PSM Training
ECHO

OmniSense
Analysis
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. Overview
2. Graph Options
3. Log Data
4. Reports
5. Fitness Considerations
6. Analysis Impacts
7. Readiness
8. Fitness Test Analysis
9. 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

## Overview

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Both Live and Analysis modules send and receive data from the OmniSense database.

The database is a single file, `polling.fdb`, located at `C:\Program Files (x86)\Zephyr\OmniSense\Database\DbFile`. At each upgrade install, the existing database is backed up before a new instance is created and populated with any existing data.

The database contains:
- All subject & team data
- All device data and who devices are assigned to
- All session data

The database is populated either by receiving data over ECHO from OmniSense Live, by BioModule Log data imported via OmniSense Analysis, or external .zsf session files also imported via OmniSense Analysis.

OmniSense Live and Analysis can run at the same time, but a refresh button must be used in Analysis to update to latest data.
Database Rules

- Subject names must be unique (no duplicates).

- The hierarchy for displaying session data in OmniSense Analysis is
  - Team (or “No Team Assigned”)
    - Subject
      - Session Data
      - Subsession data

- Subjects are listed under the last team they were assigned to.

- If the subject has never been assigned to a Team (possible if log data is imported), they are listed as ‘No Team Assigned’.

- Team names can be deleted and recreated as necessary.

- Sessions can be Archived – they are saved as an external .zsf file, and are deleted from the database. The external zsf file can be re-imported at will. Use this function to ‘de-clutter’ a database and speed up database loading time.

If a subject is deleted from the database, all of their sessions are deleted and cannot be recovered. If you re-use the name, you will be prompted to ‘reactivate’ a deleted subject, but their old data will no longer be available.
• Data must be recorded in the Live module (or logged internally in BioModules) for later display in the Analysis module.

• Recording is the default state when Live mode is engaged.

• Analysis and Live modules can run simultaneously, but data must be refreshed manually in the Analysis module.
• Each time the Record button is pressed in a continuous session in the Live Module, new individual subject sessions are created in the database for each subject deployed

• These are displayed as individual subject sessions in Analysis
Session Naming

- Custom Session names make for easy filtering of data for display in Analysis.
- Session Names can be created in OmniSense Live, in the Zephyr Downloader when importing Log data, or by renaming sessions in Analysis itself.
- Session Name list can be populated in OmniSense Live > Preferences.
PSM Training Modules

Workflow

1. Select graph type:
   - Time (line)
   - Summary (bar)

2. Use filter pull downs to populate Session tree. Date defaults to today's date.

3. Drag and drop or double-click selected sessions to populate Legend.

4. Select 2 variables to display on graph. 3 display for Treadmill or Beep Test.

• Time Graphs:
  - First parameter selected: left vertical axis, solid trace
  - Second parameter selected: right vertical axis, dashed trace

• Reports – select the Reports tabs, see module on reports

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Graph Types

Drag vertical cursor to see exact values

Left axis: 1st parameter selected

Right axis: 2nd parameter selected.

Time Graph

Summary Graph

<table>
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<th>Time Data – line graph, two traces per subject</th>
<th>Summary Data – histogram (bar chart)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Drag vertical cursor for exact values displayed above graph</td>
<td>• Average, Max Min or Total values, dependent on parameter</td>
</tr>
<tr>
<td>• Show variability over time</td>
<td>• Show historical trends over multi sessions</td>
</tr>
<tr>
<td>• Compare any 2 parameters (or HR, BR + Activity if a fitness test)</td>
<td>• Compare up to 16 subjects</td>
</tr>
<tr>
<td>• Automatic Analysis of fitness tests</td>
<td></td>
</tr>
<tr>
<td>• Compare up to 16 subjects</td>
<td></td>
</tr>
<tr>
<td>• Real or elapsed time horizontal axis</td>
<td></td>
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</tbody>
</table>
Filter Sessions

Filter by Team
Filter by Session Name
Filter by Subject
Filter by Subsession Name

- Effective naming of sessions at time of recording in OmniSense Live will make for faster filtering when retrieving data
- The *From* date field defaults to today’s date
- To access demonstration data, set the *From* field to Jan 2012
Select Session

- Use the filtered sessions to populate the Legend for Graph display, or the Reports pane

- Hold the Control Key and click to select multiple sessions
PSM Training Modules

Legend

- Use check boxes to hide or display a session trace on the graph
- Select a Session and right-click to remove
- Use the filtered sessions to populate the Legend for Graph display, or the Reports pane
- Hold the Control Key and click to select multiple sessions

Click ‘X’ to clear all data
Select Variables

Select 2 variables, or 1 only for Beep/Treadmill Test

1\textsuperscript{st} variable selected = \textbf{left} vertical axis
solid trace

2\textsuperscript{nd} variable selected = \textbf{right} axis
dashed trace

Two variables selected

Treadmill/Beep Test selected: HR + BR + Activity displayed

- If a variable is de-selected, any remaining variable displays against the \textbf{left} vertical axis
# PSM Training Modules

## Graph Options

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Background Shading - ROG

Background Options apply to Time Data graphs only – not Summary Data
Default is a plain, uncolored background

ROG status is determined by the Safety Alarm thresholds set in the Setup > Subject screen in OmniSense Live. It is displayed as Subject Status ROG in the Live BioGauge.
Training Zones are ranges of $HR_{\text{max}}$ or $HR@AT$ set in Preferences in OmniSense Live.
• Speed Zone background will only display for sessions which incorporate GPS data – either recorded from OmniSense Live or imported from BioModule log data into OmniSense Analysis. Sessions which contain no GPS data will display an un-colored background. See the Training Module on Log Data for more information.
Real/Elapsed Time

- Elapsed Time comparison allows overlay of similar sessions which have occurred at a different minute, hour or day.
- The example shows two laps of the same circuit. In Real Time, they don’t overlap, so can’t be compared directly.
- In Elapsed time, both sessions Start Times are shifted to 00:00:00
- If Elapsed Time data is exported from Analysis, the original timestamp data is replaced with new timestamps starting at 00:00:00 for all sessions exported.
Creating subsessions allows you to isolate a smaller component of a parent session, or trim off unwanted data to exclude from graphs or reports.

If a parent subsession is deleted from the database, all subsessions are also deleted.

You cannot make a subsession from a subsession.

Multiple subsessions may overlap within a parent session.
Create a Subsession

Display Sessions and parameters as needed

Select subsession button

Use mouse arrow to draw a rectangular frame for the subsession. Both vertical and time axes will truncate automatically when the subsession displays on its own.

Rename the subsession in the dialogue

If more than one session is graphed when a subsession is framed, then a separate subsession is created for each parent session.
Subsessions by Wizard

- Best used to make multiple subsessions where Start & End times are known
- Use *Show Sessions* to display only those session you want to use
- Right-click to show context menu
- Use subsession dialogue & edit as needed. Give subsessions a meaningful name. Check *Filtered Sessions*
Time Graph Zoom & Pan

**Drag a frame top left to bottom right round any section of a time graph to zoom in**

**Right click and use mouse cursor to drag graph in any direction for closer inspection. The axis markers will adjust automatically**

**Drag any frame bottom right to top left h to zoom out**
PSM Training Modules

Time Graph Cursor Values

Real Time timestamp
Elapsed Time timestamp
Primary Session Variables

Drag the vertical cursor to display primary parameter value
Print Graph

- The Time or Summary graph will print exactly as displayed i.e. if zoomed-in
- A legend will identify sessions and parameters

Demo Subject 3 Treadmill Test / [18 Apr 2012 / 14:02:01] / [00:11:51] Heart Rate (BPM)

Demo Subject 3 Treadmill Test / [18 Apr 2012 / 14:02:01] / [00:11:51] Breathing Rate (BPM)
• The full-screen button will display the graph contents only in a separate, resizable window.
• Zoom and Pan are still active in this window
**PSM Training Modules**

**Export Data - ZSF**

- Right click a session for a context menu
- Select Export to ZSF (Zephyr Serial Format)
- Browse, name the .zsf file and save in your preferred location.
- A ZSF file can only be opened by reimporting it back into an instance of Analysis from the Import Menu button
- Use to archive a single session, or to send to another user for their use
PSM Training Modules

Export Data – External File

- Export to the selected format
- Image files show Markers; csv and Excel files do not

- CSV
- JPEG
- GIF
- PDF
- PNG
- TIFF
- XLS
<table>
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Set Log format with Zephyr Config Tool.

<table>
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<th>Summary</th>
<th>Log settings</th>
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<tr>
<td>1 Hz Data</td>
<td>[Default logging format]</td>
</tr>
<tr>
<td>Summary &amp; Waveform</td>
<td>Additional 250 Hz ECG + 100Hz Accelerometry, 1 Hz GPS</td>
</tr>
<tr>
<td>Summary &amp; Development</td>
<td>Additional 1KHz ECG + 50Hz Accelerometry. No GPS.</td>
</tr>
</tbody>
</table>

- Log Download time increased by a factor of 5x approximately for Summary and Waveform logs
- Waveform data can ONLY be accessed via External Files with 3rd party application, and NOT via OmniSense Analysis
- BioModule must be configured to Summary & Waveform logging to record GPS data
1. BioModule must be configured to log (Log Enable) in correct format.
2. Log format: Summary for general use, Summary and Waveform if optional GPS is used
3. For automatic log download using the Zephyr Downloader, the subject should use the BioModule and optional GPS they are currently assigned in OmniSense Live, otherwise Team and Subject must be assigned or updated manually in the Downloader settings

A BioModule / GPS combination must have been used previously in a live ECHO session, to Bluetooth-pair the BioModule and GPS, otherwise the BioModule must be configured manually.
PSM Training Modules

Manually Pair BioModule & GPS

- GPS MAC Address [00:1c:88:22:13:23 in example] must be configured using the Zephyr Config Tool
- MAC Address is shown in Add Hardware Wizard after GPS is detected over Bluetooth
- MAC Address can be determined from Windows > Devices and Printers > Add Device after GPS detected over Bluetooth by PC
- The MAC address remains set in the BioModule after it's powered off, unless updated
- Use of the BioModule and a different GPS in an ECHO system will configure for the new GPS
Zephyr Downloader Overview

- The Downloader will not download any logs already existing in the database for the assigned subject.
- The Downloader has a single-select menu option which will automatically download all devices logs to currently-assigned subjects – see next section.
- BioModule **green** LED will flash while logs are downloading.
- For devices in a system case, the Downloader will download up to 20 logs by USB, and any remaining BioModules automatically over Bluetooth.
- Logs remain in the device unless specifically erased.
- Oldest logs are overwritten when the device memory is full.
BioModule Logging Capacity & Download Times

<table>
<thead>
<tr>
<th>Log Format</th>
<th>Total Logging Capacity (Hours)</th>
<th>Approximate Download Time (per hour of data) - Bluetooth</th>
<th>Approximate Download Time (per hour of data) - Bluetooth</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>500</td>
<td>1 min</td>
<td></td>
</tr>
<tr>
<td>General and ECG</td>
<td>140</td>
<td>3 min</td>
<td></td>
</tr>
<tr>
<td>General and Accelerometer</td>
<td>280</td>
<td>2 min</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td>450</td>
<td>1 min</td>
<td>12 min</td>
</tr>
<tr>
<td>Summary and Waveform</td>
<td>55</td>
<td>5 ½ min</td>
<td>1 h 30 min</td>
</tr>
<tr>
<td>Summary and Development</td>
<td>30</td>
<td>12 min</td>
<td></td>
</tr>
</tbody>
</table>

- Download times are for a single device. 4 devices will download in parallel over USB. Remaining devices are queued.
- General, General and ECG & General and Accelerometer are legacy log formats used by the BioHarness BT 2.0.
- The Summary format is an extended format compared to General.
- The *BioHarness Log Descriptions* document describes each format in detail.

Changing the Log Format in a BioModule erases all existing logs. Download old logs first if they are important.
# PSM Training Modules

## Downloader Menu Options

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<th>Option</th>
<th>Description</th>
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<tr>
<td>Retry on Error</td>
<td>Retry download if a memory corruption is encountered</td>
</tr>
<tr>
<td>Synchronize clocks</td>
<td>Set BioModule clocks to PC time. Clocks are also set over the air when a live ECHO session is started.</td>
</tr>
<tr>
<td>Auto Download</td>
<td>Will automatically download any new logs to the subject to whom the BioModule is assigned to in the database. The fastest method of downloading new logs.</td>
</tr>
<tr>
<td>Auto Erase</td>
<td>Erase old logs on download. New logs overwrite old logs when memory is full.</td>
</tr>
<tr>
<td>Auto Discover</td>
<td>Detect and queue/download new logs over Bluetooth – use when large numbers of BioModules contain logs. BioModules must be charging.</td>
</tr>
<tr>
<td>Write CSV</td>
<td>Write an external csv file. All files go to ..\My Documents\BioHarness Test Logs\Team Name\Subject Name. The only way to generate ECG and 100Hz Accelerometer data</td>
</tr>
<tr>
<td>Write DaDISP</td>
<td>Write .DAT/.HED data files to the same location as above, for use with the 3rd party DaDISP Data Analysis Application</td>
</tr>
<tr>
<td>Write KML</td>
<td>Write .kml files to the same location as above. GPS must have been used in conjunction with the BioModule.</td>
</tr>
</tbody>
</table>
Auto Download Preconfigured BioModules

Preconditions

- All BioModules are assigned to a Team which is currently deployed in Live mode – the data will be associated with the subject the BioModules are currently assigned to
- The logs are downloaded on the day they are recorded (otherwise Session Start Time will have to be selected manually)
- Selecting the menu option Auto Download Configured Units (it is unchecked by default) will cause all new logs to be downloaded automatically
- If Auto Discover Bluetooth Device is also checked, all BioModules in the case not marked in USB-enabled bays will have logs downloaded over Bluetooth.
## PSM Training Modules

### Zephyr Downloader Wizard

<table>
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<th>Step</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Select Team – if subject not in a team, their name must be entered manually from the Subject column pulldown.</td>
</tr>
<tr>
<td>2.</td>
<td>Retrieve Team/Subject – based on BioModule numbers, the Wizard will populate the Subject Names column automatically. These can be corrected individually if needed. Use Clear All button to start again.</td>
</tr>
<tr>
<td>3.</td>
<td>Session Range – defaults to midnight at start of current day. Use to exclude sessions if there are logs you do not want to download.</td>
</tr>
<tr>
<td>4.</td>
<td>Name session – use for later filtering in Analysis. Name can be changed later in Analysis if needed.</td>
</tr>
<tr>
<td>5.</td>
<td>Download all logs from all devices as per criteria set in 1 – 4.</td>
</tr>
</tbody>
</table>

**Team & Subject** – use to over-ride any device if the automatically-populated values need changing, or a subject is not in a Team.

**Manual Log selection download using the legacy log downloader. Not active if subject not known. See next page.**

The Wizard is designed to retrieve Team/Subject combinations from the database based on BioModules currently assigned in Live. If a subject is not in a Team, then the individual ‘No Team Assigned’ & Subject Names must be populated manually.
The legacy BioHarness Log Downloader can be used to select any individual log. Rename in the Log Record field and save to any location, as well as into the OmniSense database.

The Log Downloader shows logs, their format and duration. Default location (checked) is ..\My Documents\BioHarness Test Logs\Team Name\…

External CSV files are generated by default.
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<td>Overview – Team Fitness Report</td>
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<td>Workout Compliance Report</td>
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<td>Edit A Group Summary Report</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview – Individual Fitness Report

### Fitness Parameters

<table>
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<th>VO2 max</th>
<th>%VO2 max@AT</th>
<th>HRmax</th>
<th>HR@AT</th>
<th>HR@AT as %HRmax</th>
<th>BR@AT</th>
<th>HR Recovery 30sec</th>
<th>HRmin Standing</th>
<th>HRmin Resting</th>
<th>BRmin Resting</th>
<th>HRV@Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Demo Subject 1**
  - Scaled Subject %
  - Scaled Norm %
  - Min
  - Max
  - Subject
  - Normative

- **Description**
  - VO2Max; normative value = 62.96; subject value = 55.00 (mL/kg/min)
  - % VO2Max @ AT; normative value = 80.00; subject value = 85.00 (% of VO2Max)
  - HR@AT as % of HRMax
    - Heart Rate Max; normative value = 196.00; subject value = 172.00 (beats/minute)
  - HR@AT
    - HR @ AT as % of HRMax
    - Heart Rate Recovery; normative value = 10.00; subject value = 15.00 (beats/minute)
  - Min Heart Rate Standing
    - Min Heart Rate Standing; normative value = 60.80; subject value = 75.00 (beats/minute)
  - Min Heart Rate Resting
    - Min Heart Rate Resting; normative value = 50.80; subject value = 55.00 (beats/minute)
  - HRV@Rest; normative value = 110.00 (beats/minute)

- **Available Comparison Data:**
  - Fire Fighters
  - Military Special Forces
  - Elite Soccer Players (Male 17 – 20)
  - College Basket Ball (Female)

- Fitness Reports depend on fitness parameters *already held in the OmniSense database* for each subject.
- These may have been entered manually or populated automatically through Fitness Test analysis on a maximal fitness test session recorded using OmniSense Live (see module *Baseline Fitness Testing*).
- Reports can be printed or exported as an Excel Spreadsheet.
Create Individual Fitness Report

1. Select Fitness Report Tab, Check Individual Person

2. Use Select Normative to browse to normative .xls files. These can be copied and customized to suit.

3. Select desired subject from the list

4. Select Chart to display the report. Scroll down for radar plot. Use to export to an external file.

- Normative files represent optimal fitness data for comparison in the table and radar plots
- Any fitness parameters which have no value for the selected subject are omitted from the report, but the initial table displayed may be edited before selecting the button, if values are known for missing parameters.
As for individual reports, data is based on values already existing in the database.

Fitness Level on a 1 – 10 scale is established using an algorithm which uses VO₂ max, HR@AT and HRR as inputs.

The polygon on the radar plots represent the group average value for each parameter. It shows individual performance against the group normative.
PSM Training Modules

Create Team Fitness Report

1. Select Fitness Report Tab, Check *Team*

2. Select Team from pull down list

3. Use Select Team button to populate table

4. Select *Chart* to display the multi-tab report. Use [export] to export to an external file.

- Any fitness parameters which have no value for the selected subject are omitted from the report, but the initial table displayed may be edited before selecting the *Chart* button, if values are known for missing parameters.
- Use the tabs below the display in Analysis or the exported spreadsheet to select Session Summary or Individual reports.
The Group Consolidated Summary is the super-set of all data.
Other reports are subsets of this data, for more specific analysis
Once exported as an Excel spreadsheet, reports can be edited, and unwanted parameters removed from tables and radar plots.

All reports feature a Session Summary as well as individual tables and radar plots for each subject.
# PSM Training Modules

## Report Parameters

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<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Time</td>
<td>Start time of session</td>
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<tr>
<td>Duration</td>
<td>Duration of session</td>
<td>Total Calories burned</td>
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<tr>
<td>%Time &gt;85%HRmax</td>
<td>% Time above 85%</td>
<td>Physiological Load/Intensity</td>
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<tr>
<td>%Time 65-84%HRmax</td>
<td>% Time above 85%</td>
<td>Mechanical Load/Intensity</td>
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<td>% Time below 64%</td>
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<td>%Time above HR at Anaerobic Threshold</td>
<td>Time in Workout Zones</td>
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<td>%Time below HR at Anaerobic Threshold</td>
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<td>Average HRR</td>
<td>Average heart rate recovery (30sec)</td>
<td>Elevation Descent</td>
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<td>Max HRR</td>
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<td>Total Distance</td>
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<tr>
<td>Average Core Temp</td>
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<td>Total distance travelled</td>
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</tbody>
</table>

**Physiological Summary Report**

**Periodization Report**

**Workout Compliance Report**

**Summary GPS Report**

[Back to Main Index]
The **SIGNIFICANTLY LOW** and **SIGNIFICANTLY HIGH** thresholds are one standard deviation above and below the average value for the group.

- Any green cell value is within one standard deviation of the group average.
- Any orange cell value is less than one standard deviation below the group average.
- Any red cell is more than one standard deviation above the group average.
Create A Group Summary Report

1. Select Training Reports Tab

2. Use filters to populate Select Session panel with desired subjects & sessions.
   * Right-click a session and select Copy Sessions To > Training Reports to populate the report panel.

3. Select Generate > Group Consolidated Summary
   Uncheck in table to remove session from final report

4. View the multi-tab report, or use the icon to export as a spreadsheet for editing.

- The Group Consolidated Report shows all available parameters (physiological, training, workouts & GPS) available from the database.
- *Individual sessions can be dragged from the Select Session panel to the Training Reports Panel
PSM Training Modules

Edit A Group Summary Report

The default Consolidated report contains all parameters supplied by the BioModule and OmniSense Analysis.

Export the report to a spreadsheet and edit (delete columns) to remove unwanted parameters.

Remove any unnecessary columns in a subject tab to customize your report.

The sessions shown have no GPS data in the Subject tab, selected in blue.

Delete the selected columns to simplify the subject radar plots.

Right-click a spreadsheet tab and select Select All Sheets to delete from all simultaneously.

Subject radar plot with unwanted GPS segment

Simplified radar plot with GPS data removed

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The Periodization Report shows load & intensity parameters only (Physiological, Mechanical & Training).

*Individual sessions can be dragged from the Select Session panel to the Training Reports Panel.

Parameters are shown in table and bar chart format.

1. Select Training Reports Tab

2. Use filters to populate Select Session panel with desired subjects & sessions.

   *Right-click a session and select Copy Sessions To > Training Reports to populate the report panel.

3. Select Generate > Periodization Report

   Uncheck in table to remove session from final report

4. View the multi-tab report, or use the icon to export as a spreadsheet for editing.
• Report designed for use with Workout Sessions, selected in OmniSense Live
• In the Session Summary tab, sessions are grouped by Session Name
• Individual Subject tabs show the calendar progression of a subject’s workout levels.
PSM Training Modules

Create A Summary GPS Report

1. Select Training Reports Tab

2. Use filters to populate Select Session panel with desired subjects & sessions.

   *Right-click a session and select Copy Sessions To > Training Reports to populate the report panel.

3. Select Generate > Summary GPS Report

   Uncheck in table to remove session from final report

4. View the multi-tab report, or use the icon to export as a spreadsheet for editing.

- The Summary Report shows speed, distance & elevation parameters only.
- *Individual sessions can be dragged from the Select Session panel to the Training Reports Panel.
- Session Summary is table only. Subject tabs show table and a radar plot comparing individual vs group average data.
PSM Training Modules

Summary GPS Report

Session Summary

Individual Subject Tabs:
Each session itemised

Speed Zones are configured in
OmniSense Live > Preferences

Subject radar plots show
individual data (red line) vs group average
(blue polygon)
Create A Summary Physiological Report

1. Select Training Reports Tab

2. Use filters to populate Select Session panel with desired subjects & sessions.
   *Right-click a session and select Copy Sessions To > Training Reports to populate the report panel.

3. Select Generate > Summary Physiological Report
   Uncheck in table to remove session from final report

4. View the multi-tab report, or use the icon to export as a spreadsheet for editing.

- The Summary Physiological Report shows HR-related, temperature and calories parameters only.
- *Individual sessions can be dragged from the Select Session panel to the Training Reports Panel.
- Session Summary is table only. Subject tabs show table and a radar plot comparing individual vs group average data.
The displayed parameters are a subset of those displayed in the Consolidated Report, and relate to:

- Time in the zones delimited by 65% and 85% of HR_{max}
- Time above and below HR @ AT
- Peak & Average HR
- Peak and Average HRV
- Peak & Average HRR
- Peak & Average Est. Core Temp.
- Total Calories burned

Note that all of the above parameters are HR-determined.
• Workout Compliance Report shows Intensity and Loading parameters, as well as time in Workout Zones configured in OmniSense Live.
• *Individual sessions can be dragged from the Select Session panel to the Training Reports Panel.
• Session Summary is table only. Subject tabs show table and a radar plot comparing individual vs group average data.
Load & Intensity Parameters are the same as the Periodization Report, with additional Time in Training Zones, set in Live:

- **Red:** High intensity
- **Orange:** Anaerobic
- **Yellow:** Zone Gap
- **Green:** Aerobic
- **Blue:** Recovery

Zone limits are % of HRmax or %HR@AT

Subject radar plots show individual data (red line) vs group average (blue polygon)
## Fitness Considerations

<table>
<thead>
<tr>
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<th>Title</th>
<th>Slide</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>59</td>
<td>Physiological Intensity &amp; Load</td>
<td>66</td>
<td>Recovery &amp; Fatigue</td>
</tr>
<tr>
<td>60</td>
<td>Mechanical Intensity &amp; Load</td>
<td>67</td>
<td>Safety &amp; Core Temperature</td>
</tr>
<tr>
<td>61</td>
<td>Physiological, Mechanical &amp; Training Intensity and Load</td>
<td>68</td>
<td>Safety &amp; Core Temperature</td>
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<td>Physiological vs Mechanical Intensity</td>
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<td>Physiological vs Mechanical Load</td>
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<td>65</td>
<td>Recovery &amp; Fatigue</td>
<td>72</td>
<td>$HR_{avg}$ and HRR Indicating Stress &amp; Anxiety</td>
</tr>
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</table>

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Physiological Intensity & Load

Intensity 10 = 100% HR_{max}
Intensity 1 = 50% HR_{max}

Linear scaling in between
Calculated once per second
Below 50% HR_{max}, Intensity = 0

Physiological Load = (Sum of Physiological Intensities) / 60
[Divide by 60 as Intensity is measured in 1/60 minute epochs]
Load increases continuously during a session: longer session = higher load

- Physiological Intensity is measured on a scale of 1 – 10, related to subject maximum heart rate. Below 50% HR_{max}, P.I. = 0
- Physiological Load is the total sum of physiological intensities, divided by 60
- Average Physiological Intensity per session = Physiological Load / Session time in minutes
Mechanical Intensity & Load

Intensity 10 = 3.0 g
Intensity 1 = 0.5 g

Linear scaling in between
Calculated once per second
Below 0.5, Intensity = 0

Mechanical Load = (Sum of Mechanical Intensities) / 60
[Divide by 60 as Intensity is measured in 1/60 minute epochs]

Load increases continuously during a session: longer session = higher load

- Mechanical Intensity is measured on a scale of 1 – 10, related to subject Activity Level. Below 0.5 g, M.I. = 0
- Mechanical Load is the total sum of mechanical intensities, divided by 60
- Average Mechanical Intensity per session = Mechanical Load / Session time in minutes
# PSM Training Modules

## Physiological, Mechanical & Training Intensity and Load

<table>
<thead>
<tr>
<th></th>
<th>Intensity</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physiological</td>
<td>Cumulative effort of the cardiovascular system</td>
</tr>
<tr>
<td></td>
<td>An index of cardiovascular output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td>Cumulative effort of the musculoskeletal system</td>
</tr>
<tr>
<td></td>
<td>An index of musculoskeletal output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td>Average of Physiological + Mechanical Loads</td>
</tr>
<tr>
<td></td>
<td>Average of Physiological + Mechanical Intensities</td>
<td>Total cumulative effort of the body</td>
</tr>
<tr>
<td></td>
<td>An index of combined output</td>
<td></td>
</tr>
</tbody>
</table>

- Aerobic, plyometric and similar training will have a high physiological intensity.

- Weight and other relatively static training methods will have a lower mechanical intensity, as measured by the BioModule, whose accelerometers are measuring whole body movement.
Physiological vs Mechanical Intensity

- High average Mechanical Intensity with low relative Physiological Intensity is a good indicator of efficiency and useful when comparing multiple people doing similar activities.

- For example, Subject D (brown) has Physiological Intensity 4.6 and Mechanical Intensity 5.5 for the session. This subject is more efficient than subject B (blue, left) whose Physiological Intensity is 7.1 and Mechanical Intensity of 3.7.

- Subject D’s heart is working less hard, for more mechanical results, than subject B’s (or A or G) is.
PSM Training Modules

Physiological vs Mechanical Load

- Load is the summation (or area under the curve) of the corresponding intensity value plotted over time
- It provides a measure of the overall conditioning value or impact of the session
- High physiological load with low mechanical load can be an indicator of anxiety or inefficiency – assuming the session involves running or movement. Subjects B and G (both blue) show this possible indication.

Left Axis
- Physiological Load

Right Axis
- Mechanical Load
Training Load & Intensity provide a metric that is a combination of the physiological and Mechanical components for the most simplified summary of overall training value & impact of the workout session.
Recovery & Fatigue

- HRR 30 recordings are triggered when an athlete has exceeded an activity threshold and HR threshold for a set period of time, and then become inactive for 30 seconds to take a recovery measurement.

- Blue Subject 5 rarely stopped long enough for an HRR 30 recovery measurement to be taken.

- Red subject 6 HRR30 trend line shows only a very slight fatigue slope (recovery becomes slightly less as the session proceeds), which indicates that the subject is well conditioned and not pushed to fatigue. A steeper trend line may indicate the onset of fatigue.
In the second half of this session, less recovery time was allowed, so automatic HRR 30 calculations are less frequent.
• This plot shows the subject Heart Rate % (& of Maximum Heart Rate) and Estimated Core Temperature over time.

• At the end of the session the vertical cursor location shows his core temperature reached a max of 102.56 which is at the low end of potential heat stress.

• Beyond 103 to 104, there would be safety concerns.
• The subject’s temperature never reached an alarming level (Max 101.3) because he was able to recover periodically.
PSM Training Modules

Time in HR Zones

- This Summary Variable shows the time spent from 0 – 64% HR_{max} (green), 65 – 85% (orange) and 85 – 100% (red).

- Maximum heart rate should be measured along with other fitness parameters and calibrated in the software by running through a fitness test as described in the Baseline Fitness Testing module.

- Subject 5 is included twice (bar B and bar G). Bar G is the log data imported later from his BioModule, with post session recovery data removed. You can do this by creating a subsession, described in the Analysis Graph Options module.
This graph shows a measure of calories burned and total session duration, which can be useful in figuring dietary replenishment needs.
Physiological Strain & Stress Indicators

• Estimated Core Temperature (Max) and Heart Rate Variability (Avg) can both be interpreted as measures of physiological strain.

• A low HRV is an indication of stress, fatigue and dehydration, and also relates to heat stress.

• Elevated Core Temperature (estimated) is also an indication of heat stress and should be monitored carefully on a hot intense practice session.
HR\textsubscript{avg} and HRR Indicating Stress & Anxiety

- Summary graph of average heart rate recovery in 30 seconds (drop in beats per minute after stopping an ‘interval’ of high intensity activity), against average heart rate for the session.

- A low average recovery value indicates either a high level of anxiety, as in for bar B, and could also indicate a lower level of fitness in other cases.
# PSM Training Modules

## Impacts

<table>
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<th>Slide</th>
<th>Title</th>
</tr>
</thead>
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<td>Types of Impulse</td>
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<td>Impact Zones of Severity</td>
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<td>Accelerometer Data</td>
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<td>Impact Report - Summary</td>
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<td>77</td>
<td>Time &amp; Summary Values</td>
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<td>Impact Report – Impulse Data Lines</td>
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<td>Impact Report – Accelerometry Streaming</td>
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<tr>
<td>79</td>
<td>Download Logs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PSM Training Modules

Accelerometry Overview

- Analysis of Accelerometer data is available in two components:

An Impact AccelPro report generated by the Impact Processor Tool

Time and Summary Variables in Analysis
• The Zephyr BioModule samples X/Y/Z accelerometer data at 100 Hz and performs on-board analysis. An Impulse is any event which results in a signature in the accelerometer data.

• Zephyr proprietary algorithms can analyze the signature of each impulse and classify it. The two major categories are:
  • An Impact resulting from a collision between the subject and an object (including the ground) or another subject
    • Impacts are classified into Zones of Severity, dependent on the Peak Accelerometer Magnitude value detected during the impulse
  • A Step – forces detected by the BioModule resulting from voluntary movement of the subject
    • Categorized into walking, bounding and running steps
    • Jumps, having a recognized takeoff and landing

• The algorithms analyze magnitude, duration and direction of each impulse. They calculate the intervals between successive impulses in order to characterize their type

• Some parameters e.g. Step Period are averaged over the 10 previous detected Step impulses
Accelerometer Data

• All* accelerometer-based data (step count, etc etc) is reported once per 1 / 2.5 / 5 seconds**, but is based on analysis of data sampled at 100Hz – transmitted at 50Hz, logged at 100Hz.

100 Hz X / Y / Z accelerometer data of an impulse signature (a jump)

Peak Acceleration and Activity level for the same event. Values are calculated for each 1 – second epoch from the 100 Hz data.

• Except the Accelerometry parameter. This data is activated in Live in the Accel side panel. The button activates the Accelerometer data packet to transmit X/Y/Z data for the selected BioModule

** Dependent upon ECHO mode setting in OmniSense Live
As of OmniSense 4.0, BioModule Firmware version 1.4.12.0 now performs on-board accelerometer analysis, and new accelerometer parameters are available both in the Live BioGauge and directly in Analysis without the need to create an impact report.
AccelPro Impact Report

- The Report uses BioModule Log data, which must first be generated using the Zephyr Downloader in the Analysis module.
- The BioModule must be configured to log in **Summary & Waveform** or **Enhanced Summary & Waveform** format to record 100Hz accelerometer data.

- Use the Zephyr Config Tool > User Config tab to set logging to **Summary & Waveform** or **Enhanced Summary & Waveform**.
- The Tool is located at **Windows Start > All Programs > Zephyr > OmniSense > Tools**.
**PSM Training Modules**

**Download Logs**

- Log data must be downloaded by the Zephyr Downloader, and an external csv accelerometer file generated. The Impact Processor Tool uses the external file for its analysis.

Start Downloader from the Analysis toolbar

- When downloading logs, make sure that the *Write CSV Format Log Files* option is checked in the Options menu.
Impact Report Tool

• The Impact Report Tool scans ../My Documents/BioHarness Test Logs/.. for *_accel.csv files generated by the Zephyr Downloader.

Start Impact Processor from Analysis Toolbar

Select Process for the required files

• Only _accel.csv files not yet processed will show on the Impact Processor dialogue.
• The Impact Processor generates a Session_Name/YYYY_MM_DD_hh_mm_ss_AccelPro file in the same location as the original.
• Zones of Severity in the Report are configurable, and set in Processor Edit > Preferences dialogue
• Set the Impact Zone ranges specific to your activity
• Impact Peak g values below the configured Impact Baseline Limit will be ignored
• Report divides impulse events into Impacts (top) and Steps (below)
  • Impacts are classified into Zones, defined on previous page
    • Zone count and Impulse Load are given for each zone, and a total for all impacts
  • Steps are categorized by type
    • Count, Total Peak G load & Impulse Load are given for each step type

• Total count of all impulses (Impacts + Steps), total Peak g Load and Total Impulse load are given for all impulses (in black)
Detailed data is displayed for each detected impulse.

- **Time of Peak** – a hyperlink to the Streamed Data
- **Peak Magnitude in g**
- **Duration** – will determine how many lines highlight in the streamed data
- **Rise & Fall times**
- **30ms (before the peak) rate of Force Development**
- **Time since last impulse**
- **Classification (Impact or Step)**
- **Type (Impact Zone or step type)**
- **Orientation – direction of impact (from above, below etc)**
**Impact Report – Accelerometry Stream**

<table>
<thead>
<tr>
<th></th>
<th>Time of Peak</th>
<th>Instant Rate of Force Development</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Accelerometer Magnitude</td>
<td>Impulse Load N s</td>
</tr>
<tr>
<td></td>
<td>Phi &amp; Theta – vertical &amp; horizontal impact angles</td>
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</table>

<table>
<thead>
<tr>
<th>1</th>
<th>Time</th>
<th>Vertical g</th>
<th>Lateral g</th>
<th>Sagittal g</th>
<th>Magnitude g</th>
<th>Phi</th>
<th>Theta</th>
<th>Instant Rate of Force N/s</th>
<th>Impulse Load N s</th>
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- Hyperlinks in the 1\textsuperscript{st} column of the Data Lines tab locate the corresponding event in the 100Hz X/Y/Z streamed data.
## PSM Training Modules

### Readiness

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<th>Overview</th>
<th>Slide</th>
<th>Display Readiness Data</th>
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<td>88</td>
<td>Readiness Survey</td>
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<td></td>
</tr>
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Readiness is measured on a 0 – 10 scale. 10 = optimal readiness
Subjects perform an orthostatic hypotension test to establish resting HR and HRV, and standing HR
Subjects complete a subjective survey, rating a number of factors on 1-10 scales (Factor weightings can be set in Preferences)
A Zephyr proprietary algorithm calculates a Readiness estimate
Readiness History can be imported and displayed
A future implementation will include an Android application to allow users to take an orthostatic test and complete a survey at home, with results emailed automatically to a data coordinator.
Orthostatic Hypotension Test

- Orthostatic Test – subject lies down in a comfortable quiet location for 9 minutes, then stands for 1 minute. Record results in Live, or log data on BioModule and import to Analysis.

- Import the session data into the legend, select the Readiness toolbar button, then the detect button to analyze and detect resting HR & HRV, and standing HRV. Place the graph vertical cursor in required location and use manual buttons to update detected values if necessary.

- Select the survey button to display the survey dialogue
Readiness Survey

- Use the button to display the dialogue
- Result from the current orthostatic test are already populated
- Orthostatic tension value = change in HR from resting to standing
- Complete the survey and answer on a subjective 1 – 10 scale

<table>
<thead>
<tr>
<th>Survey</th>
<th></th>
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<tbody>
<tr>
<td>Training Load</td>
<td>Average in previous 10 days on 1 – 10 scale</td>
</tr>
<tr>
<td>Training Intensity</td>
<td>Average in previous 10 days on 1 – 10 scale</td>
</tr>
<tr>
<td>Sleep Quality</td>
<td>0 – 10 subjective or scaled based on an external 3rd party system</td>
</tr>
<tr>
<td>Overall Stress</td>
<td>0 = no stress, 10 = completely stressful</td>
</tr>
<tr>
<td>Current stress</td>
<td>0 = no stress, 10 = completely stressful</td>
</tr>
<tr>
<td>Eating Habits</td>
<td>0 = poor, 10 = optimal</td>
</tr>
<tr>
<td>Hydration</td>
<td>0 = dehydrated, 10 = hydrated</td>
</tr>
<tr>
<td>Injury</td>
<td>0 = unable to perform, 10 = no injury</td>
</tr>
</tbody>
</table>

- Individual weighting scaling factors can be customized in the Analysis > Preferences > Readiness dialogue
PSM Training Modules

Display Readiness History

1. Select a date range in the Filter Session List. (This can be adjusted later)

2. Populate the Legend with a session – (any session will suffice to trigger data display)

3. Selected desired parameters from Readiness pane

4. Readiness History will display

- Readiness history and parameters are displayed in the Readiness panel, accessed by the Readiness button on the toolbar
Import of external readiness data is intended to support an Android application which will be available for a future implementation. Subjects will perform an orthostatic test a and complete a survey at home, and results will be emailed to a desired recipient. This receiver updates the subject history file manually. A file template will be provided by Zephyr for this purpose. It will be a .csv file, editable in Microsoft® Excel.

1. Select the Import History button
2. Select a subject
3. Browse and locate the external .csv file containing history. A template will be provided by Zephyr for recording data.
4. Confirm the records to be imported. Records, once imported, remain in the OmniSense database. The external file can be updated at any time.
## Fitness Test Analysis

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PSM Training Modules

Overview

- OmniSense can perform automatic and manual analysis of ramped maximal fitness tests to establish and save fitness parameters to the database:
  - $HR_{\text{max}}$, $HR @ AT$, HRR, $VO_2\text{max}$, $BR @ AT$, $%VO_2\text{max} @ AT$, Fitness Level
• Load the Fitness test analysis into the legend and select *Treadmill Test* or *Beep Test* from the Assessments list.

• Use the **Detect** button – OmniSense will attempt to determine the AT threshold, maximum HR and HRR 30-second value. These will be displayed on the graph.

• If automatical analysis cannot detect these values, or they need to be adjusted, then set the points manually, as shown on the next slide.
• Position the graph vertical cursor on the start and end of the test, perceived AT threshold and Max HR points successively, and use the Start, End, AT, and HRR buttons to mark the relevant parameters, or relocate those obtained automatically.
Manual AT Estimation

Automatic detection has wrongly placed the AT threshold at the 56% VO_{2}max level.

The eye can perceive a trend in the BR (thick red) data – a slowly increasing rate, followed by a more rapidly increasing rate.

The blue lines show the trends.

AT should be placed where they intersect.

AI alternative method is to look for the major upswing in BR which raises it above 40 bpm (horizontal blue) and keeps it there.

The blue circle marks the major inflection which finally pushes BR above 40 bpm.
Session Detail:
• AT, HR$_{\text{max}}$ and HRR markers will be saved with the session, and will always display when the test results are re-displayed

Subject Data:
• Details will be saved into the OmniSense Database
• Max values saved will be reflected in 100% deflection on subject BioGuage in Live
• VO$_2$$_{\text{max}}$ will be displayed in Fitness Reports
## Software Utilities

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Locate OmniSense Tools

A number of tools are installed with OmniSense, located at C:\Program Files (x86)\Zephyr\OmniSense\Tools

Tools accessed from OmniSense Analysis Toolbar

- BioHarness Log Downloader – Manually display/download logs from a single BioModule.
- Zephyr Downloader – auto-download logs from multiple BioModules.
- Zephyr Impact Processor – Analysis Accelerometer data from BioModules.

Tools accessed directly from this folder

- ISM Configuration – legacy tool for configuring ISM BioModules, which are now discontinued.
- Zephyr Config Tool – for manual configuration of one or more BioModules.
- Zephyr USB Updater – update firmware of one or more BioModules.
OmniSense Analysis Tools

These tools are accessed directly or indirectly from the OmniSense Analysis Toolbar.

**Zephyr Downloader**
- Import Log Files from Multiple BioModules
  - Wizard or manual workflow
  - Import to database
  - Export to External files

**BioHarness Log Downloader**
- Import Log Files from a single BioModule
  - Manual log selection
  - Display all logs in device
  - Import to database
  - Export to External files

**Impact Analysis Tool**
- Generate Analysis Reports from selected BioModule Log Files

See Module Analysis – Log Data

See Module Analysis – Log Data

See Module Analysis – Impacts
PSM Training Modules

Standalone Tools

These tools are accessed directly or indirectly OmniSense > Tools directory.

- **ISM Configuration.exe**
- **Zephyr Config Tool.exe**
- **ZUSBUpdater.exe**

**Legacy Tool for configuring ISM BioModules.**

**Manually Configure BioModule(s):**
- Bluetooth & ECHO Connectivity
- GPS Pairing
- Set subject parameters
- Logging Modes
- Internal clock time
- Accelerometer mapping for garment type
- ECHO settings

**Manually Configure BioModule(s):**
- Update firmware version
Zephyr Config Tool

These tools are accessed directly or indirectly from the OmniSense > Tools directory.

- Enter a name or select a previous name from pulldown. This updates a log .csv file at C:\ProgramData\Zephyr

- Connect BioModules in cradle or case to PC.

- Manually change BioModule settings with care. Changing some settings may cause the device to stop working or give invalid data.
- A PSM ECHO system resets some BioModule settings over-the-air on start-up. This may cause some manual settings (e.g. GPS address & device clock time) to be overwritten.
The Config Tool display will vary, depending on how many BioModules are connected.

**Single device connected**
- Select device by checkbox
- Both sides of Config Tool fully populated

**Multiple devices connected**
- Properties listed separately for each BioModule
- To edit a property on the left, deselect all BioModules except that to be edited.
- Properties common to each BioModule connected
PSM Training Modules

Config – Read Only Data

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot Software Version</td>
<td>Not user updateable</td>
</tr>
<tr>
<td>App Software Version</td>
<td>Device firmware – can be updated with ZUSBUpdater</td>
</tr>
<tr>
<td>RF Module Firmware</td>
<td>Not user updateable</td>
</tr>
<tr>
<td>Serial &amp; Part Nos.</td>
<td>Zephyr internal part numbers</td>
</tr>
<tr>
<td>Unit MAC Address</td>
<td>Bluetooth Address</td>
</tr>
<tr>
<td>Bluetooth Name</td>
<td>Name when detected over Bluetooth</td>
</tr>
<tr>
<td>Date/Time</td>
<td>Internal device time – does not update in real time</td>
</tr>
<tr>
<td>Battery Status</td>
<td>4.2V = 100%, 3.6V = 0%</td>
</tr>
<tr>
<td>Delete Log Files</td>
<td>Delete all logs in device</td>
</tr>
<tr>
<td>Reset To Factory Defaults</td>
<td>Reset all parameters</td>
</tr>
<tr>
<td>Save, Load Template</td>
<td>Use templates for rapid configuration of multiple devices with the same settings.</td>
</tr>
</tbody>
</table>
### Config – Bluetooth

#### Network ID
Device ID when detected over Bluetooth

#### Discoverable
Make device discoverable or ‘hide’ from BT detection

#### Connectable
Enable Bluetooth Connectivity

#### LE Connectable
Enable Bluetooth Low Energy Connectivity, if device supports it.

#### Link Timeout, Lifesign Period
Default settings will ensure BioModule never terminates BT connection

#### BioHarness
Not used to configure BioModule

#### BT Access Point #
Legacy Settings for older BT access Point systems (out of production)

#### Apple iOS Device
Not Implemented

#### GPS Device
For Manual Pairing with GPS. This is normally configured automatically over ECHO.

#### Named Bluetooth Device To Call
Not used in PSM ECHO systems
PSM Training Modules

Config – Polling / Subject Info

- Polling Tab is not used for PSM ECHO systems
- Subject Info Parameters are used to configure various parameters in the Subject Status algorithms. They are populated over-the-air by an ECHO system and should not be edited manually
# PSM Training Modules

## Config – User Config

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Enable</td>
<td>Enable Logging (checked by default)</td>
</tr>
<tr>
<td>Bluetooth Enable</td>
<td>Enable Bluetooth transmit</td>
</tr>
<tr>
<td>ECHO Enable</td>
<td>Enable ECHO transmit</td>
</tr>
<tr>
<td>ECG Polarity Invert</td>
<td>Invert the ECG waveform</td>
</tr>
<tr>
<td>Visual Feedback Enable</td>
<td>If unchecked, all LEDs turn off after 30 seconds</td>
</tr>
<tr>
<td>Event Mode Enable</td>
<td>For non-PSM systems</td>
</tr>
<tr>
<td>Log Format</td>
<td>General / +ECG / +Accelerometer – legacy log formats for BioModule 2.0</td>
</tr>
<tr>
<td></td>
<td>Summary / + Waveform / + Development for BioModule 3.0 – default Summary,</td>
</tr>
<tr>
<td></td>
<td>Summary + Waveform required for GPS logging</td>
</tr>
<tr>
<td>Update Configuration</td>
<td>Save any updated settings</td>
</tr>
</tbody>
</table>
Config – Time

BioModule clocks are automatically set to local PC time under two conditions:

- On Startup of OmniSense Live in a PSM ECHO system
- When the device logs are read by the Zephyr Downloader in OmniSense Analysis (this can be turned off in the Downloader options menu)

If a BioModule is used directly in logging mode after being powered off, resynchronize the clock manually using the Config Tool, or by using OmniSense Live in ECHO mode, otherwise there maybe an offset of more than 1 second from real time.
Config – Accelerometer

Calibration presets allow a BioModule to be reconfigured for a different garment type, which may have a different device orientation.

- BioModule Axis orientation is described in the BioModule Data Sheet.
- The inv option was designed to allow flexibility for future garment designs.

<table>
<thead>
<tr>
<th>Presets</th>
<th>Set to required garment type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Mapping</td>
<td>Use to commit a new settings</td>
</tr>
<tr>
<td>Calibrate Accelerometer</td>
<td>Use to zero-reset accelerometer orientation. See warning below.</td>
</tr>
</tbody>
</table>

Device accelerometers are factory calibrated and should *never* normally require recalibration. Recalibrating may create an offset in device orientation. It should only be attempted on a calibrated horizontal surface. Device should be reset to factory defaults on left panel of Config Tool first.
PSM Training Modules

Config – ECHO

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Transceiver Address</td>
<td>Should be different for each BioModule in a PSM system. Assigned on shipment.</td>
</tr>
<tr>
<td>RF Channel</td>
<td>Must be same as ECHO Gateway and all repeaters. Do not change.</td>
</tr>
<tr>
<td>RF Power Level</td>
<td>Set to 19 (maximum)</td>
</tr>
<tr>
<td>Max Repeaters</td>
<td>Set to 4</td>
</tr>
<tr>
<td>Max Repeats</td>
<td>Set to 1</td>
</tr>
<tr>
<td>Alerts</td>
<td>Disabled (not for PSM systems)</td>
</tr>
<tr>
<td>Config File Panel</td>
<td>Used by Zephyr before shipping a PSM system to generate a config file to allow new users to add large numbers of BioModules to their database, without having to add each BioModule individually.</td>
</tr>
</tbody>
</table>

No two BioModules in a PSM system should have the same Short Transceiver Address, otherwise a conflict may occur. No data, or the wrong data, may be received from either device.
ZUSBUpdater Tool

This tool is accessed directly from the OmniSense > Tools directory.

Connect BioModules in cradle or case to PC.

Enter a name or select a previous name from pulldown. This updates a log .csv file at C:\ProgramData\Zephyr

Firmware version in device

Detected BioModules

Browse to locate firmware image file

Confirm you have the correct firmware version for your device. In some instances the wrong firmware may be loaded, and the device will not work in your system, until the correct version is loaded.

The _1G, _2G and _3G suffixes in firmware image file names refer to different versions of the BioModule.
Update Firmware

This tool is accessed directly from the OmniSense > Tools directory.

1. Browse your computer to locate the correct firmware image file (type *.img).
2. Check the boxes for those devices to be updated.
3. Click Start – red & green LEDs will flash while firmware is updating.
4. Retry if not successful first time.

Red & Green LEDs flash while firmware is updating.