

Specification Test Log

Date/Time of testing:	10 March 2019
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. <i>Lead: Lorena, checker: Joanna</i>
Test ID Number:	001
Relevant functional specification(s) being tested:	SS-01

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Given 2.50 in/lbs torque, a deflection of 2.5mm occurs, showing that the medication cannot be accessed.

Test Deviations

Deviations from the test as written in the test plan

Test Results (circle)

Complete Pass	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*. If fail, you must comment on *why the system failed* and *what would be involved in meeting the specification* (i.e. how much work for the company, how much cost, etc.).

Signoff

Name	Signature	Role
Lorena Ferreira	<i>Lorena Ferreira</i>	conductor/lead
Joanna Dickinson	<i>Joanna D.</i>	checker

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Finite Element Analysis
Test ID Number:	001
Relevant functional specifications being tested:	SS-01: <i>The lockbox shall withstand 200 in*lbs. (prying force) without allowing access to the pills. The lockbox should withstand 250 in*lbs. of prying force (the average arm force of a 95th percentile male at 5'')</i>
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; text-align: center;"> <p>White Box</p> </div> <div style="text-align: center;"> <p>Black Box</p> </div> </div>
Purpose of test and test summary including number of replicates of test:	The purpose of this test is to ensure that the medication is secure, meaning that a person applying a torque of 250 in*lbs. (prying force of 50 lbs.) cannot break into the lockbox and steal the medication. The test involves using SolidWorks simulation to conduct a design study and obtain the stress/strain, deflection, and safety factor scale.
Equipment List:	Computer with SolidWorks software
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	N/A

Description and/or images of test setup	In the SolidWorks simulation an upwards force of 50 lbs. on the center corner of the lockbox lid will be applied, a mesh will be created, and the design study will be conducted to obtain the stress/strain and deflection scales.
Inputs or input ranges to be used (include number or test points and increments)	<50 lbs. force
Anticipated Results and Outcome	It is anticipated that if a person applies a torque of 250 in*lb. (prying force of 50 lbs.) on the lockbox lid there will be less than 10 mm so the person would not be able to attain any of the medication.

Specification Test Log

Date/Time of testing:	
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Nick - Lead
Test ID Number:	002 - Object Avoidance
Relevant functional specification(s) being tested:	SS-02

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Bot stops 1.5 ft away from object.

Test Deviations

Deviations from the test as written in the test plan

Test Results (circle)


Complete Pass	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Signoff

Name	Signature	Role
Jocanna Dickinson	<i>Jocanna D.</i>	Recorder
Leanna Temple	<i>Leanna Temple</i>	Object
Nick Sharp	<i>Nick Sharp</i>	Coder/Controller
Lorena Ferreira	<i>Lorena Ferreira</i>	Video Recorder

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Object Avoidance
Test ID Number:	002
Relevant functional specification(s) being tested:	SS-02: <i>Pill Bot shall identify and avoid hazardous objects (walls, doors, people, etc.) within 2.5 ft of itself. Pill Bot should identify and avoid hazardous objects within 4 ft of itself</i>
Type of test(circle)	
Purpose of test and test summary including number of replicates of test:	The purpose of this test is to determine whether the Pill Bot can safely decelerate when a hazardous object is detected in its path. This ensures that the Pill Bot is not harmful to itself, users, and its environment. The test consists of placing dummy objects in the hallway that would represent a person or another object in a medical facility, and observe the robot's movement through the hallway and the distance away from the object at which it stops.
Equipment List:	Dummy object, robot, painters tape, and measuring tape
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	A test code will be programmed into the bot instructing it to drive in a straight line. The ultrasonic sensors on the front will detect obstructions and stop the bot. The system will take two inputs which are both IR sensors and be able to power both motors constantly. The bot will then stop the motors if there is an obstruction.

Description and/or images of test setup	<p>Dummy objects will be placed in the hallway in the same path that the robot would take. The robot will be placed at the beginning of the hallway and activated to observe its travel throughout the hallway into the designated room. Within the time that the robot stops as a result of detecting an object, the distance between the object and the robot will be measured.</p>
Inputs or input ranges to be used (include number or test points and increments)	<p>2.5 ft 4 ft</p>
Anticipated Results and Outcome	<p>It is anticipated that the robot will stop within 2.5 ft of itself when a hazardous object is identified and the robot will find an alternative way (move pass the object in a circle) to its destination.</p>

Specification Test Log

Date/Time of testing:	4/23 @ 5:00 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. head: Leanna Support: Lorena
Test ID Number:	003 - Visual Check/Sterilization
Relevant functional specification(s) being tested:	SS-03 SS-05 U-01 S-03

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

- Enclosure and door protects electrical components
- 14 compartments in lockbox

SS-03 [Electrical components are not directly accessible]

Test Deviations

Deviations from the test as written in the test plan

SS-05 [Sterilizable]

S-03 [Holds ≥ 12 different medications]

U-01 [Equipped with cable to USB port]

Test Results (circle)

Complete Pass	Partial Pass	Fail
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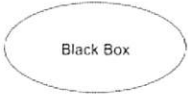
Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Due to cost restrictions, panels cannot be cleaned with certain abrasive products, however, the lockbox interior CAN be cleaned with abrasive solutions

Signoff

Name	Signature	Role
Leanna Temple	<i>Leanna Temple</i>	Lead
Lorena Ferreira	<i>Lorena Ferreira</i>	Support.

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Visual Check /Sterilization
Test ID Number:	003
Relevant functional specification(s) being tested:	<p>SS-03: <i>Pill Bot's internal electrical components will not be directly accessible during normal use</i></p> <p>SS-05: <i>The Pill Bot system will be sterilizable</i></p> <p>S-03: <i>The lockbox shall have the capacity to hold 12 separate medication assignments. The lockbox should have the capacity to hold 24 separate medication assignments</i></p> <p>U-01: <i>The device shall be equipped with a cable that will connect the bot directly to the USB port of a computer for data entry. The device should be able to be programmed wirelessly so the bot can move around while the data is updated</i></p>
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Black Box</p> </div> <div style="text-align: center;"> <p>White Box</p> </div> </div>
Purpose of test and test summary including number of replicates of test:	<p>The purpose of this test is to ensure that the robot is safe for use and has the capacity to hold a sufficient amount of medication. In addition, the sterilization test ensures that the medication is kept uncontaminated and well preserved. The test involves making a check list of all the requirements that need to be met and visually determining whether those requirements were completely satisfied.</p>
Equipment List:	Notebook

<p>Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:</p>	<p>N/A</p>
<p>Description and/or images of test setup</p>	<p>A check list will be made for the following specifications: SS-03, S-03, SS-05 and U-01. The team will look at the different parts of the robot and mark whether the specification has been completely met and is visually verifiable.</p>
<p>Inputs or input ranges to be used (include number or test points and increments)</p>	<p>N/A</p>
<p>Anticipated Results and Outcome</p>	<p>Final robot prototype will meet all the specification requirements that can be seen by the customer.</p>

Specification Test Log

Date/Time of testing:	4/23 @ 9:30 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. head: Leanna, Joanna, Erin, Nick
Test ID Number:	004 - Lock / Unlock Lockbox
Relevant functional specification(s) being tested:	SS-04

Test Results

Include measured data, observations, etc. here in a format appropriate to the test.

100 / 100 tests were successful.

Test Deviations

Deviations from the test as written in the test plan

None

Test Results (circle)

Complete Pass	Partial Pass
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Test Commentary


Additional notes on the test. If partial pass, you must comment on what passed and what didn't.

Lockbox RFID

"Pass" tallies

Signoff

Name	Signature	Role
Leanna Temple	<i>Leanna Temple</i>	Head / Scanner
Joanna Dickinson	<i>Joanna D.</i>	Recorder
Erin Okona	<i>Erin Okona</i>	Scanner
Nick Sharp	<i>Nick Sharp</i>	Observer

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Lock/Unlock Lockbox
Test ID Number:	004
Relevant functional specification(s) being tested:	SS-04: <i>Pill Bot's lockbox shall automatically unlock when the correct RFID is scanned 75% of the time. The lockbox should automatically unlock when the correct RFID is scanned 95% of the time</i>
Type of test(circle)	
Purpose of test and test summary including number of replicates of test:	The purpose of this test is to ensure that the nurse can access the pills when the right RFID card is scanned and that the lockbox locks and keeps the medication secure after a nurse has accessed the medication. We will scan the RFID to unlock the lockbox 100 times. From the statistical modeling process (from https://reliabilityanalyticstoolkit.com/sample_size), it was determined that the required number of tests was 90 to achieve a reliability of 95% at a 99% confidence level with no failures.
Equipment List:	RFID cards, robot, and notebook
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	The Bot will have a code that scans for cards continuously. This will then print the RFID tag to the screen letting the tester know that the card was correctly scanned.

Description and/or images of test setup	RFID card will be scanned 100 times and the amount of times that the lockbox unlocks will be recorded on the notebook. Once the test is complete, a statistical analysis will be conducted to determine the percentage out of a 100 by which the lockbox unlocks when an RFID card is scanned.
Inputs or input ranges to be used (include number or test points and increments)	Continual scanning of an RFID card
Anticipated Results and Outcome	The lockbox should automatically unlock when the correct RFID is scanned 100% of the time.

Specification Test Log

Date/Time of testing:	April 30th @ 2:15 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Lead: Nick <u>All help</u>
Test ID Number:	005 - Distance Calculation
Relevant functional specification(s) being tested:	A-01 A-02

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Traveled 59 ft (instructed to travel 60 ft)

$$\frac{59}{60} = 98\%$$

Counted 19/20 RFID cards

Test Deviations

Deviations from the test as written in the test plan

Traveled 60 ft, 20 RFID cards
(code said 10 ft)

$$\frac{19}{20} = 95\%$$

Test Results (circle)

Complete Pass	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Signoff

Name	Signature	Role
Nick S.	<i>Nick S.</i>	Lead
Lorrana F.	<i>Lorrana F.</i>	Videographer
Erin O.	<i>Erin O.</i>	Measurer
Joanna D.	<i>Joanna D.</i>	Counter
Leanna T.	<i>Leanna T.</i>	Measurer

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Distance Calculation
Test ID Number:	005
Relevant functional specification(s) being tested:	A-01: The system shall calculate distance travelled over 10 feet with at least 80% accuracy, and should calculate distance travelled over 10 feet with <u>95%</u> accuracy. A-02: The system shall detect and process 80% of the floor location RFID cards scanned and should detect, and process <u>95%</u> of the floor location RFID cards scanned.
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; text-align: center;">Black Box</div> <div style="text-align: center;">White Box</div> </div>
Purpose of test and test summary including number of replicates of test:	This test will determine if the system can correctly calculate distance traveled using line counting sensors and floor RFID card scanning. The test will consist of 3 trials of 4 different distances. We will determine how many RFID cards were scanned and processed during each trial and will measure the distance traveled to compare to the input distance instructions given to the bot.
Equipment List:	Completed bot, 20 RFID cards, Measuring Tape
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	Dummy code will be made that drives the bot directly forward for 10 feet. The distance will then be measured to make sure it is at least within 8 ft of the 10 ft specified. There will also be a dummy code that will go forward and run over the RFID cards and light up an LED every time a card is scanned.

$$\frac{59}{60} \text{ ft} = .983$$

$$\frac{19}{20} = .95$$

Description and/or images of test setup	20 RFID cards will be equally spaced (3 ft apart) along a hallway floor, a measuring tape will be stretched along the wall for reference with the starting point marked on the tape
Inputs or input ranges to be used (include number or test points and increments)	10 ft, 20 ft, 40 ft, 60 ft 3x each trial
Anticipated Results and Outcome	In previous testing, distance accuracy has not been an issue. We are expecting to scan all RFID cards and for the bot to be at least 90% accurate in distance travel.

Commented [AA1]: For a test plan you want a specific plan and commitments, not "at least".

Specification Test Log

Date/Time of testing:	
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results.
Test ID Number:	006 - Delivery Cycle
Relevant functional specification(s) being tested:	A-03 E-03 U-03 A-04 U-02

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Test unable to be completed.

Test Deviations

Deviations from the test as written in the test plan

Test Results (circle)

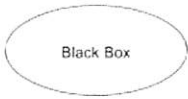
Complete Pass	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Signoff

Name	Signature	Role

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Delivery Cycle
Test ID Number:	006
Relevant functional specification(s) being tested:	<p>A-03: <i>The system shall arrive to the correct room 90% of the time, and should arrive to the correct room 98% of the time.</i></p> <p>A-04: <i>The system, coming from home base or its previous room location, shall arrive to the correct room within three minutes of the scheduled delivery time, and should arrive to the correct room within one minute of the scheduled delivery time.</i></p> <p>E-03: <i>When a delivery cycle is completed, the bot shall return to its "home base" charging station within 3 ft of its designated wall outlet.</i></p> <p>U-02: <i>The device will light up an LED when the box is unlocked to show which compartment of medication is for the specified patient.</i></p> <p>U-03: <i>The device will display the current room number for which the pills are to be delivered.</i></p>
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Black Box</p> </div> <div style="text-align: center;"> <p>White Box</p> </div> </div>
Purpose of test and test summary including number of replicates of test:	<p>This test will measure several important parts of the bot's function as it completes a basic delivery cycle. The bot will be programmed to deliver to (at least) 2 different rooms back to back, where we will observe whether or not it arrives to the correct room at the correct time. Upon arrival, we will observe whether the screen displays room number and whether or not the correct LED lights up when the lockbox is opened. After the cycle, the bot will be programmed to return to home base. We will record how closely the bot returns to its home base location. 10 trials.</p>
Equipment List:	Completed bot, measuring tape

Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	Code will be required to direct the bot to travel to different rooms and return to its home base. This will take input from a user to know where the bot is going. It will also take input from the ultrasonic and IR sensors to get the bot to the correct room.
Description and/or images of test setup	Once navigation code is initiated, we will have someone in either room that the bot will deliver to. They'll record LCD display info, open the lockbox, check LED accuracy, and send the bot to its next destination. Someone with a measuring tape will measure how closely the bot eventually returns to its home base location.
Inputs or input ranges to be used (include number or test points and increments)	Navigation code to three different rooms and to home base, cycle (travel, delivery, next room, home base) will be completed 10 times to test reliability and consistency.
Anticipated Results and Outcome	We anticipate all tests to be 95% accurate based on previous observations and tests. Though the timer and home base aspects have yet to be tested, we anticipate they will work as expected.

Commented [AA2]: Please proofread. There are multiple errors like this in the document.

Commented [AA3]: That's not the anticipated result. The anticipated result is that it will work.

Specification Test Log

Date/Time of testing:	4/23 @ 6:30 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Lead: Joanna Leanna, Erin, Lorrena
Test ID Number:	007 - Linear Motion
Relevant functional specification(s) being tested:	E-01 M-03 M-01

Velocity:

- Trial 1: 4.55 sec.
- Trial 2: 5.00 sec
- Trial 3: 4.7
- Trial 4: 4.5

Avg: 2.133 ft/s

Test Results
Include measured data, observations, etc. here in a format appropriate to your test

Velocity: $\frac{10 \text{ ft}}{4.69 \text{ s}} = 2.133 \text{ ft/s}$

Acc. from Tracker: $\approx 3 \text{ ft/s}^2$

Test Deviations

Deviations from the test as written in the test plan

Decel: $\approx 6 \text{ ft/s}^2$

*2 ft marked on wall in tracker videos

Test Results (circle)

Complete Pass	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on what passed and what didn't.

Tracker software is very "jumpy", so acceleration/deceleration are averages over the time from stop to full speed.

Signoff

Name	Signature	Role
Erin O.	<i>[Signature]</i>	Operator
Lorrena F.	<i>[Signature]</i>	Video
Leanna T.	<i>[Signature]</i>	Timer
Joanna D.	<i>[Signature]</i>	Lead/Recorder

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Linear Motion
Test ID Number:	007
Relevant functional specification(s) being tested:	<p>E-01: <i>The system shall be able to travel at a velocity of at least 1.5 ft/s, and system should be able to travel at a velocity of at least 2.0 ft/s.</i> ✓</p> <p>M-01: <i>The system, moving at 1.5 ft/s and turning at 0.5 ft/s, shall support a load of at least 45 lbs. without tipping, and should support a load of at least 60 lbs. without tipping.</i> ✓</p> <p>M-03: <i>The system shall have an acceleration/deceleration of at least 1 ft/s² after detecting an object, and should have a have an acceleration/deceleration of at least 1.5 ft/s².</i> ✓</p>
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Black Box</p> </div> <div style="text-align: center;"> <p>White Box</p> </div> </div>
Purpose of test and test summary including number of replicates of test:	The purpose of this test is to ensure that the robot can efficiently move around its environment and stop within enough time to avoid obstacles. This test will measure cruising velocity, acceleration from stop, deceleration from cruising speed, and will verify that the bot is stable under a given load.
Equipment List:	Completed bot, measuring tape, timer, camera, Tracker program
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	<p>Dummy code that allows the bot to travel in a straight line, starting and stopping on command.</p> <p>Dummy code that allows the bot to travel in a straight line and turn a corner at cruising speed.</p>

Description and/or images of test setup	Velocity will be determined by letting the bot run at cruising speed over 10 feet and dividing by the amount of time it takes to travel this far (verify with Tracker). Acceleration will be determined with video footage and the Tracker program. The bot will also be programmed to turn a corner at cruising speed and we will observe if any tipping occurs.
Inputs or input ranges to be used (include number or test points and increments)	N/A
Anticipated Results and Outcome	We expect a cruising speed of about 1.7 m/s and an acceleration/deceleration of 1.5 ft/s ² . We do not expect to see tipping or instability of any sort.

Commented [AA4]: How will you know when you are at full speed?

Specification Test Log

Date/Time of testing:	4/10 - 4/12 from 11pm - 11am
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Lead: Erin Support: Leanna
Test ID Number:	008 - Battery
Relevant functional specification(s) being tested:	E-02 E-04

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

E-02: Battery Usage

t_{START}: (4/10) 11:17 P.M. [13.1V]

t_{END}: (4/11) 10:25 A.M. [11.8V]

t_{TAKE}: 11 HR. 8 MIN

E-04 Charging Time:

t_{START}: (4/11) 10:30 P.M. [LED Red]

t_{END}: (4/12) 10:40 A.M. [LED Green]

t_{TAKE}: 12 HR. 10 MIN.

Test Deviations

Deviations from the test as written in the test plan

Test Results (circle)

<u>Complete Pass</u>	Partial Pass	Fail
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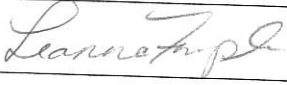
Test Commentary


Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

*Additional data on tests E-02 & E-04 available in Week 4 Team Update presentation on Sharepoint/Google Drive

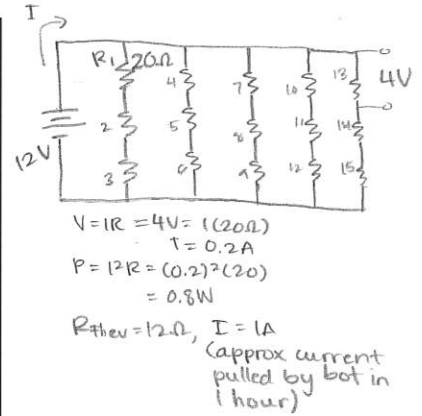
*Results align w/ graphical expectations

Signoff

Name	Signature	Role
Erin Okuna		Lead
Leanna Temple		Support

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Battery
Test ID Number:	008
Relevant functional specification(s) being tested:	<p>E-02: <i>The system battery shall support 8 hours of continuous operation with a 50% duty cycle, and should support 12 hours with a 50% duty cycle.</i></p> <p>E-04: <i>The system's battery shall fully recharge within 16 hours of being plugged in and should fully recharge within 8 hours.</i></p>
Type of test (circle)	<p>Black Box</p> <p style="text-align: center;">  </p>
Purpose of test and test summary including number of replicates of test:	This test will determine how long the robot can function without needing to be charged as well as how long it takes for the dead battery to return to full charge.
Equipment List:	Battery, wall outlet, clock, load (15 x 20Ω, 1W resistors), battery charger
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	N/A

Description and/or images of test setup	Because we will not be able to continually run our bot for several hours straight for testing purposes, we will measure how much power is required during normal use in order to calculate how long the battery would last under such conditions. We will also drain the battery completely and observe how long it takes to return to full charge.
Inputs or input ranges to be used (include number or test points and increments)	N/A
Anticipated Results and Outcome	We expect 10 hours of continual operation before losing battery power, and we expect the battery to completely recharge in 5 hours.



Commented [AA5]: Clear explicit statements, not approximations or guesses.

Specification Test Log

Date/Time of testing:	4/23 @ 7:00 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Lead: Leanna Erin, Joanna
Test ID Number:	009 - Turning Radius
Relevant functional specification(s) being tested:	M-02

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Turning Radius = 17" (1'5") Time : 8.2 sec
 Circum : 106.8" Turning Speed : ~~26.7"/sec~~ → ~~2.23 ft/sec~~
Test Deviations 1.1 ft/sec

Deviations from the test as written in the test plan

Test Results (circle)


Complete Pass	Partial Pass	Fail
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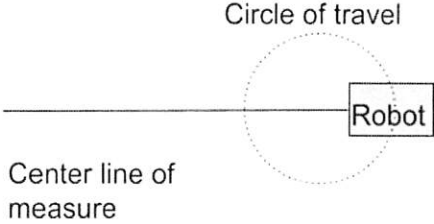
Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Signoff

Name	Signature	Role
Joanna Dickinson	<i>Joanna D</i>	Timer + Recorder
Leanna Temple	<i>Leanna Temple</i>	Marker + Measurer
Erin Okuna	<i>Erin Okuna</i>	Videographer

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Turning Radius
Test ID Number:	009
Relevant functional specification(s) being tested:	M-02: <i>The system shall have a minimum turning radius of 2 ft while traveling at approximately 0.5 ft/s. The system should have a have a minimum turning radius of 0 ft while traveling at approximately 0.5 ft/s.</i>
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Black Box</p> </div> <div style="text-align: center;"> <p>White Box</p> </div> </div>
Purpose of test and test summary including number of replicates of test:	<p>The robot will need to make its way around medical facilities through turning into doorways and around corners in order to deliver medications. The purpose of the test is to determine if the robot can make tight enough turns to safely and effectively maneuver around.</p> <p>The test will consist of marking out distances on the flat surface the test will be conducted, placing the robot on the line and powering it to turn and complete one full circle. The radius of the circle which the robot completed will be measured and the time it takes to complete the circle will be timed to determine the speed while turning. The test will be repeated at least three times in both directions.</p>
Equipment List:	The robot, timer, measuring tape, painters tape

<p>Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:</p>	<p>Code to power the robot to turn in a full circle will need to be created for use during the test.</p>
<p>Description and/or images of test setup</p>	
<p>Inputs or input ranges to be used (include number or test points and increments)</p>	<p>The robot will be fully powered and programmed to drive in a circle.</p>
<p>Anticipated Results and Outcome</p>	<p>It is anticipated that the robot will turn with a radius of 9 in when traveling at cruising speed.</p>

Specification Test Log

Date/Time of testing:	4/23/19 @ 2:10 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Lead: Joanna, Checker: Leanna
Test ID Number:	010 - Size
Relevant functional specification(s) being tested:	S-01 S-02

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Measurements: 22" x 18" x 33" (B x W x H)

Total Weight: 44 lbs

Test Deviations

Deviations from the test as written in the test plan

N/A

Test Results (circle)


<u>Complete Pass</u>	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Signoff

Name	Signature	Role
Joanna Dickinson	<i>Joanna D.</i>	Lead
Leanna Temple	<i>Leanna Temple</i>	Checker

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Size
Test ID Number:	010
Relevant functional specification(s) being tested:	S-01: <i>The entire pill bot shall weigh no more than 60 lbs. The entire pill bot should weigh no more than 45 lbs.</i> S-02: <i>The Pill Bot structure shall measure no greater than 24''x 24''x 40'' (BxWxH). The Pill Bot structure should measure no greater than 20''x 20''x 38''.</i>
Type of test(circle)	<div style="text-align: center;">  </div>
Purpose of test and test summary including number of replicates of test:	<p>The purpose of the test is to prove that the Pill Bot is small enough to travel within medical facilities without taking up too much space or being too heavy to impact speed and maneuverability capabilities.</p> <p>The test will be comprised of weighing the overall robot with all components installed and secured to determine the final weight, and measuring the overall dimensions of the robot (L, W, H).</p> <p>The test will be replicated three times and measurements will be verified by multiple individuals to improve accurate readings.</p>
Equipment List:	The Pill Bot, scale, measuring tape
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	N/A

Description and/or images of test setup	The robot will be placed on a zeroed scale and the weight will be recorded. The overall measurements will be taken for length, width, and height when the robot is on a flat surface.
Inputs or input ranges to be used (include number or test points and increments)	N/A
Anticipated Results and Outcome	The robot is expected to weigh 45 lbs. and measure 22.25" X 18" X 33.25" when fully assembled.

Specification Test Log

Date/Time of testing:	4/23/19 @ 2:05 pm
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. Lead: Leanna, Checker: Joanna
Test ID Number:	011 - Cost
Relevant functional specification(s) being tested:	C-01

Test Results

Include measured data, observations, etc. here in a format appropriate to your test

Official BOM "Total" cell

Mechanical (\$955.95) + Electrical (\$214.14) = \$1170.09

Test Deviations

Deviations from the test as written in the test plan

NONE

Test Results (circle)

<u>Complete Pass</u>	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*.

Per 100 cost would be significantly lower, most likely meeting the goal of < \$1000.

Signoff

Name	Signature	Role
Leanna T.	<i>Leanna Temple</i>	Lead
Joanna Dickinson	<i>Joanna D</i>	Checker

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Cost
Test ID Number:	011
Relevant functional specification(s) being tested:	<i>C-0: The total production cost shall be less than \$1500 and should be less than \$1000.</i>
Type of test(circle)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Black Box</p> </div> <div style="text-align: center;"> <p>White Box</p> </div> </div>
Purpose of test and test summary including number of replicates of test:	The purpose of the test is to determine if the total production cost is a reasonable amount so that profit and accessibility to customers are both possible. The production cost is determined by determining and adding up all costs of parts used to build the robot. The cost summary will be verified by another individual to avoid errors.
Equipment List:	Bill of materials, receipts
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	N/A

Description and/or images of test setup	Use an excel spreadsheet to add up all used components to produce the robot.
Inputs or input ranges to be used (include number or test points and increments)	N/A
Anticipated Results and Outcome	The robot currently costs \$1100 and is anticipated to cost \$1400 once equipped with finishing hardware and aesthetic adjustments.

Specification Test Log

Date/Time of testing:	23 April 2019 - 4 May 2019 on Survey Monkey
Test participants:	Please identify a single engineer as the test lead, others are considered to be "supporting" the test. The test lead is responsible for adherence to the test plan and the overall quality of the test results. <i>Lead: Lorena, Distributor: Joanna</i>
Test ID Number:	012 - Appeal
Relevant functional specification(s) being tested:	AP-01

Test Results

Include measured data, observations, etc. here in a format appropriate to your test
 65% (13/20) of people said that the Pill Bot's appearance was suitable for a medical facility.

Test Deviations

Deviations from the test as written in the test plan

Test Results (circle)


Complete Pass	Partial Pass	Fail
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Test Commentary

Additional notes on the test. If partial pass, you must comment on *what passed* and *what didn't*. If fail, you must comment on *why the system failed* and *what would be involved in meeting the specification* (i.e. how much work for the company, how much cost, etc.).

Signoff

Name	Signature	Role
Lorena Ferreira	<i>[Signature]</i>	Lead
Joanna Dickinson	<i>[Signature]</i>	Distributor

Team/Project:	Pill Bot/Robo-Medics
Test Name:	Appeal
Test ID Number:	012
Relevant functional specification(s) being tested:	<i>AP-01: When a sample group of people with experience in medical facilities are asked about Pill Bot's appeal, at least 60% shall agree that Pill Bot is visually suitable for a medical facility environment, and at least 85% should agree that Pill Bot is visually suitable for a medical facility.</i>
Type of test(circle)	
Purpose of test and test summary including number of replicates of test:	<p>The purpose of the test is to determine whether or not the Pill Bot would be visibly suitable for a professional medical environment.</p> <p>A sample of 20 people from the SPU nursing department (students and/or faculty) will be asked whether the Pill Bot would be visibly suitable in a such work environment. The survey will be conducted once using Surveymonkey.com</p>
Equipment List:	Pictures and/or videos of completed Pill Bot compiled into an easily accessible online survey, 20 people who have experience in medical facilities
Necessary dummy inputs, their source, and mechanism for validation of dummy inputs:	N/A

Description and/or images of test setup	A survey will be created to ask whether or not the Pill Bot would be visibly suitable for a medical facility. The participants will answer yes or no, and provide feedback on how a the Pill Bot's physical appearance can be improved if their answer is no.
Inputs or input ranges to be used (include number or test points and increments)	N/A
Anticipated Results and Outcome	The anticipated result is for the Pill Bot to be visibly suitable according to at least 60% of surveyed participants.