Test a Starting and Charging System

Name________________

Testing the starting and charging system can be hazardous especially when working with batteries and running engines. Be sure to carefully review what you have written on Safety.

A defect in the starting or charging system often shows up as a dead battery. When testing the starting and charging systems, a weak battery can lead to misdiagnoses. In other words, a bad starter can cause a dead battery and a bad battery can make a starter look bad.

The first step to diagnosing any problem in the starting and charging system is to make sure the battery is fully charged, and in good condition.

You can find answers at the websites provided by www.autoshop101.com


1) How many volts does a fully charged battery have?

2) What should you do before testing the battery state of charge using voltage?

3) How can you remove a surface charge on a battery?

4) If you have to charge the battery, why should you unhook the ground cable first?

5) Which is better for the battery, a fast or a slow charge?

6) What does Cold Cranking Amps (CCA) mean?
Read the article on Testing Batteries using the Battery Conductance Tester

Practice using the battery tester on some of the batteries on the classroom

Look up the CCA for a vehicle. I recommend looking in the C-Specifications area of Mitchell On-Demand. Once in this area look under Capacities. If more than one battery capacity is listed, use the higher rating if the vehicle has Air conditioning and other optional accessories. If the rating is in Amp Hours (many Asian cars use this) multiply the specification by 6 to get an approximate CCA rating.

7) Select any vehicle newer than 1983 and fill out a work order with LBCC as the Owner, 6500 Pacific Blvd. SW Albany OR 97321 for the address and 917-4602 for the phone. Your own name should be recorded as the estimator. The reason you are working on this vehicle is to find the cause of the dead battery. Clearly write this as the “Customer Concern”

8) Hook up the Midtronics Conductance tester to the battery and record the voltage

_____ Volts

9) Remove the surface charge and record the voltage at the battery _______ Volts

10) Perform a conductance test on the battery and write on your work order: “Evaluate battery condition” indicate the test results (good, undercharged, bad)

11) Demonstrate how you use the conductance tester and get an instructor sign off on the work order.

Starting systems check

To test the starter you must keep the vehicle from starting. If this is done improperly the vehicle may be damaged. Have the instructor show you how to disable the fuel or ignition for the starter tests.

Most battery, starting, and charging system test can be performed using a VAT tester or Volt Amp Tester. The machines I recommend for these tests are the AVR testers

Read the article on Starting System Tests
12) What is the first step to testing a starting system?

13) How will you avoid damage to the vehicles paint when testing a starter?

14) How have you set up the engine so that it will crank and not start?

15) How can you protect the starter motor when performing the starter tests?

16) What is the cranking Voltage for this vehicle?

17) When would cranking voltage indicate that there is a problem with the starter?

18) What is the cranking Amperage for this vehicle?

19) When would the cranking Amperage indicate a problem with the starter?

20) Write on your work order the cranking voltage and cranking amps. Indicate your interpretation of these test results. Demonstrate this test for an instructor sign off.

**Test the Charging System**

Alternators are responsible for charging the battery and supplying the electrical power (volts x amps) to run all the electrical systems in the vehicle. Alternators are rotated by
drive belts (fan belts). One important check for charging systems is to make sure the drive belt is not too loose, glazed (shiny), or cracked and worn out. A glazed or slipping belt can cause an undercharging alternator.

It is easy to check a charging system for adequate performance. You can quickly check the system using the voltmeter found on the AVR tester. To test the charging system you must run the vehicle.

21) How can you insure that carbon monoxide will not escape into the shop?

22) Why is allowing an engine to run unattended a dangerous practice?

In order to charge a battery, the Voltage (electrical pressure) must be high enough to force Amperage (electrons moving from one atom to the next) in to the battery. To do this efficiently the alternator must maintain a voltage that is about 2 volts higher than the battery.

23) What is considered a normal charging system Voltage?

Since electrical Power (measured in Watts) is equal to Volts times Amps we can know if the charging system can deliver enough power simply by watching the voltage. If the power demands of the vehicle exceed the power production of the alternator the voltage will go down.

24) If the alternator can not supply enough power to run the electrical system where does the extra power come from?

25) At what voltage will amps start leaving the battery?

If the alternator puts out too much power the amps will have no place to go except into the battery. If too many amps go into the battery it will overheat and also cause excessive “gassing” of the battery. This gas is very explosive (hydrogen and oxygen) causes a loss of water form the battery. Battery cases that are bulged out (from the
overheating) and low on electrolyte (the water and acid inside the battery) may indicate an overcharging alternator. In addition light bulbs and fuses may start to burn out. The charging system should not exceed 15 volts.

26) How will you know if the alternator is Overcharging the battery?

27) How will you know if the alternator is Undercharging the battery?

It takes very little electrical power to run a vehicle. Maximum power is needed when lights and defrosters and blower motors and windshield wipers and rear window defoggers and everything else is turned on. (typical day for Oregon in the wintertime) An alternator needs to be able to supply all this power when the engine is running at normal driving RPM. For most vehicles the alternator will reach maximum efficiency when the engine is running at about 2,000 RPM.

28) How will you test the charging system to ensure that it can meet the electrical power needs of the vehicle? (drive belts, under-charging, over-charging)

Run this test. Watch to ensure that the voltage does not drop too low. After you turn off all electrical loads make sure the voltage does not go too high.

Record these Voltage readings:

29) Voltage at idle all electrical loads turned OFF ________________

30) Voltage at idle all electrical loads turned ON ________________

31) Voltage at about 2,000 RPM (cruise speed) all loads turned ON _____________

32) Voltage at about 2,000 RPM (cruise speed) all loads turned OFF _____________
33) Write an interpretation of your charging system tests on the work order. Demonstrate the above tests for an instructor sign off.

**Charging the Battery**

Any problem in the starting or charging system can cause a battery to go dead. A common, but dangerous, service is to charge a battery. The best way to charge a battery is to place it on a slow charge (under 10 amps) and leave it there for 24 hours. As there is not always time for this procedure a fast charge is often used.

There are three primary dangers to fast charging a battery. The first is that charging a battery at too high of a rate will cause a battery to give off lots of hydrogen and oxygen. If these gasses see any spark they can cause the battery to EXPLODE! If you disconnect the battery charger without first turning off all current flow, it will spark and can explode the battery. Battery caps are vented and have flame arrestors to keep any sparks or flame out of the cells and make an explosion far less likely.

34) How can you be absolutely sure the charger is turned off when connecting or disconnecting a battery charger?

36) Why should you leave the vent caps ON when charging a battery?

The next danger in fast charging is to the battery itself. If the battery is overcharging, or it has a defective cell, it may get hot, the voltage will go too high (over 15 volts), and it will begin to give off the hydrogen and oxygen gas. Hydrogen has a strong odor but by the time you smell it the battery is already being “cooked”. You can often see the bubbles forming and/or hear the gas escaping the vent caps.

37) How can you be sure the battery is not being overcharged?

Finally there is danger to the vehicle computers. Computers are at risk of being destroyed if the charging voltage goes over 16 volts. Many battery chargers will quickly reach this voltage when they are placed on a Fast charge.

38) How can you best protect the vehicle computers when using a battery charger?