

# Automotive Technology 5<sup>th</sup> Edition

## Chapter 51 BATTERY TESTING & SERVICE

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This course or class provides complete coverage of the components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
<b>Motivate Learners</b>	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
<b>State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.</b>	Explain learning objectives to students as listed on NEXT SLIDE. <ol style="list-style-type: none"> <li>1. List the precautions necessary when working with batteries.</li> <li>2. Describe how to inspect and clean terminals and hold-downs.</li> <li>3. Discuss how to test batteries for open-circuit voltage and specific gravity.</li> <li>4. Describe how to perform a battery load test and a conductance test.</li> <li>5. Explain how to safely charge or jump-start a battery.</li> <li>6. Discuss how to perform a battery drain test.</li> </ol>
<b>Establish the Mood or Climate</b>	Provide a <b>WELCOME</b> , Avoid put downs and bad jokes.
<b>Complete Essentials</b>	Restrooms, breaks, registration, tests, etc.
<b>Clarify and Establish Knowledge Base</b>	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

**NOTE:** This lesson plan is based on the 5<sup>th</sup> Edition Chapter Images found on Jim's web site @ [www.jameshalderman.com](http://www.jameshalderman.com)

**LINK CHP 51:** [ATE5 Chapter Images](#)

## ICONS



## CH51 Battery Testing & Service

### 1. TITLE SLIDE 1 BATTERY TESTING & SERVICE

Check for **ADDITIONAL VIDEOS & ANIMATIONS**  
@ <http://www.jameshalderman.com/>  
**WEB SITE IS CONSTANTLY UPDATED**

### Videos

[Jump Box Usage \(View\) \(Download\)](#)

[Jump Starting Hybrids \(View\) \(Download\)](#)

[Jumper Cable Usage \(View\) \(Download\)](#)

[Measure Battery Voltage Drop \(View\) \(Download\)](#)

[Meter Usage Battery Volt Check \(View\) \(Download\)](#)

2. **SLIDE 1 EXPLAIN Figure 51-1** visual inspection on this battery shows the electrolyte level was below the plates in all cells.
3. **SLIDE 1 EXPLAIN Figure 51-2** Corrosion on a battery cable could be an indication that the battery itself is either being overcharged or is sulfated, creating a lot of gassing of the electrolyte.

**DEMONSTRATION: Using a voltmeter, demonstrate how to find corroded and/or poor connections by measuring voltage drop.**

4. **SLIDE 4 EXPLAIN Figure 51-3** Besides baking soda and water, a sugar-free diet soft drink can also be used to neutralize the battery acid

**DEMONSTRATION: Show students proper procedure for removing a surface charge. Load battery with fixed load for 15 sec. to remove surface charge, using AVR.**

**DEMO Open Circuit Voltage (OCV) Test**

5. **SLIDE 5 EXPLAIN Figure 51-4 (a)** A voltage reading of 12.28 volts indicates that the battery is not fully charged and should be charged before testing.
6. **SLIDE 6 EXPLAIN Figure 51-4 (b)** A battery that measures 12.6 volts or higher after the surface charge has been removed is 100% charged.

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[Measure Battery Voltage Drop \(View\) \(Download\)](#)

[Meter Usage Battery Volt Check \(View\) \(Download\)](#)

7. **SLIDE 7 EXPLAIN Figure 51-5** When testing a battery using a hydrometer, the reading must be corrected if the temperature is above or below 80° F (27° C).

**DISCUSSION: Have students discuss correlation between specific gravity, open-circuit voltage, & battery state of charge. How do you detect defective battery? Talk about differences between open-circuit voltage and specific gravity when determining battery state of charge. Why might a technician prefer one or the other?**

8. **SLIDE 8 EXPLAIN Figure 51-6** This battery has cold-cranking amperes (CCA) of 550 A, cranking amperes (CA) of 680 A, and load test amperes of 270 A listed on the top label. Not all batteries have this complete information.

**DEMONSTRATION: Show students how to load test battery. Typically done at 1/2 CCR.**

9. **SLIDE 9 EXPLAIN Figure 51-7** An alternator regulator battery starter tester (ARBST) automatically loads the battery with a fixed load for 15 sec. to remove the surface charge, then removes the load for 30 sec. to allow the battery to recover, and then reapplies the load for another 15 sec. The results of the test are then displayed.

10. **SLIDE 10 EXPLAIN Figure 51-8** Most light-duty vehicles equipped with two batteries are connected in parallel as shown. Two 500 A, 12 volt batteries are capable of supplying 1,000 A at 12 volts, which is needed to start many diesel engines.

11. **SLIDE 11 EXPLAIN Figure 51-9** Many heavy-duty trucks and buses use two 12 volt batteries connected in series to provide 24 volts.

12. **SLIDE 12 EXPLAIN Figure 51-10** conductance tester is very easy to use and has proved to accurately determine battery condition if the connections are properly made. Follow instructions on the display exactly for best results

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**DISCUSSION: Have students discuss difference between battery load testing and conductance testing. What are pros & cons of each?**

**DEMONSTRATION: Show students how to properly test a battery using Conductance Tester**

**13. SLIDE 13 EXPLAIN Figure 51-11** A typical industrial battery charger. Be sure that the ignition switch is in the off position before connecting any battery charger. Connect the cables of the charger to the battery before plugging the charger into the outlet. This helps prevent a voltage spike and spark that could occur if the charger happened to be accidentally left on. Always follow the battery charger manufacturer's instructions.

**14. SLIDE 14 EXPLAIN Figure 51-12** Adapters should be used on side terminal batteries whenever charging.

**DEMONSTRATION: Show students how to properly disable high-voltage battery to decrease risk of Injury/death when working around high voltage systems.**

**15. SLIDE 15 EXPLAIN Figure 51-13** typical battery jump box used to jump start vehicles. These hand-portable units have almost made jumper cables obsolete.

**16. SLIDE 16 EXPLAIN Figure 51-14** Jumper cable usage guide. Notice that the last connection should be the engine block of the disabled vehicle to help prevent the spark that normally occurs from igniting the gases from the battery.

**17. SLIDE 17 EXPLAIN Figure 51-15** code on the Delphi battery indicates that it was built in 2005 (5), in February (B), on the eleventh day (11), during third shift (C), and in the Canadian plant (Z).

**18. SLIDE 18 EXPLAIN Figure 51-16** This mini clamp-on digital multimeter is being used to measure the amount of battery electrical drain that is present. In this case, a reading of 20 Ma (displayed on the meter as 00.02 A) is within the normal range of 20 to 30 Ma. Be sure to clamp around all of the positive battery cable or all of the negative battery cable, whichever is easiest to get the clamp around.

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[Jump Box Usage \(View\) \(Download\)](#)

[Jump Starting Hybrids \(View\) \(Download\)](#)

[Jumper Cable Usage \(View\) \(Download\)](#)

19. **SLIDE 19 EXPLAIN** Figure 51-17 After connecting the shut-off tool, start the engine and operate all accessories. Stop the engine and turn off everything. Connect the ammeter across the shut-off switch in parallel. Wait 20 minutes. This time allows all electronic circuits to “time out” or shut down. Open the switch—all current now will flow through the ammeter. A reading greater than specified (usually greater than 50 Ma, or 0.05 A) indicates a problem that should be corrected.

**DEMONSTRATION: Show students how to perform a parasitic draw test using an ammeter with an inductive lead.**

**DEMONSTRATION: Show the students how to perform a parasitic draw test using an ammeter hooked up in series.**

20. **SLIDE 20 EXPLAIN** Figure 51-18 battery was replaced in this Acura and the radio displayed “code” when the replacement battery was installed. Thankfully, the owner had the five-digit code required to unlock the radio.

**DISCUSSION: Have the students discuss why vehicle manufacturers use radios that require codes after the battery has been disconnected. What should be checked before disconnecting battery?**

**DEMONSTRATION: Show the students how to use a memory saver to retain radio memory.**

Students complete NATEF Task Sheet, Page 147 Task Sheet: Measure and diagnose the cause (s) of excessive parasitic draw; determine necessary action (P-1)

Students complete NATEF Task Sheet, Page 149 Task Sheet: Maintain or restore electronic memory functions. (P-1)

Students complete NATEF Task Sheet Perform battery state-of-charge (conductance) test; determine necessary action. (P-1), Page 148 B2 Perform battery capacity test; confirm proper

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battery capacity for vehicle application; determine necessary action. (P-1), Page 148

Students complete NATEF Task Sheet, Page 150  
Task Sheet: Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs (P-1)

Students complete NATEF Task Sheet, Page 151  
Task Sheet: Perform battery charge (P-1)

Students complete NATEF Task Sheet, Page 152  
Task Sheet: Start a vehicle using jumper cables or an auxiliary power supply (P-1)

Students complete NATEF Task Sheet, Page 153  
Task Sheet: Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect. (P-1)

Students complete NATEF Task Sheet, Page 154  
Task Sheet: Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures (P-3)

Crossword Puzzle (Microsoft Word) (PDF)  
Word Search Puzzle (Microsoft Word) (PDF)