POWER WALKER

System Test Plan

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System Test Plan

The SolexPRO should be entirely safe to use as failures could potentially cause harm to the user due to battery leakage. In order to ensure safety, the SolexPRO will go through unit and integration testing meaning that each system will be tested separately and then simultaneously. These tests will examine the reliability, safety, and durability of our product. The product should be able to adhere to a typical usage as outlined below. A failure in any of the tests would require a redesign of the system or components.

Unit Testing

Here we will make sure each component is working according to specifications.

Energy Harvesting Unit

- **Solenoid**
  - The copper wires that are wrapped over the solenoid are taut.
  - The copper wires are not to be broken at any point.
  - The wire is affixed to the solenoid by the use of washers and electrical tape.
  - The leads are long enough to make a proper and convenient connection to the Digital Multimeter.
  - The core of the solenoid is sturdy and can withstand forces applied by the average human body.
  - The solenoid fits inside the sole of the shoe.
- **Magnets**
  - When the solenoid is shaken, the magnets are able to move easily and freely inside the solenoid tube.
  - Weight of magnets are relatively light therefore they do not contribute any significant weight to the overall system weight.
  - The magnetic field generated by the magnets and the solenoid is sufficient enough to charge up a AA battery.
  - The magnetic discs are displaced enough with a sufficient velocity to produce enough electricity to charge AA batteries
- **Electrical Connections and Measurements**
  - Test that the amount of current produced by the solenoid is enough to charge the battery.
  - DMM is used at different circuit points to ensure the circuit is connected properly and wires are attached in the right place.

Energy Storage Unit

- **Rectifier**
  - Using DMM, the connection of each component on the board is verified.
  - The input leads of the EHU are securely connected to the solenoid and the output leads are securely connected to the battery through the casing, which will be verified again using the DMM.
- **Battery**
  - The battery should be securely fixed to the water resistant casing.
  - The battery should be securely connected to the rectifier.
  - The battery should be defect free.

Energy Dissipation Unit

A partially or fully charged battery from the SolexPRO unit is taken out of the place holder and inserted into a device compatible with AA batteries. The device should function as expected.

Integration Testing

This type of testing is executed once we have fabricated all the units into the shoe. This process helps us with the reliability of the shoe as a whole.

Table 1 - Integration testing tables

Test 1	Procedure	Pass/Fail	Comments
SolexPRO Power Generation	<u>User input:</u> User walks at a normal gait for 15 minutes.		
	<u>Measurement:</u> A Digital Multi-Meter (DMM) that is set to measure DC Voltage is connected to the output leads of the lithium-ion battery before and after walking.		

	Expected observations: The DMM will read an increase in voltage from the time before walking to the time after.		

Test 2	Procedure	Pass/Fail	Comments
SolexPRO Vibration Resistance	User input: User jumps up and down for 10 minutes. User walks on the treadmill at level 7 for one hour.		
	Measurement: A visual inspection will be made to ensure that no components have become loose and/or disconnected.		
	Expected observations: The SolexPRO will sustain no damage.		

Test 3	Procedure	Pass/Fail	Comments
SolexPRO Water Resistance	User input: User walks through a puddle of water.		
	Measurement: A hands on inspection will confirm if the EHU remains dry or not.		
	Expected observations: The SolexPRO will be completely dry inside its housing.		

Test 4	Procedure	Pass/Fail	Comments
SolexPRO Comfort	User input: User walks, runs, jumps and does everyday activities for two days.		
	Measurement: User will be surveyed upon the comfort of the SolexPRO and asked if they notice any difference from regular shoes.		
	Expected observations: User will experience no difference from regular shoes.		

Test 5	Procedure	Pass/Fail	Comments
SolexPRO Noise	User input: User walks at a normal gait in a quiet room.		
	Measurement: A noise measuring application will measure the decibel difference of the SolexPRO versus normal shoes.		
	Expected observations: The decibels of the SolexPRO should not be significantly higher than normal shoes.		