TEST: Magnetometer Scaling Function

ENGINEER: [Name removed for privacy]

PREREQUISITES:

- Two magnetometers fully wired
- Code downloaded to Arduino controller
- Magnetometers are pre-calibrated and reading correct azimuths

EQUIPMENT:

- A computer with Arduino IDE installed
- 5 VDC power supply
- Head/Neck Subsystem assembly (includes head, neck, motors, etc.)
- Motor control circuit (includes Arduino MEGA controller, “motor enable” switch, etc.)
- USB cable
- Wearable hat (includes hat, magnetometer sensor, wiring)
- Two QMC5883L magnetometers (one handheld, one mounted on wearable hat)
- Cell phone (with compass app)

PERSONNEL:
Any team member

OBJECTIVE:
Ensure the head can rotate properly even when magnetometers cross over “North” axis.

SAFETY PROCEDURE(S):
Make the “motor enable” switch accessible throughout the testing procedure. The motors will not move unless this is actuated to the “ON” state.

PROCEDURE:
The wearable hat and the reference magnetometer will be pointed in various directions to ensure the scaling function is working correctly. The reference magnetometer will be pointed towards “Northeast”, and the hat will be pointed towards “Northwest”. Next, the reference magnetometer will be pointed towards “Northwest”, and the hat will be pointed towards “Northeast”. The head/neck assembly should rotate in coordination with the hat in both situations. Refer to below figures for test setup.

Action	Complete	Initials	Comments
Open Arduino Serial Monitor and verify communication with the controller.			It should display the scaled servo angles for both conditions stated above.
Wear the hat with the bill facing forward. Hold the reference			Refer to Figure 2.

sensor with the x-axis pointing forward.			
Verify the following directions with a cell phone compass: Northwest, North, Northeast.			
Orient the reference sensor towards Northeast. Point the hat towards Northwest.			
When ready, toggle the “motor enable” switch to the “ON” state.			After 3 seconds, the head on the robot should move to the “left” position.
Slowly rotate the hat towards the reference sensor and rotate it beyond the reference.			The head should continue to rotate with the hat.
Toggle the “motor enable” switch to the “OFF” position.			
Reposition the reference sensor towards “Northwest”. Orient the hat towards “Northeast”.			
When ready, toggle the “motor enable” switch to the “ON” state.			After 3 seconds, the head on the robot should move to the “right” position.
Slowly rotate the hat towards the reference sensor and rotate it beyond the reference.			The head should continue to rotate with the hat.
Toggle the “motor enable” switch to the “OFF” position.			
Turn off all power supplies and de-energize any electrical circuits.			

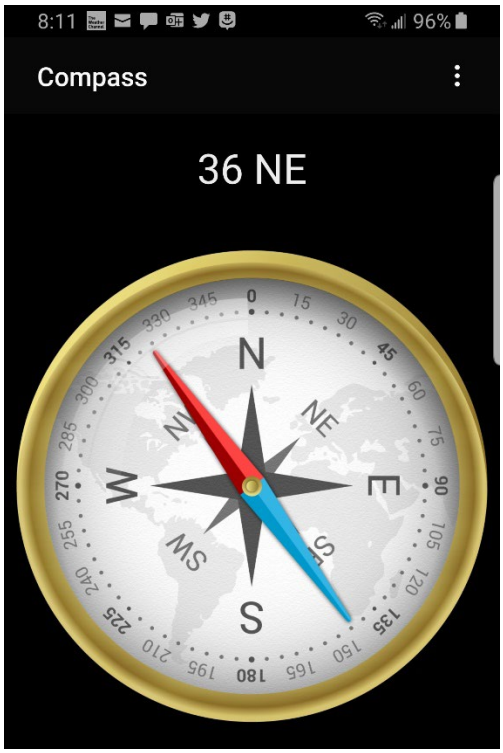

Figure 1. An example of a cell phone compass app.

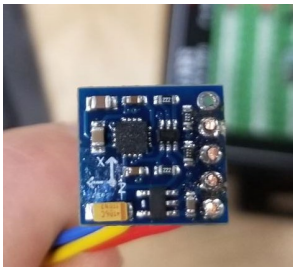

Figure 2. A top view of a magnetometer.