February SRC Roundtable meeting 2013'

1. Programming Activity Board:
    a. **Checking the soldering on the board** – Be sure that you have NO solder bridges and that all parts are mounted correctly. This means checking resistor values to see if they are in the right place as well as checking LED polarity, capacitor polarity etc….
    b. **Plugging the PAB onto the RCB –** Place the RCB in front of you with the PROP PLUG connector on your left. Holding the PAB with the top toward the top of the RCB, place the FEMALE Headers from the PAB onto the MALE headers on the RCB. Line up the PAB on the RCB so that the top right MALE headers (Closest to the fan) go into the first FEMALE pins on the PAB. (Bottom line – be sure its lined up on the right furthermost pins of the RCB)
    c. **Programming for the first time –** To program the board you must power up the RCB with the BLACK WALL TRANSFORMER that was provided. See the back page of this handout to see how to cut the plug end off the transformer , strip the wire leads and tin the leads for use. Once the leads are cut, stripped and tinned, the STRIPED lead goes into the power terminal to the POSITIVE side. The SOLID BLACK lead goes into the power terminal on the DIODE side.
        i. Once the board is connected and powered up, you can begin downloading code to the Programming Activity Board THROUGH the Robot control board PROP PLUG connection.
    d. Be sure your students go to the www.srcvb1.weebly.com website to get the latest programming activities. Its best to have your students TYPE the code into the Propeller SPIN Tool Program on the computer so that they will retain the information a little better. Students quickly discover they can cut and paste code into the Propeller Spin Tool Program.
    e. Students should complete all the activities. When you get a few fast working and smart students, plan to re-direct them to solve higher level problems. For example, plan some challenges for them to solve. Possibly type up your challenges and have them ready to hand out to kids that pick up programming quickly. Its best to CHALLENGE them by having them figure out a solution to a problem that you give them. This is a higher order thinking process and requires a much deeper understanding of the code than completing the given exercises. For example, a challenge might be to make airport runway lights, or to make lights like the old "KNIGHT RIDER" car. (I know I have just dated myself! ☺) Think of flashing processes that are NOT already given. A challenge to flash one light on and off 4 X every ½ second followed by a quicker flashing sequence could also be a challenge.
    f. There are some "NEW" programming activities on the website also. These are in PDF format. Students can complete these also. For any RETURNING STUDENTS, the "NEW" activities are intended to be a higher order challenge than the older activities in POWERPOINT. There are many more questions with the "NEW" challenges as well.
    g. Questions about Programming???

2. **Building your first Robot Chassis:**
    a. Take a look at the drawn chassis diagram on one of the back pages of this document. It shows the physical parts of the robot drawn so that you can see the basic assembly. The photos can help you visualize the assembly as well.
    b. Be advised that when you are attempting to assemble the chassis, using a clamp greatly simplifies the installation of screws. Once the material is clamped together and clamped to a desk, the screws will go into the material and NOT cause the material to separate.
    Without a clamp, you will likely need to screw the materials together, back the screw out and then screw them back together to prevent a GAP between the top and side pieces.
    c. I will demonstrate the process in a short video that I will post on the website.

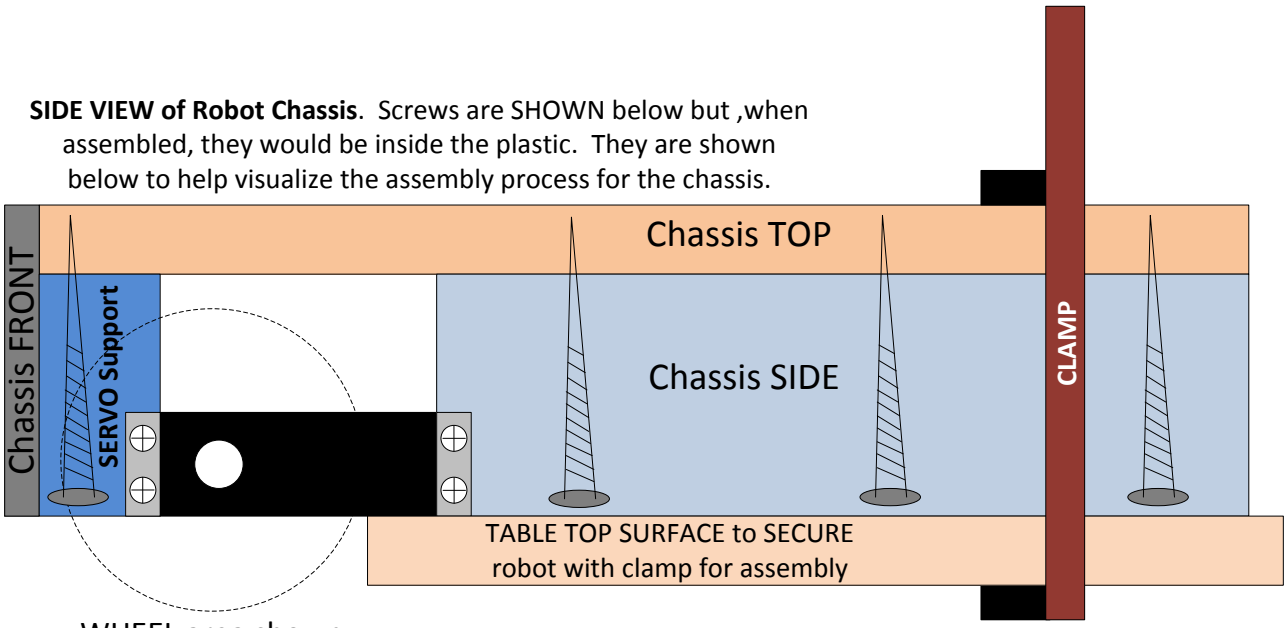
3. **Installing your drive SERVOS on your chassis –**
    a. Once your chassis is built, you are ready to install your DRIVE SERVOS. Place a servo into the gap between the SERVO SUPPORT and the CHASSIS SIDE. Make four marks in the center of the servo holes so you will know where to pre-drill pilot holes for your screws. (A PILOT HOLE is a hole drilled slightly smaller than the threads of a screw you intend to install.)
    b. Select the correct drill bit and drill four pilot holes for the servo to be mounted.
    c. Place the servo in position and screw them into place. Repeat the process for the opposite side.

4. **Making wheels for your robot**
    a. Once your students have completed programming and assembled their chassis, it's time to make some wheels!
        i. Using the WHITE 3" wheels provided, place a horn with the flat side toward the wheel in the VERY CENTER of the wheel. If you place the horn correctly, the ridge on the HORN fits exactly into the center hole of the wheel. Using a sharp pointed object, make a PRICK mark in one small horn hole on each side of the center hole. See figure 3 on the back of this document.
        ii. You only need two holes to secure the horn to the wheel. Remove the horn and PRE-DRILL a pilot hole in the marked areas on the wheel.
        iii. Once the holes are pre-drilled, use a screwdriver to install 2 small wood screws through the horn and into the wheel. As long as the screw is **not** longer than ½" , it should be fine. If the holes in the horn are too small for the screws, you may also drill a through hole into the small holes on the horn so that the screw may go through easily. (A THROUGH HOLE is a hole drilled in a material slightly larger than the threads of a screw you intend to install. This is done so that the screw will NOT thread into the top layer material, but only the bottom layer material
        iv. Once the horns are installed on each wheel, push the wheel in place lining up the SPLINES on the servo with the SPLINES of the servo HORN. (A SPLINE is a grooved shaft that accepts a matching grooved shaft and locks the two pieces together so that one can drive the other.) Once in place on the servo, screw the horn in place through the center of the wheel to the servo. Finally, you can place the VBSCHOOLS rubber wrist bands around each of the wheels for tires. You will likely have to sand any ridges down along the wheel that may have been left by the circle cutter.

5. **Creating a BACK WHEEL:**
    a. All students need to be creative in making a back wheel/back wheel assembly. This is the FIRST of several DESIGN challenges that students face. Allowing them to come to a solution with this simple task will help get them geared up for bigger challenges. As a suggestion, acquire some appropriate sized wheels from old toys. Ask your students to bring in several wheels that that they might be able to use as a back wheel on their robot. This gets the students involved in the process and also gets them thinking about how they might engineer the assembly. This is also a good time to allow them to paper model the rear wheel assembly before cutting up all the VEX material for this task. If ANY students have any old ERECTOR SET parts and or Erector set model books, these would come in VERY HANDY when you try to assemble a moving back wheel. As an alternate plan, Home depot sells a small rotating castor that can be easily mounted on a robot for this purpose. I would ONLY recommend this if your teams are way behind.

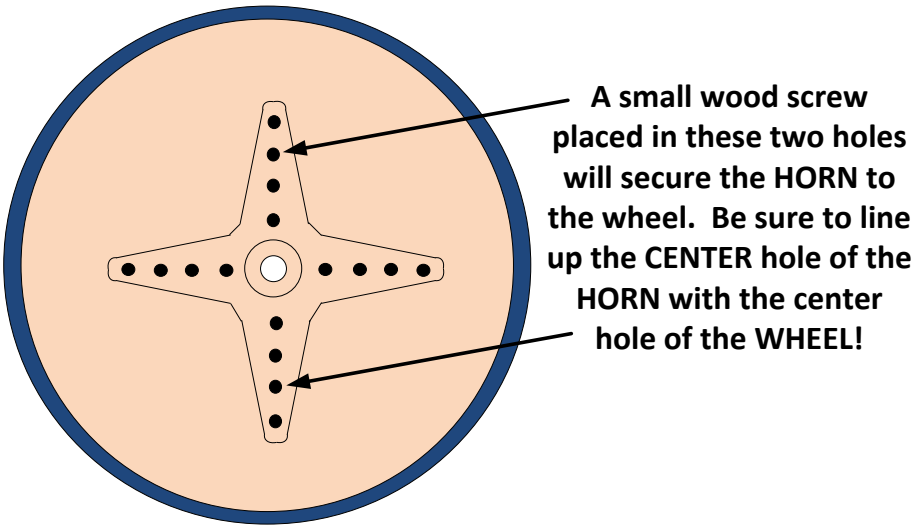
    b. **Installing your RCB into the robot chassis –**
        i. Once the chassis is assembled and the wheels are installed you are ready to screw the RCB into place. Place the board into place pushed toward the back of the robot with the XBEE socket closest to the BACK of the robot. The POWER TERMINAL of the RCB (Blue or Green) should be closest to the front of the robot. See photo of robot chassis in the back page of this document. Generally you only need two small wood screws no longer than ½" in length to secure two corners of the RCB. DON'T SCREW THE BOARD DOWN TIGHT! The board should not be flexed on the bottom it should remain flat even when its secured in place. If it wiggles slightly that is fine. It will not fall out.
        ii. Next, the battery is laid on its side and placed between the board and the front bumper. It should fit pretty tight. You will use a small strip of VEX metal angled across the battery to secure the battery into place.
        iii. The final part of this assembly is to make battery wires. You will need to solder a female disconnect terminal on the end of two pieces of wire approximately 4 – ¼" in length. Once the female disconnects are soldered, take a BLACK PERMANENT MARKER and color the NEGATIVE TERMINAL BLACK. This will remind the students to place the RED on Positive and the BLACK on NEGATIVE. This is IMPERATIVE especially since students get in a hurry at the contest and could hook them up backwards.

SIDE VIEW of Robot Chassis. Screws are SHOWN below but ,when assembled, they would be inside the plastic. They are shown below to help visualize the assembly process for the chassis.



WHEEL area shown as dotted line!

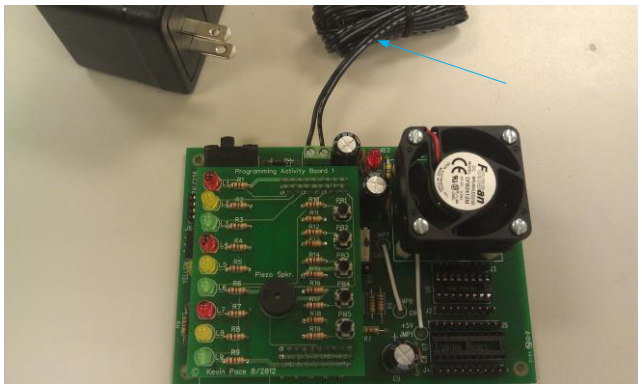
Screws go from bottom of side into the top surface But not THROUGH the top surface. (As Shown) Holes "may" need to be drilled to sink screw heads below the surface for assembly.



3" ROBOT WHEEL and TIRE

The 12v Transformer should look like this after the plug end is cut off.

The transformer connects as shown below. The STRIPED SIDE (Shown with an arrow) connects to POSITIVE!



The PHOTOS below show the assembled Robot Chassis.