Students please affix one of your self adhesive identification labels to this space. Do not obscure other parts of this page with the label. If you do not have a self adhesive identification label, please complete the following information. Write your name as it appears on your badge.

Your Name: _____

Participation Number:

			0	3			0	

Two letter state abbreviation. →

State code (0301, 0302, …… to 0350)

Team member number (01, 02, 03, or 04)

Students please do not write or mark within this box.

Judges, after this skill sheet has been scored and double checked, write the total score for this activity in the blank below.

Skill Activity Score: _____

Judges Initials: _____

2009 National Agriculture Mechanics Career Development Event: Plant Production Systems

Energy Systems Skill Activity

Materials Provided: A remote outlet protected by a buss fuse, an electrical multi-meter, a one-half inch portable electrical drill, and a test board with an 18 inch electrical cord attached.

Skill Activity: An electrical multi-meter will be used to measure voltage and operating amperage of a power drill. The values measured will be compared to operating parameters provided on the drill's nameplate and questions will be asked about the drill's operation. *Do not move the drill or attempted to remove any of the other equipment from its secured position during this activity.*

Part A: (2 points) Use the multi-meter to measure the voltage at the remote outlet. Set the selection dial of the meter to measure voltage, insert one end of each of the meter's leads into the remote outlet positioned on the table top, and record the voltage reading in the space at the right. The remote outlet switch (red light) must be on to measure voltage.

1. **Outlet Voltage = _____ Volts**

Part B: (2 points each) Connect the electric drill to make amperage readings. The drill's cord must be connected to the test board and the test board must be plugged into the remote outlet. The trigger of the electric drill is secured in the on position, so when the remote outlet (red light) is on, the drill will operate.

Set the selection dial of the meter to measure amperage and with the drill operating, clamp the jaws for induction current readings around each individual insulated conductor that is looped up in the center of the test board. Record the amperage passing through each conductor in the space at the right. The drill must be operating to read amperage. After the three readings are recorded, turn the remote outlet switch (and drill) off.

2. **Black Insulated Wire = _____ Amps**
3. **White Insulated Wire = _____ Amps**
4. **Green Insulated Wire = _____ Amps**

Part C: Answer questions about the amperage values measured and recorded above.

5. (3 points) If any of the amperage values measured in the black, white, or green conductors (numbers 2, 3, or 4) is zero or near zero, explain why the amperage value is so low?

_____

_____

6. (3 points) If any of the amperage values measured in the black, white, or green conductors (numbers 2, 3, or 4) are equal or very similar, explain why the amperage readings are equal or very similar?

_____

_____

Part D: (2 points each) *Do not move the drill or attempted to remove any of the other equipment from its secured position during this activity.* Unplug the electric drill from the test board and carefully examine the nameplate affixed to the side of the drill. Record the information listed at the right as it appears on the drill's nameplate.

Drill Motor Nameplate Information

7. **Voltage = _____ Volts**
8. **Amperage = _____ Amps**

9. (4 points) The amperage value appearing on the drill's nameplate is the full load amperage specified by the manufacturer of the electric drill. Explain in detail why the amperage recorded in number 2 of Part B above is higher or lower than the amperage specified on the nameplate (amperage recorded in number 8 of Part D).

_____

_____

_____

_____

This skill activity is continued on the back of this page.

Part E: The following questions relate to trouble shooting electric motor problems. Assume an electric drill, like the one on the table top, is used to drill a hole in a very tough material. After several minutes of attempting to drill a hole, the electric drill begins to smell like it is burning or that a plastic or synthetic material is burning.

10. (3 points) When a drill exhibits the characteristics as described in Part E above, what does this indicate to the operator?

*Circle **YES** by any of the following statements that could CAUSE the problem.*
*Circle **NO** by any of the following statements that could **NOT** cause the problem.*

Yes No a. Drill bit might be dull causing the drill to become overheated and/or overloaded
Yes No b. Drill bit could be too small for the drill, causing the drill to become overheated
Yes No c. The operator could be applying too much pressure and/or the material is very difficult to drill
Yes No d. The operator may be standing on the cord and restricting the drill's flow of electrical current
Yes No e. Drill could be pointed upward which limits the horsepower, causing it to become overheated
Yes No f. Drill could be operating under low voltage conditions, causing the drill to become overheated

11. (3 points) How would the operator of an electric drill with problems like those described in Part E above correct the problem(s)?

*Circle **YES** by any of the following statements that could CORRECT the problem.*
*Circle **NO** by any of the following statements that could **NOT** correct the problem.*

Yes No a. Increase the diameter of the drill bit so that a bigger hole is being drilled
Yes No b. Make sure the drill bit is sharp and ready to correctly drill a hole
Yes No c. Operate the variable speed drill at the lowest revolutions possible (partially depress trigger)
Yes No d. Make sure the electrical drill is operating at the correct voltage
Yes No e. Allow the drill to periodically cool between attempts to drill the hole
Yes No f. Use an adhesive in the hole to increase the drilling friction

Part F. The drill on the table top has a one-half inch chuck. Answer the following question about the drill size.
12. (2 points) What does the one-half inch chuck designation indicate as far as the limitations and/or applications for this electric drill? *Circle the letter to the left of all correct responses.*

a. The maximum size (diameter) hole the electric drill can drill
b. The minimum size (diameter) hole the electric drill can drill
c. The maximum size (diameter) drill shank the drill's chuck can hold
d. The minimum size (diameter) drill shank the drill's chuck can hold
e. The drill's chuck can hold drill shank sizes up to one-half inch in diameter
f. The largest chuck key that will work in the drill's chuck is one-half inch in diameter

Students do not write below this line,

Skill Activity Scoring	Possible Score	Student Score
Part A: Question 1	2 points	_____
Part B: Questions 2, 3, and 4	6 points	_____
Part C: Questions 5 and 6	6 points	_____
Part D: Questions 7, 8, and 9	8 points	_____
Part E: Question 10 and 11	6 points	_____
Part F: Question 12	2 points	_____
Safety: If unsafe practices are demonstrated, if a fuse or fuses are intentionally blown, or any equipment is damaged, deductions of from 5 to 30 points can be made to penalize the student. A negative score cannot be recorded.	(– 5 to – 30)	(-_____)
	Total	_____
	30 points maximum	