

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:

Two letter state abbreviation. →

State code (0301, 0302, to 0350) ↑

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

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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.

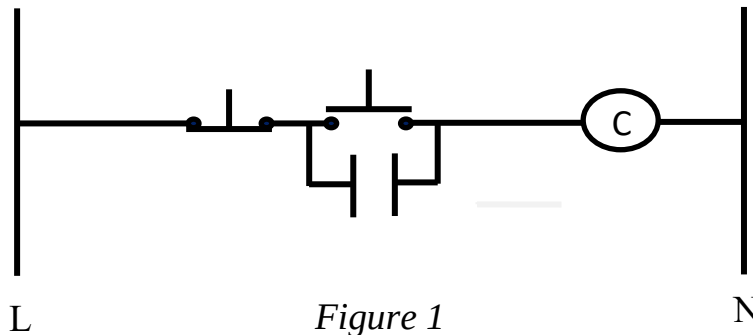
Skill Activity Score: _____

Judges Initials: _____

2017 National Agricultural Technology & Mechanical Systems Career Development Event Electrical Systems Skill Activity

Scenario: Motor control circuits provide for less arcing between switch contacts and are desirable for use in environments where fine, combustible particulates & flying's, like those found in feed mills and cotton gins, are present. The push button station and definite purpose contactor control a ventilation fan motor in a feed mill. Your job is to make all of the necessary connections in the junction box so that the ventilation fan comes on when the start button is depressed and shuts off when the stop button is depressed. The motor will need to be wired for **high voltage** and **clockwise rotation**. **The motor application should be considered continuous duty.**

Directions: Using the tools, supplies & equipment provided, make the proper connections for the control circuit (Figure 1) in the control circuit junction box. Make connections in the electric motor junction box so that the motor will be wired for high voltage and clockwise rotation. **You may strip the ends of the THHN insulated conductors in the CONTROL CIRCUIT JUNCTION BOX. DO NOT CUT CONDUCTORS TO MAKE THEM SHORTER. DO NOT CUT OR STRIP CONDUCTORS IN THE ELECTRIC MOTOR JUNCTION BOX!** If you do not understand the instructions ask before doing. If you cannot distinguish colors, ask a contest official for assistance. Use the reference materials provided and the nameplate rating information on the relay and motor to answer all of the questions. **DO NOT mark on any reference materials.**



Answer the following questions and record your answers in the space provided. Include units for full credit.

1. What is the RPM rating for the motor? _____ (1 pt.)
2. According to Article 430.6 of the 2014 National Electrical Code, for general motor applications, "Table 430.247, Table 430.248, Table 430.249 and Table 430.250 shall be used to determine the ampacity of motor branch-circuit conductors instead of the actual current rating marked on the motor nameplate". Identify the appropriate table and use it to determine the ampere rating of the ventilation fan electric motor at 230 V.

_____ (1 pt.)

3. Based on NEC Article 430.22, which states that “conductors supplying a single motor that is used in a continuous duty application shall have an ampacity of not less than 125% of the full-load current rating”, the branch circuit supply conductors (from the overcurrent protection to the relay) and load conductors (from the relay to the motor) should be rated at a minimum of how many amperes?

_____ (1 pt.)

4. According to Table 16 in the Ag. Wiring Handbook, if the conductors supplying the current to the electric motor are run in conduit and the distance from the relay housing and the fan motor is 160 feet, what is the minimum size (AWG) THHN insulated copper conductor that should be used for the branch circuit based on 2% voltage drop?

_____ (1 pt.)

5. According to Table 210.24 and article 240.4(D) of the NEC, what size (ampere) overcurrent protection is required for the branch circuit conductor size determined in question # 4?

_____ (1 pt.)

6. Assuming the coil is rated at 6 watts, what is the total load in milliamps of the control circuit when the coil is energized based on the voltage rating of the coil? **Note: $W = V \times A$, 1 milliamp (mA) = .001 amps**

_____ (1 pt.)

7. The control circuit conductors extend beyond the relay enclosure in this application and overcurrent protection for the control circuit is provided by the branch-circuit protection device. According to NEC Table 430.72(B), what is the minimum size (AWG) copper conductor that can be used between the relay and push-button station?

_____ (1 pt.)

Evaluation Score Sheet (for contest officials only)					
Item		Points Each	# of Opportunities	Total Possible pts.	Points Earned
A	Responses to Questions (1 pt. ea. – ½ pt. for no units)	1	7	7	
B	Workability	All or None	1	7	
C	Control Circuit Connections	2	8	16	
D	Safety Violations	-2/violation	N/A	N/A	
			Total Possible	30	
				Total Earned:	

Judges: Please write the total score in the space provided at the top of the first page and initial in the space provided. Round total points earned to the nearest whole number.