AUTOMOTIVE ELECTRICITY AND ELECTRONICS
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NEW TO THIS EDITION. Based on the suggestions and recommendations from automotive instructors and reviewers, the following changes have been made to the sixth edition:

1. The number of chapters has been increased from 28 to 30 making it easier to select the exact content to study or teach.

2. The content in each chapter has been updated and expanded with over 40 new full color photos and line drawings to make the subject come alive.

3. The beginning chapters are more concisely organized making learning electrical systems easier. For example, the first chapter has been expanded and then divided into two shorter chapters:
   - Chapter 1—Service Information, Work Orders, and Vehicle Identification
   - Chapter 2—Tools and Safety

4. All of the electrical accessory circuits have been expanded so that it meets all of the latest ASE tasks and then divided into three chapters including:
   - Chapter 26—Security and Anti-Theft Systems
   - Chapter 28—Body Electrical Accessories
   - Chapter 29—Advanced Driver Assist Systems

5. New Case Studies included in this edition covering the “three Cs” (Complaint, Cause, and Correction).

6. New OSHA hazardous chemical labeling requirements added to Chapter 3 (Environmental and Hazardous Materials).

7. Static electricity and lightning information added to Chapter 4 (Electrical Fundamentals).

8. New content on three-legged and low-profile fuses, plus smart junction boxes, added to Chapter 11 (Automotive Wiring and Wire Repair).

9. Enhanced lead–acid batteries (ELA) information added to Chapter 18 (Batteries).

10. New content on float-type battery charges and memory saver tool that uses a 12-volt battery to connect to the power (terminal 16) and ground (terminals 4 and 5) of the DLC added to chapter 19 (Battery Testing and Service).

11. Stop-start and push-button start system added to Chapter 20 (Cranking Systems).

12. Cloudy headlight restoration information added to Chapter 24 (Lighting and Signaling Circuits).

13. Dash warning symbols (122 of them) added to Chapter 25 (Driver Information and Navigation Systems).


ASE CORRELATED ASE-certified programs need to demonstrate that they use course material that covers ASE tasks. All Professional Technician textbooks have been correlated to the appropriate ASE task lists.

A COMPLETE INSTRUCTOR AND STUDENT SUPPLEMENTS PACKAGE All Professional Technician textbooks are accompanied by a full set of instructor and student supplements. Please see page xvi for a detailed list of supplements.

A FOCUS ON DIAGNOSIS AND PROBLEM SOLVING The Professional Technician Series has been developed to satisfy the need for a greater emphasis on problem diagnosis. Automotive instructors and service managers agree that students and beginning technicians need more training in diagnostic procedures and skill development. To meet this need and demonstrate how real-world problems are solved, the Case Study features are included throughout and highlight how real-life problems are diagnosed and repaired.

The following pages highlight the unique core features that set the Professional Technician Series book apart from other automotive textbooks.
LEARNING OBJECTIVES AND KEY TERMS

LEARNING OBJECTIVES

After studying this chapter, the reader should be able to:

1. Discuss the importance of vehicle owner's manuals, service records, and service information.
2. Explain the different types of service information.
3. Describe vehicle recalls and campaigns.
4. Discuss the importance of the work order.
5. Explain why service records are important.
6. Discuss the parts of a vehicle, and differentiate between front-wheel drive and rear-wheel drive.
7. Explain vehicle identification, vehicle safety certification label, and the VECI label.
8. Discuss the different types of emission standards.
9. Explain calibration codes and casting numbers.

This chapter will help prepare for the Suspension and Steering (A4) and Brakes (A5) ASE certification test.

KEY TERMS:

- Campaign
- Country of origin
- Flat rate
- Gross axle weight rating (GAWR)
- Gross vehicle weight rating (GVWR)
- Model year (MY)
- Owner's manual
- Recall
- Repair order (RO)
- Service information
- Technical service bulletin (TSB)
- Vehicle emissions control information (VECI)
- Vehicle identification number (VIN)
- Work order

SERVICE INFORMATION, WORK ORDERS, AND VEHICLE IDENTIFICATION

The owner's manual is the instructional booklet that comes with every new vehicle and includes important information. It has been said by many automotive professional technicians and service advisors that the owner's manual is not read by many vehicle owners. Most owner's manuals contain all or most of the following information:

1. Meaning of dash symbols
2. How to reset the maintenance reminder light
3. Specifications, including viscosity of oil needed and number of quarts (liters)
4. Tire pressures and standard, as well as optional, tire sizes
5. Maintenance schedule for all fluids, including coolant, brake fluid, automatic transmission fluid, and differential fluid
6. How to program the remote control, as well as the power windows and door locks
7. How to reset the tire pressure monitoring system (TPMS) after a tire rotation.

SEE FIGURE 1–1.

OWNER'S MANUALS

CONTENT

- The owner's manual is the instructional booklet that comes with every new vehicle and includes important information. It contains maintenance and service advice that the owner's manual must tell every vehicle owner.

- The owner's manual contains all or most of the following information:
  1. Meaning of all symbols
  2. Specifications, including viscosity of oil and number of quarts (liters)
  3. Tire pressures and standard, as well as optional, tire sizes
  4. Maintenance schedule for all fluids, including coolant, brake fluid, automatic transmission fluid, and differential fluid
  5. How to program the remote control, as well as the power windows and door locks
  6. How to reset the tire pressure monitoring system (TPMS) after a tire rotation.

SHOP CLOTH DISPOSAL

Always dispose of oily shop cloths in an enclosed container to prevent a fire. SEE FIGURE 1–69. Whenever oily clothes are thrown together on the floor or workbench, a chemical reaction can occur, which can ignite the cloth even without an open flame. This process of ignition without an open flame is called spontaneous combustion.

CASE STUDY

Lightning Damage

A radio failed to work in a vehicle that was outside during a thunderstorm. The technician checked the fuses and verified that power was reaching the radio. Both the radio and the antenna were replaced to correct the problem. SEE FIGURE 28–26.

Summary:

- Complaint—Customer stated that the radio did not work.
- Cause—Visual inspection showed an antenna that had been stuck by lightning.
- Correction—Replacing the radio and the antenna restored proper operation.

CASE STUDY

present students with actual automotive scenarios and show how these common (and sometimes uncommon) problems were diagnosed and repaired.
FREQUENTLY ASKED QUESTIONS are based on the author’s own experience and provide answers to many of the most common questions asked by students and beginning service technicians.

CAUTIONS alert students about potential damage to the vehicle that can occur during a specific task or service procedure.

WARNINGS alert students about potential dangers to themselves during a specific task or service procedure.

### WARNING

Do not use incandescent trouble lights around gasoline or other flammable liquids. The liquids can cause the bulb to break and the hot filament can ignite the flammable liquid, which can cause personal injury or even death.

### CAUTION: Do not use a screwdriver as a pry tool or chisel. Screwdrivers use hardened steel only at the tip and are not designed to be pounded on or used for prying because they could bend easily.

### REVIEW QUESTIONS

1. Why are wrenches offset 15 degrees?
   - a. to help with blind nuts
   - b. to avoid crossing over the nut
   - c. to make turning easier
   - d. to make putting the nut on easier

2. What are the standard automotive drive sizes for sockets?
   - a. 1/4 in.
   - b. 3/8 in.
   - c. 1/2 in.
   - d. All of the above

3. What is inside a dead-blow hammer?
   - a. lead core
   - b. aluminum core
   - c. rubber core
   - d. steel core

4. What type of screwdriver requires the use of a hammer or mallet?
   - a. slotted
   - b. Phillips
   - c. square
   - d. hex

5. Which type of wrench requires the use of a hammer or mallet?
   - a. box wrench
   - b. monkey wrench
   - c. ratchet wrench
   - d. channel lock wrench

6. Why are heavy-duty wrenches made from cast iron?
   - a. strength
   - b. weight
   - c. durability
   - d. all of the above

7. How do torque wrenches measure the amount of torque applied to a fastener?
   - a. using a gauge
   - b. using a spring
   - c. using a ratcheting mechanism
   - d. using a digital display

8. A 1/2 in.-drive ratchet gives the user _______.
   - a. more control over the tool
   - b. more leverage
   - c. more torque
   - d. all of the above

9. What are the other names for a line wrench?
   - a. channel lock wrench
   - b. slip-joint pliers
   - c. multigroove pliers
   - d. locking pliers

10. Why are wrenches offset 15 degrees?
    - a. to help with blind nuts
    - b. to avoid crossing over the nut
    - c. to make turning easier
    - d. to make putting the nut on easier

11. What is the proper term for Channel Locks?
    - a. wrench
    - b. locking pliers
    - c. channel lock wrench
    - d. channel lock pliers

12. What is inside a dead-blow hammer?
    - a. lead core
    - b. aluminum core
    - c. rubber core
    - d. steel core

### SUMMARY

1. Torque wrenches measure the amount of torque applied to a fastener.
2. Screwdriver types include straight blade (flat tip) and Phillips.
3. Hammers and mallets come in a variety of sizes and weights.
4. Pliers are a useful tool and are available in many different types, including slip-joint, multigroove, linesman’s, diagonal, needle-nose, and locking pliers.
5. Other common hand tools include snap-ring pliers, files, cutters, punches, chisels, and hammers.
6. Hybrid electric vehicles should be de-powered if any of the high-voltage components are going to be serviced.

### REVIEW QUESTIONS

1. Why are wrenches offset 15 degrees?
   - a. to help with blind nuts
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   - d. channel lock wrench

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   - b. weight
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   - a. using a gauge
   - b. using a spring
   - c. using a ratcheting mechanism
   - d. using a digital display

8. A 1/2 in.-drive ratchet gives the user _______.
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    - b. locking pliers
    - c. channel lock wrench
    - d. channel lock pliers

12. What is inside a dead-blow hammer?
    - a. lead core
    - b. aluminum core
    - c. rubber core
    - d. steel core

### CHAPTER QUIZ

1. The correct location for the pads when hoisting or jacking a vehicle can often be found in the _______.
   - a. service manual
   - b. shop manual
   - c. owner’s manual
   - d. all of the above

2. For the best working position, the work should be at _______.
   - a. neck or head level
   - b. shoulder level
   - c. at knee or ankle level
   - d. overhead by about 1 foot

3. A high-strength bolt is identified by _______.
   - a. UNC symbol
   - b. a UNC symbol
   - c. strength letter codes
   - d. a grade number

4. A fastener that uses threads on both ends is called a _______.
   - a. cap screw
   - b. machine screw
   - c. slotted head
   - d. cotter pin

5. Wrenches are made from _______.
   - a. cast from nickel steel
   - b. cast from chrome steel
   - c. machined from billet steel
   - d. forged alloy steel

6. The proper term for Channel Locks is _______.
   - a. Vise Grips
   - b. slip-joint pliers
   - c. locking pliers
   - d. multigroove adjustable pliers

7. Torque wrenches measure the amount of torque applied to a fastener.
   - a. using a gauge
   - b. using a spring
   - c. using a ratcheting mechanism
   - d. using a digital display

8. A 1/2 in.-drive ratchet gives the user _______.
   - a. more control over the tool
   - b. more leverage
   - c. more torque
   - d. all of the above

9. What type of tool can be used to remove fuel or refrigerant lines?
   - a. pliers
   - b. wrenches, or tube-nut wrenches
   - c. pliers, cutters, punches, chisels
   - d. pliers, cutters, punches, chisels, and hammers

10. Why are wrenches offset 15 degrees?
    - a. to help with blind nuts
    - b. to avoid crossing over the nut
    - c. to make turning easier
    - d. to make putting the nut on easier

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    - a. lead core
    - b. aluminum core
    - c. rubber core
    - d. steel core

12. Which type of screwdriver requires the use of a hammer or mallet?
    - a. slotted
    - b. Phillips
    - c. square
    - d. hex

### THE SUMMARY, REVIEW QUESTIONS, AND CHAPTER QUIZ

At the end of each chapter help students review the material presented in the chapter and test themselves to see how much they’ve learned.
## SUPPLEMENTS

### RESOURCES IN PRINT AND ONLINE

**Automotive Electricity and Electronics**

<table>
<thead>
<tr>
<th>NAME OF SUPPLEMENT</th>
<th>PRINT</th>
<th>ONLINE</th>
<th>AUDIENCE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Instructor Resource Manual</td>
<td>✔</td>
<td></td>
<td>Instructors</td>
<td>NEW! The Ultimate teaching aid: Chapter summaries, key terms, chapter learning objectives, lecture resources, discuss/demonstrate classroom activities, and answers to the in-text review and quiz questions.</td>
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<td>TestGen</td>
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<td>Instructors</td>
<td>All of the images and graphs from the textbook to create customized lecture slides.</td>
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<td>ASE Correlated Task Sheets—for Instructors</td>
<td>✔</td>
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<td>Instructors</td>
<td>Downloadable ASE task sheets for easy customization and development of unique task sheets.</td>
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<tr>
<td>ASE Correlated Task Sheets—for Students</td>
<td>✔</td>
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<td>Students</td>
<td>Study activity manual that correlates ASE Automobile Standards to chapters and pages numbers in the text. Available to students at a discounted price when packaged with the text.</td>
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<tr>
<td>VitalSource eText</td>
<td>✔</td>
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<td>An alternative to purchasing the print textbook, students can subscribe to the same content online and save up to 50% off the suggested list price of the print text. Visit <a href="http://www.vitalsource.com">www.vitalsource.com</a></td>
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All online resources can be downloaded from the Instructor's Resource Center: [www.pearsonhighered.com/irc](http://www.pearsonhighered.com/irc)
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