Task 272-T04 MECHATRONICS ENGINEERING TECHNOLOGY

NAME: _____ ***START DATE:*** _____/_____/_____
COMPLETION DATE: _____/_____/_____

TASK: T04 Electrical wiring and industrial controls

PERFORMANCE OBJECTIVE: After completing the industrial controls training unit, the student will build a circuit from a diagram, from memory, and from a description. The circuit will meet all safety guidelines and it will function correctly. The student will follow all safety rules while wiring the circuit.

ENABLING OBJECTIVE: Complete Q01-Q24, and T03

TOOLS REQUIRED: Instructor theory lesson, industrial controls training system, hand tools, digital multimeter, and PPE

SAFETY FACTORS: Complete Q01-Q02 and observe all school/classroom safety rules at all times

ACADEMIC ANCHORS:
M11.A.1.1.2 Express numbers using scientific notation
M11.A.2.1.1 Solve problems operations with rational numbers using rates and percentages
R11.A.1.3.5 Demonstrate after reading understanding of non-fiction text
R11.A.2.1.2 Identify meaning of content specific words used in text

CAREER & WORK ANCHORS:
13.2.11.E Demonstrate essential workplace skills.

PERFORMANCE CHECKLIST:

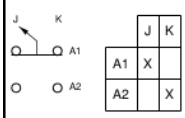
STUDENT CHECK	***TASK TO BE COMPLETED***	***TEACHER SIGN OFF***
_____	1. Identify academic anchors and complete learning guide AA01	_____
_____	2. View instructor theory lesson	_____
_____	3. Complete training program on industrial controls trainer	_____
_____	4. Review your notes and memorize components and symbols	_____
_____	5. Get quiz from instructor	_____

PERFORMANCE LEVEL:
MASTERY SATISFACTORY FAMILIARIZATION INSTRUCTED/CANNOT PERFORM

INFORMATION SHEET

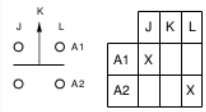
SELECTOR

TWO-POSITION



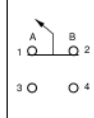
X-CONTACT CLOSED

THREE-POSITION



X-CONTACT CLOSED

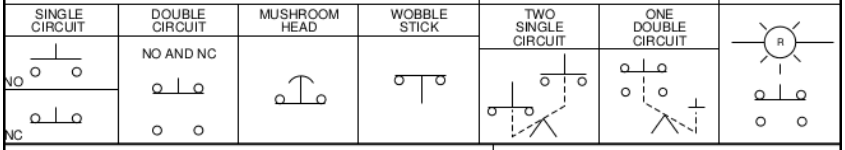
TWO-POSITION SELECTOR PUSHBUTTON



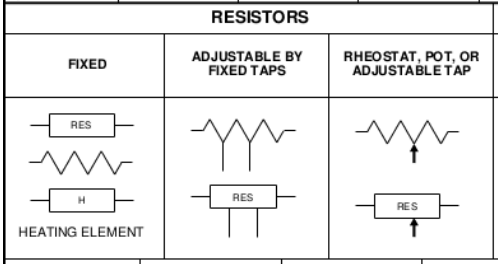
CONTACTS	SELECTOR POSITION			
	A		B	
	BUTTON		BUTTON	
	FREE	DEPRESSED	FREE	DEPRESSED
1-2	X			
3-4		X	X	X

X - CONTACT CLOSED

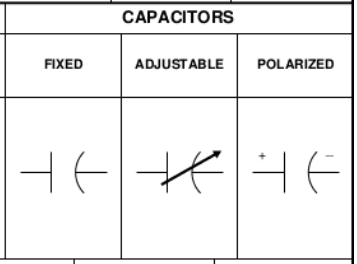
PUSHBUTTONS

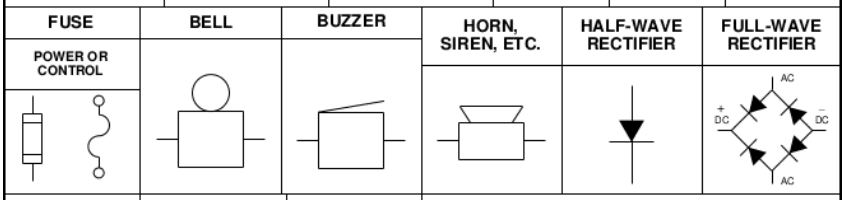


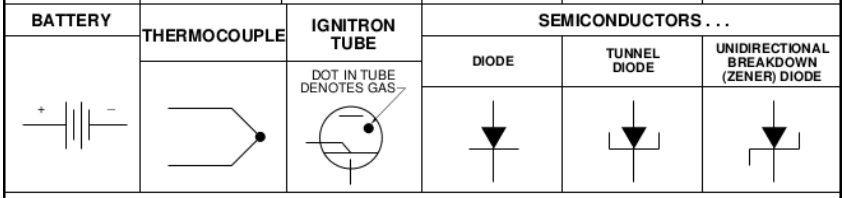
RESISTORS



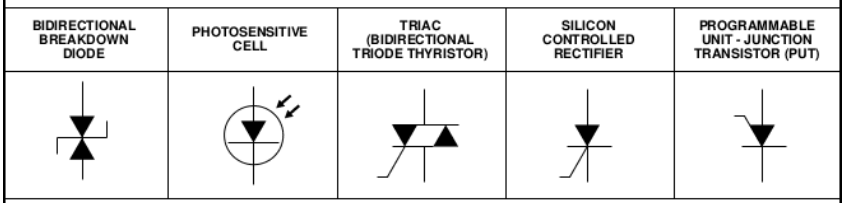
CAPACITORS



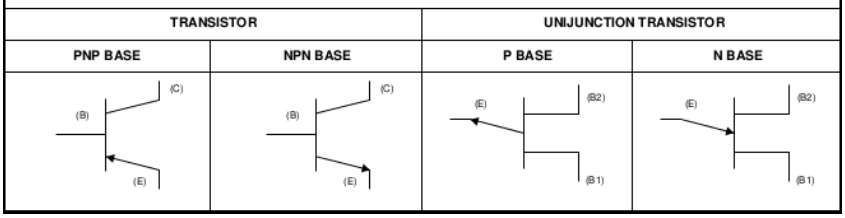




. . . SEMICONDUCTORS . . .

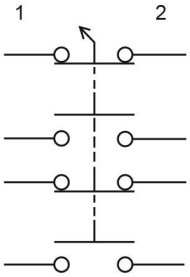


. . . SEMICONDUCTORS

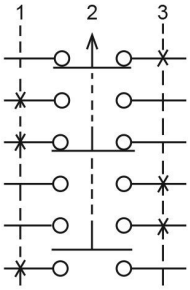


INFORMATION SHEET

Selector Switches

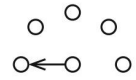


Selector Switch
2-Position

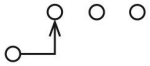


Selector Switch
3-Position

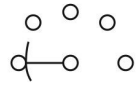
Rotary Selector Switches



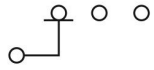
Rotary Selector Switch
Non-Bridging Contacts



Alternate Symbol
Rotary Selector Switch
Non-Bridging Contacts

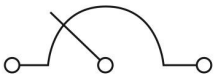


Rotary Selector Switch
Bridging Contacts

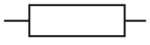


Alternate Symbol
Rotary Selector Switch
Bridging Contacts

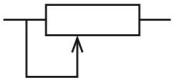
Resistors



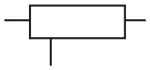
Potentiometer



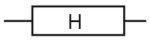
Resistor



Rheostat

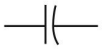


Tapped Resistor



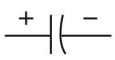
Heating Element

Capacitors



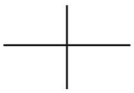
Capacitor, Fixed

Capacitor Adjustable

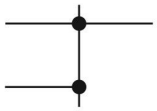


Capacitor, Electrolytic

Miscellaneous



Conductors
Not Connected

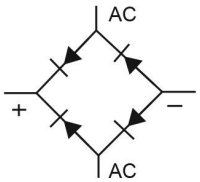


Conductors
Connected

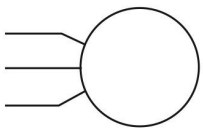
Battery

Fuse

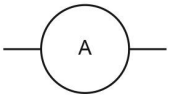
Rectifier



Bridge Rectifier



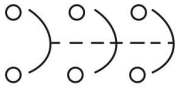
Three-Phase
Electric Motor



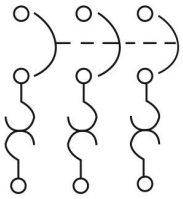
D-C Electric Motor

Thermal Overload

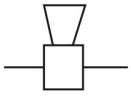
Alternate Symbol
Thermal Overload



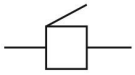
Circuit Interrupter



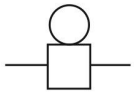
Circuit Breaker



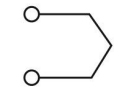
Horn, Siren, etc.



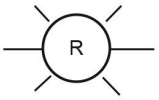
Buzzer



Bell



Thermocouple

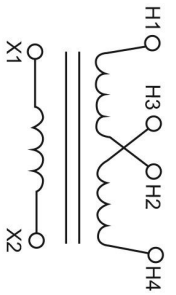


Pilot Lamp

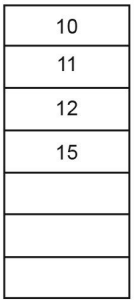
Earth Ground

Chassis Ground, not
Neccessarily Earth Ground

Plug & Receptable

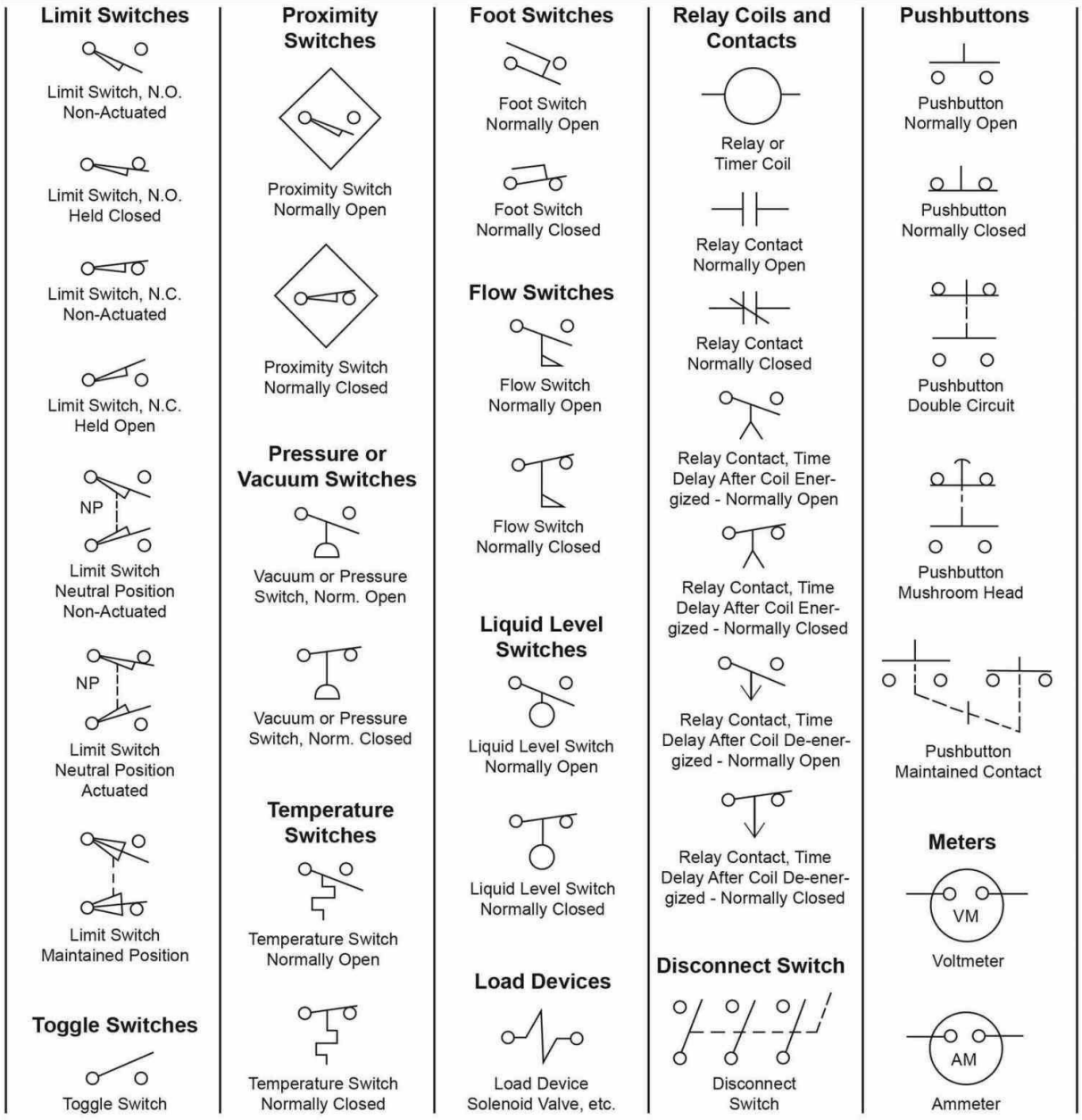


Control Transformer



Terminal Board

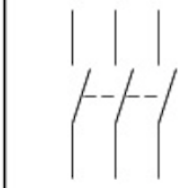
INFORMATION SHEET



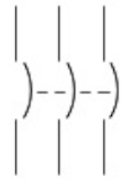
INFORMATION SHEET

INDUSTRIAL ELECTRICAL SYMBOLS . . .

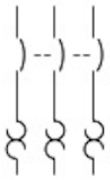
DISCONNECT



CIRCUIT INTERRUPTER



CIRCUIT BREAKER WITH THERMAL OL



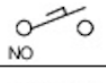
CIRCUIT BREAKER WITH MAGNETIC OL

CIRCUIT BREAKER W/ THERMAL AND MAGNETIC OL

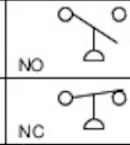
LIMIT SWITCHES

NORMALLY OPEN	NORMALLY CLOSED
HELD CLOSED	HELD OPEN

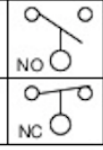
FOOT SWITCHES



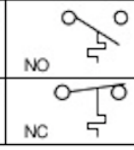
PRESSURE AND VACUUM SWITCHES



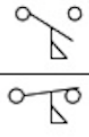
LIQUID LEVEL SWITCH



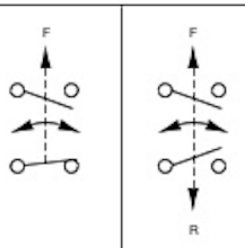
TEMPERATURE-ACTUATED SWITCH



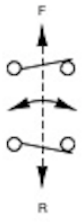
FLOW SWITCH (AIR, WATER, ETC.)



SPEED (PLUGGING)

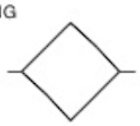


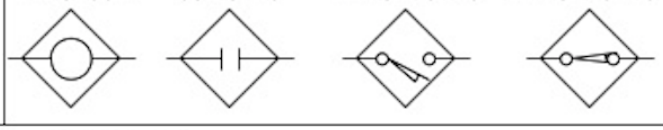
ANTI-PLUG



SYMBOLS FOR STATIC SWITCHING CONTROL DEVICES

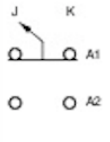
STATIC SWITCHING CONTROL IS A METHOD OF SWITCHING ELECTRICAL CIRCUITS WITHOUT USE OF CONTACTS, PRIMARILY BY SOLID-STATE DEVICES. USE SYMBOLS SHOWN IN TABLE AND ENCLOSE THEM IN A DIAMOND.





SELECTOR

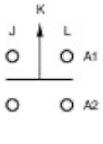
TWO-POSITION



	J	K
A1	X	
A2		X

X-CONTACT CLOSED

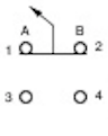
THREE-POSITION



	J	K	L
A1	X		
A2			X

X-CONTACT CLOSED

TWO-POSITION SELECTOR PUSHBUTTON

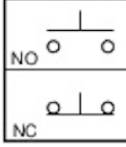
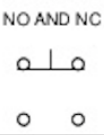


CONTACTS	SELECTOR POSITION			
	A		B	
	BUTTON		BUTTON	
	FREE	DEPRESSED	FREE	DEPRESSED
1-2	X			
3-4		X	X	X

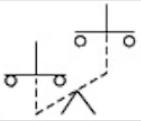
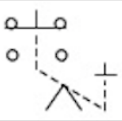
X - CONTACT CLOSED

PUSHBUTTONS

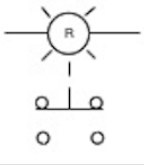
MOMENTARY CONTACT

SINGLE CIRCUIT	DOUBLE CIRCUIT	MUSHROOM HEAD	WOBBLE STICK
			

MAINTAINED CONTACT

TWO SINGLE CIRCUIT	ONE DOUBLE CIRCUIT
	

ILLUMINATED



PERFORMANCE SHEET

SAFETY REMINDERS!

This activity requires you to work with live circuits and high voltage.

Always follow all lock out - tag out procedures

Always wear safety glasses

Wear a face shield when working in the electrical panel in case of arc-flash

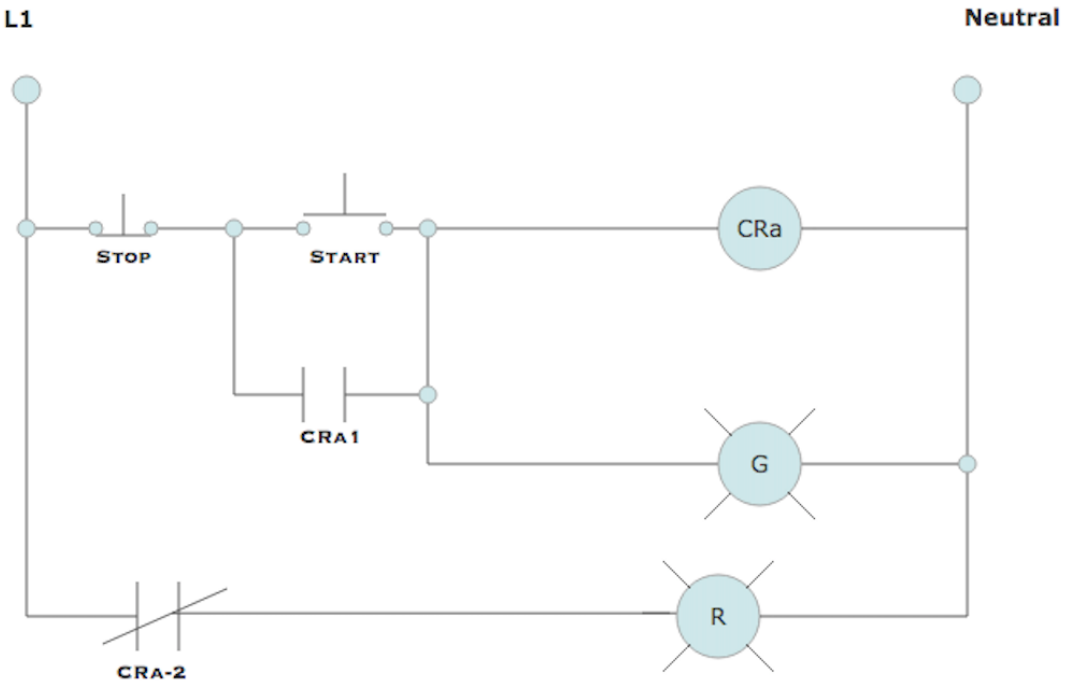
Never work alone

Have instructor check your wiring before turning the circuit on

PERFORMANCE SHEET

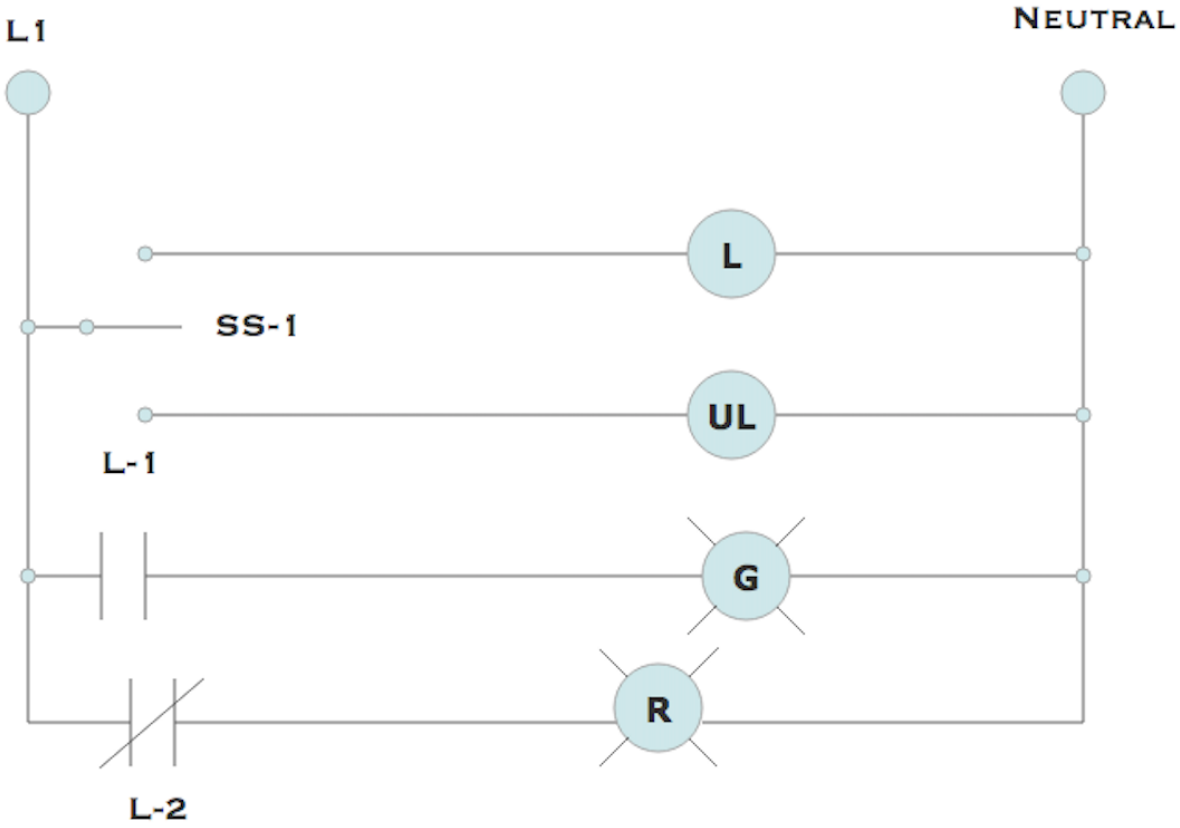
Practice wiring the following circuit diagrams
Always turn off power when wiring
Do not apply power until instructor checks your work

SEAL IN (MEMORY) CIRCUIT



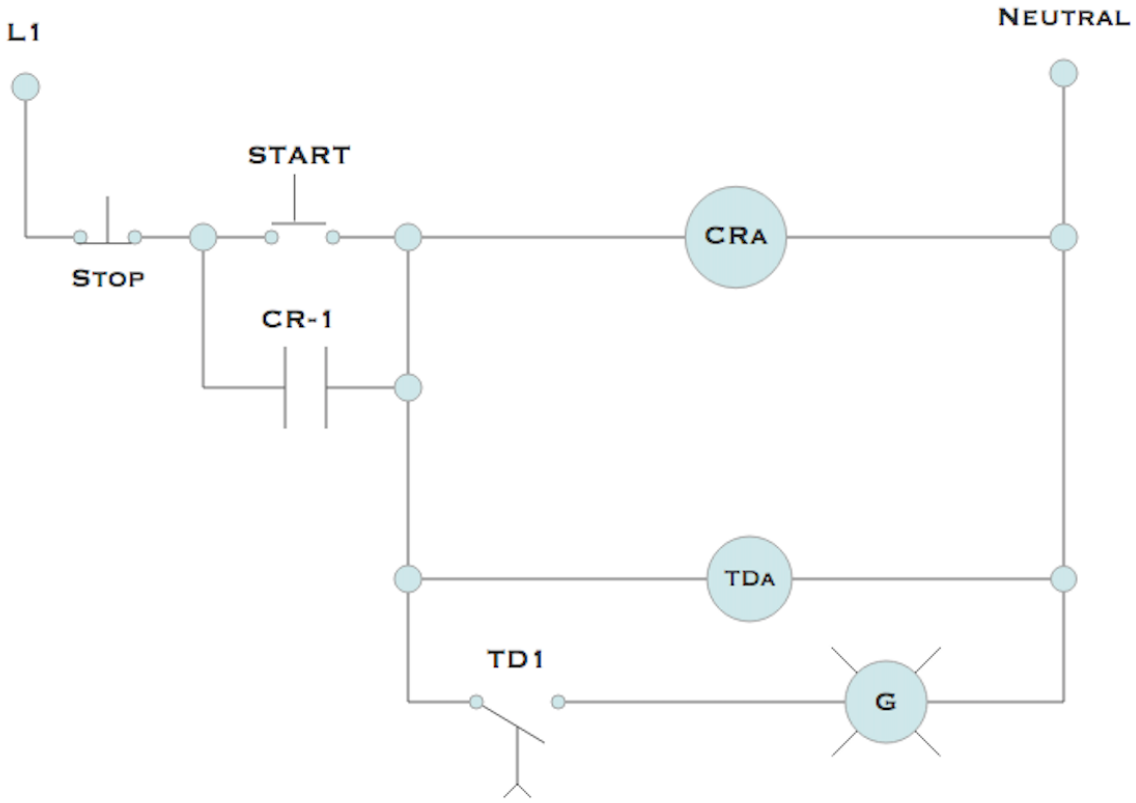
Instructor sign off _____

Relays and Contactors



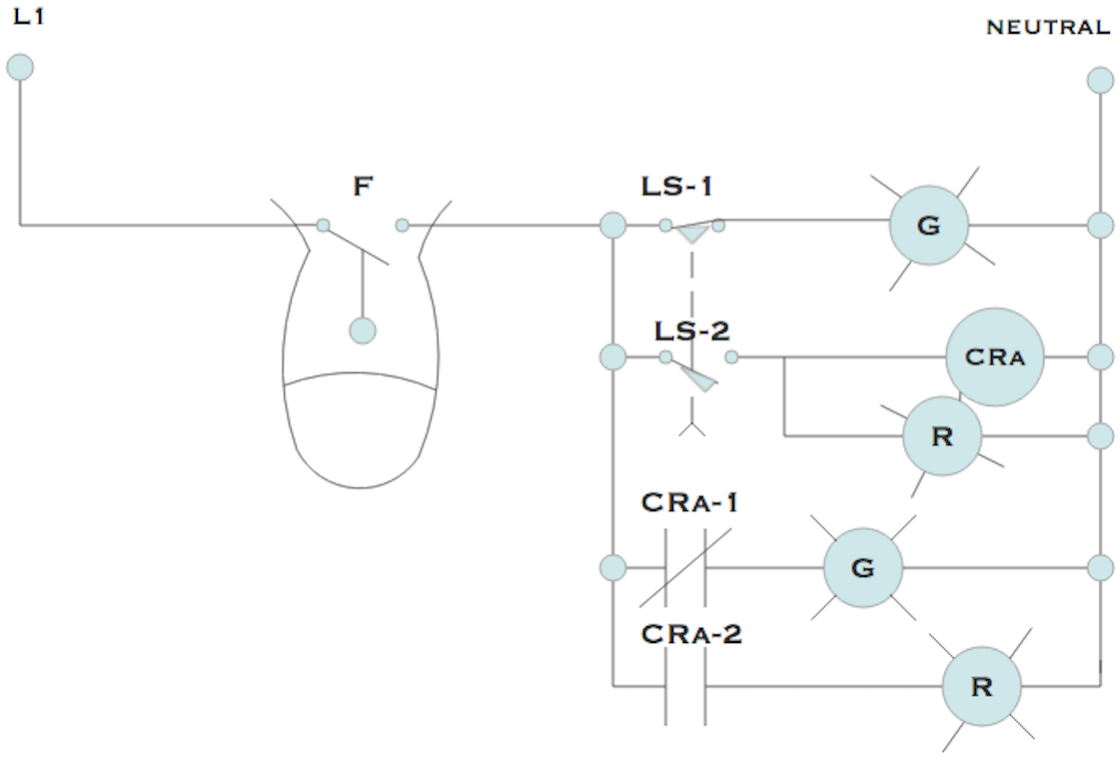
Instructor sign off _____

Timing Relays



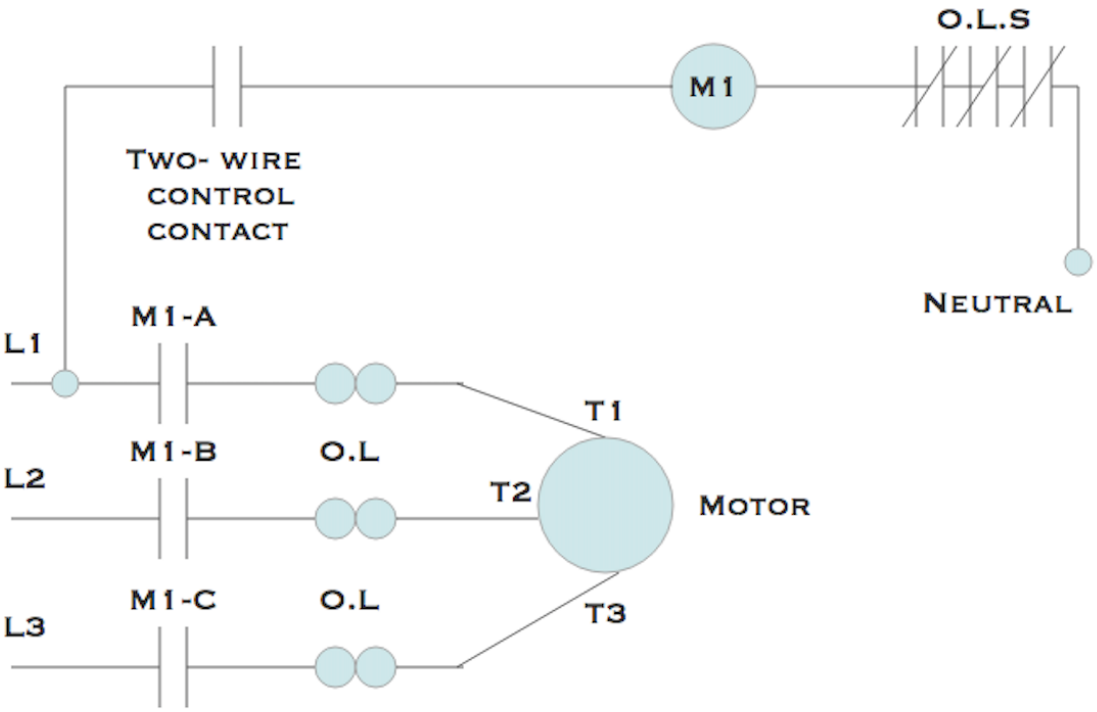
Instructor sign off _____

SWITCHES



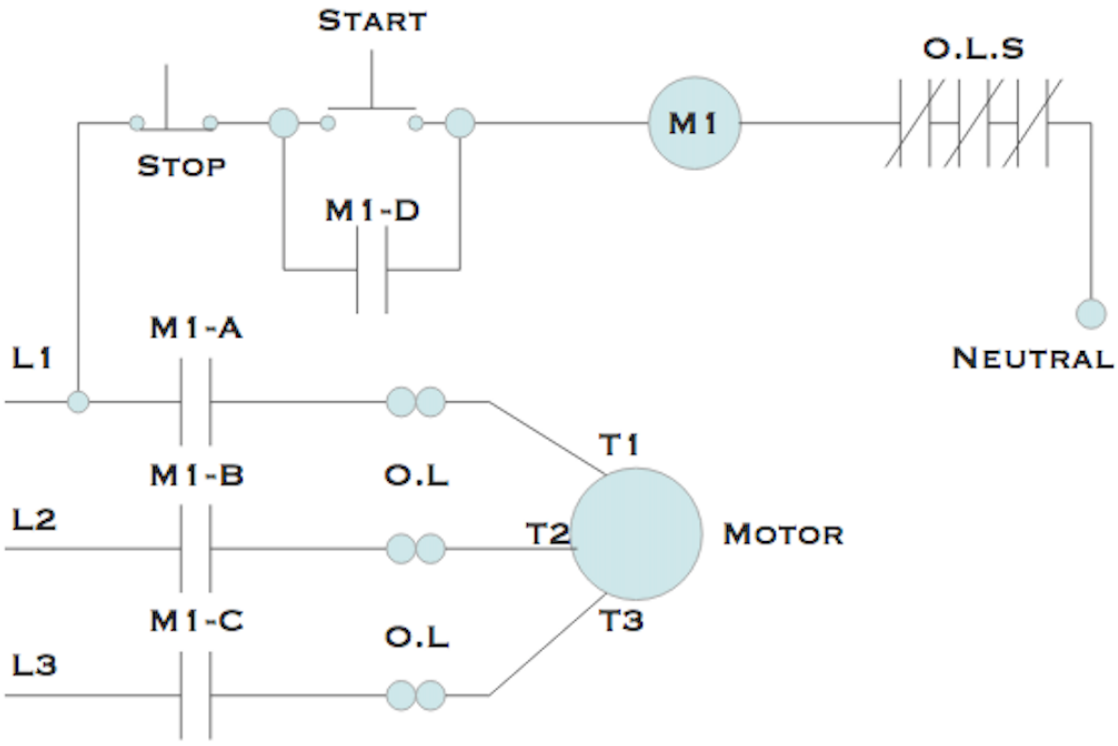
Instructor sign off _____

Two Wire Controls



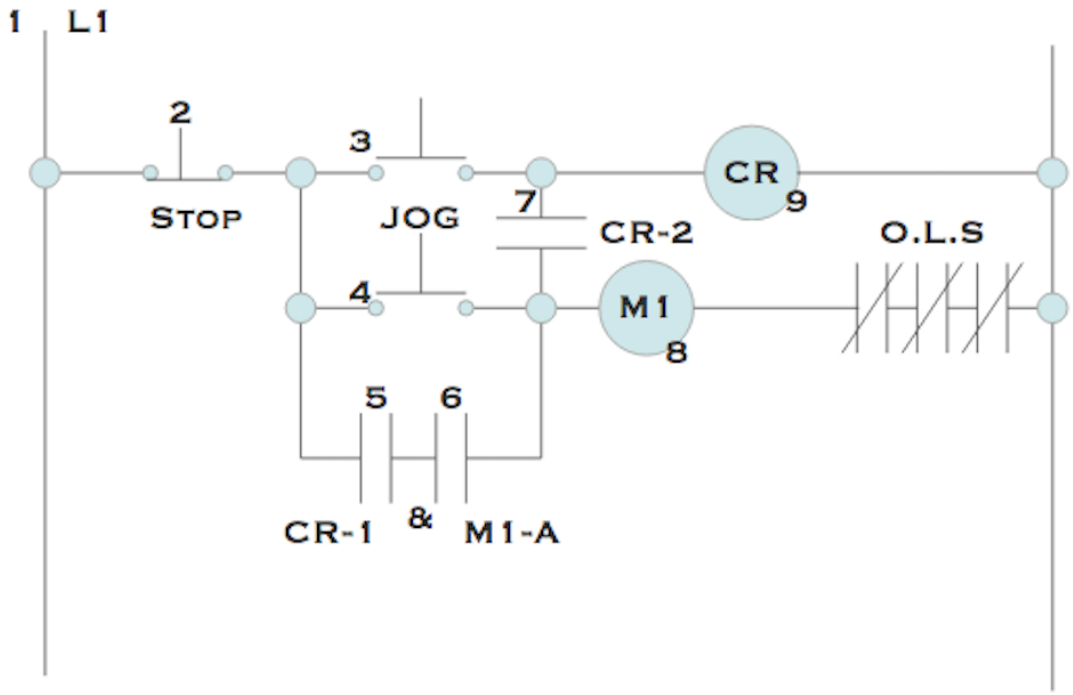
Instructor sign off _____

THREE WIRE CONTROLS



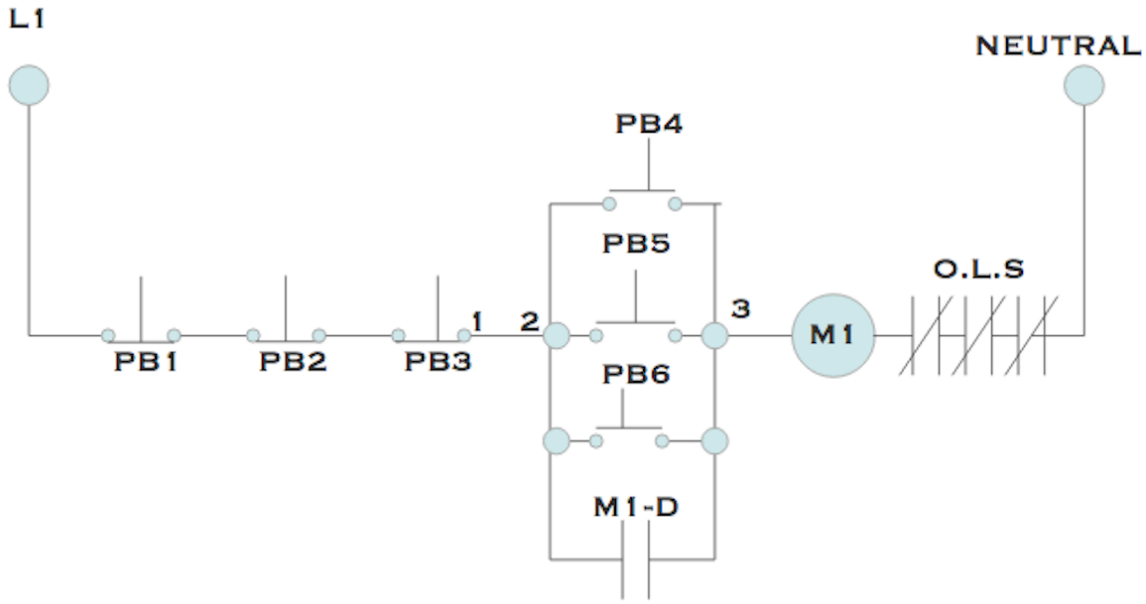
Instructor sign off _____

Start, Stop, Jog

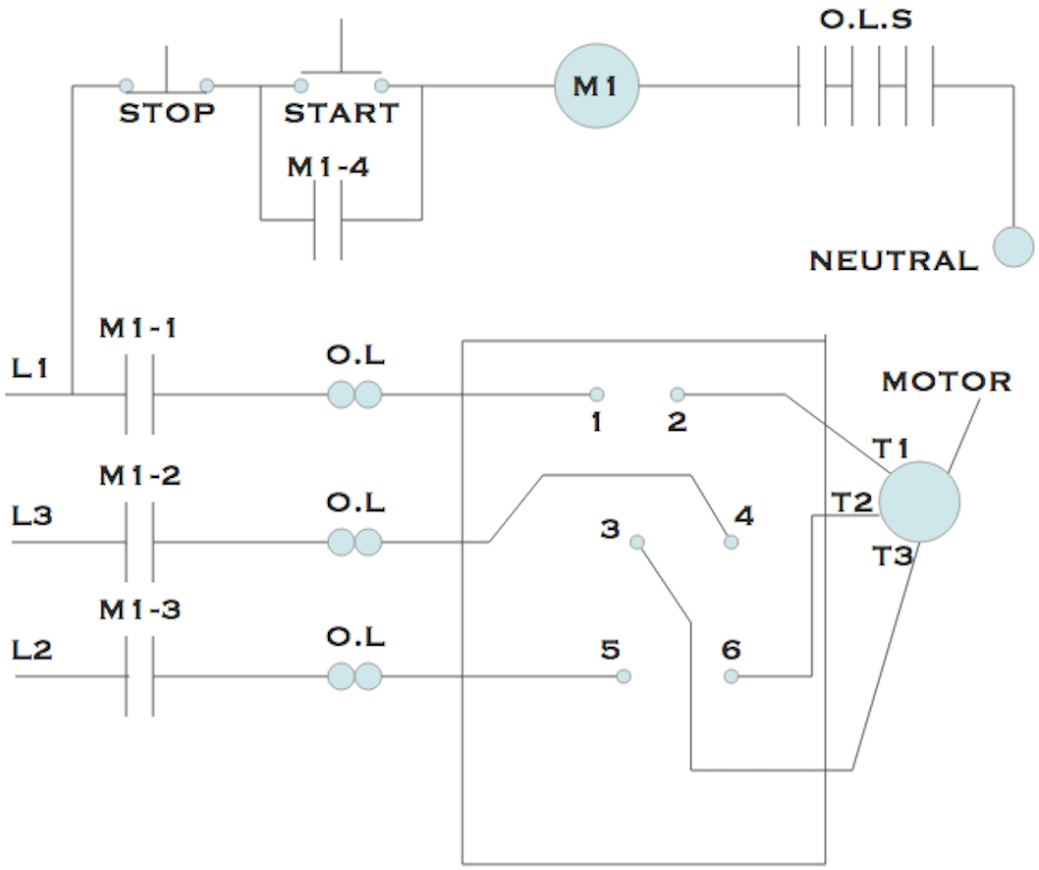


Instructor sign off _____

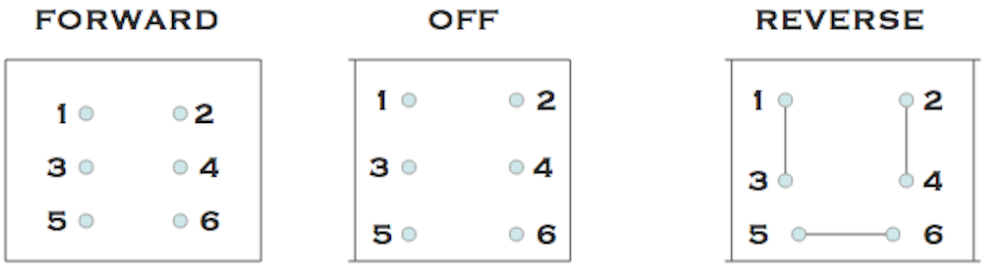
MULTIPLE PUSHBUTTONS



Instructor sign off _____

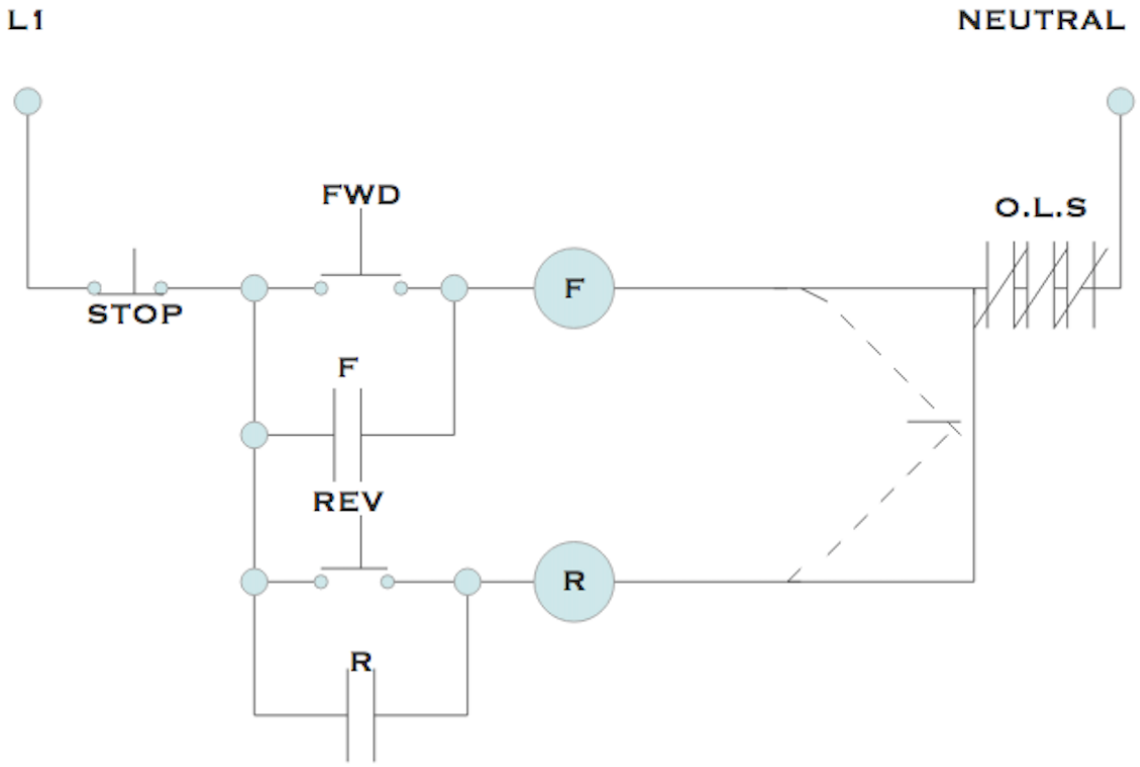


DRUM SWITCH CONTROL



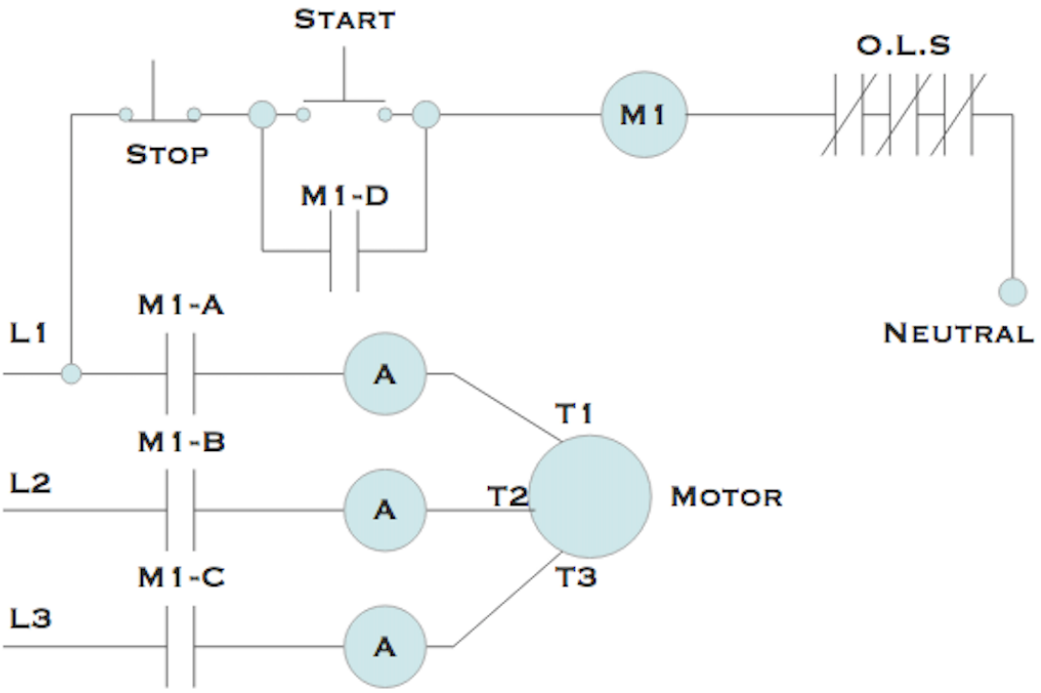
Instructor sign off _____

REVERSING MOTOR STARTER



Instructor sign off _____

Motor start control with ammeter



Instructor sign off _____

Grading Rubric for Industrial Controls

Task	Instructed/Cannot perform (0)points	Familiarization (1)point	Satisfactory (2)points	Mastery (3)points
Safety	Student rarely followed safety rules.	Had to frequently remind student to follow safety rules. Safety glasses, work boots, lock out tag out procedures, powered off at correct times, neat and organized wiring.	Followed all safety rules, but required one reminder. Safety glasses, work boots, lock out tag out procedures, powered off at correct times, neat and organized wiring.	Followed all safety rules with no reminders. Safety glasses, work boots, lock out tag out procedures, powered off at correct times, neat and organized wiring.
Wiring diagrams	Unable to wire from a diagram with assistance. The circuit was not wired correctly.	Wired circuit from a diagram with frequent assistance and it was 100% correct.	Wired circuit from a diagram with very little assistance and it was 100% correct.	Wired circuit from a diagram with no assistance and it was 100% correct.
Wiring from description	Unable to wire from a description with assistance. The circuit was not wired correctly.	Wired circuit from a description with frequent assistance and it was 100% correct.	Wired circuit from a description with very little assistance and it was 100% correct.	Wired circuit from a description with no assistance and it was 100% correct.
Wiring from memory	Unable to wire from memory with assistance. The circuit was not wired correctly.	Wired circuit from memory with frequent assistance and it was 100% correct.	Wired circuit from memory with very little assistance and it was 100% correct	Wired circuit from memory with no assistance and it was 100% correct
Parts Identification and symbols	Student was unable to identify 70% or more of the symbols and parts.	Student was able to identify parts with 70% accuracy and identify 70% of the symbols correctly..	Student was able to identify parts with 100% accuracy and identify 90% of the symbol correctly.	Student was able to identify parts and symbols with 100% accuracy.

Total Points: _____

Mastery=<13 points
Satisfactory=9-13 points
Familiarization=5-8 points
Instructed/Cannot perform=>5 points