

Automotive Technology 5th Edition

Chapter 55 Charging System Diagnosis & Service

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	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.
Motivate Learners	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.
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.	Explain learning objectives to students as listed below: <ol style="list-style-type: none"> 1. Discuss the various methods to test the charging system. 2. Discuss the alternator output test. 3. Explain how to disassemble an alternator and test its component parts.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	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 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 55: [ATE5 Chapter Images](#)

ICONS



CH 55 Charging Diagnosis

1. TITLE SLIDE 1 CHARGING SYSTEM DIAGNOSIS AND SERVICE

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

Videos

2. **SLIDE 2 EXPLAIN Figure 55-1** digital multimeter should be set to read DC volts, with the red lead connected to the positive (+) battery terminal and the black meter lead connected to the negative (-) battery terminal.
3. **SLIDE 3 EXPLAIN Figure 55-2** A scan tool can be used to diagnose charging system problems.
4. **SLIDE 4 EXPLAIN FIGURE 55-3** Before replacing an alternator, the wise technician checks that battery voltage is present at output and battery voltage sense terminals

DEMONSTRATION: Show schematic diagrams from several different vehicles and point out circuit protection devices to the students. Try to find examples of systems using maxi fuses, fusible links, and mega fuses. Show the students how to determine the location of the devices.

5. **SLIDE 5 EXPLAIN Figure 55-4** accessory drive belt is worn and requires replacement. Newer belts are made from ethylene propylene diene monomer (EPDM). This rubber does not crack like older belts & may not show wear even though the ribs do wear & can cause slippage.

DEMONSTRATION: Show the students how to use a stethoscope to isolate a belt/bearing noise concern. Figure 55-4

DEMONSTRATION: Show & Discuss information provided by service bulletins and practice of checking for service bulletins as part of diagnosing charging system concerns. Point out that service bulletins can contain information about problems such as pattern failures with regard to wire harness routing and control module calibrations.

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6. **SLIDE 6 EXPLAIN Figure 55-5** Check service information for the exact marks where the tensioner should be located for proper belt tension.

7. **SLIDE 7 EXPLAIN Figure 55-6**

8. **SLIDE 8 EXPLAIN Figure 55-7** Testing AC ripple at the output terminal of the alternator is more accurate than testing at the battery due to the resistance of the wiring between the alternator and the battery. The reading shown on the meter, set to AC volts, is only 78 mV (0.078 V), far below what the reading would be if a diode were defective.

Measure AC Ripple (View) (Download)

Many charging systems are computer controlled, so some charging system problems can be fixed by recalibrating control module

Scan tool snap shot function or vehicle data recorder is good way to monitor charging system operation on test drive. Scan tool, digital storage oscilloscope, or vehicle data recorder can capture glitches that might be difficult to find with a DMM

33. **SLIDE 33 EXPLAIN Figure 55-9** mini clamp-on meter can be used to measure alternator output as shown here (105.2 Amp). Then meter can be used to check AC current ripple by selecting AC Amps on rotary dial. AC ripple current should be < 10% of DC current output

DEMONSTRATION: Demonstrate ways to do an Alternator Output Test. Show students how to perform carbon pile test with AVR or equivalent tool. Have students interpret results by comparing them to OEM specifications.

NATEF Task Sheet, Page 166 Task Sheet: Perform charging system output test; determine necessary action. (P-1)

A6D2 Page 167 Task Sheet: Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions. (P-1)

NATEF Task Sheet, Page 168 Task Sheet: Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment (P-1)

Remove, inspect, and install generator (alternator) (P-1)

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Students complete NATEF Task Sheet Perform charging circuit voltage drop tests; determine necessary action. (P-1)

11. **SLIDE 11 EXPLAIN Figure 55-10** Voltmeter hookup to test the voltage drop of the charging circuit.
12. **SLIDE 12 EXPLAIN Figure 55-11** A typical tester used to test batteries as well as the cranking and charging system. Always follow the operating instructions.

[Charging Circuit Volt Drop Ground Side \(View\) \(Download\)](#)
[Charging Circuit Volt Drop Power Side \(View\) \(Download\)](#)

HANDS-ON TASK: Have students locate amp rating of alternators on several different vehicles. Have them report where information was located and what ratings were.

13. **SLIDE 13 EXPLAIN Figure 55-12** The best place to install a charging system tester amp probe is around the alternator output terminal wire, as shown.

DEMONSTRATION: Demonstrate how to properly remove an alternator using OEM service procedures. Have the students look up the labor time for the alternator R&R operation for several different vehicles and report their findings to class.

14. **SLIDE 14 EXPLAIN FIGURE 55-13** Replacing an alternator is not always as easy as it is from a Buick with a 3800 V-6, where the alternator is easy to access.
15. **SLIDE 15 EXPLAIN Figure 55-14** Always mark the case of the alternator before disassembly to be assured of correct reassembly.
16. **SLIDE 16 EXPLAIN Figure 55-15** Explanation of clock positions. Because the four through bolts are equally spaced, it is possible for an alternator to be installed in one of four different clock positions. The connector position is determined by viewing alternator from the diode end with threaded adjusting lug in up or 12 o'clock position. Select 3 o'clock, 6 o'clock, 9 o'clock, or 12 o'clock position to match unit being replaced.

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DISCUSSION: Have the students discuss the importance of checking the wire harness routing before removing the old alternator. What could result from routing the wire harness incorrectly?

17. **SLIDE 17 EXPLAIN Figure 55-16** Testing an alternator rotor using an ohmmeter.
18. **SLIDE 18 EXPLAIN Figure 55-17** If the ohmmeter reads infinity between any two of the three stator windings, the stator is open and, therefore, defective. The ohmmeter should read infinity between any stator lead and the steel laminations. If the reading is less than infinity, the stator is grounded. Stator windings cannot be tested if shorted because normal resistance is very low.

[Ohmmeter Test, Alternator Rotor \(View\) \(Download\)](#)

[Ohmmeter Test, Alternator Stator \(View\) \(Download\)](#)

19. **SLIDE 19 EXPLAIN Figure 55-18** Typical diode trio. If one leg of a diode trio is open, the alternator may produce close to normal output, but the charge indicator light on the dash will be on dimly.
20. **SLIDE 20 EXPLAIN Figure 55-19** A typical rectifier bridge that contains all six diodes in one replaceable assembly.
21. **SLIDE 21 EXPLAIN Figure 55-20** Brush holder assembly with new brushes installed. Holes in brushes are used to hold brushes up in holder when it is installed. After rotor has been installed, retaining pin is removed which allows brushes to contact slip rings
22. **SLIDES 22-57 OPTIONAL COVERAGE of ALTERNATOR OVERHAUL**

[Crossword Puzzle \(Microsoft Word\) \(PDF\)](#)

[Word Search Puzzle \(Microsoft Word\) \(PDF\)](#)