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**Grand Blanc High School Robotics Team**  
**2015 Electrical Deliverable**  
Identify Assigned Simulation and Battery Measurement



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Mentor(s) to ask if you have questions about this Challenge: Clinton or Cathy for the simulation, and Dave for the battery measurements.

Gather the following Materials:

1. Simulation Board (from the bin on the black shelf in the conference room)
2. Multimeter (from the tool box)
3. Battery Beak (attached to the battery cart downstairs - do not detach)
4. Competition Battery for the FRC Robot (noted by a sticker on the top with a Team logo, Battery number, and year.) **PLEASE KEEP BATTERIES DOWNSTAIRS.**

Background Information:

This board simulates a circuit containing a switch. The current enters the switch through the Common wire and exits the switch through EITHER the Port A wire or the Port B wire (you can't tell which), depending if the switch is in the open or closed state.

Reference Material:

*Battery Beak Reference Materials:*

1. Read pages 2, 6 (begin at the "TESTING" section near the bottom of the page), 7, and 8 of the Cross the Road Battery Beak Manual (attached)
2. For the full, online version, visit here: <https://www.ctr-electronics.com/downloads/pdf/Beak-User-Manual.pdf>

*Multimeter Reference Materials:*

1. Read the attached "How to Use a Multimeter" document (contains pages 2-10, read all)
2. For the full, online version, visit here (you'll need pages 2-10):  
<https://www.ifixit.com/Guide/How+To+Use+A+Multimeter/25632#s64987>

Challenge Instructions:

*You may complete the simulation and the battery measurement section of this deliverable in any order. It doesn't matter which one you do first, as long as you've read the reference materials. Use complete sentences to record this information in your Engineering Notebook as you work*

**Assigned Simulation Instructions:**

1. Use the multimeter to determine the following for the simulation board,:
  - a. Which port is connected when the switch is in the open state?
  - b. Which port is connected when the switch is in the closed state?

**FRC Battery Measurement Instructions:**

1. Use the multimeter to measure the DC voltage of the battery
2. Use the Battery Beak to measure the following for a competition FRC battery:
  - a. The Status
  - b. The Charge
  - c. The Voltage at No Load
  - d. The Voltage at Load 1
  - e. The Voltage at Load 2
  - f. The Internal Resistance (Rint)



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Engineering Notebook Entry Instructions:

- a. Take notes while you are working and discuss any difficulties that you may have
- b. Answer the following questions:
  - a. Did you enjoy this simulation and measurement task? Why or why not?
  - b. What did this task teach you about the electrical subsection that may assist you if you are a member of the other subsections?
  - c. Which port is connected when the switch is in the open state?
  - d. Which port is connected when the switch is in the closed state?
  - e. Make a table that includes the following information for your battery:
    1. Battery Identifier and Year, The Status, The Charge, The Voltage at No Load, The Voltage at Load 1, The Voltage at Load 2, The Internal Resistance ( $R_{int}$ )
  - f. Why is it important to know the status and charge of any given battery?

To Complete Your Challenge:

1. Ensure that your Engineering Notebook entry is complete
2. Find Clinton OR Cathy and escort him/her to your workstation to inspect your completed work for the simulation, or ask Dave to help with the battery measurement.
3. Ask Clinton OR Cathy to approve your Engineering Notebook entry and have your deliverables checklist validated. Ask Dave to validate the battery measurement.
4. Be sure to turn off the multimeter, **return it to the correct spot in the TOOL BOX.**
5. Return the Materials to the Electrical Simulation Bin in the conference room.
6. Leave your workspace cleaner than it was when you found it.