

Contents at a Glance

<i>Introduction</i>	1
<i>Part I: Getting to Know Your Vehicle</i>	9
Chapter 1: Things Every Driver Should Know.....	11
Chapter 2: Preventive Maintenance: A Monthly Under-the-Hood Check.....	29
Chapter 3: The Way to Your Car's Heart Is through Your Toolbox	45
Chapter 4: What Makes It Go? The Inner Secrets of Your Car Revealed!.....	65
<i>Part II: Powering Up with Air, Fuel, and Fire</i>	79
Chapter 5: The Electrical System: Your Car's Spark of Life.....	81
Chapter 6: Keeping Your Electrical System in Tune	99
Chapter 7: The Traditional Fuel System: The Heart and Lungs of Your Car	125
Chapter 8: Keeping Your Fuel System in Tune.....	145
Chapter 9: Diesels For Dummies	161
Chapter 10: From Horses to Hybrids: Alternatively Powered Vehicles	181
<i>Part III: Staying Cool and In Control</i>	193
Chapter 11: The Cooling System Up Close.....	195
Chapter 12: Keeping Your Car from Getting Heartburn.....	203
Chapter 13: Oil: Keeping Your Car Young and Happy.....	233
Chapter 14: It's the Brakes!	249
Chapter 15: Be a Buddy to Your Brakes and Bearings.....	263
<i>Part IV: Smoothing the Ride: Steering and Suspension, Tires and Transmissions</i>	291
Chapter 16: Steering and Suspension Systems Smooth the Way	293
Chapter 17: How to Keep Your Car from Getting Sore Feet: Tires, Alignment, and Balancing	311
Chapter 18: Take the Drive Train: Understanding and Maintaining Your Transmission without Losing Your Mind.....	335
<i>Part V: Staying Safe and Dealing with Emergencies</i>	359
Chapter 19: Staying Safe on the Road	361
Chapter 20: Troubleshooting Leaks, Squeaks, Smells, and Strange Sensations.....	385
Chapter 21: What to Do If Your Car Drops Dead or Won't Start	397
Chapter 22: When All Else Fails: Finding and Dealing with a Good Mechanic.....	409

<i>Part VI: Helping Your Vehicle Look Its Best</i>	427
Chapter 23: Keeping Your Vehicle Clean and Beautiful	429
Chapter 24: Bodywork: Getting Rid of Dings, Dents, and Other Hard Knocks	449
<i>Part VII: The Part of Tens</i>	463
Chapter 25: The Ten Most Important Preventive Maintenance Measures.....	465
Chapter 26: Ten “Eco-Logical” Ways to Save Fuel	469
<i>Appendix A: A Practical Glossary of Automotive Terms</i>	475
<i>Appendix B: Specifications and Maintenance Records</i>	507
<i>Index</i>	513

Table of Contents

.....

<i>Introduction</i>	1
About This Book.....	1
How I Became Intimately Involved with My Car, and Why You Should Too	2
Conventions Used in This Book	3
How I Picture You.....	4
How This Book Is Organized.....	4
Part I: Getting to Know Your Vehicle.....	5
Part II: Powering Up with Air, Fuel, and Fire	5
Part III: Staying Cool and In Control.....	5
Part IV: Smoothing the Ride: Steering and Suspension, Tires and Transmissions.....	6
Part V: Staying Safe and Dealing with Emergencies	6
Part VI: Helping Your Vehicle Look Its Best	6
Part VII: The Part of Tens	7
Appendixes.....	7
Icons Used in This Book.....	7
Where to Go from Here.....	8
<i>Part I: Getting to Know Your Vehicle</i>	9
Chapter 1: Things Every Driver Should Know	11
Before You Tackle Any Job.....	12
Buying the right parts for your vehicle	13
Following safety rules	14
How to Fill 'Er Up Yourself	15
How to Open the Hood	17
How to Take Anything Apart — and Get It Back Together Again.....	18
How to Use a Jack Safely	20
How to Change a Tire	23
Removing a wheel cover or hubcap.....	24
Loosening the lug nuts	24
Changing the tire	26
How to Get In When You're Locked Out.....	28
Chapter 2: Preventive Maintenance: A Monthly Under-the-Hood Check	29
Getting Your Bearings under the Hood	30
Check the Air Filter	31
Check the Accessory Belts	32
Check the Battery	33

Check the Coolant	36
Check the Hoses	37
Check the Dipsticks	38
Check the oil	38
Check the automatic transmission fluid.....	40
Check the power-steering fluid.....	41
Check the Brake Fluid.....	41
Check the Wiring.....	43
Check the Windshield Washer Fluid	43
Check and Replace Windshield Wipers.....	43
Check the Tires.....	44
Drive and Enjoy!	44

Chapter 3: The Way to Your Car's Heart Is through Your Toolbox . . . 45

Shopping for Tools	45
Screwdrivers	46
Screwdrivers	48
Wrenches.....	49
Socket wrenches.....	49
Combination wrenches.....	51
Torque wrenches.....	52
Adjustable wrenches.....	53
Pliers	53
Gauges	55
Wire and taper feeler gauges	55
Tire pressure gauges.....	56
Compression gauges	56
Work Lights	57
Jacks	58
Jack Stands.....	59
Creepers	59
Fire Extinguishers	60
Funnels	60
More Things to Carry in Your Vehicle	61

Chapter 4: What Makes It Go? The Inner Secrets of Your Car Revealed! . . . 65

Keeping Your Owner's Manual Handy	66
Introducing the Engine Control Unit (ECU)	67
What Makes Your Vehicle Start?.....	68
What Makes Your Vehicle Run?	73
The ignition system.....	73
The cooling system	74
The lubrication system.....	74
The exhaust system	75
What Makes Your Vehicle Stop?	75

***Part II: Powering Up with Air, Fuel, and Fire* 79**
Chapter 5: The Electrical System: Your Car's Spark of Life 81

Introducing the Engine Control Unit (ECU)	81
The Starting System.....	82
The battery.....	83
The starter.....	85
The Charging System.....	86
The alternator.....	86
The voltage regulator.....	88
The Ignition System	88
The spark plugs	89
Modern distributorless ignition systems.....	93
Electronic ignitions with a distributor	94
Warning Lights and Malfunction Indicator Lights (MIL).....	96
Other Electrical Gadgets	97

Chapter 6: Keeping Your Electrical System in Tune 99

Determining Whether Your Vehicle Needs a Tune-up	100
Changing Your Spark Plugs	101
Finding your spark plugs.....	101
Deciding if you should do the job yourself.....	101
What you need to change and gap your plugs	103
Buying the right plugs.....	104
Removing old spark plugs	106
Reading your spark plugs.....	109
Gapping your spark plugs	111
Installing a spark plug.....	112
Replacing a Battery.....	114
Deciding if you should do the job yourself	114
Buying the right battery for your vehicle	115
How to remove and install a battery	115
Changing Fuses.....	116
Blade-type fuses	118
Tubular fuses	118
Dealing with Headlights and Directional Signals.....	119
Troubleshooting headlights.....	119
Determining which headlights you have.....	119
Replacing and adjusting halogen and Xenon headlamps.....	120
Replacing and adjusting sealed-beam headlights	121
Checking headlight alignment	122
Replacing directional signals	123

Chapter 7: The Traditional Fuel System: The Heart and Lungs of Your Car	125
Basic Fuel System Components	126
Fuel tank	126
Fuel lines and fuel pump	127
Fuel filters	128
Cold air collector box and air filter	129
The intake and exhaust manifolds	129
The fuel/air mixture	130
Following Fuel through the Fuel Injectors	130
Multi-port fuel injection	131
Sequential fuel injection	132
Gasoline direct injection	133
Throttle-body fuel injection	134
The Engine Block: Where the Fuel System and Ignition System Meet	135
Major engine components	135
The four-stroke power cycle	137
Supercharging with Turbochargers	140
The Exhaust System	141
The muffler	142
The PCV valve	142
The catalytic converter	143
Other emissions control devices	144
Chapter 8: Keeping Your Fuel System in Tune	145
Maintaining Your Air Filter	146
Checking and cleaning your air filter and cold air collector box	147
Buying and replacing an air filter	148
Replacing a Fuel Filter	148
Deciding whether to change a fuel filter yourself	149
Locating the fuel filter	149
Replacing a fuel filter	151
Replacing an insert in a fuel filter	151
Servicing the PCV Valve	152
Locating the PCV valve	152
Checking the PCV valve	153
Removing and replacing the PCV valve	154
Cleaning the PCV valve	155
Troubleshooting Catalytic Converters	155
Checking the Compression in the Cylinders	156
What to Do When All Else Fails	159
Chapter 9: Diesels For Dummies	161
Clean Diesels: Nontoxic Newcomers	161
The Pros and Cons of Diesels	162
What Makes It Go?	164

The Fuel System167
 The diesel four-stroke power cycle.....168
 Diesel fuel168
 The Electrical System171
 The Emissions System171
 Caring for Your Diesel.....173
 Changing the lubricating oil.....174
 Changing the air filter175
 Changing the fuel filters.....175
 Bleeding and priming the fuel system175
 Draining water separators.....176
 Jump-starting diesel batteries176
 Getting Started on a Frosty Morning178
 Block heaters178
 Battery warmers179
 Oil warmers179
 What not to do on a frosty morning.....179
 Finding a Reliable Diesel Mechanic180

**Chapter 10: From Horses to Hybrids:
 Alternatively Powered Vehicles181**

Ethanol182
 Flex-fuel Vehicles183
 Hybrids183
 Parallel hybrids184
 Series hybrids185
 Plug-in hybrids.....186
 Two-mode hybrids187
 Regenerative Brakes187
 Electric Vehicles (EV)188
 Hydrogen and Fuel Cell Vehicles190
 How fuel cells work190
 Natural Gas Vehicles (NGV)191

Part III: Staying Cool and In Control..... 193

Chapter 11: The Cooling System Up Close195

Coolant/Antifreeze196
 The Radiator197
 The hoses197
 The coolant recovery system198
 The pressure cap199
 The Fan199
 The Water Pump.....200
 The Thermostat.....200
 The Heater Core201

The Transmission Cooler	201
Air Conditioning	202

Chapter 12: Keeping Your Car from Getting Heartburn 203

Overcoming Overheating	203
Addressing occasional overheating	204
Dealing with a chronic hothead.....	204
Identifying other causes of overheating	205
Checking and Adding Liquid to Your Cooling System	206
Removing a pressure cap safely	206
Avoiding disaster when adding liquid to any type of cooling system	208
Checking and adding liquid to a coolant recovery system.....	209
Checking and adding liquid to a radiator.....	209
Flushing Your System and Changing Your Coolant.....	210
Deciding if you're up for the job.....	210
Determining whether your coolant needs changing.....	211
Figuring out how much coolant you need.....	212
Keeping coolant out of the mouths of babes and small animals	213
Flushing the system	215
Finding Leaks in the Cooling System	216
Look under your vehicle	217
Check the radiator	218
Check the pressure cap	218
Check the hoses	218
Buying and Replacing Hoses and Hose Clamps	219
Buying the right hose.....	220
Buying and replacing hose clamps	222
Replacing hoses.....	223
Repairing Leaks in the Cooling System	225
Radiator leaks	225
Leaks in the engine-block core plugs.....	226
Internal leaks.....	227
Leaky water pump.....	228
Locating leaks by pressure-testing the cooling system.....	228
Adjusting and Replacing Accessory Belts	229
Replacing Your Thermostat.....	230
Servicing Air Conditioners.....	231

Chapter 13: Oil: Keeping Your Car Young and Happy 233

How Oil Benefits Your Vehicle	234
Oil cools the engine.....	234
Oil keeps your engine clean	234
Oil cuts down on friction.....	234
Oil retards corrosion.....	235

What You Should Know about Oil235
 Oil additives236
 Viscosity ratings236
 Oil classification codes237
 Synthetic oil238
 Choosing the Right Oil for Your Vehicle238
 How Often You Should Change Your Oil240
 How to Change Your Oil Yourself241
 Get your supplies together242
 Do the job systematically244
 Clean up spilled oil thoroughly248
 Recycle your old oil and filter248

Chapter 14: It's the Brakes!249

Brake System Basics249
 The brake pedal250
 Power brakes251
 The brake master cylinder252
 Brake lines253
 Brake fluid253
 Drum Brakes254
 Brake drums255
 Wheel cylinders255
 Brake shoes256
 Brake linings256
 Adjusting devices257
 Disc Brakes257
 The Parking Brake258
 Anti-Lock Braking Systems (ABS)260
 How ABS works261
 What ABS doesn't do261
 Other Electronic Braking Systems262
 Brake Assist (BA)262
 Electronic brakeforce distribution (EBD)262

Chapter 15: Be a Buddy to Your Brakes and Bearings263

Checking Your Brake System264
 Checking your brake pedal265
 Checking your master cylinder267
 Checking your brake lines270
 Getting at Your Brakes271
 Things to do and not to do when working on brakes271
 Checking drum brakes273
 Reassembling drum brakes276
 Checking disc brakes277
 Checking and Packing Wheel Bearings279
 Inspecting and repacking your wheel bearings280
 A quick way to tell whether your bearing's wearing283

Flushing and Changing Brake Fluid.....	284
Bleeding Your Brakes.....	285
Adjusting Your Parking Brake.....	288
Checking Anti-Lock Brakes	289

***Part IV: Smoothing the Ride: Steering and Suspension, Tires and Transmissions*291**

Chapter 16: Steering and Suspension Systems Smooth the Way . . .293

The Steering System	293
The steering linkage.....	294
Power steering systems.....	295
Checking your steering.....	299
Suspension Systems	300
Major parts of the suspension system	301
Types of suspensions.....	307

Chapter 17: How to Keep Your Car from Getting Sore Feet:

Tires, Alignment, and Balancing311

Tire Construction	312
The Secrets on Your Sidewalls, Revealed!.....	314
Tire codes.....	314
Speed ratings	315
DOT identification and registration	316
Tire quality grade codes.....	317
Other sidewall information	318
Types of Tires	318
Passenger vehicles	318
Tires for trucks and SUVs.....	319
Specialized Tire Systems.....	320
Run-flat tires	320
Low-pressure warning systems	321
Self-inflating tire systems	322
Tips for Buying Tires	322
Caring for Your Tires	324
Checking tire inflation pressure	324
Adding air to your tires	327
Rotating your tires	327
Balancing your wheels.....	329
Aligning your wheels.....	329
Checking your tires for wear.....	332
Dealing with Defective Tires	334

Chapter 18: Take the Drive Train: Understanding and Maintaining Your Transmission without Losing Your Mind 335

The Drive Train	336
How Power Flows through the Drive Train.....	337
Four-wheel drive.....	340
All-wheel drive	341
Manual Transmissions.....	342
What a manual transmission consists of.....	342
How a manual transmission works	345
Automatic Transmissions	346
Dual-clutch transmissions.....	348
Continuously variable transmissions	349
Troubleshooting Your Drive Train	350
Symptoms of a sick transmission system	351
Those low-transmission-fluid blues	352
Taking Care of Your Clutch	353
Undertaking Transmission Repairs Wisely.....	354
How to Keep from Driving Your Transmission Crazy.....	356

Part V: Staying Safe and Dealing with Emergencies359

Chapter 19: Staying Safe on the Road 361

Air Bags	362
Traveling safely with air bags	362
How air bags work.....	363
Replacing air bags	365
Frontal air bags.....	365
Side air bags (SAB).....	367
Side Impact Protection Systems (SIPS)	368
Adjustable Devices.....	368
Child Safety Seats and Booster Seats	370
Child safety seat requirements.....	370
Choosing child safety seats	372
Smart Seat Belts	375
“Eyes” in the Back of Your Vehicle.....	376
Back-up beepers and sensors.....	376
Back-up cameras and monitors	376
Blind-spot information systems (BLIS).....	377
Brake-Shift Interlocks	378
Traction Control Systems (TCS)	378
Electronic Stability Control (ESC).....	379
Rollover Stability Control (RSC).....	381
Adaptive Cruise Control (ACC)	382
Telematics: How Cars Communicate	383
Navigation systems	383
Tracking systems.....	384

Chapter 20: Troubleshooting Leaks, Squeaks, Smells, and Strange Sensations	385
Sounds	386
Squeaks, Rattles, and Vibrations	389
Smells	390
Smoke	392
Leaks	393
Strange Sensations	395
Directional Signals	396
Chapter 21: What to Do If Your Car Drops Dead or Won't Start	397
Getting Off the Road Safely	397
Troubleshooting the Problem	400
Air	400
Fuel	401
Fire	402
Handling a Vehicle That Overheats on a Hot Day	403
Overheating When It Isn't Hot Outside	404
If Your Vehicle Won't Start	405
Won't-start symptoms	405
Jumping a start	406
Chapter 22: When All Else Fails: Finding and Dealing with a Good Mechanic	409
Choosing a Service Facility	409
Dealerships	410
Chain and department stores	411
Independents	412
Specialists	412
Finding a Reliable Service Facility	413
Evaluating a Facility	414
Getting the Best Possible Deal	416
Always check the invoice carefully	417
Establish a good relationship with your service facility	420
Complaining Effectively	422
Getting satisfaction on <u>any</u> complaint	422
Climbing the complaint ladder	424
Part VI: Helping Your Vehicle Look Its Best	427
Chapter 23: Keeping Your Vehicle Clean and Beautiful	429
Environmentally Safe Ways to Clean Your Vehicle	430
Cleaning the Exterior	431
De-bugging your vehicle safely	431
Washing your vehicle's body	432

Restoring visibility to windows and mirrors434
 Polishing metal trim and chrome435
 Caring for wheels and tires436
 Cleaning and repairing convertible tops436
 Cleaning and polishing your vehicle.....438
 Waxing your vehicle440
 Cleaning under the Hood441
 Cleaning the Interior442
 Keeping things tidy443
 Cleaning upholstery and carpeting.....444
 Fighting stains and odors445
 Repairing tears and holes.....446
 Caring for headliners446
 Cleaning floor mats447
 Cleaning inside the windows447
 Remembering Those Final Touches.....447

**Chapter 24: Bodywork: Getting Rid of Dings, Dents,
 and Other Hard Knocks449**

Getting Rid of Rust450
 Checking for rust450
 Dealing with any rust you find.....451
 Undercoating to prevent rust452
 Removing Small Dents and Dings.....453
 Filling Small Dents and Holes454
 Touching Up Your Paint Job455
 Installing New Weatherstripping or Patching the Old.....457
 Dealing with Damaged Windshields459
 Turning to the Pros for Larger Repairs459
 Evaluating body shops460
 Choosing parts.....461
 Checking bodywork462

Part VII: The Part of Tens.....463

**Chapter 25: The Ten Most Important Preventive
 Maintenance Measures465**

Change the Oil Frequently and Regularly465
 Do a Monthly Under-the-Hood Check.....466
 Check the Tire Inflation and Alignment.....466
 Keep the Interior Clean466
 Wash the Vehicle Frequently and Keep It Out of the Sun.....467
 Get Rid of Rust.....467

Change the Filters	467
Change the Coolant.....	468
Lubricate the Moving and Rubber Parts.....	468
Get Scheduled Maintenance to Keep Warranties Valid	468
Chapter 26: Ten “Eco-Logical” Ways to Save Fuel	469
Take a Look under the Hood.....	469
Start Up without Warming Up.....	470
Drive Eco-Logically	471
Structure Trips to Save Fuel	472
Fill 'Er Up Eco-Logically.....	473
Keep Your Side Windows Shut and the AC Turned Off	473
Keep Your Tires Properly Inflated.....	473
Clean Out the Junk	474
Keep Your Vehicle Waxed.....	474
Use a Trailer Instead of a Roof Rack.....	474
 <i>Appendix A: A Practical Glossary of Automotive Terms</i>	 <i>475</i>
 <i>Appendix B: Specifications and Maintenance Records</i>	 <i>507</i>
Specifications Record	508
Maintenance Record	509
 <i>Index.....</i>	 <i>513</i>