

MANUAL DRIVETRAINS AND AXLES

FIFTH EDITION

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Upper Saddle River, New Jersey
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Library of Congress Cataloging-in-Publication Data

Birch, Thomas W. (Thomas Wesley)
Manual drivetrains and axles / Tom Birch, Chuck Rockwood. — 5th ed.
p. cm.
ISBN 0-13-199405-0
1. Automobiles—Power trains. 2. Automobiles—Axles. I. Rockwood, Chuck. II. Title.
TL260.B57 2008
629.2'4—dc22

2007060007

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This book was set in Weidemann Book by Carlisle Publishing Services. It was printed and bound by Edwards Brothers. The cover was printed by Phoenix Color Corp.

Thanks to Byers Chevrolet, Dublin, Ohio, for allowing us to shoot the cover image in their showroom.

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10 9 8 7 6 5 4 3 2 1
ISBN-13: 978-0-13-199405-8
ISBN-10: 0-13-199405-0

PREFACE

PROFESSIONAL TECHNICIAN SERIES

Part of Prentice Hall Automotive's Professional Technician Series, the fifth edition of *Manual Drivetrains and Axles* presents students and instructors with a practical, real-world approach to automotive technology and service. The series includes textbooks that cover all eight ASE certification test areas of automotive service: Engine Repair (A1), Automotive Transmissions (A2), Manual Drivetrains and Axles (A3), Steering and Suspension (A4), Brakes (A5), Electrical/Electronic Systems (A6), Heating and Air Conditioning (A7), and Engine Performance (A8). Current revised editions are written by experienced authors and peer reviewed by automotive instructors and experts in the field to ensure technical accuracy.

UPDATES TO THE FIFTH EDITION

- All content is correlated to 100% of the ASE and NATEF tasks for the Manual Drivetrains and Axles (A3) content area.
- New material describing electronic torque management (ETM), including electronic stability control (ESC), is included.
- New material on limited slip and locking differentials is presented.
- Many new photographs and line drawings help students understand the content material and bring the subject alive.
- Expanded content describing FWD platform-based AWD is included.
- Each technical topic is discussed in one place or chapter. Unlike other textbooks, this book is written so that the theory, construction, diagnosis, and service of a particular component or system is presented in one location.

ASE AND NATEF CORRELATED

NATEF-certified programs need to demonstrate that they use course materials that cover NATEF and ASE tasks. This textbook has been correlated to the ASE and NATEF task lists and offers comprehensive coverage of all tasks. A **NATEF TASK CORRELATION CHART** is located in the appendix of the accompanying worktext, now called NATEF Correlated Task Sheets.

A COMPLETE INSTRUCTOR AND STUDENT SUPPLEMENTS PACKAGE

This textbook is accompanied by a full package of instructor and student supplements. See page vi for a detailed list of all supplements available with this book.

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 “Real World Fix” and the “Real World Problem” features in this textbook 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.

IN-TEXT FEATURES

OBJECTIVES and **KEY TERMS** appear at the beginning of each chapter to help students and instructors focus on the most important material in each chapter. The chapter objectives are based on specific ASE and NATEF tasks.



TECH TIP

A common mistake made by new technicians is to think that the size of a bolt or nut is the size of the wrench used to turn the fastener. The size of the bolt or nut (outside diameter of the threads) is usually smaller than the size of the wrench or socket that fits the head of the bolt or nut. Examples are given in the following table:

Wrench Size	Thread Size
7/16 in.	1/4 in.
1/2 in.	5/16 in.
9/16 in.	3/8 in.
5/8 in.	7/16 in.
3/4 in.	1/2 in.
10 mm	6 mm
12 mm or 13 mm*	8 mm
14 mm or 17 mm*	10 mm

* European (Système



REAL WORLD FIX

A 1994 Saab 900 (90,000 miles) had a clutch problem so the clutch assembly and cable were replaced. The clutch now begins engaging with the pedal about 1" off the floor, way too soon. The technician cannot find any adjustment or parts that indicate that the linkage is self-adjusting.

Following advice, the technician moved the fuse box aside, and found the adjustment spring. Pulling the spring forward allowed the cable to readjust and fixed this problem.

TECH TIPS feature real-world advice and “tricks of the trade” from ASE-certified master technicians.

REAL WORLD FIXES AND PROBLEMS present students with actual automotive service scenarios and show how these common (and sometimes uncommon) problems were diagnosed and repaired.

NOTES provide students with additional technical information to give them a greater understanding of a specific task or procedure.

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

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

NOTE: Some power steering pumps are of the slipper or roller design instead of the vane type. See Figures 26-7 on page 515 and 26-8 on page 516. When the engine starts, the drive belt rotates the power steering pump pulley and the rotor assembly inside the power steering pump.

CAUTION: When the steering wheel is released, the spring force of the torsion bar returns the two elements to their natural positions. Fluid pressure equalizes throughout the steering gear and re-centers the piston in the middle of the steering gear.

WARNING: When the steering wheel is aimed straight-ahead, the valve is in its neutral position. Fluid enters the valve and flows equally to both sides of the steering gear piston and to the return line. See Figure 26-16.

HOISTING A VEHICLE Step-by-Step

(Photos courtesy of James Halderman)



STEP 1 The first step in hoisting a vehicle is to center the vehicle on the hoist.



STEP 2 Most vehicles will be correctly positioned when the left front tire is centered on the tire pad.



STEP 3 Many pads at the end of the hoist arms can be rotated to allow for many different types of vehicle construction.



STEP 4 The arms of the lifts can be retracted or extended to accommodate vehicles of different lengths and widths.

STEP-BY-STEP photo sequences show in detail the steps involved in performing a specific task or service procedure.

SUMMARY

1. Vehicles carry several different identification numbers
VIN: identifies the vehicle plus where and when it was assembled.
VECI: Necessary vehicle emission control information
Calibration codes
Casting number on major components
2. Vehicle service information is available in printed and electronic format as service manuals and TSBs.
3. Bolts, nuts, and studs, threaded fasteners use fractional inch or metric sizes; they also come in a series of grades.
4. Technicians have a tool set of hand tools in a variety of sizes. A technician must be able to use tools properly to prevent injury.
5. A technician must be aware of potential safety hazards when working on and around motor vehicles.

REVIEW QUESTIONS

1. The two common types of bolt sizes are _____ and _____.
2. A 5/16-18 bolt has _____ threads and a _____ diameter of 5/16".
3. A M8 X 1.5 bolt has a thread diameter of _____ and a _____ of 1.5 mm.
4. A grade 8 bolt is _____ than a grade 5 bolt.
5. Loctite is an _____ compound used to the nut on the bolt.
6. A Crescent wrench should properly be called an _____.
7. When you loosen a tight nut or bolt, you should _____ on the wrench.
8. The best tool to loosen a really tight nut is either a _____ socket or a _____ wrench.
9. A _____ is a good tool to measure a shaft to see if it is worn.
10. A _____ can be used to measure shaft end play or flywheel runout.
11. An oily shop cloth can ignite and burn without an open flame because of _____.
12. A critical step in lifting a vehicle on a hoist is to _____ the _____.
13. The third prong of a three-prong electrical plug is for _____.
14. Class B fire extinguishers are designed to extinguish _____ fires.
15. A _____ fire extinguisher is good for most types of fire.

CHAPTER QUIZ

1. Student A says that if a micrometer thimble is rotated two complete revolutions, the spindle will move 0.050". Student B says the micrometer barrel has 40 threads per inch. Who is correct?
a. Student A
b. Student B
c. Both A and B
d. Neither A nor B
2. Two students are discussing bolts. Student A says the wrench used with a bolt is the same size as the bolt. Student B says the thread diameter is the bolt size. Who is correct?
a. Student A
b. Student B
c. Both A and B
d. Neither A nor B

The **SUMMARY**, **REVIEW QUESTIONS**, and **CHAPTER QUIZ** at the end of Chapters 1 to 15 help students review the material presented in the chapter and test themselves to see how much they've learned.

SUPPLEMENTS

The comprehensive **INSTRUCTOR'S MANUAL** includes chapter outlines, answers to all questions from the book, teaching tips, and additional exercises.

An **INSTRUCTOR'S RESOURCE CD-ROM** features:

- A complete text-specific **TEST BANK WITH TEST CREATION SOFTWARE**
- A comprehensive, text-specific **POWERPOINT PRESENTATION** featuring much of the art from the text as well as video clips and animations
- An **IMAGE LIBRARY** featuring additional images to use for class presentations
- A **SAMPLE ASE TEST** as well as the complete **ASE TASK LIST**
- ASE Task Correlation Chart with check list. The chart correlates the ASE tasks to the text and Worktext.

Included with every copy of the book, the **STUDENT RESOURCE CD-ROM** features:

- A comprehensive, text-specific **POWERPOINT PRESENTATION** featuring much of the art from the text as well as video clips and animations
- A **SAMPLE ASE TEST** as well as the complete **ASE TASK LIST**
- ASE Task Correlation Chart with check list. The chart correlates the ASE tasks to the text and Worktext.

Available to be packaged with the book, the **NATEF Correlated Task Sheet** includes dozens of job sheets tied to specific NATEF and ASE tasks. Contact your local Prentice Hall representative for information on ordering the textbook packaged with the student worktext.

ACKNOWLEDGMENTS

A large number of people and organizations have cooperated in providing the reference material and technical information used in this text. The author wishes to express sincere thanks to the following organizations for their special contributions:

Acra Electric Corporation
 Advance Adapters
 Alston Race Car Engineering
 American Honda
 ARB Air Locker
 Band-It
 Harold Beck, Yuba City
 Borroughs
 Tom Broxholm, Skyline College
 John Brunner
 Borgwarner Inc.
 BWD Automotive Corporation
 Centerforce Clutches
 Chassis Ear, Steelman
 Cosmos International, Inc.
 CR Services
 DaimlerChrysler Corporation
 Dana Corporation
 Darrell Gwynn Racing Team
 Dorman Products
 Drive Line Service of Sacramento, Jim Scoggin
 Durston/Vim Tools
 Everco Industries
 Exedy/Daikin
 Fluke Corporation
 Ford Motor Company
 Joel Gelfand
 Gear Vendors, Inc.
 General Motors Corporation
 GKN Driveline
 James Halderman
 HeliCoil
 Hyundai Motor America
 Jerico Performance Products
 John Deere
 K-D Tools
 Kent-Moore
 L & T Slider Clutches, Lanny and Tony Miglizzi
 LUK Clutches
 Manual Transmission Warehouse, Richard Tinucci
 Mark Williams Enterprises
 McLeod Industries, Inc., George Koehler
 Mighty Mover

Moog Automotive
 Neapco
 OTC Tools
 Perfect Circle
 Phoenix Systems
 Plews
 Quarter Master Industries
 Racepak
 RAM Automotive
 Richmond Gear
 Rockland Standard Gear
 Snap-on Tools Company
 Sta-Lube
 Bill Steen, Yuba College
 Stock Car Products
 Summer Brothers
 Thexton Manufacturing Co.
 Tilton Engineering, McLane Tilton
 Toyota Motor Sales USA
 Tractech, Inc.
 Transmission Technologies Corporation, TTC
 Warn Industries
 Warner Electric
 Van Norman Equipment Company
 Zexel Torsen, Inc.

TECHNICAL AND CONTENT REVIEWERS

The following people reviewed the manuscript before production and checked it for technical accuracy and clarity of presentation. Their suggestions and recommendations were included in the final draft of the manuscript. Their input helped make this textbook clear and technically accurate while maintaining the easy-to-read style that has made other books from the same authors so popular.

Ron Chappell
 Santa Fe Community College

Curtis Cline
 Wharton County Junior College

Kenneth P. Dytrt
 Pennsylvania College of Technology

Russell A. Leonard
Ferris State University

William Milam
Eastfield College

Scott Russell
Blue Ridge Community College

Ken Welch
Saddlehack College/Mission Viejo High School

Photo Sequences

The author wishes to thank Rick Henry, Blaine Heeter, and Frank Clay of Sinclair Community College.

Tom Birch

Chuck Rockwood

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