

1. GENERAL INFORMATION

100 : Service information

100-00 : General information

Description and operation

Application and Use of Specifications

Torque Specifications

Torque specifications are shown in the torque specifications chart located at the front of the relevant section

General Service Information

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 installation of replacement parts and accessories:

- Safety features embodied in the vehicle may be impaired if other than genuine parts are installed. In certain territories, legislation prohibits the installation 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 installed. If the efficiency of a locking device is impaired during removal it must be renewed.
- Owners purchasing accessories while travelling abroad should make sure that the accessory and its installed location on the vehicle conform to mandatory requirements existing in their country of origin.
- The vehicle warranty may be invalidated by the installation 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.

Vehicle Specifications

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 Manufacturer reserves the right to vary the specifications, with or without notice, and at such times and in such manner as the Manufacturer thinks 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 make sure the accuracy of the particulars contained in this manual, neither the Manufacturer nor the Dealer, by whom the manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

Service Repair Operation Numbering

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

Each operation is allocated a number from the master index and cross-refers with an identical number in the Repair Operation Times schedule. The number consists of six digits arranged in three pairs.

Each maintenance procedure in this manual is described in the sequence necessary to complete the operation in the minimum time, as specified in the Repair Operation Times schedule.

References to Bank-1 and Bank-2

References to Bank-1 and Bank-2 are made with regard to the engine. When viewed from the flywheel the right-hand bank will be Bank-1 and the left-hand bank will be Bank-2.

Special Tools

Any special tools and equipment required to perform a maintenance procedure, are shown at the beginning of each procedure. When possible, illustrations are given to assist in identifying the tool needed.

Disconnecting/Connecting the Battery

Always stop the engine before disconnecting the battery negative lead and make sure the battery positive lead is isolated i.e. wrapped in a suitable cloth.



WARNING: Radio code saving devices must not be used when conducting work on Air Bag or Fuel systems. It must be noted that, when using these devices, the vehicle electrical system is still live albeit with a reduced current flow.

NOTE:

Before disconnecting the battery make sure that the radio receiver/cassette player/mini disc player and compact disc player keycodes are known and, that no data is required from the Engine Control Module (ECM) as battery disconnection will erase any fault codes and idle/drive values held in the Keep Alive Memory (KAM).

Always disconnect the battery before commencing repair operations which require:

- The vehicle to be jacked up
- Work on the engine
- Work underneath the vehicle
- Arc welding

Alternatively a Radio Code Saver may be used, when not working on the Air Bag or Fuel systems. With the battery disconnected, a Radio Code Saver will allow sufficient current to pass to maintain the radio receiver/cassette player/mini disc player and compact disc player memory, operate the clock and supply the door operated interior lights while isolating the battery in the event of a short circuit.

Reconnecting the Battery



WARNING: If the battery has been on bench charge the cells may be giving off explosive hydrogen gas. Avoid creating sparks, and if in doubt cover the vent plugs or covers with a damp cloth.

Always make sure that all electrical systems are switched OFF before reconnecting the battery to avoid causing sparks or damage to sensitive electrical equipment.

Always reconnect the battery positive lead first and the negative last, ensuring that there is a good electrical contact and the battery terminals are secure.

Restart the clock (where installed) and set it to the correct time.

Enter the radio receiver/cassette player/mini disc player and compact disc player keycodes and preset frequencies, if known.

Following reconnection of the battery, the engine should be allowed to idle until it has reached normal operating temperature as the stored idle and drive values contained within the ECM have been lost. Allow the vehicle to idle for a further three minutes. Drive the vehicle at constant speeds of approximately 48 km/h (30 mph), 64 km/h (40 mph), 80 km/h (50 mph), 96 km/h (60 mph) and 112 km/h (70 mph) for three minutes each. This will allow the ECM to relearn idle and drive values, and may cause driveability concerns if the procedure is not carried out.

Connecting a Slave Battery Using Jump Leads



WARNING: If the slave battery has recently been charged and is gassing, cover the vent plugs or covers with a damp cloth to reduce the risk of explosion should arcing occur when connecting the jump leads.



CAUTION: A discharged battery condition may have been caused by an electrical short circuit. If this condition exists there will be an apparently live circuit on the vehicle even when all circuits are switched off. This can cause arcing when the jump leads are connected.



CAUTION: Whilst it is not recommended that the vehicle is jump started, it is recognized that this may occasionally be the only practical way to mobilize a vehicle. In such an instance the discharged battery must be recharged immediately after jump starting to avoid permanent damage.

- Always make sure that the jump leads are adequate for the task. Heavy duty cables must be used.
- Always make sure that the slave battery is of the same voltage as the vehicle battery. The batteries must be connected in parallel.
- Always make sure that switchable electric circuits are switched off before connecting jump leads. This reduces the risk of sparks occurring when the final connection is made.



WARNING: Make sure that the ends of the jump leads do not touch each other or ground against the vehicle body at any time while the leads are attached to the battery. A fully charged battery, if shorted through jump leads, can discharge at a rate well above 1000 amps causing violent arcing and very rapid heating of the jump leads and terminals, and can even cause the battery to explode.

Always connect the jump leads in the following sequence.

- Slave battery positive first then vehicle battery positive.
- Slave battery negative next and then vehicle ground at least, 300 mm (12 in) from the battery terminal e.g. engine lifting bracket.

Always reduce the engine speed to idle before disconnecting the jump leads.

Before removing the jump leads, switch on the heater blower (high) or the heated rear screen, to reduce the voltage peak when the leads are removed.

Always disconnect the jump leads in the reverse order to the connecting sequence and take great care not to short the ends of the leads.

Do not rely on the generator to restore a discharged battery. For a generator to recharge a battery, it would take in excess of 8 hours continuous driving with no additional loads placed on the battery.

Component Cleaning

To prevent ingress of dirt, accumulations of loose dirt and greasy deposits should be removed before disconnecting or dismantling components or assemblies.

Components should be thoroughly cleaned before inspection prior to reassembly.

Cleaning Methods:

- Dry Cleaning
- Removal of loose dirt with soft or wire brushes
- Scraping dirt off with a piece of metal or wood
- Wiping off with a rag



CAUTION: Compressed air is sometimes wet so use with caution, especially on hydraulic systems.

- Blowing dirt off with compressed air (Eye protection should be worn when using this method)
- Removal of dry dust using vacuum equipment. This method should always be used to remove friction lining material dust (asbestos particles)
- Steam Cleaning

Calibration of Essential Measuring Equipment



WARNING: Failure to comply may result in personal injury or damage to components.

It is of fundamental importance that certain essential equipment e.g. torque wrenches, multimeters,

exhaust gas analysers, rolling roads etc., are regularly calibrated in accordance with the manufacturers instructions.

Use of Control Modules

Control modules may only be used on the vehicle to which they were originally installed. Do not attempt to use or test a control module on any other vehicle.

Functional Test

On completion of a maintenance procedure, a thorough test should be carried out, to ensure the relevant vehicle systems are working correctly.

Preparation

Before disassembly, clean the surrounding area as thoroughly as possible. When components have been removed, blank off any exposed openings using grease-proof paper and masking tape. Immediately seal fuel, oil and hydraulic lines when separated, using plastic caps or plugs, to prevent loss of fluid and the entry of dirt. Close the open ends of oil ways, exposed by component removal, with tapered hardwood plugs or readily visible plastic plugs. Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts. Before dismantling a component, clean it thoroughly with a recommended cleaning agent; check that the agent will not damage any of the materials within the component. Clean the bench and obtain marking materials, labels, containers and locking wire before dismantling a component.

Dismantling

Observe scrupulous cleanliness when dismantling components, particularly when parts of the brake, fuel or hydraulic systems are being worked on. A particle of dirt or a fragment of cloth could cause a dangerous malfunction if trapped in these systems. Clean all tapped holes, crevices, oil ways and fluid passages with compressed air.



WARNING: Do not permit compressed air to enter an open wound. Always use eye protection when using compressed air.

Make sure that any O-rings used for sealing are correctly reinstalled or renewed if disturbed. Mark mating parts to make sure that they are replaced as dismantled. Whenever possible use marking materials which avoid the possibilities of causing distortion or the initiation of cracks, which could occur if a center punch or scribe were used. Wire together mating parts where necessary to prevent accidental interchange (e.g roller bearing components). Tie labels on to all parts to be renewed and to parts requiring further inspection before being passed for reassembly. Place labelled parts and

other parts for rebuild in separate containers. Do not discard a part which is due for renewal until it has been compared with the new part, to make sure that the correct part has been obtained.

Inspection

Before inspecting a component for wear or performing a dimensional check, make sure that it is absolutely clean; a slight smear of grease can conceal an incipient failure. When a component is to be checked dimensionally against figures quoted for it, use the correct equipment (surface plates, micrometers, dial gauges etc.) in serviceable condition. The use of makeshift equipment can be dangerous. Reject a component if its dimensions are outside the limits quoted, or if damage is apparent. A component may be reinstalled if its critical dimension is exactly to the limit size and it is otherwise satisfactory. Use Plastigauge 12 Type PG-1 for checking bearing surface clearance, e.g. big end bearing shell to crank journal. Instructions for the use of Plastigauge and a scale giving bearing clearances in steps of 0,0025 mm (0.0001 in) are supplied with the package.

On-Board Diagnostics (OBD)

This vehicle uses programmed electronic control systems to provide engine management and emission regulation, automatic transmission operation and anti-lock braking control. These control systems are integral with the On-Board Diagnostics (OBD) facility that is used in conjunction with either the Jaguar approved diagnostic system or the more restricted scan tools.

The OBD information in this manual provides diagnostic and rectification procedures for emission related electrical and mechanical systems. The information is intended to facilitate fault diagnosis and the subsequent rectification of the vehicle without recourse to the Jaguar approved diagnostic system.

The diagnosis and testing sections within the manual cover:

- System principles of operation with links to the relevant Description and Operation sections
- Self tests (where appropriate)
- Inspection and Verification - manual checks, symptom and Diagnostic Trouble Code (DTC) driven diagnostic charts with actions required to rectify concerns
- Component tests (where appropriate)

Circuit Diagrams

To understand the relationship between the vehicle electrical system and the system circuit diagrams, Refer to the Electrical Guide.

In the interest of clarity, single lines may represent multiple wires. Refer to the color code (1st alpha) followed by the wire reference (numeric/alpha/numeric) to trace origin and destination.

e.g. BW 647B002. BW (black with white trace) 647 (wire reference) B002 (stage from origin).

Glossary of Terms

This glossary of terms is intended to cover mainly emissions-related (to SAE J 1930) terminology, and other abbreviations that may be used in this manual.

The required term may be looked-up in the left-hand column, and subsequent columns give the standard acronym, unit or abbreviation, and definition.

Term(s)	Acronym/Unit/Abbreviation	Definition
Air Conditioning	A/C	
Accelerator Pedal Position	APP	Is a multitrack sensor which inputs the drivers demand into the engine control module (ECM)
After Bottom Dead Center	ABDC	Event occurring after bottom dead center
After Top Dead Center	ATDC	Event occurring after top dead center
Anti-lock Brake System	ABS	System which prevents wheel lock-up under braking by sensing lack of rotation of a wheel(s) and diverting fluid pressure away

		from it (them)
Alternating Current	ac	
Amplitude Modulation	AM	
Automatic Temperature Control	ATC	
Automatic Transmission Fluid	ATF	
Ampere	A	SI unit of current
Ampere hour	Ah	
Barometric Pressure	BARO	Pressure of surrounding air at any given temperature and altitude
Battery positive voltage	B+	The positive voltage from a battery or any circuit connected directly to it
Before Bottom Dead Center	BBDC	Event occurring before bottom dead center
Before Top Dead Center	BTDC	Event occurring before top dead center

Bottom Dead Center	BDC	Lowest point of piston travel in a reciprocating engine
Battery Junction Box	BJB	
Brake Pedal Position	BPP	
Brake Horsepower	BHP	Effective horsepower developed by an engine or motor, as measured by a brake applied to its output shaft
British Standard	BS	Standard specification issued by the British Standards Institution
Brake Traction Control System	BTCS	
Bus	Topology of a communication network	
Coast Clutch Solenoid	CCS	
Camshaft Position	CMP	Indicates camshaft

		position
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
Chlorofluorocarbon	CFC	
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 degrees
Compact Disc	CD	
Cylinder Head Temperature Sensor	CHT Sensor	A sensor for measuring the

		temperature of the cylinder head
Central Junction Box	CJB	
Crankshaft Position	CKP	Indicates crankshaft position
Clutch Pedal Position	CPP	Indicates clutch pedal position
Controller Area Network	CAN	A communication system which allows control modules to be linked together
Constant Velocity	CV	
Cubic centimeter	cm ³	
Central Security Module	CSM	Electronic module to support security system functionality
Data Link Connector	DLC	Connector providing access and/or control of the vehicle information, operating

		conditions, and diagnostic information
Driver Door Module	DDM	Electronic module to support driver door functionality
Driver Seat Module	DSM	Electronic module to support driver seat functionality
Daytime Running Lamps	DRL	
Deutsche Institut fur Normung	DIN	German standards regulation body
Diagnostic Trouble Code	DTC	An alpha/numeric identifier for a fault condition identified by the On-Board Diagnostic (OBD) system
Direct current	dc	Current which flows in one direction only, though it may

		have appreciable pulsations in its magnitude
Domestic Data Bus	D2B	
Digital Versatile Disc	DVD	
Electronic Automatic Temperature Control	EATC	
Exhaust Gas Recirculation	EGR	
Exhaust Gas Recirculation Temperature Sensor	EGRT	Sensing EGR function based on temperature change
Electronic Brake Force Distribution	EBD	
Engine Control Module	ECM	Electronic module to support engine functionality
Electronic Crash Sensor	ECS	Sensor to measure severity of impact
Engine Coolant Temperature	ECT	
Engine Oil Pressure	EOP	

European On-Board Diagnostic	EOBD	
Electronic Pressure Control	EPC	
Electrically Erasable Programmable Read-Only Memory	EEPROM	
Erasable Programmable Read-Only Memory	EPROM	
Evaporative Emission	EVAP	System designed to prevent fuel vapor from escaping into the atmosphere. Typically includes a charcoal filled canister to absorb fuel vapor
Flash Electrically Erasable Programmable Read-Only Memory	FEEPROM	
Front Electronic Module	FEM	

Flash Erasable Programmable Read-Only Memory	FEPRM	
Frequency Modulation	FM	
Fuel Pump Driver Module	FPDM	
Fuel Rail Pressure	FRP	
Generic Electronic Module	GEM	
Ground	GND	Electrical conductor used as a common return for an electrical circuit or circuits, and with a relative zero potential
Global Positioning System	GPS	
Global System for Mobile Communication	GSM	
Gross Vehicle Weight	GVW	
Heated Oxygen Sensor	HO2S	Electrically heated oxygen sensor which induces fuelling

		corrections
Hydrofluorocarbon	HFC	
High tension	HT	
Hydrocarbon	HC	
Idle Air Control	IAC	Stepper motor driven device which varies the volume of air by-passing the throttle to maintain the programmed idle speed
Intake Air Temperature	IAT	Temperature of intake air
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
Input Shaft Speed	ISS	Indicates input shaft speed

Key On, Engine Off	KOEO	
Key On, Engine Running	KOER	
Kilogram (mass)	kg	
Kilogram (force)	kgf	
Kilogram force per square centimeter	kgf/cm ²	
Kilometer	km	
Kilometer per hour	km/h	
Kilopascal	kPa	
Kilovolt	kV	
Knock Sensor	KS	Sensor which detects the onset of detonation, and signals the ECM to retard the ignition
Liquid Crystal Display	LCD	Optical digital display system, to which applied voltage varies the way the crystals reflect light, thereby modifying the

		display
Lighting Control Module	LCM	
Light Emitting Diode	LED	
Low Tension	LT	Primary circuit of the ignition system, linking the battery to the primary winding in the ignition coil
Left-Hand	LH	
Left-Hand Drive	LHD	
Mass Air Flow	MAF	System which provides information on the mass flow rate of the intake air to the engine
Manifold Absolute Pressure	MAP	Absolute pressure of the intake manifold air
Manifold Absolute Pressure and Temperature	MAPT	

Malfunction Indicator Lamp	MIL	A required on-board indicator to alert the driver of an emission related malfunction
Meter (measurement)	m	
Metric (screw thread, e.g. M8)	M	
Farad	F	Unit of electrical capacitance
Millimeter	mm	
Millimeter of mercury	mmHg	
Millisecond	ms	
Model year	MY	
Newton	N	SI unit of force. 1 N = 0.2248 pounds force
Newton Meter	Nm	SI unit of torque. Must not be confused with nm (nanometer)
Negative Temperature	NTC	

Coefficient		
Naturally aspirated	N/A	Fuelling system using intake air at atmospheric pressure; not supercharged or turbocharged
Noise, Vibration and Harshness	NVH	
North American Specification	NAS	Vehicles for sale in the USA and Canadian markets
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
Oxides of Nitrogen	Nox	
Oxygen Sensor	O2S	A sensor which detects oxygen

		content in the exhaust gases
On-board Refuelling Vapour Recovery	ORVR	
Output State Control	OSC	
Output Shaft Speed	OSS	
Passenger Air Bag Deactivation	PAD	
Pulsed Secondary Air Injection	PAIR	
Passive Anti-Theft System	PATS	
Positive Crankcase Ventilation	PCV	
Parameter Identification	PID	An index number referring to a parameter within a module without knowledge of its storage location
Park/Neutral Position	PNP	
Pulse Width Modulation	PWM	

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
Portable Support Electronics	PSE	
Power Steering Pressure	PSP	
Polytetrafluoroethylene	PTFE	
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 changed
Restraints Control Module	RCM	Electronic module to support functionality of the Supplemental Restraints System
Radio Data System	RDS	
Rear Electronic Module	REM	
Remote Keyless Entry	RKE	
Right-hand	RH	
Right-hand drive	RHD	
Research Octane Number	RON	
Rear Seat Module	RSM	Electronic module to support functionality of rear seats
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)
Serial Communications Link	SCL	
Standard Corporate Protocol	SCP	A high-speed, serial communication s system linking all body system control modules. Control messages and data are passed between modules at up to 786 messages per second

Supplemental Restraints System	SRS	
Shift Solenoid	SS	Controls shifting in an automatic transmission
Seat Control Module	SCM	Module controlling the seat motor systems (not electric raise/lower-only seats)
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
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'
Society of Automotive Engineers	SAE	
Timing/Coast Clutch Solenoid	T/CCS	
Torque Converter Clutch	TCC	

Transmission Control Indicator Lamp	TCIL	
Throttle Position	TP	
Top Dead Center	TDC	
Transmission Control Module	TCM	Controls the shifting pattern of the (automatic) transmission
Transmission Control Switch	TCS	Modifies the operation of electronically controlled transmissions
Transmission Fluid Temperature	TFT	Indicates temperature of transmission fluid
Transmission Range	TR	The range in which the transmission is operating
Turbine Shaft Speed	TSS	Indicates rotational speed of transmission output shaft or turbine shaft

Variable Assist Power Steering	VAPS	
Variable Camshaft Timing	VCT	A system by which the relationship of the crankshaft and camshaft may be altered during engine running
Vehicle Identification Number	VIN	Number assigned to the vehicle by the manufacturer, primarily for licensing and identification purposes
Vehicle Speed Sensor	VSS	Sensor which provides vehicle speed information
Worldwide Diagnostic System	WDS	Jaguar approved diagnostic system
Wide Open Throttle	WOT	Full throttle position

How To Use This Manual

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Workshop Manual Organization

This manual covers descriptive, diagnostic (including OBD), and repair aspects to service the vehicle effectively.

The manual is arranged in sections, each section dealing with a specific part of a vehicle system. For example, Section 412-03 [Air Conditioning] covers air conditioning, which is part of the climate control system.

The first digit of the section number indicates the group (in the above example this being Electrical). There are five groups:

- General Information.
- Chassis.
- Powertrain.
- Electrical.
- Body and Paint.

The second and third digits of the section number indicate the vehicle system (12 in the above example being Climate Control).

The last two digits of the section number indicate the part of the system covered by the section (03 in the example denotes Air Conditioning).

Important Safety Instructions

Safety Notice

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as the safety of the person doing the work. This manual provides general directions for accomplishing service and repair work with tested effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the person doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in the manual must first establish that neither personal safety or vehicle integrity is compromised from choices of methods, tools or parts.

Road/Roller Testing

Road or roller testing may be carried out for various reasons and a procedure detailing pre-test checks, through engine starting and stopping, pre-driving checks, on-test checks to final checks on completion of the test is given in this section.

Unless complete vehicle performance is being checked, the full road test procedure need not be carried out. Instead, those items particularly relevant to the system/s being checked can be extracted.

Pre - Test Checks



WARNING: If the brake system hydraulic fluid level is low, pedal travel is excessive or a hydraulic leak is found, do not attempt to road test the vehicle until the reason for the low fluid level, excessive pedal travel or hydraulic leak is found and rectified.

It is suggested that pre-test checks, and functional tests of those systems/circuits which affect the safe and legal operations of the vehicle, such as brakes, lights and steering, should always be carried out before the road or roller test.

- Engine oil level
- Engine coolant level
- Tires, for correct pressure, compatible types and tread patterns, and wear within limits
- There is sufficient fuel in the tank to complete the test
- All around the engine, transmission and under the vehicle for oil, coolant, hydraulic and fuel leaks. Make a note of any apparent leaks and wipe off the surrounding areas to make it easier to identify the extent of the leak on completion of the test

Starting the Engine



CAUTION: On initial drive away from cold and within the first 1.5 km (1 mile), do not depress accelerator pedal beyond half travel until the vehicle has attained a minimum speed of 25 km/h (15 miles/h). Never operate at high engine speed or with the accelerator pedal at full travel whilst the engine is cold.

With the ignition switched off, check:

- The parking brake is applied
- The transmission selector lever is in Park
- All instrument gauges (except fuel gauge) read zero

With the ignition switched on, check:

- Ignition controlled warning lamps come on

- Engine coolant temperature gauge registers a reading compatible with the engine coolant temperature
- Fuel gauge registers a reading appropriate to the fuel level in the tank
- The operation of the parking brake and brake fluid level warning lamps

On Road or Roller Test Check:



CAUTION: If road testing, check the brake operation while still travelling at low speed before continuing with the test. If the brakes pull to one side, or appear to be otherwise faulty, do not continue with the road test until the fault has been found and rectified.

- Initial gear engagement is smooth
- Parking brake control operates smoothly and the parking brake releases quickly and completely
- Transmission takes up the drive smoothly, without judder
- The engine power output is satisfactory, full power is achieved, acceleration is smooth and pedal operation not stiff or heavy, and engine speed returns to idle correctly
- There is no excessive or abnormally colored smoke from the engine under normal driving, heavy load or overrun conditions
- Steering operation, including power steering, is smooth, accurate, not excessively heavy or with excessive free play or vibration. Does not pull to one side and self centres smoothly after cornering
- Speedometer, oil pressure warning lamp, coolant temperature gauge and tachometer register the correct readings or operate correctly
- Switches and controls operate smoothly and positively, warning lamps operate correctly and the direction indicator control self cancels when the steering is returned to the straight ahead position
- Heating and ventilation systems work correctly and effectively
- Brake operation and efficiency

Brake Testing



WARNING: When brake testing, avoid breathing the smoke or fumes from hot brakes, this may contain asbestos dust which is hazardous to health, see Health and Safety Precautions.

Avoid brake testing on busy roads where it can cause inconvenience or danger to other road users.



CAUTION: Brake testing which includes heavy brake applications should not be carried out with new brake pads/discs or linings/drums until the components have bedded-in. New brake friction components will not reach full efficiency until the bedding-in process is complete.

Test the brakes at several speeds within the normal operating range using both light and heavy pedal pressure. Note any tendency to snatch, pull or drag, and any undue delay in application or release.

Allow the vehicle to coast and note any tendency to pull to one side, or evidence that the brakes are binding.

After stopping the vehicle (not immediately after a period of heavy braking), carefully check the brake temperature. A disc which feels hot, or appreciably hotter than the others, indicates that the brake is binding.

After completion of the test, check for:

- Oil, coolant, hydraulic, air and fuel leaks
- Abnormal temperature of any moving components or assemblies, e.g. wheel hubs, transmission, axle etc., which might indicate over tightness or lack of lubrication

Solvents, Sealants and Adhesives



WARNING: Always handle all solvents, sealers and adhesives with extreme care. Some contain chemicals or give off fumes which can be dangerous to health. Always follow the manufacturers instructions. If in doubt about any substance, particularly a solvent, DO NOT use it.



CAUTION: If in doubt about the suitability of any proprietary solvent or sealer for a particular application, contact the manufacturer of the product for information regarding storage, handling and application.

The Solvents, Sealers and Adhesives subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken.

Adhesives and Sealers

Highly flammable, flammable, combustible – observe No Smoking policy.

Generally should be stored in No Smoking' areas. Cleanliness and tidiness in use should be observed e.g. disposable paper covering benches; should be dispensed from applicators where possible; containers, including secondary containers, should be labelled appropriately.

Solvent - based Adhesives/Sealers - See Solvents

Follow manufacturer's instructions.

Water - based Adhesives/Sealers

Those based on polymer emulsions and rubber latexes may contain small amounts of volatile toxic and harmful chemicals. Skin and eye contact should be avoided and adequate ventilation provided during use.

Hot Melt Adhesives

In the solid state, they are safe. In the molten state they may cause burns and health hazards may arise from the inhalation of toxic fumes.

Use appropriate protective clothing and a thermostatically controlled heater with a thermal cut - out and adequate extraction.

Resin - based Adhesives/Sealers e.g. Epoxide and Formaldehyde Resin - based

Mixing should be carried out in well ventilated areas, as harmful or toxic volatile chemicals may be released.

Skin contact with uncured resins and hardeners can result in irritation, dermatitis, and absorption of toxic or harmful chemicals through the skin. Splashes can damage the eyes.

Provide adequate ventilation and avoid skin and eye contact.

Anaerobic, Cyanoacrylate (Super - glues) and other Acrylic Adhesives

Many are irritant, sensitizing or harmful to the skin and/or respiratory tract. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturer's instructions followed.

Cyanoacrylate adhesives (super-glues) MUST NOT contact the skin or eyes. If skin or eye tissue is bonded, cover with a clean moist pad and seek immediate medical attention. Do not attempt to pull tissue apart. Use in well ventilated areas as vapors can cause irritation to the nose and eyes.

For two - pack systems see Resin - based and Isocyanate Adhesives/Sealers.

Isocyanate (Polyurethane) Adhesives/Sealers

See also Resin - based Adhesives

Individuals suffering from asthma or respiratory allergies should not work with or near these materials as sensitivity reactions can occur.

Over exposure is irritating to the eyes and respiratory system. Excessive concentrations may produce effects on the nervous system including drowsiness. In extreme cases, loss of consciousness may result. Long term exposure to vapor concentrations may result in adverse health effects.

Prolonged contact with the skin may lead to skin irritation and, in some cases, dermatitis.

Splashes entering the eye will cause discomfort and possible damage.

Any spraying should preferably be carried out in exhaust ventilated booths removing vapors and spray droplets from the breathing zone.

Wear appropriate gloves, eye and respiratory protection.

Standard Workshop Practices

Protecting the Vehicle

Always install covers to protect the fenders before commencing work in the engine compartment. Always install the interior protection kit, wear clean overalls and wash hands or wear gloves before working inside the vehicle. Avoid spilling hydraulic fluid, antifreeze or battery acid on the paintwork. In the event of spillage, wash off with water immediately. Use polythene sheets in the luggage compartment to protect carpets. Always use the recommended service tool, or a satisfactory equivalent, where specified. Protect temporarily exposed screw threads by replacing nuts or installing caps.

Vehicle in Workshop

When working on a vehicle in the workshop always make sure that:

- The parking brake is applied or the wheels are securely chocked to prevent the vehicle moving forwards or backwards
- If the engine is to be run, there is adequate ventilation, or an extraction hose to remove exhaust fumes is installed
- There is adequate room to jack up the vehicle and remove the wheels, if necessary
- Fender covers are always installed if any work is to be carried out in the engine compartment
- The battery is disconnected if working on the engine, underneath the vehicle, or if the vehicle is jacked up



CAUTION: When electric arc welding on a vehicle, always disconnect the generator wiring to prevent the possibility of a surge of current causing damage to the internal components of the generator.

- If using welding equipment on the vehicle, ensure a suitable fire extinguisher is readily available.

100-01 : Identification codes

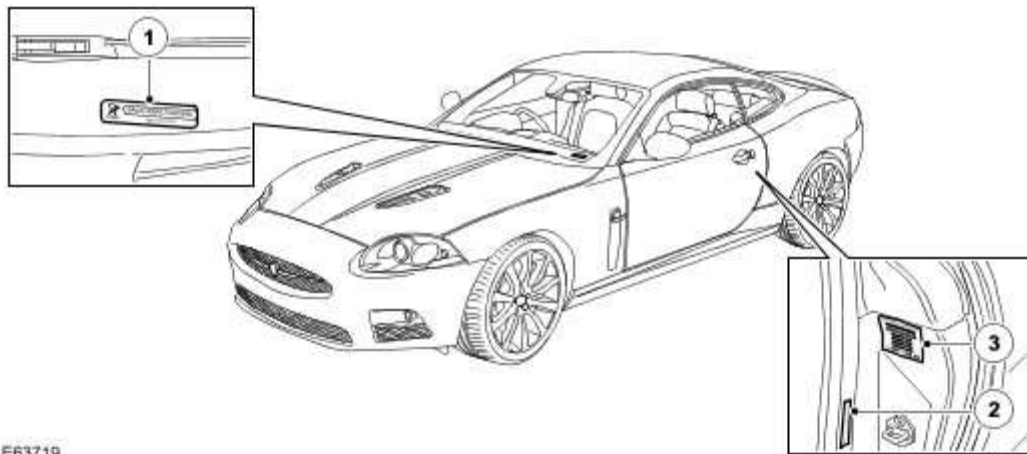
Description and operation

Identification Codes - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

Vehicle Identification Number (VIN)

The official VIN for title and registration purposes is stamped on a metal plate and fastened to the instrument panel. It is positioned close on the left-hand side of the vehicle and is visible from the outside.

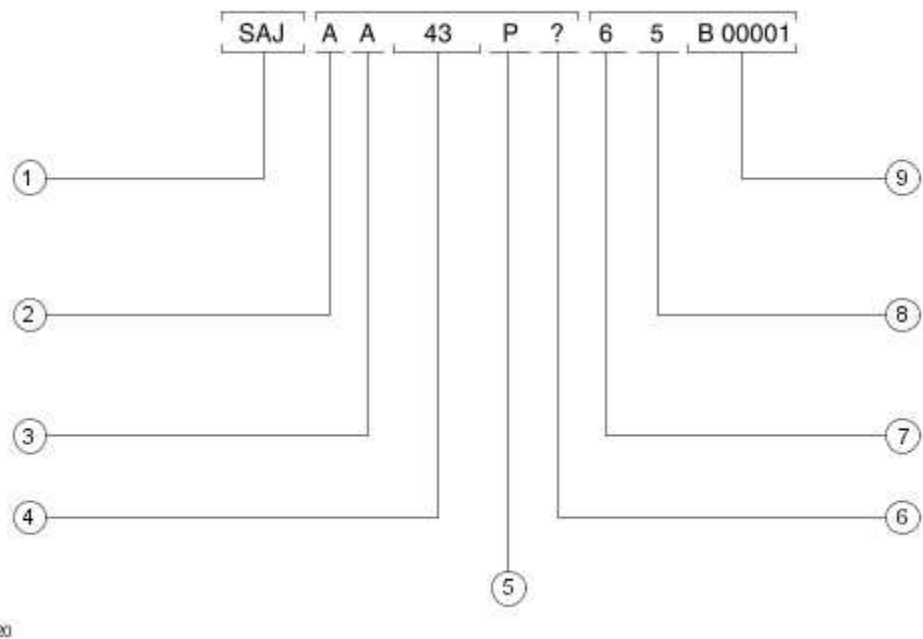
The vehicle identification number is also located on the vehicle certification label.



E63719

Item	Description
1	VIN plate
2	Bar code label (America)
3	Vehicle certification label (Europe/rest of world shown)

Vehicle Identification Number (Typical)



Item 1 - World Manufacturer Identifier

Codes	Manufacturer	Make	Type
SAJ	Jaguar Cars Limited, England	Jaguar	Passenger Car

Item 2 - Market, Air Bag Specification

VIN code	Description
A	Rest of the world with four air bags
D	USA with four air bags
F	Canada with four air bags
K	Japan with four air bags
P	Mexico with four air bags

Item 3 - Transmission, Steering Code

VIN Code	Description
A	Automatic LHS
C	Automatic RHS

Item 4 - Body Code

VIN Code	Description
43	X150 2 door Coupe
44	X150 2 door Convertible

Item 5 - Engine Emission System

VIN Code	Description
B	4.2L Naturally aspirated ULEV II
F	4.2L Naturally aspirated Stage 2
K	4.2L Naturally aspirated Stage 3
P	4.2L Naturally aspirated stage 4
U	4.2L Naturally aspirated Stage 2 (91 RON)
X	4.2L Naturally aspirated Stage 2 (E22 RON)

Item 6 - Check Digit

VIN Code	Description
0 - 9 or X	Calculated in accordance with American standard CFR part 565

Item 7 - Model Year

VIN Code	Description
6	2006 model year
7	2007 model year
8	2008 model year

Item 8 - Assembly Plant and Model Line

VIN Code	Description
5	Castle Bromwich 4.2L

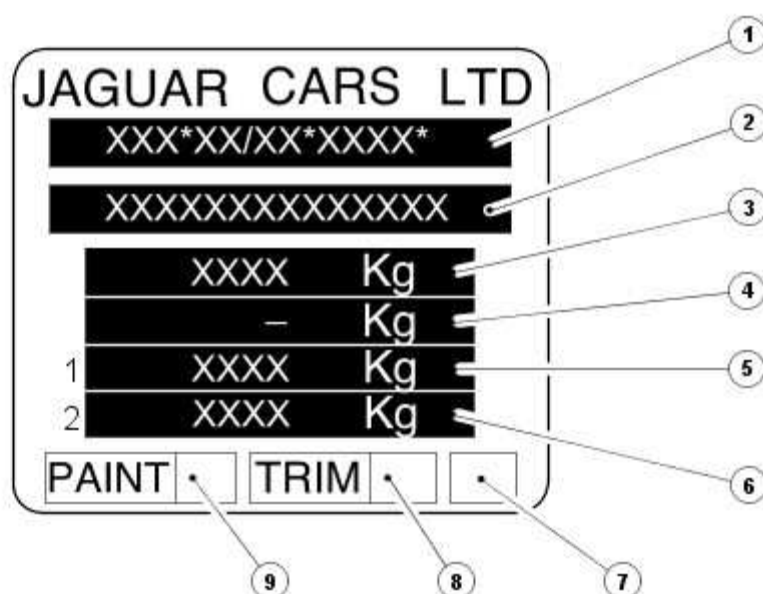
Item 9 - Production Sequence Number

Sequence Number
B00001 - B99999

Vehicle Certification Label

The vehicle certification label also contains the 17 character vehicle identification number.

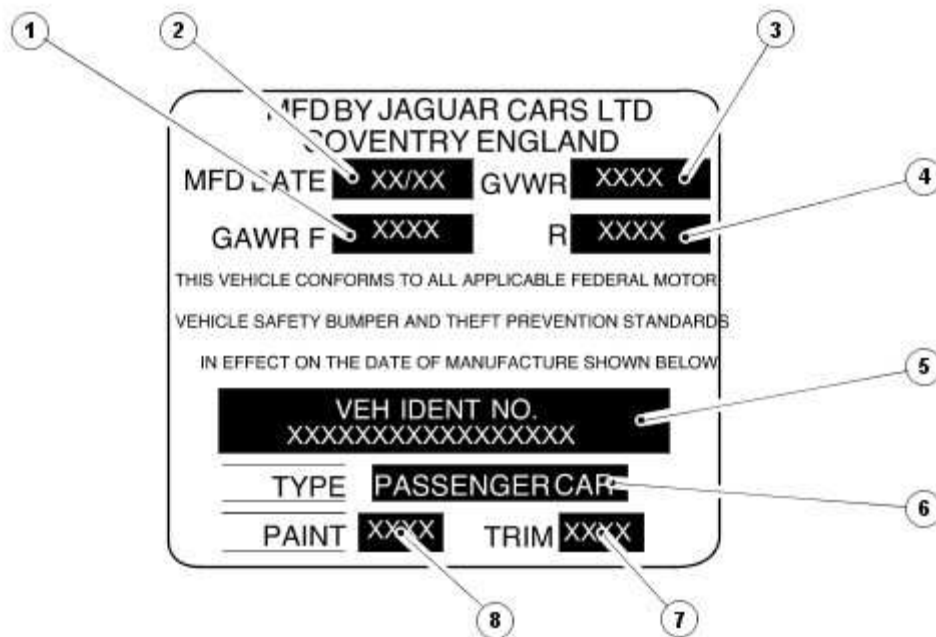
Vehicle Certification Label (Europe and Rest of the world)



E36533

Item	Description
1	Whole Vehicle Type Approval (WVTA) number printed here when applicable
2	Vehicle identification number
3	Gross vehicle weight
4	Gross train weight
5	Maximum permitted front axle loading
6	Maximum permitted rear axle loading
7	Date of manufacture
8	Interior trim code
9	Paint code

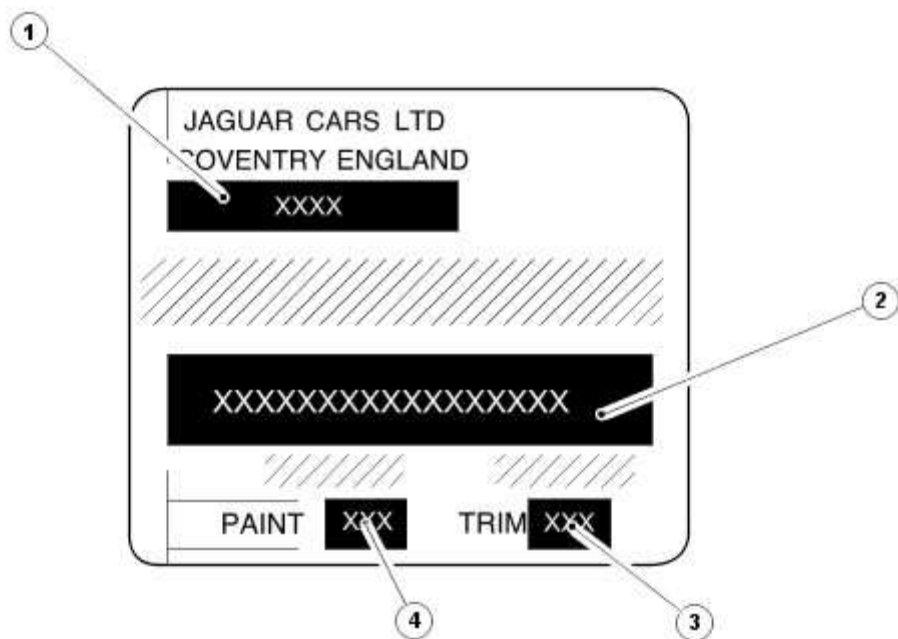
Vehicle Certification Label (North America)



E36534

Item	Description
1	Maximum permitted front axle loading
2	Date of manufacture
3	Maximum permitted rear axle loading
4	Gross vehicle weight
5	Vehicle identification number
6	Type
7	Interior trim code
8	Paint code

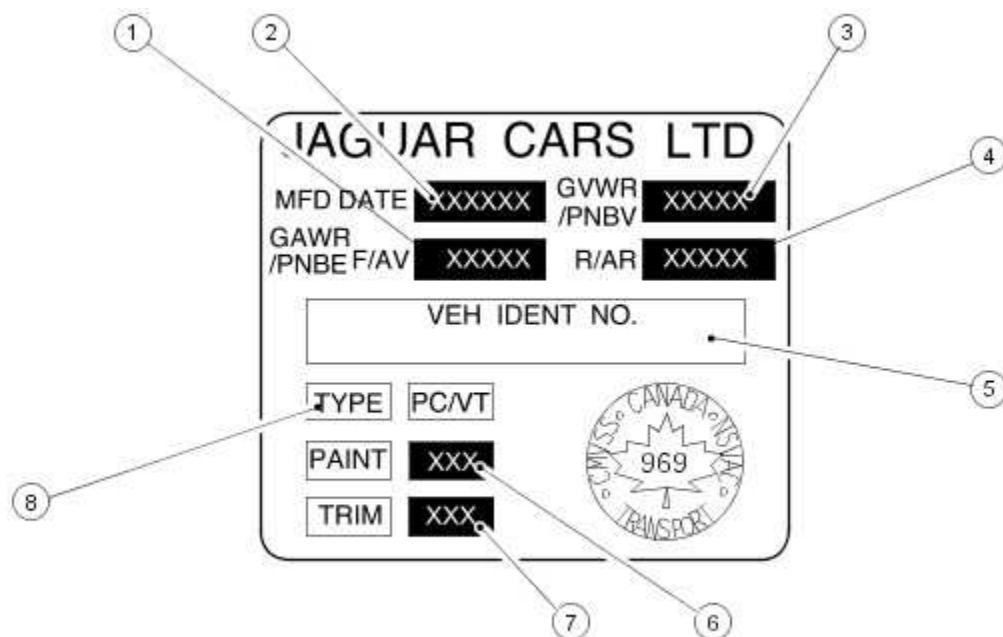
Vehicle Certification Label (Saudi Arabia and Gulf States)



E36535

Item	Description
1	Date of manufacture
2	Vehicle identification number
3	Interior trim code
4	Paint code

Vehicle Certification Label (Canada)



E36536

Item	Description
1	Maximum permitted front axle loading
2	Date of manufacture
3	Maximum permitted rear axle loading
4	Gross vehicle weight
5	Vehicle identification number
6	Paint code
7	Interior trim code
8	Type

Automatic Transmission Number

The serial number of the transmission unit is etched into the transmission casing.

Engine Number

The engine serial number is stamped on an engine web on the left-hand side of the cylinder block behind the engine mounting.

100-02 : Jacking and Lifting

Description and operation

Jacking

Safety Precautions



WARNING: The jack provided with the vehicle is intended to be used in an emergency for changing a deflated tire. To avoid damage to the vehicle, never use the jack to raise the vehicle for any other purpose. Refer to the Driver Handbook when using the jack supplied with the vehicle. Failure to follow these instructions may result in personal injury.

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

- Never rely on a jack alone to support a vehicle. Always use suitable vehicle stands to provide rigid support.
- When working beneath a vehicle, whenever possible use a vehicle hoist instead of a jack and vehicle stands.
- Make sure that the vehicle is standing on firm, level ground before using a jack.
- Do not rely on the parking brake alone; chock the wheels and put the automatic transmission into Park if possible.
- Check that any lifting equipment used has adequate capacity for the load being lifted and is in correct working order.

Lifting

Lifting Points—Two-Post Lift



CAUTION: Do not allow the hoist adapters to contact the steering linkage, suspension arms, stabilizer bar, rear subframe stabilizer brackets or to compress the lower suspension arm stabilizer bar insulator. Damage to the suspension, exhaust and steering linkage components may occur if care is not exercised when positioning the hoist adapters of two-post lift prior to lifting the vehicle.



CAUTION: Never use the rear axle as a lift point. Damage to the rear axle seals and bushes may occur.



CAUTION: When using a two-post lift, a cushioned pad must be utilized to avoid body damage.

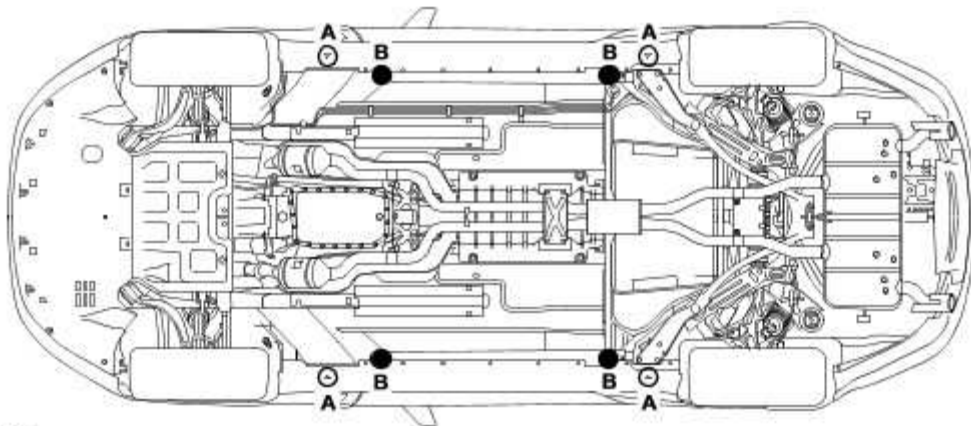
Lifting Points—Floor Jack and Axle Stands



CAUTION: When using a floor jack, a cushioned pad must be utilized to avoid body damage.



CAUTION: When using axle stands, a cushioned pad must be utilized to avoid damage to the body.



E64162

Item	Description
A	Jacking point
B	Axle stand positioning point

Vehicle Recovery

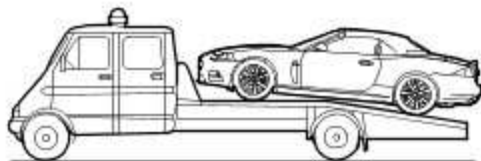
NOTE:

Prior to vehicle recovery, make sure the vehicle keys are available and the security system is disarmed.

Vehicle recovery methods are:

- By transporter or trailer
- Emergency towing

Transporter or Trailer Recovery



E64163

When the vehicle is being recovered by transporter or trailer:

- The parking brake must be applied and the wheels chocked
- The gear selector lever must be in Neutral. Do not select Park on automatic transmission vehicles, as the park lock mechanism may be damaged by the forward and backward rocking motion of the vehicle
- The vehicle must be securely tied down to the transporter or trailer

Emergency Towing



WARNING: If the engine is not running, the steering will become heavy and the force necessary to effectively apply the brakes will be greatly increased.



CAUTION: A vehicle with a defective transmission must be recovered by transporter or trailer.

When the vehicle is being towed on its own wheels:

- Local regulations for the towing of vehicles must be adhered to. In some countries the registration number of the towing vehicle and an 'On Tow' sign or warning triangle must be displayed at the rear of the towed vehicle
- The gear selector lever must be in Neutral
- The ignition switch must be in position II to release the steering lock and to allow for the operation of the direction indicators, horn and stop lamps
- A distance of 0,8 km (0.5 mile) must not be exceeded
- A speed of 48 km/h (30 mph) must not be exceeded
- The tow rope must be attached to the front towing

100-04 : Noise, Vibrations and Harshness

Description and operation

Noise, Vibration and Harshness (NVH)

Noise, vibration and harshness (NVH) is becoming more important as vehicles become more sophisticated and passenger comfort levels increase. This section is designed to aid in the diagnosis, testing and repair of NVH concerns.

- Noise is defined as sounds not associated with the operation of passenger compartment equipment that interface with customer satisfaction.
- Vibration is defined as impulses felt by the customer that are not caused by road surface changes.
- Harshness is a ride quality issue where the customer feels that the vehicle response to the road surface is sharply transmitted to the customer.

Diagnostic Theory

Diagnosis is more than just following a series of interrelated steps in order to find the solution to the specific condition. It is a way of looking at systems that are not functioning the way they should and finding out why. Also it is knowing how the system should work and whether it is working correctly.

There are basic rules for diagnosis. If these rules are followed, the cause of the condition is usually found the first time through the system.

Know the System

- Know how the parts go together.
- Know how the system operates as well as its limits and what happens when the system goes wrong.
- Sometimes this means checking the system against one that is known to be working correctly.

Know the History of the System

A clue in any one of these areas may save time:

- How old or new is the system?
- What kind of treatment has it had?
- Has it been repaired in the past in such a manner that might relate to the present condition?
- What is the repair history?

Know the History of the Condition

- Did it start suddenly or appear gradually?
- Was it related to some other occurrence such as a collision or previous part renewal?
- Know how the condition made itself known; it may be an important clue to the cause.

Know the Probability of Certain Conditions Developing

- Look for the simple rather than the complex.
- For example: Electrical conditions usually occur at connections rather than components. An engine no-start is more likely to be caused by a loose wire or small adjustment rather than a sheared-off camshaft.
 - Electrical conditions usually occur at connections rather than components.
 - An engine no-start is more likely to be caused by a loose wire or small adjustment rather than a sheared-off camshaft.
- Know the difference between impossible and improbable. Certain failures in a system can be improbable but still happen.
- New parts are just that, new. It does not mean they are always good functioning parts.

Do Not Cure the Symptom and Leave the Cause

Lowering the pressure in a front tire may correct the condition of a vehicle leaning to one side, but it does not correct the original condition.

Be Positive the Cause is Found

- Double check the findings.
- What caused a worn component?
- A loose transmission or engine mount could indicate that other mounts are also loose.

Diagnostic Charts

Charts are a simple way of expressing the relationship between basic logic and a physical system of components. They help discover the cause of a condition in the least time. Diagnostic charts combine many areas of diagnosis into one visual display:

- probability of certain things occurring in a system
- speed of checking certain components or functions before others
- simplicity of carrying out certain tests before others
- elimination of checking huge portions of a system by carrying out simple tests
- certainty of narrowing down the search to a small portion before carrying out in-depth testing

The fastest way to find a condition is to work with the tools that are available. This means working with proven diagnostic charts and the correct special equipment for the system.

Noise, Vibration and Harshness (NVH)

Principle of Operation

For a detailed description of Noise, Vibration and Harshness issues, refer to the Description and Operation section of the workshop manual.

Noise, Vibration and Harshness (NVH)

Inspection and Verification

- 1 . Verify the customer's concerns by operating the vehicle to duplicate the condition.
- 2 . Visually inspect the vehicle to determine any obvious cause(s) of the concern(s).
- 3 . If the inspection reveals obvious causes that can be readily identified, repair as necessary.
- 4 . If the concern(s) remains after the inspection, determine the symptom(s) and refer to the Symptom Chart.

How To Use This Diagnostic Procedure Section

- Noise, vibration and harshness (NVH) concerns have become more important as vehicles have become more sensitive to these vibrations. This section is designed as an aid to identifying these situations
- The section provides diagnostic procedures based on symptoms. If the condition occurs at high speed, for instance, the most likely place to start is under High Speed Shake
- The road test procedure will tell how to sort the conditions into categories and how to tell a vibration from a shake
- A series of Road Test Quick Checks is provided to make sure that a cause is either pinpointed or eliminated
- Name the condition, proceed to the appropriate section and locate the correct diagnosis. When the condition is identified, the job is partly done
- Follow the diagnostic procedure as outlined
- Quick Checks are described within the step, while more involved tests and adjustments are outlined in General Procedures
- Always follow each step exactly and make notes to recall important findings later

Customer Interview

The road test and customer interview (if available) provide information that will help identify the concerns and will provide direction to the correct starting point for diagnosis.

Identify the Condition

NVH problems usually occur in a number of areas:

- tires
- engine accessories
- suspension
- driveline
- air leakage (wind noise)
- squeaks and rattles
- heating ventilation and air conditioning (HVAC)
- electrical (e.g. motor noise)
- transmission
- engine

It is important, therefore, that an NVH concern be isolated into its specific area(s) as soon as possible. The easiest and quickest way to do this is to carry out the Road Test as outlined.

Noise Diagnostic Procedure

Non-Axle Noise

The five most important sources of non-axle noise are exhaust, tires, roof racks, trim and mouldings, and transmission.

Therefore, make sure that none of the following conditions are the cause of the noise before proceeding with a driveline tear down and diagnosis.

- Under certain conditions, the pitch of the exhaust may sound very much like gear noise. At other times, it can be mistaken for a wheel bearing rumble
- Tires, especially snow tires, can have a high pitched tread whine or roar, similar to gear noise. Radial tires, to some degree, have this characteristic. Also, any non-standard tire with an unusual tread construction may emit a roar or whine type noise
- Trim and mouldings can also cause whistling or a whining noise
- Clunk may be a metallic noise heard when the automatic transmission is engaged in reverse or drive, or it may occur when the throttle is applied or released. It is caused by backlash somewhere in the driveline
- Bearing rumble sounds like marbles being tumbled. This condition is usually caused by a damaged wheel bearing

Noise Conditions

- Gear noise is typically a howling or whining due to gear damage or incorrect bearing preload. It can occur at various speeds and driving conditions, or it can be continuous
- Chuckle is a particular rattling noise that sounds like a stick against the spokes of a spinning bicycle wheel. It occurs while decelerating from approximately 64 km/h (40 miles/h) and can usually be heard all the way to a stop. The frequency varies with vehicle speed

- Knock is very similar to chuckle, though it may be louder and occurs on acceleration or deceleration. The tear down will disclose what has to be corrected

Check and rule out tires, exhaust and trim items before disassembling the transmission to diagnose and correct gear noise.

The noises described under Road Test usually have specific causes that can be diagnosed by observation as the unit is disassembled. The initial clues are the type of noise heard on the road test and the driving conditions.

Vibration Conditions

NOTE:

New Constant Velocity (CV) joints should not be installed unless disassembly and inspection revealed unusual wear.

Clicking, popping or grinding noises may be caused by the following:

- Cut or damaged CV joint boots resulting in inadequate or contaminated lubricant in the outboard or inboard CV joint bearing housings
- Loose CV joint boot clamps
- Another component contacting the rear drive half shaft
- Worn, damaged or incorrectly installed wheel bearing, suspension or brake component

Vibration at highway speeds may be caused by the following:

- Out-of-balance front or rear wheels
- Out-of-round tires
- Driveline imbalance
- Driveline run-out (alignment)

NOTE:

Rear drive half shafts are not balanced and are not likely to contribute to rotational vibration disturbance.

Shudder or vibration during acceleration (including from rest) may be caused by the following:

- Driveline alignment
- Excessively worn or damaged outboard or inboard CV joint bearing housing
- Excessively high CV joint operating angles caused by incorrect ride height. Check ride height, verify correct spring rate and check items under Inoperative Conditions
- Excessively worn driveshaft components

Leakage Conditions

- 1 . Inspect the CV joint boots for evidence of cracks, tears or splits.
- 2 . Inspect the underbody for any indication of grease splatter in the vicinity of the rear drive half shaft, outboard and inboard CV joint boot locations, which is an indication of CV joint boot or CV joint boot clamp damage.
- 3 . Inspect the inboard CV joint bearing housing seal for leakage.

Inoperative Conditions

If a CV joint or rear drive half shaft pull-out occurs, check the following:

- suspension components for correct location, damage or wear
- bushings for wear
- subframe for damage
- bent or worn components Stabilizer bar link Left-hand rear suspension lower arm and bushing Right-hand rear suspension lower arm and bushing Rear wheel hub and rear drive half shaft

Road Test

A gear-driven unit will produce a certain amount of noise. Some noise is acceptable and may be audible at certain speeds or under various driving conditions as on a newly paved blacktop road. The slight noise is in no way detrimental and must be considered normal.

The road test and customer interview (if available) provide information needed to identify the condition and give direction to the correct starting point for diagnosis.

- 1 . Make notes throughout the diagnosis routine. Make sure to write down even the smallest piece of information, because it may turn out to be the most important.
- 2 . Do not touch anything until a road test and a thorough visual inspection of the vehicle have been carried out. Leave the tire pressures and vehicle load just where they were when the condition was first observed. Adjusting tire pressures, vehicle load or making other adjustments may reduce the conditions intensity to a point where it cannot be identified clearly. It may also inject something new into the system, preventing correct diagnosis.
- 3 . Make a visual inspection as part of the preliminary diagnosis routine, writing down anything that does not look right. Note tire pressures, but do not adjust them yet. Note leaking fluids, loose nuts and bolts, or bright spots where components may be rubbing against each other. Check the luggage compartment for unusual loads.
- 4 . Road test the vehicle and define the condition by reproducing it several times during the road

test.

5 . Carry out the Road Test Quick Checks as soon as the condition is reproduced. This will identify the correct diagnostic procedure. Carry out the Road Test Quick Checks more than once to verify they are providing a valid result. Remember, the Road Test Quick Checks may not tell where the concern is, but they will tell where it is not.

Road Test Quick Checks

1 . 24-80 km/h (15-50 miles/h): With light acceleration, a moaning noise is heard and possibly a vibration is felt in the front floor pan. It is usually worse at a particular engine speed and at a particular throttle setting during acceleration at that speed. It may also produce a moaning sound, depending on what component is causing it. Refer to Tip-In Moan in the Symptom Chart.

2 . Acceleration/deceleration: With slow acceleration and deceleration, a shake is sometimes noticed in the steering wheel/column, seats, front floor pan, front door trim panel or front end sheet metal. It is a low frequency vibration (around 9-15 cycles per second). It may or may not be increased by applying brakes lightly. Refer to Idle Boom/Shake/Vibration in the Symptom Chart.

3 . High speed: A vibration is felt in the front floor pan or seats with no visible shake, but with an accompanying sound or rumble, buzz, hum, drone or booming noise. Coast with the clutch pedal depressed or shift control selector lever in neutral and engine idling. If vibration is still evident, it may be related to wheels, tires, front brake discs, wheel hubs or front wheel bearings. Refer to High Speed Shake in the Symptom Chart.

4 . Engine rpm sensitive: A vibration is felt whenever the engine reaches a particular rpm. It will disappear in neutral coasts. The vibration can be duplicated by operating the engine at the problem rpm while the vehicle is stationary. It can be caused by any component, from the accessory drive belt to the torque converter which turns at engine speed when the vehicle is stopped. Refer to High Speed Shake in the Symptom Chart.

5 . Noise/vibration while turning: Clicking, popping, or grinding noises may be due to a worn, damaged, or incorrectly installed front wheel bearing, rear drive half shaft or CV joint.

6 . Noise/vibration that is road speed relative: This noise/vibration can be diagnosed independent of engine speed or gear selected (engine speed varies but torque and road speed remain constant). The cause may be a rear drive axle/differential whine.

Road Conditions

An experienced technician will always establish a route that will be used for all NVH diagnosis road tests. The road selected should be reasonably smooth, level and free of undulations (unless a particular condition needs to be identified). A smooth asphalt road that allows driving over a range of speeds is best. Gravel or bumpy roads are unsuitable because of the additional road noise produced. Once the route is established and consistently used, the road noise variable is eliminated from the

test results.

NOTE:

Some concerns may be apparent only on smooth asphalt roads.

If a customer complains of a noise or vibration on a particular road and only on a particular road, the source of the concern may be the road surface. If possible, try to test the vehicle on the same type of road.

Vehicle Preparation

Carry out a thorough visual inspection of the vehicle before carrying out the road test. Note anything which is unusual. Do not repair or adjust any condition until the road test is carried out, unless the vehicle is inoperative or the condition could pose a hazard to the technician.

After verifying the condition has been corrected, make sure all components removed have been installed.

Lift Test

After a road test, it is sometimes useful to do a similar test on a lift.

When carrying out the high-speed shake diagnosis or engine accessory vibration diagnosis on a lift, observe the following precautions:



WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (35 miles/h) indicated on the speedometer since actual wheel speed will be twice that indicated on the speedometer. Speed exceeding 55 km/h (35 miles/h) or allowing the drive wheel to hang unsupported could result in tire disintegration, differential failure, constant velocity joint and drive half shaft failure, which could cause serious personal injury and extensive vehicle damage. Failure to follow these instructions may result in personal injury.



CAUTION: The suspension should not be allowed to hang free. When the CV joint is run at a very high angle, extra

vibration as well as damage to the seals and joints can occur.

The rear suspension lower arm should be supported as far outboard as possible. To bring the vehicle to its correct ride height, the full weight of the vehicle should be supported in the rear by floor jacks.

Jacking

Lifting

1 . Raise and support the vehicle.

Jacking

Lifting

2 . Explore the speed range of interest using the Road Test Quick Checks as previously described.

3 . Carry out a coast down in neutral. If the vehicle is free of vibration when operating at a steady indicated speed and behaves very differently in drive and coast, a transmission concern is likely.

Note, however, that a test on the lift may produce different vibrations and noises than a road test because of the effect of the lift. It is not unusual to find vibrations on the lift that were not found in the road test. If the condition found on the road can be duplicated on the lift, carrying out experiments on the lift may save a great deal of time.

Exhaust Neutralization Procedure

1 . Raise vehicle on lift and slacken all exhaust fixings.

2 . With all fixings loose, neutralize the exhaust system.

3 . Tighten all fixings to correct torque, starting at the rear-most point working towards the front of the vehicle.

Symptom Chart

High-speed shake

Possible Source(s):

- Wheel end vibration
- Engine/transmission
- Driveline

Action(s) to take:

- GO to Pinpoint Test G543314p1.

Tip-in moan**Possible Source(s):**

- Air cleaner
- Power steering
- Powertrain
- Engine mounts
- Exhaust system

Action(s) to take:

- GO to Pinpoint Test G543314p2.

Idle boom/shake/vibration, or shudder**Possible Source(s):**

- Cable(s)/hoses(s)
- Intake air distribution and filtering system
- Engine mounts
- Exhaust system
- Belt/pulleys

Action(s) to take:

- GO to Pinpoint Test G543314p3.

Wheel end vibration analysis

Possible Source(s):

- Suspension/rear drive halfshaft and CV joints
- Tires/wheels
- Wheel bearings
- CV joint boots

Action(s) to take:

- GO to Pinpoint Test G543314p4.

Non-axle noise

Possible Source(s):

- Trim/mouldings
- A/C system
- Accessories

Action(s) to take:

- GO to Pinpoint Test G543314p5.

Pinpoint Tests

NOTE:

These Pinpoint Tests are designed to take the technician through a step-by-step diagnosis procedure to determine the cause of a condition. It may not always be necessary to follow the chart to its conclusion. Carry out only the Pinpoint Test steps necessary to correct the condition. Then check operation of the system to

make sure the condition is corrected.

After verifying that the condition has been corrected, make sure all components removed have been installed.

PINPOINT TEST G543314p1 : HIGH-SPEED SHAKE

G543314t1 : NEUTRAL COAST

1. Carry out the neutral coast test.

- **Does the vibration disappear during the neutral coast test?**

-> **Yes**

CHECK and INSTALL new engine/transmission mounts as necessary. REPEAT Road Test as outlined.

-> **No**

GO to Pinpoint Test G543314t9.

PINPOINT TEST G543314p2 : TIP-IN MOAN

G543314t2 : CHECK THE AIR CLEANER

1. Check the air cleaner.

Check the air cleaner, inlet tube, outlet tube, resonators and all other components associated with the air induction system for correct installation and tightness of all connections.

- **Are the components OK?**

-> **Yes**

GO to Pinpoint Test G543314t3.

-> **No**

CORRECT the condition. REPEAT the Road Test as outlined.

G543314t3 : CHECK THE EXHAUST SYSTEM

1. Carry out the exhaust system neutralizing procedure in this section.

- **Is the exhaust system OK?**

-> **Yes**

GO to Pinpoint Test G543314t4.

-> **No**

REPAIR as necessary. RESTORE vehicle. REPEAT the Road Test as outlined.

G543314t4 : CHECK THE POWER STEERING

1. Remove the auxiliary drive belt and test for tip-in moan.

- **Is the tip-in moan OK?**

-> **Yes**

REPAIR the power steering as necessary. For additional information, refer to Power Steering

-> **No**

CHECK and INSTALL new engine/transmission mounts as necessary. REPEAT Road Test as outlined.

PINPOINT TEST G543314p3 : IDLE BOOM/SHAKE/VIBRATION/SHUDDER

G543314t5 : CHECK CABLE/HOSES

1. Check the engine compartment for any component that may be grounding between the engine and body or chassis. Example: air conditioning (A/C) hoses.

- **Are the components OK?**

-> **Yes**

GO to Pinpoint Test G543314t16.

-> **No**

CORRECT the condition. REPEAT the Road Test as outlined.

G543314t16 : CHECK INTAKE AIR DISTRIBUTION AND FILTERING SYSTEM

1. Check the intake air distribution and filtering system for loose/damaged components (primarily upstream of the Mass Air Flow (MAF) sensor).

- **Are the components OK?**

-> **Yes**

GO to Pinpoint Test G543314t6.

-> **No**

CORRECT the condition. REPEAT the road test as outlined.

G543314t6 : CHECK THE STEERING WHEEL DAMPER

1. Remove the driver air bag module and visually inspect the steering wheel damper for correct installation or any touch condition.

- **Is the damper OK?**

-> **Yes**

GO to Pinpoint Test G543314t7.

-> **No**

CORRECT the condition. REPEAT the Road Test as outlined.

G543314t7 : CHECK THE COOLING RADIATOR

1. Check the engine cooling radiator mountings and bushings for security and condition. Check the radiator installation for any component that may have a touch condition.

- **Are the installation and bushings OK?**

-> **Yes**

GO to Pinpoint Test G543314t8.

-> **No**

CORRECT the condition. REPEAT the Road Test as outlined.

G543314t8 : CHECK THE EXHAUST SYSTEM

1. Carry out the exhaust system neutralizing procedure in this section.

- **Is the exhaust system OK?**

-> **Yes**

CHECK and INSTALL new engine/transmission mounts as necessary. REPEAT Road Test as outlined.

-> **No**

REPAIR as necessary. REPEAT Road Test.

PINPOINT TEST G543314p4 : WHEEL END VIBRATION ANALYSIS

G543314t9 : INSPECT THE TIRES

1. Inspect the tires.

Raise and support the vehicle.

Lifting

Inspect the tires for:

Correct tire pressures

Correct tire size

Tire/wheel compatibility

Wear or damage

Tire beads correctly seated

- **Are the tires OK?**

-> **Yes**

GO to Pinpoint Test G543314t10.

-> **No**

REPAIR as necessary. REPEAT the Road Test as outlined.

G543314t10 : INSPECT WHEEL BEARINGS

1. Inspect the wheel bearings.

- **Are the wheel bearings OK?**

-> **Yes**

GO to Pinpoint Test G543314t11.

-> **No**

REPAIR as necessary. REPEAT the Road Test as outlined.

G543314t11 : INSPECT THE CONSTANT VELOCITY (CV) JOINT BOOTS

1. Inspect the CV joint boots.

Inspect for evidence of cracks, tears, splits or splattered grease

- **Are the CV joint boots OK?**

-> **Yes**

GO to Pinpoint Test G543314t12.

-> **No**

REPAIR as necessary. REPEAT the Road Test as outlined.

G543314t12 : INSPECT WHEEL AND TIRE RUNOUT

1. Inspect the wheel and tire runout.

- **Is the wheel and tire runout OK?**

-> **Yes**

Balance the wheels and tires. Refer to the wheel balance equipment manufacturers instructions.

-> **No**

REPAIR as necessary.

REPEAT the Road Test as outlined.

PINPOINT TEST G543314p5 : NON-AXLE NOISE

G543314t13 : INSPECT VEHICLE TRIM

1. Check the grille and trim mouldings to see if they are the source of the noise.

- **Are the vehicle trim components causing the noise?**

-> **Yes**

INSTALL new trim or REPAIR as necessary.

-> **No**

GO to Pinpoint Test G543314t14.

G543314t14 : CHECK THE A/C SYSTEM FOR NOISE

1. Check the A/C system components for noise by turning the A/C system on and off.

- **Is the A/C system causing the noise?**

-> **Yes**

Diagnose the A/C system.

Climate Control System

-> **No**

GO to Pinpoint Test G543314t15.

G543314t15 : CHECK NON-FACTORY ACCESSORIES

1. Inspect any accessories for being the source of the noise. Example: grounding body-to-frame, antennas, visors, bug deflectors and fog lights.

- **Are the accessories the cause of the noise?**

-> **Yes**

ADJUST, REPAIR or INSTALL new accessories or fasteners as required.

-> **No**

Verify the customer concern