All Block Check-Off

Caleb Hubbell

Block Diagram

BLACK_BOX_DESCRIPTION

outside_station_acpwr → Charging Station Housing I, II
station_outside_envin ←
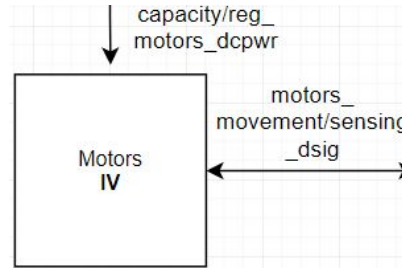station_robot_dcpwr → Robot Housing III, IV
robot_outside_envin ↔

CHARGING_STATION_HOUSING_DESCRIPTION

outside_surge_acpwr → Surge Protection I
surge_conversion_acpwr → Power Conversion II
conversion_robot_dcpwr →
conversion_tx_dcpwr → Station Location Transmitter II

ROBOT_HOUSING_DESCRIPTION

station_robot_dcpwr → Portable Power III
portable_CPD_asig → Capacity Processing and Display III
portable_CPD_dcpwr
CPD_outside_envin →
CPD_movement_dsig
portable_return_dcpwr → Return to Base Interface I
portable_movement/sensing_dcpwr → Motors IV
motors_movement/sensing_dsig ↔ Movement Sensing/ Motor Comm IV
robot_outside_envin ↔
return_movement_dsig

TASK ASSIGNMENTS

I Alex Thompson
II Colbey Stadelman
III Tony Penoyer
IV Caleb Hubbell

Functional Overview - Motor

Motor Block

DG02S DC Brushed Motor

capacity/reg_motors_dcpwr

motors_movement/sensing_dsig

robot_outside_motion

robot_outside_envin
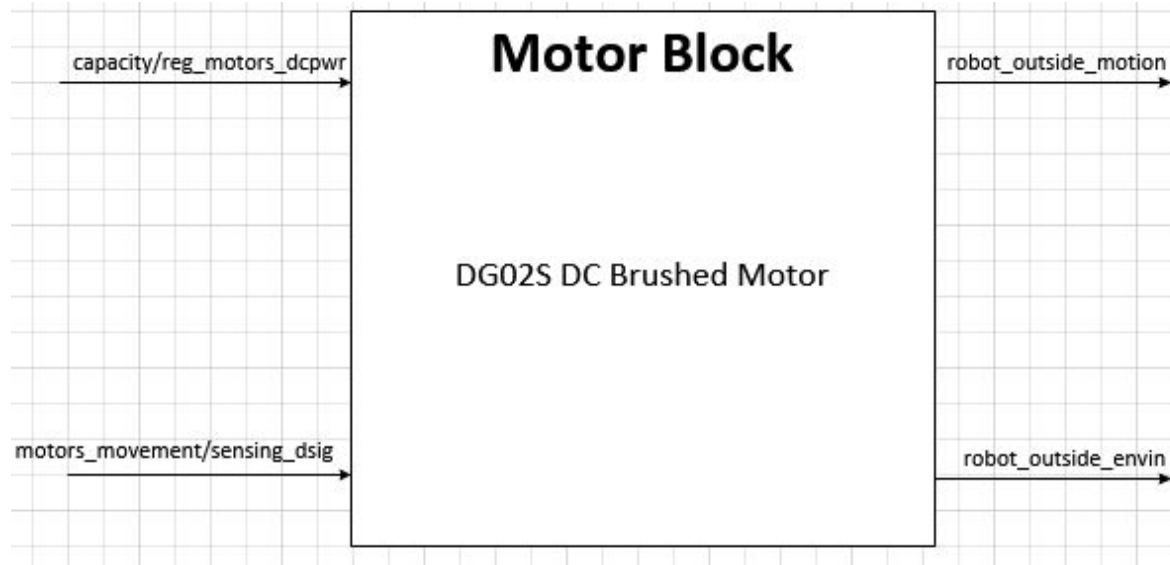
Interface Verification for System Integration - Motor

| Interface	Properties
robot_outside_envin	• Surfaces include: tile, short carpet, concrete • Obstacles include: walls, chair legs, cords, clothing
robot_outside_motion	• Speed on all surfaces must be greater than 0.3 m/s • Max speed > 0.3 m/s • 10 min or greater time in motion
capacity/reg_motors_dcpwr	• 3-12 V DC • 0 - 0.7 A • 10% tolerance on input parameters
motors_movement/sensing_dsig	• PWM DC signal powering 2 motors • PWM frequency of 1.6KHz. • Draw of 0 - 0.45A • Duty cycle of 0-40% • 2 active high inputs; 5V high, 0V low

Testing Plan Overview - Motor

2 Steps:

A.   Top Speed No Load Test
B.   Top Speed Max Current Draw Test

Conclusion:

If the block passes all of the listed tests, all interface properties have been verified and the block is ready for inclusion into the system.

Schematic and Testing Setup - Motor
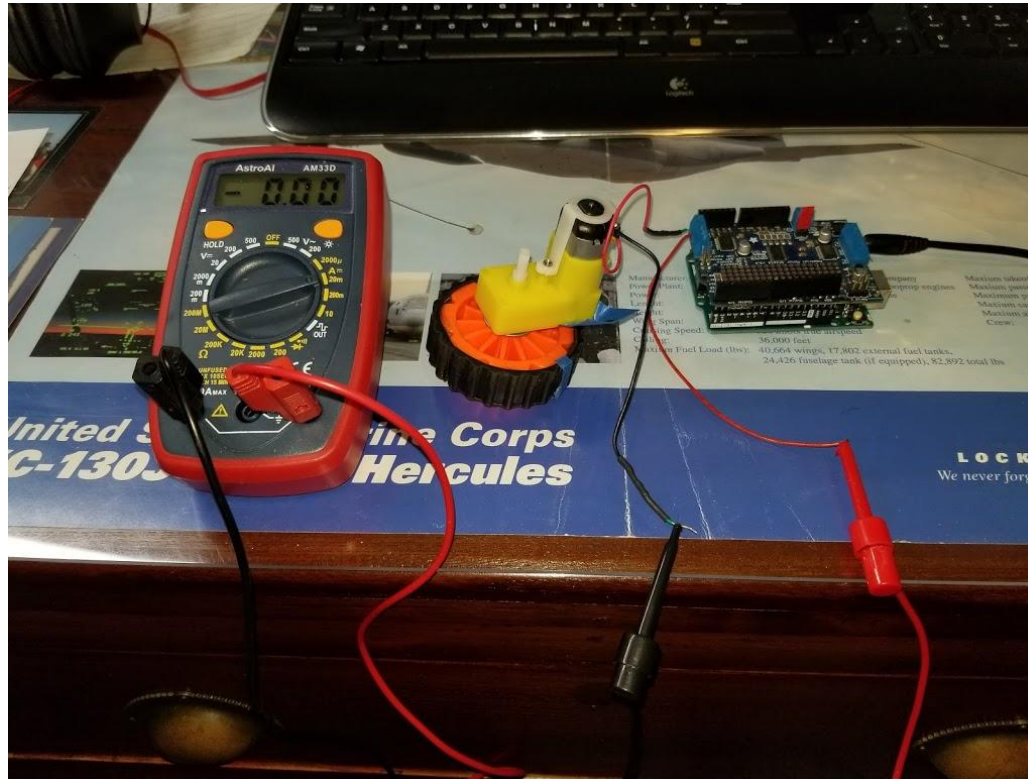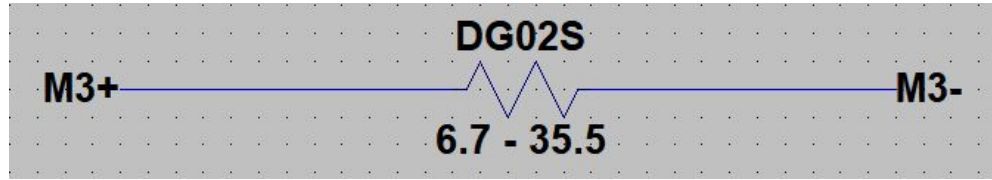
Test Videos - Motor

Test A: Top Speed No Load Test

Test B: Top Speed Max Current Draw Test

Test Results - Motor

Numerical Results:

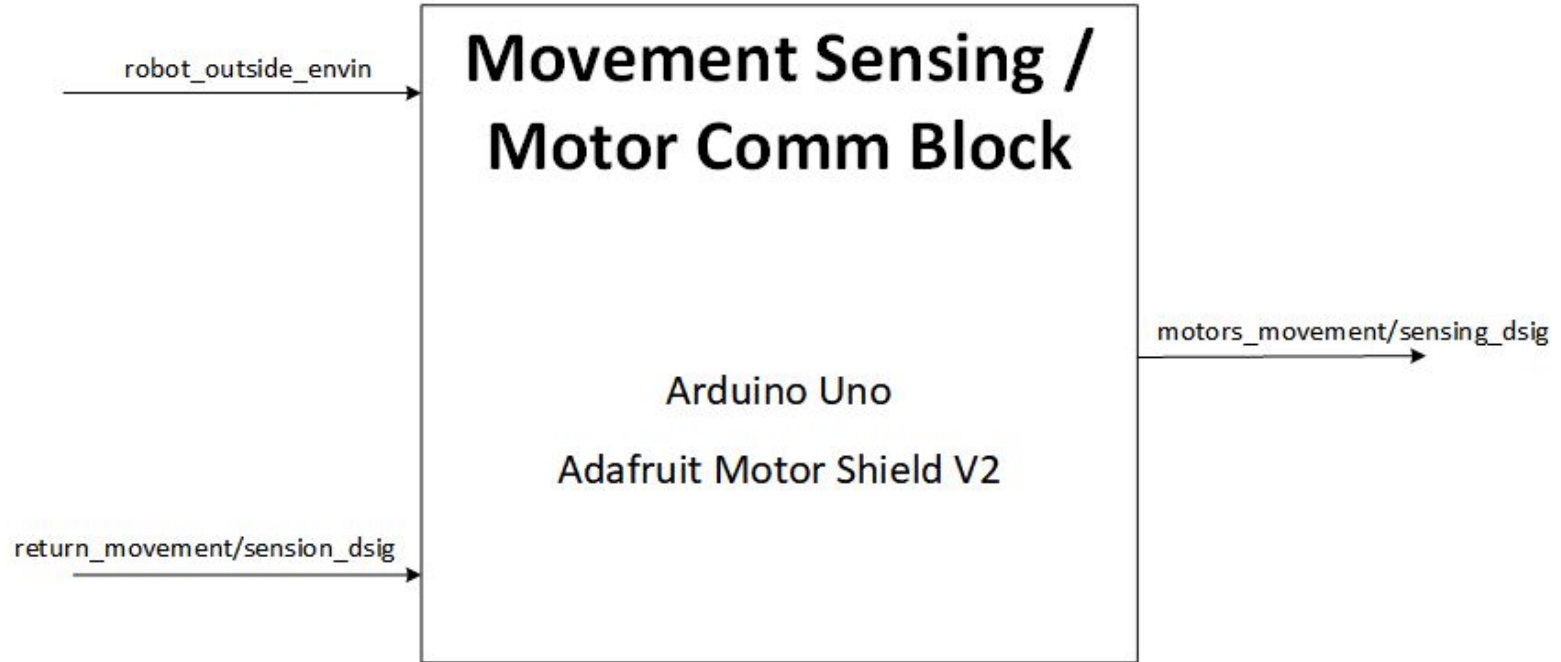A.   **V = 3.53V. I = 0.1A. R = 35.5Ω. RPM = 150.**

   Linear Velocity = 0.93m/s

B.   **V = 3.35V. I= 0.5A. R = 6.7Ω. RPM = 54.**

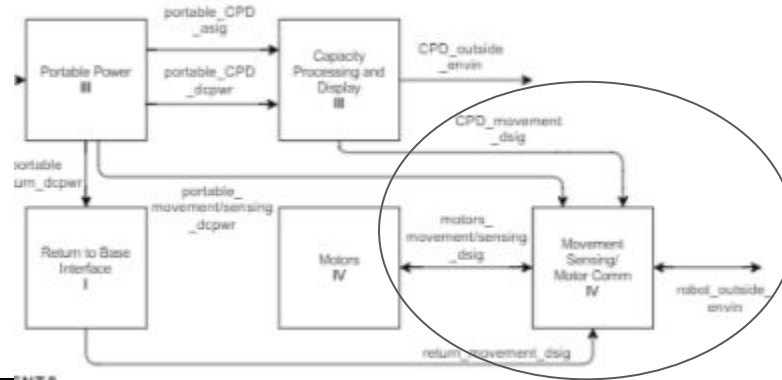   **Linear Velocity = 0.33m/s**

Results: <u>Passed</u>

Both linear velocities were above the required minimum velocity of 0.3m/s. This demonstrates that the motor block is ready to be incorporated into the system for further testing and should not result in system damage or malfunctions.

Interface Verification for System Integration - Movement Sensing / Motor Comm

Interface	Properties
robot_outside_envin	- Surfaces include: tile, short carpet, concrete - Obstacles include: walls, chair legs, cords, clothing
return_movement/sension_dsig	Function calls which demand motor movement in all 4 directions
motors_movement/sensing_dsig	- PWM DC signal powering 2 motors - PWM frequency of 1.6KHz. - Draw of 0 - 0.45A - Duty cycle of 0-40% 2 active high inputs; 5V high, 0V low

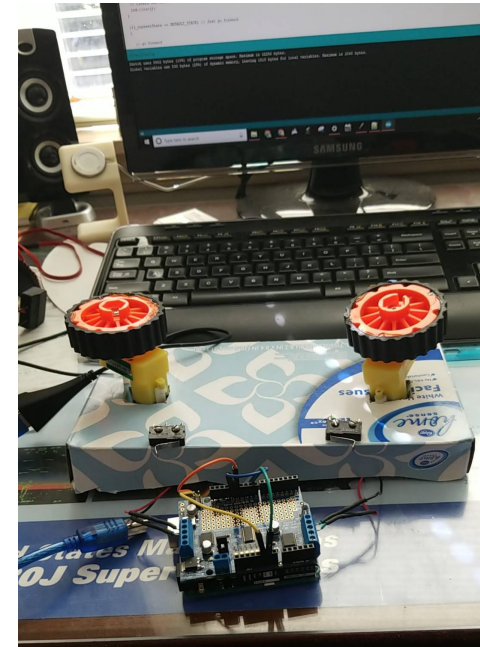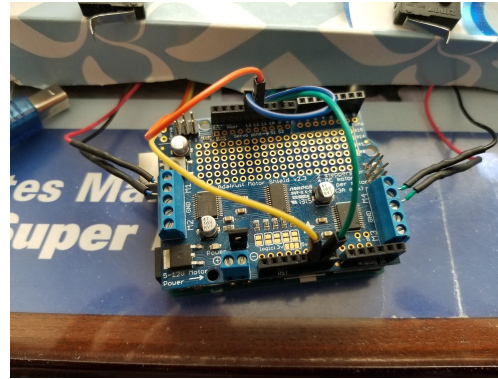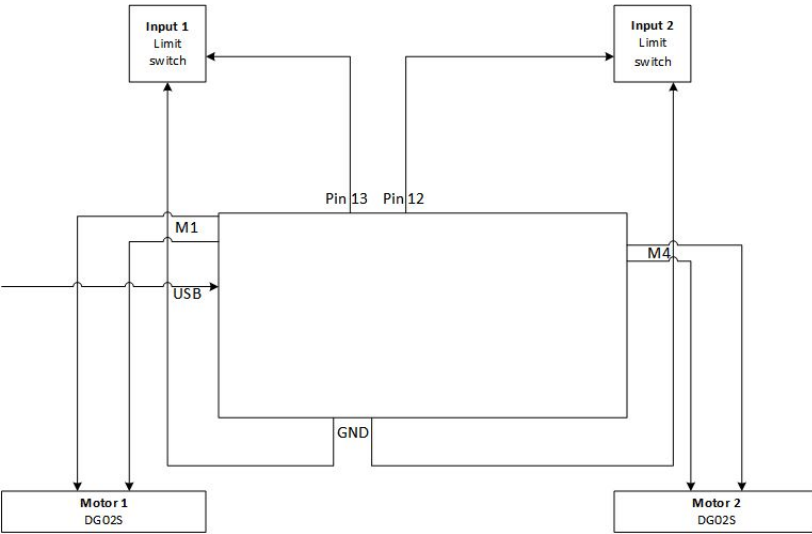# Testing Plan Overview - Movement Sensing / Motor Comm

5 Steps:

A. Setup
B. Forward movement test
C. Left object test
D. Right object test
E. Front object test

Conclusion:

If the block passes all of the listed tests, all interface properties have been verified and the block is ready for inclusion into the system.

Schematic and Testing Setup - Movement Sensing / Motor Comm

Test Video - Movement Sensing / Motor Comm

Testing the object detection / avoidance

Test Results - Movement Sensing / Motor Comm

Results: <u>All Passed</u>

The robot accurately responded to all provided inputs. This demonstrates that the motor block is ready to be incorporated into the system for further testing and should not result in system damage or malfunctions.

Add'n Block
Robot Housing

Interface	Properties
robot_outside_envin	- Surfaces include: tile, short carpet, concrete - Obstacles include: walls, chair legs, cords, clothing
station_robot_dcpwr	- IMAX : 150mA 11.5-18V DC - Conductive