ADAS

Advanced Driver Assistance Systems

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Publisher
The Goodheart-Willcox Company, Inc.
Tinley Park, IL
www.g-w.com

Library of Congress Control Number: 2023940508

ISBN 979-8-88817-415-9

1 2 3 4 5 6 7 8 9 – 24 – 28 27 26 25 24 23

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Preface

Since its emergence in 1886, the automobile has progressed beyond the technology available in any other industry, even the airline industry—for example, a Boeing Dreamliner 787 only has 6.5 million lines of code, while modern vehicles contain nearly 20 times that. In fact, it is estimated that vehicles could contain 200–300 million lines of code by the year 2030. A large part of this development is because of the rapid evolution and growing availability of advanced driver assistance systems (ADAS) in vehicles. According to Strategic Market Research, of the nearly 16 million new passenger vehicles sold in 2021, 90% of them were equipped with at least one form of ADAS.

For this reason, ADAS training will provide technicians with an incredible opportunity for rapid advancement in the automotive industry. *Advanced Driver Assistance Systems (ADAS)* is geared toward current automotive technicians and students who have already undergone some basic vehicle system training. The content is designed to unpack the artificial intelligence, communication networks, and complex perception systems that are at the heart of ADAS features. In addition, the content provides additional knowledge on how fundamental vehicle systems and infrastructure have evolved and will continue to evolve to accommodate ADAS technology.

Chapters include safety recommendations; tools and equipment lists; facility and environmental requirements; liability and documentation information; and step-by-step guidance on repairing, programming, encoding, diagnosing, and calibrating specific ADAS features. To ensure that every learner has a basic understanding of the mathematical concepts used by ADAS technology, a chapter containing a review of math for automotive technicians is included. To expand knowledge within and beyond the text, Deep Dive features focus on specific events or concepts in ADAS development and implementation. Pro Tip features provide advice that has helped automotive technicians apply the textbook concepts in a shop setting.

In addition, the learner will gain hands-on experience by completing the job sheets associated with the chapter content. Case Study features explore real situations encountered by repair technicians and expose learners to what they might encounter when working in a shop. Finally, end of chapter critical thinking ASE-type questions help the user prepare for the ASE Education Foundation's Advanced Driver Assistance Systems Specialist (Test L4) certification.

About the Authors

Steve Zack has been a technician, technical engineer, and automotive technical instructor for most of his career. As an automotive technical instructor for Bosch, OTC, Mr. Zack taught technicians around the world how to use their electronic test equipment to diagnose difficult drivability and electronic issues using a hands-on approach. In 2017, Mr. Zack was the recipient of the ASE Training Managers Council (ATMC) National Excellence in Training Award. He held ASE Master and ASE L1 certifications and is a US EPA-certified Emission Master Instructor. He has been published many times, been featured in multiple diagnostic videos, and holds numerous automotive patents. Mr. Zack recently retired from Bosch, OTC after 28 years. He spends his time with family discovering how things work, riding his Moto Guzzi motorcycle, and thinking about the next great patent.

Kurt Shadbolt has over 37 years of experience as a technician and educator in the automotive industry. As a technician, he specialized in electrical, drivability, and diagnostics. Mr. Shadbolt has instructed at the high school, technical, and community college levels, and he has provided instruction at BMW/MINI and Lucid Motors manufacturer trainings as well as at numerous train-the-trainer and webinar events. Mr. Shadbolt is an ASE Master Technician with C1, L1, L3, and L4 certifications and is a California Bureau of Automotive Repair certified instructor. He is also a California licensed smog check inspector and repair technician and MACS-certified instructor. He has extensive experience in curriculum development and has completed work for multiple manufacturers, the State of California, regional grant projects, and various levels of public education. Currently, Mr. Shadbolt is a faculty member in the automotive department at Chabot College in Hayward, California, where he focuses on hybrid, EV, and ADAS.

Scott Brown is a professional automotive service technician and an independent automotive service and repair facility owner with over 38 years of professional experience. He is the owner of Connie and Dick's Service Center, Inc., an automotive service and repair shop and ADAS service training center. Dedicated to service industry relations, Mr. Brown is the former Industry Relations Manager and President of the International Automotive Technicians Network (IATN). He is also the founder of Diagnostic Network, an online community platform for automotive service industry professionals. Mr. Brown is currently an ASE Master Automotive Technician who holds L1, L3, and L4 certifications and is on the Board of Directors for NASTF, ASC-CA, and AMI. He is also a technical instructor with a strong focus on vehicle electronics; vehicle network communications; engine performance; automotive service information systems; and ADAS service, diagnostics, and repair.

Acknowledgments

The authors and publisher would like to thank the following companies, organizations, and individuals for their contribution of resource material, images, or other support in the development of *Advanced Driver Assistance Systems (ADAS)*.

- 3M—Transportation Safety Division
- AAA—The American Automobile Association, Inc.
- Autel North America
- Barry Gabie
- Buick
- Chabot College
- Dave Hobbs
- Delphi Technologies
- Department of Consumer Affairs, Bureau of Automotive Repair
- Diagnostics Network
- General Motors
- George Davy
- HERE Technologies
- Honda Motor Company
- Hunter Engineering Company
- Irene Rivas Blanco
- Lexus
- MaryAnn Zack
- Mike Cates
- Nelson Vargas
- Ouster
- Pico Technology
- SAE International
- Shop-Ware
- Siemens
- Steven A. Small
- Toyota Motor Corporation

ASE Connections

Advanced Driver Assistance Systems (ADAS) is correlated, where applicable, to the Advanced Driver Assistance Systems (ADAS) Specialist (Test L4) established by the National Institute for Automotive Service Excellence (ASE). These standards were developed with input from industry experts to ensure they reflect the skills students and technicians must master to succeed in the automobile service and repair industry.

ASE certification is becoming the benchmark for automobile repair technicians. It is recommended that you seek ASE certification once you have sufficient knowledge and meet the work experience requirements. Visit the ASE website for more information on ASE certification.

The ASE Education Foundation has established a training program accreditation process designed to improve the quality of training offered at both secondary and postsecondary levels. This foundation grants accreditation to programs that comply with their evaluation procedure, meet established standards, and adhere to the policies set forth by the organization. To learn more about the accreditation process, visit the ASE Education Foundation website.

Reviewers

The authors and publisher wish to thank the following industry and teaching professionals for their valuable input into the development of *Advanced Driver Assistance Systems (ADAS)*.

Larry Baker
Aims Community College
Denver, Colorado

Vance Bloom
Mt. San Jacinto College
San Jacinto, California

Dave Brown
Citrus College
Glendora, California

Steve Coultas
Victor Valley College
Victorville, California

Carlos Cruz
Mech-Tech College
Caguas, Puerto Rico

Richard Donia
Cypress College
Cypress, California

Roy Doucette
Rindge School of Technical Arts
Cambridge, Massachusetts

Kyle Finecy
Central Community College
Hastings, Nebraska

Josh Finley
Mission Valley ROP
Fremont, California

Scott Fockler
Greater Altoona Career and Technology Center
Altoona, Pennsylvania

John Frala
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Whittier, California

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Sinclair Community College
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Olle Gladso
Riverland Community College
Albert Lea, Minnesota

Andrew Gold
Río Hondo College
Whittier, California

Randy Golding
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Glendale, Arizona

Joe Gonzalez
Berks Career and Technology Center
Barto, Pennsylvania

Anthony Heathcoat
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Bill Heckathorn
Tennessee College of Applied Technology
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Greg Holekamp
East Central Community College
Decatur, Mississippi

Adam Karch
Parkland College
Champaign, Illinois

Nelson Kelly
Macomb Community College
Warren, Michigan

Casey Knecht
Daytona State College
Daytona Beach, Florida

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Wadley, Alabama

Chris McNally
Hudson Valley Community College
Troy, New York

Brian Noel
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Sacramento, California

Paul O'Connell
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Brian Palmiter
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Westampton, New Jersey

Paul Soar
Florida State College
Jacksonville, Florida

Terry Sparks
Tennessee College of Applied Technology
Livingston, Tennessee

John Timberman
Ivy Tech Community College
Terre Haute, Indiana

Steve Tomory
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Whittier, California

Adam Wolf
Northeast Technology Center
Kansas, Oklahoma

Features of the Textbook

The instructional design of this textbook includes student-focused learning tools to help you succeed. This visual guide highlights these features.

Chapter Opening Materials

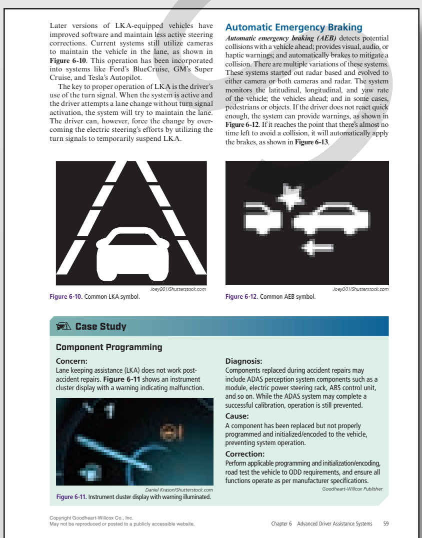
Each chapter opener contains a list of learning outcomes and a list of technical terms. Learning Outcomes clearly identify the knowledge and skills to be gained when the chapter is completed. **Technical Terms** list the key words to be learned in the chapter. **Introductions** provide an overview and preview of the chapter content.

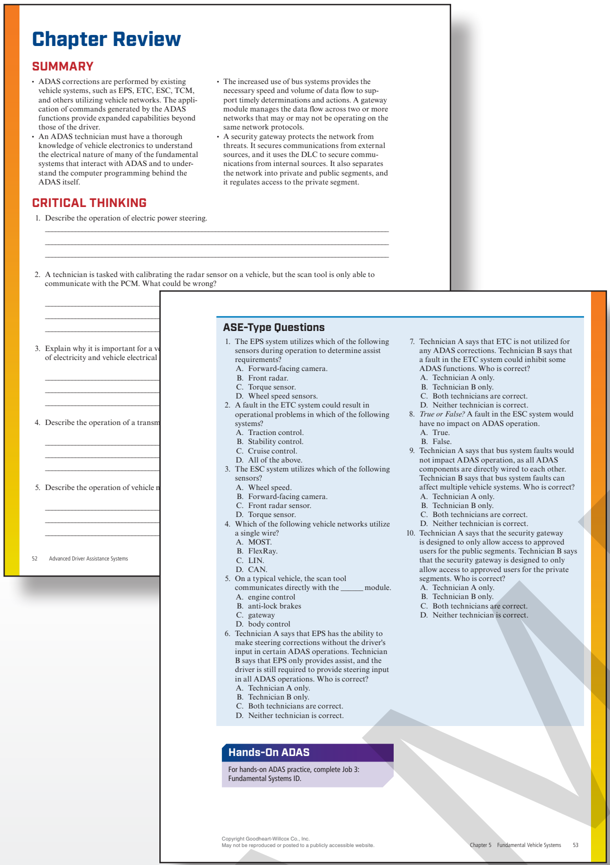
Additional Features

Additional features are used throughout the body of each chapter to further learning and knowledge. **Deep Dives** explore a topic related to ADAS by providing additional information or suggested sources outside the textbook for more in-depth learning. **Pro Tips** provide advice and guidance that is especially applicable for on-the-job situations. **Case Studies** showcase real-life situations that professional automotive technicians have encountered when calibrating, diagnosing, or repairing ADAS-equipped vehicles.

Photos and Illustrations

Photos and illustrations have been chosen to clearly and simply communicate the specific topic and show the latest equipment.



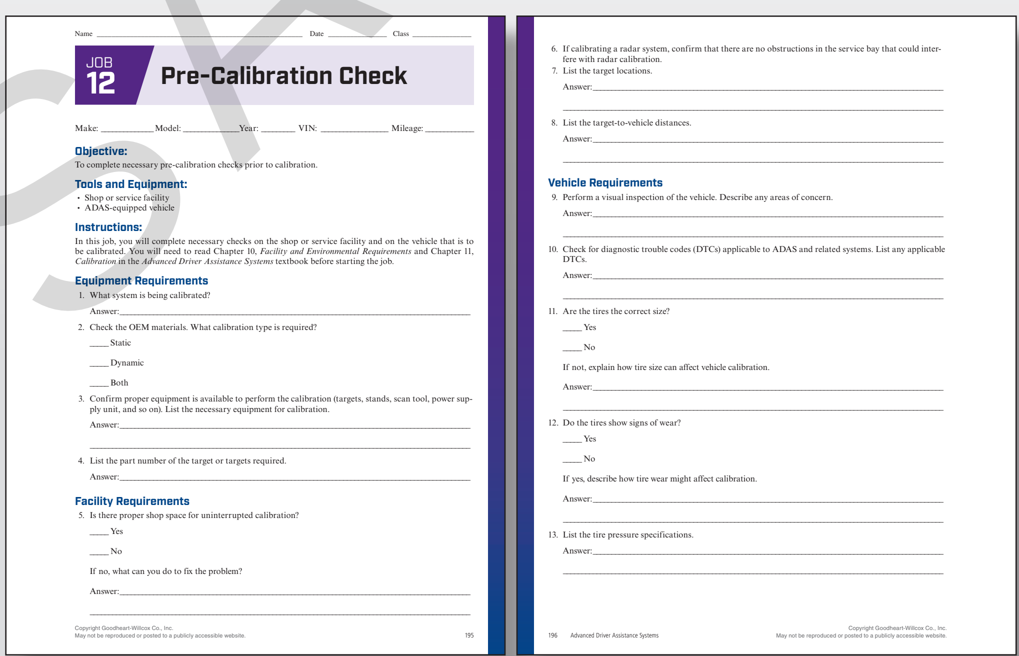


End-of-Chapter Content

End-of-chapter material provides an opportunity for review and application of concepts. A concise **Summary** provides an additional review tool and reinforces key learning outcomes. This helps students focus on important concepts presented in the text. **Critical Thinking** questions develop higher-order thinking and problem solving.

ASE-Type Questions enable students to demonstrate knowledge, identification, and comprehension of chapter material in the question style of the Advanced Driver Assistance Systems (ADAS) Specialist Test (L4) established by the National Institute for Automotive Service Excellence (ASE).

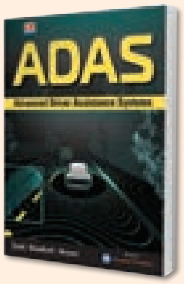
Hands-On ADAS points the student to the associated **job sheets** for hands-on practice opportunities.



TOOLS FOR STUDENT AND INSTRUCTOR SUCCESS

Student Tools

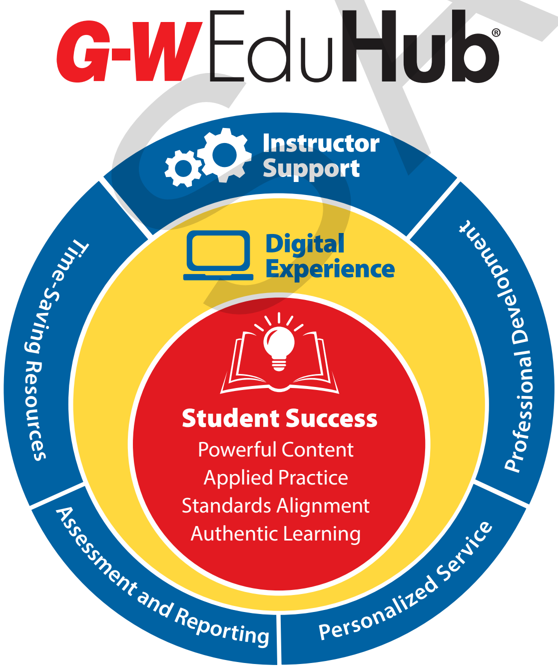
Student Text



Advanced Driver Assistance Systems (ADAS) is a comprehensive text that focuses on the information, technology, and procedures used by professional automotive technicians to service, diagnose, and repair ADAS-equipped vehicles.

G-W Digital Companion

- For digital users, e-flash cards and vocabulary exercises allow interaction with content to create opportunities to increase achievement.



Instructor Tools

LMS Integration

Integrate Goodheart-Willcox content within your Learning Management System for a seamless user experience for both you and your students. EduHub® LMS-ready content in Common Cartridge® format facilitates single sign-on integration and gives you control of student enrollment and data. With a Common Cartridge integration, you can access the LMS features and tools you are accustomed to using and G-W course resources in one convenient location—your LMS.

G-W Common Cartridge provides a complete learning package for you and your students. The following included digital resources help your students remain engaged and learn effectively:

- **Digital Textbook**
- **Videos**
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When you incorporate G-W content into your courses via Common Cartridge, you have the flexibility to customize and structure the content to meet the educational needs of your students. You may also choose to add your own content to the course.

For instructors, the Common Cartridge includes the Online Instructor Resources. QTI® question banks are available within the Online Instructor Resources for import into your LMS. These prebuilt assessments help you measure student knowledge and track results in your LMS gradebook. Questions and tests can be customized to meet your assessment needs.

Online Instructor Resources

- The **Instructor Resources** provide instructors with time-saving preparation tools such as answer keys, editable lesson plans, and other teaching aids.
- **Instructor's Presentations for PowerPoint®** are fully customizable, richly illustrated slides that help you teach and visually reinforce the key concepts from each chapter.
- Administer and manage assessments to meet your classroom needs using **Assessment Software with Question Banks**, which include hundreds of matching, completion, multiple choice, and short answer questions to assess student knowledge of the content in each chapter.

See www.g-w.com/advanced-driver-assistance-systems-2024 for a list of all available resources.

Professional Development

- Expert content specialists
- Research-based pedagogy and instructional practices
- Options for virtual and in-person Professional Development

Brief Contents

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Chapter 12

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Job Sheets

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Pro Tip

Case Study