



AUTOMOTIVE AIR CONDITIONING *AND* CLIMATE CONTROL SYSTEMS

Steven Daly



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Butterworth-Heinemann is an imprint of Elsevier
Linacre House, Jordan Hill, Oxford OX2 8DP
30 Corporate Drive, Suite 400, Burlington, MA 01803

First edition 2006

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British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress

ISBN-13: 978-0-7506-6955-9

ISBN-10: 0-7506-6955-1

For information on all Butterworth-Heinemann publications
visit our web site at <http://books.elsevier.com>

Typeset by Charon Tec Ltd, Chennai, India
www.charontec.com

Printed and bound in UK

06 07 08 09 10 10 9 8 7 6 5 4 3 2 1

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Contents

<i>Preface</i>	vii
<i>Acknowledgements</i>	viii
<i>Introduction: An overview of the automotive air-conditioning market, training and qualifications</i>	ix
1 Air-conditioning fundamentals	1
1.1 History of automotive air-conditioning systems	1
1.2 Introduction to heating and ventilation	6
1.3 The basic theory of cooling	26
1.4 Vapour compression refrigeration	39
1.5 Alternatives cycles	42
1.6 The air-conditioning system	57
1.7 The expansion valve system	58
1.8 The fixed orifice valve system (cycling clutch orifice tube)	59
1.9 Dual air-conditioning	61
2 Air-conditioning components	62
2.1 The compressor	62
2.2 The condenser	77
2.3 The receiver-drier/accumulator	81
2.4 The expansion valve/fixed orifice valve	84
2.5 The evaporator	89
2.6 Anti-frosting devices	91
2.7 Basic control switches	93
3 Air-conditioning electrical and electronic control	95
3.1 Electrical principles	95
3.2 Sensors and actuators	113
3.3 Testing sensors and actuators	159
3.4 Oscilloscope waveform sampling	172
3.5 Multiplex wiring systems	183
3.6 OBD and EOBD	188
3.7 How to read wiring diagrams	194

4	Diagnostics and troubleshooting	264
4.1	Initial vehicle inspection	264
4.2	Temperature measurements	266
4.3	Pressure gauge readings and cycle testing	267
4.4	A/C system leak testing	277
4.5	Sight glass	282
5	Service and repair	283
5.1	Servicing precautions	283
5.2	Refrigerant recovery, recycle and charging	288
5.3	System oil	310
5.4	System flushing	312
5.5	Odour removal	316
5.6	Retrofitting	317
5.7	Replacement and adjustment of compressor components	318
5.8	Fixed orifice valve remove and replace	335
6	The environment	337
6.1	Global warming	337
6.2	The ozone layer	338
7	Legislation	341
7.1	Historical perspective	341
7.2	US perspective	344
	Appendices	352
	Index	359

Preface

Vehicle subsystems are understandably never given the discourse (research) needed to allow the engineer to have a complete understanding of how such technology evolves. The subject of air-conditioning (A/C) is certainly a victim of such negligence within the UK. Textbooks exist for the US market, which contain contributions from US manufacturers like GM, but little literature exists which provides comprehensive coverage for Europe. This problem, combined with the global political pressure on manufacturers to reduce the emission of harmful refrigerant gases (R134a), is providing a catalyst for changes to A/C technology. Research into alternative refrigerants like CO₂ and alternative A/C systems has been ongoing for a number of years. The motor vehicle industry resists such radical moves and wants more of a progressive phasing out of R134a, giving more of a lead time for the replacement technology to be introduced. It is certainly accurate to predict that during the next couple of years A/C technology, which includes systems and procedures and possibly certification to technicians, will radically change.

This book is born out of the current debate between politics and industry and hopes to provide the reader with a thorough up-to-date knowledge of current A/C systems, refrigerants and the new possible replacement systems like CO₂. The book is primarily *technology* focused, providing additional chapters on legislation and the environment. The book also has an unprecedented amount of electronic coverage with some of the very latest sensors and actuators, OBD and EOBD, test procedures using meters, scanners and oscilloscopes and additional information on how to read European wiring diagrams. This information is then applied to three practical case studies based on European manufacturers. It is imperative that A/C engineers have the fundamental understanding of automotive electronic control to enable them to successfully work within the field of automotive Heating, Ventilation and Air-Conditioning (HVAC). This book gives that level of coverage providing the reader with a holistic understanding of the climate control system.

I hope you enjoy reading this book as much as I enjoyed writing it.

Steven Daly

Acknowledgements

This book has been successfully produced due to the contribution of the following companies. They have provided diagrams, information and services in the quest to help provide a comprehensive account of the current and future technological advancement of the A/C industry.

1. Amerigon – Dan Pace
2. Autoclimate – Brian Webster, James Onion
3. Autodata Ltd – Malcom Rixon
4. Crocodile Clips – Kirsty Guthrie
5. Elsevier, Commissioning editor – Jonathan Simpson
6. Environ – Barry Quested, Scott Mitchell
7. EPA – Kristen Taddonio
8. Fluent CFD – Chris Carey, Helen Rushby
9. Fluke – Simon Worrall
10. Ford – David Grunfeld, Avtar Singh, Alan Jones, Steve Green, George Klinker
11. Rover
12. Sanden UK – Mike Tabb
13. SMMT – Eva de Marchi Taylor
14. Tellurex
15. Toyota UK – Paul Hunt, Lisa Halliday, Heidi Lismore
16. Vauxhall Motor Company – Adam Colins, Tony Rust, Barry James, Paul Usher
17. Visiteon – John Sherringham

All my love to my wife Tina and two children Luke and Jack. Without your support, patience and understanding I could not have completed this book.

Introduction: An overview of the automotive air-conditioning market, training and qualifications

The aim of this section is to:

- Enable the reader to appreciate the growth pattern of the A/C market.
- Enable the reader to appreciate the opportunities available due to the growth and development of the A/C market.

The A/C market can be viewed from various statistical viewpoints, several of which are included below. Ultimately, whatever the perspective, the picture is of tremendous and sustained market growth, both over the last decade and into the coming years.

New registration of cars with A/C

The proportion of A/C registrations (the registration of new vehicles with A/C compared to without A/C) has risen dramatically since the mid-1990s. The pattern is a typical 'S-shaped' growth curve. The fastest rate of increase was between 1995 and 1998, when the penetration of factory-fit A/C tripled.

The global statistics

Figure P.1 provides information on A/C registrations per international region including predictions on future demand. These percentages include vehicles with manual, semi-automatic and Automatic Climate Control (ACC).

The statistics provide evidence of an increased penetration of the ACC system on new vehicles. The ACC system is showing growth in regions where A/C penetration has not increased – NAFTA and Japan. This provides evidence of the increased level of comfort customers expect with the purchase of a new vehicle and of course the competition involved with new vehicle sales.

