



Grand Blanc High School Robotics Team



Initial Member Deliverables Wiring Simulation and Battery Test

Clinton Bolinger
cbolinger@gmail.com
810.394.3273

Brandi Bolinger
bbolinger@gmail.com
248.249.1983

Mentor(s) to ask if you have questions about, and can sign off on this Challenge: Clinton Bolinger, Cathy Fillwock or Marty Ray.

ALWAYS REMEMBER: If you get stuck or have questions, ask a Veteran Student on your (or another) VEX Team BEFORE you approach a Mentor. We're always here to help, *but start with a Student first.*

IMPORTANT NOTE:

This Deliverable has two parts – the Wiring Simulation Test and the Battery Measurement portion. You may complete these tasks separately and/or on different days, but BOTH must be finished before your Engineering Notebook will be validated for completion of this challenge.

Part One – Simulation Test

Gather the following Materials for Part One:

1. Check the board in the conference room to see if a Kit is available to check out for this Deliverable Training.
2. Reference the Recommended Completion Schedule calendar (located on the board) to see if this Deliverable is featured for your Team this month:
 1. If your VEX Team is the featured Team, then proceed with the instructions below.
 2. If not, ask a Veteran Student Team Member to go with you to ask the Team Captain of the featured Team if they plan to use the materials at tonight's meeting:
 1. If the materials will NOT be used by that Team, then proceed with the instructions below.
 2. If the materials WILL be used tonight, please choose a different training to complete today.
3. Follow the directions listed on the board in the Conference Room to check-out a Kit (if available):
 1. Visit www.team2337.com/checkout on an internet connected device (yours or the Team's).
 2. The Password for the Team's Wifi is: 2337is1337
4. Take an inventory of the components **BEFORE** you leave the Conference Room. Your kit should contain:
 1. One wooden simulation board
 2. One Multimeter (make sure it's charged! If not, swap with some rechargeable batteries from your VEX Team)
 3. Battery Beak Instruction Manual
 4. Multimeter Instruction Manual
 5. If any materials are missing, please inform one of the Mentors listed above BEFORE you get started.

Training Instructions – Part One:

1. You may work in the back room, wood shop or lunch room for this challenge.
2. Read the "How to Use a Multimeter" document that is included in the materials kit, and familiarize yourself with how to use it.
 - a. For the full online version, visit here (you'll only need steps 2-12):
<https://www.ifixit.com/Guide/How+To+Use+A+Multimeter/25632#s64987>
3. The Simulation Test Board mimics a circuit containing a switch.
4. The "electrical current" enters the switch through the Common Wire and exits the switch through *EITHER* the Port A wire or the Port B wire (but you can't tell which!), depending if the switch is in the open or closed state; your job is to figure out the flow of current using the Multimeter.



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Engineering Notebook Instructions – Part One:

1. Check out this website to learn common symbols for Electrical Diagrams:
<http://www.physics-chemistry-class.com/electricity/diagram-circuit.html>
2. Draw a picture of the Simulation Board in your Engineering Notebook:
 - a. Label the Components, as indicated on the board
 - b. Draw a diagram to show:
 - i. The flow of current
 - ii. Open Switch
 - iii. Closed Switch
3. Document how you used 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?
 - c. How were you able to tell the difference?
4. Think about and answer the following questions, using complete sentences:
 - a. As a member of the Robotics Team, why is it important to know how to use a Multimeter?
 - b. In what applications would you need this information?
5. Once you have completed the steps for PART ONE and have at least 20 minutes:
 - a. You may move onto part two OR save PART TWO for a different day.
 - b. Since there is no “inspection” for this training, you may also complete your entries at home and have your notebook validated at a different meeting.

If you are **NOT done** with PART ONE AND PART TWO of your training by at least 15 minutes before the end of the meeting:

1. Return all tools and reference materials to the bin,
2. Clean your workspace AND the floor around you:
 - a. Wipe off tables
 - b. Push in Chairs
 - c. Sweep the floor,
 - d. Throw away trash
3. Write your name on a post-it (available on the cart next to the Deliverables shelf in the Conference Room), and attach it to the outside the bin (on the lid),
4. Return the bin to the shelf in the Conference Room, with the label facing upward
5. **DO NOT** complete the online check-in form!
6. If you do not show up for the next two meetings, the kit will be given to someone else.



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Part Two – Battery Measurement

NOTE: If you are completing Part Two on a different day than Part One and you do not have a Simulation Kit checked out, please obtain one using the instructions above.

Gather the following Materials for PART TWO:

1. Multimeter (review the instructions included in the kit if necessary)
2. Battery Beak Instruction Manual:
 - Included in the Simulation Kit, OR:
 - Online version, visit here: <https://www.ctr-electronics.com/downloads/pdf/Beak-User-Manual.pdf>
 - Read pages 2, 6 (begin at the “TESTING” section near the bottom of the page), 7, and 8
3. Battery for the FRC Robot
 - **IMPORTANT: DO NOT hold, carry, transport, or otherwise handle batteries by the leads (wires and connectors)! This damages the batteries and the connections.**
 - **IMPORTANT: Batteries are heavy – about 13 pounds each! Take caution NOT to drop them!**
 - **IMPORTANT: If you drop a battery, PLEASE inform a Veteran Team Member, so it can be inspected.** We understand that accidents happen, but it is critical all damaged batteries are identified and must be properly disposed of.
 - Batteries can be found on the Battery Cart, located downstairs in our EngiPit
 - PLEASE KEEP BATTERIES AND BATTERY BEAK DOWNSTAIRS.
4. Battery Beak (attached to the battery cart downstairs - do not detach it from the cart!)

FRC Battery Measurement Training Instructions for PART TWO:

1. Use the Multimeter to measure the DC voltage of the battery and record it in your Engineering Notebook,
2. Use the Battery Beak to measure, and then record the following information in a CHART in your Engineering Notebook:
 - 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)
3. Once you have gained the required measurements, return the battery to its designated spot on the battery cart, and begin work on your Engineering Notebook entry for PART TWO.



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Engineering Notebook Entry Instructions for PART TWO:

- a. Take notes while you are working and discuss any difficulties that you may have,
- b. In addition to the chart above, please include an answer the following questions, using complete sentences:
 - a. Why is it important to know the status and charge of any given battery?
 - b. How often should you check the charge of a battery?
 - c. Whose “job” do you think it is to know how check the charge of batteries?

To Complete Your Challenge for PART TWO:

1. Ensure that your Engineering Notebook entry is complete. Since there is no “inspection” for this training, you may also complete your entries at home and have your notebook validated at a different meeting.
2. Ask one of the Mentors above to read your Engineering Notebook Entry and validate your Training Checklist.
3. Clean your workspace AND the floor around you:
 1. Wipe off tables,
 2. Throw away trash,
 3. Push in Chairs,
 4. Sweep the floor.
4. Follow the directions on the board in the conference room to check the kit in, and:
 1. Inventory the Kit to make sure the Kit includes all of the following materials:
 1. One wooden simulation board
 2. One Multimeter (make sure it's charged! If not, swap with some rechargeable batteries from your VEX Team)
 3. Battery Beak Instruction Manual
 4. Multimeter Instruction Manual
 5. If any materials are missing or broken, please inform one of the Mentors listed above.
 2. Check the kit in using the online form, available at www.team2337.com/checkin
 3. Return the bin to the correct shelf in the Conference Room, with the label facing outward,
 4. Erase your name from the sign-out board, using a tissue and hand sanitizer.