

UNIT V - ELECTRICITY

Lesson 12: Detecting Problems

Competency/Objective: Identify problems in electrical systems.

Study Questions

1. What types of testers are used in troubleshooting?
2. How are the testing devices used?

References

1. *Agricultural Structures (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1999, Unit V.
2. Transparency Master
 - a) TM 12.1: Types of Electrical Testers
3. Activity Sheet
 - a) AS 12.1: Using Testing Devices

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Lesson 12: Detecting Problems

TEACHING PROCEDURES

A. *Review*

Lesson 11 described how to protect electrical systems from lightning. Lightning is not the only potential cause of problems, however. After an electrical system is installed, problems caused by poor wiring practices, misuse, or wear can occur. This lesson will focus on troubleshooting electrical problems, particularly the use of electrical testers.

B. *Motivation*

Ask students the following questions. Discuss their answers, pointing out that the problems described are all common and must be addressed to safely and efficiently provide electrical power.

- Have any of you experienced breakers tripping on a repeated basis?
- Are there any electrical outlets in your home that do not function properly?
- Have you ever felt a tingle when plugging or unplugging a cord in an outlet?

C. *Assignment*

D. *Supervised Study*

E. *Discussion*

1. Identifying and correcting electrical problems involves the use of different testing devices that make it possible to safely and easily detect problems. Discuss these devices, using TM 12.1 to illustrate them.

What types of testers are used in troubleshooting?

- a) Neon tester
 - 1) Simplest device used by electricians
 - 2) Used on either a 120-volt or 240-volt system
 - 3) Glowing light - indicates that voltage is present; the greater the voltage, the brighter the light
- b) Voltage tester
 - 1) Used to indicate the voltage and polarity, or direction of electrical flow, in a circuit
 - 2) Uses a series of neon lights to indicate the approximate voltage moving through the circuit
- c) VOM (volt-ohm-milliammeter) meter

- 1) Displays the voltage and polarity of the circuit; also provides accurate measurements of circuit resistance and amperage
 - 2) Combines a voltmeter, ohmmeter, and ammeter in one casing
 - (a) Voltmeter - measures voltage across two points in an electrical circuit
 - (b) Ohmmeter - measures resistance
 - (c) Ammeter - measures the electrical flow or amperage
 - 3) Provides information on a calibrated numerical scale
2. Explain how to use the testing devices listed. Emphasize that the manufacturer's directions for the proper use of these testing devices should be understood prior to their use. Have students complete AS 12.1. It may be appropriate to create a malfunction in the receptacle tested. Students could also add an outlet receptacle to the electrical board described in AS 9.1 that could be made to malfunction for testing.

How are the testing devices used?

- a) Neon tester for testing outlet receptacles
 - 1) Place the ends of the leads into the parallel slot openings; if the tester lights up, no problem exists.
 - 2) If the tester does not light up, insert the end of one of the leads into the ground opening, with the other lead in one of the other slots.
 - 3) If the tester lights up, the problem is with the neutral connection or the neutral wire.
 - 4) If the tester still does not glow, remove the outlet cover plate and receptacle.
 - 5) Touch the leads to the opposite terminal screws.
 - 6) If the tester lights up, the receptacle does not function and should be replaced.
- b) Voltage tester for outlets, switches, fixtures, and other electrical devices
 - 1) It works in a similar way as the neon tester.
 - 2) The tester also indicates whether an electrical system carries 120 volts or 240 volts as well as its polarity.
- c) VOM meter
 - 1) The leads are color coded, with red used for the power side and black for return or neutral side of the circuit during testing.
 - 2) The leads are used as they are with the other testers.
 - 3) The ohmmeter contains its own power source, so all power to the electrical system should be disconnected before testing for circuit resistance.

F. Other Activities

Using a VOM meter, test a switch.

G. Conclusion

To troubleshoot electrical systems, it is important to be competent in the use of various testing devices. A problem can only be fixed if it can be identified.

H. *Answers to Activity Sheet*

I. *Answers to Evaluation*

1. d
2. b
3. c
4. Volt-ohm-milliammeter
5. Faulty receptacle
6. Using a series of neon lights

EVALUATION

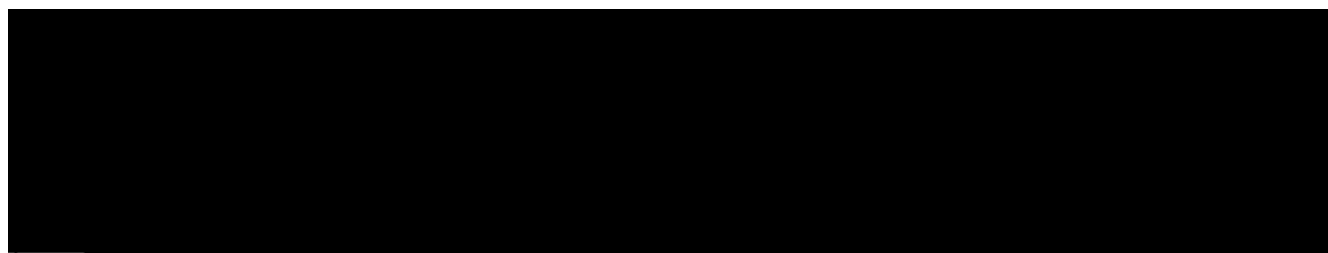
Circle the letter that corresponds to the best answer.

1. The power should be disconnected when using the _____.
 - a. Neon tester
 - b. Voltage tester
 - c. Voltmeter
 - d. Ohmmeter
2. On a voltmeter, what is the color of the lead that is used for the power side of the circuit?
 - a. White
 - b. Red
 - c. Black
 - d. Green
3. What does the glowing light on a neon tester indicate?
 - a. Resistance
 - b. Amperage
 - c. Voltage
 - d. Polarity

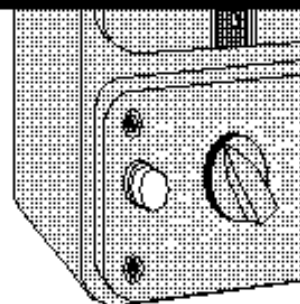
Complete the following short answer questions.

4. What does VOM mean?
5. When testing an outlet receptacle with the neon tester, you find that the tester lights up only when you touch the leads directly to the terminal screws of the outlet. What is the problem?

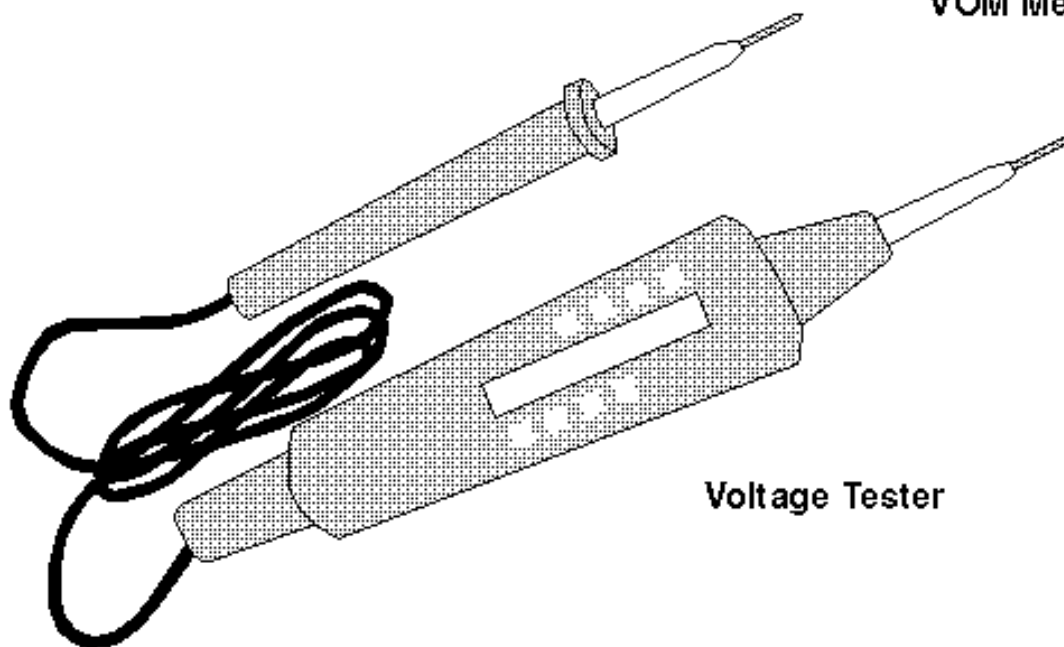
6. How does the voltage tester indicate the approximate voltage moving through the circuit?



Neon Tester



VOM Meter



Voltage Tester

Using Testing Devices

Objective: Use an electrical testing device to test an outlet receptacle for power.

Use the different testing instruments described in this lesson to test an electrical outlet chosen by your instructor. Fill in the table, describing the types of information provided by the different testers, the procedures followed to conduct the test, and the results of the test.

Type of Tester	Information Provided	Test Procedure and Results
Neon tester		
Voltage tester		
VOM meter		

