

Automotive Technology 5th Edition

Chapter 53 Cranking 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: <ol style="list-style-type: none"> 1. Discuss how to perform a voltage drop test on the cranking circuit. 2. Perform control circuit testing and starter amperage test, and determine necessary action. 3. Explain starter motor service and bench testing.
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.

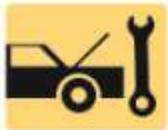
NOTE: This lesson plan is based on the 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 53: [ATE5 Chapter Images](#)

ICONS



Figure 53-1



What to DO: CH53 Cranking Diagnosis

1. SLIDE 1 CRANKING SYSTEM DIAGNOSIS & SERVICE

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

Videos

[Starter Circuit \(View\) \(Download\)](#)

[Starter Circuit Neutral Safety Switch \(View\) \(Download\)](#)

[DC Motor \(View\) \(Download\)](#)

10. SLIDE 10 EXPLAIN Figure 53-1

DISCUSSION: Discuss how battery condition is critical to the function of all electrical and electronic systems in the vehicle.

After verifying a customer's concern about a fault in the cranking system, what should be checked?

DEMONSTRATION: Show how to use service information to look up starting system control circuit. Have them help you identify different components of starting system control circuit.

HANDS-ON TASK: Have the students print out a schematic of the starter circuit for vehicle they will be working on and point out the test points.

Discuss with them that starter circuits and components can vary greatly from vehicle to vehicle, and from OEM to OEM.

11. SLIDE 11 HEADER: VOLTAGE DROP TESTING

12. SLIDES 12-17 READ & EXPLAIN TEXT

18. SLIDE 18 EXPLAIN Figure 53-2 Voltmeter hookups for voltage drop testing of a solenoid-type cranking circuit.

19. SLIDE 19 EXPLAIN Figure 53-3 Voltmeter hookups for voltage drop testing of a Ford cranking circuit.

20. SLIDE 20 EXPLAIN Figure 53-4 To test the voltage drop of the battery cable connection, place one voltmeter lead on the battery terminal and the other voltmeter lead on the cable end and crank the engine. The voltmeter will read the difference in voltage between the two leads,

ICONS



Click on **ICON** to go to frame containing **TECH-TIP**. Click **MULTIPLE** times to see all frames. **ICON** that says **BACK TO PRESENTATION**, to Return



What to DO: CH53 Cranking Diagnosis

which should not exceed 0.20 volt (200 mV).

DEMONSTRATION: Show students how to perform a voltage drop test on starter motor circuit of a live vehicle. Emphasize disabling the vehicle. Also, emphasize how not to accidentally turn wrenches, jewelry, & other metal objects into arc welders.

DEMONSTRATION: Use a jump box & remote start switch to set up a starter on a bench. Place alligator clips on ends of DMM leads to perform a voltage drop test on the starter control circuit. Use a bugged wire with a spliced-in resistor to show what unwanted resistance in the signal side of the circuit can do to overall circuit function.

21. SLIDE 21 HEADER: CONTROL CIRCUIT TESTING

22. SLIDES 22-24 READ & EXPLAIN TEXT SLIDE 24 has 4 TECH-TIP ICONS . Click on these links to take you to multiple frames

25. SLIDE 25 HEADER: STARTER AMPERAGE TEST

26. SLIDES 26-27 READ & EXPLAIN TEXT

28. SLIDE 28 EXPLAIN Figure 53-5

29. SLIDES 29-39 READ & EXPLAIN TEXT

DISCUSSION: Have the students talk about the use of noninvasive test procedures; for instance, using a scan tool to check for proper starter operation by commanding the starter relay on and off. How can noninvasive test procedures save time and prevent unnecessary damage to wiring and components?

DEMONSTRATION: Show Scan Tool Diagnosis process from the above discussion.

DISCUSSION: Discuss the ways current can be measured in a circuit, such as using a DMM in series set on amps, using Ohm's law to calculate current based on voltage & resistance, or measuring magnetic field surrounding a circuit by using an inductive pickup. When should each type of measurement be used?

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Click on ICON  to go to frame containing TECH-TIP. Click MULTIPLE times to see all frames. ICON that says BACK TO PRESENTATION, to Return

What to DO: CH53 Cranking Diagnosis

SHOW VIDEO: Checking Starter Current Draw Video 53.1

40. SLIDE 40 HEADER: STARTER REMOVAL

41. SLIDES 41-43 READ & EXPLAIN TEXT

44. SLIDE 44 EXPLAIN Figure 53-6

45. SLIDE 45 HEADER: STARTER MOTOR SERVICE

46. SLIDES 46-47 READ & EXPLAIN TEXT

48. SLIDE 48 EXPLAIN Figure 53-7 exploded view of a typical solenoid-operated starter.

49. SLIDES 49-51 READ & EXPLAIN TEXT

52. SLIDE 52 EXPLAIN Figure 53-8 GM solenoid ohmmeter check. The reading between 1 and 3 (S terminal and ground) should be 0.4 to 0.6 ohm (hold-in winding). The reading between 1 and 2 (S terminal and M terminal) should be 0.2 to 0.4 ohm (pull-in winding).

53. SLIDE 53 EXPLAIN Figure 53-9 Measuring an armature shaft for runout using dial indicator & V-blocks.

54. SLIDE 54 EXPLAIN Figure 53-10 Replacement starter brushes should be installed so the beveled edge matches the rotation of the commutator.

55. SLIDE 55 HEADER: BENCH TESTING

56. SLIDE 56 READ & EXPLAIN TEXT

DEMONSTRATION: Show the students how to properly bench-test a starter. Emphasize that the remote starter cables should not smoke during this test.

HANDS-ON TASK: Have students bench test a starter before and after taking it apart to encourage them to pay attention and be careful during the service procedure.

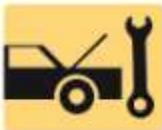
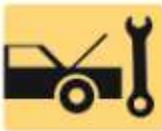
57. SLIDE 57 HEADER: STARTER INSTALLATION

58. SLIDES 58-59 READ & EXPLAIN TEXT SLIDE 59 has a TECH-TIP ICON . Click on these links to take you to multiple frames

ICONS



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What to DO: CH53 Cranking Diagnosis

60. SLIDE 60 HEADER: STARTER DRIVE-TO-FLYWHEEL CLEARANCE

61. SLIDE 61 READ & EXPLAIN TEXT

62. SLIDE 62 EXPLAIN Figure 53-11 A shim (or half shim) may be needed to provide the proper clearance between the flywheel teeth of the engine & pinion teeth.

63. SLIDES 63-67 READ & EXPLAIN TEXT

SHOW VIDEO: Measuring Starter Circuit Voltage Drop Video 53.1

68. SLIDE 68: STARTING SYSTEM SYMPTOM GUIDE

69. SLIDES 69-71 READ & EXPLAIN TEXT

72. SLIDES 72-94 OPTIONAL STARTER OVERHAUL

DEMONSTRATION: Show how to properly hook up and perform a starter current draw test using an AVR tester or similar equipment. Explain how AVR can be used to perform a variety of starting & charging tests in a short amount of time.

NATEF Task Sheet A6C4, Page 160 Task Sheet: Remove and install starter in a vehicle (P-1)

Starter Disassembly & Testing on page 156

NATEF Task Sheet A6C3 Inspect and test starter relays and solenoids; determine necessary action. (P-2)

A6C5: Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action. (P-2) Both Page 159 Task Sheet

Starter Solenoid Testing on page 157 of Worktext:

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What to DO: CH53 Cranking Diagnosis

NATEF Task Sheet A6C1 Perform starter current draw tests; determine necessary action. (P-1)

Combined Page 158 Task Sheet

A6C2: Perform starter circuit voltage drop tests; determine necessary action. (P-1)

A6C6: Differentiate between electrical and engine mechanical problems that cause slow-crank or no-crank condition (P-2)

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

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