

Opal V2R* Sensor System

Product Guide

***Research Use Only**

Software Applications:

Motion Studio

Base software for raw inertial data and sensor orientation

Mobility Lab

Active and Passive movement assessments

Moveo Explorer

Joint angle estimate enhancement to Mobility Lab

Table of Contents

1.	Opal System Equipment and Hardware Setup.....	7
1.1	Opal System Equipment Available	7
1.2	Hardware Setup	9
1.3	Applying a Strap to an Opal Sensor	10
2.	Participant Visit Space Requirements and Setup.....	10
3.	Using the Opal System	12
3.1	Creating a Subject - Mobility Lab or Moveo Explorer	12
3.2	Hardware Configuration	13
3.2.1	Motion Studio	13
3.2.2	Mobility Lab or Moveo Explorer	15
3.3	Opal Sensor Placement - Mobility Lab and Moveo Explorer	16
3.4	Conducting and Recording Tests	18
3.4.1	Motion Studio – Synchronized Streaming.....	18
3.4.2	Motion Studio – Synchronized Logging, Low Power Logging, Passive	20
3.4.3	Active In-Clinic – Mobility Lab or Moveo Explorer	21
3.5	Power Off, Standby, Storage and Cleaning.....	24
3.5.1	Power Off	24
3.5.2	Standby	24
3.5.3	Storage.....	25
3.5.3.1	Instructions for Packing a 6 Opal System.....	25
3.5.4	Cleaning	27
4.	Opal Reports.....	27
4.1	In Software	27
4.1.1	Motion Studio – Managing Data	27
4.1.2	Mobility Lab or Moveo Explorer	28
4.1.2.1	Subjects – Test Summary and Test Results.....	28
4.2	Exports	29
4.2.1	Export Data – Mobility Lab and Moveo Explorer	29
4.2.1.1	Export Scope	29
4.2.1.2	Export Filtering Options	29
4.2.1.3	Export Options.....	30
5.	Opal and Access Point Screen Interface.....	32
5.1	Opal Screen Interface	32
5.2	Access Point Screen Interface	33
6.	Active Assessments Test Setup & Administration Instructions – Mobility Lab & Moveo Explorer	34
6.1	Sensor Placement.....	34
6.1.1	Left Wrist	34
6.1.1.1	Supplies.....	34
6.1.1.2	Test Setup Instructions.....	34
6.1.1.3	Instructions	34
6.1.2	Right Wrist.....	35
6.1.2.1	Supplies.....	35
6.1.2.2	Test Setup Instructions.....	35
6.1.2.3	Instructions	35
6.1.3	Left Foot	35
6.1.3.1	Supplies.....	35

6.1.3.2	Test Setup Instructions.....	36
6.1.3.3	Instructions.....	36
6.1.4	Right Foot.....	36
6.1.4.1	Supplies.....	36
6.1.4.2	Test Setup Instructions.....	36
6.1.4.3	Instructions.....	36
6.2	Gait Assessments.....	37
6.2.1	Walk (2-Minute).....	37
6.2.1.1	Supplies.....	37
6.2.1.2	Test Setup Instructions.....	37
6.2.1.3	Instructions.....	38
6.2.2	Walk (6-Minute).....	38
6.2.2.1	Supplies.....	38
6.2.2.2	Instructions.....	39
6.2.2.3	Test Setup Instructions.....	39
6.2.3	Walk (Open Ended).....	40
6.2.3.1	Supplies.....	40
6.2.3.2	Instructions.....	40
6.2.3.3	Test Setup Instructions.....	40
6.2.4	SAW (7m Walkway).....	40
6.2.4.1	Supplies.....	40
6.2.4.2	Instructions.....	40
6.2.4.3	Test Setup Instructions.....	41
6.3	Balance Assessments.....	41
6.3.1	Sway (Feet Apart, Eyes Closed, Firm Surface).....	41
6.3.1.1	Supplies.....	41
6.3.1.2	Instructions.....	42
6.3.1.3	Test Setup Instructions.....	42
6.3.2	Sway (Feet Apart, Eyes Closed, Foam Surface).....	43
6.3.2.1	Supplies.....	43
6.3.2.2	Test Setup Instructions.....	43
6.3.2.3	Instructions.....	43
6.3.3	Sway (Feet Apart, Eyes Open, Firm Surface).....	44
6.3.3.1	Supplies.....	44
6.3.3.2	Test Setup Instructions.....	44
6.3.3.3	Instructions.....	44
6.3.4	Sway (Feet Apart, Eyes Open, Foam Surface).....	45
6.3.4.1	Supplies.....	45
6.3.4.2	Test Setup Instructions.....	45
6.3.4.3	Instructions.....	45
6.3.5	Sway (Feet Together, Eyes Closed, Firm Surface).....	45
6.3.5.1	Supplies.....	45
6.3.5.2	Test Setup Instructions.....	46
6.3.5.3	Instructions.....	46
6.3.6	Sway (Feet Together, Eyes Open, Firm Surface).....	46
6.3.6.1	Supplies.....	46
6.3.6.2	Test Setup Instructions.....	47
6.3.6.3	Instructions.....	47

6.3.7	Sway (One Foot, Eyes Closed, Firm Surface).....	47
6.3.7.1	Supplies.....	47
6.3.7.2	Test Setup Instructions.....	47
6.3.7.3	Instructions.....	48
6.3.8	Sway (One Foot, Eyes Open, Firm Surface).....	48
6.3.8.1	Supplies.....	48
6.3.8.2	Test Setup Instructions.....	48
6.3.8.3	Instructions.....	49
6.3.9	Sway (Tandem Feet, Eyes Closed, Firm Surface).....	49
6.3.9.1	Supplies.....	49
6.3.9.2	Test Setup Instructions.....	49
6.3.9.3	Instructions.....	49
6.3.10	Sway (Tandem Feet, Eyes Open, Firm Surface).....	50
6.3.10.1	Supplies.....	50
6.3.10.2	Test Setup Instructions.....	50
6.3.10.3	Instructions.....	50
6.4	Additional Movement Assessments.....	51
6.4.1	Sit to Stand (5x).....	51
6.4.1.1	Supplies.....	51
6.4.1.2	Test Setup Instructions.....	51
6.4.1.3	Instructions.....	51
6.4.2	TUG (3m Walkway).....	52
6.4.2.1	Supplies.....	52
6.4.2.2	Test Setup Instructions.....	52
6.4.2.3	Instructions.....	53
6.4.3	360 Degree Turn (1x).....	53
6.4.3.1	Supplies.....	53
6.4.3.2	Test Setup Instructions.....	53
6.4.3.3	Instructions.....	54
6.5	Tremor Assessments.....	54
6.5.1	Tremor (Postural – Arms Forward).....	54
6.5.1.1	Supplies.....	54
6.5.1.2	Test Setup Instructions.....	54
6.5.1.3	Instructions.....	55
6.5.2	Tremor (Postural – Arms Lateral).....	55
6.5.2.1	Supplies.....	55
6.5.2.2	Test Setup Instructions.....	55
6.5.2.3	Instructions.....	55
6.5.3	Tremor (Resting).....	56
6.5.3.1	Supplies.....	56
6.5.3.2	Test Setup Instructions.....	56
6.5.3.3	Instructions.....	56
6.6	Bradykinesia Assessments.....	57
6.6.1	Hand Pronation-Supination (Left).....	57
6.6.1.1	Supplies.....	57
6.6.1.2	Test Setup Instructions.....	57
6.6.1.3	Instructions.....	57
6.6.2	Hand Pronation-Supination (Right).....	58

6.6.2.1	Supplies.....	58
6.6.2.2	Test Setup Instructions.....	58
6.6.2.3	Instructions.....	58
6.6.3	Heel Tapping (Left).....	59
6.6.3.1	Supplies.....	59
6.6.3.2	Test Setup Instructions.....	59
6.6.3.3	Instructions.....	59
6.6.4	Heel Tapping (Right).....	60
6.6.4.1	Supplies.....	60
6.6.4.2	Test Setup Instructions.....	60
6.6.4.3	Instructions.....	60
6.6.5	Toe Tapping (Left).....	61
6.6.5.1	Supplies.....	61
6.6.5.2	Test Setup Instructions.....	61
6.6.5.3	Instructions.....	61
6.6.6	Toe Tapping (Right).....	62
6.6.6.1	Supplies.....	62
6.6.6.2	Test Setup Instructions.....	62
6.6.6.3	Instructions.....	62
6.6.7	Fast Alternating Hand (Left).....	63
6.6.7.1	Supplies.....	63
6.6.7.2	Test Setup Instructions.....	63
6.6.7.3	Instructions.....	63
6.6.8	Fast Alternating Hand (Right).....	64
6.6.8.1	Supplies.....	64
6.6.8.2	Test Setup Instructions.....	64
6.6.8.3	Instructions.....	64
7.	Metrics / Endpoint Data and Definitions.....	65
7.1	Active In-Clinic or Active Remote.....	65
7.2	Joint Angle – Moveo Explorer.....	71
7.3	Passive Actigraphy.....	74
7.4	Passive Lumbar.....	78
8.	Product Information - Opal V2R System.....	80

Pre-Visit Checklist

Active In-Clinic and Active Remote

Item	Action	Description
1	Set up Mobility Lab or Moveo Explorer System & Charge Opal Sensors	Charge Opal battery for 2-3 hours prior to participant site visit. For Active Movement Assessment use, battery lasts ~ 12 hours.
2	Confirm Test Set-Up Requirements	For example: Clear Walkway (minimum 7m with additional 1m buffer on both ends – up to 30m long for 6MWT).
3	Collect Items Needed to Perform Tests	For example: Armless Chair: Use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker). Tape Measure: To measure spacing. Masking Tape: To mark floor temporarily for some tests. Cones: Recommended for 6MWT. Foam balance pad: For balance tests on Foam Surface, non-slip 20"x16"x2.5" foam balance pad. Wall hanging: Center an object on the wall, such as a picture, at participant eye-level to focus gaze.
4	Participant Attire	Wear clothing that does not bind movement in any significant way. The same walking shoes, trainers, or sneakers are to be worn at each visit (i.e., no heels or flip-flops).

	Footwear should remain consistent throughout the study.
---	---

Passive Actigraphy

Item	Action	Description
1	Set up Mobility Lab or Moveo Explorer Laptop & Charge Opal Sensor	Charge Opal battery for 2-3 hours prior to use. For Actigraphy use, the battery lasts 21 days.

Passive Lumbar

Item	Action	Description
1	Set up Mobility Lab or Moveo Explorer Laptop & Charge Opal Sensor	Charge Opal battery for 2-3 hours prior to use. For Passive Movement Assessment – Lumbar use, battery lasts 4 days.

1. Opal System Equipment and Hardware Setup

1.1 Opal System Equipment Available

Image	Name	Description
	Carrying Case	Holds Opal system equipment.
	Footplate	Designed to standardize stance width for tests that require it.
	Access Point with Foot Stand	Allows for wireless communication between the Opals and Application Software.
	Opals	The Opal inertial sensors contain triaxial accelerometers, gyroscopes, and magnetometers.

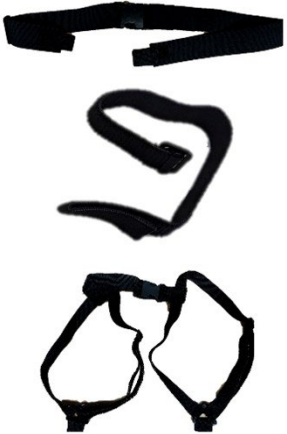
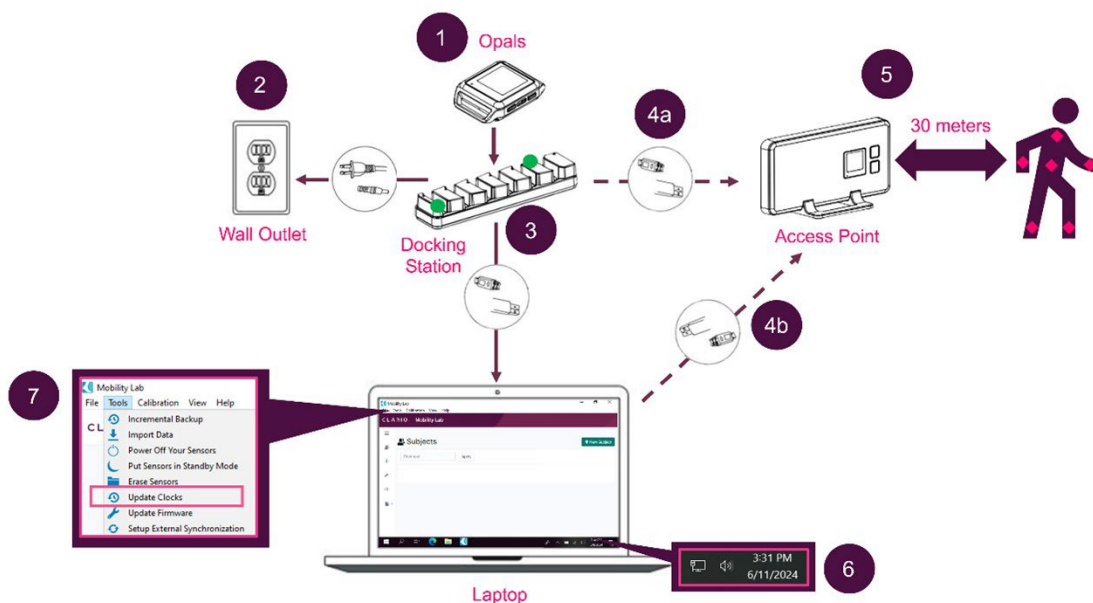
Image	Name	Description
	Straps	Straps used for positioning and securing the Opals on participants. All latex-free. Small, medium, large, lumbar, sternum, pediatric, and extenders for lumbar and sternum available.
	Docking Station	The Docking Station is used to charge and configure the Opal movement sensors.
	Docking Station Power Cord	Connects to Docking Station and Power Outlet to charge Opals. Note: International electrical plug adapters will be included with shipments outside of the US.
	USB-A to USB-B micro cables <i>(beneath access point in carry case)</i>	Used to connect Docking Station to computer and to connect the Access Point to Docking Station.
	Logitech Wireless Remote Control	Allows for starting and stopping tests away from computer if participant needs standby assistance. <i>To use, switch power on, remove USB to insert in computer USB port</i>

Image	Name	Description
	Wall Charger	Used to charge the Opal sensor at home.
	USB Drive	Contains the software. *Software also available for download from support.apdm.com – username and password provided by sales or support.

1.2 Hardware Setup



1. Plug the Opal sensors into the Docking Station slots in any order.
2. Connect the power adapter to the Docking Station and plug it into a power outlet.
3. Connect the Docking Station (USB-B micro) to the laptop (USB-A).

Helpful Tips:

The **Access Point** is required to use a data streaming recording mode. This applies to **Synchronized Streaming in Motion Studio** and **Active In-Clinic in Mobility Lab or Moveo Explorer**. Follow steps 4 and 5 below. Data logging modes, including remote and passive, do not use the Access Point.

4. Connect Access Point choosing one of the options below:
 - a. Connect Access Point (USB-B micro) to Docking Station (USB-A) if testing in the same area used for hardware setup.
 - b. If you need to move laptop and equipment after hardware configuration, the Access Point (USB-B micro) can be connected directly to laptop (USB-A).
5. Ensure Access Point is within 30 meters line of sight from participant at the start/stop of testing. Position so the display screen is facing the participant for quickest data transmission.
6. Ensure the laptop is connected to a secure and stable network then verify the time and day are correct on the lower corner of the desktop.

7. Open the Opal System software and go to the toolbar to select **Tools** and **Update Clocks** to ensure the Opals reflect the correct time. *This step may not be necessary since Opal clocks are updated to match the time and day on the desktop when applying the **Hardware Configuration**.

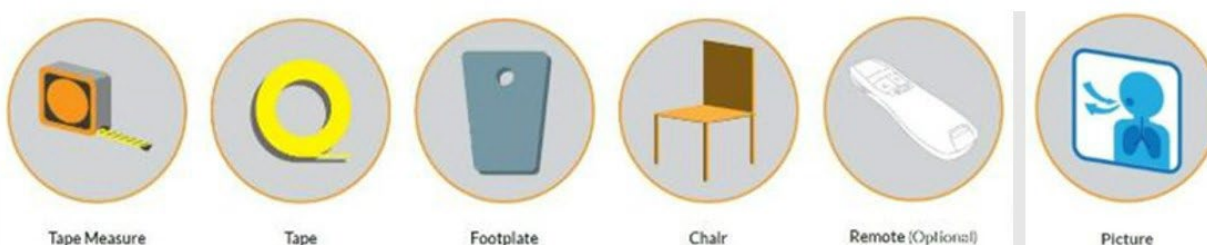
1.3 Applying a Strap to an Opal Sensor

Thread the strap side through one of the Opal sensor slots with Velcro facing towards the Opal. Thread the strap through each buckle slot so buckle can move. Move the buckle towards the Opal. Thread the strap through the second Opal sensor slot. Fasten Velcro to the strap.	
---	--

2. Participant Visit Space Requirements and Setup

Active movement assessments require preparation of the following testing space parameters. We recommend setting up your test environment at least 2 hours prior to in-clinic participant visit and discussing space requirements with the participant in advance of a remote visit. Passive movement assessments in real-world environments (Actigraphy or Lumbar) do not have testing space requirements.

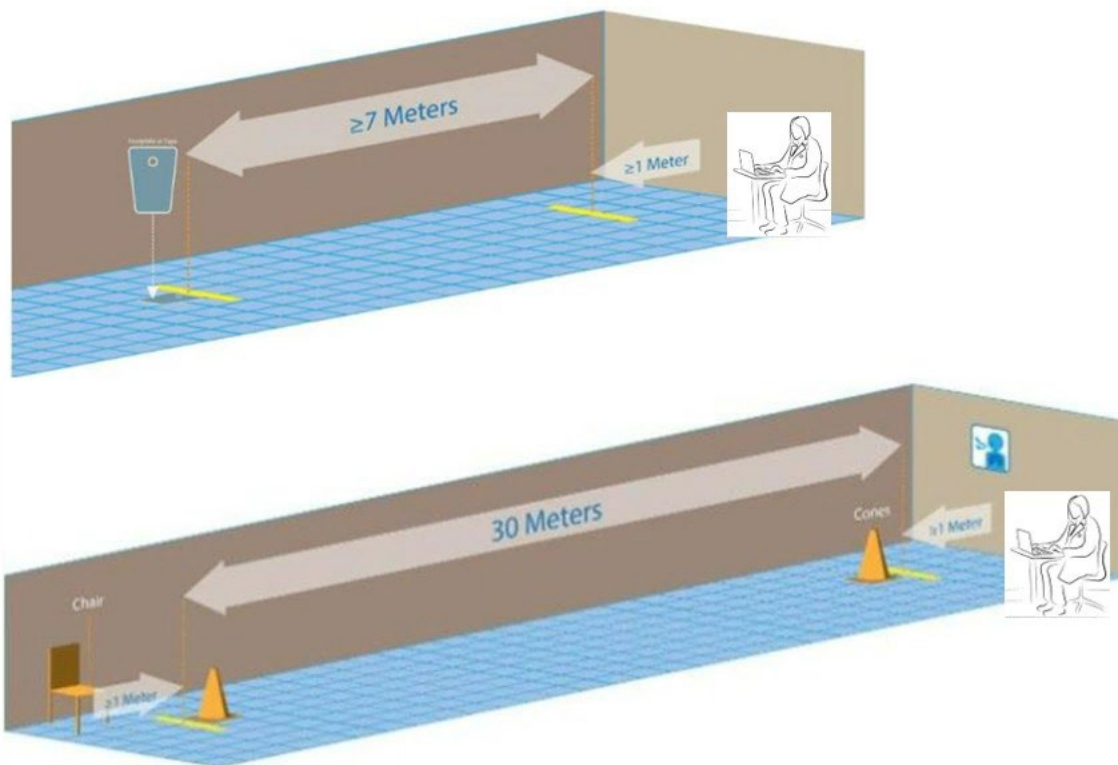
Supplies



Walk Tests

2-Minute Walk: Measure a straight walkway $\geq 7\text{m}$ (23ft) long. Place a 1m (3ft) line of tape at the ends of the walkway, $\geq 1\text{m}$ (3ft) from walls to allow space for turns.

6-Minute Walk: Measure a straight walkway 30m (98.5ft) long. Place a 15 cm (6 inch) line of tape to mark the start and endpoints of the course, $\geq 1\text{m}$ (3ft) from walls to allow space for turns. Place cones at each endpoint of the course, lining up the straight edge of the cone with the inside edge of the tape.

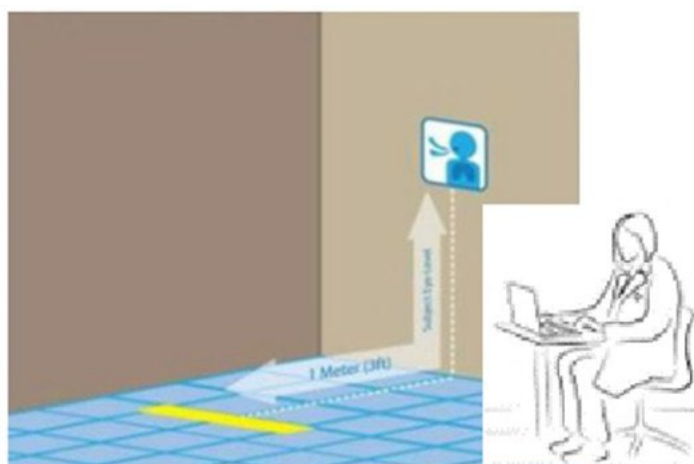


Sway Tests & 360 Turn Test

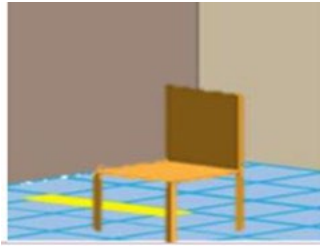
1m (3ft) line of tape 1m (3 ft) from a wall.

Picture is set up at participant eye-level only for **Eyes Open Sway Tests**.

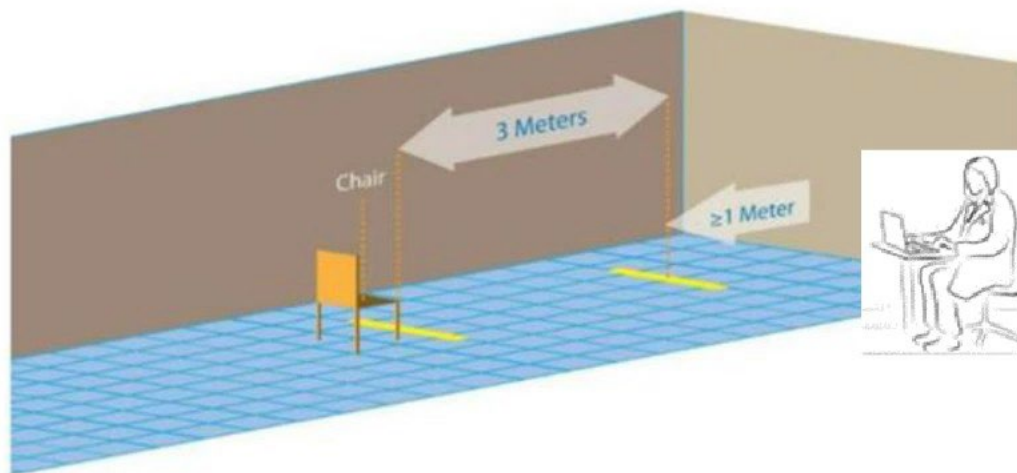
Footplate used for **Feet Apart Sway Tests**.



Other Mobility Tests (Sensor Placement Checks, TUG, Sit-to-Stand, Tremor, Bradykinesia)
Standard 46cm (18in) Chair (armless, no swivel, no wheels, no rocker).



Timed Up and Go (TUG): Measure a straight 3m (10ft) long walkway from the front of the chair. Place a 1m (3ft) line of tape at the end of the walkway, ≥ 1 m (3ft) from walls to allow space for the turn.



3. Using the Opal System

3.1 Creating a Subject - Mobility Lab or Moveo Explorer

× Add Subject

Go to "Options" → "Display Options" to enable or disable these fields.

1 → 3

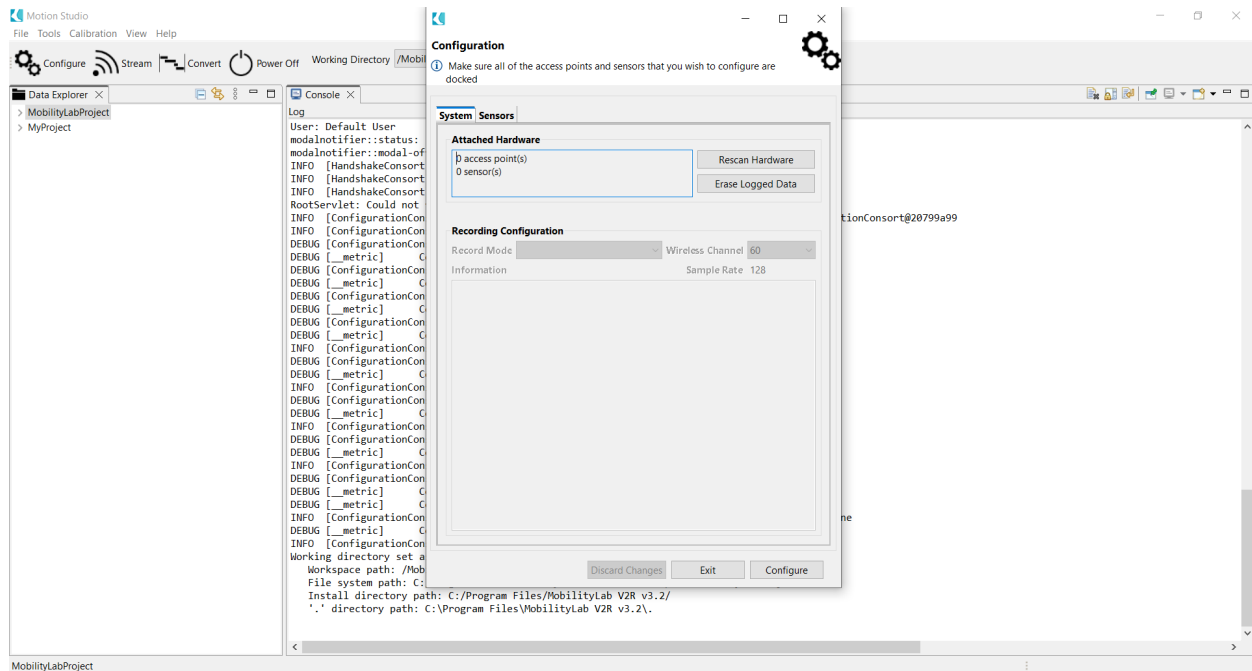
2

4

1. Click on the **Subjects** icon in the left menu bar to navigate to the Subject list.
2. Click on **New Subject** at the top right section of the screen.
3. Enter the **Subject ID** as outlined in the site-specific instructions.
4. Click **Save** to add the participant to the database.

3.2 Hardware Configuration

3.2.1 Motion Studio



Configure button opens the **Configuration** panel.

The screenshot shows the 'Configuration' dialog box with the 'System' tab selected. It displays the 'Attached Hardware' section with 1 access point(s) and 2 sensor(s), and the 'Recording Configuration' section with 'Record Mode' set to 'Synchronized Streaming', 'Wireless Channel' set to '60', and 'Sample Rate' set to '128'. The 'Information' box contains text about the recording mode and a list of bullet points: 'Data is buffered on the sensors, so no data is lost if there are temporary interruptions in the wireless signal', 'After configuring, click on the "Stream" button to open the record dialog', 'You can make multiple recordings during each streaming session', 'You can save recordings in HDF format', and 'You can visualize the data as it is streaming'. At the bottom are buttons for 'Discard Changes', 'Exit', and 'Configure'.

Configuration Panel System Tab provides an overview of the major configuration details.

Attached Hardware lists all the detected hardware. To change, add or remove hardware and click the **Rescan Hardware** button. To clear the current memory used on the sensors, click **Erase Logged Data**.

Recording Configuration section allows you to select record mode, wireless channel, and sample rate. **Record Mode** drop down list contains options available for the hardware attached which may include Synchronized Streaming, Synchronized Logging, Low Power Logging, and Passive. The **Information** box displays details pertaining to the selected record mode.

Wireless Channel drop down list contains options from 10-80. **Sample Rate** default is 128Hz, and can be set to any integer value from 20-800Hz.

**Each access point can stream up to 1600 samples per second with a maximum of 1000 samples per second for low latency streaming.*

Synchronized Streaming - stream data from multiple synchronized sensors directly to your computer

- Data is buffered on the sensors, so no data is lost if there are temporary interruptions in the wireless signal
- After configuring, click on the Stream button to open the record dialog

- You can make multiple recordings during each streaming session
- You can save recordings in HDF format
- You can visualize the data as it is streaming

Synchronized Logging - sensors log recorded data to their on-board flash memory.

- The sensors are synchronized wirelessly with each other while recording, so the individual recordings can be synchronized with each other after import
- Recording starts once the sensors are undocked, and stops when they are redocked
- The data can be imported after docking by using the Import Manager

Low Power Logging - sensors log recorded data to their on-board flash memory.

- Recording starts once the sensors are undocked, and stops when they are redocked
- The data can be imported after docking by using the Import Manager
- The sensor's radios are disabled to conserve power
- The sensors are not actively synchronized, so the recordings are subject to clock drift and simultaneous recordings may be difficult to synchronize after import

Passive - sensors log recorded data to their on-board flash memory.

- Only the accelerometer and gyroscope can be enabled
- Power usage is optimized in order to maximize runtime.
- Recording starts once the sensors are undocked, and stops when they are redocked
- The data can be imported after docking by using the Import Manager
- The sensor's radios are disabled to conserve power
- The sensors are not actively synchronized, so the recordings are subject to clock drift and simultaneous recordings may be difficult to synchronize after import

Configuration Panel Sensors Tab provides specific configuration details for a particular sensor.

Select Sensor drop down allows you to customize configuration details for the selected sensor. Click **Copy Configuration To All Sensors** if applicable.

Sensor Label will appear on the selected Opal sensor display screen once configured.

Sensors section allows you to enable and disable attributes of the selected sensor.

Power section allows you to select Battery Charge Cutoff to determine the level sensors go into standby mode. In standby mode, the clock on the Opal will continue to keep time. Default is 10%.

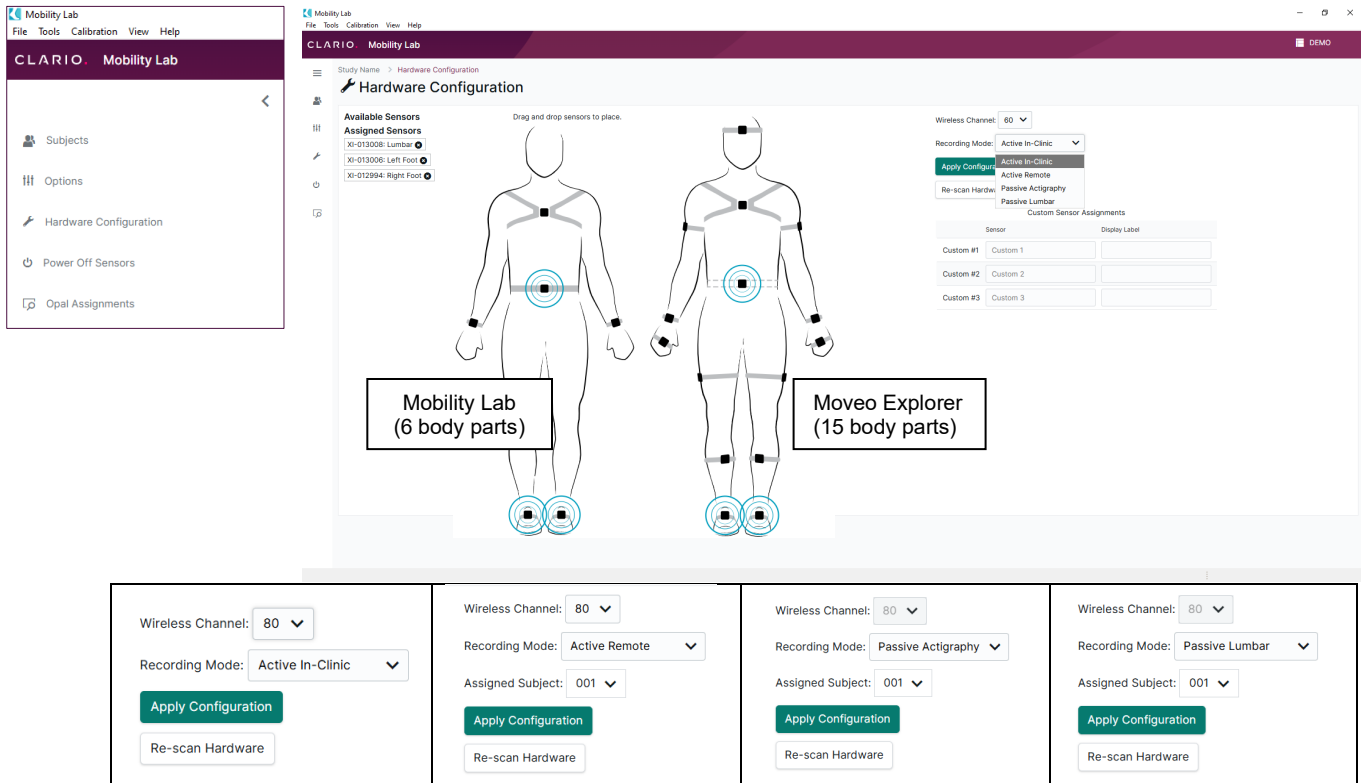
**If the battery depletes completely, the clock on the Opal will not keep time and the timestamp on logged data will be impacted.*

Button Event Labels section allows you to specify the text for events that will be saved to your Opal when in logging mode. See *Opal Screen Interface* for details on putting an Opal into the Event Logging mode.

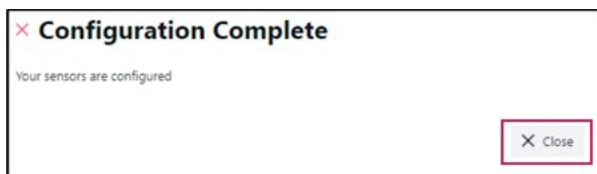
Sensor Data (Onboard Memory) section allows you to view memory used and **Erase Logged Data** on the selected sensor.

Debug section allows you to view and clear the debug log on the selected sensor.

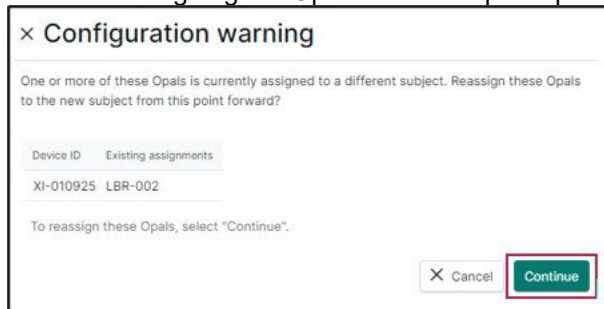
3.2.2 Mobility Lab or Moveo Explorer



1. Click on  at the top of the left side panel to expand the menu, if desired.
2. Select the  for **Hardware Configuration**
3. Drag all Available or Assigned Sensors oval labels to the body part and ensure all sensors show in the Assigned Sensors list and Available Sensors is empty.
4. If using **Custom Sensor Assignments**, only raw inertial data and sensor orientations are provided.
5. **Wireless Channel** drop down list contains options from 10-80.
6. **Recording Mode** drop down list contains options available for the hardware attached which may include Active In-Clinic, Active Remote, Passive Actigraphy, and Passive Lumbar.
 - a. **Active In-Clinic** uses the Access Point to stream data logged to Opal onboard memory, formerly 'Streaming' mode, 128Hz sample rate, all inertial sensors enabled.
 - b. **Active Remote** requires Assigned Subject selection. Formerly 'Logging' mode, 128Hz sample rate, all inertial sensors enabled.
 - c. **Passive Actigraphy** requires Assigned Subject selection. 30Hz sample rate, accelerometer only enabled.
 - d. **Passive Lumbar** requires Assigned Subject selection. 100Hz sample rate, accelerometer and gyroscope only enabled.
7. Click **Apply Configuration** and wait for the Configuration Complete message.

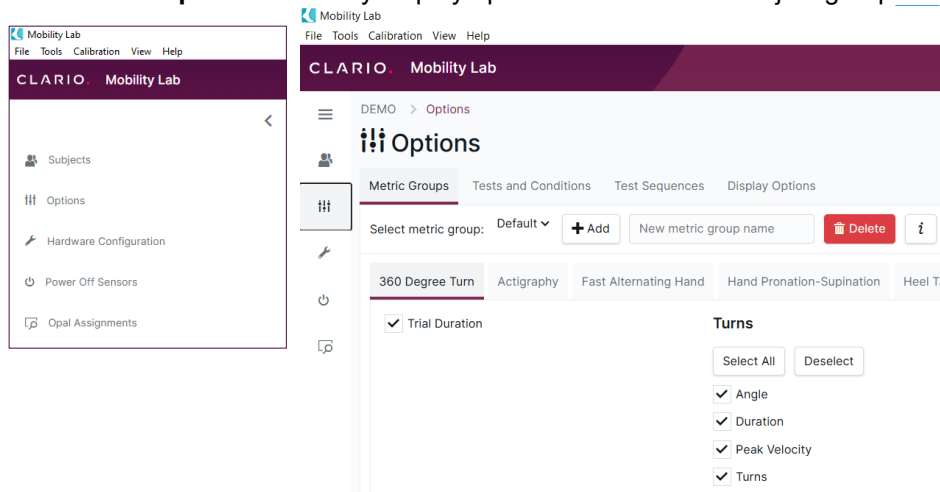


8. Unplug the Opal Sensors from Docking Station and wait approximately 30 seconds for configuration to set.
 - a. For **Active In-Clinic** mode, ensure the LED lights on the Opals and Access Point blink green in unison.
 - b. For recording modes that require Assigned Subject, if the Opal sensor has been previously configured for another participant, a Configuration Warning screen will appear. Click Continue to confirm reassigning the Opal to the new participant.



Note: For Passive Actigraphy or Passive Lumbar mode, the Opal display screen will turn blank after it has been initialized to maximize runtime. Press the side button on the Opal to view the screen.

Select  **Options** to modify display options for a selected subject group. [_____](#)



Metric Groups to select metrics to display in the test results window and add custom metric groups
Tests and Conditions to add, import, view/edit, delete, and make visible/hide
Test Sequences to add, import, view/edit, delete, and make visible/hide
Display Options to set editable subject fields, select default report table, and enable the recording of annotations

3.3 Opal Sensor Placement - Mobility Lab and Moveo Explorer

- Opal display screen shows body part label.
- Make sure you can see the Opal sensor screen and LED light.
- Face Opal away from the participant's body and ensure it is un hindered by clothing, jewelry, etc.
- Fasten to be comfortable, yet secure, so that there is minimal excess movement of the Opal sensor.
- Lumbar and Sternum sensors and straps should be placed over clothing.
- Foot sensors and straps should be placed over footwear.

Body Part	Anatomical Description	Common Description	Orientation
Foot	Dorsal surface of the foot, distal to the navicular, centered on the intermediate and lateral cuneiform.	Centered on the top of the foot (not including toes or ankle).	Connector pointed towards middle toe.
Lumbar	Superior aspect of posterior sacral surface, positioned just below L5.	Centered on the low back, at the base of the spine.	Connector pointed straight down towards floor.
Sternum	On top of the sternum centered over the manubrium.	Centered on the flat surface of the chest just below where the collar bones meet.	Connector pointed straight down towards floor.
Wrist	Posterior aspect of the distal radius and ulna.	On the wrist worn like a watch.	Connector pointed towards middle finger.
Lower Leg	Just medial to the anterior surface of the tibia, high enough for the strap to wrap just above the widest part of the gastrocnemius.*	Just inside the front of the shin, on the flat surface of the bone, high enough for the strap to wrap just above the widest part of the calf muscle.*	Connector pointed straight down towards floor.
*Note: if sensor/strap is more secure when placed lower on the calf, it is acceptable and will not alter joint angle measures.			
Upper Leg	Lateral side of thigh, on top of the iliotibial band, ~4 inches above the knee.	Side of thigh, midline, between muscular tissue, one hand's width above the knee.	Connector pointed straight down towards floor.
Head	Centered on the anterior aspect of the frontal bone.	Centered on the front of the forehead.	Connector pointed straight down towards floor.
Upper Arm	Lateral aspect of the humerus, just below the insertion of the deltoid.	Centered on the outside of the arm, just below the shoulder muscle.	Connector pointed straight down towards floor.
Hand	Center of the posterior aspect of the hand over the metacarpals.	On the back of the hand.	Connector pointed towards middle finger.

***Resource within Mobility Lab and Moveo Explorer Software Application** – When going through the Testing steps, on the Hardware Check screen, click [How should sensors be placed?](#) to view pop up window.

Lumbar sensor: Centered on the low back at the base of the spine.



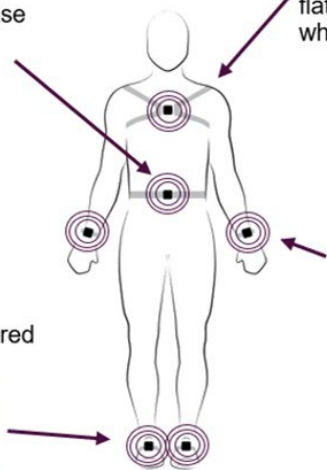
Sternum sensor: Centered on the flat surface of the chest just below where the collar bone meets.



Wrist sensor: On the wrist worn like a watch.



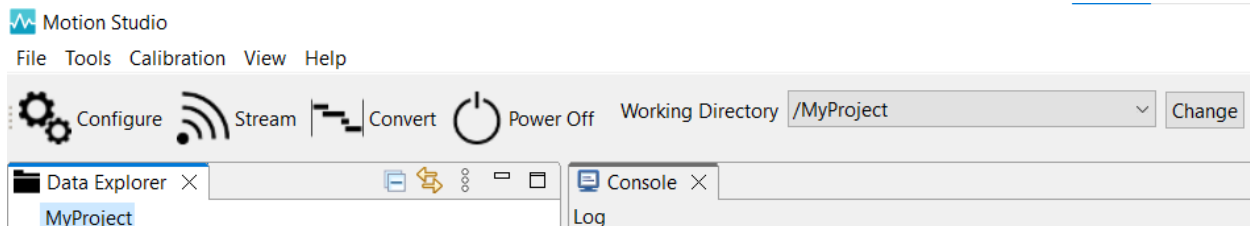
Foot sensors: Centered on top of the foot.



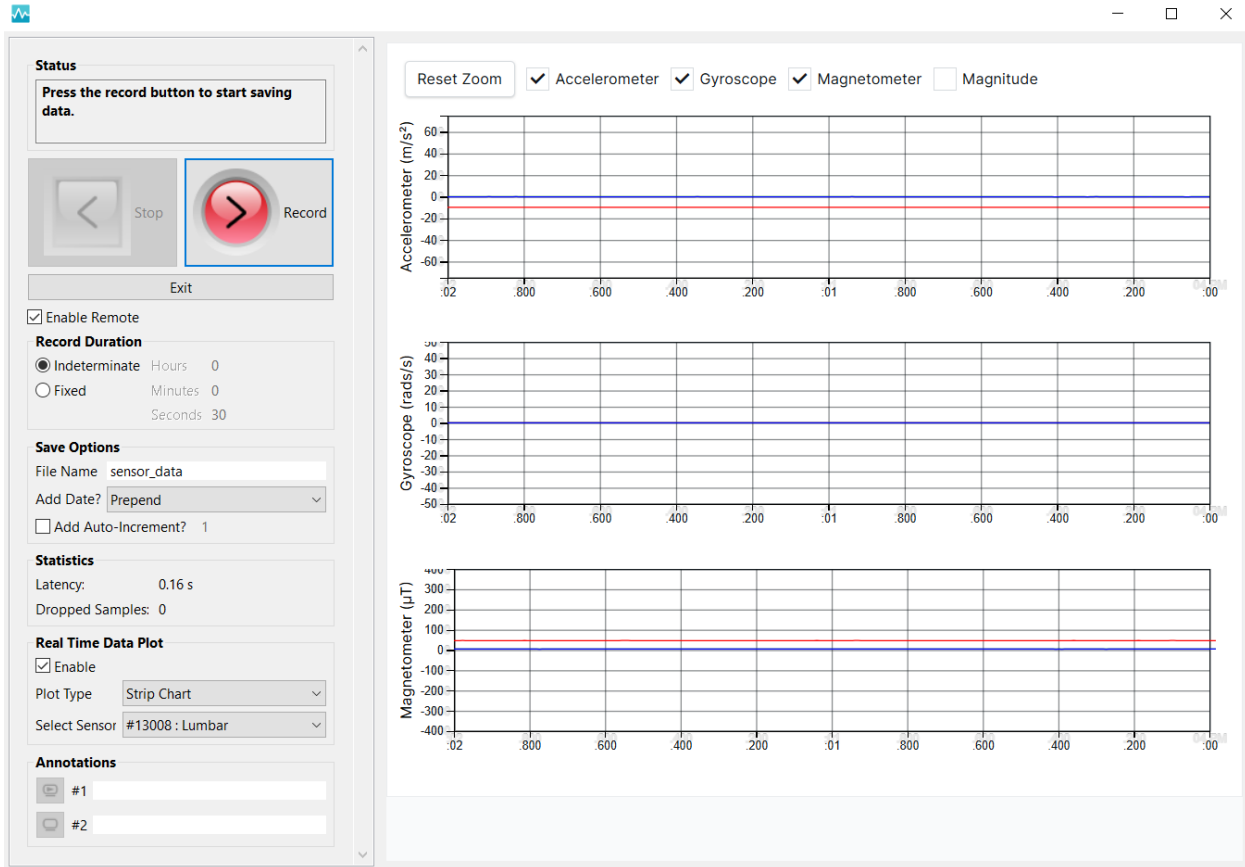
If bathing or submerging wrist into water, temporarily remove the Opal sensor and place back on immediately after the water activity is finished.

3.4 Conducting and Recording Tests

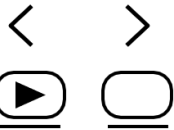
3.4.1 Motion Studio – Synchronized Streaming



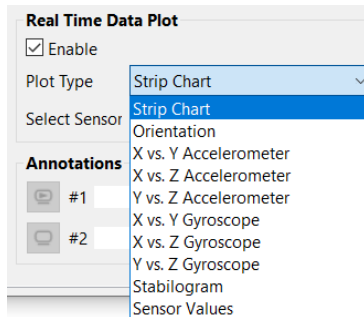
1. Complete Hardware Configuration using Synchronized Streaming Record Mode.
2. Select **Stream** button to open stream panel.



3. Select **Record** to start saving data, **Stop** to stop if record duration is set to indeterminate, **Exit** to leave streaming panel.
4. **Enable Remote** to utilize the provided Logitech Wireless Remote Control to start and stop recording or mark annotations away from the computer. **Start** and **Stop** are mapped to **Next** and **Previous** slide buttons on the remote.



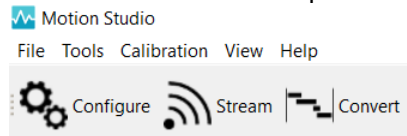
5. **Record Duration**
 - a. **Indeterminate** is controlled by user by pressing **Stop**
 - b. **Fixed Duration** can be specified in hours, minutes, and seconds.
6. **Save Options** include customizing File Name, Add Date, Add Auto-Increment.
7. **Statistics**
 - a. **Latency** - time data is recorded to the time it is received by the computer. This may increase with poor wireless reception or sensors that are occluded from the Access Point. Additional latency will be incurred by the plotting of the data to the screen.
Helpful Tips: Select a different wireless channel and ensure Opal to Access Point line of sight.
 - b. **Dropped Samples** - number of samples dropped in current streaming session. Dropped samples should be very rare. All data is stored on Opal sensor onboard memory and can be recovered manually selecting **Convert** and using the Import Manager after the sensor is docked.
 - c. **Real Time Data Plot** – enable/disable and select Plot Type and Sensor to view data streaming. For Orientation visualization, hold the sensor so the port is facing you and press **Center** button.



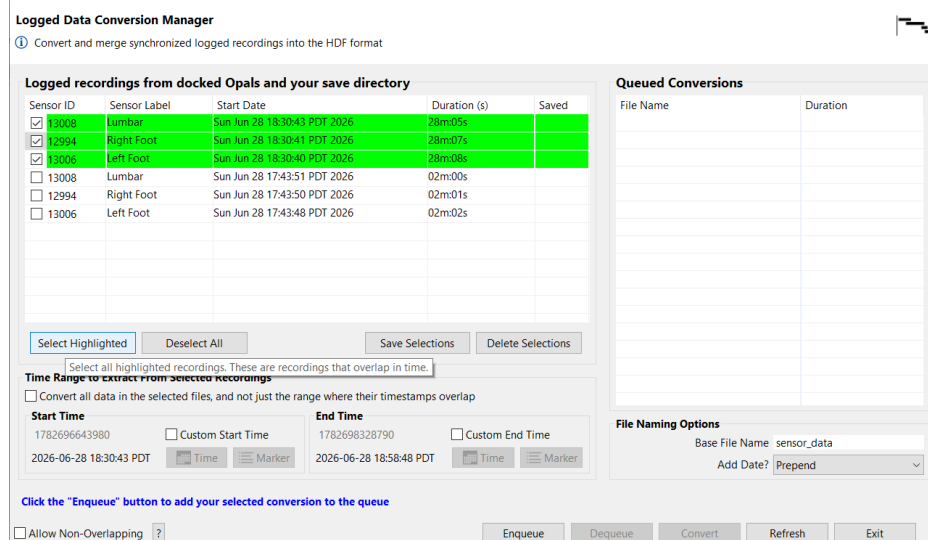
- d. **Annotations** – add custom text to #1 and #2 and click the annotation buttons, or related remote control buttons, to add a timestamped marker to the recorded file.

3.4.2 Motion Studio – Synchronized Logging, Low Power Logging, Passive

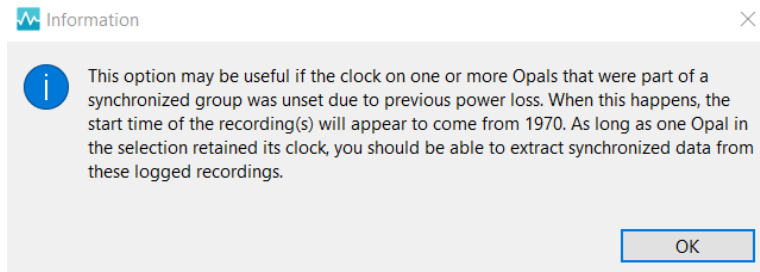
1. Undock the sensor(s) after configuration.
2. Collect data.
3. To import recorded data, reconnect sensor(s) to powered dock connected to computer.
4. Click **Convert** button to open the logged data conversion manager panel.



5. Logged Data Conversion Manager



- a. Select data for conversion using checkboxes. Click on a label in the table to highlight overlapping recording times.
- b. **Time Range to Extract From Selected Recordings**
 - Select checkbox to convert all data in the selected files, and not just the range where their timestamps overlap.
- c. **Start Time and End Time** – Unix epoch timestamp is displayed along with date and time. Select checkbox for **Custom Start Time** and/or **Custom End Time** and select **Time** to manually enter Unix epoch time or **Marker** if button event markers were used.
- c. **Allow Non-Overlapping** – check if desired



- d. Click **Enqueue** to add to Queued Conversions.
- e. **File Naming Options** may include Base File Name, adding sensor ID or label, and adding date.
- f. Click **Convert** to create h5 file. Double click to open h5 to view Plot panel.

3.4.3 Active In-Clinic – Mobility Lab or Moveo Explorer

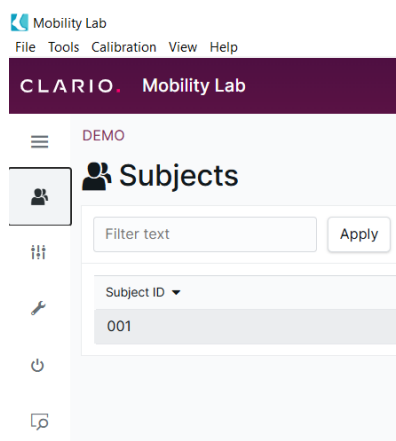
Helpful Tips:

Follow Pre-Visit Checklist and Test Setup Instructions to ensure proper test environment setup for all study tests prior to initiating tests or test sequence.

Active Assessments are short duration, prescribed tests conducted under supervision. **Active In-Clinic** tests utilize the Access Point to stream the raw data collected onboard the Opal sensors to the software on a computer to instantly produce the digital health endpoints or outcome metrics.

Active Remote uses data logging tools to enable conducting short duration, prescribed tests outside of the clinic or lab. Configure Opal System for Active Remote (synchronized logging at 128Hz sample rate), document test start and stop time (button event marker), and follow test setup and administration instructions including the 3 second still period after test start time. **End user is responsible to identify and utilize tools to visually supervise subjects during active remote testing such as telehealth or video conferencing.*

1. Click on participant listed under **Subject ID** on **Subjects** screen to open that participant file.



2. Click **New Test** at the top of the screen.
3. Select the **Single Test** or **Test Sequence** by clicking on the addition sign . Multiple Single tests can be selected. Test Sequences cannot be combined with another single test or test sequence.

Test Selection

Select the test or sequence to run.

Single tests:

360 Degree Turn	1x	+
Actigraphy	Non-Dominant Wrist	+
Fast Alternating Hand	Left	+
Hand Pronation-Supination	Left	+
Heel Tapping	Left	+
Passive Lumbar	Passive Lumbar	+
SAW	7m Walkway	+
Sensor Placement	Left Foot	+
Sit to Stand	5x	+
Sway	Feet Apart, Eyes Clo	+
TUG	3m Walkway	+
Toe Tapping	Left	+
Tremor	Postural - Arms Forv	+
Walk	6-Minute	+

Test sequences:

CTSIB	+
Romberg Quotient	+
mBESS	+

Selected tests:

- X Walk, 6-Minute
- X Sway, Feet Apart, Eyes Closed, Firm Surface

X Cancel Next >>

- The **Selected tests** will appear on the right half of the screen. Select **Next**.
- The **Hardware Check** screen will appear with a list of Opal sensors and their respective body locations. Click **Next**. (If needed, click link to view pop up showing **How should sensors be placed?**)
- Follow **Test Administration** instructions and reference **Test Setup** to confirm setup compliance.
- Add **Annotation** labels at the bottom, if desired. Annotation markers are set using the computer buttons or the related buttons on the Logitech wireless remote control.

Annotations:

- Click **Start** to initiate test and observe participant to ensure they performed the test correctly.
- Upon test completion, a dialog box will appear **Test Completed (Figure 1)** or **Test Completed with Errors (Figure 2)**. Enter **Trial Notes** for any pertinent mobility observations.

Figure 1

1 **Test Completed** ✓
Test: Sensor Placement
Condition: Left Foot

Trial Notes

Analysis Log

Next test: Sensor Placement
 Condition: Right Foot

Figure 2

Test Completed With Errors ⚠️
Test: Sensor Placement
Condition: Right Foot

Trial Notes

Analysis Log
 Error: Sensor detected at wrong location on the body. Confirm sensors are placed on the correct body locations and redo the test.

Next test: Sway
 Condition: Feet Together, Eyes Closed, Firm Surface

10. Select **Redo**, **Skip**, or **Continue/Finish**.

- a. **Continue:** If the outcome is **Test Completed**, select this to proceed to the next test in sequence.
- b. **Redo:** Click to repeat test.
 - Select Keep to *keep* the completed test in site view.
 - Select Delete to *remove* the test.

✖ **Redo Test**

Would you like to keep or delete the trial you are redoing?

- c. **Skip:** Deletes the recorded test and skips to the next test in the sequence.
 - Select **Delete** to remove the test.



11. Click **Finish** at the end of a single test or end of a test sequence.



3.5 Power Off, Standby, Storage and Cleaning

3.5.1 Power Off

Daily users can keep Opals plugged into a powered docking station when not in use. Fully powered off Opals lose the time clock. Avoid fully powering off Opals when logging data as it will affect the timestamps on data. Ways the Opals can be powered off:

- Select **Power Off Sensors** button within software to prepare any docked sensors to turn off when undocked.
- Use the Opal buttons to go to the power menu and select **Power Off**
- Opals will fully power off when the battery runs out.

3.5.2 Standby

Standby mode can be used to help keep Opals from powering off and losing the clock time. All components in the Opal sensors are turned off except for the clock. This is particularly important if you are using a logging mode and need to retain the Opal System configuration and need to know the time of the recordings.

- Dock Opals and click on **Tools/Put your sensors into standby mode**
- Use the Opal buttons to go to the power menu and select **Enter Standby**

3.5.3 Storage

Device Usage	Storage Method	Description
For periodic users	Power off all system components for storage and transport.	1. Connect equipment following the Hardware Set-Up Instructions and click the  to  Power Off Sensors 2. Disconnect Opals from Docking Station to fully power off. Note: To power off Opals using the Opal buttons, see Help section.
For daily users	Keep Opals plugged into the powered Docking Station when not in use.	When Opals are plugged in, batteries charge, recording stops, and data transmission stops.

3.5.3.1 Instructions for Packing a 6 Opal System

Instructions	Example
Step 1: Pack the power supply and wireless remote in their slots. Remove the stand from the Access Point and place it in the slot on the left. Coil up the two Micro-USB cables and tuck them into the space next to the stand.	
Step 2: Place the Access Point in its slot above the stand and cables. Place the Docking Station on its side in its slot. Fold the lumbar strap so that the buckle is at one end and the Opal at the other. Tuck the buckle into the top small slot and the Opal into the bottom small slot.	

Instructions	Example
<u>Step 3:</u> Lay the buckle of the sternum strap into the bottom pocket. Moving back and forth, pack the straps into the space, holding the Opal so that it will remain on top.	
<u>Step 4:</u> Tuck the triangles on either side of the Opal in last, so that the Opal is centered above the space. Tuck the loose lumbar strap into the center slot, repeatedly tucking until all excess is packed in. Place the Footplate in its slot above the Access Point.	
<u>Step 5:</u> Fold each Opal on a small strap in half, so that the Opal is on one end. Tuck the Opals into the top and bottom slots. If the system is shipping with a backup Opal, place that in the space with the power supply. If there is not enough room, it can also be tucked in with the sternum strap.	

Instructions	Example
Step 6: Tuck the ends of the small straps into the center slot. The carry case is now packed.	

3.5.4 Cleaning

- Clean Opal sensor after every use with a low-level disinfectant on a soft, lint-free cloth (70% isopropyl alcohol IPA).
- Opal straps can be removed and washed using mild soap and water.
- Cleaning is not required for Access Point, Docking Station, and all associated cabling. If you clean, use 70% IPA on a soft, lint-free cloth.
- Do not immerse in liquid or spray the Opal, Access Point or Docking Station with liquid.
- Do not use abrasive cleaners.

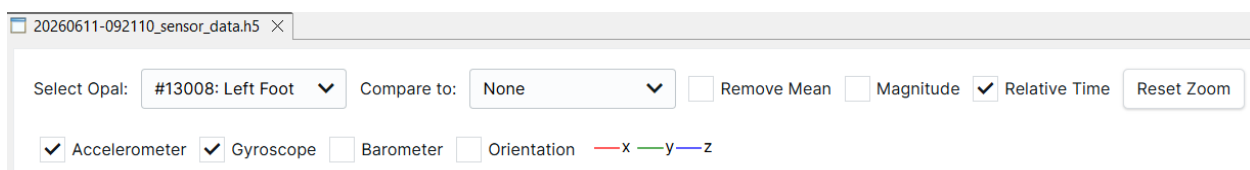
4. Opal Reports

4.1 In Software

4.1.1 Motion Studio – Managing Data

The Data Explorer shows a hierarchical view of your projects and folders. Projects are the top level containers in the Data Explorer, and can hold any number of folders. Folders hold other folders or data files. The projects and folders that are visible in the Data Explorer are called your Workspace.

Working Directory shows the project and folder where recorded data will be saved.



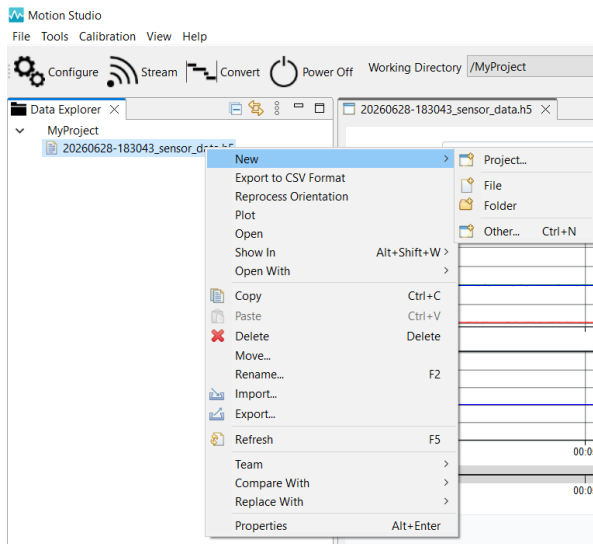
Select Opal dropdown to see data from each sensor.

Compare to dropdown to see data from select Opal and another Opal.

Check or uncheck boxes next to sensor components to view or hide component data.

Check or uncheck boxes to **Remove Mean**, show **Magnitude** or **Relative Time**.

To zoom in or out on sensor data visual, click **Reset Zoom** button. Click and drag with mouse or use the time scrubbing bar for the x-axis and the scroll wheel for the y-axis.



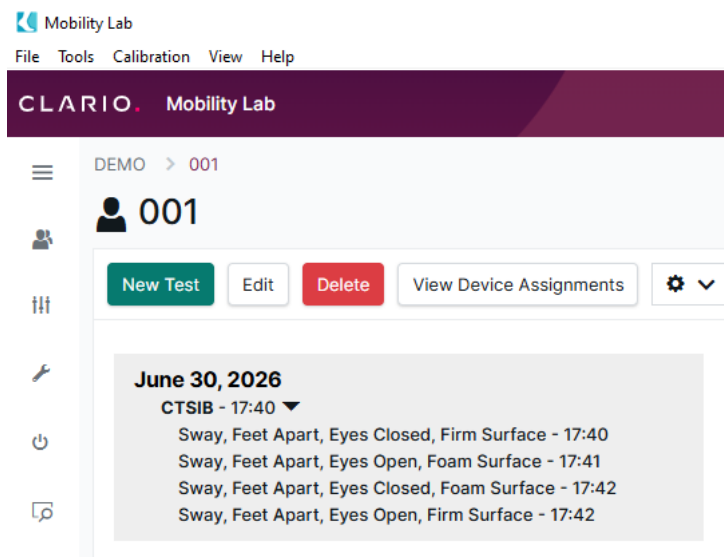
Right click in the **Data Explorer** to access data management tools including:

- Create **New Project/File/Folder**
- **Export to CSV Format**
- **Plot** a recorded file (or double click on the file)

4.1.2 Mobility Lab or Moveo Explorer

4.1.2.1 Subjects – Test Summary and Test Results

Subjects screen will show summary information including each Subject ID, First visit, Last visit, and # of visits. Click on each Subject ID row to view summary information for each date, test, condition, and test duration. Click on the test to view the Test Results report.



× Test Results

Subject: 001

Sway, Feet Apart, Eyes Closed, Firm Surface - 30-Jun-2026 17:40



Subject ID **Test and Condition - Test date and start time**

	Toggle trial and sequence report
	Information
	Visual Overview options - Detailed Visualization , Drill-Down, Longitudinal
	Overview Metric Values options - Z-Score, Metric Values , Percentiles
	Filter By Current Condition, By Current Sequence, By Current Day
	Cogwheel dropdown to access Print view, Export trial, Plot raw data, Edit trial type, Assign to different subject, Upload trial to support, and Delete trial *Additional in Moveo Explorer Only – Plot joint angles, Plot gait joint angles, Export Joint Angles to BVH

Overview Metric Values

UNILATERAL	NORMATIVE	30-Jun-2026 17:40	CHANGE FROM 30-Jun-2026 17:40
Trial Duration(sec)	--	30	↓ 0.0%

Overview Metric Values table columns (left to right) - the unilateral or bilateral metric or digital endpoint name and units, normative data (if available), mean, and percent change from test selected as baseline under Longitudinal view.

4.2 Exports

4.2.1 Export Data – Mobility Lab and Moveo Explorer

4.2.1.1 Export Scope

- **Export all trials in the current subject group** by clicking on the name of your subject group in the top right corner and choosing the "Export" option.
- **Export all trials in the current subject** by clicking on the cog icon in the top right corner of the Subjects panel and choosing the "Export" option.
- **Export a single trial** by clicking on the cog icon in the top right corner of a trial's report view and choosing the "Export" option.

4.2.1.2 Export Filtering Options

Sequence type (select from dropdown list)

Test type (select from dropdown list)

Test condition (select from dropdown list)

Exclude trials before (enter date/time)

Exclude trials after (enter date/time)

4.2.1.3 Export Options

× Export Data

Export data for offline analysis or backup.

☒ Summary analysis results

Computed metrics for all trials of each type (e.g., Sway) in one CSV file.

☒ Detailed analysis results

Computed metrics for each trial in its own detailed CSV file.

☒ Trial metadata

XML format containing metadata, such as trial type, subject ID, etc.

☒ Raw inertial data

HDF format containing movement data (linear acceleration, rotational velocity, sensor orientation, etc.).

☒ Data Transfer

A flat, CSV format that captures all output in one file with a standard output format.

☒ Compress export into single zip file

For backup purposes, the "Trial metadata" and "Raw inertial data" options are sufficient for import into a different workspace.

Filters

Sequence type

None

Exclude trials before

dd-MMM-yyyy

Test type

All

Exclude trials after

dd-MMM-yyyy

Test condition

All

× Cancel

Export

Additional Export Options in Moveo Explorer Only

☒ Joint angle data

CSV format containing continuous joint angle data covering the duration of the trial.

☒ Joint angle data

HDF format containing continuous joint angle data covering the duration of the trial.

Summary analysis results (CSV format). These exports are in CSV (comma separated value) format, which can be read from any spreadsheet application or parsed by many scientific computing applications. A single summary CSV export includes results from only a single test type. For example, if you export 40 trials where 25 are Sway trials and 15 are Walk trials, you will have 2 summary CSV files -- one for all the Sway trials and one for all the Walk trials. Each row of this export represents the analysis results for one trial. The first 8-10 column represent the metadata about the trial (e.g., subject ID, trial date/time). The

remaining rows include the analysis results, where each row is a single metric. For trials where there are repeated values for a single metric (e.g., for a Walk trial with 20 gait cycles detected, there are 20 "Stride Length" metrics), the average and standard deviation of the metric is reported. These files also include the mean and standard deviation of our normative dataset in the top rows (when normative data is available). Attached to this knowledge base article is a PDF document defining each of the metrics that Mobility Lab computes.

Detailed analysis results (CSV format). A single detailed CSV export documents the results from a single trial. For example, if you export 40 trials, where 25 are Sway trials and 15 are Walk trials, you will have 40 detailed CSV files. Attached to this knowledge base article is a PDF document that annotates a detailed CSV export. This detailed format includes the following, additional differences relative to the summary export:

- **Multiple values for repeated metrics.** Using the same example as above, a Walk trial with 20 gait cycles would include 20 values for the "Stride Length" metric.
- **Event timing.** Some test types also compute the timing of certain events. For example, the export of a Walk trial includes the timing of every toe-off event.
- **Annotations.** If you annotate your trial during the recording, the annotation events (name and time) will be present in the detailed CSV export.

Asymmetry metrics (applies to summary and detailed CSV formats). When this option is selected, the percent difference between left and right sided metrics is included in the output CSV file. Positive values indicate that the right sided metric is larger than the left sided one. For gait metrics, the percent difference is first computed for each gait cycle, and then the mean is computed from these (e.g., it is the mean of the individual percent differences, rather than the percent difference of the metric means). The unbiased estimator is used in the calculation of the standard deviation.

Trial Metadata (XML format). Regardless of how many trials your exported, one XML file will be generated that describes the metadata for all of the exported trials. This information is largely redundant with what is provided in the metadata fields in the CSV exports, but is in a format that can be re-imported into Mobility Lab. If you are exporting data with the goal of re-importing it into another Mobility Lab system or workspace, this option and the "Raw inertial data" option must both be selected.

Raw inertial data (HDF format). These are the actual recordings that were made for the exported trials. Each trial results in one such recording, and each of these recordings will contain the data from all Opals that were configured at the time of the recording.

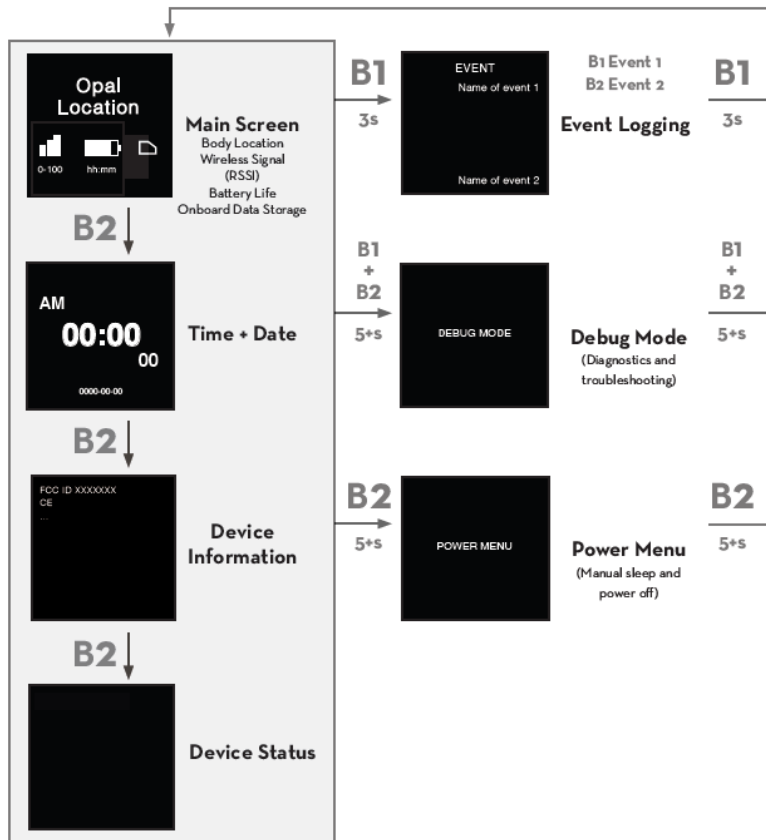
- **Export to CSV format.** Locate HDF format file by expanding monitorData folder under Data Explorer/MobilityLabProject. Right click to select Export to CSV format which will appear above the HDF file.

Data transfer (CSV). This CSV format is not as human readable as the analysis results CSV format described above but is easier to write a custom parser for inputting into another database or for downstream analysis. This export option is self-documenting and will output Data Transfer Specification files along with the export (these are named similarly to "Walk_DTSv3.csv").

Compress export into a single zip file. When selecting this option, all the exported files will be compressed into a single zip file.

5. Opal and Access Point Screen Interface

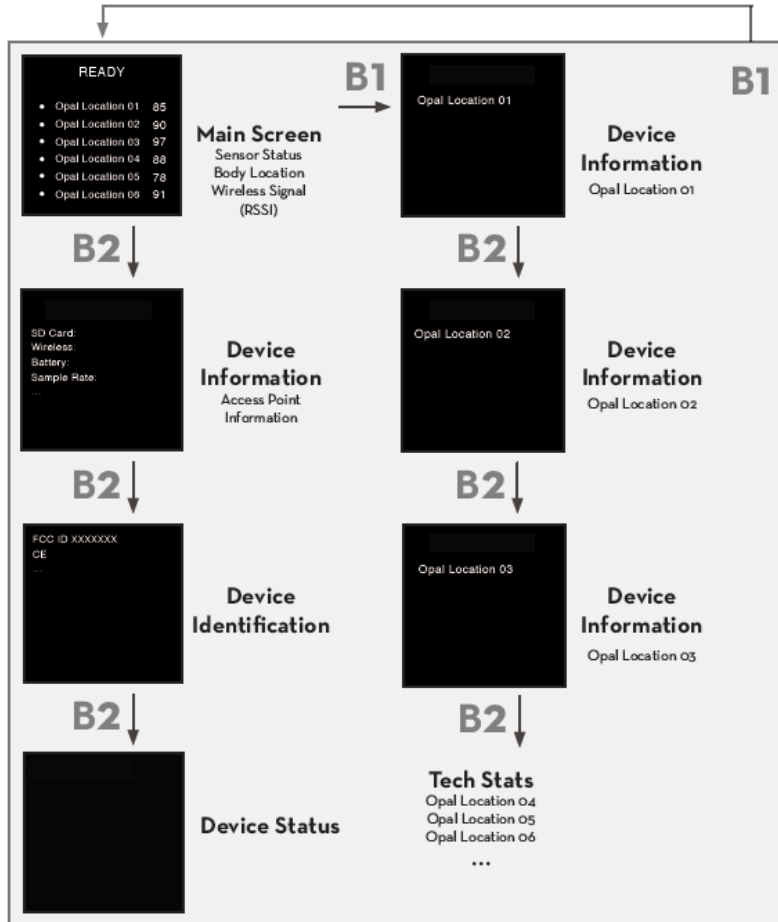
5.1 Opal Screen Interface



5.2 Access Point Screen Interface

The Main Screen on the Access Point indicates if the Opal sensors are ready to record data. Symbols to the left of each sensor ID:

- Opal ready to stream data
- X Not yet ready to stream
- ! Not receiving data – may be out of range or Opal is docked.

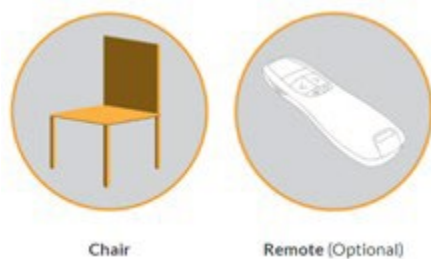


6. Active Assessments Test Setup & Administration Instructions – Mobility Lab & Moveo Explorer

6.1 Sensor Placement

6.1.1 Left Wrist

6.1.1.1 Supplies



6.1.1.2 Test Setup Instructions

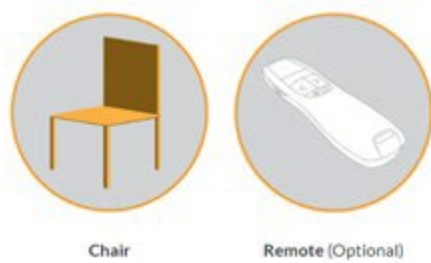
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.1.1.3 Instructions

1. **Subject Instructions (Read Aloud to Subject):**
 - g. Please sit with your back against the chair.
 - h. Extend your left arm fully out in front of you.
 - i. At the end of the first tone, rotate your left wrist back and forth, as if turning a door knob. Do not move your other wrist.
 - j. The test will last 3 seconds.
 - k. Stop when you hear the second tone.
2. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 3 seconds indicated by a second tone.
3. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
4. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.1.2 Right Wrist

6.1.2.1 Supplies



6.1.2.2 Test Setup Instructions

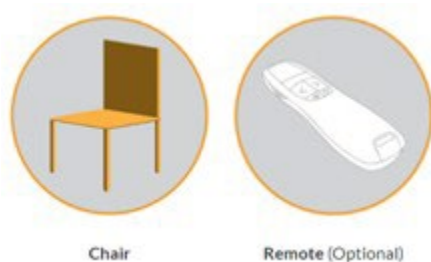
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.1.2.3 Instructions

1. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.
 - b. Extend your right arm fully out in front of you.
 - c. At the end of the first tone, rotate your right wrist back and forth, as if turning a doorknob. Do not move your other wrist.
 - d. The test will last 3 seconds.
 - e. Stop when you hear the second tone.
2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 3 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.1.3 Left Foot

6.1.3.1 Supplies



6.1.3.2 Test Setup Instructions

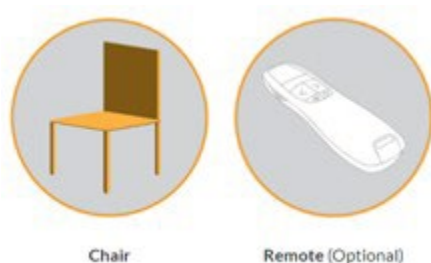
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.1.3.3 Instructions

1. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.
 - b. At the end of the first tone, tap your left toes without interruption and without lifting your heel. Do not move your other foot.
 - c. The test will last 3 seconds.
 - d. Stop when you hear the second tone.
2. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 3 seconds indicated by a second tone.
3. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
4. If there is a need to **Skip, Redo, or Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.1.4 Right Foot

6.1.4.1 Supplies



6.1.4.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.1.4.3 Instructions

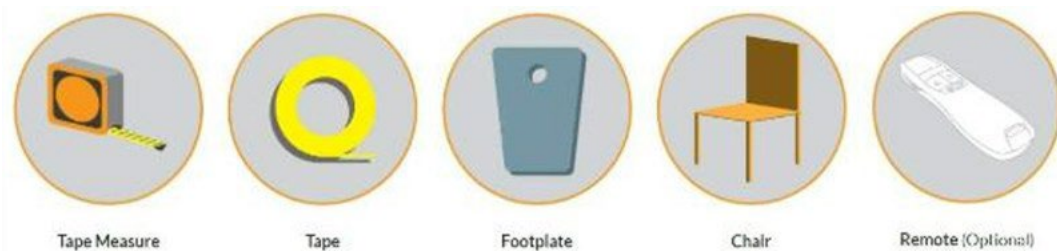
1. **Subject Instructions (Read Aloud to Subject):**

- a. Please sit with your back against the chair.
 - b. At the end of the first tone, tap your right toes without interruption and without lifting your heel. Do not move your other foot.
 - c. The test will last 3 seconds.
 - d. Stop when you hear the second tone.
2. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 3 seconds indicated by a second tone.
3. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press Continue.
4. If there is a need to **Skip, Redo, or Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.2 Gait Assessments

6.2.1 Walk (2-Minute)

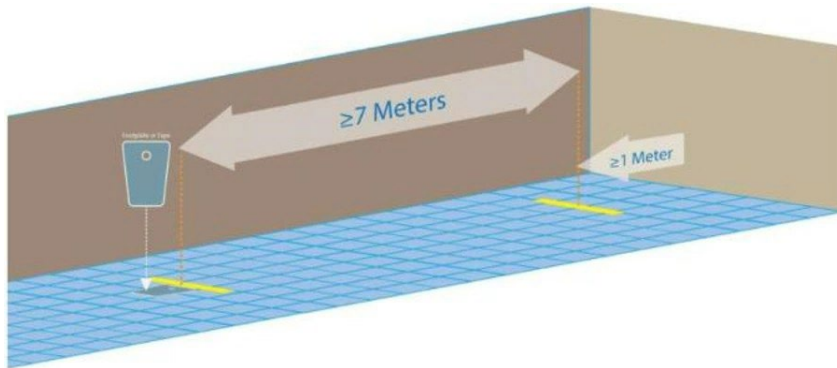
6.2.1.1 Supplies



6.2.1.2 Test Setup Instructions

- For best results, use a straight walkway $\geq 7\text{m}$ (23ft) long. Place a 1m (3ft) line of tape at the ends of the walkway, $\geq 1\text{m}$ (3ft) from walls to allow space for turns.
- Do not talk or interact with the subject during the recording as it may affect the results.
- To normalize subject stance (for anticipatory postural adjustment metrics), the footplate is placed directly behind the start tape and removed before the test to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the ground in the same dimensions as the footplate.
- Ensure that the walkway is free from obstructions.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them walk barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Walk behind and to the side of the subject for safety if concerned about fall risk.

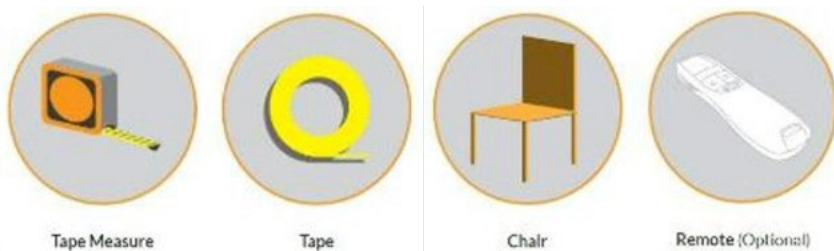
6.2.1.3 Instructions



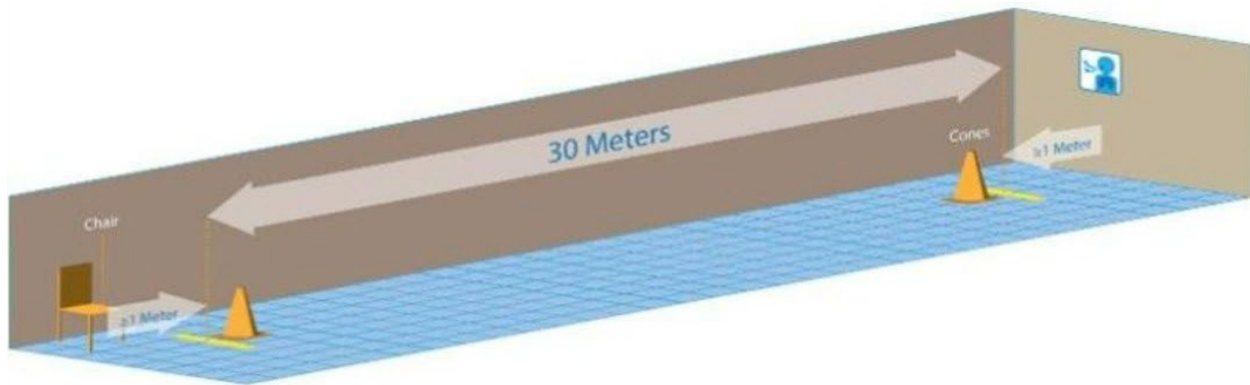
1. Place the footplate on the floor just behind the start line.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Place your feet around the footplate, aligning your heels with the short edge.
 - b. Stand upright with straight legs, arms by your sides with palms facing inward.
 - c. Look forward and remain still until you hear the first tone.
 - d. At the end of the first tone, begin walking at a natural and comfortable pace.
 - e. After crossing the tape at the ends of the walkway, turn around and walk back the other way. Continue walking back and forth the full length of the walkway.
 - f. The test will last 2 minutes. Stop walking when you hear the second tone.
3. **REMOVE FOOTPLATE BEFORE STARTING TEST.**
4. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 2 minutes indicated by a second tone.
5. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
6. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.2.2 Walk (6-Minute)

6.2.2.1 Supplies



6.2.2.2 Instructions



1. Have the subject sit and rest in a chair for 10 mins before the test starts.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Place your feet just behind and to the right of the start cone.
 - b. Stand upright with straight legs, arms by your sides with palms facing inward.
 - c. The goal of this test is to walk as far as possible in six minutes.
 - d. Look forward and remain still until you hear the first tone.
 - e. At the end of the first tone, walk quickly (yet safely) for the duration of the test.
 - f. After each minute, I will be informing you how much time you have left.
 - g. Pivot briskly around the cones and continue walking back and forth the full length of the walkway without hesitation.
 - h. The test will last 6 minutes. Stop walking when you hear the second tone.
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 6 minutes indicated by a second tone. If the subject does not hear the second tone, tell them to stop walking.
4. Provide the following **Phrases of Encouragement** to the subject while walking at the following 1-minute intervals.
 - a. 300 seconds left: You are doing well. You have 5 minutes to go.
 - b. 240 seconds left: Keep up the good work. You have 4 minutes to go.
 - c. 180 seconds left: You are doing well. You are halfway done.
 - d. 120 seconds left: Keep up the good work. You have only 2 minutes left.
 - e. 60 seconds left: You are doing well. You have only 1 minute to go.
5. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
6. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.2.2.3 Test Setup Instructions

- For best results, use a straight walkway 30m (98.5ft) long. If using an alternate walkway length, ensure the same length is utilized during subsequent test visits.
- Place a 15 cm (6 inch) line of tape to mark the start and endpoints of the course, ≥ 1 m (3ft) from walls to allow space for turns.
- Place the provided cones at each endpoint of the course, lining up the straight edge of the cone with the inside edge of the tape.
- Ensure that the walkway is free from obstructions.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).

- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them walk barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Walk behind and to the side of the subject for safety if concerned about fall risk.

6.2.3 Walk (Open Ended)

6.2.3.1 Supplies

6.2.3.2 Instructions

1. Place the footplate on the floor just behind the start line.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Place your feet around the footplate, aligning your heels with the short edge.
 - b. Stand upright with straight legs, arms by your sides with palms facing inward.
 - c. Look forward and remain still until you hear the first tone.
 - d. At the end of the first tone, begin walking at a natural and comfortable pace.
 - e. After crossing the tape at the end of the walkway, turn around and walk back the other way. Continue walking back and forth the full length of the walkway.
 - f. Stop walking when you hear the second tone.
3. **REMOVE FOOTPLATE BEFORE STARTING TEST.**
4. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. Press **Stop** (or press > on remote) to initiate the second tone which informs the subject to stop walking.
5. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.

6.2.3.3 Test Setup Instructions

- For best results, use a straight walkway $\geq 7\text{m}$ (23ft) long. Place a 1m (3ft) line of tape at the ends of the walkway, $\geq 1\text{m}$ (3ft) from walls to allow space for turns.
- Do not talk or interact with the subject during the recording as it may affect the results.
- To normalize subject stance (for anticipatory postural adjustment metrics), the footplate is placed directly behind the start tape and removed before the test to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the ground in the same dimensions as the footplate.
- Ensure that the walkway is free from obstructions.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them walk barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Walk behind and to the side of the subject for safety if concerned about fall risk.

6.2.4 SAW (7m Walkway)

6.2.4.1 Supplies

6.2.4.2 Instructions

1. Place the footplate on the floor just behind the start line.
2. Subject Instructions (Read Aloud to Subject):
 - a. Place your feet around the footplate, aligning your heels with the short edge.

- b. Stand upright with straight legs, and your hands on your hips.
 - c. Look forward and remain still.
 - d. At the first tone, continue to look forward with your eyes open, and remain still without talking or moving for 30 seconds.
 - e. At the second tone, relax your arms by your sides and begin walking at a natural and comfortable pace.
 - f. After crossing the tape at the end of the walkway, turn around, walk back and stop at the starting point without turning back around.
 - g. Remain still until you hear the final tone.
3. **REMOVE FOOTPLATE BEFORE STARTING TEST.**
 4. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. Press **Stop** (or press > on remote) to initiate the final tone when the subject has stopped walking.
 5. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
 6. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

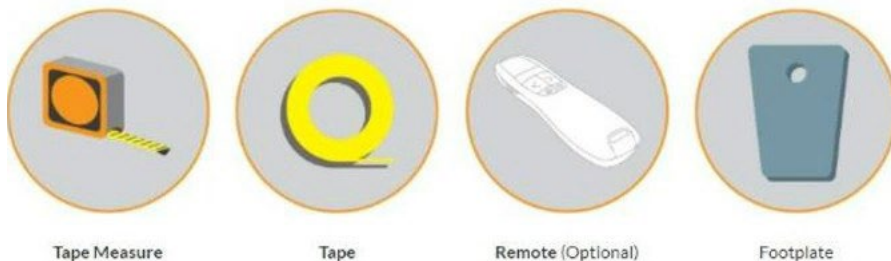
6.2.4.3 Test Setup Instructions

- For best results, use a straight walkway 7m (23ft) long. Place a 1m (3ft) line of tape at the ends of the walkway, $\geq 1\text{m}$ (3ft) from walls to allow space for turns.
- Do not talk or interact with the subject during the recording as it may affect the results.
- To normalize subject stance (for anticipatory postural adjustment metrics), the footplate is placed directly behind the start tape and removed before the test to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the ground in the same dimensions as the footplate.
- Ensure that the walkway is free from obstructions.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them walk barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand and walk behind and to the side of the subject for safety if concerned about fall risk.

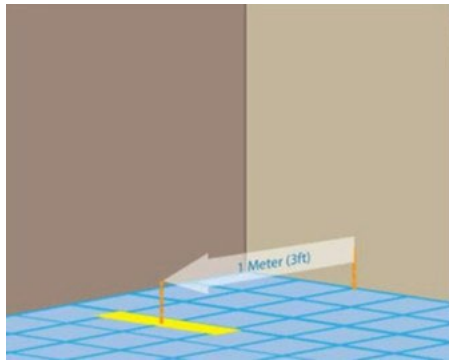
6.3 Balance Assessments

6.3.1 Sway (Feet Apart, Eyes Closed, Firm Surface)

6.3.1.1 Supplies



6.3.1.2 Instructions



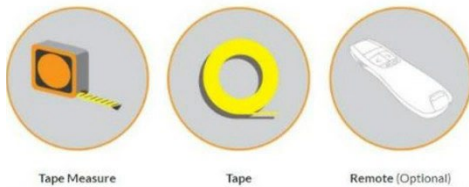
1. Place the footplate on the floor.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Place your feet around the footplate, aligning your heels with the short edge.
 - b. Stand upright with straight legs, and your hands on your hips.
 - c. Close your eyes and remain still without talking or moving for the entire 30-second test.
 - d. The first tone will indicate the start of the test.
 - e. The second tone will indicate the completion of the test.
3. **REMOVE FOOTPLATE BEFORE STARTING TEST.**
4. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
5. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
6. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.1.3 Test Setup Instructions

- To normalize subject stance, the footplate is to be utilized and removed before the trial to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the ground in the same dimensions as the footplate.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.2 Sway (Feet Apart, Eyes Closed, Foam Surface)

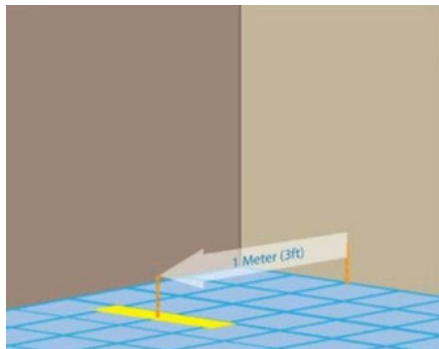
6.3.2.1 Supplies



6.3.2.2 Test Setup Instructions

- For best results, utilize a non-slip 20"x16"x2.5" foam balance pad.
- To normalize subject stance, the footplate is to be placed on top of the pad and removed before the trial to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the pad in the same dimensions as the footplate.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.2.3 Instructions



1. Place the footplate on top of the foam balance pad.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Step on the foam balance pad and place your feet around the footplate, aligning your heels with the short edge.
 - b. Stand upright with straight legs, and your hands on your hips.
 - c. Close your eyes and remain still without talking or moving for the entire 30-second test.
 - d. The first tone will indicate the start of the test.
 - e. The second tone will indicate the completion of the test.
3. **REMOVE FOOTPLATE BEFORE STARTING TEST.**
4. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
5. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.

6. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.3.3 Sway (Feet Apart, Eyes Open, Firm Surface)

6.3.3.1 Supplies



6.3.3.2 Test Setup Instructions

- For best results, place a 1m (3ft) line of tape 1m (3 ft) from a wall. Center a fixed object on the wall, such as a picture, at subject eye-level.
- To normalize subject stance, the footplate is placed directly behind the tape and removed before the trial to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the ground in the same dimensions as the footplate.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.3.3 Instructions

1. Place the footplate on the floor behind the line of tape.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Place your feet around the footplate, aligning your heels with the short edge.
 - b. Stand upright with straight legs, and your hands on your hips.
 - c. Look forward and remain still without talking or moving for the entire 30-second test.
 - d. The first tone will indicate the start of the test.
 - e. The second tone will indicate the completion of the test.
3. REMOVE FOOTPLATE BEFORE STARTING TEST.
4. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
5. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
6. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.4 Sway (Feet Apart, Eyes Open, Foam Surface)

6.3.4.1 Supplies

6.3.4.2 Test Setup Instructions

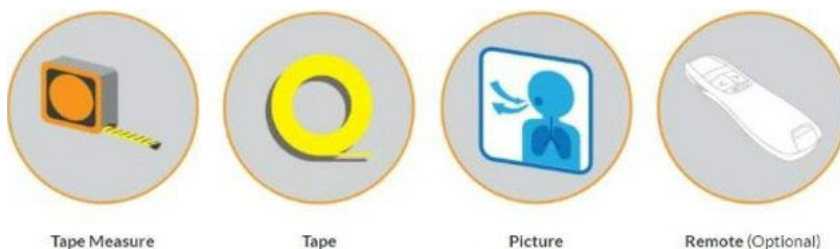
- For best results, place a 1m (3ft) line of tape 1m (3 ft) from a wall. Center a fixed object on the wall, such as a picture, at subject eye-level.
- Place a non-slip 20"x16"x2.5" foam balance pad directly behind the tape.
- To normalize subject stance, the footplate is to be placed on top of the pad and removed before the trial to avoid any tripping hazard. Alternatively, stance can be normalized with tape on the pad in the same dimensions as the footplate.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot.
- Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.4.3 Instructions

1. Place the footplate on top of the foam balance pad.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Step on the foam balance pad and place your feet around the footplate, aligning your heels with the short edge.
 - b. Stand upright with straight legs, and your hands on your hips.
 - c. Look forward and remain still without talking or moving for the entire 30-second test.
 - d. The first tone will indicate the start of the test.
 - e. The second tone will indicate the completion of the test.
3. REMOVE FOOTPLATE BEFORE STARTING TEST.
4. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
5. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
6. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.5 Sway (Feet Together, Eyes Closed, Firm Surface)

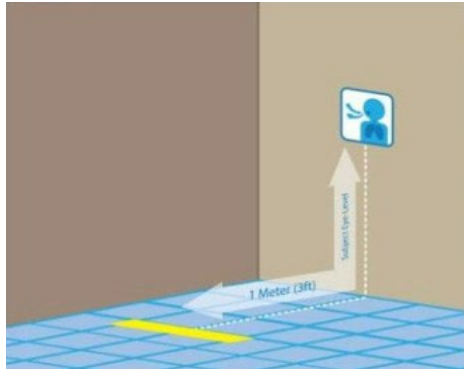
6.3.5.1 Supplies



6.3.5.2 Test Setup Instructions

- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

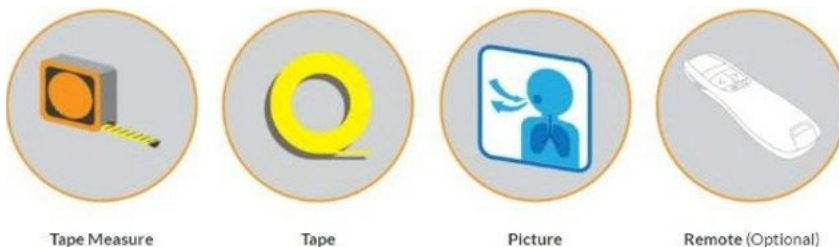
6.3.5.3 Instructions



1. **Subject Instructions (Read Aloud to Subject):**
 - a. Place your feet together so that they are touching.
 - b. Stand upright with straight legs, and your hands on your hips.
 - c. Close your eyes and remain still without talking or moving for the entire 30-second test.
 - d. The first tone will indicate the start of the test.
 - e. The second tone will indicate the completion of the test.
2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.6 Sway (Feet Together, Eyes Open, Firm Surface)

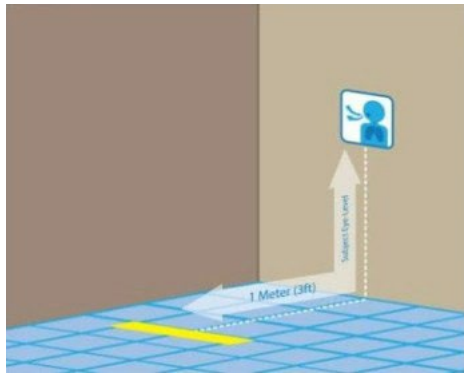
6.3.6.1 Supplies



6.3.6.2 Test Setup Instructions

- For best results, place a 1m (3ft) line of tape 1m (3 ft) from a wall. Center a fixed object on the wall, such as a picture, at subject eye-level.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.6.3 Instructions



1. **Subject Instructions (Read Aloud to Subject):**
 - a. Align your toes with the tape and place your feet together so that they are touching.
 - b. Stand upright with straight legs, and your hands on your hips.
 - c. Look forward and remain still without talking or moving for the entire 30-second test.
 - d. The first tone will indicate the start of the test.
 - e. The second tone will indicate the completion of the test.
2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop down menu on the next screen. Additional information may be added in the Test notes field.

If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.7 Sway (One Foot, Eyes Closed, Firm Surface)

6.3.7.1 Supplies

6.3.7.2 Test Setup Instructions

- Determine foot dominance by asking the subject, "which foot would you kick a soccer ball with?" The answer is their dominant foot.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).

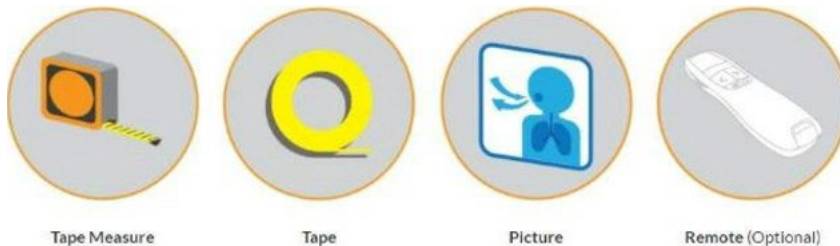
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.7.3 Instructions

1. **Subject Instructions (Read Aloud to Subject):**
 - a. Stand quietly on your non-dominant foot with your hands on your hips.
 - b. Close your eyes and remain still without talking or moving for the entire 30-second test.
 - c. The first tone will indicate the start of the test.
 - d. The second tone will indicate the completion of the test.
2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.8 Sway (One Foot, Eyes Open, Firm Surface)

6.3.8.1 Supplies



Tape Measure

Tape

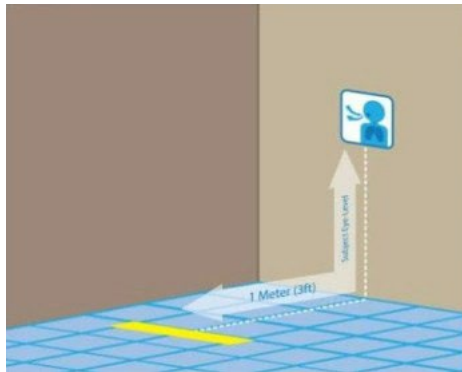
Picture

Remote (Optional)

6.3.8.2 Test Setup Instructions

- For best results, place a 1m (3 ft) line of tape 1m (3ft) from a wall. Center a fixed object on the wall, such as a picture, at subject eye-level.
- Determine foot dominance by asking the subject, "which foot would you kick a soccer ball with?" The answer is their dominant foot.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.8.3 Instructions



1. **Subject Instructions (Read Aloud to Subject):**
 - a. Align your toes with the tape, then stand quietly on your non-dominant foot with your hands on your hips.
 - b. Look forward and remain still without talking or moving for the entire 30-second test.
 - c. The first tone will indicate the start of the test.
 - d. The second tone will indicate the completion of the test.
2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.9 Sway (Tandem Feet, Eyes Closed, Firm Surface)

6.3.9.1 Supplies

6.3.9.2 Test Setup Instructions

- Determine foot dominance by asking the subject, "which foot would you kick a soccer ball with?" The answer is their dominant foot.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.9.3 Instructions

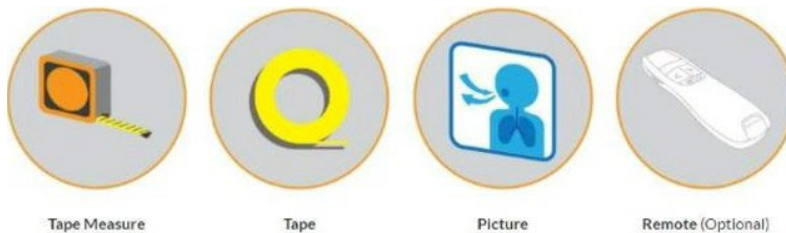
1. **Subject Instructions (Read Aloud to Subject):**
 - a. Stand quietly in a tandem stance with your dominant foot forward, and your hands on your hips.
 - b. Close your eyes and remain still without talking or moving for the entire 30-second test.
 - c. The first tone will indicate the start of the test.
 - d. The second tone will indicate the completion of the test.

2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.3.10 Sway (Tandem Feet, Eyes Open, Firm Surface)

6.3.10.1

Supplies



Tape Measure

Tape

Picture

Remote (Optional)

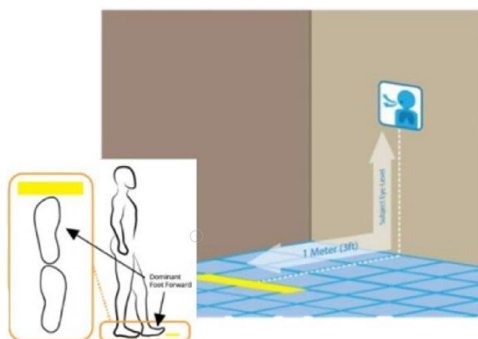
6.3.10.2

Test Setup Instructions

- For best results, place a 1m (3 ft) line of tape 1m (3ft) from a wall. Center a fixed object on the wall, such as a picture, at subject eye-level.
- Determine foot dominance by asking the subject, "which foot would you kick a soccer ball with?" The answer is their dominant foot.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them stand barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.3.10.3

Instructions



1. Subject Instructions (Read Aloud to Subject):

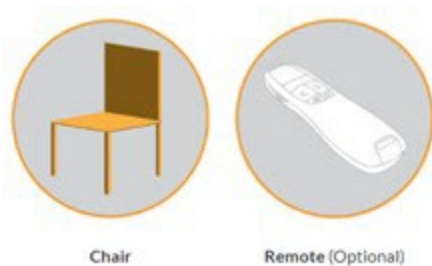
- a. Stand quietly in a tandem stance with your dominant foot forward, and your hands on your hips.
- b. Look forward and remain still without talking or moving for the entire 30-second test.
- c. The first tone will indicate the start of the test.
- d. The second tone will indicate the completion of the test.

2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 30 seconds indicated by a second tone.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.4 Additional Movement Assessments

6.4.1 Sit to Stand (5x)

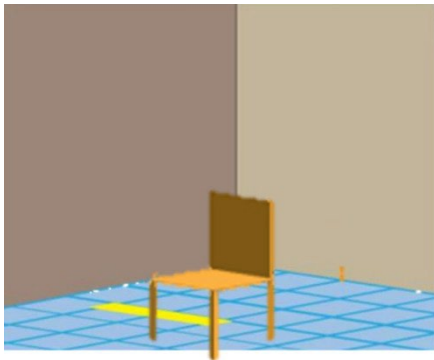
6.4.1.1 Supplies



6.4.1.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them perform the test barefooted. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.4.1.3 Instructions



1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.

- b. Place your arms across your chest.
 - c. Put both feet flat on the floor with your heels directly beneath your knees.
 - d. When you hear the first tone, stand up straight as quickly as you can, then sit back down.
 - e. Keep your arms folded across your chest if possible.
 - f. Repeat arising from the chair and sitting back down for a total of 5 times.
 - g. The second tone indicates the completion of the test.
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. Press Stop (or press > on remote) when the subject has returned to the sitting position the 5th time.
4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.4.2 TUG (3m Walkway)

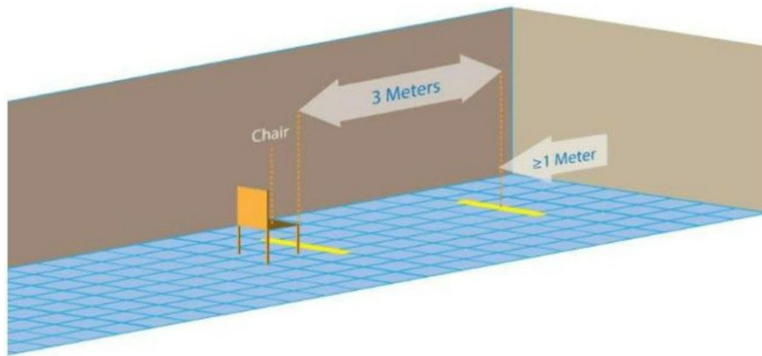
6.4.2.1 Supplies



6.4.2.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Do not talk or interact with the subject during the recording as it may affect the results.
- Measure a straight 3m (10ft) long walkway from the front of the chair. Place a 1m (3ft) line of tape at the end of the walkway, $\geq 1\text{m}$ (3ft) from walls to allow space for the turn.
- Ensure that the walkway is free from obstructions.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them walk barefoot. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Walk behind and to the side of the subject for safety if concerned about fall risk.

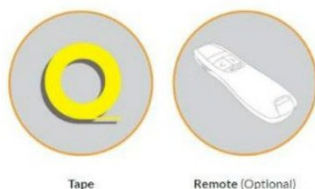
6.4.2.3 Instructions



1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.
 - b. Place your arms across your chest.
 - c. Put both feet flat on the floor with your heels directly beneath your knees.
 - d. At the end of the first tone, stand up from the chair without using your hands and walk toward the line of tape on the floor as quickly and safely as possible.
 - e. Once you cross the tape, turn around, walk back, and sit down with your back against the chair.
 - f. Sit quietly until you hear the second tone.
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. Press Stop (or press > on remote) when the subject has returned to the sitting position with their back against the chair.
4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.4.3 360 Degree Turn (1x)

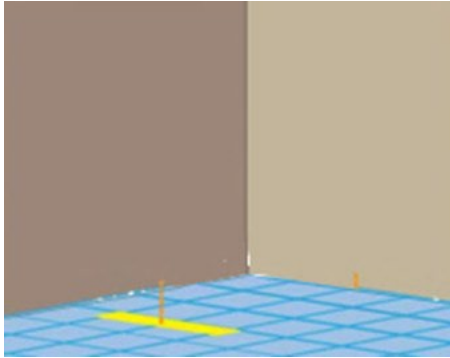
6.4.3.1 Supplies



6.4.3.2 Test Setup Instructions

- For best results, place a 1m (3ft) line of tape on the floor to mark the start and stop position.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** The subject should wear comfortable walking shoes (no high-heels or flip-flops). Ideally, the same shoes should be worn each visit. If not, have them perform the test barefooted. Ensure sensors are visible and not hindered by clothing, jewelry, etc. Stand behind and to the side of the subject for safety if concerned about fall risk.

6.4.3.3 Instructions

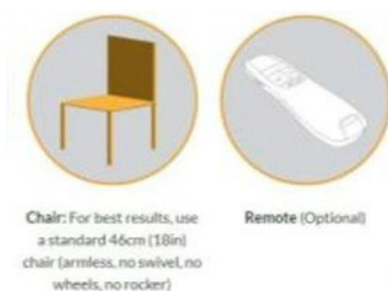


1. **Subject Instructions (Read Aloud to Subject):**
 - a. Stand with your toes aligned with the tape.
 - b. At the end of the first tone, turn completely around to the right until you are facing the same direction, immediately followed by turning completely around to the left.
 - c. Remain still until you hear the second tone which indicates the completion of the test.
2. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. Press Stop (or press > on remote) to initiate the second tone when the subject has completed the test.
3. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
4. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.5 Tremor Assessments

6.5.1 Tremor (Postural – Arms Forward)

6.5.1.1 Supplies



6.5.1.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).

- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.5.1.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.
 - b. Raise your arms out in front of your body so that they are parallel to the ground.
 - c. Face your palms down with your wrists straight.
 - d. Keep your fingers comfortable separated.
 - e. Look straight ahead and do not attempt to suppress tremor.
 - f. At the sound of the first tone, sit quietly in this position for 20 seconds.
 - g. The second tone indicates the completion of the test.
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.5.2 Tremor (Postural – Arms Lateral)

6.5.2.1 Supplies



6.5.2.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.5.2.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.

- b. Raise your elbows out to the side so that your arms are parallel to the ground.
 - c. Place your hands so that they do not quite touch each other at the level of your nose.
 - d. Keep your fingers comfortable separated.
 - e. Look straight ahead and do not attempt to suppress tremor.
 - f. At the sound of the first tone, sit quietly in this position for 20 seconds.
 - g. The second tone indicates the completion of the test.
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.5.3 Tremor (Resting)

6.5.3.1 Supplies



6.5.3.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.5.3.3 Instructions

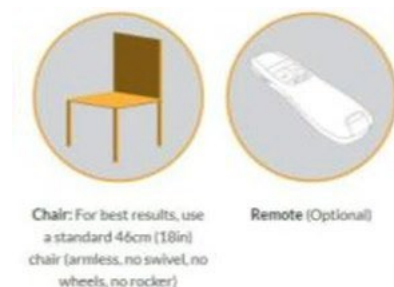
1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.
 - b. Place your hands in your lap, resting one wrist on each thigh.
 - c. Look straight ahead and do not attempt to suppress tremor.
 - d. At the sound of the first tone, sit quietly in this position for 20 seconds.
 - e. The second tone indicates the completion of the test.
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.

4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.6 Bradykinesia Assessments

6.6.1 Hand Pronation-Supination (Left)

6.6.1.1 Supplies



6.6.1.2 Test Setup Instructions

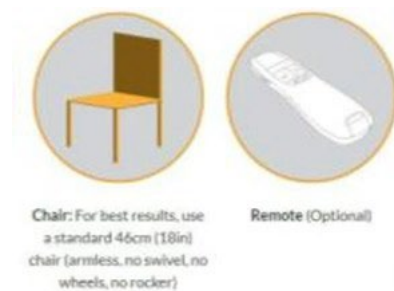
1. For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
2. Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
3. Do not talk or interact with the subject during the recording as it may affect the results.
4. The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
5. **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.1.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. Please sit with your back against the chair.
 - b. Extend your left arm out in front of you with your palm facing down.
 - c. At the sound of the first tone, alternate turning your palm up and down as fast and fully as possible.
 - d. Repeat this for 20 seconds.
 - e. The second tone indicates the completion of the test.
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press **Continue**.
5. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.6.2 Hand Pronation-Supination (Right)

6.6.2.1 Supplies



6.6.2.2 Test Setup Instructions

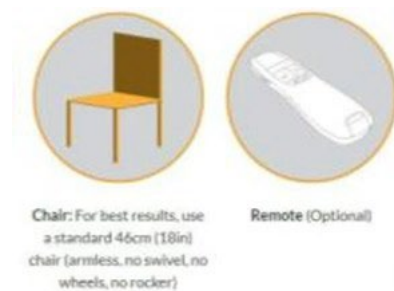
1. For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
2. Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
3. Do not talk or interact with the subject during the recording as it may affect the results.
4. The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
5. **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.2.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair.**
 - b. **Extend your right arm out in front of you with your palm facing down.**
 - c. **At the sound of the first tone, alternate turning your palm up and down as fast and fully as possible.**
 - d. **Repeat this for 20 seconds.**
 - e. **The second tone indicates the completion of the test.**
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
5. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.6.3 Heel Tapping (Left)

6.6.3.1 Supplies



6.6.3.2 Test Setup Instructions

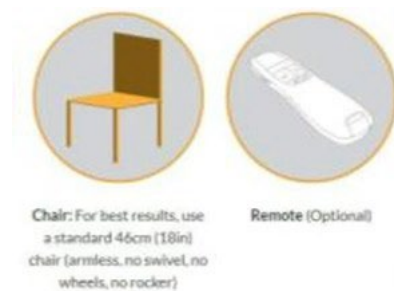
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.3.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair with both feet flat on the floor.**
 - b. **At the sound of the first tone, raise and stomp your left foot on the ground as fast and high as possible.**
 - c. **Repeat this for 20 seconds.**
 - d. **The second tone indicates the completion of the test.**
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
5. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.6.4 Heel Tapping (Right)

6.6.4.1 Supplies



6.6.4.2 Test Setup Instructions

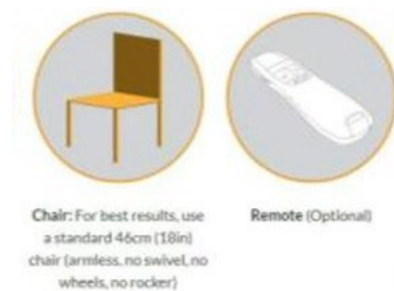
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.4.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair with both feet flat on the floor.**
 - b. **At the sound of the first tone, raise and stomp your right foot on the ground as fast and high as possible.**
 - c. **Repeat this for 20 seconds.**
 - d. **The second tone indicates the completion of the test.**
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
5. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.6.5 Toe Tapping (Left)

6.6.5.1 Supplies



6.6.5.2 Test Setup Instructions

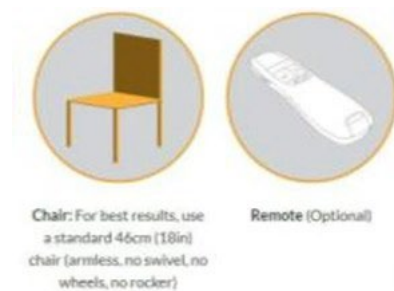
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.5.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair with both feet flat on the floor.**
 - b. **At the sound of the first tone, keep your heel on ground, and tap your left toes as fast and big as possible.**
 - c. **Repeat this for 20 seconds.**
 - d. **The second tone indicates the completion of the test.**
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
5. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.6.6 Toe Tapping (Right)

6.6.6.1 Supplies



6.6.6.2 Test Setup Instructions

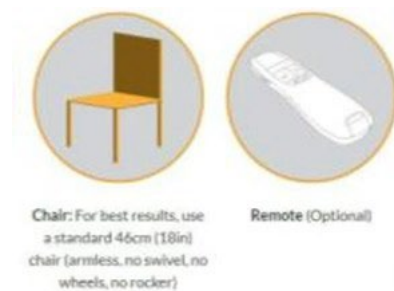
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.6.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair with both feet flat on the floor.**
 - b. **At the sound of the first tone, keep your heel on ground, and tap your right toes as fast and big as possible.**
 - c. **Repeat this for 20 seconds.**
 - d. **The second tone indicates the completion of the test.**
3. Press **Record** (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the **Trial Notes** field may be used to enter additional information in regard to subject test performance. Review the **Analysis Log** before proceeding to the next test. Press **Continue**.
5. If there is a need to **Skip**, **Redo**, or **Stop** the test before it is completed, select the **Reason for action** from the drop-down menu on the next screen. Additional information may be added in the **Test notes** field.

6.6.7 Fast Alternating Hand (Left)

6.6.7.1 Supplies



6.6.7.2 Test Setup Instructions

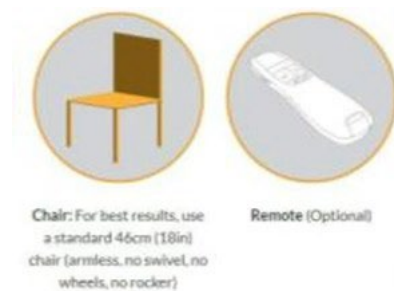
- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.7.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair.**
 - b. **With your left upper arm at your side, bend your elbow to a 90 degree angle.**
 - c. **At the sound of the first tone, alternate turning your left palm up and down as fast as possible.**
 - d. **Repeat this for 20 seconds.**
 - e. **The second tone indicates the completion of the test.**
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

6.6.8 Fast Alternating Hand (Right)

6.6.8.1 Supplies



6.6.8.2 Test Setup Instructions

- For best results, use a standard 46cm (18in) chair (armless, no swivel, no wheels, no rocker).
- Prior to the recording, demonstrate how to perform the test correctly while reading the Subject Instructions to the subject.
- Do not talk or interact with the subject during the recording as it may affect the results.
- The wireless remote can be used to administer the test if away from the computer. (Insert USB from remote into computer, switch remote to ON, press > to start and to advance).
- **Subject Preparation & Safety:** Ensure sensors are visible and not hindered by clothing, jewelry, etc. Assist the subject in and out of the chair if concerned about fall risk.

6.6.8.3 Instructions

1. Have the subject sit in the chair.
2. **Subject Instructions (Read Aloud to Subject):**
 - a. **Please sit with your back against the chair.**
 - b. **With your right upper arm at your side, bend your elbow to a 90 degree angle.**
 - c. **At the sound of the first tone, alternate turning your right palm up and down as fast as possible.**
 - d. **Repeat this for 20 seconds.**
 - e. **The second tone indicates the completion of the test.**
3. Press Record (or press > on remote) to begin data acquisition. There will be a silent 3-second countdown (subject still period) before the start tone. The recording will automatically stop after 20 seconds indicated by a second tone.
4. On the next screen, the Trial Notes field may be used to enter additional information in regard to subject test performance. Review the Analysis Log before proceeding to the next test. Press Continue.
5. If there is a need to Skip, Redo, or Stop the test before it is completed, select the Reason for action from the drop-down menu on the next screen. Additional information may be added in the Test notes field.

7. Metrics / Endpoint Data and Definitions

7.1 Active In-Clinic or Active Remote

Name (units)	Definition	Tests	Body Placement Required
Trial Duration (sec)	The duration of the trial. The countdown period is not included	All	Any
Timed Up & Go (TUG)			
TUG Duration (sec)	The duration of the interval between the start of the sit to stand event to the end of the stand to sit event.	TUG	Lumbar
Anticipatory Postural Adjustment			
APA Duration (sec)	The duration of the period starting from the first measurable change of the lateral lumbar acceleration from baseline, to when the lateral acceleration goes back to the baseline value.	Walk, SAW	Lumbar, Right Foot, Left Foot
First Step Duration (sec)	The duration of the period spanning from the end of the APA to the initial contact of the first step.	Walk, SAW	Lumbar, Right Foot, Left Foot
First Step Range of Motion (degrees)	The integrated angular velocity of the stepping foot from the end of the APA to the initial contact of the step.	Walk, SAW	Lumbar, Right Foot, Left Foot
Forward APA Peak (m/sec ²)	The peak forward lumbar acceleration during the APA.	Walk, SAW	Lumbar, Right Foot, Left Foot
Lateral APA Peak (m/sec ²)	The peak lateral lumbar acceleration during the APA.	Walk, SAW	Lumbar, Right Foot, Left Foot
Gait - Lower Limb			
Cadence (steps/min)	The number of steps per minute, counting steps made by both feet.	Walk, SAW	Lumbar, Right Foot, Left Foot
Circumduction (cm)	The maximum amount that the foot travels perpendicular to forward movement during an individual stride. Positive values indicate movement to the outside.	Walk, SAW	Lumbar, Right Foot, Left Foot
Double Support (% GCT)	The percentage of the gait cycle in which both feet are on the ground.	Walk, SAW	Lumbar, Right Foot, Left Foot
Elevation at Midswing (cm)	The height of the foot sensor measured at midswing, relative to its start position while standing.	Walk, SAW	Lumbar, Right Foot, Left Foot

Name (units)	Definition	Tests	Body Placement Required
Foot Strike Angle (degrees)	The angle of the foot at the point of initial contact. The pitch of the foot when flat is zero and positive when the heel contacts first.	Walk, SAW	Lumbar, Right Foot, Left Foot
Gait Cycle Duration (sec)	The duration of a full gait cycle, measured from the left foot's initial contact to the next initial contact of the left foot.	Walk, SAW	Lumbar, Right Foot, Left Foot
Gait Speed (m/sec)	The forward speed of the subject, measured as the forward distance traveled during the gait cycle divided by the gait cycle duration.	Walk, SAW	Lumbar, Right Foot, Left Foot
Lateral Step Deviation (cm)	When considering three consecutive foot placements made by the same foot, this describes the perpendicular deviations of the middle foot placement from the line connecting the first and the third.	Walk, SAW	Lumbar, Right Foot, Left Foot
Single Limb Support (%GCT)	The percentage of the gait cycle in which the opposite foot is not touching the ground.	Walk, SAW	Lumbar, Right Foot, Left Foot
Stance (%GCT)	The percentage of the gait cycle in which the foot is on the ground.	Walk, SAW	Lumbar, Right Foot, Left Foot
Step Duration (sec)	The duration of a step, measured as the period from initial contact of one foot to the next initial contact of the opposite foot. The handedness refers to the stepping foot.	Walk, SAW	Lumbar, Right Foot, Left Foot
Stride Length (m)	The forward distance traveled by the foot during a gait cycle.	Walk, SAW	Lumbar, Right Foot, Left Foot
Swing (%GCT)	The percentage of the gait cycle in which the foot is not on the ground.	Walk, SAW	Lumbar, Right Foot, Left Foot
Terminal Double Support (%GCT)	The percentage of the gait cycle in which both feet are on the ground. The handedness refers to the foot that is in the aft position.	Walk, SAW	Lumbar, Right Foot, Left Foot
Toe Off Angle (degrees)	The angle of the foot as it leaves the floor at push off. The pitch of the foot when flat is zero.	Walk, SAW	Lumbar, Right Foot, Left Foot
Toe Out Angle (degrees)	The lateral angle of the foot during the stance phase, relative to the forward motion of the foot during the swing phase. Positive angles indicate an outward rotation of the toes.	Walk, SAW	Lumbar, Right Foot, Left Foot
Valid Gait Cycles (no.)	The number of valid gait cycles detected within the recording.	Walk, SAW	Lumbar, Right Foot, Left Foot

Name (units)	Definition	Tests	Body Placement Required
Walk Distance (m)	The average total horizontal distance traveled across all left and right strides.	Walk, SAW	Lumbar, Right Foot, Left Foot
Gait – Lumbar			
Coronal Range of Motion (degrees)	The angular range of the lumbar spine in the coronal plane.	Walk, SAW	Lumbar, Right Foot, Left Foot
Sagittal Range of Motion (degrees)	The angular range of the lumbar spine in the sagittal plane.	Walk, SAW	Lumbar, Right Foot, Left Foot
Transverse Range of Motion (degrees)	The angular range of the lumbar spine in the transverse plane.	Walk, SAW	Lumbar, Right Foot, Left Foot
Gait – Trunk			
Coronal Range of Motion (degrees)	The angular range of the thoracic spine in the coronal plane.	Walk, SAW	Trunk, Lumbar, Right Foot, Left Foot
Sagittal Range of Motion (degrees)	The angular range of the thoracic spine in the sagittal plane.	Walk, SAW	Trunk, Lumbar, Right Foot, Left Foot
Transverse Range of Motion (degrees)	The angular range of the thoracic spine in the transverse plane.	Walk, SAW	Trunk, Lumbar, Right Foot, Left Foot
Gait – Upper Limb			
Arm Swing Range of Motion (degrees)	The angular range of the arm swing.	Walk, SAW	Right Wrist, Left Wrist, Lumbar, Right Foot, Left Foot
Arm Swing Velocity (degrees/sec)	The maximum rotational velocity of the arm swing.	Walk, SAW	Right Wrist, Left Wrist, Lumbar, Right Foot, Left Foot
Postural Sway – Acceleration			
Centroidal Frequency (Hz)	Frequency of sway from the centroid of the sway path's power spectrum in the transverse plane.	Sway, SAW	Lumbar
Centroidal Frequency (Coronal) (Hz)	Frequency of sway from the centroid of the sway path's power spectrum in the medial/lateral direction.	Sway, SAW	Lumbar

Name (units)	Definition	Tests	Body Placement Required
Centroidal Frequency (Sagittal) (Hz)	Frequency of sway from the centroid of the sway path's power spectrum in the anterior/posterior direction.	Sway, SAW	Lumbar
Frequency Dispersion	Frequency dispersion in the transverse plane.	Sway, SAW	Lumbar
Frequency Dispersion (Coronal)	Frequency dispersion in the medial/lateral direction.	Sway, SAW	Lumbar
Frequency Dispersion (Sagittal)	Frequency dispersion in the anterior/posterior direction.	Sway, SAW	Lumbar
Jerk (m2/sec5)	Smoothness of sway from the time derivative of the sway path in the transverse plane (top view looking down).	Sway, SAW	Lumbar
Jerk (Coronal) (m2/sec5)	Smoothness of sway from the time derivative of the sway path in the medial/lateral direction.	Sway, SAW	Lumbar
Jerk (Sagittal) (m2/sec5)	Smoothness of sway from the time derivative of the sway path in the anterior/posterior direction.	Sway, SAW	Lumbar
Mean Velocity (m/sec)	Mean velocity of the sway path in the transverse plane.	Sway, SAW	Lumbar
Mean Velocity (Coronal) (m/sec)	Mean velocity of the sway path in the medial/lateral direction.	Sway, SAW	Lumbar
Mean Velocity (Sagittal) (m/sec)	Mean velocity of the sway path in the anterior/posterior direction.	Sway, SAW	Lumbar
Path Length (m/sec2)	Total length of the sway path in the transverse plane.	Sway, SAW	Lumbar
Path Length (Coronal) (m/sec2)	Total length of the sway path in the medial/lateral direction.	Sway, SAW	Lumbar
Path Length (Sagittal) (m/ sec2)	Total length of the sway path in the anterior/posterior direction.	Sway, SAW	Lumbar
RMS Sway (m/sec2)	The root mean square (RMS) of the sway angle in both the coronal and sagittal planes.	Sway, SAW	Lumbar
RMS Sway (Coronal) (m/ sec2)	The root mean square (RMS) of the sway angle in the coronal plane.	Sway, SAW	Lumbar
RMS Sway (Sagittal) (m/ sec2)	The root mean square (RMS) of the sway angle in the sagittal plane.	Sway, SAW	Lumbar
Range (m/sec2)	Total range of the sway path in the transverse plane.	Sway, SAW	Lumbar
Range (Coronal) (m/sec2)	Total range of the sway path in the medial/lateral direction.	Sway, SAW	Lumbar
Range (Sagittal) (m/sec2)	Total range of the sway path in the anterior/posterior direction.	Sway, SAW	Lumbar

Name (units)		Definition	Tests	Body Placement Required
Sway Area (m2/sec4)		The area of an ellipse covering 95% of the sway angle in the coronal and sagittal planes.	Sway, SAW	Lumbar
Postural Sway – Angles				
RMS Sway (degrees)		The root mean square (RMS) of the sway angle in both the coronal and sagittal planes.	Sway, SAW	Lumbar
RMS Sway (Coronal) (degrees)		The root mean square (RMS) of the sway angle in the coronal plane.	Sway, SAW	Lumbar
RMS Sway (Sagittal) (degrees)		The root mean square (RMS) of the sway angle in the sagittal plane.	Sway, SAW	Lumbar
Sway Area (degrees2)		The area of an ellipse covering 95% of the sway angle in the coronal and sagittal planes.	Sway, SAW	Lumbar
Sit to Stand				
Duration (sec)		The duration of the sit-to-stand transition.	Sit to Stand, TUG	Lumbar
Lean Angle (degrees)		The angular range of motion of the trunk during the sit- to-stand transition.	Sit to Stand, TUG	Trunk, Lumbar
Sit to Stand Events (no.)		The number of sit to stand events detected within the recording.	Sit to Stand, TUG	Lumbar
Gait – Turns				
Average Angle Per Step (degrees)		Average change in turn angle for each transition from one step to another during the turn.	Walk, SAW	Lumbar, Right Foot, Left Foot
Average Duration Per Step (sec)		Average duration for each transition from one step to another during the turn.	Walk, SAW	Lumbar, Right Foot, Left Foot
Average Velocity Per Step (degrees/sec)		Average heading velocity for each transition from one step to another during the turn.	Walk, SAW	Lumbar, Right Foot, Left Foot
Peak Angle Per Step (degrees)		Maximum change in turn angle for each transition from one step to another during the turn.	Walk, SAW	Lumbar, Right Foot, Left Foot
Peak Duration Per Step (sec)		Maximum duration for each transition from one step to another during the turn.	Walk, SAW, 360 Degree Turn	Lumbar, Right Foot, Left Foot
Peak Velocity Per Step (degrees/sec)		Maximum heading velocity for each transition from one step to another during the turn.	Walk, SAW	Lumbar, Right Foot, Left Foot
Steps in Turn (no.)		Total number of steps detected during the turn.	Walk, SAW, TUG	Lumbar, Right Foot, Left Foot

Name (units)	Definition	Tests	Body Placement Required
Turns			
Angle (degrees)	The rotational angle of the turn.	Walk, SAW, TUG, 360 Degree Turn	Lumbar
Average Velocity (degrees/sec)	Average angular velocity of the turn.	Walk, SAW, TUG	Lumbar
Direction (0=CW,1=CCW)	Direction of the turn expressed as clockwise (0) or counterclockwise (1).	Walk, SAW, TUG	Lumbar
Duration (sec)	The duration of the turn.	Walk, SAW, TUG, 360 Degree Turn	Lumbar
Hesitations (no.)	Total number of hesitations, slowing, or pauses detected during the turn.	Walk, SAW, TUG	Lumbar
Peak Velocity (degrees/sec)	Maximum angular velocity of the turn.	Walk, SAW, TUG, 360 Degree Turn	Lumbar
Turns (no.)	The number of turns detected within the recording.	Walk, SAW, TUG, 360 Degree Turn	Lumbar
Tremor - Left Wrist, Tremor - Right Wrist			
Frequency (Hz)	Estimated number of tremor cycles per second.	Tremor	Right Wrist, Left Wrist
Linear/Translational Amplitude (cm)	Tremor amplitude defined as spatial translational movement.	Tremor	Right Wrist, Left Wrist
Rotation Amplitude (degrees)	Tremor amplitude defined as rotational movement.	Tremor	Right Wrist, Left Wrist
Tremor Detected (%)	Indicator variable of whether tremor was detected or not, where 0 indicates tremor was not detected and 1 indicates tremor was detected.	Tremor	Right Wrist, Left Wrist
Bradykinesia - Hand Pronation-Supination, Fast Alternating Hand			
Amplitude (degrees)	Amplitude of the minimum to maximum range of movement.	Bradykinesia	Right Wrist, Left Wrist
Cycle Duration (sec)	Duration of maximum to maximum (or minimum to minimum) range of movement.	Bradykinesia	Right Wrist, Left Wrist
Velocity (degrees/sec)	Rate of minimum to maximum range of movement.	Bradykinesia	Right Wrist, Left Wrist
Bradykinesia - Toe tapping			

Name (units)	Definition	Tests	Body Placement Required
Amplitude (degrees)	Amplitude of the minimum to maximum range of movement.	Bradykinesia	Right Foot, Left Foot
Cycle Duration (sec)	Duration of maximum to maximum (or minimum to minimum) range of movement.	Bradykinesia	Right Foot, Left Foot
Velocity (degrees/sec)	Rate of minimum to maximum range of movement.	Bradykinesia	Right Foot, Left Foot
Bradykinesia - Heel tapping			
Amplitude (m)	Amplitude of the minimum to maximum range of movement.	Bradykinesia	Right Foot, Left Foot
Cycle Duration (sec)	Duration of maximum to maximum (or minimum to minimum) range of movement.	Bradykinesia	Right Foot, Left Foot
Velocity (m/sec)	Rate of minimum to maximum range of movement.	Bradykinesia	Right Foot, Left Foot

7.2 Joint Angle – Moveo Explorer

Name (units)	Definition	Tests	Body Placement Required
Ankle			
Abd-Add Max./Min./Range (degrees)	The maximum/minimum/absolute difference between abduction-adduction. Abduction is outward rotation of the ankle moving the forefoot away from the midline of the body. Adduction is inward rotation of the ankle moving the forefoot towards from the midline of the body.	Walk, Free Form	Right Foot and Right Lower Leg, Left Foot and Left Lower Leg
Dor-Plantar Max./Min./Range (degrees)	The maximum/minimum/absolute difference between plantar-dorsal flexion. Plantar Flexion is extension of the ankle moving the forefoot away from the body. Dorsiflexion is moving the top of foot toward the body.	Walk, Free Form	Right Foot and Right Lower Leg, Left Foot and Left Lower Leg
Ev-Inv Max./Min./Range (degrees)	The maximum/minimum/absolute difference between eversion-inversion. Eversion (Pronation) is turning the foot laterally resulting in the top of the foot moving outward. Inversion (Supination) is turning the foot medially resulting in the top of the foot moving inward.	Walk, Free Form	Right Foot and Right Lower Leg, Left Foot and Left Lower Leg
Back			
Flex-Ext Max./Min./Range (degrees)	The maximum/minimum/absolute difference between flexion-extension angle. Flexion is moving the torso forward. Extension is moving the torso backward.	Walk, Free Form	Sternum and Lumbar

Name (units)	Definition	Tests	Body Placement Required
Left Lat. Bend Max. (degrees)	The minimum lateral bend. Lateral bending is movement of the torso away from the midline of the body.	Walk, Free Form	Sternum and Lumbar
Left Rot Max. (degrees)	The minimum rotation angle. Rotation is turning the torso to the side (right or left).	Walk, Free Form	Sternum and Lumbar
R-L Lat Bend Range (degrees)	The absolute difference between the maximum and minimum lateral bending. Lateral bending is movement of the torso away from the midline of the body.	Walk, Free Form	Sternum and Lumbar
R-L Rot Range (degrees)	The absolute difference between the maximum and minimum rotation. Rotation is turning the torso to the side (right or left).	Walk, Free Form	Sternum and Lumbar
Right Lat. Bend Max. (degrees)	The maximum lateral bend. Lateral bending is movement of the torso away from the midline of the body.	Walk, Free Form	Sternum and Lumbar
Right Rot Max. (degrees)	The maximum rotation angle. Rotation is turning the torso to the side (right or left).	Walk, Free Form	Sternum and Lumbar
Elbow			
Flex-Ext Max./Min./Range (degrees)	The maximum/minimum/absolute difference between flexion-extension. Flexion is bending the forearm upward. Extension is moving the forearm downward.	Walk, Free Form	Upper Arm and Wrist
Sup-Pro Max./Min./Range (degrees)	The maximum/minimum/absolute difference between supination-pronation. Supination is rotating the forearm resulting in the palm moving up. Pronation is rotating the forearm resulting in the palm moving down.	Walk, Free Form	Upper Arm and Wrist
Hip			
Abd-Add Max./Min./Range (degrees)	The maximum/minimum/absolute difference between abduction-adduction. Abduction is lateral movement away from the midline of the body. Adduction is medial movement toward the midline of the body.	Walk, Free Form	Lumbar and Right Upper Leg, Lumbar and Left Upper Leg
Flex-Ext Max./Min./Range (degrees)	The maximum/minimum/absolute difference between flexion-extension. Flexion is moving the thigh upward to the front. Extension is moving the thigh backward.	Walk, Free Form	Lumbar and Right Upper Leg, Lumbar and Left Upper Leg
Int-Ext Rot Max./Min./Range (degrees)	The maximum/minimum/absolute difference between internal-external rotation. Internal rotation is turning the thigh inward. External rotation is turning the thigh outward.	Walk, Free Form	Lumbar and Right Upper Leg, Lumbar and Left Upper Leg

Name (units)		Definition	Tests	Body Placement Required
Knee				
Flex-Ext Max./Min./Range (degrees)		The maximum/minimum/absolute difference between flexion-extension. Flexion is moving the lower leg toward the back of the thigh. Extension is moving the lower leg away from the back of the thigh.	Walk, Free Form	Right Upper Leg and Right Lower Leg, Left Upper Leg and Left Lower Leg
Int-Ext Rot Max./Min./Range (degrees)		The maximum/minimum/absolute difference between internal-external rotation. Internal rotation is turning the lower leg inward. External rotation is turning the lower leg outward.	Walk, Free Form	Right Upper Leg and Right Lower Leg, Left Upper Leg and Left Lower Leg
Val-Var Max./Min./Range (degrees)		The maximum/minimum/absolute difference between valgus-varus. Valgus describes knee caving in toward the other knee. Varus results in a bowlegged appearance.	Walk, Free Form	Right Upper Leg and Right Lower Leg, Left Upper Leg and Left Lower Leg
Neck				
Flex-Ext Max./Min./Range (degrees)		The maximum/minimum/absolute difference between flexion-extension. Flexion is bending the head forward. Extension is bending the head backward.	Walk, Free Form	Forehead and Sternum
Left Rot Max. (degrees)		The minimum lateral bending. Lateral bending is moving the head toward the shoulder.	Walk, Free Form	Forehead and Sternum
Left Rot Max. (degrees)		The minimum rotation. Rotation is turning the head to the side (right or left).	Walk, Free Form	Forehead and Sternum
R-L Lat Bend Range (degrees)		The absolute difference between the maximum and minimum lateral bending. Lateral bending is moving the head toward the shoulder.	Walk, Free Form	Forehead and Sternum
R-L Rot Range (degrees)		The absolute difference between the maximum and minimum rotation. Rotation is turning the head to the side (right or left).	Walk, Free Form	Forehead and Sternum
Right Lat. Bend Max. (degrees)		The maximum lateral bending. Lateral bending is moving the head toward the shoulder.	Walk, Free Form	Forehead and Sternum
Right Rot Max. (degrees)		The maximum rotation. Rotation is turning the head to the side (right or left).	Walk, Free Form	Forehead and Sternum
Shoulder				

Name (units)	Definition	Tests	Body Placement Required
Abd-Add Max./Min./Range (degrees)	The maximum/minimum/absolute difference between abduction-adduction. Abduction is moving the arm up to the side away from the body. Adduction describes moving the arm down to the side toward the body.	Walk, Free Form	Sternum and Right Upper Arm, Sternum and Left Upper Arm
Flex-Ext Max./Min./Range (degrees)	The maximum/minimum/absolute difference between flexion-extension. Flexion is moving the arm upward to the front. Extension is moving the arm down to the rear.	Walk, Free Form	Sternum and Right Upper Arm, Sternum and Left Upper Arm
Int-Ext Rot Max./Min./Range (degrees)	The maximum/minimum/absolute difference between internal-external rotation. Internal rotation is turning the upper arm inward around toward the center of the body. External rotation is turning the upper arm outward.	Walk, Free Form	Sternum and Right Upper Arm, Sternum and Left Upper Arm
Wrist			
Flex-Ext Max./Min./Range (degrees)	The maximum/minimum/absolute difference between flexion-extension. Flexion of the wrist moves the palm closer to the forearm. Extension moves the back of the hand towards the forearm.	Walk, Free Form	Right Hand and Right Wrist, Left Hand and Left Wrist
Uln-Rad Max./Min./Range (degrees)	The maximum/minimum/absolute difference between ulnar-radial deviation. Ulnar deviation moves the little finger closer to the forearm. Radial deviation moves the thumb closer to the forearm.	Walk, Free Form	Right Hand and Right Wrist, Left Hand and Left Wrist

7.3 Passive Actigraphy

Name (units)	Definition	Tests	Body Placement Required
Activity – per day and per hour			
Counts Vector Magnitude	Activity counts vector magnitude the combines all three sensor axes.	Actigraphy	Wrist
Counts x-Axis	Activity counts along the sensor x axis.	Actigraphy	Wrist
Counts y-Axis	Activity counts along the sensor y axis.	Actigraphy	Wrist

Name (units)	Definition	Tests	Body Placement Required
Counts z-Axis	Activity counts along the sensor z axis.	Actigraphy	Wrist
Crouter Adolescent Light	Counts of light activity according to the cut points specified by Crouter et al. (2015)	Actigraphy	Wrist
Crouter Adolescent Moderate	Counts of moderate activity according to the cut points specified by Crouter et al. (2015)	Actigraphy	Wrist
Crouter Adolescent MVPA	Counts of moderate to vigorous activity according to the cut points specified by Crouter et al. (2015)	Actigraphy	Wrist
Crouter Adolescent Sedentary	Counts of sedentary activity according to the cut points specified by Crouter et al. (2015)	Actigraphy	Wrist
Crouter Adolescent Vigorous	Counts of vigorous activity according to the cut points specified by Crouter et al. (2015)	Actigraphy	Wrist
Evenson Children Light	Counts of light activity according to the cut points specified by Evenson et al. (2008).	Actigraphy	Wrist
Evenson Children Moderate	Counts of moderate activity according to the cut points specified by Evenson et al. (2008).	Actigraphy	Wrist
Evenson Children MVPA	Counts of moderate to vigorous activity according to the cut points specified by Evenson et al. (2008).	Actigraphy	Wrist
Evenson Children Sedentary	Counts of sedentary activity according to the cut points specified by Evenson et al. (2008).	Actigraphy	Wrist
Evenson Children Vigorous	Counts of vigorous activity according to the cut points specified by Evenson et al. (2008).	Actigraphy	Wrist
Freedson Children Light	Counts of light activity according to the cut points specified by Freedson et al. (2005).	Actigraphy	Wrist
Freedson Children Moderate	Counts of moderate activity according to the cut points specified by Freedson et al. (2005).	Actigraphy	Wrist
Freedson Children MVPA	Counts of moderate to very vigorous activity according to the cut points specified by Freedson et al. (2005).	Actigraphy	Wrist
Freedson Children Sedentary	Counts of sedentary activity according to the cut points specified by Freedson et al. (2005).	Actigraphy	Wrist
Freedson Children Very Vigorous	Counts of very vigorous activity according to the cut points specified by Freedson et al. (2005).	Actigraphy	Wrist

Name (units)	Definition	Tests	Body Placement Required
Freedson Children Vigorous	Counts of vigorous activity according to the cut points specified by Freedson et al. (2005).	Actigraphy	Wrist
Freedson Light	Minutes per day of light intensity activity according to the cut points specified by Freedson et al. (1997).	Actigraphy	Wrist
Freedson Moderate	Minutes per day of moderate intensity activity according to the cut points specified by Freedson et al. (1997).	Actigraphy	Wrist
Freedson MVPA	Minutes per day of moderate to very vigorous intensity activity according to the cut points specified by Freedson et al. (1997).	Actigraphy	Wrist
Freedson Sedentary	Minutes per day of sedentary activity according to the cut points specified by Freedson et al. (1997).	Actigraphy	Wrist
Freedson Very Vigorous	Minutes per day of very vigorous intensity activity according to the cut points specified by Freedson et al. (1997).	Actigraphy	Wrist
Freedson Vigorous	Minutes per day of vigorous intensity activity according to the cut points specified by Freedson et al. (1997).	Actigraphy	Wrist
Freedson VM3 Light	Minutes per day of light intensity activity according to the cut points specified by Freedson et al. (2011).	Actigraphy	Wrist
Freedson VM3 Moderate	Minutes per day of moderate intensity activity according to the cut points specified by Freedson et al. (2011).	Actigraphy	Wrist
Freedson VM3 MVPA	Minutes per day of moderate to very vigorous intensity activity according to the cut points specified by Freedson et al. (2011).	Actigraphy	Wrist
Freedson VM3 Very Vigorous	Minutes per day of very vigorous intensity activity according to the cut points specified by Freedson et al. (2011).	Actigraphy	Wrist
Freedson VM3 Vigorous	Minutes per day of vigorous intensity activity according to the cut points specified by Freedson et al. (2011).	Actigraphy	Wrist
Mattocks Children Light	Counts of light activity according to the cut points specified by Mattocks et al. (2007).	Actigraphy	Wrist
Mattocks Children Moderate	Counts of moderate activity according to the cut points specified by Mattocks et al. (2007).	Actigraphy	Wrist
Mattocks Children MVPA	Counts of moderate to vigorous activity according to the cut points specified by Mattocks et al. (2007).	Actigraphy	Wrist

Name (units)	Definition	Tests	Body Placement Required
Mattocks Children Sedentary	Counts of sedentary activity according to the cut points specified by Mattocks et al. (2007).	Actigraphy	Wrist
Mattocks Children Vigorous	Counts of vigorous activity according to the cut points specified by Mattocks et al. (2007).	Actigraphy	Wrist
Puyau Children Light	Counts of light activity according to the cut points specified by Puyau et al. (2002).	Actigraphy	Wrist
Puyau Children Moderate	Counts of moderate activity according to the cut points specified by Puyau et al. (2002).	Actigraphy	Wrist
Puyau Children MVPA	Counts of moderate to vigorous activity according to the cut points specified by Puyau et al. (2002).	Actigraphy	Wrist
Puyau Children Sedentary	Counts of sedentary activity according to the cut points specified by Puyau et al. (2002).	Actigraphy	Wrist
Puyau Children Vigorous	Counts of vigorous activity according to the cut points specified by Puyau et al. (2002).	Actigraphy	Wrist
Sleep* (*non-diagnostic)			
Average Awake Duration*	The average duration of all awake episodes during each sleep interval.	Actigraphy	Wrist
Efficiency*	The percentage of minutes scored as asleep relative to the total number of minutes in each sleep interval.	Actigraphy	Wrist
Number of Awakenings*	Number of times awake episodes occurred during each sleep interval.	Actigraphy	Wrist
Sleep Counts*	The total actigraphy counts during each sleep interval.	Actigraphy	Wrist
Total Sleep Time*	Total number of minutes that were scored as asleep for each sleep interval.	Actigraphy	Wrist
Wake After Sleep Onset*	Total number of minutes from the onset of sleep to the end of each sleep interval that were scored as awake.	Actigraphy	Wrist
Step Count – per day and per hour			
Step Count	The number of steps detected.	Actigraphy	Wrist
Wear Time – per day and per hour			
Nonwear Time	The number of minutes the sensor was worn.	Actigraphy	Wrist
Wear Time	The number of minutes the sensor was not worn.	Actigraphy	Wrist

7.4 Passive Lumbar

Name (units)		Definition	Tests	Body Placement Required
Mobilise-D Gait Outcomes - Results provided for healthy or therapeutic indications, per day and per entire recording				
Mobilise-D Pace				
90th percentile walking speed in longer (>30s) walking bouts (m/s)	90th percentile of stride speed of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar	
90th percentile walking speed in walking bouts (>10s) (m/s)	90th percentile of stride speed in walking bouts longer than 10s.	Passive Lumbar	Lumbar	
Stride length in longer (>30s) walking bouts (cm)	Average stride length of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar	
Stride length in shorter (10-30s) walking bouts (cm)	Average stride length of walking bouts between 10s and 30s duration.	Passive Lumbar	Lumbar	
Walking speed in longer (>30s) walking bouts (m/s)	Average stride speed of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar	
Walking speed in shorter (10-30s) walking bouts (m/s)	Average stride speed of walking bouts between 10s and 30s duration.	Passive Lumbar	Lumbar	
Mobilise-D Pattern				
90th percentile walking bout duration (s)	90th percentile of duration of walking bouts.	Passive Lumbar	Lumbar	
Number of walking bouts (No.)	Number of walking bouts.	Passive Lumbar	Lumbar	
Number of walking bouts>10s (No.)	Number of walking bouts with duration longer than 10s.	Passive Lumbar	Lumbar	
Number of walking bouts>30s (No.)	Number of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar	
Number of walking bouts>60s (No.)	Number of walking bouts with duration longer than 60s.	Passive Lumbar	Lumbar	
Walking bout duration (s)	Median duration of walking bouts.	Passive Lumbar	Lumbar	
Walking bout duration variability (N/A)	Coefficient of variation in walking bout duration.	Passive Lumbar	Lumbar	

Name (units)	Definition	Tests	Body Placement Required
Mobilise-D Rhythm			
90th percentile cadence in longer (>30s) walking bouts (steps/min)	90th percentile of cadence of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar
Cadence in all walking bouts (steps/min)	Average cadence of walking bouts.	Passive Lumbar	Lumbar
Cadence in longer (>30s) walking bouts (steps/min)	Average cadence of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar
Stride duration in all walking bouts (s)	Average stride duration of walking bouts.	Passive Lumbar	Lumbar
Stride duration in longer (>30s) walking bouts (s)	Average stride duration of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar
Mobilise-D Variability			
Cadence variability between all walking bouts (N/A)	Coefficient of variation in cadence of walking bouts.	Passive Lumbar	Lumbar
Stride duration variability between all walking bouts (N/A)	Coefficient of variation in stride duration of walking bouts.	Passive Lumbar	Lumbar
Step length variability between longer (>30s) walking bouts (N/A)	Coefficient of variation in stride length of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar
Walking speed variability between longer (>30s) walking bouts (N/A)	Coefficient of variation in stride speed of walking bouts with duration longer than 30s.	Passive Lumbar	Lumbar
Mobilise-D Volume			
Number of steps (No.)	Number of steps in all walking bouts.	Passive Lumbar	Lumbar
Number of turns (No.)	Number of turns in all walking bouts.	Passive Lumbar	Lumbar
Walking duration (min)	Duration of all walking bouts.	Passive Lumbar	Lumbar
Turns – Clario Precision Motion			
Turns – Angle (degrees)	The rotational angle of the turn.	Passive Lumbar	Lumbar

Name (units)	Definition	Tests	Body Placement Required
Turns – Average Velocity (degrees/sec)	Average angular velocity of the turn.	Passive Lumbar	Lumbar
Turns – Direction (0=CW,1=CCW)	Direction of the turn expressed as clockwise (0) or counterclockwise (1).	Passive Lumbar	Lumbar
Turns – Duration (sec)	The duration of the turn.	Passive Lumbar	Lumbar
Turns – Hesitations (No.)	Total number of hesitations, slowing, or pauses detected during the turn.	Passive Lumbar	Lumbar
Turns – Peak Velocity (degrees/sec)	Maximum angular velocity of the turn.	Passive Lumbar	Lumbar
Turns – Turns (No.)	The number of turns detected within the recording.	Passive Lumbar	Lumbar

8. Product Information - Opal V2R System

Product Information

Intended purpose

The Opal V2R System ("Opal") is a small wearable device-based system designed for the measurement of human physical movement.

Intended use statement

The Opal V2R is a small worn monitor designed for documenting human physical movement associated with applications in physiological monitoring. The device is indicated for either transient, short-term or long-term use dependent on the study protocol.

Opal V2R System description

The Opal V2R System is a non-medical device. Opal V2R System is the version of the Opal V2C System appropriate for use in research and academic applications. As such, for Opal V2R System, the Opal sensor and hardware are marked 'For Research Use', and the code base is the same with cloud-based functionality disabled (Opal App, Mobility Exchange, Mobility Web). Application software, Motion Studio and Moveo Explorer, not available in the Opal V2C System.

The Opal V2R System ("Opal") is a small wearable device-based system designed for the quantification of human motion. The Opal includes inertial sensors and a microcontroller running firmware for control of the device. The Opal system can be used as a single-sensor system or as part of a synchronized multi-sensor system for quantification of human motion.

The device logs kinematic data to on-board memory, which can be transmitted to software on a computer either wirelessly or via a USB adapter. The system uses Docking Station, to recharge the Opal's battery and transfer the raw sensor data to a computer, Access Point, to enable wireless streaming to a computer, Opal's firmware, provides overall control and functionality for the hardware to achieve its intended use.

The system includes three levels of application software designed to run on a general-purpose computer platform: Motion Studio, Mobility Lab, and Moveo Explorer. The application software functionality includes: 1) configuring the Opals, 2) collecting and storing Opal data, 3) analyzing the data algorithmically, 4) storing analysis results in a database, 5) reporting tools to help visualize the sensor data and analysis results, and 6) exporting the data and analysis results in various formats. The Opal monitors are designed to be operated with an operating temperature of -10 to +50°C (14 to 122°F), 10% to 95% relative humidity and an atmospheric pressure of 64.4 to 106.6kPA. The Opal monitor has IP64 rating: water resistant and dust tight. The carrying case has IP21 rating: IP2X - protection against solid objects >12.5mm; IPX1 - protection against dripping water.

Contraindications

Do not apply Opals or the Opal straps to broken or otherwise non-intact skin. Opals and straps should not be used in conjunction with an MRI. Not a medical device. Medical uses require Opal V2C System (FDA Class II Medical Device, CE Class I Medical Device; Rx Only).

Side effects

No known undesirable side effects.

Expected service life

The Opal V2R System is intended to last 3 years.

Warnings and precautions



The Opals and straps should not be used in conjunction with a Magnetic Resonance Imaging (MRI).

Warning: MR-unsafe - Do not expose the device to a magnetic resonance (MR) environment.

- The device may present a risk of projectile injury due to the presence of ferromagnetic materials that can be attracted by the MR magnet core.
- Thermal injury and burns may occur due to the metal components of the device that can heat during MR scanning.
- The device may generate artifacts in the MR image.
- The device may not function properly due to the strong magnetic and radio frequency fields generated by the MR scanner.

The Opal and straps should not be applied to broken or otherwise non-intact skin.

Do not use the Opal System components if damaged or defective. Recurrent device checks (e.g. safety related checks) and maintenance activities are the sole responsibility of the manufacturer. These activities need to be performed by personnel with adequate expertise. The expertise of such personnel may include, amongst others, technical expertise, knowledge and experience of relevant technologies and standards (e.g. IEC 62353, IEC 60601-1). Regardless of the above requirements, local regulatory requirements must be adhered to.

The Opal is a Type BF Applied Part, i.e., a part of the system which comes into contact with the patient. The Docking Station, Access Point, USB cables, and Docking Station power supply are not applied parts, and are not intended to come into contact with the patient. Opals should be cleaned in between subjects. See Cleaning section for cleaning directions. All Opal System components going with the participant outside of the clinic are Single Patient Use. Patient is the intended operator when used outside of the clinical environment.

Do not open any Opal System hardware enclosures; there are no user serviceable parts inside. The Opals contain a rechargeable lithium-ion battery which is not intended to be replaced by the user.

The Opal System Docking Station should only be powered by the provided 12V 2A center positive power adapter. Do not use other power adapters with the Docking Station.

The Opal System Docking Station has a spare USB Type A port. Only attach USB peripherals and cables that comply with the USB 2.1 specification. The Opal System can only be connected to a host PC via the USB Micro-B connector.

The Opal wearable sensor may become warm during use and rise as much as 5 °C (9 °F) above ambient temperature. At the Opal's maximum operational temperature of 50 °C (122 °F), the Opal could reach 55 °C (131 °F). Discontinue use if wearing the sensor becomes uncomfortable.

The Opal System is designed to be stored and transported in a standard indoor environment: a temperature of -10° C (14 °F) without relative humidity control and +50° C (122 °F) at relative humidity up to 93% non-condensing.

The Opals are designed to be operated in either an indoor or outdoor environment, with an operating temperature of -10 to +50 °C (14 to 122 °F), 0 to 100% relative humidity, and an atmospheric pressure of 64.4 to 106.6 kPa. Opals are rated water resistant up to IP64 but are not waterproof. Do not submerge Opals in water. Prolonged exposure to warm light sources (e.g. halogen lamps, hot sunshine) may affect the ability of the Opal to charge its battery and/or accelerate the aging of the battery, thereby reducing runtime.

The Access Point and Docking Station are designed to be stored, operated and transported in a standard indoor environment: a temperature of 0 to 30 °C (32 to 86°F), 0 to 100% relative humidity, and an atmospheric pressure of 80 to 106.6 kPa (at an altitude of less than 2000m). The Access Point and Docking Station are not water resistant or waterproof.

Do not unplug the Access Point when in use during testing; this may result in lost data. If using a laptop, always make sure that your laptop is plugged into a power outlet when testing during test mode. A low battery during a test session may cause the test data to be lost.

Warning on Stacking: Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

Avoid dropping or subjecting the device to significant impacts. This can cause damage to the outside case, break the glass or degrade the water resistance. If the case or glass is broken, chipped or fractured, discontinue use and contact Clario or your authorized representative for service or repair.

Ensure pets do not come into contact with the device. Chewing, scratching, or other actions by pets can damage the device. Store the device in a location where pests (e.g., rodents) cannot access it. Pests can damage wiring and compromise the device's functionality. If not used to collect data from children, keep the device out of reach of young children. Children may mishandle or damage the device, potentially causing injury or damage to the device.

It is recommended that you backup your workspace before upgrading or uninstalling the software. You must dispose of this product properly according to local laws and regulations. Because this product contains electronic components, it must be disposed of separately from household waste. When this product reaches its end of life, contact local authorities to learn about disposal and recycling options, or simply return it to APDM Wearable Technologies, Inc., a Clario Company. For more information, please contact clario.com/contact/customer-support/.

This equipment Opal System has been tested and found to comply with the limits for medical devices to the IEC 60601-1-2 standard. These limits are designed to provide reasonable protection against harmful interference in a typical medical installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful

interference with other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference with other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Configure the system to use a different radio frequency.
- Reorient or relocate the receiving device.
- Increase the separation between the equipment.
- Connect the equipment into an outlet on a circuit different from that to which the other device(s) are connected.
- Consult the manufacturer or field service technician for help.

Information security for computers running Mobility Lab

Mobility Lab may store private or identifying information on your computer. The local Mobility Lab database is not itself secured or encrypted. Instead, you should secure access to the Mobility Lab data using your operating system's built in security features. Always follow information security best practices on the Mobility Lab computer, including:

- Control physical access to your computer.
- Keep your operating system and Mobility Lab software up to date.
- Use separate user and admin accounts.
- Use strong passwords.
- Lock the computer after a few minutes of inactivity.
- Back up your computer regularly and store your backups securely.
- Use your operating system's built-in filesystem encryption features.
- Use internet security software to prevent intrusion or malware infections.

**European Authorized
Representative Information:**
eResearchTechnology GmbH
Sieboldstrasse 3
97230 Estenfeld, Germany



UK Responsible Person:
Exco InTouch Limited,
Unit 6,
Wheatcroft Business Park,
Landmere Lane, Nottingham,
NG12 4DG UK



Compliance information

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Clario could void the user's authority to operate the equipment.

To access FCC and IC information on the Clario Opal and Access Point - Press Button 2 twice from the home screen.

FCC Notice "Declaration of Conformity Information"

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Note: "Harmful interference" is defined in 47 CFR §2.1 by the FCC as follows: Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radio communication service operating in accordance with the [ITU] Radio Regulations.

Industry Canada (IC)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canadienne applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire d'interférence, et (2) l'utilisateur de l'appareil doit accepter toute interférence subie, même si l'interférence est susceptible d'en compromettre le fonctionnement.

FCC ID: 2AHZD-OPAL

IC: 21349-OPAL

Model: Opal

FCC ID: 2AHZD-AP

IC: 21349-AP

Model: AP

Exposure to radio frequency energy

The radiated output power of this device meets the limits of FCC/IC radio frequency exposure limits.

Refer to Specifications Table for frequency band.

Adverse Event Reporting

Since the first introduction of Opal V2C system into the clinical market, there has been no reports of adverse events using the Opal system.

Report any serious incident in relation to the medical device to the manufacturer and the authority having jurisdiction in your locale.

WEEE Directive Statement for the European Union

In common with all Electronic and Electrical products, Clario equipment should not be disposed of in household waste. Alternative arrangements may apply in other jurisdictions.

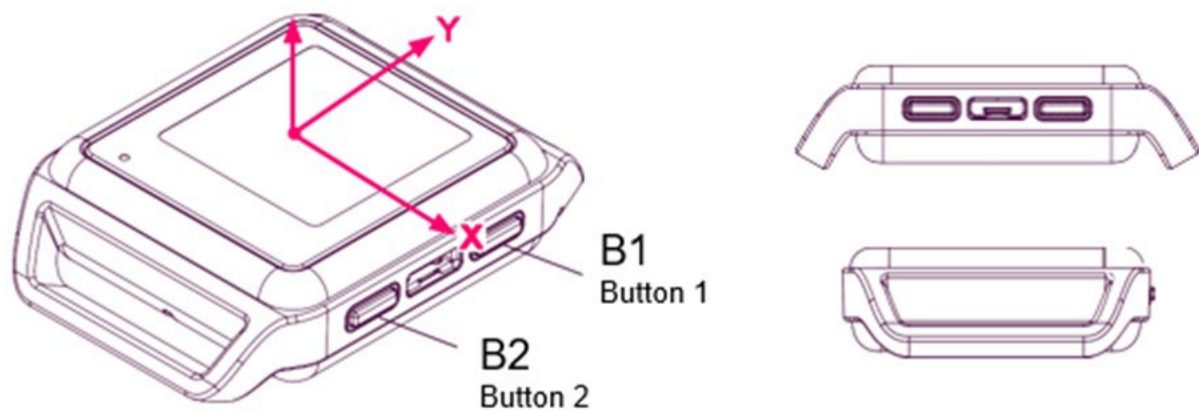
Radio equipment for Japan

Opal V2 Monitor: R 205-220002

Opal V2 Access Point: R 205-220001

Symbols

	Serial Number
	Not for General Waste
	European Union (EU) Mark
	FCC Compliance
	UK Conformity Assessed marking
	Japanese Certification for Radio Equipment
	Type BF Applied Part
	Direct Current
	Refer to Instruction Manual/Booklet
IP64 IP21	Ingress Protection Rating – Opal sensor Ingress Protection Rating – Carrying case
	Manufacturer
	Shipment contains lithium-ion batteries which are packed within or contained within the equipment.
	Keep dry



Specifications	
Dimensions	55mm x 40mm x 14 mm
Material	Polycarbonate, glass
Weight	26 grams (with battery)
Battery life	Wireless Streaming (8h), Synchronous Logging (12h), Actigraphy Mode (21 days)
Wireless radio	Nordic Semiconductor nRF51822
Frequency band	2.40-2.48GHz ISM band, adjustable
Data rate	2Mbps on-air data-rate
Effective Radiated Power	4.41 dBm
Latency	300ms (typical) with data buffer, 30ms (typical) without data buffer
Transmission range	30m line of sight, 10m indoors
Data buffer	8Gb (~450 hours) Nominal
Synchronization	<_ 1ms difference, up to 24 Opals
Screen resolution	128px x 128px

EMC Declarations

The Opal Wearable Sensor, Docking Station, and Access Point (“Opal V2R System”) must be installed and put into service according to the electromagnetic compliance (EMC) guidelines and declarations provided here.

EMC Declarations and Guidance	
Table A-1	Electromagnetic emissions.
Table A-2	Electromagnetic immunity.
Table A-3	Electromagnetic immunity for non-life-supporting equipment.
Table A-4	Recommended separation distances between radiofrequency (RF) communications equipment for non-life-supporting equipment.

Note: Portable and mobile RF communications equipment can affect the operation of the Opal V2R System hardware. A Magnetic Field Immunity – Proximity Fields Test was added to comply with the recent addition to the IEC 60601-1-2 Ed. 4.1.

Warning: The use of accessories and cables other than those provided by APDM Wearable Technologies, Inc., a Clario Company may result in increased emissions or decreased immunity of the Opal V2R System hardware.

Table A-1: Guidance and Manufacturer's Declarations— Electromagnetic Emissions

The Opal V2R System is intended for use in the electromagnetic environment specified below. The customer or user of the Opal V2R System should ensure that they are used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment—Guidance
RF Emissions	CISPR 11	Group 1 The Opal V2R System uses very low level RF energy and are not likely to cause any interference in nearby electronic equipment.
RF Emissions	CISPR 11	Class B The Opal V2R System is suitable for use in all establishments, including domestic establishments and those directly connected to the public low voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Current Emissions IEC 61000-3-2	Class B	
Voltage Fluctuations and Flicker IEC 61000-3-3	Complies	

Table A-2: Guidance and Manufacturer's Declaration— Electromagnetic Immunity

The Opal V2R System is intended for use in the electromagnetic environment specified below. The customer or user of the Opal V2R System should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance	Electromagnetic Environment— Guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	± 8kV contact ± 15kV air	± 8kV contact ± 15kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast Transients and Bursts (EFT) IEC 61000-4-4	± 2kV for power supply lines	± 2kV for power supply lines	The mains power quality should be that of a typical commercial or hospital environment.
Surge IE 6C 1000-4-5	± 2kV differential mode ± 2kV common mode	± 2kV differential mode ± 2kV common mode	The mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips and Interruptions IEC 61000-4-11	■ 100% dip in 0.5 cycles ■ 60% dip in 5 cycles ■ 30% dip in 25/30 cycles ■ 100% dip in 250/300 cycles	■ 100% dip in 0.5 cycles ■ 60% dip in 5 cycles ■ 30% dip in 25/30 cycles ■ 100% dip in 250/300 cycles	The mains power quality should be that of a typical commercial or hospital environment. If the user of the Opal V2R System requires continued operation during a power mains interruption, it is recommended that the Opal V2R System be powered from an uninterruptible power supply or battery.
Magnetic Field Immunity (50/60 Hz) IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical commercial or hospital environment.
Proximity to Magnetic Fields IEC 61000-4-39:2017	>= 8 A/m 30 kHz	8 A/m	Continuous wave modulation. Field strength is measured at the exit plane of the injection coil.
Proximity to Magnetic Fields IEC 61000-4-39:2017	>= 65 A/m 134.2 kHz	65 A/m	The modulation is square wave on/off with 50% duty cycle at 2.1kHz. Field strength is measured at the exit plane of the injection coil.

Immunity Test	IEC 60601 Test Level	Compliance	Electromagnetic Environment— Guidance
Proximity to Magnetic Fields IEC 61000-4- 39:2017	≥ 7.5 A/m 13.56 MHz	7.5 A/m	The modulation is square wave on/off with 50% duty cycle at 50kHz. Field strength is measured at the exit plane of the injection coil.

Table A-3: Guidance and Manufacturer's Declarations— Electromagnetic Immunity for Non-life-supporting Equipment.

The Opal V2R System is intended for use in the electromagnetic environment specified below. The customer or user of the Opal V2R System should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance	Electromagnetic Environment— Guidance
			WARNING: Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Opal System, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
Conducted Immunity IEC 61000-4-6	≥ 6 VRMS 150 kHz to 80 MHz	3 VRMS	$d = 1.2\sqrt{P}$
Radiated Immunity IEC 61000-4-3:2010	≥ 10 V/m 80 MHz to 2700 MHz	10 V/m	$d = 1.2\sqrt{P}$ d 80 MHz to 800 MHz $= 1.2\sqrt{P}$ 880 MHz to 2.5 GHz
			Where P is the maximum output power rating of the transmitter in Watts according to the transmitter manufacturer and d is the recommended separation distance in meters. Field strengths from fixed RF transmitters, as determined by an electromagnetic site surveys, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 

Note 1	At 80 MHz and 800 MHz, the higher frequency range applies.
Note 2	These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
a	Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Opal V2C System is used exceeds the applicable RF compliance level above, the Opal V2C System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Opal V2R System.
b	Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.

Table A-4: Recommended separation distances between portable and mobile RF communications equipment and the Opal V2R System

The Opal V2R System is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Opal V2R System can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Opal V2R System as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power (Watts) of transmitter	Separation distance (meters) according to frequency of transmitter		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 1.2\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in Watts (W) according to the transmitter manufacturer.

Note 1	At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
Note 2	These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structure, objects, and people.

Contact us



APDM Wearable Technologies Inc.
7204 SW Durham Rd, Suite 800 Portland, OR 97224 USA
support.apdm.com

© 2026 Clario.
Opal V2R Wearable Sensor System – Product Guide
All rights reserved.