Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electrical Troubleshooting Activities

# Station #1 – Resistance Testing

## Directions:

1. Using your multi-meter measure the resistance of each lamp (light bulb) or resistor.
2. Record the resistance.
3. Determine which lamps are good.

|  |  |  |
| --- | --- | --- |
| Lamp | Resistance (ohms) | Good/Bad |
| A |  |  |
| B |  |  |
| C |  |  |
| D |  |  |

# Station #2 – Wiring Testing

## Directions:

Procedure

1. Shorted wire test: Test for continuity between each of the wires. Black & White, Black and Ground, White & Ground. If you measure continuity then the wired are shorted.

2. Broken wire test: Connect a wire pair (Black & White, Black and Ground, or White & Ground) at one end of the cable with a wire nut. Test for continuity at the other end. If you don’t have continuity then one or both of the wires are broken. Repeat the test for the other 2 pairs.

Record the results of the tests below.

|  |  |  |
| --- | --- | --- |
| Cable | Fault (circle) | Which Wire(s) |
| A | a. Shorted  b. Broken  c. No Fault |  |
| B | a. Shorted  b. Broken  c. No Fault |  |
| C | a. Shorted  b. Broken  c. No Fault |  |
| D | a. Shorted  b. Broken  c. No Fault |  |

# Station #3 – Switch testing

## Directions Toggle Switch:

1. Test for continuity between the terminals with the switch in off position.
2. Test for continuity between the terminals with the switch in on position. Is the switch working (Yes / No)

## Directions 3 way Switch:

1. Test for continuity between the terminals with the switch in one position. Record your results.
2. Test for continuity between the terminals with the switch in other position. Record your results.
3. Determine which terminal is the “common” terminal.
4. Label the diagrams with the letters of the terminals.

|  |  |
| --- | --- |
| Switch Position | Circle connected terminals |
| 1 | A-B  A-C  B-C |
| 2 | A-B  A-C  B-C |

|  |  |
| --- | --- |
| Position 1 | Position 2 |

# Station #4 – DC Voltage Testing

## Materials:

4 – 1.5V alkaline batteries

## Directions:

1. Measure the voltage of each battery and record on the data sheet.
2. If a battery voltage > 1.5V which batteries are fully charged? Indicate on the data sheet by circling the letter.

|  |  |
| --- | --- |
| Battery | Voltage |
| A |  |
| B |  |
| C |  |
| D |  |

# Station #5 – DC Voltage Testing Lead Acid Battery

## Directions:

1. Measure the DC Voltage of the battery.
2. Use the chart to determine the amount of capacity (charge). Charge: \_\_\_\_\_\_\_\_\_\_\_\_\_\_%

|  |  |
| --- | --- |
| Capacity | Voltage |
| 100% | 12.70 V or higher. |
| 90% | 12.50 V. |
| 80% | 12.42 V. |
| 70% | 12.32 V. |
| 60% | 12.20 V. |
| 50% | 12.06 V. |
| 40% | 11.90 V. |
| 30% | 11.75 V. |
| 20% | 11.58 V. |
| 10% | 11.31 V. |
| 0% | 10.50 V. |

# Station #6 – Auto/Trailer Testing

## Directions:

1. Using your multi-meter measure the resistance of each lamp (light bulb).
2. Determine which lamps are good.

|  |  |
| --- | --- |
| Lamp | Good/Bad |
| A |  |
| B |  |
| C |  |
| D |  |

# Station #7 – Motor Windings

## Directions:

1. Using your multi-meter measure the resistance of motor.
2. Record the resistance.
3. Determine if the motor winding is good.

|  |  |  |
| --- | --- | --- |
| Motor | Resistance (ohms) | Good/Bad |
| A |  |  |
| B |  |  |

# Station #8 – Contactor

## Directions:

1. Measure the resistance of the coil and record. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Station #9 AC Voltage Testing



HOT

GROUND

NEUTRAL

## Materials:

Power Strip (optional)

## Directions:

1. Using the multi-meter set to AC Voltage.
2. Measure the voltage between each slot on the receptacles. USE CAUTION AS YOU ARE TESTING 120V.
3. Record your findings in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Outlet (DR) | Slot | Voltage Readings |  |
| A | Neutral – Ground |  |  |
| Neutral – Hot |  |  |
| Hot - Ground |  |  |
| B | Neutral – Ground |  |  |
| Neutral – Hot |  |  |
| Hot - Ground |  |  |
| C | Neutral – Ground |  |  |
| Neutral – Hot |  |  |
| Hot - Ground |  |  |
| D | Neutral – Ground |  |  |
| Neutral – Hot |  |  |
| Hot - Ground |  |  |

# Station #10 – Pump Float Switch

## Materials:

1 – pump float switch

## Directions:

Remove the connection directions (if any)

Using a meter determine if the switch is working.

# Station #11 – Transformer

## Directions:

1. Test the primary for resistance. Unplug first! The primary is the side with the plug. Is the primary good? Yes /No.
2. Test the secondary coil for resistance. Unplug first! The secondary is the coil not connected to the plug. Is the secondary good? Yes / No
3. Plug in the transformer and test for AC voltage. What is the voltage? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Station #12 – Power Supply

## Directions:

1. Test the primary for resistance. Unplug first! The primary is the side with the plug. Is the primary good? Yes /No.
2. Test the secondary coil for resistance. Unplug first! The secondary is the coil not connected to the plug. Is the secondary good? Yes / No
3. Plug in the transformer and test for AC voltage. What is the voltage? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Plug in the transformer and test for DC voltage. What is the voltage? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Questions

1. Determine the expected resistance draw of a good 60W lamp using the formula below. Assume voltage will be 120V.

**Electrical Formulas:**

Watts = Volt x Amps -> Amps = Watts ÷ Volts

Volts = Amps x Resistance (E=IR) -> Resistance=Volts ÷ Amps

\_\_\_\_\_\_\_\_\_\_\_ Amps = 60 watts ÷ 120v

\_\_\_\_\_\_\_\_\_\_\_ Ohms = 120v ÷ \_\_\_\_\_\_\_\_\_ Amps

1. How does the calculated resistance compare to your measurement at station #1?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the expected resistance of a broken wire?
   1. Infinite
   2. < 5 ohms
   3. 6-600 ohms
   4. > 600 ohms
2. What is the expected resistance of two shorted wires?
   1. Infinite
   2. < 5 ohms
   3. 6-600 ohms
   4. > 600 ohms
3. What is the expected resistance of a good switch when the contacts are closed?
   1. Infinite
   2. < 5 ohms
   3. 6-600 ohms
   4. > 600 ohms
4. What is the approximate voltage you would expect to find at a working outlet (DR)? \_\_\_\_\_\_\_\_\_\_\_V
5. On a transformer like you tested at station #11 (step down) which coil has the most resistance?
   1. Primary
   2. Secondary
   3. Both are the same
6. To test to see if an outlet is working what scale would you use on your multi-meter?
   1. DC Volts
   2. AC Volts
   3. Amperes
   4. Resistance (ohms)
7. When testing a live 120v circuit with a multi-meter what precautions should you take?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Before replacing an AC device like a DR, what should you do?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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