- Preface p. ix
- Acknowledgements p. xi
- Chapter 1 Common Technology p. 1
- 1.1 Common technology p. 1
- 1.2 Engine-related systems p. 2
- 1.3 Ignition systems p. 2
- 1.4 Computer controlled petrol fuelling systems p. 10
- 1.5 Engine management systems (EMS) p. 17
- 1.6 Anti-lock braking (ABS) p. 19
- 1.7 Traction control p. 22
- 1.8 Stability control p. 25
- 1.9 Air conditioning p. 27
- 1.10 Computer controlled damping rate p. 30
- 1.11 Computer controlled diesel engine management systems p. 30
- 1.12 Summary p. 38
- 1.13 Review questions p. 38
- Chapter 2 The Computer ECM p. 40
- 2.1 The fundamental parts of a computer p. 40
- 2.2 A practical automotive computer system p. 41
- 2.3 Principles of operation p. 44
- 2.4 Computer data p. 45
- 2.5 Computer interfaces p. 46
- 2.6 Control of output devices p. 47
- 2.7 Computer memories p. 48
- 2.8 Fault codes p. 51
- 2.9 Adaptive operating strategy of the ECM p. 51
- 2.10 Networking of computers p. 52
- 2.11 Vehicle network systems p. 55
- 2.12 Prototype network systems p. 59
- 2.13 Summary p. 62
- 2.14 Review questions p. 63
- Chapter 3 Self-diagnosis and fault codes p. 65
- 3.1 Access to DTCs p. 65
- 3.2 Developments in self-diagnosis p. 78
- 3.3 Diagnostic equipment and limitations of DTCs p. 81
- 3.4 Review questions p. 83
- Chapter 4 Diagnostic tools and equipment p. 85
- 4.1 Diagnostic tools that connect to the ECM p. 85
- 4.2 Breakout boxes p. 94
- 4.3 The digital multimeter p. 95
- 4.4 Portable flat screen oscilloscopes p. 96
- 4.5 Diagnostic tool and oscilloscope combined p. 97
- 4.6 Pressure gauges p. 99
- 4.7 Calibrating test instruments p. 103

- 4.8 Location charts and wiring diagrams p. 103
- 4.9 Sources of diagnostic data p. 103
- 4.10 Exhaust gas emissions and emission system testing p. 105
- 4.11 Review questions p. 110
- Chapter 5 Sensors p. 112
- 5.1 Electromagnetic sensors p. 112
- 5.2 Optical sensors p. 118
- 5.3 Combustion knock sensors p. 119
- 5.4 Variable resistance type sensors p. 121
- 5.5 Temperature sensors p. 125
- 5.6 Ride height control sensor p. 125
- 5.7 Manifold absolute pressure (MAP) p. 126
- 5.8 Exhaust gas oxygen sensors p. 130
- 5.9 Air flow measurement p. 138
- 5.10 The practical importance of sensor knowledge p. 144
- 5.11 Review questions p. 144
- Chapter 6 Actuators p. 146
- 6.1 Actuator operation p. 146
- 6.2 Petrol engine fuel injectors p. 147
- 6.3 Testing of petrol injectors p. 149
- 6.4 Exhaust gas recirculation p. 154
- 6.5 Petrol engine idle speed control p. 155
- 6.6 Ignition system p. 161
- 6.7 ABS actuators p. 161
- 6.8 A clamping diode p. 162
- 6.9 Electronic unit injectors p. 163
- 6.10 Review questions p. 165
- Chapter 7 Diagnostic techniques p. 168
- 7.1 Circuit testing p. 168
- 7.2 Vehicle specific details p. 172
- 7.3 The 'six-steps' approach p. 173
- 7.4 Skills required for effective diagnosis p. 174
- 7.5 An approach to fault finding p. 175
- 7.6 Emissions related testing p. 179
- 7.7 Ignition system tests p. 198
- 7.8 Diesel injection p. 200
- 7.9 Sensor tests on other systems p. 202
- 7.10 Intermittent faults p. 207
- 7.11 Summary p. 209
- 7.12 Review questions p. 210
- Chapter 8 Additional technology p. 212
- 8.1 Partial and absolute pressures p. 212
- 8.2 The piezoelectric effect p. 213
- 8.3 Liquid crystal displays p. 214

- 8.4 Countering cross-talk p. 216
- 8.5 Logic devices p. 216
- 8.6 OBD II p. 223
- 8.7 Computer performance (MIPS) p. 227
- 8.8 Supplementary restraint systems (SRS) p. 227
- 8.9 The coded ignition key p. 231
- 8.10 Fault tracing p. 232
- 8.11 Precautions when working with computer controlled systems p. 233
- 8.12 Variable capacitance sensor p. 233
- 8.13 Optoelectronics p. 233
- 8.14 Review questions p. 235
- Appendix
- A.1 Companies who supply equipment and diagnostic data p. 237
- A.2 Answers to review questions p. 237
- A.3 OBD II standard fault codes p. 238
- Index p. 249