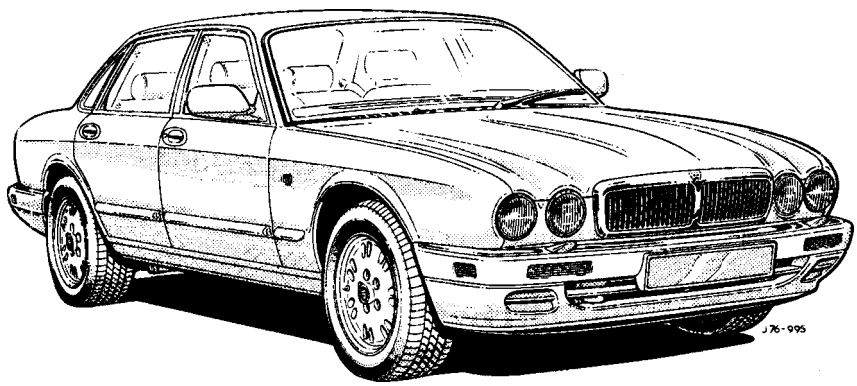
BY APPOINTMENT TO
HER MAJESTY QUEEN ELIZABETH II
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

BY APPOINTMENT TO
HER MAJESTY QUEEN ELIZABETH
THE QUEEN MOTHER
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

BY APPOINTMENT TO
HIS ROYAL HIGHNESS THE PRINCE OF WALES
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

JAGUAR

XJ6 – XJ12
Vehicle Service Manual



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FOREWORD

This Vehicle Service Manual (VSM) is part of a set of service literature which covers **procedures for the efficient** diagnosis and rectification of problems associated with all areas of the X300 family of vehicles.

It is designed to be read in conjunction with other manuals, namely the various Unit Service Manuals (USM) (as applicable to the particular vehicle under diagnosis/ repair) and the X300 Electrical Diagnostic Manual (EDM); see list below.

It should be noted that its scope is limited to those areas that are unique to the family, e.g. Remove & Refit procedures for Body Components, Engine, Transmission etcetera, Fuel, Emissions & Engine Management systems, and so on.

Fault Diagnosis and repair procedures (together with Technical Data, Recommended Lubricants, Capacities etcetera) for major assemblies such as engines, automatic and manual transmissions, are covered in the separate Unit Service Manuals.

The Unit Service Manuals are not vehicle-specific, but are designed to be read in conjunction with this VSM, and, where so equipped, with other Jaguar Vehicle Service Manuals for new models launched subsequent to the X300 family.

The X300 Electrical Diagnostic Manual is the final part of the 'set' of service documentation. This manual is family-specific, and is designed to aid the Technician to isolate electrical faults and to correct them. It covers all aspects of electrical fault diagnosis, including:

OBD II Codes and emission control system related fault diagnosis / rectification.
Circuit Diagrams
Component (Relays, fuse boxes, control modules etcetera) Location / Harness Diagrams
Ground Locations
Connector Locations.

Service Manuals Required

The Manuals required to service the X300 family of vehicles are as follows:

X300 Vehicle Service Manual
X300 Electrical Diagnostic Manual
Unit Service Manuals:
- AJ16 Engine Service Manual
- V12 Engine Service Manual
- ZF Automatic Transmissions Service Manual (ZF supplies transmissions for 3.2 liter and 4.0 liter normally aspirated versions)
- Powertrain Automatic Transmissions Service Manual (The Powertrain name succeeds that of Hydra-Matic. Powertrain are suppliers of the 4L 80 E transmission as fitted to 4.0 litre supercharged and 6.0 litre versions)

Each of the X300-specific manuals is divided into Sections which adopt the same title and number where relevant, i.e. Section 5.1 of both the VSM and the EDM cover Fuel, Emission Control & Engine Management System (AJ16). An over-all contents list showing each section title and number together with its page-edge locator is given in this section and in the introduction to the EDM.
The VSM (not applicable to the EDM) also contains Appendices which cover specialized areas such as the current vehicle specification, routine maintenance schedule etc. These are carried at the rear of this Manual, and have their own contents page within this section.

INDEX

This manual carries a comprehensive index at the rear, which is designed to save the Technician time by permitting rapid location of information. The entries are set out as per the following example:

CLIMATE CONTROL SYSTEMS. Section 14.
See *also* Electrical Diagnostic Manual

Clutch
Description: *Sect.* 7.7 – 10
Fault diagnosis: ***Sect*** 7.1 – **11**

In the example the heading in upper case lettering is to a section title, and it refers to the section number, 14, and also to the EDM as electrical diagnostic information will be found in that manual's section 14.
The entry for clutch tells us that the relevant description will be found on page 10 of Section 7.1 of this manual, and that fault diagnosis procedures start on page 11.
In this case there is no reference to the EDM as electrical diagnosis does not apply to this area.

GLOSSARY OF TERMS

This Section contains a Glossary of general and emissions-related terminology (commencing on page 5).

SERVICE REPAIR OPERATION (SRO) NUMBERING

A master index of numbered operations has bee? compiled for universal application to all vehicles manufactured by Jaguar Cars Ltd.

Each operation described in this manual is allocated a number from the master index and cross-refers with an identical number in the Service Repair Operation Times Manual. The number consists of six digits arranged in three pairs. Each operation is described in the sequence necessary to complete the operation in the minimum time, as specified in the Manual of Repair Operation Times.

SERVICE TOOLS

Where non-standard service tools (i.e. tools which are not generally available hand tools) are required to complete an operation, the number and an illustration of that tool is given in the preliminary pages of the Section concerned.

TORQUE TIGHTENING SPECIFICATIONS

Torque tightening specifications are given in tabular form in the preliminary pages of the relevant Section.

REPAIRS AND REPLACEMENTS

When service parts are required, it is essential that only genuine Jaguar / Daimler replacements are used.

Attention is drawn to the following points concerning repairs and the fitting of replacement parts and accessories:

- Safety features embodied in the vehicle may be impaired if other than genuine parts are fitted. In certain territories, legislation prohibits the fitting of parts which are not produced to the vehicle manufacturer's specification.
- Torque wrench setting figures given in this Manual must be strictly adhered to.
- Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed.
- Owners purchasing accessories while travelling abroad should ensure that the accessory and its fitted location on the vehicle conforms to mandatory requirements existing in their country of origin.
- The vehicle warranty may be invalidated by the fitting of other than genuine Jaguar / Daimler parts. All Jaguar /Daimler replacements have the full backing of the factory warranty.
- Jaguar / Daimler dealers are obliged to supply only genuine service parts.

REFERENCES

References to the left or right-hand side of the vehicle are made as if viewing from the driver's seat.

SPECIFICATION

Purchasers are advised that the specification details set out in this Manual apply to a range of vehicles and not to any specific one. For the specification of a particular vehicle, purchasers should consult their dealer.

The Manufacturers reserve the right to vary their specifications, with or without notice, and at such times and in such manner as they think fit. Major as well as minor changes may be involved in accordance with the Manufacturer's policy of continuous improvement.

Whilst every effort is made to ensure the accuracy of the particulars contained in this Manual, neither the Manufacturer nor the Dealer, by whom this Manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

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GLOSSARY OF TERMS

Introduction

This glossary of terms is intended to cover both general and emissions-related (to SAE J 1930) terminology. It is intended to enable the user to ascertain the meaning of standardized terms and acronyms used throughout the Manual. The required term may be looked-up in the left-hand column, and subsequent columns give the standard abbreviation or acronym, definitions and previously used terms, as applicable.
As this Manual is a world-wide publication, and must comply with certain Society of Automotive Engineers Standards, it has been necessary to adopt the terminology etc. demanded by that Standard.

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
A			
accelerator pedal	AP		throttle pedal
across flats	AF	measurement across the spanner flats of a nut or bolt head	
adapter			adaptor
after bottom dead center	ABDC	event occurring after BDC	
after top dead center	ATDC	event occurring after TDC	
Air Cleaner	ACL		
Air Conditioning	A/C		AC. aircon
Air Conditioning Signal	ACS	air conditioning compressor clutch operation is signalled to the PCM which induces idle speed corrections to compensate for engine load changes	
Air ning Control Module	A/CCM	module controlling air conditioning, heating and ventilation	
airfoil		wing or similar, designed to obtain some effect from the flow of air over it	aerofoil
alternating current	ac	electrical current whose flow alternates in direction, in a sinusoidal wave-form	
aluminum			aluminium
Ambient temperature		Temperature of the air surrounding an object	
Ampere	A	SI unit of current	Amp
Ampere hour	Ah	1 Ampere flowing for one hour	Amp. hour
Anti-Lock Braking System	ABS	system, usually elec ·ii Ih controlled (but can be mechanically) which prevents wheel lock-up under braking by sensing lack of rotation of a wheel(s) and diverting fluid pressure away from it (them). Originally *Anti-Blockier* System (Bosch).	
ABS control module	ABS CM		
ABS / traction control control module	ABS / TC CM		
antenna (plural, antennae or antennas)			aerial
analog			analogue
Analog Volt-Ohm meter	AVOM		
atmospheres	atm	unit of pressure (1.01325 bar)	
automatic transmission			auto, auto gearbox
axle shaft		shaft transmitting power to the rear wheel hubs	drive shaft

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
5			
Babbitt metal			white metal
backlight			backlight, rear screen
back-up lamp			reversing lamp
balk ring		rotating component of manual transmission which prevents premature engagement of gears	baulk ring
battery positive Voltage	B+	The positive Voltage from a battery or any circuit connected directly to it.	B+, +ve, VSS
Barometric Absolute Pressure Sensor	BARO	sensor measuring the pressure of surrounding air at any given temperature and altitude	BARO, APS
base Idle		Idle rpm determined by the throttle lever being hard-set on the throttle body with the IAC solenoid disconnected	
base timing		Spark advance in degrees before top dead center of the base engine without any control from the PCM	
battery		Electrical storage device producing DC Voltage by means of electrochemical reaction	
before bottom dead center	BBDC	event occurring before BDC	
before top dead center	BTDC	event (usually ignition) occurring before TDC	
blower	BLR	Device which supplies a current of air at moderate pressure, e.g. heater or A/C blower	
Body Processor Module	BPM	Control module for body electrical systems, e.g. interior lamps, windshield wash / wipe control etc..	CCM (Central Control Module). CPU
British Standards	BS	standard specification issued by the British Standards Institution	
British Standards Automotive	BSAu		
brake horsepower	bhp	effective horsepower developed by an engine or motor, as measured by a brake applied to its output shaft	
brake mean effective pressure	BMEP	that part of the effective pressure developed in a cylinder that would result in a cylinder output equal to the bhp of the engine	
brake on/off	BOO	indicates the position of the brake pedal	
brake rotor			brake disc
break-in, breaking-in, wearing-in		process of bedding-in the internal working surfaces of e.g. an engine by avoiding excess build-up of heat	running-in
bottom dead center	BDC	lowest point of piston travel in a reciprocating engine	
bypass air	BPA	mechanical control of throttle bypass air	
bumper guard			overrider
bushing		cylindrical plain bearing	bush

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
camshaft		a shaft on which phased cams are mounted. Usually used to regulate opening and closing of engine cylinder head valves	
Camshaft Position	CMP		
Camshaft Position Sensor	CMPS	indicates camshaft position	CID sensor, Hall sensor
canister		device designed to hold dry material, e.g. evaporative emission canister	
Canister Purge	CANP	controls purging of the EVAP canister	
Carbon Dioxide	CO_2	colorless gas with a density of approximately 1.5 times that of air	
Carbon Monoxide	CO	poisonous gas produced as the result of incomplete combustion	
Case Ground	CSEGND	Control module casing ground	
camber		inclination of the plane of a wheel to the vertical plane of the vehicle. May be negative or positive. Also convex curvature across road surface	
Canadian Motor Vehicle Safety Standard	CMVSS		
caster		trail built in to the geometry of a steered roadwheel to give it a caster – self-steering – effect	caster, castor
Catalytic Converter		in-line exhaust system device used to reduce the level of engine exhaust emissions	
Celsius	C	SI term for the Centigrade scale, with freezing point at zero and boiling point at 100°	
center			centre
centimeters	cm		centimetres
charge current		current developed by the generator	charging current
Closed Loop	CL		
Closed Loop System	CLS	control system with one or more feedback loops	
Clutch		device which uses mechanical, magnetic or friction type connections to facilitate engaging or disengaging two shafts or rotating members	
clutch disc, clutch disk		friction disc of a clutch assembly	clutch plate, centre plate, driven plate
clutch throwout bearing		bearing mounted on clutch throw-out fork, which depresses the pressure plate's diaphragm spring to release the clutch disc	clutch release bearing
color			colour
column/mirror control module	C/M CM		
connecting rod bearing		bearing (usually split, plain) at the lower end of the connecting rod where it connects with the crankshaft	big end bearing

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GLOSSARY OF TERMS

Term(s)	Abbreviation (*if* applicable)	Definition	rev used term(s) (or English Equivalent)
Control		a means or device to direct and regulate a process or guide the operation of a machine, apparatus or system	
Control Module	CM	a self-contained group of electrical/electronic components, designed as a single replaceable unit, and controlling one or more processes as above	
convertible top		flexible, usually fabric, roof of an open (convertible) vehicle	hood, convertible hood
countershaft		shaft, carrying pinions, running parallel to the mainshaft in a transmission unit	layshaft
		split pin which is used as a locking device for a castellated nut, etc.	split pin, cotter pin
Crankshaft Position	CKP		
Crankshaft Position Sensor	CKPS	generates crankshaft position information in conjunction with the CKPTR (also generates speed information in certain applications)	
Crankshaft Position Timing Ring	CKPTR	toothed ring which triggers the CKPS	
Crankcase Ventilation System	CV	system which scavenges camshaft cover and crankcase emissions and feeds them into the inlet manifold.	
cubic centimeters	cm^3		cubic centimetres
curb weight		weight of vehicle with fuel, lubricants and coolant, but excluding driver, passengers or payload	kerb weight
cylinder sleeve, sleeve		thin-walled, hard metal cylinder inserted into the cylinder block of an engine, and in which the piston runs	cylinder liner

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
downshift			change down
draft			draught
drivability			driveability
driveshaft		longitudinal shaft transmitting power from transmission output to rear axle differential	propeller shaft
driveshaft tunnel		tunnel in floor above the driveshaft (to accommodate shaft)	transmission tunnel
dry sleeve		cylinder sleeve which is not in contact with coolant	dry liner
Dual Overhead Cam	DOHC	engine configuration with two camshafts mounted above the valves	
Data		*(US)* a set or group of facts.	(English) Group of facts (i.e. plural of *datum*)
Data Link Connector	DLC	connector providing access and/or control of the vehicle information, operating conditions, and diagnostic	
Data Output Line	DOL	circuit that sends certain information from the PCM to the instrument cluster	
defogger, backlight defogger			HRW, rear screen heater, demister
degree (angle or temperature)	deg, ^{o}		
Department of Transportation (US)	DOT		
Department of Transport (UK)	DTp		
Deutsche Institut fur Normuna	DIN	German Standards regulation body	
diameter	dia		
Diagnostic Module	DM	Supplemental Restraint System (non-controlling) module for diagnostics overview	
Diagnostic Test Mode	DTM	a level of capability in an OBD system. May include different functional states to observe signals, a base level to read DTCs, a monitor level which includes information on signal levels, bi-directional control with on/off board aids, and the ability to interface with remote diagnosis	Self Test Mode
Diagnostic Trouble Code	DTC	an alpha/numeric identifier for a fault condition identified by the On-Board Diagnostic (OBD) system	Self Test Code. Fuel Fail code
differential housing		rotating housing (in a bevel differential) attached to the crownwheel, carrying the final drive pinions	differential cage
differential pressure		pressure difference between two regions e.g. between intake manifold and atmospheric pressures	
Differential Pressure Feedback EGR	DPFE	an EGR system that monitors differential EGR pressure across a remote orifice to control EGR flow	
dimmer switch			dip switch, dipper switch

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
direct current	dc	current which flows in one direction only, though it may have appreciable pulsations in its magnitude	
disk, disc			disc
Distributor Ignition	DI		distributor
Distributor Ignition Cap	DIC		distributor cap
Distributor Ignition Carbon Brush	DICB		distributor carbon brush
Distributor Ignition Leads	DIL		distributor leads
Distributor Ignition Rotor Arm	DIRA		distributor rotor arm

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
E			
Exhaust Gas Recirculation	EGR	System which reduces NOx emissions by adding exhaust gases to the incoming fuel/air charge	EGR
EGR Temperature EGRT Sensor	EGRT	Sensing EGR function based on temperature change.	
EGR Vacuum Regulator	EVR	controls EGR flow by changing vacuum to the EGR valve	
EGR Valve Position	EVP	an EGR system that directly monitors EGR valve position to control EGR flow	
Electrical Diagnostic Manual	EDM	Manual which deals with the diagnosis of electrical faults (see also Vehicle Service Manual and Unit Service Manual)	
Electrically Erasable Programmable Read–Only memory	EEPROM		EEPROM, E2PROM
Electrically Programmable Read–only memory	EPROM		EPROM
Electronic Engine Control	EEC	a system that provides electronic control of engine electronics	
Electronic Secondary Air Injection	EAIR	a pump–driven system for providing secondary air using an electric air pump	
Engine Control Module	ECM		ECU
Engine Coolant Level	ECL		engine coolant level indicator
Engine Coolant Temperature	ECT		
ECT Sensor	ECTS	thermistor which provides engine coolant temperature signal to the PCME to trigger enrichment circuits which increase injector 'on' time for cold start and warm–up	Coolant temp. sensor, ECT
Engine Speed	RPM		rev/min, RPM
Engine Speed Sensor		sensor fitted on flywheel of V12 engine; provides engine speed information	
Environmental Protection Agency	EPA		
Evaporative Emission	EVAP	system to prevent fuel from escaping the Typ includes a charcoal filled canister to absorb fuel vapor	
Evaporative Emission Control Valve	EVAPP		purge valve
Exhaust Gas Recirculation Solenoid Vacuum Valve	EGRS		EGR solenoid valve
Exhaust Gas Recirculation Temperature Sensor	EGRT Sensor		EGR temperature sensor
Exhaust Gas Recirculation Valve	EGRV		
Extreme Pressure	EP	additives to drive axle lubricants. Designed to protect the spiral bevel gears from wear induced by their sliding/rolling action	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
F			
Fan Control	FC	engine cooling fan control	
Fascia			fascia, facia
farad	F	SI unit of electrostatic capacitance; more usually subdivided to microfarad	
Federal Motor Vehicle Safety Standard (US)	FMVSS		
fender			wing, (also tonneau)
fiber			fibre
Figure (illustration)	Fig.		
firewall			bulkhead, dash panel
Flash Electrically Erasable Programmable Read-only Memory	FEEPROM		
Flash Erasable Programmable Read-only Memory	FEPROM		
Flywheel Sensor	CKFS	sensor mounted so as to be triggered by each flywheel ring gear tooth to give an engine speed signal	flywheel sensor
fueling			fuelling
Fuel Injectors	FI	solenoid operated devices that spray a metered quantity of fuel into the inlet ports	fuel injectors, injectors
Fuel Pressure Regulator Control	FPRC	controls fuel pressure regulator; used primarily to give extra fuel at cold start-up	
Fuel Pump	FP		
Fuel Pump Monitor	FPM	monitors operation of fuel pump	
Fuel Pump Relay	FPR		
fuel rich/lean		qualitative evaluation of air/fuel ratio based on a ratio known as stoichiometry, or 14.7:1 (Lambda)	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
gauge (gage also used, but not preferred)			gauge
gasoline			petrol, petroleum spirit
gas tank			petrol tank, fuel tank
gear cluster			layshaft
gearshift (lever), shift lever			gear lever
generator	GEN	rotating machine which converts mechanical energy into electrical energy	alternator
Gramme centimeter	gcm		
Grammes (force)	gf		
Grammes (mass)	g		
ground	GND	electrical conductor used as a common return for an electrical circuit or circuits, and with a relative zero potential	earth

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
H			
Hall Effect		process where current is passed through a small slice of semi-conductor material at the same time as a magnetic field. Produces a small voltage in the semi-conductor	
hard fault		a fault currently present in the system	
headlamp	HL		
Heated Oxygen Sensor	HO2S	electrically heated oxygen sensor which induces fueling corrections.	Lambda sensor, HEGO, HOS
heavy duty	HD		
Hertz (frequency)	Hz	frequency, one cycle per second	
High Mounted Stoplamp	HMSL		
high tension (electrical)	ht		
hood			bonnet
hose clamp			hose clip
hour	hour		h, hr
hydrocarbon	HC		
hydroplaning			aquaplaning

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
I			
Idle Air Control	IAC	electrical control of throttle bypass air	
Idle Air Control Valve	IACV	stepper motor driven device which varies the volume of air by-passing the throttle to maintain the programmed idle speed	idle speed control actuator, idle air bypass control, idle speec control valve
ignition amplifier	IA	device which amplifies the ignition system output	
ignition ground	IGN GND		
Inertia Fuel Shut–off	IFS	an inertia system that shuts off the fuel supply when activated by pre-determined force limits brought about by (e.g.) collision	
Inertia Fuel Shut–off Switch	IFSS	shuts down fuel and ignition systems in the event of a vehicle impact	inertia switch
intake			inlet
Intake Air		air drawn through a cleaner and distributed to each cylinder for use in combustion	
Intake Air Temperature	IAT	temperature of intake air	
Intake Air Temperature Sensor	IATS	device used to measure IAT	ACT, air temperature sensor, MAT: ATSD, VAT, TBT
Intake Air Temperature Sensor Ignition	IATSI	thermistor which signals the ECM to retard the ignition timing in response to high inlet air temperatures	
Intake Air Temperature Sensor Injection	IATSF	thermistor which inputs air density information to the ECM	
internal diameter	i.dia		
International Standards Organization	ISO		
interrupter			interruptor
J			

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
K			
kilogrammes (mass)	kg		
kilogrammes (force)	kgf		
kilogrammes force per square centimeter	kgf/cm^2		
kilometers	km		kilometres
kilometers per hour	km/h		km/h, kph
kilopascals	kPa		
kilovolt	kV		
knock		the sharp metallic produced sound when two pressure fronts collide in a combustion chamber (see also *ping*)	
knock sensor	KS	sensor which detects the onset of detonation and signals the ECM to retard the ignition	
L			
lash		free play, end-float	play
left-hand	LH		
left-hand drive vehicle	LHD		
left-hand thread	LH Thd		
levelina			levelling
license			licence
license plate			registration plate, number plate
liquid crystal display	LCD	optical digital display system, applied voltage to which varies the way the crystals reflect light, thereby modifvina the display	
Liter	L		Litre
louver			louvre
lowered beam			dipped beam
low tension	lt	primary circuit of the ignition system, linking the battery to the primary winding in the ignition coil	
lug nut			wheel nut

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
M			
Malfunction Indicator Lamp	MIL	a required on-board indicator to alert the driver of an emission related malfunction	fuelling failure
Manifold Absolute Pressure	MAP	absolute pressure of the intake manifold air	
Manifold Absolute Pressure Sensor	MAPS	sensor located in the PCM and ported to the intake manifold	
Manifold Surface Temperature	MST		
manual transmission, transmission	M/T	transmission which is manually, externally controlled	gearbox
Mass Air Flow	MAF	system which provides information on the mass flow rate of the intake air to the engine	
Mass Air Flow Sensor	MAFS	hot-wire sensor which monitors air flow into the intake manifold for fueling and ignition control	air flow meter
maximum	max.		
metal inert gas	MIG	electric welding system in which a stream of inert gas shields the electrode, preventing oxidation	
meters (measurement)	m		metres
metric (screw thread, e.g. M8)	M		
Microfarad	MFD	unit of electrical capacitance, one millionth of a farad	
millimeters	mm		
millimeters of mercury	mmHg		
minimum	min.		
minute	minute		min.
Model Year	MY		
Module	M	self contained group of electrical/electronic components which is designed as a single replaceable unit	
mold			mould
Motorized In-Car Aspirator	MIA	device which constantly samples cabin temperature by passing air over a sensor, and communicates with the A/CCM to modify A/C system performance to suit	motorized aspirator
muffler		device which causes exhaust gas flow to expand and thereby reduce its pressure and hence its noise	silencer
multiport fuel injection	MFI		

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
N			
National Institute of Occupational Safety & Health (US)	NIOSH		
Newton	N	SI unit of force. 1 N = 0.2248 pounds force	
Newton meters	Nm	SI unit of torque. Must not be confused with nm (nanometer)	
Nitrous Oxides	NOx	compounds of nitrogen and oxygen formed at high temperatures. Major source of exhaust-gas air-pollution	
Non-Volatile Random Access Memory	NVRAM	RAM which retains memory even if power supply is interrupted	
normally aspirated		fueling system using intake air at atmospheric pressure; not supercharged or turbocharged	
Normally Closed	NC		
Normally Open	NO		
North American Specification	NAS	vehicles for sale in the USA and Canadian markets	
number	No.		
O			
octane number		measure of the anti-knock properties of a fuel	
Occupational Safety & Health Administration (US)	OSHA		
odometer		instrument which records the total mileage covered by a vehicle	mileometer
oil gauge, oil gage			dipstick
oil pan			sump, oil sump
oil passage			oilway
On-Board Diagnostic	OBD	a system that monitors some or all computer input and output control signals. Signal(s) outside the pre-determined limits imply a fault in the system or a related system	
open circuit		a circuit which does not provide a complete path for flow of current	
oriainal equipment manufacturer	OEM		
outside diameter	o. dia		
overhead camshaft	OHC	engine configuration with single camshaft positioned above the valves	
Oxidation Catalytic Converter	OC	catalytic converter system that reduces levels of HC and CO	cat, OC
oxides of nitrogen	NOx		
Oxygen Sensor	O2S	a sensor which detects oxygen content in the exhaust gases	EGO, 0 2 EOS, EGS, OS, EGOS, Lambda Sensor

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
P			
paragraph	para		
parking brake			handbrake
Park Neutral Position	PNP		
Park Neutral Position Switch	PNPS	indicates the selected non-drive modes of the (automatic) transmission	NDS, NGS, TSN, gearbox sensor
Dart number	part no.		
pin boss		boss in the piston wall (two per piston) which is bored to accept one end of the piston pin	piston pin boss
ping, pinging		metallic pinging sound caused by detonation in the combustion chamber, usually caused by incorrect grade of fuel (too low octane) or over-advanced ignition timing (see also knock)	pinking
piston pin (also wrist pin)		pin which connects the connecting rod to the piston, and permits articulation between the two.	gudgeon pin
power assisted steering	PAS		
power steering pressure	PSP	hydraulic pump-assisted steering system	Power steering
powertrain			
power assisted steering			
power steering pressure			
powertrain		the elements of a vehicle by which motive power is generated and transmitted to the driven axle	drive line
program		sequence of events to be performed by a control module/computer	programme, program
programable *or* Programmable			programmable
programed or programmed			programmed
programer *or* programmer			programmer
programing *or* programming			programming
Programmable Electronic Control Units System	PECUS	process whereby a common ECM is programmed on the production line to suit the market requirements of a particular vehicle	
Programmable Read-Only Memory	PROM	ROM with some provision for setting the stored data after manufacture	
Prussian blue			engineer's blue
pump		device used to raise, transfer, or compress fluids by suction, pressure or both	
purge cock			drain plug, drain tap

1

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
Q			
R			
Radio Data System	RDS	local traffic information service which automatically breaks in to whichever station is being received. Also programmable to lock onto the strongest available frequency for a given nationally available radio station, regardless of the geographical location of the receiver	
Random Access Memory	RAM	fast access memory store which is accessible for entry or extraction of data	
Read-Only Memory	ROM	fast access memory in which data is fixed and may not be entered or extracted	
rear wheel drive	RWD		
relay		an (usually) electro-mechanical device in which connections in one circuit are opened or closed by changes in another circuit	
relay module	RM	a module containing two or more relays	
reservoir	RES	container, usually for oils, coolants or hydraulic fluids	
return	RTN	a dedicated sensor ground circuit	
revolutions per minute	RPM	shaft-speed of a device, usually an engine or motor	
right-hand	RH		
right-hand drive vehicle	RHD		
rocker panel			door sill, sill
roof lining			head lining

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
3			
Scan Tool	ST	device that interfaces with and communicates information on a data link	
Seat Control Module	SCM	module controlling the seat motor systems (not electric raise/lower-only seats)	
Secondary Air		air provided to the exhaust system	
Secondary Air Injection	AIR	system used for a period of time each time the engine is started, unless certain temperature criteria are met. Pumps air directly into the exhaust system which generates extra heat and reduces the time taken for the catalytic converters to reach operating temperature	AIP, AI, Thermac, air injection system
Secondary Air Injection Bypass	AIRB	vents secondary air to atmosphere	
Secondary Air Injection Check Valve	AIRC	valve which prevents back-flow of exhaust gas to the AIR system when the system is inoperative	NRV, non-return valve
Secondary Air Injection Diverter	AIRD	diverts secondary air to either the catalyst or exhaust manifold	
Secondary Air Injection Magnetic Clutch	AIRPC	clutch mounted on the AIRP drive shaft	air pump clutch
Secondary Air Injection Pump	AIRP	mechanically driven rotary vane pump, driven through the AIRPC	AIP, air pump
Secondary Air Injection Relay	AIRR	controls the injection of air into the exhaust system	air injection relay
Secondary Air Injection Switching Valve	AIRS	vacuum operated valve backing-up the AIRC	air switching valve
Security & Locking Control Module	SLCM	module controlling the vehicle's security and closure-locking functions	
sedan		passenger car having two or four doors, and front and rear seats for driver and passengers	saloon
Sensor	S	generic name for a device that senses either the absolute value or a change in a physical quantity such as temperature, pressure or flow rate, and converts that change into an electrical auantitv sianal	
Service Bulletin	SB		
Service Manual	SM		
Service Manual Preliminary Information Bulletin	SMPIB	form of Service Bulletin specifically designed to enable the rapid issue of temporary pages for inclusion in the Service Manual	
Service Repair Operation (number)	SRO	Number generated by Jaguar Methods & Techniques system which relates to the time allowed to complete a repair operation. Further information on the system can be found in the separate Jaguar Publications (for each model range) entitled 'Repair Operation Times'.	

1

GLOSSARY OF TERMS

Term(s)	Abbreviation [if applicable)	Definition	Previously used term(s) (or English Equivalent)
shift fork		part of the shift mechanism of a manual transmission, mounted on the shift rail, and relaying movement in the shift lever to the sleeve coupling which moves gears in and out of engagement	selectorfork
shift rail		rail which carries the shift fork	selector rod
shift solenoid	SS	controls shifting in an automatic transmission	
short block		part engine, usually the cylinder block, crankshaft / connecting rod / piston assemblv. supplied as a reconditioned unit	short engine
short circuit		an undesirable connection between a (usually electrical) circuit and any other point	
slant engine		in-line engine which is mounted in the vehicle at an angle from the perpendicular, as AJ6	inclined engine
sliding roof			sun roof
sliding roof control module	SRCM		sun roof control module
signal return	SIG RTN		
snap ring			circlip
snubber		buffer block, usually of a rubber compound, which fits between the axle and the body unit, and absorbs any excess travel	bump stop
Society of Automotive Engineers	SAE		
solenoid		device consisting of an electrical coil which, when energized, produces a magnetic field in a plunger which is pulled to a central position. A solenoid may be used as an actuator in a valve or switch	
splash guard			mud flap
speed		the magnitude of velocity (regardless of direction)	
Speed Control Control Module	SCCM	Module controlling Speed Control System	Cruise Control Module (CCM)
square centimeters	cm^2		
stabilizer bar		torsion bar across the vehicle, connecting body and suspension	anti-roll bar
standard	std		
station wagon			estate car, shooting brake
stop lamp			brake lamp
sulfur, sulfuric			sulphur, -ic
supercharger	SC	an intake system which utilizes a supercharger (mechanically driven device that pressurizes intake air, thereby increasing density of charge air and the consequent power output from a given displacement)	
Supercharger Bypass	SCB		
Supplemental Restraint System	SRS	airbag restraint system for driver and front seat passenger	
supply port	SP	supply port of valve	

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
switch		device for making, breaking or changing the connections in an electrical circuit	
synchromesh	synchro	manual transmission mechanism consisting of a cone shaped clutch inside a coupling sleeve which ensures that the sleeve and the gear are turning at the same speed as they mesh	
system		group of interacting mechanical or electrical components serving a common purpose	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
T			
tachometer	TACH	a circuit that provides input for an electronic tachometer display	
Thermal Vacuum Valve	TVV	controls vacuum levels or routing based on temperatur	
Three-way Catalytic Converter	TWC	catalytic converter that reduces the levels of HC, CO & NOx	cat
Three-way + Oxidation Catalytic Converter	TWC + OC	catalyticconverter systemthat has both TWC and OC. Usually secondary air is introduced between the two catalysts	cat, dual bed
test		procedure whereby the performance of a product is measured under various conditions	
Throttle		a valve for regulating the supply of a fluid, r an to an engine	
Throttle Body	TB	the throttle	
Throttle Position	TP		
Throttle Position Sensor	TPS	interprets throttle position and movement to identify idle, acceleration and full-power demands	Throttle potentiometer, TPS, TP
throw-out bearing			clutch release bearing
throw-out fork			clutch release lever
tie-rod (steering)			track rod
timing		relationship between spark plug firing and piston position, usually expressed in crankshaft degrees BTDC or ATDC of the compression stroke	
tire			tyre
top dead center	TDC		
torque converter		device which, by its design, multiplies the torque in a fluid coupling between an engine and transmission	
Torque Converter Clutch	TCC		TCC, CCC, CCO, LUS, MLUS, MCCC
Transmission		device which selectively increases or decreases the ratio of relative rotation between its input and output shafts	
Transmission Control Module	TCM	controls the shifting pattern of the (automatic) transmission	transmission ECU
Transmission Control Switch	TCS	Modifies the operation of electronically controlled transmissions	
Transmission Oil Temperature	TOT	indicates temperature of transmission fluid	
Transmission Range	TR	the range in which the transmission is operating	
Transmission Speed Sensor	TSS	indicates rotational speed of transmission output shaft or turbine shaft	
tread		track between tire contact centers; not to be confused with tire contact tread pattern	track
trunk			boot, luggage compartment
turn indicator, turn signal lamp			direction indicator
two cycle		principle of engine which fires every second stroke of the piston	two stroke

GLOSSARY Of TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
U			
undercoating			underseal
unitized construction			unitary construction
Unit Service Manual	USM	Service Manual which pertains to a major 'unit' (e.g. transmission, engine) fitted to a Jaguar vehicle (see also Vehicle Service Manual and Electrical Diagnostic Manual)	
V			
valve		a device by which the flow of liquid, gas, vacuum or loose materials may be started, stopped or regulated by a movable part which opens, shuts or partially obstructs one or more passageways or ports. A 'Valve' is also the movable part of such a device	
valve lifter		in an OHC engine, the plunger fitted between valve stem and cam lobe	tappet, bucket
vapor			vapour
Vehicle Condition Monitor	VCM	instrument panel display which warns of faults	
Vehicle Emission Control Information Label	VECI Label		
Vehicle Service Manual	VSM	Service Manual which pertains to a specific family of Jaguar vehicles (see also Unit Service Manual and Electrical Diagnostic Manual).	
Vehicle Speed Sensor	VSS	sensor which provides vehicle speed information	road speed sensor
Vehicle Identification Number	VIN	number assigned to the vehicle by the manufacturer, primarily for licensing and identification purposes	
Viscosity Index	VI		
volatile		(1)vaporizing at room temperature (liquid) (2) not permanent (memory)	
Voltage Regulator	VR	device which regulates the variable output voltage of a generator	

1 GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
W			
Warm–up Oxidation Catalytic Converter	WU–OC	catalytic converter system designed to lower HC and CO emissions during the warm–up period. Usually located in or near the exhaust manifold	
Warm–up Three–way Catalytic Converter	WU–TWC	catalytic converter system designed to lower HC, CO and NOx emissions during the warm–up period. Usually located in or near the exhaust manifold	
watts	W	SI unit of power (1 hp = 745.7 watts)	
wet sleeve		thin walled hard metal cylinder supported at cylinder head and crankshaft ends; in contact with coolant	wet liner
wheelslip			wheelspin
Wide Open Throttle	WOT	full throttle position	
windshield			windscreen
wrist pin (also *piston pin)*		pin which connects the connecting rod to the piston, and permits articulation between the two.	gudgeon pin
XYZ			

2

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2.1 JACKINGAND LIFTING

2.1.1. Safety Precautions

The following safety precautions must be observed when raising the vehicle to perform service operations:

- Whenever possible use a ramp or a pit in preference to a jack, when working beneath a vehicle.
- Never rely on a jack to support a vehicle; use axle stands or blocks under the vehicle jacking points to provide rigid support.
- When working beneath a vehicle, chock the wheels in addition to applying the handbrake.
- Ensure that the vehicle is standing on firm, level ground before using the jack
- Check that any lifting equipment used has adequate capacity for the load being lifted and is in full working order.

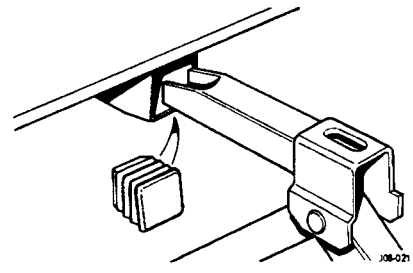


Fig. 1

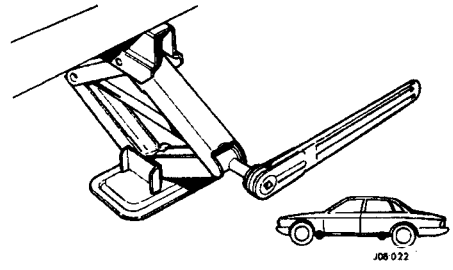


Fig. 2

2.1.2 Jacking Points

The jack provided in the vehicle toolkit engages with jacking points situated below the body side members, in front of the rear wheels (Fig. 1) and behind the front wheels (Fig. 2).

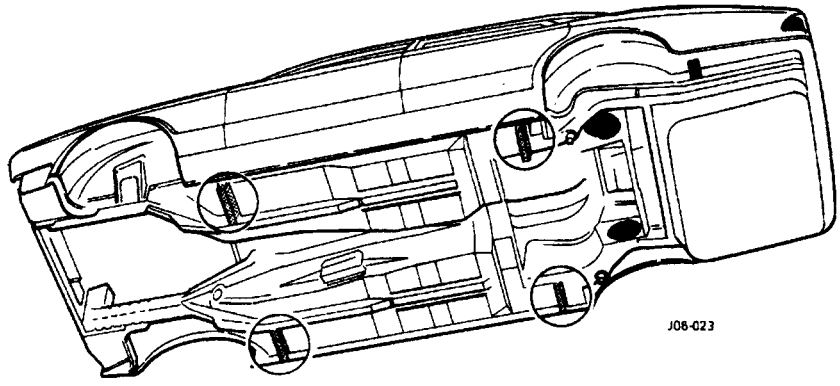


Fig. 3

2.1.3 Wheel–Free Lift

Use of a wheel–free lift is recommended for maintenance operations. Support the vehicle using lifting pads at the four jacking points (Fig. 3).

2

2.1.4 Workshop Jacks

2.1.4.1 Front – One Wheel

Position the jack under the lower spring support pan (Fig. 1), using a wooden block placed between the jack head and the spring support pan. Place an axle stand in position at the adjacent jacking point when the wheel has been raised.

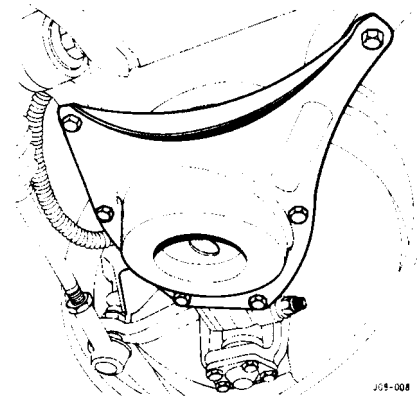


Fig. 1

2.1.4.2 Front – Both Wheels

Position the jack centrally under the front crossmember (Fig. 2), using a wooden block placed between the jack head and the crossmember. Place axle stands under both front jacking points when the vehicle has been raised.

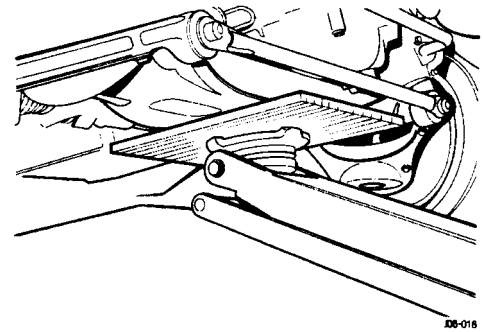


Fig. 2

2.1.4.3 Rear – Both Wheels

Place the jack centrally under the rear crossmember (Fig. 3), using a wooden block placed between the jack head and the crossmember. Place axle stands under both rear jacking points when the vehicle has been raised.

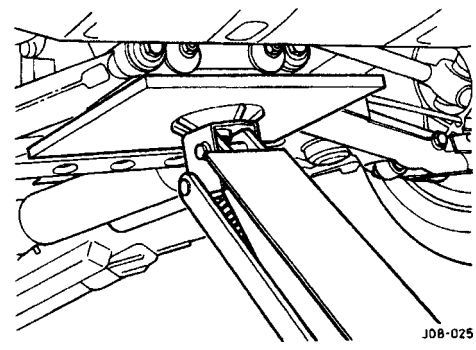


Fig. 3

2

2.2 VEHICLE RECOVERY

2.2.1 General

Note: Prior to vehicle recovery, always ensure the vehicle keys are available and the vehicle security system is 'OFF'.

The safest and preferred method of vehicle recovery is by flat bed transporter, although a rear suspended tow may also be used.

The front and rear towing eyes are provided for use only in an emergency to move the vehicle if it is causing an obstruction, on police instructions, or, when winching the vehicle onto a recovery transporter.

Note: A towing shackle cannot be fastened to the front towing eye until the grille vane has been removed. To do this, remove the (three) quarter-turn fasteners securing the grille vane (Fig. 1), and place the vane safely to one side. The towing shackle may now be secured to the towing eye.

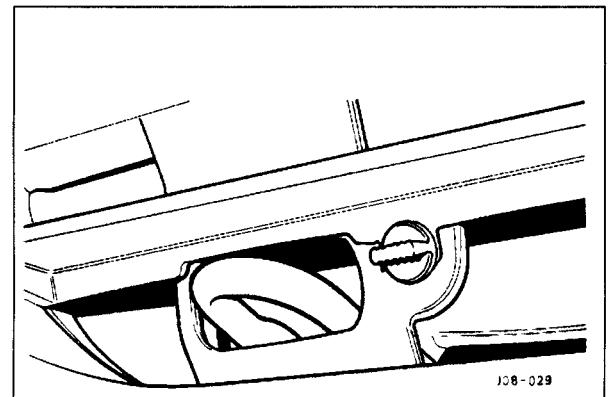


Fig. 1

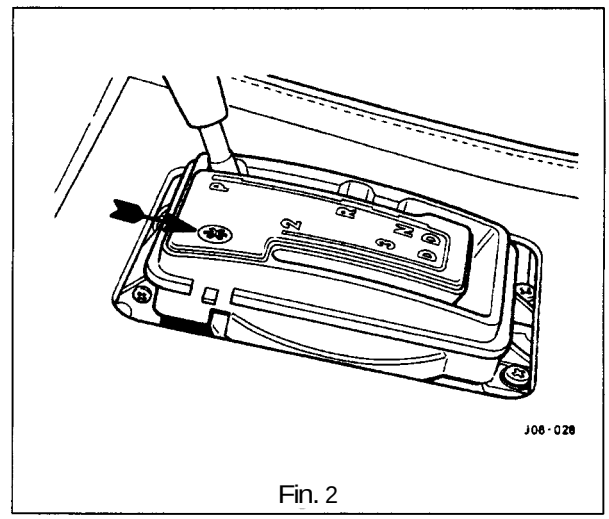
When the vehicle is being towed (see Towing Recovery), the gear lever must be set to neutral, 'N' (see Gear-shift Interlock) and the ignition key turned to position 'II' to release the steering lock and render the indicators, horn and brake lights operational.

2.2.2 Gear-shift Interlock

The gear selector lever may only be moved from the park 'P' position by turning the ignition key to position 'II' on the key switch and applying pressure to the footbrake pedal.
To remove the ignition key from the key switch, the gear selector lever must be moved to park 'P'.
With the key removed, the gear selector lever will be locked in park 'P'.

2.2.3 Gear-shift Interlock - Manual Override

In the event of electrical failure or when moving the vehicle without power, the gear selector lever can be manually unlocked from park 'P'.
Below the left-hand side of the 'J' gate (Fig. 2), is the gear-shift interlock manual release catch. With a flat bladed screwdriver, remove the plug, arrowed (Fig. 2). Insert ignition key and press down catch whilst simultaneously moving the gear-shift lever from 'P' position.



Fin. 2

Note: Gear-shift lever can only be moved approximately 25mm with the key still inserted.

Remove key and replace plug.

2

2.2.4 Transporting

If the vehicle is being transported on a trailer or flatbed transporter (Fig. 1), the handbrake must be applied, the wheels chocked and if fitted with an automatic transmission, the gear selector lever moved to neutral, 'N' (see Gear-shift Interlock).

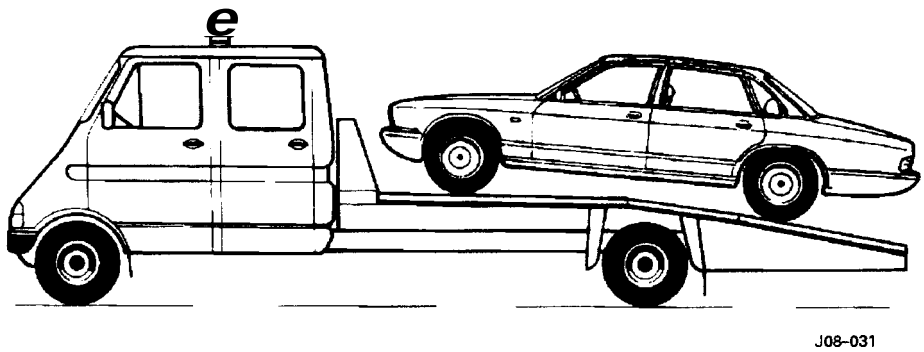


Fig. 1

CAUTION: Do not select 'P' because the parking lock mechanism may be damaged by the continuous slight forward and backward movement of the vehicle on the transporter.

There are four tie-down brackets on the vehicle underbody. Do not attach the tie down hooks of the transporter to the towing eyes of the vehicle.

2.2.5 Towing Recovery

Adhere to local regulations for the towing of vehicles. In certain countries the registration number of the towing vehicle and an 'ON TOW sign or warning triangle must be displayed in a prominent position at the rear of the vehicle which is being towed.

WARNING: WHEN THE ENGINE IS NOT RUNNING, THE STEERING AND BRAKES WILL NO LONGER BE POWER-ASSISTED. APPLICATIONS OF THE BRAKE PEDAL WILL GRADUALLY DEPRESSURIZE THE ACCUMULATOR. THEREFORE, BE PREPARED FOR HEAVY STEERING AND THE NEED FOR GREATLY INCREASED BRAKE PEDAL PRESSURE.

*The vehicle may be towed by another for a SHORT DISTANCE ONLY (maximum 0,8km / 0.5mile), with the gear lever in neutral (N) provided that a speed of 48 km / h (30 mile / h) is not exceeded.

2.2.6 Vehicles with Defective Automatic Transmission:

The vehicle must be towed with the rear wheels clear of the ground, see suspended towing.

2.2.7 Suspended Towing

CAUTION: Do not tow with sling–type equipment as damage to the bodywork may result. Do not front suspend tow vehides with automatic transmission.

2.2.8 Rear Suspended Tow

- **Remove the ignition key from the ignition/steering lock.**
- **Raise the vehicle using a lifting device with a cradle. This should be positioned under each rear wheel as indicated in Fig. 1.**

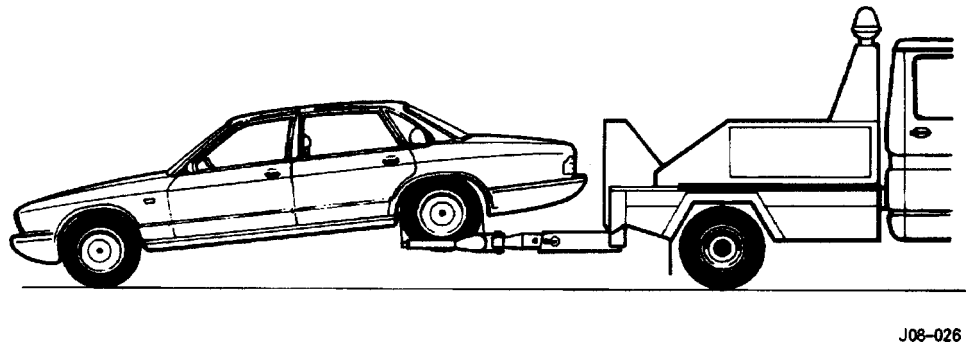


Fig. 1

3.1

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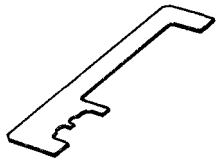
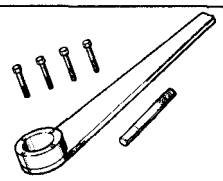
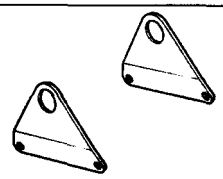
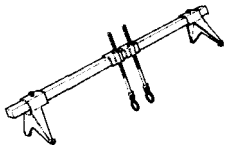
3.1.3	Engine Oil, Renew	12.60.00	3
3.1.4	Oil Filter Canister, Renew	12.60.04	3
3.1.5	Front Engine Mounting Bracket Assembly, Renew	12.45.01 LH 12.45.03 RH	4
3.1.6	Rear Engine Mounting Assembly, Renew	12.45.04	4

3.1

TOOLS & EQUIPMENT

Illustration	Jaguar Number	Description	Notes
	18G 1433	Camshaft timing tool	
	18G 1437	Front pulley lock	
	18G 1465	Engine lifting bracket	
	MS 53C	Engine support beam	
not illustrated	YA 992	'Snap–On' Oil filter canister removal tool	

II. TORQUE TIGHTENING SPECIFICATIONS

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Air duct hoses	2,5 - 3,5
Air duct lower to intercooler	2,5 - 3,5

Fixing	lightening Torque (Nm)
Supercharger (continued)	
Air duct upper casting to lower	2,5 - 3,5
Bypass valve disc to spindle	2.5 - 3,5
Bypass valve to throttle body	8,5 - 11,5
Elbow to intercooler	22 - 28
Idler bracket / timing cover to cylinder black	22 - 28
Idler bracket to water pump	22 - 28
Idler mounting bracket to thermostat housing	22 - 28
Intercooler water pipes	22 - 28
Outlet elbow to supercharger	22 - 28
Pulley to carrier	22 - 28
Supercharger mounting bracket to engine	43 - 57
Supercharger mounting stud	22 - 28
Supercharger to mounting bracket	43 - 57
Tensioner bracket / timing cover to cylinder block	22 - 28
Tensioner bracket to adapter	22 - 28
Throttle body adapter to bypass actuator	8,5 - 11,5

111. SERVICE MATERIALS

Description	Uses	Notes
Hylosil 102 sealant	Half moon seals to cylinder head	
	Oil pick-up strainer to transfer housing	
	Oil pump transfer housing to cylinder block	
	Rear seal housing to cylinder block	
	Thermostat housing to extension	
	Thermostat outer housing to inner housing	
	Timing cover blanking plate to timing cover	
	Timing cover to cylinder block	
Locktite 501 locking compound	Oil pump drive plate bolt	
	Oil pump front cover to body	
	Oil pump rear cover to body	
Tivoli Kay Adhesives No. 5696 sealant	Exhaust system joints	

3.1.1 ENGINE, GENERAL

The *3.2* / 4,0 liter normallv aspirated and the 4.0 liter supercharged engined vehicles are equipped with the AJ16 family of six cylinder in–line engines. The engines have a fully mapped engine management system with digital ignition and individual on–plug ignition coils.

This section describes the service procedures to be carried out with the engine in situ. It also covers the renewal of the engine/ transmission unit.

For information relating to strip-down, inspection, fault diagnosis, renovation and rebuild work, refer to the AJ16 Engine Service Manual.

3.1.2 ENGINE / TRANSMISSION UNIT, RENEW

SRO 12.41.02 / 20

The engine / transmission unit on the AJ 16 normally aspirated and supercharged engined vehicles are fitted on to three engine mounting/bracket assemblies. The two front engine mountings for the 3.2/4.0 liter normally aspirated and the 4.0 liter supercharged engined vehicles are identical. They are fitted to the front crossmember on either side of the engine bay. Rubber to metal engine/transmission rear mounts used for both engine types, are secured to a support bracket which traverses the two body underframe longitudinal members. For access to remove the engine carry out the following procedures:

WARNING: WHEN WORKING WITHIN THE ENGINE COMPARTMENT, KEEP CLEAR OF THE RADIATOR COOLING FANS AS THEY COULD START WITHOUT WARNING EVEN IF THE ENGINE IS NOT RUNNING.

- Remove the hood, see SRO 76.16.01, section 13
- Remove the air cleaner assembly.
- Depressurize the fuel system, see SRO 19.50.02, section 5.1.
- Disconnect the battery.
- In line with the relevant SRO's and sections, remove all appropriate obstructing parts, including their fixing and mounting arrangements.
- Disconnect all mechanical and isolate all electrical linkages leading to and from the engine.
- De-gas the airconditioning system, see section 14, Charge Recovery (System depressurization).

CAUTION: Do not vent refrigerant directly to the atmosphere and always use Jaguar approved recovery/recycle/recharge equipment.

- Drain the engine oil, see 3.1.3 this section.
- Drain the coolant, see SRO 26.10.01, section 4.1.

WARNING: DO NOT REMOVE THE HEADER TANK PRESSURE CAP WHILE THE ENGINE IS HOT. IF THE CAP MUST BE REMOVED, PROTECT THE HANDS AGAINST ESCAPING STEAM AND SLOWLY TURN THE CAP ANTI-CLOCKWISE UNTIL THE EXCESS PRESSURE CAN ESCAPE. LEAVE THE CAP IN THIS POSITION UNTIL ALL STEAM AND PRESSURE HAS ESCAPED AND THEN REMOVE THE CAP COMPLETELY.

Before lifting the complete engine / transmission unit with an engine hoist from the engine bay, ensure that two engine lifting brackets (tool 18G. 1465) are secured equally spaced to the inlet manifold studs. The engine lifting brackets should be positioned towards the front and the rear of the assembly. Ensure the front of the vehicle is jacked up securely on stands when removing the assembly.

3.1.3 ENGINE OIL, RENEW

SRO 12.60.00

- Undo and remove the sump plug positioned at the rear of the sump, drain the engine oil into a suitable receptacle and dispose of it in a safe and environmentally friendly manner.
- Replenish the engine oil, to the correct level on the dip-stick (see Fig. 1).
- When the oil is renewed, start the engine, wait for the oil light to extinguish and switch off the engine for 30 seconds.
- Finally remove and wipe clean the dip stick,
- check the oil level – replenish if necessary.
- For recommended engine oil refer to Appendix A1.

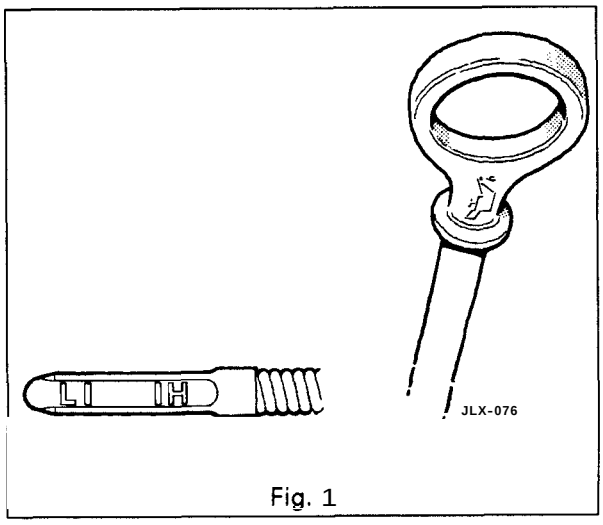

Fig. 1

3.1.4 OIL FILTER CARTRIDGE, RENEW

SRO 12.60.04

The white oil filter cartridge displaying the Jaguar logo, is located on the left–hand side of the engine below the throttle assembly (Fig. 2).

When refitting, tighten the oil filter cartridge using hand pressure only.

On no account use an oil filter strap designed for the removal of cartridges.

Note: The normal tightening torque of the oil filter is a 3/8 to 1/2 turn after initial contact.

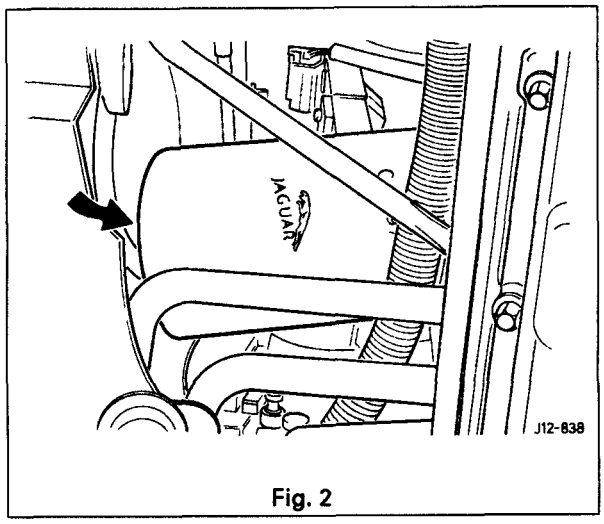

Fig. 2

3.1

3.1.5 FRONT ENGINE MOUNTING BRACKETASSEMBLY, RENEW

SRO 12.45.01 LH

SRO 12.45.03 RH

Each of the two engine mounting bracket assemblies comprises a mounting rubber (1 Fig. 1) with an insulator (2 Fig. 1) clamped between two brackets (3&4 Fig. 1).

The front of the engine complete with attached mounting bracket assemblies is seated on support brackets welded to the front crossmember and is secured to the brackets by a single fixing arrangement comprising nuts, bolts and washers.

- Jack up the vehicle and secure the engine hoist (Service Tool MS53 C) to lifting eyes of the front engine lifting brackets.
- Remove the front engine mounting bracket assembly to front crossmember fixing screws. These can be accessed via two round openings positioned underneath the crossmember.
- Remove any obstructing parts preventing the front end of the engine from being lifted from its seating.
- Lift the front end of the engine / transmission unit slightly and detach the front mounting bracket assemblies from the lower engine housing.

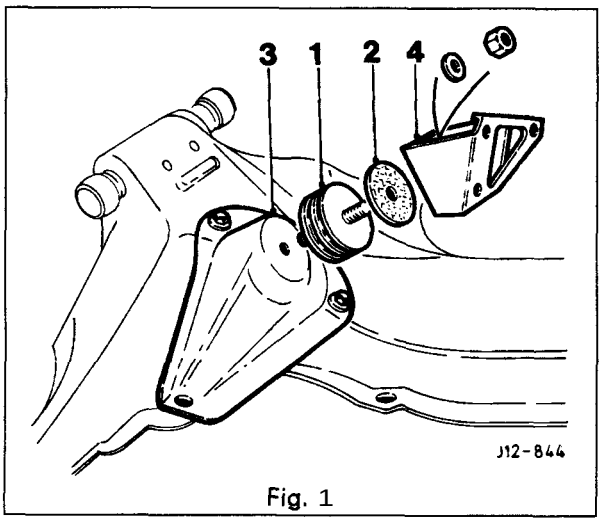

Fig. 1

3.1.6 REAR ENGINE MOUNTING ASSEMBLY RENEW

SRO 12.45.04

The rear engine mounting assembly comprises a rubber to metal engine/transmission rear mount (1 Fig. 2) secured to a support bracket (2 Fig. 2) by a single fixing arrangement.

- With the aid of the engine hoist (Service Tool MS53 C) secured to the lifting eyes of the rear engine lifting brackets, and a jack positioned under the rear mounting bracket, take the weight of the engine.
- Undo and remove the fixing arrangement securing the rear engine mounting bracket assembly.
- Lower the jack and remove assembly.
- Dismantle the assembly, clean all components and examine for any signs of wear or damage.

Renew components as necessary.

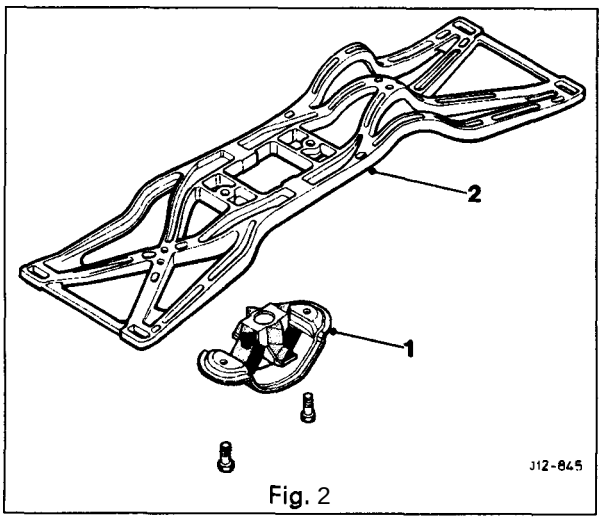

Fig. 2

3.2

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3.2.2	Engine/ Transmission Unit, Renew.	12.37. 01/90	2
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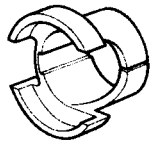
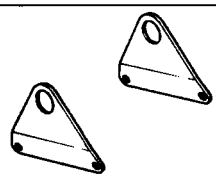
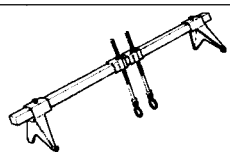
3.2.4	Oil Filter Canister, Renew	12.60.04	3
3.2.5	Oil Cooler	12.60.68	4
3.2.6	Front Engine Mounting Bracket Assembly, Renew	12.45.01 LH 12.45.03 RH	4
3.1.7	Rear Engine Mounting Assembly, Renew	12.45.08	5

3.2

I. SERVICE TOOLS & EQUIPMENT

Illustration	Jaguar Number	Description	Notes
	JD 183	Quick–fit pipe disconnecting tool	
	18G 1465	Engine lifting bracket	
	MS 53C	Engine support beam	
not illustrated	YA 992	'Snap–On' Oil filter canister removal tool	

II. TORQUE TIGHTENING SPECIFICATIONS

Fixing	lightening Torque (Nm)
Oil cooler to body	17–23
Oil cooler hose clamp to radiator cradle	7–10
Oil cooler pipes to engine	17–23
Heat shield to hydraulic mount	4–5
Hose clamp – hose to air cleaner and induction elbow	3–4

III. SERVICE MATERIALS

Description	Uses	Notes
Hylosil 102 sealant	Filler cap 'Oring	
Vaseline or Silicon 5000	Top of oil filler tube	
Tivoli Kay Adhesives No. 5696 sealant	Exhaust system joints	

3.2.1 ENGINE, GENERAL

The twelve cylinder, vee formation engine has a capacity of 6.0 liters. Each cylinder bank has a single overhead camshaft and two valves per cylinder. The engine has a fully mapped engine management system with digital ignition and two ignition coils.

This section describes the service procedures to be carried out with the engine in situ. It also covers the renewal of the engine / transmission unit.

For information relating to strip–down, inspection, fault diagnosis, renovation and rebuild work, refer to the V12 Engine Service Manual.

3.2.2 ENGINE - GEARBOX/ TRANSMISSIONASSEMBLY, RENEW

SRO 12.37.01/90

The engine /transmission unit on the **V12 6.0** liter model is mounted on three engine mounting/ bracket assemblies fitted to the front crossmember on either side of the engine bay. The engine/ transmission rear mount is a mounting bracket and spring assembly fitted and secured to body underframe longitudinal members. For access to remove the engine carry out the following procedures:

WARNING: WHEN WORKING WITHIN THE ENGINE COMPARTMENT, KEEP CLEAR OF THE RADIATOR COOLING FANS AS THEY COULD START WITHOUT WARNING, EVEN IF THE ENGINE IS NOT RUNNING.

- Remove the hood, see SRO **76.16.01,** section **13.**
- Remove the **two** air cleaner assemblies, see SRO's **19.10.01 & 19.10.02.**
- Remove the engine cover, see SRO **12.29.93 (V12** Engine Service Manual).
- Depressurize the fuel system, see SRO **19.50.02,** section **5.1.**
- Disconnect the battery.
- In line with the relevant SRO's and sections, remove all appropriate obstructing parts, including their fixing and mounting arrangements.
- Disconnect all mechanical and isolate all electrical linkages leading to and from the engine.
- De-gas the air conditioning system, see section **14,** Charge Recovery (System depressurization).

CAUTION: Do not vent refrigerant directly to the atmosphere and always use Jaguar approved recovery/recycle/re-charge equipment.

- Drain the engine oil, see **3.2.3** this section.
- Drain the coolant, see SRO **26.10.01,** section **4.1.**

WARNING: DO NOT REMOVE THE HEADER TANK PRESSURE CAP WHILE THE ENGINE IS HOT. IF THE CAP MUST BE REMOVED, PROTECT THE HANDS AGAINST ESCAPING STEAM AND SLOWLY TURN THE CAP ANTI-CLOCKWISE UNTIL THE EXCESS PRESSURE CAN ESCAPE. LEAVE THE CAP IN THIS POSITION UNTIL ALL STEAM AND PRESSURE HAS ESCAPED AND THEN REMOVE THE CAP COMPLETELY.

Before lifting the complete engine / transmission unit with an engine hoist from the engine bay, ensure that **two** engine lifting brackets (tool **18G. 1465)** are secured equally spaced to the inlet manifold studs. The four engine lifting brackets should be positioned towards the front and the rear of the assembly. Ensure the front of the vehicle is jacked up securely on stands when removing the assembly.

3.2.3 ENGINE OIL, RENEW

SRO 12.60.00

- Undo and remove the sump plug positioned at the rear of the sump, drain the engine oil into a suitable receptacle and dispose of it in a safe and environmentally friendly manner.
- Replenish the engine oil to the correct level (1 Fig. 1) on the dipstick.

Note: If the 'O' ring on the on the filler cap is damaged, remove the 'O' ring and clean the groove. Secure a new 'O' ring in position using silicon sealant. Treat the screw threads with copper grease, and grease the top face of the oil filler with Hylosil lubricant.

- When the oil is renewed, start the engine, wait for the oil light to extinguish and switch off the engine for *30* seconds.
- Finally remove and wipe clean the dip stick
- (Fig. 1), check the oil level – replenish as necessary.

For recommended engine oil refer to Appendix AI.

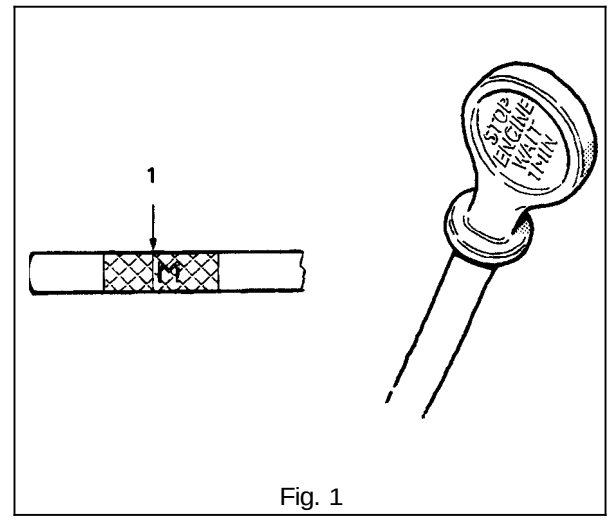


Fig. 1

3.2.4 OIL FILTER CARTRIDGE, RENEW

SRO 12.60.04

The white oil filter cartridge displaying the Jaguar logo, is located on the lower left-hand side of the engine, near side of the sump. Access for removing the cartridge is from underneath the vehicle (Fig. 2).

Remove the catalyst heat shield (where fitted) and use a coil spring type filter wrench to remove the cartridge.

Start and run the engine for a few seconds to charge the filter, then stop the engine and check the oil level. Replenish as necessary.

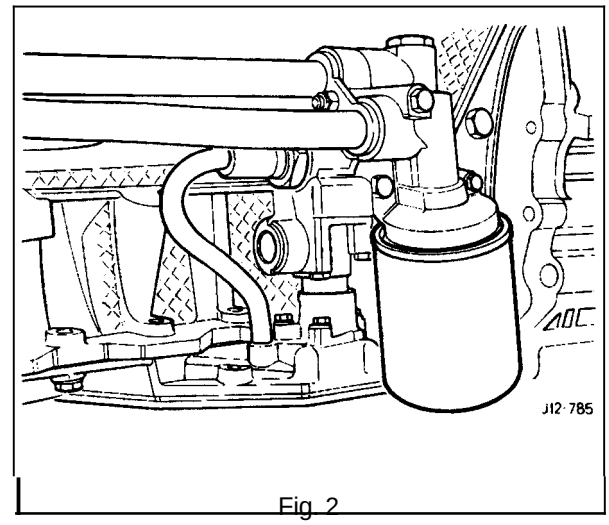


Fig. 2

3.2.5 OIL COOLER, RENEW

SRO 12.60.68

The oil cooler is located below the radiator, behind the front bumper and is fitted to the radiator lower mounting using two securing bolts. The cooler feed pipe comprising several sections and return pipe (Fig. 1) are connected to the oil cooler by means of easily detachable quick-fit connectors.

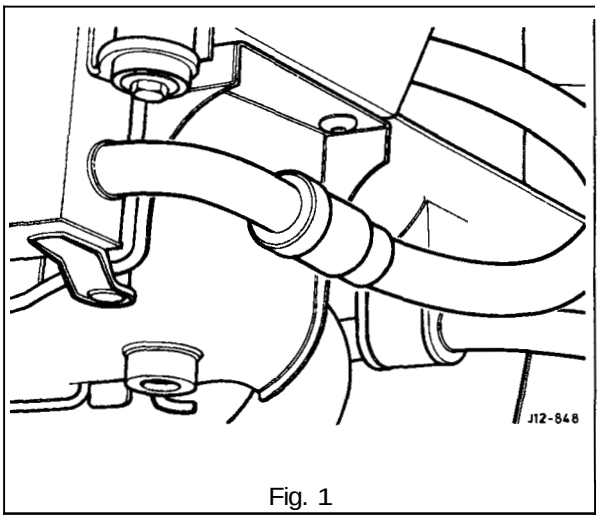


Fig. 1

3.2.6 FRONT ENGINE MOUNTING BRACKET ASSEMBLY, RENEW

SRO 12.45.01 LH

SRO 12.45.03 RH

Each of the two engine mounting bracket assemblies comprises a hydraulic mount (1) secured to an engine side mounting bracket (2) which in turn is bolted to the lower engine housing. The engine mounting heat shield (3) is fixed to the hydraulic mount studs (4), protruding through the centre hole of the engine side mounting bracket.

The front of the engine complete with attached mounting bracket assemblies is seated on support brackets welded to the front crossmember and is secured to the brackets by a single fixing arrangement comprising bolts and washers.

- Jack up the vehicle and secure the engine hoist (Service Tool MS53 C) to lifting eyes of the front engine lifting brackets
- Remove the front engine mounting bracket assembly to front crossmember fixing bolts. These can be accessed via two round openings positioned underneath the crossmember.
- Remove any obstructing parts preventing the front end of engine from being lifted from its seating.
- Lift the front end of the engine/transmission unit slightly and detach the front mounting bracket assemblies from the lower engine housing.

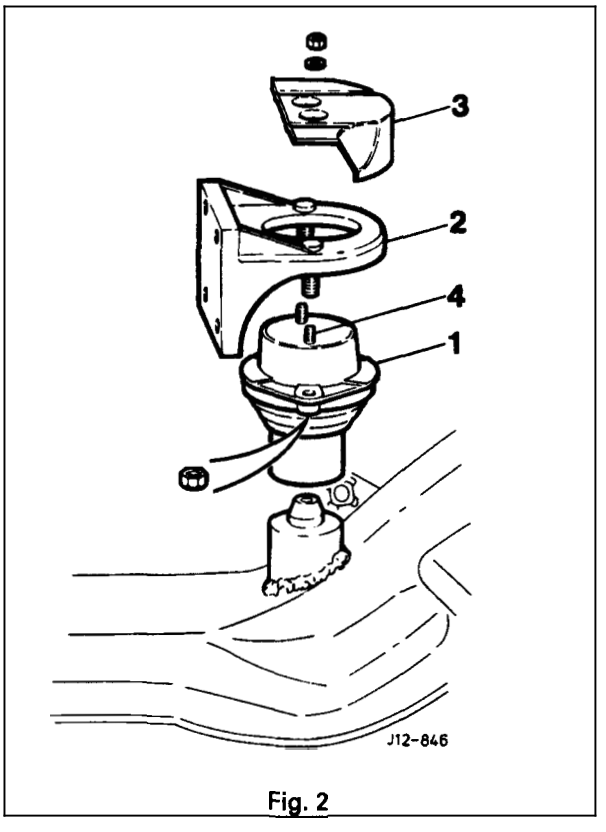


Fig. 2

3.2.7 REAR ENGINE MOUNTING ASSEMBLY, RENEW

SRO 12.45.04

The rear engine mounting assembly (Fig. 1) comprises a mounting bracket and spring assembly, secured to body underframe longitudinal members using nuts and washers.

- With the aid of the engine hoist (Service Tool MS53C) secured to the lifting eyes of the rear engine lifting brackets, and a jack positioned under the rear mounting bracket take the weight of the engine.
- Undo and remove the mounting bracket and spring assembly fixing arrangement.
- Lower the jack and remove assembly.
- Dismantle the assembly, clean all components and examine for any signs of wear or damage.
- Renew components as necessary.

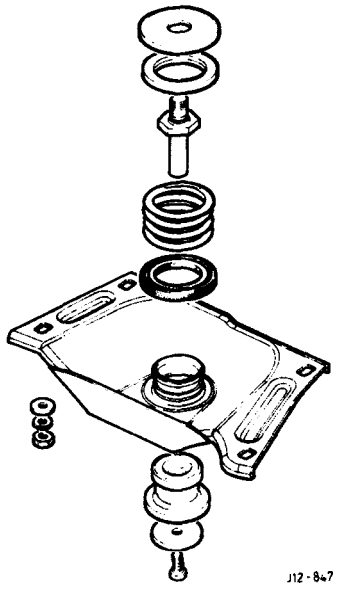


Fig. 1

SECTION CONTENTS

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4.1

1. SERVICE TOOLS & EQUIPMENT

No Jaguar service tools are required for working on the cooling system. Some normal workshop items will be required, including a pressure tester, hydrometer and thermometer.

Fixing	Tightening Torque (Nm)
Fan cowl assembly to radiator	8–9
Header tank bracket to body	7–10
Header tank to body	2,5–3,5
Hose clip, all except those shown below	2,5–3,5
Hose clip, bleed hose to radiator	1,5–2,5
Lower radiator cradle to body	7–10
Radiator drain plug	1,5–2,5
Radiator temperature switch	13–17
Supercharger pump mounting	7–10
Supercharger pump to instrumounts	5-7
Supercharger radiator to body	7–10
Top radiator panel to body	7–10

111. SERVICE MATERIALS

Description	Uses	Notes
To be issued		

IV. SERVICE DATA

Application	Specification
Engine thermostat temperature rating	88°C
Coolant header cap pressure rating	1,2 bar
Generator / water pump drive belt tension, new belt	Set to: (Burroughs method) 556 to 578 N; (Clavis method) 174 to 180 Hz. Run for one minute and allow belt to cool. Reset to: (Burroughs method) 511 to 534 N; (Clavis method) 167 to 173 Hz
Generator / water pump drive belt tension, service tension	Burroughs method: 511 to 534 N. Clavis method: 167 to 173 Hz
Generator / water pump drive belt tension measuring point	Mid–way between crankshaft and generator pulleys

4.1.1 COOLING SYSTEM DESCRIPTION

4.1.1.1 Major Components

- Main engine crossflow radiator, incorporating a concentric tube cooler for the power steering fluid mounted in the right-hand radiator side tank. Vehicles with automatic transmission have a transmission fluid cooler mounted in the left-hand radiator side tank; for 4,0 liter supercharged engines a six-plate cooler is fitted; other vehicles have a tube-type cooler. A double-action temperature switch, for controlling the radiator cooling fans, is mounted in the left-hand radiator side tank.
- Two electrically operated radiator cooling fans, mounted behind the main radiator.
- Coolant circulating pump, belt driven from the engine crankshaft.
- Coolant header tank with pressure relief cap and coolant level probe.
- Engine thermostat.

4.1

4.1.1.2 *Components for Climate Control System*

- Heater matrix.
- Electrically operated coolant circulating pump, mounted on the left-hand side of the engine bulkhead.
- Solenoid operated valve, located adjacent to the coolant circulating pump.

4.1.1.3 Components for Supercharged Engine

- Supercharger crossflow radiator, mounted in front of the main radiator. The supercharger radiator is reverse-circuited, i.e. the coolant inlet is at the bottom of the radiator.
- Electrically operated coolant circulating pump, located at the left-hand side of the main radiator.

4.1.1.4 Operation

The configuration of the cooling system for normally aspirated and supercharged (4,0 liter) engines is shown in Sub-section **4.1.2.**

The cooling system is pressurized, which allows the system to operate at a higher temperature without overheating. The header tank is fitted with a pressure relief cap to protect the system against overpressure.

Under cold start conditions, coolant is forced by the engine driven water pump through the cylinder block and cylinder head to the thermostat housing. The thermostat is closed to give rapid engine warm up, hence the coolant is returned directly to the water pump inlet. When normal engine operating temperature is reached, the thermostat opens and coolant is diverted through the radiator before returning to the water pump inlet. In vehicles fitted with a supercharger, coolant is circulated through the supercharger radiator and intercooler by the supercharger water pump. The supercharger cooling circuit uses the same coolant header tank as the main engine cooling system.

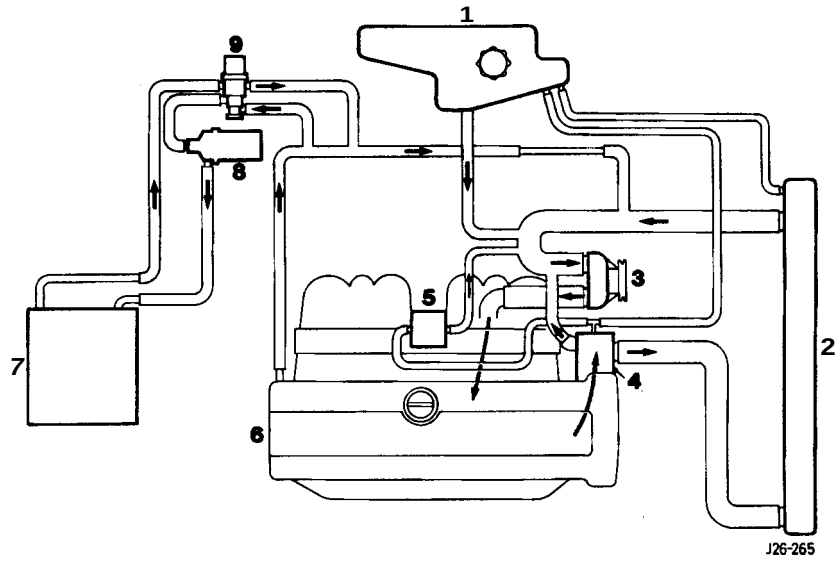
The radiator cooling fans operate in series and parallel under the control of the double-action radiator mounted temperature switch. The fans are also controlled by the climate control system on vehicles fitted with air conditioning. Under hot operating conditions, the fans may continue to operate after the engine has been switched off. The fans stop automatically when the coolant temperature has been reduced sufficiently.

The system also provides the coolant supply for the climate control system, which is described in Section **14.**

4.1

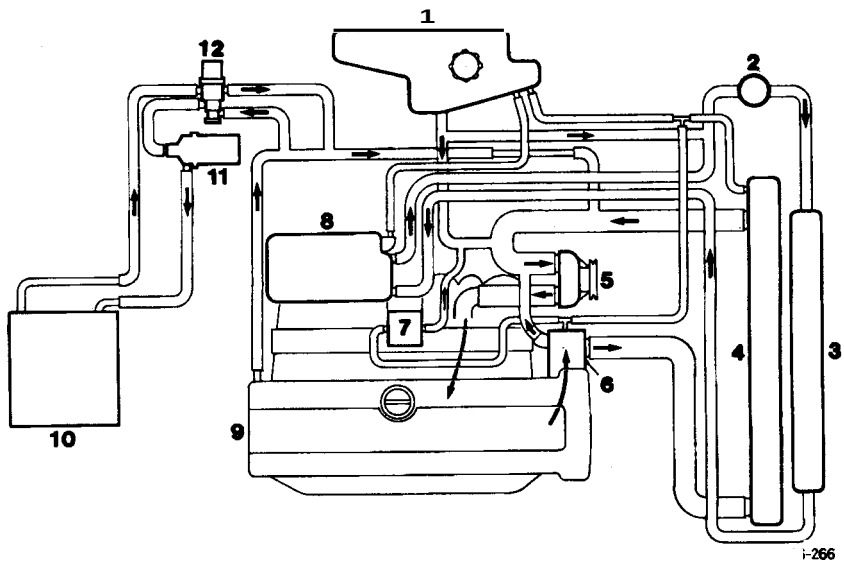
4.1.2 COOLING SYSTEM CONFIGURATION

The configuration of the cooling system for normally aspirated and supercharged engines is shown in Fig. 1 and Fig. 2. The main coolant flows, with the system at normal operating temperature (i.e. with the engine thermostat open), are indicated by arrows.



1. Header Tank
2. Radiator
3. Water Pump
4. Thermostat
5. Throttle Body
6. Engine
7. Heater
8. Heater Pump
9. Heater Valve

Fig. 1 Cooling System, Normally Aspirated Engine



1. Header Tank
2. Supercharger Pump
3. Supercharger Radiator
4. Main Radiator
5. Water Pump
6. Thermostat
7. Throttle Body
8. Intercooler
9. Engine
10. Heater
11. Heater Pump
12. Heater Valve

Fig. 2 Cooling System, Supercharged Engine

4.1.3 SERVICE PROCEDURES

4.1.3.1 Safety Precautions

The anti-freeze specified in Appendix AI must be used wherever possible. It is designed to afford the maximum corrosion protection to all metals found in the engine cooling system, as well as having the frost protection properties necessary during the winter months.

Should it not be available, then anti-freeze conforming to Ford Motor Company specification ESD-M97B49-A may be used. To provide optimum temperature and corrosion protection, the specified anti-freeze concentration must always be used.

Once coolant has been drained from the system, it must be discarded and not re-used. Anti-freeze is harmful to the environment. Used coolant must be disposed of safely and never poured down a drain connected to the public sewer.

CAUTION: Never fill or top-up the system with water only.

CAUTION: Anti-freeze is harmful to paintwork. Coolant spillages must be wiped up immediately and the affected area washed to remove all traces of coolant.

CAUTION: To prevent the possibility of damage to the heater circuit pump and supercharger pump (where fitted), the pumps should be electrically isolated if the ignition has to be turned ON while the cooling system is drained.

WARNING: DO NOT REMOVE THE HEADER TANK PRESSURE CAP WHILE THE ENGINE IS HOT. IF THE CAP MUST BE REMOVED, PROTECT THE HANDS AGAINST ESCAPING STEAM AND SLOWLY TURN THE CAP ANTI-CLOCKWISE UNTIL THE EXCESS PRESSURE CAN ESCAPE. LEAVE THE CAP IN THIS POSITION UNTIL ALL THE STEAM AND PRESSURE HAS ESCAPED AND THEN REMOVE THE CAP COMPLETELY.

WARNING: WHEN DRAINING THE COOLANT WITH THE ENGINE HOT, PROTECT THE HANDS AGAINST CONTACT WITH HOT COOLANT.

WARNING: WHEN WORKING WITHIN THE ENGINE COMPARTMENT, KEEP CLEAR OF THE RADIATOR COOLING FANS. THE FANS COULD START WITHOUT WARNING EVEN IF THE ENGINE IS NOT RUNNING.

4.1.3.2 Working Practices

When filling the system with coolant, ensure that the vehicle is standing on a level surface and that the coolant is poured in slowly so that airlocks are not introduced into the system. Airlocks can seriously affect the operation of the climate control system and can cause damage to the heater circuit pump (and supercharger circuit pump if fitted).

Hose clips should always be positioned so that there is proper access for tightening and that the clip does not foul or interfere with the operation of any components.

Drive belts must always be tensioned to the specified value and the tension checked at the correct point on the belt. This information is given in Subsection IV in the preliminary pages.

When tightening components, the torque figures given in Sub-section II in the preliminary pages should always be used for the fastenings listed.

4.1.3.3 Coolant Change

The coolant must be changed at intervals of four years. The system should be drained from the radiator drain plug, flushed and filled with fresh coolant. Flushing should be carried out thoroughly to remove all the old coolant from the engine and heater matrix. (The heater valve is open with the ignition OFF). After filling, check the coolant concentration with a hydrometer. For the specified anti-freeze and coolant concentration, see Appendix AI.

4.1.4 DRAIN AND FILL PROCEDURES

4.1.4.1 Radiator, Drain

- Place a drain tray in position under the radiator drain plug (Fig. 1).
- Remove the header tank pressure cap. Release the captive radiator drain plug and drain the coolant.
- Tighten the radiator drain plug.

CAUTION: This procedure does not drain the heater circuit.

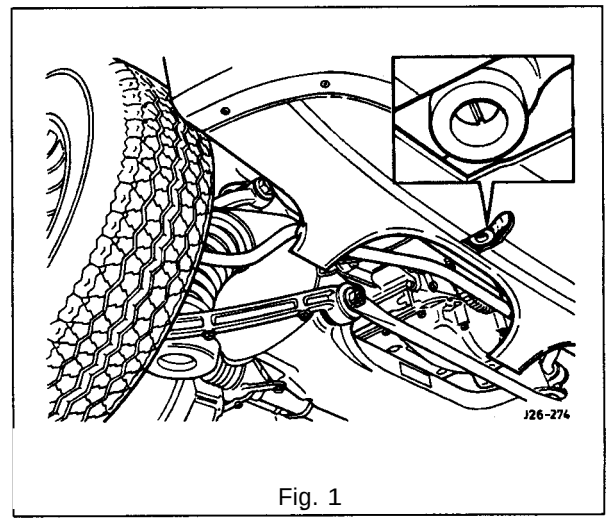
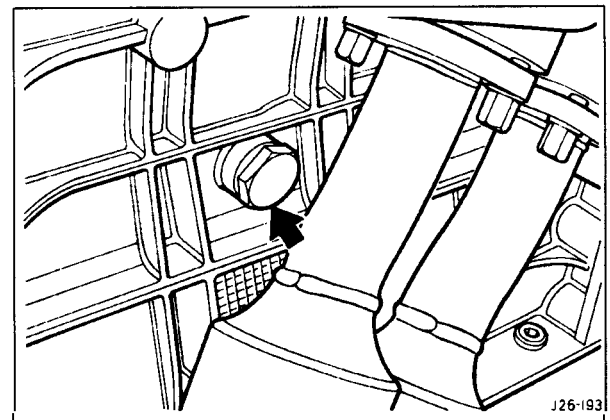


Fig. 1

4.1.4.2 Engine, Drain

Note: This procedure should only be necessary when the engine is being dismantled.

- Drain the radiator. (See the procedure above).
- Place a drain tray under the cylinder block drain plug (Fig. 2).
- Remove the block drain plug and drain the coolant.
- Fit the block drain plug.



Fia. 2

WARNING: DO NOT REMOVE THE HEADER TANK PRESSURE CAP WHILE THE ENGINE IS HOT. IF THE CAP MUST BE REMOVED, PROTECT THE HANDS AGAINST ESCAPING STEAM AND SLOWLY TURN THE CAP ANTI-CLOCKWISE UNTIL THE EXCESS PRESSURE CAN ESCAPE. LEAVE THE CAP IN THIS POSITION UNTIL ALL THE STEAM AND PRESSURE HAS ESCAPED AND THEN REMOVE THE CAP COMPLETELY.

WARNING: WHEN DRAINING THE COOLANT WITH THE ENGINE HOT, PROTECT THE HANDS AGAINST CONTACT WITH HOT COOLANT.

4.1.4.3 Radiator, Fill

- Add coolant until the level in the header tank is steady at MAX. (Do not fit the header tank cap).
- Switch on the ignition. (The climate control system must be OFF).
- Start the engine and wait until the cooling fans operate for the second time. (The engine speed may be raised to reduce the warm up time).
- While the cooling fans are operating, raise the engine speed to 1500 RPM for one minute. Return to idle speed.
- Switch off the ignition and wait for one minute.
- Check that the coolant level in the header tank is between MAX and 10 mm above MAX. Add coolant as necessary.
- Fit the header tank cap.

4.1.4.4 Complete System, Fill

- Add coolant until the level in the header tank is steady at MAX. (Do not fit the header tank cap).
- Switch on the ignition. (The climate control system must be OFF).
- Start the engine and wait until the cooling fans operate for the second time. (The engine speed may be raised to reduce the warm up time).
- While the cooling fans are operating, raise the engine speed to 1500 RPM for one minute. Return to idle speed.
- Turn the climate control system ON. Set the temperature to HI. Manually select a fan speed of approximately 50%.
- Run the engine for four minutes. Ensure that the climate control system outlet air temperature is hot to very hot and that there is no noise from the heater coolant circulating pump. (The engine speed may be raised to assist with heating).
- Switch off the ignition and wait for one minute.
- Check that the coolant level in the header tank is between MAX and 10 mm above MAX. Add coolant as necessary.
- Fit the header tank cap.

4.1.5 FAULT DIAGNOSIS

4.1.5.1 Introduction

The following diagnostic procedures are provided to assist properly qualified persons to identify and rectify the faults in the system which are most likely to be encountered. Reference is made to the Electrical Diagnostic Manual (EDM), which should be consulted for all electrical faults. When investigating faults relating to temperature, the prevailing ambient temperature conditions should be taken into account. The climate control system is dealt with in Section 14.

4.1.5.2 Diagnostic Procedures

Symptom	Possible Cause	Check	Remedy
Overheating	Thermostat stuck closed	Test thermostat	Renew thermostat
	Incorrect thermostat rating	Check thermostat operating temperature	Renew thermostat
	Faulty temperature gauge	Refer to EDM	Renew gauge
	Faulty temperature transmitter	Refer to EDM	Renew transmitter
	Radiator core blocked	Check for hotspots in radiator	Flush or renew radiator
	Radiator grille obstructed	Check grille for obstruction	Remove obstruction from grille
	Concentration of anti-freeze too high	Check strength of coolant	Drain and fill with coolant of correct concentration
	Drive belt slack	Check belt tension	Adjust belt to correct tension or renew belt if worn
	Drive belt broken	Visual check	Renew belt
	Water pump seized	Slacken drive belt and turn water pump pulley by hand. Check belt for damage	Renew water pump. Renew drive belt if required
	Insufficient coolant	Check coolant level	Top-up coolant
	Internally collapsed hoses	Pressure test system and check for deformation of hoses	Renew hoses as required
	Incorrect ignition timing	Refer to EDM	Rectify as required
	Fuel/ air mixture too weak	Refer to EDM	Rectify as required
	Incorrect valve timing	Check valve timing	Correct valve timing
	Cylinder head gasket leaking	Pressure-test system. (Check for contamination of coolant in header tank)	Renew head gasket
	Brakes binding	Check brake calipers for sticking pistons and seized brake pad pins	Rectify as required
Overheating at idle	Cooling fan(s) not operating	Refer to EDM	Rectify as required
Too cold	Thermostat stuck open	Test thermostat	Renew thermostat
	Incorrect thermostat rating	Check thermostat operating temperature	Renew thermostat
	Thermostat not fitted	Remove thermostat housing and inspect	Fit thermostat
	Cooling fan(s) operating continuously	Refer to EDM	Rectify as required
	Faulty temperature gauge	Refer to EDM	Renew gauge
	Faulty temperature transmitter	Refer to EDM	Renew transmitter

Diagnostic Procedures (continued)

Symptom	Possible Cause	Check	Remedy
Loss of coolant	Loose clips on hoses	Check clips for correct tightness	Tighten clips as required
	Hoses perished	Visual check	Renew hoses as required
	Radiator core leaking	Pressure–test system	Repair or renew radiator
	Water pump seal leaking	Pressure–test system	Renew water pump
	Thermostat gasket leaking	Pressure–test system. (Check for distortion of thermostat housing)	Renew gasket. Renew housing if required
	Header tank cap defective	Inspect cap or test cap spring pressure	Renew cap
	Porosity in castings	Pressure–test system	Rectify as required
	Corrosion caused by concentration of anti–freeze being too low	Pressure-test system. Check strength of coolant	Rectify as required. Drain and fill with coolant of correct concentration
	Cylinder head gasket leaking	Pressure–test system. Check for contamination of coolant and engine lubrication system	Renew head gasket
	Cracked or damaged internal engine component	Identify component(s) affected. (Check for contamination of engine lubrication system)	Rectify as required

SECTION CONTENTS

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4.2.1.1	Cooling System Description. Major Components		1
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I. SERVICE TOOLS & EQUIPMENT

No Jaguar service tools are required for working on the cooling system. Some normal workshop items will be required, including a pressure tester, hydrometer and thermometer.

II. TORQUE TIGHTENING SPECIFICATIONS

Fixing	Tightening Torque (Nm)
Electric fan assembly to body	7–10
Header tank bracket to body	7–10
Header tank to body	2,5–3,5
Hose clip, all main hoses	2,5–3,5
Hose clip, bleed hoses except those shown below	1,5–2,5
Hose clip, bleed hoses to header tank	2,5–3,5
Locator, fan cowl to radiator top panel	8,5–11,5
Lower radiator cradle to body	7–10
Radiator drain plug	1,5–2,5
Radiator temperature switch	13–17
Receiver drier to cooling fan assembly	2,5–3,5
Top radiator panel to body	7–10

4.2

III. SERVICE MATERIALS

Description	Uses	Notes
to be issued		

IV. SERVICE DATA

Application	Specification
Engine thermostat temperature rating	88°C
Coolant header cap pressure rating	12 bar
Water pump/ air injection pump drive belt tension	Burroughs method: new belt 650 N. In service, if tension falls below 320 N reset at 400 N Clavis method: new belt 169 to 175 Hz. In service, if tension falls below 127 Hz reset at 132 to 138 Hz.
Drive belt tension measuring point	Mid-way between crankshaft and air injection pump pulleys

4.2.1 COOLING SYSTEM DESCRIPTION

4.2.1.1 Major Components

- Engine crossflow radiator, incorporating a concentric tube cooler for the power steering fluid mounted in the left-hand radiator side tank. Vehicles with automatic transmission have a six-plate transmission fluid cooler mounted in the right-hand radiator side tank. A double-action temperature switch, for controlling the electric radiator cooling fans, is mounted in the left-hand radiator side tank.
- Engine driven, viscous-coupled, radiator cooling fan
- Two electrically operated radiator cooling fans, mounted in front of the radiator.
- Coolant circulating pump, belt driven from the engine crankshaft.
- Coolant header tank with pressure relief cap and coolant level probe.
- Two engine thermostats, one in each cylinder bank.

4.2.1.2 Components for Climate Control System

- Heater matrix.
- Electrically operated coolant circulating pump, mounted on the left-hand side of the engine bulkhead.
- Solenoid operated valve, located adjacent to the coolant circulating pump.

4.2.1.3 Operation

The configuration of the cooling system is shown in Sub-section 4.2.2.

The cooling system is pressurized, which allows the system to operate at a higher temperature without overheating. The header tank is fitted with a pressure relief cap to protect the system against overpressure.

Under cold start conditions, coolant is forced by the engine driven water pump through each cylinder block and cylinder head to the thermostat housings. The thermostats are closed to give rapid engine warm up, hence the coolant is returned via the engine cross pipe to the water pump inlet. When normal engine operating temperature is reached, the thermostats open and coolant is diverted through the radiator before returning to the water pump inlet.

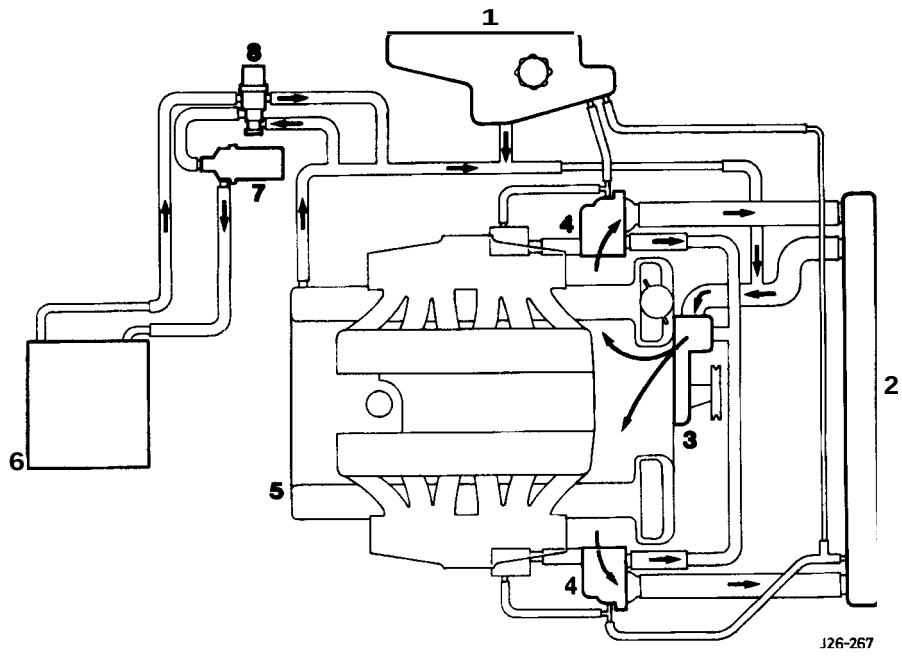
If the engine driven fan is unable to provide sufficient cooling, the electrically operated fans operate in series and parallel under the control of the radiator mounted temperature switch. Under hot operating conditions, the electric fans may continue to operate after the engine has been switched off. The fans stop automatically when the coolant temperature has been reduced sufficiently.

The system also provides the coolant supply for the climate control system, which is described in Section 14.

4.2

4.2.2 COOLING SYSTEM CONFIGURATION

The configuration of the cooling system is shown in Fig. 1. The main coolant flows, with the system at normal operating temperature (i.e. with the engine thermostats open), are indicated by arrows.



1. Header Tank
2. Radiator
3. Water Pump
4. Thermostat
5. Engine
6. Heater
7. Heater Pump
8. Heater Valve

Fig. 1 Cooling System Layout

4.2.3 SERVICE PROCEDURES

4.2.3.1 Safety Precautions

The anti-freeze specified in Appendix A1 must be used wherever possible. It is designed to afford the maximum corrosion protection to all metals found in the engine cooling system, as well as having the frost protection properties necessary during the winter months. Should it not be available, then anti-freeze conforming to Ford Motor Company specification ESD-M97B49-A may be used. To provide optimum temperature and corrosion protection, the specified anti-freeze concentration must always be used. Once coolant has been drained from the system, it must be discarded and not reused. Anti-freeze is harmful to the environment. Always dispose of used coolant safely and never pour it down a drain connected to the public sewer.

CAUTION: Never fill or top-up the system with water only.

CAUTION: Anti-freeze is harmful to paintwork. Coolant spillages must be wiped up immediately and the affected area washed to remove all traces of coolant.

CAUTION: To prevent the possibility of damage to the heater circuit pump, the pump should be electrically isolated if the ignition has to be turned ON while the cooling system is drained.

WARNING: DO NOT REMOVE THE HEADER TANK PRESSURE CAP WHILE THE ENGINE IS HOT. IF THE CAP MUST BE REMOVED, PROTECT THE HANDS AGAINST ESCAPING STEAM AND SLOWLY TURN THE CAP ANTI-CLOCKWISE UNTIL THE EXCESS PRESSURE CAN ESCAPE. LEAVE THE CAP IN THIS POSITION UNTIL ALL THE STEAM AND PRESSURE HAS ESCAPED AND THEN REMOVE THE CAP COMPLETELY.

WARNING: WHEN DRAINING THE COOLANT WITH THE ENGINE HOT, PROTECT THE HANDS AGAINST CONTACT WITH HOT COOLANT.

WARNING: WHEN WORKING WITHIN THE ENGINE COMPARTMENT, KEEP CLEAR OF THE ENGINE DRIVEN RADIATOR COOLING FAN WHEN THE ENGINE IS RUNNING.

4.2.3.2 Working Practices

When filling the system with coolant, ensure that the vehicle is standing on a level surface and that the coolant is poured in slowly so that airlocks are not introduced into the system. Airlocks can seriously affect the operation of the climate control system and can cause damage to the heater circuit pump.

Hose clips should always be positioned so that there is proper access for tightening and that the clip does not foul or interfere with the operation of any components.

The drive belt must always be tensioned to the specified value and the tension checked at the correct point on the belt. This information is given in Sub-section IV in the preliminary pages.

When tightening components, the torque figures given in Sub-section II in the preliminary pages should always be used for the fastenings listed.

When fitting a replacement thermostat, ensure that the jiggle-pin is to the top of the thermostat housing.

4.2.3.3 Coolant Change

The coolant must be changed at intervals of four years. The system should be drained from the radiator drain plug, flushed and filled with fresh coolant. Flushing should be carried out thoroughly to remove all the old coolant from the engine and heater matrix. (The heater valve is open with the ignition OFF). After filling, check the coolant concentration with a hydrometer. For specified anti-freeze and coolant concentration, see in Appendix A1.

4.2.4 DRAIN AND FILL PROCEDURES

4.2.4.1 Radiator, Drain

- Place a drain tray in position under the radiator drain plug (Fig. 1).
- Remove the header tank pressure cap. Release the captive radiator drain plug and drain the coolant.
- Tighten the radiator drain plug.

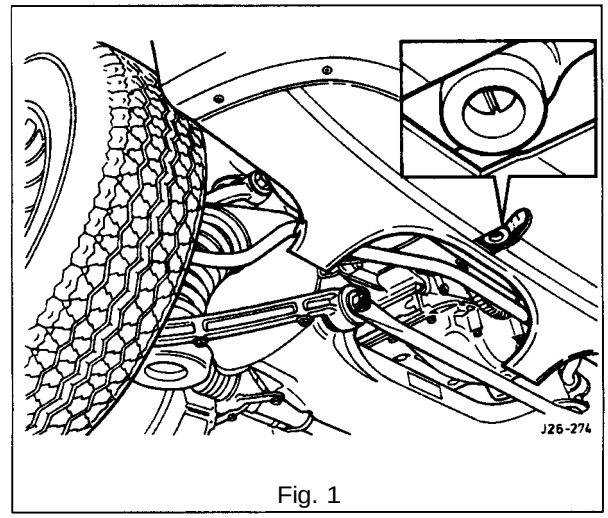


Fig. 1

CAUTION: This procedure does not drain the heater circuit.

WARNING: DO NOT REMOVE THE HEADER TANK PRESSURE CAP WHILE THE ENGINE IS HOT. IF THE CAP MUST BE REMOVED, PROTECT THE HANDS AGAINST ESCAPING STEAM AND SLOWLY TURN THE CAP ANTI-CLOCKWISE UNTIL THE EXCESS PRESSURE CAN ESCAPE. LEAVE THE CAP IN THIS POSITION UNTIL ALL THE STEAM AND PRESSURE HAS ESCAPED AND THEN REMOVE THE CAP COMPLETELY.

WARNING: WHEN DRAINING THE COOLANT WITH THE ENGINE HOT, PROTECT M E HANDS AGAINST CONTACT WITH HOT COOLANT.

4.2

4.2.4.2 Radiator, Fill

- Add coolant until the level in the header tank is steady at MAX. (Do not fit the header tank cap).
- Switch on the ignition. (The climate control system must be OFF).
- Start the engine and add coolant to the header tank if required to ensure that it does not empty.
- Run the engine until the temperature gauge reads normal. (The engine speed may be raised to reduce warm up time).
- Switch off the ignition and wait for one minute.
- Check that the coolant level in the header tank is between MAX and 10 mm above MAX. Add coolant as necessary.
- Fit the header tank cap.

4.2.4.3 Complete System, Fill

- Add coolant until the level in the header tank is steady at MAX. (Do not fit the header tank cap).
- Switch on the ignition. (The climate control system must be OFF).
- Start the engine and add coolant to the header tank if required to ensure that it does not empty.
- Run the engine until the temperature gauge reads normal, (The engine speed may be raised to reduce the warm up time).
- Turn the climate control system ON. Set the temperature to HI. Manually select a fan speed of approximately 50%.
- Run the engine for four minutes. Ensure that the climate control system outlet air temperature is hot to very hot and that there is no noise from the heater coolant circulating pump. (The engine speed may be raised to assist with heating).
- Switch off the ignition and wait for one minute.
- Check that the coolant level in the header tank is between MAX and 10 mm above MAX. Add coolant as necessary.
- Fit the header tank cap.

4.2.4.4 System, Air Bleeding

After filling the system with coolant, any air present must be purged before effective cooling is possible. Provided the correct fill procedure has been followed, purging of the system takes place automatically as follows:

The air entrained by the coolant, rises to the top of the radiator and to the highest point on each side of the engine (the thermostat housings). While the thermostats are closed, the radiator is under reduced pressure due to the pump suction and air is bled through the jiggle-pins in each thermostat. Purged air is returned via the bleed system to the header tank. When normal operating temperature is reached, the thermostats open and the system operates normally.

4.2.5 FAULT DIAGNOSIS

4.2.5.1 Introduction

The following diagnostic procedures are provided to assist properly qualified persons to identify and rectify the faults in the system which are most likely to be encountered. Reference is made to the Electrical Diagnostic Manual (EDM), which should be consulted for all electrical faults. When investigating faults relating to temperature, the prevailing ambient temperature conditions should be taken into account. The climate control system is dealt with in Section 14.

4.2.5.2 Diagnostic Procedures

Symptom	Possible Cause	Check	Remedy
Overheating	Thermostat(s) stuck closed	Test thermostat(s)	Renew thermostat(s)
	Incorrect thermostat rating	Check thermostat operating temperature	Renew thermostat(s)
	Faulty temperature gauge	Refer to EDM	Renew gauge
	Faulty temperature transmitter	Refer to EDM	Renew transmitter
	Radiator core blocked	Check for hotspots in radiator	Flush or renew radiator
	Radiator grille obstructed	Check grille for obstruction	Remove obstruction from grille
	Concentration of anti-freeze too high	Check strength of coolant	Drain and fill with coolant of correct concentration
	Drive belt slack	Check belt tension	Adjust belt to correct tension or renew belt if worn
	Drive belt broken	Visual check	Renew belt
	Water pump seized	Slacken drive belt and turn water pump pulley by hand. Check belt for damage	Renew water pump. Renew drive belt if required
	Insufficient coolant	Check coolant level	Top-up coolant
	Internally collapsed hoses	Pressure test system and check for deformation of hoses	Renew hoses as required
	Incorrect ignition timing	Refer to EDM	Rectify as required
	Fuel/ air mixture too weak	Refer to EDM	Rectify as required
	Incorrect valve timing	Check valve timing	Correct valve timing
	Cylinder head gasket(s) leaking	Pressure-test system. (Check for contamination of coolant in header tank)	Renew head gasket(s)
	Brakes binding	Check brake calipers for sticking pistons and seized brake pad pins	Rectify as required
Overheating at idle	Electric cooling fan(s) not operating	Refer to EDM	Rectify as required
Too cold	Thermostat(s) stuck open	Test thermostat(s)	Renew thermostat(s)
	Incorrect thermostat rating	Check thermostat operating temperature	Renew thermostat(s)
	Thermostat(s) not fitted	Remove thermostat housing and inspect	Fit thermostat(s)
	Electric cooling fan(s) operating continuously	Refer to EDM	Rectify as required
	Faulty temperature gauge	Refer to EDM	Renew gauge
	Faulty temperature transmitter	Refer to EDM	Renew transmitter

4.2

Diagnostic Procedures (continued)

Symptom	Possible Cause	Check	Remedy
Loss of coolant	Loose clips on hoses	Check clips for correct tightness	Tighten clips as required
	Hoses perished	Visual check	Renew hoses as required
	Radiator core leaking	Pressure–test system	Repair or renew radiator
	Water pump seal leaking	Pressure–test system	Renew water pump
	Thermostat gasket(s) leaking	Pressure–test system. (Check for distortion of thermostat housing(s))	Renew gasket. Renew housing(s) if required
	Header tank cap defective	Inspect cap or test cap spring pressure	Renew cap
	Porosity in castings	Pressure–test system	Rectify as required
	Corrosion caused by concentration of anti–freeze being too low	Pressure–test system. Check strength of coolant	Rectify as required. Drain and fill with coolant of correct concentration
	Cylinder head gasket(s) leaking	Pressure–test system. Check for contamination of coolant and engine lubrication system	Renew head gasket(s)
	Cracked or damaged internal engine component	Identify component(s) affected. (Check for contamination of engine lubrication system)	Rectify as required

SECTION CONTENTS

Sub-Section	Title	SRO	Page
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5.1.1	Fuel System layout		1
5.1.2	General Description		3
5.1.3	Fuel Rail/ Pressure Regulator Valve/ Injectors (Supercharged), Renew	18.10.01 18.10.02 19.45.11 19.60.13	5
5.1.4	Fuel Rail / Pressure Regulator Valve/ Injectors (Normally Aspirated), Renew	18.10.01 18.10.02 19.45.11 19.60.13	7
5.1.5	Purge Control Valve (All Models), Renew	17.15.30	9
5.1.6	Throttle Assembly (Supercharged), Renew	18.30.17 19.70.04 19.70.07	10
5.1.7	Idle Speed control Valve/ Gaskets (Supercharged), Renew	18.30.74 18.30.77	11
5.1.8	Idle Speed Control Valve/ Gaskets (Normally Aspirated), Renew	18.30.74 18.30.77	12
5.1.9	Fuel Cut Off Inertia Switch (All Models), Renew	18.30.35	13

5.1

5.1.1 FUEL SYSTEM LAYOUT

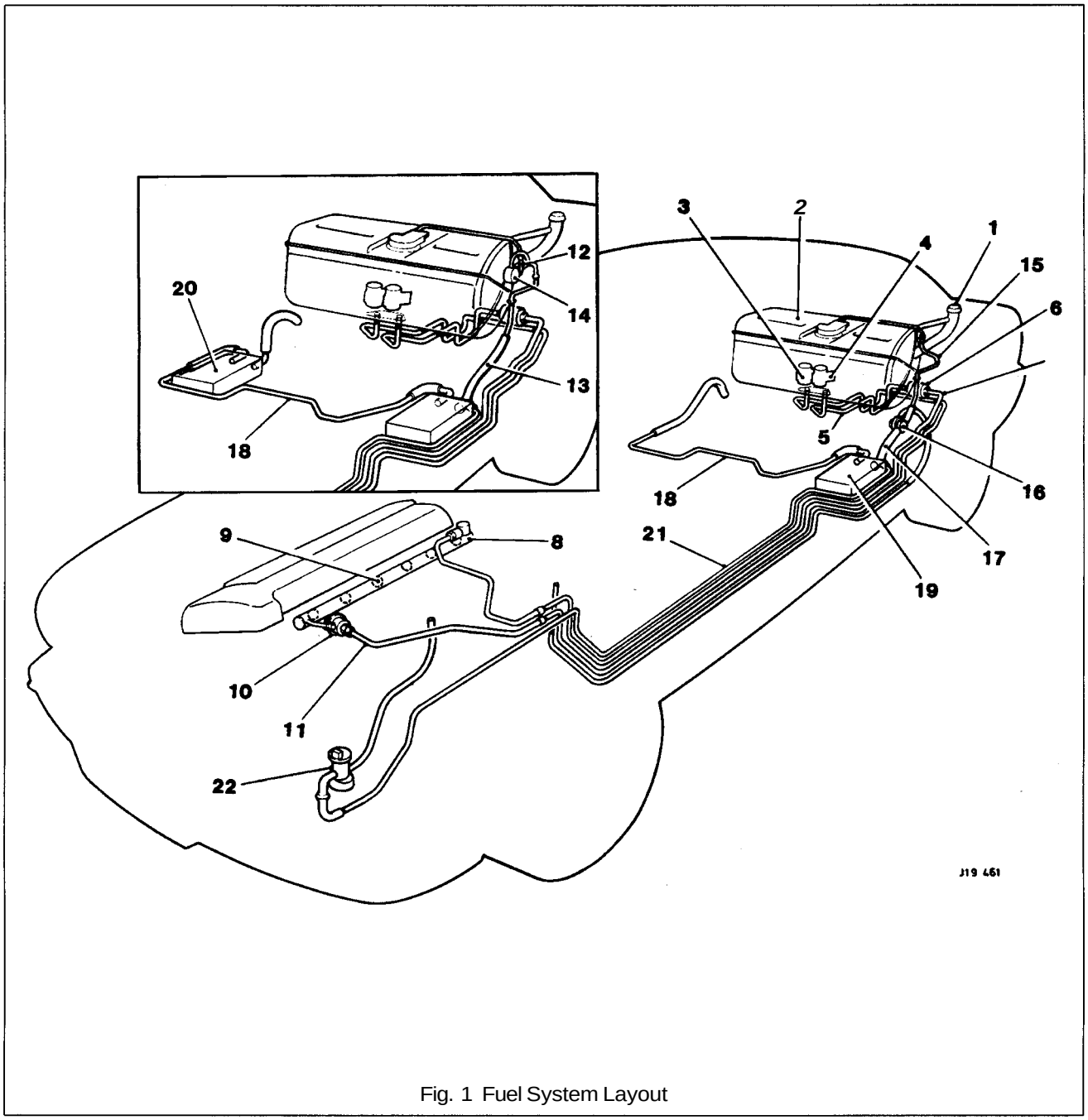

Fig. 1 Fuel System Layout

The above schematic illustration (Fig.1), shows the part and component layout of the fuel system of 4.0 liter normally aspirated engined vehicles. The inset view shows the differences in the component layout for NAS market vehicles only. This illustration is to be read with the table on Page 2.

Note: The layout of the supercharged vehicle is as shown in this illustration apart from the routing of the fuel feed line.

Key to Fig. 1, Fuel System AJ16, page 1

SRO	Component / Parts	Location	Number
19.55.13	Fuel filler assembly	Rear deck area	1
19.55.01	Fuel tank	Behind rear bulkhead	2
19.45.08	Fuel pump(s)	Inside fuel tank	3
	Fuel pump filter	Inside fuel tank	4
19.40.97	Fuel feed line	Fuel pump to fuel filter	5
19.25.02	Fuel filter	Above rear axle assembly	6
19.40.60	Fuel feed line	Fuel filter to fuel rail	7
19.60.13	Fuel rail	Inlet manifold	8
18.10.02	Fuel injectors	Inlet manifold / fuel rail	9
19.45.11	Fuel regulator valve	Mounted on the fuel rail	10
19.40.85	Fuel return line	Fuel regulator to fuel tank	11
	Emission vent line	Fuel tank to running loss control valve (NAS 4.0L normally aspirated engine only)	12
	Emission vent line	Running loss control valve to primary carbon canister (NAS 4.0L normally aspirated engine only)	13
	Running loss control valve (NAS only)	Left side of the fuel tank	14
	Emission vent line	Fuel tank to tank pressure control (Rochester) valve	15
17.15.41	Tank pressure control (Rochester) valve	Connected between emission vent lines as shown on schematic	16
	Emission vent line	Rochester valve to primary carbon canister	17
	Emission vent line	Primary carbon canister to secondary carbon canister (NAS 4.0L normally aspirated engine only)	18
	Emission vent line	Primary carbon canister to atmosphere	18
17.15.13	Primary carbon canister	Left side of vehicle, in front of the rear axle	19
17.15.13	Secondary carbon canister	To the right of the primary carbon canister on the other side of the vehicle (NAS 4.0L normally aspirated engine only).	20
	Emission vent line	Primary carbon canister to purge valve	21
17.50.30	Purge valve	Below the left head lamp module	22

5.1.2 GENERAL DESCRIPTION

WARNING: WORKING ON THE FUEL SYSTEM MAY RESULT IN FUEL AND FUEL VAPOUR BEING PRESENT IN THE ATMOSPHERE. FUEL VAPOUR IS EXTREMELY FLAMMABLE, HENCE GREAT CARE MUST BE TAKEN WHILST WORKING ON THE FUEL SYSTEM. ADHERE STRICTLY TO THE FOLLOWING PRECAUTIONS:

DO NOT SMOKE IN THE WORK AREA.

DISPLAY 'NO SMOKING' SIGNS AROUND THE AREA.

ENSURE THAT A CO_2 FIRE EXTINGUISHER IS CLOSE AT HAND.

ENSURE THAT DRY SAND IS AVAILABLE TO SOAK UP ANY FUEL SPILLAGE.

EMPTY FUEL USING SUITABLE FIRE PROOF EQUIPMENT INTO AN AUTHORIZED EXPLOSION-PROOF CONTAINER.

DO NOT EMPTY FUEL INTO A PIT.

ENSURE THAT WORKING AREA IS WELL VENTILATED.

ENSURE THAT ANY WORK ON THE FUEL SYSTEM IS ONLY CARRIED OUT BY EXPERIENCED AND WELL QUALIFIED MAINTENANCE PERSONNEL.

The fuel filler assembly, supplied complete with serviceable lid, hinge and hinge spring, is fixed to the Body-in-White (BIW) decking panel by two M5 nuts. Additional parts of the assembly comprise a adjustable rubber buffer, a snap-in striker and the fuel cap stowage magnet.

The fuel bowl, retained around the filler neck by a clip, containing a drain tube filter located over the mating drain tube, is rubber moulded onto a steel armature and fitted to the BIW decking panel by five M5 nuts.

The fuel lid latching assembly fitted to the metal armature of the fuel bowl by an M5 nut, includes the locking pin and the operating actuator.

The actuator operates from the central locking system driven by the security and locking control module (SLCM).

The fuel tank, mounted across the vehicle behind the passenger compartment rear bulkhead, is held in position by two retaining straps, tightened by two M5 fixing arrangements.

The fuel tank of AJ16 engined vehicles contains one fuel pump, supplying fuel to the normally aspirated engine and two fuel pumps, supplying fuel to the supercharged engine. They are regenerative turbine pumps supplied by Nippon-Denso. Nominal operating pressure is 3 bar (3.7 bar for supercharged engine) above the manifold depression and pump delivery is 90 litres/hour minimum at 13.2 volts, 3 bar outlet pressure. The pump(s) draw a nominal current of 7 amperes at 13 volts, 3 bar outlet pressure, ambient temperatures. Built in to the pump assembly is a over-pressure relief valve which blows at 4.5 - 8.5 bar.

Fuel is drawn by the pumps from the fuel tank and is then supplied to the fuel rail via a 70 micron filter and the fuel feed line connected in series by fuel filter.

The amount of fuel being injected into the engine is controlled by the fuel injectors combined with the engine control module (ECM).

Any excessive fuel flowing through the system, is returned to the fuel tank via the fuel regulator valve mounted on the fuel rail, the fuel return line and the check valve also located inside the tank.

The two filters prevent contaminants from entering the fuel rail and possible damage to the fuel injectors, the engine, the pump and the underfloor filter.

The fuel pumps are switched on and off by relays controlled by the engine control module (ECM).

The second fuel pump for the supercharged engine operates only in the higher speed range, switching on at 4000rpm and off at 3200rpm.

The fuel lines are made up of an assembly, combining steel under floor pipes and flexible conductive anti-permeation tubing. In order to perform speedy remove and refit operations, the underfloor steel lines are linked through the engine bay bulkhead to the flexible tubing, leading to the fuel rail and the fuel regulator by using positive sealing, quick-fit type connectors. The same type connectors, are used to connect the fuel feed and return line to the fuel tank.

Connectors used inside the engine bay are of different sizes to correspond with the difference in pipe diameter, whereas the connectors for the feed and return lines at the fuel tank are the same size.

Except for the return line connector at the fuel tank, two release tools, one for each size of connector are required to release all remaining connectors.

The connectors are released by pushing the tool into the female half of the connector and at the same time disengaging the latches.

Viton hosing surrounds the tubing, thus preventing any potential damage from fire and other matters.

The conductive anti-permeation tubing does not return to its original shape after being deformed. Therefore do not clamp (eg. for sealing purposes prior to disconnection of tubes) as this damages the fuel pipes.

The evaporative loss control system prevents unprocessed vapour emitted from the fuel tank from entering the atmosphere.

A running–loss control valve (4.0 liter NAS markets only) or a tank pressure control (Rochester) valve (where fitted) is installed between the fuel tank and the carbon canister.

Both valves are normally closed, but open during engine operation. They vent vapours from the fuel tank to the carbon canister(s).

5.1

On filling up the tank the fuel produces positive pressure inside the tank which causes only the running loss valve to close, blocking off the vent line. The Rochester valve is closed when the engine is off.

The purge valve is controlled by the engine control module (ECM) and is linked to the carbon canister.

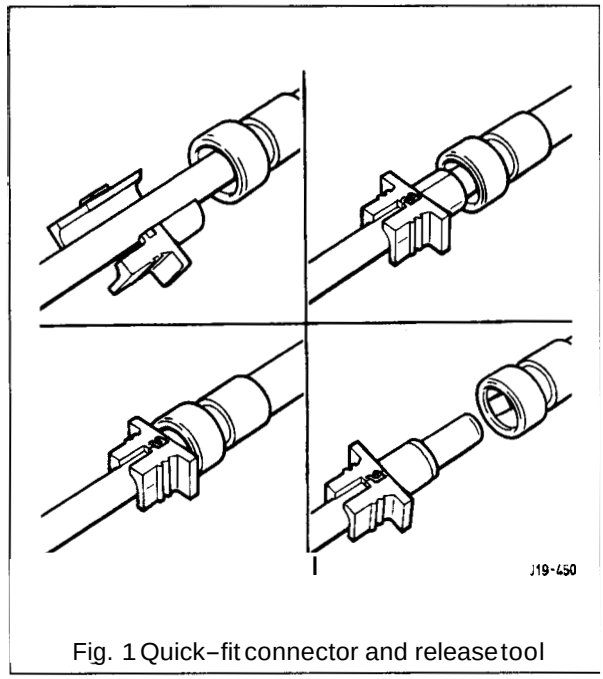

Fig. 1 Quick–fit connector and release tool

5.1.3 FUEL RAIL /PRESSURE REGULATOR VALVE/ INJECTORS (SUPERCHARGED), RENEW

SRO 19.60.13 FUEL RAIL

SRO 19.45.11 REGULATOR VALVE

SRO 18.10.01 INJECTORS

SRO 18.10.02 INJECTORS (VEHICLE SET)

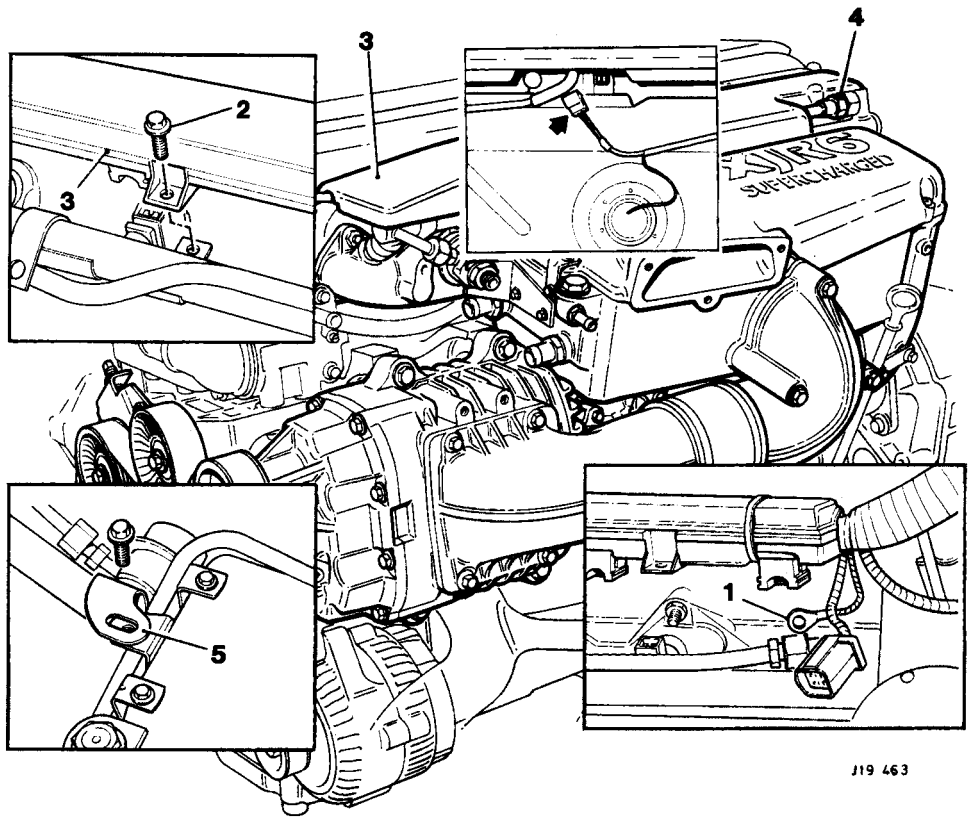

Fig. 1

Remove

- Reposition top edge of trunk front liner for access.
- Disconnect multi-plug from evaporative loss flange inset (Fig. 1).
- Switch ignition on.
- Crank engine to depressurize fuel system.
- Switch ignition off.
- Disconnect battery, see Section 15.
- Disconnect earth lead eyelet (1 Fig. 1) from inlet manifold stud.
- Disconnect engine harness to oxygen sensor leads multi-plug.
- Disconnect engine harness to starter motor solenoid link lead multi-plug.
- Undo fuel injector multi-plug cover fixings (2 Fig. 1).
- Disconnect cover from injectors (3 Fig. 1).
- Undo fuel rail to feed pipe union nut (4 Fig. 1).

- Reposition fuel feed pipe from fuel rail union and fit blanking plugs to rail and pipe.
- Undo and remove regulator mounting bracket to inlet manifold bracket securing bolt (5 Fig. 1).
- Undo fuel rail to regulator union nut.
- Reposition regulator from fuel rail union and fit blanking plugs.
- Undo and remove fuel rail securing bolts.
- Remove fuel rail assembly (1 Fig. 1) from manifold.

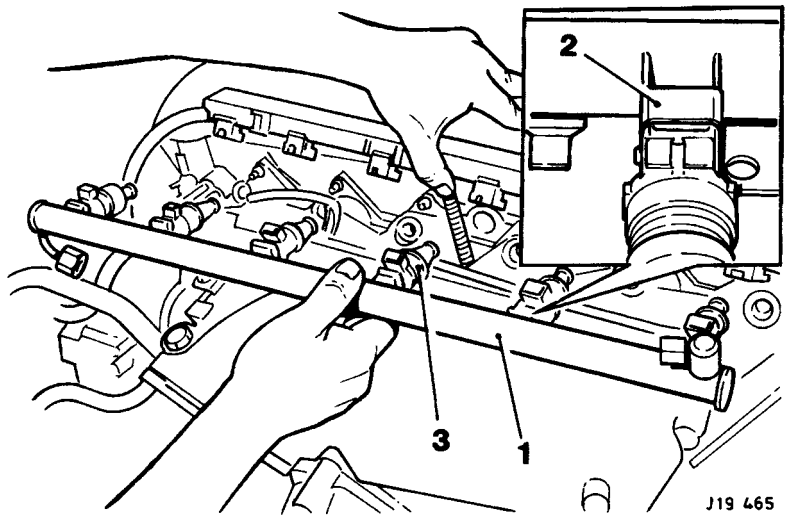

Fig. 1

- Fit blanking plugs to manifold.
- Drain the residual fuel from the fuel rail into a suitable drain tin.
- Remove the injector retaining clips (2 Fig. 1).
- Remove injectors (3 Fig. 1).
- Disconnect vacuum hose from regulator.
- Remove regulator mounting bracket.
- Undo fuel rail to regulator union nut.
- Remove regulator assembly.

Refit in the reverse order of the removal procedure.

5.1

5.1.4 FUEL RAIL /PRESSURE REGULATOR VALVE/ INJECTORS (NORMALLY ASPIRATED ENGINE), RENEW

SRO 19.60.13

SRO 19.45.11

SRO 18.10.01 INJECTORS

SRO 18.10.02 INJECTORS (VEHICLE SET)

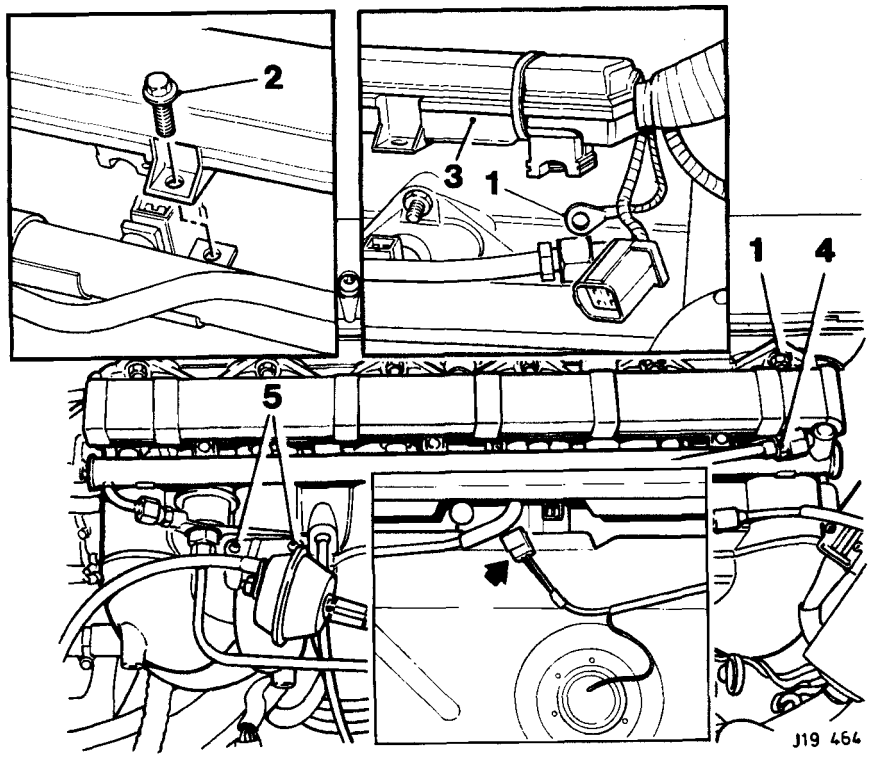

Fig. 1

Remove

- Reposition top edge of trunk front liner for access.
- Disconnect multi-plug from evaporative loss flange inset (Fig.1).
- Switch ignition on.
- Crank engine to depressurize fuel system.
- Switch ignition off.
- Disconnect battery, see Section 15.
- Disconnect earth lead eyelet (1 Fig.1) from inlet manifold stud.
- Disconnect engine harness to oxygen sensor leads multi-plug.
- Disconnect engine harness to starter motor solenoid link lead multi-plug.
- Undo fuel injector multi-plug cover fixings (2 Fig.1).
- Disconnect cover from injectors (3 Fig.1).
- Undo fuel rail to feed pipe union nut (4 Fig.1).

- Reposition fuel feed pipe from fuel rail union and fit blanking plugs to rail and pipe.
- Undo and remove regulator mounting bracket to inlet manifold bracket securing bolt (5 Fig. 1).
- Undo fuel rail to regulator union nut.
- Reposition regulator from fuel rail union and fit blanking plugs.

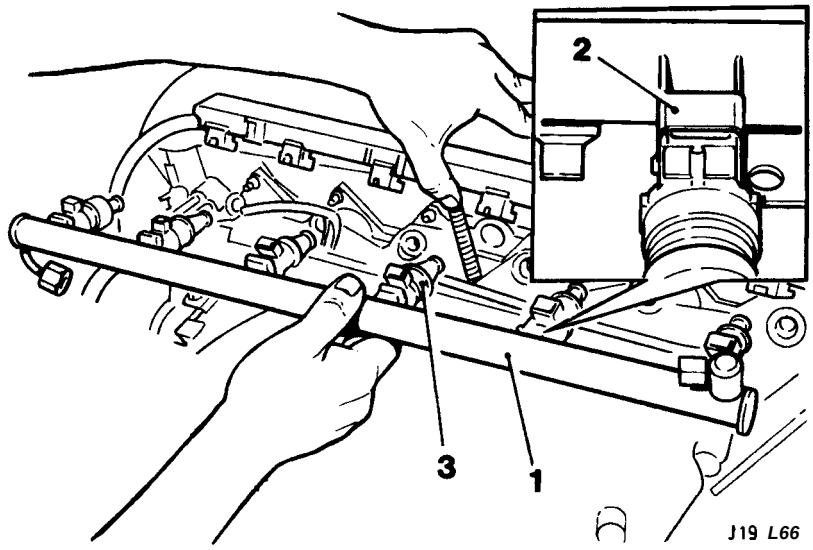

Fig. 1

- Undo and remove fuel rail securing bolts.
- Remove fuel rail assembly (1 Fig. 1) from manifold.
- Fit blanking plugs to manifold.
- Drain the residual fuel from the fuel rail into a suitable drain tin.
- Remove the injector retaining clips (2 Fig. 1).
- Remove injectors (3 Fig. 1).
- Disconnect vacuum hose from regulator.
- Remove regulator mounting bracket.
- Undo fuel rail to regulator union nut.
- Remove regulator assembly.

Refit in the reverse order of the removal procedure.

5.1.5 PURGE CONTROL VALVE (ALL MODELS), RENEW

SRO 17.15.30

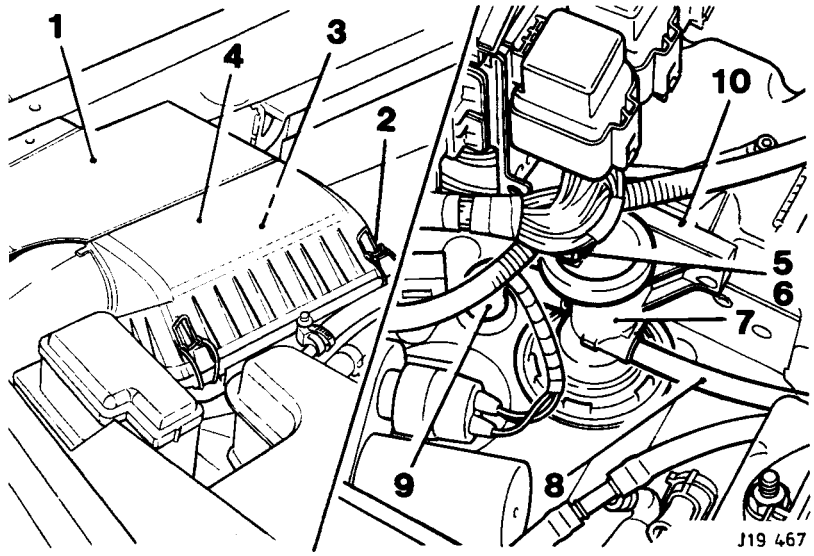

Fig. 1

Remove

- Remove blanking cover (1 Fig.1).
- Release air cleaner cover retaining clips (2 Fig.1).
- Remove filter element (3 Fig.1).
- Remove filter cover (4 Fig.1) from inner wing grommet.
- Depress retaining clip (5 Fig.1) and disconnect connector (6 Fig.1) from purge valve (7 Fig.1).
- Disconnect hose (8 Fig.1) from purge valve.
- Disconnect elbow (9 Fig.1) from front of purge valve.
- Remove purge valve from mounting bracket (10 Fig.1).

Refit in the reverse order of the removal procedure.

5.1.6 THROTTLE ASSEMBLY (SUPERCHARGED), RENEW

SRO 18.30.17 THROTTLE POTENTIOMETER

SRO 19.70.07 THROTTLE HOUSING GASKET

SRO 19.70.04 THROTTLE HOUSING

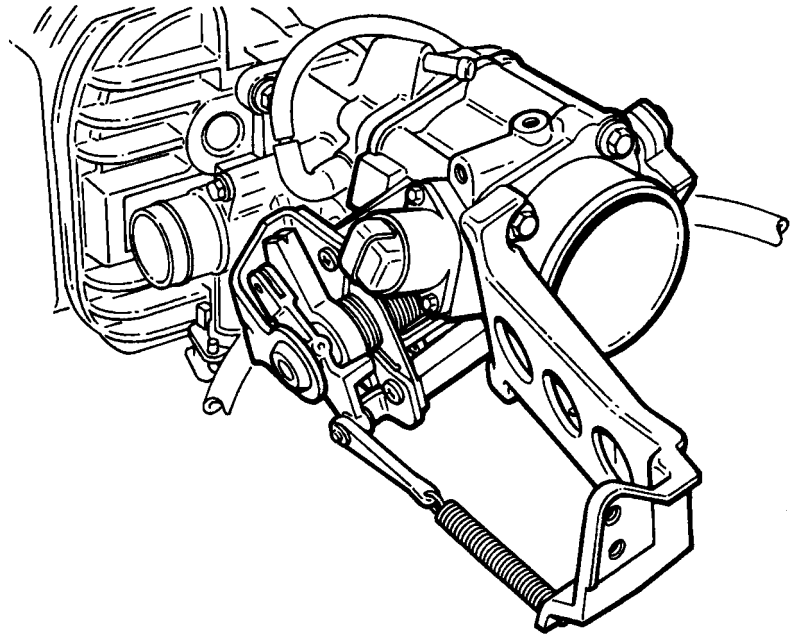

Fig. 1

Remove

- Disconnect battery.
- Remove the intercooler intake elbow.
- Raise vehicle on a four-post ramp.
- Remove the rear air duct to throttle body connecting hose.
- Remove the oil filter cartridge and gasket.
- Undo and remove bolts securing EGR supply pipe to manifold.
- Remove EGR supply pipe gasket.
- Reposition EGR sensor harness multi-plug from mounting bracket.
- Release throttle outer cable abutment from abutment bracket.
- Disconnect throttle inner cable from throttle linkage.
- Remove speed control speed control bracket to throttle lever clevis pin and pin circlip.
- Disconnect and remove return spring.
- Disconnect speed control actuator vacuum hose.
- Release cooling system pressure by slowly undoing the tank cap.
- Tighten cap after pressure release.
- Remove abutment bracket assembly.
- Disconnect idle speed actuator harness multi-plug.
- Disconnect throttle potentiometer harness multi-plug.
- Fit pipe clamps to throttle housing cooling hoses and disconnect hoses from throttle housing.

- Remove throttle housing.
- Remove throttle potentiometer.
- Remove screws securing idle speed actuator to throttle housing.
- Remove and discard gasket.
- Remove spacer and undo bolt securing throttle lever assembly to throttle housing.
- Remove butterfly outer bush, spring and inner bush.

Refit in the reverse order of the removal procedure.

5.1.7 IDLE SPEED CONTROL VALVE / GASKETS (SUPERCHARGED), RENEW

SRO 18.30.74 IDLE SPEED CONTROL VALVE

SRO 18.30.77 IDLE SPEED CONTROL VALVE GASKET

Remove

- Remove the throttle housing and gasket.
- Undo and remove bolt securing idle speed control valve.
- Remove valve.
- Remove gasket.

Refit in the reverse order of the removal procedure.

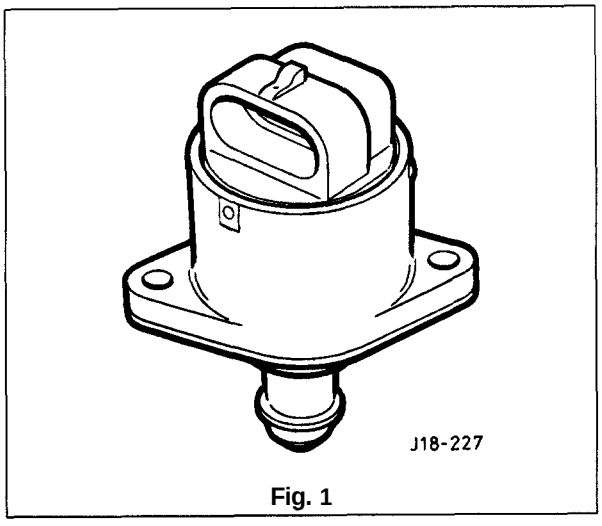

Fig. 1

5.1

5.1.8 IDLE SPEED CONTROL VALVE/ GASKETS (NORMALLY ASPIRATED), RENEW

SRO 18.30.74 IDLE SPEED CONTROL VALVE

SRO 18.30.77 IDLE SPEED CONTROL VALVE GASKET

Remove

- Disconnect battery.
- Remove the intake elbow to throttle housing hose.
- Disconnect idle speed control valve multi–plug.
- Disconnect throttle potentiometer multi–plug.
- Remove clevis pin circlip.
- Reposition link arm from quadrant.
- Disconnect kick down cable (where fitted) from quadrant.
- Open throttle fully and disconnect inner cable from quadrant.
- Carefully release throttle against stop.

Fit pipe clamps to throttle body heater feed and return hose.

- Disconnect feed hose from throttle body stub pipe.
- Remove throttle body assembly from inlet manifold.
- Remove idle speed control valve from throttle body.
- Remove gasket.
- Retrieve distance piece from throttle body recess.

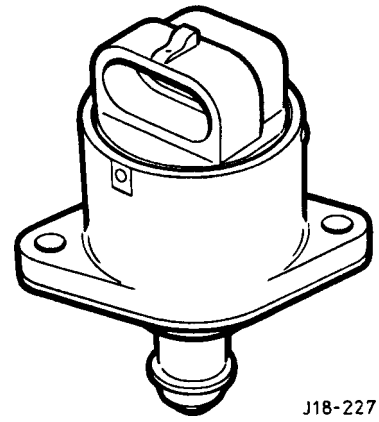

Fig. 1

Refit in the reverse order of the removal procedure.

5.1.9 FUEL CUT OFF INERTIA SWITCH (ALL MODELS), RENEW

SRO 18.30.35

Remove

- Disconnect battery.

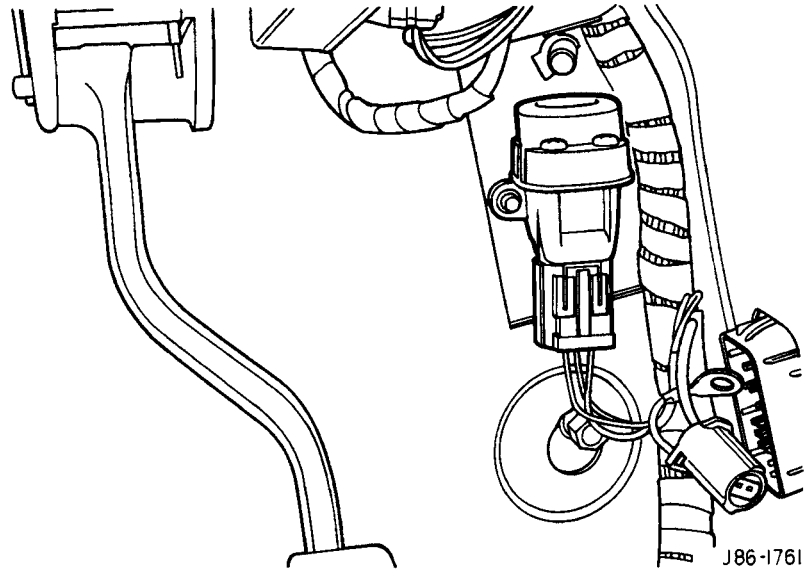

Fig. 1

- Remove the 'A' post lower trim pad.
- Remove the EMS control module, see Section 15.
- Disconnect vehicle harness through panel connector.
- Disconnect inertia switch multi-plug (Fig. 1).
- Remove switch.

Refit in the reverse order of the removal procedure.

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5.2 .1 FUEL SYSTEM LAYOUT

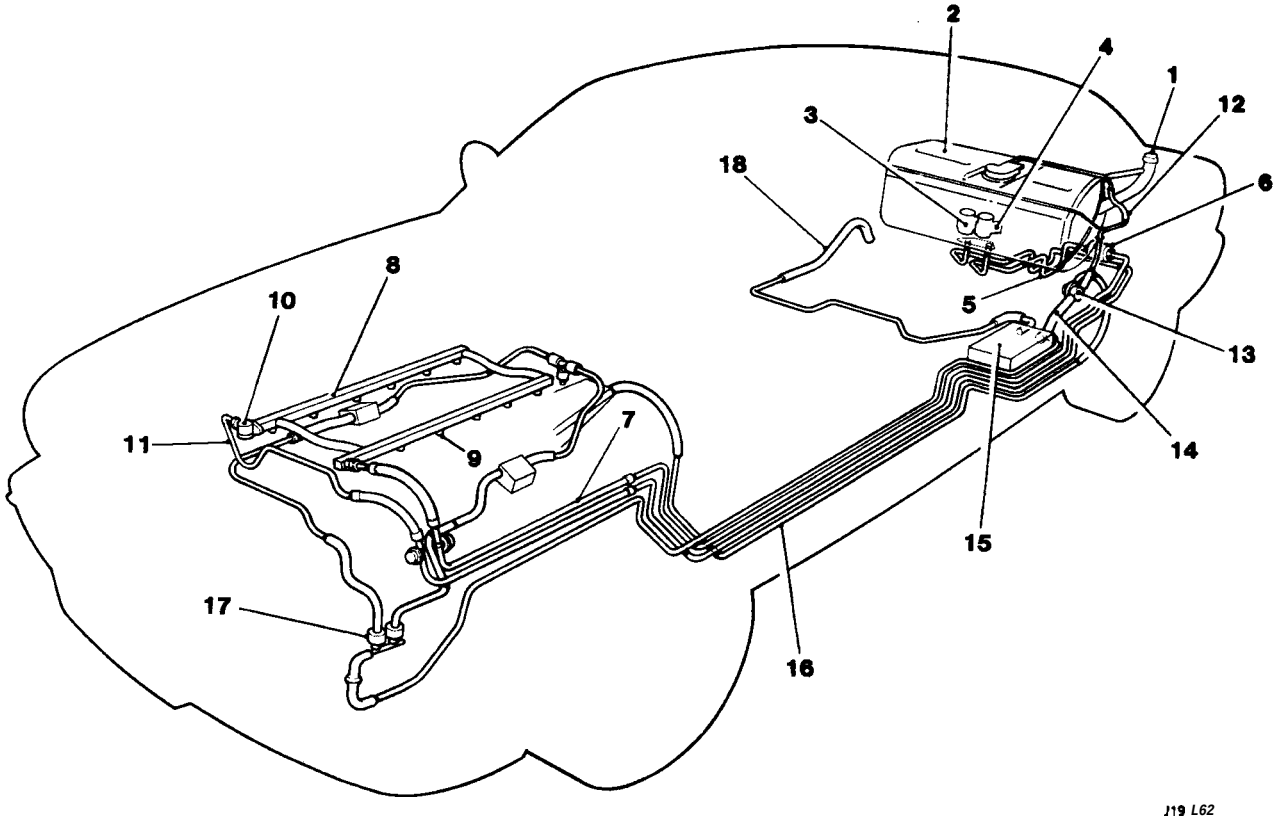

Fig. 1 Fuel System Layout

The above schematic illustration (Fig.1), shows the part and component layout of the fuel system and *is* to be read with the table on Page 2.

Key to Fig.1, Fuel System V12, page 1

SRO	Component / parts	Location	Number
19.55.13	Fuel filler assembly	Rear deck area	1
19.55.01	Fuel tank	Behind rear bulkhead	2
19.45.08	Fuel pumps	Inside fuel tank	3
	Fuel pump filter	Inside fuel tank	4
19.40.97	Fuel feed line	Fuel pump to fuel filter	5
19.25.02	Fuel filter	Above rear axle assembly	6
19.40.60	Fuel feed line	Fuel filter to fuel rail	7
19.60.13	Fuel rail	Inlet manifold	8
18.10.02	Fuel injectors	Inlet manifold / fuel rail	9
19.45.11	Fuel regulator valve	Mounted on the fuel rail	10
19.40.85	Fuel return line	Fuel regulator to fuel tank	11
	Emission vent line	Fuel tank to tank pressure control (Rochester) valve	12
17.15.41	Tank pressure control (Rochester) valve	Connected between emission vent lines as shown on schematic	13
	Emission vent line	Rochester valve to primary carbon canister	14
17.15.13 17.15.13	Primary carbon canister	Left side of vehicle, in front of the rear axle	15
	Emission vent line	Primary carbon canister to purge valve	16
17.50.30	Purge valve	Below the left head lamp module	17
	Emission vent line	Primary carbon canister to atmosphere	18

5.2

5.2.2 GENERAL DESCRIPTION

WARNING: WORKING ON THE FUEL SYSTEM RESULTS IN FUEL AND FUEL VAPOUR BEING PRESENT IN THE ATMOSPHERE. FUEL VAPOUR IS EXTREMELY FLAMMABLE, HENCE GREAT CARE MUST BE TAKEN WHILST WORKING ON THE FUEL SYSTEM. ADHERE STRICTLY TO THE FOLLOWING PRECAUTIONS:

DO NOT SMOKE IN THE WORK AREA.

DISPLAY 'NO SMOKING' SIGNS AROUND THE AREA.

ENSURE THAT A CO_2 FIRE EXTINGUISHER IS CLOSE AT HAND.

ENSURE THAT DRY SAND IS AVAILABLE TO SOAK UP ANY FUEL SPILLAGE.

EMPTY FUEL USING SUITABLE FIRE PROOF EQUIPMENT INTO AN AUTHORIZED EXPLOSION PROOF CONTAINER.

DO NOT EMPTY FUEL INTO A PIT.

ENSURE THAT WORKING AREA IS WELL VENTILATED.

ENSURE THAT ANY WORK ON THE FUEL SYSTEM IS ONLY CARRIED OUT BY EXPERIENCED AND WELL QUALIFIED MAINTENANCE PERSONNEL.

The fuel filler assembly, supplied complete with serviceable lid, hinge and hinge spring, is fixed to the Body-in-White (BIW) decking panel by two M5 nuts. Additional parts of the assembly comprise a adjustable rubber buffer, a snap-in striker and the fuel cap stowage magnet.

The fuel bowl, retained around the filler neck by a clip, containing a drain tube filter located over the mating drain tube, is rubber moulded onto a steel armature and fitted to the BIW decking panel. by five M5 nuts.

The fuel lid latching assembly fitted to the metal armature of the fuel bowl by an M5 nut, includes the locking pin and the operating actuator.

The actuator operates from the central locking system driven by the Security and Locking Control Module (SLCM).

The fuel tank, mounted across the vehicle behind the passenger compartment rear bulkhead, is held in position by two retaining straps, tightened by two M5 fixing arrangements.

V12 engined vehicles are equipped with two fuel pumps located inside the tank. They are regenerative turbine pumps supplied by Nippon Denso. Nominal operating pressure is 3 bar above the manifold depression and pump delivery is 90 litres/hour minimum at 13.2 volts, 3 bar outlet pressure. The pump draws a nominal current of 7 amperes at 13 volts, 3 bar outlet pressure, ambient temperatures. Built into the pump assembly is a over-pressure relief valve which blows at 4.5 - 8.5 bar.

Fuel is drawn by the pumps from the fuel tank and is then supplied to the fuel rail via a 70 micron filter and the fuel feed line connected in series by fuel filter.

The amount of fuel being injected into the engine is controlled by the fuel injectors combined with the engine control module (ECM).

Any excessive fuel flowing through the system, is returned to the fuel tank via the fuel regulator valve mounted on the fuel rail, the fuel return line and the check valve also located inside the tank.

The two filters prevent contaminants from entering the fuel rail and possible damage to the fuel injectors, the engine, the pump and underfloor filter.

The second fuel pump is controlled by the engine control module (ECM) and works of a mapped fuel map. The pumps 'switch on' time depends on the fuel requirement which is depending on the engine load.

The fuel lines are made up of an assembly, combining steel underfloor pipes and flexible conductive anti-permeation tubing. In order to perform speedy remove and refit operations, the underfloor steel lines are linked through the engine bay bulkhead to the flexible tubing, leading to the fuel rail and the fuel regulator by using positive sealing, quick fit type connectors. The same type connectors, are used to connect the fuel feed and return line to the fuel tank.

Connectors used inside the engine bay, are of different sizes to correspond with the difference in pipe diameter, whereas the connectors for the feed and return lines at the fuel tank are the same size.

Except for the return line connector at the fuel tank, two release tools, one for each size of connector, are required to release all remaining connectors.

The connectors are released by pushing the tool into the female half of the connector and at the same time disengaging the latches.

Viton hosing surrounds the tubing, thus preventing any potential damage from fire and other matters.

The conductive anti-permeation tubing does not return to its original shape after being deformed. Therefore do not clamp (eg. for sealing purposes prior to disconnection of tubes) as this damages the fuel pipes.

The evaporative loss control system, prevents unprocessed vapour emitted from the fuel tank from entering the atmosphere.

The tank pressure control (Rochester) valve is installed between the fuel tank and the carbon canister. It is normally closed, but open during engine operation, venting the vapours from the fuel tank to the carbon canister.

The purge valve is controlled by the engine control module (ECM) and is linked to the carbon canister.

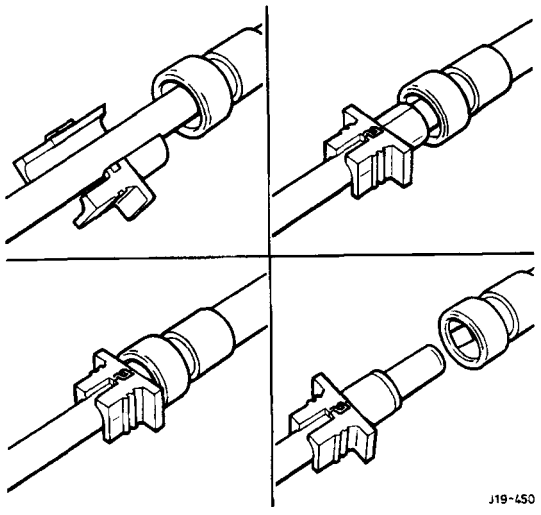

Fig. 1 Quick-fit Connector and Release Tool

5.2

5.2.3 FUEL RAIL / PRESSURE REGULATOR VALVE / INJECTORS, RENEW

SRO 19.60.13 FUEL RAIL

SRO 19.45.11 REGULATOR VALVE

SRO 18.10.01 INJECTORS

SRO 18.10.02 INJECTORS (VEHICLE SET)

SRO 18.10.04 INJECTOR – LEFT HAND BANK

SRO 18.10.05 INJECTOR – RIGHT HAND BANK

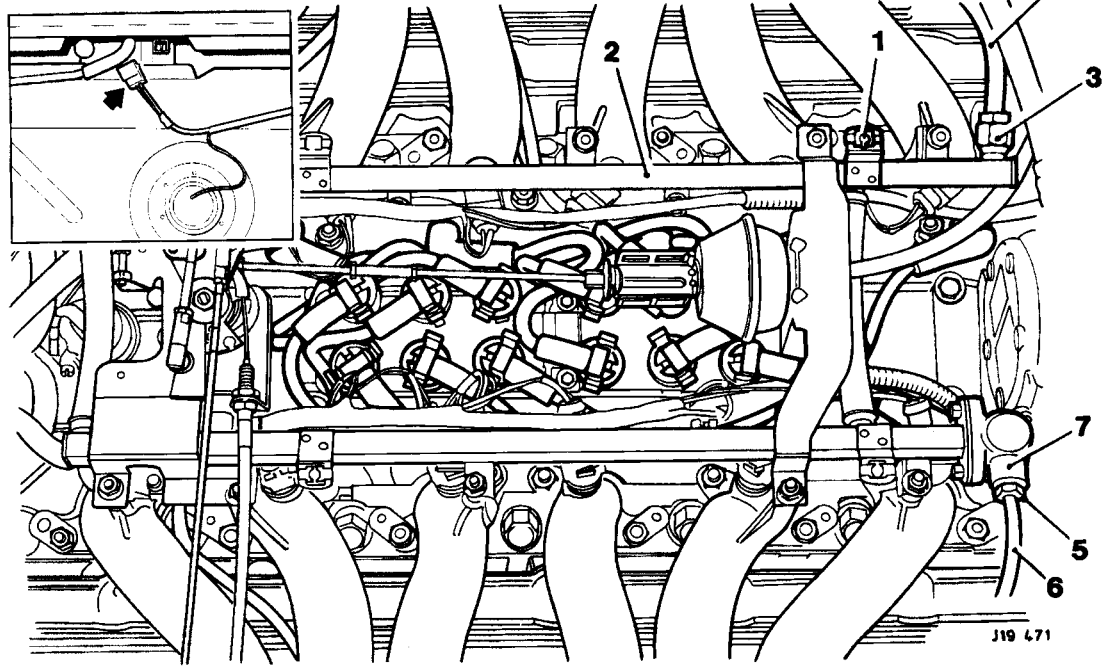

Fig. 1

5.2

Remove

- Reposition top edge of trunk front liner.
- Disconnect multi–plug from evaporative loss flange inset (Fig.1).
- Switch ignition on.
- Crank engine to depressurize fuel system.
- Switch ignition off.
- Disconnect battery see Section 15.
- Remove engine cover, See section 3.2.
- Remove engine cover 1/4 turn fastener receptacles (1 Fig.1) from fuel rail (2 Fig.1).
- Undo fuel feed hose to fuel rail union nut (3 Fig.1).
- Reposition fuel feed hose (4 Fig.1) from fuel rail.
- Undo fuel return hose to fuel pressure regulator union nut (5 Fig.1).
- Reposition fuel return hose (6 Fig.1) from fuel pressure regulator (7 Fig.1).

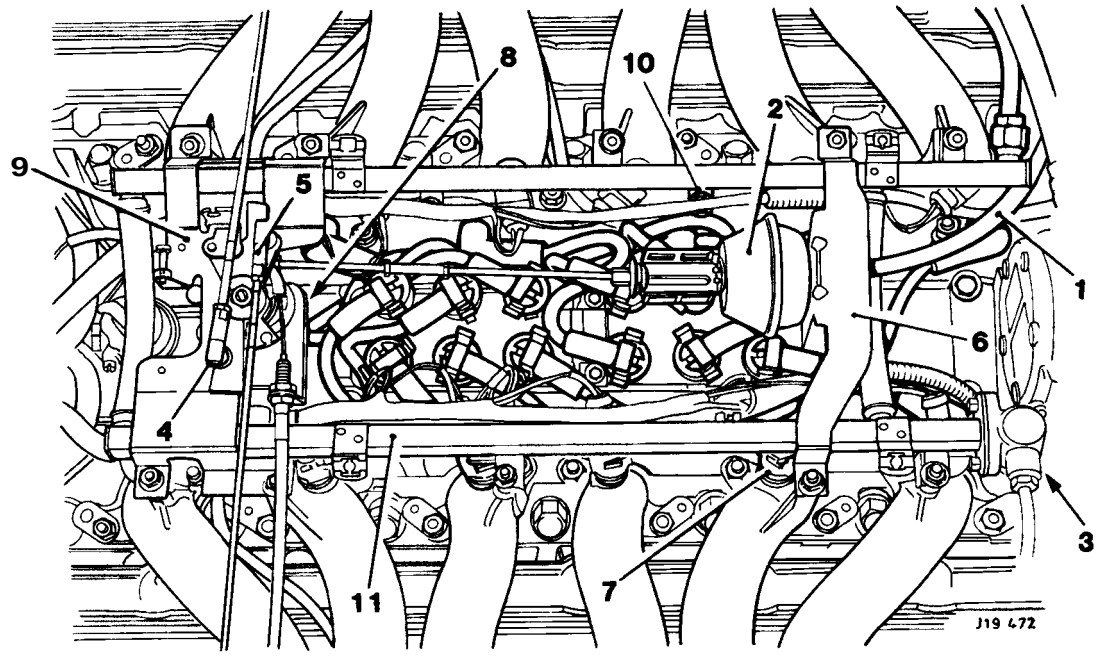

Fig. 1

- Disconnect vacuum hose (1 Fig.1) from cruise control actuator (2 Fig.1).
- Disconnect vacuum hose (3 Fig.1) from fuel pressure regulator.
- Disconnect throttle control rods from throttle pulley assembly ball pins (4 Fig.1).
- Reposition throttle control rods to inner wings.
- Disconnect cruise control rod from throttle pulley assembly ball pin (5 Fig.1).
- Undo and remove bolts securing fuel rail.
- Reposition cruise control rod below throttle pulley assembly.
- Remove cruise control actuator / bracket assembly and fixings (6 Fig.1).
- Disconnect injector harness plugs (7 Fig.1).
- Disconnect throttle potentiometer multi-plug (8 Fig.1)
- Remove throttle pulley bracket assembly and fixings (9 Fig.1)
- Remove injector harness plastic clips (10 Fig.1) from fuel rail.
- Remove fuel rail / injector assembly (11 Fig.1).

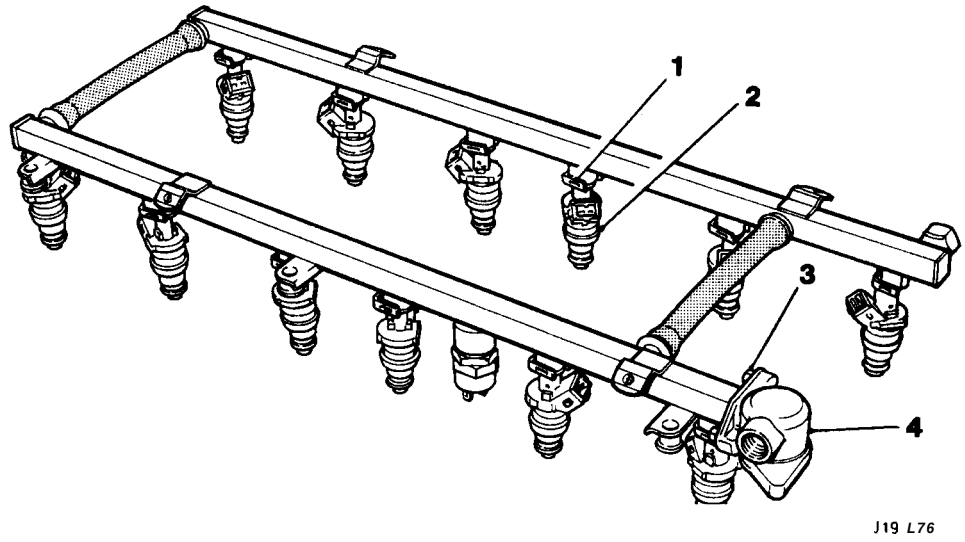

Fig. 1

- Remove injector to fuel rail retaining clips (1 Fig.1).
- Remove injector (2 Fig.1).
- Remove fuel regulator retaining plate and fixings (3 Fig.1).
- Remove fuel regulator (4 Fig.1).
- Remove and discard 'O' ring seals.

Refit in the reverse order of the removal procedure.

5.2.4 PURGE CONTROL VALVE, RENEW

SRO 17.15.42 'A' BANK

SRO 17.15.43 'B'BANK

SRO 17.15.44 VEHICLE SET

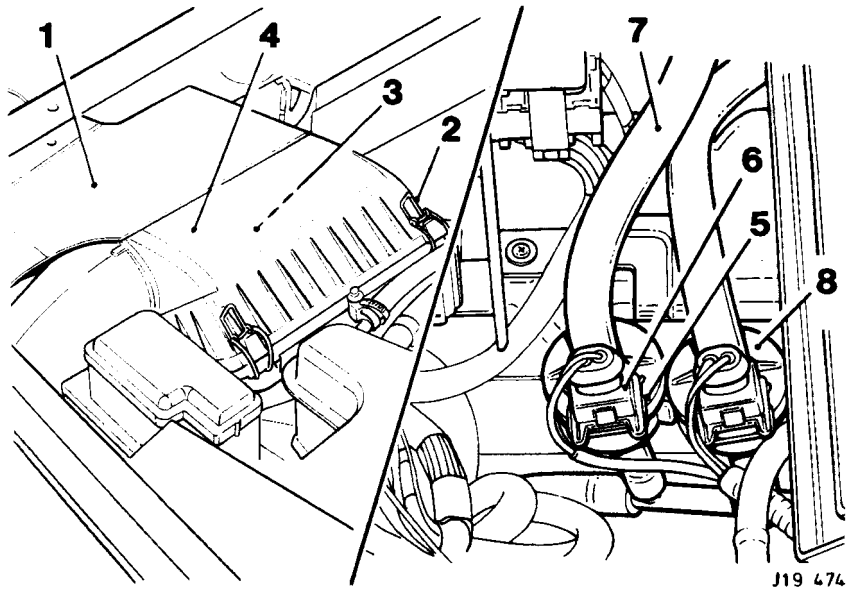

Fig. 1

Remove

- Remove the left-hand headlamp relay cover (1 Fig.1), see Section 15.
- Remove the left-hand air cleaner element (2 Fig.1).
- Remove the right-hand air cleaner assembly (3 Fig.1).
- Remove air box mounting bracket (4 Fig.1).
- Disconnect 'A' bank purge valve multi-plug (5 Fig.1).
- Release securing clip (6 Fig.1).
- Disconnect all hoses (7 Fig.1) from valve.
- Remove valve (8 Fig.1).

Refit the purge valve in the reverse order of the removal procedure.

5.2.5 IDLE SPEED CONTROL VALVE/ GASKETS, RENEW

SRO 18.30.74 VEHICLE SET

SRO 18.30.73 VALVE– RIGHT HAND

SRO 18.30.76 GASKET– RIGHT HAND

SRO 18.30.72 VALVE – LEFT HAND

SRO 18.30.75 GASKET– LEFT HAND

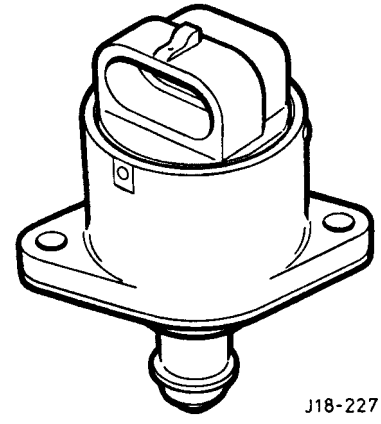

Fig. 1

Remove

- Disconnect battery.
- Drain coolant from radiator, see Section 4.2.
- Disconnect idle speed control valve multi–plug.
- Disconnect all hoses linked to the idle speed control valve.
- Remove valve.
- Remove gasket.

Refit in the reverse order of the removal procedure.

5.2.6 FUEL CUT–OFF INERTIA SWITCH, RENEW

SRO 18.30.35

Remove

- Disconnect battery.
- Remove the 'A' post lower trim pad.
- Remove the EMS control module, see Section 15.
- Disconnect vehicle harness through–panel connector.
- Disconnect inertia switch multi–plug (Fig. 2).
- Remove switch.

Refit in the reverse order of the removal procedure.

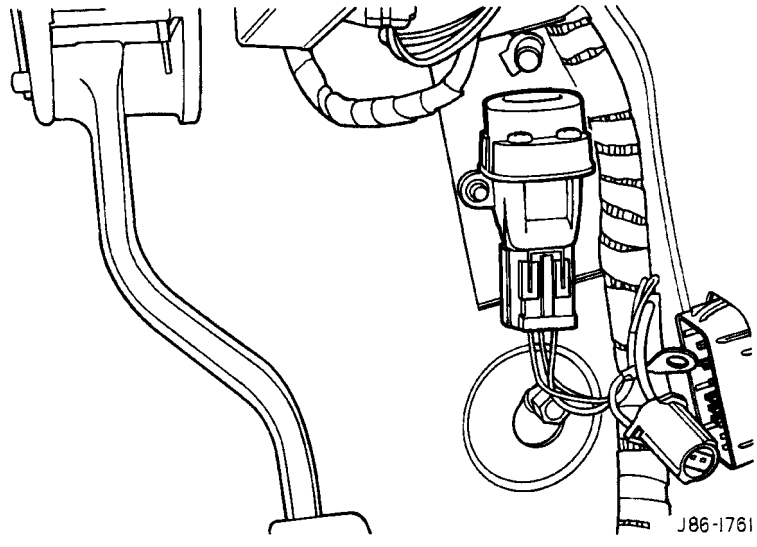

Fig. 2

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6.1.2.3	Test B, Restriction in Exhaust System		6