

# Build Your Own Car PC

**Do-it-yourself,  
customized  
installation  
in any car:**

- Satellite Navigation
- Multimedia Jukebox
- DVD Player
- Remote Control via PDA
- On-Board Diagnostics



**GAVIN D. J. HARPER**

# **Build Your Own Car PC**

**Gavin D. J. Harper**

**McGraw-Hill**

New York Chicago San Francisco Lisbon London Madrid  
Mexico City Milan New Delhi San Juan Seoul  
Singapore Sydney Toronto

Cataloging-in-Publication Data is on file with the Library of Congress.

Copyright © 2006 by The McGraw-Hill Companies, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

1 2 3 4 5 6 7 8 9 0 DOC/DOC 0 1 0 9 8 7 6

ISBN 0-07-146826-9

*The sponsoring editor for this book was Judy Bass and the production supervisor was Pamela A. Pelton. It was set in Minion by Keyword Group Ltd. The art director for the cover was Anthony Landi.*

*Printed and bound by RR Donnelley.*



This book was printed on recycled, acid-free paper containing a minimum of 50% recycled, de-inked fiber.

McGraw-Hill books are available at special quantity discounts to use as premiums and sales promotions, or for use in corporate training programs. For more information, please write to the Director of Special Sales, McGraw-Hill Professional, Two Penn Plaza, New York, NY 10121-2298. Or contact your local bookstore.

The manufacturers' logos in this book are displayed for the purposes of illustration, and to aid the reader in product identification. No warranty, endorsement or validity is given to the book by any of the manufacturers featured.

The author endorses the products shown in the book, as he has proven them to be a winning combination for a good Car PC setup; however, no responsibility is accepted for changes in product specification or any variations which may result in incompatibility.

The author has used his best endeavors to ensure that the URLs for external websites referred to in this book are correct and active at the time of going to press. However, he has no responsibility for the websites and can make no guarantee that a site will remain live or that the content is or will remain appropriate.

Information contained in this work has been obtained by The McGraw-Hill Companies, Inc. ("McGraw-Hill") from sources believed to be reliable. However, neither McGraw-Hill nor its authors guarantee the accuracy or completeness of any information published herein, and neither McGraw-Hill nor its authors shall be responsible for any errors, omissions, or damages arising out of use of this information. This work is published with the understanding that McGraw-Hill and its authors are supplying information but are not attempting to render engineering or other professional services. If such services are required, the assistance of an appropriate professional should be sought.

# Foreword

For the first half of the twentieth century, industry, society and culture were changed forever by the invention of the automobile. The second half of the century experienced a greater shift caused by the global availability of computers. The start of the twenty-first century marks the beginning of an explosion as the two greatest forces of the previous century merge.

New car computing technologies are emerging on a weekly basis. As these technologies surface most people will underestimate the potential by only looking at the obvious features such as navigation, movie playback, mp3 playback, OBD (on board diagnostics), voice recognition and Bluetooth integration. There is so much more on the horizon.

I think most advanced car features will be created by user-designed software packages. Market differentiation for auto manufacturers will not come from who has the greatest factory-installed features, but who complies best with open standards to allow for the global creativity of software developers to enter the car. Instead of replacing the car to get the newest navigation system or car feature the owner will just upgrade the software and processor. For the most part, the computer industry leaders have embraced open standards; however, automotive manufacturers have strongly resisted standards. I hope we can work together to make sure the hood doesn't get welded shut as the car leaves the factory.

I dream of future car computing to be anything the owner or driver desires through open standards. There is no doubt in my mind that if the car computing community can successfully orchestrate a collaboration between current automotive and computing technology leaders this truly will be a twenty-first century explosion. The growth of car computing will increase quality of life, safety, work place efficiency and even help save the environment. Does that sound a little bit crazy? Yes. It sure does sound crazy but it will happen.

Since the advent of computers, car geeks who wanted computer integration have suffered from problems that scared off all but the most determined. These problems have inspired over 500,000 questions and answers on the Mp3Car.com support forums. The forums have attracted millions of geeks from all around the world who still struggle to get a computer in their car. I am so excited to see books like this that simplify the installation process, organize forum data and move car computing into a mainstream hobby.

ROBERT WRAY

*Co-Founder and CEO of mp3CAR.com/*



# Preface

In-car electronics has come a *very* long way. Only a few decades ago “in-car entertainment” was unheard of. Since then fads have come and gone, in-car record players, tape cassettes, video cassettes and eight-tracks are all now unheard of, while radio has endured.

I got interested in Car PCs when I started to look around at “traditional” in-car entertainment. I quickly began to realize that there was little chance of putting together a coherent system to deliver multimedia, navigation and advanced features without boxing myself into a corner by buying from just one manufacturer.

It rapidly became apparent that proprietary standards rule in in-car entertainment and telematics, and that if I wanted an integrated system that fulfilled all my needs – and here’s the catch – at a reasonable price, I was going to need to think outside the [bass] box and look at an innovative solution.

The electronics industry is constantly delivering new innovations; new formats come out every couple of years. In-car entertainment has evolved, radio is in a transition period, moving from analog to digital, and when you think about the variety of different media and technologies that can be stored on a 15 cm optical disk, with new technologies such as Blu ray and HD DVD in the pipeline, you begin to realize that a hard-wired, fixed solution cannot compete with a modular, upgradeable, “update the software and it works,” flexible solution.

And the beauty is, you can express your individuality through your Car PC setup in the same way as you can with car modifications.

For ages, buying bigger and better, faster and more powerful cars has been the rage; performance has been the order of the day – however, it is dubious whether this can continue indefinitely. Oil prices are soaring through the roof, and despite the reluctance of petrol-heads to give up their gas-guzzlers, one day an age may dawn where legislation, prices and physical resources dictate that owning a hydrocarbon-munching monster is no longer cool.

People will always want to be individuals, customizing their vehicle to their own tastes and preferences.

Will car bumper stickers someday read “My other Car PC is a Mac”??

Enter the Car PC – megahertz is the new horsepower, code the new gas.

I will conclude with a short quote from a Forrester Research report:

“Just as the hot rodders of the 1950s begat Detroit’s muscle cars of the 1960s, today’s telematics hackers portend the future of telematics innovation.”



# Acknowledgments

A book is never the work of one person; the ideas expressed by the author are always the result of the help and encouragement of a large number of people, an invisible support network, working behind the scenes to make things work.

First of all a major thank-you to Tim Watson from Photomedia UK Ltd., without whose help, the high-quality close-up photography for this book would not have come to pass. If a picture tells a thousand words, then Tim has surely written much more of this book than I.

My fascination with Car PCs started when I was working for Betoddoreven.com. Without the encouragement of Brian Reid, my boss, and the rest of the staff at Betoddoreven.com, this project might never have left the ground. Thanks for all the encouragement you gave me.

I would like to convey my appreciation to all the people who helped me procure components for the build pictured in this book. Thanks to Beth Ellerman at Hitachi. To the folks at Pioneer, Carole Love, and Brendan Sheridan, thanks for all their help. Gratitude to Louise Huang at Travla. Thanks to Gillian Smith and Sam Harmer at Crucial Memory.

Another great big thank-you to Bulent Özen, whose expertise in on-board diagnostics has proved invaluable throughout writing the section on OBD. All of the designs in that section were developed by his firm Özen Elektronik, and I am truly grateful that he has allowed me to reprint his designs.

I would also like to thank Gaynor de Wit, Werner du Plessis, Stuart and Richard Brown, and Fiona Gatt at VIA

My thanks to Robert D. Wray, who has been great to bounce ideas off of and who wrote the Foreword to this book.

Thanks also to Armen and Marina at DigitalWW.

There is bound to be someone who has provided help along the way that has been omitted, my sincerest apologies.

Thanks to Andy Baxter at Keyword and Alan Foster for making the copy edit on this book really painless. Thanks for your patience guys.

Finally, but certainly not least, a big thank you to the folks at McGraw-Hill, to everyone in the office who makes dealing with McGraw-Hill such a joy, especially Anthony Landi and Diana Mattingly.

The biggest thank-you has to go to my amazing editor Judy Bass, who I am totally indebted to for being totally magnificent and making the whole publishing process such a breeze. I am still of the conviction that Judy is one of the nicest people in New York.



# Contents

Foreword ix

Preface xi

Acknowledgments xiii

## Chapter 1 Why would I want to build a Car PC? 1

*Custom car/Kit car builders* 2

*Audio jukebox* 3

*Radio replacement* 4

*In-car video* 5

## Chapter 2 Buying your components 7

*Travla/Casetronic C1xx Case* 7

*VIA EPIA SP 1300 Motherboard* 9

*Pioneer DVR-K04 DVD media drive* 12

*Hitachi Endurastar 30GB hard disk* 14

*Griffin Radio Shark* 16

*Griffin RocketFM* 17

*Griffin Air Click USB* 19

*Griffin Total Remote* 20

*Özen Elektronik mOByDic OBD interface* 21

*Crucial memory 1GB compact flash card* 23

*Andrea Electronics DA-350 Auto Array microphone* 23

## Chapter 3 Building your Car PC base unit 25

*Motherboard walk around* 30

*Mounting the motherboard* 35

## Chapter 4 Installing the operating system, motherboard drivers and choosing a front end 77

*The alternative to Windows (some would say the dark side...) – Open Source* 77

*Installing Windows XP* 77

*Choosing a Car PC front end* 86

## Chapter 5 Connecting your Car PC to the “Real World” 89

*Getting to grips with in-car power* 89

*In-car monitor options* 92

*Connecting your Car PC to a VGA monitor* 95

*In-car audio* 100

## Chapter 6 On-board diagnostics 105

*How it all works* 107

*Cracking your car’s OBD-II interface* 107

<i>The mOByDic hardware</i>	109
<i>Parts list</i>	110
<i>Using the circuit</i>	114
<i>OBD software</i>	115
<i>Comprehensive DTC listing</i>	116
<b>Chapter 7 In-car speech recognition</b>	129
<i>What's the point?</i>	129
<i>Styles of speech recognition</i>	130
<i>How many users?</i>	131
<i>Setting up audio and microphone properties</i>	139
<i>Voice recognition software</i>	141
<b>Chapter 8 Killer software applications for your Car PC</b>	143
<i>Lap timer</i>	143
<i>Automotive Wolf</i>	144
<i>MileMate</i>	146
<i>Vehicle Project Planner</i>	148
<i>Auto Organizer Deluxe</i>	149
<i>Engine Performance Math Calculator</i>	150
<i>Car Care</i>	151
<b>Chapter 9 Getting more out of your Car PC</b>	153
<i>Adding a webcam for reversing safely</i>	153
<i>Controlling your Car PC remotely with the Air Click remote control</i>	154
<i>Controlling your Car PC from your PDA with Total Remote</i>	155
<i>Installing the Griffin RocketFM</i>	162
<i>Replacing your radio</i>	168
<i>Griffin Radio Shark</i>	168
<i>Add a twiddly knob to your Car PC with the Griffin Powermate</i>	171
<b>Chapter 10 In-Car GPS</b>	179
<i>GPS: the background information and history</i>	179
<i>How does the technology work?</i>	180
<i>Choice of GPS hardware</i>	181
<i>Choice of GPS software</i>	183
<i>Typical GPS installation</i>	184
<b>Epilogue</b>	187
<b>Appendix A: Supplier's Index</b>	191
<b>Appendix B: Car PC Forums and Clubs</b>	195
<b>Appendix C: Car PC Installs</b>	197
<b>Appendix D: Car PC Software Links</b>	201
<b>Index</b>	203



# Chapter 1

## Why would I want to build a Car PC?

In the past several years, there has been an explosion in the amount of electronic functions and features that are available to the driver and passengers of the modern automobile.

Satellite navigation is now commonplace with small GPS devices available for only a few hundred dollars while the explosion in in-car multimedia has resulted in some very attractively priced head units coming to market.

Bluetooth phones are now common, allowing you to connect to the Internet through your mobile phone which is still in your jacket pocket.

PDAs allow us to manage important information in the palm of the hand, which we can then synchronize with our home PCs.

With this vast array of products available at a reasonable price, you may well ask what the advantages of building your own Car PC are when a lot of the Car PC's functions can be achieved with individual devices.

### ***What you want, how you want it***

*When you build your first Car PC, you are creating a unique piece of in-car entertainment that is soooooo flexible, that you can customize it to work in synergy with the way that you drive and use your vehicle. Just as you would customize your PC desktop theme background, screen setting and volume level to suit the way that you work at home or in the office, so you can customize your Car PC to work with you in the way that you drive. Don't put up with what your manufacturer has given you! Original equipment may integrate very nicely with the vehicle but the chances are that its functionality is not cutting edge. It takes a lot of investment for auto manufacturers to develop new products, so when they have something that works, the chances are they are going to cling on to it for a bit. Furthermore, ordering options such as GPS as factory or dealer fit options is usually tremendously expensive. By contrast you can buy PC components off the shelf at attractive prices.*



## **Custom car/Kit car builders**

It may be that you have a vehicle like no other, a unique creation that you have spent the last decade building from the ground up. Every last nut and bolt was specified by you, you spent hours searching the Internet for that special custom paint finish and many days trawling breakers' yards for unique components that would make your car like no other. So excuse me for shouting "MUG" when you go and stick an off-the-shelf consumer head unit in it! Why not create an automotive informatics system that is as unique as your creation? By using custom "skins" and graphics for your programs, you can create a look that is in keeping with your vehicle and does it justice.

### ***Customizability***

Create something unique that is as personal as you! By designing a system around the way you drive, you can ensure that the features and functionality it contains are right for you. There is no such thing as the average driver; everyone has their own driving styles; different drivers make different types of journeys, and require different types of information to make those journeys run smoothly.

### ***Stay ahead of the curve***

Developing an in-car entertainment system is an expensive business for the big boys: vehicle manufacturers invest a lot of money in producing GPS systems, and to see the best return on their profits it is in their interest to sell the product for as long as they can – this does not necessarily meet with the requirements of the power user who wants the latest technology – NOW – in their car.

### ***Integration***

At the moment there are so many devices available for in-car use that it is quite possible for the driver to be overwhelmed by the amount of information that is presented. There have been studies about how a driver reacts to different sources of information in a vehicle. Compelling evidence has been presented that a driver's reaction time to events happening on the road decreases as the driver becomes overloaded with more and more information from inside the vehicle. This would seem common sense. By integrating all of these devices into a single console and interface, many of these distractions can be eliminated or at least reduced. As with any technology, it is imperative that the individual uses it in a responsible manner. Watching DVDs while driving is rightly illegal in many localities as well as an example of technology



being used irresponsibly. This is not to stop passengers enjoying the in-car entertainment from the comfort of their own seat – as long as it does not distract the driver.

Another pressing case for integration can be seen by using a home multimedia/HiFi/Theatre system as an analog for in-car entertainment and information devices. Some people would prefer a “stack” of separates with each individual device being selected on its credentials for the job. Unfortunately, this not only takes up an enormous amount of space but also paves the way for unsightly cables hanging out from every angle! Fortunately, with a few small compromises, it should be possible to integrate all of these devices into a single unit.

This is the situation with the Car PC at the moment. It is possible to build a device that will integrate hi-fi functions, navigation, mobile office, Internet on the move and other functions in a single unit with a few small compromises. Thankfully the concessions made for assimilating all of the devices into a single machine are few and far between and on balance are far outweighed by the benefits.

In each of the sections, we will discuss the advantages and disadvantages of a Car PC-based system over other alternative approaches. Over the next few pages we will discuss some applications that your Car PC will be able to perform.

## Audio jukebox

Car PC enthusiasts have been building units to play \*.mp3 formats for almost as long as the format has been around. Realizing its popularity, commercial interests responded by releasing \*.mp3 capable head units that would read \*.mp3 files burnt to CD. Some manufacturers even made hard disk based units. But the problem is that everything is proprietary with these systems. If you want to increase storage capacity you have to buy one of the manufacturers' hard disks in their own caddy, etc. And manufacturers often charge a much greater \$/£/¥/€ per mb than were you to buy the hard disk from a computer retailer. By designing your own Car PC system based on industry standard components, you know that it will be easy to replace components in the case of upgrade or failure.

It is certainly the case that \*.mp3 files (and other allied formats) have become phenomenally successful over the past couple of years: the meteoric rise of Apple's iPod, in a comparatively short space of time demonstrates that the consumer is ready to take their entire music collection with them wherever they go.

The same can be said for drivers and passengers over time products such as in-car record players, tape players, 8-track, and CDs that have been sold to consumers with varying degrees of success; users have often been forced to compromise on either sound quality or amount of music in order to have the tunes they want, when they want. Listening to the radio is great, but there are certain times when you want to listen to the music *you* want rather than the random choice of some DJ a hundred miles away.



Compromise no more – laptop hard drive technology allows you to store more music than you could ever possibly want to listen to on a small compact drive that is both reliable and rugged in a car environment. Your Car PC interface allows you to access this vast archive of music instantly with ease – cataloging and indexing tracks by song title, artist, album or a variety of other parameters.

Increasingly, users are buying music in digital file formats from the web; the advantages are clear – many files can be stored on a small hard disk reducing much of the bulk of a large CD collection.

So you have an audio jukebox server at home complete with hundreds of thousands of tracks ripped from your own CD collection or bought from the web. Well, why not seamlessly update your car's collection of music via a wireless network, every time you park your car in the garage? By keeping your car's audio collection and home audio collection synchronized you can ensure that any tracks you add to your personal collection are with you wherever you go.

## **Radio replacement**

### ***Conventional audio FM/AM***

You might want to retain your existing radio if it is part of a manufacturer's installation; however, if you are sacrificing your radio for your Car PC, do not worry; help is at hand. In this book, we will talk you through the installation of a Griffin Radio Shark AM/FM receiver. This allows you to receive radio on your Car PC. It is simple to install, connects via USB and allows you to receive crystal clear FM radio. The tuner seeks fast, and allows you to store presets along with the name of the station. It also has funky cool blue LEDs in the case – which is nice. Also, imagine that you have to attend a function, but unfortunately, your favorite radio show, or a sports game is being broadcast on the radio. No problem. The Radio Shark allows you to record the radio program on your Car PC, so that you can listen to the show on the way home! Clearly, there are not many in-car radios on the market that allow you to do this!

### ***Digital XM/DAB/satellite digital radio***

Depending on where you live, the chances are that you are able to receive some form of digital radio, whether this be XM/DAB or satellite radio. The advantages of digital broadcasting are manyfold – the sound is immensely clear, CD-like sound without crackle or interference. Furthermore, there is a lot more scope with digital broadcasting to send additional information about the track and station. With RDS, used with conventional analog radio, you are limited to basic information such as the station name and genre of music played; however, with digital broadcasting there is the possibility to send diskography information and much more in the form of text and graphics. Once you have built your PC, you will find it very easy to find a compatible digital radio receiver that will interface to your Car PC via USB.



## ***Internet radio***

In later sections we will evaluate the options for accessing the Internet from your vehicle. If you are in a wireless Internet (WiFi) enabled area, you can explore the world of Internet radio; this opens up the possibility of listening to radio stations from around the world. To use this feature, you will need to have a stable broadband service, so you may find that you are OK listening to the radio when parked up outside your home or office but not while on the move.

## **In-car video**

### ***Television on the move***

Televisions in cars began to be seen throughout the 1990s, but very early installations were CRT based, a little bulky and analog. However, since then technology has improved both in quality and size, and it is now possible to get LCD screens which require a lot less mounting depth. Furthermore, by coupling a Digital Freeview receiver to your Car PC, you can receive crystal clear digital pictures in countries where terrestrial digital television is available. This is yet more “value added” from your Car PC.

### ***DVD***

In-car DVD players are a lot more expensive than domestic DVD players, as they are targeted at a niche market. If you are going to buy an “out of the box” in-car DVD player, the chances are you will be paying through-the-nose. However, by contrast, DVD drives for computers are relatively cheap; you may even have one lying around at home. By adding a DVD drive to your Car PC and some decoding software, it is possible to play DVDs from all regions in your car. Furthermore, you can use your Car PC to create backups of your DVD disks onto your Car PC hard disk, allowing your passengers to watch DVDs on the move without your having to carry bulky disks in the car. This of course is subject to your owning the copyright on the DVD. Cloning DVDs from the video star for use on your Car PC is strictly illegal.

### ***Divx***

Divx is a great file format that allows large, bulky video files to be compressed into a relatively compact file size. The advantage of this is that with the correct software installed on your Car PC, you are able to store oodles of video on your Car PC hard disk. Whether this



is for kids' films or action movies, the long journeys will certainly seem a lot shorter for your passengers. Again, this is a feature that is hard to find in conventional in-car audio, but – as we have seen with the introduction of in-car mp3 head units – where Car PCs lead, commercial manufacturers will shortly follow.

### ***Mobile office for the portable professional***

Wouldn't it be handy if you could keep in contact with your world while on the move. By installing a Car PC it becomes easy to "take your office with you," allowing you to answer your emails, send and receive faxes, compile and edit documents, all from the comfort of your car. The thing is, you don't always want to carry a laptop with you wherever you go, and laptop computers are a target for thieves; it is a lot harder to steal a PC that is integrated into your vehicle without taking the whole vehicle.

### ***Integrating with existing in-car radio equipment***

You might have just purchased an expensive high-end motor, only to find that the radio is integrated into your car. Removing it would leave ugly scars along with steering wheel controls and other accessories which are nice to have but next to impossible to remove. Your head unit hasn't got any auxiliary inputs and you simply don't want to hack your car to bits.

No problem! In this book I am going to show you how to install the Griffin RocketFM into your Car PC, which allows you to "transmit radio" to your in-car setup. This way you just set up your Car PC audio as a preset on your radio, and you select your Car PC audio much as you would your favorite radio station. Because there are no wires connecting to your audio system, you do not need to break into your wiring loom, and your manufacturer's warranty remains intact.

The video system can be run separately and unobtrusively with the only connection to the car's wiring loom being that to a 12 V feed, which can be done with minimal disruption, *or* if you really don't want to touch your car's wiring loom, you can always power your install from a cigarette lighter socket.

### ***So – again – why should I build a Car PC?***

Oh yeah . . . and if I haven't already mentioned it, it's also a lot of fun!



# Chapter 2

## Buying your components

Let's hit the shops folks and shop till you drop. By indulging in a little impromptu retail therapy you could have all the components you need to build an ultimate Car-PC system by the end of this chapter. Fortunately, with the exciting retail opportunities brought by the Internet all of this can be done from the comfort of your office chair. So take a few folks, grab your wallet (or your parents' while they aren't looking) and let's start surfing.

What follows is my "Ultimate Car PC List." It is possible to use other components, but what I am presenting below is a proven solution that is guaranteed to work, and it presents what I believe is the best that the market has to offer. With each selection, I have highlighted the features and benefits and why I believe that the selection I have made is best for the job.

Don't get me wrong; there are other solutions to installing a PC in your car; certainly some of the cases that are not constrained by the "1 DIN" size limitations can offer room for much faster motherboards, etc. But my personal feelings, as I have mentioned earlier, are that for a Car PC to warrant the title "Car PC" it has to be able to integrate with the car.

You probably have some techno-junk lying around from various projects. Think of innovative ways of integrating this into your Car PC setup; old laptops can be cannibalized for their drives, USB peripherals can often find another home in the car – the list is endless.

### Travla/Casetronic C1xx Case





◀ Figure 2.1  
*Travla C1xx Case box shot*

### Features and benefits

- Low noise and lightweight
- Compact – same size as a car stereo
- Accepts 0.8" height SDRAM memory
- Accepts slim type 2.5" HDD
- Accepts slim type media drive
- Excellent heat dissipation through extensive sets of vents
- Convenient carrying handle
- Available in black or silver color
- Material: Lightweight aluminum alloy and CRS
- Finish: Aluminum front panel with anodized finish
- Dimension (W × H × D): 7" × 2" × 10" or 177.80 mm × 50.80 mm × 254.00 mm
- Cooling: 40 mm × 40 mm × 10 mm
- Main Board: VIA mini-ITX EPIA motherboard (low profile heat sink required)
- Drive Bays: 1 slim media drive and 1 slim Hard Drive (2.5")
- Internal Power Supply: Built-in 60W DC power board
- External AC Adaptor: – Input (AC 100~240 V) – Output (DC 12 V@5 A) 60 W

### What's in the box?

- |  |  |
|--|--|
| ● Travla aluminum case                   | ● Standard IDE Lead  |
| ● Bezels to suit variety of motherboards | ● Modified IDE Lead with termination for laptop connectors |
| ● Internal PSU                           | ● Array of screws and fixings                              |
| ● External PSU                           |  |



The Travla case really warrants the title of “King Car PC Case.” Unlike other “pretenders to the throne,” the Travla case actually fits in the same space as a “single DIN” car stereo, which means that it will fit the vast majority of vehicles.

Incidentally, you will find the Travla case is longer than most car stereos, but in most cases a space can be cleared relatively easily behind the dashboard. If you really, really cannot make the room, then you still have plenty of other mounting options left. You can find DIN brackets that will allow you to sling the Car PC underneath your dashboard.

If your car stereo is fitted in a custom space (as some manufacturers do not adhere to standard sizes) you will probably find that you can procure an adaptor plate from your local car spares shop. This fits over the large hole in your dashboard, and provides you with one or two standard size DIN slots. The surrounding fascia is designed to blend in with your dashboard, giving an “original equipment” feel to the installation.

One of the things you need to bear in mind is that even though the Travla case is designed to work with minimal ventilation, it does still need a little room to breathe, so try to clear the way behind your car stereo slot in order to allow fresh air to cool the motherboard.

## VIA EPIA SP 1300 Motherboard



[www.via.com.tw](http://www.via.com.tw)



◀ **Figure 2.2**  
VIA EPIA SP 1300 Motherboard box shot  
(Tim Watson, Photomedia UK)

