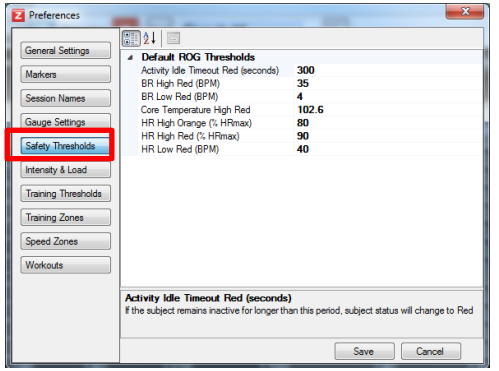
Safety tab



Activate thresholds in Setup > Subject

Set Default thresholds in Preferences



- Safety tab shows subject R /O / G status for every subject on the system
- Numeric value on subject tile shows how long the current status has endured
- Safety threshold limits are activated collectively in Live > Settings > subject tab. Use the check boxes above the column headings. They are Active by default.
- Safety threshold default values and descriptions are set in Live Preferences > Safety Thresholds

Medic Tab

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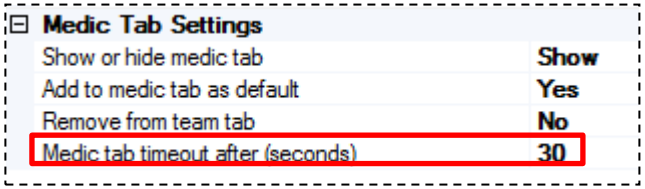
Medic tab



Medic tab settings in Preferences

- All subjects whose status is red for longer than 30 seconds (configurable) are displayed in the Medic tab in addition to their Team tab
- In the Team tab, their BioGuage will display ✚ at center while they are displayed in the Medic tab
- They continue to displayed in the Medic tab, after their status is no longer red. They can be removed using the ▬ toolbar button or set automatic removal in Preferences

Map Tab

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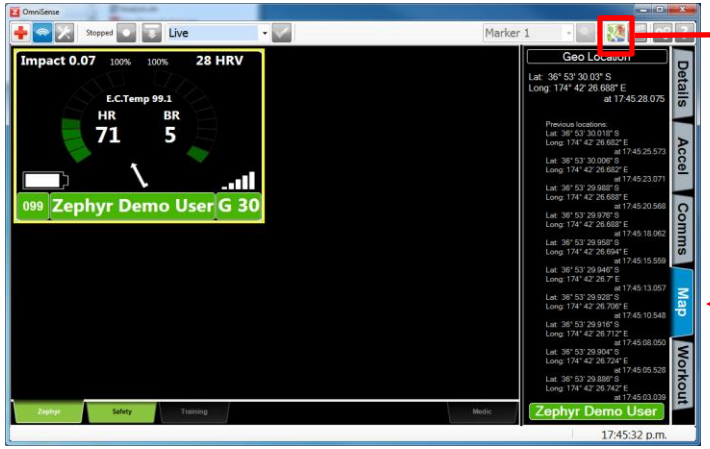
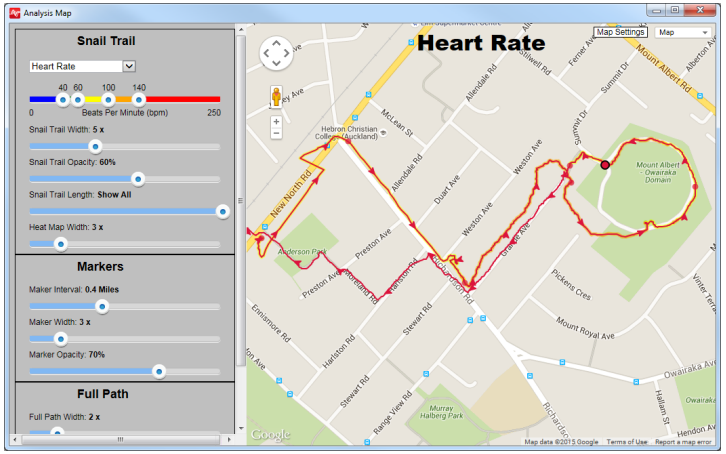


Map Tab



The Geolocation of the selected BioGuage will update on the right. The topmost location is a hyper link which will display location on Google Maps

Toolbar button will display Google Maps or Earth in a separate window

- Subjects must be fitted with a configured & Supported GPS module – currently a Qstarz 818XT or 1300ST
- Internet connection and Google Map plugin required for map display.

Map Window

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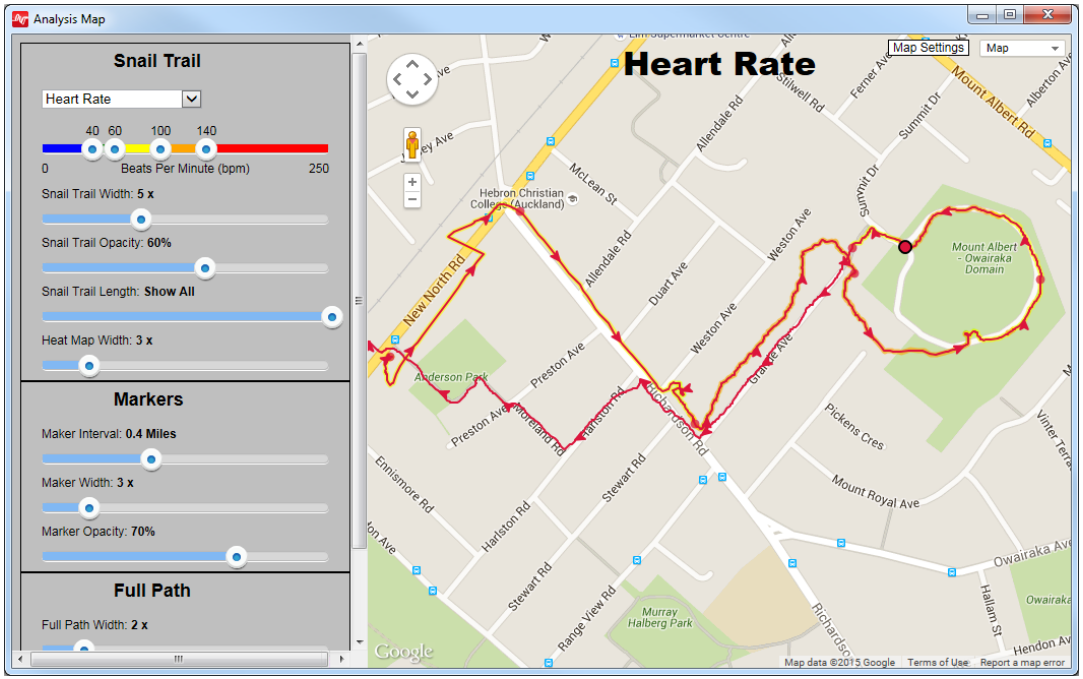
Snail Trail Options

Heart Rate	40 60 100 130 — 0 Beats Per Minute (bpm) 250
%HRmax	60% 80% 90% — 50 Heart Rate % of Maximum 125
%HR@AT	85% 100% 110% — 50 Heart Rate % of Anerobic Threshold 125
Physiological Intensity	60% 70% 80% 90% — 50 Percent of Maximum Heart Rate 100
Mechanical Intensity	1 1.5 2 2.5 — 0.5 Peak G/Epoch 3
Speed Zones	5 7.1 9 11 — 3 Miles Per Hour (mph) 13.2
Altitude Zones	2000 3000 4000 5000 — 0 Feet 6500
ROG Safety Thresholds	0 Safety.....Alarm 3

The window can be switched between map and satellite view



- Snail Trail width, opacity and length (time in seconds preceding current position) are configurable
- Configurable markers can be placed at intervals on the trail
- A Heat Path indicates…???

Workout Tab

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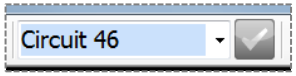
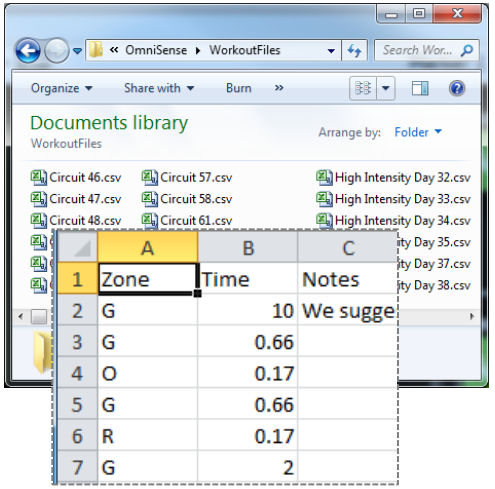


Select Workout from the Session Names List

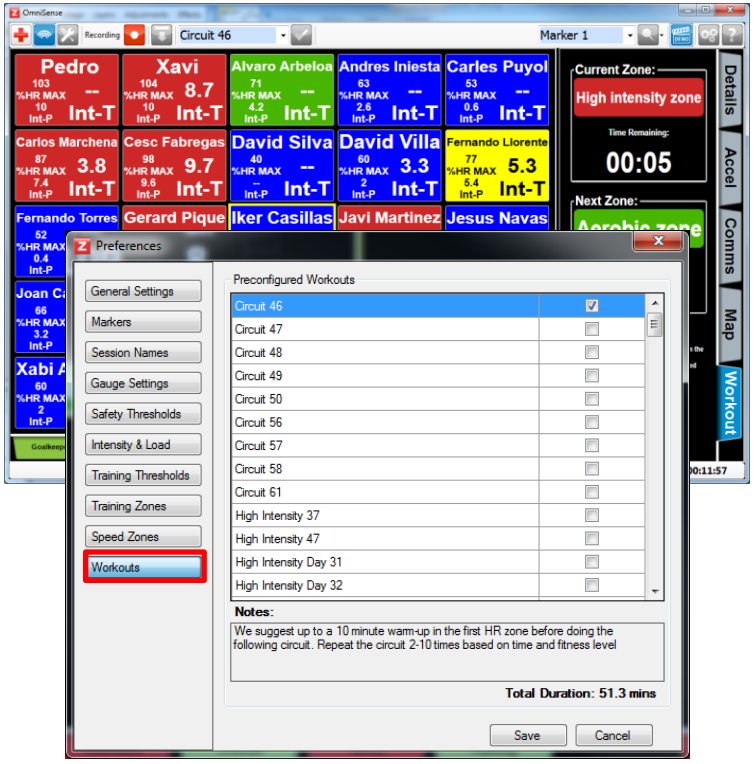
Workouts are based on the Paul Robbins Periodization system.



Workout .csv files are located at C:\...\Documents\OmniSense\WorkoutFiles

Column A shows ROG Zone. Column B shows duration in decimal minutes
e.g. 0.66 min = 40 sec

Workout files can be copied and customized as necessary



To add a workout to the Session Names list check it in the Preferences > Workouts dialogue

Session Names

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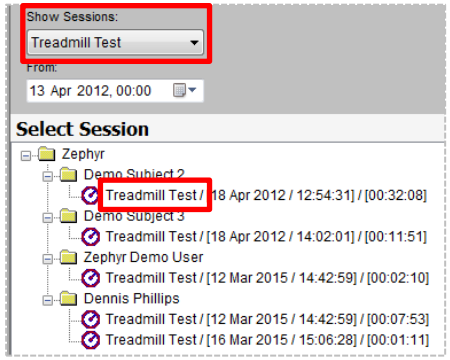
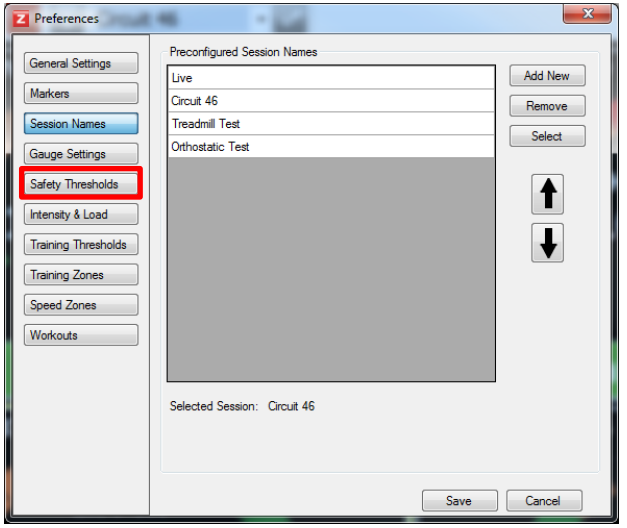
Session Name



Using Session Name to filter sessions in OmniSense Analysis



Preferences > Session Names

- Session name (default ‘Live’) will identify the session in OmniSense Analysis
- Create custom session names for easier filtering of results in OmniSense Analysis
- Populate the pulldown list of available names from Preferences > Session Names
- Activate a session name using the button
- Sessions can also be renamed in OmniSense Analysis later

Session Markers

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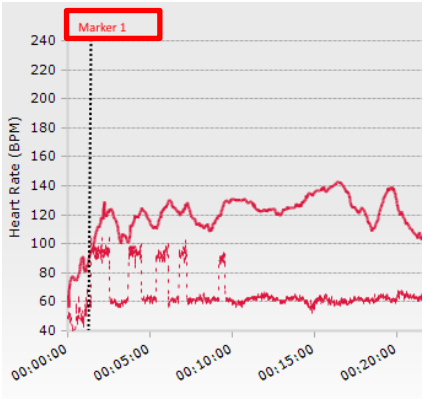
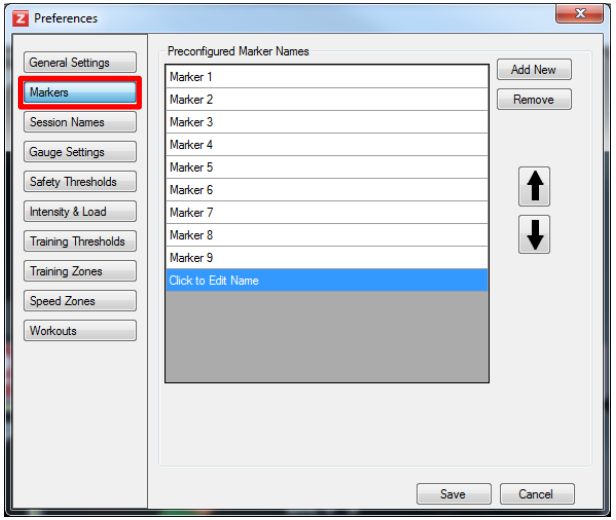
Marker Name



Markers will display in OmniSense Analysis Time graphs



Preferences > Markers

- Use Markers to identify Session start/end, or significant events as necessary
- The marker will be visible in Time graphs OmniSense Analysis
- Populate the pulldown list of available names from Preferences > Session Names
- Activate a Marker using the button
- The Marker list will increment to the next in the list, each time a Marker is placed.
- Note: Markers are visible in Analysis Time graphs, but are not exported with the graph data.

PSM Training Modules

Pebble Watch & Application

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Pebble Overview

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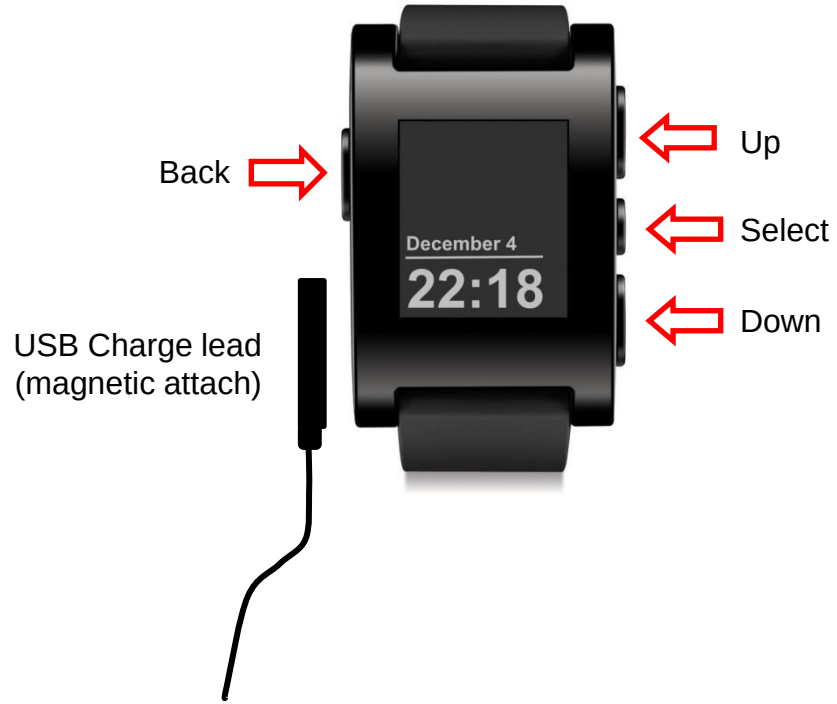

Twist wrist rapidly to activate back light

- The watch attaches to a PC or other USB power source for charging only. The watch cannot communicate with a PC over USB.

Do not connect the Pebble watch to a phone over Bluetooth. If the phone has a Pebble Watch application installed, it will initiate an automatic firmware update for the watch. This will delete the customized Zephyr firmware.

PSM Training Modules

Pebble and PSM Training

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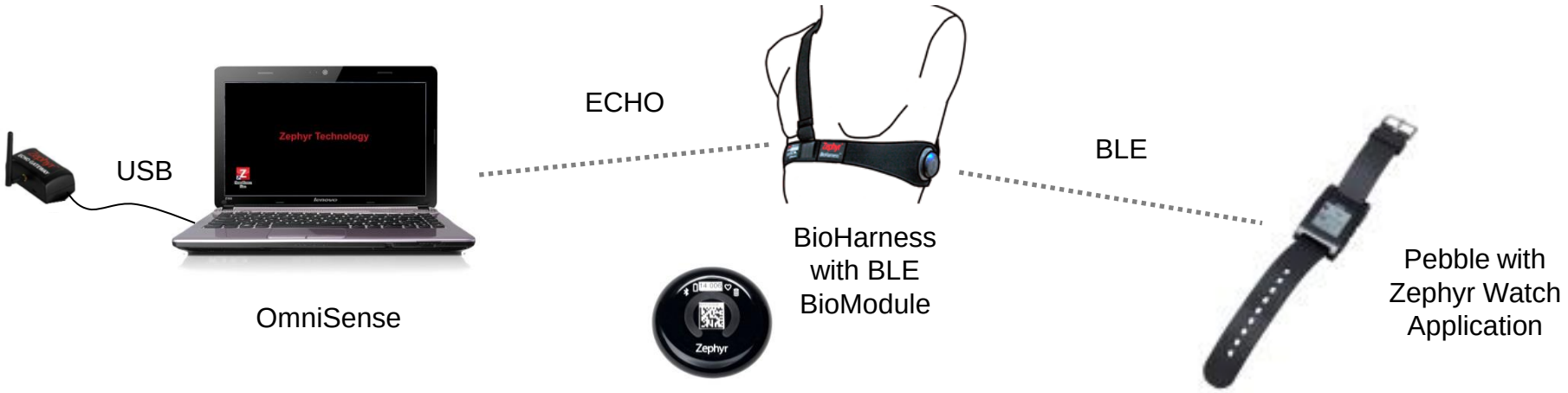

- Only Bluetooth Low Energy BioModules support the Pebble. They can be identified as having a barcode.
- PSM Training / OmniSense send user parameters such as HR_{max} and HR@AT to the BioModule by ECHO radio link.
- The BioModule sends Heart Rate, Breathing Rate, Activity Level, Posture, Heart Rate Variability (HRV) & Training Zone to the Pebble over a separate Bluetooth Low Energy (BLE) radio connection
- HRV is a rolling 300-beat calculation, and so does not appear until 300 beats/5 minutes from BioModule start up
- The Pebble can be used independently of PSM Training (i.e. with BioModule in logging mode) once the initial configuration has been sent. The BioModule remains configured after it has been powered off.

Zephyr Watch Application

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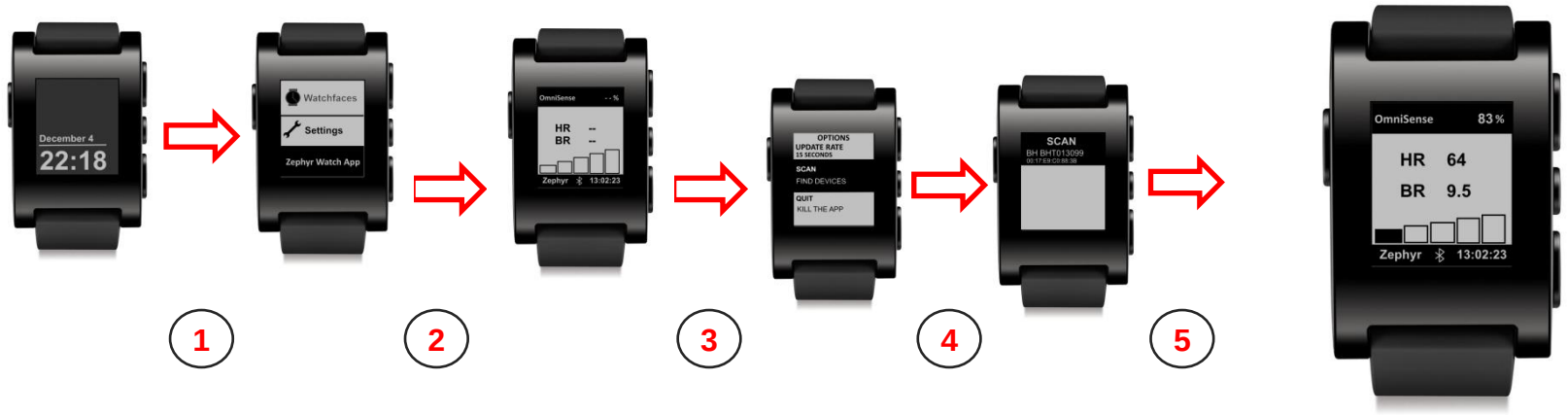

1. Select center button for Pebble menu	4. Select down for Scan, then center button to select. The watch will scan for BioModules and display by # [on the rear of the BioModule]
2. Select down button for Zephyr Watch App, then center to select. Empty Training Zones screen displays.	5. Use center button to select BioModule. You will return to the Zephyr Training screen.
3. To connect to BioModule, select center button for Zephyr App menu	See next slide for customizing the screen

Do not connect the Pebble watch to a phone over Bluetooth. If the phone has a Pebble Watch application installed, it will initiate an automatic firmware update for the watch. This will delete the customized Zephyr firmware.

Customise the Display

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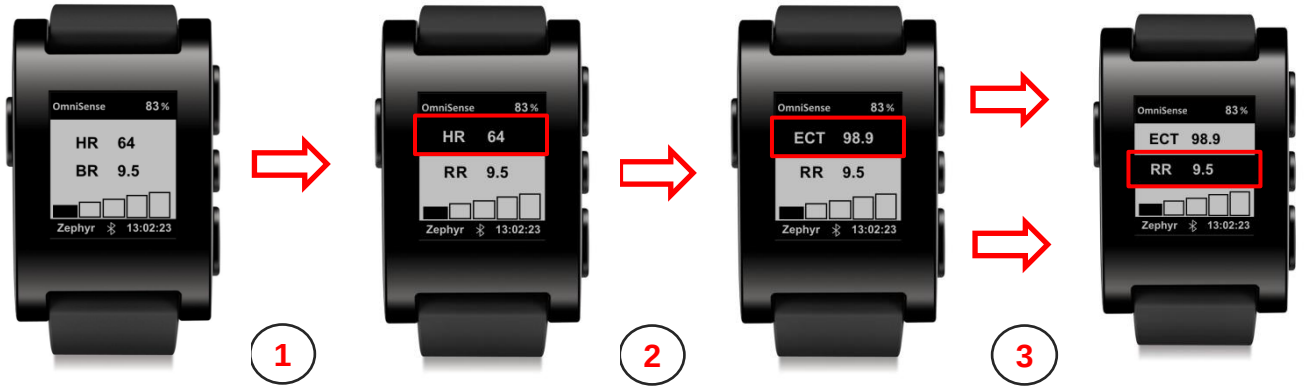
Each of the 3 fields on the screen can display one of 8 metrics



HR 67	Heart Rate
RR 8.7	Resp. Rate
	Training Zones
ECT 98.9	Est Core Temp.
POS -11	Posture
ACT .04	Activity
HRV 31	HRV
STR 5.1	Stress

1. When the data screen displays, press and hold the center button to highlight a field. It will show a dark background.	3. Use the up and down buttons to highlight a different field. Use center button again to toggle through available metrics.
2. When a field is highlighted, press the center button briefly to toggle through the available metrics.	4. Press and hold the center button when you have finished customizing the fields.

Do not connect the Pebble watch to a phone over Bluetooth. If the phone has a Pebble Watch application installed, it will initiate an automatic firmware update for the watch. This will delete the customized Zephyr firmware.

PSM Training Modules

Training Zones

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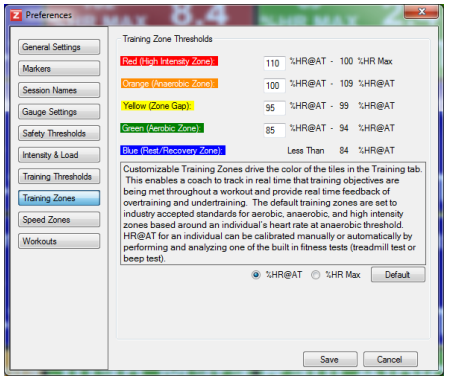

Training Zones configuration in OmniSense Live > Preferences > Training Zones

- The five-bar histogram corresponds to the colored Training Zones which can be configured in OmniSense Live > Preferences
- The subject's HR_{max} and HR @AT are sent to the BioModule when used in a PSM Training ECHO system, or can be configured manually using the Zephyr Config Tool (see Utilities module)
- The watch training zones are set using default zone settings viewed in the OmniSense Live dialogue above and the table below.

Zone 1 Blue – Recovery Zone	Less than 84% HR@AT
Zone 2 Green – Aerobic Zone	85 – 94% HR@AT
Zone 3 Yellow – Zone Gap	95 – 99 % HR@AT
Zone 4 Orange – Anaerobic Zone	100 – 109 % HR@AT
Zone 5 Red – High Intensity Zone	110 % HR@AT – 100% HR_{max}

Vital Signs

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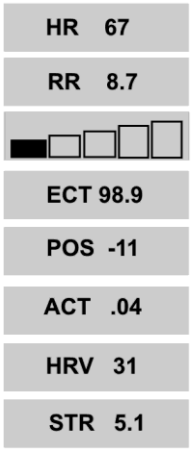
- Press and hold center button to select a field
- Press center button briefly to toggle through this list of metrics
- Use up and down buttons to select a different field
- Press and hold center button when done



xx%	BioModule Battery	Level in %
HR	Heart Rate in BPM.	‘ - - ‘ indicates HR invalid
RR	Respiratory Rate in breaths per minute.	‘ - - ‘ indicates RR invalid
ECT	Estimated Core Temperature	HR based on USARIEM research
POS	Posture in degrees from vertical.	Positive = forward lean, Negative = rearward lean. 180 = inverted
ACT	Activity Level in VMU	0.2 ~ Walking, 0.8 ~ Running
HRV	Heart Rate Variability	300-beat rolling calculation; no value for 3 - 5 minutes after power on.
STR	Stress on a scale 0 - 10	0 = (HRV > 65) 10 = (HRV < 5)

Zephyr App Menu

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- In the data screen, press the center button briefly to display the menu
- Use Up and Down buttons to select menu option

UPDATE RATE	Press center button repeatedly to scroll through 1 > 5 > 10 > 15 > 20 > 25 > 30 > 35 > 40 > 45 > 50 > 55 > 60 second intervals
SCAN	Scan for Bluetooth Low Energy BioModules in range. BioModule must be powered on.
QUIT	Press center button and hold to quit the app.

If you cannot detect the BioModule (and it is powered on), then Quit the app, and use the watch menu Settings > Bluetooth, to turn the watch Bluetooth OFF and then ON again. Then try again to scan for the BioModule.

Troubleshooting

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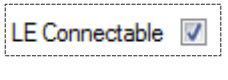
No HR / RR displayed

The BioModule transmits a Heart Rate Confidence level, dependent upon ECG signal strength, ECG noise level and other parameters. If below a certain level, no HR is displayed. Other values e.g. Act, will still display

- Check strap is tight enough
- Check strap sensor pads are initially moist to ensure good conductivity



Zephyr Config Tool setting for BioModule

BioModule not detected by scan

- Confirm the BioModule is a BLE version – it will have a barcode label on the front.
- Confirm BioModule is powered on – LEDs flashing
- Confirm Bluetooth is ON in Pebble Watch Menu > Settings > Bluetooth
- Confirm Bluetooth LE is enabled in BioModule using Zephyr Config Tool

Do not connect the Pebble watch to a phone over Bluetooth. If the phone has a Pebble Watch application installed, it will initiate an automatic firmware update for the watch. This will delete the customized Zephyr firmware.

PSM Training Modules

Baseline Fitness Testing

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PSM Training Modules

Overview

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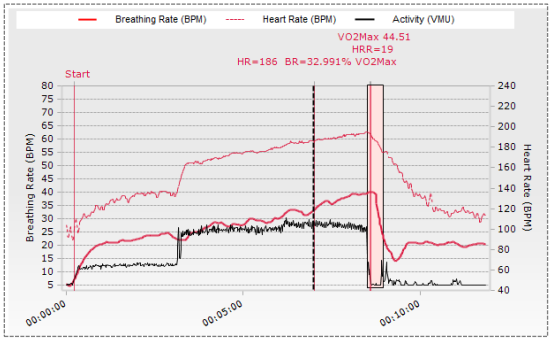
Perform Ramped Fitness Test

OmniSense Live

Analyse Data & Save Fitness Parameters to Database



OmniSense Analysis

- A ramped fitness test, performed regularly, will give a measure of an athlete's training progress
- Use a ramped maximal effort test using a treadmill, or a beep test
- Analysis of the data will provide
  - Maximum Heart Rate
  - VO2max
  - HR @ AT
  - Heart Rate Recovery
- Save these and other parameters into the OmniSense database in order to generate Individual & Group Fitness Reports.

Treadmill Test Protocol

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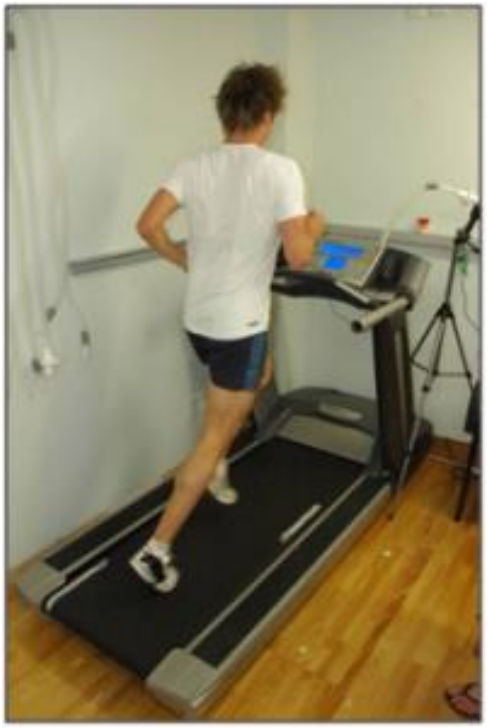

Use an ACSM ramp protocol, or a modified Conconi test.

1. 10 minute warmup, including stretches
2. Set the treadmill gradient at 5%
3. Set the start speed at 6kph (3.7 mph)
4. Every 3 minutes, increase the treadmill speed by 2kph (1.25 mph)
5. For maximum benefit, provide verbal encouragement to the athlete, especially during the latter part when effort is maximal.
6. The test finishes when the athlete can no longer continue.
7. The subject should remain stationary or reduce to walking for 30 seconds after they stop running, to allow a heart arte recovery measurement to be obtained.

It is important that the above speed and timing criteria be observed, as the automatic VO_2max calculation is determined by the speed at which the subject stops running – specifically the duration they have been running for. If different speed, gradient and timing criteria are used, the VO_2max calculation will be less accurate.

Beep Test Protocol

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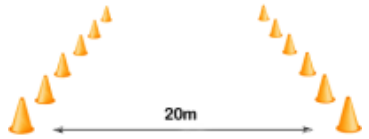

1. Place marks or cones 20 meters apart
2. Subjects should warm up and stretch for 20 min
3. Start the audio recording to initiate the test

Cycle Iteration	No shuttles at this level	Running speed (kph)
1	7	8.0
2	8	9.0
3	8	9.5
4	9	10.0
5	9	10.5
6	10	11.0
7	10	11.5
8	11	12.0
9	11	12.5
10	11	13.0

Cycle Iteration	No shuttles at this level	Running speed (kph)
11	12	13.5
12	12	14.0
13	13	14.5
14	13	15.0
15	13	15.5
16	14	16.0
17	14	16.5
18	15	17.0
19	15	17.5
20	16	18.0
21	16	18.5

Beep test protocols vary internationally, with markers 20 meter or 20 yards apart. 20-meter spacing represents a 9.3% increase in distance over 20-yard spacing. Thus subjects using metric spacing must use 9.3% more effort for a given level in the test.. If different distance and timing criteria are used, the VO_2max value will be less accurate.

Fitness Test using OmniSense Live

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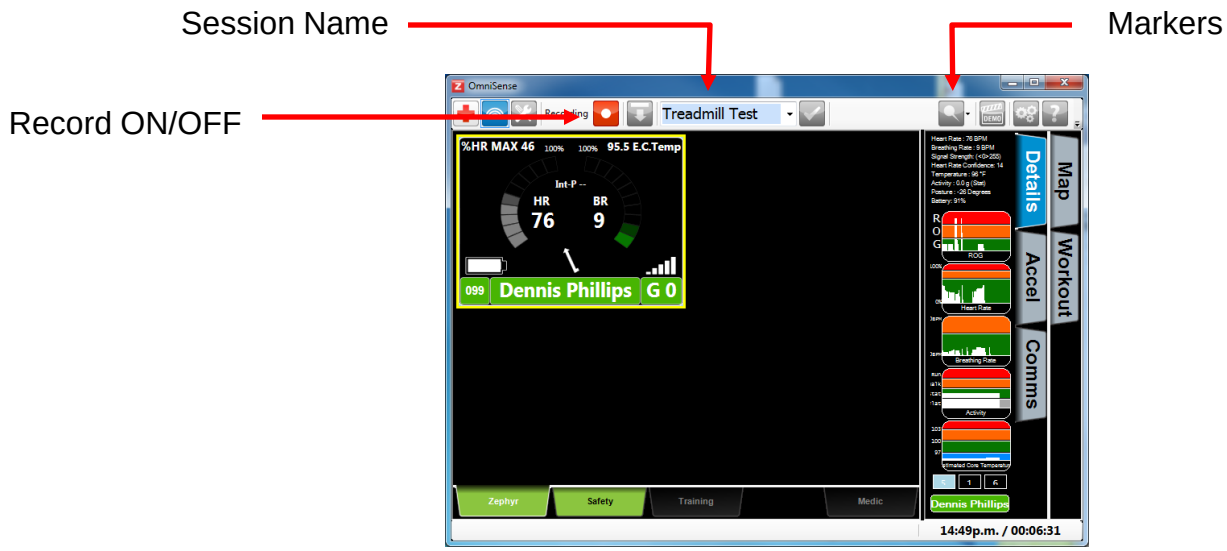

1. The setup (other than session name) is the same for a Treadmill or Beep test.
2. Create a session name for current and future use and easy filtering in Analysis – though sessions can be renamed in Analysis later to suit.
3. Recording in ON by default; turn off if you do not need to record warm-up data – or exclude the warmup data by creating a subsession later in Analysis
4. Use markers to note any events you may want to refer to later in Analysis. The start and end of the test are easy to identify due to obvious changes in activity level. They must also be marked in Analysis for VO_2max calculations.
5. Perform the test according to the protocol. Make sure recording is ON.

Fitness Test using OmniSense Analysis

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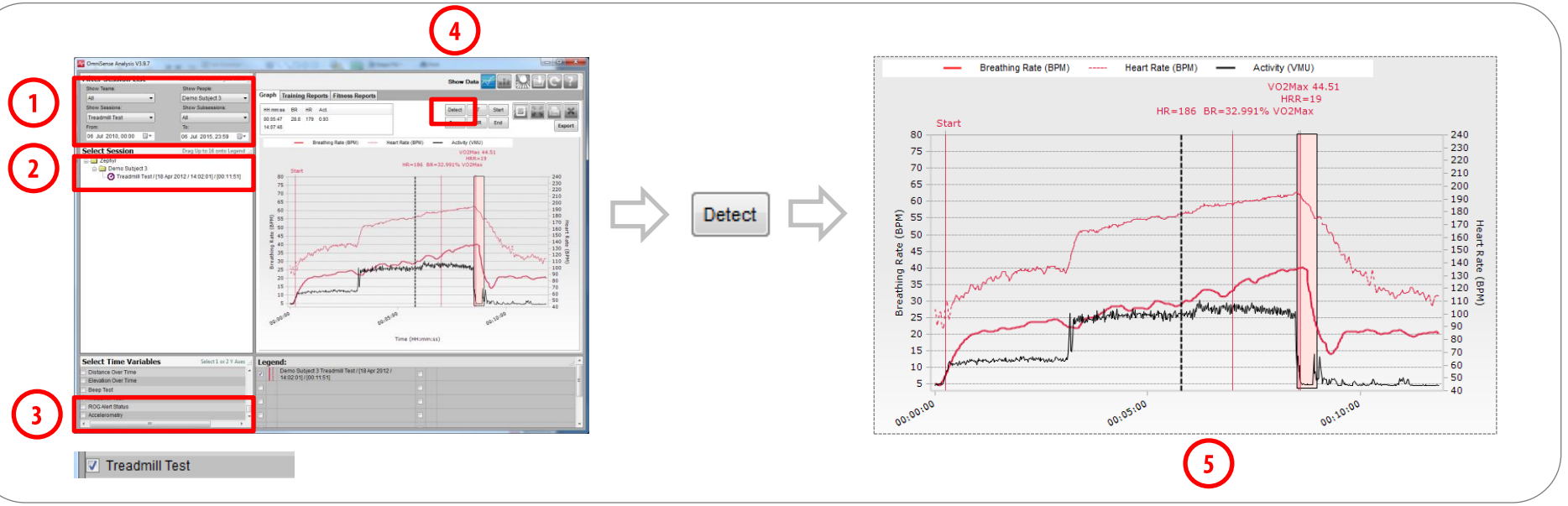
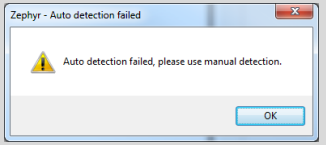


1. Use the filter pull downs to locate the relevant treadmill or beep test session.
2. Double-click the session to move it to the Legend
3. Select *Treadmill Test* or *Beep Test* from the *Time Variables* list as appropriate. Heart rate, breathing rate and activity level will be displayed on the graph. No other parameters can be selected.
4. Select the *Detect* button to implement automatic analysis of the test.
5. If successful, the anaerobic threshold will be detected, as well as HR max and heart rate recovery values. VO2max will be calculated according to an ACSM formula.

If automatic analysis is not successful, or the AT threshold detected automatically appears to be wrong, a message will display, it must be made manually – see next slide.



Manual AT Threshold Selection

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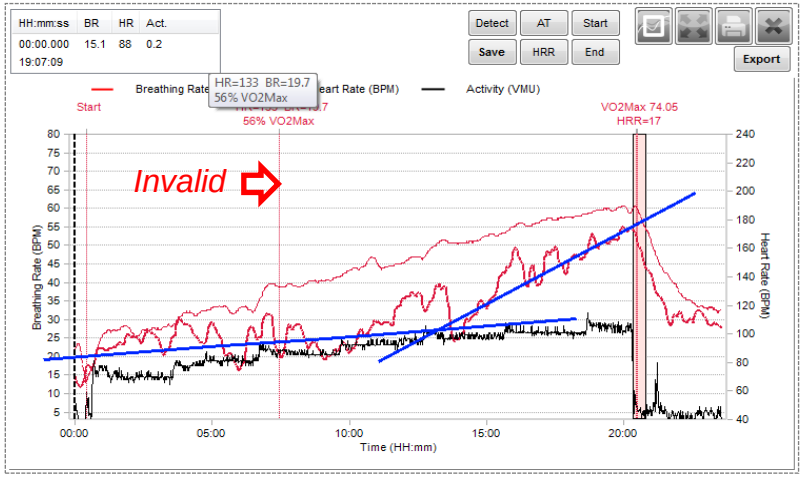
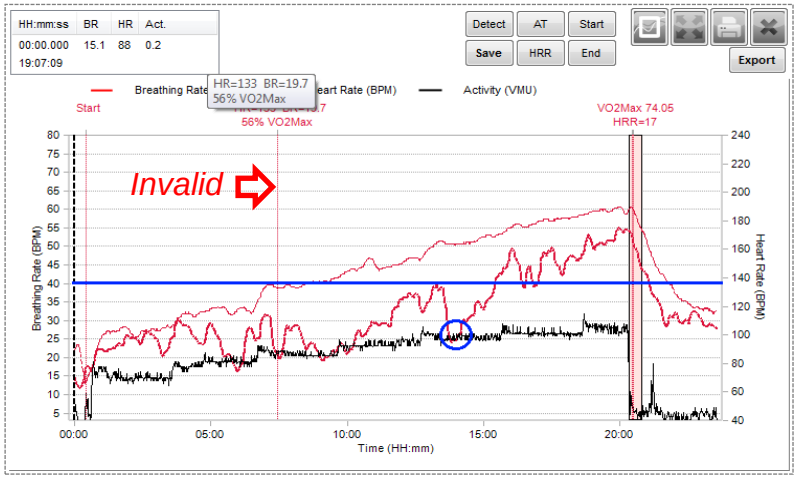
Two alternate approaches – the automatic analysis has produced an invalid AT threshold, indicated at





Look for a trend of more-rapidly-increasing breathing rate amongst the artefacts in BR rate. This is indicated where the blue lines intersect – a better estimation of AT than the automatically-determined value

Locate the last *major* inflection (upswing) in BR before the 40 breaths/min level is passed. Minor inflections should be ignore. The blue circle indicates this location.

Move the vertical graph cursor to your manually selected AT threshold and click the AT button.

You can also relocate the HRR zone by reposition the graph cursor to its start and using the HRR button.

Saving Fitness Parameters

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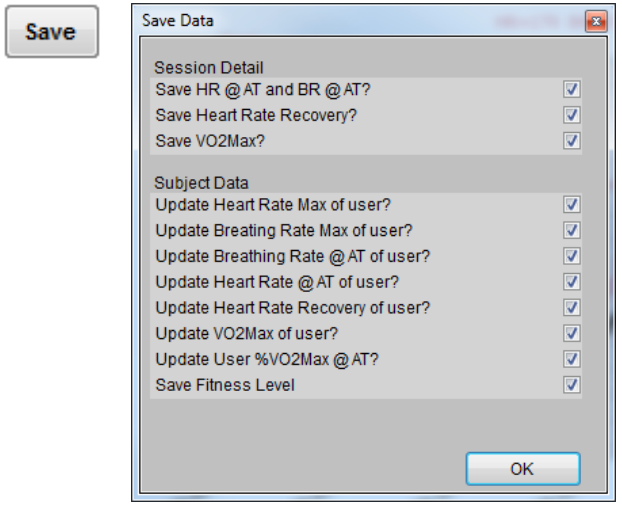
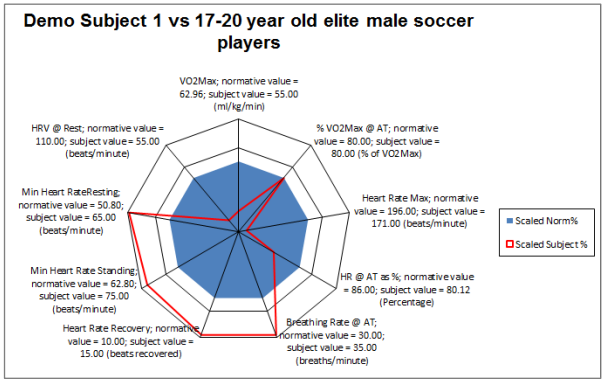
Once the AT threshold and HRR zones have been set automatically or manually, save the data to the OmniSense database.



Use the *Save* button to display a dialogue offering options to save fitness parameters for that subject. These parameters can be used to generate a fitness report for that subject.



HR max BPM	HR @ AT BPM	BR @ AT BPM
164	144	40
185	152	40

Note that only three of these parameters are visible directly, in OmniSense Live > Setup > Subject

Resting / Orthostatic Test

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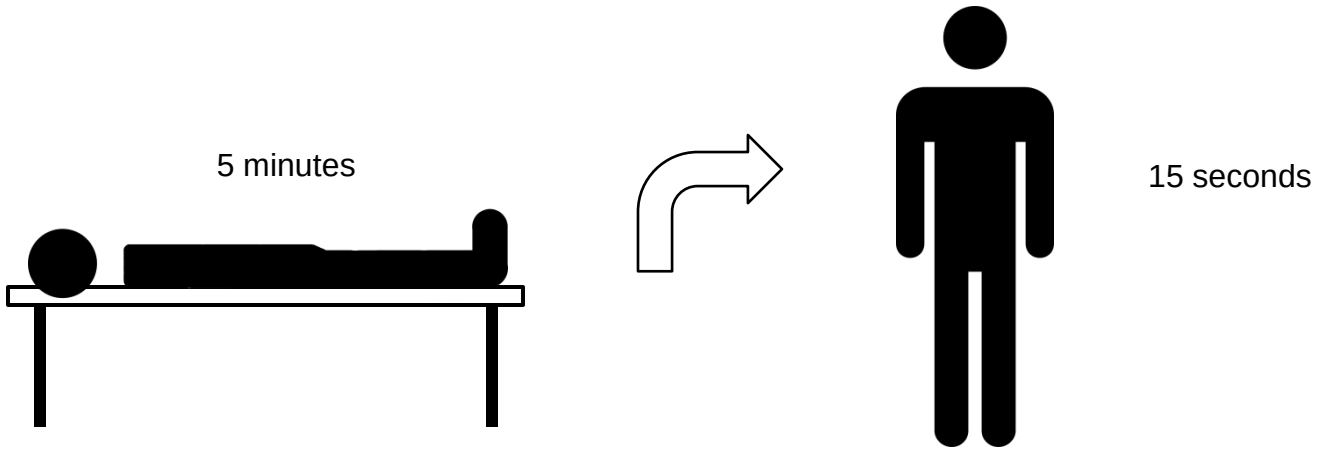

Lie down in a quiet, warm, comfortable setting for 9 minutes, then stand up & remain stationary for 1 minute

1. This test establishes some baseline metrics and is used in algorithms to determine Fitness Level and Readiness.
2. Record the session using OmniSense Live or another tool and note:
    - Heart rate at rest lying down
    - Heart rate standing up
    - Orthostatic hypotension – difference between the above two values
    - Herat rate variability at end of lying down phase

The subject status should remain green throughout the test. If status shows grey for 5 sec at any point, indicating poor conductivity (dry skin or strap), then the HRV calculation may restart when status returns to green, and may not be available until 300 beats have passed

Zephyr Demo User