KEY

A: STARTING - RECHARGING

A1 Battery
A2 Alternator
A3 Alternator with integral electronic voltage regulator
A4 Voltage regulator
A5 Ignition distributor
A5a Ignition distributor A
A5b Ignition distributor B
A6 Impulse generator
A7 Rotor
A8 Ignition coil
A8a Ignition coil A
A8b Ignition coil B
A9 Coil resistance
A10 2-way connector for coil
A11 Starter motor
A12 Spark plugs
A13 Pre-heating glow plugs
A14 Alternator cable terminal board

B: MANUAL ELECTRIC CONTROLS

B1 Ignition switch
B2 Windscreen wiper control
B3 Windscreen and/or headlight washer pump control
B4 Control for side lights, flashing, low/high beam headlights
B5 Horn control switch
B6 Direction indicator light control
B7 Low beam flashing control switch
B8 High beam flashing control switch
B9 Heated rear window control switch
B10 Fog light control switch
B11 Rear fog light control switch
B12 Road hazard lights control switch
B13 Passenger compartment front roof lamp control switch
B14 Passenger compartment rear roof lamp control switch
B15 Passenger compartment roof lamp control switch
B16 Cluster lighting dimmer rheostat
B17 Gearbox oil level warning light switch
B18 Front right door-locking control switch
B19 Front left door-locking control switch
B20 Interior door-locking switch
B21 Front right power window control switch
B22 Front left power window control swtich
B23 Rear right power window control switch
B24 Rear left power window control switch
B25 Rear power window inhibitor switch
B26 Rear power window and rear cigar lighter inhibitor switch
B27 Front seat height adjustment control switch
B28 Front left backrest adjustment control switch
B29 Front right backrest adjustment control switch
B30 Door electric rear view mirror control switch
B31 Electric aerial control switch
B32 Windscreen washer pump control
B33 Front spot light switch
B34 Rear left spot light switch
B35 Rear right spot light switch
B36 Right door rear view mirror double control switch
B37 Parking light control switch
B38 Rear window wiper control switch
B39 Trip odometer recall microswitch
B40 Trip odometer reset microswitch
B41 VF electronic rheostat
B42 Lamp dimmer rheostat
B43 Internal control switch for door unlock
B44 Rear spot light control switch
B45 Recognition light control switch
B46 Two-tone horn control switch
B47 Sunroof motor control switch
B48 Interphone system control switch
B49 Talk/listen switch
B50 Siren control switch
B51 Driver's seat heater control switch
B52 Front right seat longitudinal adjusting switch
B53 Front power window full acting switch
B54 Front left seat longitudinal adjusting switch
B55 Luggage compartment opening control switch
B56 Rear right seat adjusting device switch
B57 Rear right seat heating device switch
B58 Rear left seat adjusting device switch
B59 Rear left seat heating device switch
B60 Cluster warning light operation check push-button
B61 Fuel filler cap opening switch
B62 Front right seat heating device switch
B63 Front right seat height adjusting switch
B64 Cruise control "OFF", "RESUME" switch
B65 Cruise control "SET ACC.", "SET DEC." switch
B66 Position/Hazard/Fuel flap light control push-button panel
B67 Controlled damping suspension shock-absorber control board
B68 Combination switch unit
B69 Headlight aiming control device
B70 Rear windscreen washer-headlight washer windscreen washer pump control
B71 Front electric window double control switch (LH and RH)
B72 Four-wheel drive control switch
B73 Vehicle lift switch
B74 Vehicle lower switch
B75 Driver's seat memory panel
B76 Front right-hand seat lumbar support regulation switch
B77 Front left-hand seat lumbar support regulation switch
B78 Front right-hand seat rear tilt regulation switch
B79 Front left-hand seat rear tilt regulation switch
B80 Front right-hand seat vertical - longitudinal regulation switch
B81 Front left-hand seat vertical - longitudinal regulation switch
B82 Front right-hand seat front tilt regulation switch
B83 Front left-hand seat front tilt regulation switch
B84 Front rifht-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B85 Front left-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B86 Front left-hand seat heating switch
B87 Boot release switch with glovebox light
B88 Light dimmer rheostat (DIM-DIP)

C: INSTRUMENTS

C1 Electronic rev-counter
C2 Electronic speedometer
C3 Voltmeter
C4 Fuel level gauge
C5 Oil pressure gauge
C6 Coolant temperature gauge
C7 Clock
C8 Space free for instrument
C9 Turbo charger air pressure gauge
C10 Cluster (*)
C11 ALFA ROMEO Control display
C12 Performance gauge display
C13 Optoelectronic cluster
C14 Warning lamp panel
C15 Door lock actuated LED
C16 Display check with clock
C17 Odometer module on instrument panel

KEY

D: WARNING LAMPS

D1 Alternator warning lamp
D2 Direction indicator light warning lamp
D3 Tail light warning lamp
D4 High beam warning lamp
D5 Brake fluid low level warning lamp
D6 Heater/ventilation warning lamp
D7 Handbrake warning lamp
D8 Fuel reserve warning lamp
D9 Choke warning lamp
D10 Handbrake brake fluid level warning lamp
D11 Engine oil minimum pressure warning lamp
D12 Pre-heating glow plug warning lamp
D13 Engine coolant maximum temperature warning lamp
D14 Maximum air pressure warning lamp
D15 Low fuel pressure warning light
D16 Warning lamp free
D17 Gear position warning lamp
D18 Manual injection advance warning lamp
D19 Brake pad wear warning lamp
D20 Rear drive engagement warning lamp
D21 ALFA ROMEO Control warning lamp
D22 Heated rear window warning lamp
D23 Hazard lights warning lamp
D24 Rear fog light warning lamp
D25 Fog light warning lamp
D26 Injection diagnosis warning lamp
D27 ABS System warning lamp
D28 Recognition light warning lamp
D29 Ignition/anti-knock diagnosis warning lamp
D30 Gearbox oil level warning lamp
D31 Antitheft LED
D32 Four-wheel drive system malfunction warning light
D33 Four-wheel drive engaged warning light
D34 AIR-BUG warning lamp
D35 Vehicle lift warning lamp
D36 Right direction indicators and hazard warning lights warning lamp
D37 Left direction indicators and hazard warning lights warning lamp
D38 "Sidelights on" warning light
D39 "Brake light on" warning light
D40 "Instrument panel warning light on" warning light
D41 Low engine oil level warning light
D42 Low engine coolant warning light

E: EXTERNAL LIGHTS

E1 Front direction indicator light
E2 Front position light
E3 Front direction indicator and position light
E4 Front side marker light
E5 Low beam light
E6 Low beam with incorporated side light
E7 High beam light
E8 Low and high beam light
E9 Side indicator light
E10 Fog light
E11 Rear direction indicator light
E12 Rear side marker light
E13 Rear side light
E14 Reverse light
E15 Stop light
E16 Rear fog light
E17 Numberplate light
E18 Stop and rear side light
E19 Rear right light
E20 Rear left light
E21 Inspection light
E22 Recognition light
E23 Front right optical unit
E24 Front left optical unit
E25 Right rear light (fixed part)
E26 Left rear light (fixed part)
E27 Central rear light (mobile)
E28 Third stop light
E29 Supplementary dipped beam light
E30 Rear central foglight/right-hand reversing light
E31 Rear central foglight/left-hand reversing light

F: INTERNAL LIGHTS

F1 Passenger compartment front roof lamp
F2 Passenger compartment rear roof lamp
F3 Passenger compartment roof lamp
F4 Engine compartment lamp
F5 Luggage compartment lamp
F6 Door open signalling light
F7 Fuse light
F8 Heater/ventilation controls lighting lamp
F9 Glovebox light
F10 Ashtray light
F11 Map light
F12 Cluster light
F13 Front spot light
F14 Rear right spot light
F15 Rear spot light
F16 Ignition switch light
F17 Switch illumination light
F18 Rear spot light
F19 Passenger compartment right-side courtesy light
F20 Passenger compartment left-side courtesy light
F21 Right-side spot light with switch
F22 Left-side spot light with switch
F23 Right inner side footboard courtesy light
F24 Left inner side footboard courtesy light
F25 Courtesy mirror light on sun visor
F26 Gear shift lever plate light
F27 Light signalling front-right door opened
F28 Light signalling front-left door opened
F29 Light signalling rear-right door opened
F30 Light signalling rear-left door opened
F31 Front-right door opened ground light
F32 Front-left door opened ground light
F33 Rear-right door opened ground light
F34 Rear-right door opened ground light
F35 Central roof lamp with passenger compartment lighting controls
F36 Courtesy light with controls on rear right upright
F37 Courtesy light with controls on rear left upright
F38 Automatic gear control light
F39 Central air vent light
F40 Right-hand air vent light
F41 Tunnel air vent light
F42 Left-hand air vent light
F43 Seat control panel light
F44 Central passenger compartment rooflight

G: FUSE BOXES - CONNECTIONS - GROUNDS

G1 Fusebox
G2 Auxiliary fuse box
G3 Fuse box terminal
G4 Flying fuse box
G5 Multiple connection
G6 Multiple connection B - cluster
G7 Multiple connection R - cluster
G8 Single connection
G9 Connection between front left door wiring and door mirror switch

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G10 Connection between front right door wiring and door mirror switch
G11 Connection between board wiring and rear wiring
G12 Connection between board wiring and mirror switch
G13 Connection between board wiring and console wiring
G14 3-way connection between board wiring and door wiring
G15 2-way connection between board wiring and door wiring
G16 6-way connection between board wiring and door wiring
G17 Connection between board wiring and front right door wiring
G18 Connection between board wiring and front left door wiring
G19 Connection between board wiring and passenger compartment roof lamp
G20 Connection for front right door-locking motor
G21a Connection for front right door-wiring
G21b Connection for front right door-wiring
G22 Connection for front left door-locking motor
G23a Connection for front left door wiring
G23b Connection for front left door wiring
G24 Connection for rear right door-locking motor
G25 Connection for rear right door wiring
G26 Connection for rear left door-locking motor
G27 Connection for rear left door wiring
G28 Connection between front right door wiring and power window switch
G28a Connection between rear right door wiring and power window switch
G29 Connection between door-locking wiring and rear power windows
G30 Connection for power windows and door lock
G31 Connection between front left door wiring and power window switch
G32 Connection between console wiring and rear right door wiring
G33 Connection between console wiring and rear left door wiring
G34 Connection for power window supply cable
G35 Connection between rear wiring and rear right side light wiring
G36 Connection for power window switch cables
G37 Connection for multiswitch, on steering column
G38 Connection for air conditioner wiring
G39 Connection for clock wiring
G40 Connection for door-locking control unit
G41 Speedometer-rev counter sensor device connection
G42 Connection between alternator and min engine oil pressure switch
G43 Connection for heater/ventilation control cables
G44 Connection for rear fog lamp
G45 Connection for headlight wash-wipe cables
G46 Connection for headlights
G47 Connection for right-side repeater cables
G48 Connection between electric door mirror and left-side repeater cables
G49 Connection available
G50 Presetting for loud speaker cables
G51 Presetting for car radio cables
G52 Fuse box ground
G53 Engine compartment ground
G53a Engine compartment ground - right side
G53b Engine compartment ground - left side
G54 Passenger compartment ground
G54a Passenger compartment ground - right side
G54b Passenger compartment ground - left side
G55 Hood ledge panel ground
G56 Branch terminal board
G57 Presetting for fuel cut-off solenoid valve
G58 Connection for cigar lighter
G59 Connection for electric rear-view door mirror
G60 Injection wiring ground
G61 Connection for ignition coil
G62 Clutch switch connection
G63 Rear ground
G63a Rear right ground
G63b Rear left ground
G64 Connection for Trip Computer - clock
G65 Coaxial cable
G66 Motronic wiring ground
G67 Motronic connection
G68 Connection A with board wiring
G69 Connection B with board wiring
G70 Connection C with board wiring
G71 Connection for warning lamp on instruments
G72 Connection for seat back adjustment wiring
G73 Connection for rear services
G73a Connection for rear right accessories
G73b Connection for rear left accessories
G73c Rear services connection (4-way)
G73d Rear services connection (4-way for Alfa Control)
G74 Connection ALFA ROMEO Control Televel rear wiring
G75 Connection between right and left roof panel services
G76 Connection for roof panel - services - right side
G77 Connection for roof panel services - left side
G78 Coonection for front door services wiring
G79 Connection for rear door services wiring
G80 Connection for board wiring
G81 Connection for front left seat back adjustment
G82 Connection for front right seat back adjustment
G83 Rear connector for fast idle device
G84 Console cable connector
G84a Central panel 15-way cable connection
G84b Central panel 12-way cable connection
G85 Front accessories connector
G86 Connection for passenger compartment roof lamp
G87 Connection for rear door-locking motors
G88 Connection for rear lights
G89 Intermediate connection A
G90 Intermediate connection B
G91 Rear door sensors ground
G92 Luggage compartment ground
G93 Windscreen frame upper cross member ground
G94 Engine compartment connector
G94a 10-way connection for engine compartment
G94b 8-way connection for engine compartment
G94c Engine compartment connection - right side
G94d Engine compartment connection - left side
G95 Centralized fuse box
G95A Connection for switches
G95B Connection for switches
G95C Connection for cluster warning lamps
G95D Connection for ALFA ROMEO Control
G95E Connection for console
G95F Connection for fog light - rear fog light
G95G Connection for combination switch
G95H Connection for LH interface
G95I Connection for RH interface
G95L Connection for clock - rheostats
G95M Connection for sunroof
G95N Connection for battery
G95O Connection for ignition switch
G95P Connection for door services
G95Q Connection for performance gauge
G95R Connection for heated rear window
G95S Connection for cluster
G95V Fuses
G96 Single connector for ALFA ROMEO Control - cluster
G97 Connection for left doors services
G98 Connection for right doors services
G99a Connection for engine dashboard A
G99b Connection for engine dashboard B

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G99c Connection for engine dashboard C
G99d Connection for engine dashboard D
G99e Connection for engine dashboard E
G100 Connection for console - doors wiring
G101 Trip Computer connection
G102 Optoelectronic cluster connector
G103 Connection for grounds to brake fluid tank
G104 Connection for roof panel left upright
G105 Connection for ashtray lamp
G106 Seat grounds
G107 Connection for fuel pump
G108 CEM wiring ground
G109 Injection wiring connection
G110 Thermostat wiring ground
G111 Connection for dashboard instruments wiring
G112a Connection A for roof wiring
G112b Connection B for roof wiring
G112c Connection C for roof wiring
G112d Connection D for roof wiring
G112e Connection E for roof wiring
G113 Connection for front left fender
G114 Connection for outside temperature sensor
G115 Connection for tow bar vehicle socket
G116 Connection for tow bar trailer plug
G117 Connection for engine compartment lamp
G118 Connection for luggage compartment lamp
G119 Courtesy mirror light connection
G120 Map light connection
G121 Car electric system connection
G122 Ignition wiring connection
G123 Pedal-board ground
G124 ABS system connection
G125 ABS system fuse box
G126 ABS system electromagnetic switch protection fuse
G127 Recognition light fuse box
G128 Transciever fuse box
G129 Two-tone horn left-side engine compartment connection
G130 Switch connection
G131 Ground on upper cover
G132 Ground on manifold
G133a Electronic ignition-injecton connection wiring A
G133b Electronic ignition-injection connection wiring B
G134 Front left upright connection
G135 Rear window back-shelf wiring connection
G136 Front side-marker intermediate connection
G137 Injection supply wiring connection
G138 Combination switch headlight unit connection
G139 Interphone system control unit connection
G140 Fuel pump intermediate connection to service panel
G141 Rear side-marker intermediate connection
G142 Engine service connections
G143 Service central compartment ground
G144 Boot lid wiring connection
G145 Intermediate connection for injection switch cables
G146 Tachymeter connection
G147 Rev-counter sensor connection
G148 Under-dashboard ground
G149 Board wiring with engine compartment right-side wiring connection
G150 Board wiring with engine compartment left-side wiring connection
G150a Additional wiring connection header with left-hand engine compartment wiring
G151. Board wiring with engine service compartment wiring connection
G152 Glow plug pre-heating timing fuse (50a)
G153 Ground under diesel filter
G154 Engine wiring - board wiring connection
G155a Right seat adjustment wiring connection
G155b Left seat adjustment wiring connection
G156 Front-right door wiring - front-right door sensor connection
G157 Front-left door wiring - front-left door sensor connection
G158 Rear-right door wiring - rear-right door sensor connection
G159 Rear-left door wiring - rear-left door sensor connection
G160 Front-right door wiring - ground lighting lamp connection
G161 Front-left door wiring - ground lighting lamp connection
G162 Rear-right door wiring - ground lighting lamp connection
G163 Rear-left door wiring - ground lighting lamp connection
G164 Board wiring - conditioning unit wiring connection
G165 Door service wiring - conditioning unit wiring connection
G166 Front door wiring - front right door wiring connection
G167 Front door wiring - rear right wiring connection
G168 Front door wiring - front right door wiring connection
G168a Front door wiring and rear left door wiring one-way connection
G169 Front door wiring - rear left wiring connection
G170 Board wiring - rear right wiring connection
G171 Board wiring - rear left wiring connection
G172 Door wiring - sunroof connection
G173 Console wiring - front door wiring connection
G174 Steering column support ground
G175 Board wiring - fog light wiring connection
G176 Roof panel ground
G177 Door service wiring - board wiring connection
G178 Preset connection for seat height adjustment switch
G179 Rear left wiring - roof lamp wiring connection
G180 Rear left wiring - front door wiring connection
G181 Rear left wiring - rear console wiring connection
G182 Console area ground
G183 Rear console wiring - front right seat connection
G184 Rear console wiring - front left seat connection
G185 Luggage compartment left-side ground
G186 Luggage compartment right-side ground
G187 Single connection in rear left wiring
G188 Single connection in rear right wiring
G189 Rear seat wiring - rear console wiring connection
G190 Rear seat wiring connection
G191 Rear left wiring - rear left door wiring connection
G192 Preset connection for trailer stop signal
G193 Preset connection radio aerial
G194 Rear left wiring - central side light wiring connection
G195 Preset connection for rear left loud-speaker
G196 Preset connection for rear right loud-speaker
G197 Rear right wiring - rear right door wiring connection
G198 Rear right wiring - boot lid lock wiring connection
G199 Rear right door wiring connection
G200 Preset connection for radio headphones control unit
G201 Heated rear window fuse (30A)
G202 ABS System ground
G203 Rear right wiring - front door wiring connection
G204 Front right sensor connection - ABS
G205 Front left sensor connection -- ABS
G206 Rear right sensor connection - ABS
G207 Rear left sensor connection - ABS
G208 Front left power window connection
G209 Rear right wiring - rear console wiring connection
G210 Door wiring - rear console wiring connection
G211 Cluster intermediate connection for gearbox oil level signal
G212 Cluster internal connection for ABS warning light signals and seat belts
G213 Cluster internal connection for ABS warning light, seat belts and gearbox oil level
G214 Instrument connection for ABS warning light signals and seat belts (CA)
G215 Instrument internal connection for ABS warning light signals and seat belts
G216 Preset connection for power window control unit
G217 Preset connection for front left loud-speaker
G218 Preset connection for front right loud-speaker
G219 Sunroof connection

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G220 Coil power module connection for rev-counter
G221 Jumper connection for power window wiring
G222 Cruise Control Actuator - Cruise Control CU connection
G223 Preset connection for Cruise Control clutch push-button
G224a Right passive seat belt wiring connection
G224b Left passive seat belt wiring connection
G225a Right passive seat belt control unit switch wiring connection
G225b Left passive seat belt control unit switch wiring connection
G226a Right passive seat belt wiring ground connection
G226b Left passive seat belt wiring ground connection
G227b Under-fender services wiring connection
G228 Board wiring - cooling electric fan motor wiring connection
G229 Starting signal and "Over-boost" warning light wiring connection
G230 Ground on starting distributor bracket
G231 Board wiring - automatic transmission wiring connection
G232 Jumper connection preset for Motronic control unit (manual/automatic transmission versions)
G233 Board wiring - automatic transmission gear-lever wiring connection
G234 Interphone control unit connection A
G235 Interphone control unit connection B
G236 Interphone circuit panel connection A
G237 Interphone circuit panel connection B
G238 Board wiring - day-light lamps
G239 Car radio/car telephone CU relay - 15A
G240 Front seats relay - 20A
G241 Board wiring - antitheft wiring connection
G242 Board wiring Cruise Control wiring connection
G243 Board wiring - rear cabinet wiring single connection
G244 Board wiring - rear cabinet wiring connection
G245 Rear - right antitheft wiring connection
G246 Rear seat adjustment fuse 20A
G247 Rear electric window fuse 30A
G248 Antitheft wiring - rear right wiring connection
G249 Abtitheft wiring - cabinet wiring connection
G250 Board wiring - C.A. right side engine wiring connections
G251 Shock absorber connection clinching
G252a Board wiring - rear right wiring for shock-absorber system connection
G252b Board wiring - rear right wiring for shock-absorber system connection
G252c Board wiring - rear right wiring for chock-absorber system connection
G252d Board wiring - rear right wiring for shock-absorber system connection
G253 Rear wiring - left wiring - climatization wiring connection
G254 Engine electric fan fuse 40A
G255 Climatization electric fan fuse 40A
G256 Rear left wiring - antitheft connection
G257 Interlock SHIFT CU fuse 10A
G258 Antitheft fuse 15A
G259a Automatic transmission clinching
G259b Automatic transmission clinching
G260 Front cabinet wiring - rear cabinet wiring connection
G261 Sunroof fuses
G262 Door.locking - electric window clinching
G263 Front electric windows clinching
G264 Rear electric window enabling and closing crimping connection
G265 Left-hand front under-mudguard wiring connection
G265a Front right-hand wiring connector under wheel housing (3-way)
G265b Front right-hand wiring connector under wheel housing (2-way)
G266 Boot hatch ground
G267 Engine block ground
G268 Heated seats and handbrake switch-door locks wiring connection
G269 Glovebox compartment light connection
G270a Dashboard wiring - four-wheel drive wiring (four-way) connection
G270b Dashboard wiring - four-wheel drive wiring (six-way) connection
G271 Electric fan operation check connection
G272 ABS hydraulic group connection
G273 ABS control unit connection
G275 ABS hydraulic group ground connection
G276 Four-wheel drive intermediate wiring connection
G277 Untermediate Alfa Romeo Control unit - instrument connector
G278 Brake pad wear sensor connector
G279 Brake fluid reservoir switch connector
G280 Radio intermediate wiring connector
G281 Free connector for luggage compartment light
G282 Earth on front tunnel
G283 Earth on left service compartment
G284A Rear right passenger compartment panneling earth
G284B Rear left passenger compartment panneling earth
G285 Provision for anti-theft system connector
G286 Dash wiring - door wiring four-way connection
G287 Injection wiring - engine coolant temperature sensor wiring connection
G288 Injection wiring evaporation solenoid valve wiring connection
G289 Connection for front right-hand speaker - high tones
G290 Connection for front right-hand speaker - low tones
G291 Connection for front left-hand speaker - high tones
G292 Connection for front left-hand speaker - low tones
G293 Connection between engine services wiring - engine compartment wiring - left-hand side
G294 Earth on intake manifold
G295 Rear console wiring - driver's side seat memory wiring connection
G296 Memory wiring - driver's side longitudinal seat regulation motor wiring connection
G297a Memory wiring - driver's side seat control panel wiring connection
G297b Memory wiring - driver's seat control panel witing connection
G297c Memory wiring - driver's seat control panel wiring connection
G298 Memory wiring - driver's seat lumbar and back regulation wiring connection
G299a Front left-hand seat control pad relay unit - control pad wiring connection
G299b Front right-hand seat control pad relay unit - control pad wiring connection
G300 Front left-hand seat warming pad clinching
G301 Front right-hand seat warming pad clinching
G302 Driver's seat earth cable clinching
G303 Control pad wiring - driver's seat lumbar support and back regulation wiring connection
G304 Injection wiring intermediate clinching
G305 Electric seats and rear power window connection
G306 Right-hand engine wiring/engine wiring connection
G307 Luggage compartment/rear wiring connection
G308 Connector for engine sensors
G309a Controlled damping suspension system A
G309b Controlled damping suspension system A
G310 Front right-hand power window fuse
G311 Front left-hand power window fuse
G312 Fuse for headlight washers
G313 Air conditioner supplementary wiring connection
G314a Engine wiring/air conditioner A wiring connection
G314b Engine wiring/air conditioner B wiring connection
G315a Left-hand seat regulation motor connection
G315b Right-hand seat regulation motor connection
G316 Engine r.p.m. and timing sensor sheath earth
G317 Engine - injection wiring rev counter connection
G318 Earth on gearbox
G319 Engine oil level wiring - engine services wiring connection
G320 Rear speaker cable connection

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G321a Air conditioner control wiring - microswitch wiring connection (6-way)
G321b Air conditioner control wiring - microswitch wiring connection (3-way)
G322 Air conditioner control wiring - dashboard wiring connection
G323 Air conditioner control wiring - electric fan wiring for condensers connection
G324 Left-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G325 Right-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G326 Dashboard wiring - front foglight/headlight washer wiring connection
G327 Speedometer sensor connection
G328 Dashboard wiring - rooflight wiring connection
G329 Dashboard wiring - injection wiring connection
G330 Injection wiring - electric fan wiring for condensers connection
G331 Ultrasound soldering connection
G332 Alternator connection for recharging signal
G333 DIM-DIP fuse
G334 Fuel level sender connection
G335 Engine services with E.G.R. valve power supply clinching

H: SWITCHES

H1 Handbrake switch
H2 Reversing light switch
H3 Stop light switch
H4 Courtesy light switch on passenger compartment upright
H5 Front left door open indicator switch
H6 Front right door open indicator switch
H7 Rear left door open indicator switch
H8 Rear right door open indicator switch
H9 Front right brake pad switch
H10 Front left brake pad switch
H11 Rear right brake pad switch
H12 Rear left brake pad switch
H13 Choke switch
H14 Injection advance switch
H15 Gearbox oil low level switch (magnetic bulb)
H16 Starting and reverse inhibitor switch
H17 Brake fluid minimum level check switch
H18 Fast-idle switch in gearbox
H19 Low fuel pressure switch
H20 Inertia switch
H21 Clutch pedal fast-idle switch
H22 Ignition microswitch
H23 Engine compartment lamp switch
H24 Luggage compartment lamp switch
H25 Glovebox light switch
H26 Contact/switch on rear door for rear window wiper
H27 Contact/switch on rear door for heated rear window
H28 Carburetor contact/switch
H29 Switch for rear drive engagement warning lamp
H30 Load switch
H31 Switch for idle r.p.m. adjusting screw on carburetor
H32 Microswitch on carburetor for inserting timing variator
H33 Number plate contact/switch
H34 ABS System brake fluid tank switch
H35 Fuel pre-heating filter thermal switch
H36 Diesel post-heating microswitch
H37 Clutch pedal switch
H38 Rear right seat microswitch
H39 Rear left seat microswitch
H40 Rear right door inhibitor switch for rear seats
H41 Rear left door inhibitor switch for rear seats
H42 Accelerator throttle valve maximum opening switch
H43 Door-locking engaged signalling microswitch
H44 Engine hood antitheft device switch
H45 Cruise Control clutch and brake switch
H46 Gearbox switch for controlled damping suspension shock-absorber
H47 Engine throttle microswitch for controlled damping suspension shock-absorber
H48 Lefthand door switch for electric windows - sunroof automatic closing
H49 Auxiliary stop lights switch
H50 Seat end-run switch
H51 Sunroof stop limit switch

I: RELAYS

I1 Engine cooling electric fan relay
I2 Heated rear window relay
I3 Horn relay
I4 Headlight wiper relay
I5 Auxiliary relay for headlight wiper timer
I6 Fast-idle relay
I7 Fuel hose closing relay
I8 Relay excluding retarded rotor arm
I9 Glow plug relay
I10 Choke inhibitor relay
I11 Front power window and seat raising relay
I12 Front power window relay
I13 Rear power window relay
I14 Brake fluid automatic warning light control relay
I15 Low fuel pressure warning light relay
I16 Headlight relay
I17 Fog light relay
I18 Double contact relay
I19 Headlight washer pump relay
I20 Beam change over relay
I21 Full beam exclusion relay
I22 Low beam exclusion relay
I23 Supplementary engine cooling electric fan relay
I24 Direction and hazard lights relay
I25 Rear fog light relay
I26 Roof lamp relay
I27 Seat height adjustment relay
I28 Hazard lights relay
I29 Fuel pump relay
I30 Relay with CEM diode
I31 Front power window/climatisation relay
I32 Advance variation control unit relay
I33 Carburetor microswitch relay
I34 Rear fog light exclusion relay
I35 Key-operated supply relay
I36 Relay for brake wear and fluid level
I37 ABS System control unit relay
I38 ABS System auxiliary relay
I39 Brake fluid level warning light relay
I40 ABS System brake fluid electric pump relay
I41 Two-tone hooter, horn relay
I42 Two-tone hooter relay
I43 Inspection light relay
I44 Fuel pre-heating device relay
I45 Outer mirror defrosting relay
I46 Siren relay
I47 Engine oil cooler electric fan relay
I48 Instrument and AR control ignition key-controlled relay
I49 Low-beam light relay
I50 High-beam light relay
I51 Electronic control unit power supply relay
I52 Boot lid opening relay
I53 Fuel filter cap opening relay
I54 Rear right seat relay

KEY

I: RELAYS (Continued)

I55 Rear left seat relay
I56 Rear seat inhibitor relay
I57 ABS System electronic relay
I58 Sunroof - seat relay
I59 "OFF", "RESUME" Cruise Control switch auxiliary relay
I60 Outer mirror defrosting relay
I61 Petrol vapour motor pump relay
I62 Gear engaged signal relay (automatic transmission) for MOTRONIC control unit
I63 Oil radiator electric fan - automatic transmission relay
I64 Position light relay
I65 Foglight inhibitor relay
I66 Day-light insertion relay
I67 Day-light exclusion relay
I68 Water cooling auxiliary electric fan relay
I69 Stop switch relay
I70 Radio relay
I71 20 relay for shock-absorbes
I72 Brake fluid tank relay
I73 Front electric window - door-locking relay
I74 Rear electric window - suroof relay
I75 Electric window - sunroof closing relay
I76 Four-wheel drive supply relay
I77 Seres/parallel relay (for cooling electric fans)
I78 Relay for heater blower 50A
I79 Supplementary relay for fog lamps
I80 Seat longitudinal end-run locking relay
I81 Brake pad wear relay
I82 Headlight flashing relay
I83 Relay for electric aerial
I84 Automatic closure relay
I85 Driver's seat memory relay
I86 Relay for driver's seat memory recall stop
I87 Front left-hand seat warming pad relay
I88 Front right-hand seat warming pad relay
I89 Rear foglight permit and front foglight exclusion relay
I90 DIM-DIP exclusion relay
I91 DIM-DIP cut-in relay
I92 K.S.B. relay

L: SENSORS

L1 Low fuel pressure switch
L2 Low oil pressure switch
L3 Max air pressure switch
L4 Thermal switch for engine cooling electromagnetic coupling
L5 Thermal switch for engine coolant max temperature
L6 Thermal switch for engine cooling electric fan
L7 Engine coolant temperature gauge sender
L8 Oil pressure gauge sender
L9 Fuel level gauge sender
L10 Sender for engine coolant temperature gauge and max temperature warning lamp contact
L11 Retarded rotor arm cut-out pressure switch
L12 Engine oil level sensor
L13 Windscreen washing liquid level sensor
L14 Engine coolant level sensor
L15 Fuel flow sensor
L16 Rev-counter pulse generator
L17 Speedometer pulse generator
L18 Load sender
L19 External temperature sensor
L20 Photoelectric cell
L21 Pierburg solenoid valve regulating the supercharging pressure
L22 Knocking sensor
L23 Potentiometer
L24 Engine coolant temperature sensor for ignition advance adjustment
L25 Thermal switch for engine coolant temp erature
L26 Vacuum sensor
L27 Temperature sensor
L28 Front right brake sensor
L29 Front left brake sensor
L30 Rear right brake sensor
L31 Rear left brake sensor
L32 Turbo supercharger air pressure sensor sender
L33 Two-stage thermal contact
L34 Boot lid opened contact
L35 Thermometric switch
L36 Turbo supercharger maximum pressure safety sensor
L37 T.D.C. sensor
L38 Thermal switch for oil radiator electric fan - automatic transmission
L39 Automatic transmission oil maximum temperature sensor
L40 Steering angle sensor
L41 Oil pressure switch for controlled damping suspension shock-absorber
L42 Tooth mesh control sensor
L43 Oil pressure switch for vehicle lift warning light
L44 Engine oil temperature sender
L45 K.S.B. water temperature sender
L46 E.G.R. control solenoid valve
L47 E.G.R. valve potentiometer

M: SOLENOIDS - SOLENOID VALVES

M1 Fuel cut-off solenoid valve
M2 Injection pump solenoid valve
M3 Solenoid with injection pump fuel cut-off microswitch
M4 Fast-idle solenoid
M5 Engine stop solenoid
M6 Fuel pipe closing electromagnet
M7 Door opening/closing electromagnet
M8 Auxiliary air solenoid valve compressor actuation
M9 Pierburg solenoid valve (for idle r.p.m.)
M10 Brake fluid adjusting valve
M11 ABS System main valve
M12 Boot lid opening solenoid
M13 Fuel filter cap opening solenoid
M14 Cruise Control actuator
M15 Emission control solenoid valve
M16 Over-boost solenoid valve
M17 Front right shock-absorber solenoid valve
M18 Front left shock-absorber solenoid valve
M19 Rear right shock-absorber solenoid valve
M20 Rear left shock-absorber solenoid valve
M21 Automatic transmission unit solenoid
M22 Four-wheel drive electromagnetic coupling

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS

N1 Electronic ignition module
N1a Electronic ignition module A
N1b Electronic ignition module B
N2 Connector for Marelli module
N3 Capacitor for electronic ignition
N4 Connector for Bosch module
N5 Tachymetric switch device
N6 Pre-heating glow plug timer
N7 Trip Computer
N8 ALFA ROMEO Control
N9 Brake pad wear control unit

KEY

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS (Continued)

N10 Roof lamp timer
N11 Door-locking control unit
N12 Headlight wiper timer
N13 Road hazard and direction indicators intermittence
N14 Electronic windscreen wiper intermittence
N15 Electronic windscreen wiper intermittence and warning light control
N16 Tachymetric control unit
N17 Trip control unit for fuel flow
N18 Electronic device for headlights flashing
N19 Performance gauge control unit
N20 Advance variation control unit
N21 Power module
N22 ALFA ROMEO Control control unit
N23 Ignition control unit
N24 Pulse converter
N25 Rear fog-light device
N26 Brake pad wear warning light intermittence device
N27 ABS System control unit
N28 ABS System brake fluid electric pump device
N29 Diode holder connection
N29a A diode connection
N29b B diode holder connection
N30 Two-tone hooter control unit
N31 Fuel pre-heating device
N32 Head-phone connection control unit
N33 Differentiated rear window defrosting control unit
N34 Control unit for pulse generator
N35 Coding control unit
N36 Interphone system control unit
N37 Petrol vapour intake pump timer
N38 Power window control unit
N39 Cruise Control unit
N40 DIM DIP electronic device
N41 Lights on signalling control unit
N42 Dimmer for door-locking actuated signalling LED
N43 Automatic transmission locking/unlocking control unit
N44 Rear lights control unit
N45 Antitheft control unit
N46 Shock-absorber electronic control unit
N47 Accelerometer
N48 Radiotelephone control unit
N49 Aerial - Heated rear window control unit
N50 Four-wheel drive control unit
N51 Hydraulic group with ABS control unit
N52 CROSS-OVER control unit (radio system)
N53 Antijamming condenser radio boot panel 4.7 µF
N54 Right radio loudspeaker antijamming condenser 4.7 µF
N55 Left radio loudpseaker antijamming condenser 4.7 µF
N56 Supplementary fusebox radio antijamming condenser 22 µF
N57 Radio relay protection diode
N58 Driver's seat memory control unit
N59 Control unit
N60 Sunroof control unit
N61 Shock absorber control unit condenser
N62 ABS system - longitudinal accelerometer
N63 ABS system - transversal accelerometer
N64 Instrument panel warning light timer
N65 E.G.R. control unit
N66 Brake light radio anti-interfeence condenser
N67 Door lock remote control signal receiver

O: ANCILLARY EQUIPMENT

O1 Heated rear window
O2 Horn
O3 Electrically-operated aerial
O4 Car radio,
O5 Speaker
O6 Cigar lighter
O7 Rear cigar lighter
O8 Two-tone hooter
O9 Transceiver
O10 Rear headphone
O11 Siren
O12 External loudspeaker-microphone
O13 Internal loudspeaker-microphone
O14 Driver's seat warming pad
O15 Rear right seat warming pad
O16 Rear left seat warming pad
O17 Front right seat warming pad
O18 Right door rear-view mirror defroster
O19 Left door rear-view mirror defroster
O20 External right microphone
O21 External left microphone
O22 Engine electric fan supplementary resistance
O23 Antitheft siren
O24 Radiotelephone
O25 Windscreen defroster
O26 Front left-hand seat warming pad
O27 K.S.B. device
O28 DIM-DIP resistance

P: ELECTRIC MOTORS

P1 Windscreen wiper motor
P2 Engine cooling electric fan motor
P3 Engine cooling electric fan electromagnetic drive
P4 Headlight wiper motor
P5 Front left seat adjustment motor
P6 Front right backrest adjustment motor
P7 Front left backrest adjustment motor
P8 Motor for electric door rear-view mirror - left-side
P9 Motor for electric door rear-view mirror - right-side
P10 Front right door locking motor
P11 Front left door locking motor
P12 Rear right door locking motor
P13 Rear left door locking motor
P14 Front right power window motor
P15 Front left power window motor
P16 Rear right power window motor
P17 Rear left power window motor
P18a Main fuel electric pump
P18b Auxiliary fuel electric pump
P19 Windscreen washer pump
P20 Headlight washer pump
P21 Rear window wiper motor
P22 Rear window washer electric pump motor
P23 Supplementary engine cooling electric fan motor
P24 Sunroof motor
P25 Engine oil radiator electric fan
P26 Petrol vapour intake electric pump motor
P27 Windscreen wiper motor with control unit
P28 Front right seat longitudinal adjusting motor
P29 Front left seat longitudinal adjusting motor
P30 Front right seat adjusting motor
P32 Rear right seat motor
P33 Rear left seat motor
P34 Oil radiator electric fan - automatic transmission
P35a Right-hand headlight adjustment motor
P35b Left-hand headlight adjustment motor
P36 Vehicle lift pump motor
P37 Right-hand front seat rear tilt regulation motor
P38 Left-hand front seat rear tilt regulation motor
P39 Right-hand front seat front tilt regulation motor
P40 Left-hand front seat front tilt regulation motor

KEY

P: ELECTRIC MOTORS (Continued)

P41 Front right-hand seat lumbar support regulation
P42 Front left-hand seat lumbar support regulation

Q: HEAT/VENT - AIR CONDITIONING SYSTEM

Q1 Heater/ventilation electric fan
Q2 Pneumatic push-button control for air conditioning
Q3 Pneumatic push-button control for climatisation
Q4 Heater/ventilation electric fan control
Q5 Heater blower fan speed adjustment resistance
Q6 Switch on flap for heater blower fan
Q7 Fluid thermostat
Q8 Electromagnetic coupling pressure switch
Q9 Minimum pressure switch
Q10 Maximum pressure switch
Q11 Compressor electromagnetic coupling
Q12 Thermoswitch exclusion of compressor electromagnetic coupling
Q13 Supplementary conditioner fan
Q14 Relay for supplementary conditioner fan and electromagnetic compressor coupling
Q15 Heater/ ventilation electric fan relay
Q16 Relay for simultaneous control of engine cooling electric fan and supplementary electric fan
Q17 Relay for simultaneous coupling and supplementary electric fan
Q18 Heater
Q19 Conditioner
Q20 Min and max pressure switch (Trinary)
Q21A Automatic control check unit
Q21B Manual control check unit
Q22 Electromagnetic coupling control relay
Q23 Internal temperature sensor for climatisation
Q24 External temperature sensor for climatisation
Q25 Mixed air temperature sensor for climatisation
Q26 Defrosting thermostat
Q27 Air recirculation vent control motor
Q28 Ventilation motor for internal temperature sensor
Q29 Climatisation system branch point
Q30 Air mixture and vent controls
Q30A Air distribution motor to vents
Q30B Cold/hot mixing motor
Q31 Climatisation unit fan speed adjuster
Q32 Climatisation auxiliary relay
Q33 Passenger compartment internal temperature motor with sensor
Q34 Conditioner temperature control potentiometer
Q35 Free fuse for conditioning system
Q36 Conditioning system earth
Q37 Passenger compartment supplementary air conditioning fan
Q38 Passenger compartment supplementary fan control for heating
Q39 Air conditioning system wander fuse - 30A
Q40 Air conditioning system wander fuse - 15A
Q41 Air conditioning system relay and fuse unit
Q42 Air conditioning fan delay device
Q43 Air conditioning system wander fuse - 50A
Q44 Water by-pass electronic actuator
Q45 Electric by-pass cock control microswitches
Q46 External/recirculation air intake electric actuator
Q47 Dynamic air intake actuator control microswitches
Q48 Ait-to-floor electric actuator
Q49 Air-to-floor electric actuator control microswitches
Q50 Recirculation and 1st speed of electric fan microswitches
Q51 Control potentiometer with switch
Q52 Fan for right-hand condenser
Q53 Fan for left-hand condenser
Q54 Fan control relay for right-hand condenser
Q55 Electric fan and compressor electromagnetic coupling simultaneous control relay for left-hand condenser
Q56 Relay for heater/air conditioner
Q57 Electric fan speed selector relay
Q58 Electronic thermostat control unit
Q59 Electronic thermostat temperature sensor

R: SAFETY DEVICES

R1 Seat belt device
R2 Catalytic converter temperature indicator
R3 Thermocouple for catalytic converter temperature detection
R4 Unfastened seat belt buzzer
R5 Open door buzzer
R6 Mileometer
R7 Seat belt warning lamp
R8 30,000 mile warning lamp
R9 Push-button switch on seat belts
R10 Catalytic converter maximum temperature warning light
R11 Front left door switch for seat belt device
R12a Right-side passive seat belt control unit
R12b Left-side passive seat belt control unit
R13a Right-side passive seat belt motor
R13b Left-side passive seat belt motor
R14a Right-side seat belt winder locking mechanism
R14b Left-side seat belt winder locking mechanism
R15 Passive seat belt-unfastened buzzer
R16a Right-side passive seat belt warning light
R16b Left-side passive seat belt warning light
R17a Right-side passive seat belt-unfastened switch
R17b Left-side passive seat belt-unfastened switch
R18a Right-side passive seat belt switch set to position "A"
R18b Left-side passive seat belt switch set to position "A"
R19a Right-side passive seat belt switch set to position "B"
R19b Left-side passive seat belt switch set to position "B"
R20 AIR-BAG front - right sensor
R21 AIR-BAG front - left sensor
R22 AIR-BAG control unit
R23 Steering wheel inflation module for AIR-BAG
R24 Key-inserted and unfastened safety belt signalling buzzer
R25 Safety belt inserted hook sensor

S: ELECTRONIC FUEL INJECTION

S1 Injection control unit
S2 Double relay
S3 Electroinjectors
S4 Cold start electroinjector
S5 Air flow meter
S6 Accelerator throttle body switch
S7 Engine coolant temperature sensor
S8 Thermo-time switch
S9 Auxiliary air valve
S10 Lambda probe
S11 Motronic control unit
S12 Motronic relay
S12a Petrol pump Motronic relay
S12b Motronic relay with diode
S12c Timing variator Motronic relay
S12d Auxiliary Motronic relay
S13 Timing sensor
S14 Rev sensor
S15 Timing variator
S16 Altitude air regulator
S17 CEM control unit
S17a CEM control unit white connector
S17b CEM control unit black connector
S18 Throttle angle sensor
S19 Hall sensor

S: ELECTRONIC FUEL INJECTION (Continued)

S20 Deton sensor
S21 Throttle actuator
S22 Electroinjector terminal
S23 Electroinjector resistance
S24 Electroinjector terminal board
S25 Automatic transmission/manual transmission switch connector
S26 Injector system
S27 Lambda probe resistance
S28 Injection control relay
S29 Idle adjusting actuator
S30 Motronic control unit switch connector
S31 Rev and timing sensor
S32 Lambda probe coding connector
S33 Full load enrichment device
S34 Available
S35 Heated Lambda probe
S36 Free fuse for Auxilliary Motronic relay
S37 4x2 - 4x4 switching connector
S38 Sensor on throttle body with potentiometer
S39 Cylinder No. 1 recognition sensor
S40 Ignition/injection control unit
S41 Main relay
S42 Secondary relay
S43 Absolute pressure sensor
S44 Throttle angle potentiometer
S45 Lambda probe wander fuse
S46 Motronic power supply wander fuse
S47 Fuel pump wander fuse
S48 "CO" regulation potentiometer
S49 MP3.1 control unit switch connector for 1.5 IE and 1.7 IE engines

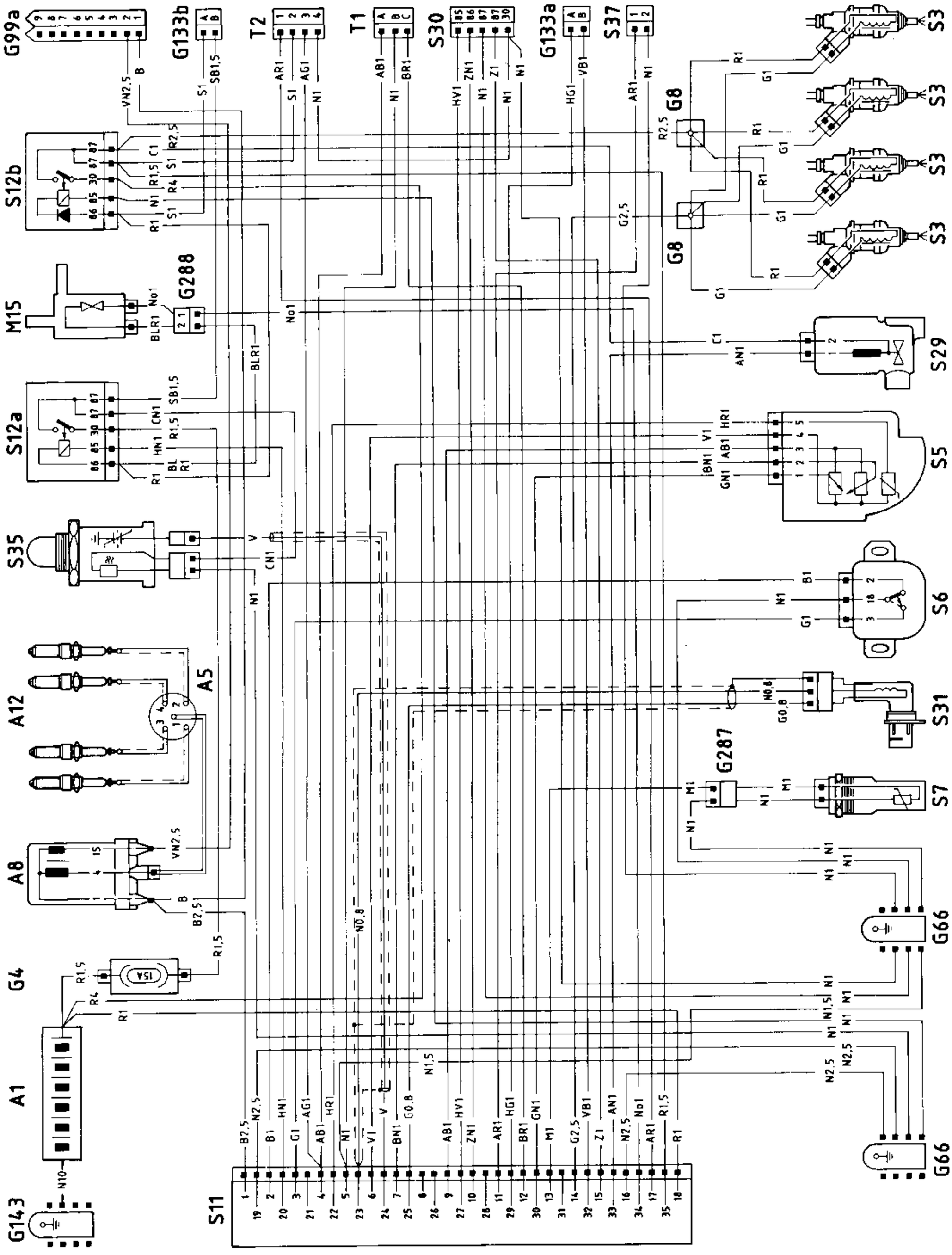
T: DIAGNOSIS

T1 Alfa Tester connector
T2 "Flashing code" diagnosis connector
T3 AIR-BAG diagnosis connector
T4 Diagnosis indicator light push-button
T5 Controlled damping suspension electric system diagnosis coupling

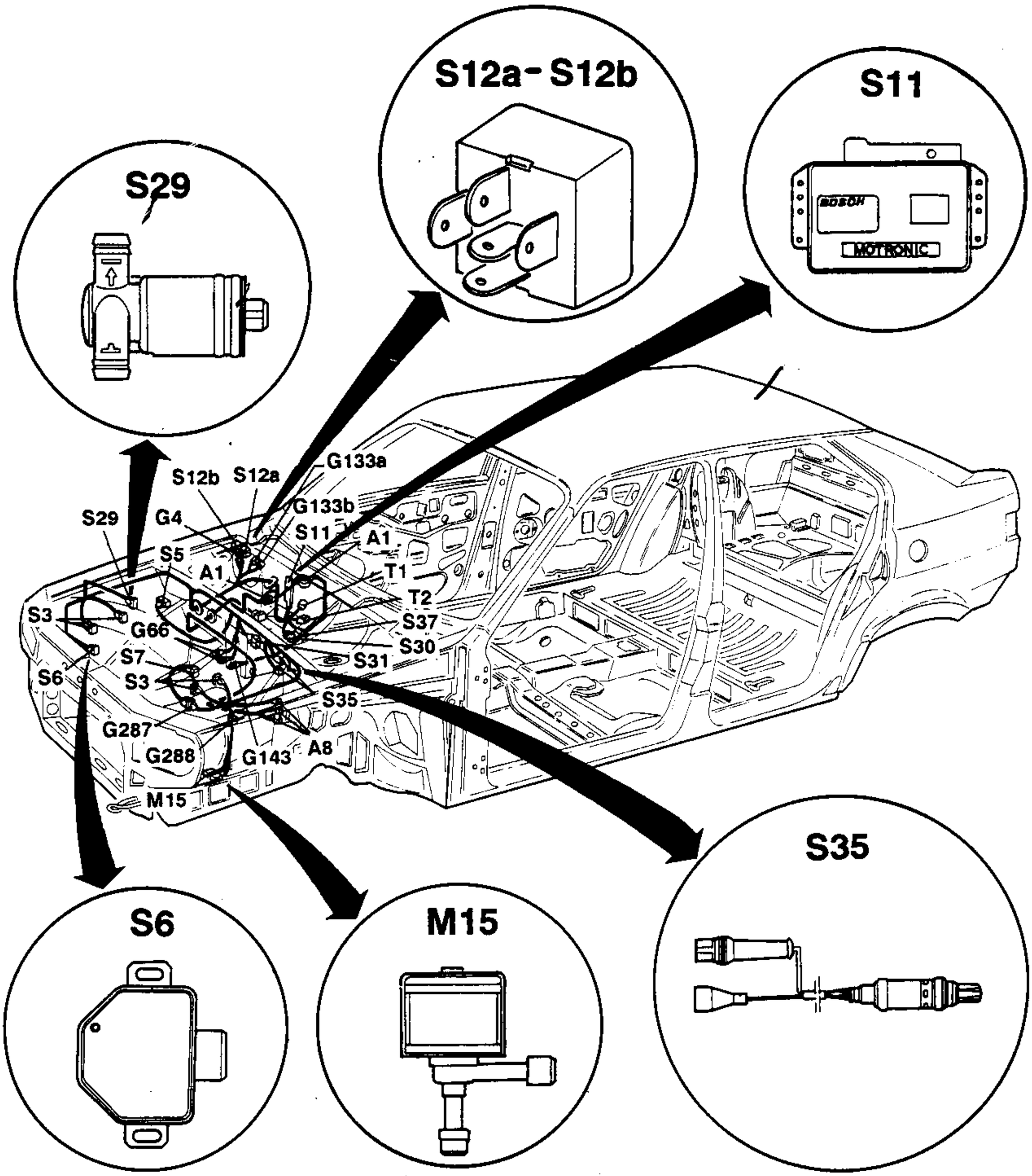
IGNITION INJECTION MOTRONIC ML4.1 (Diagram A)

33 Boxer 16V (with catalytic converter)

Wiring diagram

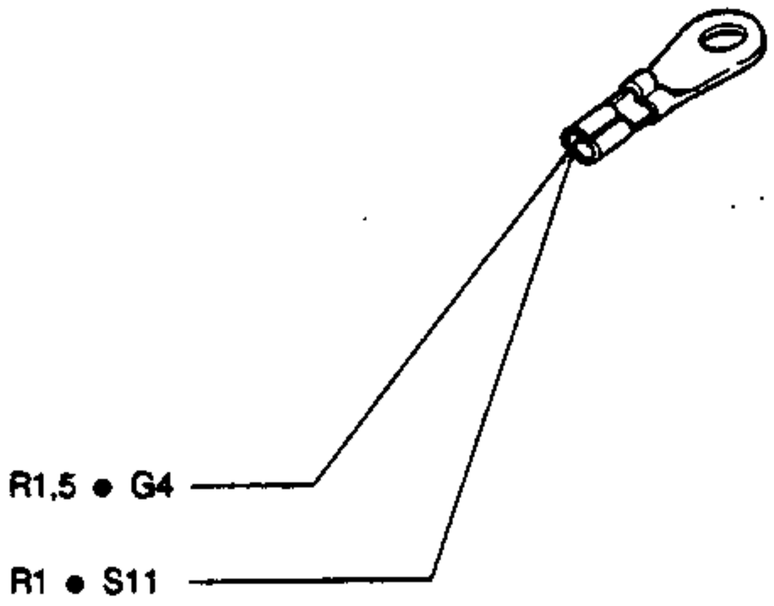


Wiring



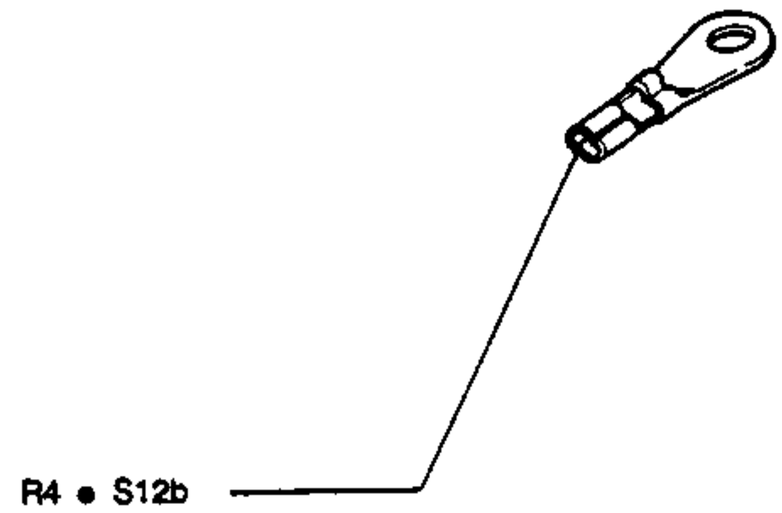
Connectors

Battery (+)	A1



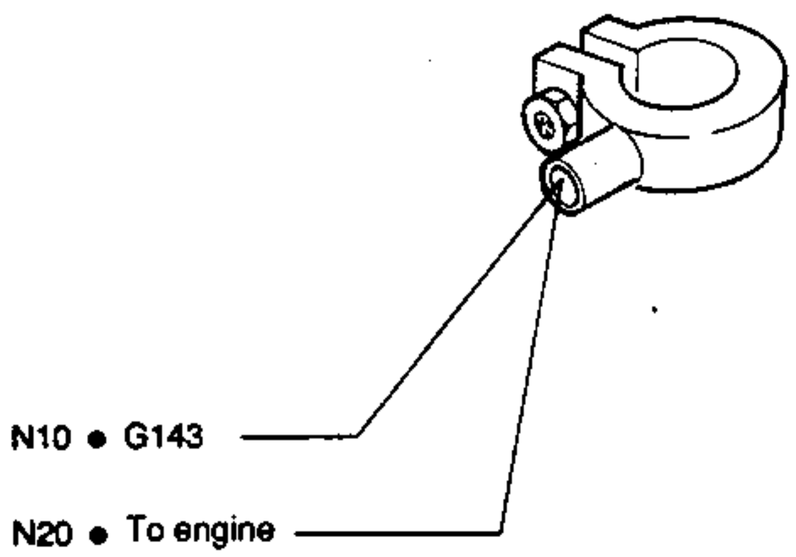
33.90.014

Battery (+)	A1



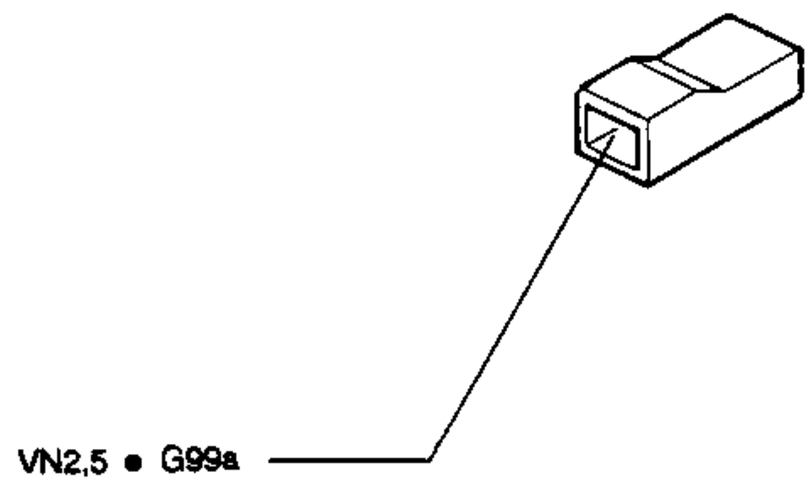
33.90.014

Battery (-)	A1



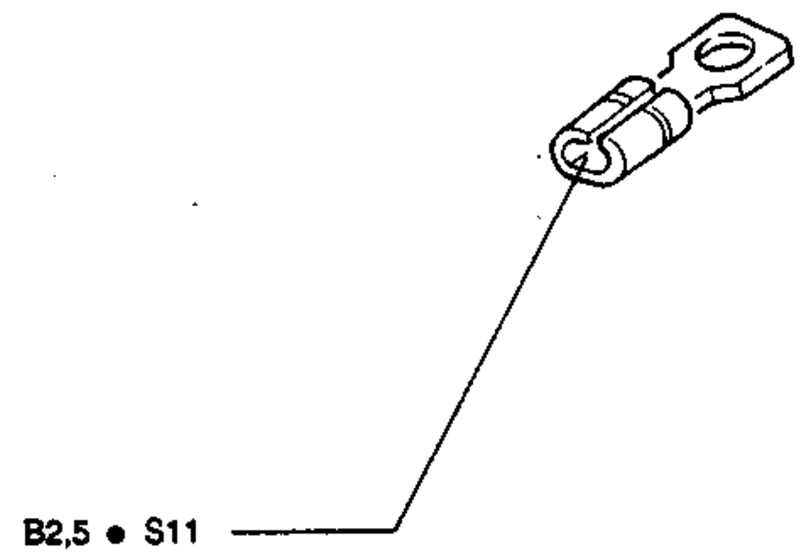
33.90.002

Ignition coil (15)	A8



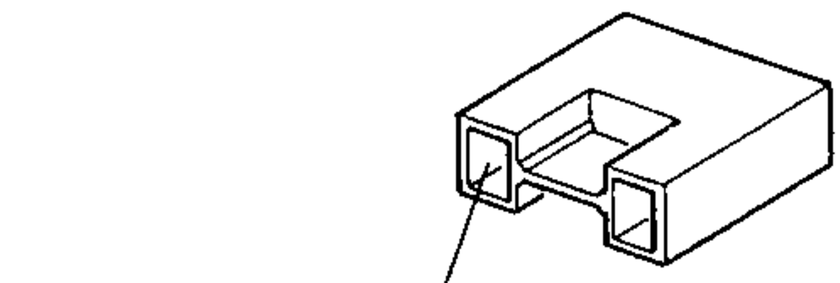
33.90.015

Ignition coil (1)	A8



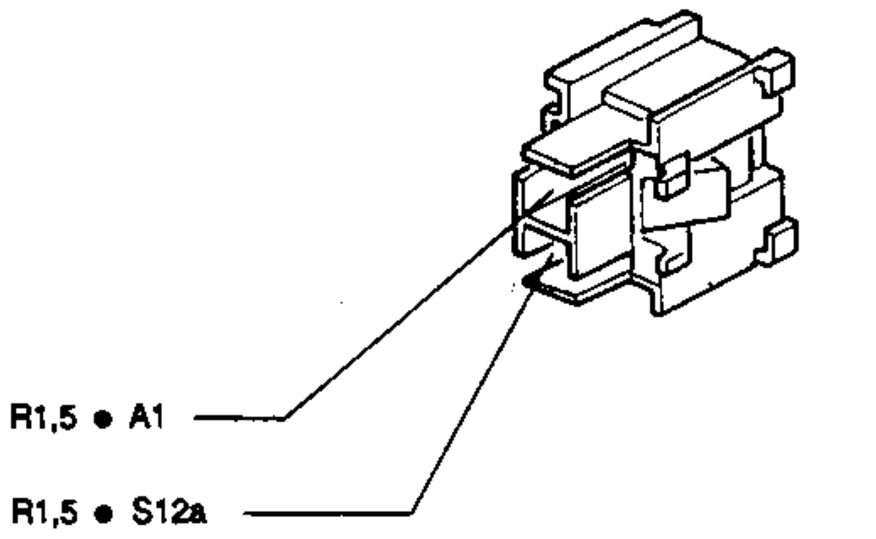
33.90.045

Ignition coil (1)	A8



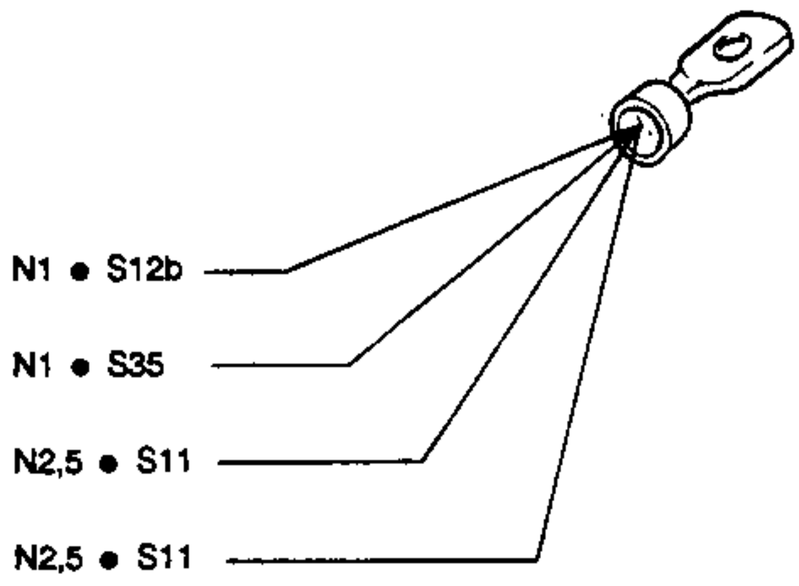
33.90.052

Free Fuse	G4



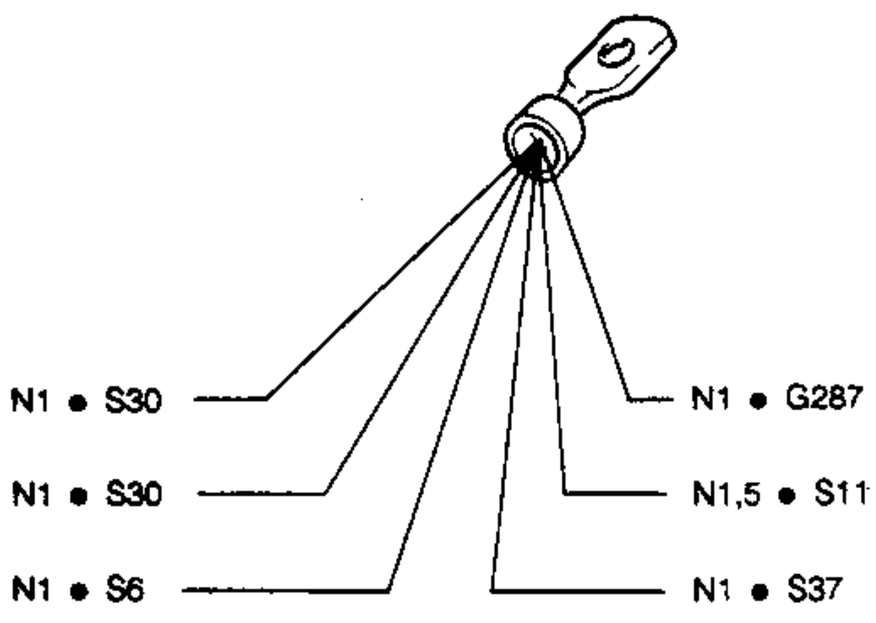
33.90.046

Motronic wiring earth	G66



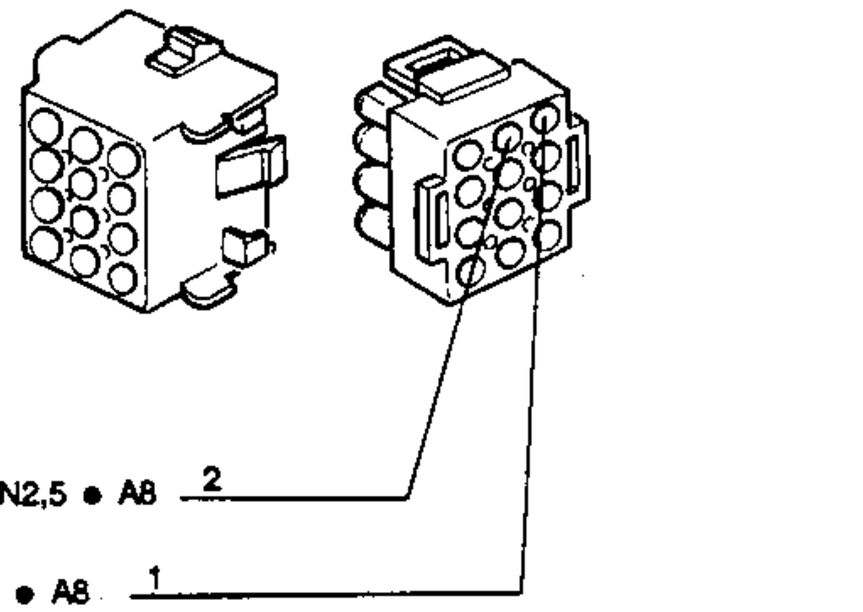
33.90.001

Motronic wiring earth	G66



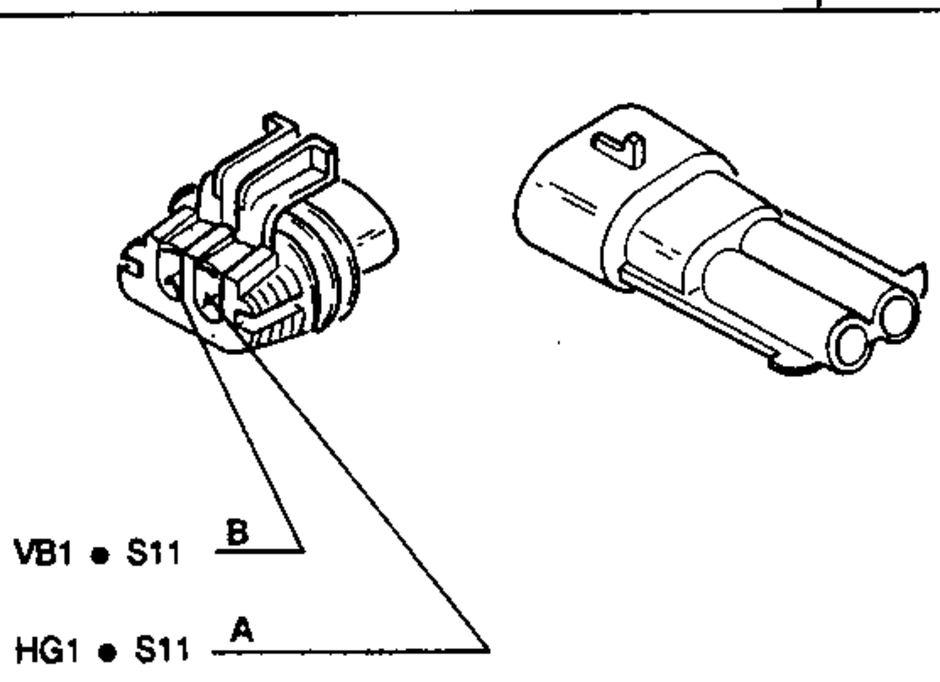
33.90.001

Connector for engine dashboard A	G99a



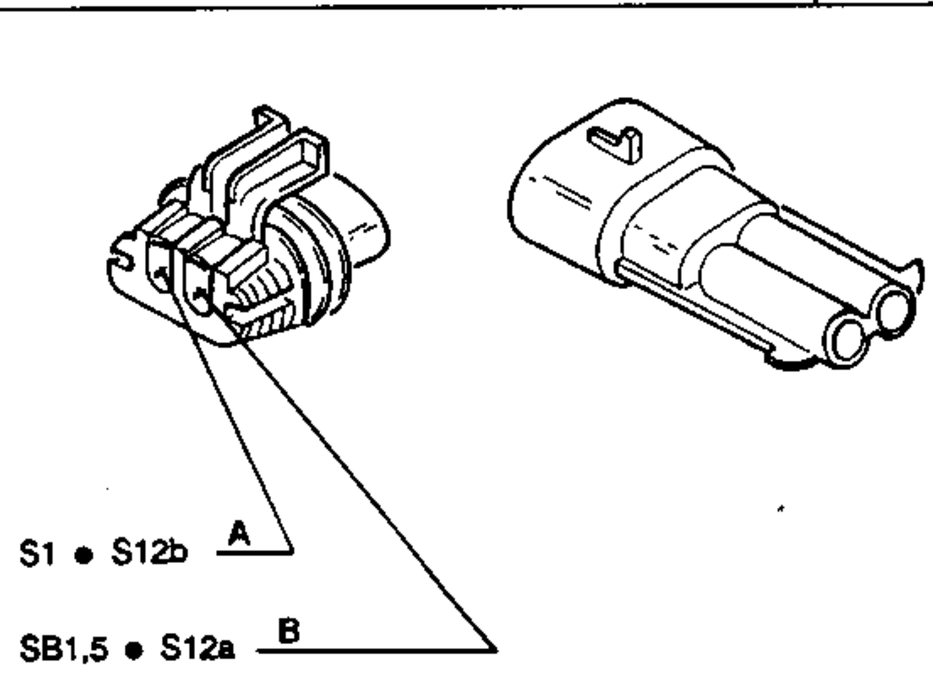
33.90.016

Ignition - electronic injection A wiring connection	G133a



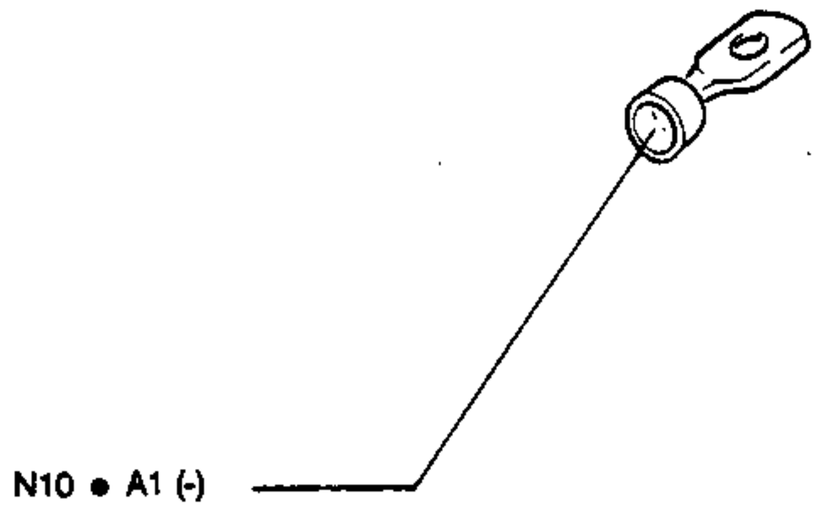
33.90.055

Ignition - electronic injection B wiring connection	G133b



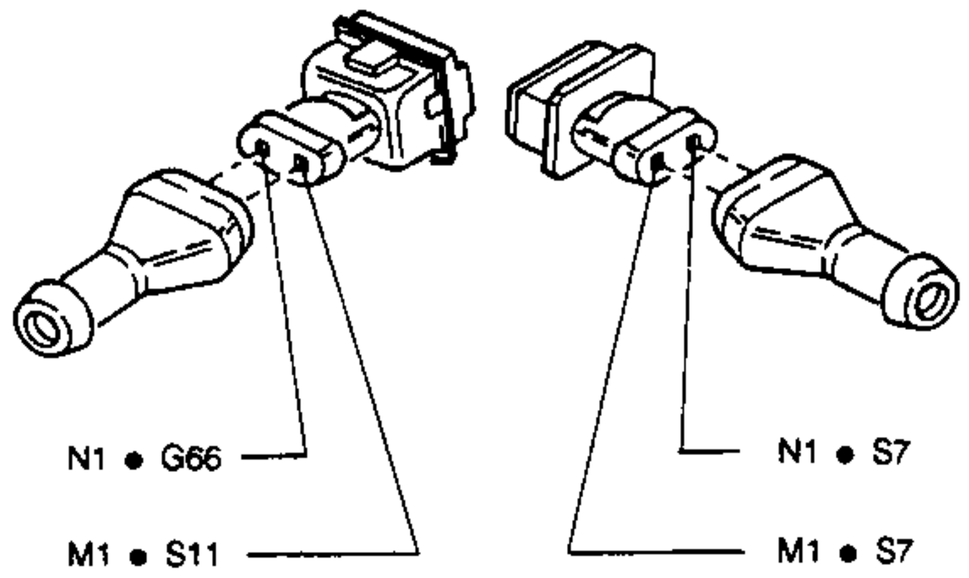
33.90.055

Central service compartment earth	G143



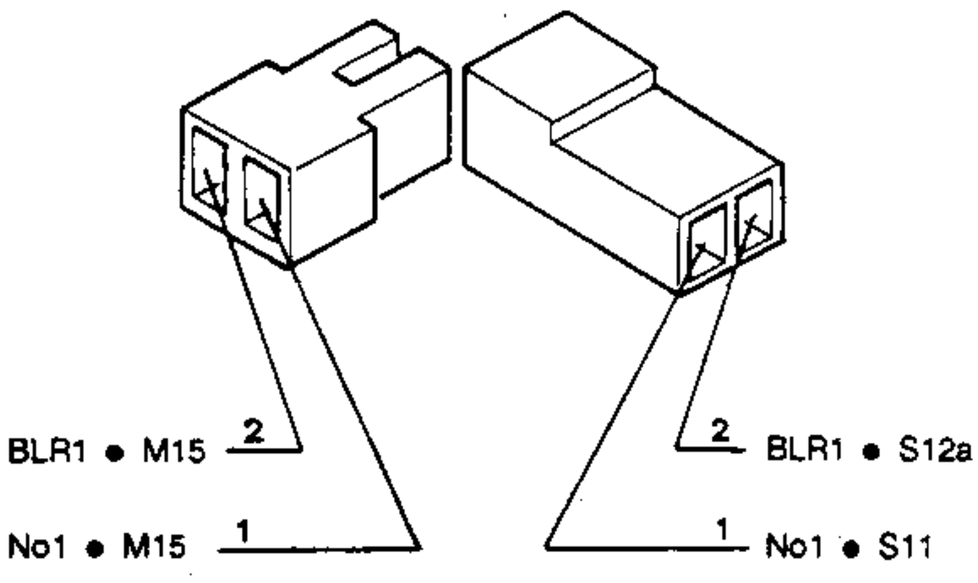
33.90.001

Injection wiring - engine coolant temperature sensor wiring connection	G287



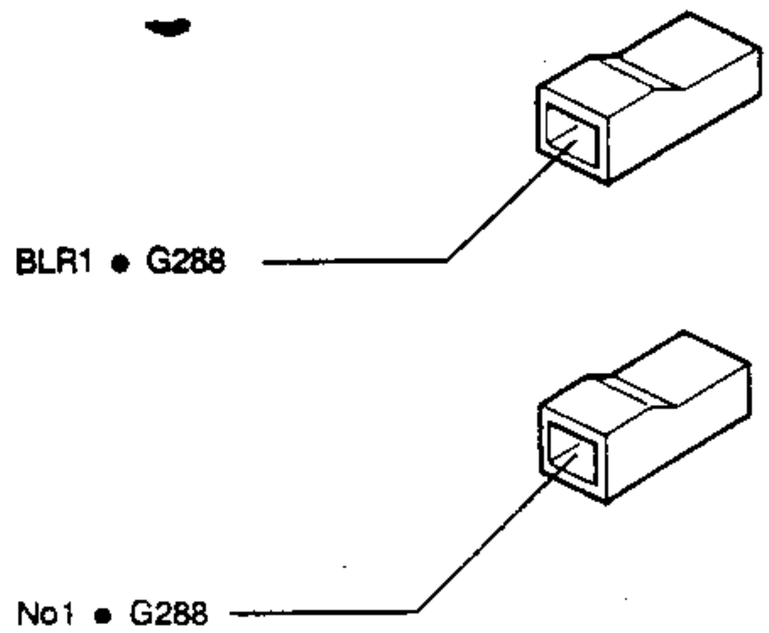
33.90.077

Injection wiring evaporation solenoid valve wiring connection	G288



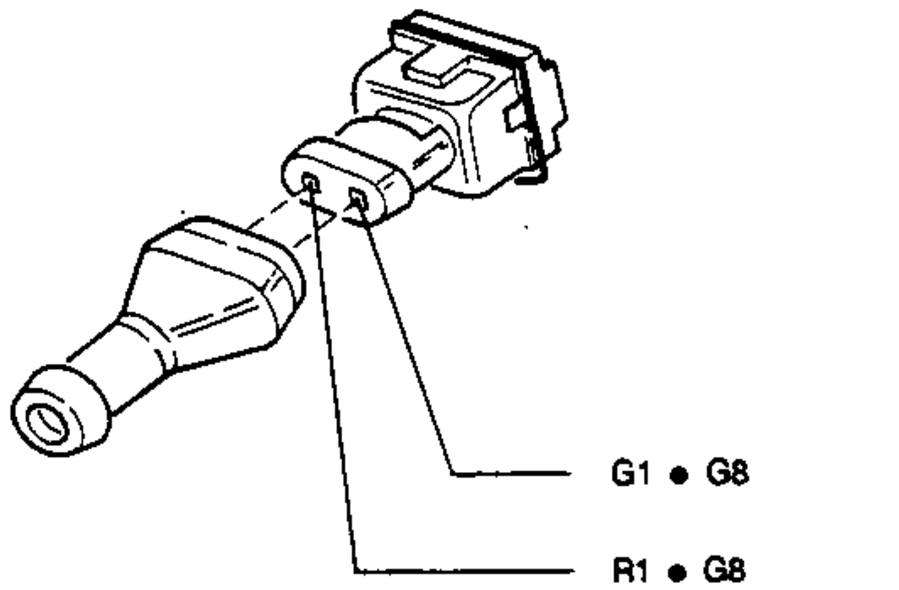
33.90.013

Evaporation solenoid valve	M15



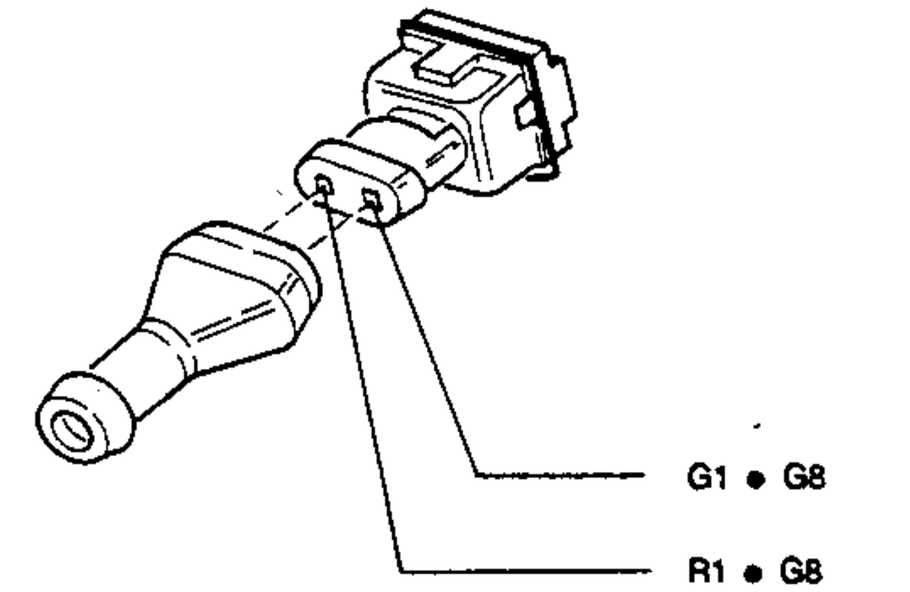
33.90.015

Electroinjector 1	S3



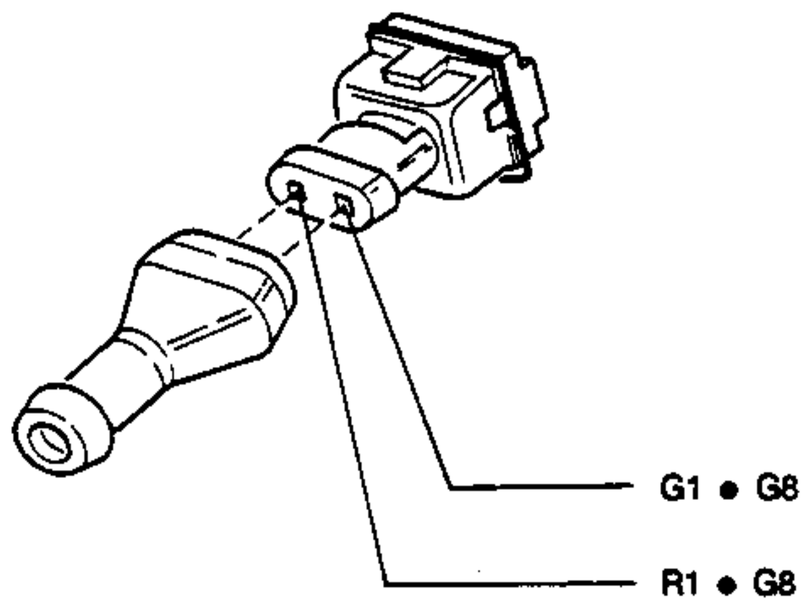
33.90.047

Electroinjector 2	S3



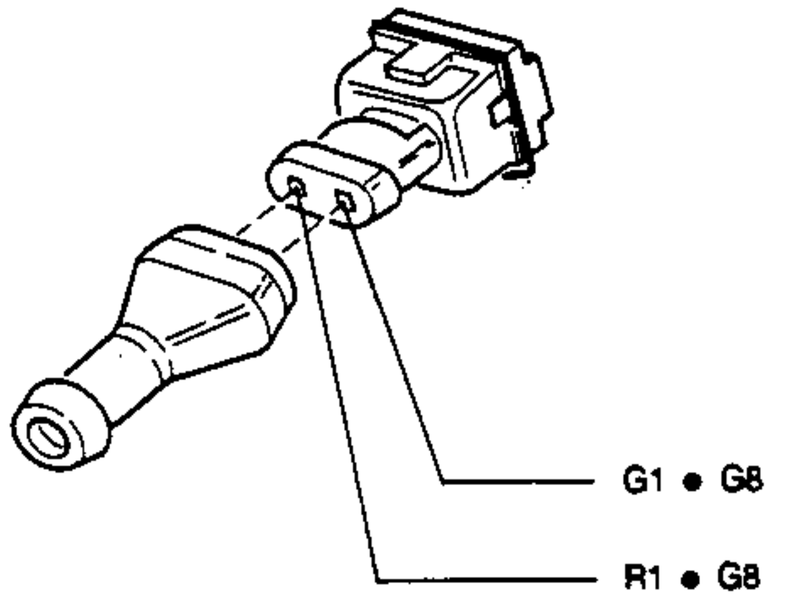
33.90.047

Electroinjector 3	S3



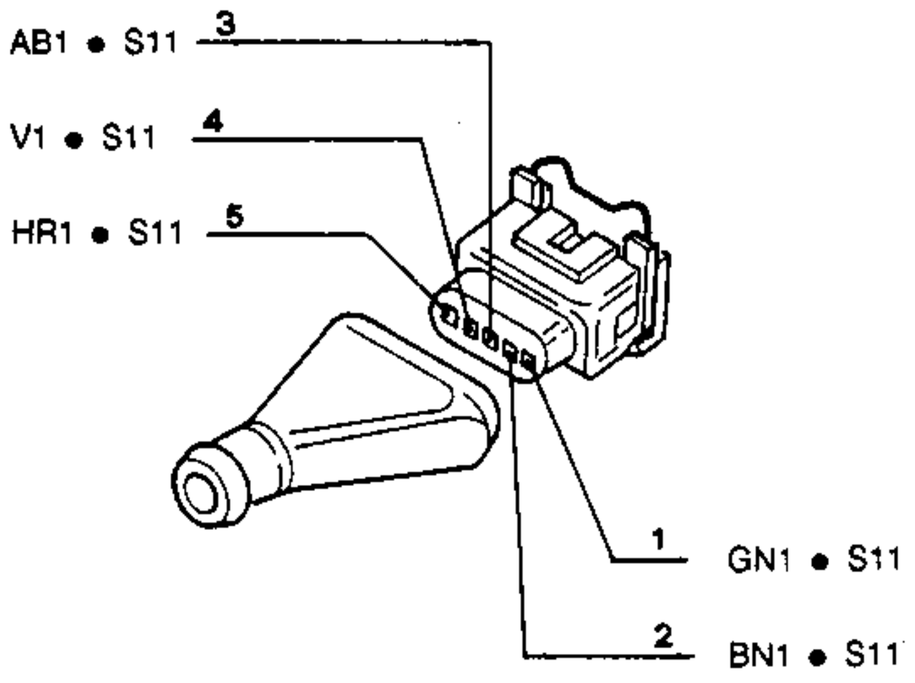
33.90.047

Electroinjector 4	S3



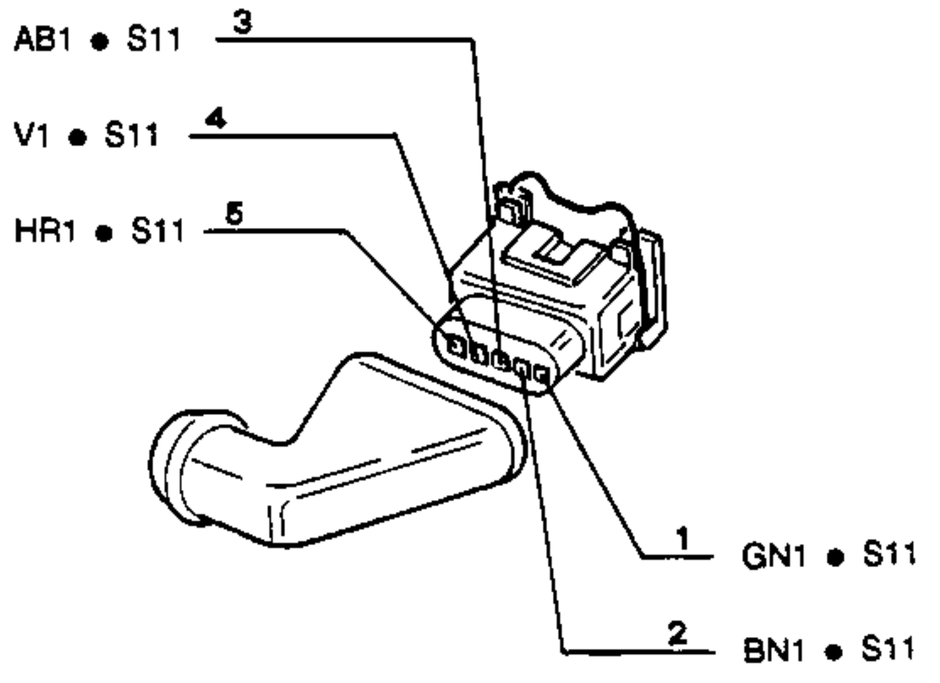
33.90.047

Air flow gauge (before modification)	S5



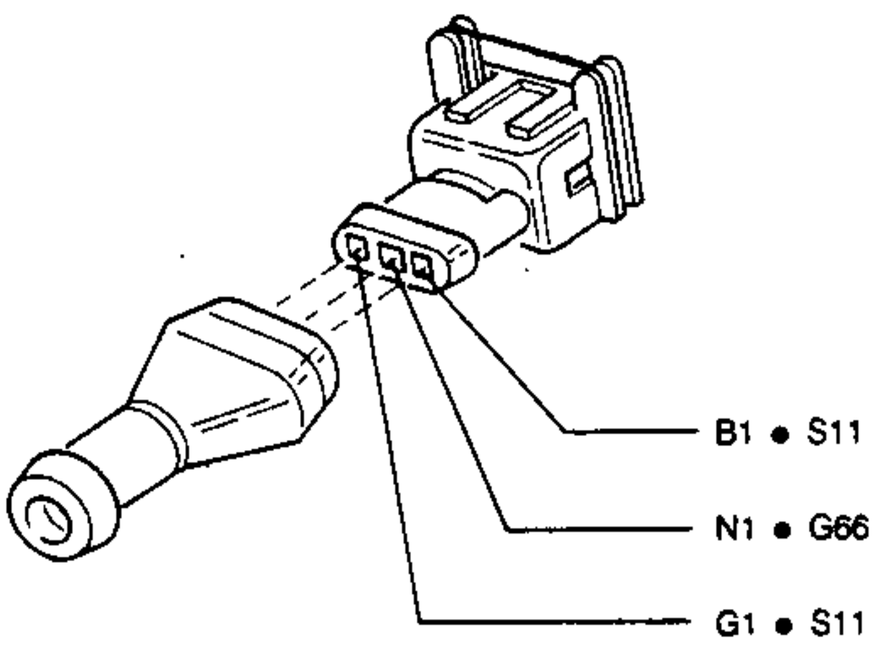
33.90.050

Air flow gauge (after modification)	S5



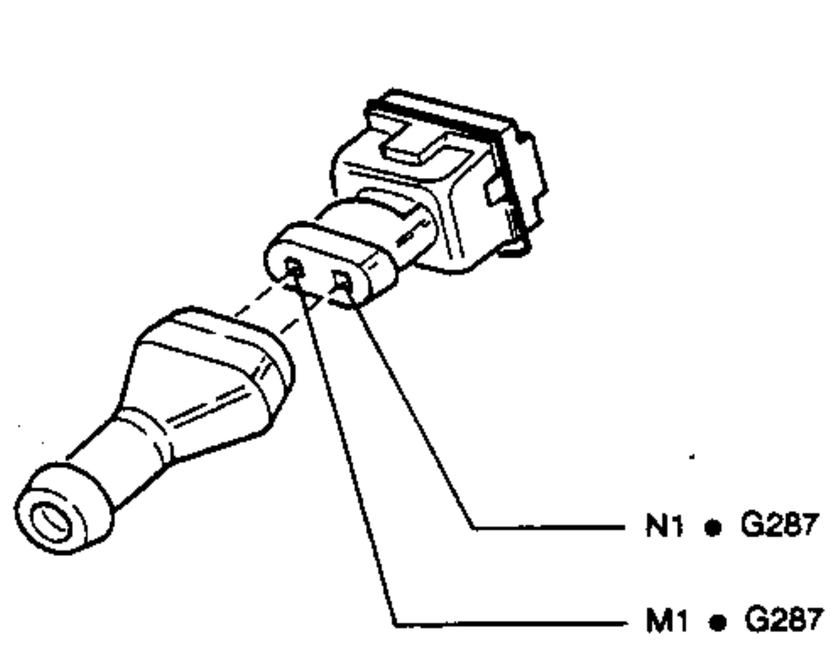
33.90.048

Accelerator butterfly switch	S6



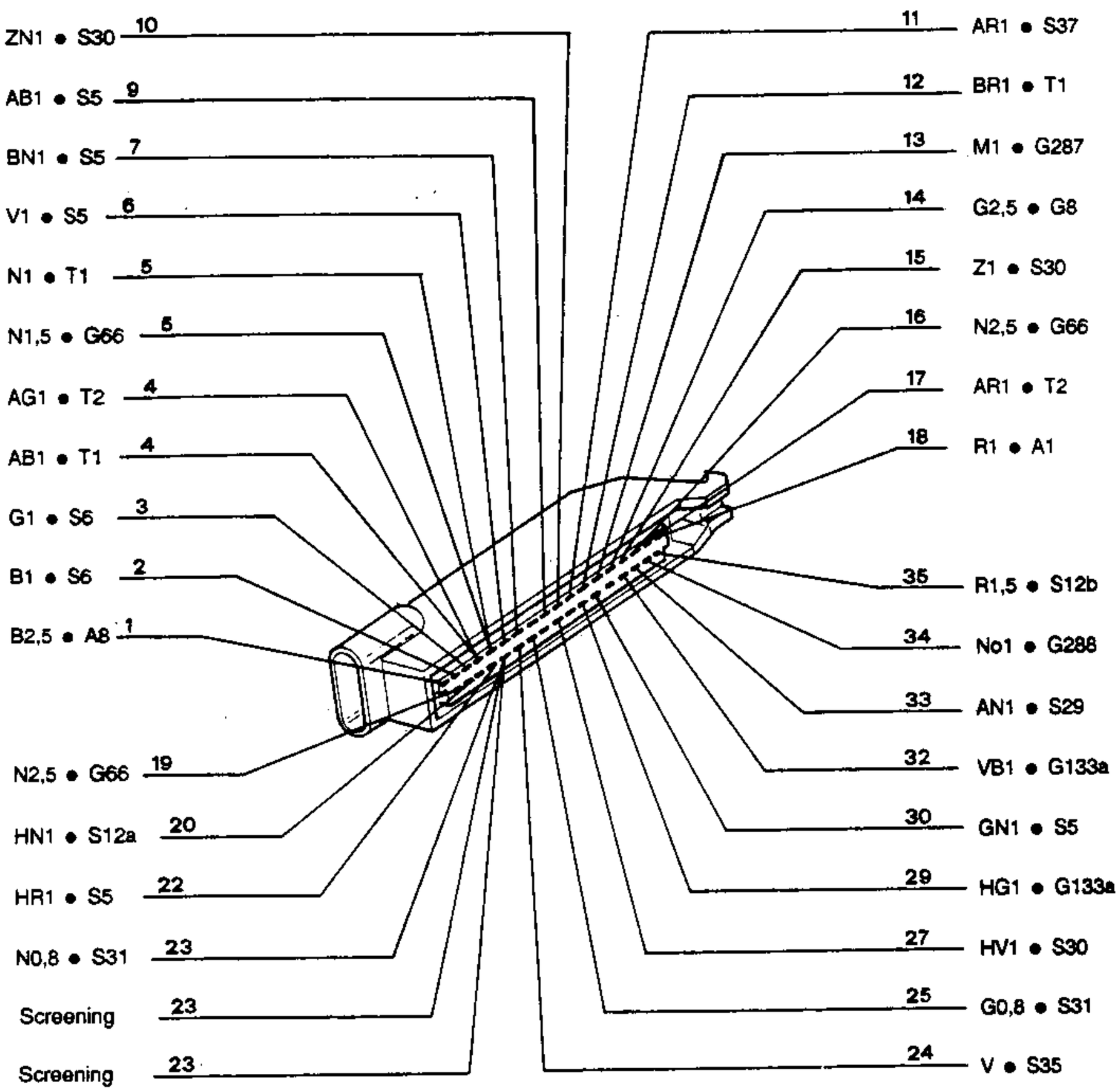
33.90.049

Engine coolant temperature sensor	S7



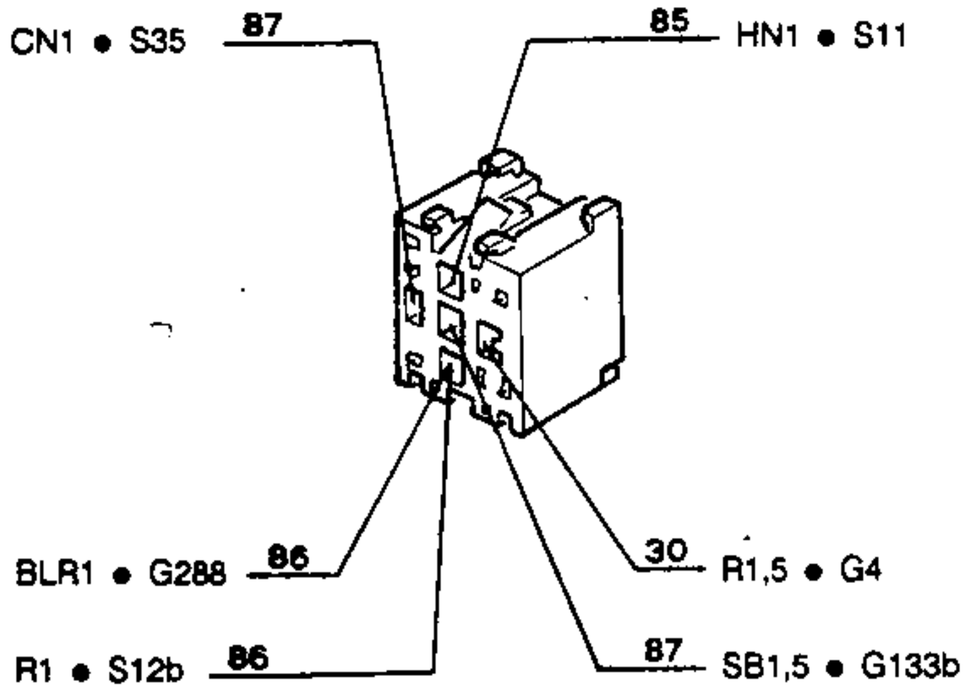
33.90.047

Motronic Control unit — S11



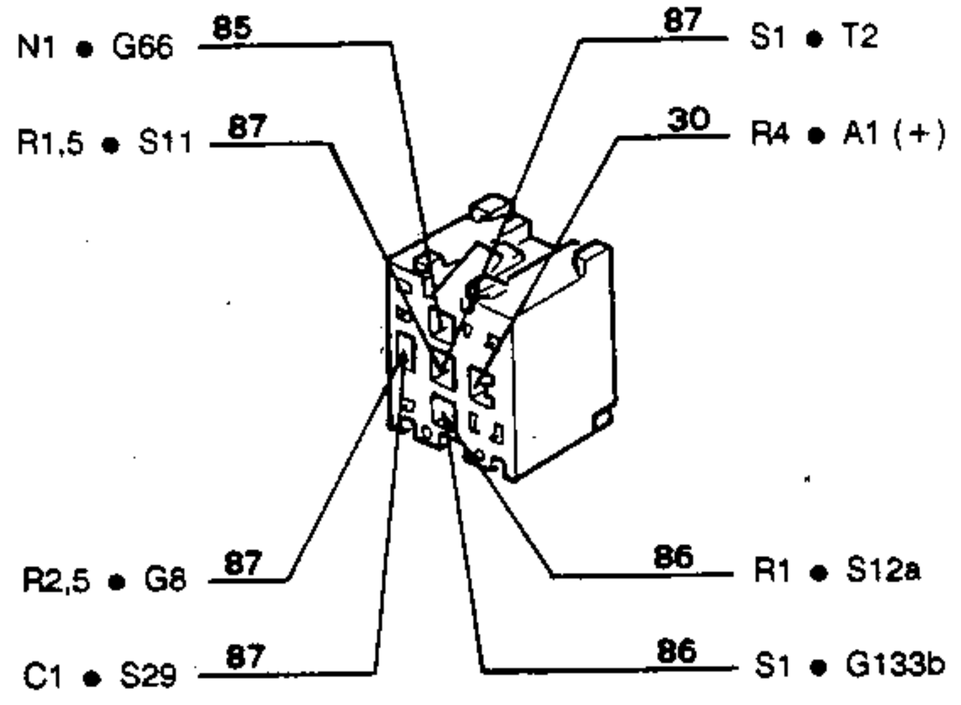
33.90.053

Petrol pump Motronic relay — S12a



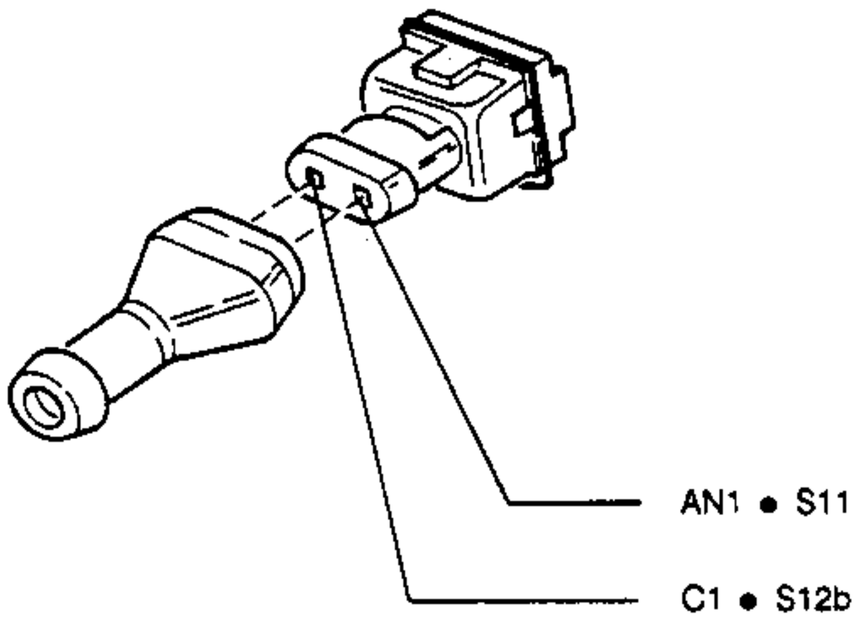
33.90.007

Motronic relay with diode — S12b



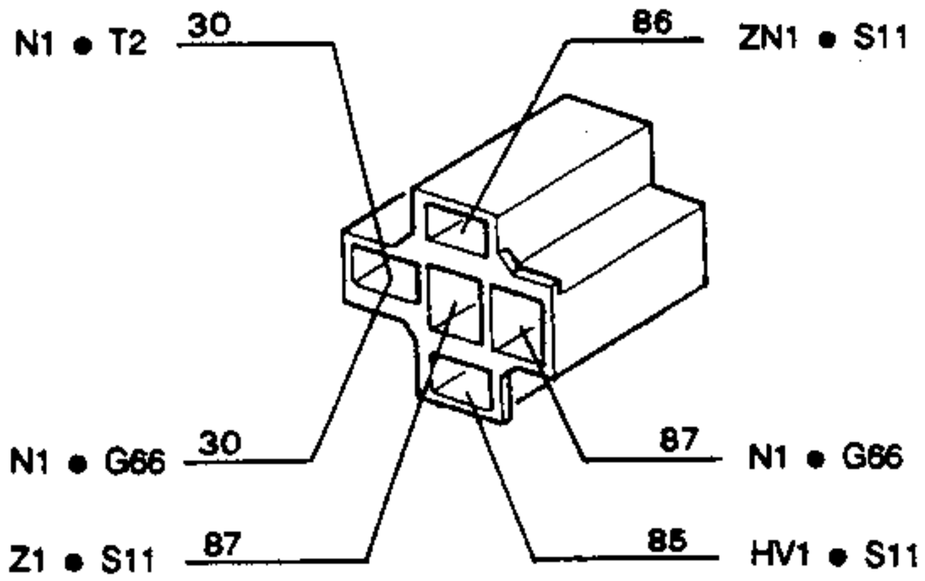
33.90.007

Idle adjusting actuator — S29



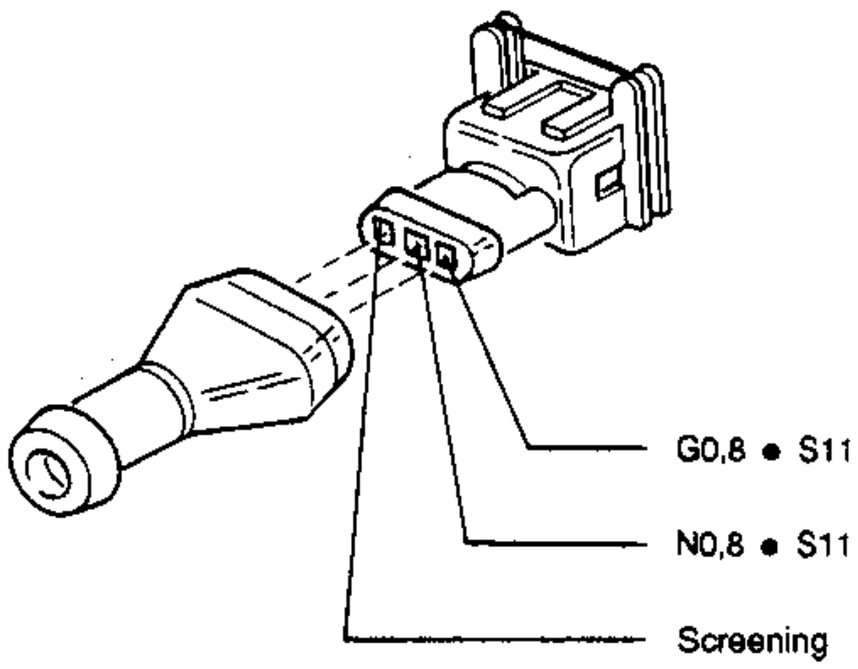
33.90.047

Motronic control unit switch connector — S30



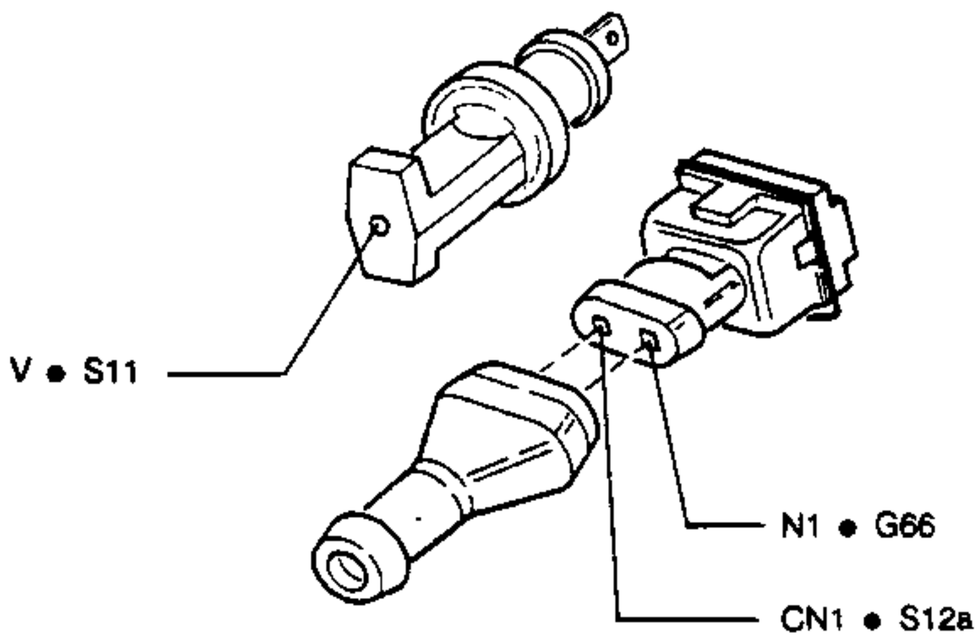
33.90.023

Revolution and timing sensor — S31



33.90.049

Heated Lambda probe — S35



33.90.047 - 33.90.051

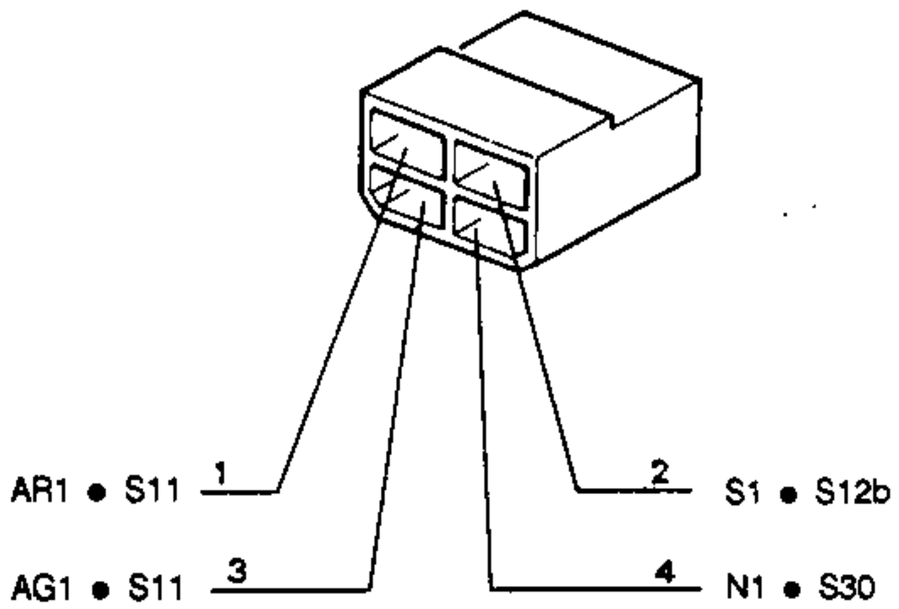
4 x 2 / 4 x 4 switching connector — S37

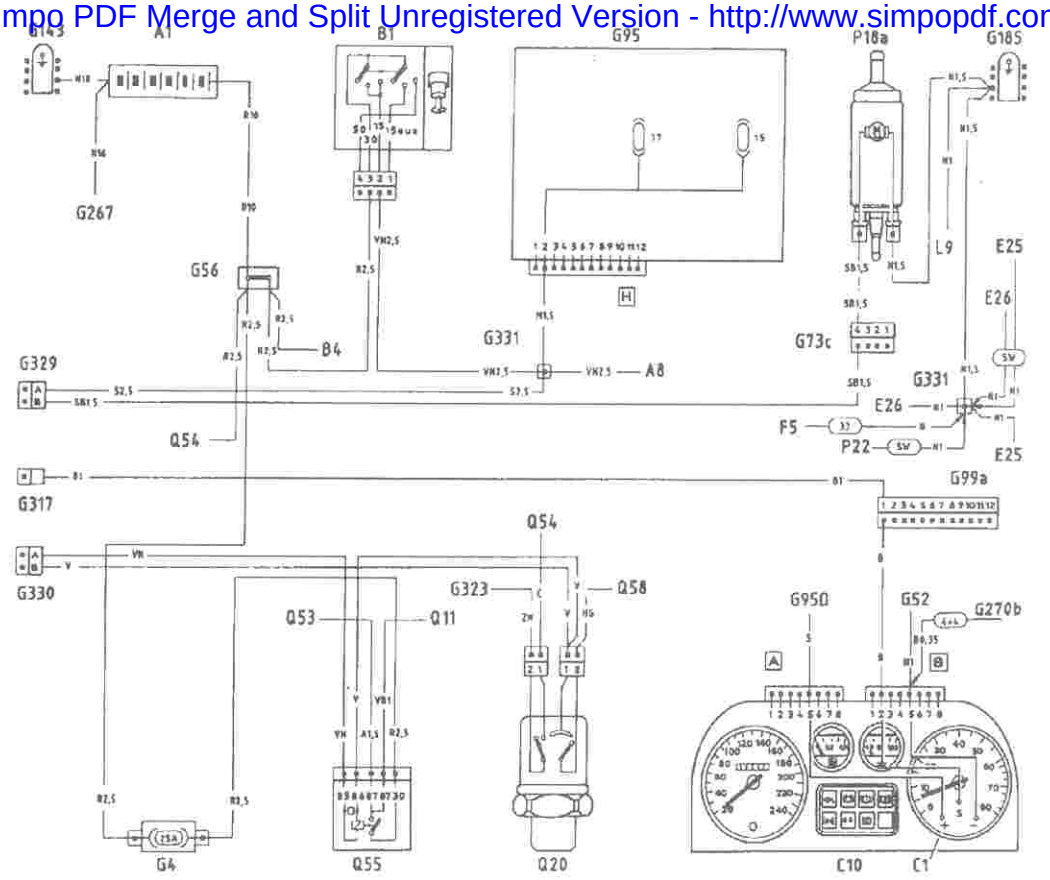
33.90.043

Connector for Alfa Tester — T1

33.90.040 - 33.90.029

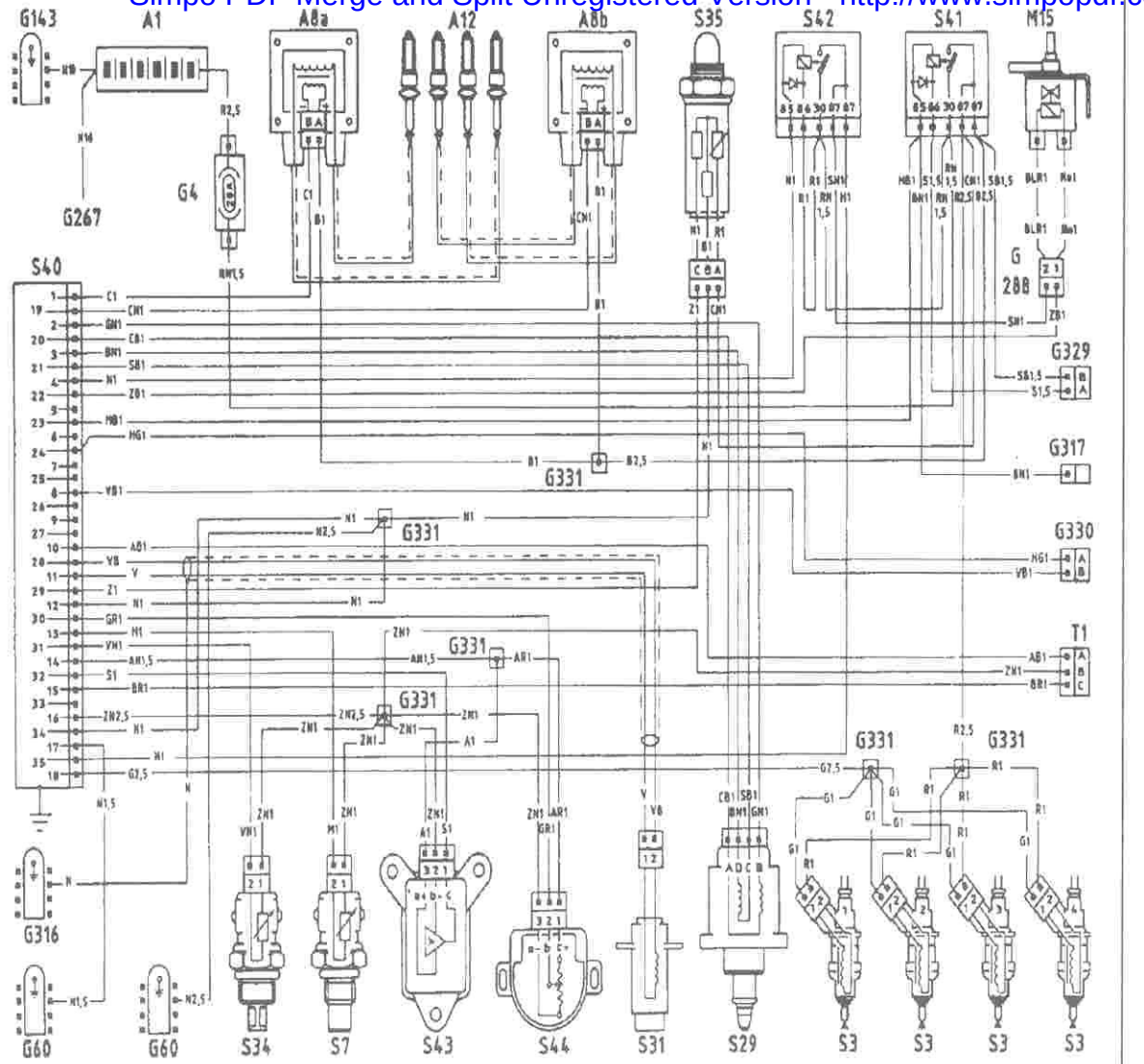
Connector for diagnostic "flashing code"	T2





4.32b.ábra:
A katalizátoros Weber IAW elektromos kapcsolási rajza (folytatás)

A1	Akkumulátor
A8	Gyújtótekercs
A8a	Gyújtótekercs “a”
A8b	Gyújtótekercs “b”
A12	Gyújtógyertyák
B1	Gyújtáskapcsoló
B4	Tompított fényszóró/ fényszóró visszajelzője
C1	Fordulatszámmérő
C10	Műszerfal
E25	Jobb hátsó lámpa
E26	Bal hátsó lámpa
F5	Csomagtérvilágítás
G4	Biztosíték
G38	Légkondicionáló berendezés dugaszoló csatlakozója
G52	Biztosítékdoboz testeléséhez
G56	Leágazás a műszerfal felé
G60	Befecskendező szelepek testelése
G73c	Üzemanyagszivattyú felé összekötő dugaszoló csatlakozó
G95	Fő biztosítékdoboz
G95D	Alfa Romeo Control felé összeköttetés
G99a	Összekötő dugaszoló csatlakozó a műszerfalhoz
G143	Központi testelés
G185	Üzemanyagszivattyú testelése a csomagtartó bal oldalán
G267	Motor testkábele
G270b	Szerelvényfal csatlakozója (4x4)
G283	Motorolajnyomás kapcsolójának testelése
G288	Üzemanyaggőz-elvezetőszelep dugaszoló csatlakozója
G331	Speciálisan hegesztett központi elágazás
G316	Forgattyústengely felső holtponti érzékelő/ fordulatszámérzékelő testelése
G317	Fordulatszámmérőhöz összekötő dugaszoló csatlakozó
G329	Rendszer reléjéhez összekötő dugaszoló csatlakozó
G330	Elektronikus vezérlőkészülék felé összekötő dugaszoló csatlakozó
L9	Üzemanyagszintmérő úszó
M15	Üzemanyaggőz-elszívó szelep
P18a	Üzemanyag-szivattyú
P22	Hátsó ablaktörlő motor
Q11	Légkondicionáló berendezés kompresszora
Q15	Fűtőventilátor reléje
Q20	Motorolajnyomás-kapcsoló
Q22	Légkondicionáló berendezés kompresszorának reléje
Q53	Fűtőventilátor (légkondicináló)
Q54	Fűtőventilátor reléje (légkondicionáló)
Q55	Légkondicionáló kompresszorának reléje
S3	Befecskendezőszelepek
S7	Hűtőfolyadék hőmérsékleti érzékelője
S29	Alapjárati állítómotor
S31	Forgattyústengely felső holtponti érzékelő/ fordulatszámérzékelő



KEY

A: STARTING - RECHARGING

A1 Battery
A2 Alternator
A3 Alternator with integral electronic voltage regulator
A4 Voltage regulator
A5 Ignition distributor
A5a Ignition distributor A
A5b Ignition distributor B
A6 Impulse generator
A7 Rotor
A8 Ignition coil
A8a Ignition coil A
A8b Ignition coil B
A9 Coil resistance
A10 2-way connector for coil
A11 Starter motor
A12 Spark plugs
A13 Pre-heating glow plugs
A14 Alternator cable terminal board

B: MANUAL ELECTRIC CONTROLS

B1 Ignition switch
B2 Windscreen wiper control
B3 Windscreen and/or headlight washer pump control
B4 Control for side lights, flashing, low/high beam headlights
B5 Horn control switch
B6 Direction indicator light control
B7 Low beam flashing control switch
B8 High beam flashing control switch
B9 Heated rear window control switch
B10 Fog light control switch
B11 Rear fog light control switch
B12 Road hazard lights control switch
B13 Passenger compartment front roof lamp control switch
B14 Passenger compartment rear roof lamp control switch
B15 Passenger compartment roof lamp control switch
B16 Cluster lighting dimmer rheostat
B17 Gearbox oil level warning light switch
B18 Front right door-locking control switch
B19 Front left door-locking control switch
B20 Interior door-locking switch
B21 Front right power window control switch
B22 Front left power window control swtich
B23 Rear right power window control switch
B24 Rear left power window control switch
B25 Rear power window inhibitor switch
B26 Rear power window and rear cigar lighter inhibitor switch
B27 Front seat height adjustment control switch
B28 Front left backrest adjustment control switch
B29 Front right backrest adjustment control switch
B30 Door electric rear view mirror control switch
B31 Electric aerial control switch
B32 Windscreen washer pump control
B33 Front spot light switch
B34 Rear left spot light switch
B35 Rear right spot light switch
B36 Right door rear view mirror double control switch
B37 Parking light control switch
B38 Rear window wiper control switch
B39 Trip odometer recall microswitch
B40 Trip odometer reset microswitch
B41 VF electronic rheostat
B42 Lamp dimmer rheostat
B43 Internal control switch for door unlock
B44 Rear spot light control switch
B45 Recognition light control switch
B46 Two-tone horn control switch
B47 Sunroof motor control switch
B48 Interphone system control switch
B49 Talk/listen switch
B50 Siren control switch
B51 Driver's seat heater control switch
B52 Front right seat longitudinal adjusting switch
B53 Front power window full acting switch
B54 Front left seat longitudinal adjusting switch
B55 Luggage compartment opening control switch
B56 Rear right seat adjusting device switch
B57 Rear right seat heating device switch
B58 Rear left seat adjusting device switch
B59 Rear left seat heating device switch
B60 Cluster warning light operation check push-button
B61 Fuel filler cap opening switch
B62 Front right seat heating device switch
B63 Front right seat height adjusting switch
B64 Cruise control "OFF", "RESUME" switch
B65 Cruise control "SET ACC.", "SET DEC." switch
B66 Position/Hazard/Fuel flap light control push-button panel
B67 Controlled damping suspension shock-absorber control board
B68 Combination switch unit
B69 Headlight aiming control device
B70 Rear windscreen washer-headlight washer windscreen washer pump control
B71 Front electric window double control switch (LH and RH)
B72 Four-wheel drive control switch
B73 Vehicle lift switch
B74 Vehicle lower switch
B75 Driver's seat memory panel
B76 Front right-hand seat lumbar support regulation switch
B77 Front left-hand seat lumbar support regulation switch
B78 Front right-hand seat rear tilt regulation switch
B79 Front left-hand seat rear tilt regulation switch
B80 Front right-hand seat vertical - longitudinal regulation switch
B81 Front left-hand seat vertical - longitudinal regulation switch
B82 Front right-hand seat front tilt regulation switch
B83 Front left-hand seat front tilt regulation switch
B84 Front rifht-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B85 Front left-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B86 Front left-hand seat heating switch
B87 Boot release switch with glovebox light
B88 Light dimmer rheostat (DIM-DIP)

C: INSTRUMENTS

C1 Electronic rev-counter
C2 Electronic speedometer
C3 Voltmeter
C4 Fuel level gauge
C5 Oil pressure gauge
C6 Coolant temperature gauge
C7 Clock
C8 Space free for instrument
C9 Turbo charger air pressure gauge
C10 Cluster (*)
C11 ALFA ROMEO Control display
C12 Performance gauge display
C13 Optoelectronic cluster
C14 Warning lamp panel
C15 Door lock actuated LED
C16 Display check with clock
C17 Odometer module on instrument panel

KEY

D: WARNING LAMPS

D1 Alternator warning lamp
D2 Direction indicator light warning lamp
D3 Tail light warning lamp
D4 High beam warning lamp
D5 Brake fluid low level warning lamp
D6 Heater/ventilation warning lamp
D7 Handbrake warning lamp
D8 Fuel reserve warning lamp
D9 Choke warning lamp
D10 Handbrake brake fluid level warning lamp
D11 Engine oil minimum pressure warning lamp
D12 Pre-heating glow plug warning lamp
D13 Engine coolant maximum temperature warning lamp
D14 Maximum air pressure warning lamp
D15 Low fuel pressure warning light
D16 Warning lamp free
D17 Gear position warning lamp
D18 Manual injection advance warning lamp
D19 Brake pad wear warning lamp
D20 Rear drive engagement warning lamp
D21 ALFA ROMEO Control warning lamp
D22 Heated rear window warning lamp
D23 Hazard lights warning lamp
D24 Rear fog light warning lamp
D25 Fog light warning lamp
D26 Injection diagnosis warning lamp
D27 ABS System warning lamp
D28 Recognition light warning lamp
D29 Ignition/anti-knock diagnosis warning lamp
D30 Gearbox oil level warning lamp
D31 Antitheft LED
D32 Four-wheel drive system malfunction warning light
D33 Four-wheel drive engaged warning light
D34 AIR-BUG warning lamp
D35 Vehicle lift warning lamp
D36 Right direction indicators and hazard warning lights warning lamp
D37 Left direction indicators and hazard warning lights warning lamp
D38 "Sidelights on" warning light
D39 "Brake light on" warning light
D40 "Instrument panel warning light on" warning light
D41 Low engine oil level warning light
D42 Low engine coolant warning light

E: EXTERNAL LIGHTS

E1 Front direction indicator light
E2 Front position light
E3 Front direction indicator and position light
E4 Front side marker light
E5 Low beam light
E6 Low beam with incorporated side light
E7 High beam light
E8 Low and high beam light
E9 Side indicator light
E10 Fog light
E11 Rear direction indicator light
E12 Rear side marker light
E13 Rear side light
E14 Reverse light
E15 Stop light
E16 Rear fog light
E17 Numberplate light
E18 Stop and rear side light
E19 Rear right light
E20 Rear left light
E21 Inspection light
E22 Recognition light
E23 Front right optical unit
E24 Front left optical unit
E25 Right rear light (fixed part)
E26 Left rear light (fixed part)
E27 Central rear light (mobile)
E28 Third stop light
E29 Supplementary dipped beam light
E30 Rear central foglight/right-hand reversing light
E31 Rear central foglight/left-hand reversing light

F: INTERNAL LIGHTS

F1 Passenger compartment front roof lamp
F2 Passenger compartment rear roof lamp
F3 Passenger compartment roof lamp
F4 Engine compartment lamp
F5 Luggage compartment lamp
F6 Door open signalling light
F7 Fuse light
F8 Heater/ventilation controls lighting lamp
F9 Glovebox light
F10 Ashtray light
F11 Map light
F12 Cluster light
F13 Front spot light
F14 Rear right spot light
F15 Rear spot light
F16 Ignition switch light
F17 Switch illumination light
F18 Rear spot light
F19 Passenger compartment right-side courtesy light
F20 Passenger compartment left-side courtesy light
F21 Right-side spot light with switch
F22 Left-side spot light with switch
F23 Right inner side footboard courtesy light
F24 Left inner side footboard courtesy light
F25 Courtesy mirror light on sun visor
F26 Gear shift lever plate light
F27 Light signalling front-right door opened
F28 Light signalling front-left door opened
F29 Light signalling rear-right door opened
F30 Light signalling rear-left door opened
F31 Front-right door opened ground light
F32 Front-left door opened ground light
F33 Rear-right door opened ground light
F34 Rear-right door opened ground light
F35 Central roof lamp with passenger compartment lighting controls
F36 Courtesy light with controls on rear right upright
F37 Courtesy light with controls on rear left upright
F38 Automatic gear control light
F39 Central air vent light
F40 Right-hand air vent light
F41 Tunnel air vent light
F42 Left-hand air vent light
F43 Seat control panel light
F44 Central passenger compartment rooflight

G: FUSE BOXES - CONNECTIONS - GROUNDS

G1 Fusebox
G2 Auxiliary fuse box
G3 Fuse box terminal
G4 Flying fuse box
G5 Multiple connection
G6 Multiple connection B - cluster
G7 Multiple connection R - cluster
G8 Single connection
G9 Connection between front left door wiring and door mirror switch

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G10 Connection between front right door wiring and door mirror switch
G11 Connection between board wiring and rear wiring
G12 Connection between board wiring and mirror switch
G13 Connection between board wiring and console wiring
G14 3-way connection between board wiring and door wiring
G15 2-way connection between board wiring and door wiring
G16 6-way connection between board wiring and door wiring
G17 Connection between board wiring and front right door wiring
G18 Connection between board wiring and front left door wiring
G19 Connection between board wiring and passenger compartment roof lamp
G20 Connection for front right door-locking motor
G21a Connection for front right door-wiring
G21b Connection for front right door-wiring
G22 Connection for front left door-locking motor
G23a Connection for front left door wiring
G23b Connection for front left door wiring
G24 Connection for rear right door-locking motor
G25 Connection for rear right door wiring
G26 Connection for rear left door-locking motor
G27 Connection for rear left door wiring
G28 Connection between front right door wiring and power window switch
G28a Connection between rear right door wiring and power window switch
G29 Connection between door-locking wiring and rear power windows
G30 Connection for power windows and door lock
G31 Connection between front left door wiring and power window switch
G32 Connection between console wiring and rear right door wiring
G33 Connection between console wiring and rear left door wiring
G34 Connection for power window supply cable
G35 Connection between rear wiring and rear right side light wiring
G36 Connection for power window switch cables
G37 Connection for multiswitch, on steering column
G38 Connection for air conditioner wiring
G39 Connection for clock wiring
G40 Connection for door-locking control unit
G41 Speedometer-rev counter sensor device connection
G42 Connection between alternator and min engine oil pressure switch
G43 Connection for heater/ventilation control cables
G44 Connection for rear fog lamp
G45 Connection for headlight wash-wipe cables
G46 Connection for headlights
G47 Connection for right-side repeater cables
G48 Connection between electric door mirror and left-side repeater cables
G49 Connection available
G50 Presetting for loud speaker cables
G51 Presetting for car radio cables
G52 Fuse box ground
G53 Engine compartment ground
G53a Engine compartment ground - right side
G53b Engine compartment ground - left side
G54 Passenger compartment ground
G54a Passenger compartment ground - right side
G54b Passenger compartment ground - left side
G55 Hood ledge panel ground
G56 Branch terminal board
G57 Presetting for fuel cut-off solenoid valve
G58 Connection for cigar lighter
G59 Connection for electric rear-view door mirror
G60 Injection wiring ground
G61 Connection for ignition coil
G62 Clutch switch connection
G63 Rear ground
G63a Rear right ground
G63b Rear left ground
G64 Connection for Trip Computer - clock
G65 Coaxial cable
G66 Motronic wiring ground
G67 Motronic connection
G68 Connection A with board wiring
G69 Connection B with board wiring
G70 Connection C with board wiring
G71 Connection for warning lamp on instruments
G72 Connection for seat back adjustment wiring
G73 Connection for rear services
G73a Connection for rear right accessories
G73b Connection for rear left accessories
G73c Rear services connection (4-way)
G73d Rear services connection (4-way for Alfa Control)
G74 Connection ALFA ROMEO Control Televel rear wiring
G75 Connection between right and left roof panel services
G76 Connection for roof panel - services - right side
G77 Connection for roof panel services - left side
G78 Coonection for front door services wiring
G79 Connection for rear door services wiring
G80 Connection for board wiring
G81 Connection for front left seat back adjustment
G82 Connection for front right seat back adjustment
G83 Rear connector for fast idle device
G84 Console cable connector
G84a Central panel 15-way cable connection
G84b Central panel 12-way cable connection
G85 Front accessories connector
G86 Connection for passenger compartment roof lamp
G87 Connection for rear door-locking motors
G88 Connection for rear lights
G89 Intermediate connection A
G90 Intermediate connection B
G91 Rear door sensors ground
G92 Luggage compartment ground
G93 Windscreen frame upper cross member ground
G94 Engine compartment connector
G94a 10-way connection for engine compartment
G94b 8-way connection for engine compartment
G94c Engine compartment connection - right side
G94d Engine compartment connection - left side
G95 Centralized fuse box
G95A Connection for switches
G95B Connection for switches
G95C Connection for cluster warning lamps
G95D Connection for ALFA ROMEO Control
G95E Connection for console
G95F Connection for fog light - rear fog light
G95G Connection for combination switch
G95H Connection for LH interface
G95I Connection for RH interface
G95L Connection for clock - rheostats
G95M Connection for sunroof
G95N Connection for battery
G95O Connection for ignition switch
G95P Connection for door services
G95Q Connection for performance gauge
G95R Connection for heated rear window
G95S Connection for cluster
G95V Fuses
G96 Single connector for ALFA ROMEO Control - cluster
G97 Connection for left doors services
G98 Connection for right doors services
G99a Connection for engine dashboard A
G99b Connection for engine dashboard B

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G99c Connection for engine dashboard C
G99d Connection for engine dashboard D
G99e Connection for engine dashboard E
G100 Connection for console - doors wiring
G101 Trip Computer connection
G102 Optoelectronic cluster connector
G103 Connection for grounds to brake fluid tank
G104 Connection for roof panel left upright
G105 Connection for ashtray lamp
G106 Seat grounds
G107 Connection for fuel pump
G108 CEM wiring ground
G109 Injection wiring connection
G110 Thermostat wiring ground
G111 Connection for dashboard instruments wiring
G112a Connection A for roof wiring
G112b Connection B for roof wiring
G112c Connection C for roof wiring
G112d Connection D for roof wiring
G112e Connection E for roof wiring
G113 Connection for front left fender
G114 Connection for outside temperature sensor
G115 Connection for tow bar vehicle socket
G116 Connection for tow bar trailer plug
G117 Connection for engine compartment lamp
G118 Connection for luggage compartment lamp
G119 Courtesy mirror light connection
G120 Map light connection
G121 Car electric system connection
G122 Ignition wiring connection
G123 Pedal-board ground
G124 ABS system connection
G125 ABS system fuse box
G126 ABS system electromagnetic switch protection fuse
G127 Recognition light fuse box
G128 Transciever fuse box
G129 Two-tone horn left-side engine compartment connection
G130 Switch connection
G131 Ground on upper cover
G132 Ground on manifold
G133a Electronic ignition-injecton connection wiring A
G133b Electronic ignition-injection connection wiring B
G134 Front left upright connection
G135 Rear window back-shelf wiring connection
G136 Front side-marker intermediate connection
G137 Injection supply wiring connection
G138 Combination switch headlight unit connection
G139 Interphone system control unit connection
G140 Fuel pump intermediate connection to service panel
G141 Rear side-marker intermediate connection
G142 Engine service connections
G143 Service central compartment ground
G144 Boot lid wiring connection
G145 Intermediate connection for injection switch cables
G146 Tachymeter connection
G147 Rev-counter sensor connection
G148 Under-dashboard ground
G149 Board wiring with engine compartment right-side wiring connection
G150 Board wiring with engine compartment left-side wiring connection
G150a Additional wiring connection header with left-hand engine compartment wiring
G151. Board wiring with engine service compartment wiring connection
G152 Glow plug pre-heating timing fuse (50a)
G153 Ground under diesel filter
G154 Engine wiring - board wiring connection
G155a Right seat adjustment wiring connection
G155b Left seat adjustment wiring connection
G156 Front-right door wiring - front-right door sensor connection
G157 Front-left door wiring - front-left door sensor connection
G158 Rear-right door wiring - rear-right door sensor connection
G159 Rear-left door wiring - rear-left door sensor connection
G160 Front-right door wiring - ground lighting lamp connection
G161 Front-left door wiring - ground lighting lamp connection
G162 Rear-right door wiring - ground lighting lamp connection
G163 Rear-left door wiring - ground lighting lamp connection
G164 Board wiring - conditioning unit wiring connection
G165 Door service wiring - conditioning unit wiring connection
G166 Front door wiring - front right door wiring connection
G167 Front door wiring - rear right wiring connection
G168 Front door wiring - front right door wiring connection
G168a Front door wiring and rear left door wiring one-way connection
G169 Front door wiring - rear left wiring connection
G170 Board wiring - rear right wiring connection
G171 Board wiring - rear left wiring connection
G172 Door wiring - sunroof connection
G173 Console wiring - front door wiring connection
G174 Steering column support ground
G175 Board wiring - fog light wiring connection
G176 Roof panel ground
G177 Door service wiring - board wiring connection
G178 Preset connection for seat height adjustment switch
G179 Rear left wiring - roof lamp wiring connection
G180 Rear left wiring - front door wiring connection
G181 Rear left wiring - rear console wiring connection
G182 Console area ground
G183 Rear console wiring - front right seat connection
G184 Rear console wiring - front left seat connection
G185 Luggage compartment left-side ground
G186 Luggage compartment right-side ground
G187 Single connection in rear left wiring
G188 Single connection in rear right wiring
G189 Rear seat wiring - rear console wiring connection
G190 Rear seat wiring connection
G191 Rear left wiring - rear left door wiring connection
G192 Preset connection for trailer stop signal
G193 Preset connection radio aerial
G194 Rear left wiring - central side light wiring connection
G195 Preset connection for rear left loud-speaker
G196 Preset connection for rear right loud-speaker
G197 Rear right wiring - rear right door wiring connection
G198 Rear right wiring - boot lid lock wiring connection
G199 Rear right door wiring connection
G200 Preset connection for radio headphones control unit
G201 Heated rear window fuse (30A)
G202 ABS System ground
G203 Rear right wiring - front door wiring connection
G204 Front right sensor connection - ABS
G205 Front left sensor connection -- ABS
G206 Rear right sensor connection - ABS
G207 Rear left sensor connection - ABS
G208 Front left power window connection
G209 Rear right wiring - rear console wiring connection
G210 Door wiring - rear console wiring connection
G211 Cluster intermediate connection for gearbox oil level signal
G212 Cluster internal connection for ABS warning light signals and seat belts
G213 Cluster internal connection for ABS warning light, seat belts and gearbox oil level
G214 Instrument connection for ABS warning light signals and seat belts (CA)
G215 Instrument internal connection for ABS warning light signals and seat belts
G216 Preset connection for power window control unit
G217 Preset connection for front left loud-speaker
G218 Preset connection for front right loud-speaker
G219 Sunroof connection

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G220 Coil power module connection for rev-counter
G221 Jumper connection for power window wiring
G222 Cruise Control Actuator - Cruise Control CU connection
G223 Preset connection for Cruise Control clutch push-button
G224a Right passive seat belt wiring connection
G224b Left passive seat belt wiring connection
G225a Right passive seat belt control unit switch wiring connection
G225b Left passive seat belt control unit switch wiring connection
G226a Right passive seat belt wiring ground connection
G226b Left passive seat belt wiring ground connection
G227b Under-fender services wiring connection
G228 Board wiring - cooling electric fan motor wiring connection
G229 Starting signal and "Over-boost" warning light wiring connection
G230 Ground on starting distributor bracket
G231 Board wiring - automatic transmission wiring connection
G232 Jumper connection preset for Motronic control unit (manual/automatic transmission versions)
G233 Board wiring - automatic transmission gear-lever wiring connection
G234 Interphone control unit connection A
G235 Interphone control unit connection B
G236 Interphone circuit panel connection A
G237 Interphone circuit panel connection B
G238 Board wiring - day-light lamps
G239 Car radio/car telephone CU relay - 15A
G240 Front seats relay - 20A
G241 Board wiring - antitheft wiring connection
G242 Board wiring Cruise Control wiring connection
G243 Board wiring - rear cabinet wiring single connection
G244 Board wiring - rear cabinet wiring connection
G245 Rear - right antitheft wiring connection
G246 Rear seat adjustment fuse 20A
G247 Rear electric window fuse 30A
G248 Antitheft wiring - rear right wiring connection
G249 Abtitheft wiring - cabinet wiring connection
G250 Board wiring - C.A. right side engine wiring connections
G251 Shock absorber connection clinching
G252a Board wiring - rear right wiring for shock-absorber system connection
G252b Board wiring - rear right wiring for shock-absorber system connection
G252c Board wiring - rear right wiring for chock-absorber system connection
G252d Board wiring - rear right wiring for shock-absorber system connection
G253 Rear wiring - left wiring - climatization wiring connection
G254 Engine electric fan fuse 40A
G255 Climatization electric fan fuse 40A
G256 Rear left wiring - antitheft connection
G257 Interlock SHIFT CU fuse 10A
G258 Antitheft fuse 15A
G259a Automatic transmission clinching
G259b Automatic transmission clinching
G260 Front cabinet wiring - rear cabinet wiring connection
G261 Sunroof fuses
G262 Door.locking - electric window clinching
G263 Front electric windows clinching
G264 Rear electric window enabling and closing crimping connection
G265 Left-hand front under-mudguard wiring connection
G265a Front right-hand wiring connector under wheel housing (3-way)
G265b Front right-hand wiring connector under wheel housing (2-way)
G266 Boot hatch ground
G267 Engine block ground
G268 Heated seats and handbrake switch-door locks wiring connection
G269 Glovebox compartment light connection
G270a Dashboard wiring - four-wheel drive wiring (four-way) connection
G270b Dashboard wiring - four-wheel drive wiring (six-way) connection
G271 Electric fan operation check connection
G272 ABS hydraulic group connection
G273 ABS control unit connection
G275 ABS hydraulic group ground connection
G276 Four-wheel drive intermediate wiring connection
G277 Untermediate Alfa Romeo Control unit - instrument connector
G278 Brake pad wear sensor connector
G279 Brake fluid reservoir switch connector
G280 Radio intermediate wiring connector
G281 Free connector for luggage compartment light
G282 Earth on front tunnel
G283 Earth on left service compartment
G284A Rear right passenger compartment panneling earth
G284B Rear left passenger compartment panneling earth
G285 Provision for anti-theft system connector
G286 Dash wiring - door wiring four-way connection
G287 Injection wiring - engine coolant temperature sensor wiring connection
G288 Injection wiring evaporation solenoid valve wiring connection
G289 Connection for front right-hand speaker - high tones
G290 Connection for front right-hand speaker - low tones
G291 Connection for front left-hand speaker - high tones
G292 Connection for front left-hand speaker - low tones
G293 Connection between engine services wiring - engine compartment wiring - left-hand side
G294 Earth on intake manifold
G295 Rear console wiring - driver's side seat memory wiring connection
G296 Memory wiring - driver's side longitudinal seat regulation motor wiring connection
G297a Memory wiring - driver's side seat control panel wiring connection
G297b Memory wiring - driver's seat control panel witing connection
G297c Memory wiring - driver's seat control panel wiring connection
G298 Memory wiring - driver's seat lumbar and back regulation wiring connection
G299a Front left-hand seat control pad relay unit - control pad wiring connection
G299b Front right-hand seat control pad relay unit - control pad wiring connection
G300 Front left-hand seat warming pad clinching
G301 Front right-hand seat warming pad clinching
G302 Driver's seat earth cable clinching
G303 Control pad wiring - driver's seat lumbar support and back regulation wiring connection
G304 Injection wiring intermediate clinching
G305 Electric seats and rear power window connection
G306 Right-hand engine wiring/engine wiring connection
G307 Luggage compartment/rear wiring connection
G308 Connector for engine sensors
G309a Controlled damping suspension system A
G309b Controlled damping suspension system A
G310 Front right-hand power window fuse
G311 Front left-hand power window fuse
G312 Fuse for headlight washers
G313 Air conditioner supplementary wiring connection
G314a Engine wiring/air conditioner A wiring connection
G314b Engine wiring/air conditioner B wiring connection
G315a Left-hand seat regulation motor connection
G315b Right-hand seat regulation motor connection
G316 Engine r.p.m. and timing sensor sheath earth
G317 Engine - injection wiring rev counter connection
G318 Earth on gearbox
G319 Engine oil level wiring - engine services wiring connection
G320 Rear speaker cable connection

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G321a Air conditioner control wiring - microswitch wiring connection (6-way)
G321b Air conditioner control wiring - microswitch wiring connection (3-way)
G322 Air conditioner control wiring - dashboard wiring connection
G323 Air conditioner control wiring - electric fan wiring for condensers connection
G324 Left-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G325 Right-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G326 Dashboard wiring - front foglight/headlight washer wiring connection
G327 Speedometer sensor connection
G328 Dashboard wiring - rooflight wiring connection
G329 Dashboard wiring - injection wiring connection
G330 Injection wiring - electric fan wiring for condensers connection
G331 Ultrasound soldering connection
G332 Alternator connection for recharging signal
G333 DIM-DIP fuse
G334 Fuel level sender connection
G335 Engine services with E.G.R. valve power supply clinching

H: SWITCHES

H1 Handbrake switch
H2 Reversing light switch
H3 Stop light switch
H4 Courtesy light switch on passenger compartment upright
H5 Front left door open indicator switch
H6 Front right door open indicator switch
H7 Rear left door open indicator switch
H8 Rear right door open indicator switch
H9 Front right brake pad switch
H10 Front left brake pad switch
H11 Rear right brake pad switch
H12 Rear left brake pad switch
H13 Choke switch
H14 Injection advance switch
H15 Gearbox oil low level switch (magnetic bulb)
H16 Starting and reverse inhibitor switch
H17 Brake fluid minimum level check switch
H18 Fast-idle switch in gearbox
H19 Low fuel pressure switch
H20 Inertia switch
H21 Clutch pedal fast-idle switch
H22 Ignition microswitch
H23 Engine compartment lamp switch
H24 Luggage compartment lamp switch
H25 Glovebox light switch
H26 Contact/switch on rear door for rear window wiper
H27 Contact/switch on rear door for heated rear window
H28 Carburetor contact/switch
H29 Switch for rear drive engagement warning lamp
H30 Load switch
H31 Switch for idle r.p.m. adjusting screw on carburetor
H32 Microswitch on carburetor for inserting timing variator
H33 Number plate contact/switch
H34 ABS System brake fluid tank switch
H35 Fuel pre-heating filter thermal switch
H36 Diesel post-heating microswitch
H37 Clutch pedal switch
H38 Rear right seat microswitch
H39 Rear left seat microswitch
H40 Rear right door inhibitor switch for rear seats
H41 Rear left door inhibitor switch for rear seats
H42 Accelerator throttle valve maximum opening switch
H43 Door-locking engaged signalling microswitch
H44 Engine hood antitheft device switch
H45 Cruise Control clutch and brake switch
H46 Gearbox switch for controlled damping suspension shock-absorber
H47 Engine throttle microswitch for controlled damping suspension shock-absorber
H48 Lefthand door switch for electric windows - sunroof automatic closing
H49 Auxiliary stop lights switch
H50 Seat end-run switch
H51 Sunroof stop limit switch

I: RELAYS

I1 Engine cooling electric fan relay
I2 Heated rear window relay
I3 Horn relay
I4 Headlight wiper relay
I5 Auxiliary relay for headlight wiper timer
I6 Fast-idle relay
I7 Fuel hose closing relay
I8 Relay excluding retarded rotor arm
I9 Glow plug relay
I10 Choke inhibitor relay
I11 Front power window and seat raising relay
I12 Front power window relay
I13 Rear power window relay
I14 Brake fluid automatic warning light control relay
I15 Low fuel pressure warning light relay
I16 Headlight relay
I17 Fog light relay
I18 Double contact relay
I19 Headlight washer pump relay
I20 Beam change over relay
I21 Full beam exclusion relay
I22 Low beam exclusion relay
I23 Supplementary engine cooling electric fan relay
I24 Direction and hazard lights relay
I25 Rear fog light relay
I26 Roof lamp relay
I27 Seat height adjustment relay
I28 Hazard lights relay
I29 Fuel pump relay
I30 Relay with CEM diode
I31 Front power window/climatisation relay
I32 Advance variation control unit relay
I33 Carburetor microswitch relay
I34 Rear fog light exclusion relay
I35 Key-operated supply relay
I36 Relay for brake wear and fluid level
I37 ABS System control unit relay
I38 ABS System auxiliary relay
I39 Brake fluid level warning light relay
I40 ABS System brake fluid electric pump relay
I41 Two-tone hooter, horn relay
I42 Two-tone hooter relay
I43 Inspection light relay
I44 Fuel pre-heating device relay
I45 Outer mirror defrosting relay
I46 Siren relay
I47 Engine oil cooler electric fan relay
I48 Instrument and AR control ignition key-controlled relay
I49 Low-beam light relay
I50 High-beam light relay
I51 Electronic control unit power supply relay
I52 Boot lid opening relay
I53 Fuel filter cap opening relay
I54 Rear right seat relay

KEY

I: RELAYS (Continued)

I55 Rear left seat relay
I56 Rear seat inhibitor relay
I57 ABS System electronic relay
I58 Sunroof - seat relay
I59 "OFF", "RESUME" Cruise Control switch auxiliary relay
I60 Outer mirror defrosting relay
I61 Petrol vapour motor pump relay
I62 Gear engaged signal relay (automatic transmission) for MOTRONIC control unit
I63 Oil radiator electric fan - automatic transmission relay
I64 Position light relay
I65 Foglight inhibitor relay
I66 Day-light insertion relay
I67 Day-light exclusion relay
I68 Water cooling auxiliary electric fan relay
I69 Stop switch relay
I70 Radio relay
I71 20 relay for shock-absorbes
I72 Brake fluid tank relay
I73 Front electric window - door-locking relay
I74 Rear electric window - suroof relay
I75 Electric window - sunroof closing relay
I76 Four-wheel drive supply relay
I77 Seres/parallel relay (for cooling electric fans)
I78 Relay for heater blower 50A
I79 Supplementary relay for fog lamps
I80 Seat longitudinal end-run locking relay
I81 Brake pad wear relay
I82 Headlight flashing relay
I83 Relay for electric aerial
I84 Automatic closure relay
I85 Driver's seat memory relay
I86 Relay for driver's seat memory recall stop
I87 Front left-hand seat warming pad relay
I88 Front right-hand seat warming pad relay
I89 Rear foglight permit and front foglight exclusion relay
I90 DIM-DIP exclusion relay
I91 DIM-DIP cut-in relay
I92 K.S.B. relay

L: SENSORS

L1 Low fuel pressure switch
L2 Low oil pressure switch
L3 Max air pressure switch
L4 Thermal switch for engine cooling electromagnetic coupling
L5 Thermal switch for engine coolant max temperature
L6 Thermal switch for engine cooling electric fan
L7 Engine coolant temperature gauge sender
L8 Oil pressure gauge sender
L9 Fuel level gauge sender
L10 Sender for engine coolant temperature gauge and max temperature warning lamp contact
L11 Retarded rotor arm cut-out pressure switch
L12 Engine oil level sensor
L13 Windscreen washing liquid level sensor
L14 Engine coolant level sensor
L15 Fuel flow sensor
L16 Rev-counter pulse generator
L17 Speedometer pulse generator
L18 Load sender
L19 External temperature sensor
L20 Photoelectric cell
L21 Pierburg solenoid valve regulating the supercharging pressure
L22 Knocking sensor
L23 Potentiometer
L24 Engine coolant temperature sensor for ignition advance adjustment
L25 Thermal switch for engine coolant temp erature
L26 Vacuum sensor
L27 Temperature sensor
L28 Front right brake sensor
L29 Front left brake sensor
L30 Rear right brake sensor
L31 Rear left brake sensor
L32 Turbo supercharger air pressure sensor sender
L33 Two-stage thermal contact
L34 Boot lid opened contact
L35 Thermometric switch
L36 Turbo supercharger maximum pressure safety sensor
L37 T.D.C. sensor
L38 Thermal switch for oil radiator electric fan - automatic transmission
L39 Automatic transmission oil maximum temperature sensor
L40 Steering angle sensor
L41 Oil pressure switch for controlled damping suspension shock-absorber
L42 Tooth mesh control sensor
L43 Oil pressure switch for vehicle lift warning light
L44 Engine oil temperature sender
L45 K.S.B. water temperature sender
L46 E.G.R. control solenoid valve
L47 E.G.R. valve potentiometer

M: SOLENOIDS - SOLENOID VALVES

M1 Fuel cut-off solenoid valve
M2 Injection pump solenoid valve
M3 Solenoid with injection pump fuel cut-off microswitch
M4 Fast-idle solenoid
M5 Engine stop solenoid
M6 Fuel pipe closing electromagnet
M7 Door opening/closing electromagnet
M8 Auxiliary air solenoid valve compressor actuation
M9 Pierburg solenoid valve (for idle r.p.m.)
M10 Brake fluid adjusting valve
M11 ABS System main valve
M12 Boot lid opening solenoid
M13 Fuel filter cap opening solenoid
M14 Cruise Control actuator
M15 Emission control solenoid valve
M16 Over-boost solenoid valve
M17 Front right shock-absorber solenoid valve
M18 Front left shock-absorber solenoid valve
M19 Rear right shock-absorber solenoid valve
M20 Rear left shock-absorber solenoid valve
M21 Automatic transmission unit solenoid
M22 Four-wheel drive electromagnetic coupling

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS

N1 Electronic ignition module
N1a Electronic ignition module A
N1b Electronic ignition module B
N2 Connector for Marelli module
N3 Capacitor for electronic ignition
N4 Connector for Bosch module
N5 Tachymetric switch device
N6 Pre-heating glow plug timer
N7 Trip Computer
N8 ALFA ROMEO Control
N9 Brake pad wear control unit

KEY

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS (Continued)

N10 Roof lamp timer
N11 Door-locking control unit
N12 Headlight wiper timer
N13 Road hazard and direction indicators intermittence
N14 Electronic windscreen wiper intermittence
N15 Electronic windscreen wiper intermittence and warning light control
N16 Tachymetric control unit
N17 Trip control unit for fuel flow
N18 Electronic device for headlights flashing
N19 Performance gauge control unit
N20 Advance variation control unit
N21 Power module
N22 ALFA ROMEO Control control unit
N23 Ignition control unit
N24 Pulse converter
N25 Rear fog-light device
N26 Brake pad wear warning light intermittence device
N27 ABS System control unit
N28 ABS System brake fluid electric pump device
N29 Diode holder connection
N29a A diode connection
N29b B diode holder connection
N30 Two-tone hooter control unit
N31 Fuel pre-heating device
N32 Head-phone connection control unit
N33 Differentiated rear window defrosting control unit
N34 Control unit for pulse generator
N35 Coding control unit
N36 Interphone system control unit
N37 Petrol vapour intake pump timer
N38 Power window control unit
N39 Cruise Control unit
N40 DIM DIP electronic device
N41 Lights on signalling control unit
N42 Dimmer for door-locking actuated signalling LED
N43 Automatic transmission locking/unlocking control unit
N44 Rear lights control unit
N45 Antitheft control unit
N46 Shock-absorber electronic control unit
N47 Accelerometer
N48 Radiotelephone control unit
N49 Aerial - Heated rear window control unit
N50 Four-wheel drive control unit
N51 Hydraulic group with ABS control unit
N52 CROSS-OVER control unit (radio system)
N53 Antijamming condenser radio boot panel 4.7 µF
N54 Right radio loudspeaker antijamming condenser 4.7 µF
N55 Left radio loudpseaker antijamming condenser 4.7 µF
N56 Supplementary fusebox radio antijamming condenser 22 µF
N57 Radio relay protection diode
N58 Driver's seat memory control unit
N59 Control unit
N60 Sunroof control unit
N61 Shock absorber control unit condenser
N62 ABS system - longitudinal accelerometer
N63 ABS system - transversal accelerometer
N64 Instrument panel warning light timer
N65 E.G.R. control unit
N66 Brake light radio anti-interfeence condenser
N67 Door lock remote control signal receiver

O: ANCILLARY EQUIPMENT

O1 Heated rear window
O2 Horn
O3 Electrically-operated aerial
O4 Car radio,
O5 Speaker
O6 Cigar lighter
O7 Rear cigar lighter
O8 Two-tone hooter
O9 Transceiver
O10 Rear headphone
O11 Siren
O12 External loudspeaker-microphone
O13 Internal loudspeaker-microphone
O14 Driver's seat warming pad
O15 Rear right seat warming pad
O16 Rear left seat warming pad
O17 Front right seat warming pad
O18 Right door rear-view mirror defroster
O19 Left door rear-view mirror defroster
O20 External right microphone
O21 External left microphone
O22 Engine electric fan supplementary resistance
O23 Antitheft siren
O24 Radiotelephone
O25 Windscreen defroster
O26 Front left-hand seat warming pad
O27 K.S.B. device
O28 DIM-DIP resistance

P: ELECTRIC MOTORS

P1 Windscreen wiper motor
P2 Engine cooling electric fan motor
P3 Engine cooling electric fan electromagnetic drive
P4 Headlight wiper motor
P5 Front left seat adjustment motor
P6 Front right backrest adjustment motor
P7 Front left backrest adjustment motor
P8 Motor for electric door rear-view mirror - left-side
P9 Motor for electric door rear-view mirror - right-side
P10 Front right door locking motor
P11 Front left door locking motor
P12 Rear right door locking motor
P13 Rear left door locking motor
P14 Front right power window motor
P15 Front left power window motor
P16 Rear right power window motor
P17 Rear left power window motor
P18a Main fuel electric pump
P18b Auxiliary fuel electric pump
P19 Windscreen washer pump
P20 Headlight washer pump
P21 Rear window wiper motor
P22 Rear window washer electric pump motor
P23 Supplementary engine cooling electric fan motor
P24 Sunroof motor
P25 Engine oil radiator electric fan
P26 Petrol vapour intake electric pump motor
P27 Windscreen wiper motor with control unit
P28 Front right seat longitudinal adjusting motor
P29 Front left seat longitudinal adjusting motor
P30 Front right seat adjusting motor
P32 Rear right seat motor
P33 Rear left seat motor
P34 Oil radiator electric fan - automatic transmission
P35a Right-hand headlight adjustment motor
P35b Left-hand headlight adjustment motor
P36 Vehicle lift pump motor
P37 Right-hand front seat rear tilt regulation motor
P38 Left-hand front seat rear tilt regulation motor
P39 Right-hand front seat front tilt regulation motor
P40 Left-hand front seat front tilt regulation motor

KEY

P: ELECTRIC MOTORS (Continued)

P41 Front right-hand seat lumbar support regulation
P42 Front left-hand seat lumbar support regulation

Q: HEAT/VENT - AIR CONDITIONING SYSTEM

Q1 Heater/ventilation electric fan
Q2 Pneumatic push-button control for air conditioning
Q3 Pneumatic push-button control for climatisation
Q4 Heater/ventilation electric fan control
Q5 Heater blower fan speed adjustment resistance
Q6 Switch on flap for heater blower fan
Q7 Fluid thermostat
Q8 Electromagnetic coupling pressure switch
Q9 Minimum pressure switch
Q10 Maximum pressure switch
Q11 Compressor electromagnetic coupling
Q12 Thermoswitch exclusion of compressor electromagnetic coupling
Q13 Supplementary conditioner fan
Q14 Relay for supplementary conditioner fan and electromagnetic compressor coupling
Q15 Heater/ ventilation electric fan relay
Q16 Relay for simultaneous control of engine cooling electric fan and supplementary electric fan
Q17 Relay for simultaneous coupling and supplementary electric fan
Q18 Heater
Q19 Conditioner
Q20 Min and max pressure switch (Trinary)
Q21A Automatic control check unit
Q21B Manual control check unit
Q22 Electromagnetic coupling control relay
Q23 Internal temperature sensor for climatisation
Q24 External temperature sensor for climatisation
Q25 Mixed air temperature sensor for climatisation
Q26 Defrosting thermostat
Q27 Air recirculation vent control motor
Q28 Ventilation motor for internal temperature sensor
Q29 Climatisation system branch point
Q30 Air mixture and vent controls
Q30A Air distribution motor to vents
Q30B Cold/hot mixing motor
Q31 Climatisation unit fan speed adjuster
Q32 Climatisation auxiliary relay
Q33 Passenger compartment internal temperature motor with sensor
Q34 Conditioner temperature control potentiometer
Q35 Free fuse for conditioning system
Q36 Conditioning system earth
Q37 Passenger compartment supplementary air conditioning fan
Q38 Passenger compartment supplementary fan control for heating
Q39 Air conditioning system wander fuse - 30A
Q40 Air conditioning system wander fuse - 15A
Q41 Air conditioning system relay and fuse unit
Q42 Air conditioning fan delay device
Q43 Air conditioning system wander fuse - 50A
Q44 Water by-pass electronic actuator
Q45 Electric by-pass cock control microswitches
Q46 External/recirculation air intake electric actuator
Q47 Dynamic air intake actuator control microswitches
Q48 Ait-to-floor electric actuator
Q49 Air-to-floor electric actuator control microswitches
Q50 Recirculation and 1st speed of electric fan microswitches
Q51 Control potentiometer with switch
Q52 Fan for right-hand condenser
Q53 Fan for left-hand condenser
Q54 Fan control relay for right-hand condenser
Q55 Electric fan and compressor electromagnetic coupling simultaneous control relay for left-hand condenser
Q56 Relay for heater/air conditioner
Q57 Electric fan speed selector relay
Q58 Electronic thermostat control unit
Q59 Electronic thermostat temperature sensor

R: SAFETY DEVICES

R1 Seat belt device
R2 Catalytic converter temperature indicator
R3 Thermocouple for catalytic converter temperature detection
R4 Unfastened seat belt buzzer
R5 Open door buzzer
R6 Mileometer
R7 Seat belt warning lamp
R8 30,000 mile warning lamp
R9 Push-button switch on seat belts
R10 Catalytic converter maximum temperature warning light
R11 Front left door switch for seat belt device
R12a Right-side passive seat belt control unit
R12b Left-side passive seat belt control unit
R13a Right-side passive seat belt motor
R13b Left-side passive seat belt motor
R14a Right-side seat belt winder locking mechanism
R14b Left-side seat belt winder locking mechanism
R15 Passive seat belt-unfastened buzzer
R16a Right-side passive seat belt warning light
R16b Left-side passive seat belt warning light
R17a Right-side passive seat belt-unfastened switch
R17b Left-side passive seat belt-unfastened switch
R18a Right-side passive seat belt switch set to position "A"
R18b Left-side passive seat belt switch set to position "A"
R19a Right-side passive seat belt switch set to position "B"
R19b Left-side passive seat belt switch set to position "B"
R20 AIR-BAG front - right sensor
R21 AIR-BAG front - left sensor
R22 AIR-BAG control unit
R23 Steering wheel inflation module for AIR-BAG
R24 Key-inserted and unfastened safety belt signalling buzzer
R25 Safety belt inserted hook sensor

S: ELECTRONIC FUEL INJECTION

S1 Injection control unit
S2 Double relay
S3 Electroinjectors
S4 Cold start electroinjector
S5 Air flow meter
S6 Accelerator throttle body switch
S7 Engine coolant temperature sensor
S8 Thermo-time switch
S9 Auxiliary air valve
S10 Lambda probe
S11 Motronic control unit
S12 Motronic relay
S12a Petrol pump Motronic relay
S12b Motronic relay with diode
S12c Timing variator Motronic relay
S12d Auxiliary Motronic relay
S13 Timing sensor
S14 Rev sensor
S15 Timing variator
S16 Altitude air regulator
S17 CEM control unit
S17a CEM control unit white connector
S17b CEM control unit black connector
S18 Throttle angle sensor
S19 Hall sensor

S: ELECTRONIC FUEL INJECTION (Continued)

S20 Deton sensor
S21 Throttle actuator
S22 Electroinjector terminal
S23 Electroinjector resistance
S24 Electroinjector terminal board
S25 Automatic transmission/manual transmission switch connector
S26 Injector system
S27 Lambda probe resistance
S28 Injection control relay
S29 Idle adjusting actuator
S30 Motronic control unit switch connector
S31 Rev and timing sensor
S32 Lambda probe coding connector
S33 Full load enrichment device
S34 Available
S35 Heated Lambda probe
S36 Free fuse for Auxilliary Motronic relay
S37 4x2 - 4x4 switching connector
S38 Sensor on throttle body with potentiometer
S39 Cylinder No. 1 recognition sensor
S40 Ignition/injection control unit
S41 Main relay
S42 Secondary relay
S43 Absolute pressure sensor
S44 Throttle angle potentiometer
S45 Lambda probe wander fuse
S46 Motronic power supply wander fuse
S47 Fuel pump wander fuse
S48 "CO" regulation potentiometer
S49 MP3.1 control unit switch connector for 1.5 IE and 1.7 IE engines

T: DIAGNOSIS

T1 Alfa Tester connector
T2 "Flashing code" diagnosis connector
T3 AIR-BAG diagnosis connector
T4 Diagnosis indicator light push-button
T5 Controlled damping suspension electric system diagnosis coupling

ISTRUZIONI DI MONTAGGIO

NUOVA ALFA 33

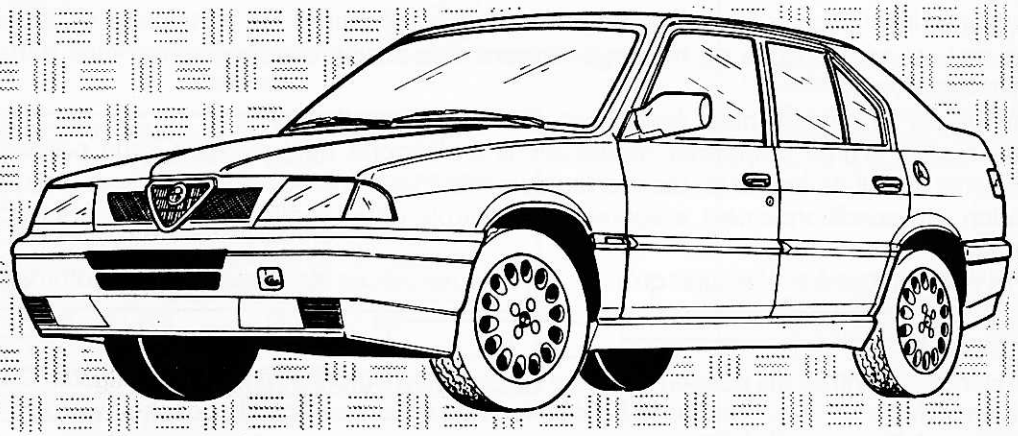
ACCESSORI

ALFA ROMEO

ACCESSORI

NUOVA ALFA 33 16V

KIT COND. 60777238
N° Serie 1007



Valido per versioni:
1.7 i.e. 16V / 1.3 i.e. – 1.5 i.e. con centralina per iniezione IAW / **1.5 i.e. 8V CAT – 1.7 i.e. 8V CAT** con centralina per iniezione MOTRONIC (come 16V) / **1.7 i.e. 8V** più kit superminimo 60750314 più kit staffe 60777598 (per vetture con n° di telaio antecedente al 578066487

Valid for models:
1.7 i.e. 16V / 1.3 i.e. – 1.5 i.e. with IAW fuel injection control unit / **1.5 i.e. 8V CAT – 1.7 i.e. 8V CAT** with MOTRONIC fuel injection control unit / **1.7 i.e. 8V** + supermin. kit 60750314 + kit brackets 60777598 (for vehicles with n° preceding 578066487)

Valable pour les versions:
1.7 i.e. 16V / 1.3 i.e. – 1.5 i.e. avec centrale pour injection IAW / **1.5 i.e. 8V CAT – 1.7 i.e. 8V CAT** avec centrale pour injection MOTRONIC **1.7 i.e. 8V** + kit ralenti 60750314 + kit brides 60777598 (pour les voitures dont le n° de chassis est antérieur au 578066487)

Gultig fur ausfuhrungen:
1.7 i.e. 16V / 1.3 i.e. – 1.5 i.e. mit einspritzsteuerung IAW / **1.5 i.e. 8V CAT – 1.7 i.e. 8V CAT** mit einspritzsteuerung MOTRONIC **1.7 i.e. 8V** + kit superminimum 60750314 + kit halterungen 60777598 (für fahrzeuge mit fahrgestelinummer vor 578066487)

Idoneo para modelos:
1.7 i.e.16V / 1.3 i.e. – 1.5 i.e. con centralita para inyecciòn IAW / **1.5 i.e. 8V CAT – 1.7 i.e. 8V CAT** con centralita para inyeccion MOTRONIC / **1.7 i.e. 8V** + kit superminimo 60750314 + kit abrazaderas 60777598 (para vehiculos con n° de bastidor precedente el 578066487)

PREFAZIONE - PREFACE - PREFACE - EINLEITUNG - PREFACION

I

Il presente manuale contiene le istruzioni necessarie per eseguire correttamente le principali operazioni di installazione dell'impianto di condizionamento.
Le prescrizioni di montaggio devono essere scrupolosamente osservate al fine di ottenere una corretta installazione dell'impianto A/C.
Si raccomanda di conservare il manuale per eventuali future consultazioni.
La nostra ditta si riserva il diritto di apportare modifiche in qualsiasi momento senza preavviso e senza incorrere in alcun obbligo al fini di fornire un manuale costantemente aggiornato.
- Prima di installare l'impianto di condizionamento eseguire un controllo per verificare l'eventuale presenza di guasti o anomalie nel veicolo.
- Verificare che il kit sia appropriato ed accertarsi che non ci siano parti mancanti o danneggiate.

GB

The present manual contains the necessary instructions to perform correctly the main operations of equipment installation of air conditioning equipment.
Assembly prescription must be strictly observed in order to obtain a correct installation of A/C equipment.
We reccomend to keep the manual for possible future consultations.
Our company has the right to make modifications in any momemt without previous notice and without any obligation to provide a manual always up-dated.
-Before setting up the air conditioning equipment verify the possible presence of breakdowns or anomalies in the vehicle.
-Verify that the kit is suitable and make sure that there are not missing or damaged parts.

F

Ce manuel contient les instructions nécessaires pour executer correctement les principales operations d'installation de conditionnement.Les prescriptions de montage doivent être scrupuleusement observées dans le but d'obtenir une correcte installation A/C.
On conseille de garder le manuel pour éventuelles futures consultations.
Notre maison se reserve le droit d'apporter modifications à n'importe quel moment sans préavis et sans devoir prendre engagements au but de fournir un manuel toujours mis à jour.
-Avant l'installation du conditionnement executer un contrôle pour vérifier l'éventuelle présence de dégâts au anomalies dans le véhicule.
-Vérifier que le kit soit approprié et s'assurer qu'il n'y ait pas des pièces manquantes ou endommagées.

D

Das vorliegende Handbuch enthält die nötigen Hinweise zur genauen Durchführung der wichtigsten Operationen für die Installation der Klimaanlage. Die Spezifikationen für die Montage müssen sorgfältig beachtet werden, um eine richtige Installation der Anlage A/C zu gewährleisten.
Es empfiehlt sich, das Handbuch für eventuelles künftiges Nachschlagen aufzubewahren.
Unsere Firma behält sich Aenderungen vor, die zu beliebiger Zeit ohne Vorbescheid vorgennommen werden können, ohne die Verpflichtung zu übernehmen, ein ständig überarbeitetes Handbuch zu erstellen.
- Vor Installation der Anlage Kontrollen durchführen, um eventuelles Vorhandensein von Schäden oder Störungen des Fahrzeuges zu ermitteln.
- Nachprüfen, dass das Kit passend und vollständig ist und keine beschädigten Teile vorhanden sind.

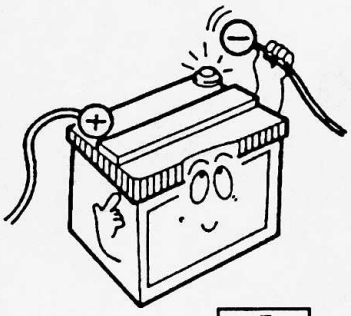
E

El presente manual contiene las instrucciones para efectuar las màs importantes operaciones de instalaciòn de acondicionamento de aire.
Las prescripciones de montaje se deben observar escrupulosamente para obtener una correcta funciòn de la instalaciòn A/C.
Se recomienda de conservar el manual para posibles futuras consultaciones.
Nuestra firma se reserva el derecho de hacer modificaciones en cualquier momento sin advertencia previa y sin ninguna obligaciòn de proveer un manual constantemente aplazado.
-Antes de montar la instalaciòn de acondicionamiento efectuar un control para verificar posibles presencias de avarias o irregularidades en el vehìculo.
-Verificar que el kit sea apropiado y asegurarse que no hayan piezas faltantes o estropeadas.

PRECAUZIONI - PRECAUTIONS - PRECAUTIONS - VORBEREITUNGSMABNAHMEN - PRECAUCIONES

I

Scollegare il cavo massa dal polo negativo della batteria.



GB

Disconnect the mass cable from negative pole of battery.

F

Dérelier le cable - masse du pole négatif de la batterie.

D

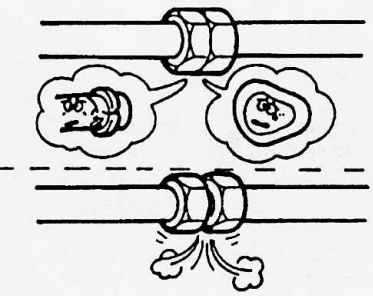
Erdkabel am Minuspol der Batterie ausschalten.

E

Desconectar el cable masa desde el polo negativo de la batería.

I

Per i raccordi utilizzare il serraggio specifico.



GB

For the connectors use the specific clampings.

F

Pour les raccords utiliser le particulier serrage.

D

Fur die Anschlusstucke die passende Befestigung benutzen.

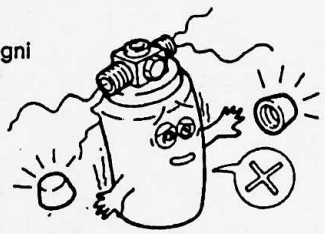
E

Para los empalmes utilizar el momento de torsiòn adecuado.

VALORI COPPIE DI SERRAGGIO RACCORDI TUBI GAS LINE TORQUE DATA COUPLES DE SERRAGE DES RACCORDS DES TUYAUX DU FREON WERTE DER ANZUGSMOMENTE GASROHRANSCHLUSSE VALO DE LOS MOMENTOS DE APRIETE DE LOS RACORES DE LOS TUBOS DEL GAS	
(5/8" - 18 UNF)	15.1 - 16.7 Nm
(3/4" - 16 UNF)	15.1 - 16.7 Nm
(1" - 14UNS)	28 - 31 Nm

I

Non rimuovere i tappi dai raccordi prima che ogni componente sia pronto per il collegamento.



GB

Do not remove the caps from the connectors before having each component ready for the connection.

F

Ne pas enlever les bouchons aux raccords avant que toutes les composantes soient prêtes pour l'essemblage.

D

Die Deckel der Anschlusse nicht entfernen bevor jedes Teil fur die Verbindung fertig ist.

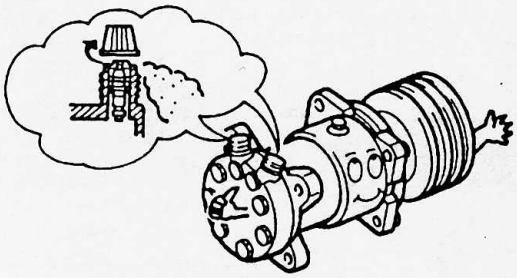
E

No remover los tapones de los empalmes antes que cada componente sea listo para la conexiòn.

I

ATTENZIONE !

Rimuovere cautamente i tappi dal compressore per impedire la dispersione dell'azoto.
Il compressore esce dalla fabbrica con un leggero carico di azoto per evitare la corrosione degli anelli.



GB

ATTENTION !

Remove cautiously the caps from the compressor to prevent azote dispersion.
The compressor goes out from the factory with a light charge of azote to prevent rings corrosion.

F

ATTENTION !

Enlever avec précaution les bouchons du compresseur pour empecher la dispersion de l'azote. Le compresseur sort de la fabrique avec une légère charge d'azote pour èviter la corrosion des baques.

D

ACHTUNG !

Deckel des Kompressors mit Vorsicht entfernen, um die Dispersion des Stickstoffs zu vermeiden. Der Kompressor verlasst die Fabrik mit einem leichten Anteil von Stickstoff, um die Korrosion der Ringe zu vermeiden.

E

CUIDADO !

Remover cautamente los tapones desde el compresor para impedir la dispersiòn de nitròqeno. El compresor sale desde la empresa con una carga pequeña de nitròqeno para evitar la corrosiòn de los anillos.

I

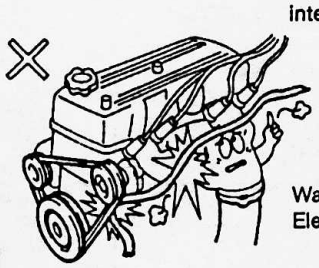
Durante l'installazione verificare che nessun particolare vada ad interferire con il funzionamento delle parti.

GB

During installation verify that there are no pieces interfering with parts working.

F

Pendant l'installation vérifier qu'aucun détail aille interferer avec le fonctionnement des parties.



D

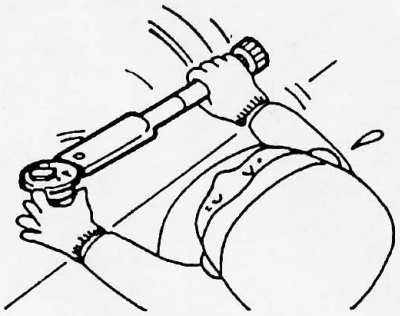
Wahrend der Installation kontrollieren, dass kein Element den Betrieb der Teile stort.

E

Durante la instalaciòn asegurarse que no hayan particulares que van a interferir con el funcionamiento de las partes.

COPPIE DI SERRAGGIO PER VITI E DADI IN N.m (Kgm) CLAMPING COUPLES FOR SCREWS AND NUTS IN N.m (Kgm)
COUPLES DE SERRAGE POUR VIS ET ECROUS EN N.m (Kgm) - ANZUGSMOMENTE FUR SCHRAUBEN UND MUTTERN IN N.m (Kgm)
PARES DE APRIETE PARA TORNILLOS Y TUERCAS EN N.m (Kgm)

Filettatura Threading Filetage Gewinde Fileteado	Apertura chiave Key aperture Ouverture de clés Schlusselweite Abertura llave	Zincati - Zinc plated - Zingués Verzinkt - Zincados		
		CLASSE DI RESISTENZA DELLA VITE SCREW RESISTANCE CLASS CLASSE DE RESISTANCE DE LA VIS WIDERSTANDSACHSE DE SCHRAUBE CLASE DE RESISTENCIA DEL TORNILLO		
		5.8	8.8	10.9
		CLASSE DI RESISTENZA DEL DADO NUT RESISTANCE CLASS CLASSE DE RESISTANCE DE L'ECROU WIDERSTANDSACHSE DER MUTTER CLASE DE RESISTENCIA DE LA TUERCA		
		8		10
M 4	7	1.3 (0.13)	2.0 (0.20)	2.9 (0.30)
M 5	8	2.6 (0.26)	4.1 (0.42)	5.8 (0.59)
M 6	10	4.4 (0.45)	7.4 (0.75)	11 (1.1)
M 8	13	15 (1.5)	24 (2.4)	32 (3.3)
M 10 X 1.25	16/17	31 (3.2)	49 (5.0)	70 (7.1)
M 12 X 1.25	18/19	55 (5.6)	88 (9.0)	123 (12.5)
M 12 X 1.5	19	52 (5.3)	83 (8.5)	118 (12.0)
M 14	21/22	87 (8.9)	142 (14.5)	196 (20.0)



I

Verificare il corretto serraggio della bulloneria fornita e rimossa di tutte le parti interessate dell'impianto A/C.

GB

Verify the correct clamping of bolts and nuts provided and removed of any involved part of A/C equipment.

F

Vérifier le correct serrage de la boulonnerie fournie et détechée de toutes les parties interessées de l'installation A/C.

D

Korrektes Anziehen der gelieferten und entfernten Schrauben von allen betreffenden Teilen der Anlage A/C kontrollieren.

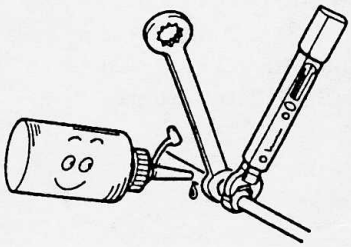
E

Verificar el correcto momento de torsiòn de los pernos provistos y remociòn de todas las partes interesadas de la instalaciòn A/C.

COMPRESSORI - COMPRESSORS - COMPRESSEURS - KOMPRESSOREN - COMPRESORES				
MODELLO TYPE MODELE TYP MODELO		OLIO - OIL - HUILE - OL - ACEITE		
		NOME NAME NOMBRE NAME NOMBRE	TIPO TYPE TYPE TYP TIPO	QUANTITA' QUANTITY QUANTITE MENGE QUANTITE (o.c.)
SANDEN	SD 505	SUNISO CAPELLA FULEALL	5 GS WF 100 S 100	100 * 15
	SD 507			165 * 15
	SD 508			175 * 15
	SD 510			135 * 15
	SD 709			
SEIKO SEIKI	SS 805 T/806 T	DAPHNE	7963	150 * 10
	SS 170 PSV			220 * 10
	SS 140 PSV			
	SS 96	DAPHNE	150 CX	150 10
HARRISON	V5	SUNISO CAPELLA FULEALL	5 GS WF 100 S 100	236 * 10

I

Prima di montare le tubazioni applicare alcune gocce di olio refrigerante sugli O-Ring. Svitare o avvitare i raccordi utilizzando due chiavi adeguate.



GB

Before assembling pipes, apply some drops of cooling oil on O-Ring
Unscrew or screw the connectors using two suitable keys.

F

Avant de monter les conduites appliquer quelques gouttes d'huile réfrigérant sur les O-Ring. Isser ou dévisser les raccords en utilisant deux clés appropriées.

D

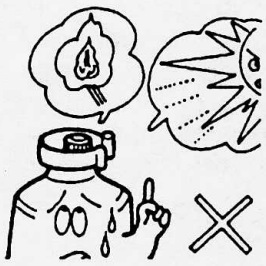
Vor Montage der Leitungen einige Tropfen Kuhlol auf die O-Ringe auftragen. Anschlusstucke durch zwei passende Schraubenschlussel ein - oder abschrauben.

E

Antes de montar las tuberìas aplicar unas gotas de aceite enfriador sobre O-Ring.Destornillar o atornillar los empalmes utilizando dos llaves adecuadas.

I

Tenere il flacone del liquido refrigerante ad una temperatura non superiore ai 40° C (100 °F). Per ulteriori istruzioni attenersi a quanto indicato dal fabbricante.



GB

Keep the cooling liquid bottle at a temperature not higher than 40° C (100 F). For further instructions follow the indications of the producer.

F

Tenir le flacon du liquide réfrigérant à une température non supérieure aux 40° C (100° F). Pour autres instructions se conformer aux indications du fabricant.

D

Das Kuhlmittelflakon bei einer nicht hoher als 40° C (100° F) Temperatur aufbehawahren.Fur weitere Hinweise sích an die Spezifikationen des Herstellers halten.

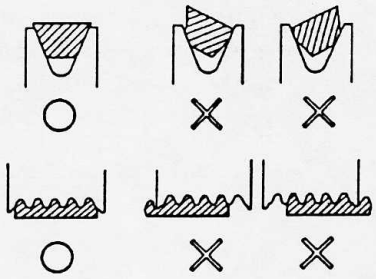
E

No poner la botella del lìquido enfriador a una temperadura de màs de 40° C (100 F). Para ulteriores instrucciones atenerse a las indicaciones del productor.

I

ATTENZIONE !

Le cinghie di trasmissione richiedono una tensione adeguata.Un allentamento di tensione provoca uno slittamento che potrebbe provocare il danneggiamento del compressore e del rinvio.Fare attenzione che le cinghie siano correttemente riposte nelle loro sedi.



GB

ATTENTION!

Transmission belts require a suitable tension. A tension loosening provokes a slipping that could give to a damage of the compressor and the transmission. Pay attention that the belts are correctly placed in their seats.

F

ATTENTION!

Les courroies de transmission exigent une tension proportionnée.Un relâchement de tension cause un glissement qui pourrait dédommager le compresseur et le revoi.Faire attention à que les courroies soient correctement placées dans leur siège.

D

ACHTUNG!

Die Treibriemen benotigen eine passende Spannung. Das Lockern der Spannung verursacht einen Schlupf, der die Beschadidung des Kompressors und des Vorgeleges verursachen konnte. Darauf achten, dass die Riemen in ihrem Sitz korrekt sind.

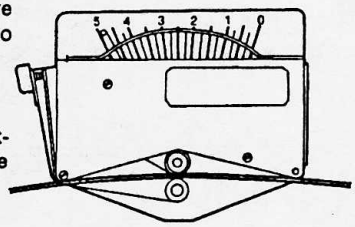
E

CUIDADO!

Las correas de transmisiòn necesitan una tensiòn adecuada. Una alineaciòn de la tensiòn provoca un deslizamiento que podrìa provocar un daño al compresor y al reenvìo. Tener cuidado que las correas sean correctamente puestas en sus asientos.

I

NOTA - La tensione della cinghia può essere misurata tra due pulegge qualsiasi utilizzando l'apposito attrezzo.



GB

NOTE - The belt tension can be measured between two pulleys of any kind using the suitable tool.

F

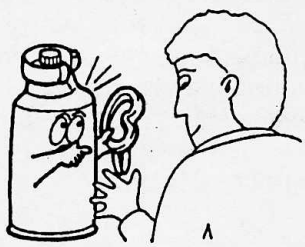
NOTE-La tension de la courroie peut être mesurée entre deux poulies n'importe lesquelles en utilisant l'outillage approprié.

D

ANMERKUNG - Die Spannung des Riemens kann zwischen zwei beliebigen Riemenscheiben mittels des ublichen Gerats abgemessen werden.

E

NOTA-La tensiòn de la correa puede ser medida entre dos poleas utilizando el utensilio adecuado.



I

Maneggiando il liquido refrigerante R-12 utilizzare gli occhiali protettivi e fare attenzione che il liquido refrigerante non venga a contatto con la pelle.

GB

Handling the cooling liquid R-12 wear protective glasses and pay attention that the cooling liquid comes in touch with skin.

F

En maniant le liquide réfrigérant R-12 utiliser les lunettes de protection et faire attention à que le liquide réfrigérant ne contacte pas la peau.

D

Beim Handhaben des Kuhlmittels R-12 Schutzbrille aufsetzen und die Beruhrung mit der Haut vermeiden.

E

Manejando el lìquido enfriador R-12 utilizar las gafas de protecciòn y asegurarse que el lìquido enfriador no vaya a contacto con la piel.

NOTE

Le indicazioni relative alla destra e alla sinistra si riferiscono al senso di marcia della vettura: Dx = Lato passeggero ; Sx = Lato guidatore. ➡ = Senso di marcia. Tutti i particolari indicati con lettera e/o ● sono intesi come originali della vettura . Tutti i particolari indicati con numero sono in dotazione al condizionatore.Tutti i blocchetti e le connessioni sono visti dal lato cavi. La tacca indicata sui blocchetti indica la polarizzazione degli stessi. I particolari contrassegnati con R possono essere assemblati sui relativi raggruppamenti. L'indicazione R sta ad indicare che possono essere ordinati singolarmente come ricambi. **La quantità di gas freon R12 necessaria per la carica dell'impianto è di 0,950 Kg.**

I

NOTES

The indication concerning the right and the left are referred to the car driving direction : Right = Passenger's side ; Left = Driver's side. ➡ Way. Detail countermarked by a letter and/or ● are the original ones. Details countermarked by a number are included in the Air Conditioner Group. Blocks and connection are seen from the cable side. The hack on the blocks shows their polarization. Details countermarked by the letter R can be assembled on the relevant groups ordered singularly as spare parts. **The quantity of R12 freon gas necessary to charge the system is 0,950 Kg.**

GB

NOTES

Les indications de droite et de gauche se réfèrent au sens de marche de la voiture : Droite = Côté passager ; Gauche = Côté conducteur. ➡ Sens de marche . Tout détail marqué par une lettre et/ou ● est original. Tout détail marqué par un nombre fait partie du groupe de conditionnement en question. Tous les blocs et les connexions sont vus du côté câbles. Le cran présent sur les blocs indique la polarisation des mêmes. Tout détail marqué par la lettre R peut être assemblé sur le groupe relatif et commandé singulièrement comme pièce de rechange. **La quantité de gaz fréon R12 nécessaire à la charge de l'installation est de 0,950 Kg.**

F

ANMERKUNGEN (FÜR ALLE BAUMUSTER)

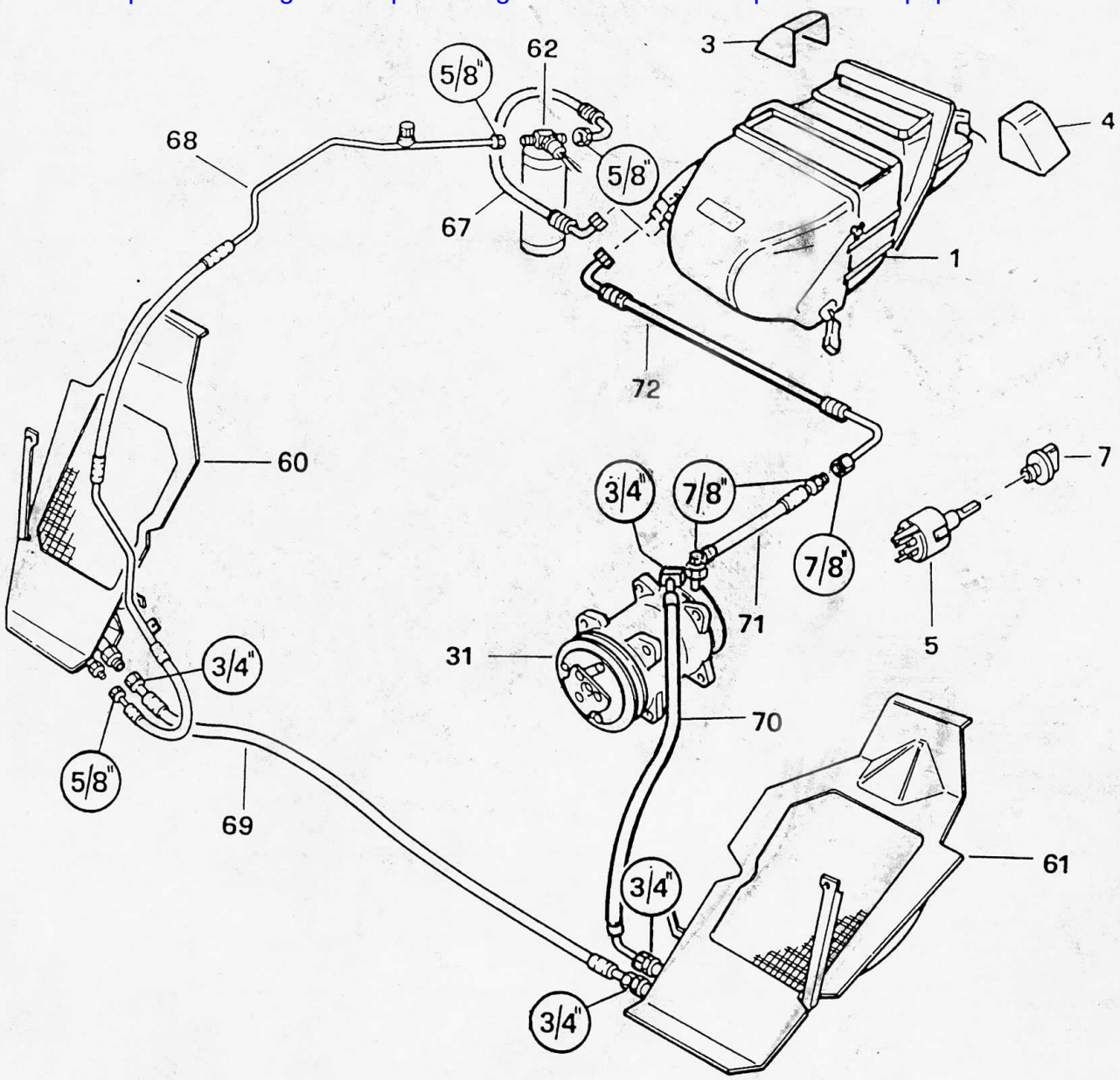
Die Angaben für rechts und links beziehen sich auf die Fahrtrichtung : RE = Beifahrerseite; LI = Fahrerseite. ➡ Fahrtrichtung. Alle mit einem Buchstaben und/oder ● gekennzeichneten Bauteile sind Fahrzeug-Originalteile. Alle numerierten Bauteile werden mit der klimaanlage beigestellt. Alle Stecker und Steckverbinder sind von der kabelseite aus gesehen. Die an den Steckverbindern vorhandene Kerbe kennzeichnet deren Polarisation. Die mit R gekennzeichneten Teile können in den entsprechenden Gruppierungen zusammengebaut werden. R gibt an,daß diese Teile einzeln als Ersatzteile bestellt werden können. **Zum Auffüllen der Anlage sind 0,950 Kg R12 Freon erforderlich.**

D

NOTAS

Las indicaciones correspondientes a la derecha y a la izquierda se refieren al sentido de marcha del automóvil : Drcha = Lado pasajero ; Izqua = Lado conductor. ➡ Sentido de marcha. Todos los detalles indicados con una letra y/o ● se interpretan como originales del automóvil. Todos los detalles indicados con un nùmero se suministran con el acondicionador. Todas las clemas y las conexiones se ven desde el lado cables. La muesca indicada en las clemas señala la polarización de las mismas.Los detalles señalados con la R se pueden acoplar a los grupos correspondientes. La indicación R significa que se pueden encargar individualmente como piezas de recambio. **La cantidad de gas freón R12 necesaria para cargar la instalación es de 0,950 Kg.**

E



Elenco dei componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
1	Gruppo climatizzatore completo		60778465	1
	Complete climatizer unit			
	Climatiseur complet			
	Komplette Klimaanlage			
	Grupo aclimatizador completo			
1.1	Rubinetto acqua		60778363	1
	Water cock			
	Robinet d'eau			
	Wasserhahn			
	Grifo agua			
1.2	Manicotto acqua entrata		60598608	1
	Water coupling			
	Pompe a eau			
	Wasser muffe			
	Manguito agua			
1.3	Manicotto acqua uscita		60598609	1
	Water coupling			
	Pompe a eau			
	Wasser muffe			
	Manguito agua			
1.4	Raccordo collegamento radiatore		60598658	2
	Pipe socket			
	Raccord			
	Rohrstutzen			
	Tubuladura			
1.5	Elettroventilatore		60777878	1
	Electric fan			
	Ventilateur electrique			
	Elektroventilator			
	Electroventilador			
1.6	Batteria evaporatrice		60778362	1
	Tap system			
	Vase d'expansion			
	Verdampfer batterie			
	Bateria evaporadora			
1.7	Massa radiante		60538689	1
	Radiant panel			
	Masse radiante			
	Kühlerblock			
	Masa radiante			
1.8	Valvola espansione		60584728	1
	Expansion valve			
	Soupape d'expansion			
	Dehnventil			
	Vàlvula d'expansiòn			
1.9	Attuatore		60777633	2
	Actuator			
	Demarreur			
	Antrieb			
	Actuador			
1.10	Termostato		60777011	1
	Thermostat			
	Thermostat			
	Thermostat			
	Termostato			

Elenco componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
2	Tubo scarico condensa		60580187	1
	Condenser drainage pipe			
	Tube d'échappement de condensateur			
	Kondenswasserabfluß			
	Tube de escape condensacion			
3	Condotto aria ai piedi destro		60598129	1
	Right air duct for foot ventilation			
	Conduit d'air droit au sol			
	Luftkanal zum rechten fuß raum			
	Conducto derecho aire dirigido hacia los pies			
4	Condotto aria ai piedi sinistro		60598130	1
	Left air duct for foot ventilation			
	Conduit d'air gauche au sol			
	Luftkanal zum linken fuß raum			
	Conducto izquierdo aire dirigido hacia los pies			
-	**Confezione per interruttore**		60777637	1
	Kit for switch			
	Confection pour interrupteur			
	Schalterkonfektion			
	Confección para interruptor			
5	Interruttore		60791005	1
	Switch			
	Interrupteur			
	Schalter			
	Interruptor			
6	Staffa fissaggio interruttore		60791009	1
	Switch bracket			
	Bride de fixation pour interrupteur			
	Haltebügel Schalter			
	Abrazadera de sujeccion del interruptor			
7	Pomello comando condizionatore		60791007	1
	Conditioner control knob			
	Pommeau de commande du conditionneur			
	Drehschalter Einstellung Klimaanlage			
	Bòton de mando del acondicionador			
8	Dima di foratura			1
	Drilling template			
	Gabarit de fixage			
	Bohrschablone			
	Dima (separador) de perfofacion			
9	Vite parker 3,5x12,7			2
	Parker screw 3.5x12.7			
	Vis parker 3.5x12.7			
	Blechschraube 3.5x12.7			
	Tornillo parker 3.5x12.7			

Elenco dei componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
12	Confezione componenti		60778466	1
	Components list			
	Confection des composants			
	Konfektion Einzelteile			
	Confecciòn de componentes			
12.1	Cablaggio più staffa micro		60778467	1
	Harness			
	Cablage			
	Verkabelung			
	Cablaje			
12.2	Distanziale Ø 5 x Ø 8 x h 15			1
	Spacer Ø 5 x Ø 8 x h 15			
	Entretoiser Ø 5 x Ø 8 x h 15			
	Distanzstücr Ø 5 x Ø 8 x h 15			
	Distanciadorr Ø 5 x Ø 8 x h 15			
12.3	Distanziale Ø 5 x Ø 8 x h 18			1
	Spacer Ø 5 x Ø 8 x h 18			
	Entretoise Ø 5 x Ø 8 x h 18			
	Distanzstück Ø 5 x Ø 8 x h 18			
	Distanciador Ø 5 x Ø 8 x h 18			
12.4	Distanziale Ø 5 x Ø 8 x h 27			1
	Spacer Ø 5 x Ø 8 x h 27			
	Entretoise Ø 5 x Ø 8 x h 27			
	Distanzstück Ø 5 x Ø 8 x h 27			
	Distanciador Ø 5 x Ø 8 x h 27			
12.5	Vite parker 4,8x31,7			2
	Parker screw 4.8x31.7			
	Vis parker 4.8x31.7			
	Blechschraube 4.8x31.7			
	Tornillo parker 4.8x31.7			
12.6	Rondella piana Ø 5,5			1
	Plain washer Ø 5.5			
	Rondelle plate Ø 5.5			
	Scheibe flach Ø 5.5			
	Arandela plana Ø 5.5			
12.7	Vite parker 4,8x38			1
	Parker screw 4.8x38			
	Vis parker 4.8x38			
	Blechschraube 4.8x38			
	Tornillo parker 4.8x38			
12.8	Vite parker 2,9 x 25			2
	Parker screw 2,9 x 25			
	Vis parker 2,9 x 25			
	Blechschraube 2,9 x 25			
	Tornillo parker 2,9 x 25			
13	Cavo Bowden distribuzione		60778372	1
	Control cable			
	Cable flexible			
	Bowdenzugseil			
	Cable tiro cable			
14	Cavo Bowden miscelazione		60778371	1
	Control cable			
	Cable flexible			
	Bowdenzugseil			
	Cable tiro cable			

Elenco componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos Pos Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
-	Confezione viterie fissaggio evaporatore		60778468	1
	Set of screws for evaporator unit			
	Confection visserie de fixage de l'évaporateur			
	Konfektion Halteschrauben Verdampfer			
	Confeccion de tornillos de fijacion del evaporador			
20	Dado M6 con rondella sottolesta			4
	Nut M6			
	Ecrou M6			
	Mutter M6			
	Tuerca M6			
21	Vite parker 3,5 x 16			1
	Parker screw 3,5 x 16			
	Vis parker 3,5 x 16			
	Blechschraube 3,5 x 16			
	Tornillo parker 3,5 x 16			
22	Piastrina elastica			2
	Stop plate			
	Plaque intermed.			
	Platte			
	Placa intermedia			
23	Vite Parker 4,8 x 13			2
	Parker screw 4,8 x 13			
	Vis parker 4,8 x 13			
	Blechschraube 4,8 x 13			
	Tornillo parker 4,8 x 13			
24	Vite Parker 2,9 x 16			1
	Parker screw 2,9 x 16			
	Vis parker 2,9 x 16			
	Blechschraube 2,9 x 16			
	Tornillo parker 2,9 x 16			
25	Rondella piana Ø 3,2			1
	Washer Ø 3,2			
	Rondelle Ø 3,2			
	Unterlegscheibe Ø 3,2			
	Arandela Ø 3,2			
-	Nastro anticondensa (Prestite)			1
	Anticondensation tape			
	Ruban anticondensation			
	Antikondensband			
	Cinta anticondensación			

Elenco dei componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
31	Compressore Sanden 508 OR-R verticale		60534460	1
	Sanden Compressor 508 OR-R vertical			
	Compresseur Sanden 508 OR-R vertical			
	Sanden-Kompressor 508 OR-R senkrecht			
	Compresor Sanden 508 OR-R vertical			
32	Bocchettone entrata acqua		60548535	1
	Water inlet pipe union			
	Embout d'entrée d'eau			
	Öffnung wasserzufuhr			
	Boca de entrada del agua			
33	Staffa anteriore fissaggio compressore			1
	Front compressor bracket			
	Bride avant de fixation du compresseur			
	Vorderer Haltebügel Kompressor			
	Abrazadera delantera de fijacion del compresor			
34	Staffa posteriore fissaggio compressore			1
	Rear compressor bracket			
	Bride arriere de fixation du compresseur			
	Hinterer Haltebügel Kompressor			
	Abrazadera trasera de fijacion del compresor			
35	Staffa sostegno alternatore		60548531	1
	Alternator support bracket			
	Bride de sourtien de l'alternateur			
	Stützbügel Alternator			
	Abrazadera de sostén del alternador			
36	Anello O.R.		60805174	1
	O.R.Ring			
	Anneau O.R.			
	Ring O.R.			
	Anillo O.R.			
37	Cinghia 13 x 935 (16V - I.E.)		60548814	1
	Belt 13 x 935 (16V-I.E.)			
	Courroie 13 x 935 (16V-I.E.)			
	Riemen 13 x 935 (16V-I.E.)			
	Correa 13 x 935 (16V-I.E.)			

Elenco dei componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
-	**Confezione viterie fissaggio adapter kit**			1
	Set of screws for adapter kit			
	Confection visserie de fixation du kit d'adaptation			
	Halteschraubenkonfektion Adapter kit			
	Confeccion de tornillos de fijacion adapter kit			
46	Vite TE M 8x1,25x70			2
	Screw TE M 8x1,25x70			
	Vis TE M 8x1,25x70			
	Schraube TE M 8x1,25x70			
	Tornillo TE M 8x1,25x70			
47	Vite TE M 8x1,25x50			2
	Screw TE M 8x1,25x50			
	Vis TE M 8x1,25x50			
	Schraube TE M 8x1,25x50			
	Tornillo TE M 8x1,25x50			
48	Vite TE M 10x1,25x115			1
	Screw TE M 10x1,25x115			
	Vis TE M 10x1,25x115			
	Schraube TE M 10x1,25x115			
	Tornillo TE M 10x1,25x115			
49	Vite TE M 10x1,25x100			1
	Screw TE M 10x1,25x100			
	Vis TE M 10x1,25x100			
	Schraube TE M 10x1,25x100			
	Tornillo TE M 10x1,25x100			
51	Vite TE M 10x1,25x50			4
	Screw TE M 10x1,25x50			
	Vis TE M 10x1,25x50			
	Schraube TE M 10x1,25x50			
	Tornillo TE M 10x1,25x50			

Elenco dei componenti - Component parts list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
52	Distanziale Ø 10 x Ø 20 x h 4		60778386	1
	Spacer Ø 10 x Ø 20 x h 4			
	Entretoise Ø 10 x Ø 20 x h 4			
	Distanzstück Ø 10 x Ø 20 x h 4			
	Distanciador Ø 10 x Ø 20 x h 4			
54	Distanziale Ø 10 x Ø 22 x h 3		60777645	1
	Spacer Ø 10 x Ø 22 x h 3			
	Entretoise Ø 10 x Ø 22 x h 3			
	Distanzstück Ø 10 x Ø 22 x h 3			
	Distanciador Ø 10 x Ø 22 x h 3			
55	Distanziale Ø 8,5 x Ø 20 x h 5		60778387	2
	Spacer Ø 8,5 x Ø 20 x h 5			
	Entretoise Ø 8,5 x Ø 20 x h 5			
	Distanzstück Ø 8,5 x Ø 20 x h 5			
	Distanciador Ø 8,5 x Ø 20 x h 5			
56	Dado E M 10 x 1,25			5
	Nut E M 10 x 1,25			
	Ecrou E M 10 x 1,25			
	Mutter E M 10 x 1,25			
	Tuerca E M 10 x 1,25			
57	Rondella ondulata Ø 10,5			10
	CrinKle washer Ø 10.5			
	Rondelle ondulée Ø 10,5			
	Scheibe gewellt Ø 10,5			
	Arandela ondulada Ø 10,5			
58	Rondella piana Ø 10,5			2
	Plain washer Ø 10.5			
	Rondelle plate Ø 10,5			
	Scheibe flach Ø 10,5			
	Arandela plana Ø 10,5			

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
60	Condensatore elettroventilato sinistro		60553108	1
	Left electrically-ventilated condenser			
	Condensateur du ventilateur électrique gauche			
	Elektrobelüfteter Kondensator links			
	Condensador electroventilado izquierdo			
61	Condensatore elettroventilato destro		60553107	1
	Right electrically-ventilated condenser			
	Condensateur du ventilateur électrique droit			
	Elektrobelüfteter Kondensator rechts			
	Condensador electroventilado derecho			
62	Filtro deidratore		60527975	1
	Dewatering filter			
	Filtre déhydrateur			
	Entwässerungsfilter			
	Filtro evaporador			
63	Pressostato trinary		60527934	1
	Trinary pressure switch			
	Pressostat trinary			
	Trinary-Druckwachter			
	Presostato trinary			
64	Staffa fissaggio filtro		60552963	1
	Filter bracket			
	Bride de fixation du filtre			
	Haltebügel Filter			
	Abrazadera de fijacion del filtro			
65	Protezione per relais		60525234	1
	Protective cover for relay			
	Protection pour relais			
	Relaisschutz			
	Protección para relé			
66	Staffa spostamento trombe		60560845	1
	Horn repositioning bracket			
	Bride de déplacement des klaxon			
	Hornversetzhaltebügel			
	Abrazadera de desplazamiento de las trompas			
67	Tubo filtro-evaporatore (G6)		60777646	1
	Filter-evaporator pipe (G6)			
	Tube filtre-évaporateur (G6)			
	Leitung Verdampferfilter (G6)			
	Tubo filtro-evaporador (G6)			
68	Tubo filtro-condensatore (G6)		60553228	1
	Filter-condenser pipe (G6)			
	Tube filtre-condensateur (G6)			
	Leitung Kondensatorfilter (G6)			
	Tubo Filtro condensador (G6)			
69	Tubo condensatore-condensatore (G8)		60553230	1
	Condenser-condenser pipe (G8)			
	Tube condensateur-condensateur (G8)			
	Leitung Kondensator-Kondensator (G8)			
	Tubo condensador-condensador (G8)			

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
70	Tubo compressore-condensatore (G8)		60777922	1
	Compressor-condenser pipe (G8)			
	Tube compresseur-condensateur (G8)			
	Leitung Kompressor-Kondensator (G8)			
	Tubo compresor-condensador (G8)			
71	Tubo compressore-raccordo (G10)		60777921	1
	Compressor-union pipe (G10)			
	Tube compresseur-raccord (G10)			
	Leitung kompressor-Anschluß stück (G10)			
	Tubo compresor-junta (G10)			
72	Tubo raccordo-evaporatore (G10)		60777647	1
	Union-evaporator pipe (G10)			
	Tube Raccord évaporateur (G10)			
	Leitung Anschluß stück -Verdampfer (G10)			
	Tubo junta-evaporador (G10)			
73	Cavallotto fissaggio tubo idroguida		60557786	1
	U-bolt for power steering pipe			
	Cavalier de fixation de la conduite d'eau			
	Haltebügelbolzen Leitung Hydrolenkung			
	Gancho de fijacion del tubo de direccion hidràulica			
-	Confezione viterie fissaggio S/FR		60791020	1
	Set of screws for cooling system			
	Confection visserie de fixation du S/FR			
	Konfektion Halteschrauben S/FR			
	Confección de tornillos de fijacion S/FR			
77	Vite TE M 6x12			4
	Screw TE M 6x12			
	Vis TE M 6x12			
	Schraube TE M 6x12			
	Tornillo TE M 6x12			
78	Vite TE M 6x16			1
	Screw TE M 6x16			
	Vis TE M 6x16			
	Schraube TE M 6x16			
	Tornillo TE M 6x16			

Elenco dei componenti - Components list - Liste des composants - Ersatzteilliste - Lista componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
79	Vite TE M 6x20			3
	Screw TE M 6x20			
	Vis TE M 6x20			
	Schraube TE M 6x20			
	Tornillo TE M 6x20			
80	Vite TE M 8x20			1
	Screw TE M 8x20			
	Vis TE M 8x20			
	Schraube TE M 8x20			
	Tornillo TE M 8x20			
81	Vite parker 3,5x12,7			1
	Parker screw 3.5x12.7			
	Vis parker 3.5x12.7			
	Blechschraube 3.5x12.7			
	Tornillo parker 3.5x12.7			
82	Dado ingabbiato E M6			3
	Caged nut E M 6			
	Ecrou prisonnier E M 6			
	Mutter E M 6			
	Tuerca almenada E M 6			
83	Dado E M6			6
	Nut E M 6			
	Ecrou E M 6			
	Mutter E M 6			
	Tuerca E M 6			
84	Tassello per vite			1
	Screw dowel			
	Cheville pour vis			
	Schraubendübel			
	Taco para tornillo			
85	Rondella piana Ø 6,5 x Ø 12,5 x h 1,5			11
	Plain washer Ø 6,5 x Ø 12,5 x h 1,5			
	Rondelle plate Ø 6,5 x Ø 12,5 x h 1,5			
	Scheibeflach Ø 6,5 x Ø 12,5 x h 1,5			
	Arandela plana Ø 6,5 x Ø 12,5 x h 1,5			
86	Rondella piana Ø 8,5			1
	Plain washer Ø 8.5			
	Rondelle plate Ø 8.5			
	Scheibe flach Ø 8.5			
	Arandela plana Ø 8.5			
87	Rondella dentellata Ø 6,5			1
	Notched washer Ø 6.5			
	Rondelle dentelée Ø 6.5			
	Scheibe gezahnt Ø 6.5			
	Arandela dentada Ø 6.5			
88	Rondella piana Ø 6,5 x Ø 20 x h 1,5			2
	Plain washer Ø 6,5 x Ø 20 x h 1,5			
	Rondelle plate Ø 6,5 x Ø 20 x h 1,5			
	Scheibe flach Ø 6,5 x Ø 20 x h 1,5			
	Arandela plana Ø 6,5 x Ø 20 x h 1,5			
89	Rondella piana Ø 3,5			1
	Plain washer Ø 3,5			
	Rondelle plate Ø 3,5			
	Scheibe flach Ø 3,5			
	Arandela plana Ø 3,5			

Elenco dei componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
90	Dado E M5			1
	Nut E M 5			
	Ecrou E M 5			
	Mutter E M 5			
	Tuerca E M 5			
91	Rondella piana Ø 5,5			2
	Plain washer Ø 5,5			
	Rondelle plate Ø 5,5			
	Scheibe flach Ø 5,5			
	Arandela plana Ø 5,5			
92	Vite parker 4,8x12,7			1
	Parker screw 4,8x12,7			
	Vis parker 4,8x12,7			
	Blechschraube 4,8x12,7			
	Tornillo parker 4,8x12,7			
93	Tassello per vite			1
	Screw dowel			
	Cheville pour vis			
	Schraubendöel			
	Taco para tornillo			
94	Fascetta			1
	Clamp			
	Collier			
	Drahtklemmen			
	Abrazadera			
95	Cablaggio collegamento evaporatore		60777648	1
	Evaporator wiring			
	Câble de jonction de l' evaporateur			
	Verkabelung Verdampferanschluß			
	Cableado de conexion evaporador			
96	Cablaggio collegamento S/FR		60777649	1
	Cooling system wiring			
	Câble de jonction S/FR			
	Verkabelung Verbindung S/FR			
	Cableado de conexion S/FR			
97	Briglia per compressore			1
	Compressor bridle			
	Bride pour compresseur			
	Mitnehmer für Kompressor			
	Brida para compresor			

OPERAZIONI PRELIMINARI NELLA VASCA SERVIZI:
Scollegare e smontare la batteria, il cofano motore e il suo aggancio.
Scollegare i tubi acqua dal gruppo riscaldamento.

OPERAZIONI DA ESEGUIRE AL BANCO:
Scollegare dal gruppo comandi riscaldamento-ventilazione del riscaldatore tutti i connettori dell'impianto elettrico e i tiretti di comando distribuzione e miscelazione aria esistentl.
Eliminare quindi il gruppo riscaldamento, i tiretti e l'impianto elettrico originale.
PARTICOLARI ORIGINALI ELIMINATI:
A) Gruppo riscaldamento con tiretti e cablaggio elettrico.
B) Convogliatori aria ai piedi.

I

PREPARATIONS IN THE SERVICE TANK:
Disconnect and disassemble the battery and his drawbar.
Disconnect the water pipes from the heating unit.

TO BE CARRIED OUT AT THE BENCH:
Disconnect from the heating-ventilation control panel of the heater all the connectors of the electrical installation and the existing control bowden cable for air distribution and mixing.
Therefore, discard the heating unit, the bowden cables and theoriginal electrical installation.
ORIGINAL PARTS DISCARDED:
A) Heating unit with bowden cables and electrical wiring.
B) Foot ventilation air conveyors.

GB

OPERATIONS PRELIMINAIRES DANS LE COLLECTEUR D'EAUX PLUVIALES
Debrancher et demonter la batterie et sa fixation.
Débrancher les tubes d'eau du groupe de chauffage.

OPERATIONS A EXECUTER AU BANC
Débrancher du groupe de commandes chauffage - ventilateur du réchauffeur tous les connecteurs de l'installation électrique et les tirettes de commande de distribution et de mélange d'air existants. Eliminer ensuite le groupe chauffage, les tirettes et l'installation électrique d'origine.
PIECES D'ORIGINE ELIMINEES
A) Groupe de chauffage avec tirettes et câble électrique.
B) Convecteur d'air au sol.

F

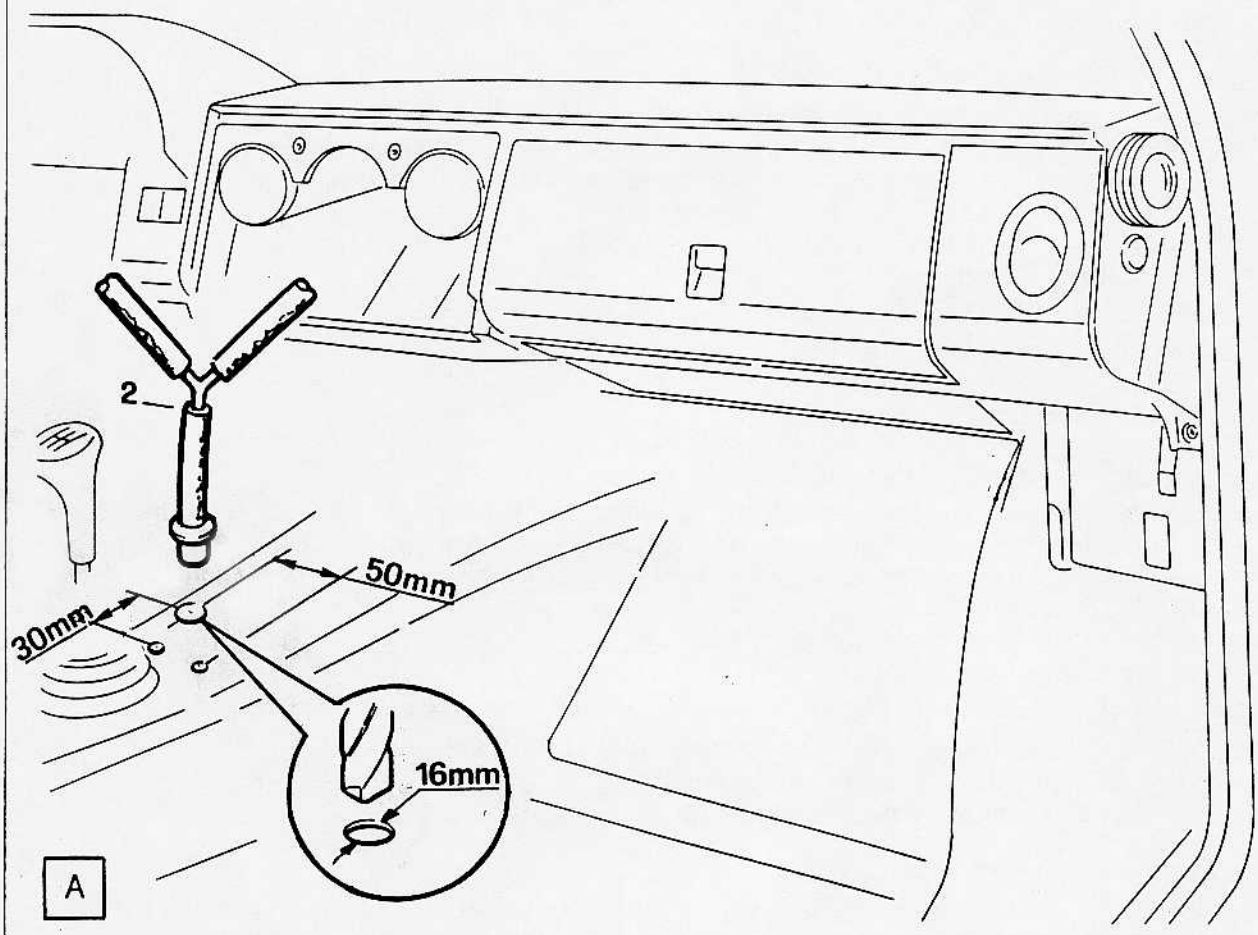
VORBEREITENDE ARBEITEN IM FLÜSSIGKEITSBEHÄLTER:
Die batterie,die Motorhaube und ihre Befestigung unterbrechen und ausbauen.
Wasserleitungen von der Heizungsvorrichtung trennen.

AN DER WERKBANK AUSZUFÜHRENDE ARBEITEN:
Von Einstellvorrichtung Heizung-Belüftung des Heizelementes alle Verbinder derelektrischen Anlage und Einstellzüge für Verteilung und Mischung der vorhandenen Luft trennen.
Dann die Heizungsvorrichtung, die Züge und die originale elektrische Anlage entfernen.
ENTFERNTE ORIGINALBAUTEILE:
A) Heizungsvorrichtung mit Zügen und elektrischer Verkabelung
B) Luftzufuhrleitungen zum Fußraum

D

OPERACIONES PRELIMINARES EN EL DEPOSITO SERVICIOS:
Desconectar y desmontar la bateria, el capo motor y su enganche.
Separar los tubos del agua del grupo calefacción.
OPERACIONES EN EL BANCO:
Desconectar el grupo mandos calefacción-ventilación del calefactor todas las conexiones de la instalación elèctrica y las gavetas existentes del mando distribución y mezcla del aire.
Una vez realizada esta operación eliminar el grupo calefacción, las gavetas y la instalación eléctrica original.
PIEZAS ORIGINALES ELIMINADAS:
A) Grupo calefacción con gavetas y cableado eléctrico.
B) Transportadores de aire dirigido hacia los pies.

E



OPERAZIONI PRELIMINARI NELL'ABITACOLO

Smontare le grembialine sottoplancia lato guida e lato passeggero.
Smontare il tunnel centrale togliendo i fissaggi del gruppo comandi riscaldamento e ventilazione.
Smontare ed eliminare dal gruppo riscaldamento il convogliatore aria ai piedi.
Smontare le quattro viti di fissaggio gruppo riscaldamento.
Scollegare dal gruppo comandi riscaldamento-ventilazione il connettore dell'impianto elettrico originale ed il tiretto comando sportello distribuzione aria defrost-bocchette centrali.
Sollevare il tappeto e l'isolante in corrispondenza del tunnel centrale, eseguire un foro Ø 16 mm alle misure indicate, se non già predisposte.
Inserire il raccordo scarico condensa (2) collegandolo superiormente alle predisposizioni sul climatizzatore, sigillare quindi i fori e i raccordi con silicone.

I

PREPARATIONS INSIDE THE VEHICLE

Remove the dashboard aprons on both driver and passengersides.
Remove the central tunnel by taking out the fastenings of the heating and ventilation control panel.
Remove and discard the foot ventilation air conveyor from the heating unit.
Remove the four heating unit clamping screws.
Disconnect the connector of the original electrical installation and the control bowden cable of the air distribution defrost vent control - central selvages from the heating-ventilation control panel. Lift up the carpet and insulator along the line of the central tunnel, and bore a 16 mm. Ø hole at the measurements indicated, if not prearranged.
Insert the condenser drainage pipe union (2), connecting it above to the three-way joint on the climatizer, then seal the holes and joints with silicone.

GB

OPERATIONS PRELIMINAIRES DANS L'HABITACLE

Démonter les protections sous le plancher côté conducteur et côté passager.
Démonter le tunnel central en enlevant les fixations du groupe de commandes du chauffage et de la ventilation. Démonter et enlever du groupe chauffage le convecteur d'air au sol.
Démonter les quattre vis de fixation du groupe chauffage.
Débrancher du groupe de commandes du chauffage - ventilation le connecteur de l'installation électrique d'origine et la tirette de commande du volet de distribution d'air de dégivrage - bouches centrales. Soulever le petit tapis et l'isolant en correspondance avec le tunnel central, exécuter un trou de Ø 16 mm selon les mesures indiquées, si elles ne sont pas déjà prévues.
Insérer le raccord d'échappement de condensation (2), en le branchant dans la partie supérieure au raccord à trois voies sur le climatiseur, sceller ensuite les trous et les raccords avec du silicone.

F

VORBEREITENDE ARBEITEN IM FAHRGASTRAUM

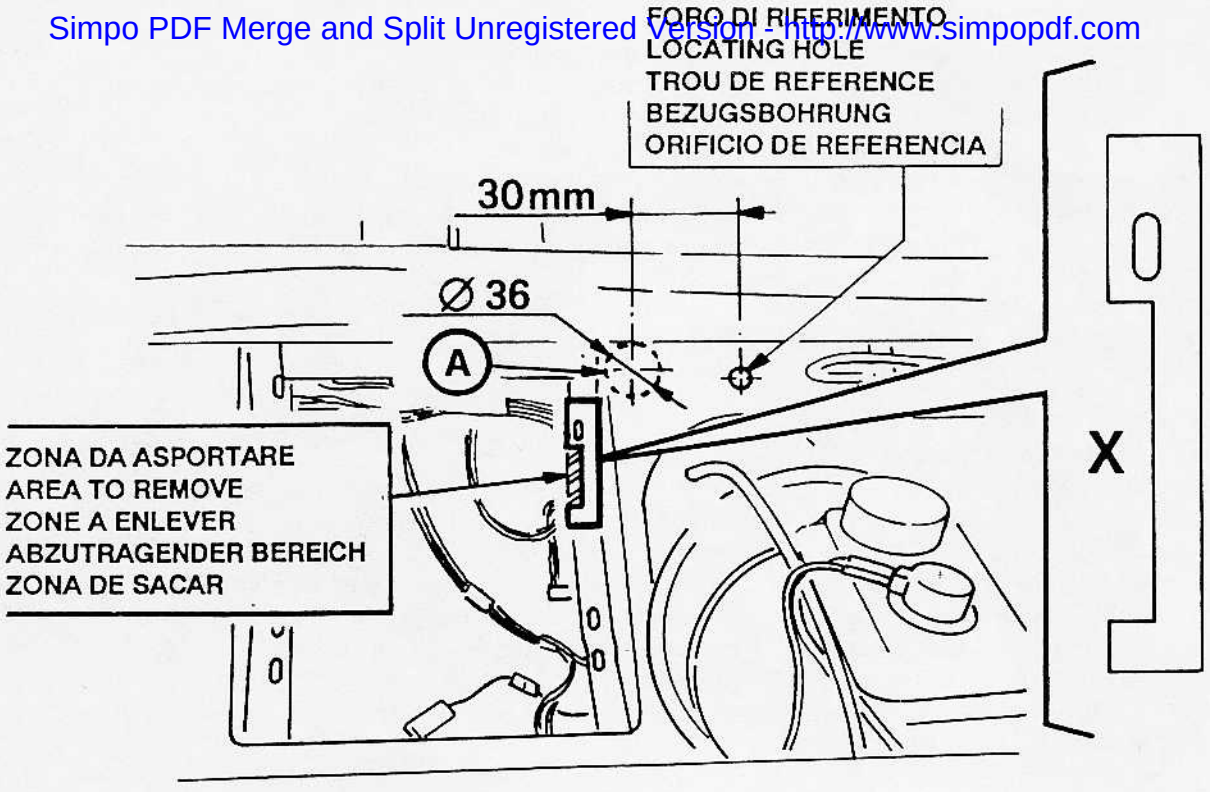
Untere Abdeckplatte auf Fahrer-und Beifahrerseite entfernen.
Zentralen Tunnel ausbauen, indem die Halterungen der Einstellvorrichtungen für Heizung und Belüftung entfernt werden. Luftzufuhrleitungen zum Fuß raum ausbauen und von der Heizungsvorrichtung entfernen. Die vier Halteschrauben der Heizungsvorrichtung ausdrehen. Den Verbinder der originalen elektrischen Anlage und den Zug für den Einstellschalter für die Luftverteilung an die zentralen Defrost-Öffnungen von den Einstellvorrichtungen für Heizung und Belüftung trennen. Teppich und Isolierbelag beim zentralen Tunnel anheben, ein Loch von 16 mm nach den angegebenen Abmessungen bohren. Das Anschluß stück Kondenswasserabfluß (2) einsetzen und oberhal des Dreiweg-Anschluß stückes mit der Klimaanlage verbinden, dann die Bohrungen und die Anschluß stücke mit Silikon abdichten.

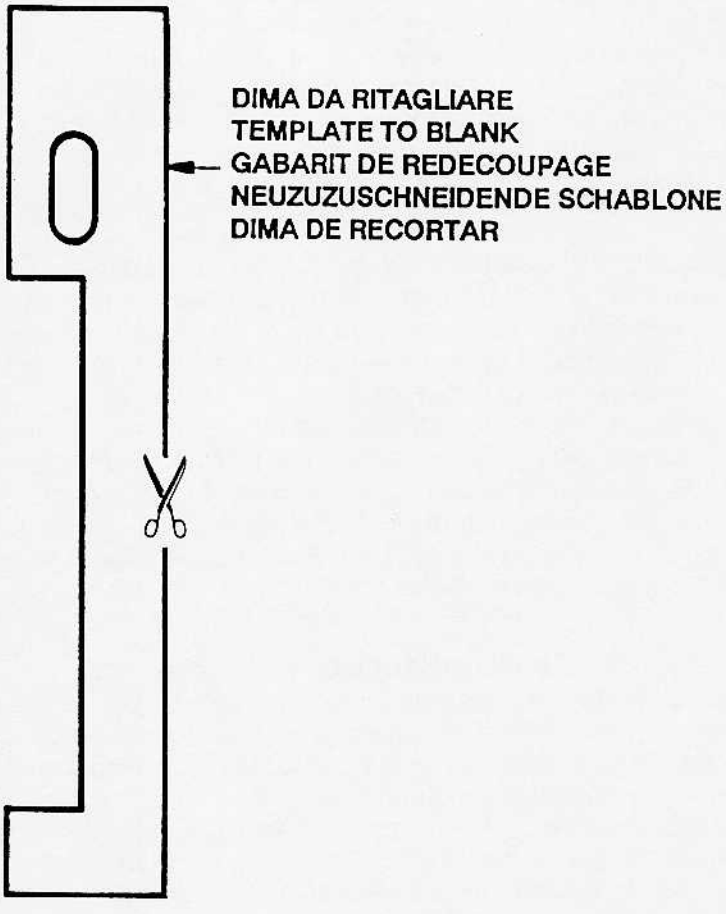
D

OPERACIONES PRELIMINARES EN EL HABITACULO

Desmontar las mascarillas de debajo de la plancha del lado conductor y del lado pasajero.
Desmontar el túnel central, quitando las fijaciones del grupo mandos calefacción y ventilación.
Desmontar y eliminar del grupo calefacción el transportador de aire. Desmontar los cuatro tornillos de sujección del grupo calefacción.
Desensamblar del grupo mandos calefacción-ventilació el conector de la instalación eléctrica original y la gaveta mando de la ventanilla distribución aire defrost-boquillas centrales.
Levantar la alfombra y el aislante correspondiente a la zona del túnel central, realizar un orificio de Ø 16 con las medidas indicadas. Inserir la junta de descarga condensación (2), uniéndola por la parte superior a la junta de tres vías, situada sobre el aclimatizador; una vez realizada esta operación sellar los orificios y las juntas con silicona.

E





OPERAZIONI PRELIMINARI NELL'ABITACOLO (SE NON GIÀ PREDISPOSTE)

Forare Ø 36 nel punto A per il passaggio dei cavi dell'impianto elettrico fornito.
Posizionare la dima fornita nella posizione di figura facendo coincidere l'asola della dima con l'asola esistente sul bordo dell'apertura di inserimento del riscaldamento.
Tagliare quindi la lamiera asportando la parte «X» delimitata sulla dima, per il passaggio bowden comando sportello miscelazione aria.
A operazioni ultimate (taglio e foratura) proteggere i bordi della lamiera con prodotto antiruggine.

I

PREPARATIONS INSIDE THE VEHICLE (IF NOT PREARRANGED)

Drill Ø 36 at point A to carry the wires of the electrical installation supplied.
Position the template supplied as shown in the diagram, matching the slot of the template to that existing on the edge of the heating insertion opening.
Then cut the plate, removing the area marked "X" on the template to carry the control bowden cable of the air mixing vent.
When cutting and drilling has been completed, protect the edges of the plate with an anti-rust solution.

GB

OPERATIONS PRELIMINAIRES DANS L'HABITACLE (SI ELLES NE SONT PAS DÉJÀ PRÉVUES)

Forer Ø 36 au point A pour le passage des câbles de l'installation électrique fournie.
Placer le gabarit fourni dans la position de la figure en faisant coïncider l'axe du gabarit avec l'axe existant sur le bord de l'ouverture de l'entrée du chauffage.
Tailler ensuite la tôle en enlevant la partie "X" délimitée sur le gabarit, pour le passage de la tirette de commande du volet du mélange d'air.
Les opérations terminées(taille et forage) protéger les bords de la tôle avec un produit antirouille.

F

VORBEREITENDE ARBEITEN IM FAHRGASTRAUM (WENN NICHT BEREITS VORGESEHEN)

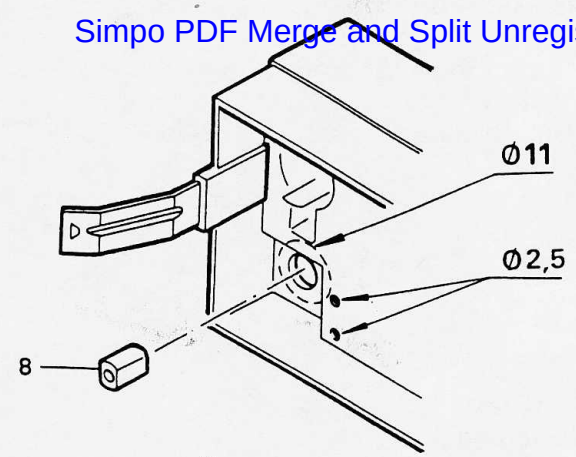
Ein Loch von Ø 36 in Punkt A bohren, in dem die Kabel der gelieferten elektrischen Anlage verlaufen.
Die gelieferte Schablone in die Position lt. Abb.bringen, dabei beachten, daß die Schablonenöse genau auf der Öse liegt, sich auf dem Rand der für den Einbau der Heizung vorgesehenen Öffnung befindet.
Dann das Blech schneiden, indem der auf der Schablone begrenzte Teil "X" für die Zugführung zum Einstellschalter für Luftmischung entfernt wird.
Bei den abschließ enden Arbeiten (Schnitt und Bohrung) die Blechränder mit rosthinderndem Produkt schützen.

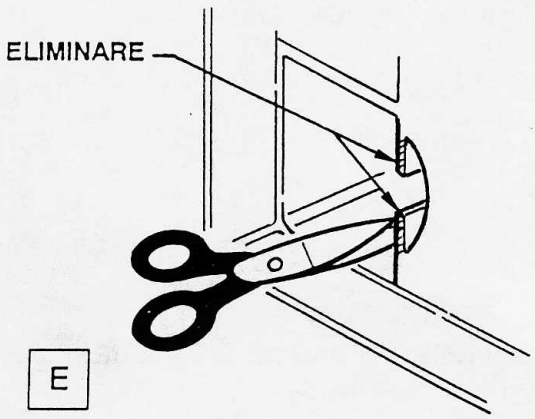
D

OPERACIONES PRELIMINARES EN EL HABITACULO (SI YA NO ESTÀN PREDISPUESTAS)

Perforar a Ø 36 en el punto A para crear el pasaje de los cables de la instalación eléctrica suministrada.
Colocar la dima (separador), como indicado en la figura, haciendo coincidir el ojal de la dima con el ojal situado en el borde de la apertura de inserción de la calefacción.
Cortar la plancha exportando la parte "X" delimitada sobre la dima, para el pasaje de la gaveta mando ventanilla dispositivo mezcla aire. Cuando se habrán realizado todas las operaciones (exportación y perforación) proteger los bordes de la chapa con un producto antioxidante.

E





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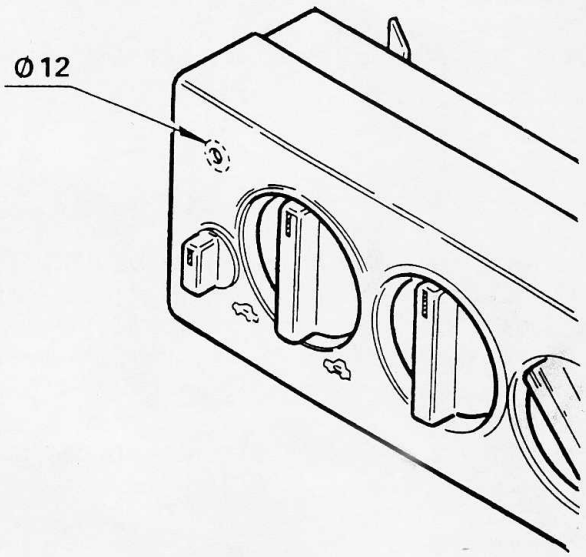

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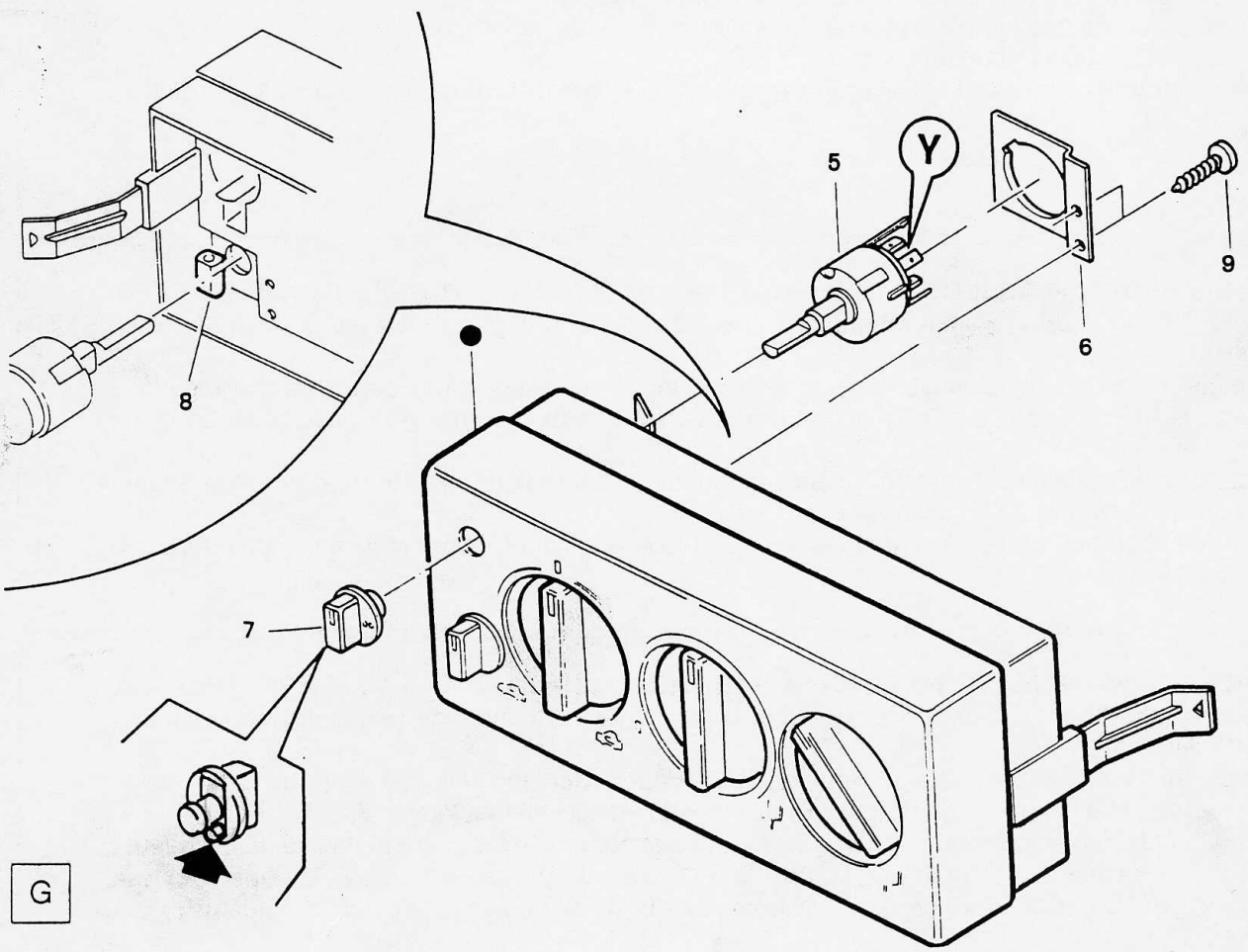


G

MONTAGGIO INTERRUTTORE COMANDO A.C.

Scollegare i cavi bowden e le connessioni elettriche dal quadretto comandi riscaldatore originale ed eseguire (al banco) le seguenti operazioni: Inserire la dima (distanziale) di foratura (8) nella sede interruttore dalla parte posteriore del quadretto e forare Ø 5 mm (dett.E). Lasciando inserito il distanziale (8), allargare il foro a Ø 11 (solo posteriore) (dett.E). Estrarre il distanziale (8), capovolgere il quadretto e allargare il foro a Ø 12 mm (solo anteriore) (dett.F). Riutilizzare la dima (8) e posizionarla nella sede interruttore creata per crearne un piano d'appoggio.Inserire l'interruttore (5) nella propria sede, bloccarlo con il pomello (7), posizionare la staffetta (6),praticare due fori Ø 2,5 mm (dett.E) e fissare la staffetta medesima con due viti parker (dett.G). Riportare il quadretto comandi riscaldatore modificato sulla vettura e ripristinare i collegamenti elettrici e meccanici (bowden).**NOTA: Prima di montare il pomello (rif.7) asportare la sporgenza in plastica posta nella parte posteriore come visibile nel dettaglio ruotato in figura G.**

I

FITTING THE A.C. CONTROL SWITCH

Disconnect the Bowden cables and electrical connections from the control panel of the original heater, then proceed at the bench as follows. Insert the drilling template (spacer) (8) in the switch seating from the rear of the panel and drill Ø 5 mm (detail E). Leaving the spacer (8) in place, enlarge the hole to Ø 11 (rear only) (detail E). Extract the spacer (8), turn the panel over and enlarge the hole to Ø 12 mm (front only) (detail F). Using the template (8) again, position it in the new switch seating so as to create a support. Insert the switch (5) into its seating, locking it by attaching the knob (7), position the bracket (6), make two holes Ø 2.5 mm (detail E) and fix the bracket with two Parker screws (detail G). Replace the modified heater control panel and reinstate the electrical and mechanical (Bowden) connections. **NB: Before fitting the knob (ref.7) remove the excess plastic on the rear part as shown in the rotated detail in diagram G.**

GB

MONTAGE DE L'INTERRUPTEUR DE LA COMMANDE A/C

Débrancher les câbles bowden et les connections électriques de l'encadrement des commandes du réchauffeur d'origine et exécuter (au banc) les opérations suivantes: Insérer le gabarit (entretoise) de forage (8) au niveau de l'interrupteur par la partie arrière de l'encadrement et forer Ø 5 mm (détail.E). En laissant l'entretoise, élargir le trou à 11 (seulement à l'arrière) (détail.E). Enlever l'entretoise (8) retourner l'encadrement et élargir le trou à 12 mm (seulement à l'avant) (détail.F). Réutiliser le gabarit (8) et le placer au niveau de l'interrupteur pour en créer un plan d'appui. Insérer l'interrupteur (5) dans son emplacement le fixer avec le pommeau (7), placer la petite bride (6) pratiquer deux trous Ø 2,5 mm (détail.G). Remettre l'encadrement des commandes du réchauffeur modifié sur la voiture et rétablir les branchements électriques et mécaniques (bowden).
NOTA: Avant de monter le pommeau (référence 7) enlever l'ergot en plastique placé dans la partie postérieure comme il est visible dans détail encerclé de la figure G.

F

MONTAGE EINSTELLSCHALTER A.C.

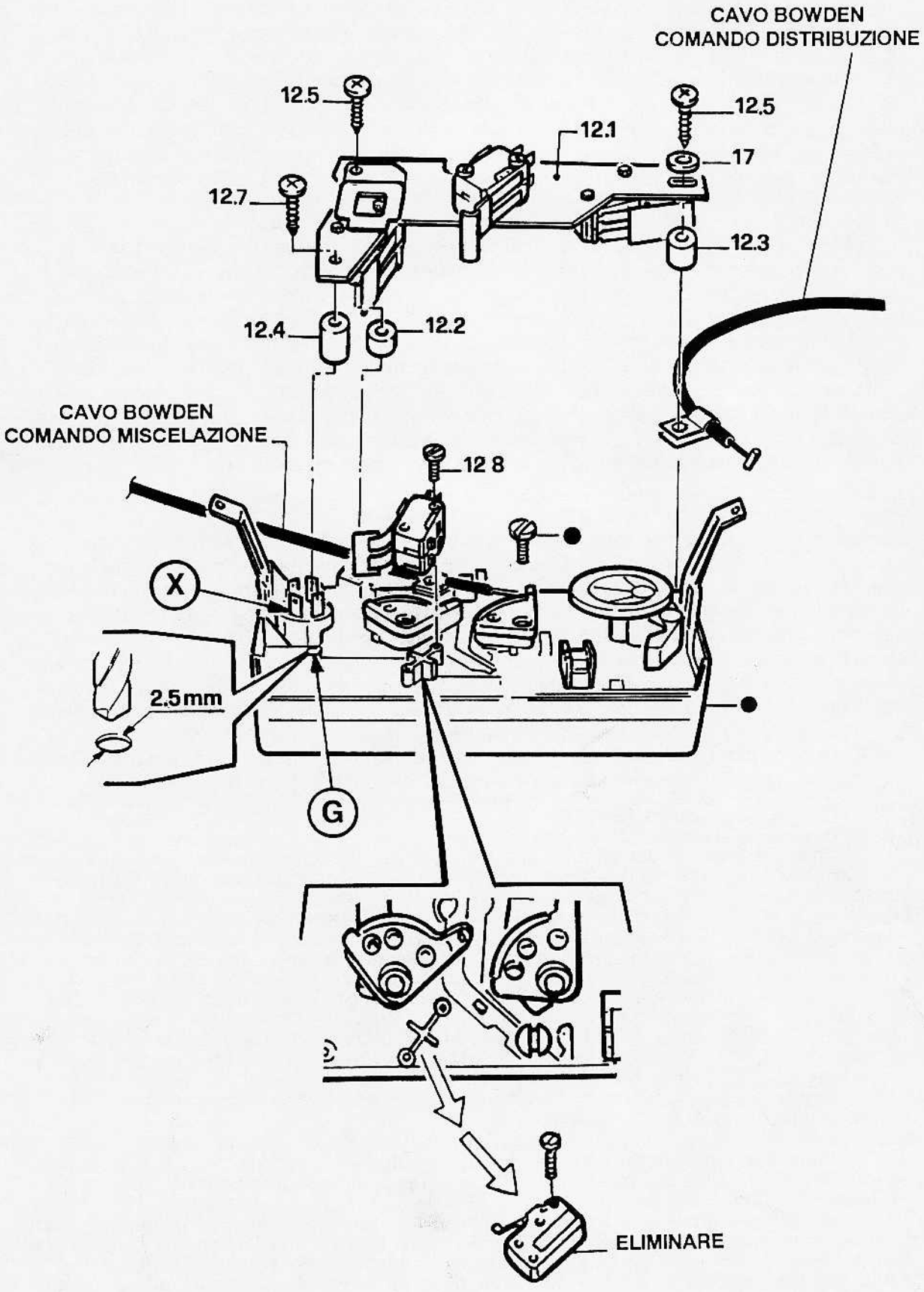
Bowdenkabel und elektrische Verbindungen von Schalttafel der Originalheizvorrichtung trennen und folgende Arbeiten (an der Werkbank) ausführen: Die Schablone (Entfernungsstück) der Bohrung (8) in den Schaltersitz von der hinteren Seite der Tafel aus einführen und ein Loch von Ø 5mm bohren (Abb. E). Während das Distanzstück (8) eingebaut bleibt, das Loch auf Ø 11 (nur hinten)(Abb.E) erweitern. Das Distanzstück (8) entfernen, die Tafel umdrehen und das Loch auf Ø 12mm (nur vorne)(Abb.F) erweitern. Die Schablone (8) wieder verwenden und in den Schaltersitz einführen, der als Auflagefläche erstellt wurde. Den Schalter (5) in seinen Sitz einführen, mit Drehschalter (7) befestigen, den Haltebügel (6) einsetzen, zwei Löcher mit Ø 2,5 mm (Abb.E) bohren und besagten Haltebügel mit zwei Blechschrauben (Abb.G) befestigen. Die abgeänderte Schalttafel für die Heizvorrichtung wieder anbringen und die elektrischen sowie die mechanischen (Bowden) Verbindungen wiederherstellen. **ANMERKUNG: Vor dem Einbau des Drehschalters (vgl.7) den Plastikvorsprung auf dem hinteren Teil entfernen, wie aus der umgedrehten Teilansicht in Abb. G ersichtlich.**

D

MONTAJE DEL INTERRUPTOR MANDO A.C.

Desconectar los cables bowden y las conexiones eléctricas del cuadro mandos del calefactor original y efectuar (en el banco) las operaciones siguientes: Inserir la dima (separador de perforación) (8) en la sede del interruptor por la parte trasera del cuadro y perforar a Ø 5mm (det. E). Dejando inserido el separador (8) ensanchar el orificio a Ø 11 (sólo posterior) (det. E). Extraer el separador (8), girar el cuadro y ensanchar el orificio a Ø 12 mm (sólo delantero) (det.F). Utilizar de nuevo el separador (8) y colocarlo en la sede del interruptor, creada para obtener un plano de apoyo. Inserir el interruptor (5) en la propia sede, bloquearlo con el botón (7, posicionar la abrazadera (6), efectuar dos orificios de Ø 2,5mm (det. E) y fijar la citada abrazadera con dos tornillos parker (det.G). Posicionar de nuevo, sobre el automóvil el cuadro mandos del calefactor modificado y restablecer las conexiones eléctricas y mecánicas (bowden). **NOTA: Antes de montar el botón (ref.7), quitar la parte de plástico saliente, situada en la parte trasera, como se puede observar en el detalle evidenciado por el círculo en la figura G.**

E



OPERAZIONI DA ESEGUIRE AL BANCO

Fissare la staffa (12.1) nel punto G utilizzando il distanziale (12.4) e vite autofilettante (16) forando in opera Ø 2,5. Fissare il gruppo microinterruttori al gruppo comandi, nella posizione in origine occupata dal microinterruttore eliminato, utilizzando le viti 12.8 Collegare i cavi del cablaggio elettrico fornito all'interruttore originale di ventilazione (zona X) ed all'interruttore comando A.C.(5) seguendo le indicazioni dello schema elettrico.

NOTA: A fissaggio ultimato del cablaggio elettrico fornito, controllare che il funzionamento di «APERTO» e «CHIUSO» dei gruppi microinterruttori, agendo sui relativi pomelli del gruppo comandi.

I

TO BE CARRIED OUT AT THE BENCH

Fix the bracket (12.1) at point G using the spacer (12.4) and self-tapping screws (16), drilling to Ø 2.5. Fix the microswitch unit to the control panel, in place of the original discarded microswitch, using the scrwes 12.8 Connect the electrical wiring supplied to the original ventilation switch (area X) and to the A.C. control switch (5) following the indications in the wiring diagram.

NB: On completing the electrical wiring supplied, check that "OPEN" and "CLOSE" on the microswitch units are working by moving the relative knobs on the control panel.

GB

OPERATIONS A EFFECTUER AU BANC

Fixer la bride (12.1) au point G en utilisant l'entretoise (12.4) et les vis autofiletantes (16) en perçant un Ø 2,5. Fixer le groupe microinterrupteurs au groupe de commandes, dans la même position d'origne occupée par le microinterrupteur éliminé, en utilisant les vis 12.8

Brancher les câbles du câblage électrique à l'interrupteur d'origine de la ventilation (zone X) et à l'interrupteur de commande A.C.(5) en suivant les indications du schéma électrique.

NOTE: Au fixage terminé du câblage électrique fourni, contrôler le fonctionnement d' "ouverture" et de "fermeture" des groupes microinterrupteurs, en agissant sur les pommeaux relatifs du groupe de commandes.

F

AN DER WERKBANK AUSZUFÜHRENDE ARBEITEN

Den Haltebügel (12.1) in Punkt G befestigen, dafür das Distanzstück (12.4) und die selbsteinschneidende Schraube (16) verwenden und dabei Ø 2,5 bohren. Die Mikroschaltervorrichtung an der Einstellvorrichtung befestigen und zwar in der ursprünglich vom entfernten Mikroschalter eingenommenen Position; dazu die entsprechenden schrauben 12.8 Die Kabel der gelieferten elektrischen Verkabelung, unter Berücksichtigung der Angaben auf dem elektrischen Schaltplan, an den Original-Belüftungsschalter (Bereich X) und den Einstellschalter A.C.(5) anschließ en.

ANMERKUNG: Bei abschließ ender Befestigung der gelieferten elektrischen Verkabelung die Funktion von "OFFEN" und "ZU" der Mikroschalter überprüfen, indem die entsprechenden Drehschalter der Einstellvorrichtungen betätigt werden.

D

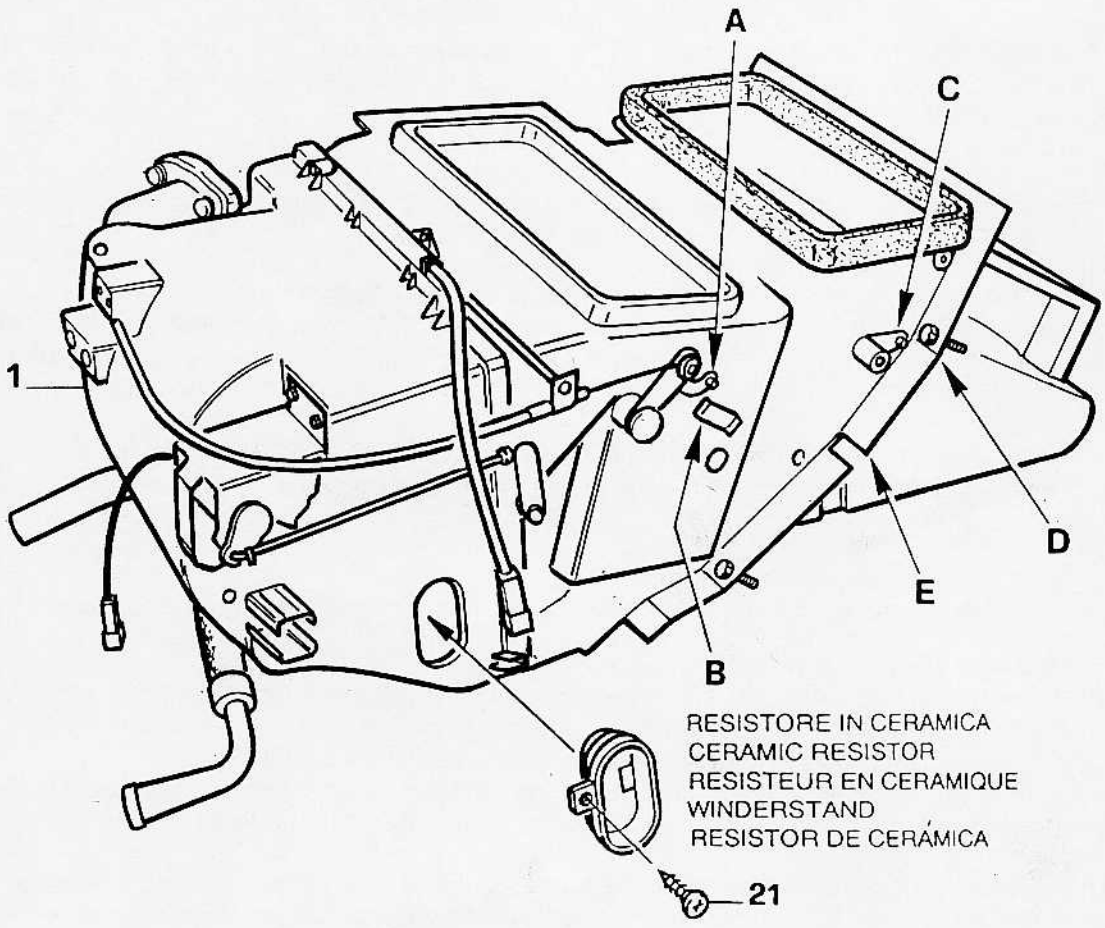
OPERACIONES EN EL BANCO

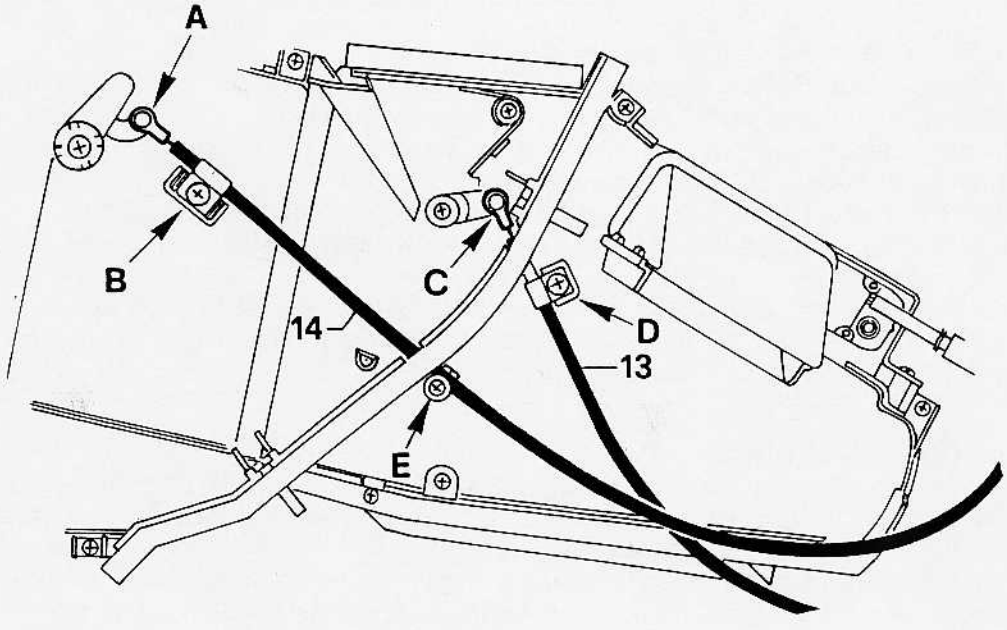
Fijar la abrazadera (12.1) en el punto G, utilizando el separador (12.4) y el tornillo (16) perforando Ø 2,5. Fijar el grupo de microinterruptores al grupo mandos en la posición que ocupaba el microinterruptor eliminado, utilizando el tornillos 12.8 Conectar los cavos del cableado eléctrico suministrado al interruptor original de ventilación (zona X) y al interruptor del mando A.C. (5) observando las indicaciones del esquema eléctrico.

NOTA: Una vez realizada la operación de fijación del cableado eléctrico suministrado, controlar el funcionamiento de "ABIERTO" y "CERRADO" de los grupos microinterruptores, obrando sobre los re lativos botones del grupo mandos.

E

MONTAGGIO CAVI BOWDEN





Recuperare il resistore dal riscaldatore smontato. Se il resistore non fosse in ceramica occorre ordinarlo a ricambio citando il codice Alfa 60583176

NOTA: il cavo bowden miscelazione si distingue per la maggiore lunghezza e per l'asola di fissaggio punto B.

I

Recover the resistor from the heater before removed. If it is not a ceramic resistor, order it as a spare part by pointing out the Alfa code 60583176.

GB

Récupérer la résistance du chauffage précedémment démonté. Si la résistance n'etait pas en céramique il serait nécessaire d'en commander une en indiquant le code Alfa 60583176.

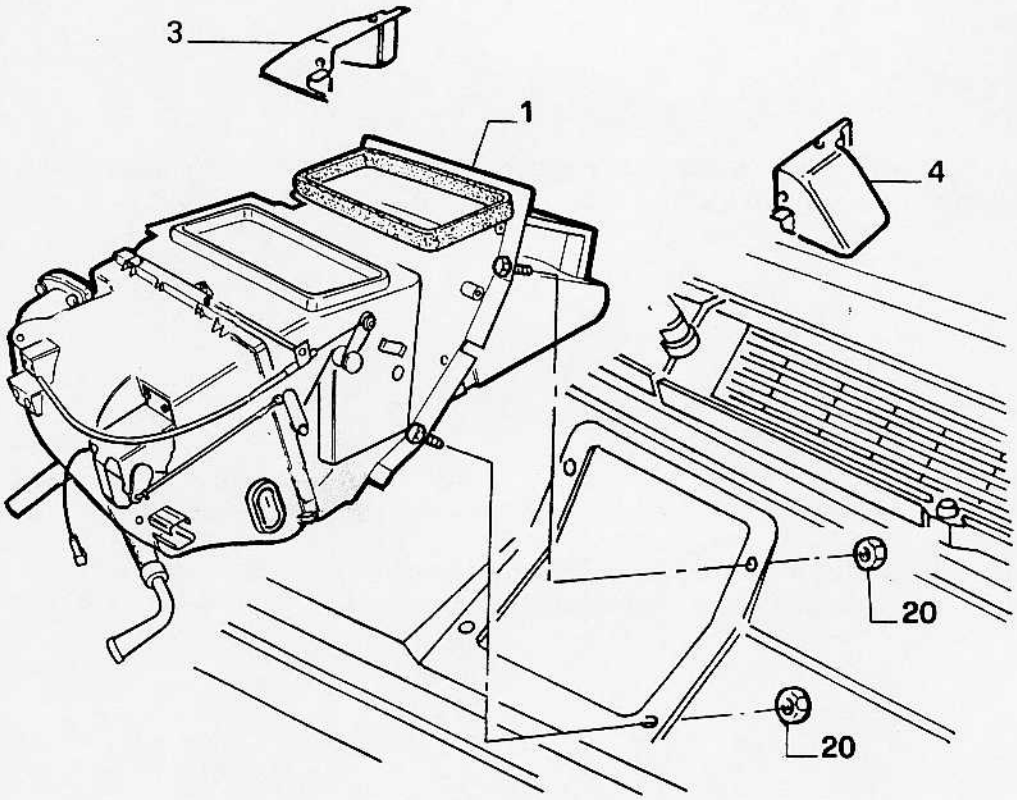
F

Den Widerstand aus dem zuvor ausgebauten Heizelement entnehen. Besteht der Widerstand nicht aus Keramik, sollte ein Ersatz unter Verwendung der Kennzahl Alfa 60583176 bestellt werden.

D

Recuperar el resistor del calentador desmontado anteriormente. Si el resistor no es de cerámica es necesario pedirlo como pieza de recambio con el còdigo Alfa 60583176.

E



MONTAGGIO GRUPPO EVAPORATORE

Montare il gruppo evaporatore (1) inserendolo attraverso l'apertura originale del riscaldamento, facendo attenzione a non danneggiare il bowden (evitare pieghe che possano comprometterne lo scorrimento). Portare dall'interno all'esterno abitacolo il cablaggio elettrico fornito collegato al gruppo comandi, attraverso il foro Ø 36, sigillandolo con il gommino passacavi. Montare i condotti aria ai piedi (3-4) fissandoli all'evaporatore

I

FITTING THE EVAPORATOR UNIT

Mount the evaporator unit (1) inserting it through the original heating opening, making sure not to damage the Bowden cable (avoid bends which could jeopardize sliding). Carry the electrical wiring supplied, connected to the control panel, from the inside to the outside of the vehicle, through the hole Ø 36, sealing it with the fairlead rubber washer. Mount the foot ventilation air ducts (3-4) fixing them to the evaporator

GB

MONTAGE DU GROUPE EVAPORATEUR

Monter le groupe évaporateur (1) en l'insérant à travers l'ouverture d'origine du chauffage en faisant attention à ne pas abimer le bowden (éviter les plis qui peuvent compromettre les déplacements). Déplacer de l'intérieur vers l'extérieur de l'habitacle le câblage électrique fourni branché au groupe de commandes à travers le trou de Ø 36, en le scellant avec le joint passe câbles en caoutchouc. Monter les conduits d'air au sol (3-4) en les fixant à l'évaporateur

F

EINBAU VERDAMPFERVORRICHTUNG

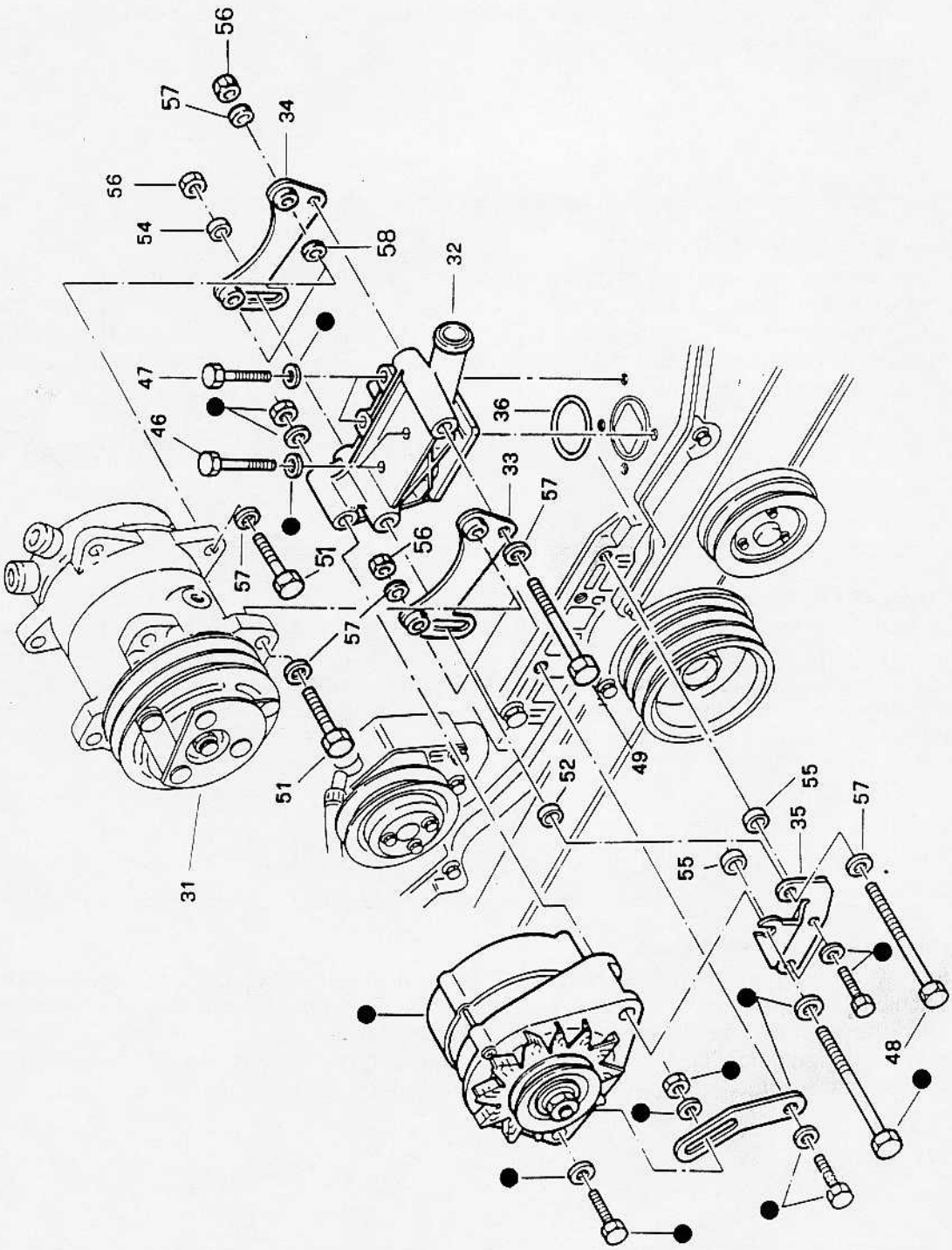
Verdampfervorrichtung (1) durch die Heizungs-Originalöffnung einbauen, dabei beachten, daß der Bowden nicht beschädigt wird (Verbiegungen, die den Durchfluß behindern könnten, vermeiden). Die gelieferte und an die Schaltervorrichtung angeschlossenen elektrische Verkabelung vom Fahrgastinnenraum durch die Bohrung Ø 36 nach auß en führen und mit der Gummilippklampe versiegeln. Die Luftzufuhrleitungen in den Fuß raum (3-4) einbauen und mit den gelieferten

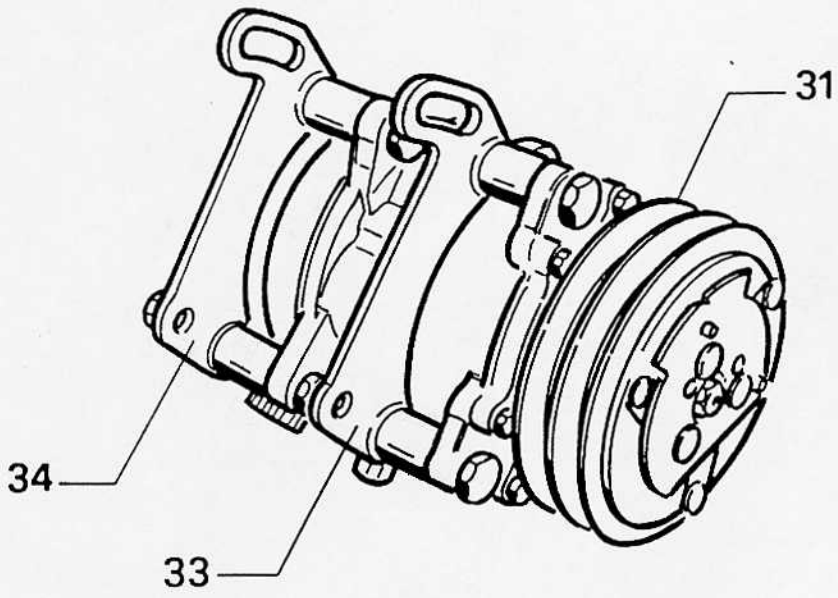
D

MONTAJE DEL GRUPO EVAPORADOR

Montar el grupo evaporador (1) introduciéndolo a través de la apertura original de la calefacción, prestando atención de no dañar el bowden (evitar plieges que puedan perjudicar el pasaje). Pasar del interior al exterior del habitáculo, el cableado eléctrico, que está conectado al grupo mandos a través del orificio Ø 36, sellándolo con la goma paracables. Montar los conductos de aire (3-4) fijándolos al evaporador

E





OPERAZIONI DA EFFETTUARE AL BANCO

Montare le staffe rif. 33 e 34 sul compressore rif. 31 mediante le viterie fornite.

I

OPERATIONS TO BE CARRIED OUT ON BENCH

Assemble brackets ref. 33 and 34 into compressor ref. 31 using the supplied screws.

G B

OPÉRATIONS Á EFFECTUER SUR LE BANC

Monter les brides réf. 33 et 34 sur le compresseur réf. 31 à l'aide de la visserie fournie.

F

AN DER WERKBANK AUSZUFÜHRENDE ARBEITEN

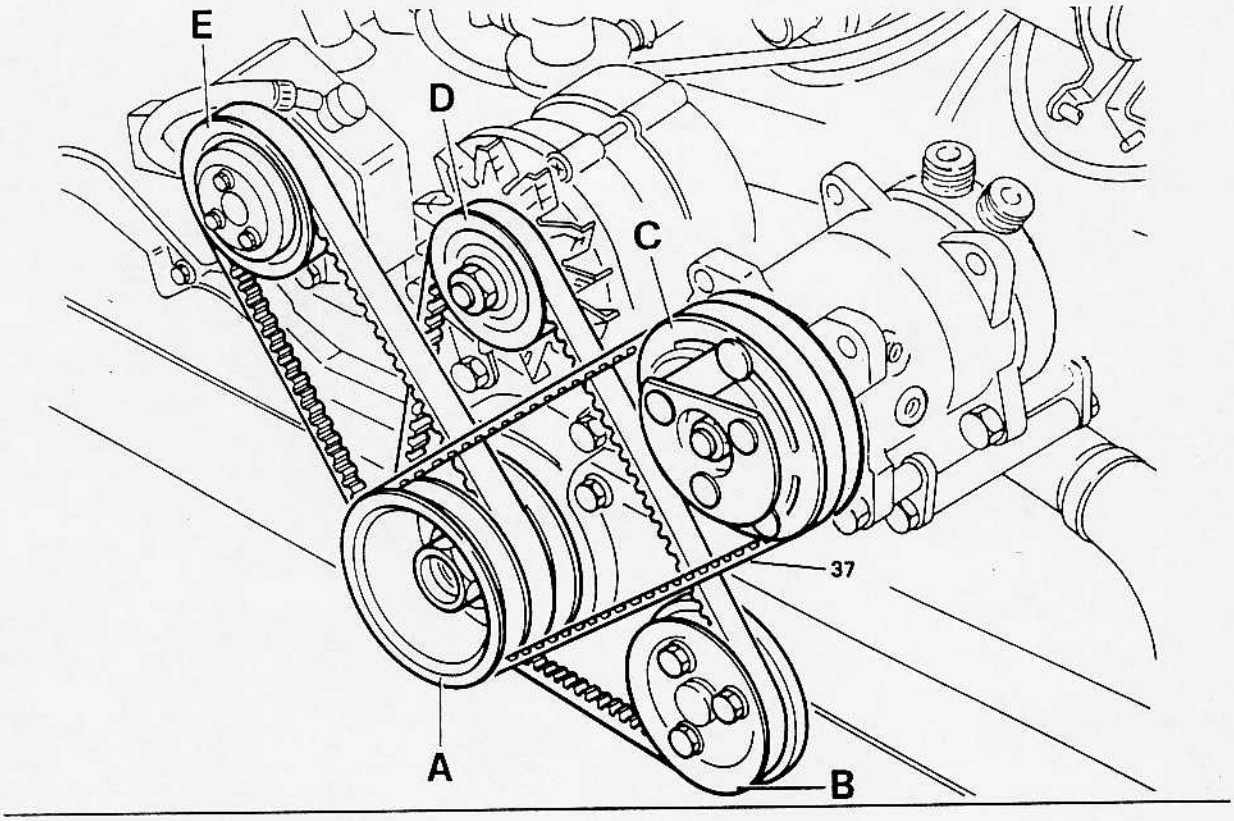
Die Halterungen vgl. 33 und 34 mit den beigestellten Schrauben auf den Kompressor vgl. 31 montieren.

D

OPERACIONES QUE DEBEN REALIZARSE EN EL BANCO

Montar las abrazaderas ref. 33 y 34 en el compresor ref. 31 mediante los tornillos suministrados.

E



I

a. PULEGGIA MOTRICE
b. POMPA ACQUA
c. COMPRESSORE
d. ALTERNATORE
e. POMPA IDRO-GUIDA
37. CINGHIA 13 x 935

GB

a. DRIVE PULLEY
b. WATER PUMP
c. COMPRESSOR
d. ALTERNATOR
e. POWER STEERING PUMP
37. 13 x 935 BELT

F

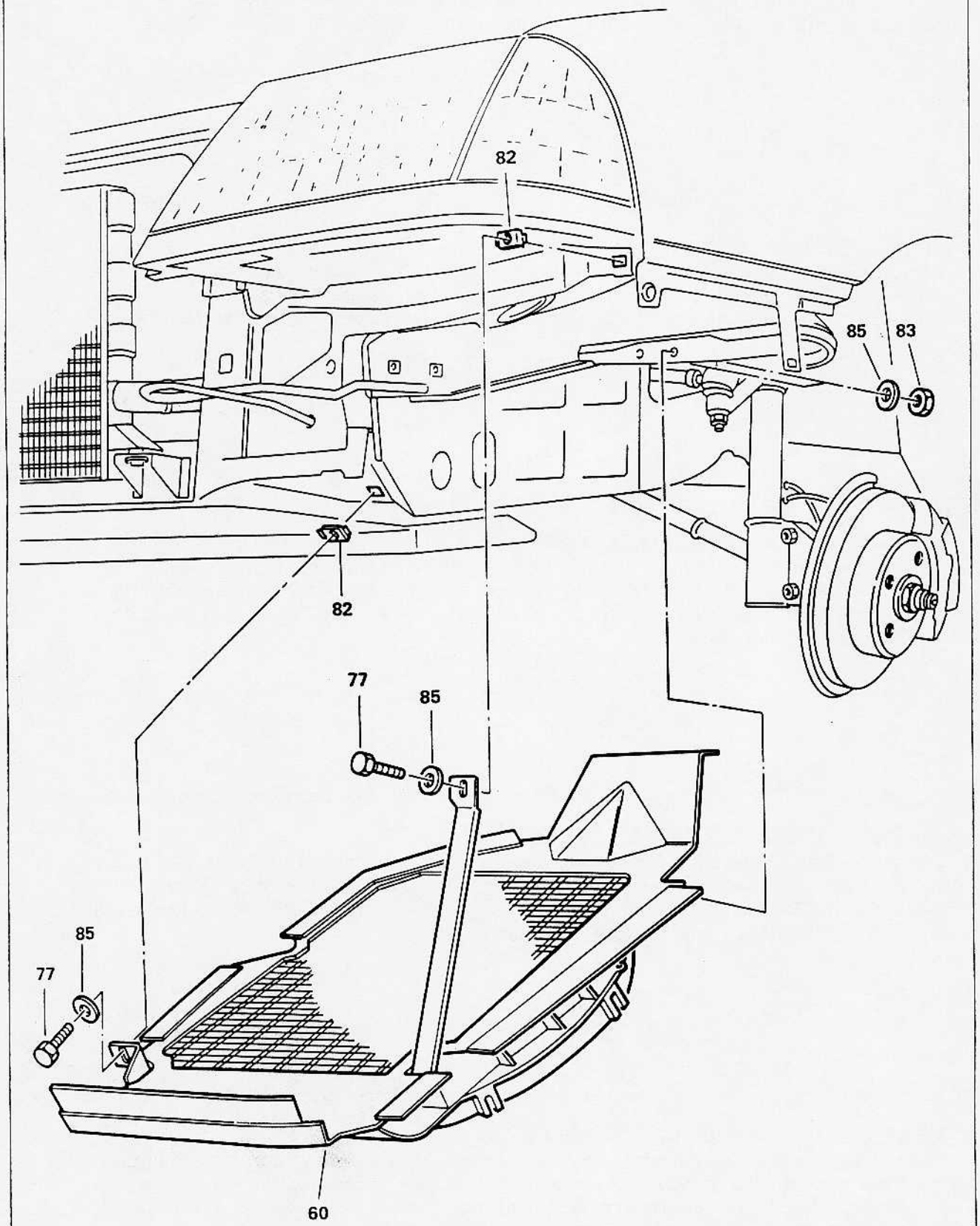
a. POULIE MOTRICE
b. POMPE À EAU
c. COMPRESSEUR
d. ALTERNATEUR
e. POMPE DE DIRECTION ASSISTÉE
37. COURROIE 13x935

D

a. TRIEBSCHEIBE
b. WASSERPUMPE
c. KOMPRESSOR
d. ALTERNATOR
e. HYDROLEN-KUNGS-PUMPE
37. RIEMEN 13 x 935

E

a. POLEA MOTRIZ
b. BOMBA AGUA
c. COMPRESOR
d. ALTERNADOR
e. BOMBA DIREC-CION HIDRAULI CA
37. CORREA 13 x 935



MONTAGGIO CONDENSATORE SINISTRO

Smontare il paraurti anteriore, la ruota ed il lockary sinistro, le trombe. Inserire due dadi ingabbiati nei fori quadri esistenti e montare il condensatore elettrov.sx (60) fissandolo posteriormente con due dadi (83) rondelle piane (85) e anteriormente con due viti (77) rondelle piane (85).

I

FITTING THE LEFT CONDENSER

Remove the front bumper,the left wheel and lockary and the horns. Fit two caged washers in the existing square holes and fit the LH electrically-ventilated condenser (60). Fasten the rear using two nuts (83) and flat washers (85). Fasten the front using two screws (77) and flat washers (85).

GB

MONTAGE DU CONDENSATEUR GAUCHE

Démonter le pare chocs avant,la roue et le lockary gauche,les klaxons.Introduire deux écrous prisonniers dans les orifices carrés existants et monter le condensateur à ventilation électrique gauche (60) en en fixant l'arrière avec deux écrous (83) rondelles plates (85) et l'avant avec deus vis (77) rondelles plates (85).

F

EINBAU LINKER KONDENSATOR

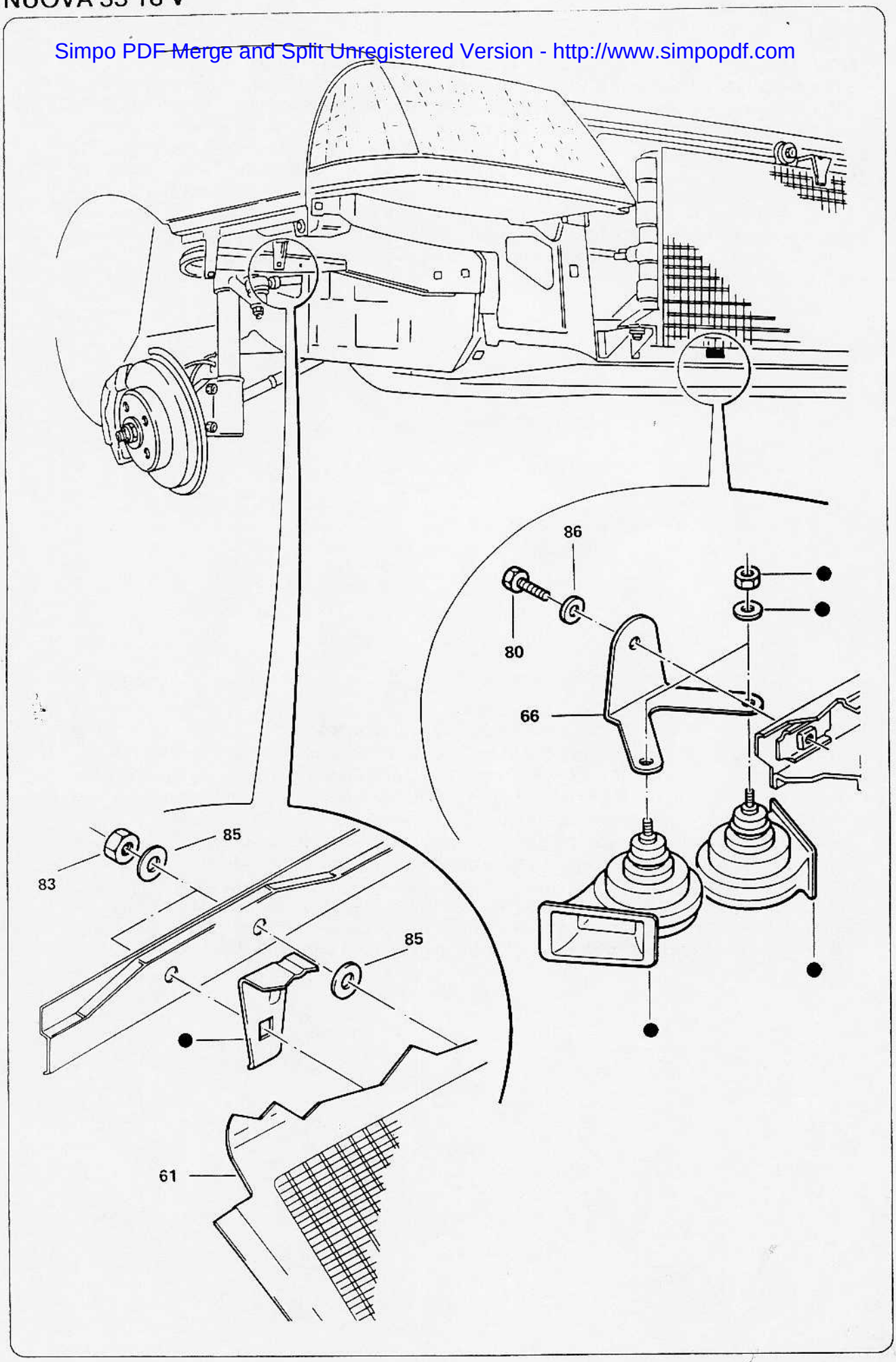
Die vordere Stoß stange,das Rad,den linken Lockary und das Signalhorn ausbauen.Zwei Muttern in die vorhandenen quadratischen Löcher einführen, den linken electrogelüfteten Kondensator (60) montieren und hinten mit zwei Muttern (83),sowie Flachscheiben (85) und vorn mit zwei Schrauben (77) und Flachscheiben (85) befestigen.

D

MONTAJE DEL CONDENSADOR IZQUIERDO

Desmontar el parachoques delantero, las ruedas y el lockary izquierdo y las trompas. Introducir dos tuercas almenadas en los orificios cuadrados y montar el condensador electroventilado izquierdo (60) fijàndolo por las parte posterior con las dos tuercas (83) y las arandelas planas (85) y por la parte anterior con los tornillos (77) y las arandelas planas (85).

E



MONTAGGIO CONDENSATORE DESTRO E SPOSTAMENTO TROMBE

Smontare la ruota ed il lockari destro.Svitare ed eliminare il fissaggio vaschetta lavavetri (eliminare anche il dado ingabbiato inserito sul supporto vaschetta originale). Inserire due dadi ingabbiati (82) nei fori quadri esistenti e montare il condensatore elettroventilato dx (61) fissandolo anteriormente con due viti (77) rondelle piane (85) (vedi anche MONTAGGIO CONDENSATORE SINISTRO).Fissare il condensatore posteriormente con due dadi (83) rondelle piane (85) previa interposizione del supporto vaschetta precedentemente modificato ( ) e di una rondella piana (85) di spessoramento (dett.L). Smontare le trombe dal supporto originale e rimontarle sulla staffa spostamento trombe (66) con i fissaggi originali. Montare il tutto sulla traversa anteriore inferiore (a destra sotto il radiatore) fissandolo ad un rinforzo esistente mediante una vite (80) rondella piana (86). Ripristinare i collegamenti elettrici utilizzando il cablaggio originale (dett.K).

I

FITTING THE RIGHT CONDENSER AND MOVING THE HORNS

Remove the right wheel and lockary. Remove and discard the windscreen washer fluid fastener (also discard the caged nut on the original reservoir support). Insert two caged nuts (82) into the existing square holes and fit the RH electrically-ventilated condenser (61), fastening it at the front using two screws (77) and plain washers (85). (See also FITTING THE LEFT CONDENSER, Fig.3). Fasten the condenser at the rear using two nuts (83) and plain washers (85), after inserting the previously modified reservoir support ( ) and a plain shimming washer (85) (Detail L). Remove the horns from the original support and remount them onto the horn repositioning bracket (66) using the original clamps. Fit the whole assembly onto the front lower crossmember (RH side under the radiator), fastening it to an existing reinforcement using a screw (80) and plain washer (86). Reinstate the electrical connections using the original wiring harness (Detail K).

GB

F

MONTAGE DU CONDENSATEUR DROIT ET DEPLACEMENT DES KLAXONS

Démonter la roue et le Lockary droit. Dévisser et supprimer la fixation du réservoir de lave-glace (supprimer également l'écrou prisonnier se trouvant sur le support du réservoir d'origine). Introduire deux écrous prisonniers (82) dans les orifices carrés exixtants et monter le condensateur à ventilation électrique droit (61) en en fixant la partie avant à l'aide de deux vis (77) rondelles plates (85) (voir également "Montage du condensateur gauche "Fig.3). Fixer la partie arrière du condensateur avec deux écrous (83) rondelles plates (85) après avoir interposé le support du réservoir modifié précedemment ( ) et une rondelle plate (85) en guise de cale (Détail L). Démonter les klaxons de leur support d'origine et les remonter sur l'étrier de déplacement des klaxons (66) en utilisant les fixations d'origine. Monter le tout sur le longeron inférieur avant (à droite, sous le radiateur) en le fixant sur un renfort existant à l'aide d'une vis (80) rondelle plate (86). Rétablir les branchements électriques en utilisant le câblage d'origine (Détail K).

D

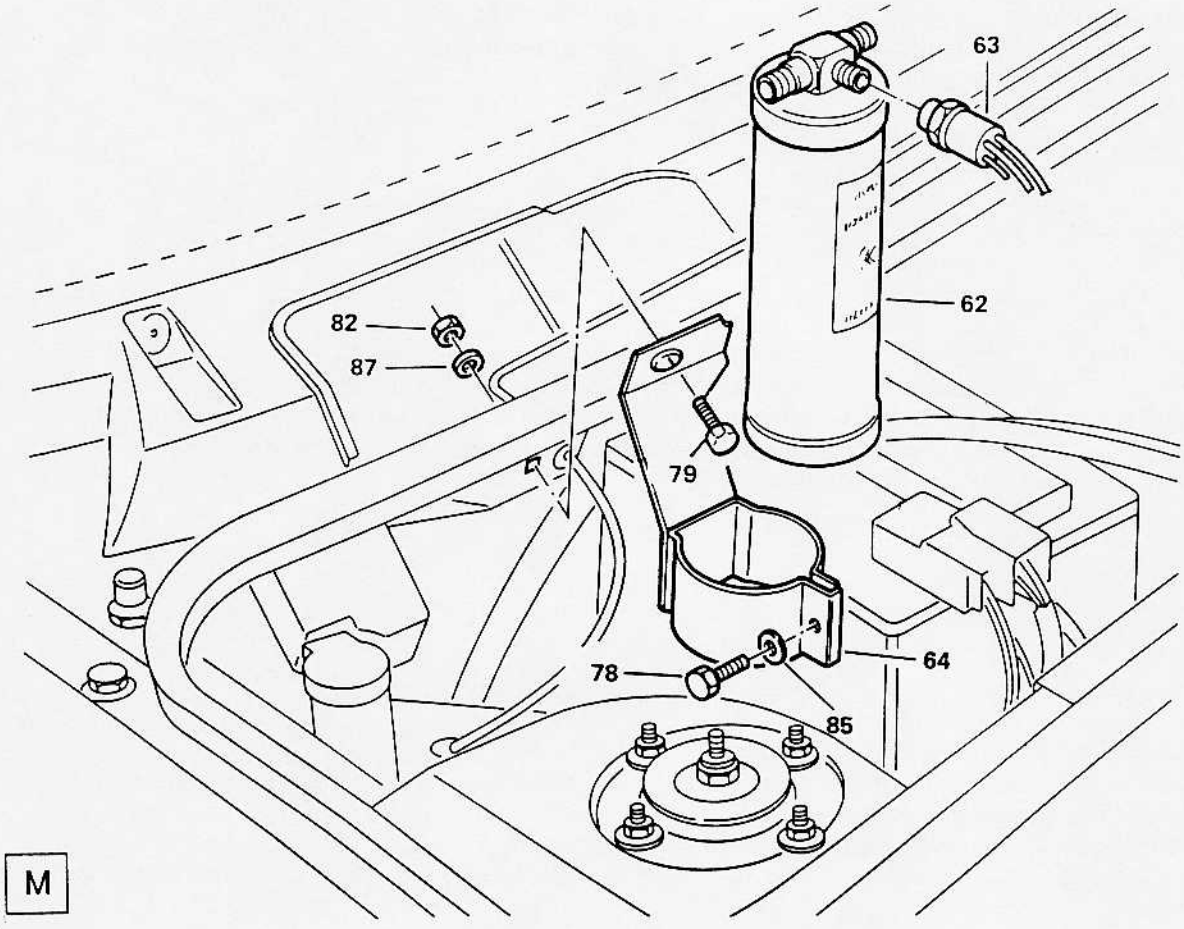
EINBAU RECHTER KONDENSATOR UND VERSETZUNG DES SIGNALHORNS

Rechtes Rad und Lockary ausbauen. Die Halterung der Scheibenwaschwanne abschrauben und entfernen (dabei auch die Mutter entfernen, die sich auf der Originalhalterung der Wanne befindet). Zwei Muttern (82) in die schon vorhandenen quadratischen Löcher einführen, den elektrobelüfteten rechten Kondensator (61) einbauen und ihn vorn mit zwei Schrauben (77) und Flachscheiben (85) befestigen (s. auch EINBAU LINKER KONDENSATOR, Abb.3). Bevor der Kondensator hinten mit zwei Muttern (83) und Flachscheiben (85) befestigt wird, sind die vorher abgeänderte ( ) Wannenhalterung, sowie eine Flachausgleichscheibe (85) zwischenzufügen (Det.L). Das Signalhorn von der Originalhalterung abbauen und mit den Originalbefestigungen auf die Hornversetzhalterung bauen (66). Alles zusammen dann auf die untere Vordertraverse (rechts unter dem Kühler) bauen und mit einer Schraube (80) und Flachscheibe (86) an einer bestehenden Verstärkung befestigen. Die elektrischen Anschlüsse unter Verwendung der Original-Verkabelung wiederherstellen (Det.K).

MONTAJE DEL CONDENSADOR DERECHO Y DESPLAZAMIENTO DE LAS TROMPAS

Desmontar la rueda, el lockary derecho. Desenroscar y quitar la fijación del depósito de los lavacristales (quitar también la tuerca almenada introducida en el soporte del depósito original). Introducir las dos tuercas almenadas (82) en los orificios cuadrados y montar el condensador electroventilado derecho (61), fijándolo por delante con dos tornillos (77) y las arandelas planas(85) (Véase también el MONTAJE DEL CONDENSADOR IZQUIERDO, Fig.3). Por detrás fijar el condensador con las dos tuercas (83) y las arandelas planas (85) de espesor (Det.L). Desmontar las trompas del soporte original y volver a montarlas en la brida de desplazamiento de las trompas (66) con los elementos de fijación originales. Montar el conjunto en el montante delantero inferior (a la derecha debajo del radiador) fijándolo al refuerzo con el tornillo (80) y la arandela plana (86). Restablecer las conexiones eléctricas utilizando el cableado original (Det. K).

E



MONTAGGIO FILTRO DEIDRATORE

Smontare il rivestimento plastico alla base del parabrezza e fissare la staffa fissaggio filtro (64) ad un foro quadro (esistente nella vasca servizi sul lato destro) con un dado (82) rondella dentellata (87).Inserire il filtro deidratore (62) e bloccarlo nella staffa mediante una vite (78) rondella piana (85).Avvitare sul filtro il pressostato Trynari (63) (dett.M).

I

FITTING THE DEWATERING FILTER

Remove the plastic trim at the windscreen base and fix the filter bracket (64) to a square hole (on the RH side of the service tank) using a nut (82) and notched washer (87). Insert the dewatering filter (62) and clamp it to the bracket using a screw (78) and plain washer (85). Bolt the Trinary pressure switch (63) onto the filter (Detail M).

GB

MONTAGE DU FILTRE DEHYDRATEUR

Démonter le revêtement en plastique à la base du pare-brise et fixer la bride de fixation du filtre (64) à un orifice carré (se trouvant sur la partie droite du collecteur d'eaux pluviales) à l'aide d'un écrou (82) rondelle crantée (87). Introduire le filtre déhydrateur (62) et le bloquer sur la bride au moyen d'une vis (78) rondelle plate (85). Visser le pressostat Trinary (63) sur le filtre (détail M).

F

EINBAU DES ENTWÄSSERUNGSFILTERS

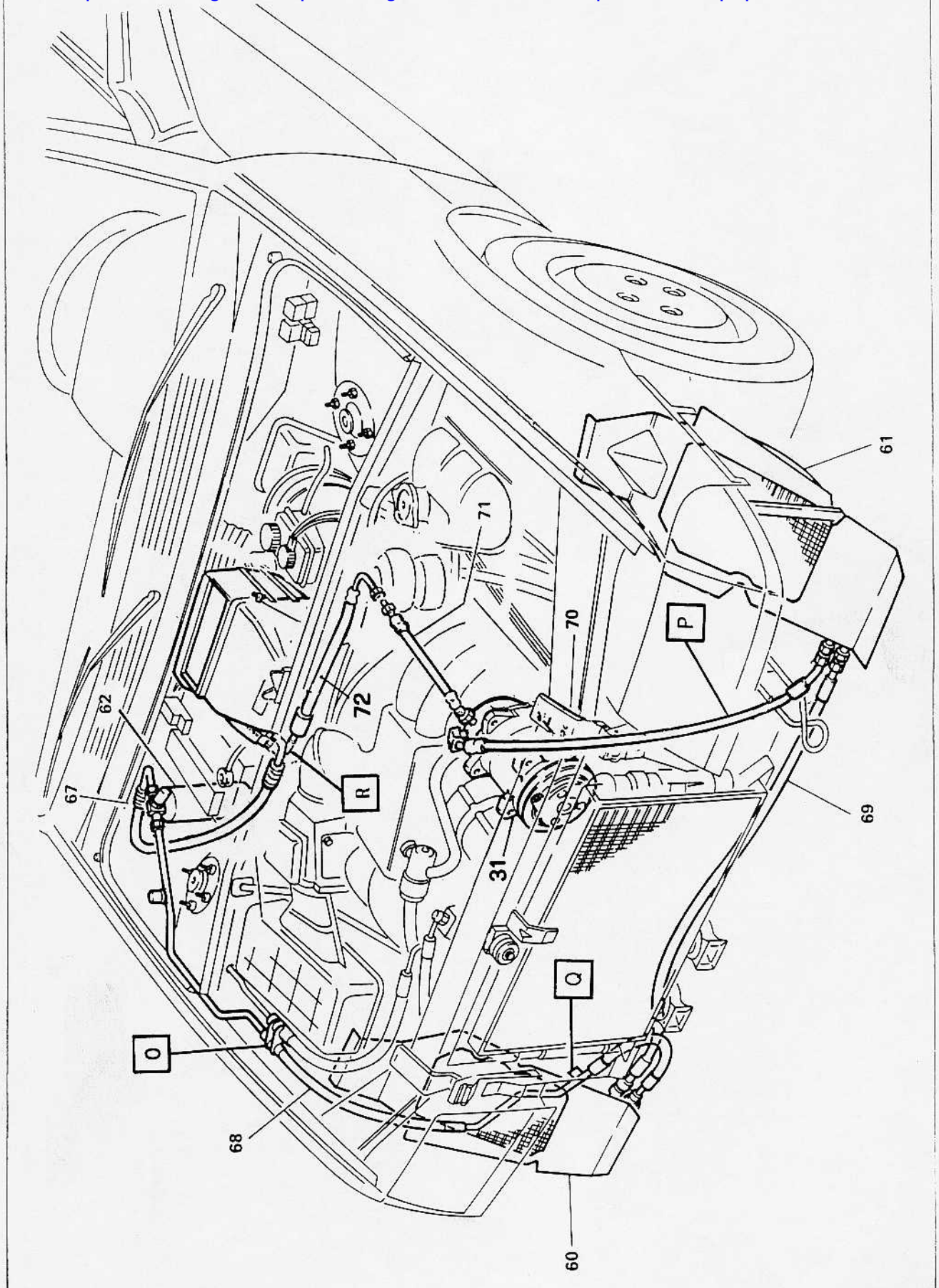
Den unteren Plastikbelag der Windschutzscheibe ausbauen und die Filterhalterung (64) durch eine quadratische Bohrung (auf der rechten Seite des Flüssigkeitsbehälters vorhanden) mit Mutter (82) und Zahnscheibe (87) befestigen. Den Entwässerungsfilter (62) einsetzen und an dem Haltebügel durch Schraube (78) und Flachscheibe (85) befestigen. Den Trinary-Druckwächter (63) auf den Filter schrauben (Det.M).

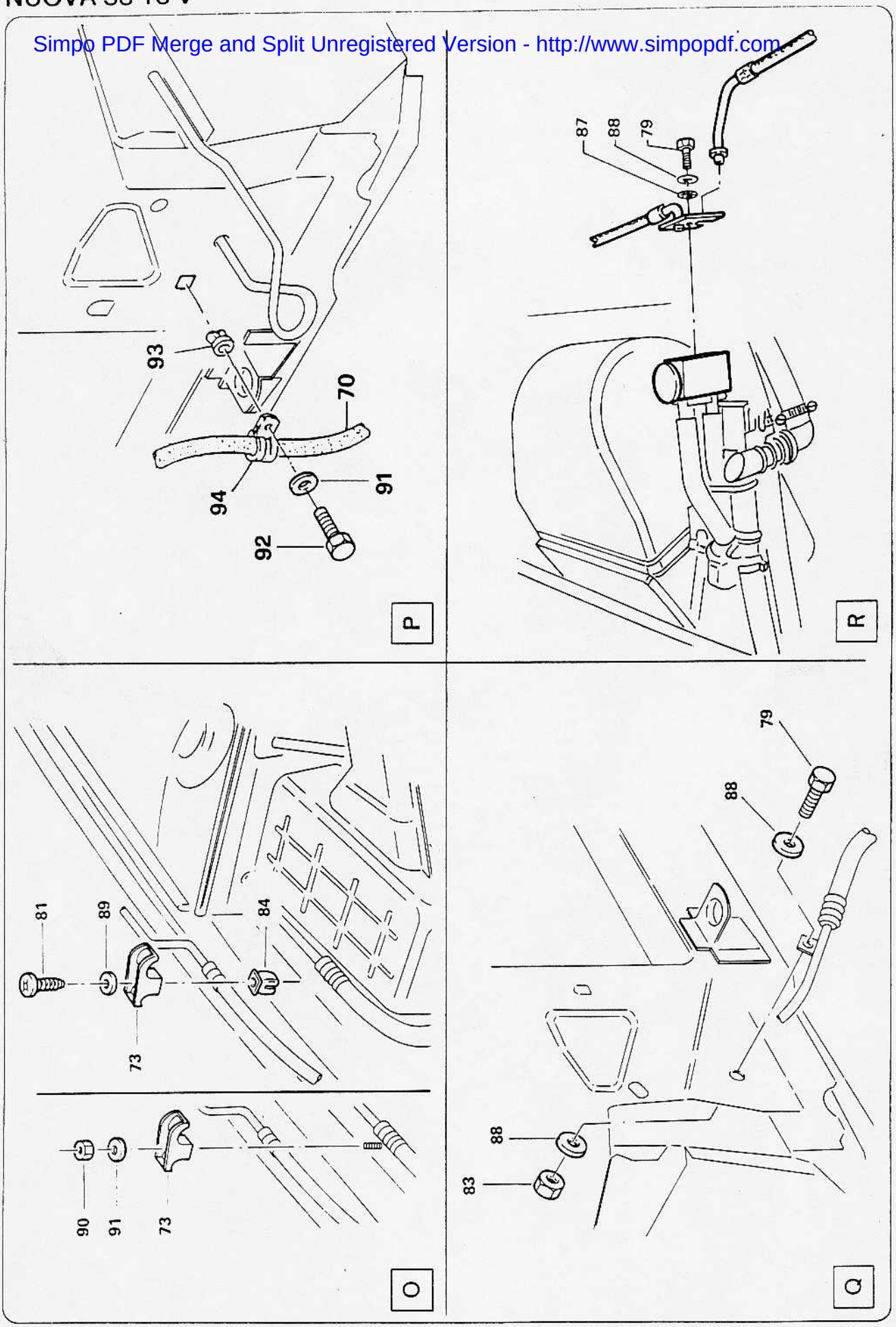
D

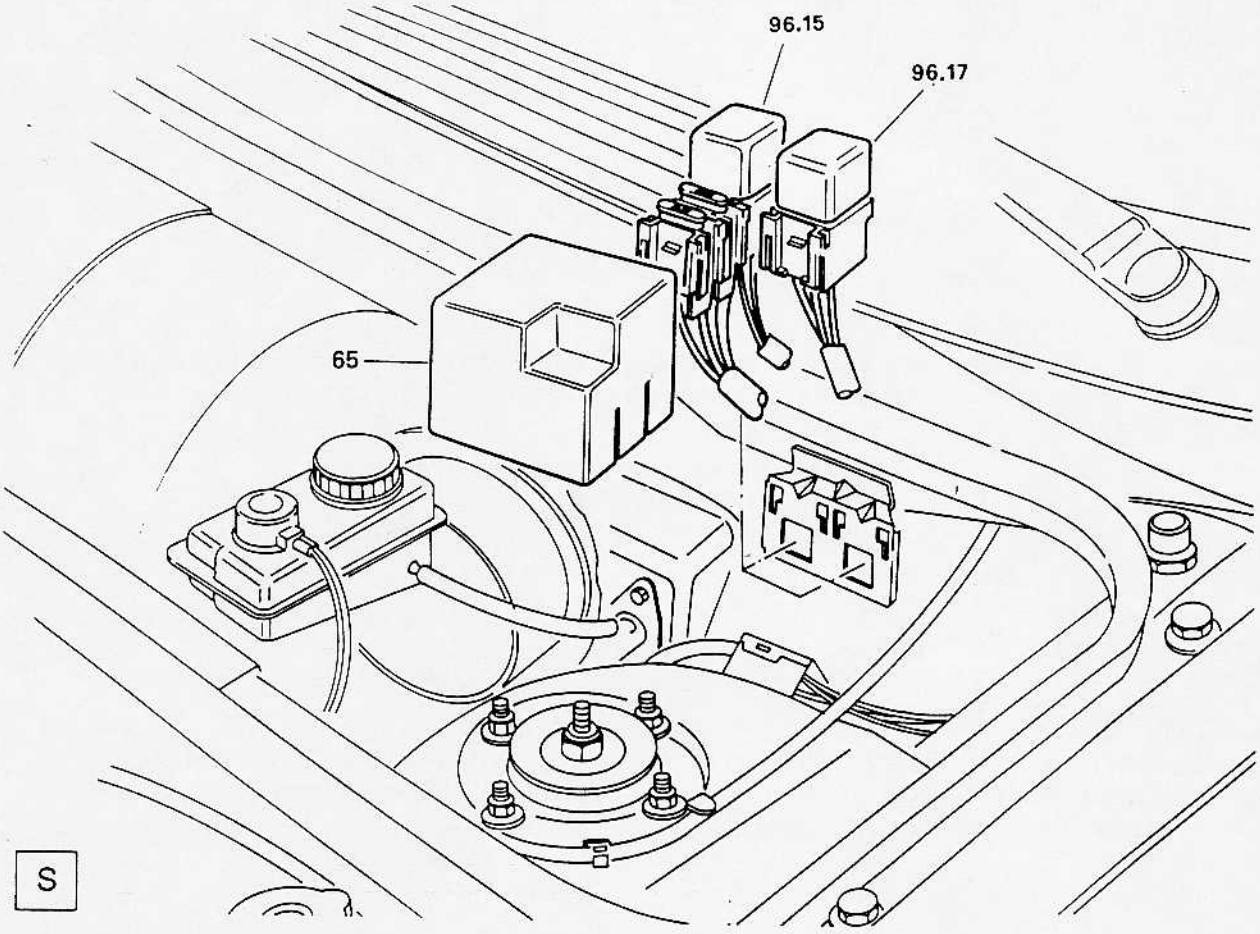
MONTAJE DEL FILTRO EVAPORADOR

Desmontar el revestimiento plástico del parabrisas y fijar la abrazadera de fijación del filtro (64) en un orificio cuadrado (situado en el lado derecho del depósito de servicios) con la tuerca (82) y la arandela dentada (87). Introducir el filtro evaporador (62)y fijarlo en la abrazadera con el tornillo (78) y la arandela plana (85).

E







FISSAGGIO RELAIS

Fissare il relais (96.15) con due portafusibili ed il relais (96.17) con un portafusibile inserendoli a scatto nell'apposita staffa saldata nella vasca servizi sul lato sinistro. Coprire gli stessi con l'apposita protezione per relais (65) fornita (dett. S).

I

FASTENING THE RELAY

Fix the relay (96.15) with fusebox and the relay (96.17), snapping them into the relative welded bracket on the left-hand side of the service tank. Cover the relays with the protective cover (65) supplied (Detail S).

GB

FIXATION RELAIS

Fixer le relais (96.15) avec le porte-fusibles et le relais (96.17) en les enclenchant dans la bride spéciale soudée dans le collecteur d'eaux pluviales sur le côté gauche. Protéger ceux-ci avec la protection spéciale pour relais (65) fournie. (détail S)

F

BEFESTIGUNG RELAIS

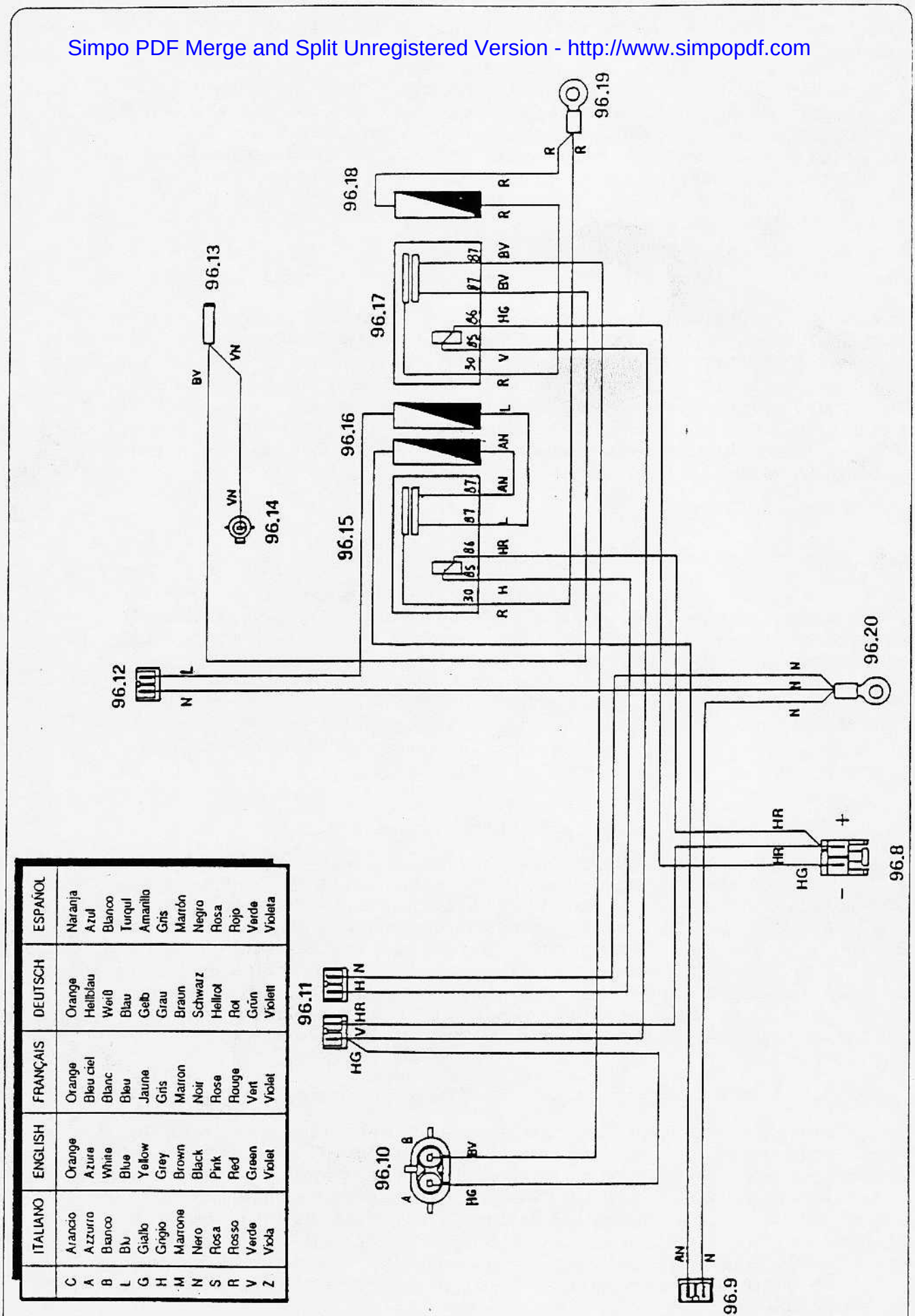
Relais (96.15) mit Sicherungshalter und Relais (96.17) befestigen, wobei sie schubweise in den entsprechenden, auf den linken Flüssigkeitsbehälter geschweiß ten Haltebügel eingeführt werden. Mit den entsprechenden gelieferten Relaisabdeckungen (65) abdecken (Det.S).

D

FIJACION DEL RELE

Fijar el relé (96.15) con portafusibles y el relé (96.17) introduciéndolos, de golpe, en la propia abrazadera soldada en el depósito de servicios en el lado izquierdo.
Cubrir los mismos con la protección para relé (65) suministrada (det. S).

E



	ITALIANO	ENGLISH	FRANÇAIS	DEUTSCH	ESPAÑOL
C	Arancio	Orange	Orange	Orange	Naranja
A	Azzurro	Azure	Bleu ciel	Hellblau	Azul
B	Bianco	White	Blanc	Weiß	Blanco
L	Blu	Blue	Bleu	Blau	Turquí
G	Giallo	Yellow	Jaune	Gelb	Amarillo
H	Grigio	Grey	Gris	Grau	Gris
M	Marrone	Brown	Marron	Braun	Marrón
N	Nero	Black	Noir	Schwarz	Negro
S	Rosa	Pink	Rosa	Hellrot	Rosa
R	Rosso	Red	Rouge	Rot	Rojo
V	Verde	Green	Vert	Grün	Verde
Z	Viola	Violet	Violet	Violett	Violeta

96.8-Blocchetto di separazione cablaggio da collegare al blocchetto 95.8 del cablaggio evaporatore. **96.9**-Blocchetto (M) a 2 vie da collegare all'elettroventilatore DX. **96.10**-Blocchetto Packard (F) a 2 vie da collegare alla predisposizione minimo veloce (16V-centralina Motronic). **96.11**-Blocchetto (M) a 2 vie per trinary. **96.12**-Blocchetto (M) a 2 vie da collegare all'elettroventilatore SX. **96.13**-Blocchetto (F) da collegare alla frizione elettromagnetica. **96.14**-Blocchetto Packard (M) da collegare al blocchetto 119.1 (i.e.) oppure 130.1 (carburata) (cablaggi minimo veloce). **96.15**-Relais comando elettroventilatori. **96.16**-Fusibile 15 A. **96.17**-Relais comando compressore e minimo veloce. **96.18**-Fusibile 10A. **96.19**-Occhiello da collegare al nodo di derivazione (+30 batteria). **96.20**-Terminale ad occhiello da collegare a massa.

I

96.8-Harness separator block to be connected to block 95.8 of the evaporator wiring. **96.9**-2-pole block (M) to be connected to the electric fan DX. **96.10**-2-pole Packard block to be connected to the presetting fast idling (16V Motronic gearcase). **96.11**-2-pole block (M) for trinary. **96.12**-2-pole block (M) to be connected to the electric fan SX. **96.13**-Block (F) to be connected to the electromagnetic friction. **96.14**-Packard block (M) to be connected to block 119.1 (i.e.) or 130.1 (carburized) (fast idling wiring). **96.15**-Electric fan control relay. **96.16**-15A fuse. **96.17**-Compressor control and fast idling relay. **96.18**-10A fuse. **96.19**-Eyelet to be connected to the branch point (+ 30 battery). **96.20**-Eyelet terminal to be earthed.

GB

96.8-Plot de séparation du câble à brancher au plot 95.8 du câble évaporateur. **96.9**-Plot (M) à deux voies à brancher au ventilateur électrique DX. **96.10**-Plot Packard (F) à deux voies à brancher au ralenti (16V standard Motronic). **96.11**-Plot (M) à deux voies pour trinary. **96.12**-Plot (M) à deux voies à brancher au ventilateur électrique SX. **96.13**-Plot (F) à brancher au débrayage électromagnétique. **96.14**-Plot Packard (M) à brancher au plot 119.1 (i.e) ou au 130.1 (carburée) (câblages ralenti). **96.15**-Relais de commande des ventilateurs électriques. **96.16**-Fusible 15 A. **96.17**-Relais de commande du compresseur et du ralenti. **96.18**-Fusible 10 A. **96.19**-Borne à oeillet à brancher au noeud de dérivation (+30 batterie). **96.20**-Terminal à oeillet à brancher à la masse.

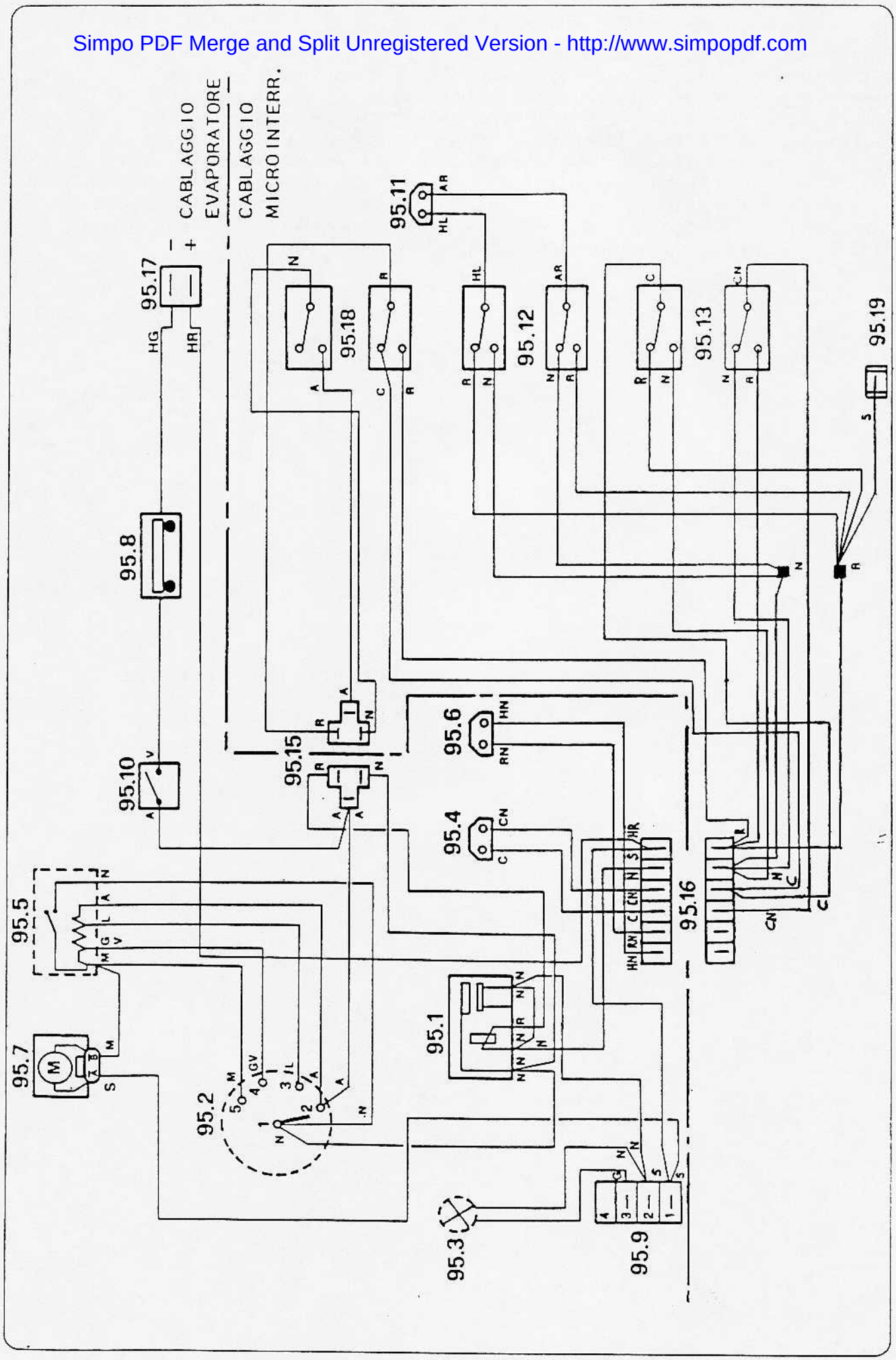
F

96.8-Verkabelungstrennblock, an Block **95.8** der Verdampferverkabelung anzuschließ en **96.9**-2-Weg-Block (M), an den Elektroventilator rechts anzuschließ en **96.10**-2-Weg-Packard-Block (F), an die vorgesehene Mindestgeschwindigkeit (16V-Motronic-Steuerung) anzuschließ en **96.11**-2-Weg-Trinary-Block. **96.12**- 2-Weg-Block, an den Elektroventilator links anzuschließ en **96.13**-Block (F), an die elektromagnetische Kupplung anzuschließ en **96.14**-Packard-Block (M), an den Block 119.1 (i.e.) oder 130.1 (vergast)(Verkabelung Mindestgeschwindigkeit) anzuschließ en. **96.15**-Schaltrelais für Elektroventilatoren. **96.16**-Sicherung 15 A. **96.17**-Schaltrelais Kompressor und Mindestgeschwindigkeit. **96.18**-Sicherung 10A. **96.19**-Öse, an den Abzweigknoten (+30 Batterie) anzuschließ en. **96.20**-Ösenförmiges Schluß stück, an die Masse anzuschließ

D

96.8-Clemas de separación cableado de conectarse a la clema 95.8 del cableado evaporador. **96.9**-Clema (M) de 2 vías de conectarse al electroventilador DX. **96.10**-Clema packard (F) de 2 vías de conectarse a la predisposición mínimo veloz (16 V-centralita Motronic). **96.11**-Clema (M) de 2 vías para trinary. **96.12**-Clema (M) de 2 vías de conectarse al electroventilador SX. **96.13**-Clema (F) de conectarse al embrague electromanético. **96.14**-Clema Packard (M) de conectarse a la clema 119.1 (i.e) ó 130.1 (carburada)(cableados mínimo veloz). **96.15**- Relé mando electroventiladores. **96.16**-Fusible 15A. **96.17**-Relé mando compresor y mínimo veloz. **96.18**-Fusible 10A. **96.19**-Ojal de conectarse al nudo de derivación (+30 Batería). **96.20**-Terminal a forma de ojal de conectar a masa.

E



95.1 Relay per il collegamento a massa dell'interruttore 95.2 – **95.2** Interruttore originale di ventilazione **95.3** Lampada illuminazione comandi – **95.4** Connessione con attuatore dinamica/ricircolo – **95.5** Resistore originale variazione velocità ventilatore – **95.6** Connessione da non utilizzare – **95.7** Motorino ventilante – **95.8** Termostato di regolazione temperatura aria – **95.9** Connettore a 4 vie per allacciamento positivo e negativo al cablaggio originale – **95.10** Interruttore comando A.C. – **95.11** Connessione con attuatore miscelazione aria – **95.12** Microinterruttori comando attuatore miscelazione aria – **95.13** Microinterruttori comando attuatore dinamica/ricircolo – **95.15/16** Giunti a 3/6 vie per allacciamento cablaggio evap. con cablaggio microinterruttori – **95.17** Giunto a due vie di separazione cablaggio da collegare al 96.8 del cablaggio S/FR – **95.18** Microinterruttori comando ricircolo e 1ª velocità ventilatore **95.19** Giunto portamaschi ad una via da non collegare.

I

GB

F

D

E

Elenco dei componenti - Components list - Liste des composants - Aufstellung der Einzelteile - Lista de componentes

Pos. Pos. Pos. Pos. Pos.	Denominazione Nomenclature Dénomination Benennung Denominación	R R R R R	Codice Code Code Code Código	Quantità Quantity Quantité Menge Cantidad
–	KIT MINIMO VELOCE	R	60791018	1
	FAST IDLE KIT			
	KIT RALENTI RAPIDE			
	KIT FÜR LANGSAM/SCHNELL			
	KIT MINIMO RAPIDO			
111	Elettrovalvola a due vie	R	60800266	1
	Two-way solenoid valve			
	Electrovanne à deux voies			
	Zweiweg-Elektroventil			
	Electroválvula de dos vías			
112	Tubo vuoto Ø 6 x Ø 12 x L=750	R	60777101	1
	Vacuum pipe Ø 6 x Ø 12 x L=750			
	Tuyau de vide Ø 6 x Ø 12 x L=750			
	Hohlrohr Ø 6 x Ø 12 x L=750			
	Tubo vacío Ø 6 x Ø 12 x L=750			
113	Fascetta SERFLEX 10 ÷ 18		60800877	2
	SERFLEX 10 ÷ 18 clamp			
	Languette SERFLEX 10 ÷ 18			
	Schelle SERFLEX 10 ÷ 18			
	Abrazadera SERFLEX 10 ÷ 18			
114	Fascetta SERFLEX 15 ÷ 24		60800878	4
	SERFLEX 15 ÷ 24 clamp			
	Collier SERFLEX 15 ÷ 24			
	Schelle SERFLEX 15 ÷ 24			
	Abrazadera SERFLEX 15 ÷ 24			
115	Raccordo a T		60777092	2
	Tunion			
	Raccord en T			
	T-Verschraubung			
	Racor en T			
116	Vite T.E. M6 x 14			2
	Hex screw M6 x 14			
	Vis tête hex. M6 x 14			
	Sechskantschraube M6 x 14			
	Tornillo C.H. M6 x 14			
117	Rondella dentellata Ø 6,5			2
	Notched washer Ø 6.5			
	Rondelle crantée Ø 6,5			
	Zahnscheibe Ø 6,5			
	Arandela dentada Ø 6,5			
118	Dado E. M6			2
	Hex. nut M6			
	Ecrou hex. M6			
	Sechskanmutter M6			
	Tuerca H M6			
119	Cablaggio		60777093	1
	Wiring harness			
	Câblage			
	Verkabelung			
	Cableado			

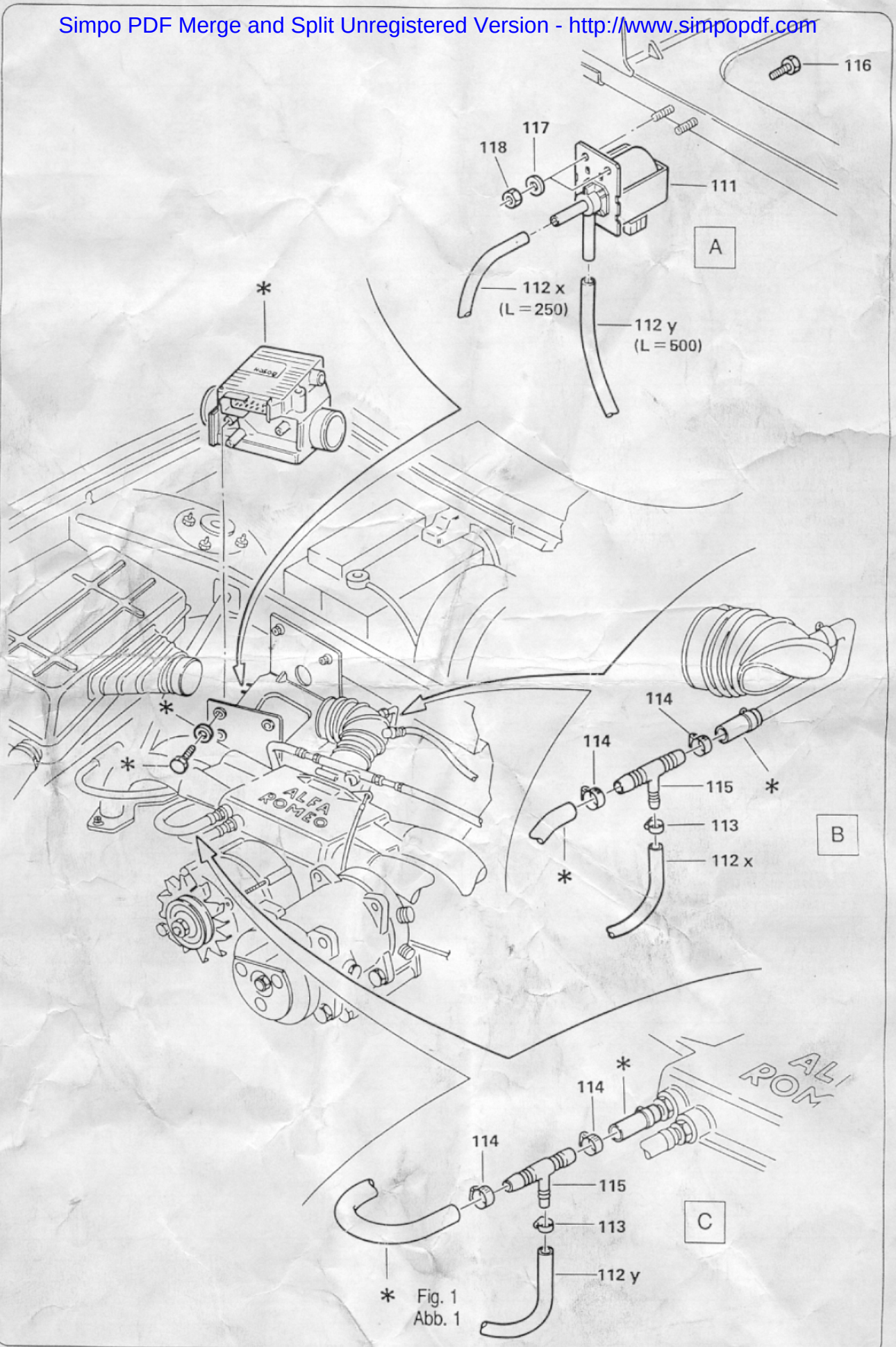


Fig. 1
Abb. 1

Do It Yourself 4x4 switch for Alfa Romeo 33 16v Permanent 4

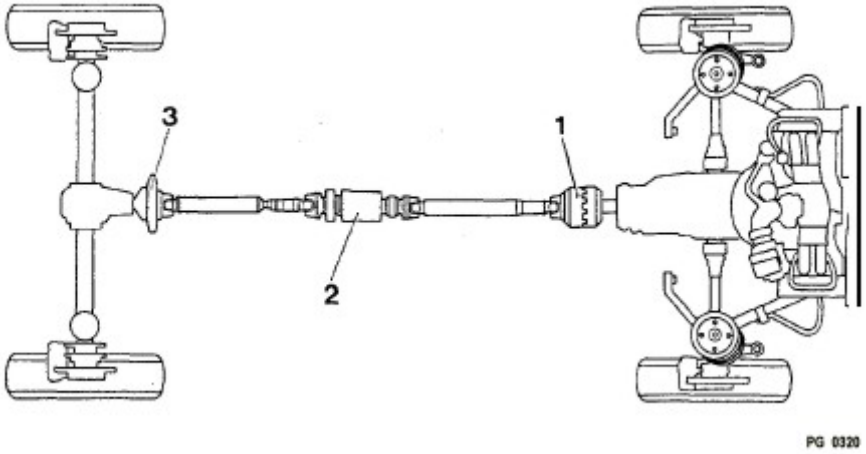
ver. 1.03

I suggest you to read all from page one to end so you could know better what and why are you doing on car and what will it affect but if you are to jumpy please read at least pages 1 and 2 before jumping to 26 and higher.

Page

I wish specially to thank Keith Walker for supplying me with all needed data for making this manual because without his help, knowledge, patience and readiness to share information I wouldn't be able to learn and make this manual and also to James Barrett, Dave Peto, Lucas Lardinois and all other people who answered to my questions when I asked them.

How Permanent 4 system works



On vehicles with permanent four-wheel drive new technical solutions have been adopted characterized by a series of devices able to guarantee optimal traction even under critical road holding conditions. These results have been obtained thanks to the adoption of a central "viscous coupling" able to transfer part of the deflecting torque from one drive shaft to another whenever there is wheel slip due to bad road conditions. Under good road holding conditions the vehicle behaves liked a front wheel drive vehicle but has the advantage that the rear axle permanently contributes to the thrust with a small torque (about 5%) transferred by the viscous coupling which, like a differential device, allows small differences in the speed of the front and rear wheels. Drive is transmitted to the viscous coupling (2) from the electromagnetic coupling (1) which is controlled by an electronic control unit which automatically engages/disengages it in accordance with evaluation parameters set by the control unit itself and measures by the relevant sensors and components. The rotating mass (3) located at the end of the drive shaft enables the vibrations generated by the imbalance of the system to be absorbed.

1 - Electromagnet coupling
2 - Viscous coupling
3 - Rotating mass
4. Body
5. Shaft
A. Integral disc with coupling body 4
B. Integral disc wit shaft 5

Electromagnetic coupling (1)

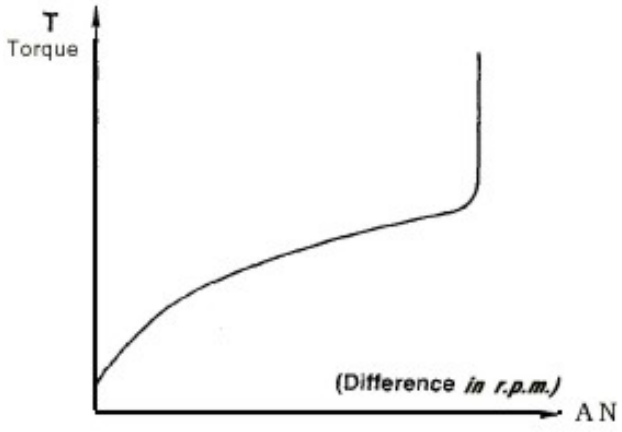
The electromagnetic coupling forms part of a sophisticated system of control managed by a specific control unit which, from the-processing of the data measured by a series of sensors, manages the traction on the basis of the best road holding conditions obtained trough the disengagement of the four-wheel drive which is the normal operational state.

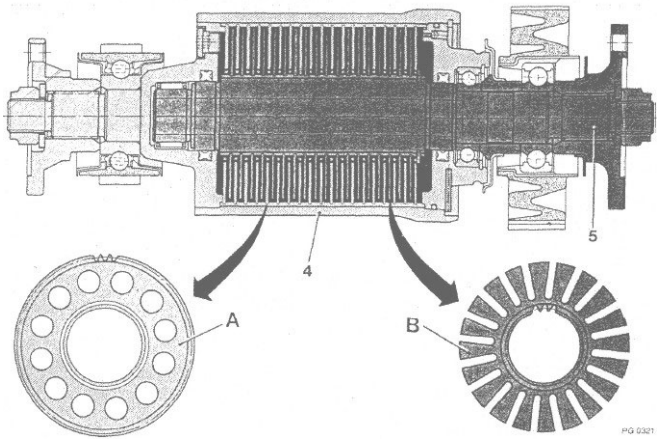
The-functions of the system are basically as follows:

- Engagement/disengagement of the coupling
- Anti-disengaging function
- Self diagnose.

Viscous coupling (2)

As shown in the following page the connection between the two drive shafts (front and rear) is formed by a special silicone fluid in which discs "A" and "B" are immersed. These discs are integral with body 4 and with the shaft 5 (through a grooved coupling). Under normal conditions, as already described, with a minimum difference in the speed of the two discs, a minimum torque is transferred as the traction is almost entirely on the front axle. When one of the drive shafts is slipping resulting in a great difference in speed between the two disks, (e.g. front wheels on ice and rear wheels ***on*** dry road) there is an increase in temperature resulting in a compression of the disks and relative blocking of the coupling itself.





FOUR-WHEEL DRIVE 33 16V Permanent 4

Description

The "33 Permanent 4" is a vehicle with **Permanent four-wheel drive** on which advanced technical solutions have been adopted characterized by a series of devices able to permit optimal traction even under critical road-holding conditions.

These results have been obtained by the addition of a "**central viscous coupling**" permitting part of the deflecting torque of a drive shaft to be transferred to the other whenever slipping conditions are encountered due to insufficient road holding by the tyres.

Under good road holding conditions though, the vehicle responds like a front-wheel drive with the advantage that the rear wheels participate permanently in the drive force through a small couple (approx. 5%) transferred to it by the viscous coupling that, like a differential device, permits small differences in speed between the front and rear wheels.

Drive is transmitted to the viscous coupling by the **electromagnetic coupling** (M22) and is managed by the **electronic control unit** (N50) which engages/disengages drive under conditions defined by the evaluation parameters of the control unit through the use of special sensors.

Introduction of the viscous coupling also facilitates reengagement of traction when the necessity to disengage it has been detected (managed by the control unit only) following particular conditions:

- The electromagnetic coupling is continuously engaged but the system has a **safety braking characteristic** which, after having obtained the consensus of the two **stop switches** (H3 - H49), automatically disengages four-wheel drive 0.001 seconds after release of the switches if a deceleration of 0.2 g is exceeded. Deceleration is not controlled at speeds lower than 50 km/hr; four obvious reasons of co-existance between this type of four-wheel drive and the ABS system.
- The system is fitted with an **anti-disengagement characteristic** based on the monitoring of magnetic disturbance which results when the teeth of the coupling do not engage.
  The sensor is a **coil** (L42) situated near the coupling.
  This safety characteristic functions on guided engagement after the brake pedal has been released following intervention of the deceleration protection.
  If after 0.1 seconds from the engagement signal the difference in angular velocity between the two gears exceeds the angle corresponding to 8 teeth, the control unit prevents engagement.
  Coupling is then repeated every 0.3 seconds up to 32 times.
  If after this, the coupling is still not engaged, the system enters in failure signalling the anomalous condition on the instrument panel. The next attempt to engage the coupling will be possible only when the system has been re-set.
  Anti-disengagement control is carried out at speeds between 50 and 150 km/hr. After this limit the difference in angular velocity is outside the limits of danger and in any event, the viscous coupling is able to absorb the differences in speed of the drive shafts.
- If the **supply voltage is less than 10V** when the coupling is engaged, the electronic control interrupts the command to the coupling without the failure warning light (D32) being illuminated, permitting automatic re-engagement as soon as the voltage exceeds 10V.

A **system failure warning lamp** (D32) is situated on the instrument panel.

This warning lamp is illuminated for 1.5 seconds after rotation of the ignition key to the "MARCIA" position.

The system is equipped with an **autodiagnosis** characteristic and diagnostic data is transmitted through the **Alfa Tester** which is able to signal (together with the system failure warning lamp) the following anomalies:

- **Absence of speedometer signal**.
  In order to ensure operating conditions with the ABS system, if the control unit does not receive the speedometer signal for a period of over 120 seconds, four-wheel drive is disengaged by depression of the brake pedal regardless of the force of the deceleration.
  After approximately 0.4 seconds from release of the brake pedal, four-wheel drive is re-engaged. With the vehicle stopped, after 120 seconds, at each activation of the brake pedal the drive is disengaged and re-engaged with the successive release of the pedal.

Absence of the speedometer signal does not cause illumination of the system failure warning light.

- **Absence of stop signal.**
  The control unit is pre-set to receive the signals from two switches acting contemporaneously and connected to the brake pedal. In case of malfunction of either (or their fuses), the system failure warning light is illuminated.
  The control of the stop switches is carried out when the vehicle is in movement.
  From the moment that a discrepancy between the two stop signals is detected, a four-second timer is activated.
  After the four seconds have elapsed, if the two stop signals are not equal, only the first braking anomaly is counted. This procedure is repeated eight times (in the event of signal dissymmetry). At the 9th braking anomaly (T > 36 sec.) the system enters in failure and the relative warning lights are illuminated and the coupling is disengaged. If on the other hand during the diagnostic phase the symmetry between the two stop signals is restored, the count of the braking anomalies is set to zero and the system is re-set for a new control.
  The presence of the second stop switch is an additional safety device necessary when considering the danger caused by the traction failing to disengage as a result of malfunction of the fuse or normal stop switch.
  As a rule it is the first of the two switches that closes and gives the consensus for the calculation of deceleration. For re-engagement of the traction both switches must be relased (which must be mechanically separated but synchronized in their actioning).
- **Interruption of anti-disengagement sensor**.
  The control unit sends a signal to the sensor so that a return signal is obtained verifying the continuity of the connection even when disengagement is not detected.
  It it is interrupted, the system failure warning light is illuminated and the supply to the part concerning power supply and consequently the coupling is interrupted.
  Short circuiting of the coil is not checked.
- **Short circuit or interruption of the 4x4 coupling coil**.
  Also in this case the coil is continuosly monitored by the control unit and in both cases (short-circuit or interruption), the system failure warning light is illuminated and the supply to the part concerning power supply is interrupted.
  The four-wheel drive is obviously disengaged.
- **Anomaly in the part concerning power supply**.
  Regarding the internal parts of the control unit.
  In the event that an anomaly in one of these is detected, the control unit illuminates the system failure warning light and interrupts supply to the part concerning power supply.
- **Missing or burnt out system failure warning lamp**.
  This anomaly can be detected when the ignition key is rotated from "GARAGE" to "MARCIA" as the lamp should come on for 1.5 seconds.
  With the system failure warning lamp burnt out or missing four-wheel drive is disengaged.
- **Short circuit or interruption of safety relay**.
  The faults are detected on the relay coil and not on its contact. Faulty contact is detected as a fault on the 4x4 coupling (and cannot be distinguished from it).
  In the event of one of the two faults being detected, four-wheel drive is disengaged and the system failure warning light is illuminated.

In the event that it becomes necessary to carry out the following operations:

- Dynamic balancing with wheels on vehicle
- Towing
- Power testing on a roller bench.

the electromagnetic coupling must be disconnected as there must be no transmission between the front and rear shafts.
This result can be otained by turning the ignition key to "GARAGE" or withdrawing from the supply relay, the fuse (30A) protecting the coupling supplu circuit, situated in the service compartment.

KEY

A: STARTING - RECHARGING

A1 Battery
A2 Alternator
A3 Alternator with integral electronic voltage regulator
A4 Voltage regulator
A5 Ignition distributor
A5a Ignition distributor A
A5b Ignition distributor B
A6 Impulse generator
A7 Rotor
A8 Ignition coil
A8a Ignition coil A
A8b Ignition coil B
A9 Coil resistance
A10 2-way connector for coil
A11 Starter motor
A12 Spark plugs
A13 Pre-heating glow plugs
A14 Alternator cable terminal board

B: MANUAL ELECTRIC CONTROLS

B1 Ignition switch
B2 Windscreen wiper control
B3 Windscreen and/or headlight washer pump control
B4 Control for side lights, flashing, low/high beam headlights
B5 Horn control switch
B6 Direction indicator light control
B7 Low beam flashing control switch
B8 High beam flashing control switch
B9 Heated rear window control switch
B10 Fog light control switch
B11 Rear fog light control switch
B12 Road hazard lights control switch
B13 Passenger compartment front roof lamp control switch
B14 Passenger compartment rear roof lamp control switch
B15 Passenger compartment roof lamp control switch
B16 Cluster lighting dimmer rheostat
B17 Gearbox oil level warning light switch
B18 Front right door-locking control switch
B19 Front left door-locking control switch
B20 Interior door-locking switch
B21 Front right power window control switch
B22 Front left power window control swtich
B23 Rear right power window control switch
B24 Rear left power window control switch
B25 Rear power window inhibitor switch
B26 Rear power window and rear cigar lighter inhibitor switch
B27 Front seat height adjustment control switch
B28 Front left backrest adjustment control switch
B29 Front right backrest adjustment control switch
B30 Door electric rear view mirror control switch
B31 Electric aerial control switch
B32 Windscreen washer pump control
B33 Front spot light switch
B34 Rear left spot light switch
B35 Rear right spot light switch
B36 Right door rear view mirror double control switch
B37 Parking light control switch
B38 Rear window wiper control switch
B39 Trip odometer recall microswitch
B40 Trip odometer reset microswitch
B41 VF electronic rheostat
B42 Lamp dimmer rheostat
B43 Internal control switch for door unlock
B44 Rear spot light control switch
B45 Recognition light control switch
B46 Two-tone horn control switch
B47 Sunroof motor control switch
B48 Interphone system control switch
B49 Talk/listen switch
B50 Siren control switch
B51 Driver's seat heater control switch
B52 Front right seat longitudinal adjusting switch
B53 Front power window full acting switch
B54 Front left seat longitudinal adjusting switch
B55 Luggage compartment opening control switch
B56 Rear right seat adjusting device switch
B57 Rear right seat heating device switch
B58 Rear left seat adjusting device switch
B59 Rear left seat heating device switch
B60 Cluster warning light operation check push-button
B61 Fuel filler cap opening switch
B62 Front right seat heating device switch
B63 Front right seat height adjusting switch
B64 Cruise control "OFF", "RESUME" switch
B65 Cruise control "SET ACC.", "SET DEC." switch
B66 Position/Hazard/Fuel flap light control push-button panel
B67 Controlled damping suspension shock-absorber control board
B68 Combination switch unit
B69 Headlight aiming control device
B70 Rear windscreen washer-headlight washer windscreen washer pump control
B71 Front electric window double control switch (LH and RH)
B72 Four-wheel drive control switch
B73 Vehicle lift switch
B74 Vehicle lower switch
B75 Driver's seat memory panel
B76 Front right-hand seat lumbar support regulation switch
B77 Front left-hand seat lumbar support regulation switch
B78 Front right-hand seat rear tilt regulation switch
B79 Front left-hand seat rear tilt regulation switch
B80 Front right-hand seat vertical - longitudinal regulation switch
B81 Front left-hand seat vertical - longitudinal regulation switch
B82 Front right-hand seat front tilt regulation switch
B83 Front left-hand seat front tilt regulation switch
B84 Front rifht-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B85 Front left-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B86 Front left-hand seat heating switch
B87 Boot release switch with glovebox light
B88 Light dimmer rheostat (DIM-DIP)

C: INSTRUMENTS

C1 Electronic rev-counter
C2 Electronic speedometer
C3 Voltmeter
C4 Fuel level gauge
C5 Oil pressure gauge
C6 Coolant temperature gauge
C7 Clock
C8 Space free for instrument
C9 Turbo charger air pressure gauge
C10 Cluster (*)
C11 ALFA ROMEO Control display
C12 Performance gauge display
C13 Optoelectronic cluster
C14 Warning lamp panel
C15 Door lock actuated LED
C16 Display check with clock
C17 Odometer module on instrument panel

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G10 Connection between front right door wiring and door mirror switch
G11 Connection between board wiring and rear wiring
G12 Connection between board wiring and mirror switch
G13 Connection between board wiring and console wiring
G14 3-way connection between board wiring and door wiring
G15 2-way connection between board wiring and door wiring
G16 6-way connection between board wiring and door wiring
G17 Connection between board wiring and front right door wiring
G18 Connection between board wiring and front left door wiring
G19 Connection between board wiring and passenger compartment roof lamp
G20 Connection for front right door-locking motor
G21a Connection for front right door-wiring
G21b Connection for front right door-wiring
G22 Connection for front left door-locking motor
G23a Connection for front left door wiring
G23b Connection for front left door wiring
G24 Connection for rear right door-locking motor
G25 Connection for rear right door wiring
G26 Connection for rear left door-locking motor
G27 Connection for rear left door wiring
G28 Connection between front right door wiring and power window switch
G28a Connection between rear right door wiring and power window switch
G29 Connection between door-locking wiring and rear power windows
G30 Connection for power windows and door lock
G31 Connection between front left door wiring and power window switch
G32 Connection between console wiring and rear right door wiring
G33 Connection between console wiring and rear left door wiring
G34 Connection for power window supply cable
G35 Connection between rear wiring and rear right side light wiring
G36 Connection for power window switch cables
G37 Connection for multiswitch, on steering column
G38 Connection for air conditioner wiring
G39 Connection for clock wiring
G40 Connection for door-locking control unit
G41 Speedometer-rev counter sensor device connection
G42 Connection between alternator and min engine oil pressure switch
G43 Connection for heater/ventilation control cables
G44 Connection for rear fog lamp
G45 Connection for headlight wash-wipe cables
G46 Connection for headlights
G47 Connection for right-side repeater cables
G48 Connection between electric door mirror and left-side repeater cables
G49 Connection available
G50 Presetting for loud speaker cables
G51 Presetting for car radio cables
G52 Fuse box ground
G53 Engine compartment ground
G53a Engine compartment ground - right side
G53b Engine compartment ground - left side
G54 Passenger compartment ground
G54a Passenger compartment ground - right side
G54b Passenger compartment ground - left side
G55 Hood ledge panel ground
G56 Branch terminal board
G57 Presetting for fuel cut-off solenoid valve
G58 Connection for cigar lighter
G59 Connection for electric rear-view door mirror
G60 Injection wiring ground
G61 Connection for ignition coil
G62 Clutch switch connection
G63 Rear ground
G63a Rear right ground
G63b Rear left ground
G64 Connection for Trip Computer - clock
G65 Coaxial cable
G66 Motronic wiring ground
G67 Motronic connection
G68 Connection A with board wiring
G69 Connection B with board wiring
G70 Connection C with board wiring
G71 Connection for warning lamp on instruments
G72 Connection for seat back adjustment wiring
G73 Connection for rear services
G73a Connection for rear right accessories
G73b Connection for rear left accessories
G73c Rear services connection (4-way)
G73d Rear services connection (4-way for Alfa Control)
G74 Connection ALFA ROMEO Control Televel rear wiring
G75 Connection between right and left roof panel services
G76 Connection for roof panel - services - right side
G77 Connection for roof panel services - left side
G78 Coonection for front door services wiring
G79 Connection for rear door services wiring
G80 Connection for board wiring
G81 Connection for front left seat back adjustment
G82 Connection for front right seat back adjustment
G83 Rear connector for fast idle device
G84 Console cable connector
G84a Central panel 15-way cable connection
G84b Central panel 12-way cable connection
G85 Front accessories connector
G86 Connection for passenger compartment roof lamp
G87 Connection for rear door-locking motors
G88 Connection for rear lights
G89 Intermediate connection A
G90 Intermediate connection B
G91 Rear door sensors ground
G92 Luggage compartment ground
G93 Windscreen frame upper cross member ground
G94 Engine compartment connector
G94a 10-way connection for engine compartment
G94b 8-way connection for engine compartment
G94c Engine compartment connection - right side
G94d Engine compartment connection - left side
G95 Centralized fuse box
G95A Connection for switches
G95B Connection for switches
G95C Connection for cluster warning lamps
G95D Connection for ALFA ROMEO Control
G95E Connection for console
G95F Connection for fog light - rear fog light
G95G Connection for combination switch
G95H Connection for LH interface
G95I Connection for RH interface
G95L Connection for clock - rheostats
G95M Connection for sunroof
G95N Connection for battery
G95O Connection for ignition switch
G95P Connection for door services
G95Q Connection for performance gauge
G95R Connection for heated rear window
G95S Connection for cluster
G95V Fuses
G96 Single connector for ALFA ROMEO Control - cluster
G97 Connection for left doors services
G98 Connection for right doors services
G99a Connection for engine dashboard A
G99b Connection for engine dashboard B

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G99c Connection for engine dashboard C
G99d Connection for engine dashboard D
G99e Connection for engine dashboard E
G100 Connection for console - doors wiring
G101 Trip Computer connection
G102 Optoelectronic cluster connector
G103 Connection for grounds to brake fluid tank
G104 Connection for roof panel left upright
G105 Connection for ashtray lamp
G106 Seat grounds
G107 Connection for fuel pump
G108 CEM wiring ground
G109 Injection wiring connection
G110 Thermostat wiring ground
G111 Connection for dashboard instruments wiring
G112a Connection A for roof wiring
G112b Connection B for roof wiring
G112c Connection C for roof wiring
G112d Connection D for roof wiring
G112e Connection E for roof wiring
G113 Connection for front left fender
G114 Connection for outside temperature sensor
G115 Connection for tow bar vehicle socket
G116 Connection for tow bar trailer plug
G117 Connection for engine compartment lamp
G118 Connection for luggage compartment lamp
G119 Courtesy mirror light connection
G120 Map light connection
G121 Car electric system connection
G122 Ignition wiring connection
G123 Pedal-board ground
G124 ABS system connection
G125 ABS system fuse box
G126 ABS system electromagnetic switch protection fuse
G127 Recognition light fuse box
G128 Transciever fuse box
G129 Two-tone horn left-side engine compartment connection
G130 Switch connection
G131 Ground on upper cover
G132 Ground on manifold
G133a Electronic ignition-injecton connection wiring A
G133b Electronic ignition-injection connection wiring B
G134 Front left upright connection
G135 Rear window back-shelf wiring connection
G136 Front side-marker intermediate connection
G137 Injection supply wiring connection
G138 Combination switch headlight unit connection
G139 Interphone system control unit connection
G140 Fuel pump intermediate connection to service panel
G141 Rear side-marker intermediate connection
G142 Engine service connections
G143 Service central compartment ground
G144 Boot lid wiring connection
G145 Intermediate connection for injection switch cables
G146 Tachymeter connection
G147 Rev-counter sensor connection
G148 Under-dashboard ground
G149 Board wiring with engine compartment right-side wiring connection
G150 Board wiring with engine compartment left-side wiring connection
G150a Additional wiring connection header with left-hand engine compartment wiring
G151. Board wiring with engine service compartment wiring connection
G152 Glow plug pre-heating timing fuse (50a)
G153 Ground under diesel filter
G154 Engine wiring - board wiring connection
G155a Right seat adjustment wiring connection
G155b Left seat adjustment wiring connection
G156 Front-right door wiring - front-right door sensor connection
G157 Front-left door wiring - front-left door sensor connection
G158 Rear-right door wiring - rear-right door sensor connection
G159 Rear-left door wiring - rear-left door sensor connection
G160 Front-right door wiring - ground lighting lamp connection
G161 Front-left door wiring - ground lighting lamp connection
G162 Rear-right door wiring - ground lighting lamp connection
G163 Rear-left door wiring - ground lighting lamp connection
G164 Board wiring - conditioning unit wiring connection
G165 Door service wiring - conditioning unit wiring connection
G166 Front door wiring - front right door wiring connection
G167 Front door wiring - rear right wiring connection
G168 Front door wiring - front right door wiring connection
G168a Front door wiring and rear left door wiring one-way connection
G169 Front door wiring - rear left wiring connection
G170 Board wiring - rear right wiring connection
G171 Board wiring - rear left wiring connection
G172 Door wiring - sunroof connection
G173 Console wiring - front door wiring connection
G174 Steering column support ground
G175 Board wiring - fog light wiring connection
G176 Roof panel ground
G177 Door service wiring - board wiring connection
G178 Preset connection for seat height adjustment switch
G179 Rear left wiring - roof lamp wiring connection
G180 Rear left wiring - front door wiring connection
G181 Rear left wiring - rear console wiring connection
G182 Console area ground
G183 Rear console wiring - front right seat connection
G184 Rear console wiring - front left seat connection
G185 Luggage compartment left-side ground
G186 Luggage compartment right-side ground
G187 Single connection in rear left wiring
G188 Single connection in rear right wiring
G189 Rear seat wiring - rear console wiring connection
G190 Rear seat wiring connection
G191 Rear left wiring - rear left door wiring connection
G192 Preset connection for trailer stop signal
G193 Preset connection radio aerial
G194 Rear left wiring - central side light wiring connection
G195 Preset connection for rear left loud-speaker
G196 Preset connection for rear right loud-speaker
G197 Rear right wiring - rear right door wiring connection
G198 Rear right wiring - boot lid lock wiring connection
G199 Rear right door wiring connection
G200 Preset connection for radio headphones control unit
G201 Heated rear window fuse (30A)
G202 ABS System ground
G203 Rear right wiring - front door wiring connection
G204 Front right sensor connection - ABS
G205 Front left sensor connection -- ABS
G206 Rear right sensor connection - ABS
G207 Rear left sensor connection - ABS
G208 Front left power window connection
G209 Rear right wiring - rear console wiring connection
G210 Door wiring - rear console wiring connection
G211 Cluster intermediate connection for gearbox oil level signal
G212 Cluster internal connection for ABS warning light signals and seat belts
G213 Cluster internal connection for ABS warning light, seat belts and gearbox oil level
G214 Instrument connection for ABS warning light signals and seat belts (CA)
G215 Instrument internal connection for ABS warning light signals and seat belts
G216 Preset connection for power window control unit
G217 Preset connection for front left loud-speaker
G218 Preset connection for front right loud-speaker
G219 Sunroof connection

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G220 Coil power module connection for rev-counter
G221 Jumper connection for power window wiring
G222 Cruise Control Actuator - Cruise Control CU connection
G223 Preset connection for Cruise Control clutch push-button
G224a Right passive seat belt wiring connection
G224b Left passive seat belt wiring connection
G225a Right passive seat belt control unit switch wiring connection
G225b Left passive seat belt control unit switch wiring connection
G226a Right passive seat belt wiring ground connection
G226b Left passive seat belt wiring ground connection
G227b Under-fender services wiring connection
G228 Board wiring - cooling electric fan motor wiring connection
G229 Starting signal and "Over-boost" warning light wiring connection
G230 Ground on starting distributor bracket
G231 Board wiring - automatic transmission wiring connection
G232 Jumper connection preset for Motronic control unit (manual/automatic transmission versions)
G233 Board wiring - automatic transmission gear-lever wiring connection
G234 Interphone control unit connection A
G235 Interphone control unit connection B
G236 Interphone circuit panel connection A
G237 Interphone circuit panel connection B
G238 Board wiring - day-light lamps
G239 Car radio/car telephone CU relay - 15A
G240 Front seats relay - 20A
G241 Board wiring - antitheft wiring connection
G242 Board wiring Cruise Control wiring connection
G243 Board wiring - rear cabinet wiring single connection
G244 Board wiring - rear cabinet wiring connection
G245 Rear - right antitheft wiring connection
G246 Rear seat adjustment fuse 20A
G247 Rear electric window fuse 30A
G248 Antitheft wiring - rear right wiring connection
G249 Abtitheft wiring - cabinet wiring connection
G250 Board wiring - C.A. right side engine wiring connections
G251 Shock absorber connection clinching
G252a Board wiring - rear right wiring for shock-absorber system connection
G252b Board wiring - rear right wiring for shock-absorber system connection
G252c Board wiring - rear right wiring for chock-absorber system connection
G252d Board wiring - rear right wiring for shock-absorber system connection
G253 Rear wiring - left wiring - climatization wiring connection
G254 Engine electric fan fuse 40A
G255 Climatization electric fan fuse 40A
G256 Rear left wiring - antitheft connection
G257 Interlock SHIFT CU fuse 10A
G258 Antitheft fuse 15A
G259a Automatic transmission clinching
G259b Automatic transmission clinching
G260 Front cabinet wiring - rear cabinet wiring connection
G261 Sunroof fuses
G262 Door locking - electric window clinching
G263 Front electric windows clinching
G264 Rear electric window enabling and closing crimping connection
G265 Left-hand front under-mudguard wiring connection
G265a Front right-hand wiring connector under wheel housing (3-way)
G265b Front right-hand wiring connector under wheel housing (2-way)
G266 Boot hatch ground
G267 Engine block ground
G268 Heated seats and handbrake switch-door locks wiring connection
G269 Glovebox compartment light connection
G270a Dashboard wiring - four-wheel drive wiring (four-way) connection
G270b Dashboard wiring - four-wheel drive wiring (six-way) connection
G271 Electric fan operation check connection
G272 ABS hydraulic group connection
G273 ABS control unit connection
G275 ABS hydraulic group ground connection
G276 Four-wheel drive intermediate wiring connection
G277 Untermediate Alfa Romeo Control unit - instrument connector
G278 Brake pad wear sensor connector
G279 Brake fluid reservoir switch connector
G280 Radio intermediate wiring connector
G281 Free connector for luggage compartment light
G282 Earth on front tunnel
G283 Earth on left service compartment
G284A Rear right passenger compartment panneling earth
G284B Rear left passenger compartment panneling earth
G285 Provision for anti-theft system connector
G286 Dash wiring - door wiring four-way connection
G287 Injection wiring - engine coolant temperature sensor wiring connection
G288 Injection wiring evaporation solenoid valve wiring connection
G289 Connection for front right-hand speaker - high tones
G290 Connection for front right-hand speaker - low tones
G291 Connection for front left-hand speaker - high tones
G292 Connection for front left-hand speaker - low tones
G293 Connection between engine services wiring - engine compartment wiring - left-hand side
G294 Earth on intake manifold
G295 Rear console wiring - driver's side seat memory wiring connection
G296 Memory wiring - driver's side longitudinal seat regulation motor wiring connection
G297a Memory wiring - driver's side seat control panel wiring connection
G297b Memory wiring - driver's seat control panel witing connection
G297c Memory wiring - driver's seat control panel wiring connection
G298 Memory wiring - driver's seat lumbar and back regulation wiring connection
G299a Front left-hand seat control pad relay unit - control pad wiring connection
G299b Front right-hand seat control pad relay unit - control pad wiring connection
G300 Front left-hand seat warming pad clinching
G301 Front right-hand seat warming pad clinching
G302 Driver's seat earth cable clinching
G303 Control pad wiring - driver's seat lumbar support and back regulation wiring connection
G304 Injection wiring intermediate clinching
G305 Electric seats and rear power window connection
G306 Right-hand engine wiring/engine wiring connection
G307 Luggage compartment/rear wiring connection
G308 Connector for engine sensors
G309a Controlled damping suspension system A
G309b Controlled damping suspension system A
G310 Front right-hand power window fuse
G311 Front left-hand power window fuse
G312 Fuse for headlight washers
G313 Air conditioner supplementary wiring connection
G314a Engine wiring/air conditioner A wiring connection
G314b Engine wiring/air conditioner B wiring connection
G315a Left-hand seat regulation motor connection
G315b Right-hand seat regulation motor connection
G316 Engine r.p.m. and timing sensor sheath earth
G317 Engine - injection wiring rev counter connection
G318 Earth on gearbox
G319 Engine oil level wiring - engine services wiring connection
G320 Rear speaker cable connection

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G321a Air conditioner control wiring - microswitch wiring connection (6-way)
G321b Air conditioner control wiring - microswitch wiring connection (3-way)
G322 Air conditioner control wiring - dashboard wiring connection
G323 Air conditioner control wiring - electric fan wiring for condensers connection
G324 Left-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G325 Right-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G326 Dashboard wiring - front foglight/headlight washer wiring connection
G327 Speedometer sensor connection
G328 Dashboard wiring - rooflight wiring connection
G329 Dashboard wiring - injection wiring connection
G330 Injection wiring - electric fan wiring for condensers connection
G331 Ultrasound soldering connection
G332 Alternator connection for recharging signal
G333 DIM-DIP fuse
G334 Fuel level sender connection
G335 Engine services with E.G.R. valve power supply clinching

H: SWITCHES

H1 Handbrake switch
H2 Reversing light switch
H3 Stop light switch
H4 Courtesy light switch on passenger compartment upright
H5 Front left door open indicator switch
H6 Front right door open indicator switch
H7 Rear left door open indicator switch
H8 Rear right door open indicator switch
H9 Front right brake pad switch
H10 Front left brake pad switch
H11 Rear right brake pad switch
H12 Rear left brake pad switch
H13 Choke switch
H14 Injection advance switch
H15 Gearbox oil low level switch (magnetic bulb)
H16 Starting and reverse inhibitor switch
H17 Brake fluid minimum level check switch
H18 Fast-idle switch in gearbox
H19 Low fuel pressure switch
H20 Inertia switch
H21 Clutch pedal fast-idle switch
H22 Ignition microswitch
H23 Engine compartment lamp switch
H24 Luggage compartment lamp switch
H25 Glovebox light switch
H26 Contact/switch on rear door for rear window wiper
H27 Contact/switch on rear door for heated rear window
H28 Carburetor contact/switch
H29 Switch for rear drive engagement warning lamp
H30 Load switch
H31 Switch for idle r.p.m. adjusting screw on carburetor
H32 Microswitch on carburetor for inserting timing variator
H33 Number plate contact/switch
H34 ABS System brake fluid tank switch
H35 Fuel pre-heating filter thermal switch
H36 Diesel post-heating microswitch
H37 Clutch pedal switch
H38 Rear right seat microswitch
H39 Rear left seat microswitch
H40 Rear right door inhibitor switch for rear seats
H41 Rear left door inhibitor switch for rear seats
H42 Accelerator throttle valve maximum opening switch
H43 Door-locking engaged signalling microswitch
H44 Engine hood antitheft device switch
H45 Cruise Control clutch and brake switch
H46 Gearbox switch for controlled damping suspension shock-absorber
H47 Engine throttle microswitch for controlled damping suspension shock-absorber
H48 Lefthand door switch for electric windows - sunroof automatic closing
H49 Auxiliary stop lights switch
H50 Seat end-run switch
H51 Sunroof stop limit switch

I: RELAYS

I1 Engine cooling electric fan relay
I2 Heated rear window relay
I3 Horn relay
I4 Headlight wiper relay
I5 Auxiliary relay for headlight wiper timer
I6 Fast-idle relay
I7 Fuel hose closing relay
I8 Relay excluding retarded rotor arm
I9 Glow plug relay
I10 Choke inhibitor relay
I11 Front power window and seat raising relay
I12 Front power window relay
I13 Rear power window relay
I14 Brake fluid automatic warning light control relay
I15 Low fuel pressure warning light relay
I16 Headlight relay
I17 Fog light relay
I18 Double contact relay
I19 Headlight washer pump relay
I20 Beam change over relay
I21 Full beam exclusion relay
I22 Low beam exclusion relay
I23 Supplementary engine cooling electric fan relay
I24 Direction and hazard lights relay
I25 Rear fog light relay
I26 Roof lamp relay
I27 Seat height adjustment relay
I28 Hazard lights relay
I29 Fuel pump relay
I30 Relay with CEM diode
I31 Front power window/climatisation relay
I32 Advance variation control unit relay
I33 Carburetor microswitch relay
I34 Rear fog light exclusion relay
I35 Key-operated supply relay
I36 Relay for brake wear and fluid level
I37 ABS System control unit relay
I38 ABS System auxiliary relay
I39 Brake fluid level warning light relay
I40 ABS System brake fluid electric pump relay
I41 Two-tone hooter, horn relay
I42 Two-tone hooter relay
I43 Inspection light relay
I44 Fuel pre-heating device relay
I45 Outer mirror defrosting relay
I46 Siren relay
I47 Engine oil cooler electric fan relay
I48 Instrument and AR control ignition key-controlled relay
I49 Low-beam light relay
I50 High-beam light relay
I51 Electronic control unit power supply relay
I52 Boot lid opening relay
I53 Fuel filter cap opening relay
I54 Rear right seat relay

I: RELAYS (Continued)

I55 Rear left seat relay
I56 Rear seat inhibitor relay
I57 ABS System electronic relay
I58 Sunroof - seat relay
I59 "OFF", "RESUME" Cruise Control switch auxiliary relay
I60 Outer mirror defrosting relay
I61 Petrol vapour motor pump relay
I62 Gear engaged signal relay (automatic transmission) for MOTRONIC control unit
I63 Oil radiator electric fan - automatic transmission relay
I64 Position light relay
I65 Foglight inhibitor relay
I66 Day-light insertion relay
I67 Day-light exclusion relay
I68 Water cooling auxiliary electric fan relay
I69 Stop switch relay
I70 Radio relay
I71 20 relay for shock-absorbes
I72 Brake fluid tank relay
I73 Front electric window - door-locking relay
I74 Rear electric window - suroof relay
I75 Electric window - sunroof closing relay
I76 Four-wheel drive supply relay
I77 Seres/parallel relay (for cooling electric fans)
I78 Relay for heater blower 50A
I79 Supplementary relay for fog lamps
I80 Seat longitudinal end-run locking relay
I81 Brake pad wear relay
I82 Headlight flashing relay
I83 Relay for electric aerial
I84 Automatic closure relay
I85 Driver's seat memory relay
I86 Relay for driver's seat memory recall stop
I87 Front left-hand seat warming pad relay
I88 Front right-hand seat warming pad relay
I89 Rear foglight permit and front foglight exclusion relay
I90 DIM-DIP exclusion relay
I91 DIM-DIP cut-in relay
I92 K.S.B. relay

L: SENSORS

L1 Low fuel pressure switch
L2 Low oil pressure switch
L3 Max air pressure switch
L4 Thermal switch for engine cooling electromagnetic coupling
L5 Thermal switch for engine coolant max temperature
L6 Thermal switch for engine cooling electric fan
L7 Engine coolant temperature gauge sender
L8 Oil pressure gauge sender
L9 Fuel level gauge sender
L10 Sender for engine coolant temperature gauge and max temperature warning lamp contact
L11 Retarded rotor arm cut-out pressure switch
L12 Engine oil level sensor
L13 Windscreen washing liquid level sensor
L14 Engine coolant level sensor
L15 Fuel flow sensor
L16 Rev-counter pulse generator
L17 Speedometer pulse generator
L18 Load sender
L19 External temperature sensor
L20 Photoelectric cell
L21 Pierburg solenoid valve regulating the supercharging pressure
L22 Knocking sensor
L23 Potentiometer
L24 Engine coolant temperature sensor for ignition advance adjustment
L25 Thermal switch for engine coolant temperature
L26 Vacuum sensor
L27 Temperature sensor
L28 Front right brake sensor
L29 Front left brake sensor
L30 Rear right brake sensor
L31 Rear left brake sensor
L32 Turbo supercharger air pressure sensor sender
L33 Two-stage thermal contact
L34 Boot lid opened contact
L35 Thermometric switch
L36 Turbo supercharger maximum pressure safety sensor
L37 T.D.C. sensor
L38 Thermal switch for oil radiator electric fan - automatic transmission
L39 Automatic transmission oil maximum temperature sensor
L40 Steering angle sensor
L41 Oil pressure switch for controlled damping suspension shock-absorber
L42 Tooth mesh control sensor
L43 Oil pressure switch for vehicle lift warning light
L44 Engine oil temperature sender
L45 K.S.B. water temperature sender
L46 E.G.R. control solenoid valve
L47 E.G.R. valve potentiometer

M: SOLENOIDS - SOLENOID VALVES

M1 Fuel cut-off solenoid valve
M2 Injection pump solenoid valve
M3 Solenoid with injection pump fuel cut-off microswitch
M4 Fast-idle solenoid
M5 Engine stop solenoid
M6 Fuel pipe closing electromagnet
M7 Door opening/closing electromagnet
M8 Auxiliary air solenoid valve compressor actuation
M9 Pierburg solenoid valve (for idle r.p.m.)
M10 Brake fluid adjusting valve
M11 ABS System main valve
M12 Boot lid opening solenoid
M13 Fuel filter cap opening solenoid
M14 Cruise Control actuator
M15 Emission control solenoid valve
M16 Over-boost solenoid valve
M17 Front right shock-absorber solenoid valve
M18 Front left shock-absorber solenoid valve
M19 Rear right shock-absorber solenoid valve
M20 Rear left shock-absorber solenoid valve
M21 Automatic transmission unit solenoid
M22 Four-wheel drive electromagnetic coupling

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS

N1 Electronic ignition module
N1a Electronic ignition module A
N1b Electronic ignition module B
N2 Connector for Marelli module
N3 Capacitor for electronic ignition
N4 Connector for Bosch module
N5 Tachymetric switch device
N6 Pre-heating glow plug timer
N7 Trip Computer
N8 ALFA ROMEO Control
N9 Brake pad wear control unit

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS (Continued)

N10 Roof lamp timer
N11 Door-locking control unit
N12 Headlight wiper timer
N13 Road hazard and direction indicators intermittence
N14 Electronic windscreen wiper intermittence
N15 Electronic windscreen wiper intermittence and warning light control
N16 Tachymetric control unit
N17 Trip control unit for fuel flow
N18 Electronic device for headlights flashing
N19 Performance gauge control unit
N20 Advance variation control unit
N21 Power module
N22 ALFA ROMEO Control control unit
N23 Ignition control unit
N24 Pulse converter
N25 Rear fog-light device
N26 Brake pad wear warning light intermittence device
N27 ABS System control unit
N28 ABS System brake fluid electric pump device
N29 Diode holder connection
N29a A diode connection
N29b B diode holder connection
N30 Two-tone hooter control unit
N31 Fuel pre-heating device
N32 Head-phone connection control unit
N33 Differentiated rear window defrosting control unit
N34 Control unit for pulse generator
N35 Coding control unit
N36 Interphone system control unit
N37 Petrol vapour intake pump timer
N38 Power window control unit
N39 Cruise Control unit
N40 DIM DIP electronic device
N41 Lights on signalling control unit
N42 Dimmer for door-locking actuated signalling LED
N43 Automatic transmission locking/unlocking control unit
N44 Rear lights control unit
N45 Antitheft control unit
N46 Shock-absorber electronic control unit
N47 Accelerometer
N48 Radiotelephone control unit
N49 Aerial - Heated rear window control unit
N50 Four-wheel drive control unit
N51 Hydraulic group with ABS control unit
N52 CROSS-OVER control unit (radio system)
N53 Antijamming condenser radio boot panel 4.7 µF
N54 Right radio loudspeaker antijamming condenser 4.7 µF
N55 Left radio loudpseaker antijamming condenser 4.7 µF
N56 Supplementary fusebox radio antijamming condenser 22 µF
N57 Radio relay protection diode
N58 Driver's seat memory control unit
N59 Control unit
N60 Sunroof control unit
N61 Shock absorber control unit condenser
N62 ABS system - longitudinal accelerometer
N63 ABS system - transversal accelerometer
N64 Instrument panel warning light timer
N65 E.G.R. control unit
N66 Brake light radio anti-interfeence condenser
N67 Door lock remote control signal receiver

O: ANCILLARY EQUIPMENT

O1 Heated rear window
O2 Horn
O3 Electrically-operated aerial
O4 Car radio,
O5 Speaker
O6 Cigar lighter
O7 Rear cigar lighter
O8 Two-tone hooter
O9 Transceiver
O10 Rear headphone
O11 Siren
O12 External loudspeaker-microphone
O13 Internal loudspeaker-microphone
O14 Driver's seat warming pad
O15 Rear right seat warming pad
O16 Rear left seat waming pad
O17 Front right seat warming pad
O18 Right door rear-view mirror defroster
O19 Left door rear-view mirror defroster
O20 External right microphone
O21 External left microphone
O22 Engine electric fan supplementary resistance
O23 Antitheft siren
O24 Radiotelephone
O25 Windscreen defroster
O26 Front left-hand seat warming pad
O27 K.S.B. device
O28 DIM-DIP resistance

P: ELECTRIC MOTORS

P1 Windscreen wiper motor
P2 Engine cooling electric fan motor
P3 Engine cooling electric fan electromagnetic drive
P4 Headlight wiper motor
P5 Front left seat adjustment motor
P6 Front right backrest adjustment motor
P7 Front left backrest adjustment motor
P8 Motor for electric door rear-view mirror - left-side
P9 Motor for electric door rear-view mirror - right-side
P10 Front right door locking motor
P11 Front left door locking motor
P12 Rear right door locking motor
P13 Rear left door locking motor
P14 Front right power window motor
P15 Front left power window motor
P16 Rear right power window motor
P17 Rear left power window motor
P18a Main fuel electric pump
P18b Auxiliary fuel electric pump
P19 Windscreen washer pump
P20 Headlight washer pump
P21 Rear window wiper motor
P22 Rear window washer electric pump motor
P23 Supplementary engine cooling electric fan motor
P24 Sunroof motor
P25 Engine oil radiator electric fan
P26 Petrol vapour intake electric pump motor
P27 Windscreen wiper motor with control unit
P28 Front right seat longitudinal adjusting motor
P29 Front left seat longitudinal adjusting motor
P30 Front right seat adjusting motor
P32 Rear right seat motor
P33 Rear left seat motor
P34 Oil radiator electric fan - automatic transmission
P35a Right-hand headlight adjustment motor
P35b Left-hand headlight adjustment motor
P36 Vehicle lift pump motor
P37 Right-hand front seat rear tilt regulation motor
P38 Left-hand front seat rear tilt regulation motor
P39 Right-hand front seat front tilt regulation motor
P40 Left-hand front seat front tilt regulation motor

P: ELECTRIC MOTORS (Continued)

P41 Front right-hand seat lumbar support regulation
P42 Front left-hand seat lumbar support regulation

Q: HEAT/VENT - AIR CONDITIONING SYSTEM

Q1 Heater/ventilation electric fan
Q2 Pneumatic push-button control for air conditioning
Q3 Pneumatic push-button control for climatisation
Q4 Heater/ventilation electric fan control
Q5 Heater blower fan speed adjustment resistance
Q6 Switch on flap for heater blower fan
Q7 Fluid thermostat
Q8 Electromagnetic coupling pressure switch
Q9 Minimum pressure switch
Q10 Maximum pressure switch
Q11 Compressor electromagnetic coupling
Q12 Thermoswitch exclusion of compressor electromagnetic coupling
Q13 Supplementary conditioner fan
Q14 Relay for supplementary conditioner fan and electromagnetic compressor coupling
Q15 Heater/ ventilation electric fan relay
Q16 Relay for simultaneous control of engine cooling electric fan and supplementary electric fan
Q17 Relay for simultaneous coupling and supplementary electric fan
Q18 Heater
Q19 Conditioner
Q20 Min and max pressure switch (Trinary)
Q21A Automatic control check unit
Q21B Manual control check unit
Q22 Electromagnetic coupling control relay
Q23 Internal temperature sensor for climatisation
Q24 External temperature sensor for climatisation
Q25 Mixed air temperature sensor for climatisation
Q26 Defrosting thermostat
Q27 Air recirculation vent control motor
Q28 Ventilation motor for internal temperature sensor
Q29 Climatisation system branch point
Q30 Air mixture and vent controls
Q30A Air distribution motor to vents
Q30B Cold/hot mixing motor
Q31 Climatisation unit fan speed adjuster
Q32 Climatisation auxiliary relay
Q33 Passenger compartment internal temperature motor with sensor
Q34 Conditioner temperature control potentiometer
Q35 Free fuse for conditioning system
Q36 Conditioning system earth
Q37 Passenger compartment supplementary air conditioning fan
Q38 Passenger compartment supplementary fan control for heating
Q39 Air conditioning system wander fuse - 30A
Q40 Air conditioning system wander fuse - 15A
Q41 Air conditioning system relay and fuse unit
Q42 Air conditioning fan delay device
Q43 Air conditioning system wander fuse - 50A
Q44 Water by-pass electronic actuator
Q45 Electric by-pass cock control microswitches
Q46 External/recirculation air intake electric actuator
Q47 Dynamic air intake actuator control microswitches
Q48 Ait-to-floor electric actuator
Q49 Air-to-floor electric actuator control microswitches
Q50 Recirculation and 1st speed of electric fan microswitches
Q51 Control potentiometer with switch
Q52 Fan for right-hand condenser
Q53 Fan for left-hand condenser
Q54 Fan control relay for right-hand condenser
Q55 Electric fan and compressor electromagnetic coupling simultaneous control relay for left-hand condenser
Q56 Relay for heater/air conditioner
Q57 Electric fan speed selector relay
Q58 Electronic thermostat control unit
Q59 Electronic thermostat temperature sensor

R: SAFETY DEVICES

R1 Seat belt device
R2 Catalytic converter temperature indicator
R3 Thermocouple for catalytic converter temperature detection
R4 Unfastened seat belt buzzer
R5 Open door buzzer
R6 Mileometer
R7 Seat belt warning lamp
R8 30,000 mile warning lamp
R9 Push-button switch on seat belts
R10 Catalytic converter maximum temperature warning light
R11 Front left door switch for seat belt device
R12a Right-side passive seat belt control unit
R12b Left-side passive seat belt control unit
R13a Right-side passive seat belt motor
R13b Left-side passive seat belt motor
R14a Right-side seat belt winder locking mechanism
R14b Left-side seat belt winder locking mechanism
R15 Passive seat belt-unfastened buzzer
R16a Right-side passive seat belt warning light
R16b Left-side passive seat belt warning light
R17a Right-side passive seat belt-unfastened switch
R17b Left-side passive seat belt-unfastened switch
R18a Right-side passive seat belt switch set to position "A"
R18b Left-side passive seat belt switch set to position "A"
R19a Right-side passive seat belt switch set to position "B"
R19b Left-side passive seat belt switch set to position "B"
R20 AIR-BAG front - right sensor
R21 AIR-BAG front - left sensor
R22 AIR-BAG control unit
R23 Steering wheel inflation module for AIR-BAG
R24 Key-inserted and unfastened safety belt signalling buzzer
R25 Safety belt inserted hook sensor

S: ELECTRONIC FUEL INJECTION

S1 Injection control unit
S2 Double relay
S3 Electroinjectors
S4 Cold start electroinjector
S5 Air flow meter
S6 Accelerator throttle body switch
S7 Engine coolant temperature sensor
S8 Thermo-time switch
S9 Auxiliary air valve
S10 Lambda probe
S11 Motronic control unit
S12 Motronic relay
S12a Petrol pump Motronic relay
S12b Motronic relay with diode
S12c Timing variator Motronic relay
S12d Auxiliary Motronic relay
S13 Timing sensor
S14 Rev sensor
S15 Timing variator
S16 Altitude air regulator
S17 CEM control unit
S17a CEM control unit white connector
S17b CEM control unit black connector
S18 Throttle angle sensor
S19 Hall sensor

S: ELECTRONIC FUEL INJECTION (Continued)

S20 Deton sensor
S21 Throttle actuator
S22 Electroinjector terminal
S23 Electroinjector resistance
S24 Electroinjector terminal board
S25 Automatic transmission/manual transmission switch connector
S26 Injector system
S27 Lambda probe resistance
S28 Injection control relay
S29 Idle adjusting actuator
S30 Motronic control unit switch connector
S31 Rev and timing sensor
S32 Lambda probe coding connector
S33 Full load enrichment device
S34 Available
S35 Heated Lambda probe
S36 Free fuse for Auxilliary Motronic relay
S37 4x2 - 4x4 switching connector
S38 Sensor on throttle body with potentiometer
S39 Cylinder No. 1 recognition sensor
S40 Ignition/injection control unit
S41 Main relay
S42 Secondary relay
S43 Absolute pressure sensor
S44 Throttle angle potentiometer
S45 Lambda probe wander fuse
S46 Motronic power supply wander fuse
S47 Fuel pump wander fuse
S48 "CO" regulation potentiometer
S49 MP3.1 control unit switch connector for 1.5 IE and 1.7 IE engines

T: DIAGNOSIS

T1 Alfa Tester connector
T2 "Flashing code" diagnosis connector
T3 AIR-BAG diagnosis connector
T4 Diagnosis indicator light push-button
T5 Controlled damping suspension electric system diagnosis coupling

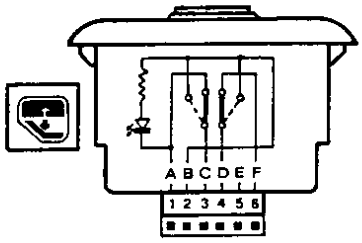
INTRODUCTION

IDENTIFICATION OF COMPONENTS

The aim of this manual is to facilitate the search for the required components and their relative connections in order to be able to identify any faults.

For clarity each electrical subsystem, as for example the starting system, heated rear window, main beam lights etc., are described seperately following 3 distinct paragraphs:

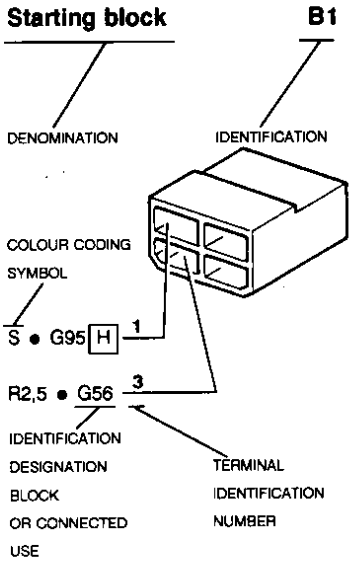
- **Wiring diagram** arranged in order to facilitate component identification and the relative connections.
  The components (shown following a lay-out that mirrors the real-life situation) are alligned on the ouside edge of the diagram and sometimes a symbol place next to the component identifies its function.
  Example:



B21

Front right power window control switch.

- **Wiring**, illustrates the arrangement of the wires and connectors on the car and also the position of the various electrical components shown with the use of lenses.
- **Connectors**, shown in charts that give information as to the nature and destination of wires connected to them according to the following example:



Each component is identified by a reference designation composed of a letter and a number (e.g.: B1). The letter identifies component type according to the following symbols:

A Starting - Recharging
B Manual electric controls
C Instruments
D Warning lamps
E External lights
F Interior lights
G Fuseboxes - connectors - earths
H Switches
I Relays
L Senders
M Solenoids - solenoid valves
N Electronic devices - intermittences - timers
O Ancillary equipment
P Electric motors
Q Heater/ventilation - air conditioning system
R Safety devices
S Electronic fuel injection
T Diagnosis

The key for all the components is given under the specific group.

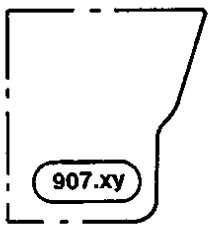
Variations

Each wiring diagram may be applicable to more than more than one model in the **33** range.

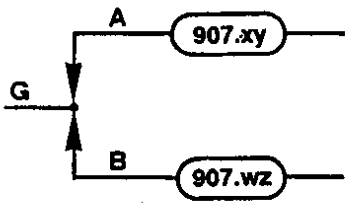
In cases where the different versions require variations in the electrical system, the wiring diagram shows each variation and where necessary duplicates the part of the circuit affected.

Any variations present between models is given in accordance with the following symbols:

- The dashed line and circled point on the diagrams, the areas conaining the specific variations for the vehicle indicated with "907.xy".

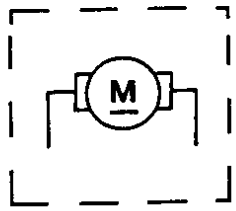


- The connection identifies two wiring variations, given as an alternative and connected in the same fashion. The variations refer to the models indicated with "907.xy" and "907.wz" respectively.



Components fitted upon request

In the wiring diagrams a dashed line encloses the components that can be fitted upon request.



IDENTIFICATION OF MODELS

The models in the **33** range dealt with in this group can be identified by way of the following tables:

MODEL 33

907.A1	33 1.7 IE
907.A1A Δ	33 1.7 IE
907.A1D	33 1.7 IE 4x4
907.A1E Δ	33 1.7 IE 4x4
907.A1B	33 Boxer 16V
907.A1C Δ	33 Boxer 16V

SPORT WAGON MODELS

907.B1	SPORT WAGON 1.7 IE
907.B1A Δ	SPORT WAGON 1.7 IE
907.B1D	SPORT WAGON 1.7 IE 4x4
907.B1E Δ	SPORT WAGON 1.7 IE 4x4

Δ Vehicles with catalytic converter.

The wiring diagrams for the **Sport Wagon** are identical to those of the **33** models of equal motorization. For this reason, apart from specific indications they will be identified using a single system of symbols following the 33 model which is:
907.A1 for the 33 1.7 IE - SPORT WAGON 1.7 IE versions;
907.A1D for the 33 1.7 IE 4x4 - SPORT WAGON 1.7 IE 4x4 versions.

CABLE IDENTIFICATION

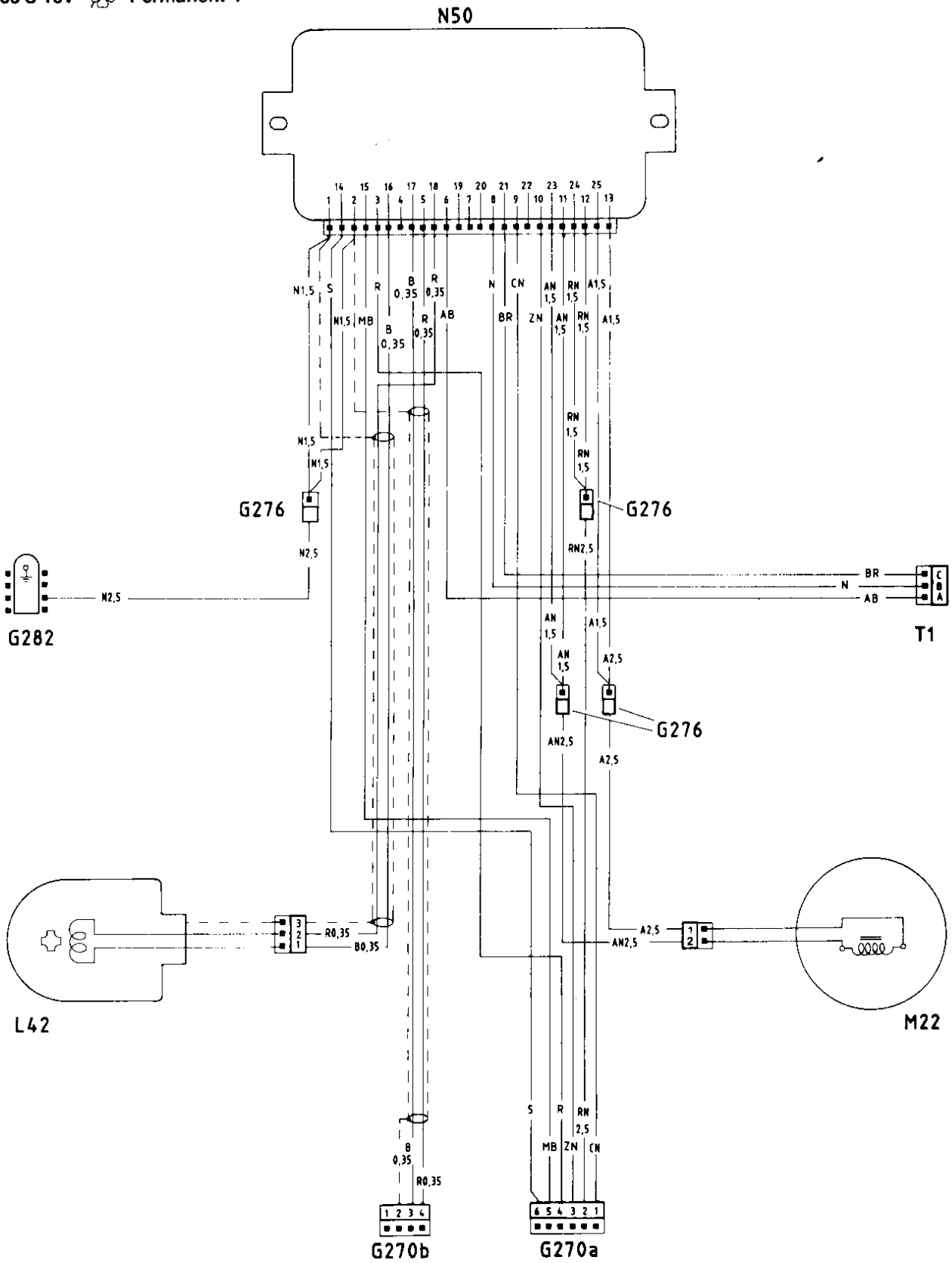
A code composed of one of more letters and a number (e.g.: BN!) is marked on the end of each cable. The letters identify the colour of the cable and the numbers indicate its thickness **(N.B. The cable section not indicated is 0.5 mm^2)**.
For convenience the names of the colours have been abbreviated. The list of these abbreviations is given below:

A	Light-blue
AB	Light-blue white
AG	Light-blue yellow
AN	Light-blue black
AR	Ligh-blue red
B	White
BN	White black
BR	White red
BL	Blue
BLN	Blue black
BLR	Blue red
Br	Dark brown
C	Amber
CB	Amber white
CN	Amnber black
G	Yellow
GB	Yellow white
GN	Yellow black
GR	Yellow red
GV	Yellow green
H	Grey
HG	Grey yellow
HN	Grey black
HR	Rey red
HV	Grey green
M	Brown
MB	Brown white
MG	Brown yellow
N	Black
No	Hazel brown
R	Red
RN	Red black
S	Pink
SB	Pink white
SN	Pink black
V	Green
VB	Green white
VN	Green black
Z	Purple
ZB	Purple white
ZN	Purple black

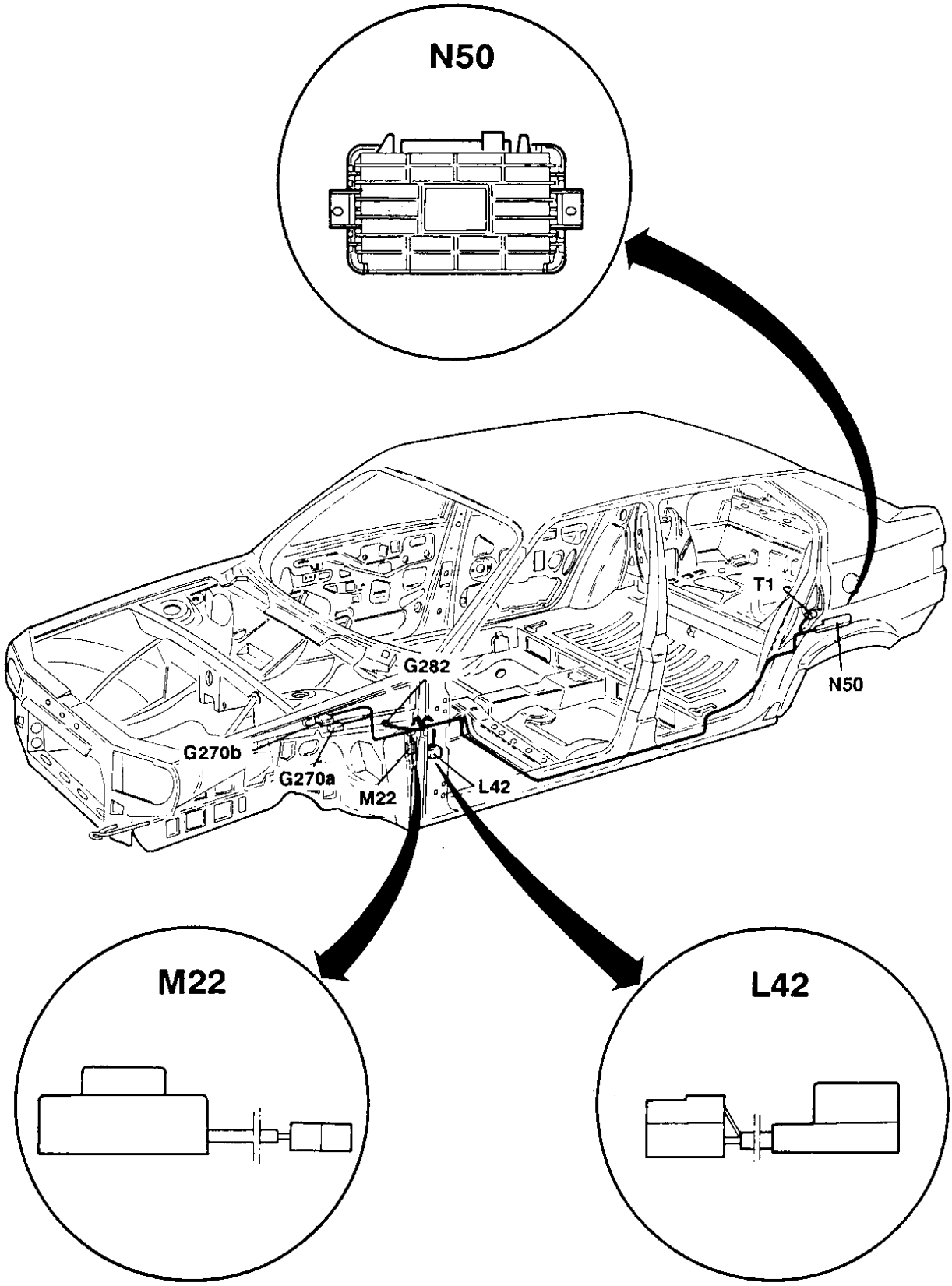
Wiring diagram (Diagram A)

PERMANEN FOUR-WHEEL DRIVE

33 S 16V Permanent 4

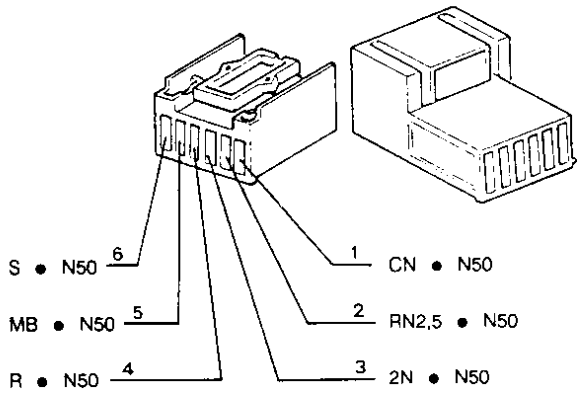


Wiring (Diagram A)



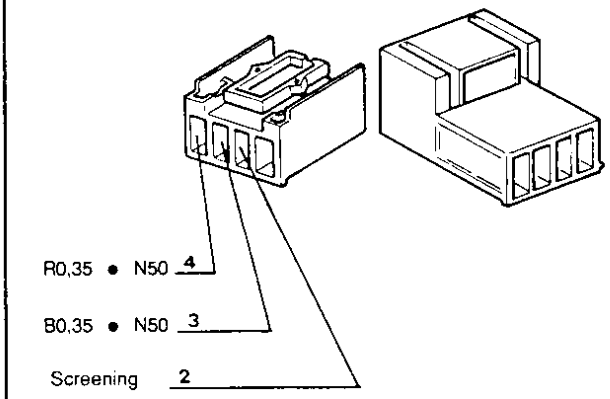
Connectors (Diagram A)

Dashboard wiring - four-wheel drive wiring connection (6 way)	G270a



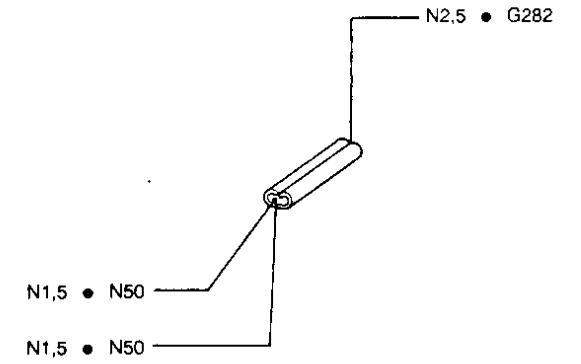
33.90.036

Dashboard wiring - four-wheel drive wiring connection (4 way)	G270b



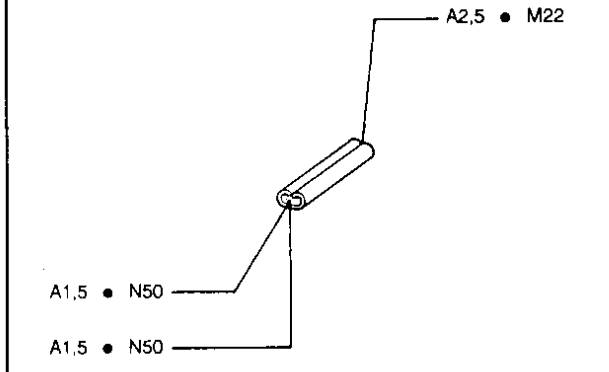
33.90.018

Four-wheel drive intermediate wiring clamp	G276



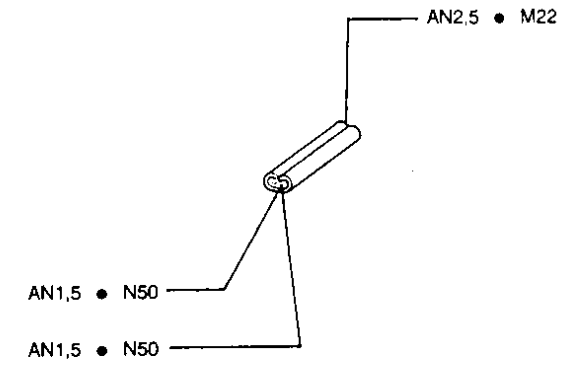
33.90.044

Four-wheel drive intermediate wiring clamp	G276



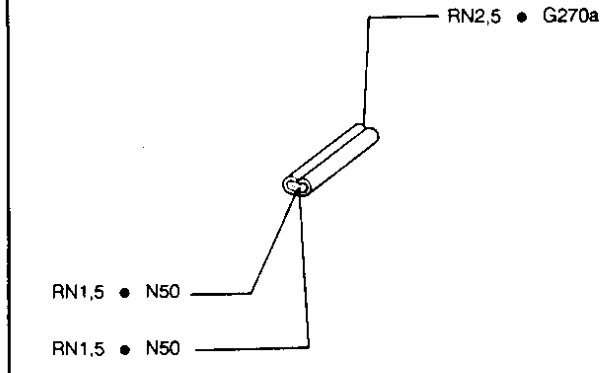
33.90.044

Four-wheel drive intermediate wiring clamp	G276



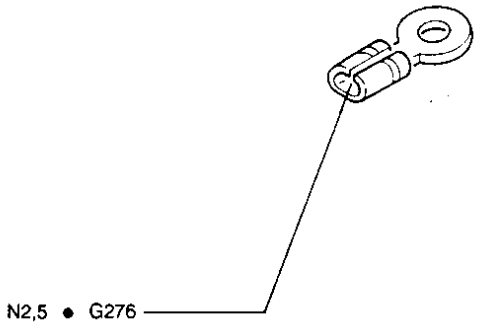
33.90.044

Four-wheel drive intermediate wiring clamp	G276



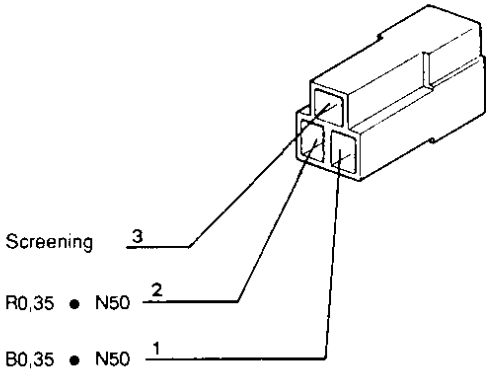
33.90.044

Earth on front tunnel	G282



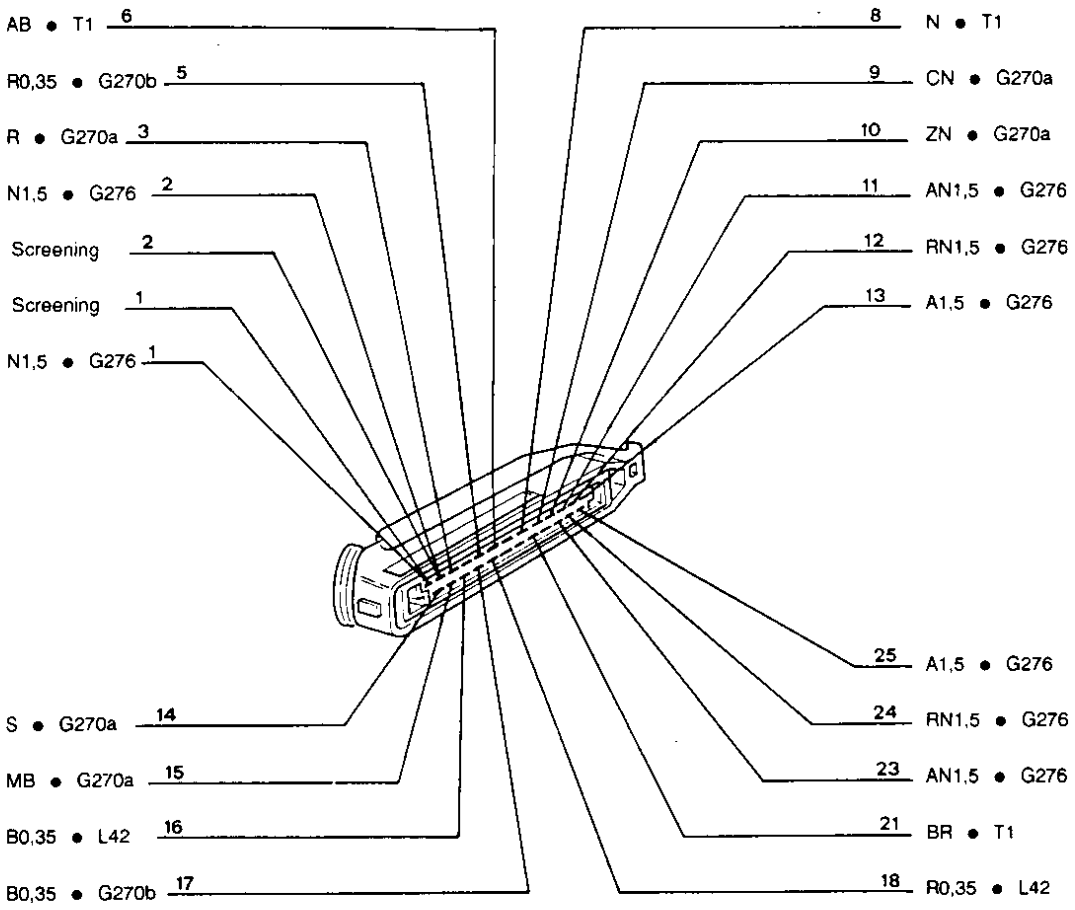
33.90.032

Anti-disengaging sensor	L42



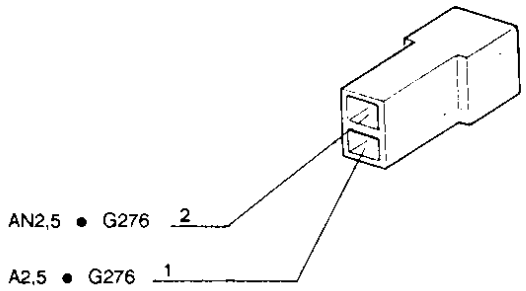
33.90.042

Four-wheel drive control unit	N50



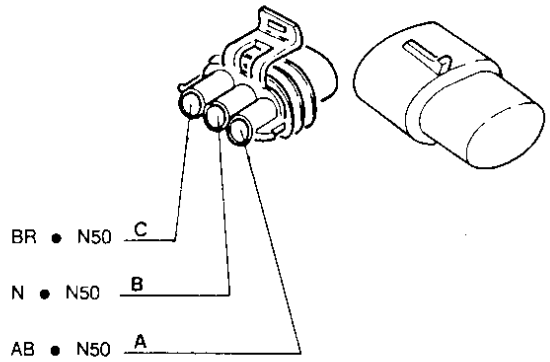
33.90.038

Electromagnetic coupling four-wheel drive	M22



33.90.043

Connector for Alfa Tester	T1

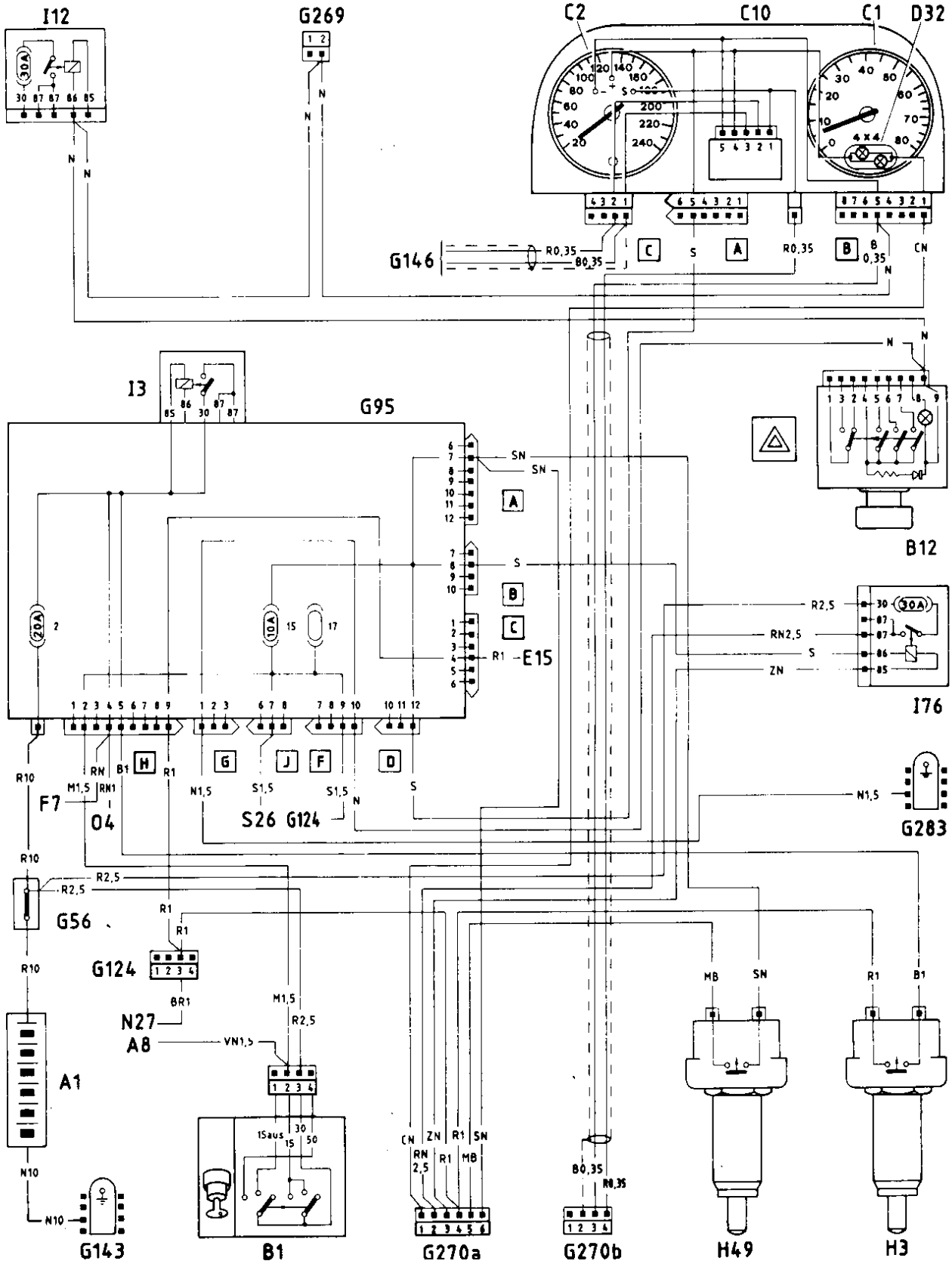


33.90.029 - 33.90.040

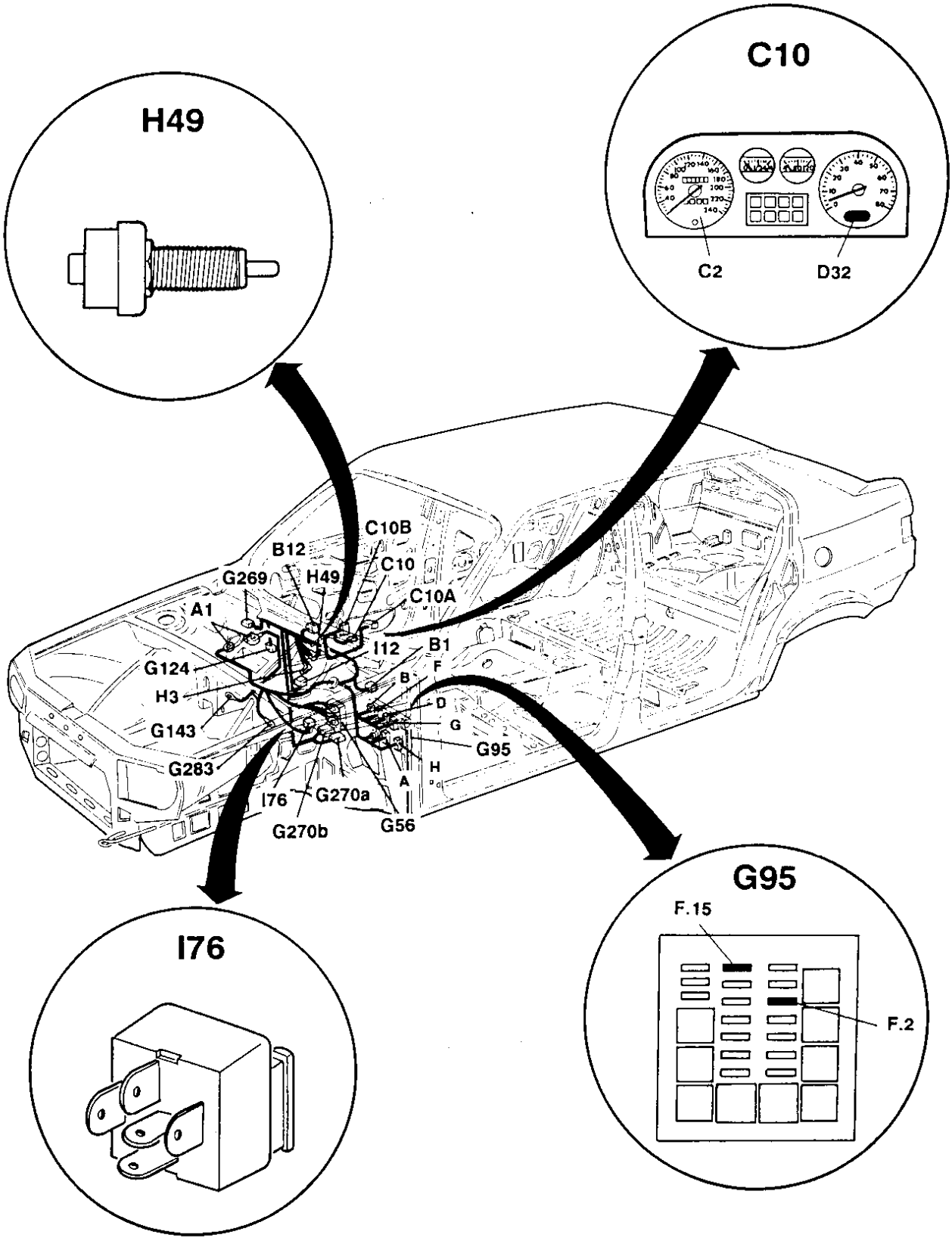
Wiring diagram (Diagram B)

PERMANENT FOUR-WHEEL DRIVE

33 S 16V Permanent 4

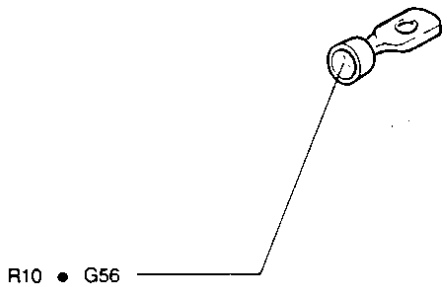


Wiring (Diagram B)



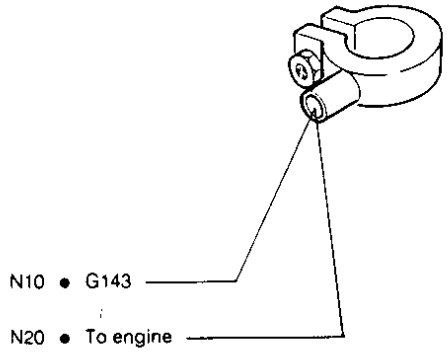
Connectors (Diagram B)

Battery (+)	A1



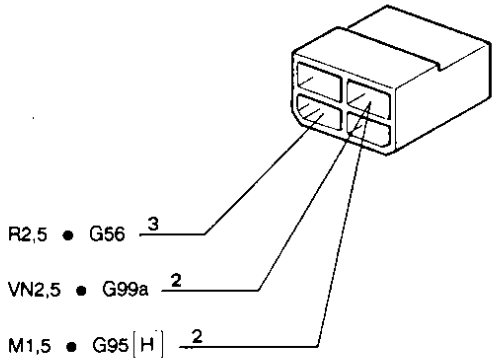
33.90.001

Battery (-)	A1



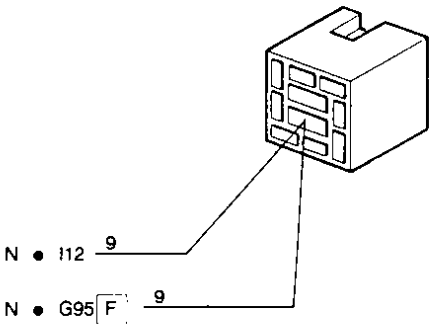
33.90.002

Ignition switch	B1



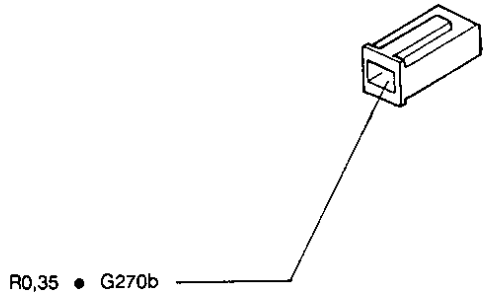
33.90.028

Hazard control lights control switch	B12



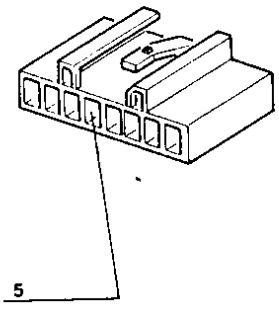
33.90.008

Instrument panel	C10



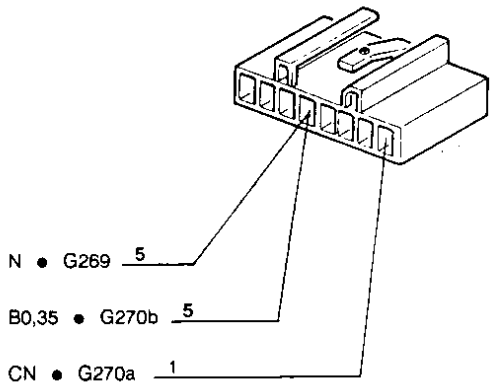
33.90.078

Instrument panel	C10 A



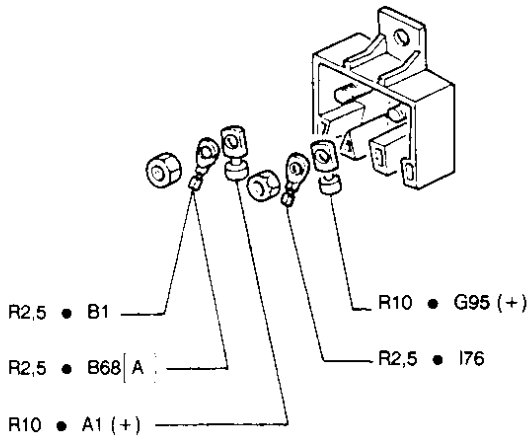
33.90.024

Instrument panel	C10 B



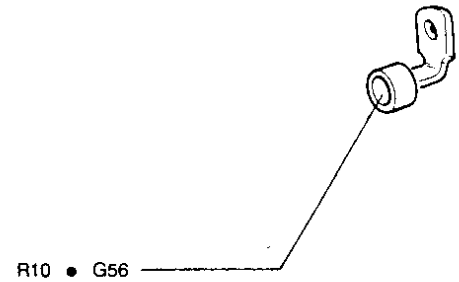
33.90.024

Branch terminal board	G56



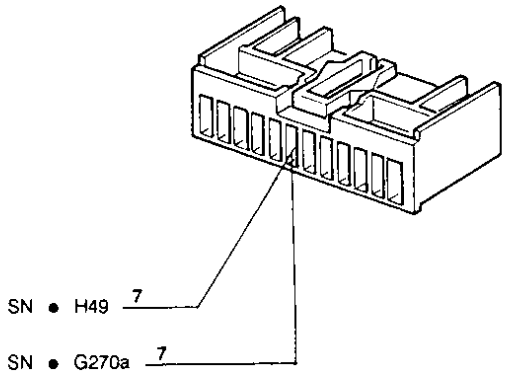
33.90.010

Central fusebox (+)	G95



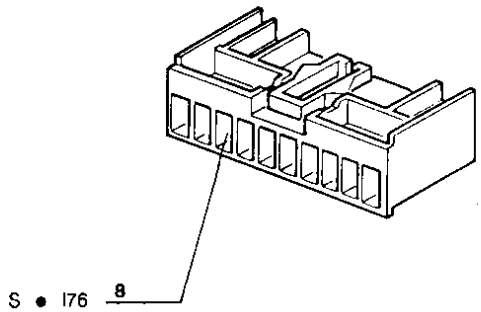
33.90.006

Central fusebox	G95 A



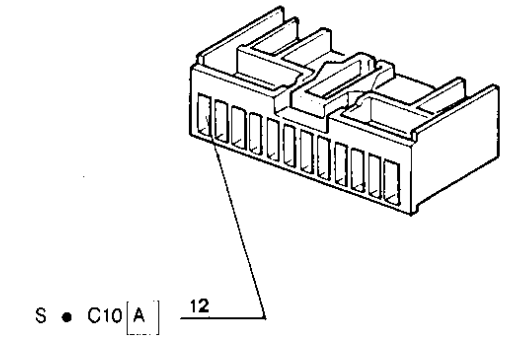
33.90.004

Central fusebox	G95 B



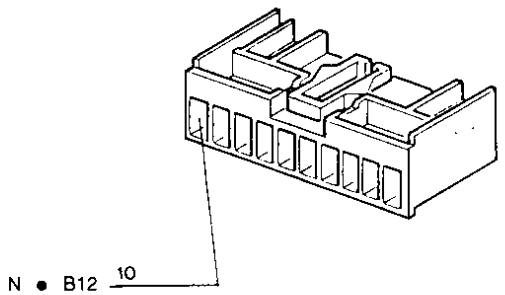
33.90.005

Central fusebox	G95 D



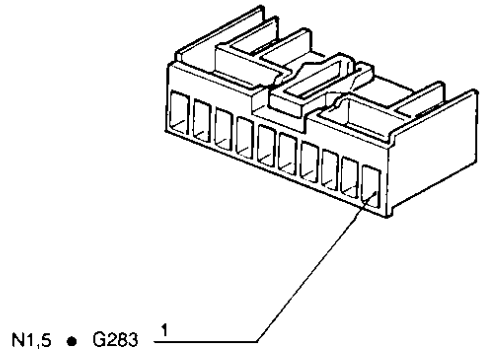
33.90.004

Central fusebox	G95 F



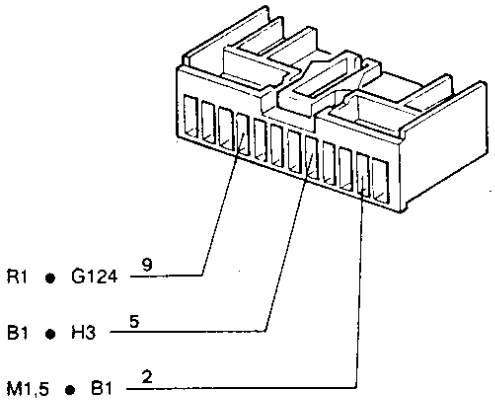
33.90.005

Central fusebox	G95 G



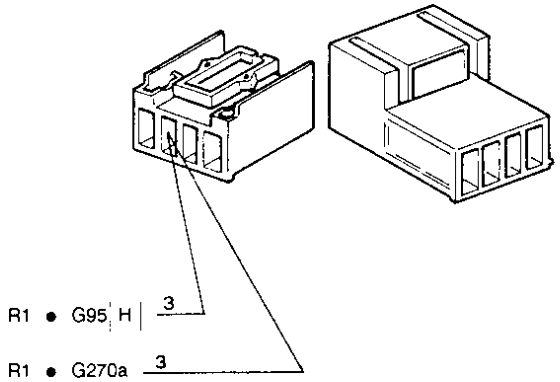
33.90.005

Central fusebox	G95 H



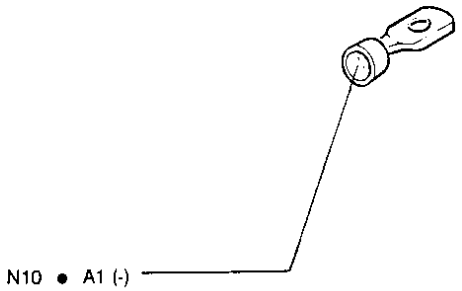
33.90.004

ABS system connector	G124



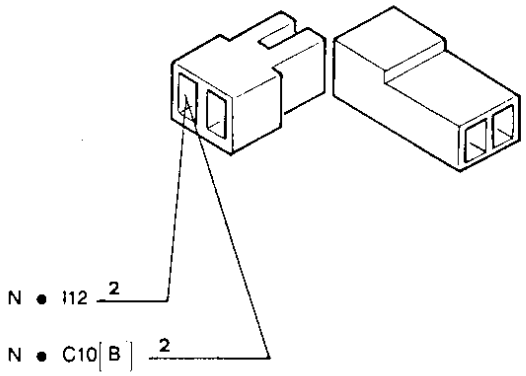
33.90.018

Central service compartment earth	G143



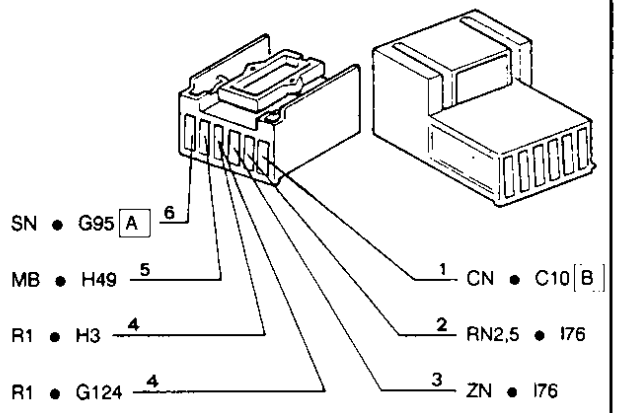
33.90.001

Glove oompartment lamp connection	G269



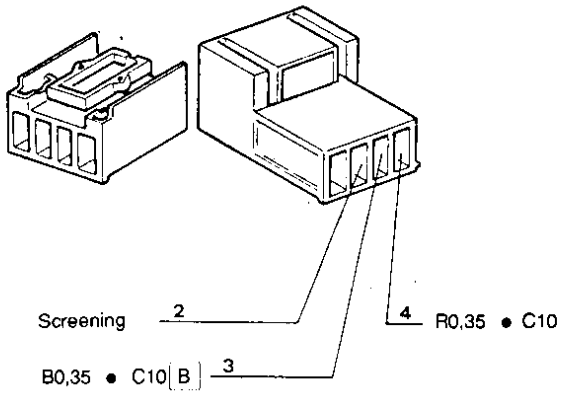
33.90.013

Dashboard wiring - four-wheel drive wiring connection (6 way) — G270a



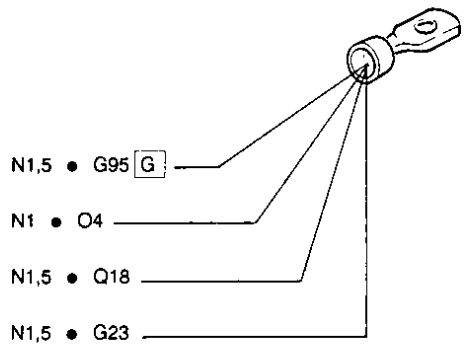
33.90.036

Dashboard wiring - four-wheel drive wiring connection (4 way) — G270b



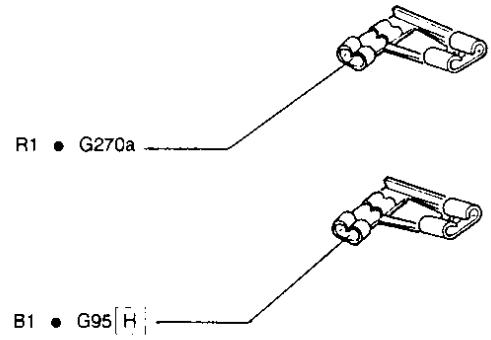
33.90.018

Earth on left service compartment — G283



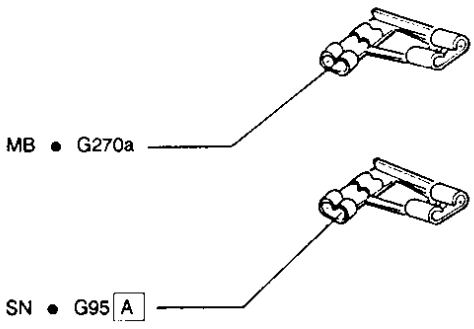
33.90.001

Stop light switch — H3



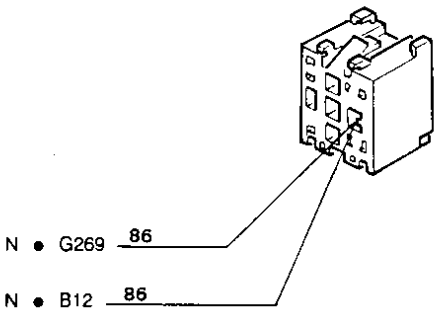
33.90.037

Supplementary stop light switch — H49



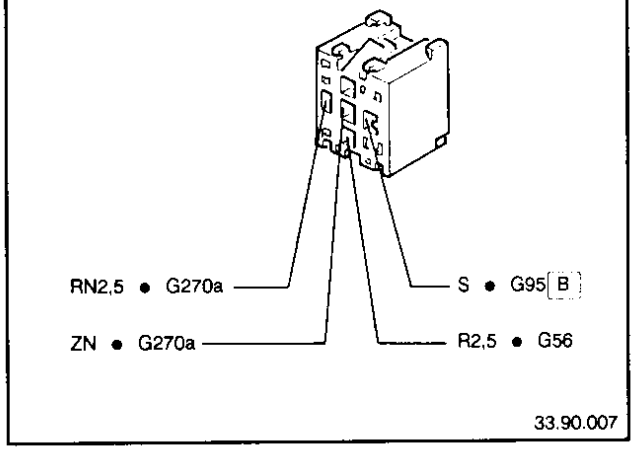
33.90.037

Front power window relay — I12



33.90.007

Four wheel drive supply relay	I76



For what is P2 better then P4?

+ less jerking on low rpm
+ no jerking at all in corners yes especially in tight corners
+ you have lower consumption, especially “grandma” drivers
+ you have higher TOP SPEED
+ it's easier to drive it in city at cruising speed
+ especially on long distances you somehow have feeling that it glides in comparison to driving with 4x4 engaged
+ yes now you can pull up hand brake and it will block rear wheels, like normal FWD car do it's handy in some situations
+ you'll have a bit smaller turning radius, helps when parking
+ definitively your clutch has less stress
+ better acceleration above some 120km/h

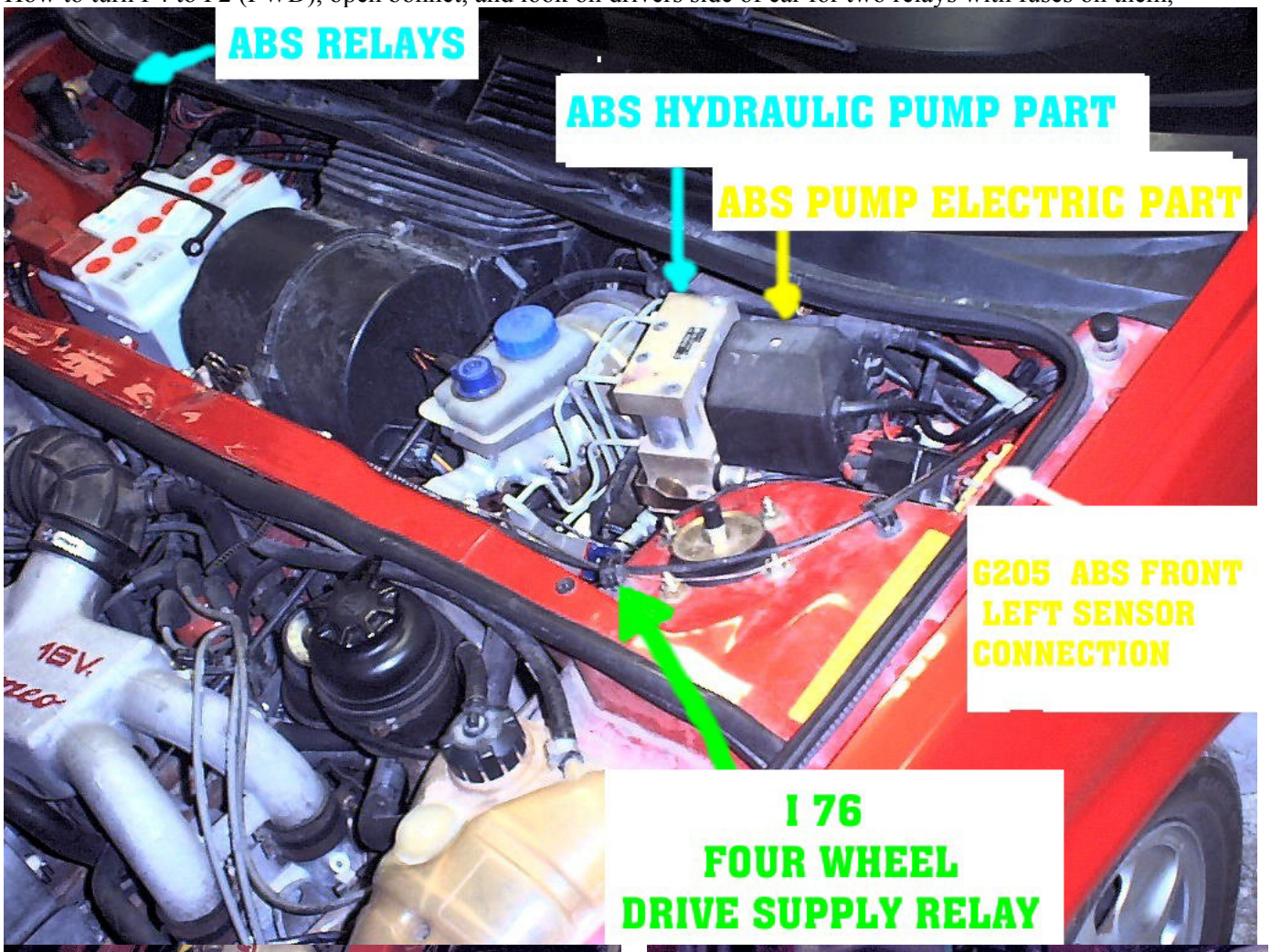
For what is P2 worse then P4?

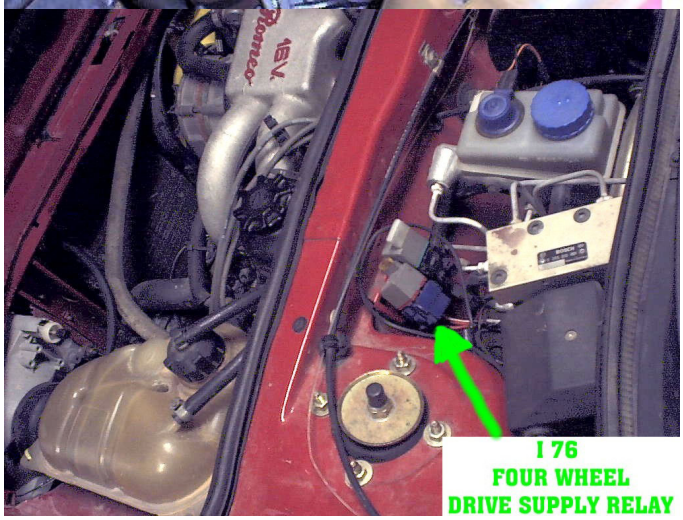
- first few days until you learn to drive it like FWD car, you won't be able to start without wheel spin
- you have slower accel. up to 120km/h because of wheel spin
- if you drive it hard you'll have wheel spin until you pass around 100Km/h, so you'll have to compensate with steering wheel just to stay on track which means no more one hand on wheel driving
- IT WILL HAVE EVEN LONGER BRAKING DISTANCE, because P4 is transferring some of braking force to back wheels with drive shaft until braking force exceed 0.2 G this is especially obvious if you have ABS
- you'll have trouble while climbing on sidewalk (normal way of parking car in my country) again
you'll have wheel spin
- yours front tires will wear more then back tires
- you'll find out that car is no more neutral in high speeding corners (you'll have under steer), and
you'll have feeling that yours car sways, you'll maybe want to put on front shocks sway bar because of it car somehow easier passes corner but you don't have that P4 feeling that it stays hard on ground with all four wheels (I missed it so much that I almost bought sway bar)
- also until you learn to drive it or ie computer learns first few day you won't see any difference in fuel consumption but after that passes, you'll be happy, if you drive like maniac all day long don’t expect big fuel saving. With P4 and yellow fuel lamp turn on I could do 50Km normal city drive, now with P2 if I'm extra careful even 90Km, while on normal drive I have some 65-70Km, normal city consumption has on my car has fallen from 13lit/100km to some 11.5lit/100km on free way it isn’t that large before on freeway I had 7.5lit/100km (in 5th on some 3-4000 rpm, around 120 km/h) now it's 6,5 lit/100km I don't think that it can go any lower than that without lowering to 2000-2200 rpm in 5th but many people know that 1900-2200 rpm is critical for Alfa boxer, because on that rpm engine wears much more so I don't like driving it lower then 2500 on long runs.

In case you didn't know DON'T EVER pull handbrake with engaged 4x4 you risk of swaying drive shaft, because we don't have central diff. we have el. clutch which acts like one, but only when you brake with foot brake.
Only reason for pulling it in drive with 4x4 is when you can't stop on time, and you risk damaging all of your car, it won't lock rear wheels but you'll have shorter braking distance and because it don't lock your rear wheels you won't spin your car, like on FWD you would.

How to TEST it without placing switch, to see if I like my P4 turned into P2?

How to turn P4 to P2 (FWD), open bonnet, and look on drivers side of car for two relays with fuses on them,





one that is closer to shock absorber should be el. clutch relay (with blue stand) come to relay red, red-black, purple-black, pink) so you can't miss it. Take fuse out or even whole relay, in any case with that el. clutch won't get electricity, also 4x4 warning lamp will ignite, which will tell you that computer found error and just disconnected further monitoring of all 4x4 system in car, which means that with it you disconnected all electric 4x4 systems in car, and you don't have to be afraid of damaging any, yours drive shaft will continue to turn but it will not transfer any Nm to rear wheels.
Don't be afraid that 4x4 is ignited because it's good thing, because it means that all 4x4 electronic is shut down.
Drive car and enjoy in P2.
After that to drive P4, turn off ignition, place back fuse (relay) and ignite car, and drive as again P4.

Do I need switches?

Well you don't if you don't look forward to those few gains mentioned from start or you tested it and didn't like it, or you like it but you think that opening bonnet every time you want to change from FWD to 4x4 or from 4x4 to FWD isn't hard.

I'm making this document to all those "lazy" people that like me think it's too much bother opening bonnet and getting out of seat, taking out fuse in let say brand new suit and dirtying yours hands and getting back to car.

What is purpose those of switches?

4x4 switch

+ you don't have to stop car, and open bonnet, and take fuse out or put it in, which can be interesting if it starts to rain and you want to transfer P2 to P4

4x4 reset switch

+ you don't need to turn off ignition and turn it back on, just to turn ON 4x4 computer and electronic, because once 4x4 yellow light ignite (error detected) 4x4 computer will disengage all 4x4 electronic and won't try to engage until you turn off/on car.

How do I operate those switches once I install them?

Best way to disengage 4x4:

1. is to stop car,
2. turn off car ignition
3. switch 4x4 to disengage
4. turn on car ignition

If you are in a hurry you can skip points 2. and 4.

Best way to engage 4x4:

1. is to stop car
2. turn off car ignition (if you have 4x4 reset switch you can leave car running)
3. switch 4x4 to engage
4. turn on car ignition (or just reset 4x4 system by 4x4 reset switch)

It is important that you stop car before engaging/disengaging 4x4 system, but if it is necessary you can engage/disengage 4x4 system at your own risk while car is moving at nearly constant velocity/speed but it is in neutral (none of gears) gearshift position.

NEVER:

- engage 4x4 when braking or accelerating fast
- disengage 4x4 when accelerating

Making switch

There are two switches, 4x4 electronic clutch power switch and 4x4 computer reset switch (as option you can make third switch which will turn on/off 4x4 orange warning light on instrument panel by cutting and inserting additional switch to amber-black wire which is first wire on G270a connector). There are two ways of doing 4x4 electronic switch one is to cut ZN (purple black) or S (pink) wire on I76 relay but since you need to open central console to make 4x4 computer reset switch I'll describe second way which include cutting (purple black) ZN wire which is #3 wire on G270a connector. Electronic scheme you can see page or two down, you'll need 2 switches (20A or more preferred) one is for 4x4 switch and it is normal switch (if you can find original Alfa Romeo switch like for fog lights/all 4 direction lights/rear window defogger) other switch 4x4 reset switch should be momentary switch (like reset switch on computer) but normal will work also only you'll have step more to do, 6-7 meters/yards of 2,5mm^2 car wire, flat and cross screwdrivers, scalper or similar sharp object with which you'll cut wire and strip it (take off plastic/rubber electric insulation), electric insulator tape (or any electric insulator spray) .

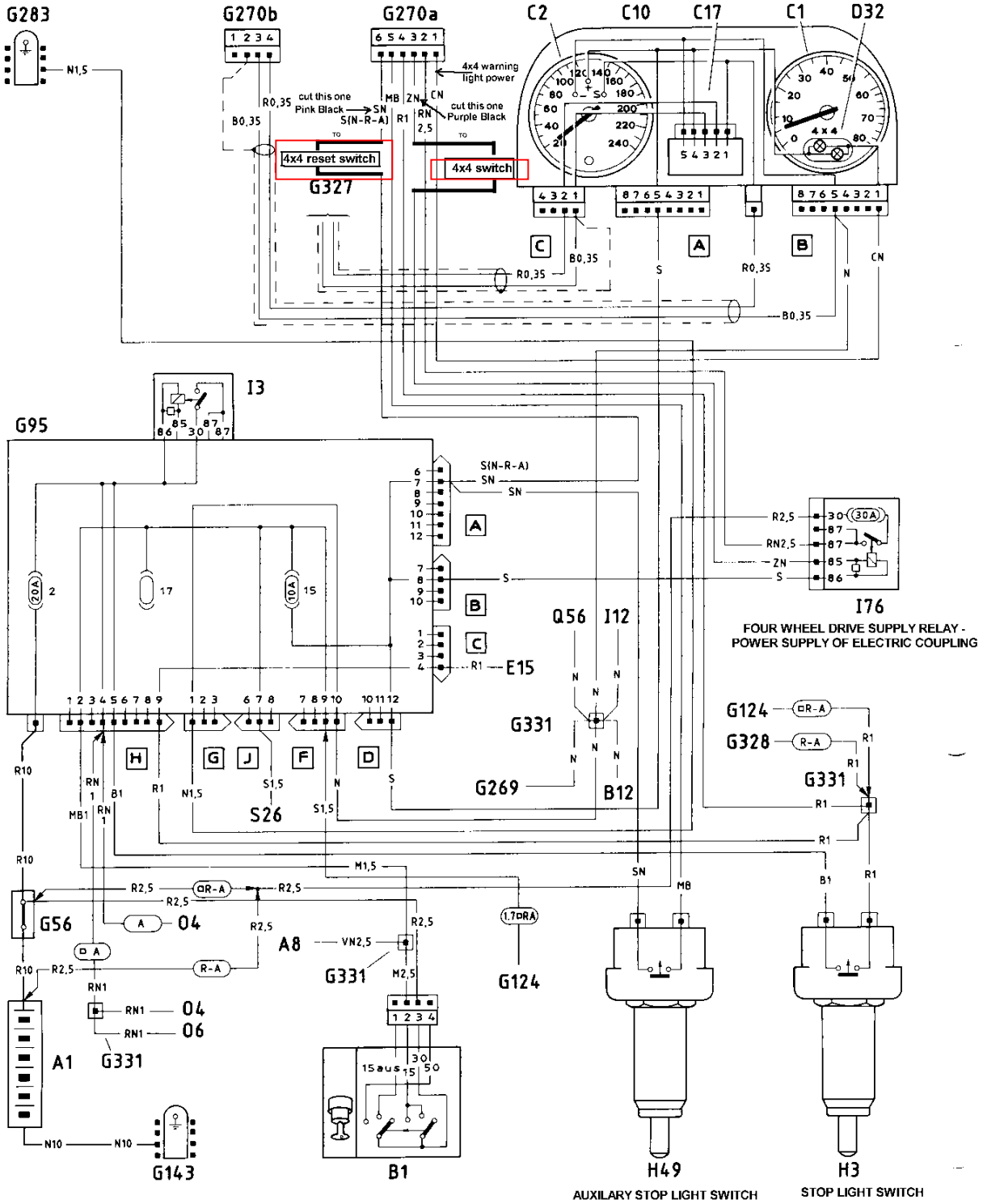
First you have to decide where in cabin would you like to have those switches, best place for them would be on lowest part of central console, between hand brake and ash tray since it's closest of connector and less wire we have, less resistance (ohms) we insert to 4x4 system, second best place for it would be on drivers shelf between steering wheel and central console, last place should be between steering wheel and driver door (this is not desirable location as you need long wires to reach that location but to me it is most ergonomic and esthetic place) , so you need to sit little in drivers seat and move hands around and see which location suits you best I recommend first as it's closest to connector.

0. take screwdriver and unscrew drivers (4 upper,2 lower screws) and co drivers shelves (2-3upper, 2 lower screws)/ if you can reach G270a connector behind ash tray and shelf above it by removing those two go to step 4. but I couldn't
1. take flat screwdriver and take out air ventilation mask and all three ventilation tunnels behind it on central console, take it out
2. take flat screwdriver and open plastic cap to access cross screw on rear part of central plastic which protects handbrake it is just after rear ash tray at rear seats, take it out
3. take off leather/plastic thing around gearshift knob, unscrew two screws that are behind ventilation system at upper part of central console, also unscrew two screws holding it in middle, and at last unscrew last one near handbrake (maybe you'll need to loosen an bit plastic L pieces around central console, so you may need Super ATTAK or any other glue when putting it back on)
4. find G270a and G270b connectors and locate wire #6 SN (pink-black) or S (pink) depending which side of G270a connector you're looking at, strip wire and cut it after that connect both new ends of SN wire to 4x4 reset switch with 2.5mm2 car wires, insulate with tape all connections
5. locate wire #3 ZN (purple-black) of G270a connector, strip wire and cut it after that connect both new ends of ZN wire to 4x4 switch with 2.5mm2 car wires, insulate with tape all connections
6. make holes and install switches on central console or wherever you decided to put them
7. start car and test both switches, when you press 4x4 switch it should disengage el. Coupling which will result click noise followed by lighting up 4x4 warning light depress switch and you'll see that nothing happens, yellow light is still on because until you reset 4x4 computer it wont try to reengage coupling, after you press 4x4 reset switch, yellow lights will turn off you'll hear click noise which is el. Coupling engaging and if all is OK yellow light will stay off, now press foot brake pedal to see if system is OK if each time you press brake pedal hear clicking sound from el. Coupling then yours system has too much wire and to high resistance is added to 4x4 system (unless yours car did that before you installed switch in which case you do not need to worry, my didn't) and computer each time you press brake pedal calculates (what computer uses to calculate 0.2G I still don't known, I can only guess) that we have excided 0.2 G force limit in braking and it disengages drive shaft it isn't that bad if rear brake pressure valve is working OK but it would be better that we don't have this side effect. Take car for spin to see if it acts as before with 4x4 engaged.
8. If all is OK and yellow light don't come after some time of driving and braking, screw back all parts of console and shelves.
9. CONGRATULATIONS ON SUCCESSFULLY INSTALLING 4X4 SWITCH

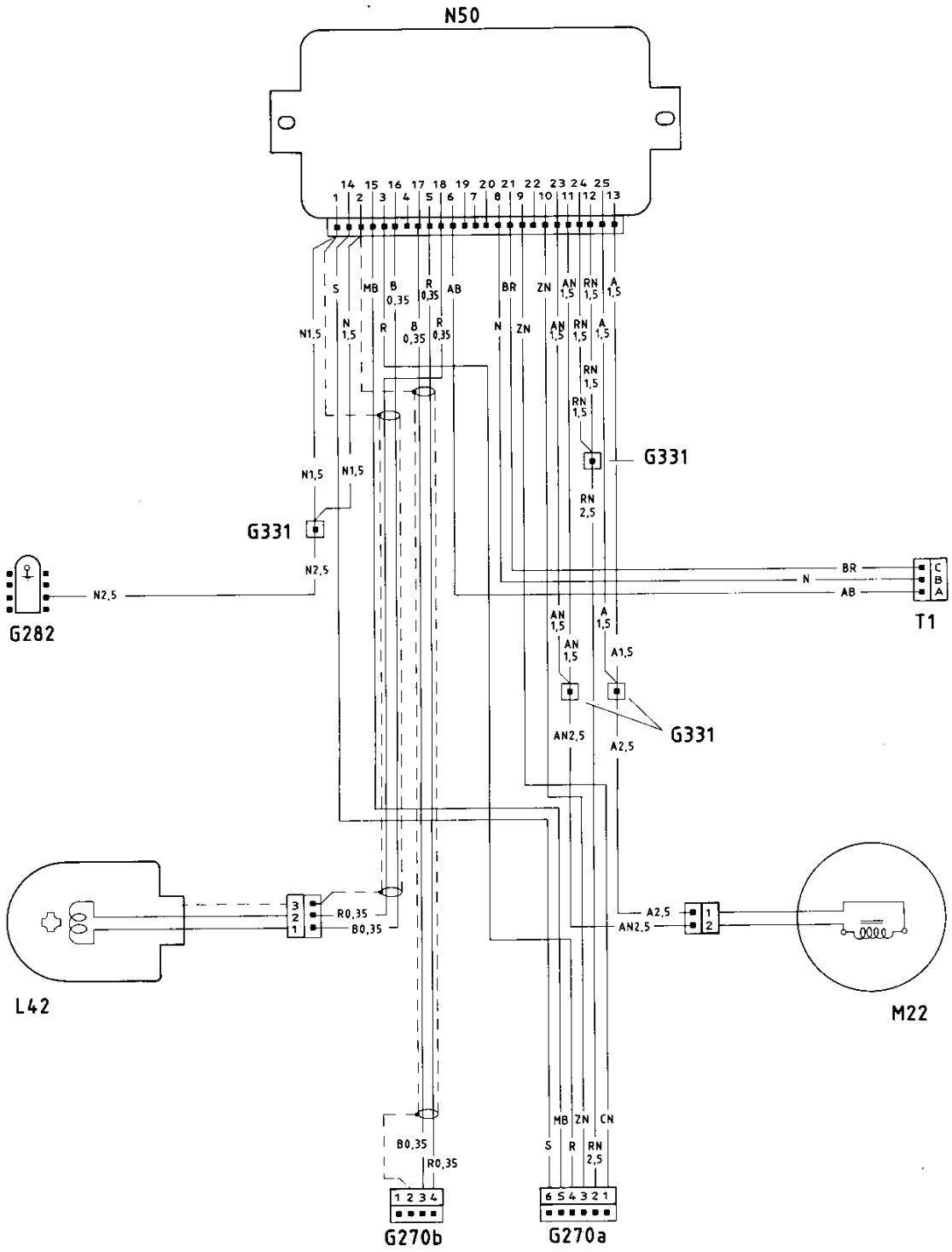
On following page 30 (298 page of wiring diagram) you can see electric wiring scheme of both switches installed on one side of G270a connector of 4x4 system, but you can also install it on other side of that connector which leads to 4x4 computer at end of car N50 page 31 (seen on page 297 of wiring diagram).

Wiring scheme of 4x4 switch and 4x4 reset switch on front part of 4x4 system.

PERMANENT FOUR-WHEEL DRIVE (Diagram B)



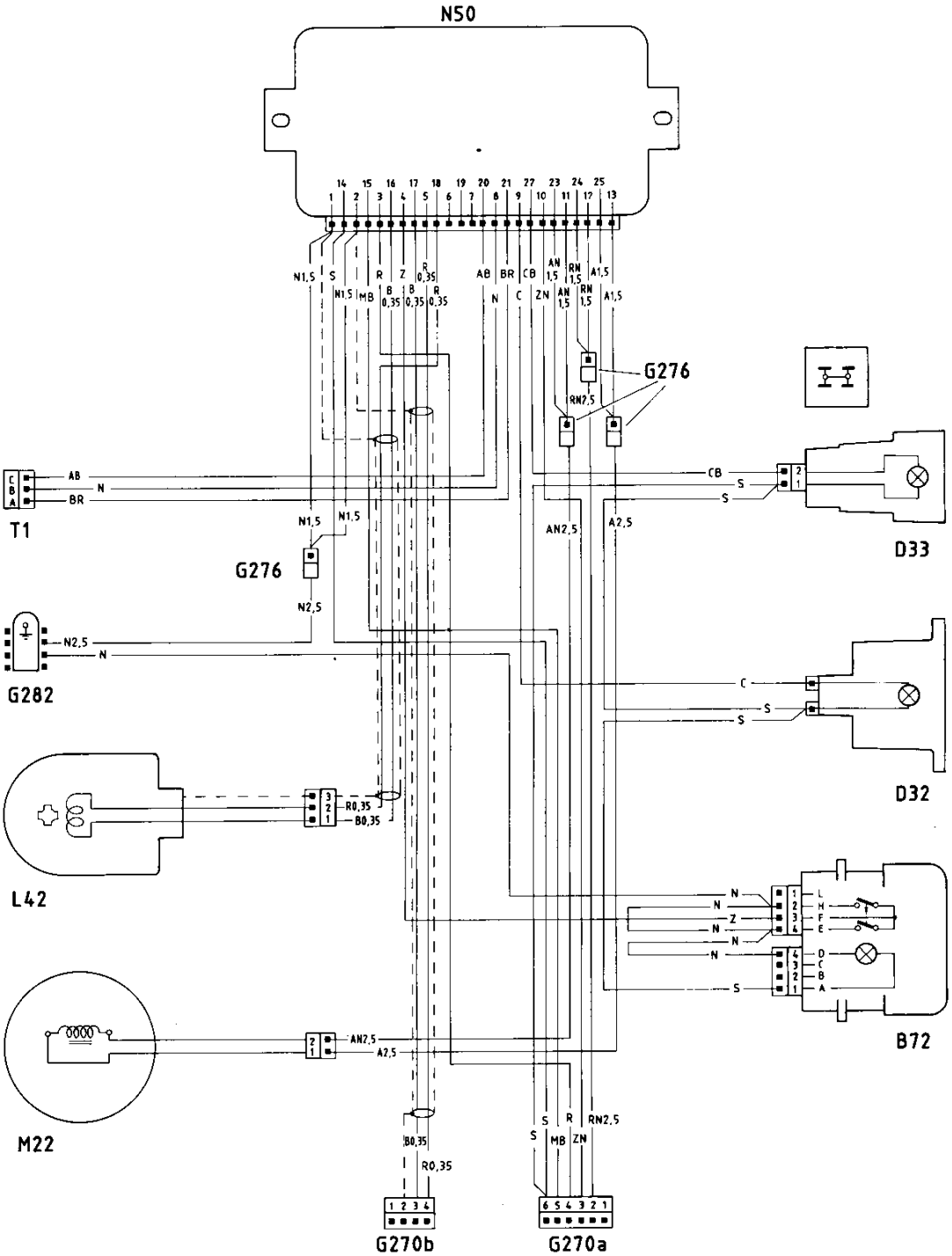
PERMANENT FOUR-WHEEL DRIVE (Diagram A)



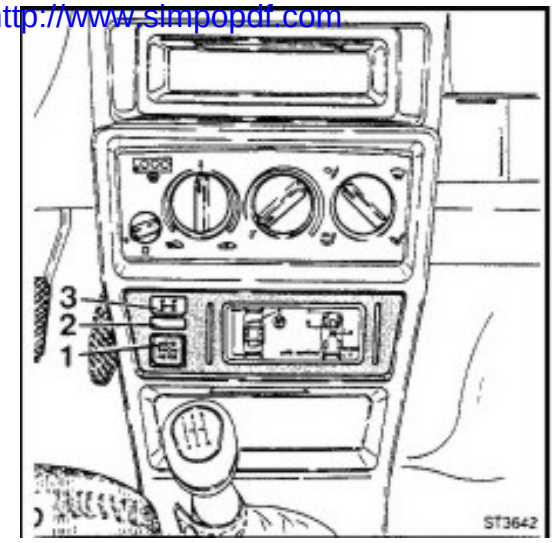
This is wiring diagram of Alfa 33 ie 4x4 car that originally comes with 4x4 switch installed and best way (factory way) would be for us to make exact copy of that or take (from scrap yard) whole rear 4x4 system of that car, computer, wires and switch, and install it in ours P4. Both N50 units work in same way they disconnect power to el. Coupling when you brake and engage it moment later. Of course 4x4 N50 units probably has implemented support for 4x4 while ours have not. ORIGINAL 4x4 SWITCH IS PLACED NEAR FRONT ASH TRAY.

Wiring diagram (Diagram A)

FOUR-WHEEL DRIVE 33 1.7 IE 4x4

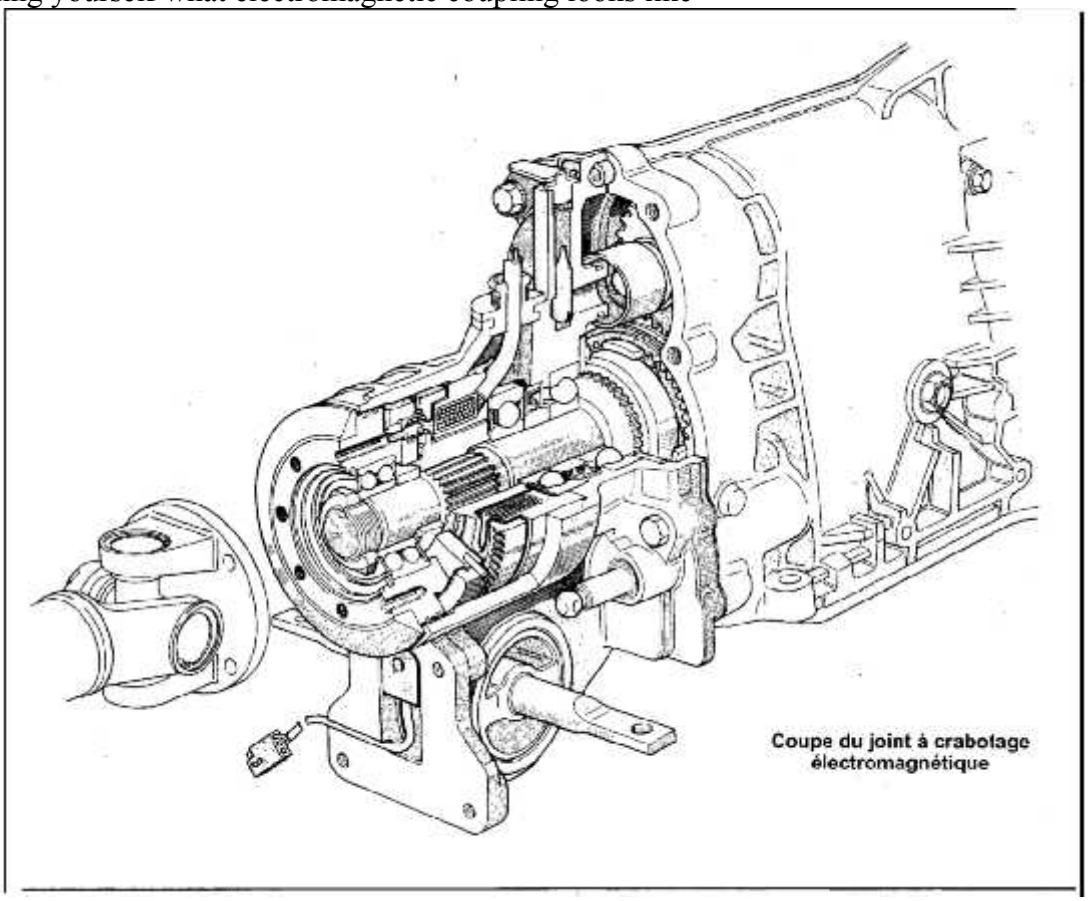


Switch inside my Permanent 4



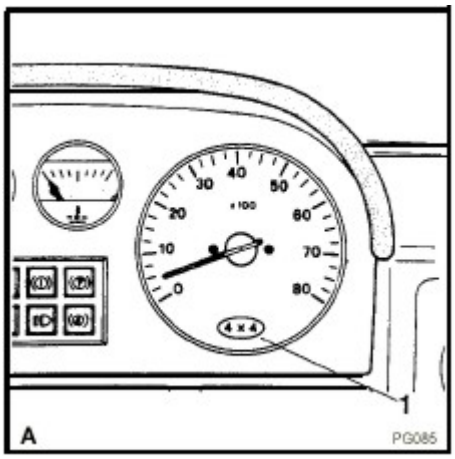
Original position of 4x4 switch on 4x4 Alfa, best position for installing both switches.

If you are asking yourself what electromagnetic coupling looks like



so now you know what expensive part you can damage if you play with 4x4 system and install/use 4x4 switch also you can see on it exactly electromagnetic coil and tooth mesh sensor if you look at it carefully.

WHAT YOU MUST KNOW WHEN DRIVING PERMANENT 4

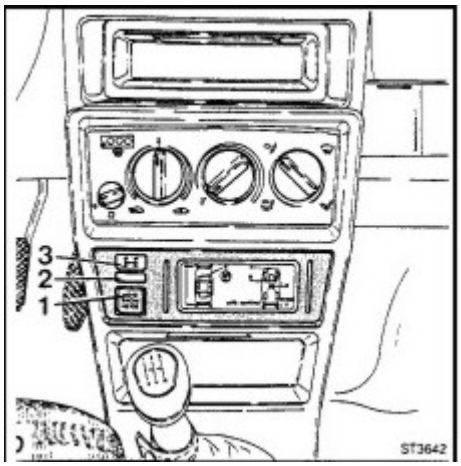


1 - Permanent 4WD failure warning light. The system comprises an electromagnetic coupling controlled by an electronic control unit for engaging the drive. The system has a self-diagnosis unit and a special warning light (1) to alert the driver in the event of the any system failures. Drive transmission also takes place through a viscous joint in an intermediate position from the propeller shaft.
Warning: The electromagnetic coupling is engaged by turning the ignition key to position 2 (key-controlled services ON). If the vehicle is to be towed, turn the ignition key to position 1 (key-controlled services OFF) **without removing the key so as to** disengage the electromagnetic coupling.

Warning
Avoid utilizing the vehicle in a manner different to that for which is was designed: it is therefore recommended not to use it as an "all terrain" vehicle. Furthermore follow the precautions listed hereunder:
- utilize tires of the same type and dimensions on all four wheels and ensure that inflation pressures are always those pre-scribed;
- always check brake efficiency after having crossed muddy, sandy or wet terrains;
- when the fitting of snow-chains is required, remember that these must be mounted onto the **front** wheels;
- never tow the vehicle by raising the rear wheels only (front wheels in contact with the ground) to avoid serious damage to the mechanics. In the case of absolute necessity only, tow the vehicle in this way only after insertion of a rotating platform under the front wheels and with the ignition key in position 1 key controlled services OFF and electromagnetic coupling disengaged
- dynamic balancing, with wheels installed on the vehicle, must be carried out with the ignition key in position 1 (ignition controlled functions cut out) in order to disconnect the electromagnetic coupling;
- before carrying out power or brake testing with a roller test bench, remove the fuse protecting the electromagnetic coupling in order to disconnect it.
An Authorized Alfa Romeo Service Station should carry out these operations.

Getting towed
When being towed, secure the towing link to the bracket shown in figure A. Turn the steering lock/ignition switch key to the position "1" (see page 34) and left **in** (key controlled services OFF and for Permanent 4 version electromagnetic coupling **disengaged).**
Warning
- When towing, care should be taken that any hauling local regulation is strictly adhered to.
- When the vehicle is being towed no power assistance is available to the brake system; a substantially greater pedal effort will therefore be needed to obtain effective braking.
- If the vehicle is equipped with power steering, the circuit is not active with the engine at rest and it is therefore necessary to exercise more force on the steering wheel.
- Never withdraw the key from the steering lock/ignition switch because it is possible for the steering lock to engage **accidentally.**
- Never tow the vehicle with only the rear wheels raised from the ground (front drive wheels on the road) to avoid serious mechanical damage. If it cannot be avoided use this system only after placing a rotating platform under the front wheels and turn the steering lock/ignition switch key to the position "1" (key controlled services OFF and for Permanent 4 version electromagnetic coupling disengaged).
- When getting towed, on 4WD version, **disengage** the four-wheel drive.
Towing
When taking another vehicle in tow, secure the towing link to the bracket on the underside of the boot as shown in figure 6 or C (4WDversions).
Note for 4WD versions
TO facilitate towing of another vehicle, it is advisable to engage the four-wheel drive.

WHAT YOU MUST KNOW WHEN DRIVING 4x4 WHEEL DRIVE



1 - Push-button to engage 4WD
2 - Self-diagnosis system warning light
3 - 4-wheel drive engagement warning light.

The system is composed of a rear differential coupled to the engine unit by a propeller shaft fitted with an electromagnetic coupling; this mechanical device is controlled by an electronic control unit. Engagement of 4WD is possible **at any vehicle speed** and is actuated by a push-button (1).

Avoid maneuvering on high-adhesion road surfaces with the wheels steered to locks and the **4WD engaged.** Under this condition, even though the reliability and strain resisting capabilities of the cars mechanical components are not impaired, the vehicle will result in a braking action.

The device is provided with **a** self-diagnosis system and a special warning light (2) on the dashboard, signaling any possible faulty condition of the control unit, the electromagnetic coupling and the sensors. In such a case, 4WD is automatically disengaged thus preserving safety and reliability levels. 4WD engagement is signaled by warning light (3).

Note

Thanks to a series of sensors, the system optimizes functionality and reliability in any condition:

- inhibiting engagement in case of speed difference between front and rear wheels;
- disengaging 4WD in case of Sharp braking and automatically engaging it when the brake pedal is released.

The system is also fitted with a mesh-control safety device, the operation of which is based on the detection, performed by a coil installed near the coupling, of electromagnetic noises due to mesh failure. Said safety device operates upon engagement driven either by the push-button switch or by brake pedal release (after intervention of brake safety device).

How to chose which drive to utilize

Front-wheel drive only: this is most suitable on normal, dry roads, as it allows maximum savings in fuel consumption, a more comfort-able drive and lower wear of mechanical parts.

4WD: this must be utilized in all those circum-stances when the road presents low adhesion values, I.e. disconnected, wet, snowy or muddy roads and on sandy or muddy routes.

In general: it is recommended to utilize front wheel drive whenever road or atmospheric conditions do not expressly required the use of 4WD.

Warning

Avoid utilizing the vehicle in a manner different to that for which it was designed: it is therefore recommended not to use it as an “all terrain” vehicle. Furthermore follow the precautions listed hereunder:

- utilize tires of the same type and dimensions on all four wheels and ensure that inflation pressures are always those pre-scribed;
- always check brake efficiency after having crossed muddy, sandy or wet terrains;
- when the fitting of snow-chains is required, mounted on-to the front wheels without engaging 4WD.

DISCLAIMER

All written data here are obtained by TESTING with "pick and try" method (also known as right wire-wrong wire, good-bad wire..) on my P4 and from reading all other data you can find here in pictures. All data written here present my knowledge and my own belief so they can be wrong or insufficient. If you find any data that you think is incorrect or wish to change it, adopt it or fulfill manual please let me know by sending me e-mail to tvatavuk@usa.net .Nor me or any other person has any financial benefit from making/distributing this manual.

I 'm not and will be not hold responsible for any damage electric, mechanic or any other as result of following this manual, installing and using 4x4 switch in your car. If you install switch you could damage: 4x4 control unit, instrument panel, central console, electromagnetic coupling or any other electric/mechanic part of yours car for which you and only you will be responsible. What I didn't scare you well then go and make switch, if you want that is. You wouldn't believe how much I hate when they write disclaimer with so small font size. Stop reading this you'll lose yours eyesight.

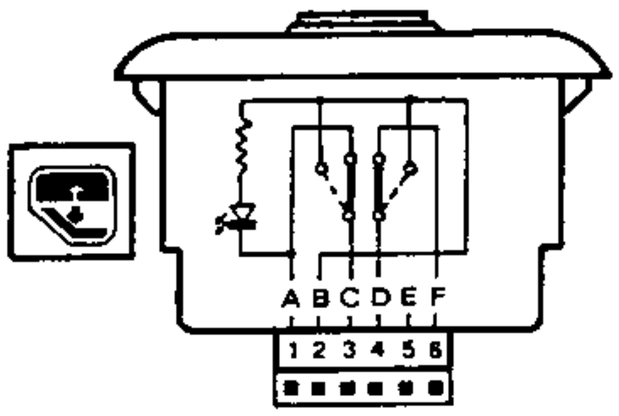
INTRODUCTION

IDENTIFICATION OF COMPONENTS

The aim of this manual is to facilitate the search for the required components and their relative connections in order to be able to identify any faults.

For clarity each electrical subsystem, as for example the starting system, heated rear window, main beam lights etc., are described seperately following 3 distinct paragraphs:

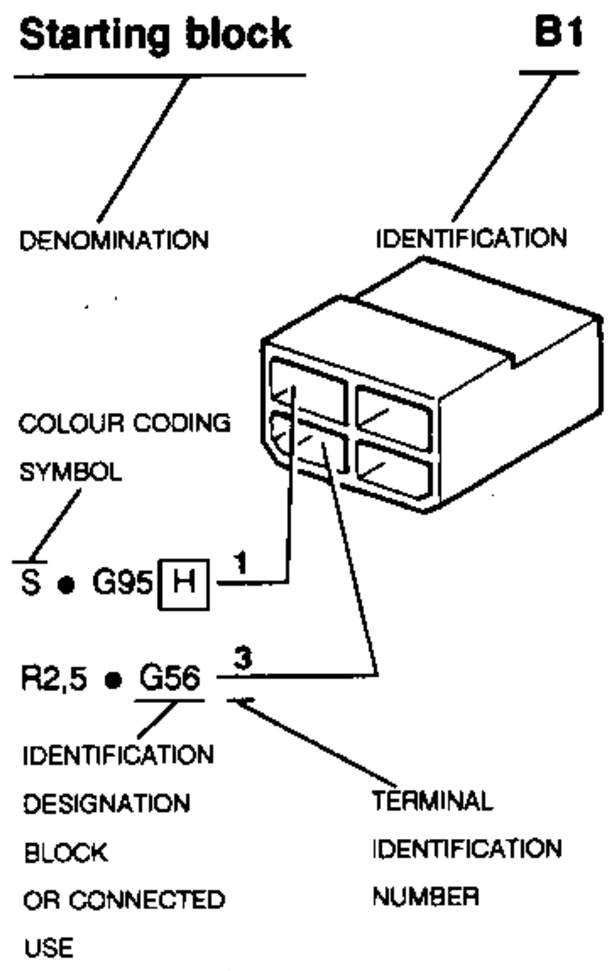
- **Wiring diagram** arranged in order to facilitate component identification and the relative connections.
  The components (shown following a lay-out that mirrors the real-life situation) are alligned on the ouside edge of the diagram and sometimes a symbol place next to the component identifies its function.
  Example:



B21

Front right power window control switch.

- **Wiring**, illustrates the arrangement of the wires and connectors on the car and also the position of the various electrical components shown with the use of lenses.
- **Connectors**, shown in charts that give information as to the nature and destination of wires connected to them according to the following example:



Each component is identified by a reference designation composed of a letter and a number (e.g.: B1). The letter identifies component type according to the following symbols:

- **A** Starting - Recharging
- **B** Manual electric controls
- **C** Instruments
- **D** Warning lamps
- **E** External lights
- **F** Interior lights
- **G** Fuseboxes - connectors - earths
- **H** Switches
- **I** Relays
- **L** Senders
- **M** Solenoids - solenoid valves
- **N** Electronic devices - intermittences - timers
- **O** Ancillary equipment
- **P** Electric motors
- **Q** Heater/ventilation - air conditioning system
- **R** Safety devices
- **S** Electronic fuel injection
- **T** Diagnosis

The key for all the components is given under the specific group.

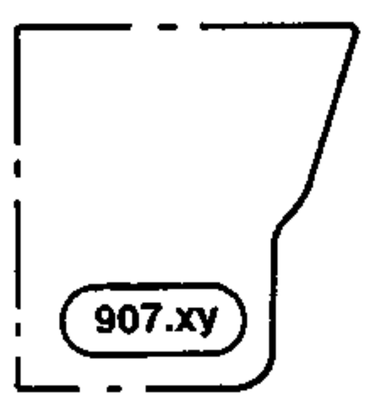
Variations

Each wiring diagram may be applicable to more than more than one model in the **33** range.

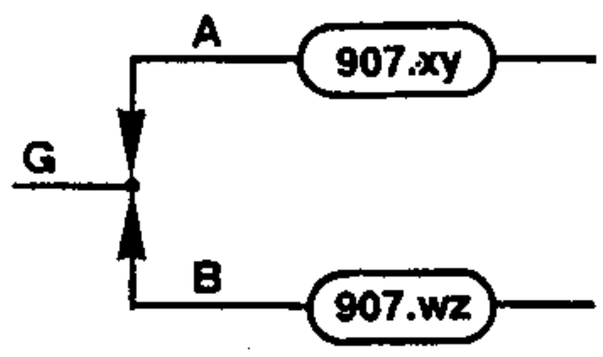
In cases where the different versions require variations in the electrical system, the wiring diagram shows each variation and where necessary duplicates the part of the circuit affected.

Any variations present between models is given in accordance with the following symbols:

- The dashed line and circled point on the diagrams, the areas conaining the specific variations for the vehicle indicated with "907.xy".

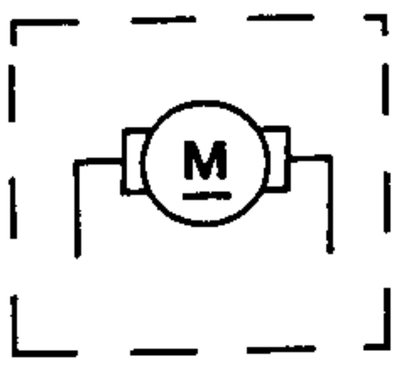


- The connection identifies two wiring variations, given as an alternative and connected in the same fashion. The variations refer to the models indicated with "907.xy" and "907.wz" respectively.



Components fitted upon request

In the wiring diagrams a dashed line encloses the components that can be fitted upon request.



IDENTIFICATION OF MODELS

The models in the **33** range dealt with in this group can be identified by way of the following tables:

MODEL 33

907.A1	33 1.7 IE
907.A1A Δ	33 1.7 IE
907.A1D	33 1.7 IE 4x4
907.A1E Δ	33 1.7 IE 4x4
907.A1B	33 Boxer 16V
907.A1C Δ	33 Boxer 16V

SPORT WAGON MODELS

907.B1	SPORT WAGON 1.7 IE
907.B1A Δ	SPORT WAGON 1.7 IE
907.B1D	SPORT WAGON 1.7 IE 4x4
907.B1E Δ	SPORT WAGON 1.7 IE 4x4

Δ Vehicles with catalytic converter.

The wiring diagrams for the **Sport Wagon** are identical to those of the **33** models of equal motorization. For this reason, apart from specific indications they will be identified using a single system of symbols following the 33 model which is:

907.A1 for the 33 1.7 IE - SPORT WAGON 1.7 IE versions;

907.A1D for the 33 1.7 IE 4x4 - SPORT WAGON 1.7 IE 4x4 versions.

CABLE IDENTIFICATION

A code composed of one of more letters and a number (e.g.: BN!) is marked on the end of each cable. The letters identify the colour of the cable and the numbers indicate its thickness (**N.B. The cable section not indicated is 0.5 mm²**).

For convenience the names of the colours have been abbreviated.

The list of these abbreviations is given below:

A	Light-blue
AB	Light-blue white
AG	Light-blue yellow
AN	Light-blue black
AR	Ligh-blue red
B	White
BN	White black
BR	White red
BL	Blue
BLN	Blue black
BLR	Blue red
Br	Dark brown
C	Amber
CB	Amber white
CN	Amnber black
G	Yellow
GB	Yellow white
GN	Yellow black
GR	Yellow red
GV	Yellow green
H	Grey
HG	Grey yellow
HN	Grey black
HR	Rey red
HV	Grey green
M	Brown
MB	Brown white
MG	Brown yellow
N	Black
No	Hazel brown
R	Red
RN	Red black
S	Pink
SB	Pink white
SN	Pink black
V	Green
VB	Green white
VN	Green black
Z	Purple
ZB	Purple white
ZN	Purple black

KEY

A: STARTING - RECHARGING

A1 Battery
A2 Alternator
A3 Alternator with integral electronic voltage regulator
A4 Voltage regulator
A5 Ignition distributor
A5a Ignition distributor A
A5b Ignition distributor B
A6 Impulse generator
A7 Rotor
A8 Ignition coil
A8a Ignition coil A
A8b Ignition coil B
A9 Coil resistance
A10 2-way connector for coil
A11 Starter motor
A12 Spark plugs
A13 Pre-heating glow plugs
A14 Alternator cable terminal board

B: MANUAL ELECTRIC CONTROLS

B1 Ignition switch
B2 Windscreen wiper control
B3 Windscreen and/or headlight washer pump control
B4 Control for side lights, flashing, low/high beam headlights
B5 Horn control switch
B6 Direction indicator light control
B7 Low beam flashing control switch
B8 High beam flashing control switch
B9 Heated rear window control switch
B10 Fog light control switch
B11 Rear fog light control switch
B12 Road hazard lights control switch
B13 Passenger compartment front roof lamp control switch
B14 Passenger compartment rear roof lamp control switch
B15 Passenger compartment roof lamp control switch
B16 Cluster lighting dimmer rheostat
B17 Gearbox oil level warning light switch
B18 Front right door-locking control switch
B19 Front left door-locking control switch
B20 Interior door-locking switch
B21 Front right power window control switch
B22 Front left power window control swtich
B23 Rear right power window control switch
B24 Rear left power window control switch
B25 Rear power window inhibitor switch
B26 Rear power window and rear cigar lighter inhibitor switch
B27 Front seat height adjustment control switch
B28 Front left backrest adjustment control switch
B29 Front right backrest adjustment control switch
B30 Door electric rear view mirror control switch
B31 Electric aerial control switch
B32 Windscreen washer pump control
B33 Front spot light switch
B34 Rear left spot light switch
B35 Rear right spot light switch
B36 Right door rear view mirror double control switch
B37 Parking light control switch
B38 Rear window wiper control switch
B39 Trip odometer recall microswitch
B40 Trip odometer reset microswitch
B41 VF electronic rheostat
B42 Lamp dimmer rheostat
B43 Internal control switch for door unlock
B44 Rear spot light control switch
B45 Recognition light control switch
B46 Two-tone horn control switch
B47 Sunroof motor control switch
B48 Interphone system control switch
B49 Talk/listen switch
B50 Siren control switch
B51 Driver's seat heater control switch
B52 Front right seat longitudinal adjusting switch
B53 Front power window full acting switch
B54 Front left seat longitudinal adjusting switch
B55 Luggage compartment opening control switch
B56 Rear right seat adjusting device switch
B57 Rear right seat heating device switch
B58 Rear left seat adjusting device switch
B59 Rear left seat heating device switch
B60 Cluster warning light operation check push-button
B61 Fuel filler cap opening switch
B62 Front right seat heating device switch
B63 Front right seat height adjusting switch
B64 Cruise control "OFF", "RESUME" switch
B65 Cruise control "SET ACC.", "SET DEC." switch
B66 Position/Hazard/Fuel flap light control push-button panel
B67 Controlled damping suspension shock-absorber control board
B68 Combination switch unit
B69 Headlight aiming control device
B70 Rear windscreen washer-headlight washer windscreen washer pump control
B71 Front electric window double control switch (LH and RH)
B72 Four-wheel drive control switch
B73 Vehicle lift switch
B74 Vehicle lower switch
B75 Driver's seat memory panel
B76 Front right-hand seat lumbar support regulation switch
B77 Front left-hand seat lumbar support regulation switch
B78 Front right-hand seat rear tilt regulation switch
B79 Front left-hand seat rear tilt regulation switch
B80 Front right-hand seat vertical - longitudinal regulation switch
B81 Front left-hand seat vertical - longitudinal regulation switch
B82 Front right-hand seat front tilt regulation switch
B83 Front left-hand seat front tilt regulation switch
B84 Front rifht-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B85 Front left-hand rear tilt, front tilt, longitudinal and vertical regulation switch unit
B86 Front left-hand seat heating switch
B87 Boot release switch with glovebox light
B88 Light dimmer rheostat (DIM-DIP)

C: INSTRUMENTS

C1 Electronic rev-counter
C2 Electronic speedometer
C3 Voltmeter
C4 Fuel level gauge
C5 Oil pressure gauge
C6 Coolant temperature gauge
C7 Clock
C8 Space free for instrument
C9 Turbo charger air pressure gauge
C10 Cluster (*)
C11 ALFA ROMEO Control display
C12 Performance gauge display
C13 Optoelectronic cluster
C14 Warning lamp panel
C15 Door lock actuated LED
C16 Display check with clock
C17 Odometer module on instrument panel

KEY

D: WARNING LAMPS

D1 Alternator warning lamp
D2 Direction indicator light warning lamp
D3 Tail light warning lamp
D4 High beam warning lamp
D5 Brake fluid low level warning lamp
D6 Heater/ventilation warning lamp
D7 Handbrake warning lamp
D8 Fuel reserve warning lamp
D9 Choke warning lamp
D10 Handbrake brake fluid level warning lamp
D11 Engine oil minimum pressure warning lamp
D12 Pre-heating glow plug warning lamp
D13 Engine coolant maximum temperature warning lamp
D14 Maximum air pressure warning lamp
D15 Low fuel pressure warning light
D16 Warning lamp free
D17 Gear position warning lamp
D18 Manual injection advance warning lamp
D19 Brake pad wear warning lamp
D20 Rear drive engagement warning lamp
D21 ALFA ROMEO Control warning lamp
D22 Heated rear window warning lamp
D23 Hazard lights warning lamp
D24 Rear fog light warning lamp
D25 Fog light warning lamp
D26 Injection diagnosis warning lamp
D27 ABS System warning lamp
D28 Recognition light warning lamp
D29 Ignition/anti-knock diagnosis warning lamp
D30 Gearbox oil level warning lamp
D31 Antitheft LED
D32 Four-wheel drive system malfunction warning light
D33 Four-wheel drive engaged warning light
D34 AIR-BUG warning lamp
D35 Vehicle lift warning lamp
D36 Right direction indicators and hazard warning lights warning lamp
D37 Left direction indicators and hazard warning lights warning lamp
D38 "Sidelights on" warning light
D39 "Brake light on" warning light
D40 "Instrument panel warning light on" warning light
D41 Low engine oil level warning light
D42 Low engine coolant warning light

E: EXTERNAL LIGHTS

E1 Front direction indicator light
E2 Front position light
E3 Front direction indicator and position light
E4 Front side marker light
E5 Low beam light
E6 Low beam with incorporated side light
E7 High beam light
E8 Low and high beam light
E9 Side indicator light
E10 Fog light
E11 Rear direction indicator light
E12 Rear side marker light
E13 Rear side light
E14 Reverse light
E15 Stop light
E16 Rear fog light
E17 Numberplate light
E18 Stop and rear side light
E19 Rear right light
E20 Rear left light
E21 Inspection light
E22 Recognition light
E23 Front right optical unit
E24 Front left optical unit
E25 Right rear light (fixed part)
E26 Left rear light (fixed part)
E27 Central rear light (mobile)
E28 Third stop light
E29 Supplementary dipped beam light
E30 Rear central foglight/right-hand reversing light
E31 Rear central foglight/left-hand reversing light

F: INTERNAL LIGHTS

F1 Passenger compartment front roof lamp
F2 Passenger compartment rear roof lamp
F3 Passenger compartment roof lamp
F4 Engine compartment lamp
F5 Luggage compartment lamp
F6 Door open signalling light
F7 Fuse light
F8 Heater/ventilation controls lighting lamp
F9 Glovebox light
F10 Ashtray light
F11 Map light
F12 Cluster light
F13 Front spot light
F14 Rear right spot light
F15 Rear spot light
F16 Ignition switch light
F17 Switch illumination light
F18 Rear spot light
F19 Passenger compartment right-side courtesy light
F20 Passenger compartment left-side courtesy light
F21 Right-side spot light with switch
F22 Left-side spot light with switch
F23 Right inner side footboard courtesy light
F24 Left inner side footboard courtesy light
F25 Courtesy mirror light on sun visor
F26 Gear shift lever plate light
F27 Light signalling front-right door opened
F28 Light signalling front-left door opened
F29 Light signalling rear-right door opened
F30 Light signalling rear-left door opened
F31 Front-right door opened ground light
F32 Front-left door opened ground light
F33 Rear-right door opened ground light
F34 Rear-right door opened ground light
F35 Central roof lamp with passenger compartment lighting controls
F36 Courtesy light with controls on rear right upright
F37 Courtesy light with controls on rear left upright
F38 Automatic gear control light
F39 Central air vent light
F40 Right-hand air vent light
F41 Tunnel air vent light
F42 Left-hand air vent light
F43 Seat control panel light
F44 Central passenger compartment rooflight

G: FUSE BOXES - CONNECTIONS - GROUNDS

G1 Fusebox
G2 Auxiliary fuse box
G3 Fuse box terminal
G4 Flying fuse box
G5 Multiple connection
G6 Multiple connection B - cluster
G7 Multiple connection R - cluster
G8 Single connection
G9 Connection between front left door wiring and door mirror switch

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G10 Connection between front right door wiring and door mirror switch
G11 Connection between board wiring and rear wiring
G12 Connection between board wiring and mirror switch
G13 Connection between board wiring and console wiring
G14 3-way connection between board wiring and door wiring
G15 2-way connection between board wiring and door wiring
G16 6-way connection between board wiring and door wiring
G17 Connection between board wiring and front right door wiring
G18 Connection between board wiring and front left door wiring
G19 Connection between board wiring and passenger compartment roof lamp
G20 Connection for front right door-locking motor
G21a Connection for front right door-wiring
G21b Connection for front right door-wiring
G22 Connection for front left door-locking motor
G23a Connection for front left door wiring
G23b Connection for front left door wiring
G24 Connection for rear right door-locking motor
G25 Connection for rear right door wiring
G26 Connection for rear left door-locking motor
G27 Connection for rear left door wiring
G28 Connection between front right door wiring and power window switch
G28a Connection between rear right door wiring and power window switch
G29 Connection between door-locking wiring and rear power windows
G30 Connection for power windows and door lock
G31 Connection between front left door wiring and power window switch
G32 Connection between console wiring and rear right door wiring
G33 Connection between console wiring and rear left door wiring
G34 Connection for power window supply cable
G35 Connection between rear wiring and rear right side light wiring
G36 Connection for power window switch cables
G37 Connection for multiswitch, on steering column
G38 Connection for air conditioner wiring
G39 Connection for clock wiring
G40 Connection for door-locking control unit
G41 Speedometer-rev counter sensor device connection
G42 Connection between alternator and min engine oil pressure switch
G43 Connection for heater/ventilation control cables
G44 Connection for rear fog lamp
G45 Connection for headlight wash-wipe cables
G46 Connection for headlights
G47 Connection for right-side repeater cables
G48 Connection between electric door mirror and left-side repeater cables
G49 Connection available
G50 Presetting for loud speaker cables
G51 Presetting for car radio cables
G52 Fuse box ground
G53 Engine compartment ground
G53a Engine compartment ground - right side
G53b Engine compartment ground - left side
G54 Passenger compartment ground
G54a Passenger compartment ground - right side
G54b Passenger compartment ground - left side
G55 Hood ledge panel ground
G56 Branch terminal board
G57 Presetting for fuel cut-off solenoid valve
G58 Connection for cigar lighter
G59 Connection for electric rear-view door mirror
G60 Injection wiring ground
G61 Connection for ignition coil
G62 Clutch switch connection
G63 Rear ground
G63a Rear right ground
G63b Rear left ground
G64 Connection for Trip Computer - clock
G65 Coaxial cable
G66 Motronic wiring ground
G67 Motronic connection
G68 Connection A with board wiring
G69 Connection B with board wiring
G70 Connection C with board wiring
G71 Connection for warning lamp on instruments
G72 Connection for seat back adjustment wiring
G73 Connection for rear services
G73a Connection for rear right accessories
G73b Connection for rear left accessories
G73c Rear services connection (4-way)
G73d Rear services connection (4-way for Alfa Control)
G74 Connection ALFA ROMEO Control Televel rear wiring
G75 Connection between right and left roof panel services
G76 Connection for roof panel - services - right side
G77 Connection for roof panel services - left side
G78 Coonection for front door services wiring
G79 Connection for rear door services wiring
G80 Connection for board wiring
G81 Connection for front left seat back adjustment
G82 Connection for front right seat back adjustment
G83 Rear connector for fast idle device
G84 Console cable connector
G84a Central panel 15-way cable connection
G84b Central panel 12-way cable connection
G85 Front accessories connector
G86 Connection for passenger compartment roof lamp
G87 Connection for rear door-locking motors
G88 Connection for rear lights
G89 Intermediate connection A
G90 Intermediate connection B
G91 Rear door sensors ground
G92 Luggage compartment ground
G93 Windscreen frame upper cross member ground
G94 Engine compartment connector
G94a 10-way connection for engine compartment
G94b 8-way connection for engine compartment
G94c Engine compartment connection - right side
G94d Engine compartment connection - left side
G95 Centralized fuse box
G95A Connection for switches
G95B Connection for switches
G95C Connection for cluster warning lamps
G95D Connection for ALFA ROMEO Control
G95E Connection for console
G95F Connection for fog light - rear fog light
G95G Connection for combination switch
G95H Connection for LH interface
G95I Connection for RH interface
G95L Connection for clock - rheostats
G95M Connection for sunroof
G95N Connection for battery
G95O Connection for ignition switch
G95P Connection for door services
G95Q Connection for performance gauge
G95R Connection for heated rear window
G95S Connection for cluster
G95V Fuses
G96 Single connector for ALFA ROMEO Control - cluster
G97 Connection for left doors services
G98 Connection for right doors services
G99a Connection for engine dashboard A
G99b Connection for engine dashboard B

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G99c Connection for engine dashboard C
G99d Connection for engine dashboard D
G99e Connection for engine dashboard E
G100 Connection for console - doors wiring
G101 Trip Computer connection
G102 Optoelectronic cluster connector
G103 Connection for grounds to brake fluid tank
G104 Connection for roof panel left upright
G105 Connection for ashtray lamp
G106 Seat grounds
G107 Connection for fuel pump
G108 CEM wiring ground
G109 Injection wiring connection
G110 Thermostat wiring ground
G111 Connection for dashboard instruments wiring
G112a Connection A for roof wiring
G112b Connection B for roof wiring
G112c Connection C for roof wiring
G112d Connection D for roof wiring
G112e Connection E for roof wiring
G113 Connection for front left fender
G114 Connection for outside temperature sensor
G115 Connection for tow bar vehicle socket
G116 Connection for tow bar trailer plug
G117 Connection for engine compartment lamp
G118 Connection for luggage compartment lamp
G119 Courtesy mirror light connection
G120 Map light connection
G121 Car electric system connection
G122 Ignition wiring connection
G123 Pedal-board ground
G124 ABS system connection
G125 ABS system fuse box
G126 ABS system electromagnetic switch protection fuse
G127 Recognition light fuse box
G128 Transciever fuse box
G129 Two-tone horn left-side engine compartment connection
G130 Switch connection
G131 Ground on upper cover
G132 Ground on manifold
G133a Electronic ignition-injecton connection wiring A
G133b Electronic ignition-injection connection wiring B
G134 Front left upright connection
G135 Rear window back-shelf wiring connection
G136 Front side-marker intermediate connection
G137 Injection supply wiring connection
G138 Combination switch headlight unit connection
G139 Interphone system control unit connection
G140 Fuel pump intermediate connection to service panel
G141 Rear side-marker intermediate connection
G142 Engine service connections
G143 Service central compartment ground
G144 Boot lid wiring connection
G145 Intermediate connection for injection switch cables
G146 Tachymeter connection
G147 Rev-counter sensor connection
G148 Under-dashboard ground
G149 Board wiring with engine compartment right-side wiring connection
G150 Board wiring with engine compartment left-side wiring connection
G150a Additional wiring connection header with left-hand engine compartment wiring
G151. Board wiring with engine service compartment wiring connection
G152 Glow plug pre-heating timing fuse (50a)
G153 Ground under diesel filter
G154 Engine wiring - board wiring connection
G155a Right seat adjustment wiring connection
G155b Left seat adjustment wiring connection
G156 Front-right door wiring - front-right door sensor connection
G157 Front-left door wiring - front-left door sensor connection
G158 Rear-right door wiring - rear-right door sensor connection
G159 Rear-left door wiring - rear-left door sensor connection
G160 Front-right door wiring - ground lighting lamp connection
G161 Front-left door wiring - ground lighting lamp connection
G162 Rear-right door wiring - ground lighting lamp connection
G163 Rear-left door wiring - ground lighting lamp connection
G164 Board wiring - conditioning unit wiring connection
G165 Door service wiring - conditioning unit wiring connection
G166 Front door wiring - front right door wiring connection
G167 Front door wiring - rear right wiring connection
G168 Front door wiring - front right door wiring connection
G168a Front door wiring and rear left door wiring one-way connection
G169 Front door wiring - rear left wiring connection
G170 Board wiring - rear right wiring connection
G171 Board wiring - rear left wiring connection
G172 Door wiring - sunroof connection
G173 Console wiring - front door wiring connection
G174 Steering column support ground
G175 Board wiring - fog light wiring connection
G176 Roof panel ground
G177 Door service wiring - board wiring connection
G178 Preset connection for seat height adjustment switch
G179 Rear left wiring - roof lamp wiring connection
G180 Rear left wiring - front door wiring connection
G181 Rear left wiring - rear console wiring connection
G182 Console area ground
G183 Rear console wiring - front right seat connection
G184 Rear console wiring - front left seat connection
G185 Luggage compartment left-side ground
G186 Luggage compartment right-side ground
G187 Single connection in rear left wiring
G188 Single connection in rear right wiring
G189 Rear seat wiring - rear console wiring connection
G190 Rear seat wiring connection
G191 Rear left wiring - rear left door wiring connection
G192 Preset connection for trailer stop signal
G193 Preset connection radio aerial
G194 Rear left wiring - central side light wiring connection
G195 Preset connection for rear left loud-speaker
G196 Preset connection for rear right loud-speaker
G197 Rear right wiring - rear right door wiring connection
G198 Rear right wiring - boot lid lock wiring connection
G199 Rear right door wiring connection
G200 Preset connection for radio headphones control unit
G201 Heated rear window fuse (30A)
G202 ABS System ground
G203 Rear right wiring - front door wiring connection
G204 Front right sensor connection - ABS
G205 Front left sensor connection -- ABS
G206 Rear right sensor connection - ABS
G207 Rear left sensor connection - ABS
G208 Front left power window connection
G209 Rear right wiring - rear console wiring connection
G210 Door wiring - rear console wiring connection
G211 Cluster intermediate connection for gearbox oil level signal
G212 Cluster internal connection for ABS warning light signals and seat belts
G213 Cluster internal connection for ABS warning light, seat belts and gearbox oil level
G214 Instrument connection for ABS warning light signals and seat belts (CA)
G215 Instrument internal connection for ABS warning light signals and seat belts
G216 Preset connection for power window control unit
G217 Preset connection for front left loud-speaker
G218 Preset connection for front right loud-speaker
G219 Sunroof connection

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G220 Coil power module connection for rev-counter
G221 Jumper connection for power window wiring
G222 Cruise Control Actuator - Cruise Control CU connection
G223 Preset connection for Cruise Control clutch push-button
G224a Right passive seat belt wiring connection
G224b Left passive seat belt wiring connection
G225a Right passive seat belt control unit switch wiring connection
G225b Left passive seat belt control unit switch wiring connection
G226a Right passive seat belt wiring ground connection
G226b Left passive seat belt wiring ground connection
G227b Under-fender services wiring connection
G228 Board wiring - cooling electric fan motor wiring connection
G229 Starting signal and "Over-boost" warning light wiring connection
G230 Ground on starting distributor bracket
G231 Board wiring - automatic transmission wiring connection
G232 Jumper connection preset for Motronic control unit (manual/automatic transmission versions)
G233 Board wiring - automatic transmission gear-lever wiring connection
G234 Interphone control unit connection A
G235 Interphone control unit connection B
G236 Interphone circuit panel connection A
G237 Interphone circuit panel connection B
G238 Board wiring - day-light lamps
G239 Car radio/car telephone CU relay - 15A
G240 Front seats relay - 20A
G241 Board wiring - antitheft wiring connection
G242 Board wiring Cruise Control wiring connection
G243 Board wiring - rear cabinet wiring single connection
G244 Board wiring - rear cabinet wiring connection
G245 Rear - right antitheft wiring connection
G246 Rear seat adjustment fuse 20A
G247 Rear electric window fuse 30A
G248 Antitheft wiring - rear right wiring connection
G249 Abtitheft wiring - cabinet wiring connection
G250 Board wiring - C.A. right side engine wiring connections
G251 Shock absorber connection clinching
G252a Board wiring - rear right wiring for shock-absorber system connection
G252b Board wiring - rear right wiring for shock-absorber system connection
G252c Board wiring - rear right wiring for chock-absorber system connection
G252d Board wiring - rear right wiring for shock-absorber system connection
G253 Rear wiring - left wiring - climatization wiring connection
G254 Engine electric fan fuse 40A
G255 Climatization electric fan fuse 40A
G256 Rear left wiring - antitheft connection
G257 Interlock SHIFT CU fuse 10A
G258 Antitheft fuse 15A
G259a Automatic transmission clinching
G259b Automatic transmission clinching
G260 Front cabinet wiring - rear cabinet wiring connection
G261 Sunroof fuses
G262 Door.locking - electric window clinching
G263 Front electric windows clinching
G264 Rear electric window enabling and closing crimping connection
G265 Left-hand front under-mudguard wiring connection
G265a Front right-hand wiring connector under wheel housing (3-way)
G265b Front right-hand wiring connector under wheel housing (2-way)
G266 Boot hatch ground
G267 Engine block ground
G268 Heated seats and handbrake switch-door locks wiring connection
G269 Glovebox compartment light connection
G270a Dashboard wiring - four-wheel drive wiring (four-way) connection
G270b Dashboard wiring - four-wheel drive wiring (six-way) connection
G271 Electric fan operation check connection
G272 ABS hydraulic group connection
G273 ABS control unit connection
G275 ABS hydraulic group ground connection
G276 Four-wheel drive intermediate wiring connection
G277 Untermediate Alfa Romeo Control unit - instrument connector
G278 Brake pad wear sensor connector
G279 Brake fluid reservoir switch connector
G280 Radio intermediate wiring connector
G281 Free connector for luggage compartment light
G282 Earth on front tunnel
G283 Earth on left service compartment
G284A Rear right passenger compartment panneling earth
G284B Rear left passenger compartment panneling earth
G285 Provision for anti-theft system connector
G286 Dash wiring - door wiring four-way connection
G287 Injection wiring - engine coolant temperature sensor wiring connection
G288 Injection wiring evaporation solenoid valve wiring connection
G289 Connection for front right-hand speaker - high tones
G290 Connection for front right-hand speaker - low tones
G291 Connection for front left-hand speaker - high tones
G292 Connection for front left-hand speaker - low tones
G293 Connection between engine services wiring - engine compartment wiring - left-hand side
G294 Earth on intake manifold
G295 Rear console wiring - driver's side seat memory wiring connection
G296 Memory wiring - driver's side longitudinal seat regulation motor wiring connection
G297a Memory wiring - driver's side seat control panel wiring connection
G297b Memory wiring - driver's seat control panel witing connection
G297c Memory wiring - driver's seat control panel wiring connection
G298 Memory wiring - driver's seat lumbar and back regulation wiring connection
G299a Front left-hand seat control pad relay unit - control pad wiring connection
G299b Front right-hand seat control pad relay unit - control pad wiring connection
G300 Front left-hand seat warming pad clinching
G301 Front right-hand seat warming pad clinching
G302 Driver's seat earth cable clinching
G303 Control pad wiring - driver's seat lumbar support and back regulation wiring connection
G304 Injection wiring intermediate clinching
G305 Electric seats and rear power window connection
G306 Right-hand engine wiring/engine wiring connection
G307 Luggage compartment/rear wiring connection
G308 Connector for engine sensors
G309a Controlled damping suspension system A
G309b Controlled damping suspension system A
G310 Front right-hand power window fuse
G311 Front left-hand power window fuse
G312 Fuse for headlight washers
G313 Air conditioner supplementary wiring connection
G314a Engine wiring/air conditioner A wiring connection
G314b Engine wiring/air conditioner B wiring connection
G315a Left-hand seat regulation motor connection
G315b Right-hand seat regulation motor connection
G316 Engine r.p.m. and timing sensor sheath earth
G317 Engine - injection wiring rev counter connection
G318 Earth on gearbox
G319 Engine oil level wiring - engine services wiring connection
G320 Rear speaker cable connection

KEY

G: FUSEBOX - CONNECTIONS - GROUNDS (Continued)

G321a Air conditioner control wiring - microswitch wiring connection (6-way)
G321b Air conditioner control wiring - microswitch wiring connection (3-way)
G322 Air conditioner control wiring - dashboard wiring connection
G323 Air conditioner control wiring - electric fan wiring for condensers connection
G324 Left-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G325 Right-hand seat warming pad spiral cable - heated seats ns door locks wiring connection
G326 Dashboard wiring - front foglight/headlight washer wiring connection
G327 Speedometer sensor connection
G328 Dashboard wiring - rooflight wiring connection
G329 Dashboard wiring - injection wiring connection
G330 Injection wiring - electric fan wiring for condensers connection
G331 Ultrasound soldering connection
G332 Alternator connection for recharging signal
G333 DIM-DIP fuse
G334 Fuel level sender connection
G335 Engine services with E.G.R. valve power supply clinching

H: SWITCHES

H1 Handbrake switch
H2 Reversing light switch
H3 Stop light switch
H4 Courtesy light switch on passenger compartment upright
H5 Front left door open indicator switch
H6 Front right door open indicator switch
H7 Rear left door open indicator switch
H8 Rear right door open indicator switch
H9 Front right brake pad switch
H10 Front left brake pad switch
H11 Rear right brake pad switch
H12 Rear left brake pad switch
H13 Choke switch
H14 Injection advance switch
H15 Gearbox oil low level switch (magnetic bulb)
H16 Starting and reverse inhibitor switch
H17 Brake fluid minimum level check switch
H18 Fast-idle switch in gearbox
H19 Low fuel pressure switch
H20 Inertia switch
H21 Clutch pedal fast-idle switch
H22 Ignition microswitch
H23 Engine compartment lamp switch
H24 Luggage compartment lamp switch
H25 Glovebox light switch
H26 Contact/switch on rear door for rear window wiper
H27 Contact/switch on rear door for heated rear window
H28 Carburetor contact/switch
H29 Switch for rear drive engagement warning lamp
H30 Load switch
H31 Switch for idle r.p.m. adjusting screw on carburetor
H32 Microswitch on carburetor for inserting timing variator
H33 Number plate contact/switch
H34 ABS System brake fluid tank switch
H35 Fuel pre-heating filter thermal switch
H36 Diesel post-heating microswitch
H37 Clutch pedal switch
H38 Rear right seat microswitch
H39 Rear left seat microswitch
H40 Rear right door inhibitor switch for rear seats
H41 Rear left door inhibitor switch for rear seats
H42 Accelerator throttle valve maximum opening switch
H43 Door-locking engaged signalling microswitch
H44 Engine hood antitheft device switch
H45 Cruise Control clutch and brake switch
H46 Gearbox switch for controlled damping suspension shock-absorber
H47 Engine throttle microswitch for controlled damping suspension shock-absorber
H48 Lefthand door switch for electric windows - sunroof automatic closing
H49 Auxiliary stop lights switch
H50 Seat end-run switch
H51 Sunroof stop limit switch

I: RELAYS

I1 Engine cooling electric fan relay
I2 Heated rear window relay
I3 Horn relay
I4 Headlight wiper relay
I5 Auxiliary relay for headlight wiper timer
I6 Fast-idle relay
I7 Fuel hose closing relay
I8 Relay excluding retarded rotor arm
I9 Glow plug relay
I10 Choke inhibitor relay
I11 Front power window and seat raising relay
I12 Front power window relay
I13 Rear power window relay
I14 Brake fluid automatic warning light control relay
I15 Low fuel pressure warning light relay
I16 Headlight relay
I17 Fog light relay
I18 Double contact relay
I19 Headlight washer pump relay
I20 Beam change over relay
I21 Full beam exclusion relay
I22 Low beam exclusion relay
I23 Supplementary engine cooling electric fan relay
I24 Direction and hazard lights relay
I25 Rear fog light relay
I26 Roof lamp relay
I27 Seat height adjustment relay
I28 Hazard lights relay
I29 Fuel pump relay
I30 Relay with CEM diode
I31 Front power window/climatisation relay
I32 Advance variation control unit relay
I33 Carburetor microswitch relay
I34 Rear fog light exclusion relay
I35 Key-operated supply relay
I36 Relay for brake wear and fluid level
I37 ABS System control unit relay
I38 ABS System auxiliary relay
I39 Brake fluid level warning light relay
I40 ABS System brake fluid electric pump relay
I41 Two-tone hooter, horn relay
I42 Two-tone hooter relay
I43 Inspection light relay
I44 Fuel pre-heating device relay
I45 Outer mirror defrosting relay
I46 Siren relay
I47 Engine oil cooler electric fan relay
I48 Instrument and AR control ignition key-controlled relay
I49 Low-beam light relay
I50 High-beam light relay
I51 Electronic control unit power supply relay
I52 Boot lid opening relay
I53 Fuel filter cap opening relay
I54 Rear right seat relay

KEY

I: RELAYS (Continued)

I55 Rear left seat relay
I56 Rear seat inhibitor relay
I57 ABS System electronic relay
I58 Sunroof - seat relay
I59 "OFF", "RESUME" Cruise Control switch auxiliary relay
I60 Outer mirror defrosting relay
I61 Petrol vapour motor pump relay
I62 Gear engaged signal relay (automatic transmission) for MOTRONIC control unit
I63 Oil radiator electric fan - automatic transmission relay
I64 Position light relay
I65 Foglight inhibitor relay
I66 Day-light insertion relay
I67 Day-light exclusion relay
I68 Water cooling auxiliary electric fan relay
I69 Stop switch relay
I70 Radio relay
I71 20 relay for shock-absorbes
I72 Brake fluid tank relay
I73 Front electric window - door-locking relay
I74 Rear electric window - suroof relay
I75 Electric window - sunroof closing relay
I76 Four-wheel drive supply relay
I77 Seres/parallel relay (for cooling electric fans)
I78 Relay for heater blower 50A
I79 Supplementary relay for fog lamps
I80 Seat longitudinal end-run locking relay
I81 Brake pad wear relay
I82 Headlight flashing relay
I83 Relay for electric aerial
I84 Automatic closure relay
I85 Driver's seat memory relay
I86 Relay for driver's seat memory recall stop
I87 Front left-hand seat warming pad relay
I88 Front right-hand seat warming pad relay
I89 Rear foglight permit and front foglight exclusion relay
I90 DIM-DIP exclusion relay
I91 DIM-DIP cut-in relay
I92 K.S.B. relay

L: SENSORS

L1 Low fuel pressure switch
L2 Low oil pressure switch
L3 Max air pressure switch
L4 Thermal switch for engine cooling electromagnetic coupling
L5 Thermal switch for engine coolant max temperature
L6 Thermal switch for engine cooling electric fan
L7 Engine coolant temperature gauge sender
L8 Oil pressure gauge sender
L9 Fuel level gauge sender
L10 Sender for engine coolant temperature gauge and max temperature warning lamp contact
L11 Retarded rotor arm cut-out pressure switch
L12 Engine oil level sensor
L13 Windscreen washing liquid level sensor
L14 Engine coolant level sensor
L15 Fuel flow sensor
L16 Rev-counter pulse generator
L17 Speedometer pulse generator
L18 Load sender
L19 External temperature sensor
L20 Photoelectric cell
L21 Pierburg solenoid valve regulating the supercharging pressure
L22 Knocking sensor
L23 Potentiometer
L24 Engine coolant temperature sensor for ignition advance adjustment
L25 Thermal switch for engine coolant temp erature
L26 Vacuum sensor
L27 Temperature sensor
L28 Front right brake sensor
L29 Front left brake sensor
L30 Rear right brake sensor
L31 Rear left brake sensor
L32 Turbo supercharger air pressure sensor sender
L33 Two-stage thermal contact
L34 Boot lid opened contact
L35 Thermometric switch
L36 Turbo supercharger maximum pressure safety sensor
L37 T.D.C. sensor
L38 Thermal switch for oil radiator electric fan - automatic transmission
L39 Automatic transmission oil maximum temperature sensor
L40 Steering angle sensor
L41 Oil pressure switch for controlled damping suspension shock-absorber
L42 Tooth mesh control sensor
L43 Oil pressure switch for vehicle lift warning light
L44 Engine oil temperature sender
L45 K.S.B. water temperature sender
L46 E.G.R. control solenoid valve
L47 E.G.R. valve potentiometer

M: SOLENOIDS - SOLENOID VALVES

M1 Fuel cut-off solenoid valve
M2 Injection pump solenoid valve
M3 Solenoid with injection pump fuel cut-off microswitch
M4 Fast-idle solenoid
M5 Engine stop solenoid
M6 Fuel pipe closing electromagnet
M7 Door opening/closing electromagnet
M8 Auxiliary air solenoid valve compressor actuation
M9 Pierburg solenoid valve (for idle r.p.m.)
M10 Brake fluid adjusting valve
M11 ABS System main valve
M12 Boot lid opening solenoid
M13 Fuel filter cap opening solenoid
M14 Cruise Control actuator
M15 Emission control solenoid valve
M16 Over-boost solenoid valve
M17 Front right shock-absorber solenoid valve
M18 Front left shock-absorber solenoid valve
M19 Rear right shock-absorber solenoid valve
M20 Rear left shock-absorber solenoid valve
M21 Automatic transmission unit solenoid
M22 Four-wheel drive electromagnetic coupling

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS

N1 Electronic ignition module
N1a Electronic ignition module A
N1b Electronic ignition module B
N2 Connector for Marelli module
N3 Capacitor for electronic ignition
N4 Connector for Bosch module
N5 Tachymetric switch device
N6 Pre-heating glow plug timer
N7 Trip Computer
N8 ALFA ROMEO Control
N9 Brake pad wear control unit

KEY

N: ELECTRONIC DEVICES - INTERMITTENCES - TIMERS (Continued)

N10 Roof lamp timer
N11 Door-locking control unit
N12 Headlight wiper timer
N13 Road hazard and direction indicators intermittence
N14 Electronic windscreen wiper intermittence
N15 Electronic windscreen wiper intermittence and warning light control
N16 Tachymetric control unit
N17 Trip control unit for fuel flow
N18 Electronic device for headlights flashing
N19 Performance gauge control unit
N20 Advance variation control unit
N21 Power module
N22 ALFA ROMEO Control control unit
N23 Ignition control unit
N24 Pulse converter
N25 Rear fog-light device
N26 Brake pad wear warning light intermittence device
N27 ABS System control unit
N28 ABS System brake fluid electric pump device
N29 Diode holder connection
N29a A diode connection
N29b B diode holder connection
N30 Two-tone hooter control unit
N31 Fuel pre-heating device
N32 Head-phone connection control unit
N33 Differentiated rear window defrosting control unit
N34 Control unit for pulse generator
N35 Coding control unit
N36 Interphone system control unit
N37 Petrol vapour intake pump timer
N38 Power window control unit
N39 Cruise Control unit
N40 DIM DIP electronic device
N41 Lights on signalling control unit
N42 Dimmer for door-locking actuated signalling LED
N43 Automatic transmission locking/unlocking control unit
N44 Rear lights control unit
N45 Antitheft control unit
N46 Shock-absorber electronic control unit
N47 Accelerometer
N48 Radiotelephone control unit
N49 Aerial - Heated rear window control unit
N50 Four-wheel drive control unit
N51 Hydraulic group with ABS control unit
N52 CROSS-OVER control unit (radio system)
N53 Antijamming condenser radio boot panel 4.7 µF
N54 Right radio loudspeaker antijamming condenser 4.7 µF
N55 Left radio loudpseaker antijamming condenser 4.7 µF
N56 Supplementary fusebox radio antijamming condenser 22 µF
N57 Radio relay protection diode
N58 Driver's seat memory control unit
N59 Control unit
N60 Sunroof control unit
N61 Shock absorber control unit condenser
N62 ABS system - longitudinal accelerometer
N63 ABS system - transversal accelerometer
N64 Instrument panel warning light timer
N65 E.G.R. control unit
N66 Brake light radio anti-interfeence condenser
N67 Door lock remote control signal receiver

O: ANCILLARY EQUIPMENT

O1 Heated rear window
O2 Horn
O3 Electrically-operated aerial
O4 Car radio,
O5 Speaker
O6 Cigar lighter
O7 Rear cigar lighter
O8 Two-tone hooter
O9 Transceiver
O10 Rear headphone
O11 Siren
O12 External loudspeaker-microphone
O13 Internal loudspeaker-microphone
O14 Driver's seat warming pad
O15 Rear right seat warming pad
O16 Rear left seat warming pad
O17 Front right seat warming pad
O18 Right door rear-view mirror defroster
O19 Left door rear-view mirror defroster
O20 External right microphone
O21 External left microphone
O22 Engine electric fan supplementary resistance
O23 Antitheft siren
O24 Radiotelephone
O25 Windscreen defroster
O26 Front left-hand seat warming pad
O27 K.S.B. device
O28 DIM-DIP resistance

P: ELECTRIC MOTORS

P1 Windscreen wiper motor
P2 Engine cooling electric fan motor
P3 Engine cooling electric fan electromagnetic drive
P4 Headlight wiper motor
P5 Front left seat adjustment motor
P6 Front right backrest adjustment motor
P7 Front left backrest adjustment motor
P8 Motor for electric door rear-view mirror - left-side
P9 Motor for electric door rear-view mirror - right-side
P10 Front right door locking motor
P11 Front left door locking motor
P12 Rear right door locking motor
P13 Rear left door locking motor
P14 Front right power window motor
P15 Front left power window motor
P16 Rear right power window motor
P17 Rear left power window motor
P18a Main fuel electric pump
P18b Auxiliary fuel electric pump
P19 Windscreen washer pump
P20 Headlight washer pump
P21 Rear window wiper motor
P22 Rear window washer electric pump motor
P23 Supplementary engine cooling electric fan motor
P24 Sunroof motor
P25 Engine oil radiator electric fan
P26 Petrol vapour intake electric pump motor
P27 Windscreen wiper motor with control unit
P28 Front right seat longitudinal adjusting motor
P29 Front left seat longitudinal adjusting motor
P30 Front right seat adjusting motor
P32 Rear right seat motor
P33 Rear left seat motor
P34 Oil radiator electric fan - automatic transmission
P35a Right-hand headlight adjustment motor
P35b Left-hand headlight adjustment motor
P36 Vehicle lift pump motor
P37 Right-hand front seat rear tilt regulation motor
P38 Left-hand front seat rear tilt regulation motor
P39 Right-hand front seat front tilt regulation motor
P40 Left-hand front seat front tilt regulation motor

KEY

P: ELECTRIC MOTORS (Continued)

P41 Front right-hand seat lumbar support regulation
P42 Front left-hand seat lumbar support regulation

Q: HEAT/VENT - AIR CONDITIONING SYSTEM

Q1 Heater/ventilation electric fan
Q2 Pneumatic push-button control for air conditioning
Q3 Pneumatic push-button control for climatisation
Q4 Heater/ventilation electric fan control
Q5 Heater blower fan speed adjustment resistance
Q6 Switch on flap for heater blower fan
Q7 Fluid thermostat
Q8 Electromagnetic coupling pressure switch
Q9 Minimum pressure switch
Q10 Maximum pressure switch
Q11 Compressor electromagnetic coupling
Q12 Thermoswitch exclusion of compressor electromagnetic coupling
Q13 Supplementary conditioner fan
Q14 Relay for supplementary conditioner fan and electromagnetic compressor coupling
Q15 Heater/ ventilation electric fan relay
Q16 Relay for simultaneous control of engine cooling electric fan and supplementary electric fan
Q17 Relay for simultaneous coupling and supplementary electric fan
Q18 Heater
Q19 Conditioner
Q20 Min and max pressure switch (Trinary)
Q21A Automatic control check unit
Q21B Manual control check unit
Q22 Electromagnetic coupling control relay
Q23 Internal temperature sensor for climatisation
Q24 External temperature sensor for climatisation
Q25 Mixed air temperature sensor for climatisation
Q26 Defrosting thermostat
Q27 Air recirculation vent control motor
Q28 Ventilation motor for internal temperature sensor
Q29 Climatisation system branch point
Q30 Air mixture and vent controls
Q30A Air distribution motor to vents
Q30B Cold/hot mixing motor
Q31 Climatisation unit fan speed adjuster
Q32 Climatisation auxiliary relay
Q33 Passenger compartment internal temperature motor with sensor
Q34 Conditioner temperature control potentiometer
Q35 Free fuse for conditioning system
Q36 Conditioning system earth
Q37 Passenger compartment supplementary air conditioning fan
Q38 Passenger compartment supplementary fan control for heating
Q39 Air conditioning system wander fuse - 30A
Q40 Air conditioning system wander fuse - 15A
Q41 Air conditioning system relay and fuse unit
Q42 Air conditioning fan delay device
Q43 Air conditioning system wander fuse - 50A
Q44 Water by-pass electronic actuator
Q45 Electric by-pass cock control microswitches
Q46 External/recirculation air intake electric actuator
Q47 Dynamic air intake actuator control microswitches
Q48 Ait-to-floor electric actuator
Q49 Air-to-floor electric actuator control microswitches
Q50 Recirculation and 1st speed of electric fan microswitches
Q51 Control potentiometer with switch
Q52 Fan for right-hand condenser
Q53 Fan for left-hand condenser
Q54 Fan control relay for right-hand condenser
Q55 Electric fan and compressor electromagnetic coupling simultaneous control relay for left-hand condenser
Q56 Relay for heater/air conditioner
Q57 Electric fan speed selector relay
Q58 Electronic thermostat control unit
Q59 Electronic thermostat temperature sensor

R: SAFETY DEVICES

R1 Seat belt device
R2 Catalytic converter temperature indicator
R3 Thermocouple for catalytic converter temperature detection
R4 Unfastened seat belt buzzer
R5 Open door buzzer
R6 Mileometer
R7 Seat belt warning lamp
R8 30,000 mile warning lamp
R9 Push-button switch on seat belts
R10 Catalytic converter maximum temperature warning light
R11 Front left door switch for seat belt device
R12a Right-side passive seat belt control unit
R12b Left-side passive seat belt control unit
R13a Right-side passive seat belt motor
R13b Left-side passive seat belt motor
R14a Right-side seat belt winder locking mechanism
R14b Left-side seat belt winder locking mechanism
R15 Passive seat belt-unfastened buzzer
R16a Right-side passive seat belt warning light
R16b Left-side passive seat belt warning light
R17a Right-side passive seat belt-unfastened switch
R17b Left-side passive seat belt-unfastened switch
R18a Right-side passive seat belt switch set to position "A"
R18b Left-side passive seat belt switch set to position "A"
R19a Right-side passive seat belt switch set to position "B"
R19b Left-side passive seat belt switch set to position "B"
R20 AIR-BAG front - right sensor
R21 AIR-BAG front - left sensor
R22 AIR-BAG control unit
R23 Steering wheel inflation module for AIR-BAG
R24 Key-inserted and unfastened safety belt signalling buzzer
R25 Safety belt inserted hook sensor

S: ELECTRONIC FUEL INJECTION

S1 Injection control unit
S2 Double relay
S3 Electroinjectors
S4 Cold start electroinjector
S5 Air flow meter
S6 Accelerator throttle body switch
S7 Engine coolant temperature sensor
S8 Thermo-time switch
S9 Auxiliary air valve
S10 Lambda probe
S11 Motronic control unit
S12 Motronic relay
S12a Petrol pump Motronic relay
S12b Motronic relay with diode
S12c Timing variator Motronic relay
S12d Auxiliary Motronic relay
S13 Timing sensor
S14 Rev sensor
S15 Timing variator
S16 Altitude air regulator
S17 CEM control unit
S17a CEM control unit white connector
S17b CEM control unit black connector
S18 Throttle angle sensor
S19 Hall sensor

S: ELECTRONIC FUEL INJECTION (Continued)

S20 Deton sensor
S21 Throttle actuator
S22 Electroinjector terminal
S23 Electroinjector resistance
S24 Electroinjector terminal board
S25 Automatic transmission/manual transmission switch connector
S26 Injector system
S27 Lambda probe resistance
S28 Injection control relay
S29 Idle adjusting actuator
S30 Motronic control unit switch connector
S31 Rev and timing sensor
S32 Lambda probe coding connector
S33 Full load enrichment device
S34 Available
S35 Heated Lambda probe
S36 Free fuse for Auxilliary Motronic relay
S37 4x2 - 4x4 switching connector
S38 Sensor on throttle body with potentiometer
S39 Cylinder No. 1 recognition sensor
S40 Ignition/injection control unit
S41 Main relay
S42 Secondary relay
S43 Absolute pressure sensor
S44 Throttle angle potentiometer
S45 Lambda probe wander fuse
S46 Motronic power supply wander fuse
S47 Fuel pump wander fuse
S48 "CO" regulation potentiometer
S49 MP3.1 control unit switch connector for 1.5 IE and 1.7 IE engines

T: DIAGNOSIS

T1 Alfa Tester connector
T2 "Flashing code" diagnosis connector
T3 AIR-BAG diagnosis connector
T4 Diagnosis indicator light push-button
T5 Controlled damping suspension electric system diagnosis coupling

L-Jetronic

Since their introduction, Jetronic fuel-injection systems have proved themselves millions of times over under the harsh conditions of everyday driving. The on-going development of the control unit and the sensors has led from the D-Jetronic to the L-Jetronic, and resulted in this fuel-injection system becoming even more precise and reliable. New circuitry for the evaluation of the sensor signals has led to more economical and more sophisticated engine operating characteristics. Thanks to the employment of the Lambda sensor, and the integration of the Lambda closed-loop control in the control unit, the L-Jetronic can already comply today with the exhaust-gas legislation of tomorrow. This booklet tells you all you want to know about the latest developments in the L-Jetronic.

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Translation: Peter Girling.
Prepared in cooperation with the appropriate technical departments of the Robert Bosch GmbH.

The spark-ignition engine

The spark-ignition engine is an externally ignited internal-combustion engine which converts the energy contained in fuel into kinetic energy.

In the spark-ignition engine an air-fuel mixture is formed outside the combustion chamber. This mixture is fed into the combustion chamber where it is compressed. Combustion of the mixture is caused by time-controlled external ignition. The spark-ignition engine operates in timed phases.

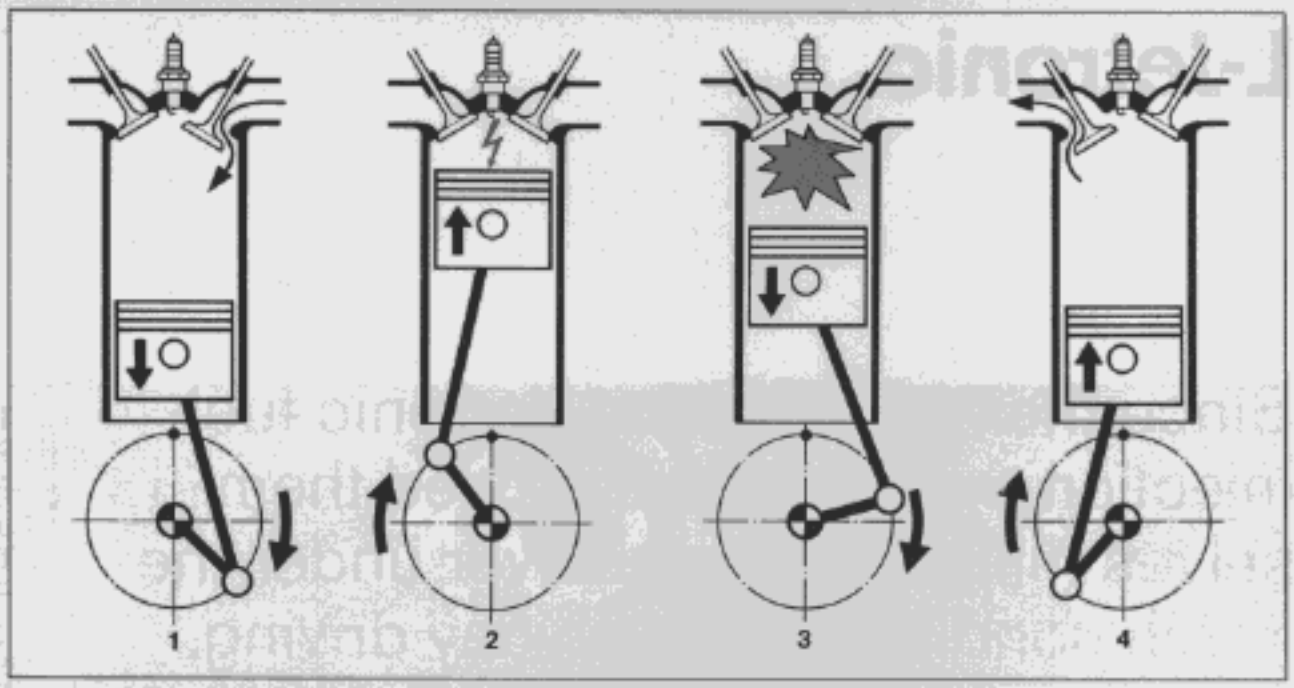


Fig. 1 Working strokes of the 4 stroke engine
1 Suction stroke, 2 Compression stroke, 3 Working stroke, 4 Exhaust stroke

Principles of operation

An ignitable air-fuel mixture is ignited and burnt inside a working cylinder. The combustion heat given off increases the pressure of the pre-compressed gases. This combustion pressure is higher than the pre-combustion pressure and produces mechanical work via the pistons and the crankshaft. After each power stroke the burnt gases are exchanged for a fresh air-fuel mixture. In the motor-vehicle engine this change of gas takes place usually in accordance with the 4-stroke principle.

4-stroke principle
The exchange of gas in the 4-stroke spark-ignition engine is controlled by valves which open or close the inlet and outlet ports of the cylinder depending on the position of the crankshaft.
The 4 strokes of a working cycle are:
- suction
- compression
- combustion (work)
- exhaust

1st. stroke: suction
Inlet valve: open
Outlet valve: closed
Piston movement: downwards
Combustion: none

The downward moving piston increases the volume of the combustion chamber, enabling a fresh air-fuel mixture to be sucked past the open inlet valve and into the cylinder.

2nd. stroke: compression
Inlet valve: closed
Outlet valve: closed
Piston movement: upwards
Combustion: none

The upward moving piston reduces the volume of the combustion chamber thereby compressing the air-fuel mixture. The compression factor is approx. 7 ... 10, according to the type of engine.

3rd. stroke: combustion (work)
Inlet valve: closed
Outlet valve: closed
Piston movement: downwards
Combustion: yes

The compressed air-fuel mixture is ignited by the ignition spark at the spark plug. As the mixture is burnt its temperature increases and the pressure in the cylinder increases. The pressure of the combustion gases drives the piston downwards in the cylinder and by means of the connecting rod produces movement of the crankshaft.

4th. stroke: exhaust
Inlet valve: closed
Outlet valve: open
Piston movement: upwards
Combustion: none

The upward moving piston reduces the volume of the combustion chamber, whereby the burnt gases (exhaust) are expelled through the open outlet valve. The stroke cycle repeats itself after the 4th. stroke. In the actual cycles of the internal-combustion engine the opening times of the valves overlap somewhat, whereby gas flows and oscillations are utilized for improved filling and emptying of the cylinder.

Efficiency of the spark-ignition engine

The efficiency of the spark-ignition engine depends to a large extent upon the following criteria:
compression
combustion process
air-fuel mixture,
as well as upon its mechanical design.

Compression
The higher the compression, then the higher the thermal efficiency of the internal-combustion engine becomes and the better the fuel usage. The maximum compression is limited by the octane requirement. Knocking means an irregular combustion of the ignited mixture and leads to overstressing and damaging of the engine. With regular (homogenous) air-fuel mixture and by using the flow effects in the intake path, the octane requirement can be adjusted in the direction of higher compression.

Combustion procedure
For the quality of the combustion process it of is prime importance that the fuel mixes intimately with the air so that it can be burnt as completely as possible during the power stroke. Furthermore it is important that the flame front progresses spatially and in regular form during this period until the whole mixture has been burnt. The combustion process is considerably influenced by the point in the combustion chamber at which the mixture is ignited, and by the mixture ratio as well as the manner in which the mixture is fed into the combustion chamber.

Air-fuel mixture
The specific fuel consumption of a spark-ignition engine is for the most part dependent on the mixture ratio of the air-fuel mixture. Consumption is at its lowest with an air-fuel ratio of approx. 15 kg air to 1 kg fuel. Taking an example this means that approx. 10000 l of air are necessary to burn 1 l of fuel. The exact (theoretical) value for complete combustion, also known as stoichiometric ratio, is 14.7 : 1.
Since motor-vehicle engines operate most of the time in the part-load range, they are designed for low fuel consumption in this range. For other ranges (idle, full load) a richer fuel mixture-composition is more favourable. The fuel induction system must be able to fulfill these varying requirements.

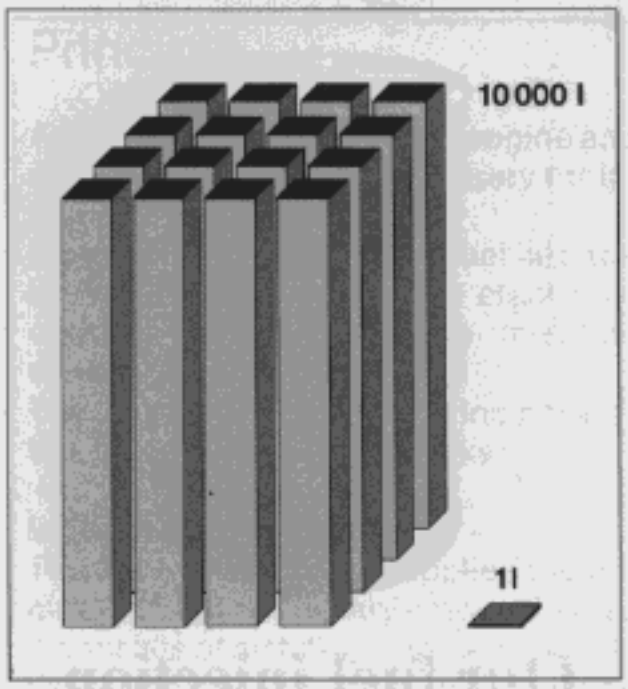


Fig. 2 Stoichiometric air-fuel ratio for ideal combustion with low pollution

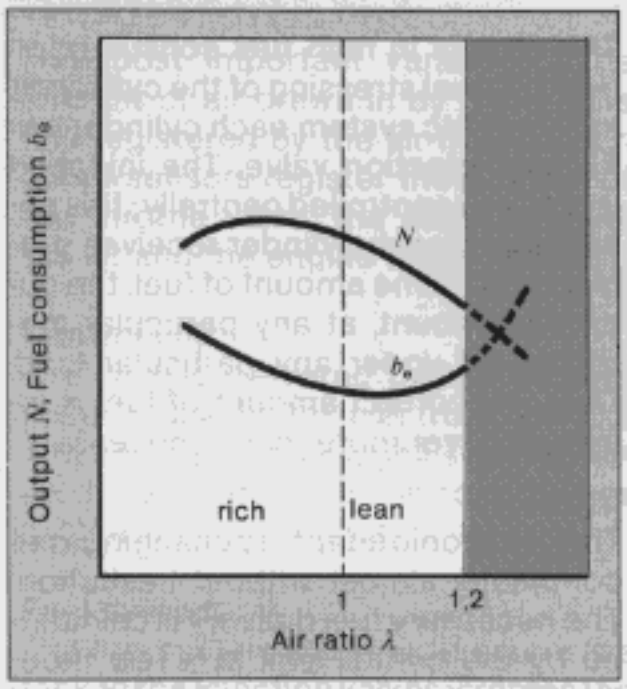


Fig. 3 Influence of air ratio on output N and consumption b_e in a spark-ignition engine

The air ratio

To indicate how far the actual, available air-fuel mixture differs from the ideal, theoretical value necessary (14.7 : 1), the air ratio λ (lambda) has been chosen.

$$\lambda = \frac{\text{input air amount}}{\text{air amount required in theory}}$$

$\lambda = 1$
The input air amount corresponds to the amount necessary in theory.

$\lambda < 1$
Lack of air or rich mixture, increased power output.

$\lambda > 1$
Excess of air or lean mixture, reduced fuel consumption, reduced power output.

$\lambda > 1.3$
The mixture is so lean that combustion can no longer take place.

Fuel-induction systems

Fuel-induction systems, whether carburetor or fuel-injection systems, are intended to produce an optimum air-fuel mixture. Fuel induction for the spark-ignition engine is carried out by a carburetor or a fuel-injection system. The carburetor is still the most common form of fuel induction, but nowadays there is a marked tendency to use manifold injection for fuel induction.
This trend has arisen as a result of the advantages offered by fuel injection in connection with the demands for economy, efficiency and, last but not least, for low-pollution exhaust gas.
The reason for these advantages is that manifold injection permits extremely precise metering of the fuel as a factor of the operating and loading condition of the engine, whilst taking into account the environmental influences. The composition of the mixture is thereby maintained at such an exact level that the pollution content in the exhaust gas is relatively low. In addition, the arrangement of one injection valve per cylinder results in an improved distribution of the mixture.
Since the carburetor can be dispensed with, the induction paths can be constructed in the best possible way, thus permitting improved filling of the cylinders, which in turn leads to a more favourable torque.

Mechanical systems
Nowadays the K-Jetronic is the most widespread mechanical fuel-injection system; one that does not require any form of drive and which injects fuel continuously. This system is described in detail in the booklet "K-Jetronic" (VDT-U 3/1) in the Bosch Technical Instruction series.

Electronic systems
The L-Jetronic is an electronically-controlled fuel-injection system. It is a further development of the D-Jetronic. At regular intervals the fuel is injected electronically via injection valves into the intake ports. You will find a description of the system in this booklet.

Fuel injection in motor racing

TOP TUNING

with fuel-injection pumps

Fuel injection was first used in racing car engines at the beginning of the fifties. After 1951 experiments were made in the USA on Indianapolis racing cars. First of all it was direct injection that became generally accepted in motor racing. This type of injection, whereby gasoline is fed directly into the combustion chamber of the cylinder head, became popular with the post-war Silver Arrows of Daimler-Benz. Injection was carried out by in-line pumps, as is common with today's diesel engines.
1954 saw the appearance of the Mercedes-Benz W196 with fuel injection. Shortly after this the British racing-engine manufacturers BRM and Vanwall went over to fuel injection. Now there are no more engines in Formula 1 racing which are supplied with fuel by carburetors. The Ferrari, Matra, Alfa Romeo and BRM 12 cylinder engines all use fuel-injection pumps for their fuel supply, just like the Ford V8 Cosworth engine which is still used in racing and with which James Hunt became World Champion in 1976. These 31 engines turn out between 450 and 525 HP.
Fuel injection became predominant relatively quickly in Formula 1, the highest motor sport class, relatively quickly. One of the reasons was certainly the almost total lack of restrictions governing the fuel-induction system used. Nevertheless, the carburetor continued to dominate the touring-car class for a long time. The racing laws prescribed namely an approximation to a series, so that fuel induction had to be maintained as standard even with increased output.
When the restrictions on the type of fuel induction to be used were lifted for the higher racing classes 2 and 4, and the present group 5, there was no stopping the breakthrough of fuel injection on a broad basis. The result is a 10 per cent increase in output compared to the spark-ignition engines.

L-Jetronic

The L-Jetronic is an electronically controlled fuel-injection system which injects fuel intermittently into the intake manifold. It does not require any form of drive.

Task

The task of the gasoline injection is to supply to each cylinder just the correct amount of fuel as is necessary for the operation of the engine at that particular moment. A prerequisite for this, however, is the processing of as many influential factors as possible relevant to the supply of fuel. Since, however, the operating condition of the engine often changes quite rapidly, a speedy adaptation of the fuel delivery to the driving situation at any given moment is of prime importance. The electronically controlled gasoline injection is particularly suitable here. It enables a variety of operational data on any particular location on the vehicle to be processed and converted into electrical signals by sensors.
These signals are then passed on to the control unit in the fuel-injection system. The control unit processes the signals and calculates the exact amount of fuel to be injected.

Advantages

High output
The elimination of the carburetor enables the induction paths to be designed in the best possible way and a higher torque can be achieved with better filling of the cylinders. The fuel is injected directly in front of the inlet valves. Only air is fed to the engine through the intake manifolds. To achieve an optimal distribution of air and filling of the cylinder they can be designed to make the maximum use of air-input flow.
In this way a higher specific output and a torque curve appropriate to practice can be achieved.

Less fuel
With the help of the L-Jetronic the engine only receives the amount of fuel that it actually needs. Each cylinder receives the same amount of fuel in all operating conditions. In the case of carburetor fuel induction systems, unequal air-fuel mixtures occur for the individual cylinders of the engine as a result of segregation processes in the intake manifolds. Optimum fuel distribution cannot be achieved if a mixture is created which is suitable for supplying sufficient fuel even to the worst-fed cylinder.
This results in high fuel consumption and unequal stressing of the cylinders. In a Jetronic system each cylinder has its own injection valve. The injection valves are controlled centrally; this ensures that each cylinder receives precisely the same amount of fuel, the optimum amount, at any particular moment and under any particular load. Only the correct amount of fuel is injected, never more than is necessary.

In a flash
The L-Jetronic adapts to changing load conditions almost without hesitation. The necessary fuel delivery is calculated by the control unit in a few thousandths of a second and is injected through the injection valves directly in front of the intake valves of the engine.

Exhaust gas with low pollution
The concentration of pollutants in the exhaust gas is directly related to the air-fuel ratio. If you wish to operate the engine with the least pollutant emissions, then a fuel induction is necessary which is capable of maintaining a certain air-fuel ratio.
The L-Jetronic works so precisely that the exactness of the mixture formation necessary for observing the present-day exhaust regulations, can be maintained.

Fig. 4 Output and torque curve
a = with Jetronic, b = with carburetor

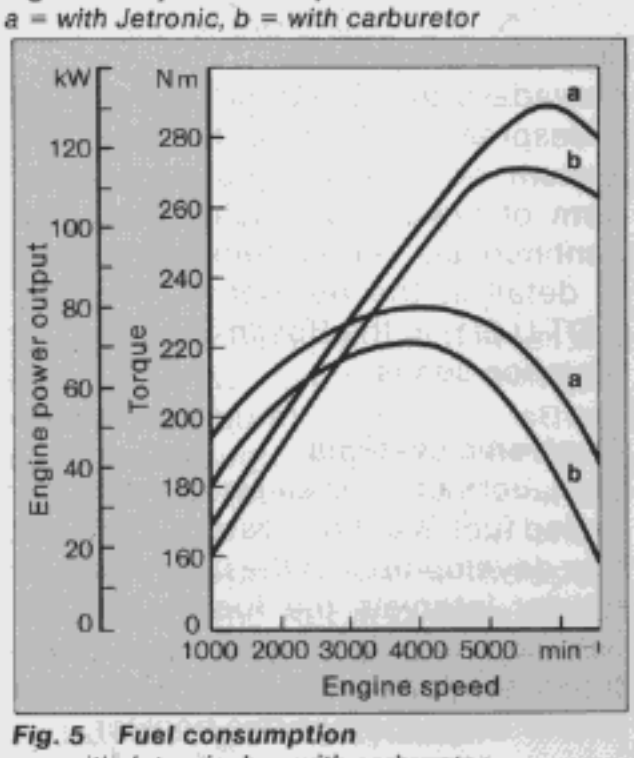
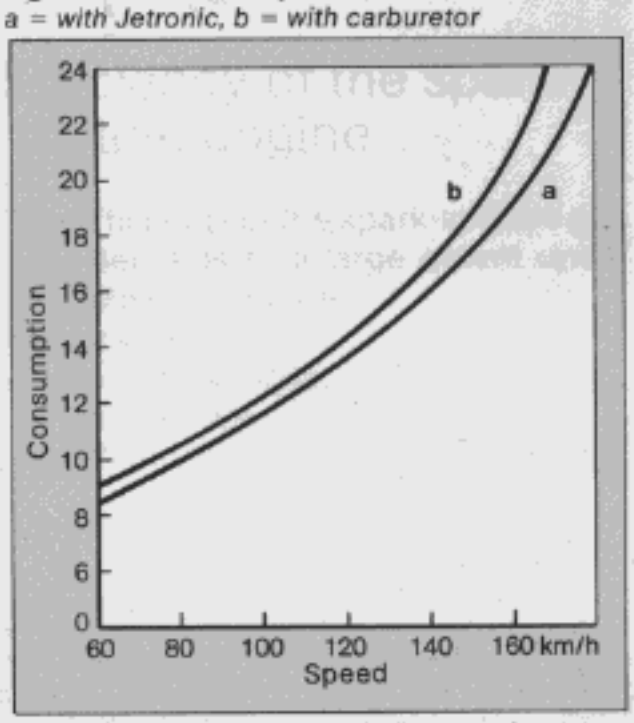


Fig. 5 Fuel consumption
a = with Jetronic, b = with carburetor



Our fuel injection systems save fuel by the barrel!

An "E" or an "I" on the rear of the car denotes "Gasoline fuel-injection". It can save up to 16% fuel according to the manner of driving and the traffic situation. With a middle-class fuel-injection car, it is possible to save an average of 200 liters on a yearly mileage of 20,000 km.

The relevant measurements were carried out at the Technical University in Vienna: A car with a standard carburetor engine underwent a cleverly thought out test program. The same vehicle was then converted to Bosch gasoline fuel-injection and the test program was repeated. Technical difference: Bosch gasoline fuel-injection.

The journey covered hundreds of kilometers, through heavy city traffic, along country roads and expressways. The result was quite clear: in practical driving situations in cities and on country roads a vehicle with gasoline fuel-injection saves up to 11% of fuel compared to the same model with carburetor. With overrun-cutoff (switching off the fuel supply during overrun) up to 16% can be saved.

A result confirmed by tests which we have been making since 1951, the year we started making fuel-injection systems.

What is the secret?

The Bosch gasoline fuel-injection system measures out the fuel so that just enough as is necessary for the particular driving condition is supplied. This applies whether it is warm or cold, whether the engine is lightly or heavily loaded. In our "Technical Center for Gasoline Fuel-Injection" K- and L-Jetronic are adapted to the engines in close cooperation with all the well-known motor-vehicle manufacturers.

In order to guarantee the optimum fuel utilization we use climatic and cold test stands to simulate the most varied environmental conditions as are found, for example, in the Sahara or in the Arctic.

Over 100 models with Bosch gasoline fuel-injection

The first series production of Bosch gasoline fuel-injection systems started in 1951. Since then they have proved their worth nearly 7 million times over. Due to the many advantages, such as fuel economy, higher output, reduction of pollutants in the exhaust gas and improved starting and warm-up behaviour, cars of nearly all classes are now being fitted with Bosch gasoline fuel-injection.

Principle

A pump supplies fuel to the engine and creates the pressure necessary for injection.
Injection valves inject the fuel into the individual intake tubes. An electronic control unit controls the injection valves.
The L-Jetronic consists principally of the following function blocks:

Induction system
The induction system supplies the engine with the necessary amount of fuel. It consists of air filter, manifold, throttle valve and the individual intake tubes.

Sensors
The sensors (probes) register the variable quantities which characterize the operating condition of the engine.
The most important variable is the amount of air drawn in by the engine and registered by the air-flow sensor. Other sensors register the position of the throttle valve, the engine speed, the air and the engine temperature.

Control unit
The signals delivered by the sensors are evaluated in the electronic control unit and from these signals are generated the appropriate control impulses for the injection valves.

Fuel system
The fuel system supplies fuel from the tank to the injection valves, creates the pressure necessary for injection and maintains it at a constant level. The fuel system also includes: supply pump, fuel filter, distributor pipe pressure regulator, injection and cold-start valves.

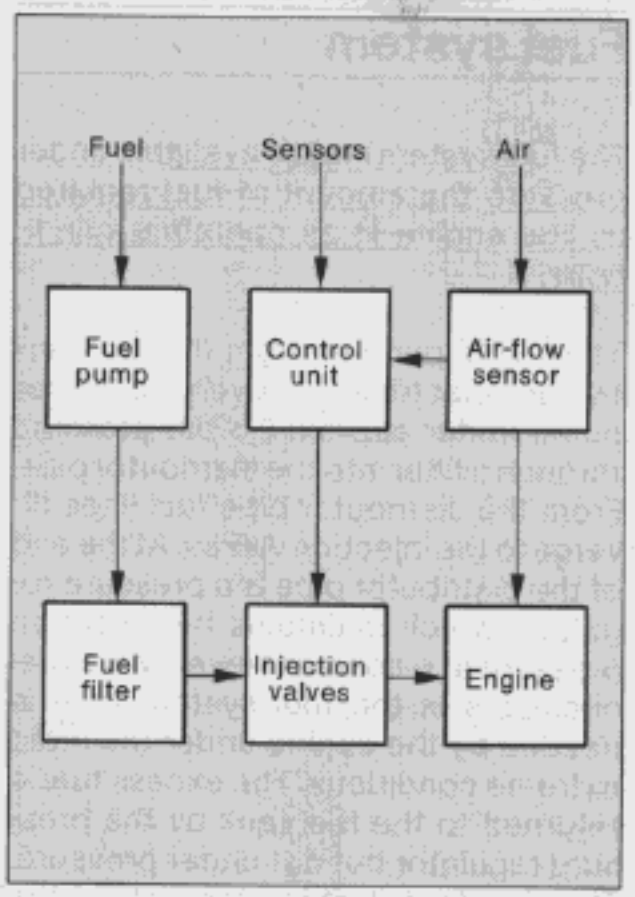


Fig. 6 Principle of the L-Jetronic (simplified)

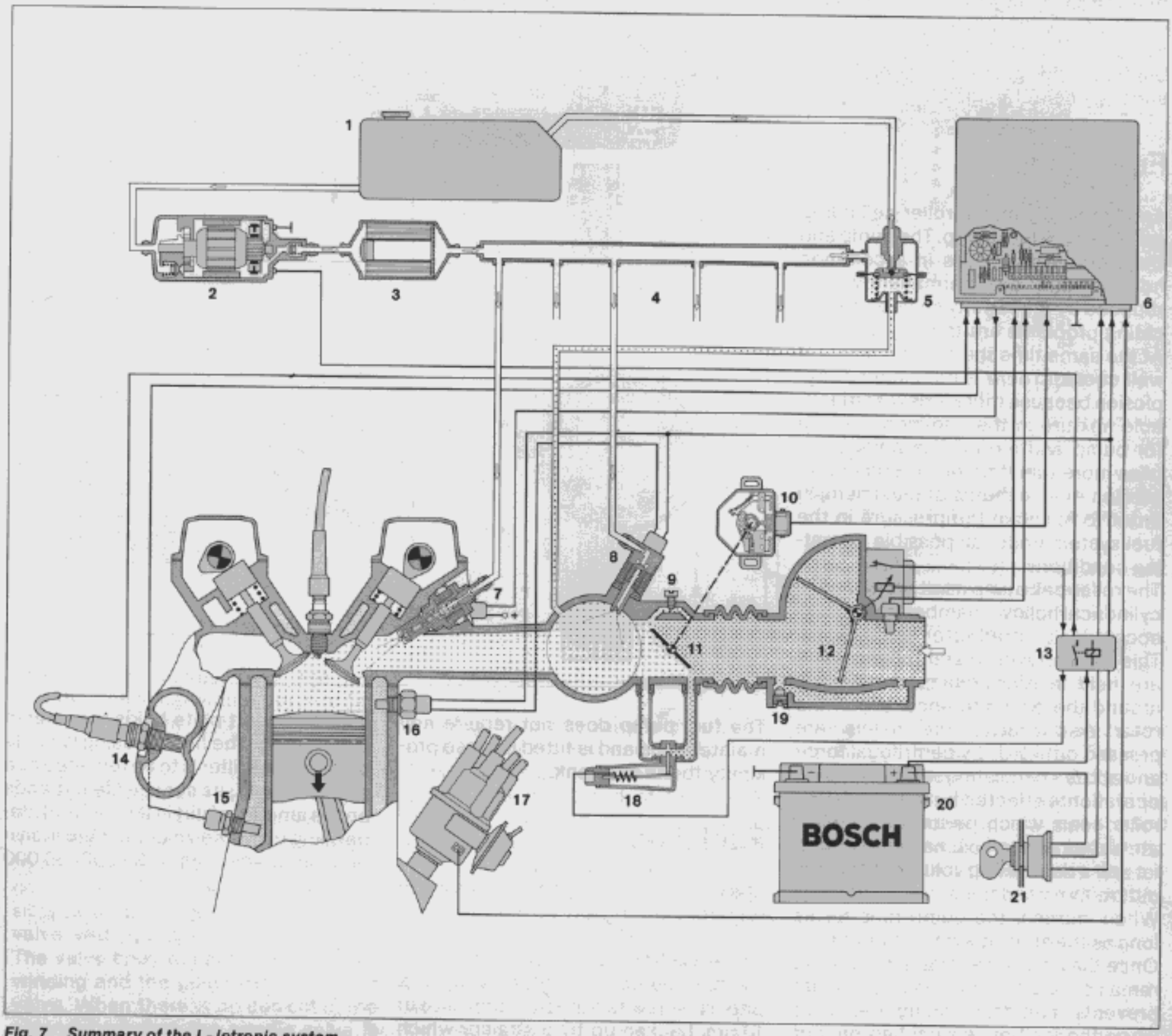


Fig. 7 Summary of the L-Jetronic system
1 Fuel tank, 2 Electric fuel pump, 3 Fuel filter, 4 Distributor pipe, 5 Pressure regulator, 6 Control unit, 7 Injection valve, 8 Start valve, 9 Idle-speed adjusting screw, 10 Throttle-valve switch, 11 Throttle valve, 12 Air-flow sensor, 13 Relay combination, 14 Lambda sensor (only for certain countries), 15 Engine temperature sensor, 16 Thermo-time switch, 17 Ignition distributor, 18 Auxiliary-air device, 19 Idle-mixture adjusting screw, 20 Battery, 21 Ignition-starter switch

Fuel system

The fuel system makes available under pressure the amount of fuel required by the engine in all operating conditions.

The fuel is pumped from the fuel tank by an electrically driven roller-cell pump under approx. 2.5 bar pressure through a filter into the distributor pipe. From the distributor pipe fuel lines diverge to the injection valves. At the end of the distributor pipe is a pressure regulator which maintains the injection pressure at a constant level. More fuel circulates in the fuel system than is needed by the engine under the most extreme conditions. The excess fuel is returned to the fuel tank by the pressure regulator but not under pressure. The constant flushing through of the fuel system enables it to be continually supplied with cool fuel. This helps to avoid the formation of fuel vapor bubbles and guarantees good hot-starting characteristics.

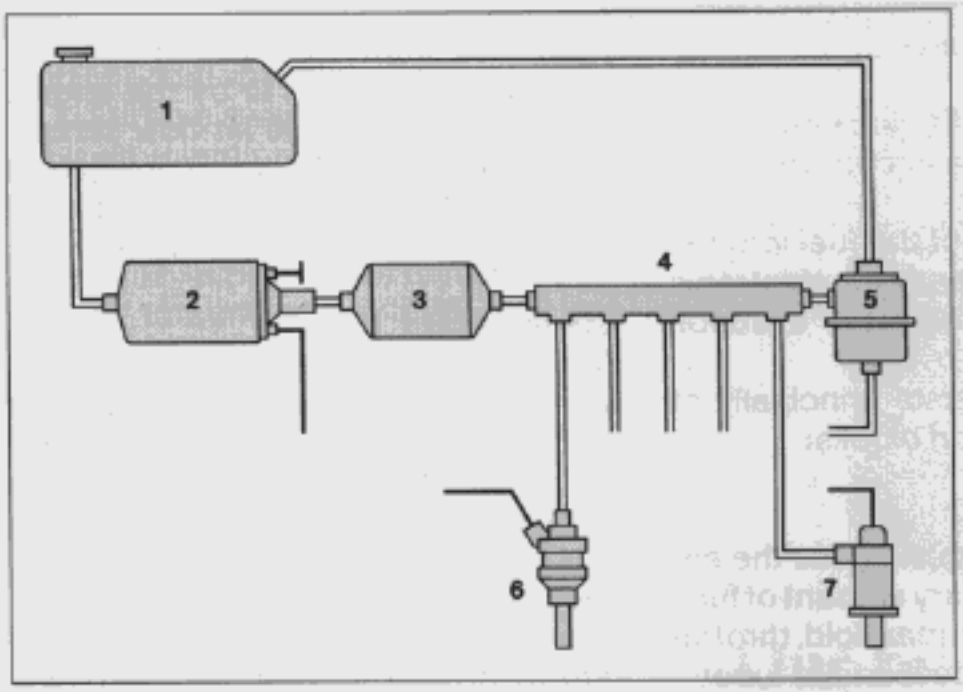


Fig. 8
Block diagram of fuel system
1 Fuel tank
2 Fuel pump
3 Fuel filter
4 Distributor pipe
5 Pressure regulator
6 Fuel-injection valve
7 Start valve

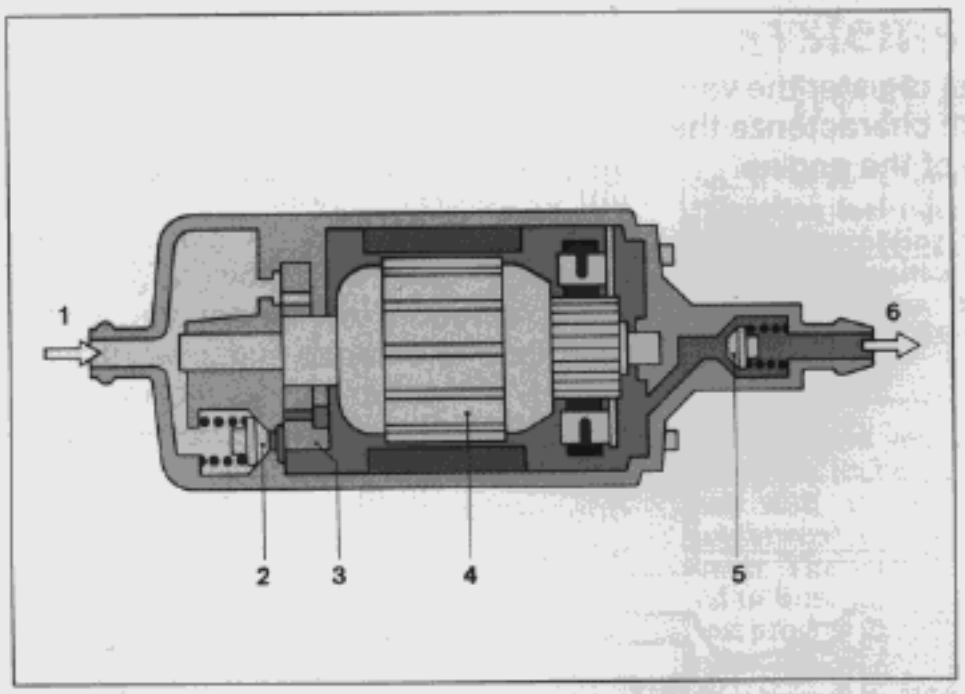


Fig. 9
Electric fuel-pump
1 Intake (suction) side
2 Pressure limiter
3 Roller-cell pump
4 Motor armature
5 Non-return valve
6 Pressure side

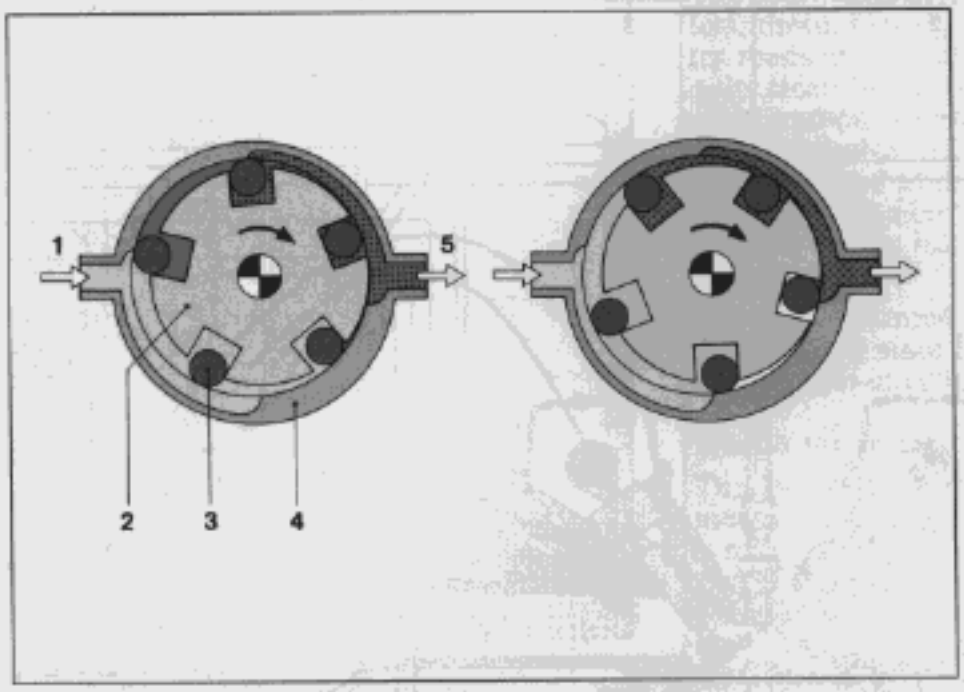


Fig. 10
Pumping procedure Roller-cell pump
1 Intake (suction)
2 Rotor disc
3 Roller
4 Pump housing
5 Pressure side

Fuel pump

An electrically driven roller-cell pump serves as the fuel pump. The pump and the electric motor are in a common housing and are permanently surrounded by fuel. Faulty seals and lubricating problems are thereby avoided. At the same time the electric motor is well cooled. There is no danger of explosion because there is never an ignitable mixture in the common housing for pump and motor. The pump supplies more fuel than the internal-combustion engine needs at maximum, in order to maintain the pressure in the fuel system under all possible operating conditions.
The roller-cell pump itself consists of a cylindrical hollow chamber in which an eccentrically fitted rotor disc rotates. This is fitted with metal rollers which are held in pocket-shaped recesses around the circumference. When the rotor disc rotates the rollers are pressed outwards by centrifugal force and act as a circulating seal. A pumping operation is effected by the circulating roller seals which periodically generate an increasing volume at the fuel inlet and a decreasing volume at the fuel outlet.
When starting, the pump runs for as long as the starting switch is operated. Once the engine has started the pump remains switched on. A safety circuit prevents fuel from being delivered when the ignition is switched on, but when the engine is stationary (e.g. after an accident).

The fuel pump does not require any maintenance and is fitted in close proximity to the fuel tank.

Fuel filter

The fuel filter prevents impurities in the fuel from getting any further.

A filter is fitted into the fuel circuit after the fuel pump. The filter contains a paper insert with a medium pore size of 10 μm, backed up by a strainer which retains any loose paper particles. The direction of flow indicated on the filter must be strictly adhered to for this reason. A support plate holds the filter in the housing. The filter housing is made of metal. The filter is to be replaced as a complete unit; its service life depends on the amount of dirt in the fuel and, depending upon the volume of the individual filter, amounts to 30,000–80,000 km.

Pressure regulator

The pressure regulator controls the pressure in the fuel system.

The pressure regulator is fitted at the end of the fuel rail. The pressure regulator is a diaphragm-controlled overflow type which maintains the fuel pressure at 2.5 or 3 bar according to the individual system. It consists of a metal housing divided into two chambers by a beaded diaphragm: a spring chamber for the pre-stressed helical spring which rests on the diaphragm and a chamber for the fuel.
When the set pressure is exceeded, a valve controlled by the diaphragm opens the inlet to an overflow channel through which the excess fuel can flow back to the fuel tank without pressure. The spring chamber of the pressure regulator is connected by a fuel line to the intake manifold of the engine behind the throttle valve. This results in the fuel-system pressure being dependent on the absolute pressure in the manifold and the pressure drop across the injection valves therefore being identical for every throttle-valve position.

Fuel rail

The fuel rail guarantees the same fuel pressure at each injection valve.

The fuel rail has a storage function. Its volume compared with the amount of fuel injected during each working cycle of the engine is large enough to prevent variations in pressure. The injection valves connected to the fuel rail are therefore subjected to the same fuel pressure. The fuel rail also facilitates easy fitting of the injection valves.

Fuel-injection valve

The injection valves inject the fuel into the individual intake ports of the cylinders in front of the engine inlet valves.

Each engine cylinder has its own injection valve. The valves are solenoid-operated and are opened and closed by means of electric impulses from the control unit. The injection valve consists of a valve body and the needle valve with fitted solenoid armature. The valve body contains the solenoid winding and the guide for the needle valve. When there is no current in the solenoid winding the needle valve is pressed against its seat on the valve outlet by a helical spring. When a magnetic field is generated in the solenoid winding the needle valve is lifted by approximately 0.1 mm and the fuel can flow out through a calibrated annular orifice. The front end of the needle valve is provided with a specially ground pintle for atomizing the fuel. The pull-in and release times of the valve lie in the range of 1 to 1.5 ms. To achieve good fuel distribution with low condensation loss, wetting of the intake manifold walls must be avoided. A particular spray angle in connection with a particular distance of the injection valve from the inlet valve must therefore be maintained specific to the engine concerned. The injection valves are fitted with the help of special holders and are mounted in rubber mouldings in these holders. The heat insulation thereby achieved prevents the formation of fuel-vapor bubbles and guarantees good hot-starting characteristics. The rubber mouldings also ensure that the injection valve is not subjected to excessive vibration.

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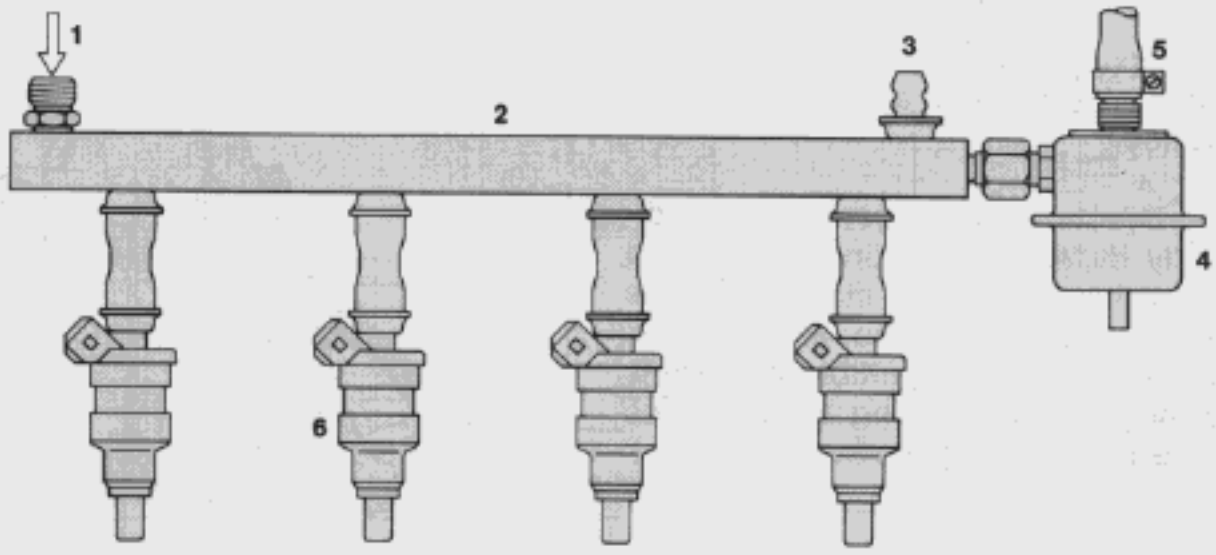

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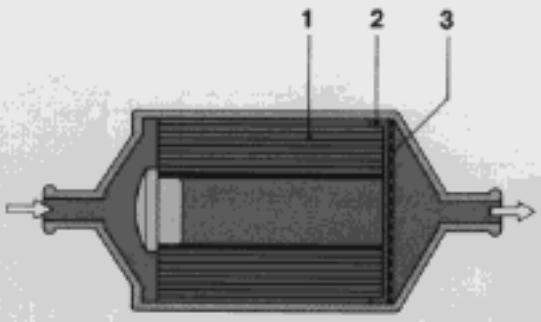

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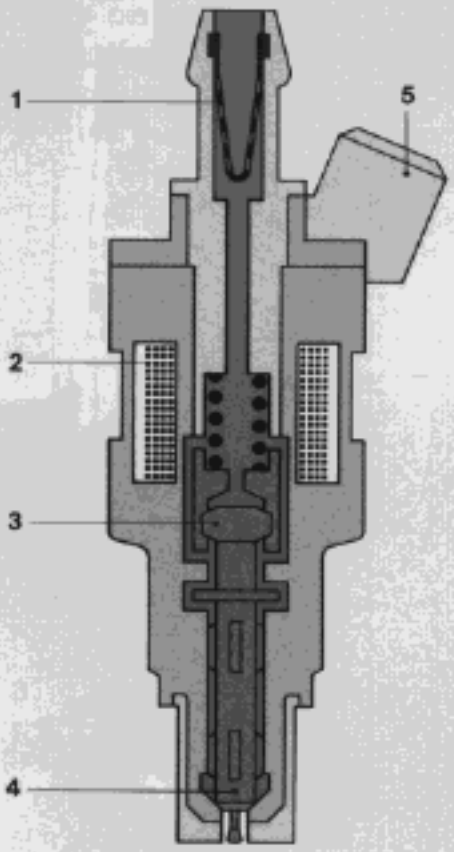

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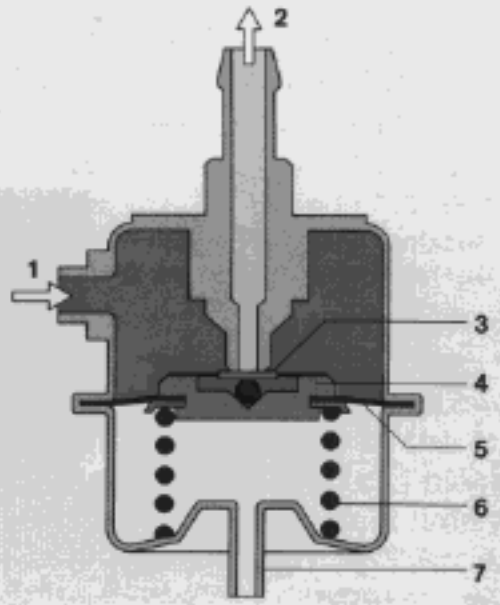


Fig. 11 Fuel rail
1 Fuel inlet, 2 Fuel rail, 3 Connection for start valve, 4 Pressure regulator, 5 Return line, 6 Injection valves

Fig. 12 Fuel filter
1 Paper filter, 2 Strainer, 3 Support plate

Fig. 13 Injection valve
1 Filter, 2 Solenoid winding, 3 Solenoid armature, 4 Needle valve, 5 Electrical connection

Fig. 14 Pressure regulator
1 Fuel connection, 2 Fuel-return connection, 3 Valve plate, 4 Valve holder, 5 Diaphragm, 6 Compression spring, 7 Vacuum connection

Mixture formation

The mixture formation is carried out in the intake manifold and in the engine cylinder.

The injection valve injects its fuel directly in front of the inlet valve and when this opens, the cloud of fuel is drawn along with the air which is sucked in and an ignitible mixture is formed by the swirling action which takes place during the intake cycle.

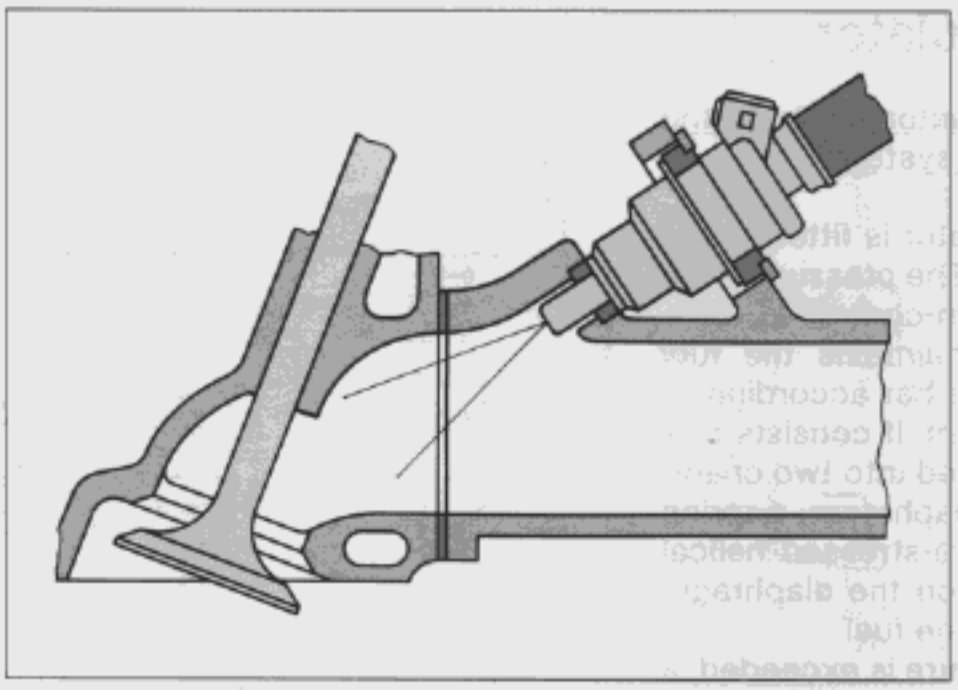
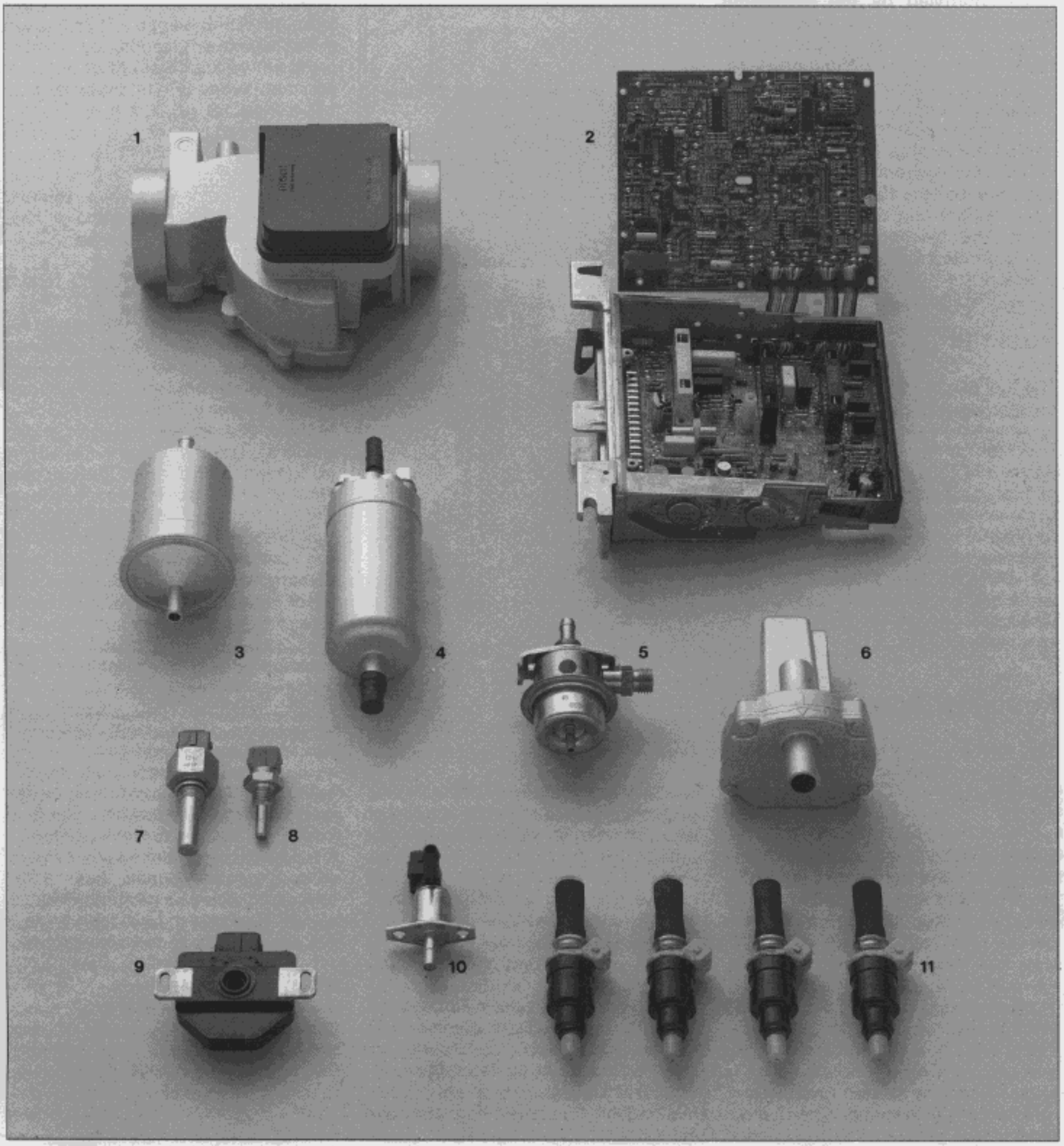


Fig. 15
Injection-valve mounting

Fig. 16
Components of the L-Jetronic
1 Air-flow sensor
2 Control unit
3 Fuel filter
4 Fuel pump
5 Fuel pressure regulator
6 Auxiliary-air device
7 Thermo-time switch
8 Temperature sensor
9 Throttle-valve switch
10 Start valve
11 Injection valves



Control system

The operating temperature of the engine is calculated by means of sensors and fed into the control unit in the form of electric signals. The sensors and the control unit form the control system.

Variable quantities and operating condition

The variable quantities characterizing the operating condition of the engine can be distinguished according to the following system:

- Main variable quantities
- Variable quantities for compensation
- Variable quantities for precision compensation

Main variable quantities
The main variable quantities are the engine speed and the amount of air drawn in by the engine. These determine the amount of air per stroke which then serves as a direct measure for the loading condition of the engine.

Variable quantities for compensation
For operating conditions which deviate from normal operation the mixture must be adapted to the modified conditions. We are concerned in this connection with the following operating conditions: starting, warm-up, load adaptation. The calculation of starting and warm-up conditions is carried out by sensors which transmit the engine temperature to the control unit. For compensating various loading conditions, the load range (idle, part-load, full-load) is transmitted to the control unit via the throttle-valve switch.

Variable quantities for precision compensation
In order to achieve optimum driving behaviour, further operating ranges and influences can be considered: transitional behaviour when accelerating, maximum engine-speed limitation and overrun can all be calculated by the sensor as mentioned above. The signals from this sensor have a particular relationship to each other in these operating ranges. These relationships are recognized by the control unit and influence the control signals of the injection valves accordingly.

Combined effect of variable quantities
All the variable quantities together are evaluated by the control unit in such a manner that the engine is always supplied with the amount of fuel necessary for its operation at that particular moment. In this way optimum driveability is achieved.

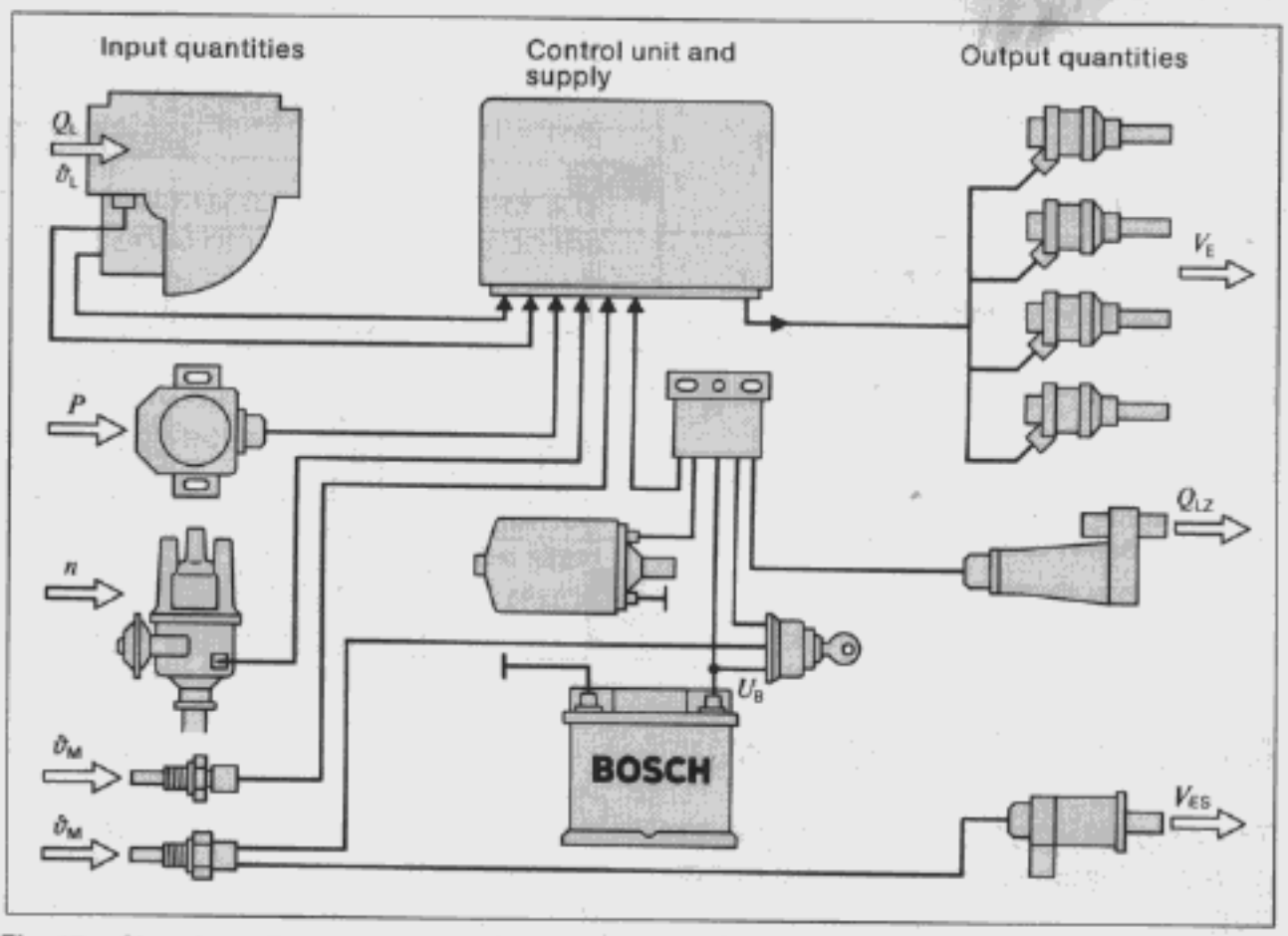


Fig. 17 Signals and control quantities fed into the control unit
Q_L air drawn in, ϑ_L air temperature, n engine speed, P engine load-range, ϑ_M engine temperature, V_E fuel quantity injected, Q_{LZ} auxiliary air, V_{ES} excess fuel for starting, U_B vehicle-system voltage

Calculating engine speed

Information on engine speed and the start of injection is passed on to the L-Jetronic control unit in breaker-triggered ignition systems by the contact-breaker points in the ignition distributor, and in breakerless ignition systems by terminal 1 of the ignition coil.

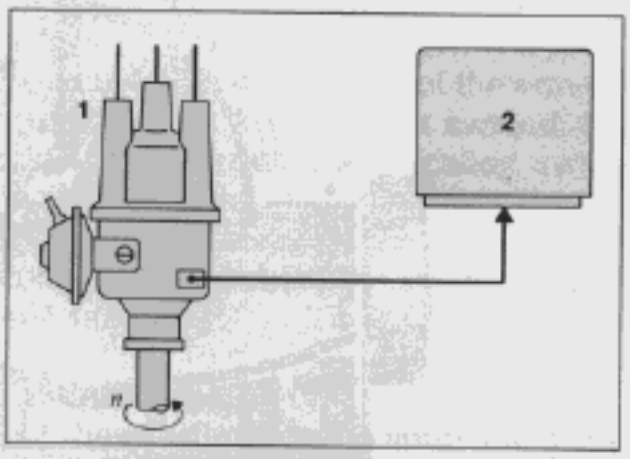


Fig. 18 Calculating engine speed with a breaker-triggered ignition system
n engine speed, 1 ignition distributor, 2 control unit

Processing of impulses
The impulses delivered by the ignition system are processed in the control unit. First of all they pass through a pulse-shaping circuit which forms rectangular pulses from the signal "delivered" in the form of damped oscillations. These rectangular pulses are fed into a frequency divider.
The frequency divider divides the pulse frequency given by the ignition sequence in such a manner that two pulses occur for each working cycle regardless of the number of cylinders. The start of the pulse is at the same time the start of injection for the injection valves. For each turn of the crankshaft each injection valve injects once, regardless of the position of the inlet valve. When the inlet valve is closed, the fuel is stored and the next time the inlet valve opens it is drawn into the combustion chamber together with the air. The duration of injection depends on the amount of air and the engine speed.

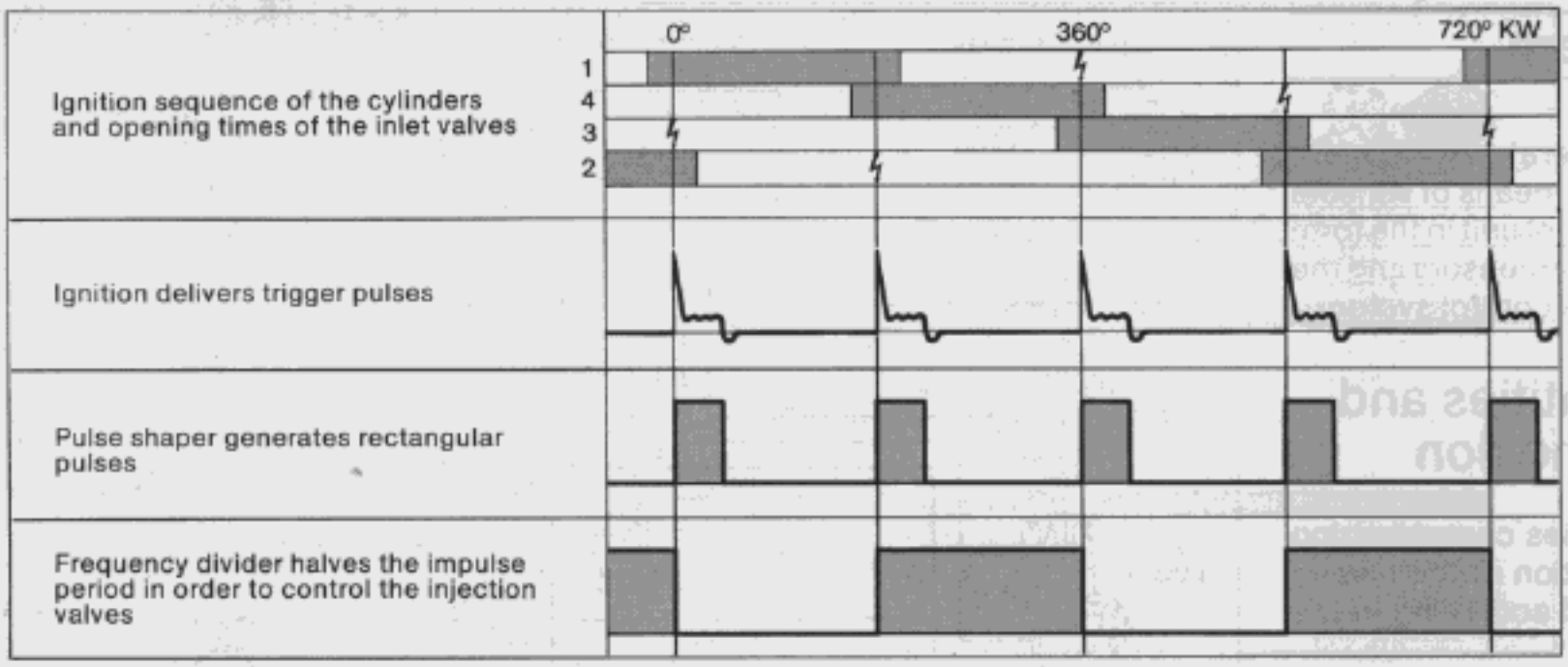


Fig. 19
Processing the ignition pulses in the control unit
in a 4-cylinder engine
°KW = °crankshaft

Measuring the air flow

The amount of air drawn in by the engine is a measure of its loading condition.

All the air drawn in by the engine is measured and serves as a main variable quantity for the fuel distribution. The amount of fuel determined from the air-flow sensor output and the engine speed is referred to as the basic fuel quantity.
The air-flow measurement registers all changes which can take place in the engine during the service life of the vehicle, e. g. wear, combustion-chamber deposits, changes to the valve setting. Since the quantity of air drawn in must first pass through the air-flow sensor before entering the engine, this means that during acceleration the signal leaves the sensor before the air is actually drawn into the cylinder. In this way, namely by supplying more fuel in advance, fuel enrichment for acceleration is achieved.

Air-flow sensor
The principle is based on the measurement of the force emanating from the stream of air drawn in by the engine. This force has to counteract the opposing force of a return spring acting upon the air-flow sensor flap. The flap is deflected in such a manner that, together with the profile of the measurement duct, the free cross-section increases along with the rise in the quantity of air passing through it.
The change in the free air-flow sensor cross-section depending on the position of the sensor flap, was selected so that a logarithmic relationship results between flap angle and air throughput. The result is that at low air throughput, where measurement precision must be particularly high, the sensitivity of the air-flow sensor is also high. In order to prevent the oscillations caused by the engine suction strokes from having more than a minimum effect upon the sensor-flap position, a compensation

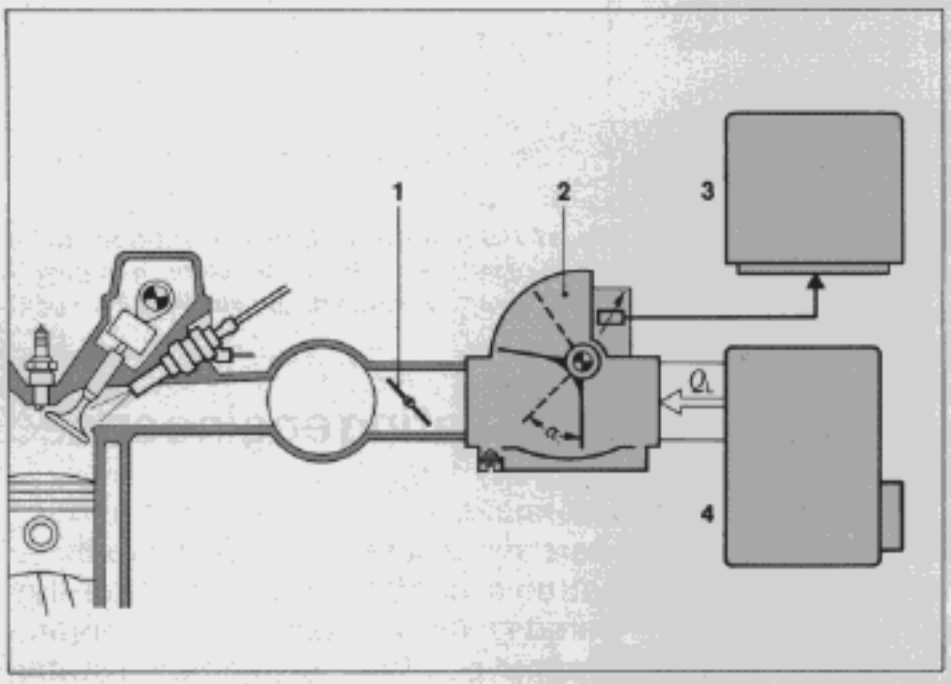


Fig. 20
Air-flow sensor in the intake system
1 Throttle valve
2 Air-flow sensor
3 Control unit
4 Air filter
Q_L Amount of air drawn in

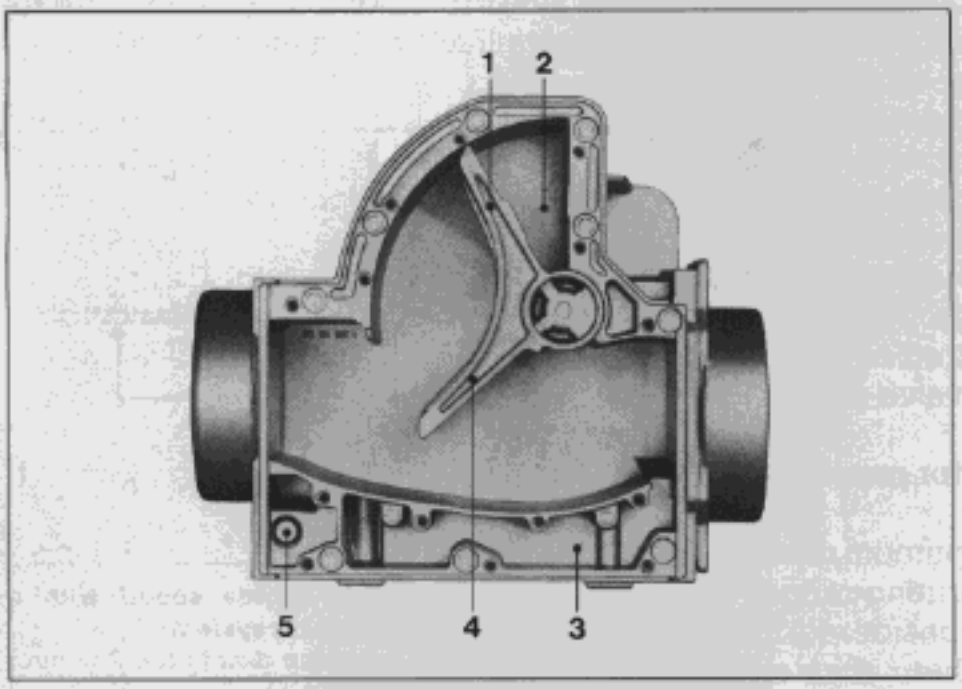


Fig. 21
Air-flow sensor (air side)
1 Compensation valve
2 Damping chamber
3 Bypass
4 Sensor flap
5 Idle-mixture adjusting screw (Bypass)

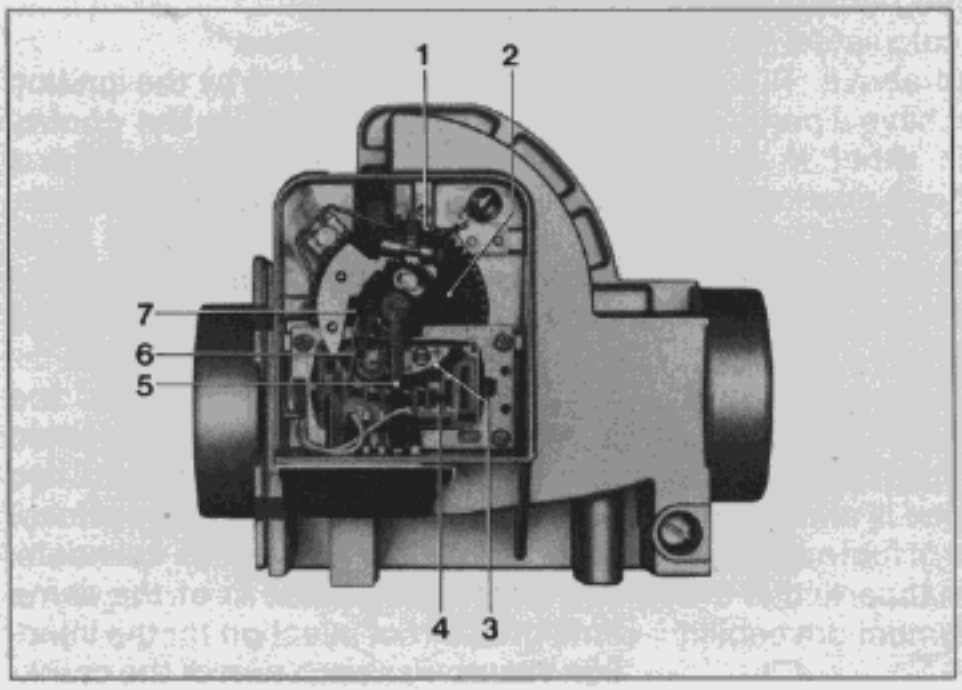


Fig. 22
Air-flow sensor (connection side)
1 Ring gear for spring preloading
2 Return spring
3 Wiper track
4 Ceramic substrate with resistors and conductor straps
5 Wiper tap
6 Wiper
7 Pump contact

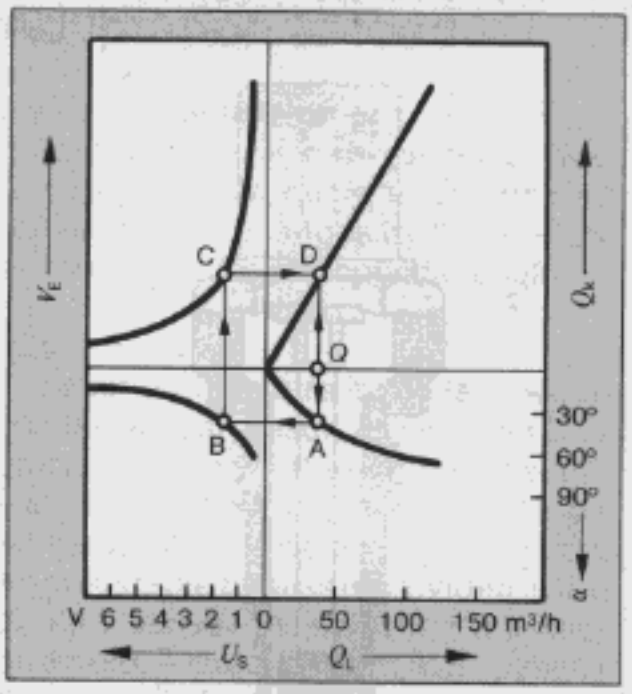


Fig. 23 The relationships between air quantity, sensor-flap angle, voltage at the potentiometer and fuel quantity injected
Starting with a certain volume of air Q_L flowing through the air-flow sensor (point Q), we can derive the theoretically required amount of fuel Q_K (point D). In addition, the sensor flap is deflected to a certain flap angle α (point A) depending on the amount of air. The potentiometer activated by the air-flow sensor flap sends a voltage signal U_S to the control unit (point B). The control unit controls the injection valves, whereby point C represents the amount of fuel injected V_E. It can be seen that the amount of fuel theoretically required and the amount of fuel injected are the same (line C–D).

flap is incorporated as an integral part of the sensor flap. The pressure oscillations have the same effects upon both flaps. The moments of force cancel each other out so that the measurement is not affected. The angular position of the sensor flap is transformed by a potentiometer into a voltage. The potentiometer is calibrated such that the relationship between air throughput and voltage output is inversely proportional. In order that ageing and the temperature characteristic of the potentiometer have no effect upon the accuracy, only resistance values are evaluated in the control unit. In order to set the air-fuel ratio at idle, an adjustable bypass duct is provided through which a small amount of air can bypass the sensor flap.
The diagram shows the relationships between the air quantity, the angle of the sensor flap, the potentiometer voltage and the fuel injected.

Cold starting

When the engine is started additional fuel is injected for a limited period depending on the temperature of the engine.

When a cold engine is started fuel in the air-fuel mixture condenses and is thereby lost.

To compensate for this and to facilitate the starting of the cold engine, extra fuel must be injected at the moment of starting.
This additional fuel is injected for a limited period of time depending on the temperature of the engine.
This procedure is known as "cold-start enrichment". During this procedure the mixture becomes "richer", i. e. the excess-air factor is temporarily lower than 1.
Cold-start enrichment can be carried out in two different ways: by the start control with the help of the control unit and injection valves or by means of a thermo-time switch and a start valve.

Start control

By extending the period during which the injection valves inject, more fuel can be supplied during the starting phase. The control unit controls the start procedure by processing the signals from the starting switch and from the engine temperature.
The construction and method of operation of the temperature sensor are described in the chapter "Warm-up".

Start valve

The start valve is ooerated by a solenoid, the winding of which is situated in the valve. In the neutral position a helical spring presses the movable armature of the solenoid against a seal, thereby shutting off the valve. When a current is passed through the solenoid the armature, which now rises from the valve seat, allows fuel to flow. The fuel then flows along the sides of the armature to a nozzle where it is swirled. In this form of nozzle, a so-called swirl nozzle, the fuel is particularly finely atomized and enriches the air in the intake manifold behind the throttle valve with fuel.

Thermo-time switch

The thermo-time switch limits the duration of injection of the start valve depending on the temperature of the engine.
The thermo-time switch is an electrically heated bimetal switch which opens or closes a contact depending on its temperature. It is housed in a hollow threaded pin which is located in a position where typical engine temperature prevails. The thermo-time switch determines the length of time the start valve is to be switched on. The time during which the start valve is switched on depends on the heating of the thermo-time switch by the warmth from the engine, the ambient temperature and by the electrical heating in the switch itself. This self-heating is necessary in order to limit the maximum time that the start valve is switched on and to prevent the engine from being over-

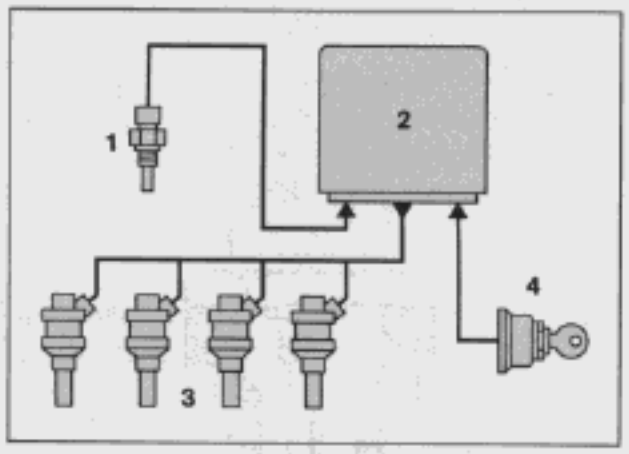


Fig. 24 Cold-start enrichment by start control
1 Engine-temperature sensor, 2 Control unit, 3 Injection valves, 4 Ignition-starter switch

Fig. 25 Cold-start enrichment by start valve
1 Start valve, 2 Thermo-time switch, 3 Relay combination, 4 Ignition-starter switch

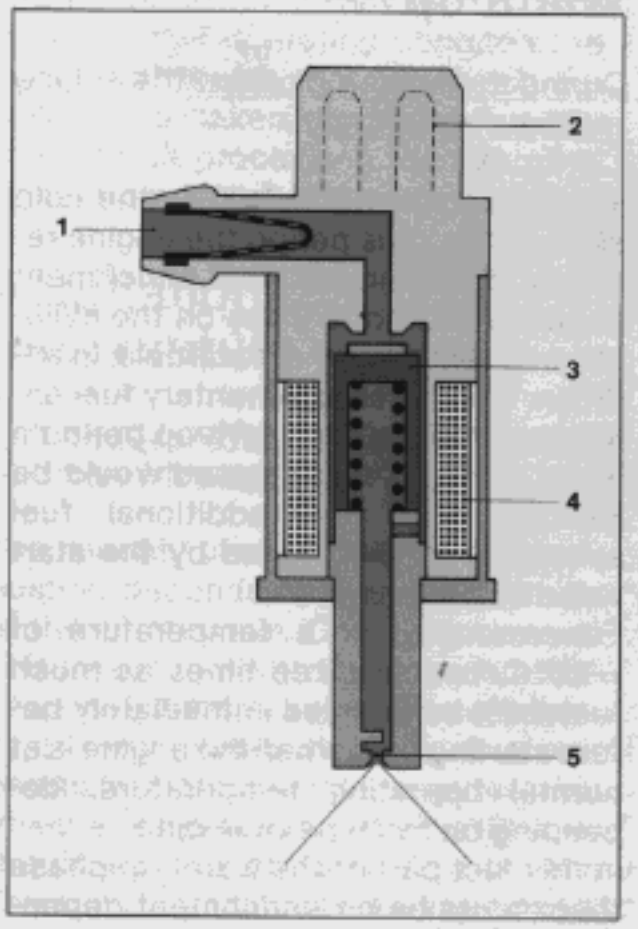


Fig. 26 Start valve
1 Fuel inlet, 2 Electrical connection, 3 Solenoid armature, 4 Solenoid winding, 5 Swirl nozzle

enriched and "drowned". The electrical heating is the main factor governing the measurement of the time during which the valve is switched on when starting, (e. g. at −20° C it switches off after approx. 8 seconds). When the engine is warm, the thermo-time switch is heated so much by the heat from the engine that it is constantly open. When starting with a warm engine, therefore, no extra fuel for starting is injected by the start valve.

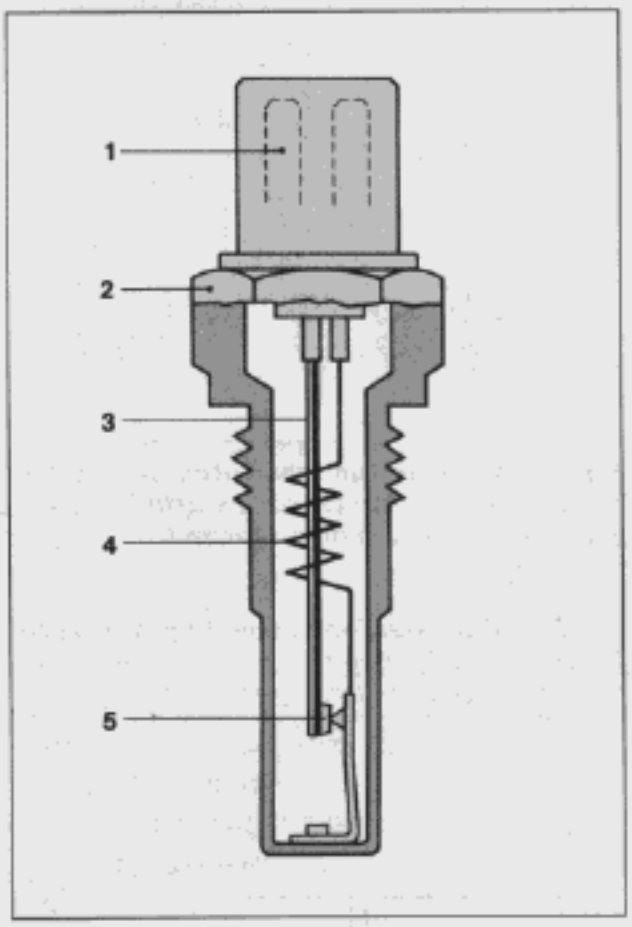


Fig. 27 Thermo-time switch
1 Electrical connection, 2 Housing, 3 Bimetal, 4 Heating winding, 5 Switch contact

Warm-up

During the warm-up period the engine receives more fuel.

The warm-up period follows the cold start. During this period the engine requires considerable fuel enrichment because fuel condenses on the cylinder walls when they are still cold. In addition, without supplementary fuel enrichment during the warm-up period a major drop in engine speed would be noticed after the additional fuel sprayed into the engine by the start valve had been cut off.
For example, at a temperature of −20°C, two to three times as much fuel must be injected immediately before starting than when the engine is at normal operating temperature, depending on the type of engine.
In this first part of the warm-up phase there must be an enrichment dependent on time, the so-called after-start enrichment. This enrichment has to last about 30 s and, according to temperature, gives in the order of between 30% and 60% more fuel.
When the after-start enrichment has finished the engine only needs a slight enrichment of the mixture; this being controlled by the engine temperature. The diagram shows a typical enrichment curve with reference to time with a starting temperature of 20°C.
In order to trigger off this control procedure, the control unit must receive information on the engine temperature. This task is performed by the temperature sensor.

Temperature sensor
The temperature sensor consists of a hollow threaded pin in which an NTC resistor is embedded. NTC stands for "negative temperature coefficient" and means that the electrical resistance of this resistor, which is made of a semi-conductor material, decreases as the temperature increases. This change is used for measurement purposes.
In water-cooled engines the temperature sensor is installed in the engine block where it is immersed in the coolant. Here, it gradually assumes the temperature of the coolant. In air-cooled engines the temperature sensor is installed in the cylinder head of the engine.

Idle-speed control

During the warm-up phase the engine receives more fuel due to the influence of an auxiliary-air device. This is to overcome the frictional resistance in the cold engine and to guarantee a stable idling speed.

There are increased frictional resistances present in a cold engine which must be overcome at idling speed. The engine is therefore allowed to take in more air through the auxiliary-air device by bypassing the throttle valve. Since this additional air is measured by the air-flow sensor and is taken into account when the fuel is metered, the engine receives more air-fuel mixture. With a cold engine a stable idling speed can therefore be achieved.

Auxiliary-air device
In the auxiliary-air device a bimetallic strip operates a blocking plate which controls the cross-section of the bypass channel. The cross-section opening of this blocking plate is adjusted depending on the temperature, so that the opening is large enough for cold-starting but becomes smaller as the engine temperature increases until it eventually closes. The bimetallic strip is heated electrically. In this way a limited opening time can be achieved, according to the individual type of engine.
The auxiliary-air device is fitted in a position where it can sense the temperature of the engine. This prevents the auxiliary-air device from coming into operation when the engine is warm.

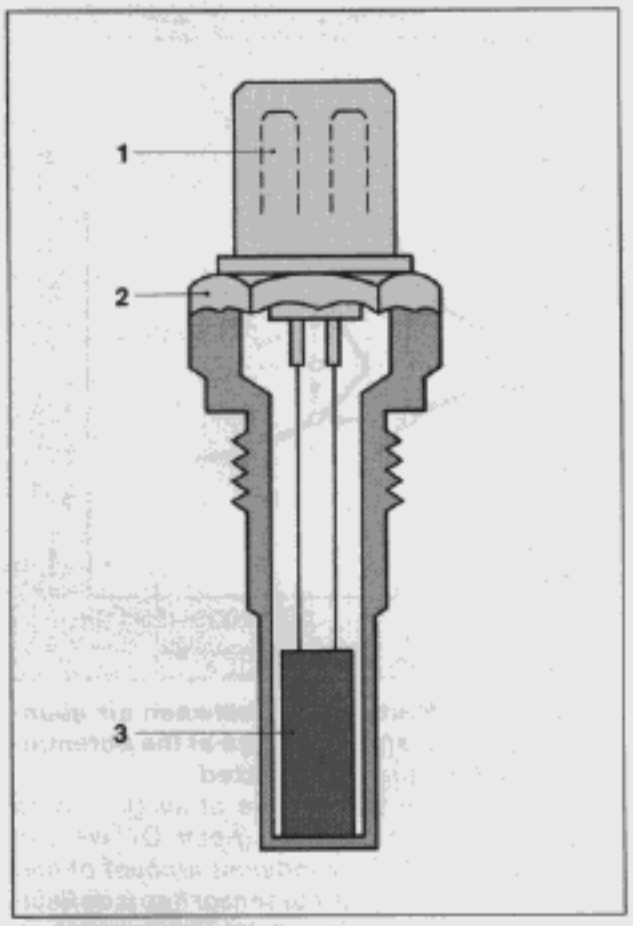


Fig. 28 Temperature sensor
1 Electrical connection, 2 Housing, 3 NTC resistor

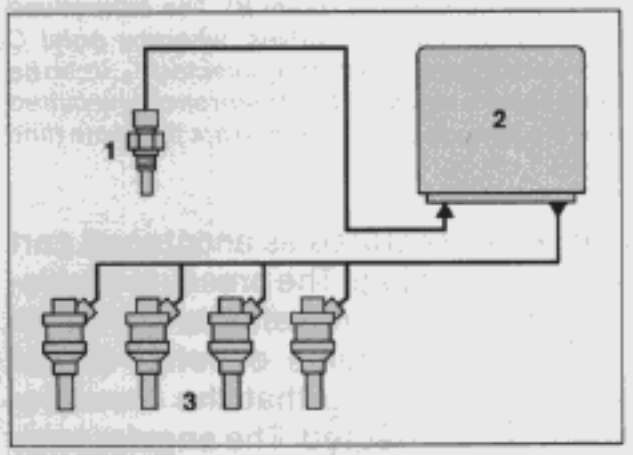


Fig. 29 Warm-up enrichment
1 Engine temperature sensor, 2 Control unit, 3 Injection valves

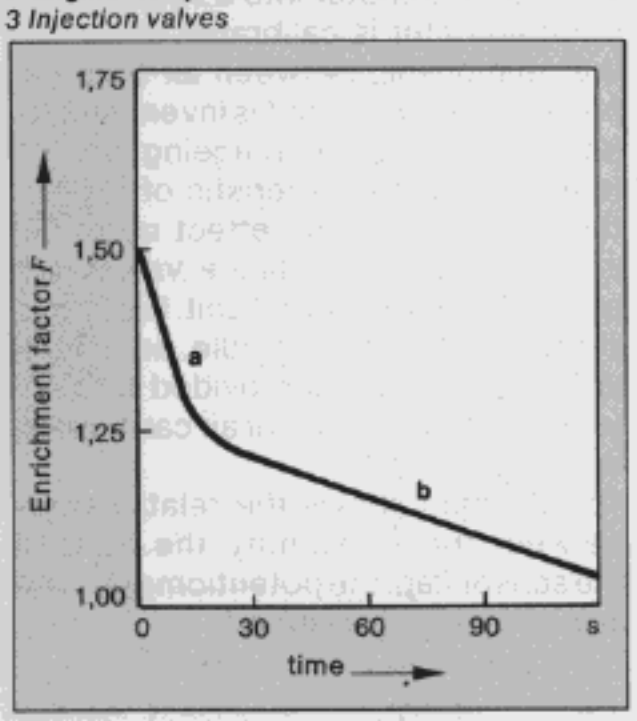


Fig. 30 Warm-up enrichment curve
Enrichment factor as a function of time, a proportion mainly dependent on time, b proportion mainly dependent on engine temperature

Adaptation to load

Different loading ranges necessitate different mixture compositions. The fuel-requirement curve is determined for all operating ranges by the air-flow sensor curve for the specific engine.

Idle
If the air-fuel mixture is too lean when idling, this can result in misfiring and uneven running of the engine. If necessary, the mixture should, therefore, be enriched for this operating condition. An adjustable bypass is provided in the air-flow sensor for adjusting the mixture ratio. A small amount of air passes through this bypass, thereby avoiding the sensor flap.

Part load
By far the greater part of the time the engine will be operating in the part-load range. The fuel requirement curve for this range is programmed in the control unit and determines the amount of fuel supplied. The curve is plotted so that the fuel consumption of the engine is low in the part-load range.

Full-load
In the full-load range the engine must give its greatest output. This is achieved by enriching the mixture compared with its composition in the part-load range. The extent of the enrichment is programmed in the control unit for the specific engine. Information on operation in the full-load range is passed from the throttle-valve switch to the control unit.

Throttle-valve switch
The throttle-valve switch is fitted to the intake manifold and is operated by the throttle-valve shaft. In each of the end positions "full-load" and "idle" a contact is closed.

Acceleration
During acceleration additional fuel is injected.

When changing from one operating condition to another, deviations in mixture occur which are corrected to improve driveability.
If the throttle valve is suddenly opened at a constant engine speed, then both the amount of air which reaches the combustion chamber as well as that which is necessary to raise the pressure in the intake manifold to the new level, flow through the air-flow sensor. The sensor flap then deflects briefly beyond the fully-open-throttle position. This overswing increases the metered fuel quantity (acceleration enrichment), and the result is good transitional response.
During the warm-up phase this acceleration enrichment may not be sufficient. In this operating conditon the speed with which the sensor flap deflects is also taken into account by the control unit processing the electrical signal from the air flow sensor.

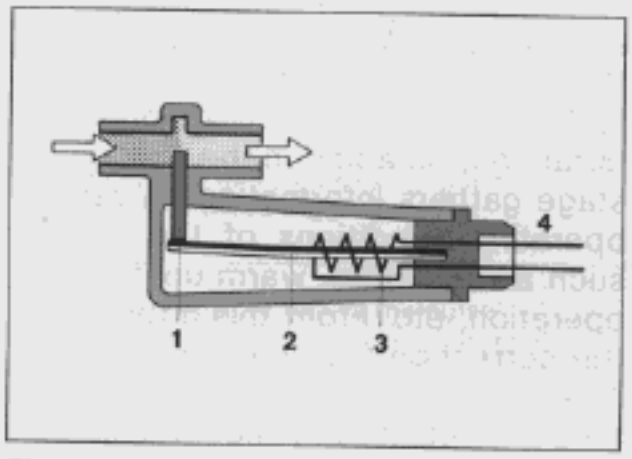


Fig. 31 Auxiliary-air device
1 Blocking plate, 2 Bimetallic strip, 3 Electric heating element, 4 Electrical connection

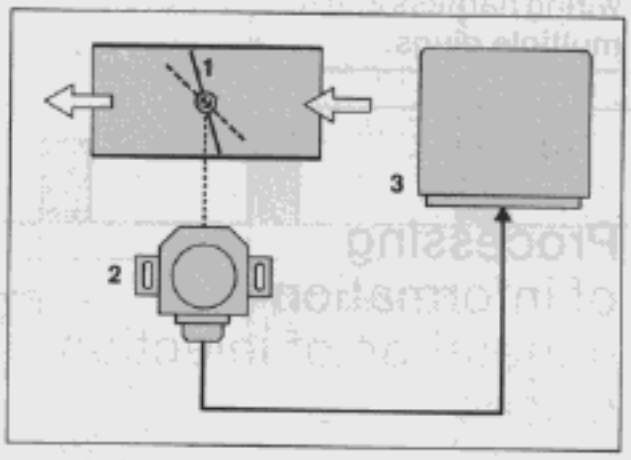


Fig. 33 Idle/full-load correction
1 Throttle valve, 2 Throttle-valve switch, 3 Control unit

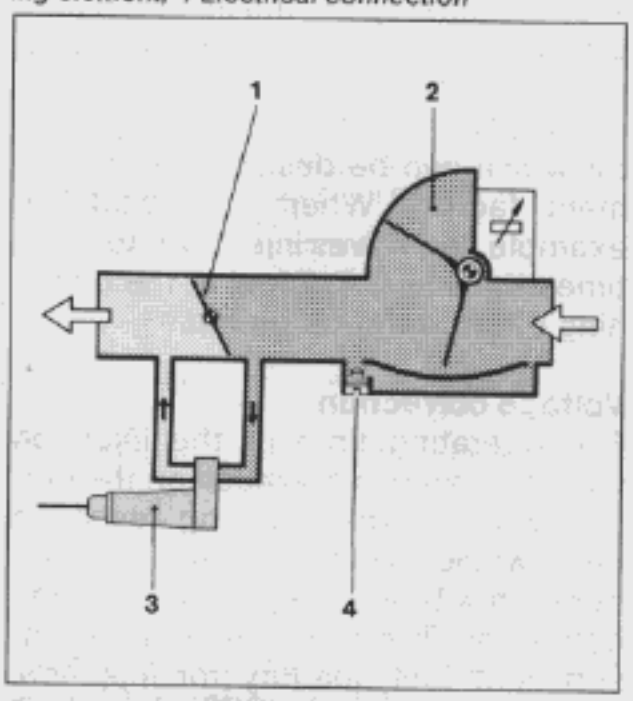


Fig. 32 Idle-speed control
1 Throttle valve, 2 Air-flow sensor, 3 Auxiliary-air device, 4 Idle-mixture adjusting screw

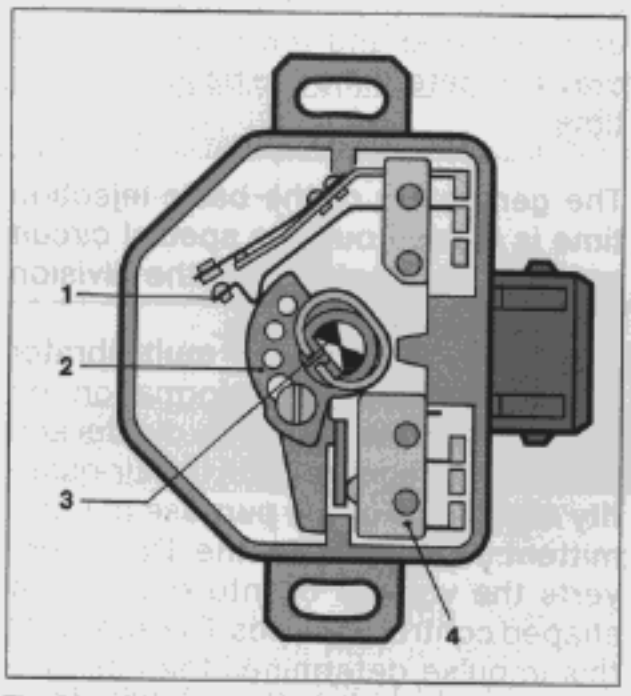


Fig. 34 Throttle-valve switch
1 Full-load contact, 2 Contact path, 3 Throttle-valve shaft, 4 Idle contact

Adaptation to the air temperature

The quantity of fuel injected is adapted to the air temperature.

The quantity of air necessary for combustion depends on the temperature of the air drawn in. Cold air is denser. This means that with the same throttle-valve position the volumetric efficiency of the cylinders drops as the temperature increases. To register this effect a temperature sensor is fitted in the intake duct of the air-flow sensor. This sensor measures the temperature of the air drawn in and passes this information onto the control unit which then controls the amount of fuel metered to the cylinders accordingly.

Additional adaptations

In order to optimize the driveability of a particular vehicle model under certain driving conditions, a variety of different adaptation facilities can be incorporated.

Engine-speed limitation
With the existing engine-speed limitation the ignition is short-circuited by the distributor rotor when a certain max. speed has been reached.
This method is no longer possible in vehicles with catalysts, since the fuel still injected would pass into the catalyst unburnt. This leads to thermal failures of the catalyst. An electronic engine-speed limitation offers a solution here. Triggering of this circuit is carried out by the control unit itself. The speed-dependent signal is compared with a fixed limit. If the limit is exceeded the injection signals are suppressed.

Overrun operation (coasting)
During the transition to overrun operation the fuel supply can be cut off above a certain engine speed, i. e. the injection valves remain closed. For this process the control unit evaluates the signals from the throttle-valve switch and from the engine speed. If the speed sinks below a certain value or if the idle contact opens again in the throttle-valve switch, then the fuel supply is resumed again.
The engine speed above which the injection pulses are suppressed is controlled as a factor of the engine temperature.

Control unit

As the central unit of the system, the control unit evaluates the data delivered by the sensors on the operating condition of the engine. From this data, control pulses for the injection valves are formed, whereby the quantity of fuel to be injected is determined by the length of time the injection valves are opened.

Composition of the control unit

The L-Jetronic control unit is in a metal housing which is protected against splash water and is fitted where it is not affected by the heat radiated from the engine. The electronic components of the control unit are arranged on printed circuit boards; the output components for the final stage are on the metal frame of the control unit, whereby good heat dissipation is assured. By using integrated circuits and hybrid components the number of parts required can be kept to a minimum. The combining of functional groups in integrated circuits (e.g. pulse shaper, pulse divider, division control multivibrator) and components in hybrid form increases the reliability of the control unit.
A multiple plug is used to connect the control unit to the injection valves, the sensors and the vehicle electrical system. The input circuit in the control unit is designed so that the latter cannot be connected with the wrong polarity and cannot be short-circuited.
Special Bosch testers are available for carrying out measurements on the control unit and on the sensors. The testers can be connected between the wiring harness and the control unit with multiple plugs.

Processing of information and generation of injection pulses

The frequency of the injection pulses is calculated from the engine speed. The engine speed and the quantity of air drawn in determine the basic injection time.

The generation of the basic injection time is carried out in a special circuit group in the control unit, the division control multivibrator.
The division control multivibrator (DSM) receives the information on speed n from the frequency divider and evaluates it together with the air-quantity signal U_s. For the purpose of intermittent fuel injection the DSM converts the voltage U_s into rectangular shaped control impulses. Duration t_p of this impulse determines the basic injection quantity, i. e. the quantity of fuel to be injected per suction stroke without considering any corrections. t_p is therefore regarded as the "basic injection time". The greater the quantity of air drawn in with each suction stroke, the longer the basic injection time. Two border cases are possible here: if the engine speed n increases at a constant air throughput Q, then the absolute pressure sinks downstream of the throttle valve and the cylinders draw in less air per stroke, i. e. the cylinders are not filled as much. As a result less fuel is needed for combustion and the duration of the impulse t_p is correspondingly shorter. If the engine output and thereby the amount of air drawn in per minute increase and providing the speed remains constant, then the cylinders will be filled better and more fuel will be required: the impulse duration t_p of the DSM is longer. During normal driving, engine speed and output usually change at the same time, whereby the DSM continually calculates the basic injection time t_p. At a high speed the engine output is normally high (full load) and this results in the end effect in a longer impulse duration t_p and therefore more fuel per injection cycle.

The basic injection time is extended by the signals from the sensors depending on the operating condition of the engine.

Adaptation of the basic injection time to the various operating conditions is carried out by the multiplying stage in the control unit. This stage is controlled by the DSM with the pulses of duration t_p. In addition the multiplying stage gathers information on various operating conditions of the engine, such as cold start, warm-up, full-load operation, etc. From this information the correction factor k is calculated. This is multiplied by the basic injection time t_p calculated by the division control multivibrator. The resulting time is designated t_m. t_m is added to the basic injection time t_p, i. e. the injection time is extended and the air-fuel mixture becomes richer. t_m is therefore a measure of fuel enrichment, expressed by a factor which can be designated "enrichment factor". When it is cold, for example, the valves inject two to three times the amount of fuel at the beginning of the warm-up period.

Voltage correction
The operating time of the injection valves depends very much on the battery voltage. The resulting response delay would have too short an injection duration without an electronic voltage correction. The result would be an insufficient fuel quantity for injection. The lower the battery voltage the less fuel the engine would receive. For this reason a low battery voltage, e. g. after starting with a heavily discharged battery, must be compensated for with an appropriately selected extension t_s of the pre-calculated pulse time in order that the engine receives the correct fuel quantity. This is known as "voltage compensation".
For voltage compensation, the effective battery voltage as the controlled variable is fed into the control unit. An electronic compensation stage ex-

tends the valve control pulses by the amount t_s of the voltage-dependent response delay of the injection valves. The total duration of the injection pulses t_i consists of the sum of $t_p + t_m + t_s$.

Injection pulses

The injection pulses generated by the multiplying stage are amplified in a following final stage. The injection valves are controlled with these amplified pulses.

All the injection valves in the engine open and close at the same time. With each valve a series resistor is wired into the circuit as a current limiter.

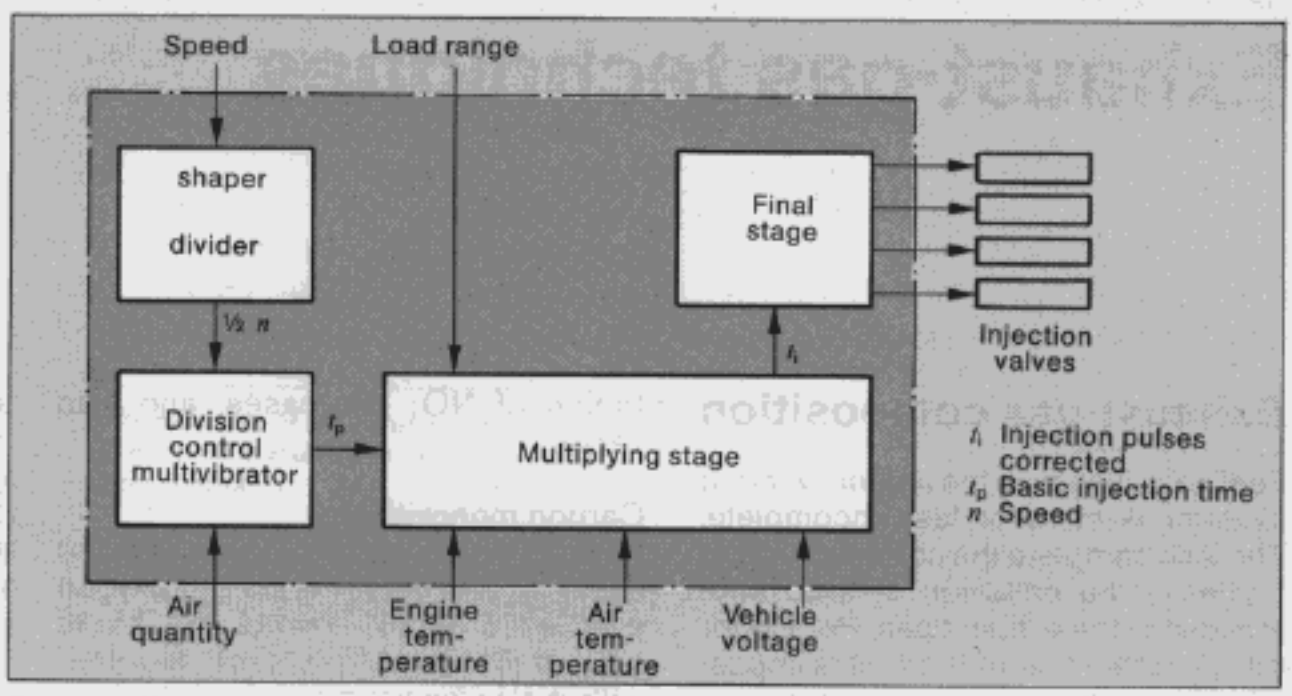


Fig. 35 Block diagram of the control unit

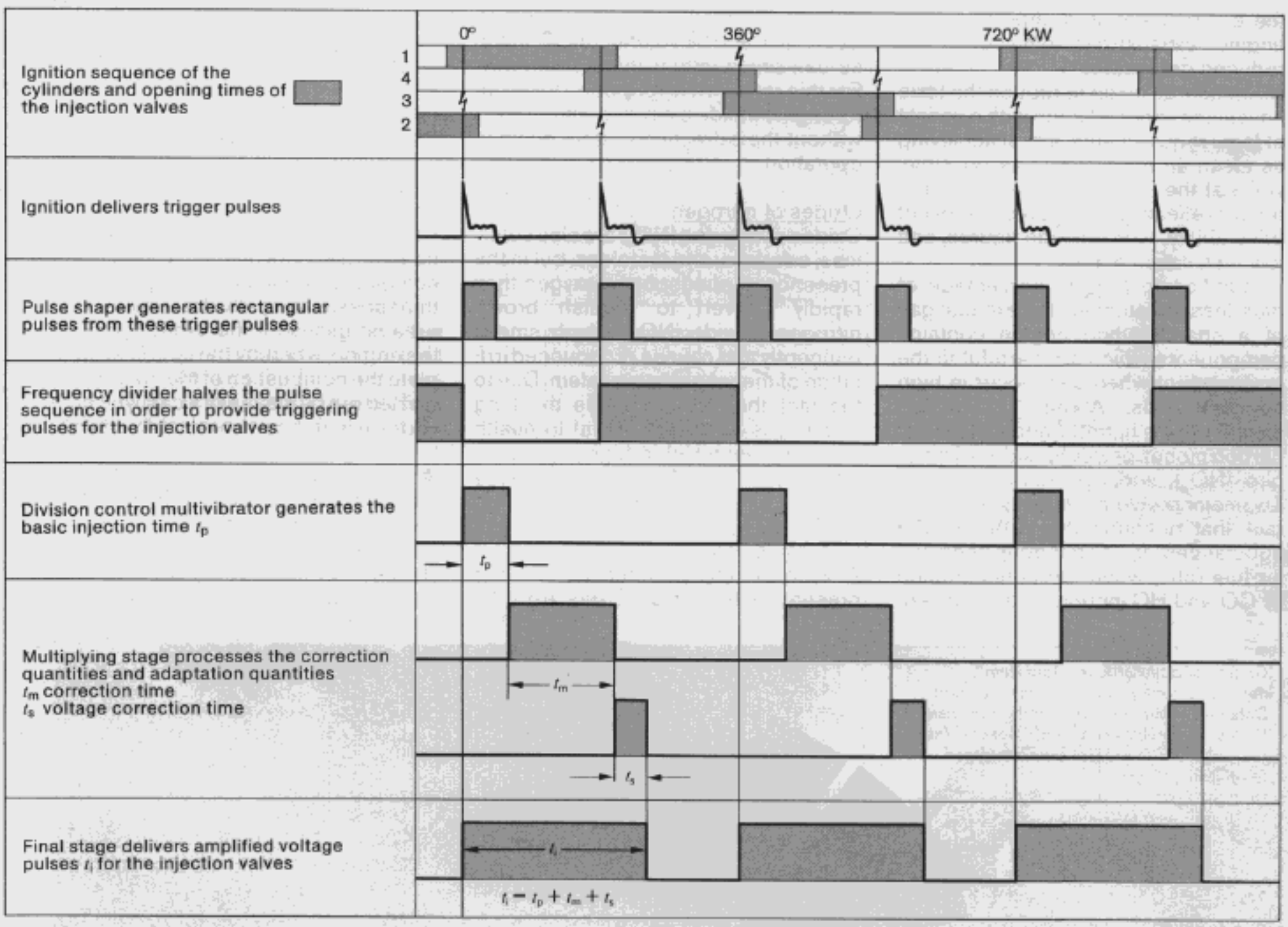


Fig. 36 Generation of the injection pulses in the control unit for a 4-cyl. engine.
°KW = °crankshaft

The final stage of the L-Jetronic supplies 3 or 4 valves simultaneously with current. Control units for 6 and 8-cyl. engines have two final stages with 3 and 4 injection valves respectively. Both final stages operate in unison. The injection cycle of the L-Jetronic is selected so that for each revolution of the camshaft half the amount of fuel required by each working cylinder is injected twice.

In addition to controlling the injection valves through series resistors some control units have a regulated final stage. In these control units the injection valves are operated without series resistors. Control of the injection valves takes place then as follows: as soon as the valve armatures have operated at the beginning of the impulse, the valve current is regulated for the rest of the impulse duration to a considerably reduced current, the holding current. Since these valves are switched on at the start of the impulse with a very high current, short response times are the result. By means of the reduction in current strength after switching on, the final stage is not subjected to such heavy loading. In this way up to 12 valves can be switched with one final stage.

Exhaust-gas techniques

Exhaust-gas composition

Fuel combustion in the engine working cylinder is more or less incomplete. The less complete the combustion, the higher is the emission of toxic substances in the exhaust gas. Perfect, or total, combustion of the fuel is impossible even when surplus air is available in plenty. In order to reduce the load on the environment, it is imperative that engine exhaust-gas emissions are reduced drastically.
All measures taken to reduce the toxic emissions in compliance with a variety of legal requirements, aim at achieving as clean an exhaust gas as possible, while at the same time featuring optimum fuel-economy figures, excellent drive ability, high mileage figures, and low installation costs.
In addition to a large percentage of harmless substances, the exhaust gas of a spark-ignition engine contains components which are harmful to the environment when they occur in high concentrations. About 1% of the exhaust gas is harmful, and consists of carbon monoxide (CO), oxides of nitrogen (NO_x), and hydrocarbons (HC). The major problem in this respect is the fact that although these three toxic substances are dependent upon the air-fuel ratio, when the concentration of CO and HC increases the concentration of NO_x decreases, and vice versa.

Carbon monoxide
Carbon monoxide (CO) reduces the ability of the blood to absorb oxygen and, as a result, lowers the blood oxygen content. This fact, together with it also being colorless, odorless, and tasteless, makes CO extremely dangerous. Even as low a proportion as 0.3 percent by volume of CO in the air can prove fatal within 30 minutes. For this reason, it is forbidden to run an IC engine inside closed rooms or halls without the extraction system being in operation.

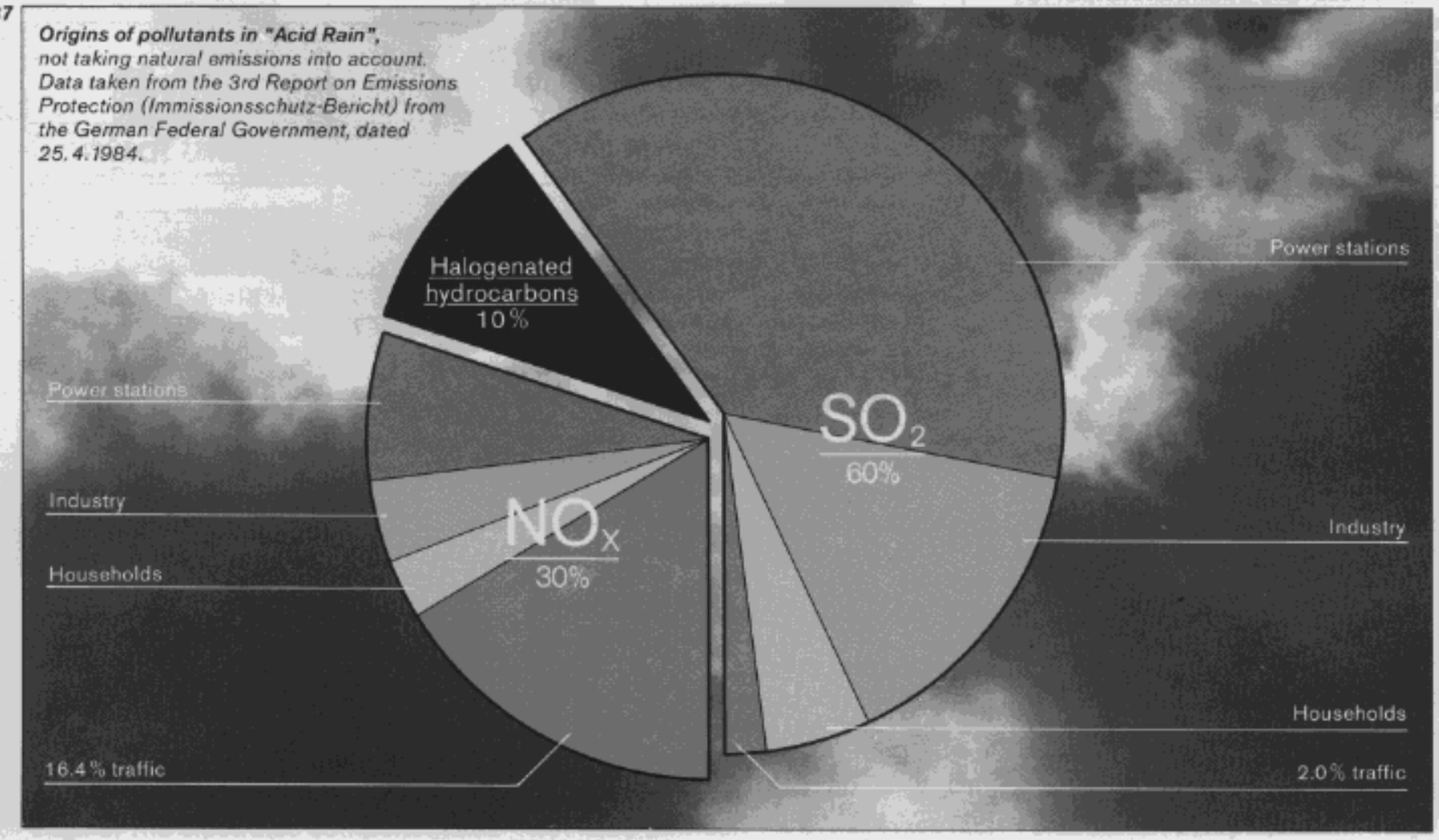
Oxides of nitrogen
Oxides of nitrogen (NO_x) are also colorless, odorless, and tasteless, but in the presence of atmospheric oxygen they rapidly convert to reddish brown nitrogen dioxide (NO_2) which smells pungently and causes pronounced irritation of the respiratory system. Due to the fact that NO_2 destroys the lung tissue it is also detrimental to health when encountered in higher concentrations. NO and NO_2 are usually referred to together as NO_x.

Hydrocarbons
A wide variety of hydrocarbons are present in the exhaust gas from IC engines. In the presence of oxides of nitrogen and sunshine they produce products of oxidization. A number of hydrocarbons are detrimental to health.

Catalytic aftertreatment

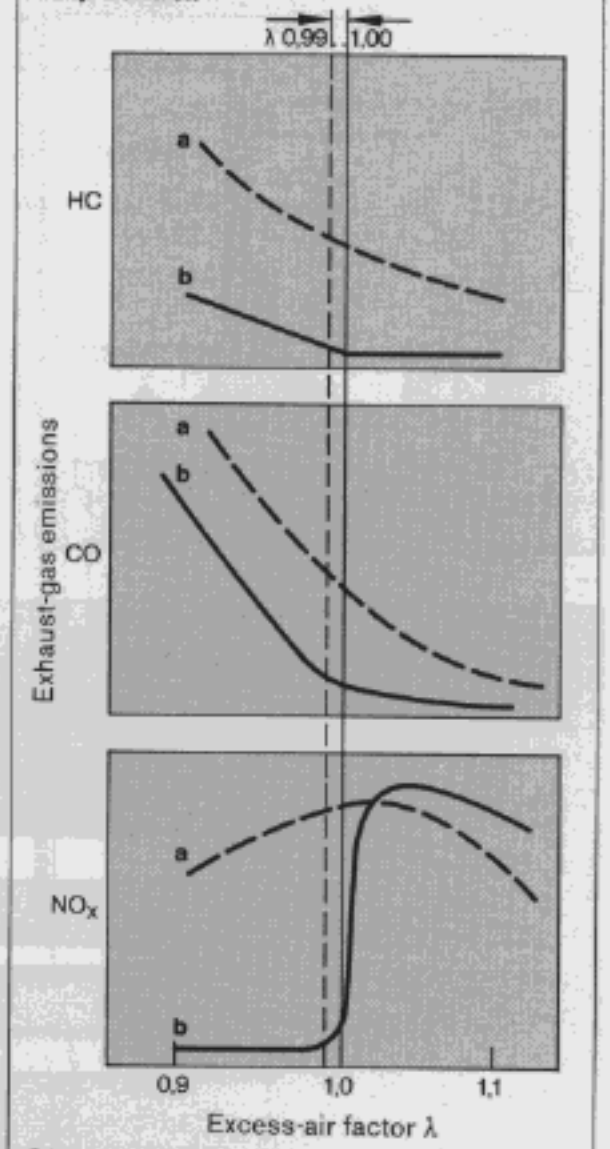
The toxic emissions of the spark-ignition engine can be considerably reduced by the use of catalytic aftertreatment.
The exhaust-gas emission level of an engine can be influenced at three different points. The first possibility of influencing the emissions is during the mixture-formation stage before the engine. The second possibility is the use of special design measures on the engine itself (for instance, optimized combustion-chamber shape). The third possibility is aftertreatment of the exhaust gases on the exhaust side of the engine, whereby the task is to complete the combustion of the fuel. This is carried out by means of a catalytic converter which has two notable characteristics:
- The catalytic converter promotes the afterburning of CO and HC to harmless carbon dioxide (CO_2) and water (H_2O).
- At the same time, the catalytic converter reduces the nitrogen of oxide

37 ***Origins of pollutants in "Acid Rain",*** *not taking natural emissions into account. Data taken from the 3rd Report on Emissions Protection (Immissionsschutz-Bericht) from the German Federal Government, dated 25.4.1984.*



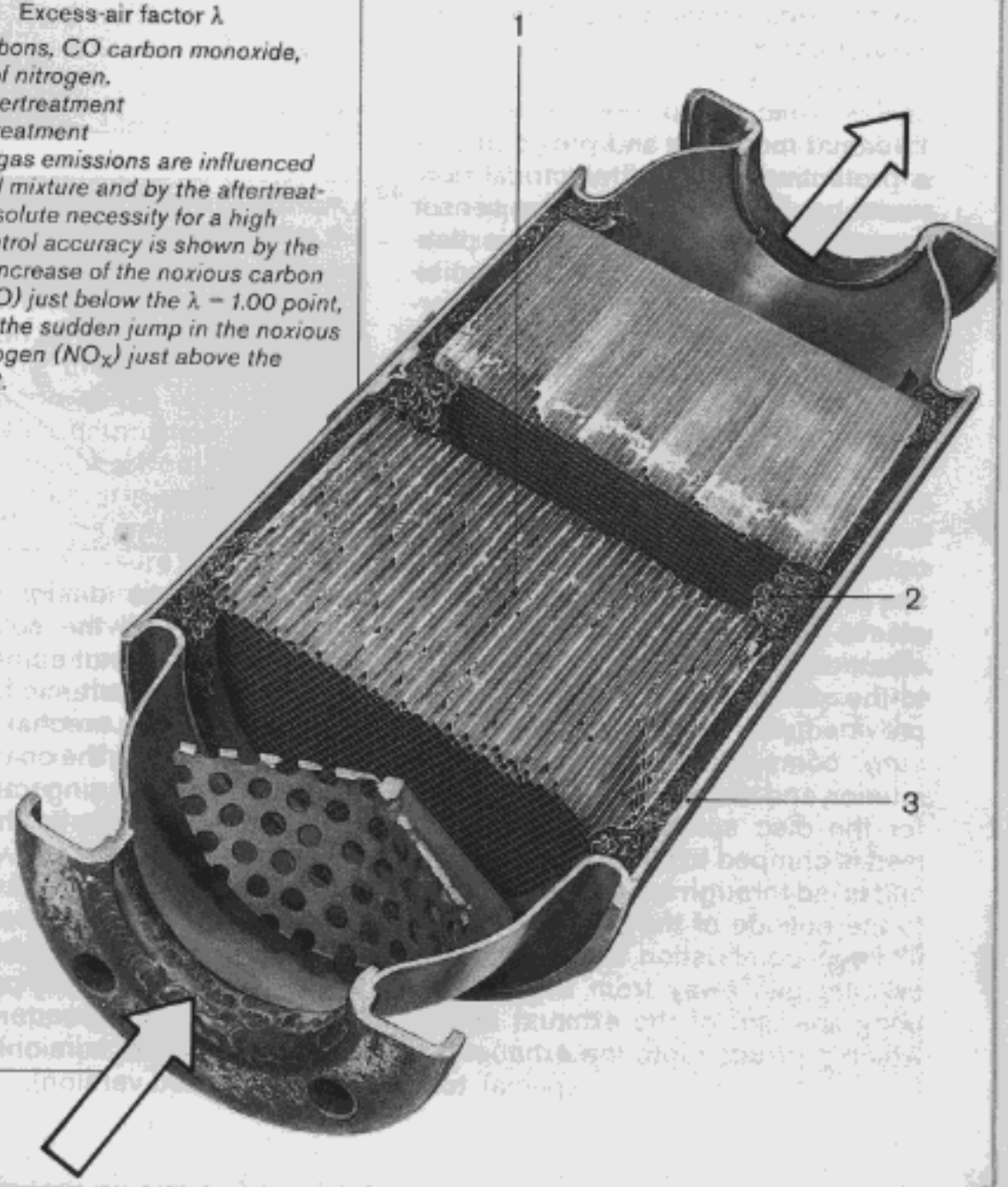
present in the exhaust gas to neutral nitrogen (N).
It is therefore perfectly clear that the catalytic aftertreatment of the exhaust gas is considerably more effective than for instance the purely thermal afterburning of the exhaust gases in a thermal reactor. Using a catalytic converter, more than 90 % of the toxic substances can be converted to harmless substances.
The three-way catalytic converter has come into widespread use (here, the term "3-way" means that all three toxic substances CO, HC, and NO_x are degraded at the same time). The converter shell contains a ceramic "honeycomb" which is coated with a precious metal, preferably with platinum and rhodium. When the exhaust gas flows through this honeycomb, the platinum and rhodium accelerate the chemical degradation of the toxic substances. Only lead-free gasoline may be used with such converters because the lead otherwise destroys the catalytic properties of the noble-metal catalyst. This means that lead-free gasoline is a prerequisite for the employment of catalytic converters. The catalytic conversion principle presupposes that the engine burns an optimum air-fuel mixture. Such an optimum, or stoichiometric, air-fuel mixture is characterized by the excess-air factor of $\lambda = 1.00$, and it is imperative that the excess-air factor is maintained precisely at this figure otherwise the catalytic converter cannot operate efficiently.
Even a deviation of only 1 % has considerable adverse effects upon the aftertreatment. But the best open-loop control is incapable of holding the air-fuel mixture within such close tolerances, and the only solution is to apply an extremely accurate closed-loop control, featuring almost zero lag, to the air-fuel mixture management system. The reason is that although an open-loop mixture control calculates and meters the required fuel quantity, it does not monitor the results. Here, one speaks of an open control loop. The closed-loop control of the mixture on the other hand measures the composition of the exhaust gas and uses the results to correct the calculated injected fuel quantity. This is referred to as a closed control loop. This form of control is particularly effective on fuel-injection engines because they do not have the additional delay times resulting from the long intake paths typical of carburetor engines.

38 *Effectiveness of the catalytic aftertreatment of exhaust gas using the Lambda closed-loop control.*



CH hydrocarbons, CO carbon monoxide, NO_x oxides of nitrogen.
a: without aftertreatment
b: with aftertreatment
The exhaust-gas emissions are influenced by the air-fuel mixture and by the aftertreatment. The absolute necessity for a high degree of control accuracy is shown by the pronounced increase of the noxious carbon monoxide (CO) just below the $\lambda = 1.00$ point, as well as by the sudden jump in the noxious oxides of nitrogen (NO_x) just above the $\lambda = 1.00$ point.

39 *Cataytic converter*
When exhaust gases flow through the catalytic converter, the chemical degradation of the noxious substances is accelerated particularly by the platinum and rhodium. 1 Ceramic material coated with catalytically active material, 2 Steel wool for locating purposes, 3 Converter shell.



Lambda closed-loop control

Lambda sensor

The Lambda sensor inputs a voltage signal to the ECU which represents the instantaneous composition of the air-fuel mixture.

The Lambda sensor is installed in the engine exhaust manifold at a point which maintains the necessary temperature for the correct functioning of the sensor over the complete operating range of the engine.

Operation

The sensor protrudes into the exhaust-gas stream and is designed so that the outer electrode is surrounded by exhaust gas, and the inner electrode is connected to the atmospheric air.

Basically, the sensor is constructed from an element of special ceramic, the surface of which is coated with microporous platinum electrodes. The operation of the sensor is based upon the fact that ceramic material is porous and permits diffusion of the oxygen present in the air (solid electrolyte). At higher temperatures, it becomes conductive, and if the oxygen concentration on one side of the electrode is different to that on the other, then a voltage is generated between the electrodes. In the area of stoichiometric air-fuel mixture ($\lambda = 1.00$), a jump takes place in the sensor voltage output curve. This voltage represents the measured signal.

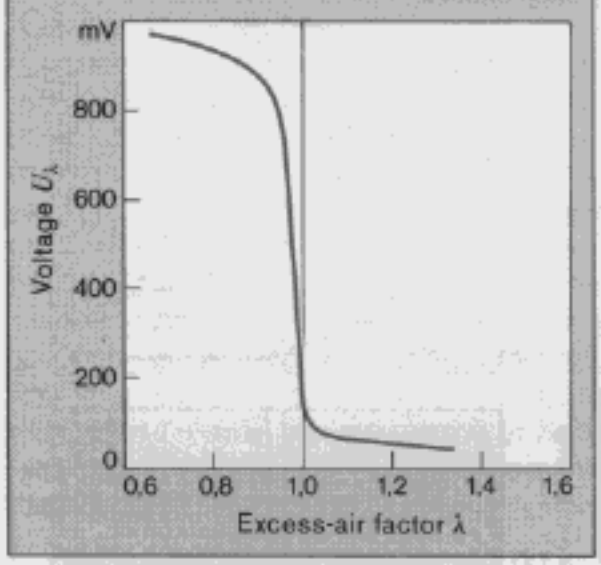
Construction

The ceramic sensor body is held in a threaded mounting and provided with a protective tube and electrical connections. The surface of the sensor ceramic body has a microporous platinum layer which on the one side decisively influences the sensor characteristic while on the other serving as an electrical contact. A highly adhesive and highly porous ceramic coating has been applied over the platinum layer at the end of the ceramic body that is exposed to the exhaust gas. This protective layer prevents the solid particles in the exhaust gas from eroding the platinum layer. A protective metal sleeve is fitted over the sensor on the electrical connection end and crimped to the sensor housing. This sleeve is provided with a bore to ensure pressure compensation in the sensor interior, and also serves as the support for the disc spring. The connection lead is crimped to the contact element and is led through an insulating sleeve to the outside of the sensor. In order to keep combustion deposits in the exhaust gas away from the ceramic body, the end of the exhaust sensor which protrudes into the exhaust-gas flow is protected by a special tube having slots so designed that the exhaust gas and the solid particles entrained in it do not come into direct contact with the ceramic body.

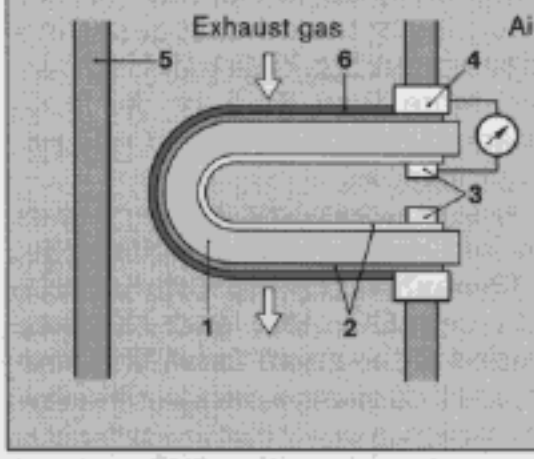
In addition to the mechanical protection thus provided, the changes in sensor temperature during transition from one operating mode to the other are effectively reduced.

The voltage output of the λ sensor, and its internal resistance, are dependent upon temperature. Reliable functioning of the sensor is only possible with exhaust-gas temperatures above 350 °C (unheated version), and above 200 °C (heated version).

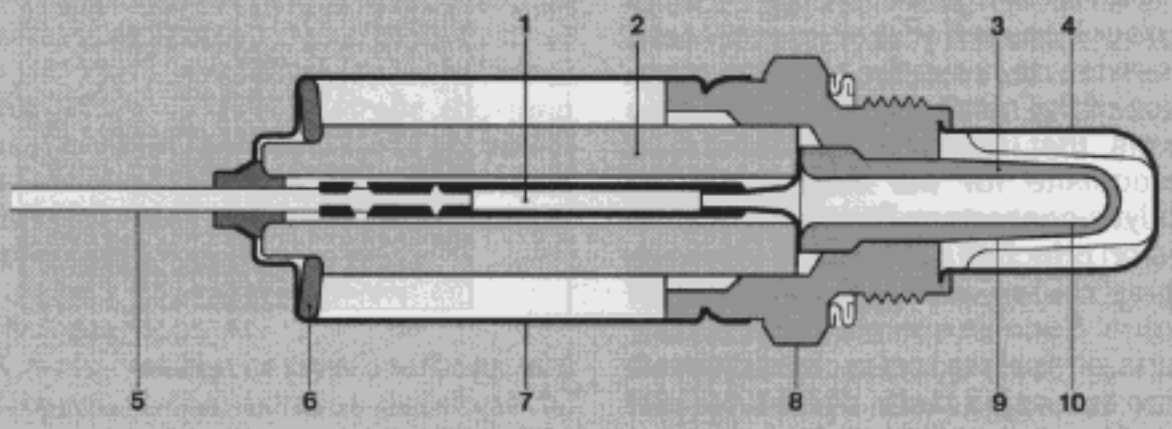
40 *Voltage curve of the Lambda sensor at an operating temperature of 600 °C.*



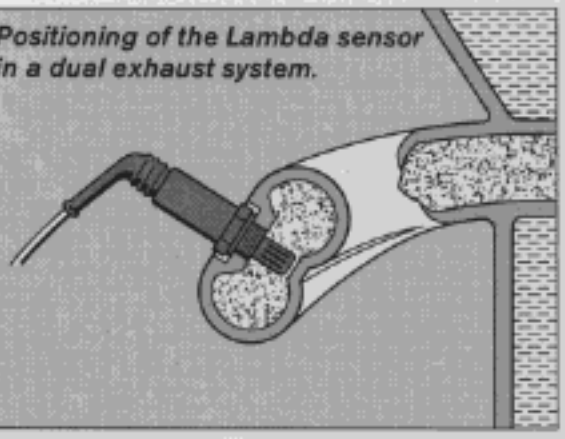
41 *Location of the Lambda sensor in the exhaust manifold (shown schematically).*
1 Sensor ceramic, 2 Electrodes, 3 Contacts, 4 Electrical contacting to the housing, 5 Exhaust manifold, 6 Protective ceramic layer (porous).



42 *Lambda sensor.*
1 Contact element, 2 Protective ceramic element, 3 Sensor ceramic, 4 Protective tube (exhaust end), 5 Electrical connection, 6 Disc spring, 7 Protective sleeve (atmosphere end), 8 Housing (−), 9 Electrode (−), 10 Electrode (+).



43 *Positioning of the Lambda sensor in a dual exhaust system.*



Heated Lambda oxygen sensor

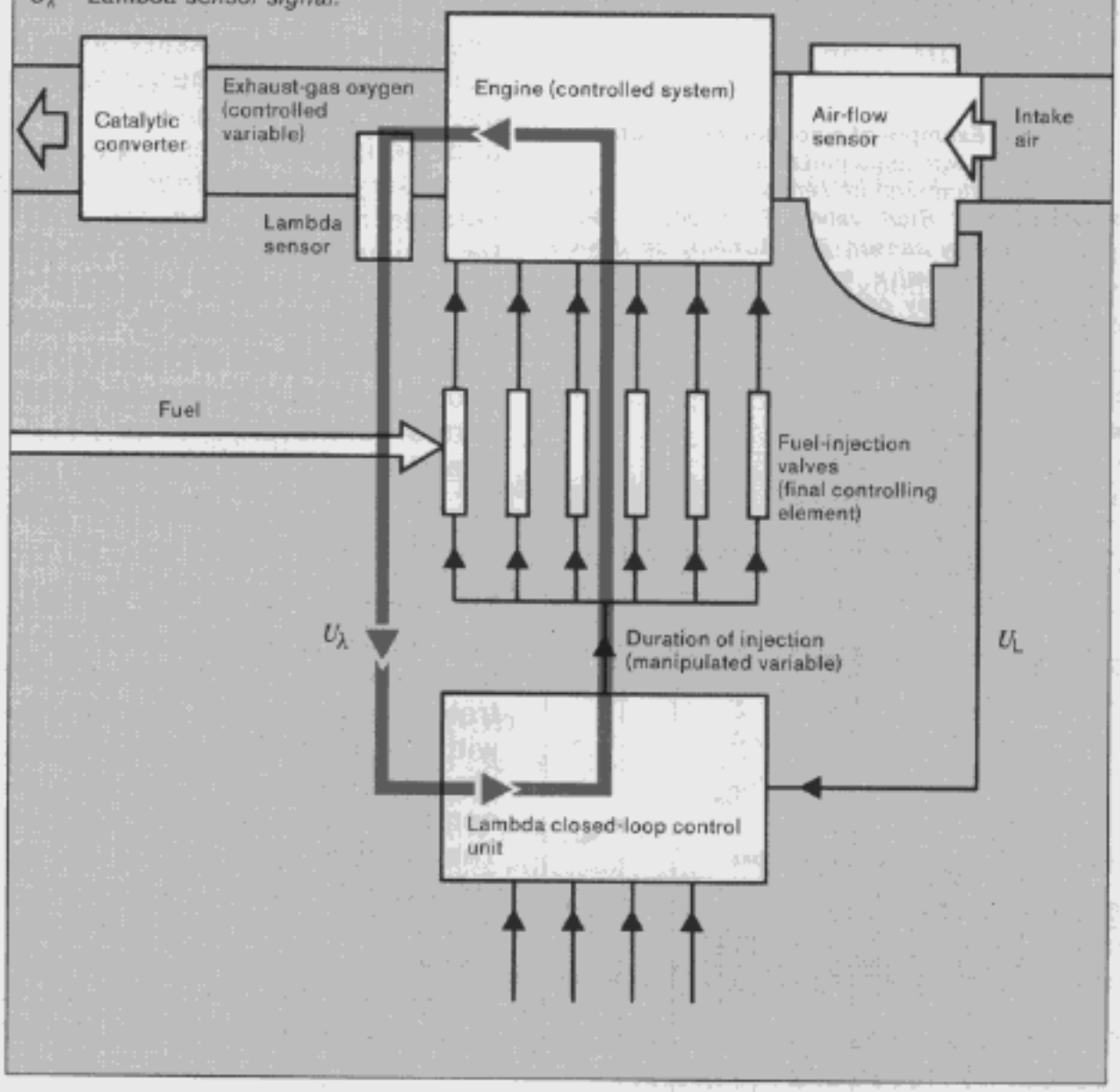
To a large extent, the design principle of the heated Lambda sensor is identical to that of the unheated sensor.

The active sensor ceramic is heated internally by a ceramic heating element with the result that the temperature of the ceramic body always remains above the function limit of 350 °C.

The heated sensor is equipped with a protective tube having a smaller opening. Amongst other things, this prevents the sensor ceramic from cooling down when the exhaust gas is cold.

Among the advantages of the heated Lambda sensor are the reliable and efficient control at low exhaust-gas temperatures (e.g. at idle), the minimum effect of exhaust-gas temperature variations, the rapid coming into effect of the Lambda control following engine start, short sensor-reaction which avoids extreme deviations from the ideal exhaust-gas composition, versatility regarding installation because the sensor is now independent of heating from its surroundings.

44 **Lambda closed control-loop.**
The Lambda closed control-loop is superimposed upon the air-fuel mixture control. The fuel quantity to be injected, as determined by the air-fuel mixture control, is modified by the Lambda closed-loop control in order to provide optimum combustion. U_L = Air-flow sensor signal, U_λ = Lambda-sensor signal.



Lambda closed-loop control circuit

By means of the Lambda closed-loop control, the air-fuel ratio can be maintained precisely at $\lambda = 1.00$.
The Lambda closed-loop control is an add-on function which, in principle, can supplement every controllable fuel-management system. It is particularly suitable for use with Jetronic gasoline-injection systems or Motronic.
Using the closed-loop control circuit formed with the aid of the Lambda sensor, deviations from a specified air-fuel ratio can be detected and corrected. This control principle is based upon the measurement of the exhaust-gas oxygen by the Lambda sensor. The exhaust-gas oxygen is a measure for the composition of the air-fuel mixture supplied to the engine. The Lambda sensor acts as a probe in the exhaust pipe and delivers the information as to whether the mixture is richer or leaner than $\lambda = 1.00$.
In case of a deviation from this $\lambda = 1.00$ figure, the voltage of the sensor output signal changes abruptly. This pronounced change is evaluated by the ECU which is provided with a closed-loop control circuit for this purpose.
The injection of fuel to the engine is controlled by the fuel-management system in accordance with the information on the composition of the air-fuel mixture received from the Lambda sensor. This control is such that an air-fuel ratio of $\lambda = 1$ is achieved. The sensor voltage is a measure for the correction of the fuel quantity in the air-fuel mixture. The signal which is processed in the closed-loop control circuit is used to control the actuators of the Jetronic installation.
In the L-Jetronic this means that the ECU becomes a closed-loop unit which controls the fuel-injection valves accordingly. The signal processing takes place in a similar manner in the Motronic.
In this manner, the fuel can be metered so precisely that depending upon load and engine speed, the air-fuel ratio is an optimum in all operating modes.
Tolerances and the ageing of the engine have no effect whatsoever. At values above $\lambda = 1.00$, more fuel is metered to the engine, and at values below $\lambda = 1.00$, less.
This continuous, almost lag-free adjustment of the air-fuel mixture to $\lambda = 1.00$, is one of the prerequisites for the efficient aftertreatment of the exhaust gases by the downstream catalytic converter.

Control functions at various operating modes

Start
The Lambda sensor must have reached a temperature of above 350 °C before it outputs a reliable signal. Until this temperature has been reached, the closed-loop mode is suppressed and the air-fuel mixture is maintained at a mean level by means of an open-loop control. Starting enrichment is by means of appropriate components similar to the Jetronic installations not equipped with Lambda control.

Acceleration and full load (WOT)
The enrichment during acceleration can take place by way of the closed-loop control unit. At full load, it may be necessary for temperature and power reasons to operate the engine with an air-fuel ratio which deviates from the $\lambda = 1$ figure. Similar to the acceleration range, a sensor signals the full-load operating mode to the closed-loop control unit which then switches the fuel-injection to the open-loop mode and injects the corresponding amount of fuel.

Deviations in air-fuel mixture
The Lambda closed-loop control operates in a range between $\lambda = 0.8 \ldots 1.2$, in which normal disturbances (such as the effects of altitude) are compensated for by controlling λ to 1.00 with an accuracy of $\pm 1\,\%$. The control unit incorporates a circuit which monitors the Lambda sensor and prevents prolonged marginal operation of the closed-loop control. In such cases, open-loop control is selected and the engine is operated at a mean λ-value.

Electric circuitry

The complete circuitry of the L-Jetronic has been designed so that it can be conneced to the vehicle electrical system at a single point.
At this point you will find the relay combination which is controlled by the ignition starter switch, and which switches the vehicle voltage to the control unit and the other Jetronic components.
The relay combination has two separate plug connections, one to the vehicle electrical system and one to the Jetronic.

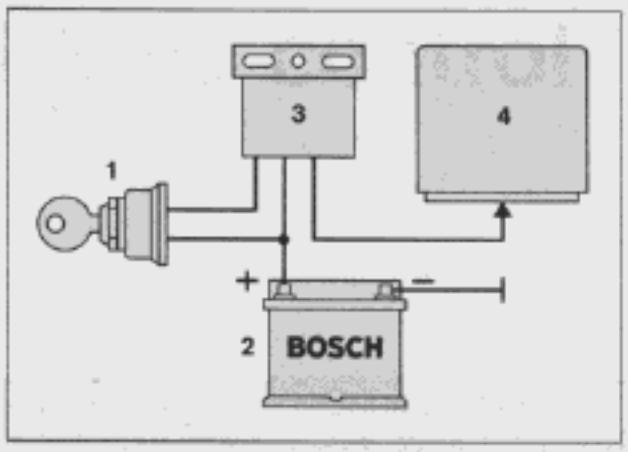
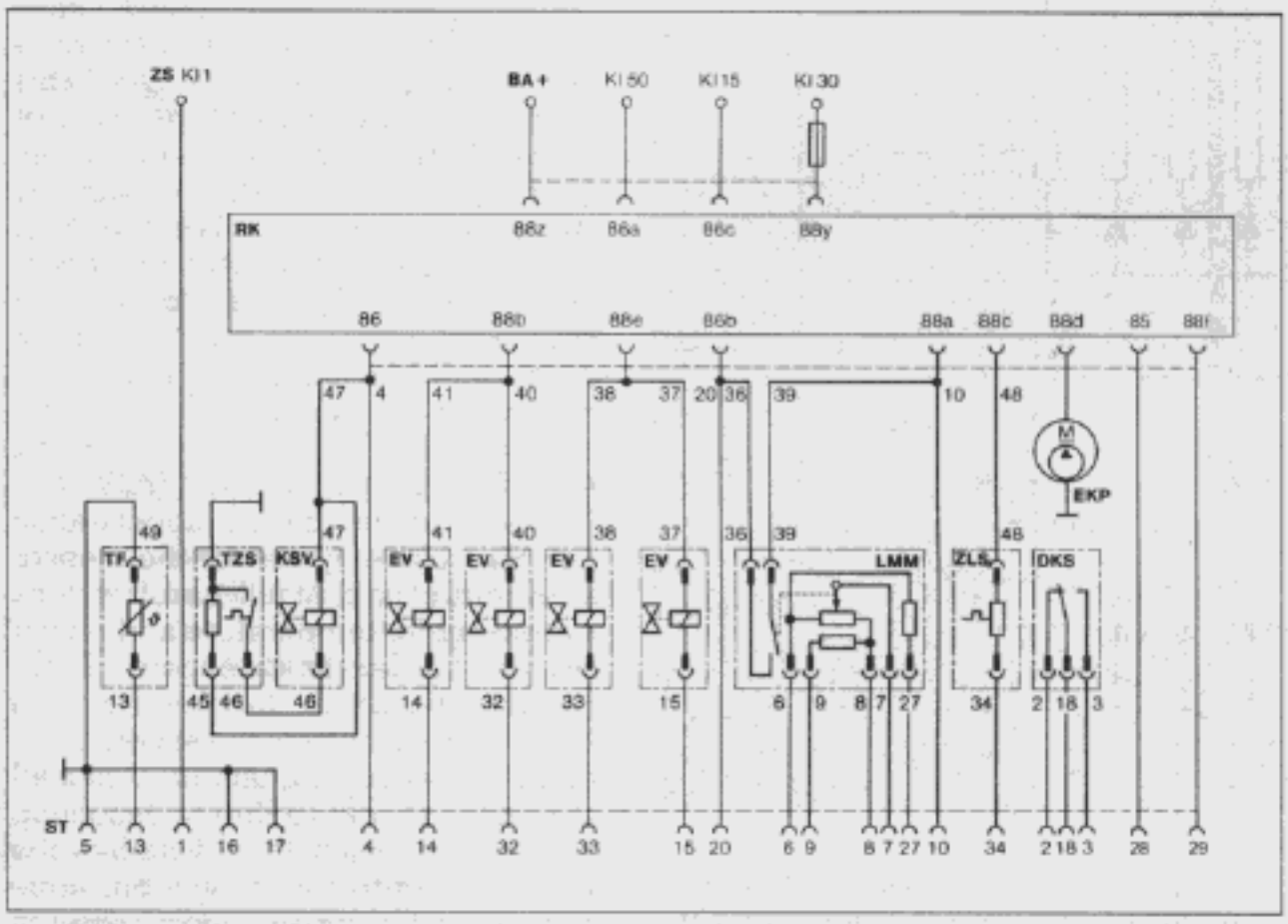


Fig. 45 Voltage supply (diagram)
1 Ignition and starter switch, 2 Battery, 3 Relay combination, 4 Control unit

Fig. 46 Example of a connection diagram
(L-Jetronic with regulated final stage)
TF Engine temperature sensor, TZS Thermo-time switch, KSV Start valve, EV Injection valve, LMM Air-flow sensor, ZLS Auxiliary-air device, DKS Throttle-valve switch, EKP Electric fuel-pump, RK Relay combination, ZS Ignition coil, BA Battery, ST multiple plug to control unit



air is passed through, controls the relay combination, which in turn switches the electric fuel pump. If the engine stops when the ignition is switched on, i.e. when there is no longer any air throughput, the supply of current to the pump is interrupted. During the starting procedure the relay combination is controlled in a corresponding manner via terminal 50 from the ignition switch.

Connection diagram
The example shown here is a typical connection diagram for a vehicle with a 4-cyl. engine.
Please note with the wiring harness that terminal 88z of the relay combination is connected directly and without a fuse to the positive pole (terminal post) of the battery in order to avoid interference and voltage drops caused by contact resistances.

Terminals 5, 16, 17 of the control unit as well as terminal 49 of the temperature sensor are to be connected with separate cables to a common ground point.

Ongoing development of electronically controlled fuel-injection systems

"Bosch Motronic"

The efficiency of the present-day micro-computers makes it possible to combine the functions "gasoline injection" and "ignition", so that the basic cost of the micro-computer itself as well as of the voltage supply and the housing is only necessary once. Apart from this, almost all the sensors can be used for both the gasoline injection and the ignition. These, too, are only necessary once. We therefore have increased reliability and less cost than for two separate systems. Bosch has therefore developed a system which contributes considerably in reducing costs, in reducing the impact on the environment and in improving the driving comfort of motor vehicles.
The Motronic is an integrated system for the electronic control of gasoline injection and ignition.

The Motronic combines for the first time individual systems such as injection and ignition in a digital engine control system. We are concerned here with a computerized control for the engine, i.e. the application of a microcomputer in the electronic control unit. The use of a digital control unit makes the system flexible on the one hand and on the other hand guarantees a constant exactness (long-duration constancy) and the ability to reproduce, as and when required, the engine data which only needs to be stored once. In addition to the main item of the Motronic, the micro-computer which consists of a micro-processor in which data and programs are stored, and of the input and output circuit, the system is characterized by fewer fast-moving parts for the ignition and common pick-ups for injection and ignition. In this way maintenance is kept at an absolute minimum. In practice this means that the adjustment of the mechanical governor and of the vacuum can be dispensed with and in its place comes an integrated fully electronic (breaker-less triggered) computerized ignition in the Motronic system with inductive speed and reference mark sensor.
A detailed description of this system is to be found in the "Motronic" Technical Instruction manual.

Everything for your car.
Everything for your safety.
Everything from your Bosch Service.

It is the job of the customer-service organisation to maintain the high quality of Bosch products over a long period of time, or to restore it if necessary. The customer-service organisation is your reliable partner for the complete automotive electrics and electronics, and for the fuel-management system.

Ignition system
It is often the ignition that is at fault when power and performance sink and the fuel consumption increases. The Bosch Service Stations have the most modern electronic test equipment at their disposal, and test and adjust the ignition or convert to the more modern breakerless ignition systems.

Carburetor system
50% of all vehicles use too much fuel. Applying modern testing and measurement methods, the Bosch Service Stations find the fault quickly and efficiently without wasting a lot of time on trial-and-error methods. They then carry out the necessary adjustments and repairs, or replace the faulty items.

Gasoline fuel-injection system
Although Bosch fuel-injection systems increase the engine output power, they also save fuel.
But such a fuel-injection system can only calculate, control, and inject the precise amount of fuel efficiently and over a long period of time if it is precisely adjusted and tuned to the engine.
Such tuning demands a high level of knowledge and skill, as well as special test equipment.
And who is better able to look after the Bosch gasoline fuel-injection systems than the specialists from the Bosch Service.

Diesel fuel-injection system
Bosch has been manufacturing diesel fuel-injection systems for more than 50 years.
So, who is better able to maintain such systems than the specialists from the Bosch Service.
By means of precision adjustment and careful maintenance, they ensure full engine power output and minimum fuel consumption.

Electrical power supplies
Nothing can function without electric power. Neither the alternator nor the battery, the headlamps or the windshield wipers, the turn signals or the stop lamps, or the warning systems and the driver-information systems. Often, it is only a minor defect which leads to a major breakdown, but trouble-shooting such a fault is often a very long-winded matter. Unless you are a specialist. The Bosch Service Stations have the specialists, and they know how to find and repair the fault, quickly and efficiently.

Starting system
Immediate starting even in the most severe winter is a matter of course. But only if the complete starting system is in good working order. That is, the battery, the starter, the ignition lock, the starter cable, and all cable connections.
Along with the increasing service life of the vehicle, wear in the starting system can become apparent which causes considerable problems when starting. The Bosch Service Stations are familiar with these problems and also know how to solve them.
They test the complete starting system with special measuring and testing equipment.

Engine test and exhaust test
The Bosch Service Stations check all those important functions which are necessary to guarantee correct engine operation. They also ensure that specified exhaust-gas limits are complied with.

Car radio
The car-radio specialists from Bosch not only install the most modern Blaupunkt radio systems, they also take care that perfect interference suppression is carried out.

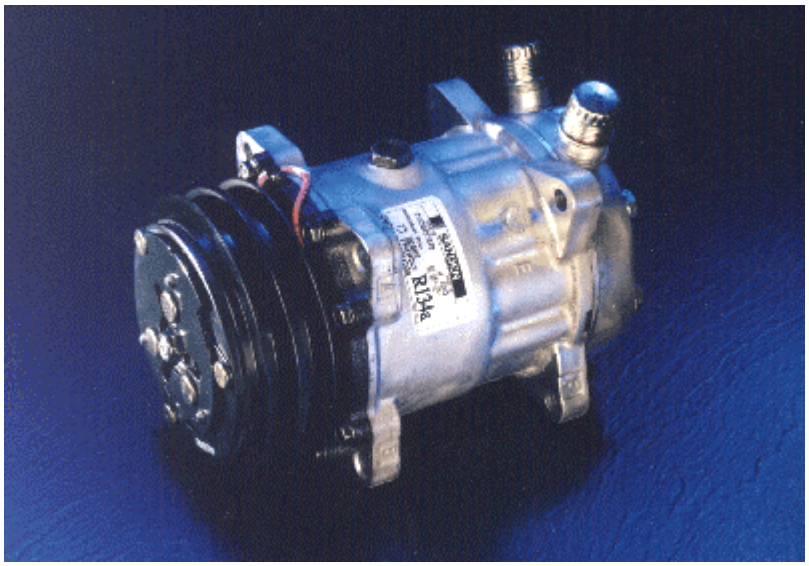
Safety equipment
The Bosch Service Stations provide demonstration, consultation, sales, and installation of such safety equipment as fog lamps, driving lamps, H4 conversion kits, fog warning lamps, high-level stop lamps, wiper blades, fanfare horns, and car alarms.

The specialist from the Bosch Service Station is there to help.

BOSCH
SERVICE

for R134a

SD Compressor
Service Manual



SANDEN

SD COMPRESSOR SERVICE MANUAL

TABLE OF CONTENTS

This service manual has been prepared by Sanden International (USA), Inc. It Includes information on application, troubleshooting, and repair of automotive air conditioning compressors manufactured by Sanden Corporation and its subsidiaries, in accordance with the appropriate SAE standards for mobile air conditioning. Service operations not described in this manual are not authorized for Sanden compressors. For further information contact your nearest Sanden representative.

Compressor Models

1. Model Conversions

TYPE	R-12	R134a
5 Cylinder	SD-505	SD7B10 / SD5H09
	SD-507	SD5H11
	SD-508	SD5H14
	SD-510	SD7H15HD and SD5H14HD
7 Cylinder	SDB-706	SD7B10
	SD-708	SD7H13
	SD-709	SD7H15
	SDB-709	SD7B15

COMPRESSOR NOMENCLATURE

2. Identification

R-12 Compressors

SD	**--**	**7**	**09**
| Sanden reciprocating wobble plate compressors		| Number of Cylinders	| Approximate displacement, in cubic inches

SD	**7**	**H**	**15**	**HD**
| Sanden reciprocating wobble plate compressors	| Number of cylinders	| Port location (H if on head, B if on body)	| Approximate displacement, in cubic centimeters (divided by 10)	| Heavy Duty (HD) or Sealed Heavy-duty (SHD) clutch

CAUTIONARY INFORMATION

3.1 Pressure Release

Before disconnecting any lines, always make sure refrigerant has been removed from the A/C system by recovering it with the appropriate recovery equipment.

When working on compressors, separate from the system, always be sure to relieve internal pressure first. Internal compressor pressure can be relieved by removing the oil plug (if necessary) or by removing shipping caps / pads from both ports.

3.2 Recovery of Refrigerant

Never discharge refrigerant to the atmosphere. Always use approved refrigerant recovery / recycling equipment to capture refrigerant which is removed from the A/C
system. Do not mix refrigerants in the same piece of equipment; one should be designated for R-12 and another for R134a.

3.3 Handling of Refrigerant

Always wear eye and hand protection when working on an A/C system or compressor. Liquid refrigerant can cause frostbite and / or blindness.

3.4 Ventilation

Keep refrigerants and oils away from open flames. Refrigerants can produce poisonous gasses in the presence of a flame. Work in a well-ventilated area.

3.5 Avoid Use of Compressed Air

Do not introduce compressed air into an A/C system due to the danger of contamination.

3.6 Warranty for Recycled Refrigerant

The warranty offered by Sanden International (U.S.A.), Inc., on air conditioning compressors when used with recycled refrigerant will be the same as for new refrigerant provided that the following SAE standards are met:

	R-12	R134a
Refrigerant Purity	J1990	J2099
Recycling Machine	J1989	J2210

Recycling machines must be validated to the appropriate SAE standard by Underwriters Laboratories. Recycled refrigerant from other sources must meet the appropriate ARI standards. Failure to comply with these provisions may void any warranty on the compressor.

R134a INFORMATION

4.1 R134a / PAG Oil Handling Precautions

As a conscientious member of the global community, Sanden Corporation with its subsidiaries is committed to the elimination of CFC-based refrigerants. This manualfocuses on service information for Sanden compressors intended for use with R134a and PAG oils.

4.1 (Cont.)

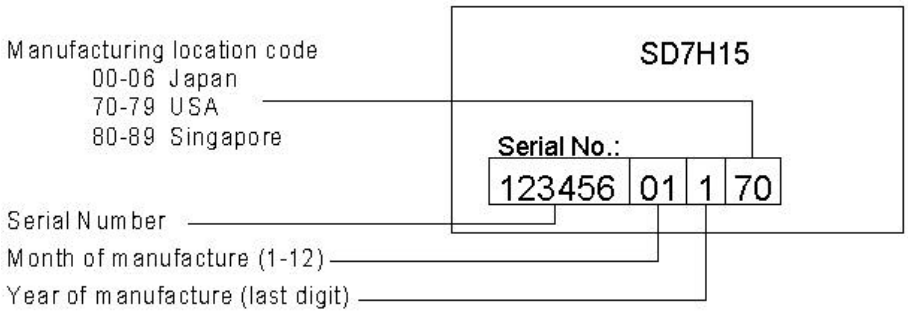
1. Always follow safety precautions described in Section 3.
2. Do not discharge R134a into the atmosphere. Even though its ozone depletion potential is zero, it does have global warming potential. Recovery and recycling are mandated by the Clean Air Act. Use recovery equipment designated only for R134a. Never introduce another refrigerant into the R134a equipment.
3. Never mix R134a with other refrigerants or A/C systems failure is likely to occur.
4. Use only Sanden specified PAG lubricants for R134a systems using Sanden compressors. If other lubricants are used, A/C system failure is likely to occur.
5. Never introduce R134a or PAG oil into a system not designed for them except when following the appropriate retrofit procedure described in Section 19.
6. The Sanden specified PAG oils used in R134a systems absorb atmospheric moisture very quickly. Moisture in the A/C system can cause major damage or failure.
   - Never leave PAG oil exposed to air for a prolonged time. Tightly reseal the oil container immediately after each use.
   - During A/C system repair, cap all fittings as soon as opened and leave capped until just before they are reconnected.
   - If a repair is performed on an R134a compressor or system, evacuate the system for at least 45 minutes before recharging to ensure the removal of moisture which may have been absorbed by the PAG oil in the compressor and system.

4.2 Table of Saturation Temperatures and Pressures

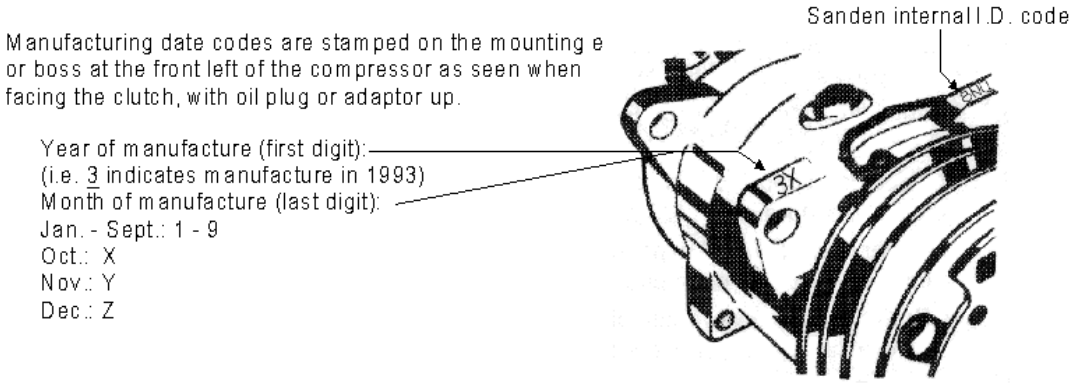
Temp.(°F)	Pressure (psig)	Temp.(°F)	Pressure (psig)	Temp.(°F)	Pressure (psig)
-40	-7.2 in. Hg	25	22	105	135
-30	-4.8 in. Hg	30	26	110	147
-20	-1.7 in. Hg	40	35	115	159
-15	0	50	45	120	172
-10	2	60	57	130	200
-5	4	70	71	140	231
0	6	80	85	150	264
5	9	85	95	160	301
10	12	90	104	180	3
15	15	95	114	200	485
20	18	100	124	210	549

COMPRESSOR IDENTIFICATION

5.1 Label



5.2 Manufacturing Date Codes Stamped on Compressor - Manufactured in USA Only



COMPRESSOR SPECIFICATIONS

6.1 Belt Tension

Grooves	Tension, lb (kgf)
A	121 ± 5 (55 ± 2)
B	132 ± 5 (60 ± 2)
C	132 ± 5 (60 ± 2)
M	132 ± 5 (60 ± 2)
PV4	132 ± 5 (60 ± 2)
PV6	198 ± 5 (90 ± 2)

(PolyVee tension based on 33 lb (15kgf) per groove).

6.2 Speed Rating

Model	Clutch Type	Maximum RPM	
		Constant	Downshift
SD5H14	Std.	6,000	7,000
SD5H14	HD	4,000	6,000
SD7B10	All	6,000	7,000
SD7H13	All	6,000	8,000
SD7H15	Std.	6,000	8,000
SD7H15	HD	4,000	6,000
SD7H15	SHD	4,000	4,000

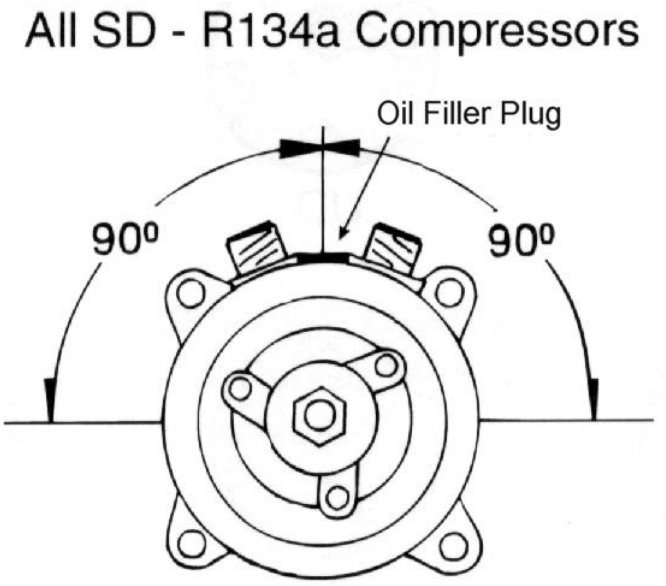
6.3 Basic Compressor Specifications

Model	Refrigerant	Displacement cu.in. (cc)	Typical Weight, lb. (kg.)			Standard Oil Charge			Rotation
			Compressor	Clutch	Assembly	Oil Type	System Type	Amount fl. oz. (cc)	
SD5H14	R134a	8.4 (138)	11.2 (5.1)	6.0 (2.7)	17.2 (7.8)	SP-20	TXV	7.2±0.5 (210±15)	Either Way
							CCOT	No standard	
SD7B10	R134a	6.1 (100)	5.9 (2.7)	3.3 (1.5)	9.2 (4.2)	SP-10	TXV	No standard	CW (Clock wise only)
SD7H13	R134a	7.9 (129)	9.3 (4.2)	4.6 (2.1)	13.9 (6.3)	SP-20	TXV	4.6±0.5 (135±15)	CW (Clock wise only)
SD7H15 /HD	R134a	9.5 (155)	9.9 (4.5)	5.3 (2.4)	15.2 (2.4)	SP-20	TXV	4.6±0.5 (135±15)	CW (Clock wise only)
							CCOT	8.1±0.5 (240±15)	
SD7H15 /SHD	R134a	9.5 (155)	9.9 (4.5)	7.7 (3.5)	17.6 (8.0)	SP-20	TXV	4.6±0.5 (135±15)	CW (Clock wise only)
							CCOT	8.1±0.5 (240±15)	

6.4 Assembly Torques

Item	ft -lb	N-m	kgf-cm
Armature retaining nut, 1/2" - 20	22.4 ± 2.9	30.4 ± 3.9	310 ± 40
Armature retaining nut, M8	13.0 ± 2.2	17.7 ± 2.9	180 ± 30
Cylinder head bolts, M6	10 ± 2.2	13.7 ± 2.9	140 ± 30
Cylinder head bolts, M8	25.3 ± 3.6	34.3 ± 4.9	350 ± 50
Oil filler plug	14.5 ± 13.6	19.6 ± 4.9	200 ± 50
Hose fitting 1" - 14 rotolock	26.7 ± 2.9	36.3 ± 3.9	370 ± 40
7/8" Tube-O	23.9 ± 2.9	32.4 ± 3.9	330 ± 40
3/4" Tube - O	17.3 ± 2.5	23.5 ± 3.4	240 ± 35
Pad fitting bolt, M10	28.9 ± 2.9	39.2 ± 3.9	440 ± 40
Pad fitting bolt 3/8" -24	28.9 ± 2.9	39.2 ± 3.9	440 ± 40
Pad fitting bolt, M8	26.3 ± 2.9	34.3 ± 3.9	350 ± 40
Clutch lead wire clamp screw	11 ± 3 in•lb	1.3 ± 0.3	13 ± 3
High pressure relief valve	7.2 ± 1.4	9.8 ± 2.0	100 ± 20
Thermal protector switch clamp bolt	7.2 ± 2.2 - 1.4	9.8 ± 2.9 - 2.0	100 ± 30 - 20
Clutch dust cover screws (6 - M5)	6.5 ± 1.4	9 ± 2	90 ± 20
Clutch dust cover screws (3 - 1/4" - 20)	2.7 ± 0.9	3.6 ± 1.2	37 ± 12

6.5 Acceptable Mounting Angles



CYLINDER HEAD / PORTING GUIDE

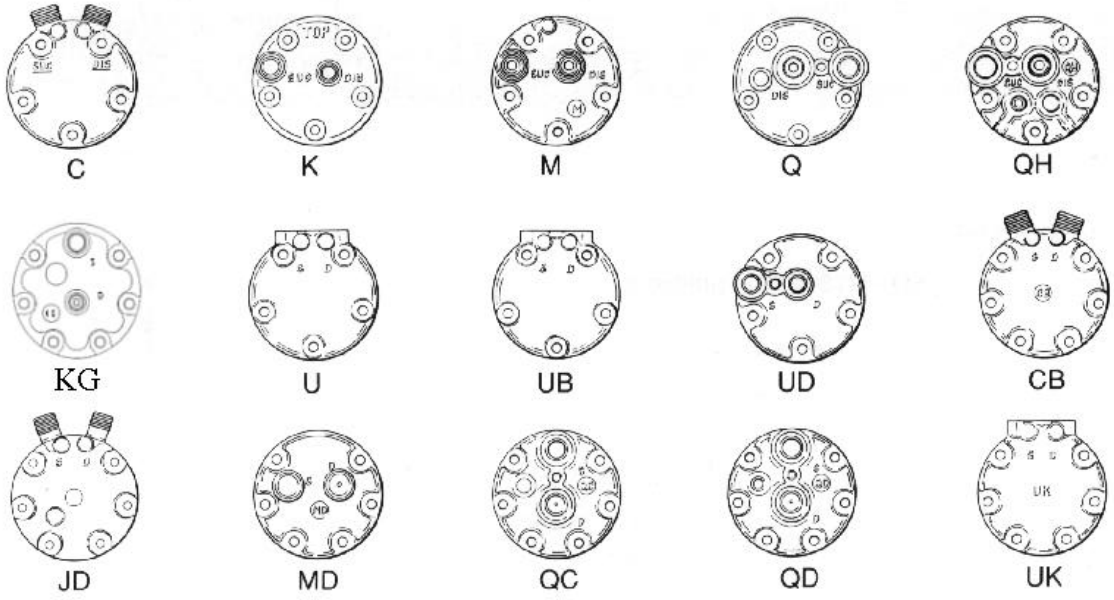
7. SD R143a COMPRESSOR SERIES

For SD5H14, SD7H13, SD7H15 and SD7H15HD / SHD Units

Sanden Service Kit Part No.	Name	Position on Cylinder head	Hose Port Information			SD Compressor Series			
			Suction Port Dimension/Type	Discharge Port Dimension/Type	TPS or Switch?	5H14	7H13	7H15	7H15 HD/SHD
9580-9630	C	Vertical	Tube-O 1" - 14 rotolock	Tube-O 1" - 14 rotolock	No	X			
TDB	FL	Vertical	Tube-O #10 (7/8")	Tube-O #8 (3/4")	No	X			
9034-9630	K	Horizontal	Tube-O #10 (7/8")	Tube-O #8 (3/4")	No	X			
9699-9630*	M	Horizontal	Tube-O 1" - 14 rotolock	Tube-O 1" - 14 rotolock	No	X			
9150-9630*	Q	Horizontal	GM Pad, 3/8" - 24 Bolt	GM Pad, 3/8" - 24 Bolt	No	X			
9695-9630*	QH	Horizontal	GM Pad, 3/8" - 24 Bolt	GM Pad, 3/8" - 24 Bolt	Yes	X			
9298-9630*	U	Vertical	Pad-M10 x 1 Bolt	Pad-M10 x 1 Bolt	No	X			
9517-9630*	UB	Vertical	Pad-M10 x 1.25 Bolt	Pad-M10 x 1.25 Bolt	No	X			
9516-9630*	UB	Horizontal	Pad-M10 x 1.25 Bolt	Pad-M10 x 1.25 Bolt	No	X			
7412-9630	CB	Vertical	Tube-O 1" - 14 rotolock	Tube-O 1" - 14 rotolock	No		X	X	X
7832-9630	JD	Vertical	Tube-O #10 (7/8")	Tube-O #8 (3/4")	No		X	X	X
7863-9630	JE	Vertical	Tube-O #10 (7/8")	Tube-O #8 (3/4")	No		X	X	X
7862-9630	KG	Horizontal	Tube-O #10 (7/8")	Tube-O #8 (3/4")	No		X	X	X
7406-9630*	MD	Horizontal	Tube-O 1" - 14 rotolock	Tube-O 1" - 14 rotolock	No		X	X	X
7433-9630	QC	Horizontal	GM Pad, 3/8" - 24 Bolt	GM Pad, 3/8" - 24 Bolt	No		X	X	X
7484-9630	QD	Horizontal	Pad-M10 x 1.25 Bolt	Pad-M10 x 1.25 Bolt	No		X	X	X
7200-9631	UK	Vertical	Pad-M10 x 1.25 Bolt	Pad-M10 x 1.25 Bolt	No		X	X	X

A) Sanden R134a compressors do not offer the option of charging valves on the compressor.

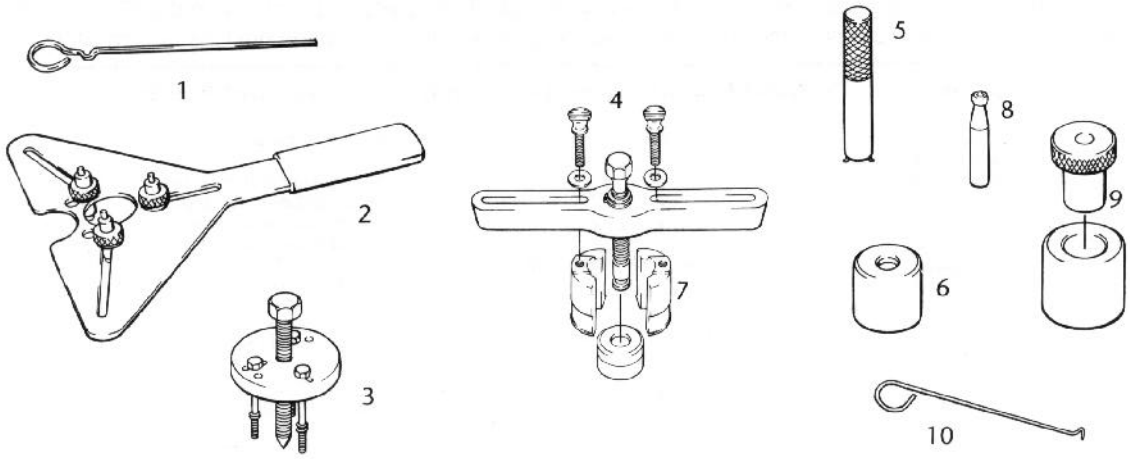
B) * Indicates that a compressor featuring this cylinder head should not be mounted with the suction port at the bottom.



SERVICE TOOLS

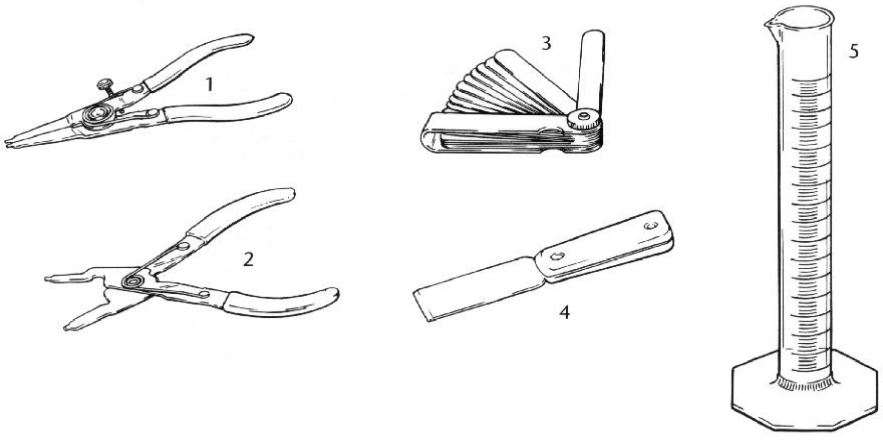
8.1 Special Service Tools

These tools can be obtained from your local tool supplier.



1. Oil Dipstick	5. Lip Seal / SD7 Seal Plate Tool	9. Rotor Installation Driver
2. Armature Plate Spanner	6. Armature Driver	10. O-Ring Hook
3. Armature Plate Puller	7. Rotor Puller Jaws	
4. Rotor Puller Set	8. Shaft Seal Protective Sleeve	

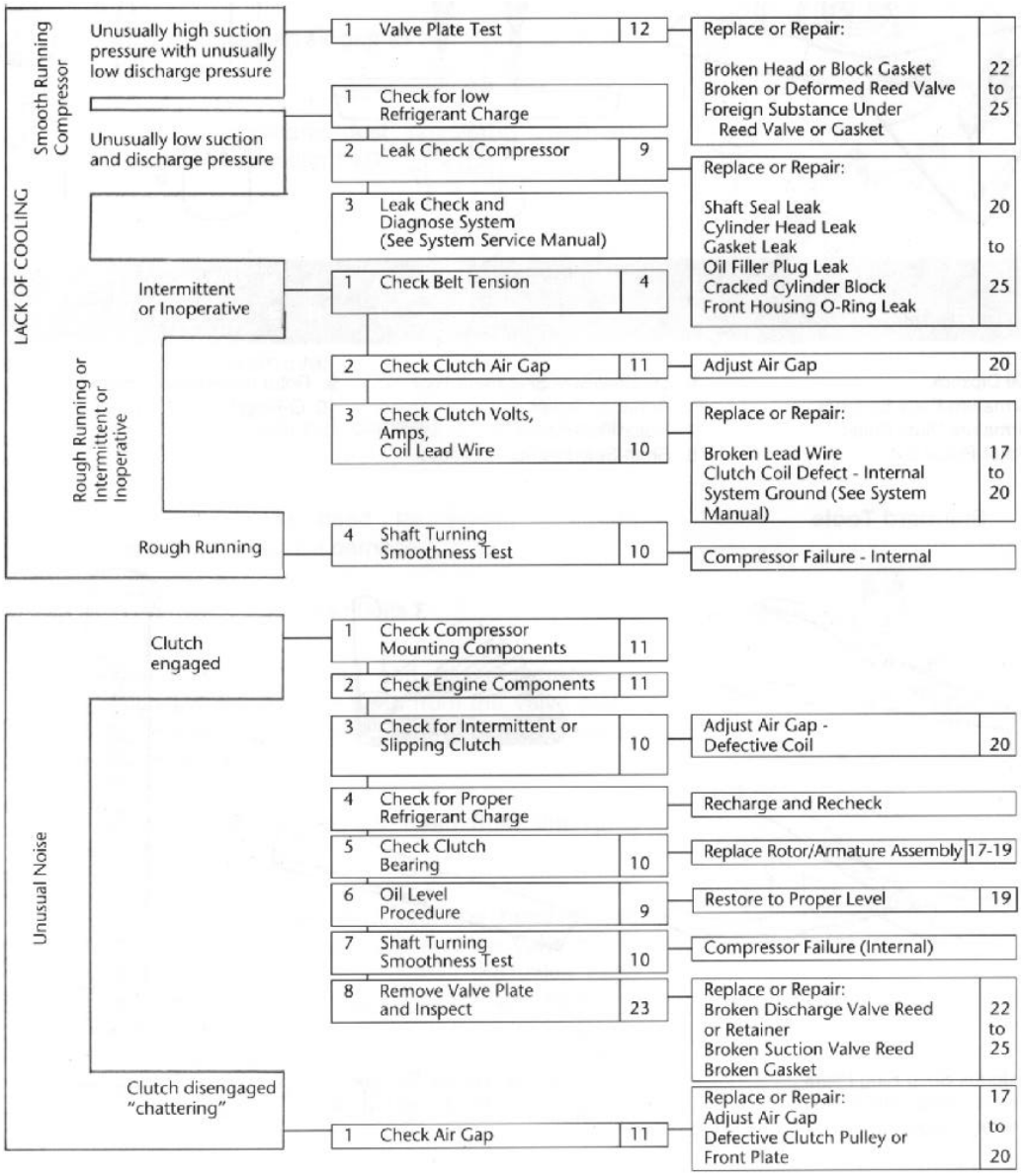
8.2 Standard Tools



1. External Snap Ring Pliers	4. Gasket Scraper
2. Internal Snap Ring Pliers	5. Graduated Cylinder
3. Feeler Gauges	

9. TROUBLESHOOTING CHART

This chart refers specially to the Sanden compressor. During diagnosis follow the inspection procedures in the sequence shown until a defect is found. Then perform the repair in the Cause and Remedy Section. If this repair does not fully solve the problem, proceed to the next inspection step.



INSPECTION PROCEDURES

10.1 Leak Checking

1. **Visual Inspection** - Although oil seepage does not necessarily indicate leakage of refrigerant, it should be considered a sign that a leak may exist. Look for the following items:

   - Oil seepage in shaft seal area (between clutch and compressor) - repairable.
   - Pinching or extrusion of front housing O-ring - nonrepairable.
   - Oil around cylinder head (gaskets, service valves, fittings) - repairable.
   - Oil around oil plug - repairable.
   - Stripped threads - nonrepairable.
   - Oil around crack in compressor body - nonrepairable.

2. **Soap Bubble Detection** - Any leak showing up as bubbles on the compressor will require repair.

3. **Shop Type Electronic Detectors**

   - Ensure that the detector being used is sensitive to R134a refrigerant. Many leak detectors intended for R-12 cannot detect R134a leaks.
   - Use the leak detector in accordance with the manufacturer's instructions.
   - The leak rate at any portion of the compressor should not exceed 1.0 oz./yr. Make sure that a suspected leak is an actual flow of refrigerant, not a small pocket of refrigerant trapped in a recess. Cleaning the suspect area with soap and water (never a solvent) or blowing off the area with compressed air can help confirm a suspected leak.
   - Leak check procedures should be in accordance with SAE J1628.

4. **Leak Detection Dyes** - The use of leak detection dyes is not recommended by Sanden as their chemical compositions are proprietary and their effects on Sanden oils and elastomers are unknown at this time.

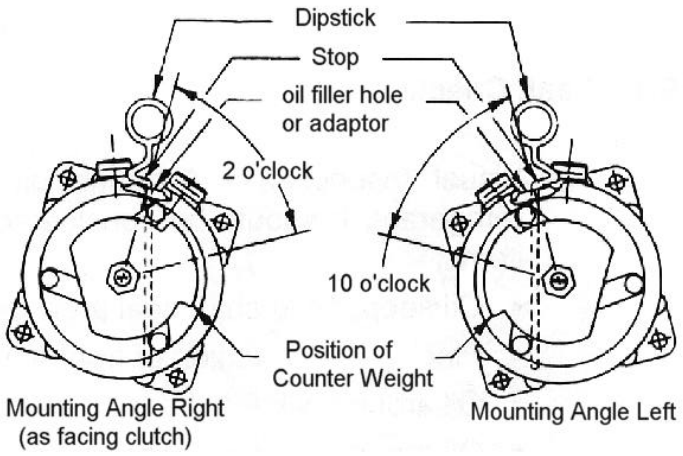
10.2 Oil Level Measurement (In Vehicle)

Oil level in the compressor should be checked when a system component has been replaced, when an oil leak is suspected, or when it is specified as a diagnostic procedure.

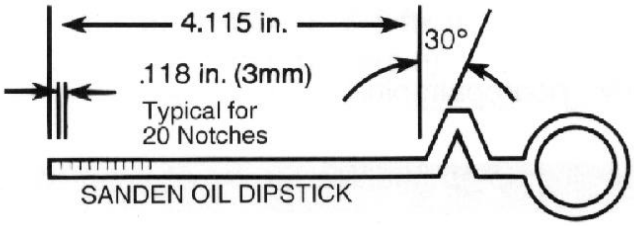
1. Run the compressor for 10 minutes with the engine at idle.
2. Recover all refrigerant from the system, slowly so as not to lose any oil.
3. Determine the mounting angle of the compressor from horizontal (i.e., oil plug or adapter on top). This is most readily done by using a machinist's universal level, if access to the compressor permits.

10.2 (Cont.)

4. Remove the oil filler plug. Using a socket wrench on the armature retaining nut, turn the shaft clockwise until the counterweight is positioned as shown.



5. Insert oil dipstick up to the stop, as shown in the figure above, with the angle pointing in the correct direction.



6. Remove dipstick and count number of notches covered by oil.

7. Add or subtract oil to meet the specifications shown in the table.

8. Reinstall oil plug. Seat and O-ring must be clean and not damaged. Torque to 11-15 ftðlb (15-20 Nðm, 150-200 kgf•cm).

Mounting Angle (Degrees)	Acceptable oil level in increments	
	SD5H14	SD7H15
0	3-5	5-7
10	4-6	6-8
20	5-7	7-9
30	6-8	8-10
40	7-9	9-11
50	8-10	10-12
60	8-10	11-13
90	8-10	16-18

10.3 Shaft Turning Smoothness Inspection

1. If on vehicle, remove refrigerant from A/C system and disconnect hoses.
2. If on bench, uncap fittings.
3. Using a socket wrench on the armature retaining nut, turn the shaft clockwise only.
4. If severe rough spots or catches are felt while turning shaft, the compressor has been damaged internally and must be replaced.

10.4 Clutch Inspection

1. Measure voltage at clutch. Low voltage at the clutch may be due to poor ground or power connection, or problems with the vehicle electrical system. Check for tight fit of field coil retaining snap ring.

2. Measure current draw when clutch is engaged. Normal current should be 3.6 - 4.2A at 12VDC.

   - Overcurrent- Short circuit within field coil or in compressor circuit.
   - No current - Open circuit.
   - If a short or open is found in the field coil, it must be replaced.

3. Air Gap

   - Clutch air gap should be 0.016 - 0.031 in (0.4 - 0.8 mm). Measure with a feeler gauge.
   - Adjust as per Section 14.6

4. Suspected Clutch Rotor Bearing Noise

   - Remove drive belt.
   - With clutch disengaged, rotate pulley by hand. If excessive roughness or wobble is found, replace the clutch rotor assembly.

10.5 Unusual Noise Not due to Compressor

Unusual noises may be caused by components other than the compressor.

1. Compressor Mounting - Check for:

   - Loose belt - see belt tension specifications.
   - Broken bracket or compressor mounting ear. Replace broken component.
   - Missing, broken, or loose mounting bolts. Replace, reinstall, or tighten.
   - Flush fit of compressor to bracket and vehicle engine. Replace any part not properly fitted.
   - Loose or wobbling crankshaft pulley. Check for damage to pulley, incorrect center bolt torque or center bolt bottoming. Repair to vehicle manufacturer's specifications.
   - Bad idler pulley bearing. Replace if necessary.

2. Other Engine components - Check for noise in:

   - Alternator bearing
   - Air pump (if present)
   - Water pump bearing
   - Valves
   - Timing belt or chain
   - Power steering pump (if present)
   - Loose engine mount bolts.

10.6 Unusual Noises Due to Compressor

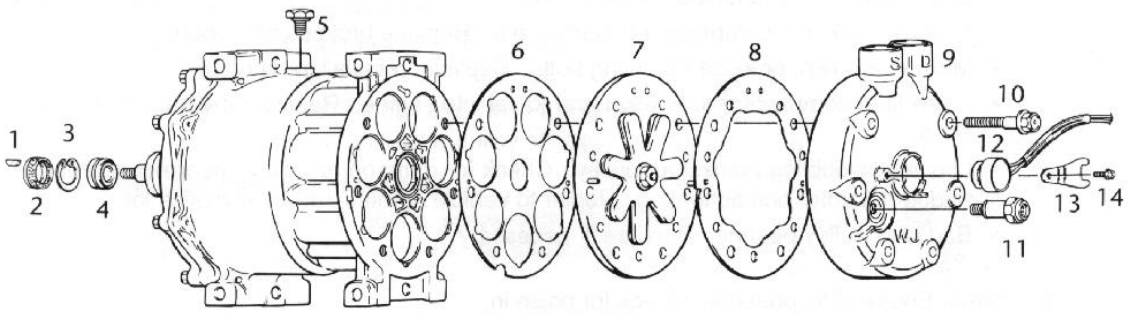
1. Suction pressure less than about 5 psig can cause unusual noise. Charge refrigerant to proper amount and test by applying heat to evaporator to increase suction pressure.
2. Clutch bearing--See clutch Inspection in section 10.4
3. Oil level--insufficient oil can cause unusual noise. See Oil Level Check Procedure in Section 10.2.
4. Valve Noise--test for valve plate assembly failure per Valve Plate Test Procedure in Section 10.7.

10.7 Valve Plate Test

1. Suction or discharge valve breakage will cause a clacking sound at idle.
2. If head gasket failure occurs, discharge pressure will be low and suction pressure will be high at idle.
3. Valve and gasket condition can be checked as follows:
   - Connect gauge set to suction and discharge service valves.
   - Run compressor for 5 minutes at idle and stop.
   - Observe time for discharge pressure and suction pressure to equalize. If less than 2 minutes, in a TVX system, a valve or gasket may be damaged. CCOT systems will equalize more quickly.

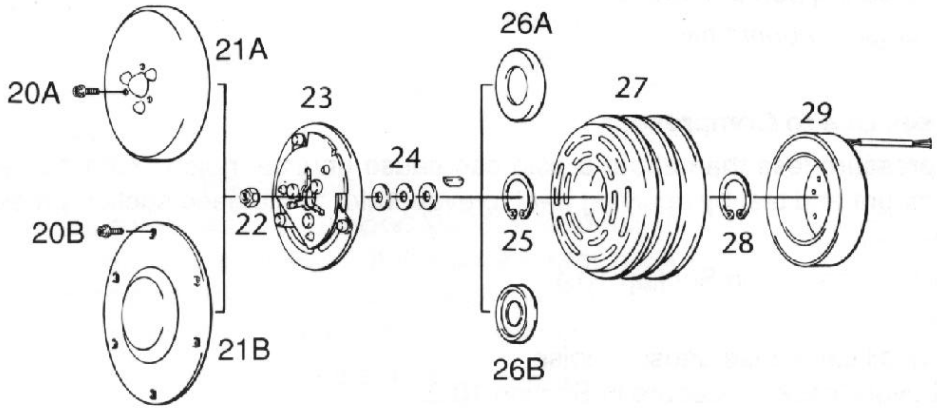
FIELD REPLACEABLE PARTS

11.1 Compressor



1. Shaft Key*	7.Valve Plate Assembly*	13. TPS Clip (Optional)
2. Felt Ring*	8. Head Gasket*	14. TPS Screw (Optional)
3. Shaft Seal Snap Ring*	9. Cylinder Head*	15. Shaft Seal Kit - 2, 3 & 4
4. Lip Seal with O-ring*	10. Cylinder Head Bolt	16. Valve Plate Kit - 6, 7 & 8
5. Oil Plug	11. Pressure Relief Valve (Optional)	17. Cylinder Head Kit - 8 & 9
6. Block Gasket*	12. Thermal Protector Switch (Optional)	18. Gasket Kit - 6 & 8

11.2 Clutch



20A. Armature Dust Cover Screw (SD-5)	**23.** Armature Plate*	**27.** Rotor Assembly*
20B. Armature Dust Cover Screw (SD-7)	**24.** Clutch Shims*	**28.** Field Coil Assembly Snap Ring*
21A. Armature Dust Cover (SD-5)	**25.** Rotor Snap Ring*	**29.** Field Coil Assembly
21B. Armature Dust Cover (SD-7)	**26A.** Rotor Bearing Dust Cover (SD-5)	**30.** Accessory Kit - 1, 22, 24, 25 & 28
22. Shaft Nut*	**26B.** Rotor Bearing Dust Cover (SD-7)	**31.** Armature / Rotor Assembly Kit - 23 & 27

***Sold in kits only.**

Service Operations - General Information

12. General Service Information

It is recommended that a new receiver-drier or accumulator-drier be installed if a compressor is replaced or an internal repair is made.

1. Keep dirt and foreign material from getting on or into the compressor or the A/C system. The area around the A/C hose fittings should be carefully cleaned with a non-petroleum based solvent before the connections are broken. All parts to be reused or installed should be cleaned with a non-petroleum based solvent and blown dry with clean compressed air or lint-free cloths.

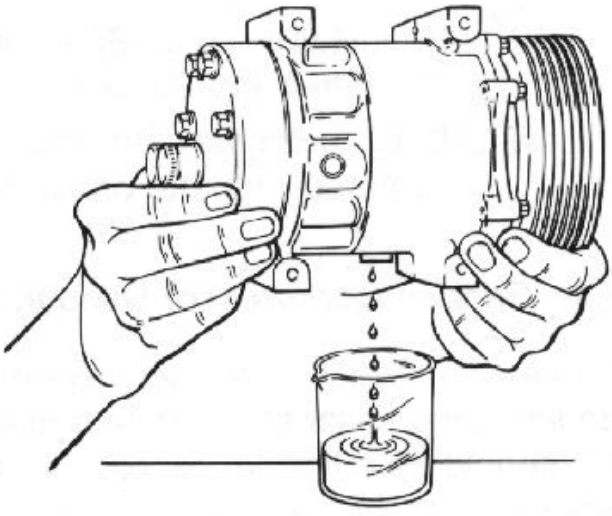
2. Trouble-free installation and operation of an SD compressor require:
   - Correct pulley alignment
   - Correct fit of compressor mounting surfaces to the bracket and correct fit of the bracket to the engine. Clearance between compressor and bracket should not exceed 0.2mm (0.008in) per ear for ear-mount compressors or 0.4mm (0.016in) total for 2 ears.
   - Correct torque of all mounting bolts and nuts
   - Correct drive belt tension
3. Never operate the compressor at high speed or for a prolonged time without a sufficient refrigerant charge in the system. Probable results are overheating, internal damage and seizure.

4. If an internal repair is performed on an R134a compressor, evacuate the A/C system for at least 45 minutes before recharging to remove moisture which may have been absorbed by the PAG oil in the compressor.

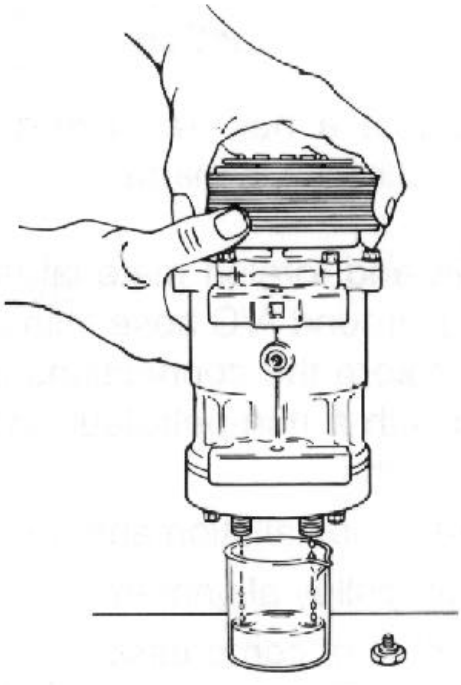
5. Parts which require lubrication before assembly, such as O-rings, should be lubricated with **clean** 5GS refrigerant oil

Service Operations - Oil Charging

13.1 Compressor Repaired Internally and Reinstalled in the System



1. Before any internal repair is done, drain the oil from the compressor.
   - Remove the oil plug and drain as much oil as possible into a suitable container.
   - Remove the caps (if present) from suction and discharge ports
   - Drain oil from the suction and discharge ports into a suitable container while turning the shaft clockwise only with a socket wrench on the armature retaining nut.



2. Measure and record the amount of oil drained from the compressor.

3. Inspect the oil for signs of contamination such as discoloration of foreign material.

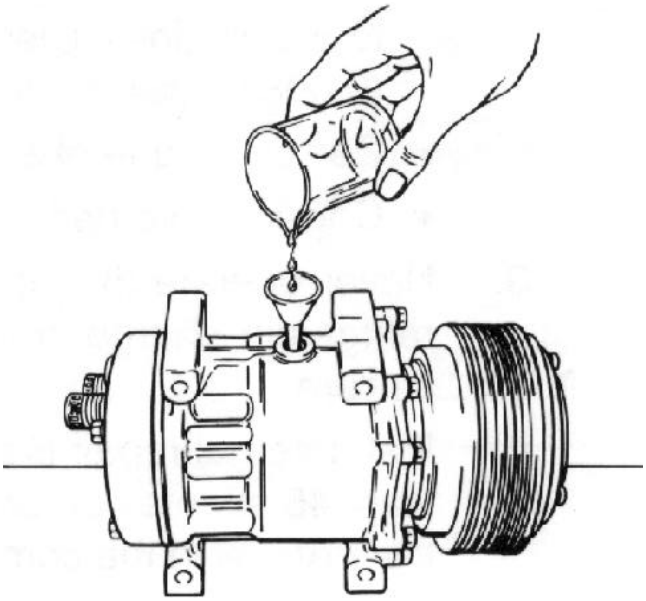
4. Perform repair to the compressor.

13.1 (Cont.)

5. Add the same amount of new oil to the compressor as was measured in step 2. Be sure to use the correct oil for the compressor as shown in Section 6.3.

6. Reinstall oil plug. Seal and O-ring must be clean and not damaged. Torque to 11-15 ft•lb (15-20 N•m, 150-200 kgf•cm). Be careful not to cross thread the oil plug.

7. It is recommended that the oil quantity be confirmed after reinstallation of the compressor to the vehicle as per Section 10.2.



13.2 Sanden Compressor Replaced by a New Sanden Compressor of the Same Type

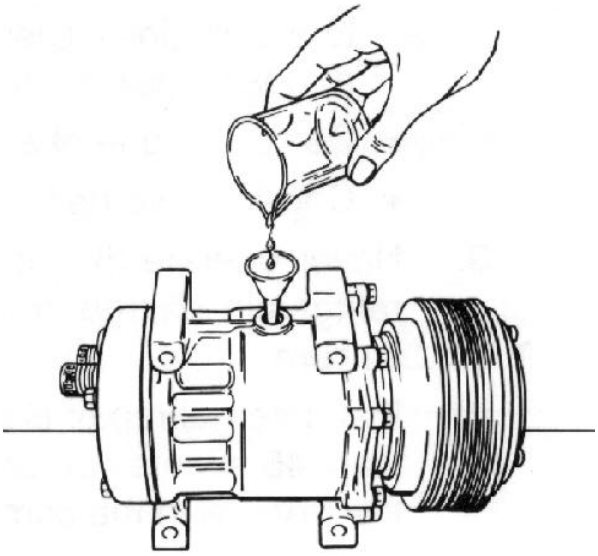
1. Drain oil from the old compressor; measure and record the amount as per the procedure in section 12.1.
2. Drain oil from the new compressor as per section 13.1
3. Add new oil of the correct type to the new compressor as shown in section 6.3. Use the same quantity as was removed from the old compressor in step 1.
4. Reinstall oil plug. Seal and O-ring must be clean and not damaged. Torque to 11-15 ft•lb (15-20 N•m, 150-200 kgf•cm).
5. It is recommended that the oil quantity be confirmed after installation of the new compressor to the vehicle per section 10.2.

13.3 Sanden Compressor Used to Replace a Compressor of a Different Type

This section applies to replacement of another manufacturer's compressor or to the replacement of a Sanden compressor by a different model Sanden compressor. In this case, the procedure of Section 13.2 should be followed, except that the oil quantity must be confirmed after installation of the new compressor to the vehicle as shown in Section 10.2.

13.4 Oil Charge Determination for Long Hose Applications

13.4.1 TXV Systems, Less than 56 oz. (1600g) Refrigerant Charge



1. The desired oil charge for the systems with unusually long hoses, such as trucks, tractors, etc., can be determined based on the total refrigerant charge when less than 56 oz. (1600g) refrigerant is used.
2. Calculate the desired oil charge as below:

   SD5H14: Oil amount (fl.oz.) = (Refrigerant charge in oz. x 0.125) + 1.35. Oil amount (cc) = (Refrigerant charge in grams x 0.125) + 40.

   SD7H15: Oil amount (fl.oz.) = [(Refrigerant charge in oz. x 0.06) + 2.2] ÷ 0.9. Oil amount (cc) = [(Refrigerant charge in grams x 0.06) + 60] ÷ 0.9.
3. For a new compressor to be used in this type of system, subtract the standard oil charge shown in Section 6.3 from the desired total oil charge to determine how much oil should be added to the compressor.
4. Remove the oil filler plug and charge the compressor with the amount of additional oil determined in step 3. Use only new oil of the correct type as shown in Section 6.3.
5. Reinstall oil plug. Seat and O-ring must be clean and not damaged. Torque to 11-18 ft•lb (15-25 N•m, 150-200 kgf•cm).

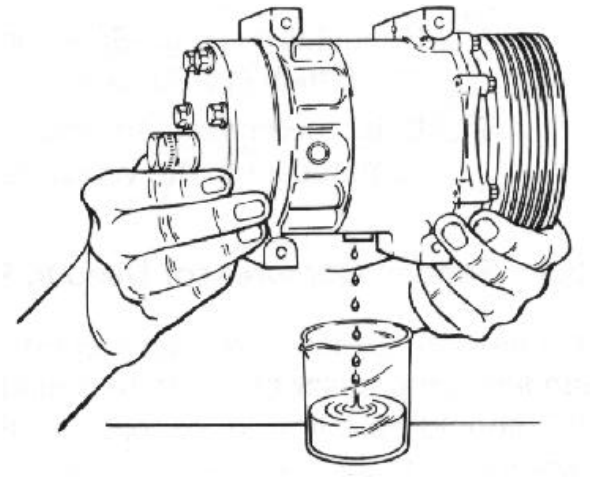
13.4.2 TXV Systems, More Than 56 oz. (1600g) of Refrigerant

For systems with more than 56oz. (1600g) refrigerant, on-vehicle testing is required to determine oil charge.

1. Charge system with refrigerant.

2. Set up the vehicle as follows:

   - Doors open
   - Maximum blower speed
   - Ambient temp. at least 75°F (24°C).



3. Run the compressor at one of the speeds listed in the table below for 10-15 minutes.

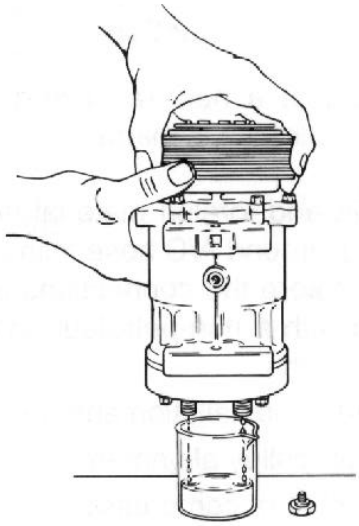
4. While maintaining engine speed, turn off A/C system and immediately turn off engine.

5. Recover refrigerant from the system.

6. Remove compressor from vehicle.

7. Remove the oil plug and drain as much oil as possible into a suitable container.

13.4.2 (Cont.)



8. Drain oil from the suction and discharge ports into a suitable container while turning the shaft clockwise only with a socket wrench on the armature retaining nut.

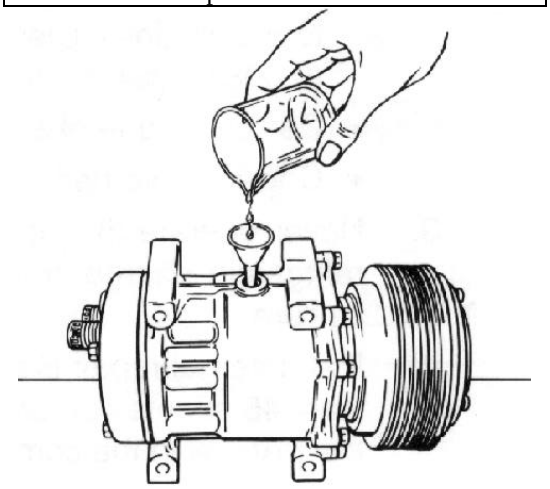
9. Measure and record the volume of the oil drained from the compressor.

10. Approximately 0.5 fl.oz. (15cc) will remain in the compressor as a film coating the internal surfaces. Add 0.5 fl.oz. (15cc) to the recorded volume of the oil. This is the calculated amount of oil in the compressor.

11. The amount of oil in the compressor after running for 10-15 minutes should be as per the table at right, if the proper amount of oil was in the system. Determine from the table what the correct amount of oil should be for the particular speed used in step 3. (The table shown applies to SD5H14 compressors. Other compressors will exhibit a lesser oil amount dependent upon type. It is important that a quantity of oil remains in the crankcase after the test.)

Comp. RPM	Oil in compressor	
	fl.oz	cc
1,000	3.4	100
2,000	2.5	75
3,000	1.7	50
4,000	1.3	40
5,000	1.2	35

- Vehicle doors open
- Maximum blower speed
- Ambient temperature at least 75°F



12. Compare the desired amount of oil as determined in step 11 with the calculated actual amount of oil in the compressor, which was determined in step 10. If the amount of oil actually in the compressor [amount drained plus 0.5 fl.oz. (15cc)] is less than the desired amount of oil, add oil as necessary to the container and pour back into the compressor, If the amount of oil actually in the compressor is too much, remove oil from the container until the correct amount is reached, and pour back into compressor. the amount of oil poured back into the compressor should equal the desired amount (from the table), minus 0.5 fl.oz. (15cc). Use the correct oil type as per Section 6.3.
13. Reinstall oil plug. Seal and O-ring must be clean and not damaged. Torque to 11-15 ft•lb (15-20 N•m, 150-200 kgf•cm).

13.5 Oil Retained in System Components

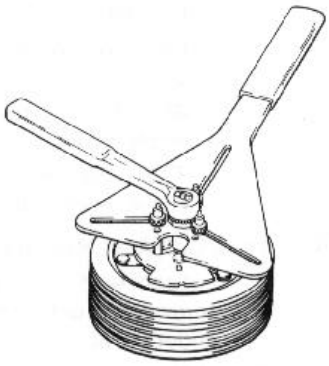
For reference, the amount of oil typically retained in other system components after running at 100 rpm compressor speed is shown at right. These volumes will of course vary with different designs of the components and compressor speeds prior to shut down.

Component	Typical oil amount	
	fl. oz.	cc
Evaporator	2.0	60
Condenser	1.0	30
Receiver - Drier	0.5	15
Accumulator	2.0	60
Hoses (normal length)	0.3	10

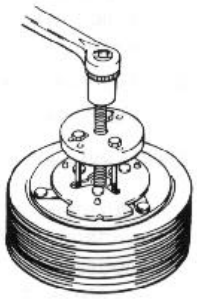
SERVICE OPERATIONS - CLUTCH

14.1a Keyed Shaft Armature Removal

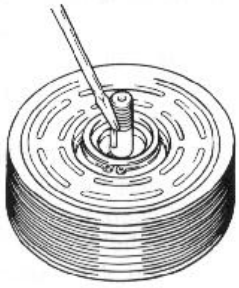
(Note: Keyed shaft can be identified in that the holes for the armature plate spanner will have threads in them.)



1. If armature dust cover is present, remove the 3 or 6 bolts holding it in place and remove cover. If auxilliary sheet metal pulley is present, remove the screws holding it in place. Then remove pulley.
2. Insert pins of armature plate spanner into threaded holes of armature assembly.
3. Hold armature assembly stationary while removing retaining nut with 3/4", 19mm or 14mm socket wrench, as appropriate.
4. Remove armature assembly using puller. Thread 3 puller bolts into the threaded holes in the armature assembly. Turn center screw clockwise until armature assembly comes loose.



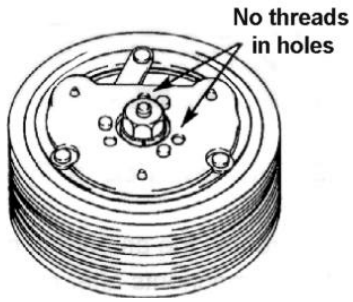
5. If shims are above shaft key, remove them now. If shims are below shaft key, the key and bearing dust cover (if present) must be removed before shims can be removed.
6. Remove bearing dust cover (if present). Use caution to prevent distorting cover when removing it.
7. Remove shaft key by tapping loose with a flat blade screwdriver and hammer.



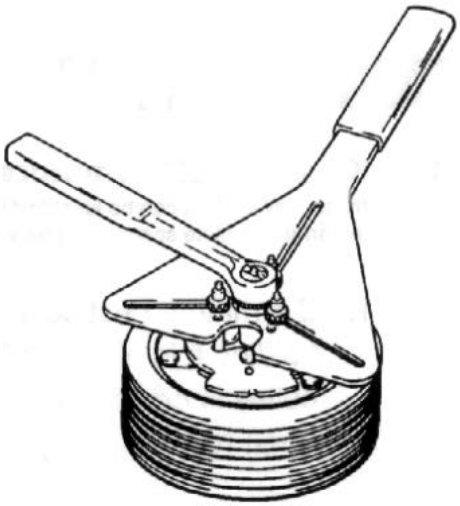
8. Remove shims. Use a pointed tool and a small screwdriver to prevent the shims from binding on the shaft.

14.1b Spline Shaft Armature Removal

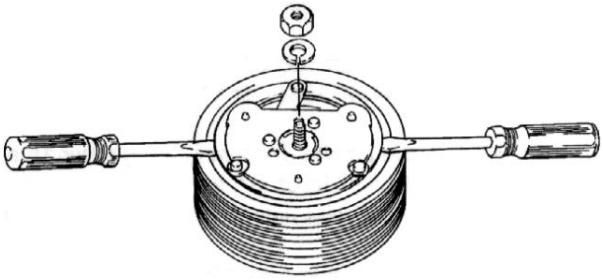
(Note: Spline shaft can be identified in that the holes for the armature plate spanner will not have threads in them.)



1. If armature dust cover is present, remove the 3 or 6 bolts holding it in place and remove cover. If auxillary sheet metal pulley is present, remove the screws holding it in place. Then remove pulley.



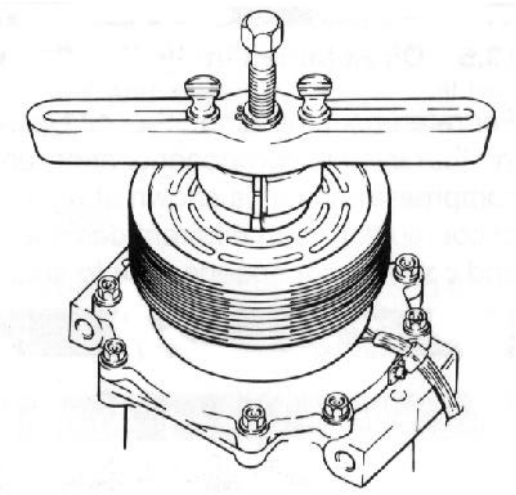
2. Insert pins of armature plate spanner into threaded holes of armature assembly.
3. Hold armature assembly stationary while removing retaining nut with 3/4", 19mm, or 14mm socket wrench, as appropriate.
4. Lift off armature plate with fingers. If armature does not come off easily, spray an anti seize oil into shaft to loosen. Armature plate can also be loosened by gently prying between rotor and armature plate with two flat screwdrivers.



5. If shims are above shaft key, remove shims. If shims are below shaft key, the key and bearing dust cover (if present) must be removed before the shims can be removed.
6. Remove bearing dust cover (if present). Use caution to prevent distorting cover when removing it.
7. Remove shims. Use a pointed tool and a small screwdriver to prevent the shims from binding on the shaft.

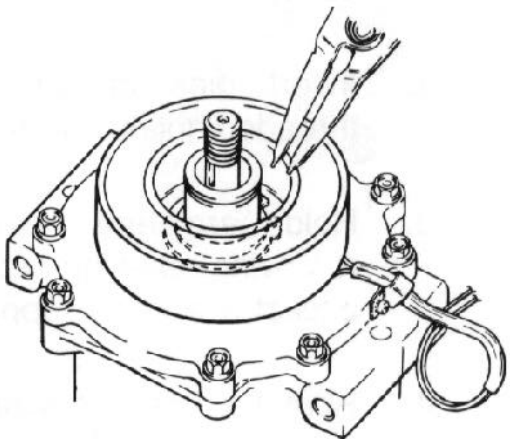
14.2 Rotor Assembly Removal

1. If bearing dust cover has not been removed, remove it now. See step 6 of Section 14.1, for Armature Assembly Removal.
2. If internal snap ring for bearing is visible above the bearing, remove it with internal snap ring pliers.
3. Remove rotor snap ring.
4. Remove shaft key.
5. Remove rotor pulley assembly:
   - Insert the lip of the jaws into the snap ring groove.
   - Place rotor pulley shaft protector (Puller set) over the exposed shaft.
   - Align thumb screws to puller jaws and finger tighten. Turn puller center bolt clockwise using a socket wrench until rotor pulley is free.



14.3 Field Coil Assembly Removal

1. Loosen lead wire clamp screw with #2 Phillips screwdriver until wire(s) can be slipped out from under clamp.
2. Undo any wire connections on the compressor which would prevent removal of the field coil assembly.
3. Remove snap ring.
4. Remove the field coil assembly.

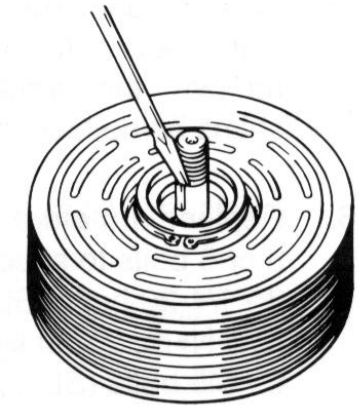


14.4 Field Coil Assembly Installation

Reverse the steps of Section 14.3. Protrusion on underside of coil ring must match hole in front housing to prevent movement and correctly locate lead wire(s).

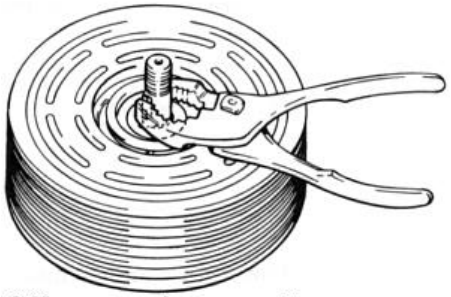
14.5 Rotor Assembly Installation

1. Place compressor on support stand, supported at rear end of compressor. If the compressor must be clamped in a vise, clamp only on the mounting ears, never on the body of the compressor.
2. Set rotor squarely over the front housing boss.
3. Place the rotor installer ring into the bearing bore. Ensure that the edge rests only on the inner race of the bearing, not on the seal, pulley, or outer race of the bearing.



4. Place the driver into the ring and drive the rotor down onto the front housing with a hammer or arbor press. Drive the rotor against the front housing step. A distinct change of sound can be heard when using the hammer to install the rotor.
5. Reinstall rotor bearing snap ring, if it has been removed, with internal snap ring pliers.
6. Reinstall rotor retaining snap ring with external snap ring pliers. If a bevel is present on the snap ring, it should face up (away from the body of the compressor).
7. Reinstall rotor bearing dust cover (if present) by gently tapping it into place.

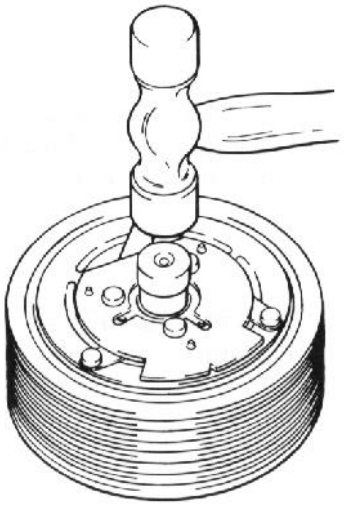
14.6 Armature Assembly Installation



Sólo para eje con cuñero

1. Install shaft key with pliers.
2. Install clutch shims. NOTE: Clutch air gap is determined by shim thickness. When installing a clutch on a used compressor, try the original shims first. When installing a clutch on a compressor that has not had a clutch installed before, first try 0.04", 0.02", and 0.004" (1.0, 0.5, 0.1 mm) shims.

14.6 (Cont.)

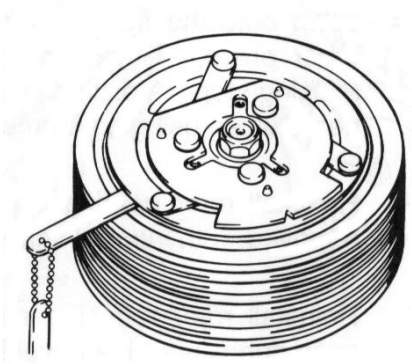


3. Align keyway in armature assembly to shaft key. Using driver and a hammer or arbor press, drive the armature assembly down over the shaft until it bottoms on the shims. A distinct sound change will be noted if driving with a hammer.

4. Replace retaining nut and torque to specification.

   1/2-20: 20-25 ft•lb (27-34 N•m, 270-350 kg•cm)

   M8: 11-15 ft•lb (15-21 N•m, 150-210 kgf•cm)



5. Check air gap with feeler gauge. Specification is 0.016" -0.031" (0.4 - 0.8mm). If gap is not even around the clutch, gently tap down at the high spots. If the overall gap is out of spec., remove the armature assembly and change the shims as necessary.

6. Replace armature dust cover (if used) and torque 3 or 6 bolts to specification below.

   3 - 1/4-20 bolts (SD-5): 2-4 ft•lb (2-5 N•m, 25-50 kgf•cm)

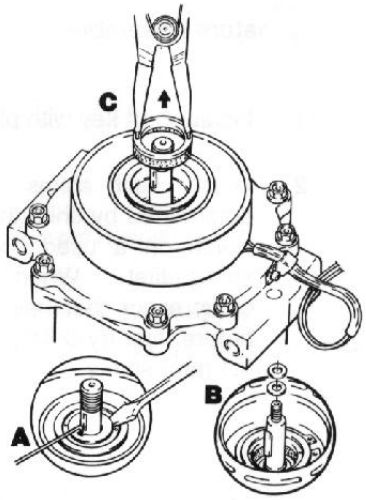
   6 - M5 bolts (SD-7): 5-8 ft•lb (7-11 N•m, 70-110 kgf•cm)

***Note: Over torque of SD508/SH14 dust cover bolts will cause air gap to become out of spec.**

SERVICE OPERATIONS - SHAFT SEAL

15. Replacement of Lip Type Shaft Seal (SD5H14, SD7B10, SD7H13, SD7H15)

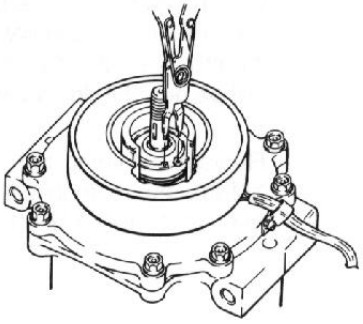
Note: Lip seal assembly and felt ring must never be reused. Always replace these components.



1. Be sure all gas pressure inside the compressor has been relieved.

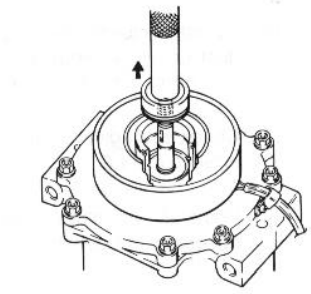
2. Remove armature dust cover (if used), armature assembly, rotor bearing dust cover (if used), shaft key, and clutch shims as per section 14.1.

3. Insert the points of a pair of snap ring pliers into the holes of the felt ring retainer and pry out the retainer and felt ring.



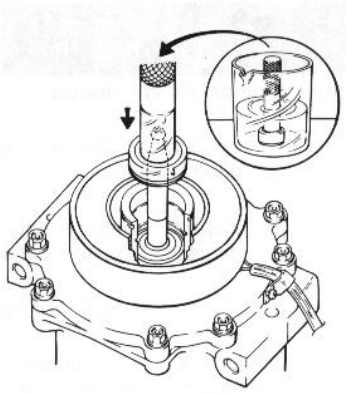
4. Remove seal snap ring with internal snap ring pliers.

15. (Cont.)



5. Use lip seal removal and installation tool to remove lip seal assembly. Twist the tool until the 2 lips on the tool engage the slots in the lip seal housing and pull the seal out with a twisting motion.

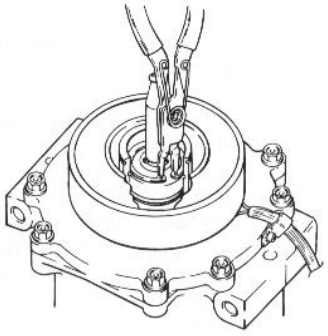
6. Clean out shaft seal cavity thoroughly. Debris can be removed using a non-petroleum based solvent and lint free cloth. The area should then be blown out with clean, dry compressed air. Make sure all foreign material is completely removed.



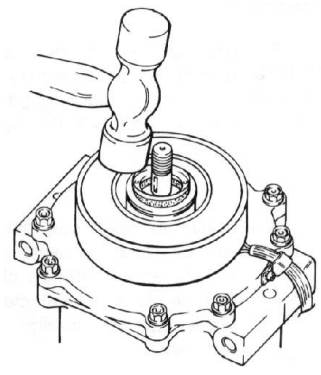
7. Place shaft seal protective sleeve over compressor shaft. Inspect the sleeve to ensure that it has no scratches and is smooth so that the lip seal will not be damaged. Make sure there is no gap between the end of the sleeve and the seal surface on the shaft.

8. Engage the lips of the seal removal and installation tool with the slots in the new lip seal housing. Make sure the lip seal assembly, especially the O-ring, is clean. Dip the entire lip seal assembly, on the tool, into clean 5GS refrigerant oil. Make sure the seal assembly is completely covered with oil.

9. Install lip seal over shaft and press firmly to seat. Twist the tool in the opposite direction to disengage it from the seal and withdraw the tool.



10. Reinstall shaft seal snap ring with internal snap ring pliers. Beveled side should face up (outward/away from compressor body). Ensure that snap ring is completely seated in groove. It may be necessary to tap the snap ring lightly to seat it in the groove.



11. Tap new felt ring assembly into place.

12. Reinstall clutch shims, shaft key, rotor bearing dust cover (if used), and armature assembly as described in Section 14.6

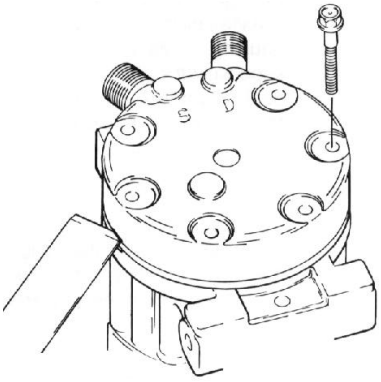
13. Check and adjust air gap as necessary as shown in Section 14.6.

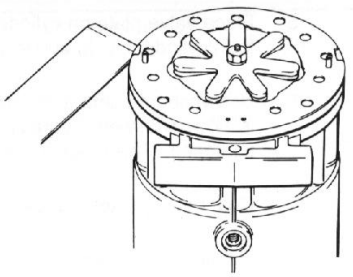
14. Reinstall armature dust cover (if used) as described in Section 14.6.

SERVICE OPERATIONS - CYLINDER HEAD / VALVE PLATE

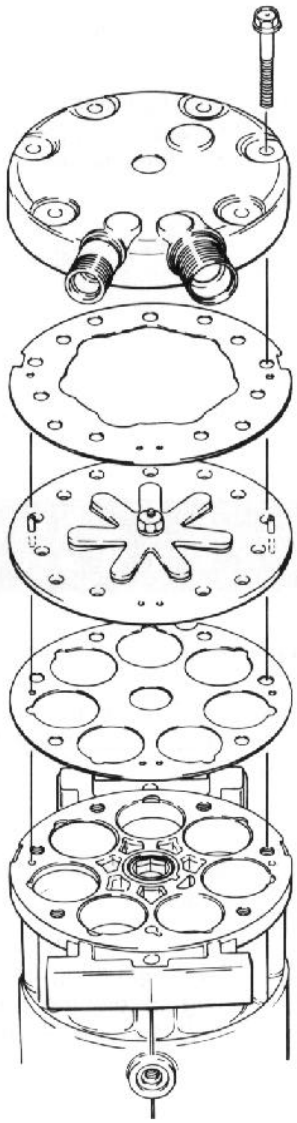
16.1 Cylinder Head Removal

1. Be sure all internal compressor pressure has been relieved.
2. Inspect cylinder head for fitting or thread damage. Replace if damaged
3. Remove cylinder head bolts.
4. Use a small hammer and gasket scraper to separate the cylinder head from the valve plate. Be careful not to scratch the gasket surface of the cylinder head.
5. Carefully lift the cylinder head from the valve plate.
6. It is recommended that both the head gasket (between the cylinder head and the valve plate) and the block gasket (between the valve plate and the cylinder block) be replaced any time the cylinder head is removed. However, if no service is required to the valve plate, it may be left in place. If the valve plate comes loose from the cylinder block, the block gasket must be replaced.
7. Carefully remove old head gasket from top of valve plate with gasket scraper. Be careful not to disturb the valve plate to cylinder block joint if valve plate has been left in place. If valve plate comes loose from cylinder block, proceed to Section 16.2, Valve Plate Removal, and replace block gasket.





16.2 Valve Plate Removal



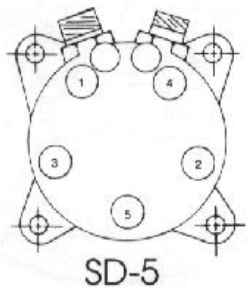
1. Using a small hammer and gasket scraper, carefully separate valve plate from cylinder block. **Be careful not to damage sealing surface of cylinder block.**

2. Inspect reed valves and retainer. Replace valve plate assembly if any part is damaged.

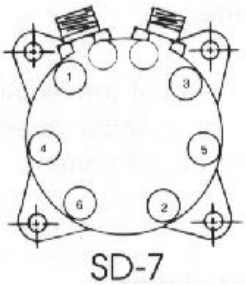
3. Carefully remove any gasket material remaining on valve plate, cylinder block or cylinder head. Do not damage sealing surfaces on components.

16.3 Valve Plate and Cylinder Head Installation

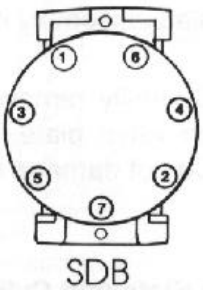
1. Large gasket: OD of block gasket is 4-3/4" (120mm) and sealing face of block does not have a 4-1/2" (114.7mm) diameter step.
2. Small gasket: OD of gasket is 4-1/2" (114.7mm) and sealing face of the cylinder block has a 4-1/2" (114.7mm) diameter step.
3. Coat new block gasket with clean 5GS refrigerant oil.
4. Install block gasket. Align new gasket to location pin holes and orifice(s). Notch (if present) should face same direction as oil plug or adapter.
5. Place valve plate on cylinder block with discharge valve, retainer and nut facing up (away from cylinder block) and location pins properly located in holes.
6. Use vacuum pump and small tube to remove residual oil from each bolt hole. If this step is not performed, hydraulic pressure can be created when the cylinder head bolts are tightened. This pressure can break the cylinder block.
7. Coat head gasket with clean 5GS refrigerant oil.
8. Install head gasket cover location pins, checking for correct orientation.
9. Install cylinder head.
10. Install cylinder head bolts and tighten in a star pattern. Torque first to approximately 14 ft•lbf (19.6 N•m, 200 kgf•cm), then finish by torquing to 24-27 ft•lbf (32.4-36.3 N•m, 330-370kgf•cm).



SD-5



SD-7



SDB

SERVICE OPERATIONS - THERMAL PROTECTOR SWITCH

17.1 TPS Testing

Some models of SD compressors are equipped with a bi-metal type thermal protector switch (TPS) to protect against abnormally high temperatures. Contact Sanden Application Engineering for additional information.

1. Check continuity at room temperature. If switch is open at room temperature, remove and replace.
2. Check actuating temperature. Remove TPS and place in container of PAG oil. Heat oil using an electric hot plate while monitoring oil temperature. TPS should open at 116 ± 5°C (241 ± 9°F). If it does not function properly, replace it.

17.2 TPS Replacement

1. Disconnect all electrical connections.
2. Remove TPS retaining clip bolt.
3. Spray around TPS with commercial non-petroleum based solvent (volatile type such as 1,1,1-trichloroethane or approved substitute), to loosen silicone.
4. Remove TPS with pliers. Use care to prevent deforming the TPS housing because this can change the temperature setting.
5. Clean silicone out of TPS well with flat bladed screwdriver. Wipe out the TPS well with a cloth. Make sure well area is clean and dry.
6. Apply a dot of silicone RTV (Dow Corning #8390 or 1340 recommended) approximately 1/4" (6mm) in diameter and 1/8" (3mm) high at the bottom of the TPS well.
7. Install TPS, making sure lead wires are oriented to the clearance notch.
8. Install TPS retaining clip and bolt. Hold clip tight against stop while torquing bolt to 6-9 ft•lb (8-13 N•m, 80-130 kgf•cm)
9. Reconnect electrical connections and check function.

SERVICE OPERATIONS - HIGH PRESSURE RELIEF VALVE

18. HPRV Replacement

Some models of Sanden compressors are fitted with a high pressure relief valve (HPRV) to protect against damage from abnormally high discharge pressures.

1. **Note:** When replacing a failed HPRV with a new one, be sure to identify whether the A/C system is for R-12 or R134a. The HPRV and the small O-ring at the threaded portion are both different for R134a. Contact your supplier for additional information.
2. Be sure all gas pressure has been released from inside the compressor.
3. Remove HPRV.
4. Coat O-ring of a new HPRV with clean 5GS refrigerant oil. Seat and O-ring must be clean and not damaged.
5. Install new HPRV and torque to 6-9 ft•lb (8-12 N•m, 80-120 kgf•cm).

CONVERTING R-12 SYSTEMS TO R134a

19.1 Recommended Procedures for Sanden R-12 Compressors Retrofitted with R134a

The use of R134a in mobile A/C systems designed for R-12 refrigerant use causes higher discharge pressures (as much as 10-15%) and necessitates changing the compressor lubricant from mineral oil (5GS) to PAG oil (Sanden's SP-10 or SP-20) to ensure compatibility.

These changes result in greater wear to the internal components of the compressor. Therefore, to ensure consistent and expected reliability, Sanden does not recommend using R134a in systems and compressors designed for R-12.

However

Sanden recognizes the realities of the automotive service markets and consumer preferences. If a retrofit is required, please follow the vehicle manufacturer's published retrofit procedures. Ensure all work done complies with SAE recommended practices as described in J1660 &J1661:

- Repair any problems or leaks before retrofitting.
- Affix labels to the vehicle showing conversion status.
- Observe all safety recommendations.

If an OEM retrofit procedure is not available, Sanden recommends the following procedure:

19.2 Sanden's Procedure for Conversion from R-12 to R134a

1. If the R-12 vehicle air conditioning system is optional, run it at idle with the A/C blower on high speed for five (5) minutes to maximize the amount of oil in the compressor.
2. Recover all R-12 refrigerant from the vehicle's A/C system.
3. Remove the compressor from the vehicle.
4. Remove the compressor oil plug and then drain as much mineral oil as possible from the compressor body.
5. Drain mineral oil from the cylinder head suction and discharge ports while turning the shaft with a socket wrench on the clutch armature retaining nut.
6. Remove the existing R-12 receiver-drier or accumulator-drier from the vehicle and discard. Allow as much oil as possible to drain from the A/C hoses.
7. Change any O-rings on the receiver-drier or accumulator-drier joints to approved HNBR O-rings; replace any other O-rings that have been disturbed.
8. Replace the receiver-drier or accumulator-drier with a new R134a compatible one containing XH7 or XH9 desiccant.
9. If a CCOT system is being repaired due to compressor damage, or foreign material is found in the oil drained from the system, this foreign material must be removed from the system. At this time an in-line filter should be installed in the liquid line. Allow as much oil as possible to drain from the A/C lines when installing the filter. Change any O-rings disturbed in the installation of the filter to approved HBNR O-rings.
10. Perform any necessary repairs to the compressor or A/C systems.
11. Using the original refrigerant oil quantity specification, add SP-20 or SP-10 oil to the compressor (SP-10 for TR, SDV-710, SDB-705, SDB-706 and SDB-709; SP-20 for all other SD compressors).
12. Replace the compressor oil plug O-ring with an HNBR O-ring.
13. Reinstall the compressor oil plug. The plug seat and O-ring must be clean and free of damage. Torque the plug to 11-15 ft•lb (15-20 N•m, 150-200 kgf•cm)

19.2 (Cont.)

14. Change any seals at the compressor ports to approved HNBR seals.
15. Reinstall the compressor to the A/C system. Evacuate the A/C system for at least forty-five (45) minutes to a vacuum of 29 in. Hg, using R-12 equipment, to remove as much R-12 as possible from the residual mineral oil.
16. Remove all R-12 service equipment and disable the R-12 service fittings to prevent any refrigerant other than R134a from being used. Permanently install R134a quick connect service fittings to the A/C system.
17. Connect R134a service hoses and other equipment. Re-evacuate the system for thirty (30) minutes using the R134a equipment.
18. Charge the A/C system with R134a. Generally, about 5% (by weight) less than the R-12 charge amount is required. Leak check the system per SAE J1628 procedure.
19. If the A/C system is a CCOT type, which has been repaired due to damage or the discovery of foreign material in the oil drained from the system, run the system for sixty (60) minutes to capture this material in the filter installed in step 9. Recover the refrigerant, remove and dispose of the filter, reconnect the lines, evacuate for at least forty-five (45) minutes, and recharge the A/C system. This step should not be necessary for TXV systems, since the drier is fitted with an internal filter.
20. Check the A/C system operating parameters. The system should function correctly within acceptable limits of temperatures and pressures. This will ensure that the correct amount of R134a has been charged.
21. In extreme circumstances when expected cooling performance cannot be achieved and high discharge pressures are experienced, it may be necessary to add more condensing capacity to the A/C system. An electric fan(s) and/or larger capacity condenser can be used.
22. Replace all R-12 compressor labels with retrofit labels per SAE J1660 in order to provide information on the R134a retrofit which has been performed.

Model	Retrofit PAG oil amount fluid ounces (cc)	
	Expansion valve systems	Orifice tube systems
SD-505	3.4±0.5 (100±15)	No Standard
SD-507	5.5±0.5 (165±15)	No Standard
SD-508	7.2±0.5 (210±15)	9.5±0.5 (280±15)
SD-510	No Standard	8.1±0.5 (240±15)
SDB-706	No Standard	No Standard
SD-708	4.6±0.5 (135±15)	No Standard
SD-709	4.6±0.5 (135±15)	8.1±0.5 (240±15)

Sanden SP-20 REFRIGERANT OIL FOR R134a SD COMPRESSORS

Sanden provides field service containers of SP-20 PAG oil for Sanden SD-series compressors in convenient 250cc cans. These cans are designed to withstand moisture ingression. Always keep the cap of the can tightly closed when not handling the oil.

Cans are packed in "six-packs" and available through your Sanden representative. Material safety data is also available.

Sanden limits the warranty of SD compressors for field service with the condition that only Sanden-approved SP-20 is utilized.

"Six-Pack" of 250 cc cans of SP-20 oil -Sanden Number 7803-1997.