Car Hacks & Mods FOR DUMMIES®

by David Vespremi

Wiley Publishing, Inc.

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About the Author

David Vespremi is an automotive expert and has appeared on national television programs and automotive print media for his unique insights into cutting edge import car technology.

An attorney by trade, David has spent the past few years living and breathing car modifications, and working closely with top engineers and tuners in the hub of California's import car scene. A track driving instructor with various car clubs at Thunderhill Raceway in Northern California, David enjoys modding and driving his JDM Toyota MR2 Turbo (featured numerous times in *Sport Compact Car* magazine) and (having grown up on his share of Volkswagen Golfs, Jettas and GTIs) has recently acquired an E30 BMW that he has been tinkering with to get back in touch with his Euro roots.

David lives in Menlo Park, California, with his wife Hadley.

For more on *Car Hacks & Mods For Dummies*, visit `www.carhacksandmods.com`. David can be reached at `author@carhacksandmods.com`.

Dedication

I would like to dedicate this book to my parents, for their unequivocal and boundless support of my enthusiasm for all things car related, even if none of us have any idea how I became so fascinated with cars. I would also like to thank my wife Hadley, for being patient and devoted through the course of this book. There is, however, one person that captures the spirit of this book, and that is my sister Sarah, a critical co-editor and contributor to this project. Couldn't have done it without you — thanks to the best sister ever!

Author's Acknowledgments

There are books dealing with cars, various aspects of their upkeep and ownership, and then there are car books. This project, which represents a comprehensive and current reference, for touching on nearly all performance aspects of late model cars, required a fair bit of technical expertise and guidance. The list of those that helped along the way is far too long to recount here, but a few contributors to this project merit special acknowledgement:

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We're proud of this book; please send us your comments through our online registration form located at www.dummies.com/register/.

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Foreword

Cars are literally the vehicles by which we see the world, and by which the world sees us. Second in value only to the homes in which we live, cars are the reflection of who we are when we are in transit — out in the world commuting to work or having fun on the weekend. They are also the closet bond most people ever form with a machine. We think a movement, and the car translates that thought, that impulse, into action. The car becomes an extension of ourselves.

Few things are as often mutually desired and accessible as an automobile. With that possession comes opportunity, as some folks see it, to do something different. Something cool. As cars become more and more alike with each passing model year, the drive for owners to individualize them grows increasingly stronger. We want to feel something towards our cars — and anonymity isn't conducive to generating powerful emotions.

For some, that means making horsepower, or building the ultimate handling machine, while others opt for cosmetic upgrades. An ambitious few genuinely attempt all improvements in all areas. If every car is a blank canvas, there are a lot of blank canvases out there and a lot of visionaries that will commit some degree of their time, money and energy into expressing themselves through that canvas.

There is also a multi-billion dollar aftermarket literally overflowing with parts and accessories that provide the pallet for working the canvas. But getting results that improve upon what you have rather than detract from it is no easy endeavor. It is with these costly pitfalls — and glorious potential — in mind that this book was born.

Though outright performance can be objectively measured, verified and quantified, the overall success of a project cannot. Money is often wasted on ill-conceived or poorly executed modifications. So many cars are impressive on paper, but in application are underwhelming. Still others are so one-dimensional that their owners are left disillusioned after the novelty of their one-trick pony wears off (and therein lies the rub: a focused "one-trick pony" is often the perfect, uncompromised project — although few people are content with a car that only does one thing well). Planning and honest appraisal then is key — and that planning cannot come without knowledge, perspective, and the resources this book provides.

This book will not go into detail discussing compressor maps, valve overlap, or rod ratios on stroker engines. There is plenty of room left for further research. Rather, it is intended as a general guide for the novice and tuning veteran alike — the entire industry, as we could fit it, in a nutshell. This is the reference guide that we, the "experts," wish we had when we started, and the book that the headstrong don't think they need today — but will someday when their intentions don't necessarily match their results. Some things are eternal.

Drive safely, and happy modding!

Terrell E. Heick III

Editor-in-Chief, FreshAlloy.com

Automotive Freelance Writer

Introduction

Welcome to *Car Hacks & Mods For Dummies!* This book covers everything you need to increase the performance of your car for faster acceleration, shorter stopping, improved handling, and increased overall performance. It's my pleasure to introduce you to the world of car hacks and mods — an important part of my life for the past 15 years and one in which I have been immersed nearly every waking hour of every day.

The hacks and modifications that you can make to your car range from accessible and inexpensive to as technically demanding and costly as you want. It's very easy to find ways to improve the car you drive. Most people (Americans especially) spend so much time in their cars that these improvements can often be profoundly rewarding.

Even if this book is your first conscious exploration of how to go about improving the appearance or performance of your car, you've probably thought about what you would have done differently had you participated in the design and engineering meetings when your car was created. This book frames those thoughts and guides you through implementing the changes that you want to make to your car.

This book identifies areas of car dynamics and performance that you might not have realized were issues until after you had the opportunity to understand the how's, why's, and what's of the way car enthusiasts go about tuning and tweaking their cars (for example, making a humble economy sedan perform more like a high-performance sports car, and making a sports car perform at a whole new level). This book also provides useful modification tips that allow car owners to begin exploring popular weekend automotive performance pastimes, including autocross, drag racing, road course driving, drifting, and rally racing — many of which can help make you a safer and more confident driver on the road.

Modifying cars for higher performance is a multibillion-dollar industry in the United States. Upgrades are available for most late model cars and SUVs that fit any budget and any set of requirements. Americans spend more time behind the wheels of their cars than any other nationality. To most Americans, their automobiles are their costliest and most valued possessions, second only to their homes.

As cars become more sophisticated, more reliable, and better built, drivers become more attached to them. During the week, people rely on their cars for safe transportation to and from work, for running errands, for taking the kids to soccer practice, and so on. On the weekends, drivers take their cars out for the joy of driving or for a fun-filled getaway from their workaday lives.

So cars become an extension of their drivers. Discretionary spending on cars is at an all-time high. Americans are keeping cars longer while finding new ways to fall in love all over again with the cars they already own.

Sprucing up a car you already own is a terrific way to give an existing car a second lease on life and make a new car purchase (and the depreciation that accompanies it) much less attractive. Or perhaps you want your new car to be a little bit better or different from any other car in your neighborhood. Still another reason to modify your car is because you have a particular area or areas of your car that you want to improve so your car will be perfect.

Whether you want a little more power for merging on the freeway on-ramp every morning, or you want less slipping and squealing around the corners on your favorite twisty road, this book helps you make your car everything you want and more.

As you read this book, you'll pick up some useful technical insights along the way, and you'll have a terrific time finding out how to make your car better suit your driving style and your personal flair.

About This Book

Many of the concepts that I discuss in this book are related and naturally flow together. Reading about one particular modification path may encourage you to read further about other areas of modification. This book is nonetheless a reference manual designed to guide you to useful information on specific areas of car modification. Feel free to skip ahead and jump around from chapter to chapter. There's no test at the end of this book, so have fun with it!

Although many of the concepts discussed in this book apply to most cars, this book most directly speaks to the owner of a late model "sport compact" car such as a Honda Civic or a Ford Focus. But this book is also useful if you own a truck or SUV. Although the manufacturers used to illustrate performance products may differ, the core technology and engineering concepts apply universally.

How This Book Is Organized

This book is divided into nine parts, each part containing chapters that address a different aspect of modifying your car. The areas include appearance, acceleration, braking, handling, safety, and diagnostics. While this book is not intended to be an instruction manual, I do indicate the relative ease or difficultly of installation for many of the products discussed in each of these areas.

Part 1: Owning a Performance Car

The term *performance car* is not as literal as it sounds, and it can mean many things. While you might be tempted to scoff at the little economy car with pretensions of being a performance car, innovations in the performance aftermarket industry allow this benign platform to match conventional performance cars. Even the owner of a Ferrari F40, a benchmark if ever there was one, may have modified it for even better performance than a stock F40.

But there's no free lunch. Performance often goes hand-in-hand with compromise. This can mean the expense and time needed to purchase and install the shiny new go-fast part, or the compromise can be that improving one aspect of a car's performance means that another aspect has to suffer. For example, the suspension part that allows the car to corner faster and more confidently may also make the ride rougher. Likewise, an exhaust system that looks and sounds great on a car, and maybe even adds some power, might become obnoxious on longer trips or draw the unwanted attention of local police.

Owning a performance car may mean different things to different types of drivers. This part of the book explores what it is that drivers are really after when they choose to modify their cars, how they set realistic expectations, and how to know whether they will be happy with the finished modification.

Part 11: Safety

You shouldn't be surprised that safety comes first. Though it's tempting to dive headlong into the horsepower modifications, it's essential to increase the car's safety as its performance increases.

This part covers the safety upgrades to help ensure that, as the car becomes leaner, meaner, and a whole lot faster, driver and passenger safety is part of the plan. This part places equal emphasis on active safety upgrades, such as handling, and passive safety modifications, such as roll bars.

Part 111: Rims and Rubber

Changing the wheels and tires is one of the first upgrades most people make to their otherwise stock cars. Wheels can make or break the look of a car. Wheel and tire selection also has a profound impact on a car's performance. Considerations such as rotating and unsprung mass, as well as grip and breakaway characteristics, all come into play with rims and rubber.

Part IV: Stylin'

This section emphasizes what ensures that your car looks its best. Read this part before you order a full set of underbody neons or a monster aluminum wing that could double as a park bench. Fashion is fickle in the car world. A sense of what is appropriate when improving a car's looks and aerodynamics can keep you off the Web sites that mock poorly executed automotive dress-up attempts. (The Honda with a plywood body kit holds a special place in my heart.) This part also covers detailing to keep your car looking its best whether it is your daily driver or weekend cruiser.

Part V: Slowing Down

An often-quoted racing adage is that you have to go slow to go fast. This part discusses the importance of being able to safely, quickly, and predictably scrub off speed, whether on the track or on the freeway. Races are won and lost in the braking zones, and beautiful cars are crumpled and lives lost for lack of attention to brakes. Brakes are actually equal parts performance modification and active safety. The moral of this part: Never add power to your car without thinking about the implications to stopping ability.

Part VI: Corner Carver

Some modifiers live for the corners. This part guides you through making your car handle with the best. Cornering is where a Subaru WRX station wagon can be set up to pass a Porsche 911 on a twisty road. In motor sports, corners are the great equalizers. Whether you have 900 horsepower under the hood or 90, balancing the car and taking corners at speed is where the gods of G-forces and adhesion don't play favorites. This section covers everything from simple spring and shock upgrades to full racing coilover suspensions and corner balancing.

Part VII: Let's Go!

Absolute power corrupts absolutely. The most sought-after goal of automotive performance is extra power with minimum hassle and expense. Whether you want to eke out a few extra horsepower or triple your car's original output, this part walks you through the fundamentals of adding power.

Part VIII: Faster Thinking

This part goes straight to your car's brain, the ECU (Engine Control Unit). You can optimize your car's engine performance, fuel mileage, and even emissions by hacking your car's computer with electronic controllers, standalone engine management systems, and remaps. As cars depend more on ECUs to control nearly all aspects of performance, extracting additional performance from your car often becomes less about what you have under your hood and more about what is going on in your car's brain.

Part IX: The Part of Tens

Whether it's online resources you're after, or you simply want to avoid common mistakes, the Part of Tens is here to help. In this part, I show you were to find resources to debunk common myths about modifying cars, as well as areas to consider in your car hacking and modding adventures.

Icons Used in This Book

This icon points you to useful tips and insights to keep you on the right track when hacking or modding your car.

This icon is often used to explain technical concepts or provide background on the how's or why's behind the modification being discussed. This icon is excellent for those wanting to understand a bit more in depth the functional or engineering context around which a modification is being presented.

Car hacking and modding can have dire consequences if done incorrectly. This warning icon helps steer you away from common pitfalls, blunders, and misconceptions.

These icons identify key information that you should keep at the top of your brain.