

SECTION 100-00 General Information

VEHICLE APPLICATION:2008.50 Mondeo

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DESCRIPTION AND OPERATION

About This Manual

Introduction

This manual covers diagnosis and testing and repair procedures.

This manual is structured into groups and sections, with specific system sections collected together under their relevant group.

A group covers a specific portion of the vehicle. The manual is divided into five groups, General Information, Chassis, Powertrain, Electrical and Body and Paint. The number of the group is the first number of a section number.

Within Etis, the navigation tree will list the groups. After selecting a group the navigation tree will then list the sections within that group. Each section has a contents list detailing Specifications, Description and Operation, Diagnosis and Testing, General Procedures, Disassembly and Assembly, Removal and Installation.

If components need to be removed or disassembled in sequence, the sequence will be identified numerically in a graphic and the corresponding text will be numbered accordingly.

All left-hand and right-hand references to the vehicle are taken from a position sitting in the driver seat looking forward.

All left-hand and right-hand references to the engine are taken from a position at the flywheel looking towards the front camshaft pulley.

How to Use This Manual - Repair Procedures

This manual has been written in a format that is designed to meet the needs of technicians worldwide. The objective is to use common formats and include similar content in each manual.

This manual provides general descriptions for accomplishing diagnosis and testing and repair work with tested and effective techniques. Following them will help to ensure reliability.

Important Safety Instructions

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the

personal safety of the individual carrying out the work.

Anyone who departs from the instructions provided in this manual must first establish that personal safety or vehicle integrity is not compromised by the choice of method, tools or components.

Warnings, Cautions and Notes in This Manual

 **WARNING:** Warnings are used to indicate that failure to follow a procedure correctly may result in personal injury.

 **CAUTION:** Cautions are used to indicate that failure to follow a procedure correctly may result in damage to the vehicle or equipment being used.

NOTE: Notes are used to provide additional essential information required to carry out a complete and satisfactory repair.

Generic warnings or cautions are in their relevant description and operation procedure within section 100-00. If the generic warnings or cautions are required for a procedure, there will be a referral to the appropriate description and operation procedure.

If a warning, caution or note only applies to one step, it is placed at the beginning of the specific step.

Trustmark Authoring Standards (TAS) Removal and Installation Procedures

NOTE: TAS style procedures can be identified by steps that have no accompanying step text and the magenta color of the electrical connectors and fasteners such as nuts, bolts, clamps or clips.

A TAS removal and installation procedure uses a sequence of color illustrations to indicate the order to be followed when removing/disassembling or installing/assembling a component.

Many of the TAS procedures will have the installation information within the removal steps. These procedures will have the following note at the beginning of the procedure:

NOTE: Removal steps in this procedure may contain installation details.

DESCRIPTION AND OPERATION

Items such as O-ring seals, gaskets, seals, self-locking nuts and self-locking bolts are to be discarded and new components installed unless otherwise stated within the procedure. Coated nuts or bolts are to be reused, unless damaged or otherwise stated within the procedure.

Specification procedures will only contain technical data that are not already part of a repair procedure.

TAS Graphics

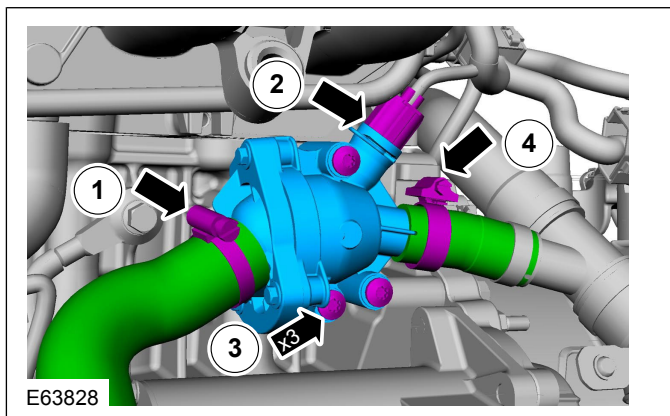
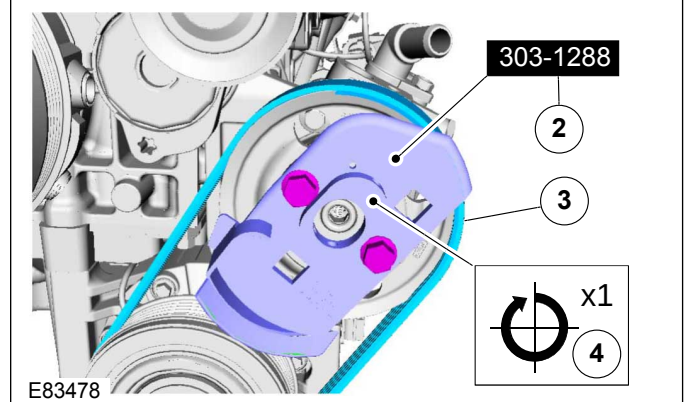
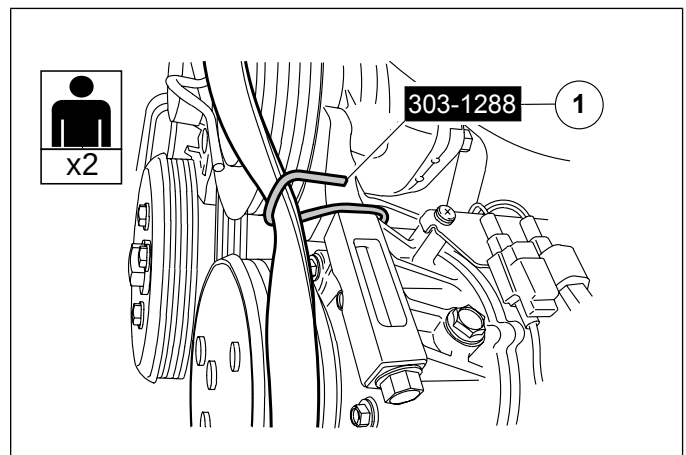
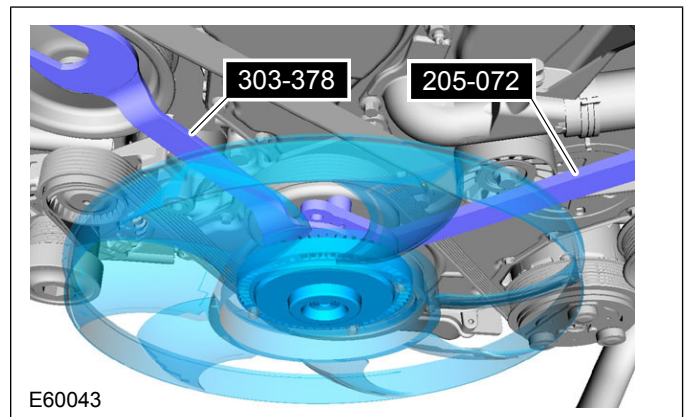
Colors used in the graphic are as follows:

- Blue - Component to be removed/installed or disassembled/assembled
- Green and Brown - Additional components that need to be removed/installed or disassembled/assembled prior to the target component
- Yellow - Component to be detached, attached or moved only and remains in the vehicle
- Magenta - Electrical connectors and fasteners such as nuts, bolts, clamps or clips
- Pale Blue - Special tool(s) and general equipment.

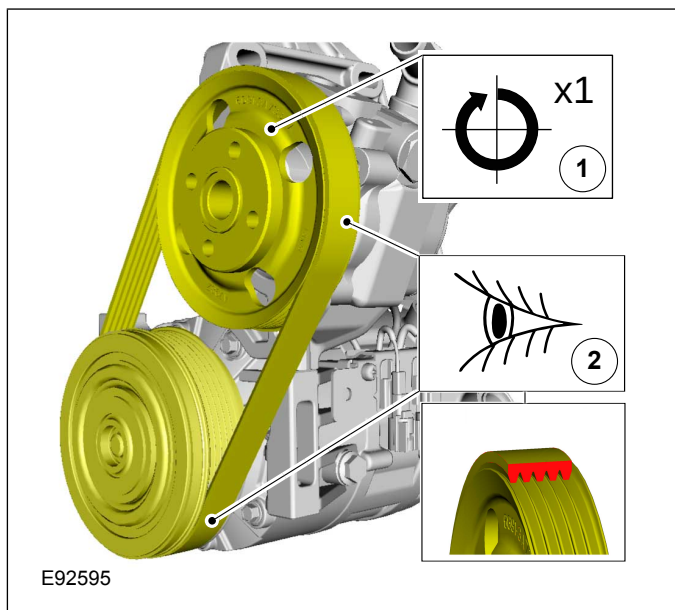
One illustration may have multiple steps assigned to it.

Numbered pointers are used to indicate the number of electrical connectors and fasteners such as nuts, bolts, clamps or clips.

Items in the illustration can be transparent or use cutouts to show hidden detail(s).



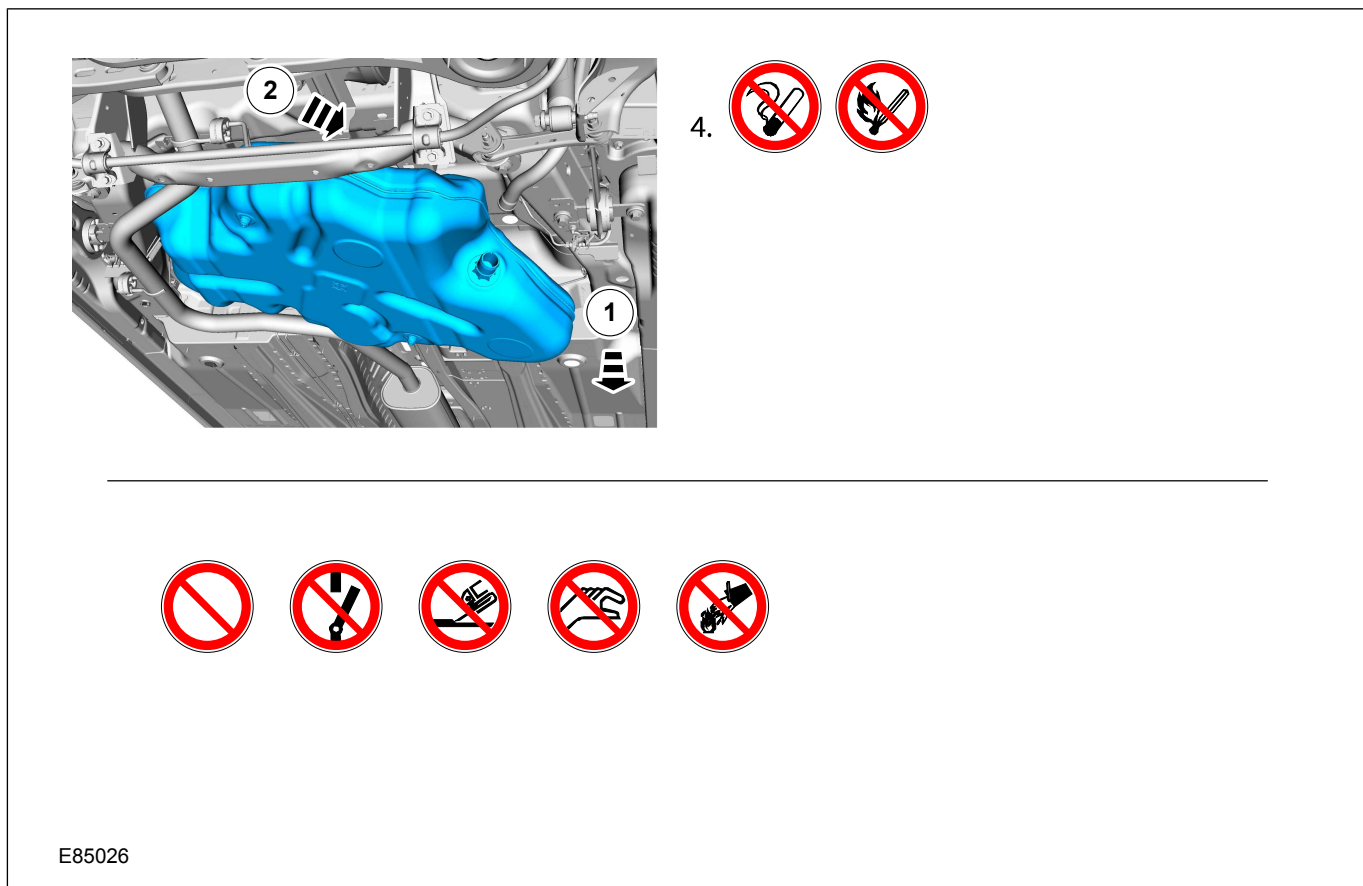
DESCRIPTION AND OPERATION



TAS Symbols

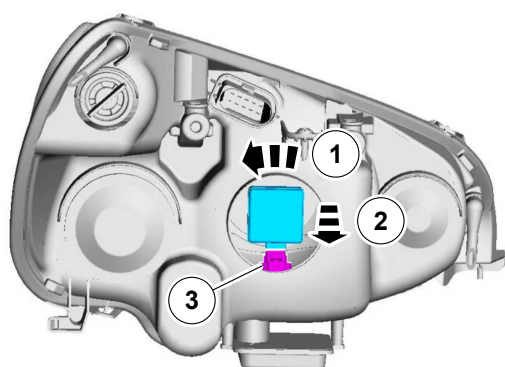
Symbols are used inside the graphics and in the text area to enhance the information display. The following paragraphs describe the various types and categories of symbols.

Prohibition symbols advise on prohibited actions to either avoid damage or health and safety related risks.



Health and Safety symbols recommend the use of particular protection equipment to avoid or at least reduce the risk or severity of possible injuries.

DESCRIPTION AND OPERATION

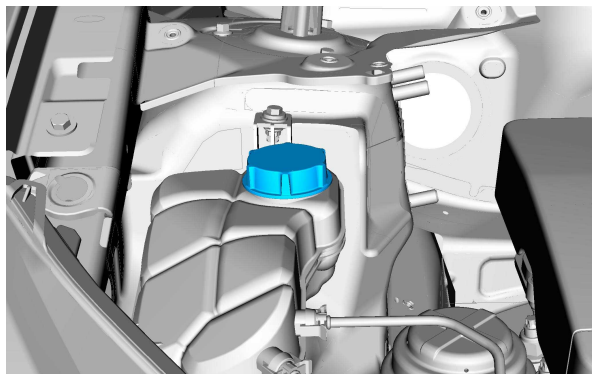


2.



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Warning symbols are used to indicate potential risks resulting from a certain component or area.



3.

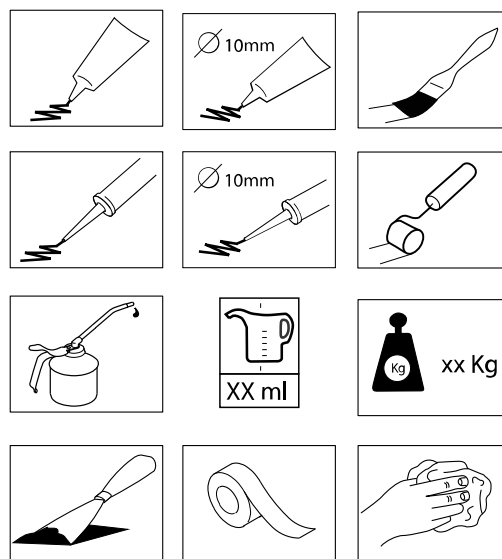
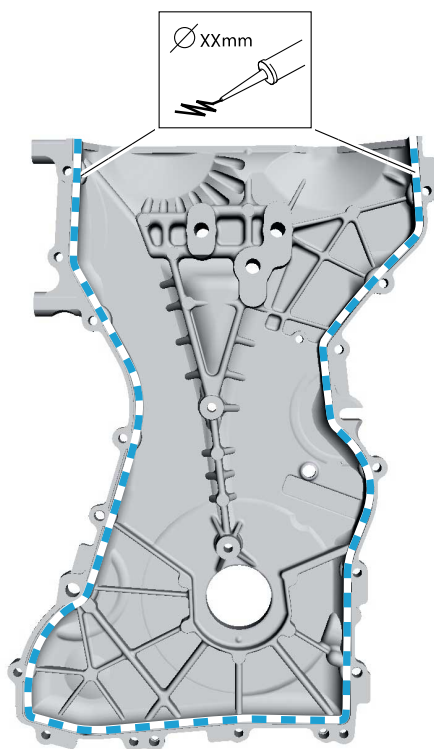


E85028

DESCRIPTION AND OPERATION

Instruction symbols are used to apply sealer, lubricant, weight, tape or cleaning detergent to a

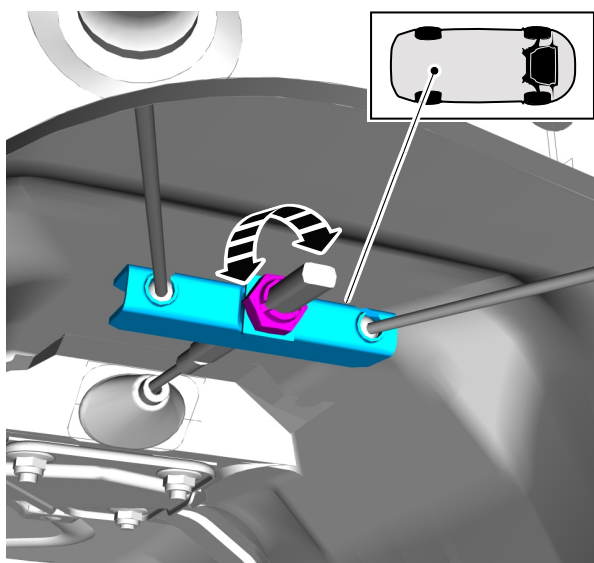
component.



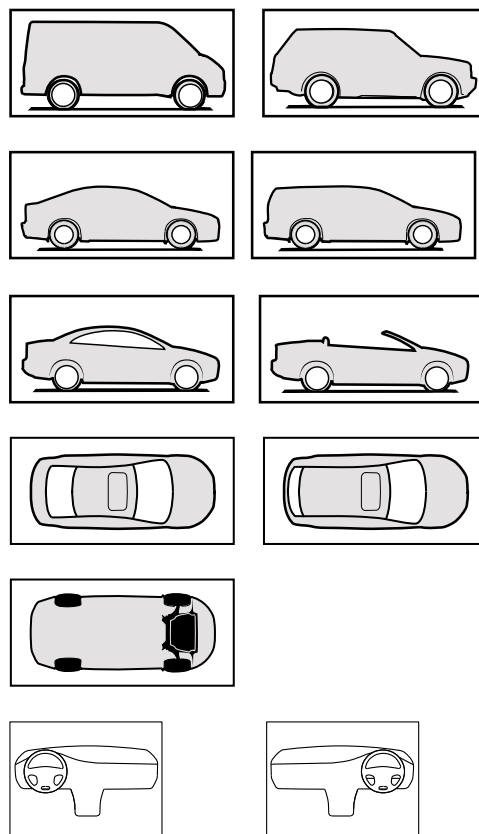
E84834

Location symbols are used to show the location of a component or system within the vehicle.

DESCRIPTION AND OPERATION

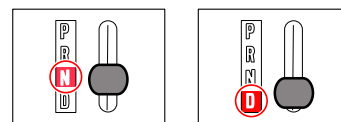
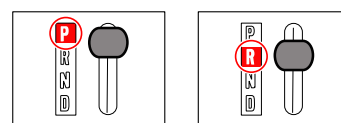
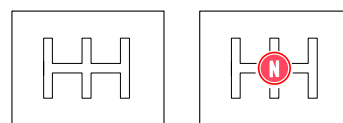
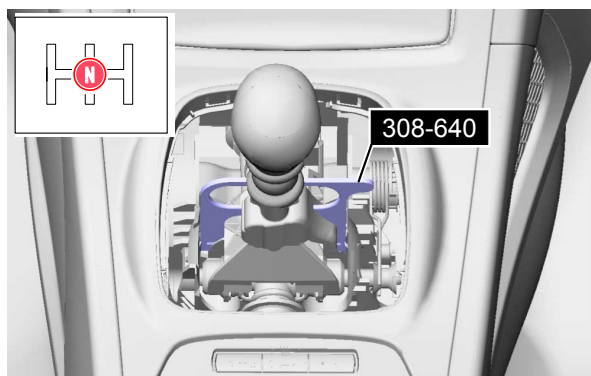


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Gearshift lever or selector lever position symbols are used to show which gearshift lever or selector lever position is to be set.

DESCRIPTION AND OPERATION

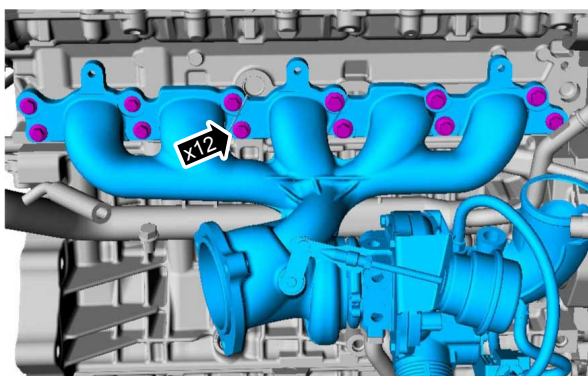
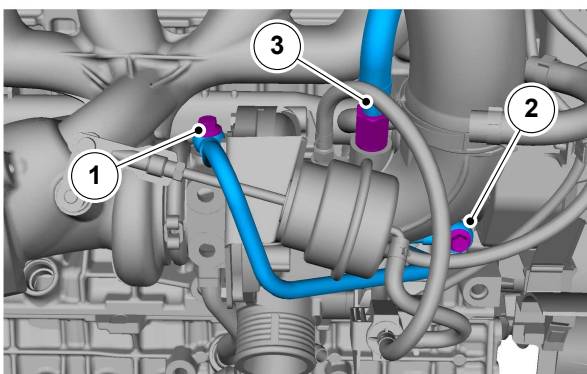


E84836

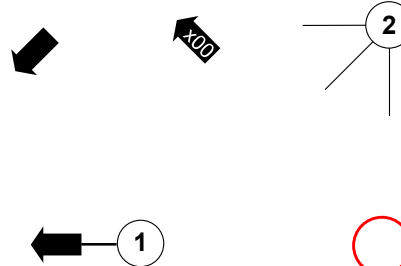
Pointer symbols are used to draw the attention to components and give special instructions such as a required sequence or number of components. The number of components is reflected by the value inside the luty arrow. A sequence number is

located inside the circle. Numbers inside circles are also used to allocate special information such as tightening torques or chemicals to a particular component.

DESCRIPTION AND OPERATION

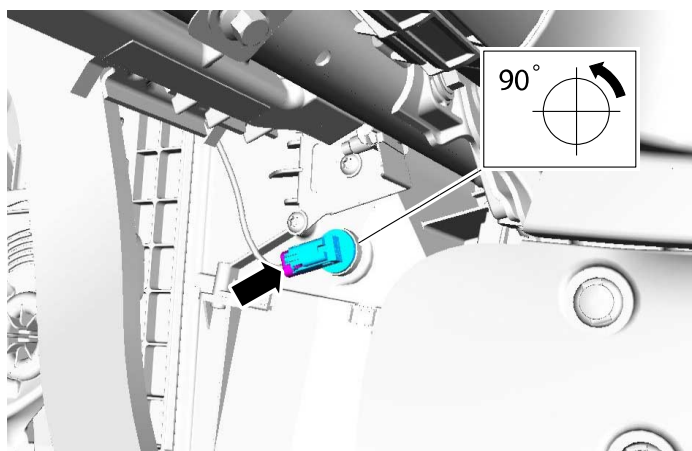


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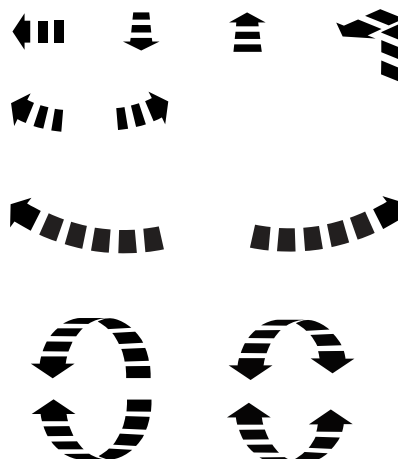
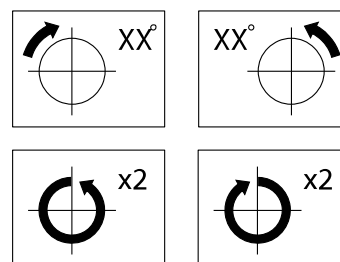


Movement arrows are used to show three dimensional or rotational movements. These

movements can include specific values inside the symbol if required.

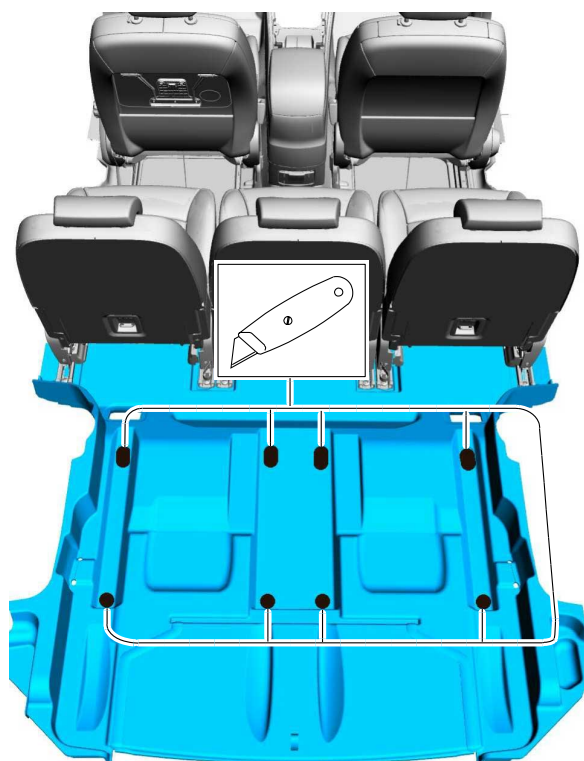


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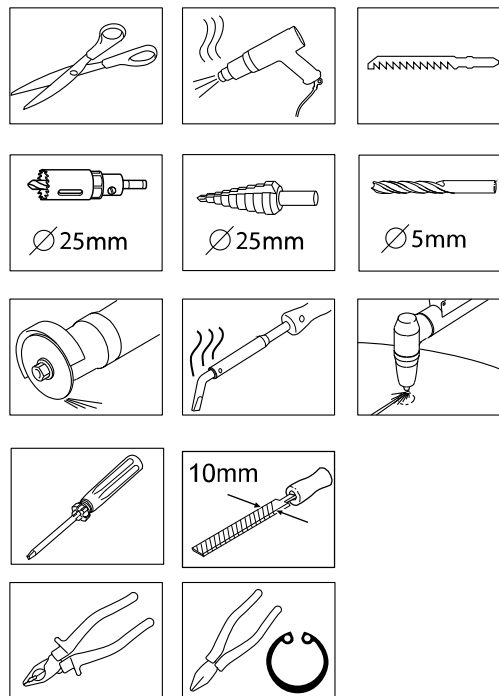


DESCRIPTION AND OPERATION

Standard tool symbols recommend the use of certain standard tools. These tools can include dimension values if required.

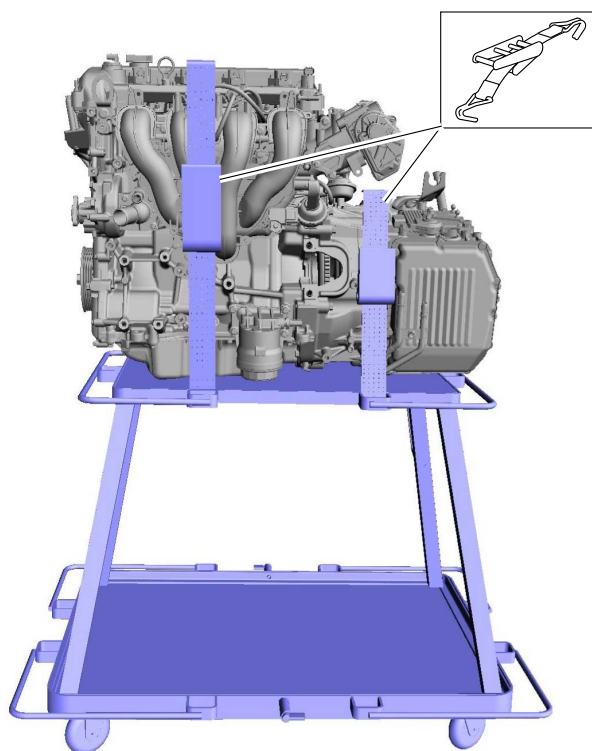


E84839

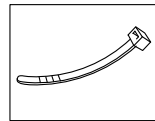
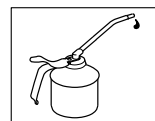
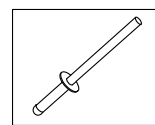
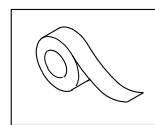


The following graphic illustrates a set of symbols that are used to provide detailed information on where to apply a material.

DESCRIPTION AND OPERATION

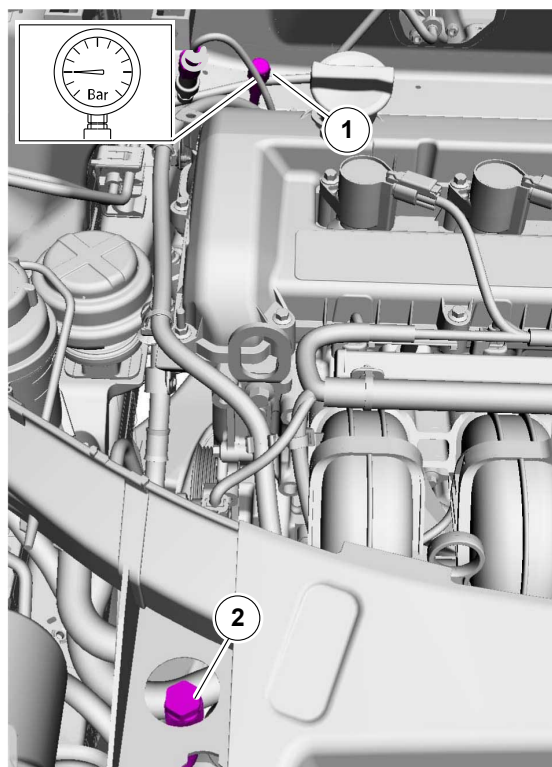


E84840

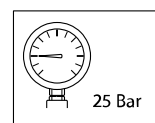
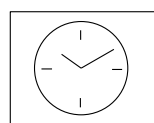
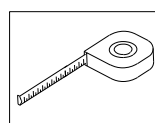
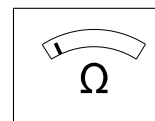
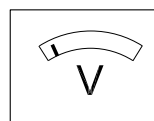
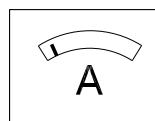


Measurement symbols provide detailed information on where to carry out a specific measurement.

These symbols can include specific values if required.



E84841



DESCRIPTION AND OPERATION

Special Tools and Torque Figure(s)

Special tools will be shown with the tool number in the illustration. The special tool number(s), general equipment, material(s) and torque figure(s) used for the procedure step will be shown in the text column.

Breakout box type testers are represented by a double circle test pin. Test pins are labeled with the pin number.

How to Use This Manual - Diagnosis and Testing procedures

Inspection and Verification

Visual Inspection Charts, Symptom Charts and other information charts (such as diagnostic routines) or supplement test procedures with technical specifications will navigate the user to a specific test procedure.

Symptom Chart

The symptom chart indicates symptoms, sources and actions to address a condition.

Pinpoint Tests

For electrical systems, pinpoint test steps are used to identify the source of a concern in a logical, step-by-step manner. Pinpoint tests have two columns: CONDITIONS and DETAILS/RESULTS/ACTIONS.

The CONDITIONS column is used exclusively for graphics and icons (with or without captions) and the DETAILS/RESULTS/ACTIONS column provides direction to another test step or specific corrective actions.

The boxed numbers indicate the order in which the described action is to be carried out.

Component Tests

A component test is used when a component is tested in multiple pinpoint tests, or if a procedure is too complicated to be formatted within a single page of the pinpoint test.

Graphics

Test graphics show the measurement or test to be carried out in a test step.

A representative tester graphic is used for voltmeters and ohmmeters.

If multiple measurements are made in a single graphic, the test leads are drawn with a solid line until the test lead splits to indicate the multiple measurements, at which point dashed lines are used.

DESCRIPTION AND OPERATION

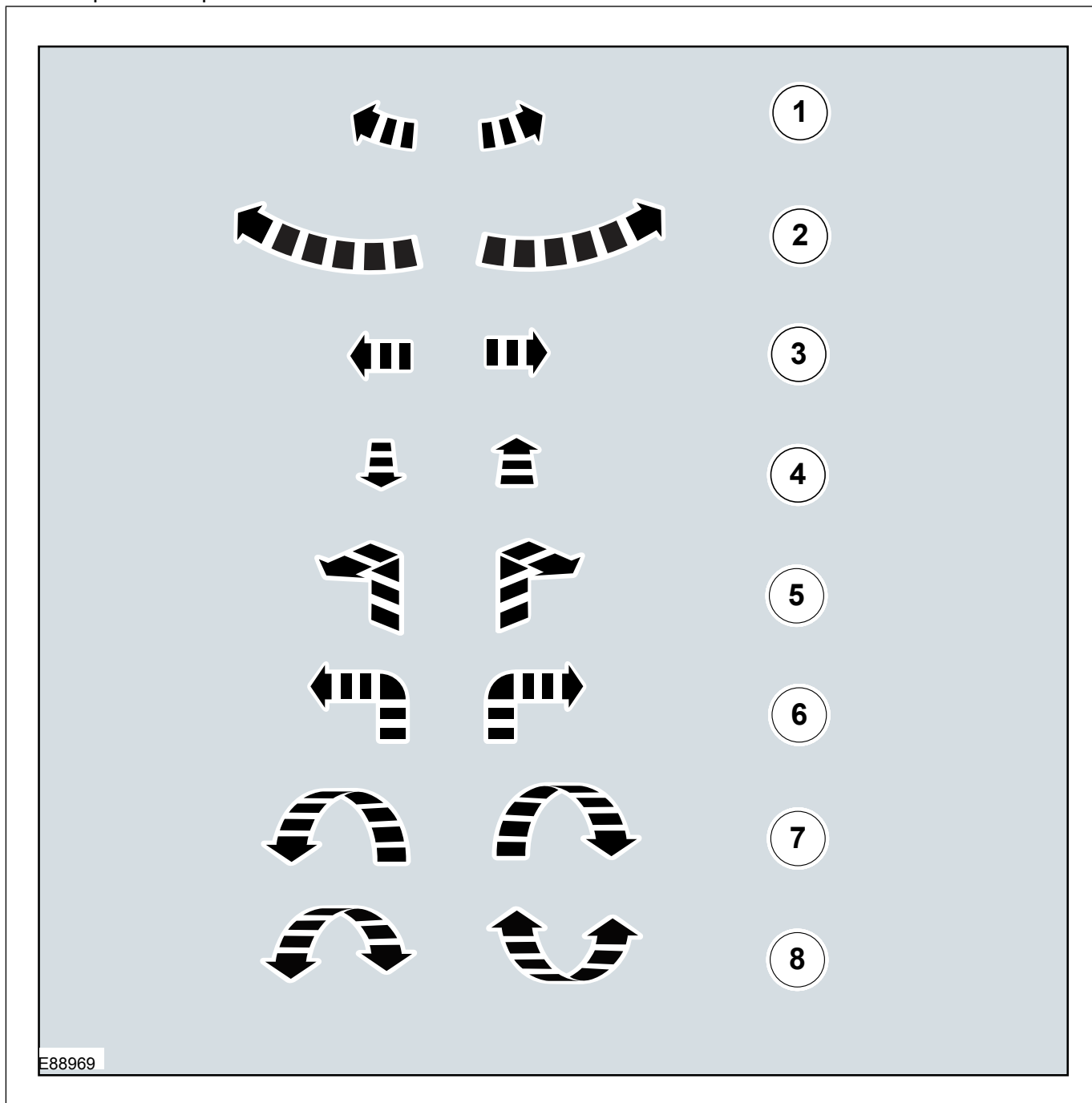
Symbols Glossary

Symbols are used inside the graphics and in the text area to enhance the information display.

component movements can be rotational or 1-3 dimensional movements.

Movement Symbols

Movement symbols provide detailed information to a required component movement. These



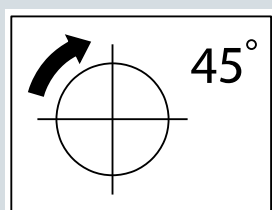
DESCRIPTION AND OPERATION

Item	Description
1	Minor component movement clockwise/counterclockwise
2	Major component movement clockwise/counterclockwise
3	Component movement to the left/right/up/down
4	Component movement towards/away
5	3 dimensional component movement

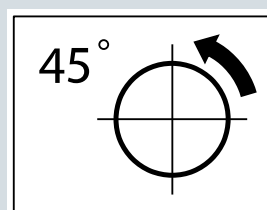
Item	Description
6	2 dimensional component movement
7	3 dimensional component rotation
8	3 dimensional component cycling

Turn Symbols

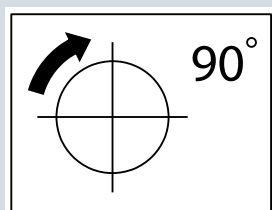
Turn symbols are used to provide further information on the direction or angle of component turns.



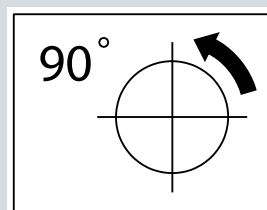
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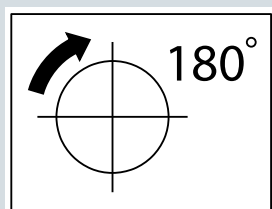
2



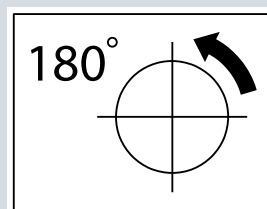
3



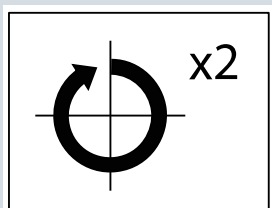
4



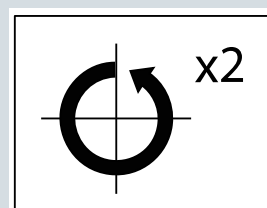
5



6



7



8

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DESCRIPTION AND OPERATION

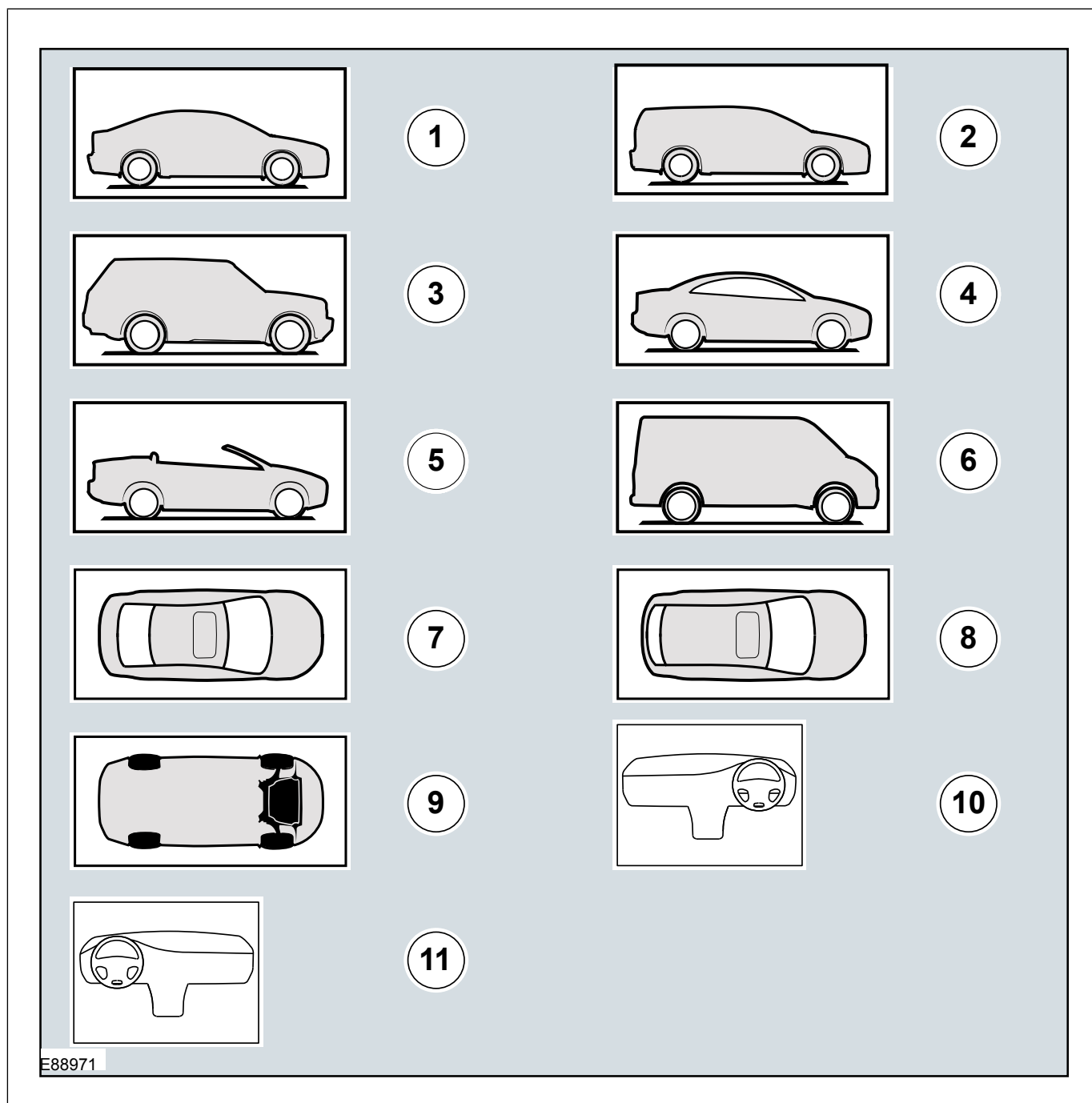
Item	Description
1	Turn the component clockwise through 45°
2	Turn the component counterclockwise through 45°
3	Turn the component clockwise through 90°
4	Turn the component counterclockwise through 90°
5	Turn the component clockwise through 180°

Item	Description
6	Turn the component counterclockwise through 180°
7	Turn the component clockwise through 2 complete turns
8	Turn the component counterclockwise through 2 complete turns

Vehicle Type and Vehicle Location Symbols

Vehicle type and vehicle location symbols are used to provide further information to the vehicle type and vehicle location that this information is relevant to.

DESCRIPTION AND OPERATION



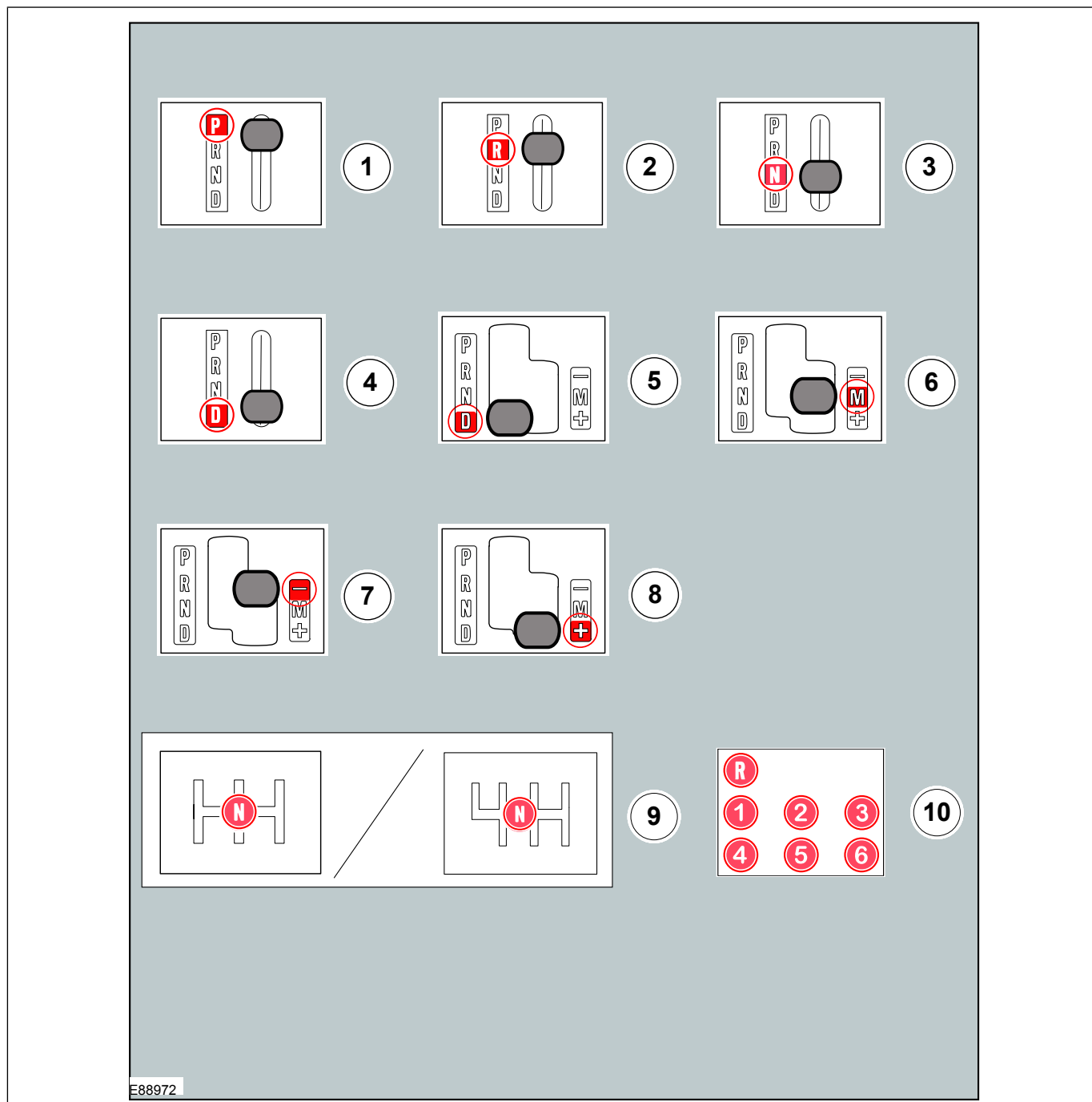
Item	Description
1	3, 4, 5-door body style
2	Wagon body style
3	Sports utility vehicle body style
4	Coupe body style
5	Convertible body style
6	Van body style
7	3, 4, 5-door body style - Top View

Item	Description
8	Wagon body style - Top View
9	Underview
10	Right-hand drive (RHD) vehicle
11	Left-hand drive (LHD) vehicle

Gearshift lever and selector lever position symbols

Gearshift lever and selector lever position symbols are used to show the lever position that is required to be selected to carry out a procedure step.

DESCRIPTION AND OPERATION



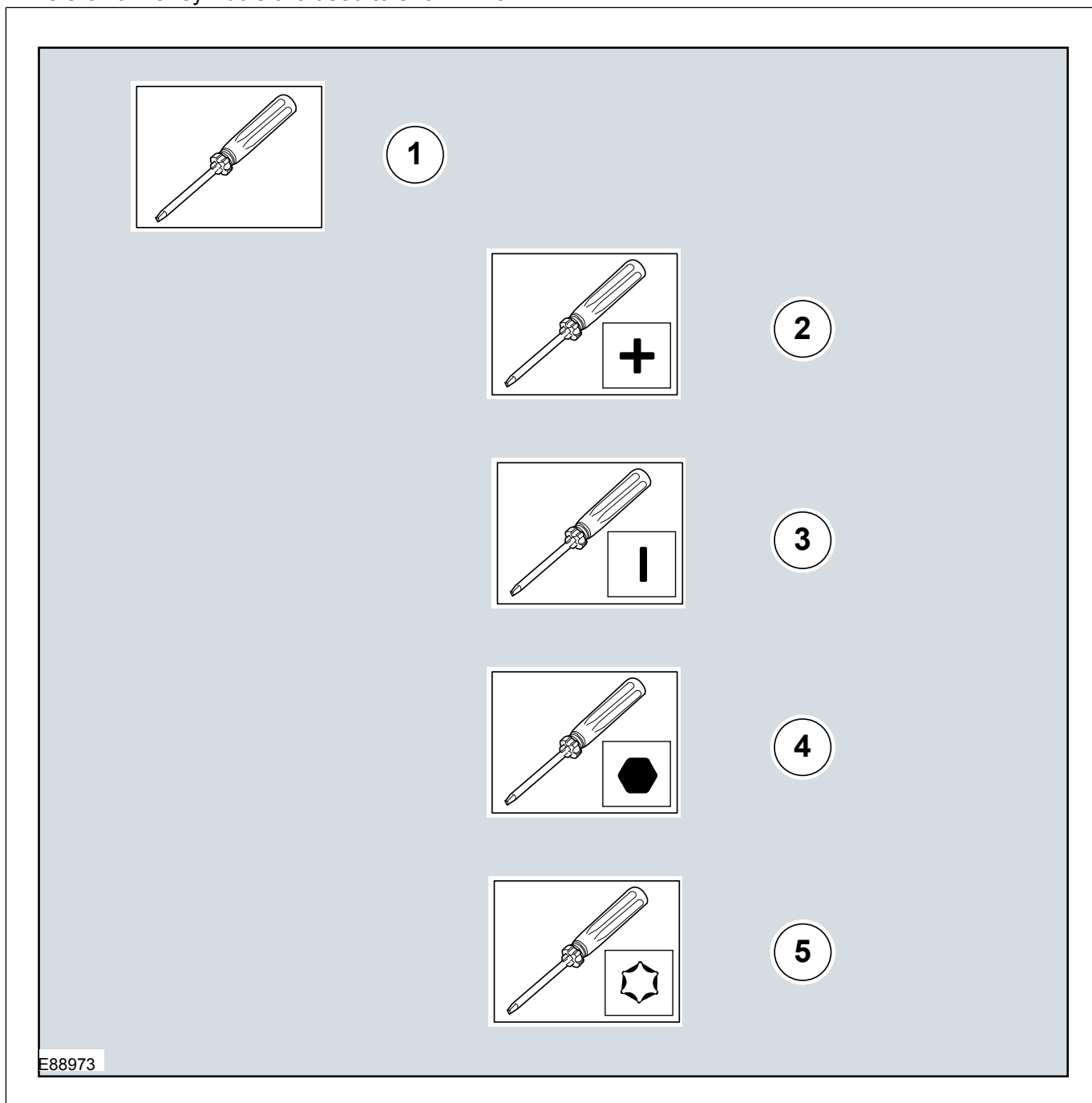
Item	Description
1	Set the selector lever to the park (P) position
2	Set the selector lever to the reverse (R) position
3	Set the selector lever to the neutral (N) position
4	Set the selector lever to the drive (D) position
5	Set the selector lever with manual shift pattern to the park (D) position

Item	Description
6	Set the selector lever with manual shift pattern to the manual (M) position
7	Set the selector lever with manual shift pattern to the shift down (-) position
8	Set the selector lever with manual shift pattern to the shift up (+) position
9	Set the gearshift lever to the neutral (N) position
10	Further gearshift lever positions that may appear in illustrations

DESCRIPTION AND OPERATION**Screwdriver symbols**

The screwdriver symbols are used to show which

screwdriver bit is recommended to carry out a procedure step.



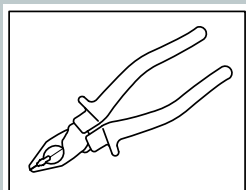
Item	Description
1	Screwdriver
2	Cross bladed screwdriver
3	Flat bladed screwdriver

Item	Description
4	Hexagonal screwdriver
5	TORX screwdriver

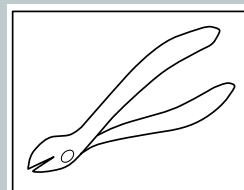
Pliers symbols

The pliers symbols are used to show which pliers is recommended to carry out a procedure step.

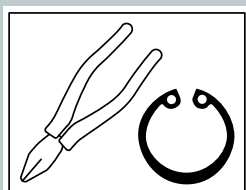
DESCRIPTION AND OPERATION



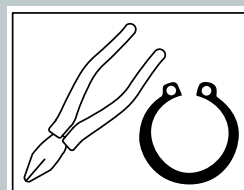
1



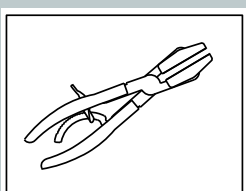
2



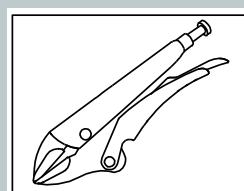
3



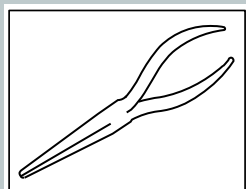
4



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7

E88974

Item	Description
1	Combination pliers
2	Side cutter pliers

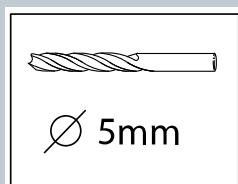
Item	Description
3	Securing ring pliers - inner
4	Securing ring pliers - outer

DESCRIPTION AND OPERATION

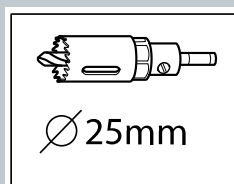
Item	Description
5	Hose clamp pliers
6	Locking pliers
7	Long nose pliers

Drill symbols

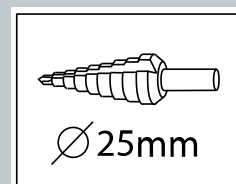
The drill symbols are used to show which type and size of drill bit is recommended to carry out a procedure step.



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2



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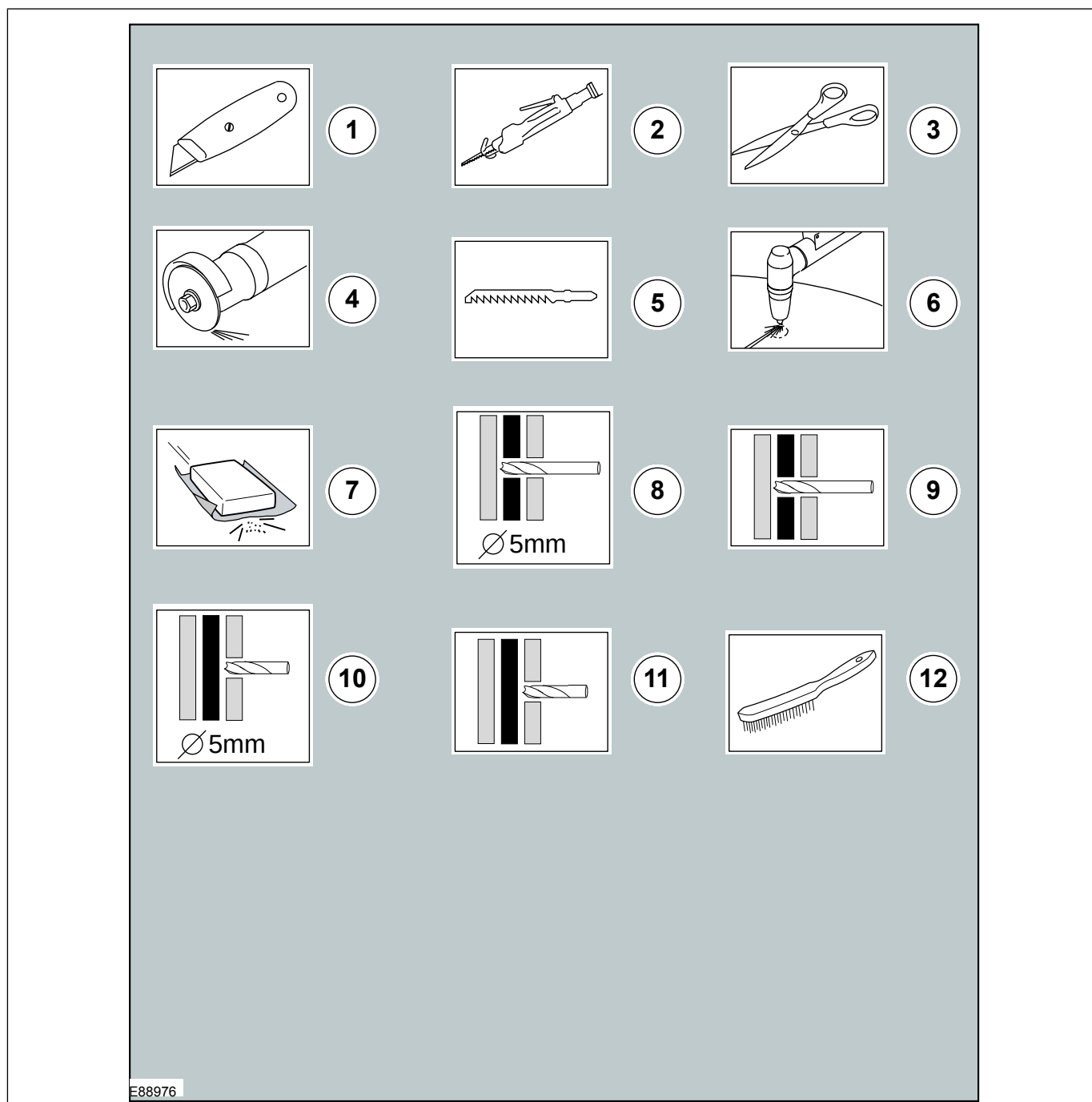
E88975

Item	Description
1	Drill bit with a specified diameter
2	Hole saw with a specified diameter
3	Stepped drill bit with a specified diameter

Cutting tool symbols

The cutting tool symbols are used to show which type of cutting tool is recommended to carry out a procedure step.

DESCRIPTION AND OPERATION



Item	Description
1	Cutting knife
2	Air body saw
3	Scissors
4	Grinder
5	Jig saw
6	Plasma cutter
7	Sanding Paper

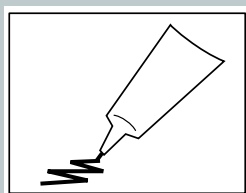
Item	Description
8	Drill through the shown number of body panel layers with a specified diameter
9	Drill through the shown number of body panel layers with a suitable diameter
10	Drill through 1 body panel layer with a specified diameter
11	Drill through 1 body panel layer with a suitable diameter
12	Wire brush

DESCRIPTION AND OPERATION

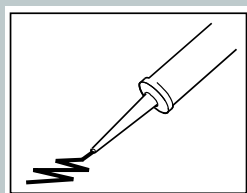
Apply Chemical or load symbols

The apply chemical or load symbols are used to

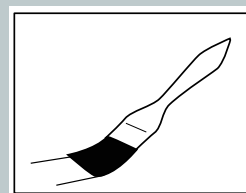
show where to apply which type of chemical or load to carry out a procedure step.



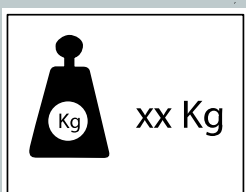
1



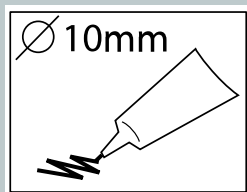
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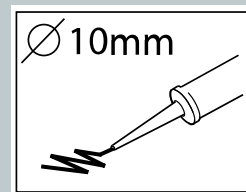
3



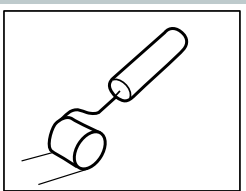
4



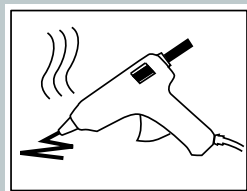
5



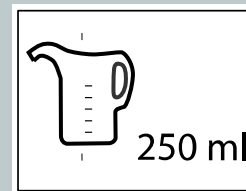
6



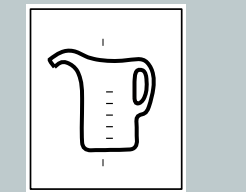
7



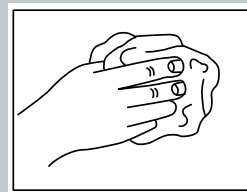
8



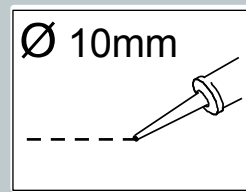
9



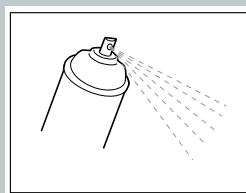
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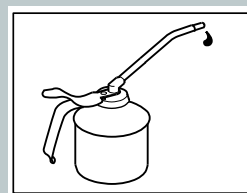
11



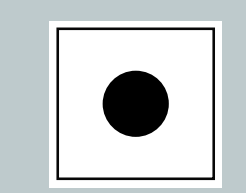
12



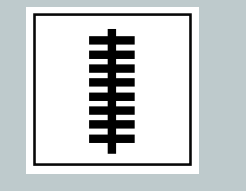
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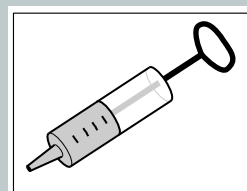
14



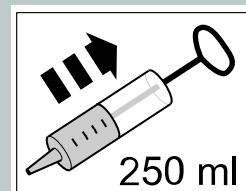
15



16



17



18

E88977

DESCRIPTION AND OPERATION

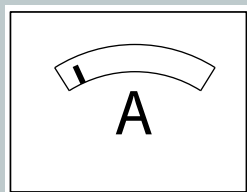
Item	Description
1	Apply a bead from the specified tube
2	Apply a bead from the specified cartridge
3	Apply the specified chemical with a brush
4	Apply the specified load to the specified component
5	Apply a bead with a specific diameter from the specified tube
6	Apply a bead with a specific diameter from the specified cartridge
7	Apply the specified chemical with a roller
8	Apply hot glue to the specified component
9	Apply the specified amount of fluid from the fluid can
10	Apply fluid from the fluid can
11	Clean the specified component with the specified material

Item	Description
12	Apply a broken bead from the specified tube
13	Apply the specified chemical from a spray can
14	Apply the specified lubricant to the specified component
15	Apply spot welds to the specified component
16	Apply a continuous weld to the specified component
17	Handle the fluid using a syringe
18	Extract the specified amount of fluid using a syringe

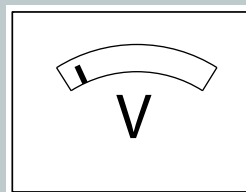
Measurement symbols

The measurement symbols are used to show where to measure which type of measurement to carry out a procedure step.

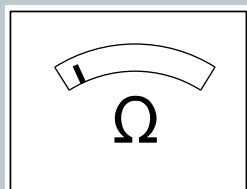
DESCRIPTION AND OPERATION



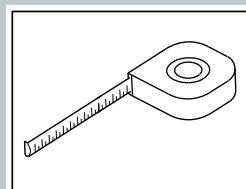
1



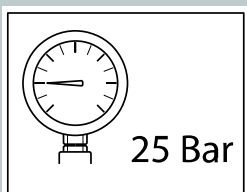
2



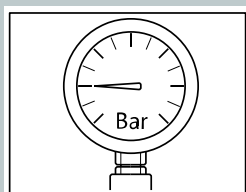
3



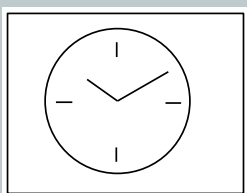
4



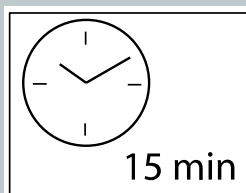
5



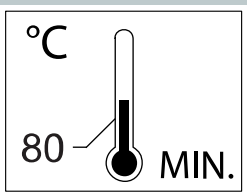
6



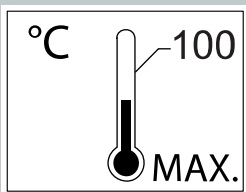
7



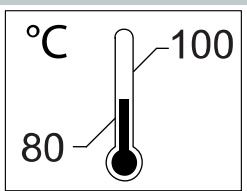
8



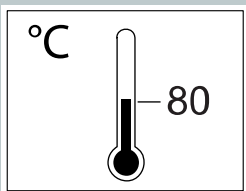
9



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11



12

E88978

DESCRIPTION AND OPERATION

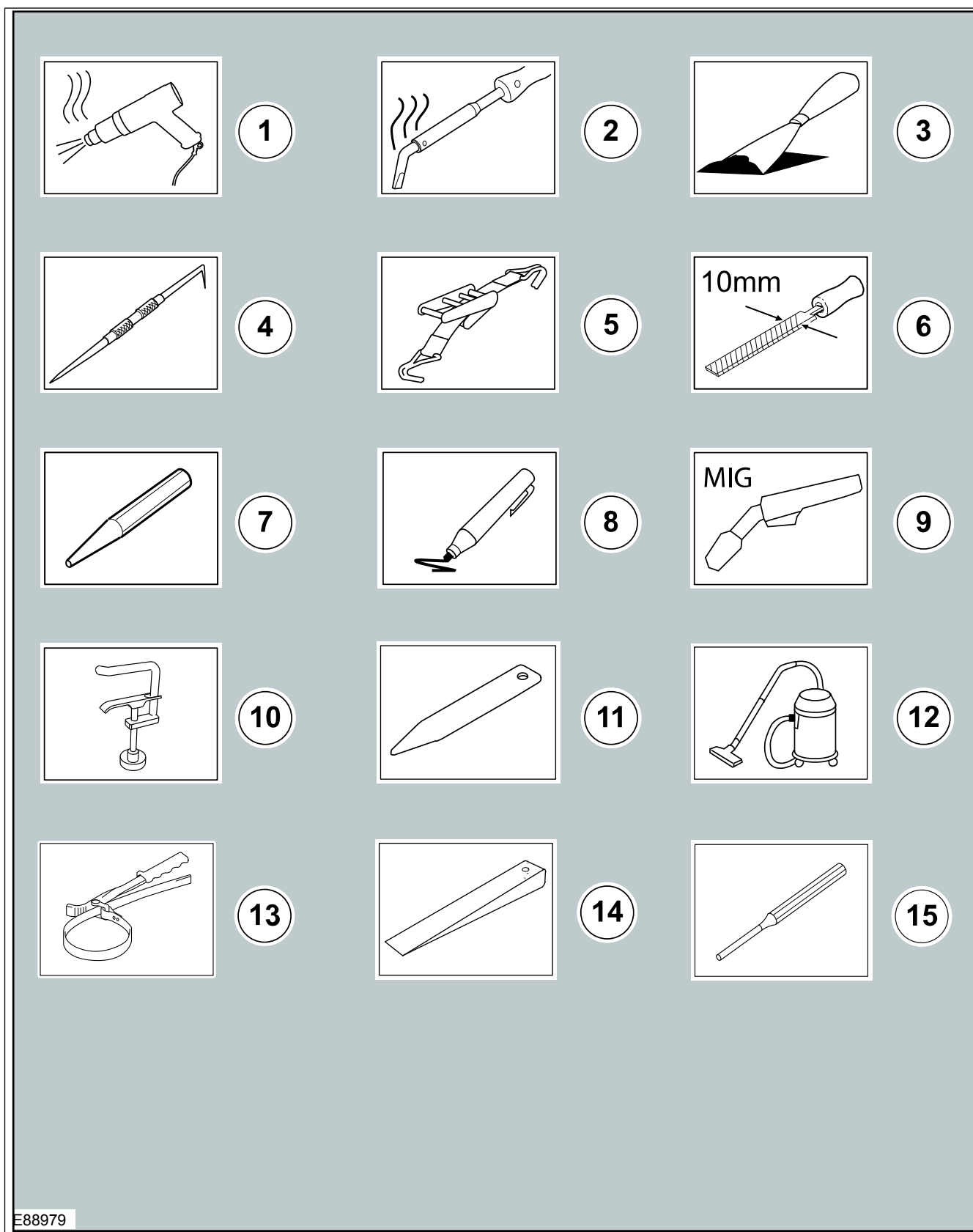
Item	Description
1	Measure the current using a digital multimeter
2	Measure the voltage using a digital multimeter
3	Measure the resistance using a digital multimeter
4	Measure the length/distance
5	Check that the specified pressure is available using a suitable pressure gauge
6	Measure the pressure at the specified port using a suitable pressure gauge
7	Measure the time using a suitable stopwatch

Item	Description
8	Wait for the specified period of time
9	The specified task requires the specified minimum temperature
10	The specified task requires the specified maximum temperature not to be exceeded
11	The specified task requires the specified temperature range
12	The specified task requires the specified temperature

General equipment symbols

The general equipment symbols are used to show where to use which type of general equipment to carry out a procedure step.

DESCRIPTION AND OPERATION



Item	Description
1	Hot air gun
2	Soldering iron

Item	Description
3	Scraper
4	Scriber

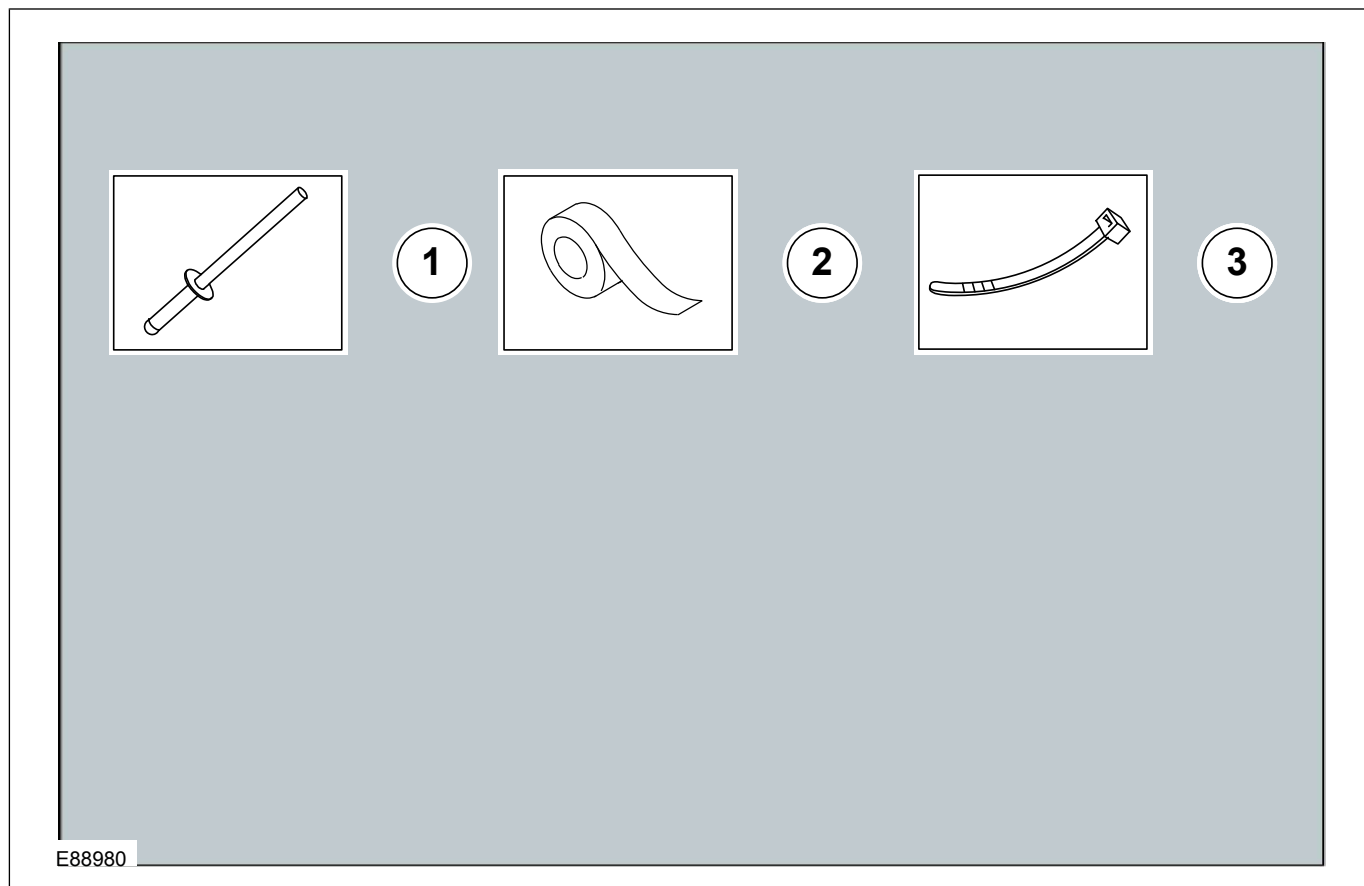
DESCRIPTION AND OPERATION

Item	Description
5	Securing strap
6	File with a specified size
7	Center punch
8	Marker
9	Metal inert gas (MIG) welding equipment
10	Hose clamp
11	Interior trim remover

Item	Description
12	Vacuum cleaner
13	Strap wrench
14	Wedge
15	Pin Punch

Material symbols

The material symbols are used to show where to use which type of material to carry out a procedure step.

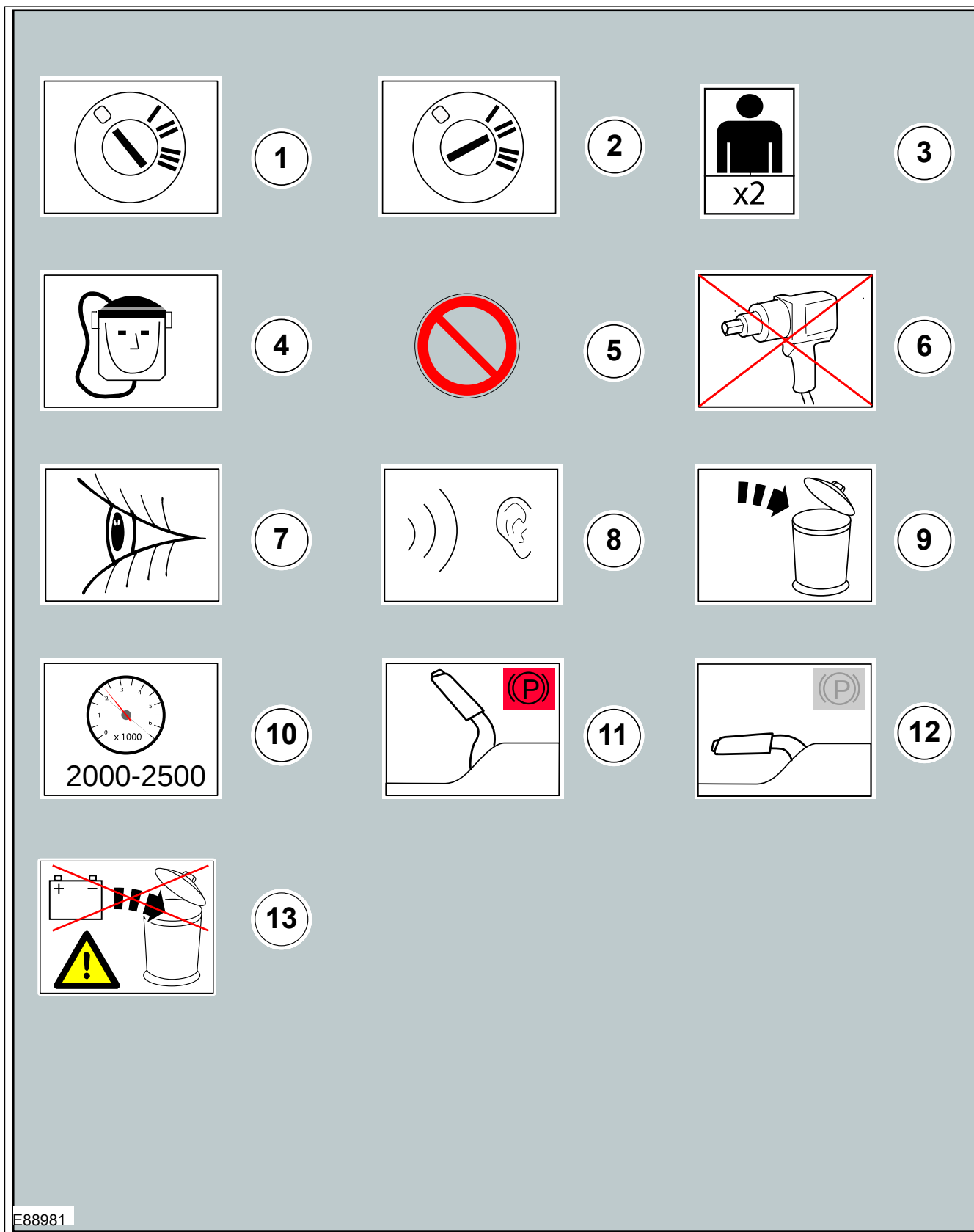


Item	Description
1	Remove/Install the specified blind rivet
2	Apply tape to the specified component/area
3	Remove/Install the specified cable tie

Miscellaneous symbols

These symbols provide further information that is required to carry out a procedure step.

DESCRIPTION AND OPERATION



Item	Description
1	Set the ignition switch to the 0 position
2	Set the ignition switch to the II position

Item	Description
3	The procedure step requires the aid of the specified number of supporting technicians

DESCRIPTION AND OPERATION

Item	Description
4	Self contained breathing apparatus
5	General prohibition used in combination with another symbol
6	Do not use power tools
7	Visual check
8	Noise check
9	Dispose the specified component
10	Set the engine speed to the specified value

Item	Description
11	Fully apply the parking brake lever
12	Fully release the parking brake lever
13	Do not dispose of batteries into the waste bin

Mandatory Protective equipment - Health and safety symbols

The protective equipment symbols advise to use a mandatory protective equipment to avoid or at least reduce possible health and safety risks.



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E89019

DESCRIPTION AND OPERATION

Item	Description
1	Wear protective gloves
2	Wear face guard
3	Wear safety goggles
4	Wear ear protectors
5	Wear safety goggles and ear protectors
6	Wear a respirator

Prohibition - Health and safety symbols and component damage

The prohibition symbols are used to prohibit the specified actions to avoid or at least reduce possible component damage and health and safety risks.



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E89020

DESCRIPTION AND OPERATION

Item	Description
1	General prohibition symbol
2	No naked flames
3	No smoking
4	No water
5	Do not touch
6	Do not switch
7	No grinding

Warning symbols - Health and safety and component damage

The warning symbols are used to advise on hazardous conditions to avoid or at least reduce possible component damage and health and safety risks.



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8



9



10



11



12

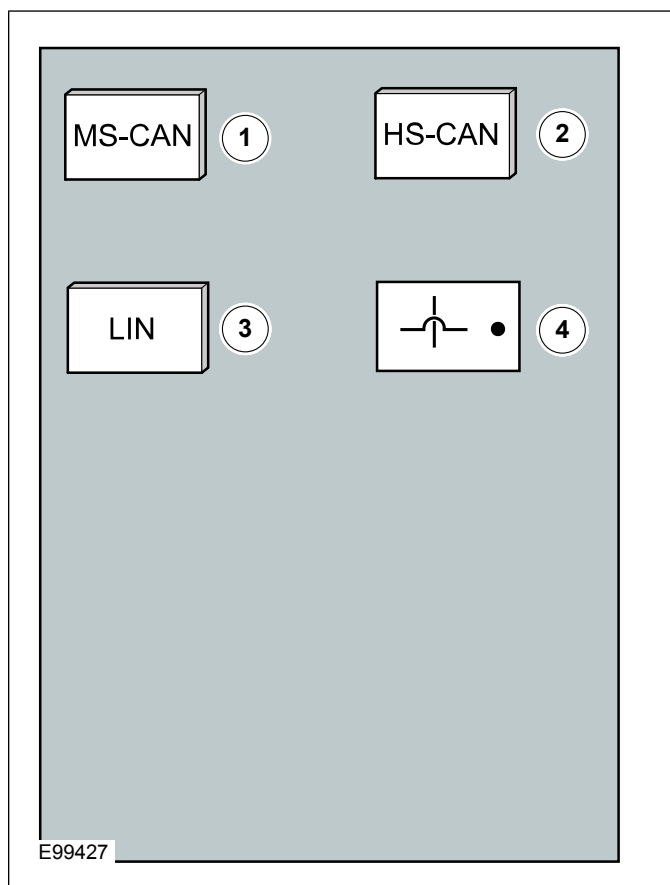
E89021

DESCRIPTION AND OPERATION

Item	Description
1	Hazardous voltage/Electrical shock/Electrocution
2	Fire Hazard/Highly flammable
3	Burn hazard/Hot surface
4	Automatic start-up
5	Toxic
6	Explosive material
7	Battery hazard
8	Corrosive material
9	Lifting hazard
10	Hand crush/Force from above
11	Cutting of fingers or hand
12	Pressure hazard

Control Diagram symbols - Description and Operation procedures

These symbols provide further information on the type of connectivity, direction of flow or type of data bus of a system.



Item	Description
1	Mid-speed Controller Area Network (CAN)
2	High-speed Controller Area Network (CAN)
3	Local Interconnect Network (LIN)
4	Wires crossing not connected

DESCRIPTION AND OPERATION

Health and Safety Precautions

Introduction

Many of the procedures associated with vehicle maintenance and repair involve physical hazards or other risks to health. This subsection lists, alphabetically, some of these hazardous operations and the materials and equipment associated with them. Precautions necessary to avoid these hazards are identified.

The list is not exhaustive and all operations and procedures, and the handling of materials, should be carried out with health and safety in mind.

Before using any product the Materials Safety Data Sheet supplied by the manufacturer or supplier should be consulted.

Acids and Alkalis

See also Battery Acids.

For example caustic soda, sulphuric acid.

Used in batteries and cleaning materials.

Irritant and corrosive to the skin, eyes, nose and throat. Cause burns. Can destroy ordinary protective clothing.

Avoid splashes to the skin, eyes and clothing. Wear suitable protective impervious apron, gloves and goggles. Do not breath mists.

Make sure access to eye wash bottles, shower and soap are readily available for splashing accidents.

Display Eye Hazard sign.

Air Bags

See also Fire, Chemical Materials.

Highly flammable, explosive – observe No Smoking policy.

Used as a safety restraint system mounted in the steering wheel and passenger side of the instrument panel.

The inflator contains a high-energetic propellant which, when ignited, produces a VERY HOT GAS (2500°C).

The gas generant used in air bags is Sodium Azide. This material is hermetically sealed in the module and is completely consumed during deployment. No attempt should be made to open an air bag

inflator as this will lead to the risk of exposure to Sodium Azide. If a gas generator is ruptured, full protective clothing should be worn when dealing with the spillage.

After normal deployment, gloves and safety goggles must be worn during the handling process.

Deployed air bags should be disposed of in a plastic bag in accordance with local regulations at an approved chemical waste site.

For additional information, refer to: [Supplemental Restraint System \(SRS\) Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Air Conditioning Refrigerant

See also Chlorofluorocarbon, Chemical Materials

Highly flammable, combustible – observe No Smoking policy.

Skin contact may result in frostbite.

Instructions given by the manufacturer must be followed. Avoid naked lights, wear suitable protective gloves and goggles.

If refrigerant comes into contact with the skin or eyes, immediately rinse the affected areas with water. Eyes should also be rinsed with an appropriate irrigation solution and should not be rubbed. SEEK MEDICAL ASSISTANCE IF NECESSARY.

For additional information, refer to: [Air Conditioning \(A/C\) System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Adhesives and Sealers

See also Fire, Chemical Materials.

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

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

DESCRIPTION AND OPERATION

Solvent-based Adhesives/Sealers - See Solvents

Follow manufacturers 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, for example 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 respiratory tract. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturers 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 have a defatting effect which 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.

Antifreeze

See also Fire, Solvents.

For example isopropanol, ethylene glycol, methanol.

Highly flammable, flammable, combustible.

Used in vehicle coolant systems, brake air pressure systems, screenwash solutions.

For additional information, refer to: [Engine Cooling System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Asbestos

See also Warning Symbols on Vehicles at the end of this subsection.

Breathing asbestos dust may cause lung damage or, in some cases, cancer.

Used in brake and clutch linings, transmission brake bands and gaskets.

DESCRIPTION AND OPERATION

The use of drum cleaning units, vacuum cleaning or damp wiping is preferred.

Asbestos dust waste should be dampened, placed in a sealed container and marked for safe disposal. If any cutting or drilling is attempted on materials containing asbestos the item should be dampened and only hand tools or low speed power tools used.

Battery Acids

See also Acids and Alkalis.

For additional information, refer to: [Battery and Battery Charging Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Brake and Clutch Linings and Pads

See Asbestos.

Brake Fluids (Polyalkylene Glycols)

See also Fire.

For additional information, refer to: [Brake System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Brazing

See Welding.

Chemical Materials

See also Legal Aspects.

Chemical materials such as solvents, sealers, adhesives, paints, resin foams, battery acids, antifreeze, brake fluids, fuels, oils and grease should always be used with caution and stored and handled with care. They may be toxic, harmful, corrosive, irritant or highly flammable and give rise to hazardous fumes and dusts.

The effects of excessive exposure to chemicals may be immediate or delayed; briefly experienced or permanent; cumulative; superficial; life threatening; or may reduce life expectancy.

Chemical Materials - Do's

- Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, posters or other instructions. Material health and safety data sheets can be obtained from manufacturers.
- Do remove chemical materials from the skin and clothing as soon as practicable after soiling. Change heavily soiled clothing and have it cleaned.
- Do organize work practices and protective clothing to avoid soiling of the skin and eyes; breathing vapors, aerosols, dusts or fumes; inadequate container labeling; fire and explosion hazards.
- Do wash before job breaks, before eating, smoking, drinking or using toilet facilities when handling chemical materials.
- Do keep work areas clean, uncluttered and free of spills.
- Do store chemical materials according to national and local regulations.
- Do keep chemical materials out of the reach of children.

Chemical Materials - Do Not's

- Do not mix chemical materials except under the manufacturers instructions; some chemicals can form other toxic or harmful chemicals, give off toxic or harmful fumes or become explosive when mixed together.
- Do not spray chemical materials, particularly those based on solvents, in confined spaces, for example when people are inside a vehicle.
- Do not apply heat or flame to chemical materials except under the manufacturers instructions. Some are highly flammable and some may release toxic or harmful fumes.
- Do not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas such as pits.
- Do not transfer chemical materials to unlabelled containers.
- Do not clean hands or clothing with chemicals. Chemicals, particularly solvents and fuels, will dry the skin and may cause irritation leading to

DESCRIPTION AND OPERATION

dermatitis or be absorbed through the skin in toxic or harmful quantities.

- Do not use emptied containers for other materials except when they have been cleaned under supervised conditions.
- Do not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be toxic or harmful.

Chlorofluorocarbons (CFC)

There is concern in the scientific community that CFCs and Halons are depleting the upper ozone layer which filters out harmful ultraviolet radiation. Decreased filtration of ultraviolet radiation may result in increases in skin cancer, cataracts and immune system suppression in humans, as well as decreased productivity of crops and aquatic systems.

CFCs are used primarily as refrigerants in vehicle air conditioning systems and as aerosol propellants. Halons are used as fire extinguishants.

Clutch Fluids

See Brake fluids.

Clutch Linings and Pads

See Asbestos.

Corrosion Protection Materials

See also Solvents, Fire.

Highly flammable, flammable – observe No Smoking policy.

These materials are varied and the manufacturers instructions must be followed. They may contain solvents, resins or petroleum products. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Cutting

See Welding.

Dewaxing

See Solvents and Fuels (Kerosene).

Dusts

Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

Fine dusts of combustible material can present an explosion hazard. Avoid explosive limits and sources of ignition.

Electric Shock

Electric shock can result from the use of faulty electrical equipment or from the misuse of equipment in good condition.

Make sure that electrical equipment is maintained in good condition and frequently tested. Faulty equipment should be labeled and preferably removed from the workstation.

Make sure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.

Make sure that electrical equipment and flexes do not come into contact with water.

Make sure that electrical equipment is protected by the correct rated fuse.

Never misuse electrical equipment and never use equipment that is in any way faulty. The results could be fatal.

Make sure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

Make sure that the designated electrical workers are trained in basic First Aid.

In cases of electrocution:

- switch off the power supply before approaching the victim.
- if this is not possible push or drag the victim from the source of electricity using dry non-conductive material.
- commence resuscitation if trained to do so.
- SUMMON MEDICAL ASSISTANCE.

Engine Oils

See Lubricants and Grease.

DESCRIPTION AND OPERATION

Exhaust Fumes

These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, lead and aromatic hydrocarbons. Engines should be run only under conditions of adequate exhaust extraction or general ventilation and not in confined spaces.

Gasoline (petrol) engine

There may not be adequate warning of odor or of irritation before toxic or harmful effects arise. These may be immediate or delayed.

Diesel engine

Soot, discomfort and irritation usually give adequate warning of hazardous fume concentrations.

Fibre Insulation

See also Dusts.

Used in noise and sound insulation.

The fibrous nature of surfaces and cut edges can cause skin irritation. This is usually a physical and not a chemical effect.

Precautions should be taken to avoid excessive skin contact through careful organization of work practices and the use of gloves.

Fire

See also Welding, Foams, Legal Aspects.

Many of the materials found on or associated with the repair of vehicles are highly flammable. Some give off toxic or harmful fumes if burnt.

Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.

Make sure, before using electrical or welding equipment, that there is no fire hazard present.

Have a suitable fire extinguisher available when using welding or heating equipment.

First Aid

Apart from meeting any legal requirements it is desirable for someone in the workshop to be trained in First Aid procedures.

Splashes in the eye should be flushed carefully with clean water for at least ten minutes.

Soiled skin should be washed with soap and water.

In case of cold burns, from alternative fuels, place affected area in cool to cold water.

Individuals affected by inhalation of gases and fumes should be removed to fresh air immediately. If effects persist, consult a doctor.

If liquids are swallowed inadvertently, consult a doctor giving him the information on the container or label. Do not induce vomiting unless this action is indicated on the label.

Fluoroelastomer

See Viton.

Foams - Polyurethane

See also Fire.

Used in sound and noise insulation. Cured foams used in seat and trim cushioning.

Follow manufacturers instructions.

Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

Individuals with chronic respiratory diseases, asthma, bronchial medical problems, or histories of allergic diseases should not work in or near uncured materials.

The components, vapors or spray mists can cause direct irritation, sensitivity reactions and may be toxic or harmful.

Vapors and spray mists must not be inhaled. These materials must be applied with adequate ventilation and respiratory protection. Do not remove the respirator immediately after spraying; wait until the vapors/mists have cleared.

Burning of the uncured components and the cured foams can generate toxic and harmful fumes. Smoking, naked flames or the use of electrical equipment during foaming operations and until vapors/mists have cleared should not be allowed. Any heat cutting of cured foams or partially cured

DESCRIPTION AND OPERATION

foams should be conducted with extraction ventilation. See also the vehicle Body Repair Manual.

Freon

See Air Conditioning Refrigerant.

Fuels

See also, Fire, Legal Aspects, Chemicals and Solvents.

Avoid skin contact with fuel where possible. Should contact occur, wash the affected skin with soap and water.

Gasoline (Petrol)

Highly flammable - observe No Smoking policy.

For additional information, refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Gas-oil (Diesel Fuel)

For additional information, refer to: [Diesel Fuel System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Kerosene (Paraffin)

Used also as heating fuel, solvent and cleaning agent.

Flammable - observe No Smoking policy.

Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs.

Liquid contact dries the skin and can cause irritation or dermatitis. Splashes in the eye may be slightly irritating.

In normal circumstances the low volatility does not give rise to harmful vapors. Exposure to mists and vapors from kerosene at elevated temperature should be avoided (mists may arise in dewaxing). Avoid skin and eye contact and make sure there is adequate ventilation.

Alternative Fuel

Highly flammable. Observe "NO SMOKING" signs.

Make sure there is adequate ventilation when working on alternative fuelled vehicles. Great care must be taken to avoid the serious consequences of inhalation in the event of vapor build up in confined spaces.

Inhalation in high concentrations may cause dizziness, headache, nausea and loss of co-ordination. Very high concentrations may result in loss of consciousness.

Contact with liquefied petroleum gas (LPG) or compressed natural gas (CNG) to the skin may cause cold burns and frost bite.

Long sleeved cotton overalls, steel toe capped safety boots and rubber neoprene gloves should be worn during removal and installation of LPG/CNG fuel system components.

LPG/CNG fuel leaks could cause a fire and be a hazard to health that can lead to personal injury, illness or even death.

If a leak is detected, under no circumstances attempt to seal the leak by tightening the union/connection until the fuel in the system or component is depressurized. Once tightened the system should be checked for integrity following the specified procedures.

If the fuel tank is to be removed for service or repair the fuel must be evacuated using dedicated equipment and following the specified procedures.

Gas Cylinders

See also Fire.

Gases such as oxygen, acetylene, argon and propane are normally stored in cylinders at pressures of up to 138 bar (2000 psi) and great care should be taken in handling these cylinders to avoid mechanical damage to them or to the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.

Cylinders should be stored in well-ventilated enclosures, and protected from ice and snow, or direct sunlight. Fuel gases, for example acetylene and propane, should not be stored in close proximity to oxygen cylinders.

Care should be exercised to prevent leaks from gas cylinders and lines, and to avoid sources of ignition.

DESCRIPTION AND OPERATION

Only trained personnel should undertake work involving gas cylinders.

Gases

See Gas Cylinders.

Gaskets (Fluoroelastomer)

See Viton.

General Workshop Tools and Equipment

It is essential that all tools and equipment are maintained in good condition and that the correct safety equipment is used where required.

Never use tools or equipment for any purpose other than that for which they were designed. Never overload equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.

Do not use damaged or defective tools or equipment, particularly high-speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.

Wear suitable eye protection when using grinding, chiseling or sand blasting equipment.

Wear a suitable breathing mask when using abrasive blasting equipment, working with asbestos-based materials or using spraying equipment.

Make sure there is adequate ventilation to control dusts, mists and fumes.

High Pressure Air, Lubrication and Oil Test Equipment

See also Lubricants and Greases.

Always keep high-pressure equipment in good condition, and regularly maintained, particularly at joints and unions.

Never direct a high-pressure nozzle, for example diesel injector, at the skin as the fluid may penetrate to the underlying tissue, and cause serious injury.

Halon

See CFCs.

Legal Aspects

There are many laws and regulations relating to health and safety in the use and disposal of materials and equipment in a workshop.

For a safe working environment and to avoid environmental pollution, workshops should be familiar, in detail, with the many health and safety laws and regulations within their country, published by both national and local authorities.

Lubricants and Greases

Avoid all prolonged and repeated contact with mineral oils. All lubricants and greases may be irritating to the eyes and skin.

Transmission Fluids

Safety instructions

Certain Transmission and Power Steering fluids supplied to Ford may contain additives which have the potential to cause skin disease (dermatitis) to exposed persons. The dermatitis may be irritant or allergic in nature. Risks are higher where prolonged or repeated skin contact with a fluid may occur. These fluids are used for vehicle initial fill and service purposes. This sub-section is to:

- Inform Service personnel who may come into contact with these vehicle fluids (hazard communication).
- Summarise appropriate workplace control measures and personal protective equipment requirements.
- Draw attention to the existence of Material Safety Datasheets (MSDS's) for the fluids (available from Ford Customer Service Division). These MSDS's contain detailed information on hazards and appropriate controls.

Control measures

Workplace risk assessments made under national chemical control regulations should identify operations involving the fluids as potentially hazardous and specify workplace control and

DESCRIPTION AND OPERATION

worker awareness measures. In such circumstances, the relevant Material Safety Datasheet (see the details specified below) which specifies hazards and control measures in detail should be made available for guidance.

Avoid unprotected skin contact with the fluids, and in particular, avoid prolonged or repeated skin contact. Work practices should be organised so as to minimise the potential for skin contact. This may include the use of drip trays, absorbents, correct fluid handling equipment (funnels etc), and workplace housekeeping measures such as the cleaning of contaminated surfaces.

Personnel engaged in operations where skin contact could occur (such as fluid draining or filling) should wear impervious gloves made from nitrile rubber, certified to a chemical protection standard, e.g. Europe Standard EN374. This glove type is widely available from reputable suppliers of gloves for chemical protection [including the manufacturers Ansell-Admont (Solvex Range), North Safety products (North Nitrile Latex Gloves range), and Marigold Industrial (Blue Nitrile range)]. If gloves become torn or contaminated on the inside they should be replaced. Eye protection with safety glasses is appropriate. Use of an impervious apron and arm protectors may be necessary if more extensive exposure is possible. Use of skin barrier creams suitable for work with mineral oil products may offer some supplementary protection, but such barrier creams should not be used in place of protective clothing.

If accidental skin contact occurs with the fluids, wash the area thoroughly with soap or skin cleanser and water.

Accidental eye contact should be dealt with as per normal first aid practices, by flushing the eyes with an eye wash or clean cool water for 10 minutes, after which medical attention should be obtained.

Remove and launder clothing which becomes contaminated with the fluids. Do not place rags contaminated with fluid in clothing pockets.

Wash thoroughly after completing operations where skin exposure may have occurred.

It is important that personnel do not smoke, eat or drink whilst handling the fluids or affected transmissions. These measures are designed to limit the risk from accidental ingestion.

Label any decanted fluid properly/use an equivalent label to that on original product containers.

Clean up any spills promptly using an inert absorbent and wash down contaminated surfaces with detergent and water.

Dispose of any waste fluids safely as hazardous waste.

Safety Data Sheets

Safety Data Sheets, which detail specific material handling instructions and precautions are available from the respective national sales company, and via internet www.msds.ford.com.

Used Engine Oil

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants, which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Do not employ used engine oils as lubricants or for any application where appreciable skin contact is likely to occur.

Environmental Precautions

Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. If in doubt check with the appropriate local authority and manufacturer of approved appliances.

Dispose of used oil and used oil filters through authorized waste disposal contractors or licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the relevant local authority for advice on disposal facilities.

It is illegal to pour used oil on to the ground, down sewers or drains, or into watercourses.

Noise

Some operations may produce high noise levels, which could, in time, damage hearing. In these cases, suitable ear protection must be worn.

Noise Insulation Materials

See Foams, Fibre Insulation.

DESCRIPTION AND OPERATION

O-Rings (Fluoroelastomer)

See Viton.

Paints

See also Solvents, Chemical Materials.

Highly flammable, flammable - observe No Smoking policy

One Pack

Can contain harmful or toxic pigments, driers and other components as well as solvents. Spraying should be carried out only with adequate ventilation.

Two Pack

Can also contain harmful and toxic unreacted resins and resin hardening agents. The manufacturers instructions should be followed. See also Resin-based Adhesives and Isocyanate Adhesives and Sealers under Adhesives and Sealers.

Spraying should preferably be carried out in exhausted ventilated booths removing vapor and spray mists from the breathing zone. Individuals working in booths should wear appropriate respiratory protection. Those doing small-scale repair work in the open workshop should wear air-fed respirators.

Pressurized Equipment

See High Pressure Air, Lubrication and Oil Test Equipment.

Solder

Solders are mixtures of metals such that the melting point of the mixture is below that of the constituent metals (normally lead and tin). Solder application does not normally give rise to toxic lead fumes, provided a gas/air flame is used. Oxy-acetylene flames should not be used, as they are much hotter and will cause lead fumes to be produced.

Some fumes may be produced by the application of any flame to surfaces coated with grease, and inhalation of these should be avoided.

Removal of excess solder should be undertaken with care, to make sure that fine lead dust is not produced, which can give toxic effects if inhaled. Respiratory protection may be necessary.

Solder spillage and filings should be collected and removed promptly to prevent general air contamination by lead.

High standards of personal hygiene are necessary in order to avoid ingestion of lead or inhalation of solder dust from clothing.

Solvents

See also Chemical Materials, Fuels (Kerosene), Fire.

For example acetone, white spirit, toluene, xylene, trichloroethane.

Used in cleaning and dewaxing materials, paints, plastics, resins and thinners.

Some may be highly flammable or flammable.

Skin contact will degrease the skin and may result in irritation and dermatitis following repeated or prolonged contact. Some can be absorbed through the skin in toxic or harmful quantities.

Splashes in the eye may cause severe irritation and could lead to loss of vision.

Brief exposure of high concentrations of vapors or mists will cause eye and throat irritation, drowsiness, dizziness, headaches and, in the worst circumstances, unconsciousness.

Repeated or prolonged exposure to excessive but lower concentrations of vapors or mists, for which there might not be adequate warning indications, can cause more serious toxic or harmful effects.

Aspiration into the lungs, for example through vomiting, is the most serious consequence of swallowing.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing if necessary.

Make sure there is good ventilation when in use, avoid breathing fumes, vapors and spray mists and keep containers tightly sealed. Do not use in confined spaces.

When spraying materials containing solvents, for example paints, adhesive, coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

DESCRIPTION AND OPERATION

Do not apply heat or flame except under specific and detailed manufacturers instructions.

Sound Insulation

See Fibre Insulation, Foams.

Suspended Loads

 **CAUTION: Never improvise lifting tackle.**

There is always a danger when loads are lifted or suspended. Never work under an unsupported, suspended or raised load, for example a suspended engine.

Always make sure that lifting equipment such as jacks, hoists, axle stands and slings are adequate and suitable for the job, in good condition and regularly maintained.

Transmission Brake Bands

See Asbestos.

Underseal

See Corrosion Protection.

Viton

In common with many other manufacturers vehicles, some components have O-rings, seals or gaskets, which contain a material known as 'Viton'.

Viton is a fluoroelastomer, that is a synthetic rubber type material, which contains Fluorine. It is commonly used for O-rings, gaskets and seals of all types. Although Viton is the most well known fluoroelastomer, there are others, including Fluorel and Tecnoflon.

When used under design conditions fluoroelastomers are perfectly safe. If, however, they are exposed to temperatures in excess of 400°C, the material will not burn, but will decompose, and one of the products formed is hydrofluoric acid.

This acid is extremely corrosive and may be absorbed directly, through contact, into the general body system.

O-rings, seals or gaskets which have been exposed to very high temperatures will appear charred or as a black sticky substance.

DO NOT; under any circumstances touch them or the attached components.

Enquiries should be made to determine whether Viton or any other fluoroelastomer has been used in the affected O-ring, seal or gasket. If they are of natural rubber or nitrile there is no hazard. If in doubt, be cautious, as the material may be Viton or any fluoroelastomer.

If Viton or any other fluoroelastomers have been used, the affected area should be decontaminated before the commencement of work.

Disposable heavy duty plastic gloves should be worn at all times, and the affected area washed down using wire wool and a limewater (calcium hydroxide) solution to neutralize the acid before disposing of the decomposed Viton residue and final cleaning of the area. After use, the plastic gloves should be discarded carefully and safely.

Welding

See also Fire, Electric Shock, Gas Cylinders.

Welding processes include Resistance Welding (Spot Welding), Arc Welding and Gas Welding.

Resistance Welding

This process may cause particles of molten metal to be emitted at a high velocity, and the eyes and skin must be protected.

Arc Welding

This process emits a high level of ultra-violet radiation, which may cause arc-eye, and skin burns to the operator and to other persons nearby. Gas-shielded welding processes are particularly hazardous in this respect. Personal protection must be worn, and screens used to shield other people.

CONTACT LENS WEARERS ARE ADVISED TO REVERT TO ORDINARY SPECTACLES WHEN ARC WELDING as the arc spectrum is believed to emit microwaves which dry out the fluid between the lens and the eye. This may result in blindness when the lens is removed from the eye.

Metal spatter will also occur, and appropriate eye and skin protection is necessary.

DESCRIPTION AND OPERATION

The heat of the welding arc will produce fumes and gases from the metals being welded, the rods and from any applied coatings or contamination on the surfaces being worked on. These gases and fumes may be toxic and inhalation of these should be avoided. The use of extraction ventilation to remove the fumes from the working area may be necessary particularly in cases where the general ventilation is poor, or where considerable welding work is anticipated. In extreme cases or confined spaces where adequate ventilation cannot be provided, air-fed respirators may be necessary.

Gas Welding (and Cutting)

Oxy-acetylene torches may be used for welding and cutting, and special care must be taken to prevent leakage of these gases, with consequent risk of fire and explosion.

The process will produce metal spatter and eye and skin protection is necessary.

The flame is bright, and eye protection should be used, but the ultra-violet emission is much less than that from arc welding, and lighter filters may be used.

The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts, and inhalation of the fumes should be avoided.

In brazing, toxic fumes may be produced from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

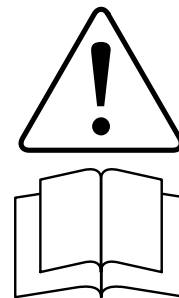
SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS, WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, FOR EXAMPLE BOILING OR STEAMING OUT OF FUEL TANKS.

Warning Symbols on Vehicles

Decals showing warning symbols will be found on various vehicle components.

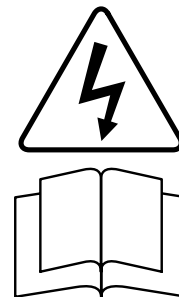
These decals must not be removed. The warnings are for the attention of owners/operators and persons carrying out service or repair operations on the vehicle.

The most commonly found decals are reproduced below together with an explanation of the warnings.



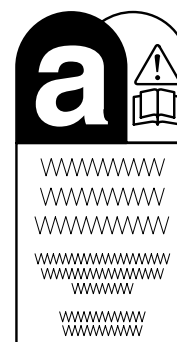
TIM0101001

1. Components or assemblies displaying the caution triangle and open book symbol advise consultation of the relevant section of the owner literature before touching or attempting adjustments of any kind.



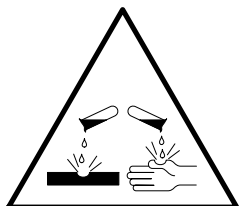
TIM0101002

2. Components or assemblies displaying the warning triangle with the 'electrified' arrow and open book symbol give warning of inherent high voltages. Never touch these with the engine running or the ignition switched on. See Electric Shock in this subsection.



TIM0101003

3. Vehicles and replacement components which contain asbestos are identified by this symbol. See Asbestos in this subsection.

DESCRIPTION AND OPERATION

TIM0101004

4. Components or assemblies displaying this symbol give warning that the component contains a corrosive substance. See Acids and Alkalis in this subsection.



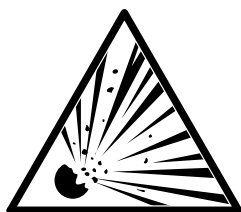
TIM0101008

7. Displaying this symbol warn that children should not be allowed in the immediate vicinity unsupervised.



TIM0101005

5. Displaying the caution circle with a deleted lighted match symbol, caution against the use of naked lights or flames within the immediate vicinity due to the presence of highly flammable or explosive liquids or vapors. See Fire in this subsection.



TIM0101006

6. Displaying this symbol (normally in conjunction with 5 above) warn of the presence of potentially explosive matter within the immediate vicinity.

White Spirit

See Solvents.

DESCRIPTION AND OPERATION

Standard Workshop Practices

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.
- the key is removed from key operated hood locks before any work is carried out around the front of the vehicle.
- if the engine is to be run, there is adequate ventilation, or an extraction hose to remove exhaust fumes.
- there is adequate room to raise the vehicle and remove the wheels, if necessary.
- fender covers are always fitted 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 raised.

 **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, a suitable fire extinguisher is readily available.

Alternative Fuel

 **WARNING: When servicing the fuel system always follow the recommended procedures. Failure to follow these instructions may result in personal injury.**

If the odor of liquefied petroleum gas (LPG) or compressed natural gas (CNG) is present in the air in the workshop, warn all persons in the area to:

- extinguish all flames and lighted tobacco.
- shut off electrical and air powered equipment.
- evacuate the area.
- ventilate the area.
- contact the fire control authorities.
- remove the vehicle to a dedicated, ventilated area.

Alternative Fuel — Do's

- Do work on the vehicle in a designated area, that is well ventilated and with access restricted to qualified personnel only.
- Install new warning labels to their original locations.
- If possible always isolate the alternative fuel tank, and run the vehicle on the alternative fuel until it automatically switches to its normal fuel prior to taking the vehicle into the workshop service area.
- Only use tested and approved components and pipes when repairing or servicing LPG and CNG systems.

Alternative Fuel — Do Nots

- Do not vent off LPG fuel.
- Do not use shop air pressure to force LPG fuel from the fuel tank.
- Do not use paint drying ovens above 40°C for any alternative fuel vehicle. LPG and CNG fuel tanks must be removed from the vehicle prior to being put into paint drying ovens above 40°C.
- Do not modify the system or install new components that are not designed for gas vehicles.
- Do not evacuate fuel tanks unless there is repair that requires the removal of the fuel tank.
- Do not work on the fuel lines or system components unless the alternative fuel has been evacuated and the pressure in the system reduced to atmospheric or less.
- Do not use anything other than the specified leak detector fluid to trace fuel leaks.

Be aware of situations that may cause the LPG or CNG fuel system to vent off fuel, such as:

- extremely hot days.
- parking by a space heater.
- hoisting a vehicle up near a ceiling heater.

Only fully trained personnel, who are conversant with local standards, are to work on alternative fuel vehicles.

DESCRIPTION AND OPERATION

Towing the Vehicle

⚠ WARNING: When the vehicle is being towed, the ignition switch must be in position II (steering lock released and warning lamps illuminated). Only then will the steering, turn signal lamps, horn and stop lamps be operational. Failure to follow these instructions may result in personal injury.

NOTE: The removable towing eye (if equipped), has a left-hand thread and must be fully tightened before towing can commence.

When towing is necessary, the vehicle towing eyes should be used. The rope must be securely fastened to the towing eyes and must also be attached to the other vehicle such that the rope will not foul the bodywork.

When a vehicle with automatic transmission is towed, the gear selector must be in position N (Neutral). Never tow a vehicle with automatic transmission at a speed greater than 30 mph (50 km/h) or for a distance greater than 30 miles (50 km). If it is necessary to tow the vehicle a greater distance, the drive wheels must be lifted clear off the ground.

Alternatively the vehicle can be transported on a low loader or a trailer.

Connecting a Slave Battery Using Jumper Cables

⚠ 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 jumper cables. Failure to follow these instructions may result in personal injury.

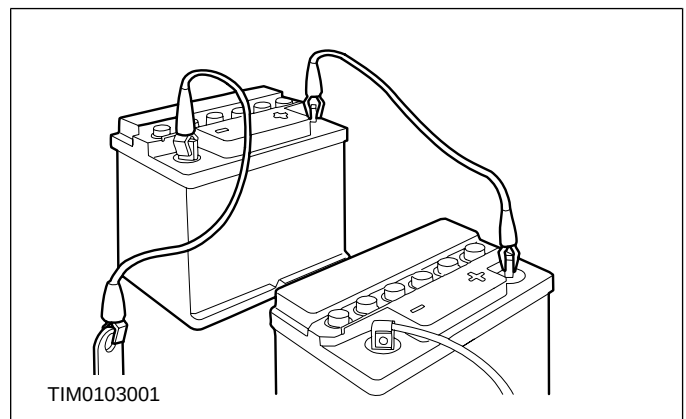
CAUTIONS:

⚠ 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 normal circuits are switched off. This can cause arcing when the jumper cables are connected.

⚠ While 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 jumper cables 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 switched electric circuits are switched off before connecting jumper cables. This reduces the risk of arcing occurring when the final connection is made.



⚠ WARNING: Make sure that the ends of the jumper cables do not touch each other or ground against the vehicle body at any time while the cables are attached to the battery. A fully charged battery, if shorted through jumper cables, can discharge at a rate well above 1000 amps causing violent arcing and very rapid heating of the jumper cables and terminals, and can even cause the battery to explode. Failure to follow these instructions may result in personal injury.

Always connect the jumper cables in the following sequence:

- Slave battery positive first and then vehicle battery positive.
- Slave battery negative next and then vehicle ground at least 12 inches (300 mm) from the battery terminal, for example engine lifting eye.

Always reduce the engine speed to idle before disconnecting the jumper cables.

Before removing the jumper cables from the vehicle that had the discharged battery, switch on the heater blower (high) or the heated rear window, to reduce the voltage peak when the cables are removed.

DESCRIPTION AND OPERATION

Always disconnect the jumper cables in the reverse order to the connecting sequence and do not short the ends of the cables.

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

Component Cleaning

To prevent the 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 cable brushes.
- Scraping dirt off with a piece of metal or wood.
- Wiping off with a rag.

 **WARNING: Wear eye protection when cleaning vehicle components with compressed air, a steam cleaner or a power washer. Failure to follow this instruction may result in personal injury.**

CAUTIONS:

 **Compressed air is sometimes 'wet' so use with caution, especially on hydraulic systems.**

 **To prevent damage to the electrical connectors in the engine compartment, do not use a steam cleaner or a power washer to clean the engine compartment.**

- Blowing dirt off with compressed air.
- Removal of dry dust using vacuum equipment. This method must always be used to remove friction lining material dust (asbestos particles).
- Steam cleaning.

 **WARNING: Most solvents require careful handling and some are harmful. Refer to Health and Safety Precautions and to the manufacturers literature for the relevant safety precautions. Failure to follow these instructions may result in personal injury.**

Various solvents are available which are suitable for component cleaning. Some components, such as brake hydraulic parts and electrical assemblies should be cleaned only with recommended solvents — refer to Solvents, Sealers and Adhesives or to the section of the manual relevant to the component.

Calibration of Essential Measuring Equipment

 **WARNING: Equipment, which requires regular calibration, must be calibrated in accordance with the manufacturers instructions. Failure to follow this instruction may result in personal injury or damage to components.**

It is of fundamental importance that certain essential equipment, for example torque wrenches, multimeters, exhaust gas analyzers or rolling roads, are regularly calibrated in accordance with the manufacturers instructions.

DESCRIPTION AND OPERATION

Solvents, Sealants and Adhesives

Introduction

 **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 Health and Safety Precautions subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken.

DESCRIPTION AND OPERATION

Road/Roller Testing

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

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 and 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.

With the ignition switched off, check:

- the engine oil level.
- the engine coolant level.
- the tires, for correct pressure, compatible types and tread patterns, and wear within limits.
- that 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

NOTE: On initial drive away from cold and within the first 1.5 km (1 mile), do not depress the 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:

- that the parking brake is applied.
- that the gear lever is in the neutral position.
- that all instrument gauges (except fuel gauge) read zero.

With the ignition switched on, check:

- that the ignition controlled warning lamps are illuminated.
- that the engine temperature gauge registers a reading compatible with the engine temperature.
- that the fuel gauge registers a reading appropriate to the fuel level in the tank.
- the operation of the parking brake warning lamp and fluid level warning indicator.

Road or Roller Testing

 **CAUTION:** If road testing, check the brake operation while still traveling 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.

During the road or roller test, check:

- that the clutch pedal operation is not stiff or heavy.
- that the initial gear engagement is smooth and there is no evidence of clutch drag.
- that the parking brake control operates smoothly and releases quickly and completely.
- that the clutch takes up the drive smoothly, without slip or judder.
- that gear changing is smooth with no abnormal noises or vibrations from the transmission.
- the engine power output is satisfactory, full power is achieved, acceleration is smooth and pedal operation is 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.
- that steering operation, including power steering (if equipped), is smooth, accurate, not excessively heavy or with excessive free play or vibration.
- that the steering does not pull to one side and self centers smoothly after cornering.

DESCRIPTION AND OPERATION

- that the speedometer, coolant temperature gauge and tachometer (if equipped) register the correct readings and operate correctly.
- that the switches and controls operate smoothly and positively, warning and indicator lamps operate correctly and the direction indicator control self cancels when the steering is returned to the straight ahead position.
- that the heating and ventilation systems operate correctly and effectively.
- the brake operation and efficiency.
- oil, coolant, hydraulic, air and fuel leaks.
- abnormal temperature of any moving components or assemblies, for example wheel hubs, transmission and axle, which might indicate over tightness or lack of lubrication.

Brake Testing

 **WARNING:** When brake testing, avoid breathing the fumes from hot brakes, this may contain asbestos dust which is hazardous to health. Failure to follow this instruction may result in personal injury.

For additional information, refer to: **Health and Safety Precautions** (100-00 General Information, Description and Operation).

CAUTIONS:

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

 **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 brake disc or brake drum that feels hot or is appreciably hotter than the others, indicates that the brake is binding.

After completion of the test, check for:

DESCRIPTION AND OPERATION**Air Conditioning (A/C) System Health and Safety Precautions****WARNINGS:**

-  Only qualified technicians are allowed to work on air conditioning (A/C) systems.
-  Air conditioning (A/C) system components can become particularly hot or cold.
-  Make sure that the air conditioning (A/C) system is at ambient temperature before carrying out any repair.
-  When handling refrigerants, always wear protective goggles and gloves made of fluoroelastomer. Leather or fabric gloves are not suitable.
-  **SKIN CONTACT:** If liquid refrigerant comes into contact with the skin, it produces severe frostbite. Immediately flush affected areas with plenty of cold running water for 15 minutes. Seek medical attention.
-  **EYE CONTACT:** If refrigerant comes into contact with the eyes, immediately flush the eyes with plenty of running water for 15 minutes. Seek medical attention.
-  **INHALED:** Toxic gases generated when refrigerant is heated are hazardous to health. The gases have an irritating smell and can cause lung damage. The symptoms can continue for a long time after having been in contact with the gases. The gases can cause lung damage even if the amount of gas in the air is too small to smell.
-  Refrigerant is flammable and explosive.
-  Make sure that refrigerant bottles are not exposed to temperatures greater than 45°C.
-  Make sure that the local regulations regarding work on air conditioning (A/C) systems are adhered to.
-  Make sure that refrigerant bottles are closed properly.
-  Gaseous refrigerant has a higher density than air. There is a danger of suffocation when working close to the ground or in workshop pits.
-  Provide adequate ventilation when handling refrigerant.
-  Never release refrigerant into the atmosphere.

-  Only use special tools, equipment and lubricants that are approved for the type of refrigerant being used.
-  Always follow the manufacturer's instructions for the correct servicing unit operating procedure.

CAUTIONS:

-  Do not mix refrigerant oils for different types of refrigerant.
-  Never mix different types of refrigerant or equipment intended for them.
-  Only use refrigerant in gas form when filling the system through the low-pressure connection.
-  Only use refrigerant in liquid form when filling the system through the high-pressure connection.
-  Refrigerant attacks certain plastics. Only use seals suitable for refrigerant.
-  If the air conditioning (A/C) compressor is damaged, the fixed orifice tube can become blocked with metal particles.
-  Any sort of blockage in the refrigerant circuit will damage the air conditioning (A/C) compressor irreparably.
-  If the air conditioning (A/C) system has been opened for a period greater than 2 hours, a new receiver drier must be installed and the evacuating time to be increased by a minimum of 2 hours.

NOTE: New air conditioning (A/C) compressors are delivered prefilled.

NOTE: Refrigerant oil in new air conditioning (A/C) compressors can contain Teflon, visible as white particles, which will not harm the system.

DESCRIPTION AND OPERATION**Battery and Battery Charging Health and Safety Precautions****WARNINGS:**

-  Batteries contain sulphuric acid, avoid contact with skin, eyes or clothing. Wear safety goggles when working near the battery to protect against possible splashing of the acid solution.
-  **EYE CONTACT:** If acid comes into contact with the eyes, flush immediately with plenty of running water for a minimum of 15 minutes. Seek immediate medical attention.
-  **SKIN CONTACT:** If acid comes into contact with the skin, flush immediately with plenty of running water for a minimum of 15 minutes. Seek immediate medical attention.
-  **SWALLOWED:** If acid is swallowed, rinse the mouth with plenty of water and then drink plenty of water or milk. Do not induce vomiting. Seek immediate medical attention.
-  Batteries normally produce explosive gases. Do not allow naked flames, sparks or lighted substances to come near the battery.
-  When charging the battery shield your face and wear safety goggles. Provide adequate ventilation.
-  **CAUTION:** Boost charging with excessive current or voltage above 16 volts will damage the battery.

DESCRIPTION AND OPERATION

Brake System Health and Safety Precautions

WARNINGS:

-  **EYE CONTACT:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid comes into contact with the eyes, flush the eyes with plenty of cold running water for 15 minutes. Seek medical attention for any persistent eye irritation or abnormality.
-  **SWALLOWED:** Brake fluid contains polyglycol ethers and polyglycols. If swallowed, drink plenty of water. Seek immediate medical attention.
-  **INHALED:** Dust from friction materials can be harmful if inhaled.
-  **Only use new specified brake fluid from airtight containers.**
-  **CAUTION:** If brake fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.

DESCRIPTION AND OPERATION

Engine Cooling System Health and Safety Precautions

WARNINGS:

-  **Extreme care must be exercised when handling hot fluids. Always wash off spilled fluids from affected areas of skin immediately.**
-  **Vapors may be given off from antifreeze when heated. Avoid breathing these vapors.**
-  **SKIN CONTACT:** Antifreeze may be absorbed through the skin in toxic or harmful quantities.
-  **SWALLOWED:** If antifreeze is swallowed, drink plenty of water, induce vomiting. Seek immediate medical attention.
-  **Antifreeze must not be used in any cooling or industrial water system that is connected or linked to general water supplies.**

DESCRIPTION AND OPERATION

Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions

WARNINGS:

-  Fuel may not give adequate warning before toxic or harmful effects arise.
-  Exposure to fuel can be harmful and can cause severe health damage or death.
-  Extreme care must be exercised when handling hot fluids. Always wash off spilled fluids from affected areas of skin immediately.
-  Highly flammable mixtures are always present and may ignite when working on fuel systems. Do not allow naked flames, sparks or lighted substances to come near fuel related components.
-  Fuel must not be used as a cleaning agent.
-  Keep fuel containers tightly closed, out of direct sunlight and in a cool area. Keep away from heat sources, ignition sources and oxidizing agents.
-  **SKIN CONTACT:** Excessive or prolonged skin contact with diesel fuel may cause serious skin disorders including skin cancer.
-  **SKIN CONTACT:** Fuel is mildly irritating to the skin and may cause dermatitis due to defatting effect. Remove contaminated clothing. Wash affected areas of skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality. Wash contaminated clothing before reuse.
-  **EYE CONTACT:** Fuel is mildly irritating to the eyes. Flush with plenty of running water, blinking as often as possible. Do not force the eyelid open. Seek medical attention for any persistent eye irritation or abnormality.
-  **SWALLOWED:** Fuel is moderately toxic and tends to foam on vomiting. If drawn into the lungs, inflammation may develop. Do not induce vomiting. If spontaneous vomiting occurs place the victim in a forward position to reduce the risk of fuel being drawn into the lungs. Give nothing by mouth. If breathing but unconscious, place in the recovery position. If breathing

has stopped, apply artificial respiration. Seek immediate medical attention.

-  **INHALED:** Fuel is toxic to the respiratory and other body systems. Exposure may result in various symptoms including drowsiness, unconsciousness or severe health damage. Move a victim to fresh air. Keep a victim warm and at rest. If unconscious, place in the recovery position. If not breathing, apply artificial respiration. Give cardiac massage if necessary. Seek immediate medical attention.

CAUTIONS:

-  Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components.
-  Make sure that the workshop area in which the vehicle is being worked on is as clean and as dust free as possible.

DESCRIPTION AND OPERATION

Supplemental Restraint System (SRS) Health and Safety Precautions

WARNINGS:

-  Only qualified technicians are allowed to work on pyrotechnic components.
-  **INHALED:** Exposure to pyrotechnic residue may cause low blood pressure, severe headache, irritation of mucous membranes, fainting, shortness of breath or rapid pulse. Move a victim to fresh air. Seek immediate medical attention.
-  **EYE CONTACT:** Exposure to unburned pyrotechnic residue may cause irritation, burning and etching of the eyes. Flush immediately with plenty of cold running water for at least 15 minutes. Seek immediate medical attention.
-  **EYE CONTACT:** Exposure to burned pyrotechnic residue may cause irritation, burning and etching of the eyes. Flush immediately with diluted boric acid solution. Seek immediate medical attention.
-  **SKIN CONTACT:** Unburned pyrotechnic residue may be rapidly absorbed through the skin in toxic quantities. Wash immediately with plenty of soap and water. Seek medical attention.
-  **SKIN CONTACT:** Burned pyrotechnic residue may be rapidly absorbed through the skin in toxic quantities. Wash with plenty of water. Do not use soap. Seek medical attention.
-  **SWALLOWED:** Unburned pyrotechnic residue is extremely toxic. If conscious drink plenty of water then induce vomiting. Seek immediate medical attention. If unconscious, or in convulsions do not attempt to induce vomiting or give anything by mouth. Seek immediate medical attention.
-  **SWALLOWED:** Burned pyrotechnic residue is extremely toxic. Drink plenty of water and seek immediate medical attention.
-  The deployment key must only be accessible to authorized personnel.
-  Make sure that the deployment key remains removed from the deployment equipment except during deployment.
-  If permanently disabling or enabling the passenger air bag a new seat belt for vehicles without or with a passenger air bag must be installed.
-  Undeployed pyrotechnic components must not be deployed in the vehicle.
-  Pyrotechnic components must be deployed following local regulations.
-  Check thoroughly that no loose objects can be spread during the deployment of pyrotechnic components.
-  Pyrotechnic components must be transported following local regulations.
-  Never carry out any electrical measurement on disconnected, undeployed pyrotechnic components.
-  Pyrotechnic components must not be disassembled.
-  Pyrotechnic components are not interchangeable between vehicles.
-  Always carry a live air bag module away from the body with the air bag or trim cover pointing upwards.
-  Live air bag modules must be placed in a suitable cage when removed from the vehicle. The air bag or trim cover must be facing upwards.
-  Do not install a rearward facing child safety seat to the passenger seat with an activated passenger air bag.

CAUTIONS:

-  Pyrotechnic components must not be subjected to temperatures higher than 110°C.
-  Never install aftermarket accessories to the vehicle on or adjacent to the supplemental restraint system module.

DESCRIPTION AND OPERATION**Window Glass Health and Safety Precautions****WARNINGS:**

-  Cured polyurethane (PU) adhesive can degrade if subjected to high temperatures. Isocyanide compounds can be released when grinding or welding in close proximity to cured PU adhesive.
-  **SKIN CONTACT:** Prolonged exposure to polyurethane (PU) adhesive may cause skin irritation. If PU adhesive comes into contact with the skin, remove any contaminated clothing. Immediately wash the skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality.
-  **EYE CONTACT:** Polyurethane (PU) adhesive may cause severe irritation or damage. If PU adhesive comes into contact with the eyes, immediately flush eyes with plenty of running water for at least 15 minutes. Seek immediate medical attention.
-  **SWALLOWED:** If polyurethane (PU) adhesive is swallowed, flush the mouth thoroughly. Do not induce vomiting. Provide rest, warmth and fresh air. Seek immediate medical attention.
-  **INHALED:** Persons having a respiratory allergy may have an allergic reaction when handling polyurethane (PU) adhesive.
-  **INHALED:** Polyurethane (PU) adhesive can cause asthma like symptoms. Isocyanate vapor from primer or PU adhesive can cause allergies in the respiratory tract.
-  **INHALED:** If polyurethane (PU) adhesive fumes are inhaled, move victim to fresh air. Provide oxygen if necessary. If breathing stops, provide artificial respiration. Keep a victim warm and at rest. Seek immediate medical attention.

CAUTIONS:

-  Make sure that the direct glazing for bonded glass cutting blades are changed where the cutting depth changes to avoid damage to the body and trim panels.
-  During the curing period of the PU adhesive, the door windows must be left open to avoid a build up of pressure when the doors are opened and closed.

DESCRIPTION AND OPERATION

Body Repair Health and Safety and General Precautions

General

Appropriate repair methods and carrying out repair and paint jobs correctly is particularly important to the operating safety of vehicles and the safety of people.

WARNING: There is danger of injury through:

- High voltage when electrical welding.
 - Do not perform welding work in a damp environment or on a wet substrate. Use suitable insulation underneath.
- Welding spatter and UV radiation.
 - Wear protective clothing, gloves and welding mask or welding goggles.
- Fire, explosion and hot surfaces in the work area.
 - Always have a suitable fire extinguisher available when using welding or heating equipment.
 - Remove flammable substances from the danger area. Remove the fuel tank and fuel pipes and hoses.
 - Welding and grinding near the battery presents the danger of explosion. Remove the battery before you start working.
 - During paint work there is an increased danger of fire or explosion. Prevent any sparks being created. Fire, open light and smoking are forbidden.
 - Always ventilate the workplace well and use an extraction system.
 - Wear protective footwear made from anti-static material.
 - Only use tools made of wood, brass or copper to clean stands and extraction ducts. Do not use tools made of steel.
 - Only fill or decant paint materials in a specially marked area.
- Inhalation and/or absorption through the skin of harmful substances.
 - Welding fumes grinding dusts and solvent vapours can be extremely harmful to the health.
 - Sealants, underbody protection and paint residues must not be burnt down with an unshielded flame, as this will produce harmful substances.
 - Always ventilate the workplace well and use an extraction system.
 - Wear protective clothing.
- Pyrotechnic components.
 - Disconnect the battery negative clamp and cover the battery terminal.
 - Remove any airbag components.
- Noise
 - Cutting, grinding and alignment work can cause a noise level over 85 dB (A).
 - Always wear ear protection.
- High Forces.
 - The various body areas are subject to very high forces during realignment work. Should any component suddenly become detached during this process, there is a very great danger of injury.
 - Pulling chains and pulling shackles must be secured with arrester cables.

As well as these general instructions on the dangers in body and paint shops, you must observe:

- All valid local national and international regulations governing Health and Safety at Work
- Safety instructions of material equipment and tool manufacturers

For additional information, refer to: (100-00 General Information)

[Solvents, Sealants and Adhesives](#) (Description and Operation),
[Air Conditioning \(A/C\) System Health and Safety Precautions](#) (Description and Operation),
[Supplemental Restraint System \(SRS\) Health and Safety Precautions](#) (Description and Operation).

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Personal protection

Besides the body and limbs, several organs vital to life are in very particular danger. Because damage is mostly irreparable, special attention and comprehensive protection is necessary.

Protective equipment

Always use the appropriate protective equipment:

- Protective helmet or welding mask
- Breathing protection
- Protective clothes gloves and safety boots
- Ear defenders
- Extraction systems

Always carry out an operational check on your protective equipment every time before you start working!

Breathing protection

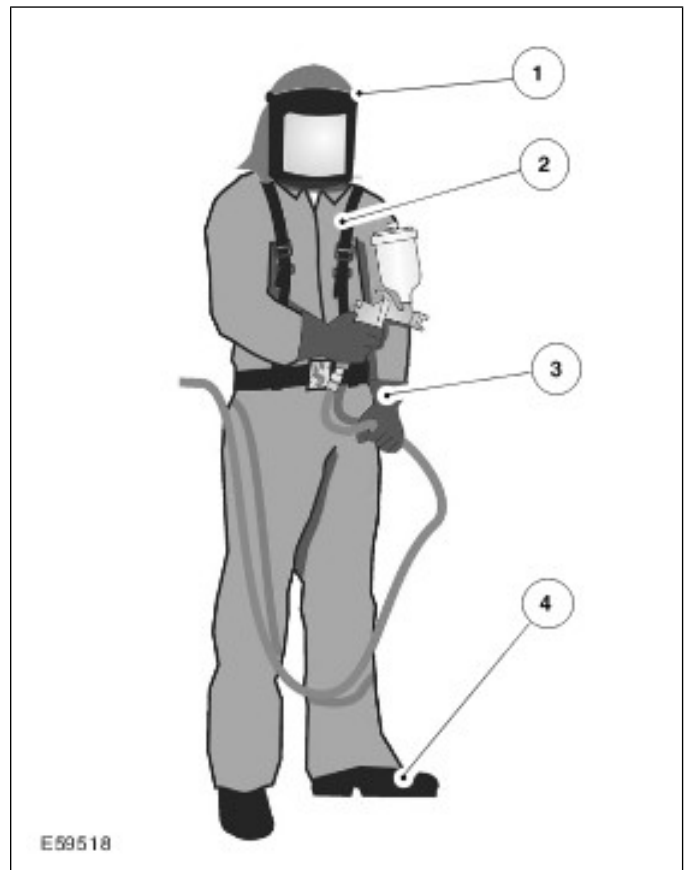
⚠ WARNING: Vapor or spray mist containing isocyanates as a paint base or hardener can cause toxic respiratory disease (conditions similar to asthma) leading to permanent damage, even when inhaled in the lowest concentrations

The instructions for use provided by the manufacturer must be observed when working with breathing protection equipment.

During painting work and in the preparations for painting, gases, vapors, mists or dusts can appear in dangerous concentrations.

Breathing protection devices which are independent of the local atmosphere are most suitable.

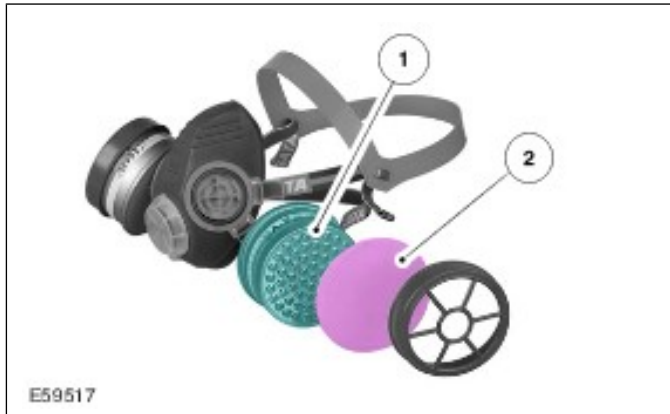
In these types of isolation systems, a compressed air hose carries natural air from the compressor line into the protective mask. During supply, the air undergoes pressure reduction, water removal, fine filtration and usually warming to natural breath temperature.



Item	Description
1	Protective hood with fresh air supply
2	Protective clothing
3	Protective gloves
4	Protective footwear

Only for short periods of work or minimal concentrations of hazardous substances breathing protection devices with a combination filter is suitable as breathing protection equipment.

DESCRIPTION AND OPERATION



Item	Description
1	Activated charcoal filter
2	Coarse filter

Filter masks with wadding, sponge or colloid filters and also paper masks are all unsuitable for working with coating materials because they do not stop solvent vapors.

Eye protection

Cutting grinding welding solvents and paint bear fundamental risks for your eyes.

Damage ranging from irritation of the cornea to incurable illnesses is possible.

Solvents and paint – even water based – could not only be absorbed via your skin but also via your eyes.

Therefore always wear the appropriate eye protection for your work.

Protective goggles must be inert toward splashes of solvent, and must have side protection. Best protection during spray painting is offered by full mask respirators or helmet respirators with built-in visor.

Skin protection

Spray painters must wear suitable protective work clothing (flame-proof and anti-static). Also, when working with water based materials, comprehensive skin protection must be worn, because these materials are very easily absorbed through the skin.

Change your protective clothing at proper intervals. Clothes contaminated with coating materials can easily catch fire.

Do not choose clothes or underwear with a large content of easy melting synthetic fiber, because this material considerably increases the danger and degree of injuries (melted plastic on the skin!).

For areas of the skin which are not covered by protective clothing suitable skin protection cleaning and care agents must be used.

Ear protection

Cutting grinding compressors and extractor fans and ducts are the main sources of noise in body and paint shops.

Always wear suitable ear protection like ear plugs or ear defenders.

Protection of the vehicle

Protect affected areas from weld spatter and dust during all welding and grinding work on the vehicle. If metallic dust stays on the vehicle for some time, there is the likelihood of film rust formation.

Grinding produces tiny spots of damage to the paint surface, which may cause corrosion. Also use suitable protective measures to protect the interior when performing repair operations which relate to the inside of the vehicle.

For this reason, make sure to:

- Use carbon fiber blankets to protect the vehicle body and the interior.
- Use covering film to protect the vehicle body from grinding dust and metal dust.
- Use covering paper to protect the interior from grinding dust.

In addition, take into account:

- Remove fuel supply components as necessary.
- Protect working areas which are in danger of catching fire with a fireproof blanket.
- Keep heat away from all components of the air conditioning system.
- Remove all components in the space adjoining the repair area.

Electronic components

Increased use of comfort and safety electronics in modern vehicles requires additional attention to be paid during body work.

Over voltages produced during welding can cause electronic systems to be damaged. In particular, the safety instructions for performing welding work on vehicles with airbag systems must be adhered to.

WARNING: After disconnecting the power supply and before performing further work, a wait time of up to 15 minutes must be

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**maintained, depending on the vehicle.
Work on airbag systems may only be
performed by persons who have a relevant
certificate of competence.**

For additional information, refer to: (501-20
Supplemental Restraint System)

[Driver Air Bag Module](#) (Removal and
Installation),

[Driver Lower Air Bag Module](#) (Removal and
Installation),

[Passenger Air Bag Module](#) (Removal and
Installation),

[Side Air Bag Module](#) (Removal and Installation),

[Side Air Curtain Module](#) (Removal and
Installation),

[Restraints Control Module \(RCM\)](#) (Removal and
Installation).

Pay attention to the following points:

- Disconnect the battery negative clamp and cover the battery terminal.
- Disconnect the electrical connector at the airbag control module.
- If welding is to be performed directly near a control module, it must be disconnected or removed.
- Never connect the negative cable of the welder near an airbag or a control module.
- Connect the negative cable of the welder close to the location of the weld.