

Understanding Electrical Diagrams

RV 7.11.19

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7. Upon passing, you will proceed to the next section. If failed to pass, you will be moved to the beginning of that section for more review.

- **Mobile users** – Many current mobile devices are compatible with AnytimeCE and will probably work. If not, use a desktop or laptop computer to complete your course.
- **WA. Electricians** – WA L&I require all online test questions and answers to be randomized. Be sure to answer all of the test questions on your printed copy.

Quiz 1: WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. Which of the following is NOT part of the basic circuit?
 - Load
 - Source of power
 - Conductors
 - Fuse
 - Switch
2. Which of the following is NOT a type of electrical wiring diagram?
 - A. Stick
 - B. Line
 - C. Pictorial

- D. Schematic
 - E. Only A and D are types of electrical wiring diagrams
3. A ladder diagram is also known as a _____.
 - Stick
 - Line
 - Pictorial
 - Schematic
 4. To determine the relative physical position of the electrical components of a system, one would use a _____ diagram.
 - stick
 - line
 - schematic
 - ladder

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5. Electricity can be understood by comparing it to a closed loop hydraulic system. In this model, amps are similar to _____.
- water pressure in PSIG
 - water flow in GPM
 - resistance to flow in head loss
 - pipes
6. Electricity can be understood by comparing it to a closed loop hydraulic system. In this model, ohms are similar to _____.
- water pressure in PSIG
 - water flow in GPM
 - resistance to flow in head loss
 - pipes
7. Electricity can be understood by comparing it to a closed loop hydraulic system. In this model, power voltage is similar to _____.
- water pressure in PSIG
 - water flow in GPM
 - resistance to flow in head loss
 - pipes
8. Electricity can be understood by comparing it to a closed loop hydraulic system. In this model, the rating of an electrical wire is similar to _____.
- water pressure in PSIG
 - water flow in GPM
 - resistance to flow in head loss
 - pipes

9. Which of the above illustrations shows a series circuit?

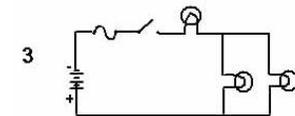
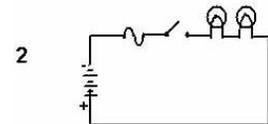
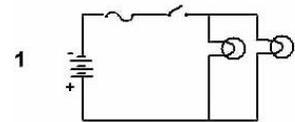
- 1
- 2
- 3

10. Which of the above illustrations shows a parallel circuit?

- 1
- 2
- 3

11. Which of the above illustrations shows a series-parallel circuit?

- 1
- 2
- 3



12. A CONDUCTOR usually means a wire.

- True
- False

13. A LOAD is a device that generates electrical power.

- True
- False

14. An example of a LOAD would be _____.

- a light
- a motor
- an AC compressor
- a resistance heater
- all of the answers provided

Quiz 2 : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. A battery generates _____.
- direct current
 - alternating current
 - pulse current
 - reversed Sine Wave current
2. A portable generator makes _____.
- direct current
 - alternating current
 - pulse current
 - reversed Sine Wave current

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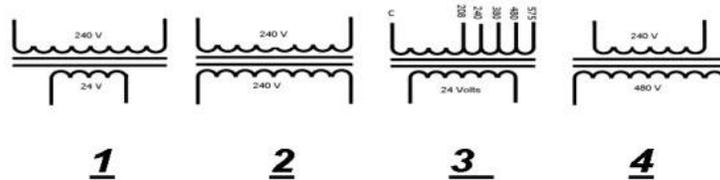


- 1
 - 2
 - 3
 - 4
 - 5
- 120
 - 208
 - 240
3. Which of the above symbols is used for electricity generated by a battery?
 - 1
 - 2
 - 3
 - 4
 - 5
 4. Which of the above symbols is used for electricity generated by a mechanical device?
 - 1
 - 2
 - 3
 - 4
 - 5
 5. At the power generation station, a/n _____ transformer is used.
 - isolation
 - step-up
 - step-down
 6. At a sub-station near the end user, a/n _____ transformer is used.
 - isolation
 - step-up
 - step-down
 7. At a sub-station, the types of transformers used would be _____.
 - wye
 - star
 - delta
 - any of the answers provided
 8. On a WYE voltage system, the expected voltage between each leg would be _____ volts.
 - 110
 - 120
 - 208
 - 240
 9. On a WYE voltage system, the expected voltage between a leg and Neutral (N) would be _____ volts.
 - 110
 10. On a DELTA voltage system, the expected voltage between each leg would be _____ volts.
 - 110
 - 120
 - 208
 - 240
 11. On a DELTA voltage system, the expected voltage between a leg and Neutral (N) would be _____ volts.
 - 110
 - 120
 - 208
 - 240
 12. A transformer can do each of the following EXCEPT _____.
 - increase AC voltage
 - decrease AC voltage
 - convert AC voltage to DC voltage
 - isolate AC voltage
 13. A transformer that electrically isolates the power source from the electrical equipment is called a/n _____ transformer.
 - isolation
 - step-up
 - step-down
 - multi-tap
 14. The transformer described in question 13 has _____ coils or windings on the primary side compared to the secondary side.
 - the same number of
 - more
 - fewer
 15. A transformer that decreases the voltage below the voltage level of the power source is called a/n _____ transformer.
 - isolation
 - step-up
 - step-down
 - multi-tap
 16. The transformer described in question 15 has _____ coils or windings on the primary side compared to the secondary side.
 - the same number of

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- more
 - fewer
17. A transformer that increases the voltage above the voltage level of the power source is called a/n _____ transformer.
- isolation
 - step-up
 - step-down
 - multi-tap
18. The transformer described in question 17 has _____ coils or windings on the primary side compared to the secondary side.
- the same number of
 - more
 - fewer
19. A transformer that has a number of taps or coils on the primary side that allow it to be used with a variety of different primary line voltages is called a/n _____ transformer.
- isolation
 - step-up
 - step-down
 - multi-tap
20. The transformer described in question 19 has _____ coils or windings on the primary side compared to the secondary side.
- the same number of
 - more
 - fewer
21. A control voltage of 24 volts is generally preferred because _____.
- it requires smaller-sized wires
 - it can be powered by small batteries
 - it is safer in case someone touches it
 - the parts and equipment are cheaper for manufacturers to produce

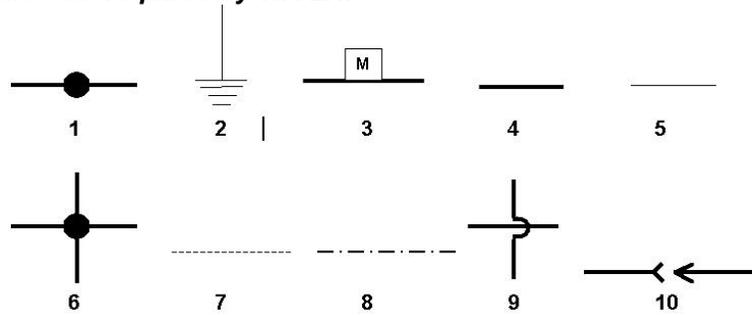


22. An isolation transformer is shown in which of the above numbered illustrations?
- 1
 - 2
 - 3
 - 4
23. A step-up transformer is shown in which of the above numbered illustrations?
- 1
 - 2
 - 3
 - 4
24. A step-down transformer is shown in which of the above numbered illustrations?
- 1
 - 2
 - 3
 - 4
25. A multi-tap transformer is shown in which of the above numbered illustrations?
- 1
 - 2
 - 3
 - 4

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Quiz 3: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

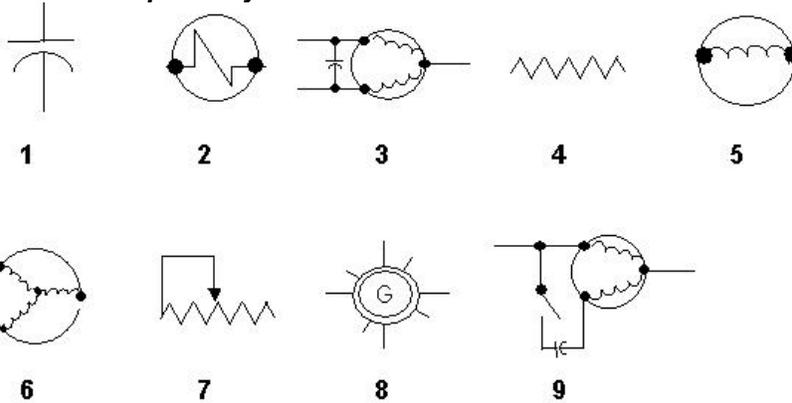


- | | |
|--|--|
| <p>1. Which of the above is the symbol for Field Line Voltage?</p> <ul style="list-style-type: none"> • 2 • 4 • 6 • 8 • 10 <p>2. Which of the above is the symbol for Field Low Voltage?</p> <ul style="list-style-type: none"> • 1 • 3 • 4 • 5 • 7 <p>3. Which of the above is the symbol for Factory Low Voltage?</p> <ul style="list-style-type: none"> • 1 • 3 • 5 • 7 • 9 <p>4. Which of the above is the symbol for Factory Line Voltage?</p> <ul style="list-style-type: none"> • 1 • 2 • 4 • 6 • 9 <p>5. Which of the above is the symbol for Marked or Flagged Line?</p> <ul style="list-style-type: none"> • 3 • 4 • 5 • 7 • 10 | <p>6. Which of the above is the symbol for Butt Splice Connector?</p> <ul style="list-style-type: none"> • 1 • 2 • 4 • 5 • 8 <p>7. Which of the above is the symbol for Wired Cross and Connected?</p> <ul style="list-style-type: none"> • 1 • 3 • 5 • 6 • 10 <p>8. Which of the above is the symbol for Wired Cross and NOT Connected?</p> <ul style="list-style-type: none"> • 2 • 3 • 5 • 7 • 9 <p>9. Which of the above is the symbol for Equipment Ground?</p> <ul style="list-style-type: none"> • 2 • 7 • 8 • 9 • 10 <p>10. Which of the above is the symbol for a Molex Plug Connection?</p> <ul style="list-style-type: none"> • 2 • 4 • 6 • 8 • 10 |
|--|--|

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Quiz 4: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI



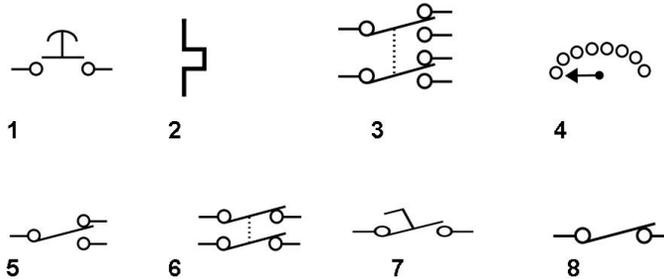
1. Which of the above symbols represents an indicator light?
 - 4
 - 5
 - 6
 - 7
 - 8
2. Which of the above symbols represents a resistance heater?
 - 1
 - 2
 - 3
 - 4
 - 5
3. Which of the above symbols represents an adjustable rheostat?
 - 2
 - 4
 - 6
 - 7
 - 9
4. Which of the above symbols represents a shaded pole motor?
 - 1
 - 2
 - 3
 - 4
 - 5
5. Which of the above symbols represents a capacitor start motor?
 - 5
 - 6
 - 7
- 8
- 9
6. Which of the above symbols represents a run or start capacitor?
 - 1
 - 2
 - 3
 - 4
 - 5
7. Which of the above symbols represents a PSC motor?
 - 1
 - 2
 - 3
 - 4
 - 5
8. Which of the above symbols represents a 3-phase motor?
 - 2
 - 4
 - 6
 - 8
 - 10
9. Which of the above symbols represents a solenoid?
 - 1
 - 2
 - 3
 - 4
 - 5
10. The primary force that moves a solenoid coil is _____.
 - magnetic energy

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- potential energy
- kinetic energy
- none of the answers provided

Quiz 5: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI



- Which of the above symbols represents a start-stop button?
 - 1
 - 4
 - 6
 - 7
 - 8
 - 3
 - 4
 - 5
- Which of the above symbols represents a single pole, double throw switch?
 - 1
 - 3
 - 5
 - 7
 - 8
 - 4
 - 5
 - 6
 - 7
 - 8
- Which of the above symbols represents a double pole, single throw switch?
 - 2
 - 4
 - 6
 - 7
 - 8
 - 4
 - 5
 - 6
 - 7
 - 8
- Which of the above symbols represents a double pole, double throw switch?
 - 1
 - 2
 - 3
 - 4
 - 5
- Which of the above symbols represents a single pole, single throw switch?
 - 4
 - 5
 - 6
 - 7
 - 8
- Which of the above symbols represents a foot switch?
 - 4
 - 5
 - 6
 - 7
 - 8
- Which of the above symbols represents a rotary switch?
 - 1
 - 2
 - 3
 - 4
 - 5

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Quiz 6: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. Bi-metal _____.
 - consists of 2 metals with different expansion rates welded together
 - is used to sense temperature changes
 - can be wound in a spiral
 - all of the answers provided
 - none of the answers provided



2. Which of the above symbols is the commonly shared symbol for all temperature-controlled devices?
 - 4
 - 5
 - 6
 - 7
 - 8
3. Which of the above symbols represents a SPST temperature switch in the closed position?
 - 1
 - 2
 - 3
 - 4
 - 5
4. Which of the above symbols represents a SPST temperature switch which closes on temperature rise?
 - 1
 - 2
 - 3
 - 4
 - 5
5. Which of the above symbols represents a SPDT temperature switch?
 - 1
 - 2
 - 3
 - 4
 - 5
6. Which of the above symbols represents a Klaxon control?
 - 1
7. A Klaxon control is mounted _____.
 - A. internally in a motor
 - B. externally on a motor
 - C. never on a motor
 - D. Both A and B
8. A Klaxon control switch could also be used to prevent overheating of resistant heaters on an electrical furnace.
 - True
 - False
9. A basic heat/cool thermostat has how many switches?
 - 1
 - 2
 - 3
 - 4
10. On a basic thermostat, the _____ colored wire from the thermostat connects to the Indoor Blower Motor Relay coil.
 - red
 - green
 - yellow
 - white
11. On a basic thermostat, the _____ colored wire from the thermostat connects to the Compressor Contactor coil.
 - red
 - green
 - yellow
 - white

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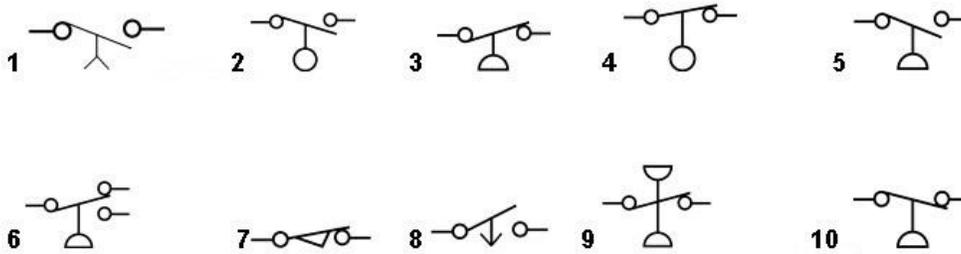
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12. On a basic thermostat, the _____ colored wire from the thermostat connects to the Heating Sequencer coils.
 - red
 - green
 - yellow
 - white
13. On a basic thermostat, the _____ colored wire from the thermostat connects to the Ground.
 - red
 - green
 - yellow
 - white
 - none of the answers provided
14. On a basic thermostat, a Cooling Anticipator is energized on a Call for Cooling.
 - True
 - False
15. On a basic thermostat, a Heating Anticipator is energized on a Call for Heating.
 - True
 - False
16. Fluid or gas filled temperature activated controls have expanding bellows which make contacts.
 - True
 - False
17. The Heat Anticipator is an adjustable resistor.
 - True
 - False
18. The Cooling Anticipator is an adjustable resistor.
 - True
 - False
19. There are _____ types of thermistors.
 - 2
 - 3
 - 4
 - 8
20. A thermistor is used to measure _____.
 - temperature
 - pressure
 - conductivity
 - amps
 - voltage
21. Which of the symbols shown in the illustration located above Question 2 represents a thermistor?
 - 4
 - 5
 - 6
 - 7
 - 8
22. PTC means _____.
 - Positive Temperature Coefficient
 - Permanent Transparent Category
 - Poly Temperature Cache
 - Positional Transference Coefficient
23. NTC means _____.
 - Not to Be Copied
 - Negative Temperature Coefficient
 - Neutral Transference Coefficient
 - Natural Transfer Cache
24. A/n _____ type of thermistor can be used in lieu of starting components in an electric motor.
 - CSCR
 - PSC
 - PTC
 - NRA
25. The thermistor removes the start windings from the circuit by increasing the windings' resistance.
 - True
 - False

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Quiz 7: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

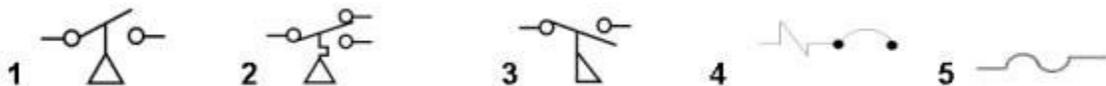


1. Which of the above symbols represents a N.C. open on pressure rise control?
 - 1
 - 2
 - 3
 - 4
 - 5
2. Which of the above symbols represents a N.C. open on pressure decrease control?
 - 6
 - 7
 - 8
 - 9
 - 10
3. Which of the above symbols represents a SPDT pressure switch?
 - 6
 - 7
 - 8
 - 9
 - 10
4. Which of the above symbols represents a SPST pressure differential switch?
 - 6
 - 7
 - 8
 - 9
 - 10
5. Which of the above symbols represents a Float switch – close on rise of fluid?
 - 1
 - 2
 - 3
 - 4
 - 5
6. Which of the above symbols represents a Float switch – open on rise of fluid?
 - 1
- 2
- 3
- 4
- 5
7. Which of the above symbols represents a Motion Limit switch?
 - 6
 - 7
 - 8
 - 9
 - 10
8. Which of the above symbols represents a Delay on Break switch?
 - 6
 - 7
 - 8
 - 9
 - 10
9. Which of the above symbols represents a Delay on Make switch?
 - 1
 - 2
 - 3
 - 4
 - 5
10. A sequencer _____.
 - has a 24-volt heater (typical)
 - has one or more Delay On Make switches
 - usually has N.O. contacts
 - all of the answers provided
11. A Time Delay Electronic Relay is typically wired in series to the control coil of the relay or contactor.
 - True
 - False
12. Electronic Time Delay Relays are always non-adjustable.

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- True
 - False
13. A Delay on Make would likely control the indoor blower motor in the heating mode.
- True
 - False
14. A Delay on Make would likely control the blower on a Heat Pump or Air Conditioning system.
- True
 - False
15. A Delay on Break would likely be found on an indoor blower motor in the heating mode.
- True
 - False
16. All Time Delays are manufactured with both a Delay on Make and a Delay on Break function incorporated in a single control device.
- True
 - False
17. The purpose of a Fuse is to limit the current flow to a system.
- True
 - False
18. Most Fuses have a non-melting internal metal strip.
- True
 - False
19. Most Fuses cannot be reset.
- True
 - False
20. A Magnetic Circuit Breaker acts like a Fuse, except that it can be reset.
- True
 - False
21. A Magnetic Circuit Breaker reacts to increases in a magnetic field due to current flow.
- True
 - False
22. A Humidistat responds to the amount of moisture in the air.
- True
 - False
23. A Humidistat can either close on humidity increase or open on humidity increase.
- True
 - False
24. A Sail switch is used aboard watercraft.
- True
 - False
25. A Flow switch is used to verify the speed of a boat or ship.
- True
 - False
26. An Enthalpy control measures both air temperature and humidity.
- True
 - False
27. An Enthalpy control is used in an economizer for "free" outdoor air cooling.
- True
 - False



28. Which of the above symbols represents a Fuse?
- 1
 - 2
 - 3
 - 4
 - 5
29. Which of the above symbols represents a Magnetic Circuit Breaker?
- 1
30. Which of the above symbols represents a Humidistat?
- 1

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- 2
- 3
- 4
- 5

31. Which of the above symbols represents a Sail switch?

- 1
- 2
- 3
- 4
- 5

32. Which of the above symbols represents an Enthalpy control?

- 1
- 2
- 3
- 4
- 5

Quiz 8: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI

1. A contactor uses a solenoid coil to initiate mechanical movement.

- True
- False

2. A contactor may have one or more sets of contacts.

- True
- False

3. The load carrying contacts in a contactor are normally _____.

- open
- closed

4. The voltage of the contactor coil is usually shown on the coil.

- True
- False

5. The control voltage of a coil could be _____.

- 24 volts
- 120 volts
- 240 volts
- any of the answers provided

6. A contactor with built-in overloads is known as a Magnetic Starter.

- True
- False

7. The overload in a magnetic starter is also known as the _____.

- cooler
- protector
- heater
- warmer

8. A mag-starter is like a contactor except it _____.

- has magnesium on the contact points instead of silver
- is only used for single-phase operations
- has built-in overload protectors
- must be mounted in a vertical position

9. In a mag-starter, if one overload protector fails, the two remaining protectors will carry the load.

- True
- False

10. Overload protectors would open up or trip because of _____.

- excessive current draw on at least 1-line voltage leg
- excessive current draw on at least 2-line voltage legs
- excessive current draw on at least 3-line voltage legs
- none of the answers provided

11. In normal operation, the overload protector connections are _____.

- closed
- opened

12. The maximum load that a relay can usually carry is _____ amps @ 120 volts.

- 5
- 12
- 16
- 20

13. A relay uses a solenoid coil to activate a mechanical pivotal arm.

- True
- False

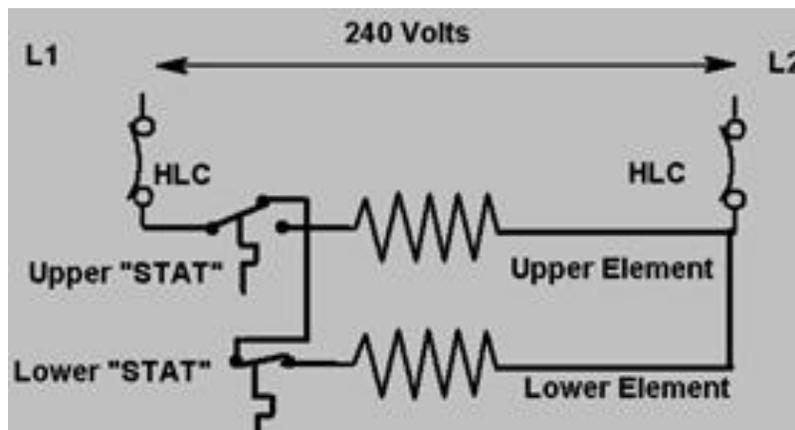
14. A relay can have more than one set of switches and each switch can be either SPST or SPDT.

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- True
 - False
15. Incoming power connections on a relay are usually terminals _____.
- 1 and 4
 - 2 and 5
 - 3 and 6
 - the unmarked contacts
16. N.O. contacts on a relay are between terminal numbers _____.
- 1 and 2
 - 1 and 3
 - 2 and 3
 - the unmarked contacts
17. N.C. contacts on a relay are between terminal numbers _____.
- 1 and 2
 - 1 and 3
 - 2 and 3
 - the unmarked contacts
18. The terminals used for the coil contacts are _____.
- 1 and 4
 - 2 and 5
 - 3 and 6
 - the unmarked contacts
19. The coil voltage for a relay can be _____.
- 24 volts
 - 120 volts
 - 240 volts
 - any of the answers provided

Quiz 9



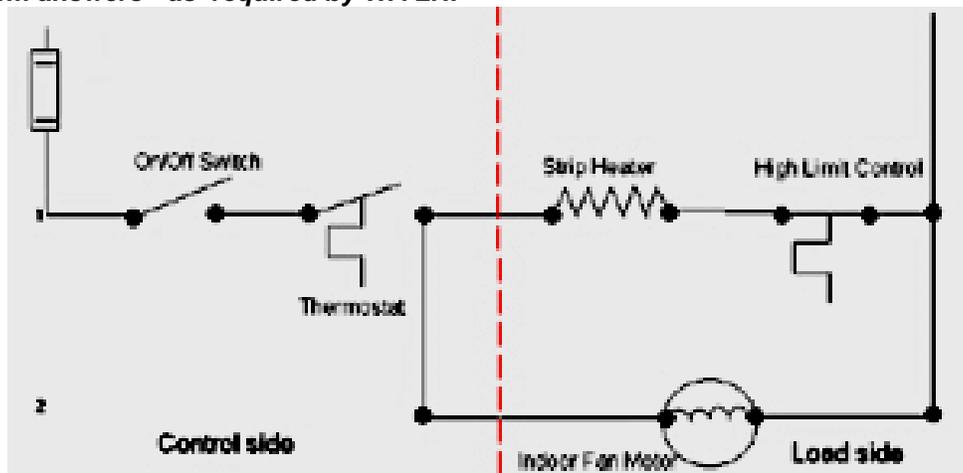
1. In a ladder diagram, the power legs form the _____ of the ladder.
 - rails
 - rungs
 - hooks
 - handles
2. Usually Line 1 (or L1) is on the left-hand side of the diagram.
 - True
 - False
3. The HLC refers to _____.
 - High Limit Control
 - Hot Limit Control
 - Higher Light Control
 - Hot Liquid Control
4. On a water heater, the HLC operates as an over-temperature safety control.
 - True
 - False
5. The HLC also closes its contacts when the temperature is too hot.
 - True
 - False
6. In a ladder diagram, the loads for the _____ of the ladder.
 - rails
 - rungs
 - hooks
 - handles
7. The lower element is connected in _____ with the upper element.
 - series
 - parallel
 - series/parallel

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8. The lower element is energized only when _____.
 - A. the upper thermostat is hot
 - B. the lower thermostat is cold
 - C. both A and B
 - D. neither A or B
9. The upper thermostat in a water heater is a/n _____ switch.
 - SPST
 - SPDT
 - DPST
 - DPDT
10. The lower thermostat in a water heater is a/n _____ switch.
 - SPST
 - SPDT
 - DPST
 - DPDT
11. The HLC is a/n _____ switch.
 - SPST
 - SPDT
 - DPST
 - DPDT

Quiz 10 : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI



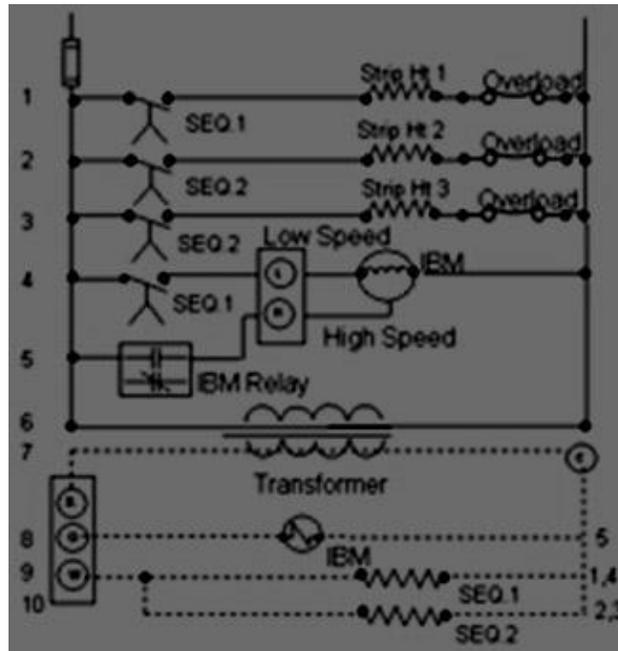
1. It is common to show a switch on the right side of the load.
 - True
 - False
2. The On/Off switch is in _____ with the thermostat.
 - series
 - parallel
 - series/parallel
3. The fan motor is in _____ with the thermostat.
 - series
 - parallel
 - series/parallel
4. The fan motor is in _____ with the strip heater.
 - series
 - parallel
5. The High Limit Control is in _____ with the strip heater.
 - series
 - parallel
 - series/parallel
6. The fan only comes on when the thermostat is _____.
 - open
 - closed
 - neither – it is not connected to the thermostat
7. The following are 24-volt controls or safeties:
 - On/Off Switch
 - thermostat

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- HLC
 - there are no 24-volt controls
8. Line locator numbers are usually shown _____.
- on the left side of the wire diagram
 - on the right side of the wire diagram
 - across the bottom of the wire diagram
 - across the top of the wire diagram

Quiz 11: : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI



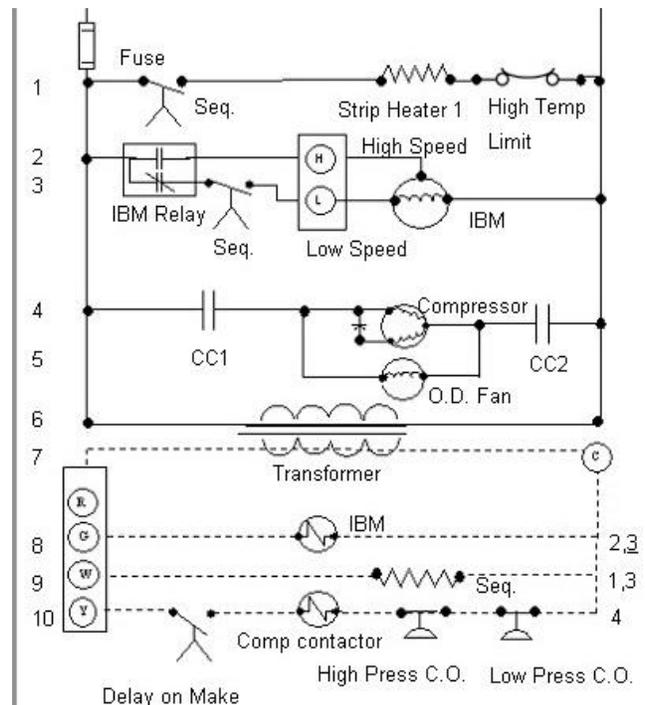
1. The transformer in the above diagram is used to convert _____.
 - 120 volts to 24 volts
 - 24 volts to 120 volts
 - 240 volts to 120 volts
 - 120 volts to 240 volts
 - line voltage to control voltage
2. The high voltage section is shown at the _____ of the diagram.
 - bottom half
 - middle section
 - top half
3. The low voltage section is shown at the _____ of the diagram.
 - bottom half
 - middle section
 - top half
4. The dividing line between the high and low voltage is the _____.
 - voltage regulator
 - transformer
 - battery
 - power generator
5. The No.1 sequencer controls _____.
 - A. heat strip No.1
 - B. low speed fan
 - C. high speed fan
 - D. both A and B
 - E. none of the answers provided
6. The Summer Fan is _____.
 - high speed
 - low speed
7. The Summer, or high speed fan, is controlled by _____.
 - sequencer No. 1
 - sequencer No. 2
 - sequencer No. 3
 - IBM relay
8. The IBM relay controls the relay contacts located on line _____.
 - 1

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- 2
 - 3
 - 4
 - 5
9. Sequencer No.1 (line 9) controls a component located on lines _____.
- 1 & 2
 - 1 & 3
 - 1 & 4
 - 1 & 5
10. Sequencer No.2 (line 10) controls a component located on lines _____.
- 1 & 2
 - 2 & 3
 - 3 & 4
 - 5 & 6
11. On a Fan on Call, the thermostat contacts that mate are _____.
- R to G
 - R to W
 - R to Y
 - R to O
12. On a Fan on Call, the N.O. contacts on the IBM relay close, allowing electrical current to pass to the high-speed IBM windings.
- True
 - False
13. On a Heat Call, the thermostat contacts that mate are _____.
- R to G
 - R to W
 - R to Y
 - R to O
14. On a Heat Call, the component that is first energized is _____.
- sequencer No.1
 - sequencer No.2
 - both sequencers No.1 and 2
 - IBM relay
15. On a Heat Call, all of the sequencer contacts close simultaneously.
- True
 - False
16. On a Heat Call, the safety device(s) in the system is (are) the _____.
- IBM
 - overload
 - IBM relay
 - transformer

Quiz 12 : WA Electricians: Answer all questions - 50% of the following will appear in random order with random answers -as required by WA LNI



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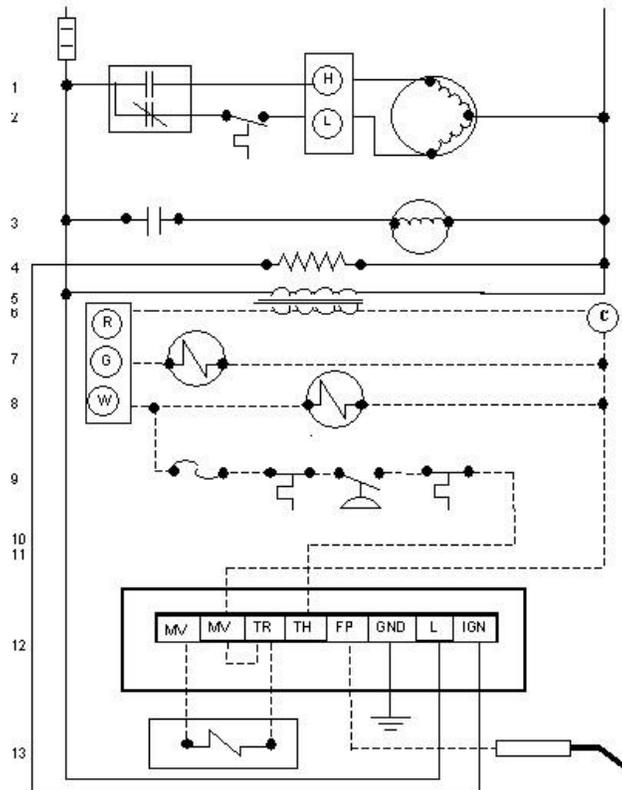
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1. The contacts for No.1 sequencer are placed in series with the low speed fan.
 - True
 - False
2. The contacts for No.1 sequencer are placed in series with the N.C. contacts on the IBM relay.
 - True
 - False
3. The contacts for No.1 sequencer are placed parallel with the high speed fan.
 - True
 - False
4. On the wiring diagram the compressor motor as shown in the diagram is a _____.
 - shade pole
 - capacitor start
 - PSC
 - 3-phase motor
5. On the wiring diagram, the compressor contactor coil is in series with the _____ thermostat terminal.
 - R
 - G
 - W
 - Y
6. On the wiring diagram, a _____ pole contactor is shown.
 - single
 - double
 - triple
7. On the wiring diagram, a High Pressure Cut-out is located in series with _____.
 - the IBM relay coil
 - the sequencer No.1 24-V heater
 - the compressor contactor coil
 - the heat strip No.1
8. A High Pressure Cut-out will activate on the failure of the _____.
 - high speed IBM
 - low speed IBM
 - compressor motor
 - outdoor fan motor
9. A Low Pressure Cut-out is in series with the _____.
 - IBM relay coil
 - sequencer No.1
 - 24-v heater
 - compressor contactor coil
10. A Low Pressure Cut-out will activate _____.
 - upon a refrigerant leak
 - on the failure of the compressor motor
 - on the failure of the outdoor fan motor
 - on the failure of sequencer No.1
11. On the wiring diagram, the primary purpose of a Time Delay is to _____.
 - allow the operator to cancel a cooling call without damage to the system
 - make sure that the conditioned space temperature has passed the set point
 - allow the IBM time to come to full speed before the compressor is engaged
 - allow system pressures to equalize before the compressor is engaged
12. On the wiring diagram, the IBM relay controls the line voltage electrical components located on lines _____.
 - 1 & 2
 - 2 & 3
 - 3 & 4
 - 5
 - none of the answers provided
13. On the wiring diagram, the sequencer controls the line voltage electrical components located on lines _____.
 - 1 & 2
 - 1 & 3
 - 1 & 4
 - none of the answers provided
14. On the wiring diagram, the compressor contactor controls the compressor motor located on line _____.
 - 1
 - 2
 - 3
 - 4
 - 5

Quiz 13

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- Which of the following is NOT a major type of ignition system for gas furnaces?
 - Standing Pilot
 - Spontaneous Ignition
 - Proven Spark Ignition
 - Hot Surface Ignition
 - resistance heater
 - solenoid
 - shaded pole motor
 - PSC motor
 - heat strip
- The Ignition Control Module is powered from the _____ 24-volt thermostat terminal.
 - R
 - G
 - W
- The gas valve is a _____.
 - resistance heater
 - solenoid
 - shaded pole motor
 - PSC motor
 - heat strip
- A flame sensor is placed in the _____.
 - indoor air stream
 - outdoor flue exhaust
 - burner flame
 - ductwork supplying warm air to the conditioned space
- The Hot Surface Igniter is a _____.
 - resistance heater
 - solenoid
 - shaded pole motor
 - PSC motor
 - heat strip
- The Temperature Activated Fan Control is in series with the _____.
 - N.C. contacts of the fan relay
 - N.O. contacts of the fan relay
 - high speed motor windings of the IBM
 - none of the answers provided
- Safety switches are placed in _____ with the ignition module.
 - series
 - parallel
 - series/parallel
- The primary purpose of the vent motor is to remove explosive gases that may be present in the combustion chamber.
 - True
 - False
- The vent motor relay is energized on a _____ call.

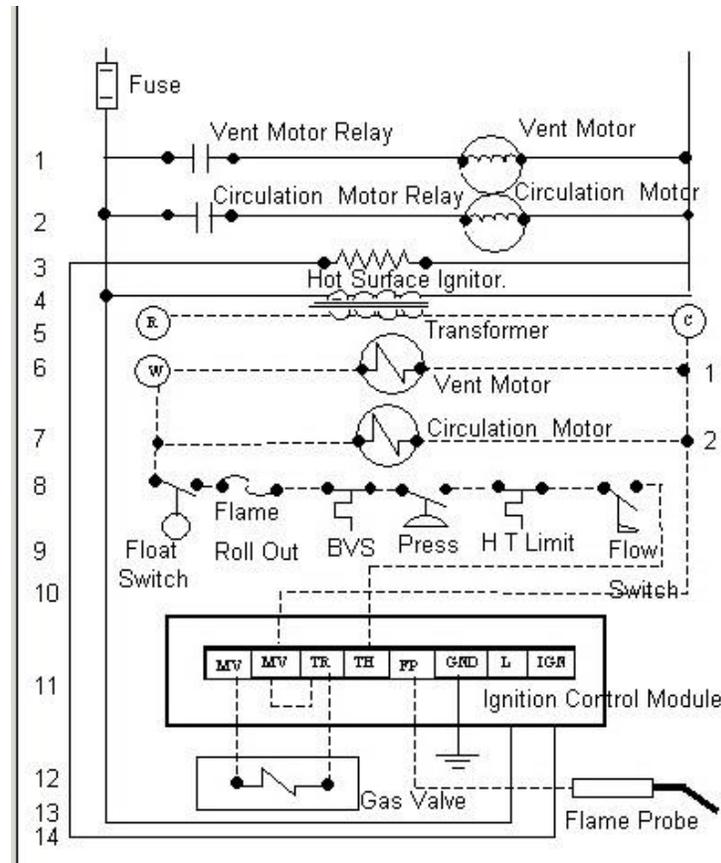
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- R to G
 - R to W
 - R to Y
 - R to O
10. The purpose of the pressure switch is to verify that there is sufficient gas pressure at the burners.
- True
 - False
11. The vent motor relay controls a line voltage device found on line _____.
- 1
 - 2
 - 3
 - 4
 - 5
12. On a call for heat, after the pressure switch closes, nothing appears to be happening except the vent motor continues to run. This is because _____.
- there is a time delay purge function built into the control module
 - the gas valve requires a warm-up time
 - the vent motor is a slow-start motor and requires time to get up to the proper RPM
 - there is a time requirement for the high temperature switches too close
13. The time required for a pre-purge can be found on the face of the ignition module.
- True
 - False
14. The igniter warm-up time can be found on the face of the ignition module.
- True
 - False
15. The time that the gas valve is open can be found on the face of the ignition module.
- True
 - False
16. If a flame is established, a small DC current is sent through the flame sensor, through the flame and to the ignition module to confirm that combustion has occurred.
- True
 - False
17. If combustion is not confirmed after four seconds, the unit may retry the ignition sequence. The number of retries is shown on the face of the ignition control module.
- True
 - False

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- A circulation pump has been added to the system. The pump contacts close _____ the vent motor contacts close.

 - before
 - at the same time as
 - after
- A safety device has been added to make sure that an adequate level of water is present in the boiler prior to ignition. This safety device is a _____ switch.

 - float
 - pressure
 - aqua stat
 - high limit
 - flow
- A safety device has been added to make sure that an adequate flow of water is present in the boiler prior to ignition. This safety device is a _____ switch.

 - float
 - pressure
 - aqua stat
 - high limit
 - flow
- If the circulation motor malfunctions, will the ignition sequence operation be completed?

 - Yes
 - No
- If the vent motor malfunctions, will the ignition sequence operation be completed?

 - Yes
 - No
- If the BVS is open, will the ignition sequence operation be completed?

 - Yes
 - No
- The ignition of the gas continues until _____.

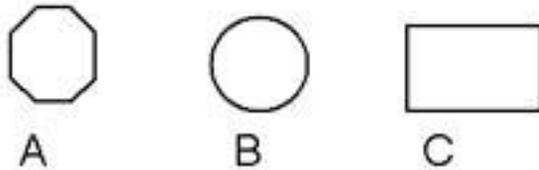
 - R to W is open
 - R to G is open
 - R to Y is open
 - R to O is open

Quiz 15

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1. All manufacturers must use the same symbols and methods of construction in making wire diagrams and schematics.
 - True
 - False
2. A line under a locator on the right-hand side indicates a/n _____.
 - N.O. contact
 - N.C. contact
 - 24-volt control
 - time delay control
3. A bracket over a locator on the right-hand side indicates a/n _____.
 - N.O. contact
 - SPST switch
 - SPDT switch
 - DPST switch
4. Standard practice for wire diagram construction requires that each component be identified with a label.
 - True
 - False
5. A Legend identifies the symbols that are used in a wire diagram.
 - True
 - False



6. On a terminal identification diagram, which of the following is used to identify a Marked Terminal?
 - A
 - B
 - C
7. On a terminal identification diagram, which of the following is used to identify an Unmarked Terminal?
 - A
 - B
 - C
8. On a diagram with a relay labeled 1R, the nomenclature 1R-1 refers to the switches having terminals _____.
 - 1, 2, 3
 - 4, 5, 6
 - on the control coil
9. There are some diagrams that number the wires and not the rungs. All components that are electrically tied together will have the same number.
 - True
 - False
10. There are some diagrams that number the wires and not the rungs. The basic rule for this method is to start at the top of the diagram and use the same number on both ends of a wire.
 - True
 - False
11. There are some diagrams that number the wires and not the rungs. The number can only be changed when a wire passes through a load or a switch.
 - True
 - False
12. There are some diagrams that number the wires and not the rungs. Each number is used only on an un-interrupted path.
 - True
 - False