

2006 Fiesta

Workshop Manual

Table of Contents

GROUP 1 General Information

Service Information

General Information	100-00
Identification Codes	100-01
Jacking and Lifting	100-02
Noise, Vibration and Harshness	100-04

GROUP 2 Chassis

Suspension

Suspension System - General Information	204-00
Front Suspension	204-01
Rear Suspension	204-02
Wheels and Tires	204-04

Driveline

Front Drive Halfshafts	205-04
------------------------	--------

Brake System

Brake System - General Information	206-00
Drum Brake	206-02
Front Disc Brake	206-03
Rear Disc Brake	206-04
Parking Brake and Actuation	206-05
Hydraulic Brake Actuation	206-06
Power Brake Actuation	206-07
Anti-Lock Control	206-09A
Anti-Lock Control - Traction Control	206-09B
Anti-Lock Control - Stability Assist	206-09C

Steering System

Steering System - General Information	211-00
Power Steering	211-02

Steering Linkage	211-03
Steering Column	211-04
Steering Column Switches	211-05

GROUP 3 Powertrain

Engine

Engine System - General Information	303-00
Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-01A
Engine - 2.0L Duratec-HE (MI4)	303-01B
Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-03A
Engine Cooling - 2.0L Duratec-HE (MI4)	303-03B
Fuel Charging and Controls - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-04A
Fuel Charging and Controls - 2.0L Duratec-HE (MI4)	303-04B
Accessory Drive	303-05
Starting System	303-06
Engine Ignition	303-07A
Engine Ignition - 2.0L Duratec-HE (MI4)	303-07B
Engine Emission Control - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-08A
Engine Emission Control - 2.0L Duratec-HE (MI4)	303-08B

Intake Air Distribution and Filtering	303-12
Evaporative Emissions	303-13
Electronic Engine Controls	303-14
Automatic Transmission/Transaxle	
Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40)	307-01
Transmission/Transaxle Cooling - Vehicles With: 4-Speed Automatic Transmission (AW81-40)	307-02
Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40)	307-05
Manual Transmission/Transaxle, Clutch and Transfer Case	
Manual Transmission/Transaxle and Clutch - General Information	308-00
Clutch	308-01
Clutch Controls	308-02
Manual Transmission/Transaxle	308-03
Manual Transmission/Transaxle External Controls	308-06
Exhaust System	
Exhaust System	309-00
Fuel System	
Fuel System - General Information	310-00
Fuel Tank and Lines	310-01
Acceleration Control - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	310-02A
Acceleration Control - 2.0L Duratec-HE (MI4)	310-02B

GROUP 4 Electrical

Climate Control System	
Climate Control System - General Information	412-00
Air Distribution and Filtering	412-01
Heating and Ventilation	412-02
Air Conditioning	412-03
Control Components	412-04

Instrumentation and Warning Systems

Instrument Cluster and Panel Illumination	413-00
Instrument Cluster	413-01
Horn	413-06
Information and Message Center	413-08
Warning Devices	413-09
Parking Aid	413-13

Battery and Charging System

Charging System - General Information	414-00
Battery, Mounting and Cables	414-01
Generator and Regulator	414-02

Information and Entertainment Systems

Information and Entertainment System - General Information	415-00
Audio Unit	415-01
Antenna	415-02

Lighting

Exterior Lighting	417-01
Interior Lighting	417-02

Electrical Distribution

Module Communications Network	418-00
Module Configuration	418-01

Electronic Feature Group

Anti-Theft - Active	419-01A
Anti-Theft - Passive	419-01B
Cellular Phone	419-08
Multifunction Electronic Modules	419-10

GROUP 5 Body and Paint

Body and Paint

Body System - General Information	501-00
Front End Body Panels	501-02
Body Closures	501-03
Interior Trim and Ornamentation	501-05
Exterior Trim and Ornamentation	501-08
Rear View Mirrors	501-09
Seating	501-10
Glass, Frames and Mechanisms	501-11
Instrument Panel and Console	501-12

Handles, Locks, Latches and Entry Systems	501-14	Front End Sheet Metal Repairs	501-27
Wipers and Washers	501-16	Roof Sheet Metal Repairs	501-28
Bumpers	501-19	Side Panel Sheet Metal Repairs	501-29
Safety Belt System	501-20A	Rear End Sheet Metal Repairs	501-30
Supplemental Restraint System	501-20B	Paint - General Information	501-36
Body Repairs - General Information	501-25	Frame and Mounting	
Body Repairs - Vehicle Specific Information and Tolerance Checks	501-26	Uni-Body, Subframe and Mounting System	502-00

GROUP

1

General Information

SECTION TITLE	PAGE
Service Information	
General Information.....	100-00
Identification Codes.....	100-01
Jacking and Lifting.....	100-02
Noise, Vibration and Harshness.....	100-04

Chassis

GROUP 2

SECTION TITLE	PAGE
Suspension	
Suspension System - General Information.....	204-00
Front Suspension.....	204-01
Rear Suspension.....	204-02
Wheels and Tires.....	204-04
Driveline	
Front Drive Halfshafts.....	205-04
Brake System	
Brake System - General Information.....	206-00
Drum Brake.....	206-02
Front Disc Brake.....	206-03
Rear Disc Brake.....	206-04
Parking Brake and Actuation.....	206-05
Hydraulic Brake Actuation.....	206-06
Power Brake Actuation.....	206-07
Anti-Lock Control.....	206-09A
Anti-Lock Control - Traction Control.....	206-09B
Anti-Lock Control - Stability Assist.....	206-09C
Steering System	
Steering System - General Information.....	211-00
Power Steering.....	211-02
Steering Linkage.....	211-03
Steering Column.....	211-04
Steering Column Switches.....	211-05



Powertrain

SECTION TITLE	PAGE
Engine	
Engine System - General Information.....	303-00
Engine 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-01A
Engine 2.0L Duratec-HE (MI4).....	303-01B
Engine Cooling 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-03A
Engine Cooling 2.0L Duratec-HE (MI4).....	303-03B
Fuel Charging and Controls 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-04A
Fuel Charging and Controls 2.0L Duratec-HE (MI4).....	303-04B
Accessory Drive.....	303-05
Starting System.....	303-06
Engine Ignition.....	303-07A
Engine Ignition 2.0L Duratec-HE (MI4).....	303-07B
Engine Emission Control 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-08A
Engine Emission Control 2.0L Duratec-HE (MI4).....	303-08B
Intake Air Distribution and Filtering.....	303-12
Evaporative Emissions.....	303-13
Electronic Engine Controls.....	303-14
Automatic Transmission/Transaxle	
Automatic Transmission/Transaxle Vehicles With: 4-Speed Automatic Transmission (AW81-40).....	307-01
Transmission/Transaxle Cooling Vehicles With: 4-Speed Automatic Transmission (AW81-40).....	307-02
Automatic Transmission/Transaxle External Controls Vehicles With: 4-Speed Automatic Transmission (AW81-40).....	307-05
Manual Transmission/Transaxle, Clutch and Transfer Case	
Manual Transmission/Transaxle and Clutch - General Information.....	308-00
Clutch.....	308-01
Clutch Controls.....	308-02
Manual Transmission/Transaxle.....	308-03
Manual Transmission/Transaxle External Controls.....	308-06

Exhaust System

Exhaust System.....309-00

Fuel System

Fuel System - General Information.....310-00

Fuel Tank and Lines.....310-01

Acceleration Control1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L

Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....310-02A

Acceleration Control2.0L Duratec-HE (MI4).....310-02B

GROUP

4

Electrical

SECTION TITLE	PAGE
Climate Control System	
Climate Control System - General Information.....	412-00
Air Distribution and Filtering.....	412-01
Heating and Ventilation.....	412-02
Air Conditioning.....	412-03
Control Components.....	412-04
Instrumentation and Warning Systems	
Instrument Cluster and Panel Illumination.....	413-00
Instrument Cluster.....	413-01
Horn.....	413-06
Information and Message Center.....	413-08
Warning Devices.....	413-09
Parking Aid.....	413-13
Battery and Charging System	
Charging System - General Information.....	414-00
Battery, Mounting and Cables.....	414-01
Generator and Regulator.....	414-02
Information and Entertainment Systems	
Information and Entertainment System - General Information.....	415-00
Audio Unit.....	415-01
Antenna.....	415-02
Lighting	
Exterior Lighting.....	417-01
Interior Lighting.....	417-02
Electrical Distribution	
Module Communications Network.....	418-00
Module Configuration.....	418-01
Electronic Feature Group	
Anti-Theft - Active.....	419-01A
Anti-Theft - Passive.....	419-01B
Cellular Phone.....	419-08
Multifunction Electronic Modules.....	419-10

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C.

GROUP

5

Body and Paint

SECTION TITLE	PAGE
Body and Paint	
Body System - General Information.....	501-00
Front End Body Panels.....	501-02
Body Closures.....	501-03
Interior Trim and Ornamentation.....	501-05
Exterior Trim and Ornamentation.....	501-08
Rear View Mirrors.....	501-09
Seating.....	501-10
Glass, Frames and Mechanisms.....	501-11
Instrument Panel and Console.....	501-12
Handles, Locks, Latches and Entry Systems.....	501-14
Wipers and Washers.....	501-16
Bumpers.....	501-19
Safety Belt System.....	501-20A
Supplemental Restraint System.....	501-20B
Body Repairs - General Information.....	501-25
Body Repairs - Vehicle Specific Information and Tolerance Checks.....	501-26
Front End Sheet Metal Repairs.....	501-27
Roof Sheet Metal Repairs.....	501-28
Side Panel Sheet Metal Repairs.....	501-29
Rear End Sheet Metal Repairs.....	501-30
Paint - General Information.....	501-36
Frame and Mounting	
Uni-Body, Subframe and Mounting System.....	502-00

SECTION 100-00 General Information

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
About This Manual.....	100-00-3
Introduction.....	100-00-3
Special Tools.....	100-00-3
Important Safety Instructions.....	100-00-3
Warnings, Cautions and Notes in This Manual.....	100-00-3
How to Use This Manual.....	100-00-3
Special Tools and Torque Figures.....	100-00-5
Health and Safety Precautions.....	100-00-6
Introduction.....	100-00-6
Acids and Alkalis.....	100-00-6
Air Bags.....	100-00-6
Air Conditioning Refrigerant.....	100-00-6
Adhesives and Sealers.....	100-00-7
Antifreeze.....	100-00-8
Asbestos.....	100-00-8
Battery Acids.....	100-00-8
Brake and Clutch Linings and Pads.....	100-00-8
Brake Fluids (Polyalkylene Glycols).....	100-00-8
Brazing.....	100-00-8
Chemical Materials.....	100-00-8
Chlorofluorocarbons (CFC).....	100-00-9
Clutch Fluids.....	100-00-9
Clutch Linings and Pads.....	100-00-9
Corrosion Protection Materials.....	100-00-9
Cutting.....	100-00-9
Dewaxing.....	100-00-10
Dusts.....	100-00-10
Electric Shock.....	100-00-10
Engine Oils.....	100-00-10
Exhaust Fumes.....	100-00-10
Fibre Insulation.....	100-00-10
Fire.....	100-00-10
First Aid.....	100-00-11
Fluoroelastomer.....	100-00-11
Foams - Polyurethane.....	100-00-11
Freon.....	100-00-11
Fuels.....	100-00-11
Gas Cylinders.....	100-00-12
Gases.....	100-00-12
Gaskets (Fluoroelastomer).....	100-00-12
General Workshop Tools and Equipment.....	100-00-12
High Pressure Air, Lubrication and Oil Test Equipment.....	100-00-13
Halon.....	100-00-13
Legal Aspects.....	100-00-13

Lubricants and Greases.....	100-00-13
Transmission Fluids.....	100-00-13
Noise.....	100-00-14
Noise Insulation Materials.....	100-00-14
O-Rings (Fluoroelastomer).....	100-00-14
Paints.....	100-00-14
Pressurized Equipment.....	100-00-15
Solder.....	100-00-15
Solvents.....	100-00-15
Sound Insulation.....	100-00-15
Suspended Loads.....	100-00-15
Transmission Brake Bands.....	100-00-16
Underseal.....	100-00-16
Viton.....	100-00-16
Welding.....	100-00-16
Warning Symbols on Vehicles.....	100-00-17
White Spirit.....	100-00-18
Standard Workshop Practices.....	100-00-19
Vehicle in Workshop.....	100-00-19
Alternative Fuel.....	100-00-19
Alternative Fuel — Do's.....	100-00-19
Alternative Fuel — Do Nots.....	100-00-19
Towing the Vehicle.....	100-00-20
Connecting a Slave Battery Using Jumper Cables.....	100-00-20
Component Cleaning.....	100-00-21
Calibration of Essential Measuring Equipment.....	100-00-21
Solvents, Sealants and Adhesives.....	100-00-22
Introduction.....	100-00-22
Road/Roller Testing.....	100-00-23
Pre-Test Checks.....	100-00-23
Starting the Engine.....	100-00-23
Road or Roller Testing.....	100-00-23
Brake Testing.....	100-00-24

DESCRIPTION AND OPERATION

About This Manual

Introduction

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, service and repair work with tested, effective techniques. Following them will help assure reliability.

Special Tools

The special tool(s) table provided at the beginning of each procedure shows all special tools required to carry out a repair. Where possible, illustrations are provided to assist in identifying the special tool required.

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.

This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Anyone who departs from the instructions provided in this manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, 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.

As you read through this manual, you will come across WARNINGS, CAUTIONS and NOTES.

A warning, caution or note is placed at the beginning of a series of steps if it applies to multiple steps. If the warning, caution or note only applies to one step, it is placed at the beginning of the specific step (after the step number).

How to Use This Manual

This manual covers diagnosis and testing, service 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.

Pages at the start of the manual list all sections available. Each section has a contents list detailing Specifications, Description and Operation, Diagnosis and Testing, In Vehicle Repairs, 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 and right-hand references to the vehicle are taken from a position sitting in the driver seat looking forward.

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

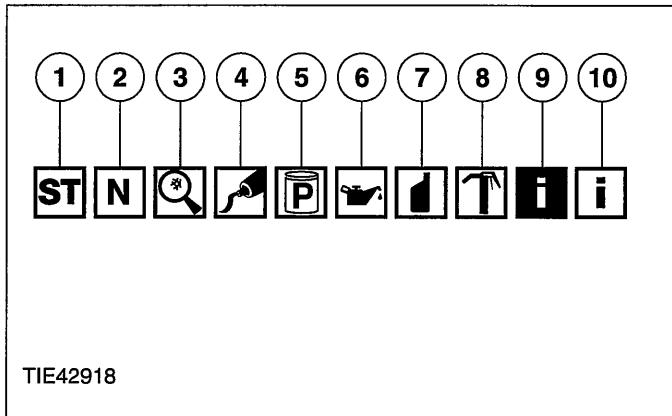
Where appropriate, instructions will be given for the use of the diagnostic tool.

Overview Procedures

Overview procedures contain an exploded view illustration(s). The numbered sequence within the illustration(s) indicate the order to be followed when removing/disassembling or when installing/assembling a component. Additional information, symbol(s) or a torque figure, may also be shown alongside the component.

There are ten symbols used to give additional information when removing/disassembling or when installing/assembling a component.

DESCRIPTION AND OPERATION



Item	Designation	Description
1	Special tool	A special tool is required for this component. There will also be a removal or installation symbol alongside the special tool symbol.
2	Install new component	Discard the old component and install a new component.
3	Inspect	Check the component for damage.
4	Apply sealant	Apply sealant to the component as specified in the materials table.
5	Apply petroleum jelly	Apply petroleum jelly to the component as specified in the materials table.
6	Apply oil	Apply oil to the component as specified in the materials table.
7	Apply fluid	Apply fluid to the component as specified in the materials table.
8	Apply grease	Apply grease to the component as specified in the materials table.
9	Removal or Disassembly detail	Go to the removal or disassembly detail for additional information to remove or disassemble a component
10	Installation or Assembly detail	Go to the installation or assembly detail for additional information to install or assemble a component

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 performed.

DESCRIPTION AND OPERATION

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 performed in a test step.

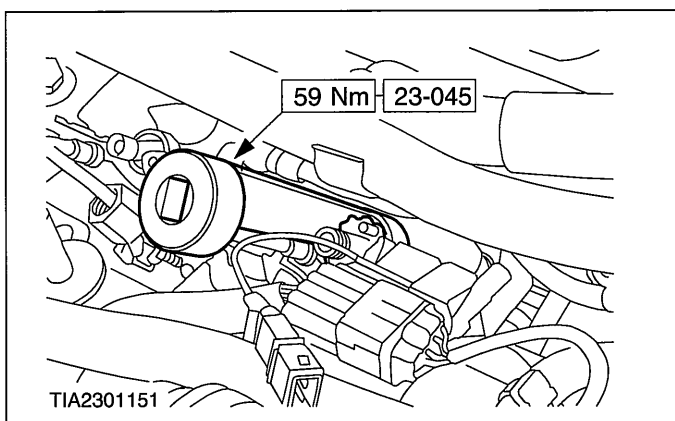
A representative tester graphic is used for voltmeters and ohmmeters.

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.

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

Special Tools and Torque Figures

Any requirement for special tools will picture the tool, showing it in use and with its tool number shown. Torque settings will be given at the relevant point in the procedure.



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.

Following any direct contact with gas generant.

- wash affected areas thoroughly with water.
- seek medical assistance if necessary.

Air Bags - Do's

- Do store modules in an upright position.
- Do keep modules dry.
- Do carry modules with the cover side pointing away from the body.
- Do place modules with their cover side upwards.
- Do carefully inspect modules for damage.
- Do stand to one side when connecting modules.
- Do make sure all test equipment is properly calibrated and maintained.
- Do wash hands after handling deployed air bags.

Air Bags - Do Nots

- Do not store highly flammable material together with modules or gas generators.
- Do not store gas generators at temperatures exceeding 80°C.
- Do not store modules upside down.
- Do not attempt to open a gas generator housing.
- Do not expose gas generators to open flame or sources of heat.
- Do not place anything on top of a module cover.
- Do not use damaged modules.
- Do not touch a fired module or gas generator for at least 10 minutes.
- Do not use any electrical probes on the wiring circuit.

Air Conditioning Refrigerant

See also Chlorofluorocarbon, Chemical Materials

Highly flammable, combustible – observe No Smoking policy.

DESCRIPTION AND OPERATION

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.

Air Conditioning Refrigerant - Do Not

- Do not expose refrigerant bottles to sunlight or heat.
- Do not stand refrigerant bottles upright; when filling, hold them with the valve downwards.
- Do not expose refrigerant bottles to frost.
- Do not drop refrigerant bottles.
- Do not vent refrigerant to atmosphere under any circumstance.
- Do not mix refrigerants, for example R12 (Freon) and R134a.

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.

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

DESCRIPTION AND OPERATION

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.

Vapors may be given off from coolant antifreeze (glycol) when heated. Avoid breathing these vapors.

Antifreeze may be absorbed through the skin in toxic or harmful quantities. Antifreeze, if swallowed, can be fatal and **MEDICAL ATTENTION SHOULD BE SOUGHT IMMEDIATELY.**

These products must not be used in any cooling or industrial water system that is connected or linked to general, food preparation or drinking water supplies.

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.

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.

Gases released during charging are explosive. Never use naked flames or allow sparks near charging or recently charged batteries.

Make sure there is adequate ventilation.

Brake and Clutch Linings and Pads

See Asbestos.

Brake Fluids (Polyalkylene Glycols)

See also Fire.

Splashes to the skin and eyes are slightly irritating. Avoid skin and eye contact as far as possible. Inhalation vapor hazards do not arise at ambient temperatures because of the very low vapor pressure.

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.

DESCRIPTION AND OPERATION**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 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.

DESCRIPTION AND OPERATION**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.

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.

DESCRIPTION AND OPERATION**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

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.

Swallowing can result in mouth and throat irritation and absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Aspiration of liquid into the lungs, through vomiting, is a very serious hazard.

Gasoline dries the skin and can cause irritation and dermatitis on prolonged or repeated contact. Liquid in the eye causes severe smarting.

Motor gasoline may contain appreciable quantities of benzene, which is toxic upon inhalation, and the concentration of gasoline vapors must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.

Make sure there is adequate ventilation when handling and using gasoline. Great care must be taken to avoid the serious consequences of inhalation in the event of vapor build up arising from spillages in confined spaces.

Special precautions apply to cleaning and maintenance operations on gasoline storage tanks.

Gasoline should not be used as a cleaning agent. It must not be siphoned by mouth. See First Aid.

Gas-oil (Diesel Fuel)

Combustible.

DESCRIPTION AND OPERATION

Gross or prolonged skin contact with high boiling point gas oils may also cause serious skin disorders including skin cancer.

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.

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.

DESCRIPTION AND OPERATION

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 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

DESCRIPTION AND OPERATION

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.

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.

DESCRIPTION AND OPERATION

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.

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.

DESCRIPTION AND OPERATION**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 Tecmoflon.

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.

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.

DESCRIPTION AND OPERATION

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.

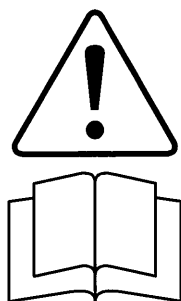
SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS, WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, FOR EXAMPLE BOILING OR STEAMING OUT OF FUEL TANKS.

Warning Symbols on Vehicles

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

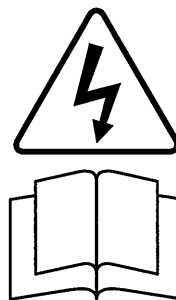
These decals must not be removed. The warnings are for the attention of owners/operators and persons carrying out service or repair operations on the vehicle.

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



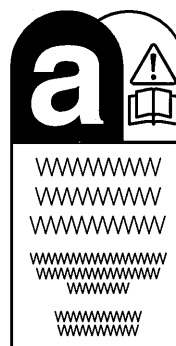
TIM0101001

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.



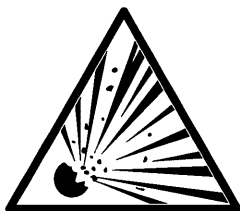
TIM0101004

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

DESCRIPTION AND OPERATION

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.



TIM0101008

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

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 Not's

- 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.

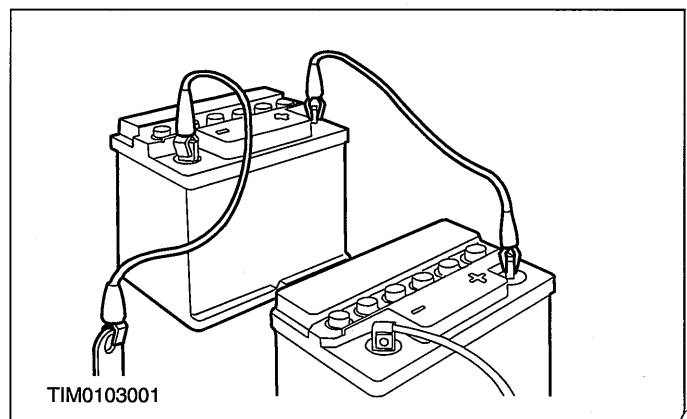
CAUTIONS:

⚠ 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:

SECTION 100-01 Identification Codes

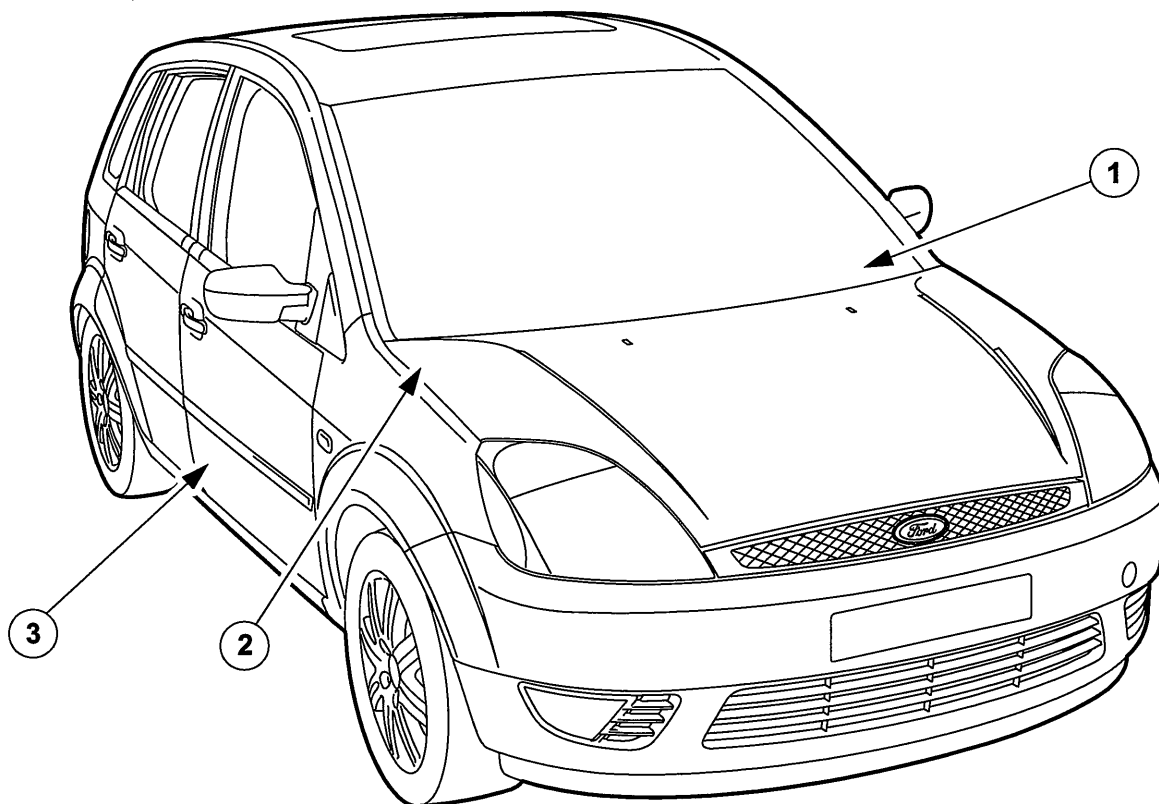
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Identification Codes.....	100-01-2
VIN (an example of VIN shown).....	100-01-3
Vehicle Certification Label (Typical) or VIN Plate.....	100-01-5

DESCRIPTION AND OPERATION**Identification Codes**

The vehicle identification plate (VIN plate) is located on the right-hand B-pillar. The codes stamped or printed on the VIN plate during production enable the precise details of the vehicle build specification to be established. The vehicle

identification number (VIN) may also be viewed through the windshield or in the engine compartment where it is stamped onto the suspension strut top mount.

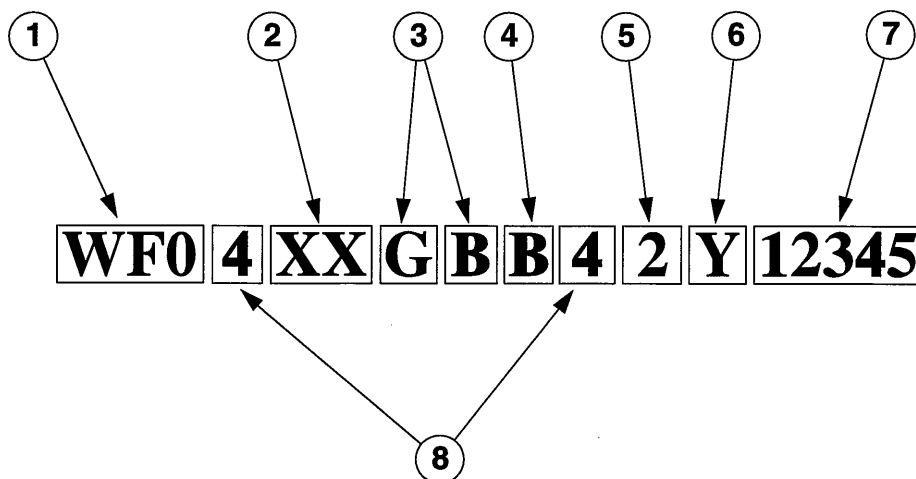


TIE30811

Item	Description
1	Visible VIN
2	VIN on the suspension strut top mount
3	VIN plate

DESCRIPTION AND OPERATION

VIN (an example of VIN shown)



E0025438

Item	Description
1	VIN Position 1, 2 and 3 - World manufacturer identifier
2	VIN Position 5 and 6 - Constant X
3	VIN Position 7 and 8 - Product source company and assembly plant
4	VIN Position 9 - Model

Item	Description
5	VIN Position 11 - Year of manufacture
6	VIN Position 12 - Month of manufacture
7	VIN Positions 13 to 17 - Vehicle serial number
8	VIN Position 4 and 10 - Body type

VIN Position 1, 2 and 3 - World Manufacturer Identifier

Codes	World Manufacturer
WF0	Ford-Werke AG Germany (European vehicles)

VIN Position 4 and 10 - Body Type

Code	Body Type
C	3-door van (Fiesta)
D	3-door (Fiesta)
H	5-door (Fiesta)
U	5-door (Fusion)

VIN Position 5 and 6 — Constant X

DESCRIPTION AND OPERATION**VIN Position 7 and 8 - Product Source Company and Assembly Plant**

Code	Product Source Company and Assembly Plant
GA	Cologne/Germany
WP	Valencia/Spain

VIN Position 9 - Model

Code	Model
J	Fiesta/Fusion

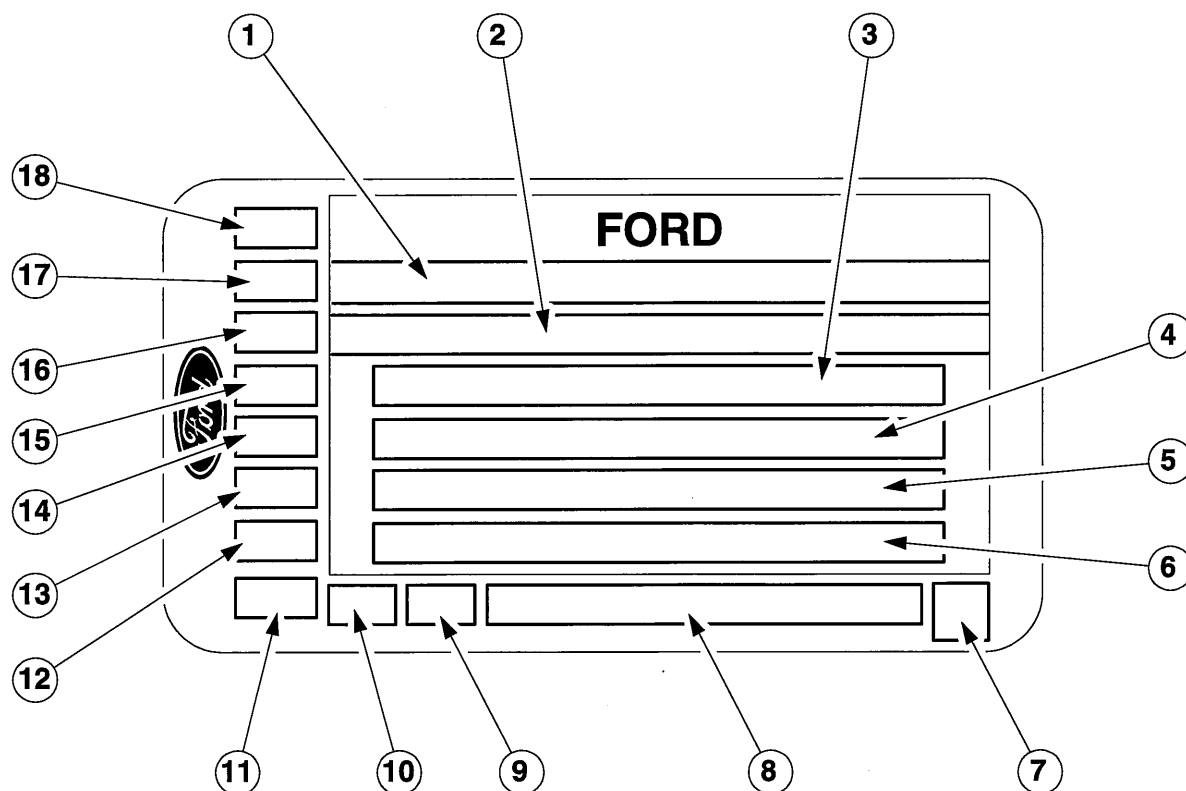
VIN Position 11 - Year of Manufacture

Code	Year of Manufacture
2	2002
3	2003
4	2004
5	2005
6	2006
7	2007

VIN Position 12 - Month of Manufacture

Month	2002	2003	2004	2005	2006	2007
January	L	C	B	J	L	C
February	Y	K	R	U	Y	K
March	S	D	A	M	S	D
April	T	E	G	P	T	E
May	J	L	C	B	J	L
June	U	Y	K	R	U	Y
July	M	S	D	A	M	S
August	P	T	E	G	P	T
September	B	J	L	C	B	J
October	R	U	Y	K	R	U
November	A	M	S	D	A	M
December	G	P	T	E	G	P

VIN Positions 13 to 17 - Vehicle Serial Number
Five Digit Number

DESCRIPTION AND OPERATION**Vehicle Certification Label (Typical) or VIN Plate**

TIE0027423

Item	Description
1	National or whole vehicle type approval
2	VIN
3	Gross vehicle mass (GVM)
4	Gross train mass (GTM)
5	Maximum permissible front axle mass
6	Maximum permissible rear axle mass
7	Smoke value (diesel only)
8	Model body or type
9	Model type

Item	Description
10	Door combination
11	Exhaust emission level codes
12	Body color codes
13	Interior trim codes
14	Transaxle final drive ratio
15	Transaxle codes
16	Engine codes
17	Hand of drive
18	Axle mounting (Transit only)

Items 1 to 6: Vehicle Certification Label

Item	Details
Item 1: National or whole vehicle type approval	A unique code required by legislation in certain territories.
Item 2: VIN	Vehicle identification number.
Item 3: GVM	Indicates maximum legal laden mass, in territories where this is required.

DESCRIPTION AND OPERATION

Item	Details
Item 4: GTM	Indicates the maximum combined mass of vehicle and trailer or caravan.
Item 5: Maximum permissible front axle mass	Maximum permissible loading on the front wheels of the vehicle.
Item 6: Maximum permissible rear axle mass	Maximum permissible loading on the rear wheels of the vehicle.

Item 7: Smoke Value (Diesel only)

Number	Smoke Value
	Per meter

Item 8 Model Body or Type

Code	Model Body or Type
JC3	3-door van (Fiesta)
JD3	3-door (Fiesta)
JH1	5-door (Fiesta)
JU2	5-door (Fusion)

Item 9: Model Type

Code	Model Type
-	-

Item 10: Door Combination

Code	Door Combination
-	-

Item 11: Exhaust Emission Level Codes

Code	Exhaust Emissions
S	2000 EEC (Stage III)
7	Stage IV requirements

Item 12: Body Color Codes

Code	Body Color
B	Diamond White
D	Panther Black
G	Performance Blue
J	Tonic
K	Colorado Red
L	Deep Rosso Red
M	Magnum Grey
Q	Oyster Silver

DESCRIPTION AND OPERATION

Code	Body Color
R	Honour Green
U	Neptune Green
W	Ink Blue
Z	Flare
1	Sublime
2	Aquarius
3	Vitro
6	Moondust Silver
7	Machine Silver
8	Deep Navy

For vehicles built in continental plants, the second digit of the paint code, on the VIN label, denotes the original model year of the color's introduction, ('0'=color introduction in 2000 model year).

Item 13: Interior Trim Codes

Code	Interior Trim
AT	Dogtooth - Mamara Blue
BR	Compass - Blue
DC	Cord - Dark Flint
DM	Mirage - Plum
FB	Bussac - Medium Flint
FC	Cord - Medium Flint
FP	Metropolitan - Medium Flint
FT	Dogtooth - Medium Flint
GM	Mirage - Green
HH	Humy - Dark Flint - Dark Flint
IW	Wire - Infra Red
JH	Humy - Dark Flint - Ebony
LM	Mirage - Medium Light Flint
MI	Intro - Midnight Black
MT	Dogtooth - Midnight Black
NM	Mirage - Tan
QB	Bussac - Ebony
QL	Leather - Ebony
QM	Mirage - Ebony
QZ	Leather - Ebony
Q2	Leather - Ebony

DESCRIPTION AND OPERATION

Code	Interior Trim
RK	Compass - Red
RR	Compass - Red
TB	Bussac - Light Stone
TL	Leather - Light Stone
VK	Compass - Silver

Item 14: Transaxle Final Drive Ratio

Code	Transaxle Final Drive Ratio
A	3.37
B	4.06
M	4.05
R	4.25
3	4.375
4	3.82

Item 15: Transaxle Codes

Code	Transaxle
A	5-Speed Manual Transaxle (iB5)
B	5-Speed Manual Transaxle (iB5) Automated Shift Manual
C	4-Speed Automatic Transaxle (AW81- 40LE)

Item 16: Engine Codes

Code	Engine
A	1.3L Duratec-8V (Rocam) (60PS)
H	1.6L Duratorq-TDCi (DV) Diesel (90PS)
U	1.25L Duratec-16V (Sigma) (75PS)
X	1.4L Duratec-16V (Sigma) (80PS)
Y	1.6L Duratec-16V (Sigma) (100PS)
4	2.0L Duratec-HE (MI4) (150PS)
6	1.4L DuraTorq-TDCi (DV) (68PS)
7	1.25L Duratec-16V (Sigma) (70PS)
9	1.3L Duratec-8V (Rocam) (70PS)

Item 17: Hand of Drive

Code	Drive
1	Left-hand drive
2	Right-hand drive
3	Left-hand drive

DESCRIPTION AND OPERATION

Code	Drive
4	Right-hand drive
5	Left-hand drive
6	Right-hand drive
N	Left-hand drive
P	Right-hand drive
Q	Left-hand drive
R	Right-hand drive
S	Left-hand drive
T	Right-hand drive

SECTION 100-02 Jacking and Lifting

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DESCRIPTION AND OPERATION

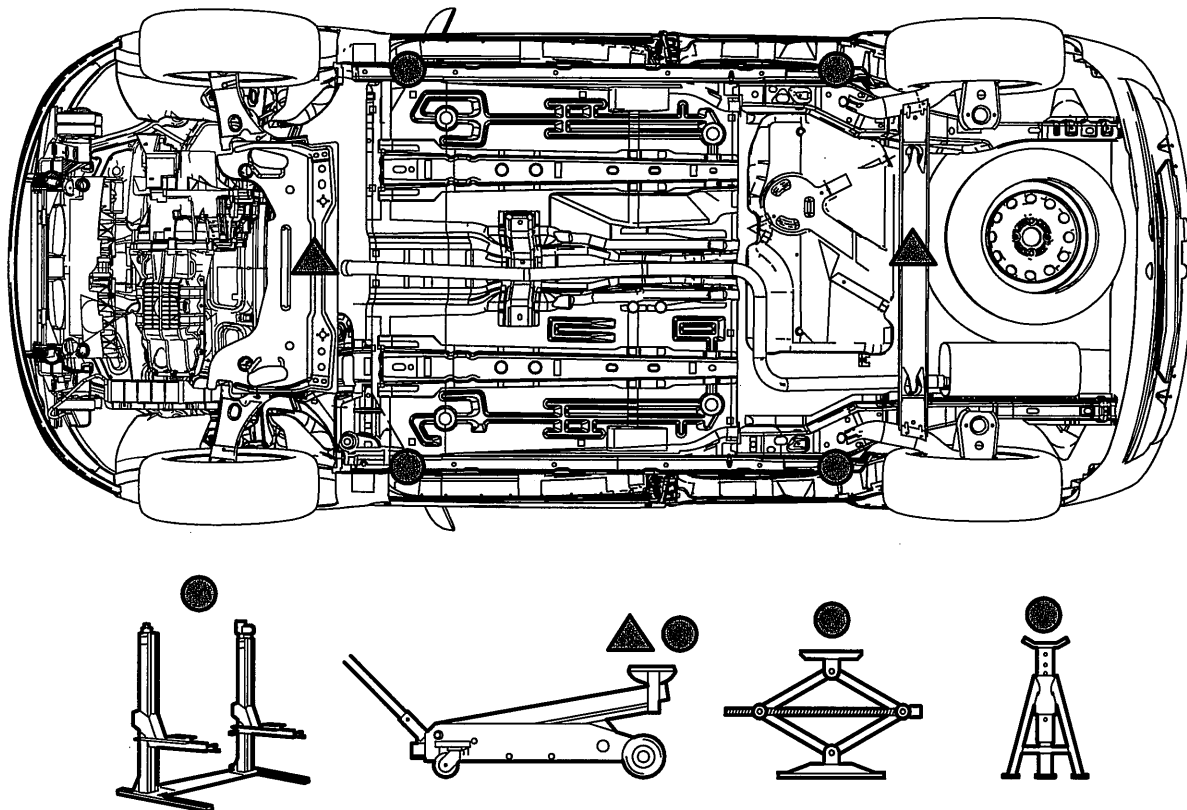
Jacking.....	100-02-2
Lifting.....	100-02-5

DESCRIPTION AND OPERATION**Jacking**

▲ **WARNING:** Only the specified jacking points may be used for jacking up and supporting the vehicle.

⚠ **CAUTION:** Park the vehicle on a flat, level and stable surface. If the vehicle must be lifted on a soft surface, the supporting

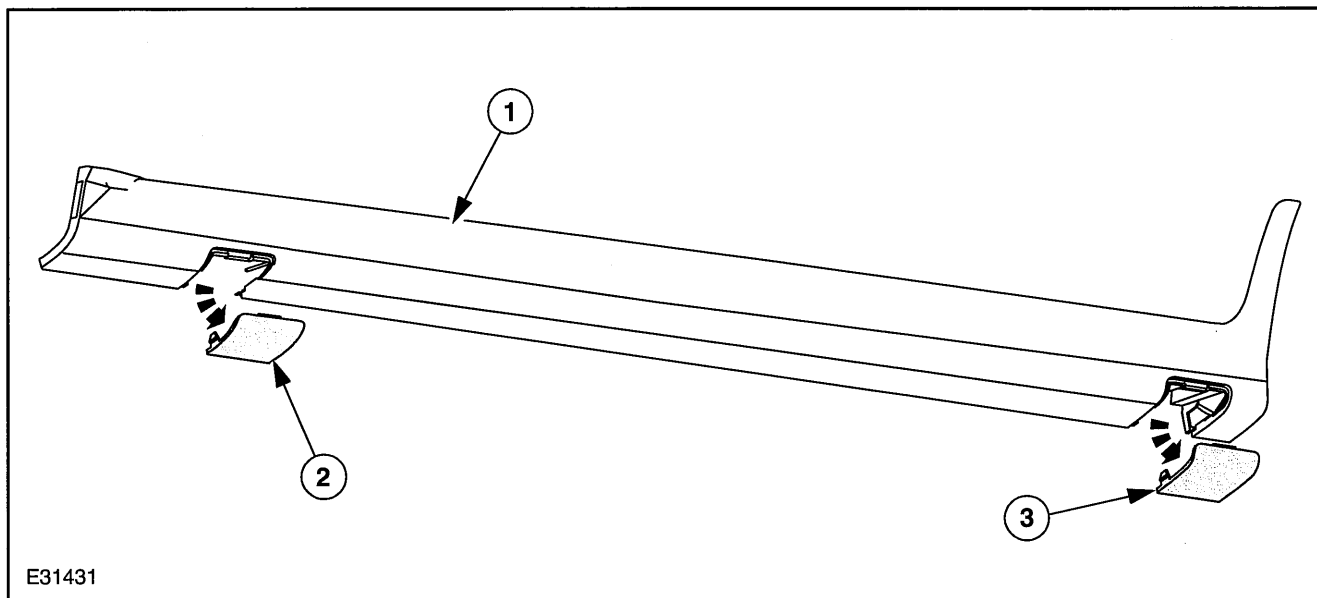
forces must be spread by using a suitable base under the jack. Place a wheel chock against the wheel opposite the jack. Failure to follow these instructions may result in personal injury.



E31125

In order to prevent damage to the rocker panel moulding (if equipped), the covers must be removed at the relevant locations in the rocker panel moulding before raising the vehicle.

DESCRIPTION AND OPERATION

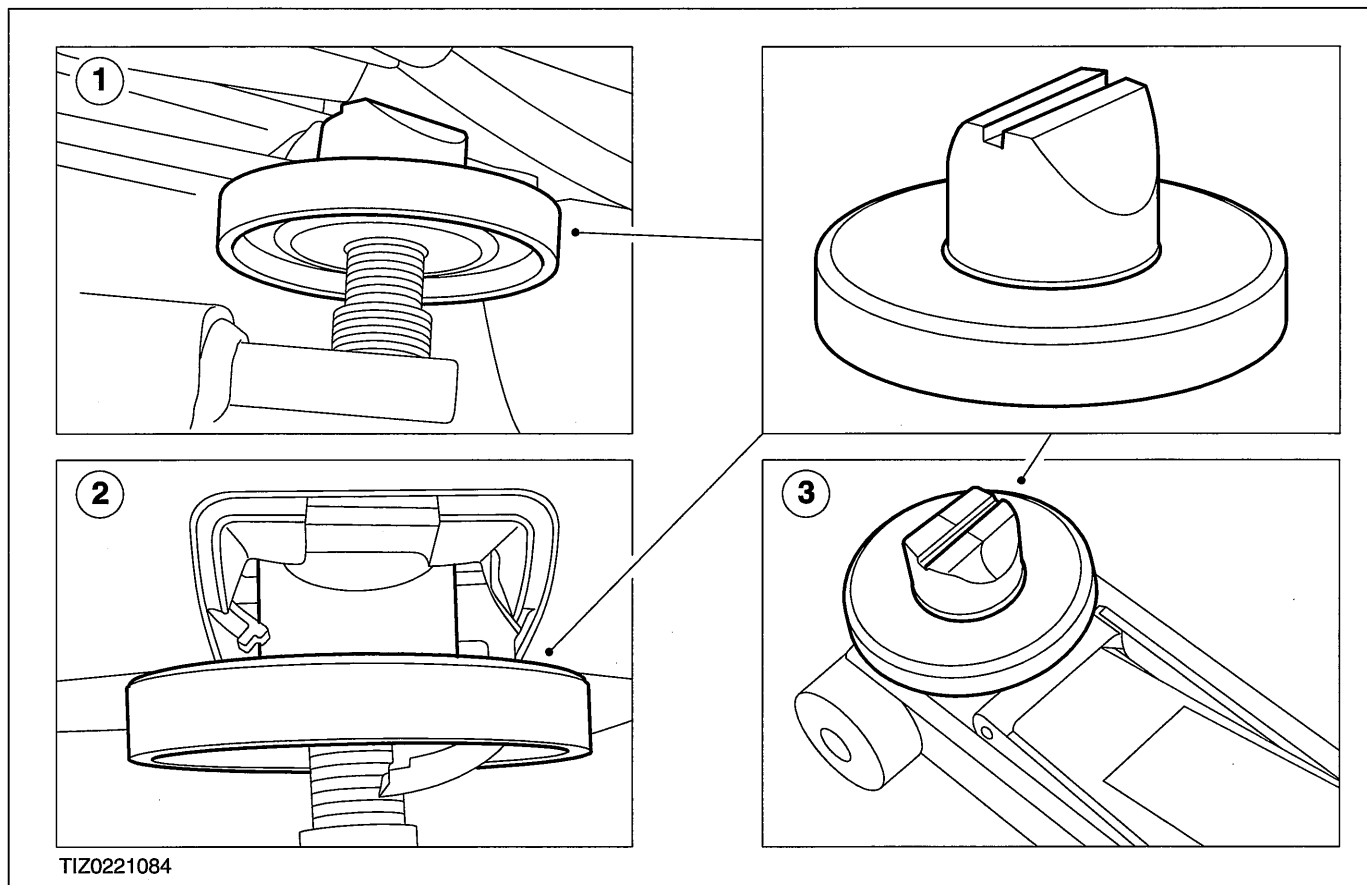


Item	Description
1	Rocker panel moulding (left-hand side shown)
2	Front cover
3	Rear cover

CAUTIONS:

⚠ When lifting the vehicle with a trolley jack or a lifting platform, special adapters with locating plates must be used.

⚠ In order to prevent damage to the chassis and the body, the vehicle must be lifted or supported using the adapters shown in the illustration.

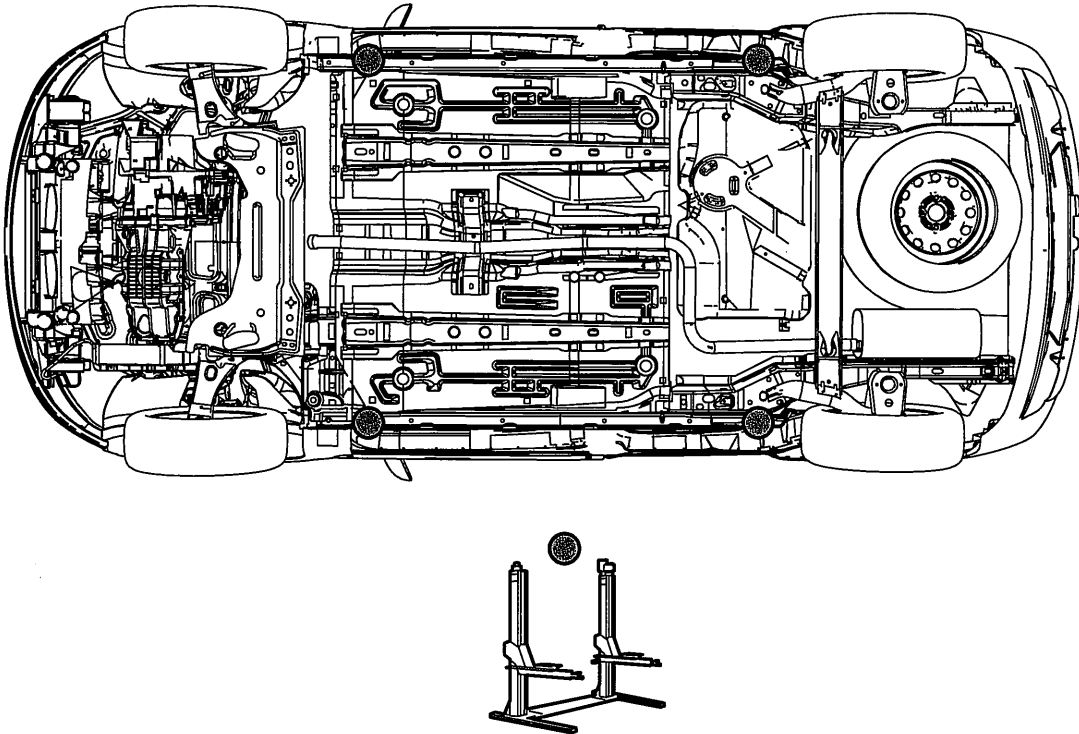
DESCRIPTION AND OPERATION**Adapters for jacking points**

Item	Description
1	Adapter with locating plate and rear jacking point (viewing angle from below the vehicle)
2	Adapter with locating plate and rear jacking point
3	Adapter with locating plate in conjunction with the trolley jack

DESCRIPTION AND OPERATION**Lifting**

▲ **WARNING:** Only raise the vehicle at the specified lifting points.

⚠ **CAUTION:** Place blocks underneath the hoist points if a two-column hoist is used.



E31126

SECTION 100-04 Noise, Vibration and Harshness

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Noise, Vibration and Harshness (NVH).....	100-04-2
Diagnostic Theory.....	100-04-2
Know the System.....	100-04-2
Know the History of the System.....	100-04-2
Know the History of the Condition.....	100-04-2
Know the Probability of Certain Conditions Developing.....	100-04-2
Do Not Cure the Symptom and Leave the Cause.....	100-04-2
Be Positive the Cause is Found.....	100-04-2
Diagnostic Charts.....	100-04-2
DIAGNOSIS AND TESTING	
Noise, Vibration and Harshness (NVH).....	100-04-4
Inspection and Verification.....	100-04-4
Noise Diagnostic Procedure.....	100-04-4
Road Test.....	100-04-5
Road Test Quick Checks.....	100-04-5
Road Conditions.....	100-04-6
Vehicle Preparation.....	100-04-6
Power Steering Conditions.....	100-04-6
Power Steering Operation Noise Check.....	100-04-6
Symptom Chart.....	100-04-9
Pinpoint Tests.....	100-04-16
GENERAL PROCEDURES	
Powertrain/Drivetrain Mount Neutralizing..... (14 001 0)	100-04-23

DESCRIPTION AND OPERATION**Noise, Vibration and Harshness (NVH)**

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

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

Diagnostic Theory

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

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

Know the System

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

Know the History of the System

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

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

Know the History of the Condition

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

Know the Probability of Certain Conditions Developing

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

Do Not Cure the Symptom and Leave the Cause

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

Be Positive the Cause is Found

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

Diagnostic Charts

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

DESCRIPTION AND OPERATION

- Probability of certain things occurring in a system.
- Speed of checking certain components or functions before others.
- Simplicity of performing certain tests before others.
- Elimination of checking huge portions of a system by performing simple tests.
- Certainty of narrowing down the search to a small portion before performing in-depth testing.

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

DIAGNOSIS AND TESTING

Noise, Vibration and Harshness (NVH)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and REFER to the Symptom Chart.

How to Use this Diagnostic Procedure Section

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

Customer Interview

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

Identify the Condition

NVH usually occur in four areas:

- tires
- engine accessories
- suspension
- driveline

It is important, therefore, that an NVH concern be isolated into its specific area(s) as soon as possible. The easiest and quickest way to do this is to carry out the Road Test as outlined. To assist in the diagnosis and testing procedure(s), use a suitable approved NVH diagnosis tester.

Noise Diagnostic Procedure

Non-Axle Noise

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

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

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

DIAGNOSIS AND TESTING

Noise Conditions

- Gear noise is typically a howling or whining due to gear damage or incorrect bearing preload. It can occur at various speeds and driving conditions, or it can be continuous.
- Chuckle is a particular rattling noise that sounds like a stick against the spokes of a spinning bicycle wheel. It occurs while decelerating from 64 km/h (40 mph) and can usually be heard all the way to a stop. The frequency varies with vehicle speed.
- Knock is very similar to chuckle, though it may be louder and occurs on acceleration or deceleration. The teardown will disclose what has to be corrected.

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

- worn, damaged or incorrectly installed wheel bearing, suspension or brake component.

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

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

Vibration Conditions

Vibration at highway speeds may be caused by the following:

- out-of-balance front or rear wheels.
- out-of-round tires.

Shudder or vibration during acceleration may be caused by the following:

- damaged powertrain/drivetrain mounts.
- excessively high constant velocity (CV) joint operating angles caused by incorrect ride height. Check ride height, verify correct spring rate and check items under inoperative conditions.

Road Test

A gear-driven unit will produce a certain amount of noise. Some noise is acceptable and may be audible at certain speeds or under various driving

conditions, as on a newly paved asphalt road. The slight noise is in no way detrimental and must be considered normal.

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

1. Make notes throughout the diagnosis routine. Make sure to write down even the smallest bit of information, because it may turn out to be the most important.
2. Do not touch anything until a road test and a thorough visual inspection of the vehicle have been carried out. Leave the tire pressures and vehicle load just where they were when the condition was first observed. Adjusting tire pressures, vehicle load or making other adjustments may reduce the condition(s) intensity to a point where it cannot be identified clearly. It may also inject something new into the system, preventing correct diagnosis.
3. Make a visual inspection as part of the preliminary diagnosis routine, writing down anything that does not look right. Note tire pressures, but do not adjust them yet. Note leaking fluids, loose nuts and bolts, or bright spots where components may be rubbing against each other. Check the load space for unusual loads.
4. Road test the vehicle and define the condition by reproducing it several times during the road test.
5. Carry out the Road Test Quick Checks as soon as the condition is reproduced. This will identify the correct diagnostic procedure. Carry out the Road Test Quick Checks more than once to verify they are providing a valid result. Remember, the Road Test Quick Checks may not tell where the concern is, but they will tell where it is not.

Road Test Quick Checks

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

DIAGNOSIS AND TESTING

2. **Acceleration/Deceleration:** With slow acceleration and deceleration, a shake is sometimes noticed in the steering wheel/column, seats, front floor panel, front door trim panel or front end sheet metal. It is a low frequency vibration (around 9-15 cycles per second). It may or may not be increased by applying the brakes lightly. REFER to Idle Boom/Shake/Vibration in the Driveline Noise and Vibration Symptom Chart.
3. **High Speed:** A vibration is felt in the front floor panel or seats with no visible shake, but with an accompanying sound or rumble, buzz, hum, drone or booming noise. Coast with the clutch pedal depressed (manual transmission) or shift control selector lever in "N" (NEUTRAL) (automatic transmission) and engine idling. If vibration is still evident, it may be related to wheels, tires, front brake discs, wheel hubs or front wheel bearings. REFER to Shake and Vibration While Driving in the Driveline Noise and Vibration Symptom Chart.
4. **Engine rpm Sensitive:** A vibration is felt whenever the engine reaches a particular rpm. It will disappear in neutral coasts. The vibration can be duplicated by operating the engine at the problem rpm while the vehicle is stationary. It can be caused by any component, from the accessory drive belt to the clutch or torque converter which turns at engine speed when the vehicle is stopped. REFER to Shake and Vibration While Driving in the Driveline Noise and Vibration Symptom Chart.
5. **Noise and Vibration While Turning:** Clicking, popping or grinding noises may be due to the following:
 - worn, damaged or incorrectly installed front wheel bearing.
 - damaged powertrain/drivetrain mounts.

Road Conditions

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

produced. Once the route is established and consistently used, the road noise variable is eliminated from the test results.

NOTE: Some concerns may be apparent only on smooth asphalt roads.

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

Vehicle Preparation

Carry out a thorough visual inspection of the vehicle before carrying out the road test. Note anything which is unusual. Do not repair or adjust any condition until the road test is carried out, unless the vehicle is inoperative or the condition could pose a hazard to the technician. After verifying that the condition has been corrected, make sure all components removed have been installed.

Power Steering Conditions

Check for the noise in the following conditions to verify the customer concern.

- Check for the noise in several temperature conditions.
- Is the noise from when the vehicle was new?
- Can the noise be repeated constantly or is it random?
- Check the condition of the vehicle age, mileage and service record.
- Interview the customer to find the operating condition in which the noise will occur. Test the vehicle based on the detail(s) from the customer interview.
- Follow the power steering operation noise condition tables below, to find which condition the noise will occur.

Power Steering Operation Noise Check

Step 1: Check for NVH concerns from non-steering components, which may sound like noises coming from the steering system.

DIAGNOSIS AND TESTING

Power assisted steering operating condition			
Parking		Driving	
Steering central/slightly off center	Steering at a steering lock stop	Driving straight ahead	Cornering condition
REFER to NVH concerns from other components column A	REFER to NVH concerns from other components column B	REFER to NVH concerns from other components column C	REFER to NVH concerns from other components column D

NVH concerns from other components

NVH concerns from other condition (column A to D)					
Noise	Driving Condition	A	B	C	D
Pedal box knocking	Drive off, stop driving and slow cornering over uneven roads	X	X	O	X
Stabilizer bar link knocking	Drive off, driving and cornering	X	O	O	X
Engine support insulator knocking	Drive off, driving, acceleration and deceleration	X		X	
Air conditioning knocking	Engine on, activate switch for air conditioning	X	X	O	O
Suspension knocking (Subframe, Springs)	Drive off, driving, cornering, acceleration and deceleration	X		O	X
Constant velocity (CV) joint knocking	Drive off, driving, cornering, acceleration and deceleration	X	O		X
Washer bottle	Deceleration, acceleration and single impact	O		X	
Loose suspension bolts	All driving conditions	O		O	X
Instrument panel rattle/squeak	All driving conditions. Engine rpm dependant	X	X	X	X
• X = Noise will most likely occur in this operating condition. • O = Noise can possibly occur in this operating condition. • Blank = Noise is unlikely to occur in this operating condition.					

Step 2: Check for steering system NVH concerns according to operation condition described at the customer interview.

Power assisted steering operating condition					
Parking		Driving		Vehicle stationary with engine off	
Steering central/slightly off center	Steering at a steering lock stop	Steering central/slightly off center	Steering at a steering lock stop	Steering central/slightly off centre	Steering at a steering lock stop

DIAGNOSIS AND TESTING

Power assisted steering operating condition					
Parking		Driving		Vehicle stationary with engine off	
REFER to steering system NVH concerns column A	REFER to steering system NVH concerns column B	REFER to steering system NVH concerns column C	REFER to steering system NVH concerns column D	REFER to steering system NVH concerns column E	REFER to steering system NVH concerns column F

Steering system NVH concerns

Steering System operation condition (column A to F)							
Noise	Driving condition	A	B	C	D	E	F
Moan	Parking between lock stops, at engine idle and also increased engine speed	X	O				
Whine	Driving, high engine rpm. Must be present from new	O	O	X	X		
Hiss	a) Parking between lock stops. Must be present from new	X	X	O	O		
	b) Holding steering wheel against lock stops. Must be present from new		X				
Lock stop impact knock	a) Parking at lock stop. Must be present from new		X				X
Mechanical knock (power assisted steering (PAS) off)	b) Parking between lock stops, engine OFF. Must be present from new					X	
Mechanical Knock (PAS on)	c) Parking between lock stops, engine ON (ball joint knock)	X					
Hammer knock	d) Parking into lock stop and release (vehicle with hydraulic power assisted steering (HPAS) only, not for vehicles with electro-hydraulic power assisted steering (EHPAS))		X				
Hydraulic knock (clonk)	e) Driving, cobble stones, rough road (clonk). Must be present from new			O	X		
Column knock	f) Parking, driving, cobble stones and rough roads	X	X	O	X	X	X
Column rattle	Mainly driving on rough roads	O		X	X	O	
Toc-toc	Steering left and right at high frequency. Must be present from new	X					
Grinding	When turning steering wheel	X			O	X	
Zip	At engine start, low temperatures below -10°C only	X	O				
• X = Noise will most likely occur in this operating condition. • O = Noise can possibly occur in this operating condition. • Blank = Noise is unlikely to occur in this operating condition.							

DIAGNOSIS AND TESTING

Step 3: According to each identified operating condition (Column A, B, C, D, E, F), check each possible Steering System NVH concern with the detail symptom charts below.

Before conducting a vehicle test to identify a NVH concern carry out the following checks.

1. Check the tire pressures and adjust to specification, as necessary.
2. Make sure the steering system fluid is correct, the system is free of leaks and is operating correctly.
3. Make sure the vehicle steering system temperature is the same as described at the customer interview.
4. All evaluations must take place in a relatively quiet location.
5. The heating - air conditioning (A/C) fan and radio must be turned off during evaluations and the windows closed.

Symptom Chart

Power Steering Moan Noise

Test Condition

Listen for steering moan noise with the vehicle parked, transmission in neutral and all windows closed in the following test conditions.

1. Engine speed at idle with no steering action.
2. Engine speed at idle with slow 90 degrees per second turning of the steering wheel.
3. Engine speed at 1250 +/- 50 rpm with no steering action.
4. Engine speed at 1250 +/- 50 rpm with slow 90 degrees per second turning of the steering wheel.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Power steering system moan noise – A continuous low pitched humming noise occurs when the steering wheel is turned and the steering system is loaded. Noise frequency changes with engine rpm changes. Particularly annoying at lower engine speed.	Power steering lines.	• CHECK the routing of the power steering lines. • CHECK the power steering line clamps are secure. • CHECK the power steering lines for clearance from the vehicle body, front axle cross-member and steering gear.
	Incorrect power steering fluid.	FLUSH the power steering system. REFER to: (211-00) Power Steering System Flushing - 1.8L Duratec-HE (MI4)/1.8L Duratec-SCi (MI4)/2.0L Duratec-HE (MI4) (General Procedures), Power Steering System Flushing - 3.0L Duratec-SE (VE6)/2.5L Duratec-VE (VE6)/3.0L Duratec-ST (VE6) (General Procedures), Power Steering System Flushing - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel/2.2L Duratorq-TDCi (Puma) Diesel (General Procedures).
	Power steering pump.	Pressure pulses from the power steering pump. Certain amount of noise level acceptable, not a safety critical item.

Power Steering Whine Noise**Test Condition**

Listen for steering whine noise with the vehicle parked, transmission in neutral and all windows closed in the following test conditions.

1. Engine speed at 1800 +/- 50 rpm with no steering action.
2. Engine speed at 1800 +/- 50 rpm with slow 90 degrees turning of the steering wheel.
3. Engine speed at 3000 +/- 50 rpm with no steering action.
4. Engine speed at 3000 +/- 50 rpm with slow 90 degrees turning of the steering wheel.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Power steering system whine noise – a high pitched buzzing sound like an electric motor or drill. Whine occurs at the higher engine rpm, 1500 - 5000 rpm, frequency does not change if system is loaded or not loaded.	Power steering fluid aeration.	BLEED the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).
	Incorrect power steering fluid.	FLUSH the power steering system. REFER to: (211-00) Power Steering System Flushing - 1.8L Duratec-HE (MI4)/1.8L Duratec-SCi (MI4)/2.0L Duratec-HE (MI4) (General Procedures), Power Steering System Flushing - 3.0L Duratec-SE (VE6)/2.5L Duratec-VE (VE6)/3.0L Duratec-ST (VE6) (General Procedures), Power Steering System Flushing - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel/2.2L Duratorq-TDCi (Puma) Diesel (General Procedures).
	Overheated power steering fluid.	FLUSH the power steering system. REFER to: (211-00) Power Steering System Flushing - 1.8L Duratec-HE (MI4)/1.8L Duratec-SCi (MI4)/2.0L Duratec-HE (MI4) (General Procedures), Power Steering System Flushing - 3.0L Duratec-SE (VE6)/2.5L Duratec-VE (VE6)/3.0L Duratec-ST (VE6) (General Procedures), Power Steering System Flushing - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel/2.2L Duratorq-TDCi (Puma) Diesel (General Procedures).
	Hydraulic operating condition of the power steering pump.	Certain amount of noise level acceptable, not a safety critical item.

DIAGNOSIS AND TESTING**Power Steering Hiss Noise**

Listen for steering hiss noise with the vehicle parked, transmission in neutral and all windows closed in the following test conditions.

Test Condition

Symptom	Possible Sources	Action
NOTE: Engine speed at idle turning the steering wheel slowly lock to lock. Power steering system hiss noise – a high frequency, continuous rush or swish noise like escaping air from a balloon. Hiss occurs while turning between the steering lock stops, all steering angles. Noise does not change with engine rpm and is worse at high operating temperatures.	Floor seal.	CHECK the installation and potential damage of the floor seal.
	Power steering gear valve design.	Certain amount of noise level acceptable, not a safety critical item.
	Power steering system hydraulic design.	Certain amount of noise level acceptable, not a safety critical item.
NOTE: Engine speed at idle holding the steering wheel against a steering lock for three seconds. Do not hold for more than five seconds. Power steering system hiss noise – a continuous noise like escaping air occurs while holding the steering against a steering lock stop.	Power steering pump pressure relief valve.	Certain amount of noise level acceptable, not a safety critical item.

Power Steering Lock Stop Impact Knock Noise

1. Turn the steering wheel to the left-hand and right-hand steering locks and listen for the impact noise.

Test Condition

Listen for steering knock noise with the engine speed at idle in the following test conditions (noise also apparent with engine off).

Symptom	Possible Sources	Action
Power steering system knock noise – a heavy loud sound like a knock on a door that occurs in parking condition when hitting the lock stop.	Power steering gear mechanical noise, metal to metal at end of steering travel.	Certain amount of noise level acceptable, not a safety critical item.

Power Steering Mechanical Knock Noise (PAS off)

1. Turn the steering wheel 90 degrees to the right, hold and then quickly release.
2. Turn the steering wheel 90 degrees to the left, hold and then quickly release.

Test Condition

Listen for steering knock noise with the engine off in the following test conditions (no power assist).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Power steering system knock noise – a heavy loud repeating sound like a knock on a door that occurs in several driving and steering conditions.	Power steering system knock noise – a damped, metallic knock noise which only occurs at steering condition with engine off (very high efforts).	Certain amount of noise level acceptable, not a safety critical item.
	Tolerances in the steering gear components.	Certain amount of noise level acceptable, not a safety critical item.

Power Steering Mechanical Knock Noise (PAS on)

1. Turn the steering wheel to a steering lock and return to center quickly.
2. Turn the steering wheel 90 degrees to the left and then 90 degrees to the right quickly.

Test Condition

Listen for steering knock noise with the engine speed at idle in the following test conditions (power assist).

Symptom	Possible Sources	Action
Power steering system knock noise – clear knock noise from steering gear linkage area.	Worn tie-rod ball joints (inner and outer ball joints).	REFER to Steering System. REFER to: Steering System (211-00, Diagnosis and Testing).

Power Steering Hammer Knock (Hydraulic) Noise

1. Turn the steering wheel to a steering lock position and return quickly.

Test Condition

Listen for steering knock noise with the engine speed at idle in the following test conditions (for vehicles with hydraulic power assisted steering only, not electro-hydraulic power steering).

Symptom	Possible Sources	Action
Power steering system knock noise – loud, metallic sound if hitting the suspension cross-member with a hammer (sounds like metallic noise but is created by pressure impulse in gear and return line).	Hydraulic noise created by pressure impulses.	Certain amount of noise level acceptable, not a safety critical item.

Power Steering Hydraulic Knock/Clonk Noise

1. Drive over cobbled roads at low speed 10-30 km/h (6-20 mph) with and without turning.
2. Drive over straight tar strips road rails or 25 mm tall harshness strips at low speed 10-30 km/h (6-20 mph) both driving straight and with moderate turning.

Test Condition

Listen for steering knock/clonk noise in the following test conditions with the windows closed.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Power steering system knock/clonk noise – sounds almost identical to column knock that occurs when driving and cornering over cobbled stones or rough roads. Noise may appear to emanate from a location closer to the floor than that for column knock (Sounds like metallic noise but is created by pressure impulse in gear and return line – similar to a sound like quickly turning off a water tap).	Power steering return lines.	Certain amount of noise level acceptable, not a safety critical item.
	High power assist gain of power steering gear valve (steering gear design - no quality issue).	Certain amount of noise level acceptable, not a safety critical item.
	High power steering pump flow rate (by design).	Certain amount of noise level acceptable, not a safety critical item.

Power Steering Column Knock Noise**Test Condition**

Listen for steering knock noise in the following test conditions with windows closed.

1. Drive over cobbled stones at low speed 16-40 km/h (10-25 mph) with and without steering input carefully listening for knock sounds.
2. Drive over straight tar strips, road rails or 25 mm tall harshness strips at low speed 16-40 km/h (10-25 mph) both driving straight and with moderate cornering.

Symptom	Possible Sources	Action
Power steering system column knock noise – a loose sounding rattle or vibration coming from the column. Noticeable by hearing and touch.	Steering column or steering column shaft.	CHECK the steering column retaining bolts and attachments to the steering column and secure if necessary. REFER to: Specifications (211-04, Specifications).
		Check steering column and intermediate shaft for free play or loose components. REFER to: Steering System (211-00, Diagnosis and Testing).

Power Steering Toc-Toc Noise**Test Condition**

Listen for steering toc-toc noise with the engine speed at idle and the vehicle parked, automatic transmission in "P" (PARK) or manual transmission in neutral and the windows closed.

1. Turn the steering wheel from left to right abruptly changing direction.
2. Drive the vehicle for low speed parking manoeuvres constantly changing steering direction.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Power steering system toc-toc noise – a metallic noise created when changing direction of steering wheel rotation during parking manoeuvre or at stand-still.	Steering gear (design tolerance in steering rack).	Certain amount of noise level acceptable, not a safety critical item.

Power Steering Grinding Noise**Test Condition**

Listen for steering grinding noise with the engine speed at idle and the vehicle parked, automatic transmission in "P" (PARK) or manual transmission in neutral and the windows closed.

1. Slowly turn the steering wheel from lock to lock.
2. Tilt and extend the steering column in various positions and slowly turn the steering wheel from lock to lock.

Symptom	Possible Sources	Action
Power steering system grinding noise – an abrasive noise (like sand paper rubbing against wood) occurs between moving components such as steering wheel and the steering column shroud.	Steering wheel to shroud interference.	Certain amount of noise level acceptable, not a safety critical item.
	Steering column bearing.	Certain amount of noise level acceptable, not a safety critical item.
	Foreign material in contact with the steering column shaft.	CHECK if floor covering is obstructing the steering gear pinion. CHECK the installation of the floor seal.
	Clockspring.	CHECK the clockspring and secure if necessary. REFER to: Clockspring (501-20B, Removal and Installation).

Power Steering Zip Noise

Symptom	Possible Sources	Action
Power steering system zip noise – occurs when hydraulic fluid does not flow freely through the power steering pump supply hose from steering fluid reservoir to power steering pump causing cavitation at the pump. Zip is primarily a cold weather start-up phenomenon (below -10°C).	High viscosity of power steering fluid at low temperature.	Certain amount of noise level acceptable, not a safety critical item.
	Aeration of the power steering fluid.	BLEED the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

DIAGNOSIS AND TESTING**Driveline Noise and Vibration**

Symptom	Possible Sources	Action
Shake and vibration while driving	• Wheel end vibration. • Engine/transmission.	GO to Pinpoint Test A.
Tip-in moan	• Air cleaner. • Power assisted steering. • Powertrain. • Powertrain/drivetrain mounts. • Exhaust system.	GO to Pinpoint Test B.
Idle boom/shake/vibration/shudder	• Cable(s)/hose(s). • Powertrain/drivetrain mounts. • Exhaust system. • Belt/pulleys.	GO to Pinpoint Test C.

Suspension Noise and Vibration

Symptom	Possible Sources	Action
Wheel end vibration analysis	• Suspension. • Wheel bearings.	GO to Pinpoint Test D.
Non-axle noise	• Trim panels. • Air conditioning (A/C) system. • Accessories.	GO to Pinpoint Test E.

Pinpoint Tests

NOTE: These Pinpoint Tests are designed to take the technician through a step-by-step diagnosis procedure to determine the cause of a condition. It may not always be necessary to follow the chart to its conclusion. Carry out only the pinpoint test

steps necessary to correct the condition. Then check the operation of the system to make sure the condition has been corrected.

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

PINPOINT TEST A : SHAKE AND VIBRATION WHILE DRIVING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

A1: NEUTRAL COAST	
	1 Carry out the neutral coast test. • Does the vibration disappear during the neutral coast test? → Yes GO to A2. → No GO to Pinpoint Test D.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A2: CHECK THE POWERTRAIN/DRIVETRAIN MOUNTS	
	1 Carry out the powertrain/drivetrain mount neutralizing procedure • Are the mounts OK? → Yes Vehicle condition corrected. ROAD TEST as necessary. → No INSTALL new powertrain/drivetrain mounts as necessary. ROAD TEST as necessary.

PINPOINT TEST B : TIP-IN MOAN

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE AIR CLEANER	
	1 Check the condition of the air cleaner mounts, inlet tube, outlet tube, resonators and all other components associated with the air induction system for correct installation and tightness of all connections. • Are the components OK? → Yes GO to B2. → No REPAIR or INSTALL new components as necessary. ROAD TEST as necessary.
B2: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure. REFER to: Exhaust System Neutralizing (100-04, General Procedures). • Is the exhaust system OK? → Yes GO to B3. → No REPAIR as necessary. ROAD TEST as necessary.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B3: CHECK THE POWER STEERING	1 Remove the accessory drive belt and test for tip-in moan. REFER to: (303-05 Accessory Drive) Accessory Drive Belt - 1.8L Duratec-HE (MI4)/1.8L Duratec-SCi (MI4)/2.0L Duratec-HE (MI4) (Removal and Installation), Accessory Drive Belt - 3.0L Duratec-SE (VE6)/2.5L Duratec-VE (VE6)/3.0L Duratec-ST (VE6) (Removal and Installation), Accessory Drive Belt - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel/2.2L Duratorq-TDCi (Puma) Diesel (Removal and Installation). Is the tip-in moan OK? → Yes REPAIR the power steering as necessary. REFER to: Steering System (211-00 Steering System - General Information, Diagnosis and Testing). → No GO to B4.
B4: CHECK THE POWERTRAIN/DRIVETRAIN MOUNTS	1 Carry out the powertrain/drivetrain mount neutralizing procedure Are the powertrain/drivetrain mounts OK? → Yes Vehicle condition corrected. ROAD TEST as necessary. → No INSTALL new powertrain/drivetrain mounts as necessary. ROAD TEST as necessary.

DIAGNOSIS AND TESTING**PINPOINT TEST C : IDLE BOOM/SHAKE/VIBRATION/SHUDDER**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK THE CABLE/HOSES	
	1 Check the engine compartment for any component that may have a touch condition between the engine and body or chassis. For example: control cable, air conditioning (A/C) hoses, acceleration cable. • Are the components OK? → Yes GO to C2. → No REPAIR or INSTALL new components as necessary. ROAD TEST as necessary.
C2: CHECK THE ENGINE COOLING RADIATOR	
	1 Check the engine cooling radiator mountings and bushings for security and condition. Check the radiator installation for any component that may have a touch condition. • Is the installation and bushings OK? → Yes GO to C3. → No REPAIR or INSTALL new components as necessary. ROAD TEST as necessary.
C3: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure. REFER to: Exhaust System Neutralizing (100-04, General Procedures). • Is the exhaust system OK? → Yes GO to C4. → No REPAIR as necessary. ROAD TEST as necessary.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C4: CHECK THE POWERTRAIN/DRIVETRAIN MOUNTS	
	1 Carry out the powertrain/drivetrain mount neutralizing procedure • Are the powertrain/drivetrain mounts OK? → Yes Vehicle condition corrected. ROAD TEST as necessary. → No INSTALL new powertrain/drivetrain mounts as necessary. ROAD TEST as necessary.

PINPOINT TEST D : WHEEL END VIBRATION ANALYSIS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: INSPECT THE WHEELS AND TIRES	
	1 Inspect the wheels and tires. REFER to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing). • Are the wheels and tires OK? → Yes GO to D2. → No INSTALL new wheels or tires as necessary. REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation). ROAD TEST as necessary.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D2: INSPECT THE WHEEL BEARINGS	1 Inspect the wheel bearings. REFER to: Wheel Bearing Inspection (204-00 Suspension System - General Information, General Procedures). • Are the wheel bearings OK? → Yes GO to D3. → No INSTALL new wheel bearings as necessary. REFER to: Wheel Bearing (204-01 Front Suspension, Removal and Installation), Wheel Bearing - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel, Vehicles With: 5-Speed Automatic Transaxle (5F31J) (204-01 Front Suspension, Removal and Installation), Wheel Hub (204-02 Rear Suspension, Removal and Installation). ROAD TEST as necessary.
D3: INSPECT THE WHEEL AND TIRE RUNOUT	1 Inspect the wheel and tire runout. • Is the wheel and tire runout OK? → Yes Balance the wheels and tires. Refer to the wheel balance equipment manufacturer's instructions. ROAD TEST as necessary. → No INSTALL new wheels or tires as necessary. REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation). ROAD TEST as necessary.

DIAGNOSIS AND TESTING**PINPOINT TEST E : NON-AXLE NOISE**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: INSPECT THE VEHICLE TRIM	
	1 Check the radiator grille and trim panels to see if they are the source of the noise. Are the vehicle trim components causing the noise? → Yes INSTALL new trim components or REPAIR as necessary. ROAD TEST as necessary. → No GO to E2.
E2: CHECK THE AIR CONDITIONING (A/C) SYSTEM FOR NOISE	
	1 Ignition switch in position III.
	2 Ignition switch in position II.
	3 Check the A/C system components for noise by turning the A/C system on and off. Is the A/C system causing the noise? → Yes INSPECT the A/C system. REFER to: (412-00 Climate Control System - General Information) Climate Control System (Diagnosis and Testing), Climate Control System (Diagnosis and Testing). ROAD TEST as necessary. → No GO to E3.
E3: CHECK NON-FACTORY FITTED ACCESSORIES	
	1 Check any non-factory installed accessories for being the source of the noise. For example: touch condition body-to-frame, antennas, deflectors and fog lights. Are the accessories the cause of the noise? → Yes ADJUST, REPAIR, or INSTALL new accessories or fasteners as required. ROAD TEST as necessary. → No VERIFY the customer concern.

GENERAL PROCEDURES**Powertrain/Drivetrain Mount Neutralizing(14 001 0)**

NOTE:There is no procedure for neutralizing the powertrain/drivetrain mounts. To check the alignment of the powertrain mounts visually, proceed as follows.

- 1. Loosen the rear support insulator retaining bolts (if equipped).**
- 2. Loosen the powertrain/drivetrain mount retaining bolts.**
- 3. NOTE:Support the powertrain/drivetrain in an approximate position and height.**

NOTE:Make sure that the right-hand mount and left-hand insulator align over the studs on the powertrain and drivetrain to allow the fixings to be assembled through the large holes in the support insulator bracket without overstraining.

Check the powertrain/drivetrain mount alignment.

- 4. Tighten the powertrain/drivetrain mount to powertrain/drivetrain mount bracket retaining bolts.**
- 5. Tighten the powertrain/drivetrain mount to body retaining bolts.**
- 6. Tighten the rear support insulator retaining bolts (if equipped).**

SECTION 204-00 Suspension System - General Information

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	204-00-2
DIAGNOSIS AND TESTING	
Suspension System.....	204-00-4
Inspection and Verification.....	204-00-4
Symptom Chart.....	204-00-4
Pinpoint Tests.....	204-00-8
Component Tests.....	204-00-14
GENERAL PROCEDURES	
Wheel Bearing Inspection.....	204-00-16
Front Toe Adjustment..... (14 117 0)	204-00-17

SPECIFICATIONS**Front Wheel Alignment (at curb weight)**

Description		Tolerance Range	Setting or Nominal	Maximum Variance Left or Right
Caster angle	Degrees and minutes	4°38' to 2°38'	3°38'	1°00'
	Decimal degrees	4.64° to 2.64°	3.64°	1.00°
Camber angle	Degrees and minutes	0°36' to -1°54'	-0°39'	1°15'
	Decimal degrees	0.60° to -1.90°	-0.65°	1.25°
Total toe	mm	3.1 Toe in $\pm$ 2.2	3.1 Toe in $\pm$ 1.0	-
	Degrees and minutes	0°30' Toe in $\pm$ 0°21'	0°30' Toe in $\pm$ 0°10'	-
	Decimal degrees	0.50° Toe in $\pm$ 0.35°	0.50° Toe in $\pm$ 0.17°	-

Front Wheel Alignment (at curb weight) – ST150

Description		Tolerance Range	Setting or Nominal	Maximum Variance Left or Right
Caster angle	Degrees and minutes	4°47' to 2°47'	3°47'	1°00'
	Decimal degrees	4.78° to 2.78°	3.78°	1.00°
Camber angle	Degrees and minutes	0°02' to -2°28'	-1°13'	1°15'
	Decimal degrees	0.03° to -2.47°	-1.22°	1.25°
Total toe	mm	1.1 Toe in $\pm$ 2.4	1.1 Toe in $\pm$ 1.2	-
	Degrees and minutes	0°09' Toe in $\pm$ 0°20'	0°09' Toe in $\pm$ 0°10'	-
	Decimal degrees	0.15° Toe in $\pm$ 0.34°	0.15° Toe in $\pm$ 0.17°	-

Front Wheel Alignment (at curb weight) - 3-Door Sport

Description		Tolerance Range	Setting or Nominal	Maximum Variance Left or Right
Caster angle	Degrees and minutes	4°39' to 2°34'	3°37'	1°00'
	Decimal degrees	4.65° to 2.57°	3.61°	1.00°
Camber angle	Degrees and minutes	0°25' to -2°08'	-0°52'	1°15'
	Decimal degrees	0.41° to -2.13°	-0.86°	1.25°
Total toe	mm	3.1 Toe in $\pm$ 2.2	3.1 Toe in $\pm$ 1.0	-
	Degrees and minutes	0°30' Toe in $\pm$ 0°21'	0°30' Toe in $\pm$ 0°10'	-
	Decimal degrees	0.50° Toe in $\pm$ 0.35°	0.50° Toe in $\pm$ 0.17°	-

SPECIFICATIONS**Rear Wheel Alignment (at curb weight) - All vehicles except ST150**

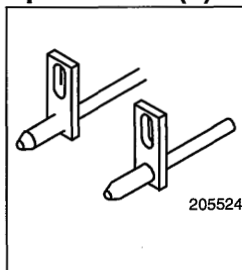
Description		Tolerance Range	Setting or Nominal	Maximum Variance Left or Right
Camber angle	Degrees and minutes	0°07' to -2°23'	-1°08'	1°15'
	Decimal degrees	0.11° to -2.39°	-1.14°	1.25°
Total toe	mm	3.2 Toe in $\pm$ 2.1	3.2	-
	Degrees and minutes	0°31' Toe in $\pm$ 0°20'	0°31'	-
	Decimal degrees	0.52° Toe in $\pm$ 0.34°	0.52°	-

Rear Wheel Alignment (at curb weight) – ST150

Description		Tolerance Range	Setting or Nominal	Maximum Variance Left or Right
Camber angle	Degrees and minutes	0°06' to -2°24'	-1°09'	1°15'
	Decimal degrees	0.10° to -2.40°	-1.15°	1.25°
Total toe	mm	3.6 Toe in $\pm$ 4.8	3.6	-
	Degrees and minutes	0°31' Toe in $\pm$ 0°40'	0°31'	-
	Decimal degrees	0.51° Toe in $\pm$ 0.67°	0.51°	-

Torque Specifications

Item	Nm	lb-ft	lb-in
Tie-rod end locknut	63	46	-

DIAGNOSIS AND TESTING**Suspension System****Special Tool(s)**

Alignment Pins, Subframe
205-524 (15-122)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
Tire pressure(s)
Wheels and tires

Mechanical
Wheel knuckles
Tie-rod ends
Front suspension lower arm ball joints
Front suspension lower arm bushings
Front strut and spring assemblies
Front stabilizer bar and connecting links
Rear springs
Rear shock absorbers
Rear suspension beam axle and bushings

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Drift left or right	• Vehicle attitude incorrect (front or rear is high or low).	• CHECK for abnormal loading, spring sag or non-standard springs.
	• Steering gear or linkage worn or damaged.	• CHECK the steering system. REFER to: (211-00 Steering System - General Information) Steering System (Diagnosis and Testing), Steering System - 1.6L Duratorq-TDCi (DV) Diesel (Diagnosis and Testing).
	• Brake system.	• CHECK the brake system. REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).
	• Incorrect wheel alignment.	• ADJUST the wheel alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Incorrect front crossmember alignment.	Using the special tool, CHECK the front crossmember alignment.
	Worn front wheel bearings.	CHECK the wheel bearings. REFER to: Wheel Bearing Inspection (204-00 Suspension System - General Information, General Procedures).
	Wheels and tires.	GO to Pinpoint Test A.
Steering wheel off-center	Vehicle attitude incorrect (front or rear is high or low).	CHECK for abnormal loading, spring sag or non-standard springs.
	Steering gear or linkage worn or damaged.	CHECK the steering system. REFER to: (211-00 Steering System - General Information) Steering System (Diagnosis and Testing), Steering System - 1.6L Duratorq-TDCi (DV) Diesel (Diagnosis and Testing).
	Suspension lower arm ball joint.	CARRY OUT the Ball Joint Inspection component test in this procedure.
	Incorrect wheel alignment.	ADJUST the wheel alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
Tracks incorrectly	Incorrect front suspension toe, castor or camber angles.	CHECK the wheel alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications). INSTALL new suspension components as necessary.
	Incorrect rear suspension toe or camber angles.	CHECK the wheel alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications). INSTALL new suspension components as necessary.
	Front or rear suspension damage.	INSTALL new suspension components as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• Rough ride	• Front strut and spring assemblies.	• CARRY OUT the Strut or Shock Absorber Testing component test in this procedure. • CHECK and INSTALL new suspension components as necessary. REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly).
	• Front stabilizer bar, connecting links or bushings.	• CHECK and INSTALL new suspension components as necessary. REFER to: (204-01 Front Suspension) Front Stabilizer Bar Bushing (Removal and Installation), Front Stabilizer Bar (Removal and Installation).
	• Front suspension lower arm bushings.	• INSTALL a new lower arm. REFER to: Lower Arm (204-01 Front Suspension, Removal and Installation).
	• Rear suspension bushings.	• CHECK and INSTALL new components as necessary.
	• Rear shock absorbers.	• CARRY OUT the Strut or Shock Absorber Testing component test in this procedure. • CHECK and INSTALL new suspension components as necessary.
• Excessive noise	• Front strut and spring assembly or rear shock absorber and spring upper mounting bolts or nuts loose or broken.	• GO to Pinpoint Test B.
	• Shock absorbers leaking	• GO to Pinpoint Test B.
	• Shock absorber performance incorrect	• GO to Pinpoint Test B.
	• Stabilizer bar components	• GO to Pinpoint Test B.
	• Strut and spring assembly and springs	• GO to Pinpoint Test B.
	• Springs moving on spring upper or lower seats	• GO to Pinpoint Test B.
	• Suspension bushings	• GO to Pinpoint Test B.
	• Lower arm ball joint	• GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Incorrect tire wear	Worn front wheel bearings	GO to Pinpoint Test B.
	Wheels and tires	GO to Pinpoint Test B.
	Front or rear suspension damage.	CHECK and INSTALL new suspension components as necessary.
	Incorrect wheel alignment.	ADJUST the wheel alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
Vibration	Damaged or worn front wheel bearings.	CHECK the front wheel bearings. REFER to: Wheel Bearing Inspection (204-00 Suspension System - General Information, General Procedures).
	Wheels and tires.	CHECK the tires. BALANCE or INSTALL new tires as necessary.
	Incorrect wheel alignment.	ADJUST the wheel alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	Steering gear or linkage worn or damaged.	CHECK the steering system. REFER to: (211-00 Steering System - General Information) Steering System (Diagnosis and Testing), Steering System - 1.6L Duratorq-TDCi (DV) Diesel (Diagnosis and Testing).
	Front strut and spring assemblies.	- CARRY OUT the Strut or Shock Absorber Testing component test in this procedure. - CHECK and INSTALL new suspension components as necessary. REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Damaged front suspension lower arm(s).	INSTALL a new lower arm(s). REFER to: Lower Arm (204-01 Front Suspension, Removal and Installation).

Pinpoint Tests**PINPOINT TEST A : DRIFT LEFT OR RIGHT**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
▲ WARNING: To avoid personal injury due to the loss of vehicle control, the inspection should be carried out by two people to maintain safe driving conditions. Adequate grip should always be maintained on the steering wheel. Failure to follow these instructions may result in personal injury.	
NOTE: The following conditions must be met when evaluating the vehicle.	
NOTE: The tire swapping procedures are for bi-directional rotating tires only.	
A1: SWAP THE FRONT WHEEL AND TIRE ASSEMBLIES	
	1 Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) Jacking (Description and Operation), Lifting (Description and Operation). - Swap the front left-hand wheel and tire assembly with the front right-hand wheel and tire assembly. - Road test the vehicle. - Does the vehicle drift? → Yes GO to A2. → No Vehicle condition corrected.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A2: SWAP THE REAR WHEEL AND TIRE ASSEMBLIES	
	1 Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) Jacking (Description and Operation), Lifting (Description and Operation). – Swap the rear left-hand wheel and tire assembly with the rear right-hand wheel and tire assembly. – Road test the vehicle. • Does the vehicle drift? → Yes GO to A3. → No Vehicle condition corrected.
A3: SWAP THE LEFT-HAND WHEEL AND TIRE ASSEMBLIES	
	1 Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) Jacking (Description and Operation), Lifting (Description and Operation). – Swap the front left-hand wheel and tire assembly with the rear left-hand wheel and tire assembly. – Road test the vehicle. • Does the vehicle drift? → Yes GO to A4. → No Vehicle condition corrected.
A4: SWAP THE RIGHT-HAND WHEEL AND TIRE ASSEMBLIES	
	1 Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) Jacking (Description and Operation), Lifting (Description and Operation). – Swap the front right-hand wheel and tire assembly with the rear right-hand wheel and tire assembly. – Road test the vehicle. • Does the vehicle drift? → Yes GO to A5. → No Vehicle condition corrected.

DIAGNOSIS AND TESTING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS****A5: SWAP THE FRONT LEFT-HAND WHEEL AND TIRE ASSEMBLY**

- 1 Raise and support the vehicle.
 - Swap the front left-hand wheel and tire assembly with the rear right-hand wheel and tire assembly.
 - Road test the vehicle.
- Does the vehicle drift?
 - **Yes**
GO to A6.
 - **No**
Vehicle condition corrected.

A6: SWAP THE FRONT RIGHT-HAND WHEEL AND TIRE ASSEMBLY

- 1 Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)
Jacking (Description and Operation),
Lifting (Description and Operation).
 - Swap the front right-hand wheel and tire assembly with the rear left-hand wheel and tire assembly.
 - Road test the vehicle.
- Does the vehicle drift?
 - **Yes**
GO to A7.
 - **No**
Vehicle condition corrected.

A7: INSTALL NEW TIRES

NOTE: Install new tires only once.

- 1 Install new tires to the four road wheels. TEST the system for normal operation.
 - Does the vehicle drift?
 - **Yes**
Verify possible sources, refer to the Symptom Chart.
 - **No**
Vehicle condition corrected.

DIAGNOSIS AND TESTING**PINPOINT TEST B : EXCESSIVE NOISE**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: INSPECT ALL STRUT AND SPRING ASSEMBLY AND SHOCK ABSORBER MOUNTING BOLTS AND NUTS	1 Inspect the strut and spring assembly and shock absorber mounting bolts and nuts. Are the mounting bolts or nuts loose or broken? → Yes TIGHTEN or INSTALL new mounting bolts and nuts. REFER to: Specifications (204-01 Front Suspension, Specifications), Specifications (204-02 Rear Suspension, Specifications). → No GO to B2.
B2: INSPECT THE STRUT AND SPRING ASSEMBLIES AND SHOCK ABSORBERS FOR LEAKS	NOTE:Make sure that the oil is not from another source. 1 Inspect the strut and spring assemblies and shock absorbers for signs of oil weepage or leaks. Refer to weepage and leakage conditions in the Strut or Shock Absorber Testing component test in this procedure. Are the struts or shock absorbers leaking? → Yes INSTALL new struts or shock absorbers as necessary. REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Removal and Installation), Rear Shock Absorber (204-02 Rear Suspension, Removal and Installation). → No GO to B3.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B3: INSPECT THE SPRINGS AND STABILIZER BAR(S)	
	1 Inspect the springs and stabilizer bar(s) for damage. Are the springs or stabilizer bar(s) damaged? → Yes INSTALL new springs or stabilizer bar(s). REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly), Front Stabilizer Bar (204-01 Front Suspension, Removal and Installation), Spring (204-02 Rear Suspension, Removal and Installation). → No GO to B4.
B4: INSPECT THE SUSPENSION BUSHINGS	
	1 Inspect the suspension bushings for excessive wear or damage. Are the bushings worn or damaged? → Yes INSTALL new components as necessary. REFER to: Front Stabilizer Bar Bushing (204-01 Front Suspension, Removal and Installation), Lower Arm (204-01 Front Suspension, Removal and Installation), Front Strut and Spring Assembly (204-01 Front Suspension, Removal and Installation), Rear Shock Absorber (204-02 Rear Suspension, Removal and Installation), Trailing Arm Bushing (204-02 Rear Suspension, Removal and Installation). → No GO to B5.
B5: INSPECT THE SUSPENSION LOWER ARM BALL JOINTS	
	1 Carry out the Ball Joint Inspection component test in this procedure. Is the lower arm ball joint or gaiter damaged? → Yes INSTALL a new lower arm. REFER to: Lower Arm (204-01 Front Suspension, Removal and Installation). → No GO to B6.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B6: INSPECT THE WHEEL BEARINGS	1 Check the wheel bearings. REFER to: Wheel Bearing Inspection (204-00 Suspension System - General Information, General Procedures). • Are the wheel bearings damaged? → Yes INSTALL a new wheel bearing(s). REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation), Rear Wheel Bearing (204-02 Rear Suspension, Removal and Installation). → No GO to B7.
B7: INSPECT THE WHEELS AND TIRES	1 Check the tires for uneven wear. • Is there uneven tire wear? → Yes REFER to the symptom chart. → No GO to B8.
B8: INSPECT THE STRUT AND SPRING ASSEMBLY AND REAR SUSPENSION SPRING INTERFACE	
	1 Loosen the strut and spring assemblies and shock absorbers top and bottom mounting bolts and nuts. Tighten the mounting bolts and nuts. REFER to: Specifications (204-01 Front Suspension, Specifications), Specifications (204-02 Rear Suspension, Specifications). – Carry out a road test. REFER to: Road/Roller Testing (100-00 General Information, Description and Operation). • Is the concern still evident? → Yes GO to B9. → No Vehicle condition corrected.
B9: INSPECT THE STRUT AND SPRING ASSEMBLIES AND SHOCK ABSORBER COMPONENTS	
	1 Check that the spring is correctly located on the spring seat and has not moved.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 Disassemble the strut and spring and assembly and inspect the individual components. REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly). 3 Inspect the shock absorber top mount for wear or damage. 4 Carry out the Strut or Shock Absorber Testing component test in this procedure. Are any of the strut and spring assemblies or shock absorber components damaged? → Yes INSTALL new components as necessary. REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly), Rear Shock Absorber (204-02 Rear Suspension, Removal and Installation), Spring (204-02 Rear Suspension, Removal and Installation). → No REINSTALL the strut and spring assemblies or shock absorbers. GO to B10.
B10: CARRY OUT A ROAD TEST	
	1 Carry out a road test. REFER to: Road/Roller Testing (100-00 General Information, Description and Operation). Is the concern still evident? → Yes REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing). → No Vehicle condition corrected.

Component Tests

Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
 Lifting (Description and Operation).

Ball Joint Inspection

1. Firmly grasp the outer end of the suspension lower arm and try to move it up and down, watching and feeling for any movement. Free movement will usually be accompanied by an audible "click". There should be no free movement.

DIAGNOSIS AND TESTING

2. If there is any free movement install a new lower arm.

REFER to: Lower Arm (204-01 Front Suspension, Removal and Installation).

3. If a new lower arm is installed it will be necessary to check and adjust the front wheel alignment.

REFER to: Specifications (204-00 Suspension System - General Information, Specifications).

4. Compress and pull the piston rod in the vertical position. Feel if the resistance force at the point of direction change-over is perceptible without a lag. If a lag is perceptible it is an indication of damper valve damage and new struts or shock absorbers must be installed. REFER to:

Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly),
Front Strut and Spring Assembly (204-01 Front Suspension, Removal and Installation),
Rear Shock Absorber (204-02 Rear Suspension, Removal and Installation).

Strut or Shock Absorber Inspection

NOTE:Inspect the struts or shock absorber for signs of oil weepage or leaks. Make sure that the oil is not from another source.

Weepage:

- deposits a thin film of oil on the strut and spring assembly or shock absorber.
- is normally noticed due to a collection of dust on the strut and spring assembly or shock absorber.
- occurs during the normal running-in period of 4800 - 8050 km. After this period no new signs of oil should be visible.
- does not require new struts or shock absorbers to be installed.

Leakage:

- covers the entire strut and spring assembly or shock absorber with oil.
- will drip oil onto the surrounding suspension components.
- requires new struts or shock absorbers to be installed.

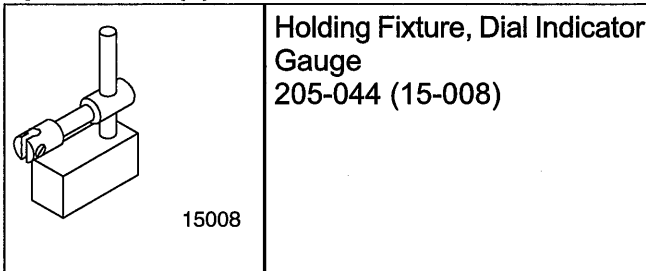
Strut or Shock Absorber Testing

NOTE:Struts or shock absorbers must be tested in the vertical position.

1. Remove both strut and spring assemblies or shock absorbers. The piston rods should extend.
 - Disassemble the strut and spring assemblies.

REFER to: Front Strut and Spring Assembly (204-01 Front Suspension, Disassembly and Assembly).

2. Compress the piston rods. Both piston rods should offer the same resistance when compressing.
3. Compress and release the piston rods. The piston rods should extent equally.

GENERAL PROCEDURES**Wheel Bearing Inspection****Special Tool(s)****General Equipment**

Dial indicator gauge

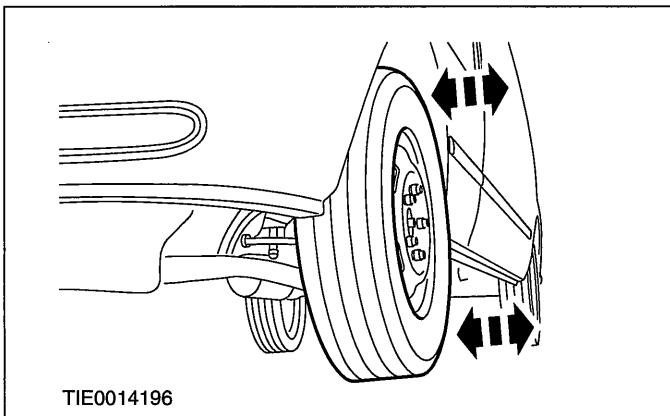
Check

1. **NOTE:** Do not to confuse lower arm ball joint looseness with bearing looseness.

Raise and support the front of the vehicle.
For additional information, refer to: (100-02)

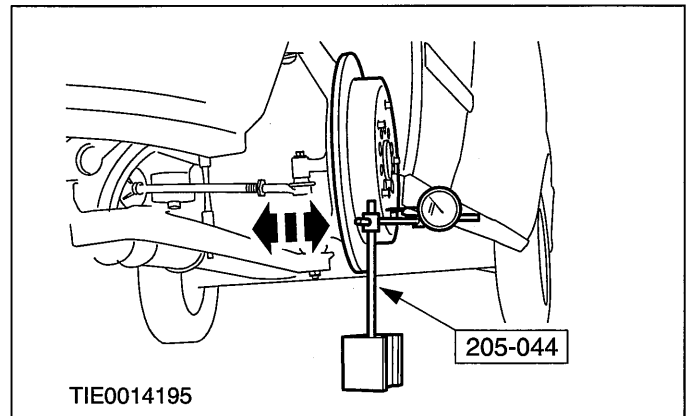
Jacking (Description and Operation),
Lifting (Description and Operation).

2. Check for loose front wheel bearings by rocking the wheels at the top and bottom.



3. Spin the wheel quickly by hand and make sure the wheel turns smoothly without noise from the wheel bearings.
4. Remove the front brake caliper anchor plate.
For additional information, refer to: Brake Caliper Anchor Plate (206-03, Removal and Installation).
5. Position a suitable Dial indicator gauge fixture or equivalent, against the wheel hub, then push and pull the wheel hub. Measure the end play of the wheel hub and front wheel

bearing assembly. There should be no end play. If end play exists, install new wheel bearings.

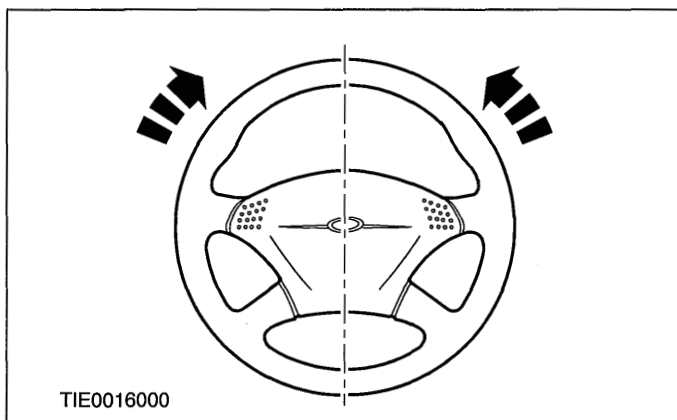


6. Install the front brake caliper anchor plate.
For additional information, refer to: Brake Caliper Anchor Plate (206-03, Removal and Installation).

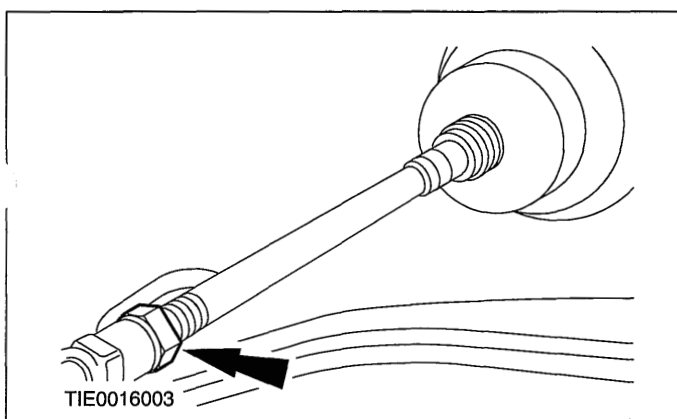
GENERAL PROCEDURES**Front Toe Adjustment(14 117 0)**

NOTE:Make sure that the vehicle is standing on a level surface.

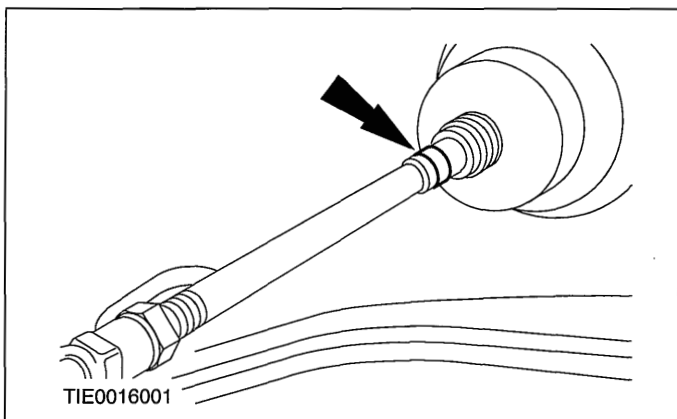
- 1. Centralize the steering and lock it in position.**



- 2. Loosen the tie-rod end locknuts.**

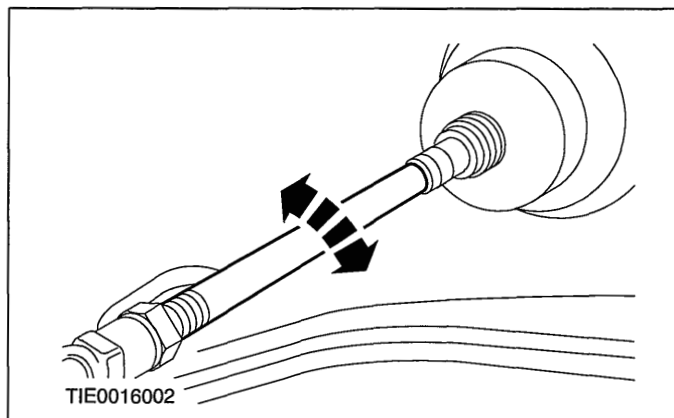


- 3. Remove the steering gear boot outer clamps.**



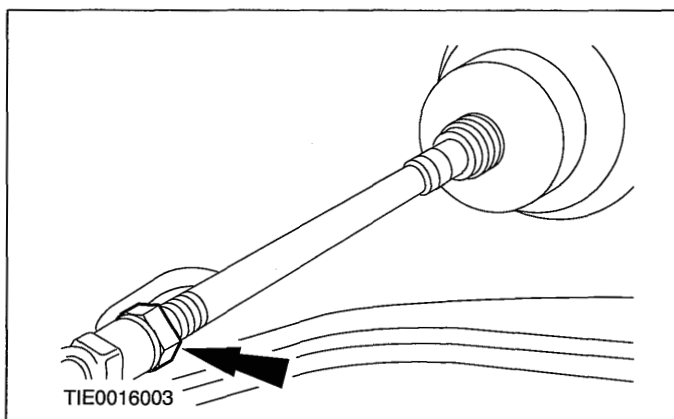
- 4. Rotate the tie-rods an equal amount in either a clockwise or a counterclockwise direction to adjust the toe setting.**

For additional information, refer to: Specifications (204-00, Specifications).

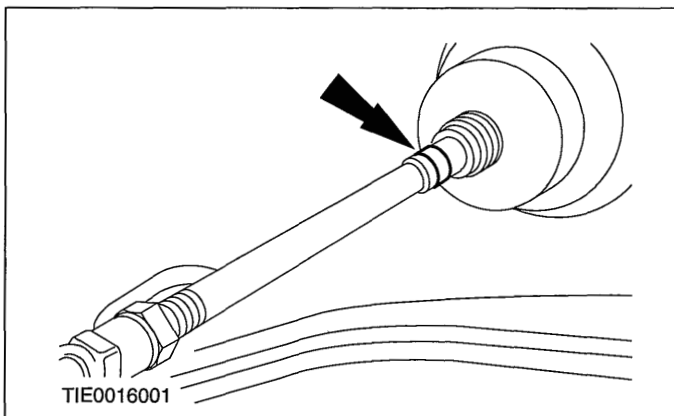


- 5. Tighten the tie-rod end locknuts.**

For additional information, refer to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).



- 6. Install the steering gear boot outer clamps.**





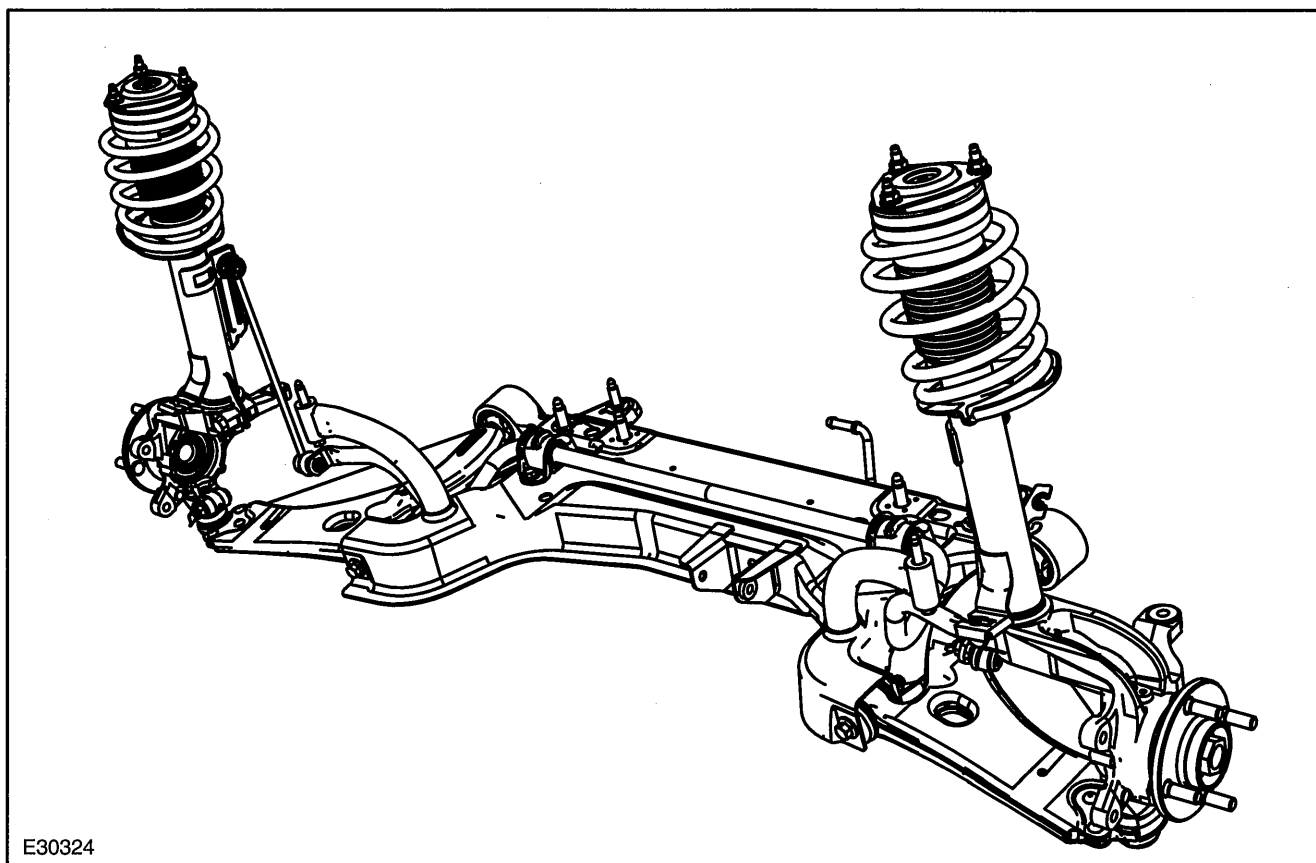
SECTION 204-01 Front Suspension

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	204-01-2
DESCRIPTION AND OPERATION	
Front Suspension.....	204-01-3
DIAGNOSIS AND TESTING	
Front Suspension.....	204-01-5
REMOVAL AND INSTALLATION	
Front Stabilizer Bar Bushing.....	(14 754 0) 204-01-6
Lower Arm.....	(14 706 0) 204-01-7
Front Stabilizer Bar.....	(14 752 0) 204-01-9
Wheel Knuckle.....	(14 343 0) 204-01-13
Front Strut and Spring Assembly.....	(14 781 0) 204-01-19
Front Wheel Bearing.....	(14 411 0) 204-01-21
DISASSEMBLY AND ASSEMBLY	
Front Strut and Spring Assembly.....	(14 783 4) 204-01-23

SPECIFICATIONS**Torque Specifications**

Item	Nm	lb-ft	lb-in
Top mount retaining nuts	25	18	-
Thrust bearing retaining nut	48	35	-
Stabilizer bar connecting link to strut and spring retaining nut	48	35	-
Wheel knuckle to suspension strut pinch bolt	85	63	-
Brake caliper anchor plate retaining bolts	70	52	-
Lower arm ball joint to wheel knuckle retaining nut	48	35	-
Tie-rod end retaining nut	48	35	-
Stabilizer bar clamp retaining bolts	55	41	-
Stabilizer bar to connecting link retaining nut	55	41	-
Steering gear retaining bolts	48	35	-
Lower arm front retaining bolt	a)	-	-
Lower arm rear clamp retaining bolts	55	41	-
Crossmember front retaining bolts	70	52	-
Crossmember rear retaining bolts	115	85	-
Crossmember inner and outer retaining bolts	175	129	-
Wheel hub retaining nut	290	214	-
Engine support insulator center bolt	48	35	-
Wheel speed sensor retaining nut	9	-	80
a) Refer to the procedure in this section.			

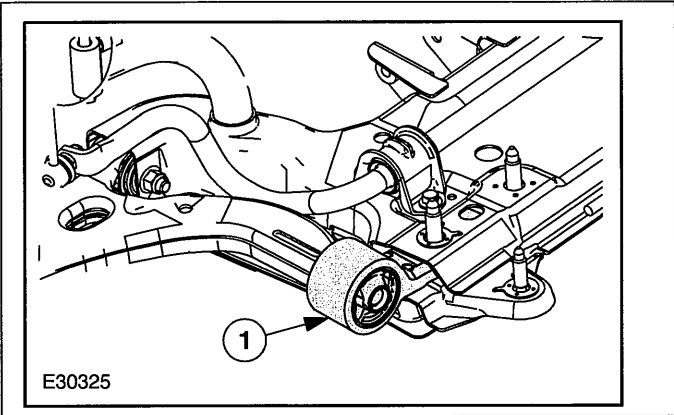
DESCRIPTION AND OPERATION**Front Suspension****Overview**

NOTE: During installation of the front wheel bearing it is important to adhere to the specified installation position, as the anti-lock brake system (ABS) sensor ring is located in the wheel bearing. A coloured rubber ring is provided to indicate the correct installation position. If the wheel bearing were to be installed incorrectly then this would cause failure of the ABS .

A newly developed Mc-Pherson front suspension with L-shaped lower arms is used. These lower suspension arms are linked via large rubber mountings to a reinforced and extremely rigid front axle crossmember.

The ball head between the lower suspension arm and the suspension strut is secured with three rivets. Toe-in is adjusted via adjustable track rods. The lower suspension arms can only be replaced as a complete unit.

DESCRIPTION AND OPERATION



Item	Description
1	Rear rubber mounting

The rear rubber mountings for the lower suspension arms are enclosed in aluminium brackets. This provides more vibration damping than previously. Both the front and rear brackets are arranged horizontally.

The suspension strut turret support bearings have two separate routes for independently deflecting the spring and shock absorber forces into the body. This reduces the level of noise transmitted from the road surface.

The correct installation position must be observed when installing the suspension strut turret support bearings. This is indicated by an arrow on the suspension strut turret support bearing. The shock absorbers are gas shock absorbers.

The spring travel has been increased by 6 mm, and the track has been increased by 48 mm to 1477 mm.

DIAGNOSIS AND TESTING**Front Suspension**

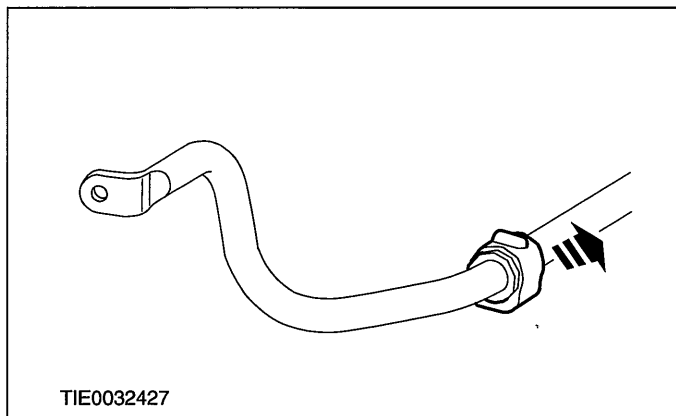
REFER to Section 204-00 [Suspension System - General Information].

REMOVAL AND INSTALLATION**Front Stabilizer Bar Bushing(14 754 0)****Removal****1. Remove the stabilizer bar.**

For additional information, refer to Stabilizer Bar in this section.

2. Remove the stabilizer bar bushings on both sides.**2. Install the stabilizer bar.**

For additional information, refer to Stabilizer Bar in this section.

**Installation****1. CAUTIONS:**

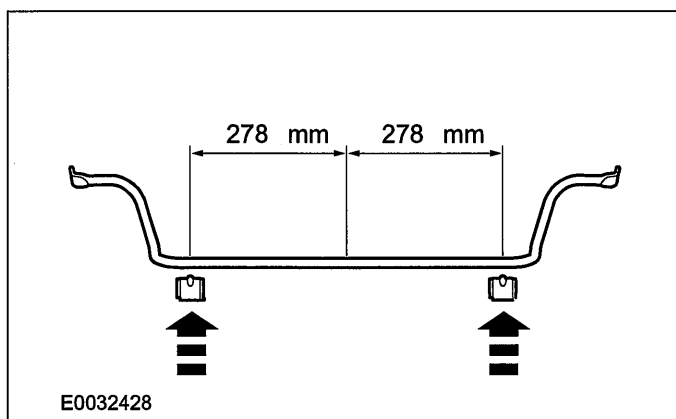
⚠ Do not lubricate the stabilizer bar bushings.

⚠ The stabilizer bar bushings must be positioned with the slot facing forwards of the stabilizer bar.

⚠ The stabilizer bar bushings must be positioned as shown.

NOTE: The location of the stabilizer bar bushings should be measured from the center mark on the stabilizer bar.

Install the stabilizer bar bushings.



REMOVAL AND INSTALLATION

Lower Arm(14 706 0)

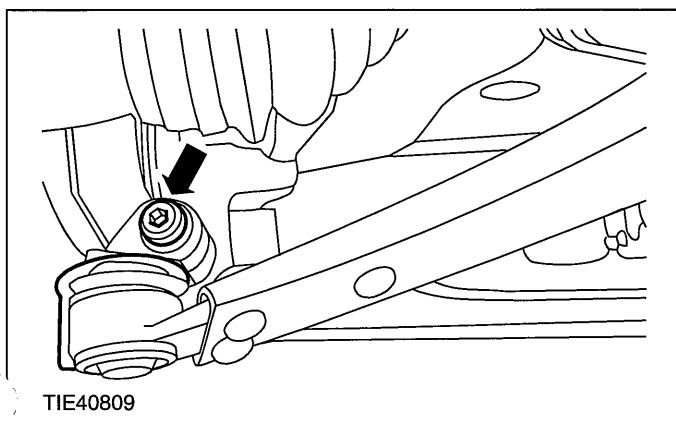
Removal

1. Remove the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].

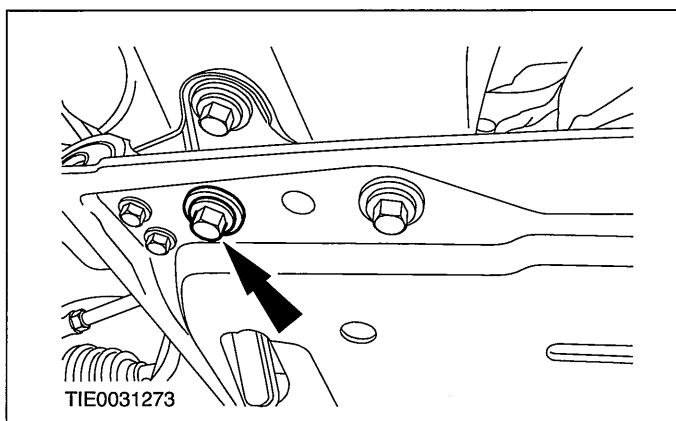
2. **⚠ CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

Detach the lower arm ball joint from the wheel knuckle.

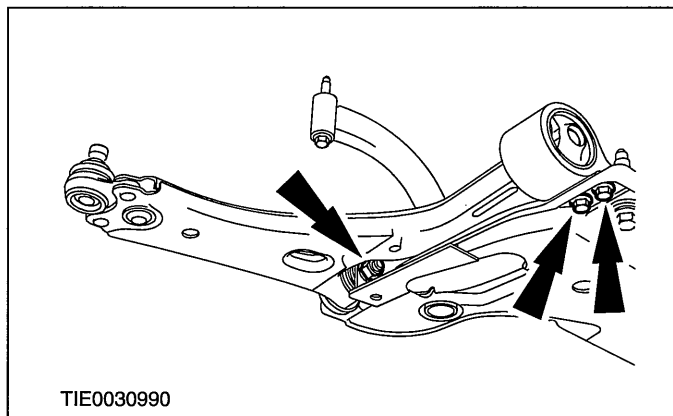
- Remove the heat shield.



3. Remove the crossmember outer retaining bolt.

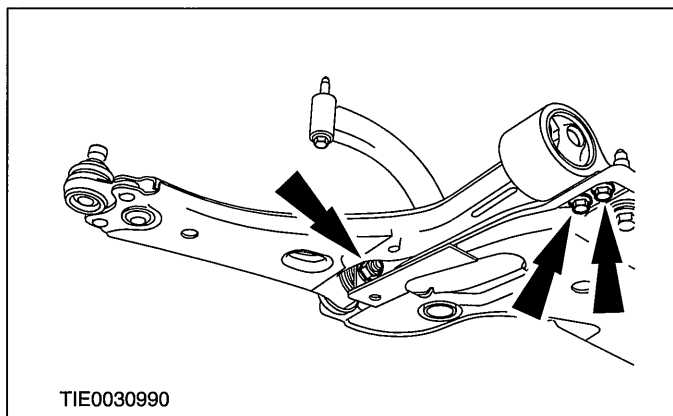


4. Remove the lower arm.

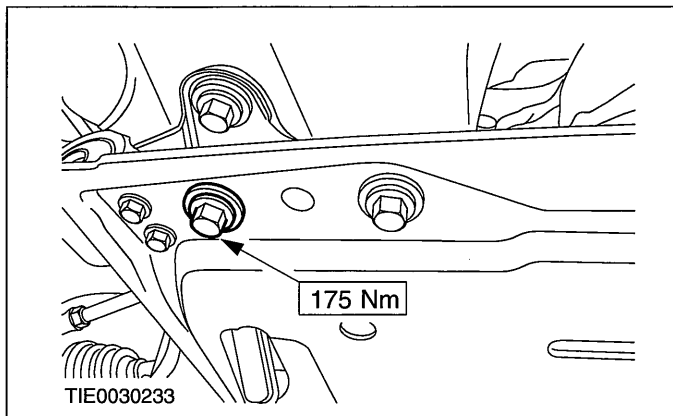


Installation

1. **NOTE:** Do not fully tighten the lower arm to crossmember retaining bolts at this stage. Install the lower arm.



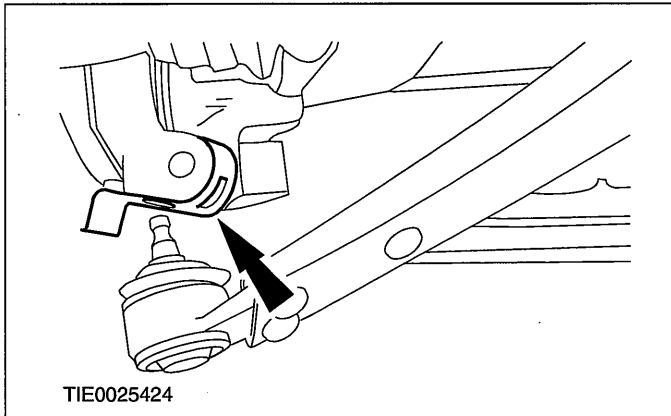
2. Install the crossmember outer retaining bolt.



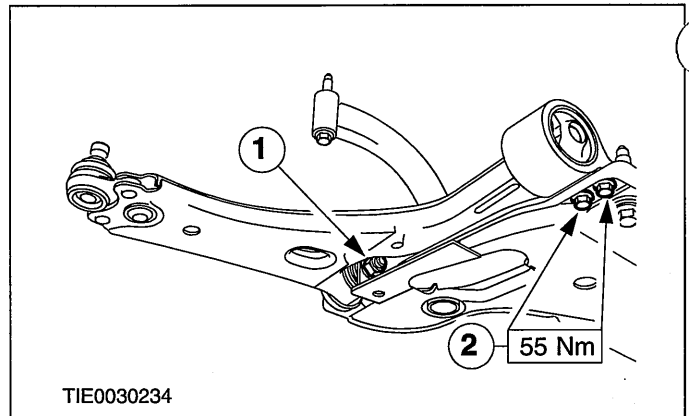
3. **⚠ CAUTION:** Make sure the heat shield is installed to prevent damage to the ball joint.

REMOVAL AND INSTALLATION

Install the heat shield.

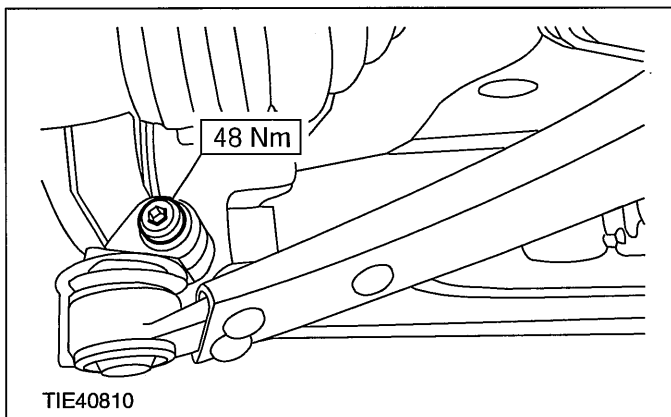


2. Tighten the bolts.



- 4. ⚠ CAUTION:** The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

Attach the lower arm ball joint to the wheel knuckle.



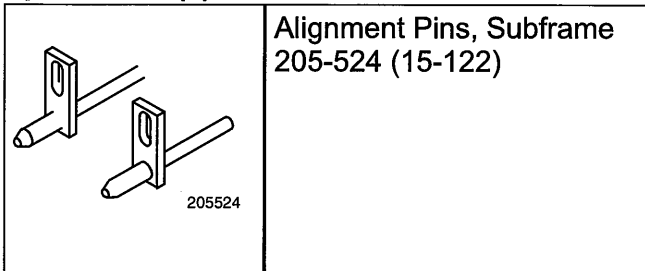
- 7. Check the toe setting and adjust as necessary. For additional information, refer to Section 204-00 [Suspension System - General Information].**

- 5. Install the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].**

- 6. NOTE:** The lower arm to crossmember retaining bolts must be tightened with the vehicle weight on the road wheels.

Tighten the lower arm to crossmember retaining bolts.

1. Tighten the bolt in two stages.
 - Stage 1: 80 Nm.
 - Stage 2: 55 degrees.

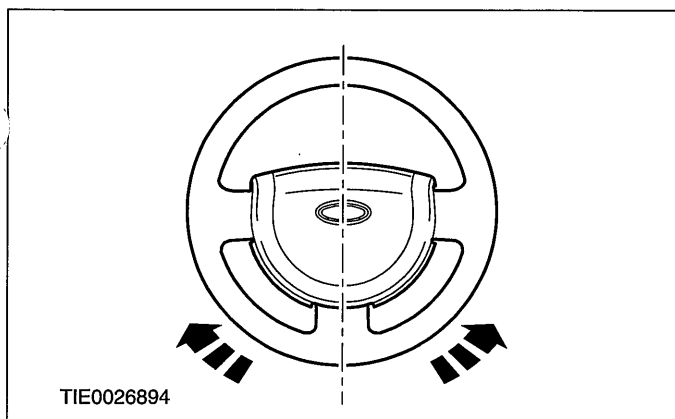
REMOVAL AND INSTALLATION**Front Stabilizer Bar(14 752 0)****Special Tool(s)****General Equipment**

Transmission jack
Wooden block

Removal

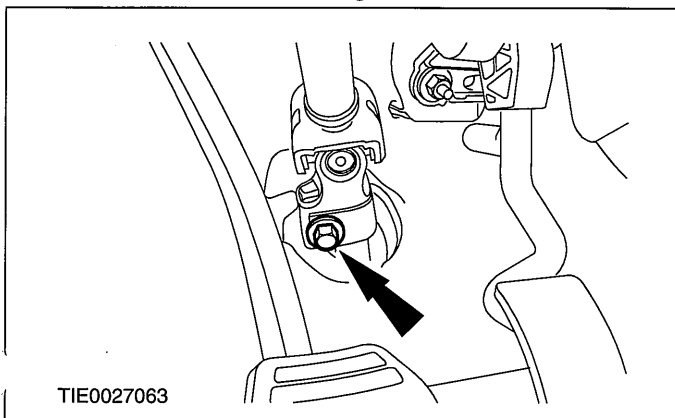
1. **NOTE:**Make sure the road wheels are in the straight ahead position.

Centralize the steering and lock it in position.



2. **Detach the steering column shaft from the steering gear pinion.**

- Discard the retaining bolt.

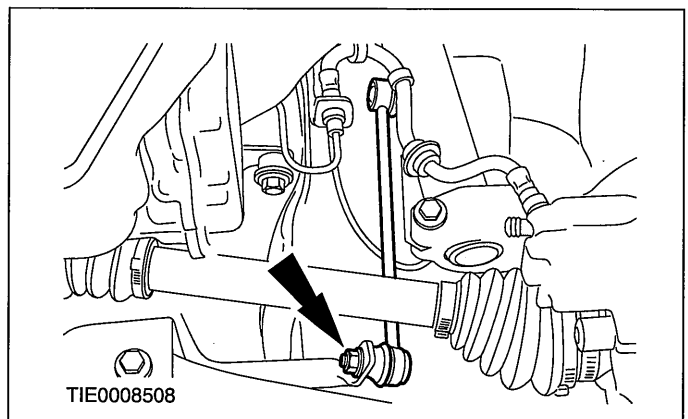


3. **Raise and support the vehicle.**

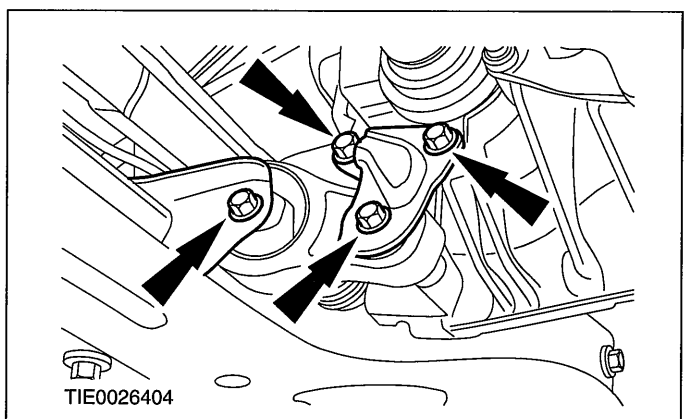
For additional information, refer to: Jacking (100-02 Jacking and Lifting, Description and Operation) / Lifting (100-02 Jacking and Lifting, Description and Operation).

4. **NOTE:**Use a 5 mm Allen key to prevent the ball joint from rotating.

Detach the stabilizer bar connecting link from the stabilizer bar on both sides.

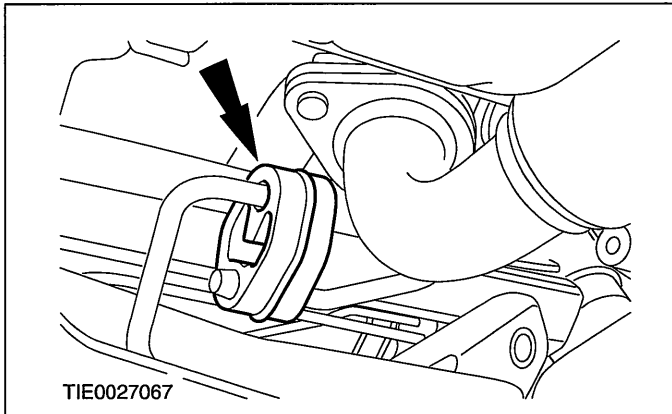


5. **Remove the engine support insulator.**

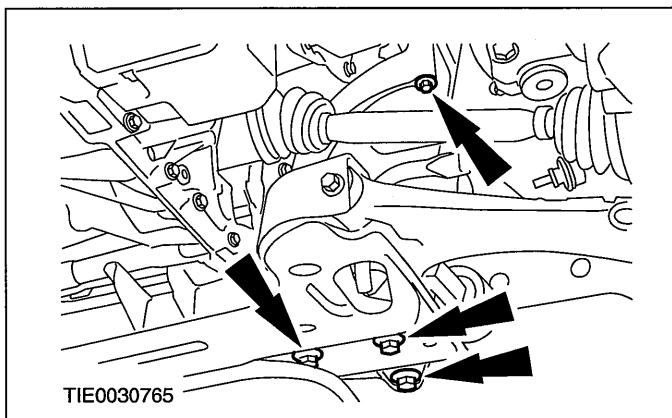


REMOVAL AND INSTALLATION

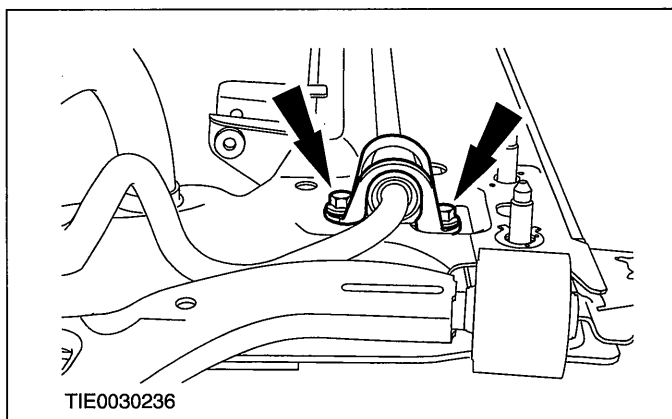
6. Detach the exhaust system from the exhaust hanger insulator.



7. Using a suitable transmission jack and a wooden block, support the crossmember.
8. Remove the crossmember retaining bolts on both sides.



9. Lower the crossmember to gain access to the stabilizer bar.
10. Remove the stabilizer bar clamp on both sides.



11. Remove the stabilizer bar.

12. Remove the stabilizer bar bushings.

For additional information, refer to: Front Stabilizer Bar Bushing (204-01 Front Suspension, Removal and Installation).

Installation

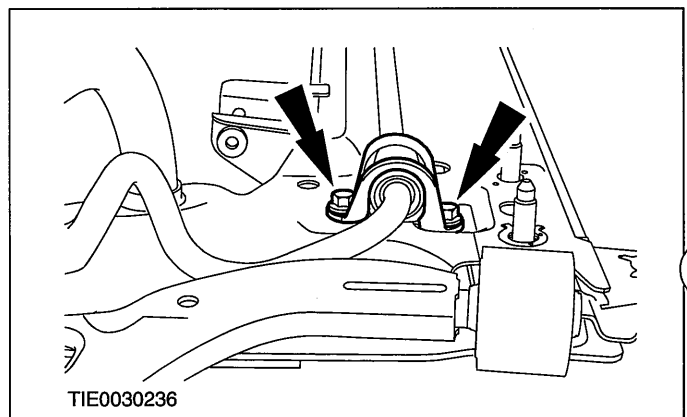
1. Install the stabilizer bar bushings.

For additional information, refer to: Front Stabilizer Bar Bushing (204-01 Front Suspension, Removal and Installation).

2. Position the stabilizer bar on the crossmember.

3. **NOTE:** Do not fully tighten the stabilizer bar clamp retaining bolts at this stage.

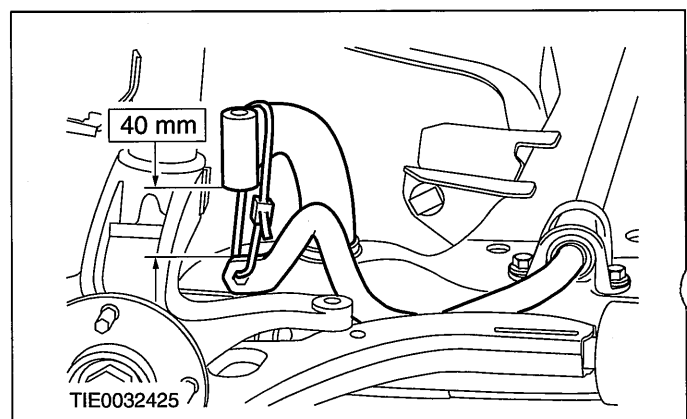
Install the stabilizer bar clamp on both sides.



4. **▲WARNING:** When installing the stabilizer bar, the measurement must be taken in a vertical plane between the crossmember and the stabilizer bar. Failure to follow this instruction may result in personal injury.

Set the stabilizer bar to the installation setting.

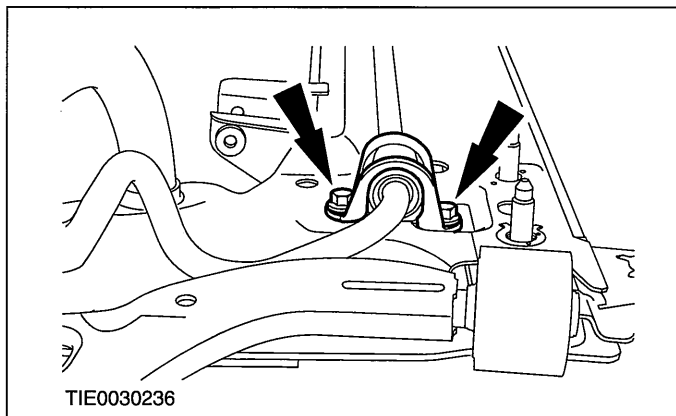
- Using cable ties, support the stabilizer bar on both sides.



REMOVAL AND INSTALLATION

5. Install the stabilizer bar.

- Tighten the bolts in two stages.
- Stage 1: 10 Nm.
- Stage 2: 55 Nm.

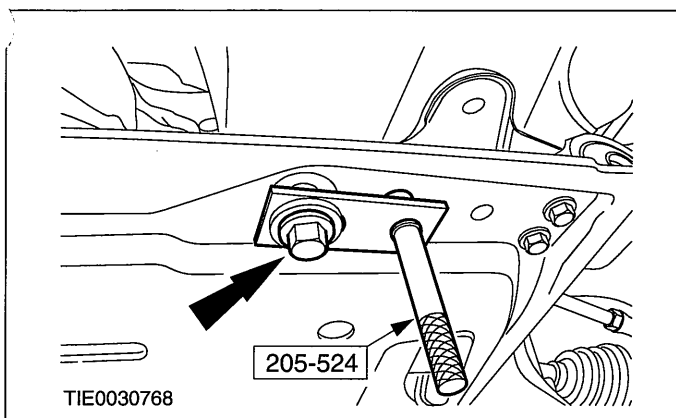


6. Remove the cable ties.

7. Using the transmission jack and the wooden block, position the crossmember.

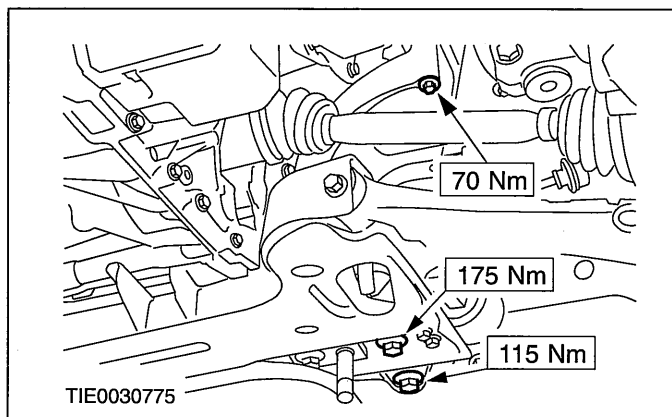
8. **NOTE:** Use the inner crossmember retaining bolt to locate the special tools.

Install the special tools on both sides.



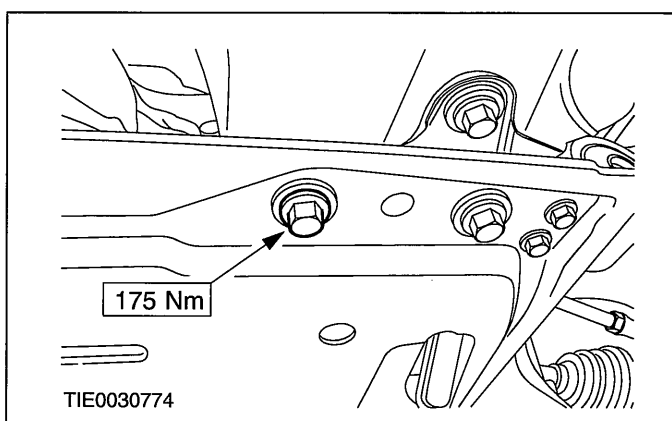
9. **⚠ CAUTION:** While tightening the crossmember retaining bolts, make sure the crossmember does not move.

Install the crossmember retaining bolts on both sides.



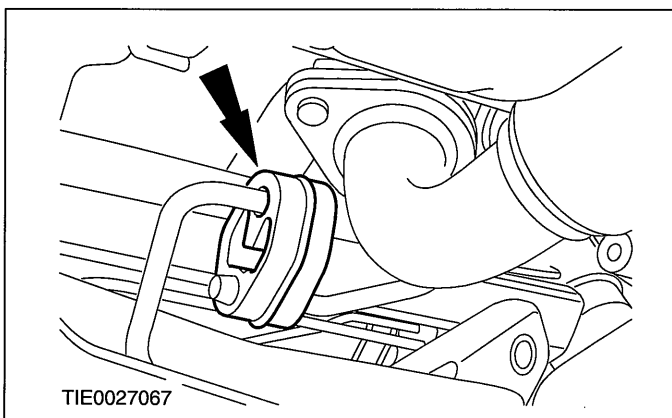
10. Remove the special tools.

11. Install the crossmember inner retaining bolts on both sides.



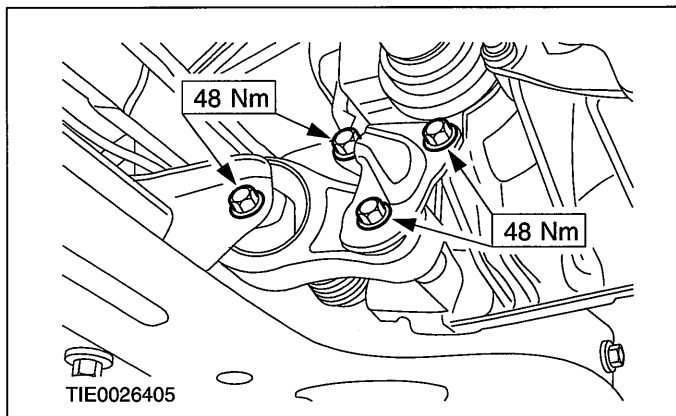
12. Remove the transmission jack and wooden block.

13. Attach the exhaust system to the exhaust hanger insulator.



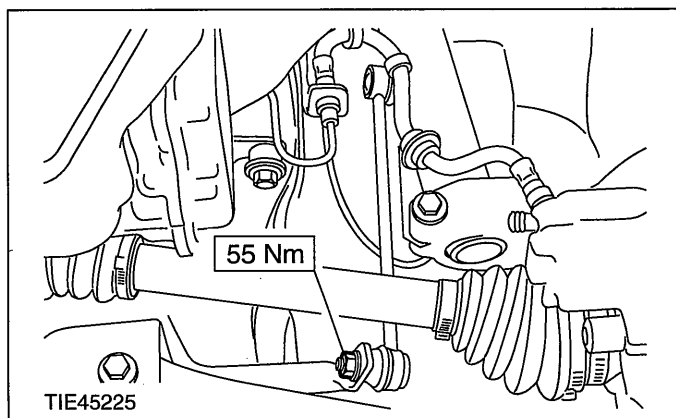
REMOVAL AND INSTALLATION

14. Install the engine support insulator.



15. **NOTE:** Use a 5 mm Allen key to prevent the ball joint from rotating.

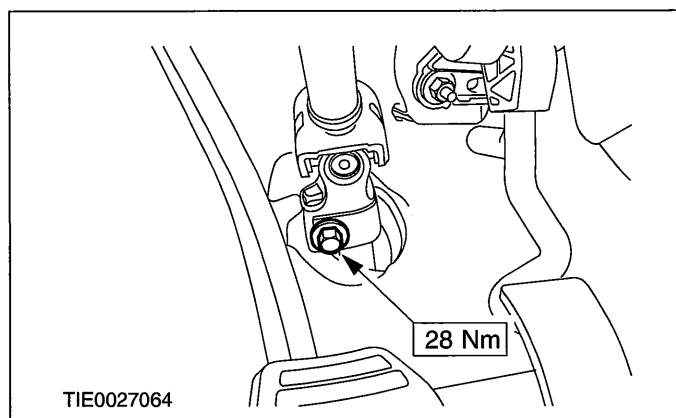
Attach the stabilizer bar connecting link to the stabilizer bar on both sides.



16. Lower the vehicle.

17. **▲WARNING:** Install a new steering column to steering gear pinion retaining bolt. Failure to follow this instruction may result in personal injury.

Attach the steering column shaft to the steering gear pinion.



18. Check the toe setting and adjust as necessary.

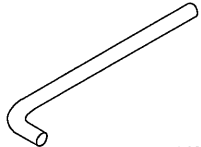
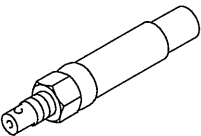
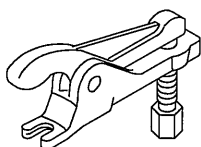
For additional information, refer to:
Specifications (204-00 Suspension System - General Information, Specifications)

/ Front Toe Adjustment (204-00 Suspension System - General Information, General Procedures).

REMOVAL AND INSTALLATION

Wheel Knuckle(14 343 0)

Special Tool(s)

 14039	Lever, Wheel Knuckle 204-159 (14-039)
 14041	Installer, Halfshaft 204-161 (14-041)
 13006	Separator, Ball Joint 211-020 (13-006)

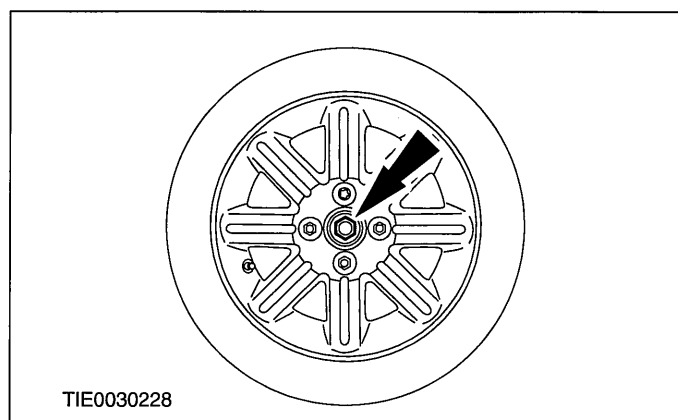
General Equipment

Three leg puller

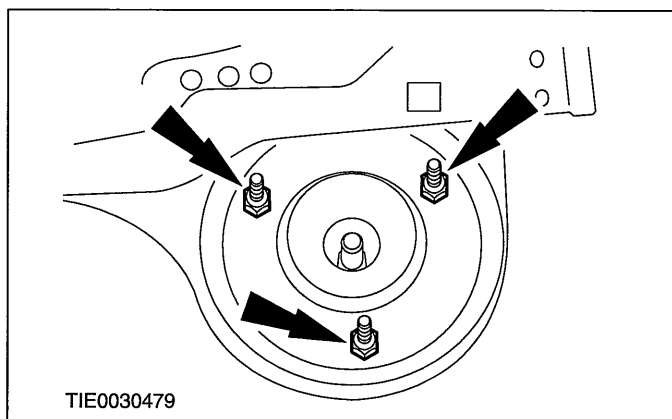
Removal

All vehicles

1. Loosen the wheel hub retaining nut.



2. Loosen the strut and spring assembly top mount retaining nuts by five turns.



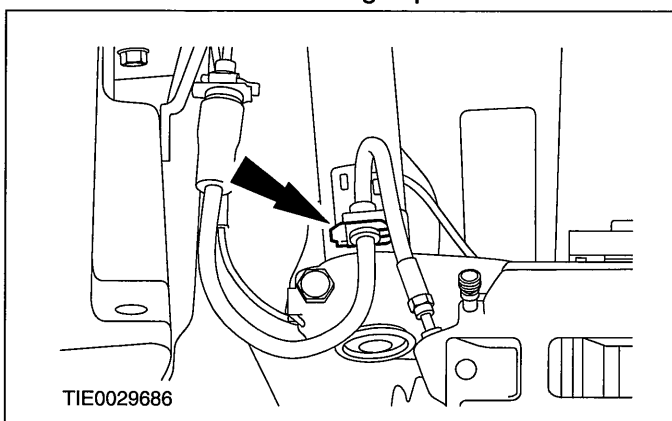
3. Remove the wheel and tire.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. NOTE: Make a note of the position of the brake hose, to aid installation.

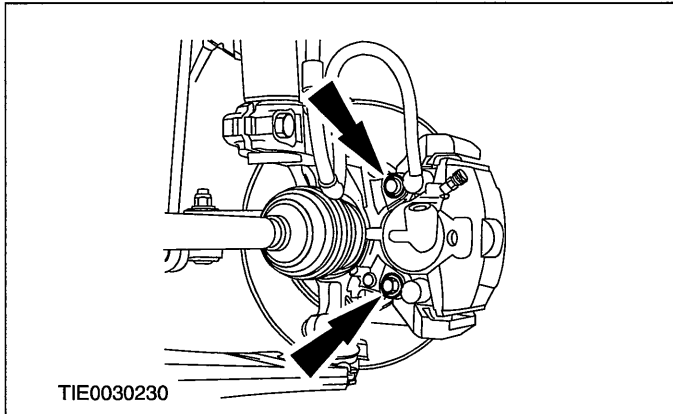
Detach the brake hose from the brake hose support bracket.

- Remove the retaining clip.

5. **CAUTION:** Suspend the brake caliper and anchor plate to prevent load being placed on the brake hose.

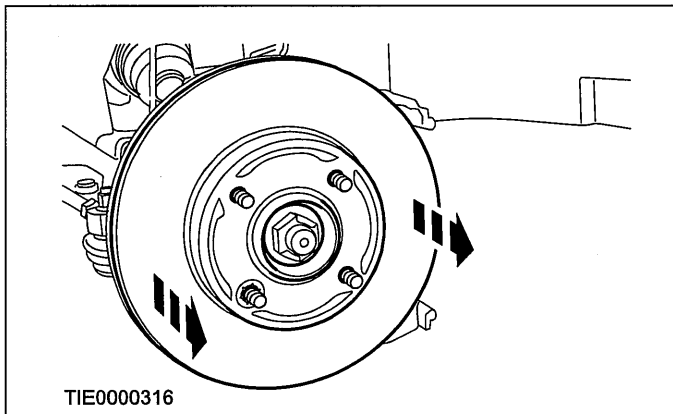
REMOVAL AND INSTALLATION

Detach the brake caliper and anchor plate from the wheel knuckle.



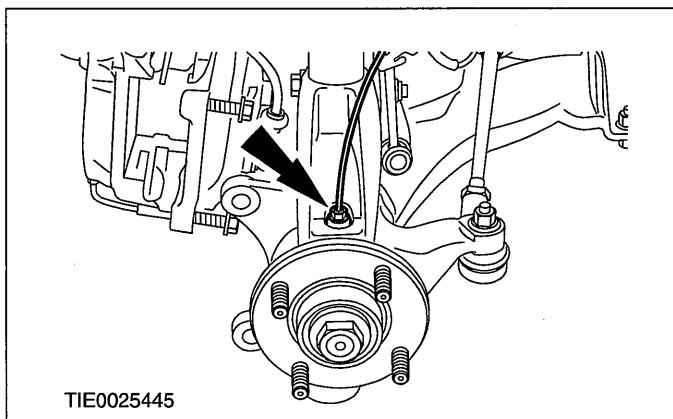
6. Remove the brake disc.

- Remove and discard the retaining washer (if equipped).



Vehicles with anti-lock brakes

7. Detach the wheel speed sensor from the wheel knuckle.

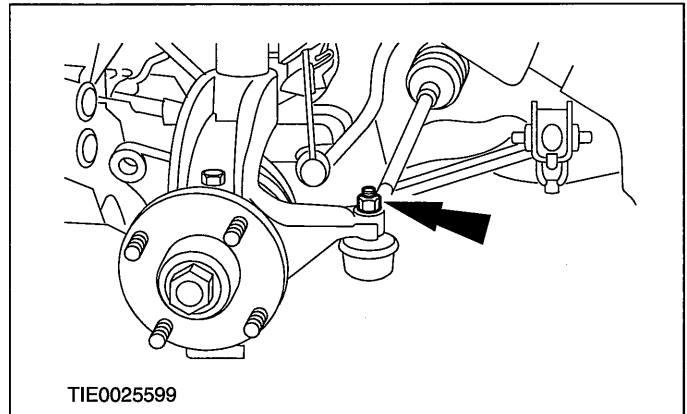


All vehicles

8. ⚠ CAUTION: Leave the tie-rod end retaining nut in place to protect the ball joint stud.

NOTE: Use a 5 mm Allen key to prevent the ball joint stud from rotating.

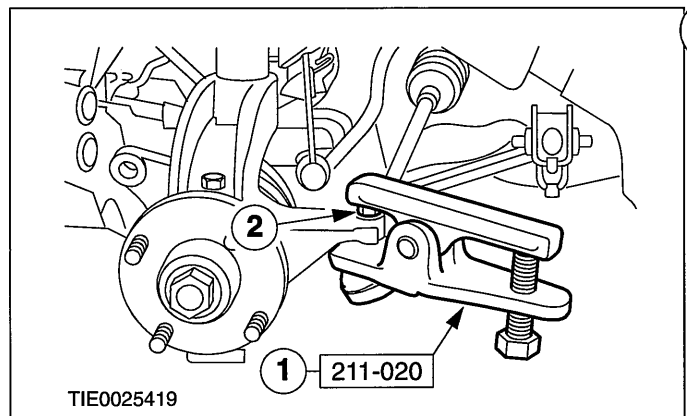
Loosen the tie-rod end retaining nut.



9. ⚠ CAUTION: Protect the ball joint seal using a soft cloth to prevent damage.

Using the special tool, detach the tie-rod end from the wheel knuckle.

- Release the tie-rod end.
- Remove and discard the tie rod end retaining nut.

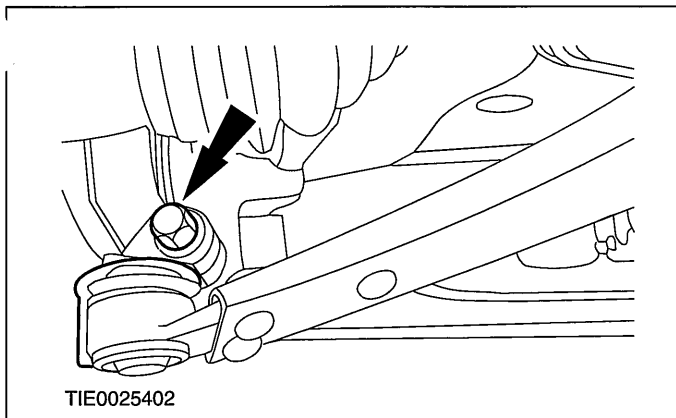


10. ⚠ CAUTION: Protect the ball joint seal using a soft cloth to prevent damage.

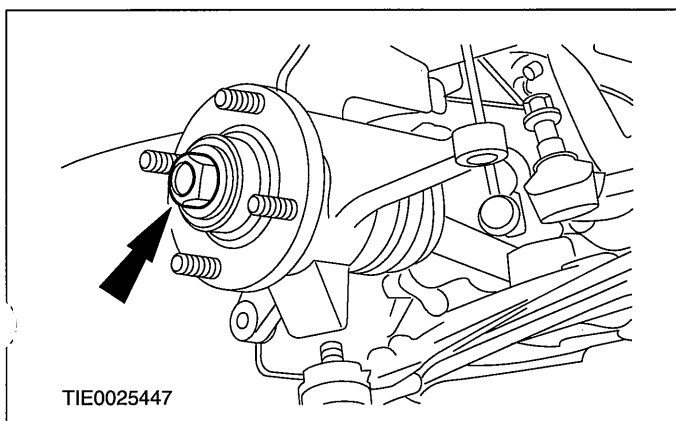
Detach the lower arm ball joint from the wheel knuckle.

REMOVAL AND INSTALLATION

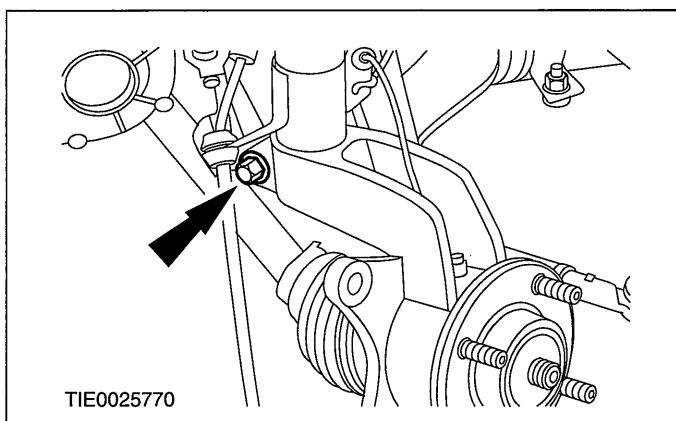
- Remove the heat shield.



- 11. Remove and discard the wheel hub retaining nut.**

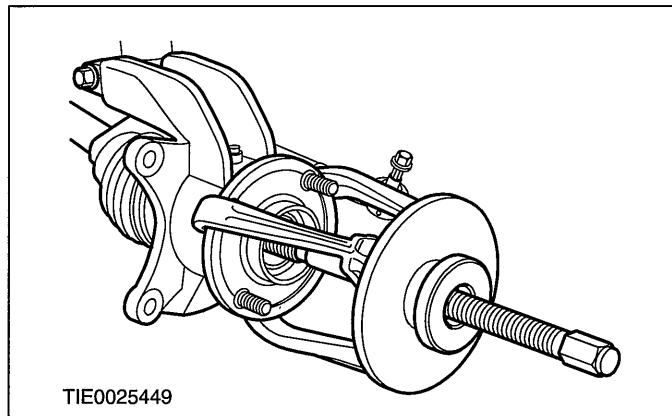


- 12. Remove the wheel knuckle to suspension strut pinch bolt.**

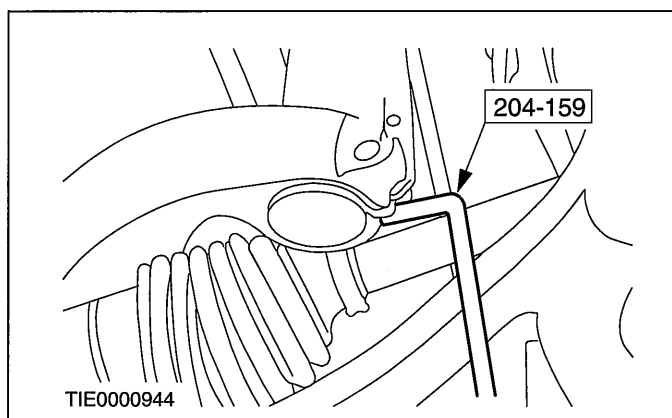


- 13. NOTE:**Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

Using a suitable three leg puller, detach the wheel hub from the halfshaft.



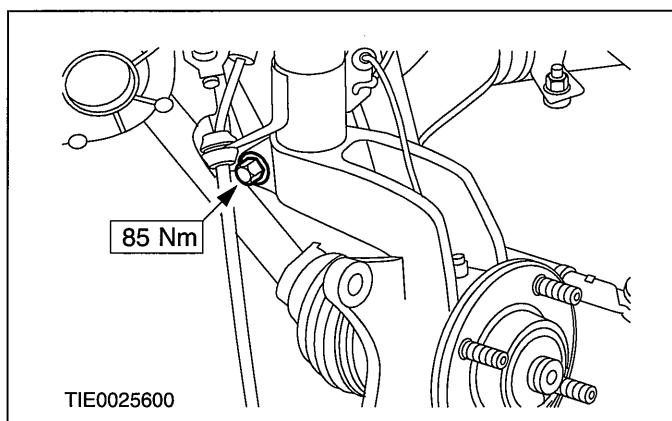
- 14. Using the special tool, remove the wheel knuckle.**



Installation

All vehicles

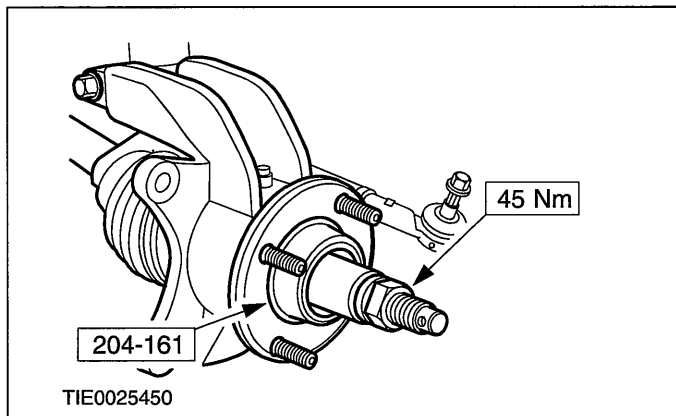
- 1. Install the wheel knuckle.**



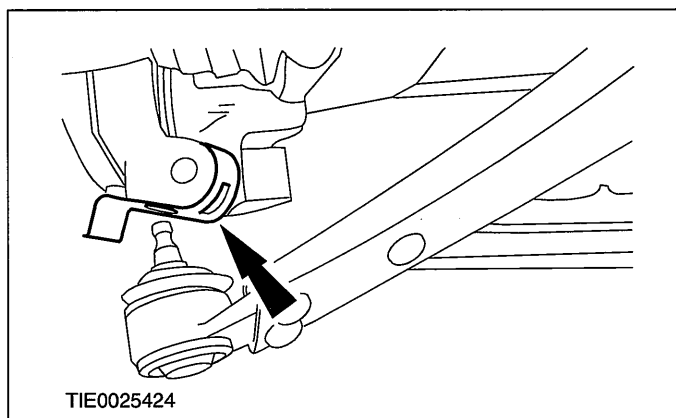
- 2. ⚠ CAUTION:**Make sure the halfshaft is completely installed into the wheel hub.

REMOVAL AND INSTALLATION

Using the special tool, attach the wheel hub to the halfshaft.

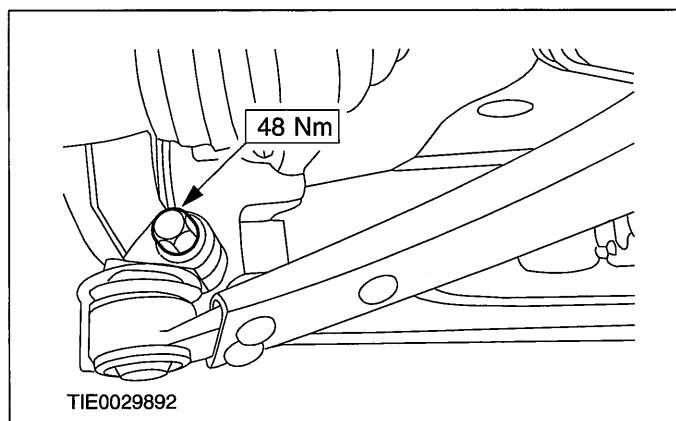


3. **⚠ CAUTION:** Make sure the heat shield is installed to prevent damage to the ball joint. Install the heat shield.



4. **⚠ CAUTION:** The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

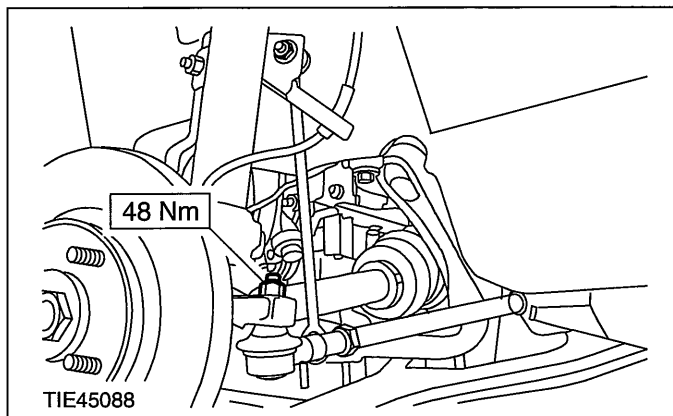
Attach the lower arm ball joint to the wheel knuckle.



5. **▲ WARNING:** Install a new tie-rod end retaining nut. Failure to follow this instruction may result in personal injury.

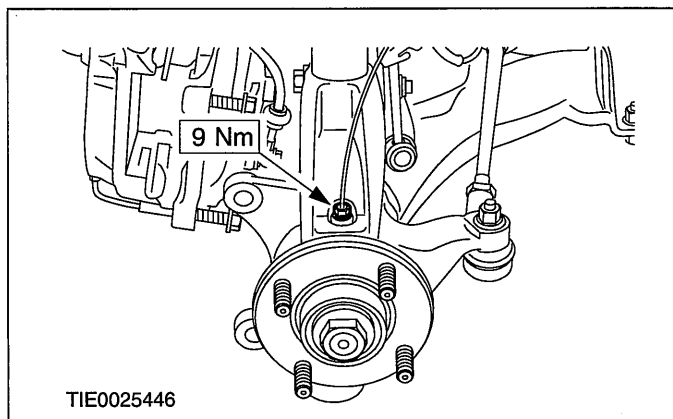
NOTE: Use a 5 mm Allen key to prevent the ball joint stud from rotating.

Attach the tie-rod end to the wheel knuckle.



Vehicles with anti-lock brakes

6. Attach the wheel speed sensor to the wheel knuckle.



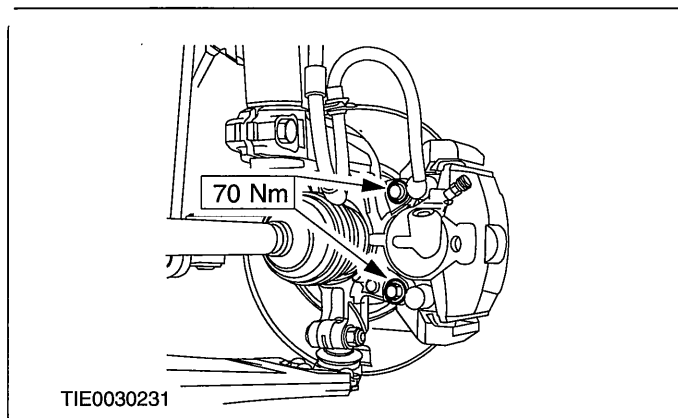
All vehicles

7. Install the brake disc.

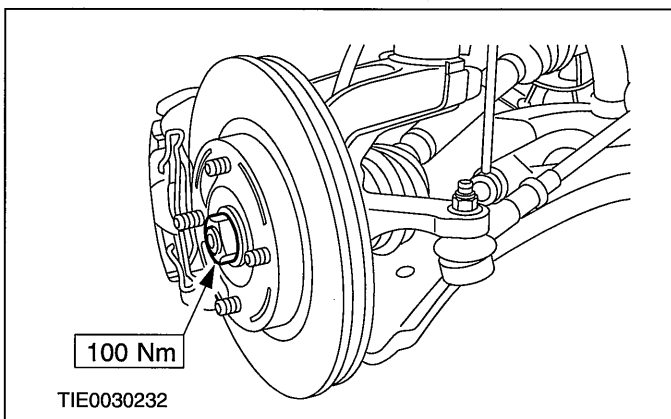
8. **⚠ CAUTION:** Do not twist the brake hose when attaching the brake caliper to prevent damage to the brake hose.

REMOVAL AND INSTALLATION

Attach the brake caliper and anchor plate to the wheel knuckle.



With the aid of another technician, apply the brakes and pre-load the wheel bearing by installing the wheel hub retaining nut.

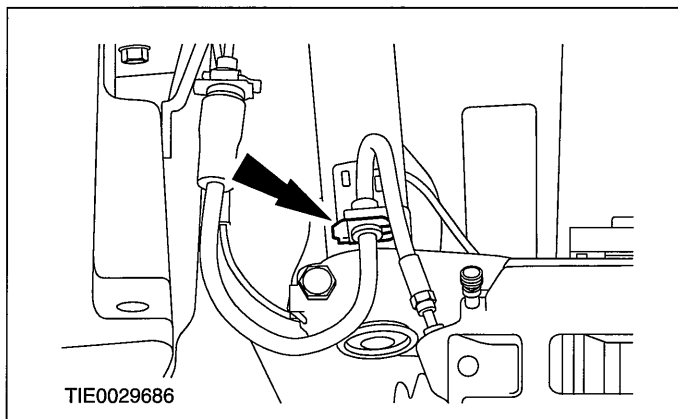


9. CAUTIONS:

⚠ Make sure the brake hose is correctly located in the brake hose support bracket to prevent damage to the brake hose.

⚠ Make sure the brake hose retaining clip is located on the underside of the brake hose support bracket to prevent damage to the brake hose.

Attach the brake hose to the brake hose support bracket.

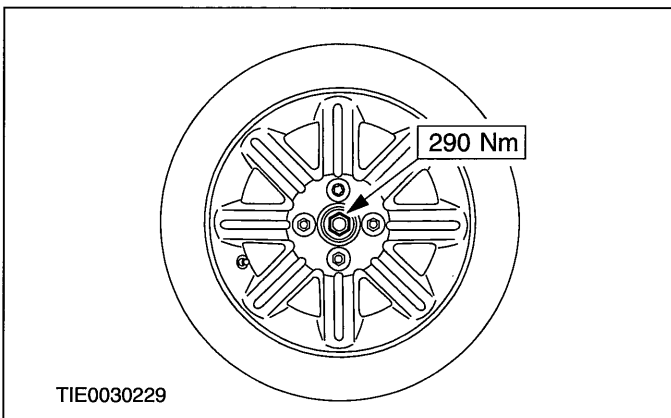


10. **▲WARNING:** Install a new wheel hub retaining nut. Failure to follow this instruction may result in personal injury.

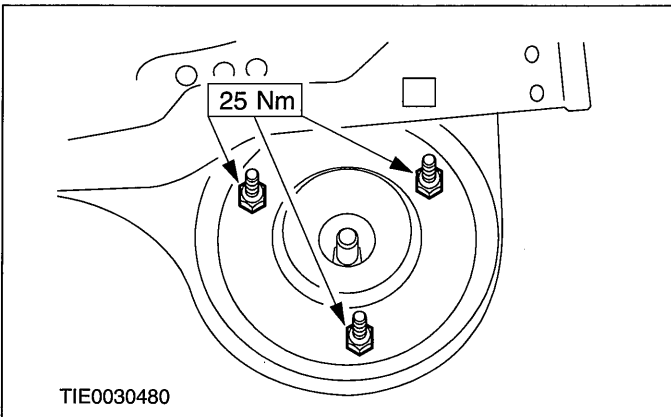
11. Install the wheel and tire.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

12. Tighten the wheel hub retaining nut.



13. Tighten the strut and spring assembly top mount retaining nuts.



REMOVAL AND INSTALLATION

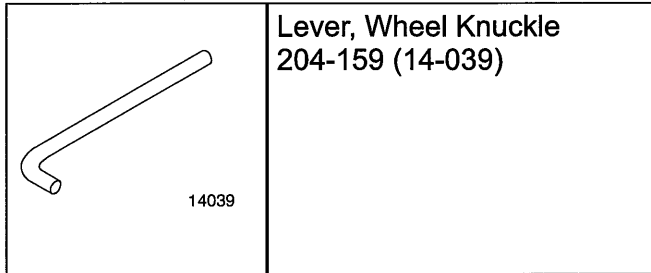
14. Check the toe setting and adjust as necessary.

For additional information, refer to:
Specifications (204-00 Suspension
System - General Information,
Specifications).

REMOVAL AND INSTALLATION

Front Strut and Spring Assembly(14 781 0)

Special Tool(s)



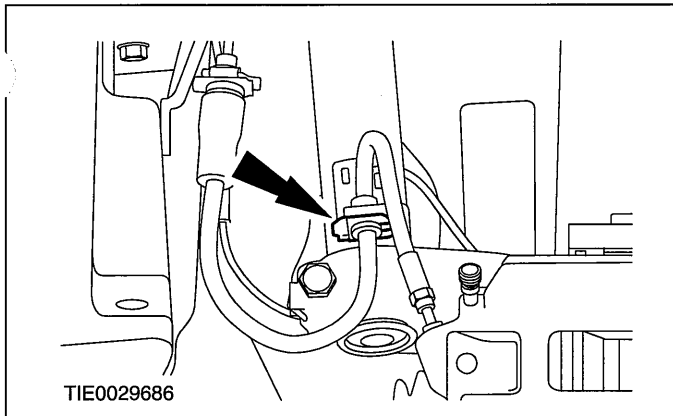
Removal

1. Remove the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].

2. **NOTE:** Make a note of the position of the brake hose, to aid installation.

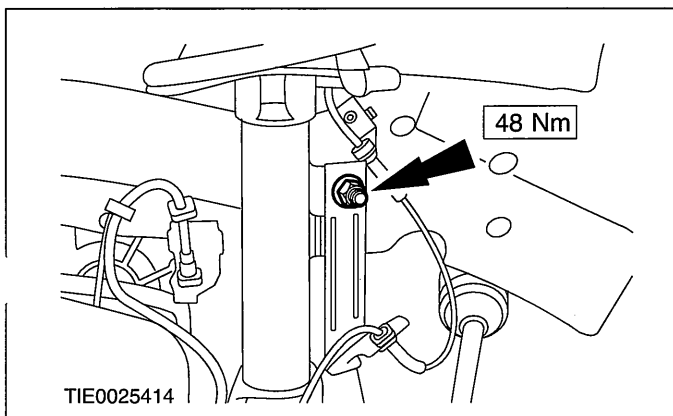
Detach the brake hose from the brake hose support bracket.

- Remove the retaining clip.



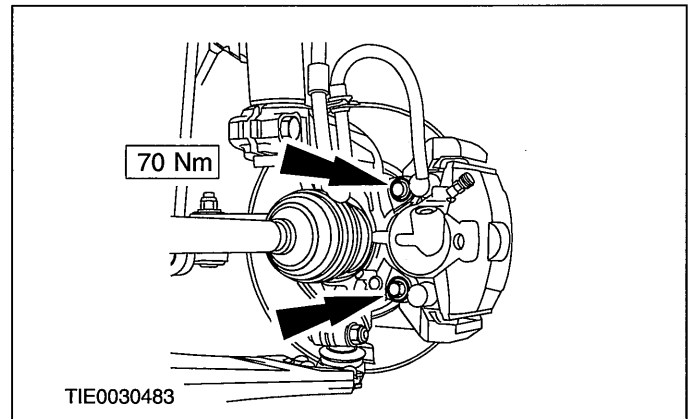
3. **NOTE:** Use a 5 mm Allen key to prevent the ball joint from rotating.

Detach the stabilizer bar connecting link from the strut and spring assembly.



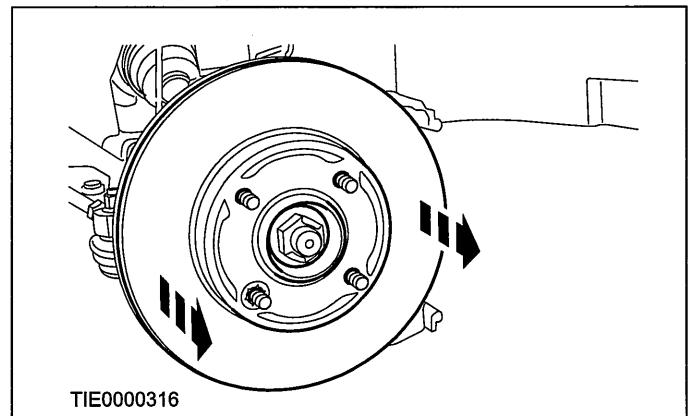
4. **⚠ CAUTION:** Suspend the brake caliper and anchor plate to prevent load being placed on the brake hose.

Detach the brake caliper and anchor plate from the wheel knuckle.



5. Remove the brake disc.

- Remove and discard the retaining washer (if equipped).

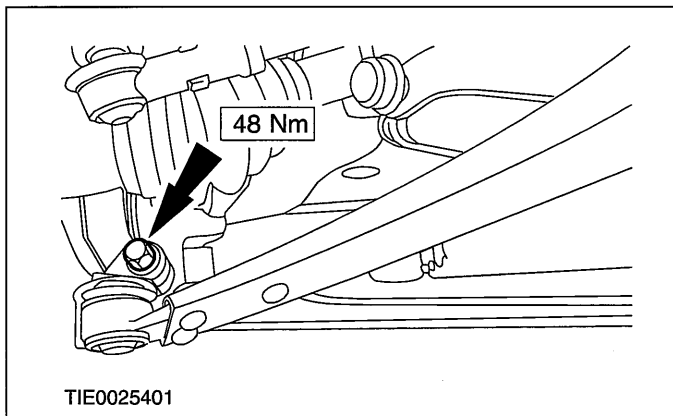


6. **⚠ CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

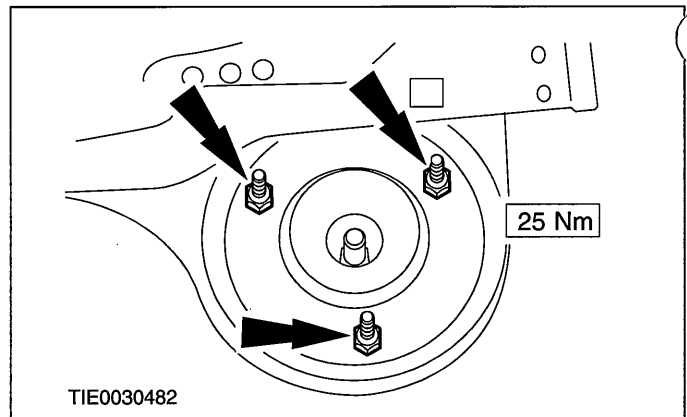
Detach the lower arm ball joint from the wheel knuckle.

REMOVAL AND INSTALLATION

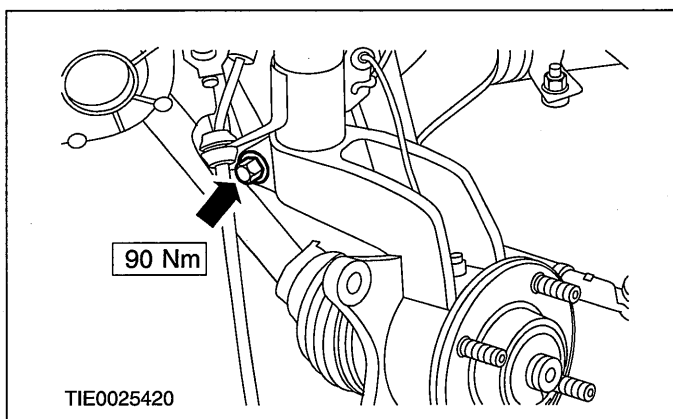
- Remove the heat shield.



Remove the strut and spring assembly.

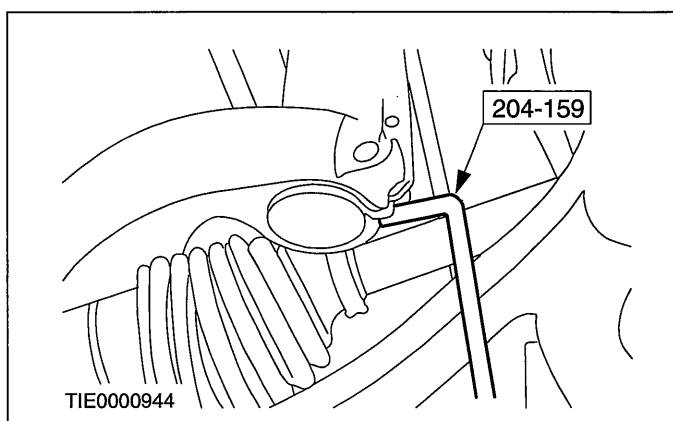


7. Remove the wheel knuckle to strut and spring assembly pinch bolt.



8. **NOTE:**Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

Using the special tool, detach the wheel knuckle from the strut and spring assembly.



9. **CAUTION:**With the aid of another technician, support the strut and spring assembly.

Installation

CAUTIONS:

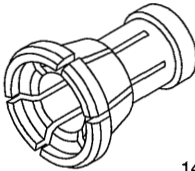
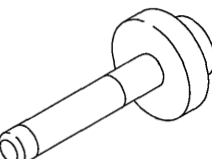
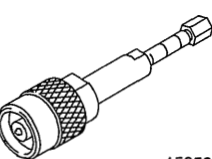
- ⚠ Make sure the heat shield is installed to prevent damage to the ball joint.
- ⚠ The lower arm pinch bolt must be installed from the rear of the wheel knuckle.
- ⚠ Do not twist the brake hose when installing the brake caliper to prevent damage to the brake hose.
- ⚠ Make sure the brake hose is correctly located in the brake hose support bracket to prevent damage to the brake hose.
- ⚠ Make sure the brake hose retaining clip is located on the underside of the brake hose support bracket to prevent damage to the brake hose.

1. To install, reverse the removal procedure.

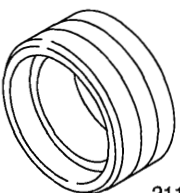
REMOVAL AND INSTALLATION

Front Wheel Bearing(14 411 0)

Special Tool(s)

 14038	Collet for 205-295 204-158 (14-038)
 1403801	Adapter for 204-158 (Thrust Pad) 204-158-01 (14-038-01)
 14040	Installer, Front Wheel Bearing 204-160 (14-040)
 14040	Adapter for 205-074 205-074-01 (15-064)
 15036	Installer, Rear Hub Oil Seal 205-075 (15-036)
 15050A	Remover, Bearing (Main Tool) 205-295 (15-050A)

Special Tool(s)

 2110203	Installer/Aligner, Crankshaft Rear Oil Seal 303-172-03 (21-102-03)
---	--

Materials

Name	Specification
Engine oil	WSS-M2C913-A

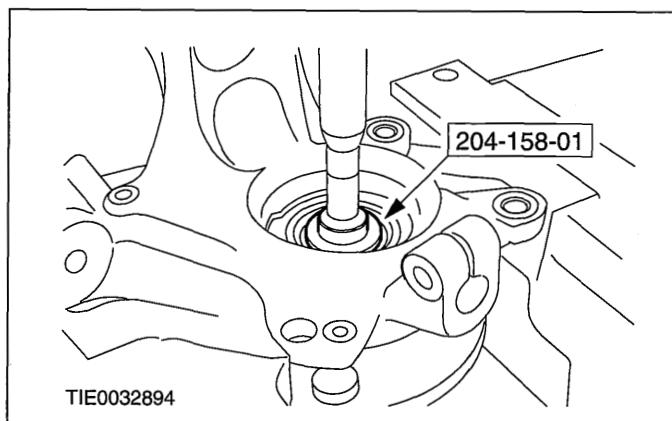
Removal

1. Remove the wheel knuckle.

For additional information, refer to Wheel Knuckle in this section.

2. **NOTE:**When removing the wheel hub from the wheel knuckle the bearing will be destroyed. The bearing inner ring will be on the wheel hub and the bearing outer ring will be in the wheel knuckle.

Using the special tool, remove the wheel hub.



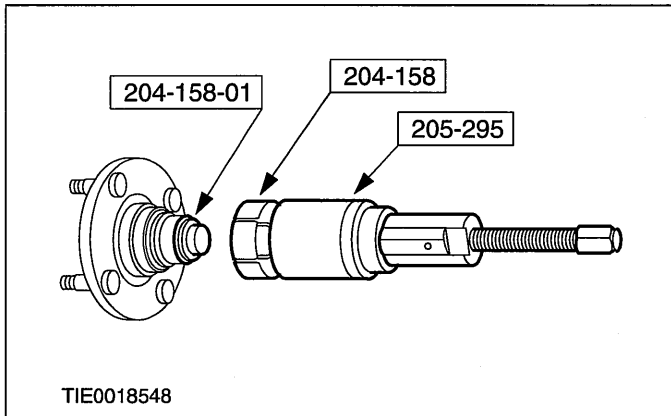
3. CAUTIONS:

⚠ The special tools must be used to prevent damage to the wheel hub. If the wheel hub is damaged a new wheel hub must be installed.

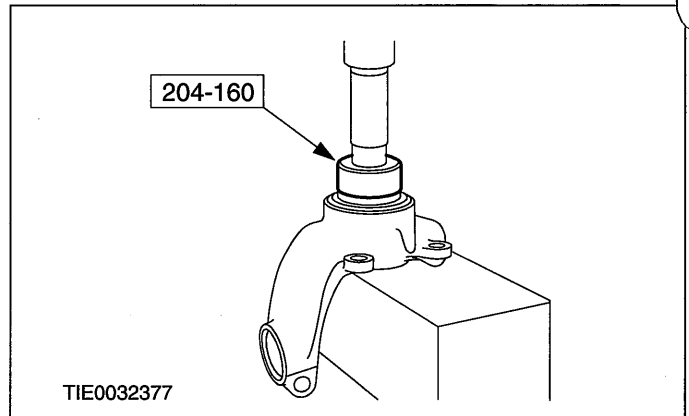
⚠ Do not use heat to remove the bearing inner ring.

REMOVAL AND INSTALLATION

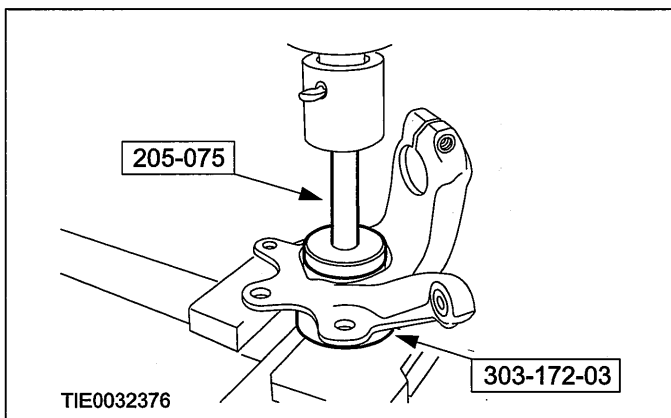
Using the special tools, remove the bearing inner ring.



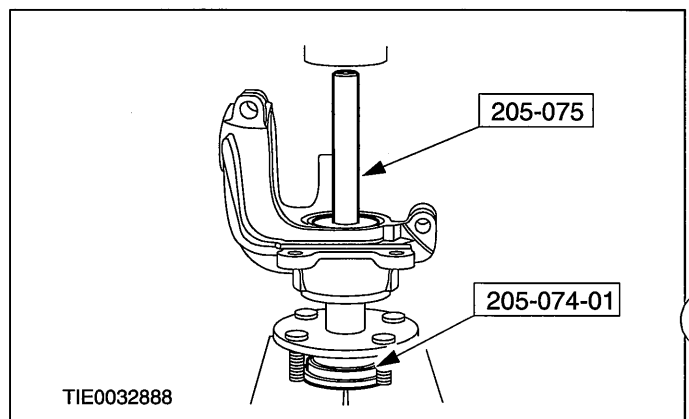
Using the special tool, install the new wheel bearing.



4. Using the special tools, remove the bearing outer ring and speed sensor ring.



2. Using the special tools, install the wheel hub.



3. Install the wheel knuckle.

For additional information, refer to Wheel Knuckle in this section.

Installation

CAUTIONS:

- ⚠ Avoid any impact on the wheel speed sensor ring.
- ⚠ Make sure the wheel speed sensor ring is clean.
- ⚠ Avoid any contact between the wheel speed sensor ring and a magnetic surface.

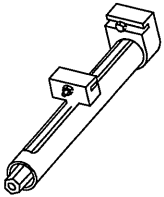
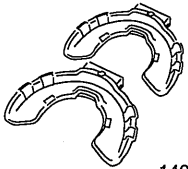
1. CAUTIONS:

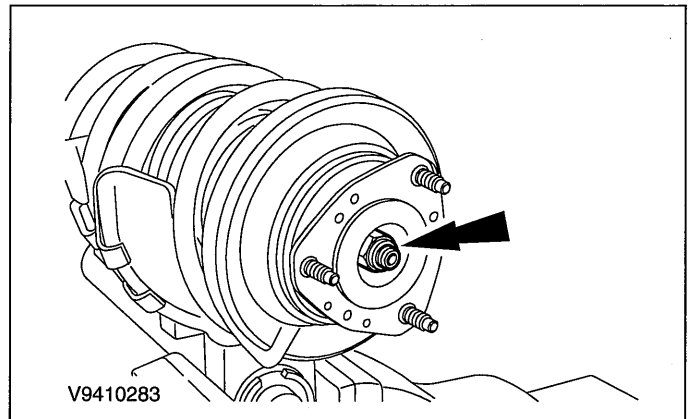
- ⚠ Make sure the wheel bearing is installed into the wheel knuckle with the wheel speed sensor ring, colored black, towards the inner face of the wheel knuckle.

- ⚠ Make sure the wheel bearing is completely installed in the wheel knuckle.

NOTE: Lubricate the bore of the wheel knuckle with clean engine oil.

DISASSEMBLY AND ASSEMBLY**Front Strut and Spring Assembly(14 783 4)****Special Tool(s)**

 14042	Compressor, Coil Spring 204-167 (14-042)
 1404201	Adaptors for 204-167 204-167-01 (14-042-01)

Loosen the thrust bearing retaining nut.

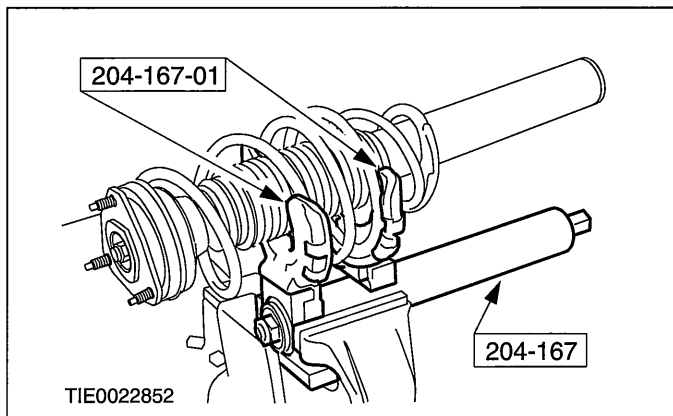
- 3. NOTE:**When access to the strut or spring only is required, remove items two through five as a complete assembly.

Disassemble the strut and spring assembly.

1. Remove the thrust bearing retaining nut.
2. Remove the top mount.
3. Remove the thrust bearing and spring seat assembly.
4. Remove the boot.
5. Remove the bump stop.
6. Remove the spring.

Disassembly

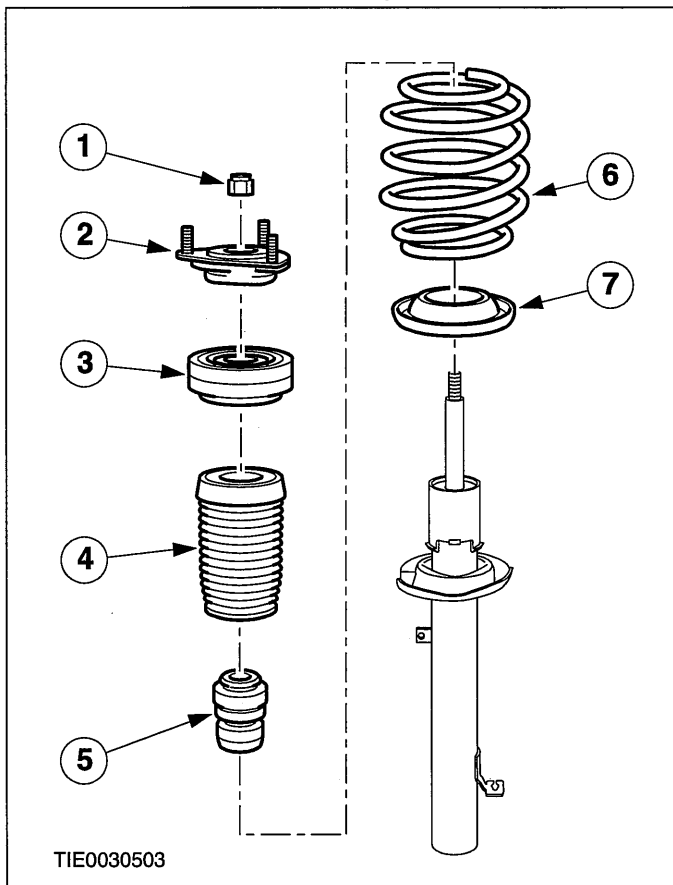
- 1. ⚠️ WARNING:**The spring is under extreme tension; care must be taken at all times. Failure to follow this instruction may result in personal injury.

Using the special tools, compress the spring.

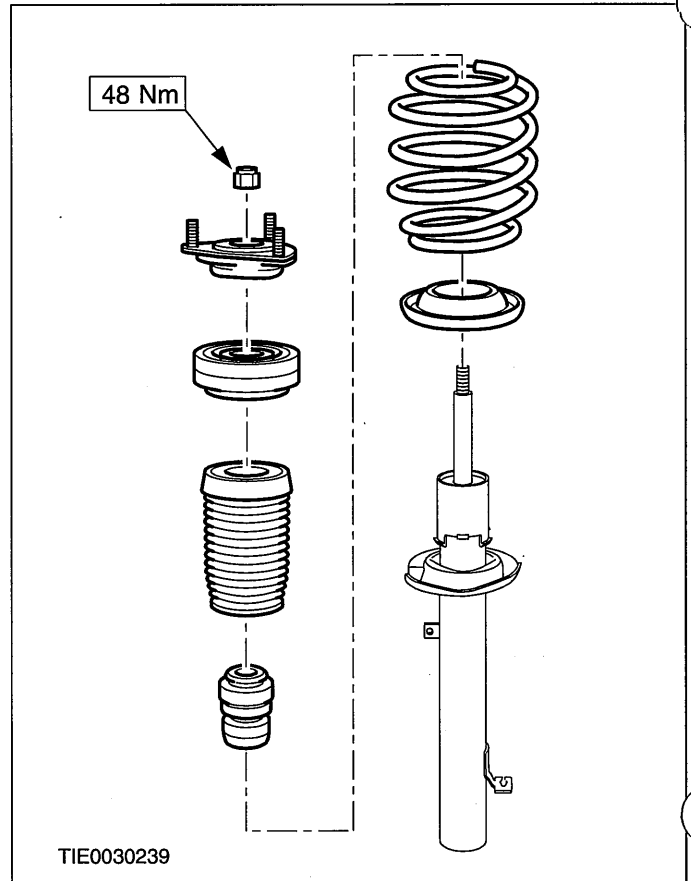
- 2. ⚠️ CAUTION:**Use an Allen key to prevent the piston rod from rotating.

DISASSEMBLY AND ASSEMBLY

7. Remove the insulator pad.



To assemble, reverse the disassembly procedure.

**Assembly**

1. **CAUTION:** The ends of the spring must locate correctly in the spring seats.

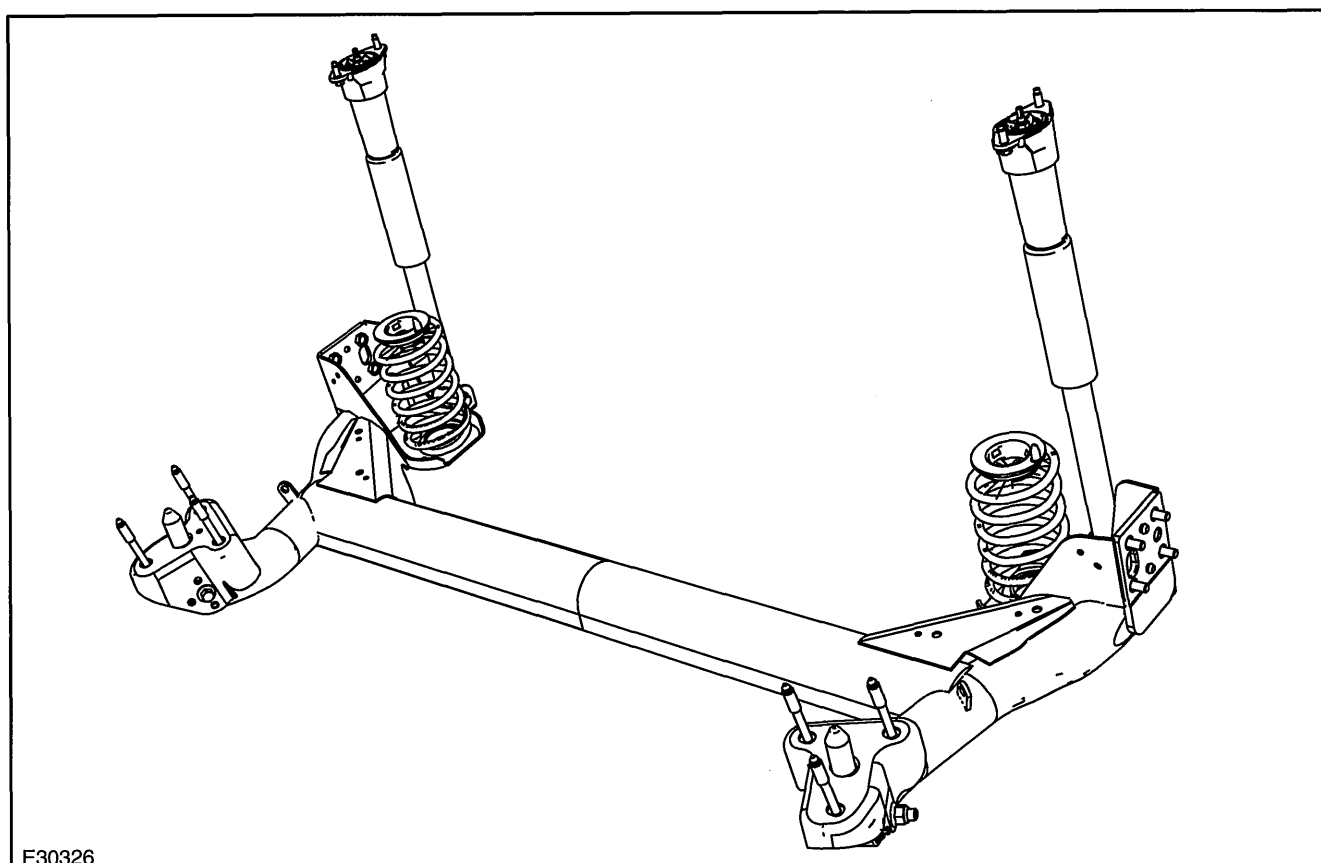
SECTION 204-02 Rear Suspension

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	204-02-2
DESCRIPTION AND OPERATION	
Rear Suspension.....	204-02-3
DIAGNOSIS AND TESTING	
Rear Suspension.....	204-02-5
REMOVAL AND INSTALLATION	
Rear Shock Absorber.....	(15 791 0) 204-02-6
Spring.....	(15 621 0) 204-02-8
Beam Axle.....	(15 231 0) 204-02-10
Wheel Spindle.....	(15 366 0) 204-02-15
Rear Wheel Bearing.....	204-02-17
Trailing Arm Bushing.....	(15 730 0) 204-02-20

SPECIFICATIONS**Torque Specifications**

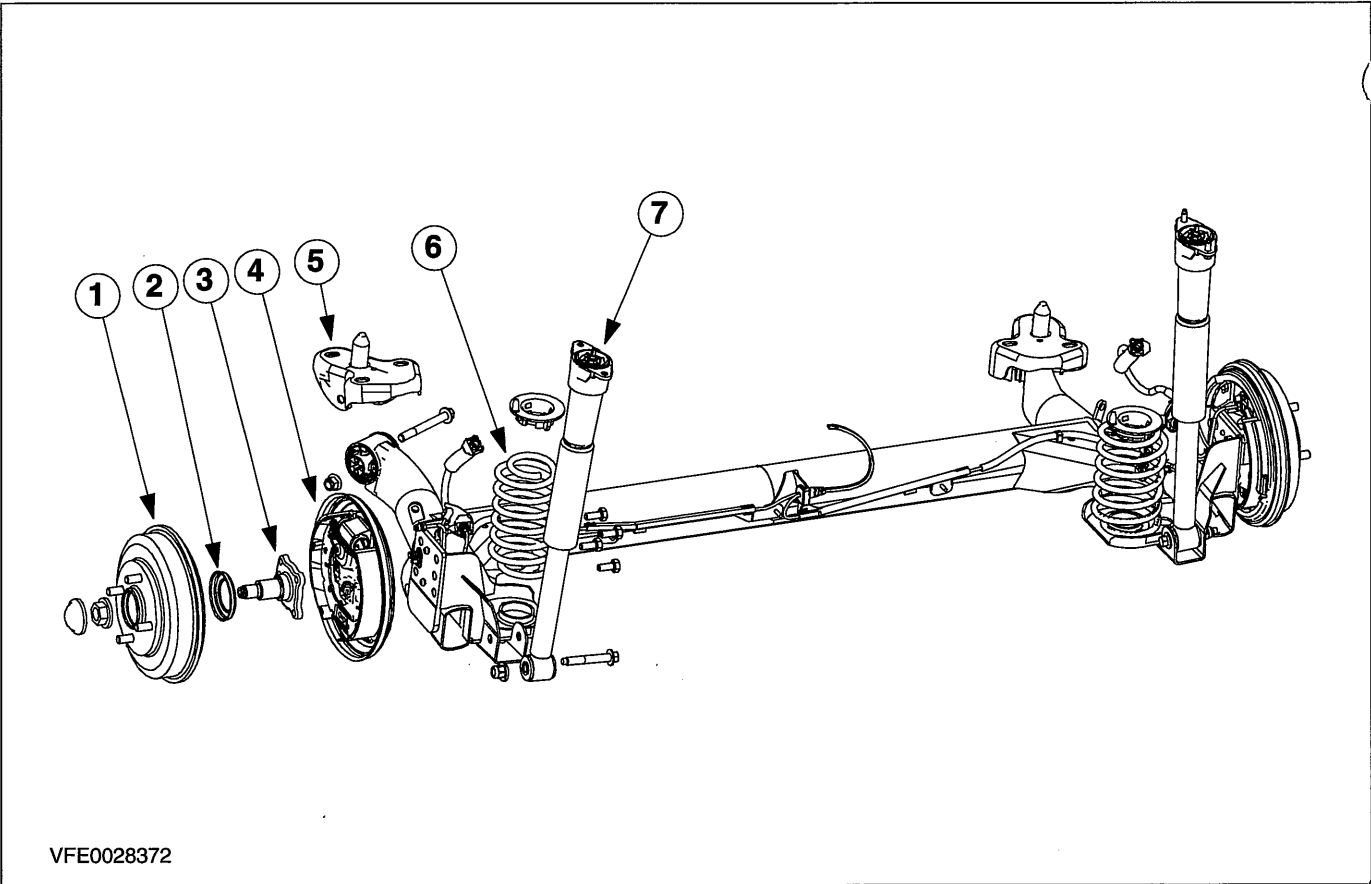
Item	Nm	lb-ft	lb-in
Shock absorber lower mount retaining bolt	115	85	-
Shock absorber upper mount retaining bolts	25	18	-
Trailing arm bushing retaining bolts	125	92	-
Beam axle retaining bolts	115	85	-
Wheel spindle retaining bolts - Vehicles with rear drum brakes	70	52	-
Wheel spindle retaining bolts - Vehicles with rear disc brakes	66	49	-
Wheel hub retaining nut	235	173	-
Brake hose to brake caliper union	15	11	-
Brake tube to brake hose union	15	11	-
Wheel speed sensor retaining bolt	9	-	80

DESCRIPTION AND OPERATION**Rear Suspension****Overview**

The rear suspension is a semi-independent suspension. The track has been increased by 71 mm to 1444 mm.

In addition, the diameter of the longitudinal members has been increased to increase stability and to reduce unwanted movements of the vehicle around the longitudinal axis.

DESCRIPTION AND OPERATION



VFE0028372

Item	Description
1	Brake drum
2	Anti-lock brake system (ABS) wheel sensor pick-up ring
3	Stub axle
4	Brake back plate assembly with brake
5	Bracket
6	Spring
7	Shock absorber

suspension will not be correct. The installation orientation of the support bearing is indicated with an arrow.

A significant modification is the replacement of the previous Mc-Pherson suspension struts with separate spring and shock absorber elements. This results in more space in the area of the suspension strut turrets, thus increasing the volume of the luggage compartment. In addition, the forces from the spring and shock absorber elements are now dissipated separately and have been individually optimised.

The shock absorbers are single-tube gas shock absorbers.

It is important that the correct installation orientation is adhered to when assembling the support bearings, as otherwise the geometry of the rear

DIAGNOSIS AND TESTING**Rear Suspension**

REFER to Section 204-00 [Suspension System - General Information].

REMOVAL AND INSTALLATION

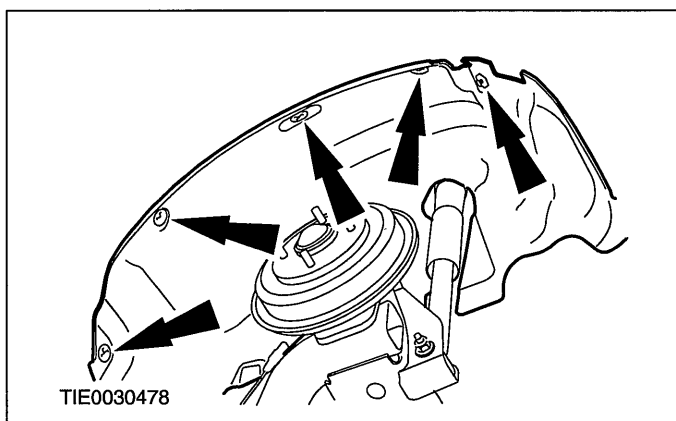
Rear Shock Absorber(15 791 0)

General Equipment

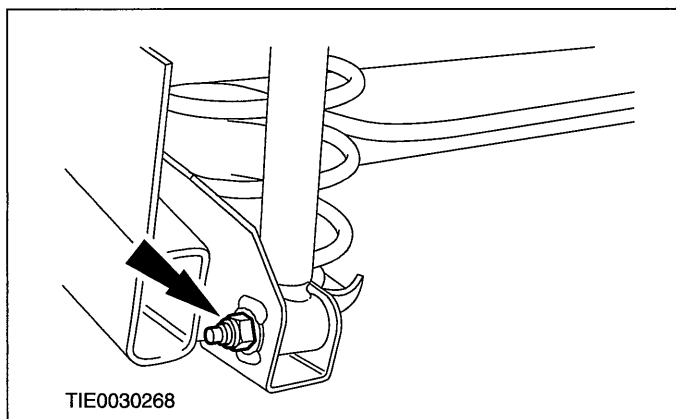
Transmission jack

Removal

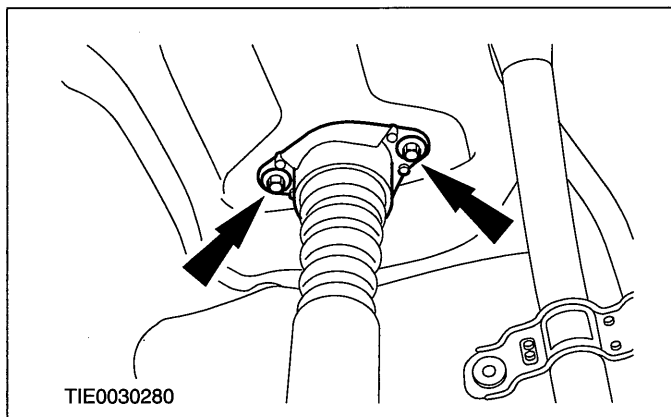
1. Remove the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].
2. Detach the fender splash shield from the fender.



3. Using a suitable transmission jack, support the beam axle.
4. Detach the shock absorber from the beam axle.

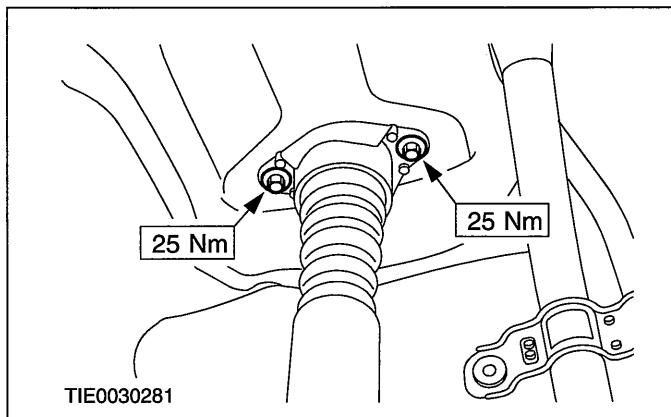


5. Remove the shock absorber.

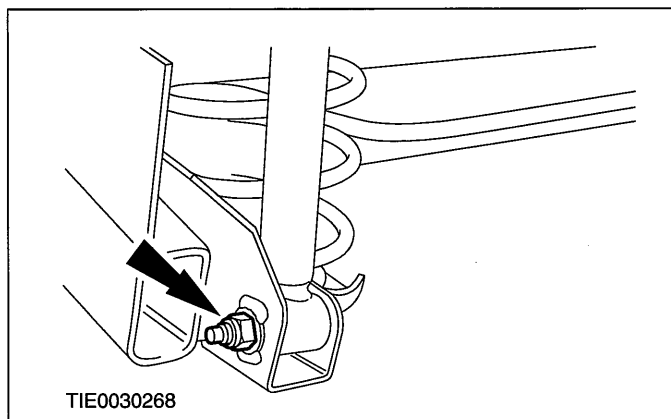


Installation

1. Attach the shock absorber to the body.

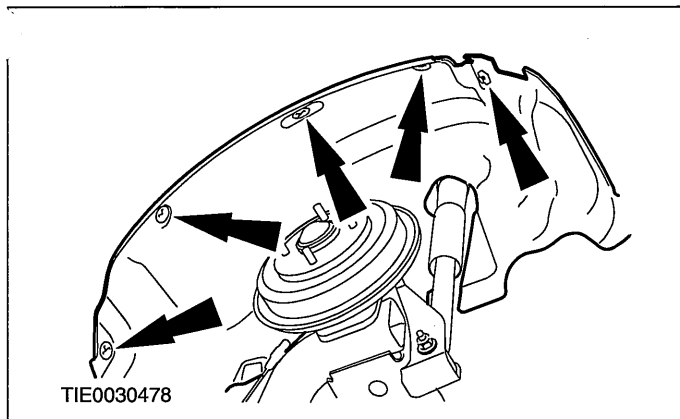


2. **NOTE:** Do not fully tighten the shock absorber lower mounting bolt at this stage. Install the shock absorber.



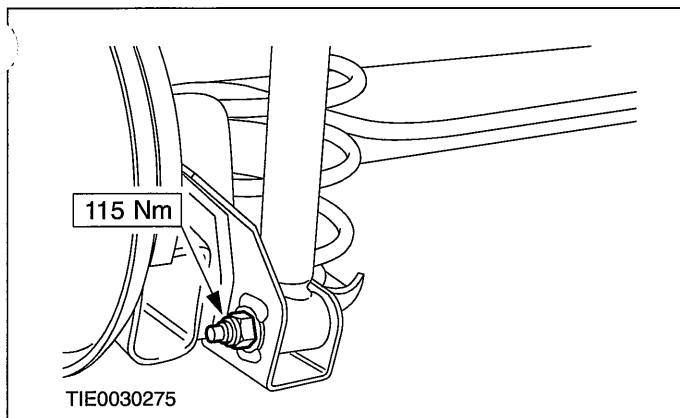
REMOVAL AND INSTALLATION

3. Attach the fender splash shield to the fender.



4. Install the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].
5. **NOTE:** The final tightening of the shock absorber lower mounting bolt should be carried out when the vehicle weight is on the road wheels.

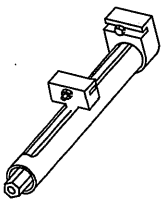
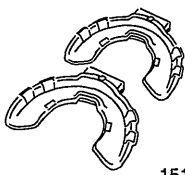
Tighten the shock absorber lower mounting bolt.



REMOVAL AND INSTALLATION

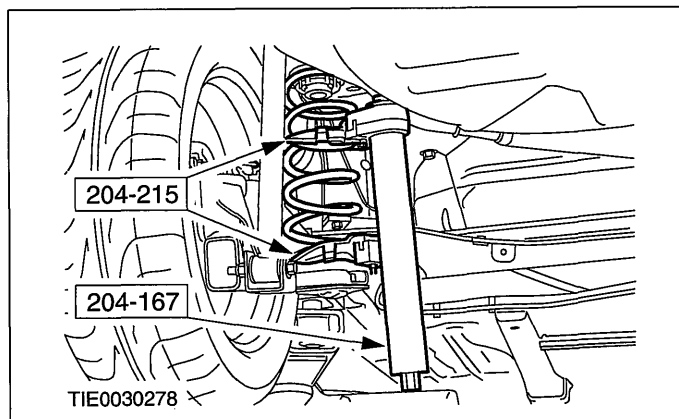
Spring(15 621 0)

Special Tool(s)

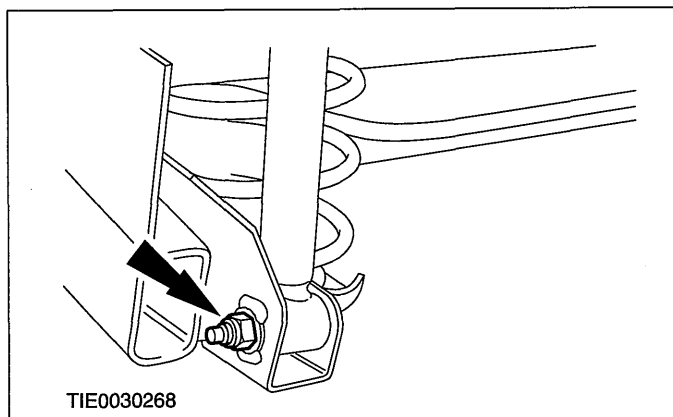
 14042	Compressor, Coil Spring 204-167 (14-042)
 15111	Adapters for 204-167 204-215 (15-111)

Removal

1. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. **▲WARNING:**As the spring is under extreme tension care must be taken at all times. Failure to follow this instruction may result in personal injury.
Using the special tools, compress the spring.



3. Detach the shock absorber from the beam axle.

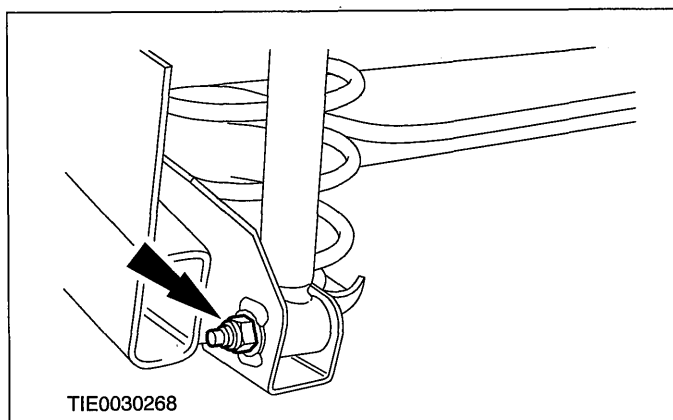


4. **▲WARNING:**As the spring is under extreme tension care must be taken at all times. Failure to follow this instruction may result in personal injury.

Remove the spring.

Installation

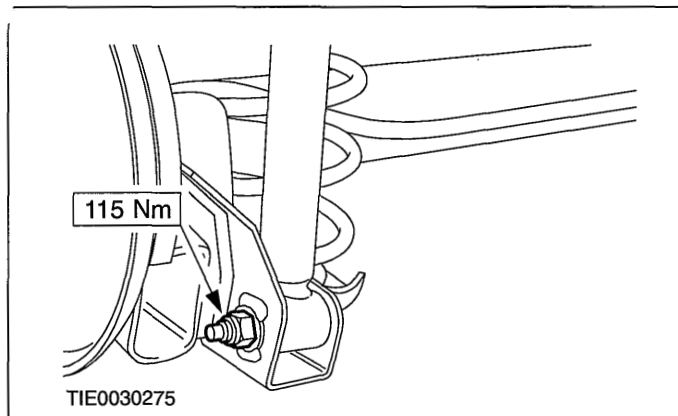
1. **NOTE:**Make sure the top seat mounting is installed, and the spring ends butt correctly against the upper and lower spring seats.
Install the spring.
2. **NOTE:**Do not fully tighten the shock absorber lower mounting bolt at this stage.
Attach the shock absorber to the beam axle.



3. Lower the vehicle.
4. **NOTE:**The final tightening of the shock absorber lower mounting bolt should be carried out when the vehicle weight is on the road wheels.

REMOVAL AND INSTALLATION

Tighten the shock absorber lower mounting bolt.



REMOVAL AND INSTALLATION

Beam Axle(15 231 0)

General Equipment

Transmission jack
Securing strap
Electric hand drill
Blind rivet gun

Removal

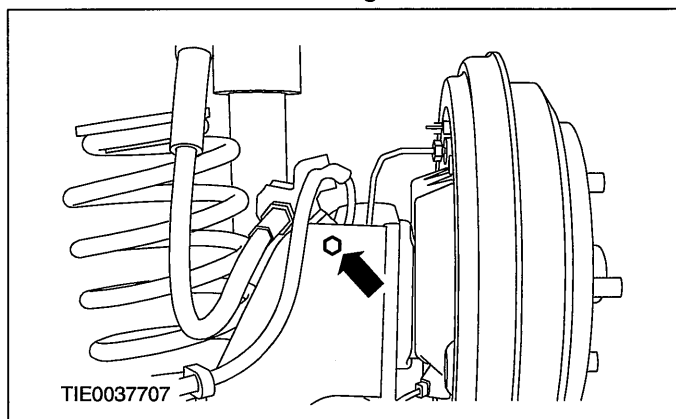
Vehicles with rear drum brakes

1. Release the parking brake.
2. Remove the rear wheels and tires.

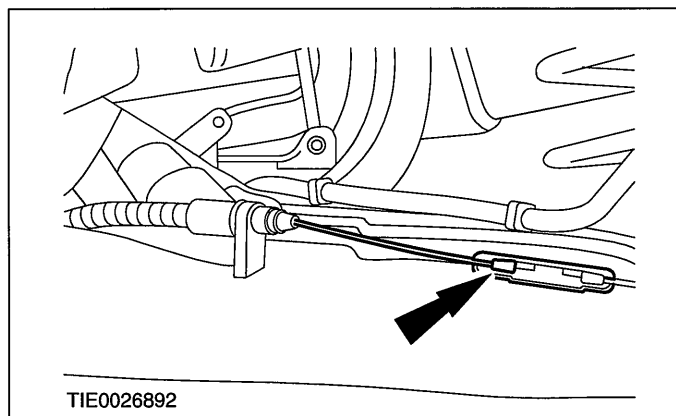
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. Detach the rear wheel speed sensor and brake hose retaining bracket from the beam axle on both sides.

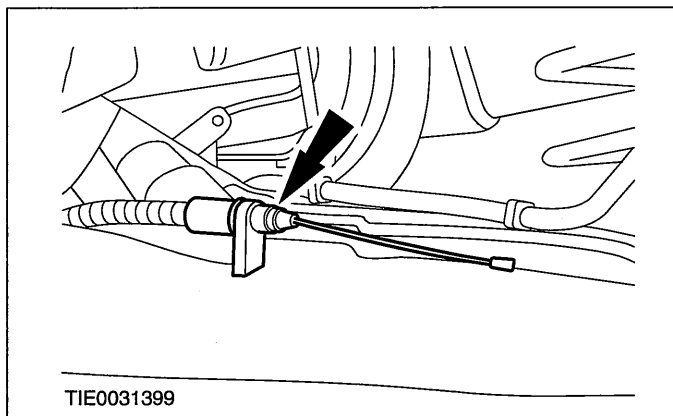
- Remove the retaining bolt.



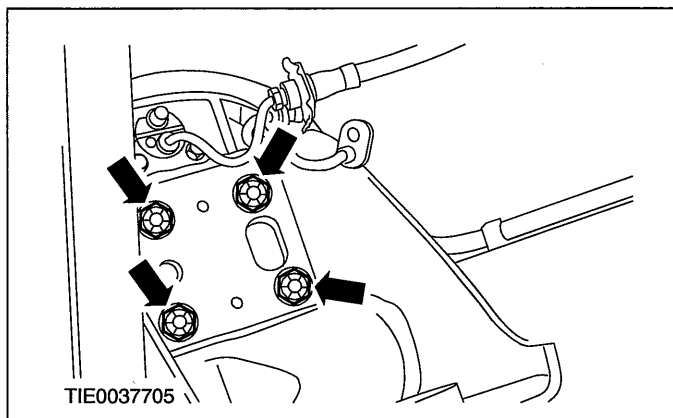
4. Disconnect the parking brake cable on both sides.



5. Detach the parking brake cable from the beam axle bracket on both sides.



6. Remove the brake drum and wheel spindle assembly on both sides.

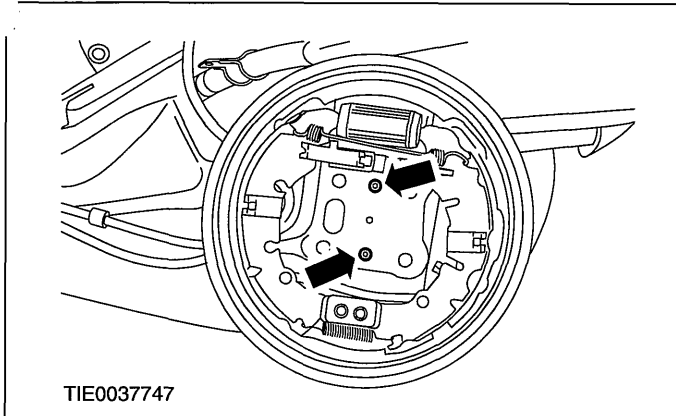


7. **CAUTION:** Suspend the brake backing plate, wheel cylinder and brake shoes assembly to prevent load being placed on the brake hose.

Detach the brake backing plate, wheel cylinder and brake shoes assembly from the beam axle on both sides.

REMOVAL AND INSTALLATION

- Using a suitable electric hand drill, remove the rivets.

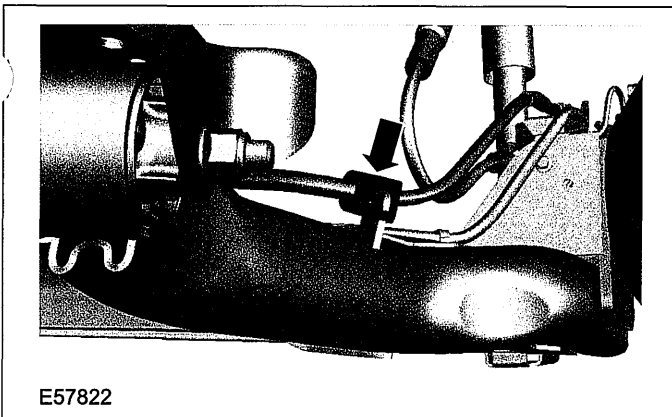


Vehicles with rear disc brakes

8. Remove the brake disc shield.

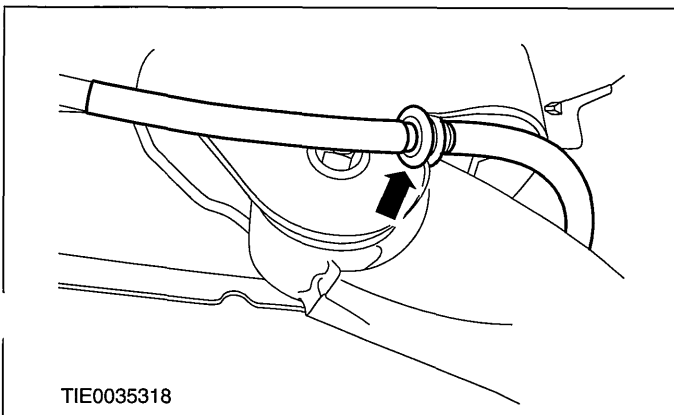
For additional information, refer to: Brake Disc Shield (206-04 Rear Disc Brake, Removal and Installation).

9. Detach the parking brake cable from the beam axle bracket on both sides.



All vehicles

10. Detach the parking brake cable from the beam axle on both sides.



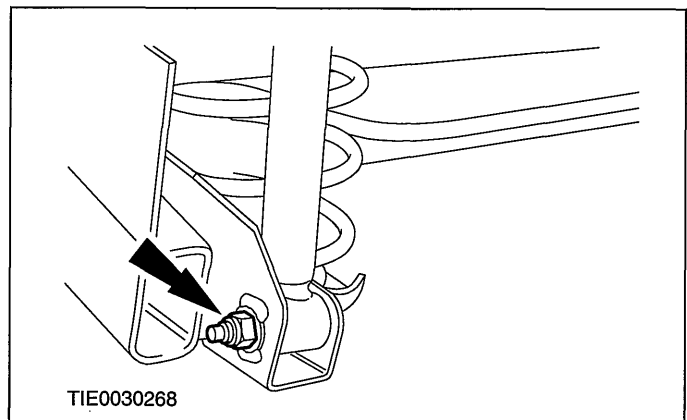
11. Remove the rear wheel speed sensor.

For additional information, refer to: Rear Wheel Speed Sensor (206-09 Anti-Lock Control, Removal and Installation).

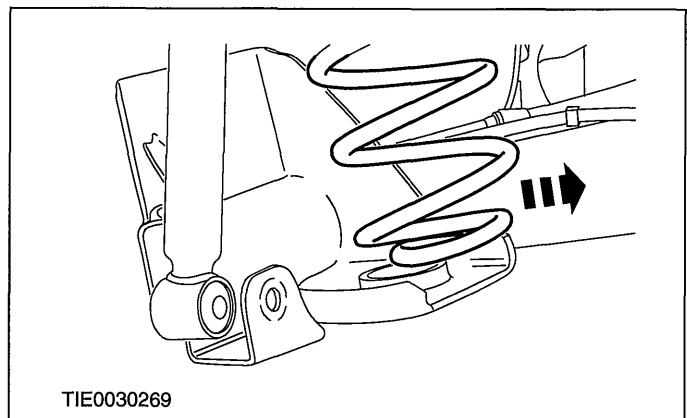
12. **▲WARNING:** Make sure that the beam axle is secured to the transmission jack. Failure to follow this instruction may result in personal injury.

Using a suitable securing strap, secure the beam axle to a transmission jack.

13. Detach the shock absorber from the beam axle on both sides.



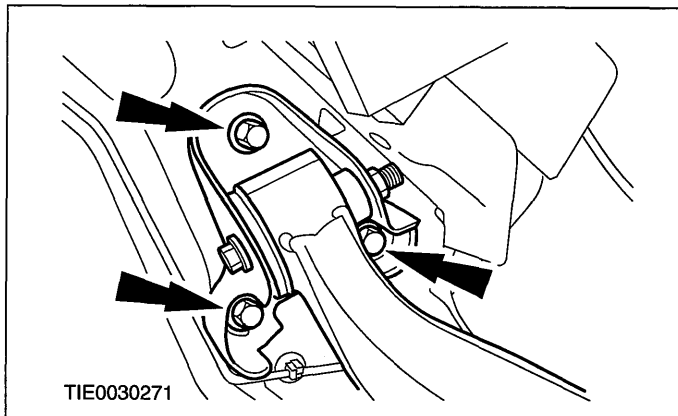
14. Detach the spring from the lower spring seat on both sides.



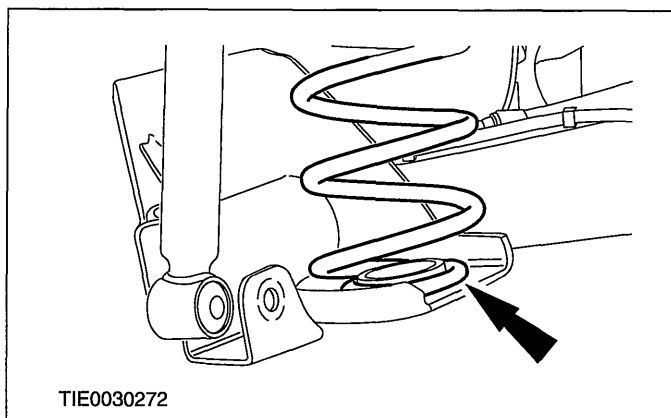
15. Remove the beam axle.

REMOVAL AND INSTALLATION

- Remove the beam axle retaining bolts on both sides.



- Attach the spring to the lower spring seat on both sides.



Installation

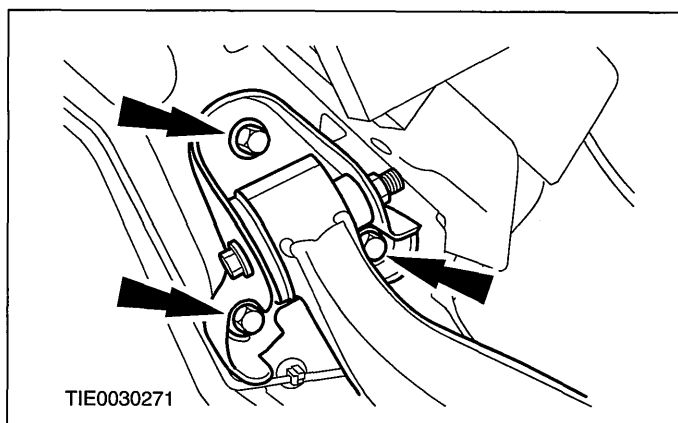
All vehicles

NOTE: Final tightening of the beam axle components should be carried out when the vehicle weight is on the road wheels.

- Using a suitable transmission jack, locate the beam axle.
- NOTE:** Do not fully tighten the beam axle retaining bolts at this stage.

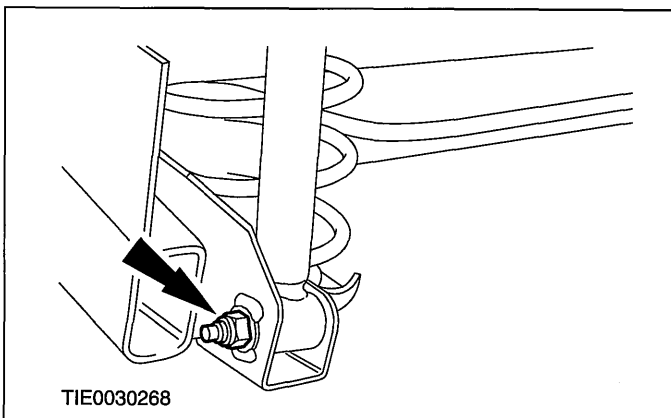
Install the beam axle.

- Install the beam axle retaining bolts on both sides.



- NOTE:** Do not fully tighten the shock absorber retaining bolts at this stage.

Attach the shock absorber to the beam axle on both sides.

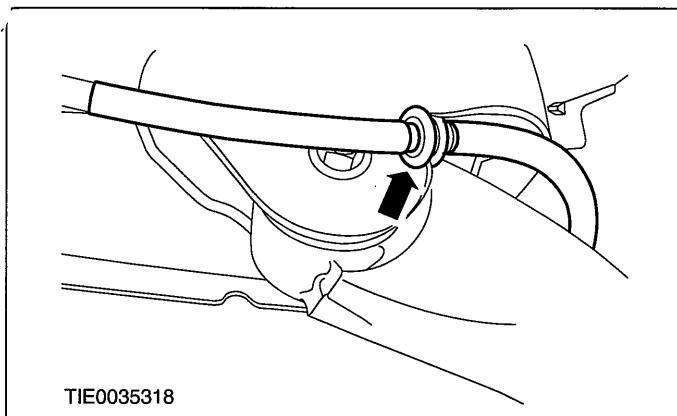


- Remove the securing strap.
- Lower and remove the transmission jack.
- Install the rear wheel speed sensor.

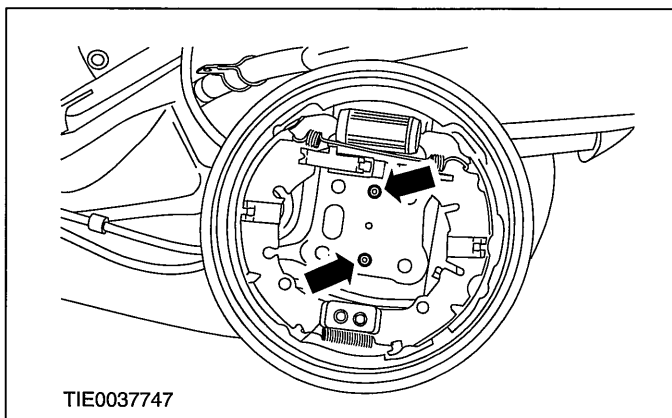
For additional information, refer to: Rear Wheel Speed Sensor (206-09 Anti-Lock Control, Removal and Installation).

REMOVAL AND INSTALLATION

- 8. Attach the parking brake cable to the beam axle on both sides.**

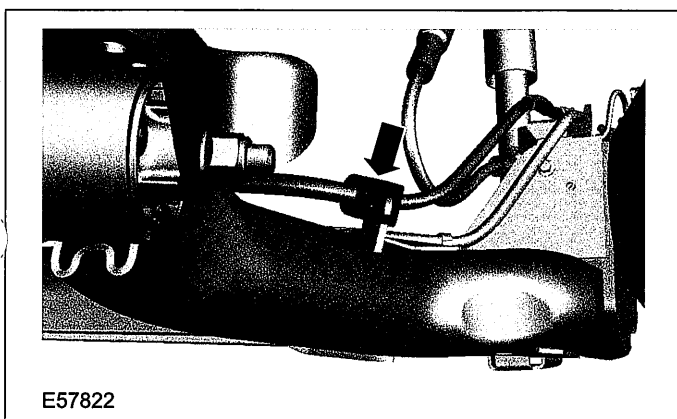


- Using a suitable blind rivet gun, install new rivets.

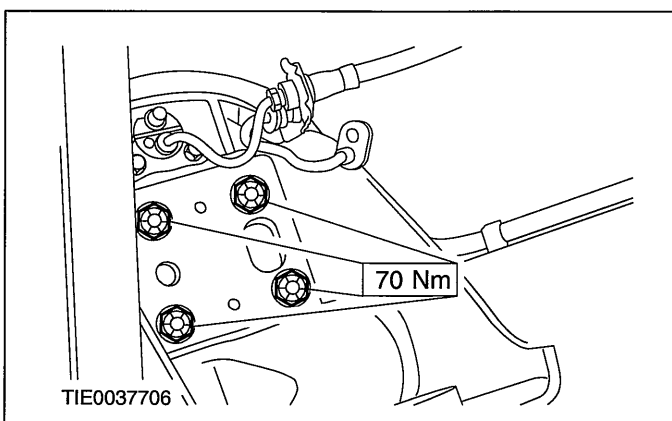


Vehicles with rear disc brakes

- 9. Attach the parking brake cable to the beam axle bracket on both sides.**



- 12. Install the brake drum and wheel spindle assembly on both sides.**

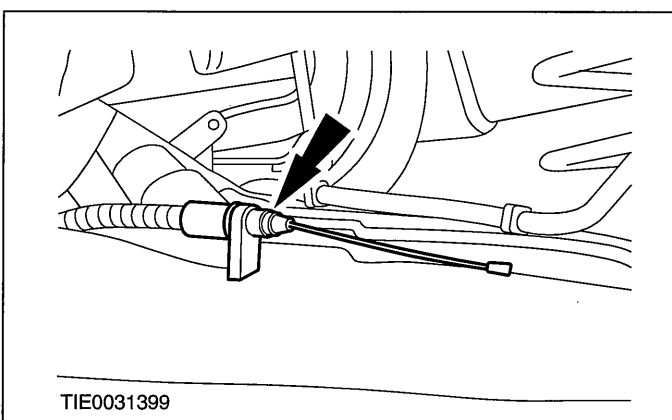


- 10. Install the brake disc shield.**

For additional information, refer to: Brake Disc Shield (206-04 Rear Disc Brake, Removal and Installation).

Vehicles with rear drum brakes

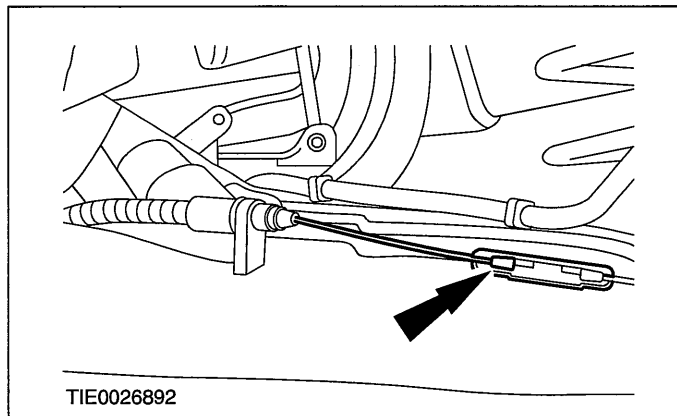
- 11. Attach the brake backing plate, wheel cylinder and brake shoes assembly to the beam axle on both sides.**



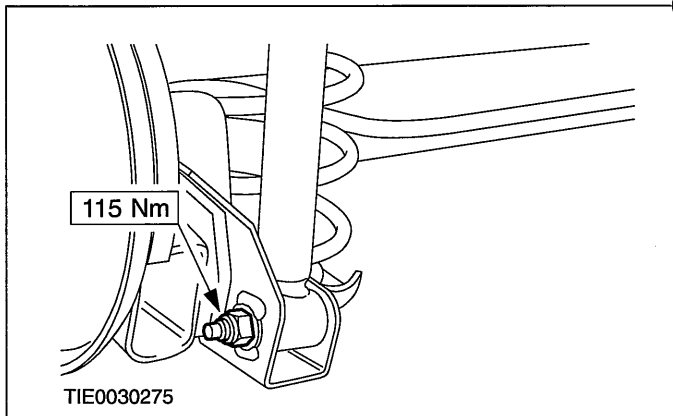
- 13. Attach the parking brake cable to the beam axle bracket on both sides.**

REMOVAL AND INSTALLATION

- 14. Connect the parking brake cable on both sides.**

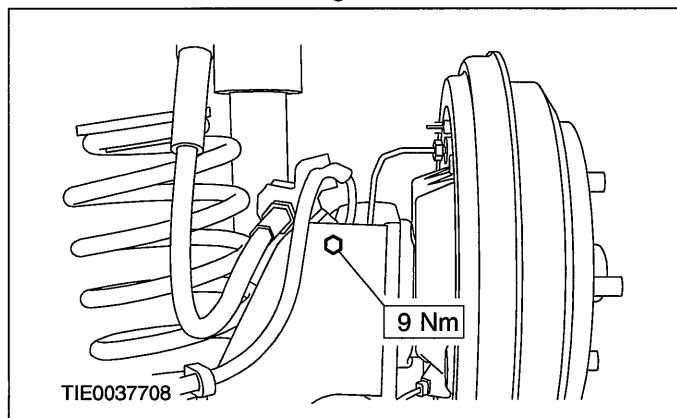


- 18. Tighten the shock absorber lower mounting bolt on both sides.**



- 15. Attach the rear wheel speed sensor and brake hose retaining bracket to the beam axle on both sides.**

- Install the retaining bolt.



- 19. Adjust the parking brake cable.**

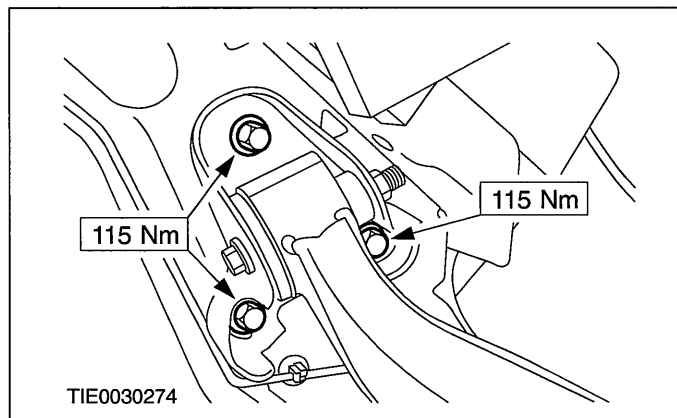
For additional information, refer to: **Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (206-05 Parking Brake and Actuation, General Procedures).**

- 16. Install the rear wheels and tires.**

For additional information, refer to: **Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).**

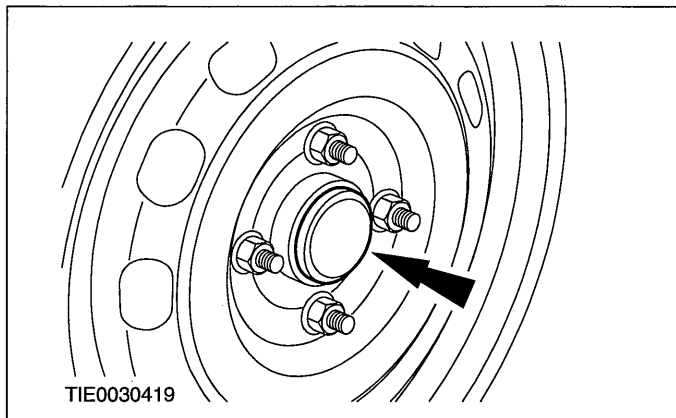
All vehicles

- 17. Tighten the beam axle retaining bolts on both sides.**



REMOVAL AND INSTALLATION**Wheel Spindle(15 366 0)****Removal**

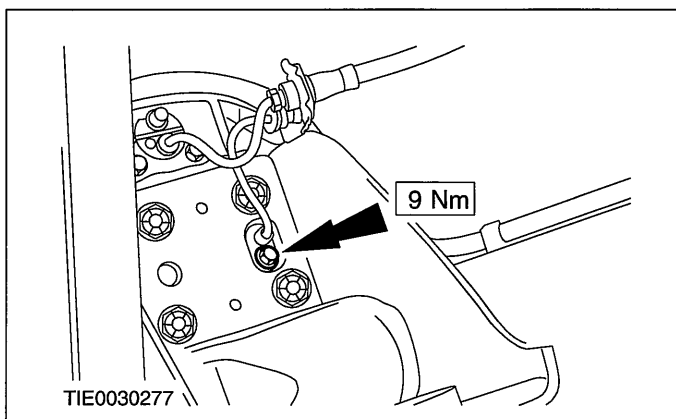
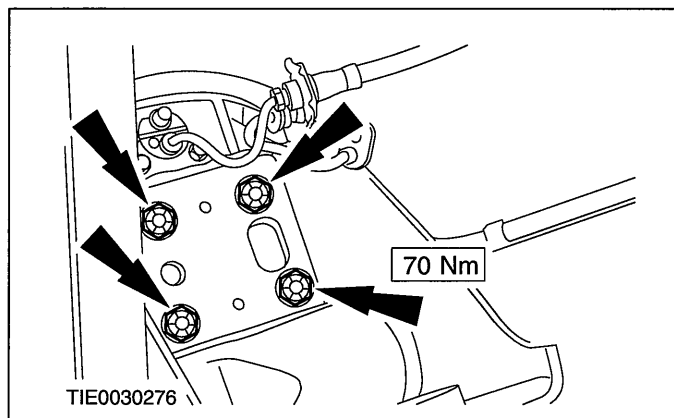
All vehicles

1. Remove the dust cap.

Vehicles with rear drum brakes

2. Remove the brake drum.

For additional information, refer to: **Brake Drum (206-02 Drum Brake, Removal and Installation).**

3. Detach the wheel speed sensor from the wheel spindle.**4. Remove the wheel spindle.**

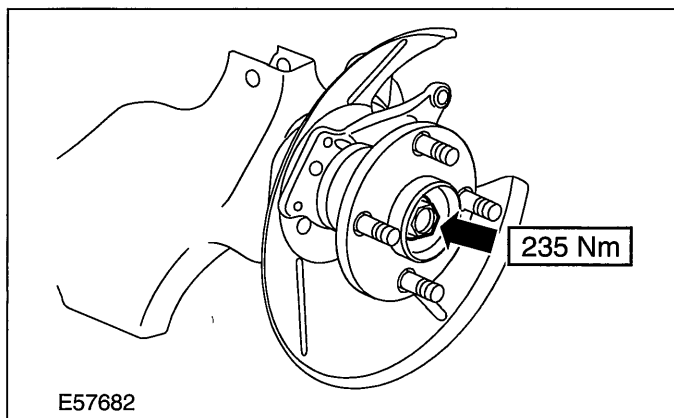
Vehicles with rear disc brakes

5. Remove the brake disc.

For additional information, refer to: **Brake Disc (206-04 Rear Disc Brake, Removal and Installation).**

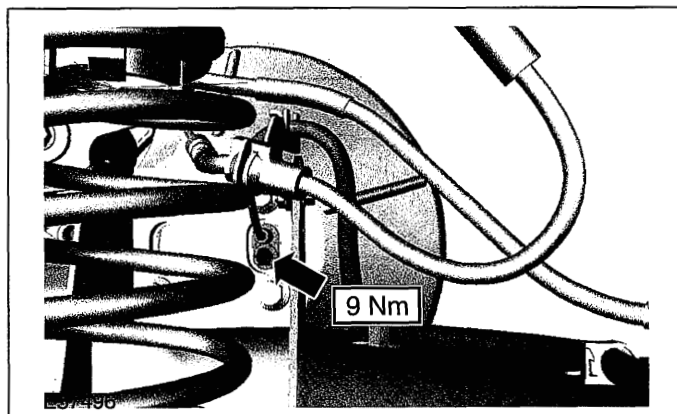
6. Remove the wheel hub.

- Remove and discard the wheel hub retaining nut.

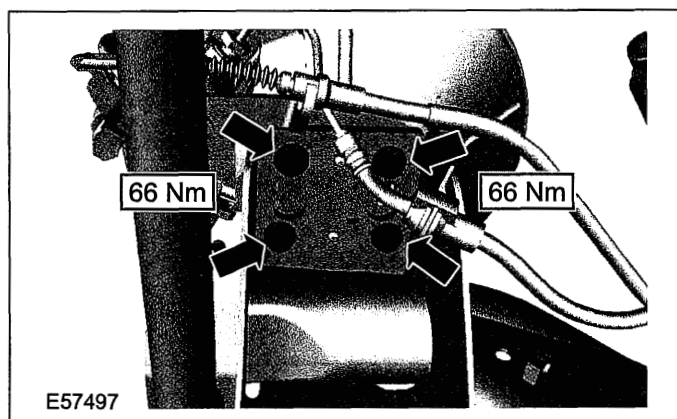


REMOVAL AND INSTALLATION

7. Detach the wheel speed sensor from the wheel spindle.



8. Remove the wheel spindle.

**Installation**

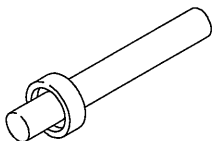
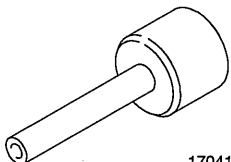
NOTE: Install a new wheel hub retaining nut.

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Rear Wheel Bearing

Special Tool(s)

 205062	Installer, Differential Bearing 205-062
 17041	Installer, Input Shaft Seal 307-210 (17-041)

General Equipment

Soft faced hammer

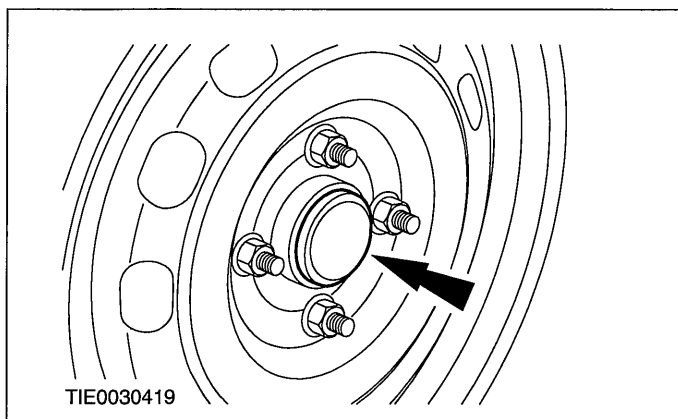
Wooden block

Removal

⚠ CAUTION: The brake drum and hub assembly removal in this procedure is for installing a new wheel bearing, not for access to brake system components.

All vehicles

1. Remove the dust cap.



2. Remove the wheel and tire.

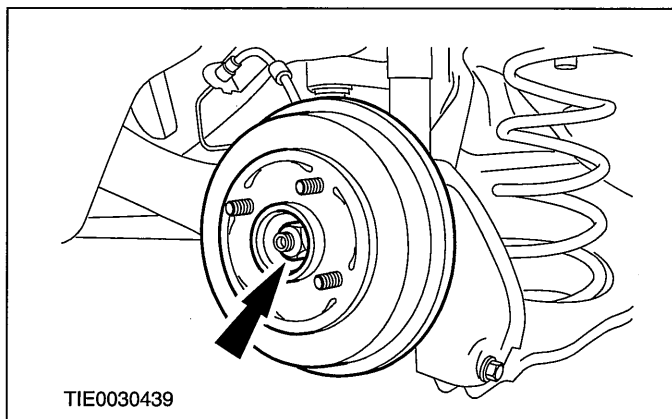
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

Vehicles with rear drum brakes

3. Release the parking brake.

4. Remove the brake drum and hub assembly.

- Remove and discard the wheel hub retaining nut.



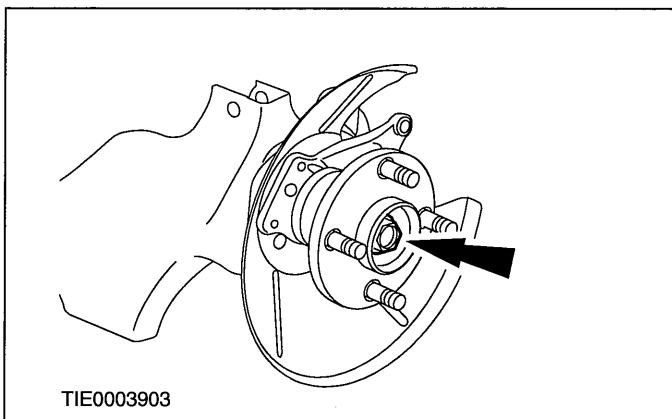
Vehicles with rear disc brakes

5. Remove the brake disc.

For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

6. Remove the wheel hub.

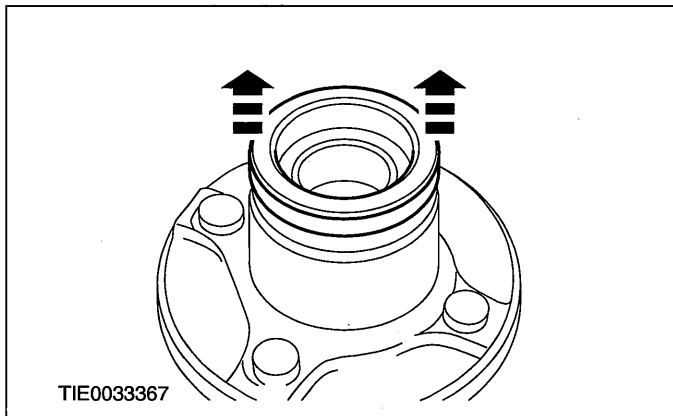
- Remove and discard the wheel hub retaining nut.



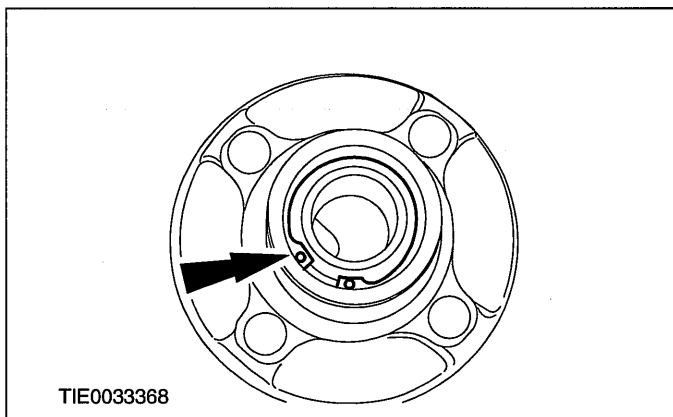
REMOVAL AND INSTALLATION

All vehicles

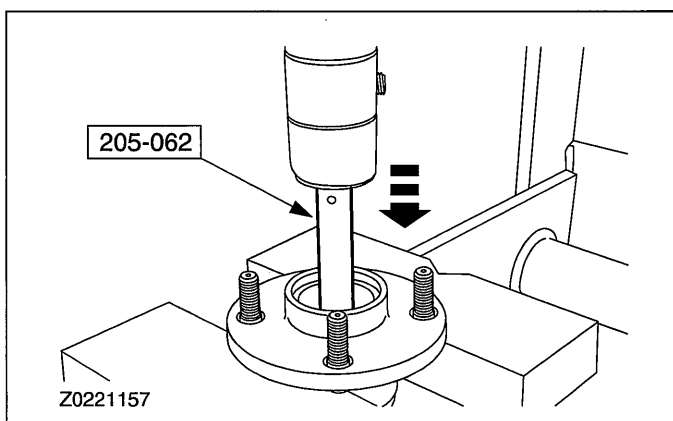
7. Remove and discard the wheel speed sensor ring (brake disc shown).



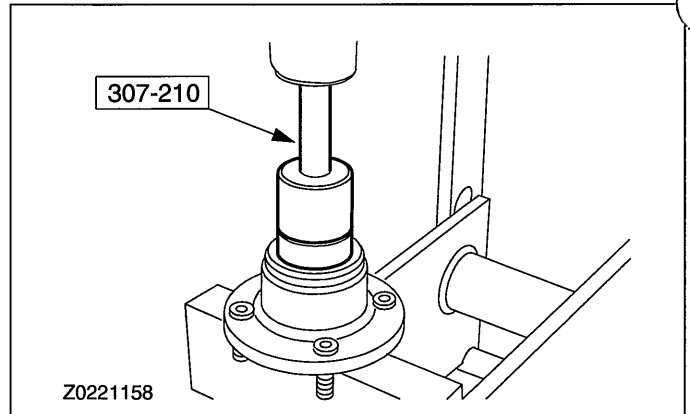
8. Remove the circlip (brake disc shown).



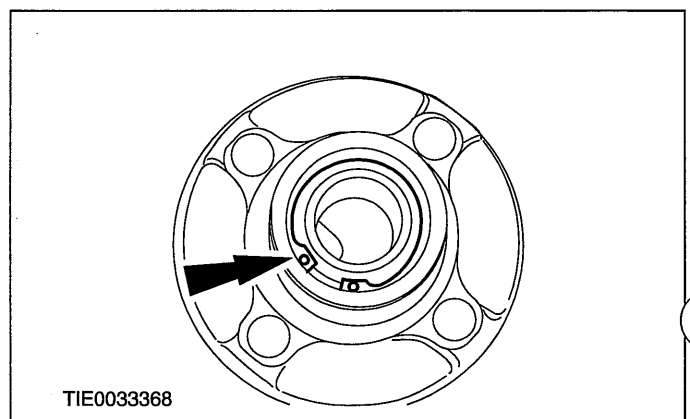
9. Using the special tool, remove and discard the wheel bearing (brake disc shown).



- Using the special tool, install the new wheel bearing (brake disc shown).



2. Install the circlip (brake disc shown).



3. CAUTIONS:

⚠ Make sure the wheel speed sensor ring is not knocked, damaged and kept free from metal fragments.

⚠ Protect the face of the wheel speed sensor ring with a non-ferrous flat block to prevent damage.

⚠ Make sure the wheel hub or brake drum is adequately supported and do not allow it to rest on the wheel studs..

⚠ Make sure the wheel speed sensor ring is pressed on slowly and squarely until fully seated.

⚠ Do not exceed a maximum load of 10 kN.

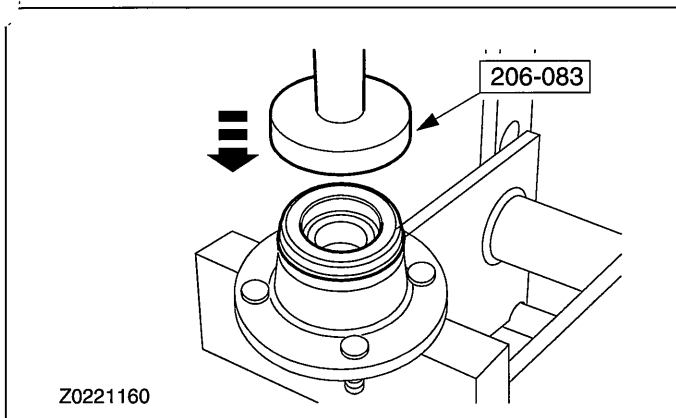
Installation

All vehicles

1. ⚠ **CAUTION:** Support the wheel hub assembly on the wheel mounting face and not on the wheel nut studs.

REMOVAL AND INSTALLATION

Using the special tool, install a new wheel speed sensor ring (brake disc shown).



Vehicles with rear drum brakes

4. CAUTIONS:

⚠ Avoid impact on the wheel speed sensor ring.

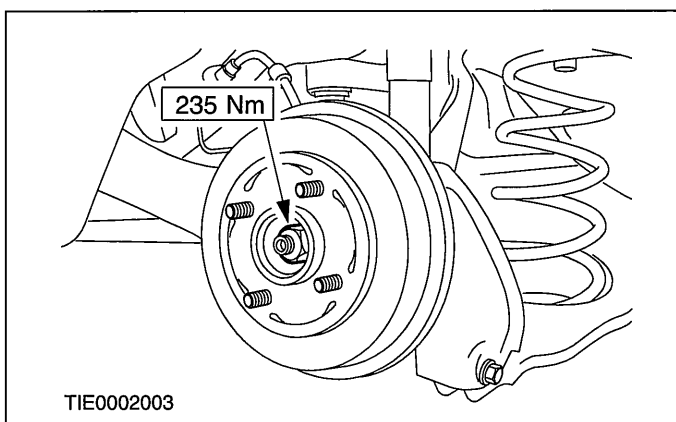
⚠ Make sure the wheel speed sensor ring is clean.

⚠ Avoid any contact between the wheel speed sensor ring and a magnetic surface.

⚠ Rotate the wheel hub assembly 10 times counter-clockwise when tightening the wheel hub retaining nut to prevent damage to the wheel bearing.

NOTE: Install a new wheel hub retaining nut.

Install the brake drum and hub assembly.



5. Apply the parking brake.

Vehicles with rear disc brakes

6. CAUTIONS:

⚠ Avoid impact on the wheel speed sensor ring.

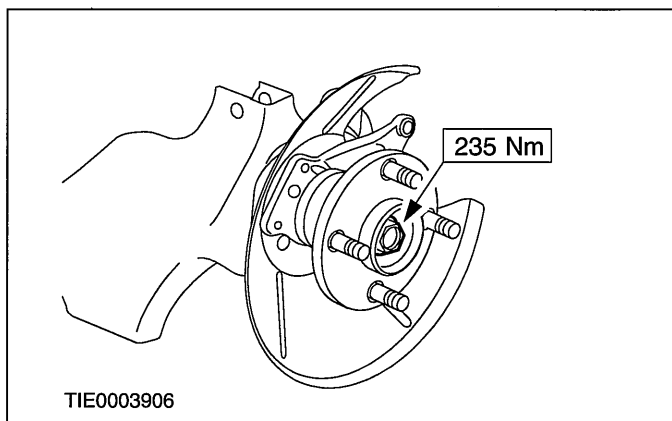
⚠ Make sure the wheel speed sensor ring is clean.

⚠ Avoid any contact between the wheel speed sensor ring and a magnetic surface.

⚠ Rotate the wheel hub assembly 10 times counter-clockwise when tightening the wheel hub retaining nut to prevent damage to the wheel bearing.

NOTE: Install a new wheel hub retaining nut.

Install the wheel hub retaining nut.



7. Install the brake disc.

For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

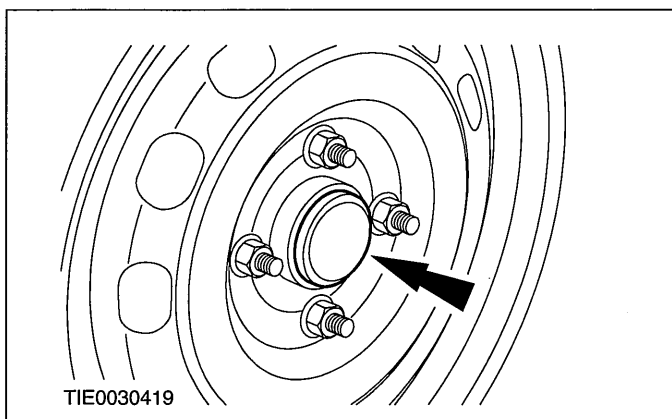
All vehicles

8. Install the wheel and tire.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

9. **NOTE:** If the dust cap is damaged a new dust cap must be installed.

Using a soft faced hammer and a wooden block, install the dust cap.



REMOVAL AND INSTALLATION

Trailing Arm Bushing(15 730 0)

Special Tool(s)

 15003b	Remover/Installer, Rear Axle Housing Bushings 205-035 (15-003B)
 15064	Adapter for 205-074 205-074-01 (15-064)
 15086	Remover/Installer, Pivot Bushing 205-297 (15-086)
 15110	Remover/Installer, Pivot Bushing 205-342 (15-110)
 1511001	Adapter for 205-342 205-342-01 (15-110-01)
 1511002	Adapter for 205-342 205-342-02 (15-110-02)

Special Tool(s)

 21171	Receiving Cup, Axle Bushing 205-510 (15-116)
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General Equipment

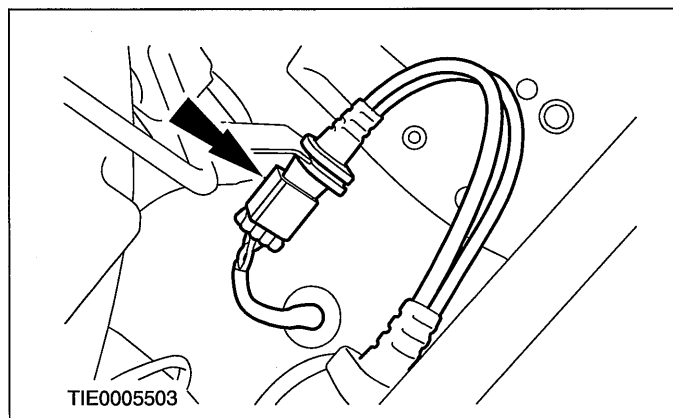
Transmission jack

Removal

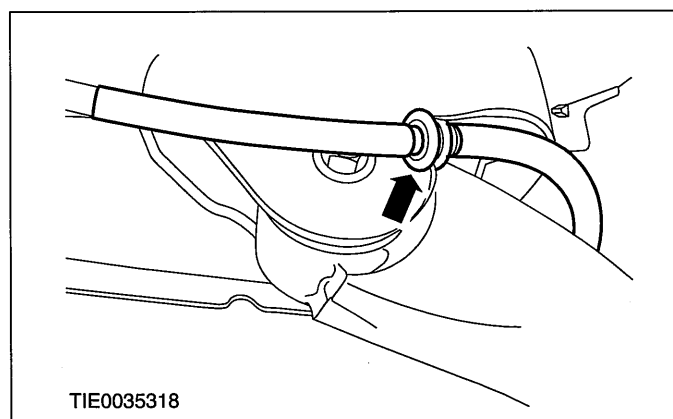
1. Raise and support the vehicle.

For additional information, refer to: Jacking (100-02 Jacking and Lifting, Description and Operation) / Lifting (100-02 Jacking and Lifting, Description and Operation).

2. Disconnect the wheel speed sensor electrical connector.

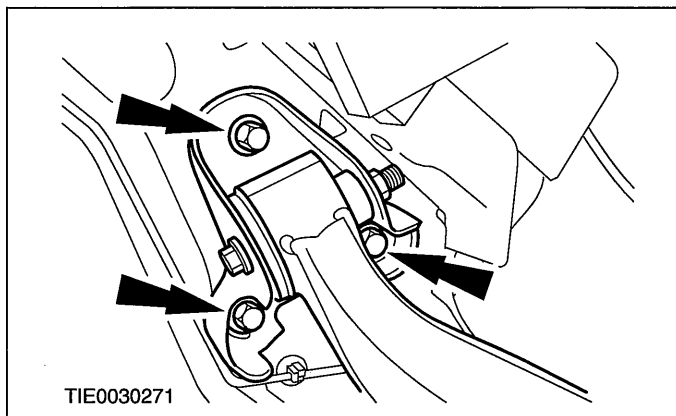


3. Detach the parking brake cable from the beam axle on both sides.

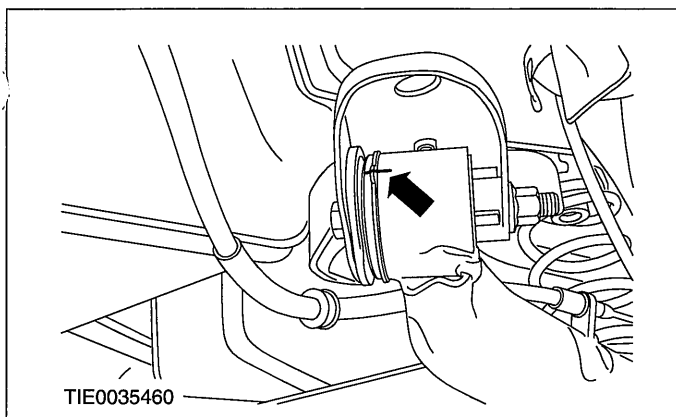


REMOVAL AND INSTALLATION

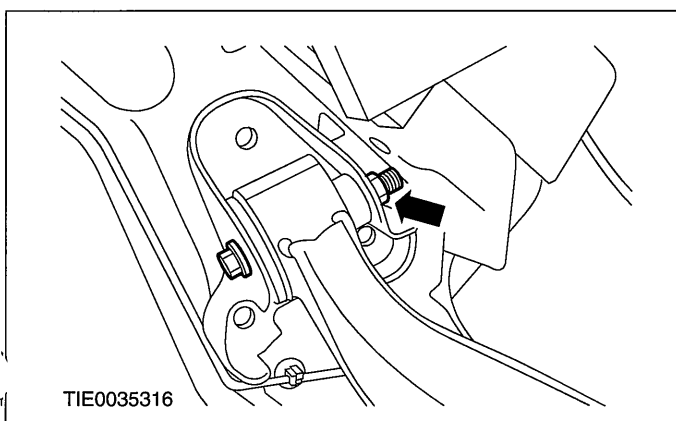
4. Using a suitable transmission jack, support the beam axle.
5. Remove the beam axle retaining bolts on both sides.



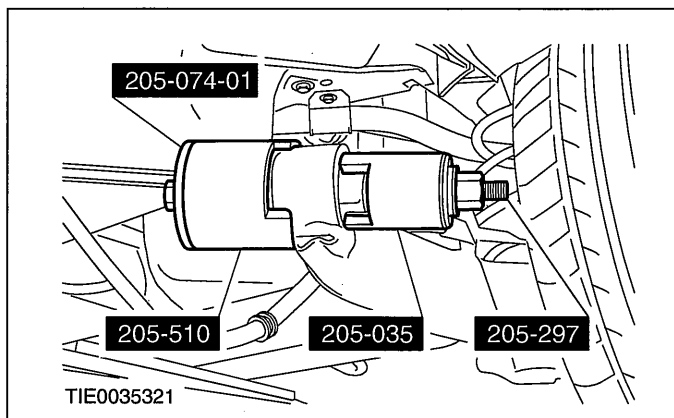
6. Lower the beam axle sufficiently to gain access to the trailing arm bushing.
7. Mark the bushing housing adjacent to the locating tang on the bushing, to aid installation.



8. Remove the trailing arm bushing retaining nut and bolt.



9. Using the special tools, remove and discard the trailing arm bushing.

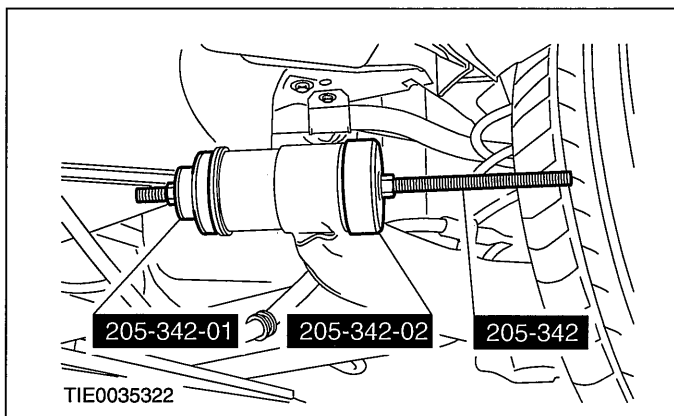


Installation

1. **NOTE:** Install a new trailing arm bushing.

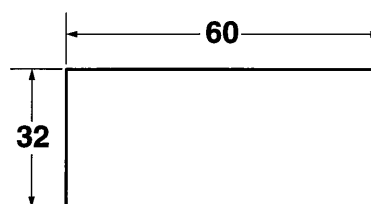
NOTE: Align the mark on the bushing housing with the locating tang on the trailing arm bushing.

Using the special tools, install the new trailing arm bushing.



2. Fabricate a 32 mm high by 60 mm long spacer.

mm



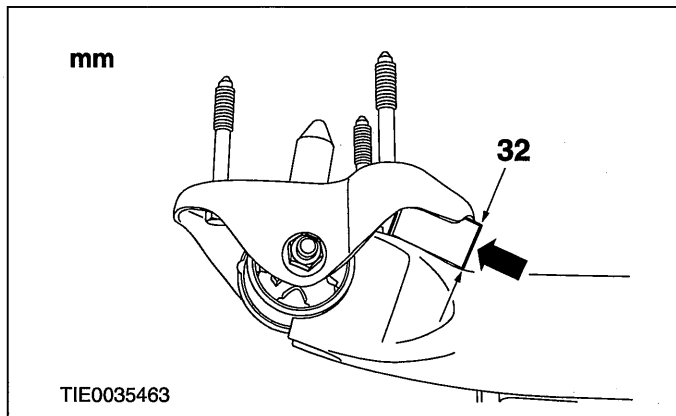
TIE0035462

REMOVAL AND INSTALLATION

3. **NOTE:**Final tightening of the trailing arm bushing retaining nut and bolt must be carried out at the installation setting.

NOTE:The spacer must be positioned exactly as illustrated.

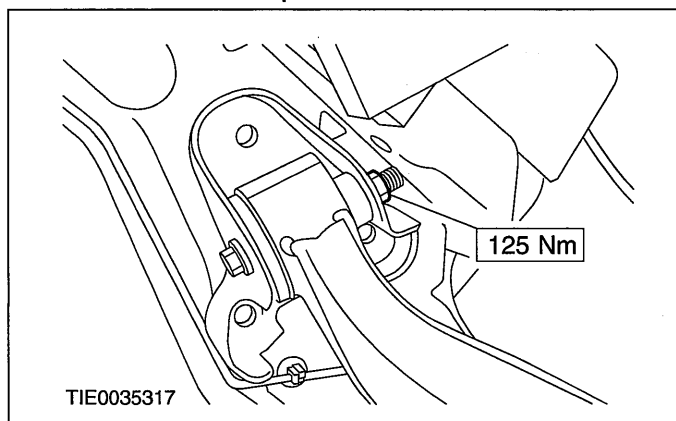
Using the fabricated spacer, set the beam axle bracket to the installation setting.



4. **NOTE:**Final tightening of the trailing arm bushing retaining nut and bolt must be carried out at the installation setting.

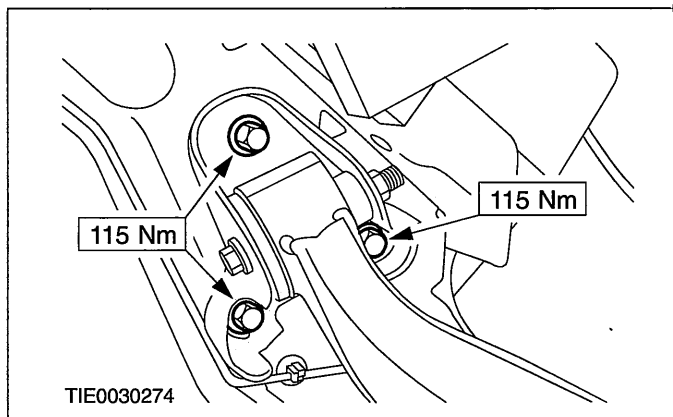
Install the trailing arm bushing retaining nut and bolt.

- Remove the spacer.



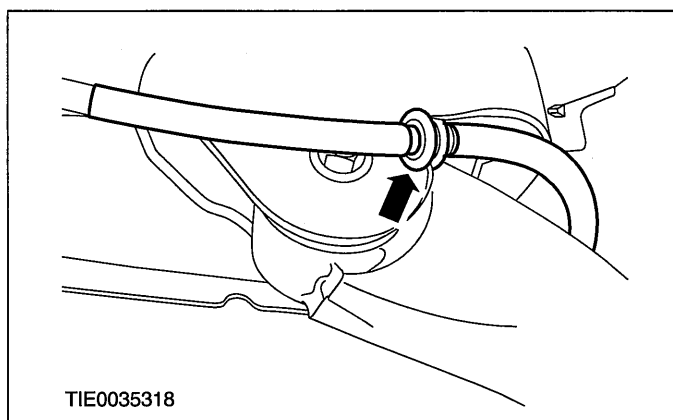
5. Raise the beam axle.

6. Install the beam axle retaining bolts on both sides.

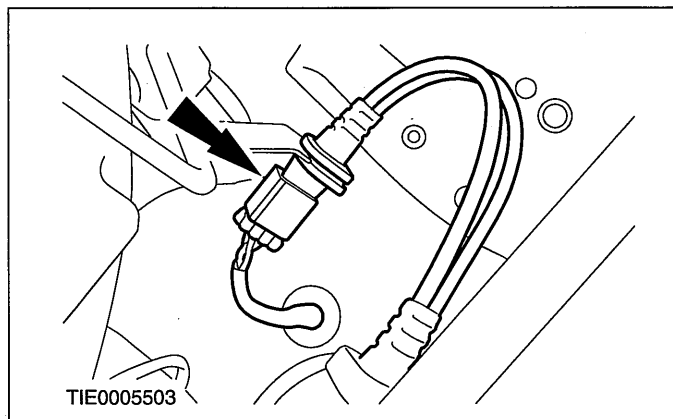


7. Lower and remove the transmission jack.

8. Attach the parking brake cable to the beam axle on both sides.



9. Connect the wheel speed sensor electrical connector.



10. Lower the vehicle.

SECTION 204-04 Wheels and Tires

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	204-04-2
DIAGNOSIS AND TESTING	
Wheels and Tires.....	204-04-3
Inspection and Verification.....	204-04-3
Symptom Chart.....	204-04-4
REMOVAL AND INSTALLATION	
Wheel and Tire.....	204-04-8

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Wheel nuts	90	66	-

Wheel and Tire Assembly Runout Specifications

Description	Alloy Wheel (mm)	Steel Wheel (mm)
Maximum lateral runout	0.3	0.6
Maximum radial runout	0.3	0.5

DIAGNOSIS AND TESTING**Wheels and Tires****Inspection and Verification****Visual Inspection Chart**

Mechanical
Wheel(s)
Tire(s)
Tire pressure(s) *
Wheel nuts
Wheel studs
* Vehicles equipped with a tire pressure monitoring system must be inspected for correct operation using the diagnostic tool.

To maximize tire performance, inspect the tires for signs of incorrect inflation and uneven wear which may indicate a need for balancing, rotation or suspension alignment. Tires should also be checked frequently for cuts, stone bruises, abrasions, blisters and for objects that may have become embedded in the tread. More frequent inspections are recommended when rapid or extreme temperature changes occur or when road surfaces are rough or occasionally littered with foreign material.

As a further visible check of tire condition, tread wear indicators are molded into the bottom of the tread grooves. When these indicator bands become visible, new tires must be installed.

Tire Wear Diagnosis

Uneven wear is usually caused by either excessive camber or excessive toe on tires.

Sometimes incorrect toe settings or worn struts will cause severe 'cupping' or 'scalloped' tire wear on non-driven wheels.

Severely incorrect toe settings will also cause other unusual wear patterns.

Tire Vibration Diagnosis

A tire vibration diagnostic procedure always begins with a road test. The road test and customer interview (if available) will provide much of the information needed to find the source of a vibration.

During the road test, drive the vehicle on a road that is smooth and free of undulations. If vibration is apparent, note and record the following:

- the speed at which the vibration occurs.
- what type of vibration occurs in each speed range.
 - mechanical or audible
- how the vibration is affected by changes in the following:
 - engine torque
 - vehicle speed
 - engine speed
- type of vibration - sensitivity:
 - torque sensitive
 - vehicle speed sensitive
 - engine speed sensitive

The following explanations help isolate the source of the vibration.

Torque Sensitive

This means that the condition can be improved or made worse by accelerating, decelerating, coasting, maintaining a steady vehicle speed or applying engine torque.

Vehicle Speed Sensitive

This means that the vibration always occurs at the same vehicle speed and is not affected by engine torque, engine speed or the transmission gear selected.

DIAGNOSIS AND TESTING**Engine Speed Sensitive**

This means that the vibration occurs at varying vehicle speeds when a different transmission gear is selected. It can sometimes be isolated by increasing or decreasing engine speed with the transmission in NEUTRAL or by stall testing with the transmission in gear. If the condition is engine speed sensitive, the cause is probably not related to the tires.

If the road test indicates that there is tire whine, but no shake or vibration, the noise originates with the contact between the tire and the road surface.

A thumping noise usually means that the tire is flat or has soft spots making a noise as they slap the roadway. Tire whine can be distinguished from axle noise. Tire whine remains the same over a range of speeds.

A complete road test procedure is described in Section 100-04.

REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing).

Symptom Chart

Symptom	Possible Sources	Action
• Tire(s) show excess wear on edge of tread	• Tire(s) under-inflated.	• ADJUST the tire pressure(s).
	• Vehicle overloaded.	• CORRECT as necessary.
	• Incorrect wheel alignment.	• ADJUST the wheel alignment. REFER to: (204-00 Suspension System - General Information) Specifications (Specifications), Front Toe Adjustment (General Procedures).
• Tire(s) show excess wear in center of tread	• Tire(s) over-inflated.	• ADJUST the tire pressure(s).
• Other excessive tire wear concerns	• Incorrect tire pressure(s).	• ADJUST the tire pressure(s).
	• Wheel and tire assemblies need rotating.	• ROTATE the wheel and tire assemblies.
	• Incorrect wheel alignment.	• ADJUST the wheel alignment. REFER to: (204-00 Suspension System - General Information) Specifications (Specifications), Front Toe Adjustment (General Procedures).
	• Vehicle overloaded.	• CORRECT as necessary.
	• Loose or leaking front strut and spring assembly.	• TIGHTEN or INSTALL new suspension components as necessary. REFER to: Shock Absorber and Spring Assembly (204-01 Front Suspension, Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Wheel bearings worn.	INSTALL new wheel bearings as necessary. REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation), Rear Wheel Bearing (204-02 Rear Suspension, Removal and Installation).
	Suspension components, bushings and ball joints.	CHECK or INSTALL new suspension components as necessary.
	Excessive lateral or radial runout of wheel or tire.	BALANCE the wheel and tire assemblies. Using a suitable dial indicator gauge and holding fixture, CHECK lateral and radial runout of the wheel and tire assemblies. INSTALL new wheel and tire assemblies as necessary. REFER to: (204-04 Wheels and Tires) Specifications (Specifications), Wheel and Tire (Removal and Installation).
Wobble or shimmy affecting wheel runout	Damaged wheel.	INSPECT the wheel rims for damage. BALANCE the wheel and tire assemblies. Using a suitable dial indicator gauge and holding fixture, CHECK lateral and radial runout of the wheel and tire assemblies. INSTALL new wheel and tire assemblies as necessary. REFER to: (204-04 Wheels and Tires) Specifications (Specifications), Wheel and Tire (Removal and Installation).
	Front wheel bearing.	CHECK or INSTALL new wheel bearings as necessary. REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation).
Excessive vehicle vibration, rough steering	Suspension components.	CHECK or INSTALL new suspension components as necessary.
Vehicle vibrations from wheels and tires	Incorrect tire pressure(s).	ADJUST the tire pressure(s).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Wheel or tire imbalance.	BALANCE the wheel and tire assemblies.
	Uneven tire wear.	INSTALL a new tire(s) as necessary. REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).
	Brake disc imbalance.	CHECK the brake disc for foreign material.
	Water in tire(s).	REMOVE the water.
	Bent wheel.	INSTALL a new wheel and tire assembly. REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).
	Incorrectly seated tire bead.	SPIN the wheel on the vehicle. EXAMINE the area where the tire and the wheel meet. If that section of the tire appears to waver while being rotated, the tire bead may not be correctly seated on the wheel. REMOVE the tire and CLEAN the bead seat areas on both wheel and tire.
	Excessive lateral or radial runout of wheel or tire.	BALANCE the wheel and tire assemblies. Using a suitable dial indicator gauge and holding fixture, CHECK the lateral and radial runout of the wheel and tire assemblies. INSTALL new wheel and tire assemblies as necessary. REFER to: (204-04 Wheels and Tires) Specifications (Specifications), Wheel and Tire (Removal and Installation).
	Foreign material between wheel mounting face and hub mounting surface.	CLEAN mounting surfaces.
	Front wheel bearing.	CHECK or INSTALL new wheel bearings as necessary. REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Rust streaks from the wheel stud holes in the wheel	Wheel nuts.	- REMOVE the wheel and tire assembly. Inspect the wheel nuts and wheel and tire assembly for damage. INSTALL new wheel nuts and wheel and tire assemblies as necessary. REFER to: (204-04 Wheels and Tires) - Specifications (Specifications), Wheel and Tire (Removal and Installation).
Seized wheel nuts	Corrosion.	- CAUTION: Do not permit lubricant to get on cone sets of stud holes or on cone angle of wheel nuts. If corrosion is slight, wire brush away. If corrosion is excessive, INSTALL new wheel studs and nuts. REFER to: (204-04 Wheels and Tires) - Specifications (Specifications), Wheel and Tire (Removal and Installation). - If the condition persists, LUBRICATE the first three threads of each wheel stud with a graphite-based lubricant.
	Vehicle overloaded	CORRECT as necessary.

REMOVAL AND INSTALLATION

Wheel and Tire

Removal

⚠ CAUTION: Do not use heat to loosen a seized wheel nut. Heat may damage the wheel and wheel hub.

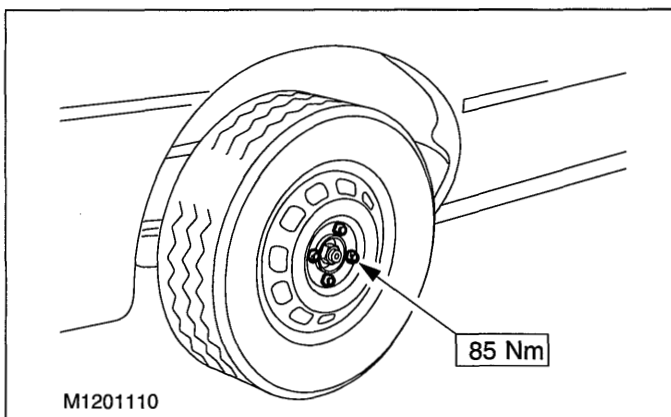
1. Loosen the wheel nuts.
2. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
3. Remove the wheel and tire assembly.

Installation

1. **▲ WARNING:** Remove the corrosion or dirt from the mounting surfaces of the wheel, wheel hub, brake drum or brake disc, as this may cause the wheel nuts to loosen and the wheel to come off while the vehicle is in motion. Failure to follow this instruction may result in personal injury.

Clean the wheel hub and mounting surfaces.

2. Install the wheel and tire assembly.
3. Lower the vehicle.
4. Tighten the wheel nuts in a diagonally opposed pattern.



SECTION 205-04 Front Drive Halfshafts

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	205-04-2
DESCRIPTION AND OPERATION	
Front Drive Halfshafts.....	205-04-3
Driveshafts.....	205-04-3
DIAGNOSIS AND TESTING	
Front Drive Halfshafts.....	205-04-4
Inspection and Verification.....	205-04-4
Symptom Chart – Front Drive Halfshafts.....	205-04-4
REMOVAL AND INSTALLATION	
Front Halfshaft LH..... (14 320 0)	205-04-6
Front Halfshaft RH..... (14 321 0)	205-04-10
Intermediate Shaft.....	205-04-13
Inner Constant Velocity (CV) Joint Boot..... (14 336 0)	205-04-15
Outer Constant Velocity (CV) Joint Boot..... (14 338 0)	205-04-18

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

Description	Specifications
Manual transmission fluid	WSD-M2C200-C
Grease, outer constant velocity (CV) joint	WSS-M1C 259-A1
Grease, inner constant velocity (CV) joint	WSS-M1C 259-A1

Constant Velocity (CV) Joint Boot Capacities

Description	Grams
Outer constant velocity (CV) joint boot	90
Inner constant velocity (CV) joint boot	100

Torque Specifications

Item	Nm	lb-ft	lb-in
Lower arm ball joint pinch bolt nut	48	35	-
Intermediate shaft center bearing cap retaining nuts	25	18	-
Wheel hub retaining nut	290	214	-
Strut and spring assembly top mount retaining nuts	25	18	-
CV joint boot clamps	21	15	-

DESCRIPTION AND OPERATION

Front Drive Halfshafts

Driveshafts

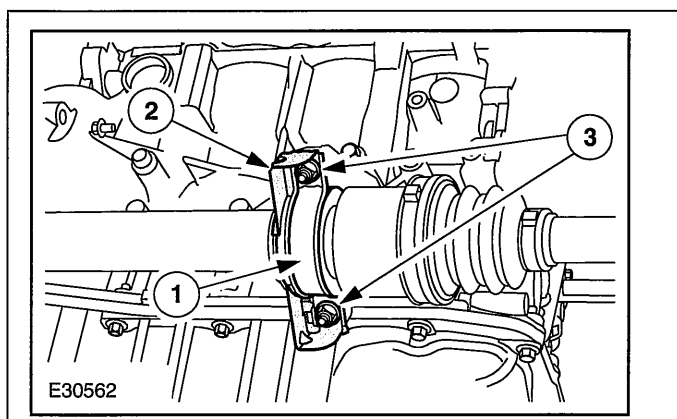
Conventional driveshafts are used on the front axle. For servicing purposes it is important to note that the inner tripod joints are pressed onto the shaft. This has made it possible to reduce noise levels when the vehicle is pulling away from standing.

The outer joint has not been approved for service repairs, so in the event of a fault it is necessary to replace the complete shaft and outer joint assembly. The inner joints are dismantled with the aid of a puller. The driveshaft needs to be removed first.

In order to install a new boot on the outer joint, it is first necessary to remove the driveshaft and then disassemble the inner joint. A special service kit is available in service for this purpose, consisting of the inner and outer boot and the necessary small parts.

The same amount of grease is used to pack the inner and outer joints.

The PAC nut used for securing the driveshaft to the wheel hub must **not** be reused.



Item	Description
1	Securing clip for bearings
2	Heat shield (only for vehicles with a petrol engine)
3	Securing pin

It should also be noted that vehicles with a petrol engine have an additional heat shield on the bearing of the intermediate shaft of the right-hand driveshaft. This is required to prevent the grease in the bearing from overheating as a result of the closeness to the catalytic converter.

DIAGNOSIS AND TESTING**Front Drive Halfshafts****Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

Symptom Chart – Front Drive Halfshafts**Symptom Chart**

Symptom	Possible Sources	Action
Clicking, Popping or Grinding Noises While Turning	Inadequate or contaminated lubricant in the inner or outer front drive halfshaft constant velocity (CV) joint.	INSPECT, CLEAN and LUBRICATE as necessary. REFER to Inner Constant Velocity (CV) Joint Boot - / Outer Constant Velocity (CV) Joint Boot - in this section.
	Another component contacting front drive halfshaft assembly.	INSPECT and REPAIR as necessary.
	Wheel bearings, brakes, suspension or steering components.	INSPECT and REPAIR as necessary. REFER to Section 204-00 [Suspension System - General Information] / 206-00 [Brake System - General Information] / 211-00 [Steering System - General Information].
Vibration at Highway Speeds	Out of balance front wheels or tires.	Balance wheels and tires as necessary.
	Out-of-round tires.	REPAIR or INSTALL new as necessary.
	Incorrectly seated outer constant velocity (CV) joint in front wheel hub.	REPAIR or INSTALL new as necessary. REFER to Halfshaft LH - / Halfshaft RH - in this section.
Shudder Vibration During Acceleration.	Excessively high CV joint operating angles caused by incorrect ride height.	CHECK the ride height, VERIFY correct spring rate. CHECK items under Halfshaft Joint Pullout. REPAIR or INSTALL new as necessary.
	Excessively worn or damaged inner or outer front drive halfshaft constant velocity (CV) joint.	INSPECT and INSTALL new as necessary. REFER to Halfshaft LH - / Halfshaft RH - in this section.

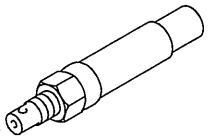
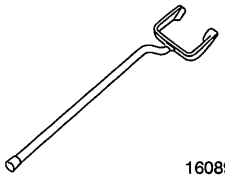
DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Halfshaft Joint Pullout	Outer front drive halfshaft retainer circlip missing or not correctly seated differential side.	INSPECT and REPAIR or INSTALL new as necessary. REFER to Halfshaft LH - / Halfshaft RH - in this section.
	Front suspension components worn or damaged.	CHECK for worn bushings or bent components (front stabilizer bar, front suspension lower arm). REPAIR or INSTALL new as necessary. REFER to Section 204-01 [Front Suspension].
	Engine/transaxle assembly misalignment.	CHECK engine mounts for damage or wear. REPAIR or INSTALL new as necessary.
	Frame rail or strut tower out of position or damaged.	CHECK underbody dimensions. REFER to Section 501-00 [Body System - General Information].

REMOVAL AND INSTALLATION

Front Halfshaft LH(14 320 0)

Special Tool(s)

 14041	Installer, Halfshaft 204-161 (14-041)
 16089	Remover, Halfshaft 308-256 (16-089)

General Equipment

Four leg puller

Tire Lever

Materials

Name	Specification
Manual transmission fluid	WSD-M2C200-C

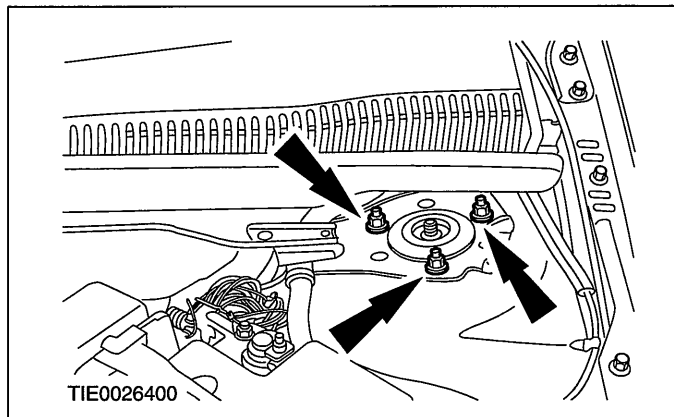
Removal

- ▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

All vehicles

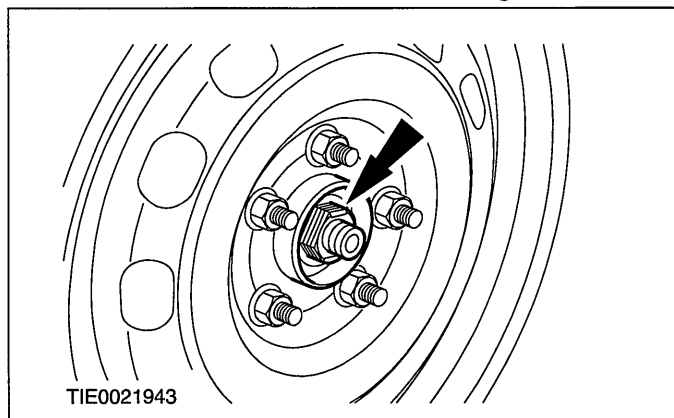
1. Loosen the strut and spring assembly top mount retaining nuts by three turns.



2. ⚠ **CAUTION:** Use a socket to loosen the wheel hub retaining nut to prevent damage.

Remove the wheel hub retaining nut.

- Discard the wheel hub retaining nut.



3. Remove the wheel and tire.

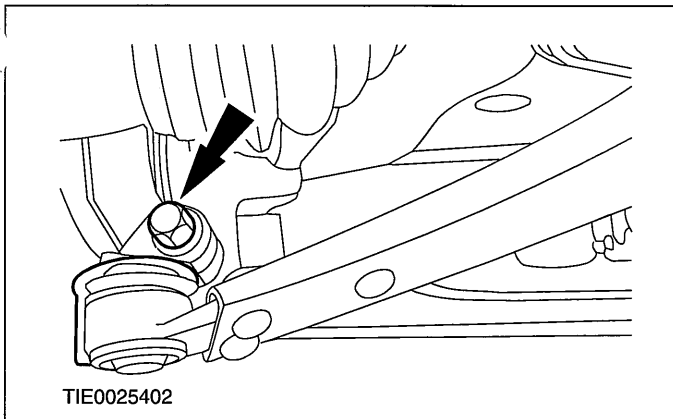
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. ⚠ **CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

Detach the lower arm ball joint from the wheel knuckle.

REMOVAL AND INSTALLATION

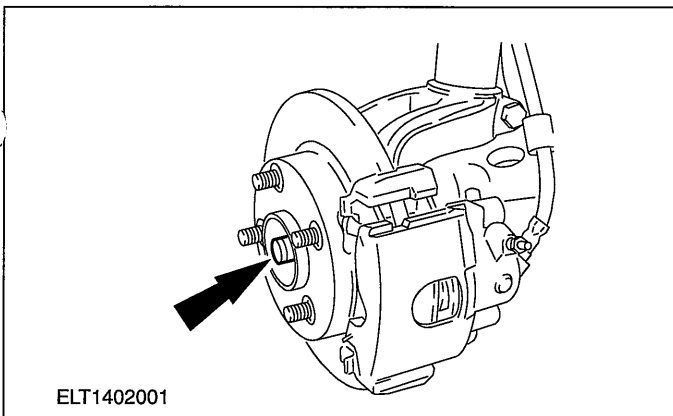
- Remove the heat shield.



5. **CAUTION:** Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

Using a suitable four leg puller, detach the halfshaft from the wheel hub.

- Secure the halfshaft to one side.



Vehicles with automatic transaxle

6. CAUTIONS:

CAUTION: Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

CAUTION: Do not damage the halfshaft oil seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

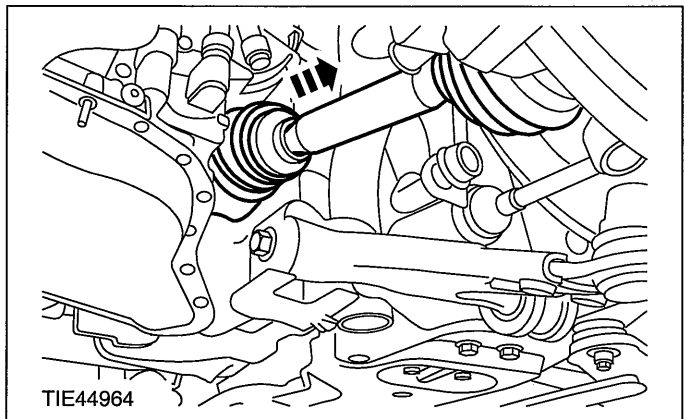
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

See - Transmission Fluids.

Using a suitable tire lever, remove the halfshaft.

- Discard the snap ring.
- Allow the oil to drain into a suitable container.

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



Vehicles with manual transaxle

7. CAUTIONS:

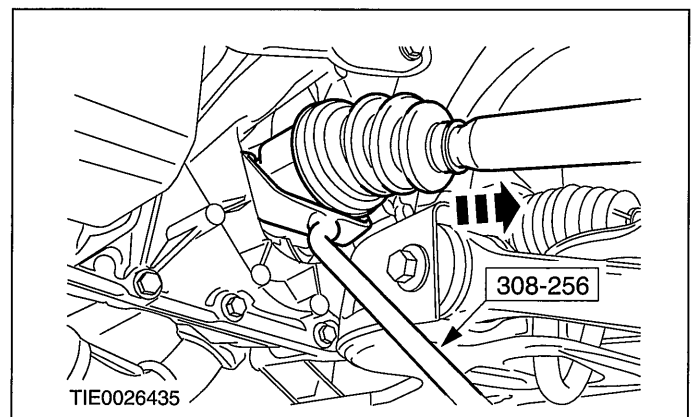
CAUTION: Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

CAUTION: Do not damage the halfshaft oil seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

Using the special tool, remove the halfshaft.

- Discard the snap ring.
- Allow the oil to drain into a suitable container.



Installation

All vehicles

1. CAUTIONS:

REMOVAL AND INSTALLATION

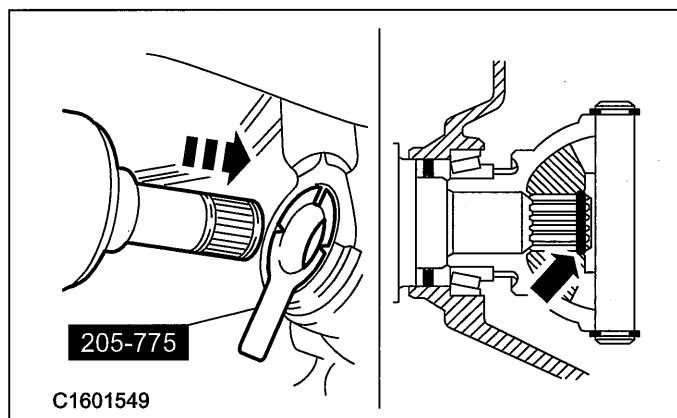
⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft oil seal.

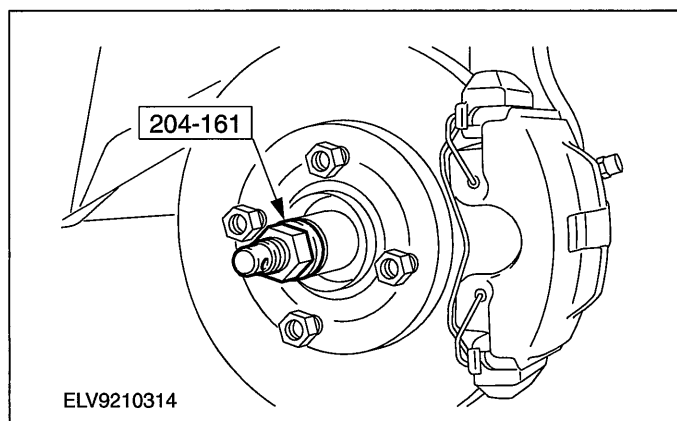
⚠ Make sure the snap ring is correctly seated.

NOTE: Install a new snap ring.

Attach the left hand halfshaft to the transaxle.



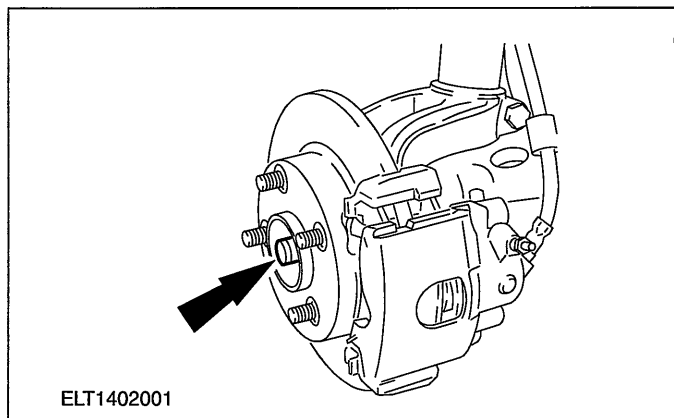
2. ⚠ **CAUTION:** Make sure the halfshaft is completely installed into the wheel hub. Using the special tool, install the halfshaft.



3. **NOTE:** Install a new wheel hub retaining nut.

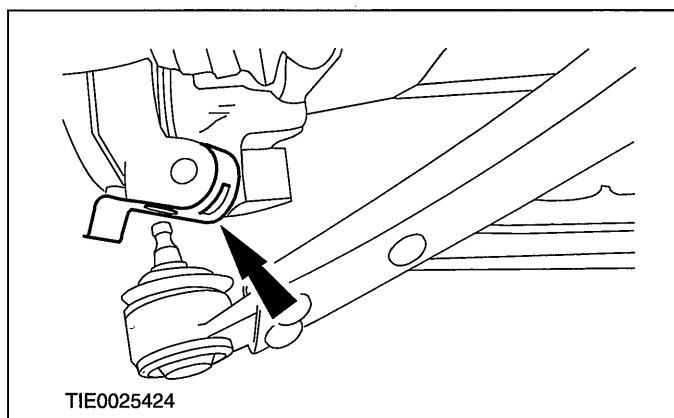
NOTE: Do not fully tighten the wheel hub retaining nut at this stage.

Install the wheel hub retaining nut.



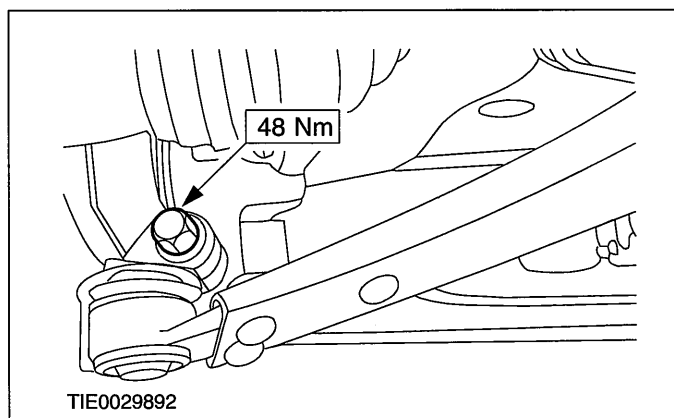
4. ⚠ **CAUTION:** Make sure that the heat shield is installed to prevent damage to the ball joint.

Install the heat shield.



5. ⚠ **CAUTION:** The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

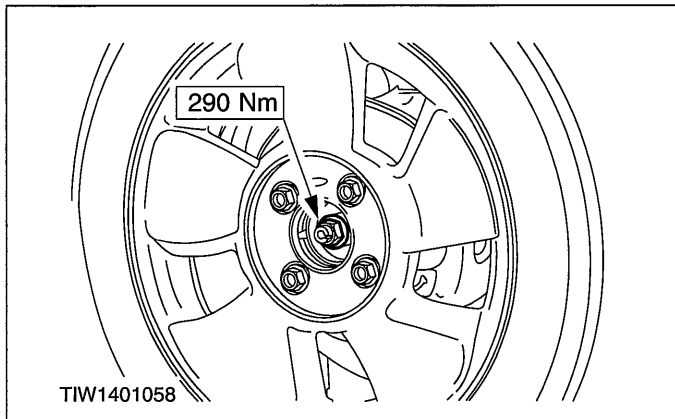
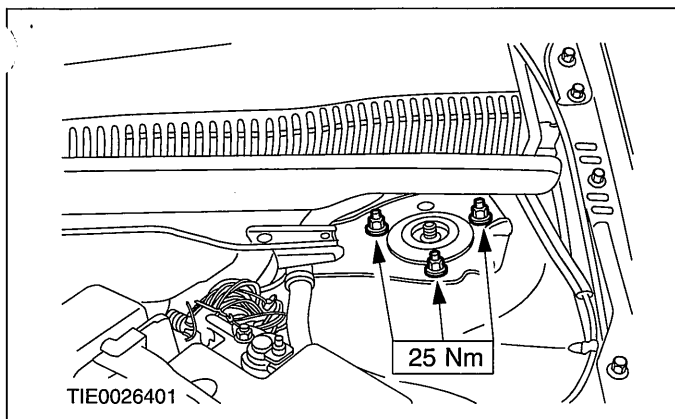
Attach the lower arm ball joint to the wheel knuckle.



REMOVAL AND INSTALLATION**6. Install the wheel and tire.**

For additional information, refer to: **Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).**

- 7. ⚠ CAUTION:** Use a socket to tighten the wheel hub retaining nut to prevent damage.
Tighten the wheel hub retaining nut.

**8. Tighten the strut and spring assembly top mount retaining nuts.****Vehicles with manual transaxle**

- 9. With the vehicle on a level surface, fill the transaxle with transmission fluid until the oil level is just below the bottom of the filler hole.**

Vehicles with automatic transaxle

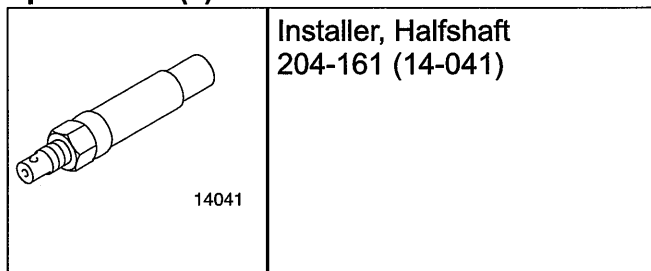
- 10. Check the transmission fluid level and top up with clean automatic transmission oil.**

For additional information, refer to:
Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).

REMOVAL AND INSTALLATION

Front Halfshaft RH(14 321 0)

Special Tool(s)

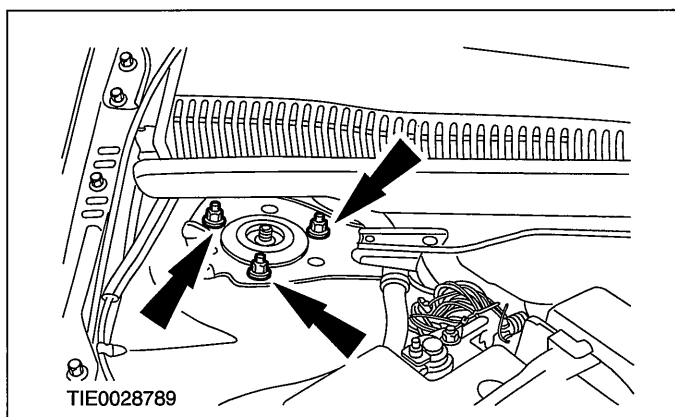


General Equipment

Four leg puller

Removal

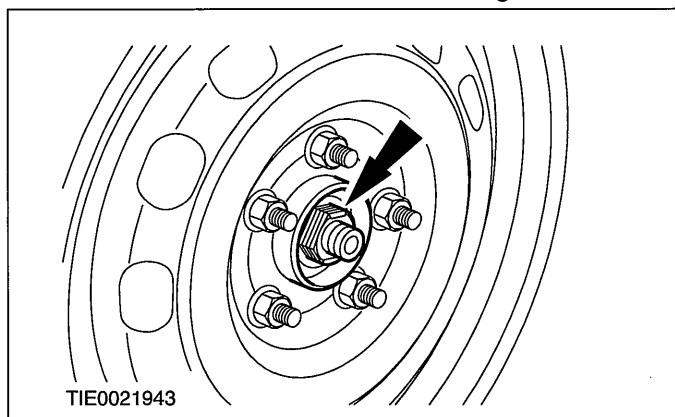
1. Loosen the strut and spring assembly top mount retaining nuts by three turns.



2. **CAUTION:** Use a socket to loosen the wheel hub retaining nut to prevent damage.

Remove the wheel hub retaining nut.

- Discard the wheel hub retaining nut.



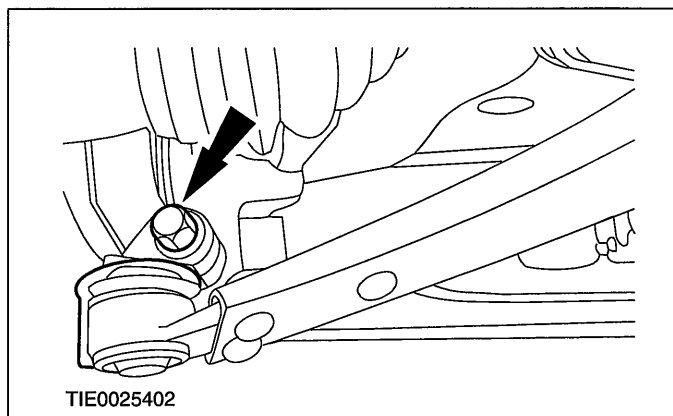
3. Remove the wheel and tire.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. **CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

Detach the lower arm ball joint from the wheel knuckle.

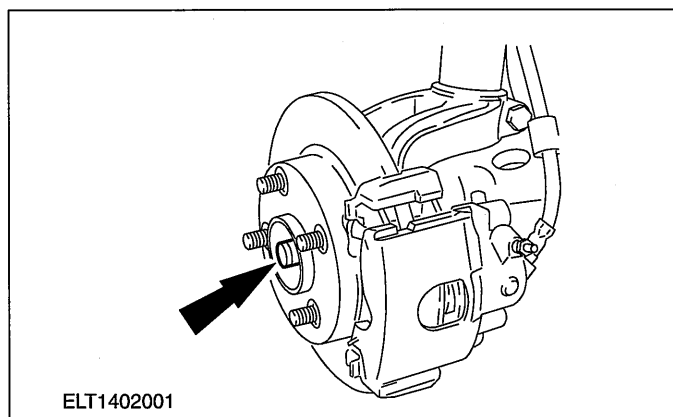
- Remove the heat shield.



5. **CAUTION:** Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

Using a suitable four leg puller, detach the halfshaft from the wheel hub.

- Secure the halfshaft to one side.



6. **CAUTION:** Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

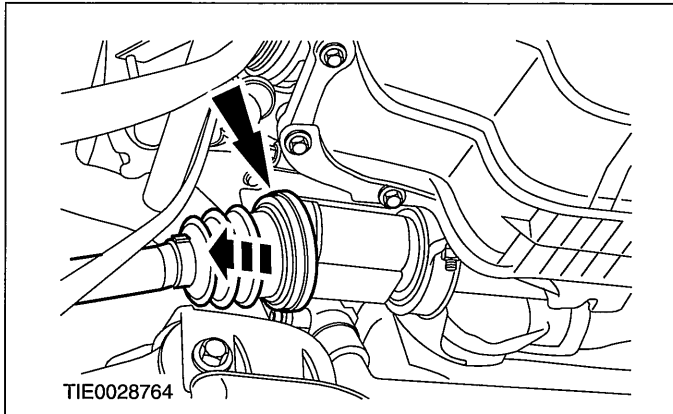
REMOVAL AND INSTALLATION

NOTE: Do not damage the inner constant velocity (CV) joint boot.

NOTE: Discard the grease.

Remove the halfshaft.

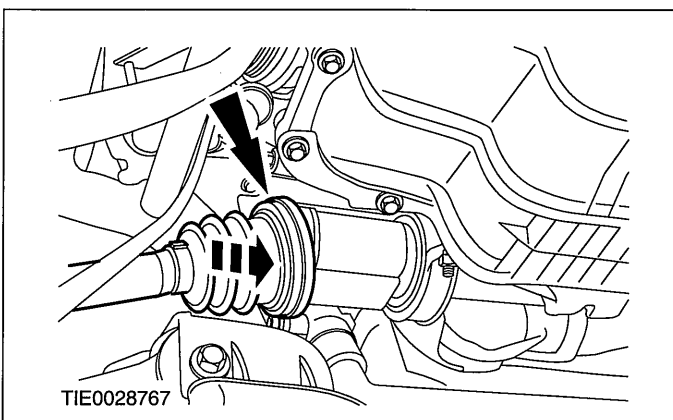
- Remove and discard the constant velocity (CV) joint boot clamp.



Installation

- CAUTION:** The total amount of grease must not exceed 100 grams.
Apply grease to the intermediate shaft.
- CAUTION:** Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

Attach the halfshaft to the intermediate shaft.

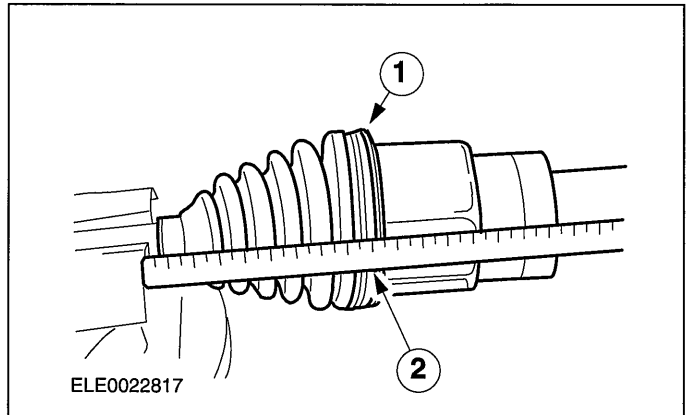


- NOTE:** Do not damage the inner constant velocity (CV) joint boot.

NOTE: Make sure that the intermediate shaft mating surface for the joint boot is clean.

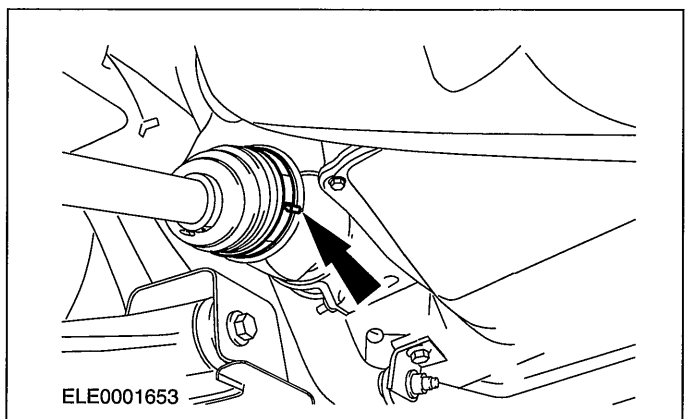
Install the inner constant velocity (CV) joint boot (halfshaft shown removed for clarity).

- Slide a small screwdriver under the boot seat to allow the air to escape.
- Insert the constant velocity (CV) joint in as far as it will go, then pull it back approximately 20 mm.

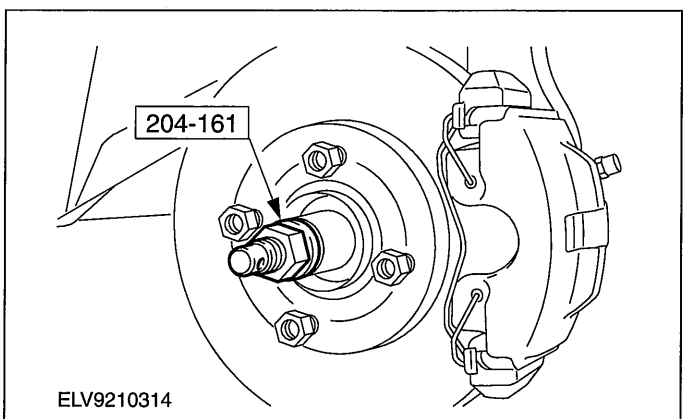


- NOTE:** Install a new CV joint boot clamp.

Using a suitable grip wrench, install the inner CV joint boot clamp.



- CAUTION:** Make sure the halfshaft is completely installed into the wheel hub.
Using the special tool, install the halfshaft.

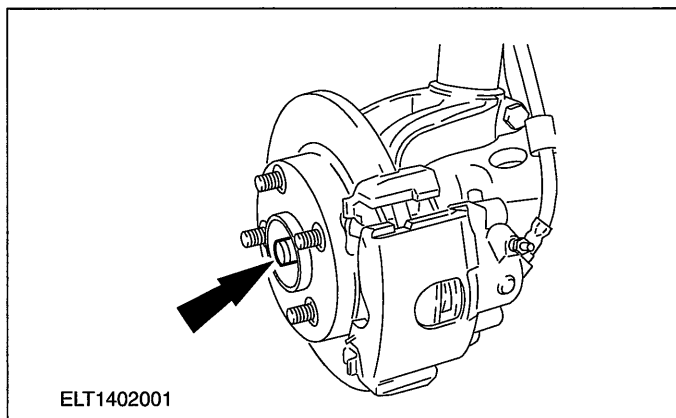


- NOTE:** Install a new wheel hub retaining nut.

REMOVAL AND INSTALLATION

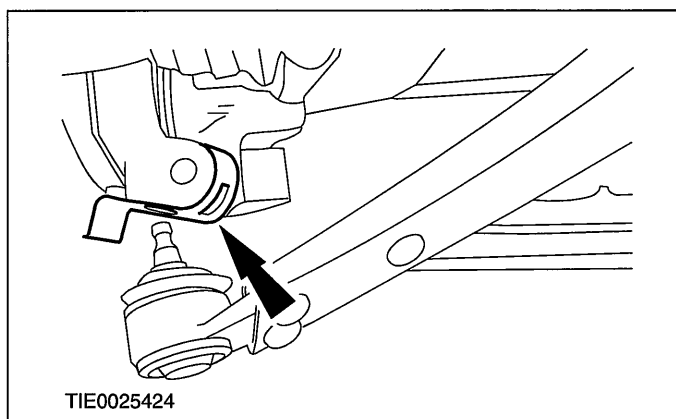
NOTE: Do not fully tighten the wheel hub retaining nut at this stage.

Install the wheel hub retaining nut.



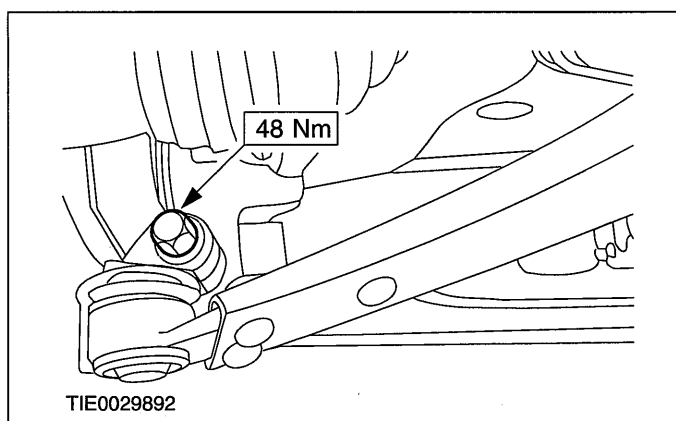
7. **CAUTION:** Make sure that the heat shield is installed to prevent damage to the ball joint.

Install the heat shield.



8. **CAUTION:** The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

Attach the lower arm ball joint to the wheel knuckle.

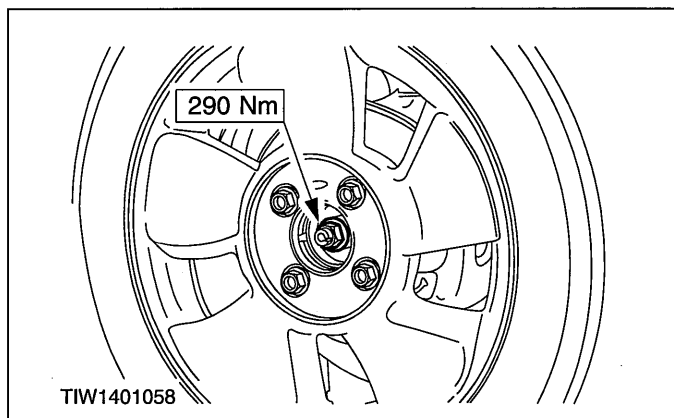


9. Install the wheel and tire.

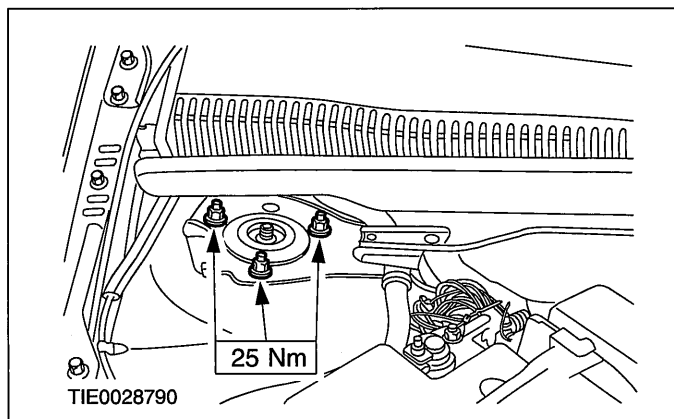
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

10. **CAUTION:** Use a socket to tighten the wheel hub retaining nut to prevent damage.

Tighten the wheel hub retaining nut.



11. Tighten the strut and spring assembly top mount retaining nuts.



REMOVAL AND INSTALLATION

Intermediate Shaft

Materials

Name	Specification
Manual transmission fluid	WSD-M2C200-C

Removal

- ▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

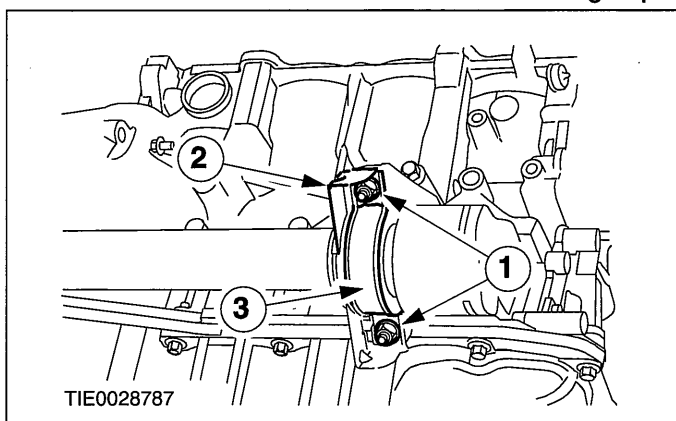
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation). See - Transmission Fluids.

1. Remove the right-hand halfshaft.

For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

2. Remove the intermediate shaft center bearing cap.

1. Remove and discard the locknuts.
2. Detach the heatshield from the bearing cap.
3. Remove and discard the center bearing cap.



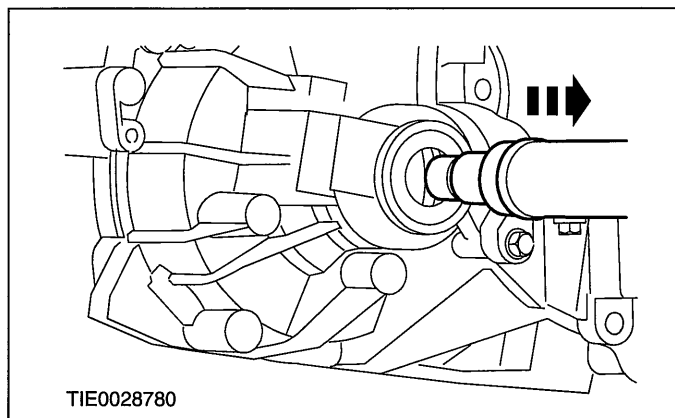
3. ⚠ CAUTION: Do not damage the halfshaft oil seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

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

Remove the intermediate shaft.

- Allow the oil to drain into a suitable container.
- For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation). See - Transmission Fluids.
- Slide the heatshield off the intermediate shaft.



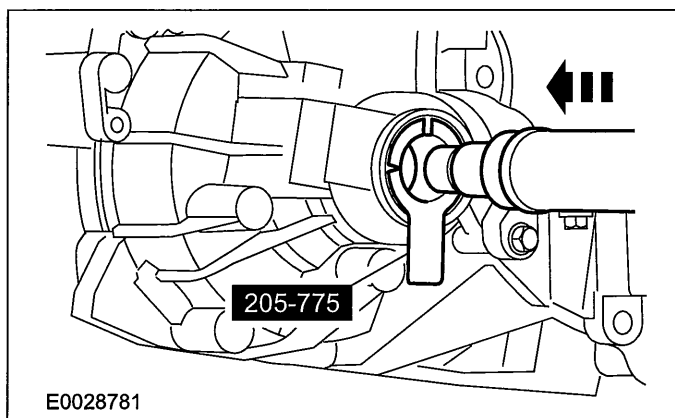
Installation

All vehicles

1. ⚠ CAUTION: Do not damage the halfshaft oil seal.

Install the intermediate shaft.

- Slide the heatshield onto the intermediate shaft.

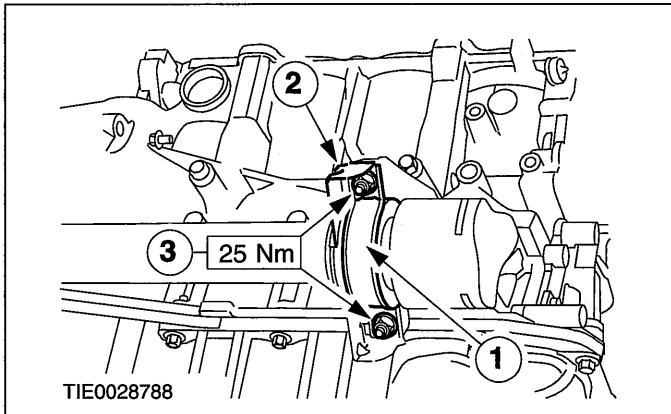


REMOVAL AND INSTALLATION

- 2. NOTE:** Install a new intermediate shaft center bearing cap and locknuts.

Install the intermediate shaft center bearing cap.

1. Install the center bearing cap.
2. Attach the heatshield to the bearing cap.
3. Install the locknuts.



- 3. Install the right-hand halfshaft.**

For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

Vehicles with manual transaxle

- 4. With the vehicle on the level surface, fill the transaxle with transmission fluid until the oil level is just below the bottom of the filler hole.**

Vehicles with automatic transaxle

- 5. Check the transmission fluid level and top up with clean automatic transmission oil.**

For additional information, refer to:
Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).

REMOVAL AND INSTALLATION

Inner Constant Velocity (CV) Joint Boot(14 336 0)

Special Tool(s)

 14044	Clamping Tool, Boot Retaining Clamp 204-169 (14-044)
 TI15091	Remover, Bearing/Gear 205-310 (15-091)
 15092	Remover, Bearing/Gear 205-311 (15-092)
 16016	Installer, Extension Housing Bushing/Oil Seal 308-046 (16-016)

Materials

Name	Specification
Grease	WSS-M1C259-A1

Removal

1. Remove the right-hand halfshaft.

For additional information, refer to Halfshaft RH in this section.

2. Remove the left-hand halfshaft.

For additional information, refer to Halfshaft LH in this section.

3. CAUTIONS:

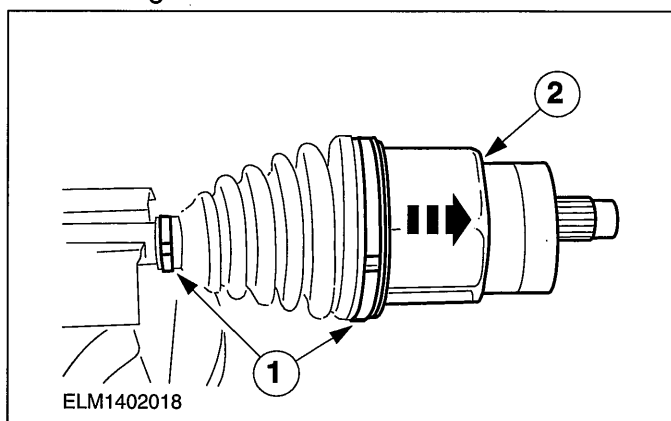
⚠ Do not bent the inner constant velocity (CV) joint more than 18 degrees and the outer CV joint more than 45 degrees.

⚠ Use vise jaw protectors for all operations in a vise.

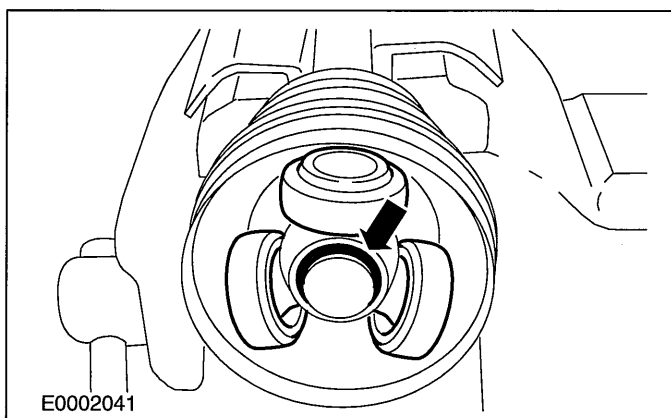
NOTE: Secure the halfshaft in a vise.

Detach the inner CV joint housing from the halfshaft.

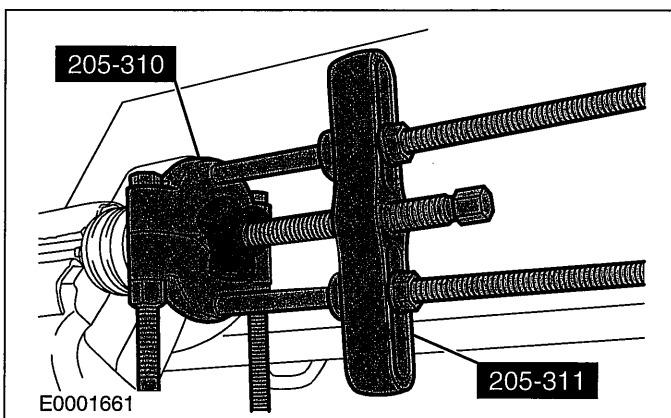
1. Remove and discard the CV joint boot retaining clamps.
2. Remove the CV joint housing and discard the grease.



4. Remove and discard the spider circlip.



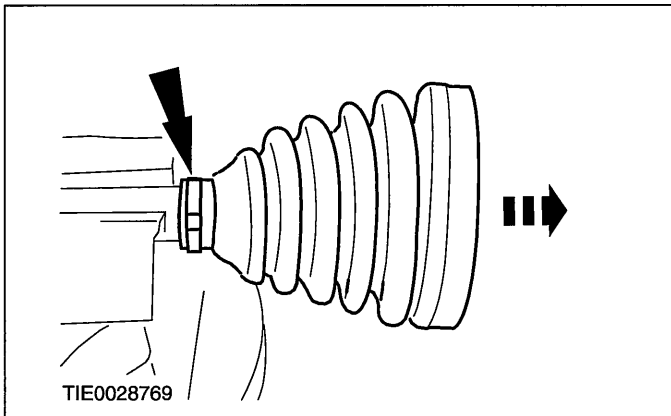
5. Using the special tool, remove the spider.



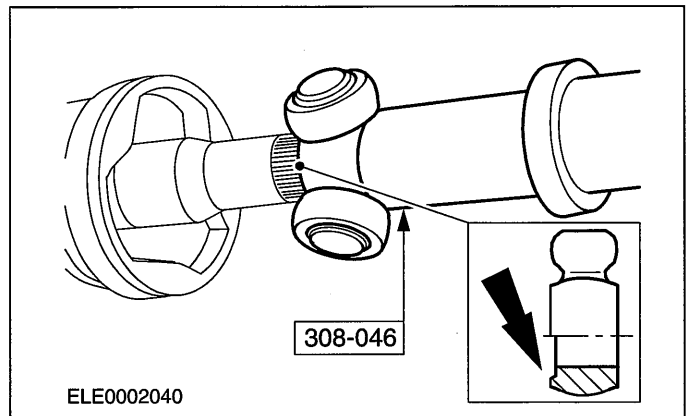
REMOVAL AND INSTALLATION

6. Remove the inner CV joint boot.

- Mark the halfshaft where the CV joint boot is located.

3. **NOTE:** Install the spider with the chamfer facing towards the halfshaft.

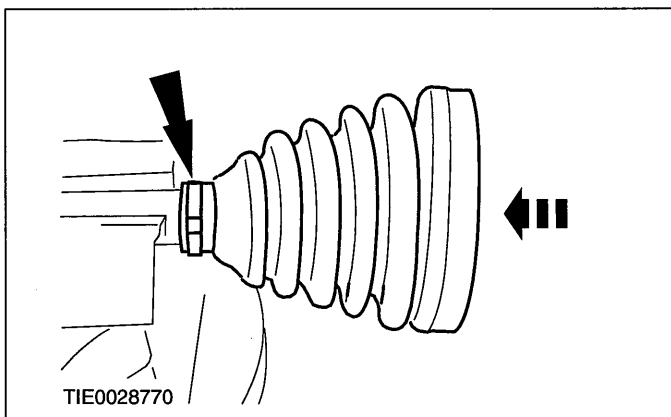
Using the special tool, install the spider.



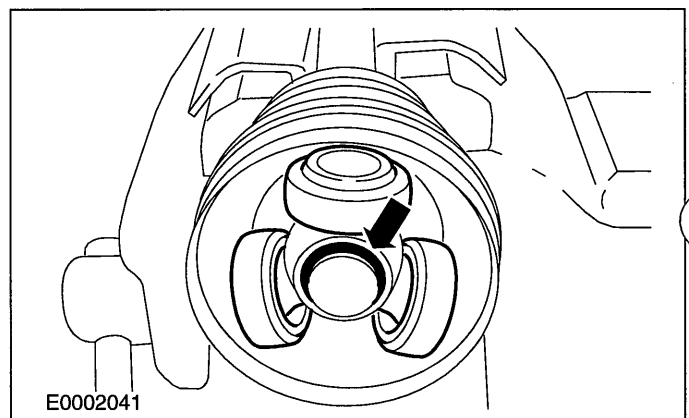
Installation

1. **NOTE:** Make sure that the inner constant velocity (CV) joint boot is installed to the marks on the halfshaft.

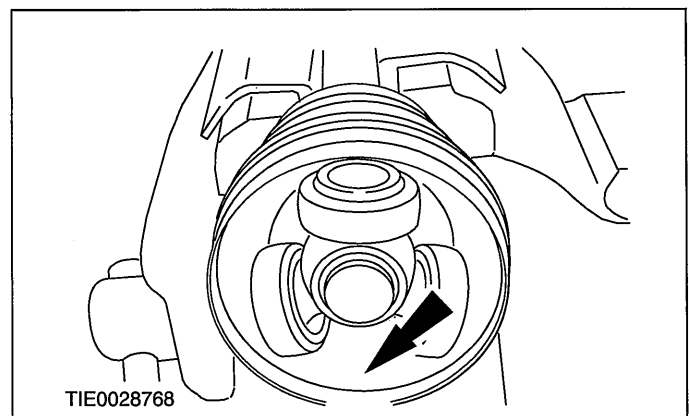
Install the inner CV joint boot.

4. **NOTE:** Install a new spider circlip.

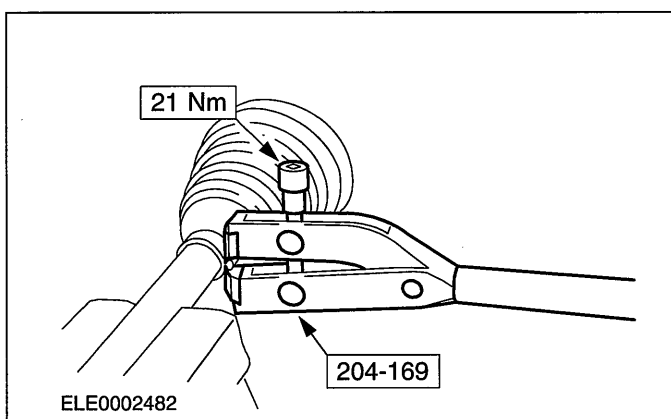
Install the spider circlip.

5. **CAUTION:** The total amount of grease in the inner CV joint must not exceed 85 grams.

Apply grease to the inner CV joint boot.

2. **NOTE:** Install a new CV joint boot retaining clamp.

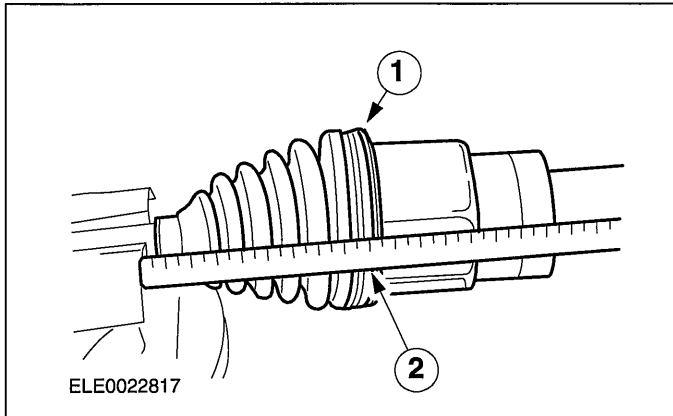
Using the special tool, install the CV joint boot retaining clamp.



6. Attach the inner CV joint housing to the halfshaft (left hand side shown for clarity).

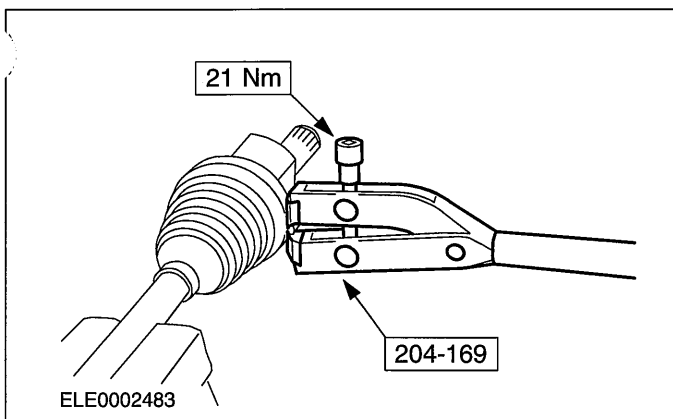
REMOVAL AND INSTALLATION

1. Use a suitable screwdriver under the CV joint boot to allow air to escape.
2. Install the CV joint boot housing and pull it backwards 20 mm.

**7. NOTE: Install a new CV joint boot retaining clamp.**

NOTE: Make sure that the CV joint boot is clamped at the measured position.

Using a special tool, install the CV joint boot retaining clamp.

**8. Install the right-hand halfshaft.**

For additional information, refer to Halfshaft RH in this section.

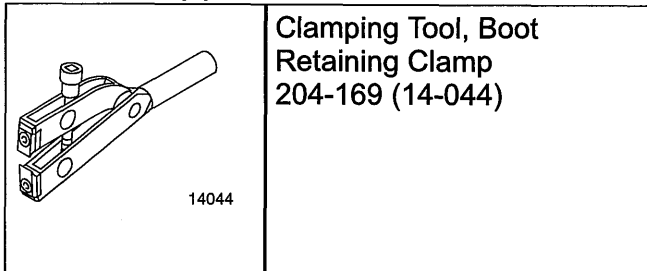
9. Install the left-hand halfshaft.

For additional information, refer to Halfshaft LH in this section.

REMOVAL AND INSTALLATION

Outer Constant Velocity (CV) Joint Boot(14 338 0)

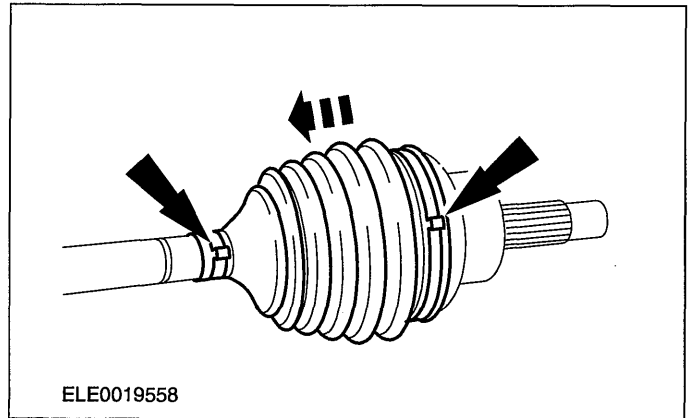
Special Tool(s)



Materials

Name	Specification
Grease	WSS-M1C259-A1

- Remove and discard the grease.



Removal

- CAUTION:** The outer constant velocity (CV) joint is a press fit. Do not disassemble. Failure to follow this instruction may result in damage to the outer CV joint.

Remove the inner CV joint boot.

For additional information, refer to Inner Constant Velocity (CV) Joint Boot in this section.

2. CAUTIONS:

CAUTION: Do not bent the inner CV joint more than 18 degrees and the outer CV joint more than 45 degrees.

CAUTION: Use vise jaw protectors for all operations in a vise.

NOTE: Secure the halfshaft in a vise.

NOTE: Mark the halfshaft where the CV joint boot is located.

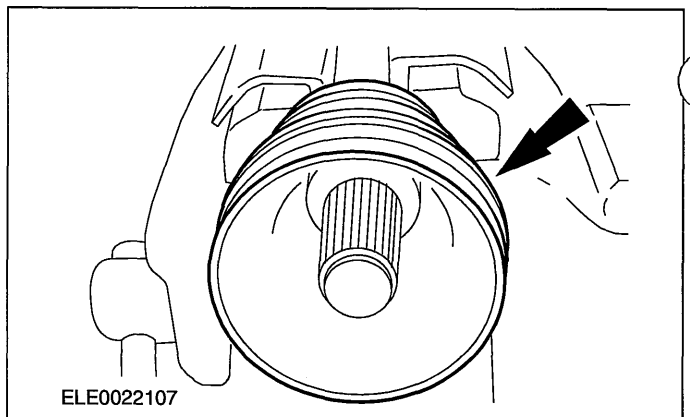
Remove the outer CV joint boot.

- Remove and discard the CV joint boot retaining clamps.

Installation

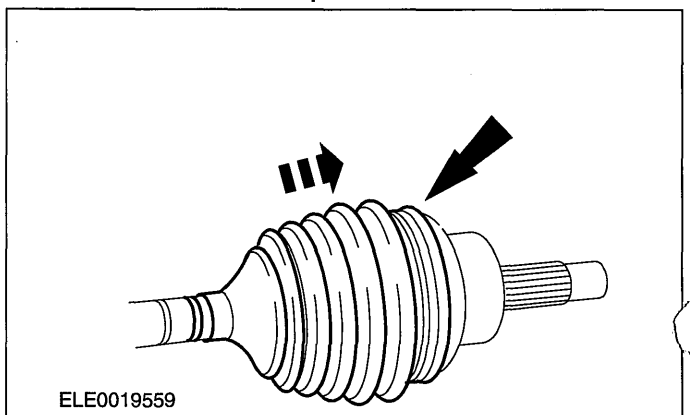
- CAUTION:** The total amount of grease in the inner constant velocity (CV) joint must not exceed 85 grams.

Apply grease to the outer CV joint boot.



2. Install the outer CV joint boot.

- Use a suitable screwdriver under the boot to allow air to escape.

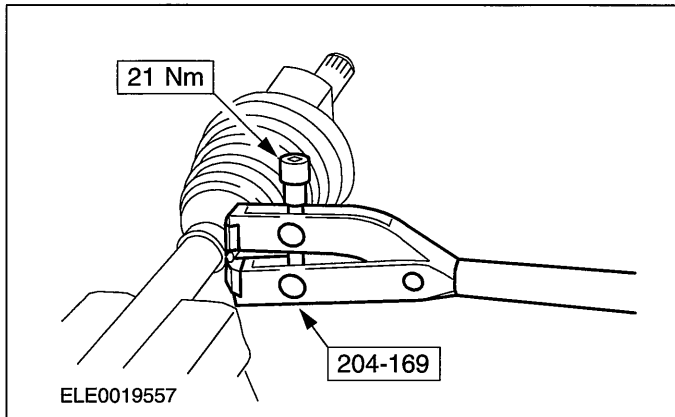


REMOVAL AND INSTALLATION

3. **NOTE:** Make sure that the outer CV joint boot is installed to the marks on the halfshaft.

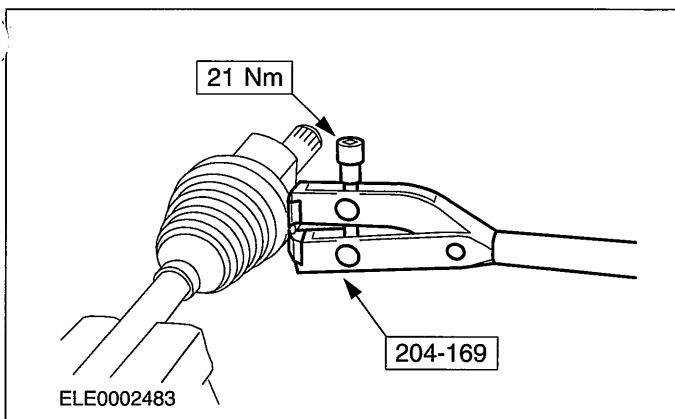
NOTE: Install a new inner CV joint boot retaining clamp.

Using the special tool, install the inner CV joint boot retaining clamp.



4. **NOTE:** Install a new outer CV joint boot retaining clamp.

Using the special tool, install the outer CV joint boot retaining clamp.



5. Install the inner CV joint boot.

For additional information, refer to Inner Constant Velocity (CV) Joint Boot in this section.



SECTION 206-00 Brake System - General Information

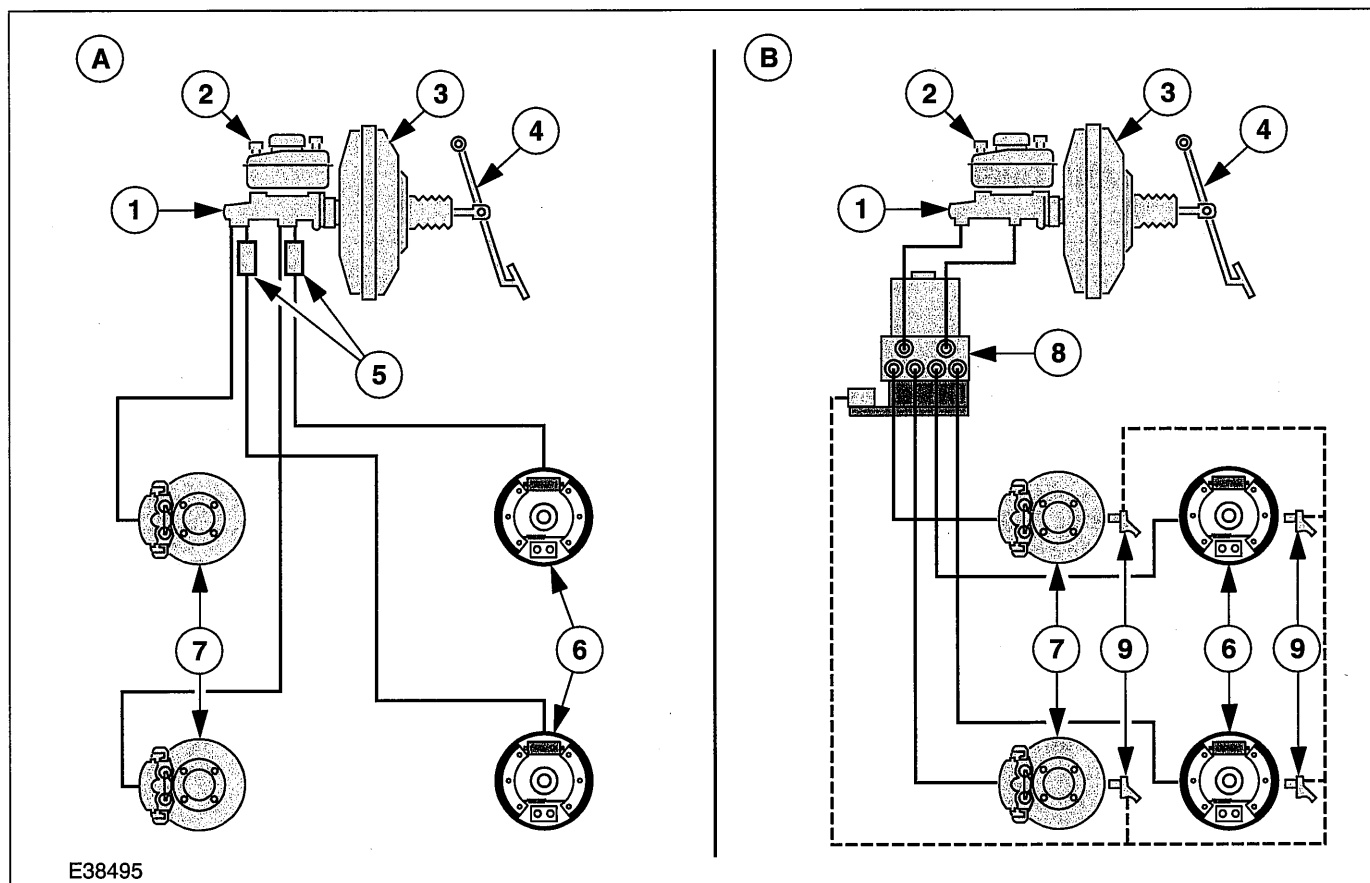
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Brake System.....	206-00-2
Overview.....	206-00-2
DIAGNOSIS AND TESTING	
Brake System.....	206-00-3
Inspection and Verification.....	206-00-3
Road Test.....	206-00-3
Pinpoint Tests.....	206-00-10
Component Tests.....	206-00-28
Brake System Check.....	206-00-29
Brake Booster Functional Test.....	206-00-29
GENERAL PROCEDURES	
Brake System Bleeding..... (12 141 0)	206-00-32
Brake System Pressure Bleeding..... (12 141 0)	206-00-33

DESCRIPTION AND OPERATION

Brake System

Overview



Item	Description
A	Brake system without Anti-lock Brake System (ABS)
B	Brake system with ABS
1	Brake master cylinder
2	Reservoir
3	Brake servo
4	Brake pedal
5	Brake pressure reduction valve
6	Rear drum brake
7	Front disk brake
8	ABS hydraulic unit with integrated control unit
9	Wheel speed sensors

Vehicles without ABS are equipped with brake pressure reduction valves for the rear wheel brakes. They are located in the corresponding brake circuits at the brake master cylinder.

Vehicles with ABS do not need brake pressure reduction valves because they are equipped with electronic brake distribution (EBD).

The handbrake is cable operated on the rear brakes.

On vehicles with a petrol engine the necessary vacuum for the brake booster is generated by the intake manifold.

On vehicles with a diesel engine, a vacuum pump driven by the engine provides the necessary vacuum for the brake booster.

DIAGNOSIS AND TESTING

Brake System

The brakes system operates by transferring effort applied to the brake pedal by the driver to the brakes at each wheel.

The braking effort is distributed to each wheel, using a hydraulic system. The system is assisted using a vacuum brake booster that reduces pedal effort and increases hydraulic pressure.

The parking brake operates on the rear wheels and is applied using a hand operated control.

Inspection and Verification

NOTE: Before carrying out any diagnosis, make sure that the brake system warning indicator is functional.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
- Tire pressure - Wheels and tires - Fluid leak from brake line(s)

3. If an obvious cause for an observed or reported concern is found, correct the case (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Road Test

Perform a road test to compare actual vehicle braking performance with the performance standards expected by the driver. The ability of the test driver to make valid comparisons and detect performance deficiencies will depend on experience.

The driver should have a thorough knowledge of the brake system operation and accepted general performance guidelines to make good comparisons and detect performance concerns.

An experienced technician will always establish a route that will be used for all brake diagnosis road tests. The road selected will be reasonably smooth

and level. Gravel or bumpy roads are not suitable because the surface does not allow the tires to grip the road equally. Crowned roads should be avoided because of the large amount of weight shifted to the low set of wheels on this type of road. Once the route is established and consistently used, the road surface variable can be eliminated from the test results.

Before a road test, get a complete description of the customer concerns or suspected condition. From the description, the technician will be able to match possible causes with symptoms. Certain components will be identified as possible sources while others will be eliminated by the evidence. More importantly, the customer description can reveal unsafe conditions which should be checked or corrected before a road test. The description will also help form the basic approach to the road test by narrowing the concern to specific components, vehicle speed or conditions.

Begin the road test with a general brake performance check. Using the description of the concern, test the brakes at different vehicle speeds using both light and heavy pedal pressure. Determine if the concern is in the front or rear braking system. First use the foot brake and then the parking brake. If the condition (i.e. pull, vibration, pulsation) occurs only on operation of the parking brake, the concern is in the rear brake system. If the condition occurs when the foot brake is depressed, the concern is in the front brake system.

Avoid locking the brakes and sliding the tires. This condition will not indicate brake efficiency. A heavily braked but turning wheel will stop the vehicle in a shorter distance than locked wheels.

If the concern becomes evident during this check, make sure it fits the description given before the road test. If the concern is not evident, attempt to duplicate the condition using the information from the description.

If a concern exists, use the Brake System Symptom Chart in order to isolate it to a specific sub-system and condition description. From this description, a list of possible sources can be used to further narrow the cause to a specific component or condition.

DIAGNOSIS AND TESTING**Symptom Chart**

Symptom	Possible Sources	Action
Brakes pull or drift	Worn or damaged brake shoes or brake pads and linings.	INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
	Abnormal wear or distortion of brake discs.	INSTALL a new brake discs. REFER to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).
	Incorrect rear brake adjustment.	PERFORM a parking brake cable adjustment. REFER to: (206-05 Parking Brake and Actuation) Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (General Procedures), Parking Brake Cable Adjustment - Vehicles With: Rear Disc Brakes (General Procedures).
	Incorrect wheel alignment adjustment.	PERFORM a wheel alignment adjustment. REFER to: Front Toe Adjustment (204-00 Suspension System - General Information, General Procedures).
	Incorrect wheel bearing preload adjustment.	ADJUST or INSTALL a new wheel bearing. REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation), Rear Wheel Bearing (204-02 Rear Suspension, Removal and Installation).
	Unequal air pressure in the tires.	INFLATE the tires to the correct pressure.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Brake warning indicator always on	Grease or fluid on the brake shoes or brake pads; glazed linings.	INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
	Stuck or seized calipers.	GO to Pinpoint Test A.
	Low brake fluid level.	FILL the reservoir. CHECK the brake and clutch system for leaks including brake fluid in the brake booster.
	Leaking brake master cylinder primary piston cup.	INSTALL a new brake master cylinder. REFER to: (206-06 Hydraulic Brake Actuation) Brake Master Cylinder - RHD (Removal and Installation), Brake Master Cylinder - LHD (Removal and Installation).
	Parking brake control not fully released.	FREE UP and ADJUST the parking brake cable. REFER to: (206-05 Parking Brake and Actuation) Parking Brake (Diagnosis and Testing), Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (General Procedures), Parking Brake Cable Adjustment - Vehicles With: Rear Disc Brakes (General Procedures). INSTALL new components as necessary.
	Shorted indicator circuit.	GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Vibration when the brakes are applied	Grease or fluid on the brake shoes or brake pads; glazed linings.	INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
	Worn or damaged brake shoes or brake pads.	INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
	Loose caliper mounting bolt(s).	TIGHTEN the caliper mounting bolt(s). REFER to: Specifications (206-03 Front Disc Brake, Specifications), Specifications (206-04 Rear Disc Brake, Specifications).
	Insufficient grease on sliding parts.	APPLY grease where necessary.
	Damaged brake drum contact surface.	INSTALL a new brake drum. REFER to: Brake Drum (206-02 Drum Brake, Removal and Installation).
	Loose or missing rear wheel spindle bolts.	- TIGHTEN or INSTALL new rear wheel spindle bolts. REFER to: Specifications (204-02 Rear Suspension, Specifications). - Go to Pinpoint Test C.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Pedal goes down fast	Leak in the hydraulic system.	REPAIR the leak. CHECK the entire hydraulic system. FILL and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures).
	Air in the system.	CHECK for leaks. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures).
	Worn brake master cylinder piston cups or scored cylinder bore.	INSTALL a new brake master cylinder. REFER to: (206-06 Hydraulic Brake Actuation) Brake Master Cylinder - RHD (Removal and Installation), Brake Master Cylinder - LHD (Removal and Installation).
	Brake disc brake 'knock back' (Brake pads push the brake caliper piston back into brake caliper. Caused by excessive brake disc lateral runout or loose wheel bearings.)	Install a new brake disc. REFER to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).
	Worn brake shoes or brake pads.	- INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation). - GO to Pinpoint Test D.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Pedal eases down slowly	Air in the system.	BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures).
	Malfunctioning brake master cylinder.	GO to Pinpoint Test E.
Pedal is low or feels spongy	Worn brake shoes or brake pads.	INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
	Hydraulic system.	GO to Pinpoint Test F.
Brake lockup during light brake pedal force	Incorrect tire pressures.	INFLATE the tires to the correct pressure.
	Tires worn.	INSTALL new tires.
	- Glazed or worn brake shoes or brake pads. - Brake booster.	- INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation). - GO to Pinpoint Test G.
Excessive or erratic pedal travel	Worn brake shoes or brake pads.	INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• Brake drag	• Brake discs. • Brake booster. • Incorrectly adjusted brake light switch. • Brake pressure control valve. • Seized brake caliper or wheel cylinder. • Parking brake applied or malfunction. • Seized parking brake cables. • Seized brake caliper slide pins.	• GO to Pinpoint Test H. • GO to Pinpoint Test I. • ADJUST the brake light switch.
• Excessive brake pedal effort	• Brake booster inoperative.	• PERFORM a brake booster functional test REFER to the component tests.
	• Worn or contaminated brake shoes or brake pads.	• INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation). • GO to Pinpoint Test J.
• Brake noise	• Worn brake shoes or brake pads.	• INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
	• Brake booster.	• GO to Pinpoint Test K.
• Slow or incomplete brake pedal return	• Brake booster. • Brake master cylinder.	• GO to Pinpoint Test L.

DIAGNOSIS AND TESTING**Pinpoint Tests****PINPOINT TEST A : BRAKES PULL OR DRIFT**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: ROAD TEST THE VEHICLE	
	1 Road test the vehicle and apply the brake pedal. Does the vehicle pull or drift? → Yes GO to A2. → No Vehicle OK.
A2: TIRE INSPECTION	
	1 Check for excessive wear or incorrect tire pressures. Are the tires in good condition? → Yes GO to A3. → No INFLATE the tires to the correct pressure. INSTALL new tires if excessively worn. TEST the system for normal operation.
A3: BRAKE SHOE OR BRAKE PADS AND LINING INSPECTION	
	1 Inspect the brake shoes or brake pads for grease or fluid on the linings and or wear concerns. Are any concerns present? → Yes INSTALL new brake shoes or brake pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation). TEST the system for normal operation. → No GO to A4.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A4: CHECK PRESSURE CONTROL VALVE—RIGHT-HAND REAR	
	1 Install pressure gauges in the left-hand front and right-hand rear bleed nipples. Apply the brake to read 6895 kPa (1000 psi) at the left-hand front wheel. – Read the pressure at right-hand rear wheel. • Does the pressure gauge read between 4692-5164 kPa (680-750 psi) at the right-hand rear wheel? → Yes INSPECT the brake calipers and INSTALL new components as required. GO to A5. → No INSTALL a new right-hand rear brake pressure control valve. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A5: CHECK PRESSURE CONTROL VALVE--LEFT-HAND REAR	
	1 Install pressure gauges in the right-hand front and left-hand rear bleed nipples. Apply the brake to read 6895 kPa (1000 psi) at the right-hand front wheel. – Read the pressure at left-hand rear wheel. • Does the pressure gauge read between 4692-5164 kPa (680-750 psi) at the left-hand rear wheel? → Yes INSPECT the brake calipers and INSTALL new components as required. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation). TEST the system for normal operation. → No INSTALL a new left-hand rear brake pressure control valve. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation.

PINPOINT TEST B : BRAKE WARNING INDICATOR ALWAYS ON

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK BRAKE WARNING INDICATOR	
NOTE:The brake warning indicator should only illuminate when the ignition switch is in the START or RUN position and the parking brake is applied.	
	1 Ignition switch in position II. 2 Release the parking brake. – Check the fluid level in the reservoir is at the MAX mark. • Does the brake warning indicator illuminate? → Yes REFER to: Instrument Cluster - Vehicles Built Up To: 10/2005 (413-01 Instrument Cluster, Diagnosis and Testing). → No GO to B2.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B2: CHECK BRAKE SYSTEM FOR LEAKAGE	
	1 Check the brake master cylinder reservoir sealing points and external brake and clutch system for leaks. Refer to the brake master cylinder component tests in this section. Does the system leak? → Yes REPAIR as necessary. ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No GO to B3.
B3: CHECK BRAKE WARNING SWITCH OR WIRING	
	1 Ignition switch in position II. 2 Remove the brake master cylinder reservoir filler cap or switch. Allow the float to rest at its lowest point. Does the brake warning indicator illuminate? → Yes The switch or wiring is OK. TEST the system for normal operation. → No REFER to: Instrument Cluster - Vehicles Built Up To: 10/2005 (413-01 Instrument Cluster, Diagnosis and Testing).

PINPOINT TEST C : VIBRATION WHEN BRAKES ARE APPLIED

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: ROAD TEST THE VEHICLE	
	1 Road test the vehicle without applying the brakes at 40-80 km/h (25-50 mph). Is a vibration present? → Yes REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing). After servicing, TEST the system for normal operation. → No GO to C2.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C2: CHECK FOR REAR BRAKE VIBRATION	
NOTE: With a manual release parking brake control, hold the parking brake control release button in the release position during parking brake control application.	
	1 Road test the vehicle at 40-80 km/h (25-50 mph) with a medium application on the parking brake control. Is a vibration present? → Yes CHECK the rear brake drums or discs for excessive wear. INSTALL new components as necessary. REFER to: Brake Drum (206-02 Drum Brake, Removal and Installation), Brake Shoes (206-02 Drum Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation), Brake Disc (206-04 Rear Disc Brake, Removal and Installation). TEST the system for normal operation. → No GO to C3.
C3: CHECK FOR FRONT BRAKE VIBRATION	
	1 Road test the vehicle at 40-80 km/h (25-50 mph) with light and medium application of the foot brake. Is a vibration present? → Yes CHECK the front brake discs for excessive wear or cracks. INSTALL new components as necessary. REFER to: (206-03 Front Disc Brake) Brake Pads (Removal and Installation), Brake Caliper (Removal and Installation). TEST the system for normal operation. → No Vehicle OK.

DIAGNOSIS AND TESTING**PINPOINT TEST D : PEDAL GOES DOWN FAST**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: ROAD TEST THE VEHICLE	
	1 Road test the vehicle and apply the foot brake. Was the brake pedal effort normal? → Yes Vehicle OK. → No GO to D2.
D2: CHECK BRAKE FLUID LEVEL	
	1 Check the brake master cylinder reservoir fluid level. Is the fluid level acceptable? → Yes GO to D3. → No CHECK the brake master cylinder reservoir sealing points for leaks. REFER to the brake master cylinder component tests in this section. ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D3: PRESSURIZE THE SYSTEM	1 Pump the foot brake rapidly five times. Does the brake pedal height build up and then hold? → Yes CHECK parking brake adjustment and ADJUST as necessary. REFER to: (206-05 Parking Brake and Actuation) Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (General Procedures), Parking Brake Cable Adjustment - Vehicles With: Rear Disc Brakes (General Procedures). If the condition still exists. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No GO to D4.
D4: CHECK FOR BRAKE SYSTEM LEAKS	1 Check for external brake and clutch system leaks. REFER to the component tests. Are any leaks found? → Yes REPAIR as necessary. ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No GO to D5.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D5: PERFORM A BRAKE MASTER CYLINDER BYPASS CONDITION CHECK	
	1 Test for a brake master cylinder bypass. REFER to the component tests. Was a concern found? → Yes INSTALL a new brake master cylinder. REFER to: (206-06 Hydraulic Brake Actuation) Brake Master Cylinder - RHD (Removal and Installation), Brake Master Cylinder - LHD (Removal and Installation). ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No System OK.

PINPOINT TEST E : PEDAL EASES DOWN SLOWLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CHECK BRAKE PEDAL OPERATION	
	1 Check if the condition occurs when applying the brake pedal while the vehicle is moving. Does the condition occur with the vehicle stationary? → Yes GO to E2. → No REFER to the component tests.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E2: CHECK FOR BRAKE SYSTEM LEAKS	
	1 Check for external brake system leaks. Refer to the component tests. • Are any leaks found? → Yes REPAIR as necessary. ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No GO to E3.
E3: PERFORM A BRAKE MASTER CYLINDER BYPASS TEST	
	1 Test for a brake master cylinder bypass. Refer to the component tests. • Was a concern found? → Yes INSTALL a new brake master cylinder. REFER to: (206-06 Hydraulic Brake Actuation) Brake Master Cylinder - RHD (Removal and Installation), Brake Master Cylinder - LHD (Removal and Installation). ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No System OK. TEST the system for normal operation.

DIAGNOSIS AND TESTING**PINPOINT TEST F : PEDAL IS LOW OR FEELS SPONGY**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: ROAD TEST THE VEHICLE	
	1 Road test the vehicle and apply the foot brake. • Did the brake pedal feel spongy? → Yes GO to F2. → No Vehicle OK.
F2: CHECK BRAKE FLUID LEVEL	
	1 Check the brake master cylinder reservoir fluid level. • Is the fluid level OK? → Yes GO to F3. → No CHECK the brake master cylinder reservoir sealing points. REFER to the component tests. ADD fluid and BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation.
F3: CHECK FILLER CAP VENT	
	1 Check if the filler cap vent holes are clogged or dirty. • Was a concern found? → Yes CLEAN as necessary. TEST the system for normal operation. → No GO to F4.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F4: BLEED THE BRAKE SYSTEM	
	1 Check for air in the brake system. Bleed the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). Is the condition still present? → Yes GO to F5. → No Vehicle OK.
F5: CHECK FRONT WHEEL HUB RETAINING NUT	
	1 Check the front wheel hub retaining nut for looseness. Is the front wheel hub retaining nut loose? → Yes INSTALL a new front wheel hub retaining nut. REFER to: Specifications (204-01 Front Suspension, Specifications). Do not reuse the front wheel hub retaining nut. TEST the system for normal operation. → No CHECK the parking brake adjustment. REFER to: (206-05 Parking Brake and Actuation) Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (General Procedures), Parking Brake Cable Adjustment - Vehicles With: Rear Disc Brakes (General Procedures).

PINPOINT TEST G : BRAKE LOCK UP DURING LIGHT BRAKE PEDAL FORCE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: ROAD TEST THE VEHICLE	
	1 Road test the vehicle and apply the brake pedal lightly. Do the rear brakes lock up? → Yes GO to G2. GO to Pinpoint Test G. → No Vehicle OK.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G2: TIRE INSPECTION	
	1 Check for excessive tire wear or incorrect tire pressures. • Are the tires in good order? → Yes GO to G3. GO to Pinpoint Test G. → No SUBSTITUTE known good tires. INFLATE to the correct pressure. TEST the system for normal operation.
G3: BRAKE SHOES OR BRAKE PADS INSPECTION	
	1 Inspect the brake shoes or brake pads are correctly fitted and for grease or fluid contamination or wear concerns. • Are there any concerns? → Yes REPAIR or INSTALL new components as necessary. TEST the system for normal operation. → No GO to G4. GO to Pinpoint Test G.
G4: CHECK PRESSURE CONSCIOUS REDUCING VALVE—RIGHT-HAND REAR	
	1 Install pressure gauges in the left-hand front and right-hand rear bleed nipples. Apply the brake to read 6895 kPa (1000 psi) at the left-hand front wheel. – Read the pressure at the right-hand rear wheel. • Does the pressure gauge read between 4692-5164 kPa (680-750 psi) at the right-hand rear wheel? → Yes TEST the brake booster. Go to Pinpoint Test I. → No INSTALL a new right-hand rear brake pressure control valve. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G5: CHECK PRESSURE CONSCIOUS REDUCING VALVE-LEFT-HAND REAR	
	1 Install pressure gauges in the right-hand front and left-hand rear bleed nipples. Apply the brake to read 6895 kPa (1000 psi) at the right-hand front wheel. – Read the pressure at the left-hand rear wheel. • Does the pressure gauge read between 4692-5164 kPa (680-750 psi) at the left-hand rear wheel? → Yes TEST the brake booster. Go to Pinpoint Test I. → No INSTALL a new left-hand rear brake pressure control valve. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation.

PINPOINT TEST H : EXCESSIVE OR ERRATIC BRAKE PEDAL TRAVEL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: ROAD TEST THE VEHICLE	
	1 Road test the vehicle under rough road conditions. Apply the brakes slowly. • Is the pedal travel OK? → Yes Vehicle OK. → No GO to H2.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H2: CHECK WHEEL BEARING	1 Check for loose front wheel bearings. Are the front wheel bearings loose? → Yes CHECK the front wheel hub retaining nut. INSTALL a new front wheel bearing(s) if worn or damaged, REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation). TEST the system for normal operation. → No CHECK the front brake disc(s) for thickness variances. REFER to: Specifications (206-03 Front Disc Brake, Specifications). INSTALL new components as necessary. TEST the system for normal operation.

PINPOINT TEST I : BRAKES DRAG

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: CHECK BRAKE BOOSTER	1 Check the brake booster push rod alignment and pedal travel. Is the push rod and pedal travel OK? → Yes GO to I2. → No INSTALL a new brake booster. REFER to: (206-07 Power Brake Actuation) Brake Booster - LHD (Removal and Installation), Brake Booster - RHD (Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I2: ROAD TEST THE VEHICLE	
	1 Road test the vehicle and apply the brakes. • Are the brakes functioning correctly? → Yes Vehicle OK. → No INSPECT individual wheel cylinders or calipers for binding or sticking components. INSTALL new components as necessary. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation.

PINPOINT TEST J : EXCESSIVE BRAKE PEDAL EFFORT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: CHECK BRAKE APPLICATION	
	1 With the engine off, apply and release the brake pedal five times to deplete all vacuum from the brake booster. Apply the brake pedal, hold with light pressure. Start the engine. • Does the brake pedal hold? → Yes GO to J2. → No GO to J6.
J2: CHECK BRAKE BOOSTER FOR LEAKS	
	1 Run the engine at medium idle, release the accelerator pedal and turn the engine off. Wait 90 seconds and apply the brakes. Two or more brake applications should be power assisted. • Does the brake booster work? → Yes Vehicle OK. → No GO to J3.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J3: CHECK BRAKE BOOSTER CHECK VALVE	
	1 Disconnect the vacuum hose, for the brake booster check valve at the intake manifold. Blow into the hose attached to the brake booster check valve. Does air pass through the valve? → Yes INSTALL a new brake booster check valve. TEST the system for normal operation. → No GO to J4.
J4: CHECK BRAKE BOOSTER CHECK VALVE VACUUM	
	1 Disconnect the vacuum hose from the brake booster check valve. Run the engine at idle. Check the supply with a vacuum gauge. Is the vacuum pressure above 40.5 kPa (12 in-Hg) with the brake booster non-operational? → Yes GO to J5. → No REPAIR or INSTALL a new vacuum hose and fittings. TEST the system for normal operation.
J5: CHECK BRAKE BOOSTER	
	1 Check the brake booster. GO to the component test procedure in this section. Is the brake booster OK? → Yes GO to J6. → No INSTALL a new brake booster. REFER to: (206-07 Power Brake Actuation) Brake Booster - LHD (Removal and Installation), Brake Booster - RHD (Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J6: CHECK BRAKE PEDAL LINKAGE	
	1 Disconnect the actuator rod from the pedal pin and apply the brake pedal fully. • Did the pedal move freely? → Yes GO to J7. → No REPAIR or INSTALL new brake pedal bushings. REFER to: (206-06 Hydraulic Brake Actuation) Brake Pedal - LHD, Vehicles With: Manual Transaxle (Removal and Installation), Brake Pedal - LHD, Vehicles With: 4-Speed Automatic Transmission (AW81-40), Vehicles With: Automated Gearshift (Removal and Installation), Brake Pedal - RHD (Removal and Installation). TEST the system for normal operation.
J7: CHECK BRAKE PRESSURE CONTROL VALVE	
	1 Check the brake pressure control valve for contamination. • Is the brake fluid contaminated? → Yes INSTALL a new brake pressure control valve. FILL the brake master cylinder reservoir. BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No Vehicle OK.

DIAGNOSIS AND TESTING**PINPOINT TEST K : BRAKE NOISE**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K1: CHECK FOR PEDAL NOISE	1 Inspect the brake pads and brake shoes for excessive wear. – Run the engine at idle for 10 seconds or longer. Apply the brake pedal and listen for noise. Compare results with a known good system. • Was a noise present? → Yes GO to K2. → No Vehicle OK.
K2: CHECK PUSH ROD ALIGNMENT	1 Check the brake booster push rod alignment and travel. • Is the push rod OK? → Yes BLEED the brake system. REFER to: (206-00 Brake System - General Information) Brake System Bleeding (General Procedures), Brake System Pressure Bleeding (General Procedures). TEST the system for normal operation. → No INSTALL a new brake booster. REFER to: (206-07 Power Brake Actuation) Brake Booster - LHD (Removal and Installation), Brake Booster - RHD (Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING**PINPOINT TEST L : SLOW OR INCOMPLETE BRAKE PEDAL RETURN**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L1: CHECK FOR BRAKE PEDAL RETURN	
	1 Run the engine at fast idle while making several brake applications. Pull the brake pedal rearward with approximately 44.5 N (10 lbs) force. Release the brake pedal and measure the distance to the floor pan. Make a hard brake application. Release the brake pedal and measure the brake pedal to floor pan distance. The brake pedal should return to its original position. • Did the brake pedal return to its original position? → Yes Vehicle OK. → No GO to L2.
L2: CHECK FOR BRAKE PEDAL BINDING	
	1 Check the brake pedal for free operation. • Is the brake pedal operating freely? → Yes INSTALL a new brake booster. REFER to: (206-07 Power Brake Actuation) Brake Booster - LHD (Removal and Installation), Brake Booster - RHD (Removal and Installation). TEST the system for normal operation. → No REPAIR or INSTALL new brake pedal bushings. REFER to: (206-06 Hydraulic Brake Actuation) Brake Pedal - LHD, Vehicles With: Manual Transaxle (Removal and Installation), Brake Pedal - LHD, Vehicles With: 4-Speed Automatic Transmission (AW81-40), Vehicles With: Automated Gearshift (Removal and Installation), Brake Pedal - RHD (Removal and Installation). TEST the system for normal operation.

Component Tests**Hydraulic Leak Check**

NOTE: There is a common clutch and brake fluid reservoir, therefore it is possible that a clutch leak can lead to reduction in the reservoir level.

It is possible that all evidence of fluid leakage may have washed off if the vehicle has been operated in rain or snow, as brake fluid is water-soluble. Refill the system, bleed then apply the brakes several times. Examine the system to verify that the reservoir fluid level is actually dropping. Locate

DIAGNOSIS AND TESTING

and repair the external leak. If the fluid level drops and no external leak can be found, check for a brake master cylinder bore end seal leak.

Brake System Check

Brake Pedal Reserve Check

Where a low brake pedal or the feel of a bottomed-out condition exists, check for brake pedal reserve.

1. Operate the engine at idle with the transaxle in NEUTRAL.
2. Apply the brake pedal lightly three or four times.
3. Allow 15 seconds for vacuum to replenish the brake booster.

NOTE: This increased resistance may feel like something has bottomed out.

4. Apply the brake pedal until it stops moving downward or an increased resistance to the pedal travel occurs.
5. Hold the brake pedal in the applied position and raise the engine speed to approximately 2000 rpm.

NOTE: The additional movement of the brake pedal is the result of the increased engine intake manifold vacuum which exerts more force on the brake booster during engine rundown. This means that additional stroke is available in the brake master cylinder and the brake system is not bottoming out.

6. Release the accelerator pedal and observe that the brake pedal moves downward as the engine returns to idle speed.

Brake Booster Functional Test

Inspect all hoses and connections. All unused vacuum connectors should be capped. Hoses and their connections should be correctly secured and in good condition with no holes and no collapsed areas. Inspect the check valve on the brake booster for damage.

Brake Booster Operation Check

1. Check the hydraulic brake system for leaks or low fluid.

2. With the transaxle in NEUTRAL, stop the engine and apply the parking brake. Apply the brake pedal several times to exhaust all vacuum in the system.
3. With the engine turned off and all vacuum in the system exhausted, apply the brake pedal and hold it down. Start the engine. If the vacuum system is operating, the brake pedal will tend to move downward under constant foot pressure. If no motion is felt, the vacuum booster system is not functioning.
4. Remove the vacuum hose from the brake booster. Intake manifold vacuum should be available at the brake booster end of the hose with the engine at idle speed and the transaxle in NEUTRAL. Make sure that all unused vacuum outlets are correctly capped, hose connectors are correctly secured and vacuum hoses are in good condition. When it is established that manifold vacuum is available to the brake booster, connector the vacuum hose to the brake booster and repeat Step 3. If no downward movement of the brake pedal is felt, install a new brake booster. REFER to: (206-07 Power Brake Actuation)
5. Operate the engine a minimum of 10 seconds at fast idle. Stop the engine and let the vehicle stand for 10 minutes. Then, apply the brake pedal with approximately 89 N (20 lb) force. The pedal feel (brake application) should be the same as that noted with the engine operating. If the brake pedal feels hard (no power assist), install a new vacuum check valve and then repeat the test. If the brake pedal still feels hard, install a new brake booster. REFER to: (206-07 Power Brake Actuation)

Brake Booster - LHD (Removal and Installation),
Brake Booster - RHD (Removal and Installation).

Brake Booster - LHD (Removal and Installation),
Brake Booster - RHD (Removal and Installation).
If the brake pedal movement feels spongy, bleed the brake system. REFER to: (206-00 Brake System - General Information)

Brake System Bleeding (General Procedures),
Brake System Pressure Bleeding (General Procedures).

Brake Master Cylinder

Usually, the first and strongest indicator of anything wrong with the braking system is a feeling through the brake pedal. In diagnosing the condition of the brake master cylinder, check pedal feel as

DIAGNOSIS AND TESTING

evidence of a brake concern. Check for the brake warning indicator illumination and the fluid level in the master cylinder reservoir.

Normal Conditions

The following conditions are considered normal and are not indications that the brake master cylinder is in need of service.

- Modern brake systems are not designed to produce as hard a pedal effort as in the past. Complaints of light pedal efforts should be compared to pedal efforts of another vehicle, of the same model and year.
- During normal operation of the brake the fluid level in the reservoir will rise during brake application and fall during release. The net fluid level (i.e., after brake application and release) will remain unchanged.
- A trace of brake fluid will exist on the brake booster shell below the master cylinder mounting flange. This results from the normal lubricating action of the master cylinder bore end seal.
- The fluid level will fall with brake shoe and lining wear.

Abnormal Conditions

NOTE: Prior to performing any diagnosis, make sure the brake system warning indicator is functional.

Changes in brake pedal feel or travel are indicators that something could be wrong with the braking system. The diagnostic procedure and techniques use brake pedal feel, warning indicator illumination and low brake fluid level as indicators in diagnosing braking system concerns. The following conditions are considered abnormal and indicate that the brake master cylinder is in need of service.

- The brake pedal goes down fast. This could be caused by an external or internal leak.
- The brake pedal eases down slowly. This could be caused by an external or internal leak.
- The brake pedal is low and/or feels spongy. This condition may be caused by no fluid in the brake master cylinder reservoir, reservoir cap vent holes clogged or air in the hydraulic system.

- The brake pedal effort is excessive. This may be caused by a bind or obstruction in the pedal or linkage, clogged fluid control valve or insufficient booster vacuum.
- The rear brakes lock up during light pedal force. This may be caused by incorrect tire pressures, grease or fluid on the brake shoes and linings, damaged brake shoes and linings, incorrectly adjusted parking brake, or damaged or contaminated brake pressure control valves.
- The brake pedal effort is erratic. This condition could be caused by a brake booster malfunction, extreme caliper piston knock back or incorrectly installed brake shoes and linings.
- The brake warning indicator is ON. This may be caused by low fluid level, ignition wire routing too close to the fluid level indicator assembly, or float assembly damage.

Bypass Condition Test

1. Check the fluid in brake master cylinder. Fill the brake master cylinder reservoir if low or empty.
2. Observe the fluid level in the brake master cylinder reservoir. If after several brake applications, the fluid level remains the same, measure the wheel turning torque required to rotate the wheels with the brakes applied as follows:

Place the transaxle in NEUTRAL and raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

Apply the brakes with a minimum of 445 N (100 lb) and hold for approximately 15 seconds. With the brakes still applied, exert a torque on the front wheels of 10.1 Nm (75 lb.ft). If either wheel rotates, install a new brake master cylinder. REFER to: (206-06 Hydraulic Brake Actuation)

Brake Master Cylinder - RHD (Removal and Installation),
Brake Master Cylinder - LHD (Removal and Installation).

Non-Pressure Leaks

Any empty brake master cylinder reservoir condition may be caused by two types of non-pressure external leaks.

DIAGNOSIS AND TESTING

Type 1: An external leak may occur at the master cylinder reservoir cap because of incorrect positioning of the gasket and cap. Reposition the cap and gasket.

Type 2: An external leak may occur at the reservoir mounting seals. Service such a leak by installing new seals.

GENERAL PROCEDURES**Brake System Bleeding(12 141 0)****General Equipment**

Worldwide Diagnostic System (WDS)

Bleeding**All Vehicles**

▲ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

NOTE: Make sure that the vehicle is standing on a level surface.

NOTE: The system consists of separate circuits for each front and diagonally opposite rear wheel. Each circuit can be bled independently.

1. **⚠ CAUTION:** The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

Install the bleed tube to the bleed nipple.

2. Immerse the end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.
3. Position the bleed jar base at least 300 mm above the bleed nipple to maintain fluid pressure and prevent air leaking past the threads of the bleed nipple.
4. Loosen the bleed nipple by one-half turn.
5. Operate the brake pedal fully (pumping brake fluid and air into the bleed jar) and allow the brake pedal to return to the rest position.
6. Fill the brake fluid reservoir to the MAX mark.
7. Continue operating the brake pedal until air-free fluid is being pumped into the bleed jar.
8. With the brake pedal fully depressed tighten the bleed nipple.

9. **⚠ CAUTION:** Make sure that the bleed nipple cap is installed after bleeding the brake line(s). This will prevent corrosion to the bleed nipple. Failure to follow this instruction may result in the bleed nipple becoming seized.

Repeat the procedure for the remaining brake lines.

Vehicles with anti-lock brakes

10. **NOTE:** This step is only necessary when changing the brake fluid to remove the used brake fluid from the hydraulic control unit (HCU).

Using WDS, bleed the brake system.

GENERAL PROCEDURES**Brake System Pressure Bleeding(12 141 0)****General Equipment**

Worldwide Diagnostic System (WDS)
Brake/clutch system pressure bleeder/filler

Vehicles with anti-lock brakes

- 4. NOTE:** This step is only necessary when changing the brake fluid to remove the used brake fluid from the hydraulic control unit (HCU).

Using WDS, bleed the brake system.

Bleeding

All vehicles

▲ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

NOTE: Make sure that the vehicle is standing on a level surface.

NOTE: The system consists of separate circuits for each front and diagonally opposite rear wheel. Each circuit can be bled independently.

1. Fill the brake fluid reservoir to the MAX mark.

2. CAUTIONS:

⚠ Make sure that the pressure within the brake system does not exceed 1 bar.

⚠ Make sure that the pressure bleeding equipment is filled with new brake fluid to the correct specification.

Using the brake/clutch system pressure bleeder/filler, pressure bleed the system in accordance with the manufacturer's instructions.

3. ⚠ CAUTION: Make sure that the bleed nipple cap is installed after bleeding the brake line(s). This will prevent corrosion to the bleed nipple. Failure to follow this instruction may result in the bleed nipple becoming seized.

Fill the brake fluid reservoir to the MAX mark as necessary.

C

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SECTION 206-02 Drum Brake

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-02-2
Drum Brake Specification.....	206-02-2
DESCRIPTION AND OPERATION	
Drum Brake.....	206-02-3
Overview.....	206-02-3
DIAGNOSIS AND TESTING	
Drum Brake.....	206-02-5
REMOVAL AND INSTALLATION	
Brake Drum.....	(12 275 0) 206-02-6
Brake Shoes.....	(12 285 0) 206-02-7
Wheel Cylinder.....	(12 305 0) 206-02-9
Brake Backing Plate.....	(12 313 0) 206-02-10

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

	Specification
Silicon dielectric compound	ESA-M1C171-A
Grease - brake shoe adjuster	SAM-1C1024-A
Super DOT 4 brake fluid	ESD-M6C57-A

Drum Brake Specification

New brake drum nominal diameter	203 mm
Worn brake drum discard diameter *	204 mm
Brake shoe width	36 mm
Worn brake shoe lining discard thickness *	1 mm
* When the discard diameter/thickness has been reached, install a new brake drum/brake shoes.	

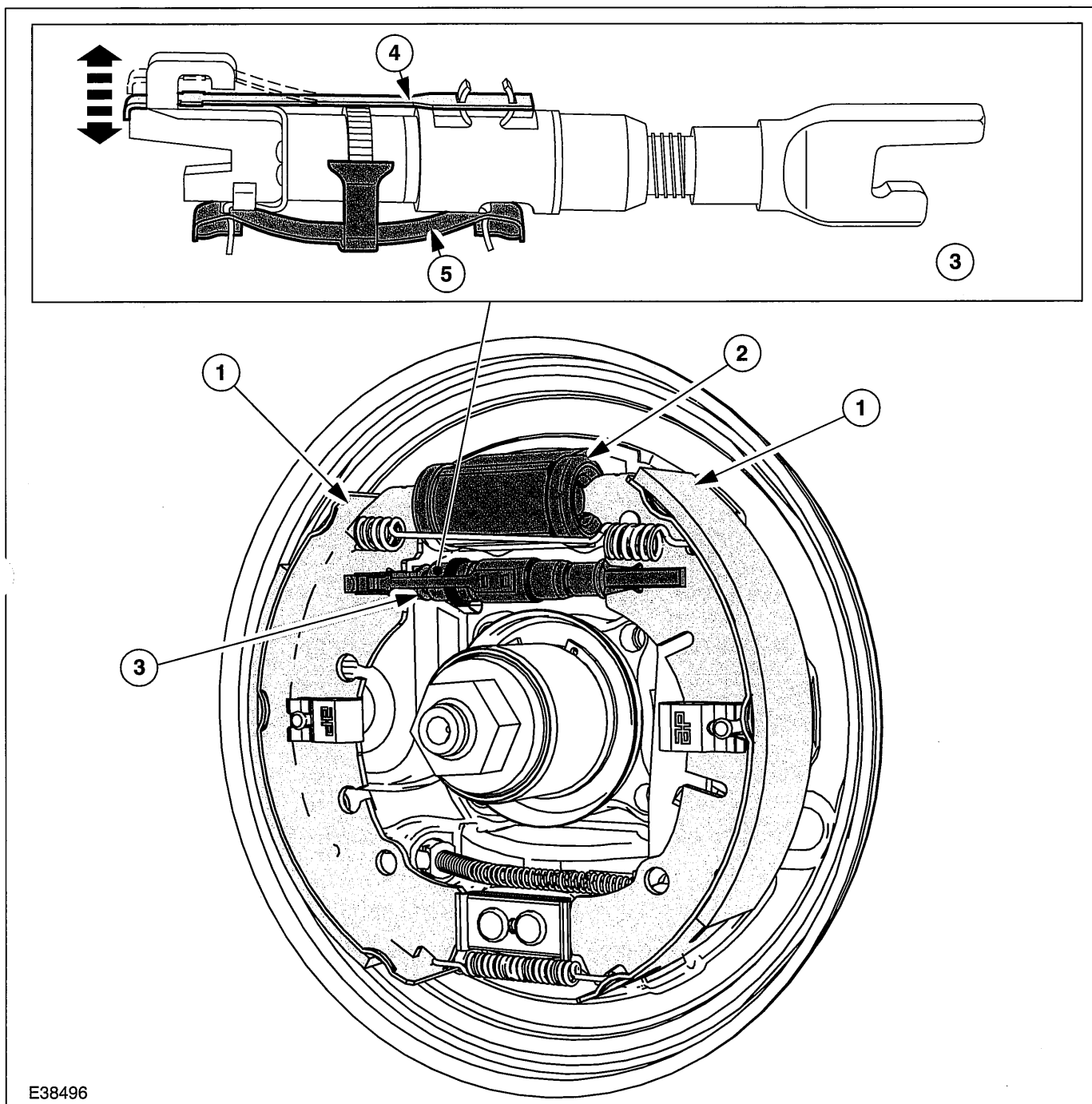
Torque Specifications

Description	Nm	lb-ft	lb-in
Wheel hub retaining nut	235	173	-
Wheel spindle retaining bolts	70	52	-
Wheel speed sensor retaining bolt	10	-	89
Wheel cylinder retaining bolts	10	-	89
Brake hose to wheel cylinder union	17	13	-

DESCRIPTION AND OPERATION

Drum Brake

Overview



E38496

Item	Description
1	Brake shoe
2	Brake cylinder
3	Automatic adjuster
4	Bi-metallic strip
5	Return spring

The drum brake is equipped with an automatic adjuster which adjusts the brake shoes towards the brake drum when lining wear occurs.

The adjustment mechanism is equipped with a bi-metallic strip which prevents undesired adjustment of the brake shoes when the brakes are run hot.

DESCRIPTION AND OPERATION

The heat generated during braking is passed to the bi-metallic strip. If the heat exceeds a critical point, the bi-metallic strip bends upwards into the corresponding nib and prevents further adjustment.

After the brake has cooled again, the bi-metallic strip returns to the initial position. Adjustment is now possible again.

DIAGNOSIS AND TESTING**Drum Brake**

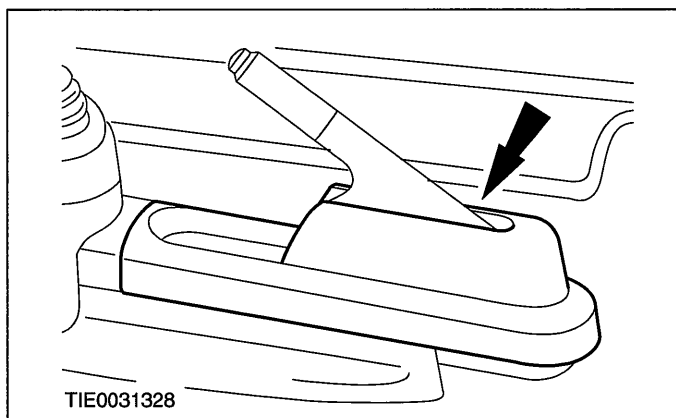
REFER to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION

Brake Drum(12 275 0)

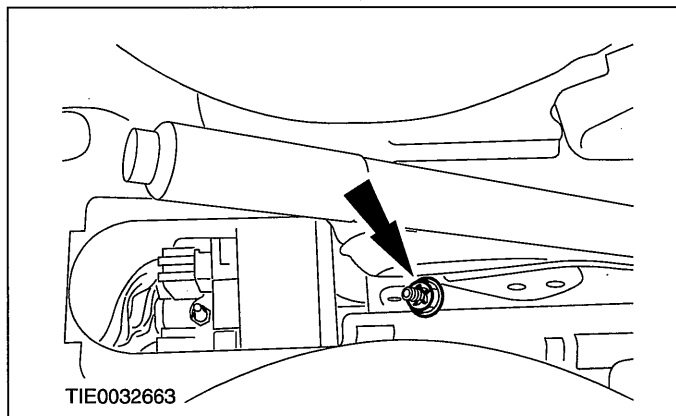
Removal

1. Remove the parking brake control trim panel.



2. Loosen the parking brake cable adjustment nut to the end of the thread.

- Discard the retaining clip.

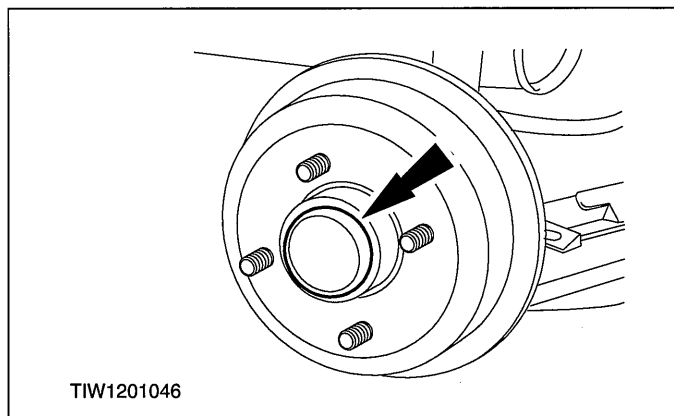


3. Release the parking brake.

4. Remove the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].

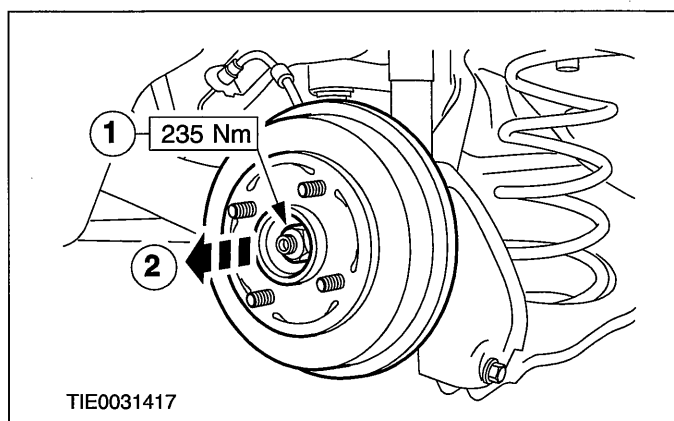
5. NOTE: If the dust cap is damaged on removal a new dust cap must be installed during installation.

Remove the dust cap.



6. Remove the brake drum.

1. Remove and discard the wheel hub retaining nut.
2. Remove the drum.



Installation

1. **CAUTION:** Rotate the drum ten times in the opposite direction when tightening the wheel hub retaining nut to prevent damage to the bearing.

NOTE: Install a new wheel hub retaining nut.

NOTE: Install a new parking brake cable retaining clip.

To install, reverse the removal procedure.

2. Adjust the parking brake cable. For additional information, refer to Section 206-05 [Parking Brake and Actuation].

REMOVAL AND INSTALLATION

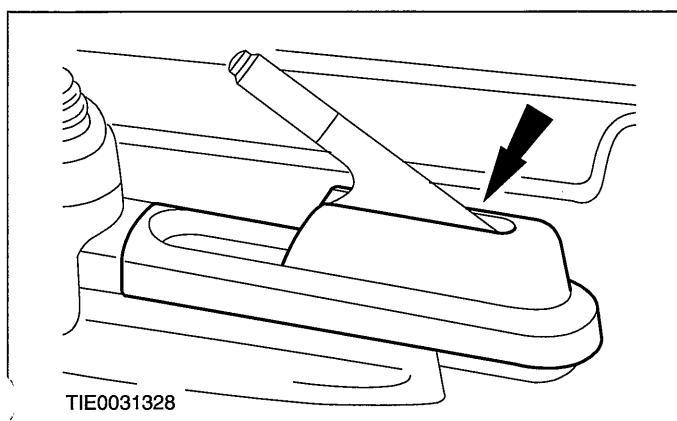
Brake Shoes(12 285 0)

Materials

Name	Specification
Silicon dielectric compound	ESA-M1C171-A
Grease - brake shoe adjuster	SAM-1C1024-A

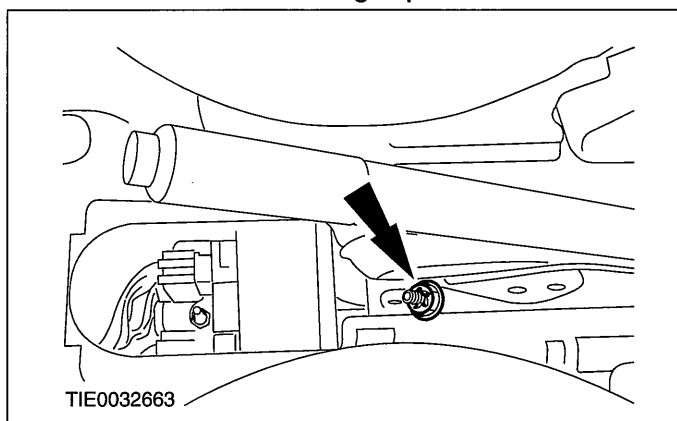
Removal

1. Remove the parking brake control trim panel.



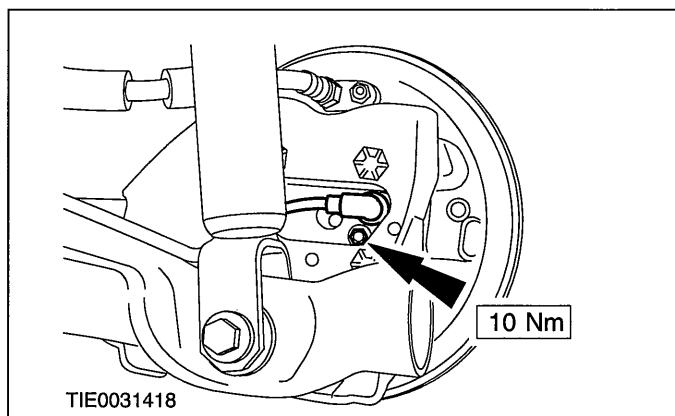
2. Loosen the parking brake cable adjustment nut to the end of the thread.

- Discard the retaining clip.

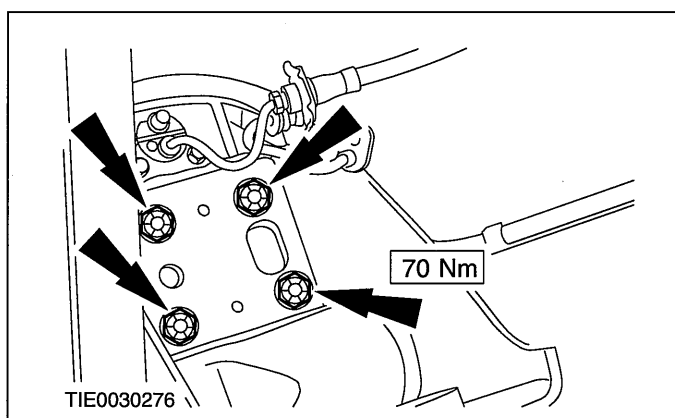


3. Release the parking brake.
4. Remove the wheel and tire. For additional information, refer to Section 204-04 [Wheels and Tires].

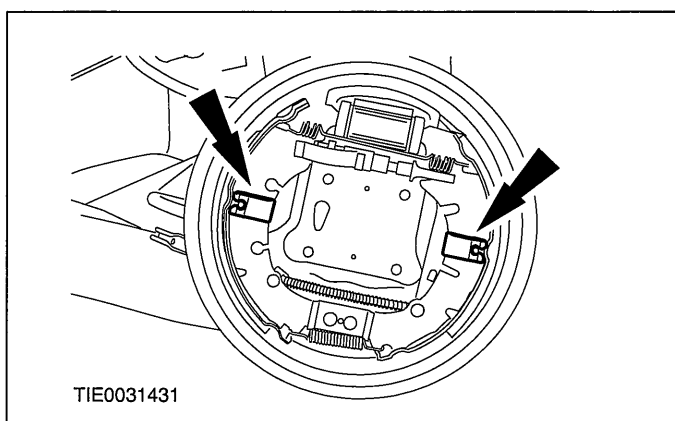
5. Detach the wheel speed sensor from the backing plate.



6. Remove the brake drum.



7. Remove the hold down springs.

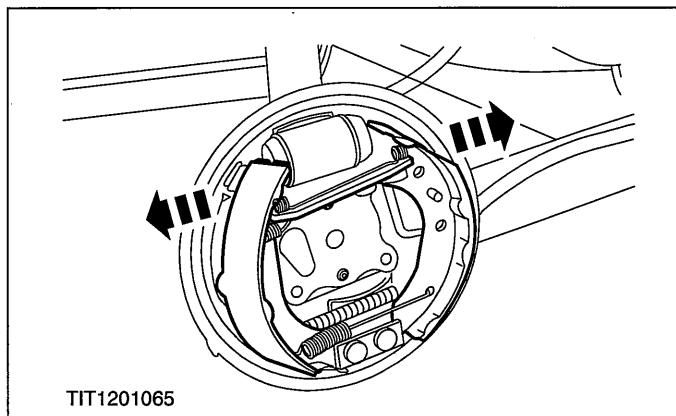


8. **⚠ CAUTION:** Do not damage the wheel cylinder boots.

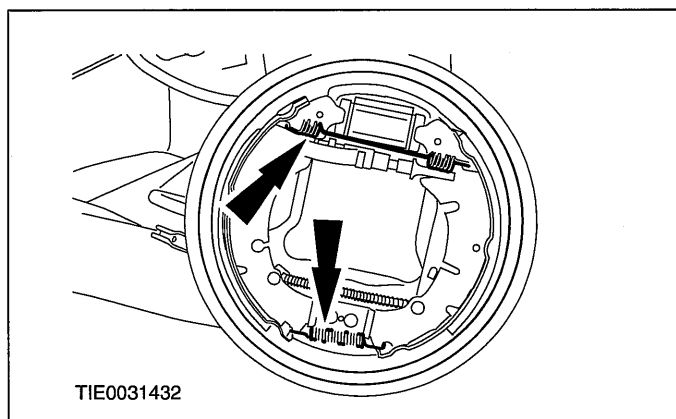
NOTE: Hold the wheel cylinder pistons in place with a rubber band.

REMOVAL AND INSTALLATION

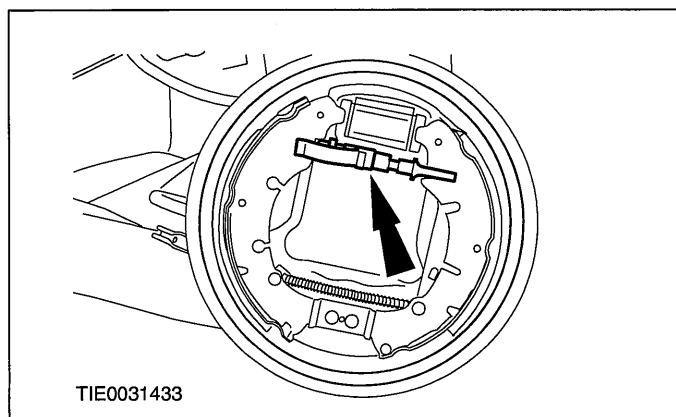
Detach the brake shoes from the wheel cylinder.



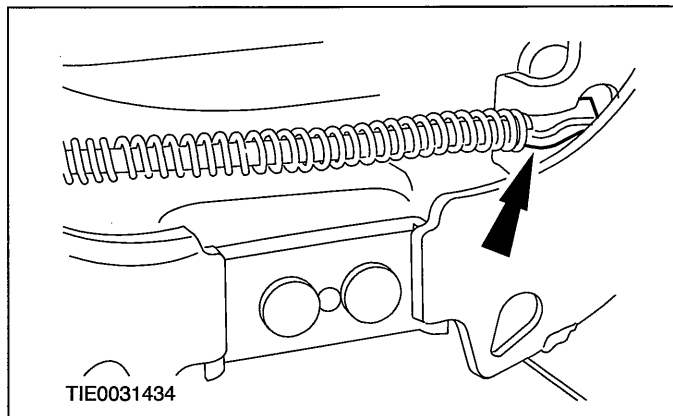
9. Remove the brake shoe return springs.



10. Remove the brake shoe adjuster from the brake shoes.



11. Disconnect the parking brake cable from the brake shoe.



12. Remove the brake shoes.

Installation

1. **NOTE:** Make sure that the brake shoe adjuster is fully released.

NOTE: Install a new parking brake cable retaining clip.

To install, reverse the removal procedure.

- Apply grease to the brake shoe adjuster strut.
- Clean the backing plate and apply silicon dielectric compound to the brake shoe contact points.

2. Adjust the parking brake cable. For additional information, refer to Section 206-05 [Parking Brake and Actuation].

REMOVAL AND INSTALLATION**Wheel Cylinder(12 305 0)****General Equipment**

Brake hose clamp

2. Bleed the brake system. For additional information, refer to Section 206-00 [Brake System - General Information].

Removal

- ⚠ **CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

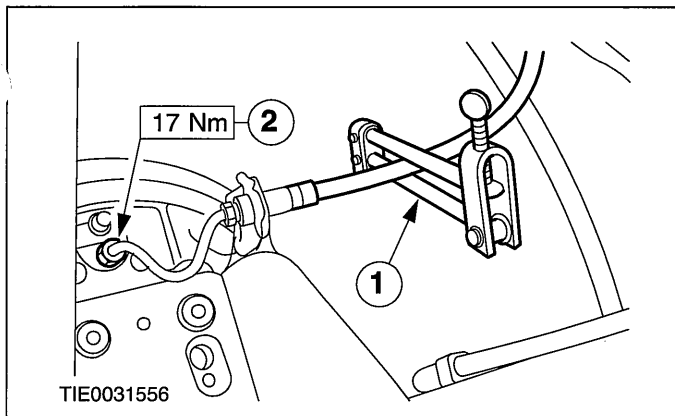
1. Remove the brake shoes.

For additional information, refer to Brake Shoes in this section.

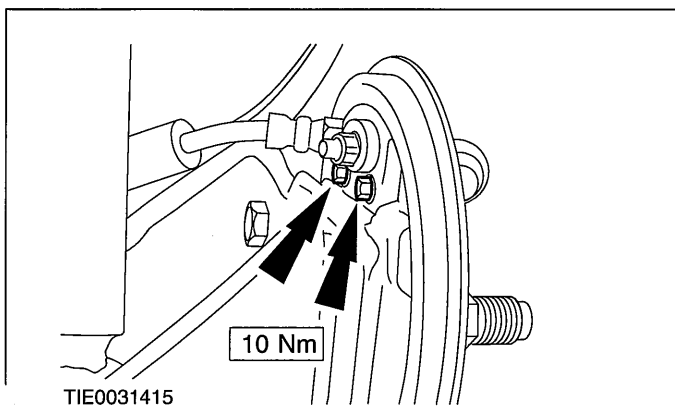
2. ⚠ **CAUTION:** Cap the brake tube to prevent fluid loss or dirt ingress.

Disconnect the brake tube from the wheel cylinder.

1. Using a suitable brake hose clamp, clamp the brake hose.
2. Disconnect the brake tube.



3. Remove the wheel cylinder.

**Installation**

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Brake Backing Plate(12 313 0)****General Equipment**

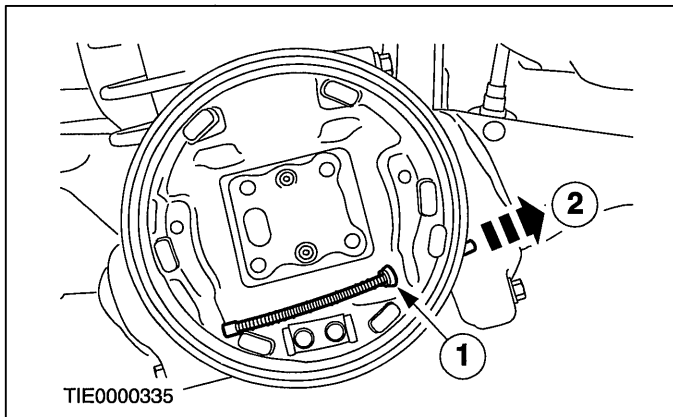
Electric hand drill
Blind rivet gun-hand

Removal**1. Remove the wheel cylinder.**

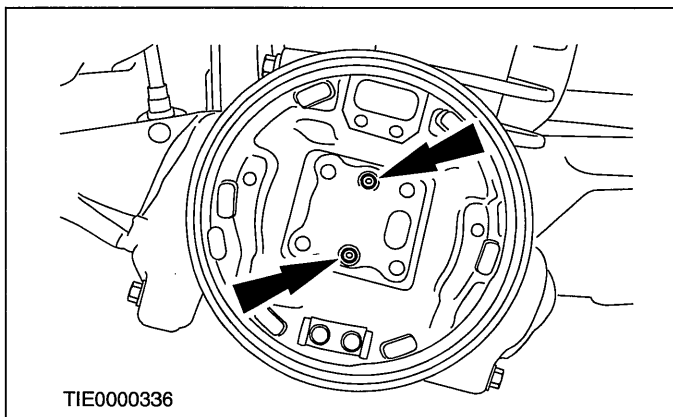
For additional information, refer to Wheel Cylinder in this section.

2. Detach the parking brake cable from the backing plate.

1. Depress the retaining clip.
2. Detach the cable.

**3. Remove the brake backing plate.**

- Using a suitable electric hand drill remove the rivets

**Installation****1. To install, reverse the removal procedure.**

- Using a suitable blind rivet gun-hand, install new rivets.

SECTION 206-03 Front Disc Brake

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-03-2
Front Disc Brake Specification.....	206-03-2
DESCRIPTION AND OPERATION	
Front Disc Brake.....	206-03-3
Overview.....	206-03-3
DIAGNOSIS AND TESTING	
Front Disc Brake.....	206-03-4
REMOVAL AND INSTALLATION	
Brake Pads..... (12 234 0)	206-03-5
Brake Caliper..... (12 243 0)	206-03-7

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

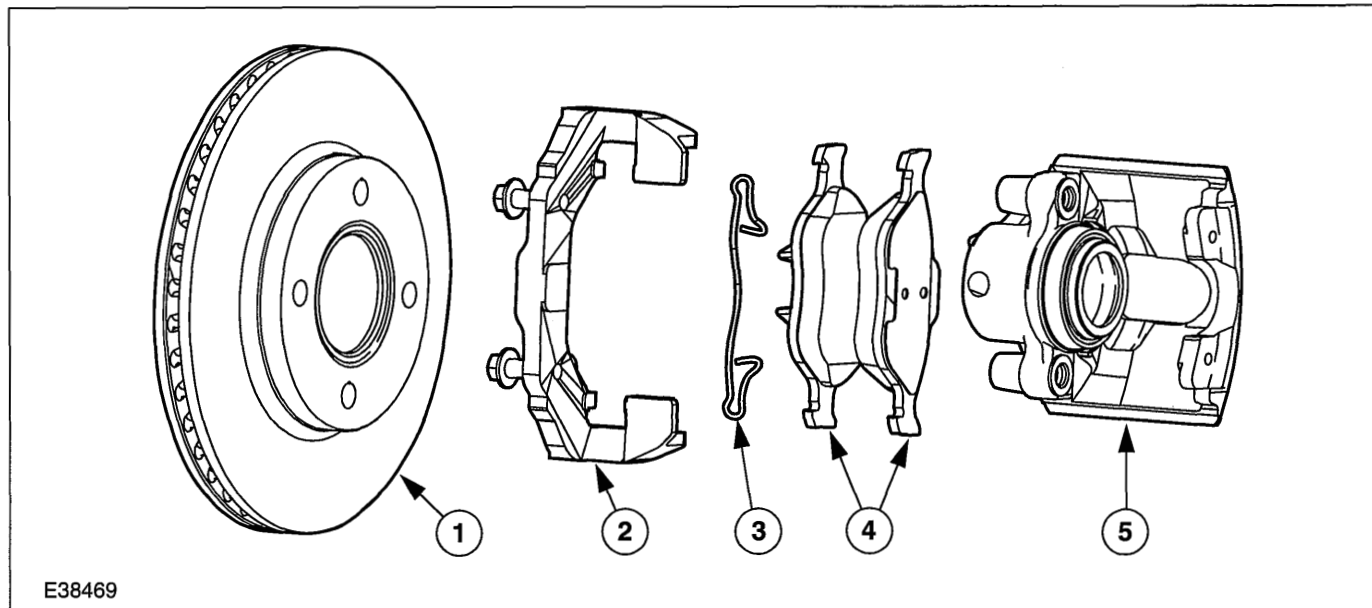
	Specification
Brake Fluid - Super DOT 4	ESD-M6C57-A

Front Disc Brake Specification

Description	mm
Brake disc diameter	258
Brake disc diameter - Vehicles with 2.0L Duratec-HE	278
New brake disc nominal thickness	22
New brake disc nominal thickness - Vehicles with 2.0L Duratec-HE	25
Worn brake disc discard thickness *	20
Worn brake disc discard thickness - Vehicles with 2.0L Duratec-HE *	23
Maximum brake disc thickness variation	0.025
Worn brake pad discard thickness **	1.5
Worn brake pad discard thickness - Vehicles with 2.0L Duratec-HE **	2.0
* When the discard thickness has been reached, install a new brake disc and new brake pads.	
** When the discard thickness has been reached, install new brake pads.	

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate retaining bolts	70	52	-
Brake caliper anchor plate retaining bolts - Vehicles with 2.0L Duratec-HE	80	59	-
Brake caliper retaining bolts	30	22	-
Brake hose to brake caliper union	17	13	-

DESCRIPTION AND OPERATION**Front Disc Brake****Overview**

Item	Description
1	Brake disc
2	Brake back plate assembly
3	Retaining spring clip
4	Brake pads
5	Brake caliper

The front brake system has internally ventilated brake discs and a single-piston floating caliper.

The front disc brakes are the same on all vehicles, irrespective of the vehicle specifications.

Please refer to the "General Specifications" section for the dimensions of the brake discs.

The piston of the brake caliper has a diameter of 54 mm.

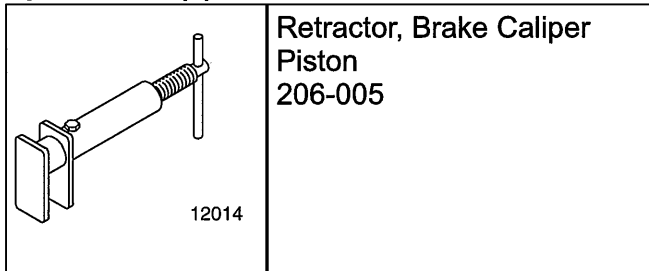
DIAGNOSIS AND TESTING**Front Disc Brake**

REFER to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION

Brake Pads(12 234 0)

Special Tool(s)



Materials

Name	Specification
Silicone Grease	ESE-M1C171-A
Brake Fluid - Super DOT4	ESD-M6C57-A

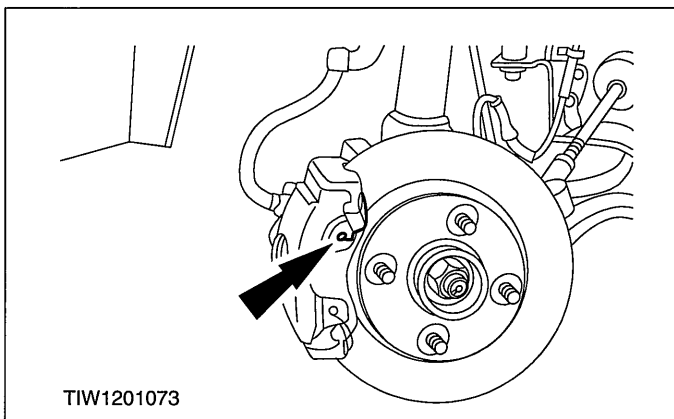
Removal

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Remove the wheel and tire.

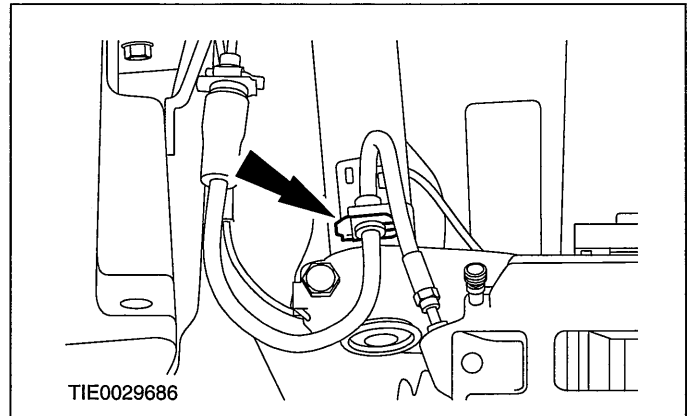
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

2. Remove the brake caliper retaining clip.

3. **NOTE:** Make a note of the position of the brake hose to aid installation.

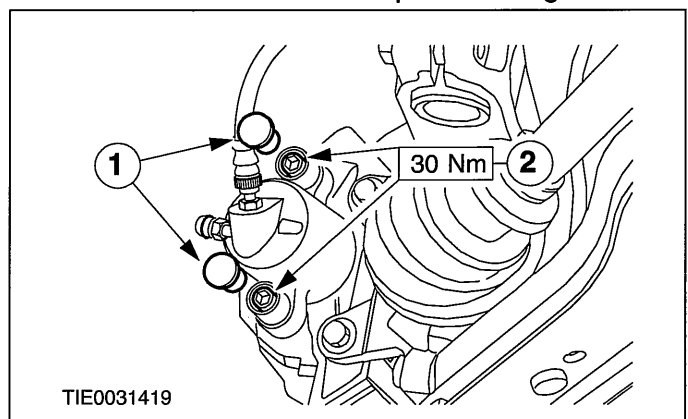
Detach the brake hose from the brake hose support bracket.

- Remove the brake hose retaining clip.

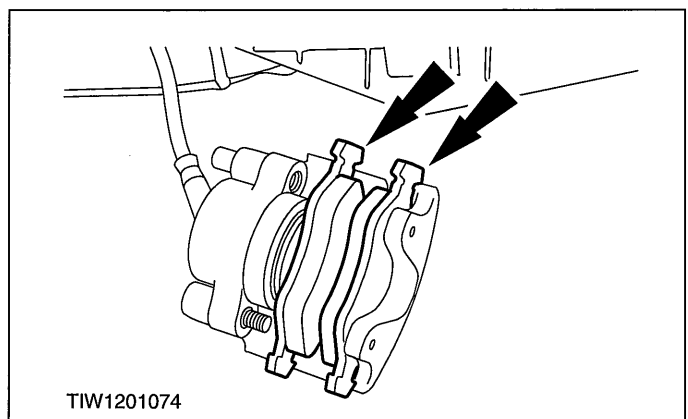
4. **⚠ CAUTION:** Suspend the brake caliper to prevent load being placed on the brake hose.

Detach the brake caliper from the brake caliper anchor plate.

1. Remove the brake caliper retaining bolt covers (if equipped).
2. Remove the brake caliper retaining bolts.



5. Remove the brake pads.



REMOVAL AND INSTALLATION

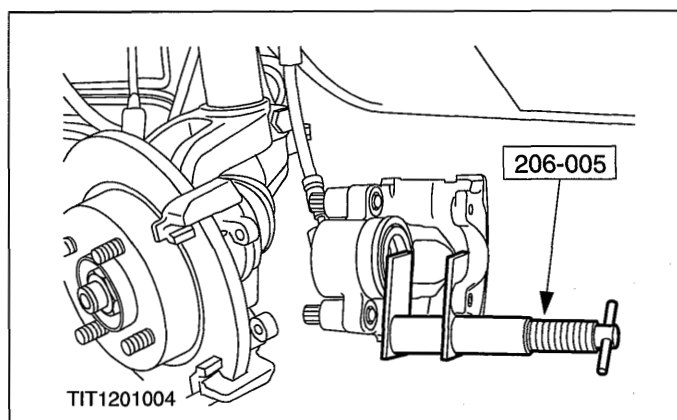
Installation

1. CAUTIONS:

⚠ When the brake caliper piston is retracted into the piston housing, brake fluid will be displaced into the brake fluid reservoir.

⚠ Support the brake caliper during brake caliper piston retraction.

Using the special tool, retract the brake caliper piston.



2. CAUTIONS:

⚠ Do not twist the brake hose when installing the brake caliper to prevent damage to the brake hose.

⚠ Make sure that the brake hose is correctly located in the brake hose support bracket to prevent damage to the brake hose.

⚠ Make sure that the brake hose retaining clip is located on the underside of the brake hose support bracket to prevent damage to the brake hose.

To install, reverse the removal procedure.

- Apply grease to the brake pad contact points.

3. Fully depress and release the brake pedal.

4. Check the fluid level in the brake fluid reservoir and top up if necessary with brake fluid.

REMOVAL AND INSTALLATION

Brake Caliper(12 243 0)

General Equipment

Brake hose clamp

Materials

Name	Specification
Silicone Grease	ESE-M1C171-A

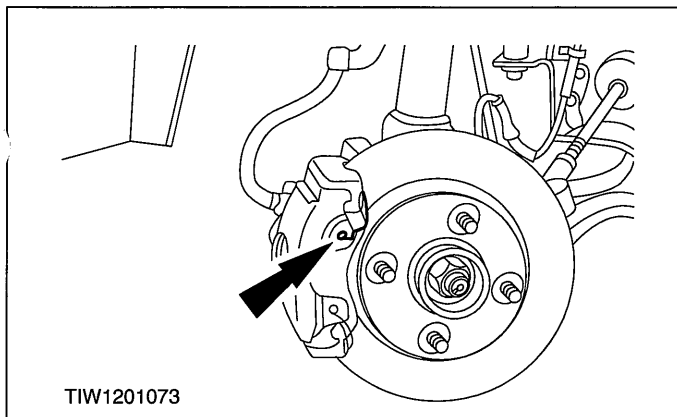
Removal

CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Remove the wheel and tire.

For additional information, refer to: **Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).**

2. Remove the brake caliper retaining clip.

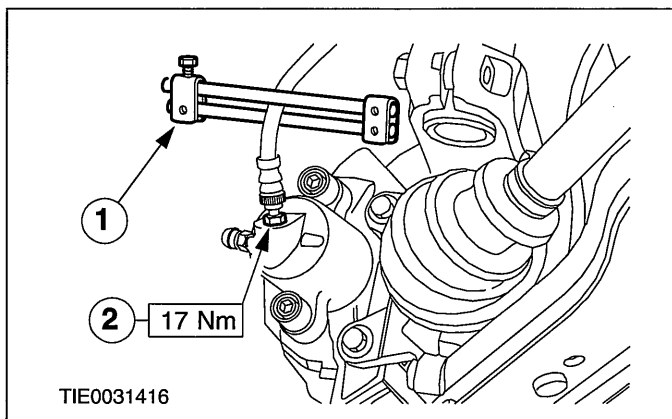
3. **CAUTION:** Cap the brake hose to prevent fluid loss or dirt ingress.

NOTE: Use a wrench to prevent the brake hose from rotating.

Disconnect the brake hose from the brake caliper.

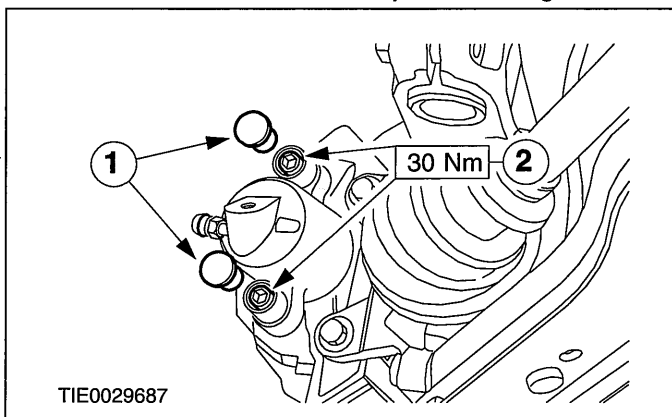
- Using a brake hose clamp, clamp the brake hose.

2. Disconnect the brake hose.

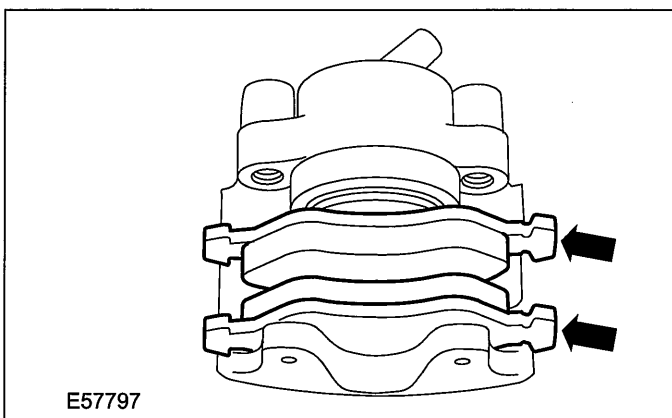


4. Remove the brake caliper.

- Remove the brake caliper retaining bolt covers (if equipped).
- Remove the brake caliper retaining bolts.



5. Remove the brake pads.



Installation

- CAUTION:** Do not twist the brake hose when connecting the brake hose to the brake caliper to prevent damage to the brake hose.

REMOVAL AND INSTALLATION

To install, reverse the removal procedure.

- Apply grease to the brake pad contact points.

2. Bleed the brake system. For additional information, refer to: (206-00 Brake System - General Information)

Brake System Bleeding (General Procedures),

Brake System Pressure Bleeding (General Procedures).

SECTION 206-04 Rear Disc Brake

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-04-2
Brake Disc Specification.....	206-04-2
DESCRIPTION AND OPERATION	
Rear Disc Brake.....	206-04-3
DIAGNOSIS AND TESTING	
Rear Disc Brake.....	206-04-5
REMOVAL AND INSTALLATION	
Brake Pads..... (12 238 0)	206-04-6
Brake Caliper..... (12 253 0)	206-04-8
Brake Disc..... (12 225 0)	206-04-10
Brake Disc Shield.....	206-04-11

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

Item	Specification
Brake Fluid - Super DOT 4	ESD-M6C57-A

Brake Disc Specification

Description	mm
Brake disc diameter	280
New brake disc nominal thickness	10.15
Worn brake disc discard thickness*	8
Maximum brake disc thickness variation	0.02
Worn brake pad discard thickness*	1.50
Brake caliper piston diameter	34
*When the discard thickness has been reached, install a new brake disc/brake pads.	

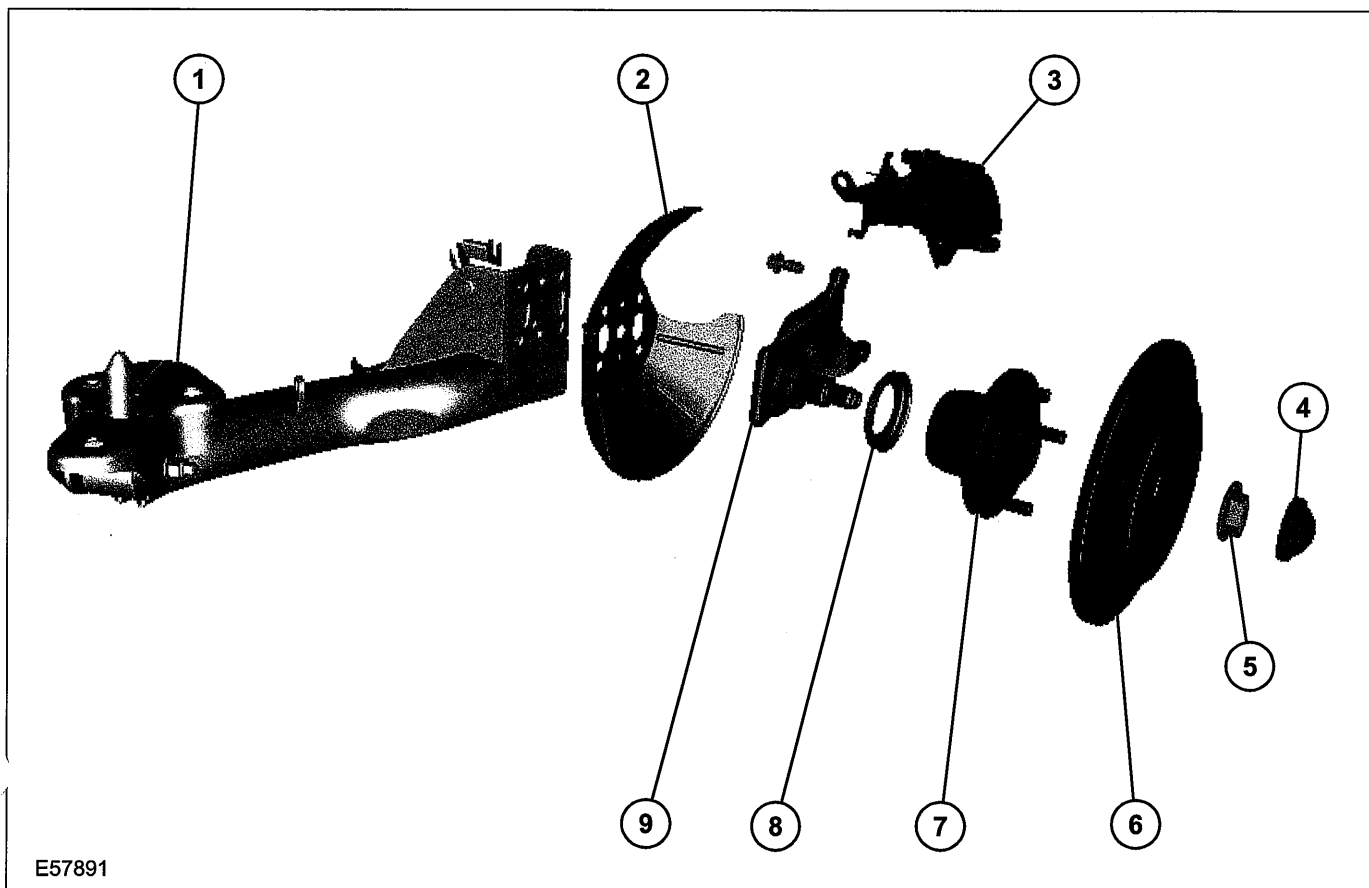
Torque Specifications

Item	Nm	lb-ft	lb-in
Wheel spindle retaining bolts	66	49	-
Brake caliper anchor plate retaining bolts	60	44	-
Brake caliper retaining bolts	35	26	-
Brake tube to brake caliper union	15	11	-

DESCRIPTION AND OPERATION

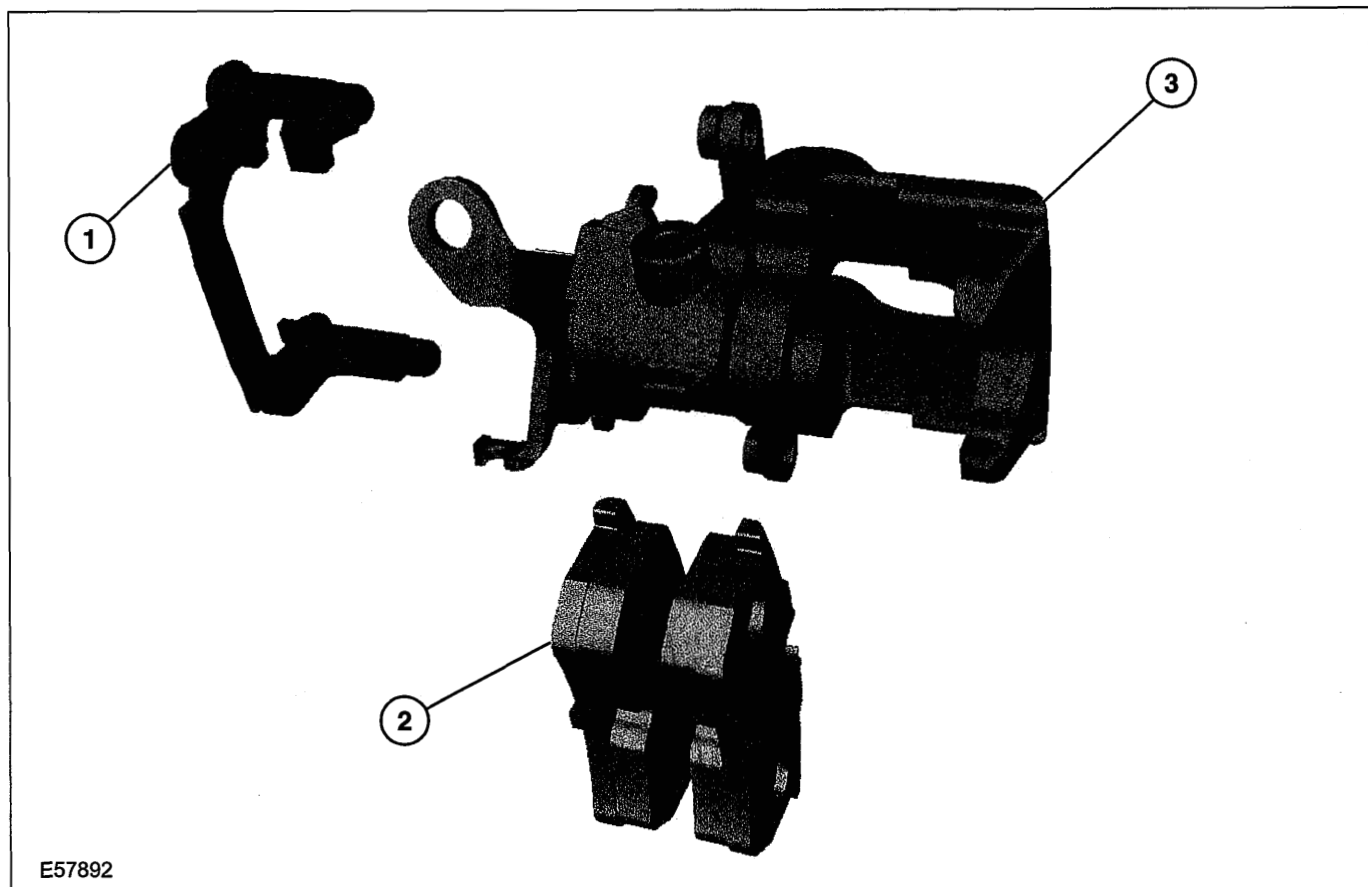
Rear Disc Brake

Rear Wheel Hub and Disc Brake Assembly



Item	Description
1	Beam axle
2	Brake disc shield
3	Brake caliper and brake caliper anchor plate assembly
4	Dust cap

Item	Description
5	Wheel hub retaining nut
6	Brake disc
7	Wheel hub
8	Wheel speed sensor ring
9	Wheel spindle

DESCRIPTION AND OPERATION**Brake Caliper and Brake Caliper Anchor Plate Assembly**

Item	Description
1	Brake caliper anchor plate
2	Brake pads
3	Brake caliper

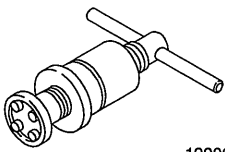
DIAGNOSIS AND TESTING**Rear Disc Brake**

REFER to: Brake System (206-00 Brake System
- General Information, Diagnosis and Testing).

REMOVAL AND INSTALLATION

Brake Pads(12 238 0)

Special Tool(s)

 12006	Retractor, Rear Brake Caliper Piston 206-012
--	--

Materials

Name	Specification
Brake Fluid - Super DOT4	ESD-M6C57-A

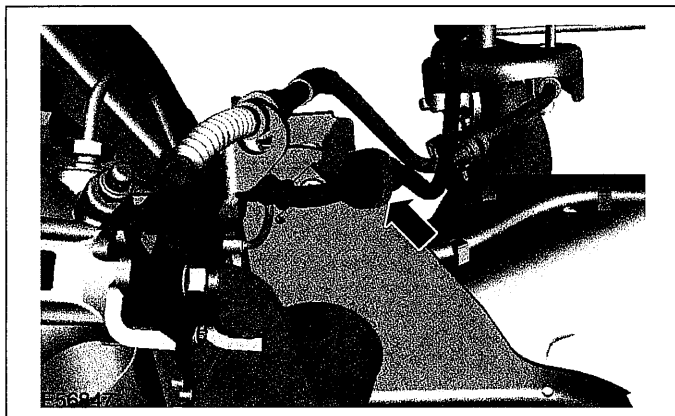
Removal

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Release the parking brake.
2. Remove the wheel and tire.

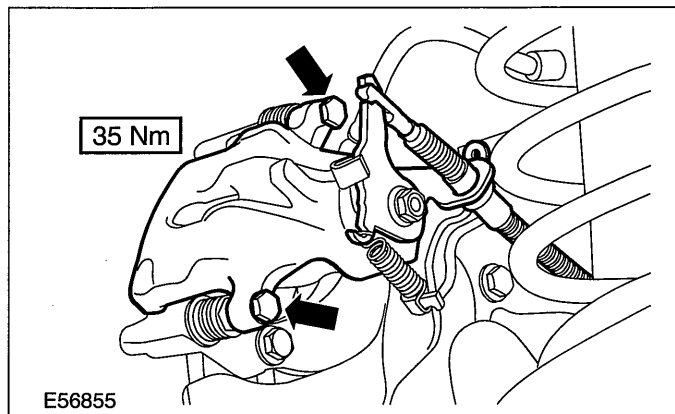
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. Detach the brake hose from the brake hose support bracket.

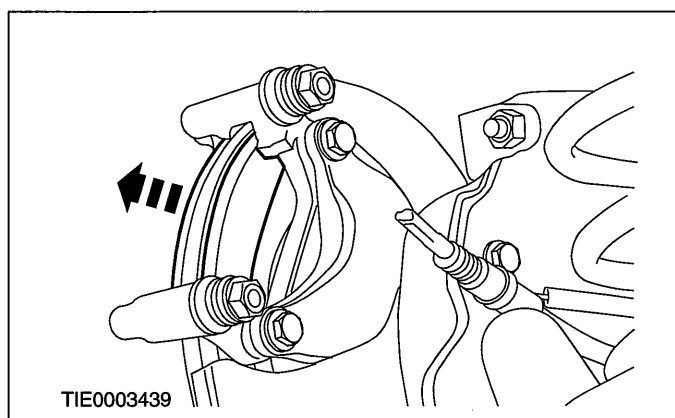


4. **⚠ CAUTION:** Suspend the brake caliper to prevent load being placed on the brake hose.

Detach the brake caliper from the brake caliper anchor plate.



5. Remove the brake pads.



Installation

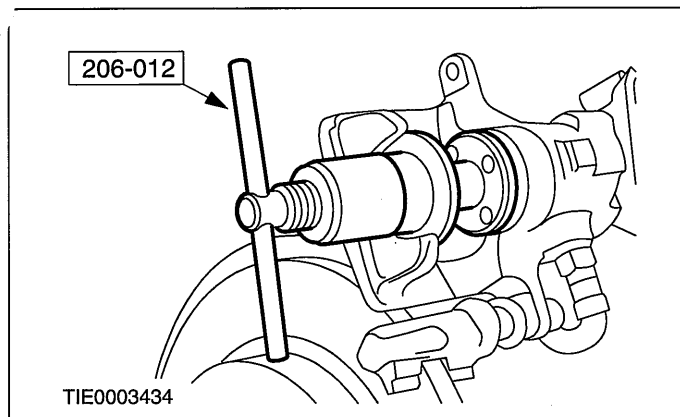
1. **CAUTIONS:**

⚠ When the brake caliper piston is retracted into the brake caliper piston housing, brake fluid will be displaced into the brake fluid reservoir.

⚠ Support the brake caliper during brake caliper piston retraction.

REMOVAL AND INSTALLATION

Using the special tool, retract the brake caliper piston.



2. NOTE:Make sure that the brake pad contact points are clean and free from contamination.

To install, reverse the removal procedure.

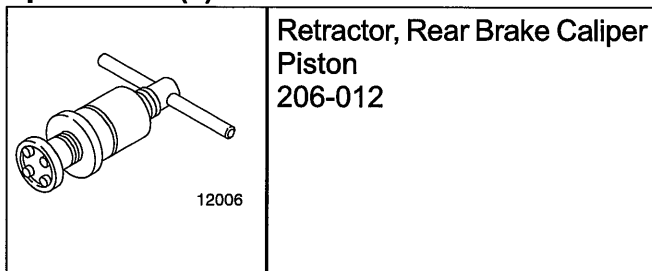
3. Fully depress and release the brake pedal.

4. Check the fluid level in the brake fluid reservoir and top up if necessary with brake fluid.

REMOVAL AND INSTALLATION

Brake Caliper(12 253 0)

Special Tool(s)



General Equipment

Brake hose clamp

Materials

Name	Specification
Brake Fluid - Super DOT4	ESD-M6C57-A

Removal

CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

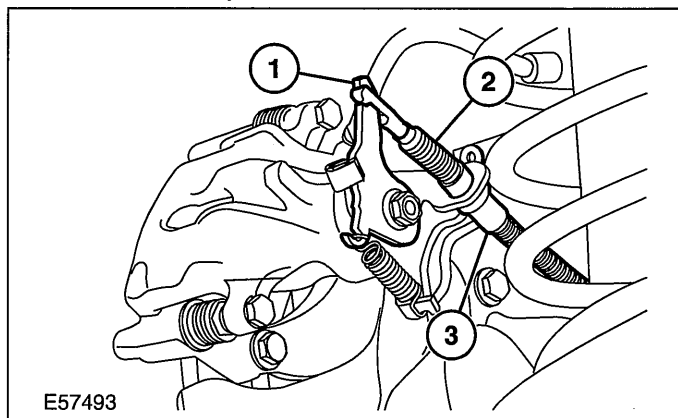
1. Release the parking brake.

2. Remove the wheel and tire.

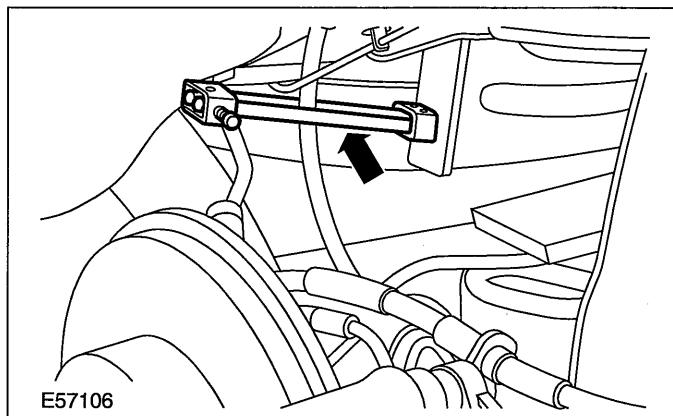
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. Detach the parking brake cable from the brake caliper.

1. Pull back the brake caliper lever.
2. Disconnect the parking brake cable from the brake caliper lever.
3. Detach the parking brake cable from the brake caliper.

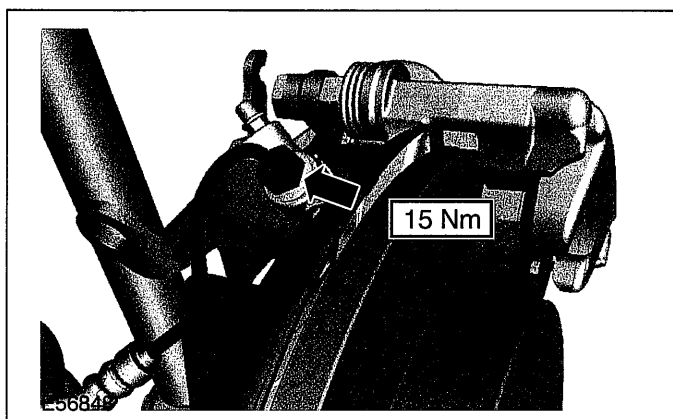


4. Using a brake hose clamp, clamp the brake hose.

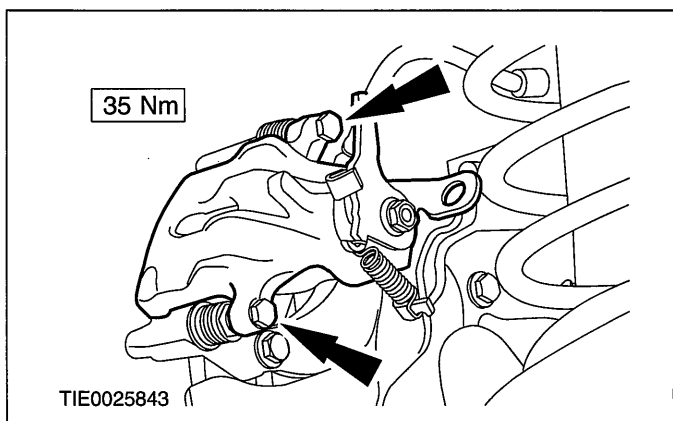


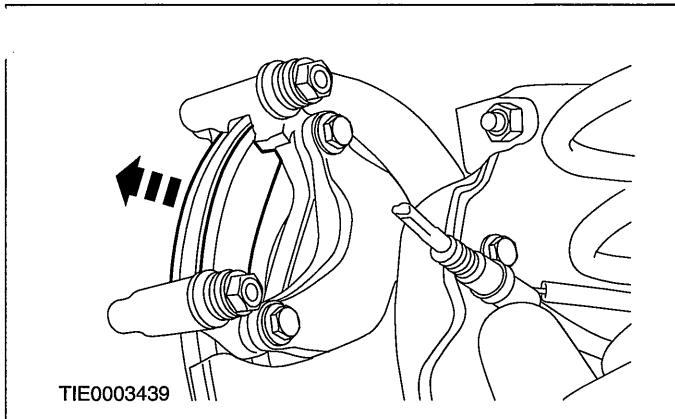
5. **CAUTION:** Cap the brake hose to prevent fluid loss or dirt ingress.

Disconnect the brake tube from the brake caliper.

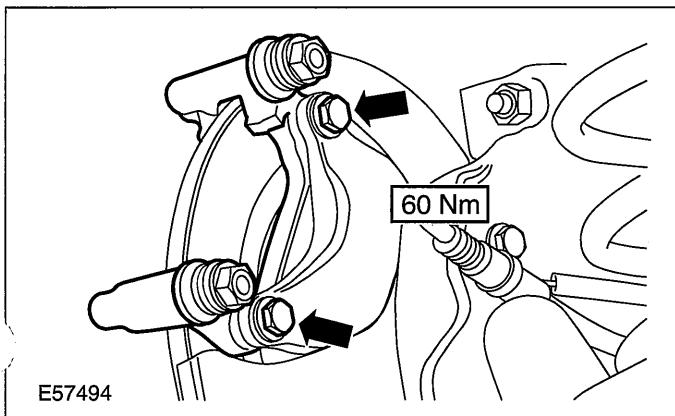
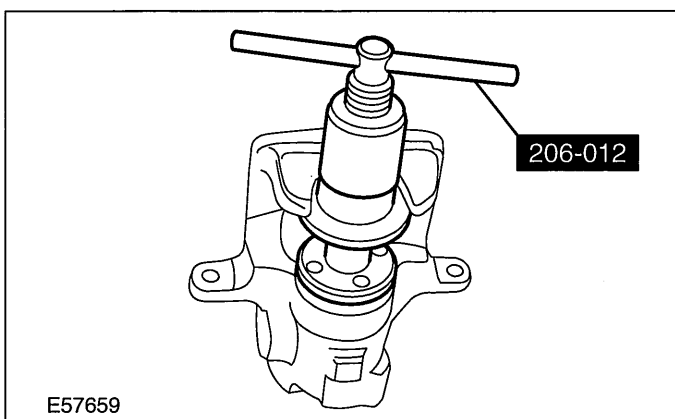


6. Detach the brake caliper from the brake caliper anchor plate.



REMOVAL AND INSTALLATION**7. Remove the brake pads.****3. Bleed the brake system. For additional information, refer to: (206-00 Brake System - General Information)**

**Brake System Bleeding (General Procedures),
Brake System Pressure Bleeding (General Procedures).**

8. Remove the brake caliper anchor plate.**Installation****1. Using the special tool, retract the brake caliper piston.****2. NOTE: Make sure that the brake pad contact points are clean and free from contamination.**

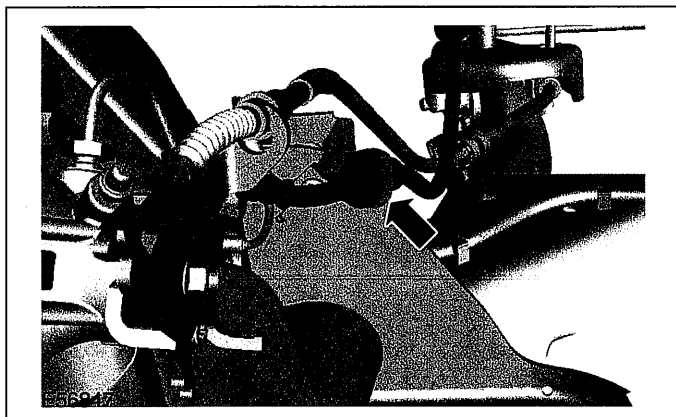
To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Brake Disc(12 225 0)****Removal**

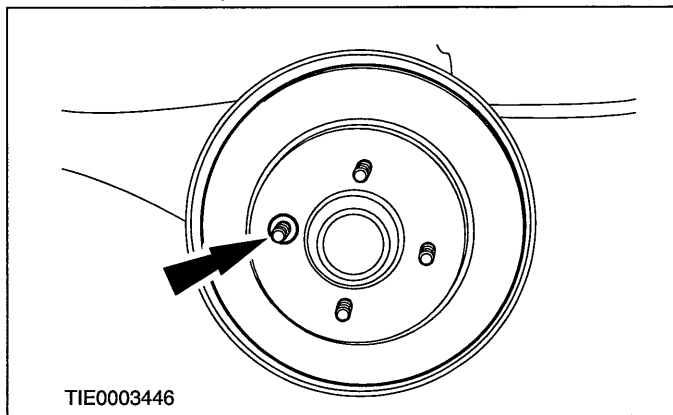
1. Release the parking brake.
2. Remove the wheel and tire.

For additional information, refer to: **Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).**

3. Detach the brake hose from the brake hose support bracket.



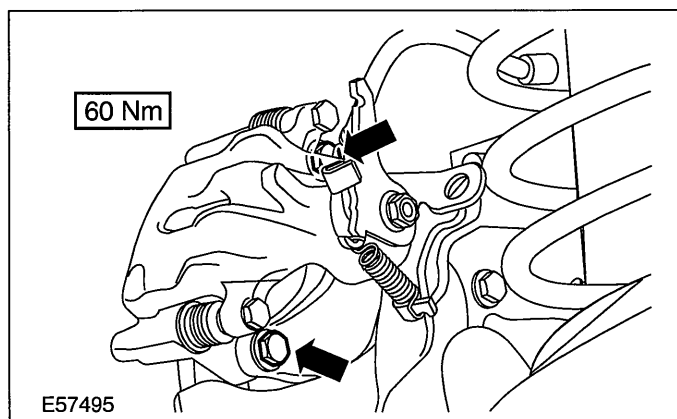
- Remove the brake disc retaining clip (if equipped).

**Installation**

1. To install, reverse the removal procedure.

4. **⚠ CAUTION:** Suspend the brake caliper and brake caliper anchor plate assembly to prevent load being placed on the brake hose.

Detach the brake caliper and brake caliper anchor plate assembly from the wheel spindle (parking brake cable shown removed for clarity).



5. Remove the brake disc.

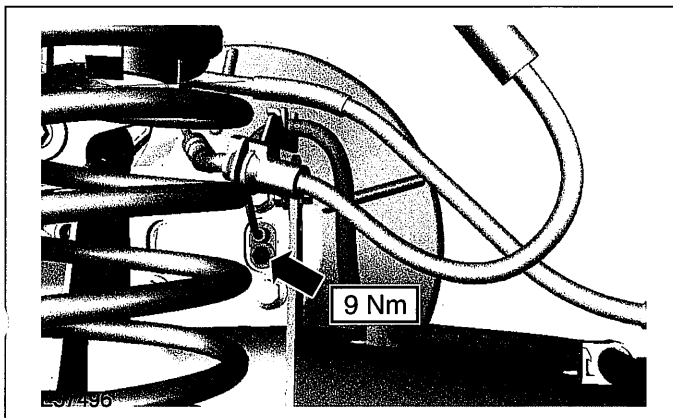
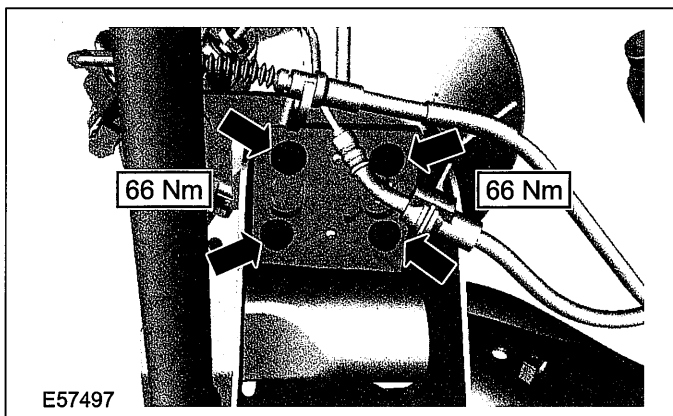
REMOVAL AND INSTALLATION**Brake Disc Shield****General Equipment**

Electric hand drill

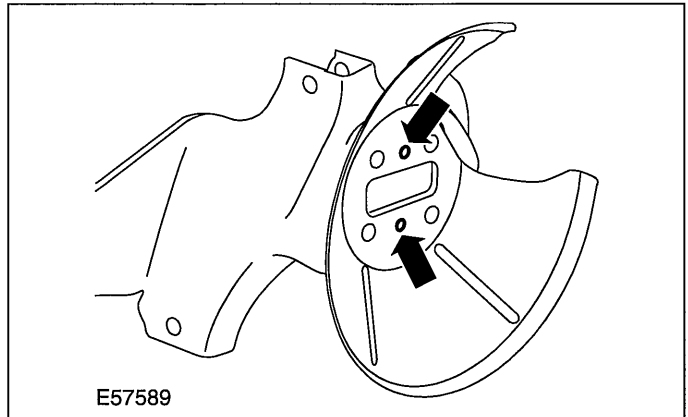
Blind rivet gun

Removal**1. Remove the brake disc.**

For additional information, refer to: **Brake Disc (206-04 Rear Disc Brake, Removal and Installation).**

2. Detach the wheel speed sensor from the wheel spindle.**3. Remove the wheel spindle and wheel hub assembly.****4. Remove the brake disc shield.**

- Using an electric hand drill, remove the rivets.

**Installation**

1. **⚠ CAUTION:** Make sure that the mating faces are clean and free from rust and foreign material.

NOTE: Using a blind rivet gun, install new rivets.

To install, reverse the removal procedure.



SECTION 206-05 Parking Brake and Actuation

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-05-2
DESCRIPTION AND OPERATION	
Parking Brake.....	206-05-3
Overview.....	206-05-3
DIAGNOSIS AND TESTING	
Parking Brake.....	206-05-5
Inspection and Verification.....	206-05-5
Symptom Chart.....	206-05-5
Pinpoint Tests.....	206-05-5
GENERAL PROCEDURES	
Parking Brake Cable Adjustment — Vehicles With: Rear Drum Brakes..... (12 662 0)	206-05-9
Parking Brake Cable Adjustment — Vehicles With: Rear Disc Brakes..... (12 662 0)	206-05-11
REMOVAL AND INSTALLATION	
Parking Brake Cable — Vehicles With: Rear Drum Brakes..... (12 675 0)	206-05-13
Parking Brake Cable — Vehicles With: Rear Disc Brakes..... (12 675 0)	206-05-15
Parking Brake Control..... (12 664 0)	206-05-17

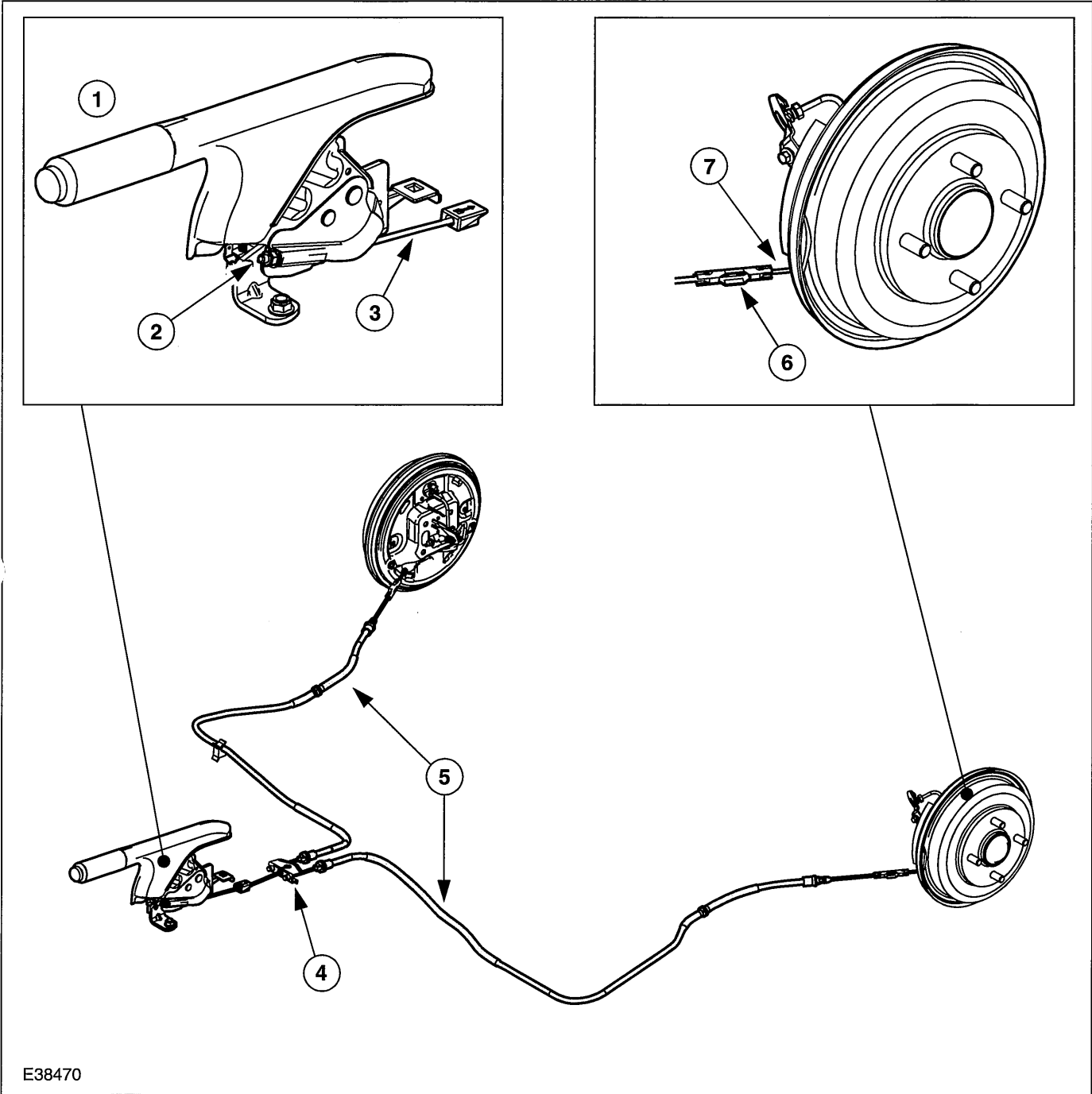
SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Parking brake cable adjustment nut	4	-	35
Parking brake control retaining nuts	24	18	-

DESCRIPTION AND OPERATION

Parking Brake

Overview



E38470

Item	Description
1	Handbrake lever
2	Handbrake adjusting nut
3	Front handbrake cable
4	Equaliser
5	Handbrake cables

Item	Description
6	Sleeve connection
7	Rear handbrake cable

DESCRIPTION AND OPERATION

Layout

The handbrake cable mechanism consists of three sections: the front handbrake cable, the two handbrake cables underneath the vehicle and the two rear handbrake cables leading to the brakes.

The front handbrake cable is connected to the handbrake lever via a threaded piece and a nut. This nut is used to adjust the handbrake cable.

The two handbrake cables underneath the vehicle are both connected via a threaded piece and a nut to the equaliser and therefore the front handbrake cable. They are connected to the rear handbrake cables via a sleeve connection.

The rear handbrake cables in turn link into the lever mechanism of the rear brakes.

Function

When the handbrake lever is operated, the front handbrake cable acts via the equaliser onto the two handbrake cables underneath the vehicle. Via the sleeve connection pieces these then act onto the rear handbrake cables and, via the lever mechanism, onto the brake.

DIAGNOSIS AND TESTING**Parking Brake****Inspection and Verification**

1. Verify the customer concern by operating the parking brake system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Parking brake control REFER to: Parking Brake Control (206-05, Removal and Installation). – Cable and conduit REFER to: Parking Brake Cable (206-05, Removal and Installation).	– Parking brake warning circuit. REFER to: Instrument Cluster (413-01, Diagnosis and Testing).

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• The parking brake will not apply	• Parking brake control. • Cable and conduit.	• GO to Pinpoint Test A.
• The parking brake will not release	• Parking brake control. • Cable and conduit.	• GO to Pinpoint Test B.

Pinpoint Tests**PINPOINT TEST A : THE PARKING BRAKE WILL NOT APPLY**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
------------------------	--------------------------------

A1: CHECK FOR MISADJUSTED REAR PARKING BRAKE CABLE

	1 Operate the parking brake control several times to adjust the cable. • Does the parking brake now engage correctly? → Yes Vehicle OK → No GO to A2.
--	--

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A2: CHECK FOR WORN BRAKE SHOES OR PADS	
	1 Inspect the brake shoes or pads for excessive wear. REFER to: Specifications (206-00, Specifications) / Brake Shoes (206-02 Drum Brake, Removal and Installation) / Brake Pads (206-04, Removal and Installation). • Are the brake shoe linings or brake pads OK? → Yes GO to A3. → No INSTALL new brake shoes or pads. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation) / Brake Pads (206-04, Removal and Installation). TEST the system for normal operation.
A3: CHECK FOR DAMAGED PARKING BRAKE CABLES	
	1 Inspect the parking brake cables and conduits for damage, rust or fraying. • Are the parking brake cables and conduits OK? → Yes CHECK for other causes such as loose parking brake control or conventional brake system components. → No REPAIR or INSTALL cables and conduit as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING**PINPOINT TEST B : THE PARKING BRAKE WILL NOT RELEASE**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK PARKING BRAKE CONTROL	
	1 Raise and support the vehicle on a lift with the parking brake fully applied. REFER to: Lifting (100-02, Description and Operation). - With the aid of another technician, release the parking brake and check the operation of the brake cables and levers. - Did the parking brake release? → Yes CHECK the other causes such as conventional brake system components. REPAIR or INSTALL new components as necessary. → No GO to B2.
B2: CHECK PARKING BRAKE CABLES	
	1 Loosen the parking brake cable tension. - Rotate the rear wheels by hand. - Did the rear wheels turn freely? → Yes INSTALL a new parking brake control. REFER to: Parking Brake Control (206-05, Removal and Installation). TEST the system for normal operation. → No GO to B3.
B3: CHECK FRONT PARKING BRAKE CABLE	
	1 Disconnect the parking brake front cable and conduit from the rear brake cable and conduit at the equalizer. - Rotate the rear wheels by hand. - Did the rear wheels turn freely? → Yes INSTALL a new front parking brake cable and conduit. REFER to: Parking Brake Cable (206-05, Removal and Installation). TEST the system for normal operation. → No GO to B4.

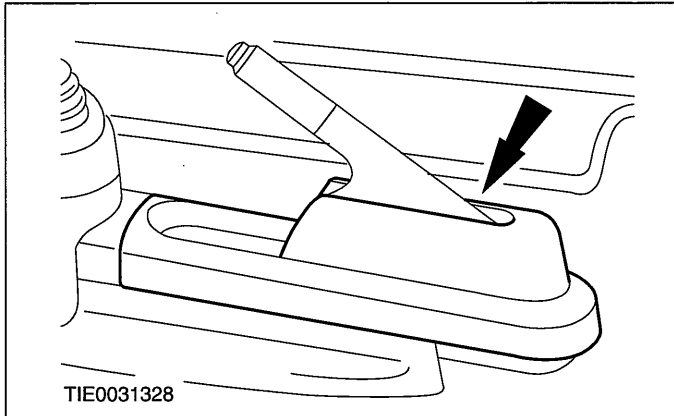
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B4: CHECK REAR PARKING BRAKE CABLES	
	1 Disconnect the parking brake at the rear brakes, one at a time. – Rotate the wheel affected by the disconnected parking brake. • Did the wheel turn freely? → Yes INSTALL a new parking brake control lever on the rear drum brakes or caliper assembly on rear disc brakes. REFER to: Brake Shoes (206-02 Drum Brake, Removal and Installation) / Brake Caliper (206-04, Removal and Installation). TEST the system for normal operation. → No REFER to: Brake System (206-00, Diagnosis and Testing).

GENERAL PROCEDURES

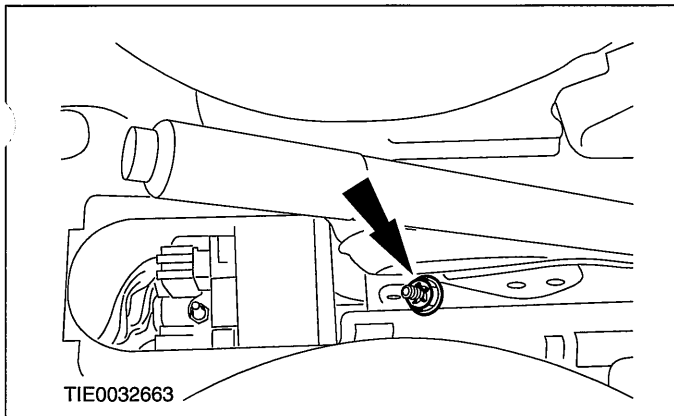
Parking Brake Cable Adjustment — Vehicles With: Rear Drum Brakes(12 662 0)

1. Remove the parking brake control trim panel.



2. Loosen the parking brake cable adjustment nut to the end of the thread.

- Discard the retaining clip.



3. Release the parking brake.

4. Make sure that the parking brake cable is correctly located.

5. NOTE: Prior to carrying out the adjustment to a new or relocated parking brake cable, settle the parking brake system.

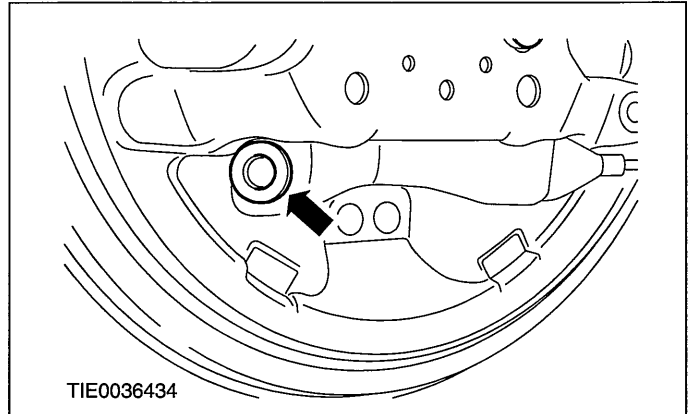
Settle the parking brake system in five stages.

- Stage 1: Raise the parking brake control four notches.
- Stage 2: Tighten the adjustment nut until increased torque is detected.
- Stage 3: Operate the parking brake control firmly ten times.
- Stage 4: Loosen the adjustment nut to the end of the thread.

- Stage 5: Depress the brake pedal firmly fifteen times.

6. Release the parking brake.

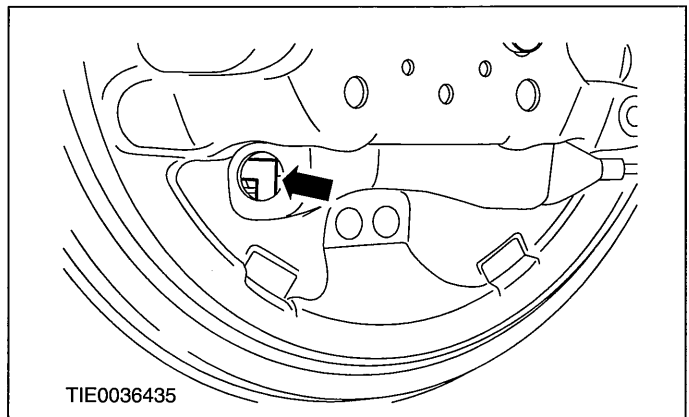
7. Remove the brake backing plate inspection cover on both sides (left-hand side shown).



8. NOTE: Make sure that the parking brake control is fully released.

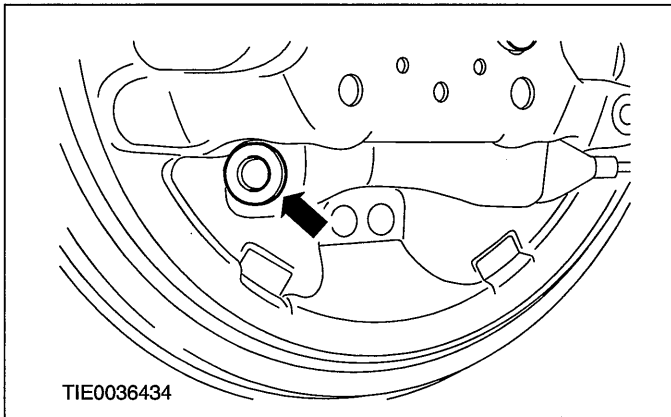
Adjust the parking brake cable in two stages

- Stage 1: With the aid of another technician, tighten the parking brake cable adjustment nut until the parking brake levers operate (left-hand side shown).
- Stage 2: When movement is observed on both levers, tighten the parking brake cable adjustment nut two full turns.

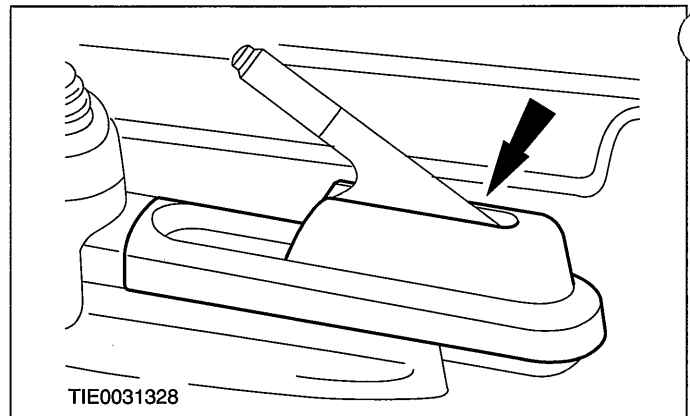


GENERAL PROCEDURES

9. Install the brake backing plate inspection cover on both sides (left-hand side shown).



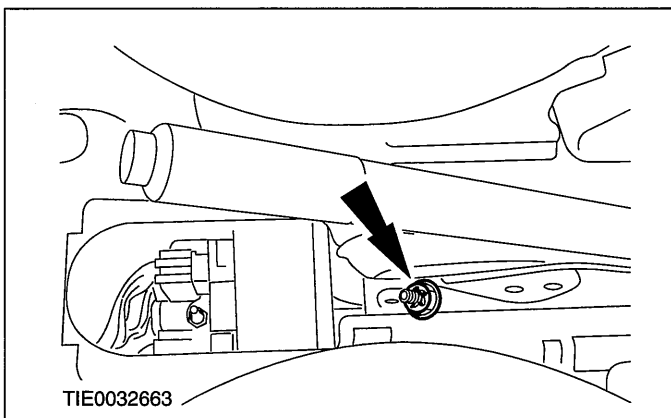
12. Install the parking brake control trim panel.



10. Check the parking brake cable adjustment in two stages.

- Stage 1: Raise and release the parking brake control and check that it returns to the fully released position. If the parking brake control does not fully release, repeat the adjustment procedure.
- Stage 2: Rotate the rear wheels and check for brake drag. If brake drag is felt, loosen the parking brake cable adjustment nut two full turns and repeat the adjustment procedure.

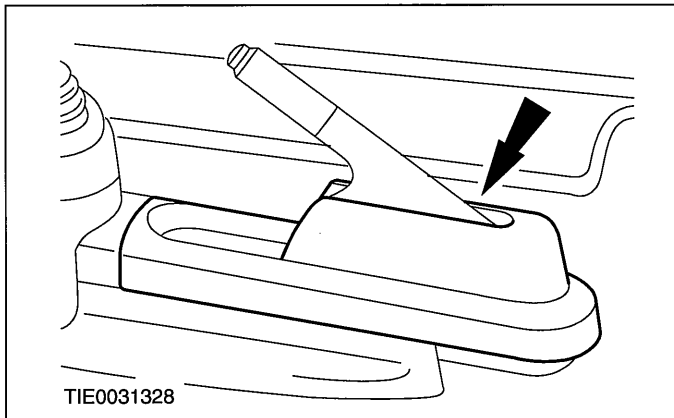
11. Install a new parking brake cable adjustment nut retaining clip.



GENERAL PROCEDURES

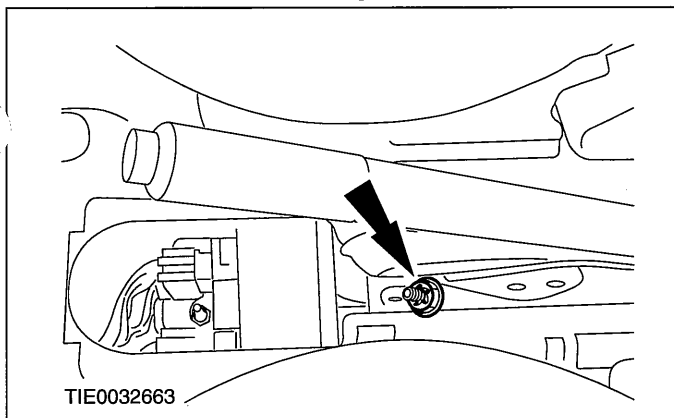
Parking Brake Cable Adjustment — Vehicles With: Rear Disc Brakes(12 662 0)

1. Remove the parking brake control trim panel.



2. Loosen the parking brake cable adjustment nut to the end of the thread.

- Discard the retaining clip.



3. Release the parking brake.

4. Make sure that the parking brake cable is correctly located.

5. NOTE: Prior to carrying out adjustment to a new or relocated parking brake cable, settle the parking brake system.

Settle the parking brake system in 5 stages.

- Stage 1: Raise the parking brake control 4 notches.
- Stage 2: Tighten the parking brake cable adjustment nut until increased torque is detected.
- Stage 3: Operate the parking brake control firmly 10 times.
- Stage 4: Loosen the parking brake cable adjustment nut to the end of the thread.

- Stage 5: Depress the brake pedal firmly 15 times.

6. Release the parking brake.

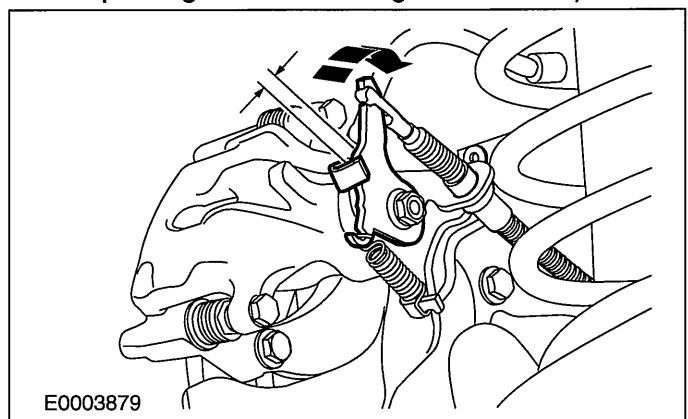
7. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

8. NOTE: Make sure that the parking brake control is fully released.

Adjust the parking brake cable in 2 stages.

- Stage 1: With the aid of another technician, tighten the parking brake cable adjustment nut until both the parking brake actuating levers start to move (left-hand parking brake actuating lever shown).
- Stage 2: Tighten the parking brake cable adjustment nut until the total movement between both the parking brake actuating levers and the stops, when added together, is between 0.5 mm and 2.0 mm (left-hand parking brake actuating lever shown).



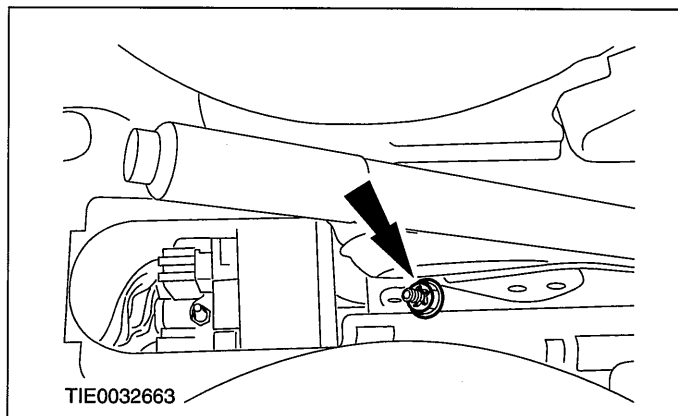
9. Check the parking brake cable adjustment in 2 stages.

- Stage 1: Raise and release the parking brake control and check that it returns to the fully released position. If the parking brake control does not fully release, repeat the adjustment procedure.
- Stage 2: Rotate the rear wheels and check for brake drag. If brake drag is felt, loosen the parking brake cable adjustment nut 2 full turns and repeat the adjustment procedure.

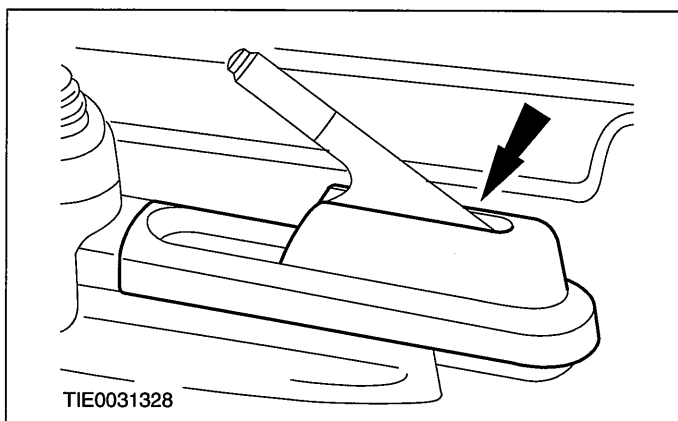
10. Lower the vehicle.

GENERAL PROCEDURES

11. Install a new parking brake cable adjustment nut retaining clip.



12. Install the parking brake control trim panel.



REMOVAL AND INSTALLATION

Parking Brake Cable — Vehicles With: Rear Drum Brakes(12 675 0)

Materials

Name	Specification
Lubricant	ESE-M99B144-B

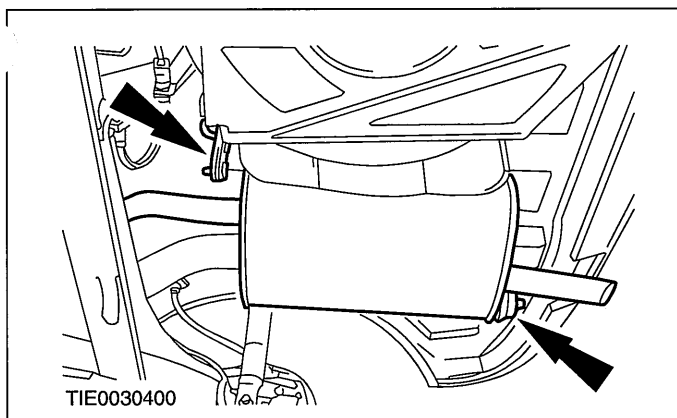
Removal

1. Release the parking brake.
2. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

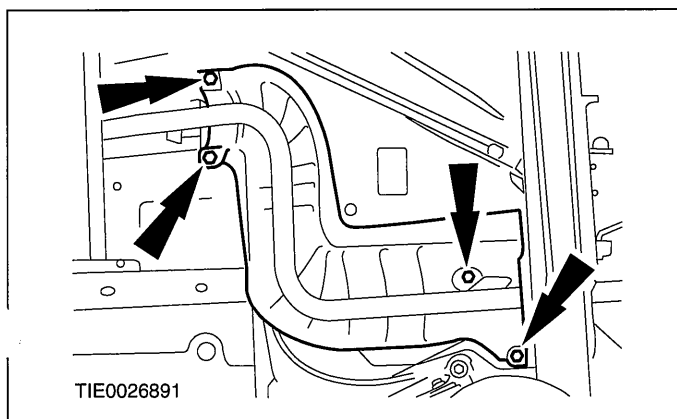
Jacking (Description and Operation),
Lifting (Description and Operation).

3. **⚠ CAUTION:** Take care when removing the exhaust hanger insulators to prevent damage.

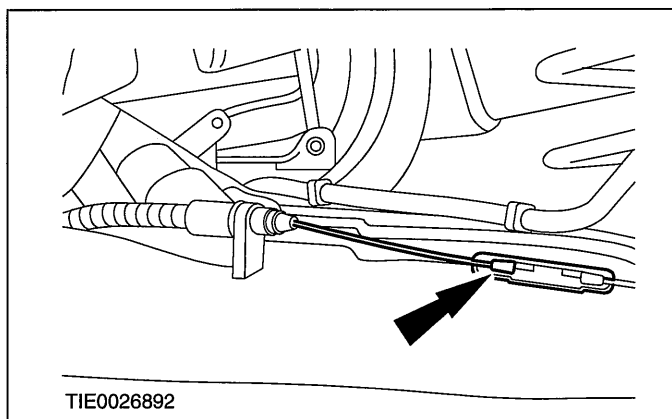
Detach the exhaust rear muffler from the exhaust hanger insulators.



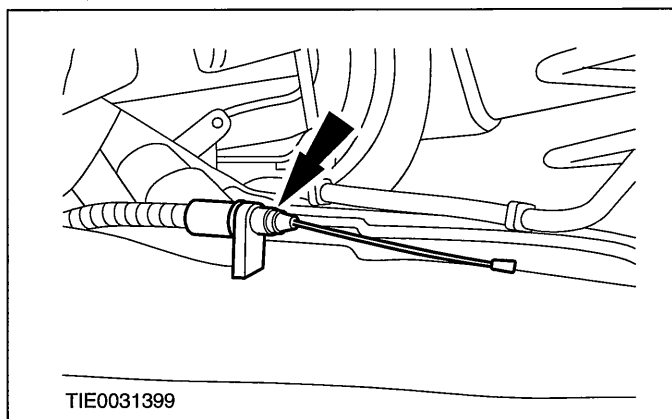
4. Detach the center section of the exhaust system heat shield from the floor panel.



5. Disconnect the parking brake cable on both sides.

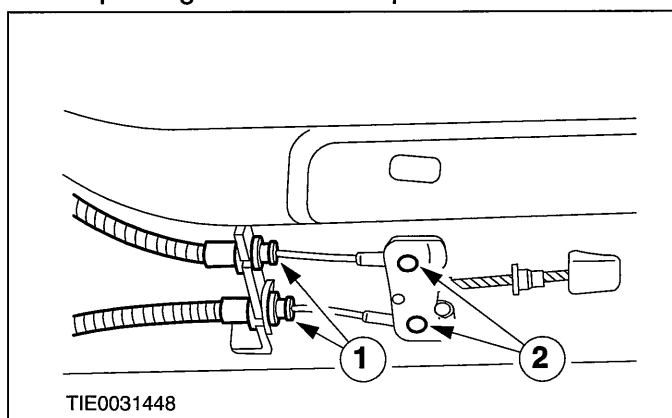


6. Detach the parking brake cable from the beam axle on both sides.



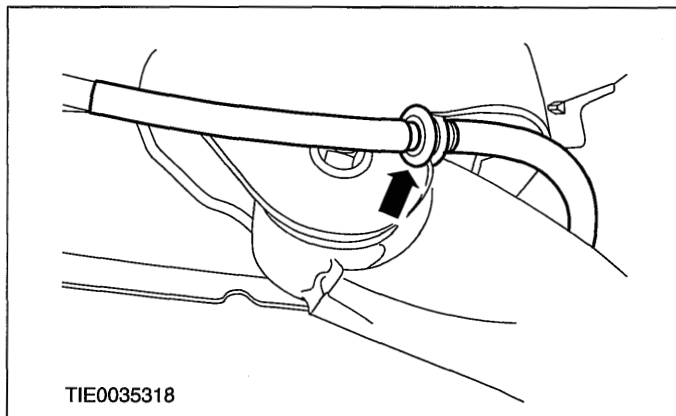
7. Detach the parking brake cables from the parking brake cable equalizer.

1. Detach the parking brake cables from the parking brake cable support bracket.
2. Detach the parking brake cables from the parking brake cable equalizer.

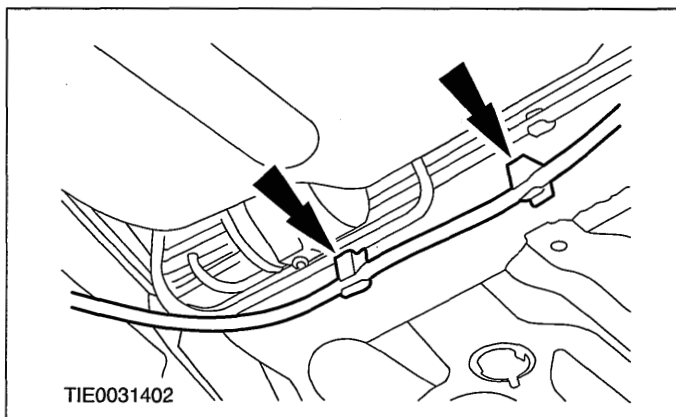


REMOVAL AND INSTALLATION

8. Detach the parking brake cable from the beam axle bracket on both sides.



9. Detach the parking brake cable from the floor panel crossmember on both sides.



10. Remove the parking brake cable.

Installation

1. **⚠ CAUTION:** Take care when installing the exhaust hanger insulators to prevent damage.

NOTE: Check the exhaust hanger insulators for damage. Install new exhaust hanger insulators if required.

To install, reverse the removal procedure.

2. Adjust the parking brake.

For additional information, refer to: Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (206-05 Parking Brake and Actuation, General Procedures).

REMOVAL AND INSTALLATION

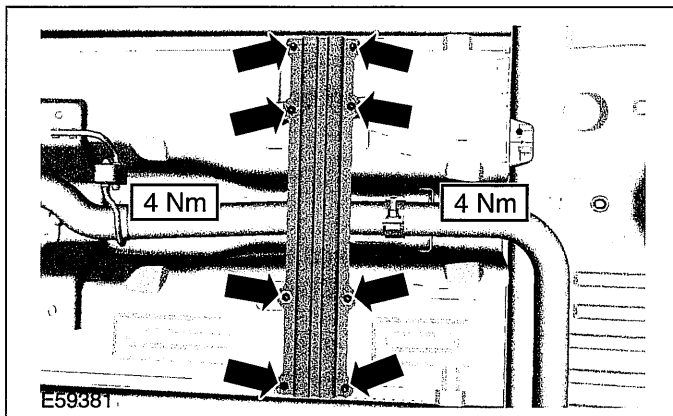
Parking Brake Cable — Vehicles With: Rear Disc Brakes(12 675 0)

Removal

1. Release the parking brake.
2. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

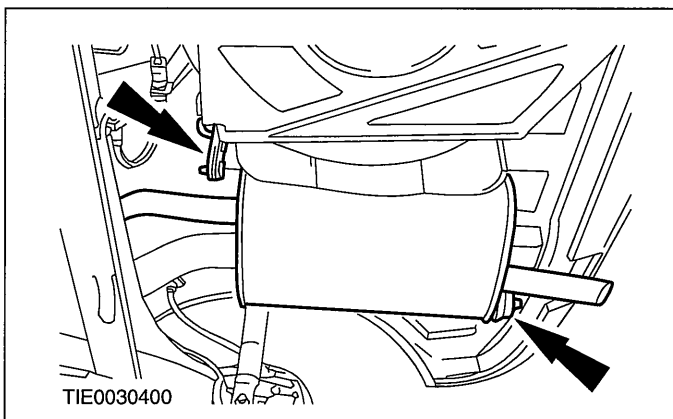
3. Remove the floor panel crossmember.



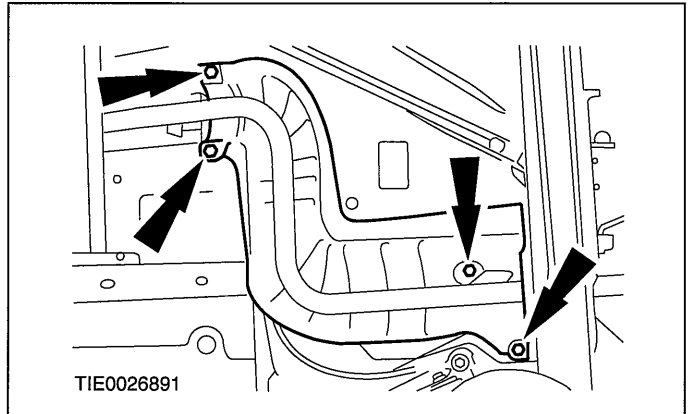
4. **⚠ CAUTION:** Take care when removing the exhaust hanger insulators to prevent damage.

NOTE: Support the rear muffler.

Detach the rear muffler from the exhaust hanger insulators.

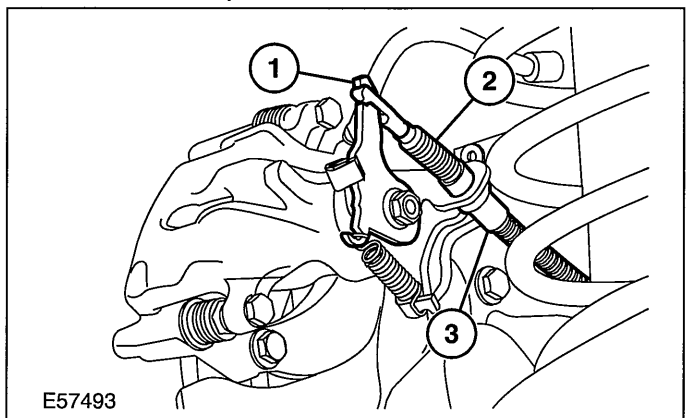


5. Detach the center section of the exhaust system heat shield from the floor pan.



6. Detach the parking brake cable from the brake caliper on both sides.

1. Pull back the parking brake actuating lever.
2. Disconnect the parking brake cable from the parking brake actuating lever.
3. Detach the parking brake cable from the brake caliper bracket.



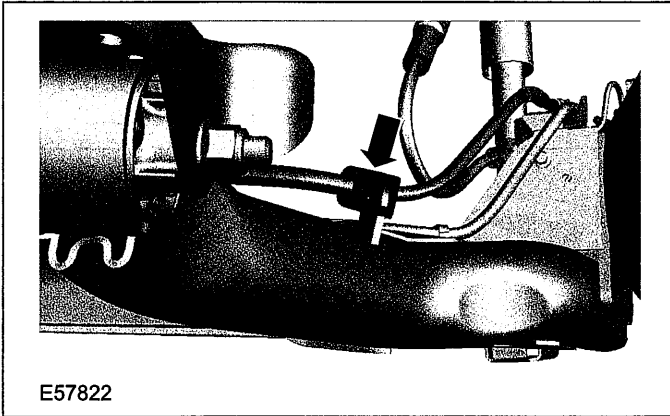
7. **⚠ CAUTION:** Do not apply excessive force when releasing the parking brake cable clip locking tangs from the parking brake cable clip support bracket. Failure to follow this instruction may result in damage to the clip.

NOTE: The parking brake cable clip is secured to the parking brake cable support bracket by a locking tang on either side of the clip.

Detach the parking brake cable from the beam axle on both sides.

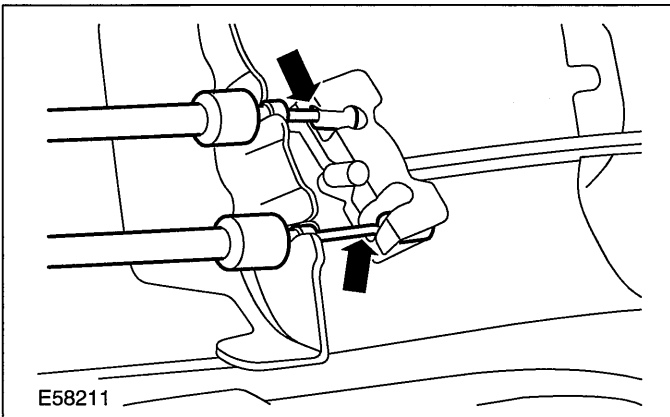
REMOVAL AND INSTALLATION

- Release the locking tangs.

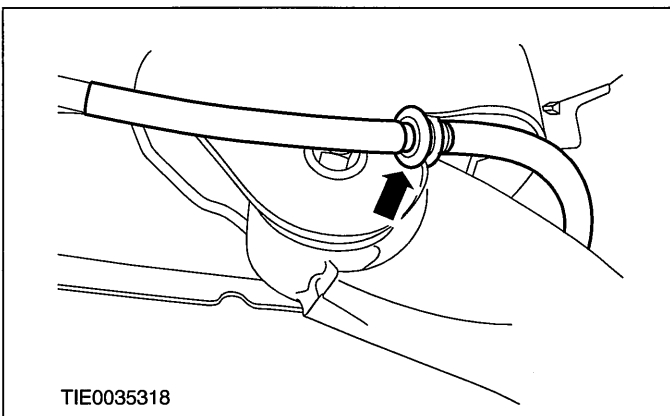


8. Detach the parking brake cables from the parking brake cable equalizer.

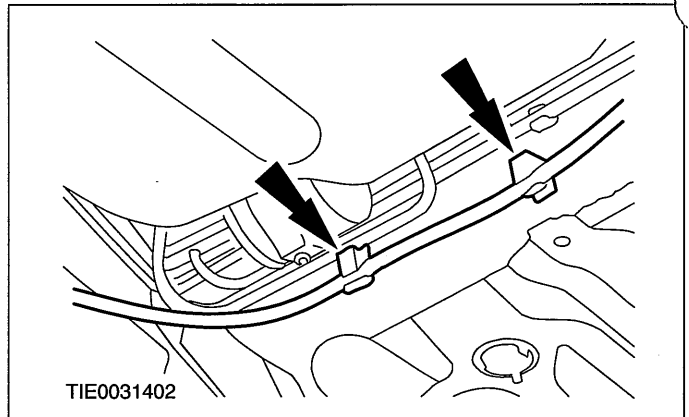
- Detach the parking brake cables from the parking brake cable support bracket.



9. Detach the parking brake cable from the beam axle bracket on both sides.



10. Detach the parking brake cable from the floor pan on both sides.



11. Remove the parking brake cable.

Installation

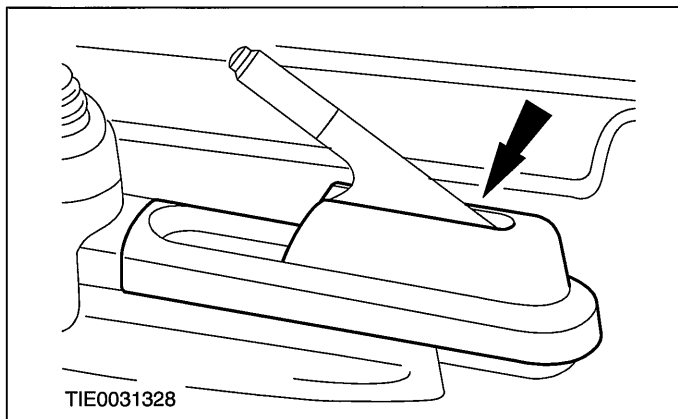
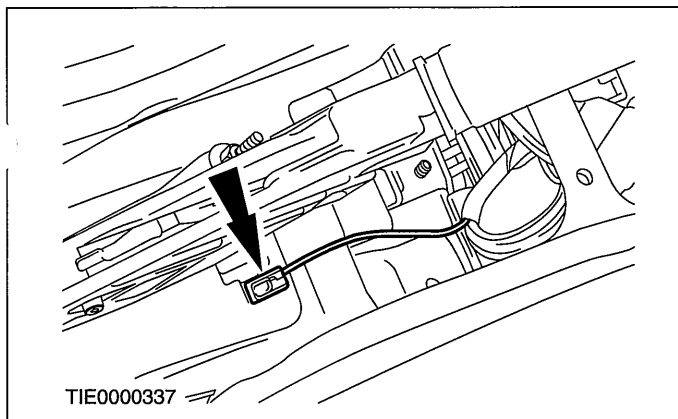
1. **⚠ CAUTION:** Take care when installing the exhaust hanger insulators to prevent damage.

NOTE: Check the exhaust hanger insulators for damage. Install new exhaust hanger insulators if required.

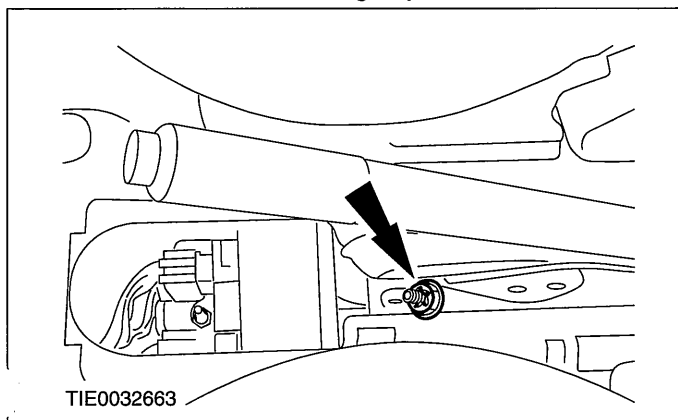
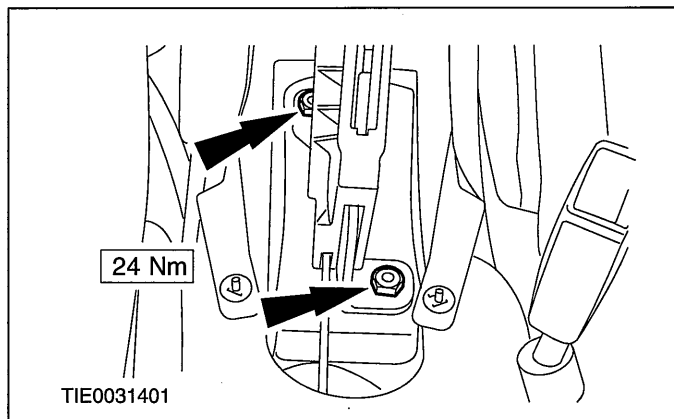
To install, reverse the removal procedure.

2. Adjust the parking brake.

For additional information, refer to: Parking Brake Cable Adjustment - Vehicles With: Rear Disc Brakes (206-05 Parking Brake and Actuation, General Procedures).

REMOVAL AND INSTALLATION**Parking Brake Control(12 664 0)****Removal****1. Remove the parking brake control trim panel.****2. Disconnect the parking brake warning indicator switch electrical connector.****3. Disconnect the parking brake cable from the parking brake control.**

- Discard the retaining clip.

**4. Release the parking brake.****5. Remove the parking brake control.****Installation**

1. To install, reverse the removal procedure.
2. Adjust the parking brake.

For additional information, refer to Parking Brake Cable Adjustment in this section.

SECTION 206-06 Hydraulic Brake Actuation

VEHICLE APPLICATION:2006.0 Fiesta

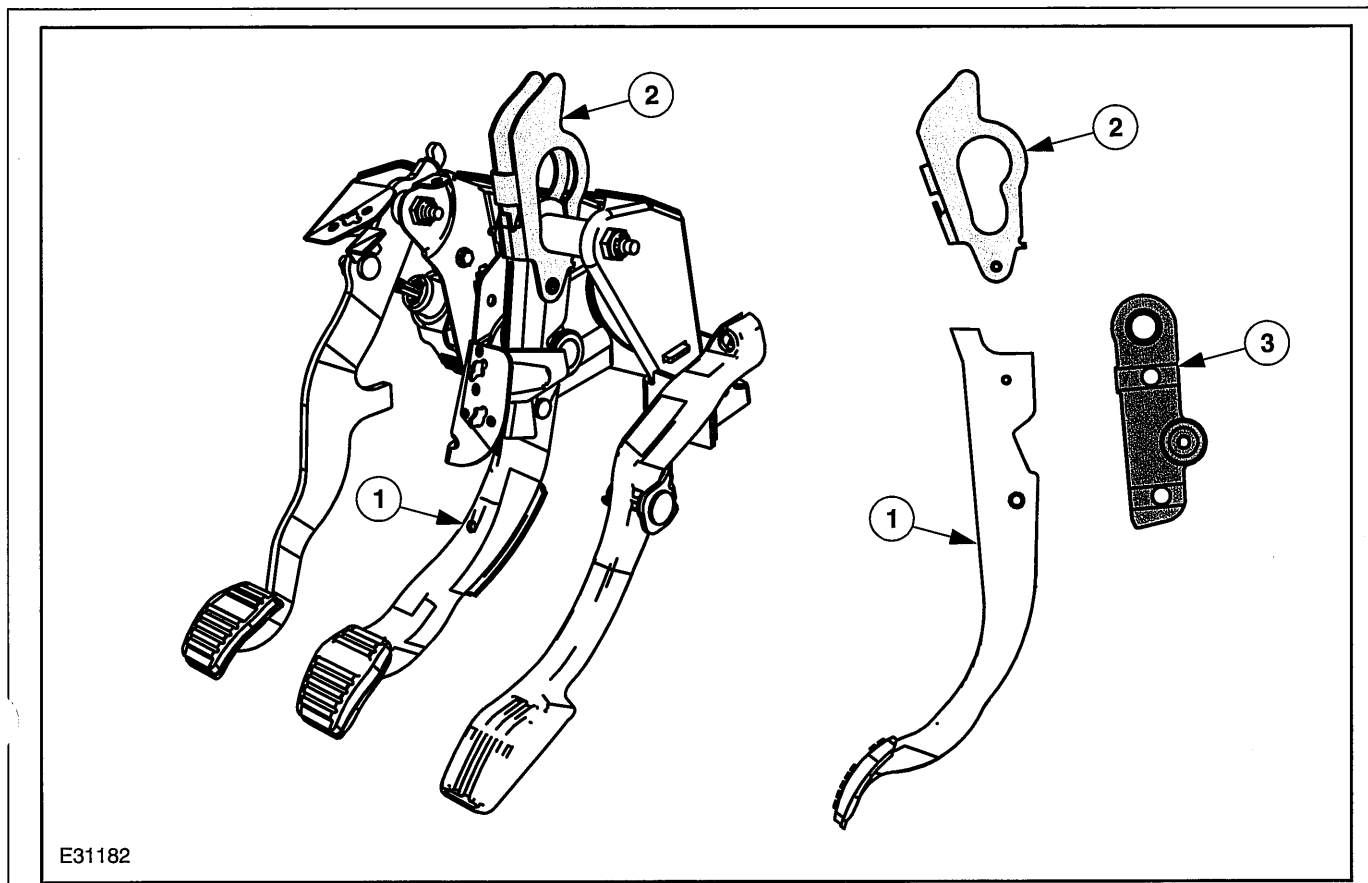
CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-06-2
DESCRIPTION AND OPERATION	
Hydraulic Brake Actuation — Vehicles Built Up To: 01/2004.....	206-06-3
Brake pedal.....	206-06-3
DIAGNOSIS AND TESTING	
Hydraulic Brake Actuation.....	206-06-5
REMOVAL AND INSTALLATION	
Brake Pedal — RHD..... (12 333 0)	206-06-6
Brake Master Cylinder — RHD..... (12 343 0)	206-06-8

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

Item	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder brake tube unions	17	13	-
Pressure conscious reducing valve unions	26	19	-
Brake master cylinder retaining nuts	25	18	-
Brake pedal cross-shaft mounting bracket nuts	25	18	-

DESCRIPTION AND OPERATION**Hydraulic Brake Actuation — Vehicles Built Up To: 01/2004****Brake pedal**

E31182

Item	Description
1	U-shaped profile of the brake pedal
2	Latch
3	Carrier plate

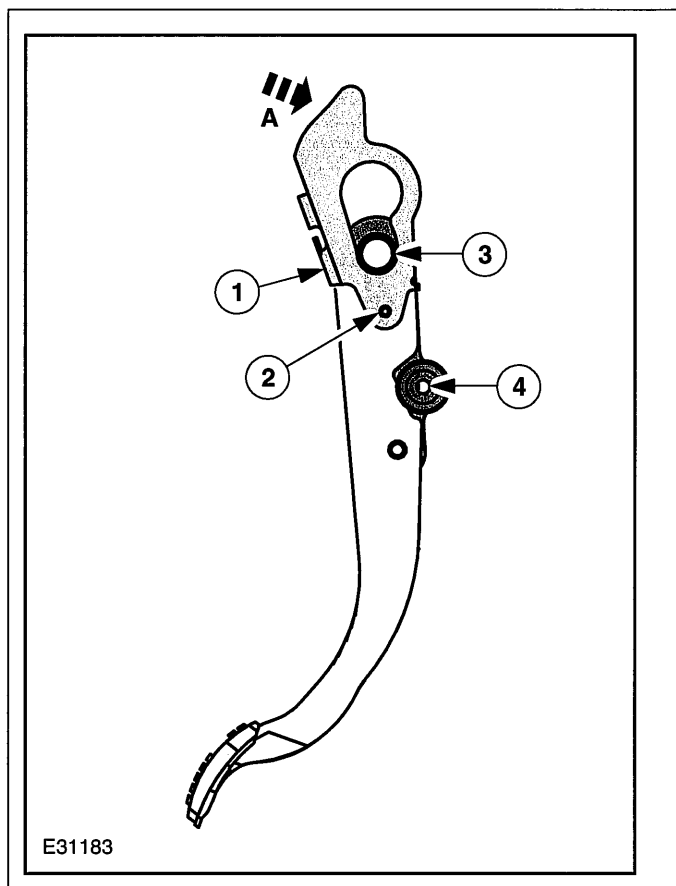
The brake pedal is equipped with a safety device which uncouples the brake pedal from the brake master cylinder in the event of a severe frontal collision to reduce injuries to the feet of the driver.

As a result, the pressure acting from the brake master cylinder on the brake pedal is interrupted and the brake pedal can be pushed to the floor.

The brake pedal is divided into 3 parts: a U-shaped profile, a latch and a carrier plate within the brake pedal.

DESCRIPTION AND OPERATION

Function



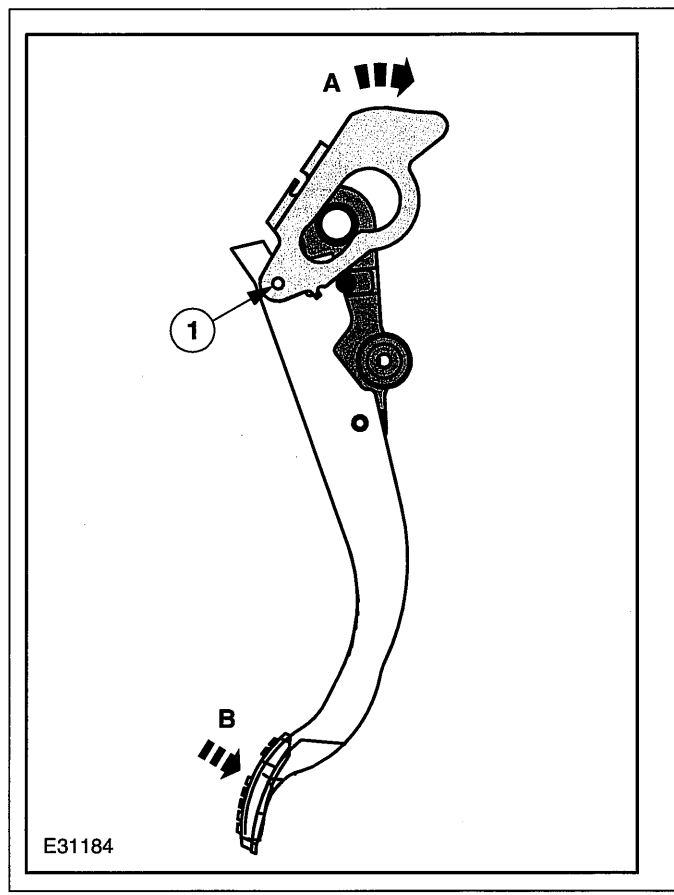
E31183

Item	Description
A	Fascia/crash padding mounting
1	Connection point between the latch and the pedal
2	Retaining pin (plastic)
3	Mounting bore
4	Mounting for the brake servo actuation rod

The complete pedal unit is mounted via a bore in the carrier plate.

The U-shaped profile of the brake pedal is held in position by the latch at a connection point.

In the event of a severe impact the entire pedal box is pushed into the footwell. As the pedal box is pushed into the footwell, the latch on the upper side of the brake pedal is pushed against the mounting of the fascia/crash padding.



E31184

Item	Description
A	Direction of motion of the latch
B	Direction of motion of the pedal
1	Sheared off retaining pin

The latch is twisted around the mounting axis of the pedal, and in the process the retaining pin is cut through.

The connection point of the brake pedal is released, and no more force can be transmitted.

The carrier plate of the pedal is uncoupled from the U-shaped pedal and the pedal is left to swing free.

It is very important not to damage the retaining pin when working on the pedal box.

DIAGNOSIS AND TESTING**Hydraulic Brake Actuation**

REFER to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION

Brake Pedal — RHD(12 333 0)

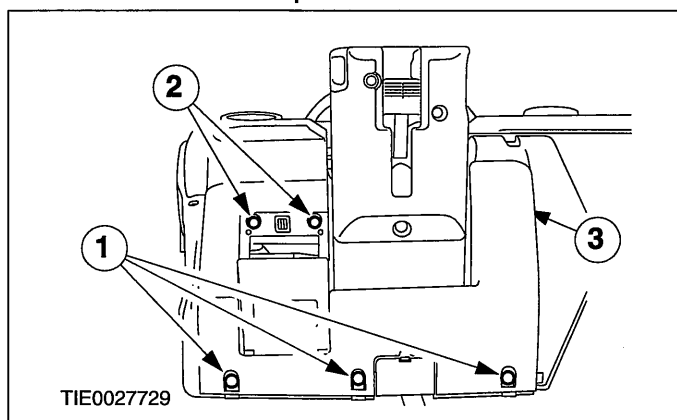
Removal

All vehicles

- ▲ **WARNING:**In the event of a frontal impact to a vehicle equipped with a decoupler brake pedal in which damage to, or significant movement of, the instrument panel or the brake booster has occurred, a new brake pedal must be installed. Failure to follow this instruction may result in personal injury.

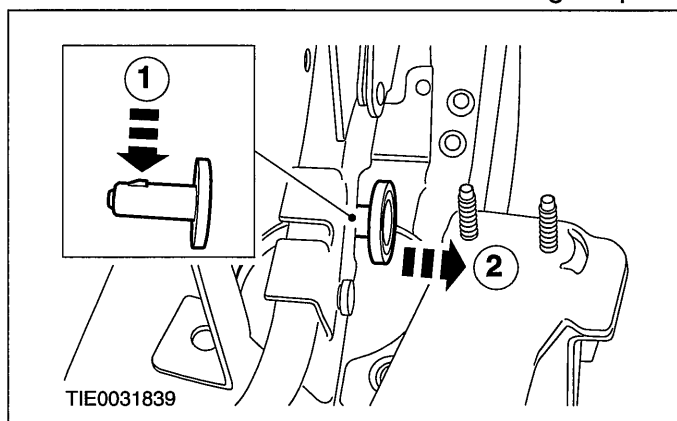
1. Remove the instrument panel lower panel.

1. Remove the lower retaining screws.
2. Remove the upper retaining screws from the stowage compartment.
3. Release the clip.



2. Detach the brake booster actuating rod from the brake pedal (accelerator pedal shown removed for clarity).

1. Depress the clip.
2. Remove the brake booster actuating rod pin.

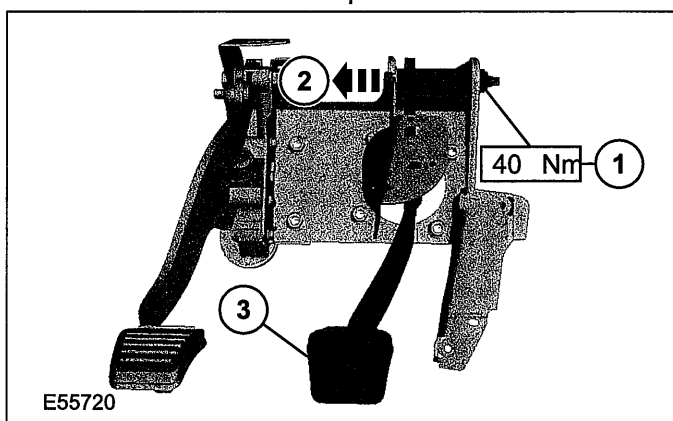


Vehicles with manual transaxle

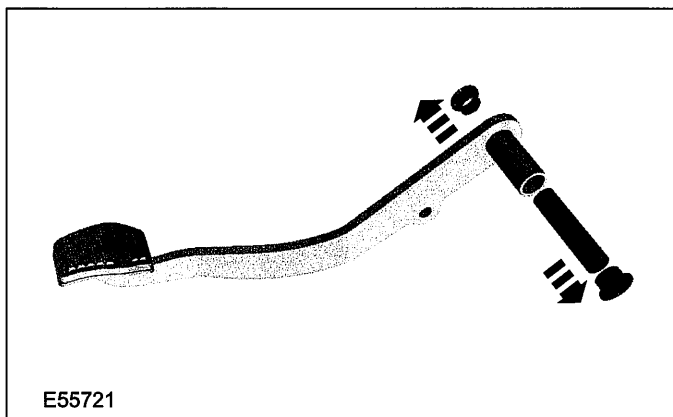
3. **NOTE:**From 02/2004 the brake pedal will not be equipped with the brake pedal decoupler mechanism.

Remove the brake pedal.

1. Remove the pivot shaft nut.
2. Slide out the pedal pivot shaft.
3. Remove the brake pedal.



4. Remove the brake pedal bushings.



Vehicles with automatic transaxle

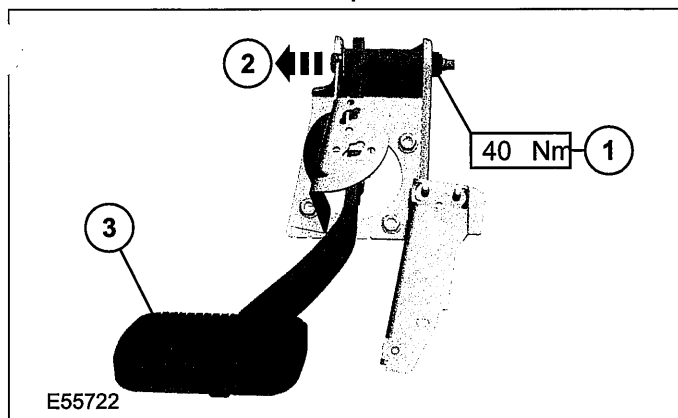
5. **NOTE:**From 02/2004 the brake pedal will not be equipped with the brake pedal decoupler mechanism.

Remove the brake pedal.

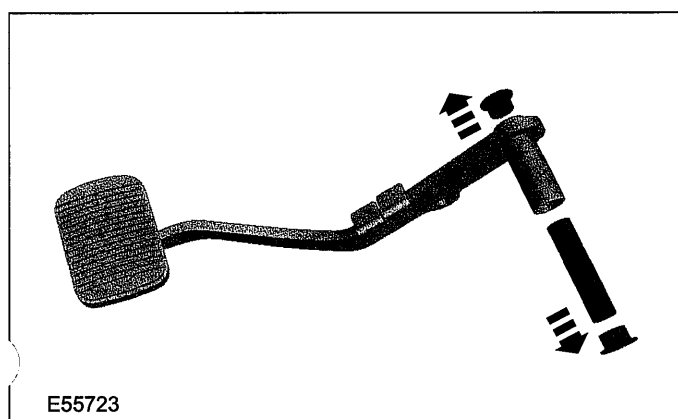
1. Remove the pivot shaft nut.
2. Slide out the pedal pivot shaft.

REMOVAL AND INSTALLATION

3. Remove the brake pedal.



6. Remove the brake pedal bushings.

**Installation**

1. **⚠ CAUTION:** Do not drop or knock the brake pedal. Failure to follow this instruction will cause damage to the brake pedal decoupler mechanism (if equipped).

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Brake Master Cylinder — RHD(12 343 0)

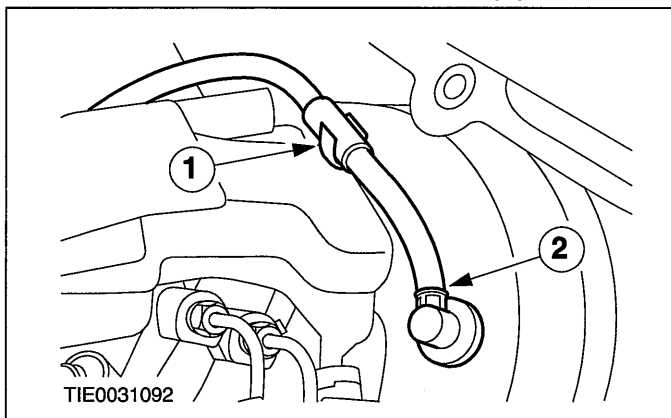
Removal

All vehicles

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Disconnect the brake vacuum pipe from the brake booster.

1. Unclip the brake vacuum pipe.
2. Disconnect the brake vacuum pipe.



- 2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].**
- 3. Remove the windshield wiper motor assembly. For additional information, refer to Section 501-16 [Wipers and Washers].**
- 4. ⚠ CAUTION:** The brake fluid reservoir cap must not become contaminated.

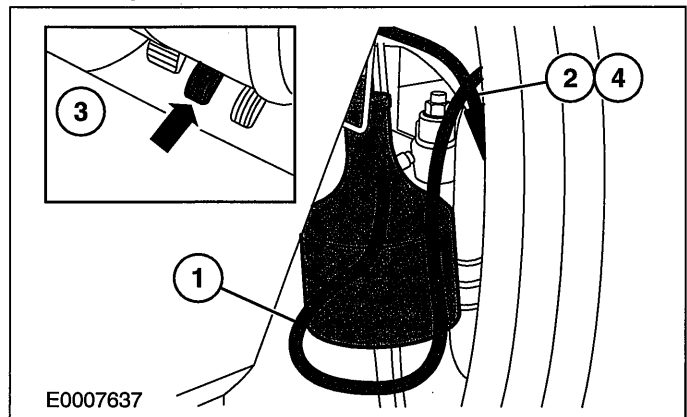
Remove the brake fluid reservoir cap.

- 5. NOTE:** It will be necessary to carry out this step on both sides in order to completely drain the brake fluid reservoir.

Drain the brake fluid reservoir.

1. Connect one end of a suitable piece of clear plastic pipe to the bleed nipple and place the other end into a suitable container.
2. Loosen the bleed nipple.
3. Depress the brake pedal until all the fluid is drained from the brake fluid reservoir.

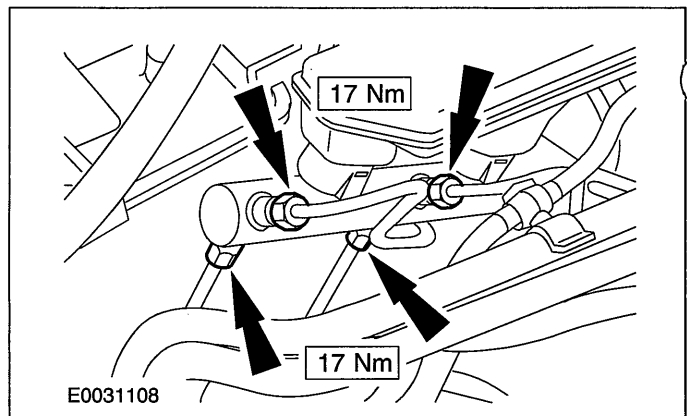
4. Tighten the bleed nipple.



6. Install the brake fluid reservoir cap.

- 7. ⚠ CAUTION:** Cap the brake tubes to prevent fluid loss or dirt ingress.

Disconnect the brake tubes from the brake master cylinder.

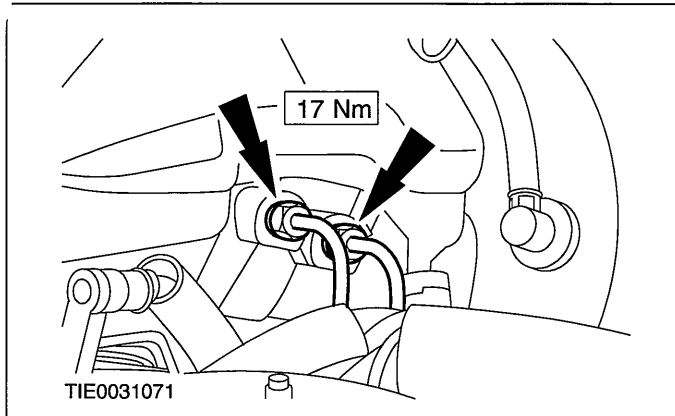


Vehicles with anti-lock brakes

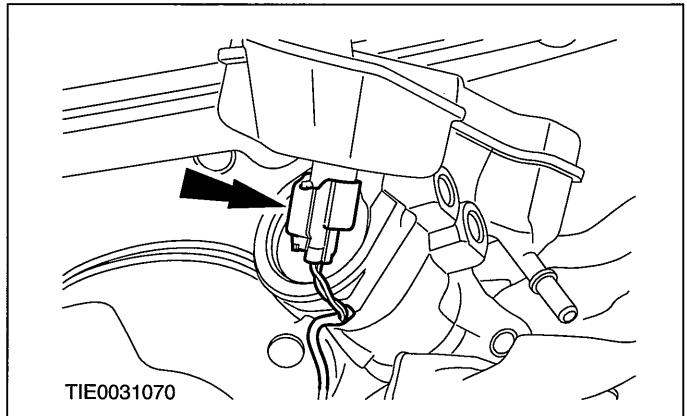
- 8. ⚠ CAUTION:** Cap the brake tubes to prevent fluid loss or dirt ingress.

REMOVAL AND INSTALLATION

Disconnect the brake tubes from the brake master cylinder.



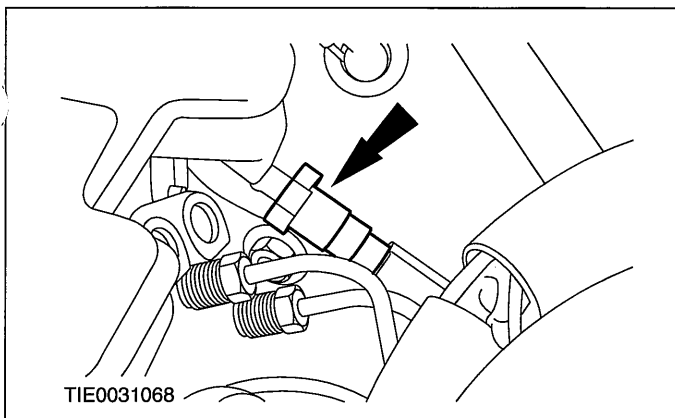
11. Disconnect the low brake fluid warning indicator switch electrical connector.



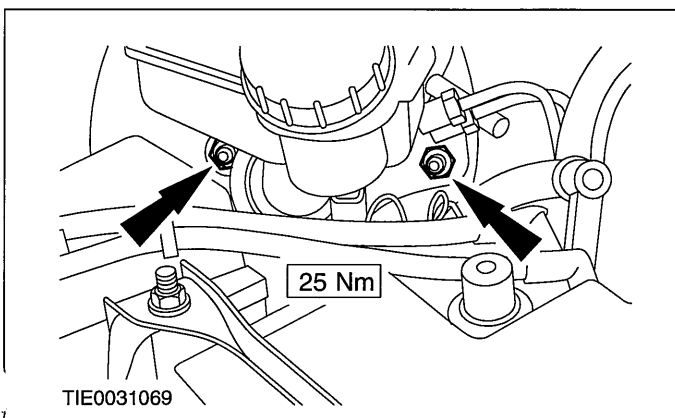
All vehicles

9. **CAUTION:** Cap the clutch master cylinder feed hose to prevent fluid loss or dirt ingress.

Disconnect the clutch master cylinder feed hose from the brake fluid reservoir.



10. Detach the brake master cylinder from the brake booster.



12. Remove the brake master cylinder and brake fluid reservoir assembly.

Installation

- CAUTION:** Make sure the brake master cylinder vacuum seal is correctly positioned before installation.

1. To install, reverse the removal procedure.
2. Bleed the brake system. For additional information, refer to Section 206-00 [Brake System - General Information].



SECTION 206-07 Power Brake Actuation

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-07-2
DESCRIPTION AND OPERATION	
Brake Booster.....	206-07-3
Emergency brake assistant (EBA).....	206-07-3
DIAGNOSIS AND TESTING	
Power Brake System.....	206-07-7
REMOVAL AND INSTALLATION	
Brake Booster — RHD..... (12 451 0)	206-07-8

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Brake booster retaining nuts	25	18	-
Brake master cylinder retaining nuts	25	18	-

DESCRIPTION AND OPERATION

Brake Booster

Emergency brake assistant (EBA)

As ABS braking systems have become widespread, it has emerged that because of incorrect use of the brakes, many drivers are losing the safety benefit which ABS provides.

Drivers are applying the brakes too timidly. Because of this, the Anti-lock Braking System (ABS) does not engage, and the maximum braking effect is not achieved.

The EBA recognises from the driver's manner of braking that an emergency situation is occurring, and automatically applies full braking power.

This occurs in a matter of milliseconds, which is faster than the driver could do it.

Furthermore, it was observed that after the first heavy application of the brake pedal, the driver releases the pressure on the pedal too early.

The EBA ensures that the ABS effect still continues when the pedal pressure would normally lie below the ABS range of control. The system is available as an option depending on market and vehicle variant.

Depending on driving manner, EBA results in a reduction in braking distance of 15% for experienced drivers, to over 40% for average drivers.

Because EBA decelerates the vehicle up to the wheel locking limit, emergency brake assist is only used in vehicles with ABS.

EBA operates purely mechanically, and is completely integral with the brake servo.

Brake servo units with and without EBA are externally identical. For identification purposes, brake servo units with EBA carry a white sticker showing a large letter "A".

The tandem master cylinder is the same for vehicles with or without EBA.

Function

In normal braking situations, the brake servo with EBA operates in the same way as a conventional brake servo unit. This means that the driver can always modulate the brakes.

If an activation threshold defined by a characteristic curve is exceeded during braking, the EBA operates.

Determination of the activation threshold is based on the pedal movement parameters, which are a function of the pressure on the brake pedal and the speed of movement of the pedal.

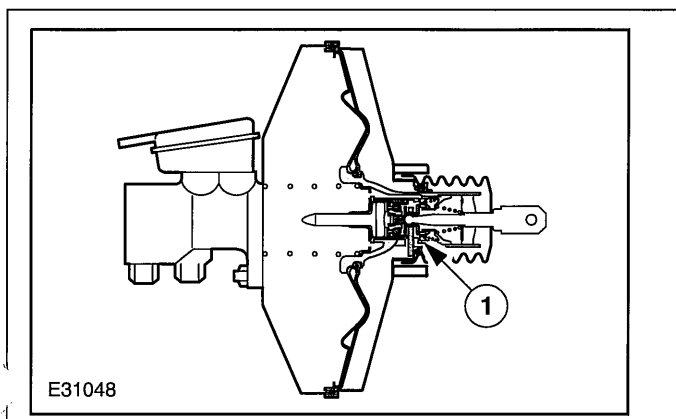
The characteristic curve is separately defined for each vehicle model.

The mechanical EBA uses the fact that in a brake servo unit, the valve piston moves ahead of the control housing when a braking operation starts.

Because of this, there is a relative travel distance between the control housing and the valve piston which can vary depending on the force applied to the brake pedal and the pedal speed.

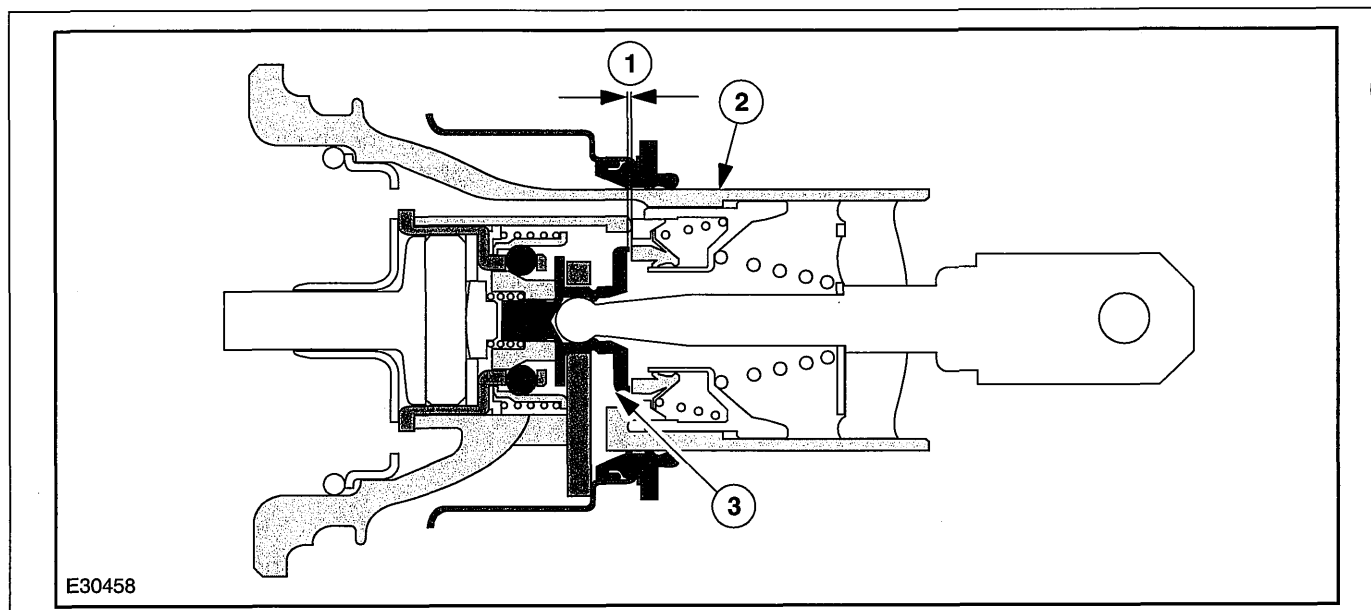
The relative travel distance is small when the pedal moves slowly with low force applied to it. The relative travel distance is larger when the pedal moves faster with higher force applied to it.

Components



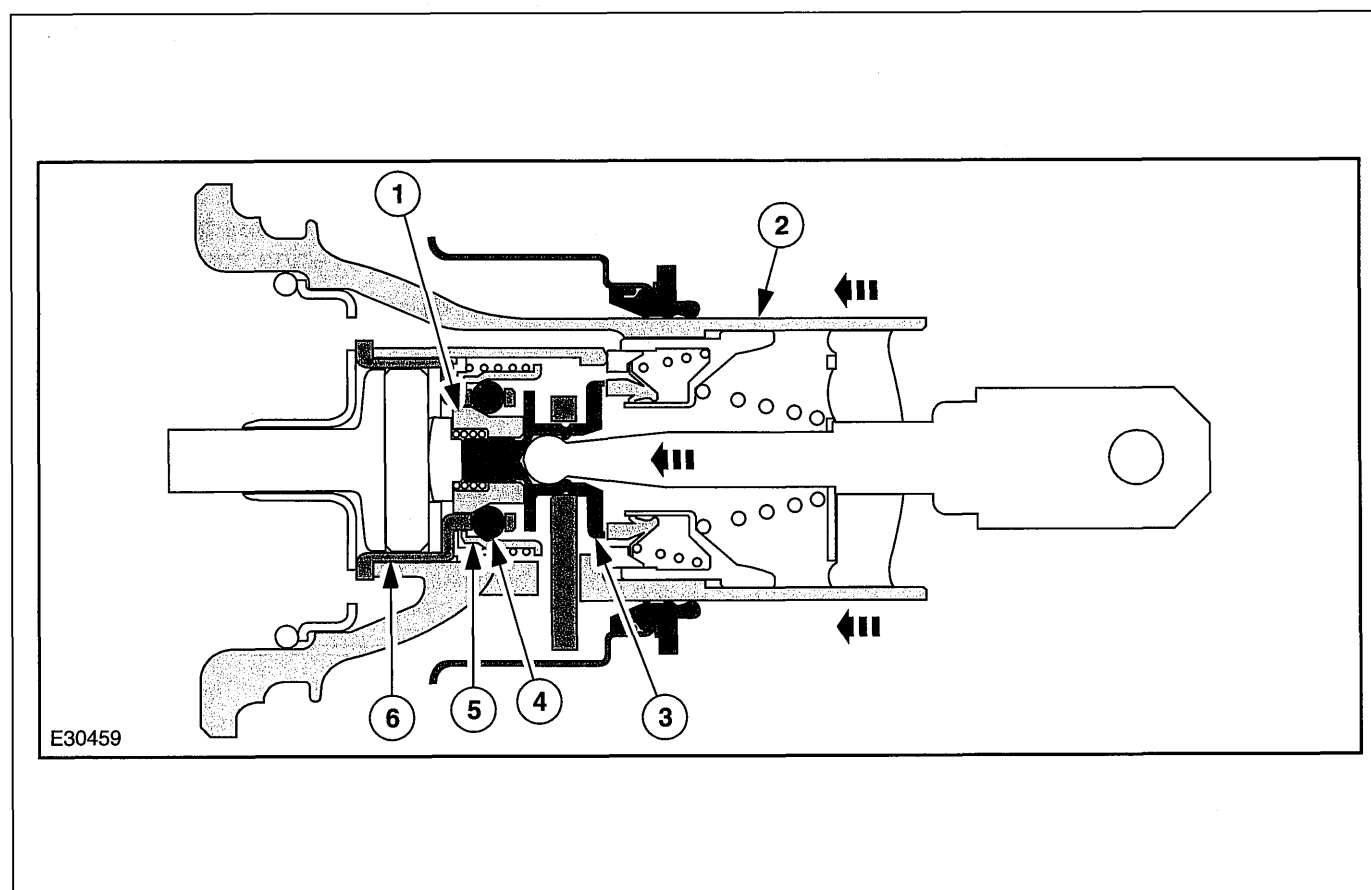
Item	Description
1	EBA

DESCRIPTION AND OPERATION



Item	Description
------	-------------

1	Relative travel distance
2	Control housing
3	Valve piston

Normal braking

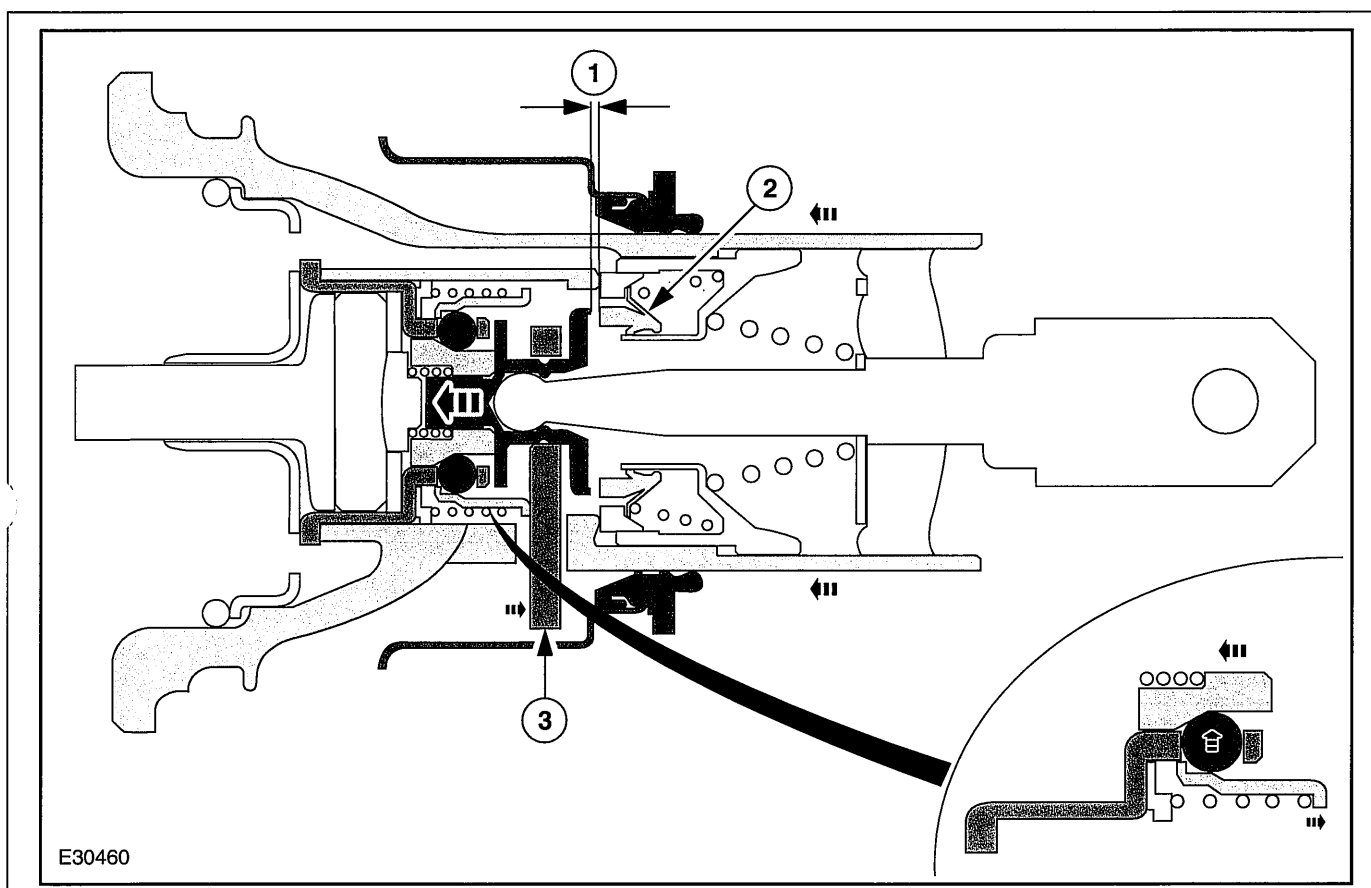
DESCRIPTION AND OPERATION

Item	Description
1	Ball sleeve
2	Control housing
3	Valve piston
4	Ball
5	Lock sleeve
6	Ball cage

Active brake assistant

In a normal braking operation, pedal operation causes the relative travel distance to remain so small that the distance required for engagement is not exceeded.

The lock sleeve is held in its rest position by the force applied by the spring, the ball cage remains free to move axially and the balls remain free to move radially.



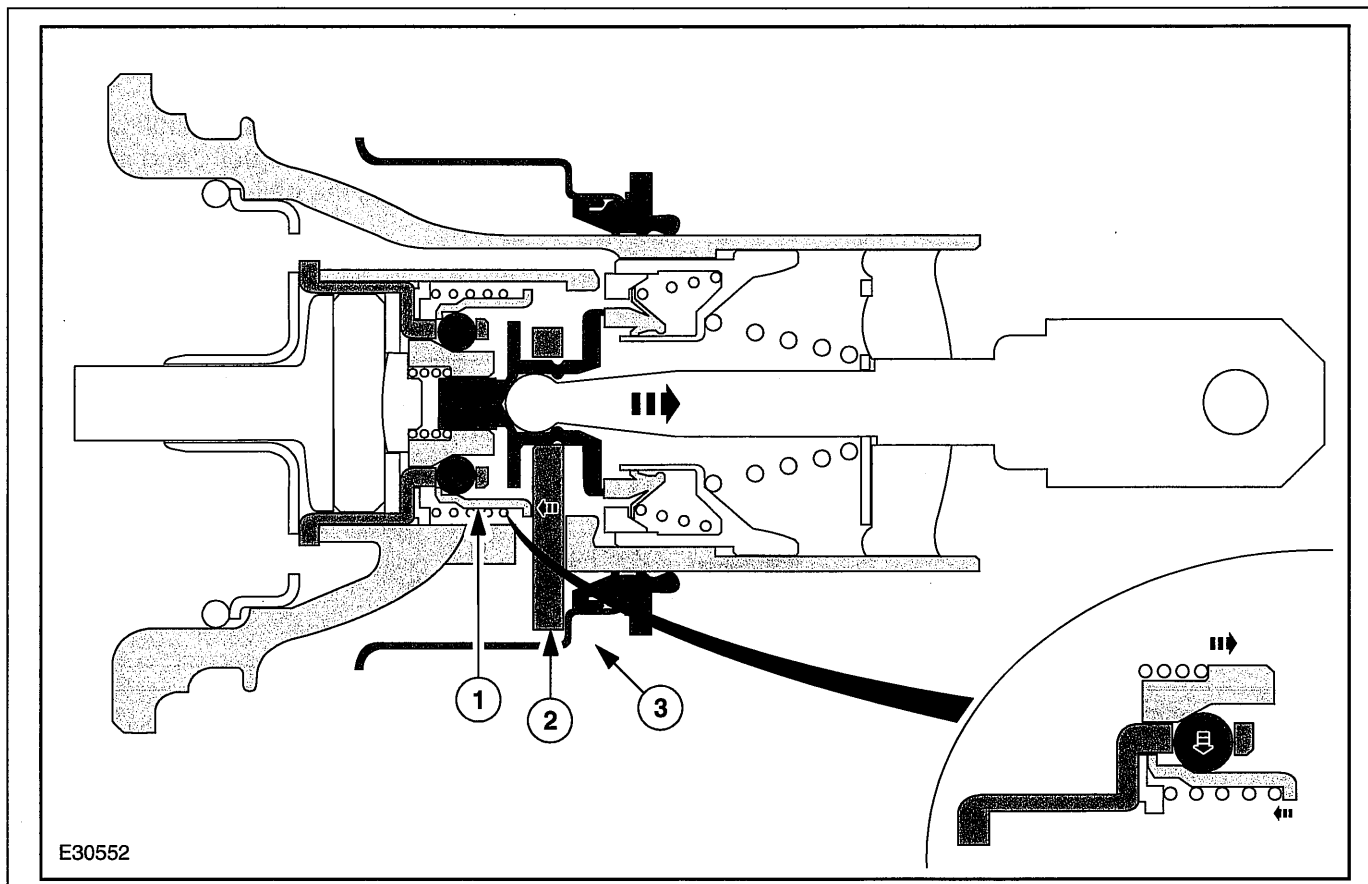
Item	Description
1	Relative travel distance
2	Disc valve
3	Key

If the activation threshold level is exceeded because of an emergency braking situation, i.e. the relative travel distance of the valve piston is so great that the balls are moved in over the slope of the ball sleeve, then the lock sleeve can move completely to its end position.

The balls are now locked, and the ball sleeve can no longer be moved in the closing direction of the disc valve.

The EBA is now active, the brake pressure is increased up to the wheel locking limit, and the brake pedal can be moved to its maximum pressure point without effort.

The brake pressure remains at the ABS control limit until the EBA is completely released again.

DESCRIPTION AND OPERATION**Release of the brake assistant**

Item	Description
1	Lock sleeve
2	Key
3	Vacuum cylinder

To release EBA, the brake pedal must be fully released, i.e. it must be returned to its rest position.

When this occurs, the control housing together with the valve piston move back into the rest position.

The key is pressed against the stop on the vacuum cylinder and by this the lock sleeve is slid back into its rest position.

The balls can again be moved outward by the ball sleeve, and the ball cage is again free to move axially and the balls free to move radially.

Service

It is not possible to repair the EBA. A new brake servo unit must be installed.

DIAGNOSIS AND TESTING**Power Brake System**

REFER to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION

Brake Booster — RHD(12 451 0)

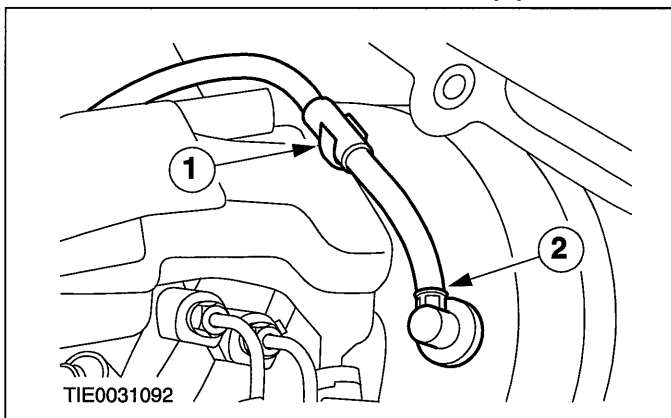
Removal

1. Remove the brake master cylinder.

For additional information, refer to: **Brake Master Cylinder - RHD (206-06 Hydraulic Brake Actuation, Removal and Installation).**

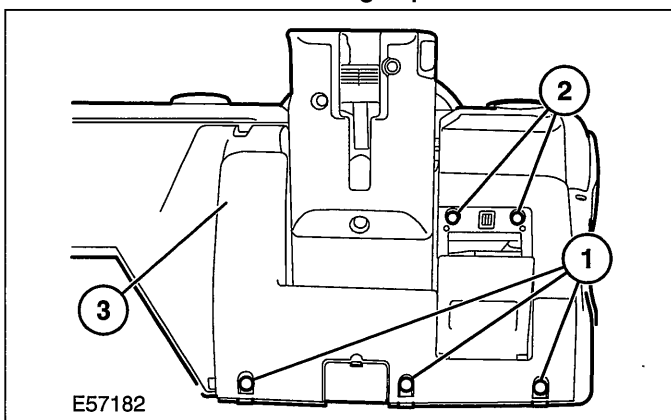
2. Disconnect the brake vacuum pipe from the brake booster.

1. Unclip the brake vacuum pipe.
2. Disconnect the brake vacuum pipe.



3. Remove the instrument panel lower panel.

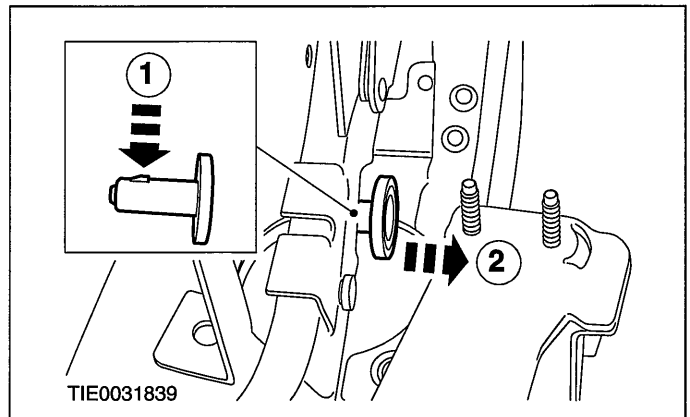
1. Remove the lower retaining screws.
2. Remove the upper retaining screws from the stowage compartment.
3. Release the retaining clip.



4. Detach the brake booster actuating rod from the brake pedal (accelerator pedal shown removed for clarity).

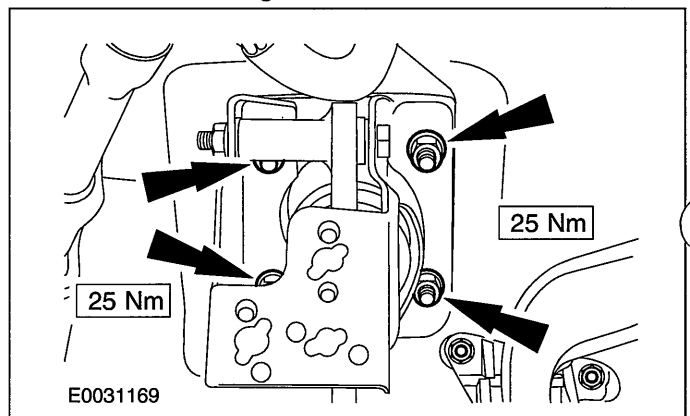
1. Depress the clip.

2. Remove the brake booster actuating rod pin.



5. Remove the brake booster.

- Discard the gasket.



Installation

1. WARNINGS:

▲ Do not install an Emergency Brake Assist (EBA) brake booster to a vehicle that is not equipped with the Anti-lock Brake System (ABS). Failure to follow this instruction may result in personal injury.

▲ Do not use a damaged brake pedal. Failure to follow this instruction may result in personal injury.

CAUTIONS:

⚠ Make sure that the brake booster gasket is correctly positioned on the brake booster before installation.

⚠ Do not drop or knock the brake pedal. Failure to follow this instruction will cause damage to the brake pedal decoupler mechanism (if equipped).

REMOVAL AND INSTALLATION

NOTE:On vehicles equipped with EBA the brake booster is identified by a white sticker showing a large letter "A".

NOTE:Install a new brake booster gasket.

To install, reverse the removal procedure.



SECTION 206-09A Anti-Lock Control

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-09A-2
DESCRIPTION AND OPERATION	
Anti-Lock Control.....	206-09A-3
Overview.....	206-09A-3
Function.....	206-09A-3
Anti-Lock Control.....	206-09A-5
MK70 Anti-lock Brake System (ABS).....	206-09A-5
MK60 ABS.....	206-09A-5
DIAGNOSIS AND TESTING	
Anti-Lock Control.....	206-09A-7
Inspection and Verification.....	206-09A-7
REMOVAL AND INSTALLATION	
Hydraulic Control Unit (HCU) — Vehicles Built Up To: 05/2004.....	206-09A-8
Hydraulic Control Unit (HCU) — Vehicles Built From: 05/2004.....	206-09A-11
Anti-Lock Brake System (ABS) Module — Vehicles Built Up To: 05/2004.....	206-09A-14
Anti-Lock Brake System (ABS) Module — Vehicles Built From: 05/2004.....	206-09A-17
Rear Wheel Speed Sensor..... (12 785 0)	206-09A-20
Rear Wheel Speed Sensor Ring..... (12 788 0)	206-09A-22
Front Wheel Speed Sensor..... (12 784 0)	206-09A-24

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

	Specificat ions
Super DOT 4 brake fluid	ESD-M6C 57-A

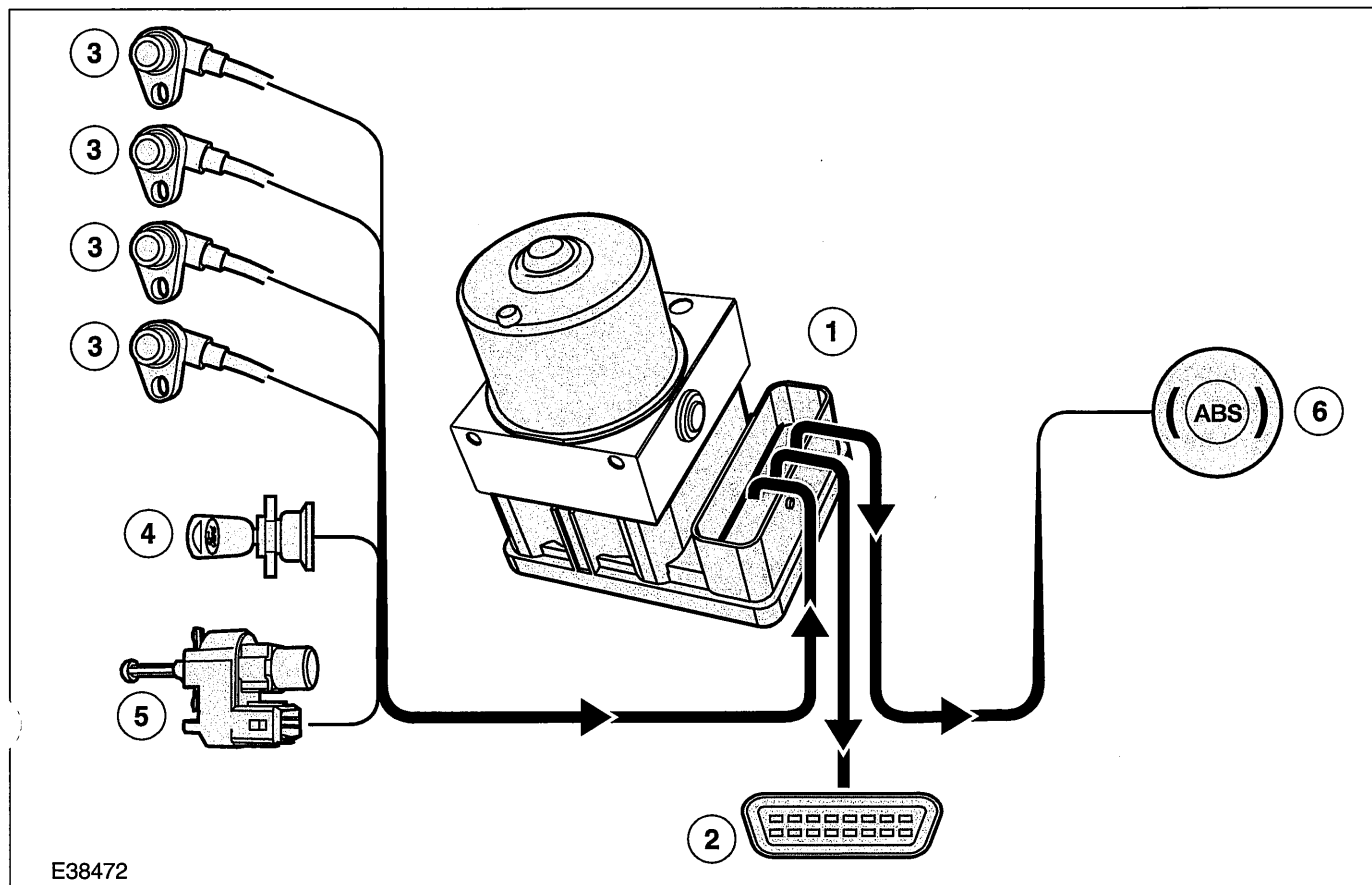
Torque Specifications

Item	Nm	lb-ft	lb-in
Hydraulic control unit (HCU) to support bracket retaining bolts	9	-	80
HCU support bracket retaining bolts	20	15	-
Brake tube to HCU unions	18	13	-
Wheel speed sensor retaining bolts	9	-	80
Anti-lock brake system (ABS) module to HCU retaining bolts	5	-	44

DESCRIPTION AND OPERATION

Anti-Lock Control

Overview



Item	Description
1	Anti-lock brake system (ABS) hydraulic unit with integrated control unit
2	Data Link Connector (DLC)
3	Wheel speed sensors
4	Ignition lock
5	Stoplamp switch
6	ABS warning lamp in the instrument cluster

In addition to the conventional brake system with two diagonally split brake circuits, the ABS consists of an ABS hydraulic unit with integrated control unit, four wheel sensors and the ABS warning lamp in the instrument cluster.

Electronic brake force distribution is integrated in the software of the ABS control unit, which electronically regulates and optimises the pressure applied to the wheel brakes on the front and rear axles in accordance with the operating conditions.

Function

The ABS is a closed loop control system in the brake system which prevents the wheels from locking up under braking and therefore maintains steerability and driving stability in extreme situations.

ABS control unit

The ABS control unit continuously compares stored physical deceleration values with those detected by the wheel sensors. This allows the lock-up tendency of each wheel to be detected separately.

If the ABS control unit detects that a wheel is threatening to lock up, then the corresponding hydraulic valves in the valve block are either closed or opened.

The ABS control unit then also passes on the vehicle speed signal obtained from the wheel sensors to the Powertrain Control Module (PCM).

DESCRIPTION AND OPERATION

The warning lamp in the instrument cluster is actuated by the ABS control unit after switching on the ignition. It remains on up to the end of the ABS self-test, and is also actuated in the event of system errors.

It continuously monitors the system for possible faults and stores these as and when they occur. The corresponding trouble codes can be interrogated with the aid of WDS via the DLC .

The ABS control unit is directly connected via a diagnostic data link to the DLC.

Valve block

The valve block contains four inlet valves and four outlet valves. There is one inlet valve and one outlet valve for each wheel.

When there is no electrical supply the inlet valves are open and the outlet valves are closed.

The valve block also contains the low-pressure reservoir and sound damping chambers.

Pump motor

In the event of an ABS intervention the pump motor ensures that the pressure can be provided to the regulating channels independently of the brake master cylinder.

ABS regulating cycle

An ABS regulating cycle has three phases:

Phase 1 - holding pressure

- The inlet valve is closed, and the brake pressure to the wheel brake cannot be increased any further, even if the actuation pressure (brake pedal) is increased further.

Phase 2 - pressure reduction

- The outlet valve is temporarily opened, and the brake pressure to the wheel brake is reduced in a controlled manner.

Phase 3 - pressure build-up

- The inlet valve is opened in stages, and the brake pressure is increased in a controlled manner to achieve the greatest possible deceleration.

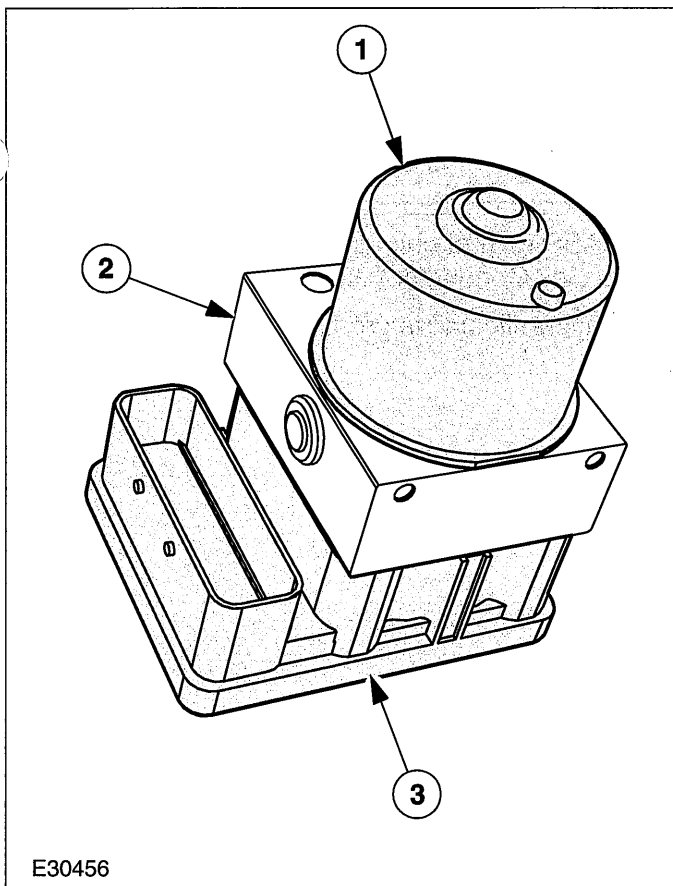
DESCRIPTION AND OPERATION**Anti-Lock Control****MK70 Anti-lock Brake System (ABS)**

The MK70 ABS is similar to the MK60 in construction and design. The main differences are:

- New ABS control unit
- New hydraulic lines through a revised valve block
- New wiring harness and electrical connector (fewer occupied pins)

The MK70 ABS system will be installed from 05/2004 in vehicles which only have one ABS function.

Vehicles with ESP/Brake Traction Control System (BTCS) will continue to be equipped with the MK60.

MK60 ABS

E30456

Item	Description
1	Pump motor
2	Valve block
3	ABS control unit

The MK60 ABS has been designed specifically for small to medium size vehicles. Compared to the MK20 ABS system, it has been possible to reduce the size of the hydraulic and electric components (e.g. hydraulic valves and solenoids) and the housing.

As a result, the overall weight of the ABS hydraulic unit has been significantly reduced.

The hydraulic unit consists of the pump motor, the valve block with 8 hydraulic valves and the electronic control unit.

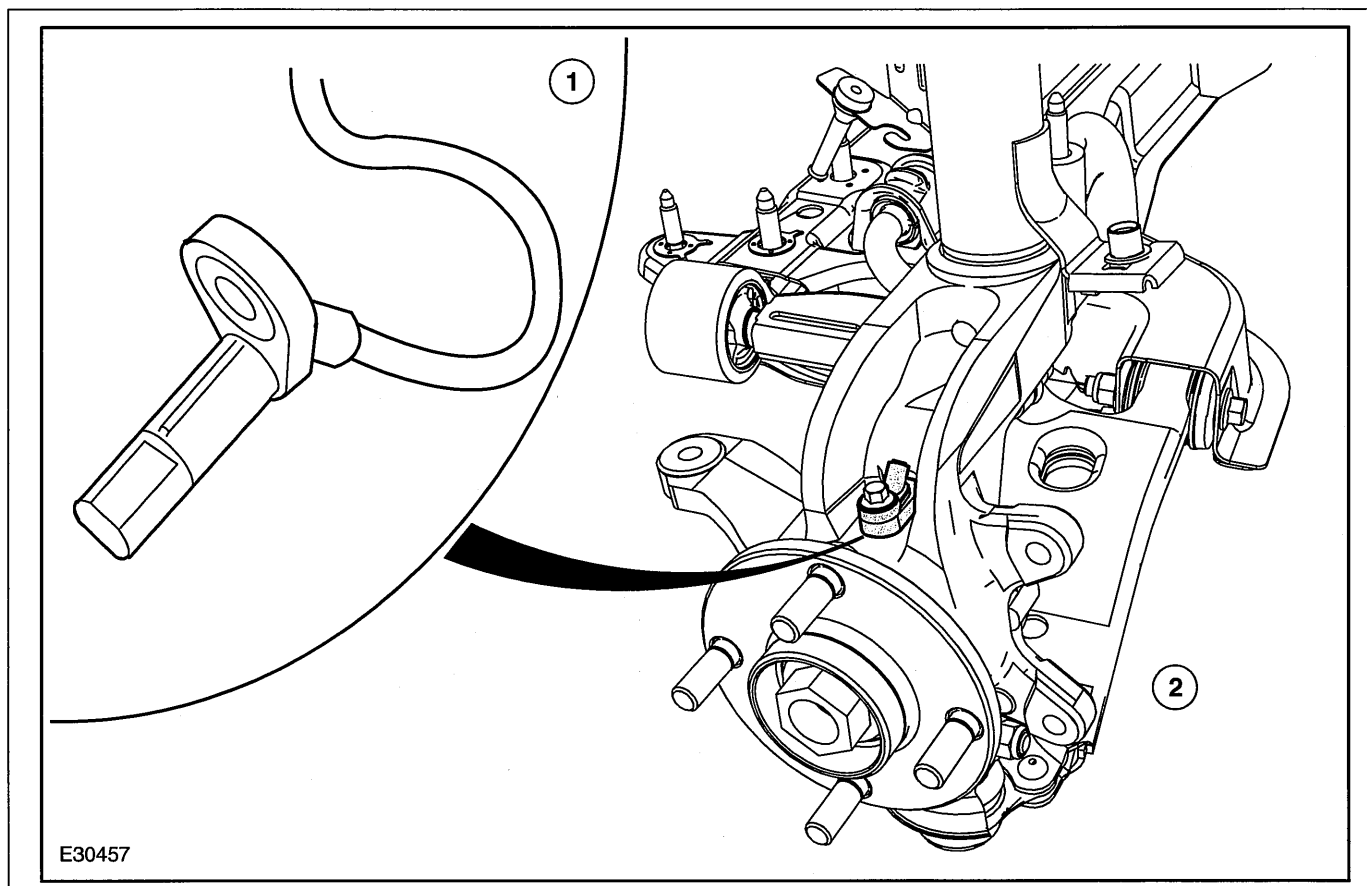
The ABS control unit actuates the ABS warning lamp in the instrument cluster via the CAN databus.

The MK60 ABS is a 4/3 system. This means that the wheel speed is measured individually for each wheel (4 wheel speed sensors).

ABS controlled braking is provided individually for the front wheels and jointly for the two rear wheels (3 control channels; select-low control), i.e. the ABS control for the rear wheels is governed by the wheel closest to locking up.

DESCRIPTION AND OPERATION

Wheel speed sensors



E30457

Item	Description
1	Sensor
2	Installation position.

The ABS control unit can be diagnosed via the Data Link Connector (DLC).

The hydraulic unit is pre-filled for service.

NOTE: The wheel speed sensors must not be checked for voltage with an ohmmeter.

The wheel speed sensors are active sensors. They are supplied with a voltage from the ABS control unit after the ignition is switched on.

The pulses are picked up from a mechanically encoded ring, which is built into the wheel bearings on the front wheels while for the rear wheels it is a metal ring which is mounted on the stub axle.

The registered wheel speed is converted into a digital (square-wave) signal by the electronics integrated in the sensor and is then transmitted to the ABS control unit.

Data transmissions to the ABS control unit take place via a 2-stranded connecting cable.

It also supplies the vehicle speed signal, which is calculated from the wheel speed sensor signals. This is transmitted via the CAN bus to the Powertrain Control Module (PCM)

DIAGNOSIS AND TESTING**Anti-Lock Control**

Refer to Wiring Diagrams Section 206-09A, for schematic and connector information.

General Equipment

Worldwide diagnostic system (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Wheel speed sensor(s) • Wheel speed sensor ring(s)	• Fuse(s) • Electrical connector(s) • Wiring harness(s).

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, connect the diagnostic tool to the data link connector and select the vehicle to be tested from the diagnostic tool menu.

REMOVAL AND INSTALLATION

Hydraulic Control Unit (HCU) — Vehicles Built Up To: 05/2004

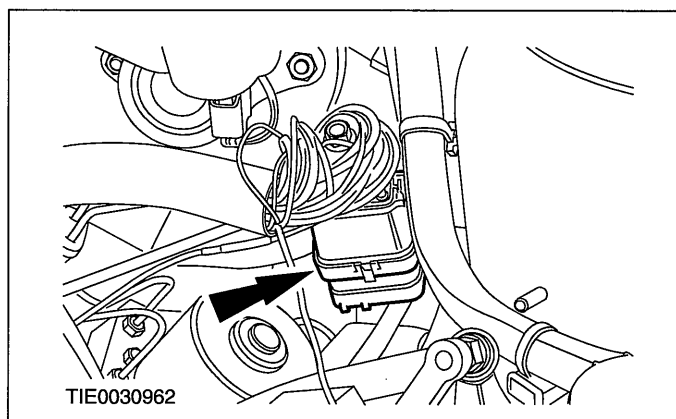
Materials

Name	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Removal

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Remove the brake master cylinder. For additional information, refer to Section 206-06 [Hydraulic Brake Actuation].
2. Detach the engine wiring harness electrical connector from the wheelhouse assembly.



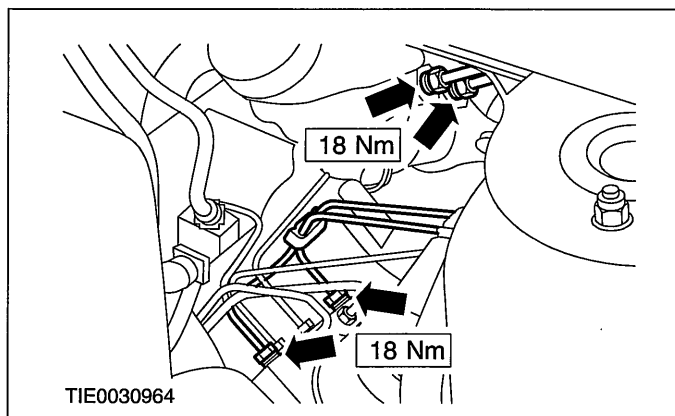
3. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes, to aid installation.

Remove the brake master cylinder to hydraulic control unit (HCU) brake tubes.



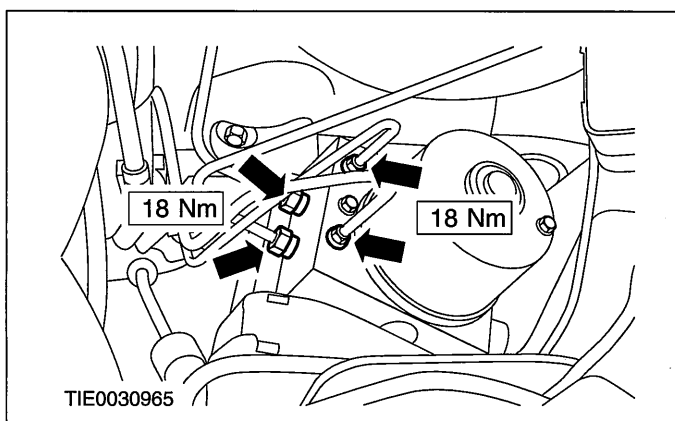
4. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the HCU ports to prevent fluid loss or dirt ingress.

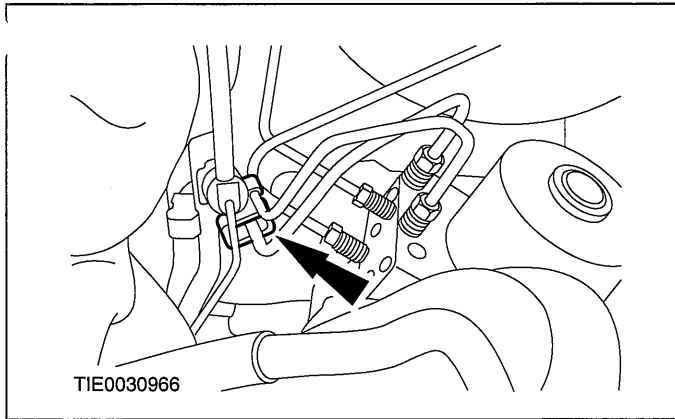
NOTE: Make a note of the position of the brake tubes, to aid installation.

Disconnect the brake tubes from the HCU.

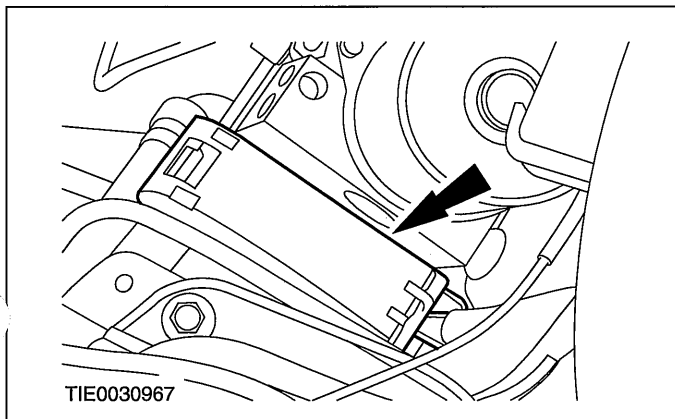


REMOVAL AND INSTALLATION

5. Detach the brake tubes from the bulkhead.

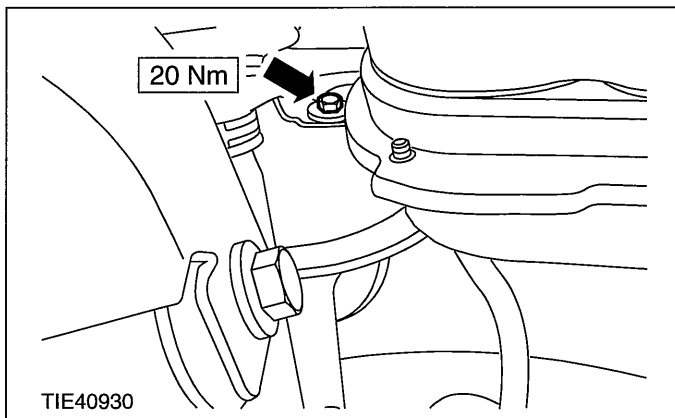


6. Disconnect the anti-lock brake system (ABS) module electrical connector.



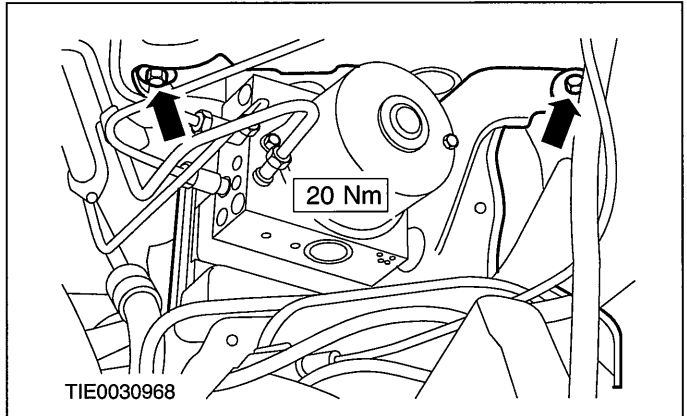
7. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

8. Remove the HCU and ABS module support bracket lower retaining bolt.

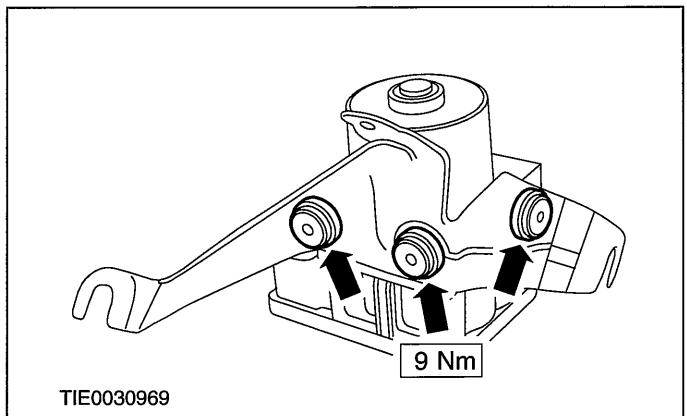


9. Lower the vehicle.

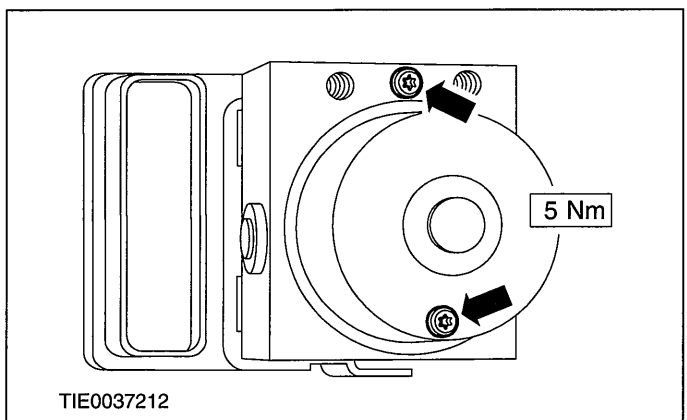
10. Remove the HCU and ABS module assembly and the support bracket.



11. Detach the HCU and ABS module assembly from the support bracket.



12. Remove the HCU to ABS module retaining bolts.



13. Remove the HCU.

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

2. Bleed the brake system. For additional information, refer to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION

Hydraulic Control Unit (HCU) — Vehicles Built From: 05/2004

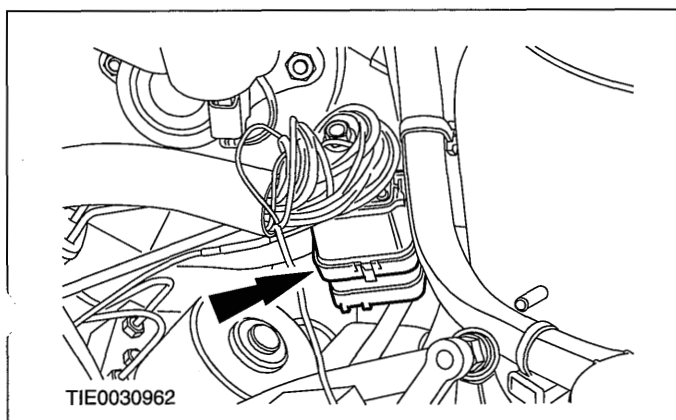
Materials

Name	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Removal**All vehicles**

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Detach the engine wiring harness electrical connector from the wheelhouse assembly.

**Left-hand drive vehicles**

2. Remove the brake master cylinder.

For additional information, refer to: **Brake Master Cylinder - LHD (206-06 Hydraulic Brake Actuation, Removal and Installation).**

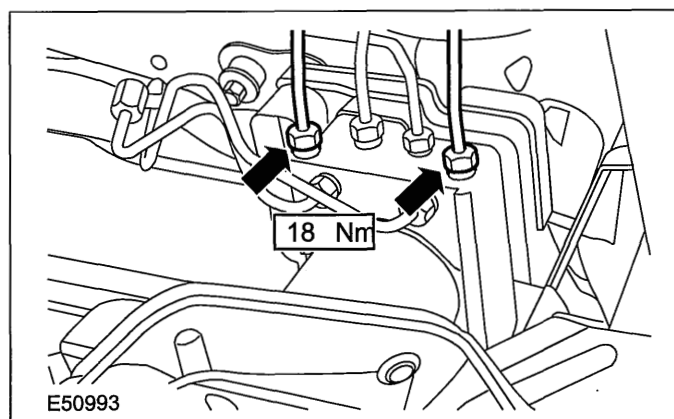
3. **CAUTIONS:**

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes to aid installation.

Remove the brake master cylinder to HCU brake tubes.

**Right-hand drive vehicles**

4. Remove the battery tray.

For additional information, refer to: **Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).**

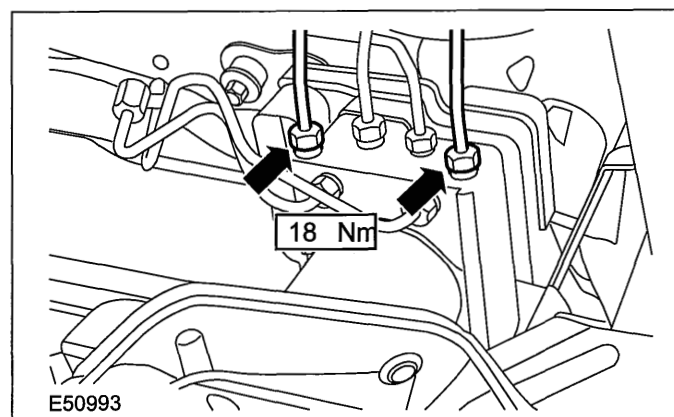
5. **CAUTIONS:**

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes to aid installation.

Disconnect the brake master cylinder to HCU brake tubes from the HCU.

**All vehicles**

6. **CAUTIONS:**

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

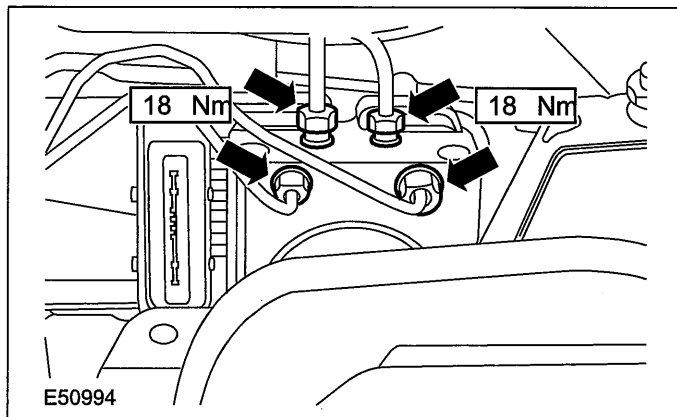
REMOVAL AND INSTALLATION

⚠ **Plug the HCU ports to prevent fluid loss or dirt ingress.**

NOTE: Make a note of the position of the brake tubes to aid installation.

Disconnect the brake tubes from the HCU.

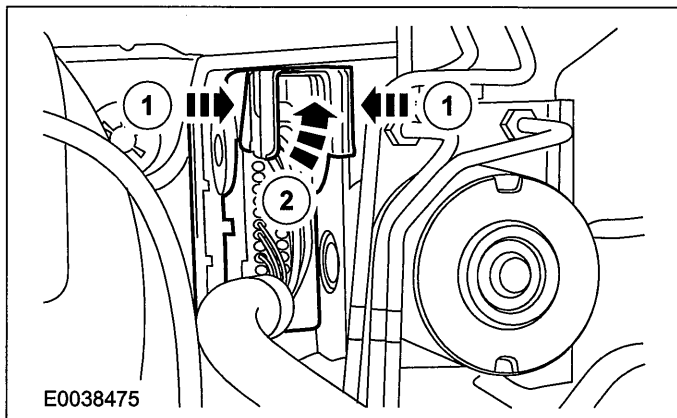
- Detach the brake tubes from the bulkhead.



7. ⚠ **CAUTION:** Cap the anti-lock brake system (ABS) module electrical connector and socket to prevent dirt and fluid ingress.

Disconnect the ABS module electrical connector.

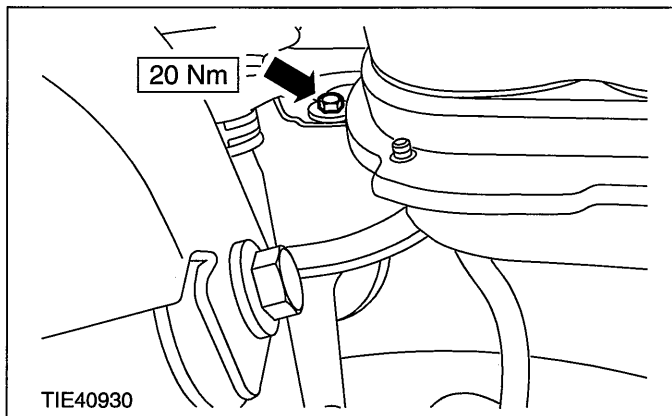
1. Depress the locking tangs.
2. Release the retainer.



8. **Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)**

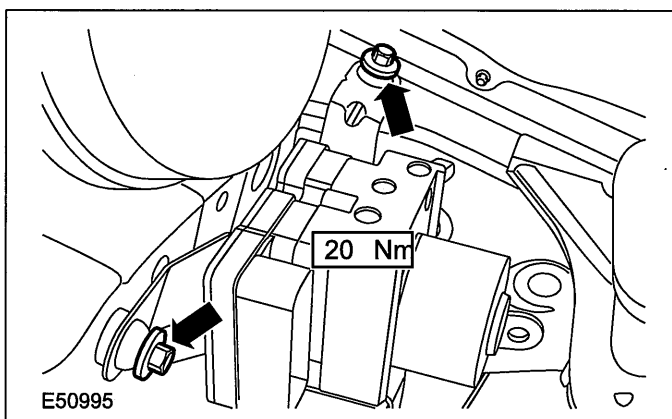
**Jacking (Description and Operation),
Lifting (Description and Operation).**

9. **Remove the HCU and ABS module support bracket lower retaining bolt.**

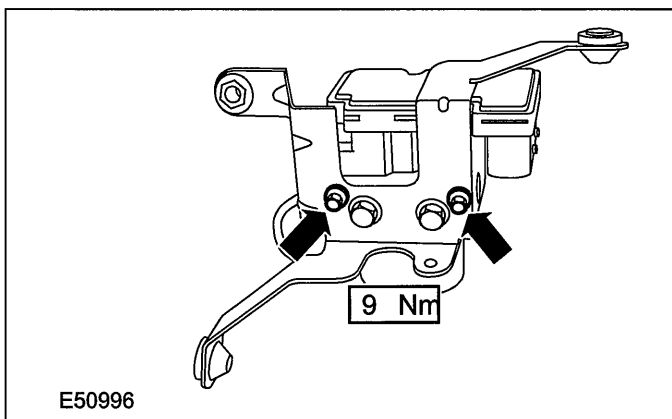


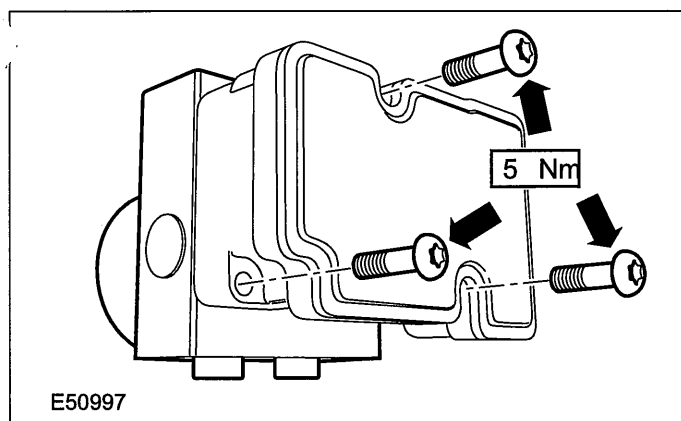
10. **Lower the vehicle.**

11. **Remove the HCU and ABS module assembly and the support bracket.**



12. **Detach the HCU and ABS module assembly from the support bracket.**



REMOVAL AND INSTALLATION**13. Remove the HCU.****Installation**

- 1. To install, reverse the removal procedure.**
- 2. Bleed the brake system. For additional information, refer to: (206-00 Brake System - General Information)**

**Brake System Bleeding (General Procedures),
Brake System Pressure Bleeding (General Procedures).**

REMOVAL AND INSTALLATION

Anti-Lock Brake System (ABS) Module — Vehicles Built Up To: 05/2004

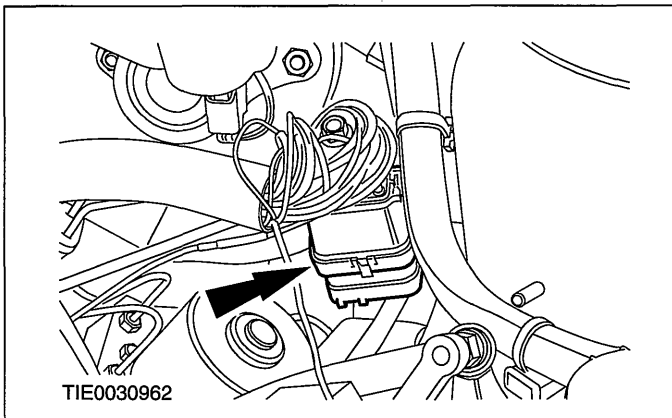
Materials

Name	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Removal

CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Remove the brake master cylinder. For additional information, refer to Section 206-06 [Hydraulic Brake Actuation].
2. Detach the engine wiring harness electrical connector from the wheelhouse assembly.



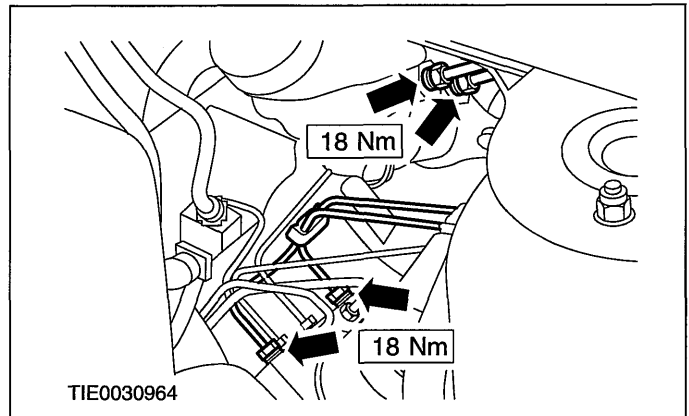
3. CAUTIONS:

CAUTION: Cap the brake tubes to prevent fluid loss or dirt ingress.

CAUTION: Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes, to aid installation.

Remove the brake master cylinder to hydraulic control unit (HCU) brake tubes.



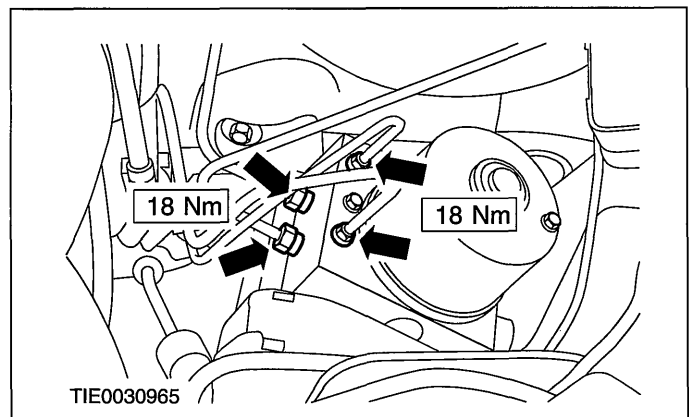
4. CAUTIONS:

CAUTION: Cap the brake tubes to prevent fluid loss or dirt ingress.

CAUTION: Plug the HCU ports to prevent fluid loss or dirt ingress.

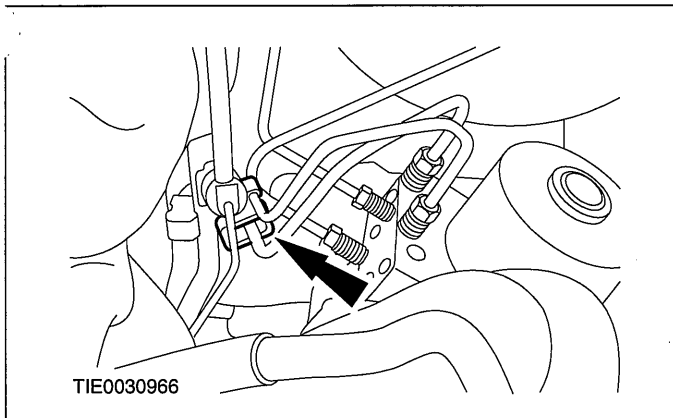
NOTE: Make a note of the position of the brake tubes, to aid installation.

Disconnect the brake tubes from the HCU.

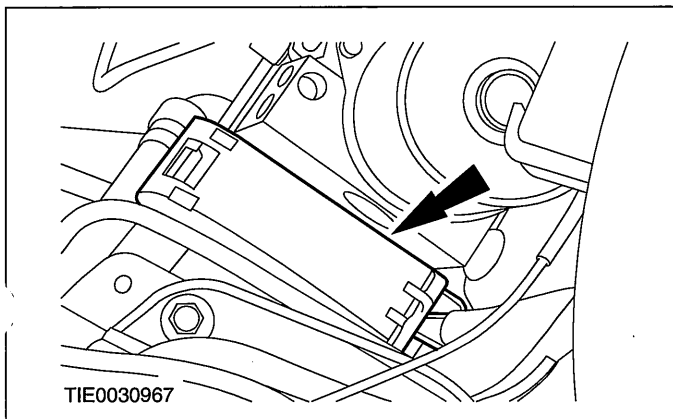


REMOVAL AND INSTALLATION

5. Detach the brake tubes from the bulkhead.

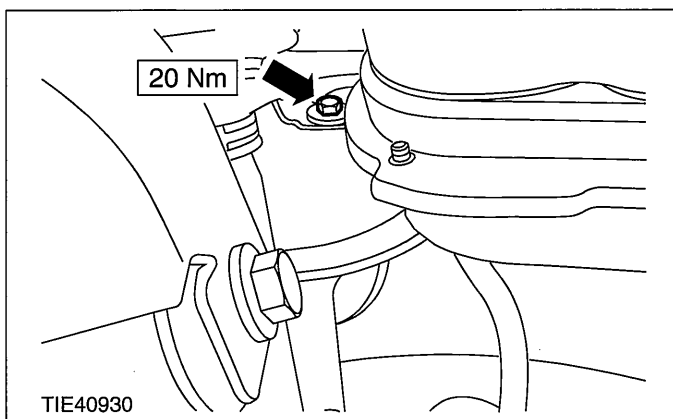


6. Disconnect the anti-lock brake system (ABS) module electrical connector.



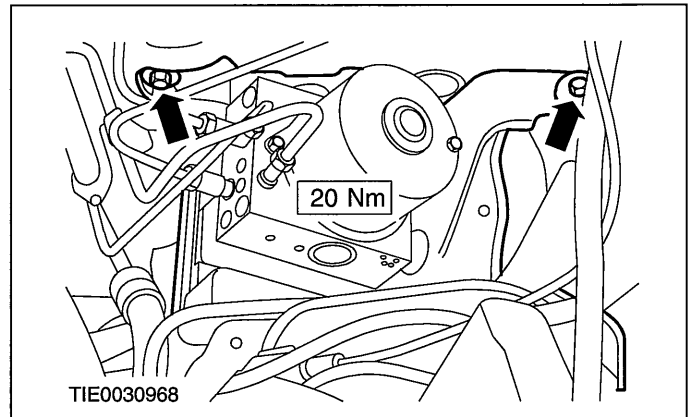
7. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

8. Remove the HCU and ABS module support bracket lower retaining bolt.

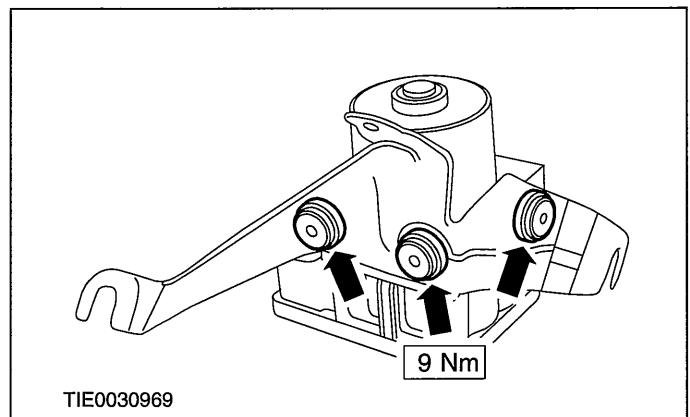


9. Lower the vehicle.

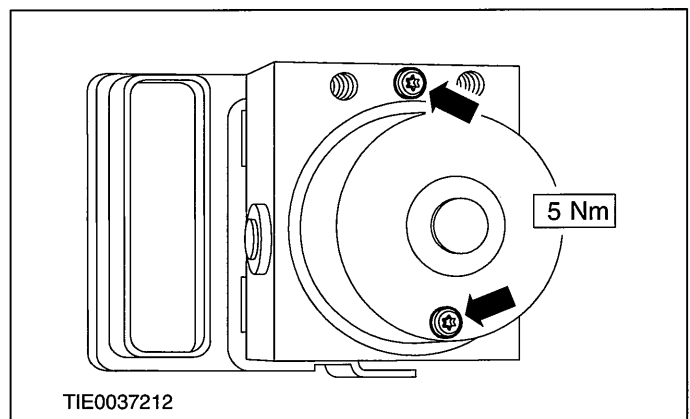
10. Remove the HCU and ABS module assembly and the support bracket.



11. Detach the HCU and ABS module assembly from the support bracket.



12. Remove the HCU to ABS module retaining bolts.



13. Remove the ABS module.

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

2. Bleed the brake system. For additional information, refer to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION

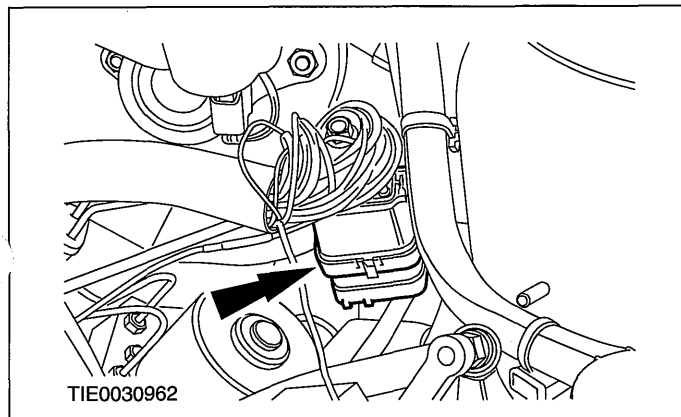
Anti-Lock Brake System (ABS) Module — Vehicles Built From:
05/2004**Materials**

Name	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Removal**All vehicles**

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Detach the engine wiring harness electrical connector from the wheelhouse assembly.

**Left-hand drive vehicles**

2. Remove the brake master cylinder.

For additional information, refer to: **Brake Master Cylinder - LHD (206-06 Hydraulic Brake Actuation, Removal and Installation).**

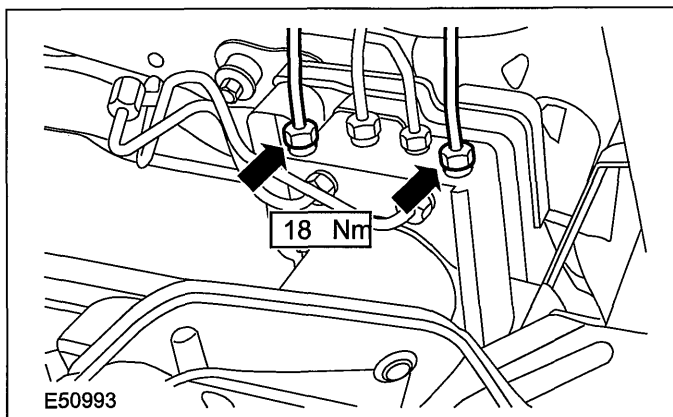
3. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes to aid installation.

Remove the brake master cylinder to HCU brake tubes.

**Right-hand drive vehicles**

4. Remove the battery tray.

For additional information, refer to: **Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).**

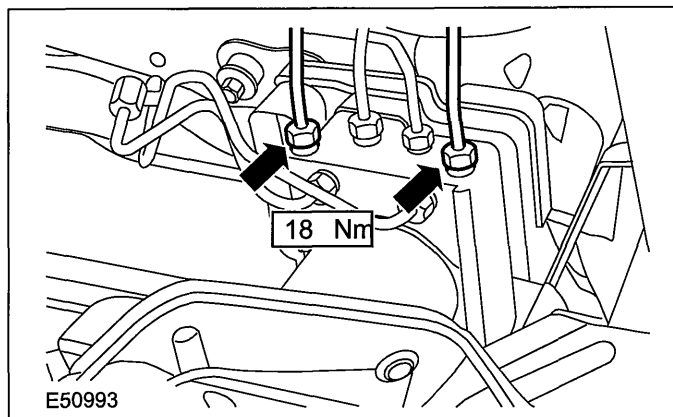
5. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes to aid installation.

Disconnect the brake master cylinder to HCU brake tubes from the HCU.

**All vehicles****6. CAUTIONS:**

REMOVAL AND INSTALLATION

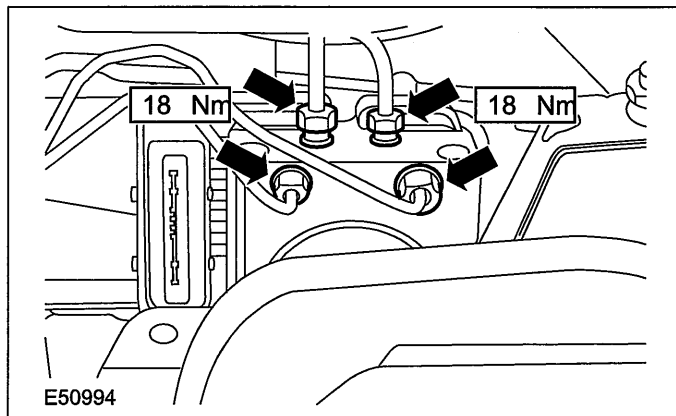
⚠ **Cap the brake tubes to prevent fluid loss or dirt ingress.**

⚠ **Plug the HCU ports to prevent fluid loss or dirt ingress.**

NOTE: Make a note of the position of the brake tubes to aid installation.

Disconnect the brake tubes from the HCU.

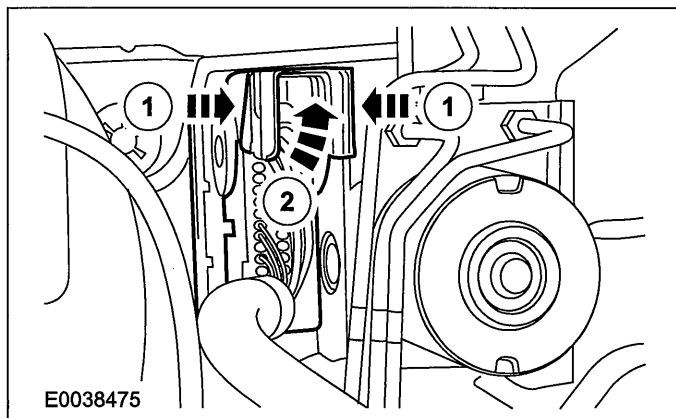
- Detach the brake tubes from the bulkhead.



7. ⚠ **CAUTION:** Cap the anti-lock brake system (ABS) module electrical connector and socket to prevent dirt and fluid ingress.

Disconnect the ABS module electrical connector.

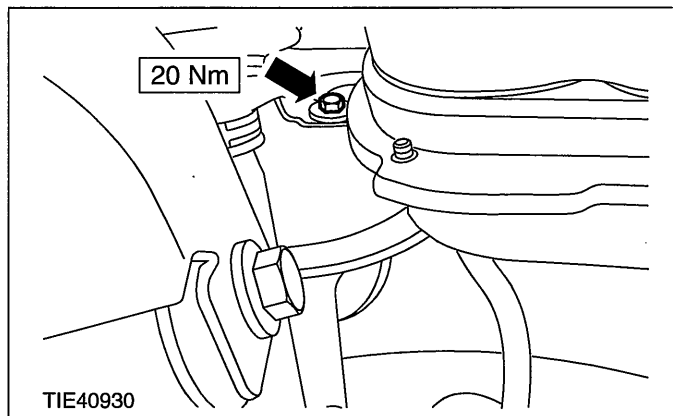
1. Depress the locking tangs.
2. Release the retainer.



8. **Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)**

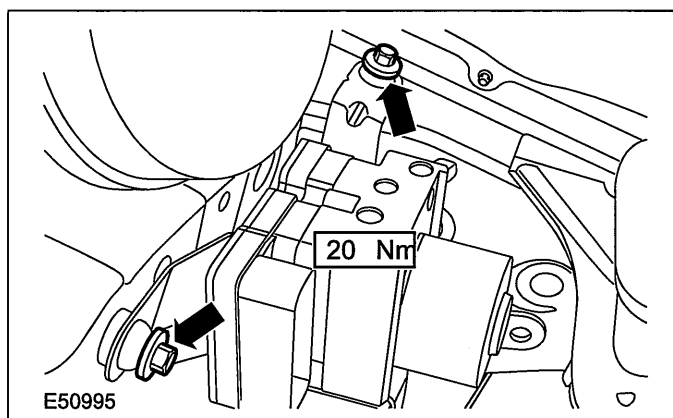
**Jacking (Description and Operation),
Lifting (Description and Operation).**

9. **Remove the HCU and ABS module support bracket lower retaining bolt.**

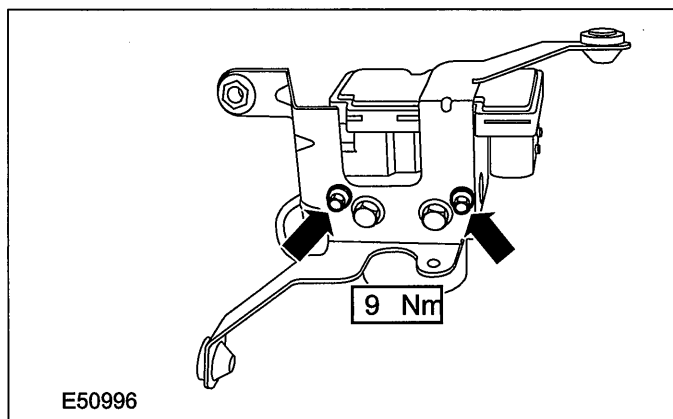


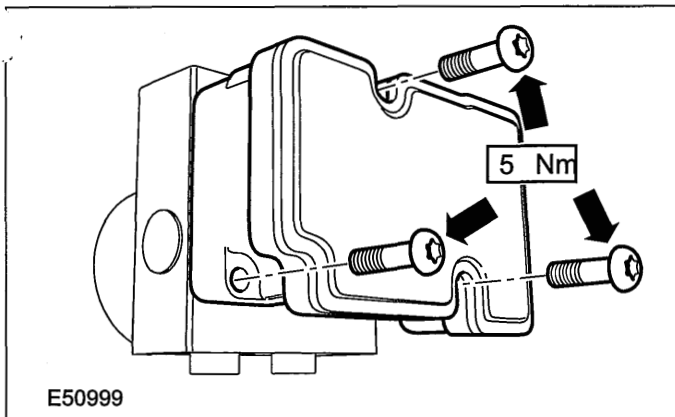
10. **Lower the vehicle.**

11. **Remove the HCU and ABS module assembly and the support bracket.**



12. **Detach the HCU and ABS module assembly from the support bracket.**



REMOVAL AND INSTALLATION**13. Remove the ABS module.****Installation**

- 1. To install, reverse the removal procedure.**
- 2. Bleed the brake system. For additional information, refer to: (206-00 Brake System - General Information)**

**Brake System Bleeding (General Procedures),
Brake System Pressure Bleeding (General Procedures).**

REMOVAL AND INSTALLATION

Rear Wheel Speed Sensor(12 785 0)

Removal

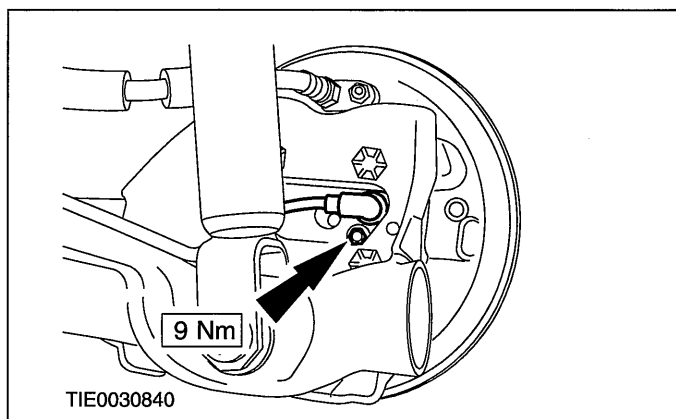
All vehicles

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

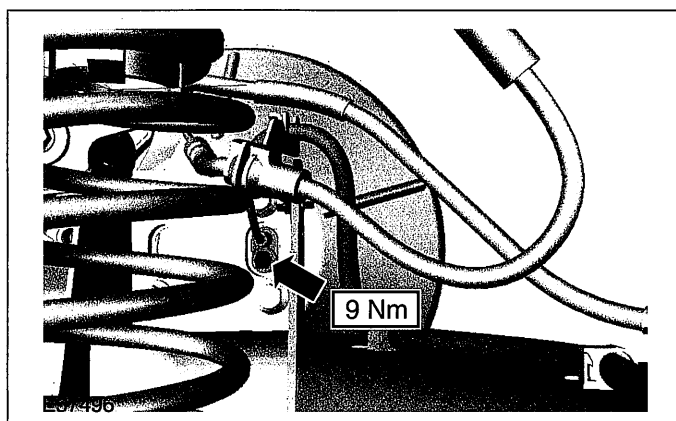
Vehicles with rear drum brakes

2. Detach the wheel speed sensor from the wheel spindle on both sides.

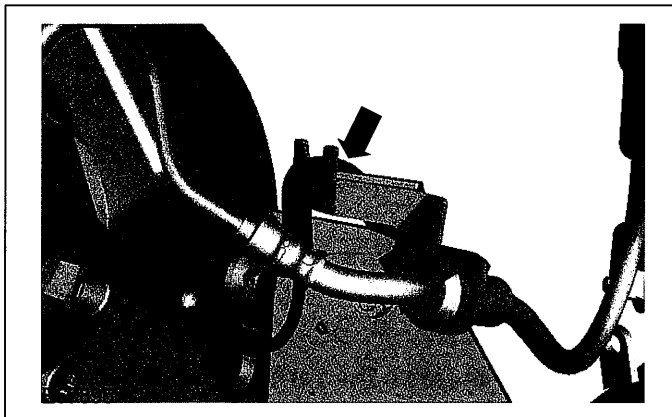


Vehicles with rear disc brakes

3. Detach the wheel speed sensor from the wheel spindle on both sides.

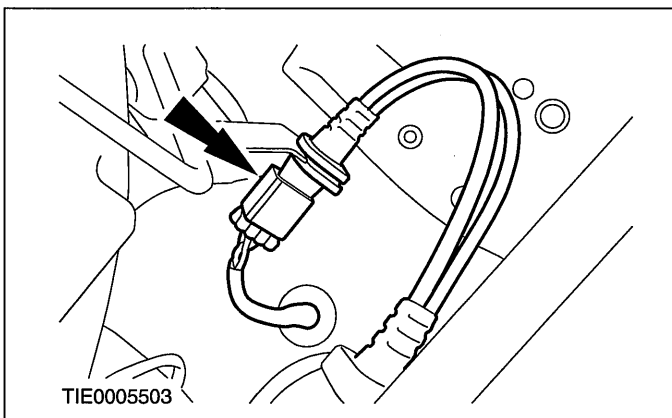


4. Detach the wheel speed sensor wiring harness from the wheel speed sensor wiring harness support bracket on both sides.



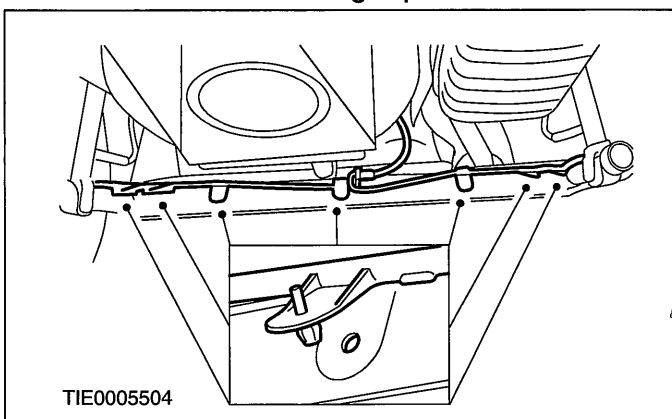
All vehicles

5. Disconnect the wheel speed sensor electrical connector.



6. Detach the wheel speed sensor support bracket and wheel speed sensor wiring harness from the beam axle.

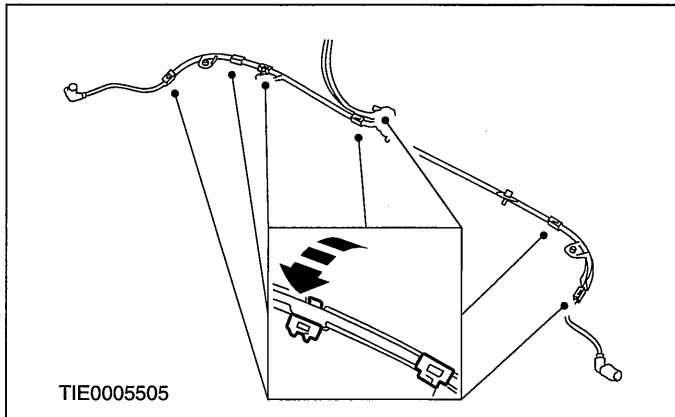
- Discard the retaining clips.



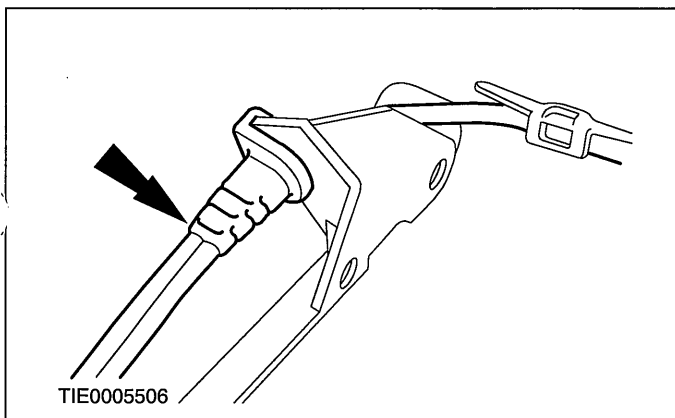
REMOVAL AND INSTALLATION

- 7. Detach the wheel speed sensor wiring harness from the wheel speed sensor support bracket.**

- Discard the retaining clips.



- 8. Detach the wheel speed sensor wiring harness from the beam axle on both sides.**



- 9. Remove the rear wheel speed sensor.**

Installation

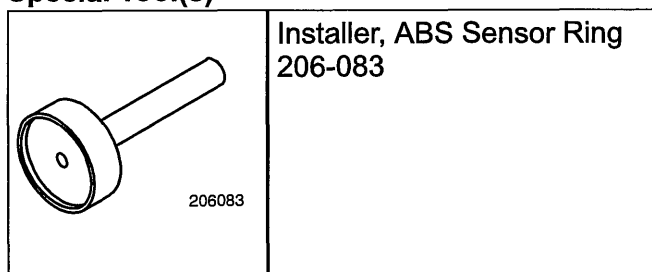
- 1. NOTE: Install new retaining clips.**

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Rear Wheel Speed Sensor Ring(12 788 0)

Special Tool(s)



General Equipment

Soft faced hammer

Removal

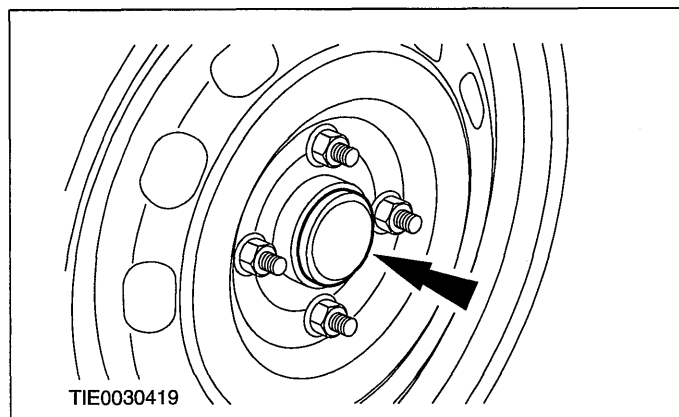
Vehicles with rear drum brakes

1. Remove the brake drum.

For additional information, refer to: Brake Drum (206-02 Drum Brake, Removal and Installation).

Vehicles with rear disc brakes

2. Remove the dust cap.

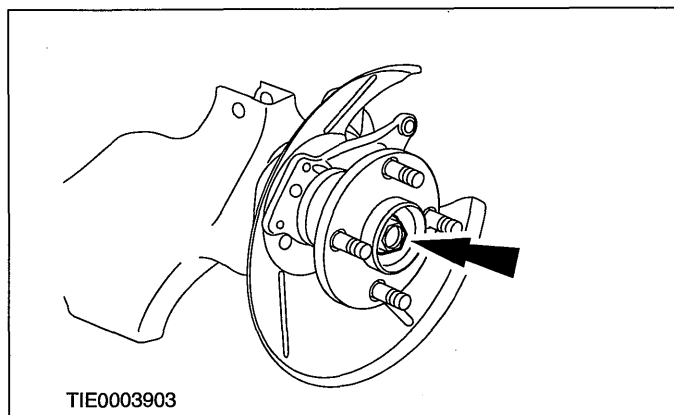


3. Remove the brake disc.

For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

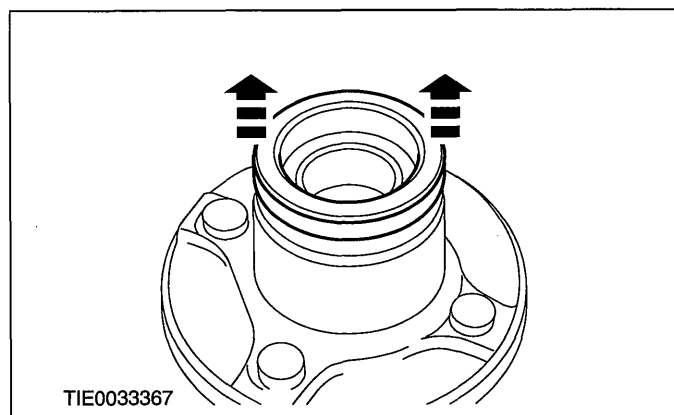
4. Remove the wheel hub.

- Remove and discard the wheel hub retaining nut.



All vehicles

5. Remove and discard the wheel speed sensor ring (brake disc shown).



Installation

All vehicles

1. CAUTIONS:

⚠ Make sure the wheel speed sensor ring is not knocked, damaged and kept free from metal fragments.

⚠ Protect the face of the wheel speed sensor ring with a non-ferrous flat block to prevent damage.

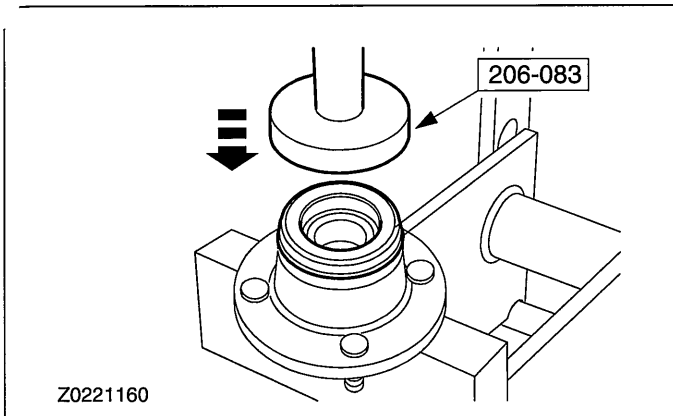
⚠ Make sure the wheel hub or brake drum is adequately supported and do not allow it to rest on the wheel studs.

⚠ Make sure the wheel speed sensor ring is pressed on slowly and squarely until fully seated.

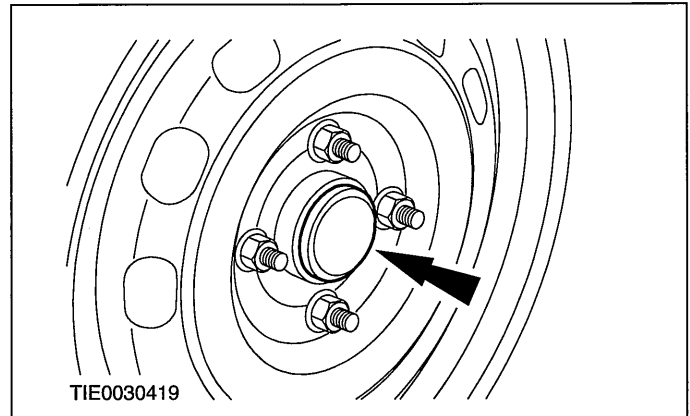
⚠ Do not exceed a maximum load of 10 kN.

REMOVAL AND INSTALLATION

Using the special tool, install a new wheel speed sensor ring (brake disc shown).



Using a soft faced hammer and a wooden block, install the dust cap.



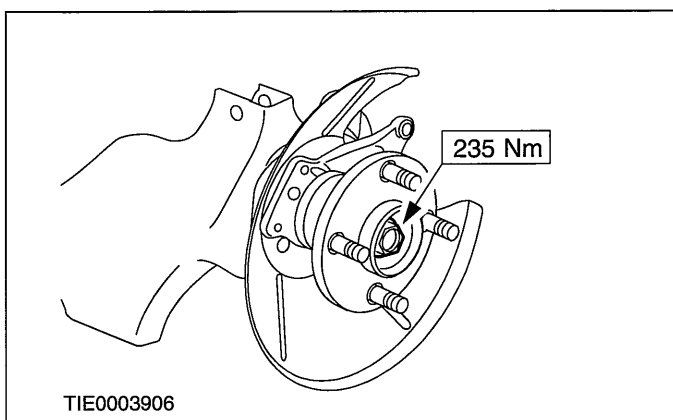
Vehicles with rear disc brakes

2. CAUTIONS:

- ⚠ Avoid any impact on the wheel speed sensor ring.
- ⚠ Make sure the wheel speed sensor ring is clean.
- ⚠ Avoid any contact between the wheel speed sensor ring and a magnetic surface.
- ⚠ Rotate the hub assembly 10 times counter-clockwise when tightening the wheel hub retaining nut to prevent damage to the wheel bearing.

NOTE: Install a new wheel hub retaining nut.

Install the wheel hub.



3. Install the brake disc.

For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

4. NOTE: If the dust cap is damaged a new dust cap must be installed.

Vehicles with rear drum brakes

5. CAUTIONS:

- ⚠ Avoid any impact on the wheel speed sensor ring.
 - ⚠ Make sure the wheel speed sensor ring is clean.
 - ⚠ Avoid any contact between the wheel speed sensor ring and a magnetic surface.
- Install the brake drum.

For additional information, refer to: Brake Drum (206-02 Drum Brake, Removal and Installation).

REMOVAL AND INSTALLATION

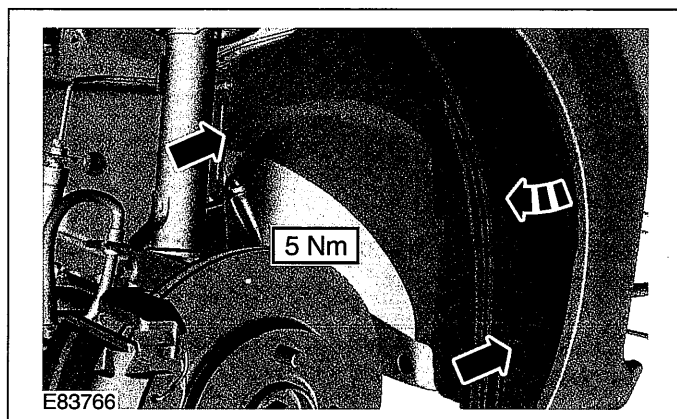
Front Wheel Speed Sensor(12 784 0)

Removal

1. Remove the wheel and tire.

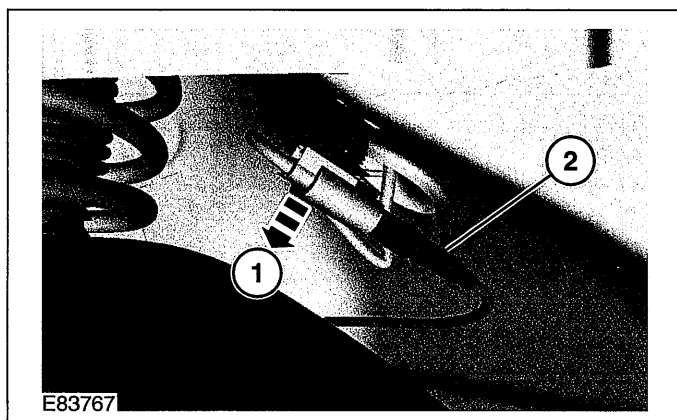
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

2. Detach the fender splash shield from the wheelhouse assembly.



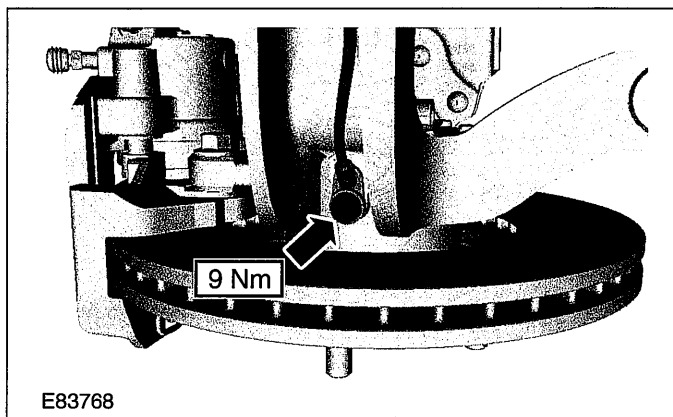
3. **CAUTION:** Make sure that the area around the component is clean and free of foreign material.

1. Detach the wheel speed sensor electrical connector from the wheelhouse assembly.
2. Disconnect the wheel speed sensor electrical connector.



4. **CAUTION:** Make sure that the area around the component is clean and free of foreign material.

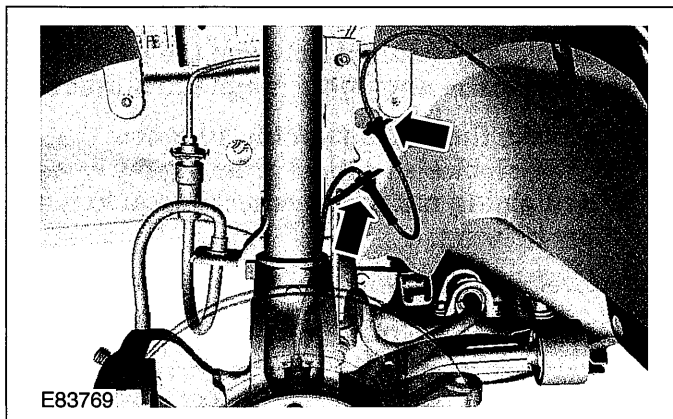
Remove the wheel speed sensor bolt.



5. **NOTE:** Make sure that all openings are sealed.

NOTE: Note the position of the component before removal.

Remove the wheel speed sensor.



Installation

1. **CAUTION:** Make sure that the wheel speed sensor cable is not twisted and correctly located.

NOTE: Make sure that the sensor housing is clean and free of foreign material.

NOTE: Make sure that the sensor is installed in the same location as when removed.

To install, reverse the removal procedure.

SECTION 206-09B Anti-Lock Control - Traction Control

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	206-09B-2
DIAGNOSIS AND TESTING	
Anti-Lock Control - Traction Control.....	206-09B-3
REMOVAL AND INSTALLATION	
Rear Wheel Speed Sensor Ring..... (12 788 0)	206-09B-4
Rear Wheel Speed Sensor..... (12 785 0)	206-09B-5
Hydraulic Control Unit (HCU).....	206-09B-6
Anti-Lock Brake System (ABS) Module.....	206-09B-7

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

	Specifications
Super DOT 4 brake fluid	ESD-M6C57-A

Torque Specifications

Item	Nm	lb-ft	lb-in
Hydraulic control unit (HCU) support bracket retaining bolts	23	17	-
HCU retaining bolts	10	-	89
Brake tube to HCU union	13	10	-
Wheel speed sensor retaining bolt	9	-	80

DIAGNOSIS AND TESTING**Anti-Lock Control - Traction Control**

REFER to Section 206-09A [Anti-Lock Control] /
206-09B [Anti-Lock Control - Traction Control] /
206-09C [Anti-Lock Control - Stability Assist].

REMOVAL AND INSTALLATION**Rear Wheel Speed Sensor Ring(12 788 0)**

For additional information, refer to
Section 206-09A [Anti-Lock Control] / 206-09B
[Anti-Lock Control - Traction Control] / 206-09C
[Anti-Lock Control - Stability Assist].

REMOVAL AND INSTALLATION**Rear Wheel Speed Sensor(12 785 0)****Removal**

1. For additional information, refer to
Section 206-09A [Anti-Lock Control] /
206-09B [Anti-Lock Control - Traction
Control] / 206-09C [Anti-Lock Control -
Stability Assist].

REMOVAL AND INSTALLATION**Hydraulic Control Unit (HCU)****Removal**

1. **NOTE:**The traction control function is only available on vehicles equipped with the MK60 anti-lock brake system (ABS) and the stability assist program.

For additional information, refer to: Hydraulic Control Unit (HCU) (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).

REMOVAL AND INSTALLATION**Anti-Lock Brake System (ABS) Module****Removal**

1. **NOTE:**The traction control function is only available on vehicles equipped with the MK60 anti-lock brake system (ABS) and the stability assist program.

For additional information, refer to: **Stability Assist Module (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).**



SECTION 206-09C Anti-Lock Control - Stability Assist

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

SPECIFICATIONS

Specifications..... 206-09C-2

DIAGNOSIS AND TESTING

Anti-Lock Control - Stability Assist..... 206-09C-3

REMOVAL AND INSTALLATION

Hydraulic Control Unit (HCU)..... 206-09C-4

Rear Wheel Speed Sensor..... (12 785 0) 206-09C-7

Yaw Rate Sensor and Accelerometer..... 206-09C-8

Steering Wheel Rotation Sensor..... 206-09C-10

Rear Wheel Speed Sensor Ring..... (12 788 0) 206-09C-11

Stability Assist Module..... 206-09C-12

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

	Specificat ions
Super DOT 4 brake fluid	ESD-M6C5 7-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Hydraulic control unit (HCU) to support bracket retaining bolts	9	-	80
HCU support bracket retaining bolts	20	15	-
Brake tube to HCU unions	18	13	-
Wheel speed sensor retaining bolts	9	-	80
Stability assist module to HCU retaining bolts	5	-	44
Yaw rate sensor and accelerometer assembly retaining bolts	5	-	44
Yaw rate sensor and accelerometer assembly cover retaining bolts	4	-	35

DIAGNOSIS AND TESTING**Anti-Lock Control - Stability Assist**

REFER to Section 206-09A [Anti-Lock Control] /
206-09B [Anti-Lock Control - Traction Control] /
206-09C [Anti-Lock Control - Stability Assist].

REMOVAL AND INSTALLATION

Hydraulic Control Unit (HCU)

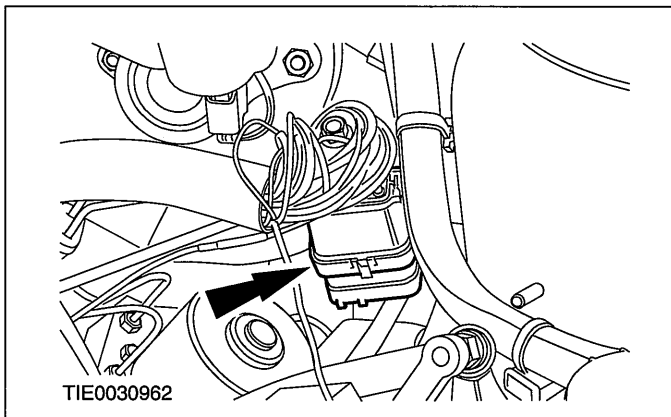
Materials

Name	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Removal

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Remove the brake master cylinder. For additional information, refer to Section 206-06 [Hydraulic Brake Actuation].
2. Detach the engine wiring harness electrical connector from the wheelhouse assembly.



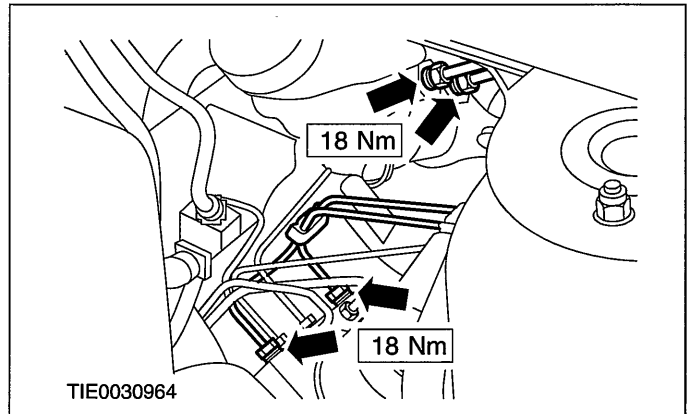
3. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes, to aid installation.

Remove the brake master cylinder to hydraulic control unit (HCU) brake tubes.



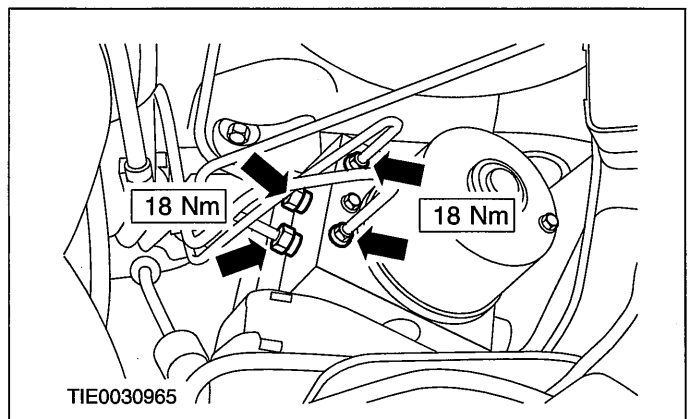
4. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the HCU ports to prevent fluid loss or dirt ingress.

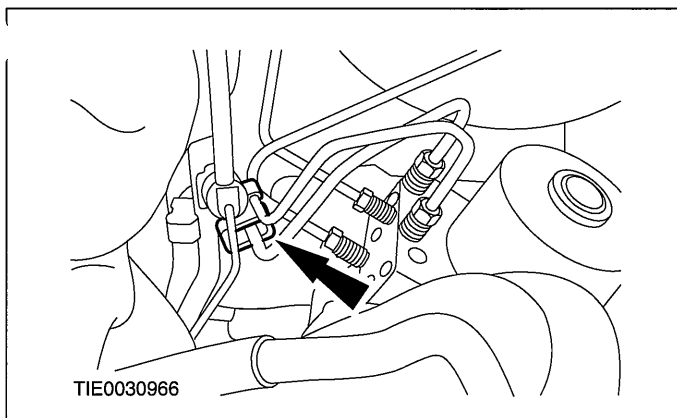
NOTE: Make a note of the position of the brake tubes, to aid installation.

Disconnect the brake tubes from the HCU.

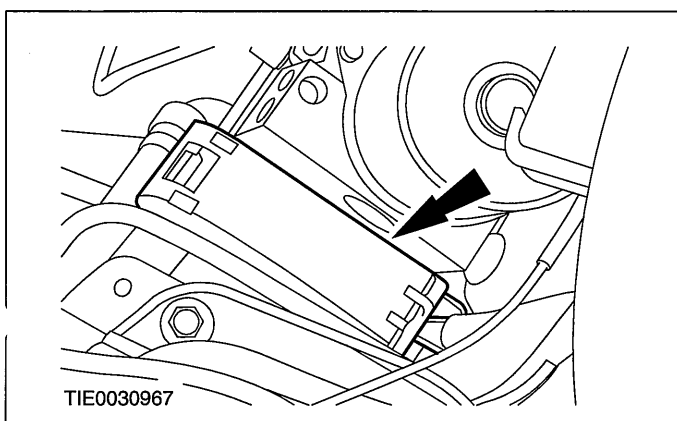


REMOVAL AND INSTALLATION

5. Detach the brake tubes from the bulkhead.

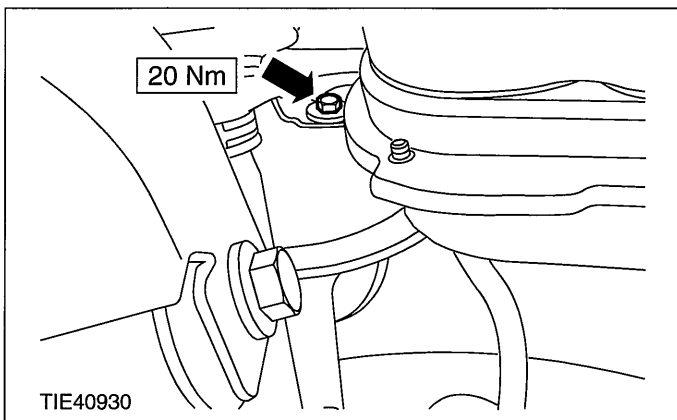


6. Disconnect the stability assist module electrical connector.



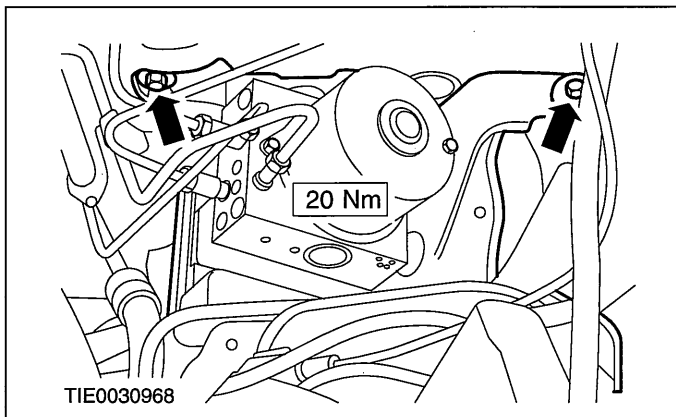
7. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

8. Remove the HCU and stability assist module support bracket lower retaining bolt.

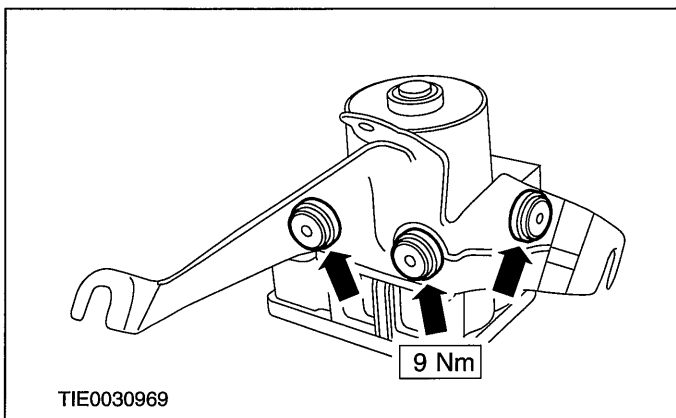


9. Lower the vehicle.

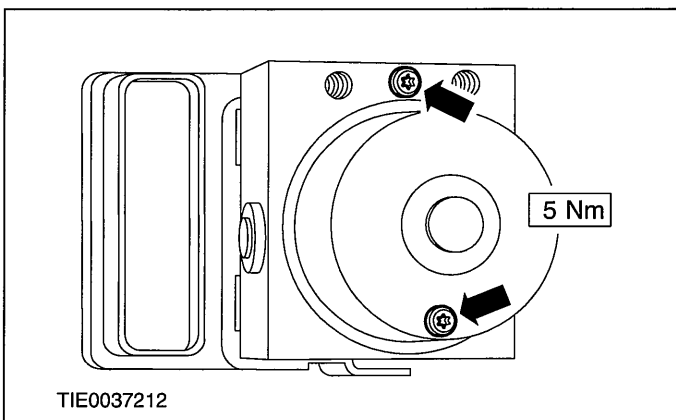
10. Remove the HCU and stability assist module assembly and the support bracket.



11. Detach the HCU and stability assist module assembly from the support bracket.



12. Remove the HCU to stability assist module retaining bolts.



13. Remove the HCU.

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

2. Bleed the brake system. For additional information, refer to Section 206-00 [Brake System - General Information].

REMOVAL AND INSTALLATION**Rear Wheel Speed Sensor(12 785 0)****Removal**

1. For additional information, refer to
Section 206-09A [Anti-Lock Control] /
206-09B [Anti-Lock Control - Traction
Control] / 206-09C [Anti-Lock Control -
Stability Assist].

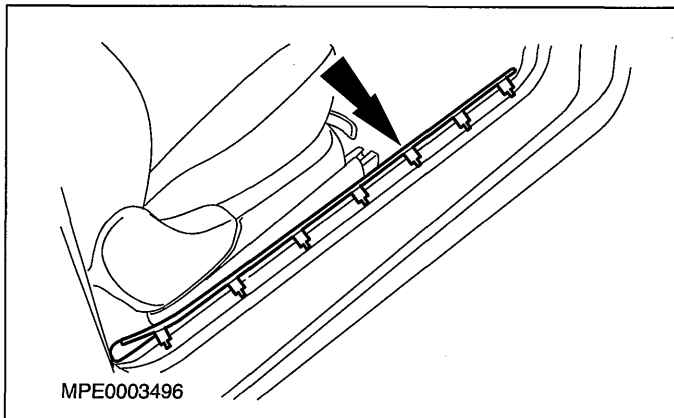
REMOVAL AND INSTALLATION

Yaw Rate Sensor and Accelerometer

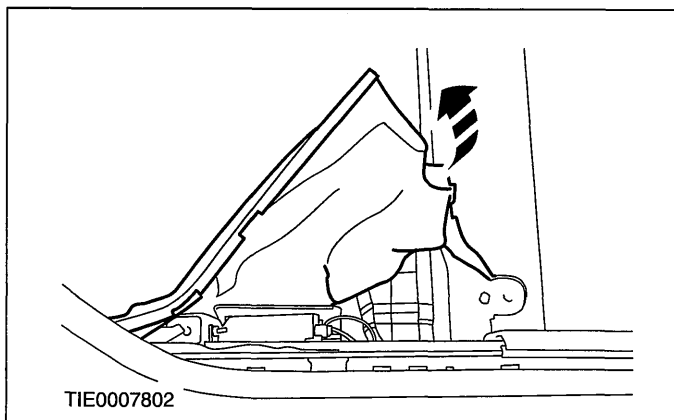
Removal

NOTE: The yaw rate sensor and accelerometer are one assembly and cannot be separated.

1. Remove the left-hand front seat. For additional information, refer to Section 501-10 [Seating].
2. Remove the scuff plate trim panels.

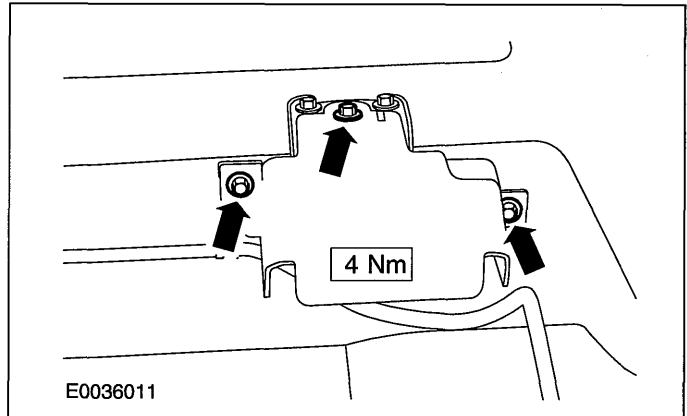


3. Remove the B-pillar trim panel. For additional information, refer to Section 501-05 [Interior Trim and Ornamentation].
4. Locally detach the carpet.



5. **NOTE:** Make a note of the position of the bolts, to aid installation.

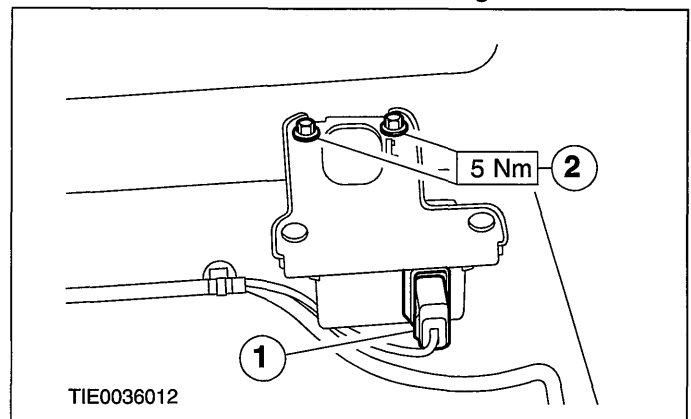
Remove the yaw rate sensor and accelerometer assembly cover.



6. **NOTE:** Make a note of the position of the bolts, to aid installation.

Remove the yaw rate sensor and accelerometer assembly.

1. Disconnect the electrical connector.
2. Remove the bracket retaining bolts.



Installation

1. **WARNINGS:**

▲ Do not use a damaged yaw rate sensor and accelerometer assembly. Failure to follow this instruction may result in personal injury.

▲ Make sure the yaw rate sensor and accelerometer assembly is correctly positioned. Failure to follow this instruction may result in personal injury.

REMOVAL AND INSTALLATION**CAUTIONS:**

-  **The yaw rate sensor and accelerometer assembly will be damaged if dropped.**
-  **Make sure the correct bolts are used for the yaw rate sensor and accelerometer assembly. Failure to follow this instruction will result in damaged threads.**
-  **Make sure the correct bolts are used for the yaw rate sensor and accelerometer assembly cover. Failure to follow this instruction will result in damaged threads.**

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Steering Wheel Rotation Sensor****Removal**

1. **NOTE:**The steering wheel rotation sensor and the clockspring cannot be separated.

Remove the clockspring. For additional information, refer to Section 501-20A [Safety Belt System] / 501-20B [Supplemental Restraint System].

Installation

1. **▲WARNING:**The stability assist program must be re-configured following installation. Failure to follow this instruction may result in personal injury.

Install the clockspring. For additional information, refer to Section 501-20A [Safety Belt System] / 501-20B [Supplemental Restraint System].

REMOVAL AND INSTALLATION**Rear Wheel Speed Sensor Ring(12 788 0)****Removal**

1. For additional information, refer to
Section 206-09A [Anti-Lock Control] /
206-09B [Anti-Lock Control - Traction
Control] / 206-09C [Anti-Lock Control -
Stability Assist].

REMOVAL AND INSTALLATION

Stability Assist Module

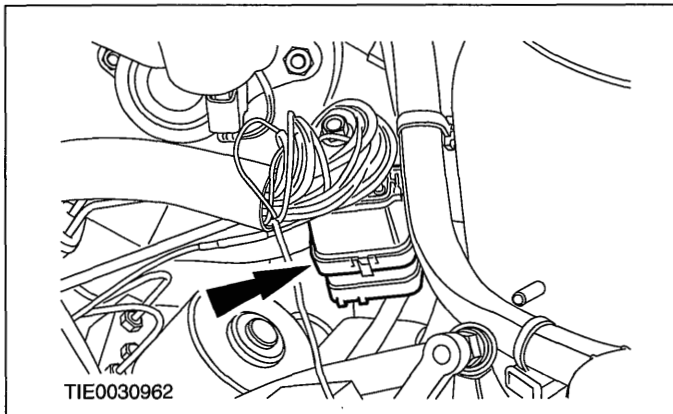
Materials

Name	Specification
Super DOT 4 brake fluid	ESD-M6C57-A

Removal

⚠ **CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. Remove the brake master cylinder. For additional information, refer to Section 206-06 [Hydraulic Brake Actuation].
2. Detach the engine wiring harness electrical connector from the wheelhouse assembly.



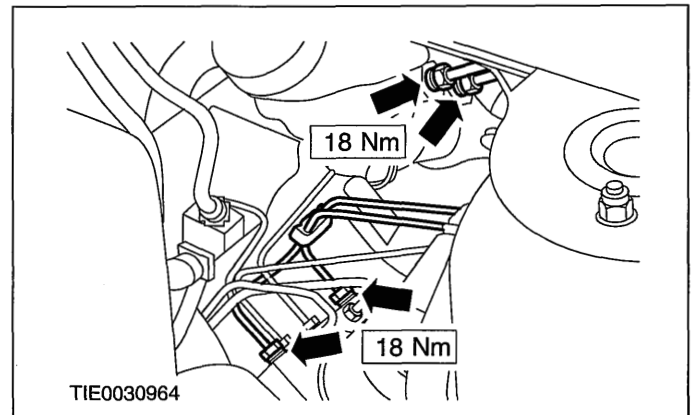
3. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the hydraulic control unit (HCU) ports to prevent fluid loss or dirt ingress.

NOTE: Make a note of the position of the brake tubes, to aid installation.

Remove the brake master cylinder to hydraulic control unit (HCU) brake tubes.



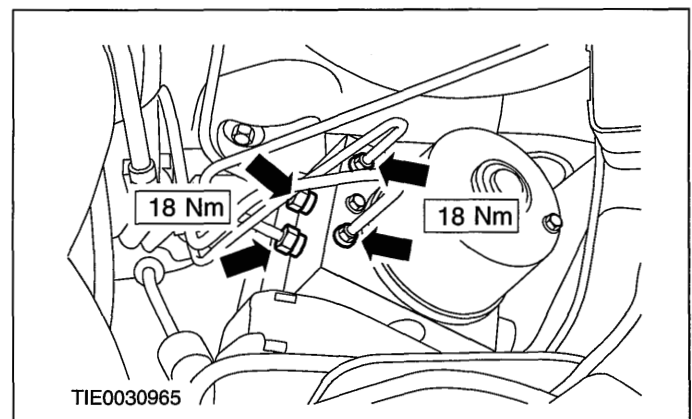
4. CAUTIONS:

⚠ Cap the brake tubes to prevent fluid loss or dirt ingress.

⚠ Plug the HCU ports to prevent fluid loss or dirt ingress.

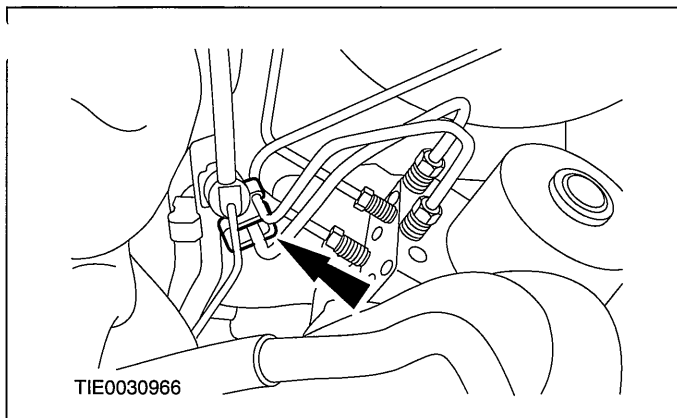
NOTE: Make a note of the position of the brake tubes, to aid installation.

Disconnect the brake tubes from the HCU.

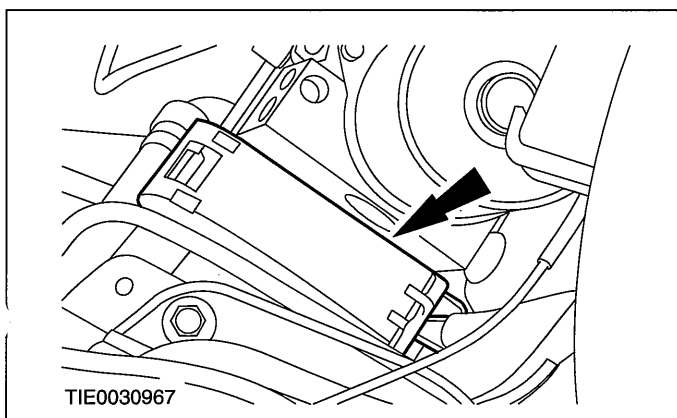


REMOVAL AND INSTALLATION

5. Detach the brake tubes from the bulkhead.

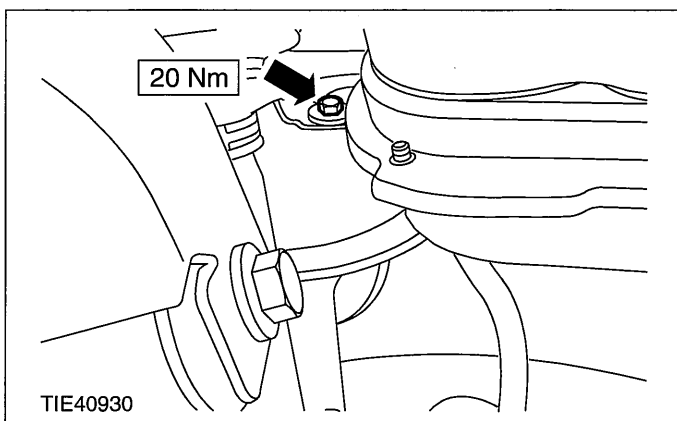


6. Disconnect the stability assist module electrical connector.



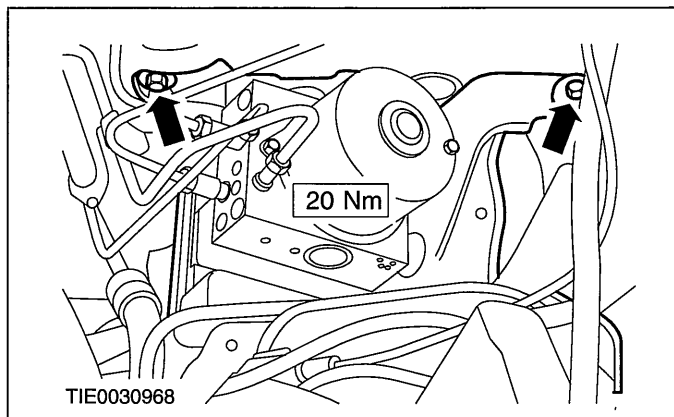
7. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

8. Remove the HCU and stability assist module support bracket lower retaining bolt.

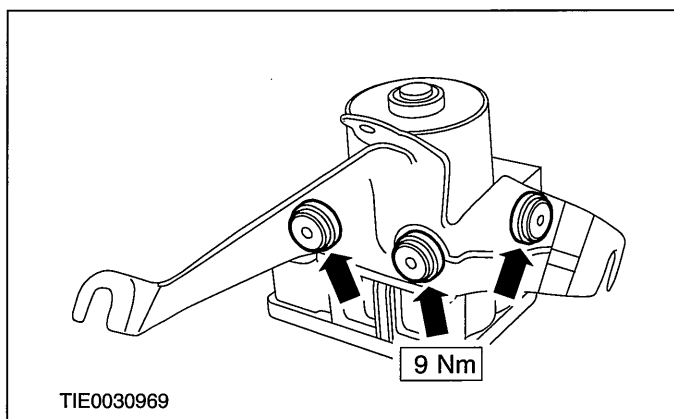


9. Lower the vehicle.

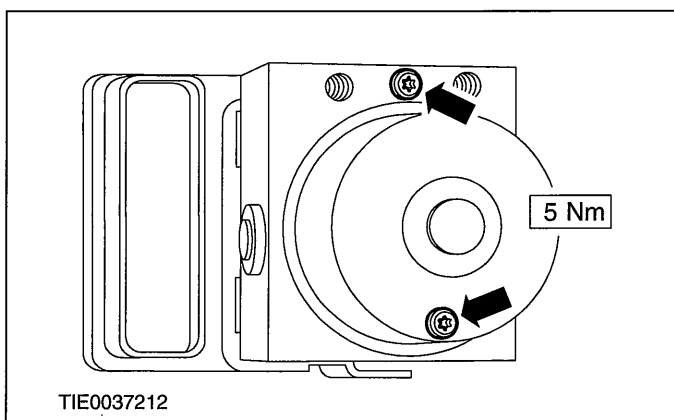
10. Remove the HCU and stability assist module assembly and the support bracket.



11. Detach the HCU and stability assist module assembly from the support bracket.



12. Remove the HCU to stability assist module retaining bolts.



13. Remove the stability assist module.

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

2. Bleed the brake system. For additional information, refer to Section 206-00 [Brake System - General Information].

SECTION 211-00 Steering System - General Information

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	211-00-2
DESCRIPTION AND OPERATION	
Steering System.....	211-00-3
Overview.....	211-00-3
DIAGNOSIS AND TESTING	
Steering System.....	211-00-5
Principles of Operation.....	211-00-5
Inspection and Verification.....	211-00-5
Components Tests.....	211-00-14
Steering Gear Checks After a Collision.....	211-00-18
GENERAL PROCEDURES	
Power Steering System Filling..... (13 002 0)	211-00-20
Power Steering System Bleeding..... (13 416 1)	211-00-21
Power Steering System Flushing — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)..... (13 001 0)	211-00-23
Power Steering System Flushing — 2.0L Duratec-HE (MI4)..... (13 001 0)	211-00-26

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

Description	Specifications
Power steering fluid	WSA-M2C195-A
Hydraulic fluid, vehicles with 1.6L Duratorq-TDCi (DV) Diesel	WSS-M2C204-A2

Turning Circle

Description	Meters
Wall to wall	10.37
Wall to wall, vehicles with 2.0L Duratec-HE (MI4)	11.65

Steering Wheel Alignment

Description	Degrees
Maximum allowable steering wheel misalignment	$\pm 3.00^\circ$

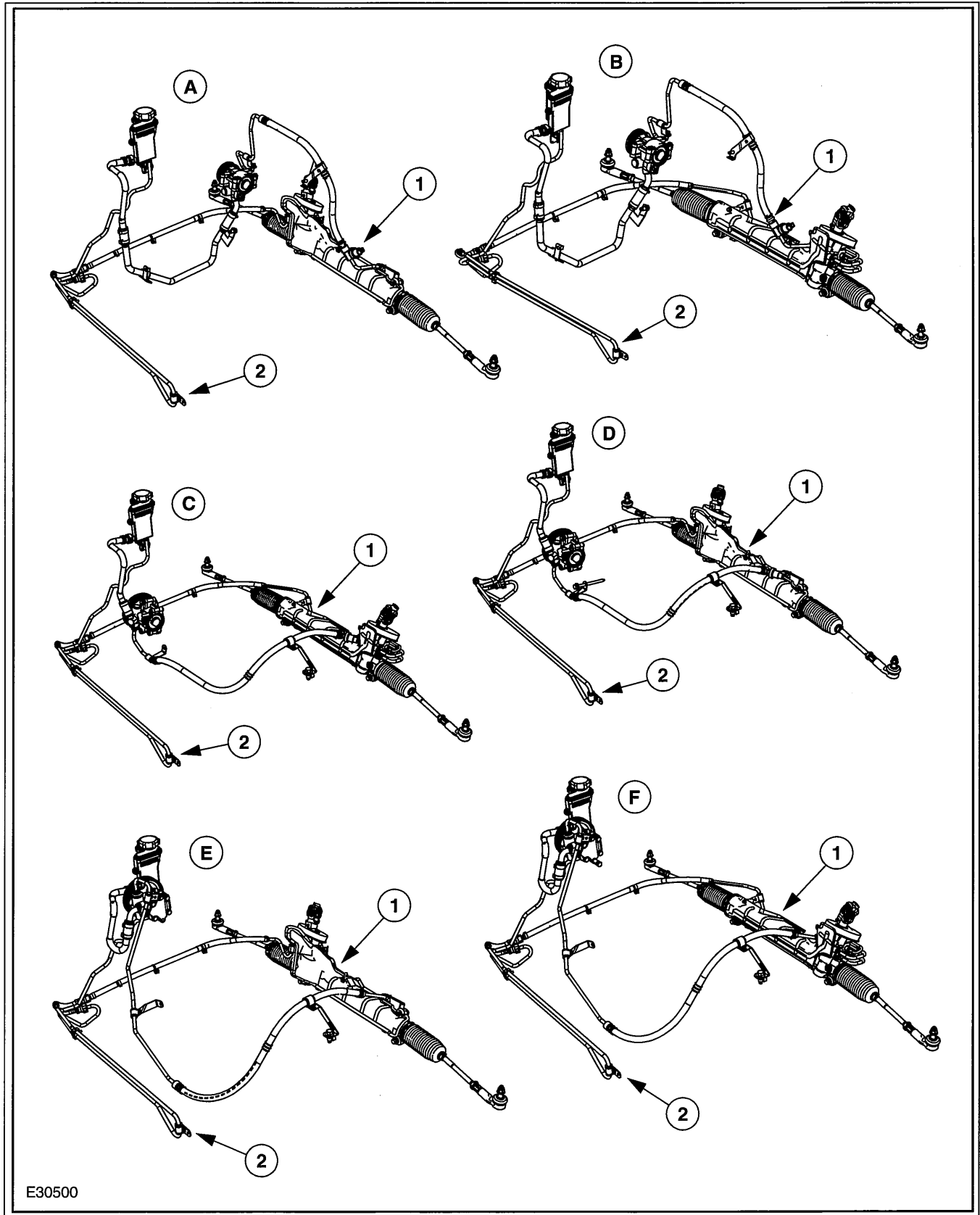
Turning Effort

Description	Nm	lb-in
Turning effort	8	71

DESCRIPTION AND OPERATION

Steering System

Overview



DESCRIPTION AND OPERATION

Item	Description
A	RHD with Duratec 16V engine and Air Conditioning (A/C)
B	LHD with Duratec 16V engine and A/C
C	RHD with Duratec 16V engine without A/C
D	LHD with Duratec 16V engine without A/C
E	RHD with 1.4L Duratorq TDCi engine
F	LHD with 1.4L Duratorq TDCi engine
1	Steering gear
2	Additional cooling loop

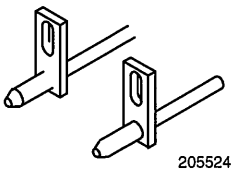
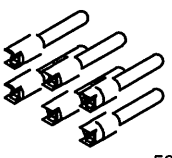
Independent of the equipment level, all vehicles have conventional power-assisted rack and pinion steering with an additional cooling loop.

The steering gear is supplied with hydraulic fluid by a hydraulic pump.

The hydraulic pump is driven by the accessory drive belt and has a separate reservoir.

Vehicles with petrol engines have a Power Steering Pressure (PSP) switch in the pressure line, which opens as the power steering load increases, thus signalling to the Powertrain Control Module (PCM) that it should increase the idle speed.

DIAGNOSIS AND TESTING**Steering System****Special Tool(s)**

 205524	Alignment Pins, Subframe 205-524
 501073	Simulator, Driver and Passenger Air Bags and Side Air Curtains 501-073A

General Equipment

Worldwide Diagnostic System (WDS)

Principles of Operation

The steering wheel rotational movement is transferred to the steering gear through the steering column shaft. The steering gear converts this rotational movement, through the action of the rack and pinion gear into lateral movement. This movement in turn is transferred to the wheel knuckles through the tie-rods and tie-rod ends.

Hydraulic fluid under pressure is supplied to the steering gear by the power steering pump. As the steering wheel is rotated, the hydraulic fluid is allowed to pass through the steering gear valve to one side of a double acting piston, dependent on which direction the steering wheel is rotated. The fluid moves the piston, which forms part of the steering gear, giving power assistance to the effort required to rotate the steering wheel.

Vehicles with petrol engines, due to the extra load on the engine imposed by the power steering pump, have a power steering pressure (PSP) switch. The switch, which is normally closed, sends

a signal to the powertrain control module (PCM) during low speed parking manoeuvres. The PCM responds by maintaining the engine idle speed.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Tire pressure(s) • Accessory drive belt • Tie-rod ends • Tie-rod(s) • Steering gear housing • Front strut and spring assemblies • Front suspension lower arm ball joints • Front suspension lower arm bushings • Pinch bolt on steering column shaft flexible coupling • Wheels and tires • Power steering line fluid leaks • Steering gear bellows	• Power steering pressure (PSP) switch

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• Drift left or right	• Vehicle attitude incorrect (front or rear is high or low).	• CHECK for abnormal loading, coil spring sag or non-standard springs.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Incorrect wheel alignment.	CHECK the wheel alignment and adjust if necessary. REFER to: (204-00 Suspension System - General Information) Specifications (Specifications), Front Toe Adjustment (General Procedures).
	Incorrect front axle cross-member alignment.	Using the special tool, CHECK the front axle crossmember alignment.
	Damaged or worn front wheel bearings.	CHECK and INSTALL new front wheel bearings as necessary. REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation).
	Brake system.	CHECK the brake system. REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).
	Steering linkage.	CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
	Steering gear.	CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
	Wheels and tires.	CHECK the wheels and tires. REFER to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).
Steering wheel off center	Vehicle attitude incorrect (front or rear is high or low).	CHECK for abnormal loading, coil spring sag or non-standard springs.
	Incorrect wheel alignment.	CHECK the wheel alignment and adjust if necessary. REFER to: (204-00 Suspension System - General Information) Specifications (Specifications), Front Toe Adjustment (General Procedures).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Front suspension lower arm ball joint.	CHECK and INSTALL new suspension components as necessary. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).
	Steering linkage.	CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
	Steering gear.	CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
Vibration	Incorrect wheel alignment.	CHECK the wheel alignment and adjust if necessary. REFER to: (204-00 Suspension System - General Information) Specifications (Specifications), Front Toe Adjustment (General Procedures).
	Wheels and tires.	CHECK the wheels and tires. BALANCE or INSTALL new wheels and tires as necessary. REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).
	Damaged or worn front wheel bearings.	CHECK and INSTALL new front wheel bearings as necessary. REFER to: Front Wheel Bearing (204-01 Front Suspension, Removal and Installation).
	Front strut and spring assemblies.	CHECK and INSTALL new suspension components as necessary. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Damaged front suspension lower arm(s).	• CHECK and INSTALL new suspension components as necessary. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).
	• Steering linkage.	• CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
• Steering effort is high/low	• Loose or worn accessory drive belt.	• CHECK the accessory drive belt. REFER to: (303-05 Accessory Drive) Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (Removal and Installation), Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (Removal and Installation), Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (Removal and Installation), Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation), Accessory Drive Belt - 2.0L Duratec-HE (MI4) (Removal and Installation).

DIAGNOSIS AND TESTING**Symptom****Possible Sources****Action**

Power steering lines restriction.	- CHECK the power steering lines for damage, kinks or restrictions. INSTALL new components as necessary. REFER to: (211-02 Power Steering) - Power Steering Pump to Steering Gear Pressure Line - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 1.3L Duratec-8V (Rocam) (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 2.0L Duratec-HE (MI4) RHD (Removal and Installation), - Steering Gear to Power Steering Fluid Reservoir Return Line - 2.0L Duratec-HE (MI4) RHD (Removal and Installation), - Steering Gear to Fluid Cooler Return Hose (Removal and Installation).
Power steering fluid aeration.	- BLEED the power steering system. - REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Steering column.	- CHECK if the floor covering is obstructing the steering gear pinion. - CHECK the installation of the steering gear bulkhead floor seal. - CARRY OUT the steering column universal joint component test. REFER to Steering Column Universal Joint Component Test in this procedure.
	Steering linkage.	CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
	Steering gear.	CARRY OUT the steering linkage component test. REFER to Steering Linkage Component Test in this procedure.
	Worn power steering pump.	INSTALL a new power steering pump. REFER to: (211-02 Power Steering) Power Steering Pump - 1.3L Duratec-8V (Rocam) (Removal and Installation), Power Steering Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (Removal and Installation), Power Steering Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (Removal and Installation), Power Steering Pump - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation), Power Steering Pump - 2.0L Duratec-HE (MI4) (Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Excessive noise	Power steering operation noise.	CARRY OUT the Power Steering Operation Noise Check. REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing).
	Power steering fluid aeration.	BLEED the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Power steering lines.	- CHECK the power steering line clamps are secure. REFER to: (211-02 Power Steering) - Power Steering Pump to Steering Gear Pressure Line - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 1.3L Duratec-8V (Rocam) (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation), - Power Steering Pump to Steering Gear Pressure Line - 2.0L Duratec-HE (MI4) RHD (Removal and Installation), - Steering Gear to Power Steering Fluid Reservoir Return Line - 2.0L Duratec-HE (MI4) RHD (Removal and Installation), - Steering Gear to Fluid Cooler Return Hose (Removal and Installation). - CHECK the power steering lines for clearance from the vehicle body, front axle cross-member and steering gear. - CHECK the steering gear transfer lines for clearance from the steering gear.
	Steering gear bushings worn or perished.	CHECK and INSTALL new components as necessary. REFER to: Steering Gear Bushing (211-02 Power Steering, Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Loose steering gear retaining bolts.	CHECK and INSTALL new steering gear retaining bolts as necessary. REFER to: Specifications (211-02 Power Steering, Specifications).
	Worn power steering pump.	INSTALL a new power steering pump. REFER to: (211-02 Power Steering) Power Steering Pump - 1.3L Duratec-8V (Rocam) (Removal and Installation), Power Steering Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (Removal and Installation), Power Steering Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (Removal and Installation), Power Steering Pump - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation), Power Steering Pump - 2.0L Duratec-HE (M14) (Removal and Installation).
	Worn tie-rod.	CARRY OUT the tie-rod component test. REFER to Tie-Rod Component Test in this procedure.
Steering does not vary with increased wheel rotation	Worn tie-rod ends.	INSTALL new components as necessary. REFER to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).
	Worn front suspension bushings.	CHECK and INSTALL new components as necessary. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Worn front suspension lower arm ball joints.	- CARRY OUT the suspension ball joint inspection component test. - REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).
	Steering gear bushings worn or perished.	- CHECK and INSTALL new components as necessary. - REFER to: Steering Gear Bushing (211-02 Power Steering, Removal and Installation).
	Loose steering gear retaining bolts.	- CHECK and INSTALL new steering gear retaining bolts as necessary. - REFER to: Specifications (211-02 Power Steering, Specifications).
	Loose steering column retaining bolts.	- CHECK and INSTALL new steering column retaining bolts as necessary. - REFER to: Specifications (211-04 Steering Column, Specifications).
	Loose steering column to steering gear pinion retaining bolt.	- CHECK and INSTALL a new steering column to steering gear pinion retaining bolt as necessary. - REFER to: Specifications (211-02 Power Steering, Specifications).
	Excessive steering gear backlash.	- CARRY OUT the steering linkage component test. - REFER to Steering Linkage Component Test in this procedure.
Engine stalls when parking with engine speed at idle	Power steering pressure (PSP) switch or circuit.	For additional information, refer to WDS.

Components Tests**Steering Linkage**

1. Grasp the steering wheel firmly and move it up and down and to the left and right without turning the steering wheel, to check for steering

column bearing wear, steering column universal joint free play, steering wheel or steering column looseness. The steering column cannot be repaired. Install a new steering column.

REFER to: Steering Column (211-04 Steering Column, Removal and Installation).

DIAGNOSIS AND TESTING

2. With the road wheels in the straight ahead position, gently turn the steering wheel to the left and the right to check free play in the steering linkage.
3. There should be no excessive free play at the steering wheel rim. If there is excessive free play, CHECK the tie-rod inner and outer ball joints, REFER to Tie-Rod Component Test in this procedure. CHECK the steering column universal joint, REFER to Steering Column Universal Joint Component Test in this procedure. If there is no free play in the tie-rod and the steering column, install a new steering gear.

REFER to: Steering Gear (211-02 Power Steering, Removal and Installation).

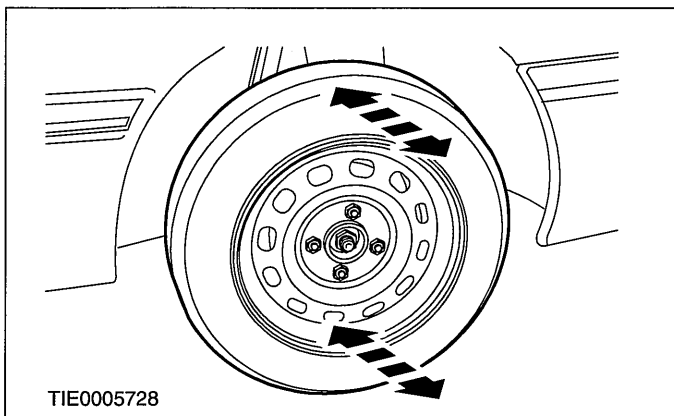
Tie-Rod

- ⚠ CAUTION:** The steering gear boots must be handled carefully to avoid damage. Use new steering gear boot clamps when installing the steering gear boots.

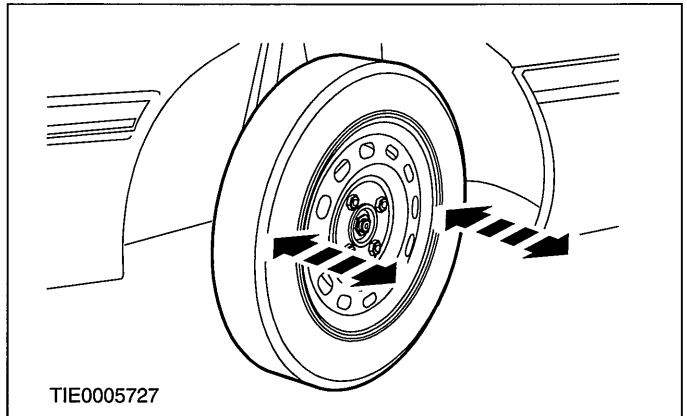
NOTE: Noises such as knocks, which may appear to originate from the steering linkage, may also be generated by front suspension components.

1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).



2. Firmly grasp the road wheel and apply a rocking motion to check for any free play in the wheel bearing or suspension components.

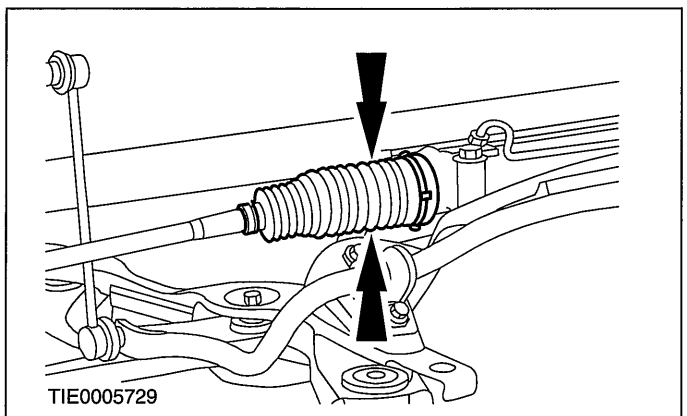


3. **⚠ CAUTION:** To prevent damage to the steering linkage, turn the steering wheel to move the steering linkage to the steering lock stop.

Turn the steering wheel to position the steering linkage against the right-hand steering lock stop.

4. **NOTE:** To isolate the steering gear design clearance, check the right-hand tie-rod with the steering held against the right-hand steering lock stop.

With the aid of another technician holding the steering against the right-hand steering lock stop, firmly grasp the right-hand road wheel and apply a rocking motion to check for any free play in the tie-rod.



5. Detach the steering gear boot from the steering gear body and check for free play at the tie-rod inner ball joint.
6. If there is free play at the tie-rod inner ball joint, install a new tie-rod.
7. If there is free play at the tie-rod end, install a new tie-rod end.

REFER to: Tie Rod (211-03 Steering Linkage, Removal and Installation).

REFER to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).

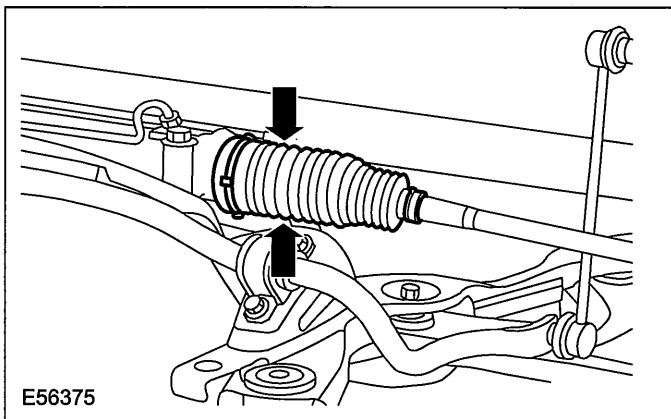
DIAGNOSIS AND TESTING

8. **⚠ CAUTION:** To prevent damage to the steering linkage, turn the steering wheel to move the steering linkage to the steering lock stop.

Turn the steering wheel to position the steering linkage against the left-hand steering lock stop.

9. **NOTE:** To isolate the steering gear design clearance, check the left-hand tie-rod with the steering held against the left-hand steering lock stop.

With the aid of another technician holding the steering against the left-hand steering lock stop, firmly grasp the left-hand road wheel and apply a rocking motion to check for any free play in the tie-rod.



10. Detach the steering gear boot from the steering gear body and check for free play at the tie-rod inner ball joint.
11. If there is free play at the tie-rod inner ball joint, install a new tie-rod.
- REFER to: Tie Rod (211-03 Steering Linkage, Removal and Installation).
12. If there is free play at the tie-rod end, install a new tie-rod end.

REFER to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).

Turning Effort Test

NOTE: Before carrying out this test, make sure that the suspension components are serviceable.

NOTE: Before carrying out this test, make sure that the steering column is serviceable.

NOTE: Before carrying out this test, make sure that the front toe adjustment and tire pressures are correct.

1. Park the vehicle on a dry, even surface and apply the parking brake.
2. Remove the driver air bag module.
REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).
3. Remove the driver air bag module wiring harness from the driver air bag module.
REFER to: Driver Air Bag Module Wiring Harness (501-20 Supplemental Restraint System, Removal and Installation).
4. Connect the driver air bag module wiring harness to the clockspring.
5. Connect the air bag simulators to the driver air bag module wiring harness in place of the driver air bag module at the top of the steering column.
6. Start the engine and turn the steering wheel from lock to lock several times until the power steering fluid has reached normal operating temperature.
7. Using a suitable torque wrench and socket, check the steering wheel turning effort.
8. If the steering wheel turning effort is greater than the specification, install a new power steering pump. REFER to:

Specifications (211-00 Steering System - General Information, Specifications),

Power Steering Pump - 1.3L Duratec-8V (Rocam) (211-02 Power Steering, Removal and Installation),

Power Steering Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (211-02 Power Steering, Removal and Installation),

Power Steering Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (211-02 Power Steering, Removal and Installation),

Power Steering Pump - 1.4L Duratorq-TDCi (DV) Diesel (211-02 Power Steering, Removal and Installation),

Power Steering Pump - 2.0L Duratec-HE (M14) (211-02 Power Steering, Removal and Installation).

9. Disconnect the air bag simulators from the driver air bag module wiring harness.
10. Disconnect the driver air bag module wiring harness from the clockspring.

DIAGNOSIS AND TESTING

11. Install a new driver air bag module wiring harness to the drive air bag module.

REFER to: Driver Air Bag Module Wiring Harness (501-20 Supplemental Restraint System, Removal and Installation).

12. Install the driver air bag module.

REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

- If the movement is not smooth or resistance is felt, renew the steering column.

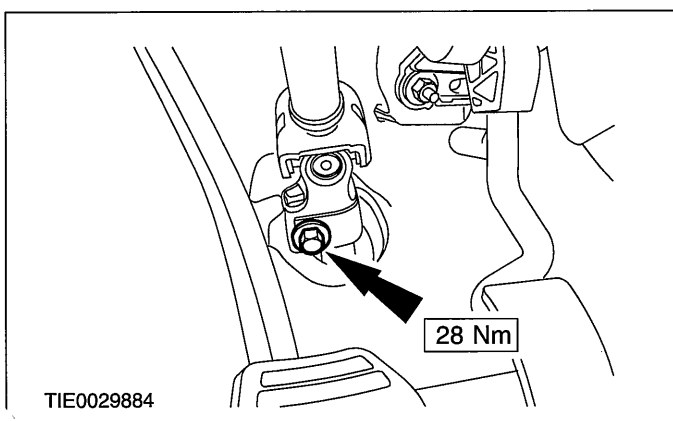
REFER to: Steering Column (211-04 Steering Column, Removal and Installation).

3. Hold both of the steering column shaft universal joint yokes and then twist them clockwise and counterclockwise.

- If any movement is felt, install a new steering column.

REFER to: Steering Column (211-04 Steering Column, Removal and Installation).

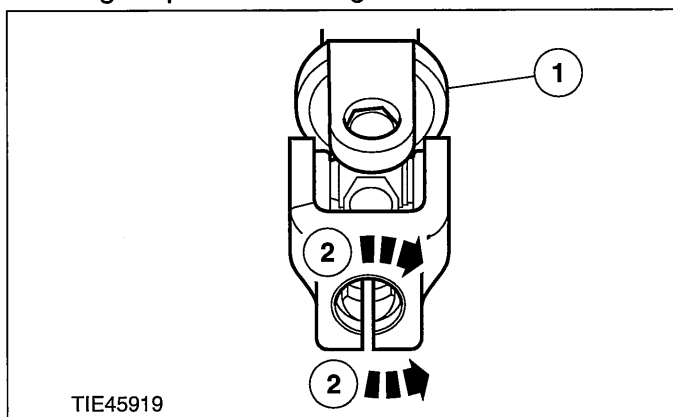
Steering Column Shaft Universal Joint



1. **▲WARNING:** Install a new steering column shaft to steering gear pinion retaining bolt. Failure to follow this instruction may result in personal injury.

Detach the steering column shaft from the steering gear pinion.

- Discard the steering column shaft to steering gear pinion retaining bolt.



2. Check for smooth movement of the steering column shaft universal joint.
 1. Hold the steering column shaft universal joint yoke.
 2. Articulate the free yoke in a figure of eight movement.

DIAGNOSIS AND TESTING**Steering Gear Checks After a Collision****General Equipment**

Feeler gauge

Straight edge

Items to be observed when checking the steering system

The following list of steering gear conditions and the methods of testing should be taken into account when carrying out checks to the steering system:

- If the steering gear has no faults after completing the following checks, do not install a new steering gear.
- Surface corrosion and marks on the tie-rod are acceptable.
- When checking for turning effort torque peaks in the steering gear, turn the steering wheel from steering lock stop to steering lock stop in approximately 15 seconds.
- A steady increase of turning effort torque from steering center to steering lock stop is acceptable.
- When checking for power steering fluid leaks, turn the steering wheel to the steering lock stop in approximately 10 seconds.
- Noises from the power steering, for example the power steering pump relief valve, are acceptable.

STEERING GEAR HOUSING

1. Raise and support the vehicle.

REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation).

2. Visually inspect the steering gear housing for cracks and damage. If the steering gear housing is cracked or damaged, install a new steering gear.

REFER to: Steering Gear (211-02 Power Steering, Removal and Installation).

TIE-RODS

1. Using a straight edge and feeler gauge, check the tie-rods to see if they are straight. If the distance between the tie-rod and straight edge is greater than 0.5 mm, install a new steering gear.

REFER to: Steering Gear (211-02 Power Steering, Removal and Installation).

2. Check the tightening torque of the tie-rod end to wheel knuckle nut.

REFER to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).

3. Check the tightening torque of the tie-rod end locking nut.

REFER to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).

CHECK FOR TURNING EFFORT TORQUE PEAKS IN THE STEERING GEAR

1. Lower and support the vehicle making sure that the road wheels are just clear of the floor.
2. With the ignition switch in position I, slowly turn the steering wheel from steering lock stop to steering lock stop. If a turning effort torque peak or judder is felt while turning the steering wheel, detach the tie-rods from the wheel knuckles.
3. Slowly turn the steering wheel from steering lock stop to steering lock stop. If a turning effort torque peak or judder is felt while turning the steering wheel, install a new steering gear.

REFER to: Steering Gear (211-02 Power Steering, Removal and Installation).

CHECK FOR POWER STEERING FLUID LEAKS

1. Lower the vehicle.
2. Run the engine at a fast idle and slowly turn the steering wheel to the left-hand steering lock stop. Hold the steering wheel in this position for 5 seconds with a turning effort torque of 15 Nm at the steering wheel rim.
3. Turn the steering wheel away from the left-hand steering lock stop for 30 seconds.
4. Run the engine at a fast idle and slowly turn the steering wheel to the right-hand steering lock stop. Hold the steering wheel in this position for 5 seconds with a turning effort torque of 15 Nm at the steering wheel rim.

DIAGNOSIS AND TESTING

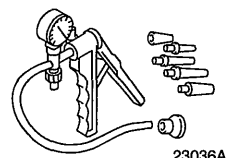
5. Turn the steering wheel away from the right-hand steering lock stop.
6. Check for power steering fluid leaks at the steering gear housing and the power steering line connections to the steering gear. If there is a power steering fluid leak at the steering gear, install a new steering gear.

REFER to: Steering Gear (211-02 Power Steering, Removal and Installation).

GENERAL PROCEDURES

Power Steering System Filling(13 002 0)

Special Tool(s)

 13016	Adapter, Power Steering Bleeding 211-189 (13-016)
 23036A	Hand Vacuum Pump/Pressure Pump 416-D001 (23-036A)

Refill

- NOTE:**When filling the power steering fluid reservoir, make sure that the power steering fluid is clean and not agitated prior to use. The power steering fluid should be poured slowly into the reservoir to minimize the possibility of aeration. The power steering fluid level should be checked with the power steering fluid cold.

Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

- Raise and support the vehicle making sure that the road wheels are just clear of the floor. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

- NOTE:**Do not start the engine at this stage.

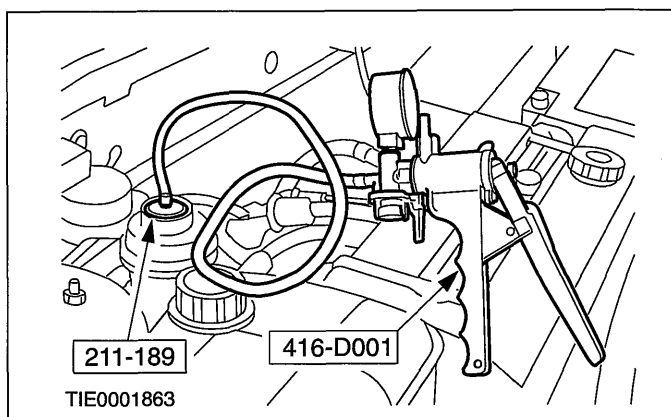
NOTE:Make sure that the power steering fluid in the power steering fluid reservoir does not fall below the MIN mark, as air could enter the system.

Slowly turn the steering wheel from lock to lock and add power steering fluid until the power steering fluid in the power steering fluid reservoir stops dropping.

- NOTE:**Make sure that the power steering fluid in the power steering fluid reservoir does not fall below the MIN mark, as air could enter the system.

Start the engine and slowly turn the steering wheel from lock to lock and add power steering fluid until the power steering fluid in the power steering fluid reservoir stops dropping.

- Switch the engine OFF and using the special tools, create a vacuum of 62cm-Hg - 75cm-Hg for 30 seconds.



- Observe the vacuum gauge reading.

- If the vacuum decreases by more than 5cm-Hg in 5 minutes, the system should be checked for leaks.

- Remove the special tools. Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid as necessary.

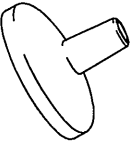
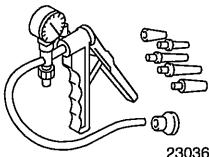
For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

- Lower the vehicle.

GENERAL PROCEDURES

Power Steering System Bleeding(13 416 1)

Special Tool(s)

 13016	Adapter, Power Steering Bleeding 211-189 (13-016)
 23036A	Hand Vacuum Pump/Pressure Pump 416-D001 (23-036A)

Bleeding

- NOTE:**When filling the power steering fluid reservoir, make sure that the power steering fluid is clean and not agitated prior to use. The power steering fluid should be poured slowly into the reservoir to minimize the possibility of aeration. The power steering fluid level should be checked with the power steering fluid cold.

Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

- Raise and support the vehicle making sure that the road wheels are just clear of the floor. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

- NOTE:**Do not start the engine at this stage.

NOTE:Make sure that the power steering fluid in the power steering fluid reservoir does not fall below the MIN mark, as air could enter the system.

Slowly turn the steering wheel from lock to lock and add power steering fluid until the power steering fluid in the power steering fluid reservoir stops dropping.

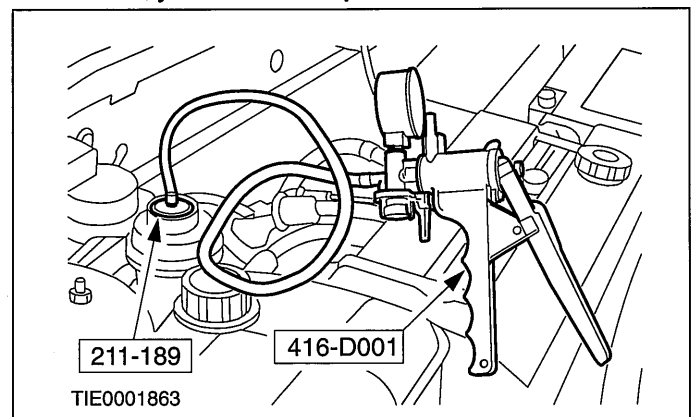
- Check the power steering fluid level. Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

- NOTE:**When bleeding the power steering system the vacuum will decrease. Using the special tools, maintain a sufficient vacuum of 38cm-Hg. If the vacuum decreases by more than 5cm-Hg in 5 minutes, the system should be checked for leaks.

Using the special tools, bleed the power steering system in the following sequence.

- Slowly turn the steering wheel from lock to lock once; then turn the steering wheel to the right, just off the stop.
- Using the special tools, create a vacuum of 38cm-Hg. Maintain the vacuum until the air is evacuated from the system (minimum of five minutes).
- Release the vacuum.
- Repeat the power steering bleeding procedure, turning the steering wheel to the left, just off the stop.



- Remove the special tools. Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid as necessary.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

- NOTE:**Make sure that the power steering fluid in the power steering fluid reservoir does not fall below the MIN mark, as air could enter the system.

GENERAL PROCEDURES

Start the engine and slowly turn the steering wheel from lock to lock and add power steering fluid until the power steering fluid in the power steering fluid reservoir does not drop.

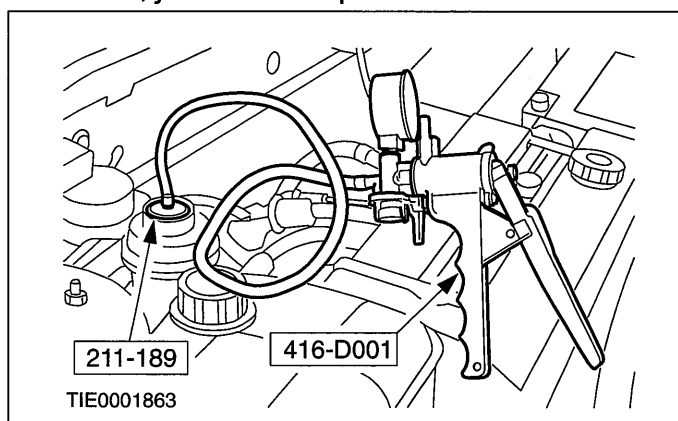
8. Switch OFF the engine and examine the power steering hose connections, steering gear boots, power steering valve body and power steering pump for external leaks.
9. Check the power steering fluid level. Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

10. **NOTE:**When bleeding the power steering system the vacuum will decrease. Using the special tools, maintain a sufficient vacuum of 38cm-Hg. If the vacuum decreases by more than 5cm-Hg in 5 minutes, the system should be checked for leaks.

Using the special tools, bleed the power steering system in the following sequence.

1. Start the engine and slowly turn the steering wheel from lock to lock once; then turn the steering wheel to the right, just off the stop.
2. Switch OFF the engine.
3. Using the special tools, create a vacuum of 38cm-Hg. Maintain the vacuum until the air is evacuated from the system (minimum of five minutes).
4. Release the vacuum.
5. Repeat the power steering bleeding procedure, turning the steering wheel to the left, just off the stop.



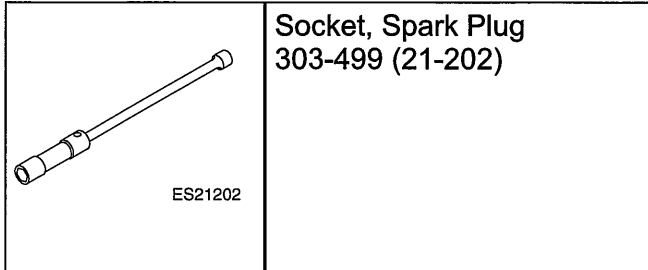
11. Remove the special tools. Fill the power steering fluid reservoir to the MAX mark with the appropriate power steering fluid as necessary.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

12. Start the engine, turn the steering wheel from lock to lock. If excessive noise is apparent, repeat the power steering bleeding procedure.
13. Lower the vehicle.
14. If the noise level is still unacceptable, leave the vehicle standing overnight then repeat the power steering system bleeding procedure.

GENERAL PROCEDURES

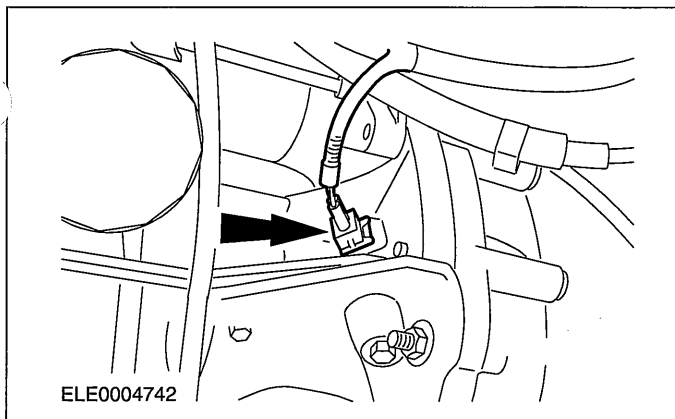
Power Steering System Flushing — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(13 001 0)

Special Tool(s)

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

2. Disconnect the crankshaft position (CKP) sensor electrical connector.

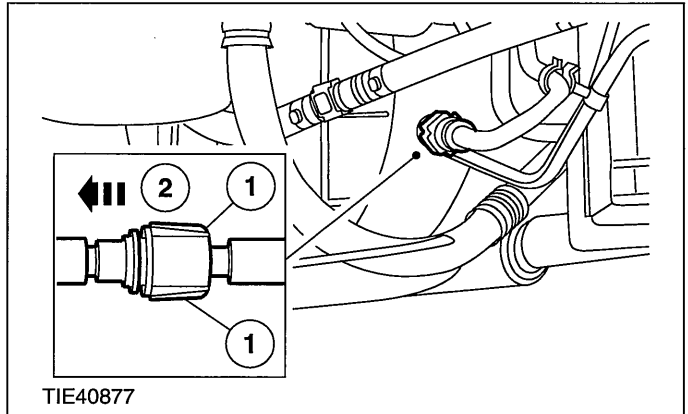


3. **NOTE:**Using a suitable blanking cap, cap the end of the hose from the power steering fluid reservoir.

Disconnect the power steering fluid reservoir return hose quick release coupling.

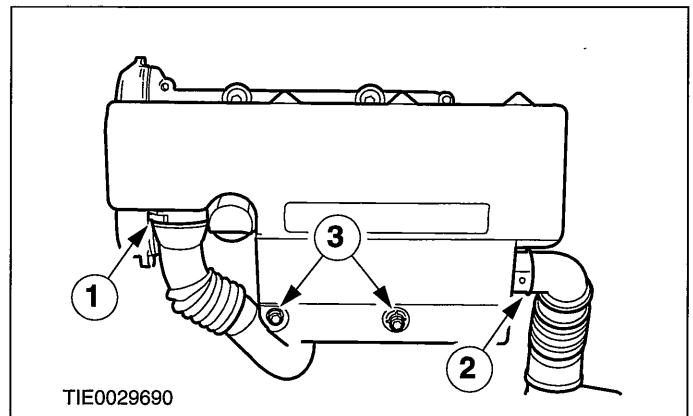
1. Press the power steering fluid reservoir return hose quick release coupling locking tangs.
2. Disconnect the power steering fluid reservoir return hose quick release coupling.

- Allow the fluid to drain into a suitable container.



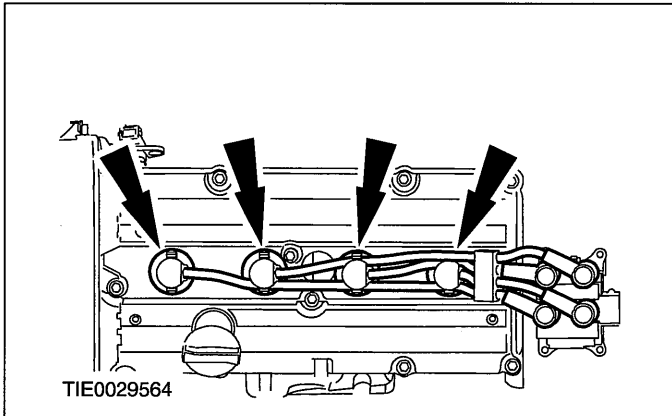
4. Place the end of the power steering fluid reservoir return hose into a suitable container.
5. Lower the vehicle until the wheels are clear of the floor to allow the steering wheel to be rotated from lock to lock.
6. Remove the air cleaner.

1. Disconnect the air cleaner outlet pipe.
2. Disconnect the air cleaner inlet pipe.
3. Remove the retaining bolts.

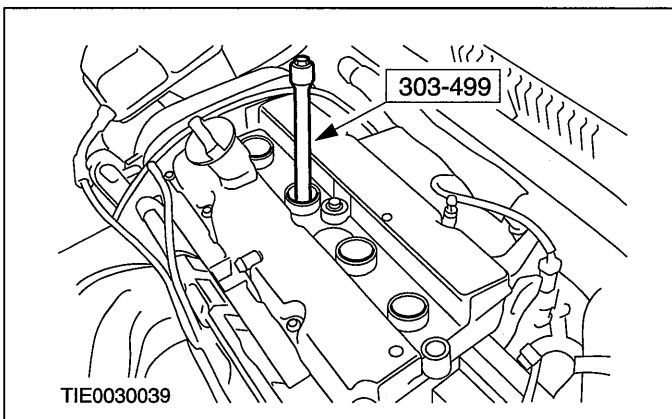


GENERAL PROCEDURES

7. Disconnect the spark plug wires.



8. Using the special tool, remove the spark plugs.



9. **NOTE:**When filling the power steering fluid reservoir, make sure that the power steering fluid is clean and not agitated prior to use. The fluid should be poured slowly into the reservoir to minimize the possibility of aeration. The fluid level should be checked with the fluid cold.

Fill the power steering reservoir to the MAX mark with the appropriate fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

10. **⚠ CAUTION:**Do not continuously crank the engine for more than 30 seconds, as damage to the starter motor may result.

NOTE:When flushing the power steering system, make sure that the power steering fluid in the reservoir does not fall below the minimum mark.

While cranking the engine for no more than 30 seconds turn the steering wheel from lock to lock.

- With the aid of another technician add 1 liter of clean power steering fluid.

11. Wait 60 seconds to allow the starter motor to cool.

12. **⚠ CAUTION:**Do not continuously crank the engine for more than 30 seconds, as damage to the starter motor may result.

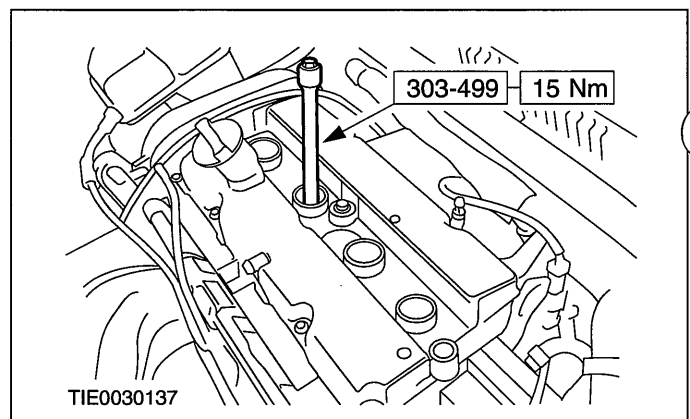
NOTE:When flushing the power steering system, make sure that the power steering fluid in the reservoir does not fall below the minimum mark.

While cranking the engine for a further 30 seconds turn the steering wheel from lock to lock.

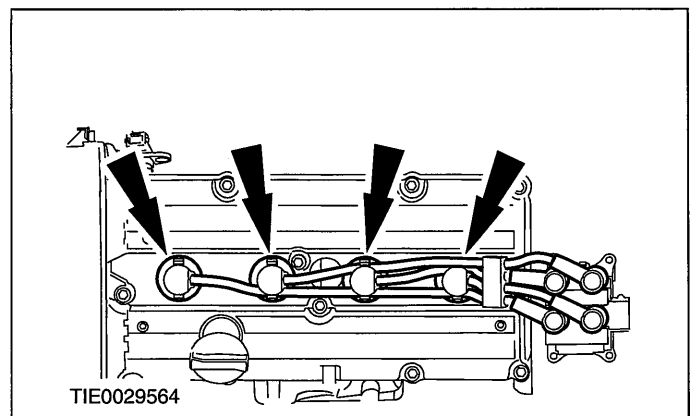
- With the aid of another technician add a further 1 liter of clean power steering fluid.

13. When all the fluid has been used, turn the ignition switch to the OFF position.

14. Using the special tool, install the spark plugs.



15. Connect the spark plug wires.

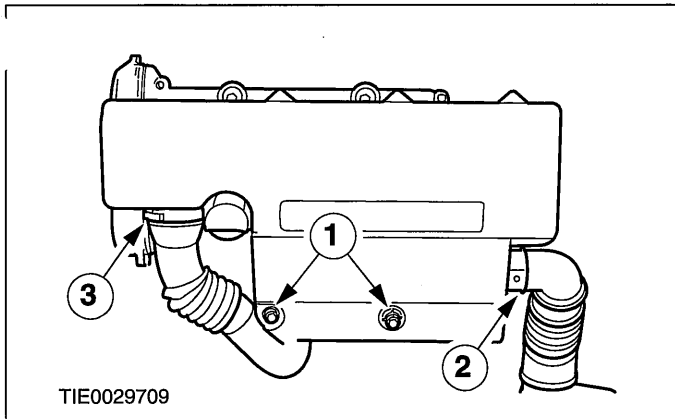


16. Install the air cleaner.

1. Install the retaining bolts.
2. Connect the air cleaner inlet pipe.

GENERAL PROCEDURES

3. Connect the air cleaner outlet pipe.

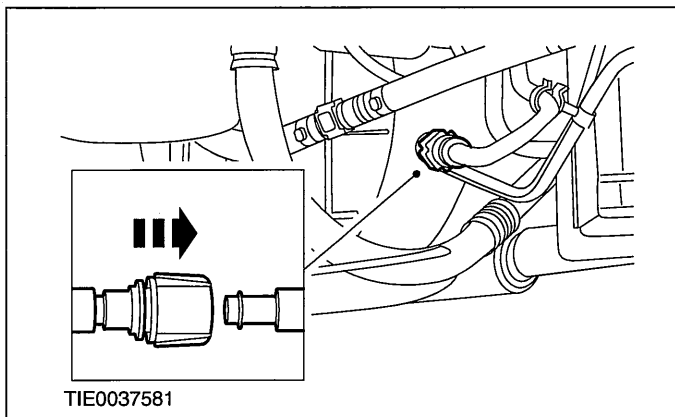


17. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

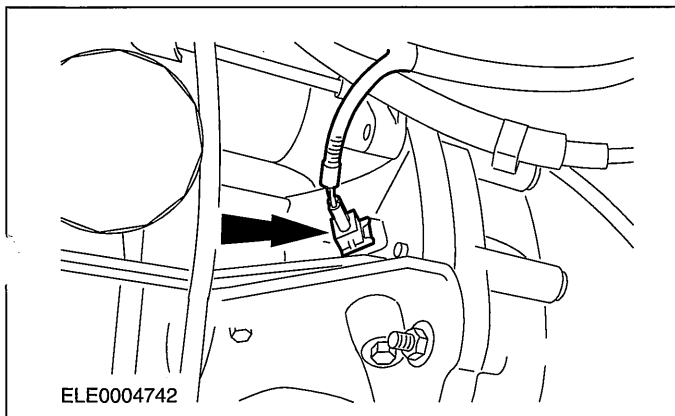
Jacking (Description and Operation),
Lifting (Description and Operation).

18. **NOTE:** Make sure that the collar on the hose is inserted fully into the quick release coupling.

Remove the blanking cap and connect the power steering fluid reservoir return hose quick release coupling.



19. Connect the CKP sensor electrical connector.



20. Lower the vehicle.

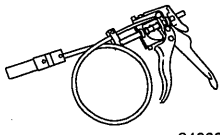
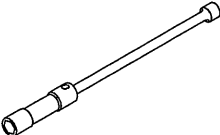
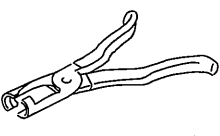
21. Fill and bleed the power steering system. For additional information, refer to: (211-00 Steering System - General Information)

Power Steering System Filling (General Procedures),
Power Steering System Bleeding (General Procedures).

GENERAL PROCEDURES

Power Steering System Flushing — 2.0L Duratec-HE (M14)(13 001 0)

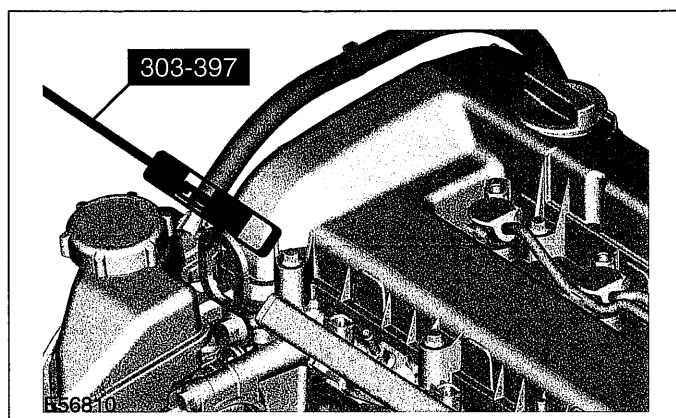
Special Tool(s)

 24003	Remover/Installer, Hose Clamp 303-397
 ES21202	Socket, Spark Plug 303-499
 21211	Pliers, Valve Stem Seal 303-508

1. **NOTE:**Cap the power steering fluid reservoir to prevent fluid loss or dirt ingress.

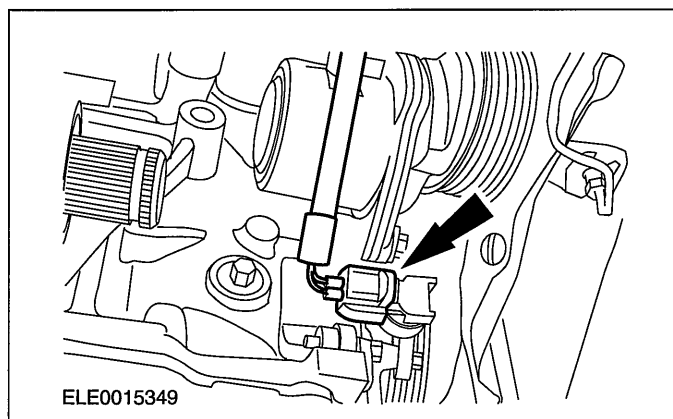
Using the special tool, disconnect the steering gear to power steering fluid reservoir return line from the power steering fluid reservoir.

- Allow the fluid to drain into a container.

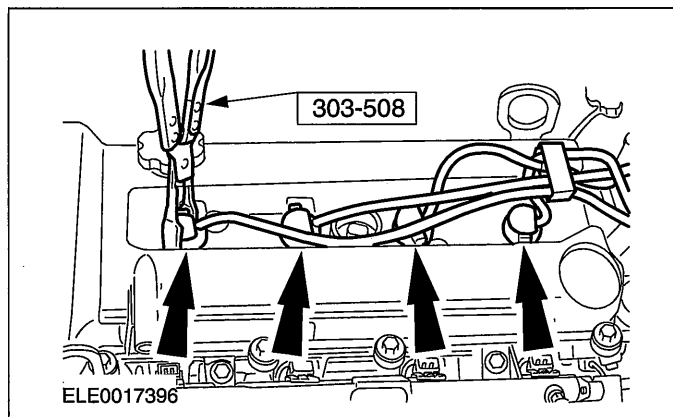


2. Place the end of the steering gear to power steering fluid reservoir return line into a container.

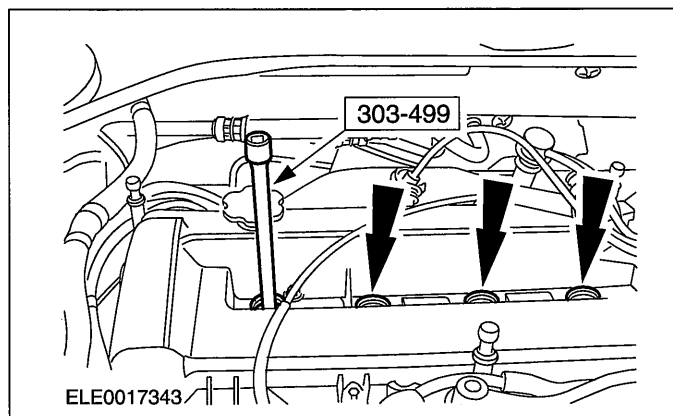
3. Disconnect the crankshaft position (CKP) sensor electrical connector.



4. Using the special tool, disconnect the spark plug wires.



5. Using the special tool, remove the spark plugs.



GENERAL PROCEDURES

6. Raise the vehicle until the road wheels are clear of the floor. Support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

7. **NOTE:**When filling the power steering fluid reservoir, make sure that the steering fluid is clean and not agitated prior to use. The steering fluid must be poured slowly into the power steering fluid reservoir to minimize the possibility of aeration. The steering fluid level must be checked with the steering fluid cold.

Fill the power steering fluid reservoir to the MAX mark with the appropriate steering fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

8. **CAUTIONS:**

⚠ Do not continuously crank the engine for more than 30 seconds.

⚠ When flushing the power steering system, make sure that the steering fluid in the power steering fluid reservoir does not fall below the MIN mark.

NOTE:When filling the power steering fluid reservoir, make sure that the steering fluid is clean and not agitated prior to use. The steering fluid must be poured slowly into the power steering fluid reservoir to minimize the possibility of aeration.

While cranking the engine turn the steering wheel from lock to lock.

- With the aid of another technician, add 1 liter of clean steering fluid to the power steering fluid reservoir.

9. Wait 60 seconds to allow the starter motor to cool.

10. **CAUTIONS:**

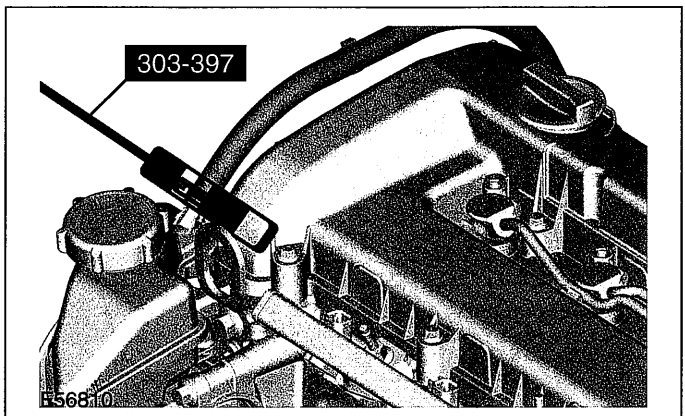
⚠ Do not continuously crank the engine for more than 30 seconds.

⚠ When flushing the power steering system, make sure that the steering fluid in the power steering fluid reservoir does not fall below the MIN mark.

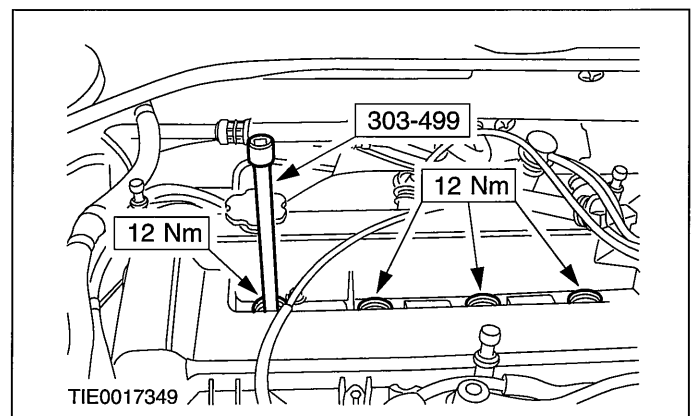
NOTE:When filling the power steering fluid reservoir, make sure that the steering fluid is clean and not agitated prior to use. The steering fluid must be poured slowly into the power steering fluid reservoir to minimize the possibility of aeration.

While cranking the engine turn the steering wheel from lock to lock.

- With the aid of another technician, add a further 1 liter of clean steering fluid to the power steering fluid reservoir.
11. When the clean steering fluid has been added to the power steering fluid reservoir, turn the ignition switch to the OFF position.
12. Lower the vehicle.
13. Using the special tool, connect the steering gear to power steering fluid reservoir return line to the power steering fluid reservoir.

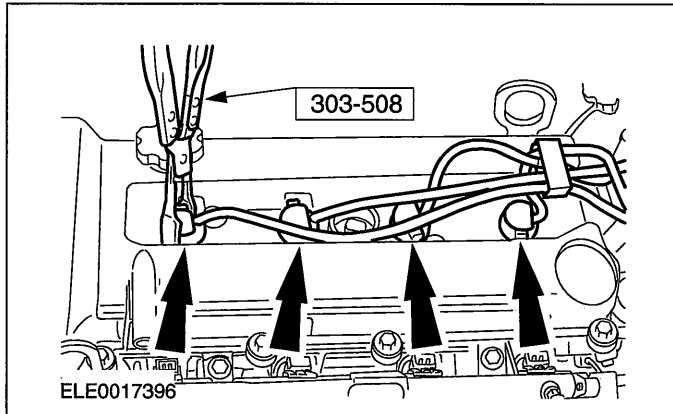


14. Using the special tool, install the spark plugs.

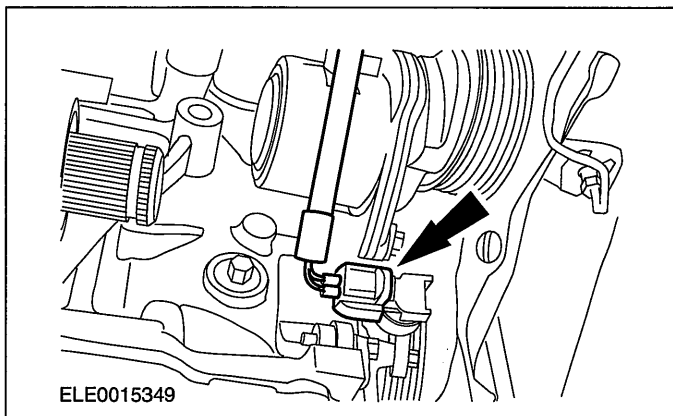


GENERAL PROCEDURES

15. Using the special tool, connect the spark plug wires.



16. Connect the CKP sensor electrical connector.



17. **NOTE:**When filling the power steering fluid reservoir, make sure that the steering fluid is clean and not agitated prior to use. The steering fluid must be poured slowly into the power steering fluid reservoir to minimize the possibility of aeration. The steering fluid level must be checked with the steering fluid cold.

Fill the power steering fluid reservoir to the MAX mark with the appropriate steering fluid.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

18. Start the engine and slowly turn the steering wheel from lock to lock.
19. Switch OFF the engine.
20. **NOTE:**When filling the power steering fluid reservoir, make sure that the steering fluid is clean and not agitated prior to use. The steering fluid must be poured slowly into the power steering fluid reservoir to

minimize the possibility of aeration. The steering fluid level must be checked with the steering fluid cold.

Check the steering fluid level. Fill the power steering fluid reservoir to the MAX mark with the appropriate steering fluid as necessary.

For additional information, refer to:
Specifications (211-00 Steering System - General Information, Specifications).

SECTION 211-02 Power Steering

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	211-02-2
DIAGNOSIS AND TESTING	
Power Steering.....	211-02-4
REMOVAL AND INSTALLATION	
Power Steering Pump — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning..... (13 434 0)	211-02-5
Power Steering Pump — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning..... (13 434 0)	211-02-8
Power Steering Pump — 2.0L Duratec-HE (MI4).....	211-02-10
Power Steering Pump to Steering Gear Pressure Line — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning..... (13 440 0)	211-02-14
Power Steering Pump to Steering Gear Pressure Line — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning..... (13 440 0)	211-02-17
Power Steering Pump to Steering Gear Pressure Line — 2.0L Duratec-HE (MI4) RHD....	211-02-20
Steering Gear to Power Steering Fluid Reservoir Return Line — 2.0L Duratec-HE (MI4) RHD.....	211-02-30
Steering Gear..... (13 116 0)	211-02-38
Steering Gear to Fluid Cooler Return Hose..... (13 439 0)	211-02-46
Power Steering Fluid Cooler..... (13 444 0)	211-02-48
Steering Gear Bushing.....	211-02-49

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Steering gear mounting bolts	48	35	-
Power steering line to steering gear valve body clamp retaining bolt	18	13	-
Power steering line bracket to steering gear retaining bolt	14	10	-
Power steering line to cylinder head support bracket retaining bolt (Duratec)	25	18	-
Power steering line to accessory drive belt support bracket retaining bolt (Duratec)	25	18	-
Power steering lines to transaxle bracket retaining bolt - vehicles with 1.6L Duratorq-TDCi (DV) Diesel	10	-	89
Power steering supply hose to engine block (rear)	25	18	-
Power steering line to transmission housing retaining bolt	30	22	-
Power steering line to engine block (front) - vehicles with 1.4L Duratorq-TDCi (DV) Diesel without air conditioning	25	18	-
Power steering line to power steering pump union - vehicles with 1.3L Duratec-8V (Rocam)	40	30	-
Power steering line to power steering pump union - vehicles with 1.4L Duratec-16V (Sigma), 1.6L Duratec-16V (Sigma) or 2.0L Duratec-HE (MI4)	65	48	-
Power steering line to power steering pump union - vehicles with 1.4L Duratorq-TDCi (DV) Diesel	40	30	-
Power steering line to power steering pump union - vehicles with 1.6L Duratorq-TDCi (DV) Diesel	33	24	-
Power steering pump to steering gear pressure line support bracket to inlet manifold retaining nut - vehicles with 2.0L Duratec-HE (MI4)	11	8	-
Power steering pump retaining bolts - vehicles with 1.3L Duratec-8V (Rocam)	25	18	-
Power steering pump retaining bolts - vehicles with 1.4L Duratec-16V (Sigma), 1.6L Duratec-16V (Sigma) or 2.0L Duratec-HE (MI4)	25	18	-
Power steering pump retaining bolts - vehicles with 1.4L Duratorq-TDCi (DV) Diesel	23	17	-
Power steering pump retaining nuts - vehicles with 1.6L Duratorq-TDCi (DV) Diesel	9	-	80
Power steering fluid cooler line to front bumper left-hand retaining bolt	3.5	-	31
Power steering fluid cooler line to front bumper right-hand retaining bolt	9	-	80

SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Power steering fluid reservoir retaining screws - vehicles with 2.0L Duratec-HE (MI4)	9	-	80
Steering gear to power steering fluid reservoir return line support bracket to generator retaining nut - vehicles with 2.0L Duratec-HE (MI4)	11	8	-
Tie-rod end retaining nut	48	35	-
Steering column shaft to steering gear pinion retaining bolt	28	21	-
Exhaust heat shield to steering gear retaining bolts	14	10	-
Exhaust flexible pipe to muffler and tailpipe assembly retaining nuts - vehicles with 1.6L Duratorq-TDCi (DV) Diesel	47	35	-
Stabilizer bar link to stabilizer bar retaining nut	48	35	-
Front crossmember rear retaining bolts	115	85	-
Front crossmember inner and outer retaining bolts	175	129	-
Front crossmember front retaining bolts	70	52	-
Engine support insulator retaining bolts	48	35	-

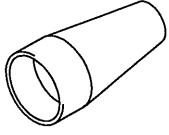
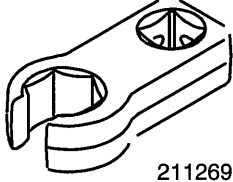
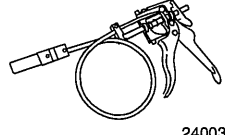
DIAGNOSIS AND TESTING**Power Steering**

REFER to Section 211-00 [Steering System - General Information].

REMOVAL AND INSTALLATION

Power Steering Pump — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning(13 434 0)

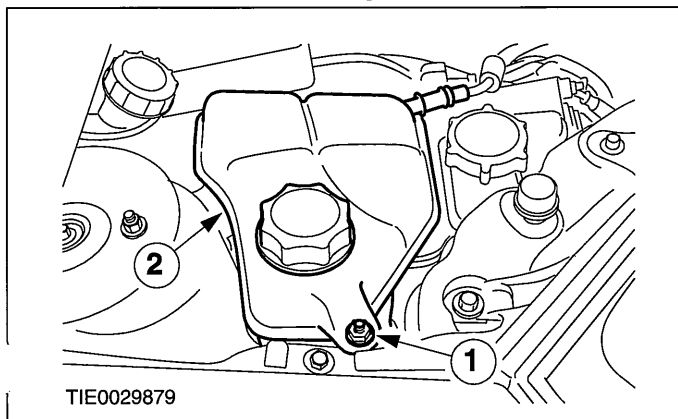
Special Tool(s)

 13015	Expander, Teflon Seal 211-188 (13-015)
 211269	Wrench, Hydraulic Line Union Nut 211-269 (13-027)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)

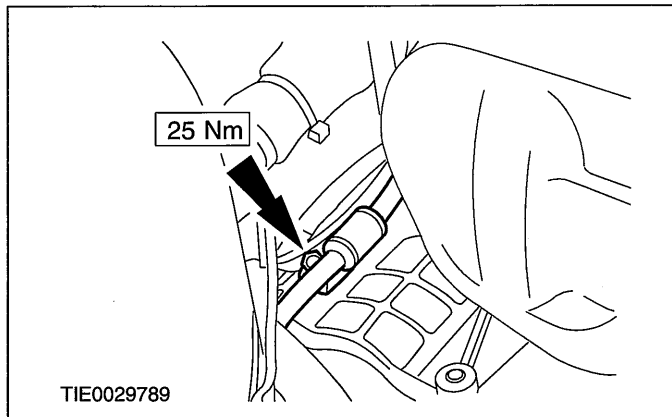
Removal

1. Detach the coolant expansion tank from the wheelhouse assembly and position it to one side.

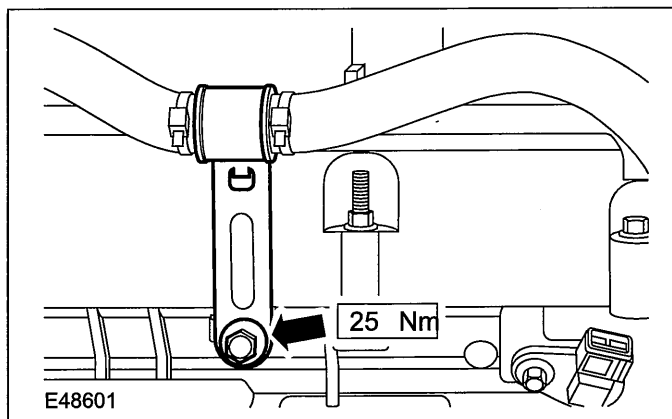
1. Remove the retaining bolt.
2. Release the retaining clip.



2. Detach the power steering line from the power steering pump mounting bracket.



3. Detach the power steering line bracket from the cylinder head.



4. Remove the accessory drive belt.

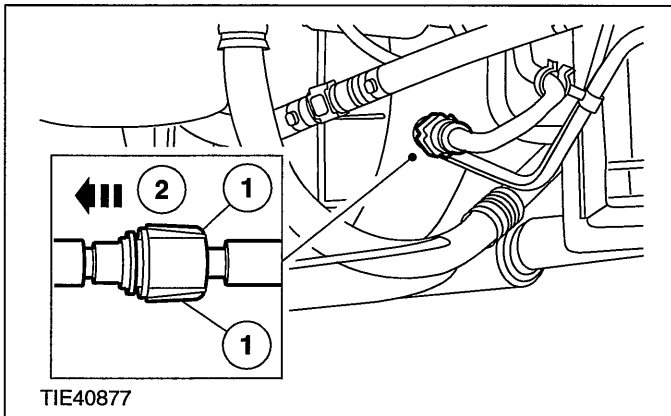
For additional information, refer to: **Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).**

5. Disconnect the power steering fluid reservoir return hose quick release coupling, from either the power steering fluid cooler or the power steering reservoir return hose.

1. Press the power steering fluid reservoir return hose quick release coupling locking tangs.
2. Disconnect the power steering fluid reservoir return hose quick release coupling.

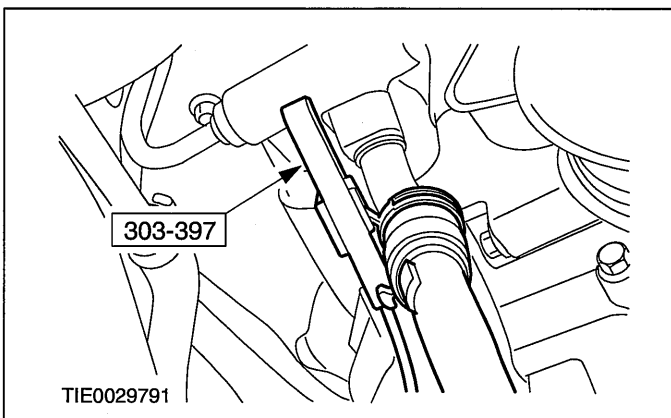
REMOVAL AND INSTALLATION

- Allow the fluid to drain into a suitable container.



6. Using the special tool, disconnect the power steering fluid supply hose from the power steering pump.

- Allow the fluid to drain into a suitable container.

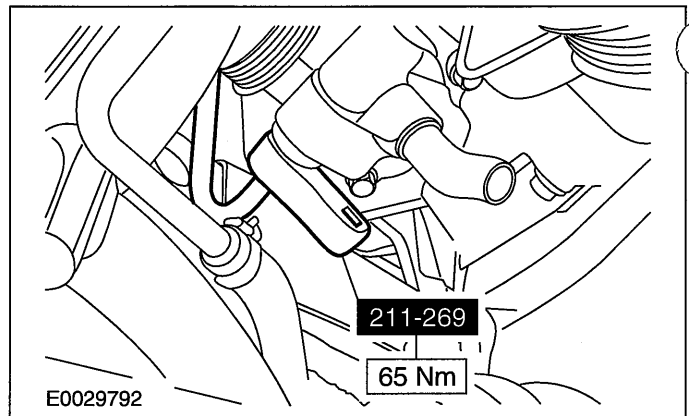


7. ⚠ CAUTION: Do not disconnect the power steering pump pressure adapter from the power steering pump.

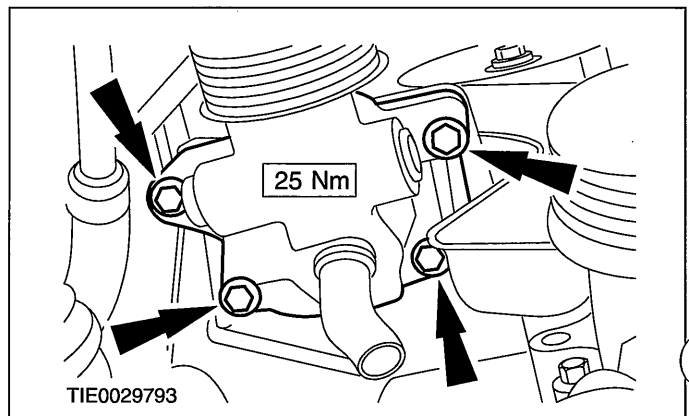
Using the special tool, disconnect the power steering line from the power steering pump pressure adapter.

- Allow the fluid to drain into a suitable container.

- Discard the O-ring seal.



8. Remove the power steering pump.

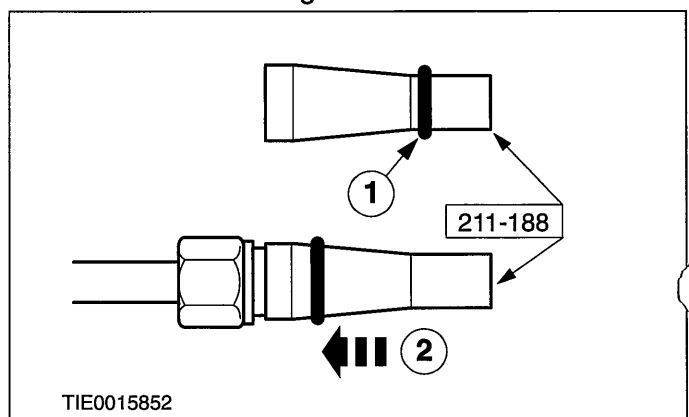


Installation

- 1. NOTE:** If installing a new power steering pump, the power steering line union supplied with the new pump should be removed and retained for further use.

Using the special tool, install a new O-ring seal onto the power steering line to power steering pump union.

1. Push the O-ring seal onto the special tool.
2. Locate the special tool onto the union and install the O-ring seal.



REMOVAL AND INSTALLATION

2. **NOTE:**Make sure the collar on the hose is inserted fully into the quick release coupling.

To install, reverse the removal procedure.

3. Fill and bleed the power steering system.

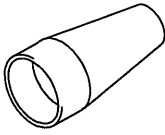
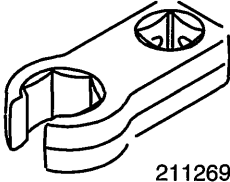
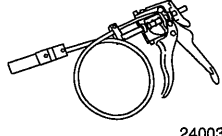
For additional information, refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures)

/ Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

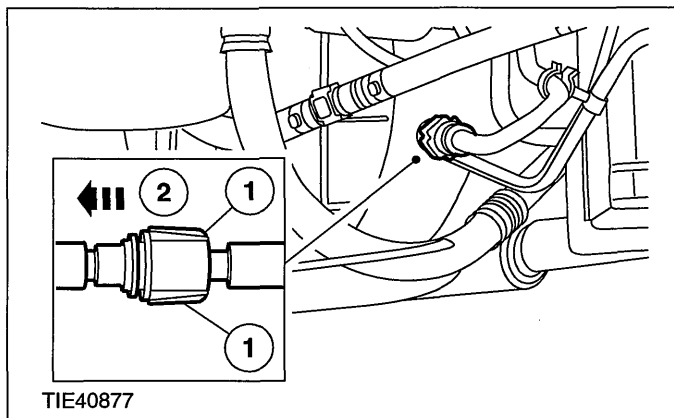
REMOVAL AND INSTALLATION

Power Steering Pump — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning(13 434 0)

Special Tool(s)

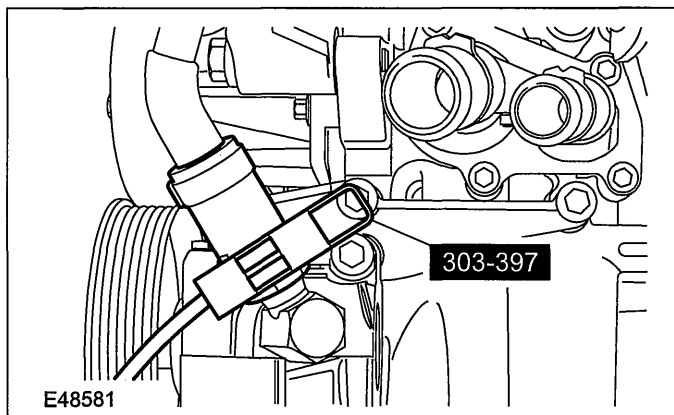
 13015	Expander, Teflon Seal 211-188 (13-015)
 211269	Wrench, Hydraulic Line Union Nut 211-269 (13-027)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)

- Allow the fluid to drain into a suitable container.



3. Using the special tool, disconnect the power steering fluid supply hose from the power steering pump.

- Allow the fluid to drain into a suitable container.



Removal

1. Remove the accessory drive belt.

For additional information, refer to:

Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

2. Disconnect the power steering fluid reservoir return hose quick release coupling, from either the power steering fluid cooler or the power steering reservoir return hose.

1. Press the power steering fluid reservoir return hose quick release coupling locking tangs.
2. Disconnect the power steering fluid reservoir return hose quick release coupling.

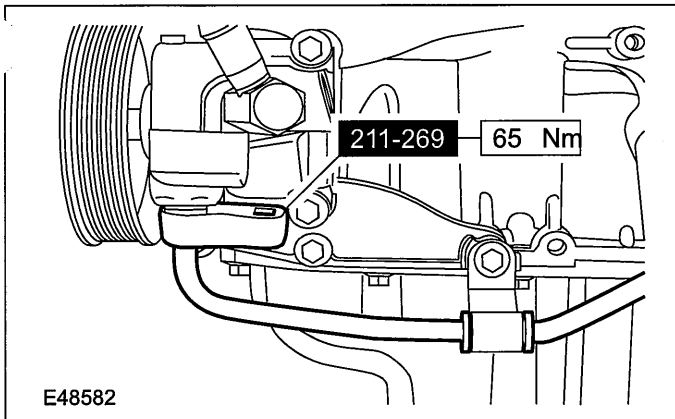
4. **CAUTION:** Do not disconnect the power steering pump pressure adapter from the power steering pump.

Using the special tool, disconnect the power steering line from the power steering pump pressure adapter.

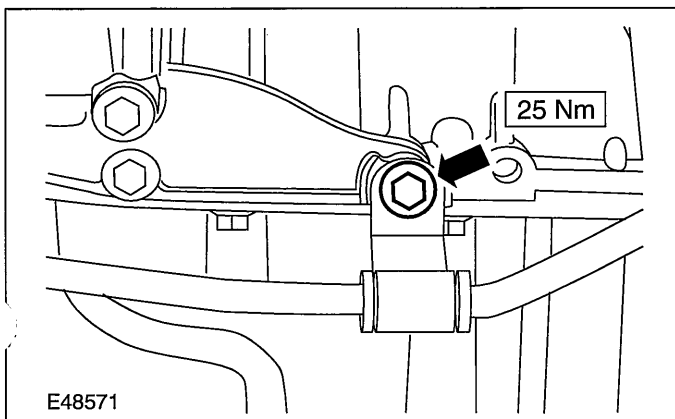
- Allow the fluid to drain into a suitable container.

REMOVAL AND INSTALLATION

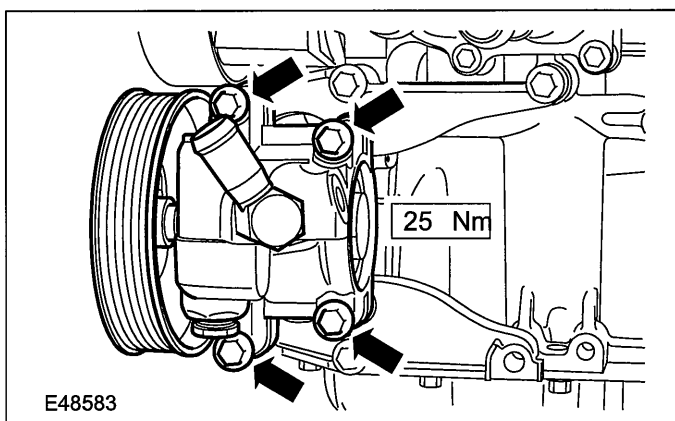
- Discard the O-ring seal.



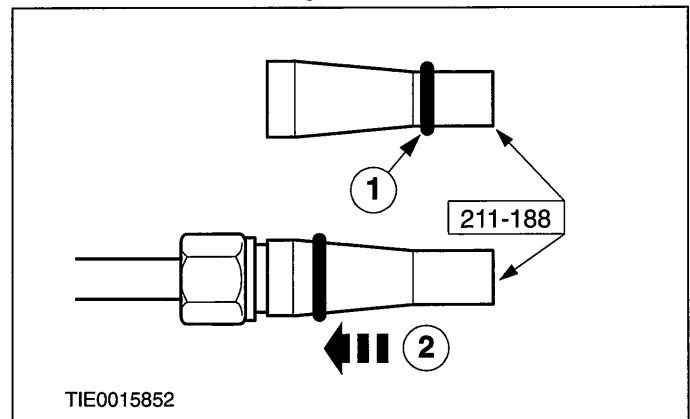
5. Detach the power steering line bracket from the engine block.



6. Remove the power steering pump.



1. Push the O-ring seal onto the special tool.
2. Locate the special tool onto the union and install the O-ring seal.



2. **NOTE:** Make sure the collar on the hose is inserted fully into the quick release coupling.
To install, reverse the removal procedure.
3. Fill and bleed the power steering system.

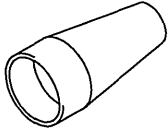
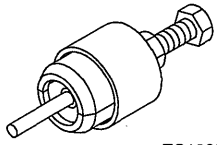
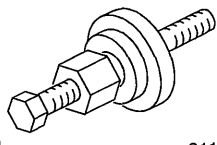
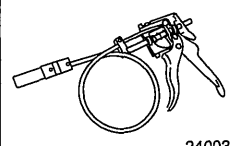
For additional information, refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures)
/ Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

Installation

1. **NOTE:** If installing a new power steering pump, the power steering pressure line union supplied with the new pump should be removed and retained for further use.

Using the special tool, install a new O-ring seal onto the power steering line to power steering pump union.

REMOVAL AND INSTALLATION**Power Steering Pump — 2.0L Duratec-HE (MI4)****Special Tool(s)**

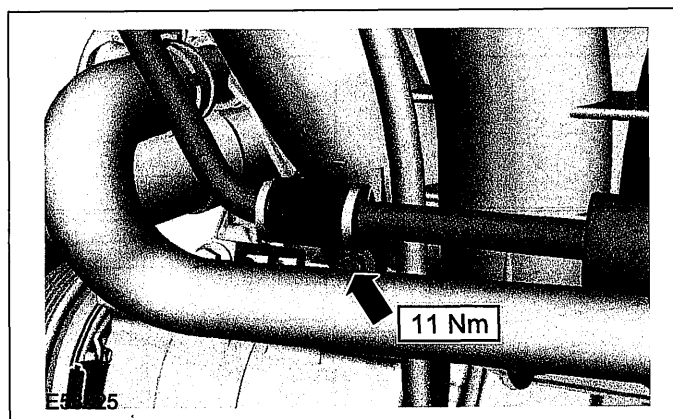
 13015	Expander, Teflon Seal 211-188
 ES13021	Remover, Power Steering Pump Pulley 211-198
 21192	Installer, Camshaft Pulley 303-458
 24003	Remover/Installer, Cooling Hose Clamp 303-397

1. Remove the right-hand headlamp assembly.

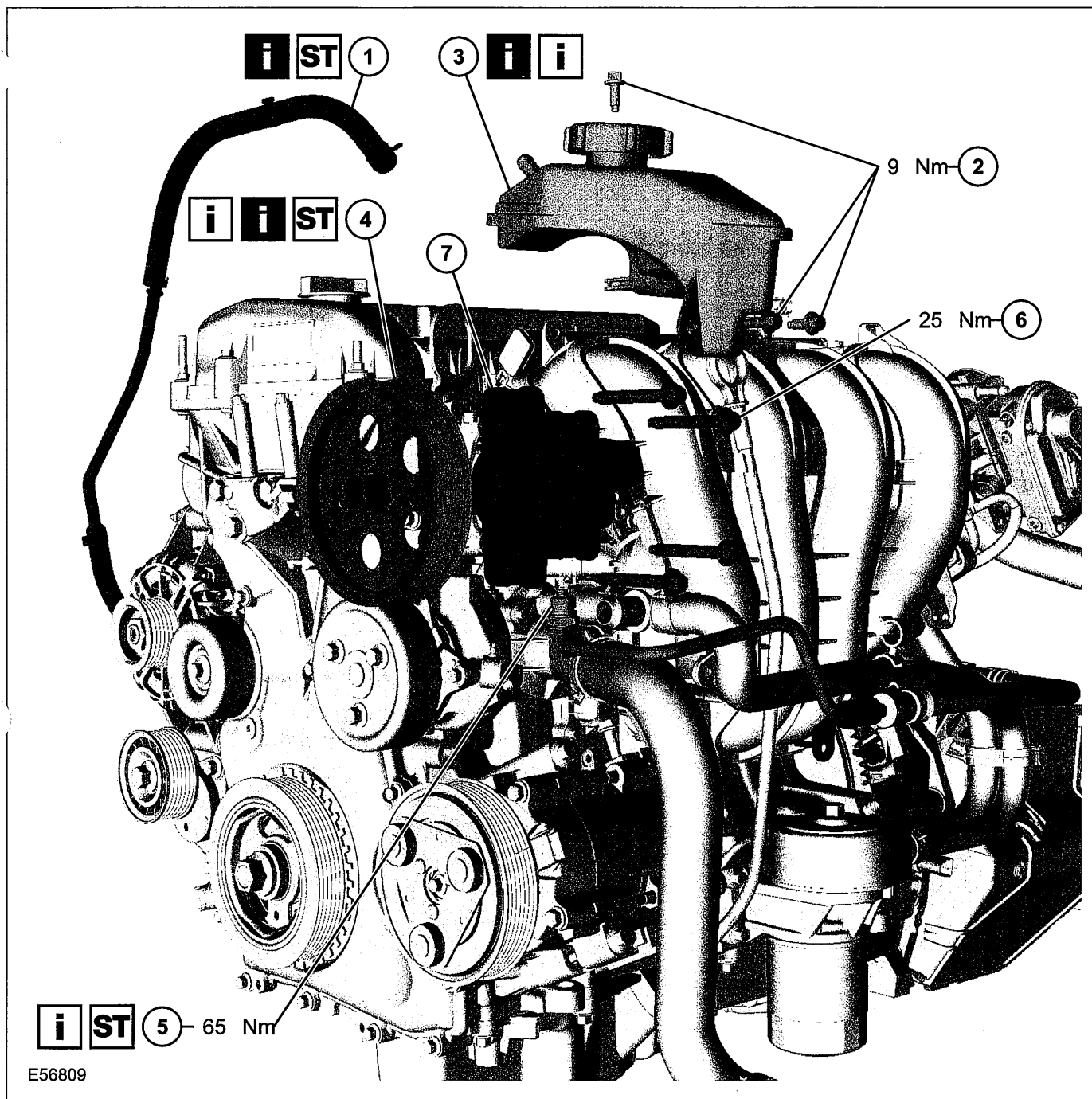
For additional information, refer to:
**Headlamp Assembly (417-01 Exterior
Lighting, Removal and Installation).**

2. Remove the accessory drive belt.

For additional information, refer to:
**Accessory Drive Belt - 2.0L Duratec-HE
(MI4) (303-05 Accessory Drive, Removal
and Installation).**

**3. Detach the power steering pump to steering
gear pressure line from the intake manifold.****4. Lower the vehicle.****5. Remove the components in the order
indicated in the following illustration(s) and
table(s).**

REMOVAL AND INSTALLATION



E56809

Item	Description
1	Steering gear to power steering fluid reservoir return line See Removal Detail
2	Power steering fluid reservoir retaining bolts
3	Power steering fluid reservoir See Removal Detail See Installation Detail
4	Power steering pump pulley See Removal Detail See Installation Detail

Item	Description
5	Power steering pump to steering gear pressure line union See Installation Detail
6	Power steering pump retaining bolts
7	Power steering pump

6. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

7. Fill and bleed the power steering system. For additional information, refer to: (211-00 Steering System - General Information)
Power Steering System Filling (General

Procedures),
Power Steering System Bleeding (General Procedures).

Removal Details

Item 1 Steering gear to power steering fluid reservoir return line

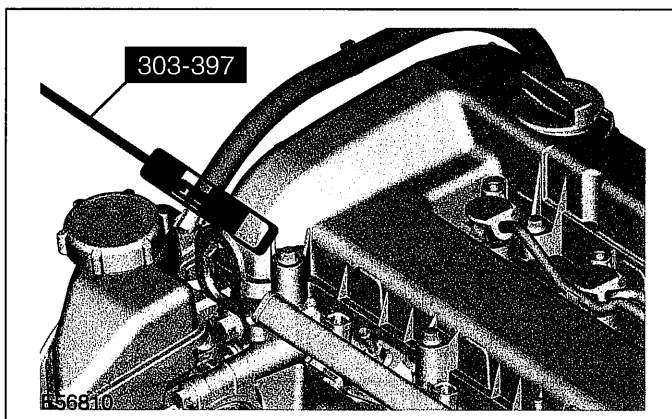
1. CAUTIONS:

⚠ Cap the steering gear to power steering fluid reservoir return line to prevent power steering fluid loss or dirt ingress.

⚠ Cap the power steering fluid reservoir to prevent power steering fluid loss or dirt ingress.

Using the special tool, disconnect the steering gear to power steering fluid reservoir return line from the power steering fluid reservoir.

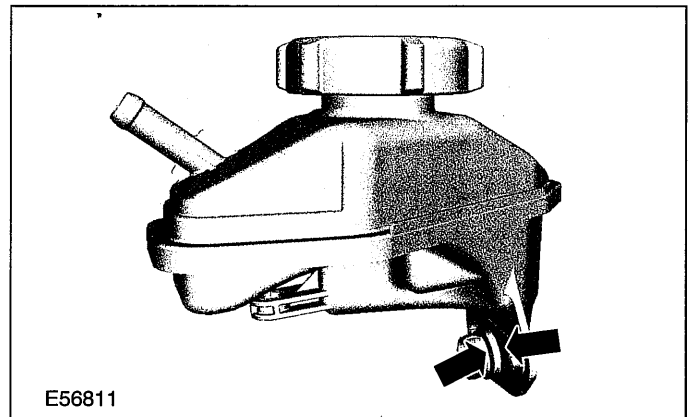
- Allow the power steering fluid to drain into a container.



Item 3 Power steering fluid reservoir

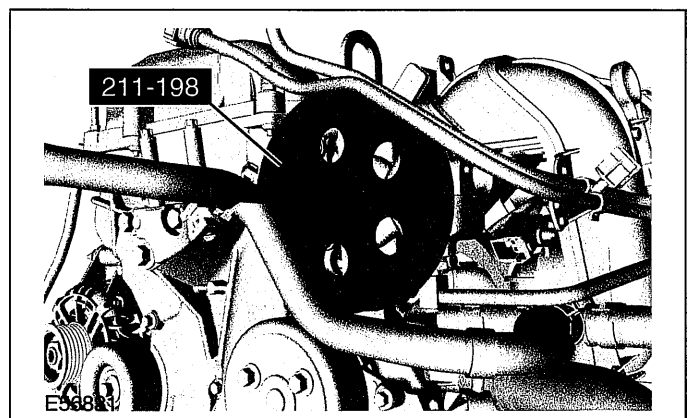
1. ⚠ CAUTION: Cap the power steering fluid reservoir to prevent power steering fluid loss or dirt ingress.

Remove and discard the power steering fluid reservoir O-rings.



Item 4 Power steering pump pulley

1. Using the special tool, remove the power steering pump pulley.



Installation Details

Item 5 Power steering pump to steering gear pressure line union

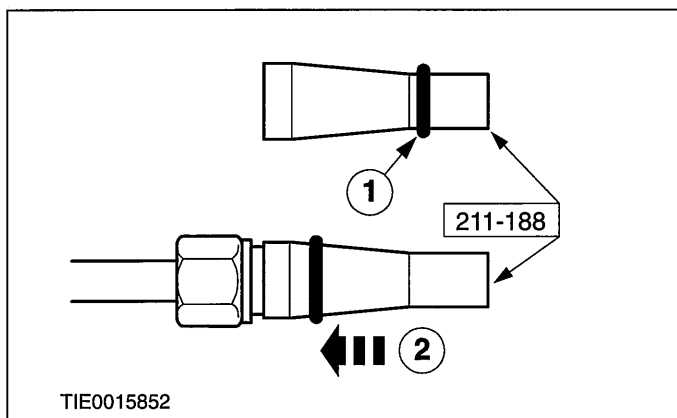
1. ⚠ CAUTION: Care must be taken to prevent dirt ingress.

Using the special tool, install a new Teflon seal onto the power steering pump to steering gear pressure line union.

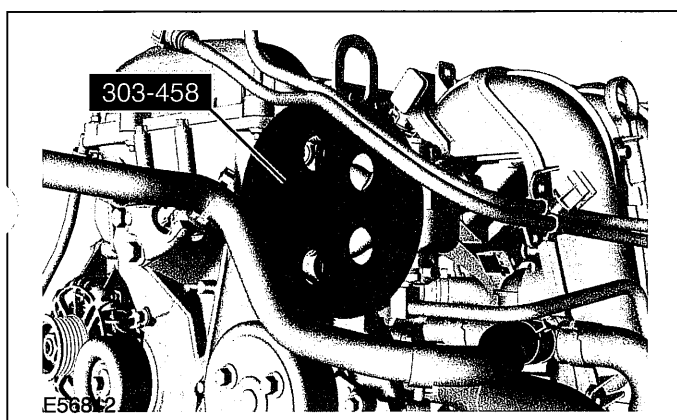
1. Push the new Teflon seal onto the special tool.

REMOVAL AND INSTALLATION

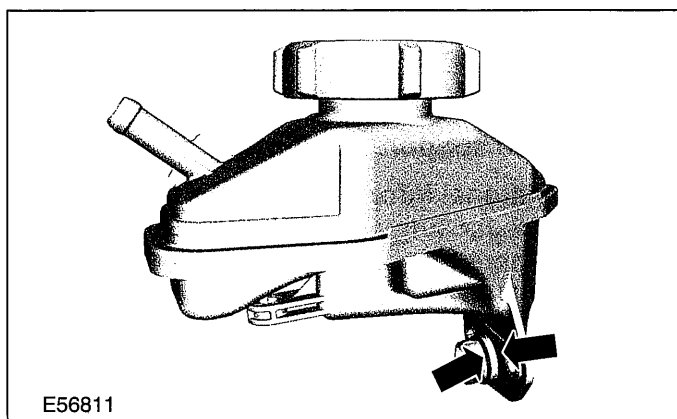
2. Locate the special tool onto the power steering pump to steering gear pressure line union and install the Teflon seal.

**Item 4 Power steering pump pulley**

1. Using the special tool, install the power steering pump pulley.

**Item 3 Power steering fluid reservoir**

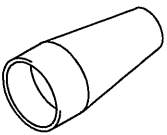
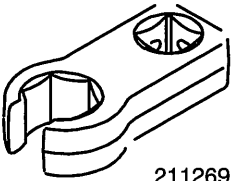
1. Install new power steering fluid reservoir O-rings.



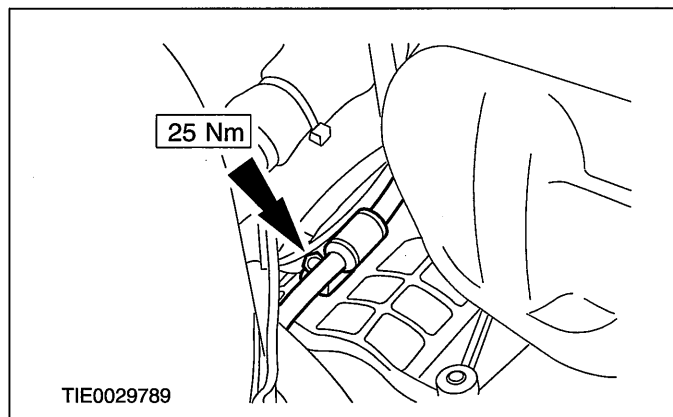
REMOVAL AND INSTALLATION

Power Steering Pump to Steering Gear Pressure Line — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning(13 440 0)

Special Tool(s)

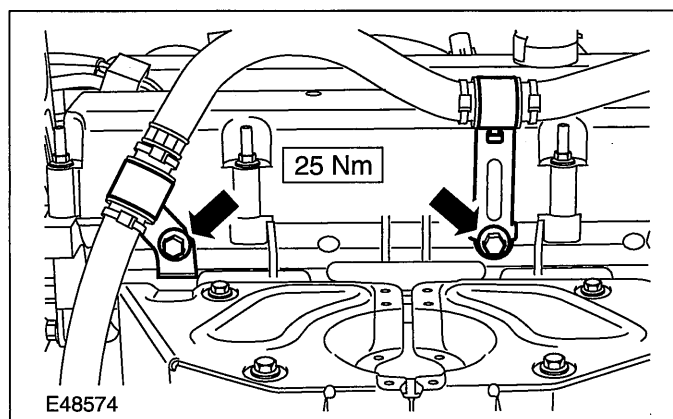
 13015	Expander, Teflon Seal 211-188 (13-015)
 211269	Socket, Hydraulic Line Union Nut 211-269 (13-027)

Detach the power steering line bracket from the power steering pump mounting bracket.



3. **NOTE:**Note the position of the power steering line to aid installation.

Detach the power steering line brackets from the cylinder head.

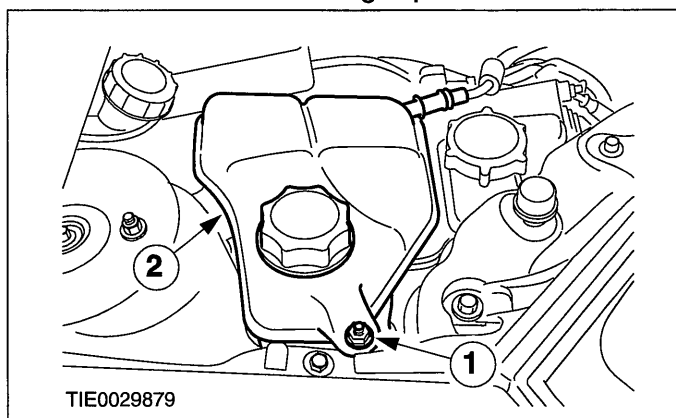


Removal

All vehicles

1. Detach the coolant expansion tank from the wheelhouse assembly and position it to one side.

1. Remove the retaining bolt.
2. Release the retaining clip.



2. **NOTE:**Note the position of the power steering line to aid installation.

4. Raise and support the vehicle.

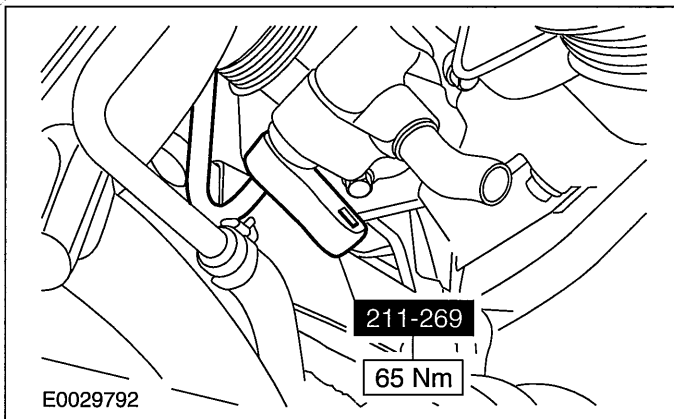
For additional information, refer to: Jacking (100-02 Jacking and Lifting, Description and Operation) / Lifting (100-02 Jacking and Lifting, Description and Operation).

5. **CAUTION:**Do not disconnect the power steering pump pressure adapter from the power steering pump.

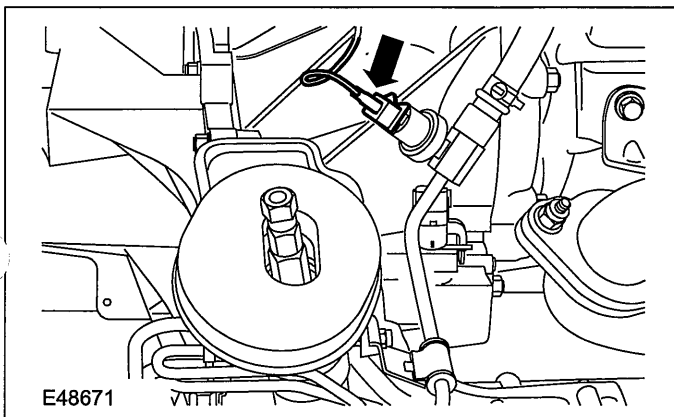
Using the special tool, disconnect the power steering line from the power steering pump pressure adapter.

REMOVAL AND INSTALLATION

- Allow the fluid to drain into a suitable container.
- Discard the O-ring seal.

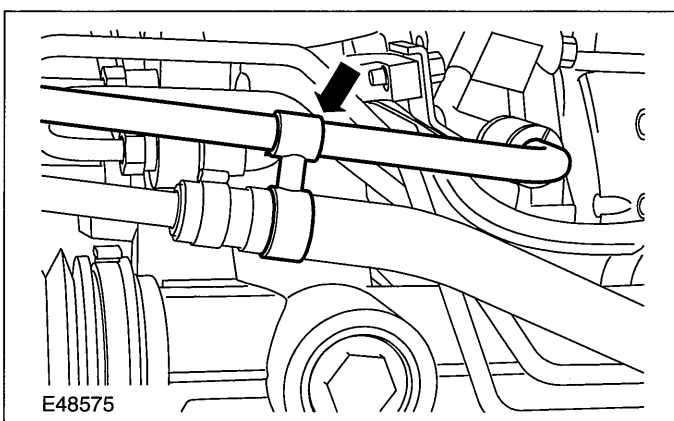


6. Disconnect the power steering pressure (PSP) switch electrical connector.



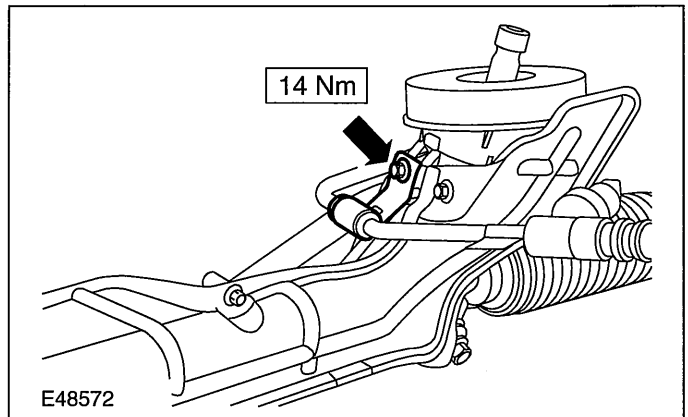
Left-hand drive vehicles

7. Detach the steering gear return hose from the pressure line.



8. NOTE: Note the position of the power steering line to aid installation.

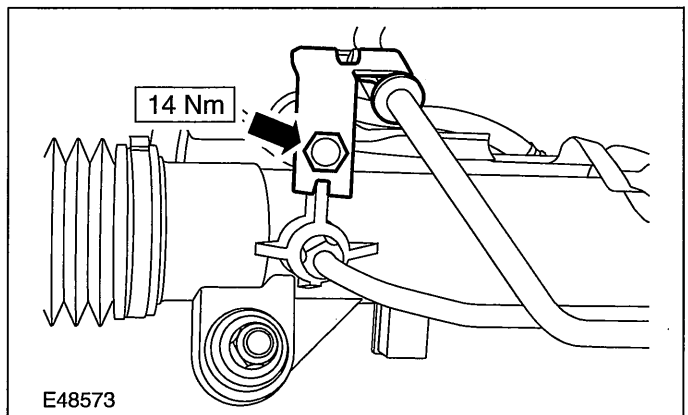
Detach the power steering line from the steering gear.



Right-hand drive vehicles

9. NOTE: Note the position of the power steering line to aid installation.

Detach the power steering line from the steering gear.



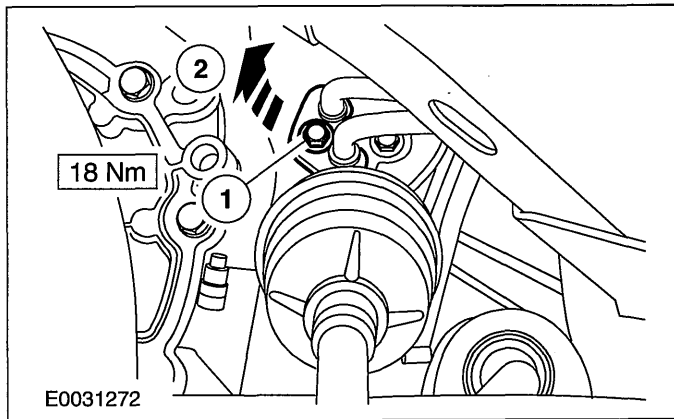
All vehicles

10. Disconnect the power steering lines from the steering gear valve body.

1. Remove the retaining bolt.
2. Rotate the clamp plate.
 - Allow the fluid to drain into a suitable container.

REMOVAL AND INSTALLATION

- Discard the O-ring seals.

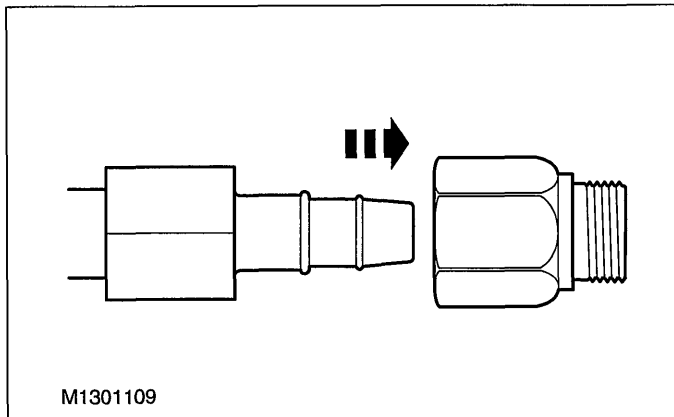


- 11. NOTE:** Note the position of the power steering line to aid installation.

Remove the power steering pump to steering gear pressure line.

Installation

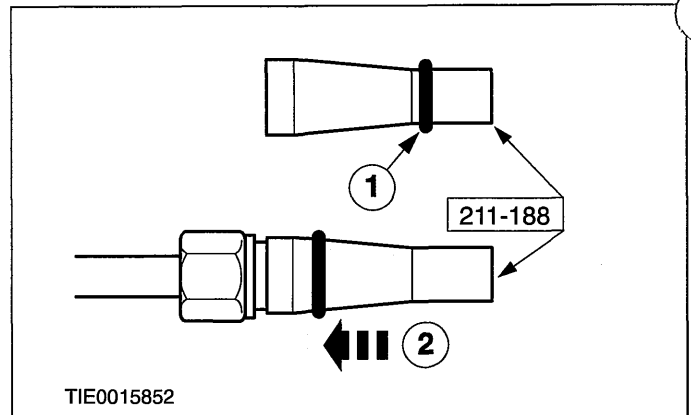
1. If a new fluid line is being installed, push the new line into the new union until it clips into place.



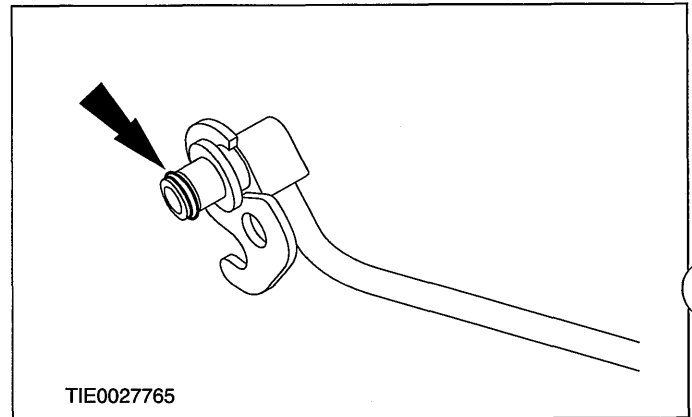
2. Using the special tool, install a new O-ring seal onto the power steering line to power steering pump union.

1. Push the new O-ring seal onto the special tool.

2. Locate the special tool onto the union and install the O-ring seal.



3. Install new O-ring seals onto the power steering lines.



4. To install, reverse the removal procedure.

5. Fill and bleed the power steering system.

For additional information, refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures)

/ Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

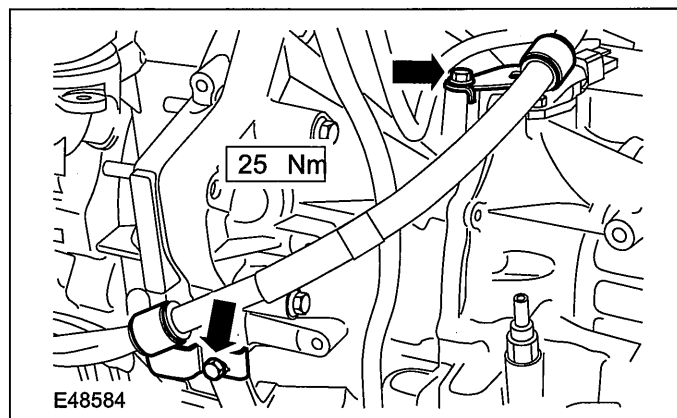
REMOVAL AND INSTALLATION

Power Steering Pump to Steering Gear Pressure Line — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning(13 440 0)

Special Tool(s)

13015	Expander, Teflon Seal 211-188 (13-015)
211269	Socket, Hydraulic Line Union Nut 211-269 (13-027)

Detach the power steering line brackets from the transaxle.



All vehicles

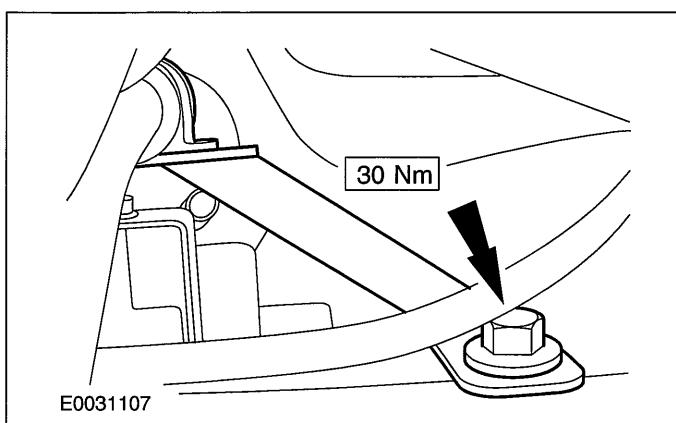
3. Raise and support the vehicle.

For additional information, refer to: Jacking (100-02 Jacking and Lifting, Description and Operation) / Lifting (100-02 Jacking and Lifting, Description and Operation).

4. CAUTION: Do not disconnect the power steering pump pressure adapter from the power steering pump.

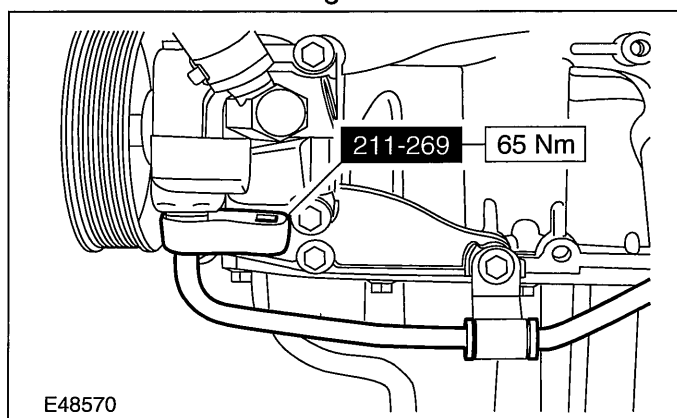
Using the special tool, disconnect the power steering line from the power steering pump pressure adapter.

- Allow the fluid to drain into a suitable container.
- Discard the O-ring seal.



Vehicles with automatic transaxle

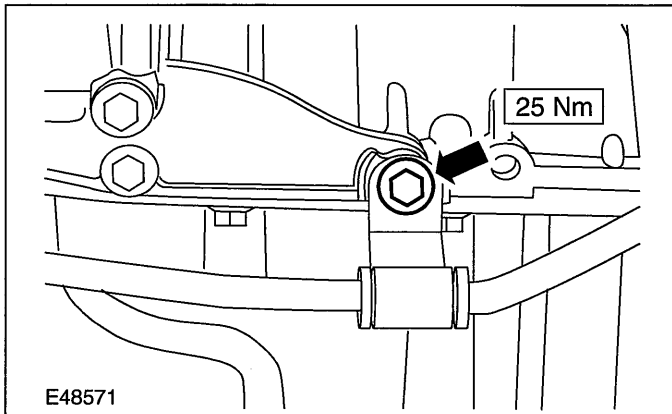
2. NOTE: Note the position of the power steering line to aid installation.



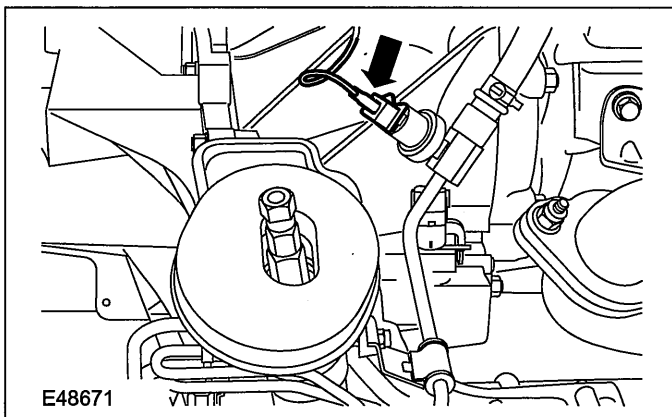
REMOVAL AND INSTALLATION

5. **NOTE:**Note the position of the power steering line to aid installation.

Detach the power steering line bracket from the engine block.

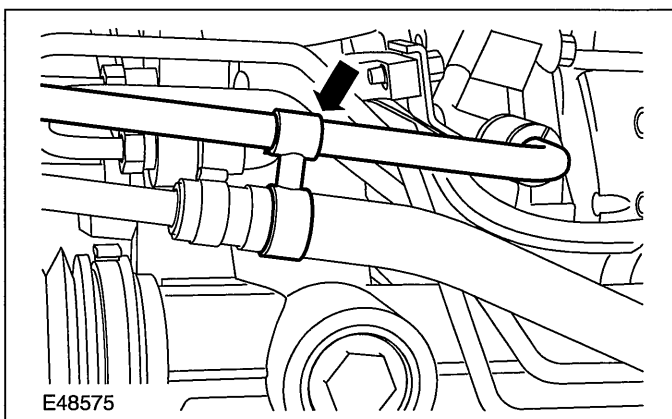


6. Disconnect the power steering pressure (PSP) switch electrical connector.



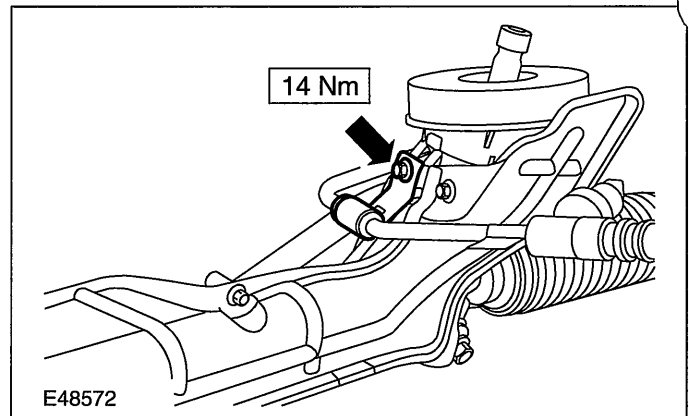
Left-hand drive vehicles

7. Detach the steering gear return hose from the pressure line.



8. **NOTE:**Note the position of the power steering line to aid installation.

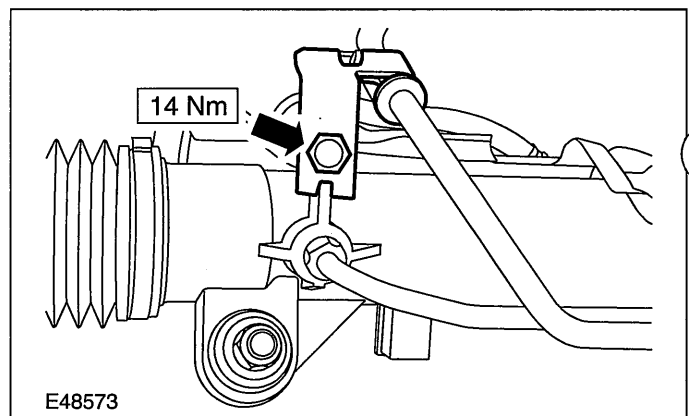
Detach the power steering line bracket from the steering gear.



Right-hand drive vehicles

9. **NOTE:**Note the position of the power steering line to aid installation.

Detach the power steering line bracket from the steering gear.



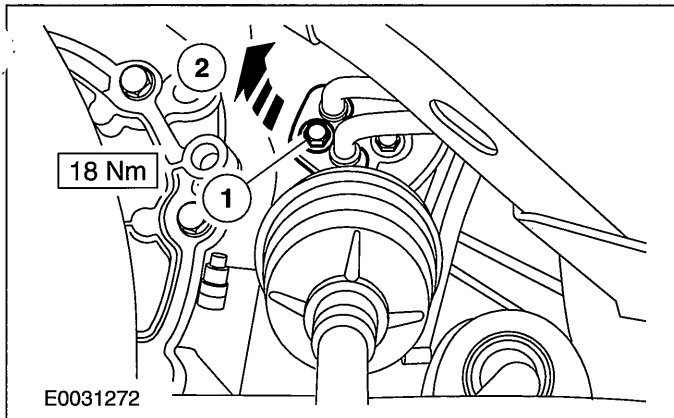
All vehicles

10. Disconnect the power steering lines from the steering gear valve body.

1. Remove the retaining bolt.
2. Rotate the clamp plate.
 - Allow the fluid to drain into a suitable container.

REMOVAL AND INSTALLATION

- Discard the O-ring seals.

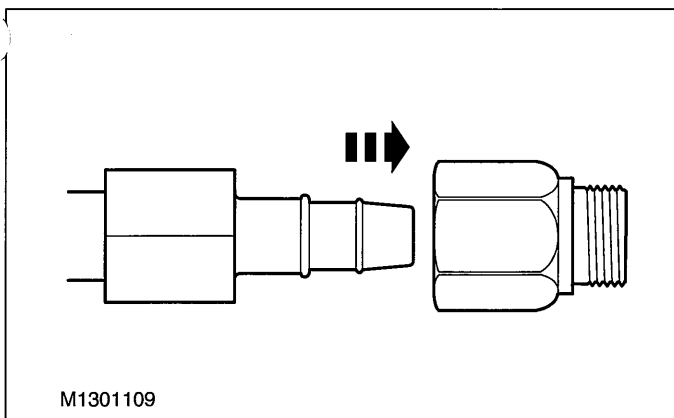


- 11. NOTE:** Note the position of the power steering line to aid installation.

Remove the power steering pump to steering gear pressure line.

Installation

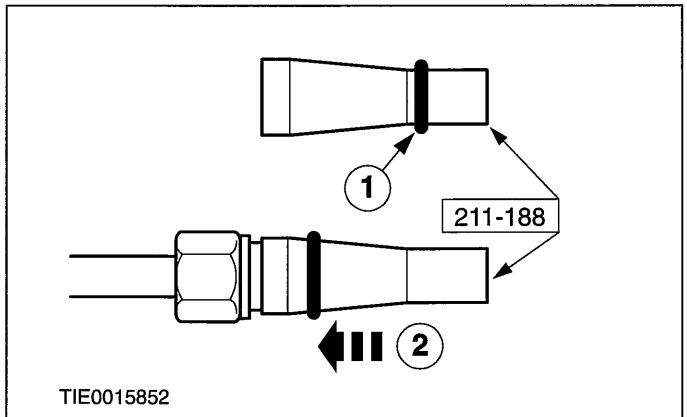
1. If a new fluid line is being installed, push the new line into the new union until it clips into place.



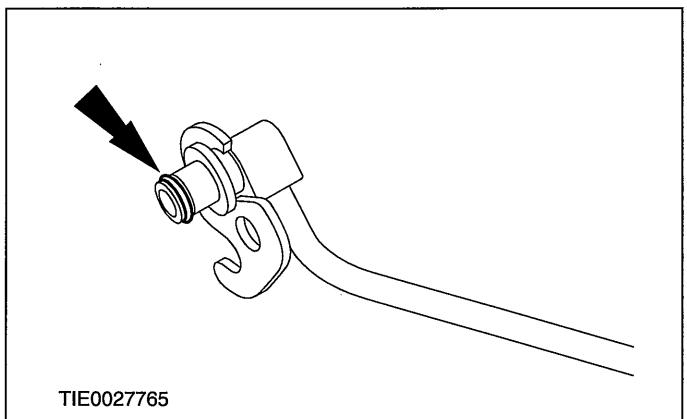
2. Using the special tool, install a new O-ring seal onto the power steering line to power steering pump union.

1. Push the new O-ring seal onto the special tool.

2. Locate the special tool onto the union and install the O-ring seal.



3. Install new O-ring seals onto the power steering lines.

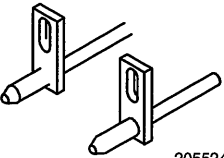
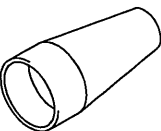
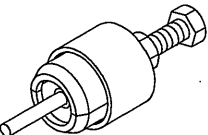
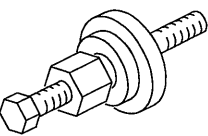


4. To install, reverse the removal procedure.
5. Fill and bleed the power steering system.

For additional information, refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures)

/ Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

REMOVAL AND INSTALLATION**Power Steering Pump to Steering Gear Pressure Line — 2.0L Duratec-HE (MI4) RHD****Special Tool(s)**

 205524	Alignment Pins, Subframe 205-524
 13015	Expander, Teflon Seal 211-118
 ES13021	Remover, Power Steering Pump Pulley 211-198
 21192	Installer, Camshaft Pulley 303-458

General Equipment

Transmission jack

Materials

Name	Specification
Grease	SA-M1C9107-A

1. Remove the right-hand headlamp assembly.

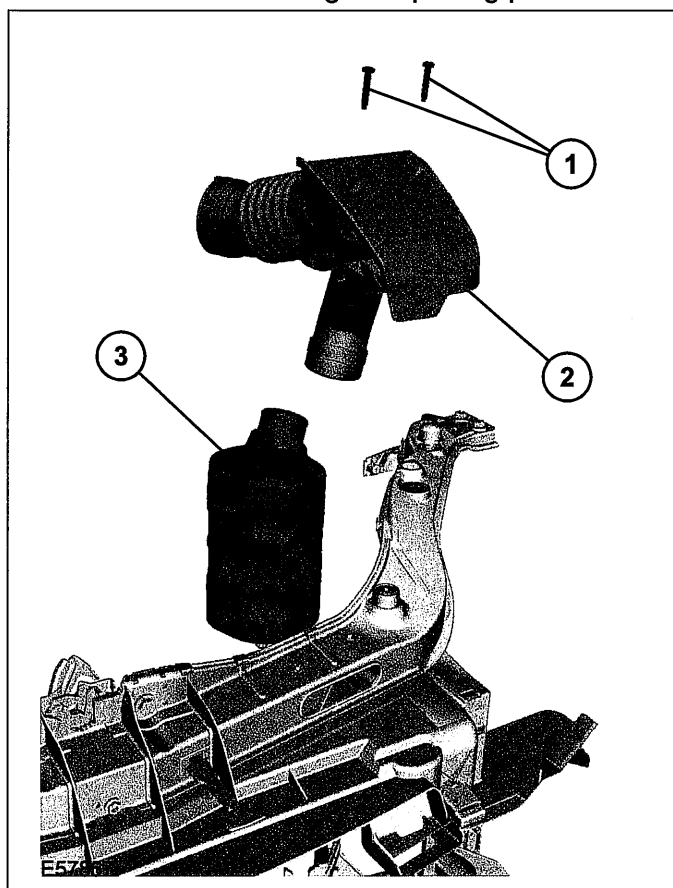
For additional information, refer to:
Headlamp Assembly (417-01 Exterior
Lighting, Removal and Installation).

2. Remove the air cleaner.

For additional information, refer to: Air
Cleaner - 2.0L Duratec-HE (MI4) (303-12
Intake Air Distribution and Filtering,
Removal and Installation).

3. Remove the air cleaner intake pipe resonator.

1. Remove the air cleaner intake pipe duct retaining bolts.
2. Remove the air cleaner intake pipe and air cleaner intake pipe duck assembly.
3. Detach the air cleaner intake pipe resonator from the radiator grille opening panel.

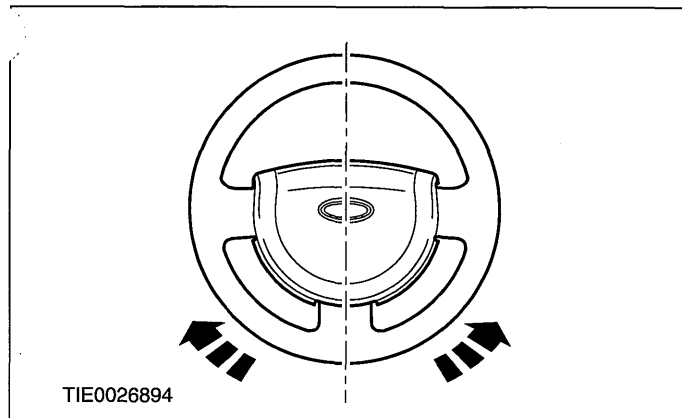
**4. Remove the battery tray.**

For additional information, refer to: Battery
Tray - 2.0L Duratec-HE (MI4) (414-01
Battery, Mounting and Cables, Removal
and Installation).

5. NOTE: Make sure that the road wheels are in the straight ahead position.

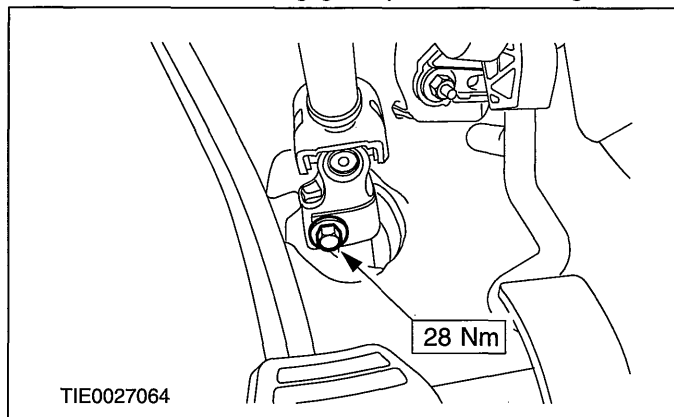
REMOVAL AND INSTALLATION

Centralize the steering and lock it in position.



6. Detach the steering column shaft from the steering gear pinion.

- Remove and discard the steering column shaft to steering gear pinion retaining bolt.



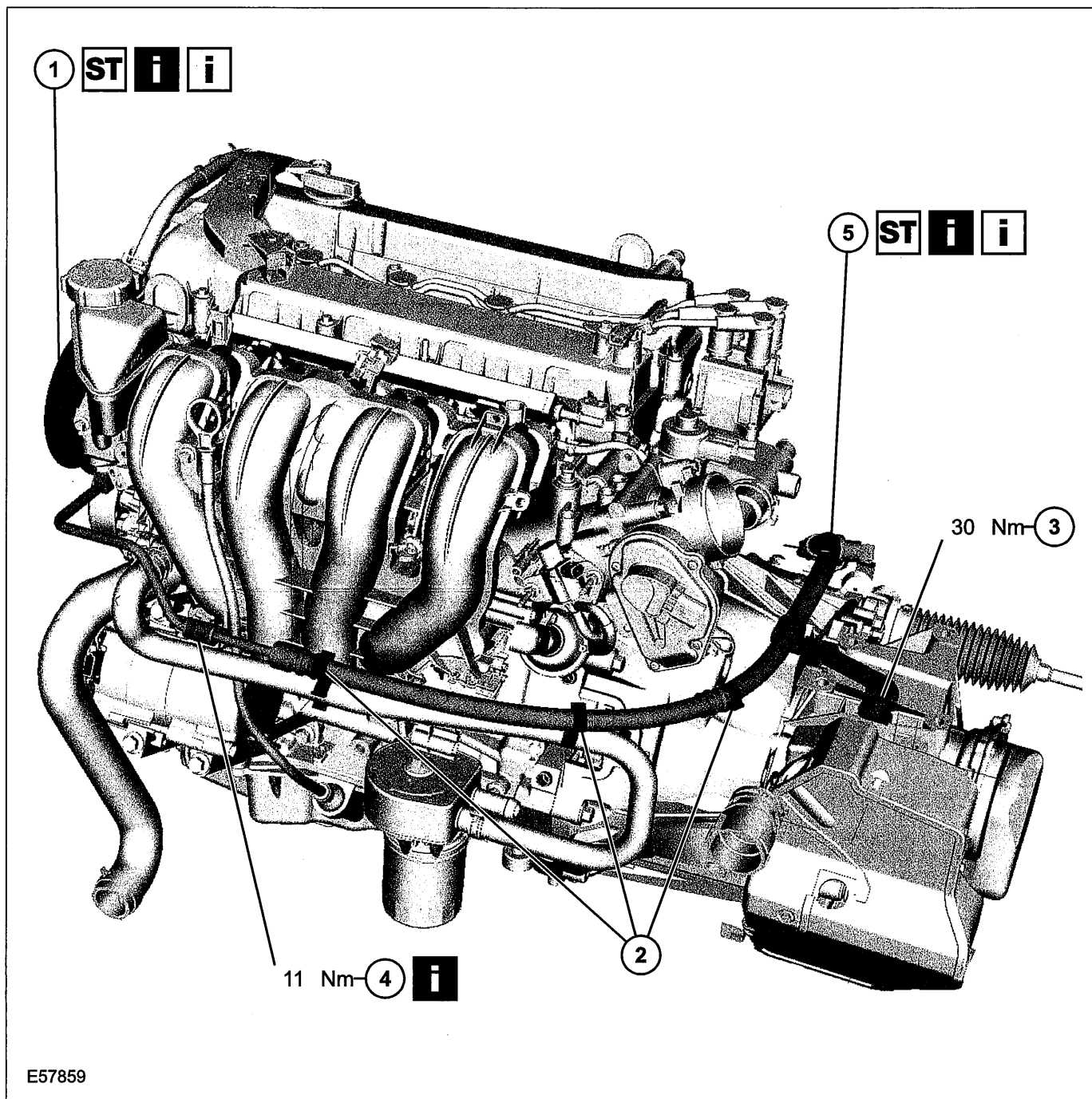
7. Remove the accessory drive belt.

For additional information, refer to:
Accessory Drive Belt - 2.0L Duratec-HE (M14) (303-05 Accessory Drive, Removal and Installation).

8. Lower the vehicle.

9. Remove the components in the order indicated in the following illustration(s) and table(s).

REMOVAL AND INSTALLATION



E57859

Item	Description
1	Power steering pump pulley See Removal Detail See Installation Detail
2	Power steering pump to steering gear pressure line retaining clips
3	Power steering pump to steering gear pressure line bracket to transaxle retaining bolt
4	Power steering pump to steering gear pressure line bracket to intake manifold retaining bolt

Item	Description
	See Removal Detail
5	Power steering pump to steering gear pressure line See Removal Detail See Installation Detail

10. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

11. Fill and bleed the power steering system.
For additional information, refer to: (211-00 Steering System - General Information)

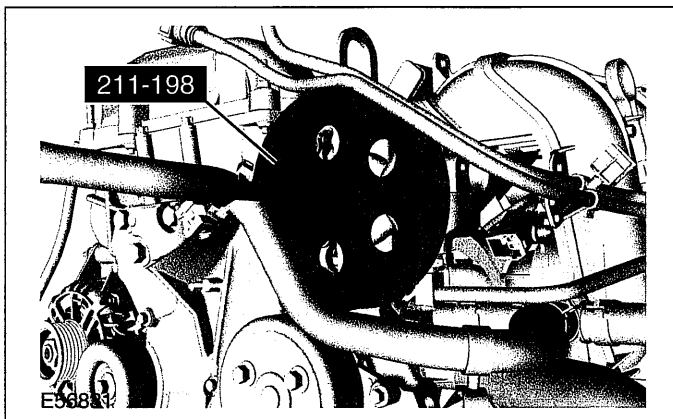
Power Steering System Filling (General

Procedures),
Power Steering System Bleeding (General Procedures).

Removal Details

Item 1 Power steering pump pulley

1. Using the special tool, remove the power steering pump pulley.



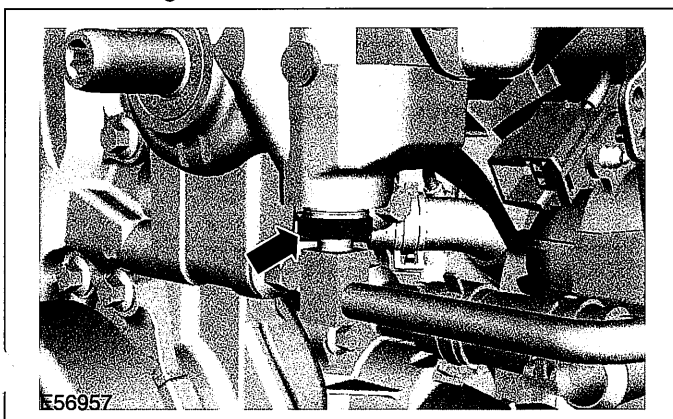
2. CAUTIONS:

⚠ Cap the power steering pump outlet port to prevent fluid loss or dirt ingress.

⚠ Cap the power steering pump to steering gear pressure line to prevent fluid loss or dirt ingress.

Disconnect the power steering pump to steering gear pressure line from the power steering pump.

- Remove and discard the power steering pump to steering gear pressure line union O-ring seal.

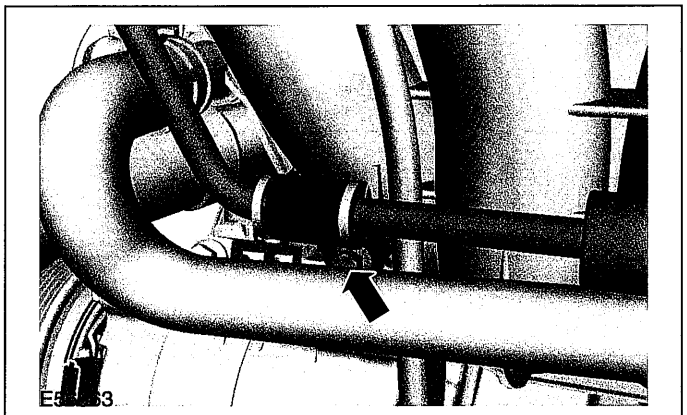


Item 4 Power steering pump to steering gear pressure line bracket to intake manifold retaining bolt

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Jacking (Description and Operation).

2. Detach the power steering pump to steering gear pressure line from the intake manifold.



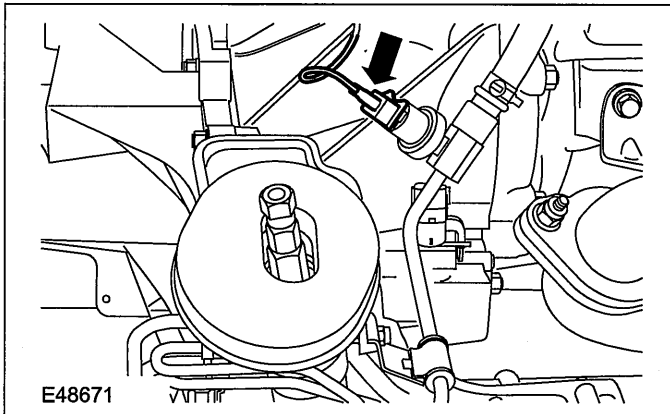
Item 5 Power steering pump to steering gear pressure line

1. Remove the front wheels and tires.

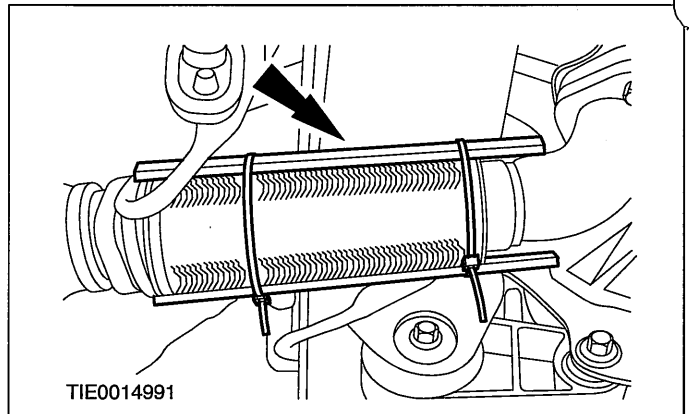
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

REMOVAL AND INSTALLATION

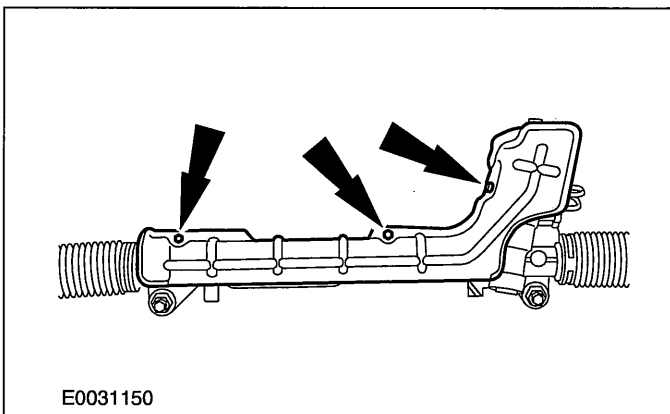
2. Disconnect the power steering pressure (PSP) switch electrical connector.



Support the exhaust flexible pipe with a support wrap or splint.

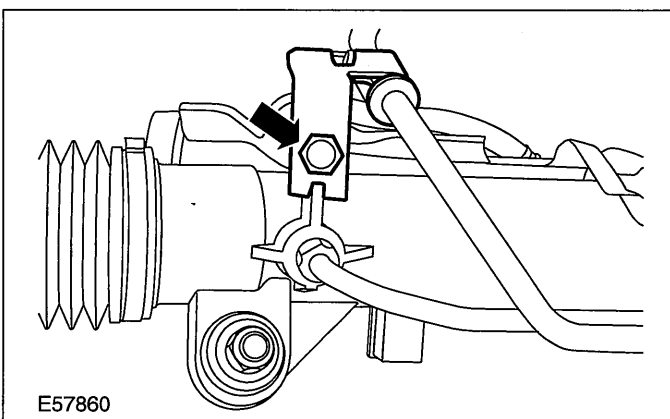


3. Detach the steering gear heat shield from the steering gear.



4. **NOTE:** Note the position of the power steering pump to steering gear pressure line to aid installation.

Detach the power steering pump to steering gear pressure line from the steering gear.



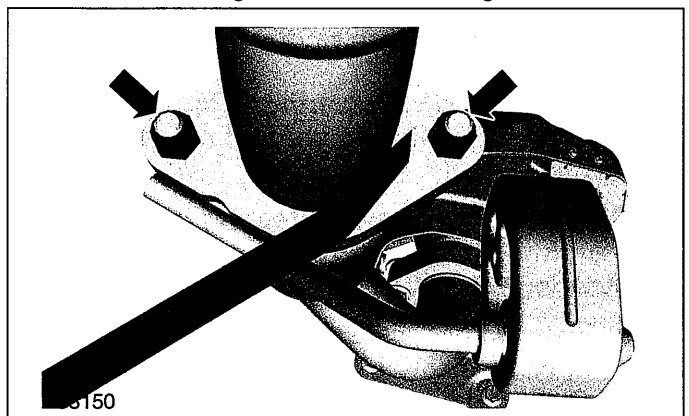
5. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

6. **⚠ CAUTION:** Twisting the exhaust flexible pipe more than two degrees may cause damage resulting in failure.

NOTE: Use a pry-bar to prevent the exhaust flexible pipe from twisting when removing the exhaust flexible pipe to catalytic converter retaining nuts.

Remove the exhaust flexible pipe to catalytic converter retaining nuts.

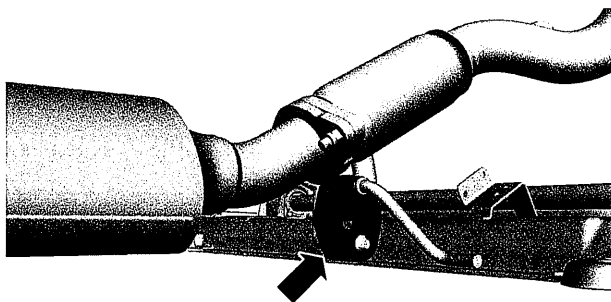
- Discard the exhaust flexible pipe to catalytic converter gasket and retaining nuts.



7. **⚠ CAUTION:** Take care when removing the exhaust hanger insulator to prevent damage.

REMOVAL AND INSTALLATION

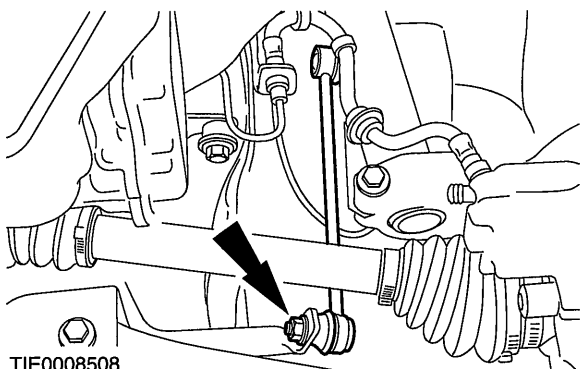
Remove the exhaust hanger insulator.



E56958

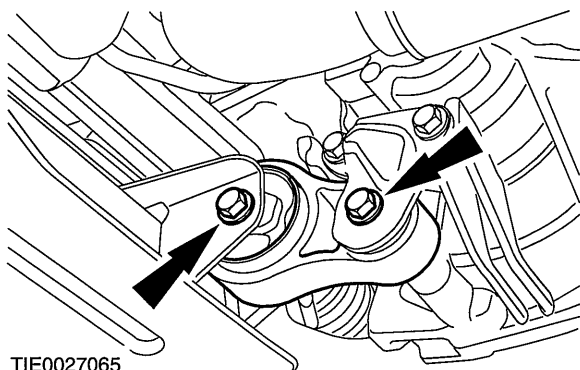
8. **NOTE:** Use a 5 mm Allen key to prevent the stabilizer bar link ball joint from rotating.

Detach the stabilizer bar link from the stabilizer bar on both sides.



TIE0008508

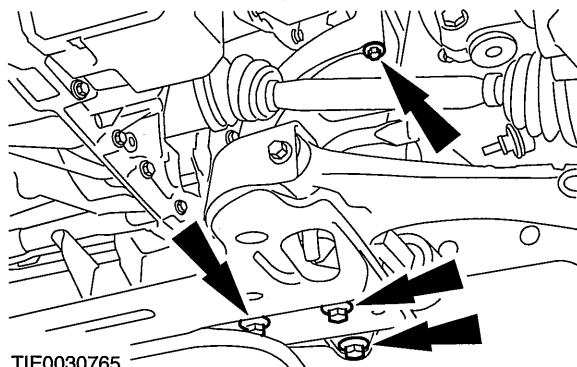
9. Remove the engine support insulator.



TIE0027065

10. Using a transmission jack and a wooden block, support the front axle crossmember.

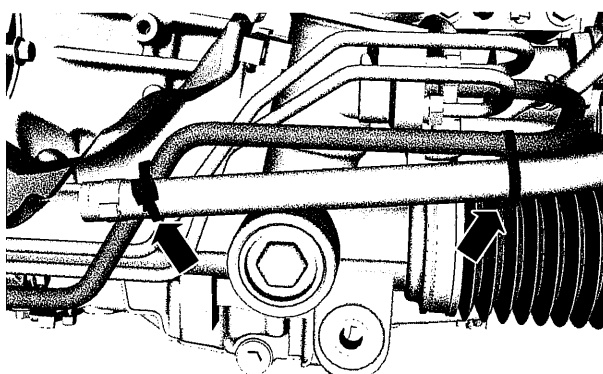
11. Remove the front axle crossmember retaining bolts on both sides.



TIE0030765

12. Lower the front axle crossmember approximately 100 mm.

13. Detach the steering gear to power steering fluid reservoir return line from the power steering pump to steering gear pressure line.



E57861

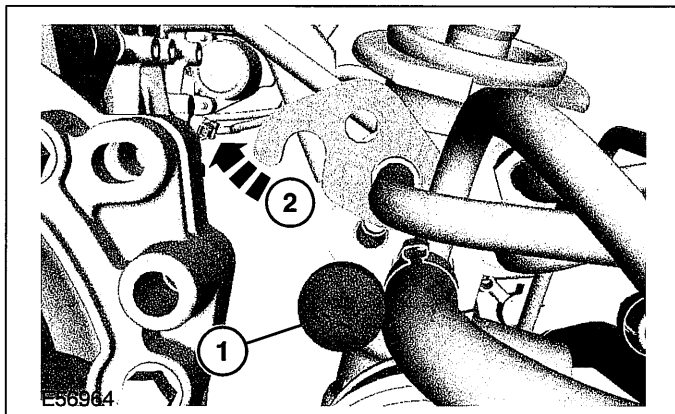
14. **⚠ CAUTION:** Cap the steering gear valve body inlet port and outlet port to prevent fluid loss or dirt ingress.

Disconnect the power steering lines from the steering gear valve body.

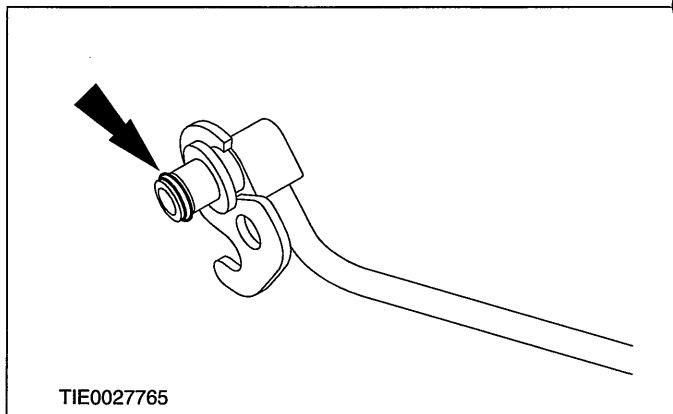
1. Remove the power steering lines clamp plate retaining bolt.
2. Rotate the power steering lines clamp plate.

REMOVAL AND INSTALLATION

- Allow the power steering fluid to drain into a container.



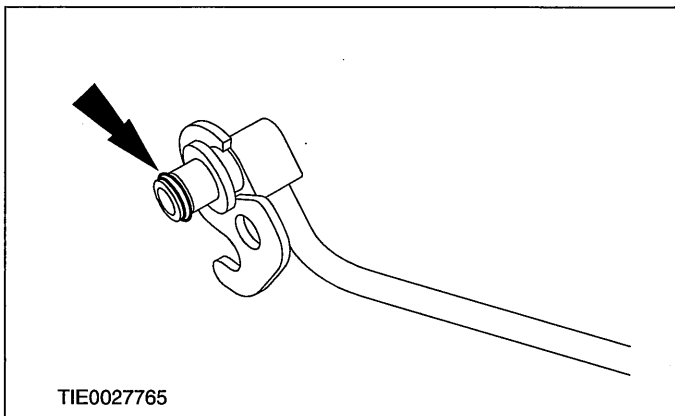
15. Remove and discard the power steering lines O-ring seals.



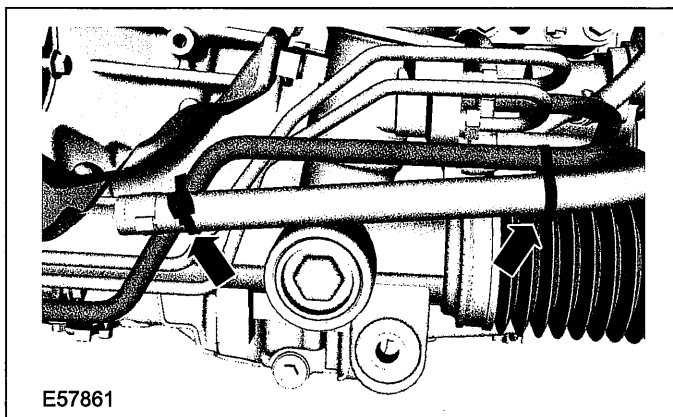
Installation Details

Item 5 Power steering pump to steering gear pressure line

1. Install new power steering lines O-ring seals.

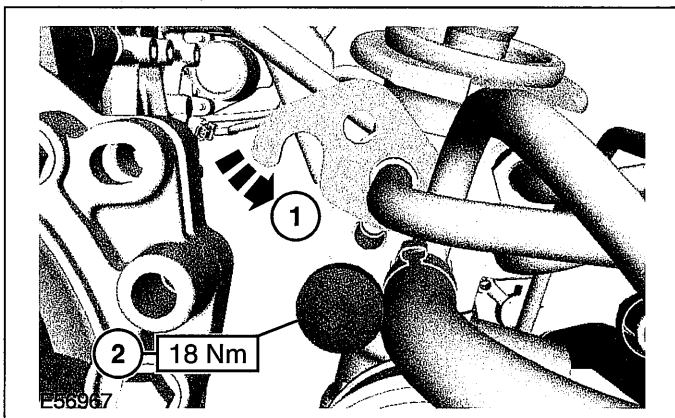


3. Attach the steering gear to power steering fluid reservoir return line to the power steering pump to steering gear pressure line.



2. Connect the power steering lines to the steering gear valve body.

1. Rotate the power steering lines clamp plate.
2. Install the power steering lines clamp plate retaining bolt.

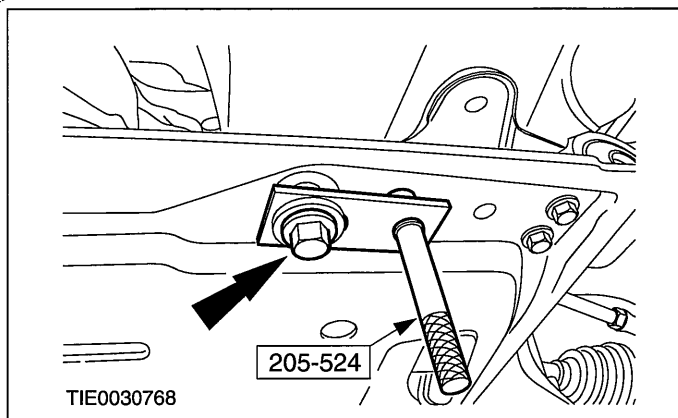


4. **NOTE:** Use the front axle crossmember rear inner retaining bolts to locate the special tool.

NOTE: Do not fully tighten the front axle crossmember rear inner retaining bolts at this stage.

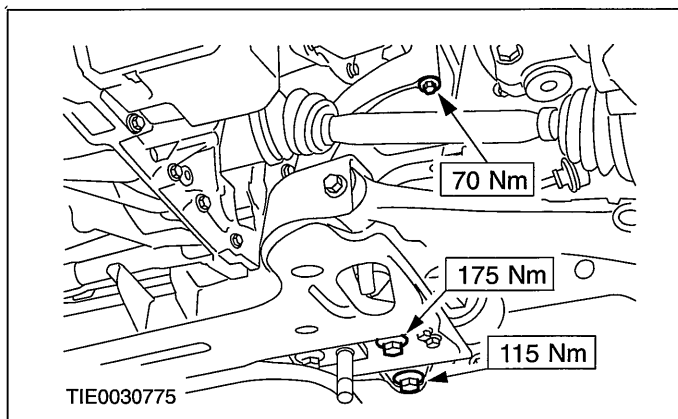
REMOVAL AND INSTALLATION

Using the transmission jack, wooden block and the special tool, position and align the front axle crossmember.

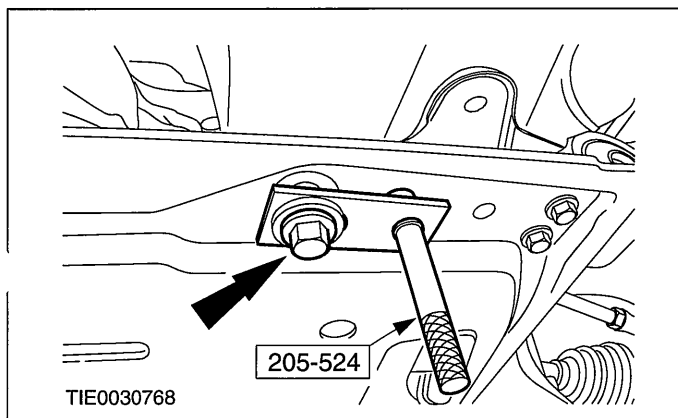


5. **⚠ CAUTION:** While tightening the front axle crossmember front retaining bolt and the front axle crossmember rear outer retaining bolts, make sure that the front axle crossmember does not move.

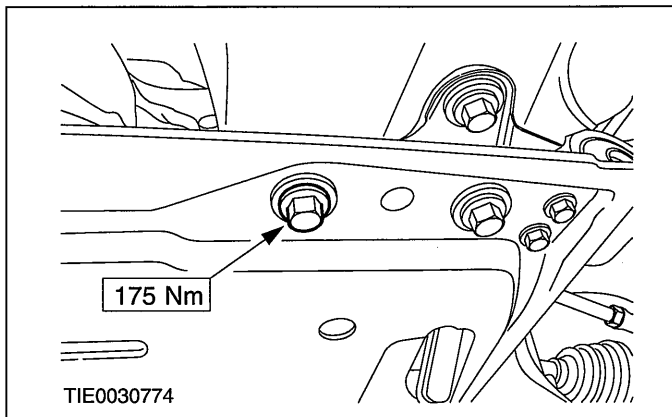
Install the front axle crossmember front retaining bolt and the front axle crossmember rear outer retaining bolts on both sides.



6. Remove the front axle crossmember rear inner retaining bolts and the special tools.

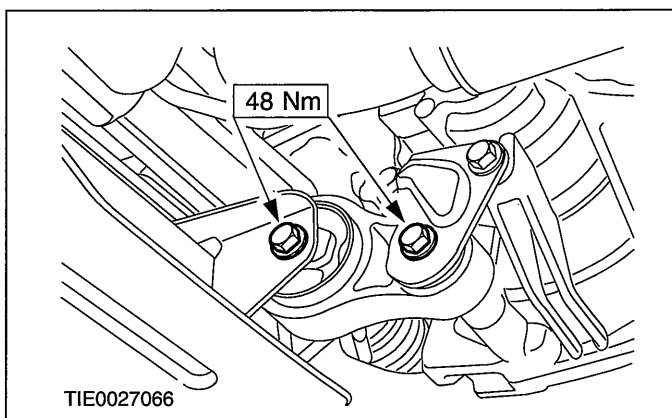


7. Install the front axle crossmember rear inner retaining bolts on both sides.



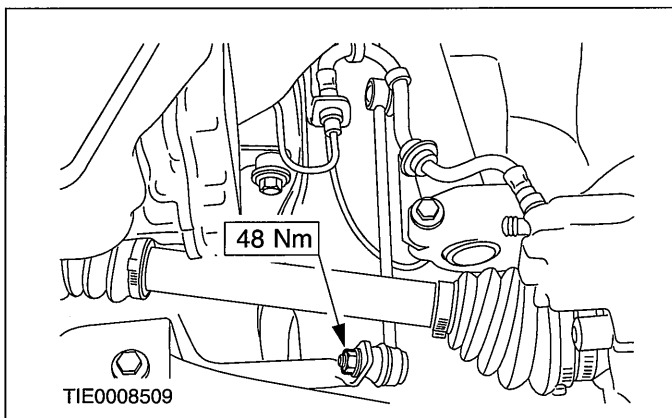
8. Lower and remove the transmission jack and the wooden block.

9. Install the engine support insulator.



10. **NOTE:** Use a 5 mm Allen key to prevent the stabilizer bar link ball joint from rotating.

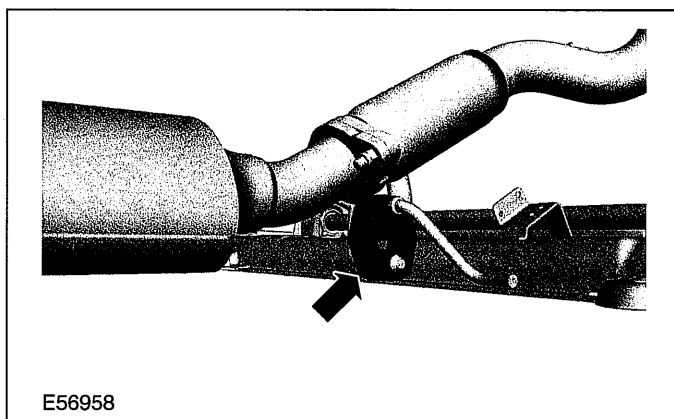
Attach the stabilizer bar link to the stabilizer bar on both sides.



11. **⚠ CAUTION:** Take care when installing the exhaust hanger insulator to prevent damage.

REMOVAL AND INSTALLATION

Check the exhaust hanger insulator for damage. Install a new exhaust hanger insulator if required.

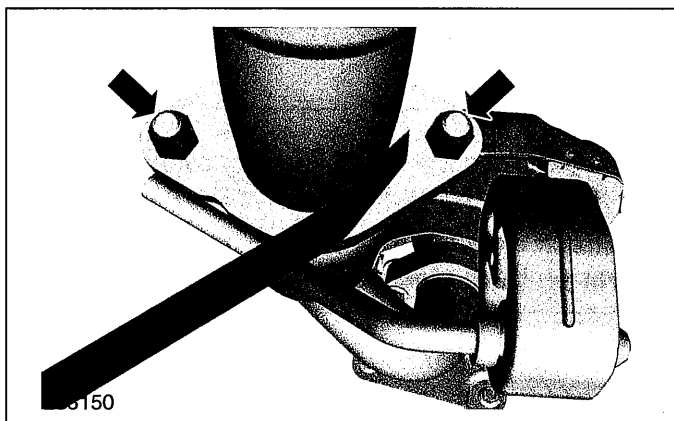


12. **⚠ CAUTION:**Twisting the exhaust flexible pipe more than two degrees may cause damage resulting in failure.

NOTE:Use a pry-bar to prevent the exhaust flexible pipe from twisting when installing the exhaust flexible pipe to catalytic converter retaining nuts.

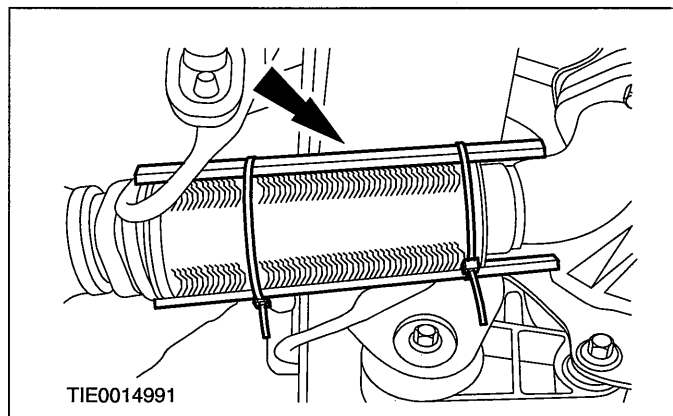
NOTE:Install a new exhaust flexible pipe to catalytic converter gasket and retaining nuts.

Install the exhaust flexible pipe to catalytic converter retaining nuts.

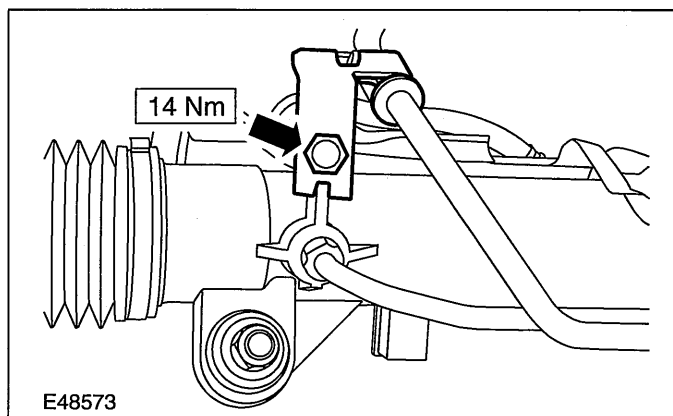


13. **⚠ CAUTION:**Over bending of the exhaust flexible pipe may cause damage resulting in failure.

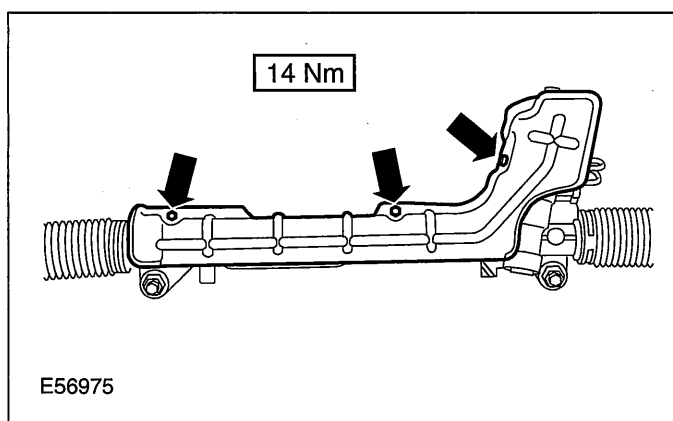
Remove the exhaust flexible pipe support wrap or splint.



14. Attach the power steering pump to steering gear pressure line to the steering gear.

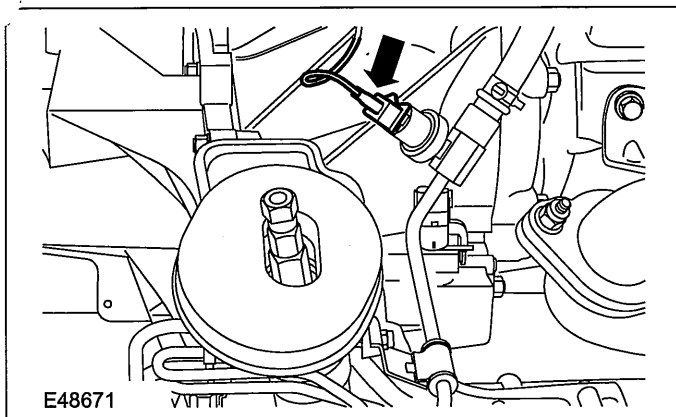


15. Detach the steering gear heat shield from the steering gear.



REMOVAL AND INSTALLATION

16. Connect the PSP switch electrical connector.



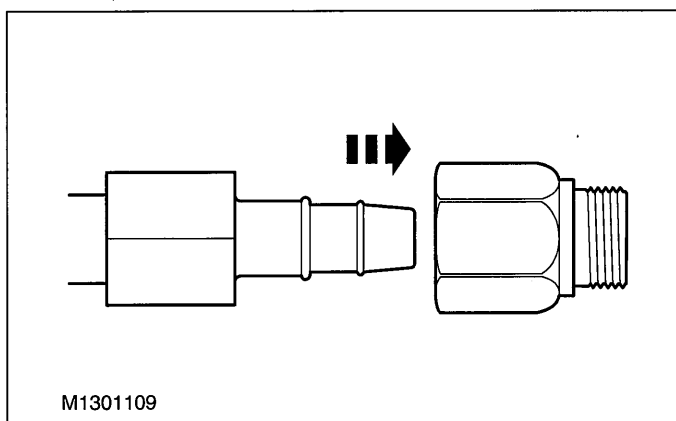
17. Install the front wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

Item 1 Power steering pump pulley

1. **NOTE:** This step is only required if installing a new power steering pump to steering gear pressure line.

Push the new power steering pump to steering gear pressure line into the new power steering pump to steering gear pressure line union until it clips into place.

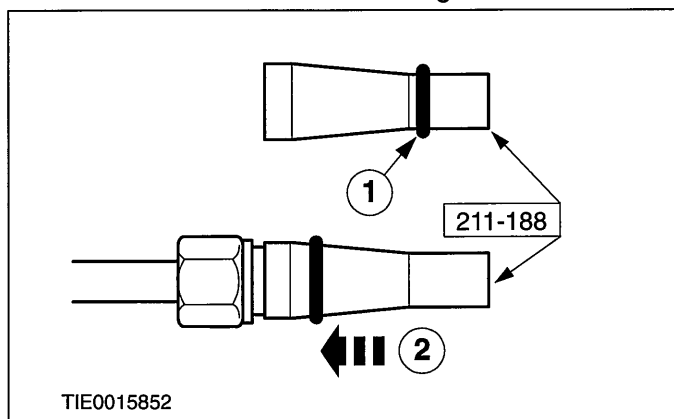


2. **⚠ CAUTION:** Care must be taken to prevent dirt ingress.

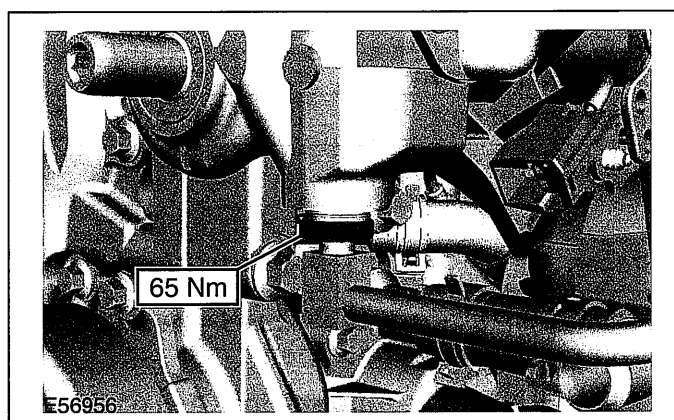
Using the special tool, install a new O-ring seal onto the power steering pump to steering gear pressure line union.

1. Push the O-ring seal onto the special tool.

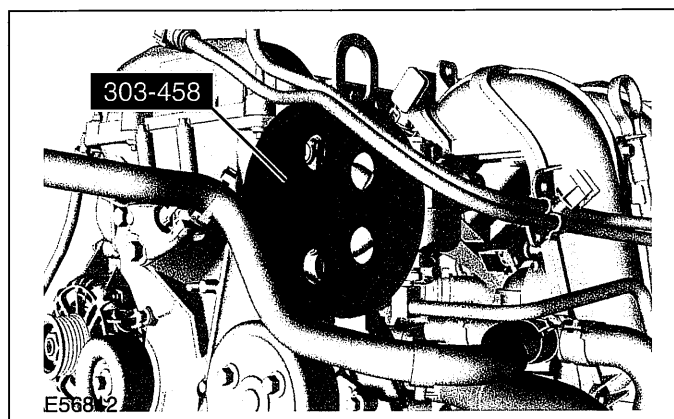
2. Locate the special tool onto the power steering pump to steering gear pressure line union and install the O-ring seal.



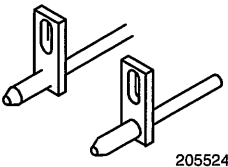
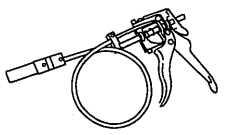
3. Connect the power steering pump to steering gear pressure line to the power steering pump.



4. Using the special tool, install the power steering pump pulley.



REMOVAL AND INSTALLATION**Steering Gear to Power Steering Fluid Reservoir Return Line —
2.0L Duratec-HE (MI4) RHD****Special Tool(s)**

 205524	Alignment Pins, Subframe 205-524
 24003	Remover/Installer, Hose Clamp 303-397

General Equipment

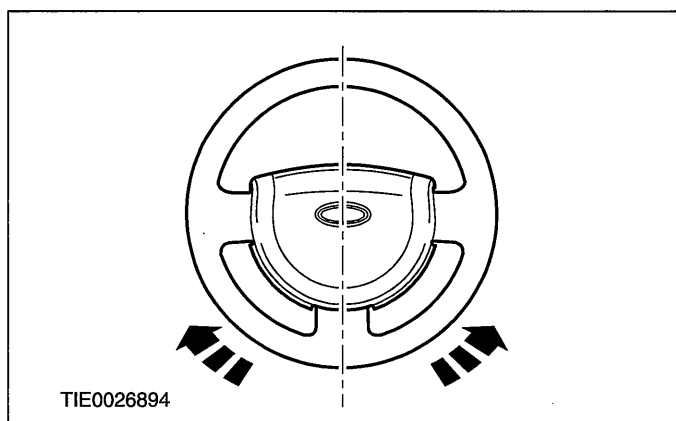
Transmission jack

Materials

Name	Specification
Grease	SA-M1C9107-A

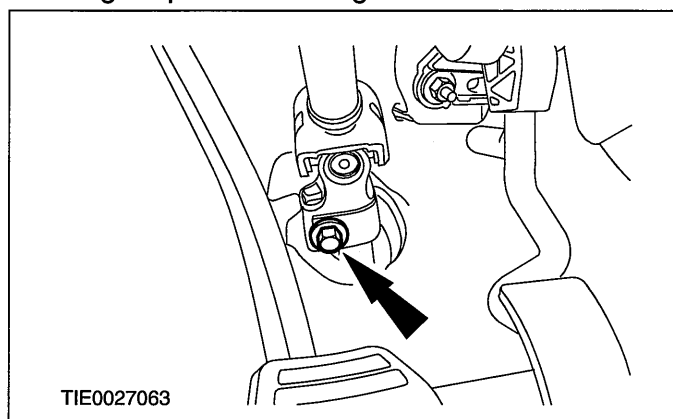
1. **NOTE:** Make sure that the road wheels are in the straight ahead position.

Centralize the steering and lock it in position.



2. Detach the steering column shaft from the steering gear pinion.

- Discard the steering column shaft to steering gear pinion retaining bolt.



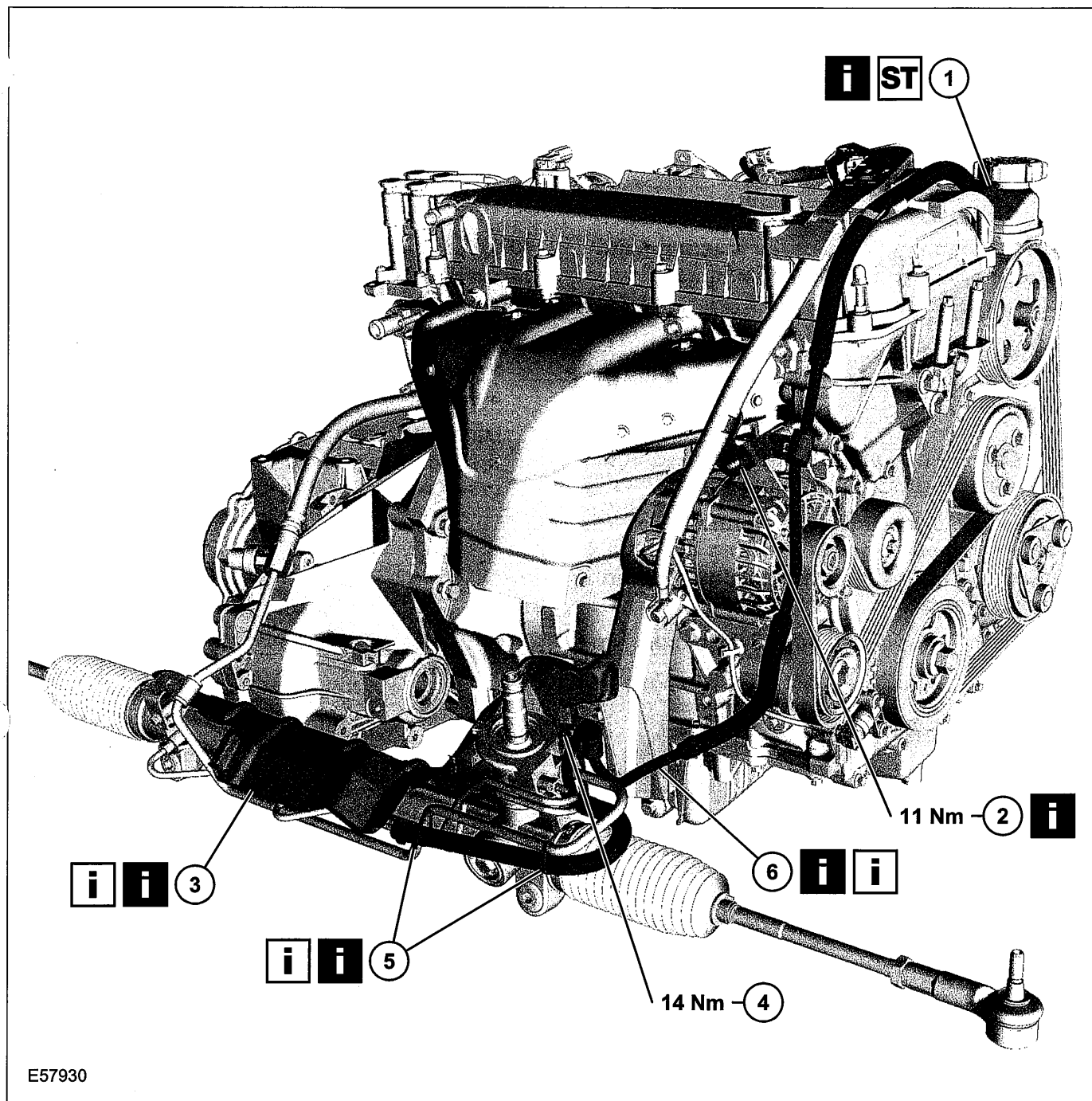
3. Remove the front wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. Lower the vehicle.

5. Remove the components in the order indicated in the following illustration(s) and table(s).

REMOVAL AND INSTALLATION



Item	Description
1	Steering gear to power steering fluid reservoir return line upper retaining clip See Removal Detail
2	Steering gear to power steering fluid reservoir return line support bracket to generator retaining nut See Removal Detail
3	Steering gear heat shield See Removal Detail See Installation Detail

Item	Description
4	Steering gear to power steering fluid reservoir return line support bracket to steering gear retaining bolt
5	Cable ties See Removal Detail See Installation Detail
6	Steering gear to power steering fluid reservoir return line See Removal Detail See Installation Detail

6. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

7. Fill and bleed the power steering system. For additional information, refer to: (211-00 Steering System - General Information) Power Steering System Filling (General

Procedures), Power Steering System Bleeding (General Procedures).

Removal Details

Item 1 Steering gear to power steering fluid reservoir return line upper retaining clip

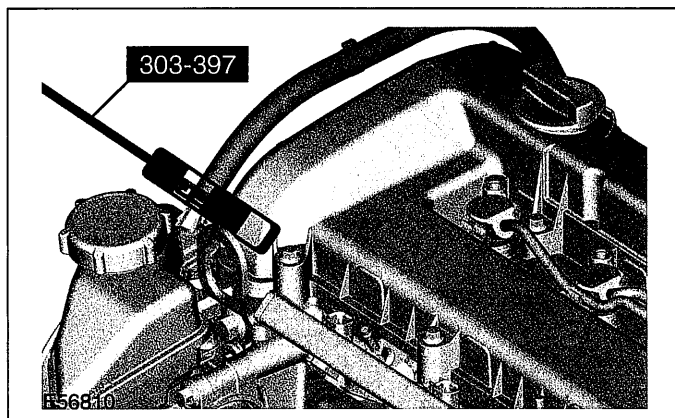
1. CAUTIONS:

⚠ Cap the steering gear to power steering fluid reservoir return line to prevent fluid loss or dirt ingress.

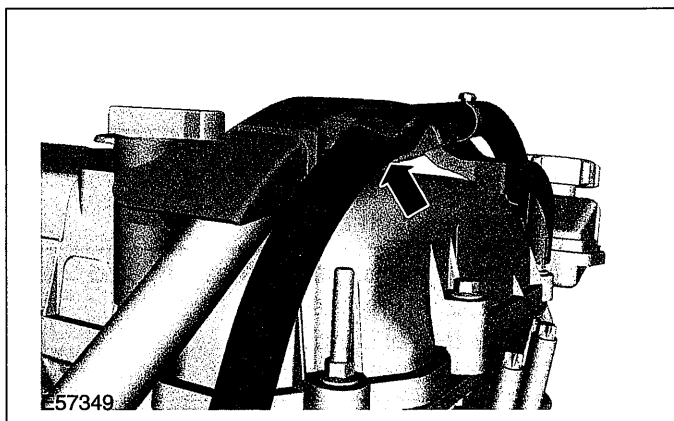
⚠ Cap the power steering fluid reservoir to prevent fluid loss or dirt ingress.

Using the special tool, disconnect the steering gear to power steering fluid reservoir return line from the power steering fluid reservoir.

- Allow the power steering fluid to drain into a container.



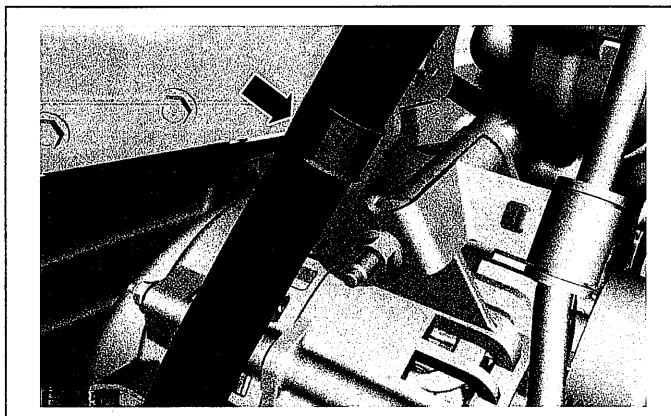
2. Detach the steering gear to power steering fluid reservoir return line from the generator wiring harness shield.



Item 2 Steering gear to power steering fluid reservoir return line support bracket to generator retaining nut

1. NOTE: Note the position of the steering gear to power steering fluid reservoir return line support bracket to aid installation.

Detach the generator wiring harness from the steering gear to power steering fluid reservoir return line support bracket.

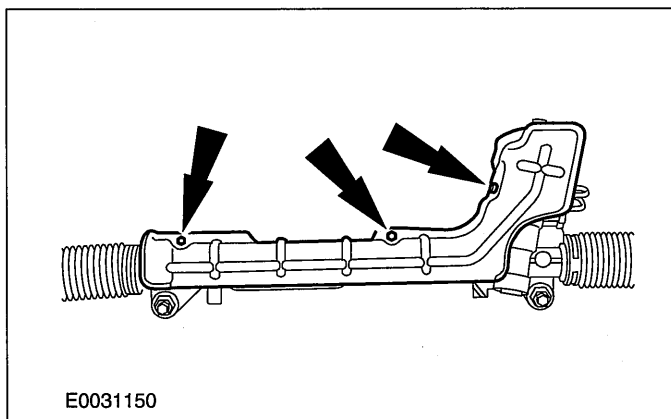


Item 3 Steering gear heat shield

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation), Lifting (Description and Operation).

2. Detach the steering gear heat shield from the steering gear.

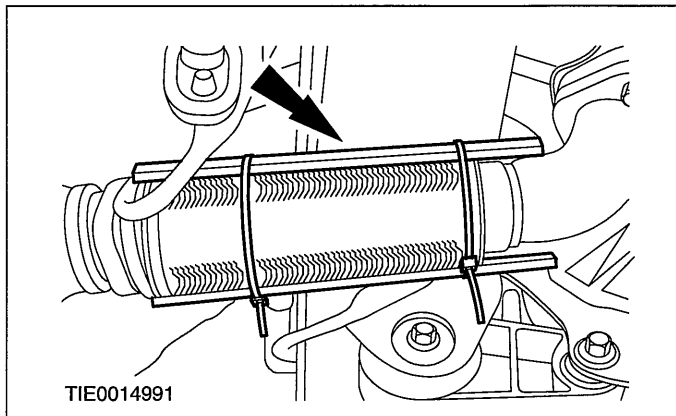


REMOVAL AND INSTALLATION

Item 5 Cable ties

1. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a support wrap or splint.

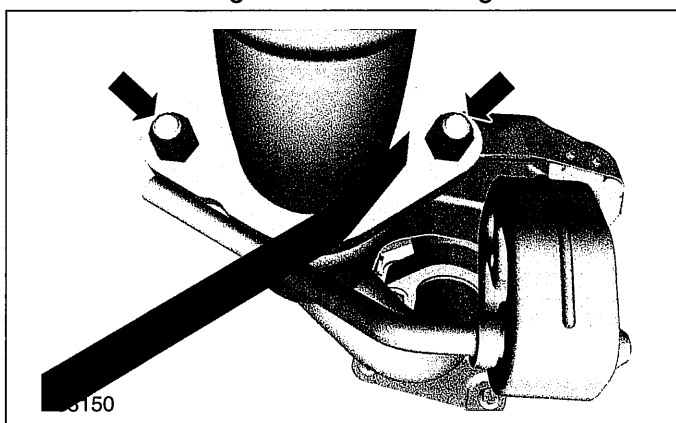


2. **⚠ CAUTION:** Twisting the exhaust flexible pipe more than two degrees may cause damage resulting in failure.

NOTE: Use a pry-bar to prevent the exhaust flexible pipe from twisting when removing the catalytic converter to muffler and tailpipe assembly retaining nuts.

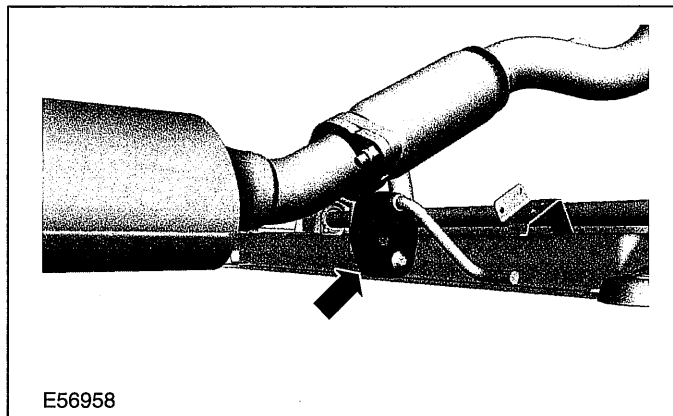
Remove the exhaust flexible pipe to catalytic converter retaining nuts.

- Discard the exhaust flexible pipe to catalytic converter gasket and retaining nuts.



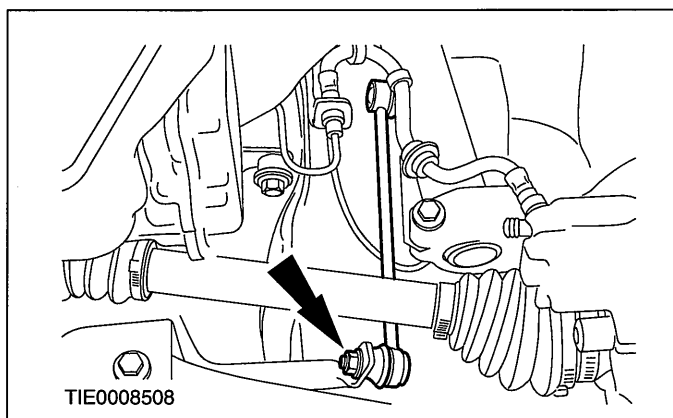
3. **⚠ CAUTION:** Take care when removing the exhaust hanger insulator to prevent damage.

Remove the exhaust hanger insulator.

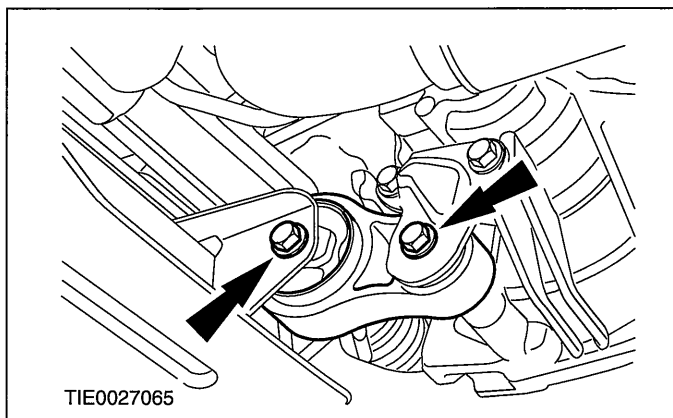


4. **NOTE:** Use a 5 mm Allen key to prevent the stabilizer bar link ball joint from rotating.

Detach the stabilizer bar link from the stabilizer bar on both sides.



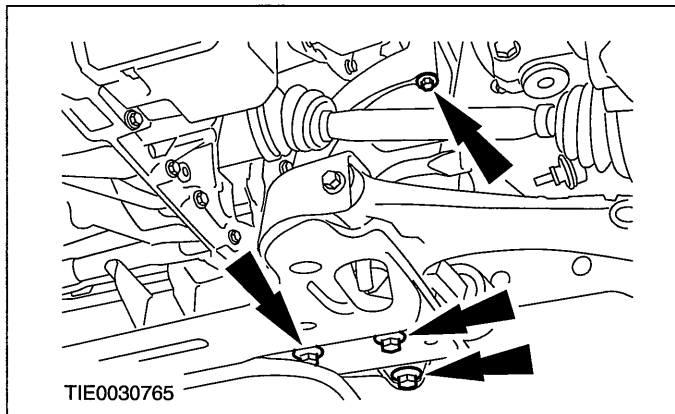
5. **Remove the engine support insulator.**



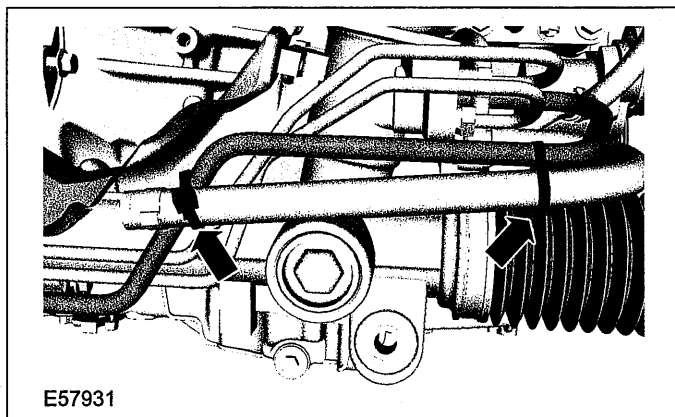
6. **Using a transmission jack and a wooden block, support the front axle crossmember.**

REMOVAL AND INSTALLATION

7. Remove the front axle crossmember retaining bolts on both sides.



8. Lower the front axle crossmember approximately 100 mm.
9. Detach the steering gear to power steering fluid reservoir return line from the power steering pump to steering gear pressure line.

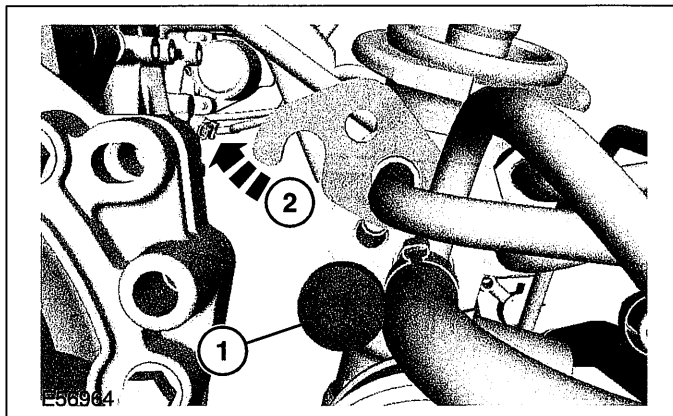


Item 6 Steering gear to power steering fluid reservoir return line

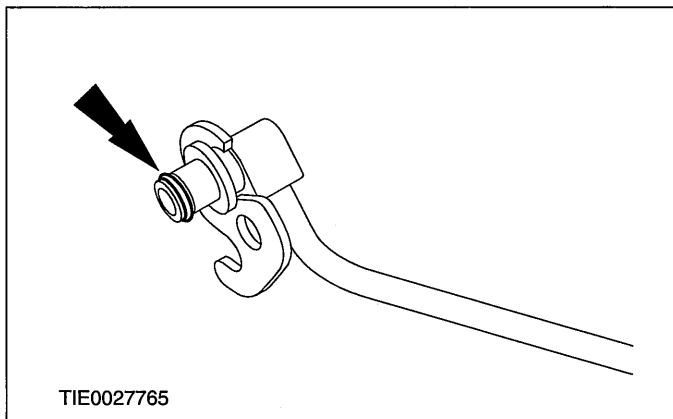
1. **CAUTION:** Cap the steering gear valve body inlet port and outlet port to prevent fluid loss or dirt ingress.

Disconnect the power steering lines from the steering gear valve body.

1. Remove the power steering lines clamp plate retaining bolt.
2. Rotate the power steering lines clamp plate.
 - Allow the power steering fluid to drain into a container.



2. Remove and discard the power steering lines O-ring seals.

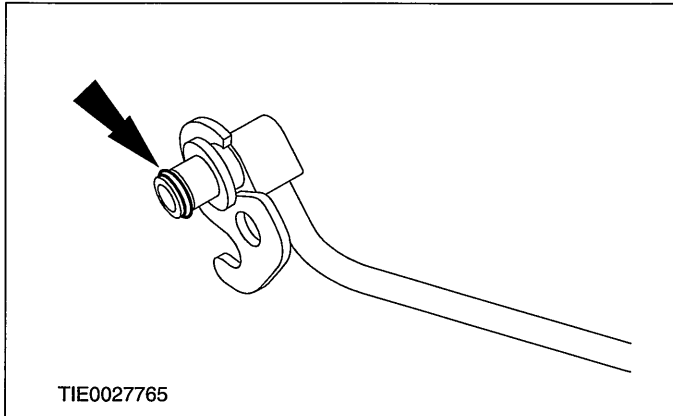


Installation Details

REMOVAL AND INSTALLATION

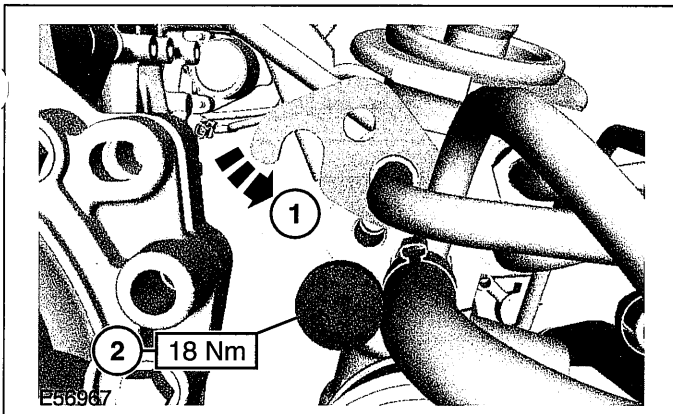
Item 6 Steering gear to power steering fluid reservoir return line

1. Install new O-ring seals onto the power steering lines.



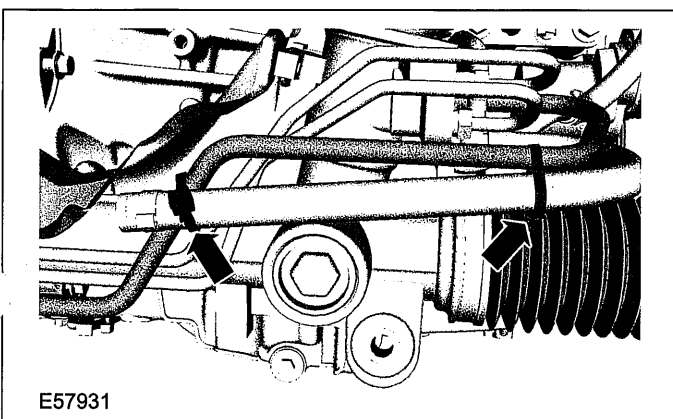
2. Connect the power steering lines to the steering gear valve body.

1. Rotate the power steering lines clamp plate.
2. Install the power steering lines clamp plate retaining bolt.



Item 5 Cable ties

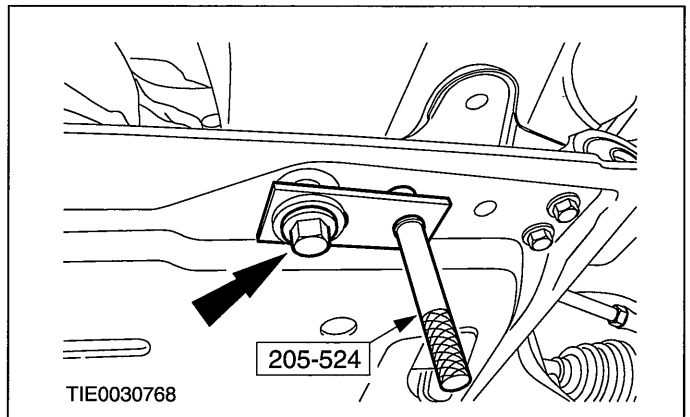
1. Attach the steering gear to power steering fluid reservoir return line to the power steering pump to steering gear pressure line.



2. **NOTE:** Use the front axle crossmember rear inner retaining bolts to locate the special tools.

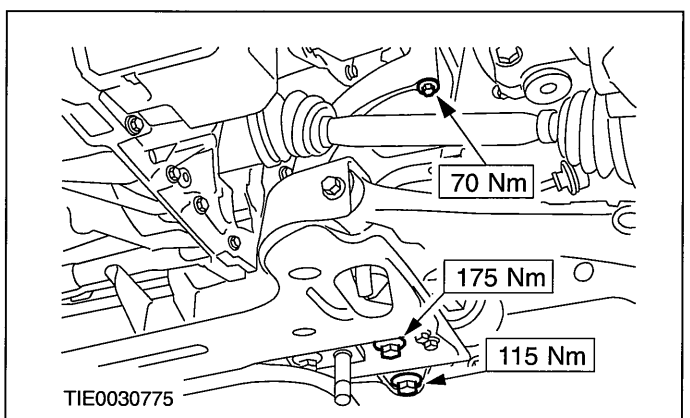
NOTE: Do not fully tighten the front axle crossmember rear inner retaining bolts at this stage.

Using a transmission jack, wooden block and the special tools, position and align the front axle crossmember.



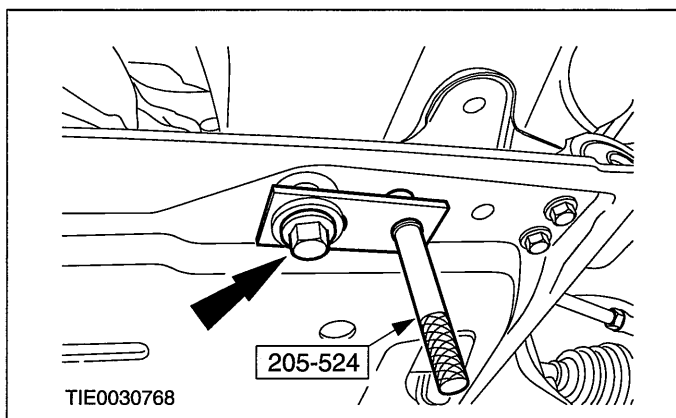
3. **CAUTION:** While tightening the front axle crossmember front retaining bolts and the front axle crossmember rear outer retaining bolts, make sure that the front axle crossmember does not move.

Install the front axle crossmember front retaining bolts and the front axle crossmember rear outer retaining bolts on both sides.

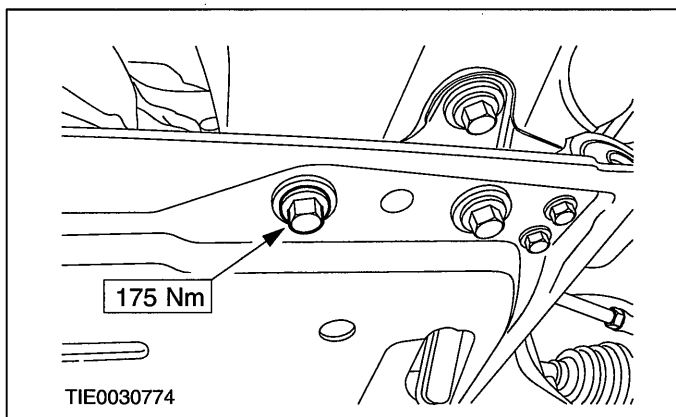


REMOVAL AND INSTALLATION

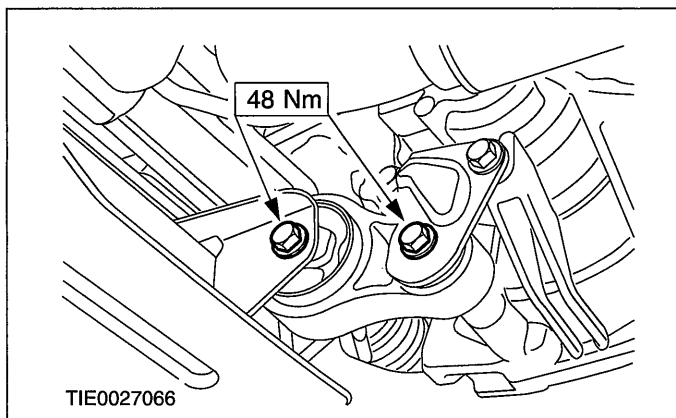
4. Remove the front axle crossmember rear inner retaining bolt and the special tool on both sides.



5. Install the front axle crossmember rear inner retaining bolts on both sides.

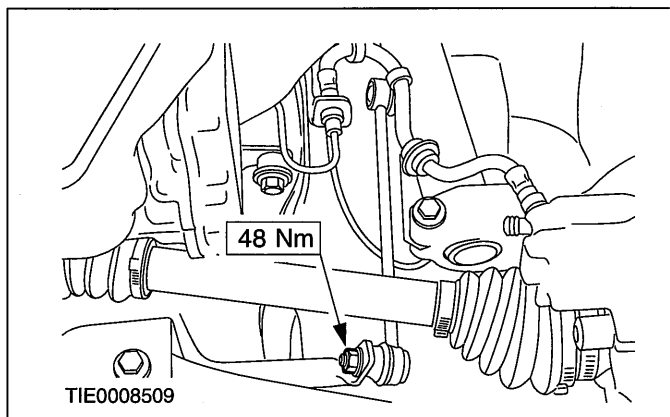


6. Lower and remove the transmission jack and wooden block.
7. Install the engine support insulator.



8. **NOTE:** Use a 5 mm Allen key to prevent the stabilizer bar link ball joint from rotating.

Attach the stabilizer bar link to the stabilizer bar on both sides.

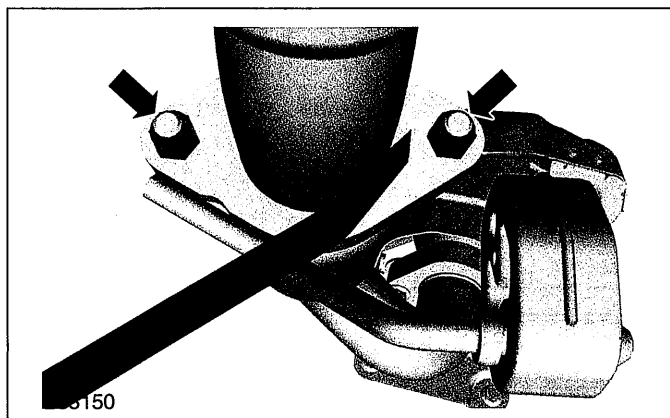


9. **⚠ CAUTION:** Twisting the exhaust flexible pipe more than two degrees may cause damage resulting in failure.

NOTE: Use a pry-bar to prevent the exhaust flexible pipe from twisting when installing the exhaust flexible pipe to catalytic converter retaining nuts.

NOTE: Install a new exhaust flexible pipe to catalytic converter gasket and retaining nuts.

Install the exhaust flexible pipe to catalytic converter retaining nuts.

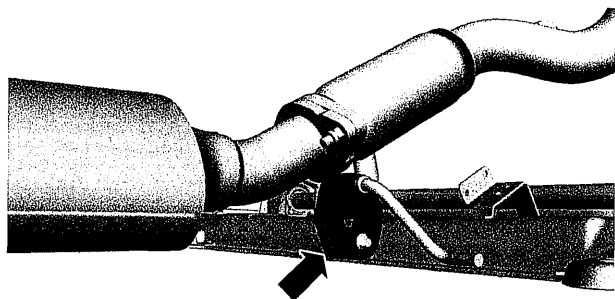


10. **⚠ CAUTION:** Take care when installing the exhaust hanger insulator to prevent damage.

NOTE: Check the exhaust hanger insulator for damage. Install a new exhaust hanger insulator if required.

REMOVAL AND INSTALLATION

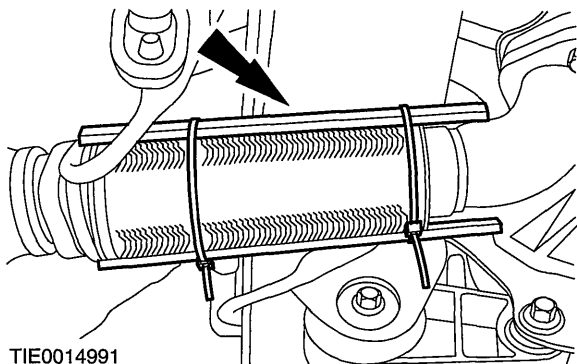
Install the exhaust hanger insulator.



E56958

11. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

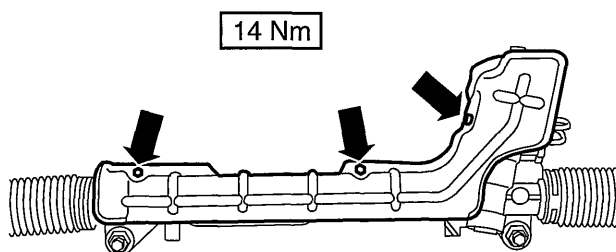
Remove the exhaust flexible pipe support wrap or splint.



TIE0014991

Item 3 Steering gear heat shield

1. Attach the steering gear heat shield to the steering gear.

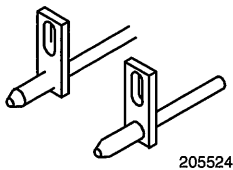
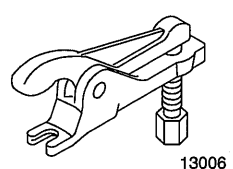


E56975

REMOVAL AND INSTALLATION

Steering Gear(13 116 0)

Special Tool(s)

 205524	Alignment Pins, Subframe 205-524 (15-122)
 13006	Separator, Ball Joint 211-020 (13-006)

General Equipment

Transmission jack

Materials

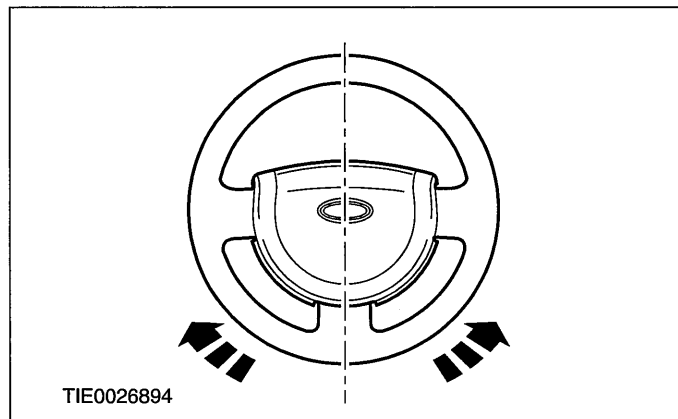
Name	Specification
Grease	SA-M1C9107-A

Removal

All vehicles

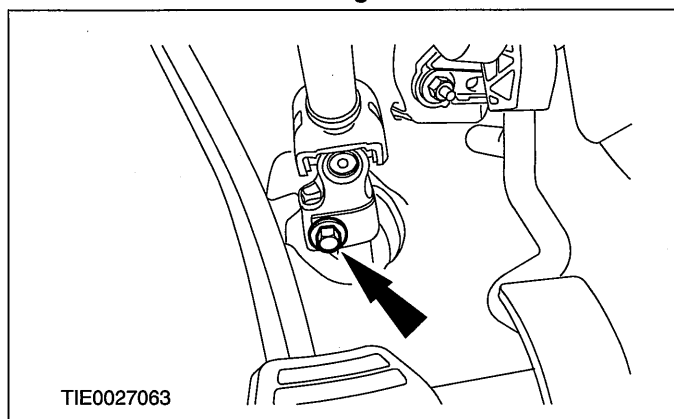
- NOTE:** Make sure that the road wheels are in the straight ahead position.

Centralize the steering and lock it in position.



- Detach the steering column shaft from the steering gear pinion.

- Discard the retaining bolt.

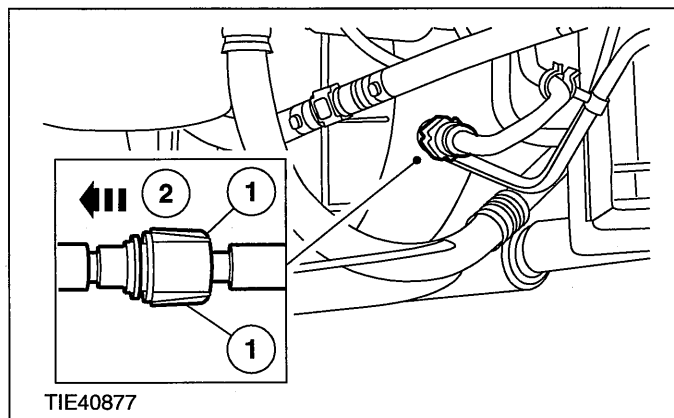


- Remove the wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

- Disconnect the power steering fluid reservoir return hose quick release coupling.

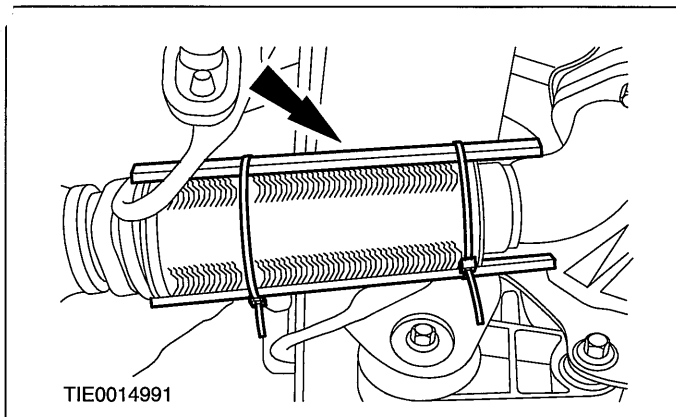
- Press the power steering fluid reservoir return hose quick release coupling locking tangs.
 - Disconnect the power steering fluid reservoir return hose quick release coupling.
- Allow the fluid to drain into a suitable container.



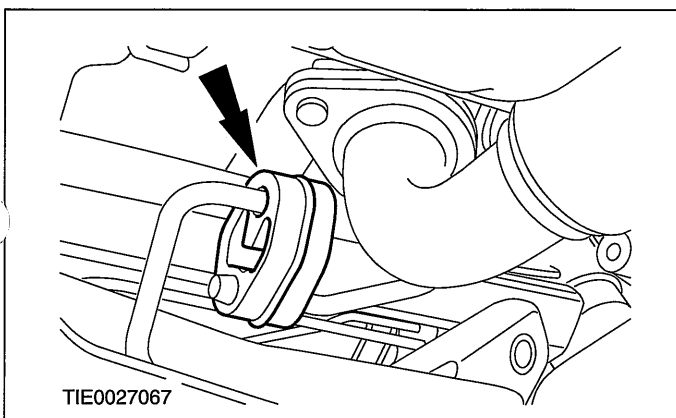
- CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

REMOVAL AND INSTALLATION

Support the exhaust flexible pipe with a support wrap or splint.



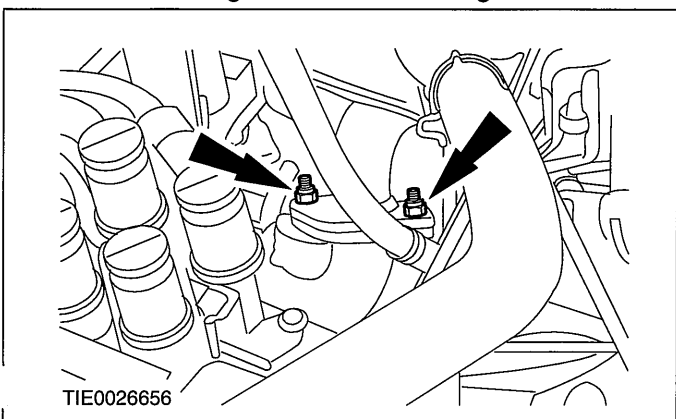
6. **⚠ CAUTION:** Take care when removing the exhaust hanger insulator to prevent damage.
Remove the exhaust hanger insulator.



Vehicles with 1.25L, 1.4L or 1.6L engine

7. **Detach the exhaust flexible pipe from the catalytic converter.**

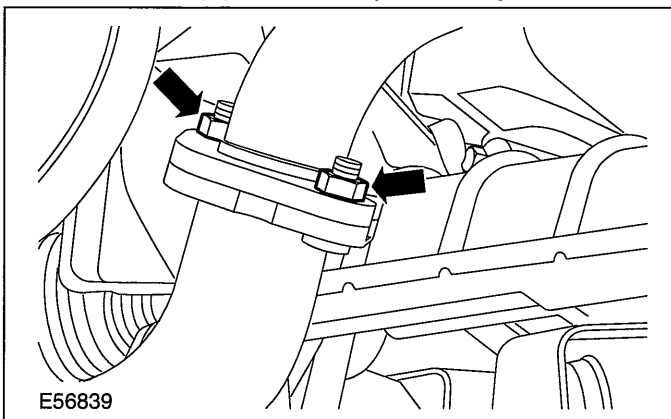
- Discard the exhaust flexible pipe to catalytic converter gasket and retaining nuts.



Vehicles with diesel engine

8. **Detach the exhaust flexible pipe from the muffler and tailpipe assembly.**

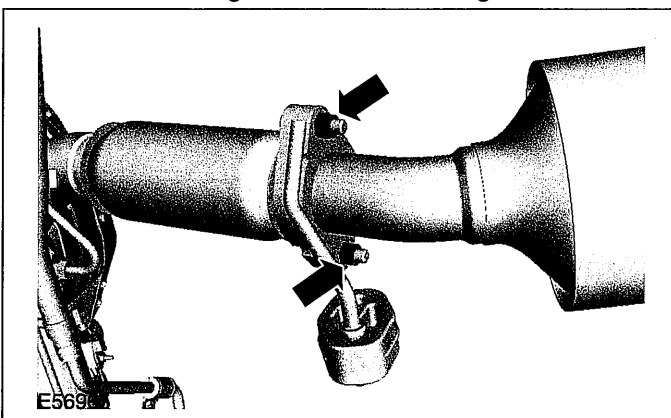
- Discard the exhaust flexible pipe to muffler and tail pipe assembly retaining nuts.



Vehicles with 2.0L engine

9. **Detach the exhaust flexible pipe from the catalytic converter.**

- Discard the exhaust flexible pipe to catalytic converter gasket and retaining nuts.



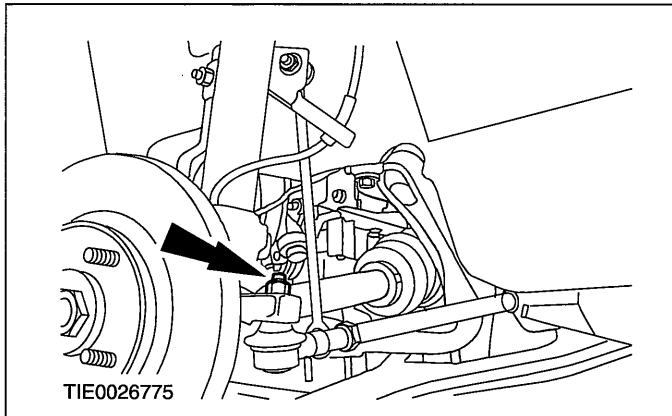
All vehicles

10. **⚠ CAUTION:** Leave the tie-rod end retaining nuts in place to protect the ball joint studs.

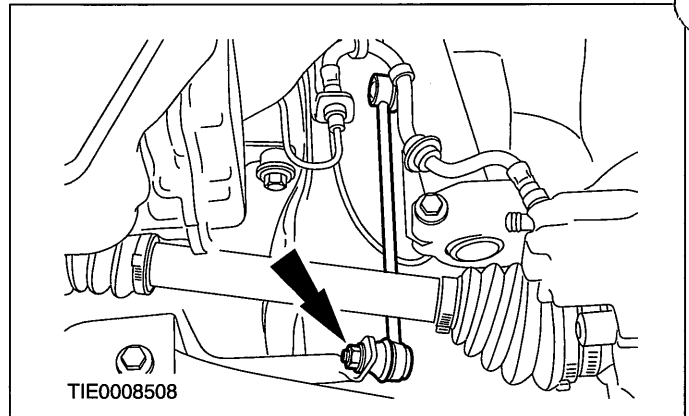
NOTE: Use a 5 mm Allen key to prevent the ball joint stud from rotating.

REMOVAL AND INSTALLATION

Loosen the tie-rod end retaining nut on both sides.



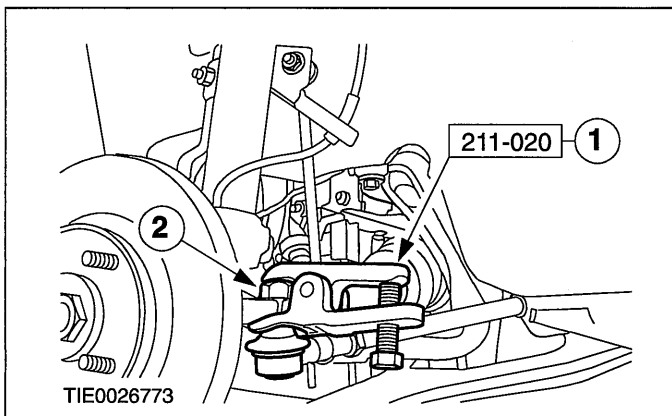
Detach the stabilizer bar connecting link from the stabilizer bar on both sides.



11. **⚠ CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

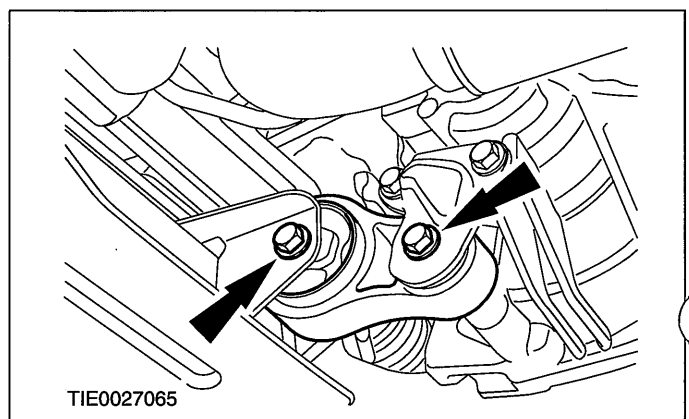
Using the special tool, detach the tie-rod end from the wheel knuckle on both sides.

1. Release the tie-rod end.
2. Remove and discard the tie-rod end retaining nut.

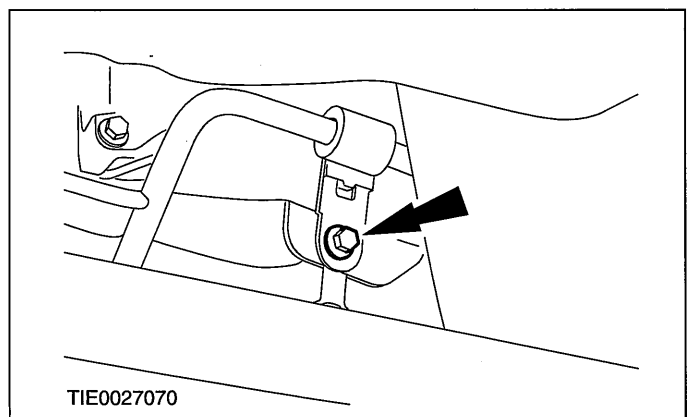


12. **NOTE:** Use a 5 mm Allen key to prevent the stabilizer bar connecting link ball joint stud from rotating.

13. Remove the engine support insulator.

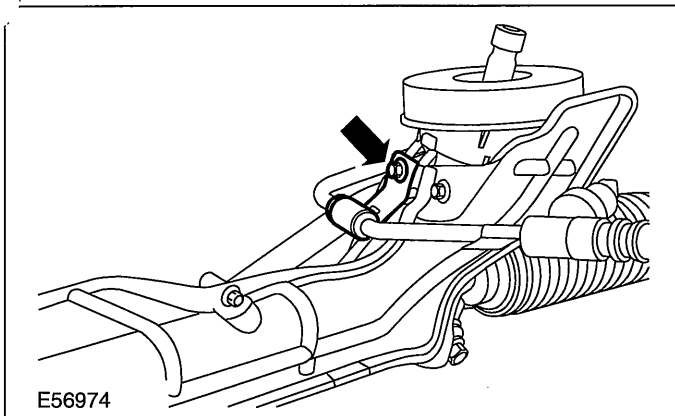


14. Detach the power steering line from the steering gear (left-hand drive shown).



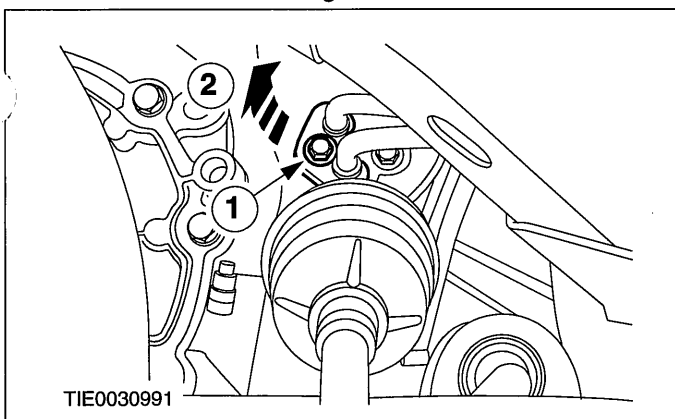
REMOVAL AND INSTALLATION

- 15. Detach the power steering lines from the steering gear (left-hand drive shown).**



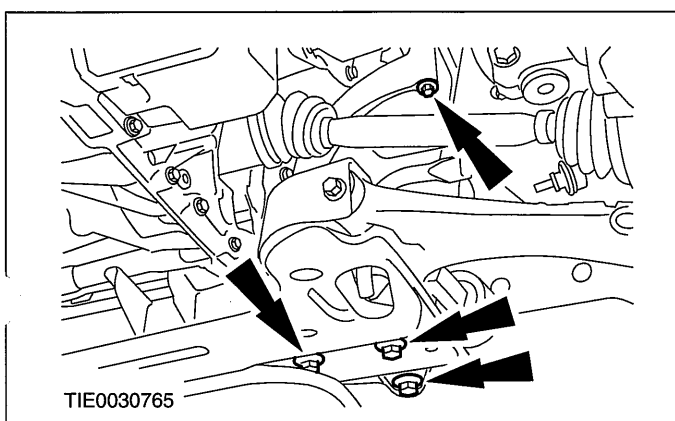
- 16. Disconnect the power steering lines from the steering gear valve body.**

1. Remove the retaining bolt.
 2. Rotate the clamp plate.
- Allow the fluid to drain into a suitable container.
 - Discard the O-ring seals.



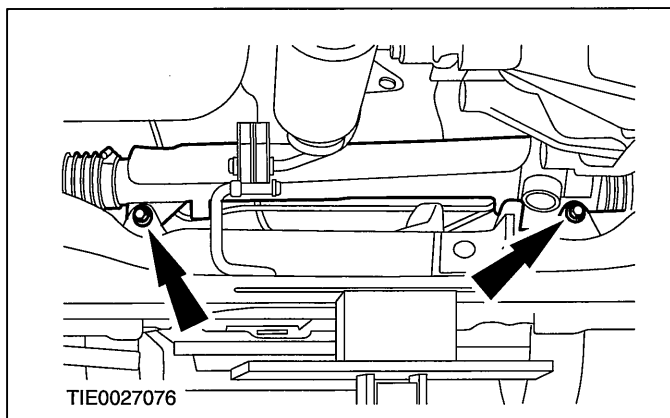
- 17. Using a transmission jack and a wooden block, support the front axle crossmember.**

- 18. Remove the front axle crossmember retaining bolts on both sides.**

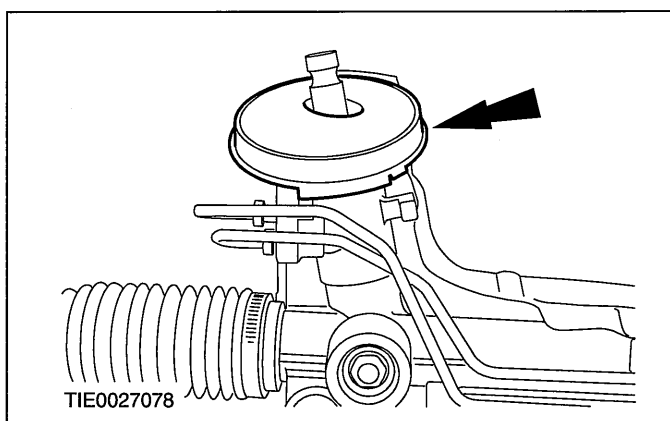


- 19. Lower the front axle crossmember to gain access to the steering gear.**

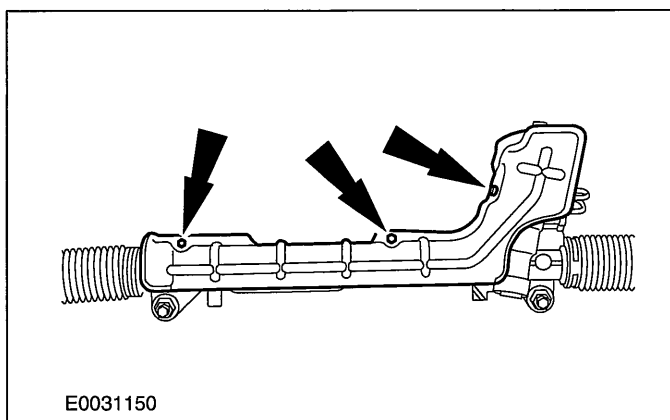
- 20. Remove the steering gear.**



- 21. Remove and discard the steering gear bulkhead floor seal.**



- 22. Remove the exhaust heat shield.**

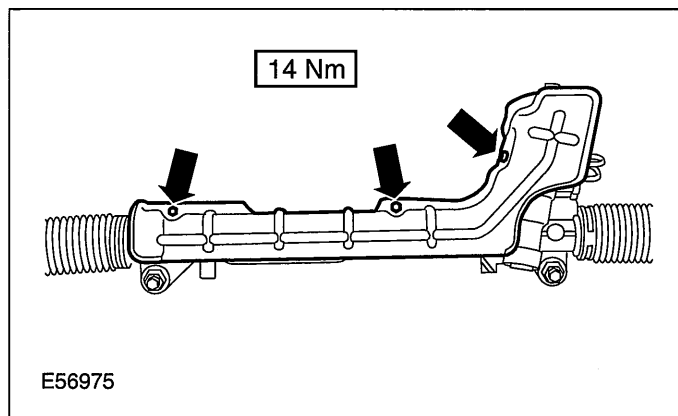


REMOVAL AND INSTALLATION

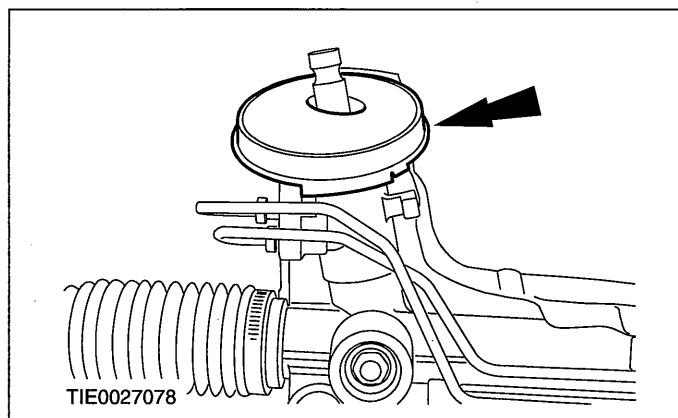
Installation

All vehicles

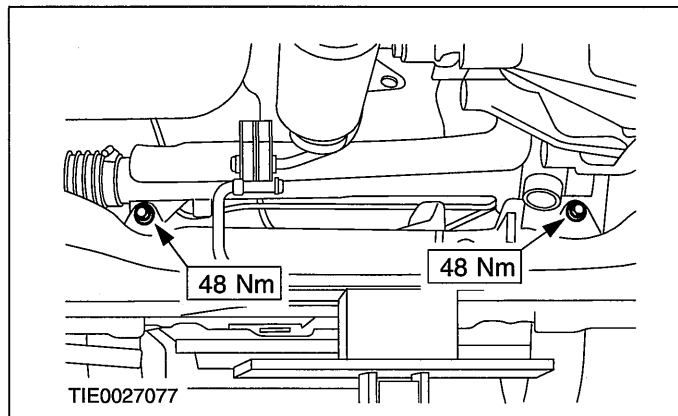
1. Install the exhaust heat shield.



2. Install a new steering gear bulkhead floor seal.

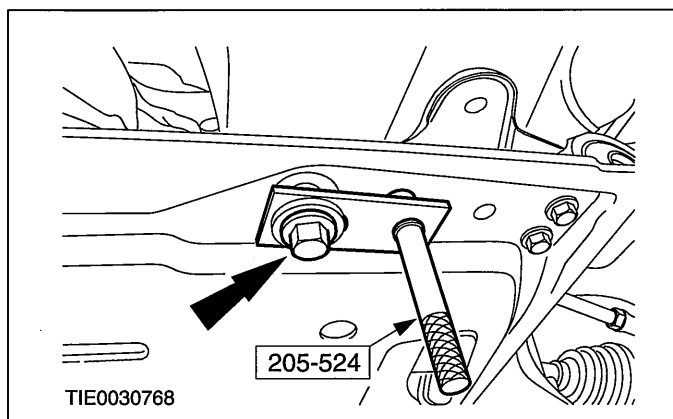


3. Install the steering gear.



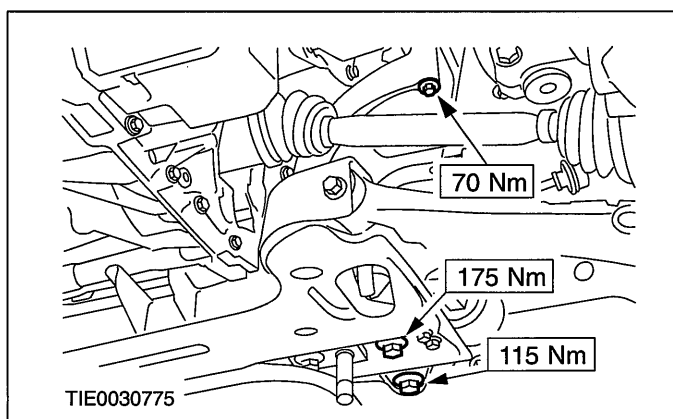
4. NOTE: Use the front axle crossmember inner retaining bolts to locate the special tools.

Using a transmission jack, wooden block and the special tools, position and align the front axle crossmember.



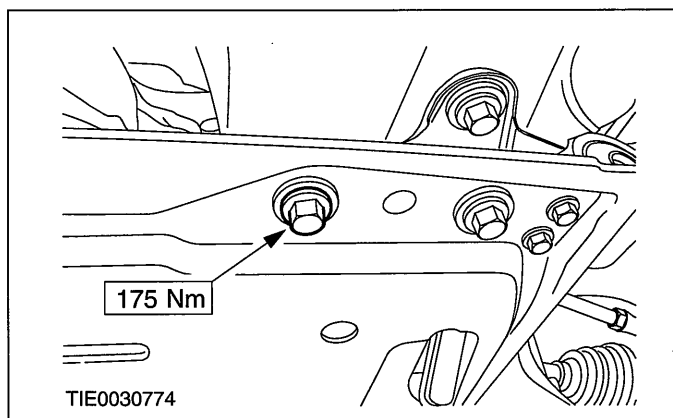
5. **CAUTION:** While tightening the front axle crossmember retaining bolts, make sure that the crossmember does not move.

Install the front axle crossmember retaining bolts on both sides.



6. Remove the special tools.

7. Install the front axle crossmember inner retaining bolts on both sides.



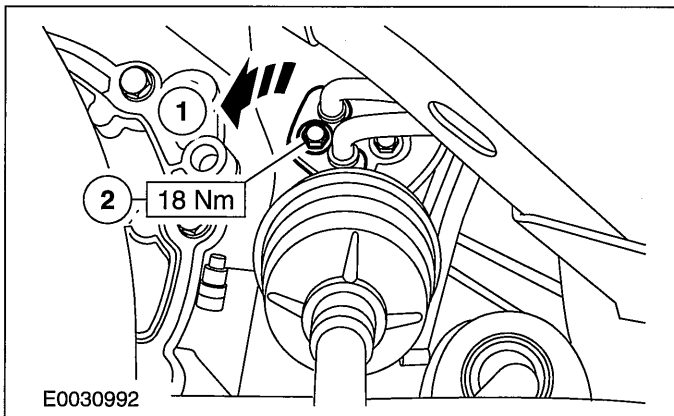
REMOVAL AND INSTALLATION

8. Remove the transmission jack and wooden block.

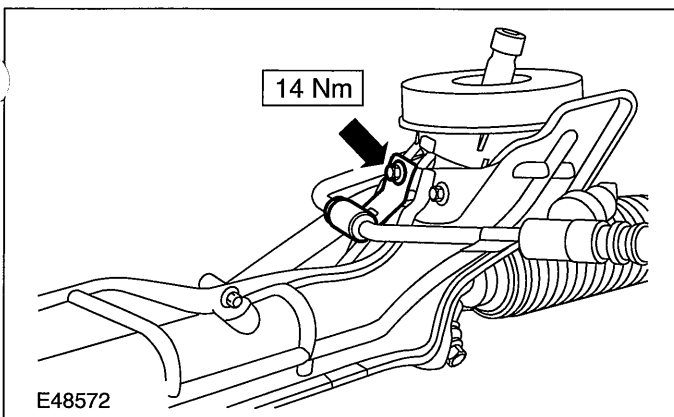
9. **NOTE:** Install new O-ring seals.

Connect the power steering lines to the steering gear valve body.

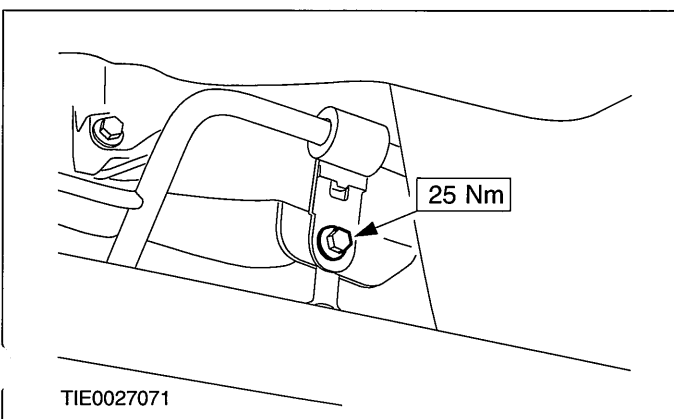
1. Rotate the clamp plate.
2. Install the retaining bolt.



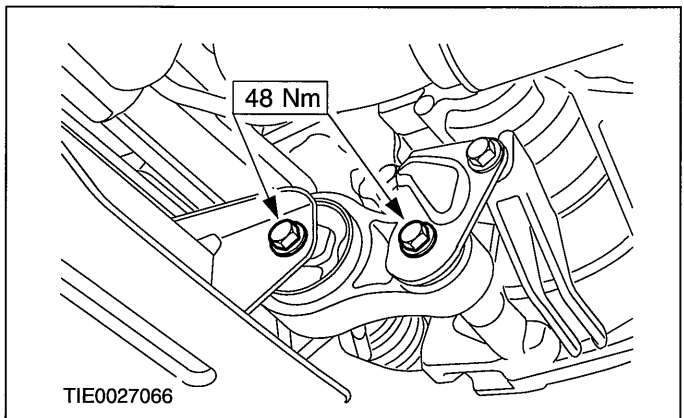
10. Attach the power steering lines to the steering gear (left-hand drive shown).



11. Attach the power steering line to the steering gear (left-hand drive shown).



12. Install the engine support insulator.

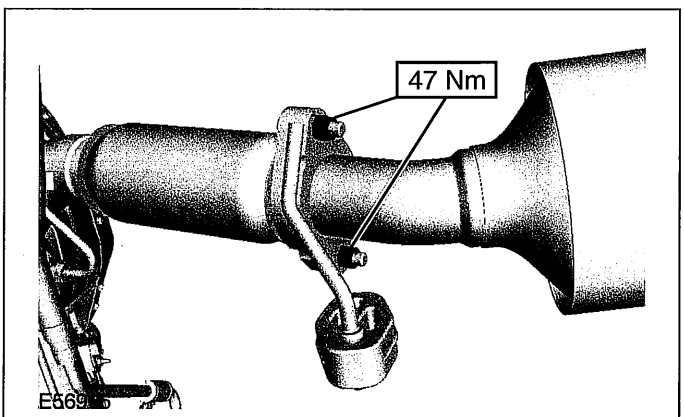


Vehicles with 2.0L engine

13. **NOTE:** Coat the exhaust flexible pipe studs with grease.

NOTE: Install a new exhaust flexible pipe to catalytic converter gasket and retaining nuts.

Attach the exhaust flexible pipe to the catalytic converter.



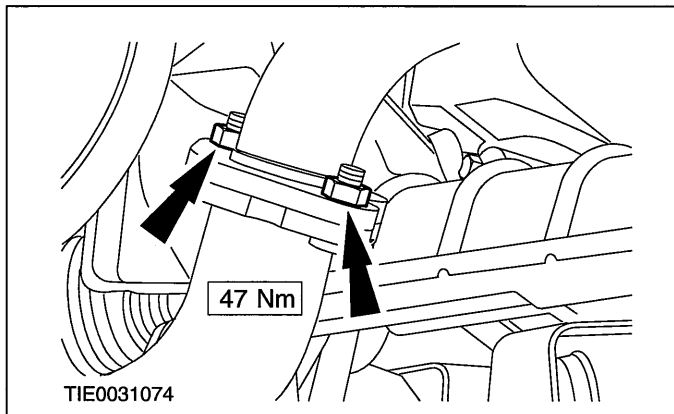
Vehicles with diesel engine

14. **NOTE:** Coat the exhaust flexible pipe studs with grease.

NOTE: Install new exhaust flexible pipe to muffler and tailpipe assembly retaining nuts.

REMOVAL AND INSTALLATION

Attach the exhaust flexible pipe to the muffler and tailpipe assembly.

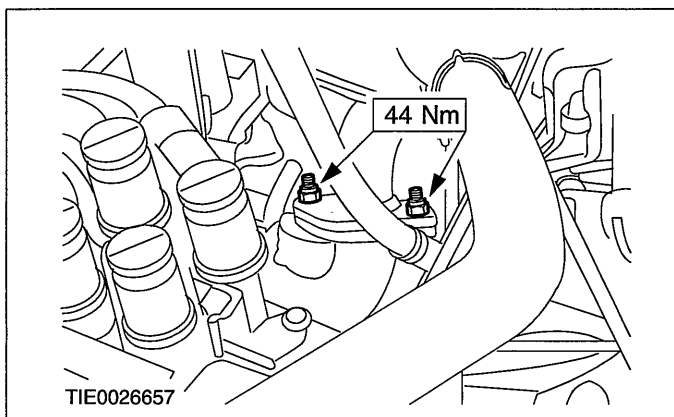


Vehicles with 1.25L, 1.4L or 1.6L engine

15. **NOTE:** Coat the exhaust flexible pipe studs with grease.

NOTE: Install a new exhaust flexible pipe to catalytic converter gasket and retaining nuts.

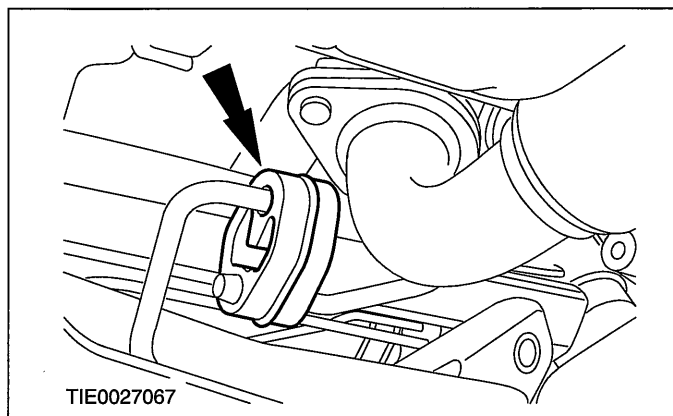
Attach the exhaust flexible pipe to the catalytic converter.



All vehicles

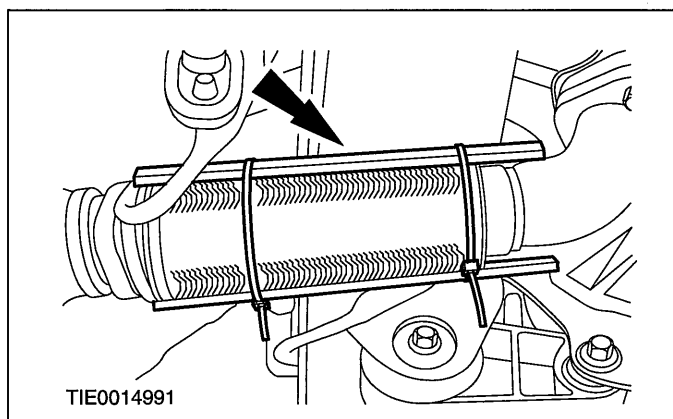
16. **⚠ CAUTION:** Take care when installing the exhaust hanger insulator to prevent damage.

Check the exhaust hanger insulator for damage. Install a new exhaust hanger insulator if required..



17. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Remove the exhaust flexible pipe support wrap or splint.

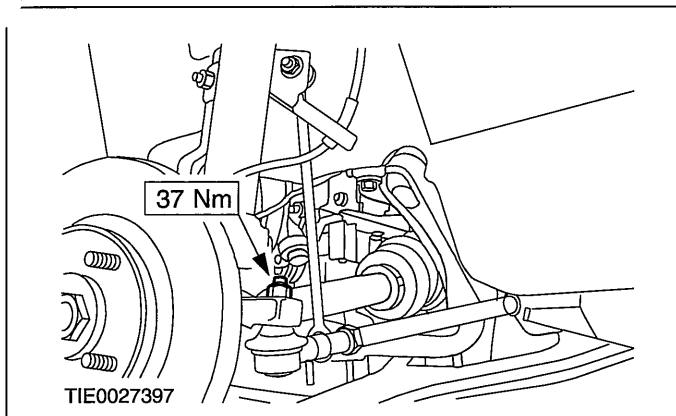


18. **▲ WARNING:** Install new tie-rod end retaining nuts. Failure to follow this instruction may result in personal injury.

NOTE: Use a 5 mm Allen key to prevent the tie-rod end ball joint stud from rotating.

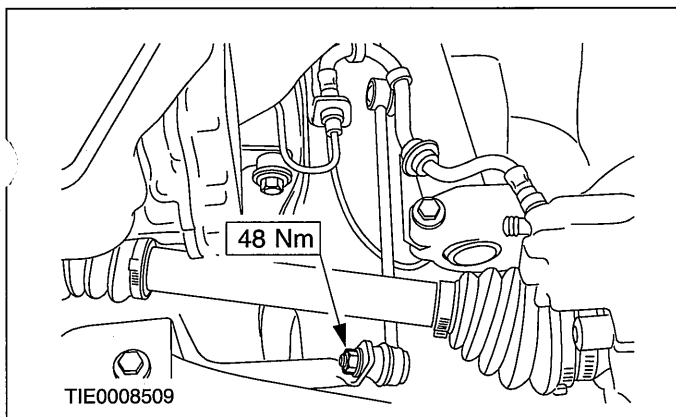
REMOVAL AND INSTALLATION

Attach the tie-rod end to the wheel knuckle on both sides.



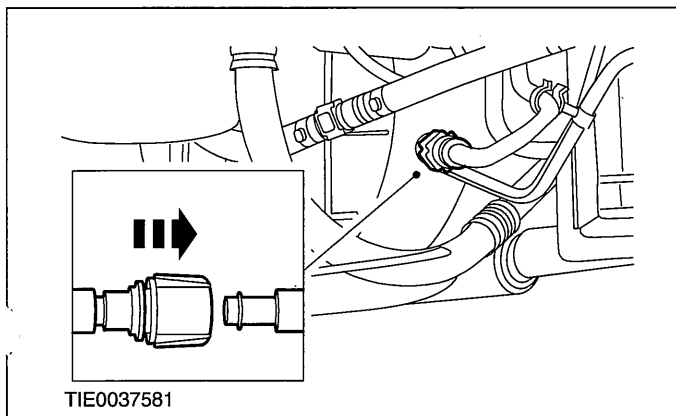
19. **NOTE:** Use a 5mm Allen key to prevent the stabilizer bar connecting link ball joint stud from rotating.

Attach the stabilizer bar connecting link to the stabilizer bar on both sides.



20. **NOTE:** Make sure that the collar on the hose is inserted fully into the quick release coupling.

Connect the power steering fluid reservoir return hose quick release coupling.

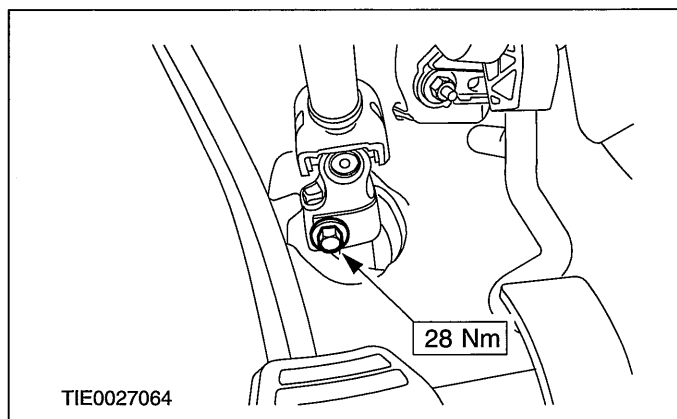


21. Install the wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

22. **▲WARNING:** Install a new steering column to steering gear pinion retaining bolt. Failure to follow this instruction may result in personal injury.

Attach the steering column shaft to the steering gear pinion.



23. Fill and bleed the power steering system. For additional information, refer to: (211-00 Steering System - General Information)

Power Steering System Filling (General Procedures),

Power Steering System Filling - 1.6L Duratorq-TDCi (DV) Diesel (General Procedures),

Power Steering System Bleeding (General Procedures),

Power Steering System Bleeding - 1.6L Duratorq-TDCi (DV) Diesel (General Procedures).

24. Check the toe setting and adjust as necessary. For additional information, refer to: (204-00 Suspension System - General Information)

Specifications (Specifications),
Front Toe Adjustment (General Procedures).

REMOVAL AND INSTALLATION

Steering Gear to Fluid Cooler Return Hose(13 439 0)

Removal

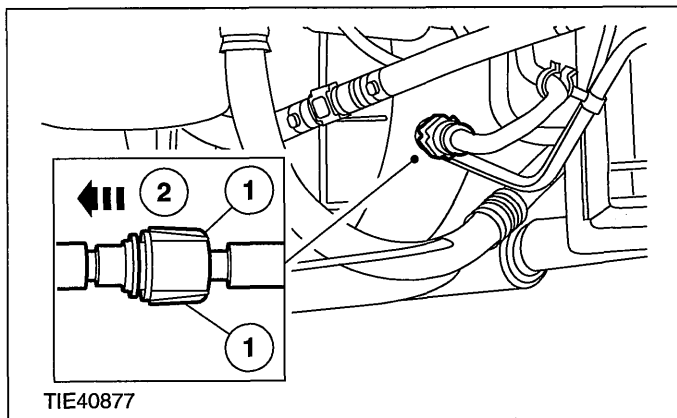
All vehicles

1. Remove the front right-hand wheel and tire.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

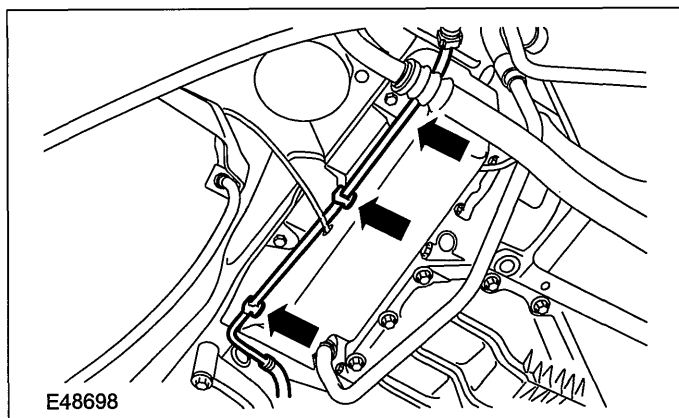
2. Disconnect the steering gear to power steering fluid cooler return hose quick release coupling, from either the power steering fluid cooler or the power steering reservoir return hose.

1. Press the power steering fluid cooler hose quick release coupling locking tangs.
2. Disconnect the power steering fluid cooler hose quick release coupling.
- Allow the fluid to drain into a suitable container.



3. NOTE: Note the position of the steering gear to power steering fluid cooler return hose to aid installation.

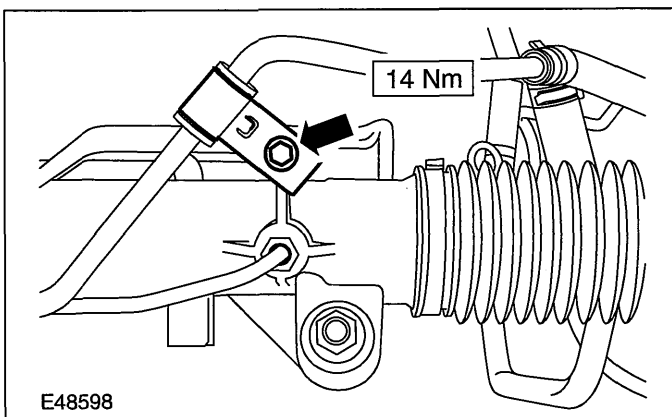
Detach the steering gear to power steering fluid cooler return hose clips from the crankshaft pulley splash shield.



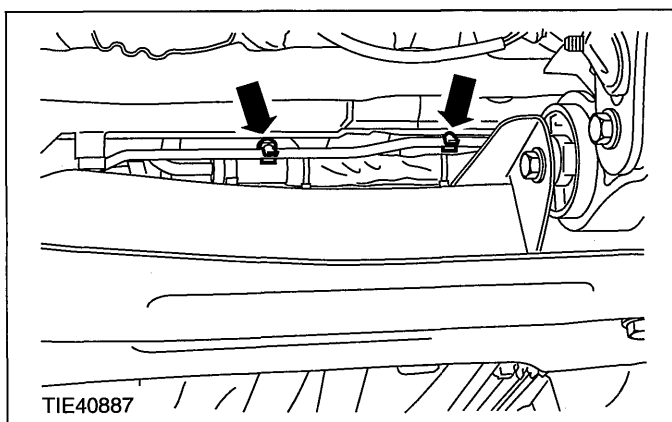
Left-hand drive vehicles

4. NOTE: Note the position of the steering gear to power steering fluid cooler return hose to aid installation.

Detach the steering gear to power steering fluid cooler return hose bracket from the steering gear.

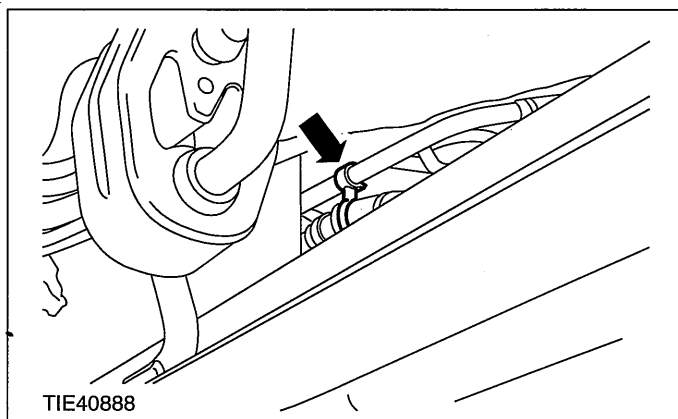


5. Detach the steering gear to power steering fluid cooler return hose clips from the steering gear.



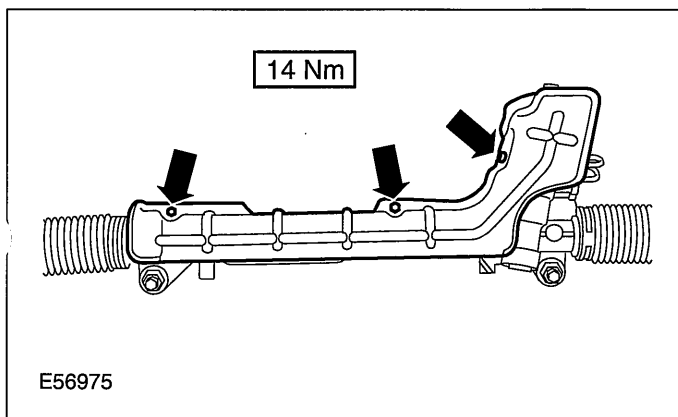
REMOVAL AND INSTALLATION

6. Detach the steering gear to power steering fluid cooler return hose from the power steering line.



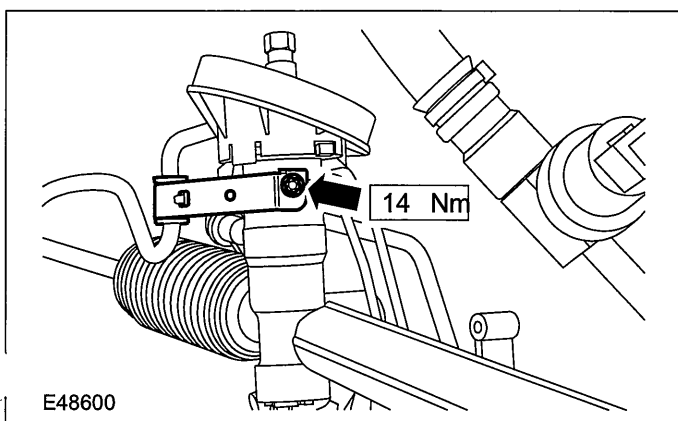
Right-hand drive vehicles

7. Remove the steering gear heat shield.



8. **NOTE:**Note the position of the steering gear to power steering fluid cooler return hose to aid installation.

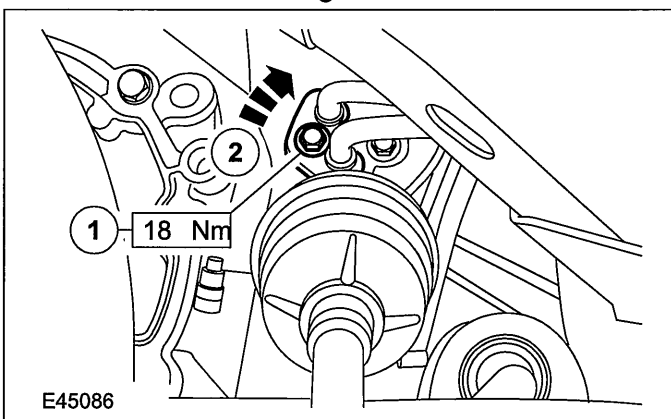
Detach the steering gear to power steering fluid cooler return hose bracket from the steering gear.



All vehicles

9. Disconnect the power steering lines from the steering gear valve body.

1. Remove the retaining bolt.
2. Rotate the clamp plate.
 - Allow the fluid to drain into a suitable container.
 - Discard the O-ring seals.



10. Remove the steering gear to power steering fluid cooler return hose.

Installation

1. **NOTE:**Make sure that the collar on the hose is fully inserted into the quick release coupling.

NOTE:Check the power steering lines to steering gear valve body O-ring seals for damage or fatigue. Install new O-ring seals as necessary.

To install, reverse the removal procedure.

2. Fill and bleed the power steering system. For additional information, refer to: (211-00 Steering System - General Information)

Power Steering System Filling (General Procedures),
Power Steering System Bleeding (General Procedures).

REMOVAL AND INSTALLATION

Power Steering Fluid Cooler(13 444 0)

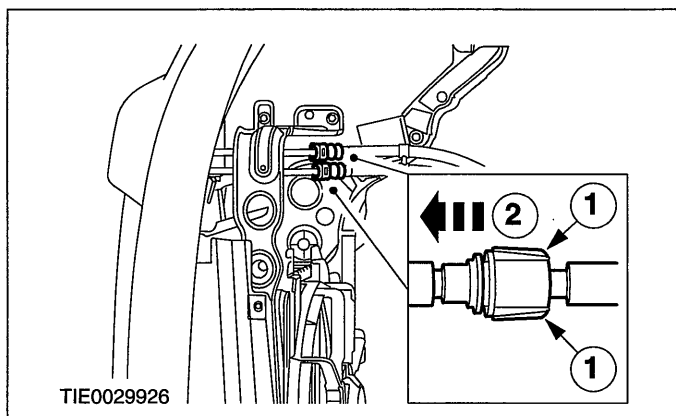
Removal

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

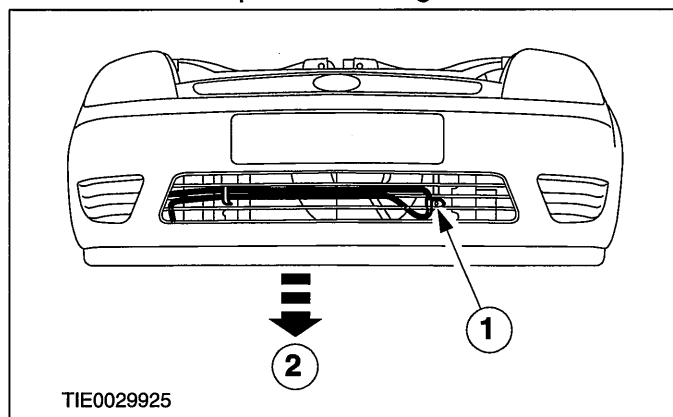
Jacking (Description and Operation),
Lifting (Description and Operation).

2. Disconnect the power steering fluid cooler quick release couplings.

1. Press the power steering fluid cooler hose quick release coupling locking tangs.
 2. Disconnect the power steering fluid cooler hose quick release coupling.
- Allow the fluid to drain into a suitable container.



2. Lower the power steering fluid cooler.



Installation

1. **NOTE:** Make sure that the collar on the hose is inserted fully into the quick release coupling.

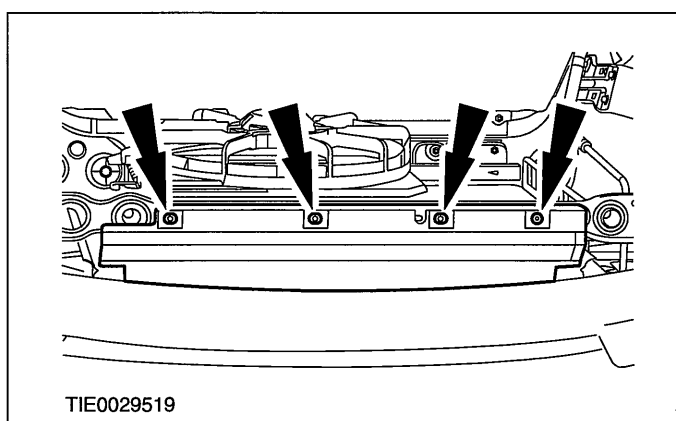
To install, reverse the removal procedure.

2. Fill and bleed the power steering system. For additional information, refer to: (211-00 Steering System - General Information)

Power Steering System Filling (General Procedures),

Power Steering System Bleeding (General Procedures).

3. Remove the radiator splash shield.



4. Lower the vehicle.

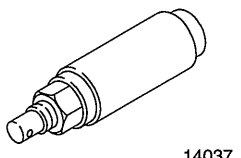
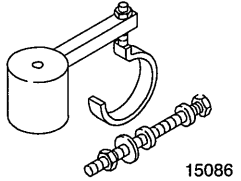
5. Remove the power steering fluid cooler.

1. Remove the retaining bolt.

REMOVAL AND INSTALLATION

Steering Gear Bushing

Special Tool(s)

 14037	Installer, Wheel Hub 204-148 (14-037)
 15086	Remover/Installer, Pivot Bushing 205-297 (15-086)

Materials

Name	Specification
Rubber Suspension Insulator Lubricant	E25J-19553-A

Removal

1. Remove the steering gear.

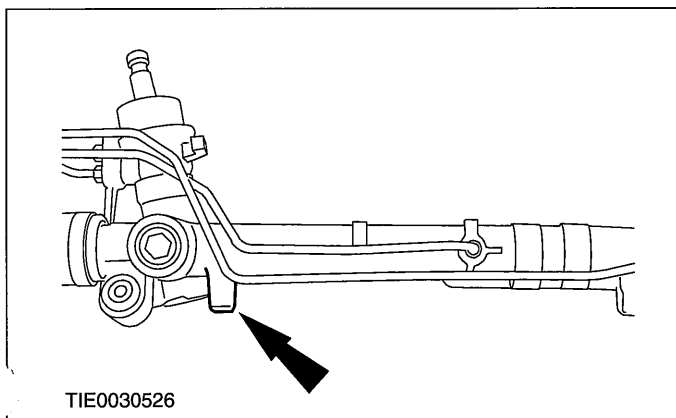
For additional information, refer to Steering Gear in this section.

2. CAUTIONS:

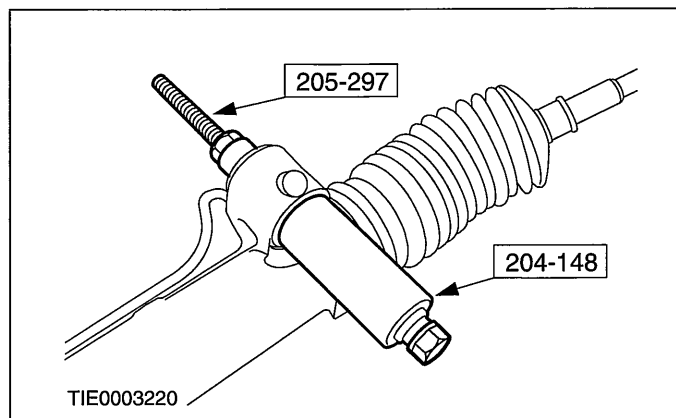
⚠ Make sure vise jaw protectors are used.

⚠ Clamp the steering gear reinforcement boss. Do not clamp the steering gear body.

Secure the steering gear in a vise.



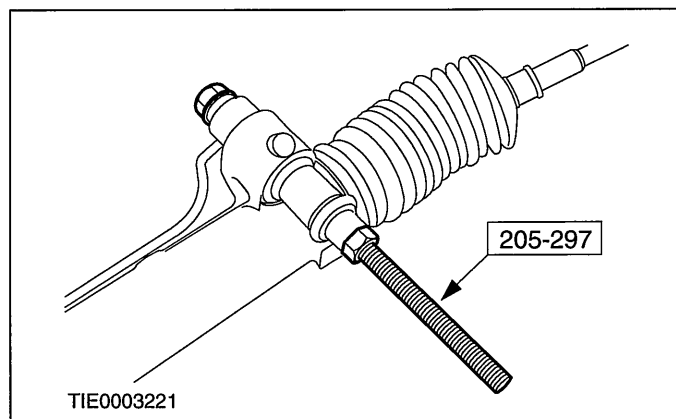
3. Using the special tools remove the steering gear insulator bushing on both sides.



Installation

1. Lubricate the steering bushing with Rubber Suspension Insulator Lubricant prior to installation.

2. Using the special tools install the steering gear insulator bushing on both sides.



3. Install the steering gear.

For additional information, refer to Steering Gear in this section.

SECTION 211-03 Steering Linkage

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	211-03-2
DIAGNOSIS AND TESTING	
Steering Linkage.....	211-03-3
REMOVAL AND INSTALLATION	
Tie Rod End.....	(13 273 0) 211-03-4
Steering Gear Boot.....	(13 134 0) 211-03-6
Tie Rod.....	(13 263 0) 211-03-8

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Tie-rod to steering gear	110	81	-
Tie-rod end locknut	63	46	-
Tie-rod end retaining nut	48	35	-

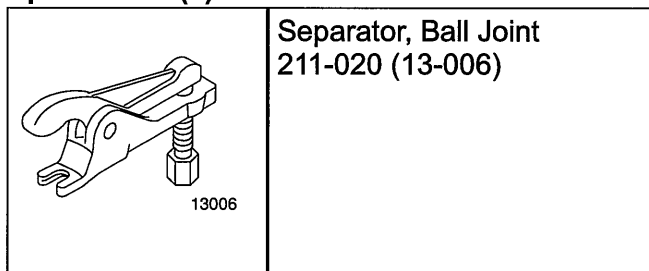
DIAGNOSIS AND TESTING**Steering Linkage**

REFER to Section 211-00 [Steering System - General Information].

REMOVAL AND INSTALLATION

Tie Rod End(13 273 0)

Special Tool(s)



Removal

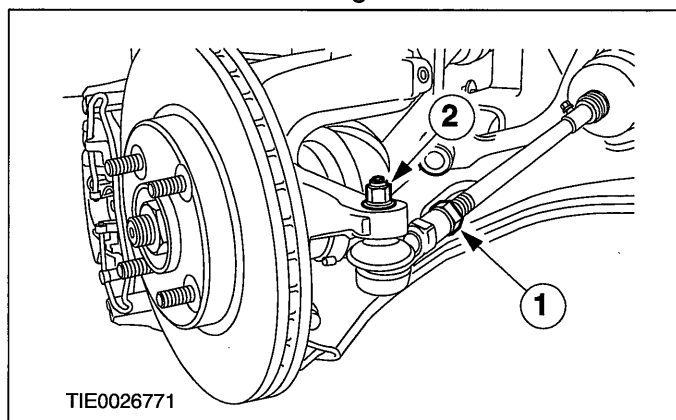
1. Remove the wheel and tire. For additional information, refer to Section 204-00 [Suspension System - General Information].

2. **CAUTION:** Leave the tie-rod end retaining nut in place to protect the ball joint stud.

NOTE: Use a 5 mm Allen key to prevent the ball joint stud from rotating.

Loosen the tie-rod end locknut and the tie-rod end retaining nut.

1. Loosen the locknut.
2. Loosen the retaining nut.

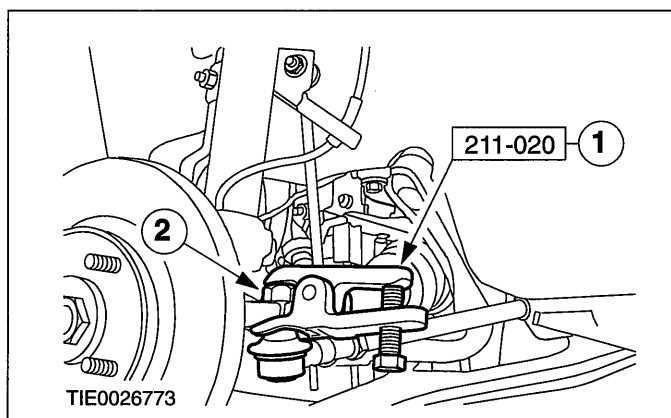


3. **CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

Using the special tool, detach the tie-rod end from the wheel knuckle.

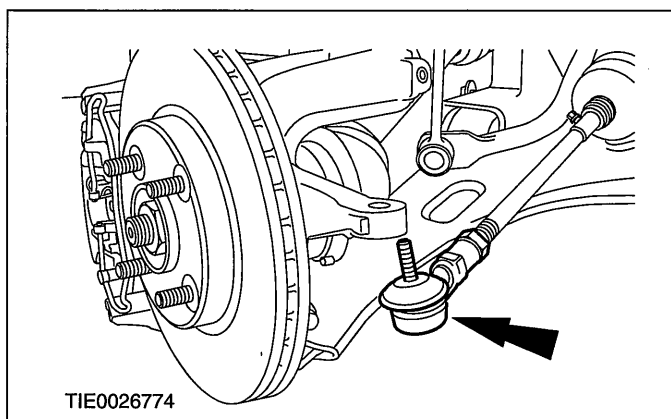
1. Release the tie-rod end.

2. Remove and discard the tie-rod end retaining nut.



4. **NOTE:** Make a note of the number of turns used to remove the tie-rod end.

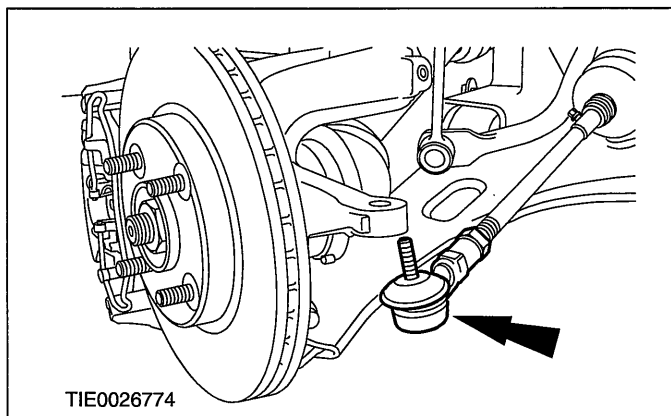
Remove the tie-rod end.



Installation

1. **NOTE:** Install the tie-rod end using the same number of turns used to remove it.

Install the tie-rod end.



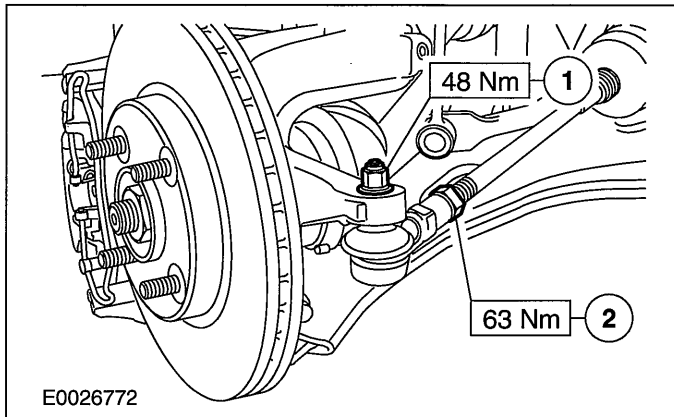
REMOVAL AND INSTALLATION

2. **▲WARNING:** Install a new tie-rod end retaining nut. Failure to follow this instruction may result in personal injury.

NOTE: Use a 5 mm Allen key to prevent the ball joint stud from rotating.

Attach the tie-rod end to the wheel knuckle.

1. Tighten the retaining nut.
2. Tighten the locknut.



3. Install the wheel and tire. For additional information, refer to Section 204-00 [Suspension System - General Information].
4. Check the toe setting and adjust as necessary. For additional information, refer to Section 204-00 [Suspension System - General Information].

REMOVAL AND INSTALLATION

Steering Gear Boot(13 134 0)

General Equipment

Pincers

Materials

Name

Specification

Grease

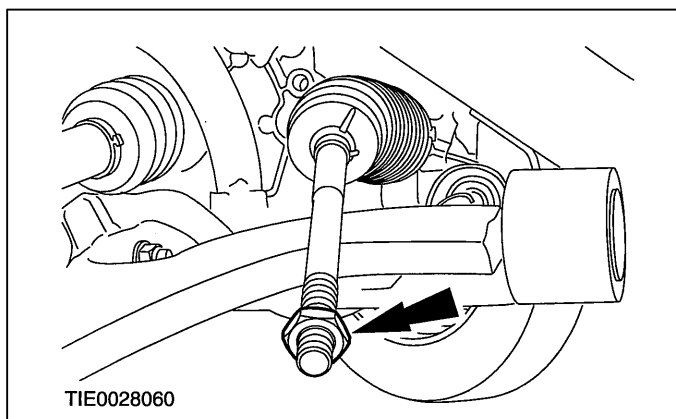
ESB-M1C119-B

Removal

1. Remove the tie-rod end.

For additional information, refer to Tie-Rod End in this section.

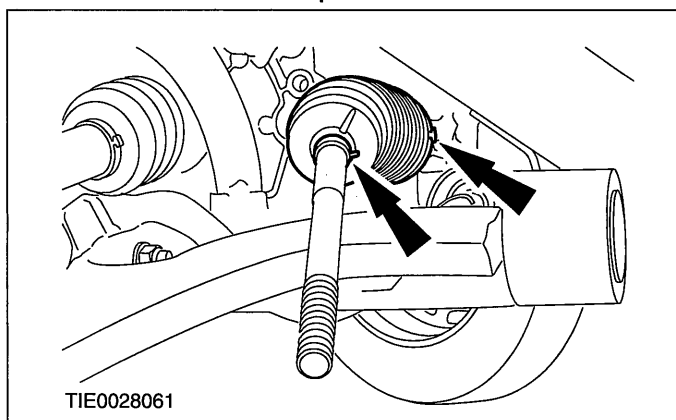
2. Remove the tie-rod end locknut.



3. NOTE: Make sure the tie-rod is clean before removing the steering gear boot.

Remove the steering gear boot.

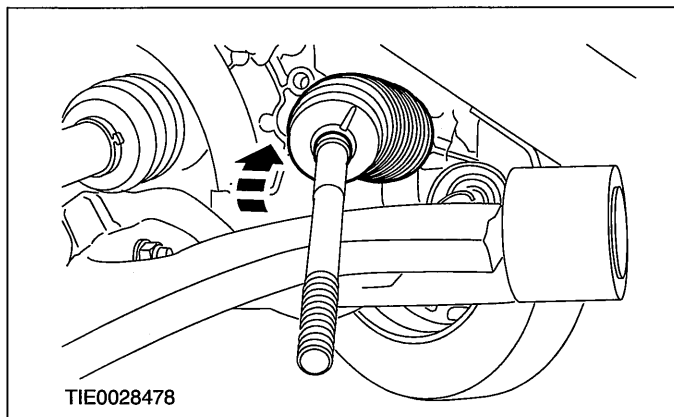
- Discard the clamps.



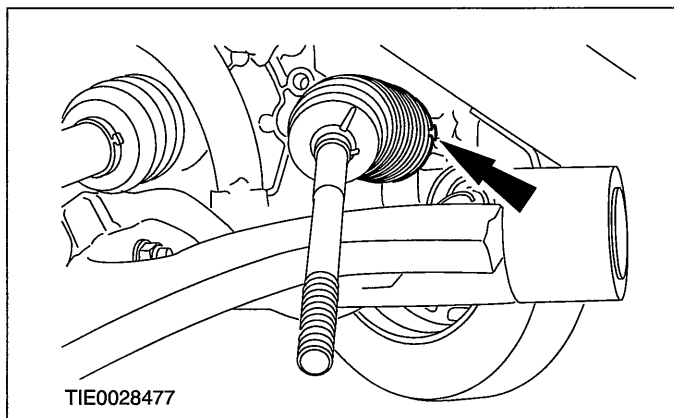
Installation

1. NOTE: Lubricate the steering gear boot.

Install the steering gear boot.

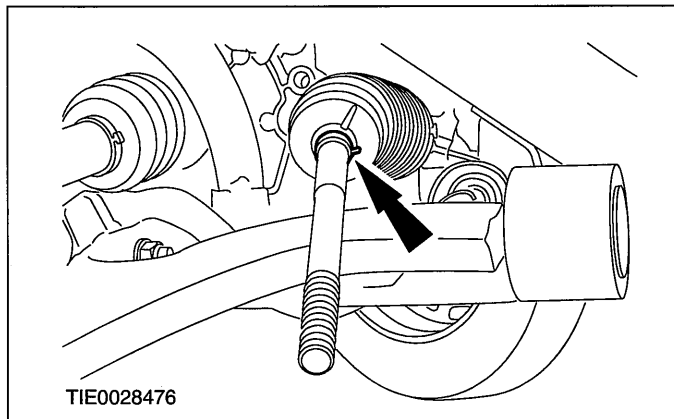


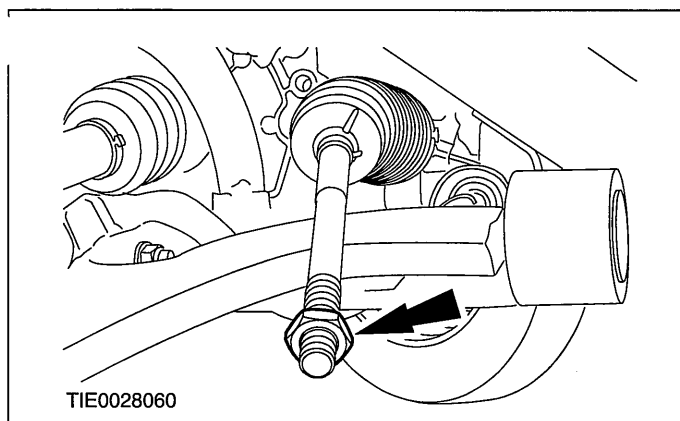
2. Using a suitable pair of pincers, install a new steering gear boot inner clamp.



3. NOTE: Make sure the steering gear boot outer clamp is located over the recess in the tie-rod.

Using a suitable pair of pincers, install a new steering gear boot outer clamp.



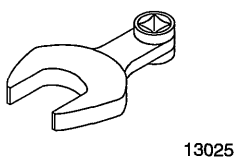
REMOVAL AND INSTALLATION**4. Install the tie-rod end locknut.****5. Install the tie-rod end.**

For additional information, refer to Tie-Rod End in this section.

REMOVAL AND INSTALLATION

Tie Rod(13 263 0)

Special Tool(s)

	Socket, Tie-Rod End, Steering Gear 211-245 (13-025)
---	---

General Equipment

Pipe wrench
Vise jaw protectors
Pincers

Materials

Name	Specification
Grease	ESB-M1C119-B

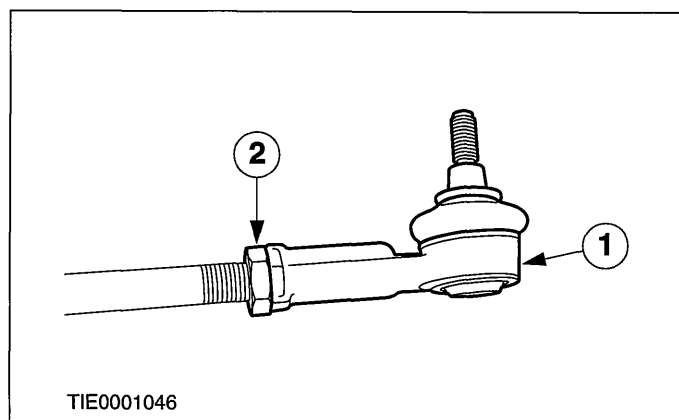
Removal

1. Remove the steering gear. For additional information, refer to Section 211-02 [Power Steering].

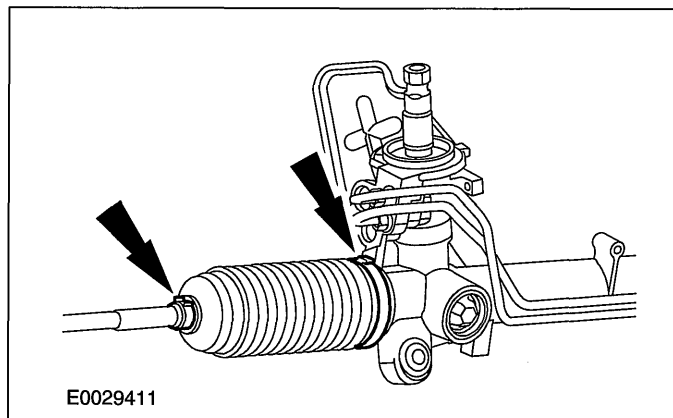
2. **NOTE:** Make a note of the number of turns used to remove the tie-rod end.

Remove the tie-rod end and the tie-rod end locknut.

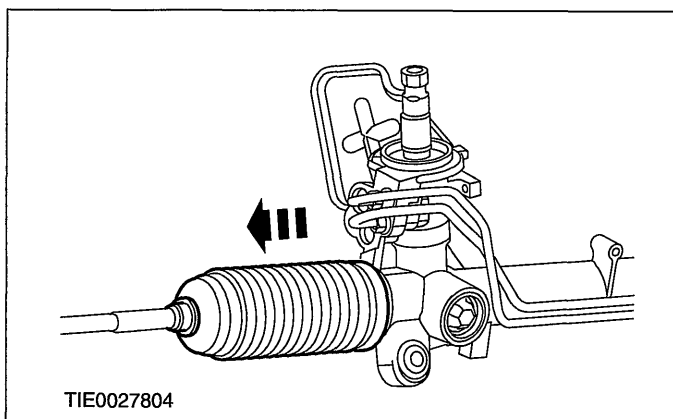
1. Remove the tie-rod end.
2. Remove the tie-rod end locknut.



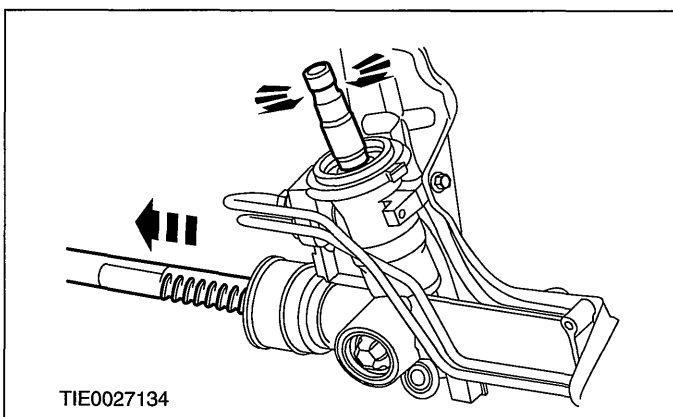
3. Remove and discard the steering gear boot clamps.



4. Remove and discard the steering gear boot.



5. Rotate the steering gear pinion to expose the rack.



6. CAUTIONS:

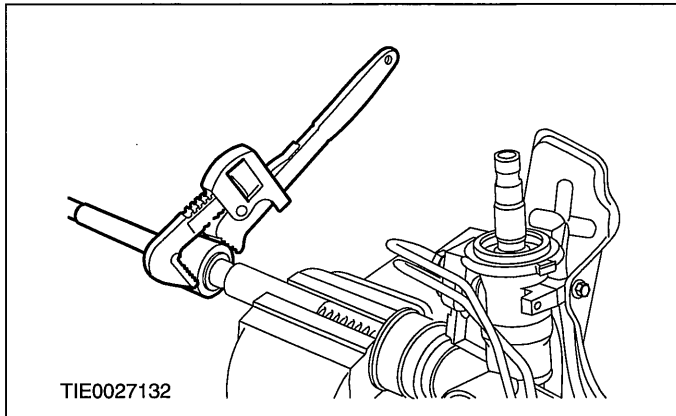
⚠ Do not clamp the steering rack on exposed hydraulic sealing surfaces.

⚠ Make sure vise jaw protectors are used.

REMOVAL AND INSTALLATION

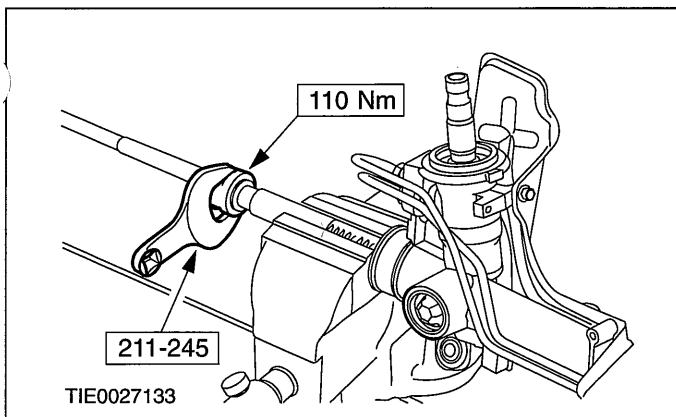
⚠ To counter the extensive torque forces required to remove the tie-rod, clamp the steering rack teeth in a suitable vise. Do not clamp the steering gear body.

Secure the steering rack in a vise and using a suitable pipe wrench remove the tie-rod.

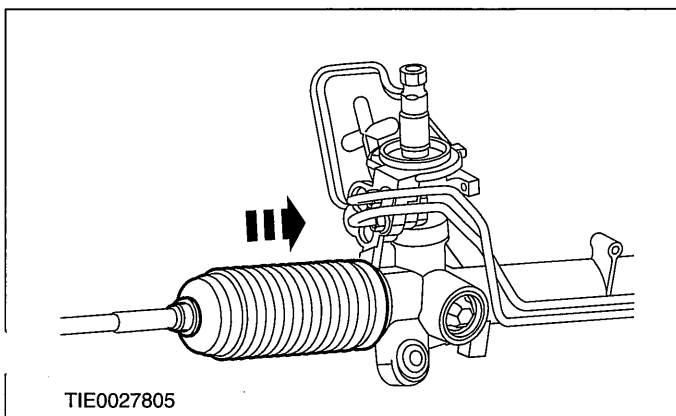


Installation

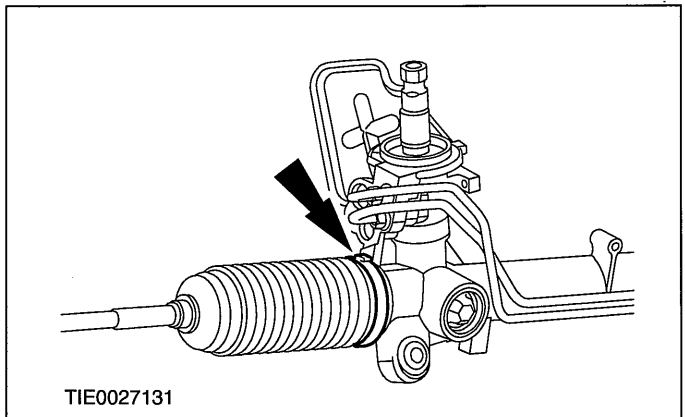
1. Using the special tool, install the tie-rod.



2. NOTE: Lubricate the steering gear boot. Install a new steering gear boot.

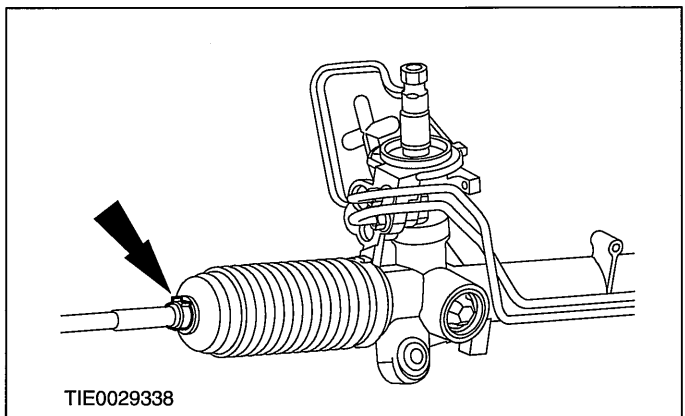


3. Using a suitable pair of pincers, install a new steering gear boot inner clamp.



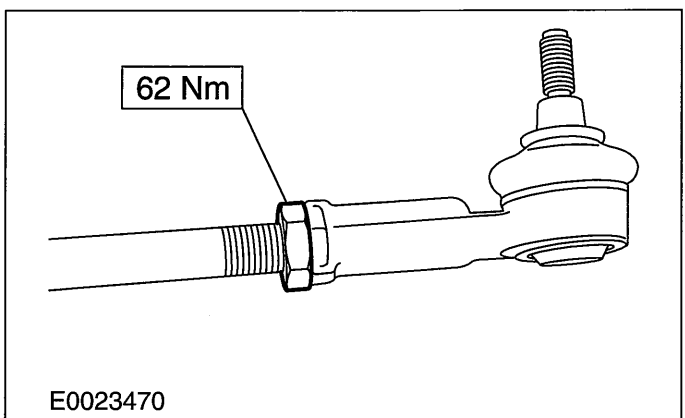
4. NOTE: Make sure the steering gear boot outer clamp is located over the recess in the tie-rod.

Using a suitable pair of pincers, install a new steering gear boot outer clamp.



5. NOTE: Install the tie-rod end using the same number of turns used to remove it.

Install the tie-rod end and the tie tie-rod end locknut.



REMOVAL AND INSTALLATION

6. Install the steering gear. For additional information, refer to Section 211-02 [Power Steering].

SECTION 211-04 Steering Column

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	211-04-2
DIAGNOSIS AND TESTING	
Steering Column.....	211-04-3
REMOVAL AND INSTALLATION	
Steering Wheel.....	(13 524 0) 211-04-4
Steering Column.....	(13 542 0) 211-04-5
DISASSEMBLY AND ASSEMBLY	
Steering Column.....	(13 543 4) 211-04-8

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Steering wheel retaining bolt	45	33	-
Steering column retaining nuts	24	18	-
Steering column shaft to steering gear pinion retaining bolt	28	21	-

DIAGNOSIS AND TESTING**Steering Column**

REFER to Section 211-00 [Steering System - General Information].

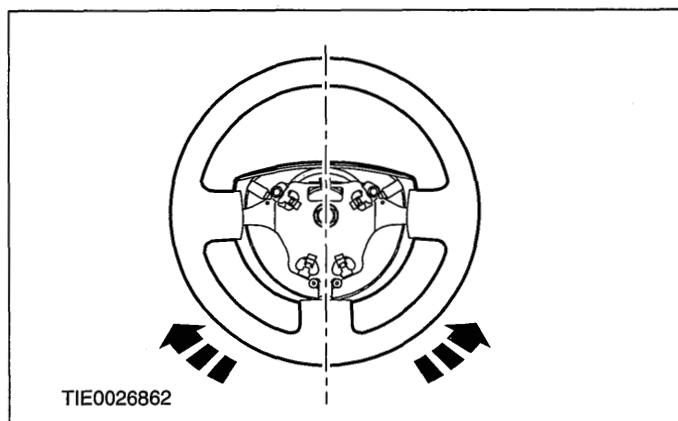
REMOVAL AND INSTALLATION**Steering Wheel(13 524 0)****Removal**

1. Remove the driver air bag module.

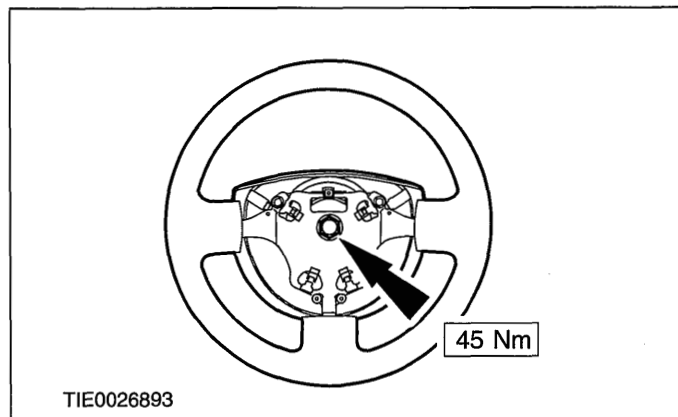
For additional information, refer to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

2. **NOTE:**Make sure that the road wheels are in the straight ahead position.

Centralize the steering and lock it in position.



3. Remove the steering wheel.

**Installation**

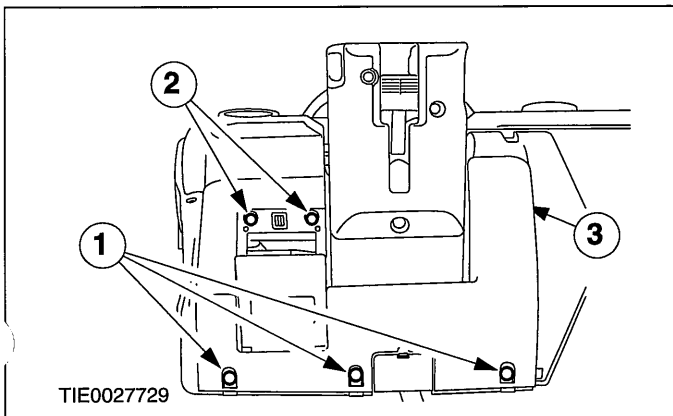
1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Steering Column(13 542 0)****Removal****1. Remove the driver air-bag module.**

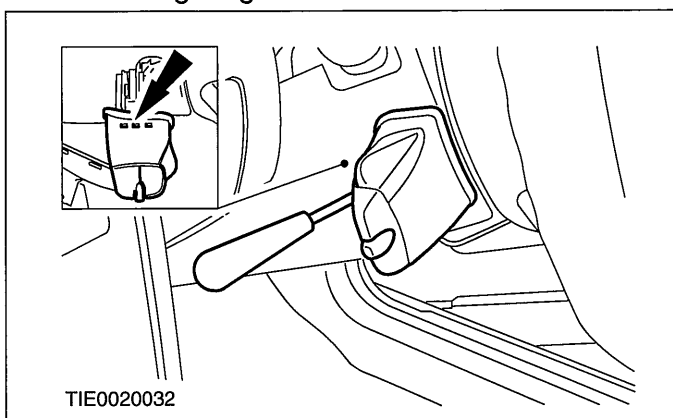
For additional information, refer to: **Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).**

2. Remove the instrument panel lower panel.

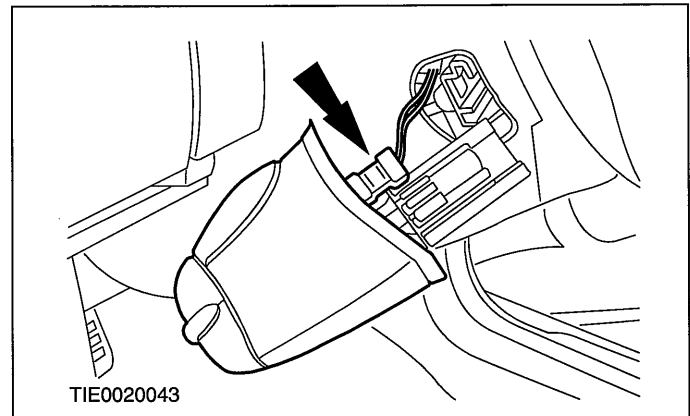
1. Remove the lower retaining screws.
2. Remove the upper retaining screws from the stowage compartment.
3. Release the clip.

**3. Detach the audio control switch from the steering column lower shroud (if equipped).**

- Using a thin bladed screwdriver, release the locking tang.

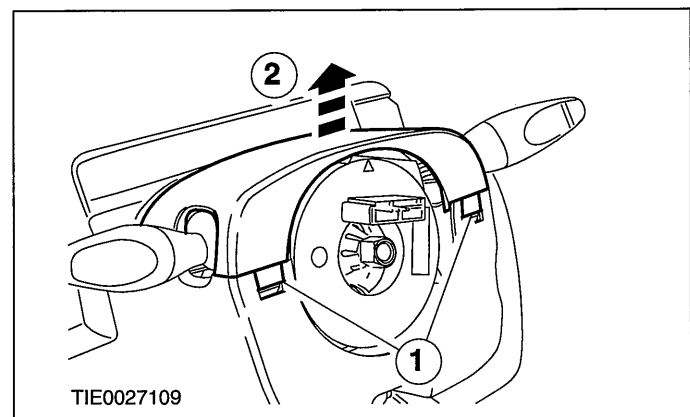
**4. Remove the audio control switch (if equipped).**

- Disconnect the electrical connector.

**5. NOTE: Turn the steering wheel to gain access to the steering column upper shroud retaining clips.**

Detach the steering column upper shroud from the steering column lower shroud (steering wheel shown removed for clarity).

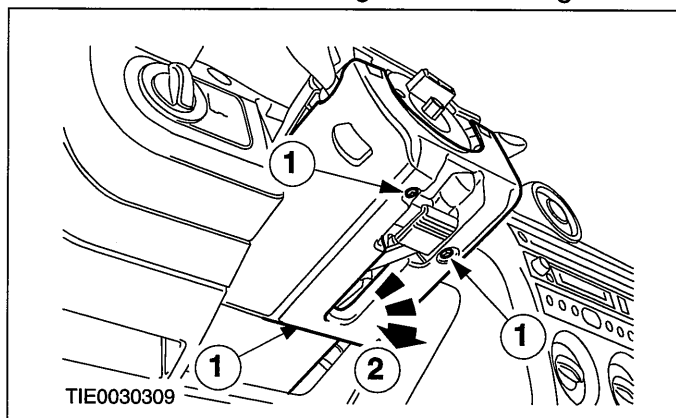
1. Using a thin bladed screwdriver, release the two clips, (one each side).
2. Detach the shroud.

**6. Remove the steering column lower shroud (steering wheel shown removed for clarity).**

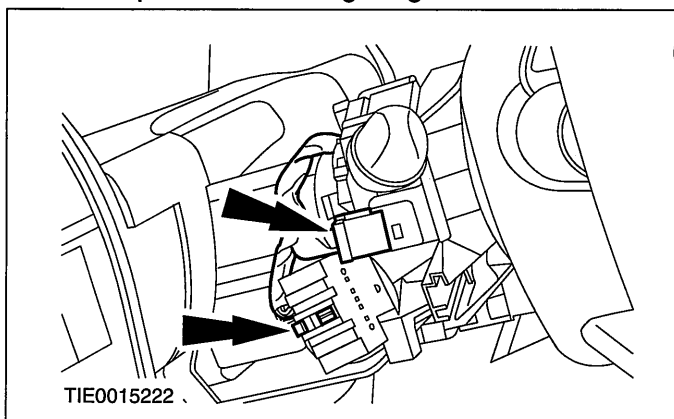
1. Remove the retaining screws.

REMOVAL AND INSTALLATION

2. Release the steering column locking lever.

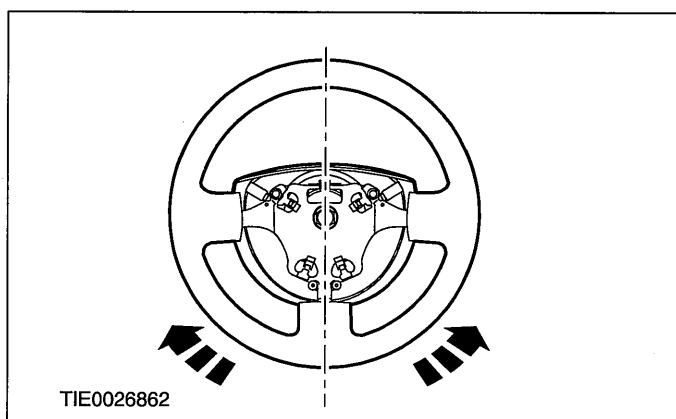


- Depress the locking tangs.



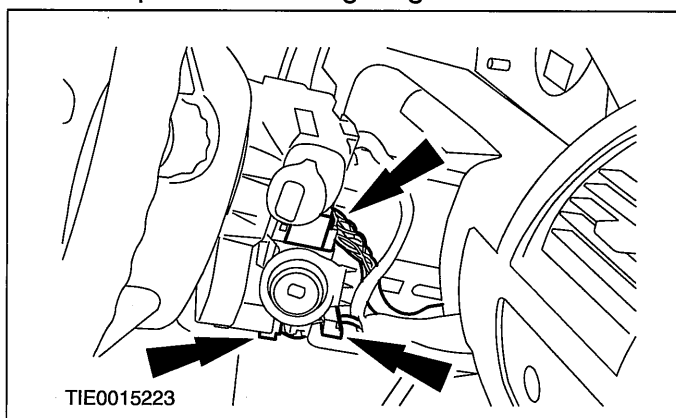
7. **NOTE:** Make sure that the road wheels are in the straight ahead position.

Centralize the steering and lock it in position.



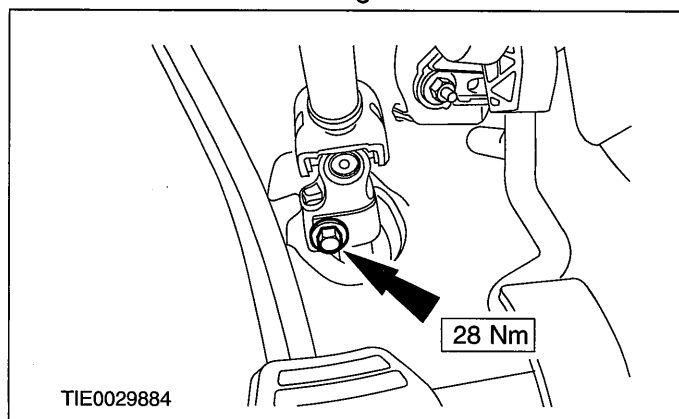
10. Disconnect the passive anti-theft system (PATS) transceiver, windshield wiper/washer switch and clockspring electrical connectors.

- Depress the locking tangs.



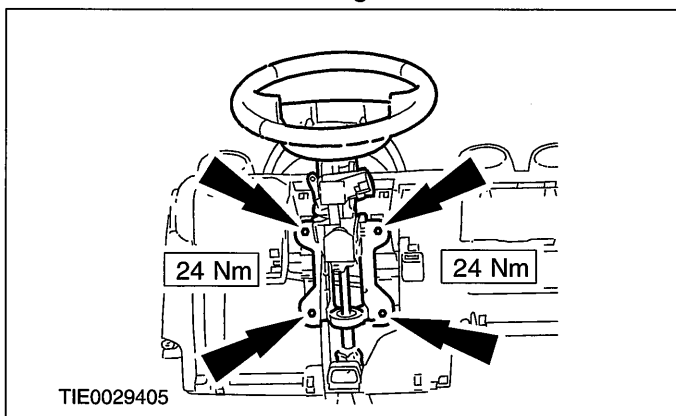
8. Detach the steering column shaft from the steering gear pinion.

- Discard the retaining bolt.



11. Remove the steering column.

- Discard the retaining nuts.



9. Disconnect the ignition switch and turn signal electrical connectors.

Installation

1. **WARNINGS:**

REMOVAL AND INSTALLATION

▲ Install a new steering column shaft to steering gear pinion retaining bolt. Failure to follow this instruction may result in personal injury.

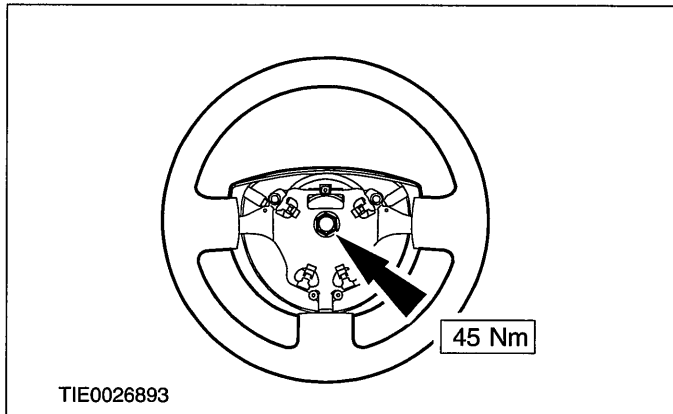
▲ Make sure that the steering column locking lever is in the locked position. Failure to follow this instruction may result in personal injury.

▲ Install new steering column retaining nuts. Failure to follow this instruction may result in personal injury.

To install, reverse the removal procedure.

DISASSEMBLY AND ASSEMBLY**Steering Column(13 543 4)****Disassembly**

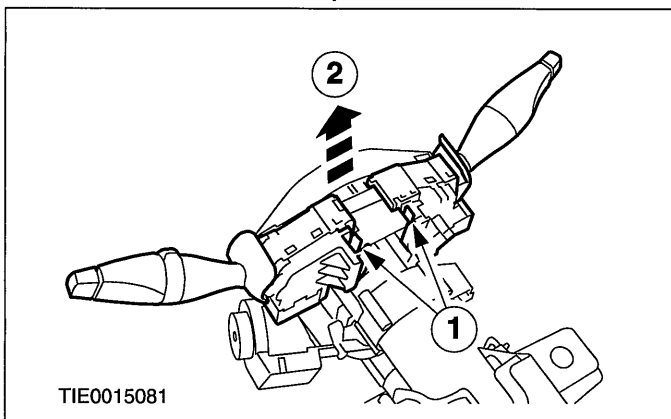
All vehicles

1. Remove the steering wheel.

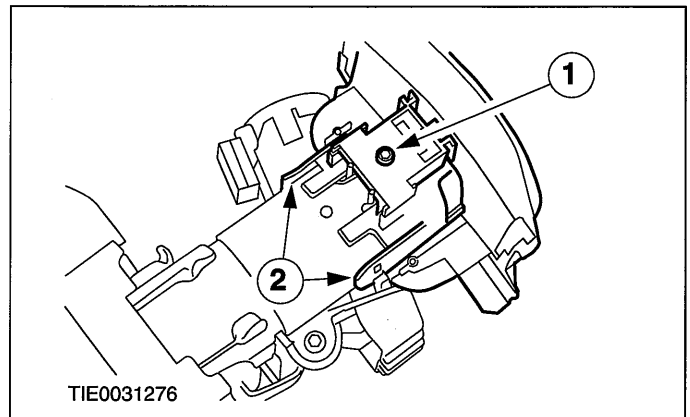
2. **⚠ CAUTION:** Make sure the clockspring is not allowed to rotate. Secure in the central position with a piece of suitable tape.

Remove the multifunction switches.

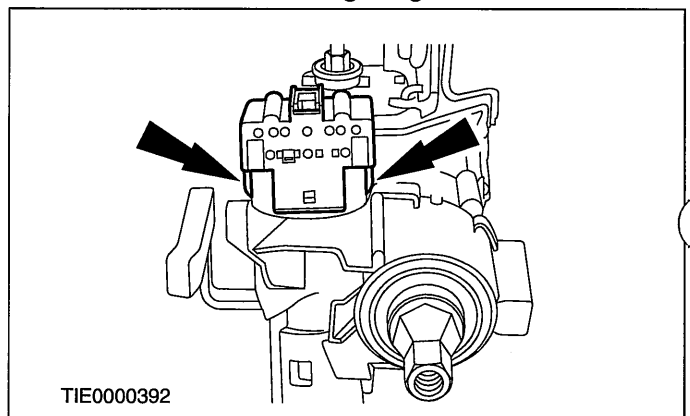
1. Depress the locking tangs.
2. Lift the switches upwards.

**3. Remove the clockspring.**

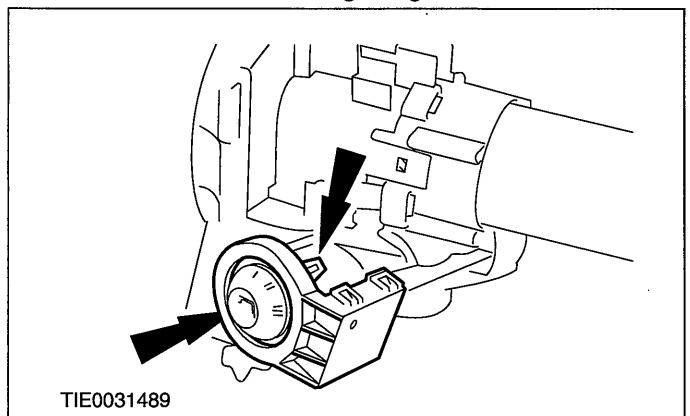
1. Remove the retaining screw.

2. Release the locking tangs.**4. Remove the ignition switch.**

- Release the locking tangs.

**5. Remove the passive anti-theft system (PATS) transceiver.**

- Release the locking tangs.



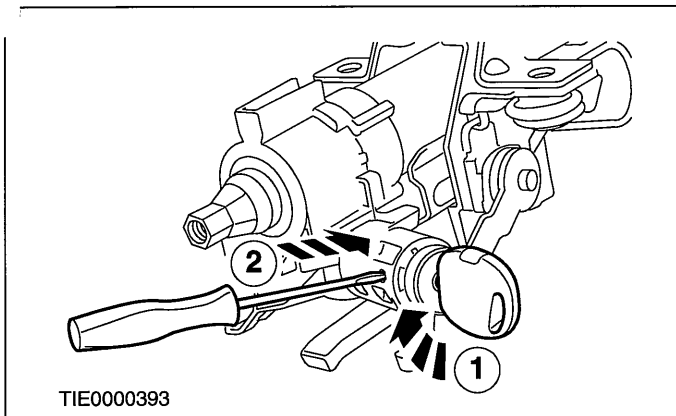
Left-hand drive vehicles

6. Remove the ignition lock cylinder.

1. Insert and turn the ignition key to position 1.

DISASSEMBLY AND ASSEMBLY

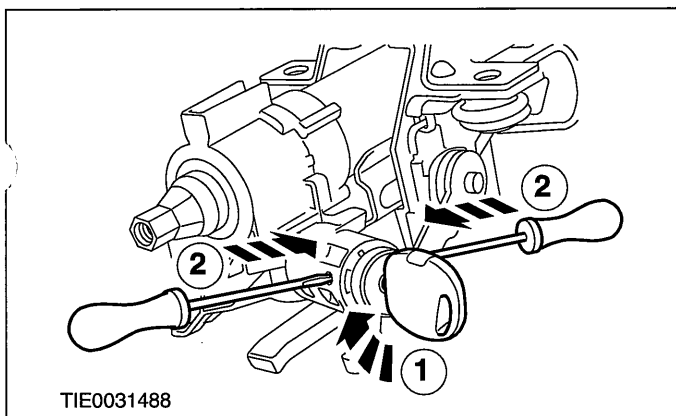
2. Using a thin bladed screwdriver, depress the detent.



Right-hand drive vehicles

7. Remove the ignition lock cylinder.

1. Insert and turn the ignition key to position 1.
2. Using a thin bladed screwdriver, depress the detent on both sides.

**Assembly**

1. To assemble, reverse the disassembly procedure.



SECTION 211-05 Steering Column Switches

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS **PAGE**

REMOVAL AND INSTALLATION

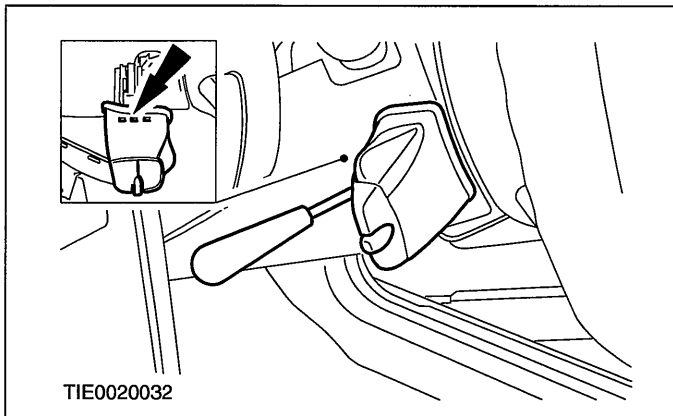
Ignition Switch.....	(36 424 0)	211-05-2
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REMOVAL AND INSTALLATION

Ignition Switch(36 424 0)

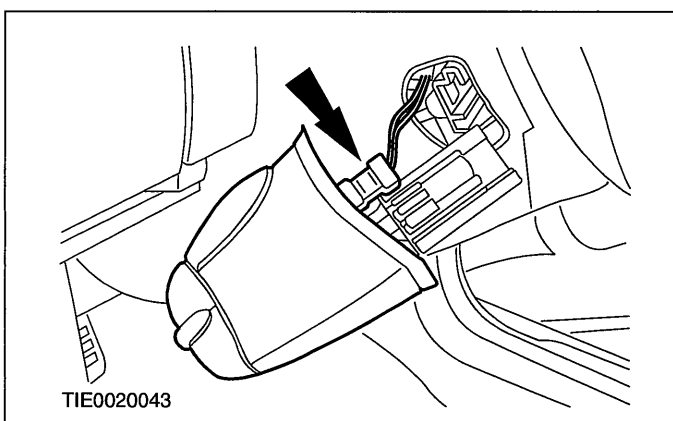
Removal

1. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
2. Detach the audio control switch from the steering column lower shroud (if equipped).
 - Using a thin bladed screwdriver, release the locking tang.



3. Remove the audio control switch (if equipped).

- Disconnect the electrical connector.

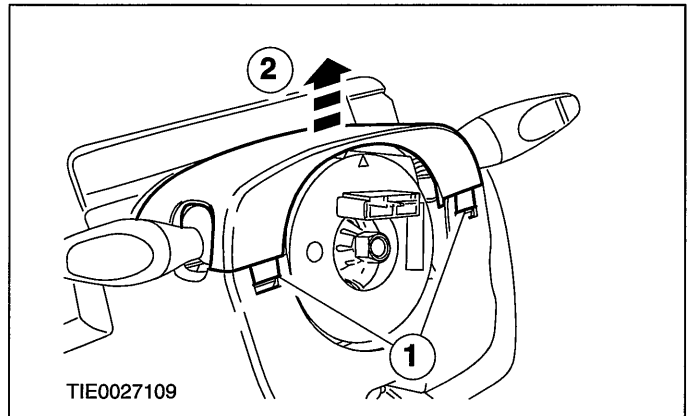


4. **NOTE:** Turn the steering wheel to access the steering column upper shroud retaining clips.

Detach the steering column upper shroud from the steering column lower shroud (steering wheel shown removed for clarity).

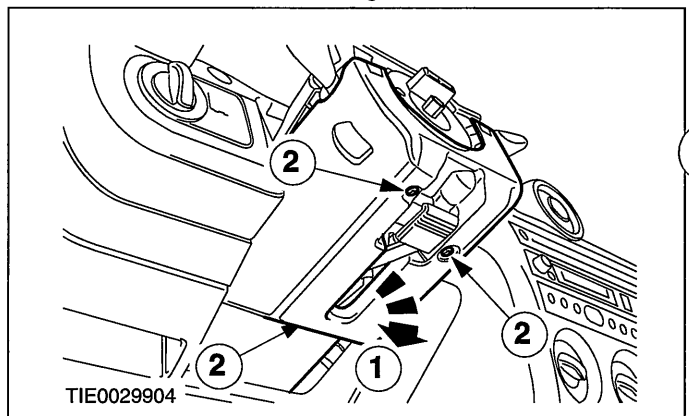
1. Using a thin bladed screwdriver, release the two clips (one each side).

2. Detach the shroud.

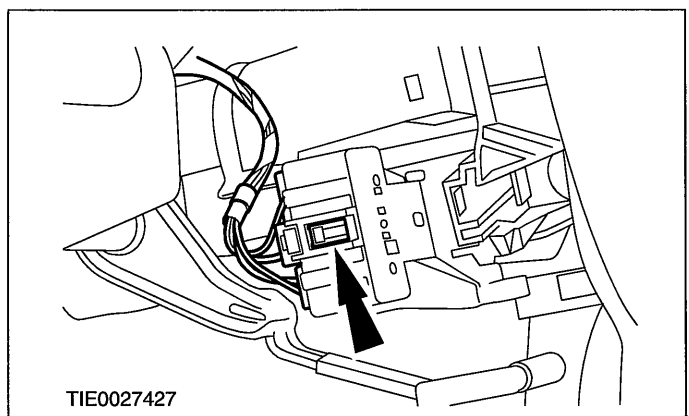


5. Remove the steering column lower shroud (steering wheel shown removed for clarity).

1. Release the steering column locking lever.
2. Remove the retaining screws.



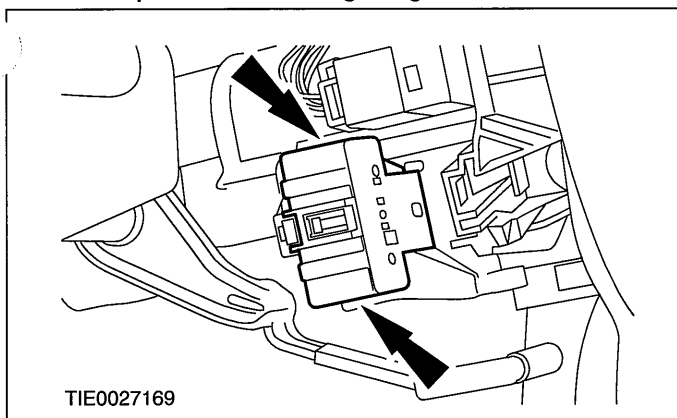
6. Disconnect the ignition switch electrical connector.



7. Remove the ignition switch.

REMOVAL AND INSTALLATION

- Depress the locking tangs.

**Installation**

1. To install, reverse the removal procedure.

SECTION 303-00 Engine System - General Information

VEHICLE APPLICATION:2006.0 Fiesta

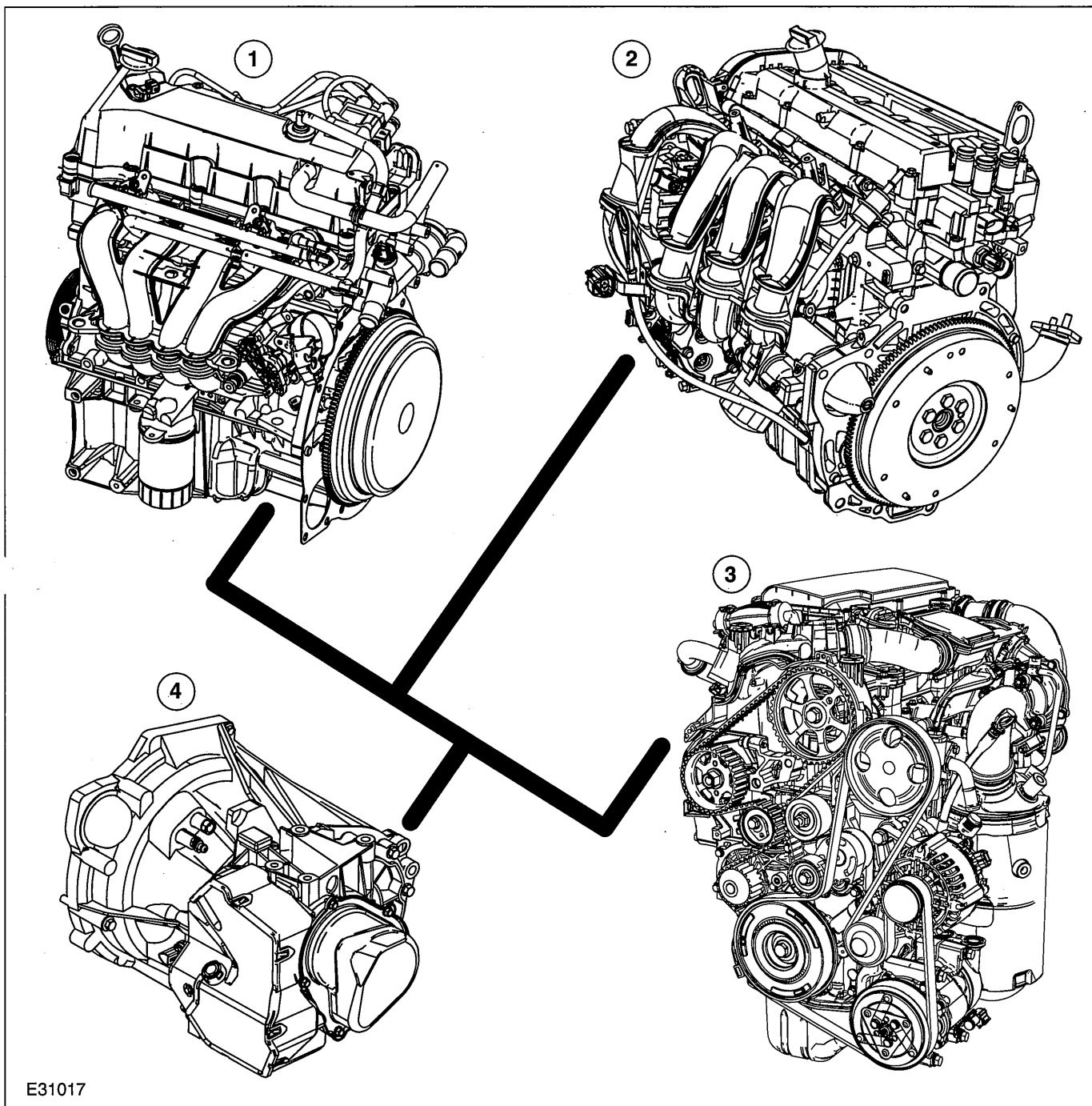
CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Engine.....	303-00-3
Engine/transmission combinations.....	303-00-3
DIAGNOSIS AND TESTING	
Engine.....	303-00-4
Engine - Oil Leaks.....	303-00-14
Ultraviolet (UV) Testing.....	303-00-14
Measure the compression pressure.....	303-00-14
Measure the compression pressure (Engine - 1.4L Duratorq-TDCi (DV) Diesel).....	303-00-15
Measure the compression pressure (Engine - 1.6L Duratorq-TDCi (DV) Diesel).....	303-00-17
Measure the compression pressure (Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)).....	303-00-20
Measure the compression pressure (Engine - 1.3L Duratec-8V (Rocam)).....	303-00-22
Measure the compression pressure (Engine - 2.0L Duratec-HE (MI4)).....	303-00-23
Measure the oil pressure (Engine - 1.4L Duratorq-TDCi (DV) Diesel).....	303-00-25
Measure the oil pressure (Engine - 1.6L Duratorq-TDCi (DV) Diesel).....	303-00-26
Measure the oil pressure (Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)).....	303-00-27
Measure the oil pressure (Engine - 1.3L Duratec-8V (Rocam)).....	303-00-28
Measure the oil pressure (Engine - 2.0L Duratec-HE (MI4)).....	303-00-30
Valve train analysis - static (engine off).....	303-00-31
GENERAL PROCEDURES	
Camshaft Bearing Journal Diameter.....	303-00-32
Camshaft Bearing Journal Clearance.....	303-00-33
Camshaft End Play.....	303-00-34
Camshaft Surface Inspection.....	303-00-35
Camshaft Lobe Lift.....	303-00-36
Crankshaft Main Bearing Journal Diameter.....	303-00-37
Crankshaft End Play.....	303-00-38
Cylinder Bore Taper.....	303-00-39
Piston Inspection.....	303-00-40
Piston Pin to Bore Diameter.....	303-00-41
Piston Diameter.....	303-00-42
Piston Ring End Gap.....	303-00-43
Piston Ring-to-Groove Clearance.....	303-00-44
Piston Pin Diameter.....	303-00-45
Connecting Rod Large End Bore.....	303-00-46
Valve Stem Diameter.....	303-00-47
Flywheel Inspection.....	303-00-48
Flywheel Inspection — Vehicles With: Dual Mass Flywheel.....	303-00-49
Cylinder Head Distortion.....	303-00-50
Cylinder Block Distortion.....	303-00-51

Exhaust Manifold Cleaning and Inspection.....	303-00-52
Bearing Inspection.....	303-00-53
Valve Seat Inspection.....	303-00-54

DESCRIPTION AND OPERATION

Engine

Engine/transmission combinations

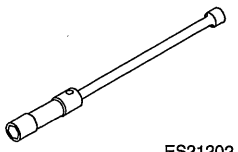
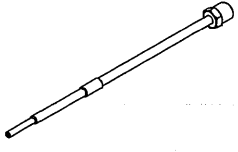
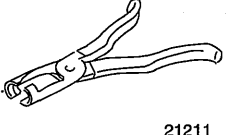


Item	Description
1	1.3L Duratec 8V engine
2	1.4/1.6L Duratec 16V engine
3	1.4L Duratorq TDCi turbodiesel engine
4	iB5 manual transmission

DIAGNOSIS AND TESTING

Engine

Special Tool(s)

 ES21202	Socket, Spark Plug 303-499
 E47332	Compression Test Adapter 303-1052
 21211	Pliers, Valve Stem Seal 303-508

Materials

Name	Specification
Adhesive - Loctite 243	WSK-M2G349-A7

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Coolant leaks – Oil leaks – Fuel system leaks – Visibly damaged or worn parts – Loose or missing nuts or bolts	– Fuse(s) – Loose or corroded connector(s) – Powertrain control module – Damaged or worn switch(es)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• Loss of oil	• Oil leaks on components that are either coated in oil themselves or on components local to them.	• CHECK for evidence of oil leaks on components. Use an ultraviolet (UV) leak tester if an oil leak is not evident. INSTALL new gaskets or components as required.
	• Internal or external leak at the oil cooler.	• CHECK the coolant expansion tank for a film of oil on the coolant surface. INSTALL a new oil cooler or oil cooler gasket.
	• Leak at the crankshaft seal.	• INSTALL a new crankshaft seal.
	• Leaks from oil carrying components or basic engine.	• CHECK for cracks in oil carrying components of the basic engine by means of a UV leak test. INSTALL new components or seals as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Oil consumption	Use of the wrong type of engine oil.	DETERMINE the last type of engine oil used and compare with the specification. Change the engine oil to the specification.
	- Faulty positive crankcase ventilation (PCV) system. - Hoses or ventilation or breather valves are blocked. This causes excessive pressure in the crankcase which causes more oil to enter the combustion chamber. - PCV oil separator is faulty and engine oil can enter the combustion chamber through the intake manifold.	CHECK if the PCV system is operating correctly and repair as necessary. REFER to: Engine Emission Control (303-08 Engine Emission Control - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Diagnosis and Testing), Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing), Engine Emission Control - Vehicles With: Vacuum Exhaust Gas Recirculation (EGR) Valve (303-08 Engine Emission Control - 1.4L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing), Engine Emission Control (303-08 Engine Emission Control - 1.6L Duratorq-TDCi (DV) Diesel, Description and Operation).
	Turbocharger seals (diesel engine only).	INSTALL a new turbocharger. REFER to: Turbocharger (303-04 Fuel Charging and Controls - Turbocharger - 1.4L Duratorq-TDCi (DV) Diesel, Removal and Installation), Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel (303-04 Fuel Charging and Controls - Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel, Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Damaged gaskets or mating surfaces. - Cylinder head gasket is damaged or mating face are warped. - Valve stem oil seals are worn and engine oil can enter the combustion chamber between the valve stem and the valve stem guide.	• CHECK the gaskets and mating surfaces for damage. Remove the cylinder head. CHECK the mating faces, cylinder head gasket and the evenness of the cylinder head and engine block mating faces. INSTALL new valve seals. REFER to: - Valve Seals (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), - Valve Seals (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), - Valve Seals (303-01 Engine - 2.0L Duratec-HE (M14), In-vehicle Repair), - Valve Seals (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), - Valve Seals (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).
	• Piston ring or cylinder liner wear.	• INSTALL new components as necessary.
	• Damaged cylinder liners or excessive clearance of engine components. - Pistons - Piston rings (clearance in groove and end gap) - Cylinder liners	• CHECK the running surfaces and clearances of the individual engine components. INSTALL new components as necessary. INSTALL a new cylinder block if necessary. • CHECK the pistons. REFER to: Piston Inspection (303-00 Engine System - General Information, General Procedures). • CHECK the piston rings. REFER to: (303-00 Engine System - General Information) Piston Ring-to-Groove Clearance (General Procedures), Piston Ring End Gap (General Procedures).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Coolant consumption	Cooling system components.	CHECK the cooling system. REFER to: Engine Cooling (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Diagnosis and Testing), Engine Cooling (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Diagnosis and Testing), Engine Cooling (303-03 Engine Cooling - 1.4L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing), Engine Cooling (303-03 Engine Cooling - 1.6L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing).
	Oil cooler.	INSTALL a new oil cooler.
	Damaged gaskets or warped mating faces.	CHECK the cylinder head gasket for damage. CHECK the cylinder head for distortion.
	Cracks or fractures in engine components surrounded by coolant, such as cylinder liners and cylinder head combustion chamber.	DETERMINE the damaged engine component(s) and install new component(s) as necessary.
Engine will not crank	Battery or cables.	CHECK the battery, bracket and cables. REFER to: Battery (414-01 Battery, Mounting and Cables, Diagnosis and Testing).
	Starter motor or cables.	CHECK the starting system. REFER to: Starting System (303-06 Starting System, Diagnosis and Testing).
Engine cranks but will not start	Fuel tank is empty.	CHECK the fuel level.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Water in fuel (diesel engine only).	Drain the water from the fuel system. Engine - 1.4L Duratorq-TDCi (DV) Diesel/Engine - 1.6L Duratorq-TDCi (DV) Diesel. REFER to: Fuel System - 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel (310-00 Fuel System - General Information, Diagnosis and Testing).
	Fuel filter blocked.	INSTALL a new fuel filter. REFER to: (310-01 Fuel Tank and Lines) Fuel Filter - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation), Fuel Filter - 1.6L Duratorq-TDCi (DV) Diesel (Removal and Installation).
	Engine intake air system.	CHECK the intake air system. REFER to: Intake Air Distribution and Filtering (303-12 Intake Air Distribution and Filtering, Diagnosis and Testing).
	Glow plug faulty (diesel engine only).	CHECK the glow plugs. INSTALL new glow plugs as necessary. REFER to: Glow Plug (303-07 Glow Plug System - 1.4L Duratorq-TDCi (DV) Diesel, Removal and Installation), Glow Plugs (303-07 Glow Plug System - 1.6L Duratorq-TDCi (DV) Diesel, Removal and Installation).
	Engine management system.	CHECK the engine management system. REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls, Diagnosis and Testing).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Ignition system (petrol engines only).	CHECK the ignition system. REFER to: Engine Ignition (303-07 Engine Ignition, Diagnosis and Testing), Engine Ignition (303-07 Engine Ignition - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
	Incorrect valve timing.	CHECK and adjust the valve timing. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Crankshaft Pulley (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).
	Broken or damaged timing belt/timing chain or pulley/sprocket.	CHECK the timing belt/timing chain and sprockets/pulleys. INSTALL new components as necessary. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Very poor power output or fuel consumption too high or engine running rough	Fuel system.	CHECK the fuel system. REFER to: Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Diagnosis and Testing), Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.3L Duratec-8V (Rocam), Diagnosis and Testing), Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.4L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing), Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.6L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing).
	Engine intake air system.	CHECK the intake air system. REFER to: Intake Air Distribution and Filtering (303-12 Intake Air Distribution and Filtering, Diagnosis and Testing).
	Exhaust system blocked.	CHECK the exhaust system. REFER to: Exhaust System (309-00 Exhaust System, Description and Operation).
	Engine management system.	CHECK the engine management system. REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls, Diagnosis and Testing).
	Fault in ignition system (petrol engines only).	CHECK the ignition system. REFER to: Engine Ignition (303-07 Engine Ignition, Diagnosis and Testing), Engine Ignition (303-07 Engine Ignition - 2.0L Duratec-HE (MI4), Diagnosis and Testing).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Turbocharger (diesel engine only).	• CHECK the turbocharger. REFER to: Turbocharger (303-04 Fuel Charging and Controls - Turbocharger - 1.4L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing), Turbocharger (303-04 Fuel Charging and Controls - Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing).
	• Incorrect valve timing. Timing belt/timing sprocket or pulley/sprocket damaged.	• CHECK and adjust the valve timing. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Crankshaft Pulley (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).
	• Ignition timing incorrect (petrol engines only).	• CHECK the electronic engine controls. REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls, Diagnosis and Testing).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Noisy running	Engine auxiliary components loose or damaged.	CHECK engine auxiliary components for damage or looseness. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).
Noisy running, misfiring, back-firing or knocking	Incorrect fuel	DETERMINE which type of fuel was last put in the tank (note the country specific fuel specifications).
	Water in fuel or fuel contaminated.	CHECK the fuel system for water or other contamination.
	Valve timing incorrect, timing belt/chain or pulley/sprocket damaged.	CHECK and adjust the valve timing. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Crankshaft Pulley (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Noisy running or valve train noise	Valve clearance too large due to faulty valve tappets or worn valve train components.	INSTALL new hydraulic lash adjusters or adjust the valve clearance. REFER to: Valve Clearance Adjustment (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures), Camshaft Followers (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Valve Clearance Adjustment (303-01 Engine - 2.0L Duratec-HE (MI4), General Procedures), Hydraulic Lash Adjuster (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Camshaft (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).
	Timing belt or timing chain damaged.	INSTALL a new timing belt or timing chain. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Timing belt or timing chain incorrectly tensioned.	CHECK the timing belt or timing chain tension. INSTALL a new timing belt or timing chain as necessary. REFER to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair), Timing Chain (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair), Timing Chain (303-01 Engine - 2.0L Duratec-HE (M14), In-vehicle Repair), Timing Belt (303-01 Engine - 1.4L Duratorq-TDCi (DV) Diesel, In-vehicle Repair), Timing Belt (303-01 Engine - 1.6L Duratorq-TDCi (DV) Diesel, In-vehicle Repair).
Noisy running or engine noise	- Engine components - Pistons - Piston rings - Connecting rod big end, main bearing or thrust bearing journals - Connecting rods bent or damaged.	CHECK the engine components for wear or damage. Make sure all components are within specification. INSTALL new components as necessary.

Engine - Oil Leaks

NOTE:Before installing new gaskets or seals, make sure that the fault is clearly established.

If the oil leak cannot be identified clearly by a visual inspection, carry out an ultraviolet (UV) test:

Ultraviolet (UV) Testing

- Clean the engine and transmission with a suitable cleaning fluid.
- Pour the UV-test fluid in accordance with the quantity specified by the manufacturer through the oil filler neck into the engine and install the oil filler cap.

▲ WARNING:Vehicles with manual transaxle, shift the transaxle into Neutral. Failure to follow this instruction may result in personal injury.

- Start the engine and let it run for about five minutes.

- Switch off the engine.

NOTE:If no leak can be found, road test the vehicle under various loads and check the engine for leaks again.

- Check the engine for oil leaks using a suitable UV lamp.
- Rectify any leaks found and check the engine for oil leaks.

Measure the compression pressure

NOTE:The powertrain control module (PCM) receives an error message when the fuel pump relay is removed or electrical components are disconnected. This error message must be deleted from the fault memory using WDS after completing the compression test.

NOTE:Valve clearance must be set correctly before performing a compression test. Make sure the engine is at the normal operating temperature.

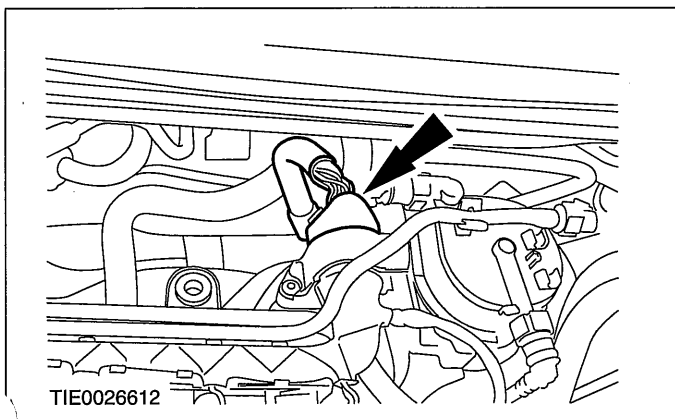
DIAGNOSIS AND TESTING

NOTE: The varying design of compression checking devices and fluctuating starter motor speeds normally only allows for a comparison to be made of the compression pressures in all cylinders.

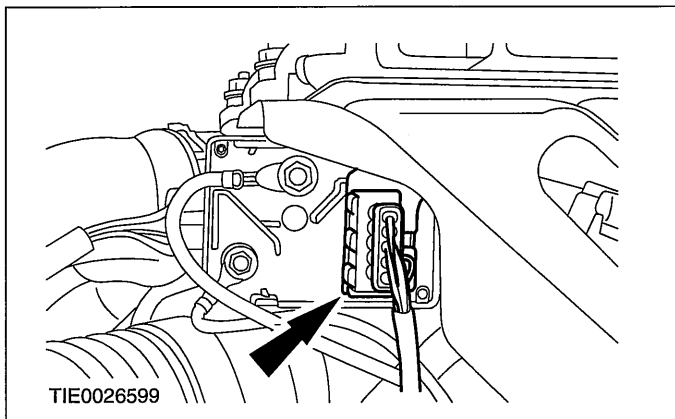
**Measure the compression pressure
(Engine - 1.4L Duratorq-TDCi (DV)
Diesel)**

1. Remove the air cleaner.

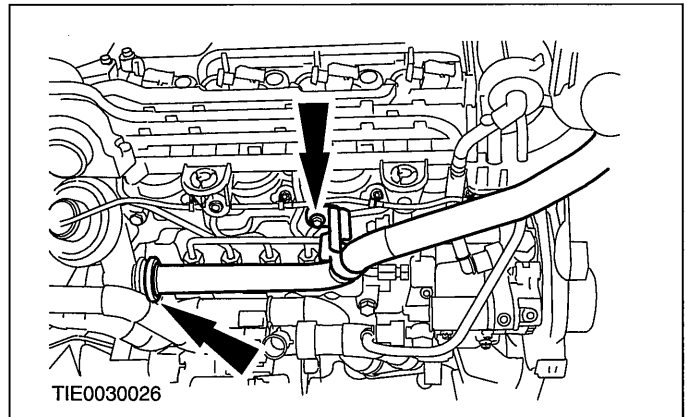
REFER to: Air Cleaner - 1.4L Duratorq-TDCi (DV) Diesel (303-12 Intake Air Distribution and Filtering, Removal and Installation).



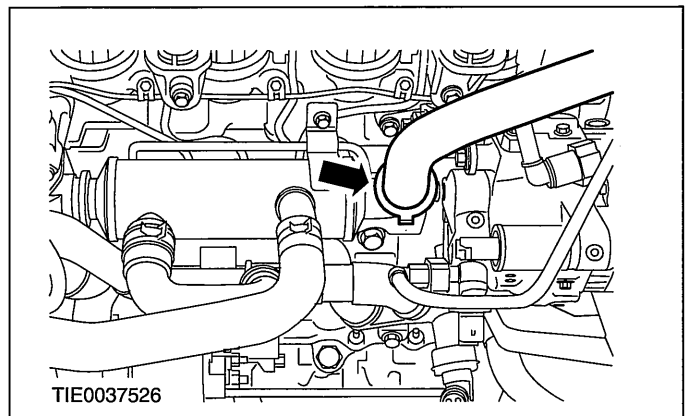
2. Disconnect the fuel injector wiring harness main connector.



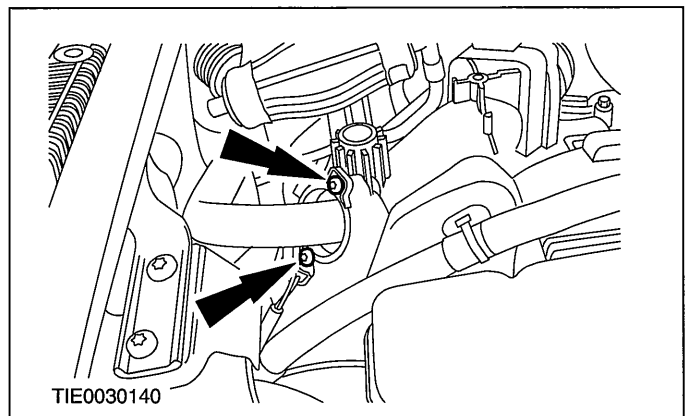
3. Disconnect the glow plug relay electrical connector.



4. Detach the exhaust gas recirculation (EGR) tube from the cylinder block and from the EGR valve (if equipped).

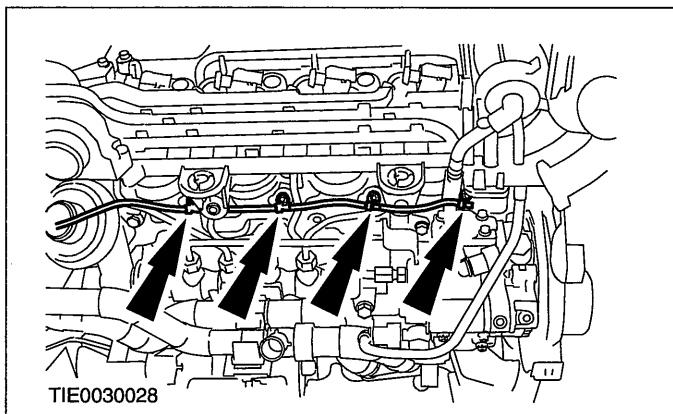


5. Detach the EGR tube from the EGR cooler (if equipped).

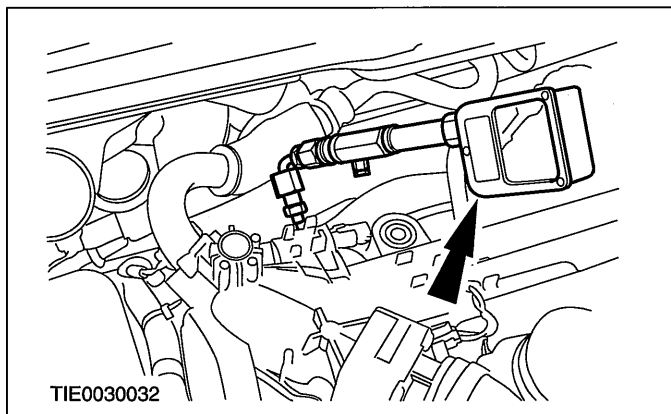


6. Remove the EGR tube from the intake manifold assembly.

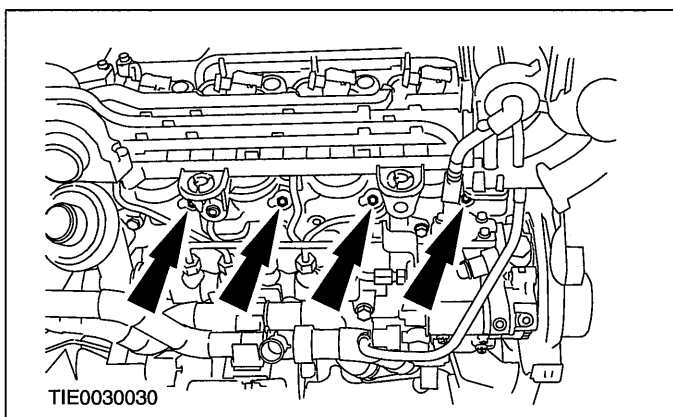
DIAGNOSIS AND TESTING



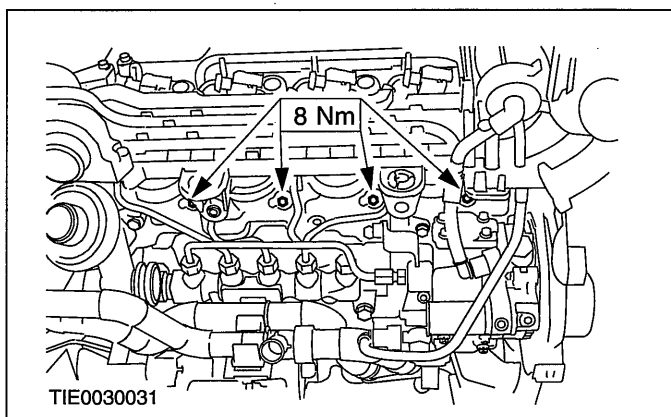
7. Disconnect the glow plug electrical connectors.



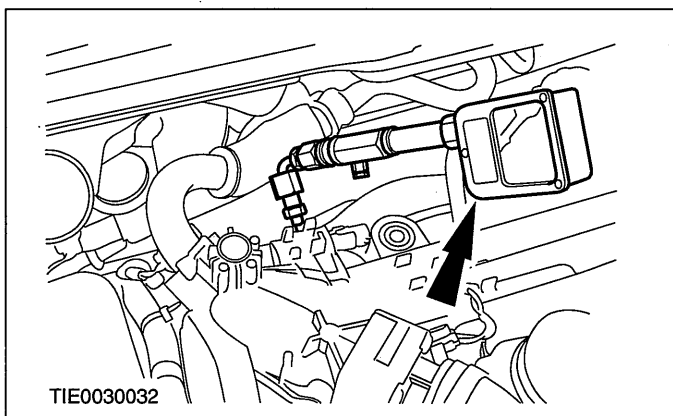
11. Detach the compression tester and adapter.



8. Remove the glow plugs.



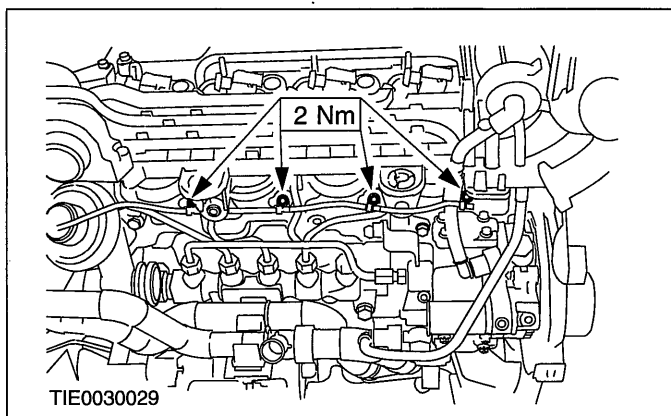
12 Install the glow plugs.



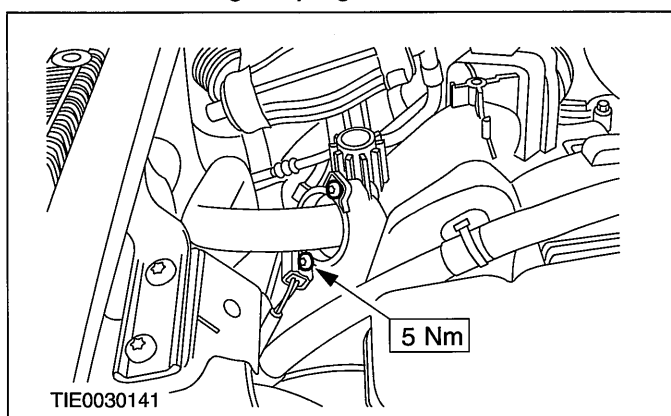
9. Install a suitable compression pressure recorder with a suitable adapter into the glow plug bore.

NOTE: Operate the starter motor until the reading on the compression tester stops rising.

10. Carry out the measurement in accordance with the instructions supplied with the measuring device on every cylinder using a suitable compression pressure recorder with a suitable adapter.



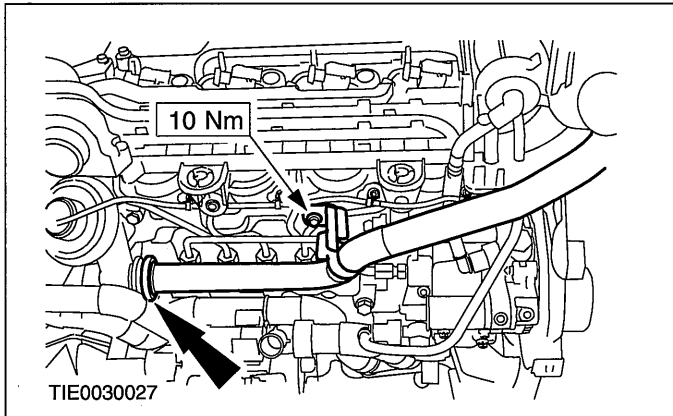
13 Connect the glow plug electrical connectors.



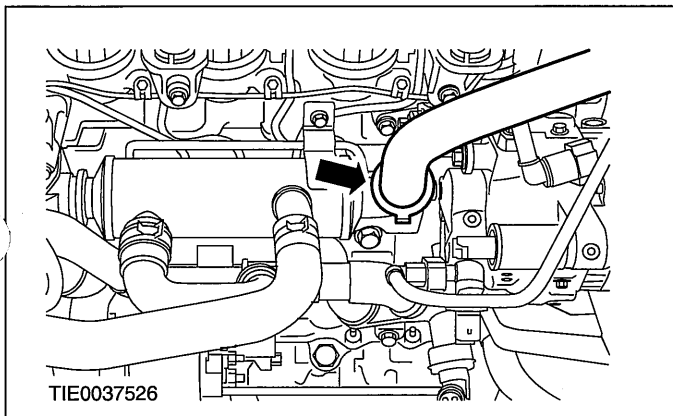
DIAGNOSIS AND TESTING

- 14. NOTE:** Check the EGR tube O-ring seal. Install a new seal if necessary.

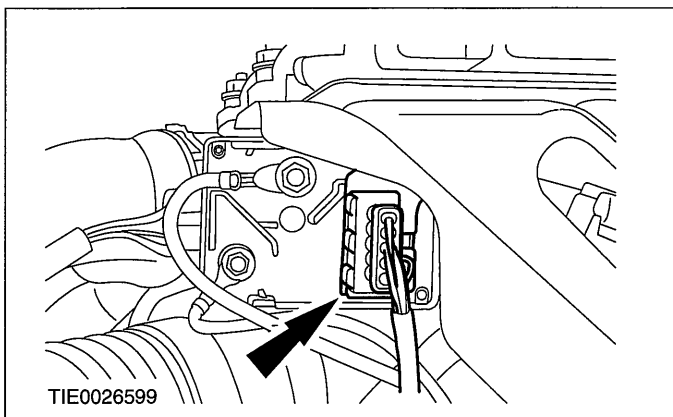
Install the EGR tube to the intake manifold assembly.



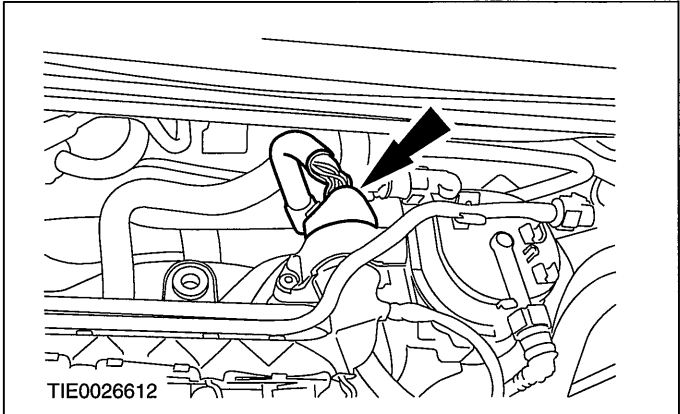
- 15** Attach the EGR tube to the cylinder block and to the EGR valve (if equipped).



- 16** Attach the EGR tube to the EGR cooler (if equipped).



- 17.** Connect the glow plug relay electrical connector.



- 18** Connect the fuel injector wiring harness main connector.
19 Install the air cleaner.

REFER to: Air Cleaner - 1.4L Duratorq-TDCi (DV) Diesel (303-12 Intake Air Distribution and Filtering, Removal and Installation).

- 20** Using worldwide diagnostic system (WDS), clear the fault codes from the PCM.

Measure the compression pressure (Engine - 1.6L Duratorq-TDCi (DV) Diesel)

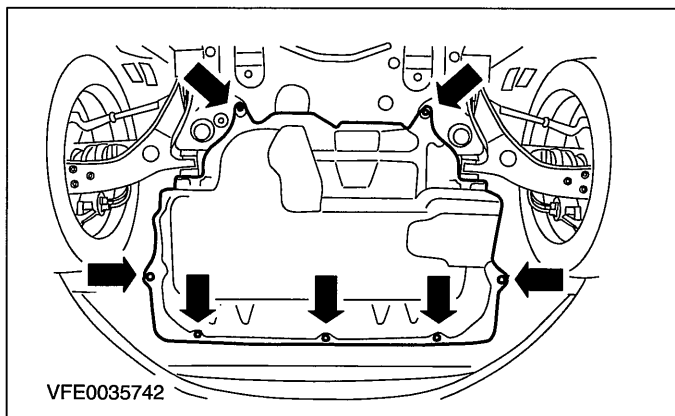
WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and can ignite. Failure to follow these instructions may result in personal injury.
- ▲ Do not carry out any repairs to the fuel injection system without checking that the fuel pressure has dropped to zero and that the fuel temperature has either reached ambient temperature or is below 30° C, whichever is the greater. Failure to follow these instructions may result in personal injury.

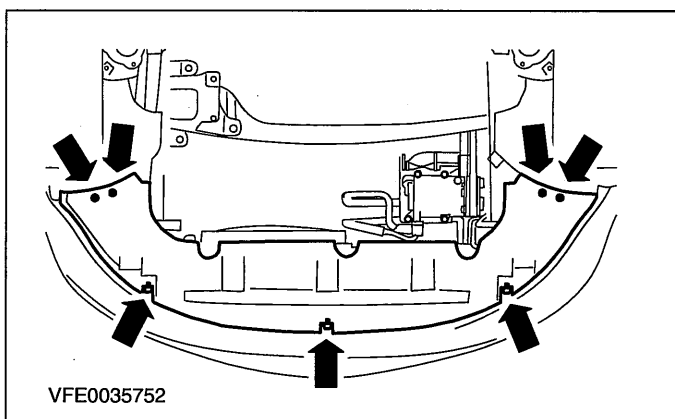
1. Using datalogger in world wide diagnostic system (WDS), check that the fuel pressure has dropped to zero and that the fuel temperature has either reached ambient temperature or is below 30°C, whichever is the greater.
2. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
 Lifting (Description and Operation).

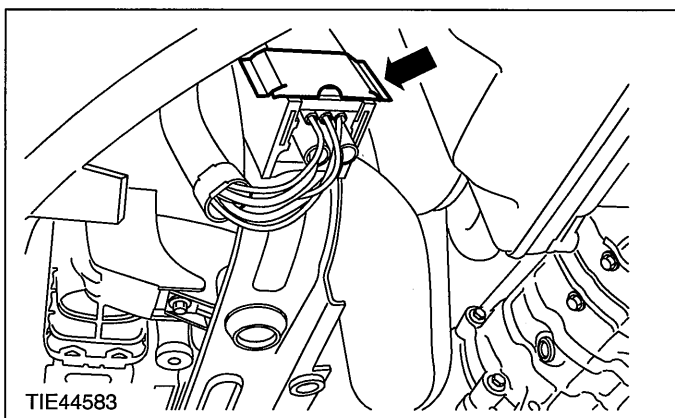
DIAGNOSIS AND TESTING



3. Remove the engine undershield.

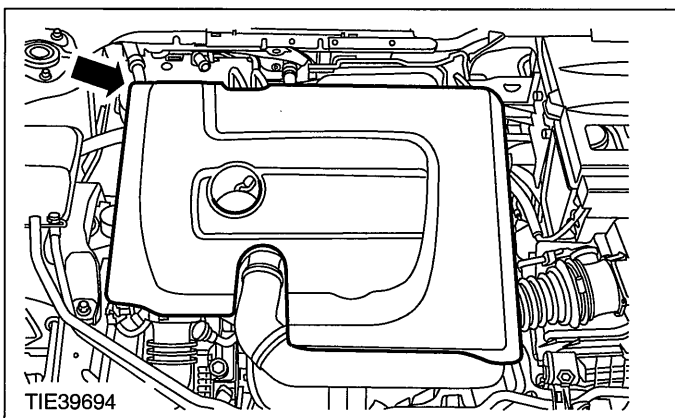


4. Remove the radiator undershield.

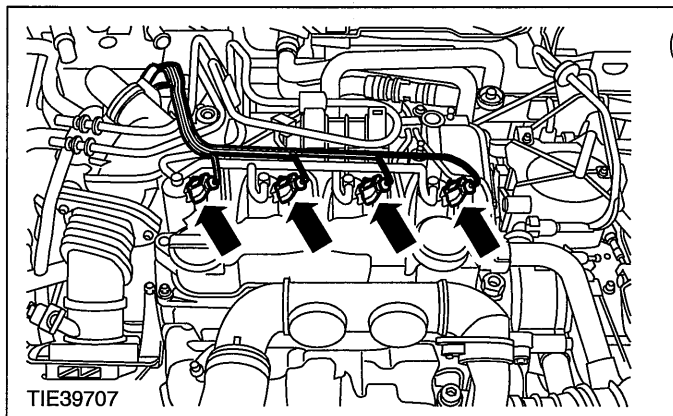


5. Remove the glow plug relay.

6. Lower the vehicle.

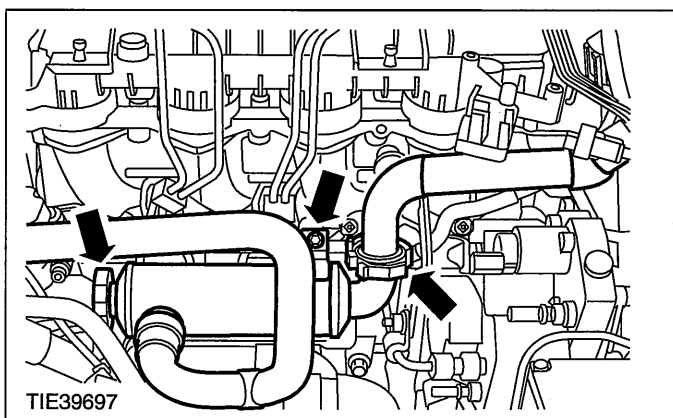


7. Remove the engine upper cover.

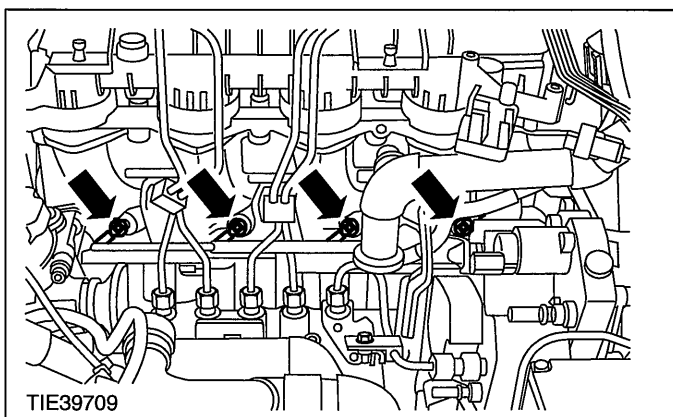


8. **⚠ CAUTION: Do not disconnect the fuel injection pump electrical connectors and crank the engine.**

Disconnect the fuel injector electrical connectors.

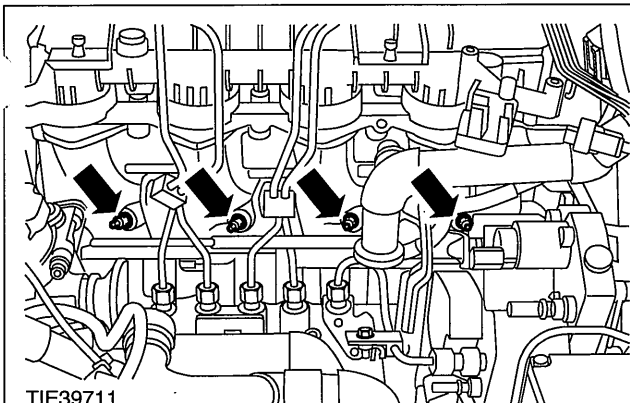


9. Detach the exhaust gas recirculation (EGR) cooler (if equipped) and position it to one side.

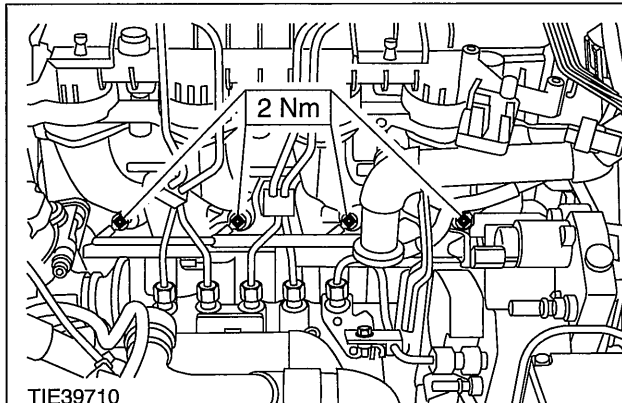


10. Remove the glow plug power supply.

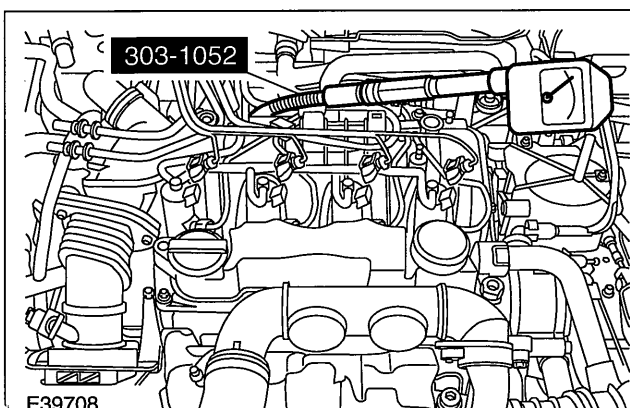
DIAGNOSIS AND TESTING



11. Remove the glow plugs.



16. Install the glow plug power supply.

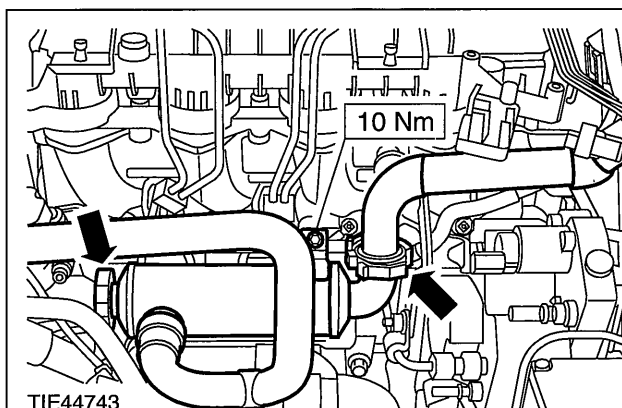


12. Install the special tool and a suitable compression tester into the glow plug bore.

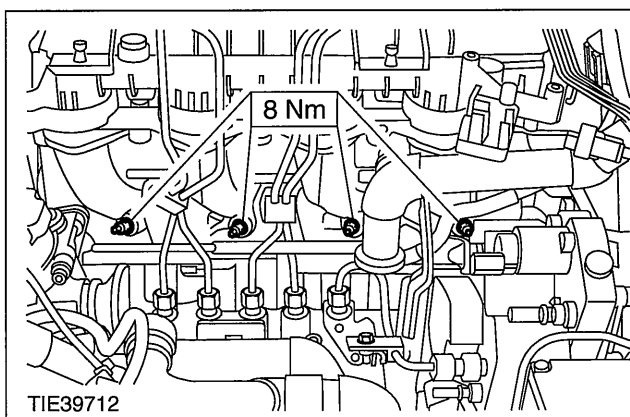
NOTE: Crank the engine with the starter motor until the reading on the compression tester stops rising.

13. Carry out the measurement on all cylinders, following the measuring equipment manufacturer's instructions.

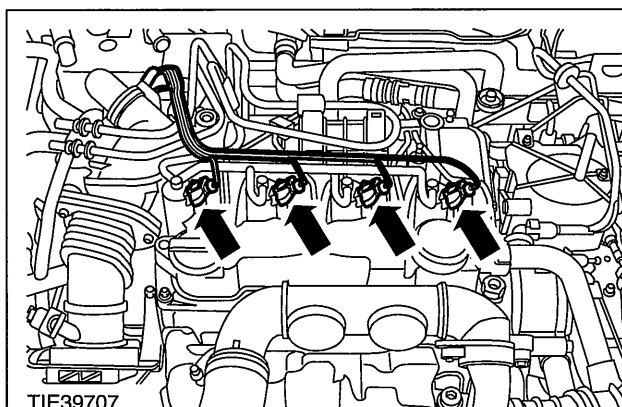
14. Detach the compression tester and the special tool.



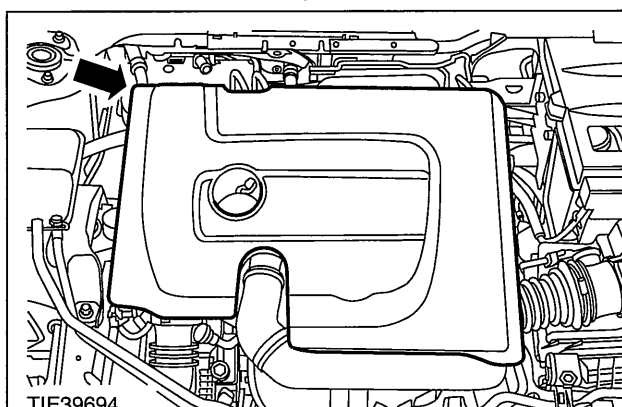
17. Attach the EGR cooler (if equipped).



15. Install the glow plugs.

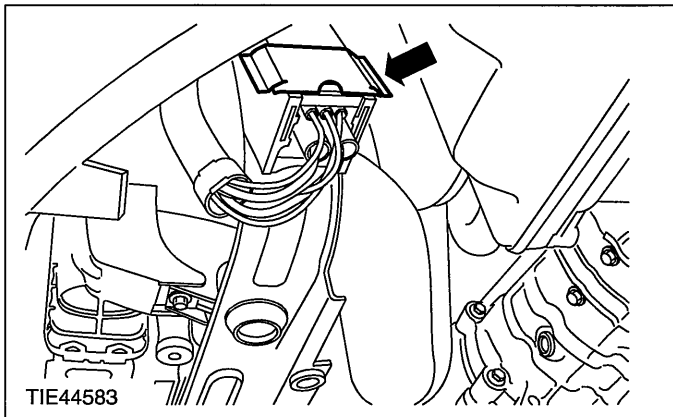


18. Connect the fuel injector electrical connectors.

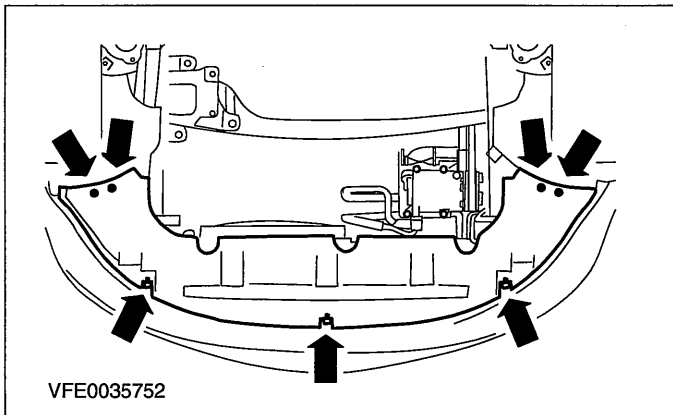


DIAGNOSIS AND TESTING

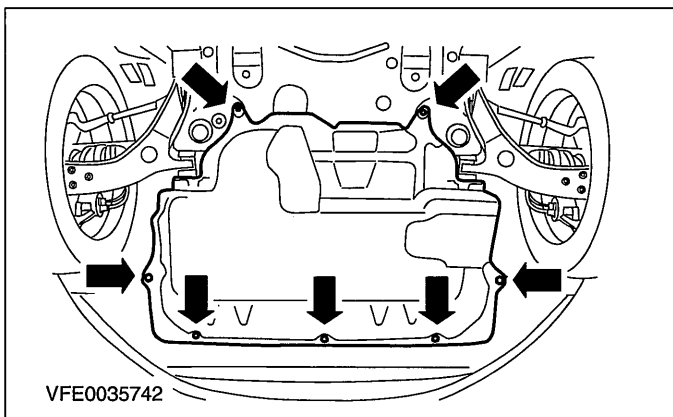
- 19 Install the engine upper cover.
- 20 Raise and support the vehicle. REFER to:
(100-02 Jacking and Lifting)
Jacking (Description and Operation),
Lifting (Description and Operation).



21. Install the glow plug relay.

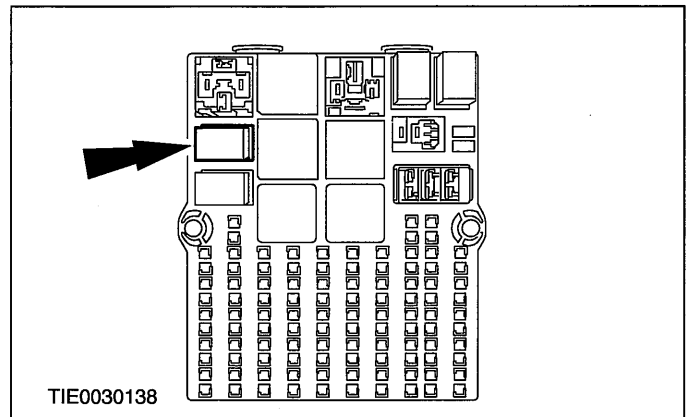


- 22 Install the radiator undershield.



- 23 Install the engine undershield.
- 24 Lower the vehicle.
- 25 Reset the PCM fault memory.

**Measure the compression pressure
(Engine - 1.25L Duratec-16V
(Sigma)/1.4L Duratec-16V (Sigma)/1.6L
Duratec-16V (Sigma))**

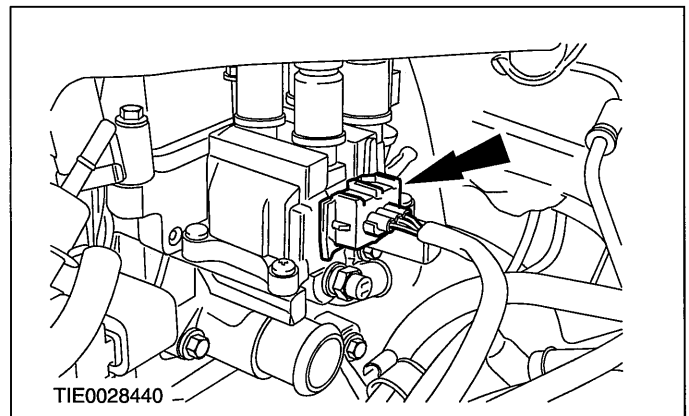


1. Open the central junction box (CJB) and remove the fuel pump relay.

NOTE:The engine will start, run for a few seconds and then stop.

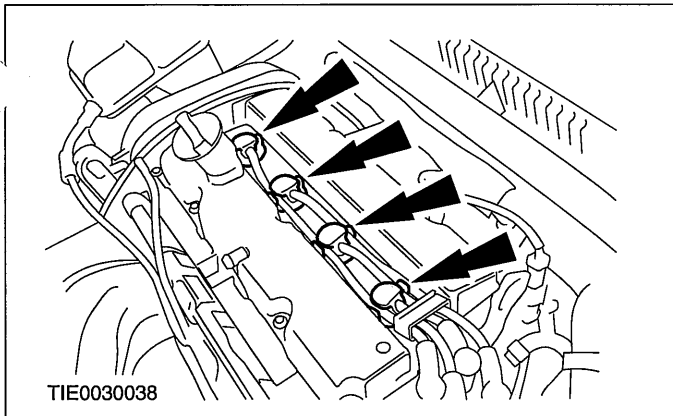
2. Start the engine.
3. Remove the air cleaner.

REFER to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).



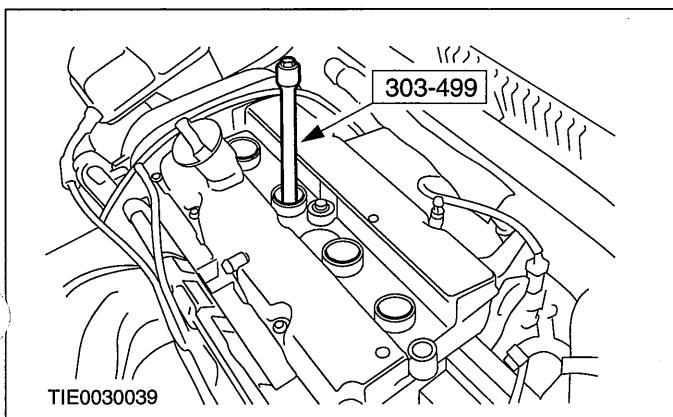
4. Disconnect the electronic ignition (EI) coil connector from the EI coil.

DIAGNOSIS AND TESTING

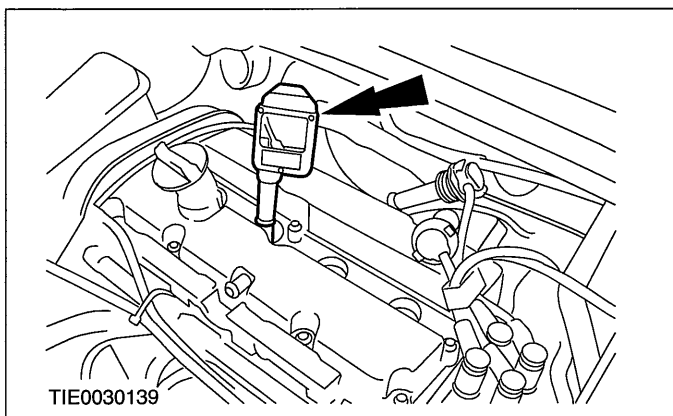


NOTE: Twist the spark plug connectors slightly before disconnecting them. Pull on the connector and not on the cable.

5. Disconnect the spark plug connectors.

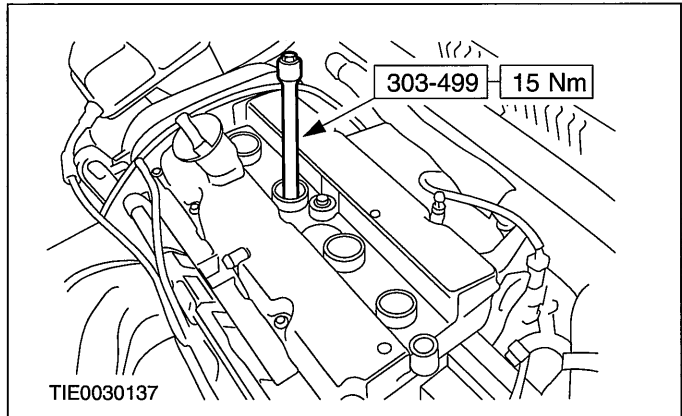


6. Using the special tool, remove the spark plugs.

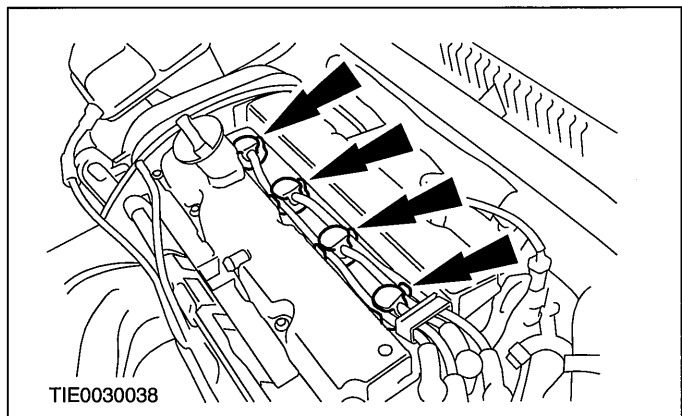


NOTE: Operate the starter motor with wide open throttle until the reading on the compression tester stops rising.

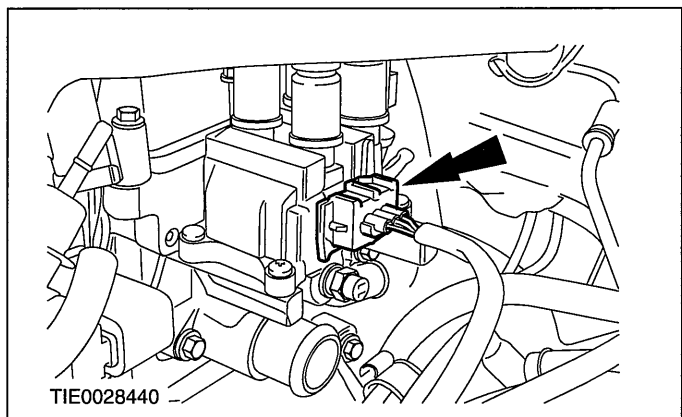
7. Carry out the measurement in accordance with the instructions supplied with the measuring device on every cylinder using a suitable compression pressure recorder with the suitable adapter.



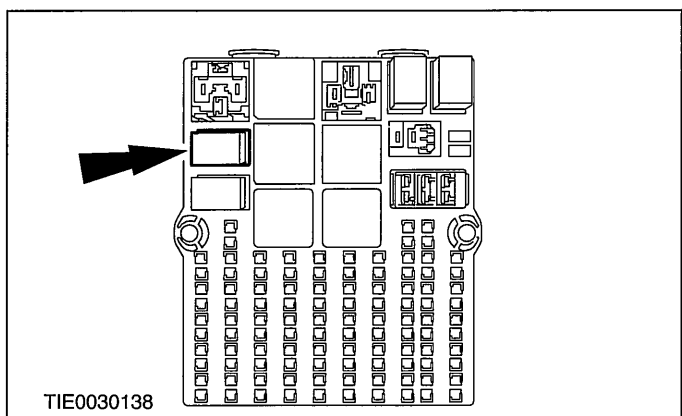
8. Using the special tool, install the spark plugs.



9. Connect the spark plug connectors.



10. Connect the EI coil electrical connector to the EI coil.



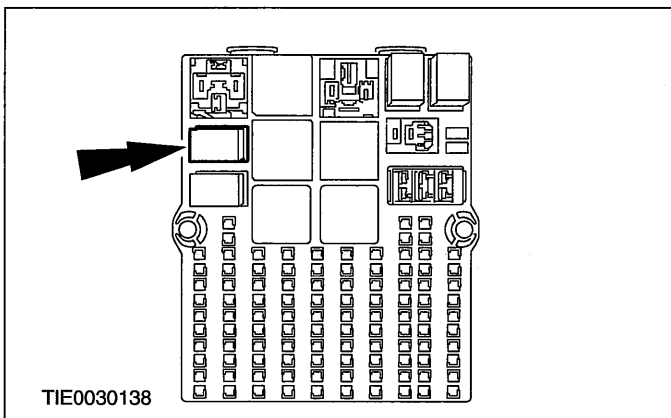
DIAGNOSIS AND TESTING

11. Install the fuel pump relay.
12. Install the air cleaner.

REFER to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

13. Using worldwide diagnostic system (WDS), clear the fault codes from the PCM.

Measure the compression pressure (Engine - 1.3L Duratec-8V (Rocam))

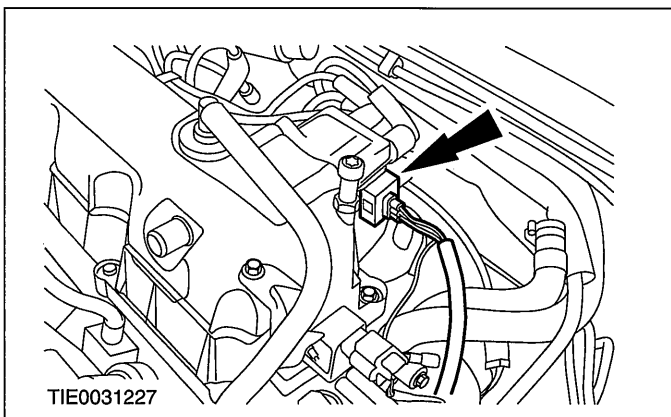


1. Open the central junction box (CJB) and remove the fuel pump relay.

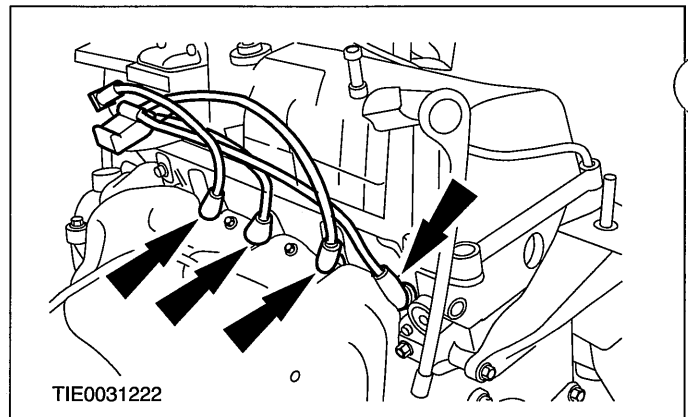
NOTE: The engine will start, run for a few seconds and then stop.

2. Start the engine.
3. Remove the air cleaner.

REFER to: Air Cleaner - 1.3L Duratec-8V (Rocam) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

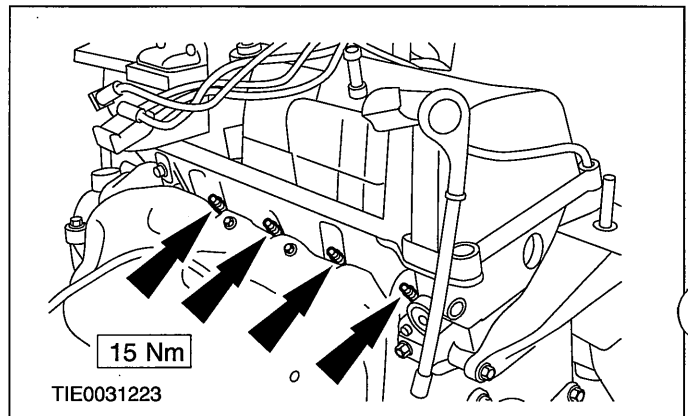


4. Disconnect the electronic ignition (EI) coil electrical connector from the EI coil.

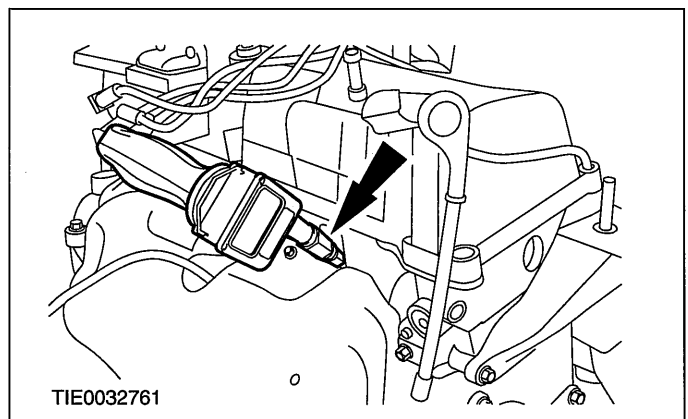


NOTE: Twist the spark plug connectors slightly before disconnecting them. Pull on the connector and not on the cable.

5. Disconnect the spark plug connectors.

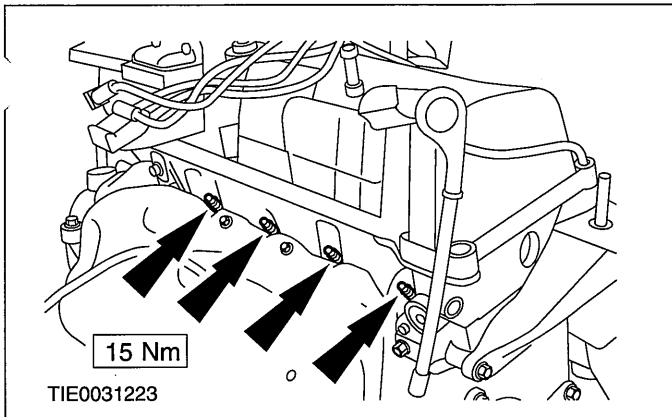


6. Remove the spark plugs.

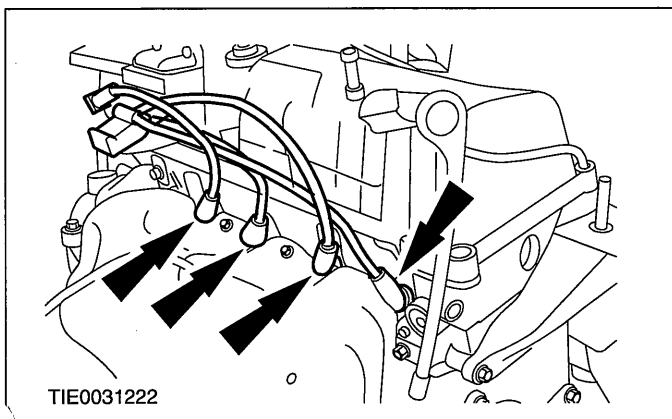


NOTE: Operate the starter motor with wide open throttle until the reading on the compression tester stops rising.

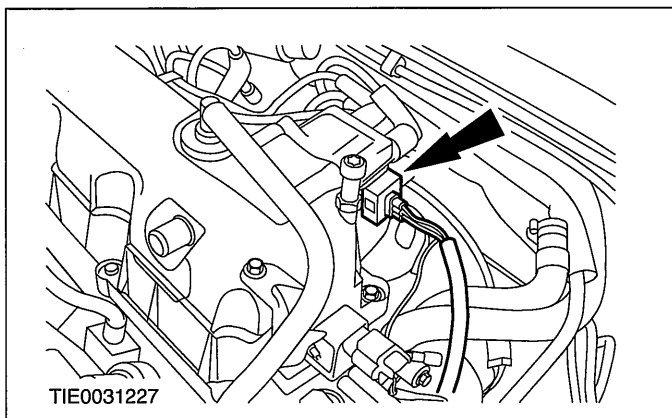
7. Carry out the measurement in accordance with the instructions supplied with the measuring device on every cylinder using a suitable compression pressure recorder with the suitable adapter.

DIAGNOSIS AND TESTING

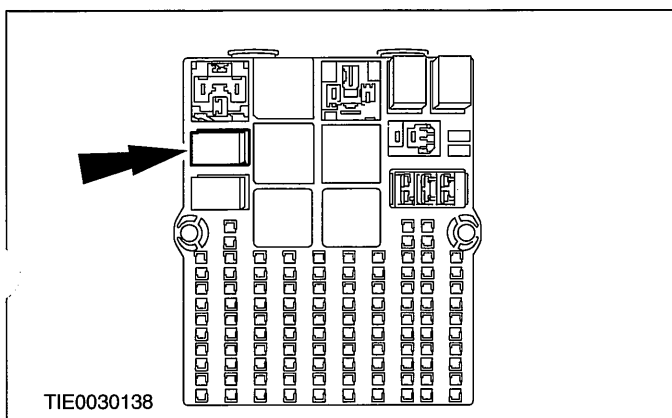
8. Install the spark plugs.



9. Connect the spark plug connectors.



10. Connect the EI coil electrical connector to the EI coil.



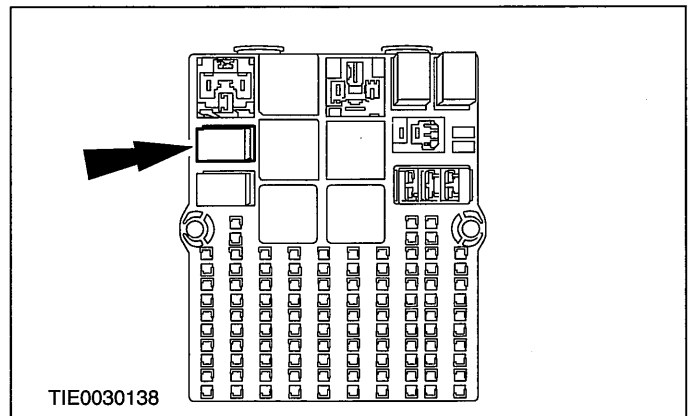
11. Install the fuel pump relay.

12. Install the air cleaner.

REFER to: Air Cleaner - 1.3L Duratec-8V (Rocam) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

13. Using worldwide diagnostic system (WDS), clear the fault codes from the PCM.

Measure the compression pressure (Engine - 2.0L Duratec-HE (MI4))



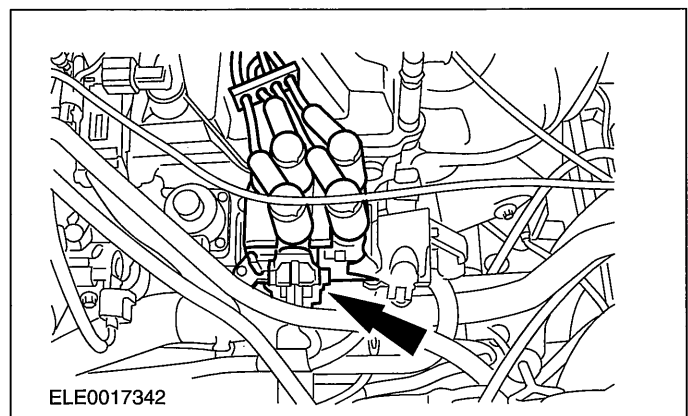
1. Open the central junction box (CJB) and remove the fuel pump relay.

NOTE: The engine will start, run for a few seconds and then stop.

2. Start the engine.

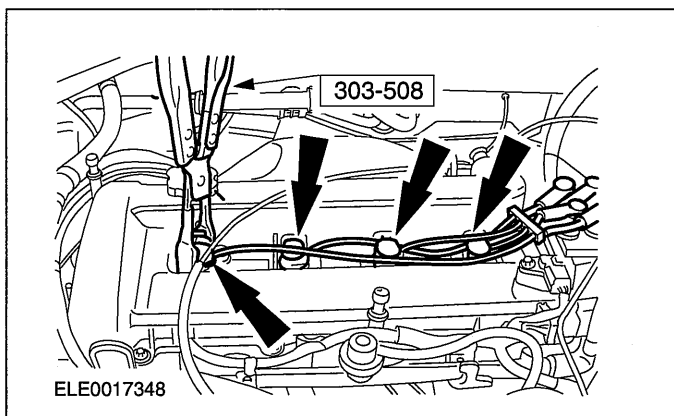
3. Remove the air cleaner.

REFER to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).



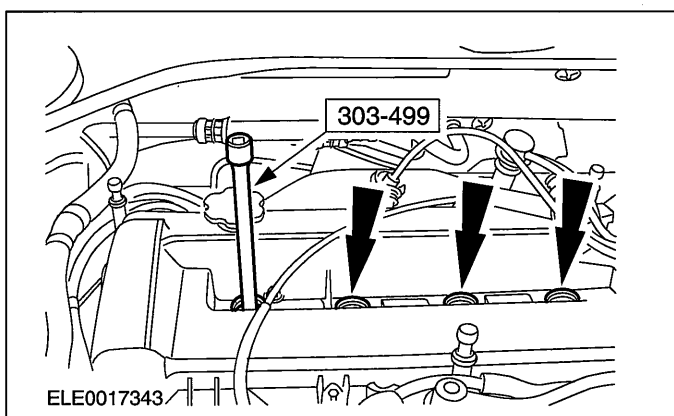
4. Disconnect the electronic ignition (EI) coil electrical connector from the EI coil.

DIAGNOSIS AND TESTING

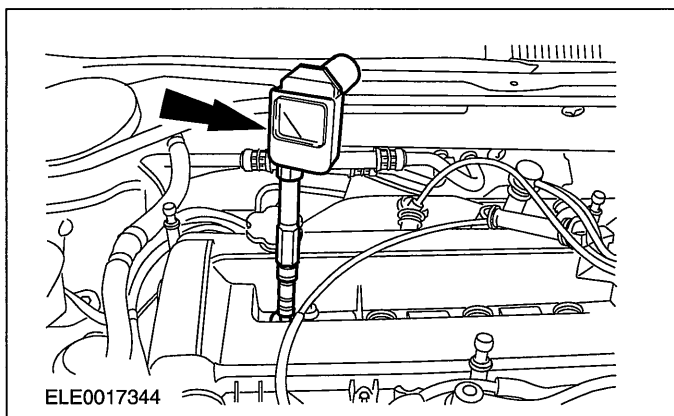


NOTE: Twist the spark plug connectors slightly before disconnecting them. Pull on the connector and not on the cable.

5. Using the special tool, remove the spark plug connectors.

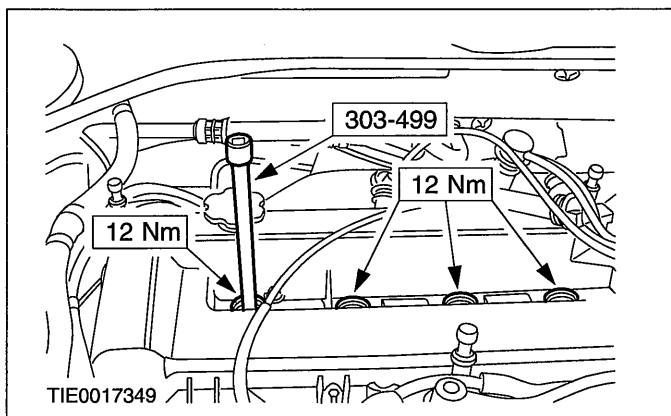


6. Using the special tool, remove the spark plugs.

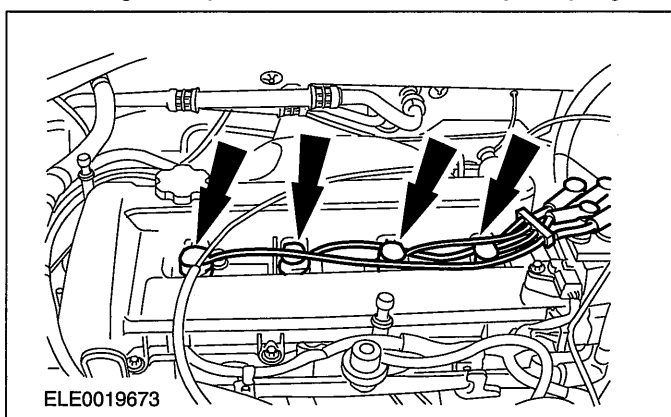


NOTE: Operate the starter motor with wide open throttle until the pointer on the measuring device stops rising.

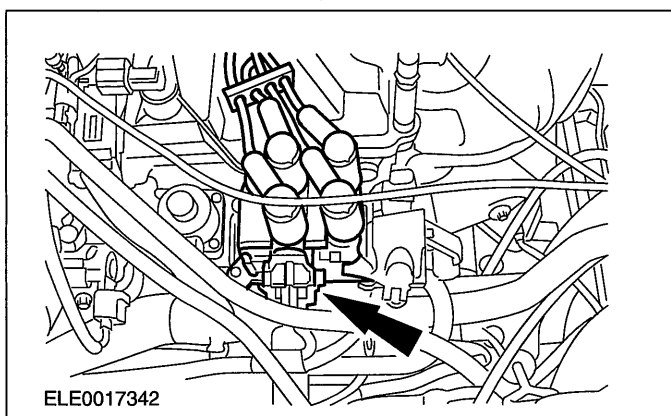
7. Carry out the measurement in accordance with the instructions supplied with the measuring device on every cylinder using compression pressure recorder 623.000.101 with the suitable adapter.



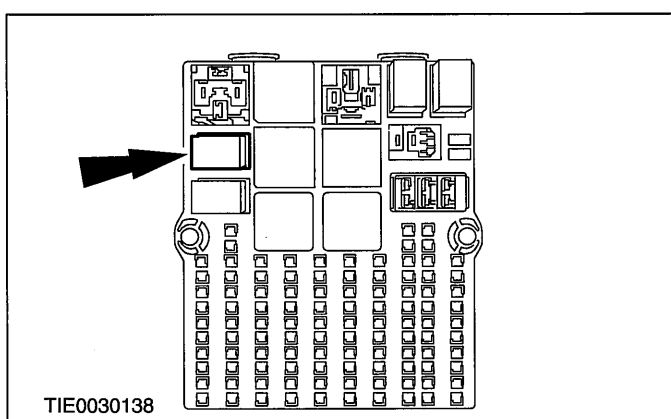
8. Using the special tool, install the spark plugs.



9. Install the spark plug connectors.



10. Connect the EI coil electrical connector to the EI coil.



DIAGNOSIS AND TESTING

11. Install the fuel pump relay.

12. Install the air cleaner.

REFER to: Air Cleaner - 2.0L Duratec-HE (M14)
(303-12 Intake Air Distribution and Filtering,
Removal and Installation).

13. Reset the PCM fault memory.

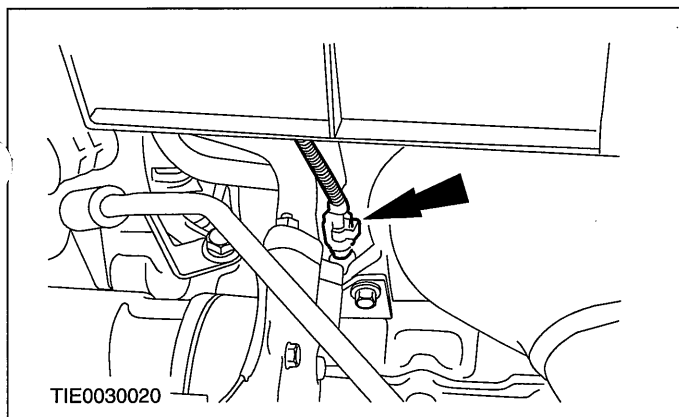
Measure the oil pressure (Engine - 1.4L Duratorq-TDCi (DV) Diesel)

NOTE: The oil pressure depends on various factors (engine speed, oil temperature, oil viscosity, extent of oil filter contamination).

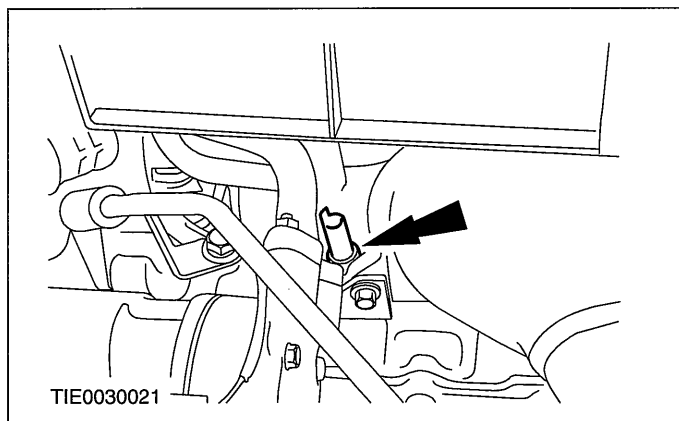
NOTE: Measure the oil pressure at the specified engine speed.

1. Raise and support the vehicle. REFER to:
(100-02 Jacking and Lifting)

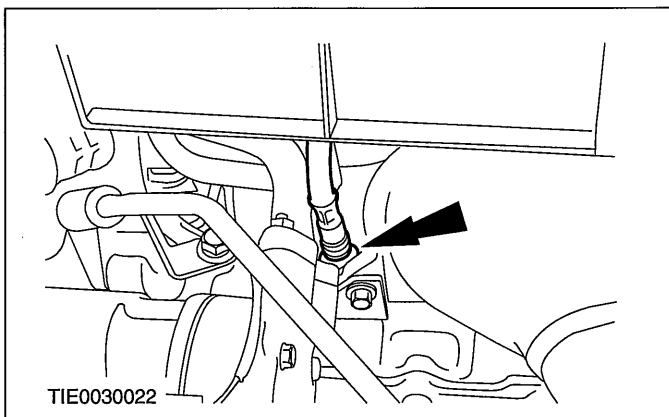
Jacking (Description and Operation),
Lifting (Description and Operation).



2. Disconnect the oil pressure switch electrical connector from the oil pressure switch.

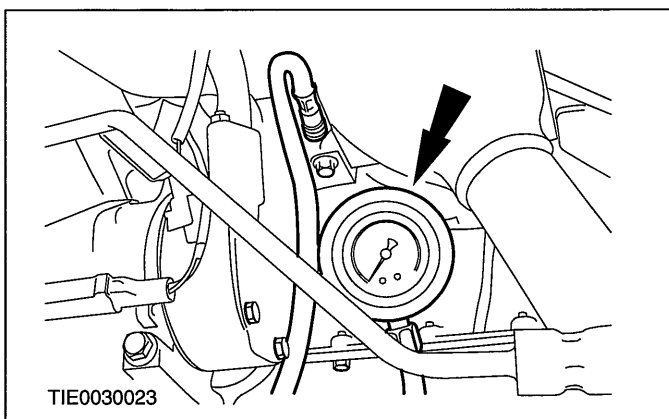


3. Remove the oil pressure switch.
• Discard the washer.



4. Attach the oil pressure gauge with the oil pressure gauge connector, and position it to allow reading from above.

5. Lower the vehicle.

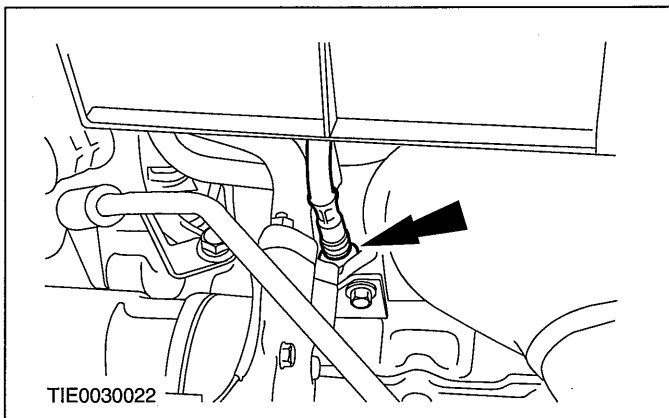


6. **NOTE:** Measure the oil pressure at an oil temperature of 110°C.

NOTE: Oil pressure at 2000 rpm: 2.3 to 3.7 bar.

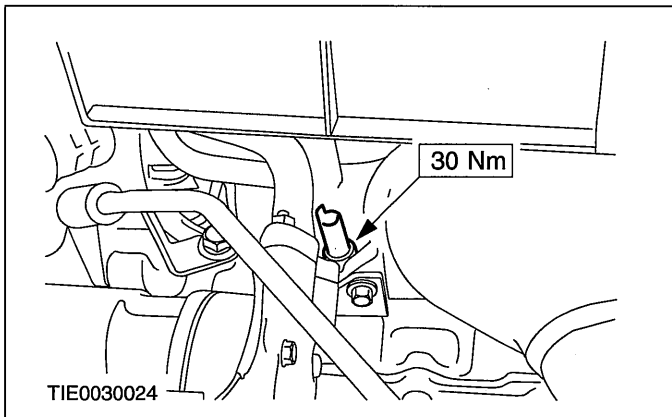
Measure the oil pressure.

7. Raise and support the vehicle. Engine - 1.4L Duratorq-TDCi (DV) Diesel



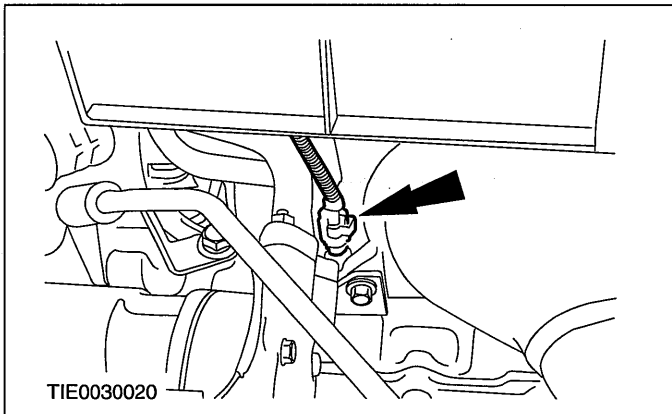
8. Remove the oil pressure gauge and the oil pressure gauge connector.

DIAGNOSIS AND TESTING



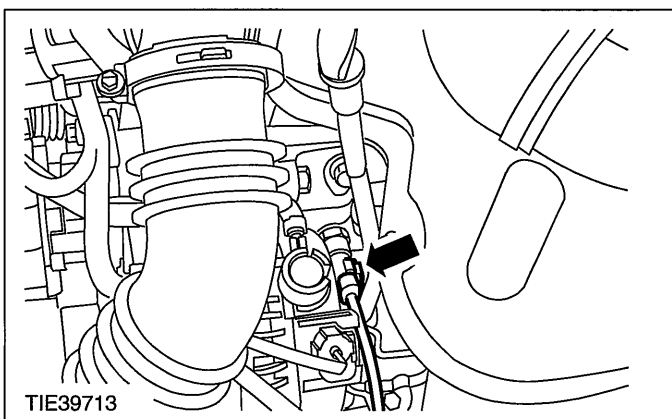
9. **NOTE:** Install a new oil pressure switch washer.

Install the oil pressure switch.

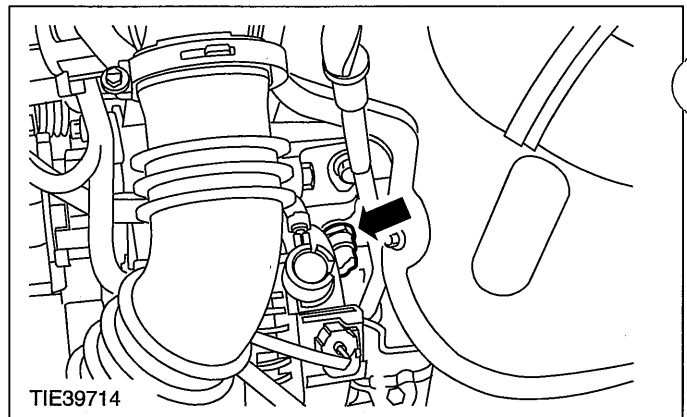


10. Connect the oil pressure switch electrical connector to the oil pressure switch.
11. Lower the vehicle.

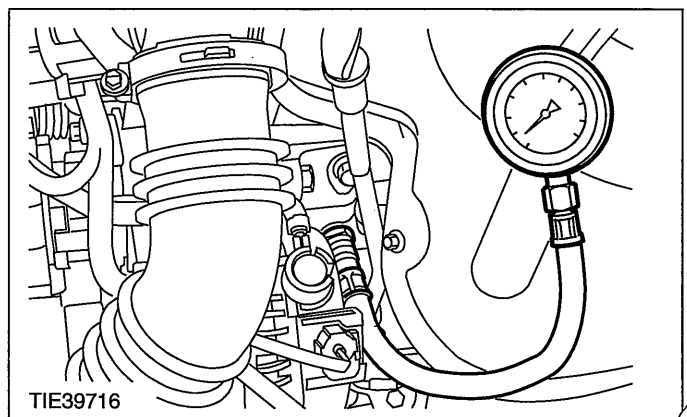
Measure the oil pressure (Engine - 1.6L Duratorq-TDCi (DV) Diesel)



1. Disconnect the oil pressure switch electrical connector from the oil pressure switch.



2. Remove the oil pressure switch.

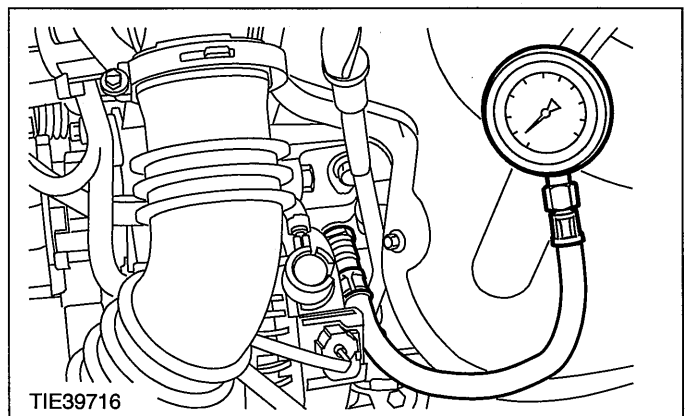


3. Attach the oil pressure gauge with the oil pressure gauge connector.

4. **NOTE:** Measure the oil pressure at the specified engine speed. Measure the oil pressure at an oil temperature of 125°C.

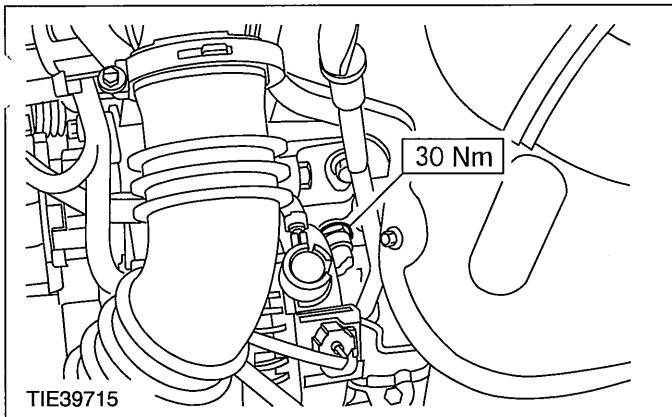
NOTE: Measure the oil pressure at idle speed and at 2000 rpm.

Check the oil pressure.

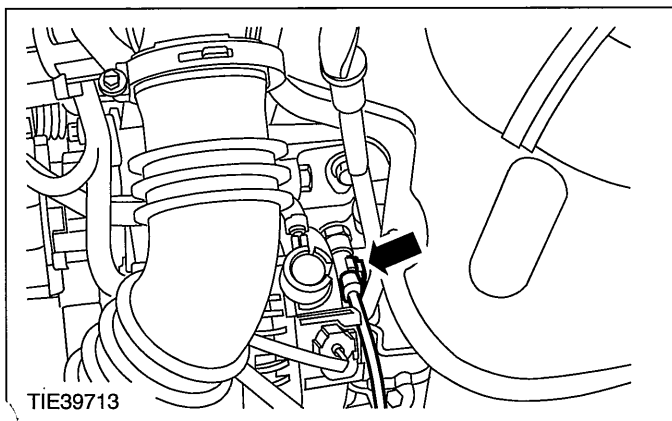


5. Detach the oil pressure gauge and the oil pressure gauge connector.
6. Coat the oil pressure switch with adhesive.

DIAGNOSIS AND TESTING



7. Install the oil pressure switch.



8. Connect the oil pressure switch electrical connector to the oil pressure switch.

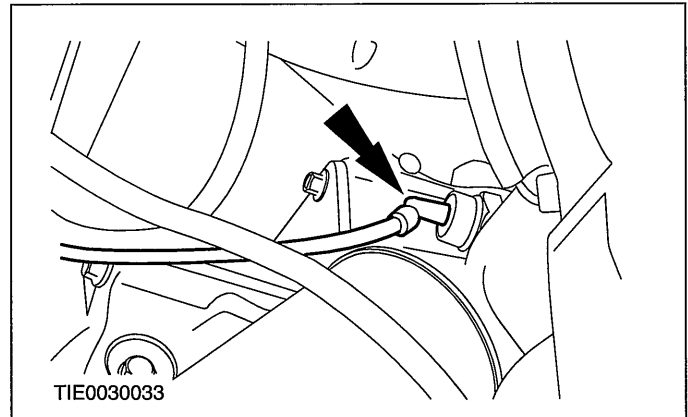
Measure the oil pressure (Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma))

NOTE: The oil pressure depends on various factors (engine speed, oil temperature, oil viscosity, extent of oil filter contamination).

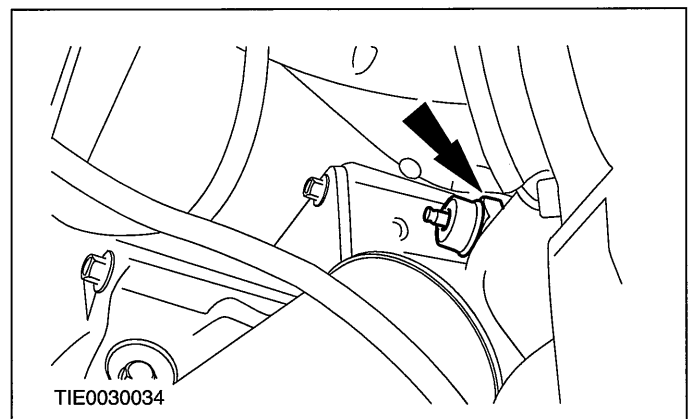
NOTE: Measure the oil pressure at the specified engine speed.

1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

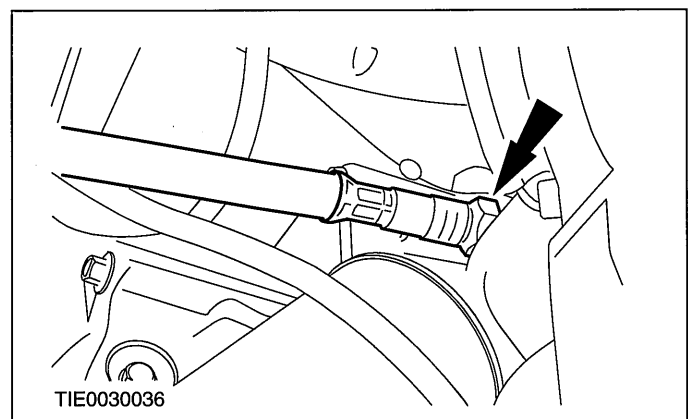
Jacking (Description and Operation),
Lifting (Description and Operation).



2. Disconnect the oil pressure switch electrical connector from the oil pressure switch.



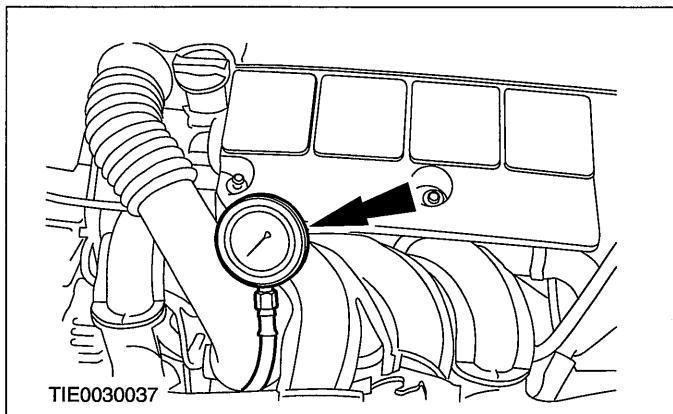
3. Remove the oil pressure switch.



4. Attach the oil pressure gauge with the oil pressure gauge connector to the oil pressure switch bore, and position it to allow reading from above.

5. Lower the vehicle.

DIAGNOSIS AND TESTING



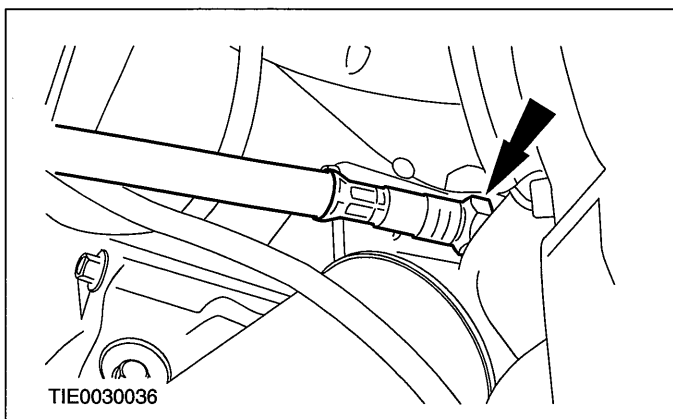
6. NOTE: Measure the oil pressure at an oil temperature of 80°C.

NOTE: Oil pressure at 2000 rpm: 3.5 bar.

Measure the oil pressure.

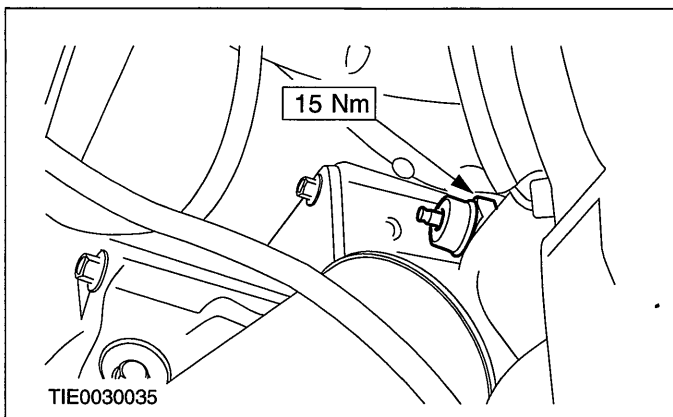
7. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

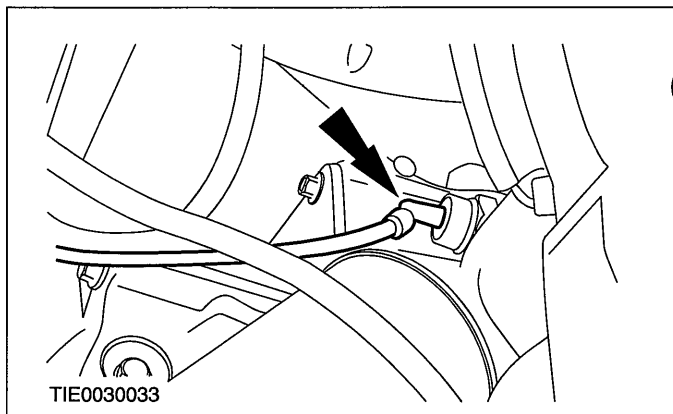


8. Detach the oil pressure gauge and connector from the oil pressure switch bore.

9. Coat the oil pressure switch with adhesive.



10. Install the oil pressure switch.



11. Connect the oil pressure switch electrical connector to the oil pressure switch.

12. Lower the vehicle.

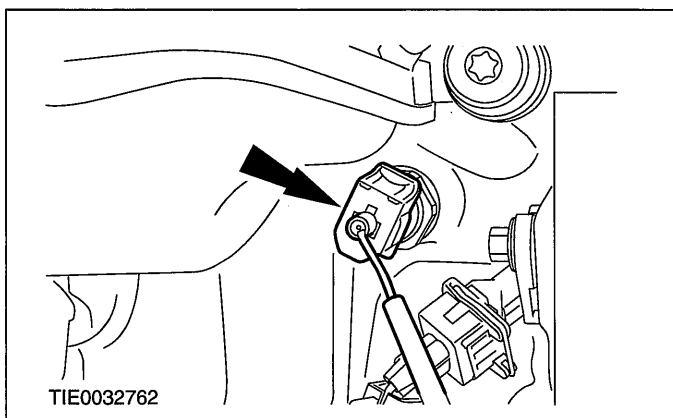
Measure the oil pressure (Engine - 1.3L Duratec-8V (Rocam))

NOTE: The oil pressure depends on various factors (engine speed, oil temperature, oil viscosity, extent of oil filter contamination).

NOTE: Measure the oil pressure at the specified engine speed.

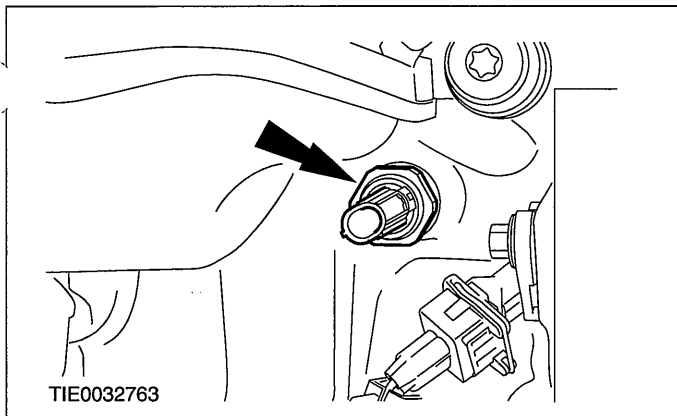
1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

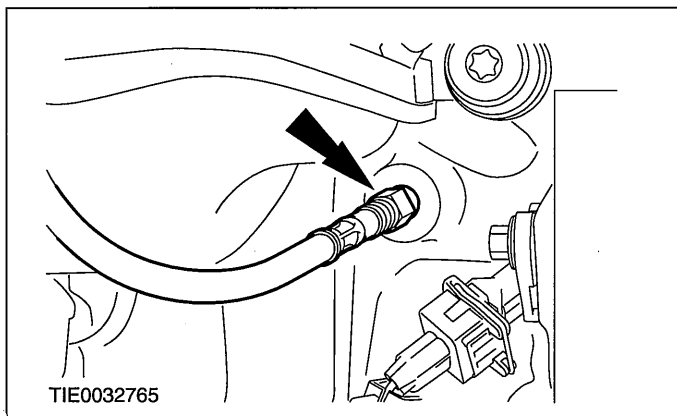


2. Disconnect the oil pressure switch electrical connector from the oil pressure switch.

DIAGNOSIS AND TESTING

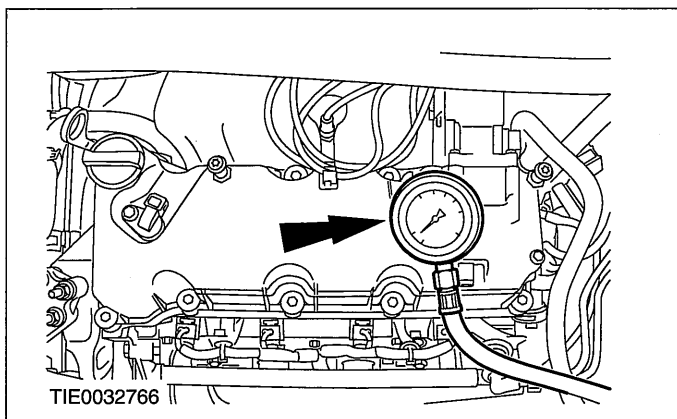


3. Remove the oil pressure switch.



4. Attach the oil pressure gauge with the oil pressure gauge connector to the oil pressure switch bore, and position it to allow reading from above.

5. Lower the vehicle.



6. **NOTE:** Measure the oil pressure at an oil temperature of 80°C.

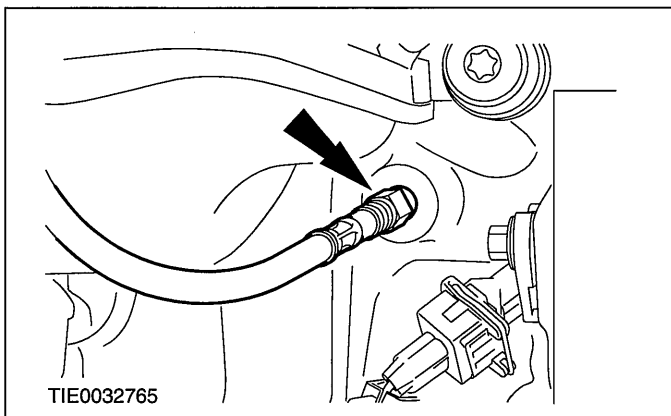
NOTE: Oil pressure at idle speed (750 rpm): 0.95 bar.

NOTE: Oil pressure at 2500 rpm: 2.7 bar.

Measure the oil pressure.

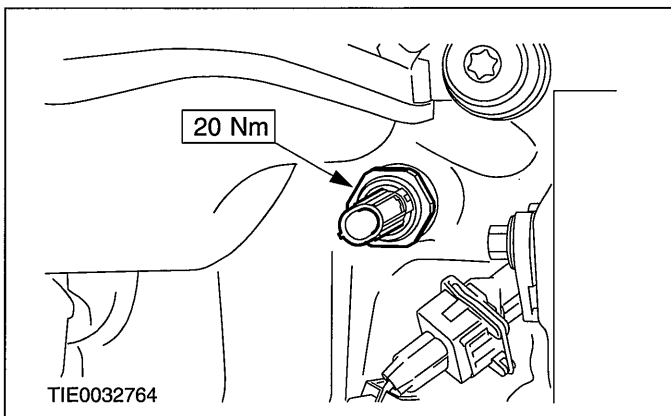
7. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation), Lifting (Description and Operation).

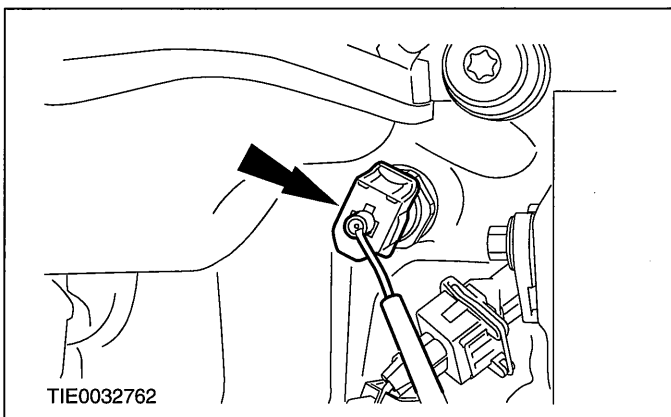


8. Detach the oil pressure gauge and connector from the oil pressure switch bore.

9. Coat the oil pressure switch with sealant adhesive.



10. Install the oil pressure switch.



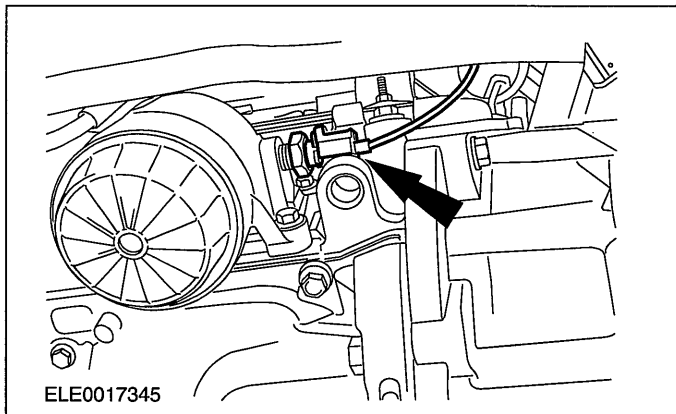
11. Connect the oil pressure switch electrical connector to the oil pressure switch.

12. Lower the vehicle.

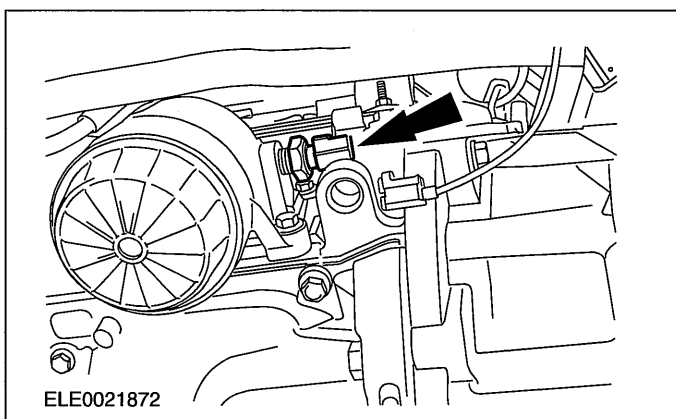
DIAGNOSIS AND TESTING**Measure the oil pressure (Engine - 2.0L Duratec-HE (M14))**

1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

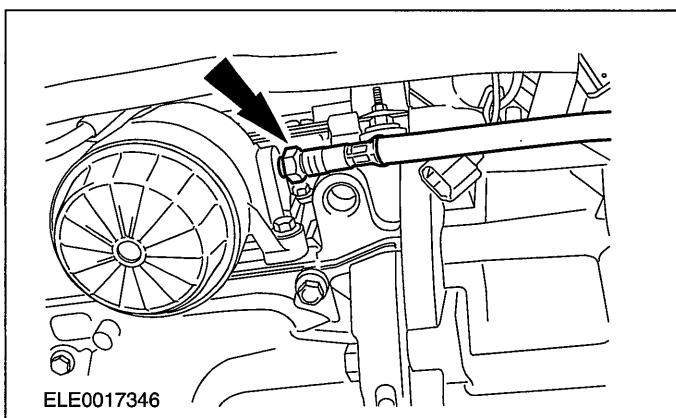
Jacking (Description and Operation),
Lifting (Description and Operation).



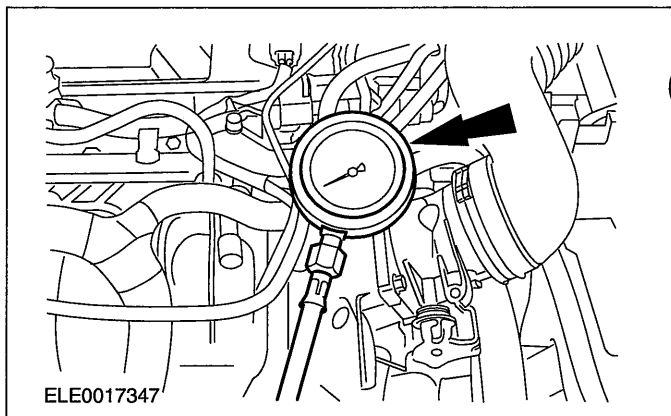
2. Disconnect the oil pressure switch electrical connector from the oil pressure switch.



3. Remove the oil pressure switch.



4. Attach the oil pressure gauge (GV 2134) with the oil pressure gauge connector to the oil pressure switch bore, and position it to allow reading from above.
5. Lower the vehicle.

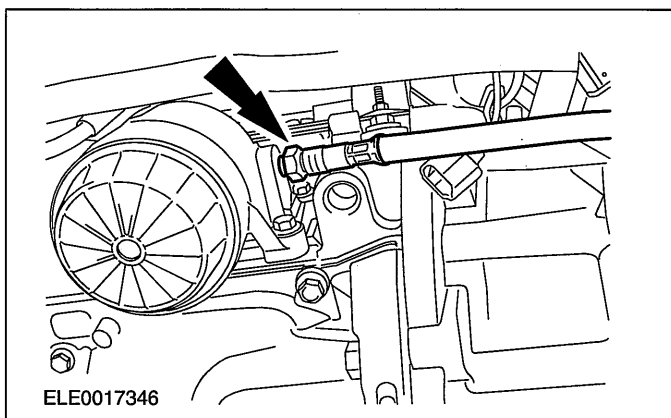


6. **NOTE:** Oil pressure at 2000 rpm: 3.5 bar.

Measure the oil pressure.

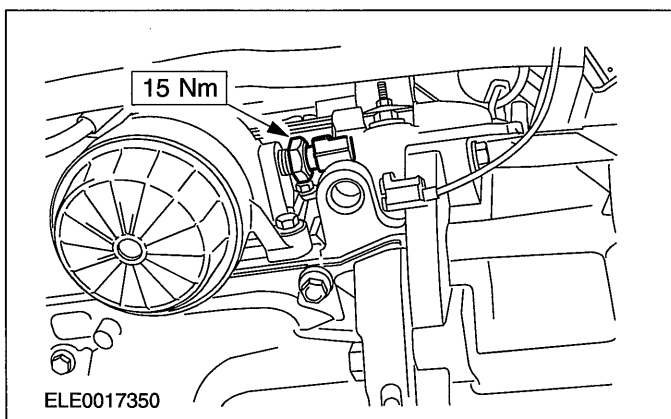
7. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

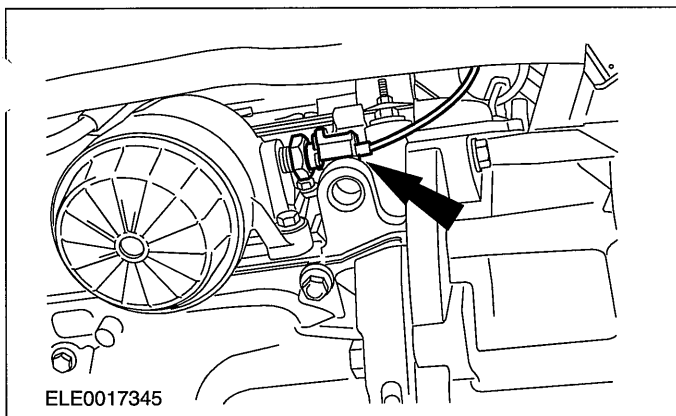


8. Detach the oil pressure gauge and connector from the oil pressure switch bore.

9. Coat the oil pressure switch with adhesive.



10. Install the oil pressure switch.

DIAGNOSIS AND TESTING

11. Connect the oil pressure switch electrical connector to the oil pressure switch.
- 12 Lower the vehicle.

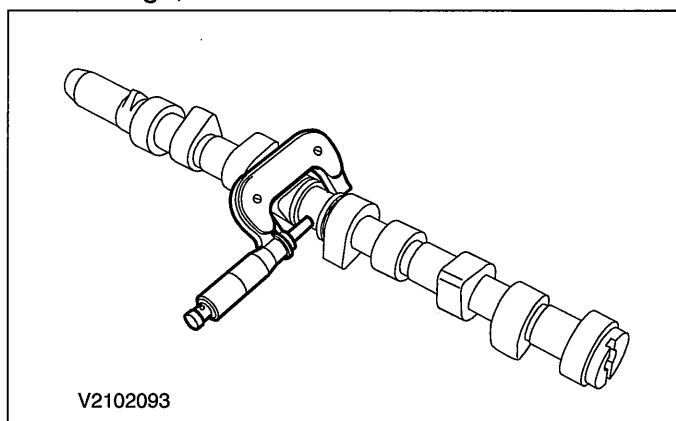
Valve train analysis - static (engine off)

Remove the valve cover.

Check all components of the valve train for damage and wear. Make sure that only original components are installed and that all nuts and bolts are tightened to the specified torque.

GENERAL PROCEDURES**Camshaft Bearing Journal Diameter****1. Determine the diameter of the camshaft journals.**

- Using a micrometer measure the diameter at 90 degrees intervals to determine if the journals are out-of-round.
- Measure at two different points on the journal to determine if there is any tapering.
- If the measurements are out of the specified range, install a new camshaft.



GENERAL PROCEDURES**Camshaft Bearing Journal Clearance**

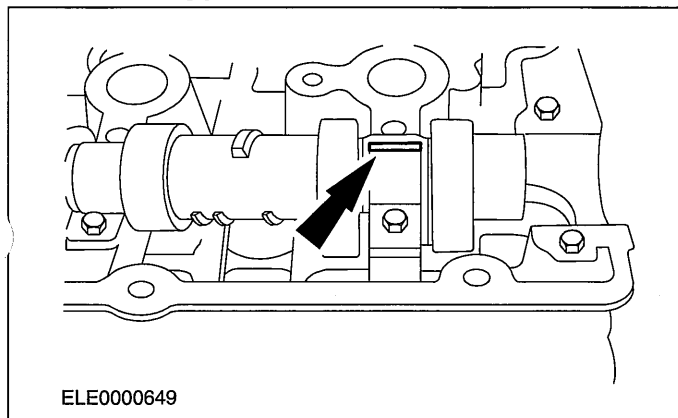
1. **NOTE:** Make sure that the following stages are followed exactly. The tappets or followers must be removed to carry out this measurement.

NOTE: Make sure that the camshaft is to specification.

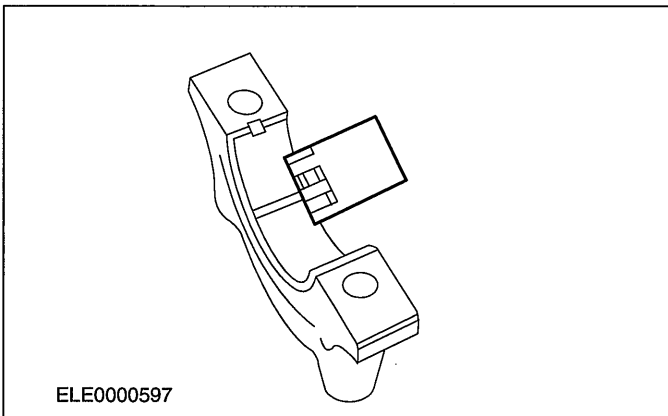
NOTE: The bearing caps and journals should be free from engine oil and dirt.

Position on a width of plastigage on the bearing cap.

- Insert the camshaft, without lubrication, into the cylinder head.
- Position a plastigage strip, which should be equal to the width of the bearing cap, on the bearing journal.



- The value that is read off is the bearing clearance.



2. Following the tightening specification, install the camshaft bearing caps. Refer to the corresponding Section 303-01.

3. **NOTE:** Do not strike the bearing caps.

Remove the camshaft bearing caps, refer to the corresponding Section 303-01.

4. Using the Plastigage, read off the measurement.

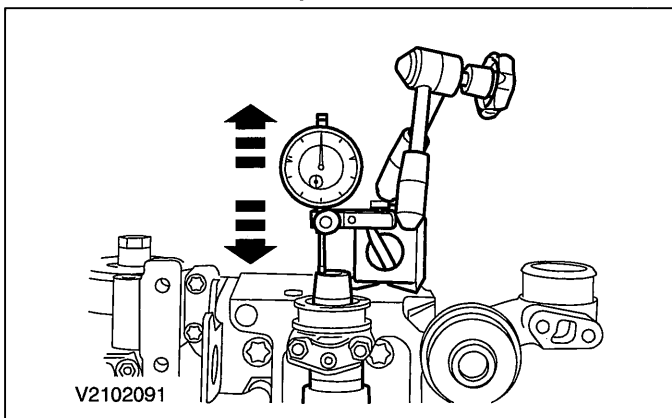
- Compare the width of plastigage with the plastigage scale.

GENERAL PROCEDURES**Camshaft End Play**

- 1. NOTE:** Make sure that the camshaft is to specification.

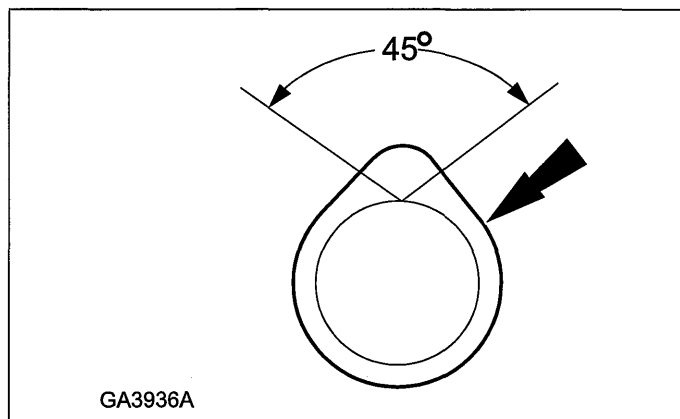
Using a Dial Indicator Gauge, measure the end play.

- Slide the camshaft in both directions. Read and note the maximum and minimum values on the Dial Indicator Gauge.
- End play = maximum value minus minimum value
- If the measurement is out of specification, install new components.



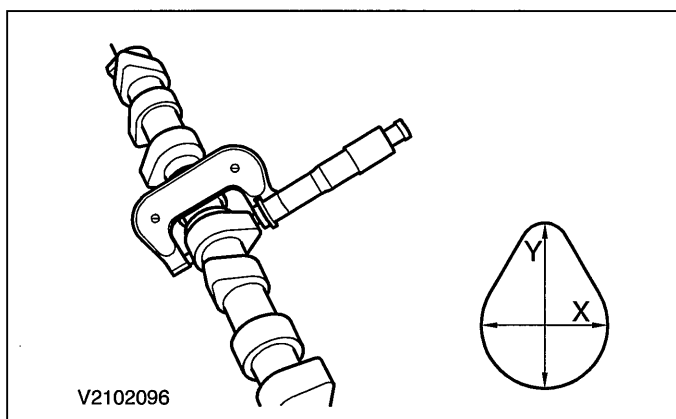
GENERAL PROCEDURES**Camshaft Surface Inspection**

1. **Inspect the camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.**



GENERAL PROCEDURES**Camshaft Lobe Lift****1. Determine the cam lift.**

- Using a micrometer measure the cam in two directions.
- The difference between the two measurements is the cam lift.

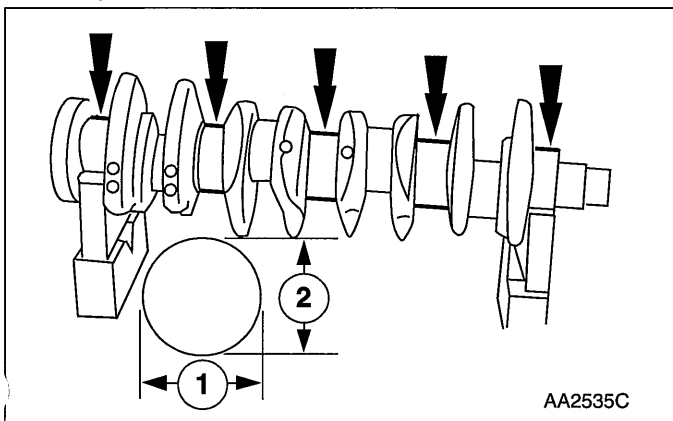


GENERAL PROCEDURES**Crankshaft Main Bearing Journal Diameter****General Equipment**

Micrometer

1. Measure the diameter of the main bearing journals and the big-end bearing journals.

- Repeat the measurement with the micrometer offset by 90°, in order to determine any eccentricity which may be present.
- Measure the journal at two different positions to determine any conicity which may be present.

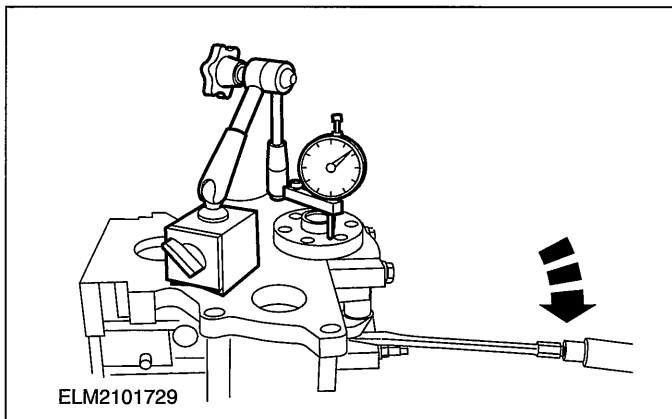


GENERAL PROCEDURES**Crankshaft End Play****General Equipment**

Dial indicator
Dial indicator fixture

1. Determine the end float

- Place on the dial indicator and bracket .
- Determine the end float by raising the crankshaft with the aid of a screwdriver.
- If necessary, correct the end float by using new thrust half washers.

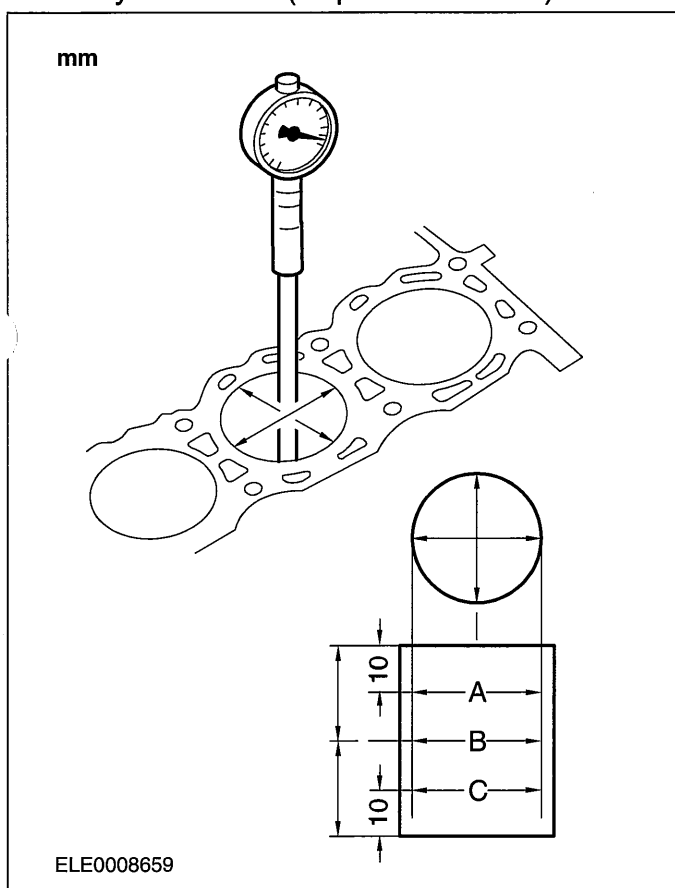


GENERAL PROCEDURES**Cylinder Bore Taper**

1. **NOTE:**The main bearing caps or lower crankcase must be in place and tightened to the specified torque; however, the bearing shells should not be installed.

Measure the cylinder bore with an internal micrometer.

- Carry out the measurements in different directions and at different heights to determine if there is any out-of-roundness or tapering.
- If the measurement is out of the specified range, install a new block or hone out the cylinder block (if applicable/allowed).

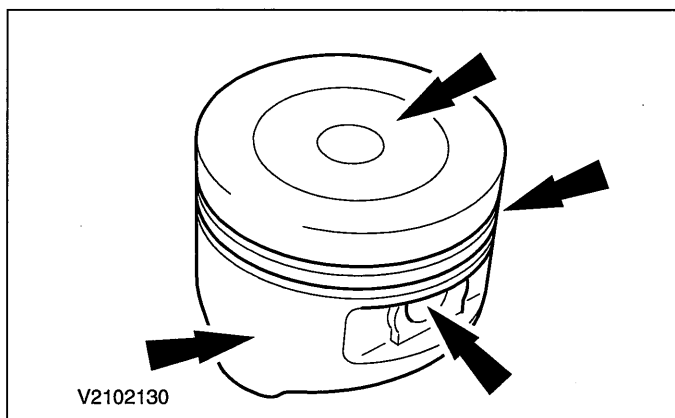


GENERAL PROCEDURES**Piston Inspection**

1. **⚠ CAUTION:** Do not use any aggressive cleaning fluid or a wire brush to clean the piston.

Carry out a visual inspection.

- Clean the piston skirt, pin bush, ring grooves and crown and check for wear or cracks.
- If there are signs of wear on the piston skirt, check whether the connecting rod is twisted or bent.

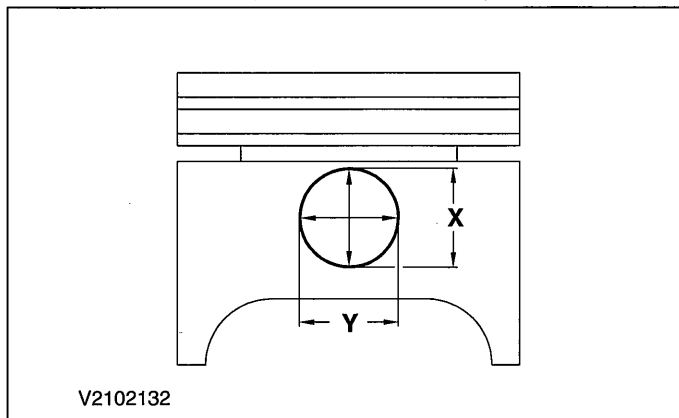


GENERAL PROCEDURES**Piston Pin to Bore Diameter**

- 1. NOTE:** The piston and piston pin form a matched pair. Do not mix up the components.

Measure the diameter of the piston pin bore.

- Measure the diameter in two directions.
- If the values are not to specification, install both a new piston and a new piston pin.

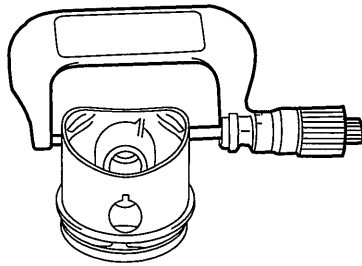


GENERAL PROCEDURES**Piston Diameter****General Equipment**

Micrometer

1. **NOTE:** Mark the piston to make sure the piston is installed correctly.

Using a Micrometer measure the piston diameter.

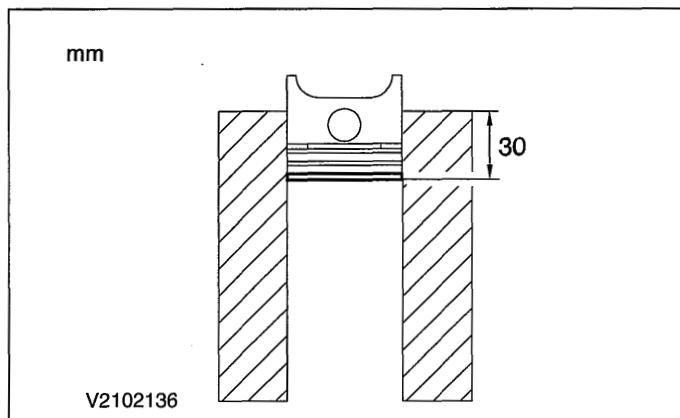


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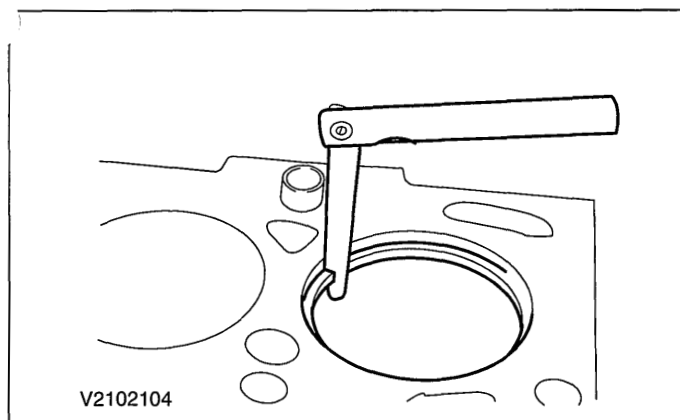
GENERAL PROCEDURES**Piston Ring End Gap**

1. **⚠ CAUTION:** Do not mix up the piston rings. Install the piston rings in the same position and location.

Take the piston ring and use a piston without rings to push the piston ring about 30 mm into the cylinder bore.



2. Using the Feeler Gauge, measure the piston ring gap.

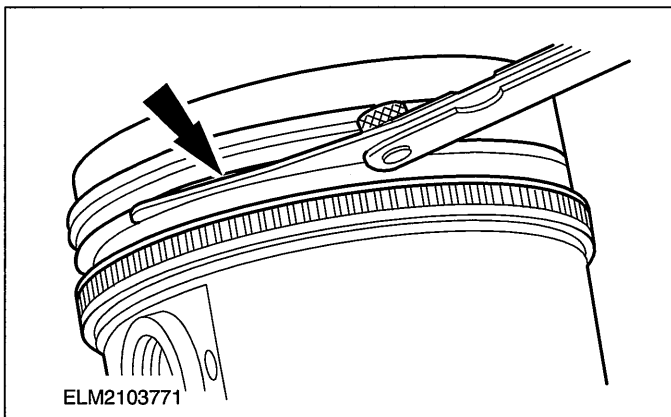


GENERAL PROCEDURES**Piston Ring-to-Groove Clearance****General Equipment**

Feeler Gauge

1. **NOTE:** The piston ring must protrude from the piston groove. To determine the piston ring clearance, insert the Feeler Gauge right to the back of the groove, behind the wear ridge.

Using the Feeler Gauge , measure the piston ring clearance.

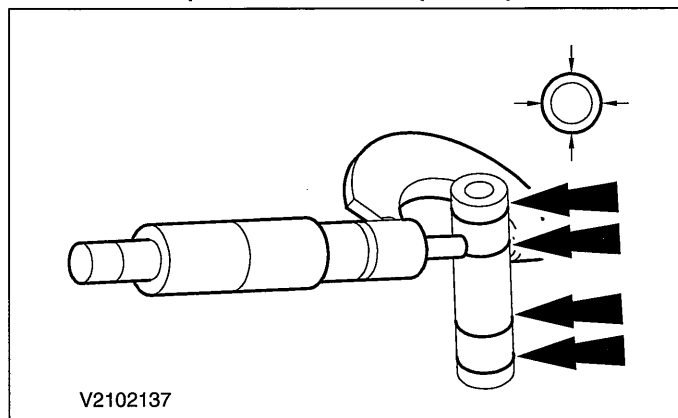


GENERAL PROCEDURES**Piston Pin Diameter**

- 1. NOTE:** The piston and piston pin are a matched pair. Do not mix up the components.

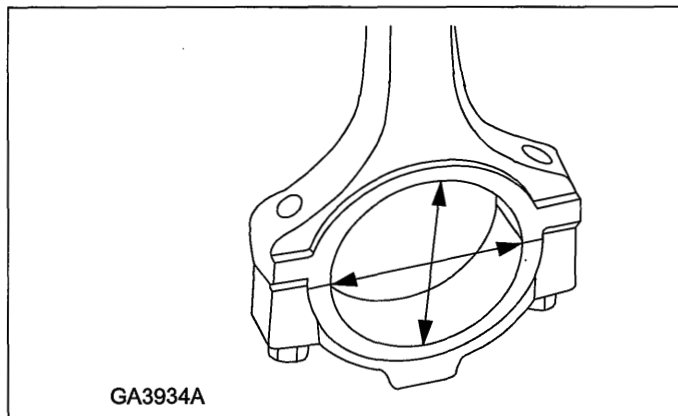
Measure the piston pin diameter.

- Measure the diameter in two directions.
- If the values are not to specification, install a new piston and a new piston pin.



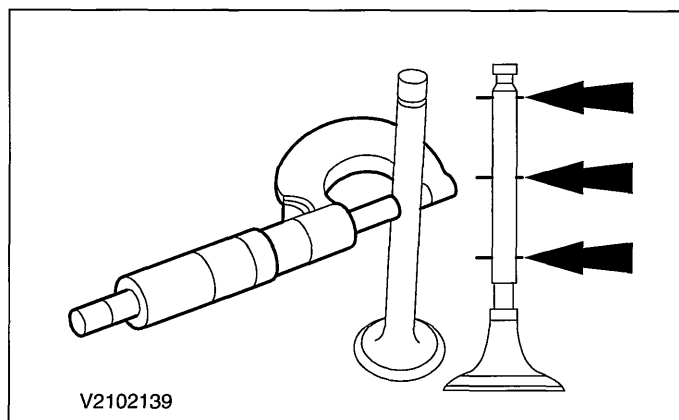
GENERAL PROCEDURES**Connecting Rod Large End Bore**

1. Measure the bearing bore in two directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round and the bearing bore is within specification.



GENERAL PROCEDURES**Valve Stem Diameter****1. Using a micrometer measure the diameter of the valve stems.**

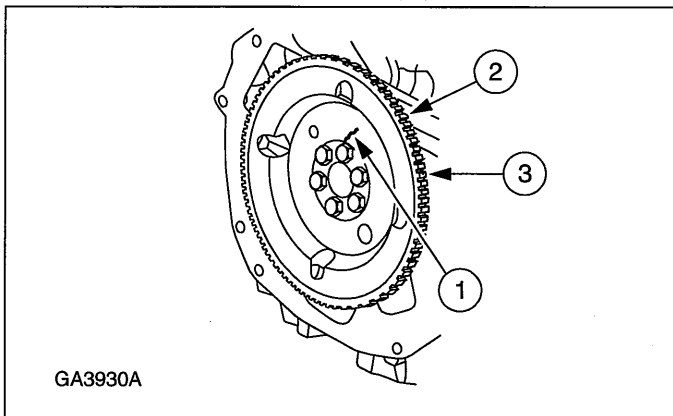
- If the measurements are not to specification, install a new valve.



GENERAL PROCEDURES**Flywheel Inspection**

1. Inspect the flywheel. If there is evidence of the following, install a new flywheel.

1. Cracks.
2. Worn ring gear teeth.
3. Chipped or cracked ring gear teeth.



GENERAL PROCEDURES**Flywheel Inspection — Vehicles With: Dual Mass Flywheel**

1. Inspection details for the dual mass flywheel are contained in the Diagnosis and Testing procedure. For additional information, refer to: (308-00 Manual Transmission/Transaxle and Clutch - General Information)

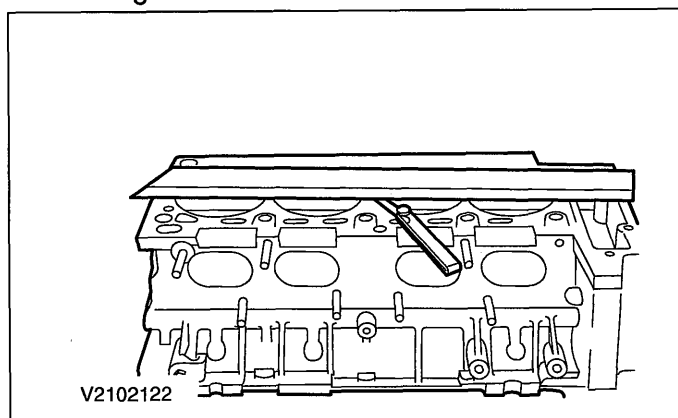
**Manual Transmission and Clutch - Vehicles With: MT-75 (Diagnosis and Testing),
Manual Transaxle and Clutch - Vehicles With: VXT-75 (Diagnosis and Testing),
Manual Transmission and Clutch - Vehicles With: MT82 (Diagnosis and Testing).**

GENERAL PROCEDURES**Cylinder Head Distortion****General Equipment**

Feeler gauge
Straight edge

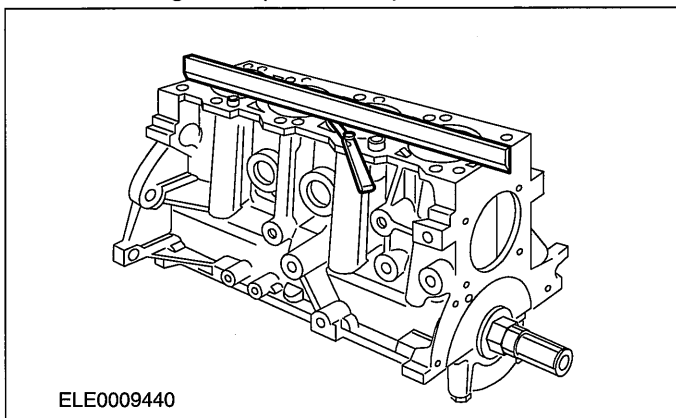
1. Using a straight edge and feeler gauge, measure the cylinder head distortion.

- Measure the mating face distortion.
- Refer to Specifications in the appropriate engine section.



GENERAL PROCEDURES**Cylinder Block Distortion**

1. **Using a Straight Edge and a Feeler Gauge, measure the cylinder block/cylinder head distortion.**
 - Measure the mating face distortion.
 - If the value is not to specification rework the mating face (if allowed).

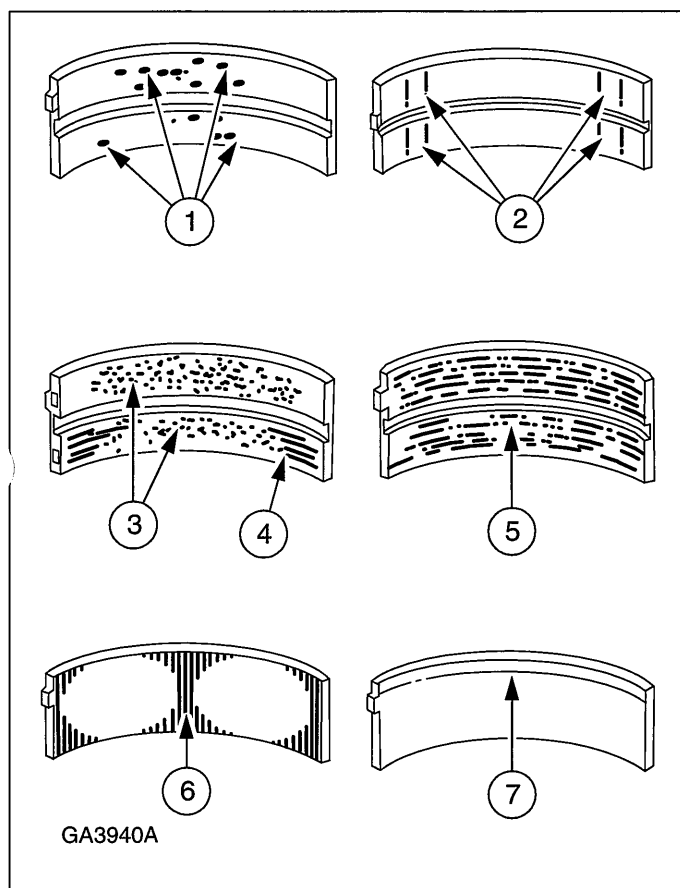


GENERAL PROCEDURES**Exhaust Manifold Cleaning and Inspection**

1. Inspect the cylinder head joining flanges of the exhaust manifold for evidence of exhaust gas leaks.
2. Inspect the exhaust manifold for cracks, damaged gasket surfaces, or other damage that would make it unfit for further use.

GENERAL PROCEDURES**Bearing Inspection****1. Inspect bearings for the following defects.**

1. Cratering - fatigue failure
2. Spot polishing - incorrect seating.
3. Imbedded dirt engine oil.
4. Scratching - dirty engine oil.
5. Base exposed - poor lubrication.
6. Both edges worn - journal damaged.
7. One edge worn - journal tapered or bearing not seated.

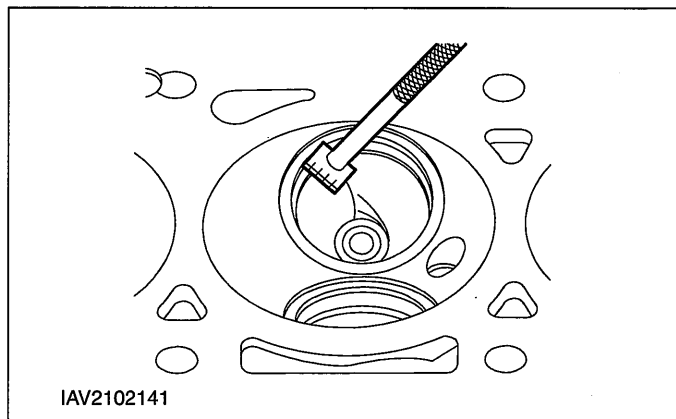


GENERAL PROCEDURES**Valve Seat Inspection****General Equipment**

Valve seat width scale

1. Measure the width of the valve seat.

- Measure the valve seat width using the Valve seat width scale.
- If the value is not to specification rework the valve seat.



SECTION 303-01A Engine — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS PAGE

SPECIFICATIONS

Specifications.....	303-01A-3
Engine Data - 1.25L.....	303-01A-3
Engine Data - 1.4L.....	303-01A-3
Engine Data - 1.6L.....	303-01A-3
Oil pressure.....	303-01A-4
Engine Oil Capacity - 1.25L/1.4L.....	303-01A-4
Engine Oil Capacity - 1.6L.....	303-01A-4
Valve Clearance - 1.25L/1.4L.....	303-01A-4
Valve Clearance - 1.6L.....	303-01A-4
Cylinder block - 1.25L.....	303-01A-5
Cylinder block - 1.4L.....	303-01A-5
Cylinder block - 1.6L.....	303-01A-5
Cylinder head.....	303-01A-5
Piston -1.25L.....	303-01A-5
Piston -1.4L.....	303-01A-5
Piston - 1.6L.....	303-01A-6

DESCRIPTION AND OPERATION

Engine.....	303-01A-9
1.4L/1.6L Duratec 16V engine.....	303-01A-9

DIAGNOSIS AND TESTING

Engine.....	303-01A-12
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GENERAL PROCEDURES

Valve Clearance Adjustment.....	303-01A-13
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IN-VEHICLE REPAIR

Crankshaft Front Seal.....	(21 467 0)	303-01A-14
Valves.....	(21 215 4)	303-01A-16
Intake Manifold.....	(21 183 0)	303-01A-19
Valve Cover.....	(21 141 0)	303-01A-28
Valve Seals.....	(21 238 0)	303-01A-30
Camshafts.....	(21 284 0)	303-01A-33
Camshaft Seal.....	(21 288 0)	303-01A-35
Timing Belt.....	(21 304 0)	303-01A-37
Exhaust Manifold.....	(21 187 0)	303-01A-47
Cylinder Head.....	(21 163 0)	303-01A-54
Oil Pan.....	(21 154 0)	303-01A-64

Oil Pump.....	(21 714 0)	303-01A-66
Crankshaft Rear Seal.....	(21 468 4)	303-01A-68

REMOVAL

Engine.....		303-01A-70
Engine — Vehicles With: Automatic Transaxle.....		303-01A-82

DISASSEMBLY

Engine.....	(21 134 8)	303-01A-95
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DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Cylinder Head.....	(21 165 6)	303-01A-105
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ASSEMBLY

Engine.....	(21 134 8)	303-01A-108
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INSTALLATION

Engine.....		303-01A-122
Engine — Vehicles With: Automatic Transaxle.....		303-01A-134

SPECIFICATIONS**Engine Data - 1.25L**

Description	
Code - Stage III	FUJB/M7JA
Code - Stage IV	FUJA/M7JB
Firing order	1-3-4-2
Bore	71.9 mm
Stroke	76.5 mm
Displacement	1242 cc
Compression ratio	10:1
Power output at 5700 rpm (Engine codes M7JA/M7JB)	51 kW (70 PS)
Power output at 5700 rpm (Engine codes FUJA/FUJB)	55 kW (75 PS)
Torque at 3500 rpm	110 Nm
Maximum permissible engine speed continuous	5950 rpm
Maximum permissible engine speed intermittent	6175 rpm
Idle speed	750 rpm
Maximum oil consumption	0.5L/1000km

Engine Data - 1.4L

Description	
Code	FXJA/FXJB
Firing order	1-3-4-2
Bore	76.0 mm
Stroke	76.5 mm
Displacement	1388 cc
Compression ratio	11:1
Power output at 5700 rpm	59 kW (80 PS)
Torque at 3500 rpm	124 Nm
Maximum permissible engine speed continuous	6450 rpm
Maximum permissible engine speed intermittent	6800 rpm
Idle speed	750 rpm
Maximum oil consumption	0.5L/1000km

Engine Data - 1.6L

Description	
Engine code	FYJA/FYJB
Firing order	1-3-4-2
Bore	79.0 mm
Stroke	81.4 mm

SPECIFICATIONS

Description	
Displacement	1595 cc
Compression ratio	11:1
Power output at 6000 rpm	74 kW (100 PS)
Torque at 4000 rpm	146 Nm
Maximum permissible engine speed continuous	6450 rpm
Maximum permissible engine speed intermittent	6800 rpm
Idle speed	750 rpm
Maximum oil consumption	0.5L/1000km

Oil pressure

Description	bar
Oil pressure (minimum, oil temperature 80°C) at 800 rpm	1.0
Oil pressure (minimum, oil temperature 80°C) at 2000 rpm	2.5
Pressure relief valve opening pressure	4

Engine Oil Capacity - 1.25L/1.4L

Description	Liters
Initial fill including oil filter	4.25
Service fill including oil filter (EFL500)	3.75
Service fill including oil filter (EFL10)	3.80
Service fill excluding oil filter	3.50

Engine Oil Capacity - 1.6L

Description	Liters
Initial fill including oil filter (EFL600)	4.50
Initial fill including oil filter (EFL10)	4.30
Service fill including oil filter (EFL600)	4.25
Service fill including oil filter (EFL10)	4.10
Service fill excluding oil filter	3.75

Valve Clearance - 1.25L/1.4L

Description	mm
Valve clearance (engine cold), intake	0.17 - 0.23
Valve clearance (engine cold), exhaust	0.27 - 0.33

Valve Clearance - 1.6L

Description	mm
Valve clearance (engine cold), intake	0.17 - 0.23
Valve clearance (engine cold), exhaust	0.31 - 0.37

SPECIFICATIONS**Cylinder block - 1.25L**

Description	mm
Cylinder bore diameter, class 1	71.900 - 71.910
Cylinder bore diameter, class 2	71.910 - 71.920
Cylinder bore diameter, class 3	71.920 - 71.930
Crankshaft end float	0.300 - 0.800

Cylinder block - 1.4L

Description	mm
Cylinder bore diameter, class 1	76.000 - 76.010
Cylinder bore diameter, class 2	76.010 - 76.020
Cylinder bore diameter, class 3	76.020 - 76.030
Crankshaft end float	0.300 - 0.800

Cylinder block - 1.6L

Description	mm
Cylinder bore diameter, class 1	79.000 - 79.010
Cylinder bore diameter, class 2	79.010 - 79.020
Cylinder bore diameter, class 3	79.020 - 79.030
Crankshaft end float	0.300 - 0.800

Cylinder head

Description	mm
Maximum distortion (mating face)	0.03

Piston -1.25L

Description	mm
Piston diameter, class 1 (uncoated)	71.875 - 71.885
Piston diameter, class 2 (uncoated)	71.885 - 71.895
Piston diameter, class 3 (uncoated)	71.895 - 71.905
Piston ring gaps, upper	0.170 - 0.270
Piston ring gaps, middle	0.700 - 0.900
Piston ring gaps, lower	0.200 - 0.900
Piston ring end float, upper	0.040 - 0.080
Piston ring end float, middle	0.025 - 0.070

Piston -1.4L

Description	mm
Piston diameter, class 1 (uncoated)	75.960 - 75.970
Piston diameter, class 2 (uncoated)	75.970 - 75.980
Piston diameter, class 3 (uncoated)	75.980 - 75.990

SPECIFICATIONS

Description	mm
Piston ring gaps, upper	0.170 - 0.270
Piston ring gaps, middle	0.700 - 0.900
Piston ring gaps, lower	0.200 - 0.900
Piston ring end float, upper	0.040 - 0.080
Piston ring end float, middle	0.025 - 0.070

Piston - 1.6L

Description	mm
Piston diameter, class 1 (coated)	78.975 - 79.005
Piston diameter, class 2 (coated)	78.985 - 79.015
Piston diameter, class 3 (coated)	78.995 - 79.025
Piston ring gaps, upper	0.180 - 0.280
Piston ring gaps, middle	0.700 - 0.900
Piston ring gaps, lower	0.200 - 0.900
Piston ring end float, upper	0.040 - 0.080
Piston ring end float, middle	0.025 - 0.070

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Ford Formula E SAE 5W-30 Engine Oil	WSS-M2C913-B
Sealant, oil pan contact surface to oil seal carrier, oil pan to cylinder block, oil pan to oil pump	WSE-M4G323-A4
Oil pressure switch sealer (Loctite 243)	WSK-M2G349-A7
Sealant, camshaft bearing cap to cylinder head	WSK-M2G348-A2
Silicone grease	ESE-M1C171-AA

Torque Specifications

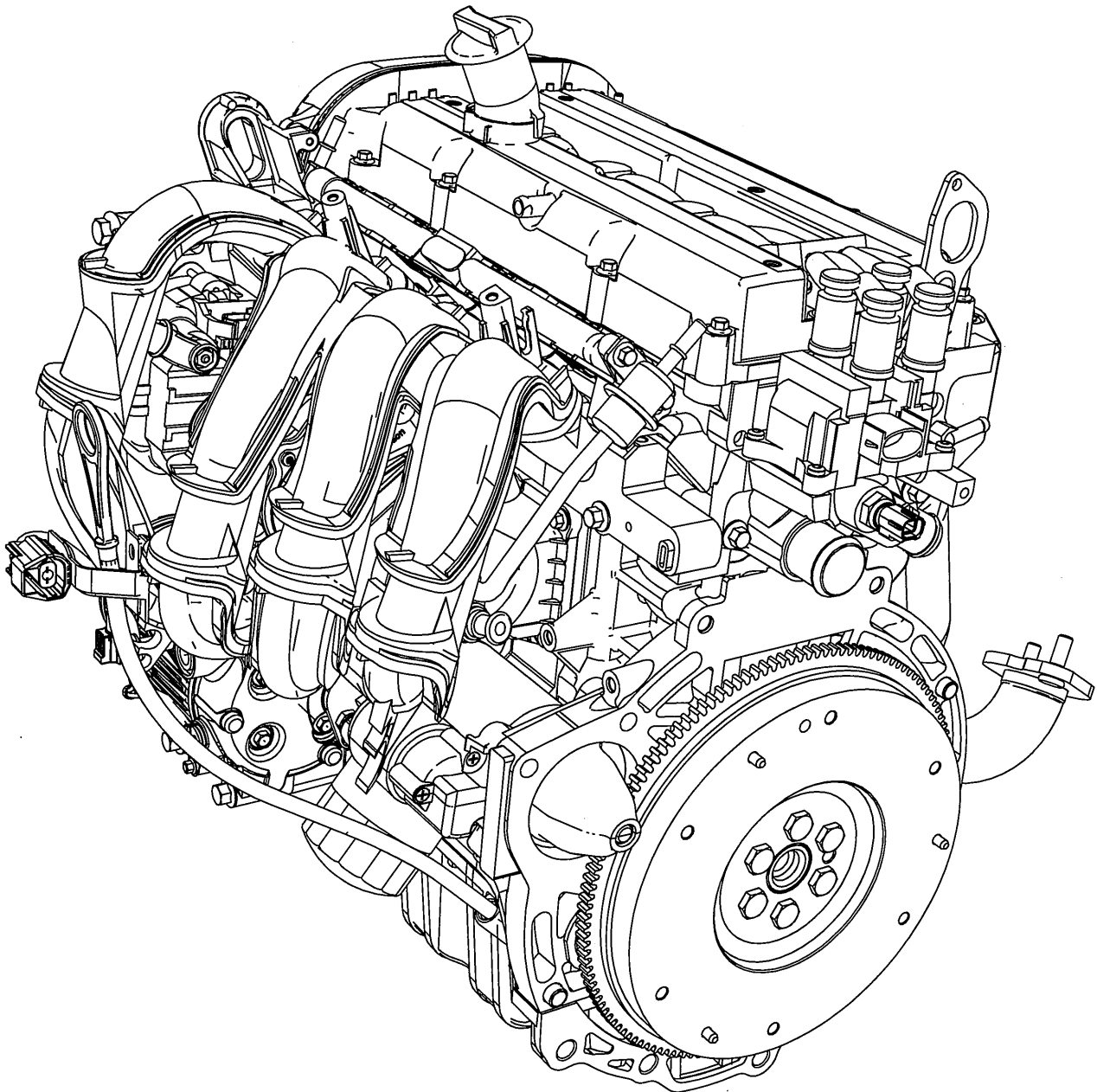
Description	Nm	lb-ft	lb-in
Exhaust flexible pipe to catalytic converter retaining nuts	44	33	-
Lower arm to wheel knuckle pinch bolt	48	35	-
Intermediate shaft center bearing bracket to cylinder block retaining bolts	24	18	-
Starter motor cable retaining nut	12	9	-
Exhaust manifold heat shield retaining bolts	12	9	-
Ground cable to transaxle retaining bolt	47	35	-
Ground cable to automatic transaxle	25	18	-
Coolant expansion tank retaining bolts	8	-	71

SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Engine front mount bracket to cylinder block retaining bolts	55	41	-
Engine front mount retaining nuts and bolts	48	35	-
Engine rear mount center retaining nut	90	66	-
Engine rear mount outer retaining nuts	48	35	-
Engine support insulator retaining bolts	48	35	-
Power steering line support bracket retaining bolts	25	18	-
Power steering line to power steering pump	40	30	-
Air conditioning (A/C) compressor to cylinder block retaining bolts	25	18	-
Generator to cylinder block top rear and lower retaining bolts	47	35	-
Water pump retaining bolts	9	-	80
Water pump pulley retaining bolts	27	20	-
Oil pump to cylinder block retaining bolts	9	-	80
Oil pan to cylinder block retaining bolts	20	15	-
Oil level indicator tube bracket retaining bolt	4	-	35
Engine oil drain plug	28	21	-
Oil pump pickup pipe to cylinder block retaining bolts	9	-	80
Oil pressure switch	15	11	-
Cylinder head bolts	a)	-	-
Valve cover retaining bolts	a)	-	-
Intake manifold to cylinder head retaining bolts	18	13	-
Exhaust manifold to cylinder head	a)	-	-
Exhaust manifold to cylinder block	47	35	-
Camshaft position (CMP) sensor	9	-	80
Timing belt rear cover retaining bolts	9	-	80
Spark plugs	15	11	-
Engine rear lifting eye retaining bolts	20	15	-
Coolant distribution housing retaining bolts	20	15	-
Ignition coil to coolant distribution housing	6	-	53
Camshaft bearing cap retaining bolts	a)	-	-
Timing belt upper cover to cylinder block retaining bolts	9	-	80
Timing belt lower cover to cylinder block retaining bolts	9	-	80

SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Timing belt tensioner two bolts fixing	20	15	-
Timing belt tensioner central bolt fixing	25	18	-
Camshaft pulley retaining bolt	60	44	-
Crankshaft position (CKP) sensor bracket to cylinder block retaining bolts	9	-	80
Crankshaft rear oil seal carrier retaining bolts	9	-	80
Cylinder block blanking plug	20	15	-
Crankshaft pulley retaining bolt	a)	-	-
Engine coolant temperature (ECT) sensor	18	13	-
Exhaust manifold studs	10	-	89
Fuel rail to intake manifold	15	11	-
Knock sensor (KS) retaining bolt	20	15	-
Positive crankcase ventilation (PCV) cover retaining bolts	9	-	80
Thermostat housing retaining bolts	9	-	80
Flywheel to crankshaft retaining bolts	a)	-	-
Transaxle retaining bolts	47	35	-
Torque converter retaining nuts	27	20	
Selector lever cable bracket to transaxle	20	15	
Intermediate shaft center bearing cap retaining nuts	25	18	-
Ground cable to cylinder head retaining bolt	18	13	-
Suspension strut and spring assembly top mount retaining nuts	25	18	-
a) Refer to procedure in this section.			

DESCRIPTION AND OPERATION**Engine****1.4L/1.6L Duratec 16V engine****Overview**

E30494

The 1.4L and 1.6L Duratec 16V inline engines have already been installed on Focus vehicles under the name of the Zetec-SE engine.

Details of this engine have been modified. The routing of the pipes in the intake manifold has been revised, and for the first time the throttle valve is electronically controlled.

The intake air routing and the air cleaner housing have also been changed. The pistons and piston rings have been modified. The cylinder head cover is made of plastic.

In addition, the auxiliary drive belt is an elastic multi-groove belt without a separate tensioning roller.

DESCRIPTION AND OPERATION**Engine**

Cross-mounted 16-valve DOHC engines with 59 kW (80 PS) and 74 kW (100 PS) respectively.

Valve train with mechanical bucket tappets

Cylinder block and cylinder head made of an aluminium alloy

Auxiliary drive via a self-tensioning belt without a belt tensioner

Engine management

Sequential multi-port fuel injection (SFI)

temperature and manifold absolute pressure (T-MAP) sensor in conjunction with a Siemens powertrain control module (PCM).

Knock control

PCM with 84 pins and integrated passive anti-theft system (PATS) immobiliser.

Engine emission control

European emissions level IV

European on-board diagnosis (EOBD) for the monitoring of emissions-relevant components.

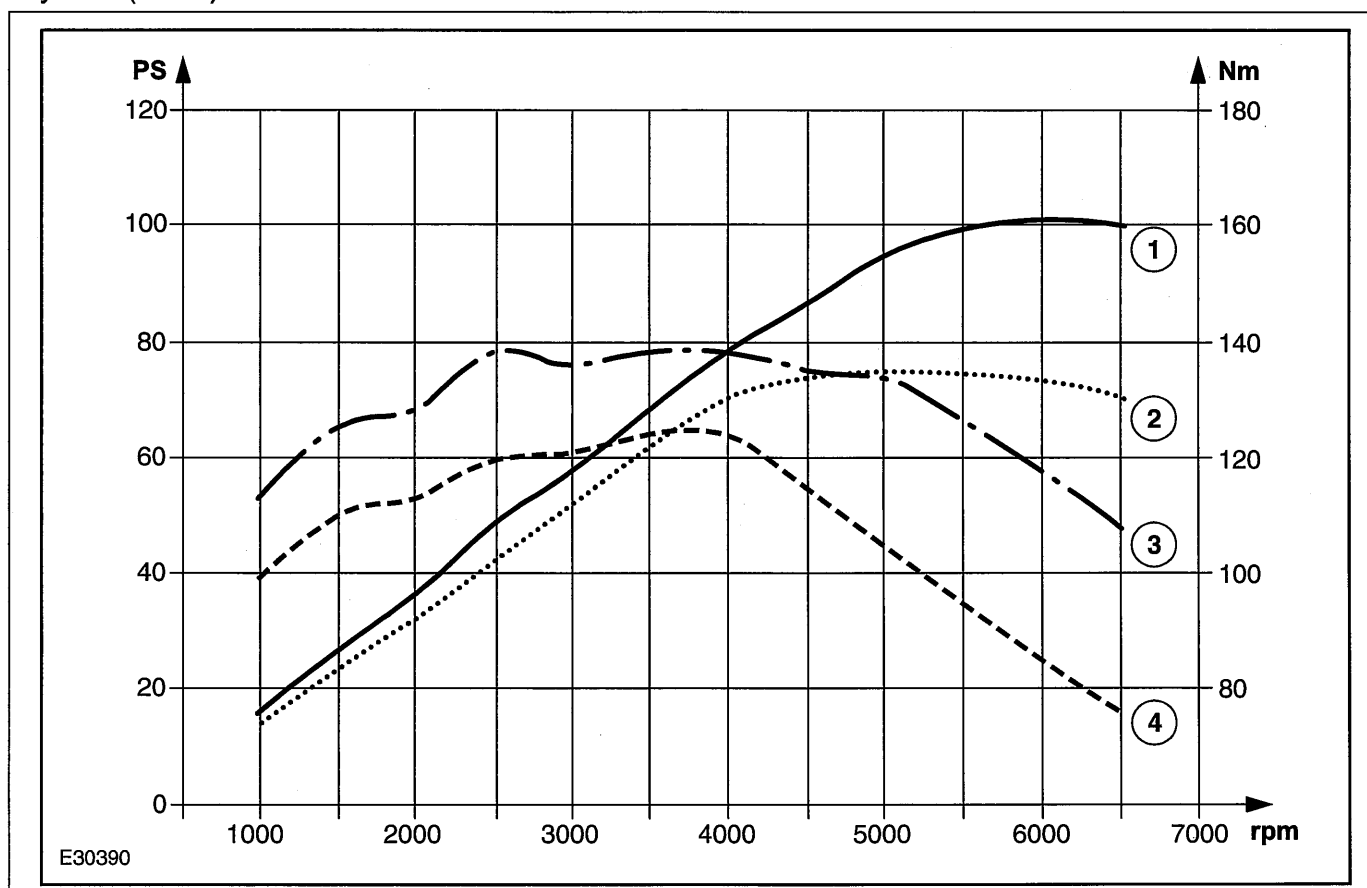
Diagnosis

WDS diagnosis CD B17.

Instrument cluster (engine indicator lamp)

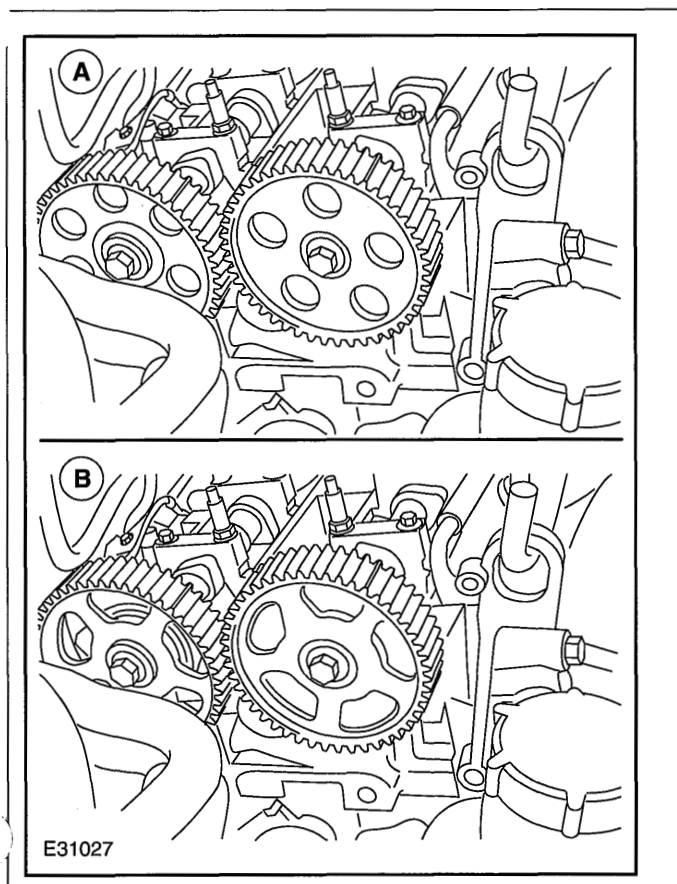
Torque/power

The Duratec 16V engines are characterised by their high level of running refinement, low emission levels and balanced development of power.



Item	Description
1	Power curve for the 1.6L-Duratec 16V engine
2	Power curve for the 1.4L-Duratec 16V engine

Item	Description
3	Torque curve for the 1.6L-Duratec 16V engine
4	Torque curve for the 1.4L-Duratec 16V engine

DESCRIPTION AND OPERATION**Valve train**

Item	Description
A	Camshaft timing belt pulleys, 1.4/1.6L Zetec SE engine
B	Camshaft timing belt pulleys, 1.4/1.6L Duratec 16V engine

As a significant modification of the valve train, the camshaft timing belt pulleys are now made of reinforced plastic. The design has also been changed in the process.

The basic procedure for installing the camshaft timing belt pulleys remains the same.

It should however be noted that plastic sleeves are located above the stud on Special Tool 205-072 (15-030 A) in order to protect the camshaft timing belt pulley against damage.

DIAGNOSIS AND TESTING**Engine**

REFER to Section 303-00 [Engine System -
General Information].

GENERAL PROCEDURES**Valve Clearance Adjustment****General Equipment**

Feeler gauges

1. Remove the valve cover.

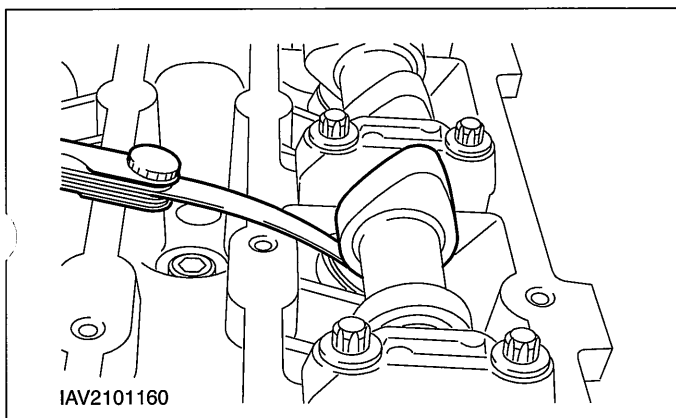
For additional information, refer to **Valve Cover** in this section.

2. ⚠CAUTION: Only turn the engine in the normal direction of rotation.

Turn the engine until piston No. 1 is at top dead center (TDC).

3. NOTE: Note down each cylinder number and the valve clearances measured.

Using a suitable set of feeler gauges, measure the valve clearances.

**4. ⚠CAUTION:** Only turn the engine in the normal direction of rotation.

Turn the engine until each piston is at TDC and measure the valve clearances.

5. NOTE: Only carry out the following steps when the valve clearance(s) require adjustment.

For additional information, refer to **Specifications** in this section.

Remove the camshafts.

For additional information, refer to **Camshafts** in this section.

6. NOTE: The number on the tappet indicates the tappet thickness.

Determine the tappet thickness required:

1. Remove the tappet and read the thickness from the underside.

2. Tappet thickness required = thickness of currently installed tappet + the measured valve clearance - the required valve clearance.

For additional information, refer to **Specifications** in this section.

3. Install the correct tappet.

7. NOTE: Do not install the timing belt at this stage.

Install the camshafts.

For additional information, refer to **Camshafts** in this section.

8. NOTE: Turn the camshafts to measure the valve clearances.

Measure the valve clearances and repeat this procedure as necessary until all valve clearances are within the specified tolerance.

9. Install the timing belt.

For additional information, refer to **Timing Belt** in this section.

10. Install the valve cover.

For additional information, refer to **Valve Cover** in this section.

IN-VEHICLE REPAIR

Crankshaft Front Seal(21 467 0)

Special Tool(s)

21143	Remover, Crankshaft Oil Seal 303-293 (21-143)
21171	Installer, Crankshaft Oil Seal 303-395 (21-171)

Materials

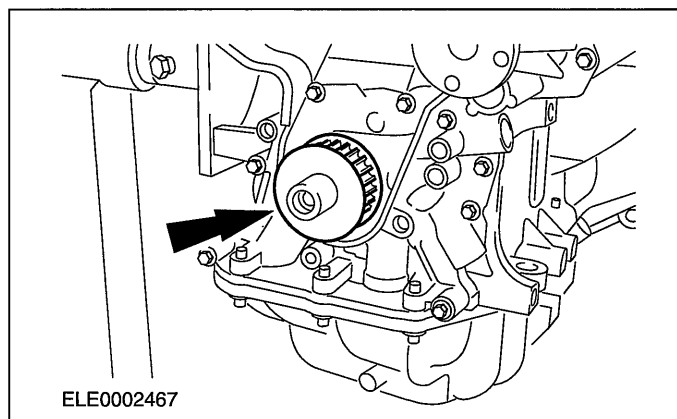
Name	Specification
Engine Oil	WSS-M2C912-A1

Removal

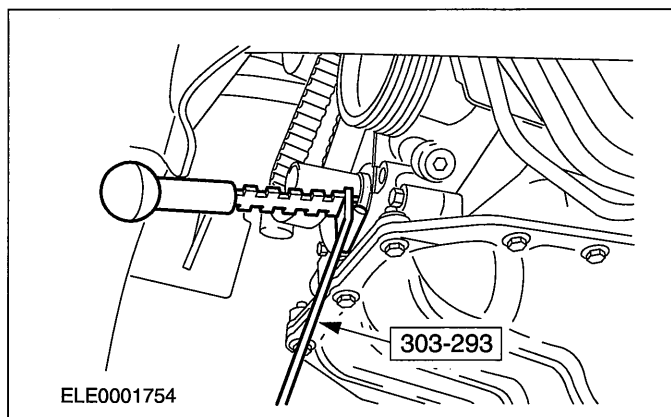
1. Remove the timing belt.

For additional information, refer to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

2. Remove the crankshaft timing pulley.



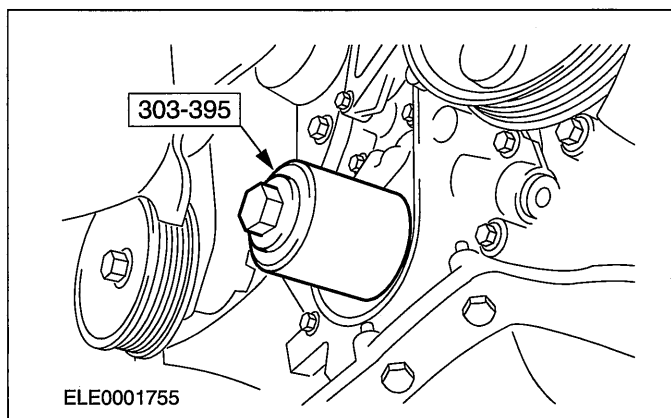
3. Using the special tool, remove the crankshaft front oil seal.



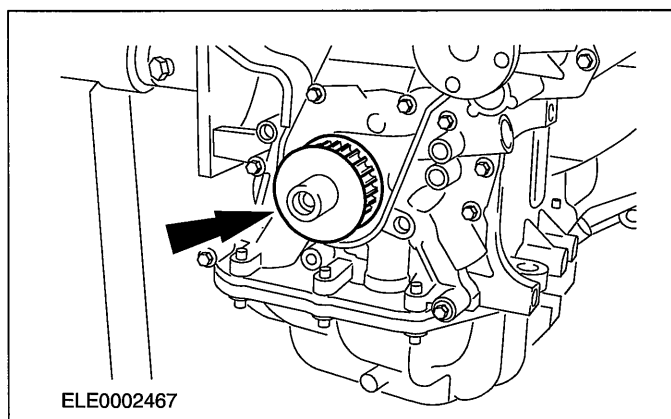
Installation

1. Coat the crankshaft front oil seal lip with clean engine oil.

2. Using the special tool, install the crankshaft front oil seal.



3. Install the crankshaft timing pulley.



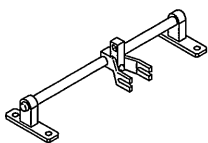
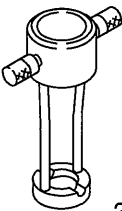
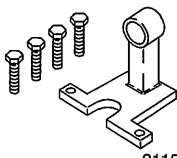
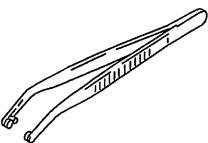
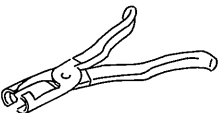
IN-VEHICLE REPAIR**4. Install the timing belt.**

For additional information, refer to: Timing
Belt (303-01 Engine - 1.25L Duratec-16V
(Sigma)/1.4L Duratec-16V (Sigma)/1.6L
Duratec-16V (Sigma), In-vehicle Repair).

IN-VEHICLE REPAIR

Valves(21 215 4)

Special Tool(s)

 21155	Compressor, Valve Spring 303-361 (21-155)
 2115504	Adaptor for 303-361 303-361-04 (21-155-04)
 2115505	Adaptor for 303-361- 303-361-05 (21-155-05)
 21156	Installer, Valve Stem Collets 303-362 (21-156)
 21211	Pliers, Valve Stem Oil Seals 303-508 (21-211)

Materials

Name	Specification
Engine Oil	WSS-M2C912-A1

Removal

1. Remove the cylinder head.

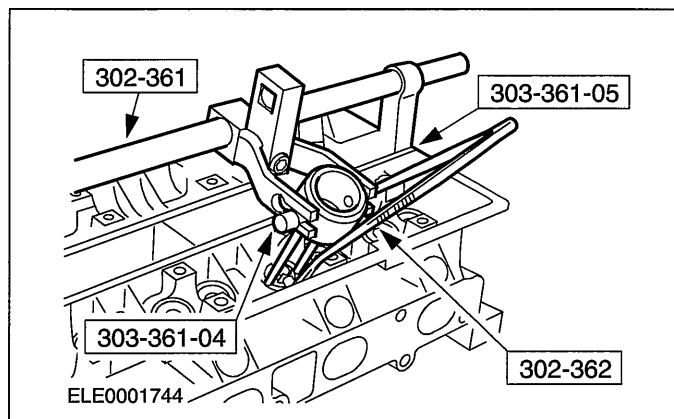
For additional information, refer to Cylinder head in this section.

2. **CAUTION:** Keep the valve tappets in order for reassembly.

Remove the valve tappets.

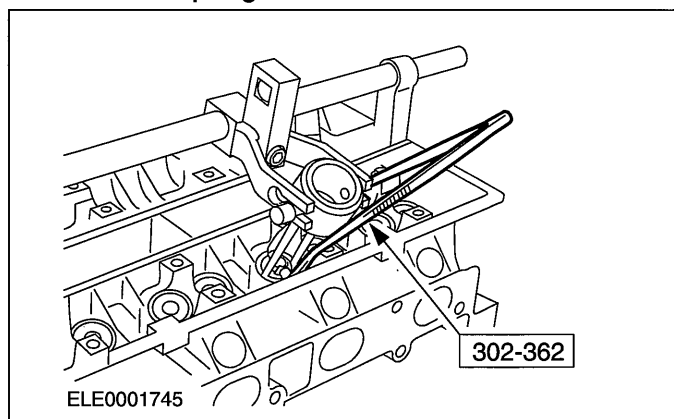
3. **NOTE:** Insert wooden wedges in the combustion chamber recesses in the cylinder head so that the valves are held in place for removal.

Install the special tools.



4. Remove the valve springs.

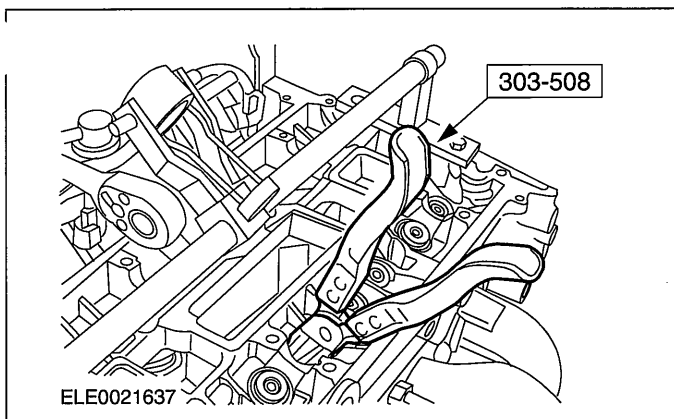
- Compress the valve springs.
- Remove the valve collets.
- Remove the valve spring retainers and the valve springs.



5. Using the special tool, remove the valve seals.

IN-VEHICLE REPAIR

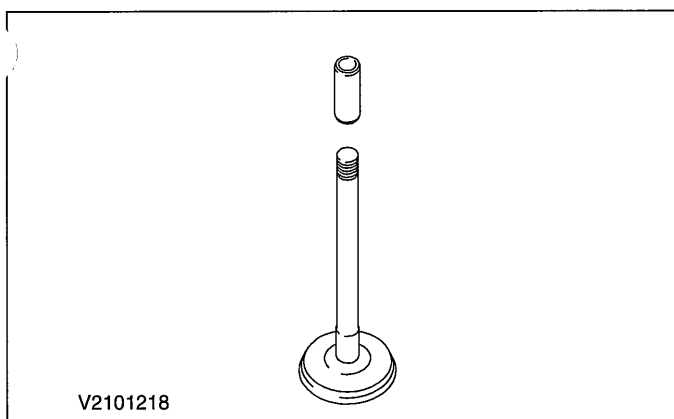
- Discard the valve seals.



6. Remove the valves.

Installation

1. Coat the valve stem with clean engine oil.
2. Install the valves.
3. Install a valve stem mounting sleeve over the valve collet groove (valve shown removed for clarity).



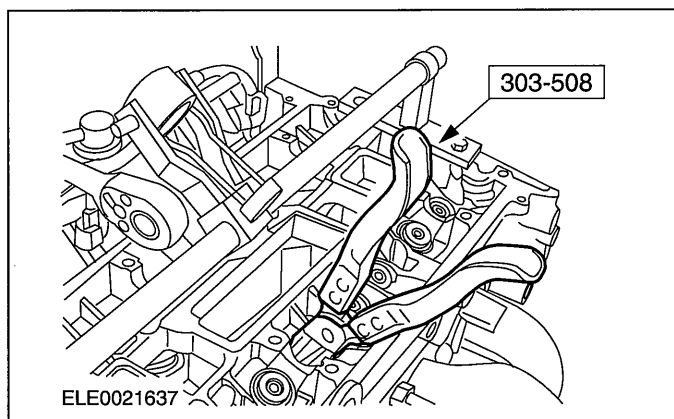
4. **⚠ CAUTION:** The valve seal for the intake valve is green. The valve seal for the exhaust valve is brown.

NOTE: Insert wooden wedges in the combustion chamber recesses in the cylinder head so that the valves are held in place for installation.

NOTE: Install new valve seals.

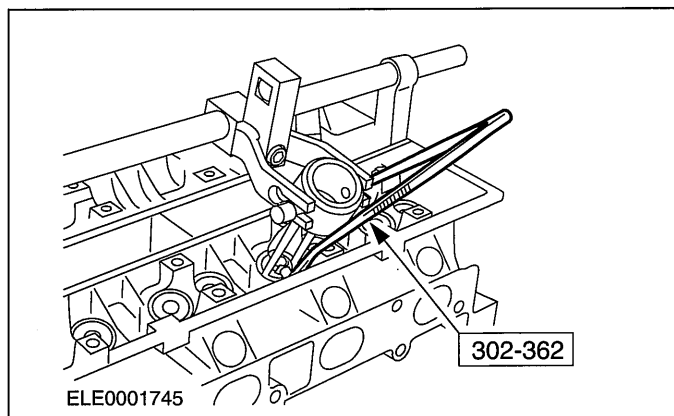
NOTE: Coat the valve seal lip and the valve stem with clean engine oil.

Using the special tool, install the valve seals.

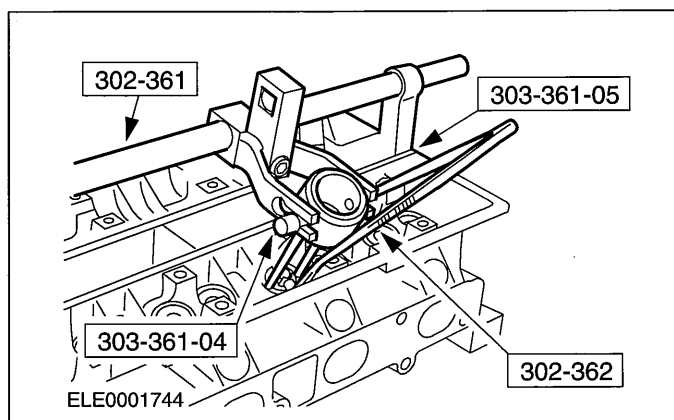


5. Using the special tool, install the valve springs.

- Install the valve spring retainers and the valve springs.
- Compress the valve springs.
- Install the valve collets.



6. Remove the special tools.



7. **⚠ CAUTION:** The valve tappets must be installed in their original locations.
Install the valve tappets.

IN-VEHICLE REPAIR**8. Install the cylinder head.**

For additional information, refer to Cylinder head in this section.

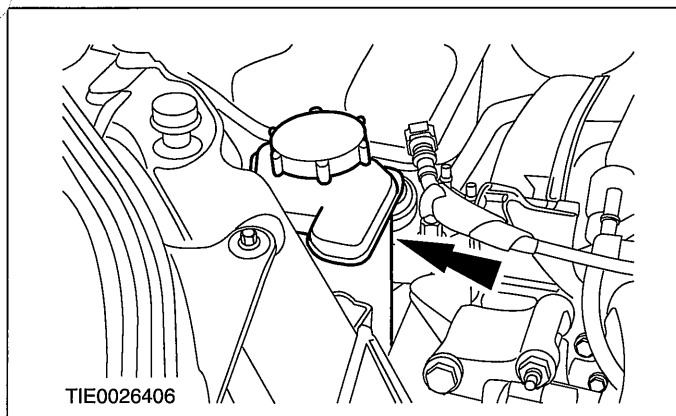
IN-VEHICLE REPAIR

Intake Manifold(21 183 0)

Removal

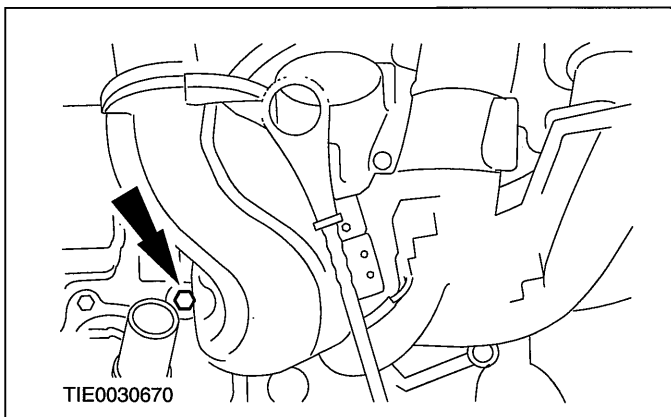
▲ **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. Release the fuel system pressure. For additional information, refer to Section 310-00 [Fuel System - General Information].
2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
3. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
4. Detach the power steering fluid reservoir from the bracket and position it to one side.

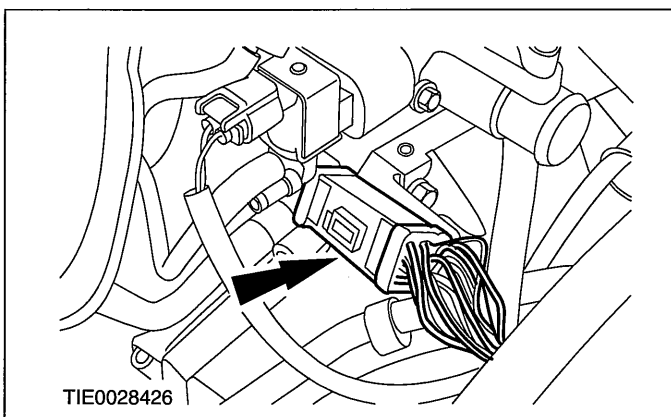


5. Remove the accessory drive belt. For additional information, refer to Section 303-05 [Accessory Drive].

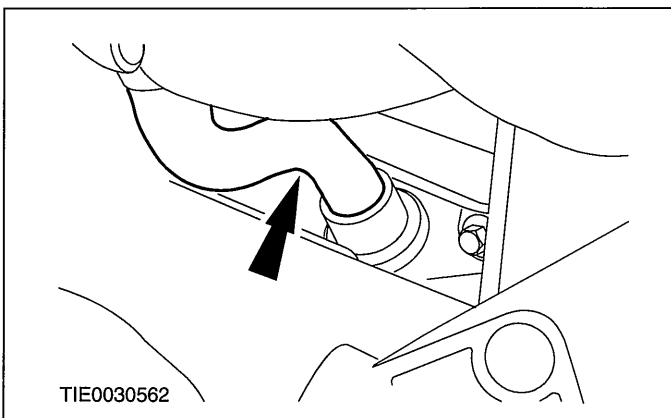
6. Remove the intake manifold lower retaining bolt.



7. Disconnect the engine wiring harness electrical connector.

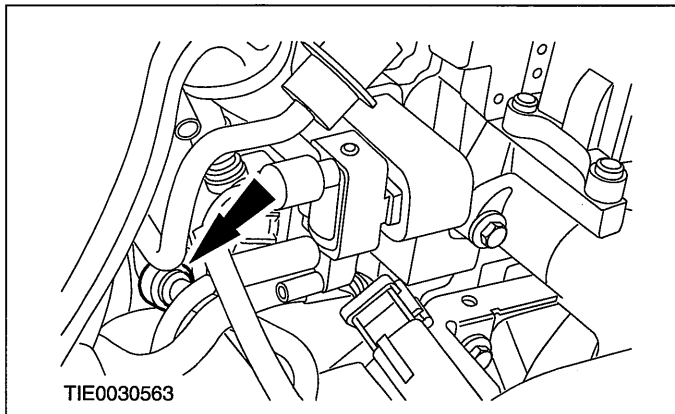


8. Disconnect the positive crankcase ventilation (PCV) hose from the PCV.

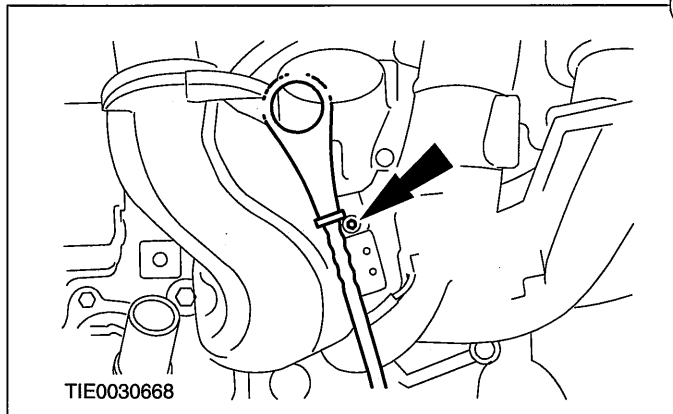


IN-VEHICLE REPAIR

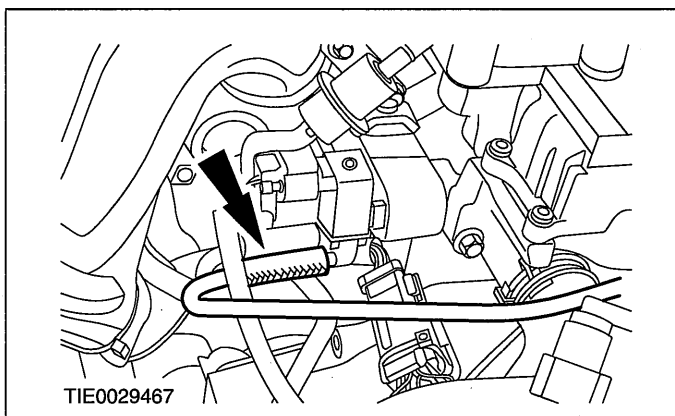
9. Disconnect the brake booster vacuum line from the intake manifold.



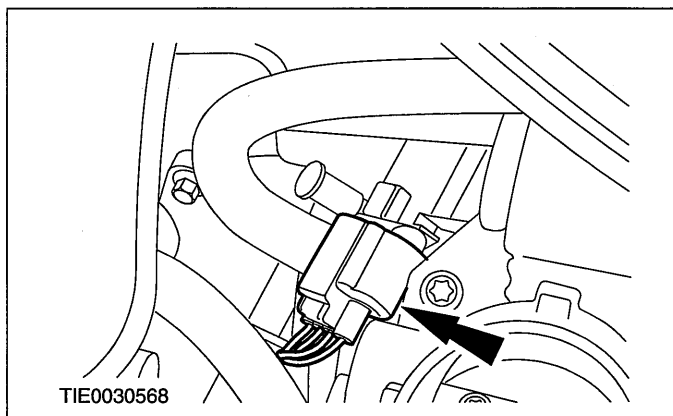
12. Detach the oil level indicator tube from the intake manifold.



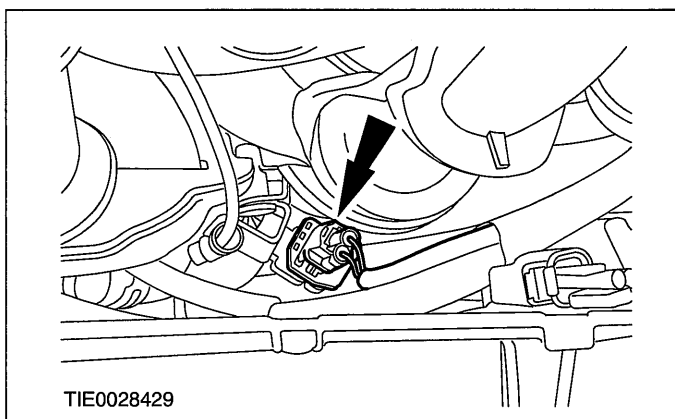
10. Disconnect the evaporate emission (EVAP) hose from the EVAP valve.



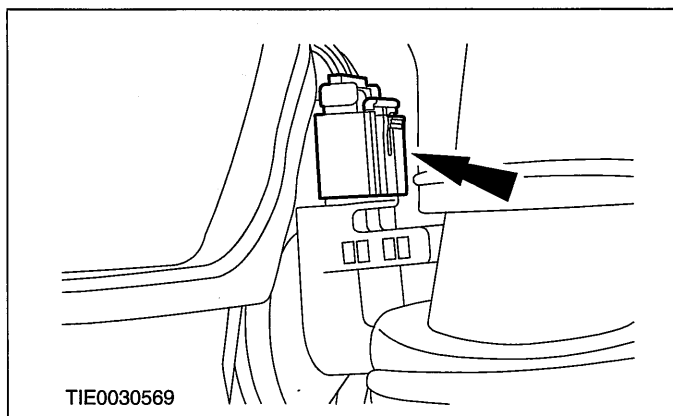
13. Disconnect the temperature and manifold absolute pressure (T-MAP) sensor electrical connector.



11. Disconnect the knock sensor (KS) electrical connector.

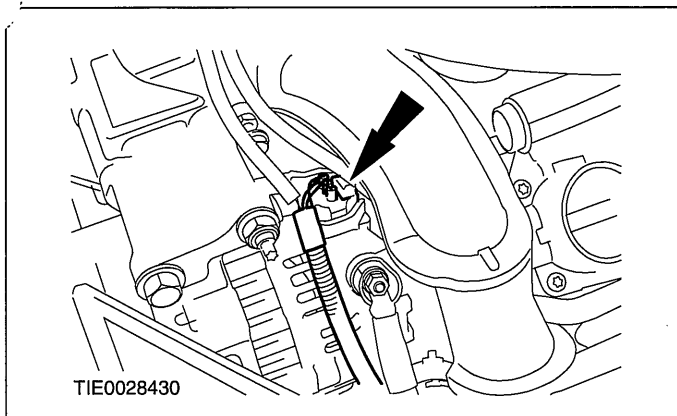


14. Disconnect the throttle plate control motor (DC-ISC) electrical connector.



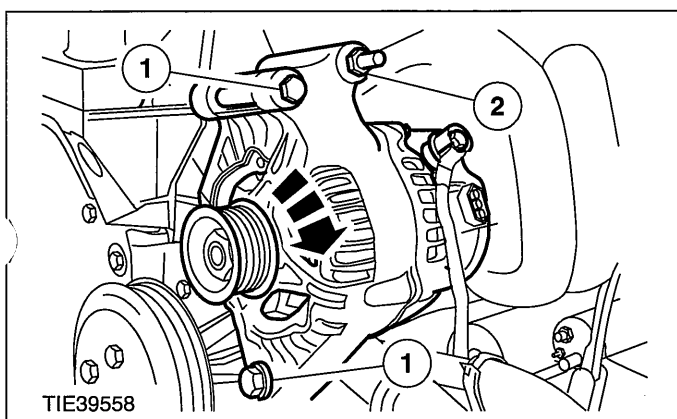
IN-VEHICLE REPAIR

- 15. Disconnect the generator electrical connector.**

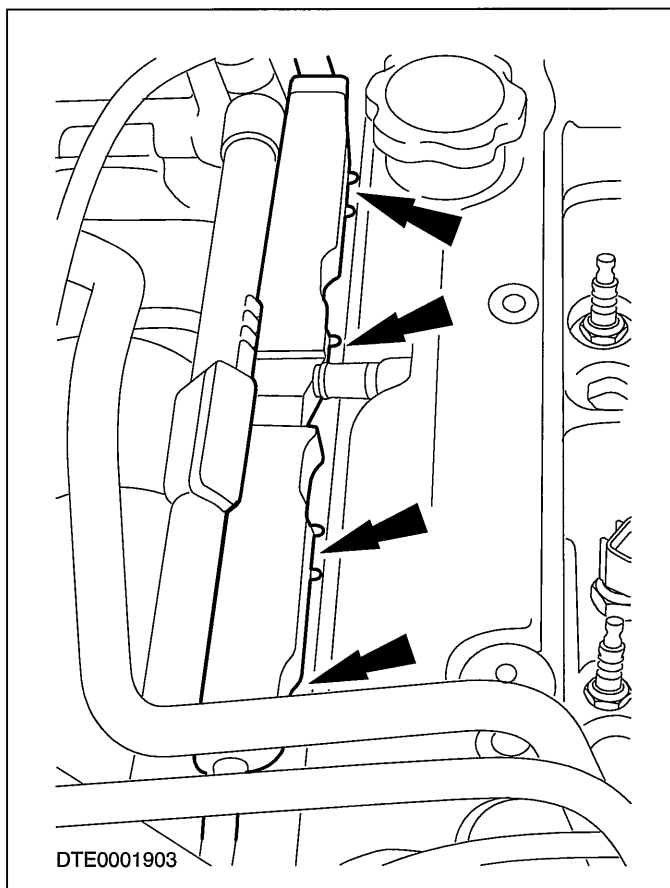


- 16. Detach the generator from the engine.**

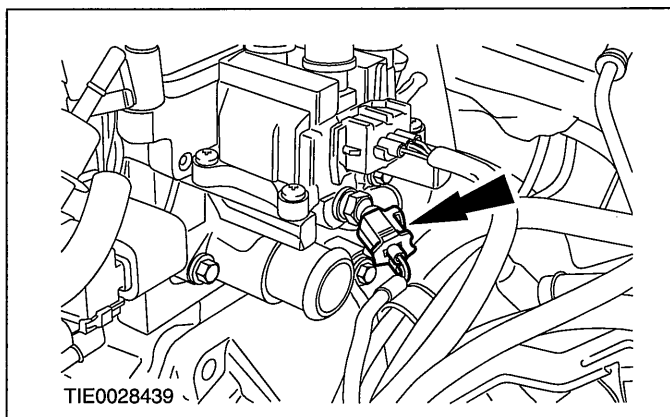
1. Remove the bolts.
2. Remove the nut and the stud.



- 17. Disconnect the fuel injector electrical connectors and position it with the engine wiring harness to one side.**

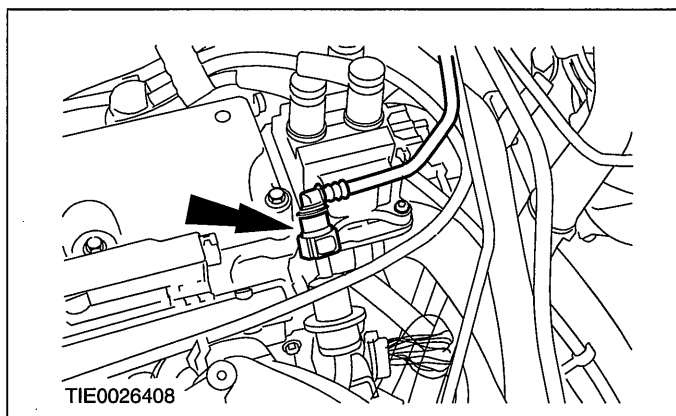


- 18. Disconnect the engine coolant temperature (ECT) sensor electrical connector.**

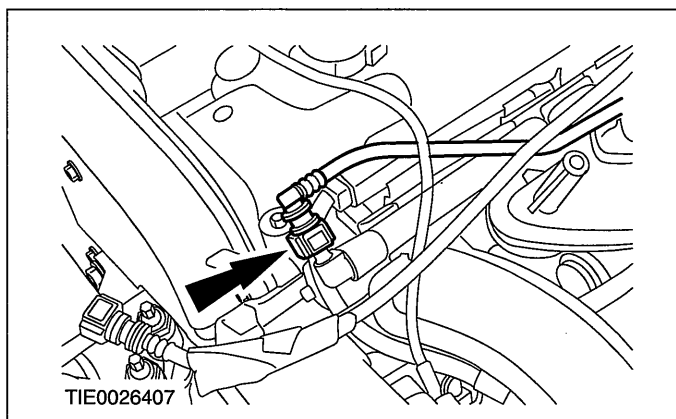


IN-VEHICLE REPAIR

- 19. Disconnect the fuel supply line quick release coupling. For additional information, refer to Section 310-00 [Fuel System - General Information].**

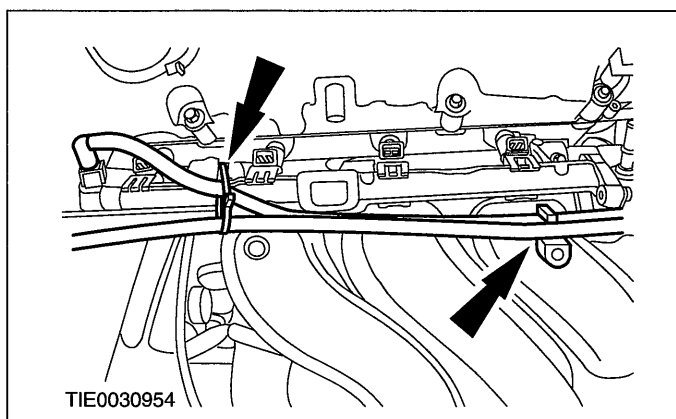


- 20. Disconnect the fuel return line quick release coupling. For additional information, refer to Section 310-00 [Fuel System - General Information].**



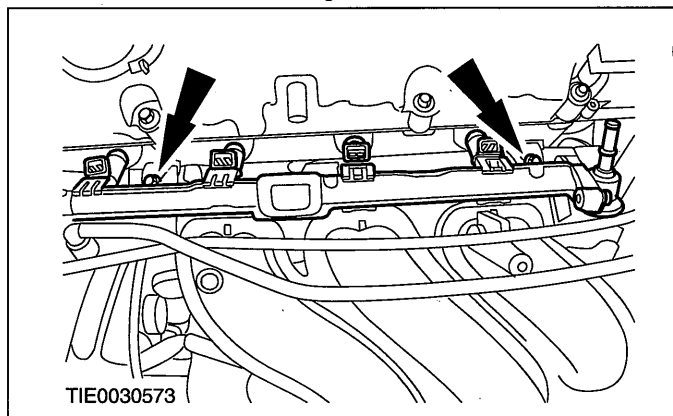
- 21. Detach the fuel line from the intake manifold and position it to one side.**

- Remove the cable tie.

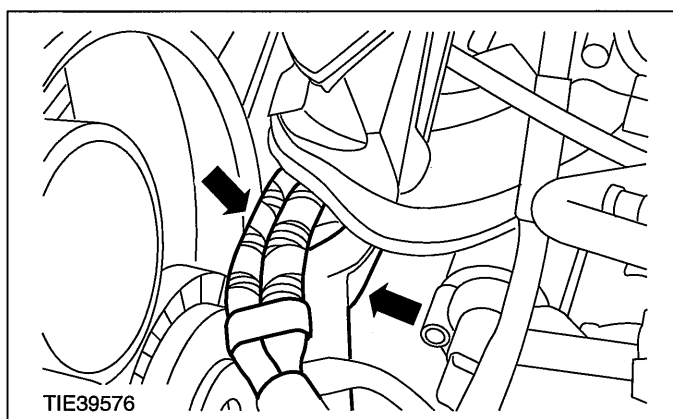


- 22. Remove the fuel supply manifold.**

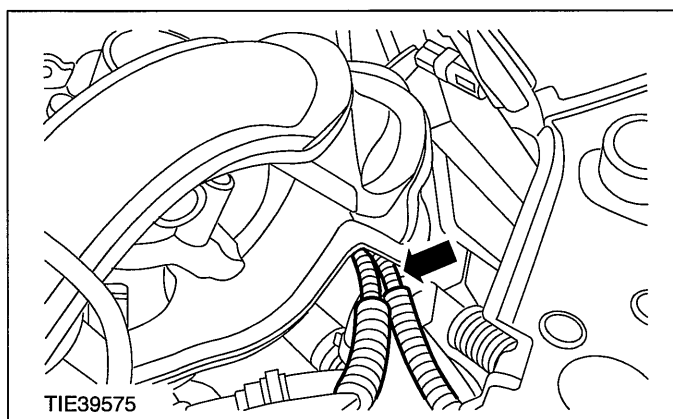
- Discard the O-ring seals.



- 23. Detach the wiring harness and the coolant hose from the intake manifold.**



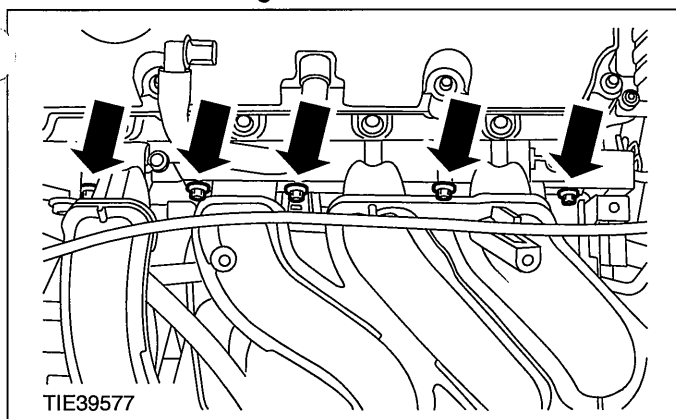
- 24. Detach the wiring harness from the intake manifold.**



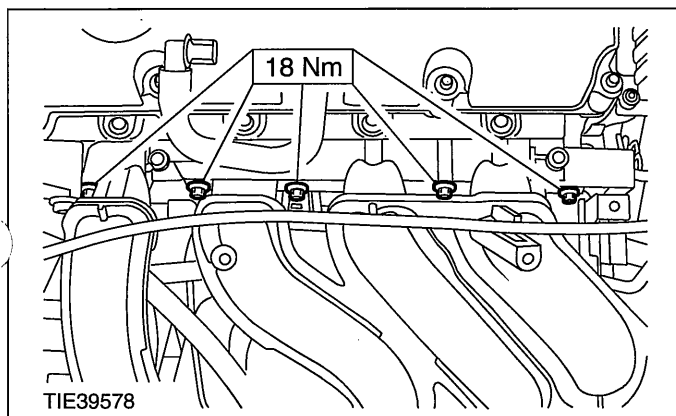
- 25. Remove the intake manifold.**

IN-VEHICLE REPAIR

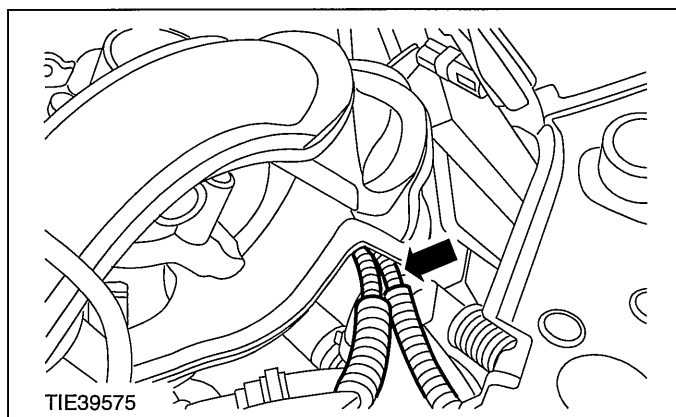
- Discard the gaskets.

**Installation**

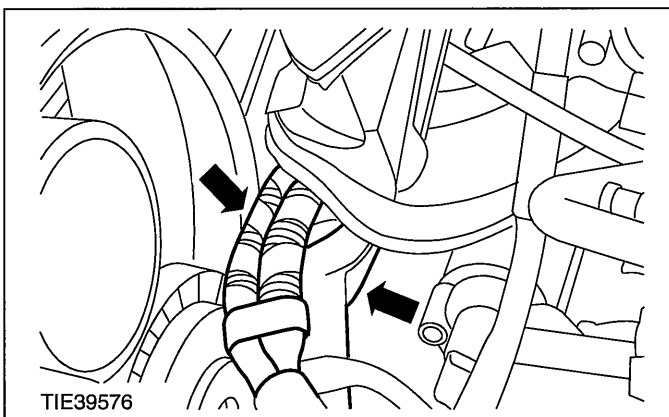
- 1. NOTE: Install new intake manifold gaskets.**
Install the intake manifold.



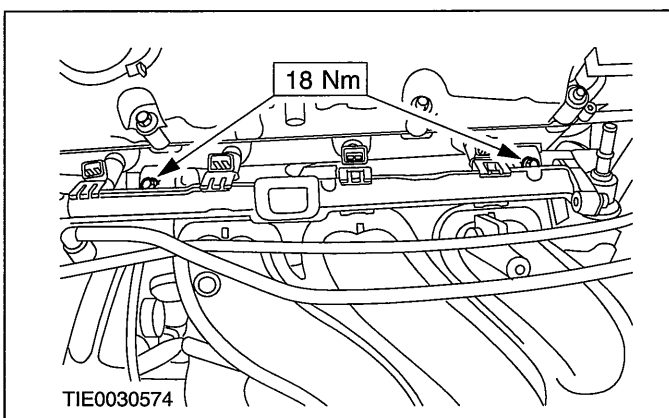
- 2. Attach the wiring harness to the intake manifold.**



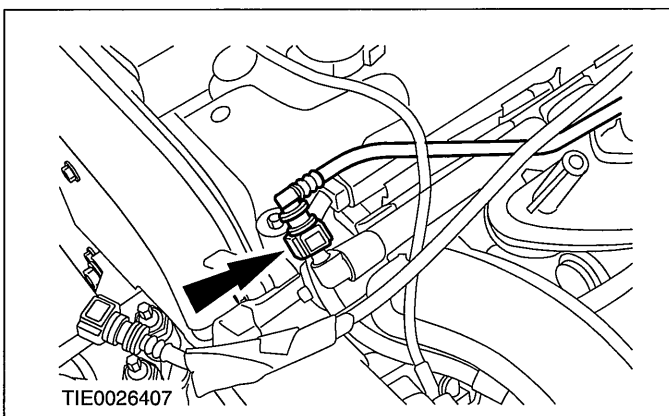
- 3. Attach the wiring harness and the coolant hose to the intake manifold.**



- 4. NOTE: Install new injector O-ring seals.**
NOTE: Coat the O-ring seals with clean engine oil.
Install the fuel supply manifold.

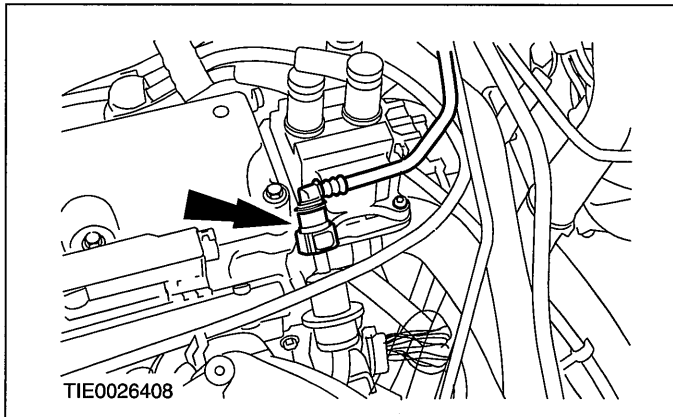


- 5. Connect the fuel return line quick release coupling. For additional information, refer to Section 310-00 [Fuel System - General Information].**



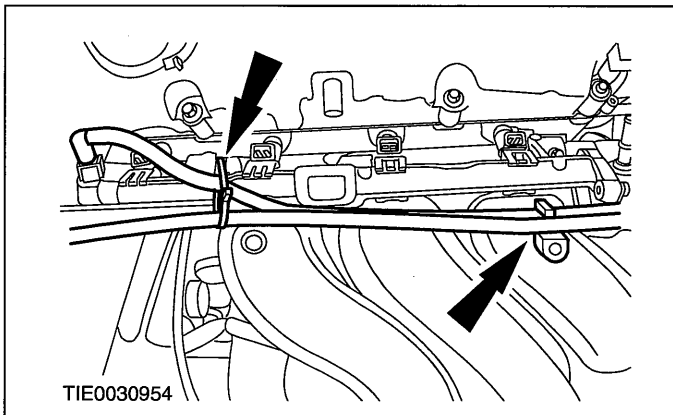
IN-VEHICLE REPAIR

6. Connect the fuel supply line quick release coupling. For additional information, refer to Section 310-00 [Fuel System - General Information].

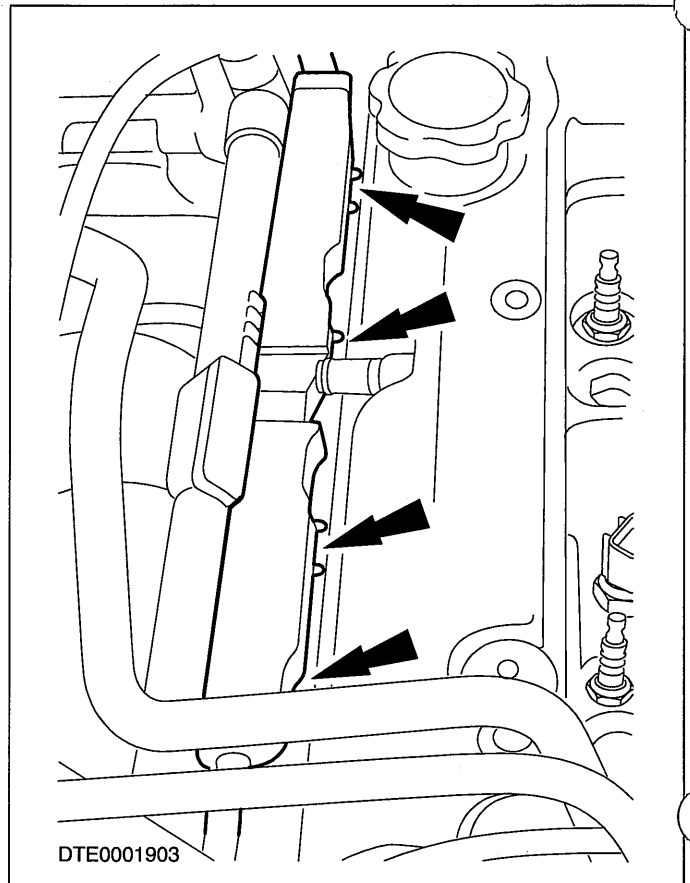


7. Attach the fuel line to the intake manifold.

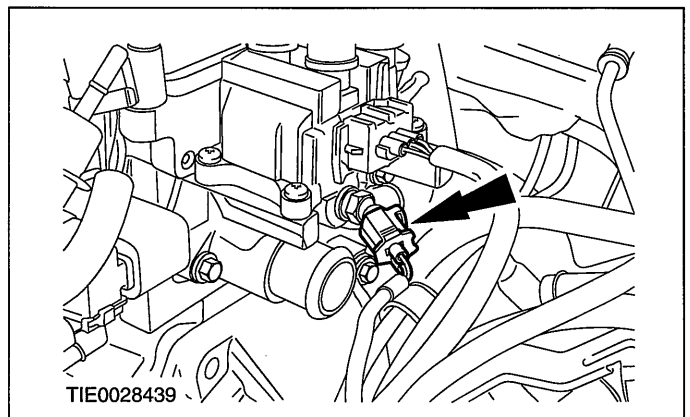
- Install the cable tie.



8. Connect the fuel injector electrical connectors.



9. Connect the engine coolant temperature (ECT) sensor electrical connector.

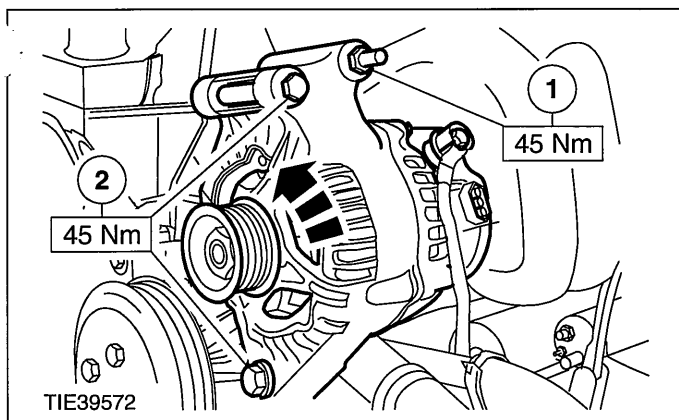


10. Attach the generator to the engine.

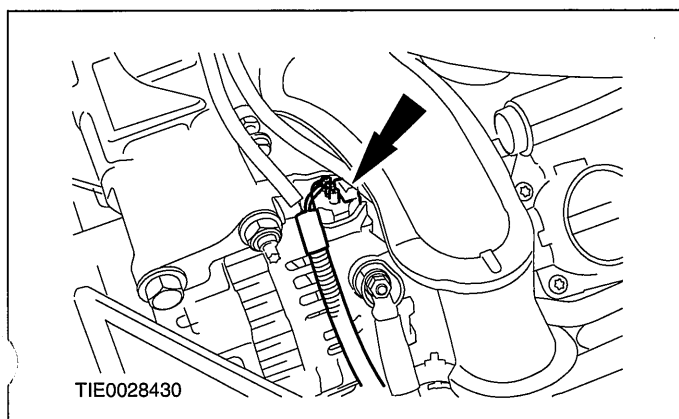
1. Install the stud and nut.

IN-VEHICLE REPAIR

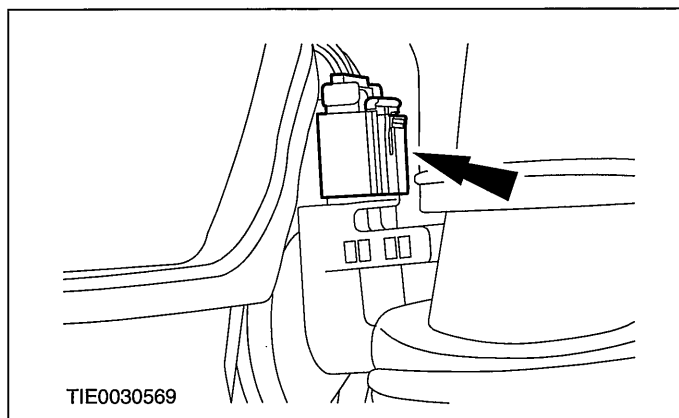
2. Install the bolts.



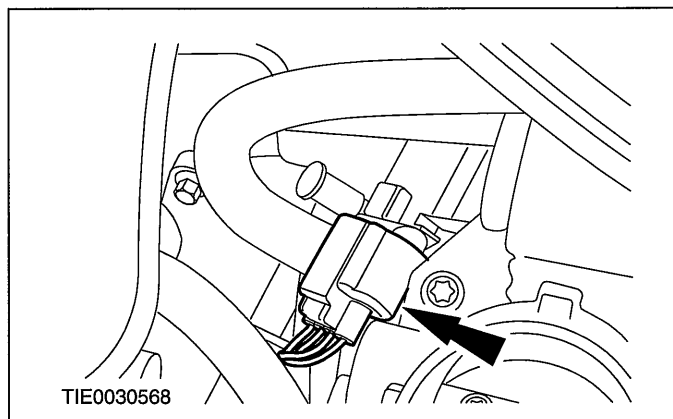
11. Connect the generator electrical connector.



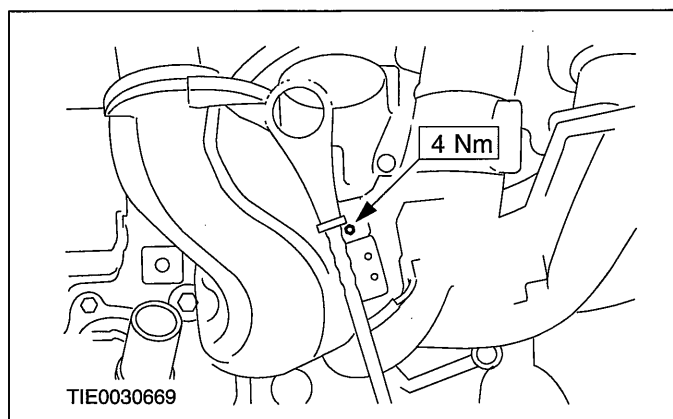
12. Connect the throttle plate control motor (DC-ISC) electrical connector.



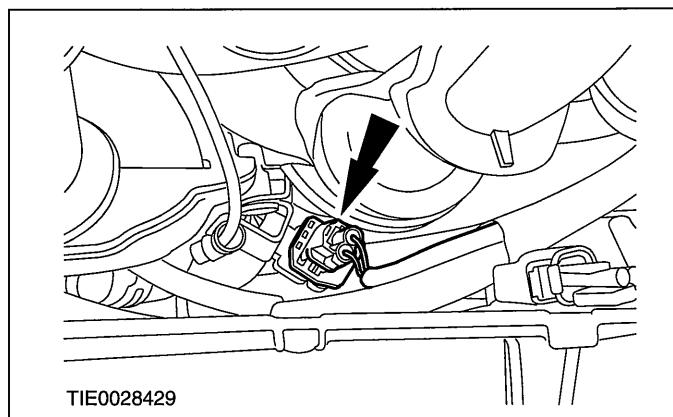
13. Connect the temperature and manifold absolute pressure (T-MAP) sensor electrical connector.



14. Attach the oil level indicator tube to the intake manifold.

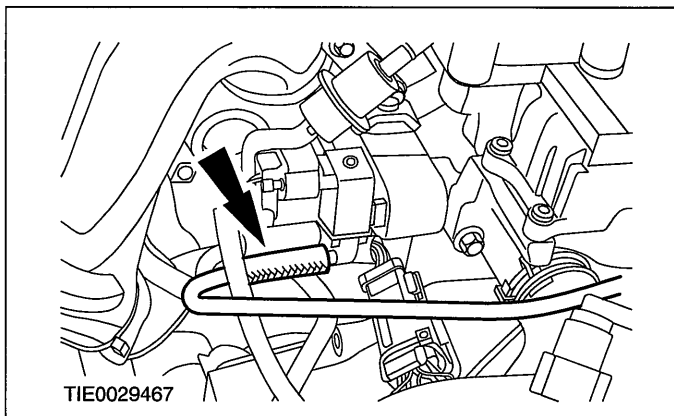


15. Connect the knock sensor (KS) electrical connector.

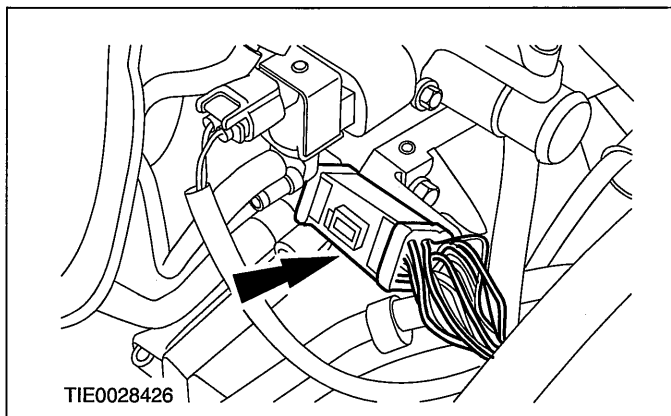


IN-VEHICLE REPAIR

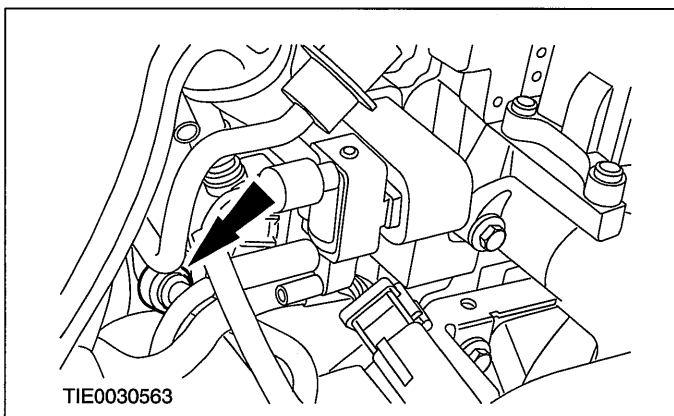
- 16. Connect the evaporate emission (EVAP) hose to the EVAP valve.**



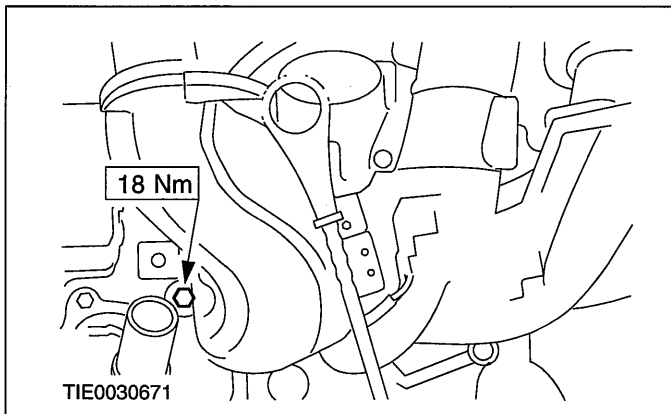
- 19. Connect the engine wiring harness electrical connector.**



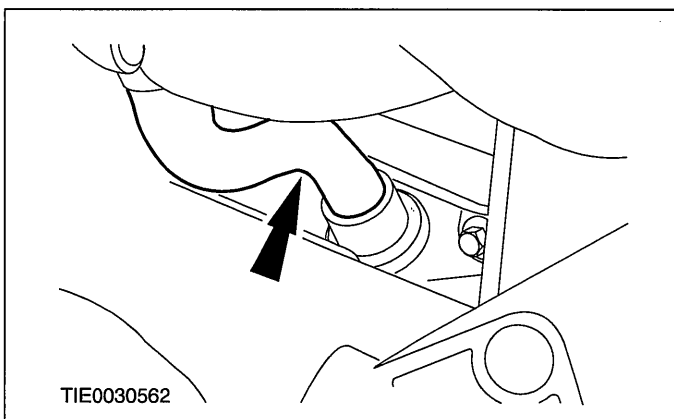
- 17. Connect the brake booster vacuum line to the intake manifold.**



- 20. Install the intake manifold lower retaining bolt and the generator bracket retaining bolts.**

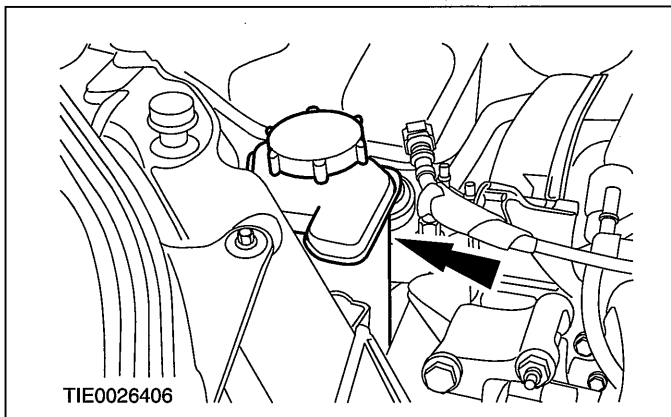


- 18. Connect the positive crankcase ventilation (PCV) hose to the PCV.**



- 21. Install the accessory drive belt. For additional information, refer to Section 303-05 [Accessory Drive].**

- 22. Attach the power steering fluid reservoir to the bracket.**



- 23. Install the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].**

IN-VEHICLE REPAIR

24. Connect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].

IN-VEHICLE REPAIR

Valve Cover(21 141 0)

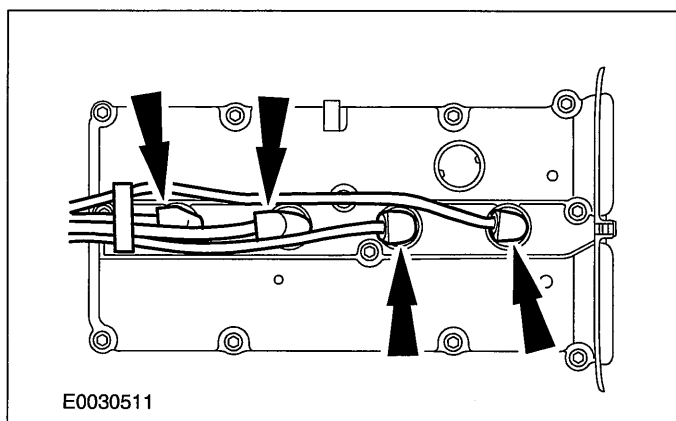
Materials

Name	Specification
Silicone grease	ESE-M1C171-AA

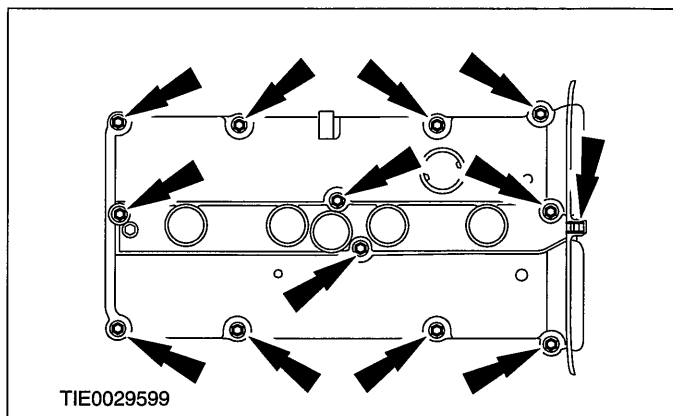
Removal

- ▲ **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
2. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
3. Disconnect the spark plug electrical connectors and detach the wires from the valve cover.



4. Remove the valve cover.



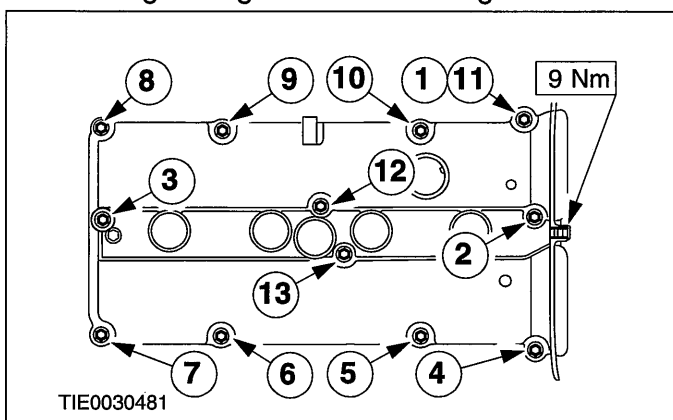
Installation

1. **NOTE:** Check the valve cover gasket for damage and install a new valve cover gasket if necessary.

NOTE: Install the stud bolts to positions 5 and 6.

Install the valve cover.

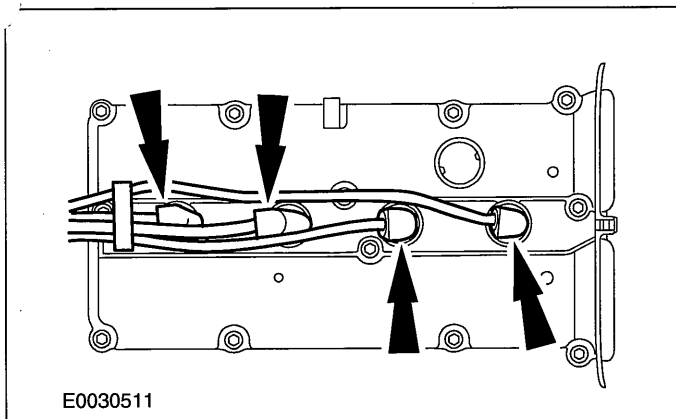
- Tighten the bolts in the sequence shown in three stages.
- Stage 1: Tighten bolt 1 by 3 to 4 turns.
- Stage 2: Tighten bolts 1 through 13 to 3 Nm.
- Stage 3: Tighten bolts 1 through 13 to 9 Nm.



2. **CAUTION:** Use a suitable blunt object to avoid damage to the spark plug connector gasket. Coat the inside of the spark plug connector with silicone grease to depth of 5-10 mm.

IN-VEHICLE REPAIR

Connect the spark plug electrical connectors and attach the wires to the valve cover.

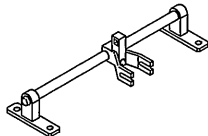
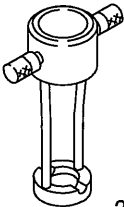
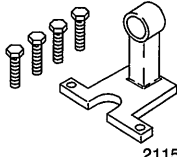
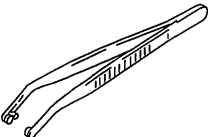
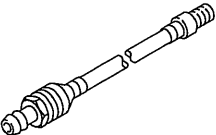
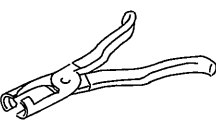


- 3. Install the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].**
- 4. Connect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].**

IN-VEHICLE REPAIR

Valve Seals(21 238 0)

Special Tool(s)

 21155	Compressor, Valve Spring 303-361 (21-155)
 2115504	Adapter for 303-361 303-361-04 (21-155-04)
 2115505	Adapter for 303-361 303-361-05 (21-155-05)
 21156	Installer, Valve Stem Collets 303-362 (21-156)
 21157	Adapter, Air Supply (Cylinder Head) 303-363 (21-157)
 21211	Pliers, Valve Stem Oil 303-508 (21-211)

Materials

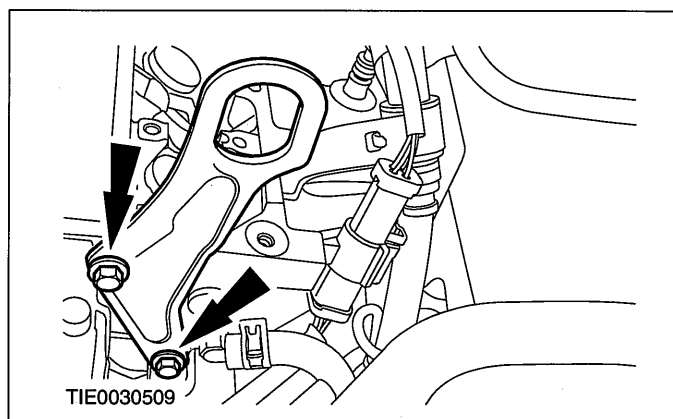
Name	Specification
Engine oil	WSS-M2C912-A1

Removal

1. Remove the camshafts.

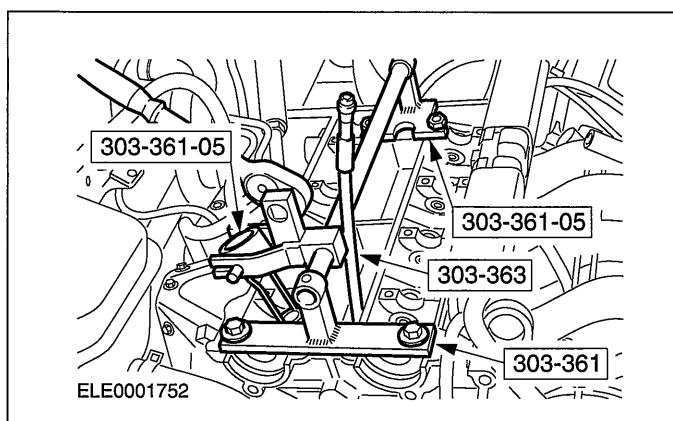
For additional information, refer to
Camshafts in this section.

2. Remove the engine rear lifting eye.

3. **⚠ CAUTION:** Keep the valve tappets in order for reassembly.

Remove the valve tappets.

4. Install the special tools.



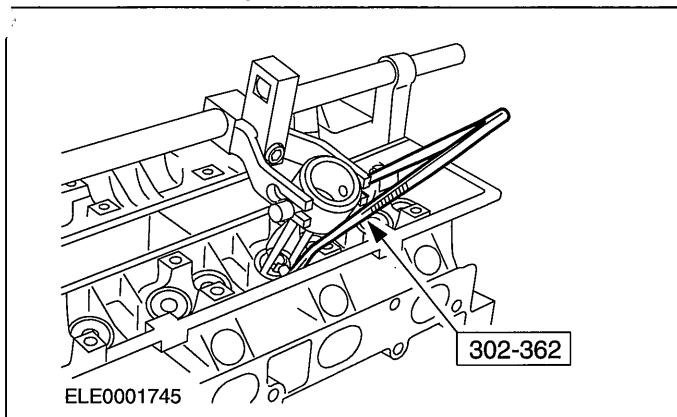
5. Apply 7 to 10 bar of compressed air into the cylinder.

6. Using the special tool, remove the valve springs.

- Compress the valve spring.
- Remove the valve collets.

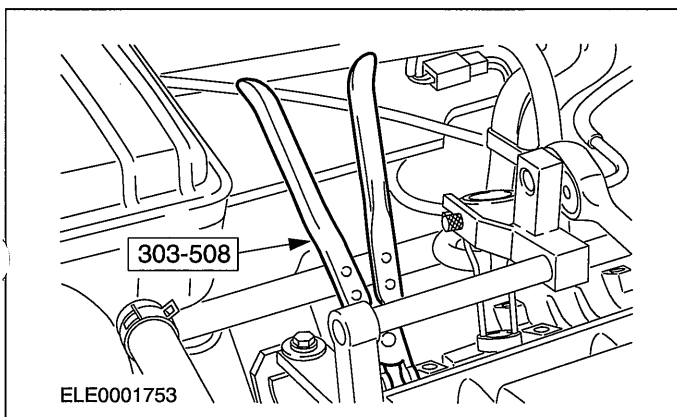
IN-VEHICLE REPAIR

- Remove the valve spring retainer and the valve springs.



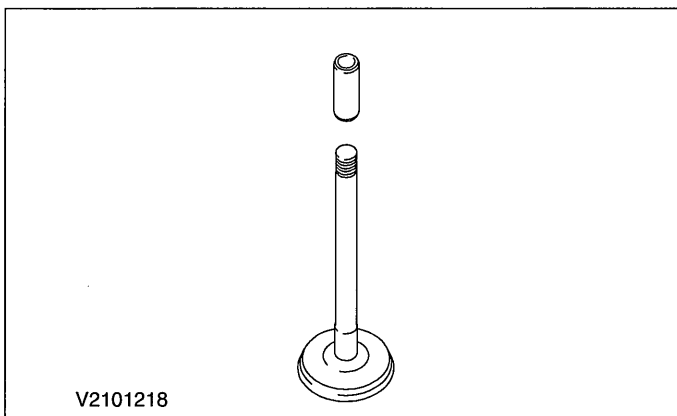
7. Using the special tool, remove the valve seals.

- Discard the valve seals.



Installation

1. Install a valve stem mounting sleeve over the valve collet groove (valve shown removed for clarity).

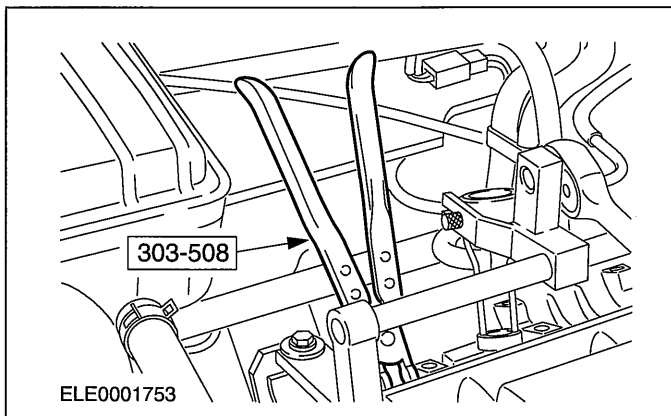


2. **CAUTION:** The intake valve seal are colored green, and the exhaust valve seals are colored brown.

NOTE: Install new valve seals.

NOTE: Coat the valve seal lip and the valve stem with clean engine oil.

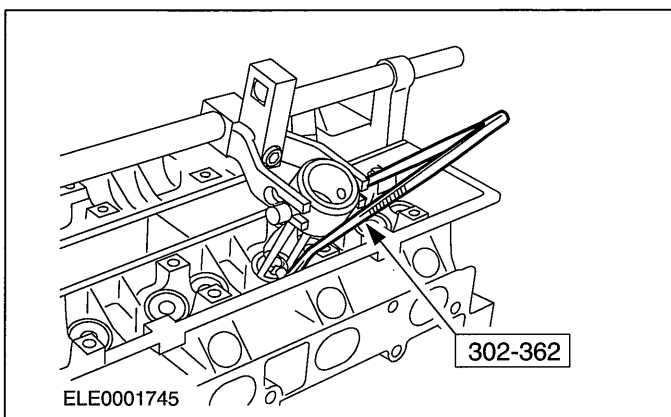
Using the special tool, install the valve seal.



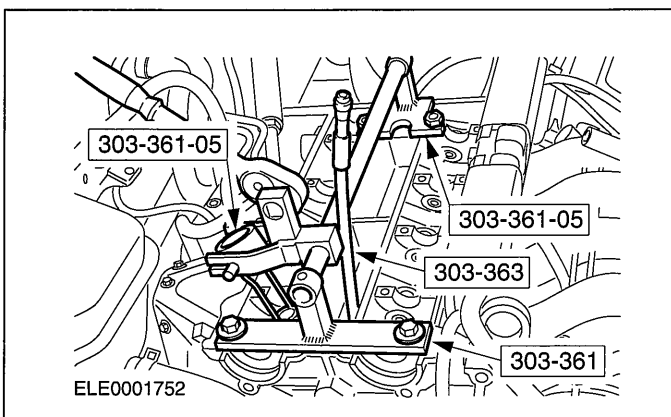
3. Remove the mounting sleeve.

4. Using the special tool, install the valve springs.

- Install the valve spring retainer and the valve springs.
- Compress the valve spring.
- Install the valve collets.



5. Remove the special tools.

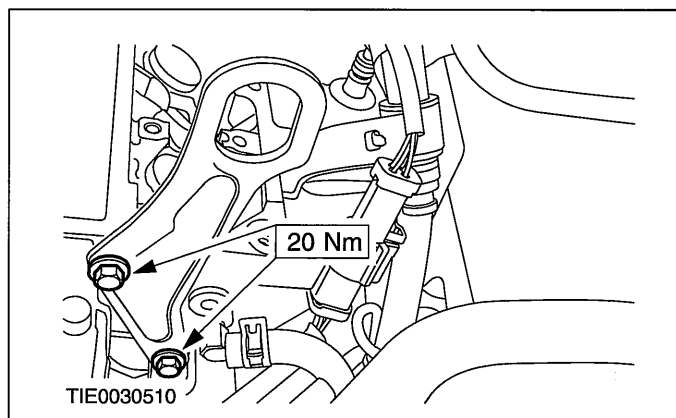


IN-VEHICLE REPAIR

6. **⚠ CAUTION:** The valve tappets must be installed in their original locations.

Install the valve tappets.

7. Install the engine rear lifting eye.



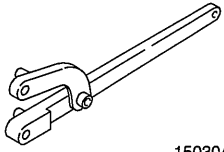
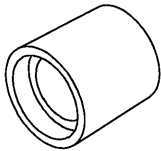
8. Install the camshafts.

For additional information, refer to
Camshafts in this section.

IN-VEHICLE REPAIR

Camshafts(21 284 0)

Special Tool(s)

 15030A	Universal Flange Holding Wrench 205-072
 21171	Installer, Crankshaft Seal 303-395

Materials

Name	Specification
Sealant	WSK-M2G348-A2
Engine Oil	WSS-M2C912-A1

Removal

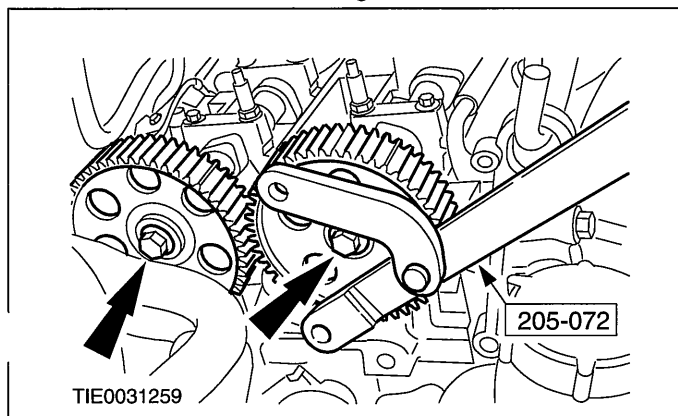
1. Remove the timing belt.

For additional information, refer to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

 2. **⚠ CAUTION:** Install a hose (order no. E890438S) to the special tool studs, to prevent damage to the camshaft pulleys.

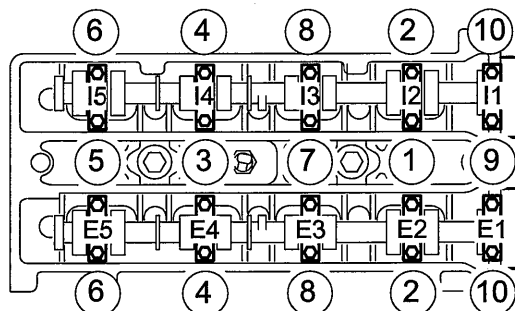
Remove the camshaft pulleys.

- Discard the retaining bolts.


 3. **⚠ CAUTION:** Keep the camshaft bearing caps in order for installation.

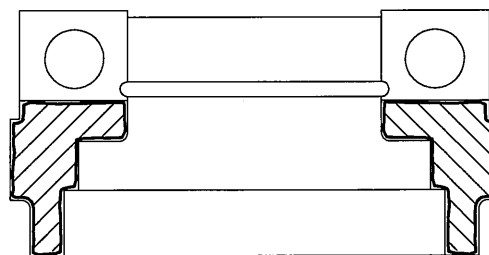
Remove the camshafts.

- Slacken each camshaft bearing cap retaining bolt in the sequence shown by one turn until the camshaft is released.
- Remove the camshaft bearing caps.
- Remove and discard the camshaft seals.



Installation

1. Apply sealant to the points indicated on the camshaft bearing cap no. 1 and to the mating surface of the cylinder head.



2. Coat the camshafts and the camshaft bearing caps with clean engine oil.

 3. **⚠ CAUTION:** Position the camshafts in place so that none of the cams are at full lift.

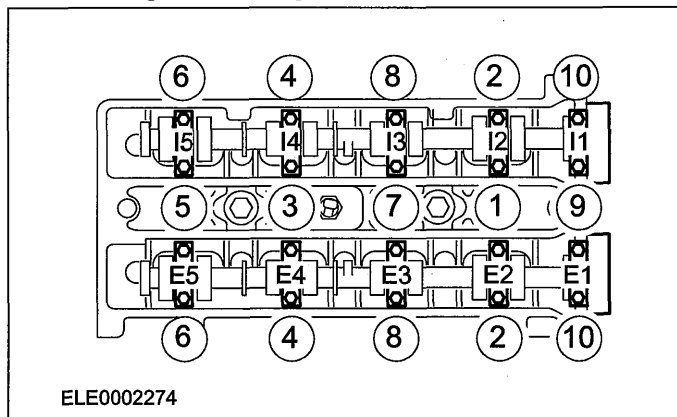
NOTE: The camshaft bearing cap numbering starts at the timing belt end with E1 on the exhaust side and with I1 on the intake side.

NOTE: The exhaust camshaft has an additional cam for the camshaft position (CMP) sensor.

IN-VEHICLE REPAIR

Install the camshafts and camshaft bearing caps.

- Tighten the camshaft bearing cap retaining bolts in the sequence shown in three stages.
- Stage 1: One half turn on each bolt until all of the camshaft bearing caps are in contact with the cylinder head.
- Stage 2: 7 Nm.
- Stage 3: 45 degrees.



7. Install the timing belt.

For additional information, refer to: **Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).**

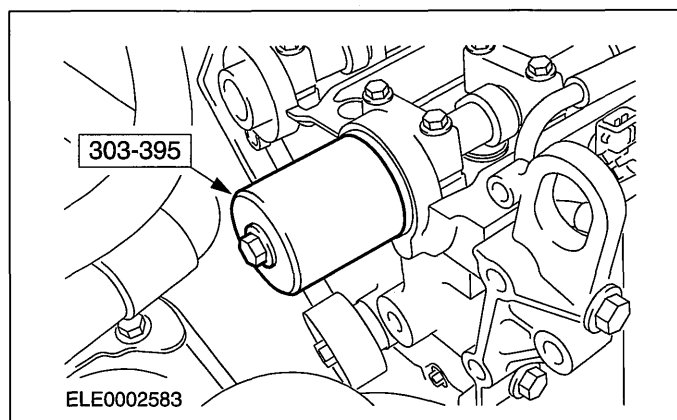
4. Adjust the valve clearances.

For additional information, refer to: **Valve Clearance Adjustment (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).**

5. NOTE: Install new camshaft seals.

NOTE: Coat the camshaft journals and camshaft seal lip with clean engine oil.

Using the special tool, install the camshaft seals.



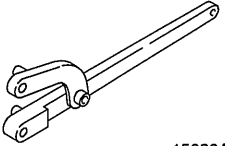
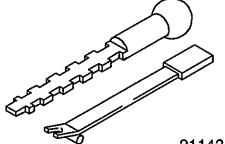
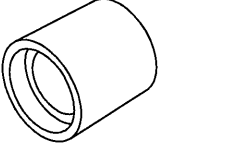
6. NOTE: Do not fully tighten the camshaft pulley retaining bolts at this stage. Make sure the camshaft pulleys turn on the camshafts.

Install the camshaft pulleys.

IN-VEHICLE REPAIR

Camshaft Seal(21 288 0)

Special Tool(s)

 15030A	Universal Flange Holding Wrench 205-072
 21143	Remover, Crankshaft Seal 303-293
 21171	Installer, Crankshaft Seal 303-395

Materials

Name	Specification
Engine Oil	WSS-M2C912-A1

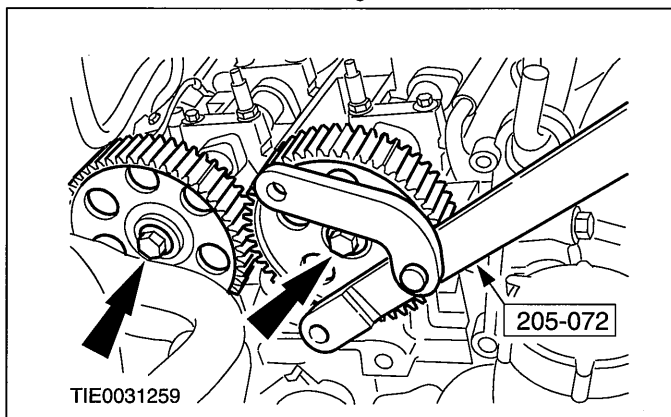
Removal

1. Remove the timing belt.

For additional information, refer to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

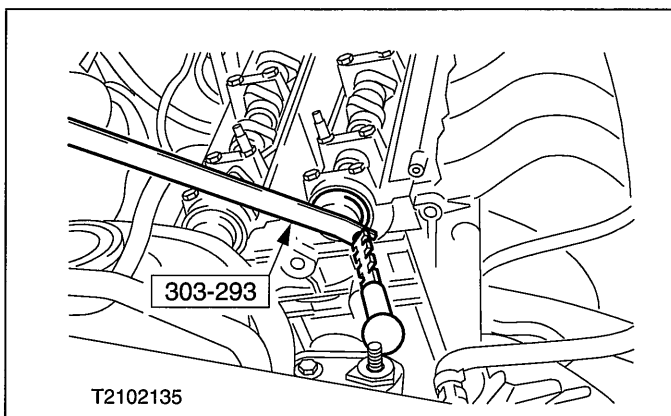
2. **CAUTION:** Install a hose (order no. E890438S) to the special tool studs, to prevent damage to the camshaft pulleys.
Remove the camshaft pulleys.

- Discard the retaining bolts.



3. Using the special tool, remove the camshaft seal.

- Discard the oil seal.

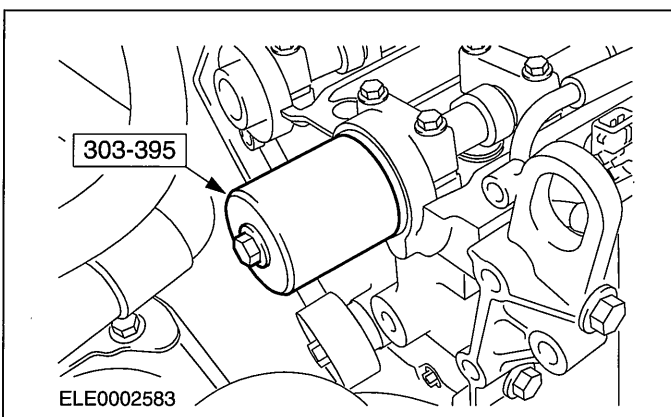


Installation

1. **NOTE:** Install a new camshaft seal.

NOTE: Coat the camshaft journals and camshaft seal with clean engine oil.

Using the special tool, install the camshaft oil seal.



IN-VEHICLE REPAIR

2. **NOTE:** Do not fully tighten the camshaft pulleys retaining bolts at this stage. Make sure the camshaft pulleys turn on the camshafts.

NOTE: Install new camshaft pulley retaining bolts.

Install the camshaft timing pulleys.

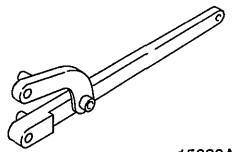
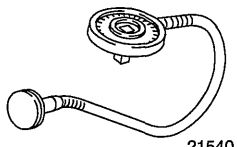
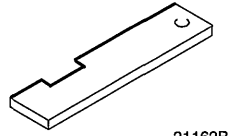
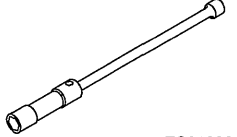
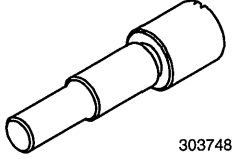
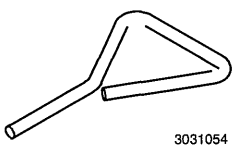
3. Install the timing belt.

For additional information, refer to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

IN-VEHICLE REPAIR

Timing Belt(21 304 0)

Special Tool(s)

 15030A	Universal Flange Holding Wrench 205-072
 21540	Gauge, Bolt Angle 303-174
 21162B	Alignment Plate, Camshaft 303-376B
 ES21202	Socket, Spark Plug 303-499
 303748	Locking Tool, Crankshaft 303-748
 3031054	Locking Tool, Timing Belt Tensioner 303-1054

General Equipment

Trolley jack

General Equipment

Wooden block

Materials

Name	Specification
High-Temperature Grease	ESD-M1C220-A

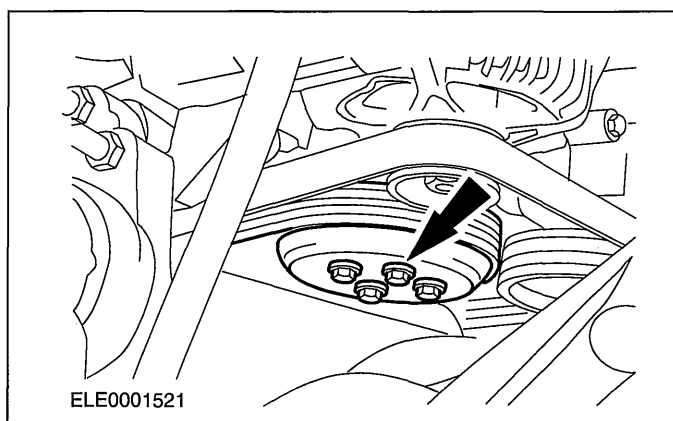
Removal

All vehicles

1. Remove the valve cover.

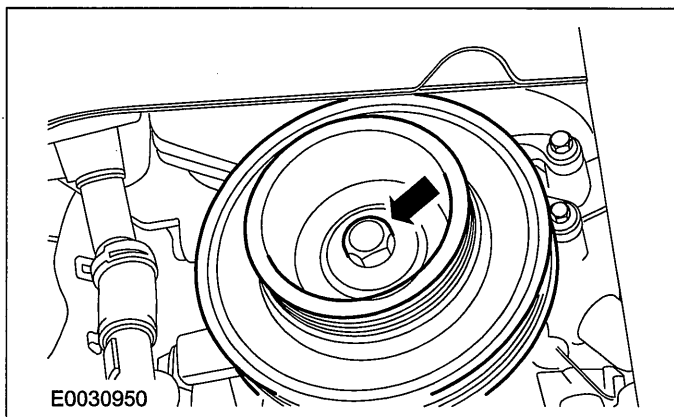
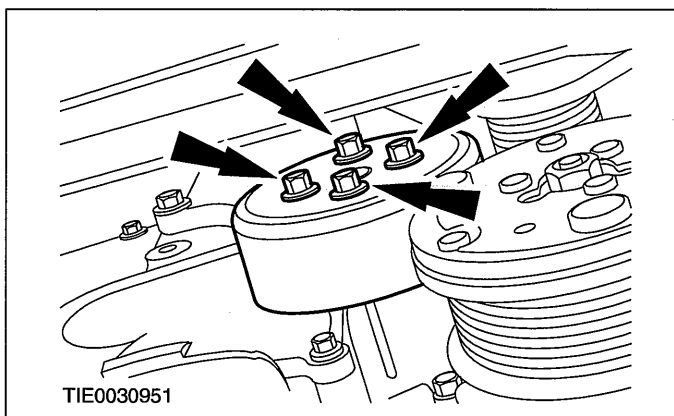
For additional information, refer to: Valve Cover (303-01A Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

2. Loosen the coolant pump pulley retaining bolts.

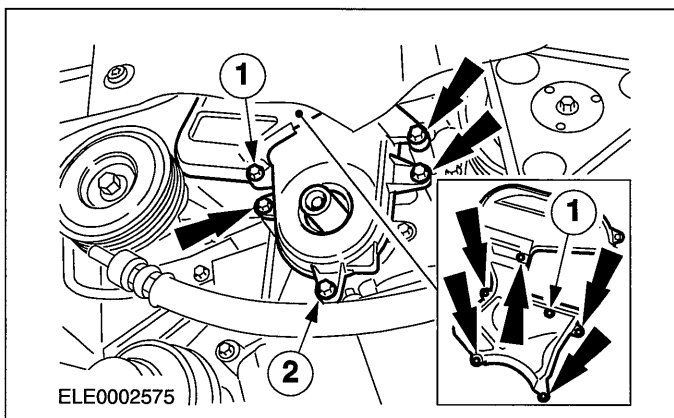
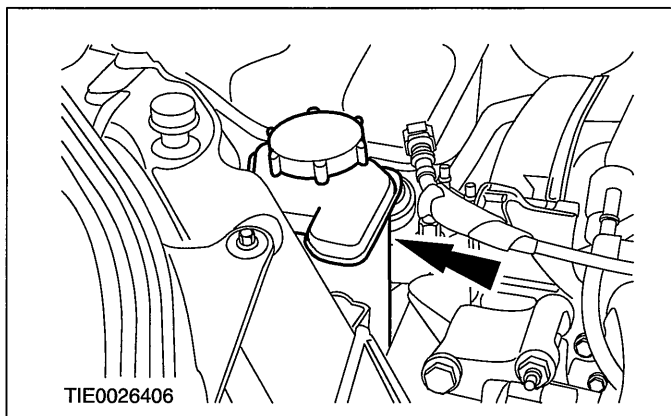
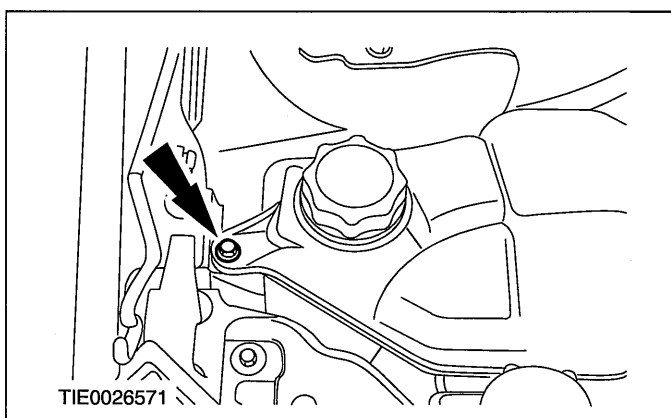
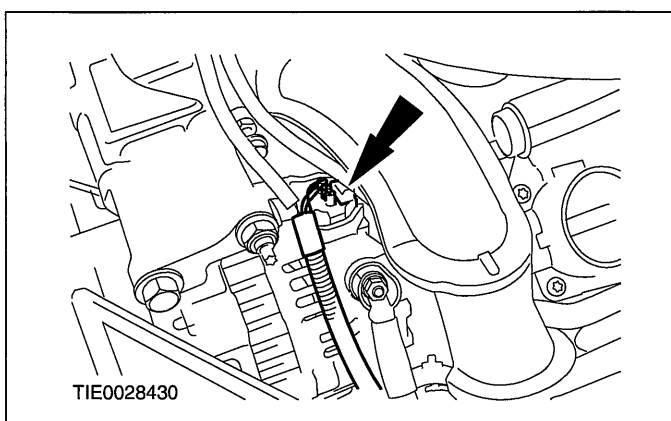


3. Remove the accessory drive belt.

For additional information, refer to: Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

IN-VEHICLE REPAIR**4. Remove the crankshaft pulley.****5. Remove the coolant pump pulley.****6. Remove the timing belt cover retaining bolts.**

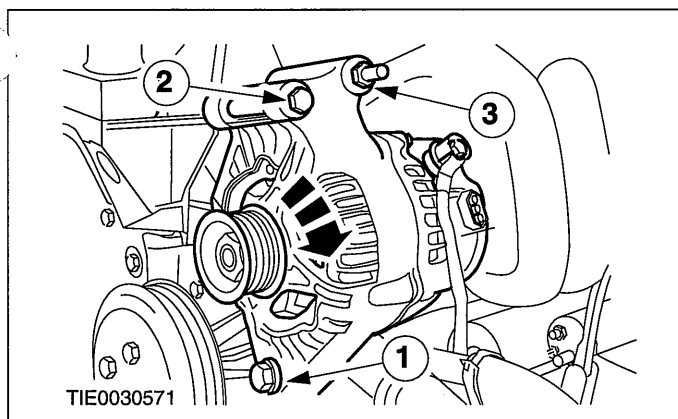
1. Remove the timing belt upper cover retaining bolts.
 2. Remove the timing belt lower cover retaining bolts.
- Remove the lower cover.

**7. Lower the vehicle.****8. Detach the power steering fluid reservoir from the bracket and position it to one side.****9. Detach the coolant expansion tank from the bracket and position it to one side.****10. Disconnect the generator electrical connector.****11. Detach the generator from the engine.**

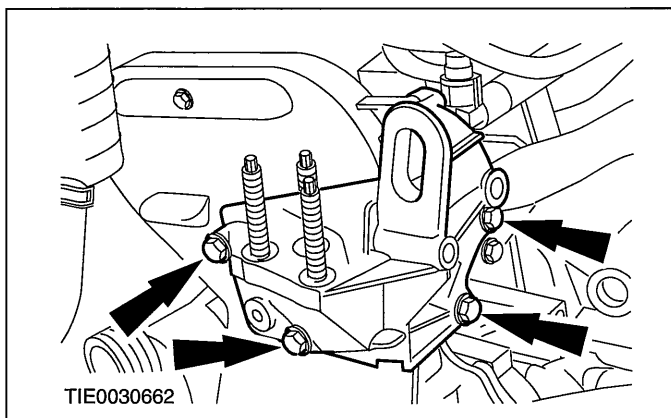
1. Loosen the bolt.
2. Remove the bolt.

IN-VEHICLE REPAIR

3. Remove the nut and the stud.



15. Remove the engine front mount bracket.

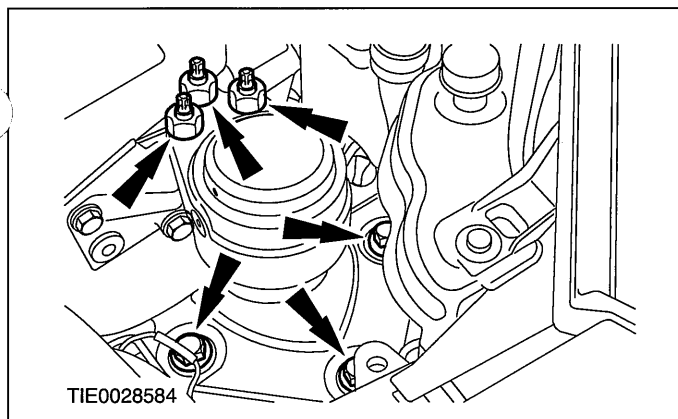


12. **CAUTION:** Do not support the engine directly on the oil pan.

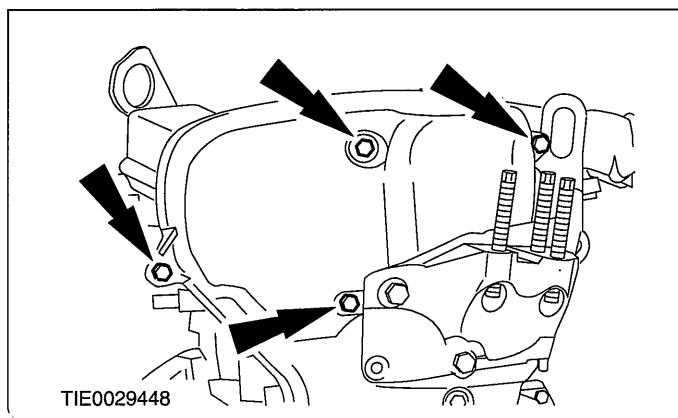
Place the trolley jack with a wooden block under the engine and raise it slightly until the engine front mount is free from strain.

13. Remove the engine front mount.

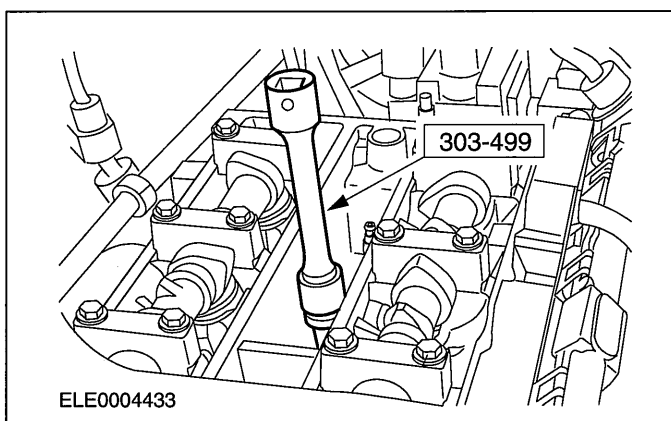
- Discard the nuts.



14. Remove the timing belt upper cover.



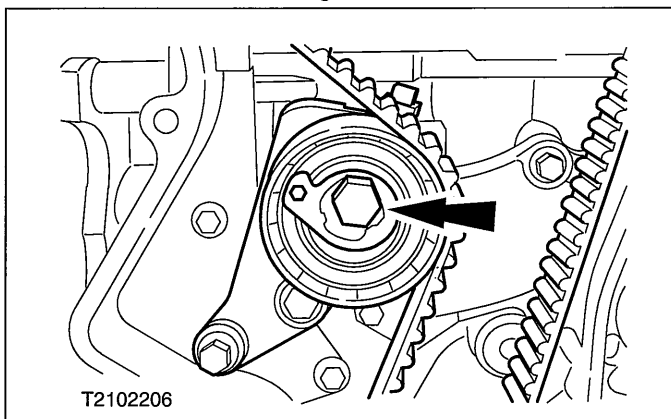
16. Using the special tool, remove the spark plugs.



Engines with eccentric cam timing belt tensioner

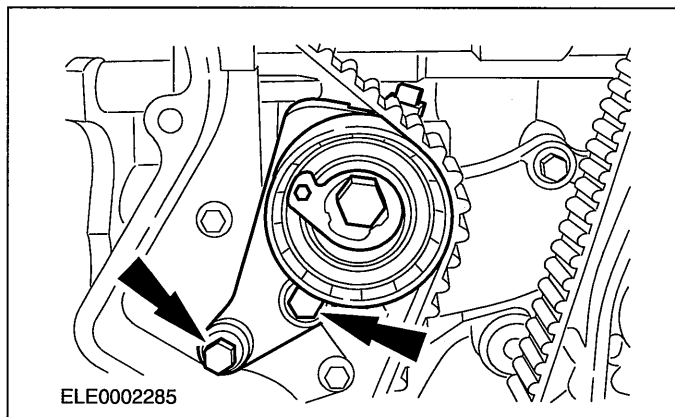
17. Slacken the timing belt tensioner and remove the timing belt.

- Discard the timing belt.



IN-VEHICLE REPAIR

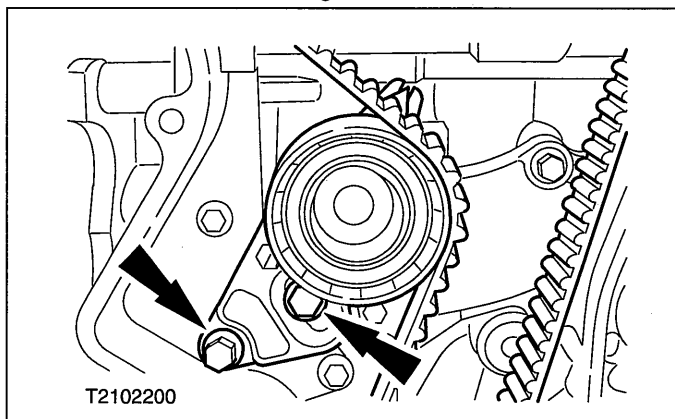
18. Remove the timing belt tensioner.



Engines with slotted bracket timing belt tensioner

19. Remove the timing belt tensioner and the timing belt.

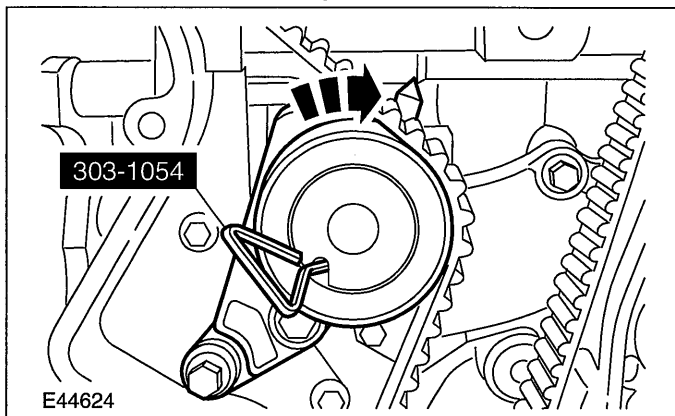
- Discard the timing belt.



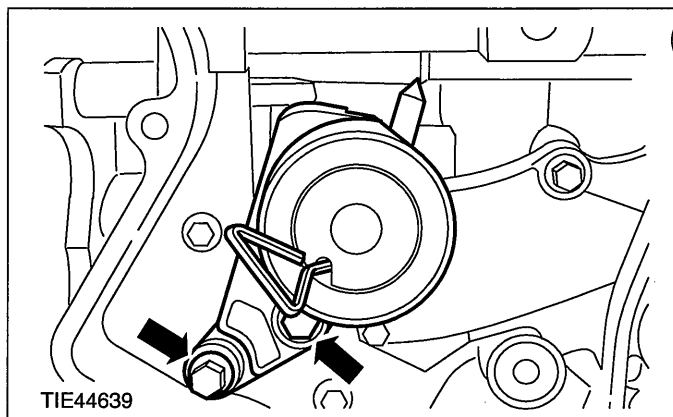
Vehicles built 09/2003 onwards

20. Remove the timing belt.

- Detension the timing belt and lock the timing belt tensioner with the special tool.
- Discard the timing belt.



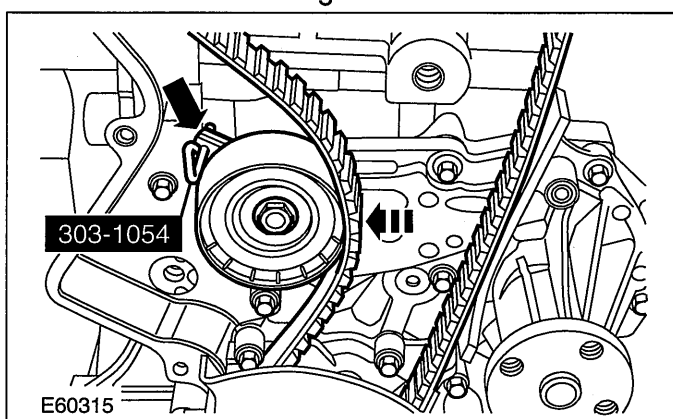
21. Remove the timing belt tensioner.



Vehicles built 04/2005 onwards

22. Remove the timing belt.

- Detension the timing belt and lock the timing belt tensioner with the special tool.
- Discard the timing belt.



Installation

All vehicles

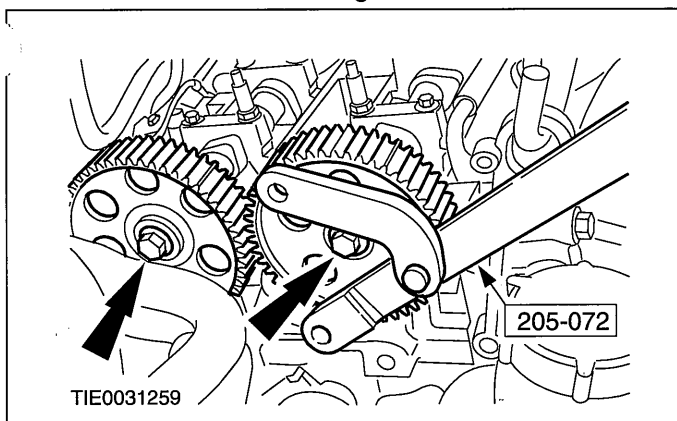
1. Set the crankshaft to approximately 20 degrees before TDC.
2. **⚠ CAUTION:** Install a hose (order no. E890438S) to the special tool studs, to prevent damage to the camshaft pulleys.

NOTE: Make sure the camshaft pulleys turn on the camshafts.

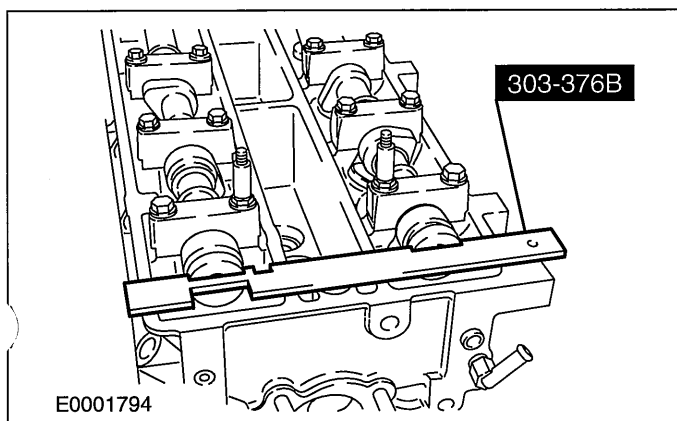
Loosen the camshaft pulley retaining bolts.

IN-VEHICLE REPAIR

- Discard the retaining bolts.

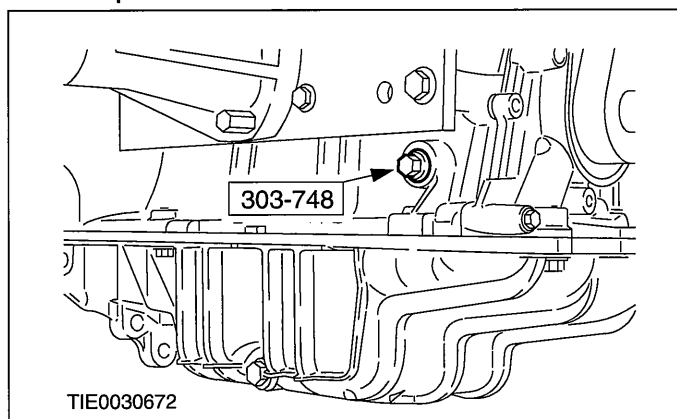


3. Turn the camshafts to TDC on cylinder number 1 and install the special tool.



4. Remove the blanking plug and install the special tool.

- Carefully turn the crankshaft against the special tool.



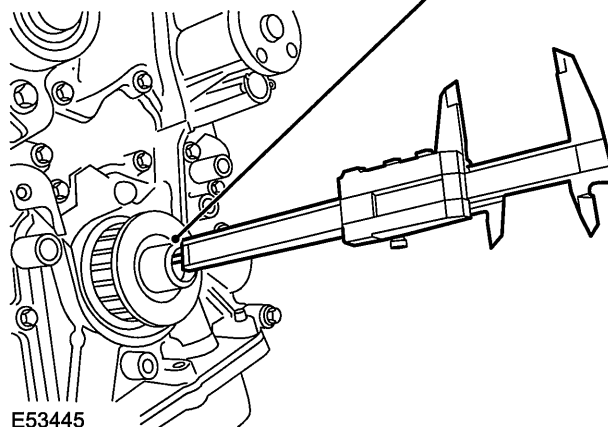
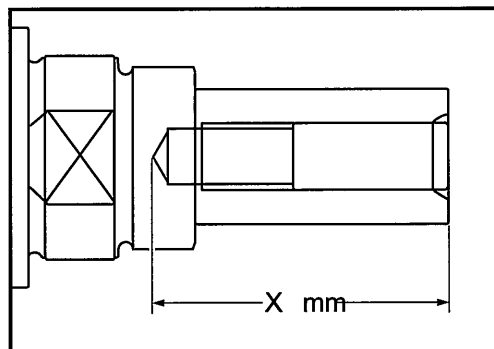
5. **NOTE:** Install a new timing belt.

NOTE: Install the timing belt, beginning with the crankshaft timing pulley working counterclockwise.

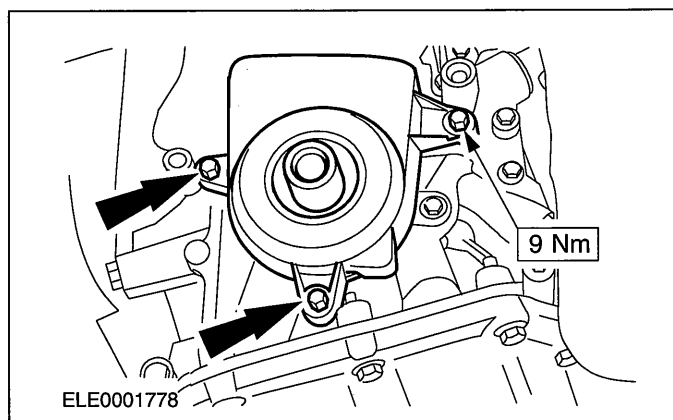
Install the timing belt.

6. Measuring the depth of the threaded hole in the crankshaft.

- Depth of the threaded = 42 mm: Use an M12x29 mm crankshaft pulley center bolt.
- Depth of the threaded = 52 mm: Use an M12x44,5 mm crankshaft pulley center bolt.



7. Attach the timing belt lower cover.



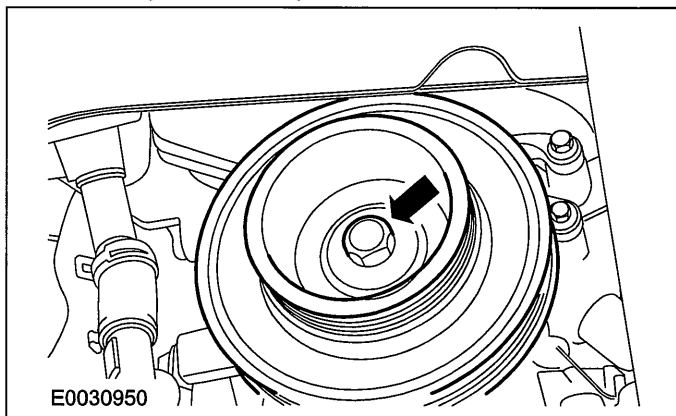
8. **NOTE:** Install a new crankshaft pulley retaining bolt.

Install the crankshaft pulley.

- Tighten the crankshaft pulley retaining bolt in two stages.
- Stage 1: 45 Nm.

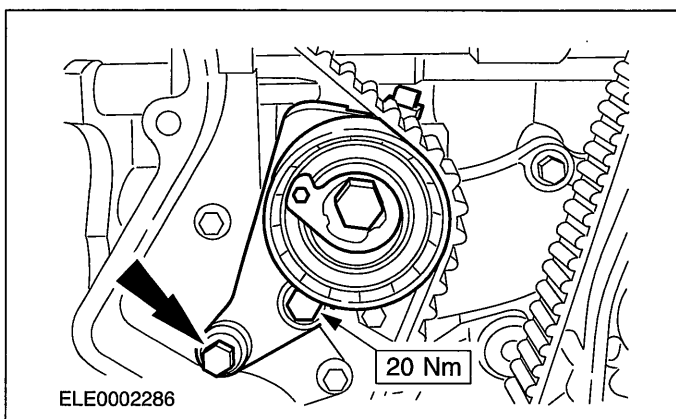
IN-VEHICLE REPAIR

- Stage 2: 90 degrees.



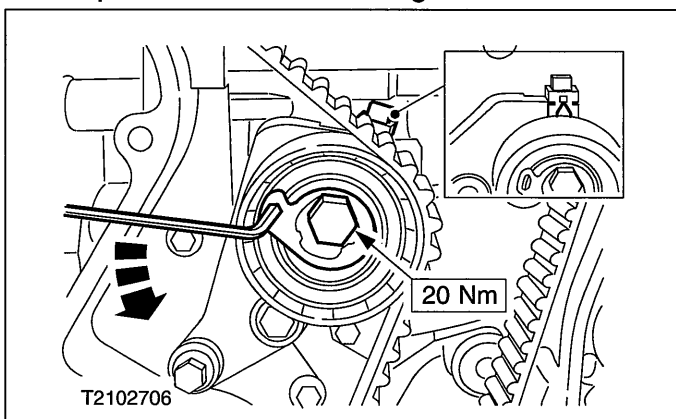
Engines with eccentric cam timing belt tensioner

9. Install the timing belt tensioner.



10. Tension the timing belt.

- Tension the timing belt by turning the tensioner counterclockwise until the arrow points at the mark and tighten the bolt.

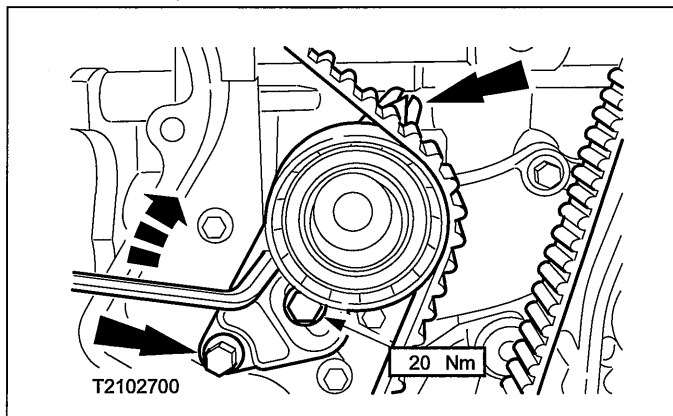


Engines with slotted bracket timing belt tensioner

11. Install the timing belt tensioner and tension the timing belt.

- Screw in the bolts finger tight.

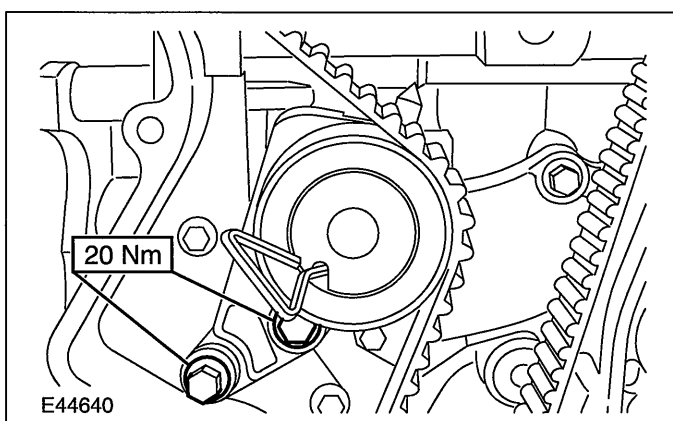
- Tension the timing belt by turning the tensioner clockwise until the arrow points in line with the center of the rectangular hole and tighten the bolt.



Vehicles built 09/2003 onwards

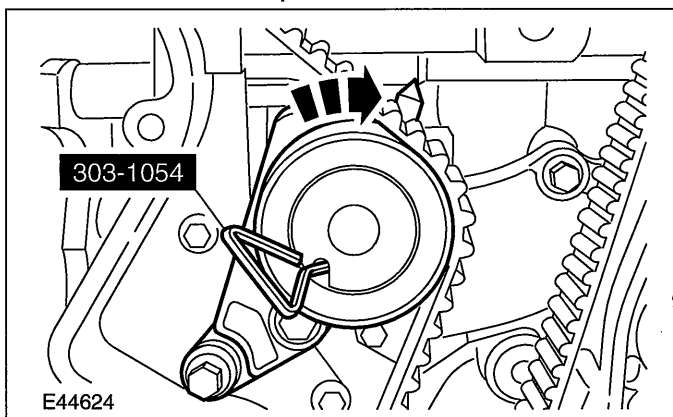
12. **▲WARNING:** Do not remove the special tool, until the timing belt is correctly positioned. Failure to follow this instruction may result in personal injury, or may damage the timing belt tensioner.

Install the timing belt tensioner.



13. Tension the timing belt.

- Remove the special tool.



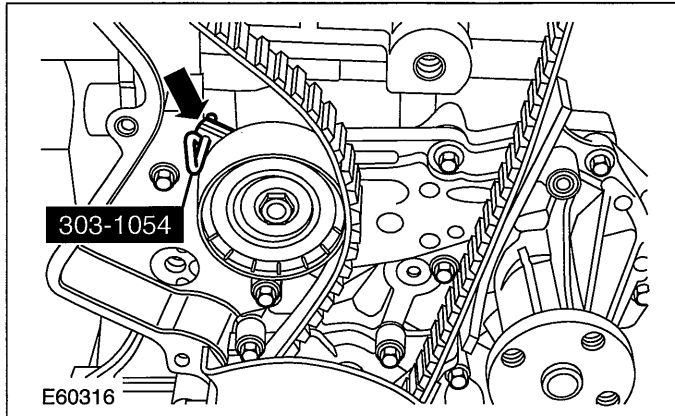
IN-VEHICLE REPAIR

Vehicles built 04/2005 onwards

14. **▲WARNING:** Do not remove the special tool, until the timing belt is correctly positioned. Failure to follow this instruction may result in personal injury, or may damage the timing belt tensioner.

Tension the timing belt.

- Remove the special tool.



All vehicles

15. **CAUTIONS:**

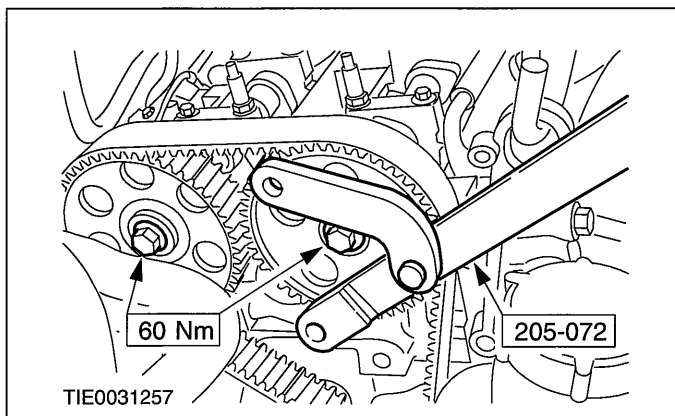
▲ Install a hose (order no. E890438S) to the special tool studs, to prevent damage to the camshaft pulleys.

▲ Do not tighten the camshaft pulley bolts against the timing plate.

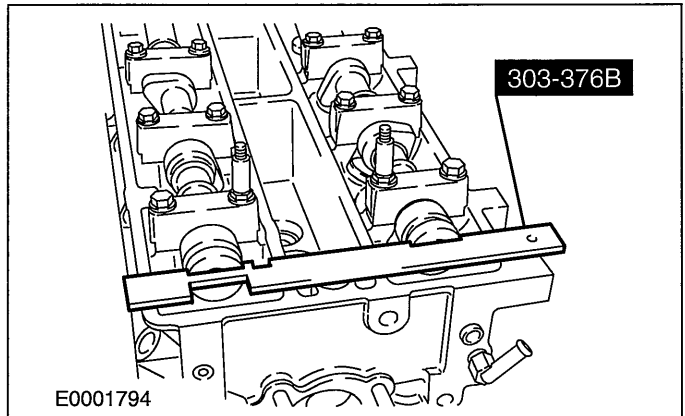
NOTE: The camshafts must remain at TDC.

NOTE: Install new camshaft pulley retaining bolts.

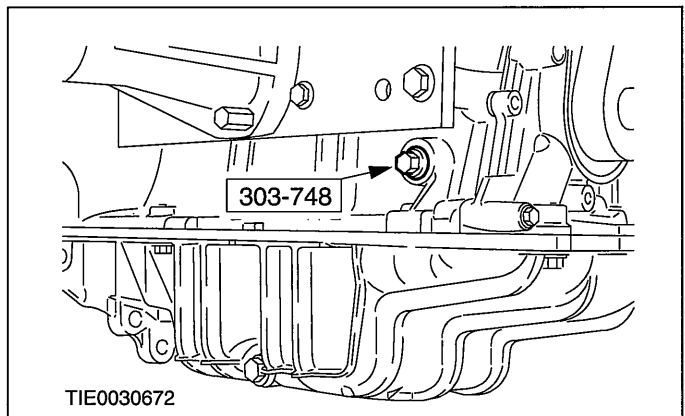
Using the special tool, tighten the camshaft pulleys.



16. Remove special tool.



17. Remove the special tool.

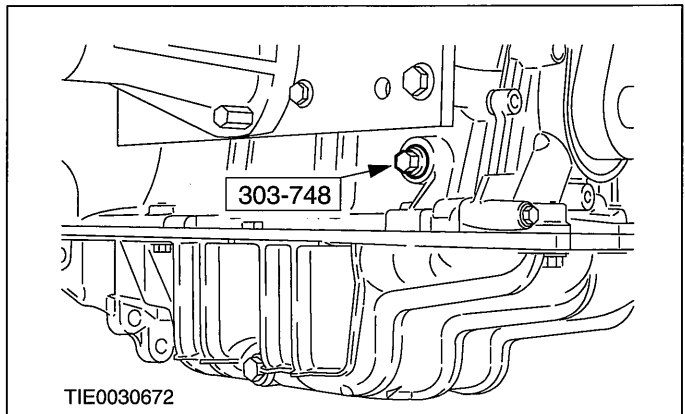


18. **NOTE:** Only turn the engine in its normal direction of rotation.

Turn the engine two revolutions.

19. Install the special tool.

- Carefully turn the crankshaft against the special tool.

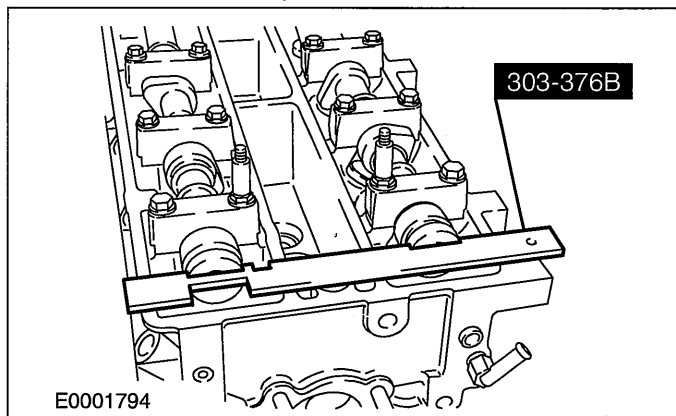


20. Check the valve timing.

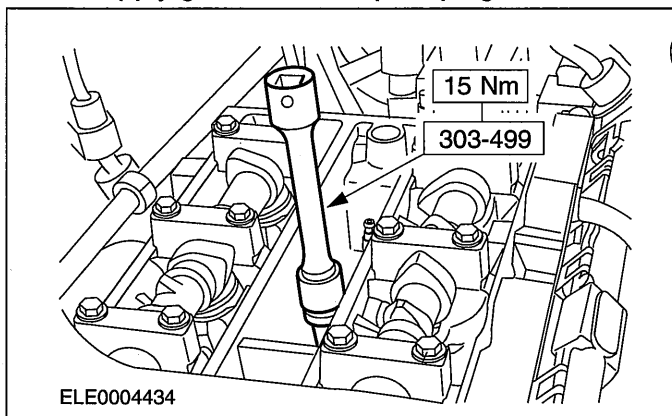
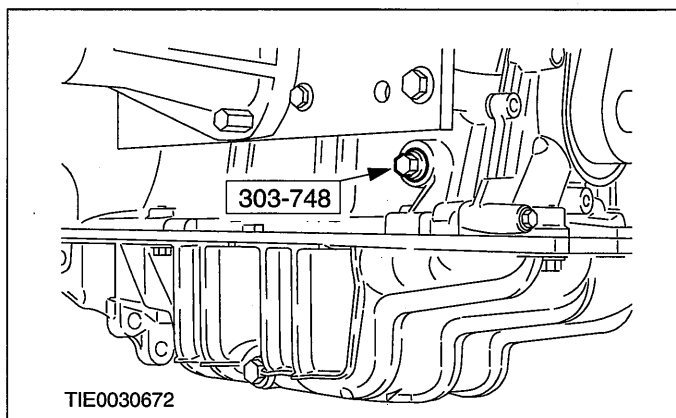
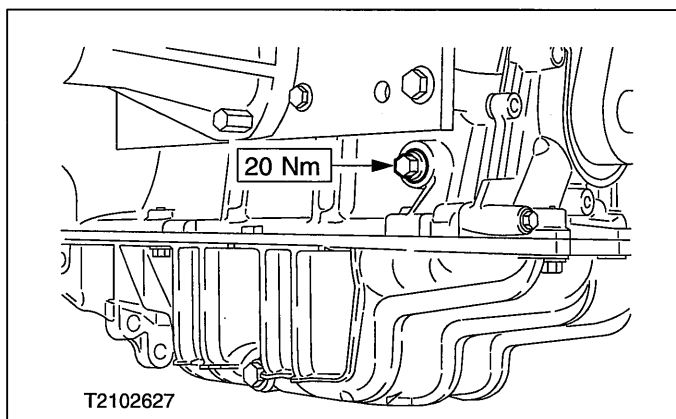
- If necessary loosen the camshaft pulleys and correct the camshaft alignment.

IN-VEHICLE REPAIR

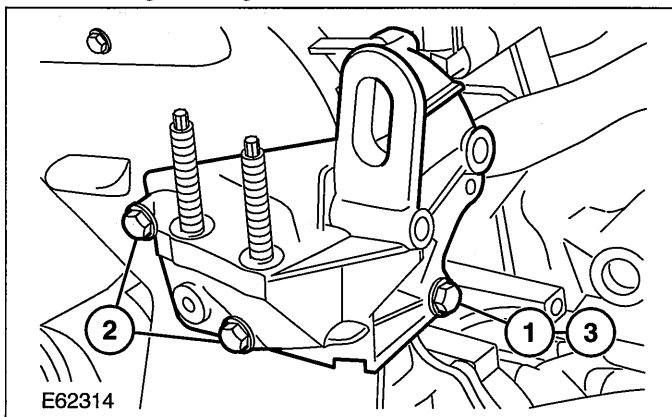
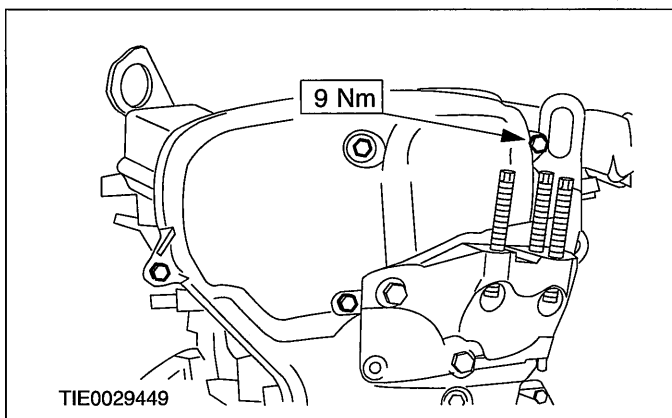
- Remove the special tool.

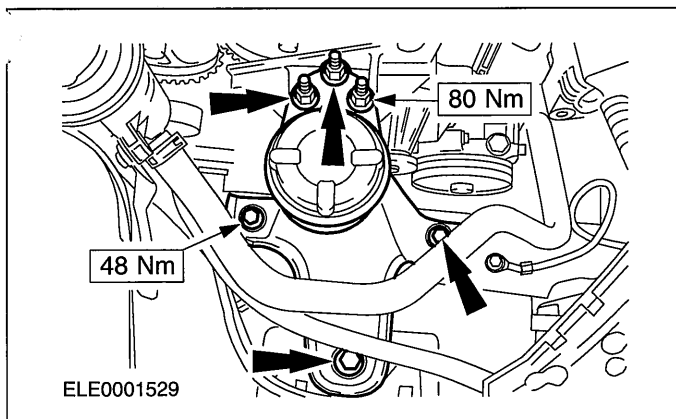


- Apply grease to the spark plug threads.

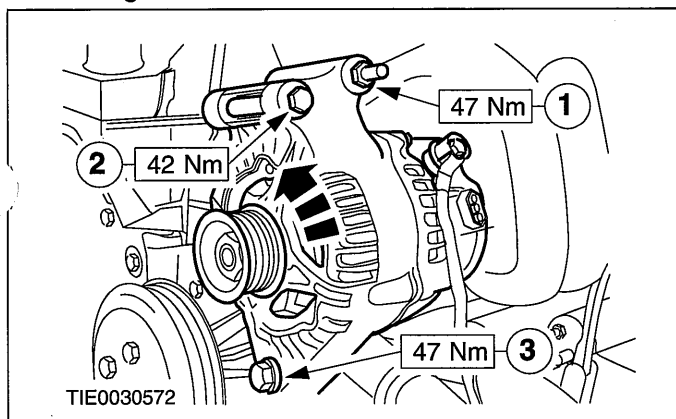
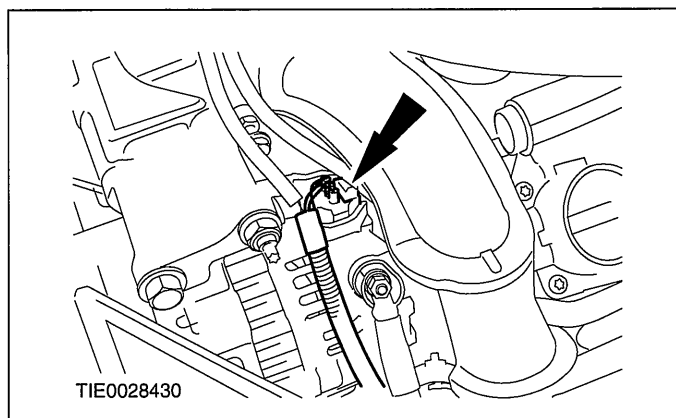
**21. Remove the special tool.****22. Install the blanking plug.****23. Using the special tool, install the spark plugs.****24. Install the engine front mount bracket.**

- Tighten the bolts in the indicated order in three stages.
- Stage 1: Hand tighten bolt 1.
- Stage 2: Tighten bolts 2 to 55 Nm.
- Stage 3: Tighten bolt 3 to 55 Nm.

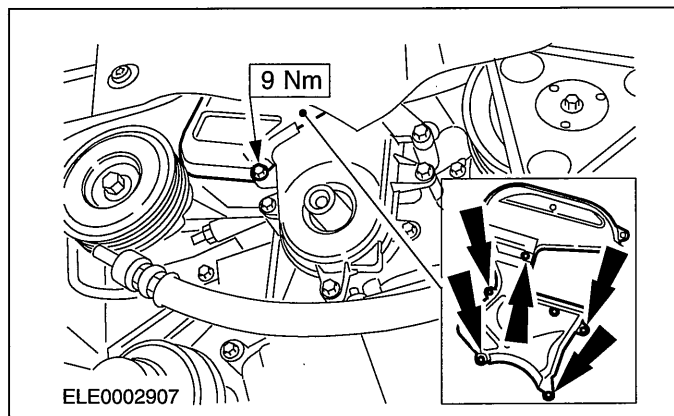
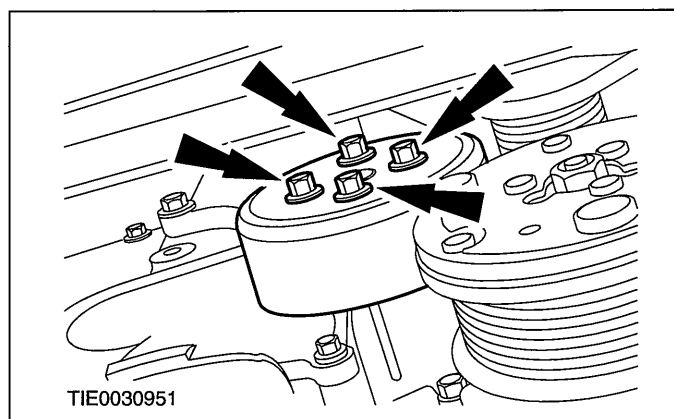
**25. Install the timing belt upper cover.****26. NOTE: Install new engine front mount retaining nuts.**

IN-VEHICLE REPAIR**Install the engine front mount.****27. Remove the trolley jack.****28. Attach the generator.**

1. Install the stud and nut.
2. Install the bolt.
3. Tighten the bolt.

**29. Connect the generator electrical connector.****30. Raise and support the vehicle.**

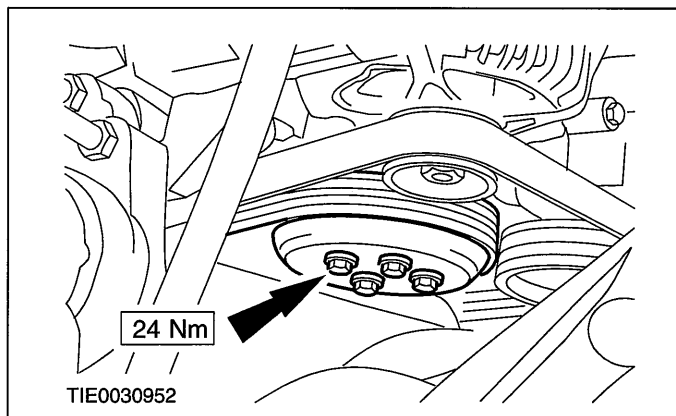
For additional information, refer to: **Lifting (100-02 Jacking and Lifting, Description and Operation).**

31. Install the timing belt upper cover retaining bolts.**32. NOTE: Do not tighten the coolant pump pulley retaining bolts at this stage.****Install the coolant pump pulley.****33. Install the accessory drive belt.**

For additional information, refer to:
Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

IN-VEHICLE REPAIR

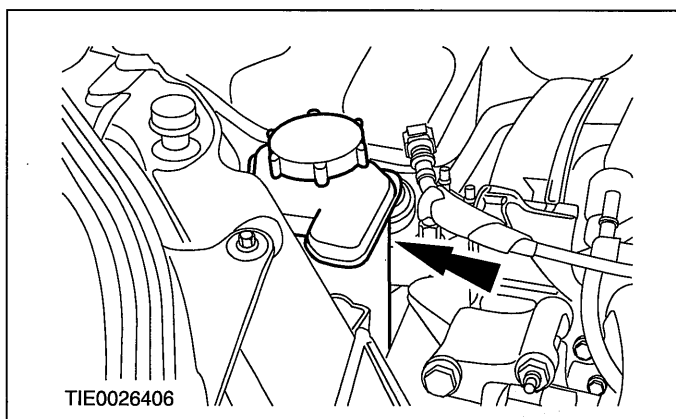
- 34. Tighten the coolant pump pulley retaining bolts.**



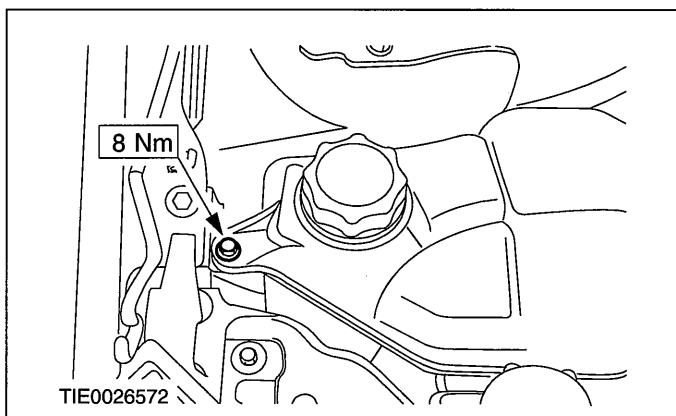
- 35. Install the valve cover.**

For additional information, refer to: Valve Cover (303-01A Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

- 36. Attach the power steering fluid reservoir to the bracket.**



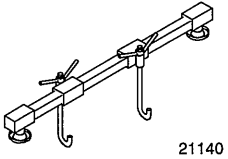
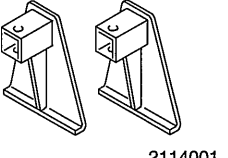
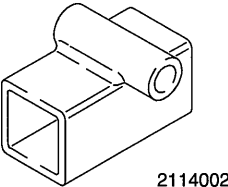
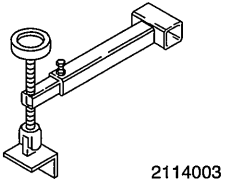
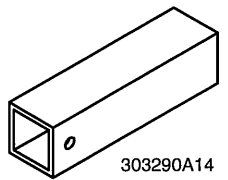
- 37. Attach the coolant expansion tank to the bracket.**



IN-VEHICLE REPAIR

Exhaust Manifold(21 187 0)

Special Tool(s)

	Support Bar, Engine 303-290A (21-140A)
	Adapter for 303-290A 303-290-01 (21-140-01)
	Adapter for 303-290A 303-290-02 (21-140-02)
	Adapter for 303-290A 303-290-03A (21-140-03A)
	Adapter for 303-290A 303-290A-14

General Equipment

Exhaust wrap

Removal

1. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the air cleaner.

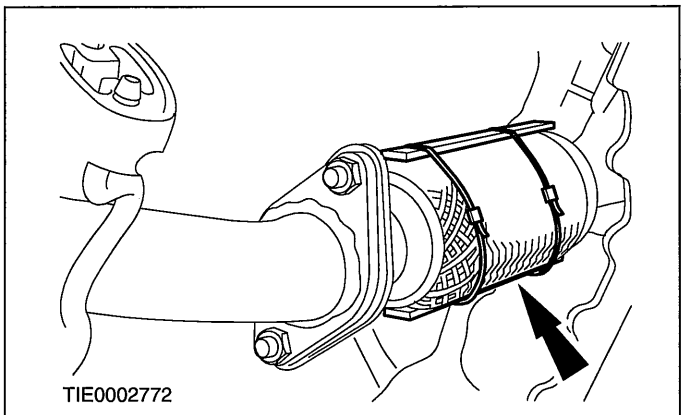
For additional information, refer to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

3. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

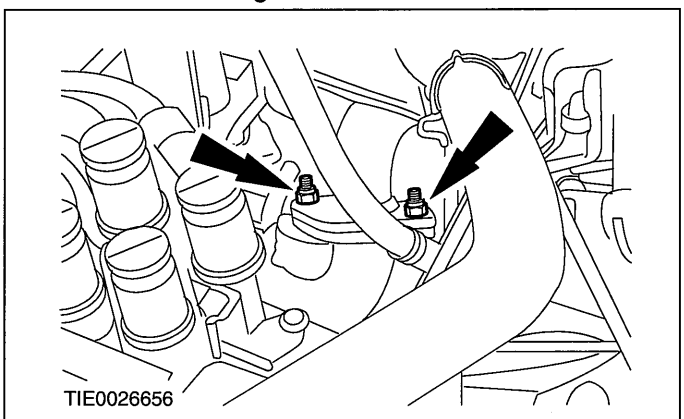
4. **CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a support wrap or suitable splint.



5. Detach the exhaust flexible pipe from the catalytic converter.

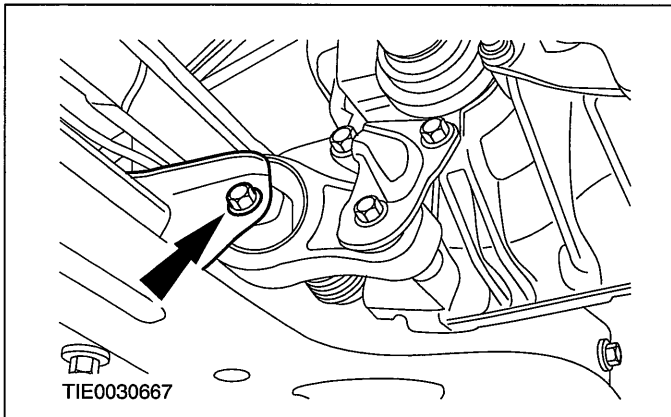
- Discard the gasket and the nuts.



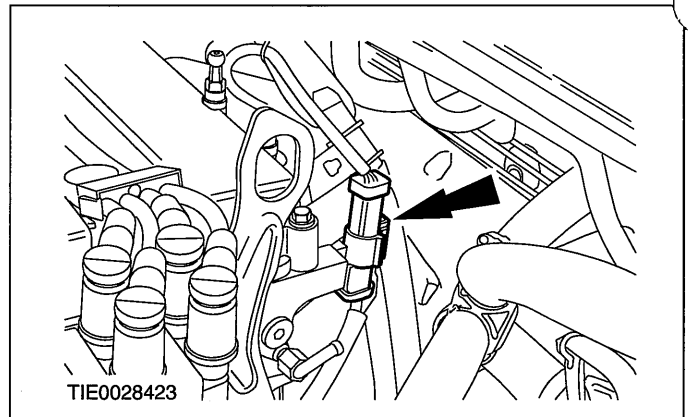
6. Detach the exhaust system insulators from the exhaust brackets and position it to one side.

IN-VEHICLE REPAIR

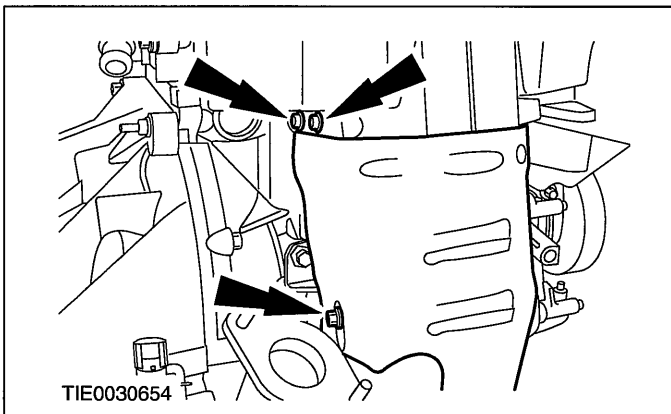
7. Remove the engine support insulator retaining bolt.



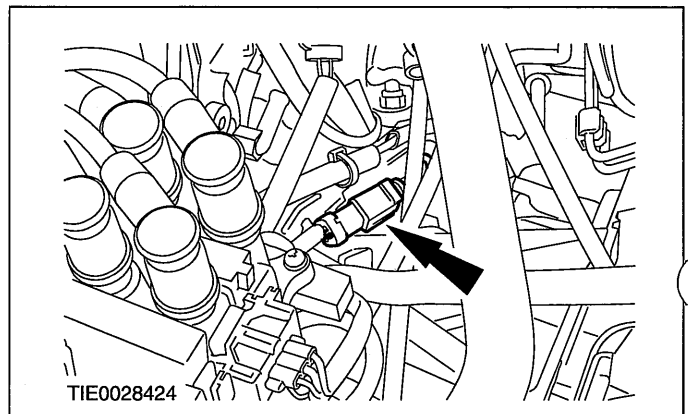
11. Disconnect the heated oxygen (HO2S) sensor electrical connector.



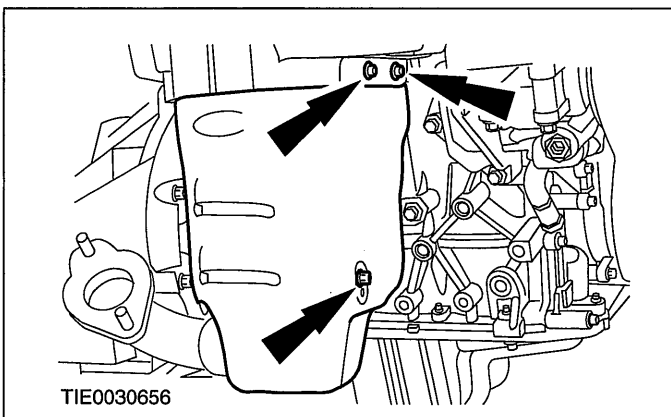
8. Remove the exhaust manifold lower heat shield left-hand retaining bolts.



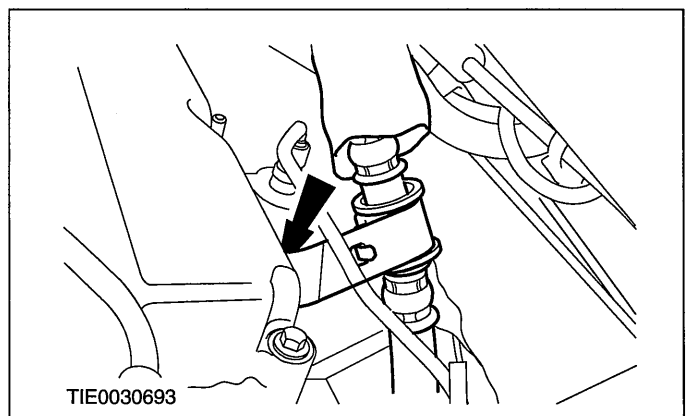
12. Disconnect the catalyst monitor sensor electrical connector.



9. Remove the exhaust manifold lower heat shield right-hand retaining bolts.
- Remove the lower heat shield.



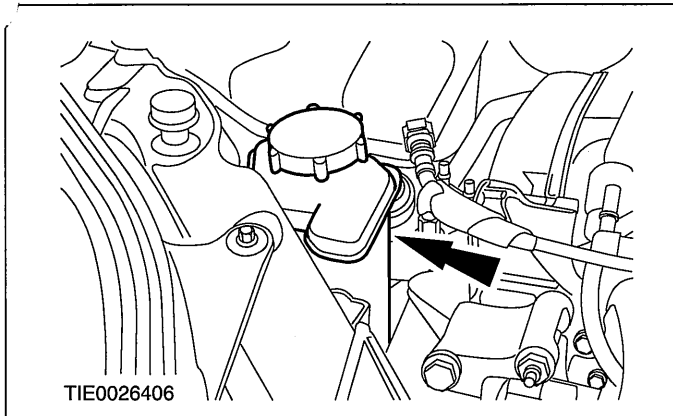
13. Detach the power steering line support bracket from the cylinder head.



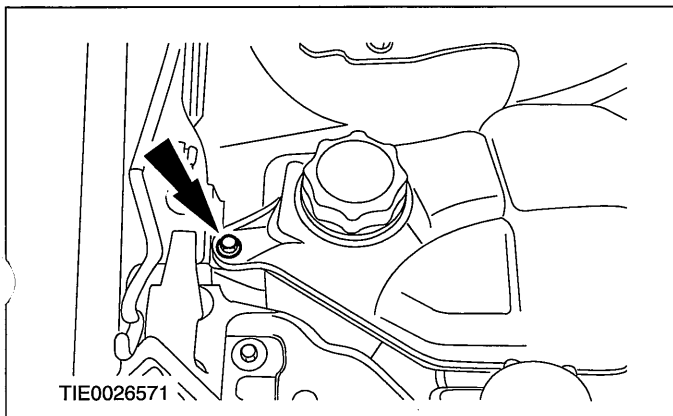
10. Lower the vehicle.

IN-VEHICLE REPAIR

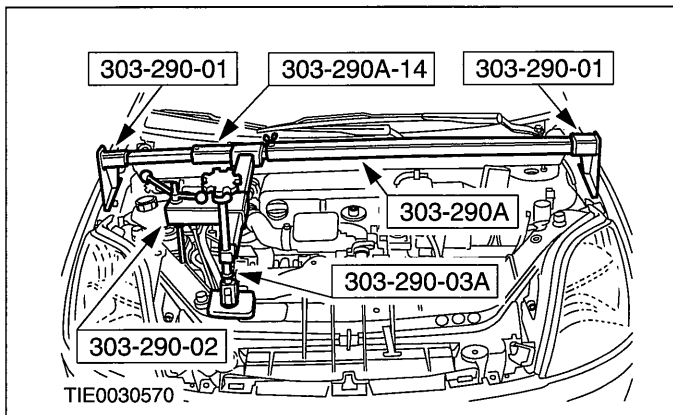
- 14. Detach the power steering fluid reservoir from the bracket and position it to one side.**



- 15. Detach the coolant expansion tank from the bracket and position it to one side.**

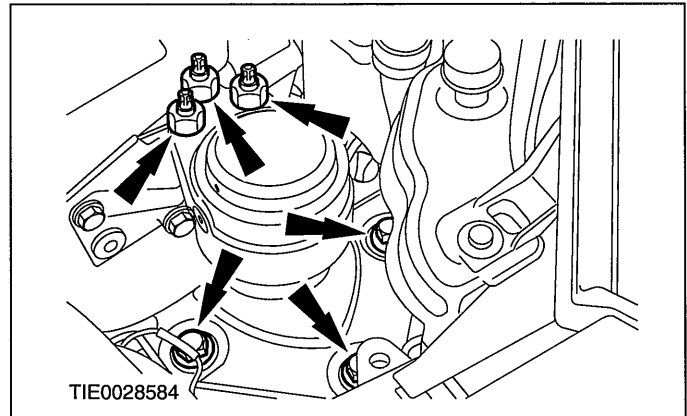


- 16. Install the special tools.**

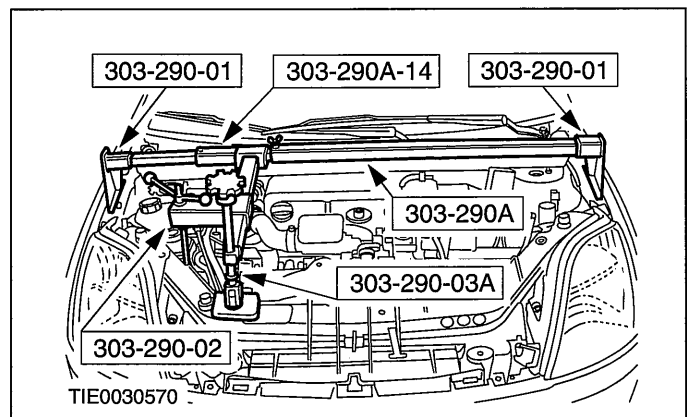


- 17. Remove the engine front mount.**

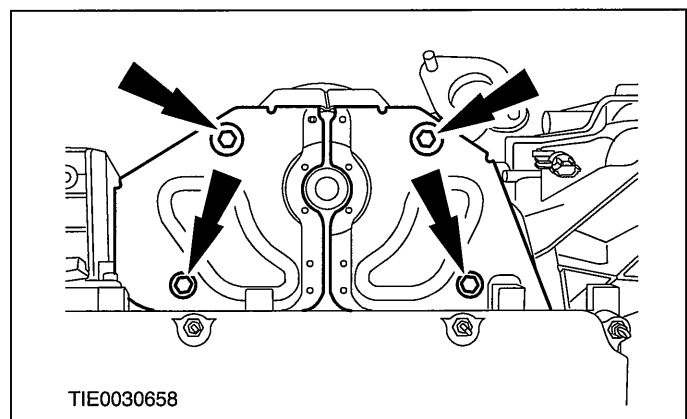
- Discard the nuts.



- 18. Using the special tools lower the engine.**



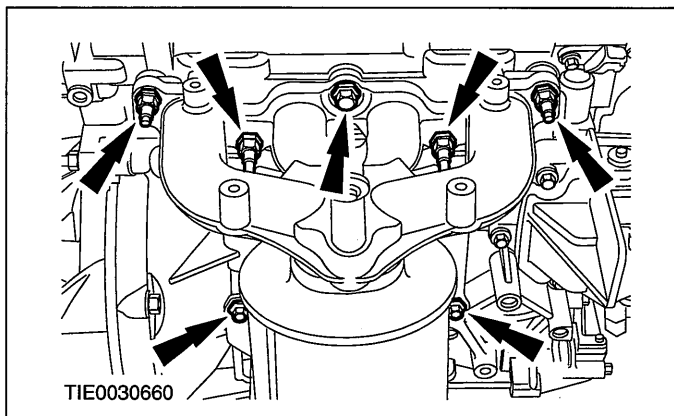
- 19. Remove the exhaust manifold upper heat shield.**



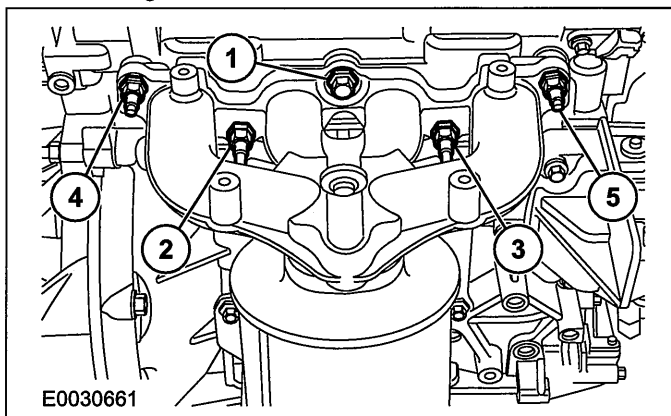
- 20. Remove the exhaust manifold retaining bolts and the nuts.**

IN-VEHICLE REPAIR

- Discard the nuts.



- Stage 2: 55 Nm.

**21. Raise and support the vehicle.**

For additional information, refer to: **Lifting (100-02 Jacking and Lifting, Description and Operation).**

22. Remove the exhaust manifold.

- Discard the gasket.

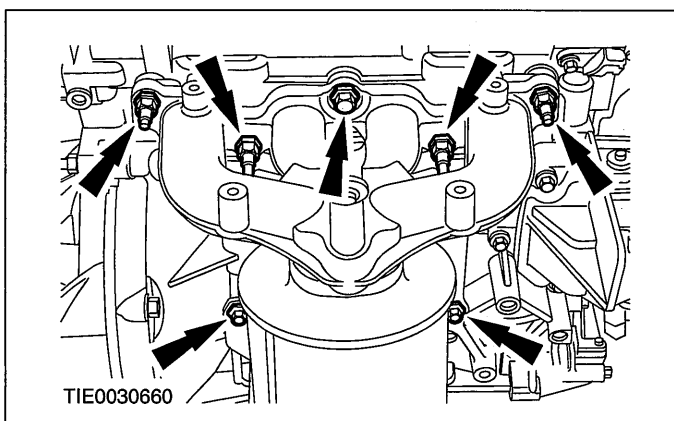
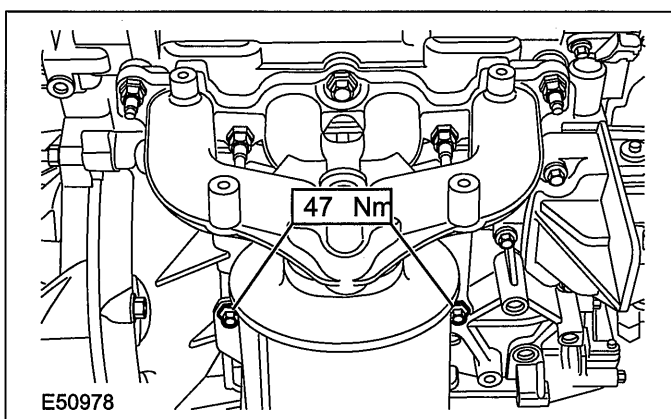
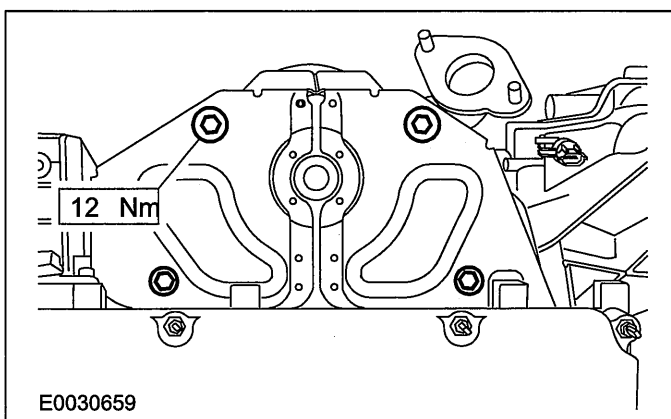
Installation**1. NOTE: Install a new exhaust manifold gasket.**

Attach the exhaust manifold to the cylinder head.

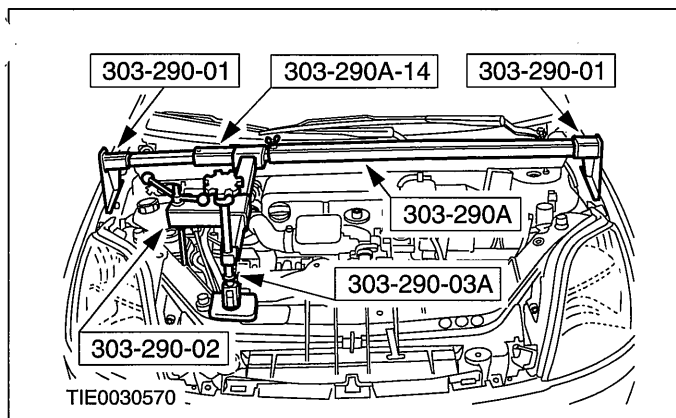
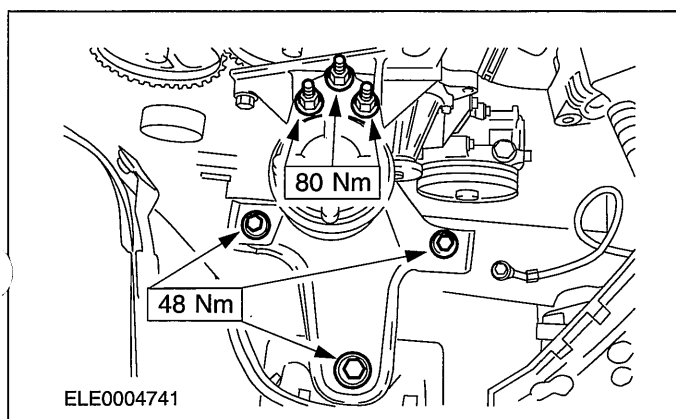
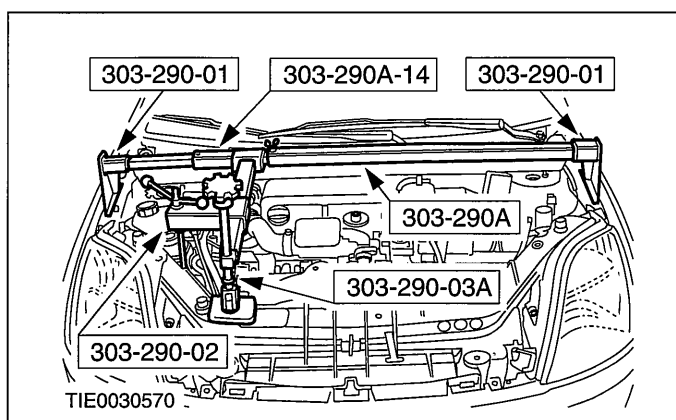
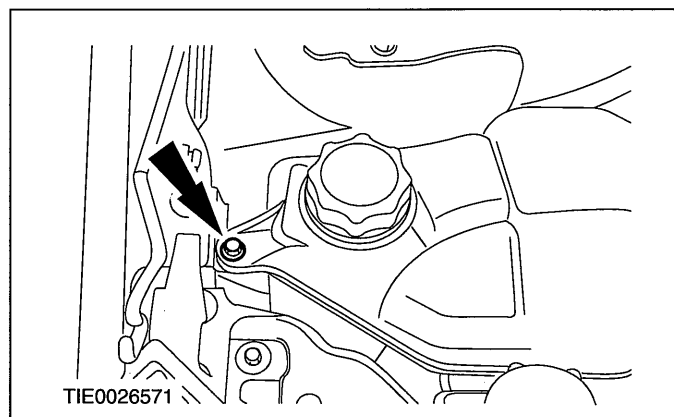
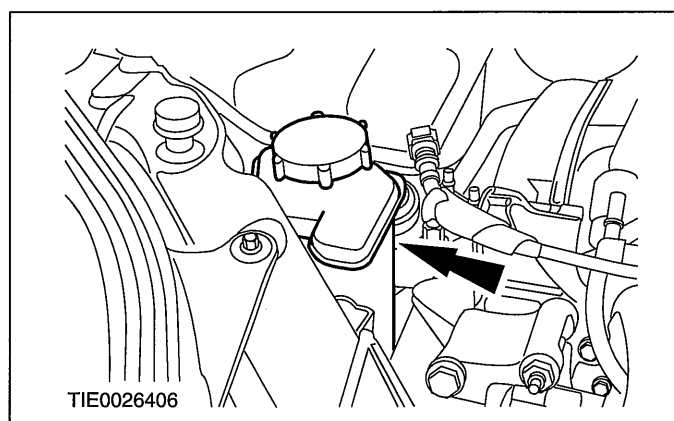
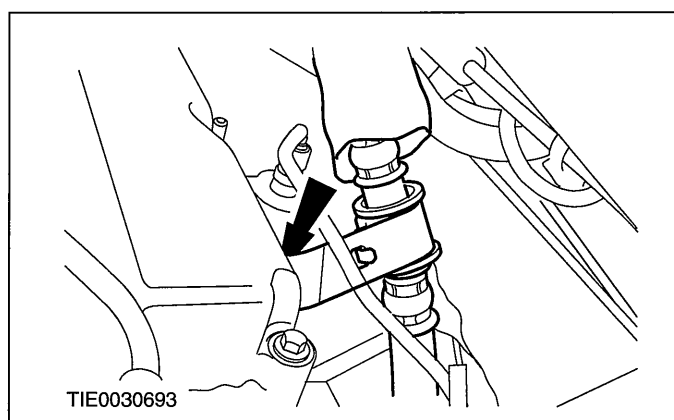
2. Lower the vehicle.**3. NOTE: Install a new exhaust manifold gasket and new exhaust manifold retaining nuts.**

NOTE: Do not fully tighten the nuts and bolt at this stage.

Install the exhaust manifold.

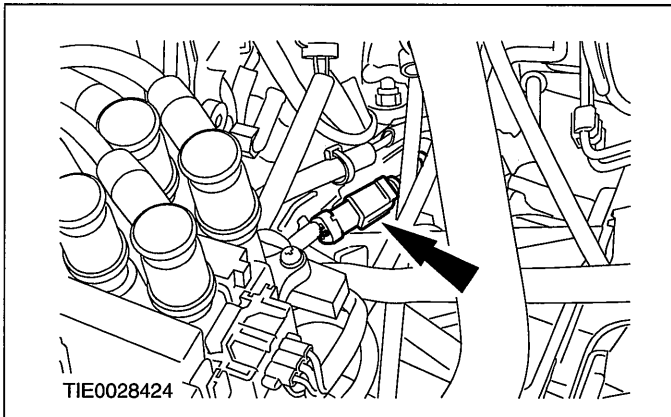
**5. Tighten the exhaust manifold lower retaining bolts.****6. Install the exhaust manifold upper heat shield.****4. Tighten the exhaust manifold upper retaining nuts and bolt in the sequence shown in two stages.**

- Stage 1: 20 Nm.

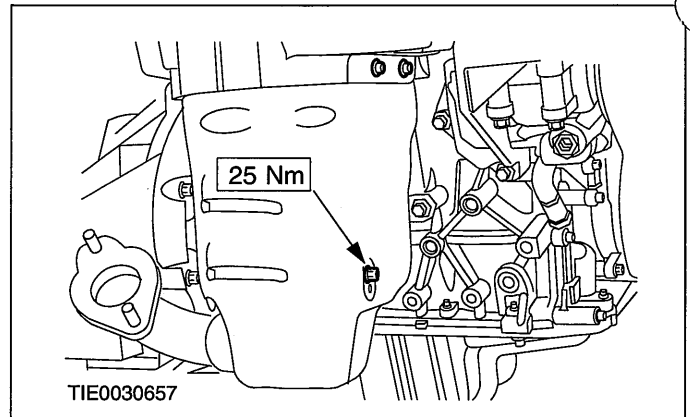
IN-VEHICLE REPAIR**7. Using the special tools, raise the engine.****8. NOTE: Install new engine front mount retaining nuts.****Install the engine front mount.****9. Remove the special tools.****10. Attach the coolant expansion tank to the bracket.****11. Attach the power steering fluid reservoir to the bracket.****12. Attach the power steering line bracket to the cylinder head.**

IN-VEHICLE REPAIR

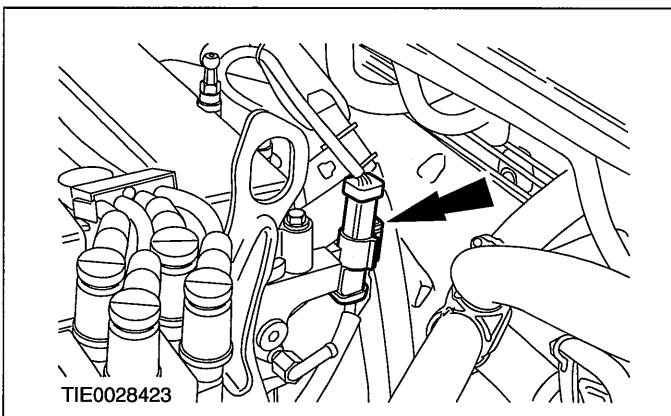
- 13. Connect the catalyst monitor sensor electrical connector.**



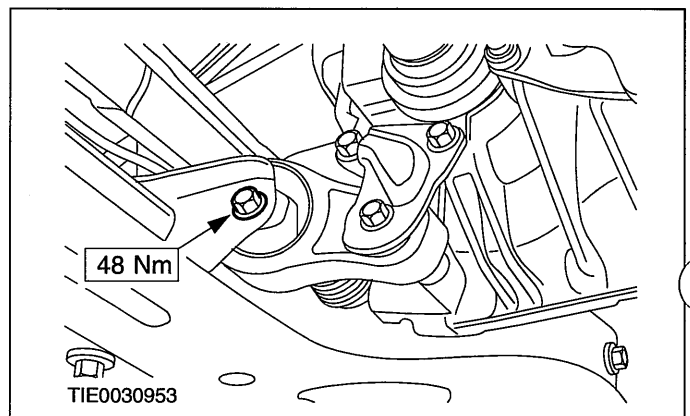
- 17. Install the exhaust manifold lower heat shield left-hand retaining bolts.**



- 14. Connect the heated oxygen (HO2S) sensor electrical connector.**



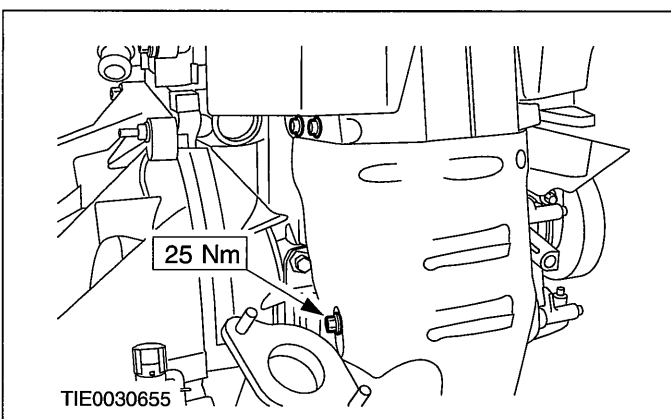
- 18. Install the engine support insulator retaining bolt.**



- 15. Raise and support the vehicle.**

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

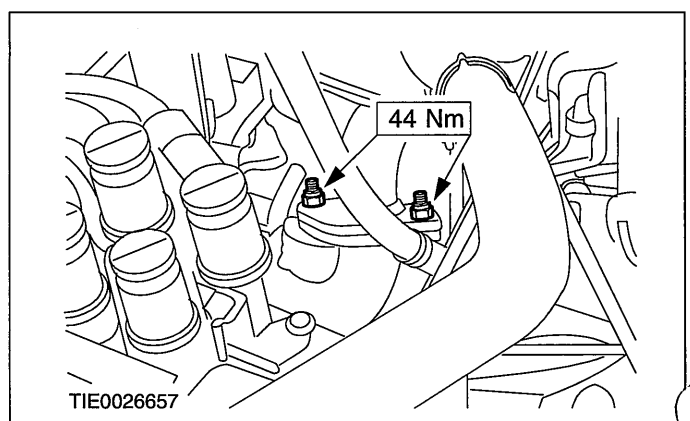
- 16. Position the exhaust manifold lower heat shield and install the right-hand retaining bolt.**



- 19. Attach the exhaust system insulators to the exhaust brackets.**

- 20. NOTE: Install a new exhaust manifold gasket and new nuts.**

Attach the exhaust flexible pipe to the catalytic converter.



- 21. Remove the exhaust flexible pipe support wrap or splint.**

IN-VEHICLE REPAIR

22. Lower the vehicle.

23. Install the air cleaner.

For additional information, refer to: Air
Cleaner - 1.25L Duratec-16V (Sigma)/1.4L
Duratec-16V (Sigma)/1.6L Duratec-16V
(Sigma) (303-12 Intake Air Distribution
and Filtering, Removal and Installation).

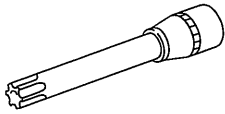
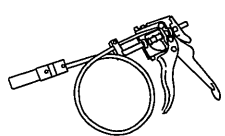
24. Connect the battery ground cable.

For additional information, refer to: Battery
Disconnect (414-01 Battery, Mounting and
Cables, General Procedures).

IN-VEHICLE REPAIR

Cylinder Head(21 163 0)

Special Tool(s)

 21167	Socket, Cylinder Head Bolts 303-392 (21-167)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)

Materials

Name	Specification
Engine oil	WSS-M2C912-A1

Removal

1. Release the fuel system pressure.

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

2. Drain the cooling system.

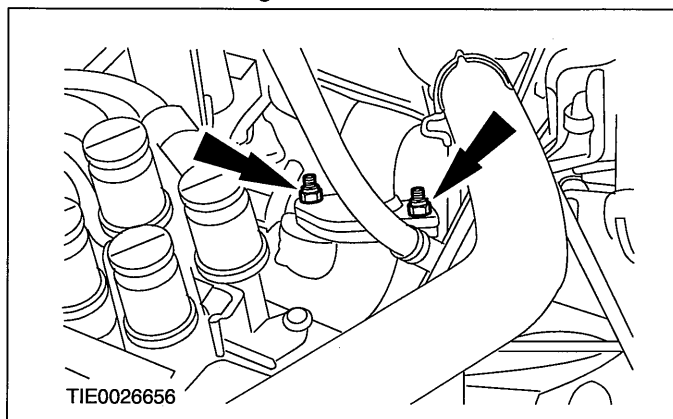
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 1.4L Duratorq-TDCi (DV) Diesel, General Procedures).

3. Remove the camshaft.

For additional information, refer to: Camshafts (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

4. Detach the exhaust flexible pipe from the catalytic converter.

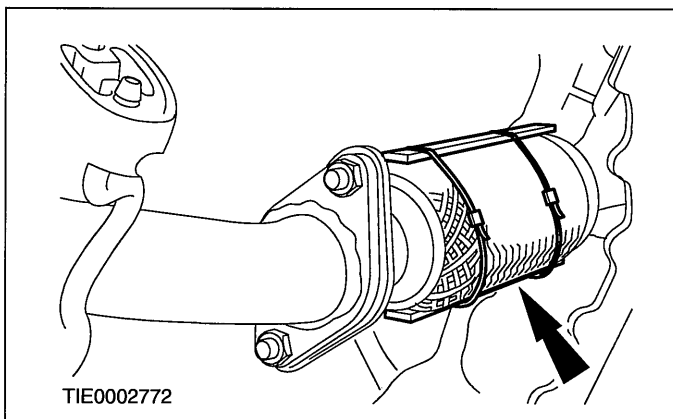
- Discard the gasket and the nuts.



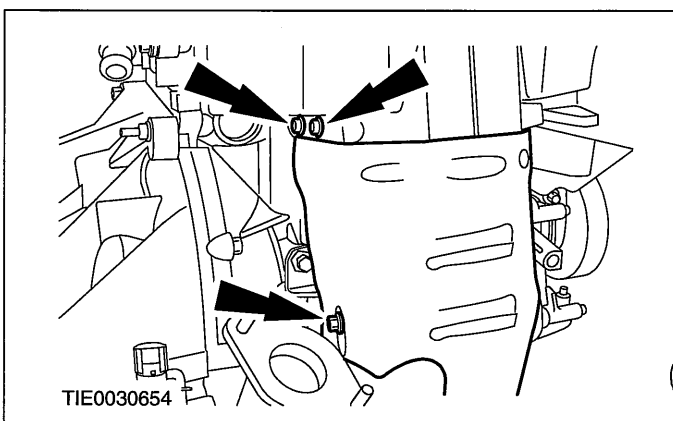
5. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

6. Using a suitable splint or wrap support the exhaust flexible pipe.



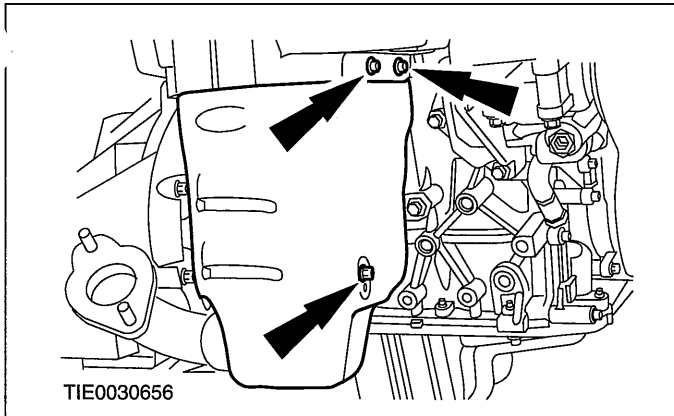
7. Remove the exhaust manifold lower heat shield left-hand retaining bolts.



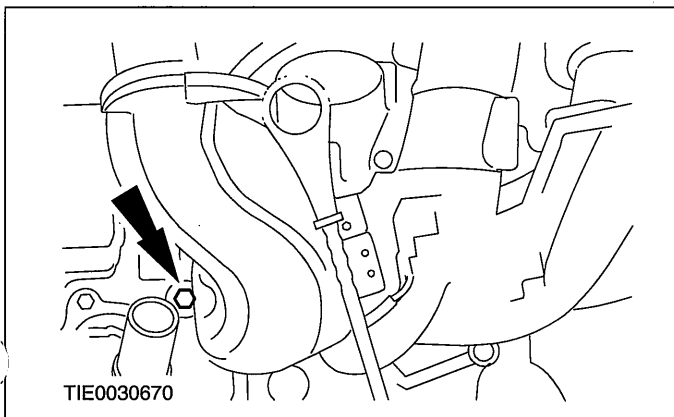
8. Remove the exhaust manifold lower heat shield right-hand retaining bolts.

IN-VEHICLE REPAIR

- Remove the lower heat shield.

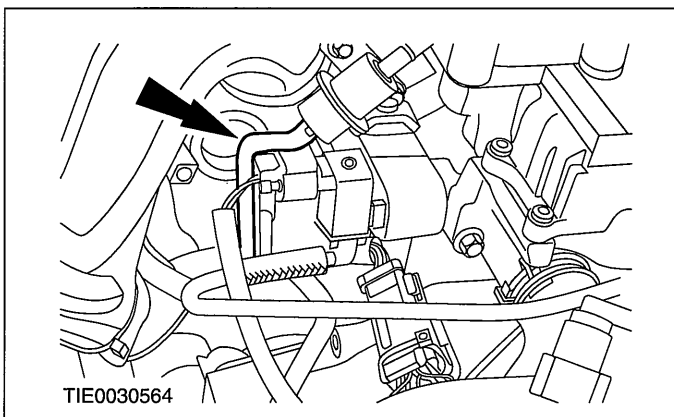


- 9. Remove the intake manifold retaining bolt.**

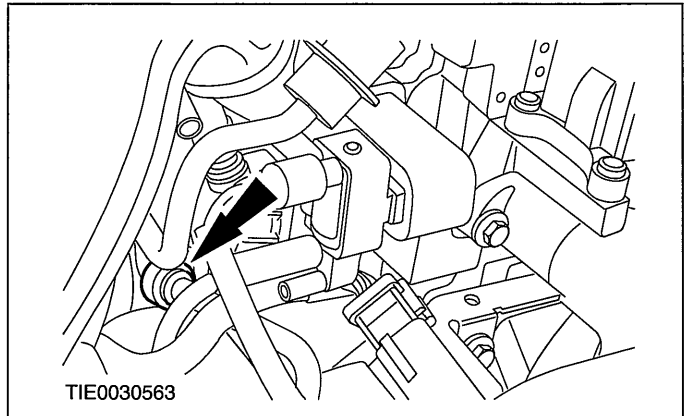


- 10. Lower the vehicle.**

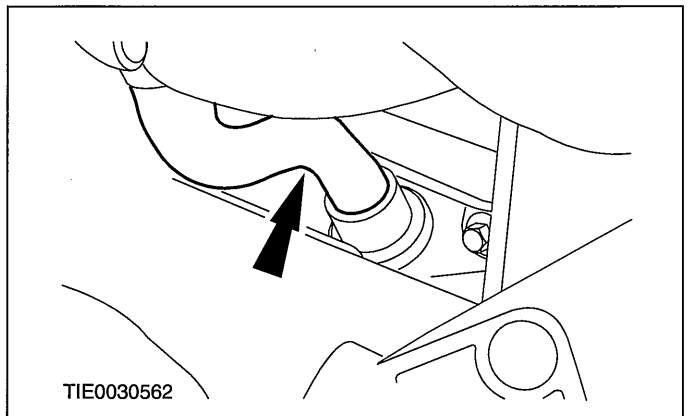
- 11. Disconnect the vacuum hose from the fuel pressure regulator.**



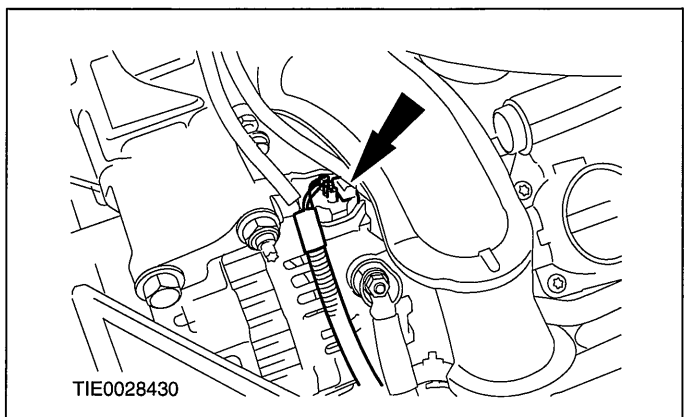
- 12. Disconnect the brake booster vacuum line from the intake manifold.**



- 13. Disconnect the positive crankcase ventilation (PCV) hose from the PCV.**

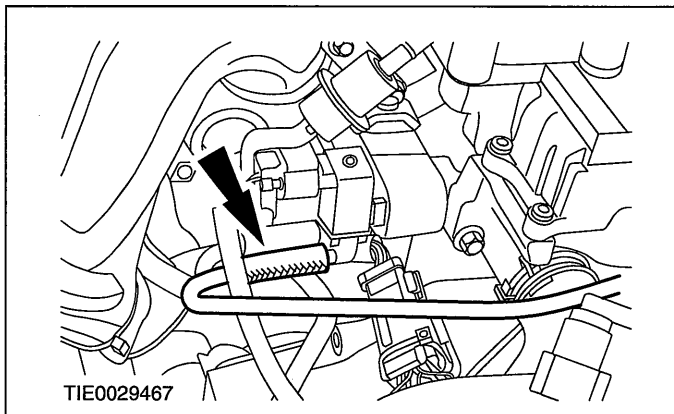


- 14. Disconnect the generator electrical connector.**

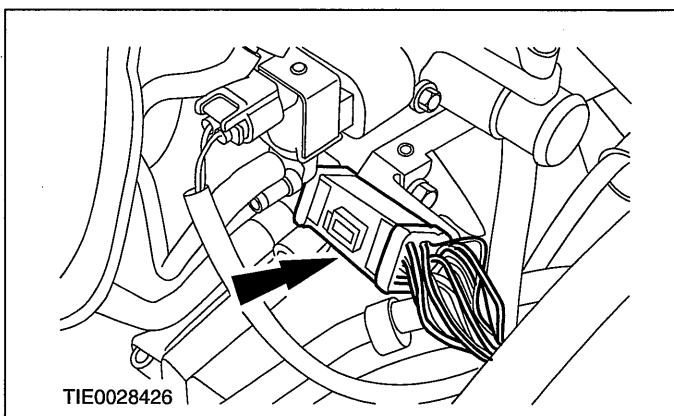


IN-VEHICLE REPAIR

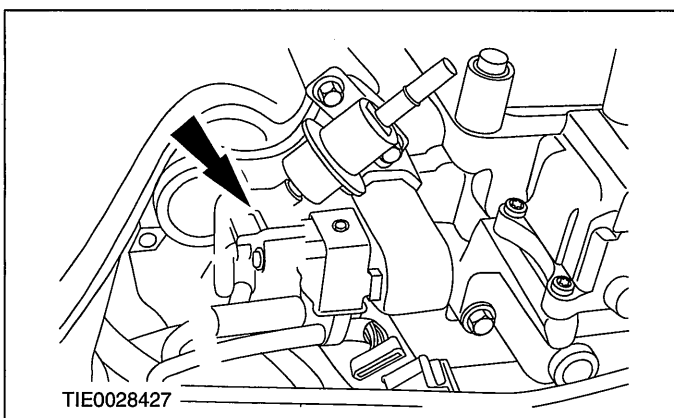
15. Disconnect the evaporative emissions (EVAP) hose from the EVAP valve.



16. Disconnect the engine wiring harness electrical connector.

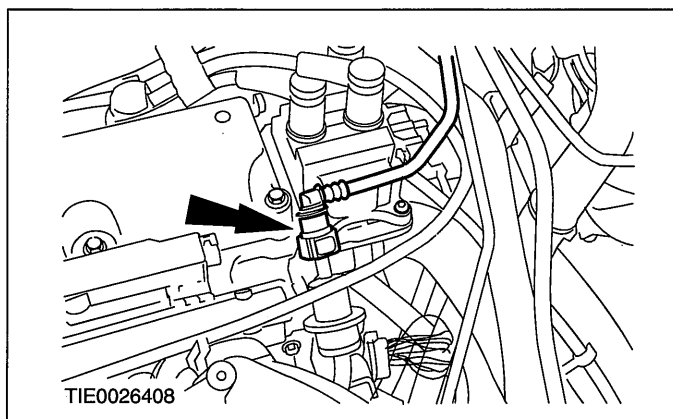


17. Disconnect the EVAP valve electrical connector.



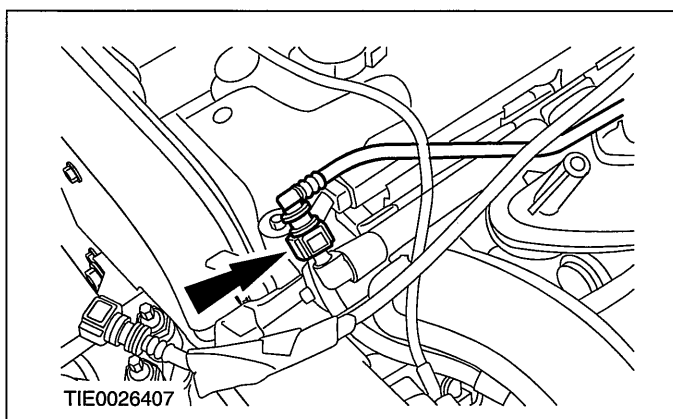
18. Disconnect the fuel supply line quick release coupling.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

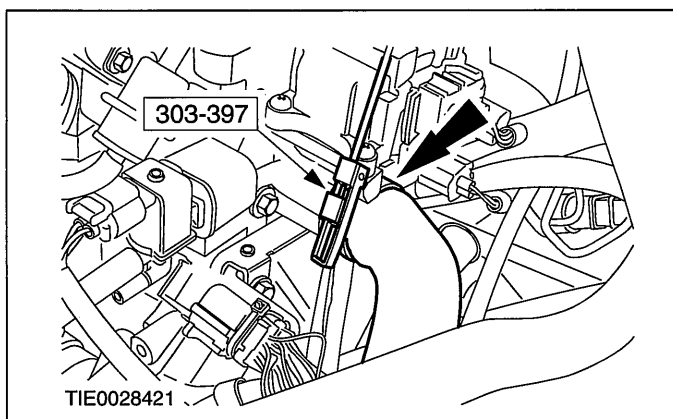


19. Disconnect the fuel return line quick release coupling.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

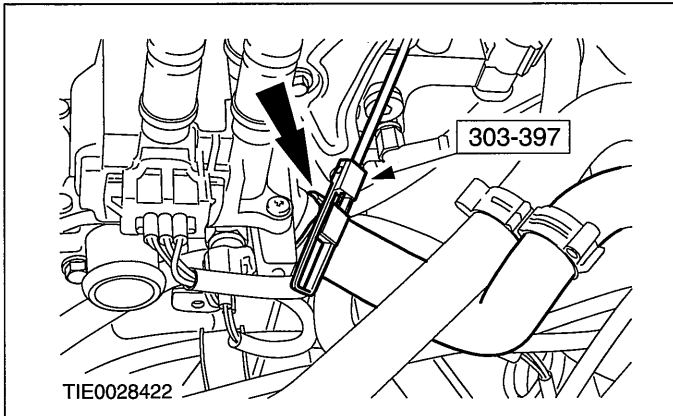


20. Using the special tool, disconnect the coolant hose from the coolant distribution assembly.

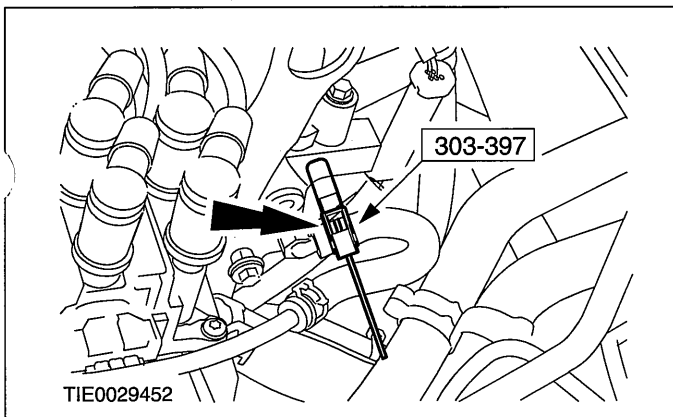


IN-VEHICLE REPAIR

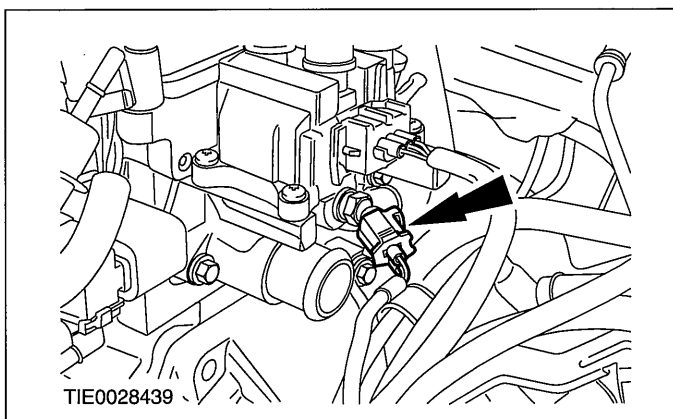
21. Using the special tool, disconnect the coolant hose from the coolant distribution assembly.



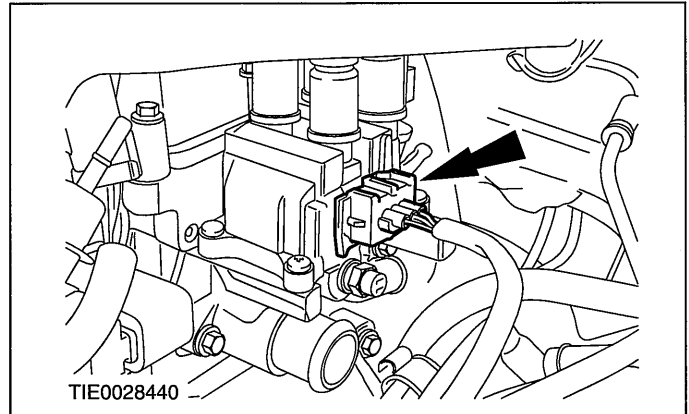
22. Using the special tool, detach the degas hose from the cylinder head.
- Using the special tool, detach the degas hose from the cylinder head.



23. Disconnect the engine coolant temperature (ECT) electrical connector.

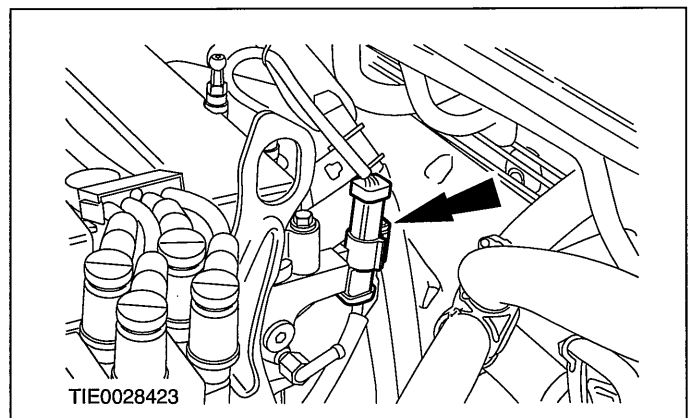


24. Disconnect the electronic ignition (EI) coil electrical connector.

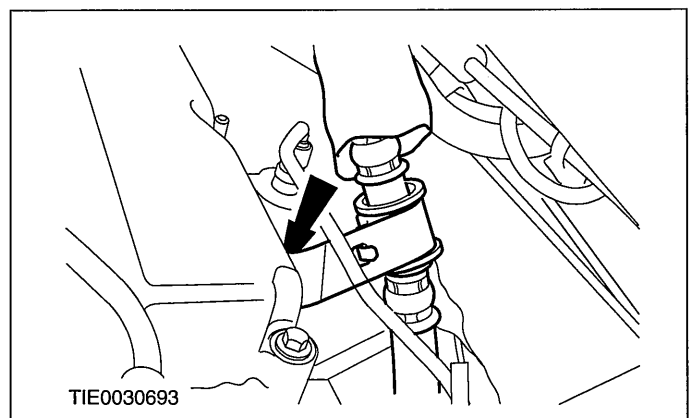


25. Disconnect the heated oxygen (HO2S) sensor electrical connector.

- Detach the electrical connector from the bracket.

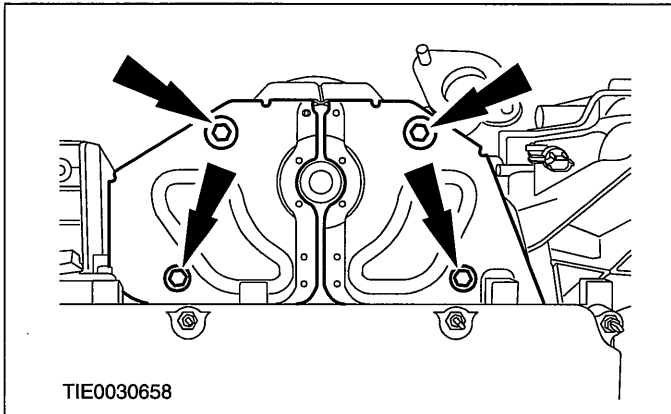


26. Detach the power steering line bracket from the cylinder head.

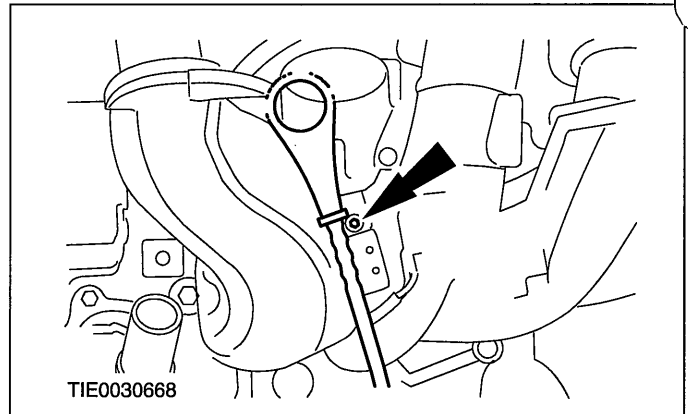


IN-VEHICLE REPAIR

- 27. Remove the exhaust manifold upper heat shield**

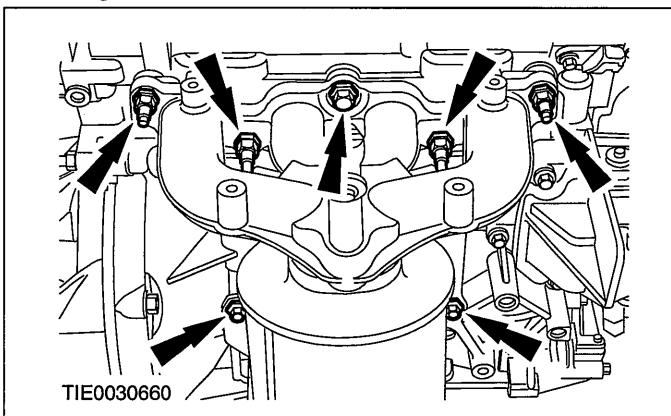


- 30. Detach the oil level indicator tube from the intake manifold.**

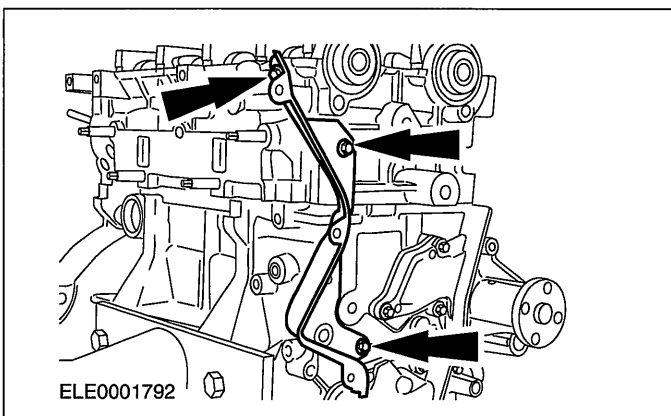


- 28. Detach the exhaust manifold and position it to one side.**

- Discard the nuts and the exhaust manifold gasket.



- 29. Remove the timing belt rear cover (engine shown removed for clarity).**



- 31. CAUTIONS:**

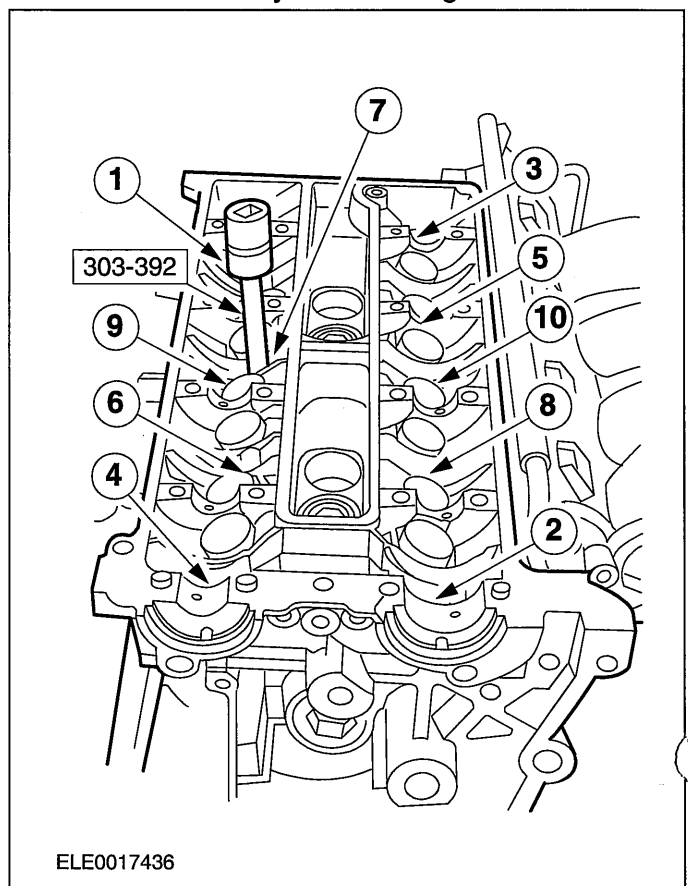
⚠ The cylinder head must have cooled to below 30°C before removal.

⚠ Position the cylinder head on a soft surface.

⚠ Remove the cylinder head bolts in the sequence shown.

Using the special tool, remove the cylinder head bolts.

- Discard the cylinder head gasket.



IN-VEHICLE REPAIR

Installation

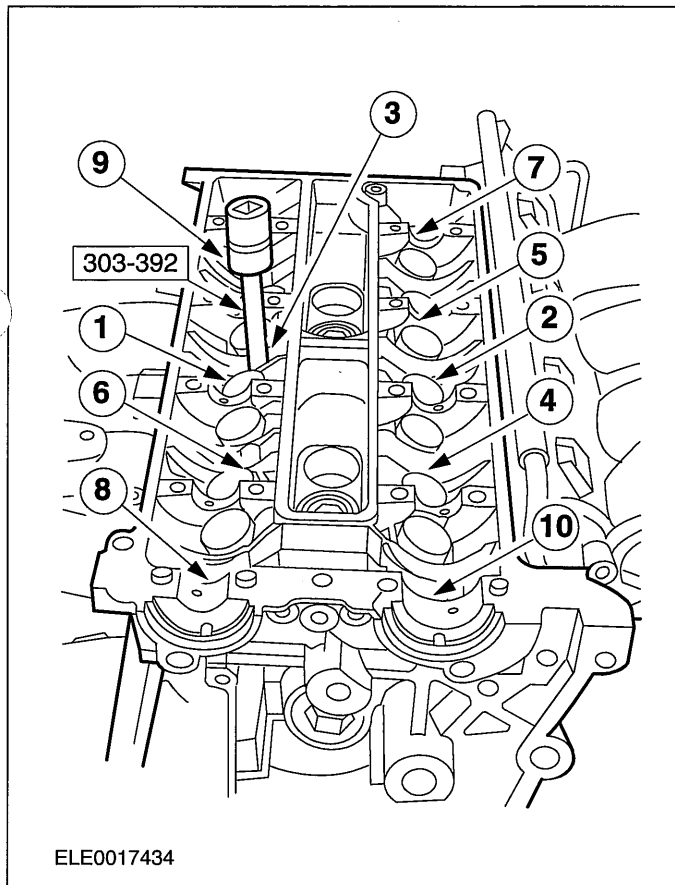
1. **CAUTION:** The thickness of the new cylinder head gasket must be the same as that of the old one (hole marked).

NOTE: Install a new cylinder head gasket.

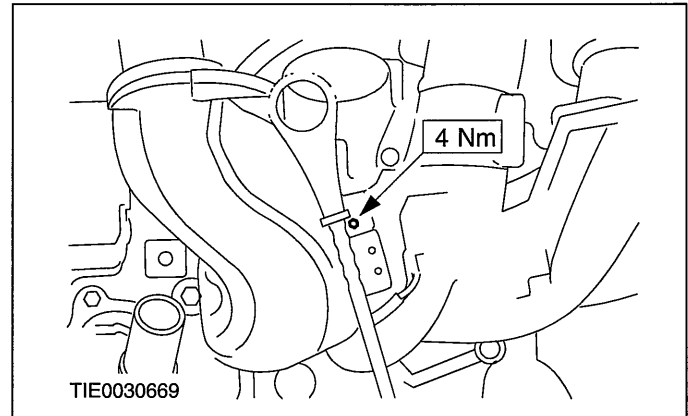
NOTE: Position the cylinder head into the two guide sleeves.

Using the special tool, install the cylinder head.

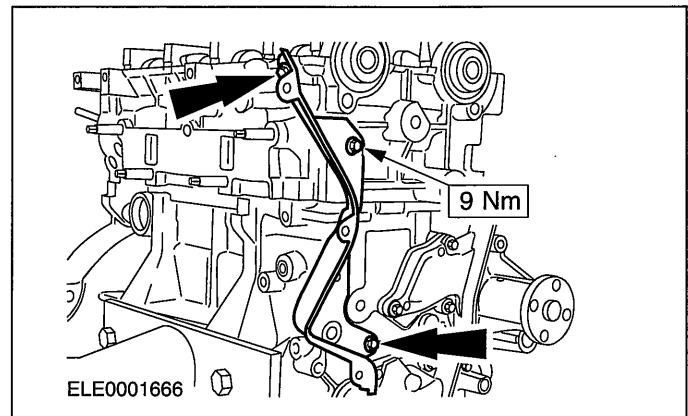
- Tighten the cylinder head bolts in the sequence shown in three stages.
- Stage 1: 15 Nm.
- Stage 2: 30 Nm.
- Stage 3: 90 degrees.



2. Attach the oil level indicator tube to the intake manifold.



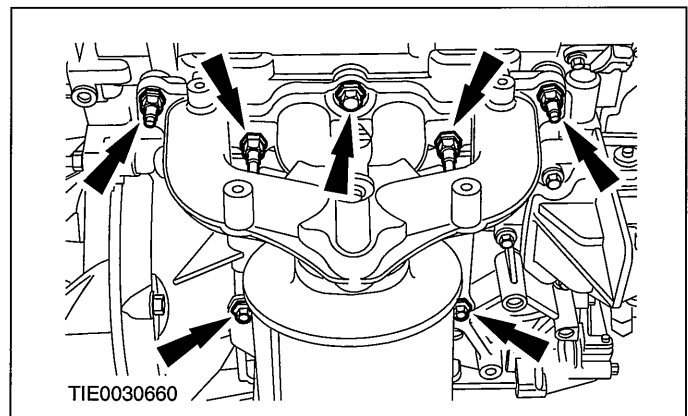
3. Install the timing belt rear cover (engine shown removed for clarity).



4. **NOTE:** Install a new exhaust manifold gasket and new exhaust manifold retaining nuts.

NOTE: Do not fully tighten the nuts and bolt at this stage.

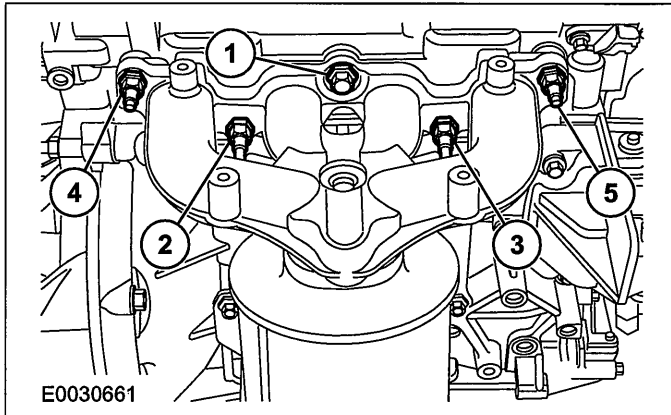
Install the exhaust manifold.



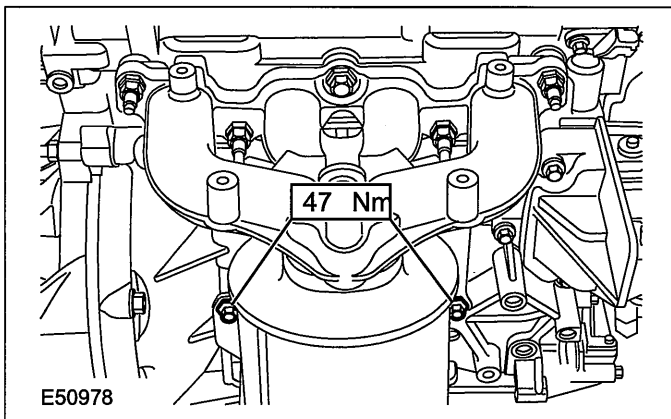
5. Tighten the exhaust manifold upper retaining nuts and bolt in the sequence shown in two stages.

IN-VEHICLE REPAIR

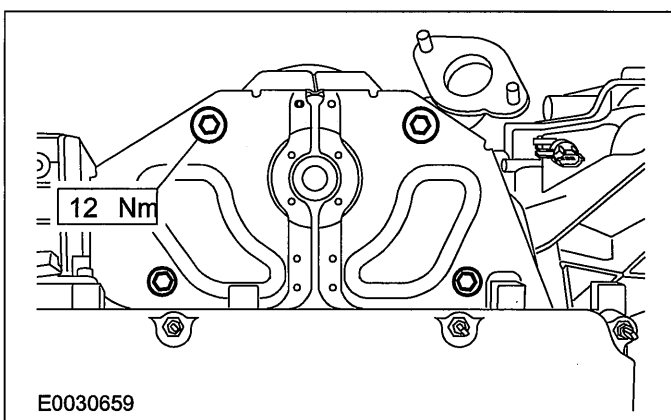
- Stage 1: 20 Nm.
- Stage 2: 55 Nm.



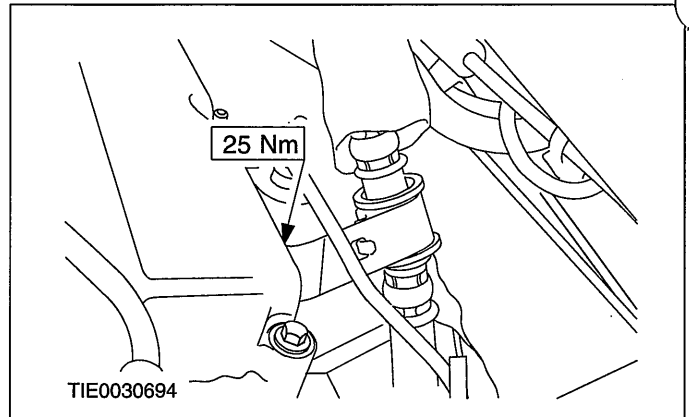
- 6. Tighten the exhaust manifold lower retaining bolts.**



- 7. Install the exhaust manifold upper heat shield.**

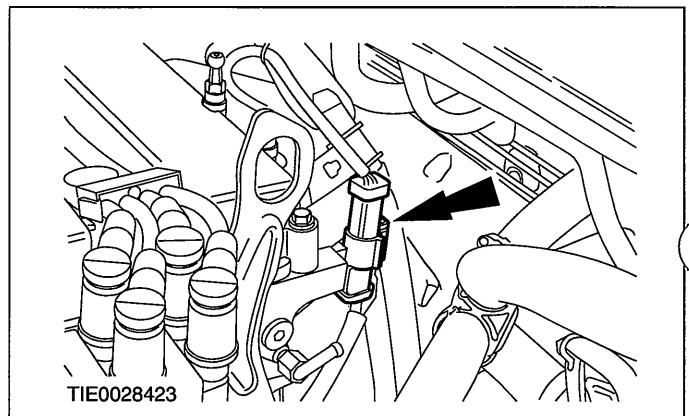


- 8. Attach the power steering line bracket to the cylinder head.**

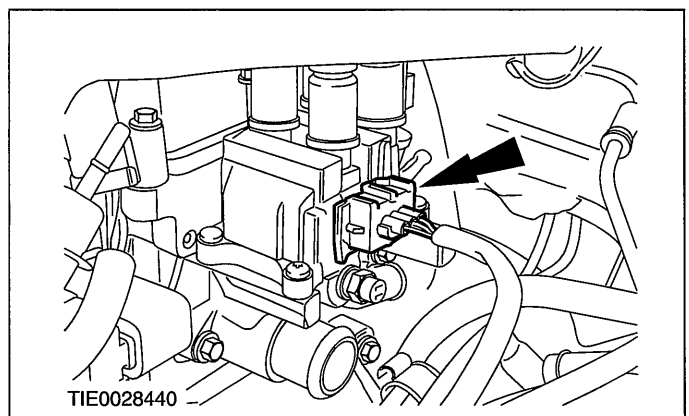


- 9. Connect the heated oxygen (HO2S) sensor electrical connector.**

- Attach the electrical connector to the bracket.

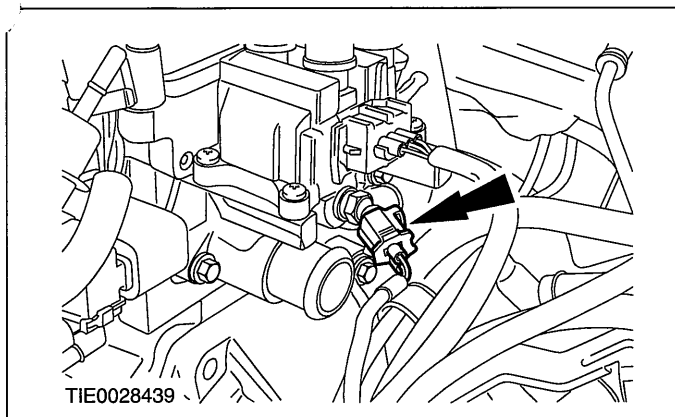


- 10. Connect the electronic ignition (EI) coil electrical connector.**

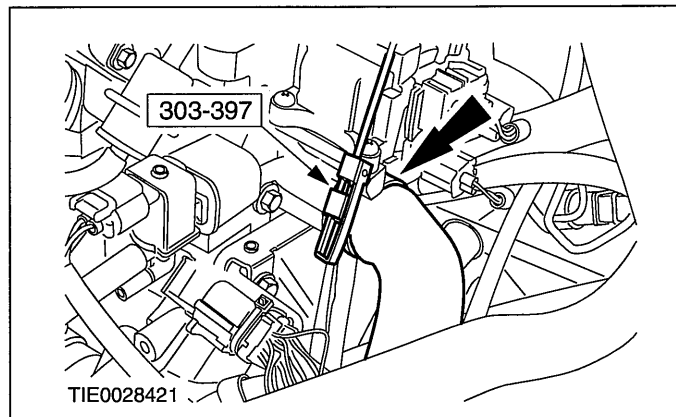


IN-VEHICLE REPAIR

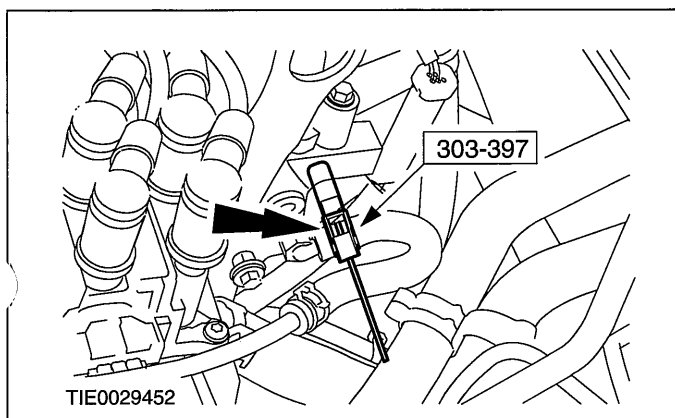
- 11. Connect the engine coolant temperature (ECT) sensor electrical connector.**



- 14. Using the special tool, connect the coolant hose to the coolant distribution assembly.**

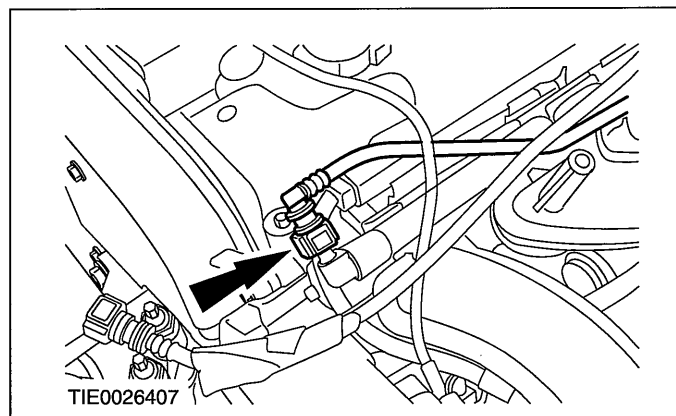


- 12. Using the special tool, connect the degas hose to the cylinder head.**

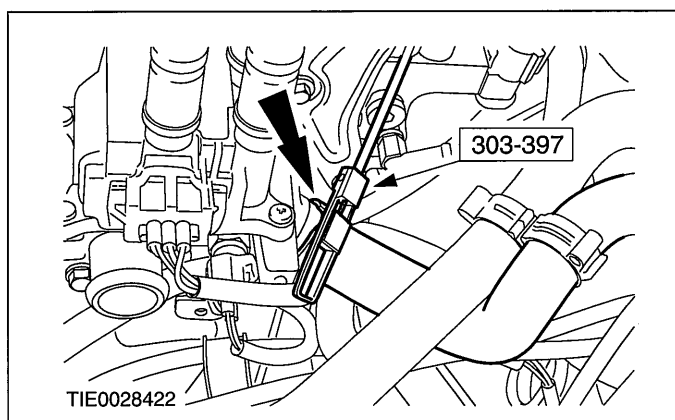


- 15. Connect the fuel return line quick release coupling.**

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

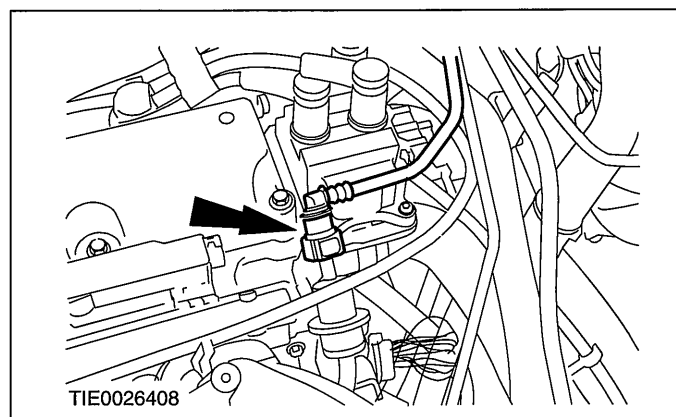


- 13. Using the special tool, connect the coolant hose to the coolant distribution assembly.**



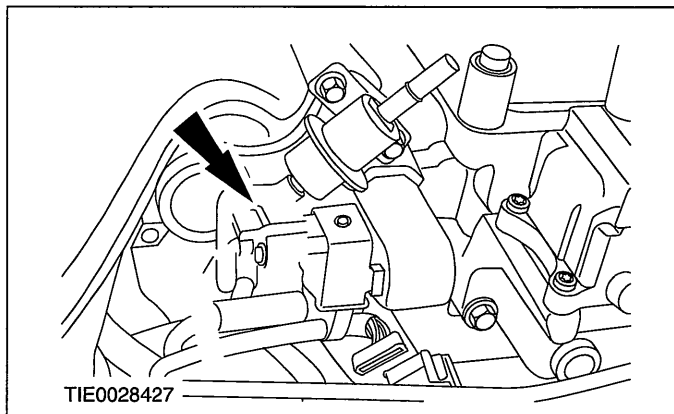
- 16. Connect the fuel supply line quick release coupling.**

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

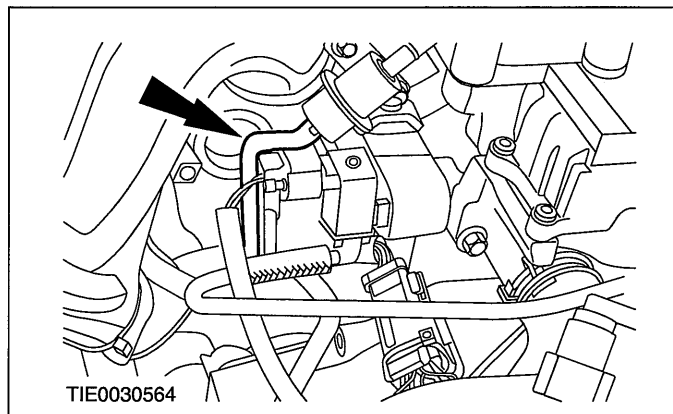


IN-VEHICLE REPAIR

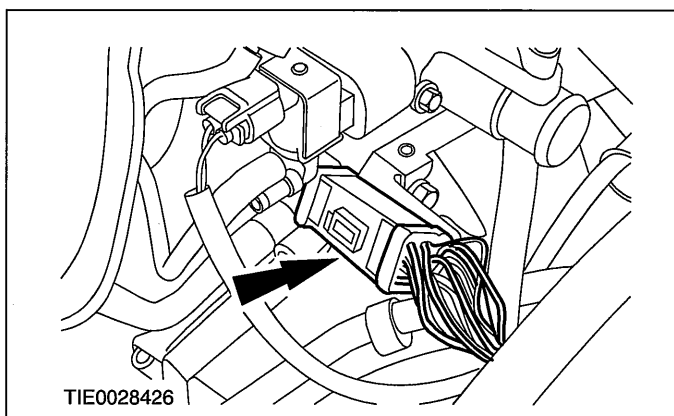
- 17. Connect the evaporate emission (EVAP) valve electrical connector.**



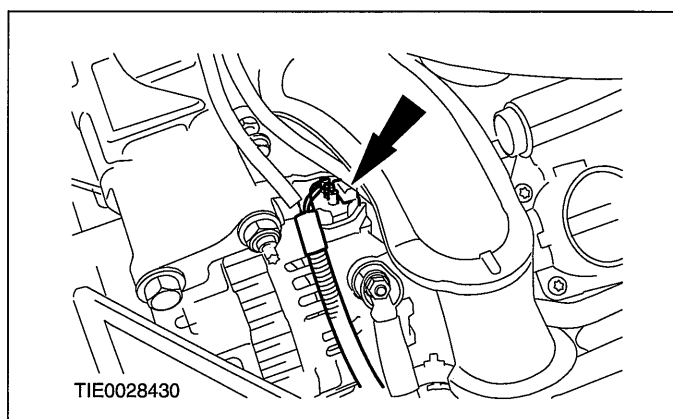
- 20. Connect the vacuum hose to the fuel pressure regulator.**



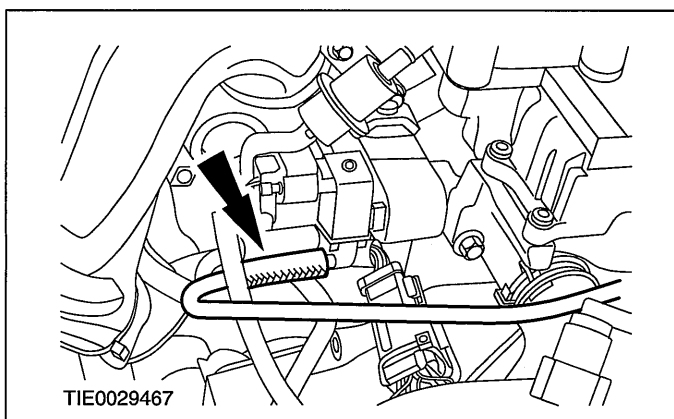
- 18. Connect the engine wiring harness electrical connector.**



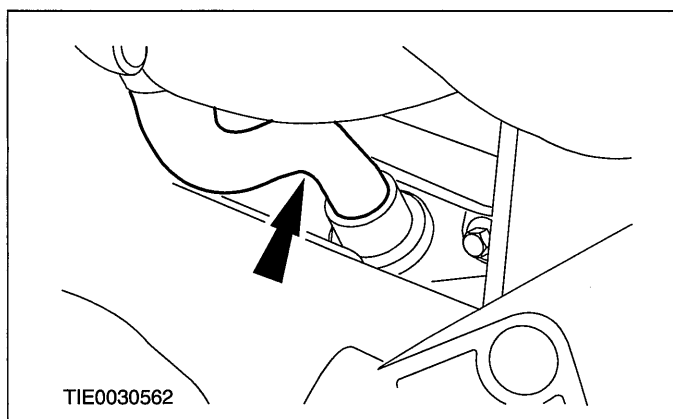
- 21. Connect the generator electrical connector.**



- 19. Connect the EVAP hose to the EVAP valve.**

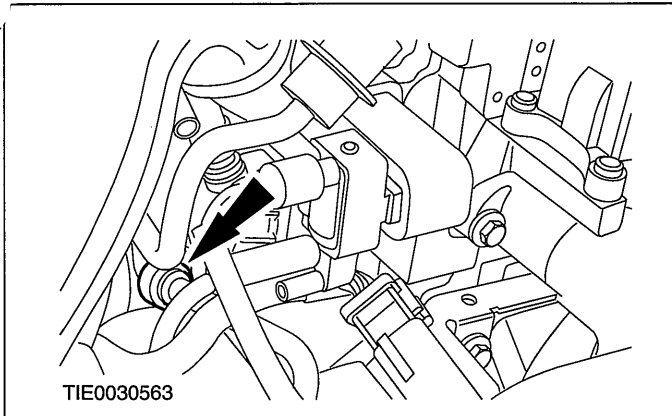


- 22. Connect the positive crankcase ventilation (PCV) hose to the PCV.**



IN-VEHICLE REPAIR

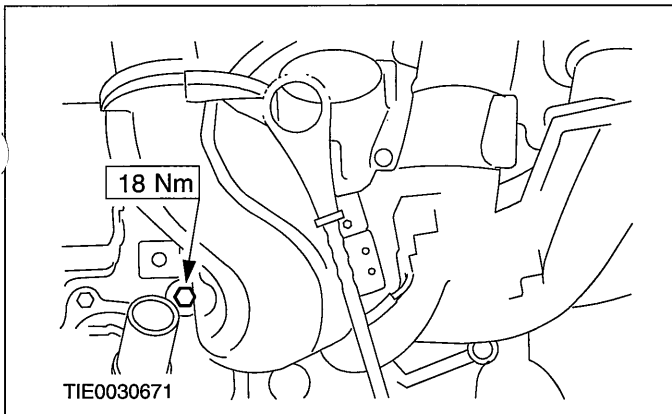
23. Connect the brake booster vacuum line to the intake manifold.



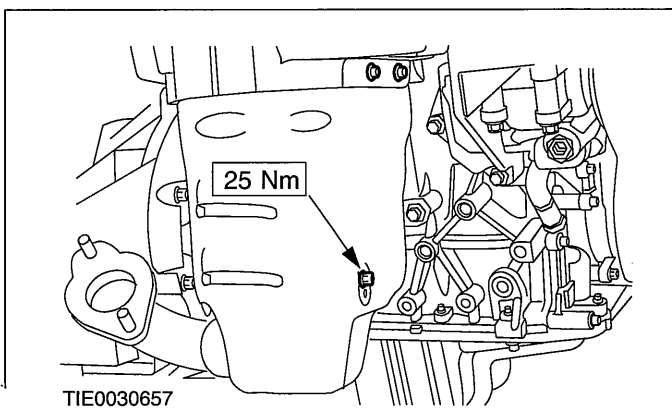
24. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

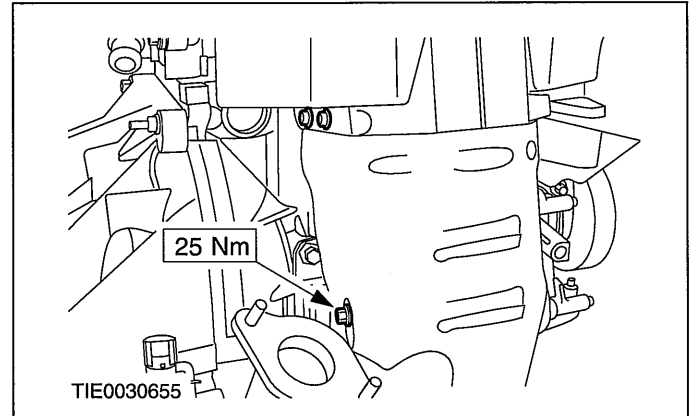
25. Install the intake manifold retaining bolt.



26. Position the exhaust manifold lower heat shield and install the right-hand retaining bolts.

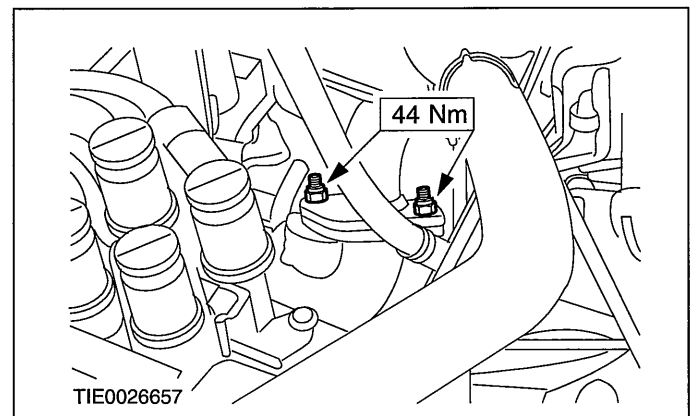


27. Install the exhaust manifold lower heat shield left-hand retaining bolts.



28. **NOTE:** Install a new flexible pipe gasket and new nuts.

Attach the flexible pipe to the catalytic converter



29. Remove the exhaust flexible pipe support.

30. Install the camshaft.

For additional information, refer to: Camshafts (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

31. **NOTE:** Install a new oil filter.

Change the engine oil.

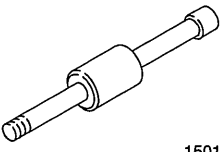
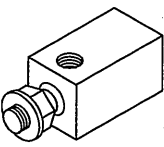
32. Fill and bleed the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 1.4L Duratorq-TDCi (DV) Diesel, General Procedures).

IN-VEHICLE REPAIR

Oil Pan(21 154 0)

Special Tool(s)

 15011	Slide Hammer 205-047 (15-011)
 21227	Adapter for 205-047 303-633 (21-227)

General Equipment

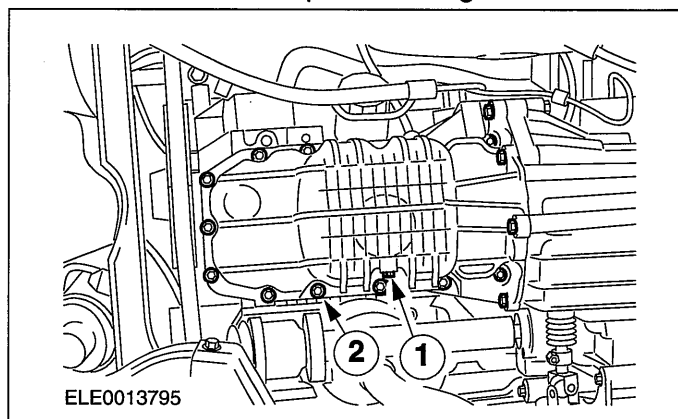
Five M8 x 20 mm studs

Materials

Name	Specification
Engine oil	WSS-M2C912-A1
Loctite 7070	
Sealant	WSE-M4G323-A4

Removal

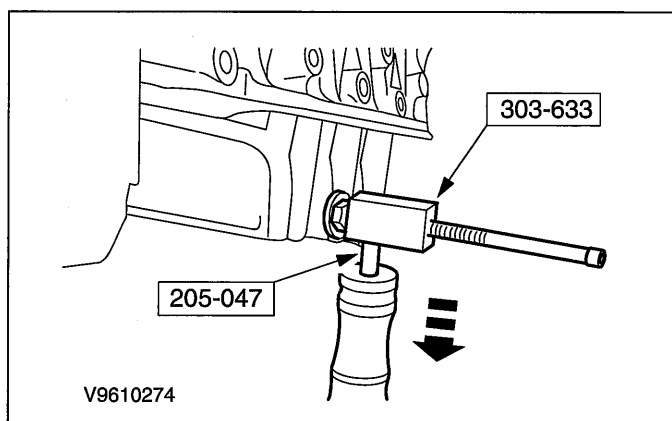
1. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. Drain the engine and remove the oil pan retaining bolts.
 1. Remove the oil drain plug.
 2. Remove the oil pan retaining bolts.



3. **CAUTION:** In order to prevent damage to the sealing surfaces, only use the designated special tool to remove the oil pan. Do not use a chisel or a screwdriver for removal.

NOTE: Tighten the lock nut against the oil pan and use several taps to release the oil pan from the cylinder block.

Using the special tool, remove the oil pan.



Installation

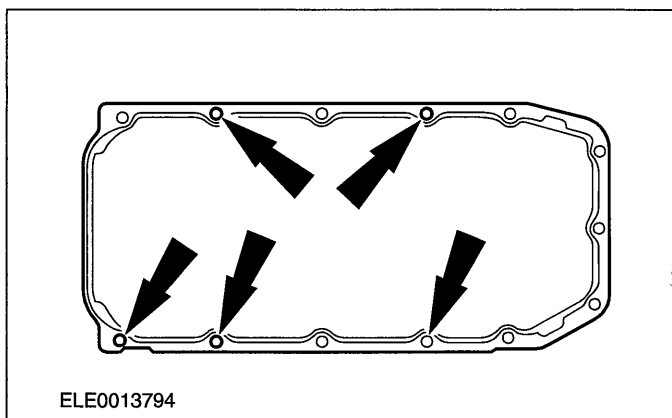
1. CAUTIONS:

CAUTION: The oil pump gasket projects over the cylinder block sealing surface and must not be damaged.

CAUTION: Do not damage the rubber sealing surface of the crankshaft rear oil seal carrier.

Using Loctite 7070, clean the engine cylinder block and oil pan mating faces.

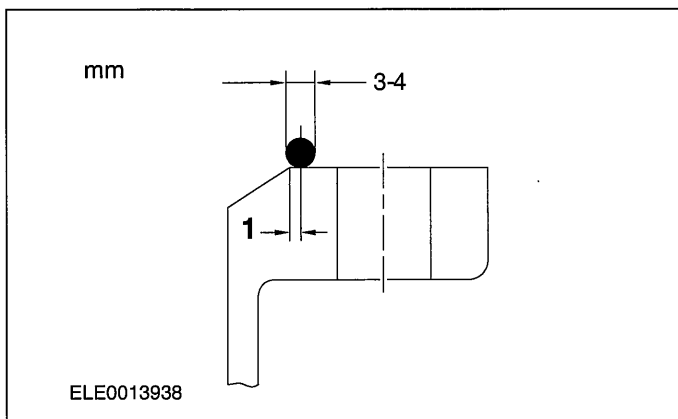
2. **CAUTION:** The crankcase may be damaged if sealant enters the blind holes. Install five M8 x 20 mm studs into the blind holes where shown.



IN-VEHICLE REPAIR

3. **NOTE:** Install the oil pan within ten minutes of applying sealant and tighten the bolts within a further 5 minutes.

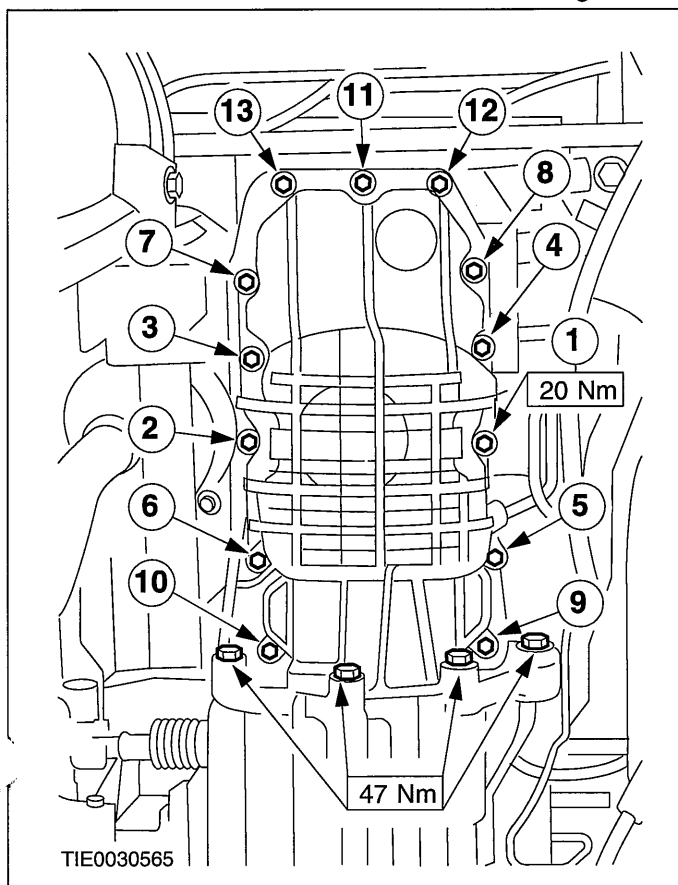
Apply a 3-4 mm diameter bead of sealant to the oil pan flange.



4. **NOTE:** Align the oil pan flush with the cylinder block at the transaxle end.

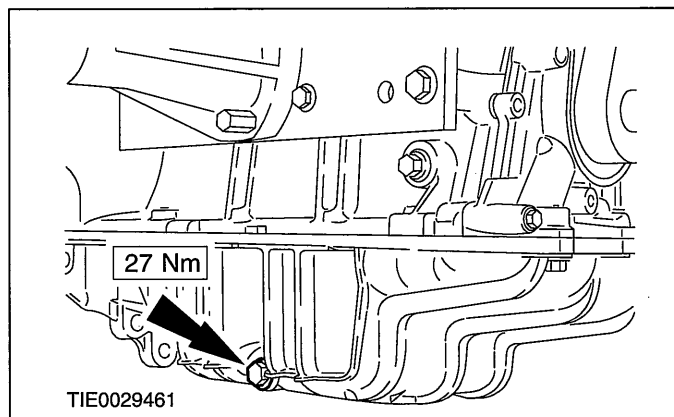
Install the oil pan.

- Tighten the oil pan retaining bolts in the sequence shown in two stages.
- Stage 1: 10 Nm.
- Stage 2: 20 Nm.
- Remove the studs and install retaining bolts.



5. **NOTE:** Check the oil drain plug seal for damage and install a new drain plug if necessary.

Install the oil drain plug.

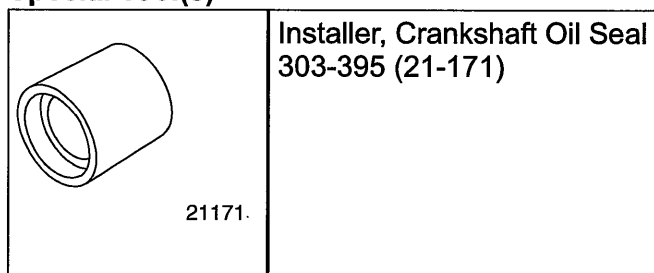


6. Fill the engine with engine oil.

IN-VEHICLE REPAIR

Oil Pump(21 714 0)

Special Tool(s)

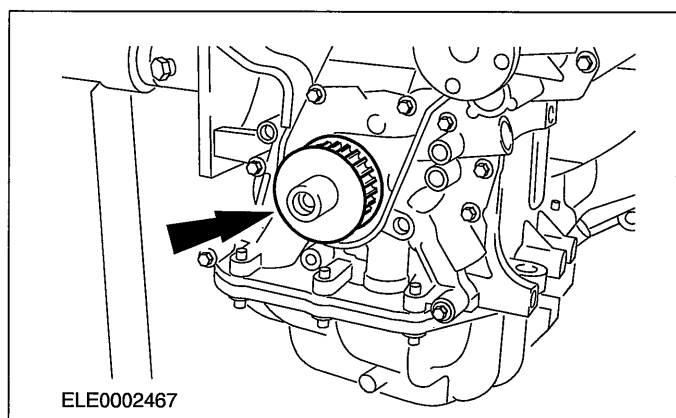


Removal

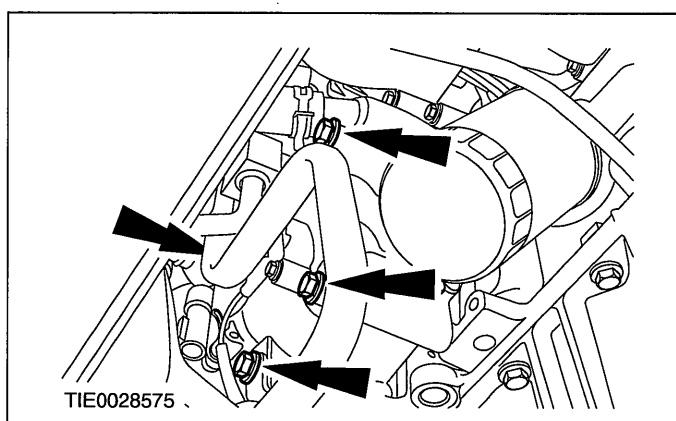
1. Remove the timing belt.

For additional information, refer to Timing Belt in this section.

2. Remove the crankshaft timing belt pulley.



3. Detach the air conditioning (A/C) compressor from the cylinder block and position it to one side.

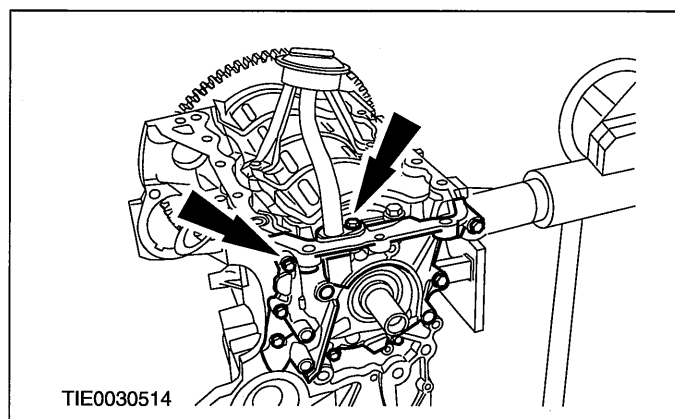


4. Remove the oil pan.

For additional information, refer to Oil Pan in this section.

5. Detach the oil pick-up tube from the oil pump and remove the oil pump (engine shown removed for clarity).

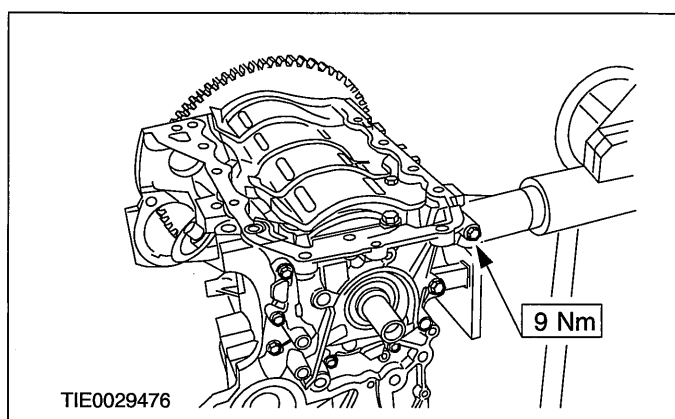
- Discard the gaskets.
- Remove and discard the crankshaft front oil seal.



Installation

1. NOTE: Install a new oil pump gasket.

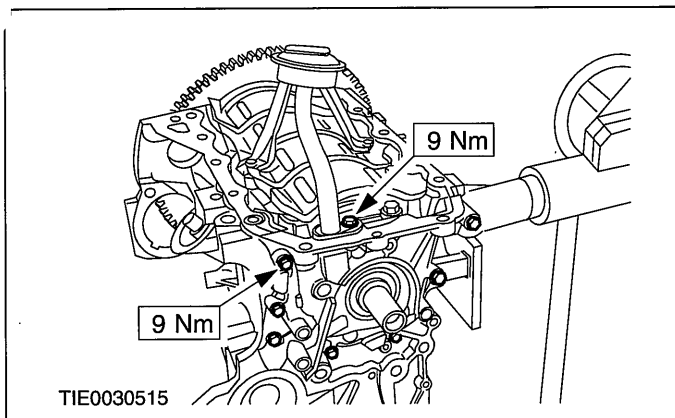
Install the oil pump (engine shown removed for clarity).



2. NOTE: Install a new oil pump intake pipe gasket.

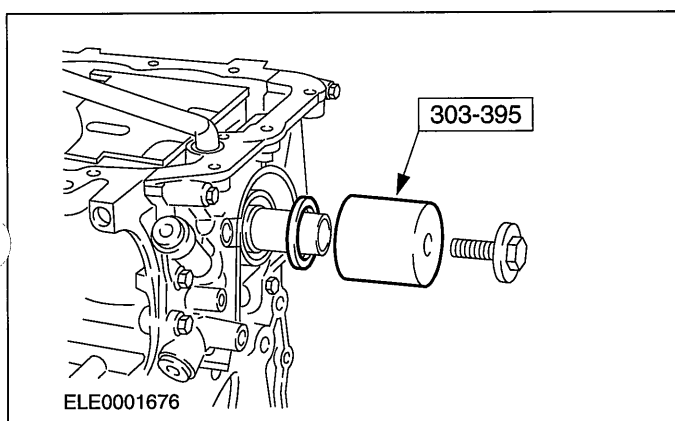
IN-VEHICLE REPAIR

Attach the oil pick-up tube to the oil pump (engine shown removed for clarity).



3. NOTE: Install a new crankshaft front oil seal.

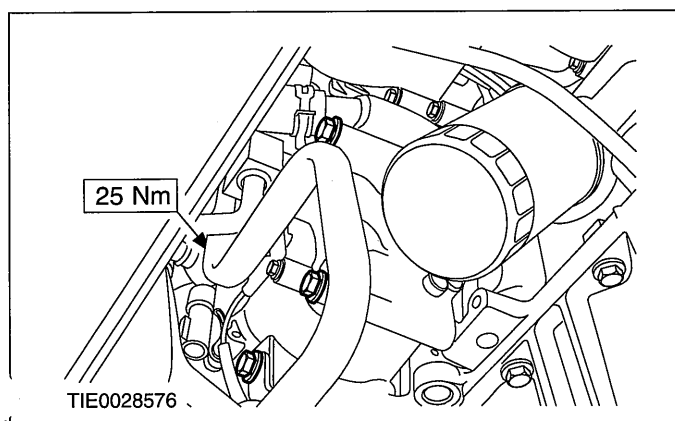
Using the special tool, install the crankshaft front oil seal.



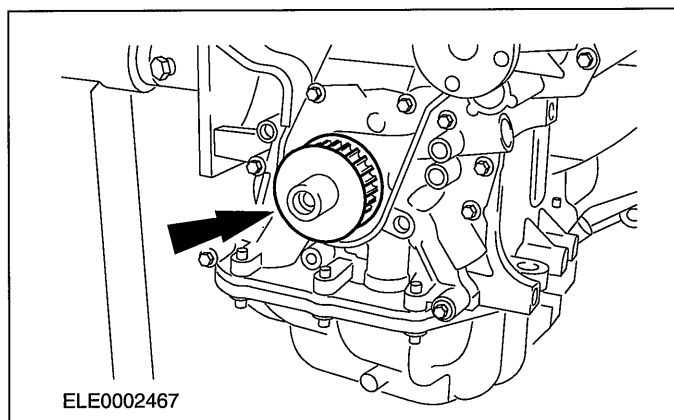
4. Install the oil pan.

For additional information, refer to Oil Pan in this section.

5. Attach the air conditioning (A/C) compressor to the cylinder block.



6. Install the crankshaft timing belt pulley.



7. Install the timing belt.

For additional information, refer to Timing Belt in this section.

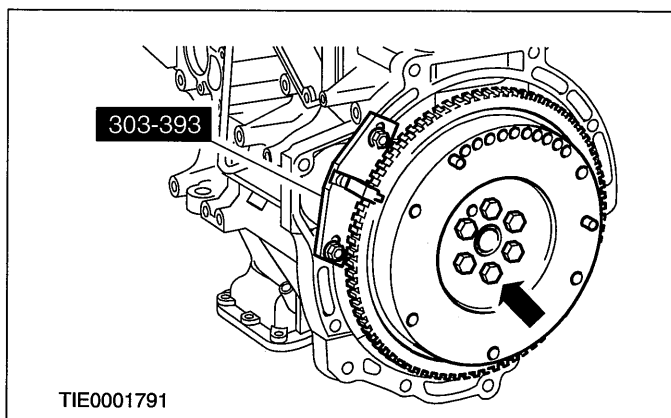
IN-VEHICLE REPAIR

Crankshaft Rear Seal(21 468 4)

Special Tool(s)

21168	Locking Tool, Flywheel 303-393 (21-168)
21540	Gauge, Bolt Angle 303-174 (21-540)

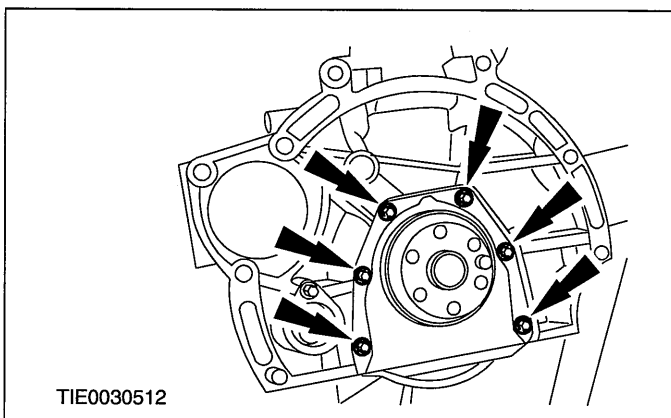
- Discard the bolts.



All vehicles

4. Remove the crankshaft rear oil seal carrier.

- Discard the crankshaft rear oil seal carrier.



Removal

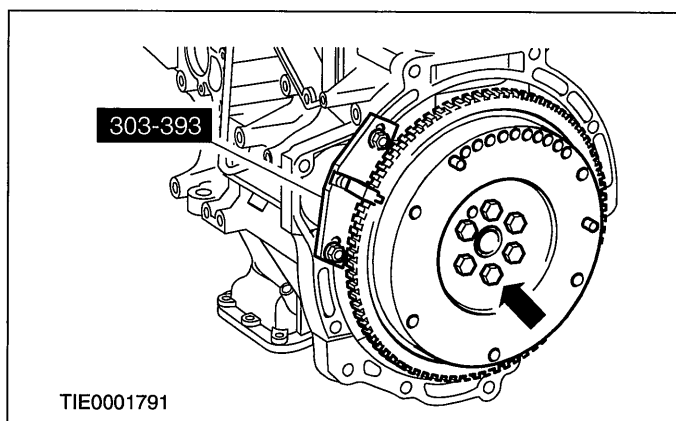
Vehicles with manual transaxle

1. Remove the clutch disc and pressure plate.

For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

2. Using the special tool, remove the flywheel.

- Discard the bolts.



Vehicles with automatic transaxle

3. Using the special tool, remove the flexplate.

Installation

All vehicles

1. Clean the crankshaft journal.

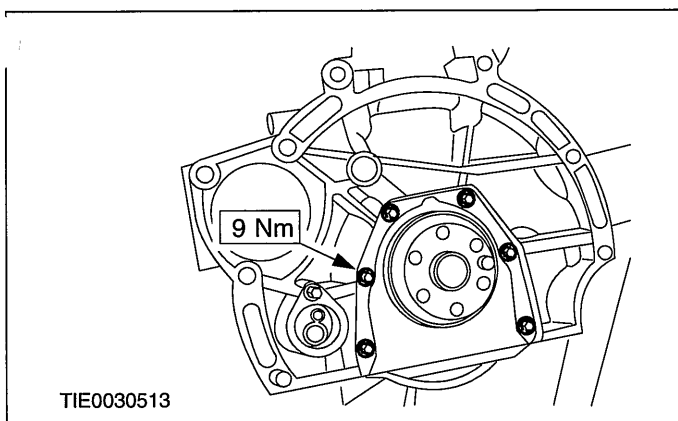
2. NOTE: Install a new crankshaft rear oil seal carrier.

NOTE: A new crankshaft rear oil seal carrier is supplied with an alignment sleeve which must be removed following installation.

NOTE: Do not lubricate the oil seal or crankshaft journal.

IN-VEHICLE REPAIR

Install the crankshaft rear oil seal carrier.



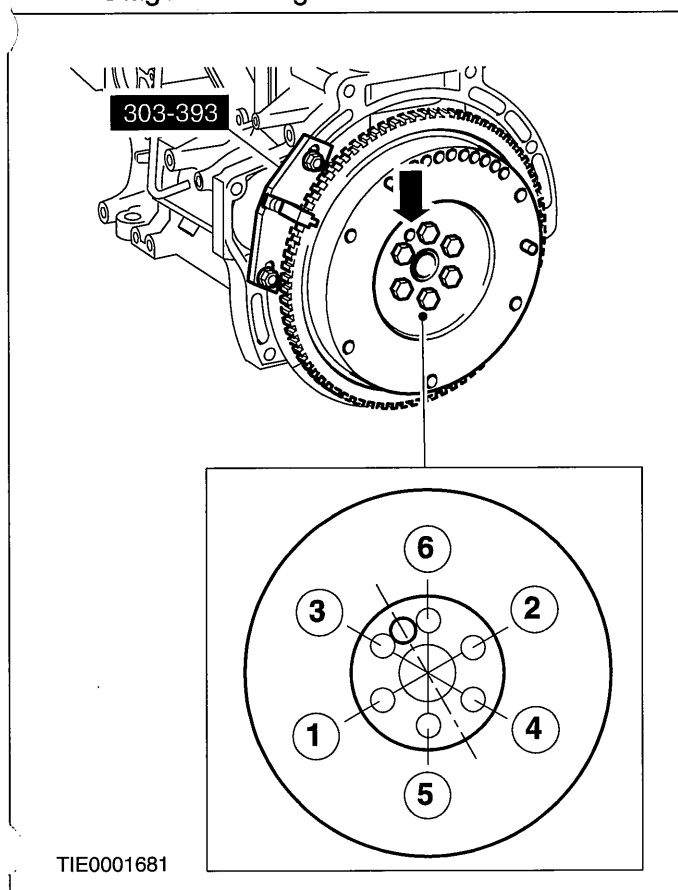
Vehicles with manual transaxle

3. NOTE:Position of location stud for the flywheel.

NOTE:Install new flywheel retaining bolts.

Using the special tool, install the flywheel.

- Tighten the bolts in the sequence shown in two stages:
- Stage 1: 30 Nm.
- Stage 2: 80 degrees.



4. Install the clutch disc and pressure plate.

For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

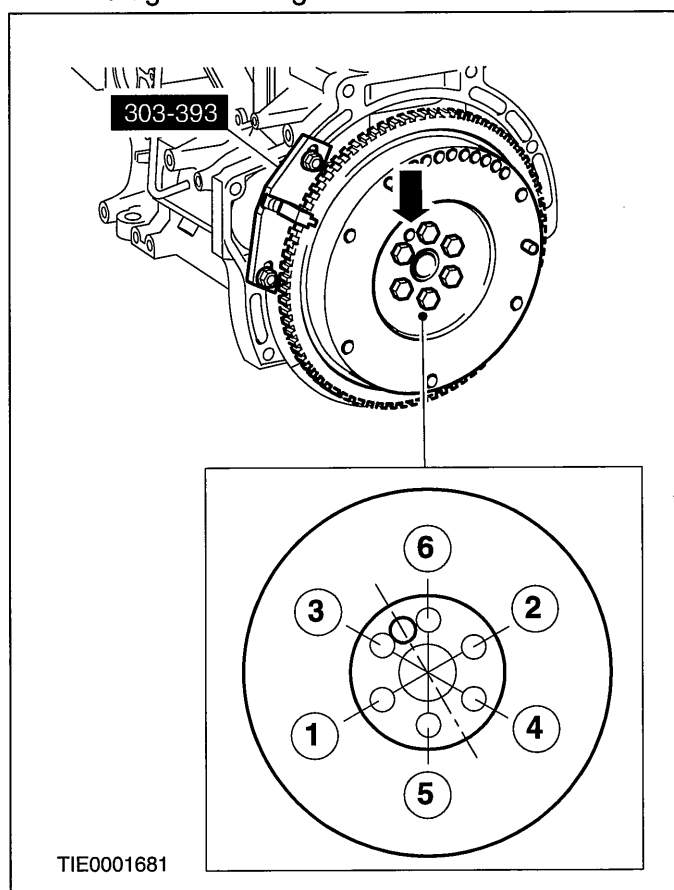
Vehicles with automatic transaxle

5. NOTE:Position of location stud for the flexplate.

NOTE:Install new flexplate retaining bolts.

Using the special tool, install the flexplate.

- Tighten the bolts in the sequence shown in two stages:
- Stage 1: 30 Nm.
- Stage 2: 80 degrees.

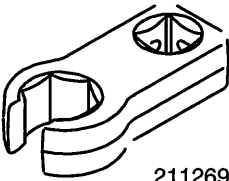
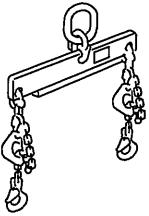
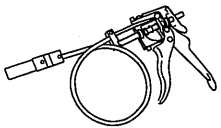
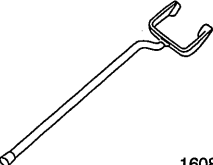


6. Remove the special tool.

REMOVAL

Engine

Special Tool(s)

 211269	Wrench, Hydraulic Line Union Nut 211-269 (13-027)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)
 16089	Remover, Halfshaft 308-256 (16-089)

General Equipment

Engine hoist
Securing straps
Workshop table

Removal

All vehicles

- ▲ **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. Release the fuel system pressure.

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

2. Remove the air cleaner.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 1.4L Duratorq-TDCi (DV) Diesel, General Procedures).

3. Drain the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 1.4L Duratorq-TDCi (DV) Diesel, General Procedures).

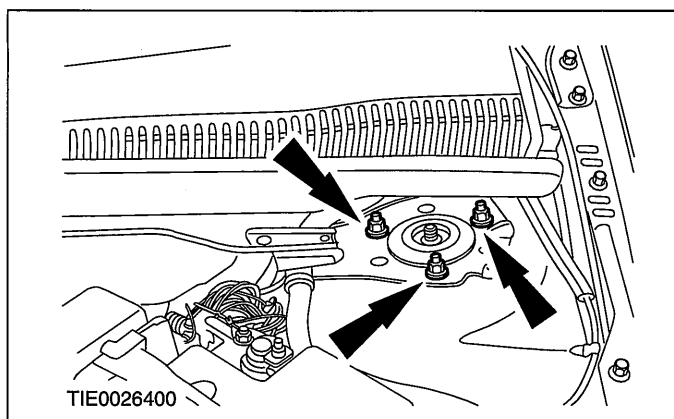
4. Remove the front wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

5. Disconnect the powertrain control module (PCM) electrical connector.

For additional information, refer to: Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation).

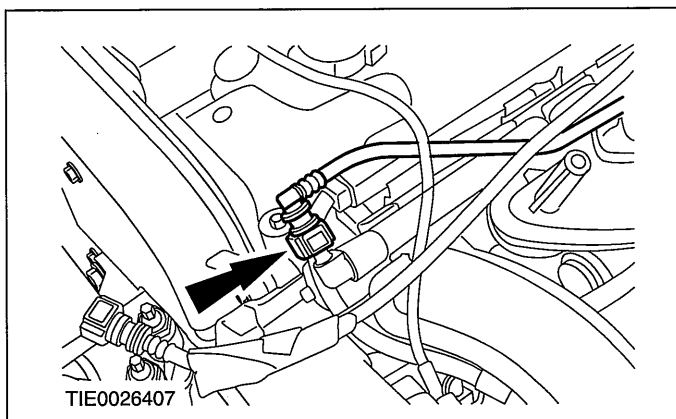
6. Loosen the strut and spring assembly top mount nuts by three turns on both sides.



REMOVAL

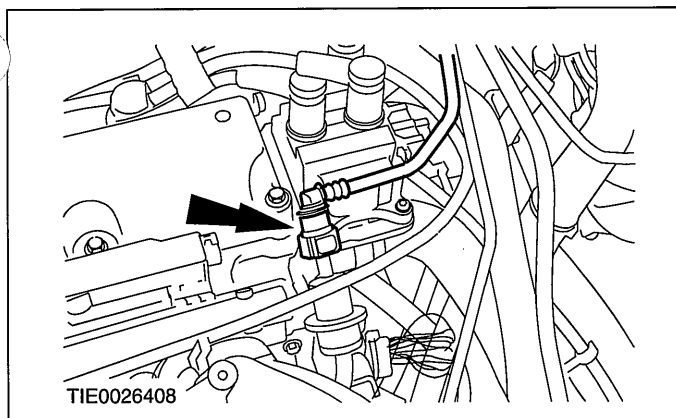
7. Disconnect the fuel return line quick release coupling.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



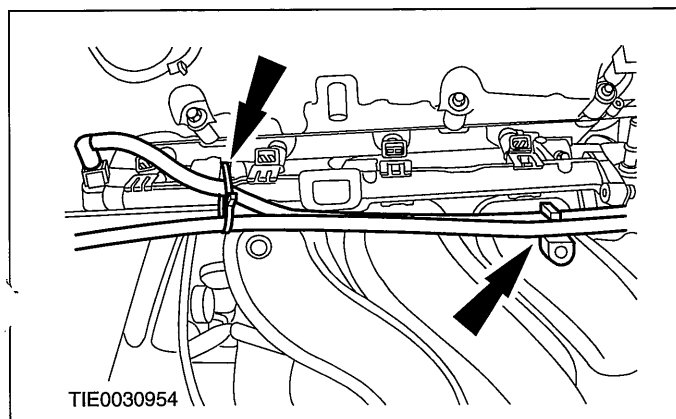
8. Disconnect the fuel supply line quick release coupling.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

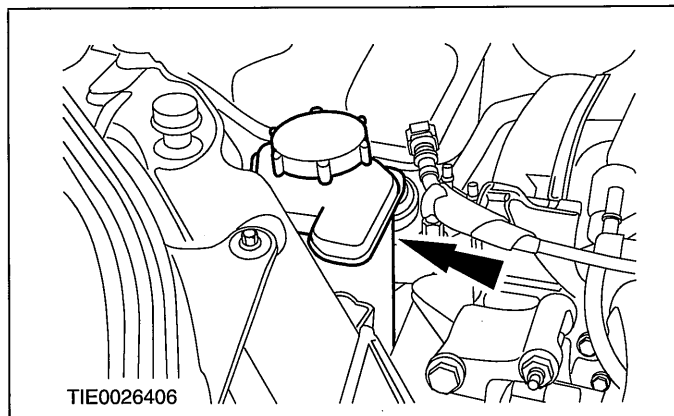


9. Detach the fuel line and the degas line from the intake manifold.

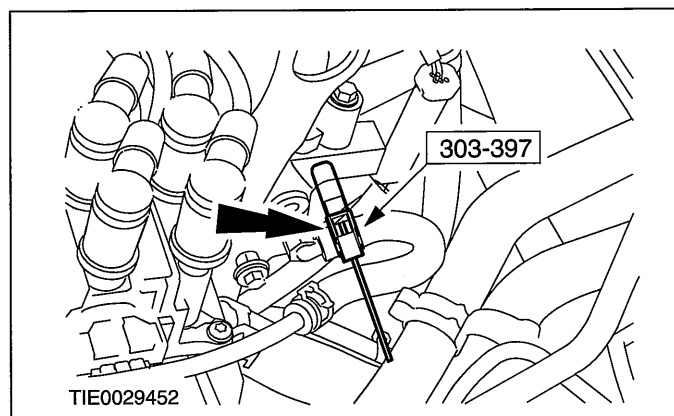
- Remove the cable tie.



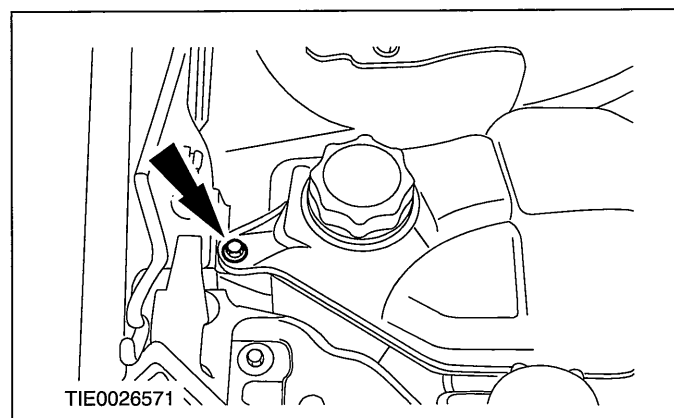
10. Detach the power steering fluid reservoir from the bracket and position it to one side.



11. Using the special tool, disconnect the degas hose from the cylinder head.

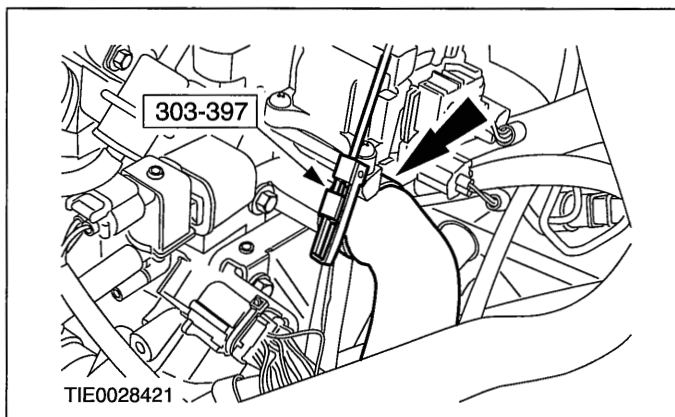


12. Detach the coolant expansion tank from the bracket and position it to one side.

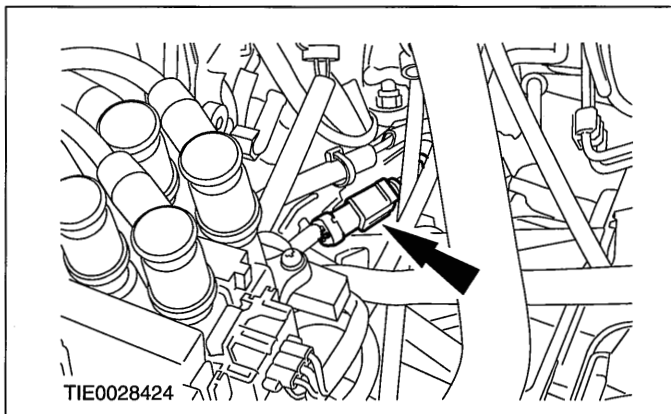


REMOVAL

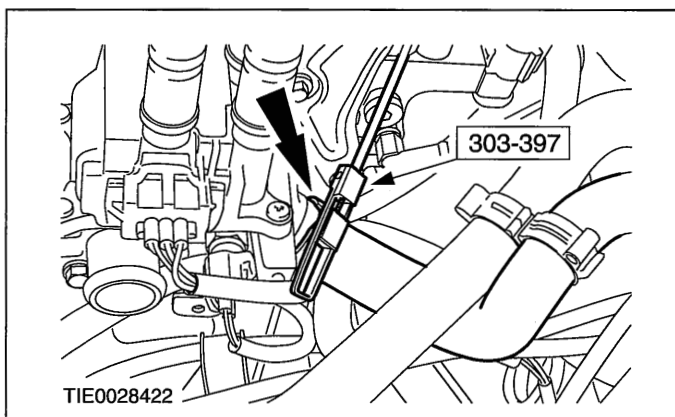
13. Using the special tool, disconnect the coolant hose from the coolant distribution housing.



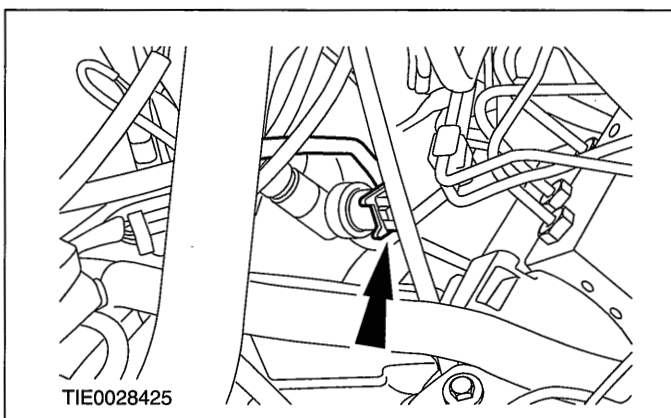
16. Disconnect the catalyst monitor sensor electrical connector.



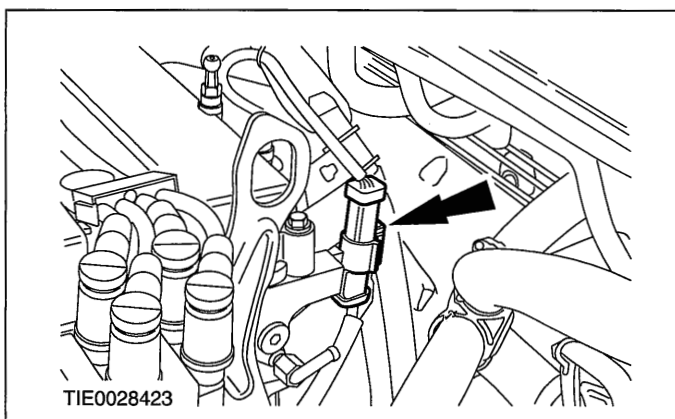
14. Using the special tool, disconnect the hose from the coolant distribution housing.



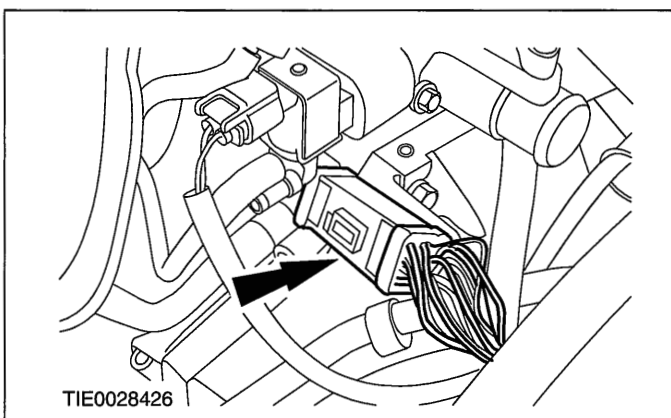
17. Disconnect the power steering pressure (PSP) switch electrical connector.



15. Disconnect the heated oxygen (HO2S) sensor electrical connector.

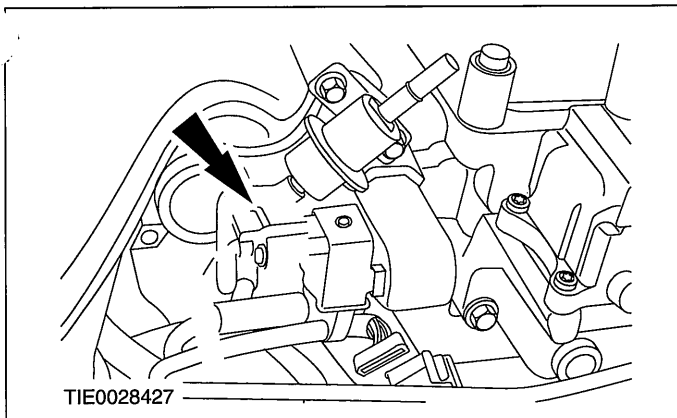


18. Disconnect the engine wiring harness electrical connector.

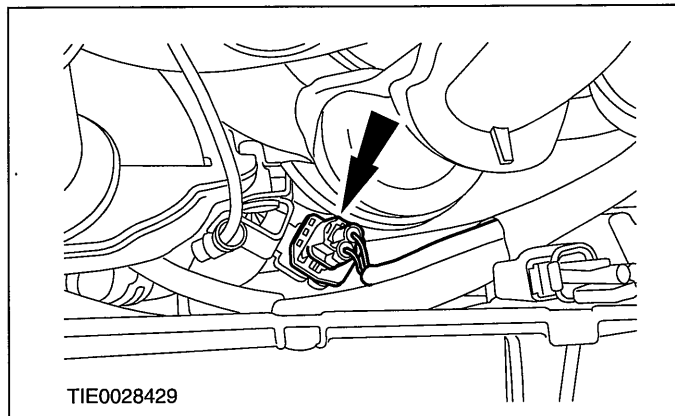


REMOVAL

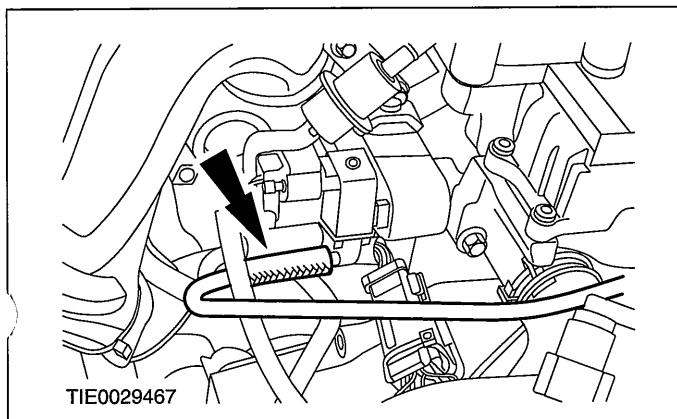
19. Disconnect the EVAP electrical connector.



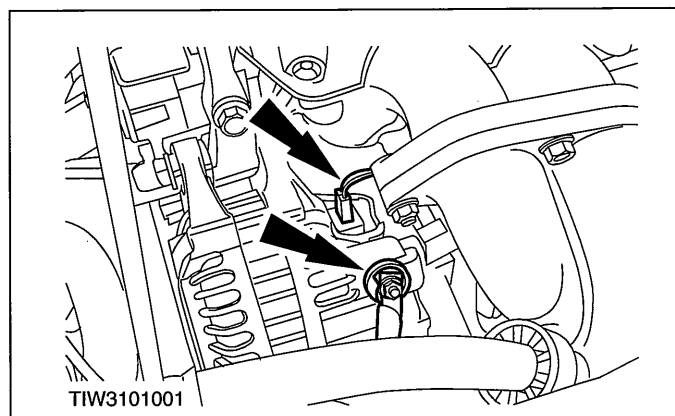
22. Disconnect the knock sensor (KS) electrical connector.



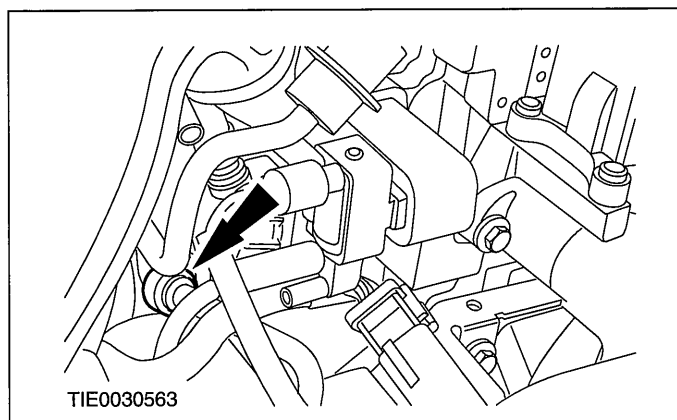
20. Disconnect the low pressure evaporate emission (EVAP) hose from the EVAP valve.



23. Disconnect the generator electrical connectors.



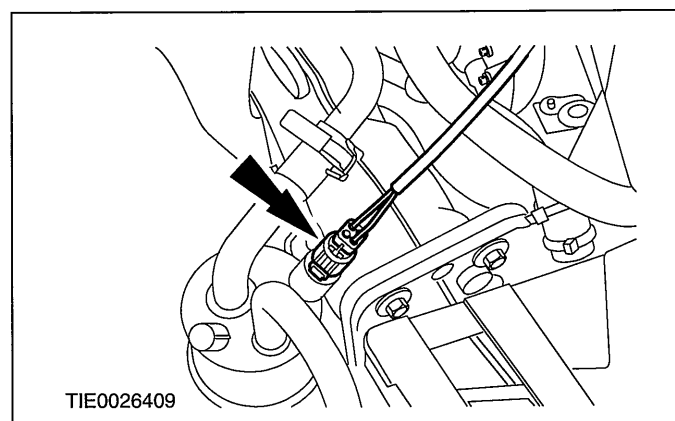
21. Detach the brake booster vacuum line from the intake manifold.



24. Remove the right-hand headlamp assembly.

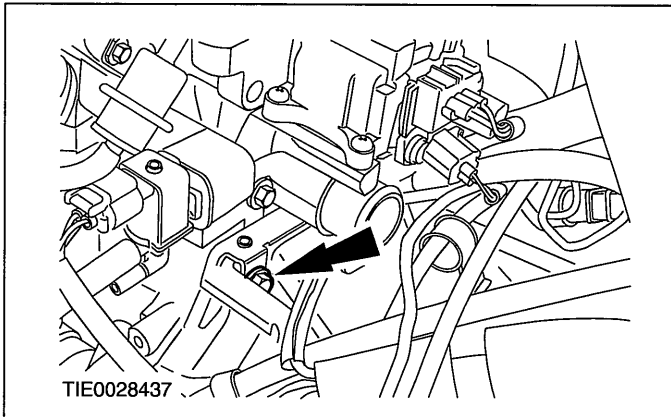
For additional information, refer to:
Headlamp Assembly (417-01 Exterior
Lighting, Removal and Installation).

25. Disconnect the air conditioning (A/C)
lower-pressure cut-off switch electrical
connector.

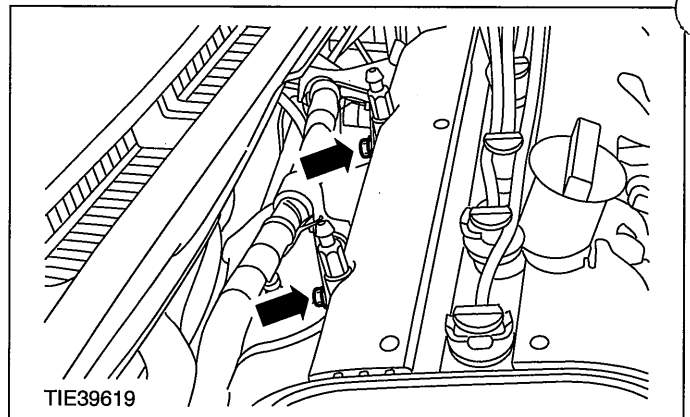


REMOVAL

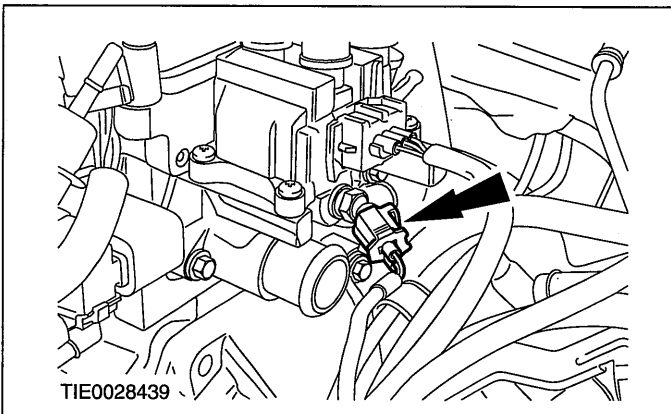
- 26. Remove the engine wiring harness support bracket.**



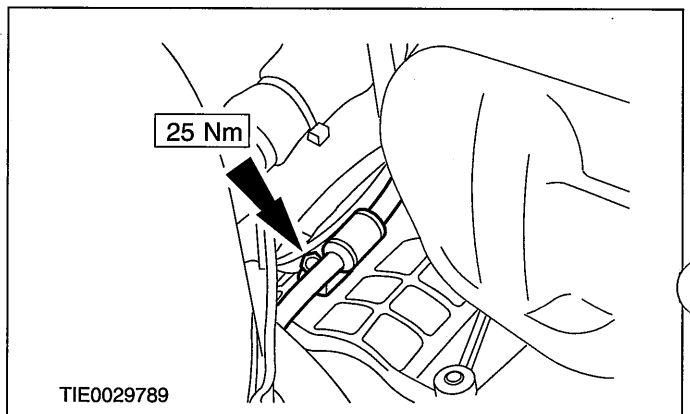
- 29. Detach the power steering line support bracket from the cylinder head.**



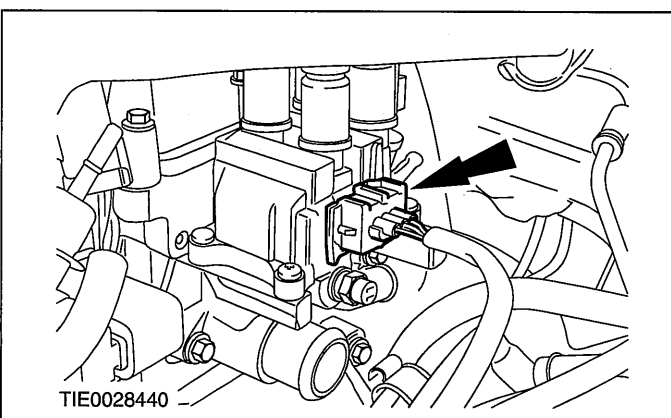
- 27. Disconnect the engine coolant temperature (ECT) electrical connector.**



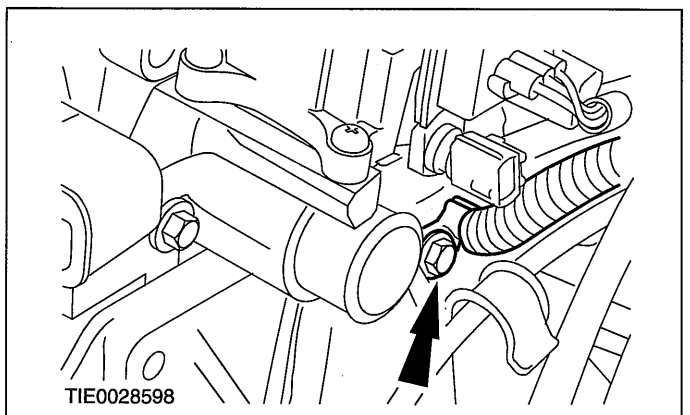
- 30. Detach the power steering line from the power steering pump mounting bracket.**



- 28. Disconnect the electronic ignition (EI) coil electrical connector.**



- 31. Disconnect the engine ground cable.**

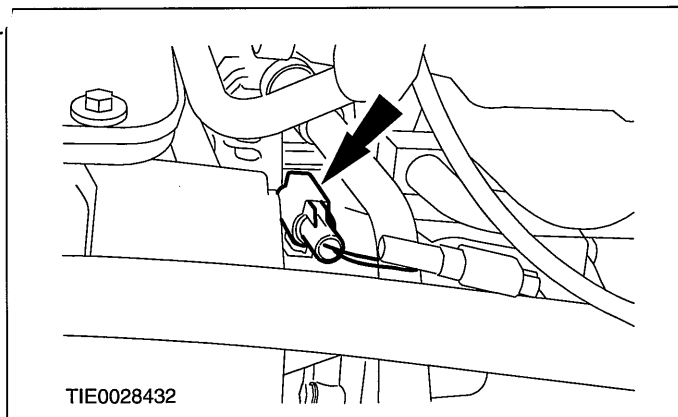


- 32. Raise and support the vehicle.**

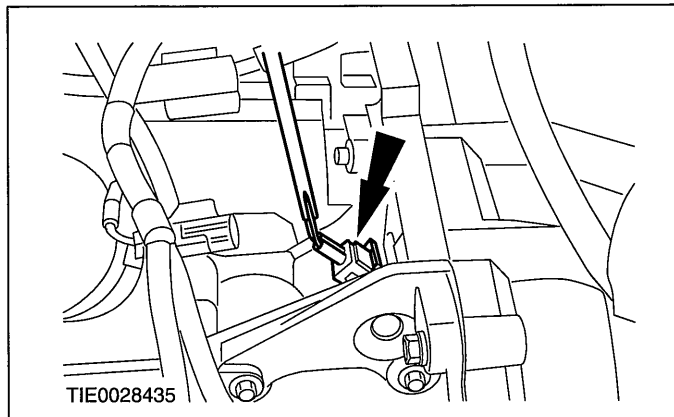
For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

REMOVAL

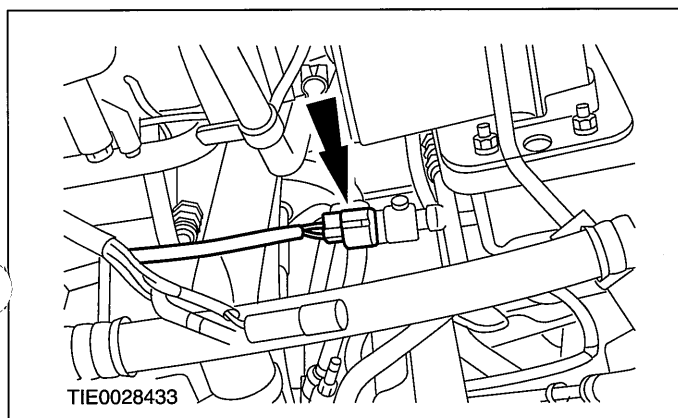
33. Disconnect the A/C compressor clutch electrical connector.



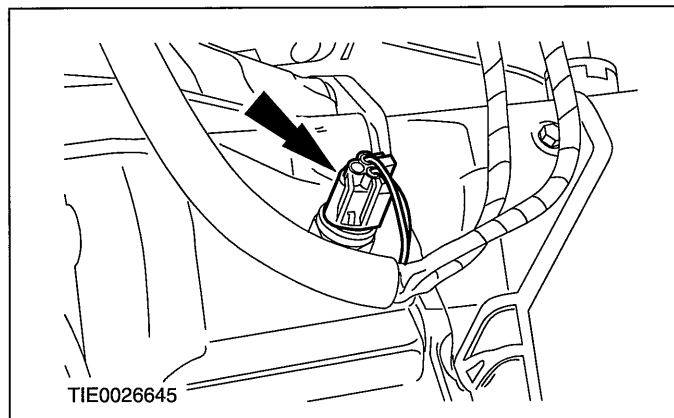
36. Disconnect the crankshaft position (CKP) sensor electrical connector.



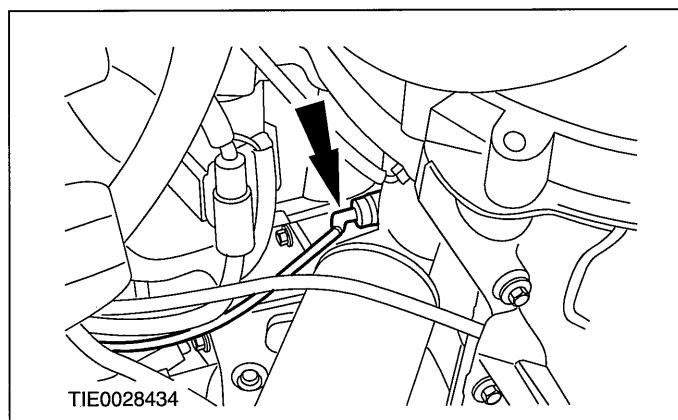
34. Disconnect the A/C high-pressure cut-off switch electrical connector.



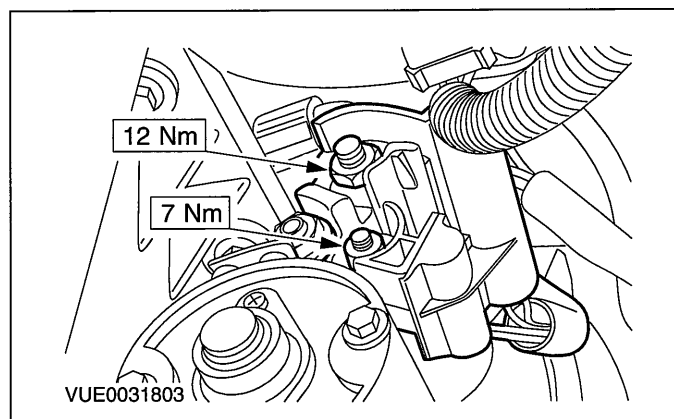
37. Disconnect the reversing lamp switch electrical connector.



35. Disconnect the oil pressure switch electrical connector.



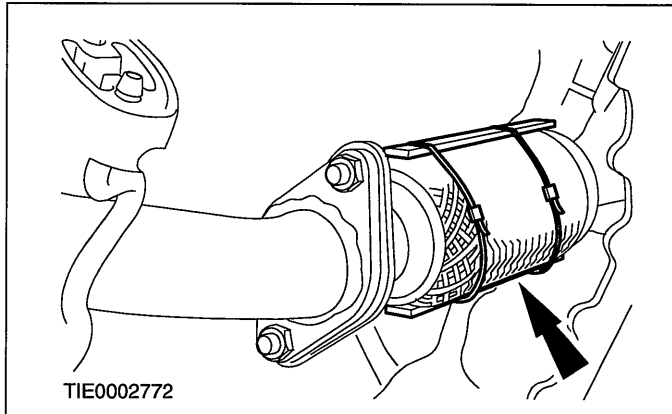
38. Disconnect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables.



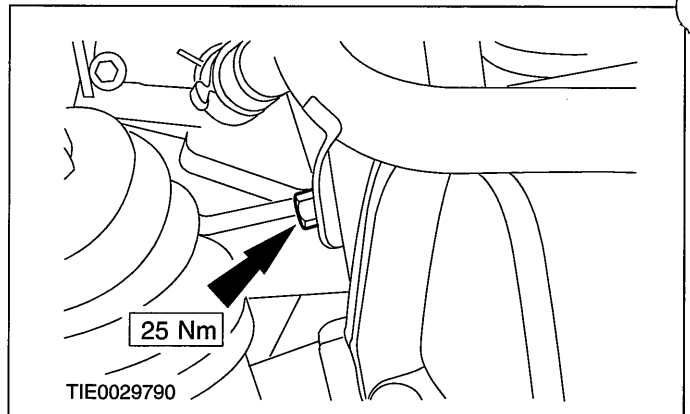
39. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

REMOVAL

Support the exhaust flexible pipe with a suitable support wrap or suitable splint.

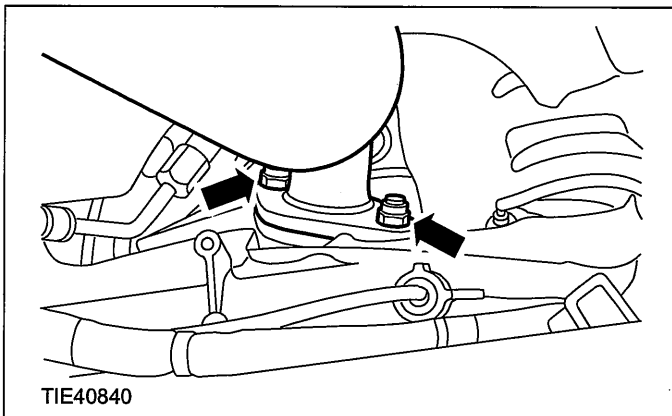


43. Detach the power steering line support bracket from the engine block.



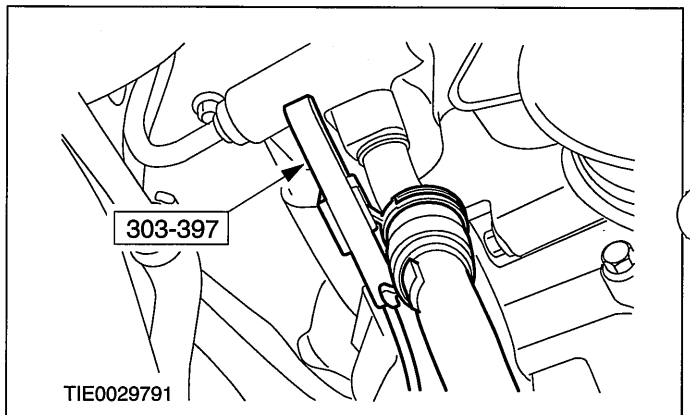
40. Detach the exhaust flexible pipe from the catalytic converter.

- Discard the nuts and the gasket.



44. Disconnect the power steering line from the steering pump.

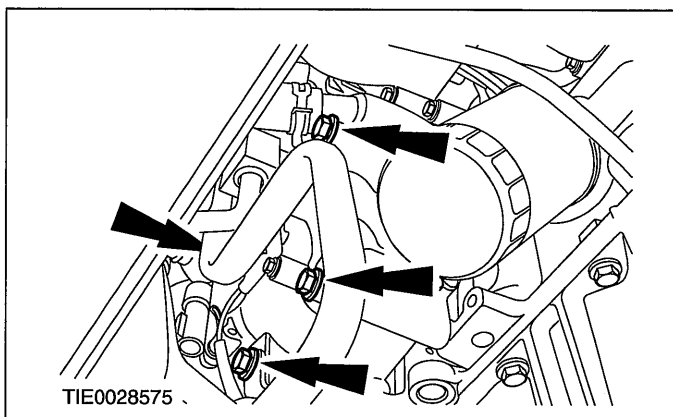
- Allow the fluid to drain into a suitable container.



41. Remove the accessory drive belt.

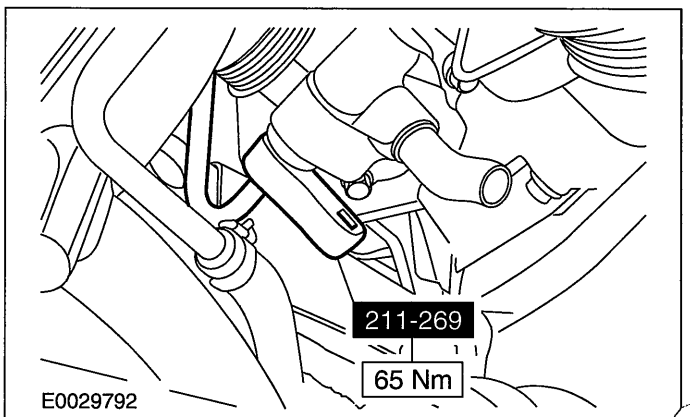
For additional information, refer to:
Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

42. Detach the A/C compressor from the cylinder block and position it to one side.



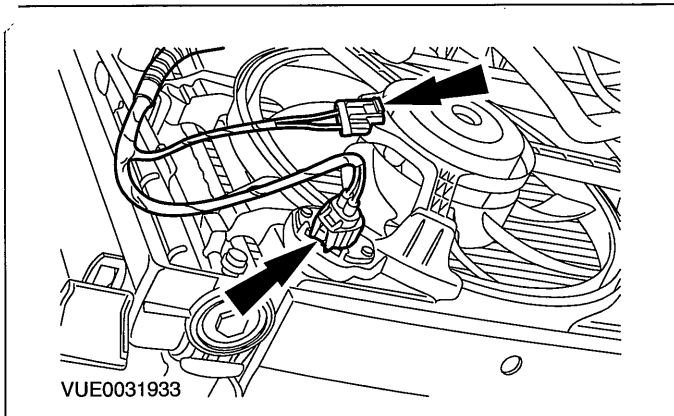
45. Using the special tool, detach the power steering line from the power steering pump.

- Allow the fluid to drain into a suitable container.

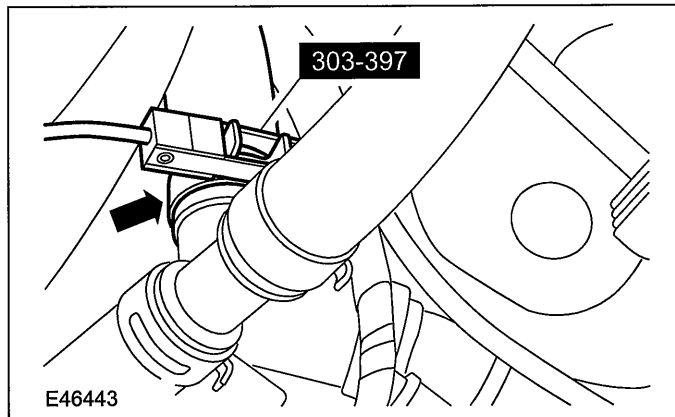


REMOVAL

46. Disconnect the cooling fan motor and cooling fan resistor electrical connectors.

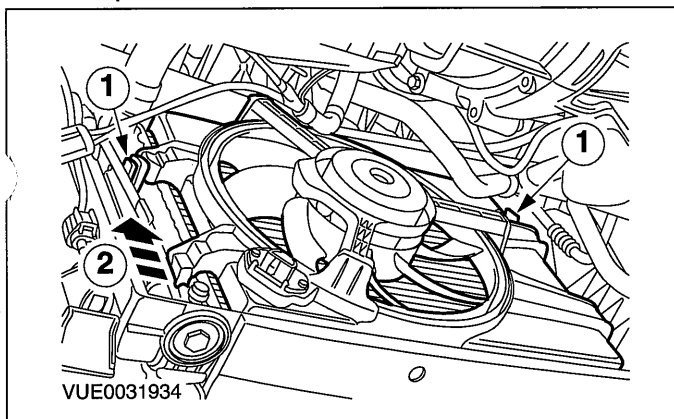


49. Using the special tool, disconnect the coolant hose from the distribution pipe

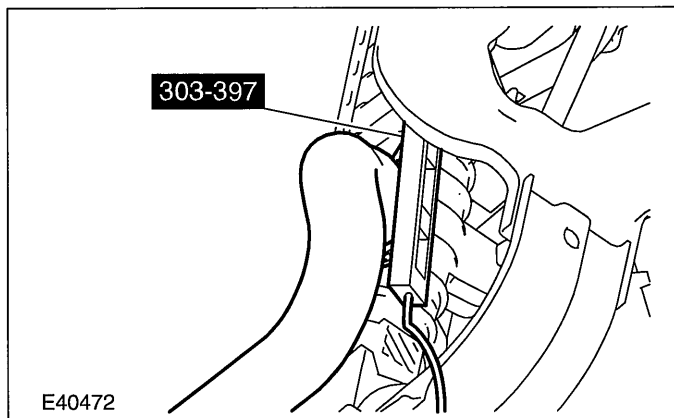


47. Remove the cooling fan motor and shroud.

1. Release the cooling fan motor and shroud from the retaining brackets.
2. Push the cooling fan motor and shroud upwards and then downwards to remove.

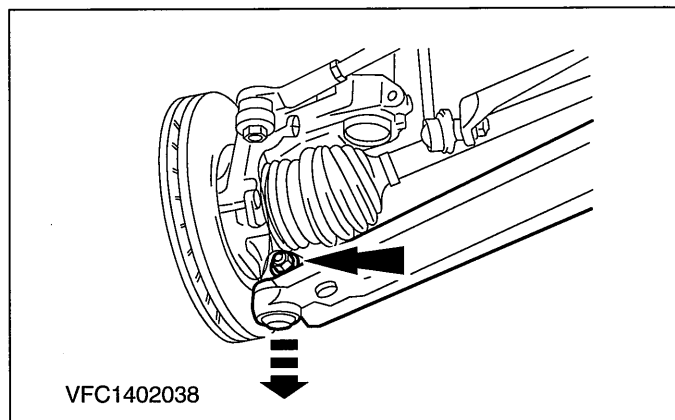


48. Using the special tool, disconnect the coolant hose from the radiator.



50. Detach the lower arm from the wheel knuckle on both sides (right-hand side shown).

- Remove the heat shield.

**51. CAUTIONS:**

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft oil seal.

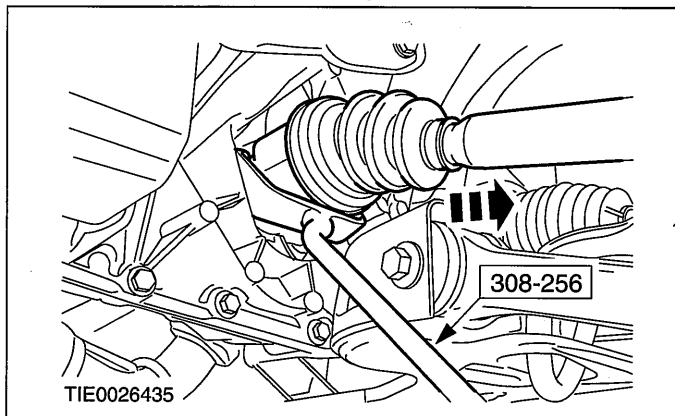
NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

Using the special tool, detach the left-hand halfshaft from the transaxle and secure it to one side.

- Allow the oil to drain into a suitable container.

REMOVAL

- Discard the snap ring.

**52. CAUTIONS:**

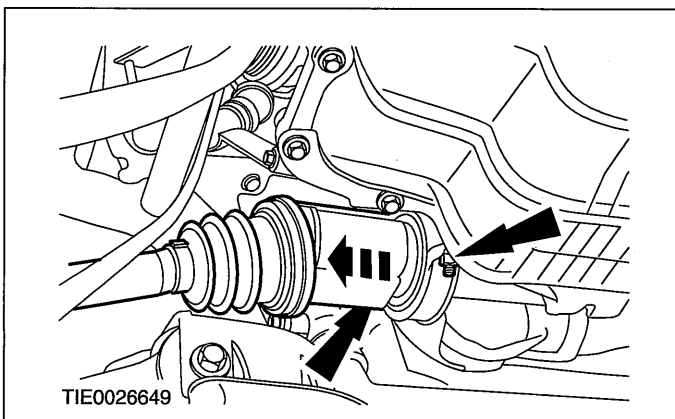
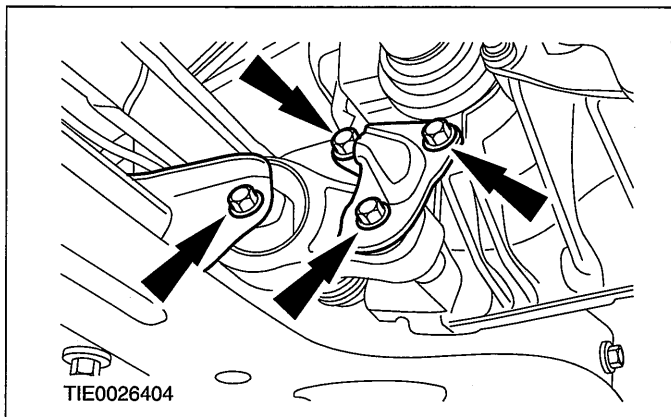
⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft oil seal.

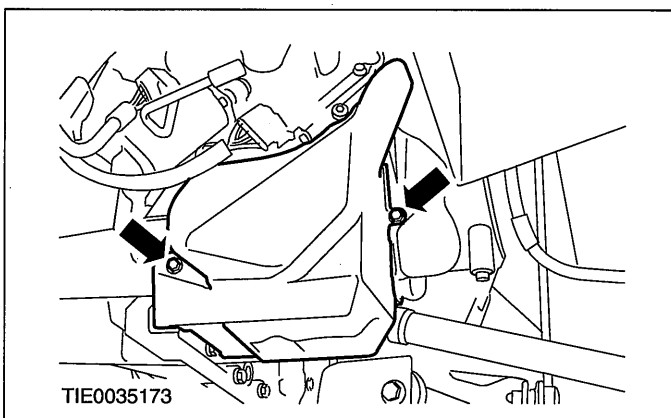
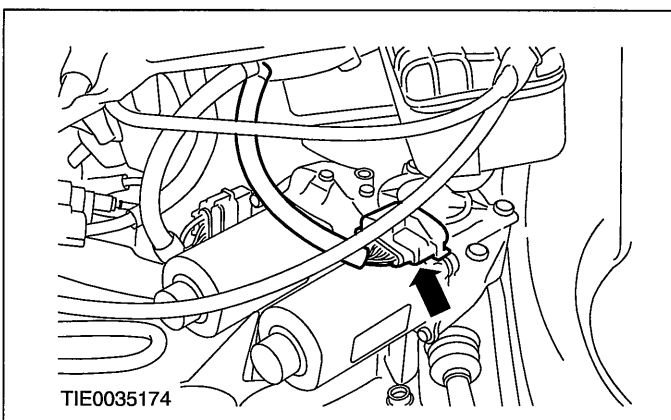
NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

Detach the right-hand halfshaft and the intermediate shaft from the transaxle and secure it to one side.

- Discard the center bearing cap and locknuts.
- Allow the oil to drain into a suitable container.

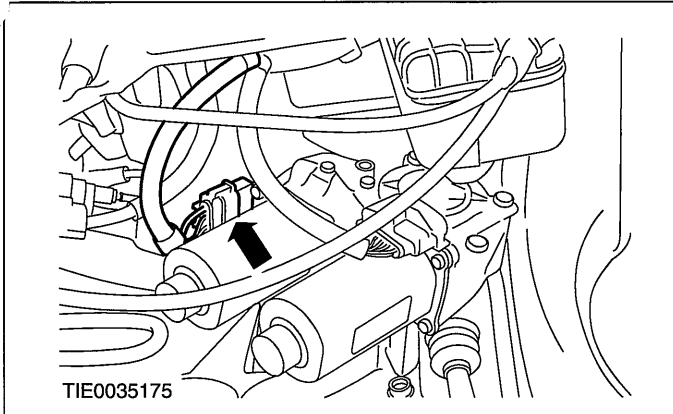
**53. Remove the engine support insulator.**

Vehicles with automated gearshift

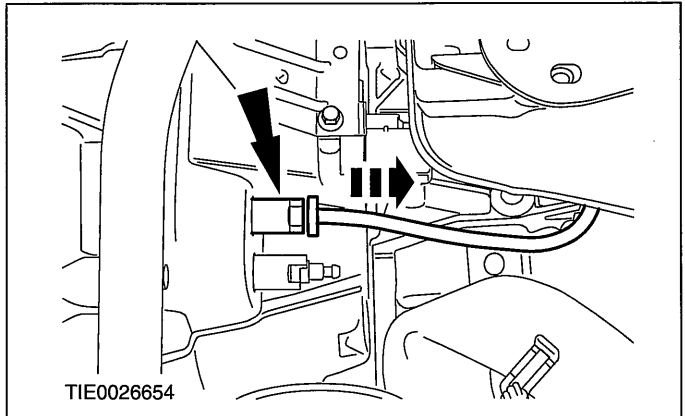
54. Remove the gearshift actuator cover.**55. Disconnect the gearshift actuator electrical connector (colored black).**

REMOVAL

56. Disconnect the gearshift actuator electrical connector (colored grey).



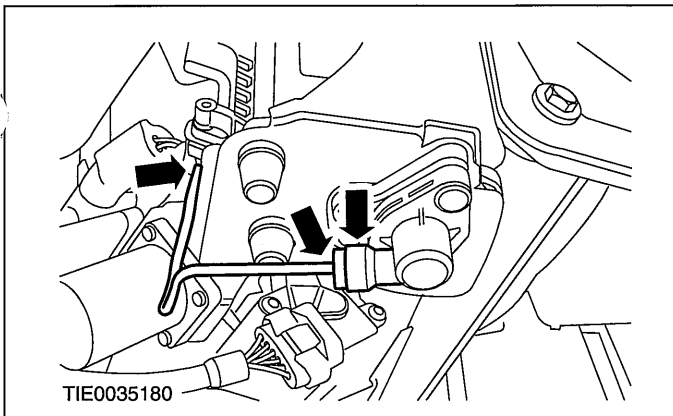
- Remove the spring clip.



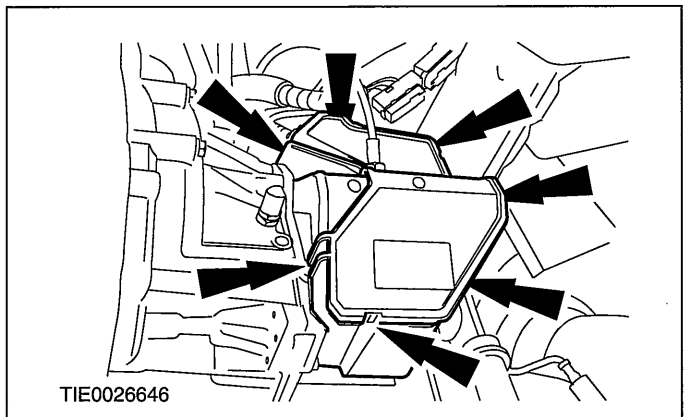
57. **⚠ CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

Disconnect the clutch slave cylinder supply line.

- Remove the spring clip.

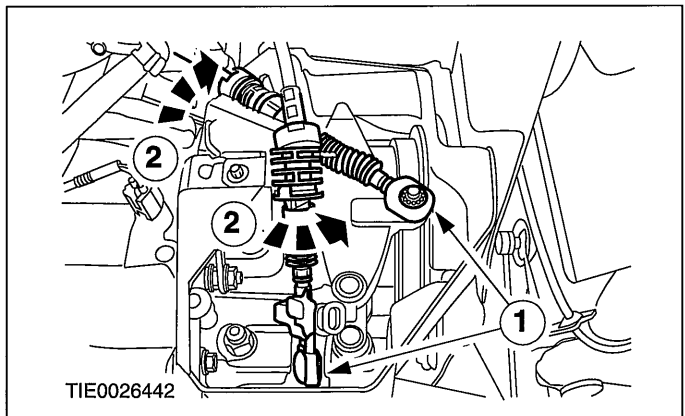


59. Remove the gearshift cables cover.



60. Detach the gearshift cables from the transaxle.

- Detach the gearshift cables and the selector cable from the selector levers.
- Turn the abutment sleeve clockwise and detach the cables from the bracket.



Vehicles without automated gearshift

58. **⚠ CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

Disconnect the clutch slave cylinder supply line.

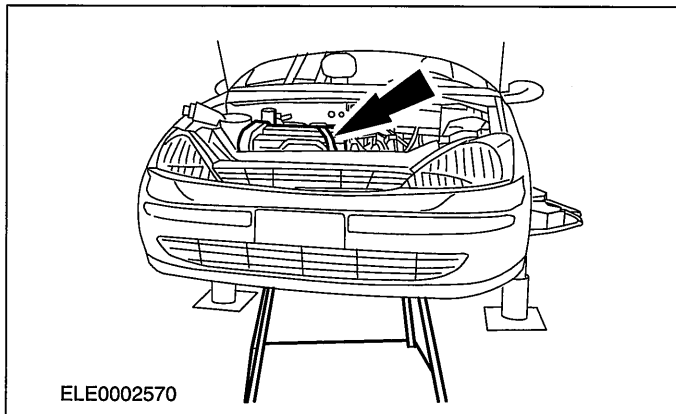
All vehicles

61. **⚠ CAUTION:** Do not support the engine directly on the oil pan.

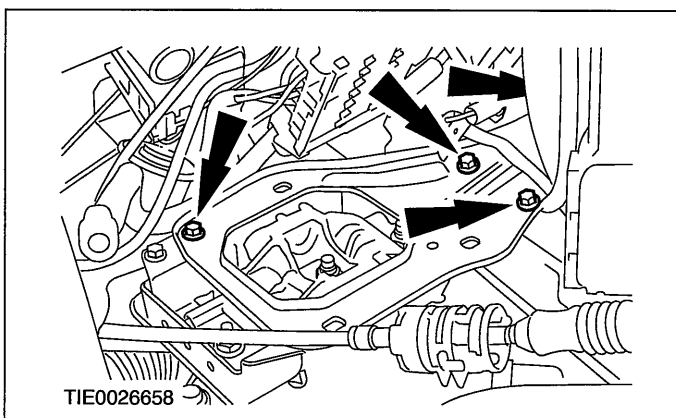
REMOVAL

NOTE: Using suitable securing straps, secure the engine and the transaxle on a workshop table.

Using suitable wooden blocks support the engine and transaxle assembly.

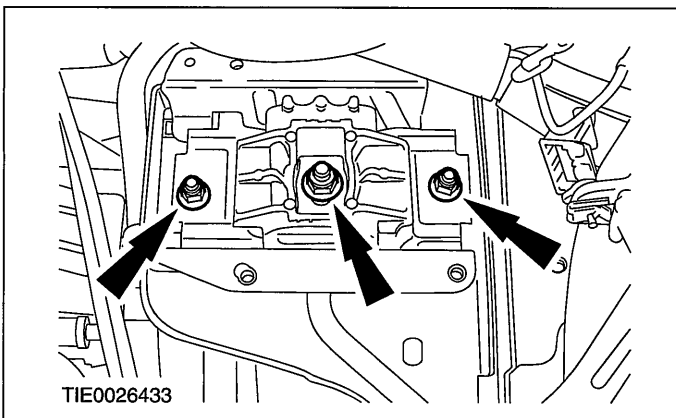


62. Remove the battery tray support bracket.



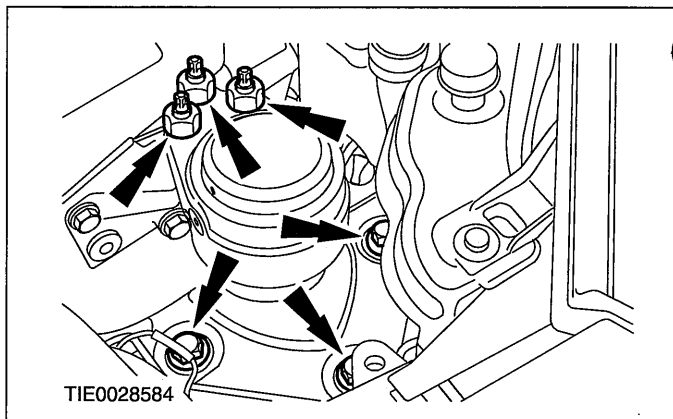
63. Remove the engine rear mount.

- Discard the nuts.



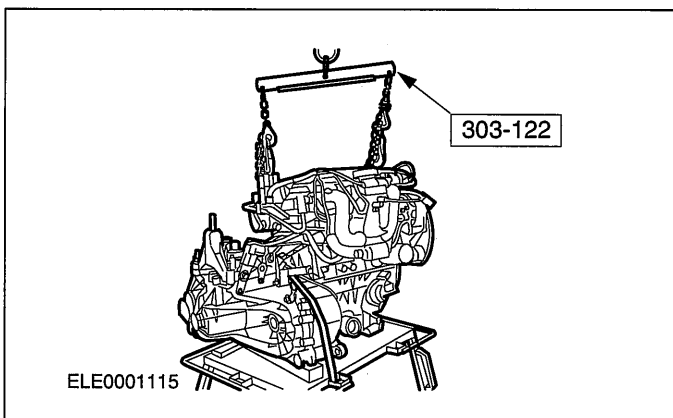
64. Remove the engine front mount.

- Discard the nuts.

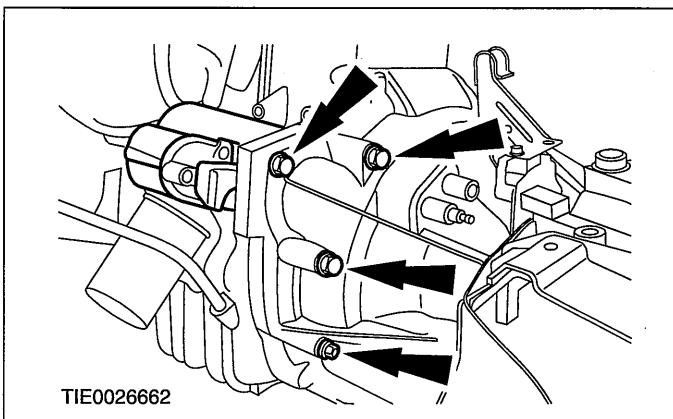


65. Raise the vehicle and remove the engine and transaxle assembly.

66. Using the special tool, attach the engine and transaxle assembly to the engine hoist.

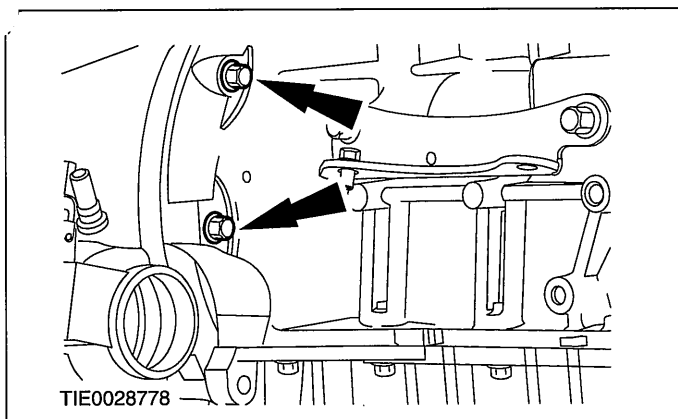


67. Remove the starter motor and the transaxle left-hand retaining bolt.

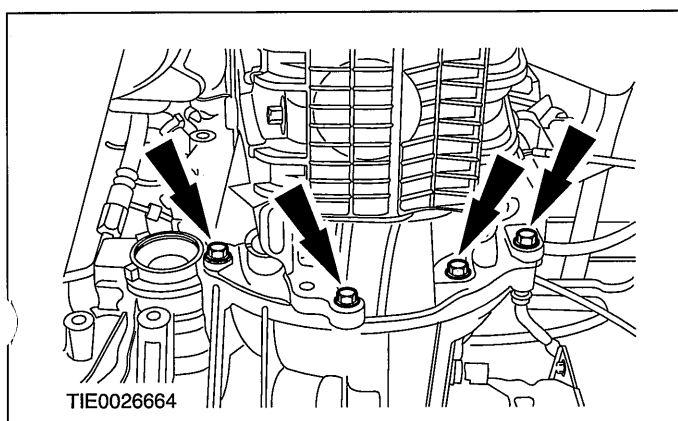


REMOVAL

- 68. Remove the transaxle right-hand retaining bolt.**

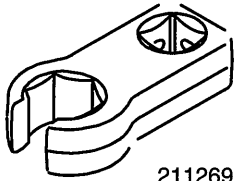
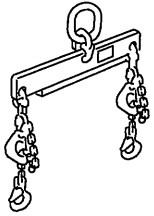
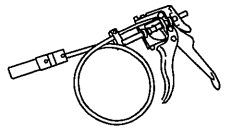


- 69. Remove the transaxle lower retaining bolts.**



- 70. Remove the transaxle from the engine.**

REMOVAL**Engine — Vehicles With: Automatic Transaxle****Special Tool(s)**

 211269	Wrench, Hydraulic Line Union Nut 211-269 (13-027)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)

General Equipment

Engine hoist
Securing straps
Workshop table

All vehicles

WARNINGS:

- ▲ Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always

present and may ignite. Failure to follow these instructions may result in personal injury.

1. Release the fuel system pressure.

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

2. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

3. Drain the cooling system.

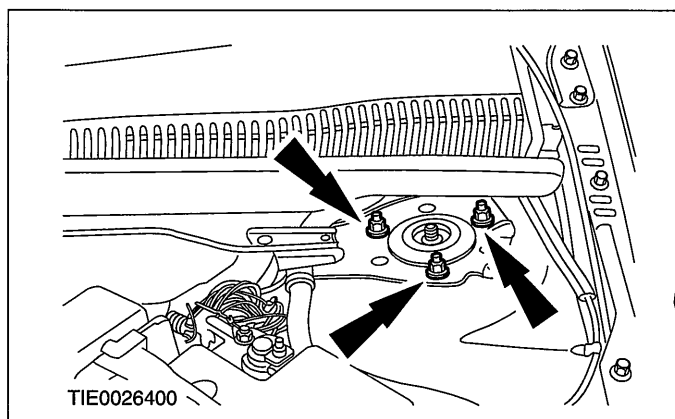
For additional information, refer to: Cooling System Draining, Filling and Bleeding - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam) (303-03A, General Procedures).

4. Remove the front wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

5. Disconnect the powertrain control module (PCM) electrical connector.

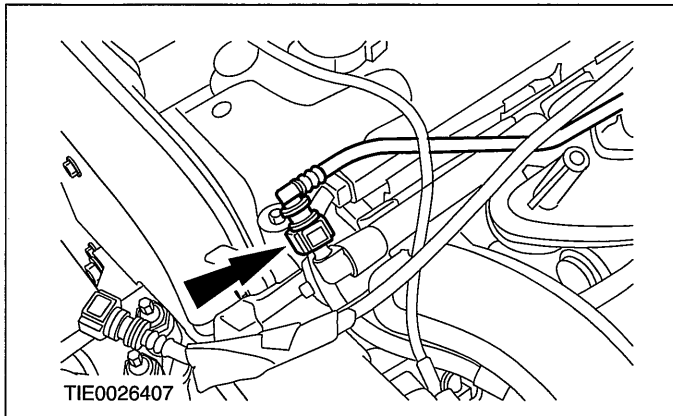
For additional information, refer to: Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation).

6. Loosen the strut and spring assembly top mount nuts by three turns on both sides.

REMOVAL

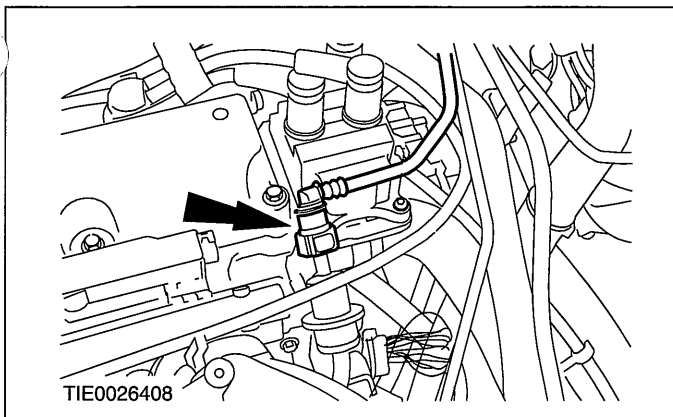
7. Disconnect the fuel return line quick release coupling.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



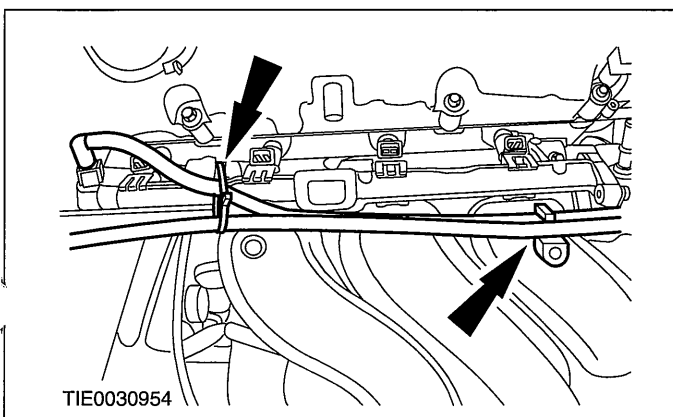
8. Disconnect the fuel supply line quick release coupling.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

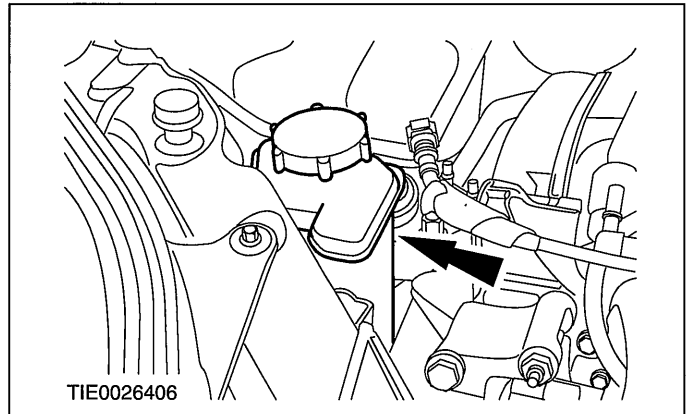


9. Detach the fuel line and the degas line from the intake manifold.

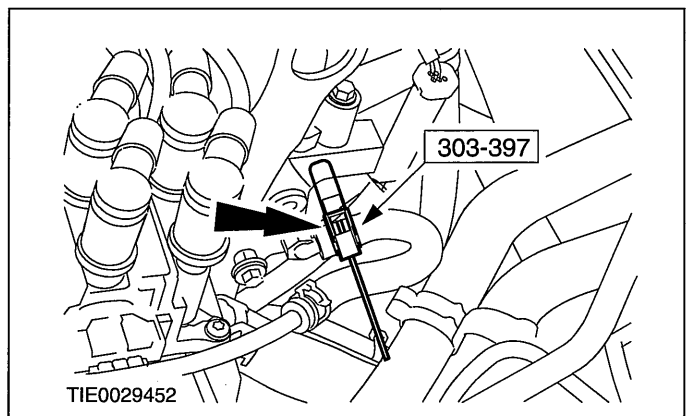
- Remove the cable tie.



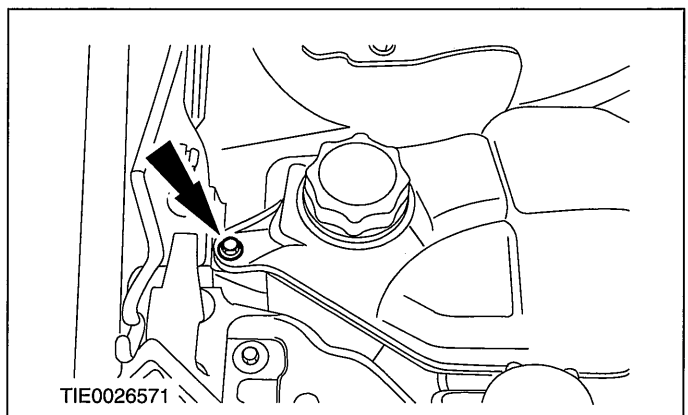
10. Detach the power steering fluid reservoir from the bracket and position it to one side.



11. Using the special tool, disconnect the degas hose from the cylinder head.

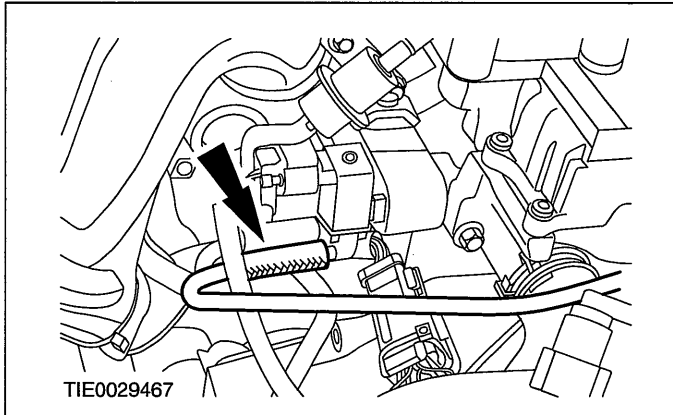


12. Detach the coolant expansion tank from the bracket and position it to one side.

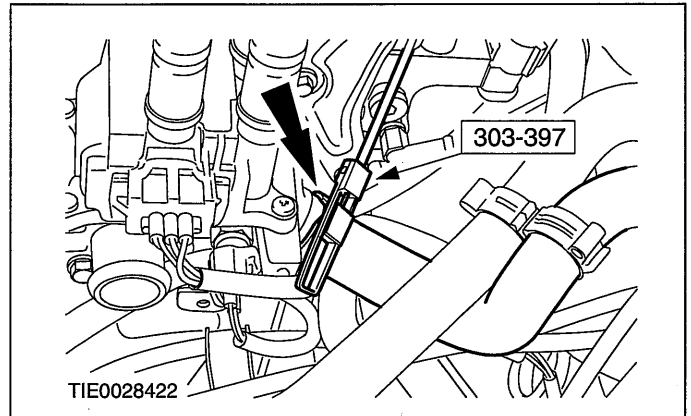


REMOVAL

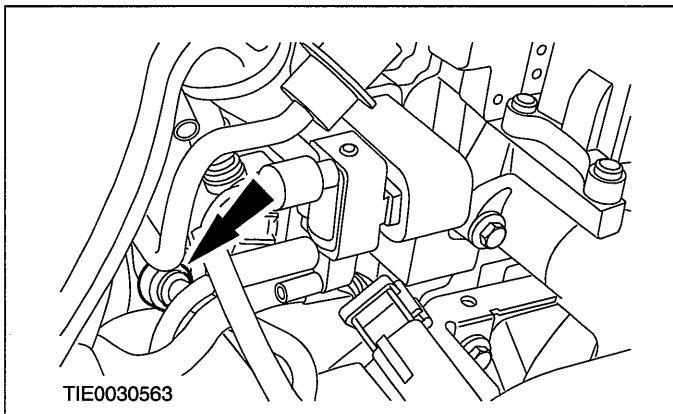
13. Disconnect the low pressure evaporate emission (EVAP) hose from the EVAP valve.



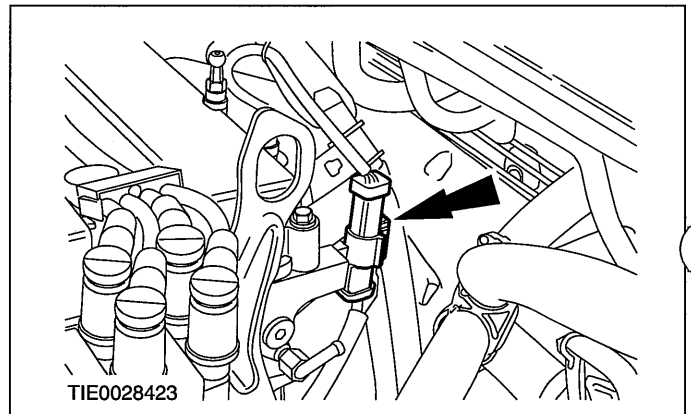
16. Using the special tool, disconnect the coolant hose from the coolant distribution housing.



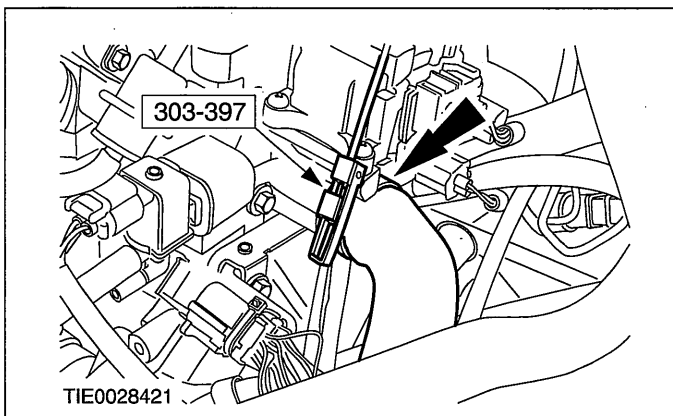
14. Detach the brake booster vacuum line from the intake manifold.



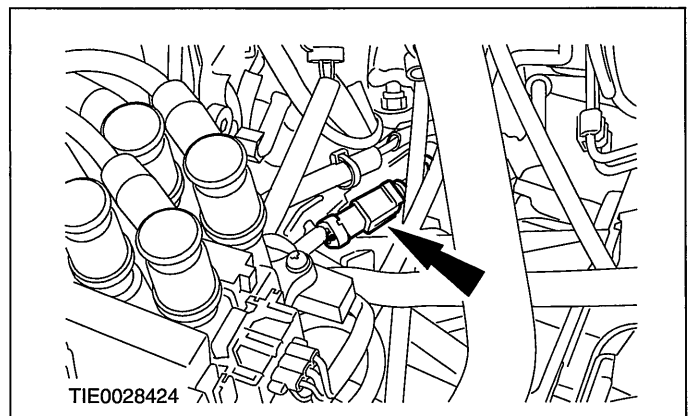
17. Disconnect the heated oxygen (HO2S) sensor electrical connector.



15. Using the special tool, disconnect the coolant hose from the coolant distribution housing.

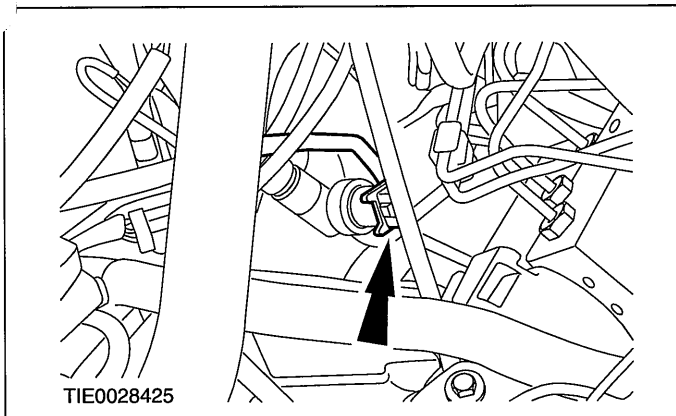


18. Disconnect the catalyst monitor sensor electrical connector.

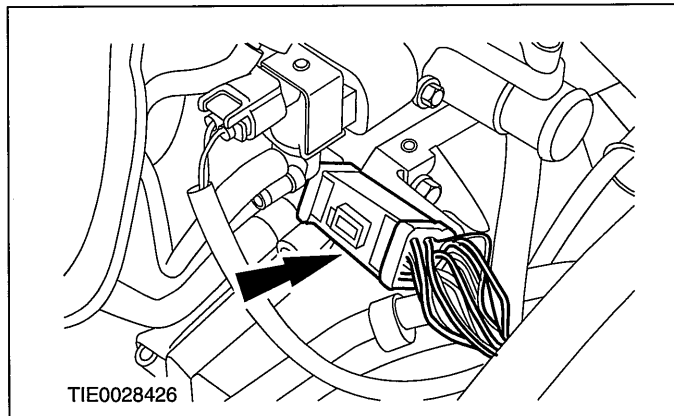


REMOVAL

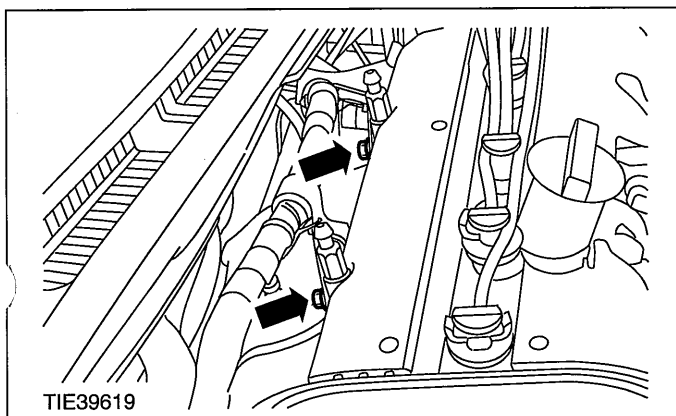
- 19. Disconnect the power steering pressure (PSP) switch electrical connector.**



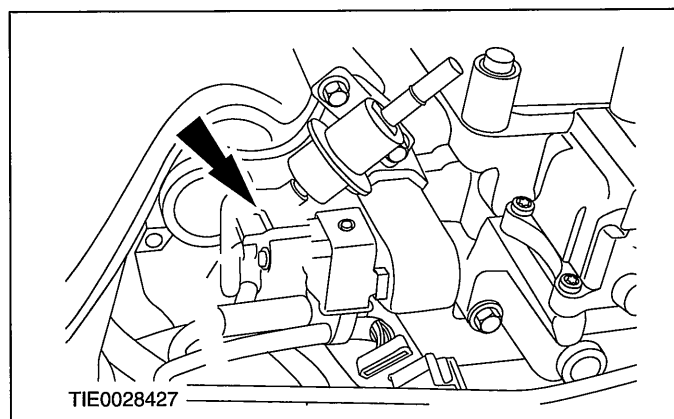
- 22. Disconnect the engine wiring harness electrical connector.**



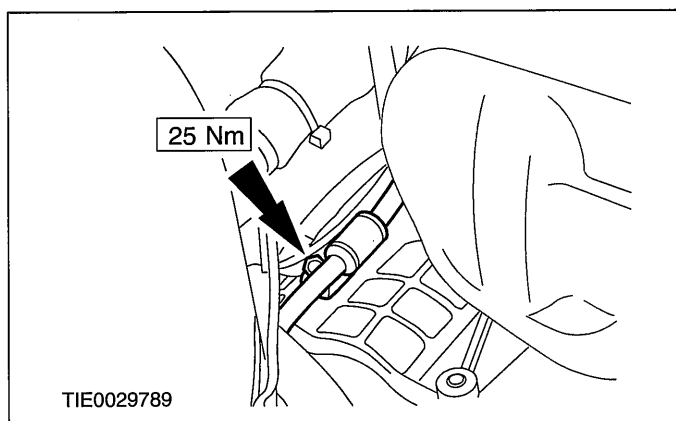
- 20. Detach the power steering line support bracket from the cylinder head.**



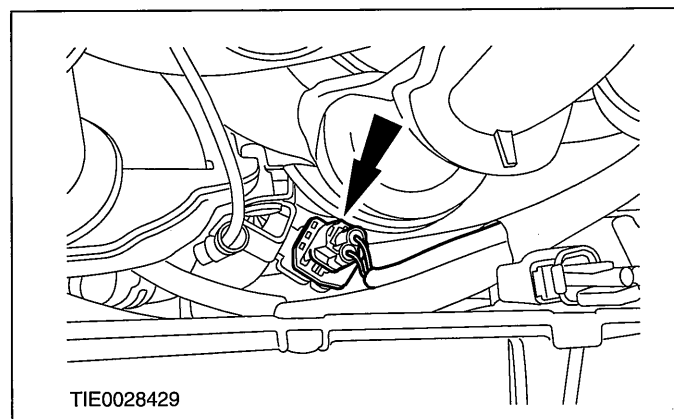
- 23. Disconnect the EVAP electrical connector.**



- 21. Detach the power steering line from the power steering pump mounting bracket.**

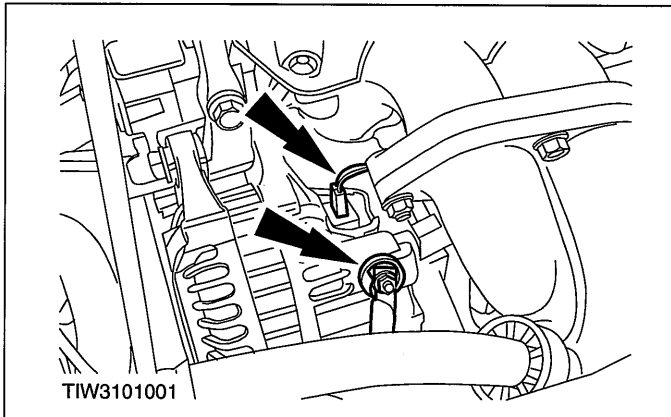


- 24. Disconnect the knock sensor (KS) electrical connector.**

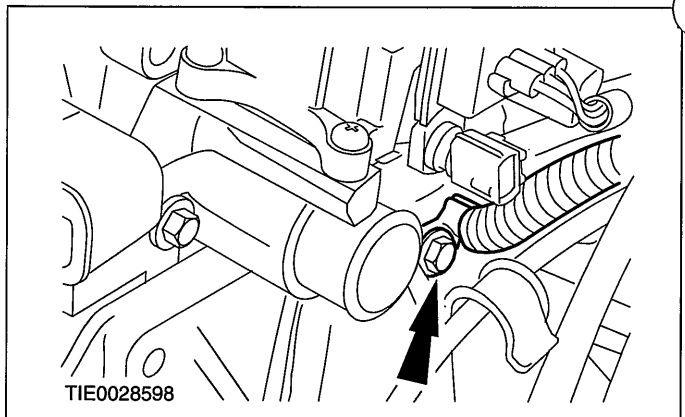


REMOVAL

- 25. Disconnect the generator electrical connectors.**



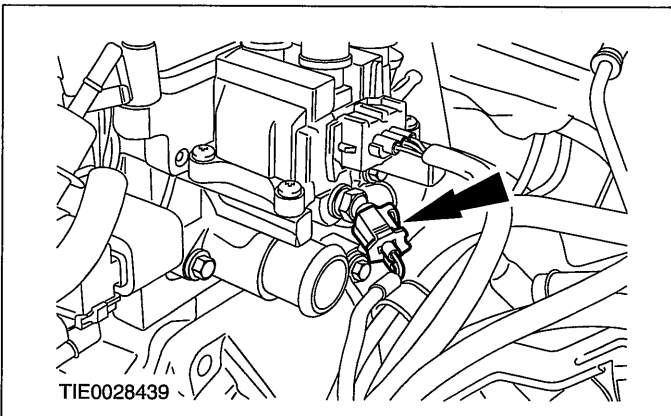
- 29. Detach the engine ground cable from the transaxle.**



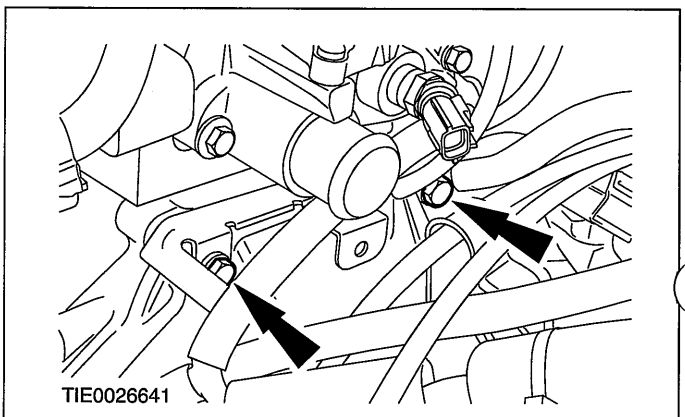
- 26. Remove the right-hand headlamp assembly.**

For additional information, refer to:
Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

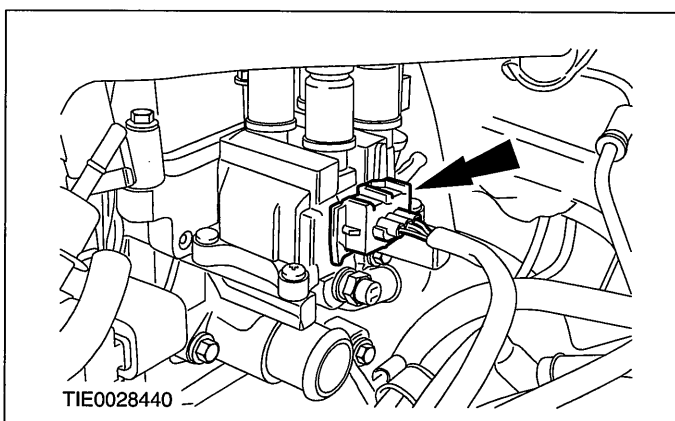
- 27. Disconnect the engine coolant temperature (ECT) electrical connector.**



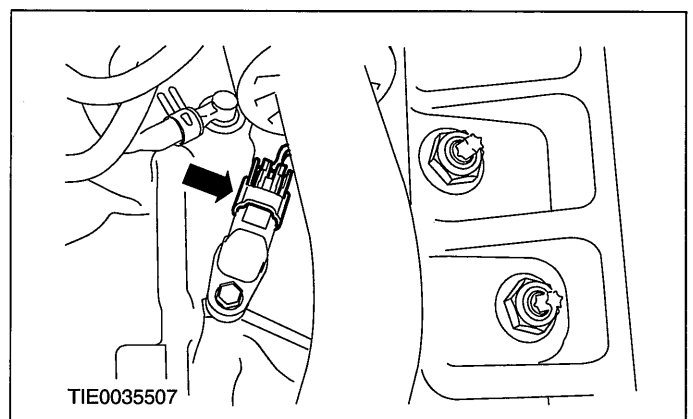
- 30. Remove the engine wiring harness support brackets.**



- 28. Disconnect the electronic ignition (EI) coil electrical connector.**

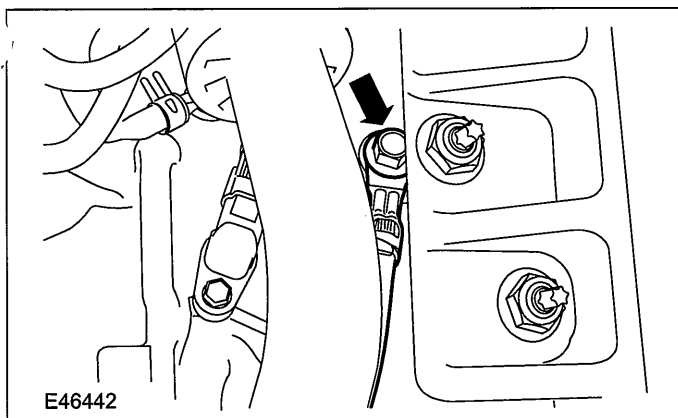


- 31. Disconnect the turbine shaft speed (TSS) sensor electrical connector.**

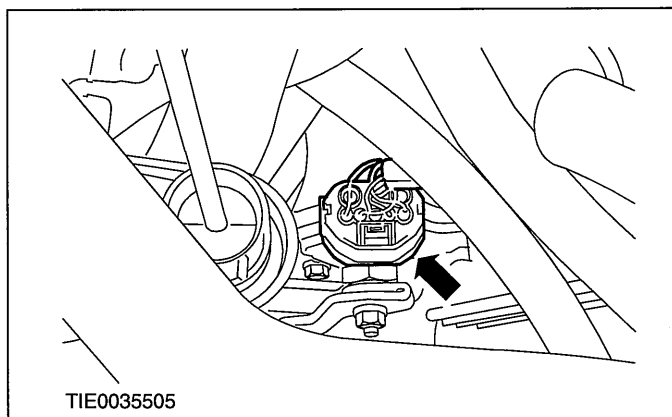


REMOVAL

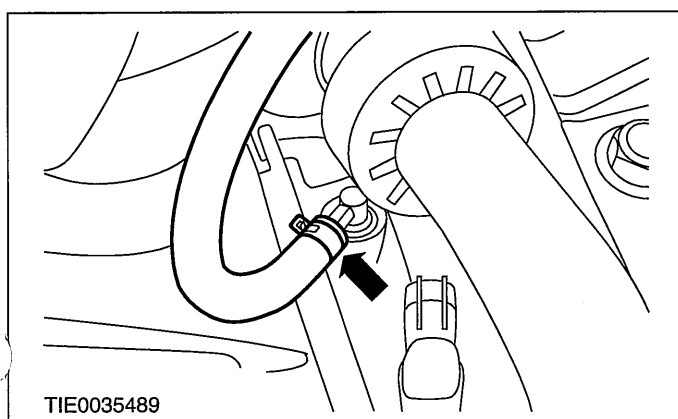
32. Detach the ground cable from the transaxle.



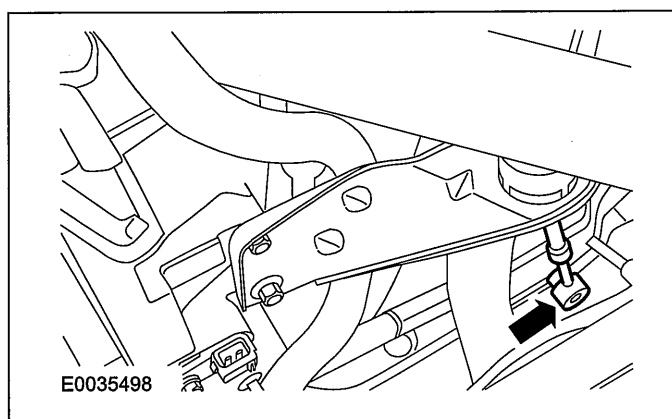
35. Disconnect the transmission range (TR) sensor electrical connector.



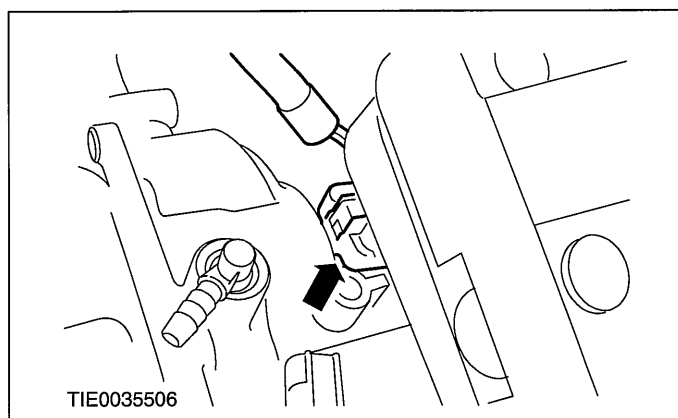
33. Disconnect the transaxle breather hose.



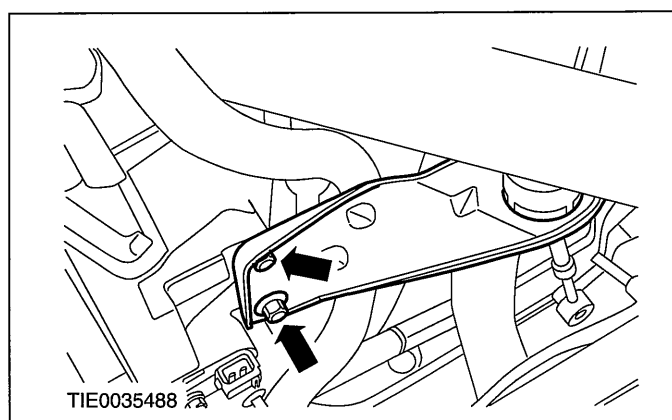
36. Detach the selector lever cable from the transaxle.



34. Disconnect the transaxle wiring harness electrical connector.

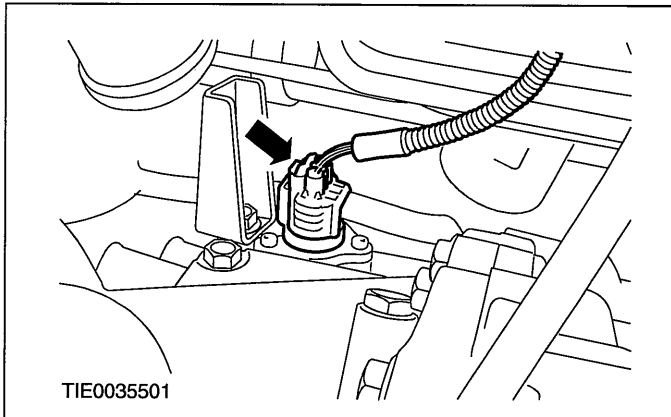


37. Detach the selector lever retaining bracket from the transaxle.

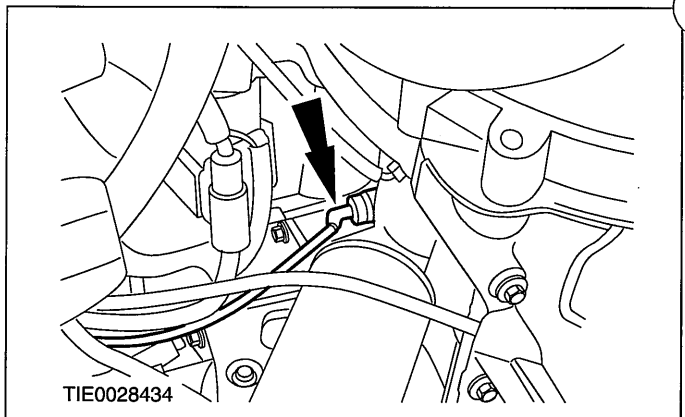


REMOVAL

38. Disconnect the vehicle speed (VSS) sensor electrical connector.



40. Disconnect the oil pressure switch electrical connector.



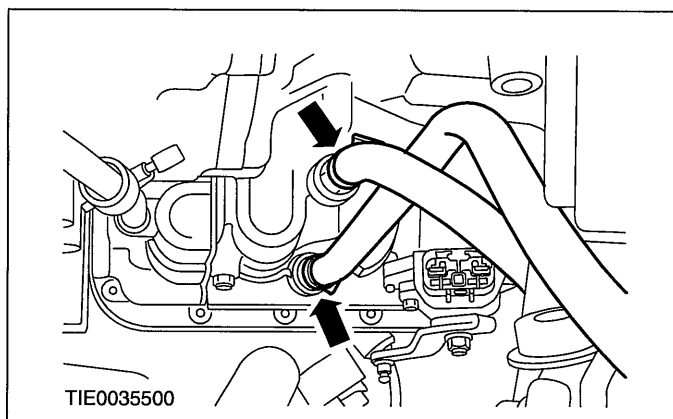
39. **NOTE:** Mark the position of the transmission fluid cooler supply line and the transmission fluid cooler return line.

Disconnect the transmission fluid cooler lines from the transaxle.

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

- Allow the fluid to drain into a suitable container.

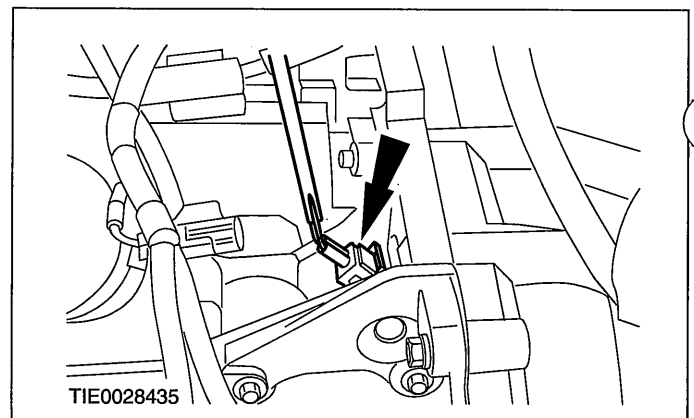
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation). See - Transmission Fluids.



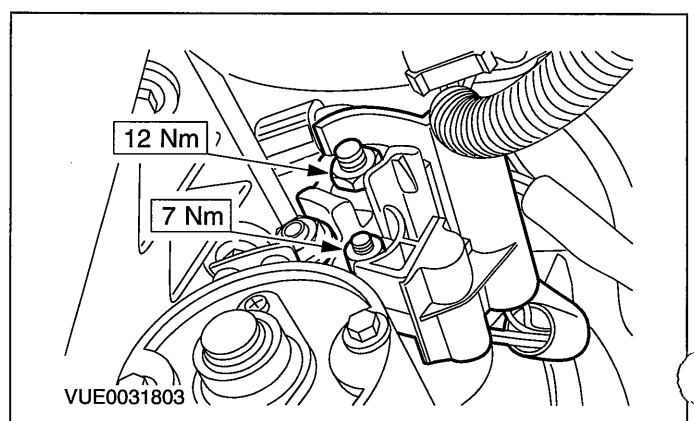
41. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

42. Disconnect the crankshaft position (CKP) sensor electrical connector.



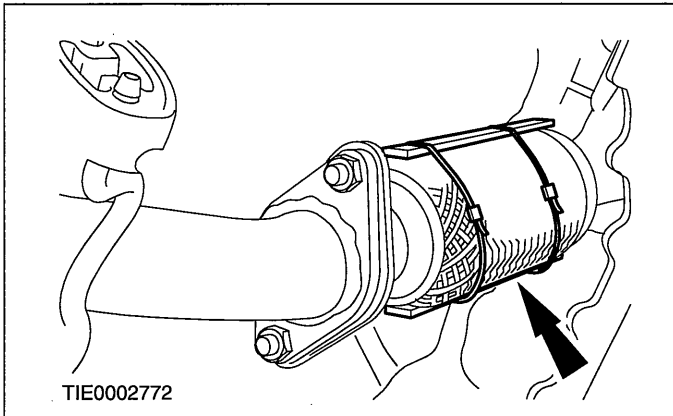
43. Disconnect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables.



REMOVAL

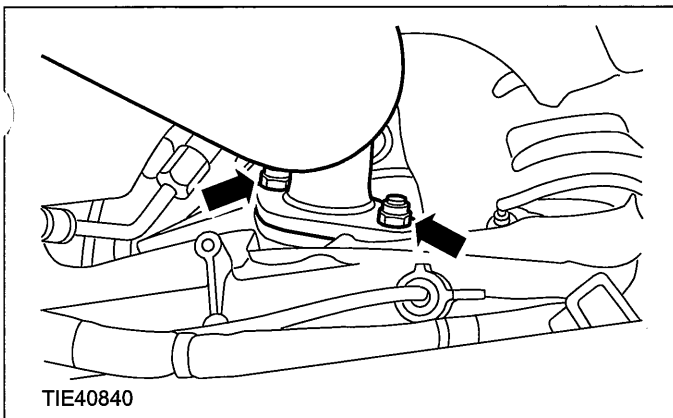
44. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a suitable support wrap or suitable splint.



45. Detach the exhaust flexible pipe from the catalytic converter.

- Discard the nuts and the gasket.

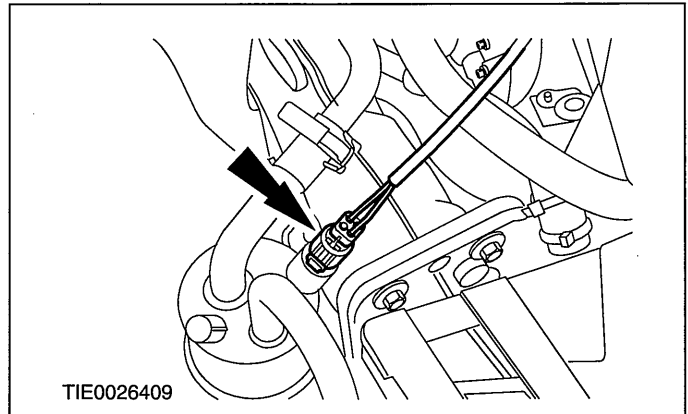


46. Remove the accessory drive belt.

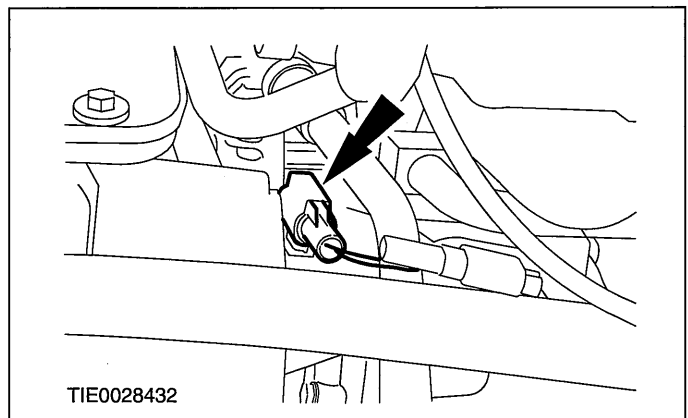
For additional information, refer to:
Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

Vehicles with air conditioning

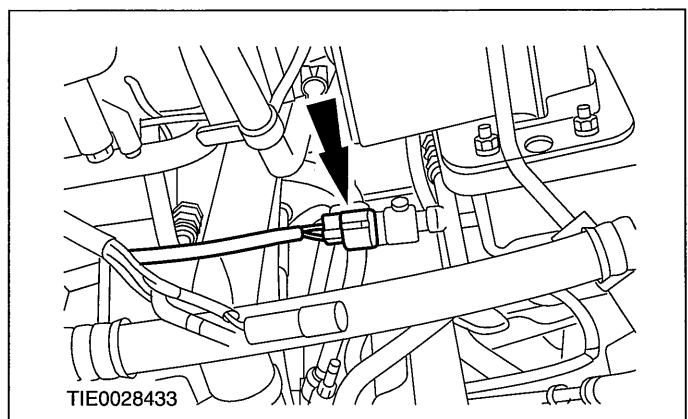
47. Disconnect the air conditioning (A/C) low-pressure cutoff switch electrical connector.



48. Disconnect the A/C compressor clutch electrical connector.

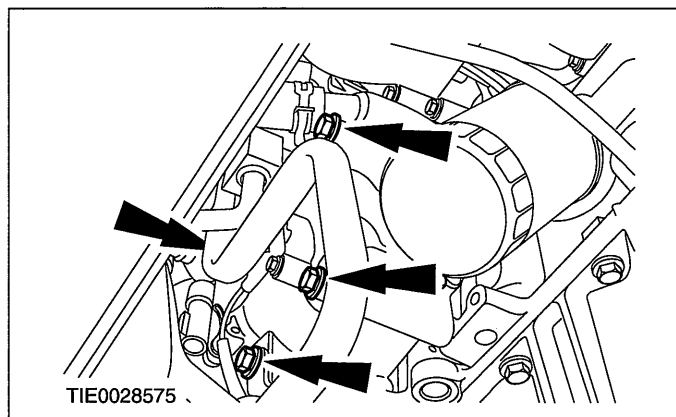


49. Disconnect the A/C high-pressure cutoff switch electrical connector.



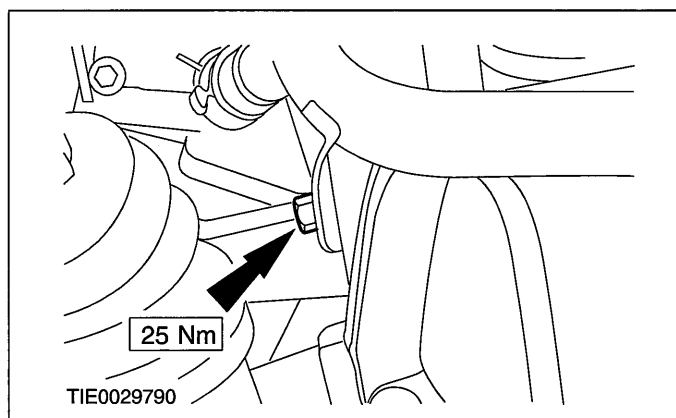
REMOVAL

- 50. Detach the A/C compressor from the cylinder block and position it to one side.**



All vehicles

- 51. Detach the power steering line support bracket from the engine block.**



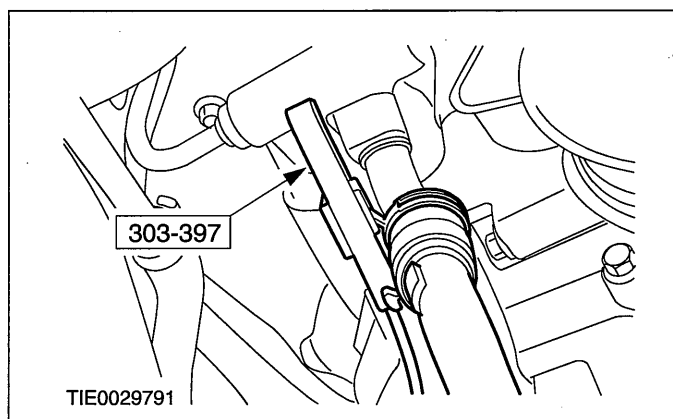
- 52. Disconnect the power steering line from the steering pump.**

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

- Allow the fluid to drain into a suitable container.

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

See - Transmission Fluids.

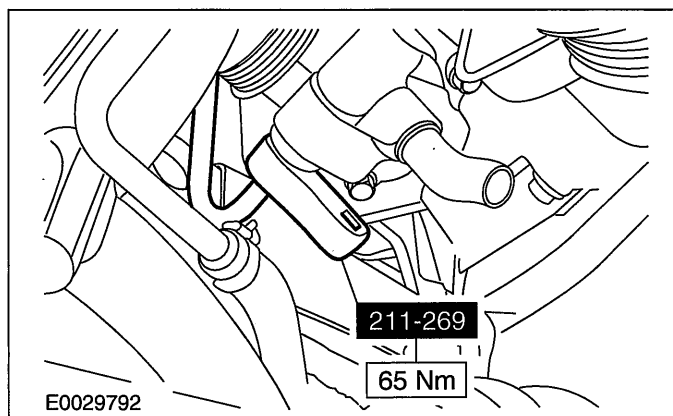


- 53. Using the special tool, detach the power steering line from the power steering pump.**

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

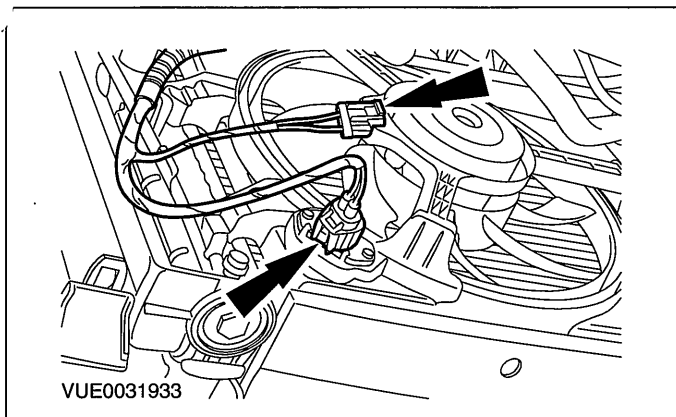
- Allow the fluid to drain into a suitable container.

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

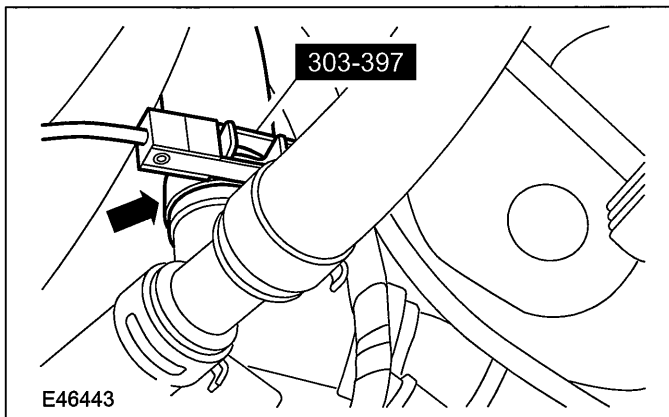


REMOVAL

- 54. Disconnect the cooling fan motor and cooling fan resistor electrical connectors.**

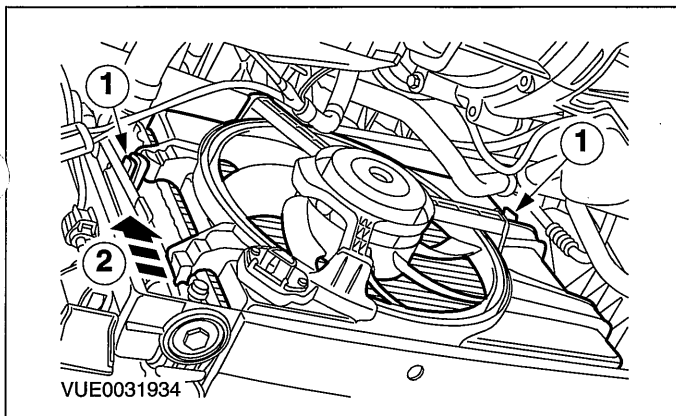


- 57. Using the special tool, disconnect the coolant hose from the distribution pipe.**



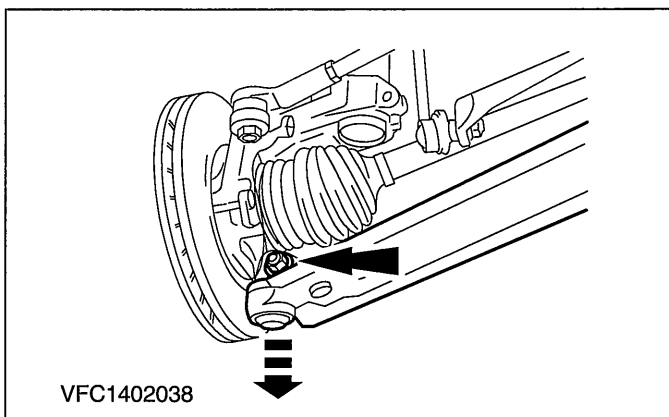
- 55. Remove the cooling fan motor and shroud.**

1. Release the cooling fan motor and shroud from the retaining brackets.
2. Push the cooling fan motor and shroud upwards and then downwards to remove.



- 58. Detach the lower arm from the wheel knuckle on both sides.**

- Remove the heat shield.



- 56. Using the special tool, disconnect the coolant hose from the radiator.**

**59. CAUTIONS:**

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

NOTE: Plug the transaxle to prevent fluid loss or dirt ingress.

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

Using a suitable tire lever, detach the left-hand halfshaft from the transaxle and secure it to one side.

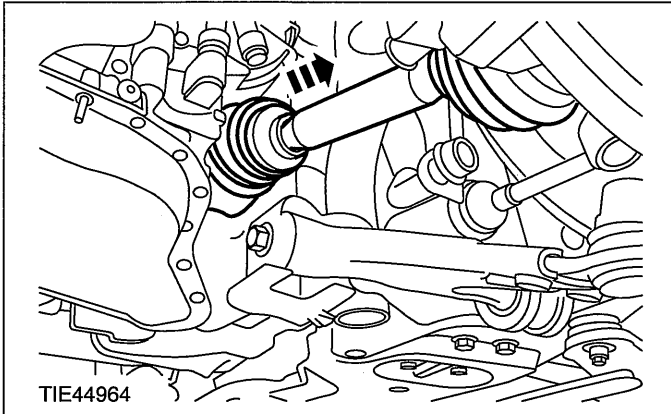
REMOVAL

- Allow the fluid to drain into a suitable container.

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

See - Transmission Fluids.

- Discard the snap ring.

**60. CAUTIONS:**

⚠ **Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.**

⚠ **Do not damage the halfshaft seal.**

NOTE: Plug the transaxle to prevent fluid loss or dirt ingress.

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

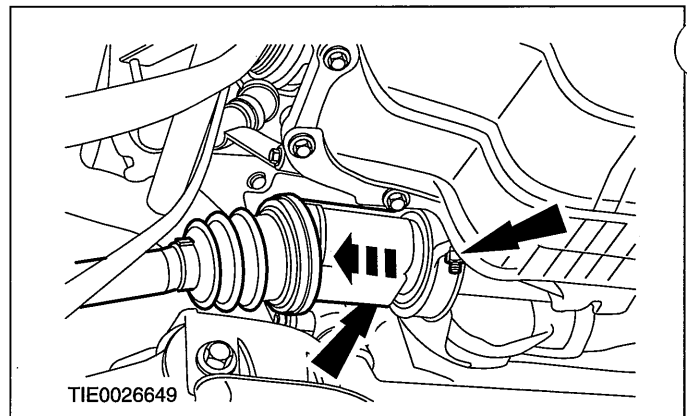
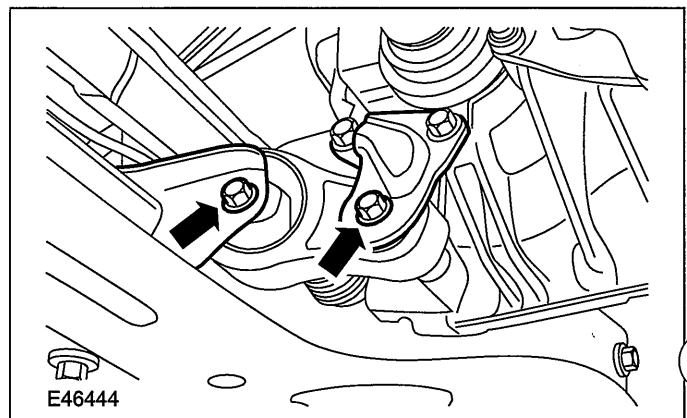
See - Transmission Fluids.

Detach the right-hand halfshaft and the intermediate shaft from the transaxle and secure it to one side.

- Discard the center bearing cap and locknuts.
- Allow the fluid to drain into a suitable container.

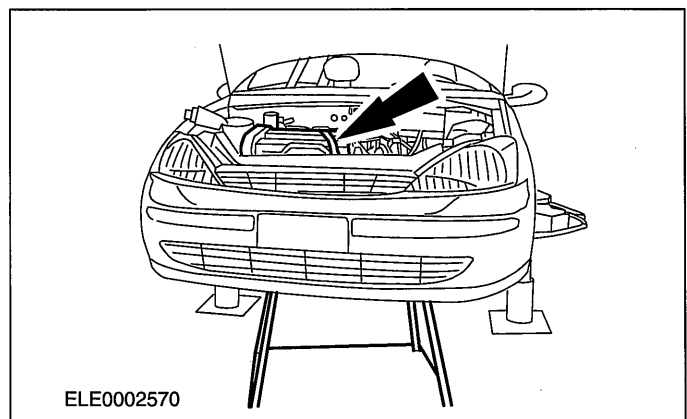
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

See - Transmission Fluids.

**61. Remove the engine support insulator.****62. ⚠ CAUTION: Do not support the engine directly on the oil pan.**

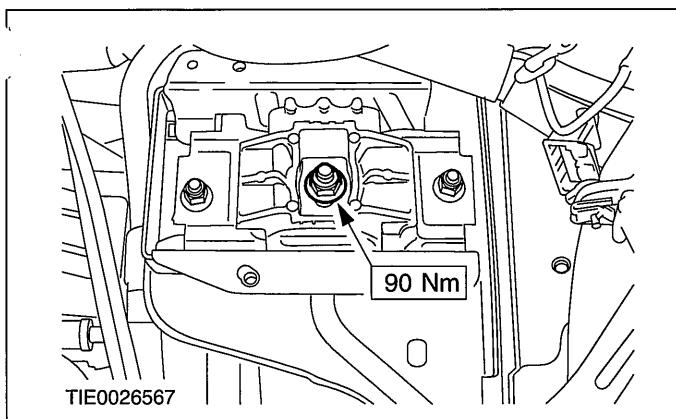
NOTE: Using suitable securing straps, secure the engine and the transaxle on a workshop table.

Using suitable wooden blocks, support the engine and transaxle assembly.

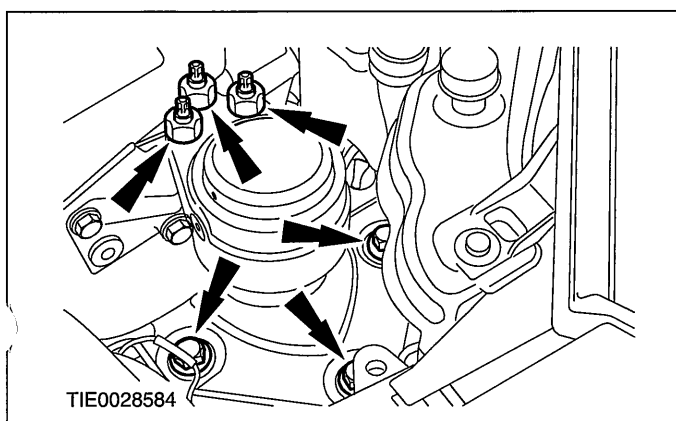
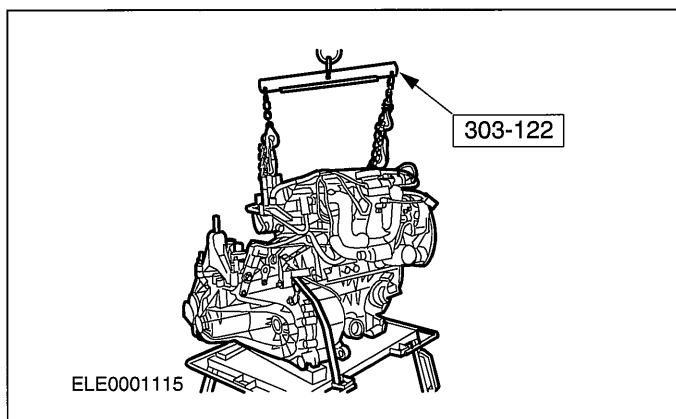
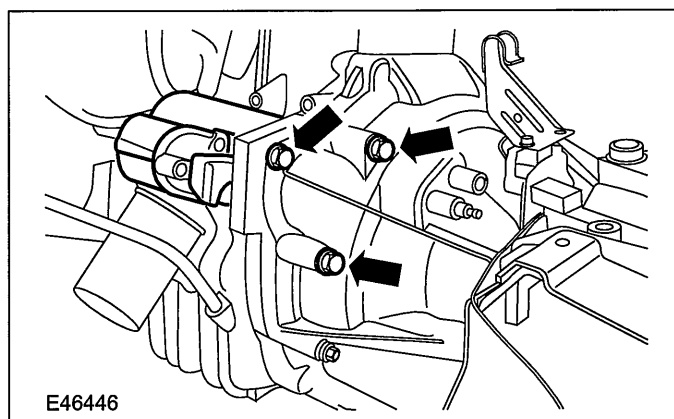
**63. Remove the engine rear mount nut.**

REMOVAL

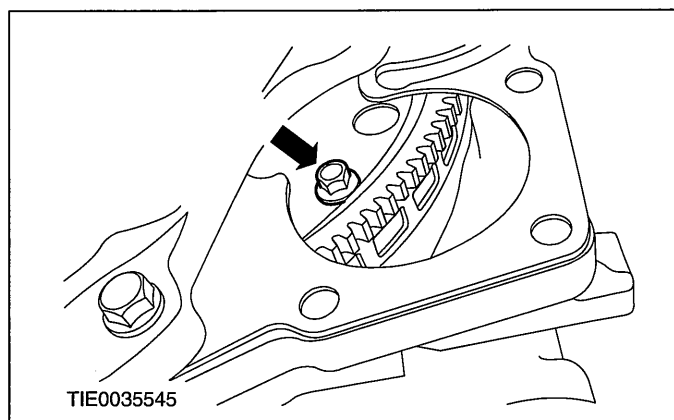
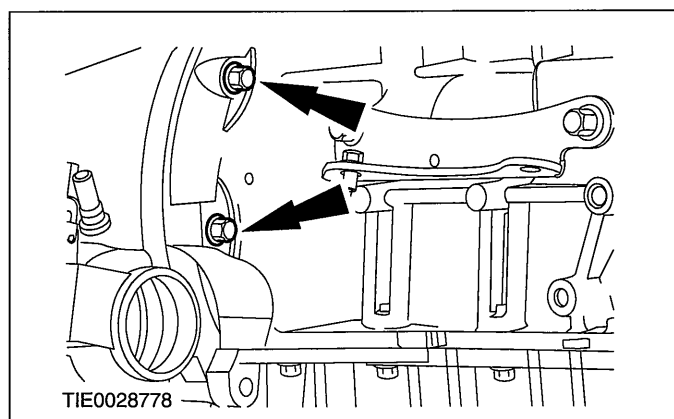
- Discard the nut.

**64. Remove the engine front mount.**

- Discard the nuts.

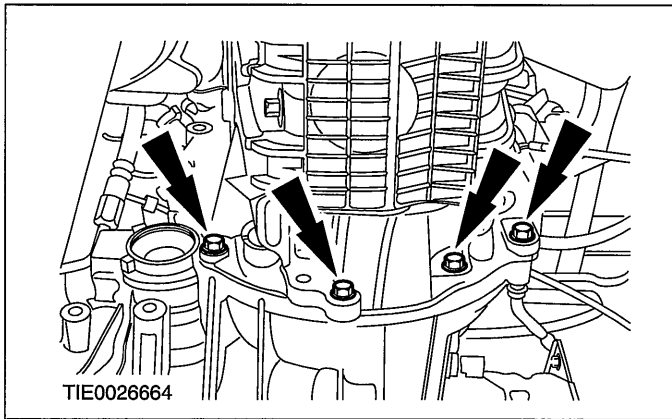
**65. Raise the vehicle and remove the engine and transaxle assembly.****66. Using the special tool, attach the engine and transaxle assembly to the engine hoist.****67. Remove the starter motor.****68. Remove the torque converter retaining nuts.**

- Rotate the torque converter to gain access to the remaining nuts.
- Discard the nuts.

**69. Remove the transaxle right-hand retaining bolts.**

REMOVAL

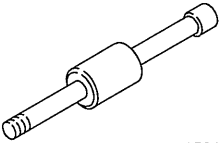
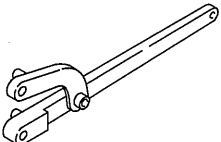
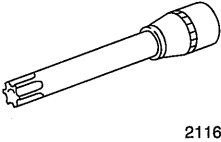
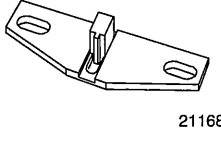
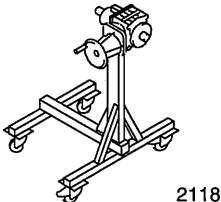
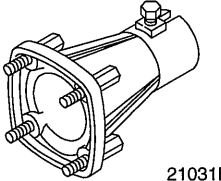
70. Remove the transaxle lower retaining bolts.



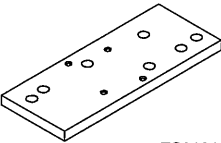
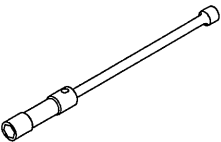
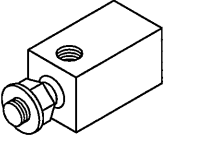
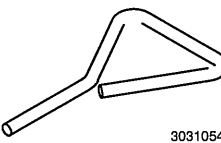
71. **▲WARNING:** Make sure the torque converter remains in the converter housing.

Remove the transaxle from the engine.

DISASSEMBLY**Engine(21 134 8)****Special Tool(s)**

 15011	Slide Hammer 205-047 (15-011)
 15030A	Universal Flange Holding Wrench 205-072 (15-030A)
 21167	Socket, Cylinder Head Bolt 303-392 (21-167)
 21168	Locking Tool, Flywheel 303-393 (21-168)
 21187	Mounting Stand 303-435 (21-187)
 21031B	Mounting Bracket for 303-435 303-435-06 (21-031B)

Special Tool(s)

 ES21212	Mounting Plate for 303-435-06 303-435-14A (21-212A)
 ES21202	Socket, Spark Plug 303-499 (21-202)
 21227	Adapter for 205-047 303-633 (21-227)
 3031054	Locking Tool, Timing Belt Tensioner 303-1054

General Equipment

Securing straps

Engine hoist

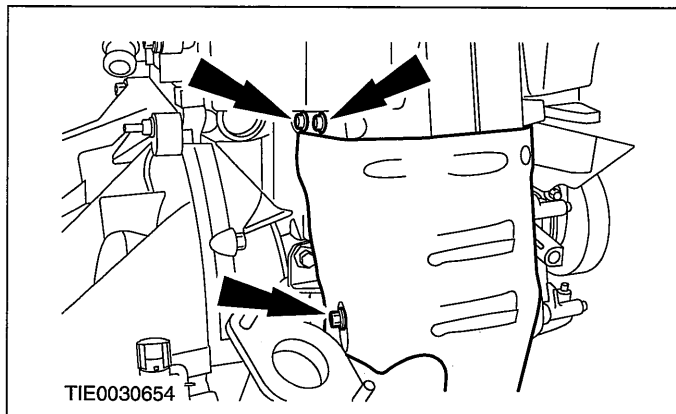
Oil filter strap wrench

All vehicles

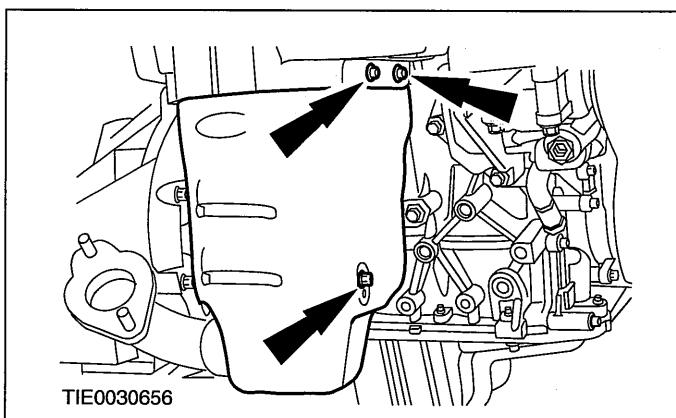
1. Remove the engine wiring harness.

DISASSEMBLY

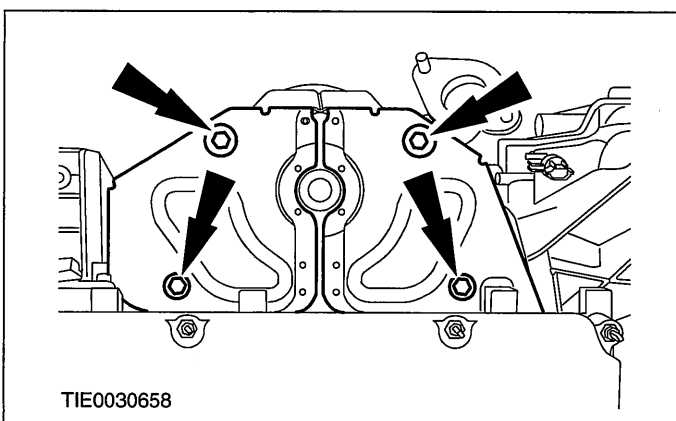
2. Remove the exhaust manifold lower heat shield left-hand retaining bolts.



3. Remove the exhaust manifold lower heat shield right-hand retaining bolts.

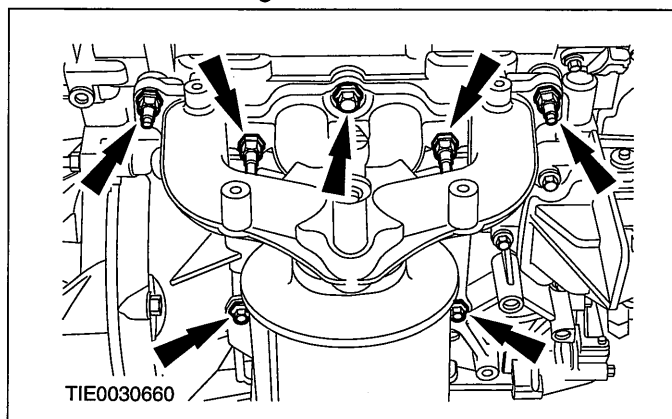


4. Remove the exhaust manifold upper heat shield.

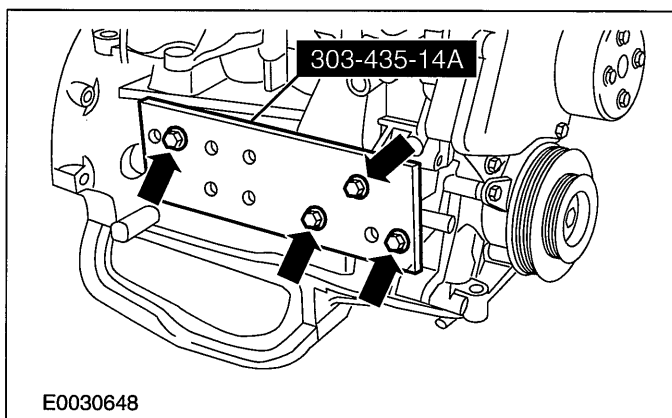


5. Remove the exhaust manifold.

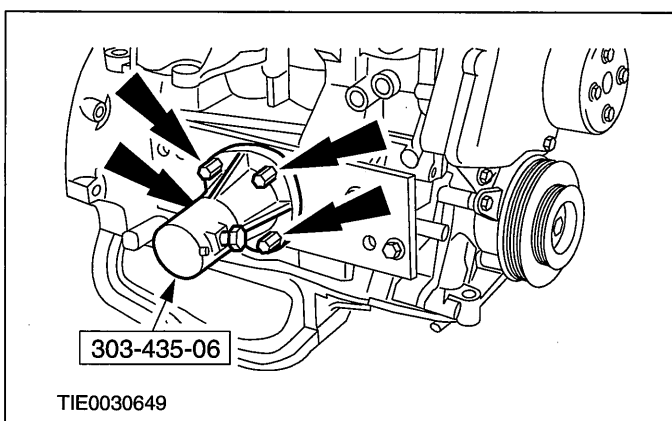
- Discard the gasket.

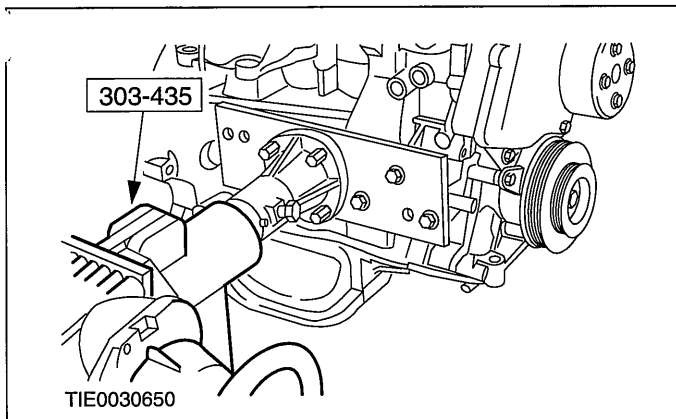
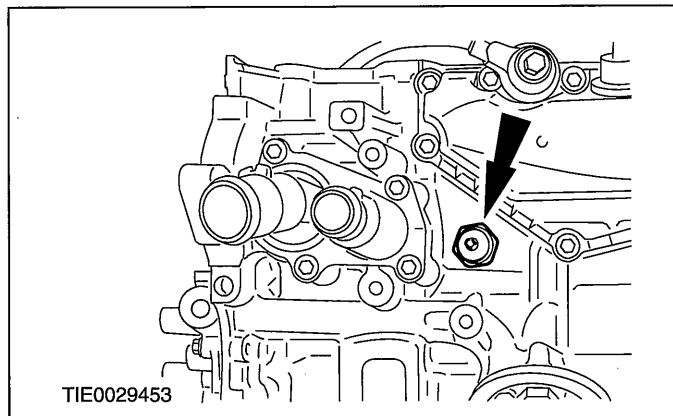


6. Install the mounting plate to the engine.

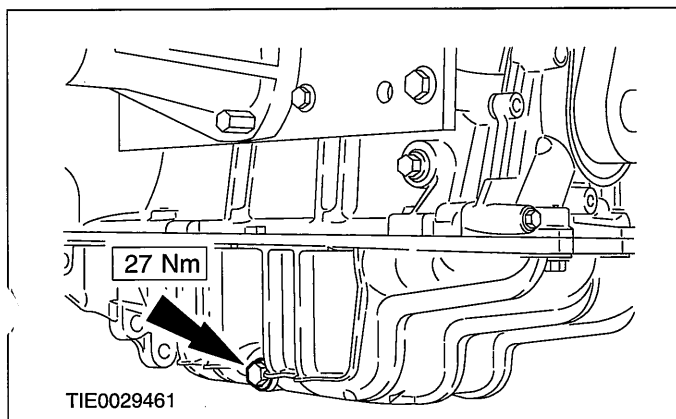
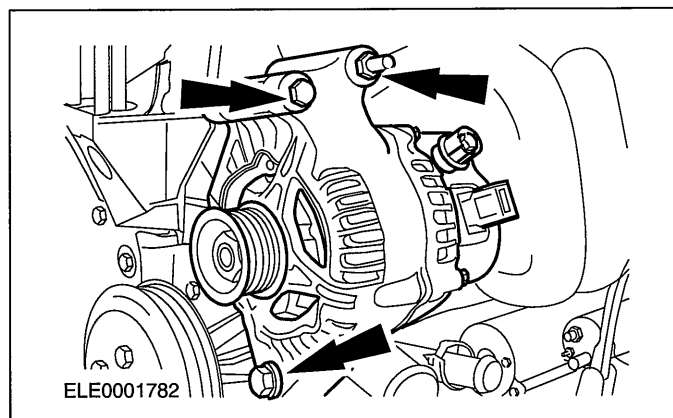


7. Install the mounting bracket to the mounting plate.

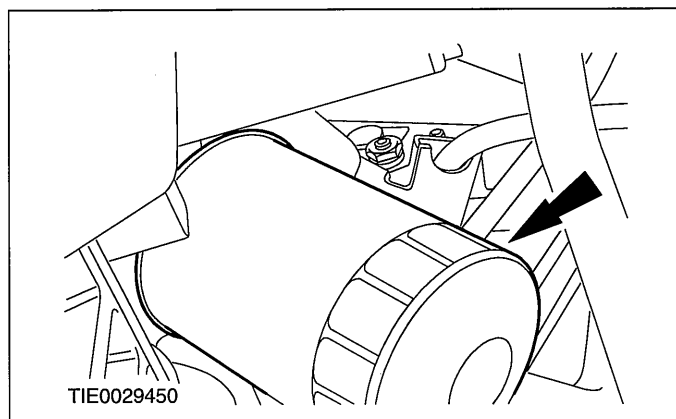
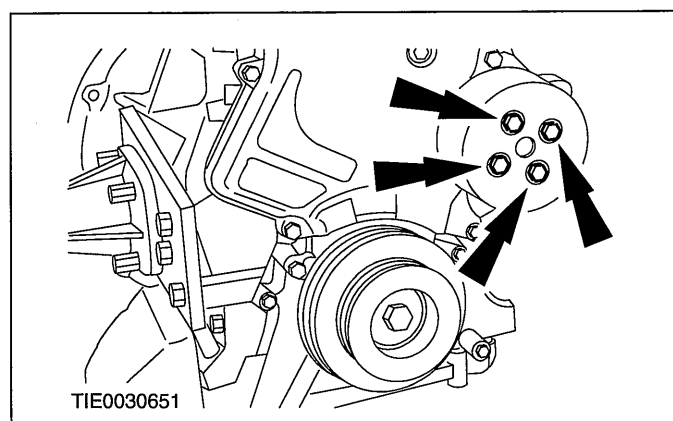


DISASSEMBLY**8. Install the engine to the mounting stand.****11. Remove the oil pressure switch.****9. Drain the engine oil.**

- Allow the oil to drain into a suitable container.

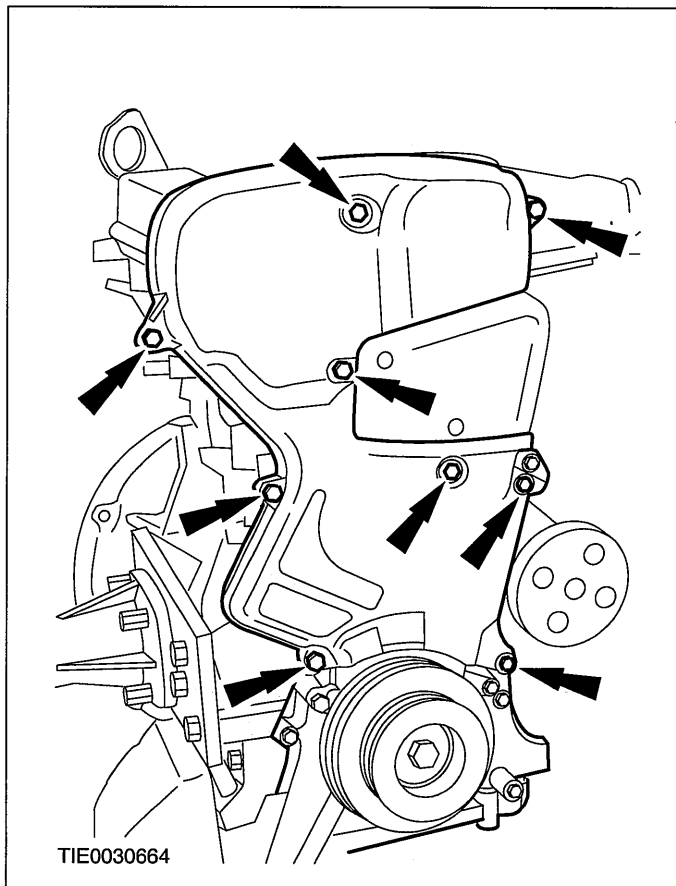
**12. Remove the generator.****10. Using a suitable oil filter strap wrench, remove the oil filter.**

- Discard the oil filter.

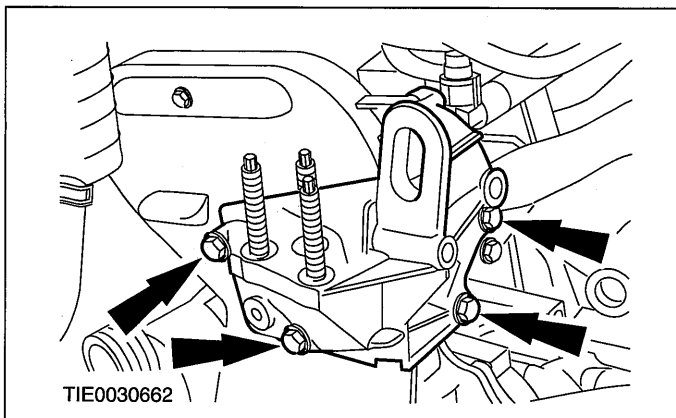
**13. Remove the coolant pump pulley.**

DISASSEMBLY

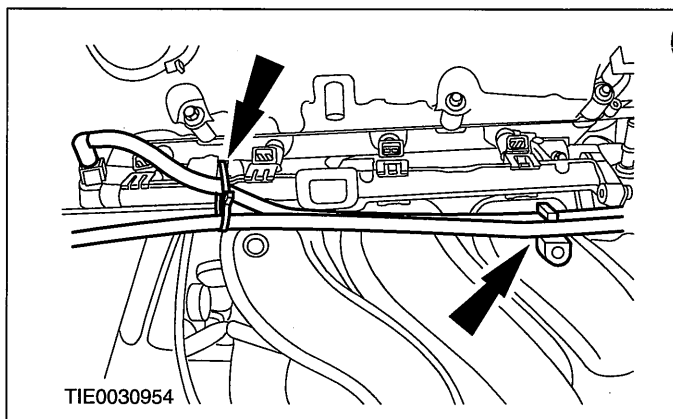
14. Remove the timing belt upper cover.



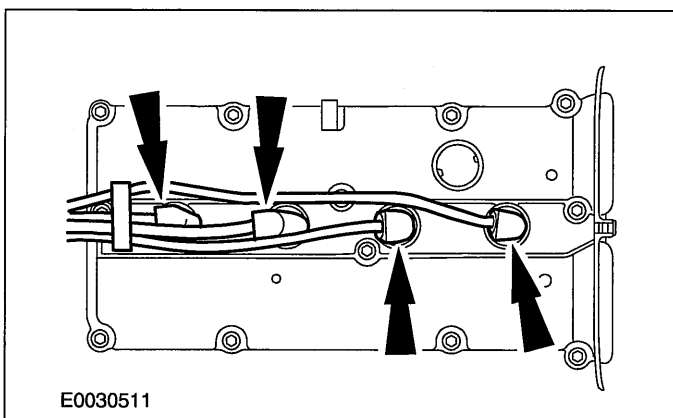
15. Remove the engine front mount bracket.



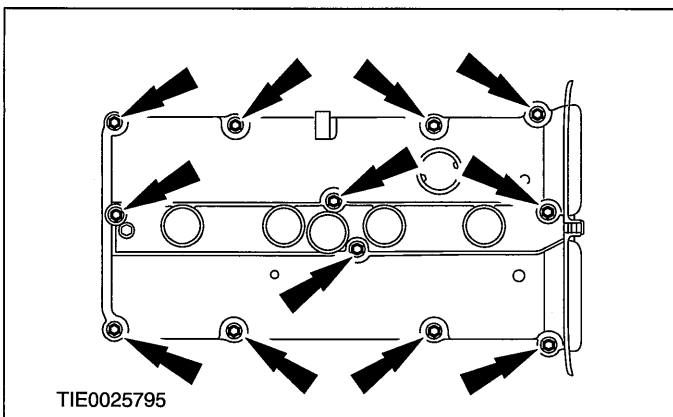
16. Remove the fuel supply and return lines.



17. Disconnect the spark plug electrical connectors and detach the wires from the valve cover.

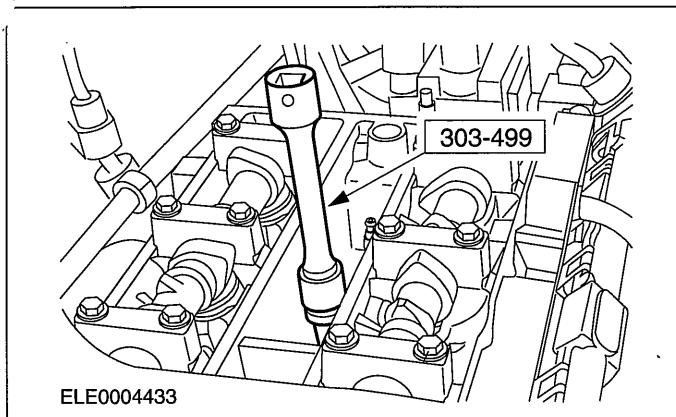


18. Remove the valve cover.



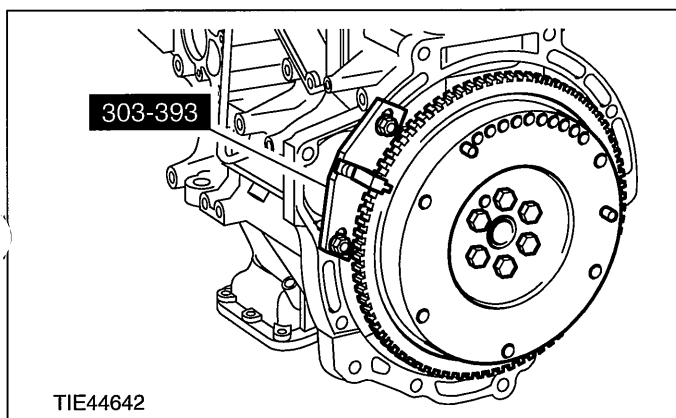
DISASSEMBLY

19. Using the special tool, remove the spark plugs.



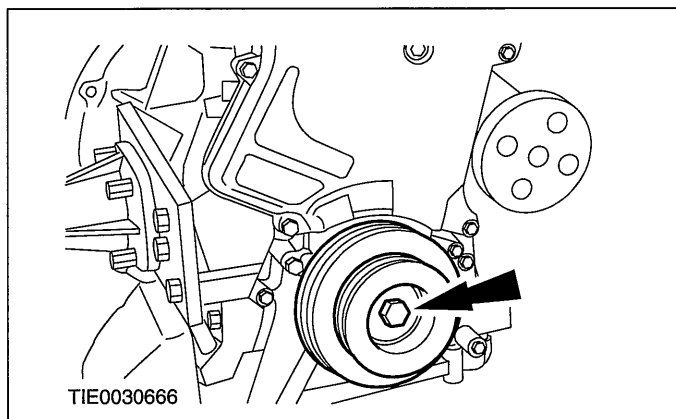
20. Set the crankshaft to approximately 20 degrees before TDC.

21. Using the special tool, lock the crankshaft.

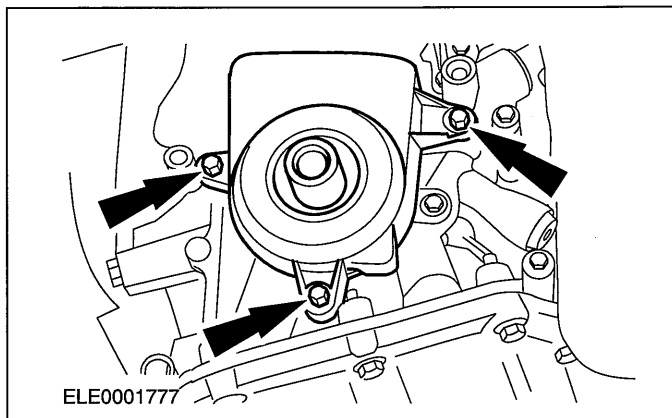


22. Remove the crankshaft pulley.

- Discard the bolt.



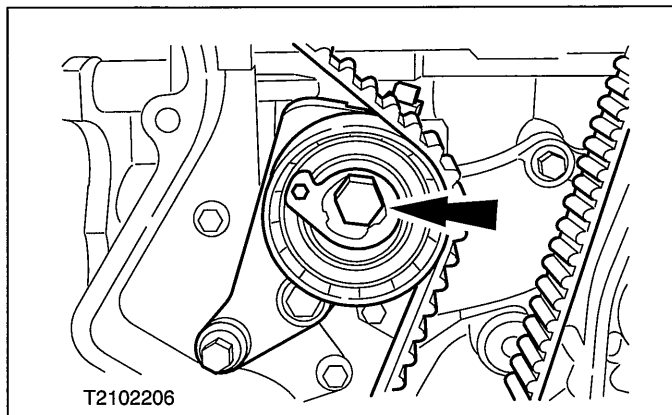
23. Remove the timing belt lower cover.



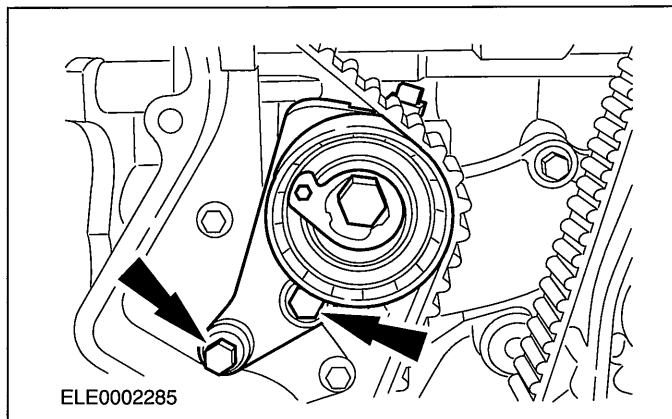
Engines with eccentric cam timing belt tensioner

24. Slacken the timing belt tensioner and remove the timing belt.

- Discard the timing belt.



25. Remove the timing belt tensioner.

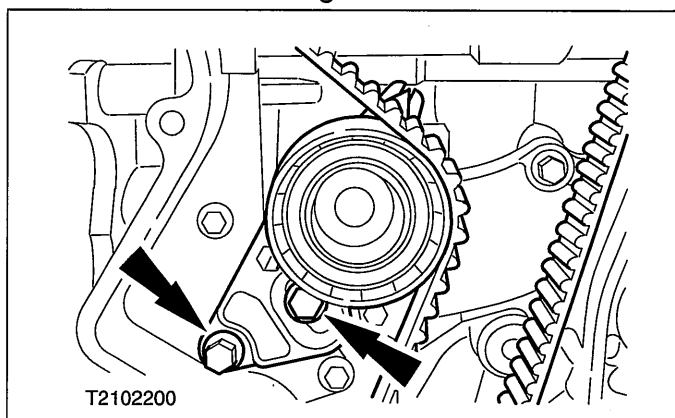


Engines with slotted bracket timing belt tensioner

26. Remove the timing belt tensioner and the timing belt.

DISASSEMBLY

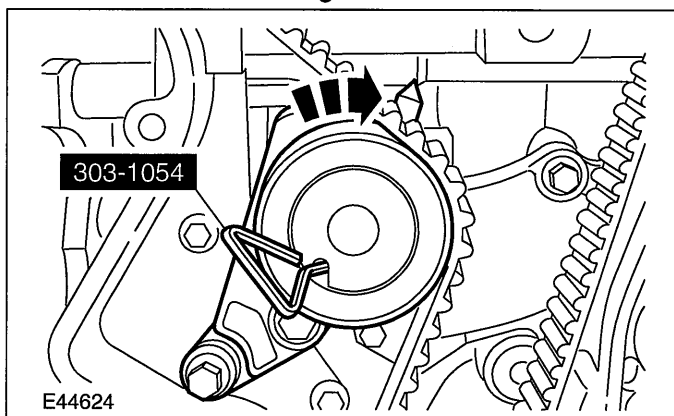
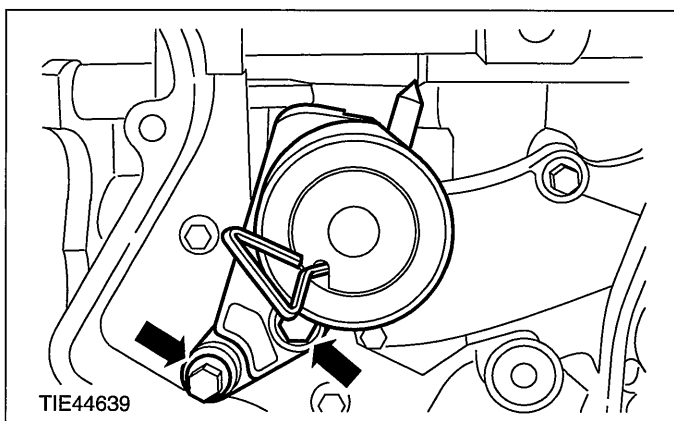
- Discard the timing belt.



Vehicles built 09/2003 onwards

27. Remove the timing belt.

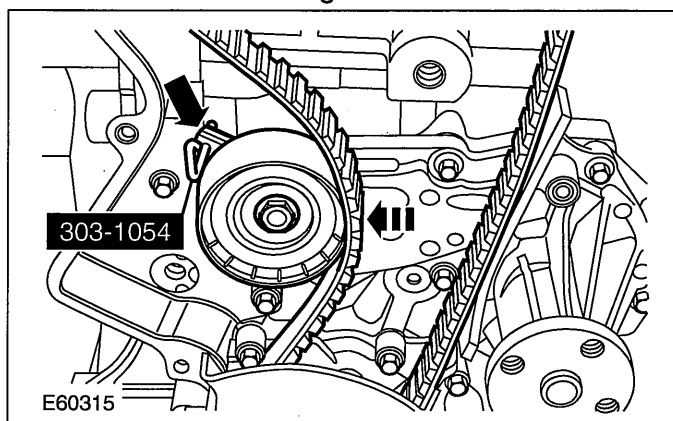
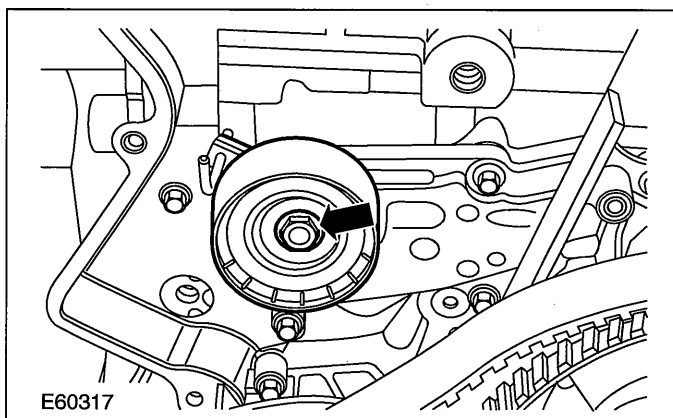
- Tension the timing belt tensioner by pulling the timing belt and lock it with the special tool.
- Discard the timing belt.

**28. Remove the timing belt tensioner.**

Vehicles built 04/2005 onwards

29. Remove the timing belt.

- Tension the timing belt tensioner by pulling the timing belt and lock it with the special tool.
- Discard the timing belt.

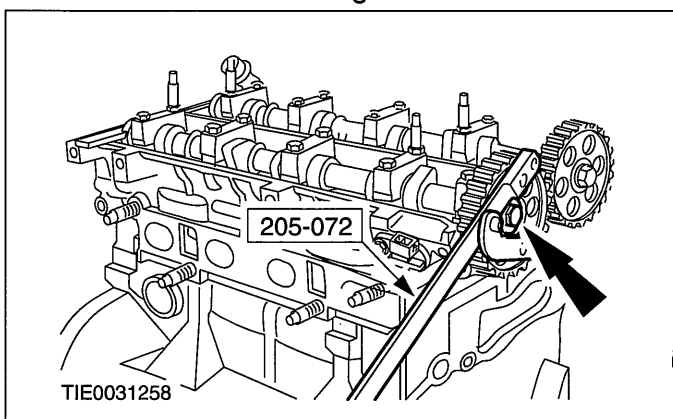
**30. Remove the timing belt tensioner.**

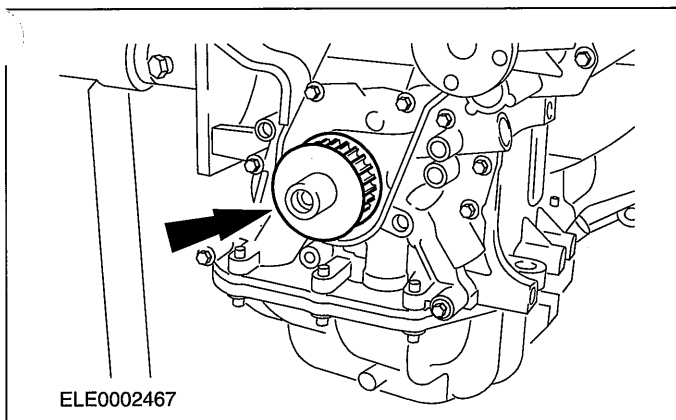
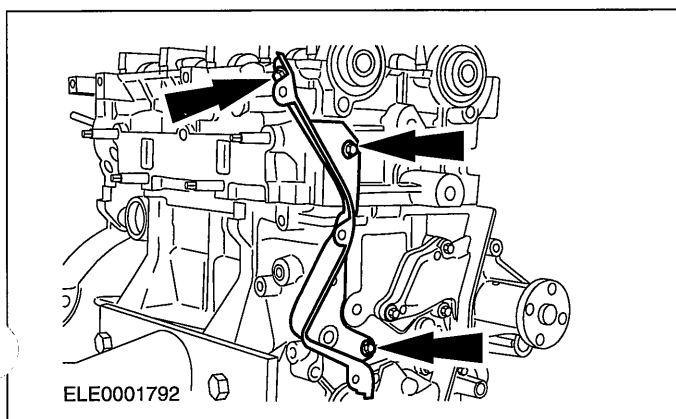
All vehicles

- 31. ⚠ CAUTION:** Install a hose (order no. E890438S) to the special tool studs, to prevent damage to the camshaft sprockets.

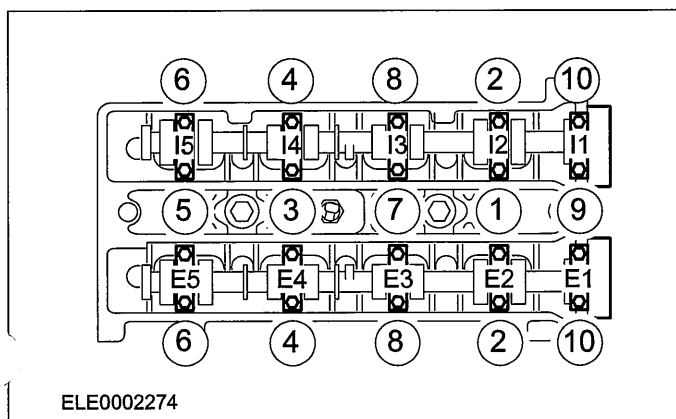
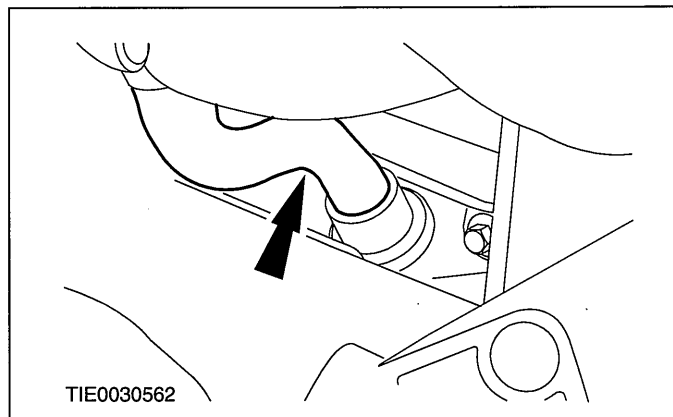
Remove the camshaft pulleys.

- Discard the retaining bolts.

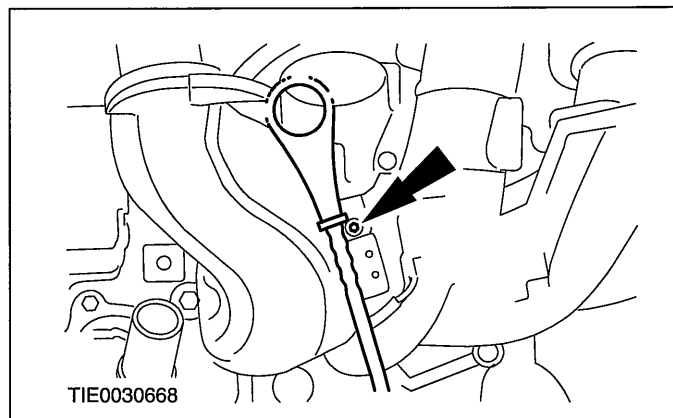
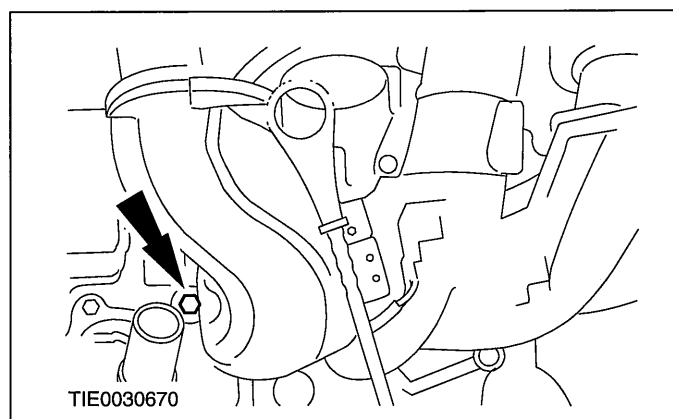


DISASSEMBLY**32. Remove the crankshaft timing belt pulley.****33. Remove the timing belt rear cover.****34. ⚠ CAUTION: Keep the camshaft bearing caps and the camshafts in order for installation.****Remove the camshafts.**

- Slacken each camshaft bearing cap retaining bolt in the sequence shown by one turn until the camshaft is released.
- Remove the camshaft bearing caps.
- Remove and discard the camshaft seals.

**35. Disconnect the positive crankcase ventilation (PCV) hose from the PCV cover.****36. Detach the oil level indicator and tube from the intake manifold.**

- Detach the knock sensor (KS) electrical connector from the oil level indicator tube.

**37. Remove the intake manifold lower bolt.****38. CAUTIONS:**

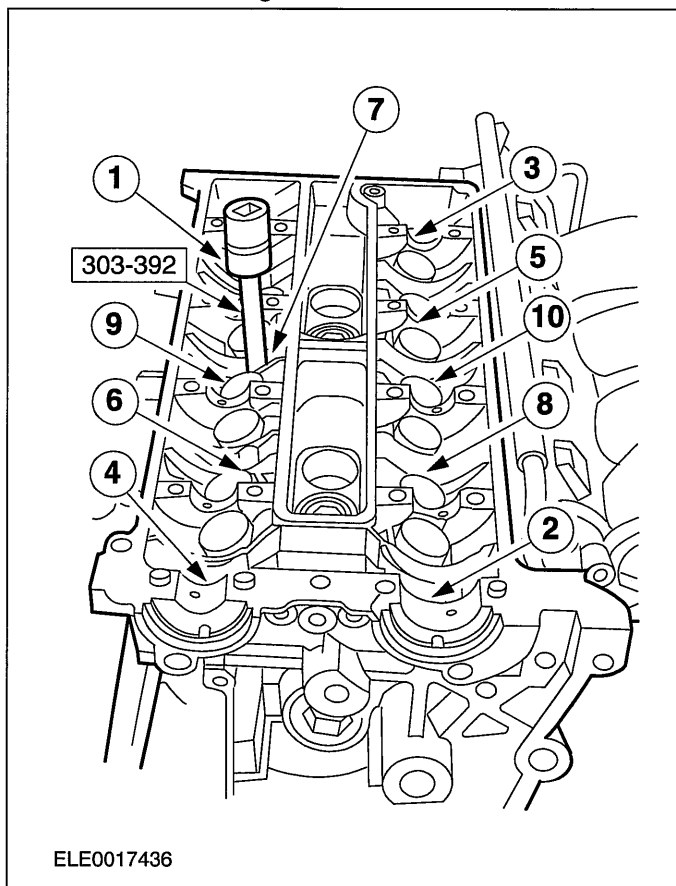
⚠ Place the cylinder head on a suitable soft surface.

⚠ Remove the cylinder head bolts in the sequence shown.

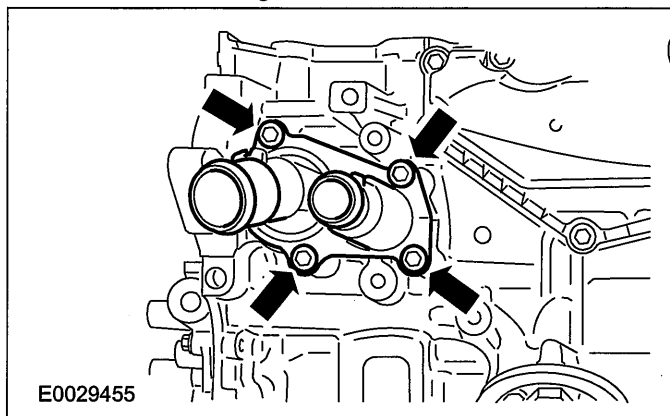
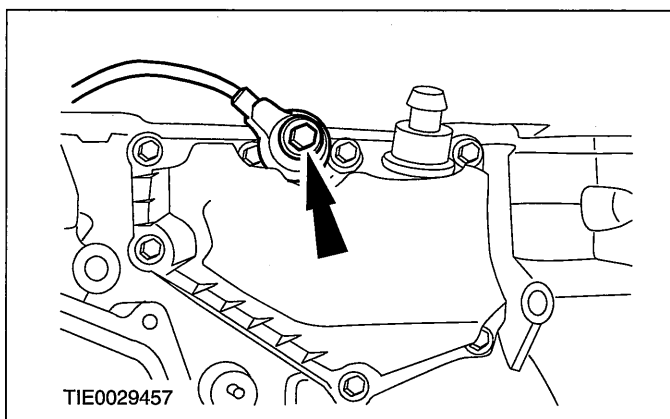
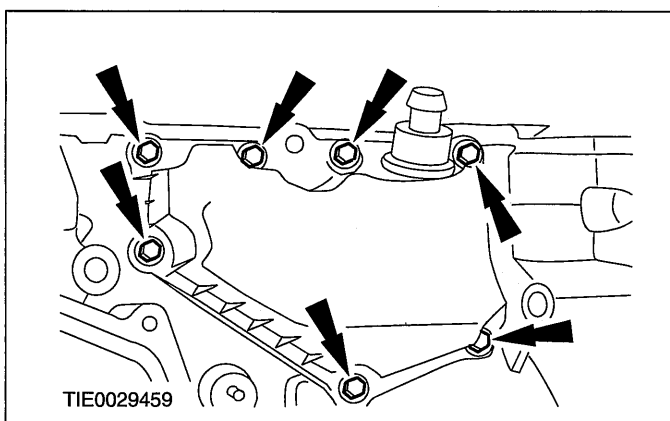
DISASSEMBLY

Using the special tool, remove the cylinder head.

- Discard the gasket.

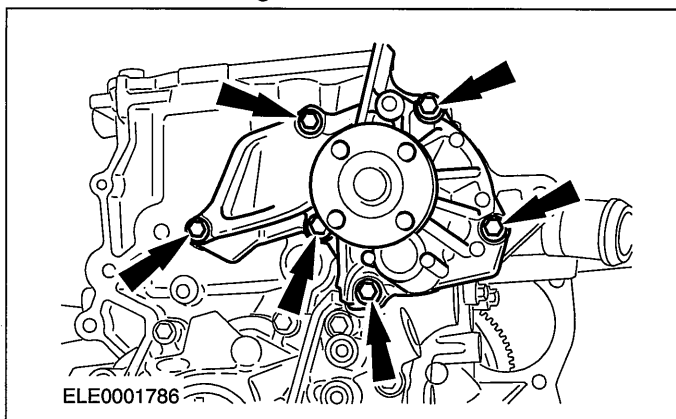


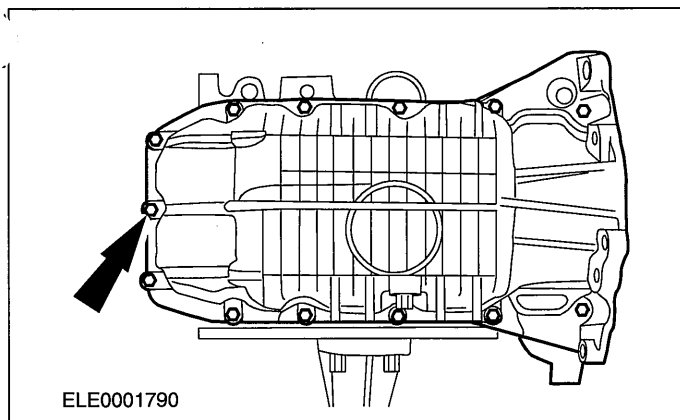
- Discard the gasket.

**41. Remove the KS.****42. Remove the the PCV cover.****39. ⚠ CAUTION: Do not damage the coolant pump impeller.**

Remove the coolant pump.

- Discard the gasket.

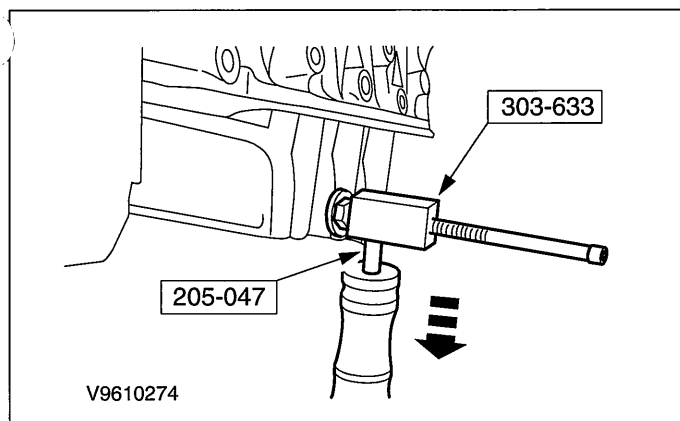
**40. Remove the thermostat housing.**

DISASSEMBLY**43. Remove the oil pan retaining bolts.**

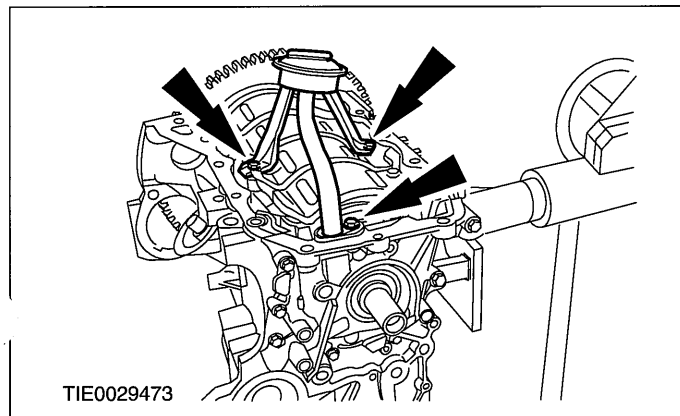
- 44. ⚠ CAUTION:** In order to prevent damage to the sealing surfaces, only use the designated special tool to remove the oil pan. Do not use a chisel or screwdriver for removal.

NOTE: Tighten the lock nut against the oil pan and use several taps to release the oil pan from the cylinder block.

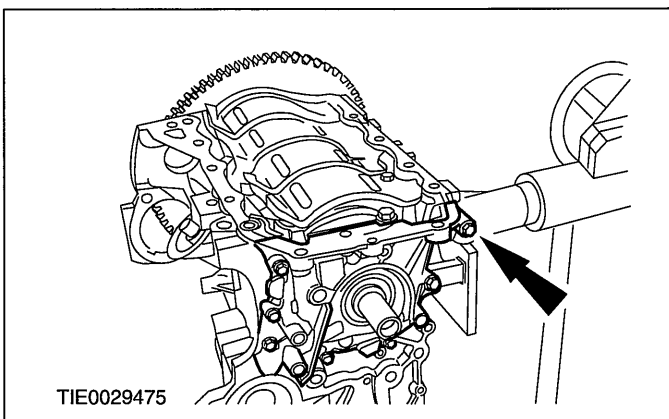
Using the special tools, remove the oil pan.

**45. Remove the oil pump pickup pipe.**

- Discard the gasket.

**46. Remove the oil pump.**

- Discard the gasket.
- Discard the crankshaft front seal.



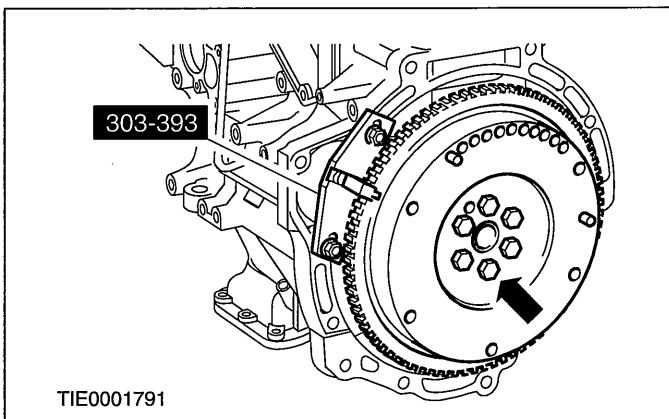
Vehicles with manual transaxle

47. Remove the clutch disc and pressure plate.

For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

48. Using the special tool, remove the flywheel.

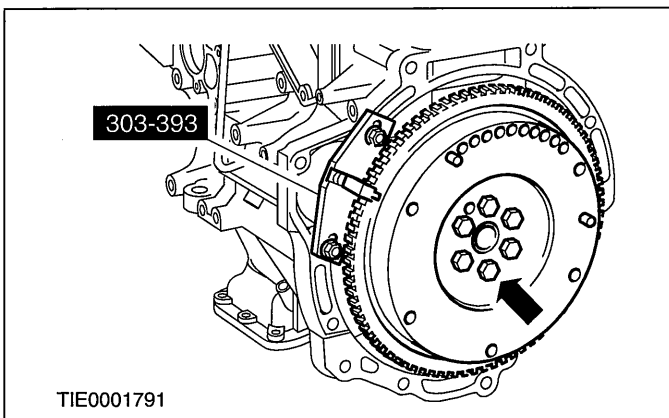
- Discard the bolts.



Vehicles with automatic transaxle

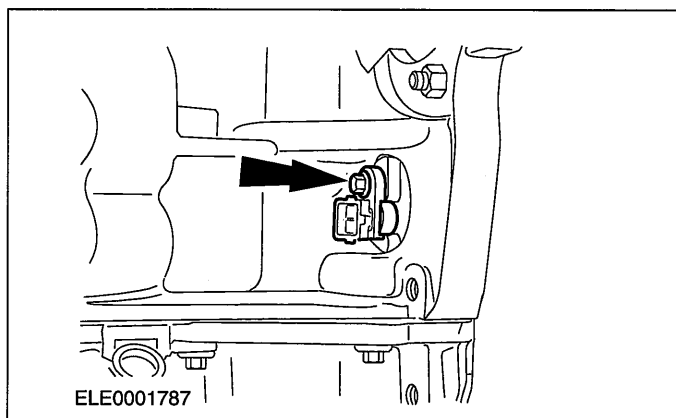
49. Using the special tool, remove the flexplate.

- Discard the bolts.

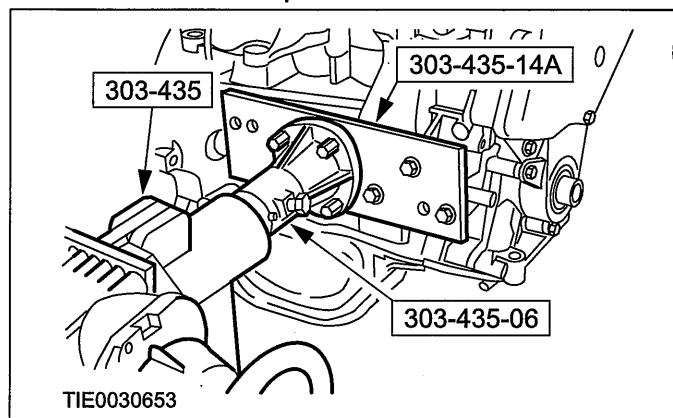
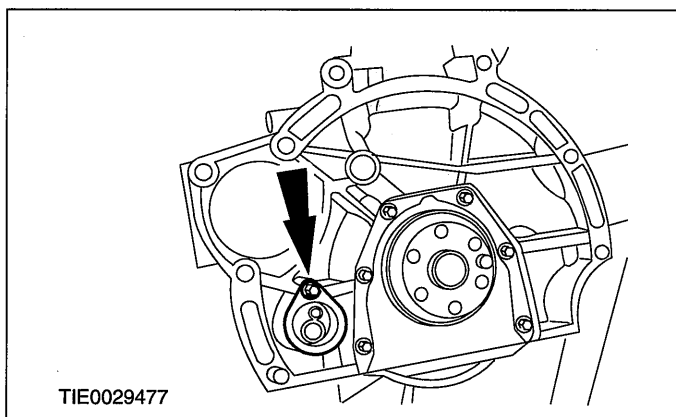


DISASSEMBLY

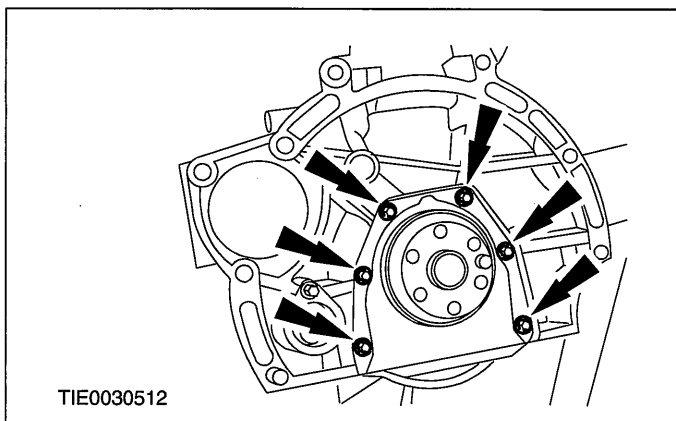
All vehicles

50. Remove the crankshaft position (CKP) sensor.

- Remove the special tools.

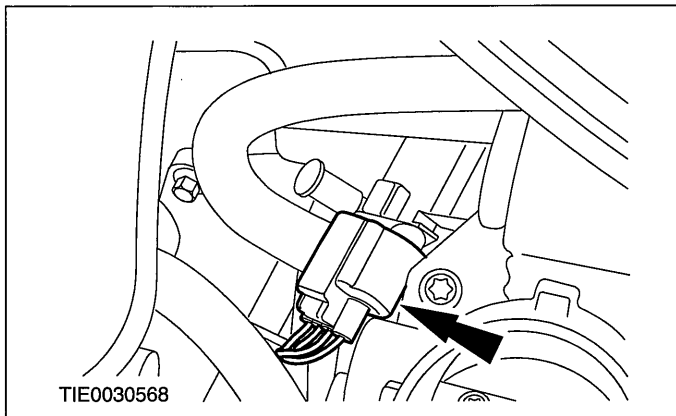
**51. Remove the CKP sensor bracket.****52. Remove the crankshaft rear seal carrier.**

- Discard the crankshaft rear seal carrier.

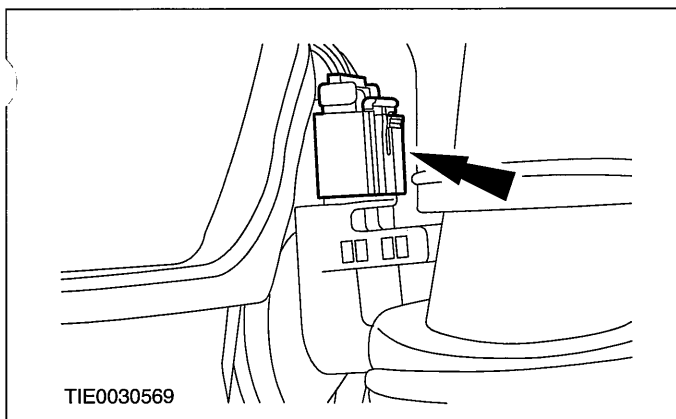
**53. Detach the cylinder block (short block) from the mounting stand.**

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES**Cylinder Head(21 165 6)****Disassembly**

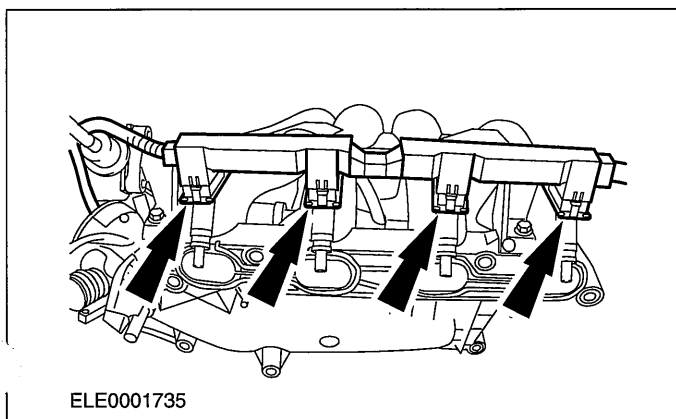
1. Disconnect the temperature and manifold absolute pressure (T-MAP) sensor electrical connector.



2. Disconnect the throttle plate control motor (DC-ISC) electrical connector.



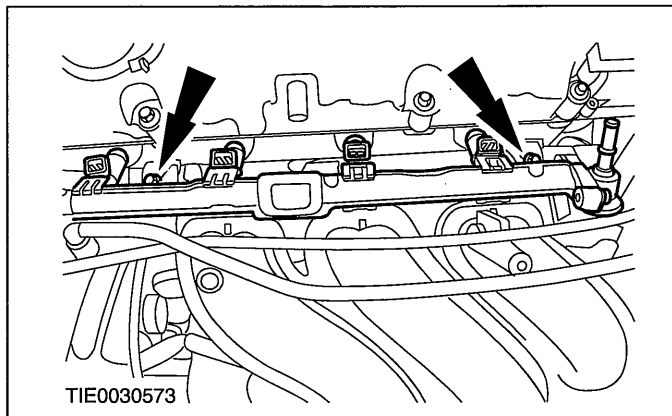
3. Disconnect the fuel injector electrical connectors.



4. Remove the engine wiring harness.

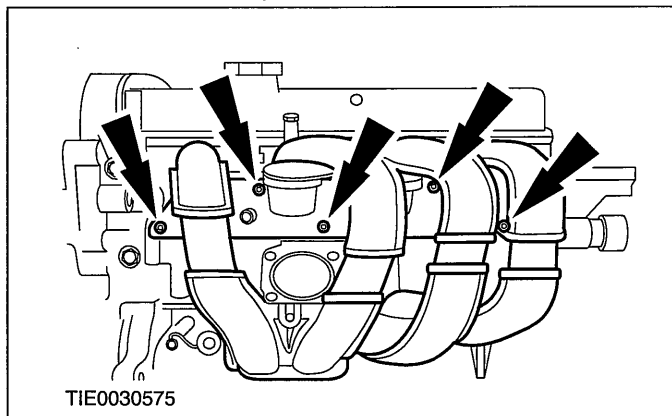
5. Remove the fuel supply manifold.

- Discard the O-ring seals.

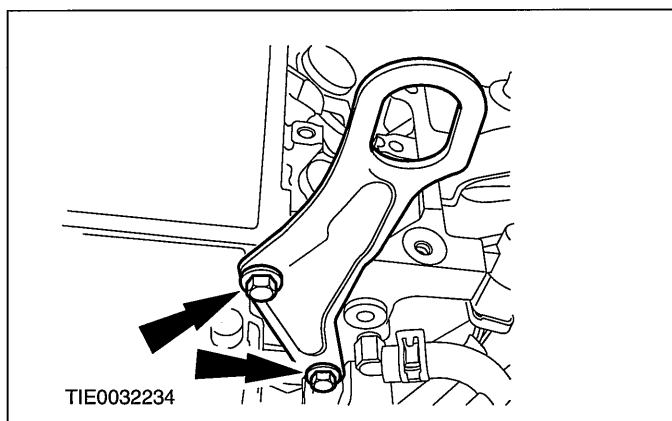


6. Remove the intake manifold.

- Discard the gaskets.



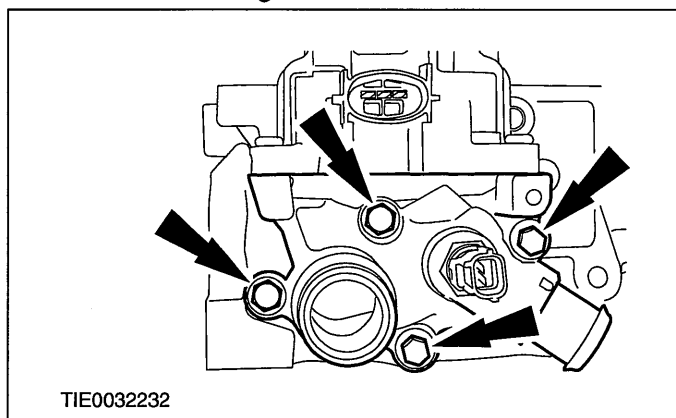
7. Remove the engine rear lifting eye.



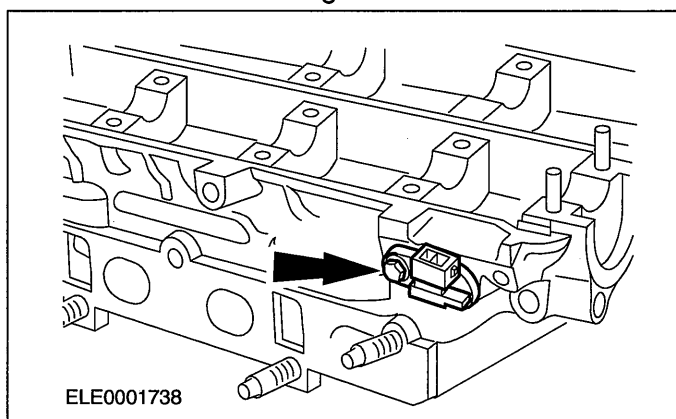
8. Remove the coolant distribution housing and the ignition coil (EI).

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

- Discard the gasket.

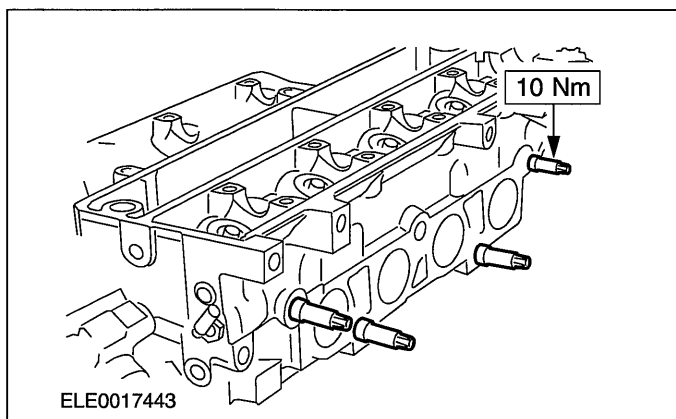
**9. Remove the camshaft position (CMP) sensor.**

- Discard the O-ring seal.

**Assembly**

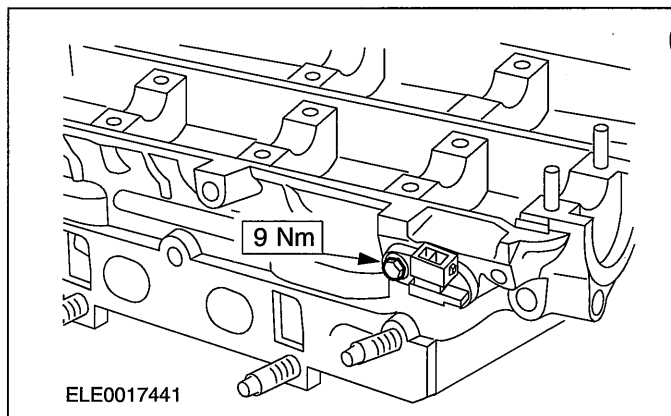
- NOTE:**A new cylinder head is supplied without exhaust manifold studs.

Install the exhaust manifold studs if necessary.



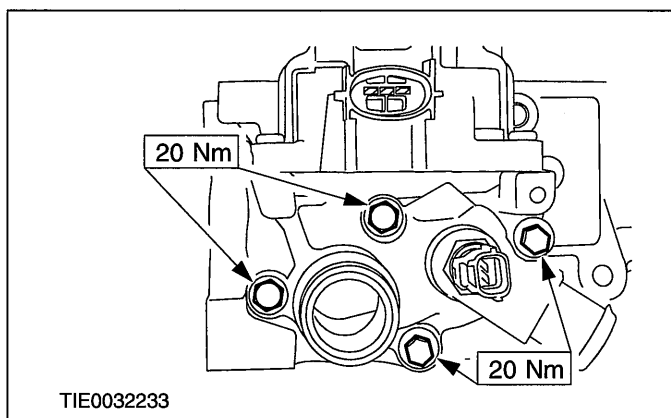
- NOTE:**Install a new camshaft position (CMP) O-ring seal.

Install the CMP sensor.

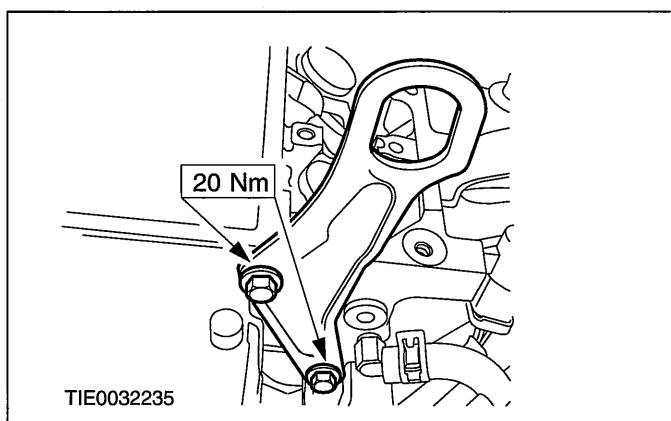


- NOTE:**Install a new coolant distribution housing gasket.

Install the coolant distribution housing and the ignition coil (EI).



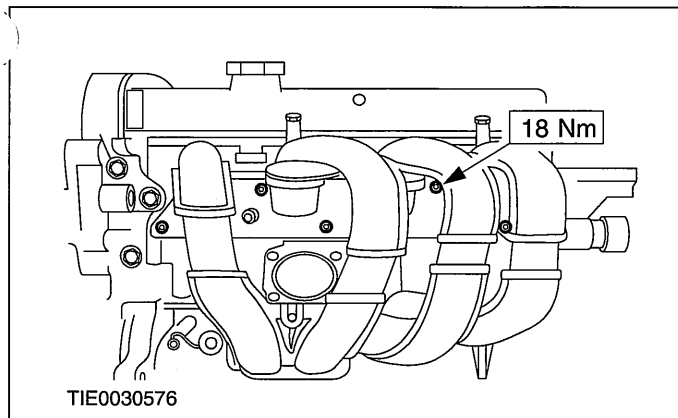
- Install the engine rear lifting eye.



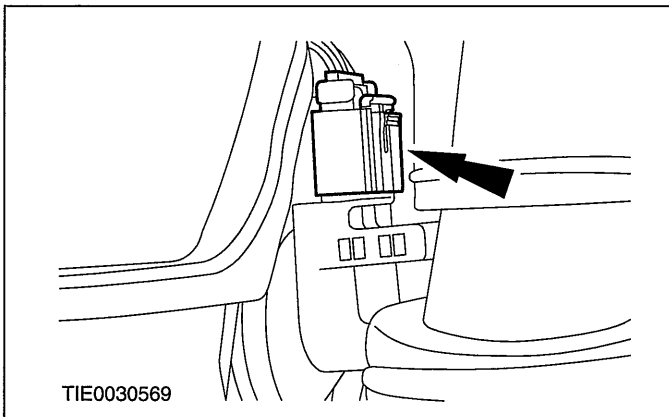
- NOTE:**Install new intake manifold gaskets.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Install the intake manifold.

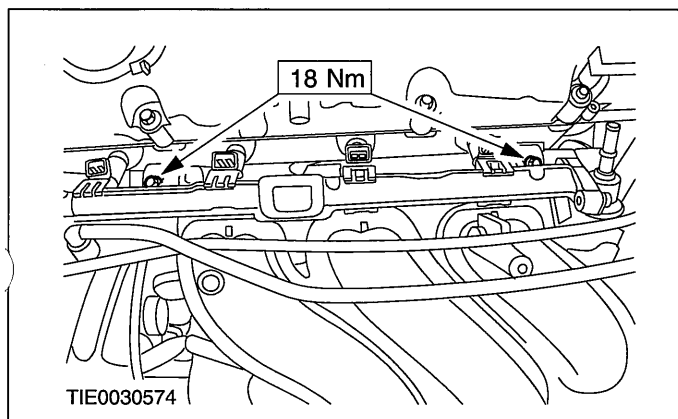


9. Connect the throttle plate control motor (DC-ISC) electrical connector.

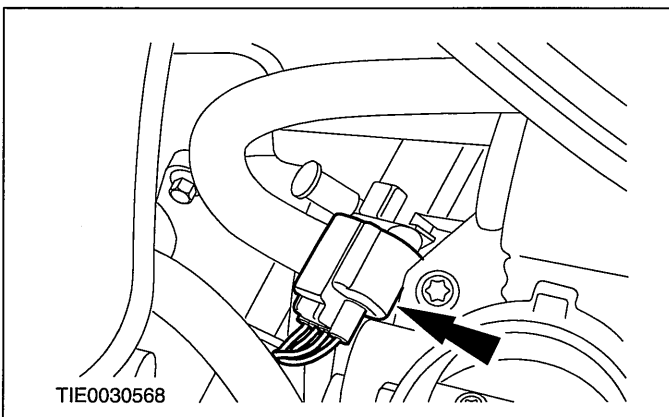


6. **NOTE:** Install new fuel supply manifold O-ring seals.

Install the fuel supply manifold.

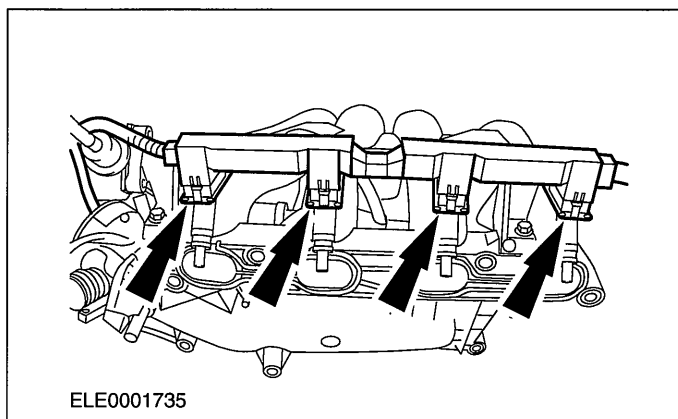


10. Connect the temperature and manifold absolute pressure (T-MAP) sensor electrical connector.

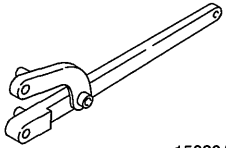
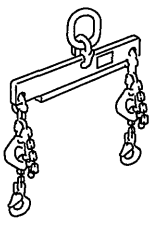
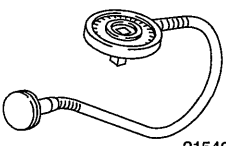
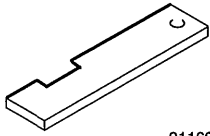
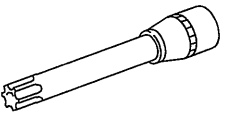
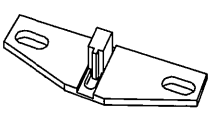


7. Install the engine wiring harness.

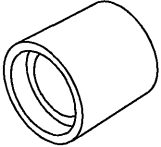
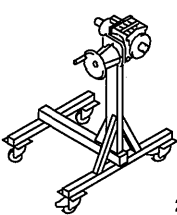
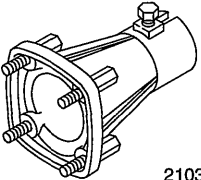
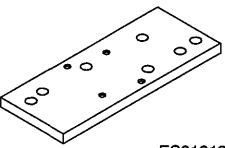
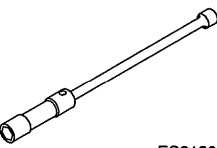
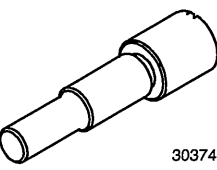
8. Connect the fuel injector electrical connectors.

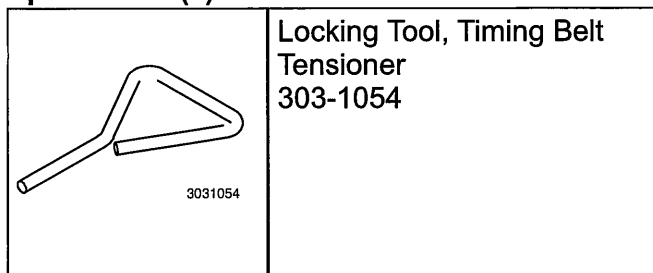


ASSEMBLY**Engine(21 134 8)****Special Tool(s)**

 15030A	Universal Flange Holding Wrench 205-072 (15-030A)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 21540	Gauge, Bolt Angle 303-174 (21-540)
 21162B	Alignment Plate, Camshaft 303-376B (21-162B)
 21167	Socket, Cylinder Head Bolt 303-392 (21-167)
 21168	Locking Tool, Flywheel 303-393 (21-168)

Special Tool(s)

 21171	Installer, Crankshaft Seal 303-395 (21-171)
 21187	Mounting Stand 303-435 (21-187)
 21031B	Mounting Bracket for 303-435 303-435-06 (21-031B)
 ES21212	Mounting Plate for 303-435-06 303-435-14A (21-212A)
 ES21202	Socket, Spark Plug 303-499 (21-202)
 303748	Locking Tool, Crankshaft 303-748 (21-259)

ASSEMBLY**Special Tool(s)**

Locking Tool, Timing Belt
Tensioner
303-1054

General Equipment

Five M8 x 20 mm studs

Engine hoist

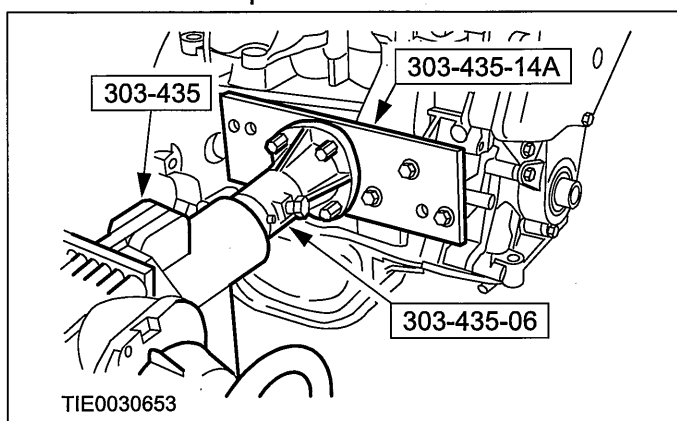
Materials

Name	Specification
Engine Oil - 5W-30	WSS-M2C913-B
Silicone Sealant	WSE-M4G323-A4
Adhesive - Loctite 243	WSK-M2G349-A7
Gasket Eliminator Sealant	WSK-M2G348-A5
High-Temperature Grease	ESD-M1C220-A

All vehicles

1. Attach the cylinder block (short block) to the mounting stand.

- Install the special tools.

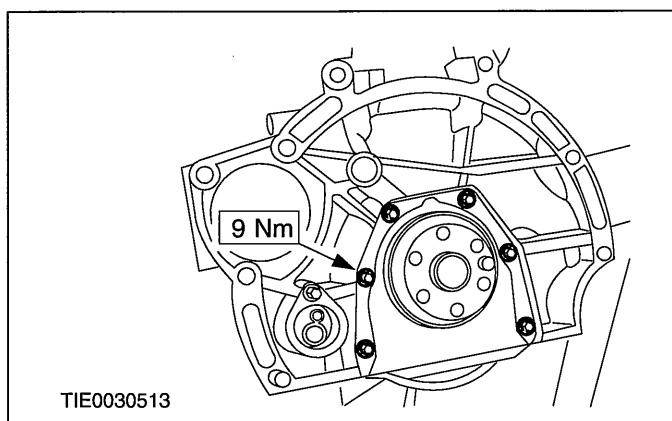


2. NOTE: Install a new crankshaft rear seal carrier.

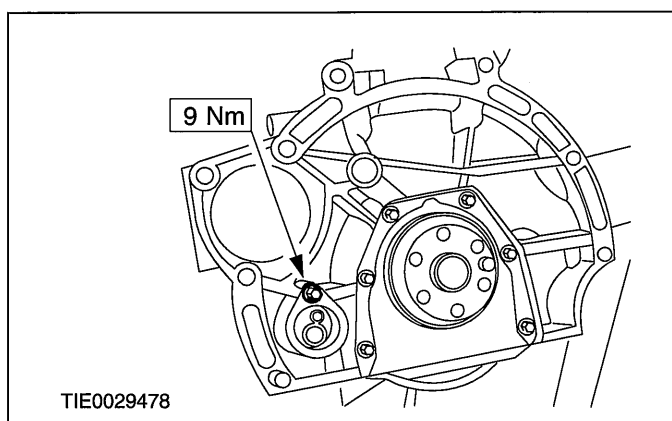
NOTE: A new crankshaft rear seal carrier is supplied with an alignment sleeve which must be removed following installation.

NOTE: Do not lubricate the seal lip.

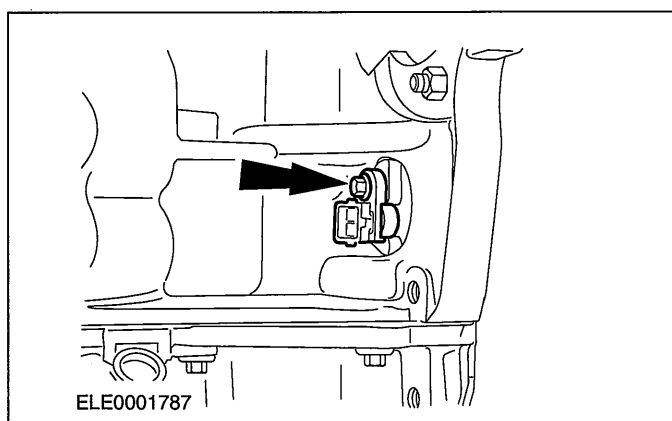
Install the crankshaft rear seal carrier.



3. Install the crankshaft position (CKP) sensor bracket.



4. Install the CKP sensor.



Vehicles with manual transaxle

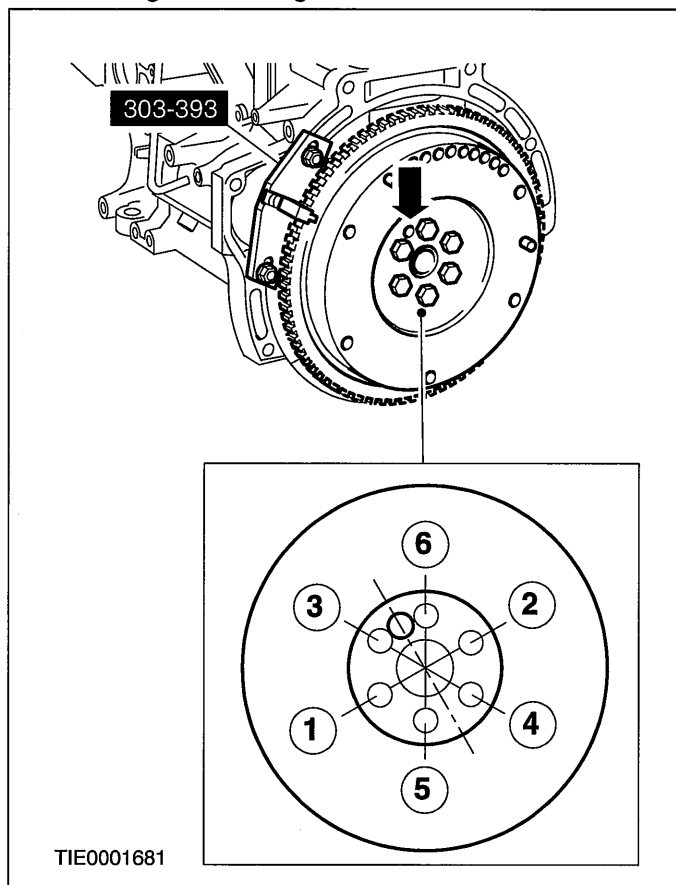
5. NOTE: Install new flywheel retaining bolts.

Using the special tool, install the flywheel.

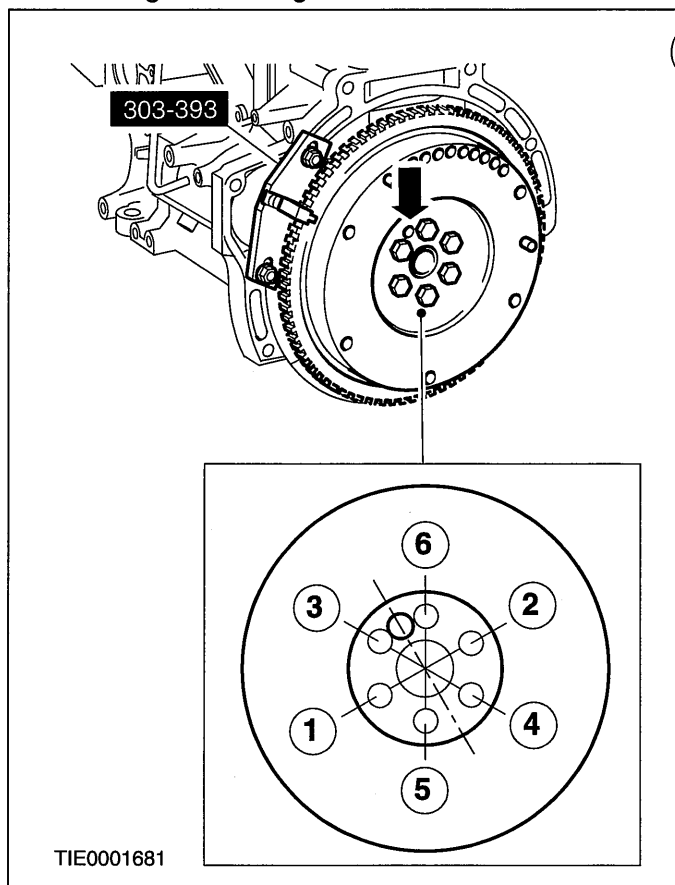
- Tighten the bolts in the sequence shown in two stages.
- Stage 1: 30 Nm.

ASSEMBLY

- Stage 2: 80 degrees.



- Stage 2: 80 degrees.

**6. Install the clutch disc and pressure plate.**

For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

7. Remove the special tool from the flywheel.

Vehicles with automatic transaxle

8. NOTE: Install new flexplate retaining bolts.

Using the special tool, install the flexplate.

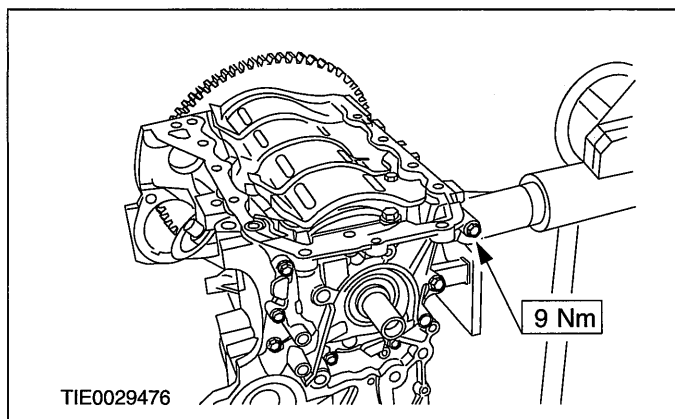
- Tighten the bolts in the sequence shown in two stages.
- Stage 1: 30 Nm.

9. Remove the special tool from the flexplate.

All vehicles

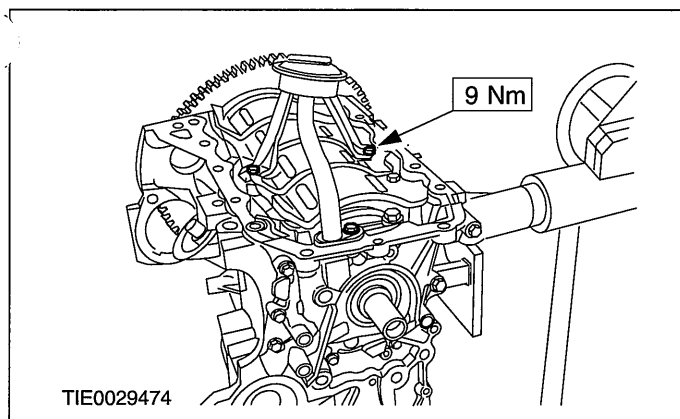
10. NOTE: Install a new oil pump gasket.

Install the oil pump.

**11. NOTE: Install a new pickup pipe gasket.**

ASSEMBLY

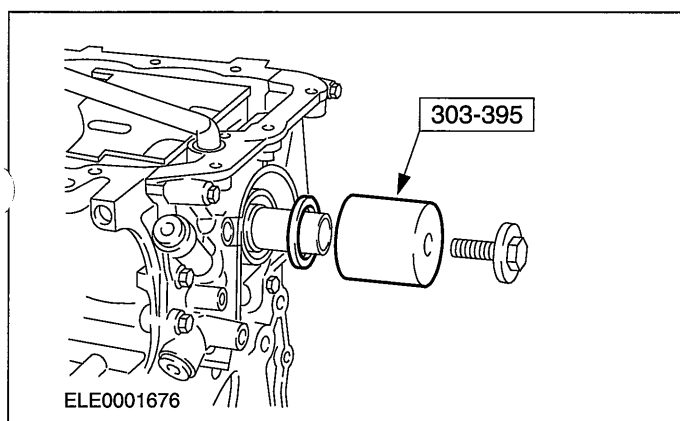
Install the oil pump pickup pipe.



12. Coat the crankshaft front seal lip with clean engine oil.

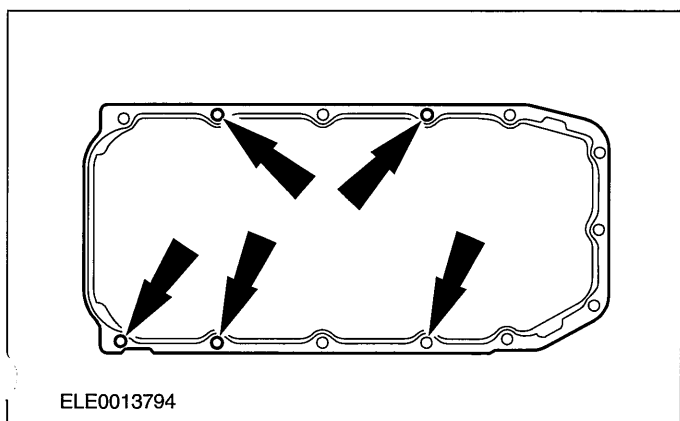
13. **NOTE:** Install a new crankshaft front seal.

Using the special tool, install the crankshaft front seal.



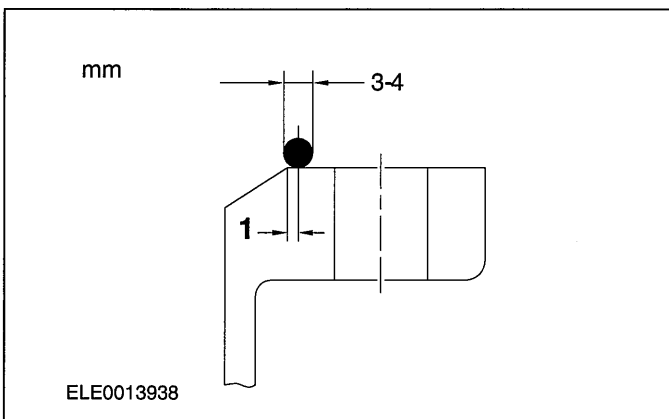
14. **⚠ CAUTION:** The crankcase may be damaged if sealant enters the blind holes.

Install five M8 x 20 mm studs into the blind holes as shown.



15. **NOTE:** Attach the oil pan within ten minutes of applying sealant and tighten the bolts within a further five minutes.

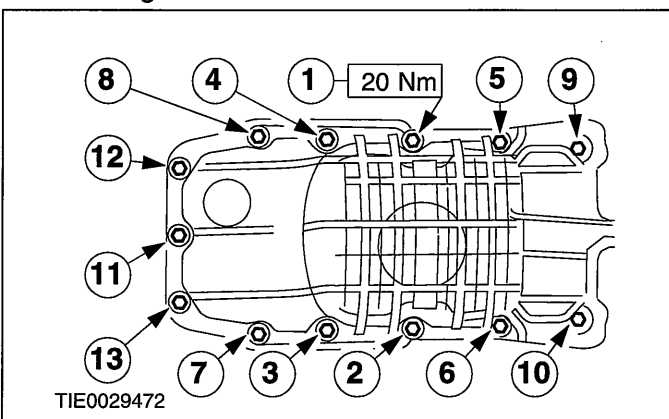
Apply a 3 to 4 mm diameter thick bead of sealant to the oil pan flange.



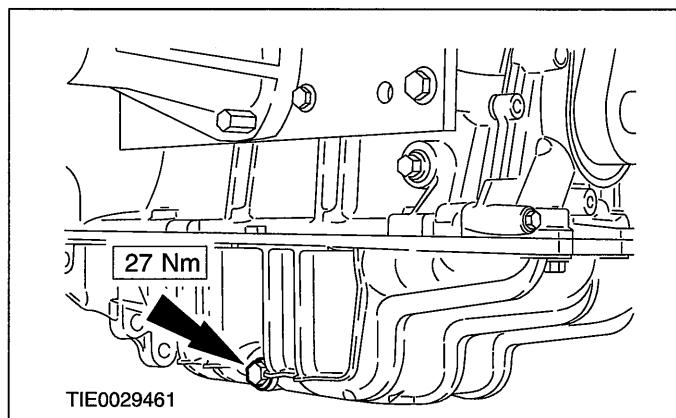
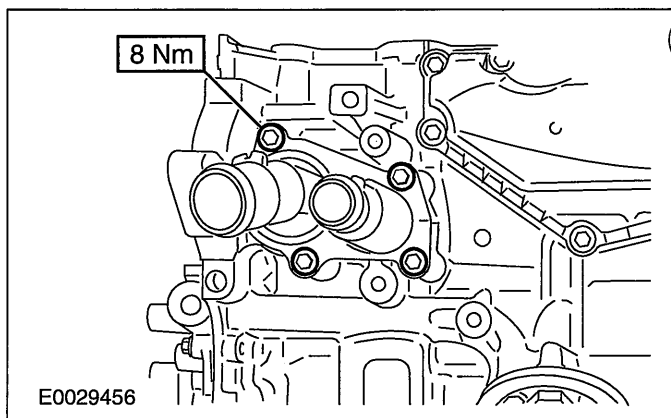
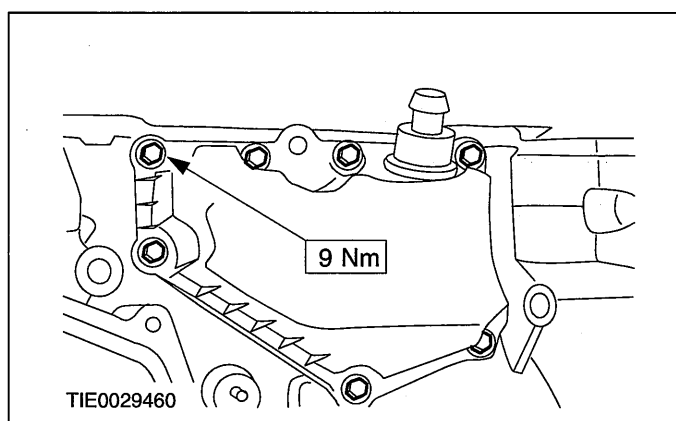
16. **NOTE:** Align the oil pan so that the cylinder block is flush with the oil pan on the flywheel side.

Install the oil pan, loosely install the retaining bolts.

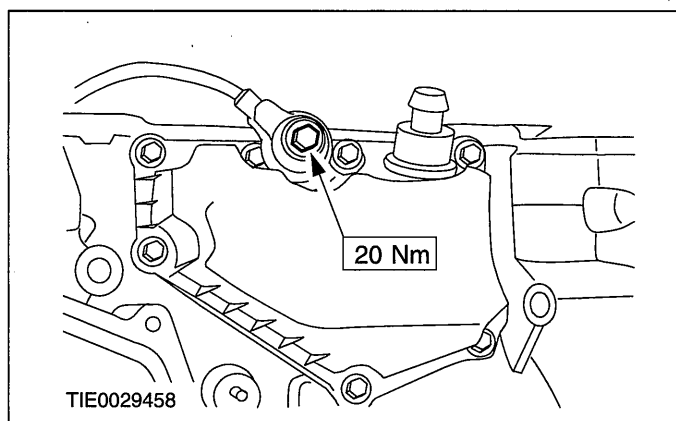
- Remove the studs and install retaining bolts.
- Tighten the oil pan retaining bolts in the sequence shown in two stages.
- Stage 1: 10 Nm.
- Stage 2: 20 Nm.



17. **NOTE:** Inspect the oil pan drain plug seal for damage. Install a new drain plug and seal if required.

ASSEMBLY**Install the drain plug.****Install the thermostat housing.****18. Install the positive crankcase ventilation (PCV) cover.**

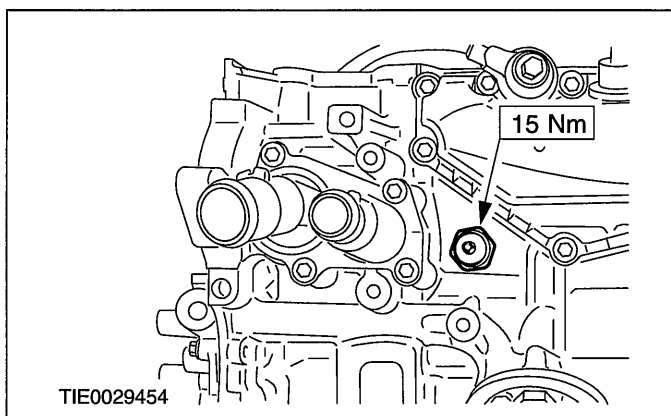
19. ⚠ CAUTION: The knock sensor (KS) cable must not touch the cylinder head or the PCV cover. Position the KS cable at approximately the 10 o'clock position.

Install the KS.

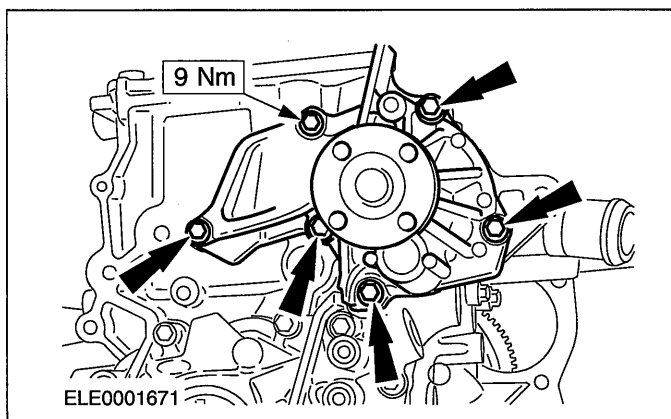
20. NOTE: Install a new thermostat housing gasket.

21. Install the oil pressure switch.

- Apply adhesive to the oil pressure switch threads.



22. ⚠ CAUTION: Do not damage the coolant pump impeller.

NOTE: Install a new coolant pump gasket.**Install the coolant pump.**

23. Turn the crankshaft to approximately 25 mm before top dead center (BTDC) on cylinder number 1.

ASSEMBLY

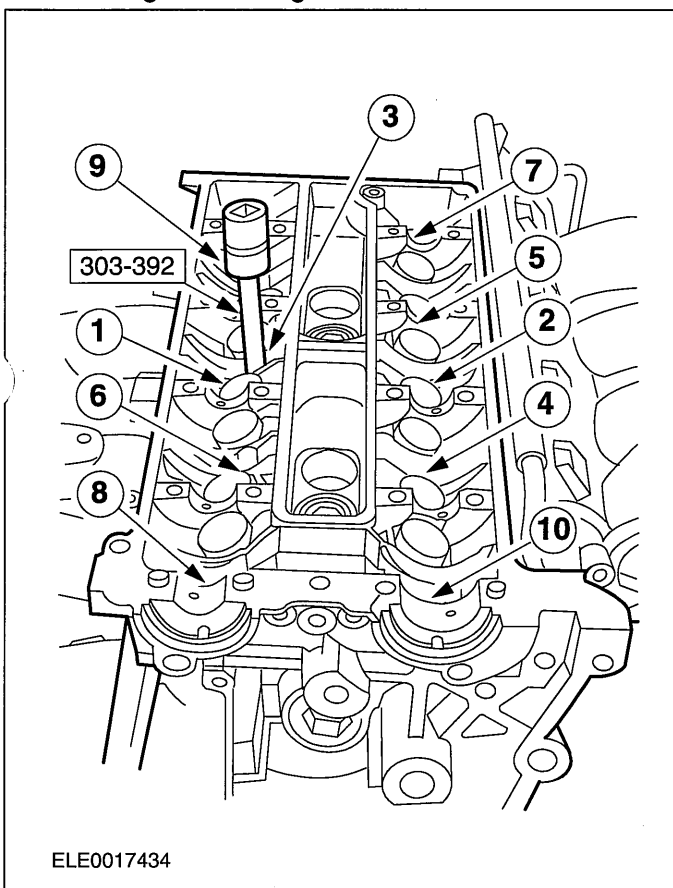
24. **⚠ CAUTION:** The thickness of the new cylinder head gasket must be the same as that of the old one (hole marked).

NOTE: Install a new cylinder head gasket.

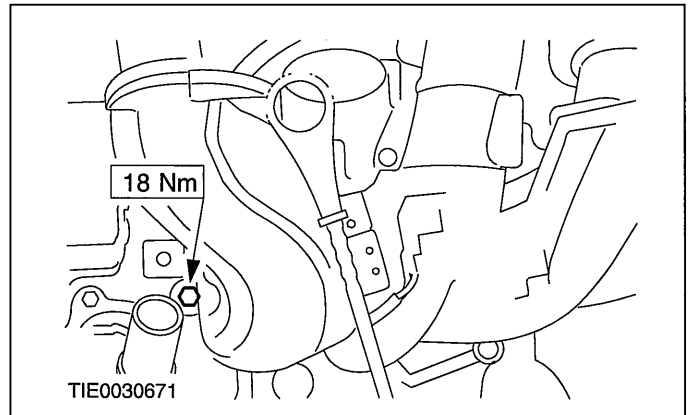
NOTE: Position the cylinder head onto the two guide sleeves.

Using the special tool, install the cylinder head.

- Tighten the cylinder head bolts in the sequence shown in three stages.
- Stage 1: 15 Nm.
- Stage 2: 30 Nm.
- Stage 3: 90 degrees.

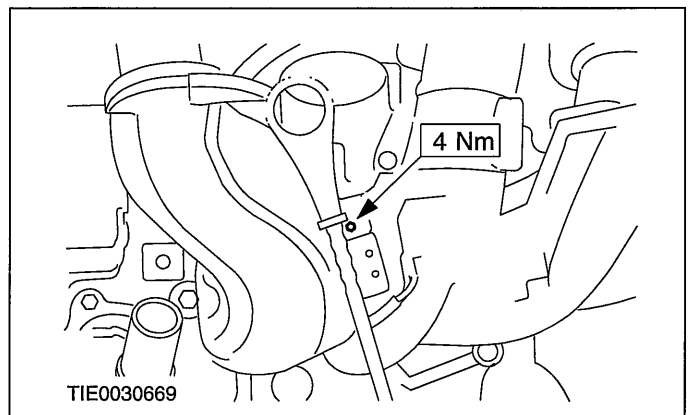


25. Install the intake manifold lower retaining bolt.

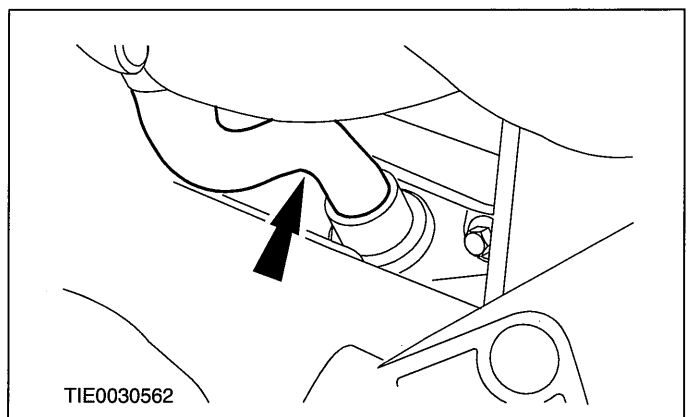


26. Attach the oil level indicator tube to the intake manifold.

- Attach the KS electrical connector to the oil level indicator tube.



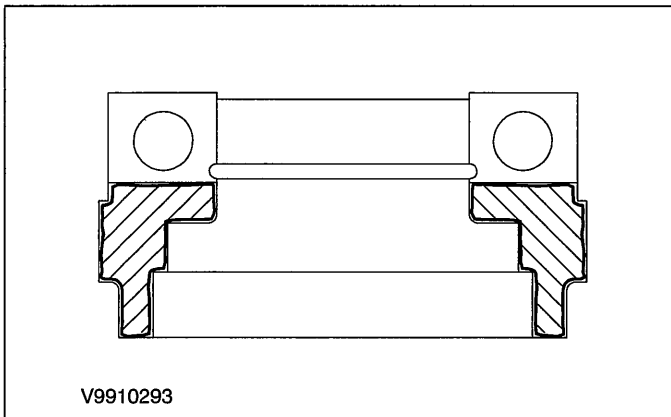
27. Connect the PCV hose to the PCV cover.



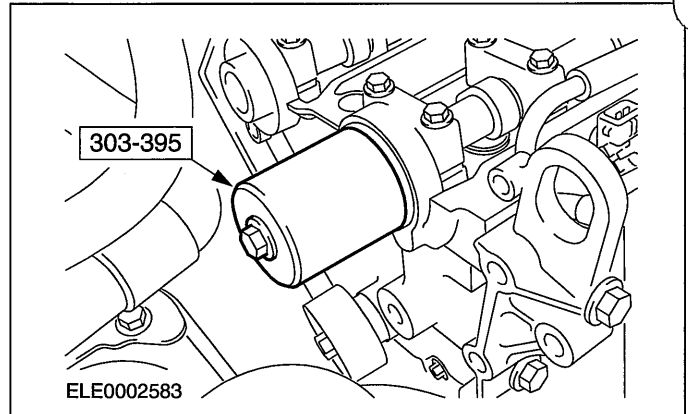
28. **NOTE:** Identification numbers are provided on the outer face of the camshaft bearing caps.

ASSEMBLY

Apply sealant to the points indicated on the camshaft bearing cap no. 1 and to the mating surface of the cylinder head.



Using the special tool, install the camshaft seals.



29. Coat the camshafts and the camshaft bearing caps with clean engine oil.

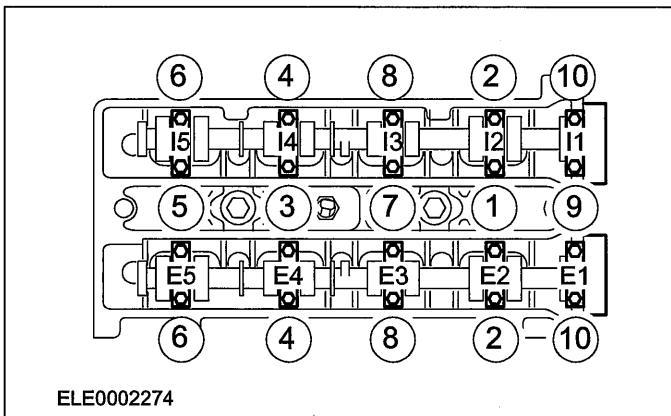
30. **CAUTION:** Position the camshafts in place so that none of the cams are at full lift.

NOTE: The camshaft bearing cap numbering starts at the timing belt end with E1 on the exhaust side and with I1 on the intake side.

NOTE: The exhaust camshaft has an additional cam for the camshaft position (CMP) sensor.

Install the camshafts and camshaft bearing caps.

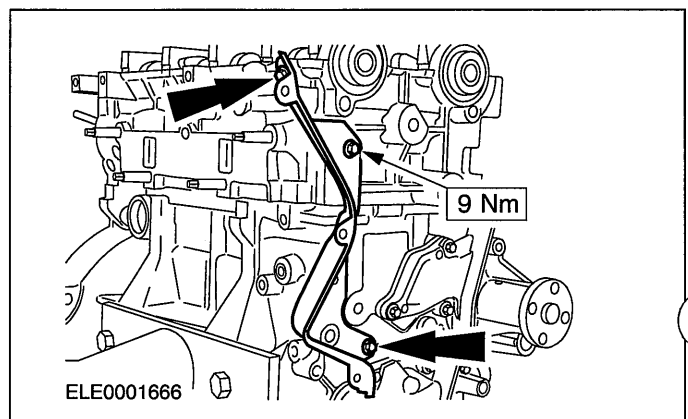
- Tighten the camshaft bearing cap retaining bolts in the sequence shown in three stages.
- Stage 1: One half turn on each bolt until all of the camshaft bearing caps are in contact with the cylinder head.
- Stage 2: 7 Nm.
- Stage 3: 45 degrees.



31. Coat the camshaft journals and seal lips with clean engine oil.

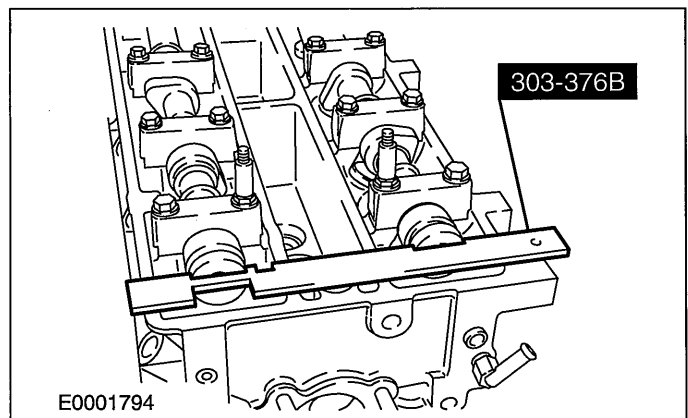
32. **NOTE:** Install new camshaft seals.

33. Install the timing belt rear cover.



34. Set the crankshaft to approximately 20 degrees before TDC.

35. Turn the camshafts to top dead center (TDC) on cylinder number 1 and install the special tool.



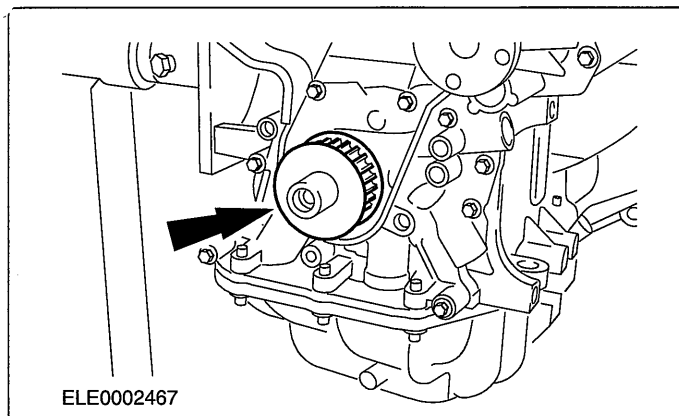
36. **NOTE:** Do not fully tighten the camshaft timing pulley retaining bolts at this stage. Make sure the camshaft pulleys turn on the camshafts.

NOTE: Install new camshaft pulley retaining bolts.

ASSEMBLY

Install the camshaft timing pulleys.

37. Install the crankshaft timing belt pulley.



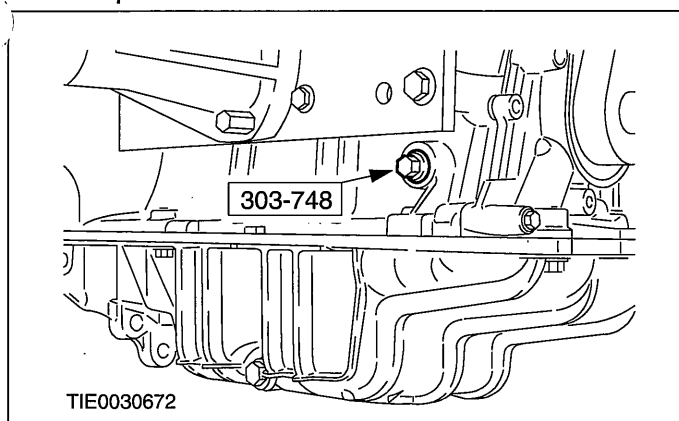
38. NOTE: Install a new timing belt.

NOTE: Install the timing belt, beginning with the crankshaft timing pulley working counterclockwise.

Install the timing belt.

39. Remove the blanking plug and install the special tool.

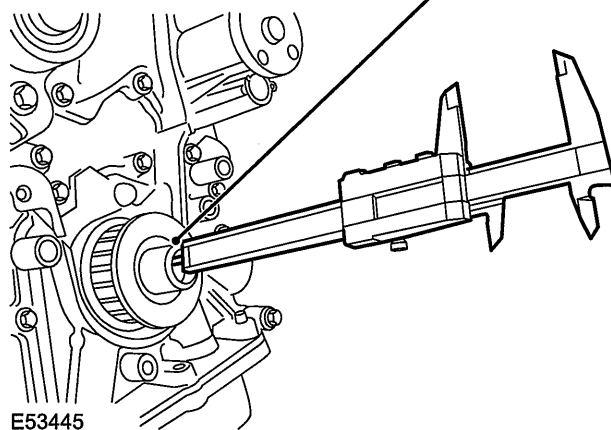
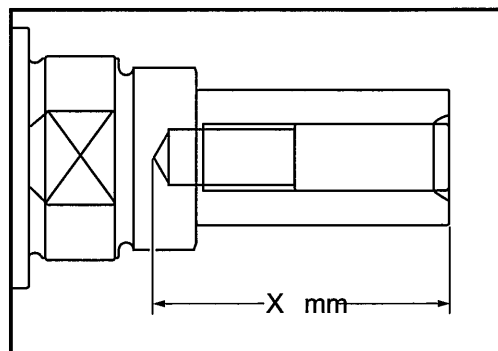
- Carefully turn the crankshaft against the special tool.



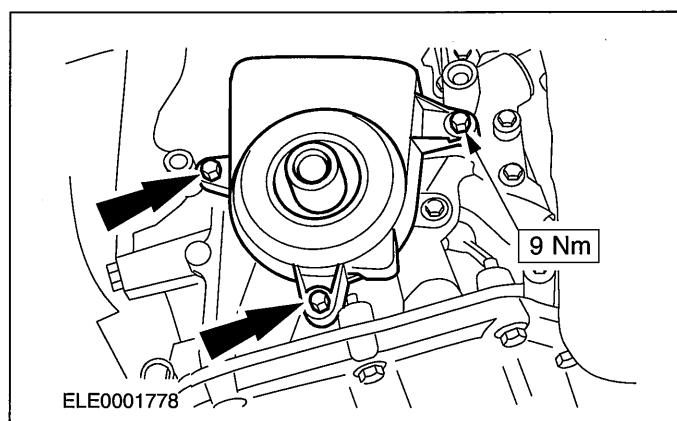
40. Measuring the depth of the threaded hole in the crankshaft.

- Depth of the threaded = 42 mm: Use an M12x29 mm crankshaft pulley center bolt.

- Depth of the threaded = 52 mm: Use an M12x44,5 mm crankshaft pulley center bolt.



41. Install the timing belt lower cover.



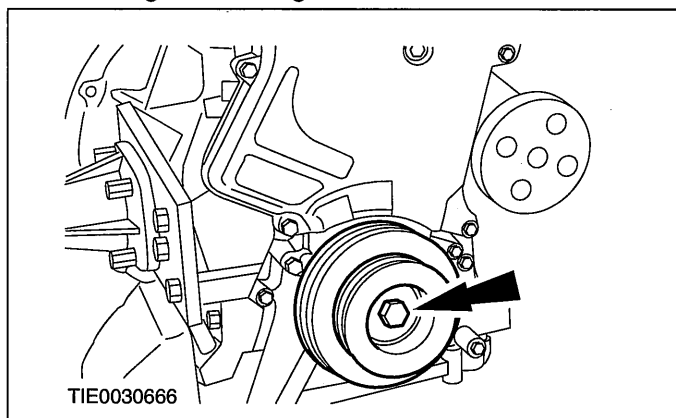
42. NOTE: Install a new crankshaft pulley retaining bolt.

Install the crankshaft pulley.

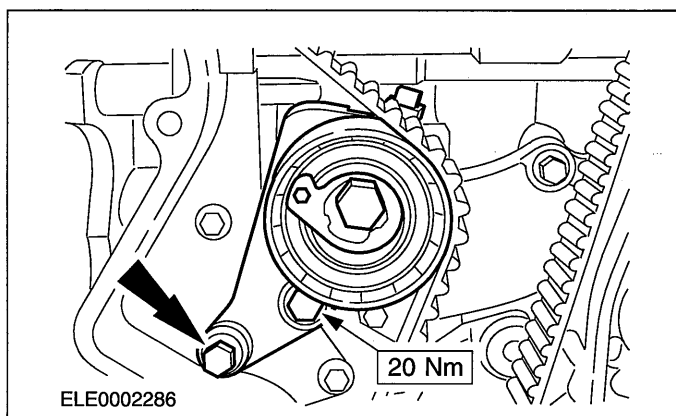
- Tighten the crankshaft pulley retaining bolt in two stages.
- Stage 1: 45 Nm.

ASSEMBLY

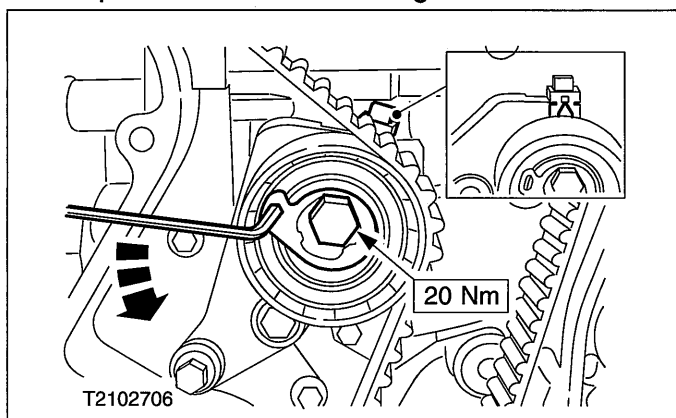
- Stage 2: 90 degrees.



Engines with eccentric cam timing belt tensioner

43. Install the timing belt tensioner.**44. Tension the timing belt.**

- Tension the timing belt by turning the tensioner counterclockwise until the arrow points at the mark and tighten the bolt.

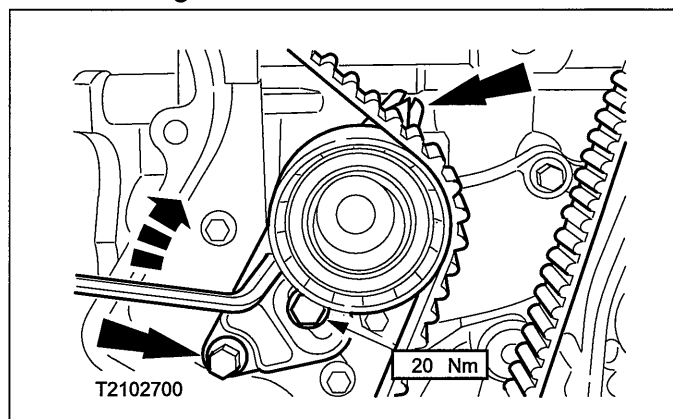


Engines with slotted bracket timing belt tensioner

45. Install the timing belt tensioner and tension the timing belt.

- Install the bolts finger tight.

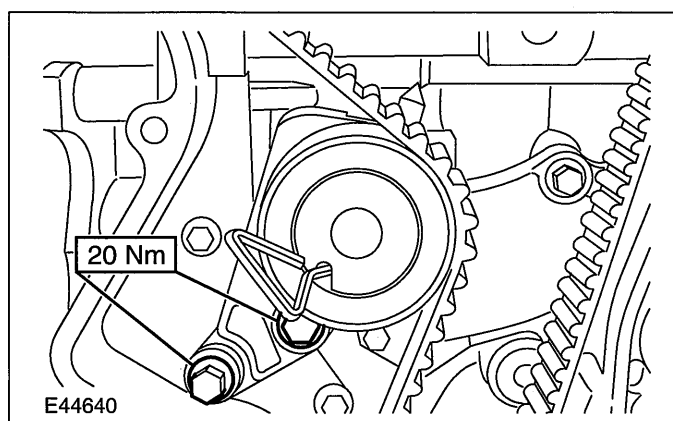
- Tension the timing belt by turning the tensioner clockwise until the arrow points in line with the center of the rectangular hole and tighten the bolts.



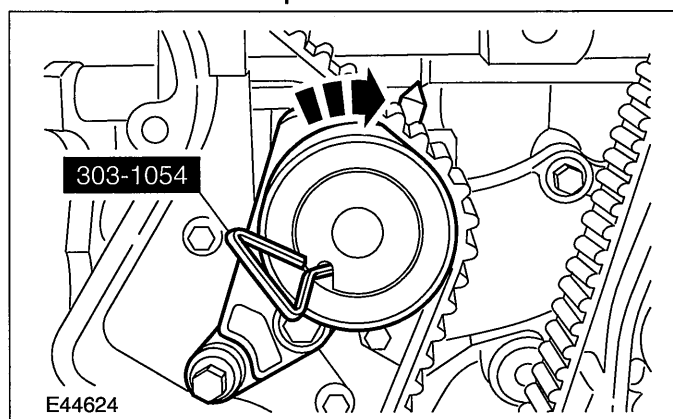
Vehicles built 09/2003 onwards

- 46. ▲WARNING:** Do not remove the special tool, until the timing belt is correctly positioned. Failure to follow this instruction may result in personal injury, or may damage the timing belt tensioner.

Install the timing belt tensioner.

**47. Tension the timing belt.**

- Remove the special tool.

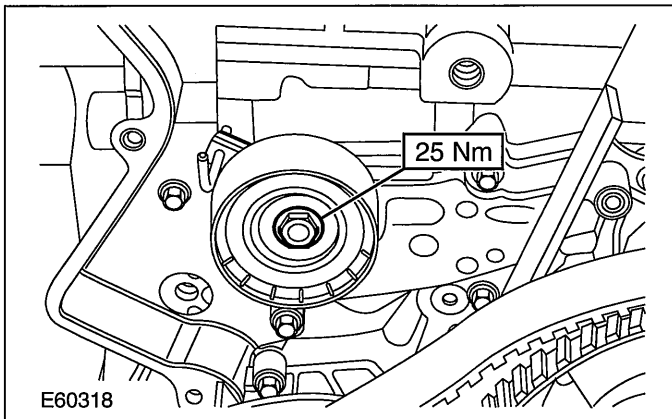


ASSEMBLY

Vehicles built 04/2005 onwards

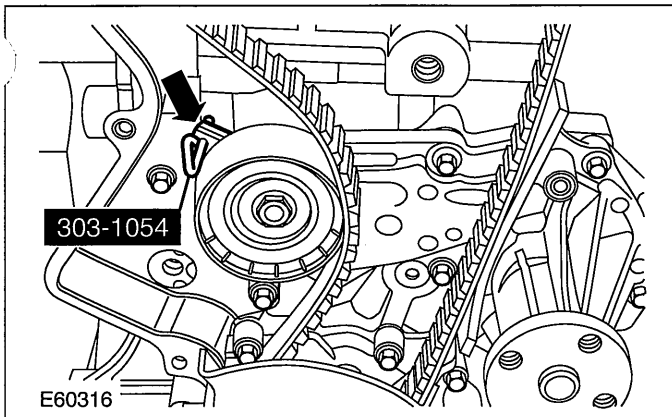
48. **▲WARNING:** Do not remove the special tool, until the timing belt is correctly positioned. Failure to follow this instruction may result in personal injury, or may damage the timing belt tensioner.

Install the timing belt tensioner.



49. Tension the timing belt.

- Remove the special tool.



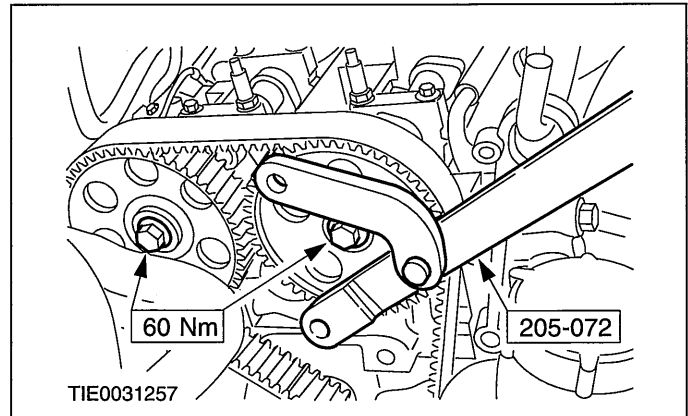
All vehicles

50. **CAUTIONS:**

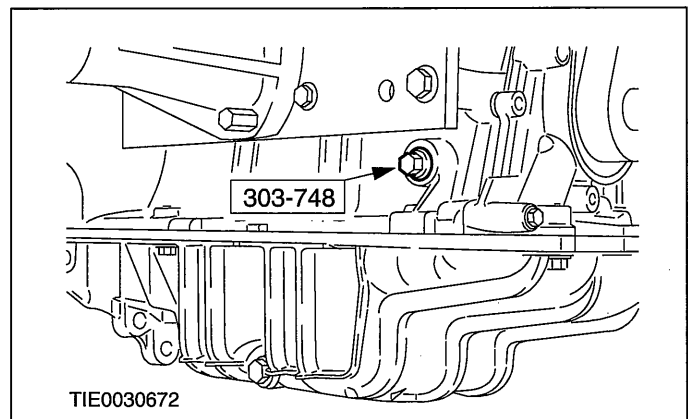
⚠ Install a hose (order no. E890438S) to the special tool studs, to prevent damage to the camshaft pulleys.

⚠ Do not tighten the camshaft pulley bolts against the timing plate.

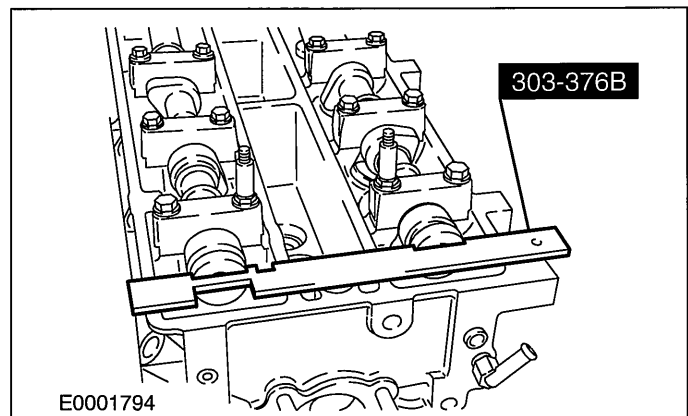
Using the special tool, tighten the camshaft pulleys.



51. Remove the special tool.



52. Remove the special tool.



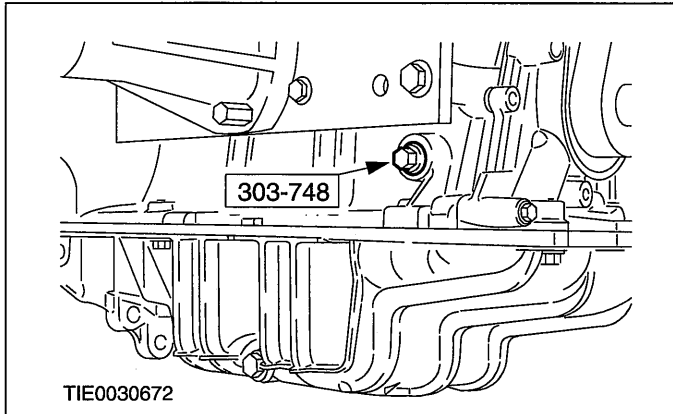
53. **NOTE:** Only turn the crankshaft in its normal direction of rotation.

Turn the crankshaft two revolutions.

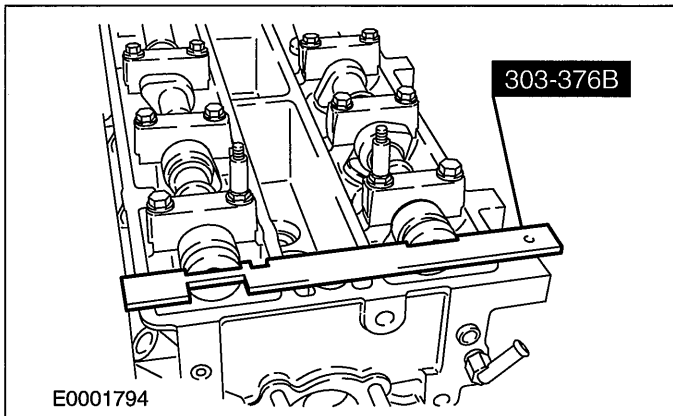
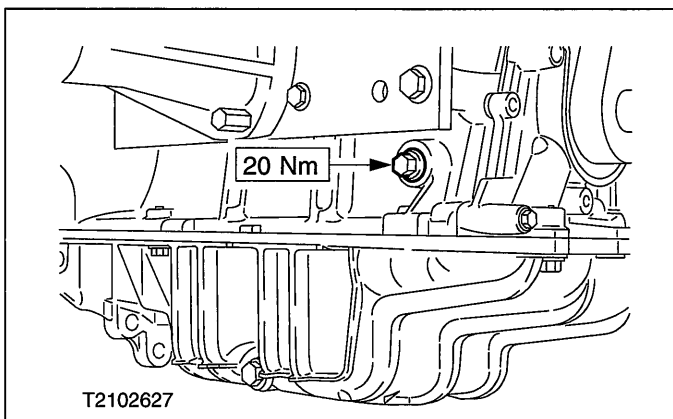
54. Install the special tool.

ASSEMBLY

- Carefully turn the crankshaft against the special tool.

**55. Check the valve timing.**

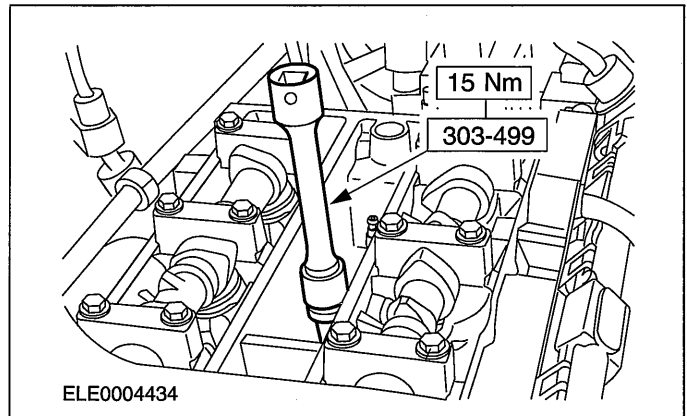
- If necessary loosen the camshaft pulleys and correct the camshaft alignment.

**56. Remove the special tools.****57. Install the blanking plug.****58. Check the valve clearances, adjust if necessary.**

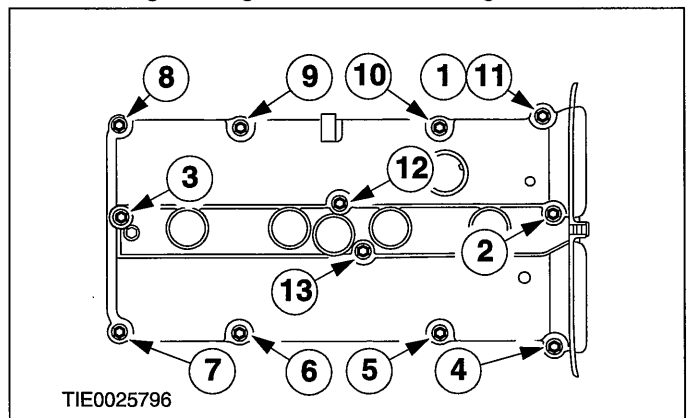
For additional information, refer to: Valve Clearance Adjustment (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).

59. Using the special tool, install the spark plugs.

- Apply grease to the spark plug threads.

**60. NOTE: Install the stud bolts to positions 5 and 6.****Install the valve cover.**

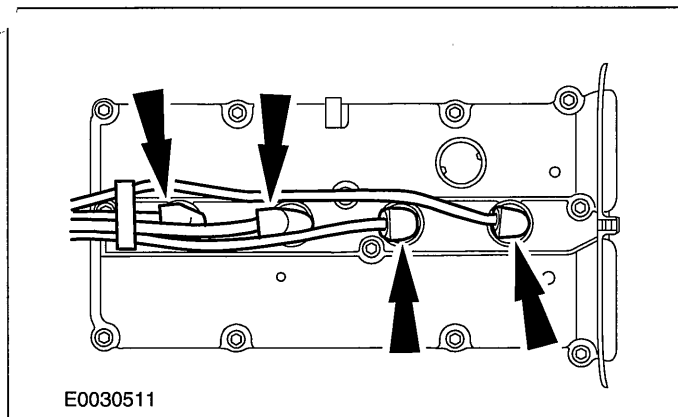
- Tighten the bolts in the sequence shown in three stages.
- Stage 1: Tighten bolt 1 by 3 to 4 turns.
- Stage 2: Tighten bolts 1 through 13 to 3 Nm.
- Stage 3: Tighten bolts 1 through 13 to 9 Nm.



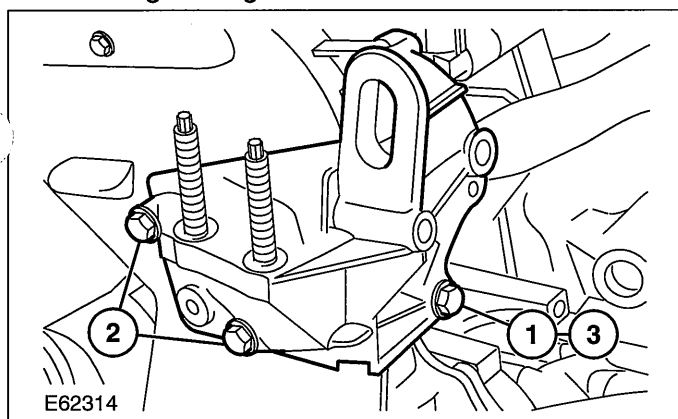
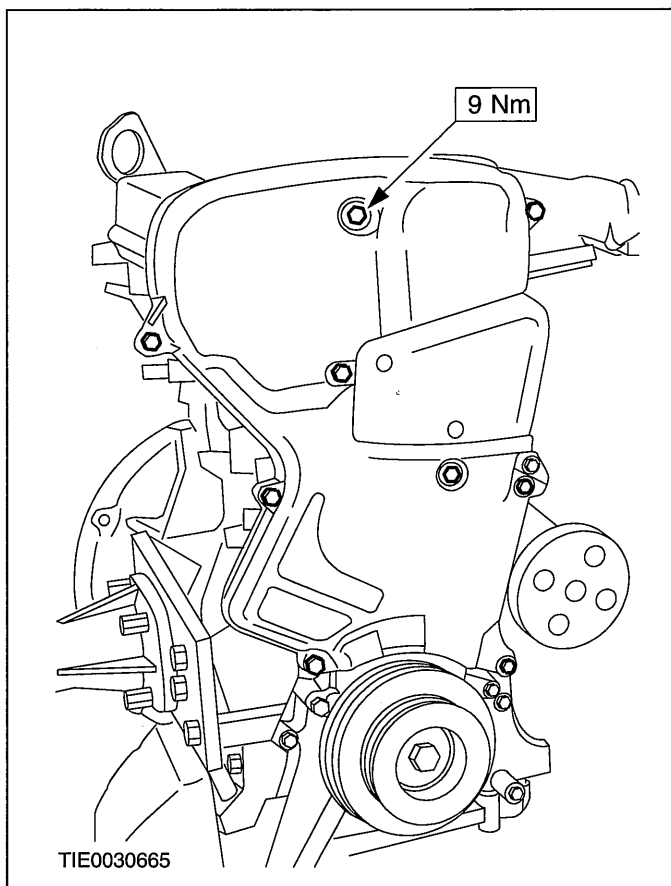
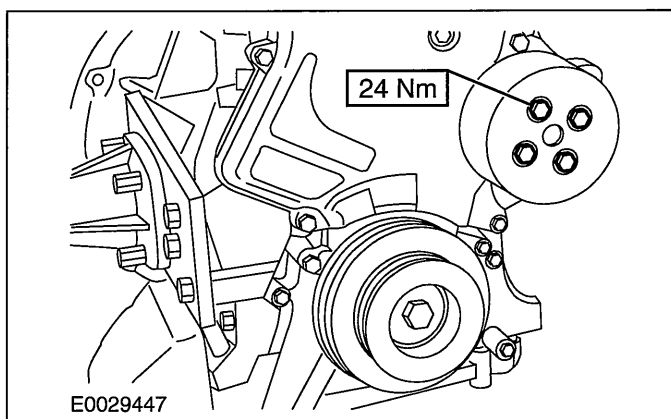
- 61. ⚠ CAUTION:** Use a suitable blunt object to avoid damage to the spark plug connector gasket. Coat the inside of the spark plug connector with silicone grease to a depth of 5-10 mm.

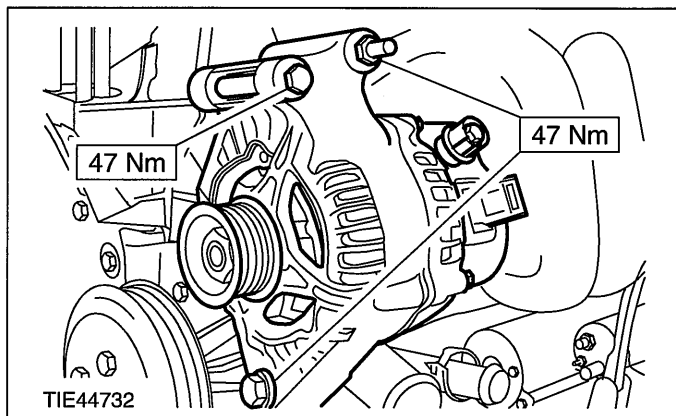
ASSEMBLY

Connect the spark plug electrical connectors and attach the wires to the valve cover.

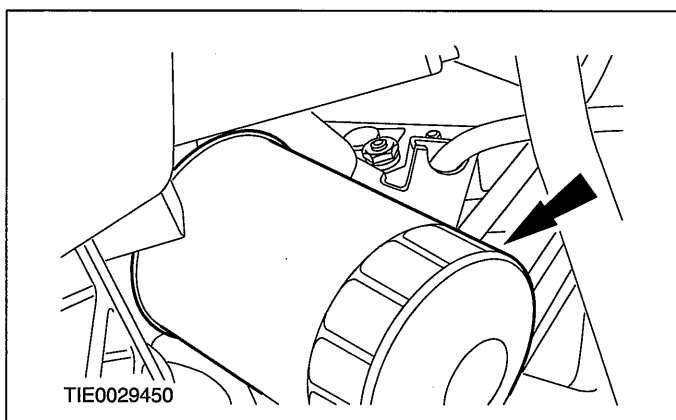
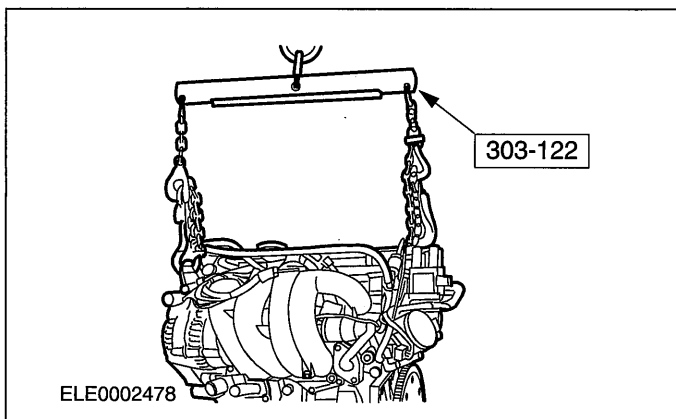
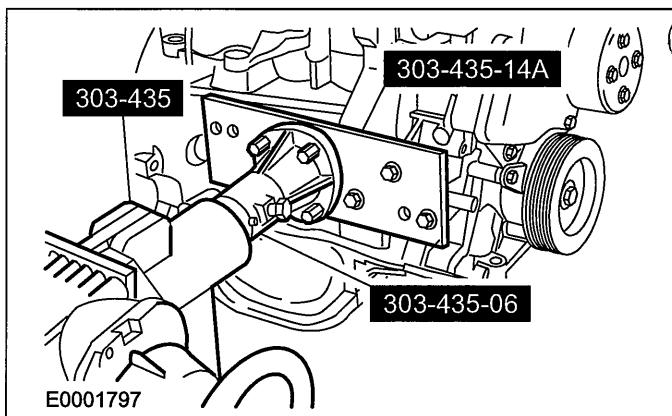
**62. Install the engine front mount bracket.**

- Tighten the bolts in the indicated order in three stages.
- Stage 1: Hand tighten bolt 1.
- Stage 2: Tighten bolts 2 to 55 Nm.
- Stage 3: Tighten bolt 3 to 55 Nm.

**63. Install the timing belt upper cover.****64. Install the coolant pump pulley.**

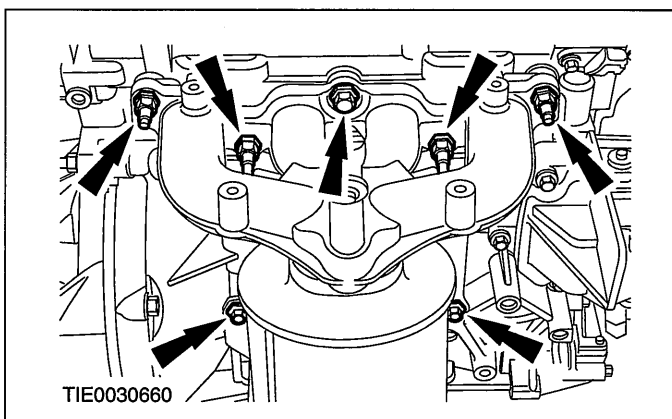
ASSEMBLY**65. Install the generator.**

66. NOTE: Install a new oil filter.
Install the oil filter.

**67. Install the engine wiring harness.****68. Using the special tool attach the engine to an engine hoist.****69. Remove the special tools.**

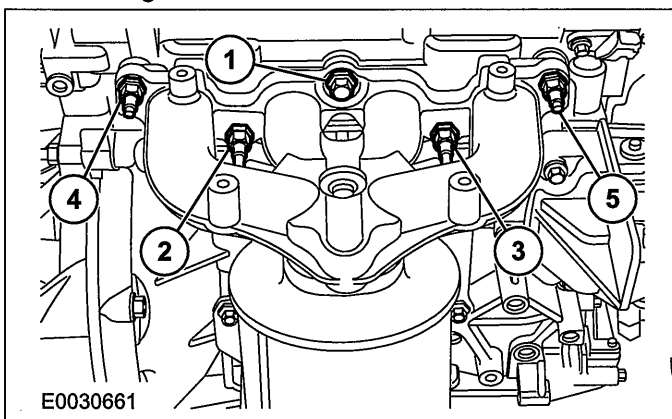
70. NOTE: Install a new exhaust manifold gasket and new exhaust manifold retaining nuts.

NOTE: Do not fully tighten the nuts and bolt at this stage.

Install the exhaust manifold.

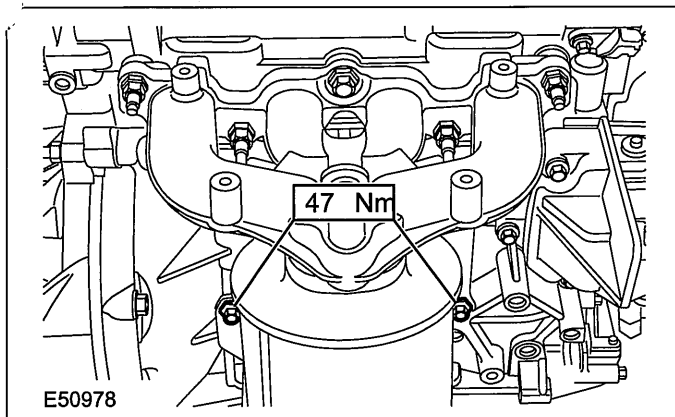
71. Tighten the exhaust manifold upper retaining nuts and bolt in the sequence shown in two stages.

- Stage 1: 20 Nm.
- Stage 2: 55 Nm.

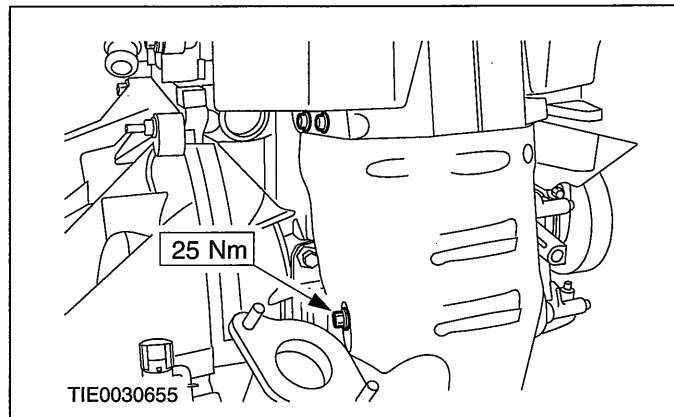


ASSEMBLY

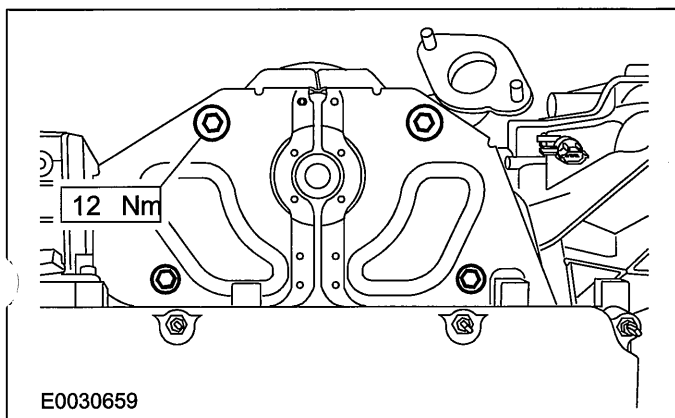
- 72. Tighten the exhaust manifold lower retaining bolts.**



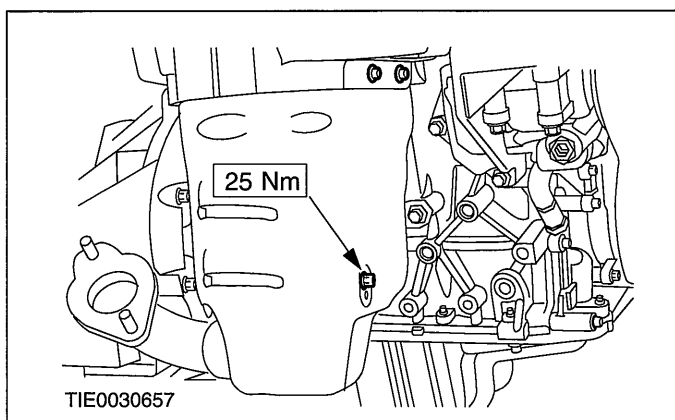
- 75. Install the exhaust manifold lower heat shield left-hand retaining bolts.**



- 73. Install the exhaust manifold upper heat shield.**



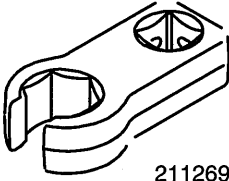
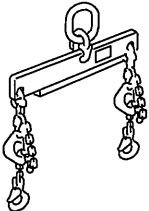
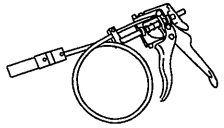
- 74. Install the exhaust manifold lower heat shield right-hand retaining bolts.**



INSTALLATION

Engine

Special Tool(s)

 211269	Wrench, Hydraulic Line Union Nut 211-269 (13-027)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)

General Equipment

Securing straps
Workshop table
Engine hoist

Installation

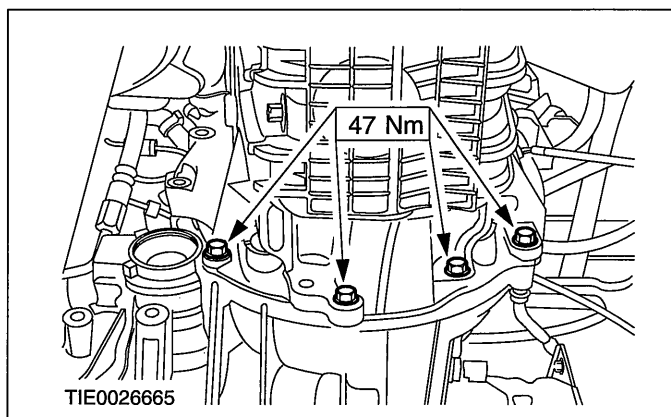
All vehicles

- ▲ **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

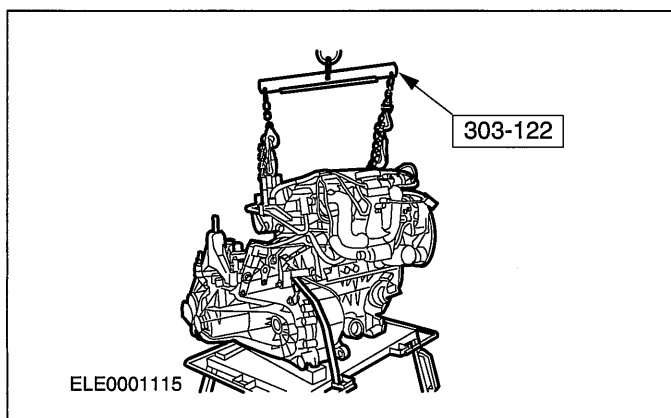
1. ⚠ **CAUTION:** Make sure that the two locating dowels are installed.

Install the transaxle to the engine.

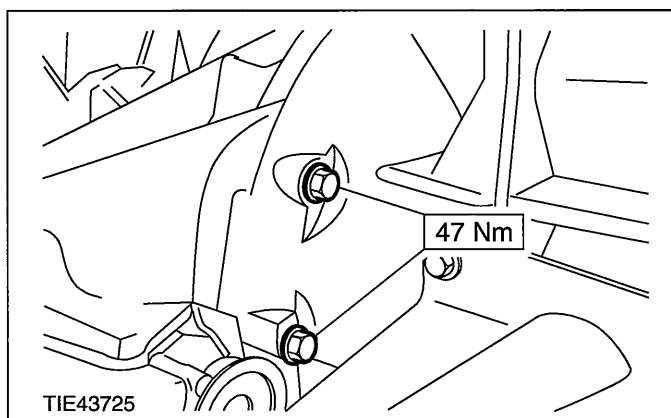
2. Install the transaxle lower retaining bolts.



3. ▲ **WARNING:** Support the engine and transaxle assembly on wooden blocks and secure it with suitable securing straps. Using the special tool and the engine hoist position the engine and transaxle assembly on the workshop table.

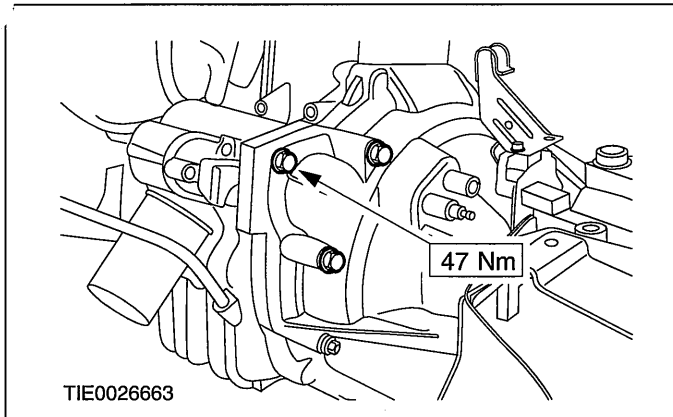


4. Install the transaxle right-hand retaining bolt.



INSTALLATION

5. Install the starter motor and the transaxle left-hand retaining bolt.



6. Raise and support the vehicle.

For additional information, refer to: **Lifting (100-02 Jacking and Lifting, Description and Operation).**

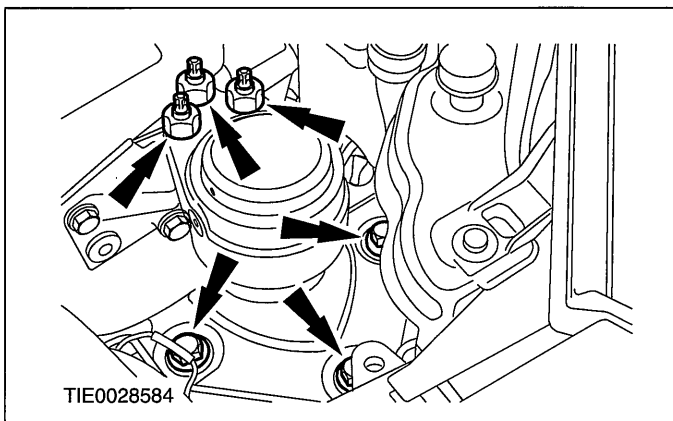
7. Position the engine and transaxle assembly in the engine compartment.

- Carefully lower the vehicle.

8. **NOTE:** Install new engine front mount retaining nuts.

NOTE: Do not tighten the engine front mount retaining bolts and nuts at this stage.

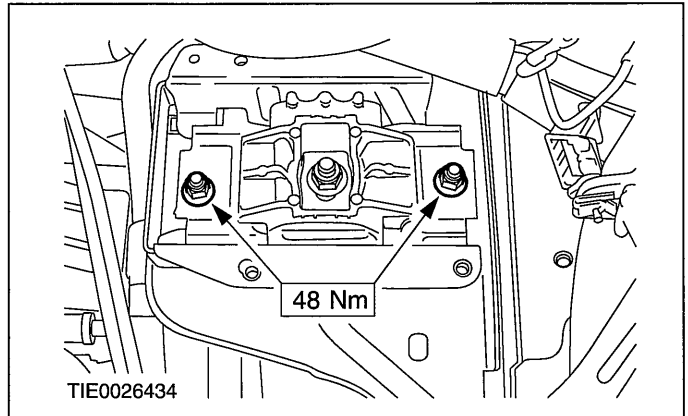
Install the engine front mount.



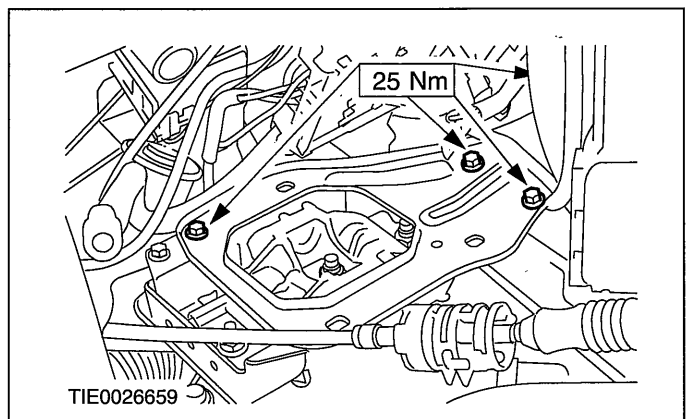
9. **NOTE:** Install new engine rear mount retaining nuts.

NOTE: Do not tighten the engine rear mount center retaining nut at this stage.

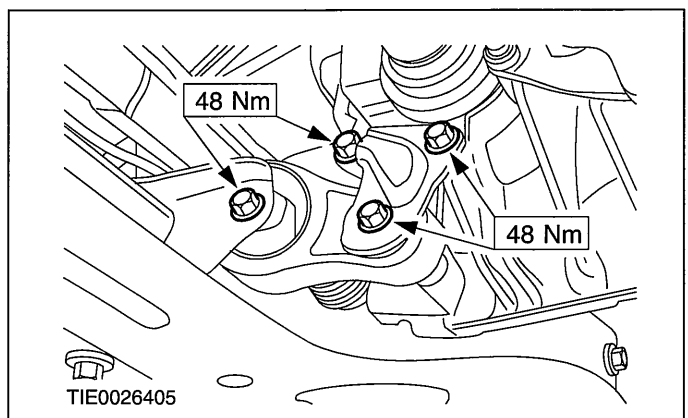
- Install the engine rear mount.



10. Install the battery tray support bracket.



11. Install the engine rear support insulator.



12. **CAUTIONS:**

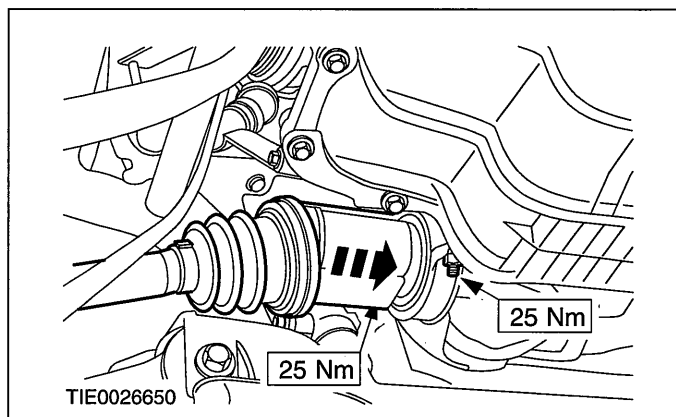
⚠ **Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.**

⚠ **Do not damage the halfshaft oil seal.**

NOTE: Install a new center bearing cap and locknuts.

INSTALLATION

Attach the right-hand halfshaft and the intermediate shaft to the transaxle.

**13. CAUTIONS:**

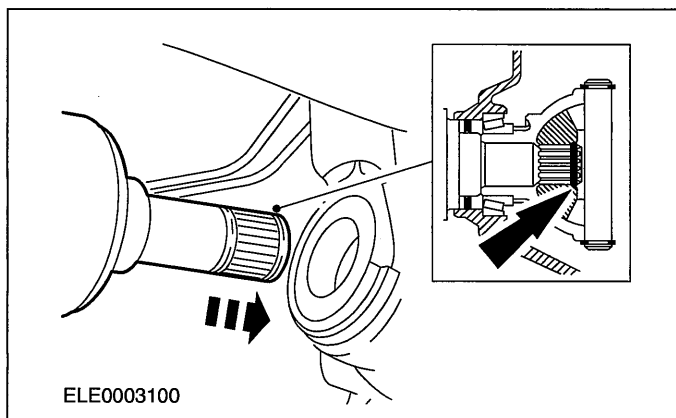
⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft oil seal.

⚠ Make sure the snap ring is correctly seated.

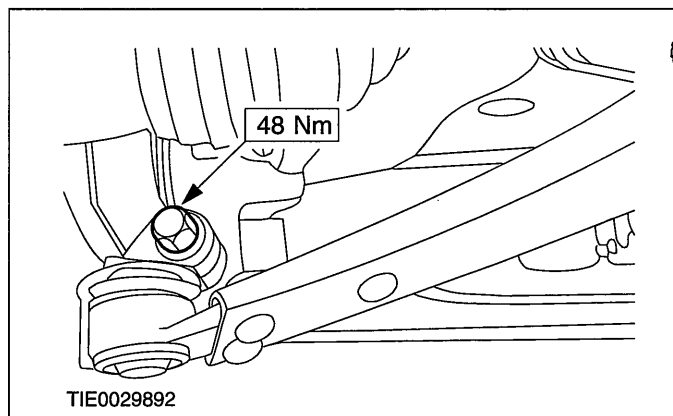
NOTE: Install a new snap ring.

Attach the left-hand halfshaft to the transaxle.

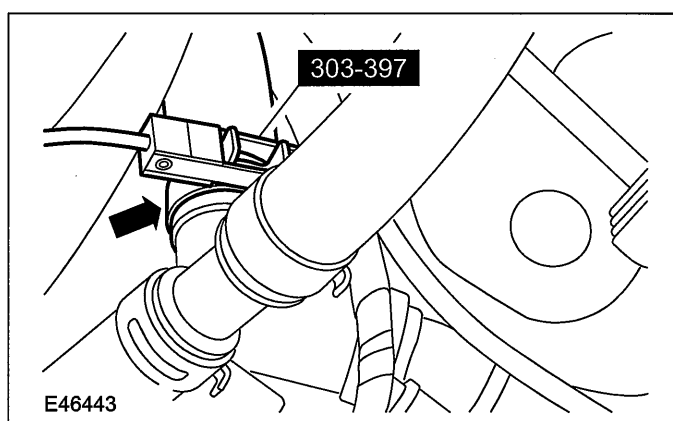


14. Attach the lower arm to the wheel knuckle on both sides (right-hand side shown).

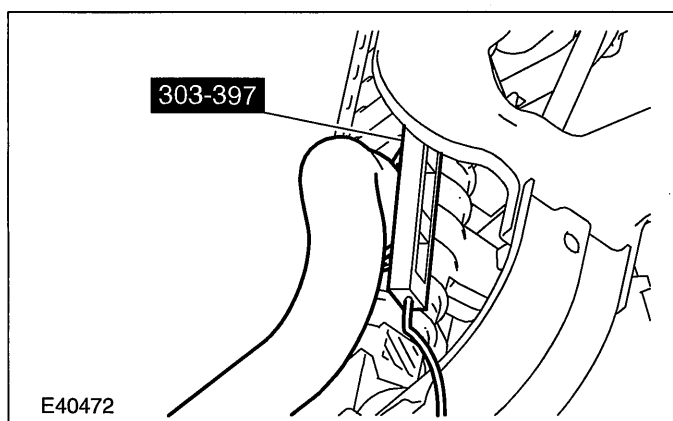
- Install the heat shield.



15. Using the special tool, connect the coolant hose to the distribution pipe

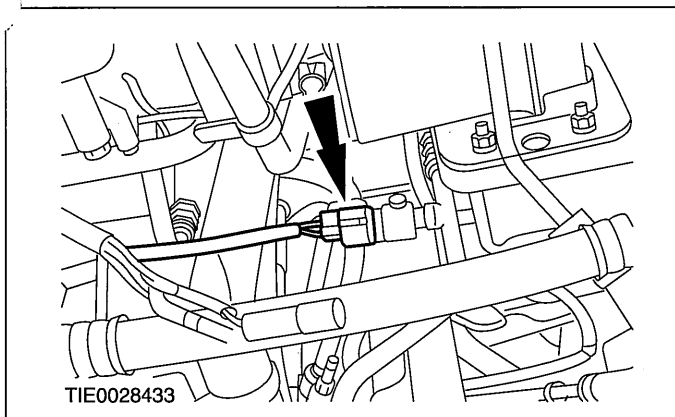


16. Using the special tool, connect the coolant hose to the radiator.

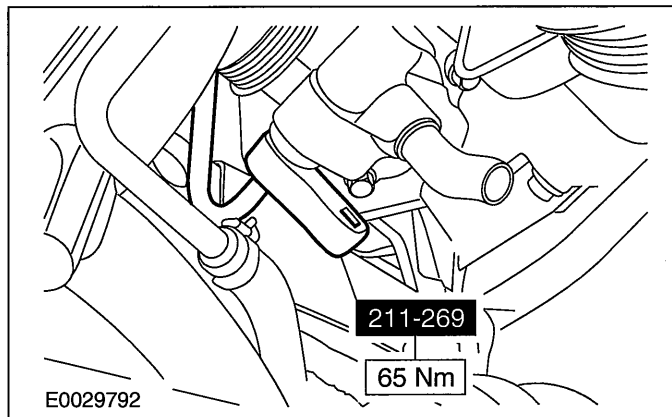


INSTALLATION

- 17. Connect the A/C high-pressure cut-off switch electrical connector.**

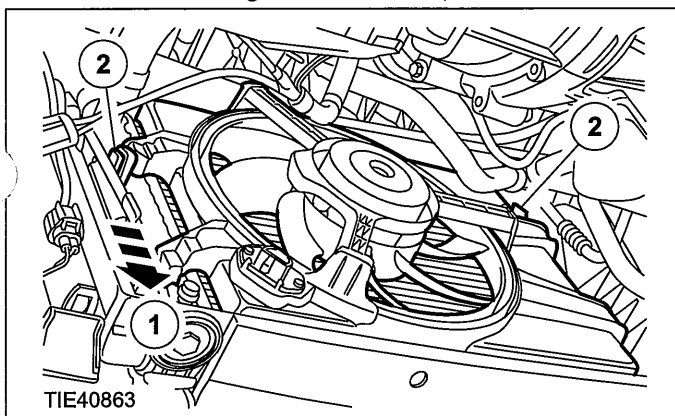


- 20. Using the special tool, attach the power steering line to the power steering pump.**

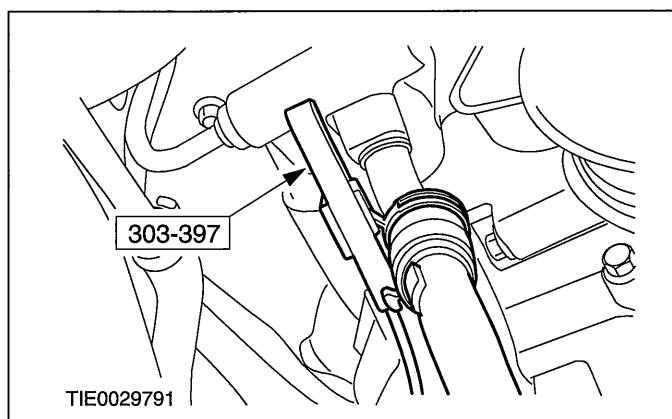


- 18. Install the cooling fan motor and shroud.**

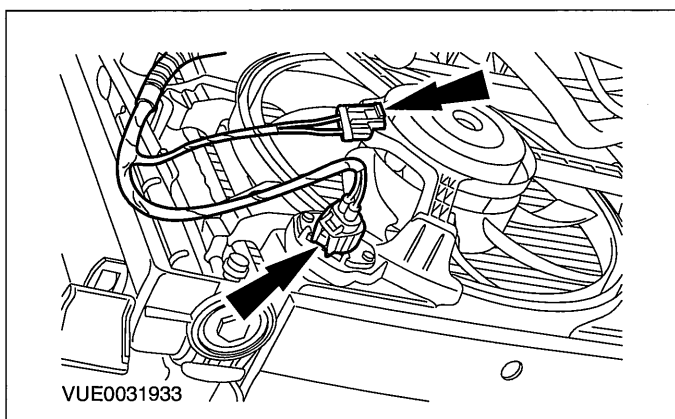
1. Push the cooling fan motor and shroud upwards and then downwards to install.
2. Install the cooling fan motor and shroud to the retaining brackets.



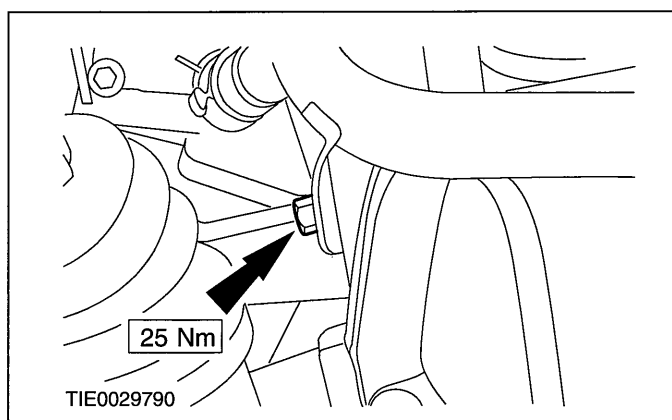
- 21. Connect the power steering line to the steering pump.**



- 19. Connect the cooling fan motor and cooling fan resistor electrical connectors.**

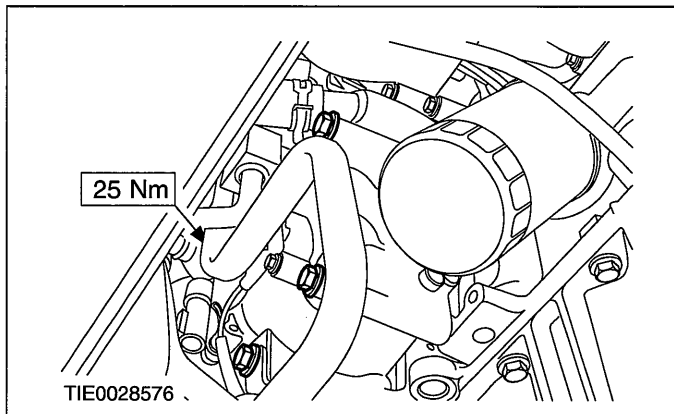


- 22. Attach the power steering line support bracket to the engine block.**

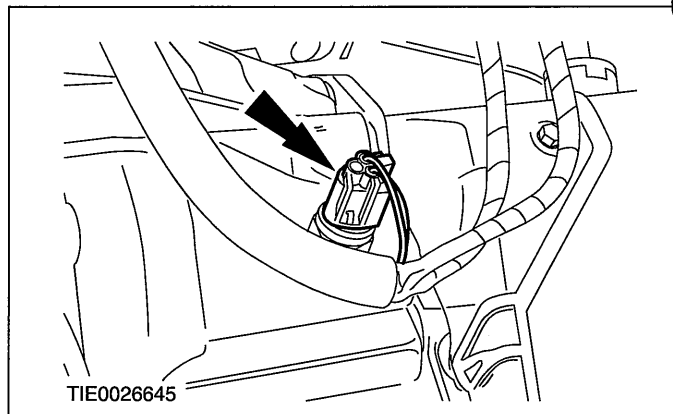


INSTALLATION

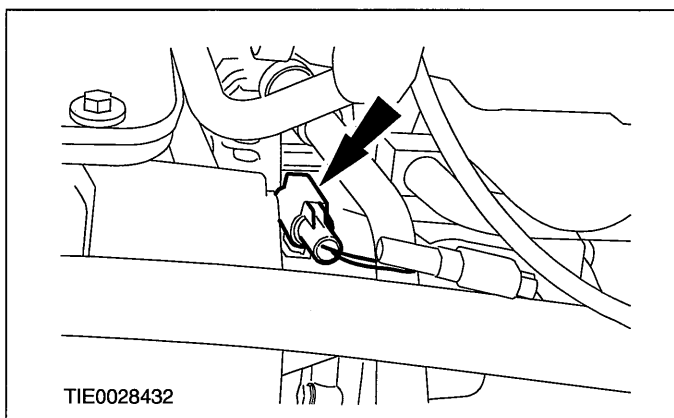
- 23. Attach the air conditioning (A/C) compressor to the cylinder block.**



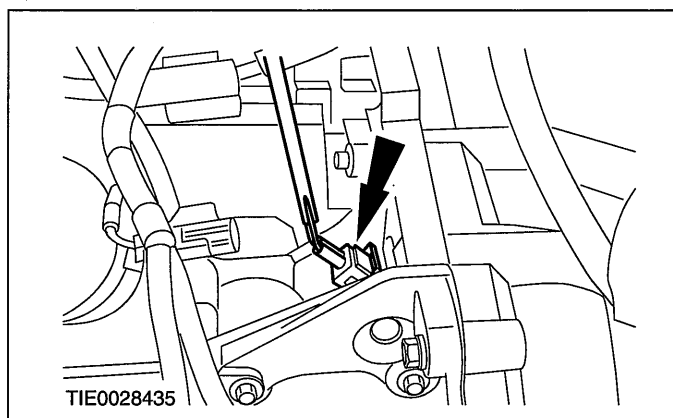
- 27. Connect the reversing lamp switch electrical connector.**



- 24. Connect the A/C compressor clutch electrical connector.**



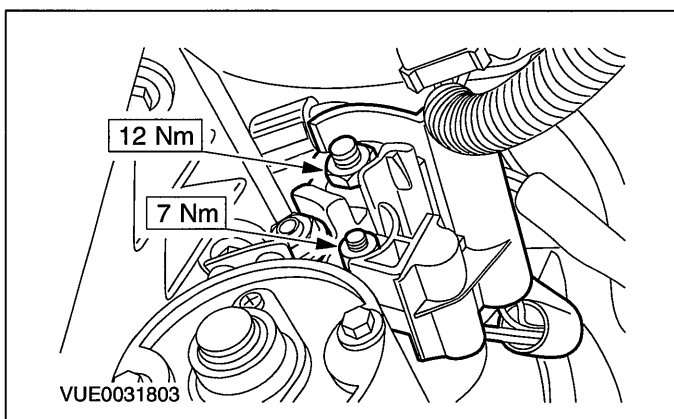
- 28. Connect the crankshaft position (CKP) sensor electrical connector.**



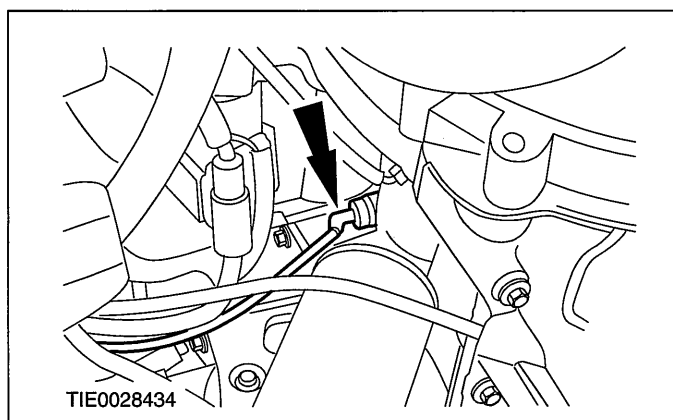
- 25. Install the accessory drive belt.**

For additional information, refer to:
Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

- 26. Connect the starter motor electrical connectors.**



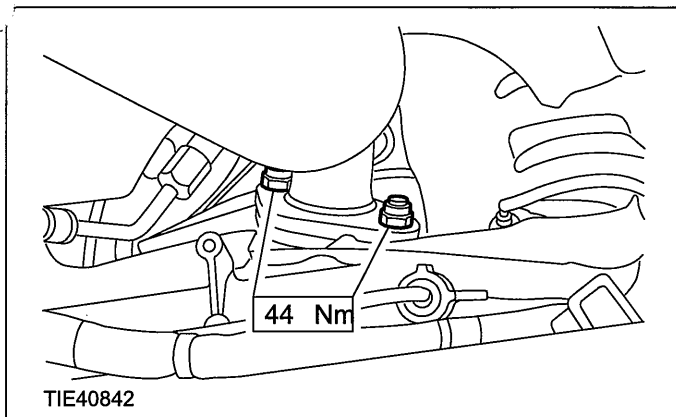
- 29. Connect the oil pressure switch electrical connector.**



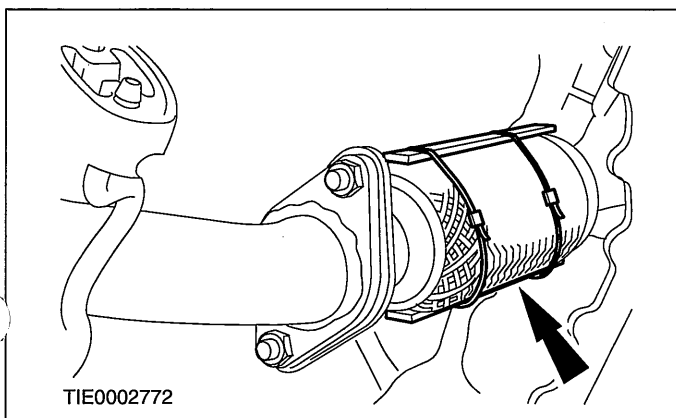
- 30. NOTE: Install new exhaust flange nuts and a new exhaust flange gasket.**

INSTALLATION

Attach the exhaust flexible pipe to the catalytic converter.



31. Remove the exhaust flexible pipe support.



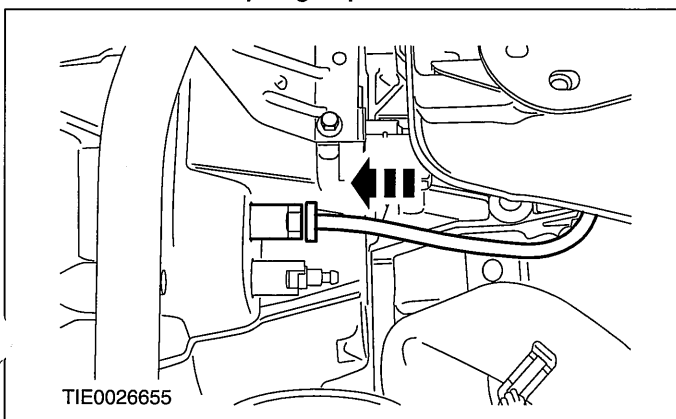
Vehicles without automated gearshift

32. **CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

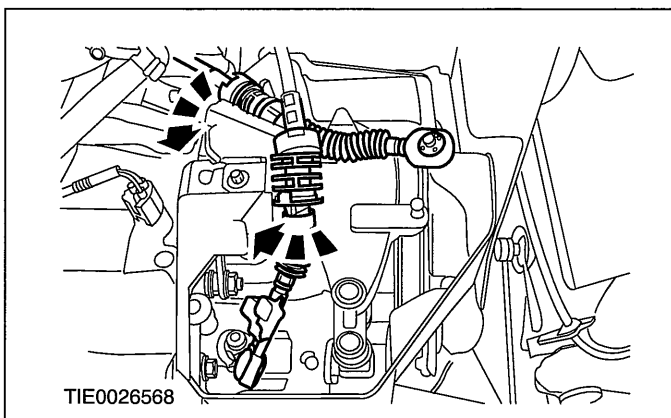
NOTE: Make sure the spring clip is correctly seated.

Connect the clutch slave cylinder supply line.

- Install the spring clip.



33. Attach the gearshift cables to the bracket and turn the abutment sleeves counterclockwise.



34. **NOTE:** Do not install the air cleaner at this stage.

Adjust the gearshift cable.

For additional information, refer to: Gearshift Cable Adjustment (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).

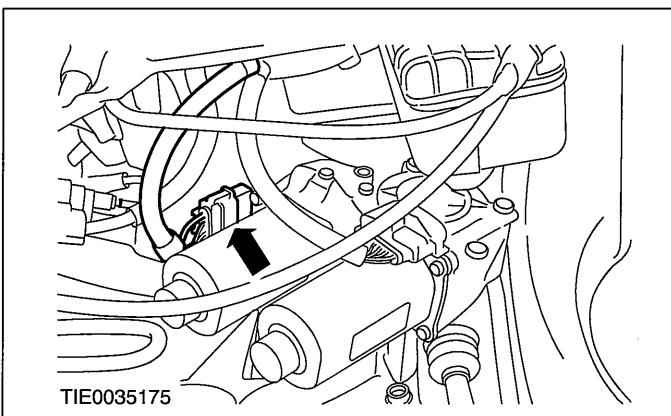
35. **NOTE:** Do not install the air cleaner at this stage.

Bleed the hydraulic clutch system.

For additional information, refer to: Clutch System Bleeding (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).

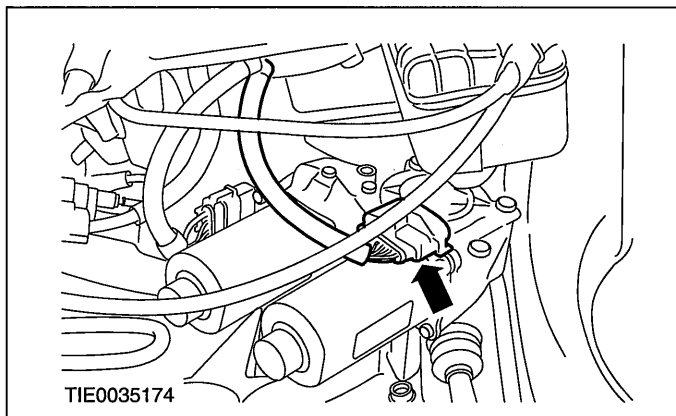
Vehicles with automated gearshift

36. Connect the gearshift actuator electrical connector (colored grey).

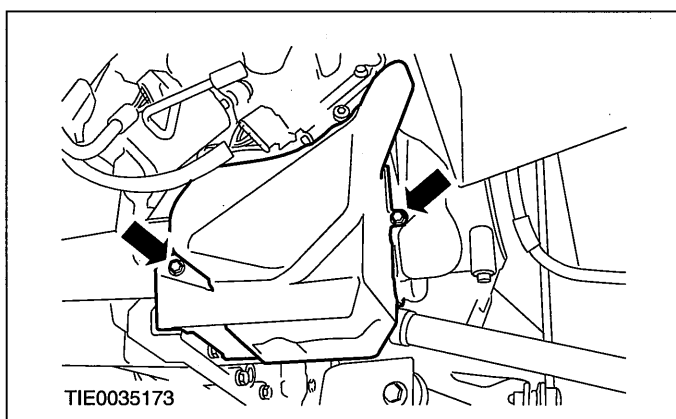


INSTALLATION

- 37. Connect the gearshift actuator electrical connector (colored black).**

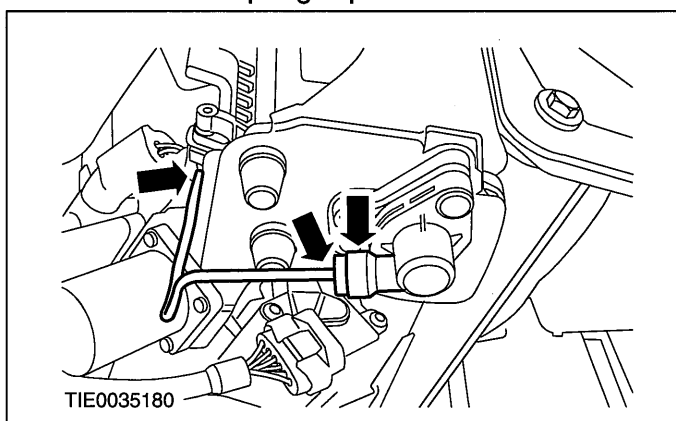


- 38. Install the gearshift actuator cover.**



- 39. Connect the clutch slave cylinder supply line.**

- Install the spring clip.



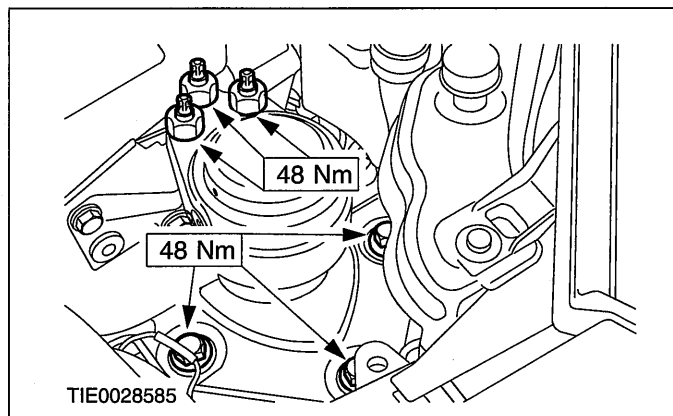
- 40. Bleed the hydraulic clutch system.**

For additional information, refer to: **Clutch System Bleeding - Vehicles With: Automated Gearshift (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).**

All vehicles

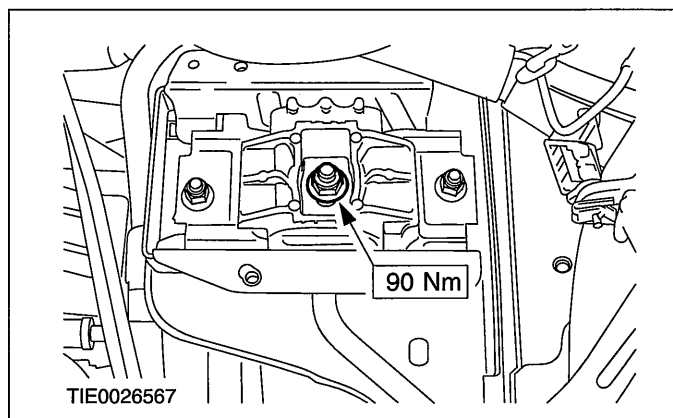
- 41. Lower the vehicle.**

- 42. Tighten the engine front mount retaining nuts and bolts.**

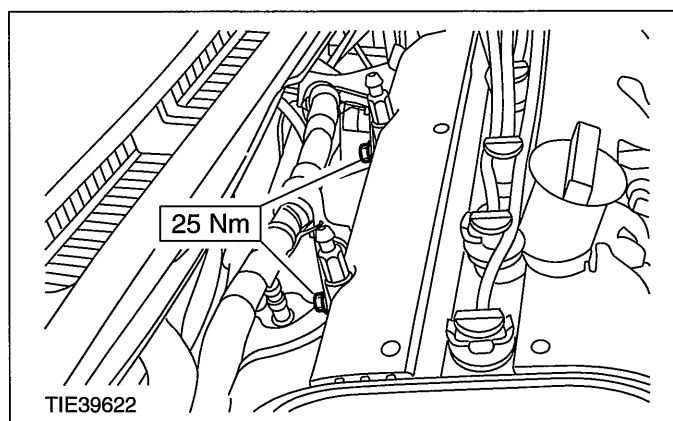


- 43. NOTE: Install a new engine rear mount center retaining nut.**

Tighten the engine rear mount center retaining nut.

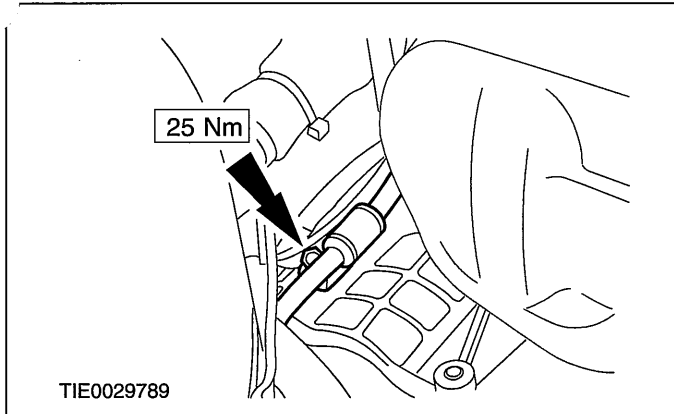


- 44. Attach the power steering line support bracket to the cylinder head.**

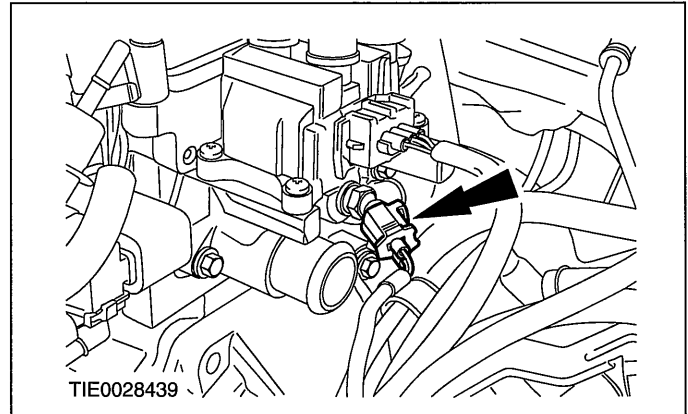


INSTALLATION

- 45. Attach the power steering line to the power steering pump mounting bracket.**

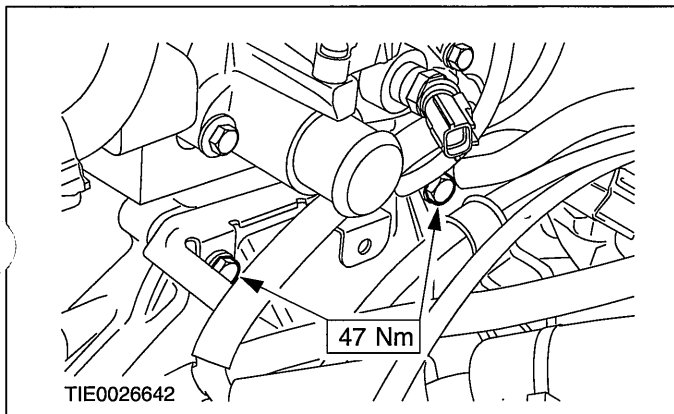


- 48. Connect the engine coolant temperature (ECT) sensor electrical connector.**

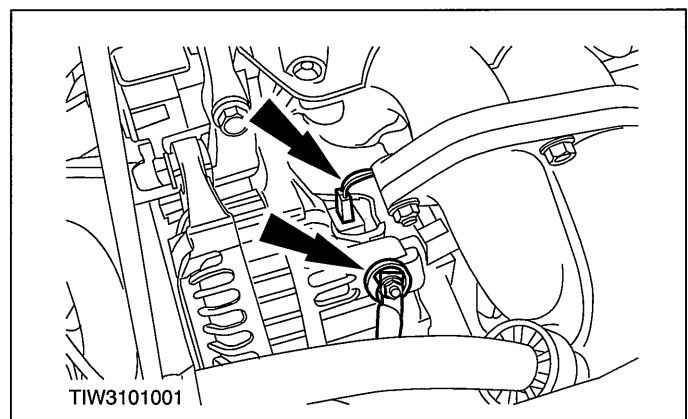


- 46. Install the engine wiring harness support brackets.**

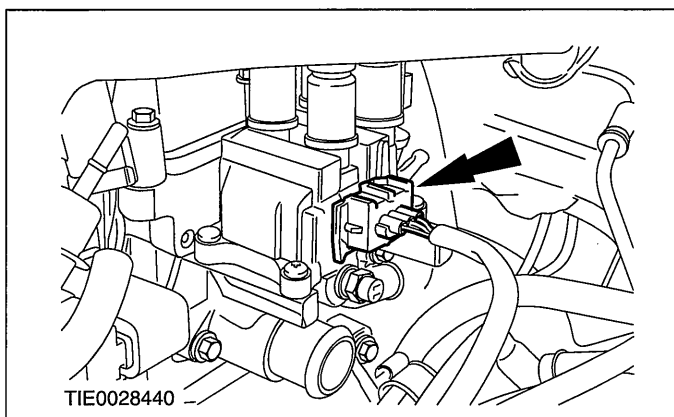
- Connect the engine ground cable.



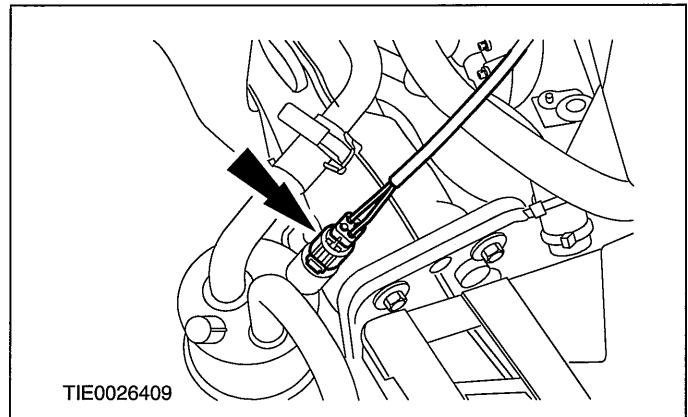
- 49. Connect the generator electrical connectors.**



- 47. Connect the electronic ignition (EI) coil electrical connector.**



- 50. Connect the air conditioning (A/C) lower-pressure cut-off switch electrical connector.**

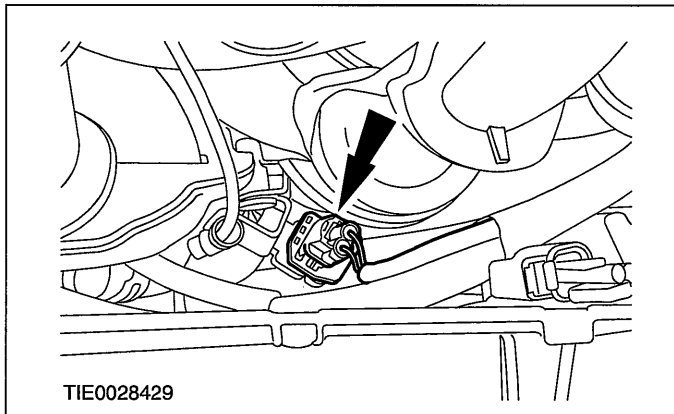


- 51. Install the right-hand headlamp assembly.**

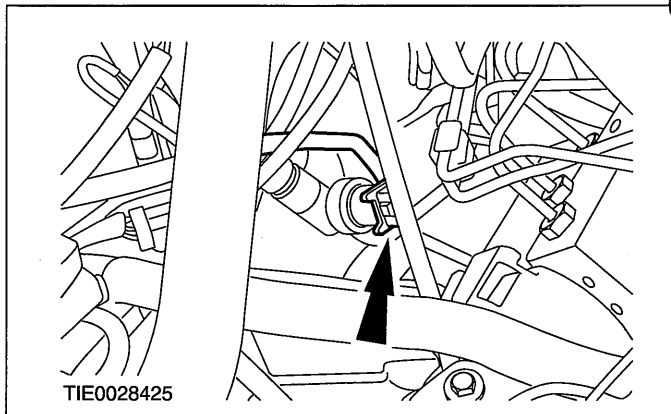
For additional information, refer to:
Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

INSTALLATION

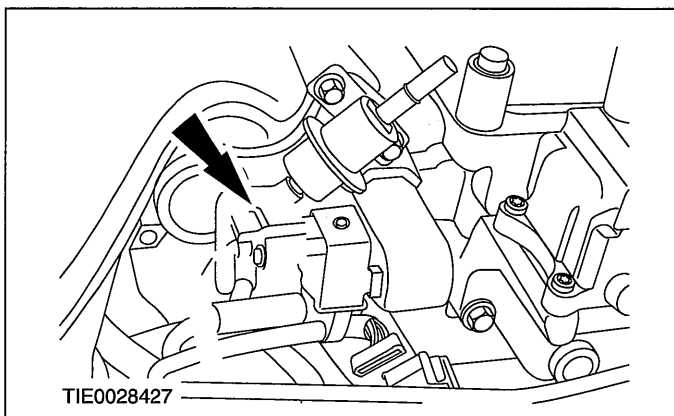
- 52. Connect the knock sensor (KS) electrical connector.**



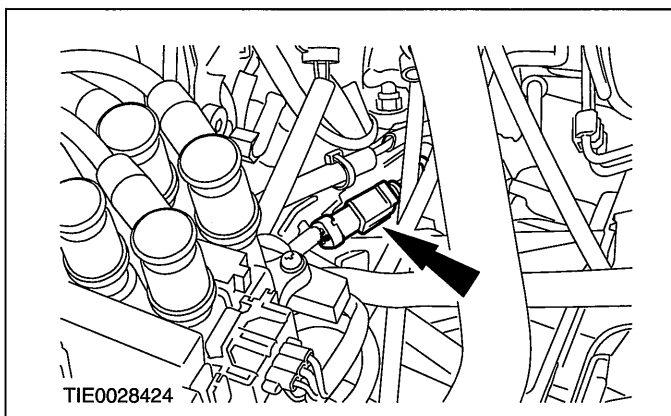
- 55. Connect the power steering pressure (PSP) switch electrical connector.**



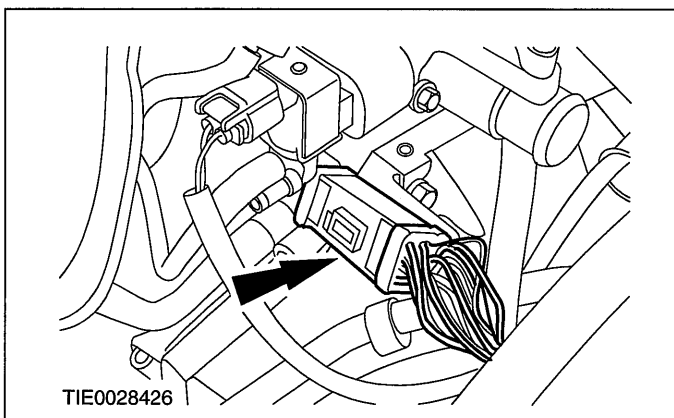
- 53. Connect the evaporative emission (EVAP) electrical connector.**



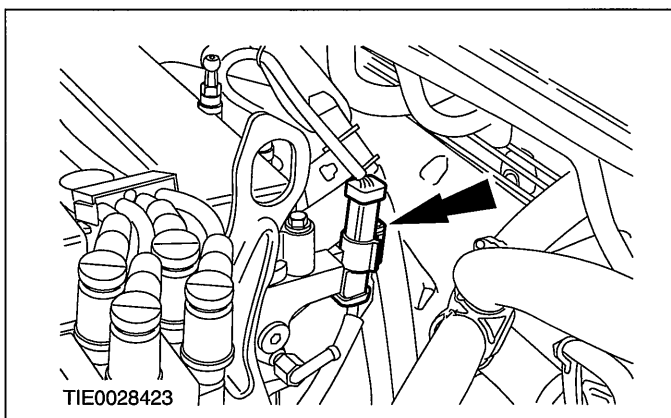
- 56. Connect the catalyst monitor sensor electrical connector.**



- 54. Connect the engine wiring harness electrical connector.**

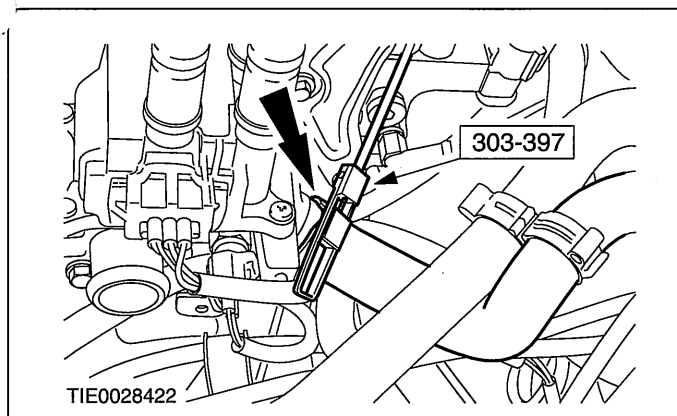


- 57. Connect the heated oxygen sensor (HO2S) electrical connector.**

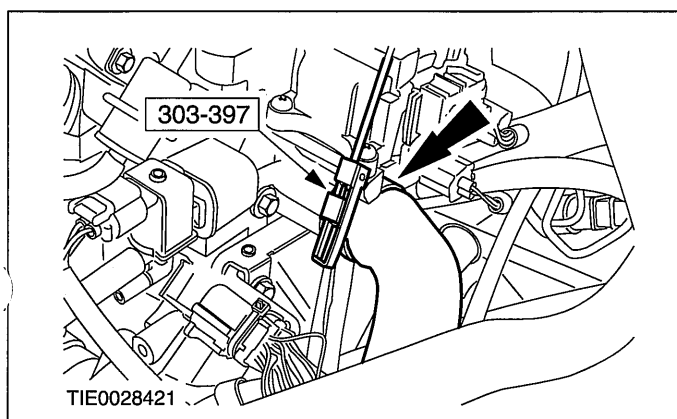


INSTALLATION

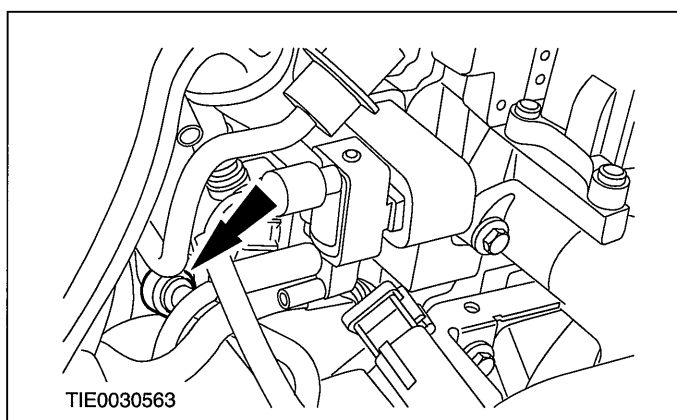
- 58. Using the special tool, connect the coolant hose to the coolant distribution housing.**



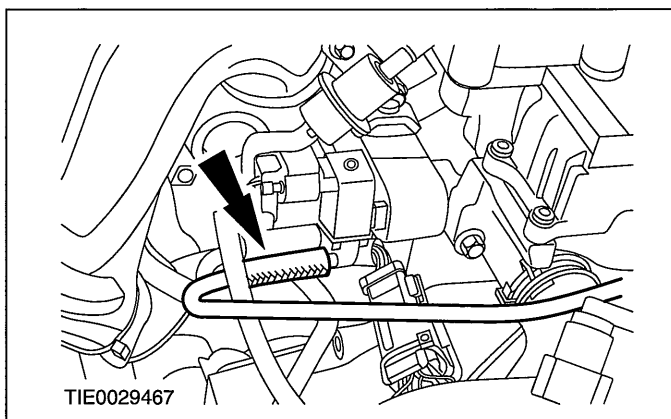
- 59. Using the special tool, connect the coolant hose to the coolant distribution housing.**



- 60. Attach the brake booster vacuum line to the intake manifold.**

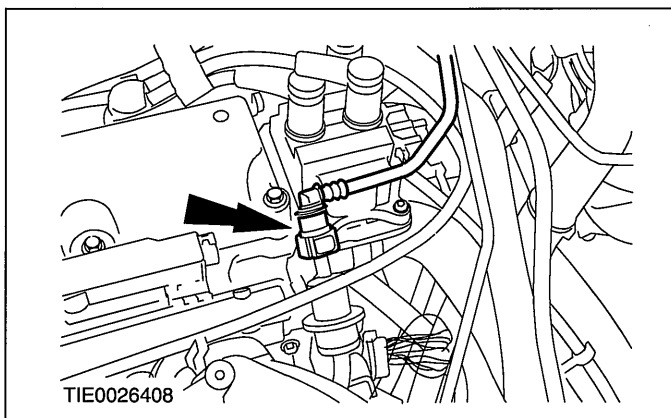


- 61. Connect the low-pressure EVAP hose.**



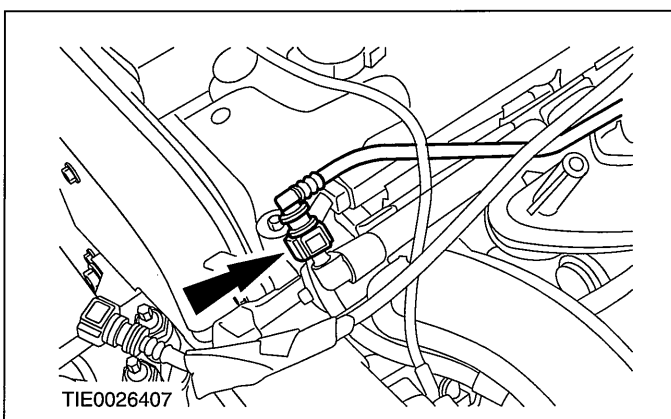
- 62. Connect the fuel supply line quick release coupling.**

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



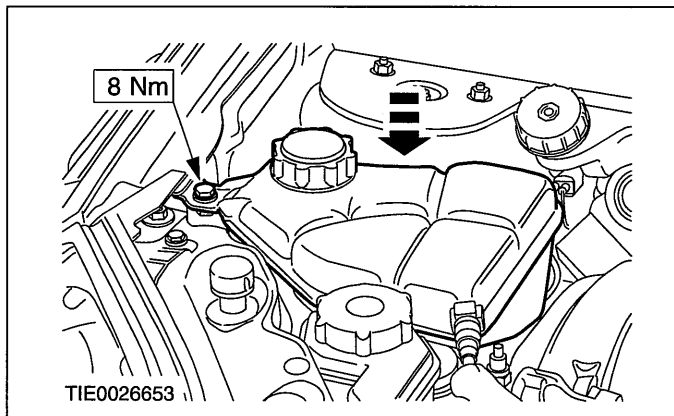
- 63. Connect the fuel return line quick release coupling.**

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

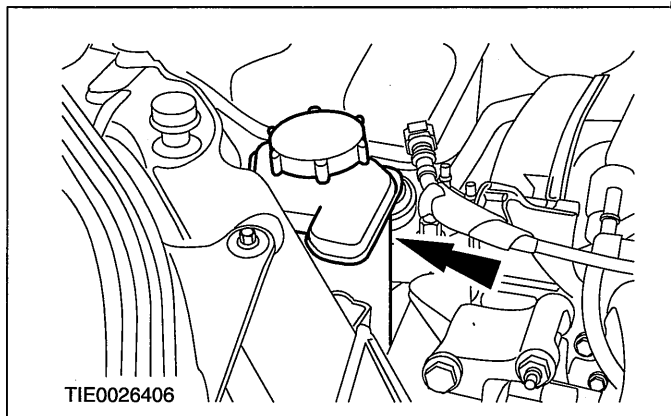


INSTALLATION

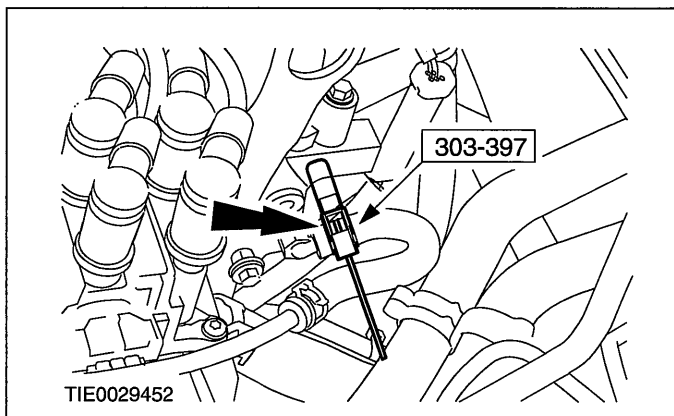
- 64. Attach the coolant expansion tank to the bracket.**



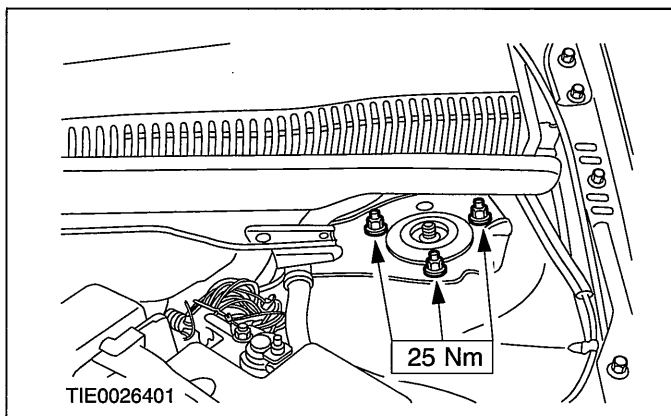
- 67. Attach the power steering fluid reservoir to the bracket.**



- 65. Using the special tool, connect the degas hose to the cylinder head.**

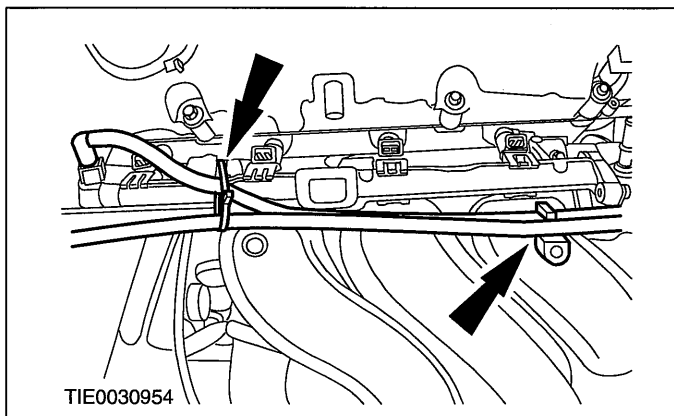


- 68. Tighten the strut and spring assembly top mount nuts on both sides.**



- 66. Attach the fuel line and the degas line to the intake manifold.**

- Install the cable tie.



- 69. Connect the powertrain control module (PCM) electrical connector.**

For additional information, refer to:
Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation).

- 70. Install the air cleaner.**

For additional information, refer to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

- 71. Install the front wheels and tires.**

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

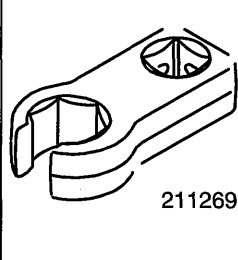
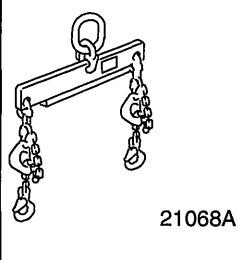
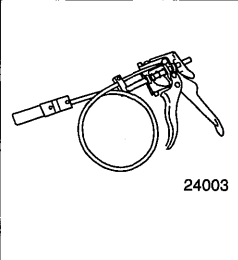
INSTALLATION**72. Fill the engine cooling system.**

For additional information, refer to: Cooling
System Draining, Filling and Bleeding -
1.25L Duratec-16V (Sigma)/1.3L
Duratec-8V (Rocam)/1.4L Duratec-16V
(Sigma)/1.6L Duratec-16V (Sigma)
(303-03A Engine Cooling - 1.25L
Duratec-16V (Sigma)/1.3L Duratec-8V
(Rocam)/1.4L Duratec-16V (Sigma)/1.6L
Duratec-16V (Sigma), General
Procedures).

INSTALLATION

Engine — Vehicles With: Automatic Transaxle

Special Tool(s)

 211269	Wrench, Hydraulic Line Union Nut 211-269 (13-027)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)

General Equipment

Straight edge
Securing straps
Workshop table
Engine hoist

All vehicles

▲ WARNING:Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

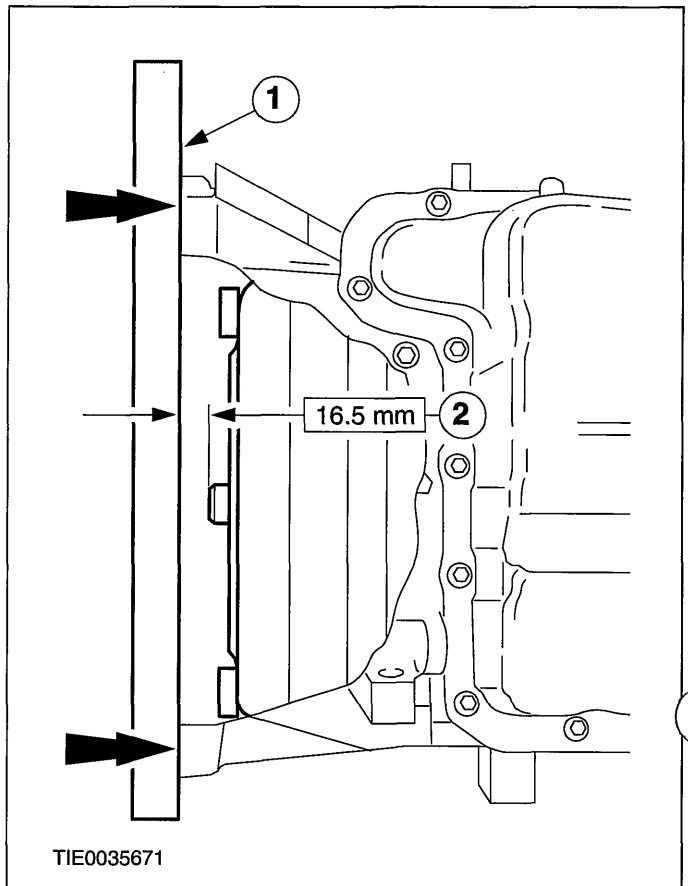
- ⚠ CAUTION:**The torque converter must remain at the correct installation depth throughout the whole installation procedure.

NOTE:The torque converter hub must engage fully in the oil pump drive gear.

Check the installation depth of the torque converter.

1. Lay a straight edge on the transaxle flange.

2. Check the installation depth between the transaxle flange and the torque converter centering spigot.

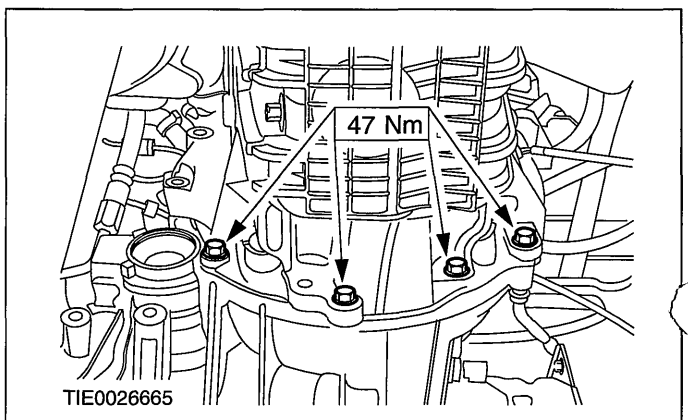


2. **⚠ CAUTION:**Make sure that the two locating dowels are installed.

NOTE:Make sure the torque converter centering spigot engages in the flexplate and the transaxle engages on the engine flange dowels.

Install the transaxle to the engine.

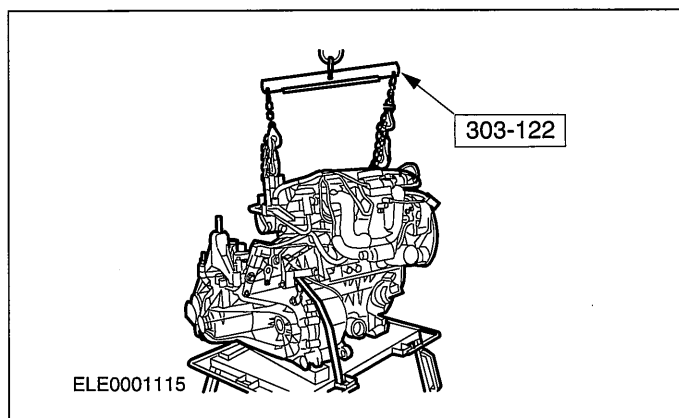
3. Install the transaxle lower retaining bolts.



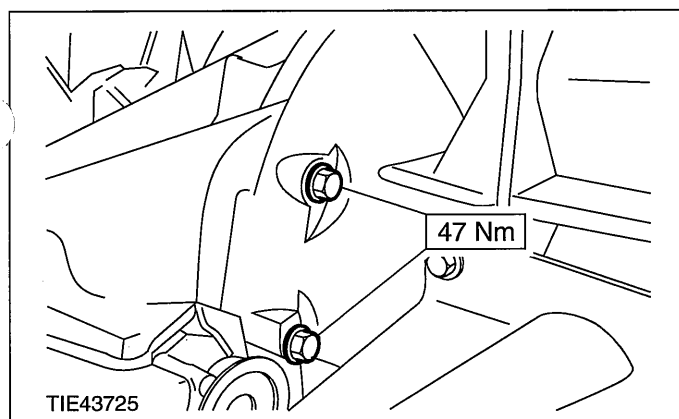
INSTALLATION

4. **▲WARNING:**Support the engine and transaxle assembly on wooden blocks and secure it with suitable securing straps.

Using the special tool and the engine hoist position the engine and transaxle assembly on the workshop table.



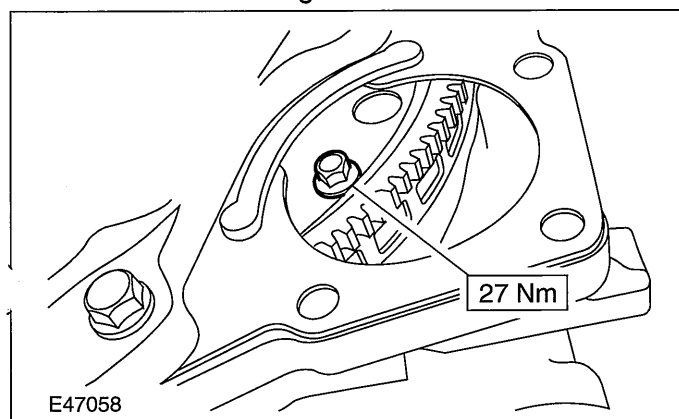
5. Install the transaxle right-hand retaining bolts.



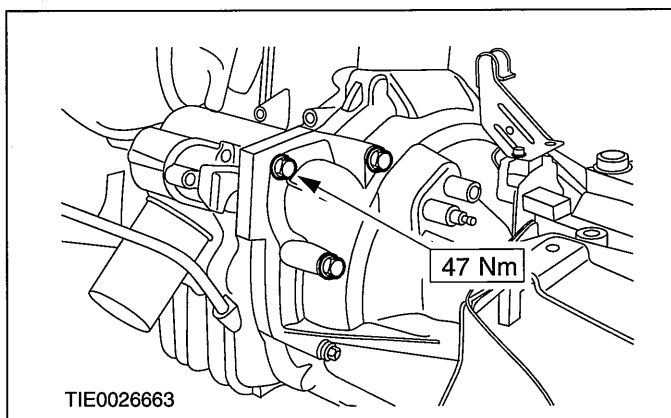
6. **NOTE:**Install new torque converter retaining nuts.

Install the torque converter retaining nuts.

- Rotate the torque converter to gain access to the remaining studs.



7. Install the starter motor.



8. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

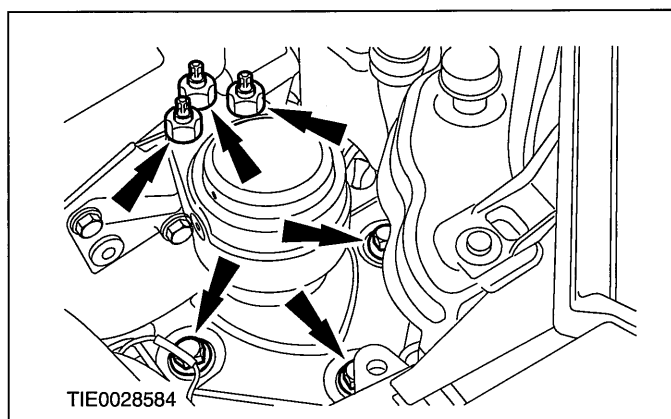
9. Position the engine and transaxle assembly in the engine compartment.

- Carefully lower the vehicle.

10. **NOTE:**Install new engine front mount retaining nuts.

NOTE:Do not tighten the engine front mount retaining bolts and nuts at this stage.

Install the engine front mount.

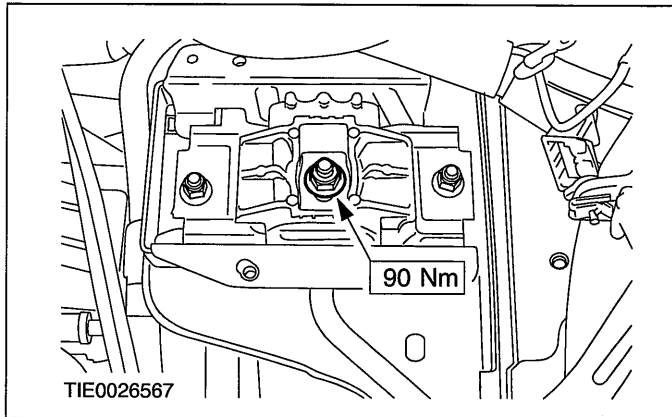


11. **NOTE:**Install new engine rear mount center retaining nut.

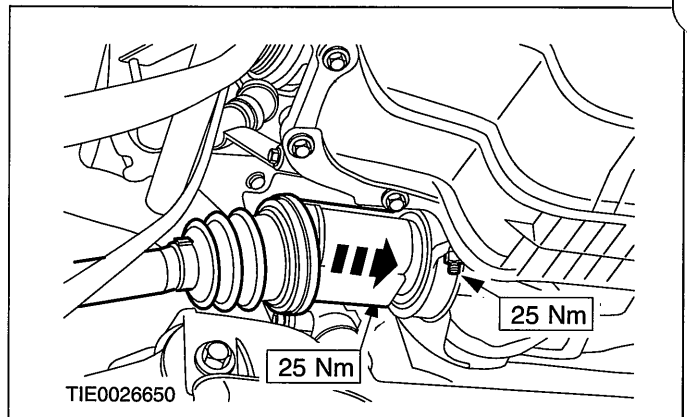
NOTE:Do not tighten the engine rear mount center retaining nut at this stage.

INSTALLATION

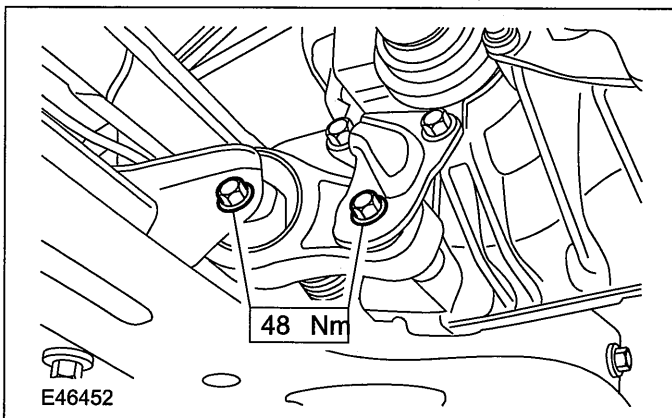
Install the engine rear mount center retaining nut.



Attach the right-hand halfshaft and the intermediate shaft to the transaxle.



12. Install the engine support insulator.



14. CAUTIONS:

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

⚠ Make sure the snap ring is correctly seated.

NOTE: Install a new snap ring.

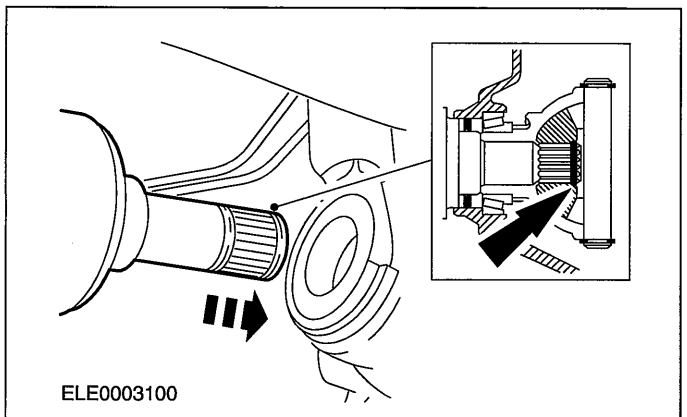
Attach the left-hand halfshaft to the transaxle.

13. CAUTIONS:

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

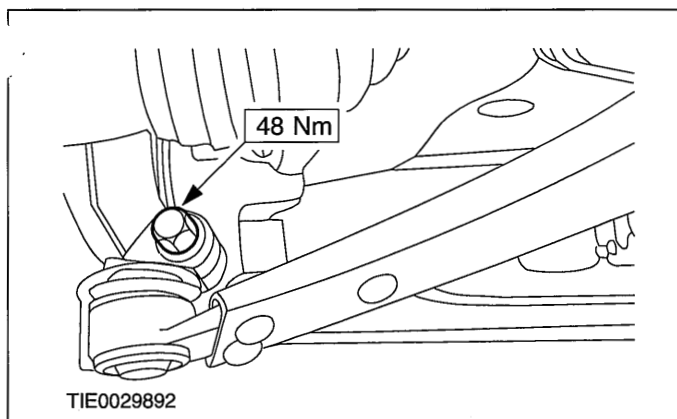
NOTE: Install a new center bearing cap and locknuts.



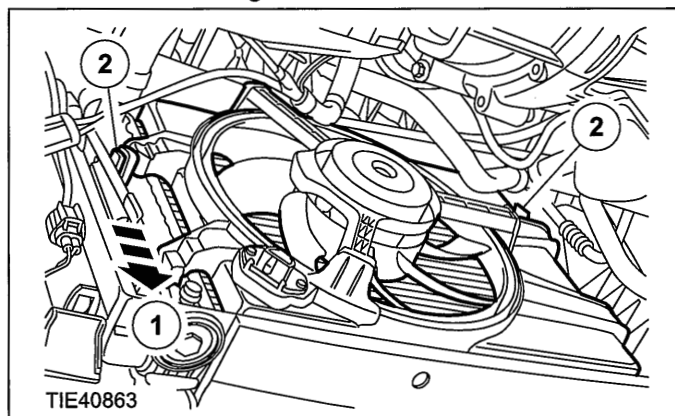
15. Attach the lower arm to the wheel knuckle on both sides (right-hand side shown).

INSTALLATION

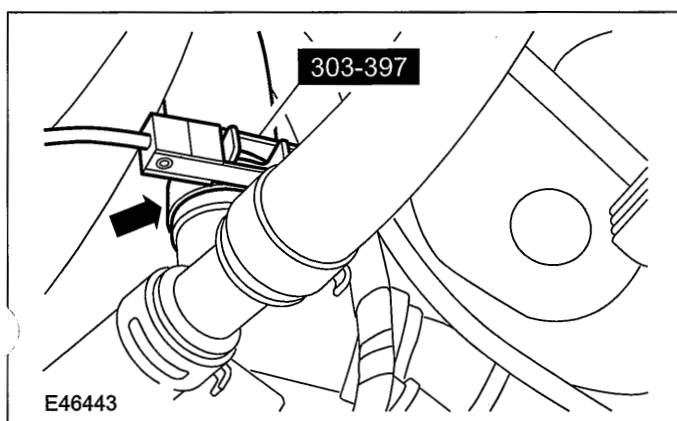
- Install the heat shield.



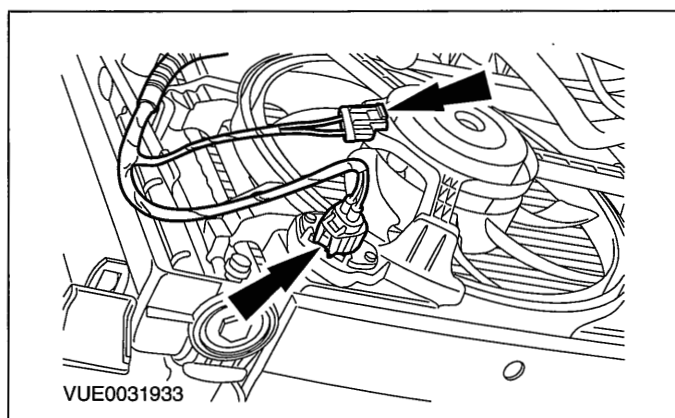
2. Install the cooling fan motor and shroud to the retaining brackets.



16. Using the special tool, connect the coolant hose to the distribution pipe.



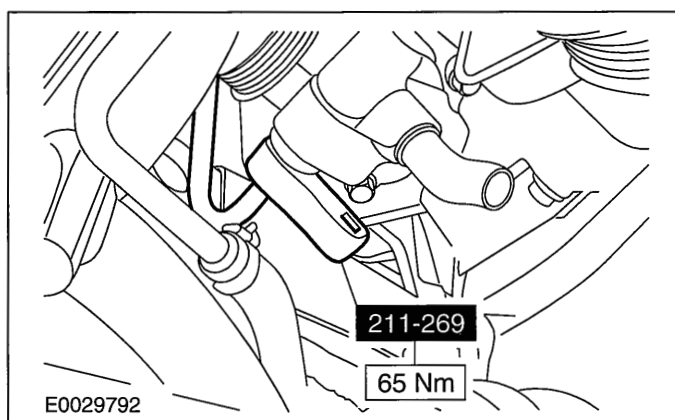
19. Connect the cooling fan motor and cooling fan resistor electrical connectors.



17. Using the special tool, connect the coolant hose to the radiator.



20. Using the special tool, attach the power steering line to the power steering pump.

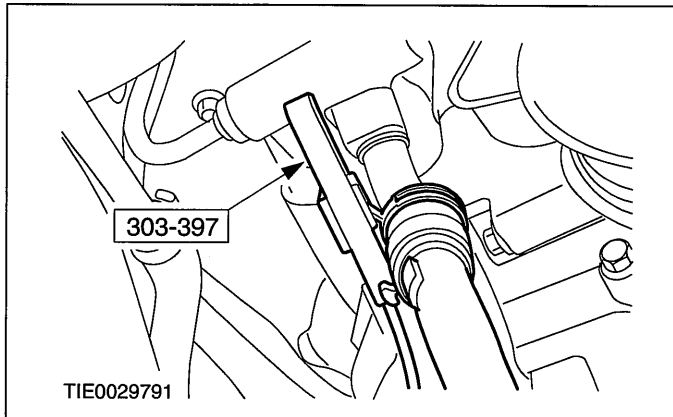


18. Install the cooling fan motor and shroud.

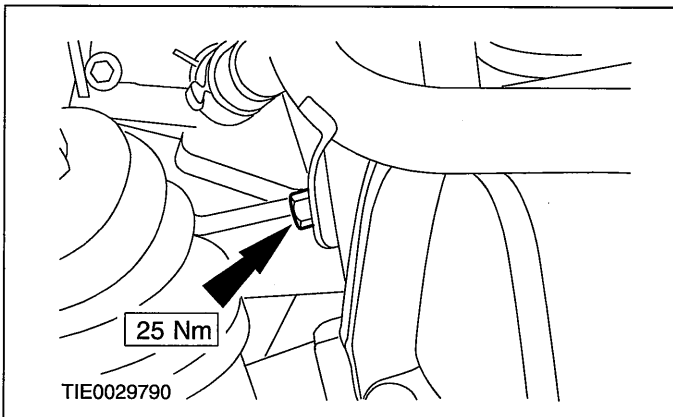
1. Push the cooling fan motor and shroud upwards and then downwards to install.

INSTALLATION

- 21. Connect the power steering line to the steering pump.**

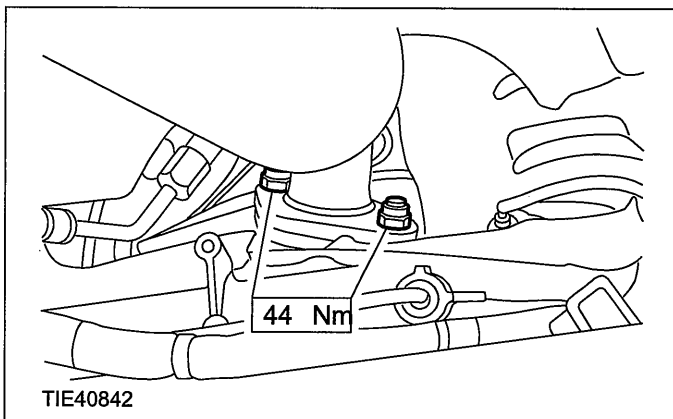


- 22. Attach the power steering line support bracket to the engine block.**



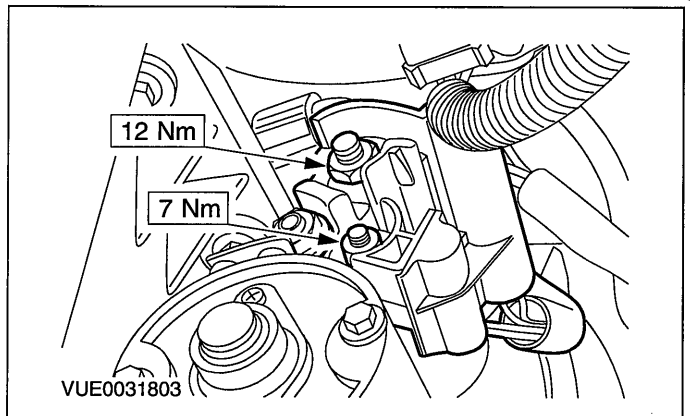
- 23. NOTE: Install new exhaust flange nuts and a new exhaust flange gasket.**

Attach the exhaust flexible pipe to the catalytic converter.

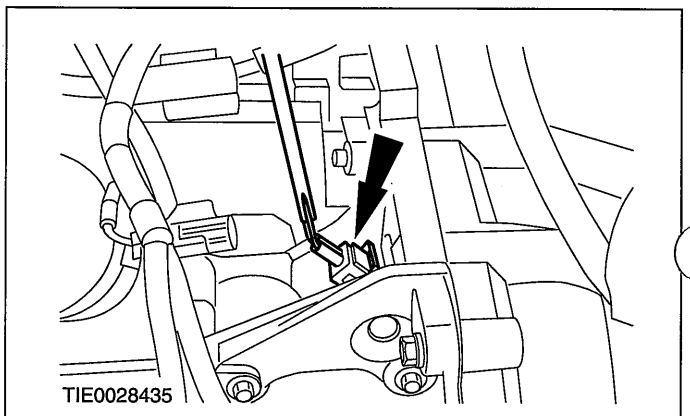


- 24. Remove the exhaust flexible pipe support.**

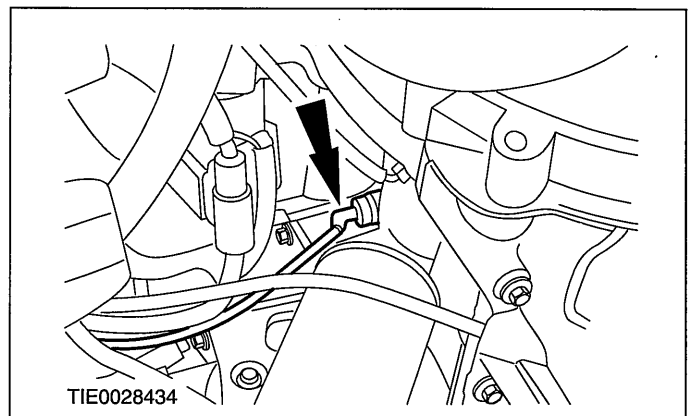
- 25. Connect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables.**



- 26. Connect the crankshaft position (CKP) sensor electrical connector.**



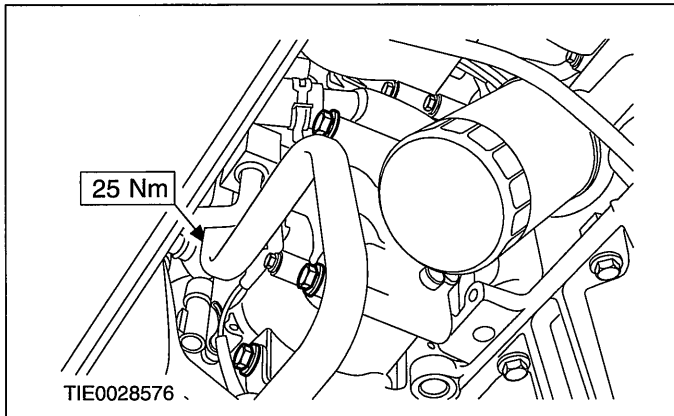
- 27. Connect the oil pressure switch electrical connector.**



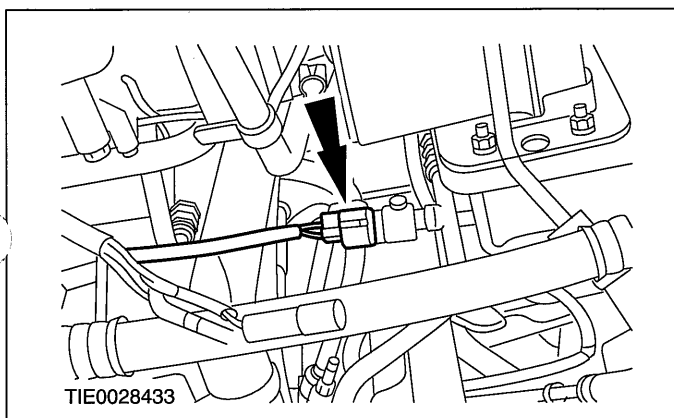
INSTALLATION

Vehicles with air conditioning

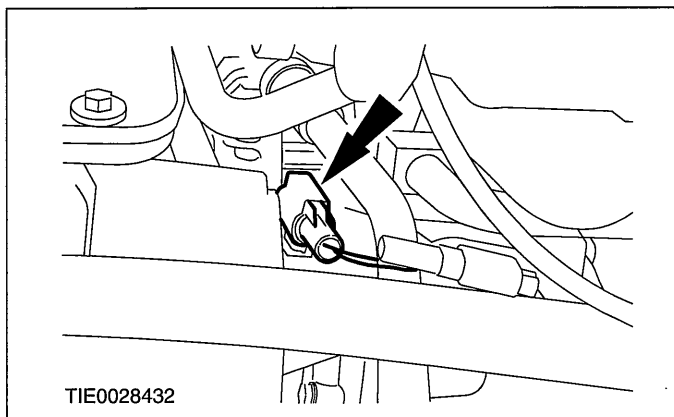
- 28. Attach the air conditioning (A/C) compressor to the cylinder block.**



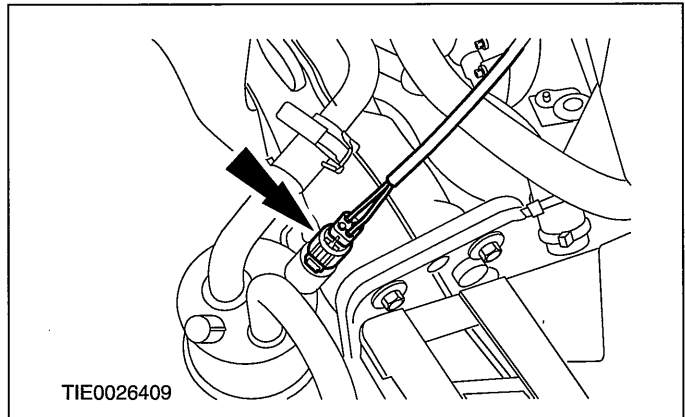
- 29. Connect the A/C high-pressure cutoff switch electrical connector.**



- 30. Connect the A/C compressor clutch electrical connector.**



- 31. Connect the air conditioning (A/C) low-pressure cutoff switch electrical connector.**



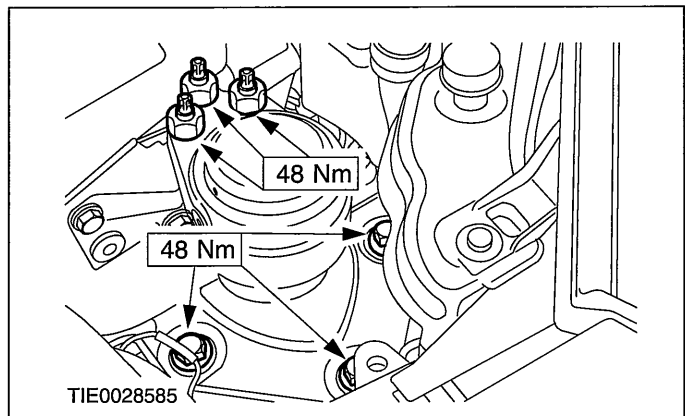
All vehicles

- 32. Install the accessory drive belt.**

For additional information, refer to:
Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation).

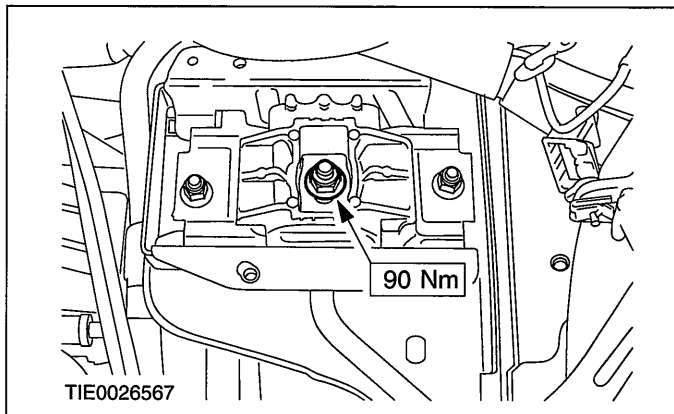
- 33. Lower the vehicle.**

- 34. Tighten the engine front mount retaining nuts and bolts.**

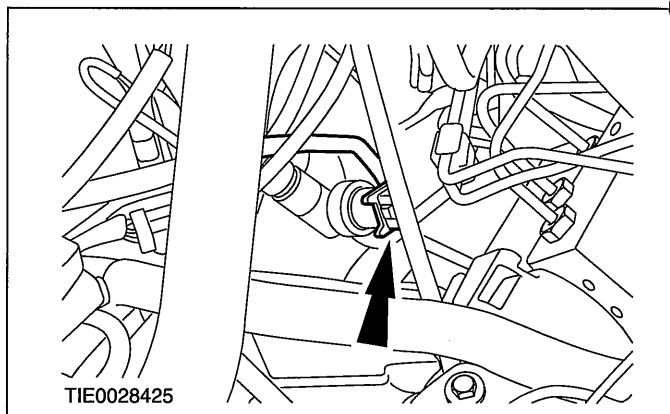


INSTALLATION

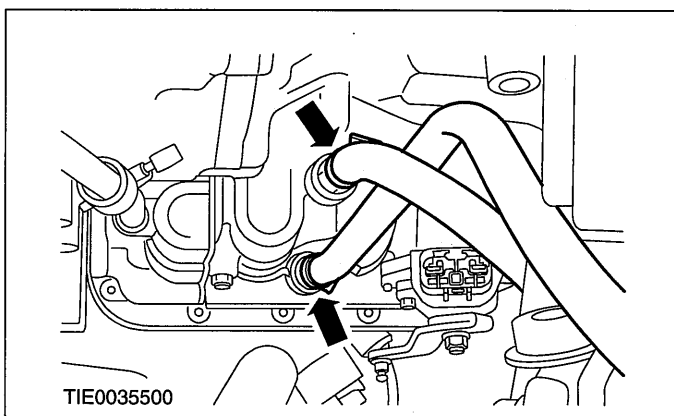
- 35. Tighten the engine rear mount center retaining nut.**



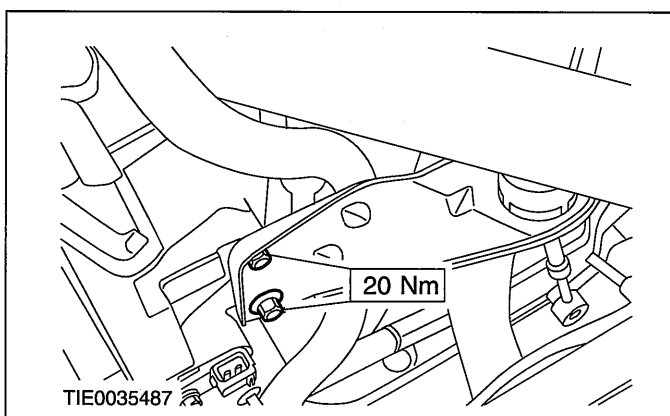
- 38. Connect the power steering pressure (PSP) switch electrical connector.**



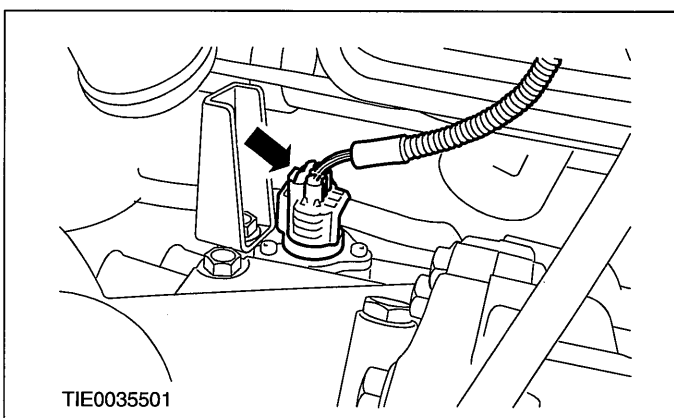
- 36. Connect the transmission fluid cooler line to the transaxle.**



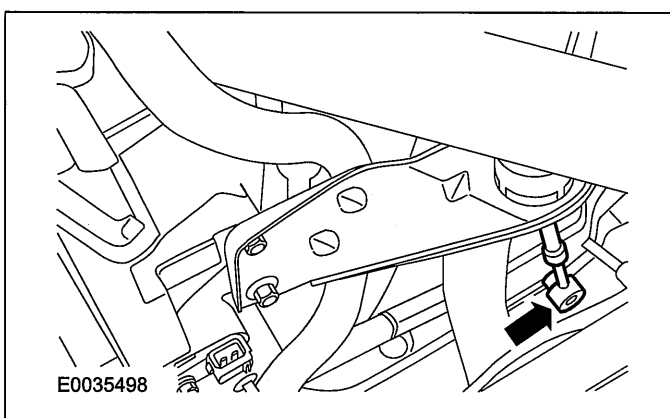
- 39. Attach the selector lever cable retaining bracket to the transaxle.**



- 37. Connect the vehicle speed (VSS) sensor electrical connector.**



- 40. Attach the selector lever cable to the transaxle.**

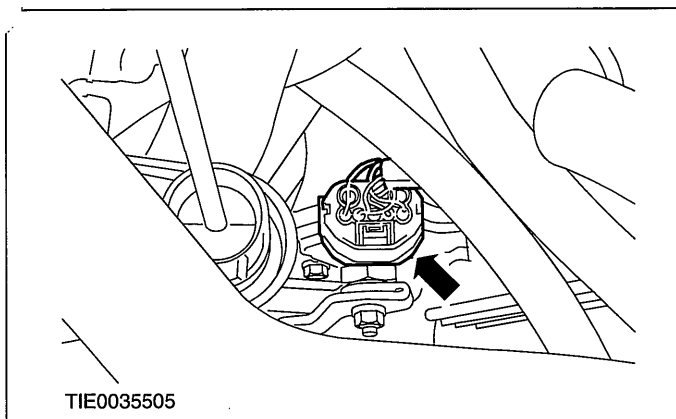


- 41. Adjust the selector lever cable.**

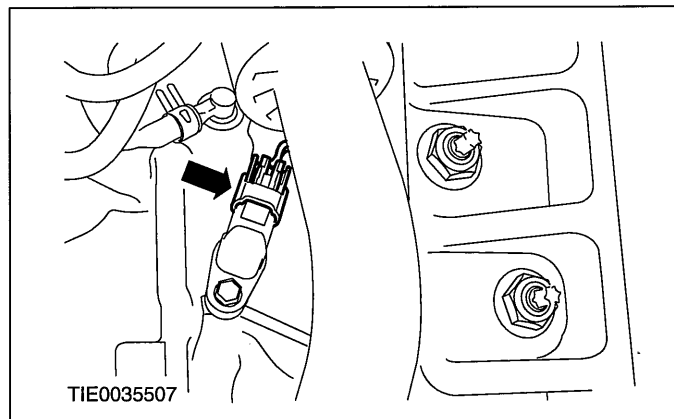
For additional information, refer to: Selector Lever Cable Adjustment (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).

INSTALLATION

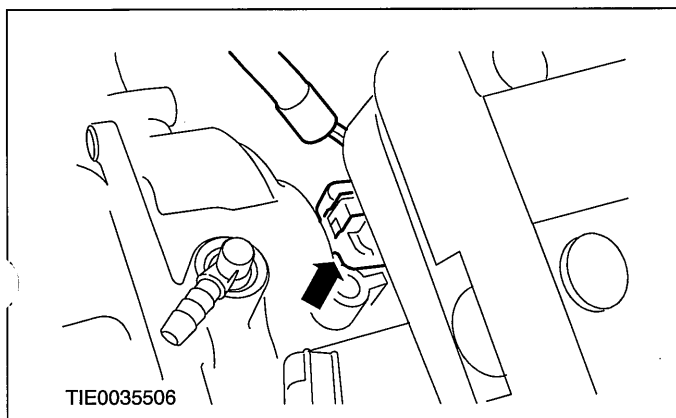
- 42. Connect the transmission range (TR) sensor electrical connector.**



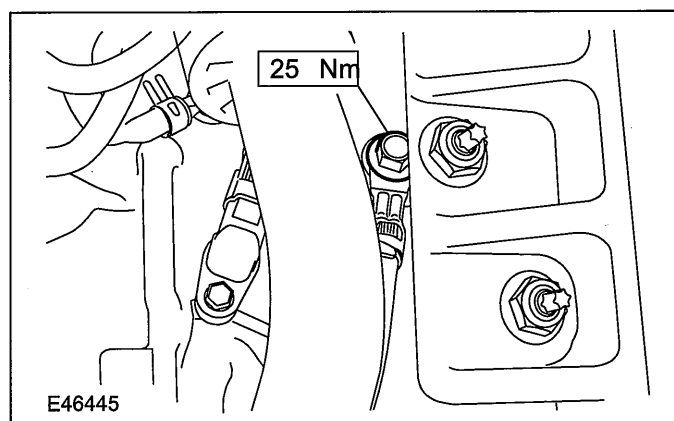
- 45. Connect the turbine shaft speed (TSS) sensor electrical connector.**



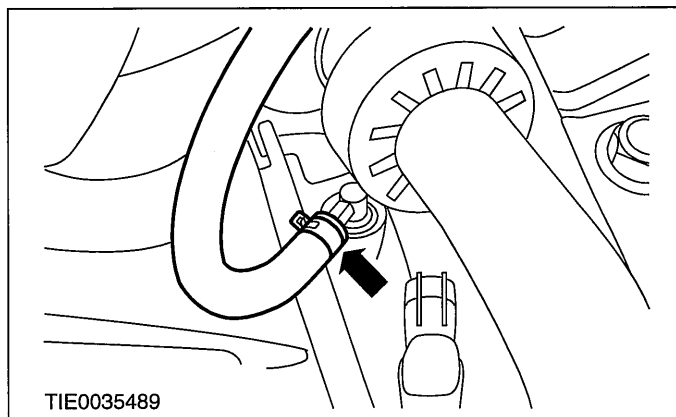
- 43. Connect the transaxle wiring harness electrical connector.**



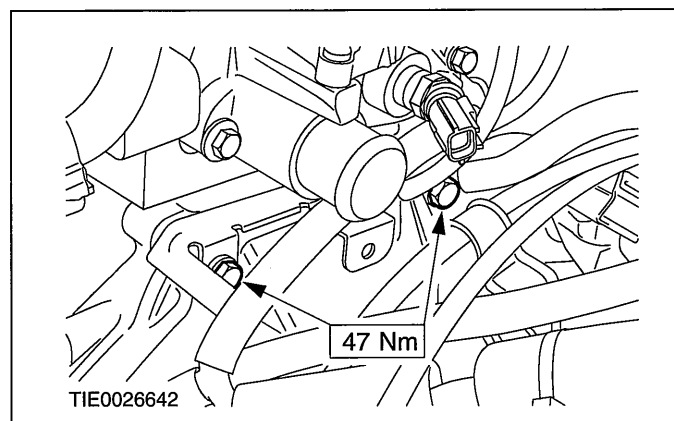
- 46. Attach the ground cable to the transaxle.**



- 44. Connect the transaxle breather hose.**

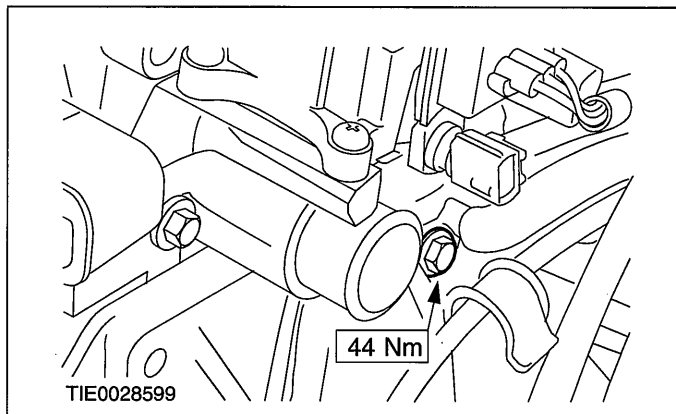


- 47. Install the engine wiring harness support brackets.**

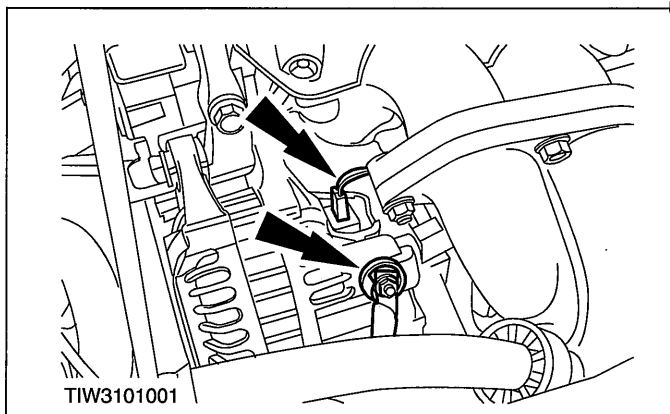


INSTALLATION

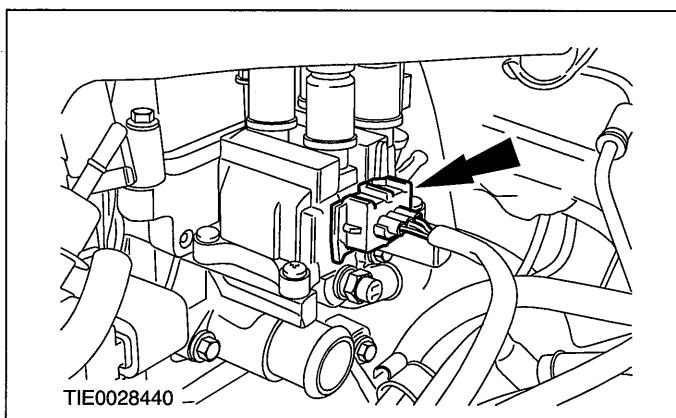
- 48. Attach the engine ground cable to the transaxle.**



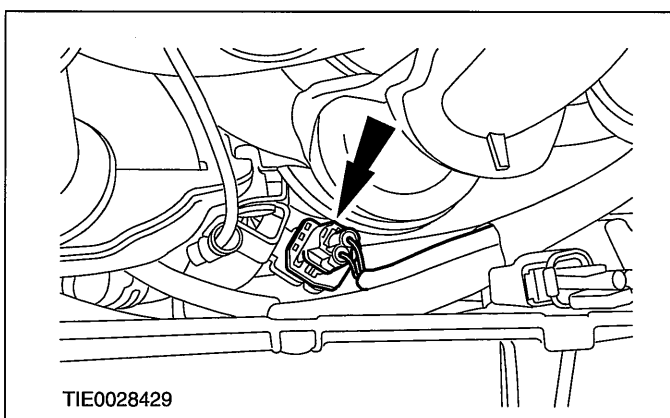
- 52. Connect the generator electrical connectors.**



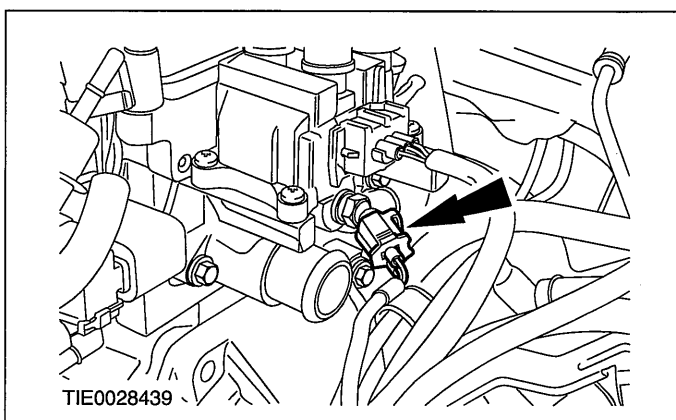
- 49. Connect the electronic ignition (EI) coil electrical connector.**



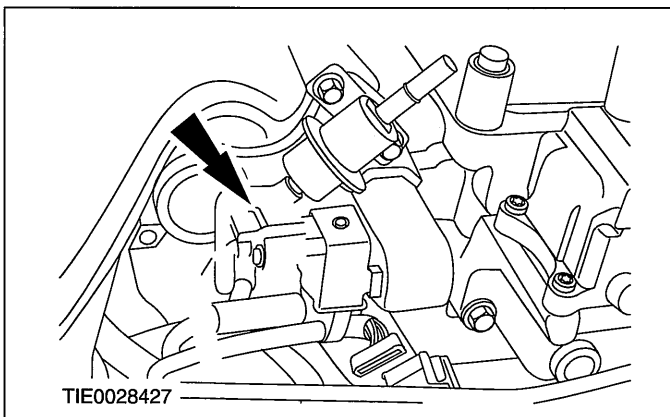
- 53. Connect the knock sensor (KS) electrical connector.**



- 50. Connect the engine coolant temperature (ECT) electrical connector.**



- 54. Connect the EVAP electrical connector.**

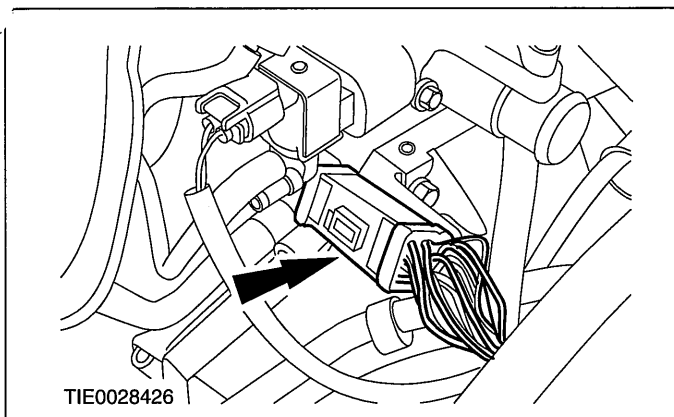


- 51. Install the right-hand headlamp assembly.**

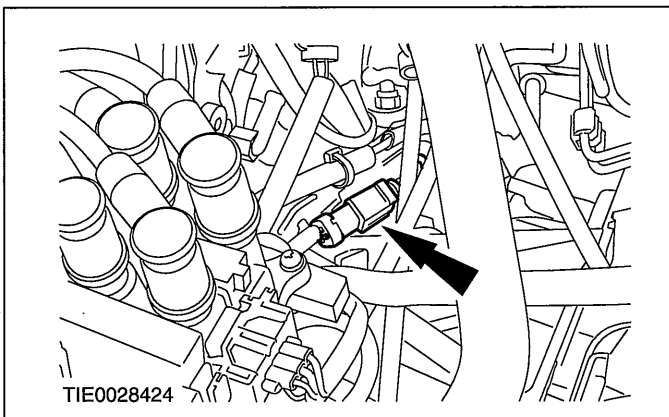
For additional information, refer to:
Headlamp Assembly (417-01 Exterior
Lighting, Removal and Installation).

INSTALLATION

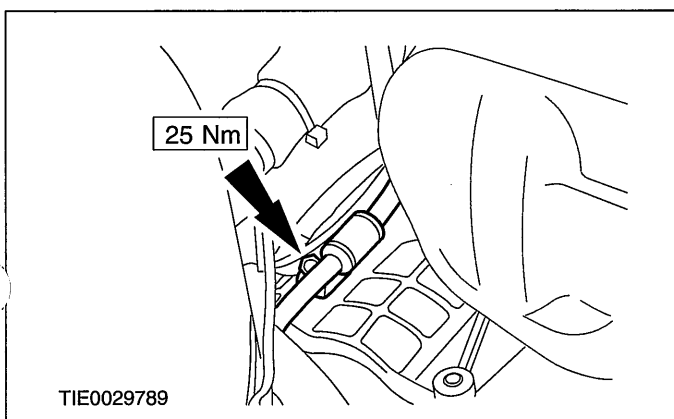
- 55. Connect the engine wiring harness electrical connector.**



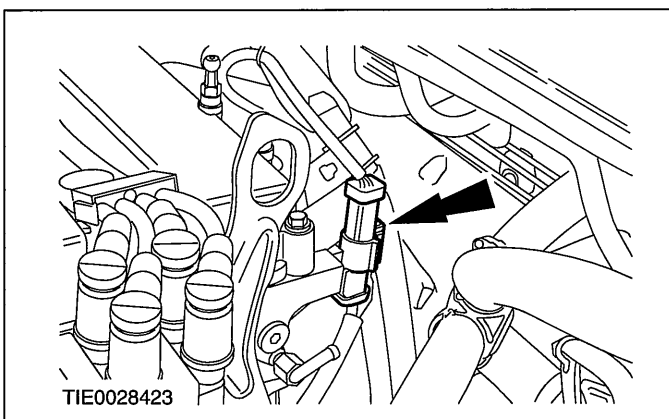
- 58. Connect the catalyst monitor sensor electrical connector.**



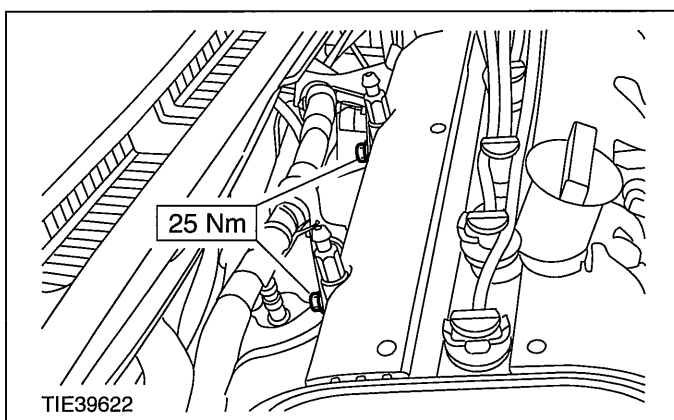
- 56. Attach the power steering line to the power steering pump mounting bracket.**



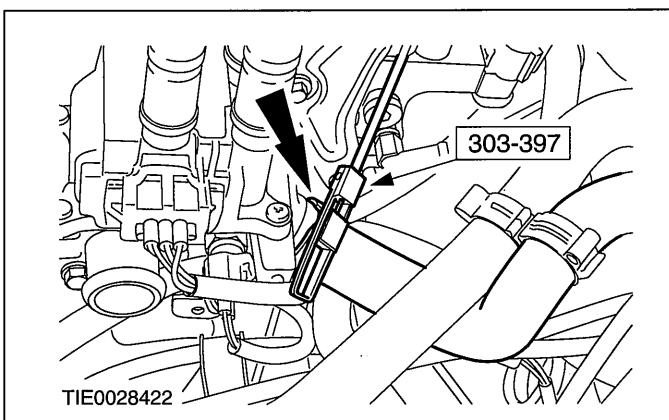
- 59. Connect the heated oxygen (HO2S) sensor electrical connector.**



- 57. Attach the power steering line support bracket to the cylinder head.**

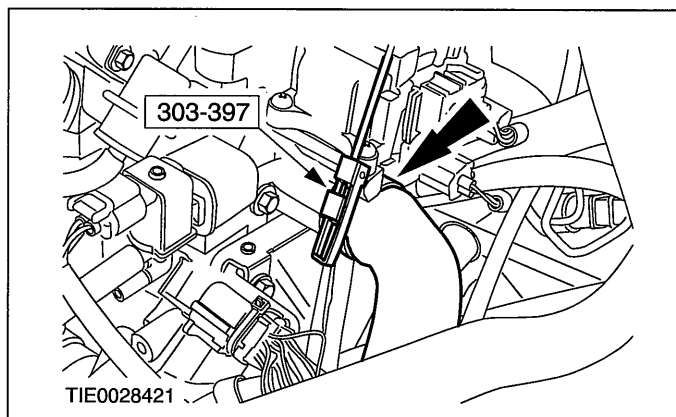


- 60. Using the special tool, connect the coolant hose to the coolant distribution housing.**

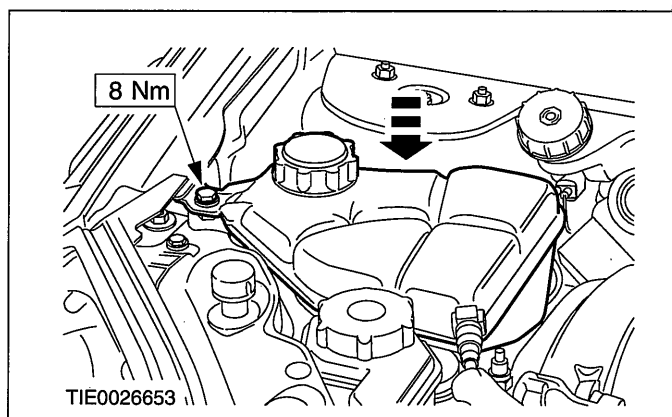


INSTALLATION

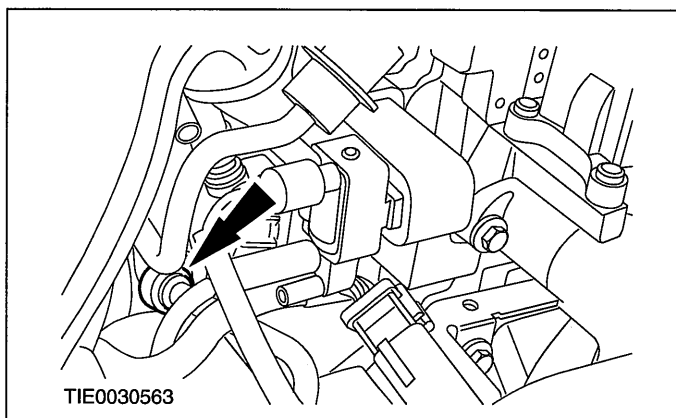
- 61. Using the special tool, connect the coolant hose to the coolant distribution housing.**



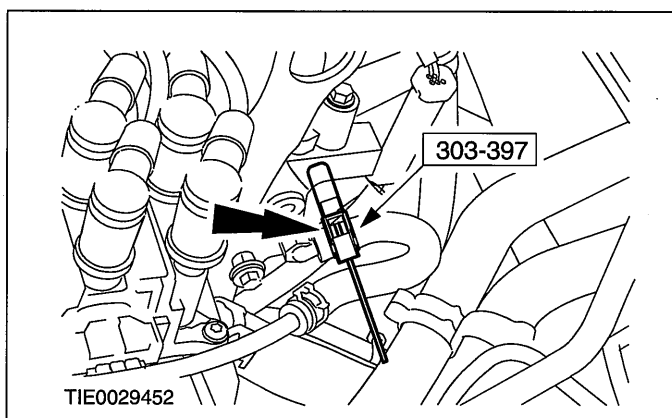
- 64. Attach the coolant expansion tank to the bracket.**



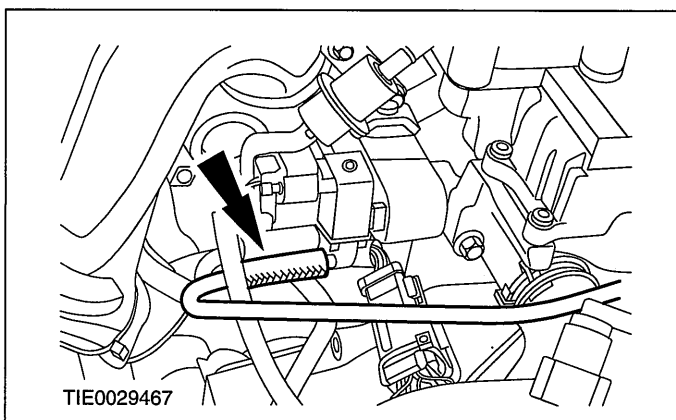
- 62. Attach the brake booster vacuum line to the intake manifold.**



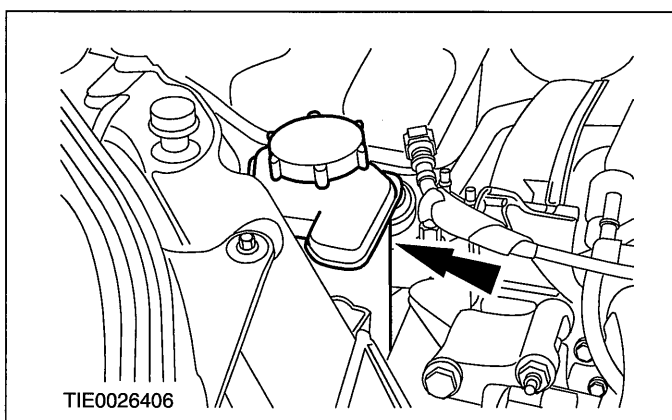
- 65. Using the special tool, connect the degas hose to the cylinder head.**



- 63. Connect the low pressure evaporate emission (EVAP) hose to the EVAP valve.**



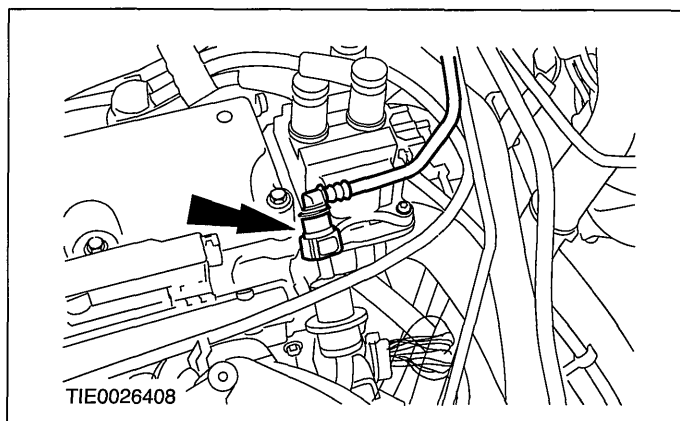
- 66. Attach the power steering fluid reservoir to the bracket.**



INSTALLATION

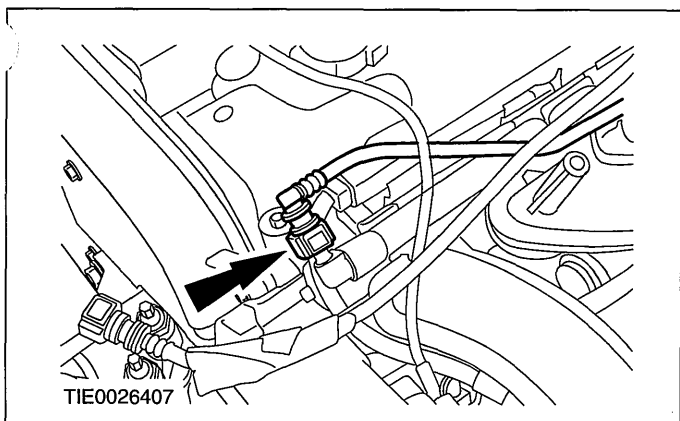
- 67. Connect the fuel supply line quick release coupling.**

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



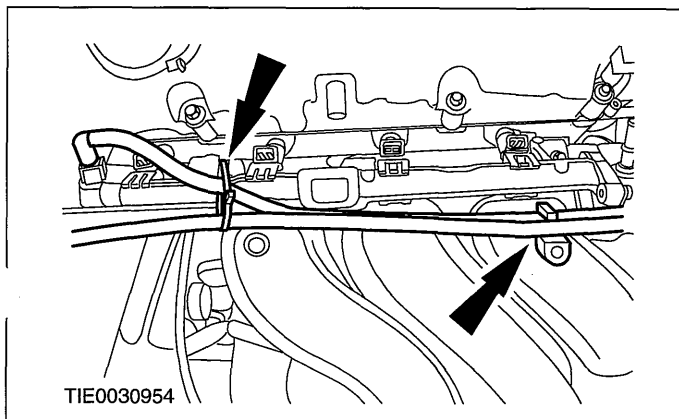
- 68. Connect the fuel return line quick release coupling.**

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

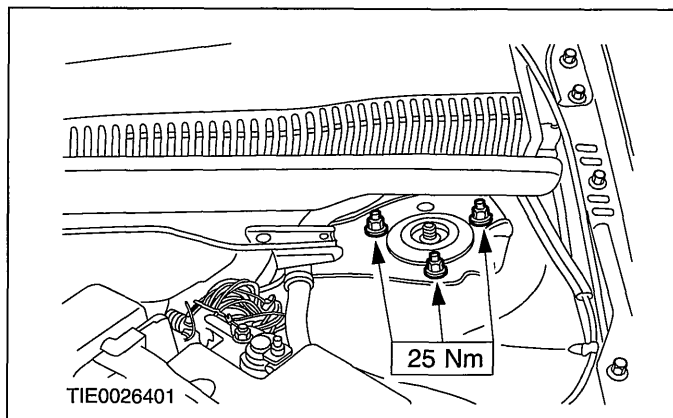


- 69. Attach the fuel line and the degas line to the intake manifold.**

- Install the cable tie.



- 70. Tighten the strut and spring assembly top mount nuts on both sides.**



- 71. Connect the powertrain control module (PCM) electrical connector.**

For additional information, refer to: Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation).

- 72. Install the air cleaner.**

For additional information, refer to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

- 73. Install the front wheels and tires.**

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

- 74. Fill the engine cooling system.**

For additional information, refer to: Cooling System Draining, Filling and Bleeding - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam) (303-03A, General Procedures).

- 75. Check the transmission fluid level and top up with clean automatic transmission fluid if necessary.**

For additional information, refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).



SECTION 303-01B Engine — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS PAGE

SPECIFICATIONS

Specifications.....	303-01B-3
Engine Data.....	303-01B-3
Engine Oil.....	303-01B-3
Oil system.....	303-01B-3
Engine Oil Capacity.....	303-01B-4
Valve Dimensions.....	303-01B-4
Camshaft Dimensions.....	303-01B-4
Crankshaft Dimensions.....	303-01B-4
Piston Dimensions.....	303-01B-4
Cylinder Head.....	303-01B-4
Cylinder Block.....	303-01B-4

DESCRIPTION AND OPERATION

Engine.....	303-01B-8
-------------	-----------

DIAGNOSIS AND TESTING

Engine.....	303-01B-15
-------------	------------

GENERAL PROCEDURES

Valve Clearance Adjustment.....	303-01B-16
---------------------------------	------------

IN-VEHICLE REPAIR

Intake Manifold.....	(21 183 0)	303-01B-21
Crankshaft Front Seal.....	(21 467 0)	303-01B-25
Crankshaft Pulley.....	(21 572 0)	303-01B-26
Valve Seals.....	(21 238 0)	303-01B-35
Valves.....	(21 215 4)	303-01B-37
Camshafts.....	(21 284 0)	303-01B-39
Oil Pan.....	(21 154 0)	303-01B-49
Oil Pump.....	(21 714 0)	303-01B-54
Crankshaft Rear Seal.....	(21 468 4)	303-01B-56
Engine Front Cover.....	(21 148 0)	303-01B-60
Exhaust Manifold.....		303-01B-64
Timing Chain.....	(21 314 0)	303-01B-67
Cylinder Head.....	(21 163 0)	303-01B-69

REMOVAL

Engine.....	303-01B-74
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DISASSEMBLY

Engine.....	(21 134 8)	303-01B-83
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ASSEMBLY

Engine..... (21 134 8) 303-01B-3

INSTALLATION

Engine..... 303-01B-111

SPECIFICATIONS**Engine Data**

Description		
Engine code	N4JA	N4JB
Emission level	Stage III	Stage IV
Firing order	1-3-4-2	1-3-4-2
Bore	87.5 mm	87.5 mm
Stroke	83.1 mm	83.1 mm
Cubic capacity	1998 cm ³	1998 cm ³
Compression ratio	10.8 : 1	10.8 : 1
Power output 6000 rpm	110 kW (150 PS)	110 kW (150 PS)
Maximum torque at 4500 rpm	190 Nm	190 Nm
Maximum engine speed (intermittent)	7000 rpm	7000 rpm
Maximum engine speed (continuous)	6500 rpm	6500 rpm
Idle speed	700 rpm	700 rpm
Number of main bearings	5	5
Camshaft drive	Chain	Chain
Maximum oil consumption	0.5l/1000 km	0.5l/1000 km

Engine Oil

Viscosity /ambient temperature	Type	Specification
Recommended engine oil		
SAE 5W-30 /below -20°C to over +40°C	Ford Formula E	WSS-M2C913-B
Alternative engine oils (for top-up only)		
SAE 10W-40 /-20°C to over +40°C	Ford Formula XR+	ACEA A3/B3
SAE 5W-40 /below -20°C to over +40°C	Ford Formula S	ACEA A3/B3
If other types of engine oil are used, these must conform at least to the respective API SH/EC viscosity class.		

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Silicone sealant, oil pan contact surface to crankshaft rear seal retainer, oil pan to cylinder block, oil pan to engine front cover, engine front cover to cylinder block/oil pan	WSE-M4G323-A4
Oil pressure switch and engine front cover blanking plug adhesive	WSK-M2G349-A7
Silicone grease	ESE-M1C171-AA

Oil system

Description	bar
Pressure relief valve opening pressure	5

SPECIFICATIONS**Engine Oil Capacity**

Description	Liters
Initial fill, including oil filter	4.6
Service fill including filter	4.3
Service fill excluding filter	3.9

Valve Dimensions

Description	mm
Valve clearance (engine cold), intake	0.22 - 0.28
Valve clearance (engine cold), exhaust	0.27 - 0.33
Valve stem diameter, intake	5.470 - 5.485
Valve stem diameter, exhaust	5.465 - 5.480

Camshaft Dimensions

Description	mm
Camshaft journal diameter	24.97 ± 0.01
Camshaft journal clearance	0.035 - 0.080
Camshaft endplay	0.09 - 0.24
Camshaft lobe lift, intake	8.8
Camshaft lobe lift, exhaust	7.7

Crankshaft Dimensions

Description	mm
Crankshaft endplay	0.335 ± 0.115

Piston Dimensions

Description	mm
Piston diameter - Class 1	87.465 - 87.475
Piston diameter - Class 2	87.475 - 87.485
Piston diameter - Class 3	87.485 - 87.495

Cylinder Head**CAUTION:** The mating face of the cylinder head must not be reworked.

Description	mm
Maximum distortion (mating face)	0.1

Cylinder Block

Description	mm
Cylinder bore diameter	87.500 + 0.030
Cylinder block distortion (maximum)	0.1

SPECIFICATIONS**Torque Specifications**

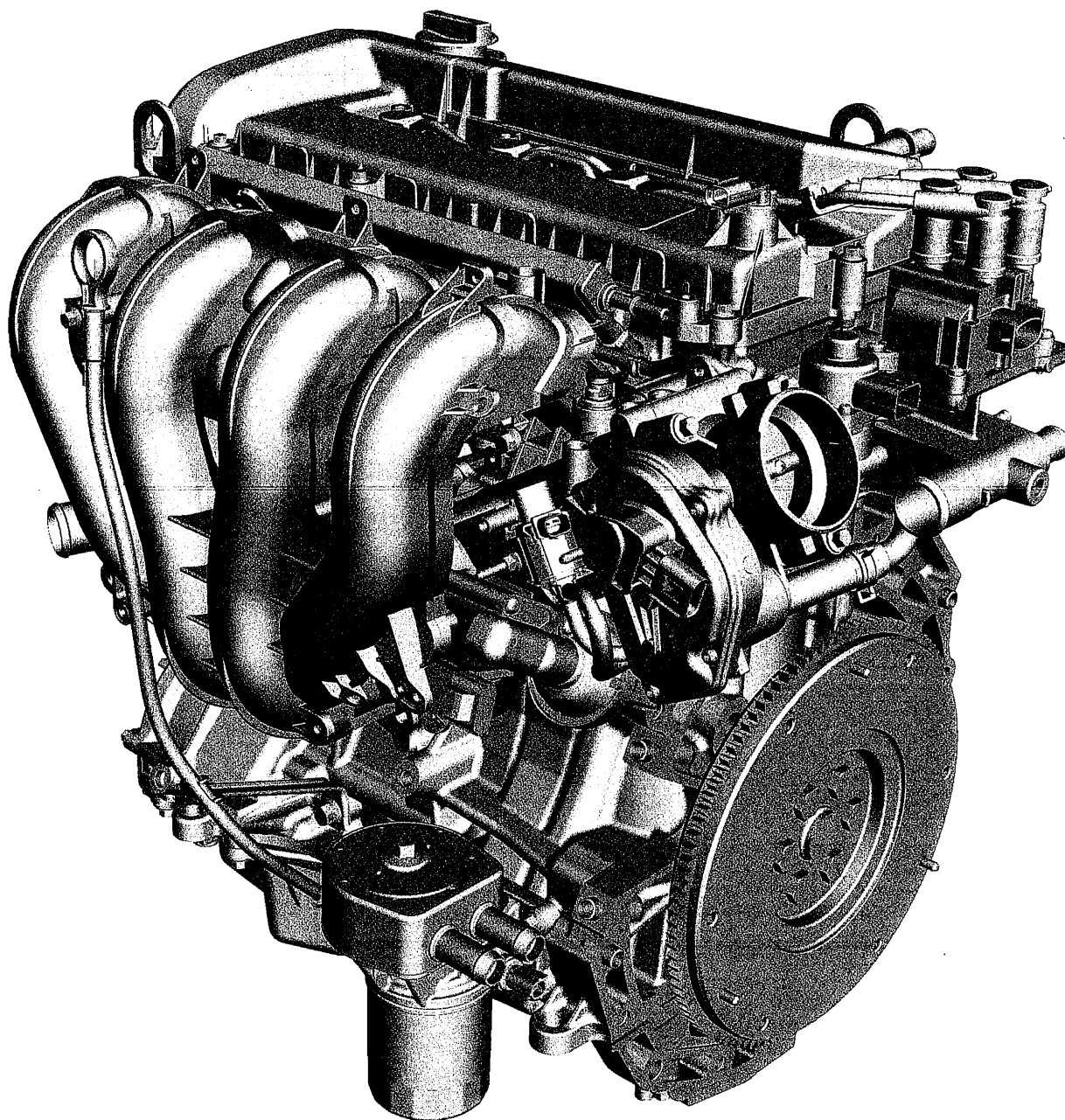
Description	Nm	lb-ft	lb-in
Air cleaner retaining bracket	8	-	71
Air cleaner resonator support bracket retaining bolts	15	11	-
Battery cable to generator electrical connector	15	11	-
Battery tray support bracket retaining bolts	25	18	-
Cylinder head retaining bolts	a)	-	-
Camshaft bearing caps retaining bolts	a)	-	-
Camshaft sprocket retaining bolts	72	53	-
Camshaft position (CMP) sensor retaining bolt	6	-	53
Engine front cover retaining bolts	a)	-	-
Engine front cover upper blanking plug	10	-	89
Engine front cover lower blanking plug	12	9	-
Engine support insulator retaining bolts	48	35	-
Engine wiring harness bracket to valve cover retaining nut	10	-	89
Generator upper retaining bolt	25	18	-
Hood latch lever retaining bolts	15	11	-
Crankshaft pulley retaining bolts	a)	-	-
Coolant expansion tank retaining nut	8	-	71
Coolant plug to cylinder block	43	32	-
Coolant plugs (4) to cylinder head	75	55	-
Power steering pump retaining bolt	23	17	-
Power steering reservoir retaining bolts	9	-	80
Power steering pipe to the power steering	65	48	-
Power steering bracket retaining nut	15	11	-
Power steering supply line to intake manifold retaining bolt	11	8	-
Power steering high-pressure line retaining bracket retaining bolt	30	22	-
Power steering return line support bracket retaining nut	15	11	-
Exhaust manifold bracket retaining bolts	25	18	-
Exhaust manifold upper heat shield retaining bolts	10	-	89
Exhaust manifold lower heat shield retaining bolts	10	-	89
Exhaust manifold to the cylinder head retaining nuts	55	41	-
Exhaust manifold studs to cylinder head	17	13	-

SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Evaporative emission (EVAP) valve retaining bracket retaining nut and bolt	10	-	89
Cylinder block blanking plug	20	15	-
Coolant pump pulley retaining bolts	25	18	-
Coolant pump retaining bolts	10	-	89
Valve cover retaining bolts	10	-	89
Oil level indicator and oil level indicator tube upper retaining bolt	10	-	89
Oil level indicator and oil level indicator tube lower retaining bolt	10	-	89
Oil pressure switch	15	11	-
Oil pan retaining bolts	25	18	-
Oil drain plug	28	21	-
Oil cooler to oil filter adaptor retaining bolt	34	25	-
Crankshaft rear seal carrier retaining bolts	10	-	89
Flywheel retaining bolts	a)	-	-
Oil filter adaptor retaining bolts	25	18	-
Positive crankcase ventilation housing retaining bolts	10	-	89
Knock sensor retaining bolt	20	15	-
Thermostat housing retaining bolts	10	-	89
Oil pump retaining bolts	a)	-	-
Oil pump sprocket retaining bolt	25	18	-
Oil pump chain guide retaining bolts	10	-	89
Oil pump chain tensioner retaining bolt	10	-	89
Timing chain guide retaining bolts	10	-	89
Timing chain tensioner retaining bolts	10	-	89
Crankshaft position sensor retaining bolts	7	-	62
Accessory drive belt idler pulley retaining bolt	25	18	-
Intake manifold retaining bolts	18	13	-
Transaxle left-hand retaining bolts	44	32	-
Transaxle right-hand retaining bolts	44	32	-
Transaxle lower retaining bolts	40	30	-
Halfshaft center bearing carrier retaining bolts	48	35	-
Intermediate shaft bearing cap retaining nuts	25	18	-
Lower arm ball joint retaining bolt	48	35	-

SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Wiring harness retaining bracket nuts	20	15	-
Starter motor retaining bolts	35	26	-
Air conditioning (A/C) compressor retaining bolts	20	15	-
Engine rear mount retaining nut	90	66	-
Engine front mount studs to front cover	12	9	-
Engine front mount retaining bolts	48	35	-
Engine front mount retaining nuts	115	85	-
Strut and spring assembly top mount retaining nuts	25	18	-
Spark plugs	12	9	-
a) Refer to the procedure in this section.			

DESCRIPTION AND OPERATION**Engine****Engine**

E58244

For the Fiesta ST the engine is available with the following specification:

2.0L Duratec-HE (MI4) engine	
Engine code	N4JA (Stage III), N4JB (Stage IV)
Displacement	1998 cm ³
Maximum power output	110 kW (150 PS) at 6000 rpm
Maximum torque	190 Nm at 4000 rpm

DESCRIPTION AND OPERATION

2.0L Duratec-HE (MI4) engine	
Emission standard	European Emissions Standard Stage IV (Stage III, depending on country)

The complete engine is made of cast aluminum which, when combined with the plastic intake manifold, gives a very light unit.

NOTE: Due to the fine tolerance in the bearing clearances and bearing shells, no service operations whatsoever are permitted on the crank assembly. In the event of damage, the complete cylinder block and crank assembly must be changed.

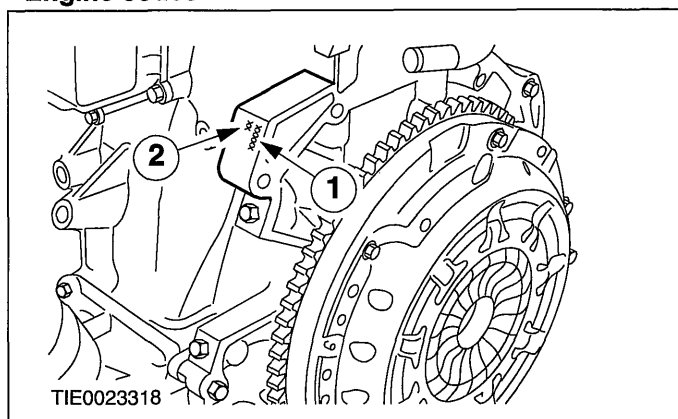
Further design features include a ladder frame incorporating the main bearing caps which support the crankshaft in the cylinder block, and the deep-drawn side walls of the cylinder block which reduce engine vibration.

The camshafts are driven by a pinned link chain which runs very quietly and is also maintenance-free.

The engine management for the 2.0L Duratec-HE (MI4) is provided by a Visteon system.

This engine management systems controls the sequential multipoint fuel injection (SFI) and the electronically controlled coolant-cooled exhaust gas recirculation (EGR) valve.

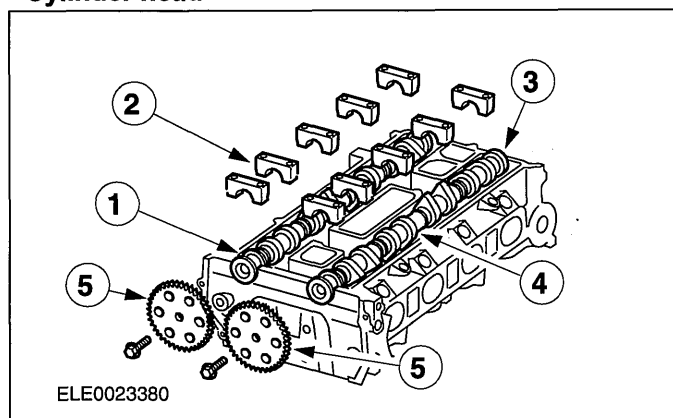
Engine codes



Item	Description
1	Engine code
2	Engine serial number

The engine code and the engine serial number are stamped on the right-hand side of the cylinder block on the flywheel side of the engine.

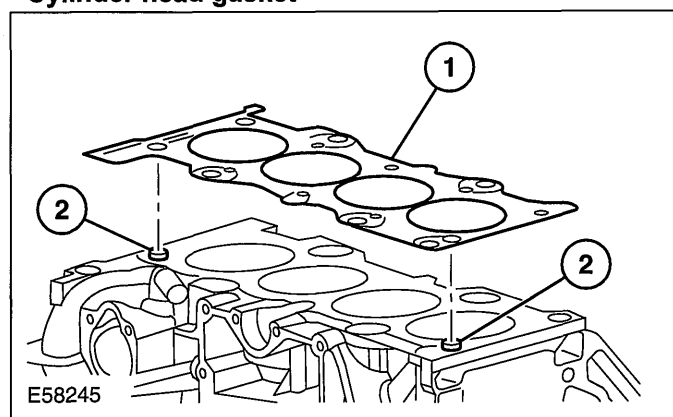
Cylinder head



Item	Description
1	Exhaust camshaft
2	Camshaft bearing cap
3	Cam to identify cylinder No. 1
4	Intake camshaft
5	Camshaft sprockets

The design and the valve arrangement in the cylinder head is similar to the head of the Zetec-SE engines.

Cylinder head gasket



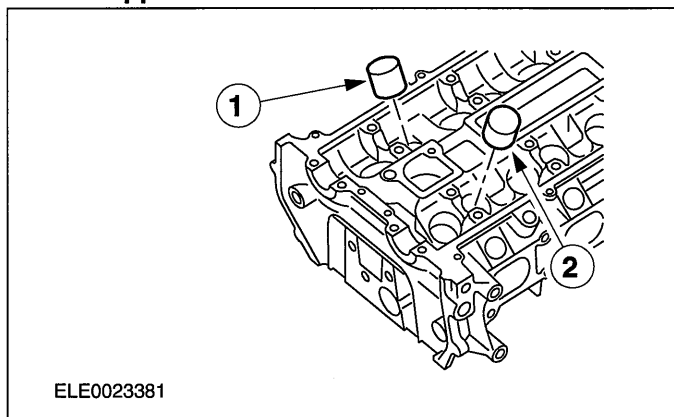
Item	Description
1	Cylinder head gasket
2	Locating dowels

A four-layer laminated steel cylinder head gasket is used.

The cylinder head gasket and cylinder head are located with two locating dowels.

DESCRIPTION AND OPERATION

Valve tappets



ELE0023381

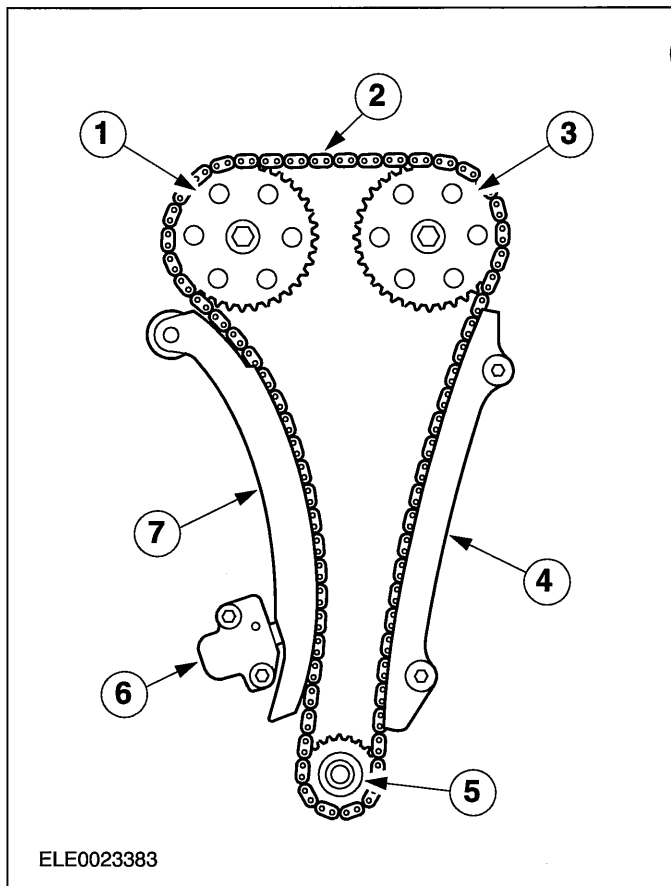
Item	Description
1	Exhaust valve tappet
2	Intake valve tappet

Mechanical tappets are fitted without adjusting shims.

Due to the special materials and the optimized camshaft profiles, the wear in the area of the valve gear is so minute that checking and adjustment of the valve clearances is only necessary after the engine has been in extensive service.

Different sizes of replacement valve tappets are available in the event of wear or repairs to the valve gear.

Camshaft drive



ELE0023383

Item	Description
1	Exhaust camshaft sprocket
2	Timing chain
3	Intake camshaft sprocket
4	Timing chain guide
5	Crankshaft sprocket
6	Hydraulic timing chain tensioner
7	Timing chain tensioner arm

The camshafts are driven by a low-noise, maintenance-free pinned link timing chain.

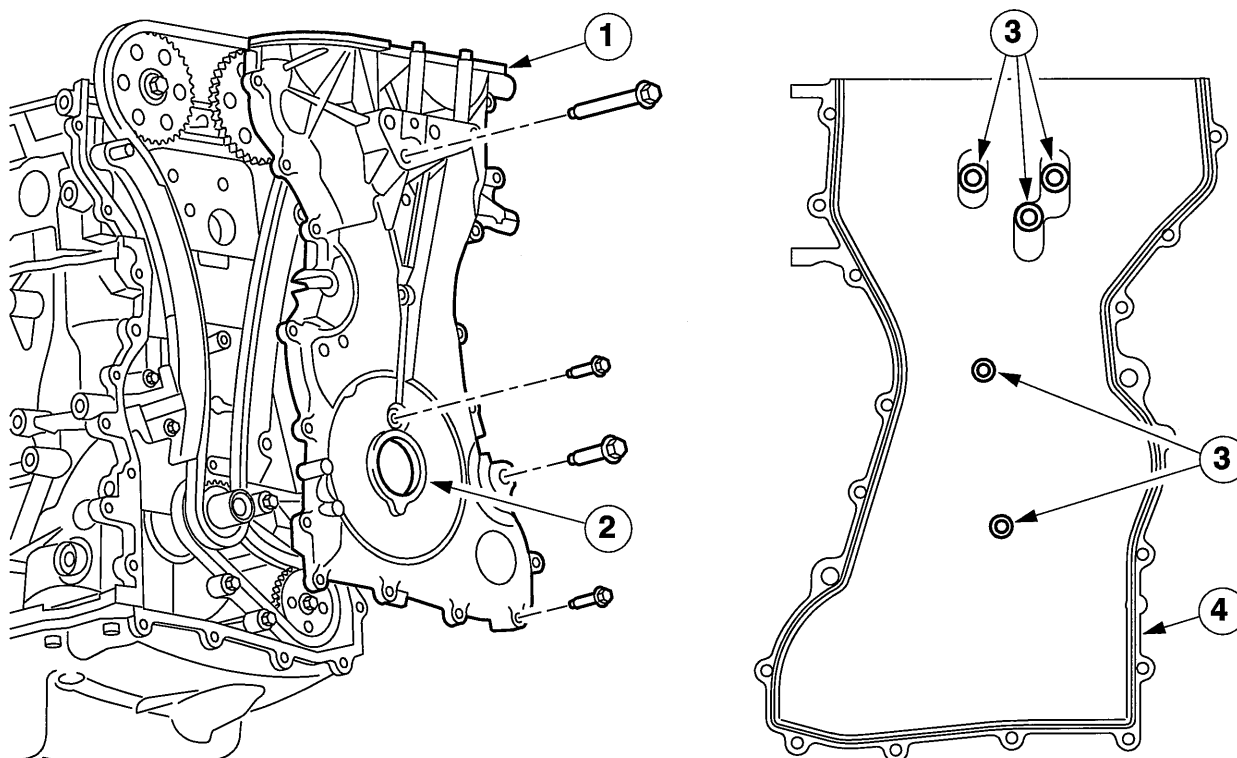
The timing chain is lubricated by the engine oil circuit.

An elongated timing chain guide and a timing chain tensioner arm ensure optimum timing chain guidance and silent running.

The timing chain is tensioned by a hydraulic timing chain tensioner which is supplied from the engine oil circuit.

The timing chain tensioner can be used again after removal.

The camshaft drive requires no maintenance.

DESCRIPTION AND OPERATION**Engine front cover**

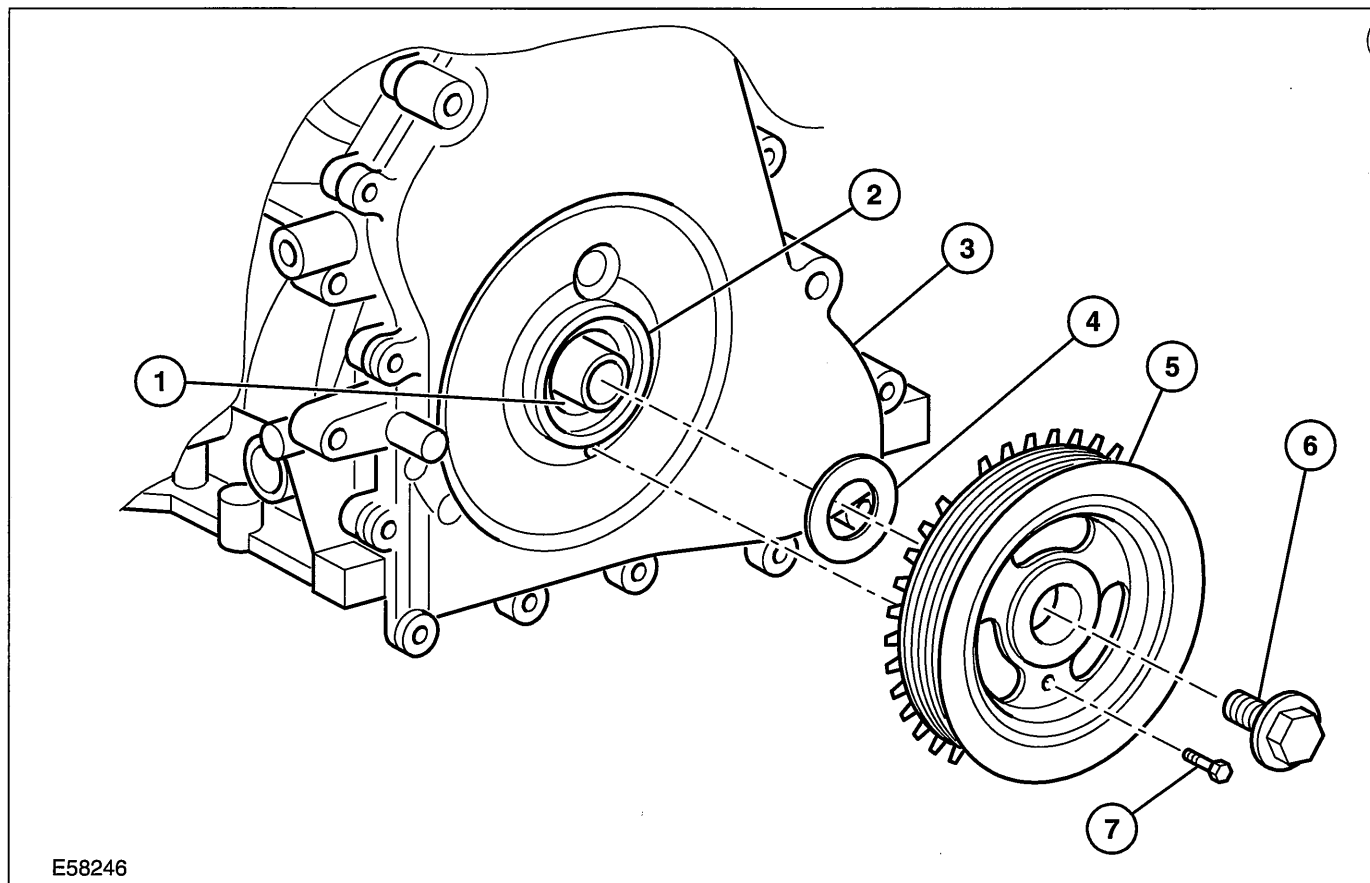
ELE0023384

Item	Description
1	Engine front cover
2	Crankshaft front seal
3	Silicone sealant for sealing at bores
4	Silicone sealant for sealing engine front cover

The camshaft drive is sealed with an aluminum engine front cover.

The crankshaft front seal is installed in the engine front cover.

The engine front cover is installed using silicone sealant.

DESCRIPTION AND OPERATION**Crankshaft pulley**

E58246

Item	Description
1	Crankshaft
2	Crankshaft front seal
3	Engine front cover
4	Friction washer
5	Crankshaft pulley
6	Crankshaft pulley retaining bolt
7	M6 bolt

The crankshaft pulley forms a unit with the rotor for indicating the crankshaft position.

It is secured to the crankshaft by the contact pressure of the retaining bolt (free to turn on the seat on the crankshaft).

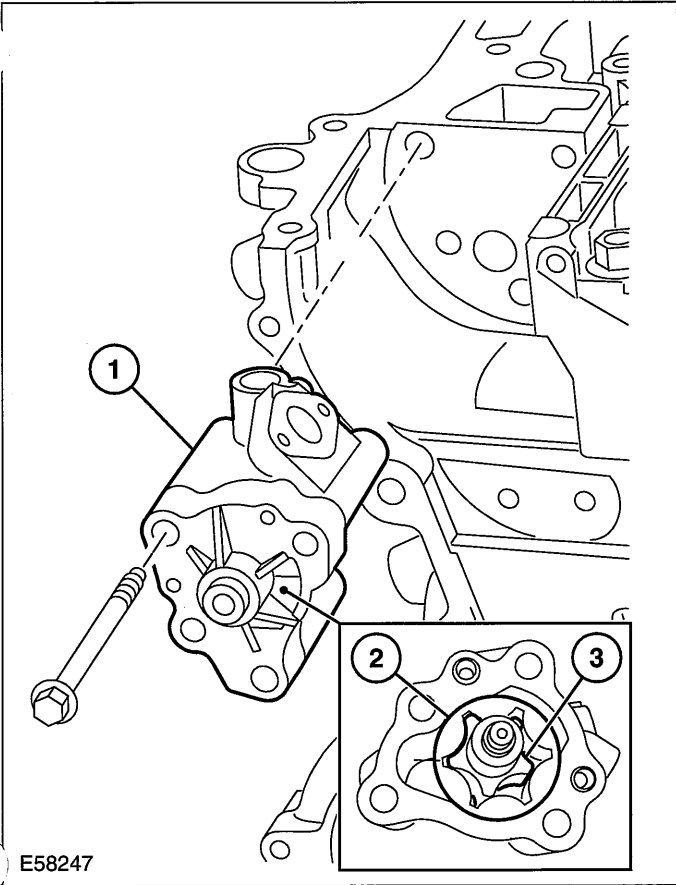
The crankshaft pulley retaining bolt must be changed after removal.

The crankshaft pulley is positioned with the aid of an M6 bolt.

NOTE: The M6 bolt must never be used as support when tightening the crankshaft pulley retaining bolt as this could damage the engine front cover.

DESCRIPTION AND OPERATION

Oil pump



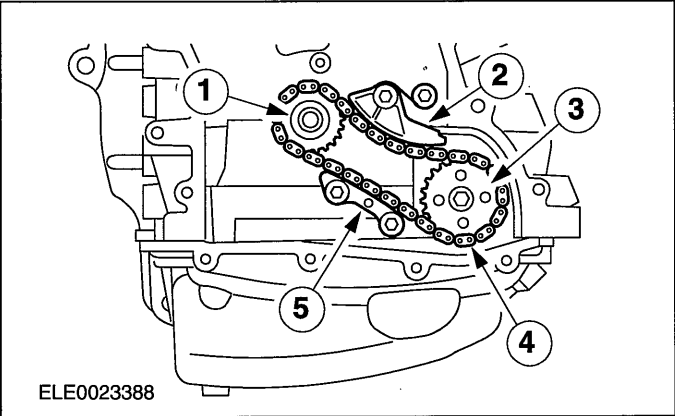
Item	Description
1	Oil pump
2	Oil pump outer rotor
3	Oil pump inner rotor

A rotor oil pump is used for engine lubrication.

The rotor oil pump is a positive displacement pump with an internally toothed outer rotor and an externally toothed inner rotor.

The rotor pump works very evenly, can produce high pressures and is therefore fundamental for optimum engine lubrication.

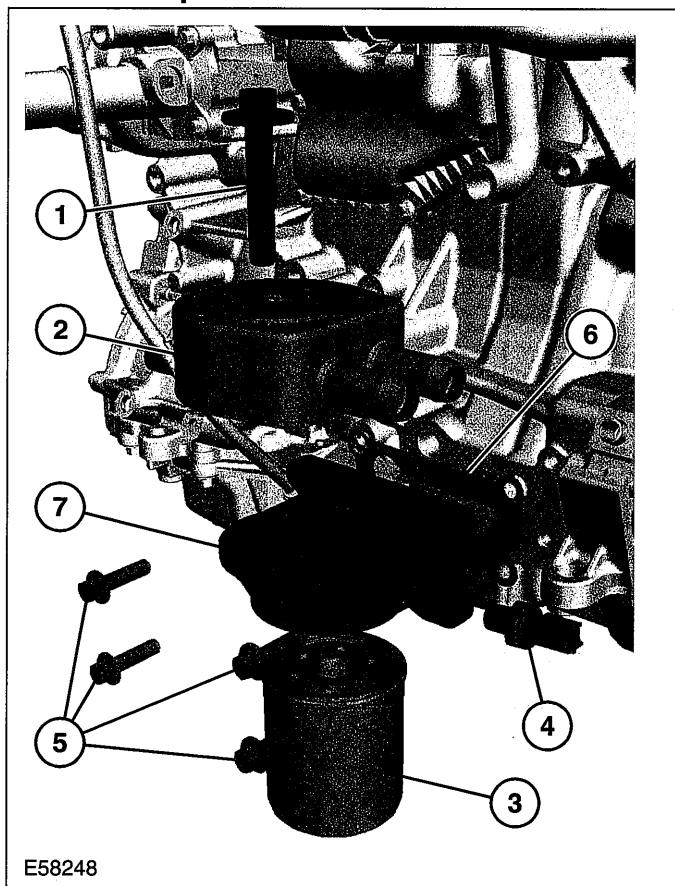
Oil Pump Drive



Item	Description
1	Crankshaft sprocket
2	Oil pump chain tensioner
3	Oil pump sprocket
4	Oil pump chain
5	Oil pump chain guide

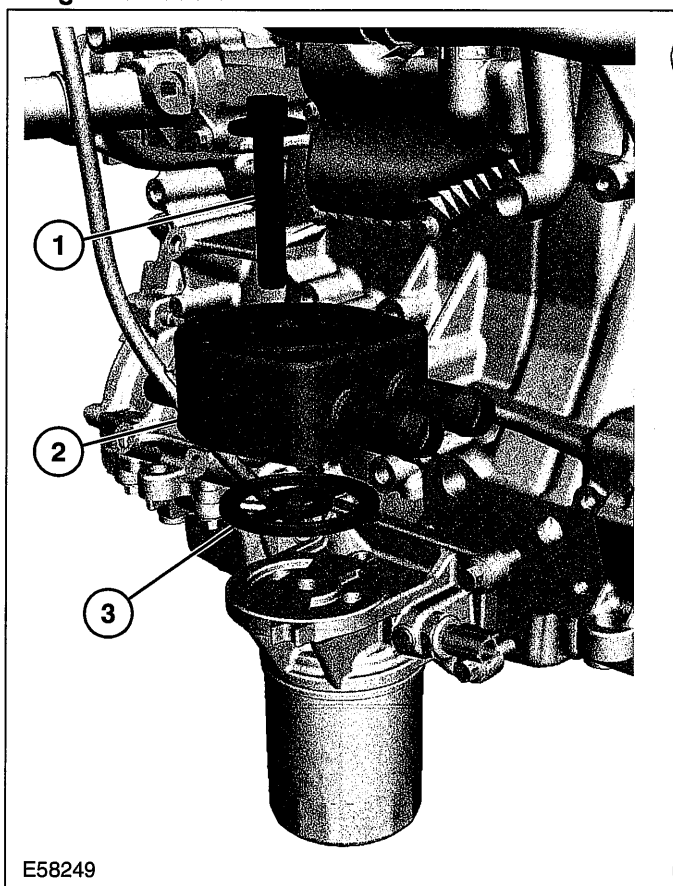
The oil pump is mounted on the cylinder block, on the engine front cover side at the bottom and driven directly from the crankshaft by a separate driving chain.

A oil pump chain guide and an oil pump spring-loaded chain tensioner ensure quiet maintenance-free operation.

DESCRIPTION AND OPERATION**Oil filter adapter**

Item	Description
1	Oil cooler retaining bolt
2	Oil cooler
3	Oil filter
4	Oil pressure switch
5	Oil filter adapter retaining bolts
6	Oil filter adapter gasket
7	Oil filter adapter

The oil filter adapter is mounted on the cylinder block with a gasket.

Engine oil cooler

Item	Description
1	Oil cooler retaining bolt
2	Oil cooler
3	Oil cooler O-ring seal

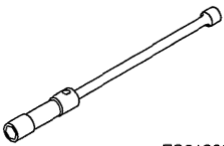
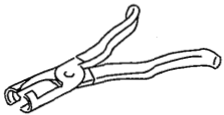
DIAGNOSIS AND TESTING**Engine**

REFER to Section 303-00 [Engine System - General Information].

GENERAL PROCEDURES

Valve Clearance Adjustment

Special Tool(s)

 ES21202	Socket, Spark Plug 303-499 (21-202)
 21211	Pliers, Valve Stem Seal 303-508 (21-211)

General Equipment

Feeler gauges

Materials

Name	Specification
Silicone Sealant	WSE-M4G323-A4

1. Disconnect the battery ground cable.

For additional information, refer to: **Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).**

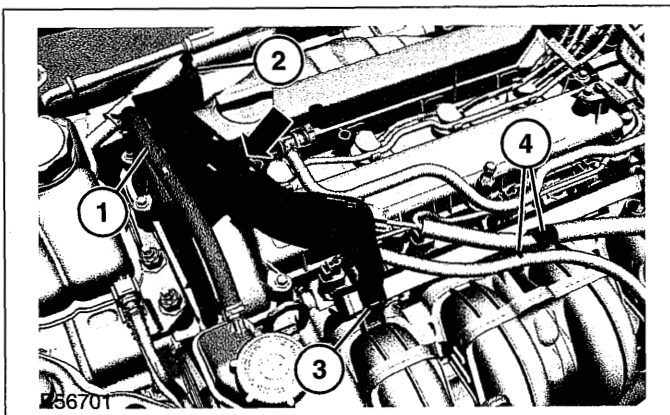
2. Remove the air cleaner.

For additional information, refer to: **Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).**

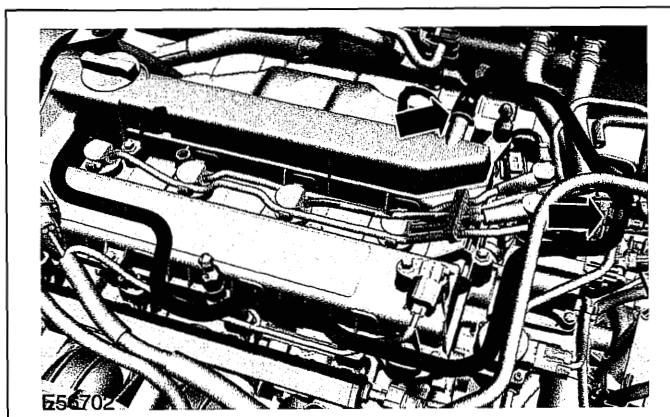
3. Detach the engine wiring harness from the valve cover.

1. Unclip the power steering return line from the engine wiring harness bracket.
2. Remove the air cleaner retaining bracket.
3. Unclip the engine wiring harness bracket from the intake manifold.

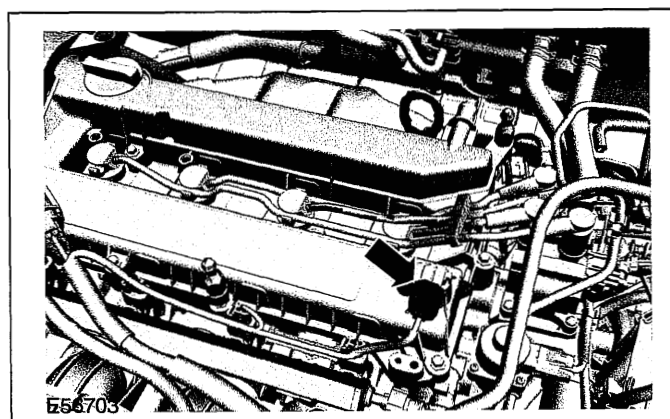
4. Unclip the engine wiring harness from the intake manifold.



4. Remove the positive crankshaft ventilation (PCV) hose.

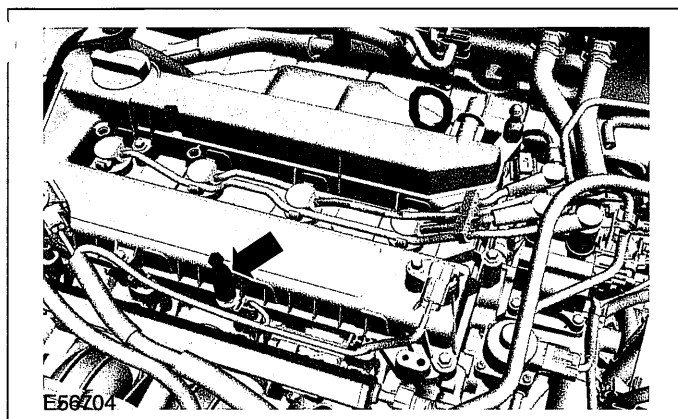


5. Disconnect the camshaft position (CMP) sensor electrical connector.

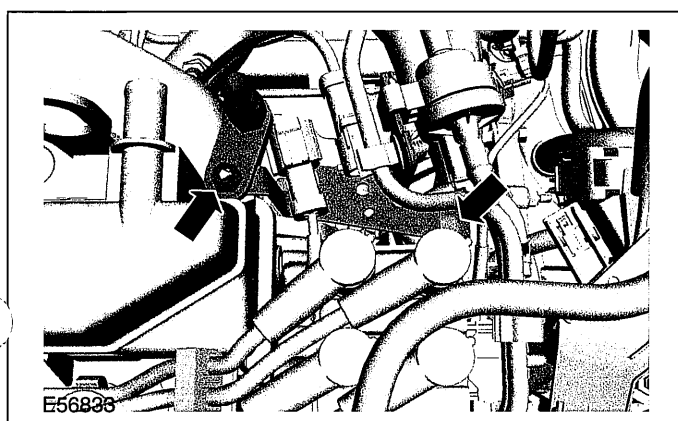


GENERAL PROCEDURES

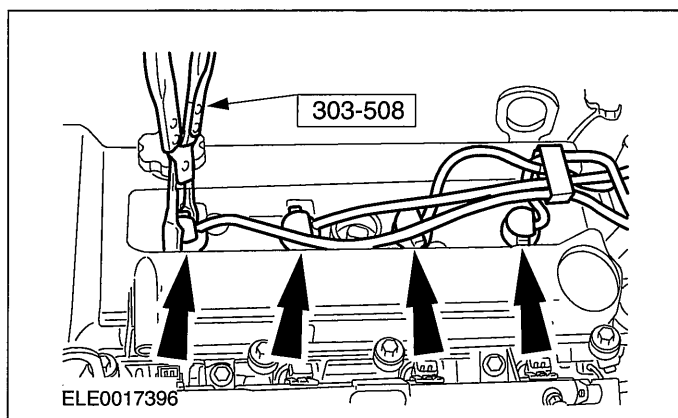
6. Remove the air cleaner retaining bracket.



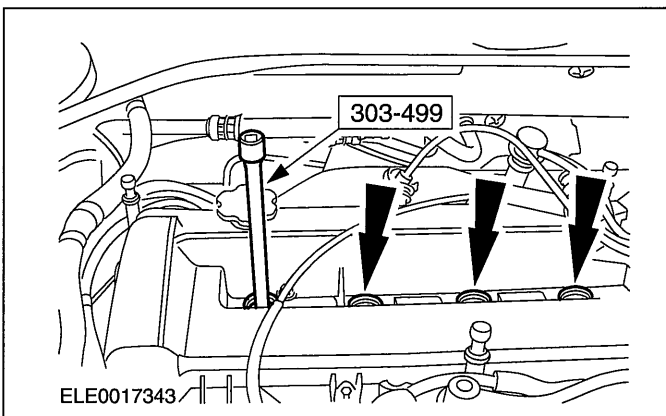
7. Remove the evaporative emission (EVAP) valve support bracket.



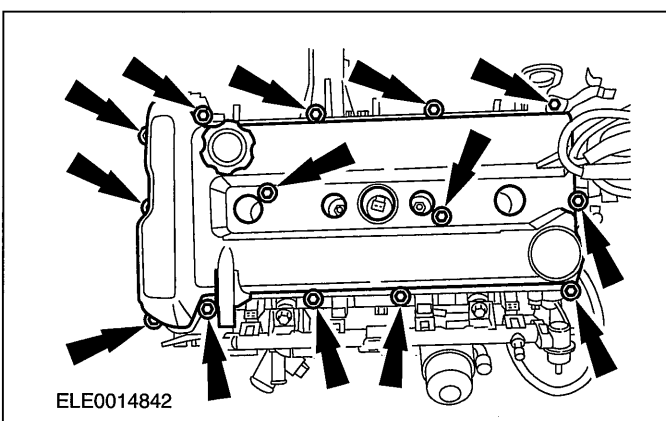
8. Using the special tool, disconnect the spark plug electrical connectors.



9. Using the special tool, remove the spark plugs.



10. Remove the valve cover.

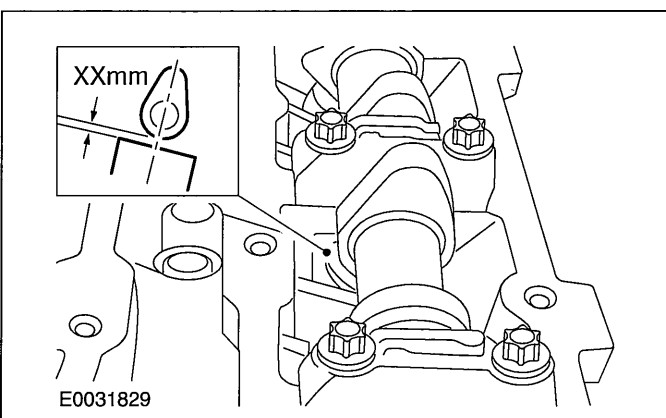


11. **CAUTION:** Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until piston No. 1 is at top dead center (TDC).

12. **NOTE:** Make a note of each cylinder number and the valve clearances measured.

Using a suitable set of feeler gauges, measure the valve clearances.



GENERAL PROCEDURES

13. **⚠ CAUTION:** Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until each piston is at TDC and measure the valve clearances.

14. **NOTE:** Only carry out the following steps when the valve clearance(s) require adjustment.

For additional information, refer to:
Specifications (303-01 Engine - 2.0L Duratec-HE (MI4), Specifications).

Remove the camshafts.

For additional information, refer to:
Camshafts (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

15. **NOTE:** The number on the valve tappet is the valve tappet thickness, however only the decimal places are marked (for example .650 = 3.650).

Determine the valve tappet thickness required:

1. Remove the valve tappet and read the thickness from the underside.
2. Valve tappet thickness required = thickness of currently installed valve tappet + the measured valve clearance - the required valve clearance.

For additional information, refer to:
Specifications (303-01 Engine - 2.0L Duratec-HE (MI4), Specifications).

3. Install the correct valve tappet.

16. **NOTE:** Do not install the valve cover at this stage.

Install the camshafts.

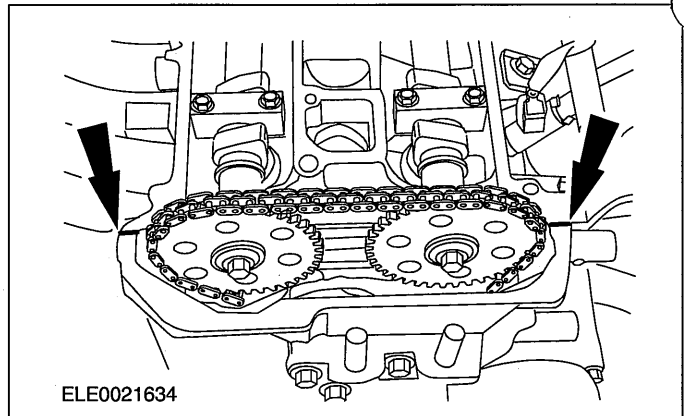
For additional information, refer to:
Camshafts (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

17. **⚠ CAUTION:** Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until each piston is at TDC and measure the valve clearances.

18. Repeat this procedure as necessary until all valve clearances are within the specified tolerance.

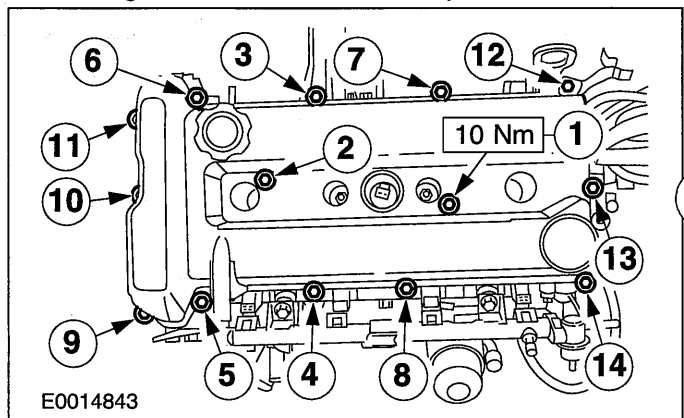
19. Apply a small bead of sealant to the areas as shown.



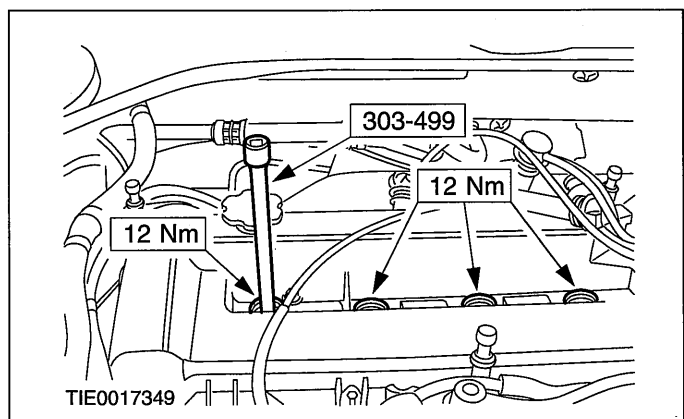
20. **NOTE:** Install a new valve cover gasket if necessary.

Install the valve cover.

- Tighten the bolts in the sequence shown.

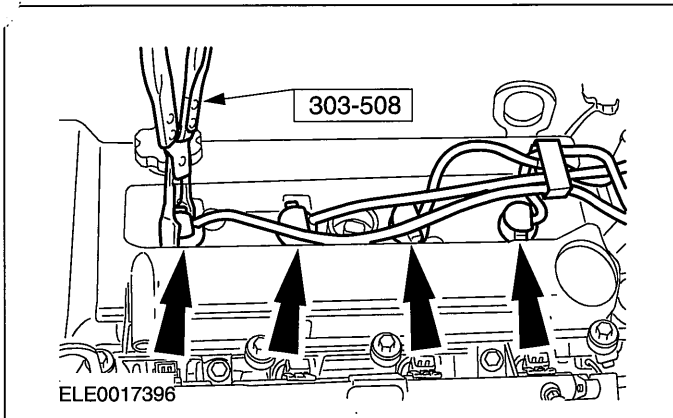


21. Using the special tool, install the spark plugs.

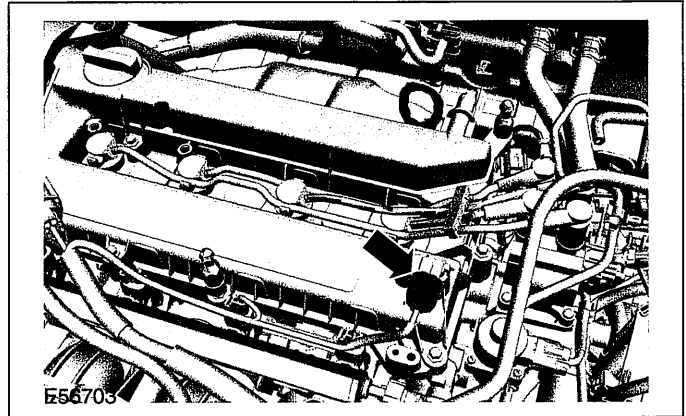


GENERAL PROCEDURES

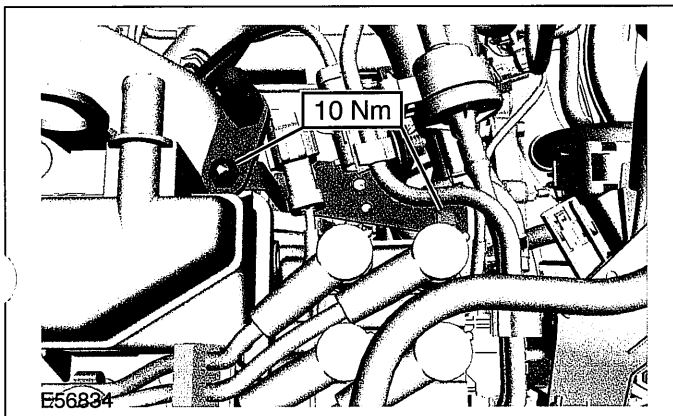
22. Using the special tool, connect the spark plug electrical connectors.



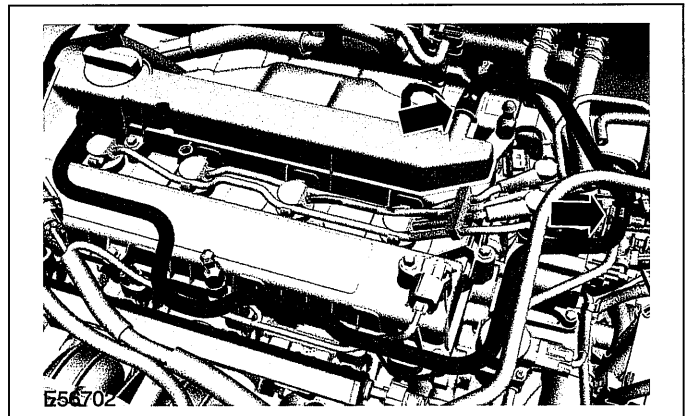
25. Connect the CMP sensor electrical connector.



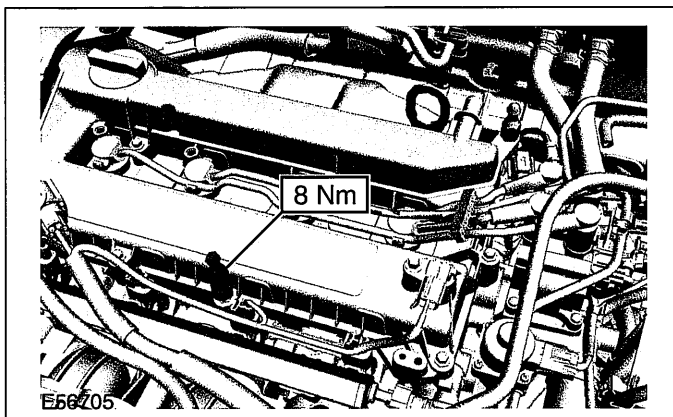
23. Install the evaporative emission (EVAP) valve support bracket.



26. Install the positive crankshaft ventilation (PCV) hose.

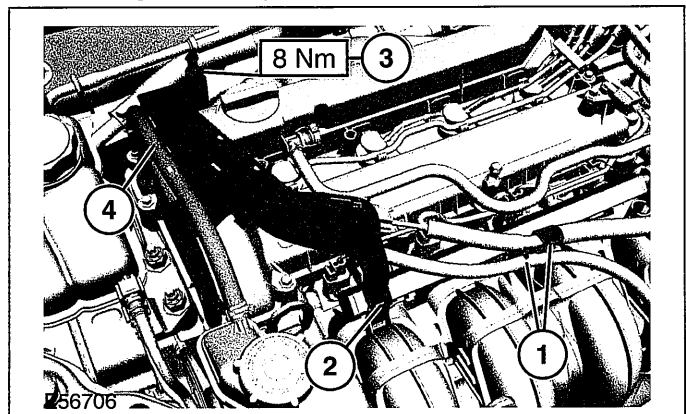


24. Install the air cleaner retaining bracket.



27. Attach the engine wiring harness to the valve cover.

1. Clip the engine wiring harness to the intake manifold.
2. Clip the engine wiring harness bracket to the intake manifold.
3. Install the air cleaner retaining bracket.
4. Clip the power steering return line to the engine wiring harness bracket.



GENERAL PROCEDURES**28. Install the air cleaner.**

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

29. Connect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

IN-VEHICLE REPAIR

Intake Manifold(21 183 0)

Removal

1. Disconnect the battery.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

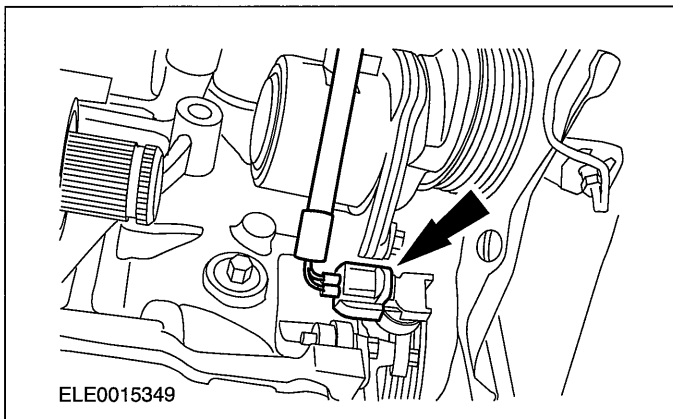
3. Remove the right-hand headlamp.

For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

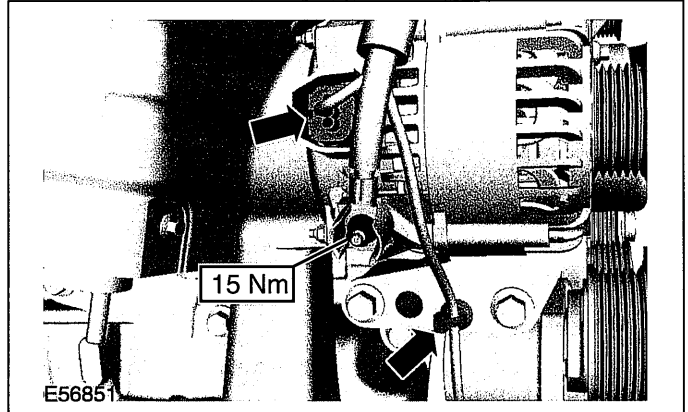
4. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation), Lifting (Description and Operation).

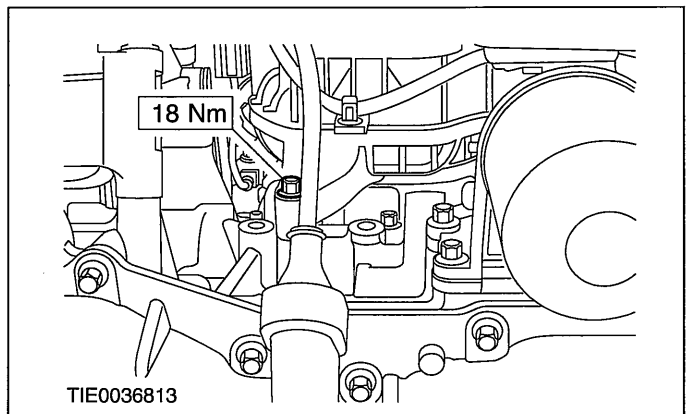
5. Disconnect the crankshaft position (CKP) sensor electrical connector.



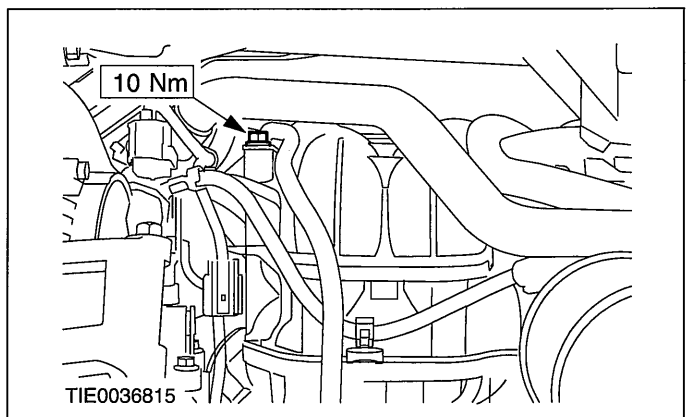
6. Disconnect the generator electrical connectors.



7. Remove the intake manifold lower retaining bolt.

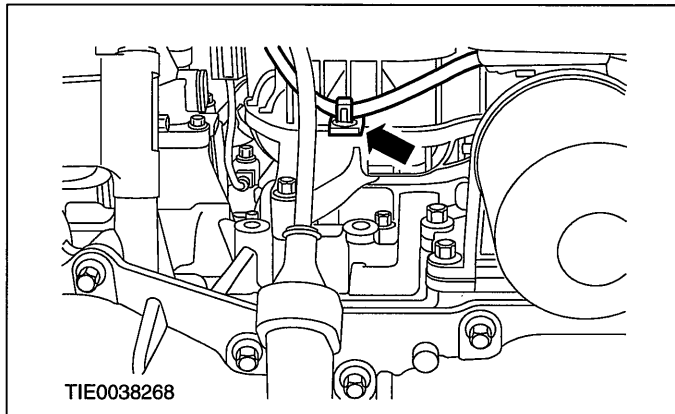


8. Remove the oil level indicator tube lower retaining bolt.

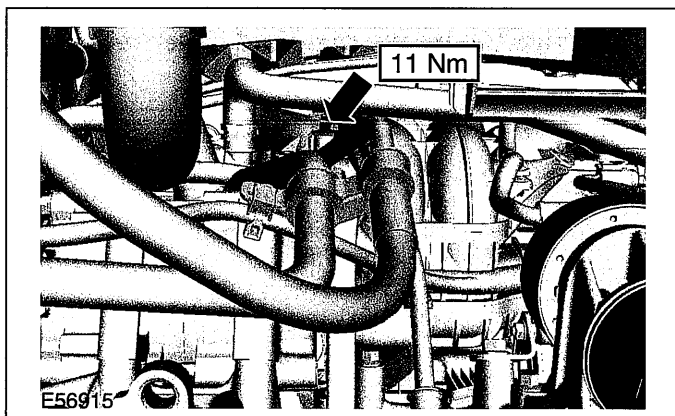


IN-VEHICLE REPAIR

9. Detach the wiring harness from the intake manifold.



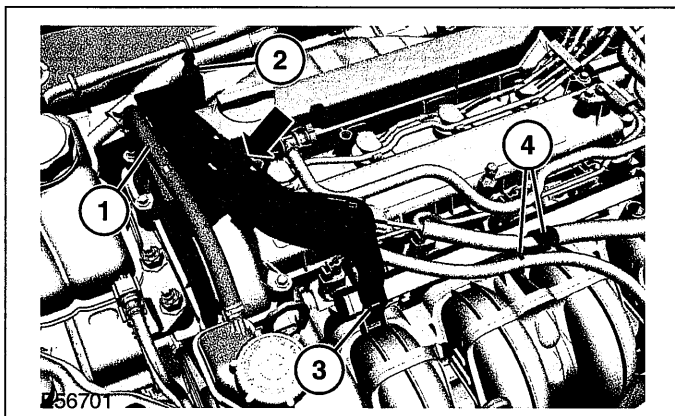
10. Detach the power steering supply line from the intake manifold.



11. Lower the vehicle.

12. Detach the engine wiring harness from the valve cover.

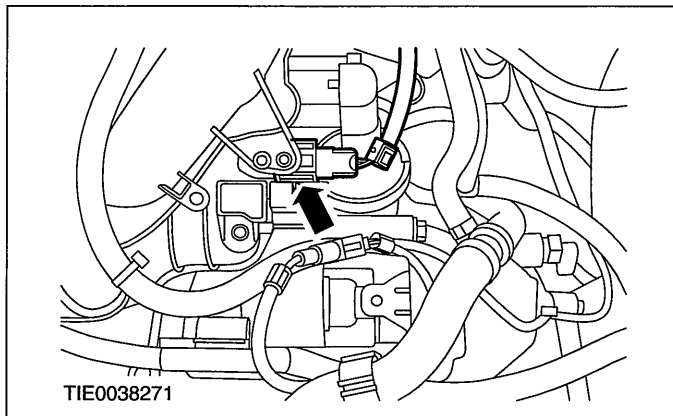
1. Unclip the power steering return line from the wiring harness bracket.
2. Remove the air cleaner retaining bracket.
3. Unclip the engine wiring harness bracket from the intake manifold.
4. Unclip the engine wiring harness from the intake manifold.



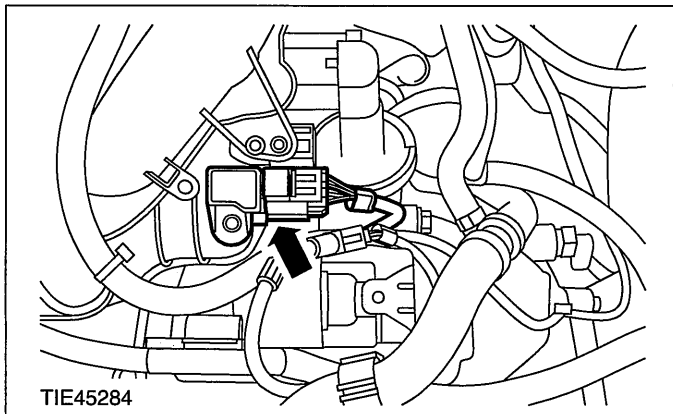
13. Remove the fuel rail.

For additional information, refer to: Fuel Rail (303-04 Fuel Charging and Controls - 2.0L Duratec-HE (MI4), Removal and Installation).

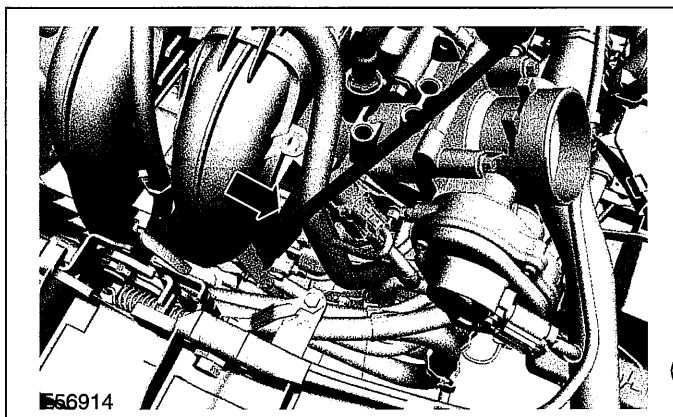
14. Detach the starter motor electrical connector from the intake manifold.



15. Disconnect the manifold absolute pressure (MAP) sensor electrical connector.

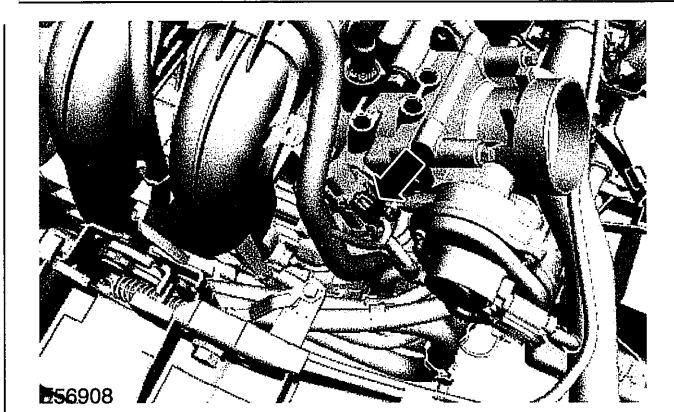


16. Detach the evaporative emission valve (EVAP) hose from the intake manifold.

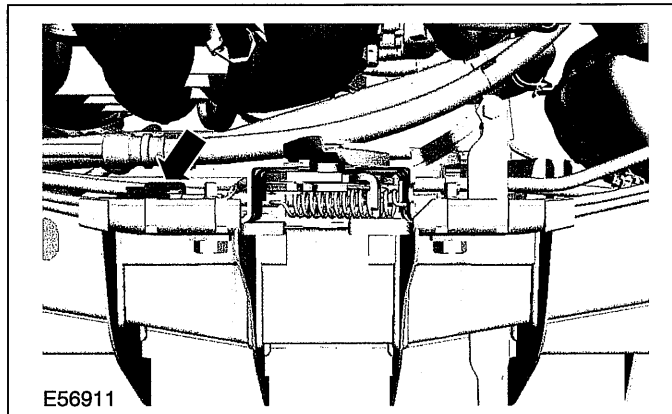


IN-VEHICLE REPAIR

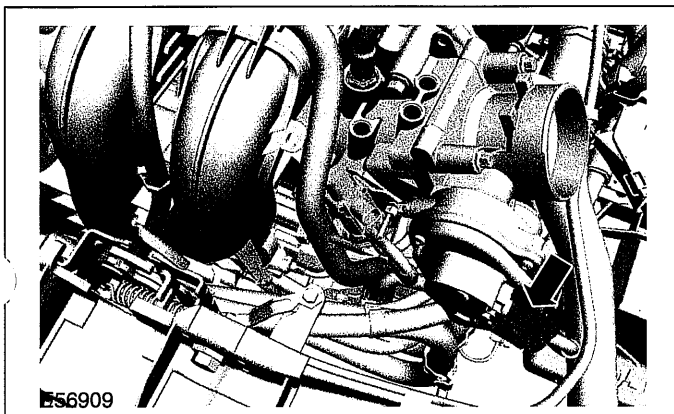
17. Disconnect the intake manifold runner control (IMRC) electrical connector.



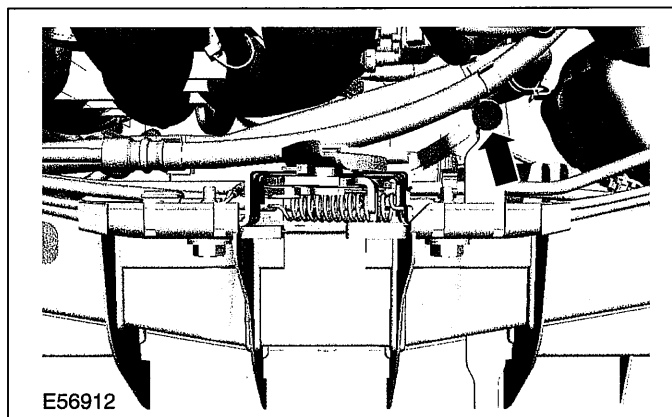
20. Disconnect the hood latch electrical connector.



18. Disconnect the throttle body electrical connector.

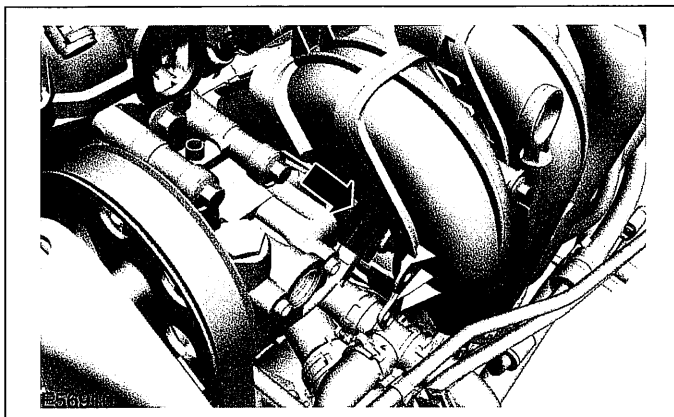


21. Remove the hood latch lever retaining bolt.

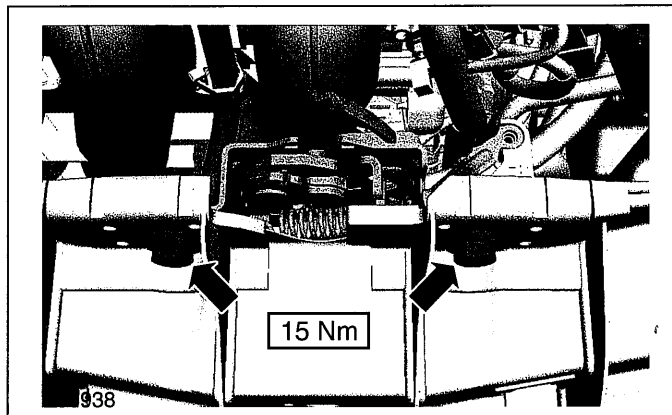


19. Disconnect the knock sensor (KS) electrical connector (power steering fluid reservoir shown removed for clarity).

- Detach the KS electrical connector from the intake manifold.

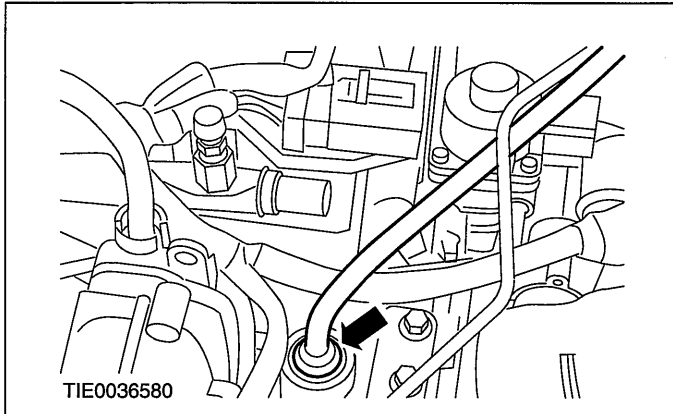


22. Detach the hood latch from the radiator grille opening panel reinforcement.

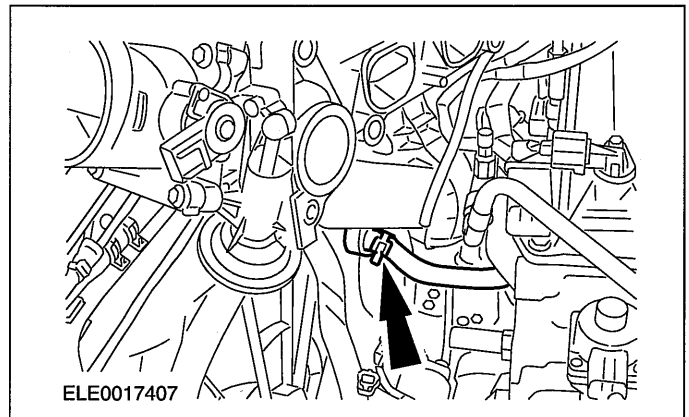


IN-VEHICLE REPAIR

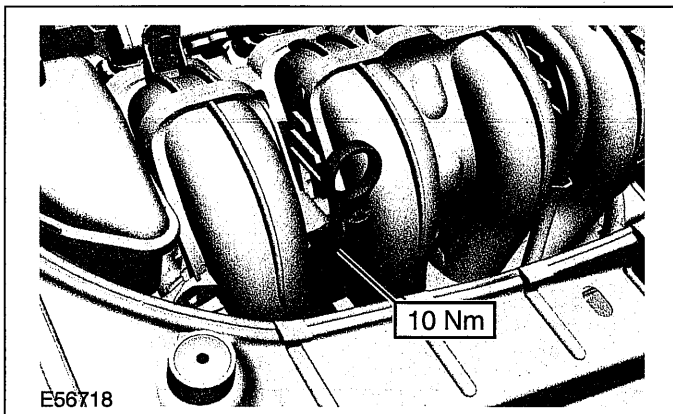
23. Disconnect the brake booster vacuum line from the intake manifold.



26. Disconnect the positive crankshaft ventilation (PCV) hose from the intake manifold.



24. Remove the oil level indicator and oil level indicator tube.



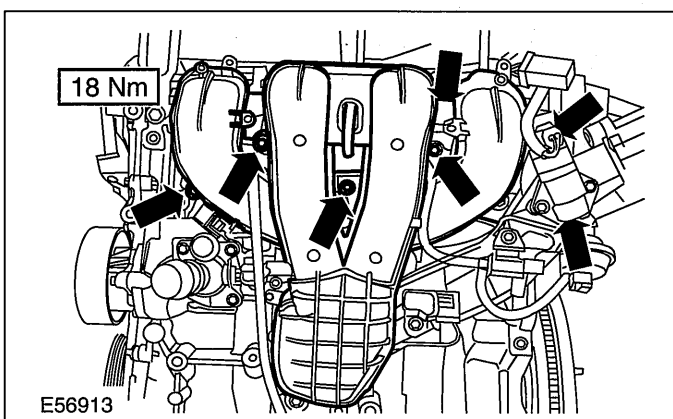
27. Remove the intake manifold.

Installation

1. **NOTE:** Install new gaskets if necessary.
To install, reverse the removal procedure.

25. Remove the intake manifold retaining bolts (engine shown removed for clarity).

- Detach the intake manifold from the cylinder head.



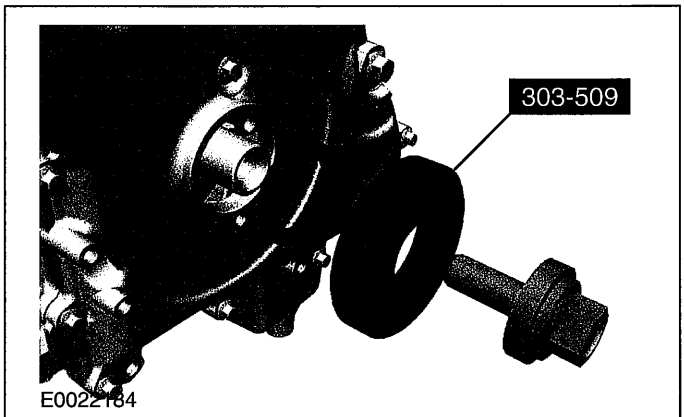
IN-VEHICLE REPAIR

Crankshaft Front Seal(21 467 0)

Special Tool(s)

 21143	Remover, Crankshaft Seal 303-293 (21-143)
 IA21213	Remover, Vibration Damper Hub 303-509 (21-213)

Using the special tool and the crankshaft pulley retaining bolt, install the crankshaft front seal (engine shown removed for clarity).



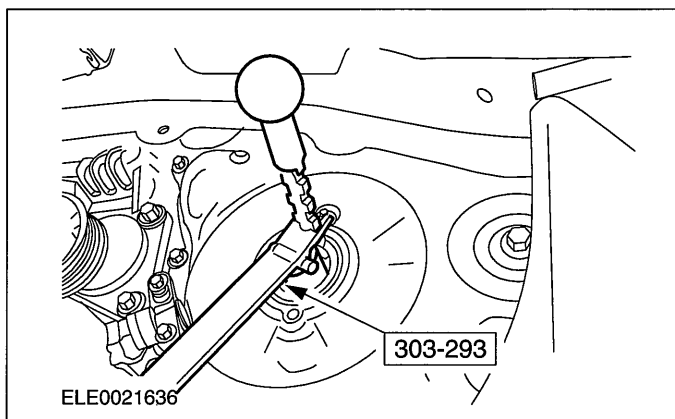
Removal

1. Remove the crankshaft pulley.

For additional information, refer to:
Crankshaft Pulley (303-01C, In-vehicle Repair).

2. Using the special tool, remove the crankshaft front seal.

- Discard the seal.



2. Remove the crankshaft pulley retaining bolt and the special tool.

- Discard the crankshaft pulley retaining bolt.

3. Install the crankshaft pulley.

For additional information, refer to:
Crankshaft Pulley (303-01C, In-vehicle Repair).

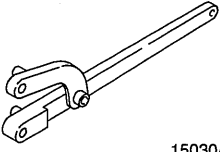
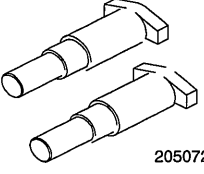
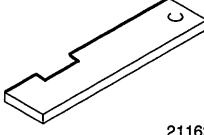
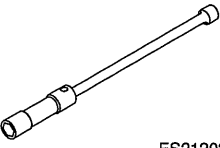
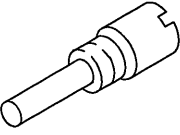
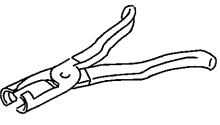
Installation

1. **NOTE:** Install a new crankshaft front seal.

IN-VEHICLE REPAIR

Crankshaft Pulley(21 572 0)

Special Tool(s)

 15030A	Flange Holding Wrench, Universal 205-072
 20507202	Adapter for 205-072 205-072-02
 21162B	Alignment Tool, Camshaft Alignment 303-376
 ES21202	Socket, Spark Plug 303-499
 PZ21210	Timing Peg, Crankshaft TDC position 303-507
 21211	Pliers, Valve Stem Seal 303-508 (21-211)

General Equipment

Bolt M6 x 18 mm

Materials

Name	Specification
Silicone sealant	WSE-M4G323-A4

Removal

1. Disconnect the battery.

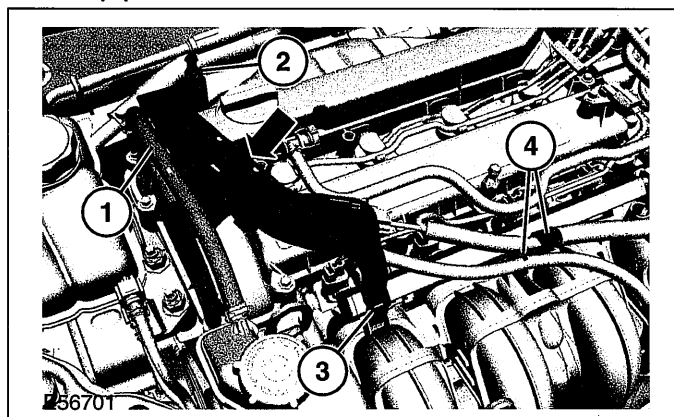
For additional information, refer to: **Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).**

2. Remove the air cleaner.

For additional information, refer to: **Air Cleaner - 2.0L Duratec-HE (M14) (303-12 Intake Air Distribution and Filtering, Removal and Installation).**

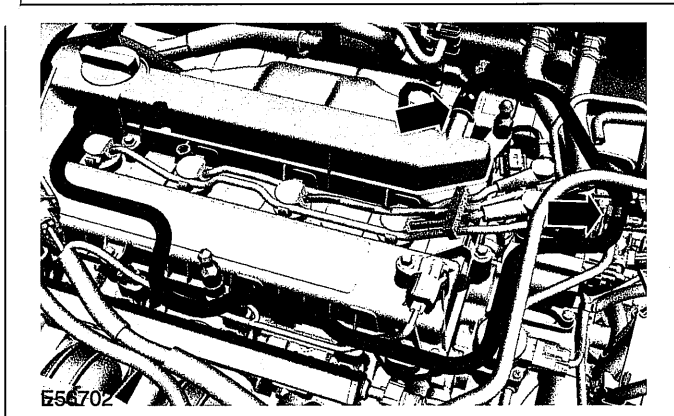
3. Detach the engine wiring harness from the valve cover.

1. Unclip the power steering fluid return line from the retaining clips.
2. Remove the air cleaner retainer.
3. Unclip the engine wiring harness bracket at the intake pipe.
4. Unclip the engine wiring harness at the intake pipe.

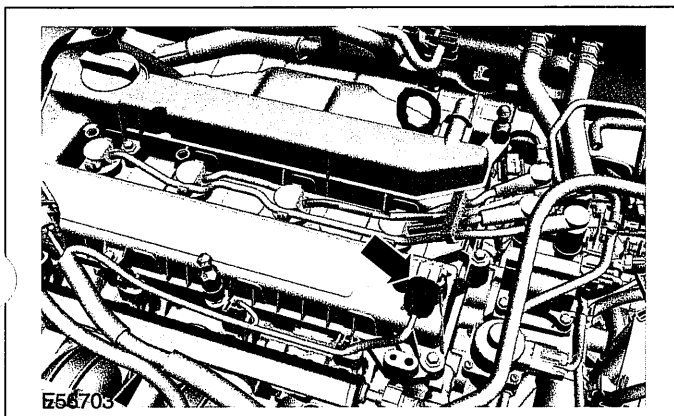


IN-VEHICLE REPAIR

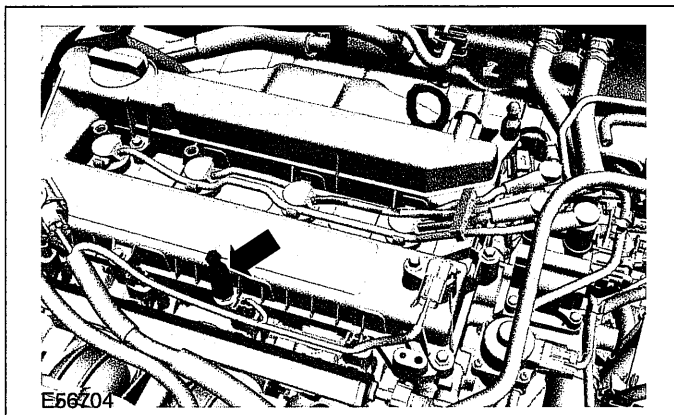
4. Detach the positive crankcase ventilation (PCV) hose from the valve cover.



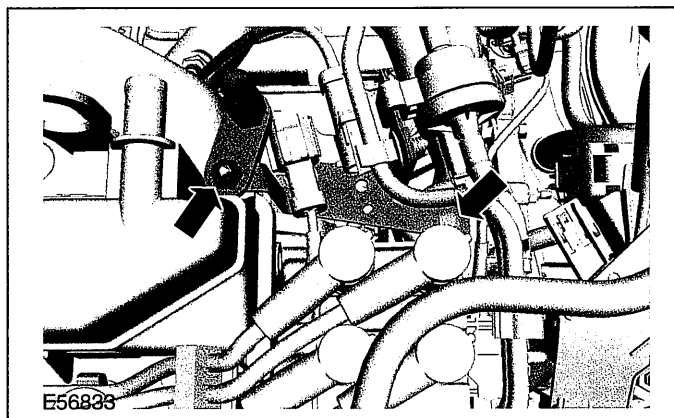
5. Disconnect the camshaft position sensor (CMP sensor) electrical connector.



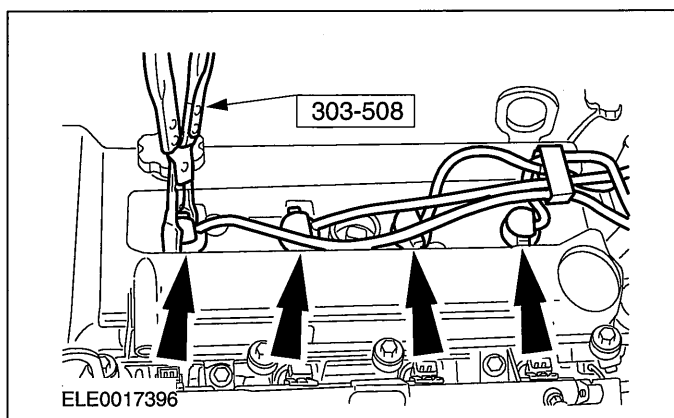
6. Remove the air cleaner retainer.



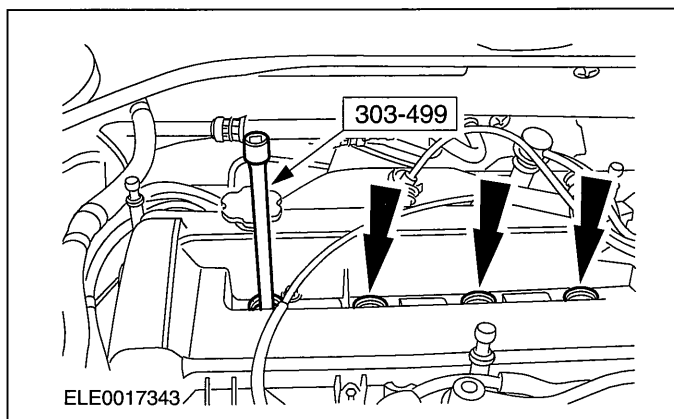
7. Remove the EVAP valve bracket.



8. Using the special tool, disconnect the spark plug electrical connectors.

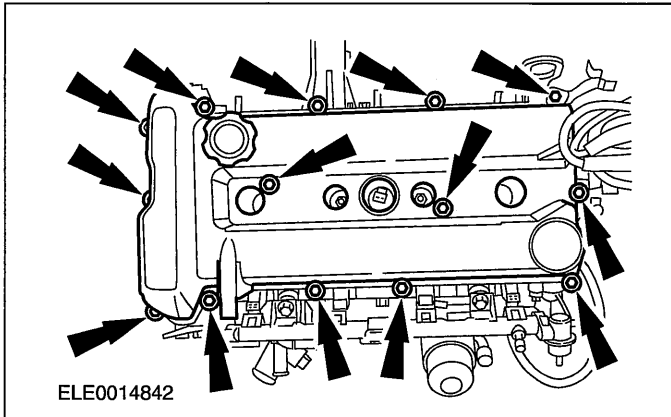


9. Using the special tool, remove the spark plugs.



IN-VEHICLE REPAIR

10. Remove the valve cover.

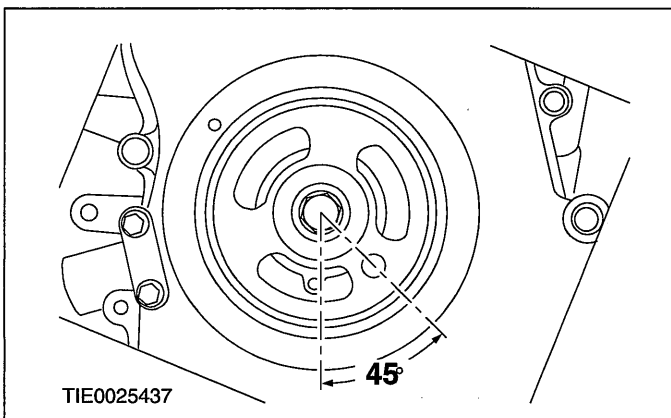


11. Remove the drive belt.

For additional information, refer to:
Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

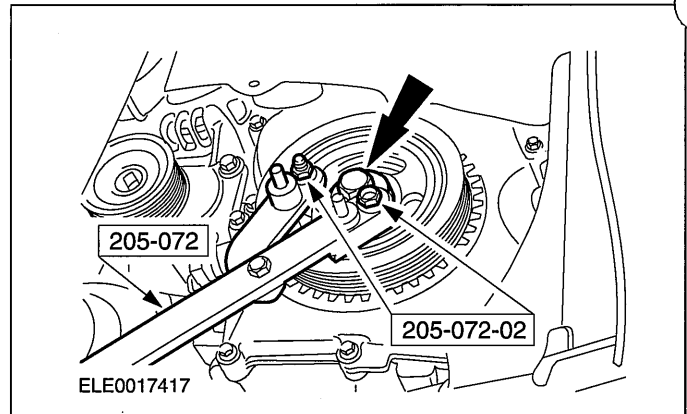
12. NOTE: Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until piston no. 1 is approx. 45 degrees before TDC.



13. NOTE: Do not discard the crankshaft pulley bolt.

Using the special tool, remove the crankshaft pulley.

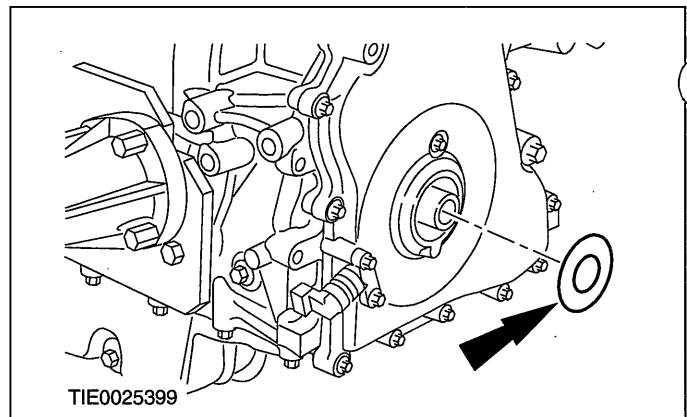


14. Remove the crankshaft front seal.

For additional information, refer to:
Crankshaft Front Seal (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

15. Remove the front friction washer (engine shown removed for clarity).

- Discard the friction washer.

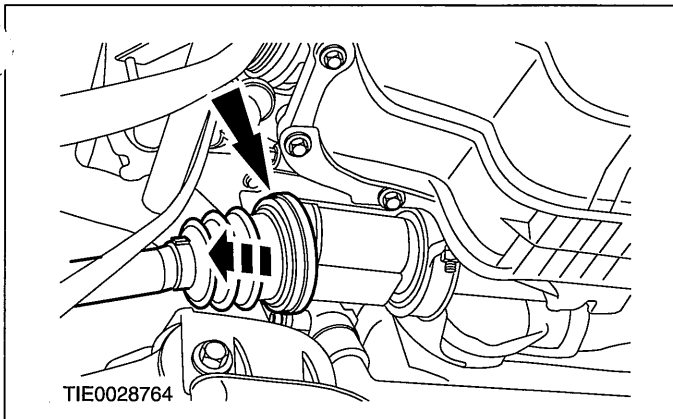


16. NOTE: Do not damage the inner constant velocity (CV) joint boot.

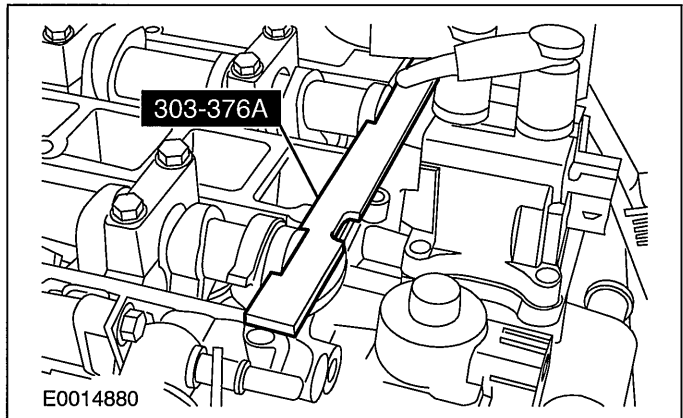
Pull the inner CV joint boot off the intermediate shaft.

IN-VEHICLE REPAIR

- Remove and discard the CV joint boot clamp.



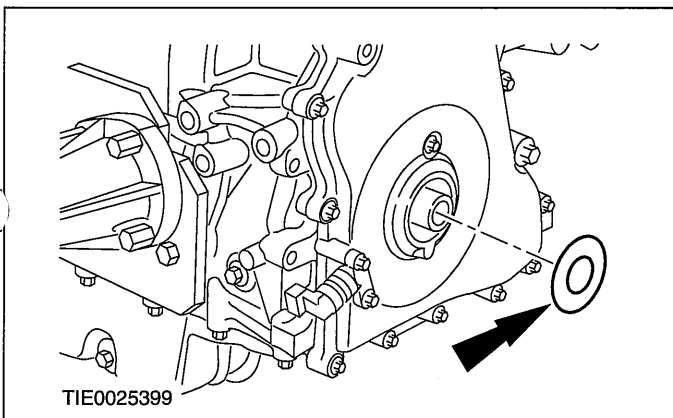
- Install the special tool.



Installation

- NOTE:** Install a new front friction washer.

Install the front friction washer (engine shown removed for clarity).



- Install the crankshaft front seal.

For additional information, refer to:
Crankshaft Front Seal (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

- Lower the vehicle.

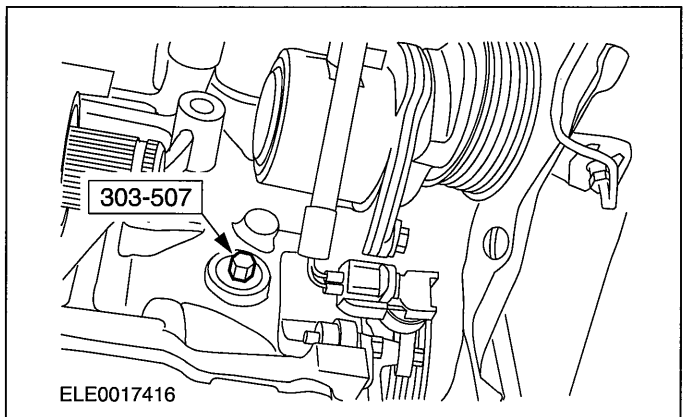
- NOTE:** Only rotate the camshafts in the normal direction of rotation.

Carefully rotate the camshafts using a spanner until the cams of cylinder no. 4 are positioned at the valve overlap.

- Raise the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

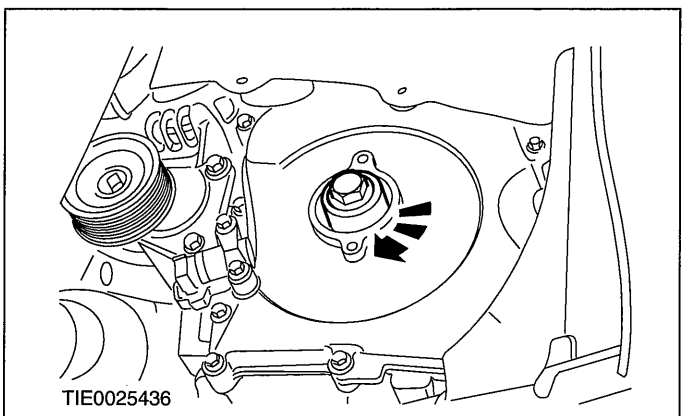
Jacking (Description and Operation),
Lifting (Description and Operation).

- Remove the cylinder block lower blanking plug and install the special tool.



- NOTE:** Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft using the crankshaft pulley bolt until the crankshaft contacts the special tool.



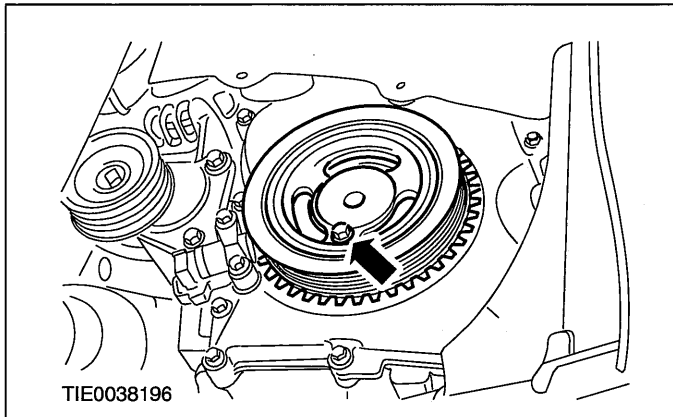
IN-VEHICLE REPAIR

9. Remove the crankshaft pulley bolt.

- Discard the bolt.

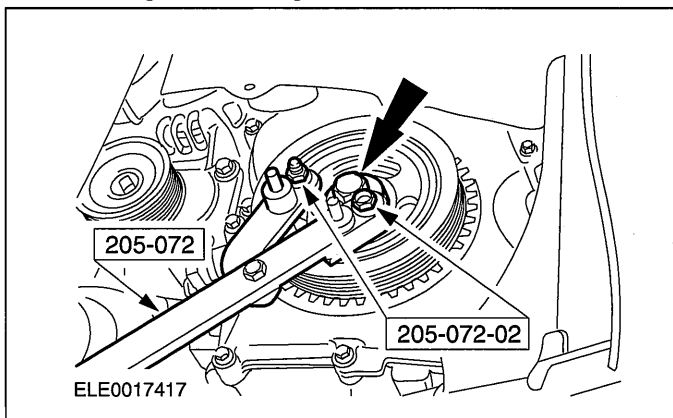
10. **⚠ CAUTION:** Tighten M6 x 18 mm bolt hand-tight only.

Install the crankshaft pulley and fasten to the engine front cover with an M6 x 18 mm bolt.

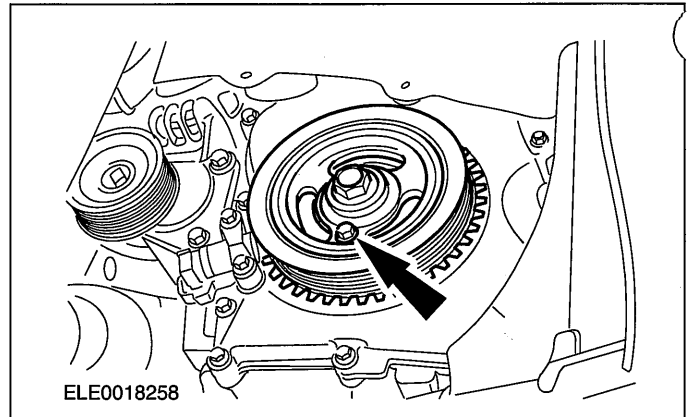
11. **NOTE:** Install a new crankshaft pulley bolt.

Counterhold the crankshaft pulley using the special tools and tighten the crankshaft pulley bolt.

- Tighten the bolt in two stages.
- Stage 1: 100 Nm.
- Stage 2: 90 degrees.

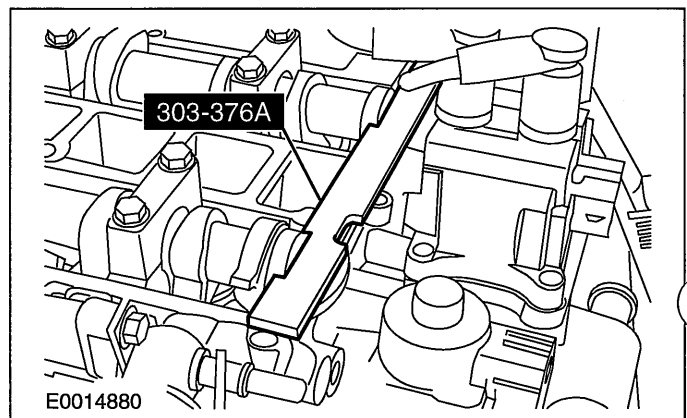


12. Remove the M6 x 18 mm bolt.



13. Lower the vehicle.

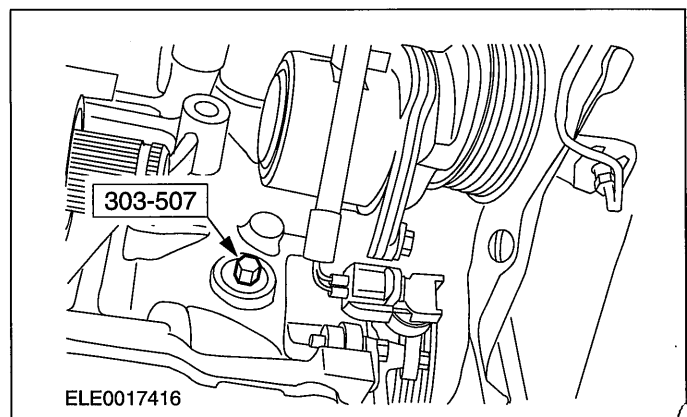
14. Remove the special tool.



15. Raise the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

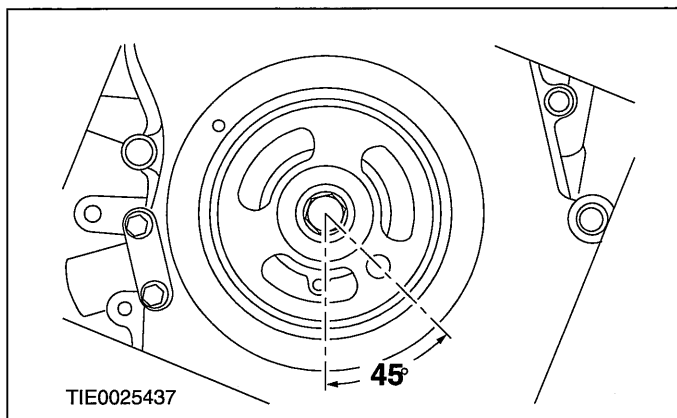
Jacking (Description and Operation),
Lifting (Description and Operation).

16. Remove the special tool.

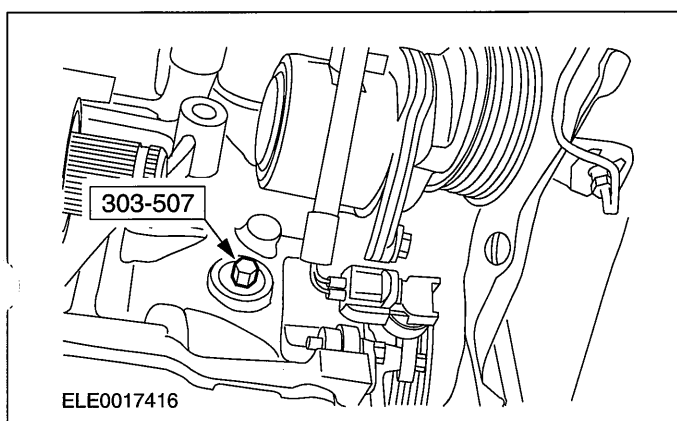
17. **NOTE:** Only rotate the crankshaft in the normal direction of rotation.

IN-VEHICLE REPAIR

Rotate the crankshaft one and three quarters of a rotation until piston no. 1 is approx. 45 degrees before TDC.



18. Install the special tool.



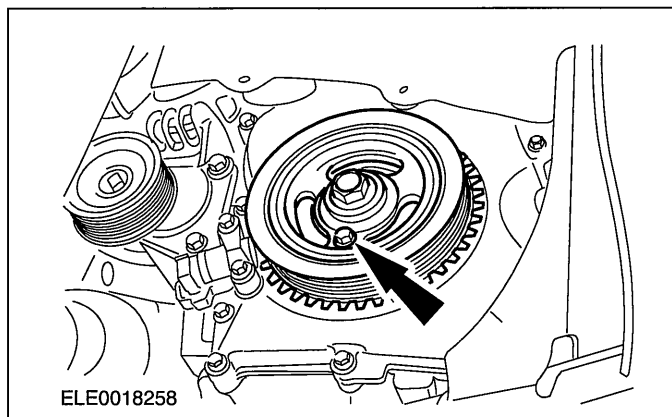
19. NOTE: Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until no. 1 piston is at TDC.

20. ⚠ CAUTION: Tighten the M6 x 18 mm bolt finger-tight only.

NOTE: If the M6 x 18 mm bolt cannot be installed, correct the valve timing.

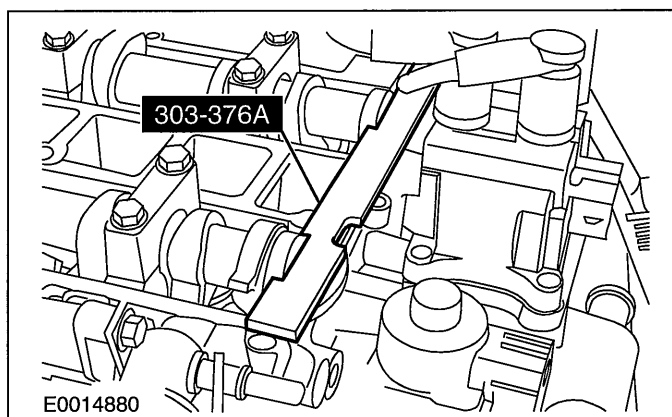
Check the position of the crankshaft pulley using the M6 x 18 mm bolt.



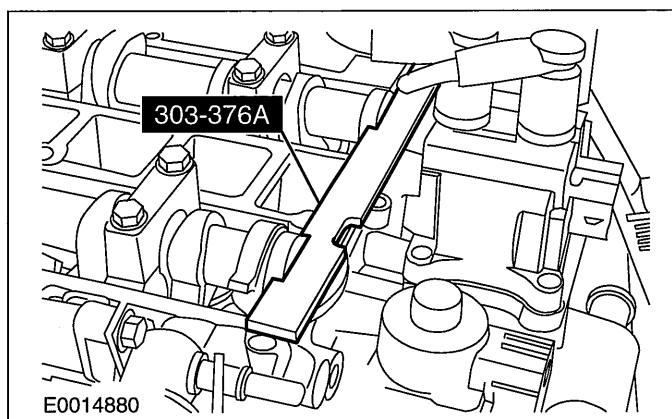
21. Lower the vehicle.

22. NOTE: If the special tool cannot be attached, correct the valve timing.

Check the position of the camshafts using the special tool.



23. Remove the special tool.

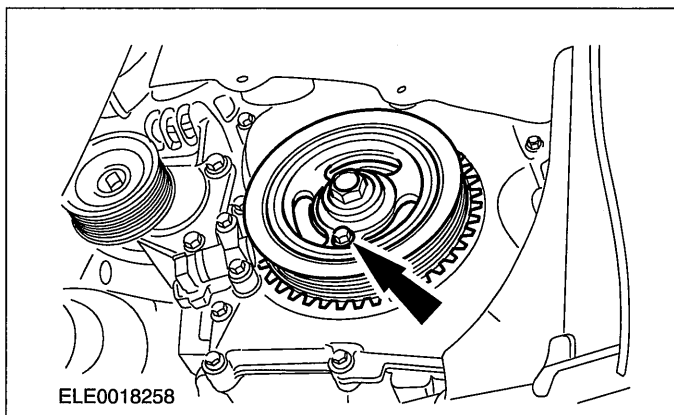


IN-VEHICLE REPAIR

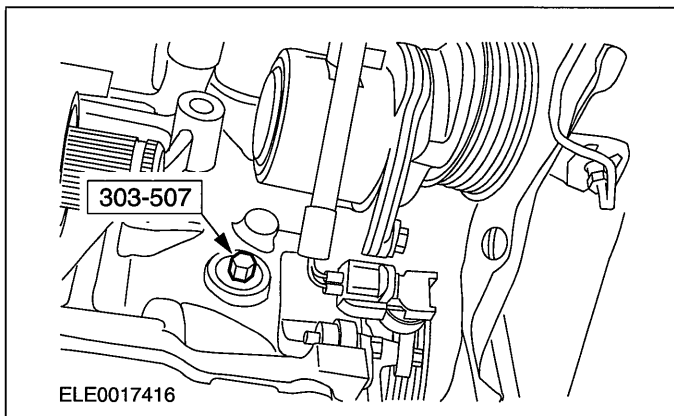
24. Raise the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

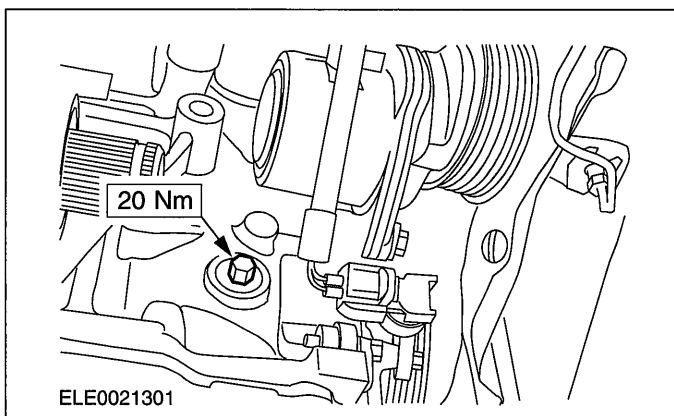
25. Remove the M6 x 18 mm bolt.



26. Remove the special tool.



27. Install the cylinder block lower blanking plug.

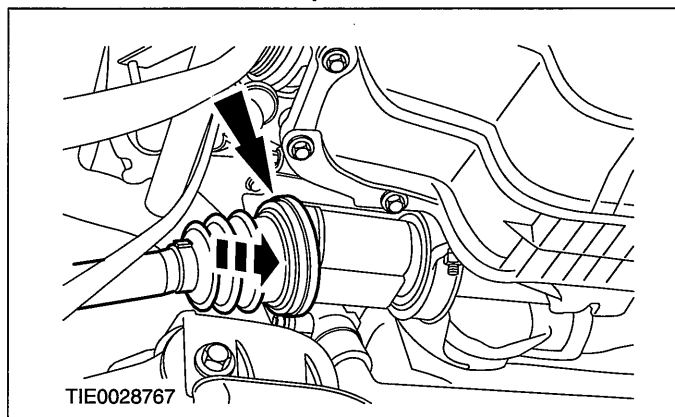


28. NOTE: Do not damage the boot of the inner CV joint.

NOTE: Make sure that the contact surface for the CV joint boot on the intermediate shaft is clean.

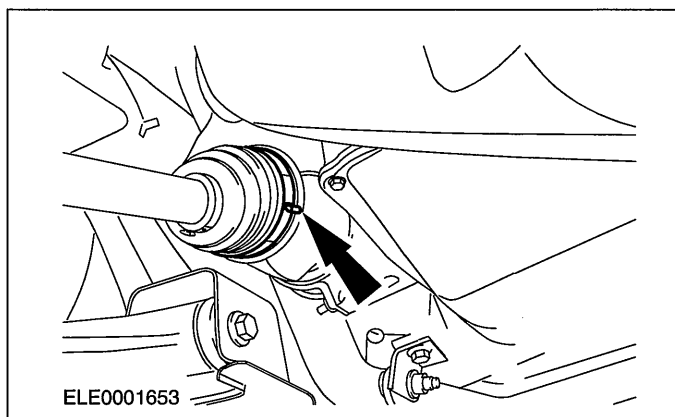
Slide the inner CV joint boot onto the intermediate shaft.

- Use a suitable screwdriver under the boot to allow air to escape.



29. NOTE: Install a new boot clamp.

Using a suitable grip wrench, install the inner CV joint boot clamp.



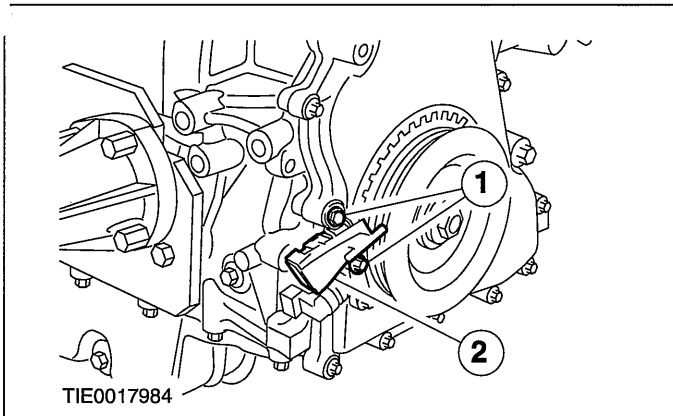
30. NOTE: When installing a new engine front cover, the crankshaft position sensor (CKP sensor) must be aligned using the tool supplied.

Align the CKP sensor (engine shown removed for clarity).

1. Loosen the CKP sensor bolts.

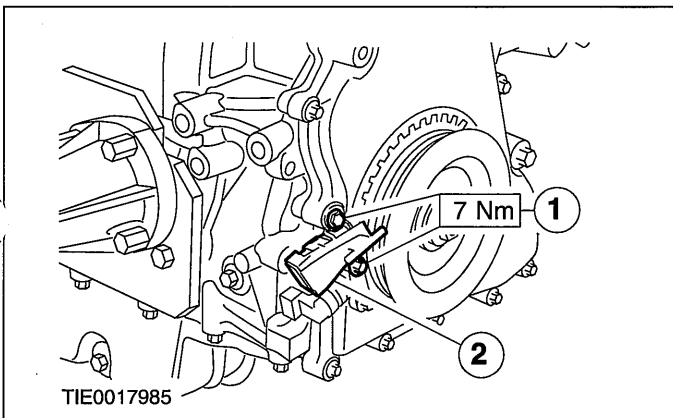
IN-VEHICLE REPAIR

2. Insert the tool supplied so that it engages with the teeth of the crankshaft pulley.



31. Install the CKP sensor (engine shown removed for clarity).

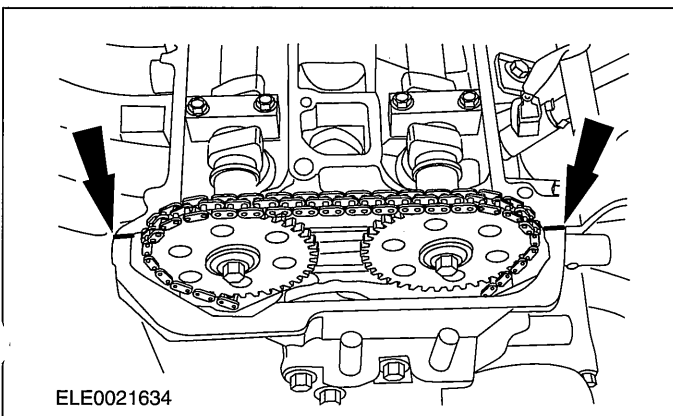
1. Install the CKP sensor bolts.
2. Remove the tool.



32. Install the drive belt.

For additional information, refer to:
Accessory Drive Belt - 2.0L Duratec-HE (M14) (303-05 Accessory Drive, Removal and Installation).

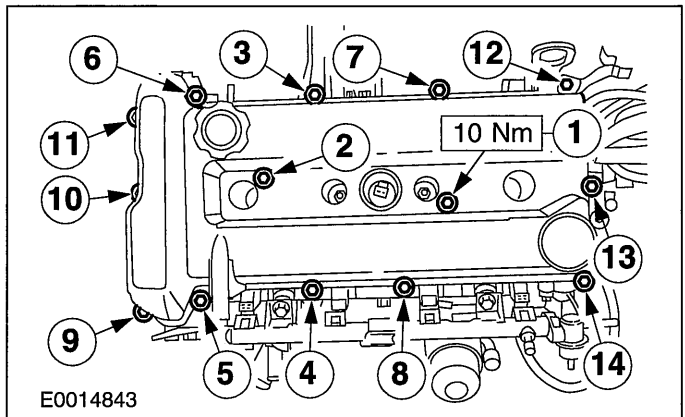
33. Apply sealant thinly on the areas shown.



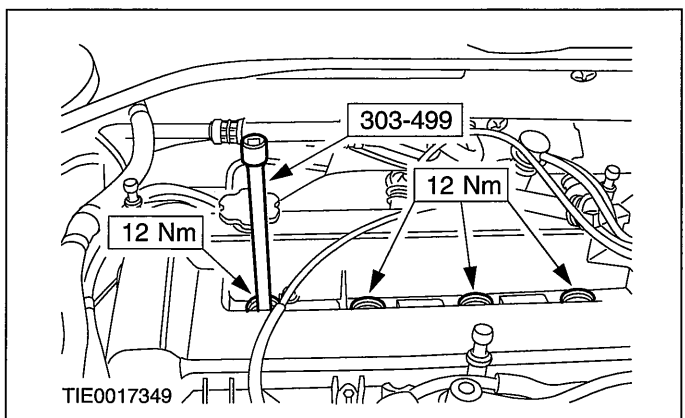
34. NOTE: If necessary, install a new valve cover gasket.

Install the valve cover.

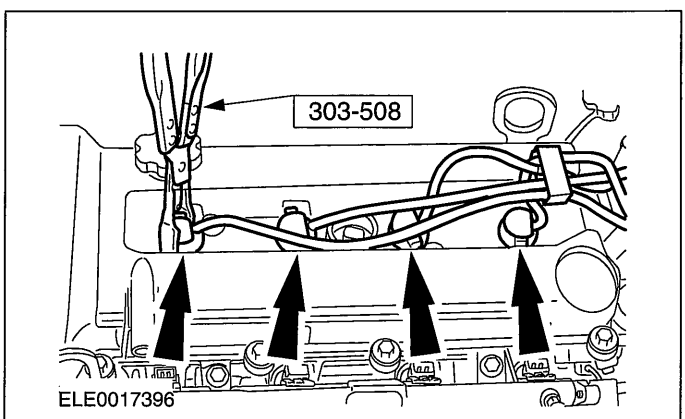
- Tighten the bolts in the sequence shown.



35. Using the special tool, install the spark plugs.

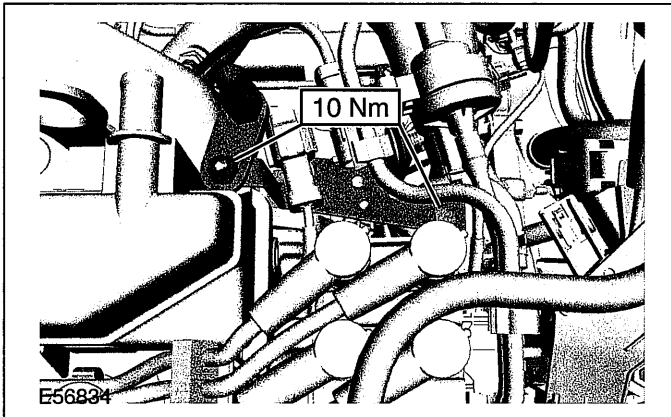


36. Using the special tool, connect the spark plug connectors.

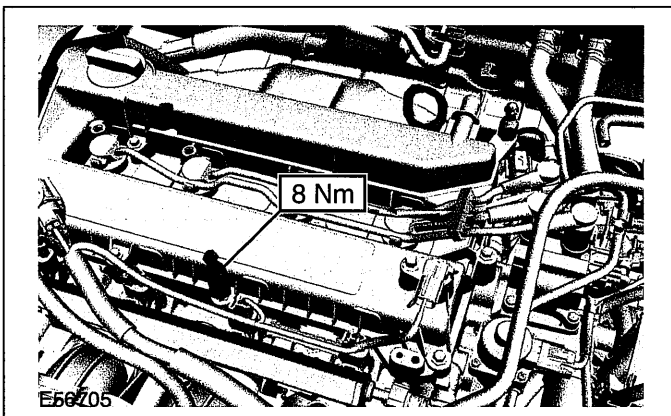


IN-VEHICLE REPAIR

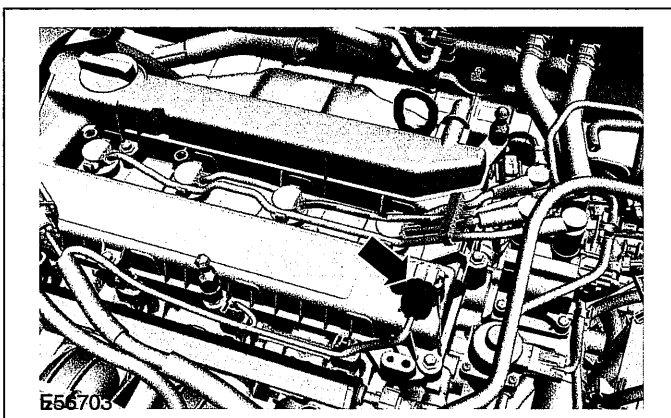
37. Install the EVAP valve bracket.



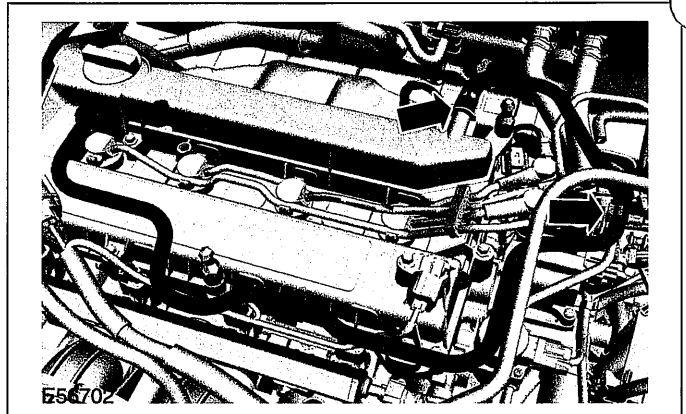
38. Install the air cleaner retainer.



39. Connect the camshaft position (CMP) sensor connector.

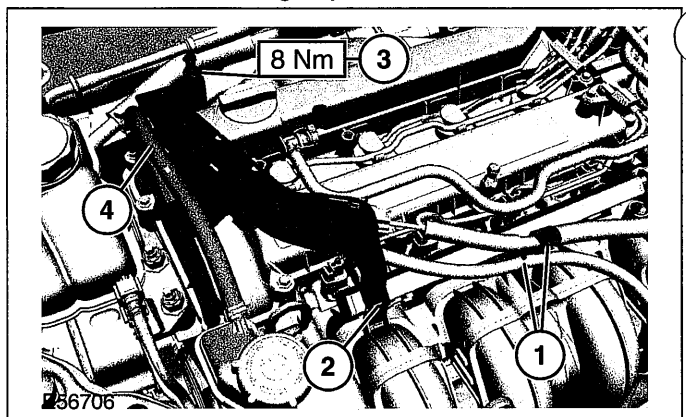


40. Attach the positive crankcase ventilation (PCV) hose to the valve cover.



41. Attach the engine wiring harness to the valve cover.

1. Clip on the engine wiring harness at the intake pipe.
2. Clip on the engine wiring harness bracket at the intake pipe.
3. Install the air cleaner retainer.
4. Connect the power steering fluid return line to the retaining clip.



42. Install the air cleaner.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

43. Connect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

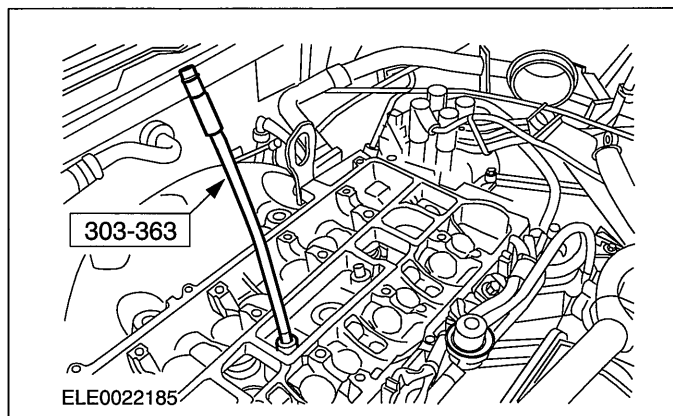
IN-VEHICLE REPAIR

Valve Seals(21 238 0)

Special Tool(s)

21155	Compressor, Valve Spring 303-361A (21-155A)
2115502A	Adapter for 303-361A 303-361-02 (21-155-02A)
21156	Installer, Valve Stem Collets 303-362 (21-156)
21157	Adapter, Air Supply (Cylinder Head) 303-363 (21-157)
21165	Pliers, Valve Stem Seal 303-508 (21-165)

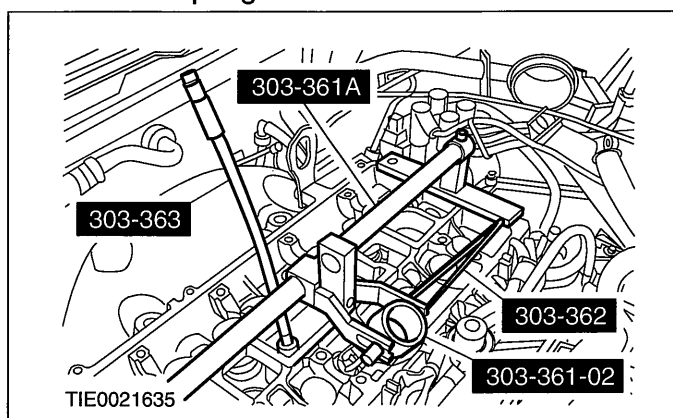
2. Using the special tool, apply 7 to 10 bar of compressed air into the cylinder.



3. Remove the valve tappets and keep them in order for reassembly.

4. Using the special tools, remove the valve springs.

- Compress the valve spring.
- Remove the valve collets.
- Release the valve spring.
- Remove the valve spring retainer and the valve spring.



5. Using the special tool, remove the valve seals.

Removal

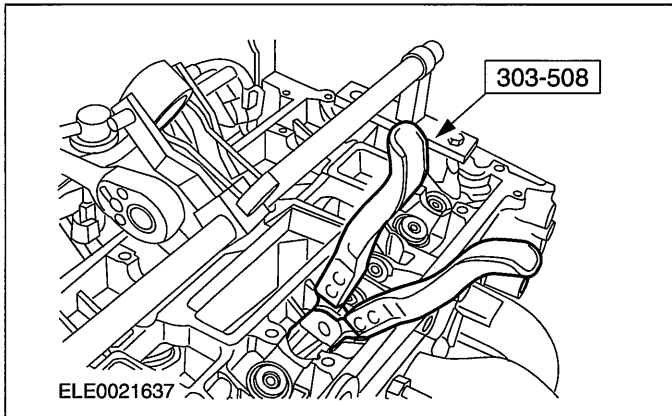
1. Remove the camshafts.

For additional information, refer to:

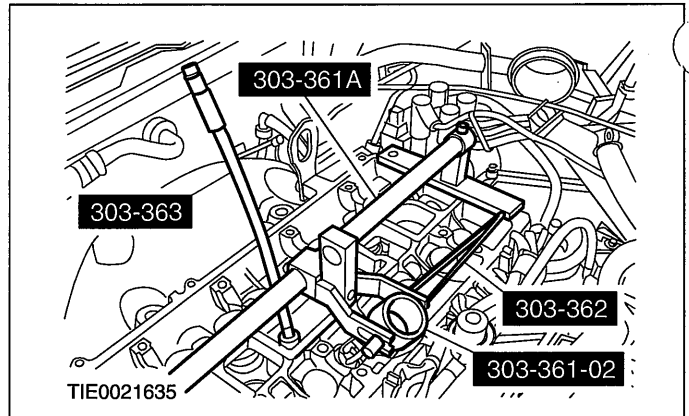
Camshafts (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

IN-VEHICLE REPAIR

- Discard the valve seals.



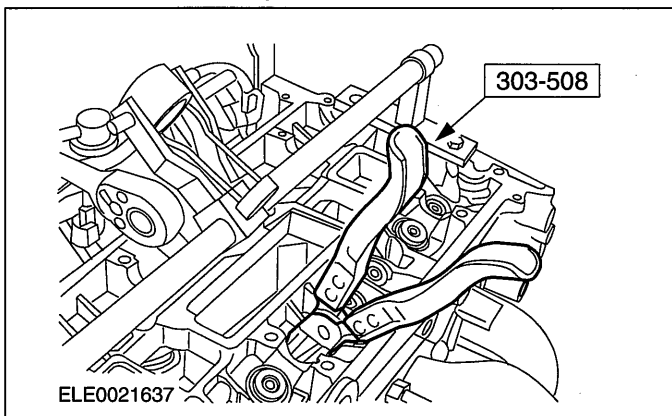
- Release the valve spring.

**Installation****1. NOTE: Install new valve seals.**

NOTE: Cover the valve collet groove on the valve stem with a protective sleeve.

Using the special tool, install the valve seals.

- Remove the protective sleeve.

**3. Remove the special tools.****4. Install the valve tappets.****5. Install the camshafts.**

For additional information, refer to:
Camshafts (303-01 Engine - 2.0L
Duratec-HE (MI4), In-vehicle Repair).

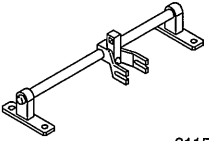
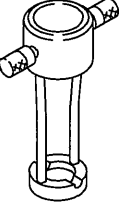
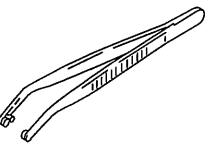
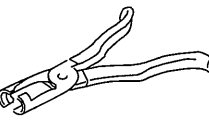
2. Using the special tools, install the valve springs.

- Install the valve spring retainer and the valve spring.
- Compress the valve spring.
- Install the valve collets.

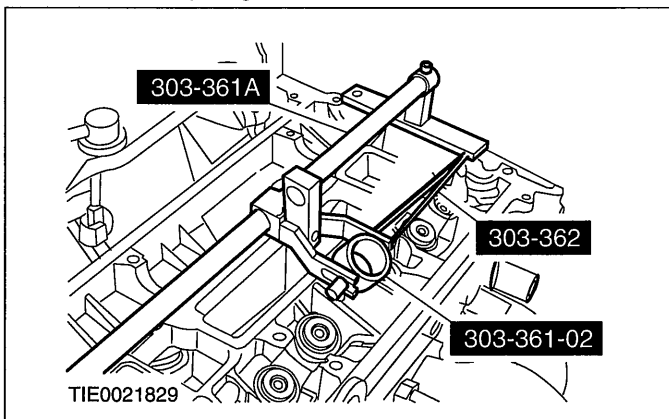
IN-VEHICLE REPAIR

Valves(21 215 4)

Special Tool(s)

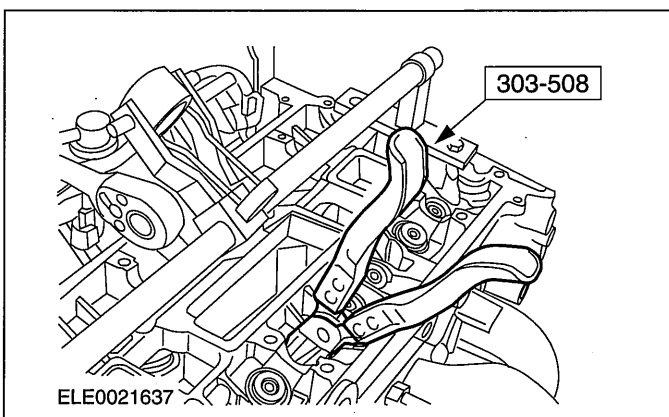
 21155	Compressor, Valve Spring 303-361A (21-155A)
 2115502A	Adapter for 303-361A 303-361-02 (21-155-02A)
 21156	Installer, Valve Stem Collets 303-362 (21-156)
 21165	Pliers, Valve Stem Seal 303-508 (21-165)

- Remove the valve spring retainer and the valve spring.



3. Using the special tool, remove the valve seals.

- Discard the valve seals.



4. Remove the valves.

Removal

1. Remove the cylinder head.

For additional information, refer to: Cylinder Head (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

2. Using the special tools, remove the valve springs.

- Compress the valve spring.
- Remove the valve collets.
- Release the valve spring.

Installation

1. Install the valves.

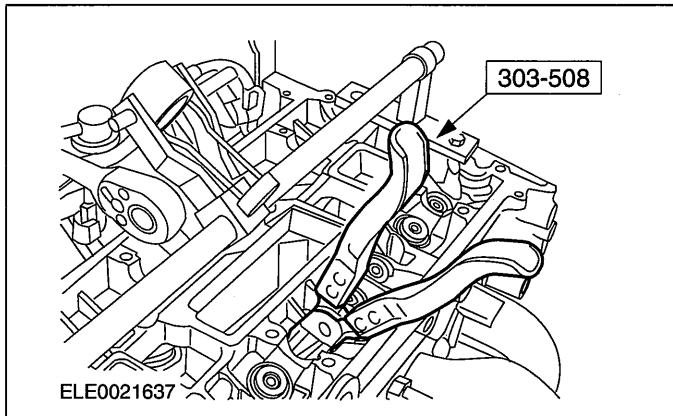
2. NOTE:Install new valve seals.

NOTE:Cover the valve collet groove on the valve stem with a protective sleeve.

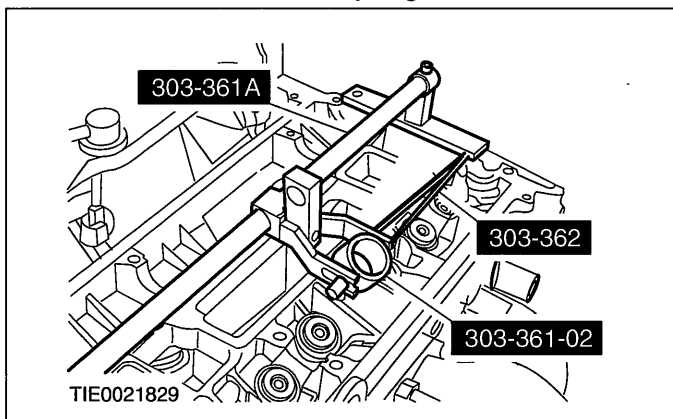
Using the special tool, install the valve seals.

IN-VEHICLE REPAIR

- Remove the protective sleeve.

**3. Using the special tools, install the valve springs.**

- Install the valve spring retainer and the valve spring.
- Compress the valve spring
- Install the valve collets.
- Release the valve spring.

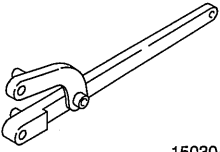
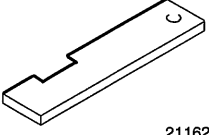
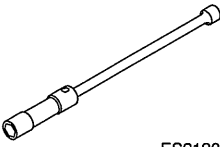
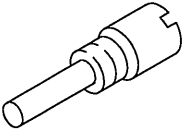
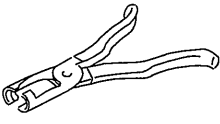
**4. Remove the special tools.****5. Install the cylinder head.**

For additional information, refer to: **Cylinder Head (303-01 Engine - 2.0L Duratec-HE (M14), In-vehicle Repair).**

IN-VEHICLE REPAIR

Camshafts(21 284 0)

Special Tool(s)

 15030A	Universal Flange Holding Wrench 205-072
 21162B	Alignment Plate, Camshaft 303-376A
 ES21202	Socket, Spark Plug 303-499
 PZ21210	Timing Peg, Crankshaft TDC 303-507
 21211	Pliers, Valve Stem Seal 303-508

General Equipment

M6 x 18 mm bolt

M6 x 25 mm bolt

Materials

Name	Specification
Hypoid Gear Oil	SQM-2C9002-AA
Silicone Sealant	WSE-M4G323-A4

Removal

1. Disconnect the battery ground cable.

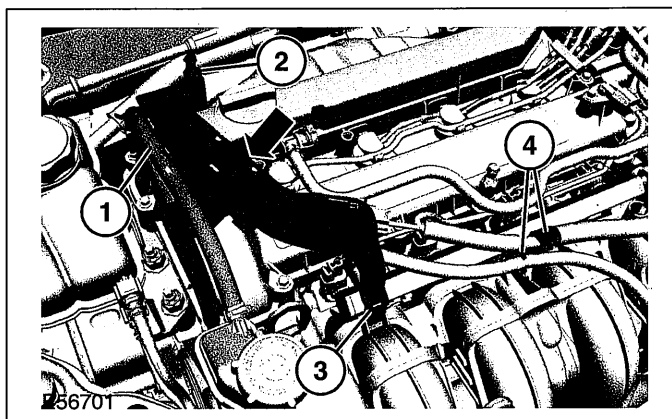
For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the air cleaner.

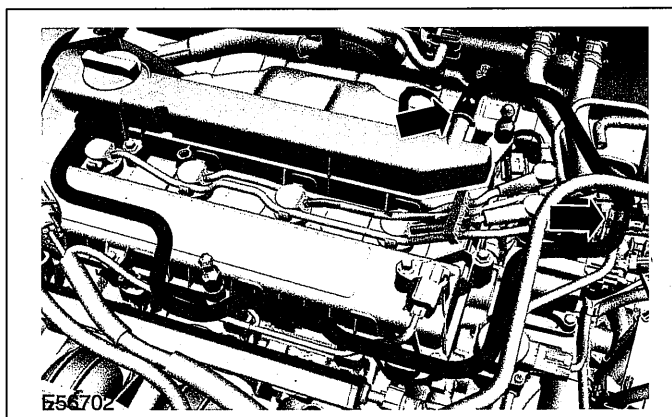
For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

3. Detach the engine wiring harness from the valve cover.

1. Unclip the power steering return line from the engine wiring harness bracket.
2. Remove the air cleaner retaining bracket.
3. Unclip the engine wiring harness bracket from the intake manifold.
4. Unclip the engine wiring harness from the intake manifold.

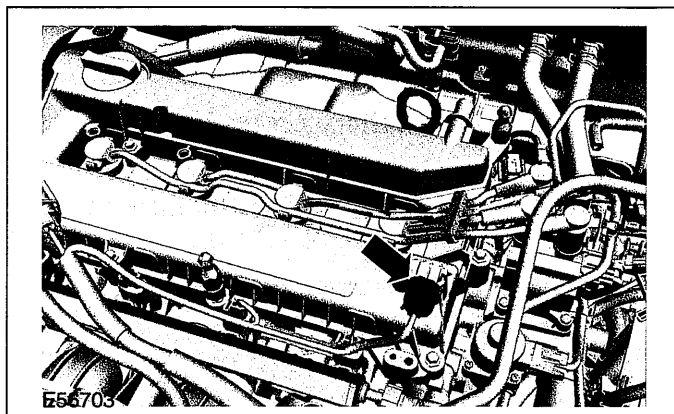


4. Remove the positive crankshaft ventilation (PCV) hose.

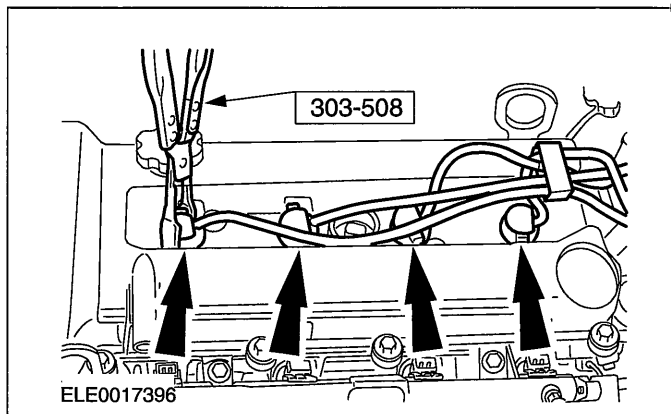


IN-VEHICLE REPAIR

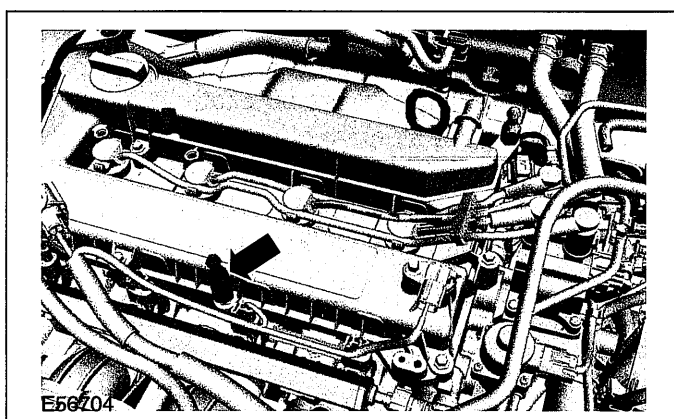
5. Disconnect the camshaft position (CMP) sensor electrical connector.



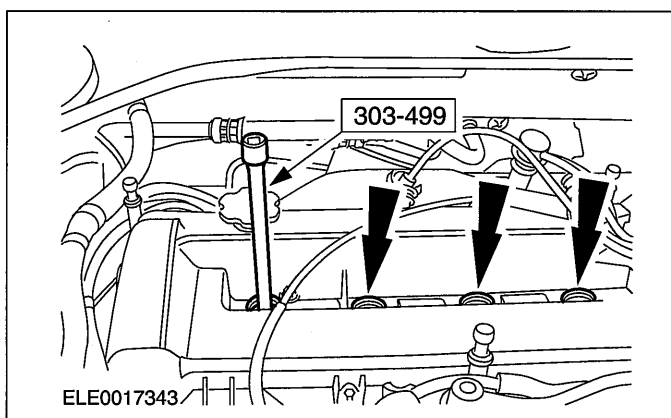
8. Using the special tool, disconnect the spark plug electrical connectors.



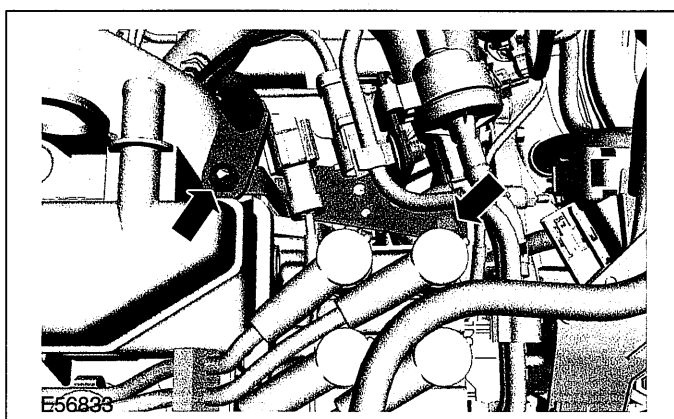
6. Remove the air cleaner retaining bracket.



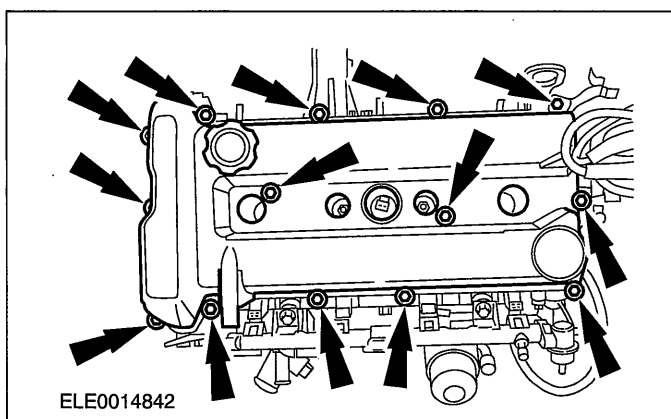
9. Using the special tool, remove the spark plugs.



7. Remove the evaporative emission (EVAP) valve support bracket.



10. Remove the valve cover.



11. Remove the accessory drive belt.

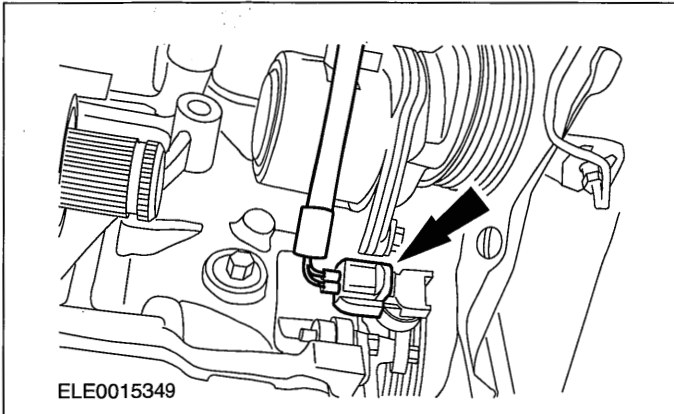
For additional information, refer to:
Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

IN-VEHICLE REPAIR

- 12. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)**

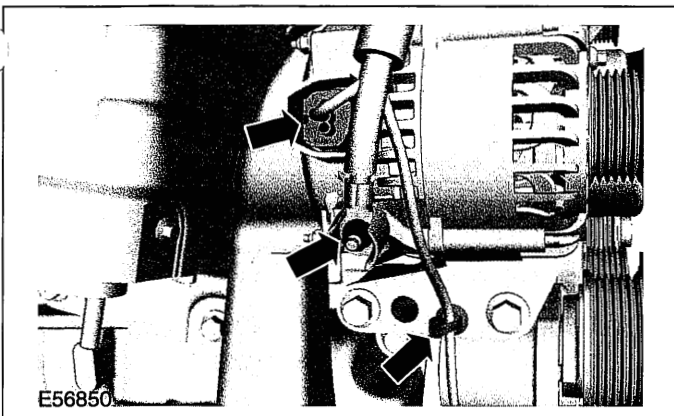
**Jacking (Description and Operation),
Lifting (Description and Operation).**

- 13. Disconnect the crankshaft position (CKP) sensor electrical connector.**



- 14. Disconnect the generator electrical connectors.**

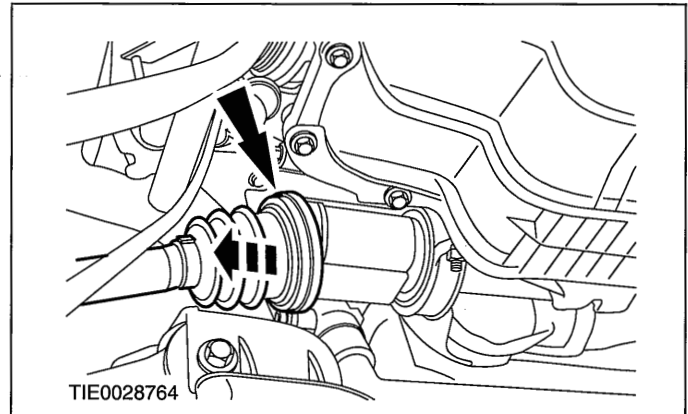
- Unclip the wiring harness.



- 15. NOTE: Do not damage the inner constant velocity (CV) joint boot.**

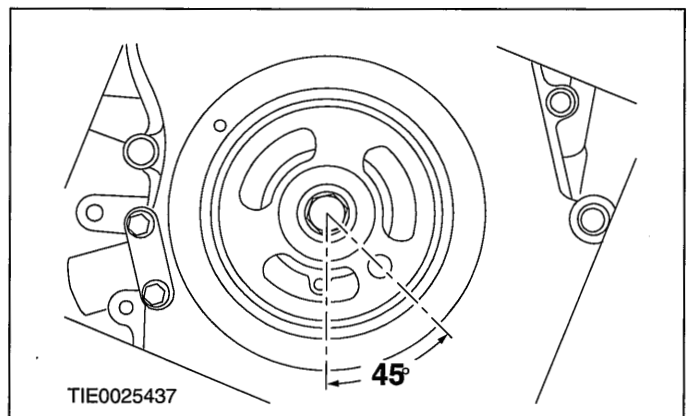
Detach the inner CV joint boot from the intermediate shaft.

- Remove and discard the constant velocity (CV) joint boot clamp.

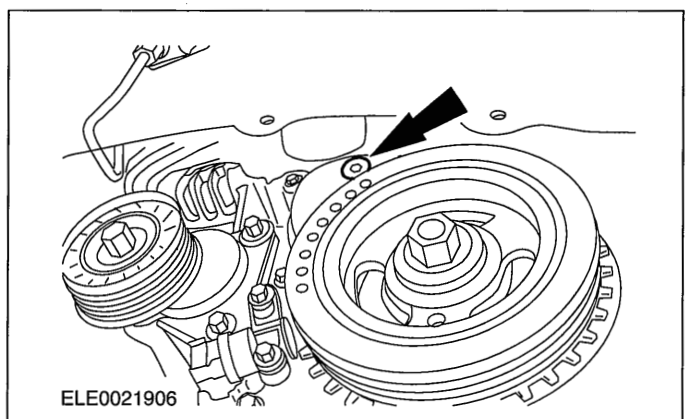


- 16. NOTE: Only rotate the crankshaft in the normal direction of rotation.**

Rotate the crankshaft until piston No. 1 is approximately 45 degrees before top dead center (BTDC).

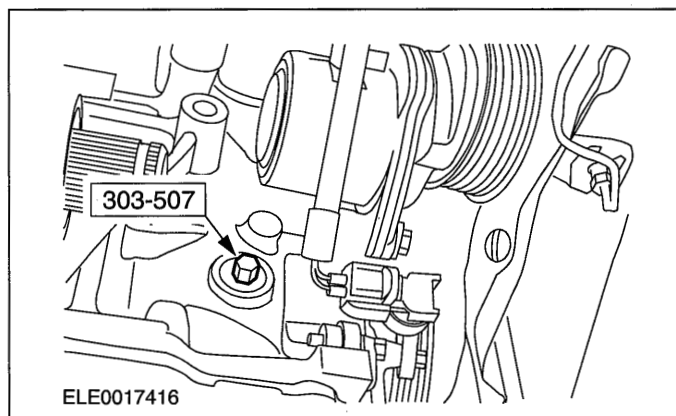


- 17. Remove the engine front cover lower blanking plug.**



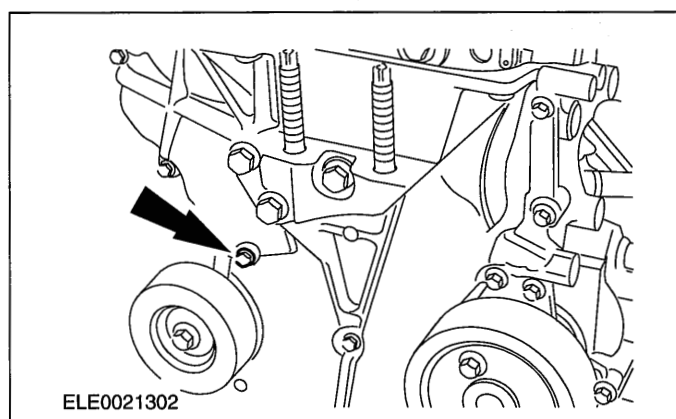
IN-VEHICLE REPAIR

18. Remove the cylinder block lower blanking plug and install the special tool.



19. Lower the vehicle.

20. Remove the engine front cover upper blanking plug.

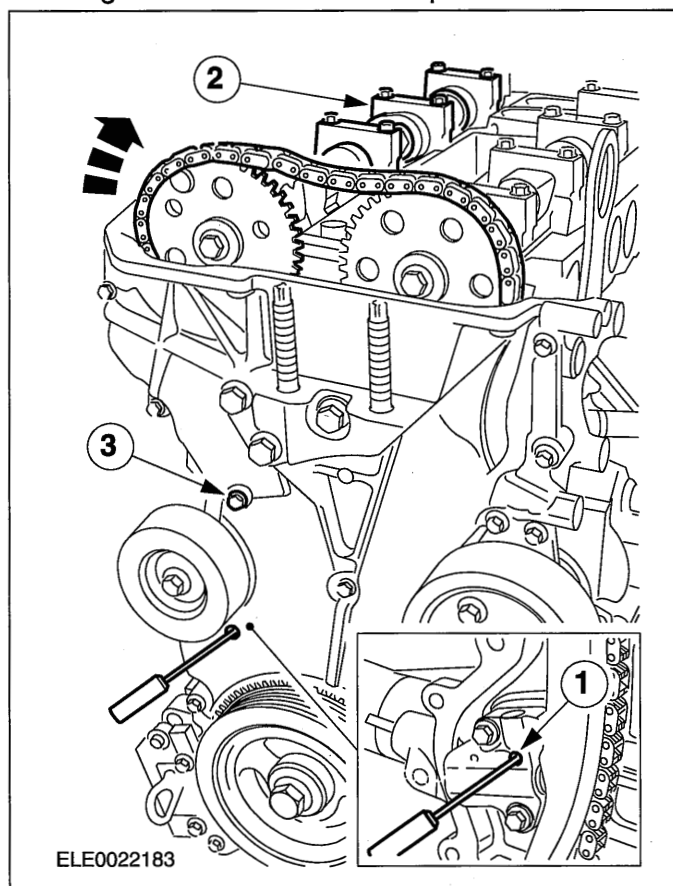


21. **⚠ CAUTION:** To detension the timing chain, make sure the timing chain tensioner ratchet is in the released position.

Detension the timing chain.

1. Using a suitable screwdriver, unlock the timing chain tensioner ratchet.
2. Carefully turn the exhaust camshaft by the hexagon in the normal direction of rotation, to detension the timing chain tensioner.

3. Install a suitable M6 x 18 mm bolt through the blanking plug to secure the timing chain guide in the detensioned position.

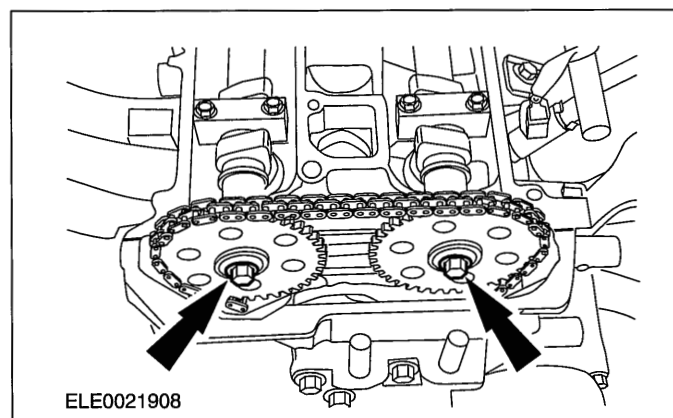


22. **⚠ CAUTION:** Hold the camshaft by the hexagon with an open-ended wrench to stop it from turning.

NOTE: Using a suitable piece of wire, prevent the timing chain and the sprocket from dropping into the timing case.

Loosen the camshaft sprockets retaining bolts.

- Detach the exhaust camshaft sprocket together with the timing chain from the exhaust camshaft.

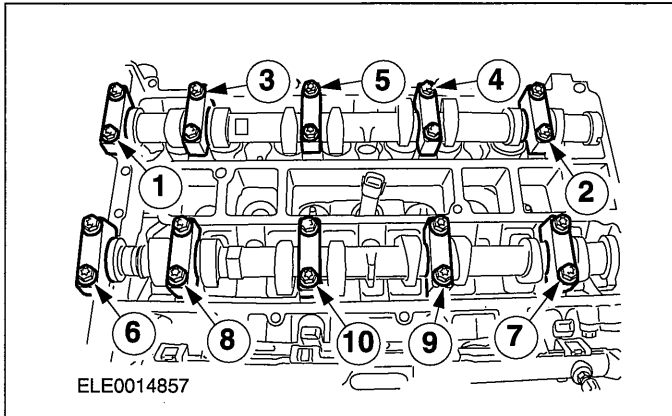


IN-VEHICLE REPAIR

23. **⚠ CAUTION:** Keep the camshaft bearing caps, the camshafts and the camshaft sprockets in order for installation.

NOTE: Working in several stages, release each camshaft bearing cap retaining bolt two turns at a time.

Remove the camshaft bearing caps in the sequence shown.



24. **NOTE:** Using a suitable piece of wire, prevent the timing chain and the sprocket from dropping into the timing case.

Detach the intake camshaft sprocket from the intake camshaft.

25. **⚠ CAUTION:** Keep the valve tappets in order for installation.

Remove the valve tappets.

Installation

1. Install the valve tappets.
2. **NOTE:** Do not tighten the camshaft sprocket retaining bolt at this stage.

Attach the intake camshaft sprocket together with the timing chain to the intake camshaft and insert the intake camshaft.

3. CAUTIONS:

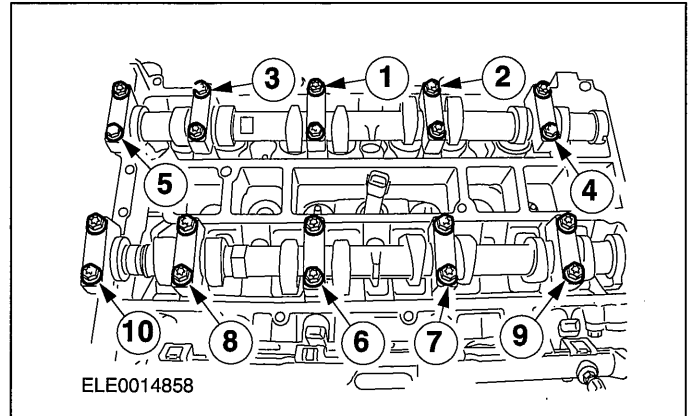
⚠ Install the camshafts approximately at valve overlap position cylinder No. 4.

⚠ Install the camshafts and bearing caps in their original location.

Install the camshafts.

- Working in several stages, evenly tighten the camshaft bearing cap bolts in the sequence shown, one half turn at a time.

- Coat the camshaft bearing caps with oil.
- Tighten the bolts in two stages:
 - Stage 1: 7 Nm.
 - Stage 2: 16 Nm.



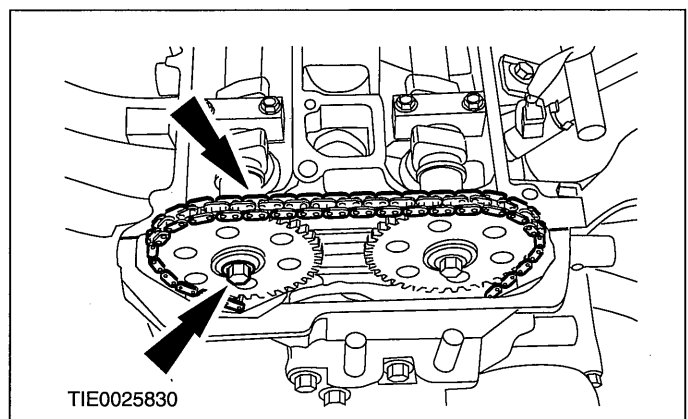
4. **NOTE:** Only carry out the following step when a new cylinder head or new valves are installed.

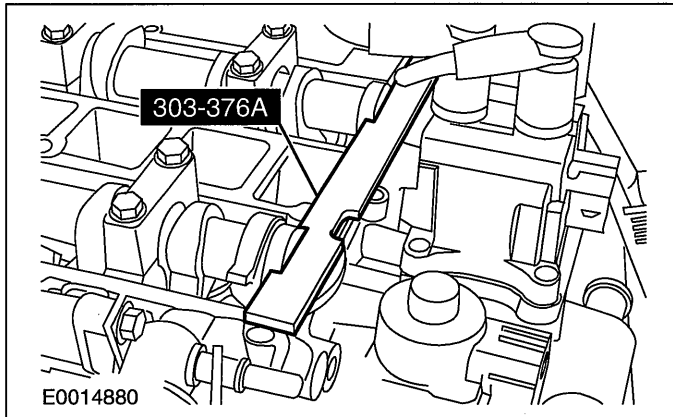
Check the valve clearance and adjust if necessary.

For additional information, refer to: Valve Clearance Adjustment (303-01 Engine - 2.0L Duratec-HE (MI4), General Procedures).

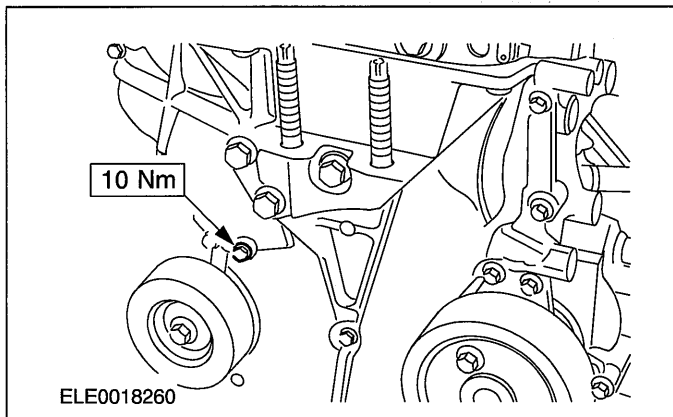
5. **NOTE:** Do not tighten the camshaft sprocket retaining bolt at this stage.

Attach the exhaust camshaft sprocket together with the timing chain to the exhaust camshaft.

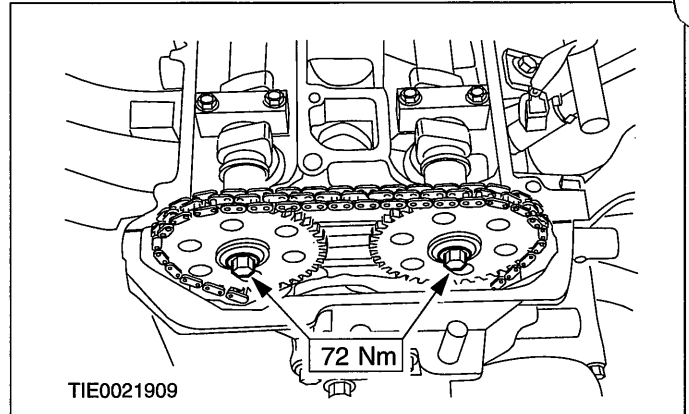
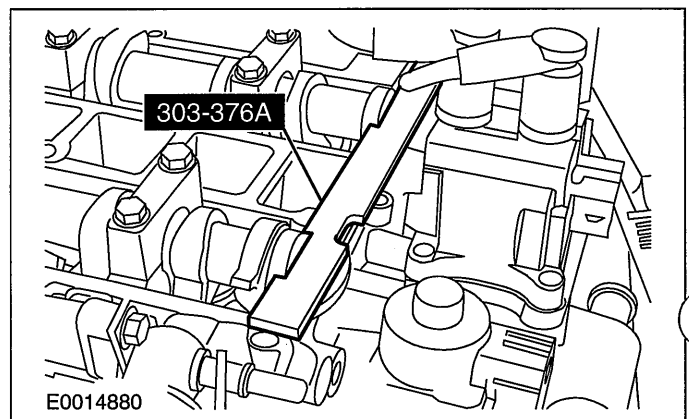


IN-VEHICLE REPAIR**6. Install the special tool.****7. Coat the engine front cover upper blanking plug with sealant.****8. Tension the timing chain.**

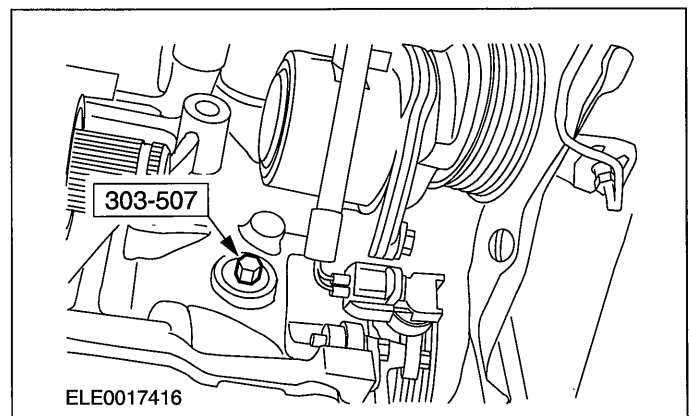
- Remove the timing chain guide securing bolt and install the engine front cover upper blanking plug.

**9. NOTE: Only rotate the crankshaft in the normal direction of rotation.**

Rotate the crankshaft until piston No. 1 is at TDC.

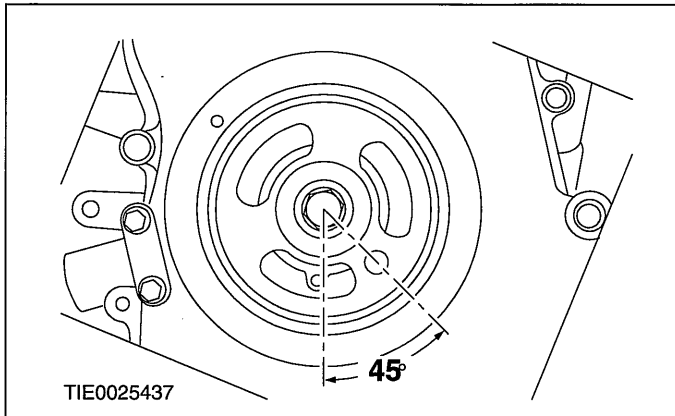
10. NOTE: Hold the camshafts by the hexagon with an open-ended wrench to stop them from rotating.**Tighten the camshaft sprocket retaining bolts.****11. Remove the special tool.****12. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)**

Jacking (Description and Operation), Lifting (Description and Operation).

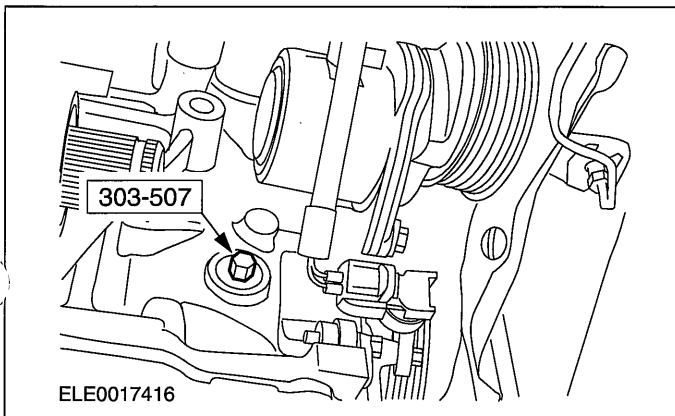
13. Remove the special tool.**14. NOTE: Only rotate the crankshaft in the normal direction of rotation.**

IN-VEHICLE REPAIR

Rotate the crankshaft approximately one and three quarter revolutions until piston No. 1 is 45 degrees before TDC.



15. Install the special tool.



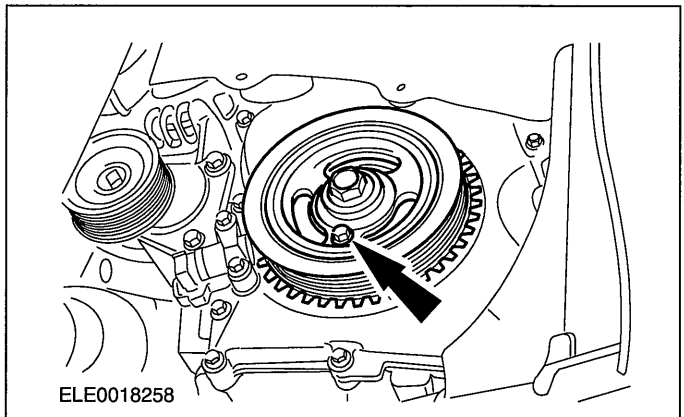
16. **NOTE:** Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until piston No. 1 is at TDC.

17. **CAUTION:** Only tighten the crankshaft pulley securing bolt finger tight.

NOTE: If it is not possible to install the crankshaft pulley securing bolt, correct the valve timing.

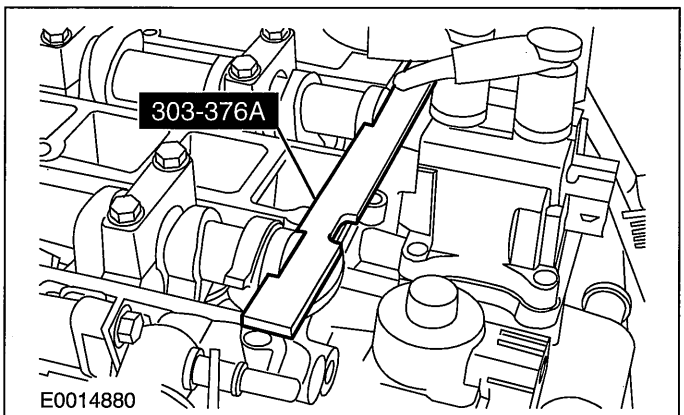
Using a M6 x 18 mm bolt, check the position of the crankshaft pulley.



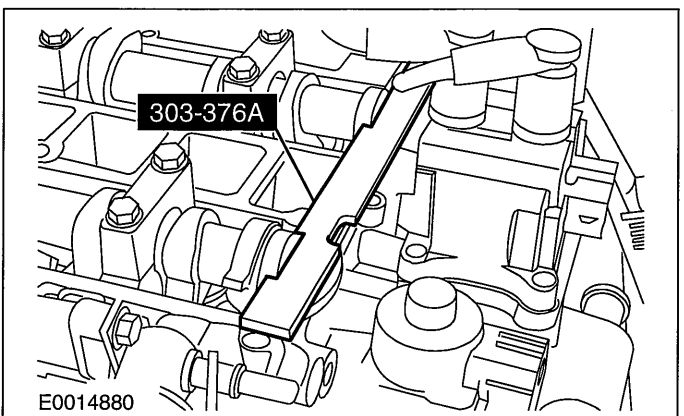
18. Lower the vehicle.

19. **NOTE:** If it is not possible to install the special tool, correct the valve timing.

Using the special tool, check the position of the camshafts.



20. Remove the special tool.

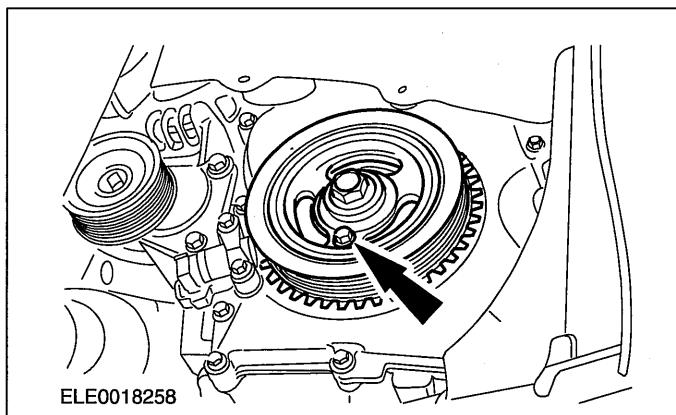


IN-VEHICLE REPAIR

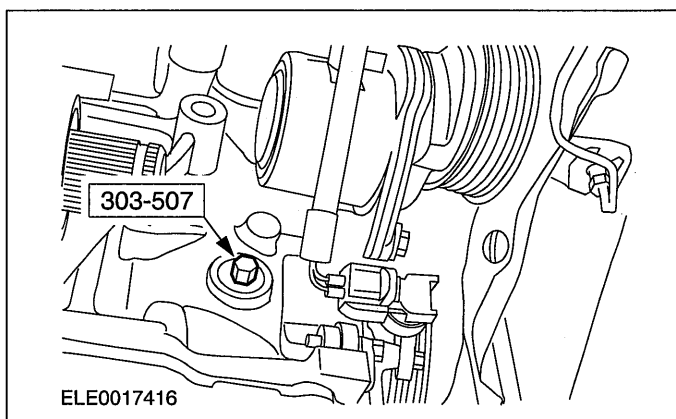
21. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

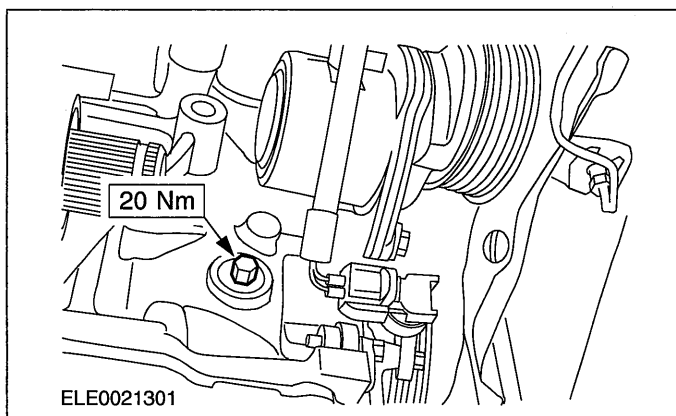
22. Remove the crankshaft pulley securing bolt.



23. Remove the special tool.

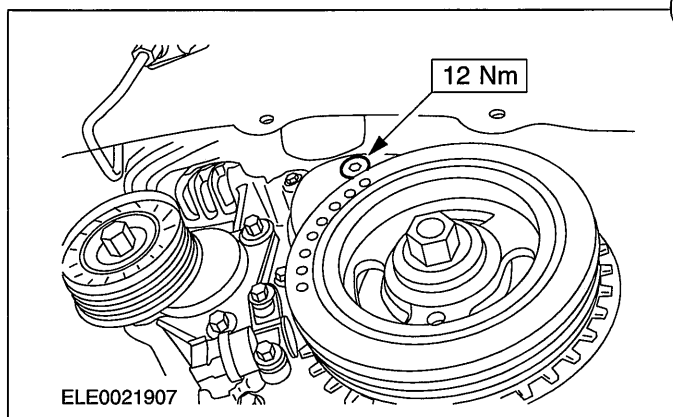


24. Install the cylinder block lower blanking plug.



25. Coat the engine front cover lower blanking plug with sealant.

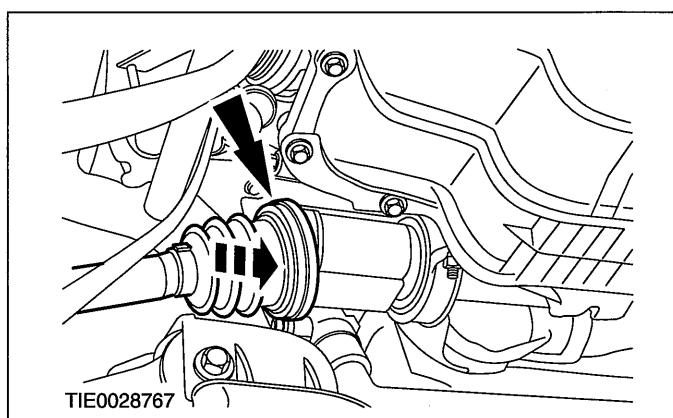
26. Install the engine front cover lower blanking plug.



27. **NOTE:** Do not damage the inner constant velocity (CV) joint boot.

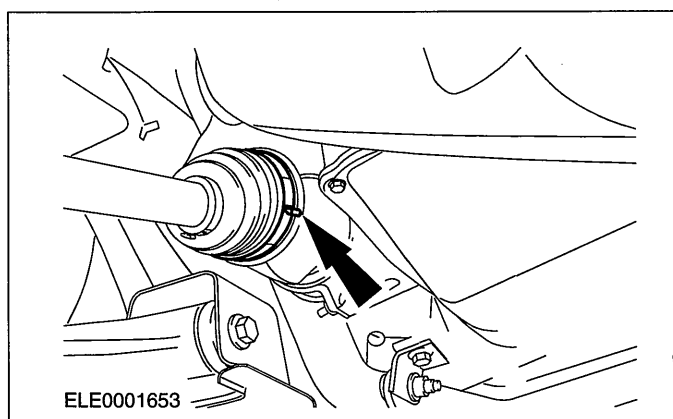
NOTE: Make sure that the intermediate shaft mating surface for the CV joint boot is clean.

Attach the inner CV joint boot to the intermediate shaft.



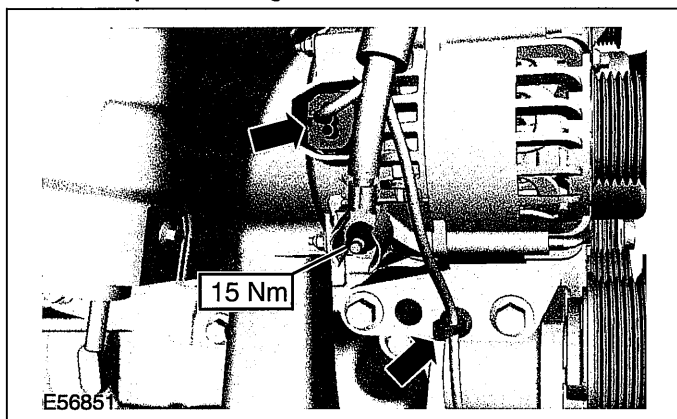
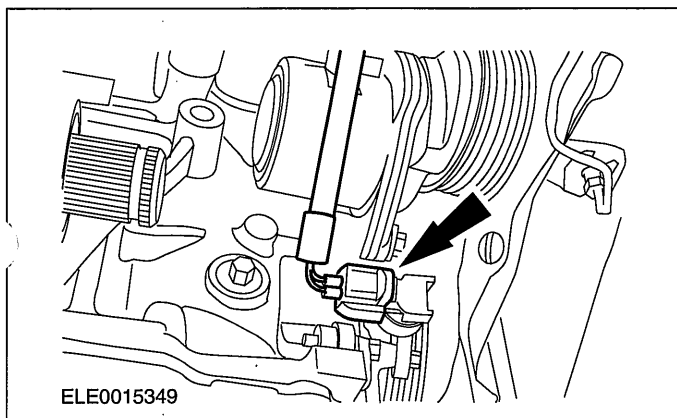
28. **NOTE:** Install a new CV joint boot clamp.

Using a suitable grip wrench, install the inner CV joint boot clamp.

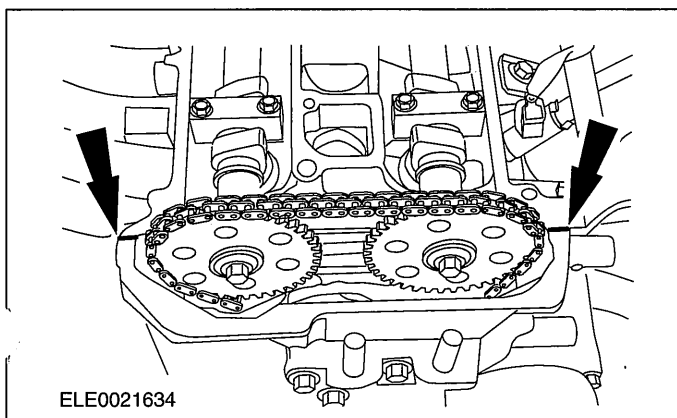


IN-VEHICLE REPAIR**29. Connect the generator electrical connectors.**

- Clip the wiring harness.

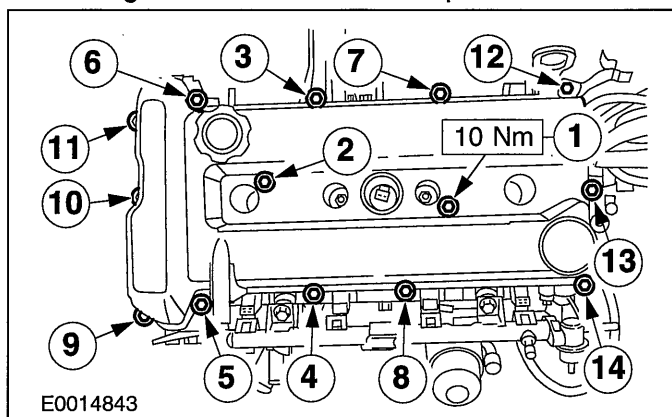
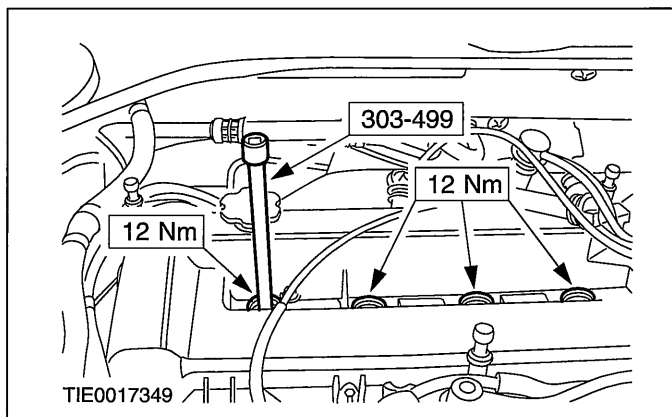
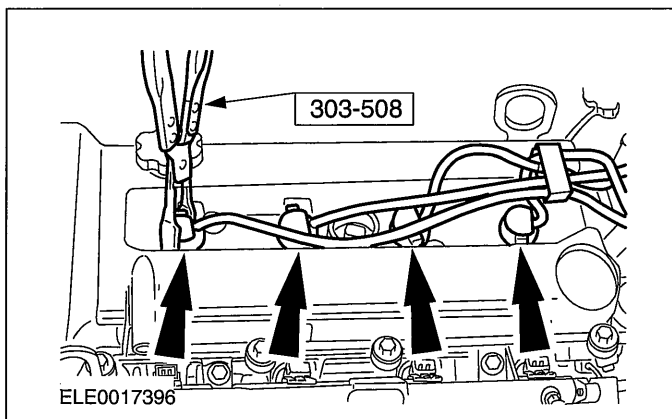
**30. Connect the crankshaft position (CKP) sensor electrical connector.****31. Install the accessory drive belt.**

For additional information, refer to:
Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

32. Apply a small bead of sealant to the areas as shown.**33. NOTE: Install a new valve cover gasket if necessary.**

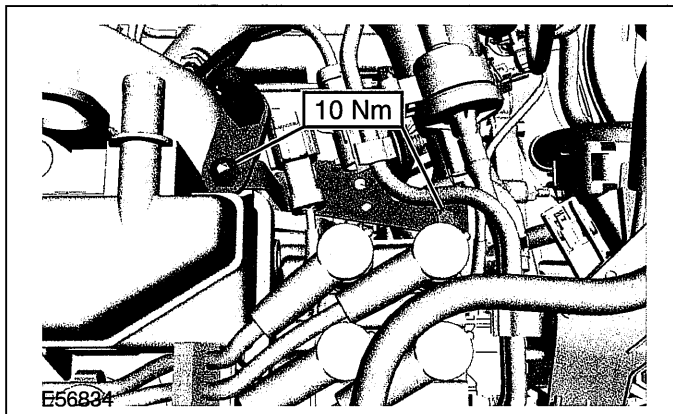
Install the valve cover.

- Tighten the bolts in the sequence shown.

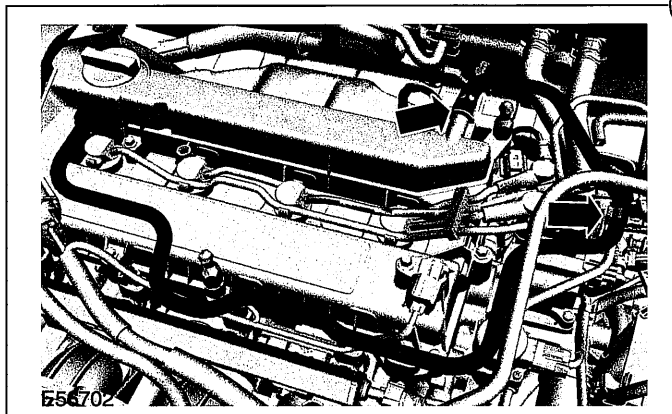
**34. Using the special tool, install the spark plugs.****35. Using the special tool, connect the spark plug electrical connectors.**

IN-VEHICLE REPAIR

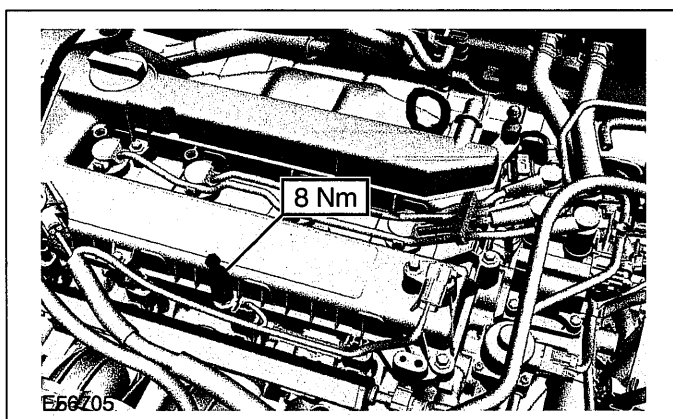
- 36. Install the evaporative emission (EVAP) valve support bracket.**



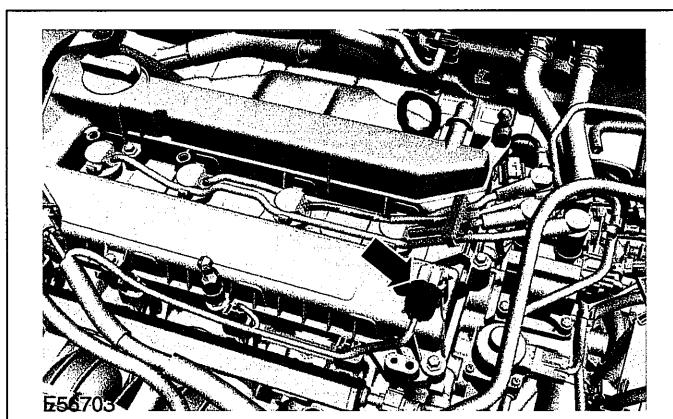
- 39. Install the positive crankshaft ventilation (PCV) hose.**



- 37. Install the air cleaner retaining bracket.**

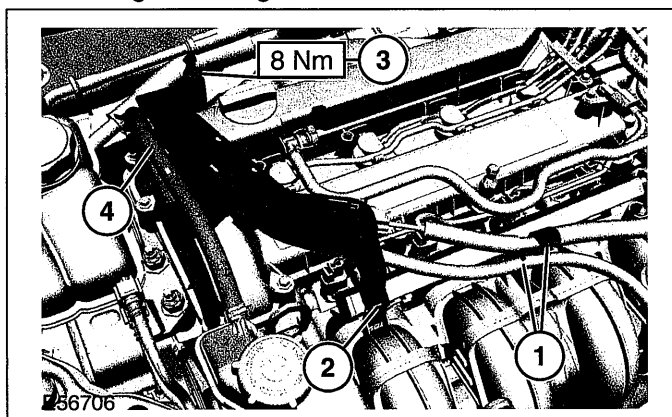


- 38. Connect the camshaft position (CMP) sensor electrical connector.**



- 40. Attach the engine wiring harness to the valve cover.**

1. Clip the engine wiring harness to the intake manifold.
2. Clip the engine wiring harness bracket to the intake manifold.
3. Install the air cleaner retaining bracket.
4. Clip the power steering return line to the engine wiring harness bracket.



- 41. Install the air cleaner.**

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

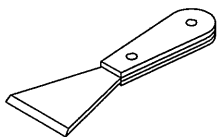
- 42. Connect the battery ground cable.**

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

IN-VEHICLE REPAIR

Oil Pan(21 154 0)

Special Tool(s)

 21179	Separator, Oil Pan 303-428 (21-179)
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Materials

Name	Specification
Cleaner	WSK-M2G342-A
Silicone Sealant	WSE-M4G323-A4

Removal

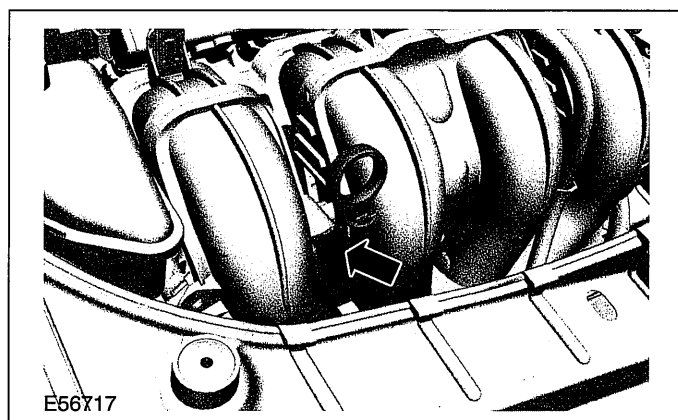
1. Disconnect the battery.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

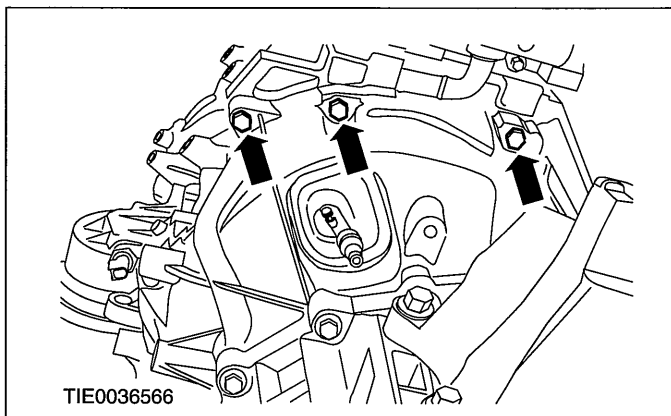
2. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (M14) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

3. Remove the oil level indicator and oil level indicator tube upper retaining bolt.



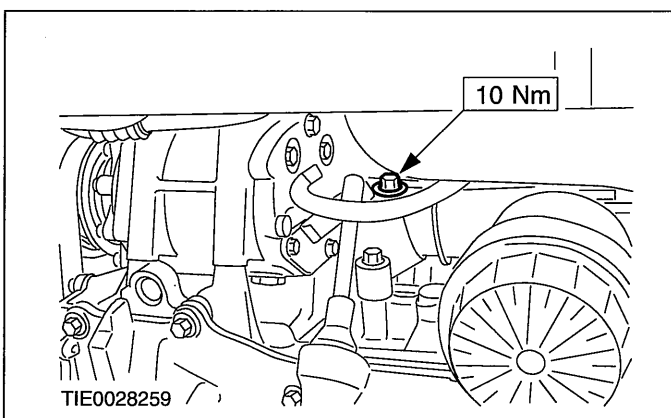
4. Loosen the transaxle upper retaining bolts approximately 10 mm.



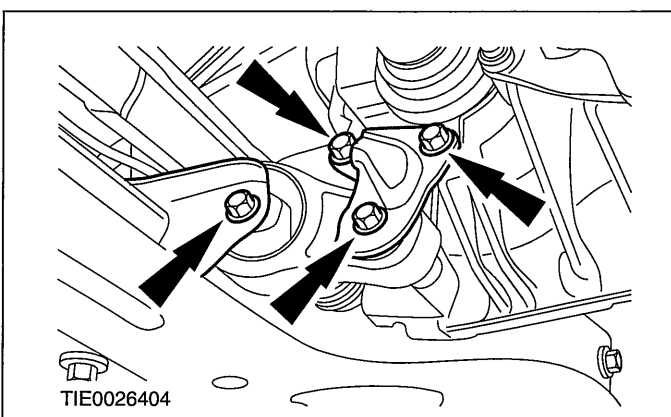
5. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation), Lifting (Description and Operation).

6. Remove the oil level indicator tube lower retaining bolt.



7. Remove the engine support insulator.

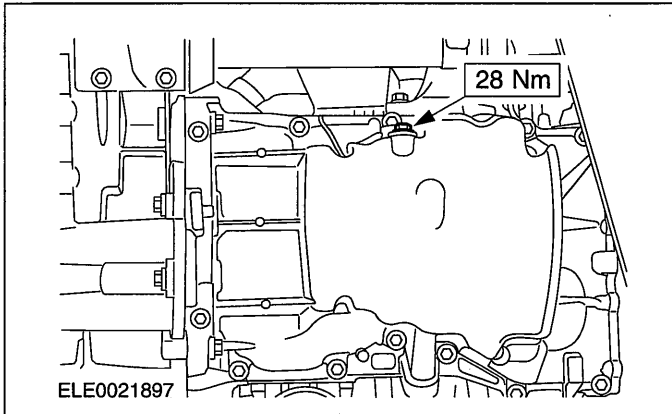
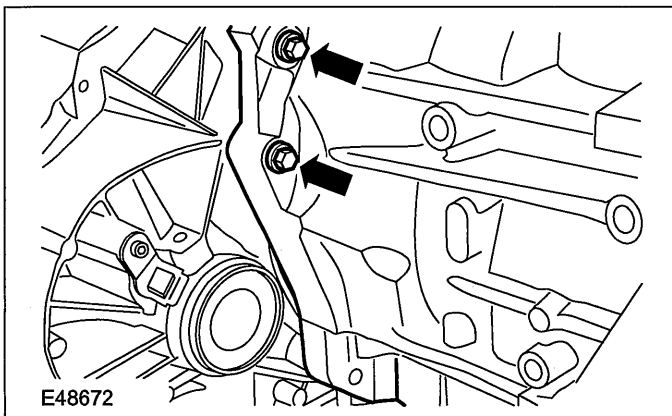
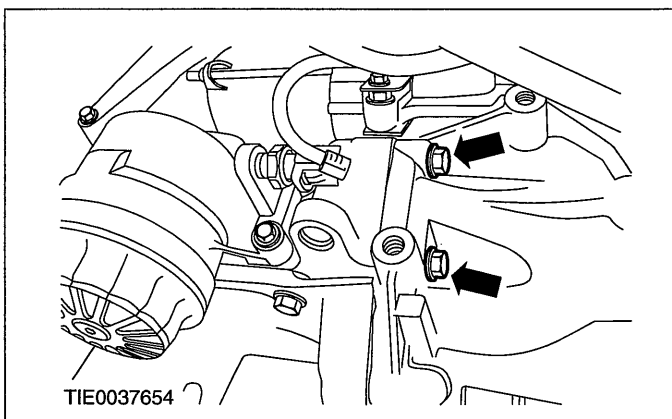
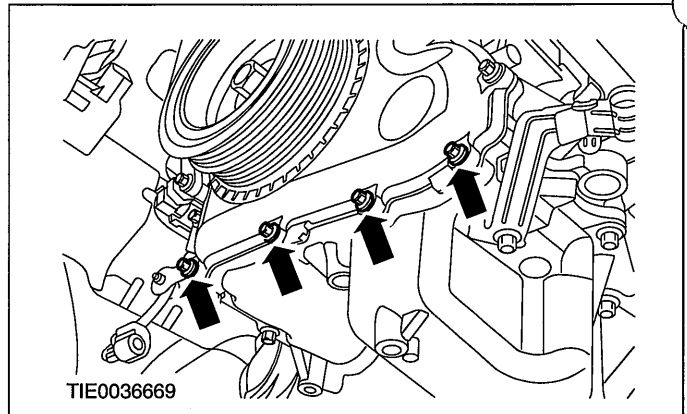
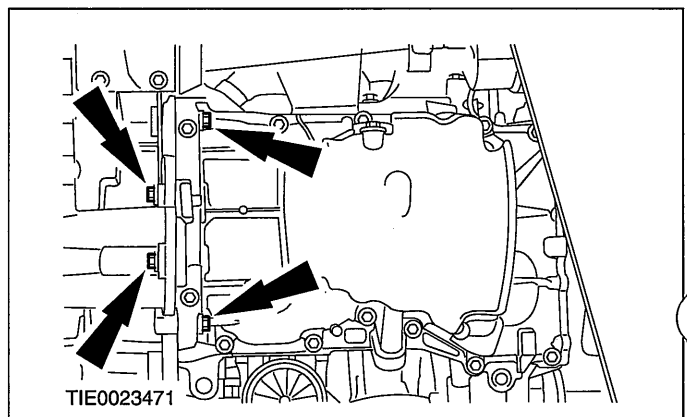
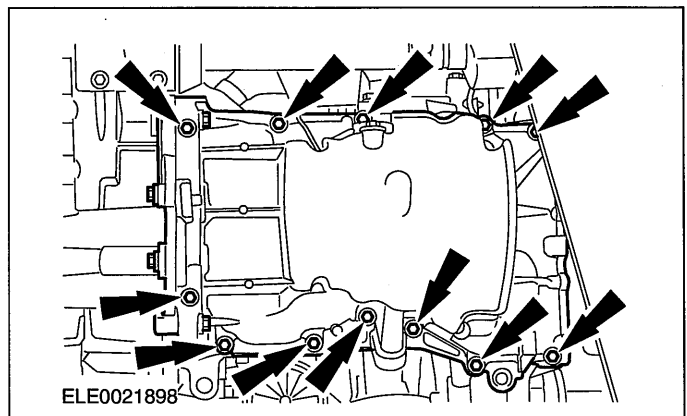


IN-VEHICLE REPAIR**8. Drain the engine.**

- Allow the oil to drain into a suitable container.

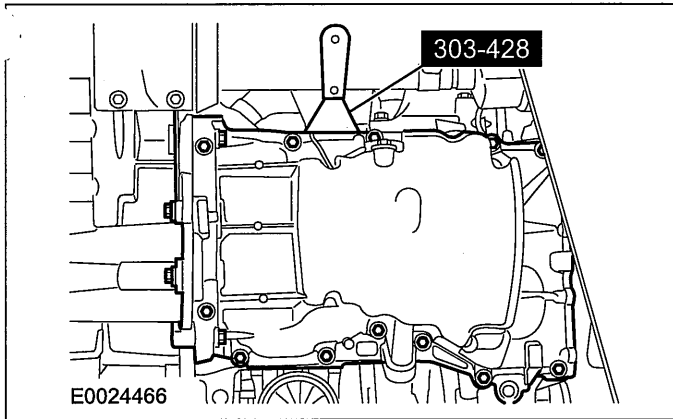
9. NOTE: Inspect the oil pan drain plug seal for damage. Install a new drain plug and seal if required.

Install the drain plug.

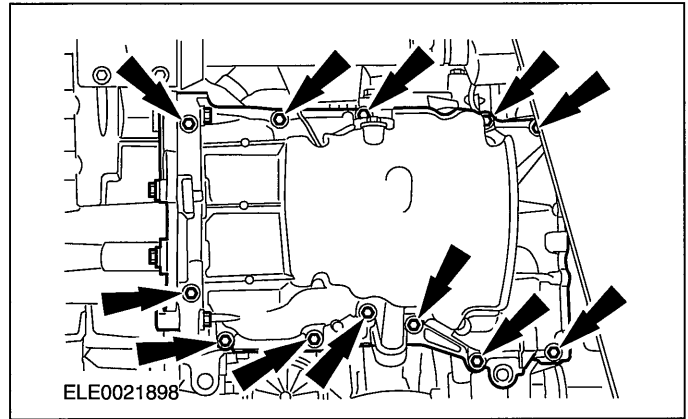
**10. Loosen the transaxle right-hand retaining bolts approximately 10 mm.****11. Loosen the transaxle left-hand retaining bolts approximately 10 mm.****12. Remove the engine front cover lower retaining bolts.****13. Remove the transaxle lower retaining bolts.****14. Slide back the transaxle approximately 8 mm.****15. Remove the oil pan retaining bolts.**

IN-VEHICLE REPAIR

16. Using the special tool, remove the oil pan.

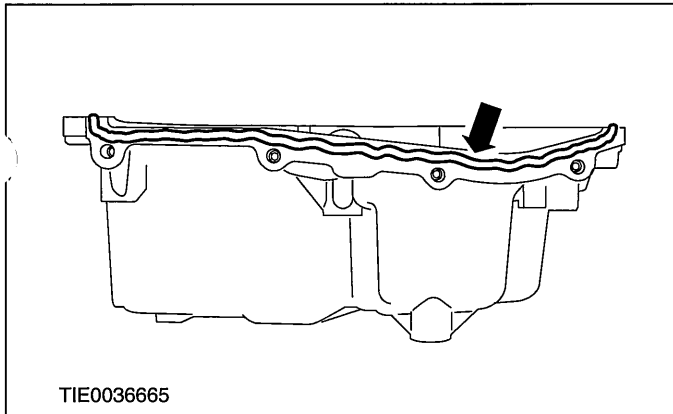


Install the oil pan.

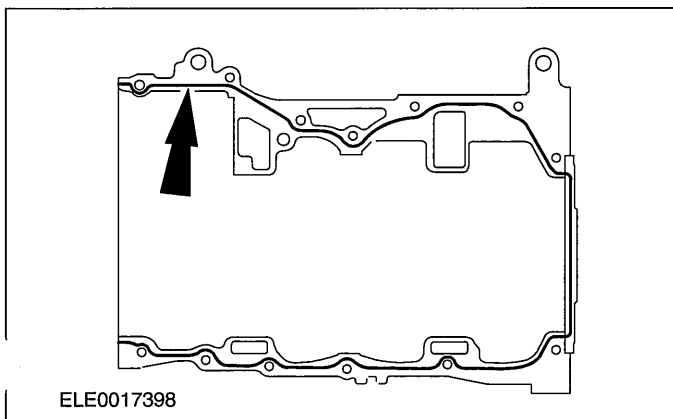


Installation

1. Clean the mating faces of the cylinder block, the oil pan and the engine front cover with cleaner.
2. Apply a 3 mm bead of sealant to the oil pan.



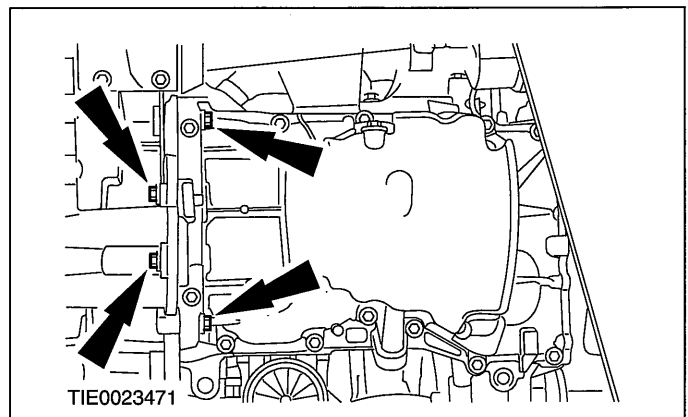
3. **NOTE:** Install the oil pan within 10 minutes of applying the silicone sealant and tighten the retaining bolts within a further 5 minutes. Apply a 3 mm bead of sealant to the oil pan.



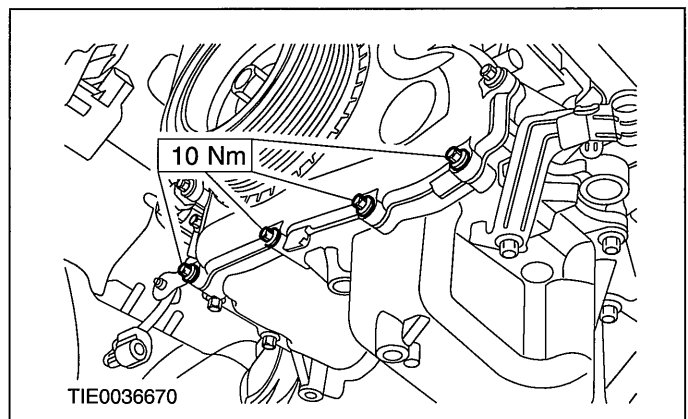
4. **NOTE:** Do not tighten the oil pan retaining bolts at this stage.

5. **NOTE:** Do not tighten the transaxle lower retaining bolts at this stage.

Install the transaxle lower retaining bolts.

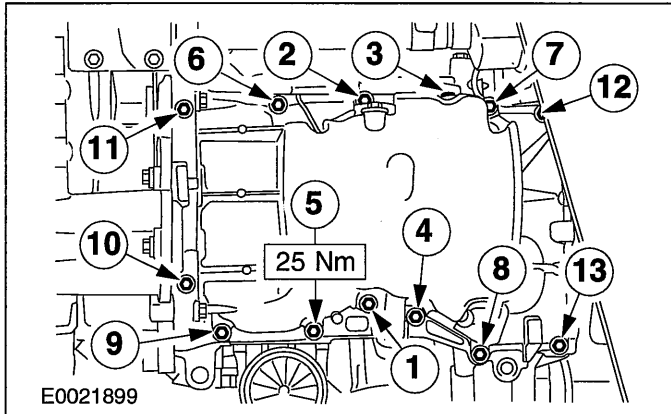


6. Install the engine front cover lower retaining bolts.

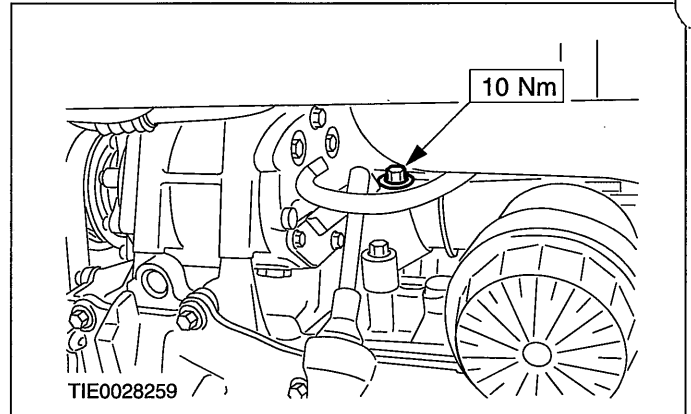


IN-VEHICLE REPAIR

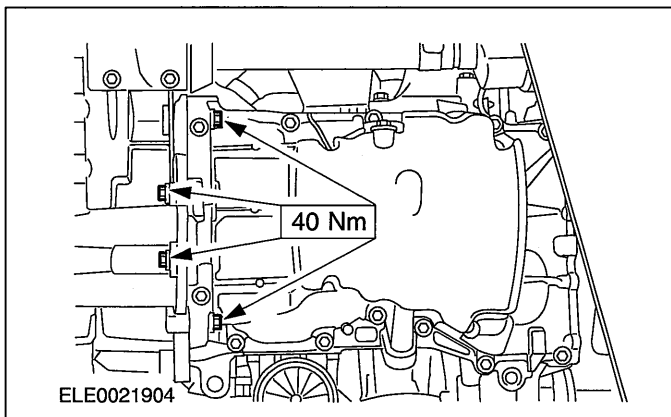
7. Tighten the oil pan retaining bolts in the sequence shown.



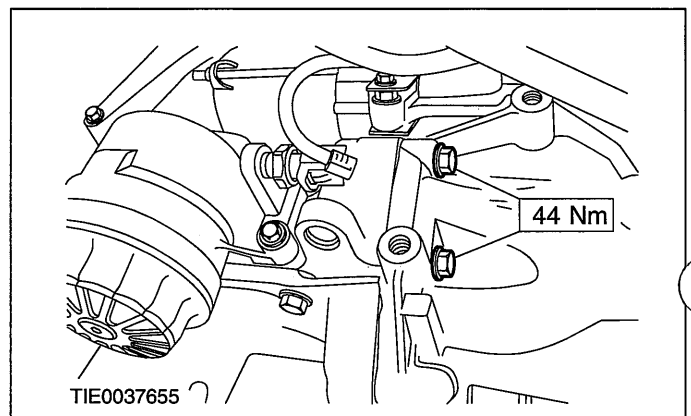
10. Install the oil level indicator tube lower retaining bolt.



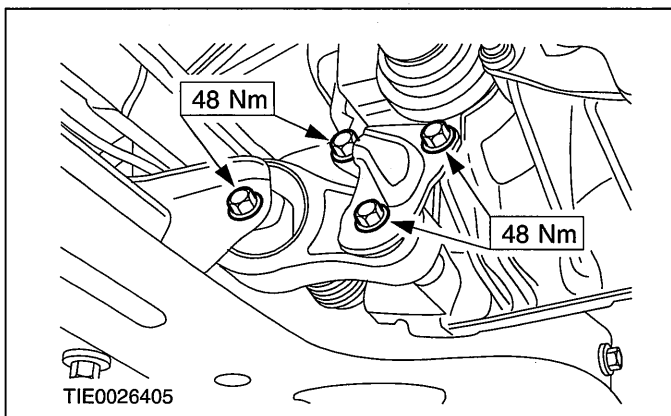
8. Tighten the transaxle lower retaining bolts.



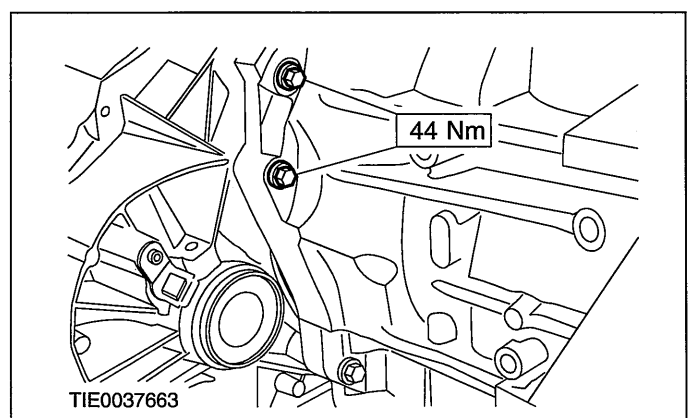
11. Tighten the transaxle left-hand retaining bolts.



9. Install the engine support insulator.



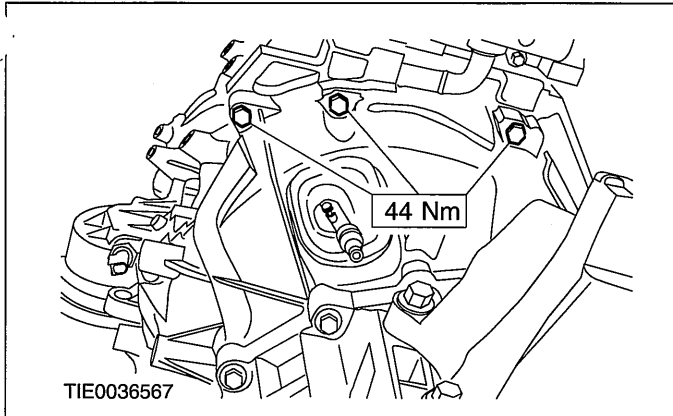
12. Tighten the transaxle right-hand retaining bolts.



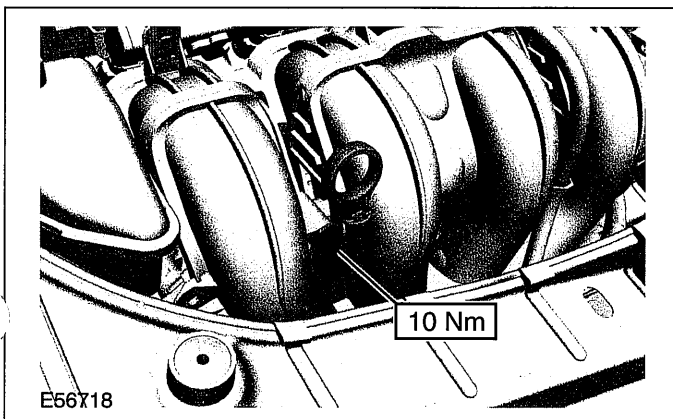
13. Lower the vehicle.

IN-VEHICLE REPAIR

- 14. Tighten the transaxle upper retaining bolts.**



- 15. Install the oil level indicator and oil level indicator tube upper retaining bolt.**



- 16. Install the air cleaner.**

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

- 17. Connect the battery.**

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

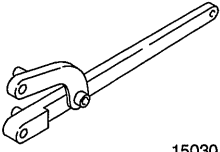
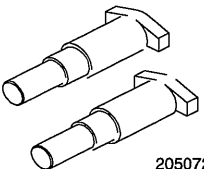
- 18. Fill the engine with engine oil.**

For additional information, refer to: Specifications (303-01 Engine - 2.0L Duratec-HE (MI4), Specifications).

IN-VEHICLE REPAIR

Oil Pump(21 714 0)

Special Tool(s)

 15030A	Universal Flange Holding Wrench 205-072 (15-030A)
 20507202	Adapter for 205-072 205-072-02 (15-030 A01)

Removal

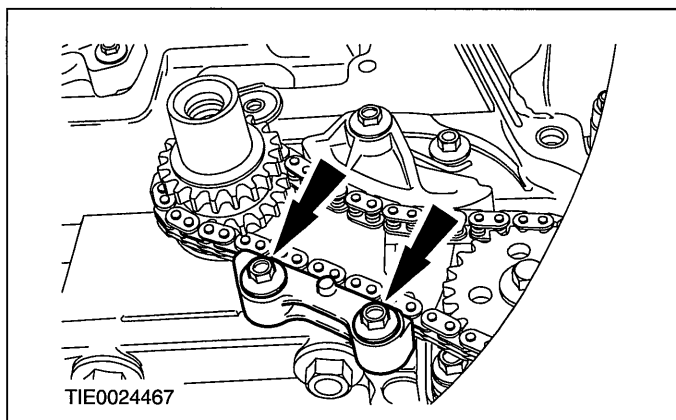
1. Remove the timing chain.

For additional information, refer to: Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

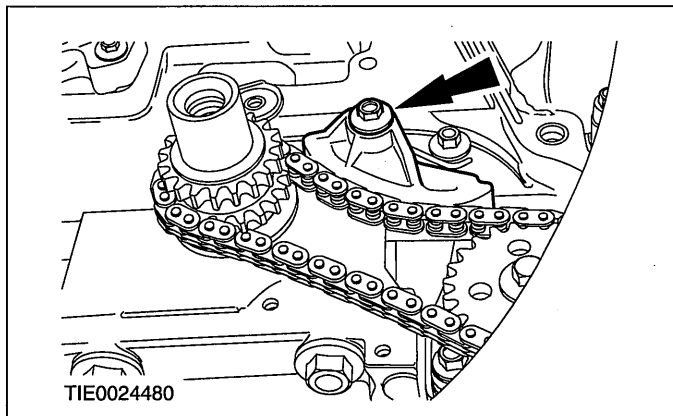
2. Remove the oil pan.

For additional information, refer to: Oil Pan (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

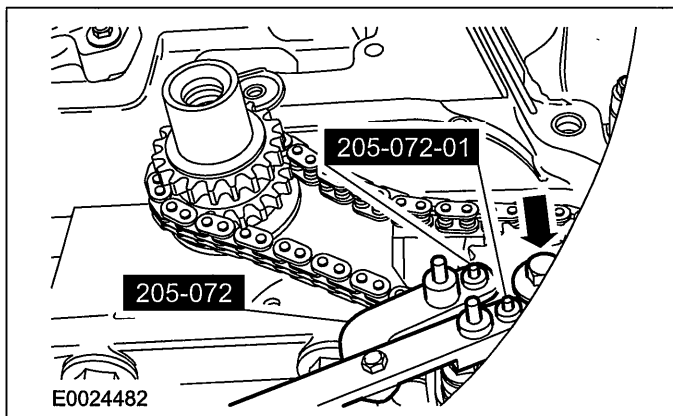
3. Remove the oil pump chain guide.



4. Remove the oil pump chain tensioner.

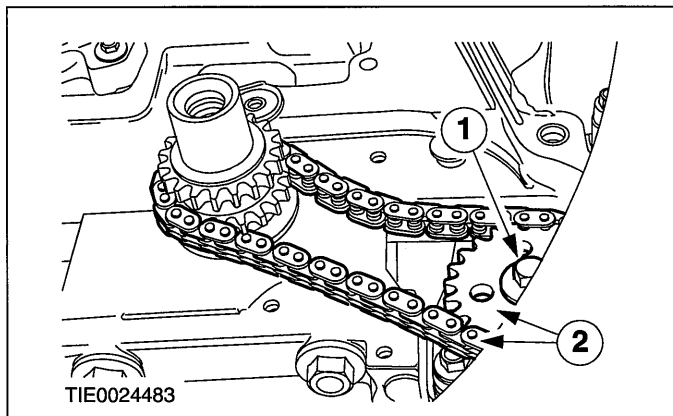


5. Using the special tools, loosen the oil pump sprocket retaining bolt.



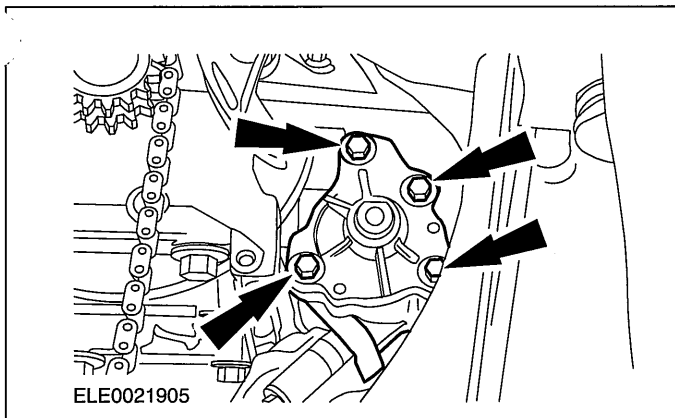
6. Remove the oil pump chain.

1. Remove the oil pump sprocket retaining bolt.
2. Remove the oil pump chain and the oil pump sprocket.

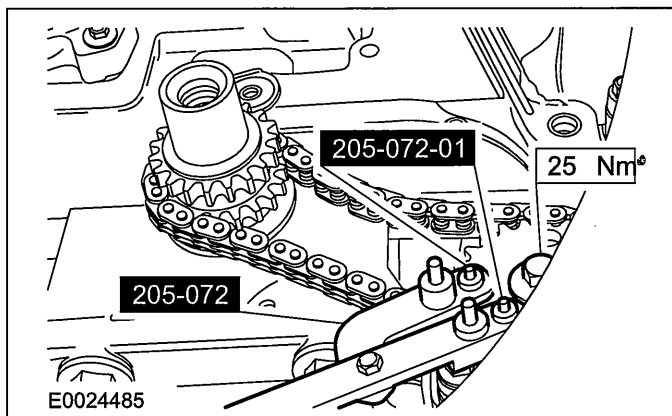


IN-VEHICLE REPAIR

7. Remove the oil pump.



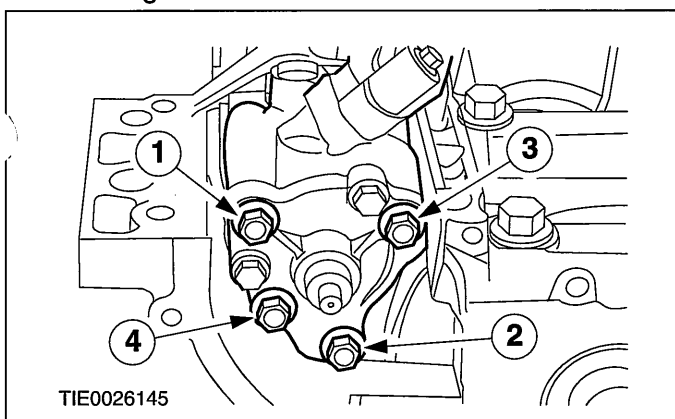
3. Using the special tools, tighten the oil pump sprocket retaining bolt.



Installation

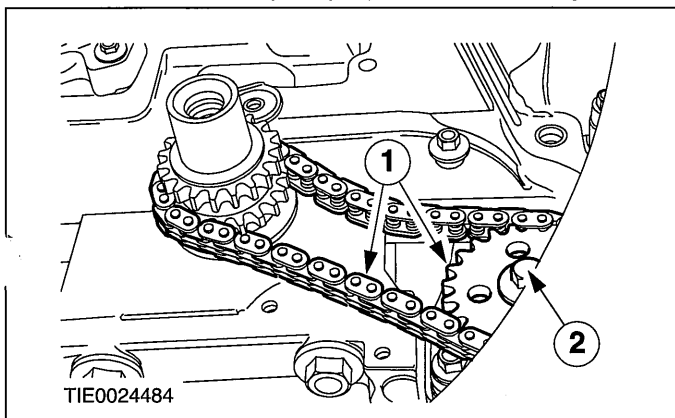
1. Install the oil pump.

- Tighten the bolts in the sequence shown in two stages.
- Stage 1: 10 Nm
- Stage 2: 23 Nm

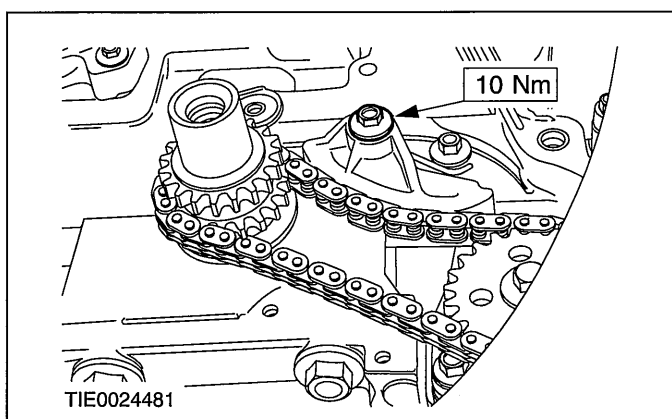
2. **NOTE:** Do not tighten the oil pump sprocket retaining bolt at this stage.

Install the oil pump chain.

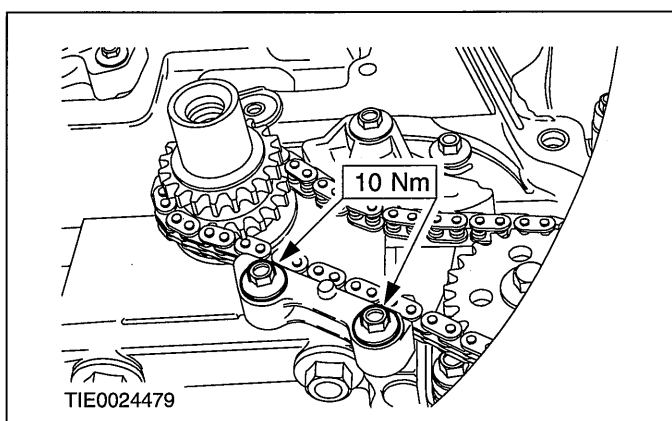
1. Install the oil pump chain and the oil pump sprocket.
2. Install the oil pump sprocket retaining bolt.



4. Install the oil pump chain tensioner.



5. Install the oil pump chain guide.



6. Install the oil pan.

For additional information, refer to: Oil Pan (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

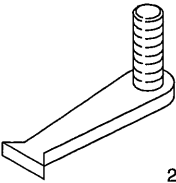
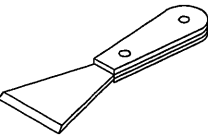
7. Install the timing chain.

For additional information, refer to: Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

IN-VEHICLE REPAIR

Crankshaft Rear Seal(21 468 4)

Special Tool(s)

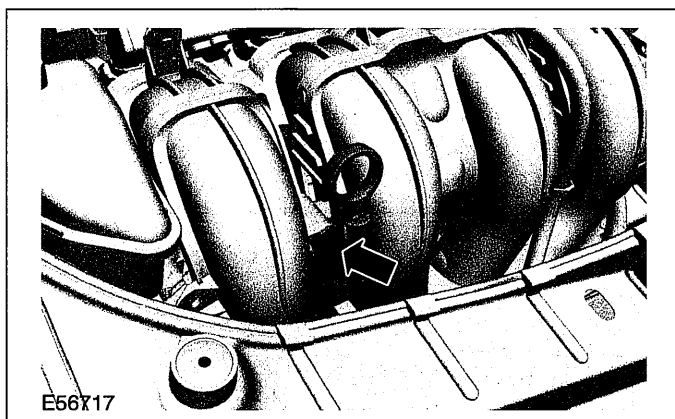
 21135	Locking Tool, Flywheel 303-254 (21-135)
 21179	Separator, Oil Pan 303-428 (21-179)

Materials

Name	Specification
Cleaner	WSK-M2G342-A
Silicone Sealant	WSE-M4G323-A4

Removal

1. Remove the oil level indicator and oil level indicator tube upper retaining bolt.



2. Remove the clutch disc and pressure plate.

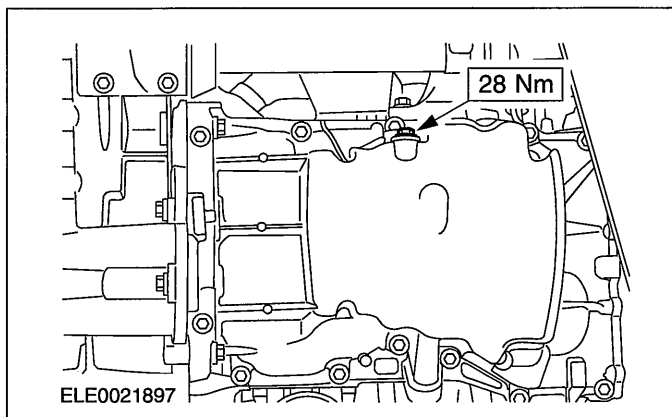
For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

3. Drain the engine.

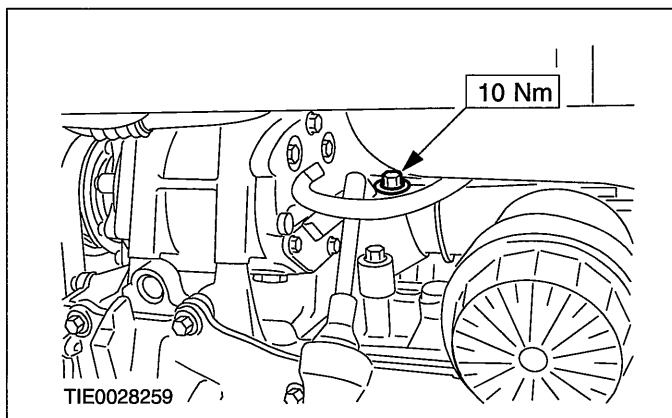
- Allow the oil to drain into a suitable container.

4. **NOTE:**Inspect the oil pan drain plug seal for damage. Install a new drain plug and seal if required.

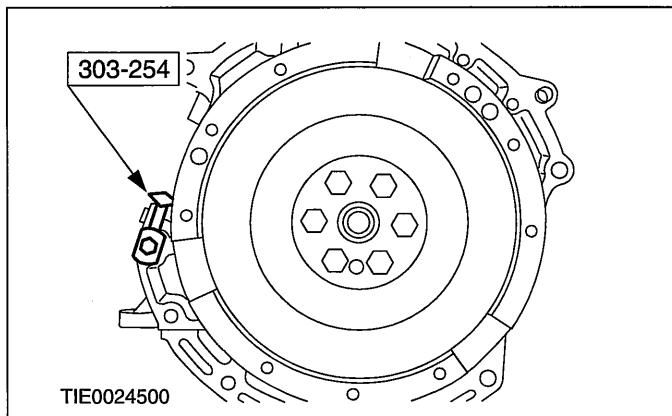
Install the drain plug.



5. Remove the oil level indicator tube lower retaining bolt.



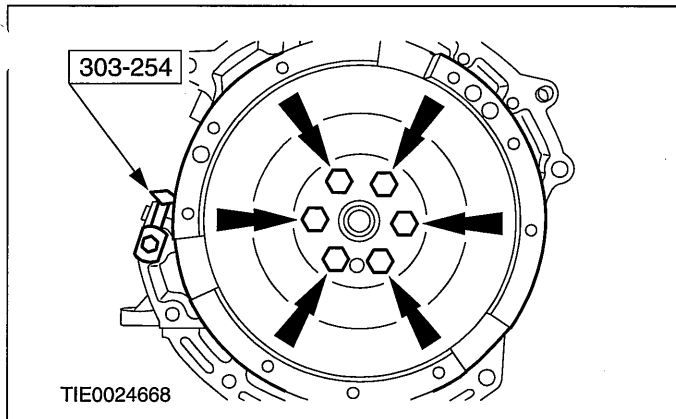
6. Using the special tool, lock the flywheel in position.



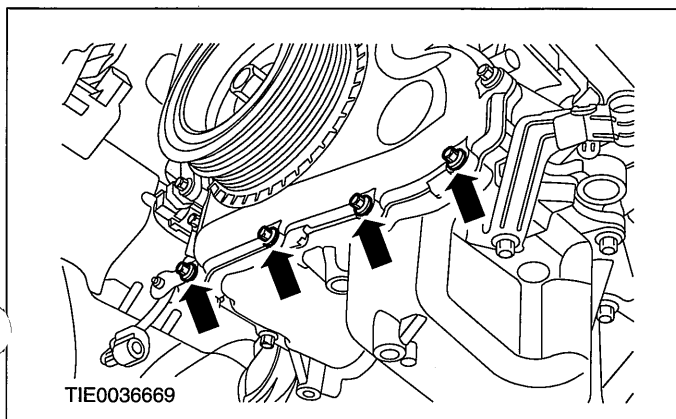
7. Remove the flywheel.

IN-VEHICLE REPAIR

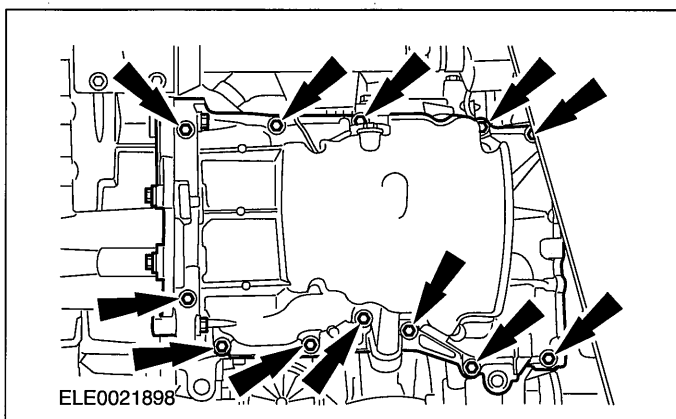
- Discard the bolts.



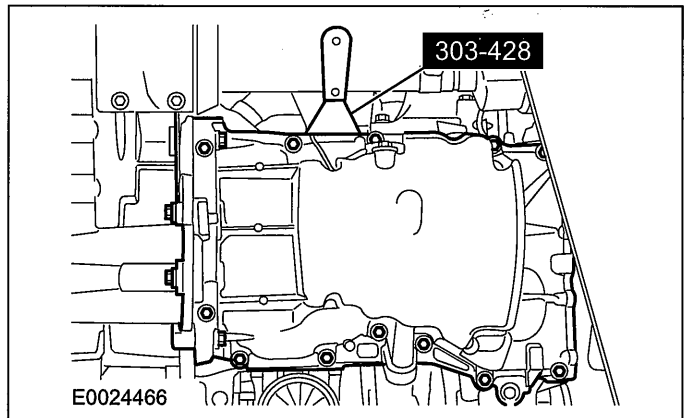
8. Remove the engine front cover lower retaining bolts.



9. Remove the oil pan retaining bolts.

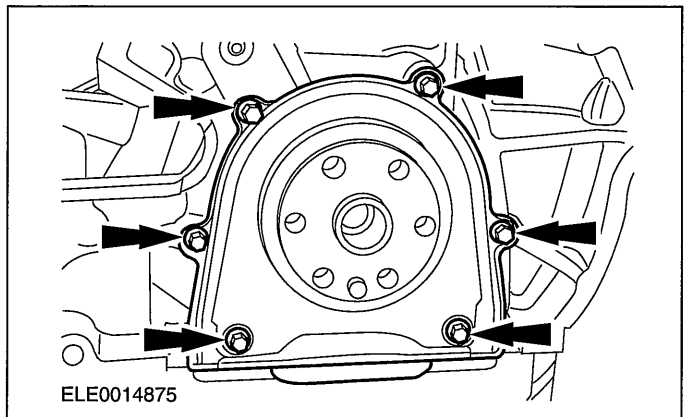


10. Using the special tool, remove the oil pan.



11. Remove the crankshaft rear seal carrier.

- Discard the crankshaft rear seal carrier.



Installation

1. **CAUTION:** Do not remove the the installation sleeve before installation.

NOTE: A new crankshaft rear seal carrier is supplied preassembled with an installation sleeve that must be removed following installation.

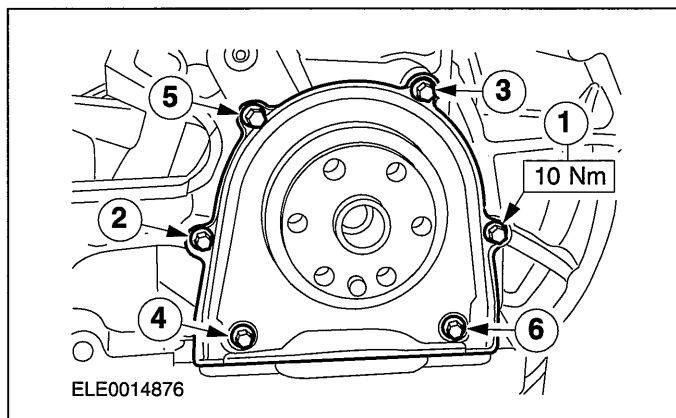
NOTE: Install a new crankshaft rear seal carrier.

Install the crankshaft rear seal carrier.

- Tighten the retaining bolts in the sequence shown.

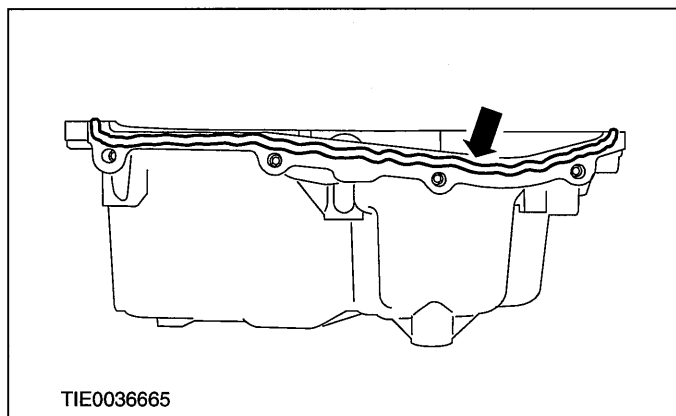
IN-VEHICLE REPAIR

- Discard the installation sleeve.

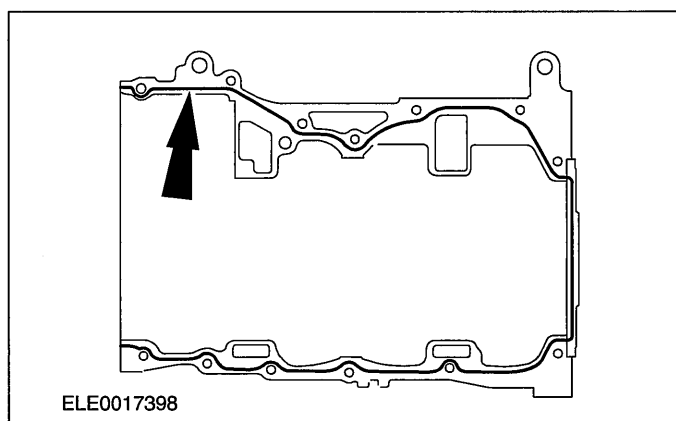


2. Clean the mating faces of the cylinder block, the oil pan and the engine front cover with cleaner.

3. Apply a 3 mm bead of sealant to the oil pan.

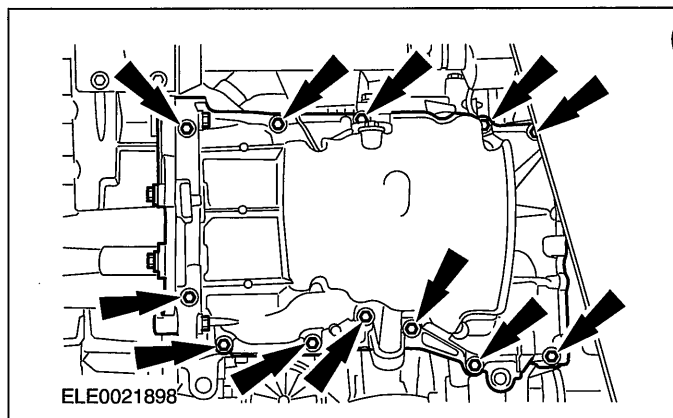


4. **NOTE:** Install the oil pan within 10 minutes of applying the silicone sealant and tighten the retaining bolts within a further 5 minutes.
Apply a 3 mm bead of sealant to the oil pan.

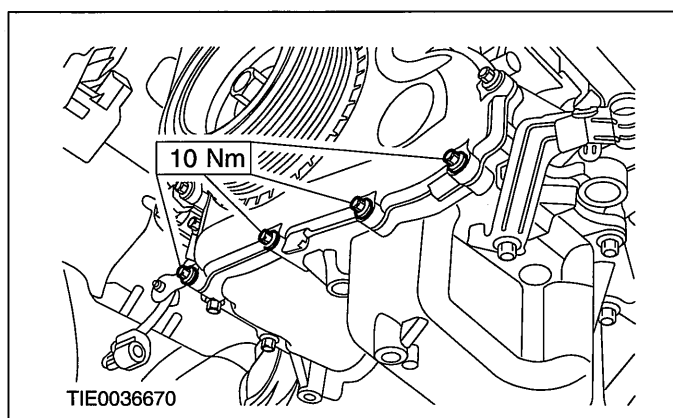


5. **NOTE:** Do not tighten the retaining bolts at this stage.

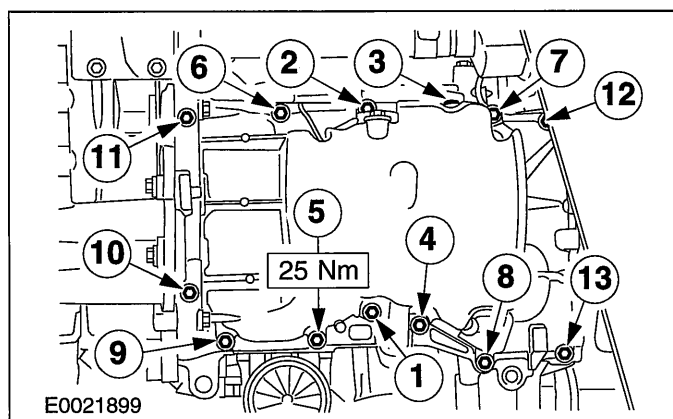
Install the oil pan.



6. Install the engine front cover lower retaining bolts.



7. Tighten the oil pan retaining bolts in the sequence shown.

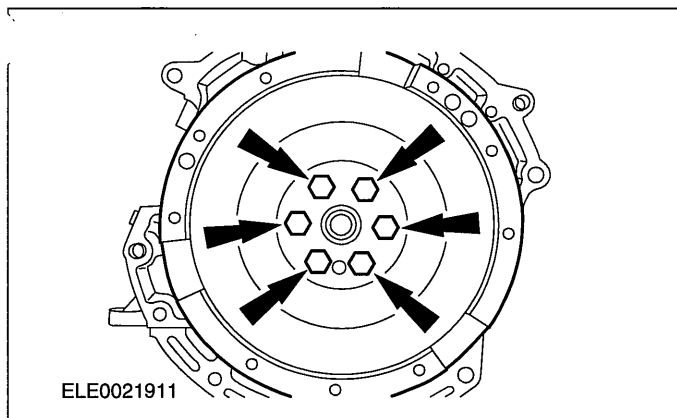


8. **NOTE:** Install new flywheel retaining bolts.

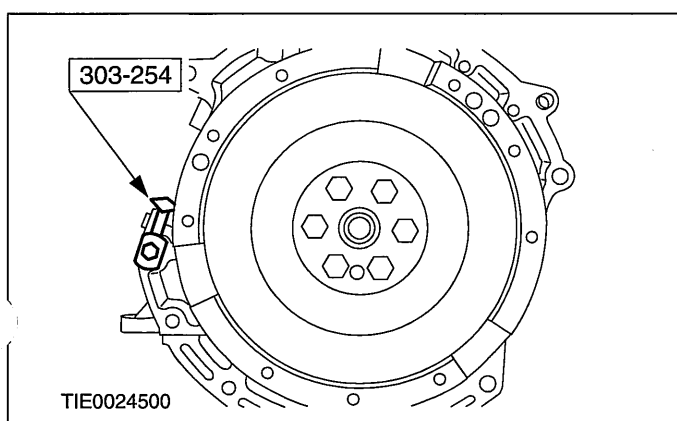
NOTE: Do not tighten the flywheel retaining bolts at this stage.

IN-VEHICLE REPAIR

Install the flywheel.

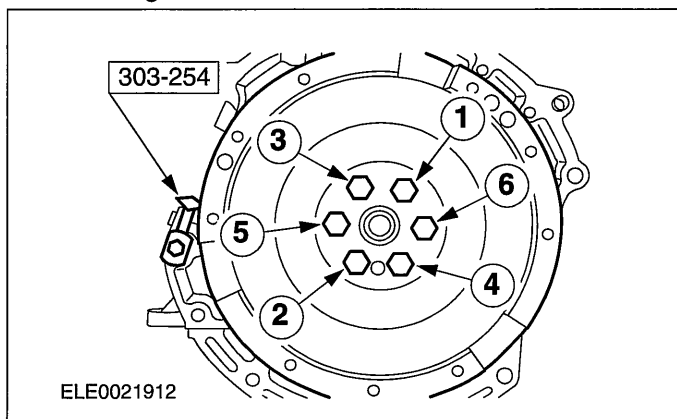


9. Using the special tool, lock the flywheel in position.



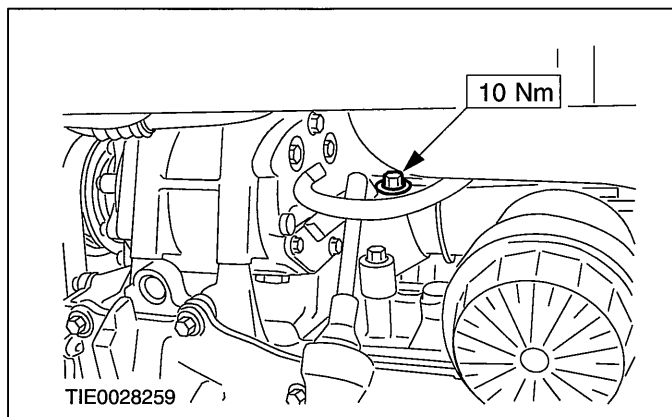
10. Tighten the flywheel retaining bolts.

- Tighten the bolts in the sequence shown in three stages.
- Stage 1: 50 Nm.
- Stage 2: 80 Nm.
- Stage 3: 112 Nm.



11. Remove the special tool.

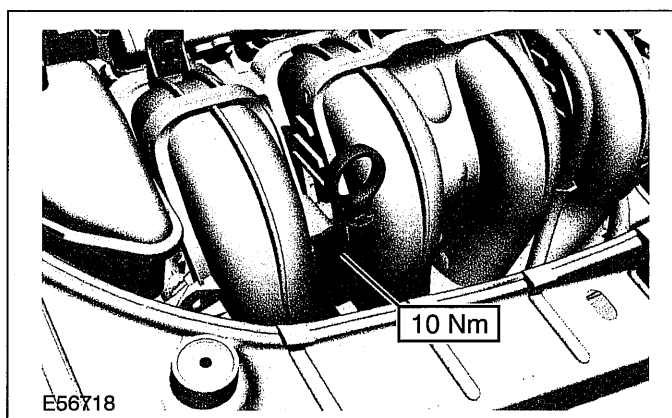
12. Install the oil level indicator tube lower retaining bolt.



13. Install the clutch disc and pressure plate.

For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

14. Install the oil level indicator and oil level indicator tube upper retaining bolt.



15. Fill the engine with engine oil.

For additional information, refer to: Specifications (303-01 Engine - 2.0L Duratec-HE (MI4), Specifications).

IN-VEHICLE REPAIR**Engine Front Cover(21 148 0)****General Equipment**

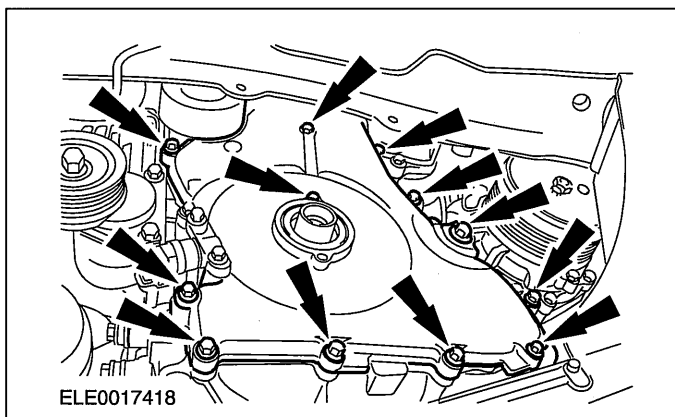
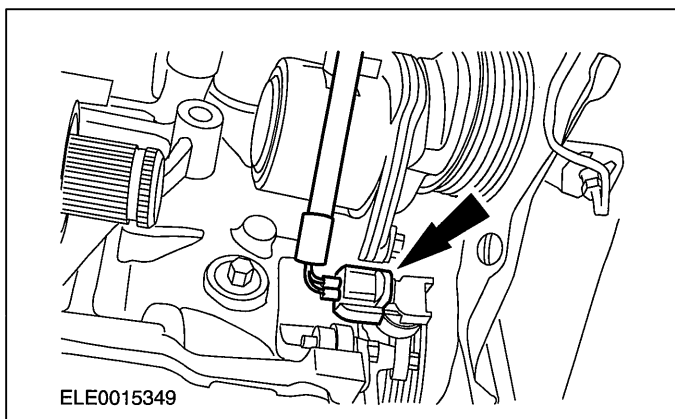
Vehicle jack

Materials

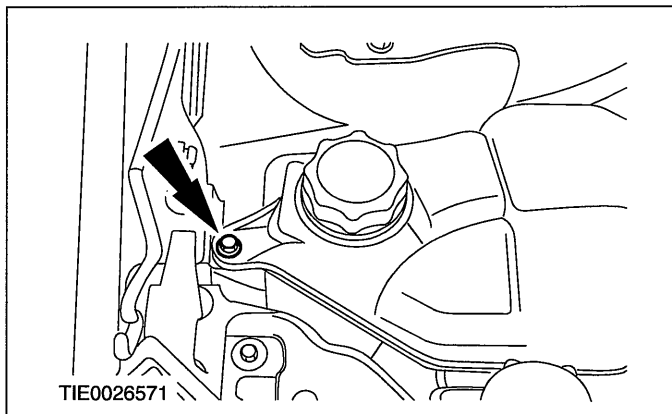
Name	Specification
Silicone Sealant	WSE-M4G323-A4

Removal**1. Remove the crankshaft belt pulley.**

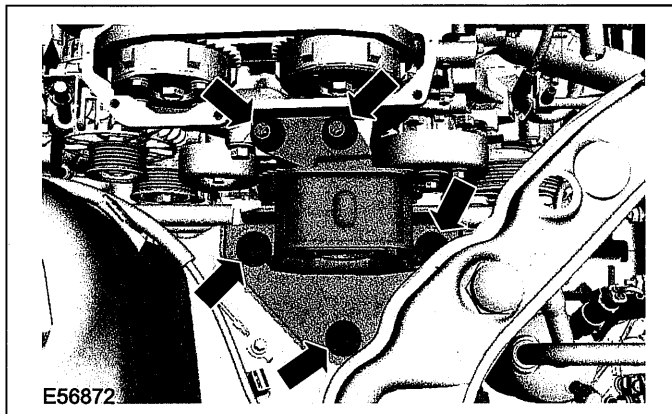
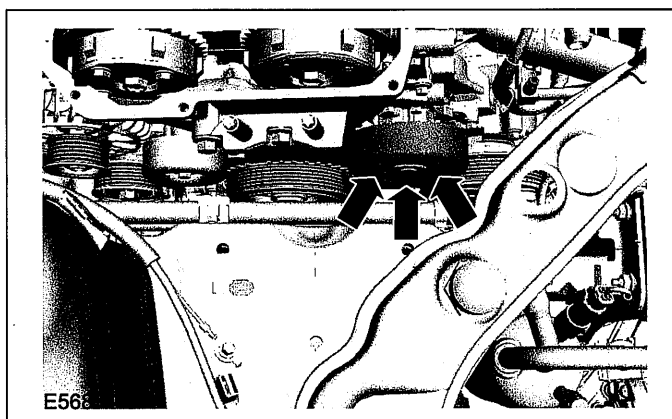
For additional information, refer to:
Crankshaft Pulley (303-01 Engine - 2.0L Duratec-HE (M14), In-vehicle Repair).

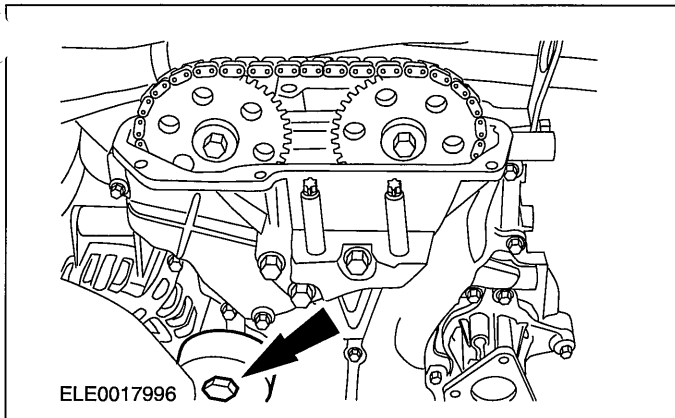
2. Remove the timing cover lower bolts.**3. Disconnect the crankshaft position (CKP) sensor electrical connector.****4. Lower the vehicle.****5. Remove the power steering pump.**

For additional information, refer to: **Power Steering Pump - 2.0L Duratec-HE (M14) (211-02 Power Steering, Removal and Installation).**

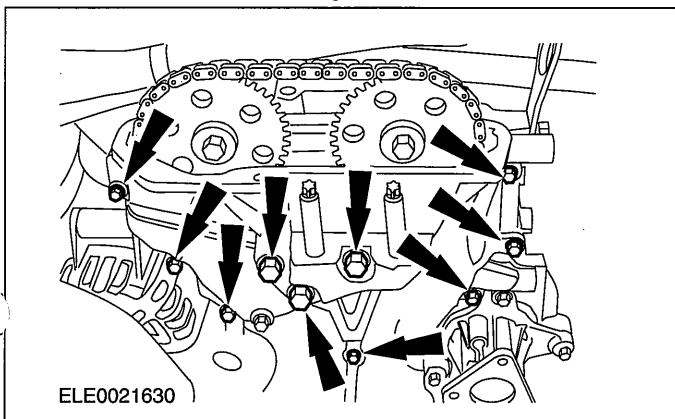
6. Detach the coolant expansion tank and lay it to one side.**7. Support the engine with a vehicle jack.****8. Remove the front engine mount.**

- Discard the front engine mount nuts.

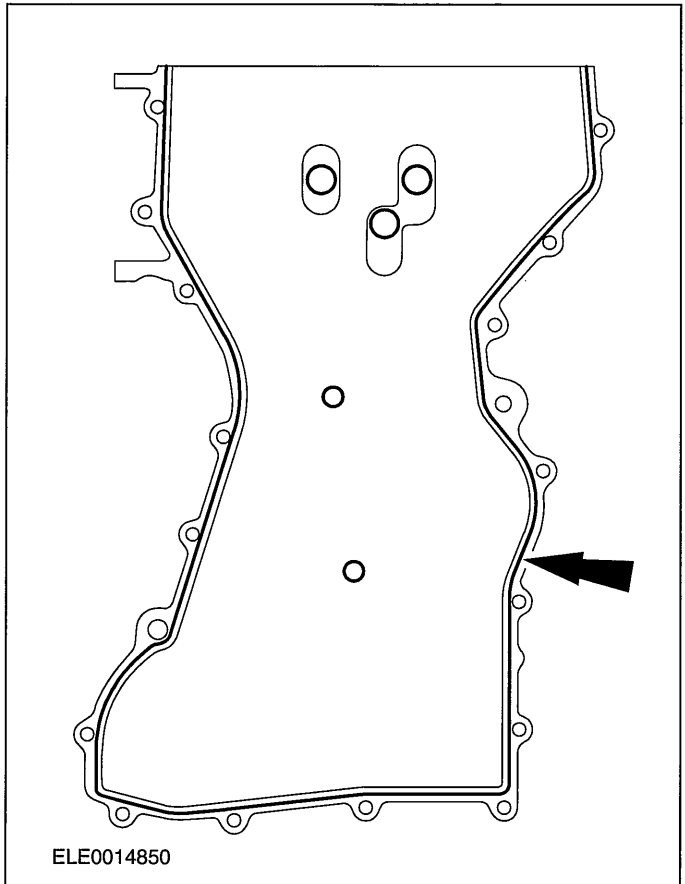
**9. Remove the coolant pump pulley.**

IN-VEHICLE REPAIR**10. Remove the drive belt idler pulley.****11. Remove the timing cover upper bolts.**

- Remove the timing cover.



Apply sealer to the timing cover (bead diameter: 3 mm).

**Installation**

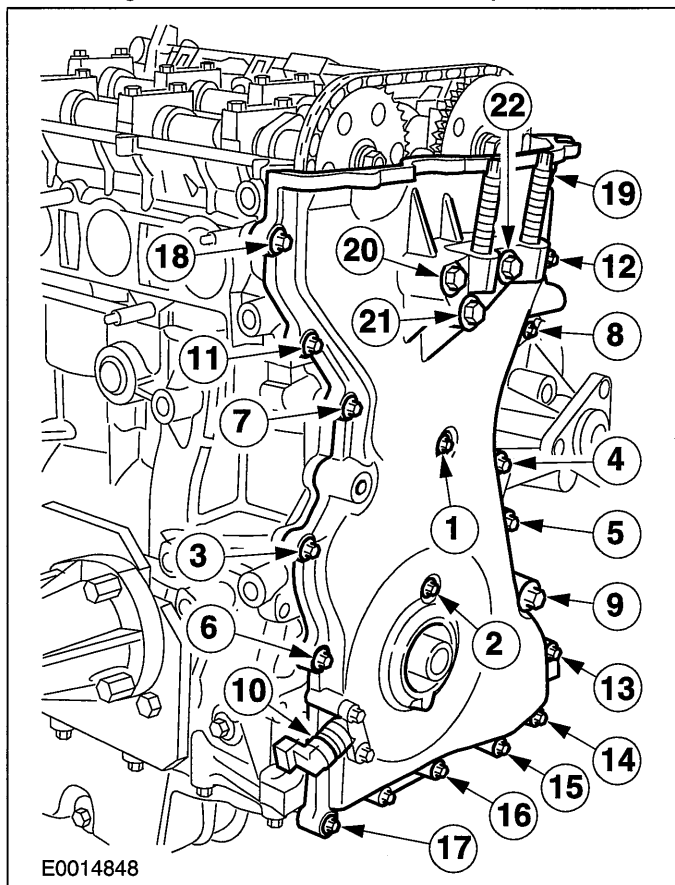
- 1. Clean the sealing surfaces of the timing cover and the cylinder block.**
- 2. NOTE:** Install the timing cover within 10 minutes of applying the silicon sealer.

3. Install the timing cover (engine shown removed for clarity).

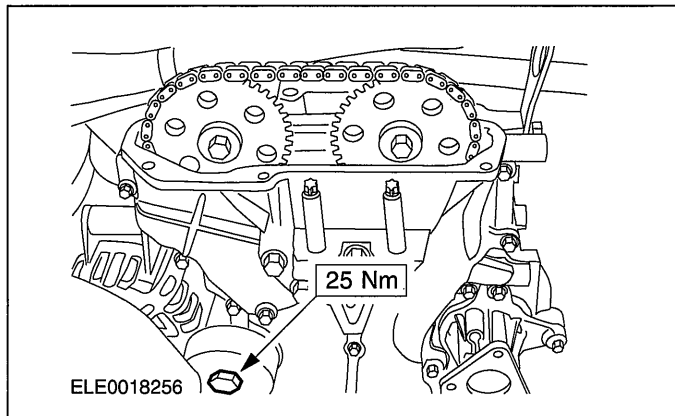
- Tighten the bolts in the sequence shown.
- Tighten bolts 1 to 8 to a torque of 10 Nm.
- Tighten bolt 9 to 48 Nm.
- Tighten bolts 10 to 19 to a torque of 10 Nm.

IN-VEHICLE REPAIR

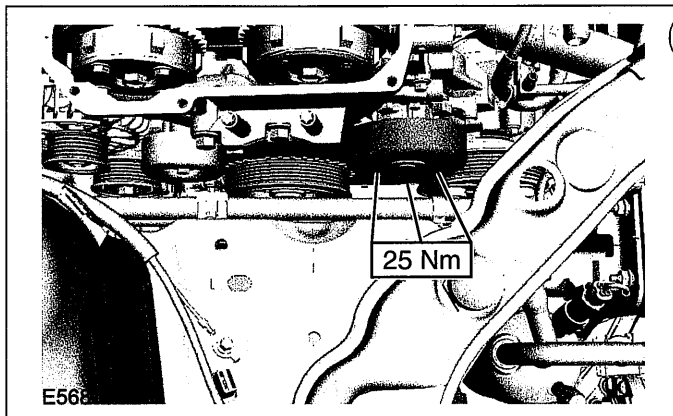
- Tighten bolts 20 to 22 to a torque of 48 Nm.



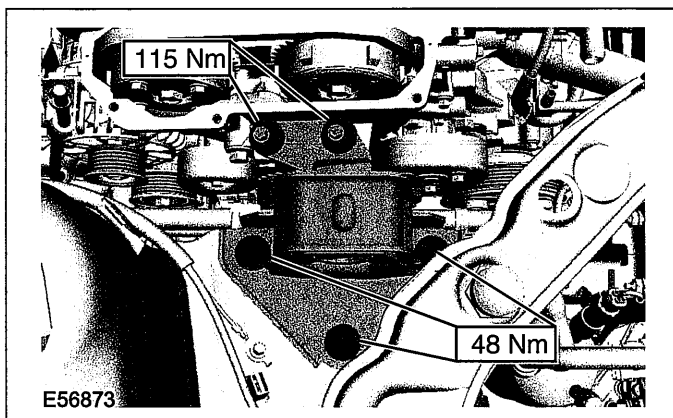
4. Install the multi-groove belt idler pulley.



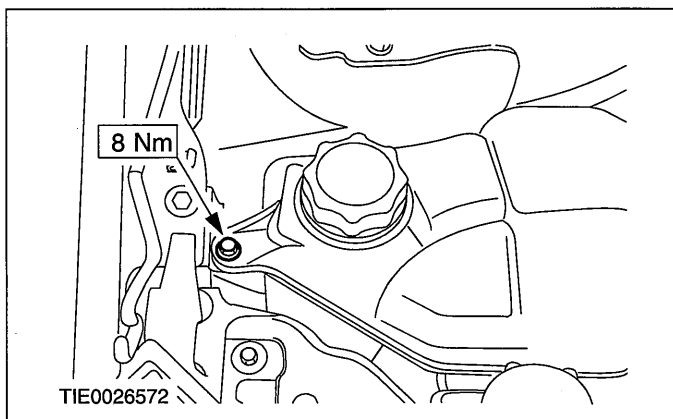
5. Install the coolant pump pulley.



6. **NOTE:** Install new front engine mount nuts. Install the front engine mount.



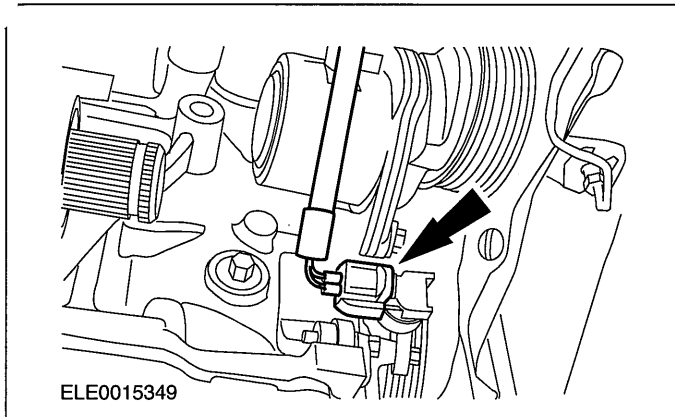
7. Install the coolant expansion tank.



8. Raise the vehicle.

IN-VEHICLE REPAIR

- 9. Connect the CKP sensor electrical connector.**



- 10. Install the crankshaft belt pulley.**

For additional information, refer to:
Crankshaft Pulley (303-01 Engine - 2.0L
Duratec-HE (MI4), In-vehicle Repair).

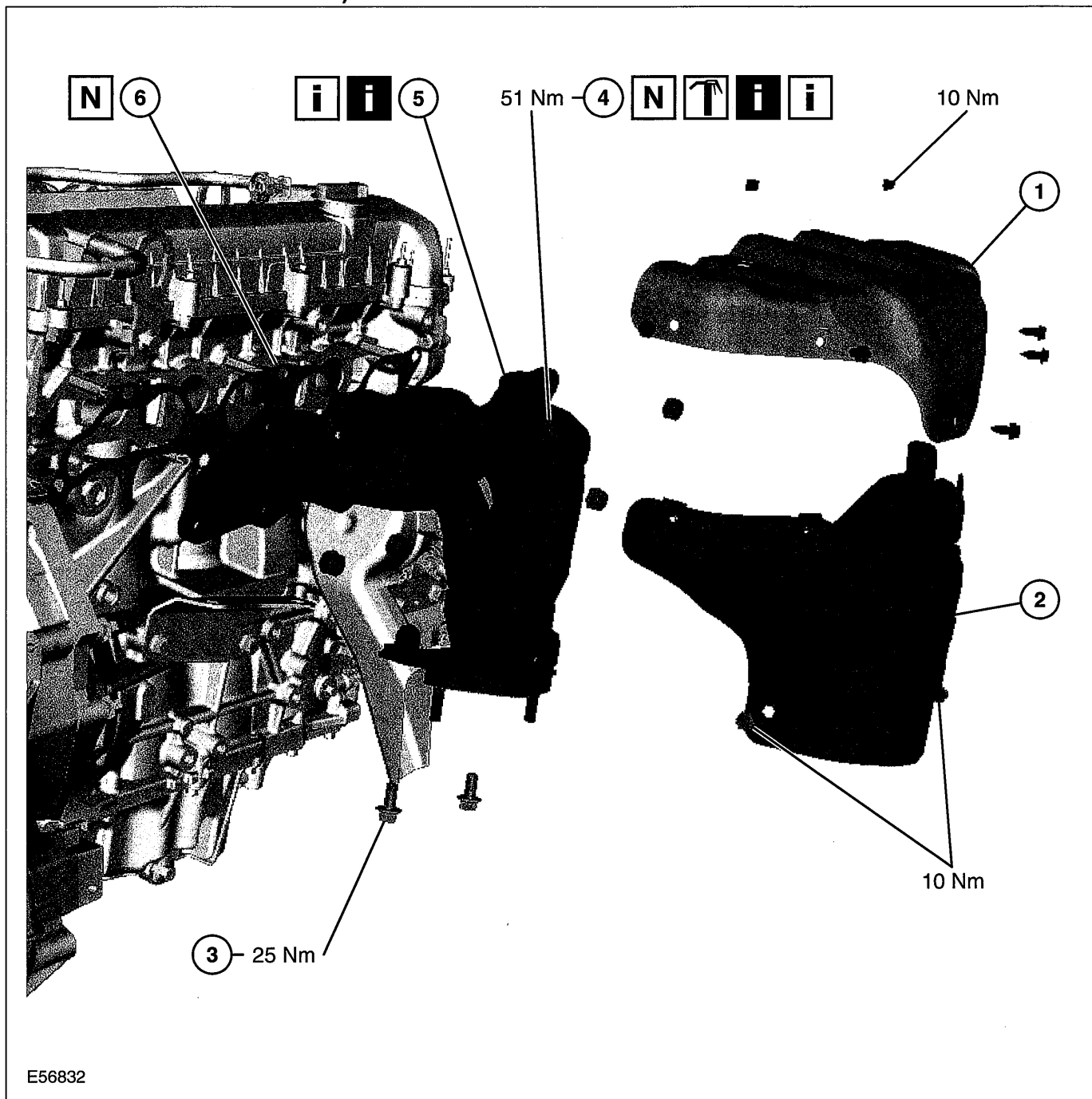
IN-VEHICLE REPAIR

Exhaust Manifold

1. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

2. Remove the components in the order indicated in the following illustration(s) and table(s).



Item	Description
1	Exhaust manifold upper heat shield
2	Exhaust manifold lower heat shield

Item	Description
3	Exhaust manifold support bracket retaining bolts
4	Exhaust manifold retaining nuts See Removal Detail

IN-VEHICLE REPAIR

Item	Description
	See Installation Detail
5	Exhaust manifold See Removal Detail

Item	Description
	See Installation Detail
6	Exhaust manifold gasket

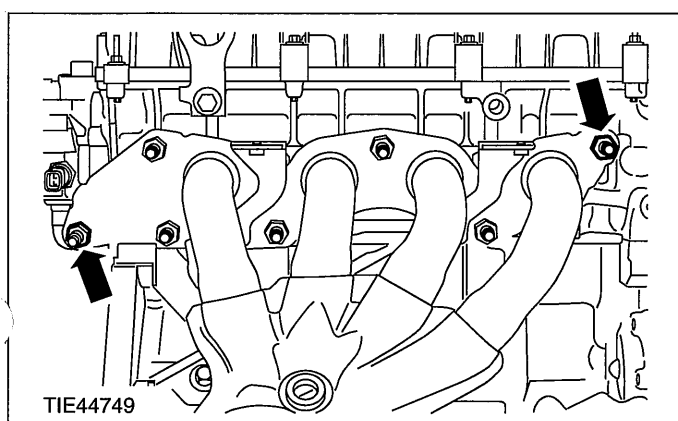
3. To install, reverse the removal procedure.

Removal Details

Item 4 Exhaust manifold retaining nuts

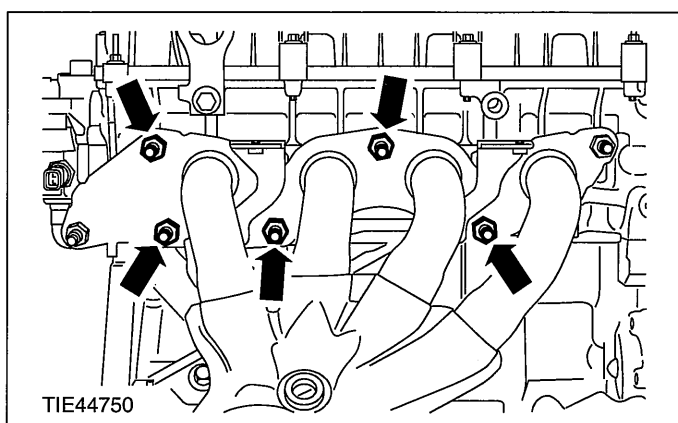
1. **NOTE:** Do not remove the exhaust manifold outer retaining nuts at this stage.

Loosen the exhaust manifold outer retaining nuts by two turns (engine shown removed for clarity).



2. Remove the exhaust manifold inner retaining nuts (engine shown removed for clarity).

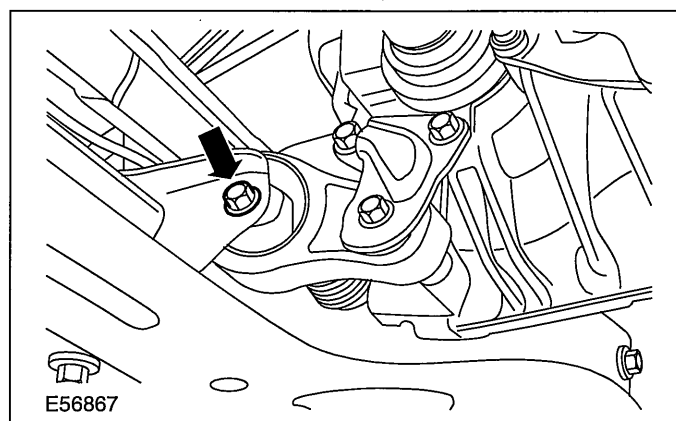
- Discard the nuts.



3. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

4. Remove the engine support insulator center retaining bolt.



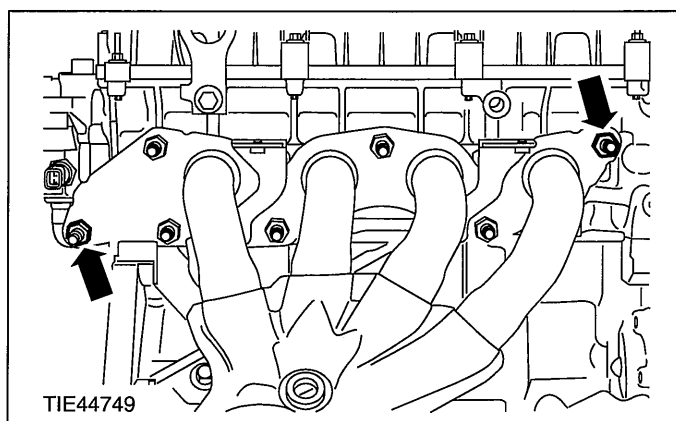
5. Remove the exhaust flexible pipe.

For additional information, refer to: Exhaust Flexible Pipe - 2.0L Duratec-HE (MI4) (309-00 Exhaust System, Removal and Installation).

Item 5 Exhaust manifold

1. Remove the exhaust manifold outer retaining nuts.

- Discard the nuts.



IN-VEHICLE REPAIR**Installation Details****Item 5 Exhaust manifold**

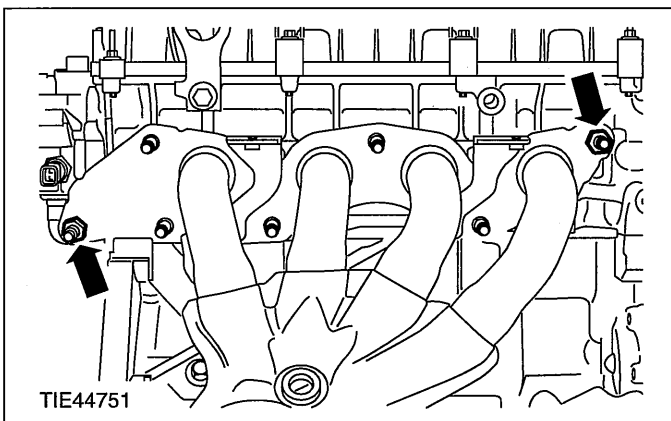
1. **⚠ CAUTION:** Never use jointing compound forward of the exhaust manifold.

NOTE: Coat the exhaust manifold studs with anti-seize grease.

NOTE: Install a new gasket and new nuts.

NOTE: Do not fully tighten the exhaust manifold outer retaining nuts at this stage.

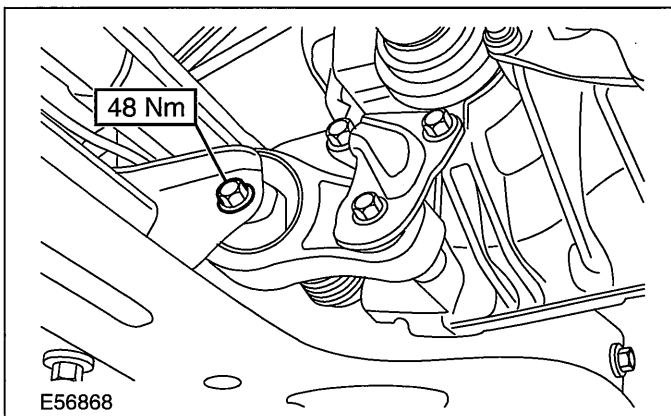
Loosely install the exhaust manifold outer retaining nuts.

**Item 4 Exhaust manifold retaining nuts**

1. Install the exhaust flexible pipe.

For additional information, refer to: Exhaust Flexible Pipe - 2.0L Duratec-HE (MI4) (309-00 Exhaust System, Removal and Installation).

2. Install the engine support insulator center retaining bolt.



3. Lower the vehicle and fully tighten the exhaust manifold retaining nuts.

IN-VEHICLE REPAIR

Timing Chain(21 314 0)

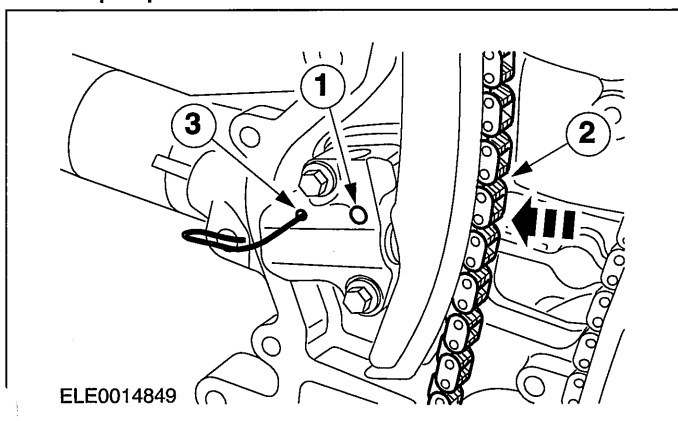
Removal

1. Remove the engine front cover.

For additional information, refer to Engine Front Cover - in this section.

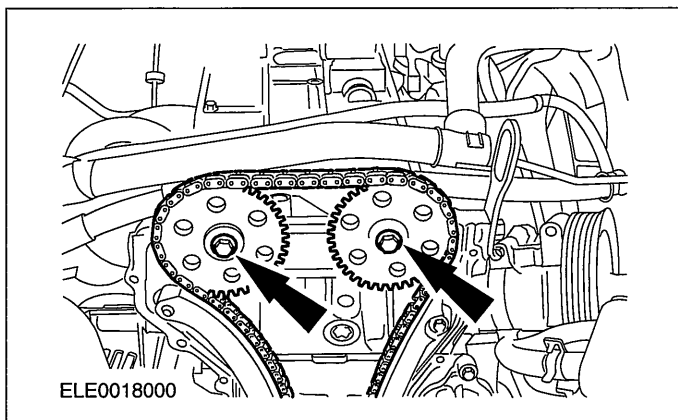
2. Detension the timing chain.

1. Unlock the timing chain tensioner ratchet.
2. Apply pressure to the timing chain guide.
3. Fix the timing chain tensioner with a suitable pin punch.

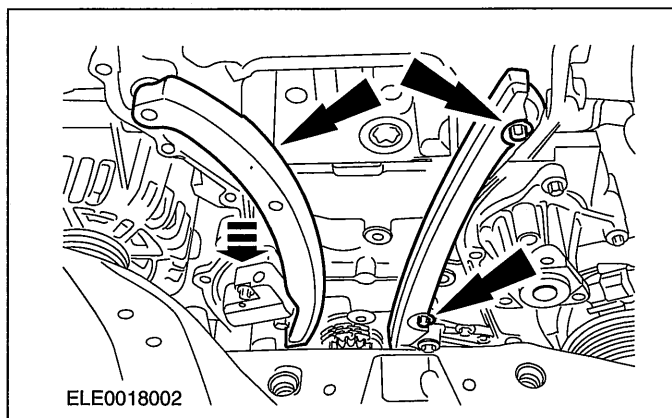


3. **NOTE:** Hold the camshafts by the hexagon with an open-ended wrench to stop them from rotating.

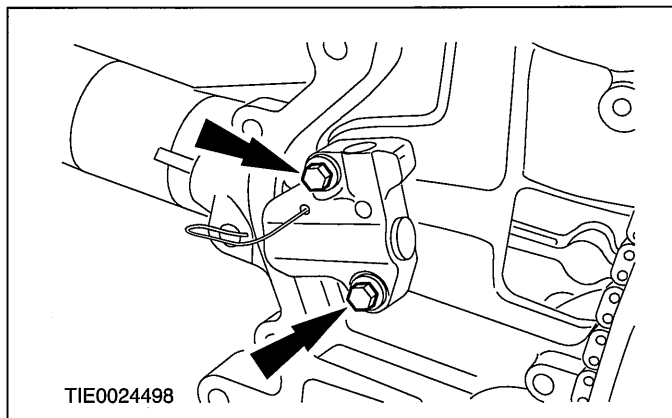
Loosen the camshaft sprocket retaining bolts.



4. Remove the timing chain guides.

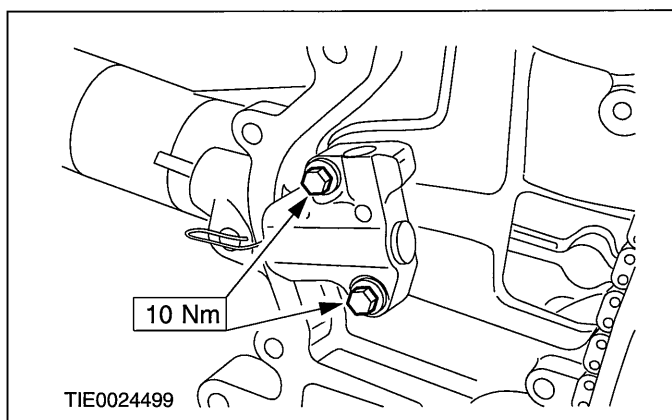


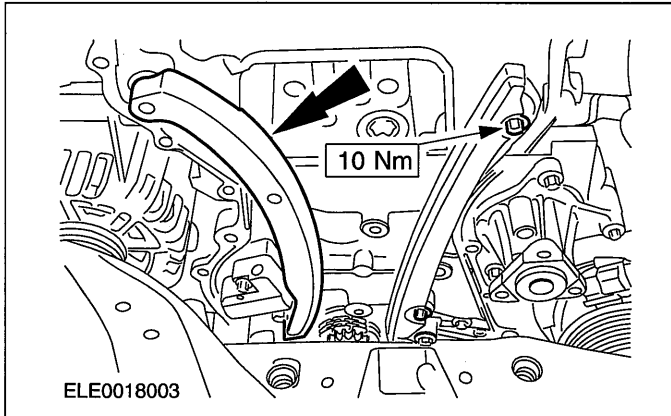
5. Remove the timing chain tensioner.



Installation

1. Install the timing chain tensioner.

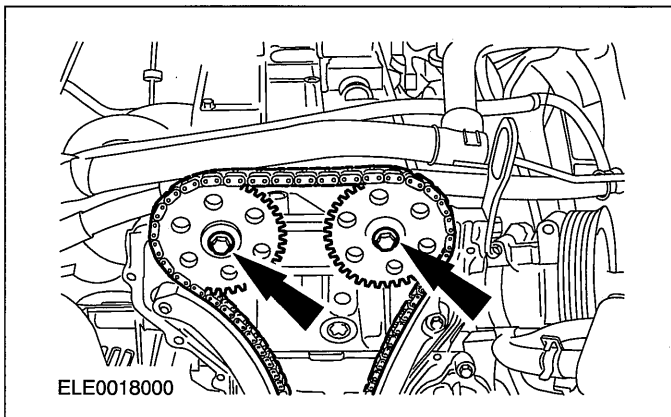


IN-VEHICLE REPAIR**2. Install the timing chain guides.**

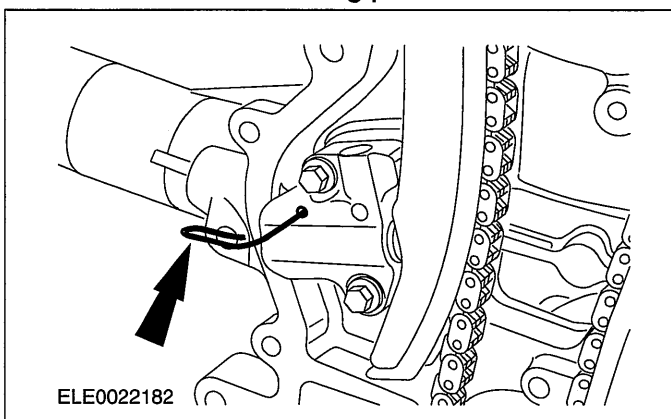
- 3. ⚠ CAUTION:** Do not tighten the camshaft sprocket retaining bolts at this stage. Make sure the camshaft sprockets rotate on the camshafts.

Install the camshaft sprockets.

- Install the timing chain.

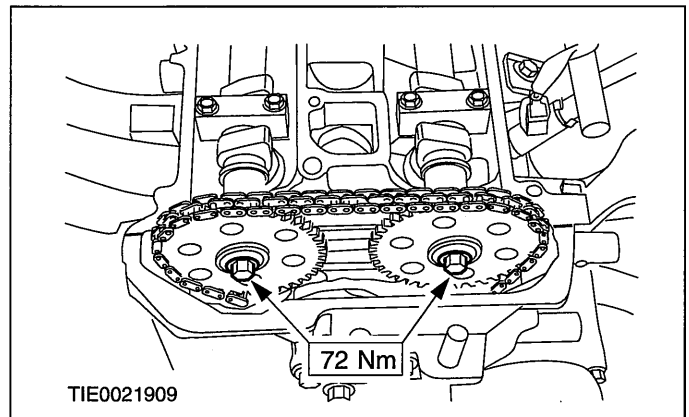
**4. Tension the timing chain.**

- Apply pressure to the timing chain and remove the securing pin.



- 5. NOTE:** Hold the camshafts by the hexagon with an open ended wrench to stop them from rotating.

Tighten the camshaft sprocket retaining bolts.

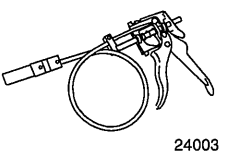
**6. Install the engine front cover.**

For additional information, refer to Engine Front Cover - in this section.

IN-VEHICLE REPAIR

Cylinder Head(21 163 0)

Special Tool(s)

	Remover/Installer, Hose Clamp 303-397
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Materials

Name	Specification
Hypoid Gear Oil	SQM-2C9002-AA

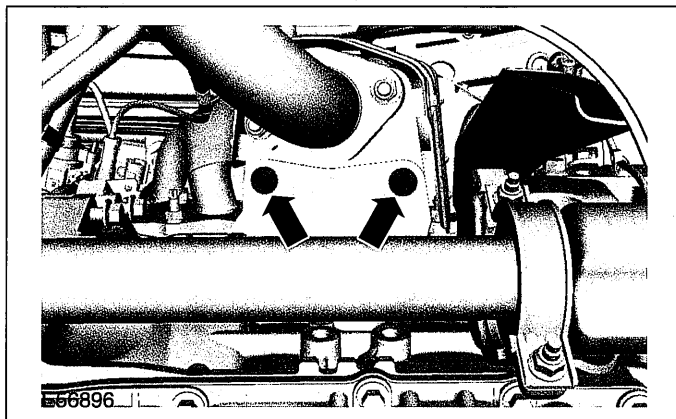
Removal

▲ **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. Drain the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).

2. Remove the exhaust manifold support bracket retaining bolts.



3. Lower the vehicle.

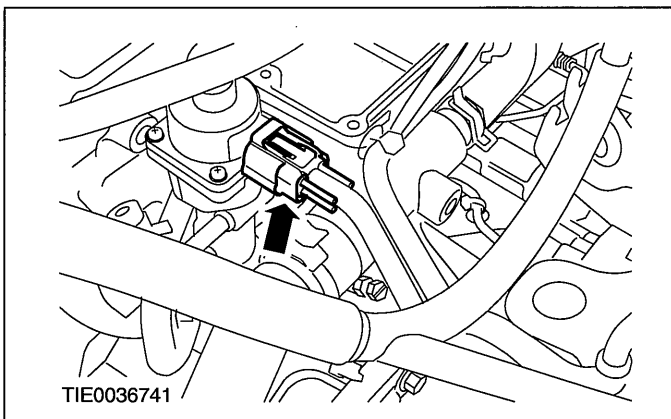
4. Remove the intake manifold.

For additional information, refer to: Intake Manifold (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

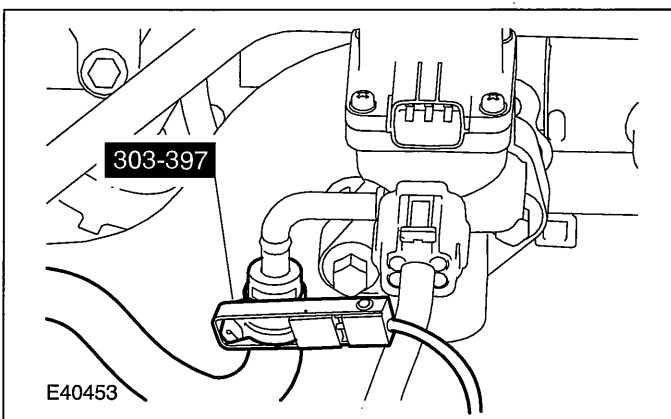
5. Remove the timing chain.

For additional information, refer to: Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

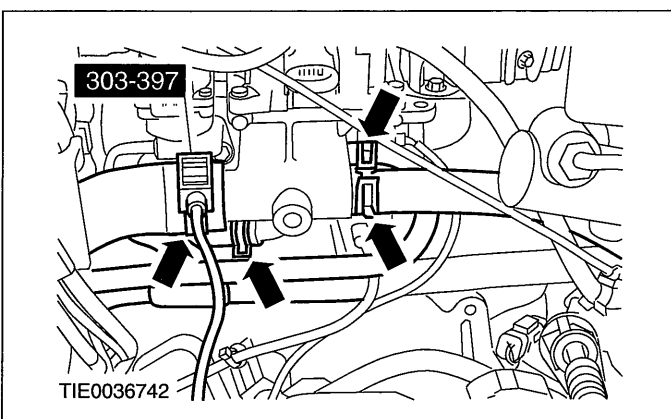
6. Disconnect the exhaust gas recirculation (EGR) valve electrical connector.



7. Using the special tool, disconnect the coolant hose from the EGR valve.

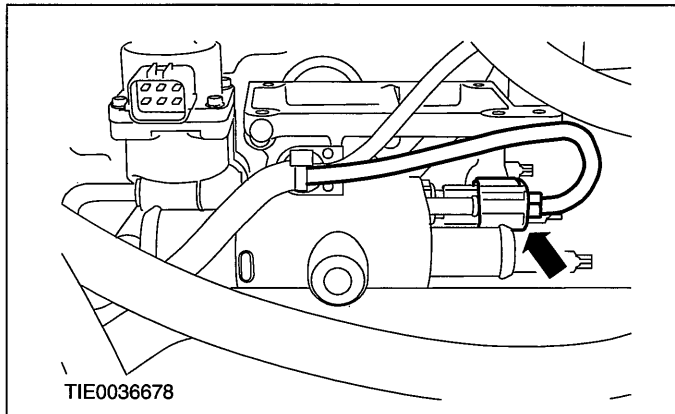


8. Using the special tool, disconnect the coolant hoses from the coolant outlet connector.

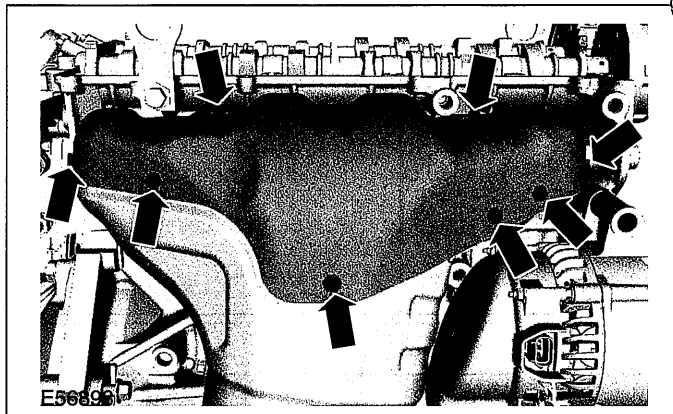


IN-VEHICLE REPAIR

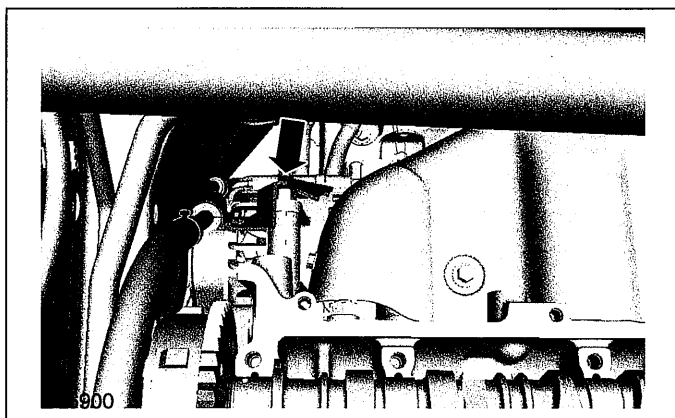
9. Disconnect the engine coolant temperature (ECT) sensor electrical connector.



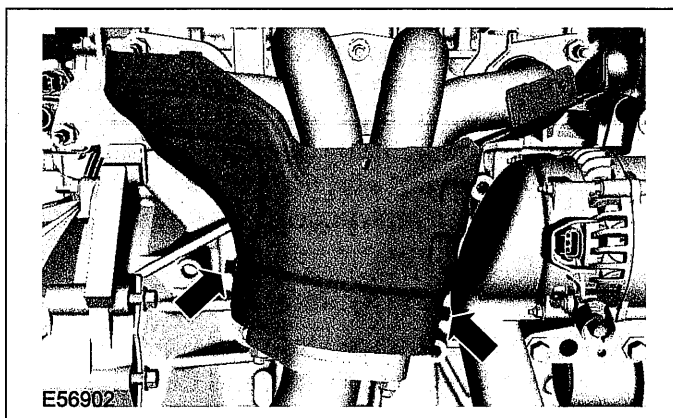
12. Remove the exhaust manifold upper heat shield (engine shown removed for clarity).



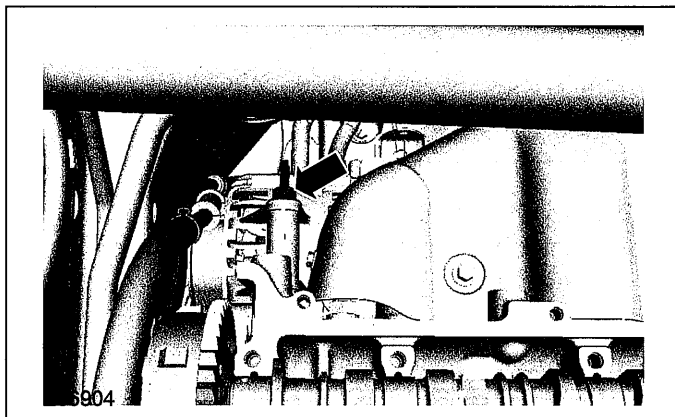
10. Remove the power steering pump return line support bracket.



13. Remove the exhaust manifold lower heat shield (engine shown removed for clarity).

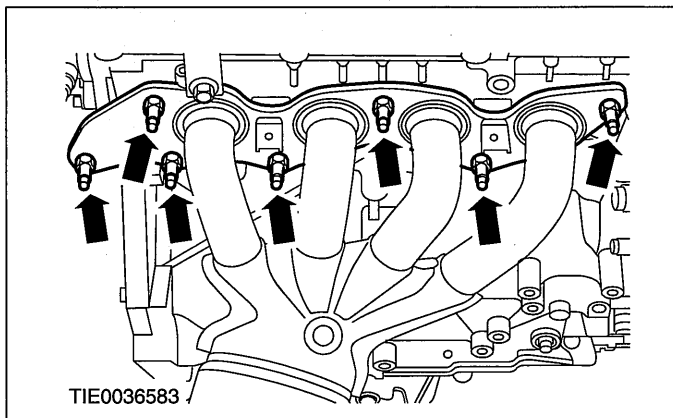


11. Remove the generator upper retaining bolt.



14. Remove the exhaust manifold retaining nuts (engine shown removed for clarity).

- Detach the exhaust manifold from the cylinder head and position it to one side.
- Discard the gasket and nuts.



15. **CAUTIONS:**

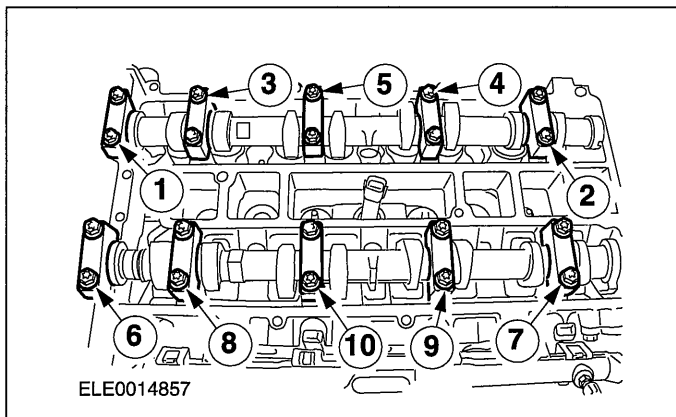
⚠ Keep the camshaft bearing caps and the camshafts in order for installation.

IN-VEHICLE REPAIR

⚠ Remove the camshaft bearing caps in the sequence shown.

NOTE: Working in several stages, release each camshaft bearing cap retaining bolt two turns at a time.

Remove the camshafts.



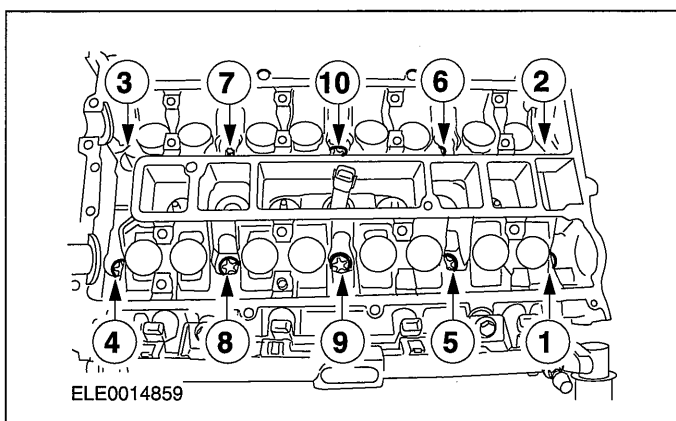
16. ⚠ CAUTION: Keep the valve tappets in order for installation.

Remove the valve tappets.

17. ⚠ CAUTION: Remove the cylinder head bolts in the sequence shown.

Remove the cylinder head.

- Discard the gasket.
- Discard the bolts.



Installation

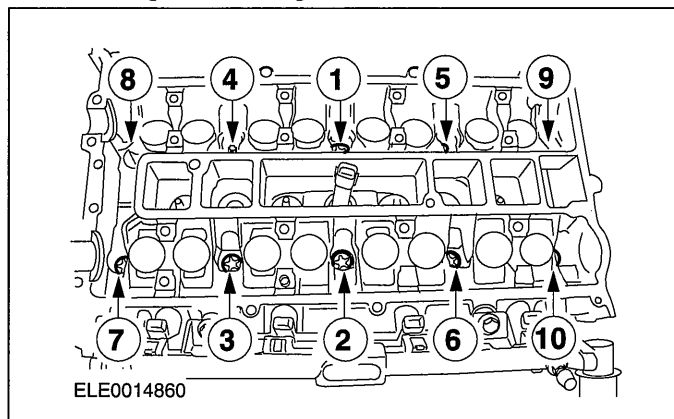
1. Check the cylinder head for distortion.

For additional information, refer to: Cylinder Head Distortion (303-00 Engine System - General Information, General Procedures).

2. NOTE: Install a new cylinder head gasket and bolts.

Install the cylinder head.

- Tighten the cylinder head bolts in the sequence shown in five stages:
- Stage 1: 5 Nm.
- Stage 2: 15 Nm.
- Stage 3: 45 Nm.
- Stage 4: 90 degrees.
- Stage 5: 90 degrees.

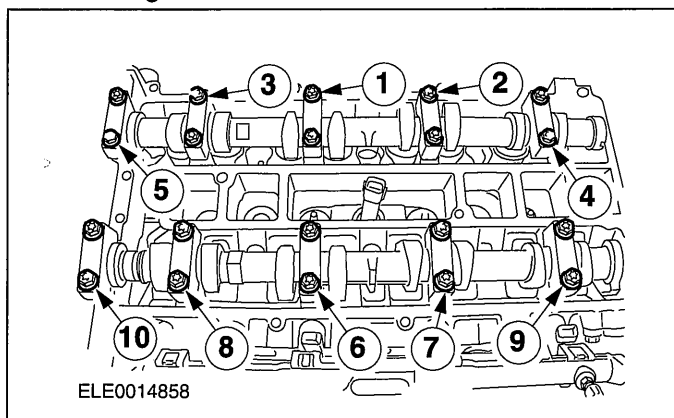


3. Install the valve tappets.

4. ⚠ CAUTION: Working in several stages, evenly tighten the camshaft bearing cap bolts in the sequence shown, one half turn at a time.

Install the camshafts.

- Coat the camshaft bearing caps with oil.
- Tighten the bolts in the sequence shown in two stages:
- Stage 1: 7 Nm.
- Stage 2: 16 Nm.



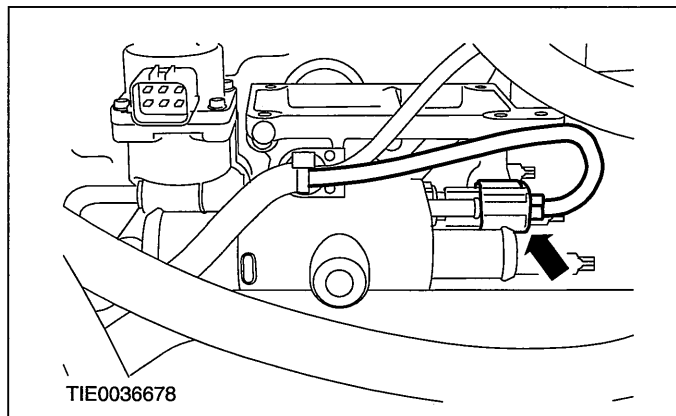
5. NOTE: Only carry out the following step when a new cylinder head or new valves are installed.

IN-VEHICLE REPAIR

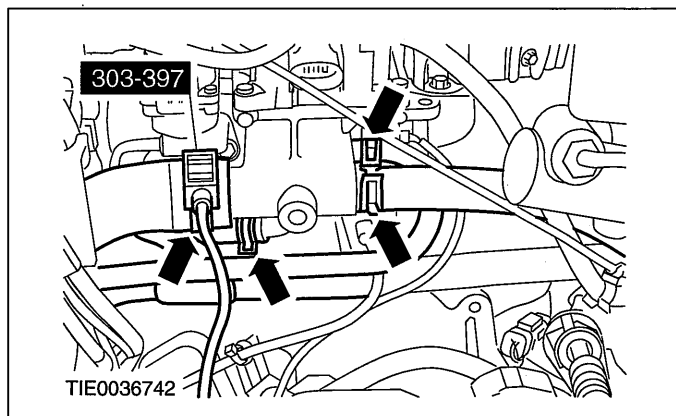
Check the valve clearance and adjust if necessary.

For additional information, refer to: Valve Clearance Adjustment (303-01 Engine - 2.0L Duratec-HE (M14), General Procedures).

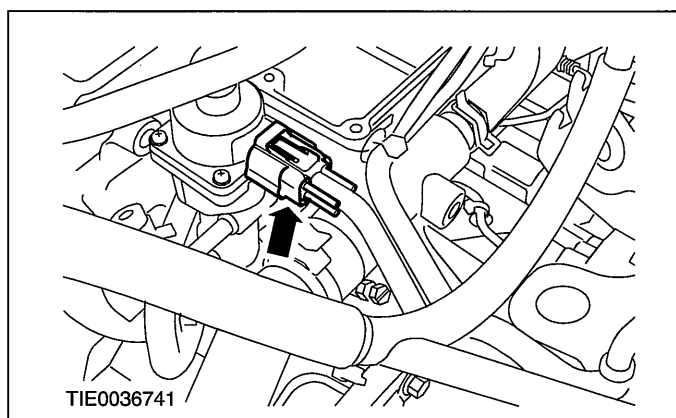
6. Connect the engine coolant temperature (ECT) sensor electrical connector.



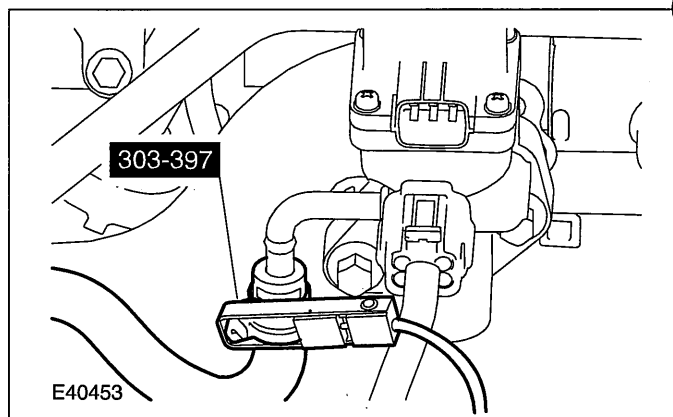
7. Using the special tool, connect the coolant hoses to the coolant outlet connector.



8. Connect the exhaust gas recirculation (EGR) valve electrical connector.

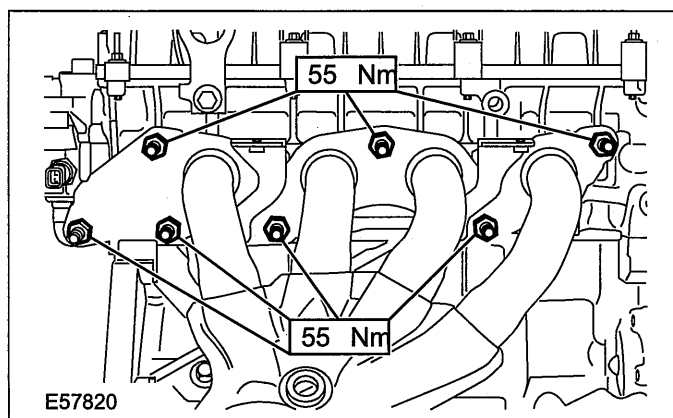


9. Using the special tool, connect the coolant hose to the EGR valve.

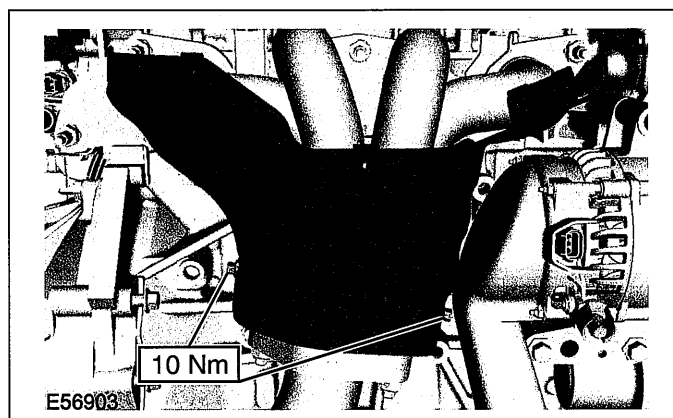


10. **NOTE:** Install a new exhaust manifold gasket and nuts.

Tighten the exhaust manifold retaining nuts (engine shown removed for clarity).

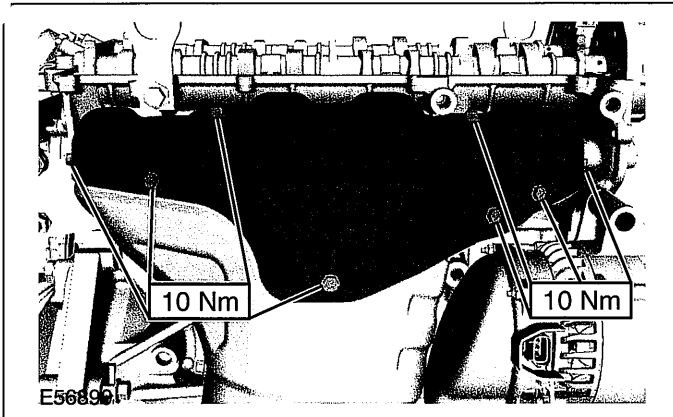


11. Install the exhaust manifold lower heat shield (engine shown removed for clarity).

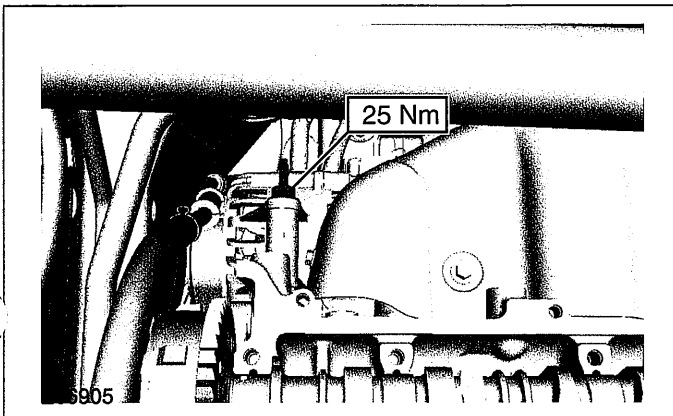


IN-VEHICLE REPAIR

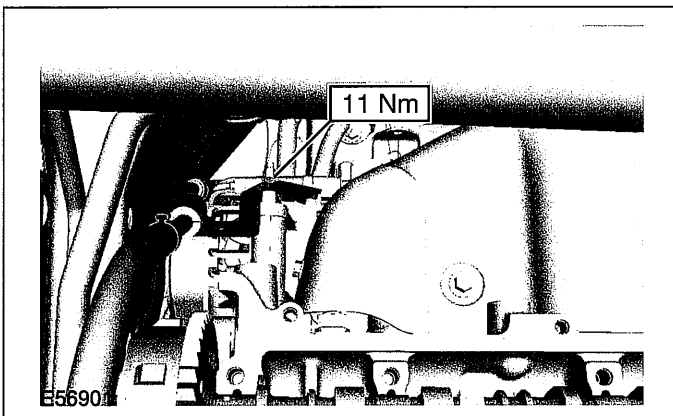
12. Install the exhaust manifold upper heat shield (engine shown removed for clarity).



13. Install the generator upper retaining bolt.



14. Install the power steering pump return line support bracket.



15. Install the timing chain.

For additional information, refer to: Timing Chain (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

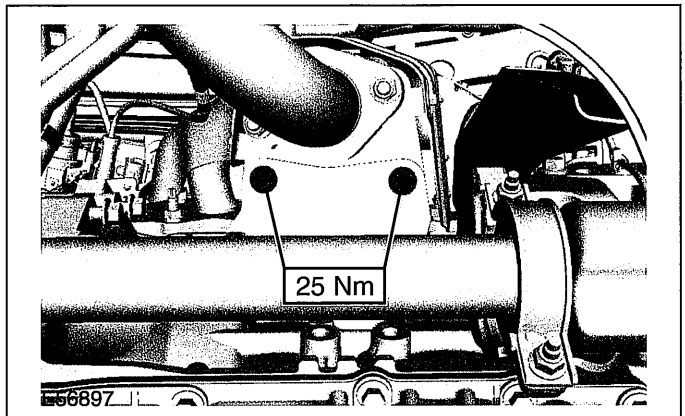
16. Install the intake manifold.

For additional information, refer to: Intake Manifold (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

17. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation), Lifting (Description and Operation).

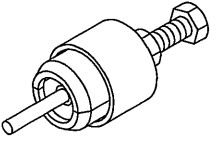
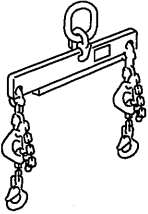
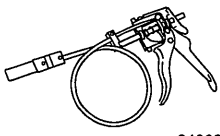
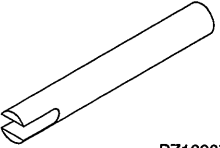
18. Install the exhaust manifold support bracket retaining bolts.



19. Fill and bleed the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).

REMOVAL**Engine****Special Tool(s)**

 ES13021	Remover, Power Steering Pump Pulley 211-198
 21068A	Lifting Bracket, Engine 303-122
 24003	Remover/Installer, Hose Clamp 303-397
 PZ16087	Remover, Halfshaft 308-237

General Equipment

Workshop table
Engine hoist
Securing straps

Removal

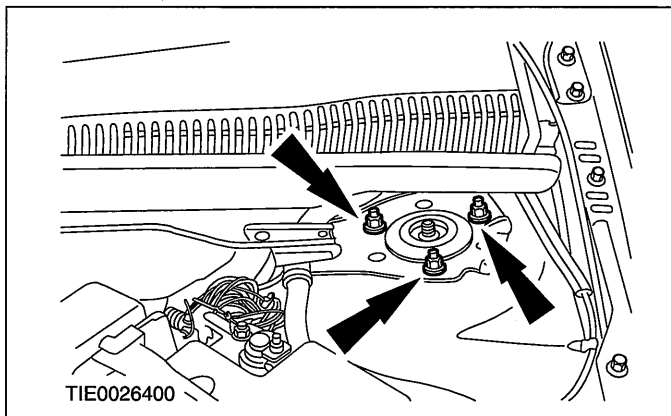
▲ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

2. Remove the battery tray.

For additional information, refer to: Battery Tray - 2.0L Duratec-HE (MI4) (414-01 Battery, Mounting and Cables, Removal and Installation).

3. Loosen the strut and spring assembly top mount nuts by three turns on both sides.**4. Remove the right-hand headlamp assembly.**

For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

5. Remove the accessory drive belt.

For additional information, refer to: Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

6. Drain the cooling system.

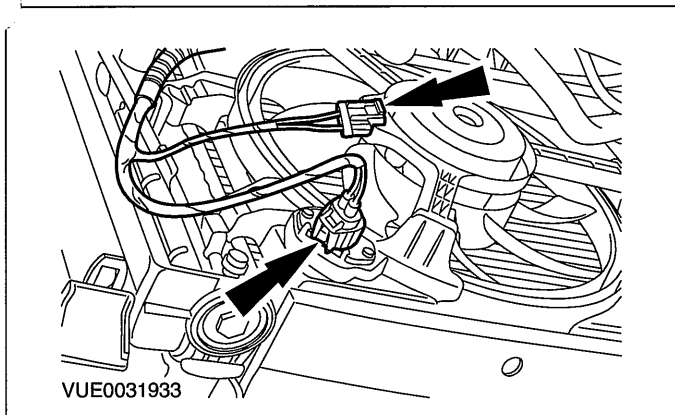
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).

7. Detach the exhaust flexible pipe from the exhaust manifold.

For additional information, refer to: Exhaust Flexible Pipe - 2.0L Duratec-HE (MI4) (309-00 Exhaust System, Removal and Installation).

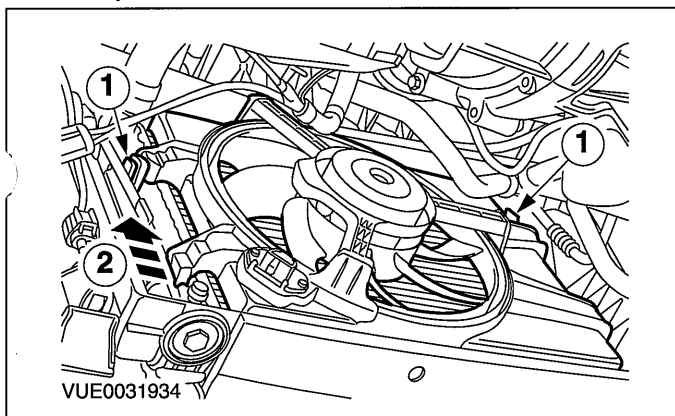
REMOVAL

- 8. Disconnect the cooling fan motor and cooling fan resistor electrical connectors.**



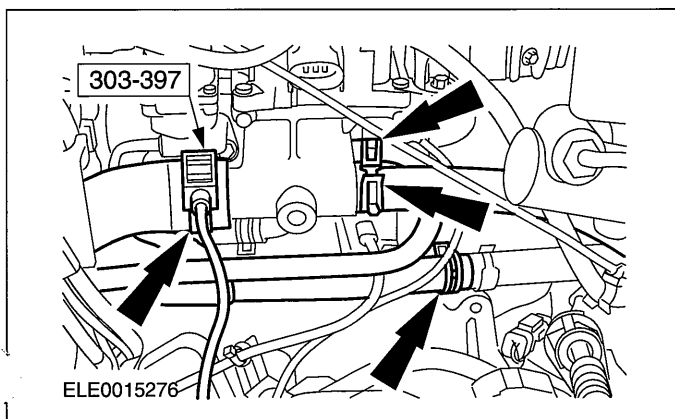
- 9. Remove the cooling fan motor and shroud.**

1. Release the cooling fan motor and shroud from the retaining brackets.
2. Push the cooling fan motor and shroud upwards and then downwards to remove.



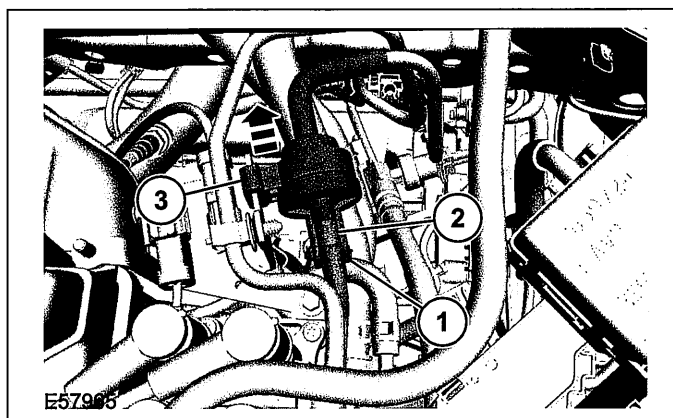
- 10. Lower the vehicle.**

- 11. Using the special tool, disconnect the coolant hose from the coolant outlet connector.**

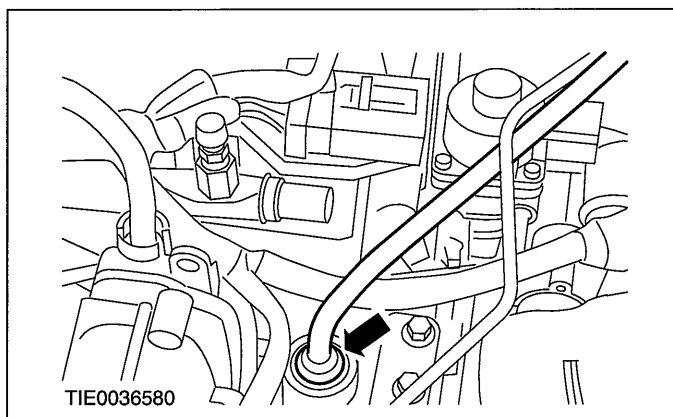


- 12. Detach the evaporative emission (EVAP) valve from EVAP valve support bracket.**

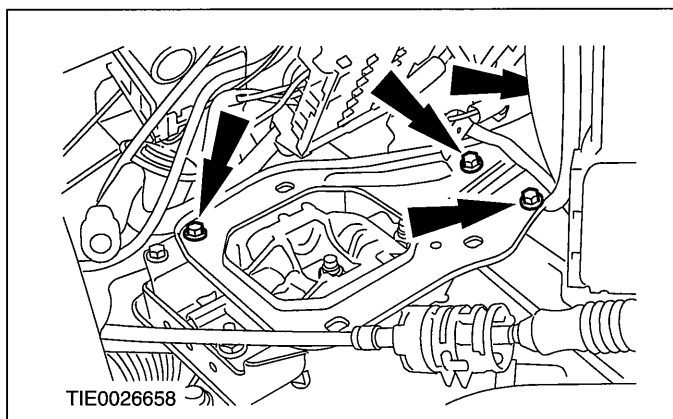
1. Disconnect the EVAP valve electrical connector.
2. Disconnect the low pressure line from the EVAP valve.
3. Push the EVAP valve from the support bracket.



- 13. Disconnect the brake booster vacuum line from the intake manifold.**

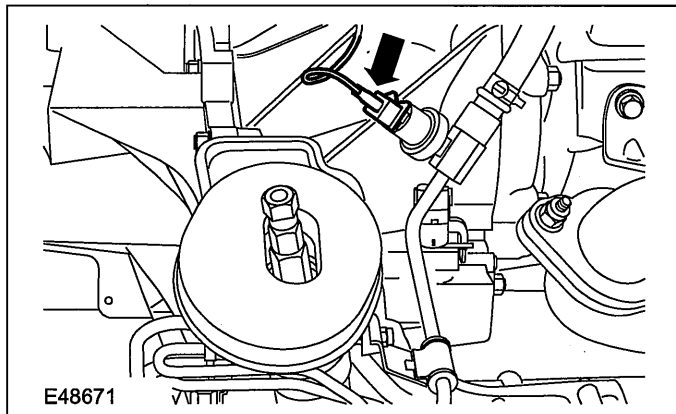


- 14. Remove the battery tray support bracket.**

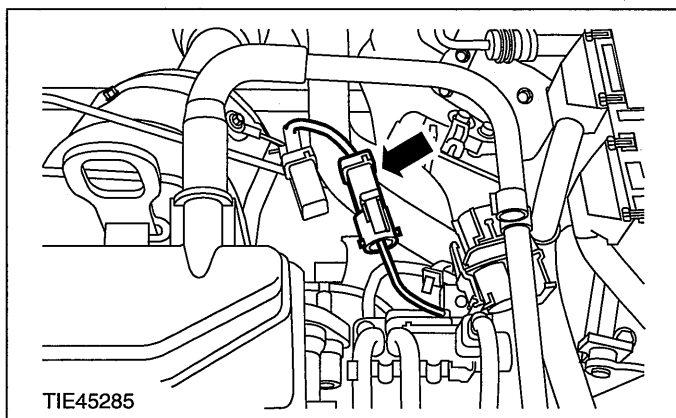


REMOVAL

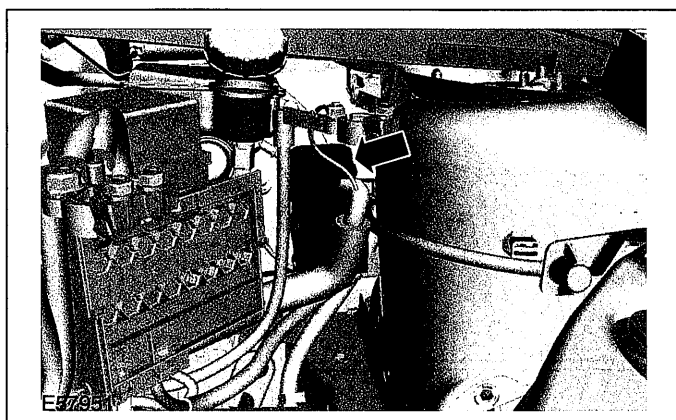
15. Disconnect the power steering pump switch electrical connector.



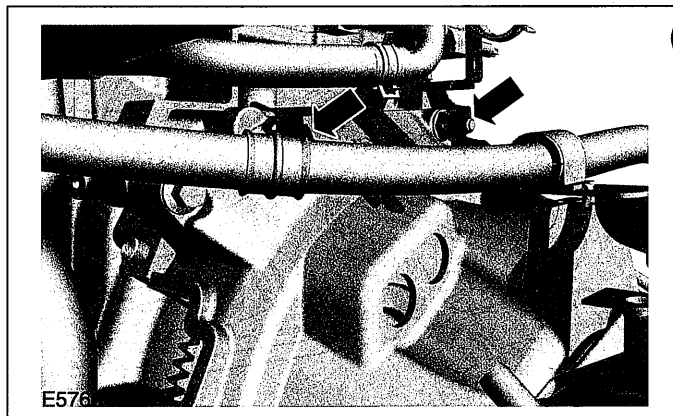
16. Disconnect the catalyst monitor sensor electrical connector.



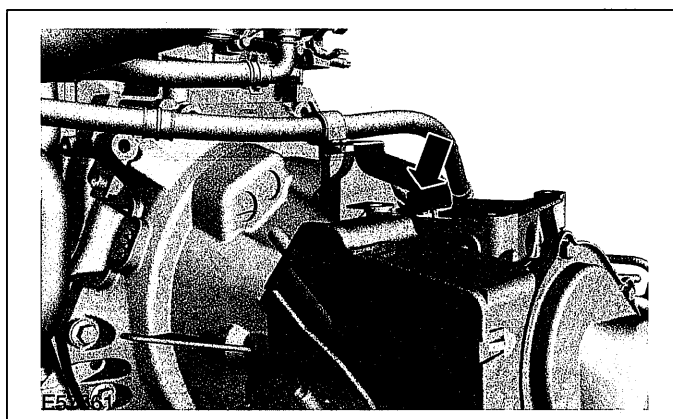
17. Disconnect the engine wiring harness electrical connector.



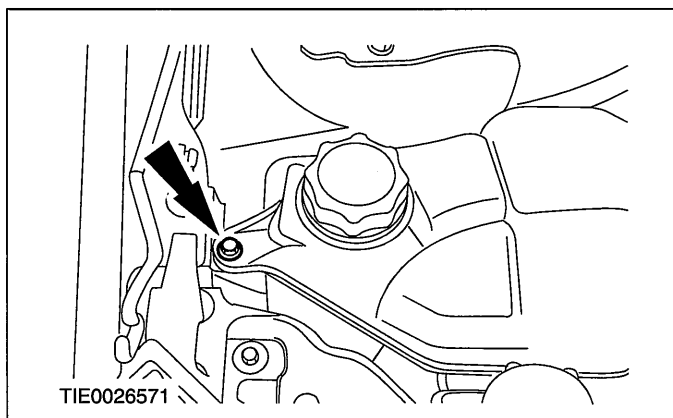
18. Remove the engine wiring harness bracket.



19. Detach the power steering high-pressure line retaining bracket from the transaxle.

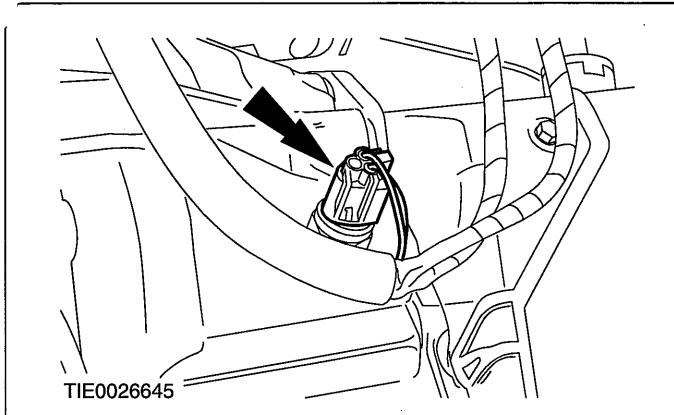


20. Remove the coolant expansion tank.

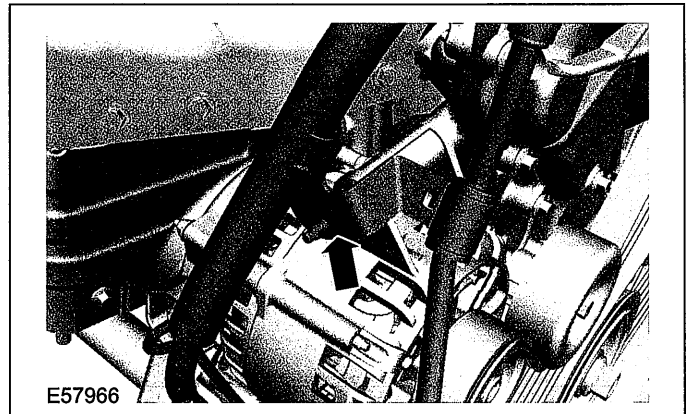


REMOVAL

21. Disconnect the reversing lamp switch electrical connector.



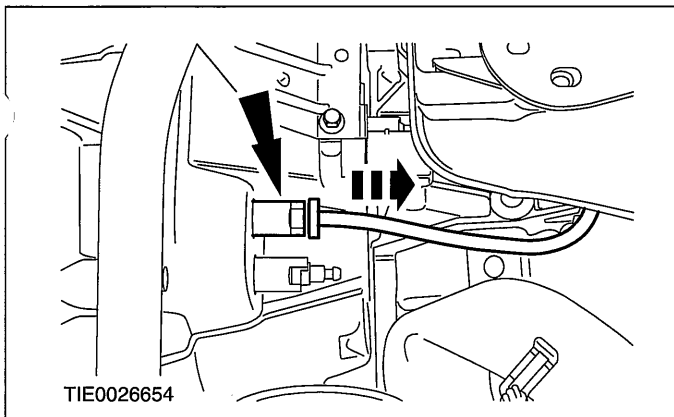
Detach the steering gear to power steering fluid reservoir return line support bracket from the generator.



22. **⚠ CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

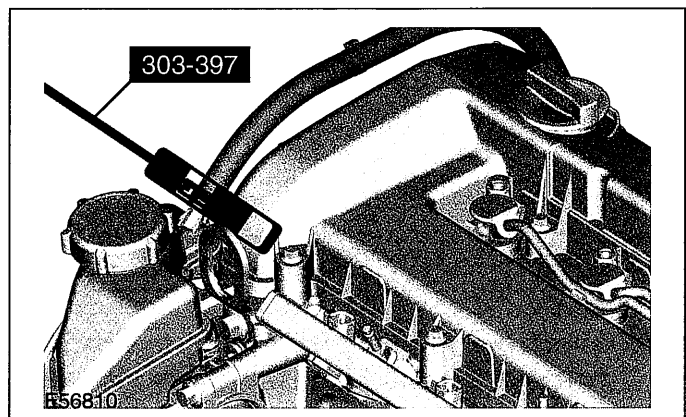
Disconnect the clutch slave cylinder supply line.

- Remove the spring clip.

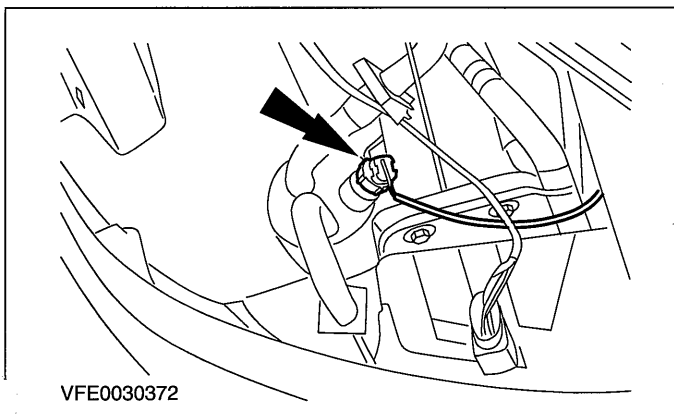


25. Using the special tool, disconnect the steering gear to power steering fluid reservoir return line from the power steering fluid reservoir.

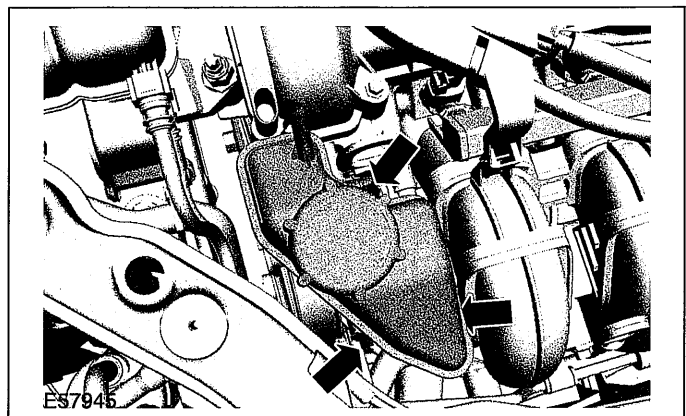
- Allow the power steering fluid to drain into a suitable container.



23. Disconnect the air conditioning low pressure switch connector.



26. Remove the power steering fluid reservoir.

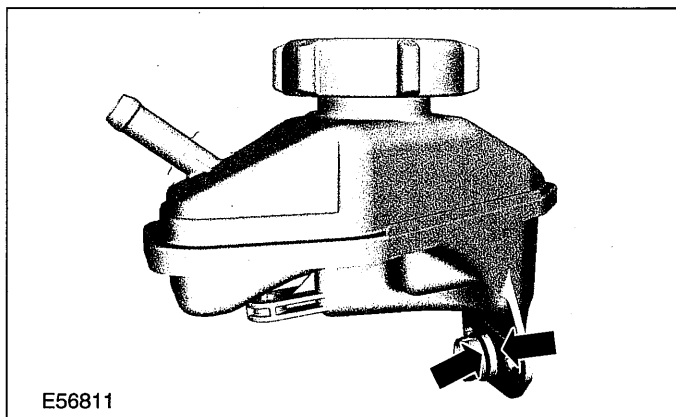


24. **NOTE:** Note the position of the steering gear to power steering fluid reservoir return line support bracket to aid installation.

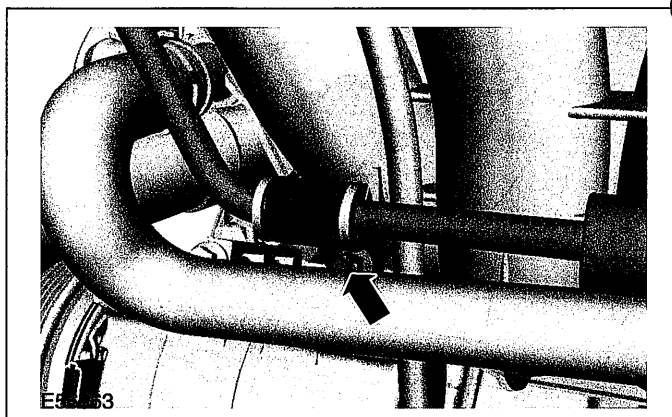
27. **⚠ CAUTION:** Cap the power steering fluid reservoir to prevent power steering fluid loss or dirt ingress.

REMOVAL

Remove and discard the power steering fluid reservoir O-rings.

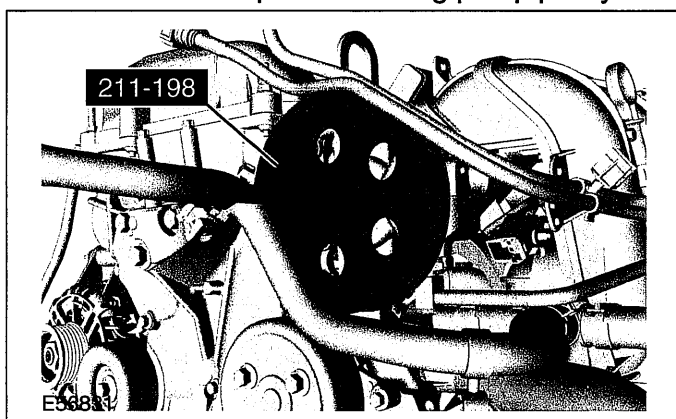


30. Detach the power steering pump to steering gear pressure line from the intake manifold.

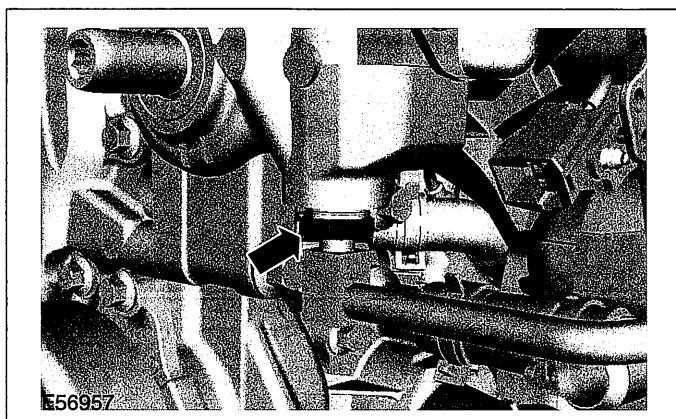


28. Using the special tool, remove the power steering pump pulley.

- Discard the power steering pump pulley.

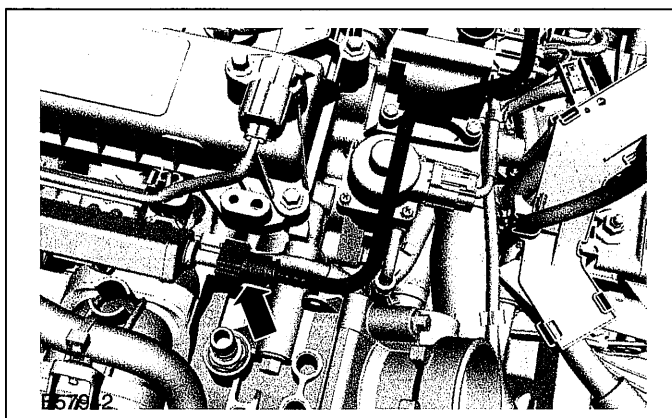


29. Detach the power steering pump to steering gear pressure line from the power steering pump.



31. Disconnect the fuel supply line.

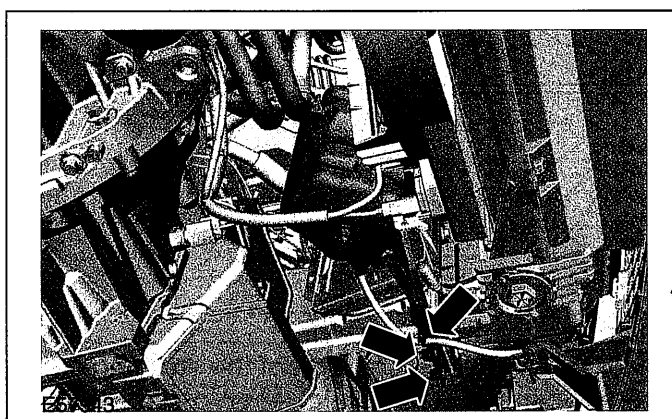
For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



32. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

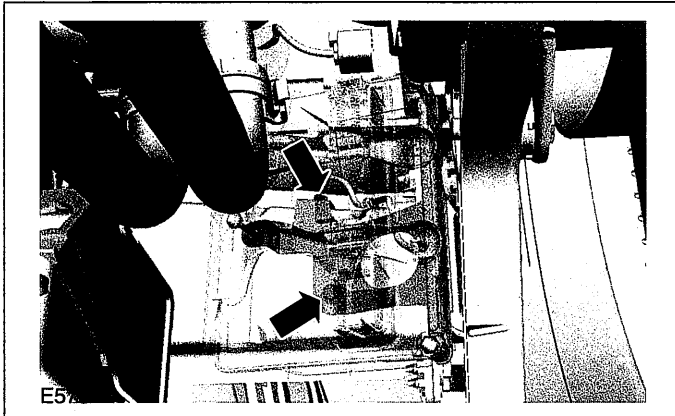
Jacking (Description and Operation), Lifting (Description and Operation).

33. Remove the air cleaner resonator support bracket.



REMOVAL

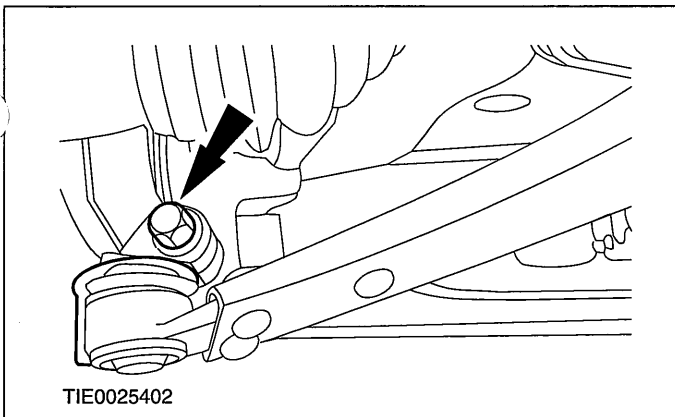
34. Detach the powertrain control module (PCM) support bracket from the side member.



35. **CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

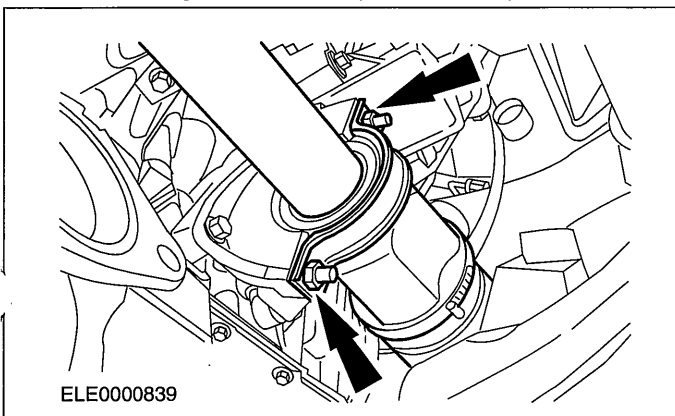
Detach the lower arm ball joint from the wheel knuckle on both sides.

- Remove the heat shield.



36. Remove the intermediate shaft center bearing cap.

- Discard the bearing cap and retaining nuts.
- Remove the intermediate shaft center bearing heat shield (if equipped).



37. **CAUTIONS:**

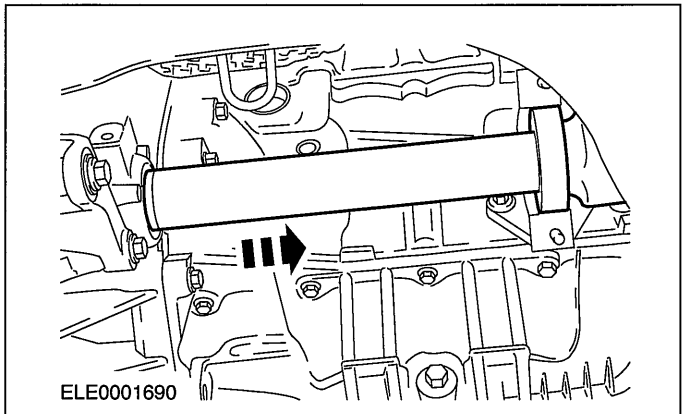
⚠ The inner CV joint must not be bent more than 23 degrees. The outer CV joint must not be bent more than 45 degrees.

⚠ Make sure the halfshaft seal is not damaged.

⚠ Plug the transaxle to prevent oil loss or dirt ingress.

Remove the halfshaft and intermediate shaft assembly.

- Allow the oil to drain into a suitable container.



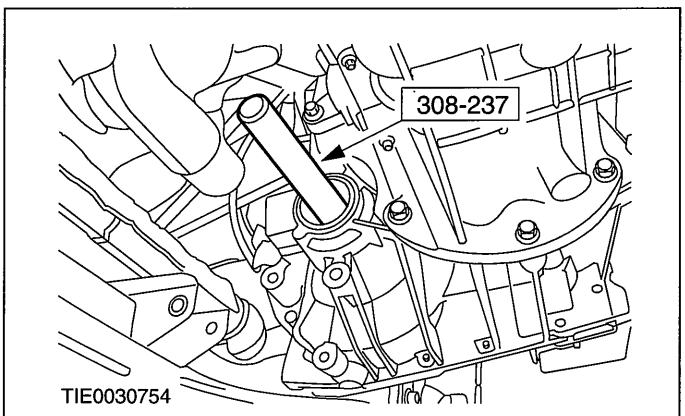
38. **CAUTIONS:**

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

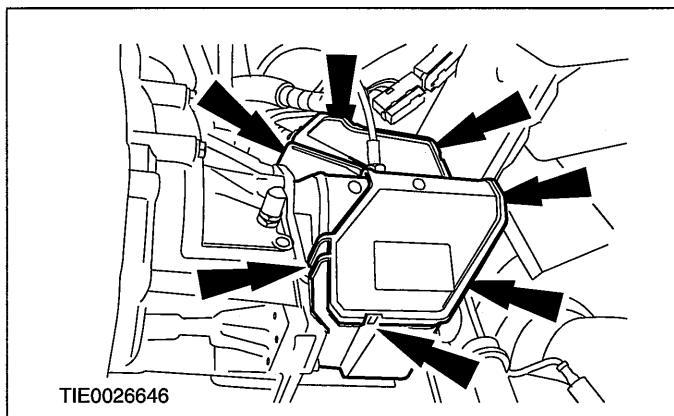
NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

Remove the left-hand halfshaft.



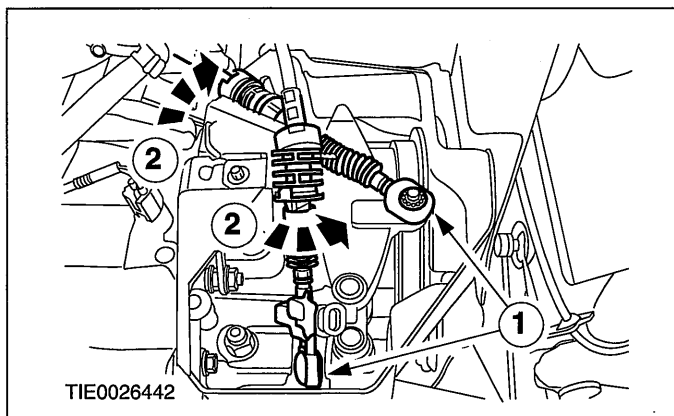
REMOVAL

39. Remove the gearshift cables cover.

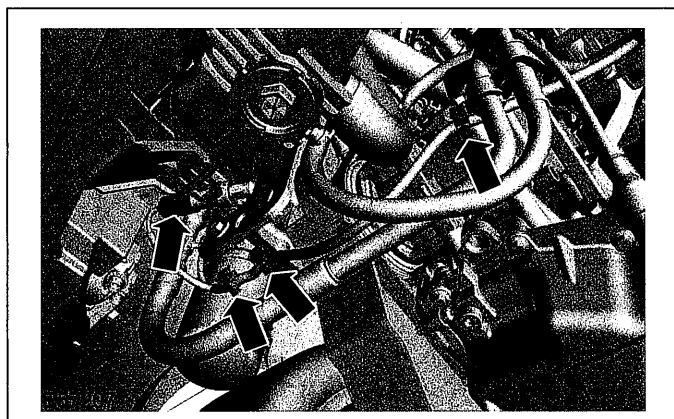


40. Detach the gearshift cables from the transaxle.

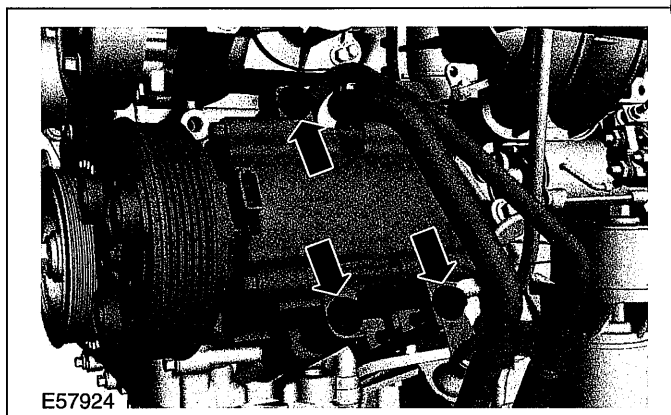
1. Detach the gearshift cables and the selector cable from the selector levers.
2. Turn the abutment sleeve clockwise and detach the cables from the bracket.



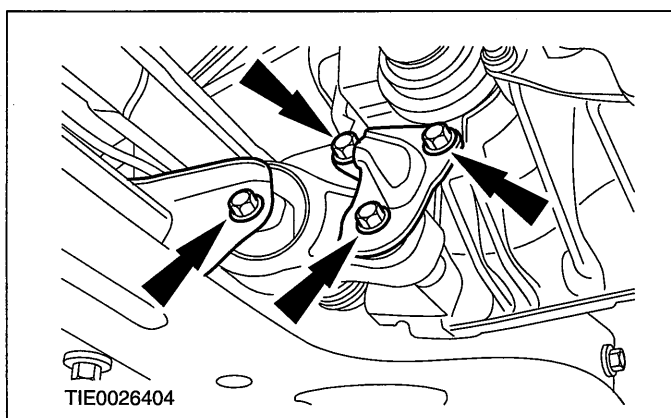
41. Disconnect the A/C high pressure switch electrical connector.



42. Detach the A/C compressor from the cylinder block and position it to one side.

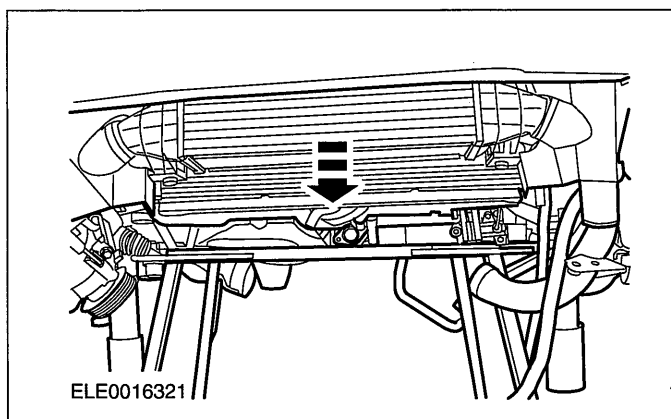


43. Remove the engine support insulator.



44. NOTE: Use securing straps to secure the engine and the transaxle on the workshop table.

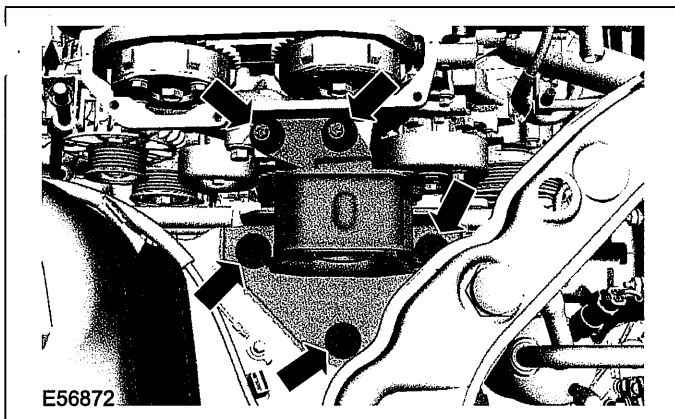
Position the workshop table under the vehicle and carefully lower the vehicle, until the engine and transaxle assembly is in the correct position to remove the engine mounts.



45. Remove the engine front mount.

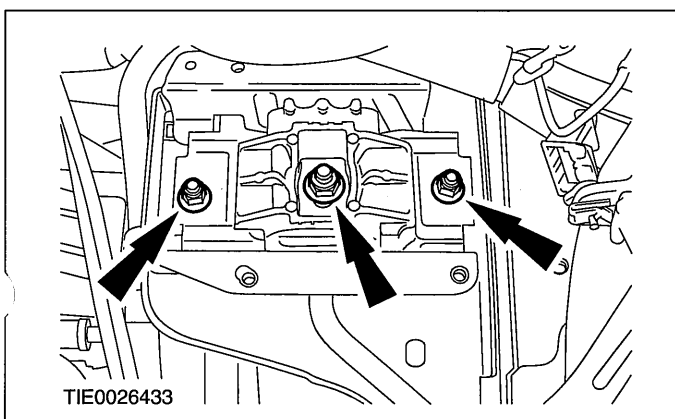
REMOVAL

- Discard the nuts.



46. Remove the engine rear mount retaining nuts.

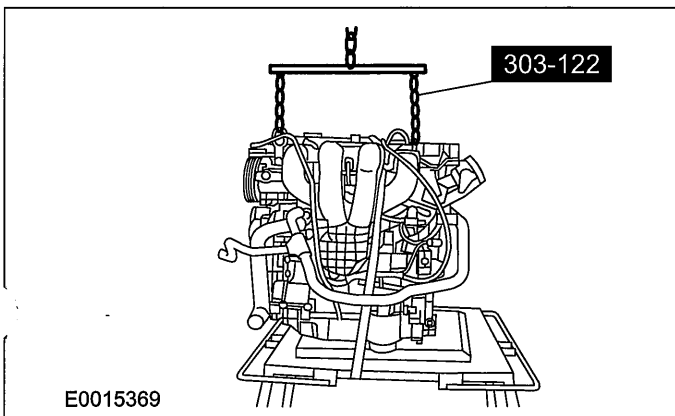
- Discard the nuts.



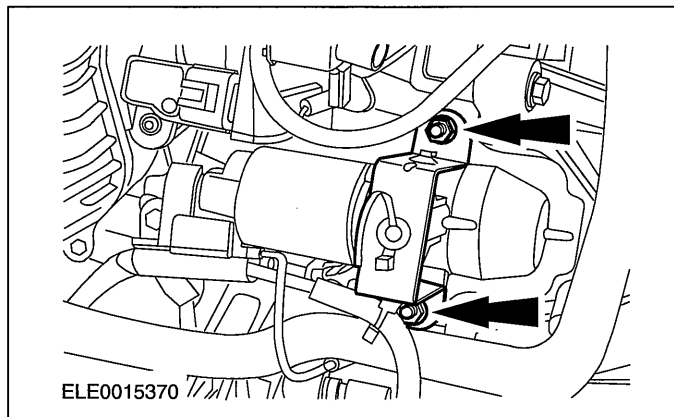
47. Raise and support the vehicle and remove the engine and transaxle assembly. For additional information, refer to: (100-02 Jacking and Lifting)

**Jacking (Description and Operation),
Lifting (Description and Operation).**

48. Using a suitable engine hoist support the engine and transaxle assembly and remove the retaining straps.

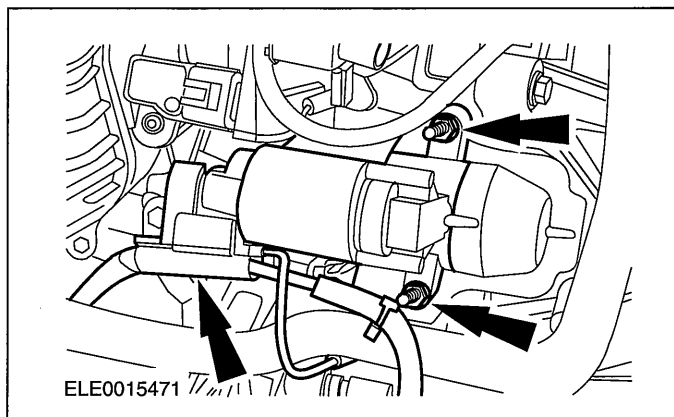


49. Remove the wiring harness retaining bracket.

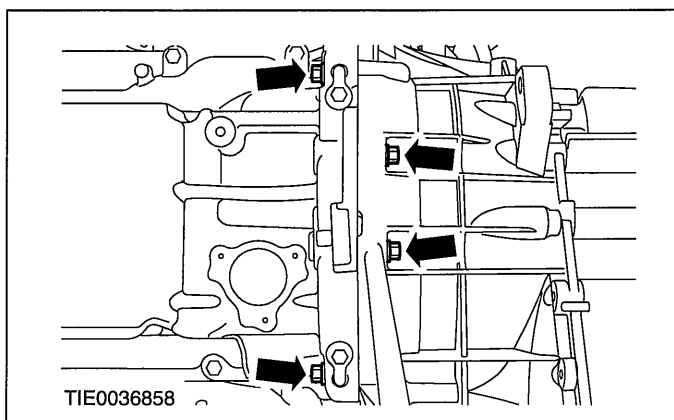


50. Remove the starter motor.

- Detach the wiring harness from the retaining bracket.

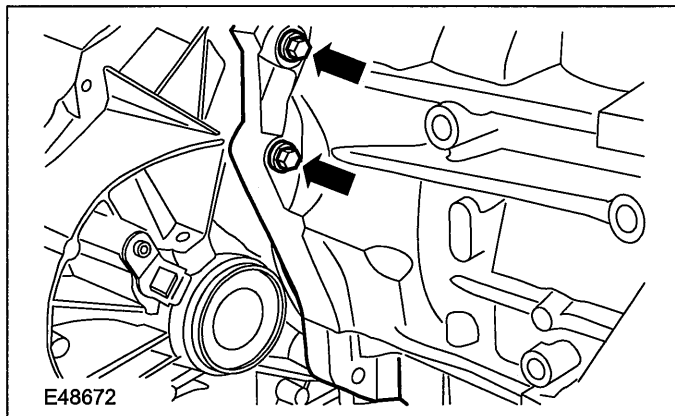


51. Remove the transaxle lower retaining bolts.

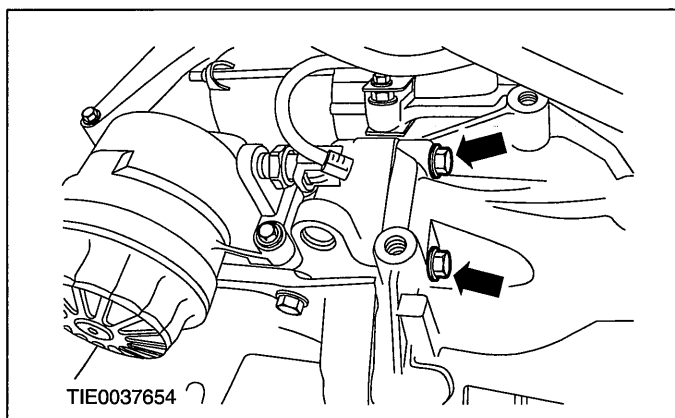


REMOVAL

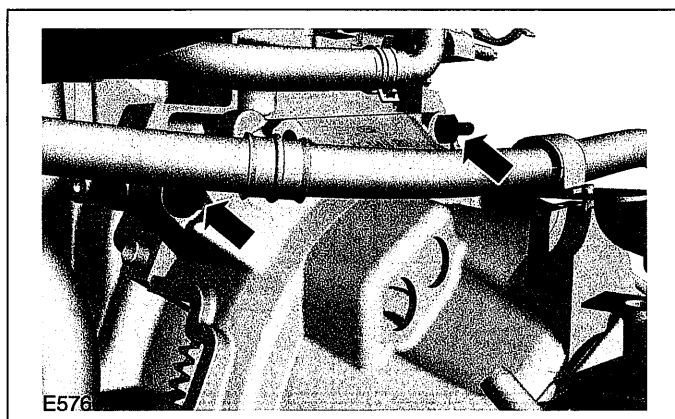
- 52. Remove the transaxle right-hand retaining bolts.**



- 53. Remove the transaxle left-hand retaining bolts.**

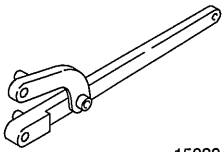
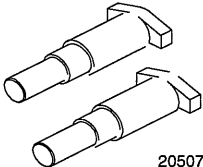
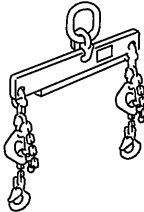
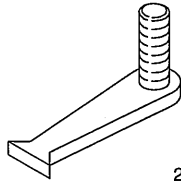
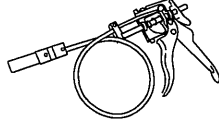
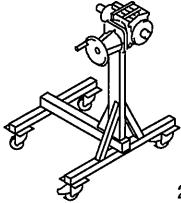


- 54. Remove the transaxle upper retaining bolts.**

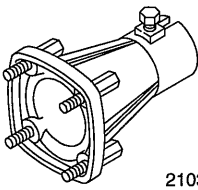
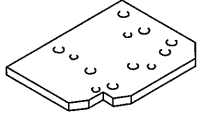
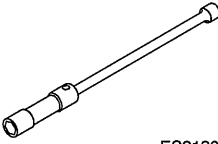
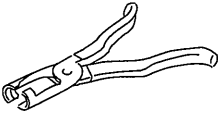


- 55. Remove the transaxle.**

DISASSEMBLY**Engine(21 134 8)****Special Tool(s)**

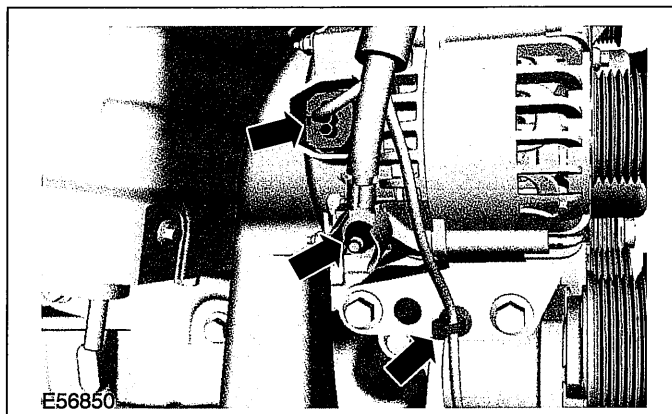
 15030A	Universal Flange Holding Wrench 205-072 (15-030A)
 20507202	Adapter for 205-072 205-072-02 (15-030A-02)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 21135	Locking Tool, Flywheel 303-254 (21-135)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)
 21187	Mounting Stand 303-435 (21-187)

Special Tool(s)

 21031B	Mounting Bracket for 303-435 303-435-06 (21-031B)
 21146C	Mounting Plate for 303-435-06 303-435-11A (21-146D)
 ES21202	Socket, Spark Plug 303-499 (21-202)
 21211	Pliers, Valve Stem Seal 303-508 (21-211)

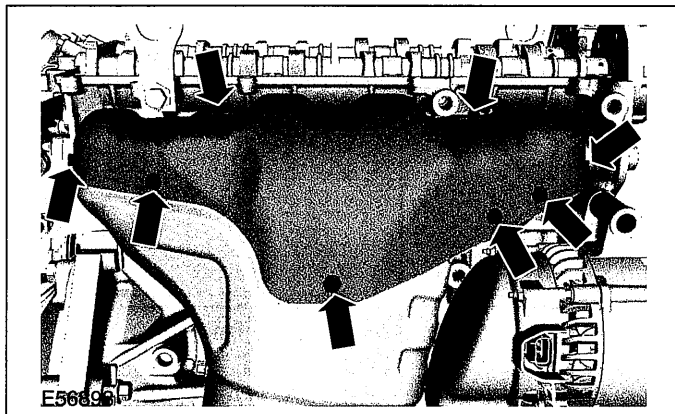
Disassembly

1. Disconnect the generator electrical connector.

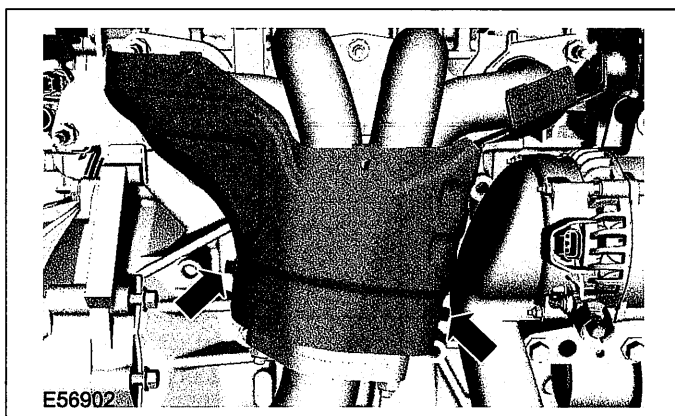


DISASSEMBLY

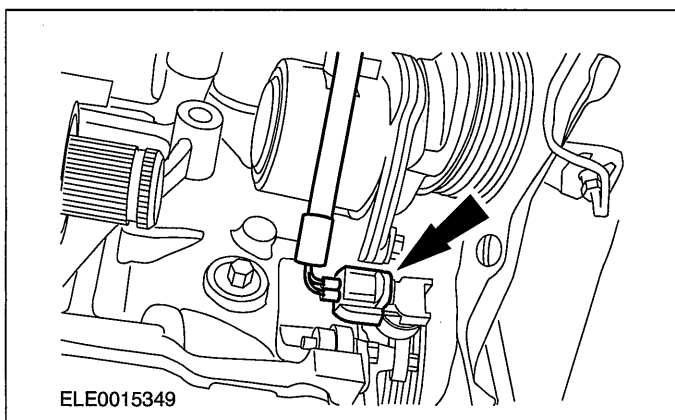
2. Remove the exhaust manifold upper heat shield.



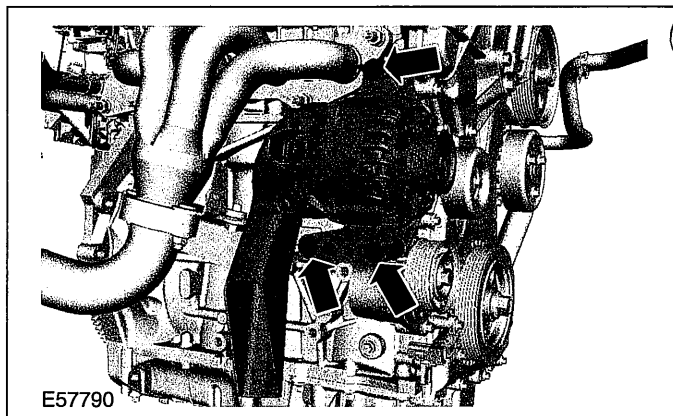
3. Remove the exhaust manifold lower heat shield.



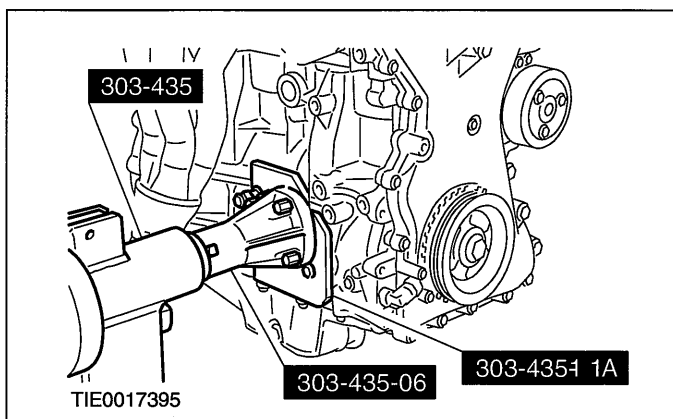
4. Disconnect the crankshaft position (CKP) sensor electrical connector.



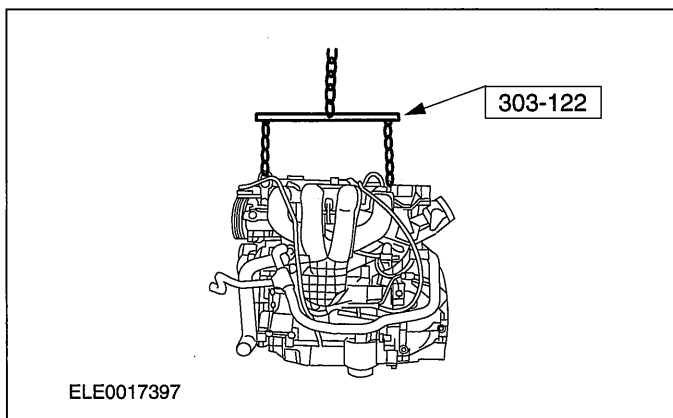
5. Remove the generator.



6. Using the special tools, mount the engine to the mounting stand.



7. Remove the special tool.



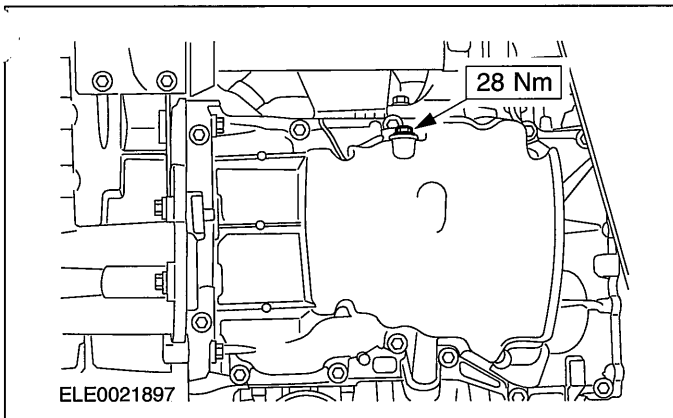
8. Drain the engine.

- Allow the oil to drain into a suitable container.

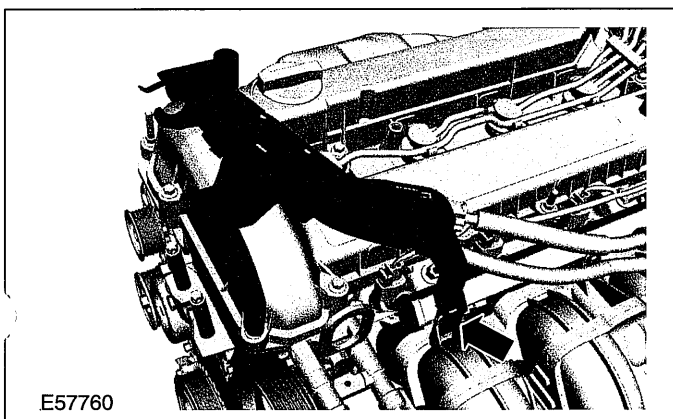
9. **NOTE:** Inspect the oil drain plug seal for damage. Install a new drain plug and seal if necessary.

DISASSEMBLY

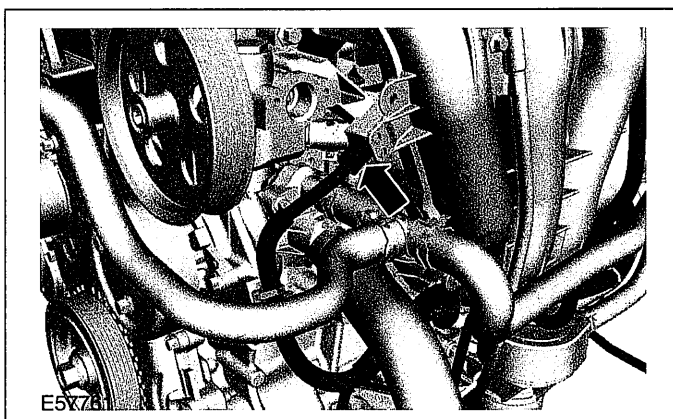
Install the drain plug.



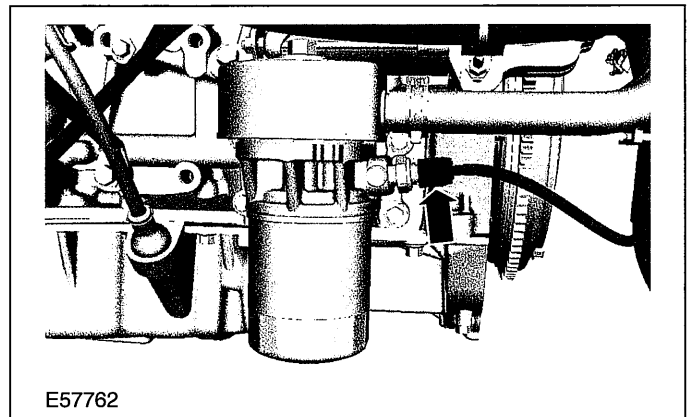
10. Detach the engine wiring harness bracket from the intake manifold.



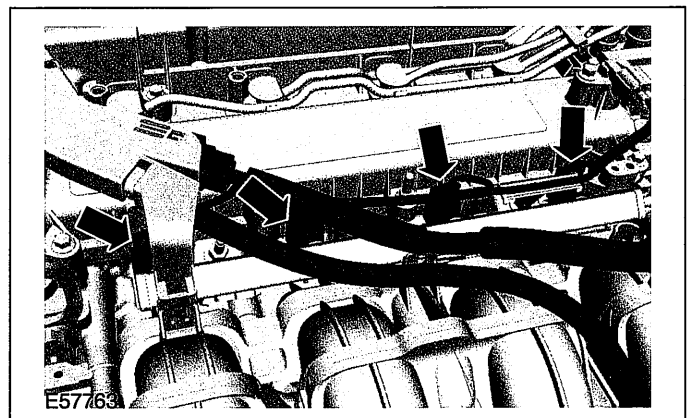
11. Disconnect the knock sensor (KS) electrical connector.



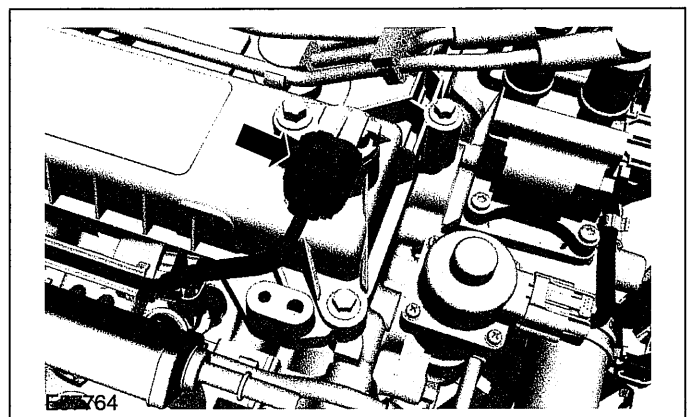
12. Disconnect the oil pressure switch electrical connector.



13. Disconnect the fuel injector electrical connectors.

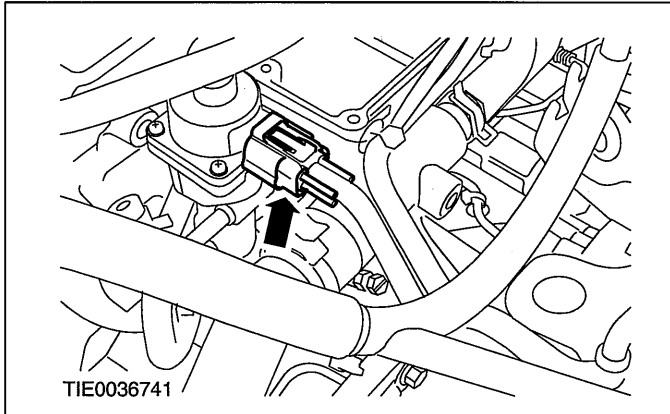


14. Disconnect the camshaft position (CMP) sensor electrical connector.

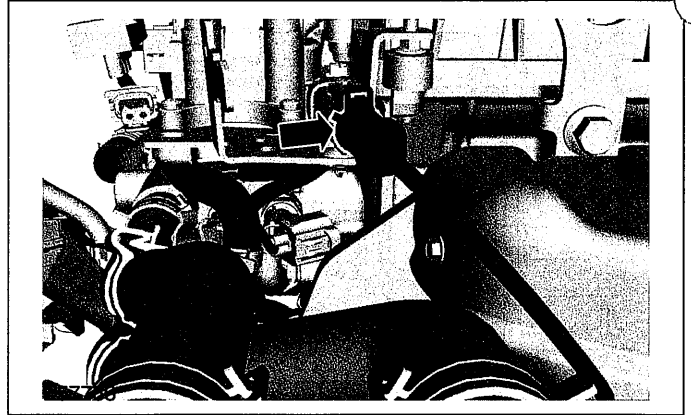


DISASSEMBLY

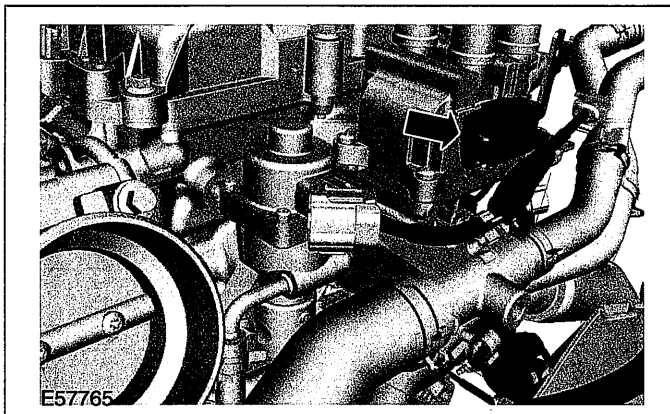
15. Disconnect the exhaust gas recirculation (EGR) valve electrical connector.



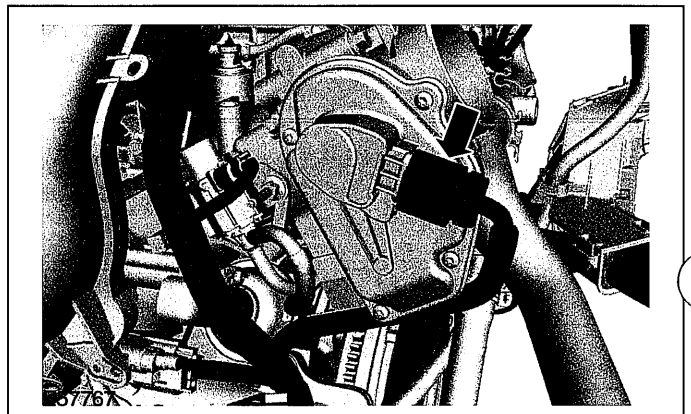
18. Disconnect the heated oxygen (H2OS) sensor electrical connector.



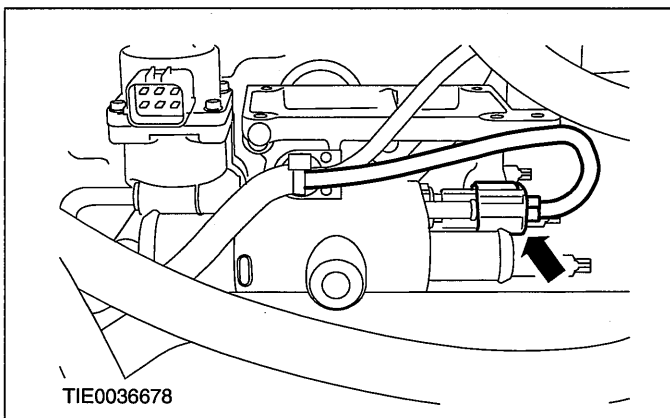
16. Disconnect the electronic ignition (EI) electrical connector.



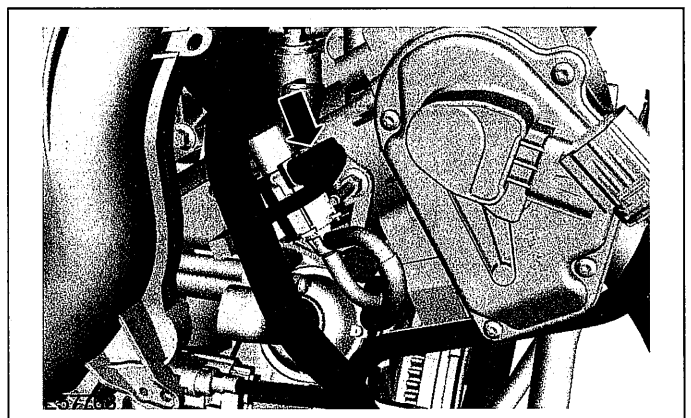
19. Disconnect the throttle body (TB) electrical connector.



17. Disconnect the engine coolant temperature (ECT) sensor electrical connector.

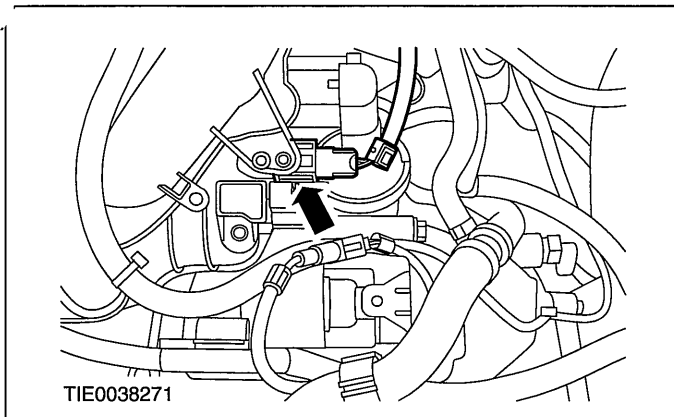


20. Disconnect the intake manifold runner control (IMRC) electrical connector.

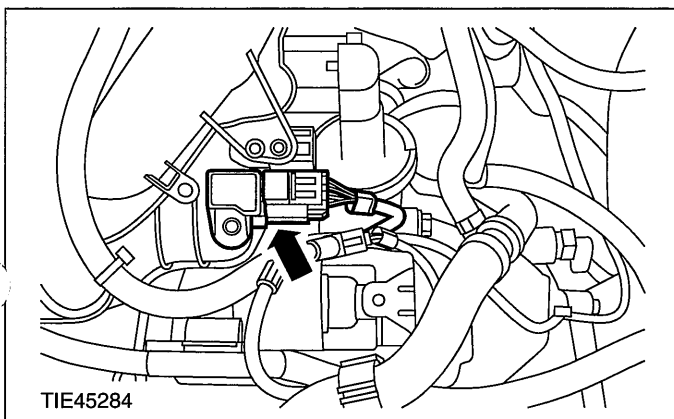


DISASSEMBLY

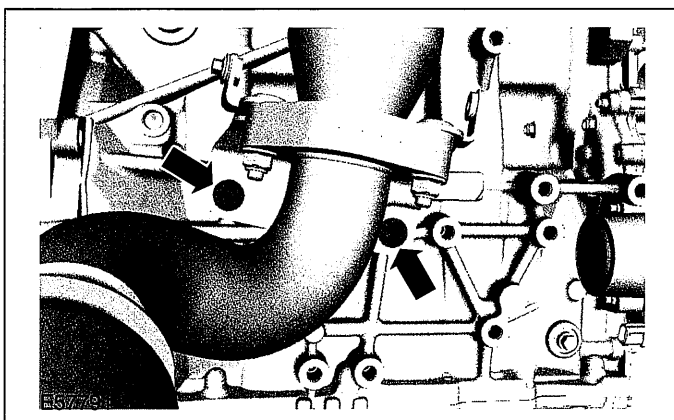
21. Detach the starter motor electrical connector from the intake manifold.



22. Disconnect the manifold absolute pressure (MAP) sensor electrical connector.

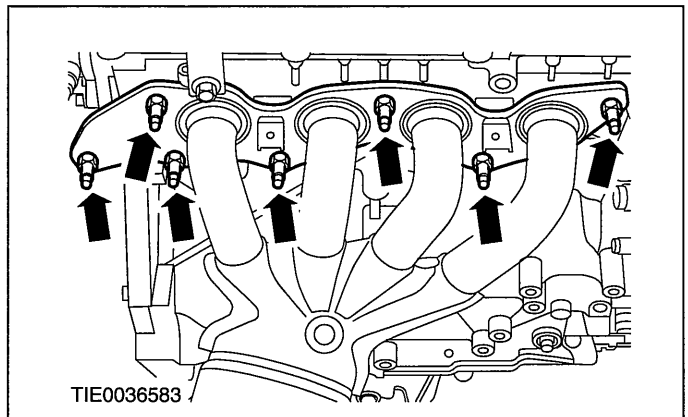


23. Remove the exhaust manifold lower retaining bolts.

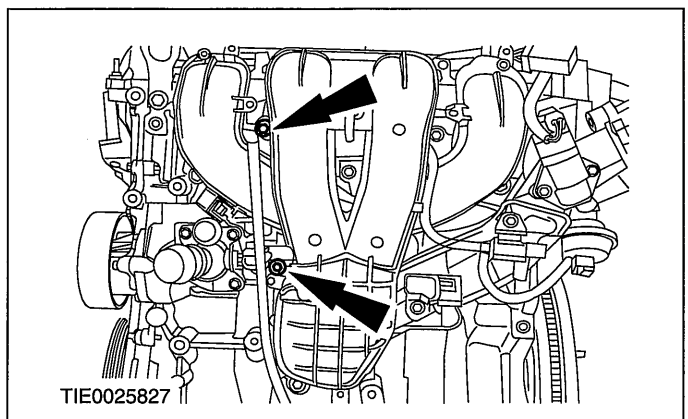


24. Remove the exhaust manifold.

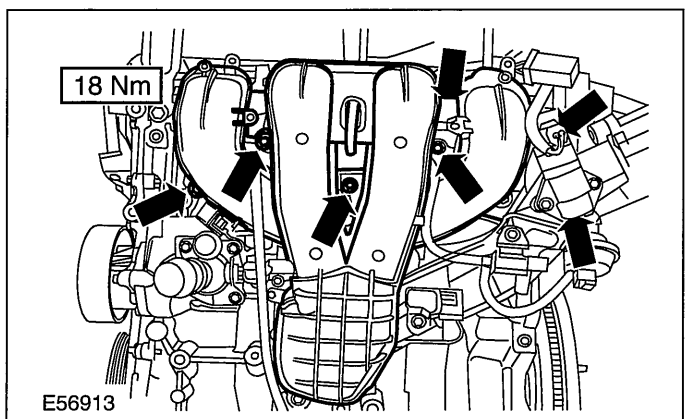
- Discard the gasket.



25. Remove the oil level indicator and oil level indicator tube.

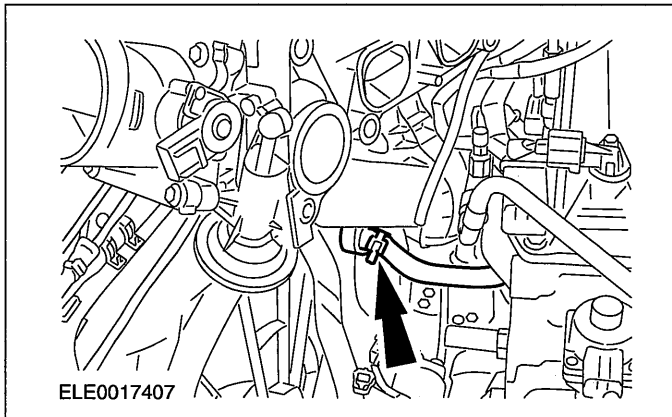


26. Remove the intake manifold.

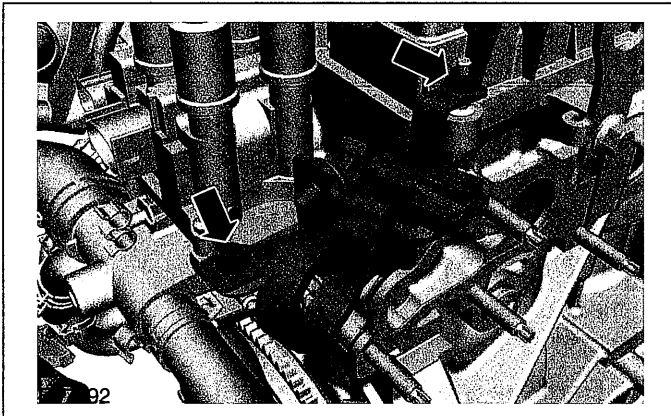


DISASSEMBLY

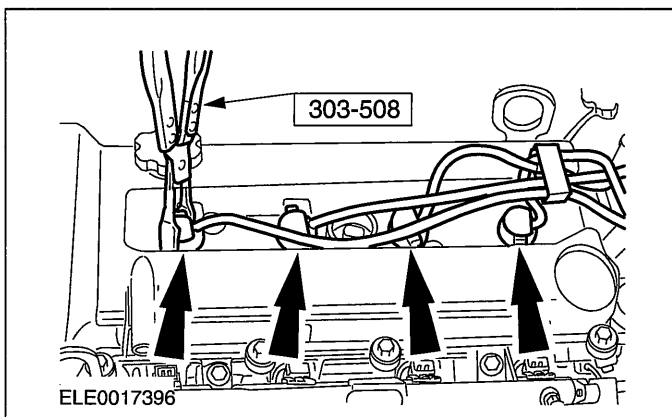
27. Disconnect the positive crankcase ventilation (PCV) hose from the intake manifold.



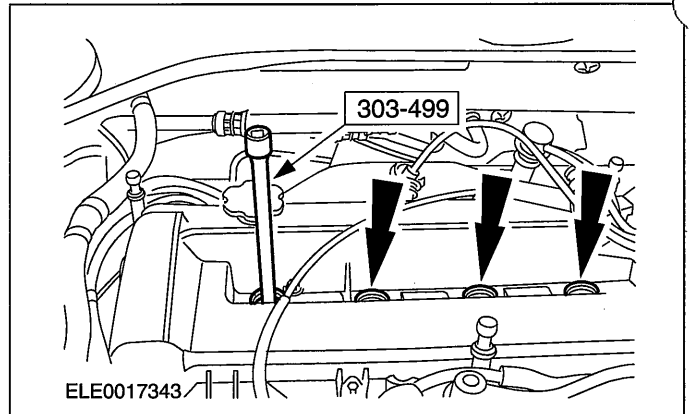
28. Remove the evaporative emission (EVAP) valve support bracket.



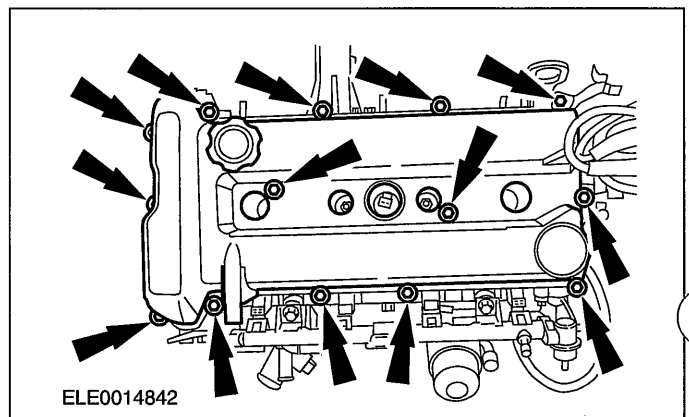
29. Using the special tool, disconnect the spark plug electrical connectors.



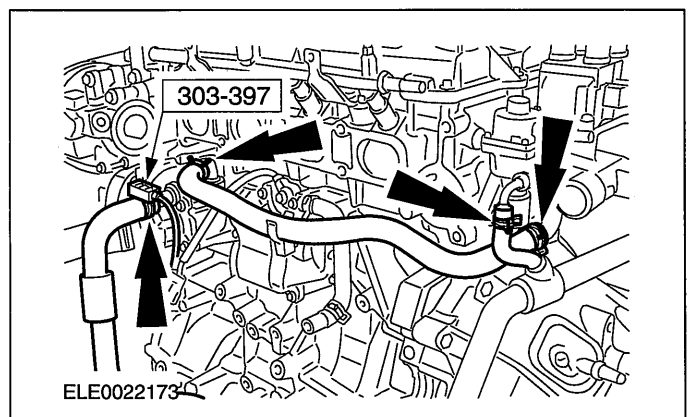
30. Using the special tool, remove the spark plugs.



31. Remove the valve cover.

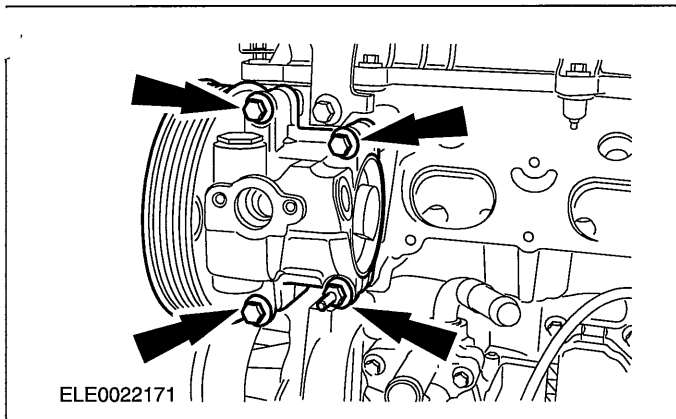


32. Using the special tool, disconnect the coolant hoses.

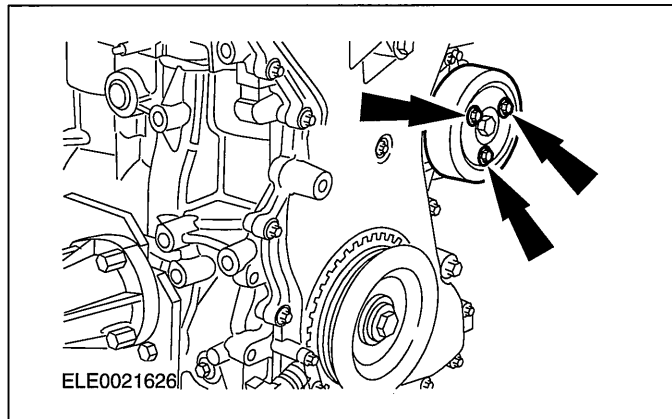


DISASSEMBLY

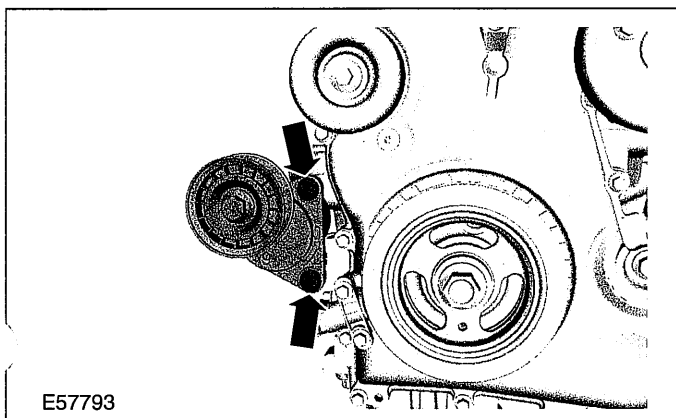
33. Remove the power steering pump.



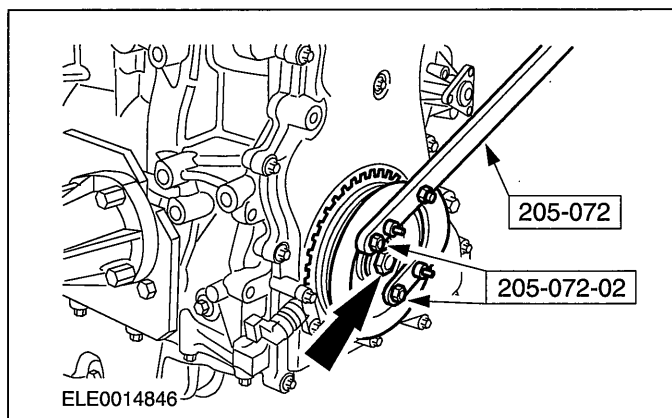
36. Remove the coolant pump pulley.



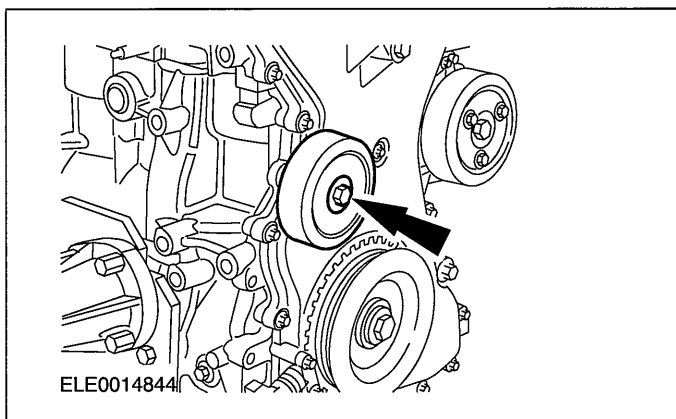
34. Remove the accessory drive belt tensioner.

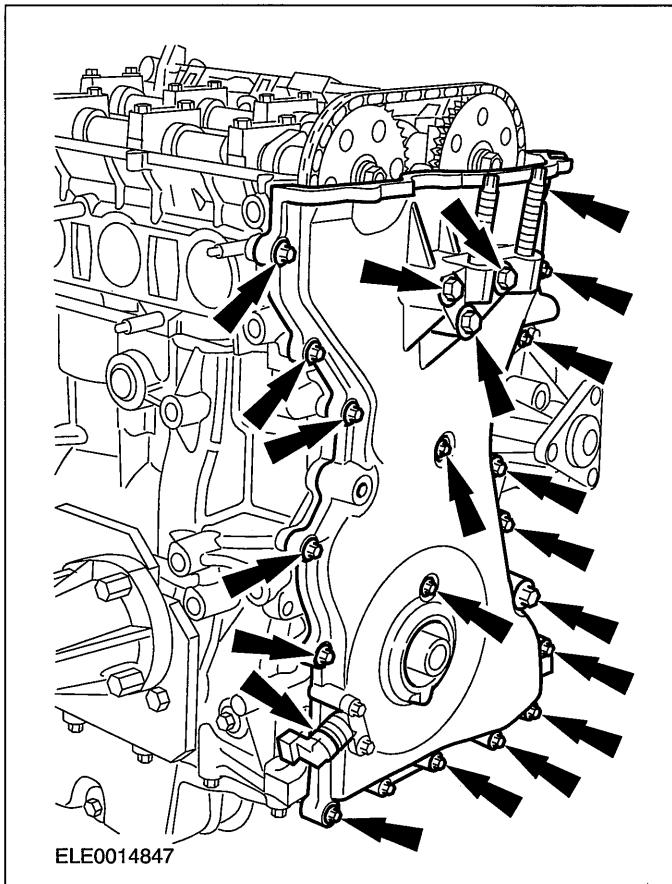


37. Using the special tools, prevent the crankshaft pulley from rotating and remove the crankshaft pulley.

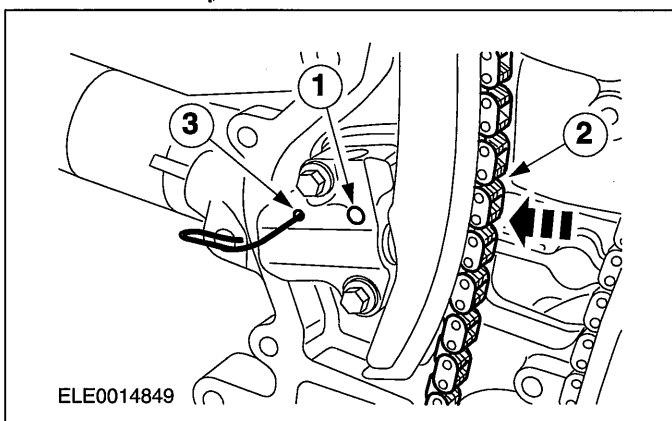


35. Remove the accessory drive belt idler pulley.

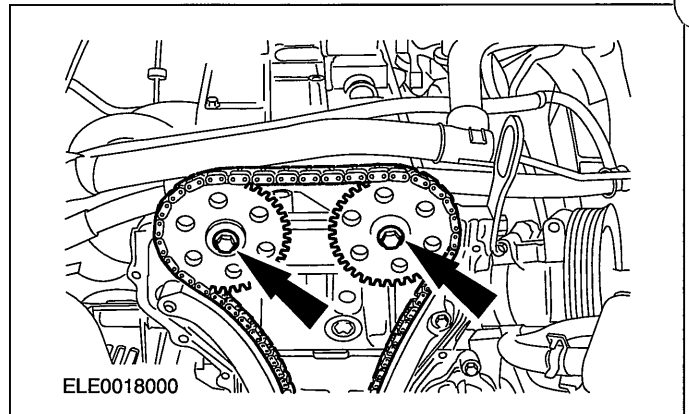
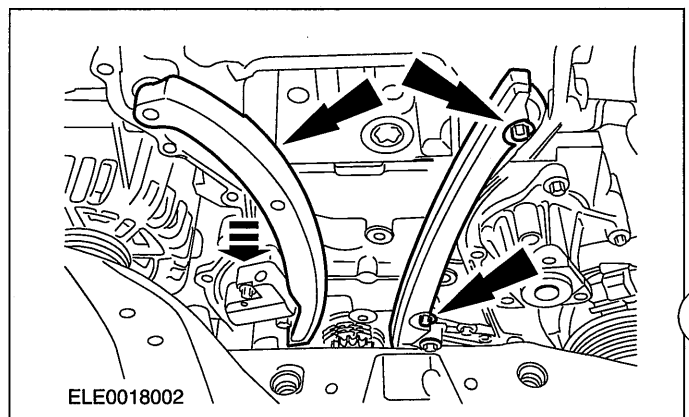
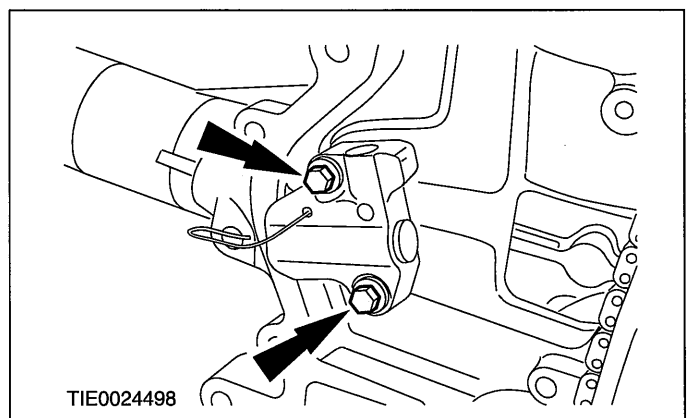


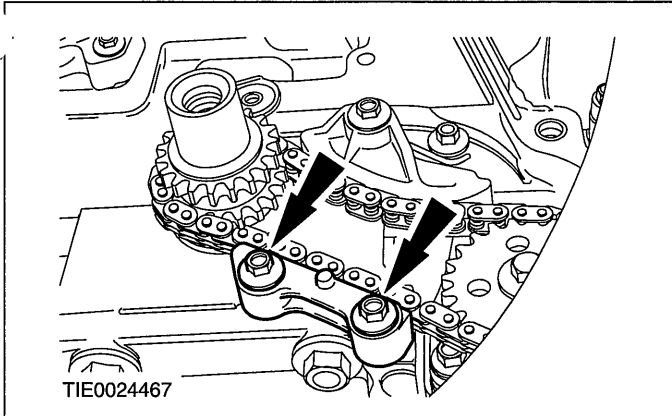
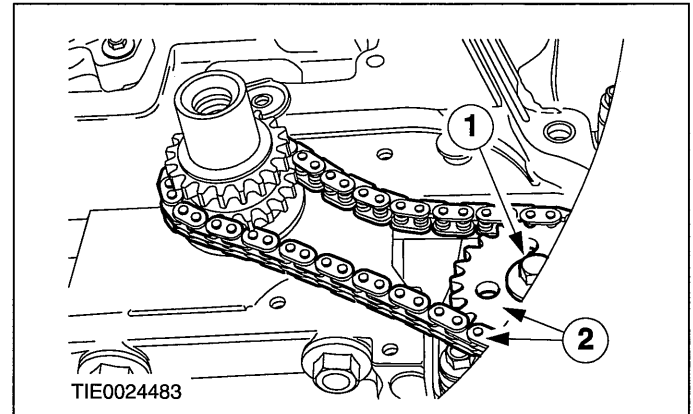
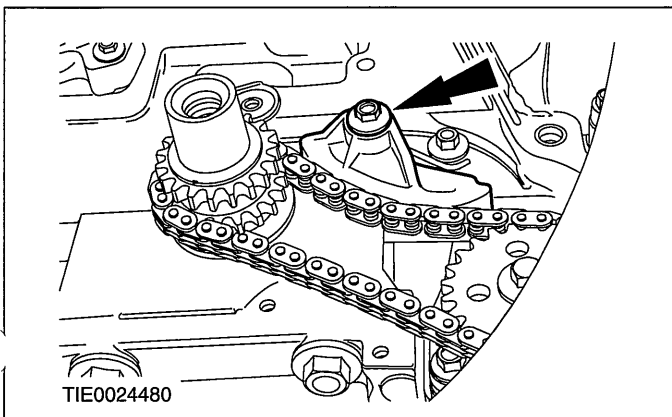
DISASSEMBLY**38. Remove the engine front cover.****39. Detension the timing chain.**

1. Unlock the timing chain tensioner ratchet.
2. Apply pressure to the timing chain guide.
3. Lock the timing chain tensioner with a suitable piece of wire.

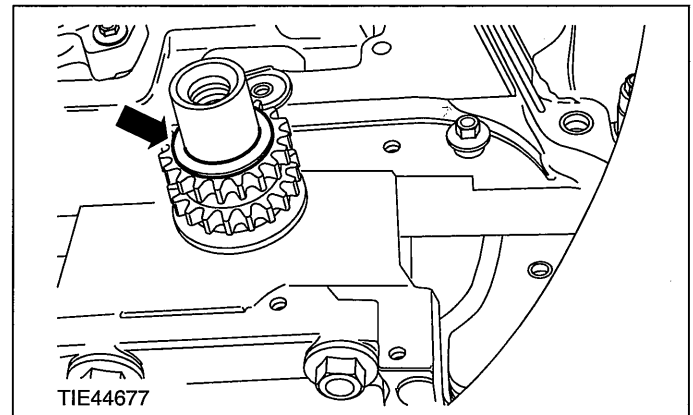
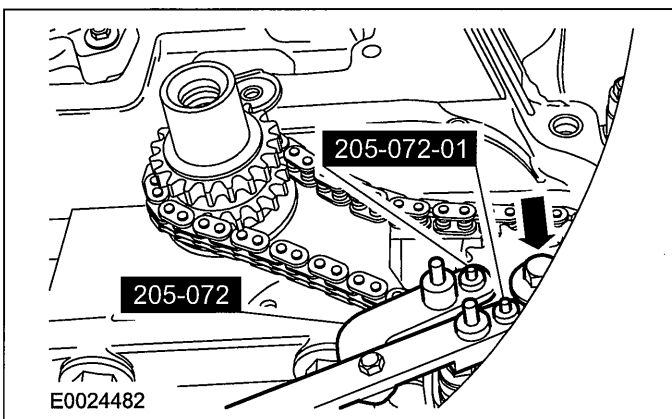
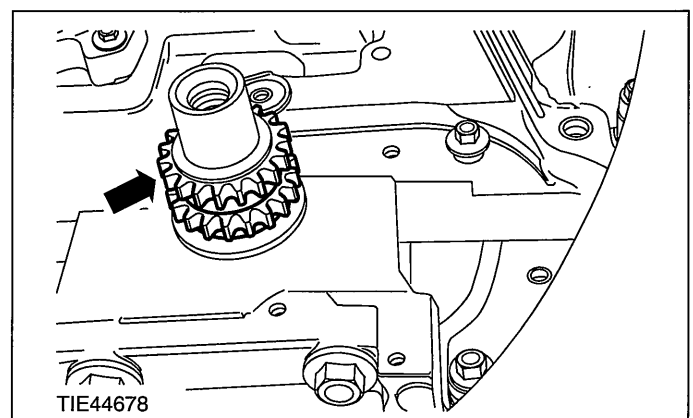


40. NOTE: Hold each camshaft by the hexagon with an open-ended wrench to stop it from rotating.

Remove the camshaft sprockets and the timing chain.**41. Remove the timing chain guides.****42. Remove the timing chain tensioner.**

DISASSEMBLY**43. Remove the oil pump chain guide.****2. Remove the oil pump chain and the oil pump sprocket.****44. Remove the oil pump chain tensioner.****47. Remove the front friction washer (if equipped).**

- Discard the friction washer.

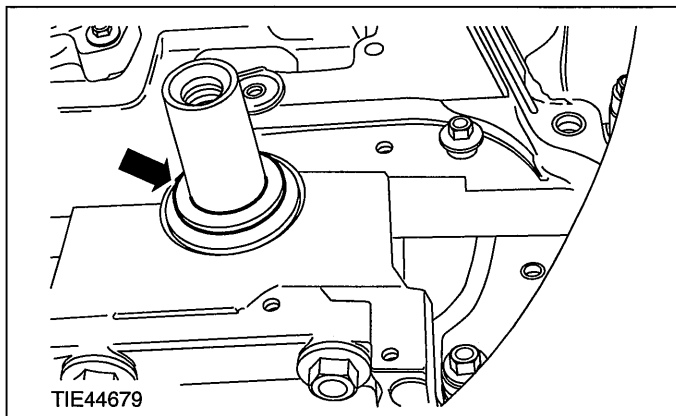
**45. Using the special tools, loosen the oil pump sprocket retaining bolt.****48. Remove the crankshaft sprocket.****46. Remove the oil pump chain.**

1. Remove the oil pump sprocket retaining bolt.

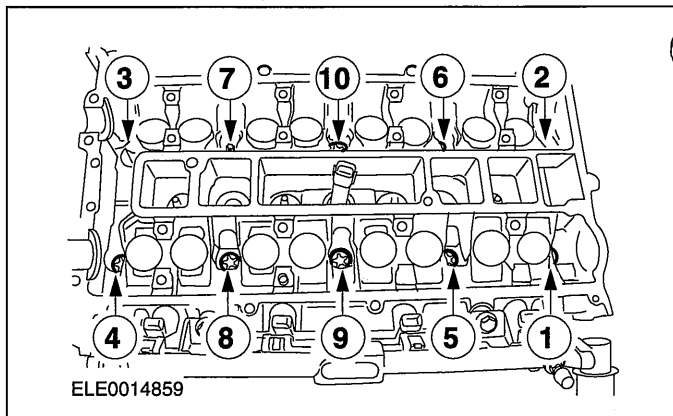
49. Remove the rear friction washer (if equipped).

DISASSEMBLY

- Discard the friction washer.



- Discard the gasket.

**50. CAUTIONS:**

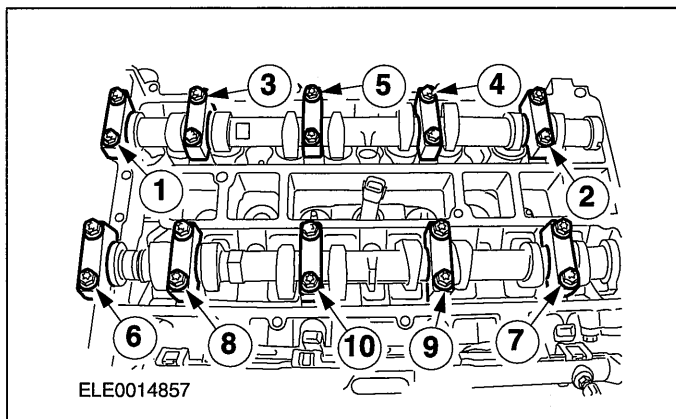
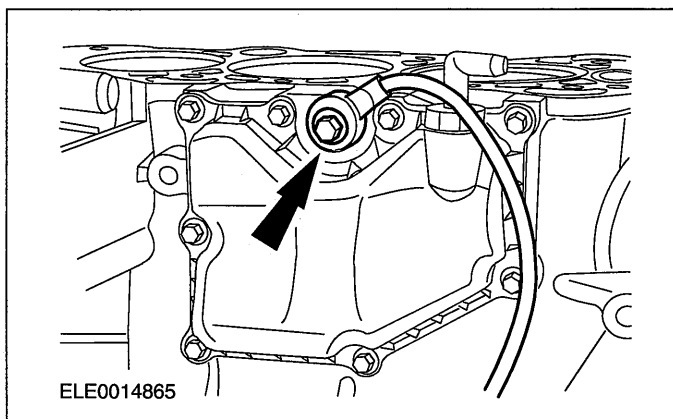
⚠ Keep the camshaft bearing caps in order for installation.

⚠ Remove the camshaft bearing caps in the sequence shown.

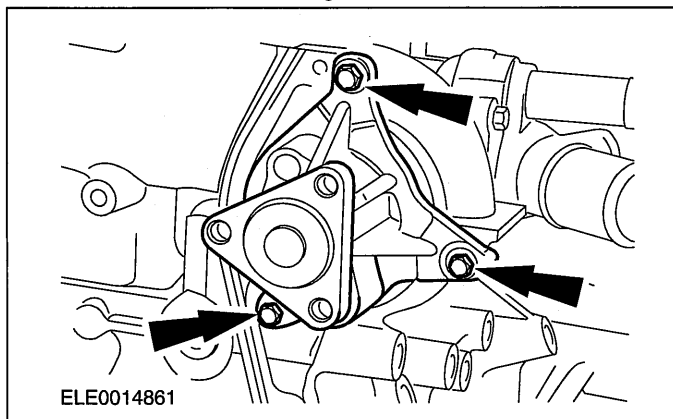
NOTE: Working in several stages, release each camshaft bearing cap retaining bolt two turns at a time.

Remove the camshaft bearing caps.

- Remove the camshafts.

**53. Remove the knock sensor (KS).****54. Remove the coolant pump.**

- Discard the O-ring seal.



51. ⚠ CAUTION: Keep the valve tappets in order for installation.

Remove the valve tappets.

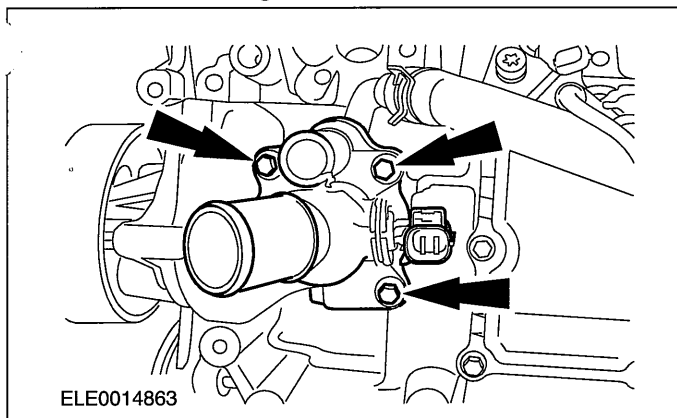
52. ⚠ CAUTION: Remove the cylinder head bolts in the sequence shown.

Remove the cylinder head.

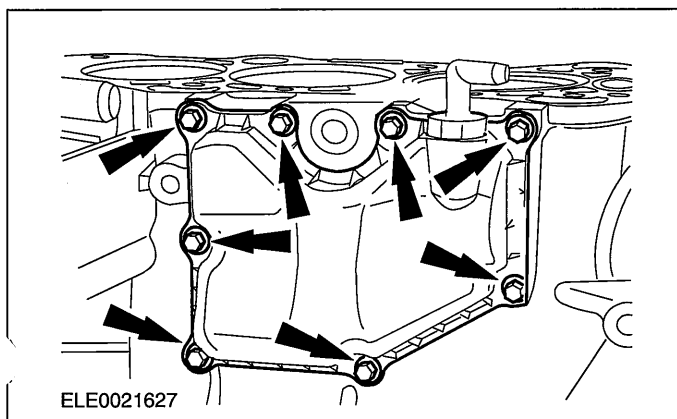
55. Remove the thermostat housing.

DISASSEMBLY

- Discard the gasket.

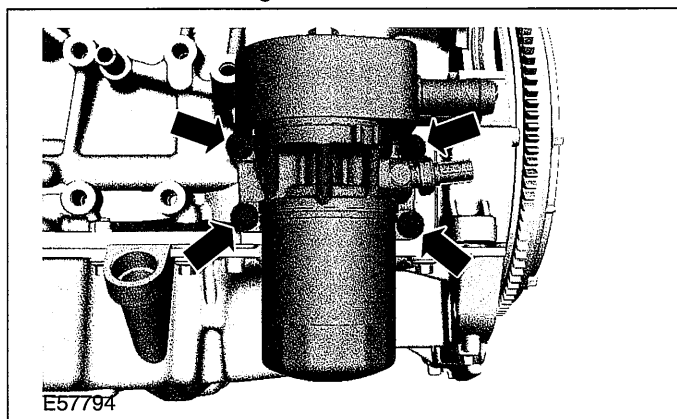


56. Remove the crankcase vent oil separator.



57. Remove the oil filter adapter.

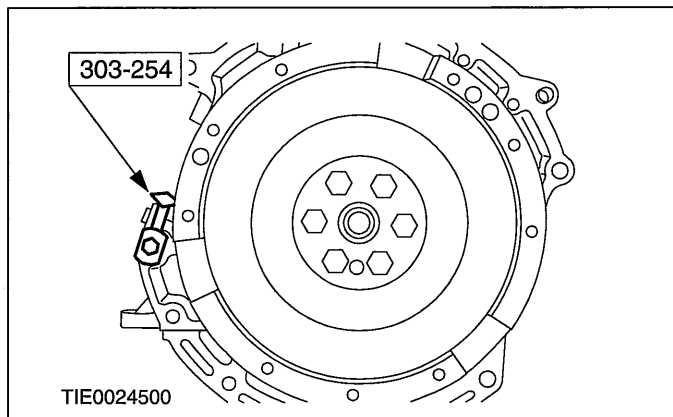
- Discard the gasket.



58. Remove the clutch disc and pressure plate.

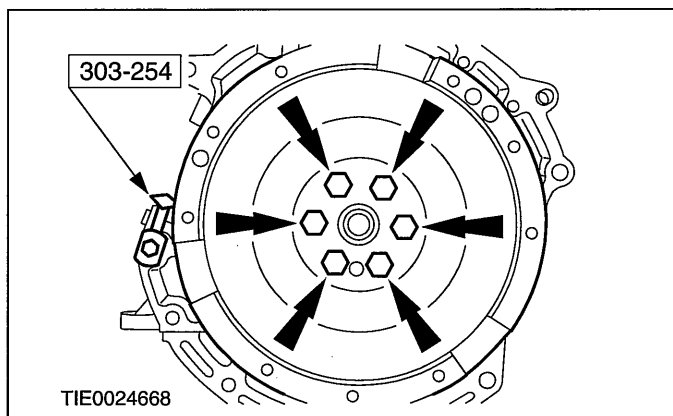
For additional information, refer to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

59. Using the special tool, lock the flywheel in position.



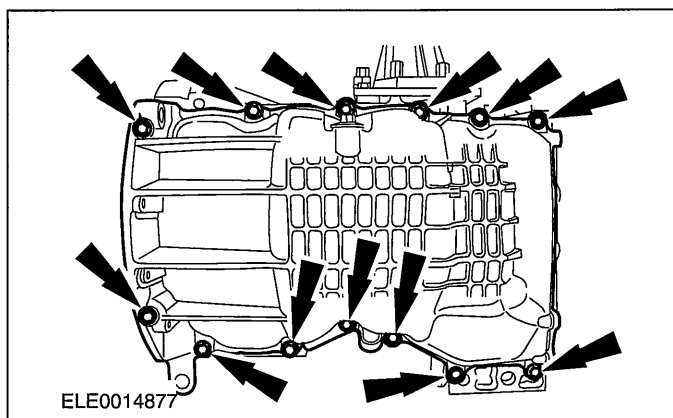
60. Remove the flywheel.

- Discard the bolts.



61. Remove the special tool.

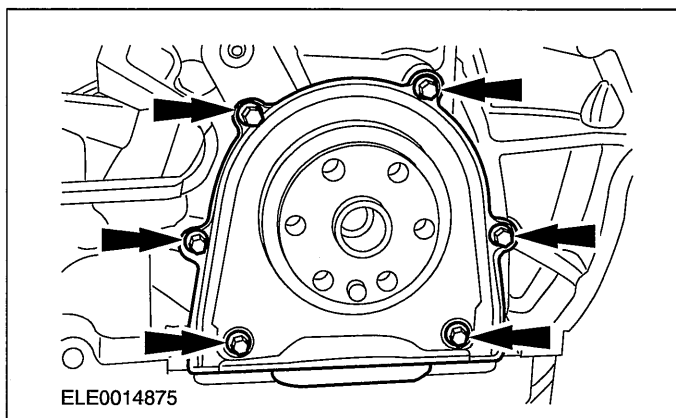
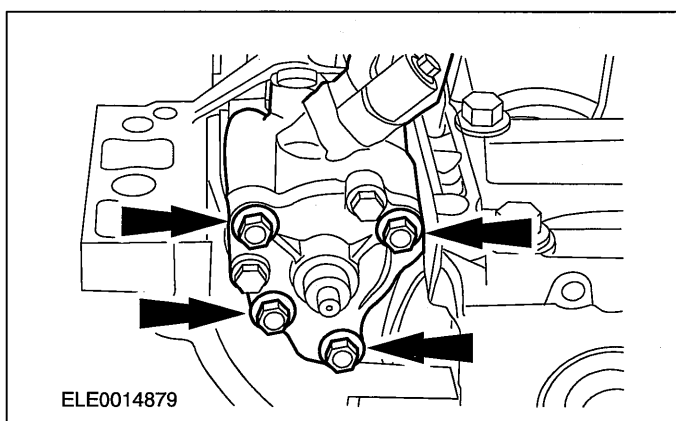
62. Remove the oil pan.



63. Remove the crankshaft rear seal carrier.

DISASSEMBLY

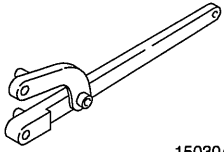
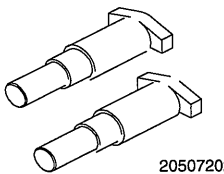
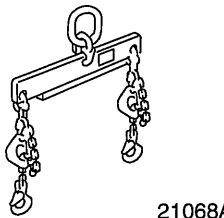
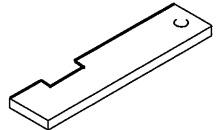
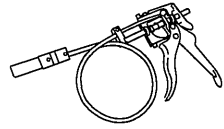
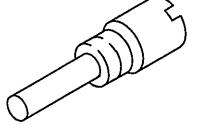
- Discard the seal carrier.

**64. Remove the oil pump.**

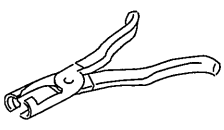
ASSEMBLY

Engine(21 134 8)

Special Tool(s)

 15030A	Universal Flange Holding Wrench 205-072 (15-030A)
 20507202	Adapter for 205-072 205-072-02 (15-030A-02)
 21068A	Lifting Bracket, Engine 303-122 (21-068A)
 21162B	Alignment Plate, Camshaft 303-376A (21-162B)
 24003	Remover/Installer, Hose Clamp 303-397 (24-003)
 PZ21210	Timing Peg, Crankshaft TDC 303-507 (21-210)

Special Tool(s)

 21211	Pliers, Valve Stem Seal 303-508 (21-211)
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General Equipment

Engine hoist
M6 x 18 mm bolt
Straight edge

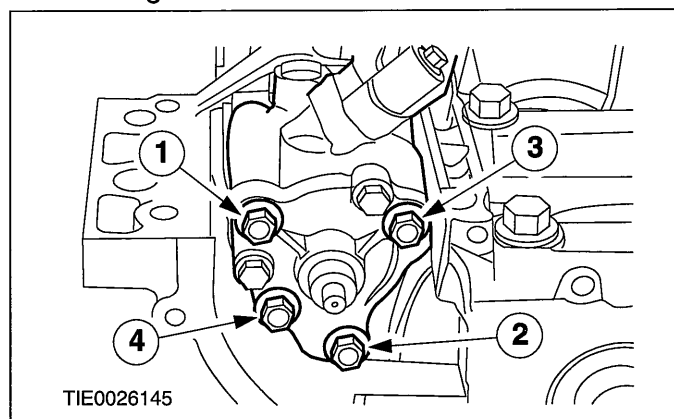
Materials

Name	Specification
Silicone Sealant	WSE-M4G323-A4
Hypoid Gear Oil	SQM-2C9002-AA

Assembly

1. Install the oil pump.

- Tighten the bolts in the sequence shown in two stages.
- Stage 1: 10 Nm.
- Stage 2: 23 Nm.

2. **CAUTION:** Do not remove the the installation sleeve before installation.

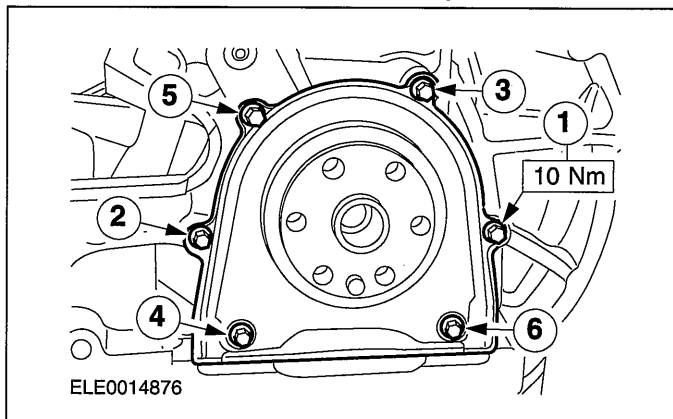
NOTE: A new crankshaft rear seal carrier is supplied preassembled with an installation sleeve that must be removed following installation.

NOTE: Install a new crankshaft rear seal carrier.

Install the crankshaft rear seal carrier.

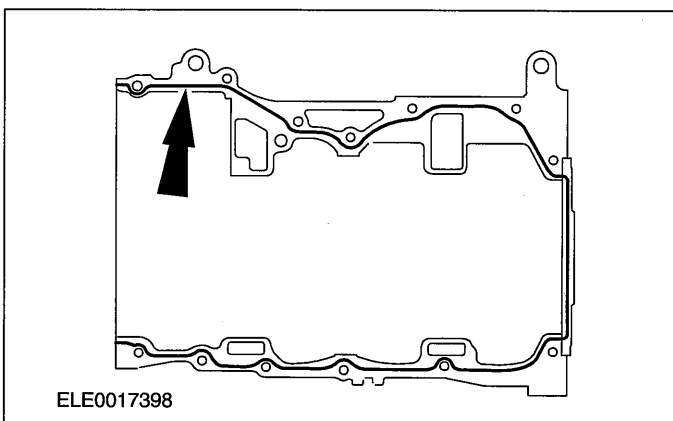
ASSEMBLY

- Tighten the bolts in the sequence shown.



3. Clean the mating faces of the cylinder block and the oil pan with a suitable metal surface cleaner.

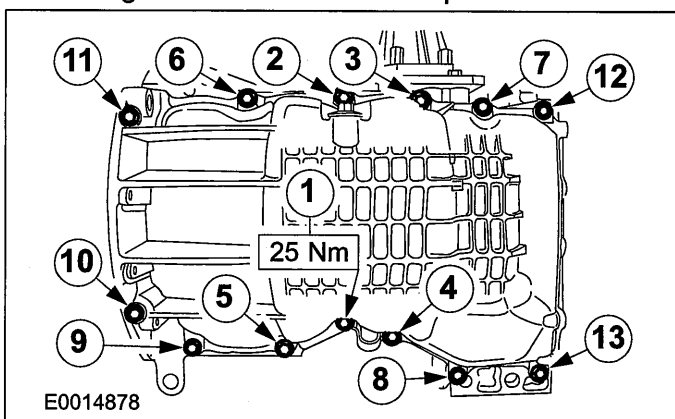
4. **NOTE:** Install the oil pan within 10 minutes of applying the sealant and tighten the retaining bolts within a further 5 minutes.
Apply a 3 mm bead of sealant to the oil pan.



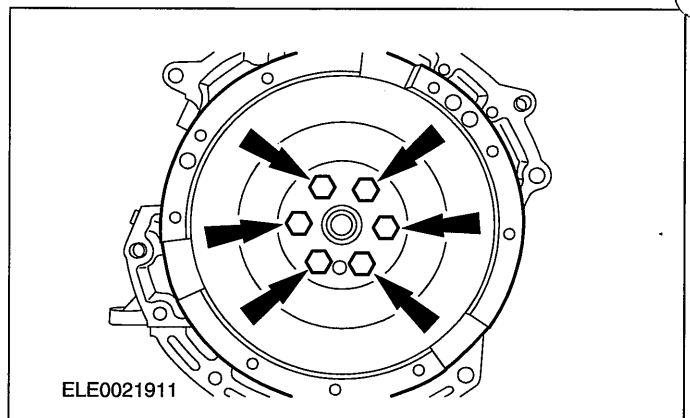
5. Using a suitable straight edge, align the oil pan to the cylinder block mating face on the timing chain side.

6. Tighten the oil pan retaining bolts.

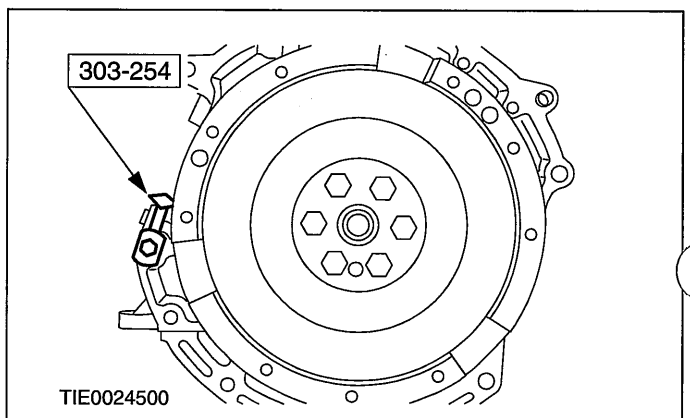
- Tighten the bolts in the sequence shown.



7. **NOTE:** Install new flywheel bolts.
Install the flywheel.

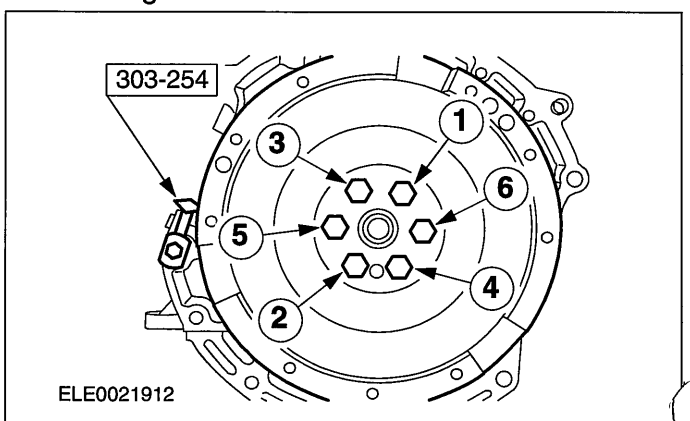


8. Using the special tool, lock the flywheel in position.



9. Tighten the flywheel bolts.

- Tighten the bolts in the sequence shown in three stages.
- Stage 1: 50 Nm.
- Stage 2: 80 Nm.
- Stage 3: 112 Nm.



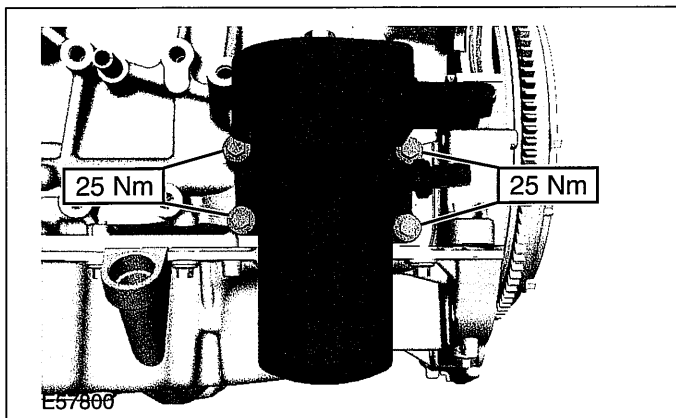
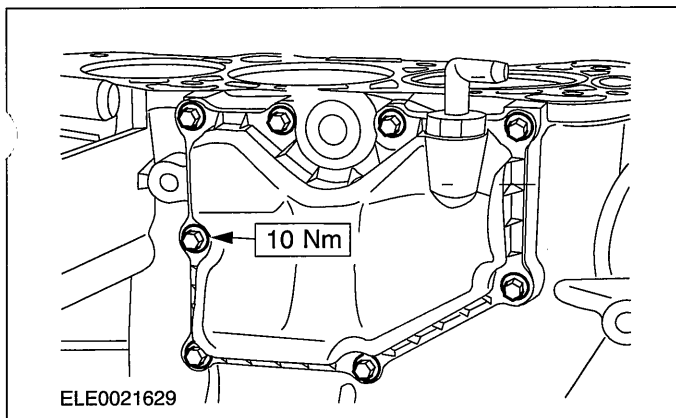
10. Remove the special tool.

ASSEMBLY**11. Install the clutch disc and pressure plate.**

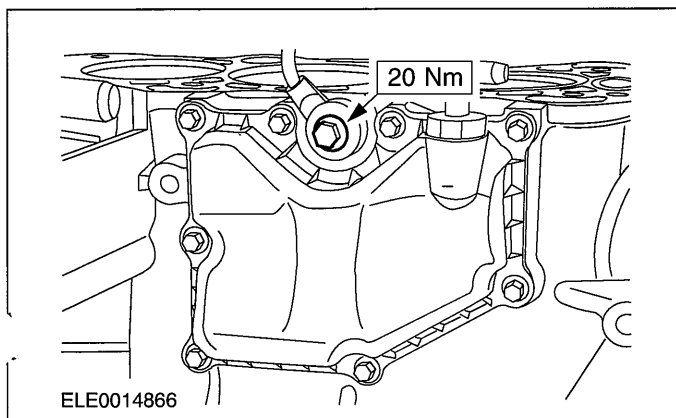
For additional information, refer to: **Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).**

12. NOTE: Install a new oil filter adapter gasket.

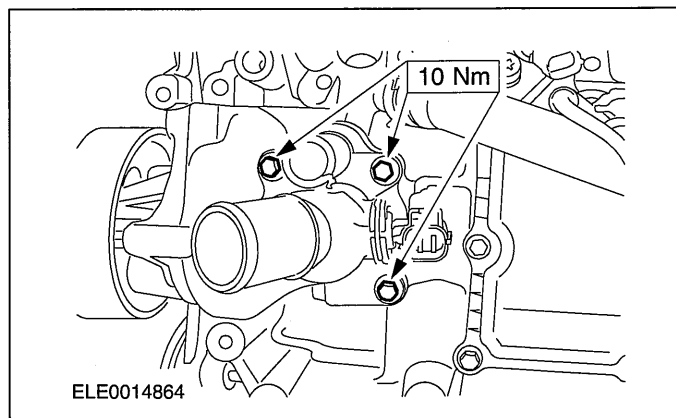
Install the oil filter adapter.

**13. Install the crankcase vent oil separator.****14. NOTE: Rotate the knock sensor (KS) as far counter-clockwise as possible without it touching the crankcase vent oil separator.**

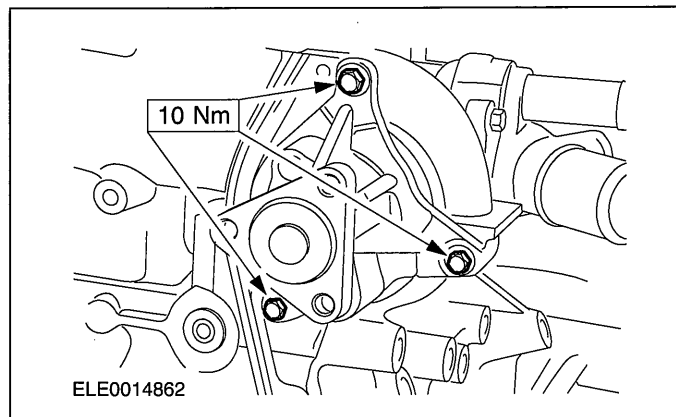
Install the KS.

**15. NOTE: Install a new thermostat housing gasket.**

Install the thermostat housing.

**16. NOTE: Install a new coolant pump O-ring.**

Install the coolant pump.

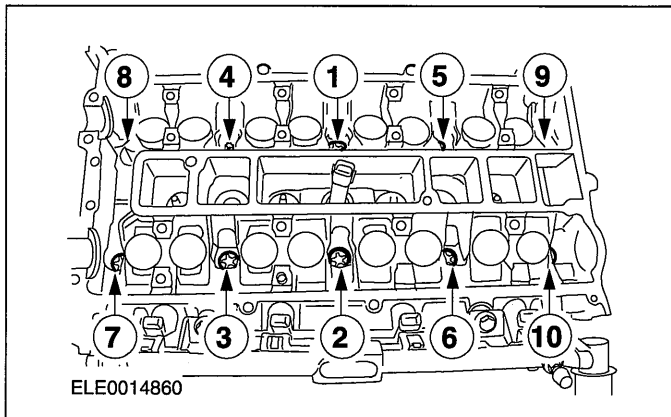
**17. NOTE: Install new cylinder head bolts and gasket.**

Install the cylinder head.

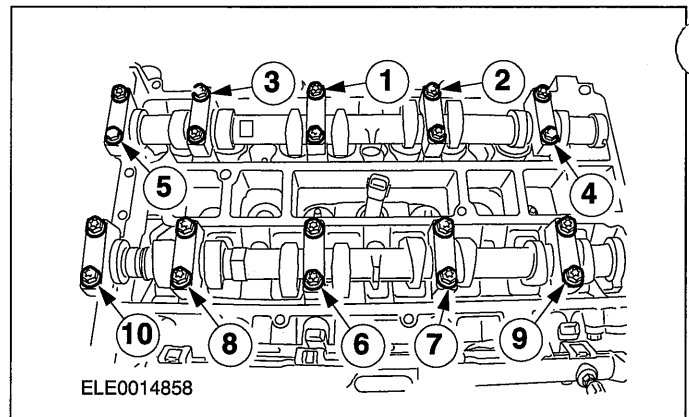
- Tighten the cylinder head bolts in five stages.
- Stage 1: 5 Nm.
- Stage 2: 15 Nm.
- Stage 3: 45 Nm.
- Stage 4: 90 degrees.

ASSEMBLY

- Stage 5: 90 degrees.

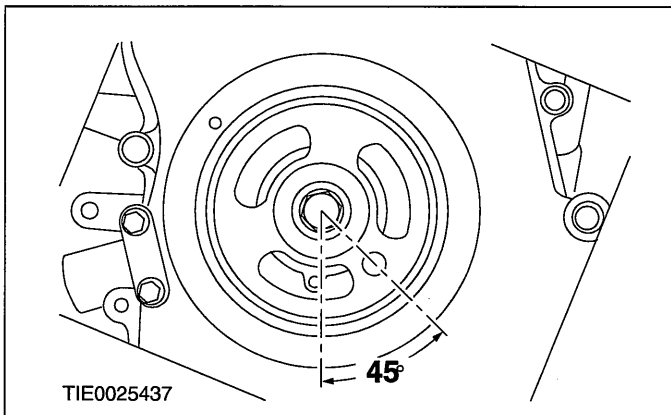


- Stage 2: 16 Nm.

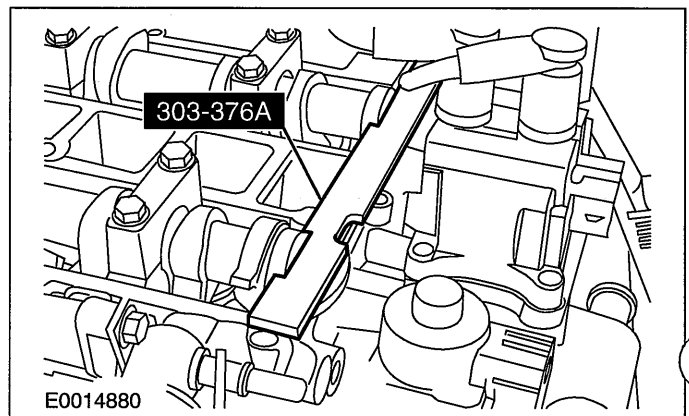


- 18. NOTE:** Only rotate the crankshaft in its normal direction of rotation.

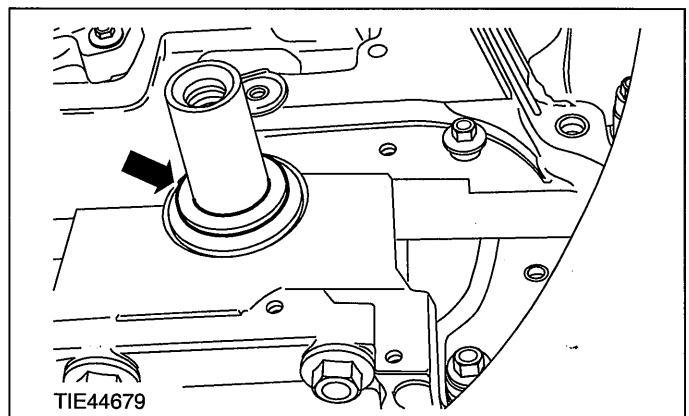
Rotate the crankshaft until piston No. 1 is approximately 45 degrees before top dead center (TDC).



- 21. Install the special tool.**



- 22. NOTE:** Install a new rear friction washer.
Install the rear friction washer.

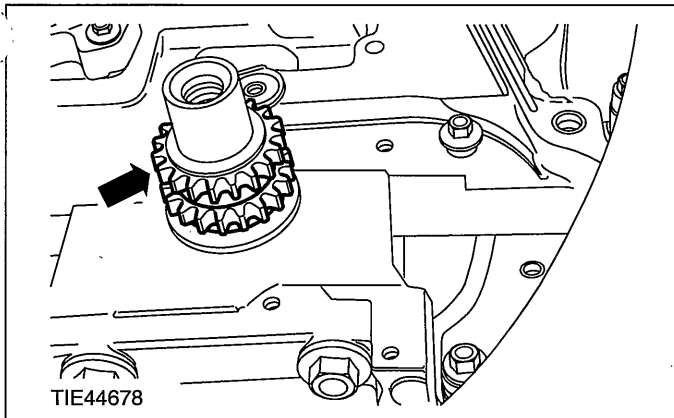


- 19. Install the valve tappets.**

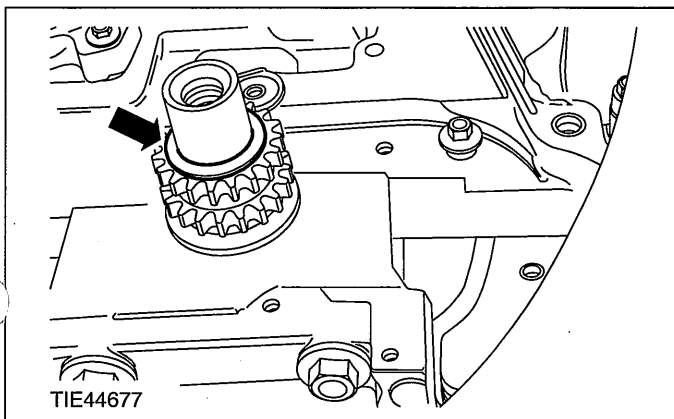
- 20. ⚠ CAUTION:** Install the camshafts approximately at valve overlap position on cylinder No. 4.

Install the camshafts.

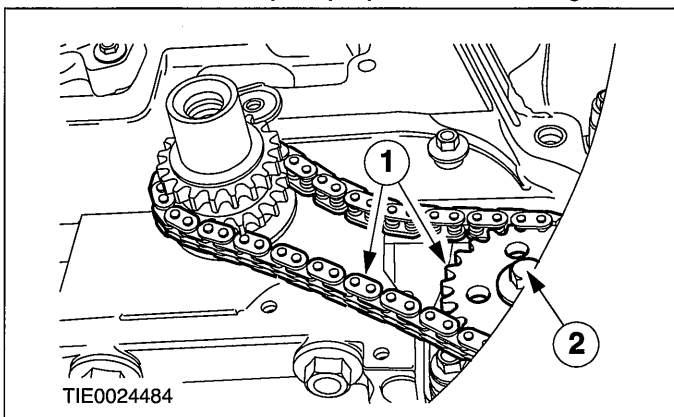
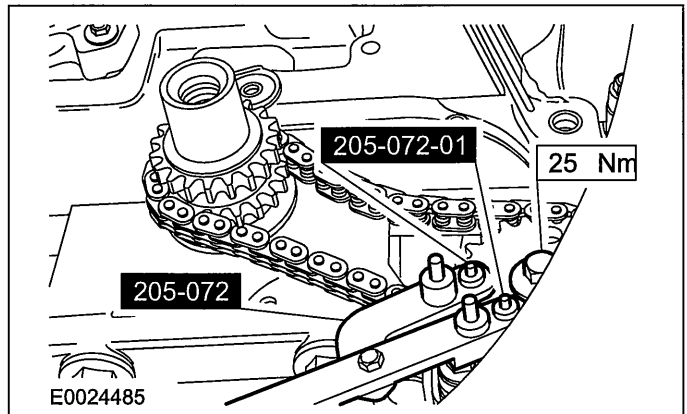
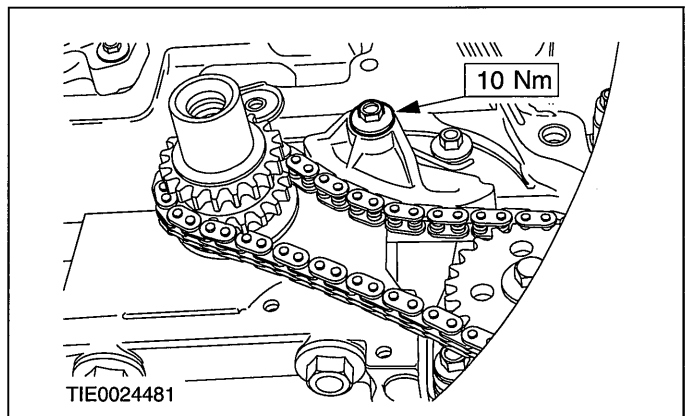
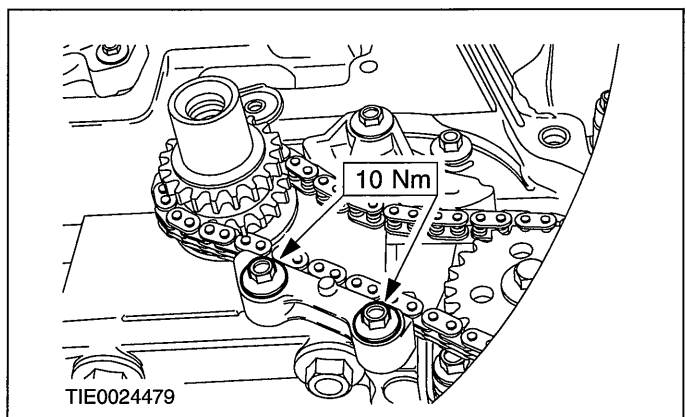
- Working in several stages, evenly tighten the camshaft bearing cap bolts in the sequence shown, one half turn at a time.
- Coat the camshaft bearing caps with oil.
- Tighten the bolts in two stages.
- Stage 1: 7 Nm.

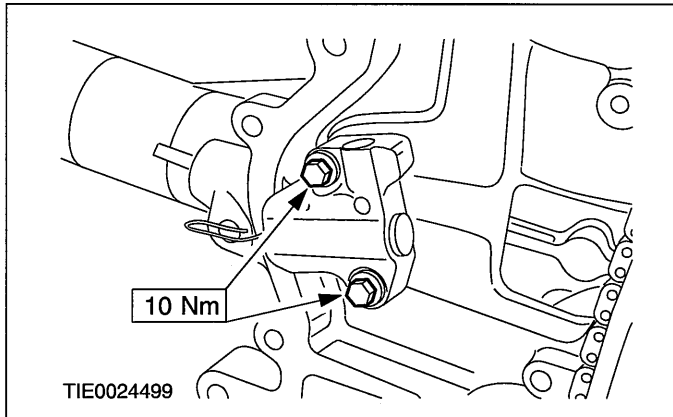
ASSEMBLY**23. Install the crankshaft sprocket.**

24. NOTE: Install a new front friction washer.
Install the front friction washer.

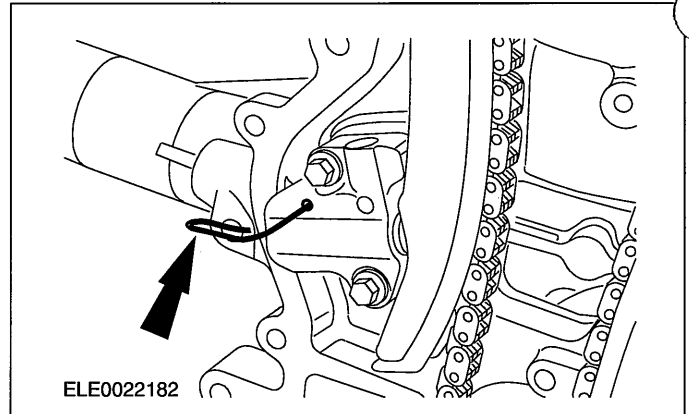
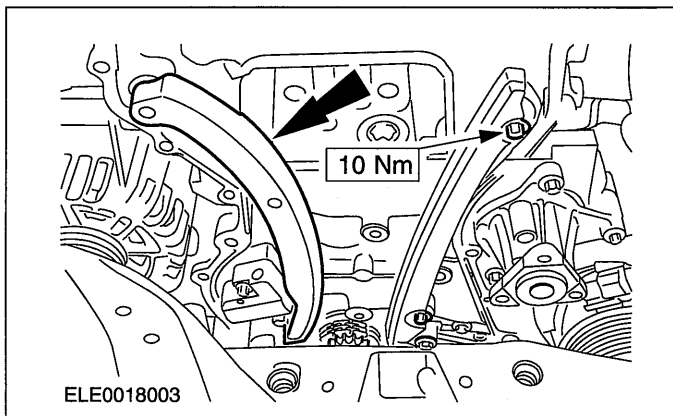
**25. Install the oil pump chain.**

1. Install the oil pump chain and the oil pump sprocket.
2. Install the oil pump sprocket retaining bolt.

**26. Using the special tools, tighten the oil pump sprocket retaining bolt.****27. Install the oil pump chain tensioner.****28. Install the oil pump chain guide.**

ASSEMBLY**29. Install the timing chain tensioner.**

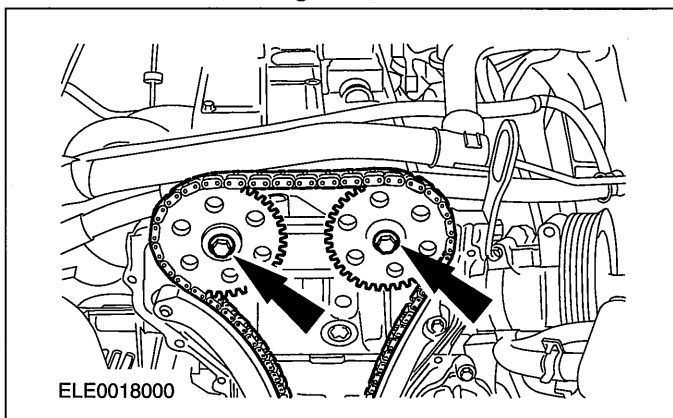
- Apply pressure to the timing chain and remove the securing pin.

**30. Install the timing chain guides.**

31. **⚠ CAUTION:** Do not fully tighten the camshaft sprocket retaining bolts at this stage. Make sure the camshaft sprockets turn on the camshafts.

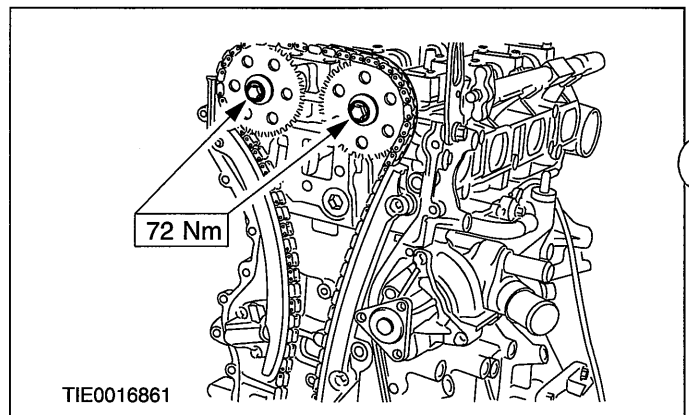
Install the camshaft sprockets.

- Install the timing chain.

**32. Tension the timing chain.**

33. **⚠ CAUTION:** Hold each camshaft by the hexagon with an open-ended wrench to stop it from turning.

Tighten the camshaft sprockets retaining bolts.

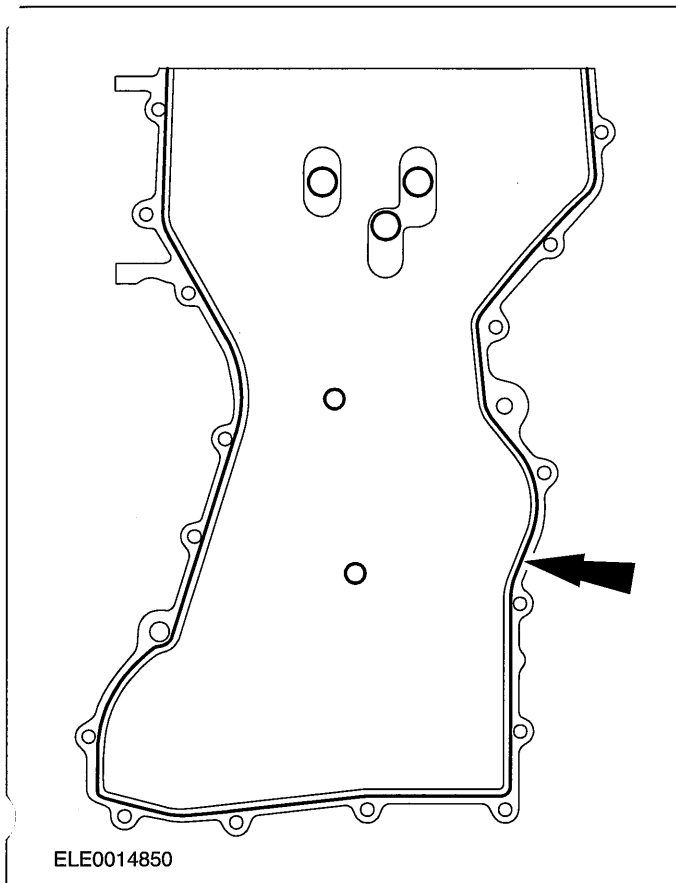


34. Clean the mating face of the engine front cover with a suitable metal surface cleaner.

35. **NOTE:** Install the engine front cover within 10 minutes of applying the sealant.

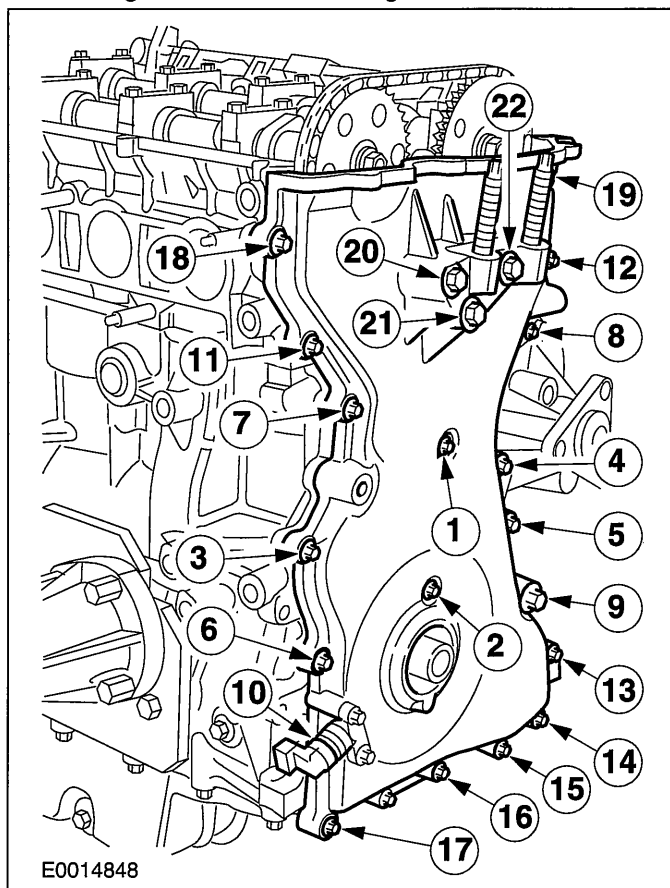
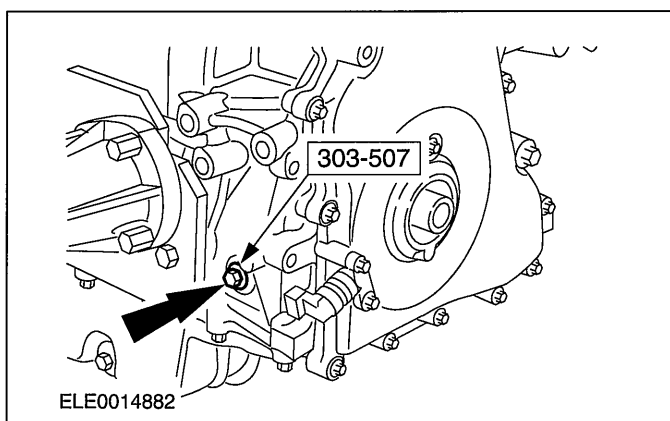
ASSEMBLY

Apply a 3 mm bead of sealant to the engine front cover.

**36. Install the engine front cover.**

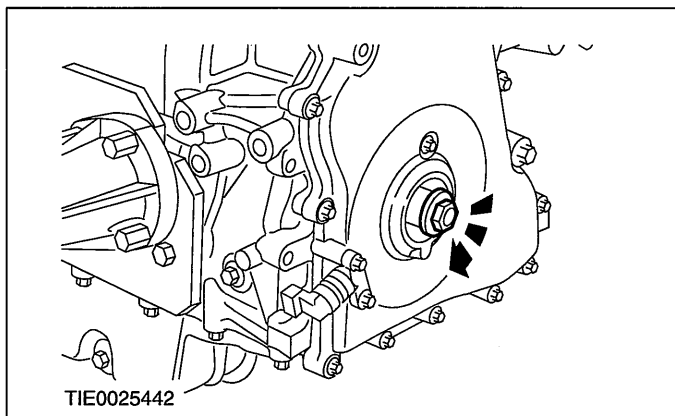
- Tighten the bolts in the sequence shown.
- Tighten bolts 1 through 8 to 10 Nm.
- Tighten bolt 9 to 48 Nm.
- Tighten bolts 10 through 19 to 10 Nm.

- Tighten bolts 20 through 22 to 48 Nm.

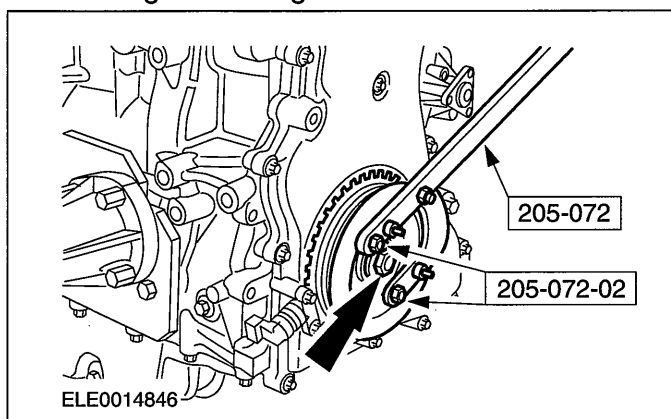
**37. Remove the cylinder block lower blanking plug from the cylinder block and install the special tool.****38. NOTE: Only rotate the crankshaft in the normal direction of rotation.**

ASSEMBLY

Using the crankshaft pulley retaining bolt, rotate the crankshaft until piston No. 1 is at TDC.



- Stage 2: 90 degrees.

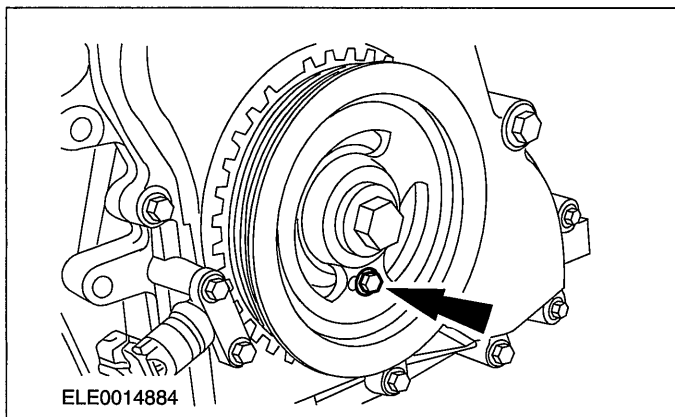


39. Remove the crankshaft pulley retaining bolt.

- Discard the bolt.

40. **⚠ CAUTION:** Only tighten the crankshaft pulley securing bolt finger tight.

Install the crankshaft pulley onto the crankshaft and secure the crankshaft pulley to the front cover using a M6 x 18 mm bolt.

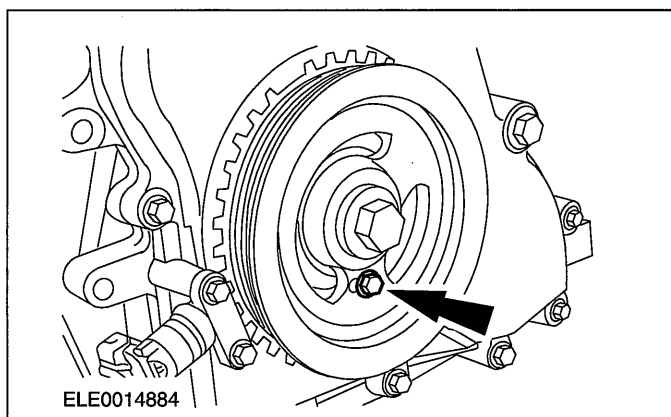


41. **NOTE:** Install a new crankshaft pulley retaining bolt.

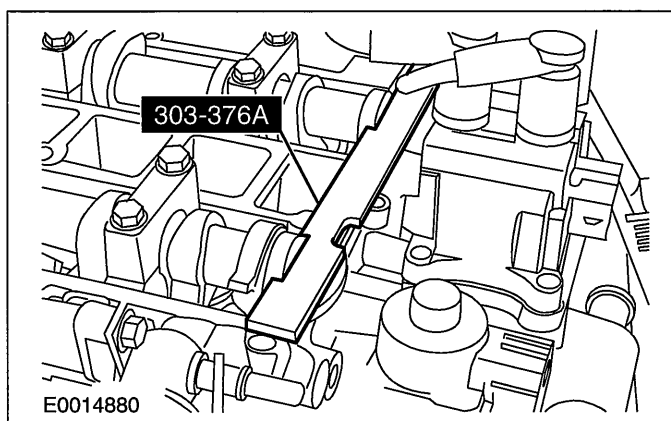
Using the special tools, prevent the crankshaft pulley from rotating and tighten the crankshaft pulley retaining bolt.

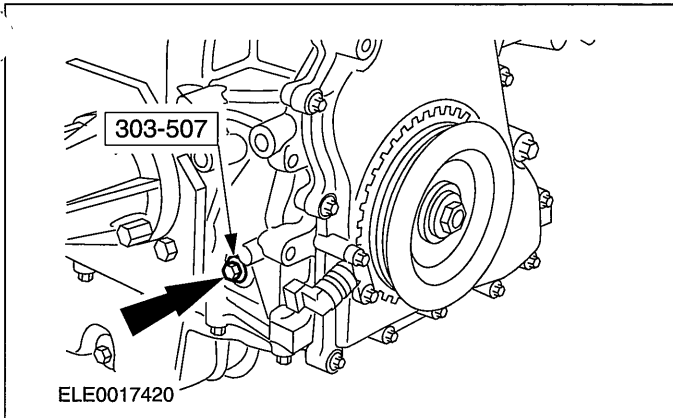
- Tighten the bolt in two stages.
- Stage 1: 100 Nm.

42. Remove the crankshaft pulley securing bolt.

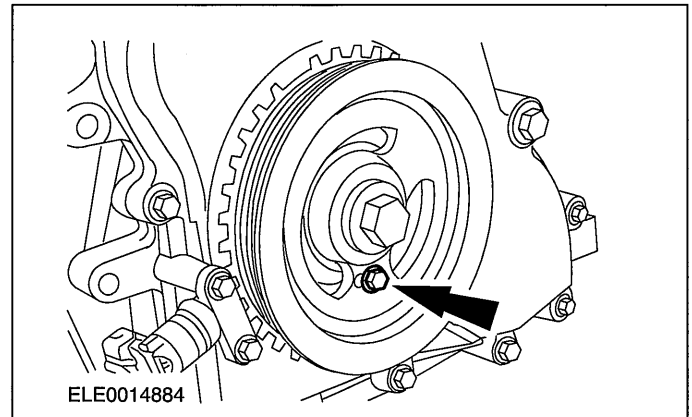


43. Remove the special tool.

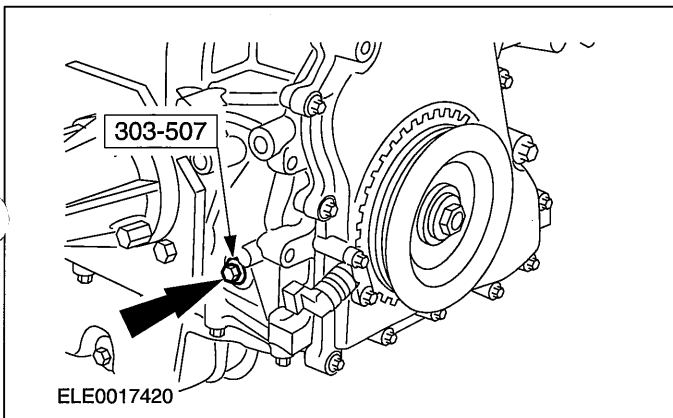


ASSEMBLY**44. Remove the special tool.**

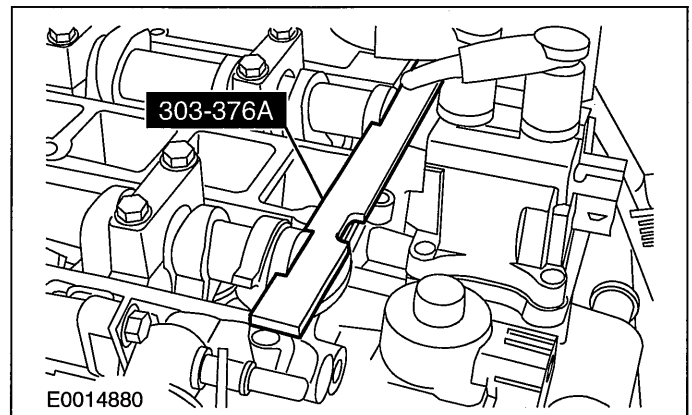
Using a M6 x 18 mm bolt, check the position of the crankshaft pulley.

**45. NOTE: Only rotate the crankshaft in the normal direction of rotation.**

Rotate the crankshaft two revolutions.

46. Install the special tool.**49. NOTE: If it is not possible to install the special tool, correct the engine timing.**

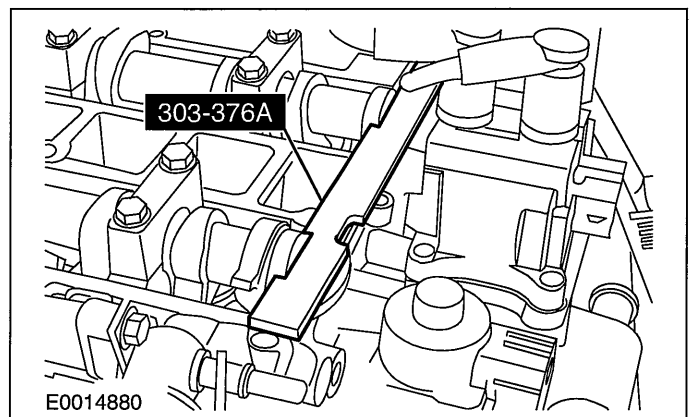
Using the special tool, check the position of the camshafts.

**47. NOTE: Only rotate the crankshaft in the normal direction of rotation.**

Rotate the crankshaft until piston No. 1 is at TDC.

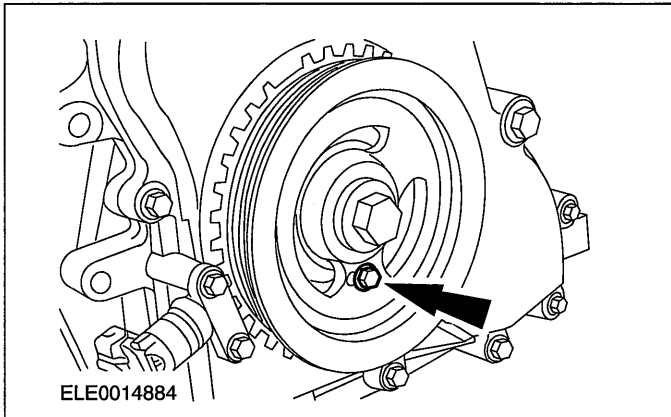
48. ⚠ CAUTION: Only tighten the crankshaft pulley securing bolt finger tight.

NOTE: If it is not possible to install the crankshaft pulley securing bolt, correct the engine timing.

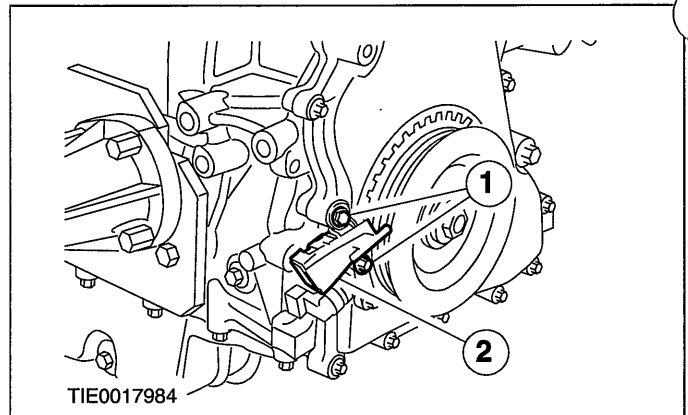
50. Remove the special tool.

ASSEMBLY

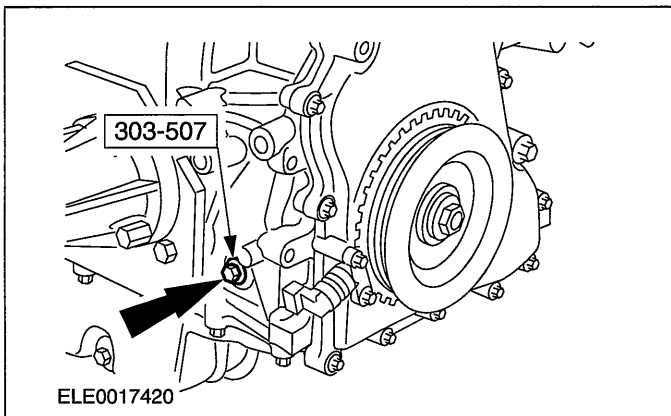
51. Remove the crankshaft pulley securing bolt.



2. Insert the alignment tool supplied, so that it is hooked in the crankshaft pulley teeth.

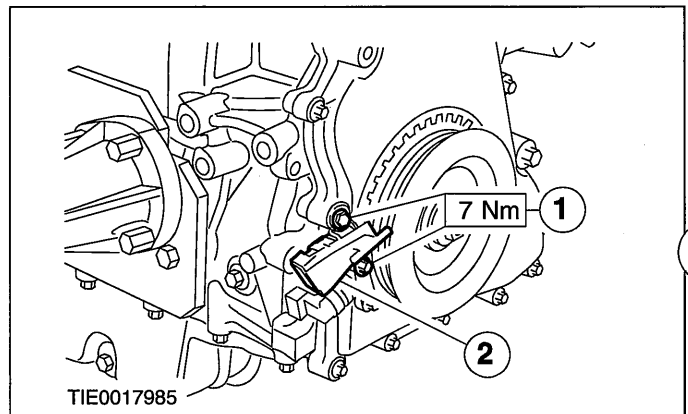


52. Remove the special tool.

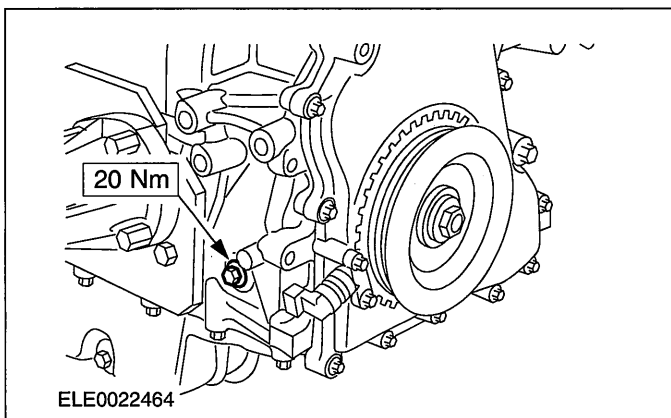


55. Install the CKP sensor.

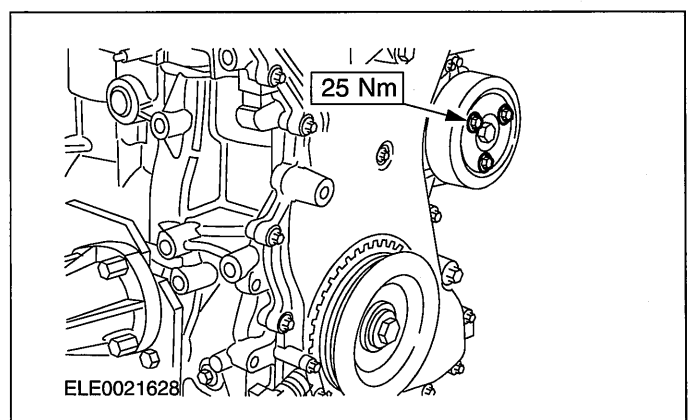
1. Tighten the CKP sensor retaining bolts.
2. Remove the alignment tool.



53. Install the cylinder block lower blanking plug.



56. Install the coolant pump pulley.



54. NOTE:When installing a new crankshaft pulley or engine front cover, the crankshaft position (CKP) sensor must be aligned using the alignment tool supplied with the new component.

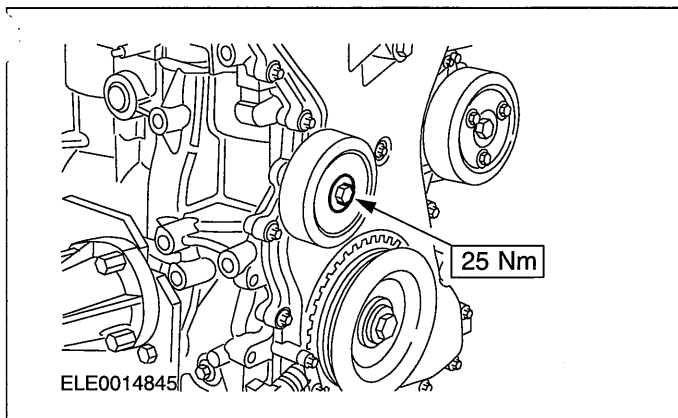
NOTE:Do not tighten the bolts at this stage.

Align the CKP sensor.

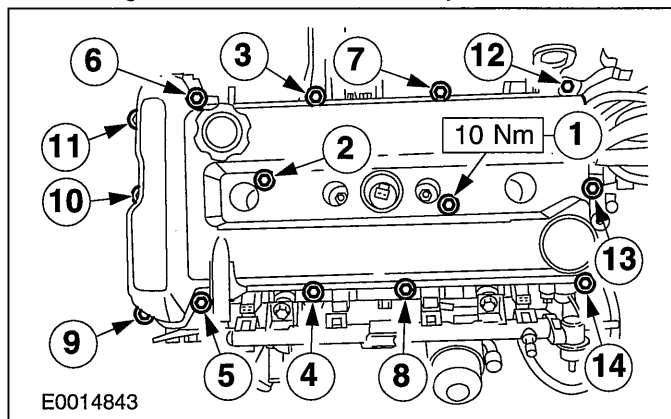
1. Loosen the CKP sensor retaining bolts.

ASSEMBLY

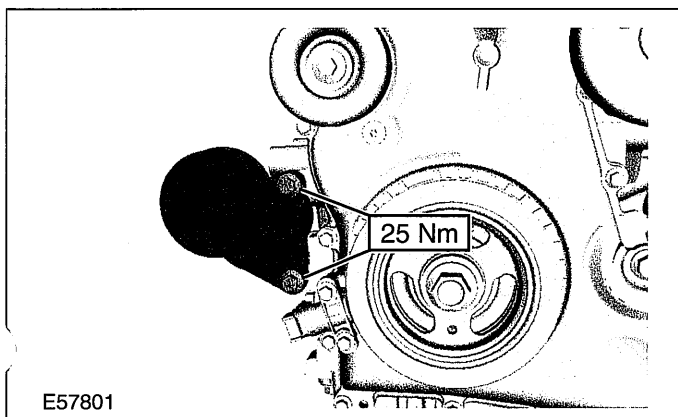
57. Install the accessory drive belt idler pulley.



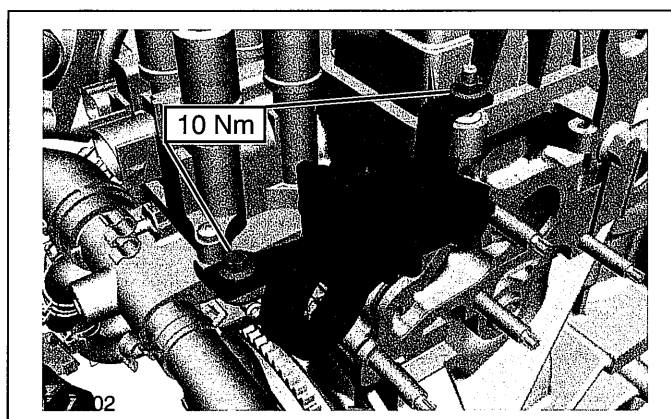
• Tighten the bolts in the sequence shown.



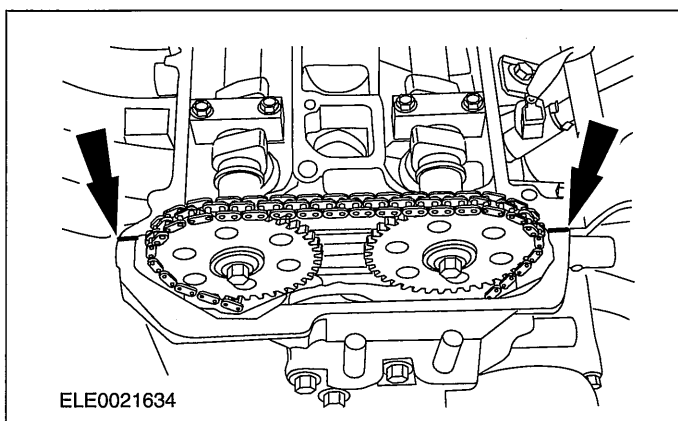
58. Install the accessory drive belt tensioner.



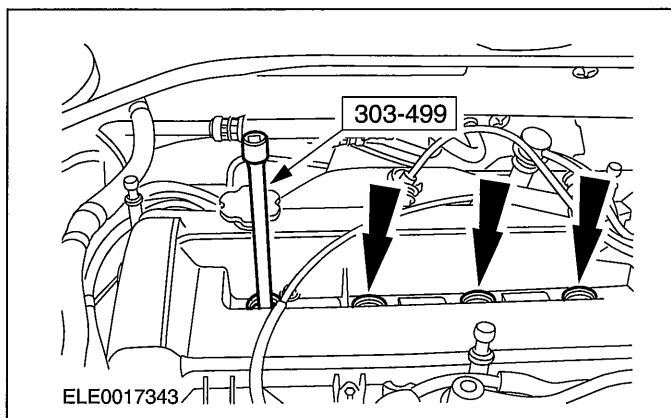
61. Install the evaporative emission (EVAP) valve support bracket.



59. Apply a small bead of sealant to the areas as shown.



62. Using the special tool, install the spark plugs.

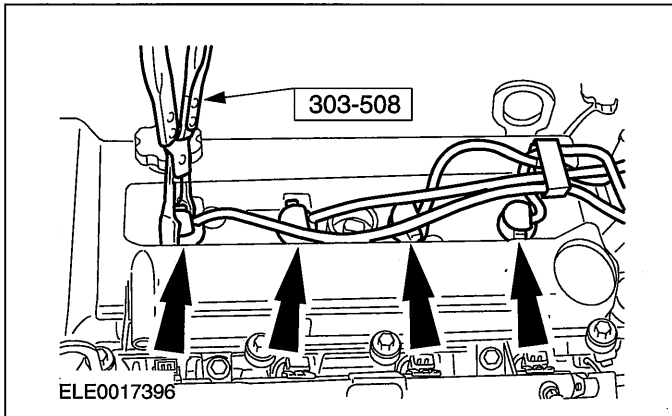


60. NOTE: Install a new valve cover gasket if necessary.

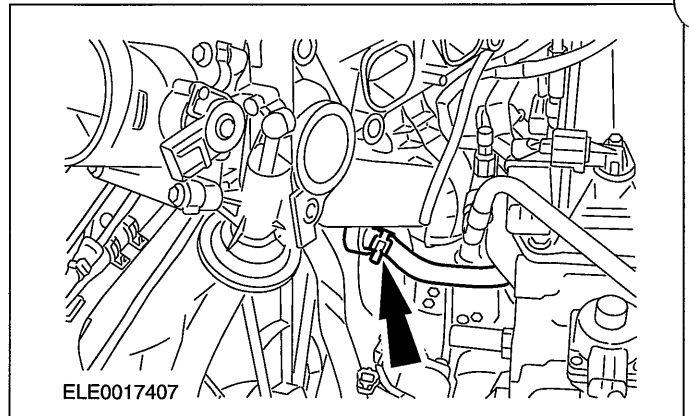
Install the valve cover.

ASSEMBLY

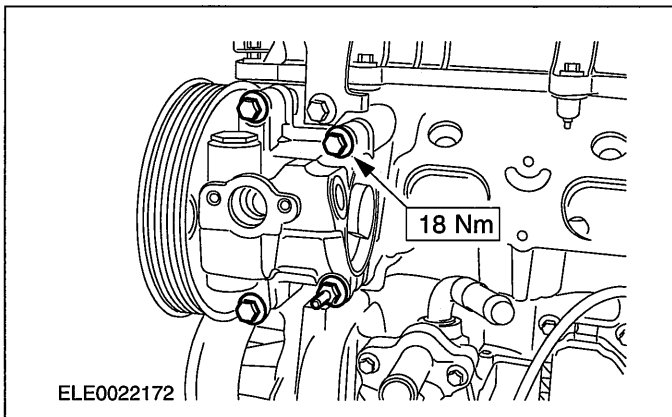
63. Using the special tool, connect the spark plug electrical connectors.



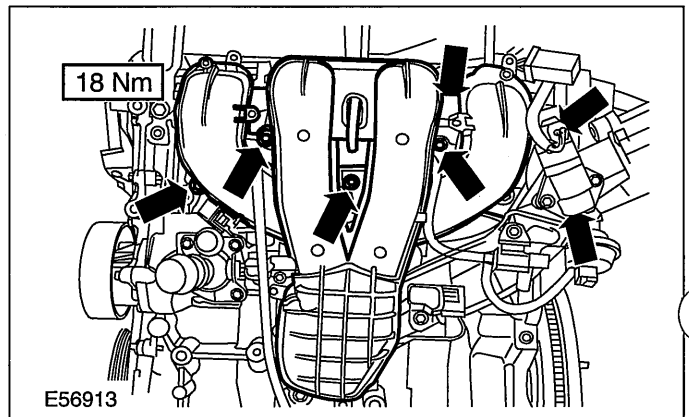
66. Connect the positive crankcase ventilation (PCV) hose to the intake manifold.



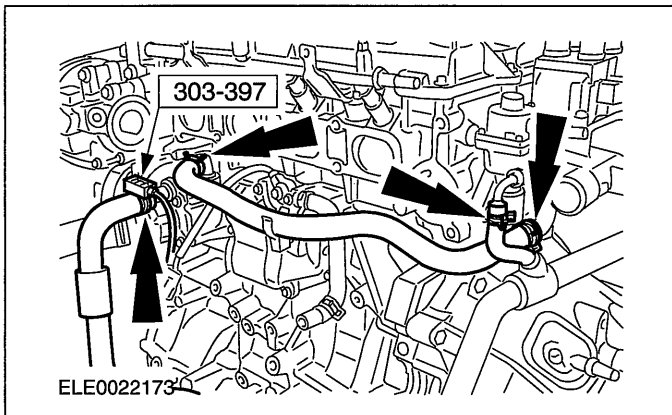
64. Install the power steering pump.



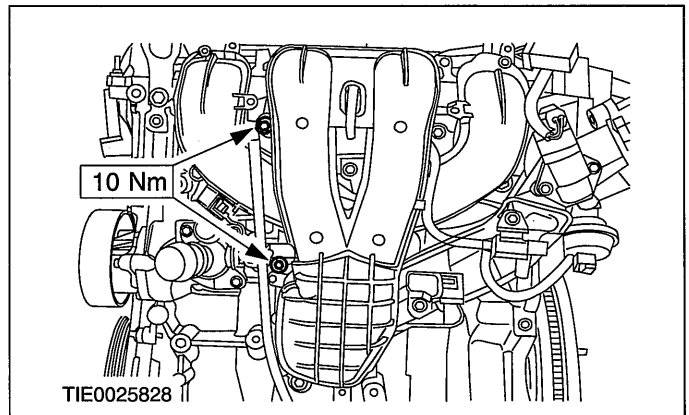
67. Install the intake manifold.



65. Using the special tool, install the coolant hoses.



68. Install the oil level indicator tube and oil level indicator.

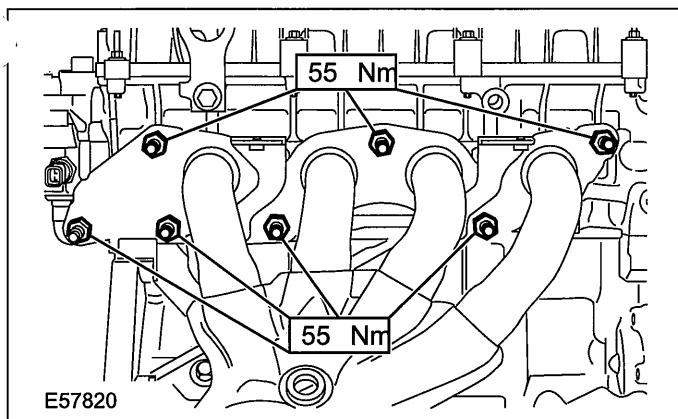


69. **NOTE:**Install a new exhaust manifold gasket.

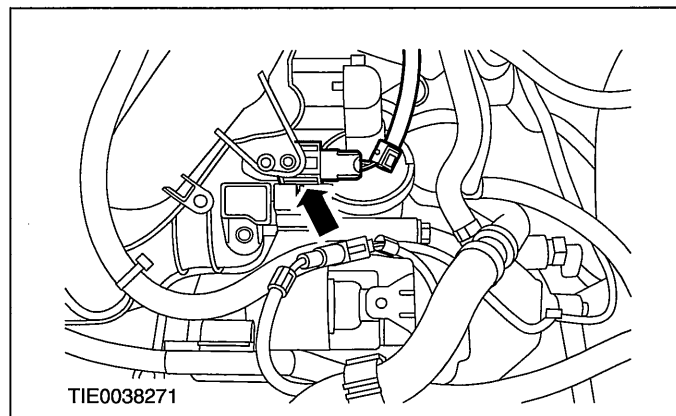
NOTE:Do not tighten the exhaust manifold retaining nuts at this stage.

ASSEMBLY

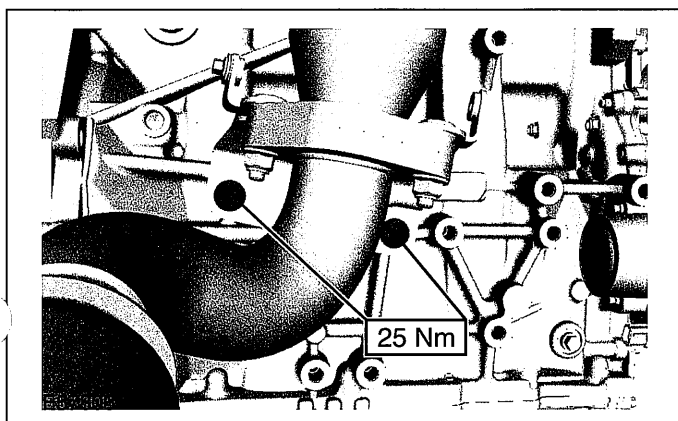
Install the exhaust manifold.



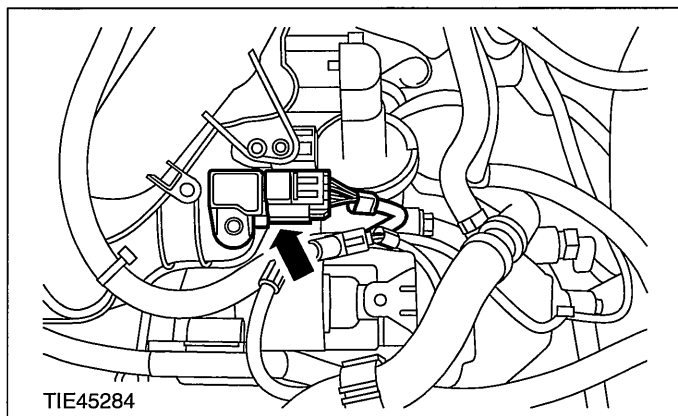
72. Attach the starter motor electrical connector to the intake manifold.



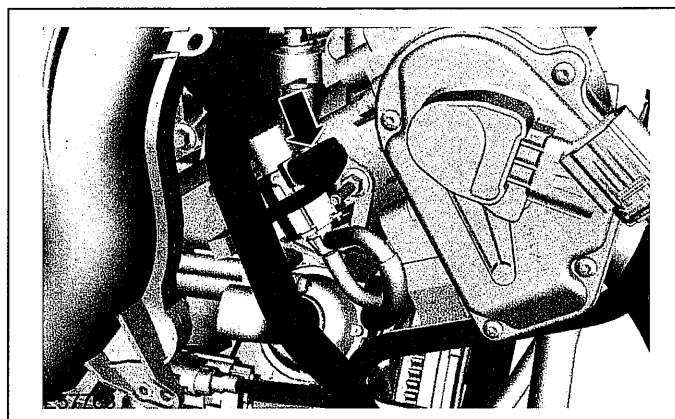
70. Install the exhaust manifold lower retaining bolts.



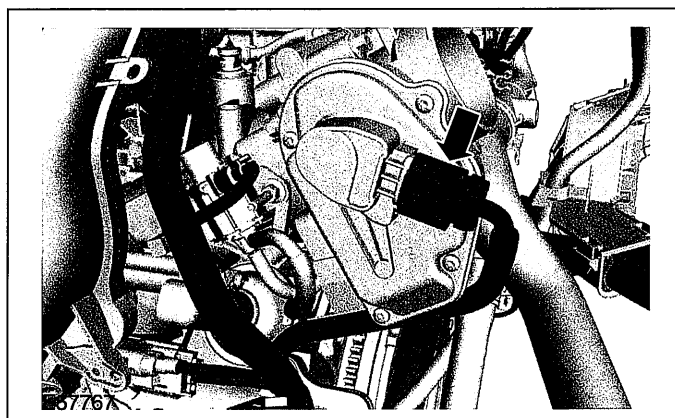
71. Connect the manifold absolute pressure (MAP) sensor electrical connector.



73. Connect the intake manifold runner control (IMRC) electrical connector.

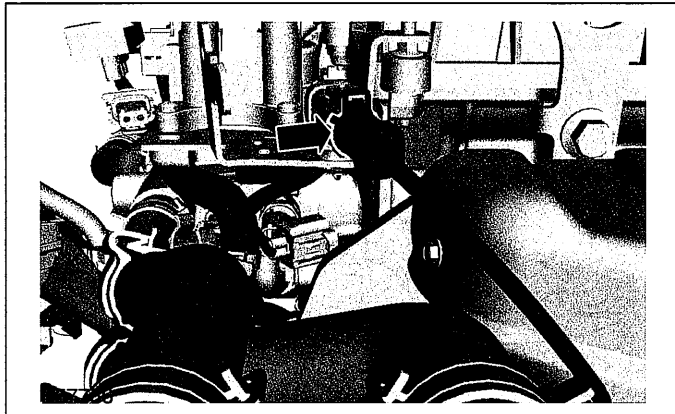


74. Connect the throttle body (TB) electrical connector.

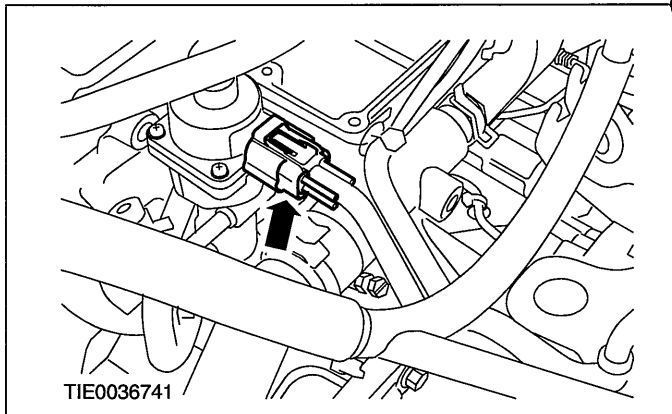


ASSEMBLY

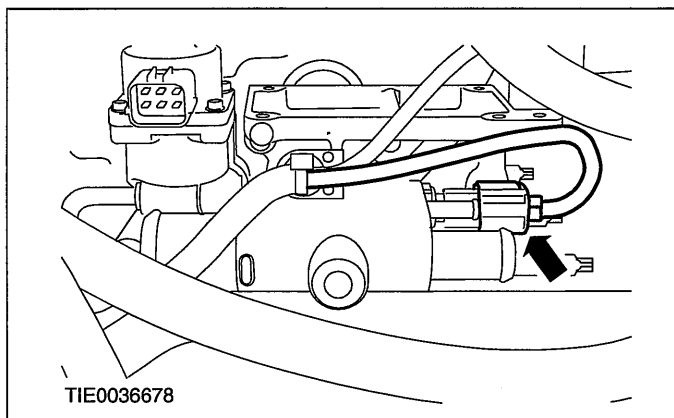
75. Connect the heated oxygen (H2OS) sensor electrical connector.



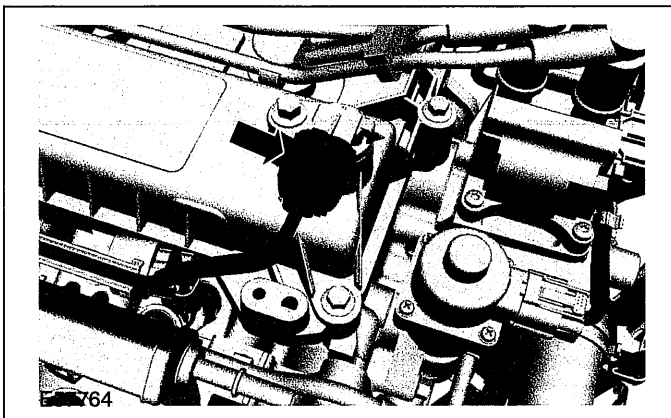
78. Connect the exhaust gas recirculation (EGR) valve electrical connector.



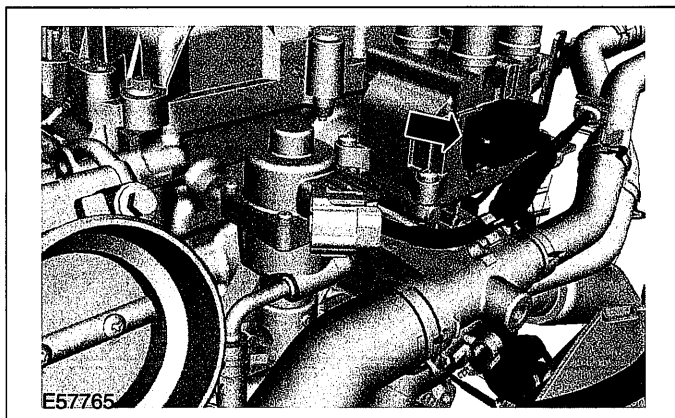
76. Connect the engine coolant temperature (ECT) sensor electrical connector.



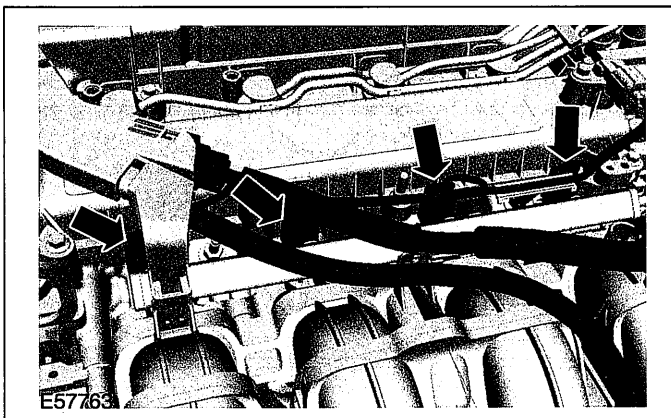
79. Connect the camshaft position (CMP) sensor electrical connector.



77. Connect the electronic ignition (EI) electrical connector.

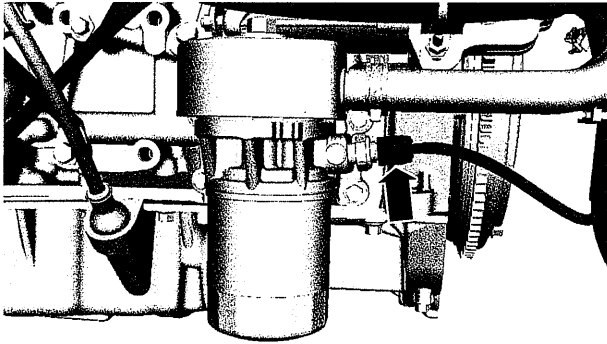


80. Connect the fuel injector electrical connectors.



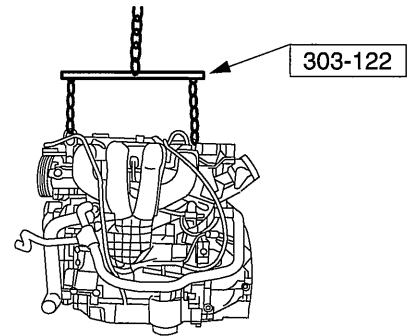
ASSEMBLY

81. Connect the oil pressure switch electrical connector.



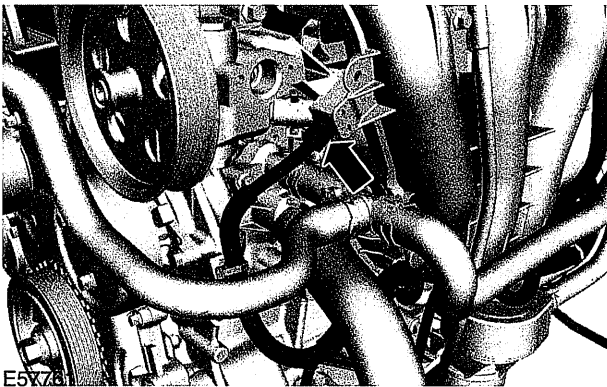
E57762

85. Using the special tool and an engine hoist, support the engine.



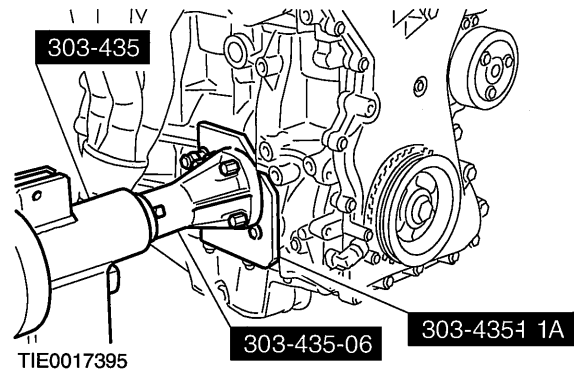
ELE0017397

82. Connect the knock sensor (KS) electrical connector.



E5X781

86. Remove the special tools.

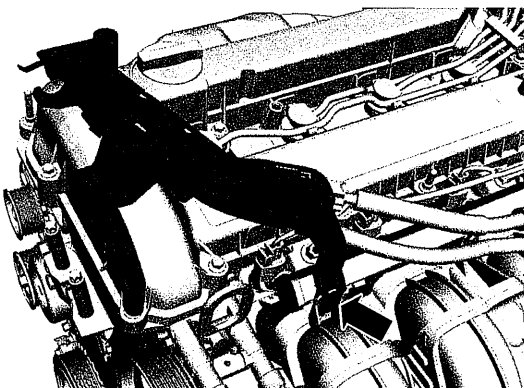


TIE0017395

303-435-06

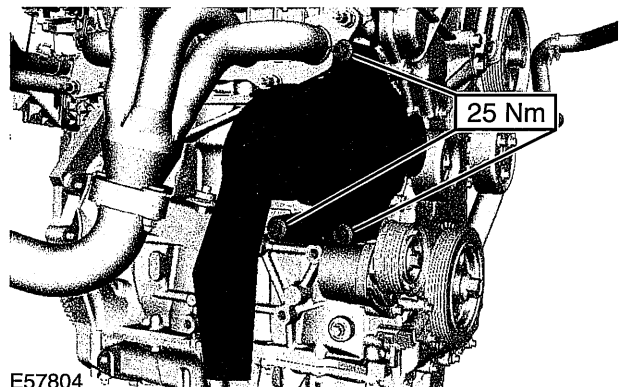
303-435 1A

83. Attach the engine wiring harness bracket to the intake manifold.



E57760

87. Install the generator.



E57804

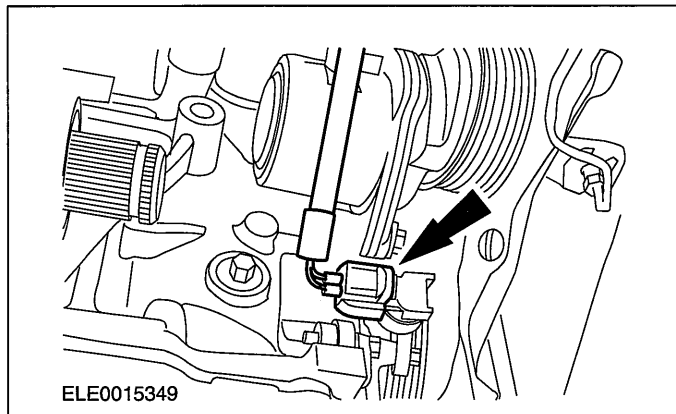
25 Nm

84. Fill the engine with engine oil.

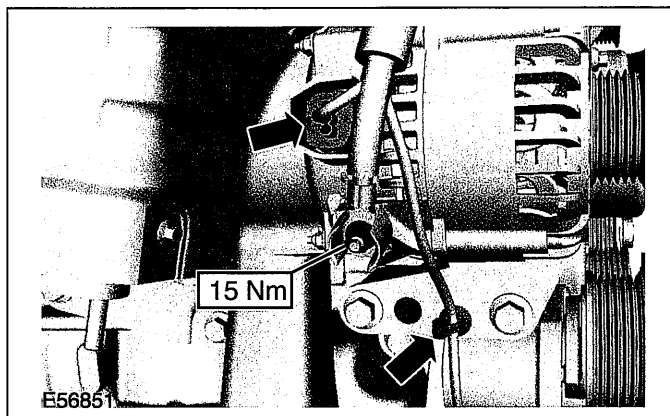
For additional information, refer to:
Specifications (303-01 Engine - 2.0L
Duratec-HE (M14), Specifications).

ASSEMBLY

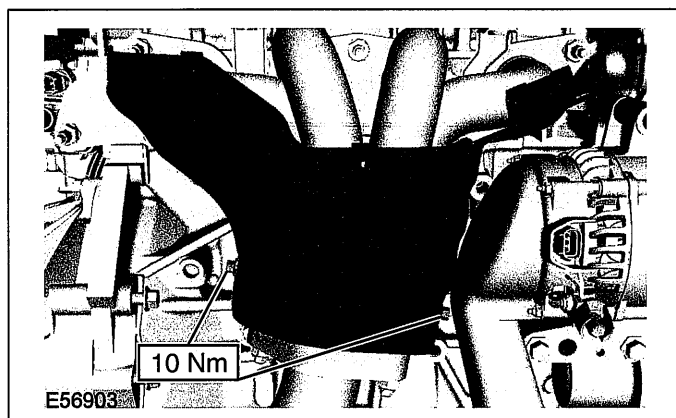
88. Connect the crankshaft position (CKP) sensor electrical connector.



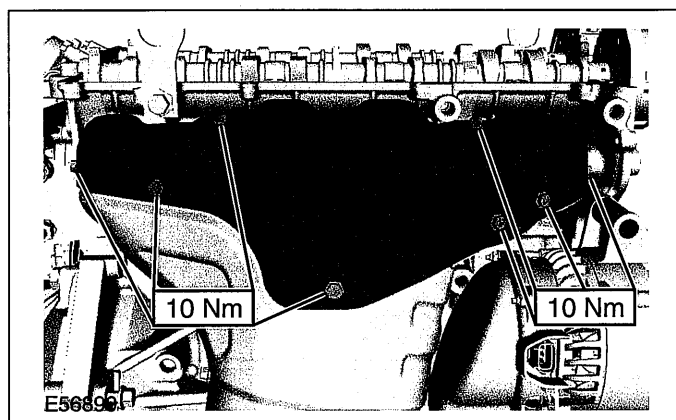
91. Connect the generator electrical connector.



89. Install the exhaust manifold lower heat shield.



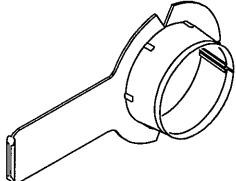
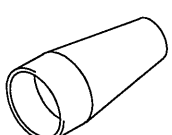
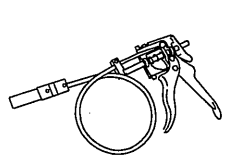
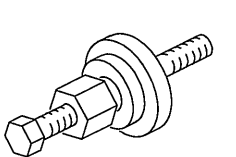
90. Install the exhaust manifold upper heat shield.



INSTALLATION

Engine

Special Tool(s)

 E47098	Protector, Halfshaft Seal 205-775
 13015	Expander, Teflon Seal 211-188
 24003	Remover/Installer, Hose Clamp 303-397
 21192	Installer, Camshaft Pulley 303-458

General Equipment

Workshop table

Securing straps

Engine hoist

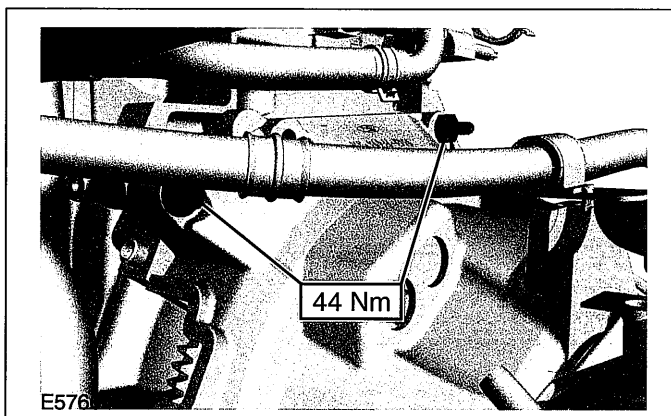
▲ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. **NOTE:** Using suitable retaining straps, secure the engine on the workshop table.

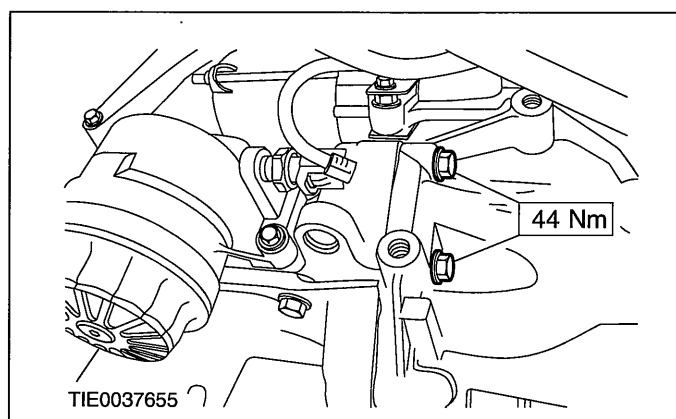
Support the engine with wooden blocks.

2. Install the transaxle.

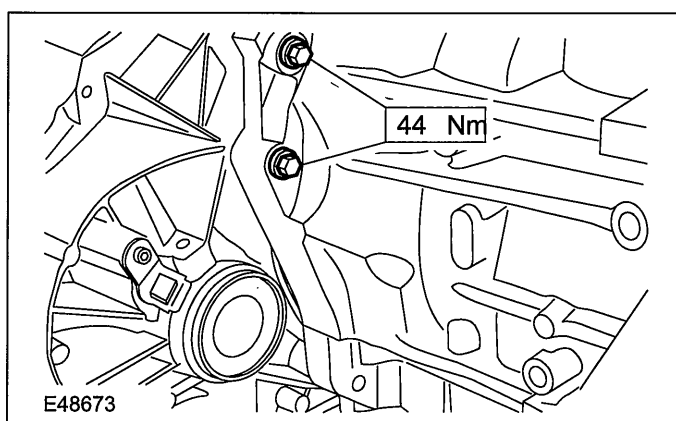
3. Install the transaxle upper retaining bolts.

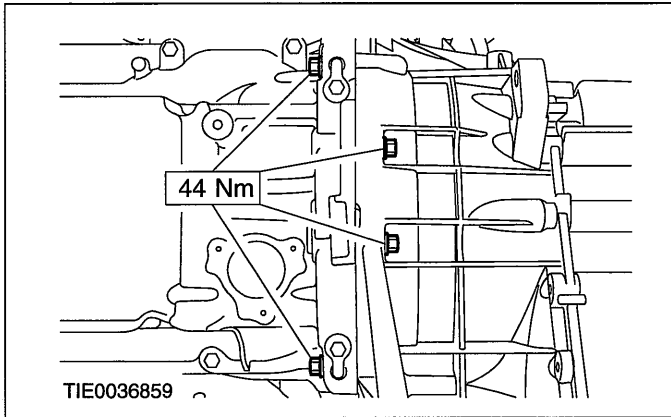
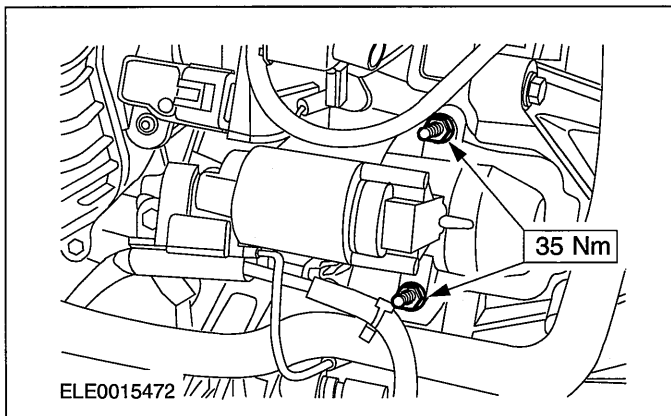


4. Install the transaxle left-hand retaining bolts.

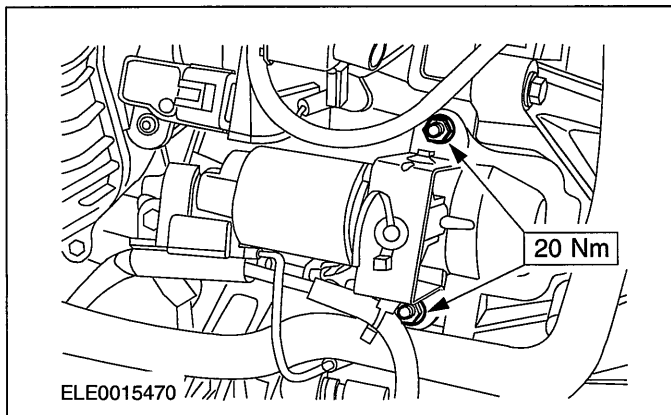
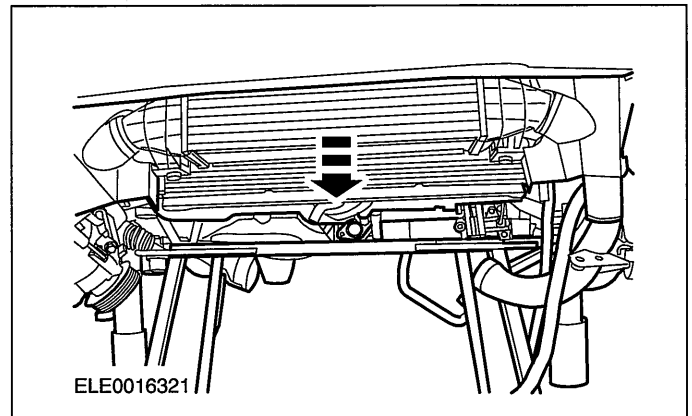


5. Install the transaxle right-hand retaining bolts.

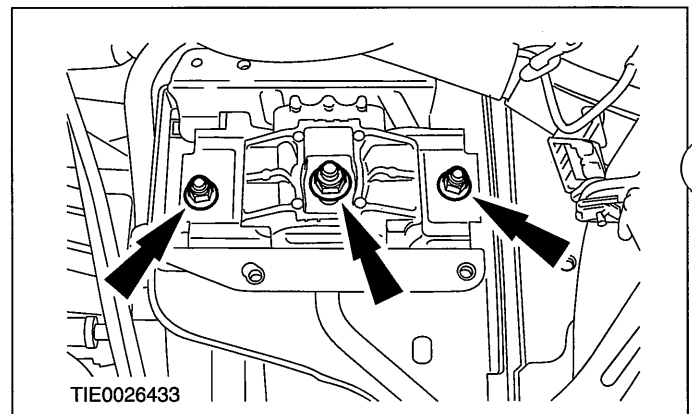


INSTALLATION**6. Install the transaxle lower retaining bolts.****7. Install the starter motor.****8. Install the wiring harness retaining bracket.**

- Attach the wiring harness to the retaining bracket.

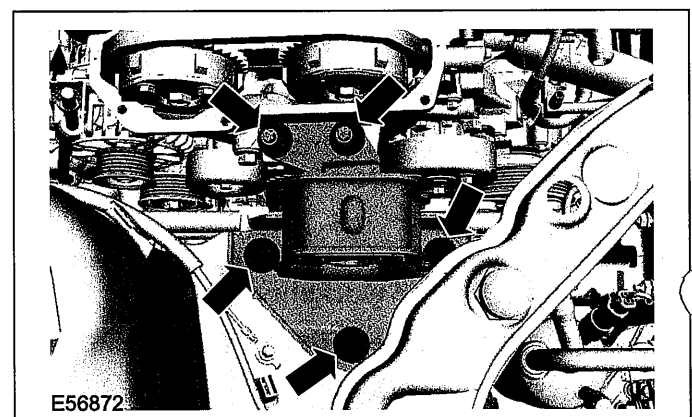
**9. Position the workshop table under the vehicle and carefully lower the vehicle until the engine and transaxle assembly is in the correct position to install the engine mounts.****10. NOTE: Do not tighten the engine rear mount retaining nuts at this stage.**

Install the engine rear mount retaining nuts.

**11. NOTE: Install new engine front mount retaining nuts.**

NOTE: Do not tighten the engine front mount retaining nuts and bolts at this stage.

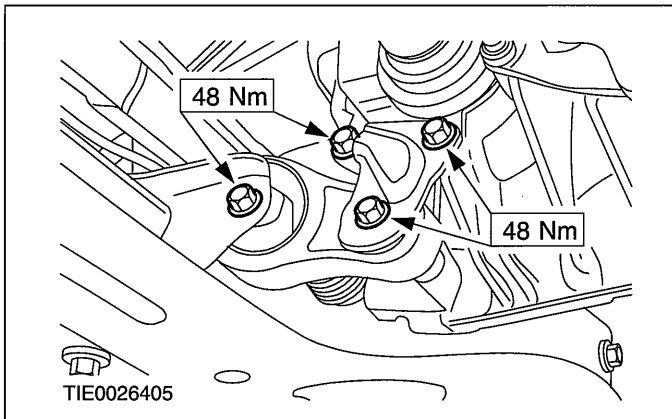
Install the engine front mount retaining nuts and bolts.



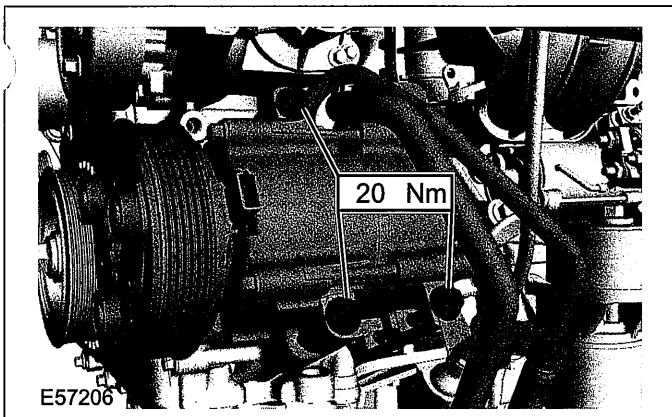
INSTALLATION

12. Remove the securing straps.
13. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

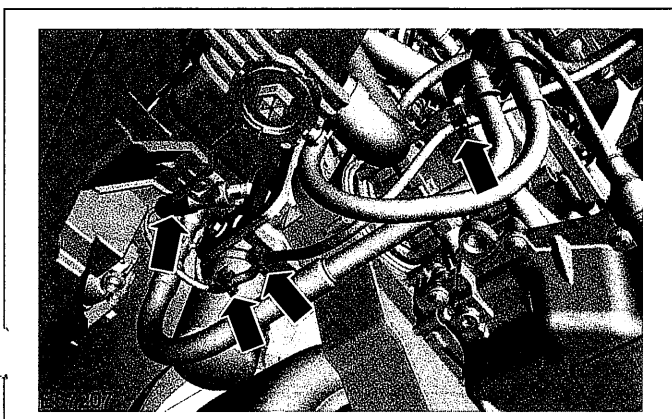
Jacking (Description and Operation),
Lifting (Description and Operation).
14. Install the engine support insulator.



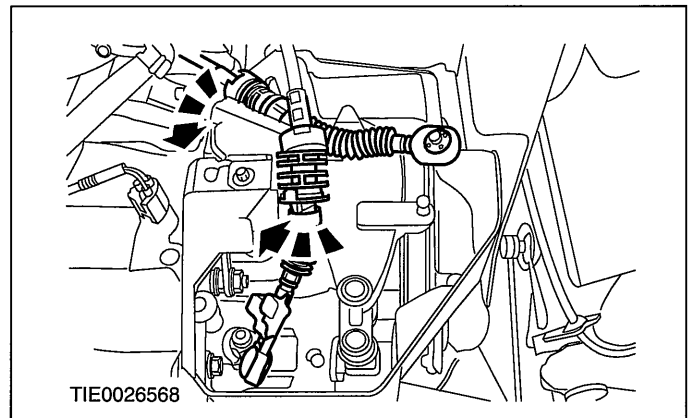
15. Attach the air conditioning (A/C) compressor to the cylinder block.



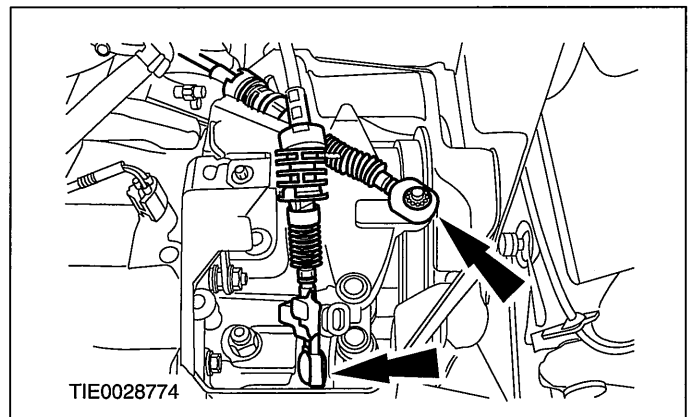
16. Connect the A/C high pressure switch electrical connector.



17. Attach the gearshift cables to the bracket and turn the abutment sleeves counterclockwise.



18. Attach the gearshift cables to the selector levers.

**19. CAUTIONS:**

⚠ The inner CV joint must not be bent more than 23 degrees. The outer CV joint must not be bent more than 45 degrees.

⚠ Make sure that the halfshaft seal is not damaged.

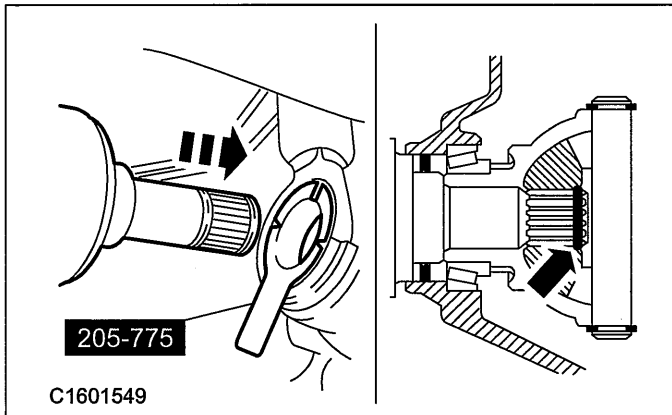
⚠ Make sure the snap ring is correctly seated.

NOTE: Install a new snap ring.

Using the special tool, attach the left-hand halfshaft to the transaxle.

INSTALLATION

- Remove the special tool before fully installing the halfshaft.



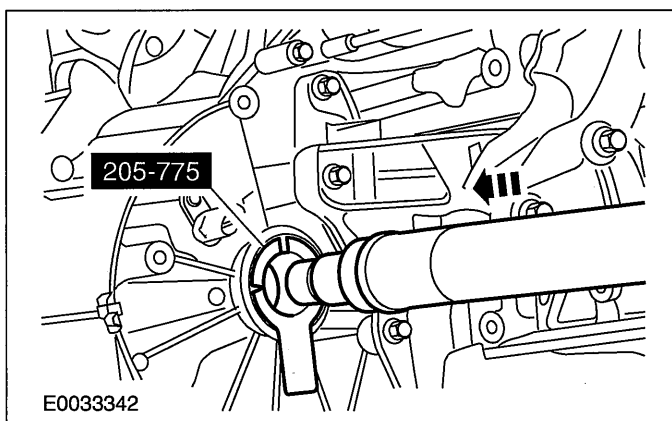
20. CAUTIONS:

⚠ The inner CV joint must not be bent more than 23 degrees. The outer CV joint must not be bent more than 45 degrees.

⚠ Make sure the halfshaft seal is not damaged.

Using the special tool, attach the right-hand halfshaft and intermediate shaft assembly to the transaxle.

- Remove the special tool before fully installing the halfshaft.



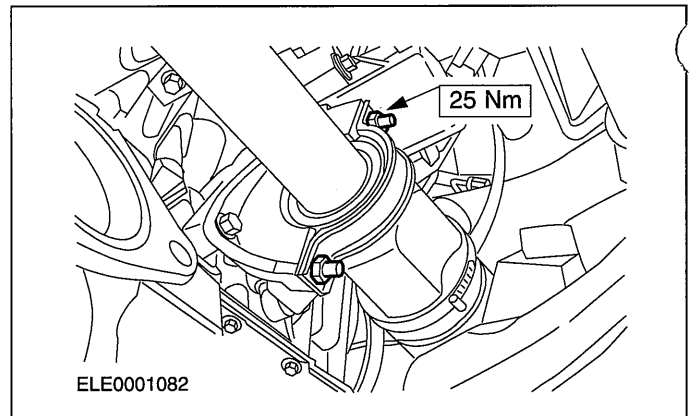
21. NOTE: Install a new intermediate shaft center bearing cap and retaining nuts.

NOTE: Make sure that the intermediate shaft center bearing is correctly positioned in the intermediate shaft center bearing retaining bracket.

Install the intermediate shaft center bearing cap.

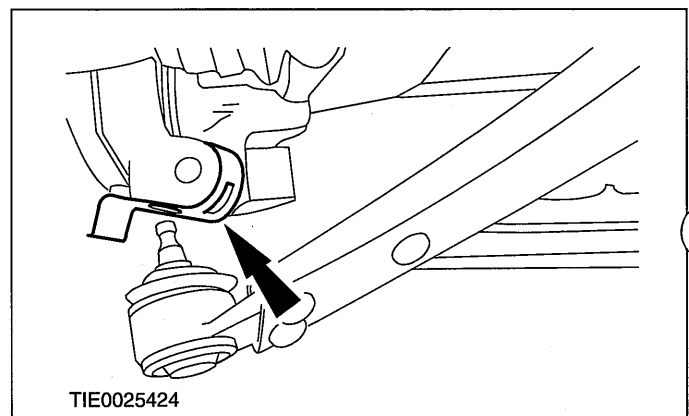
- Position the center bearing cap.
- Position the intermediate shaft center bearing heat shield (if equipped).

- Tighten the center bearing cap retaining nuts.



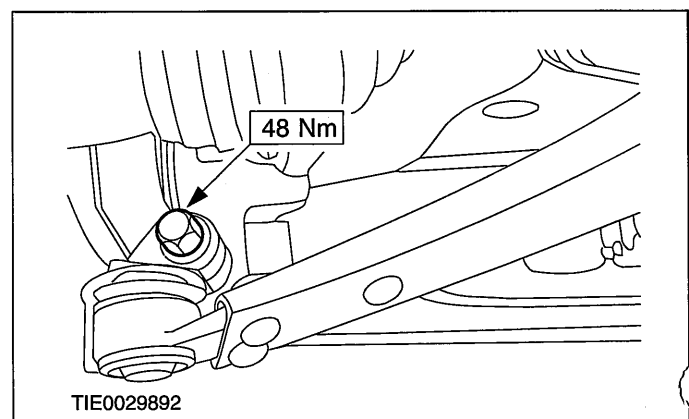
22. ⚠ CAUTION: Make sure that the lower arm ball joint heat shield is installed to prevent damage to the ball joint.

Install the lower arm ball joint heat shield.



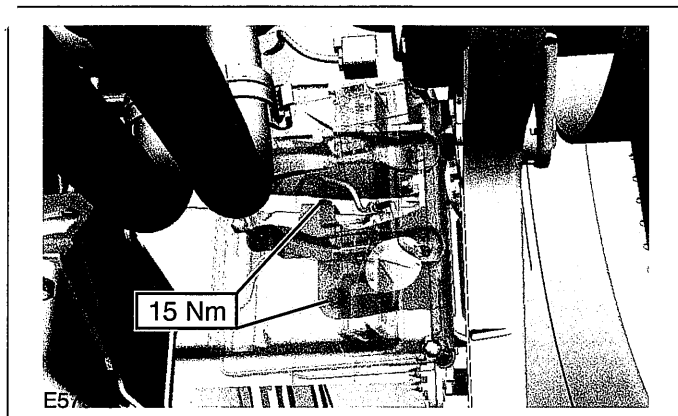
23. ⚠ CAUTION: The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

Attach the lower arm ball joint to the wheel knuckle.

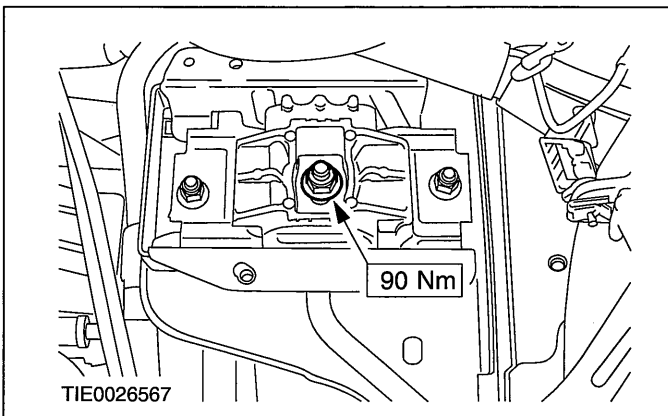


INSTALLATION

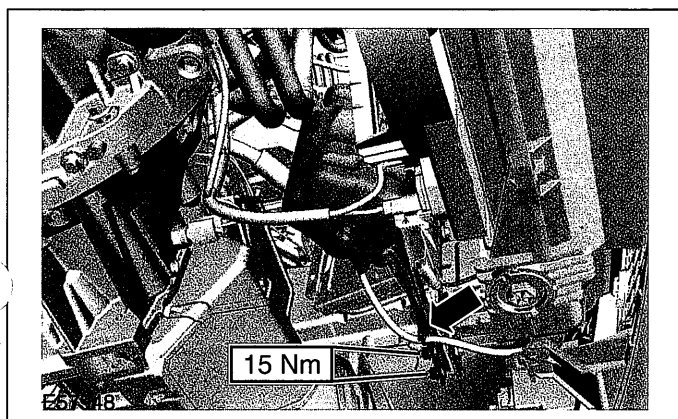
24. Attach the powertrain control module (PCM) support bracket to the side member.



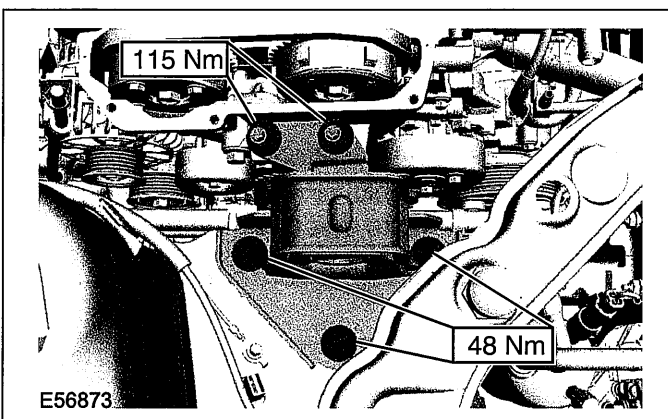
28. Tighten the engine rear mount center retaining nut.



25. Install the air cleaner resonator support bracket.

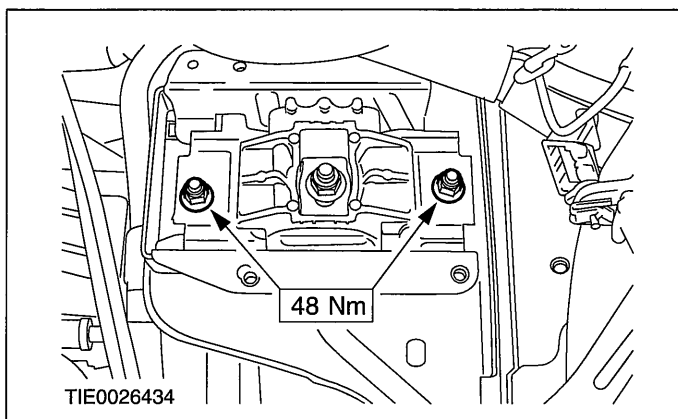


29. Tighten the engine front mount retaining nuts and retaining bolts.



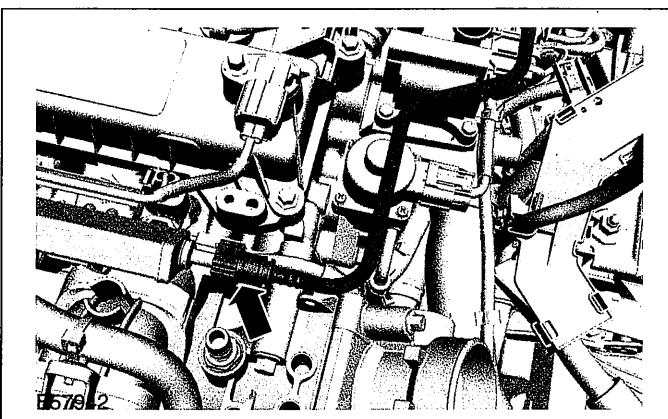
26. Lower the vehicle.

27. Tighten the engine rear mount outer retaining nuts.



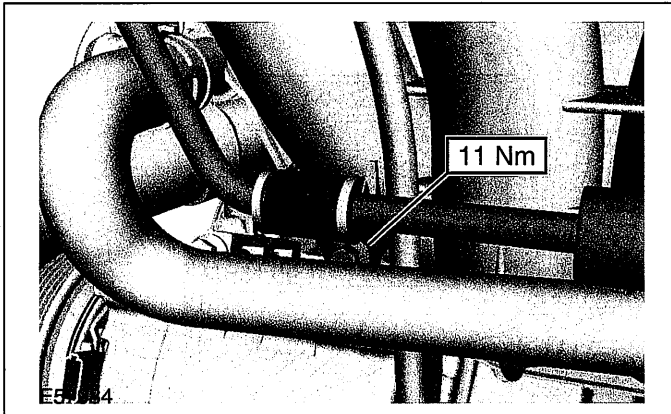
30. Connect the fuel supply line.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



INSTALLATION

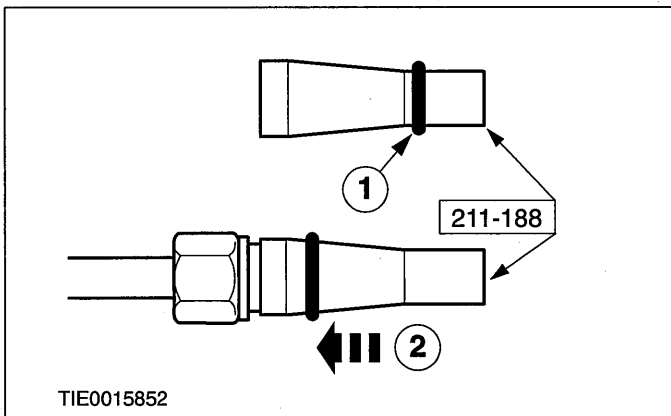
31. Attach the power steering pump to steering gear pressure line to the intake manifold.



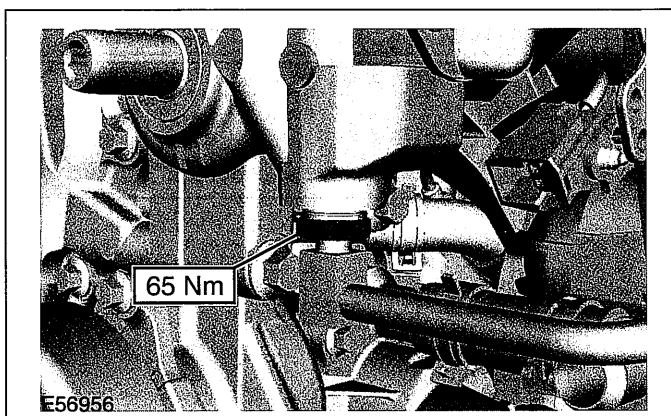
32. **CAUTION:** Care must be taken to prevent dirt ingress.

Using the special tool, install a new O-ring seal onto the power steering pump to steering gear pressure line union.

1. Push the O-ring seal onto the special tool.
2. Locate the special tool onto the power steering pump to steering gear pressure line union and install the O-ring seal.

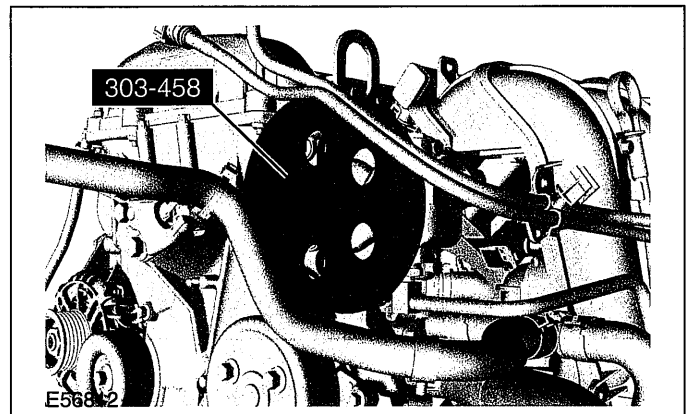


33. Attach the power steering pump to steering gear pressure line from the power steering pump.

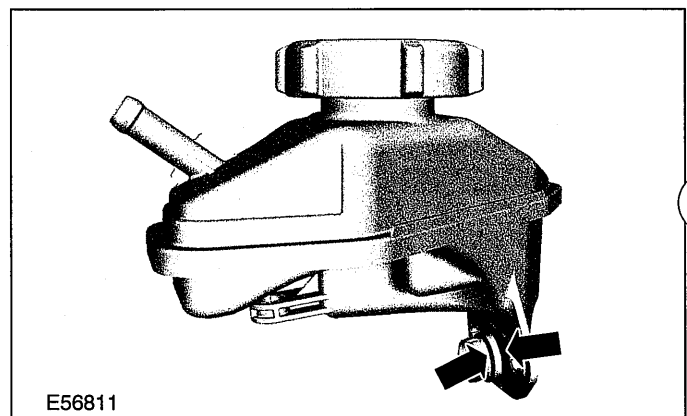


34. **NOTE:** Install a new power steering pump pulley.

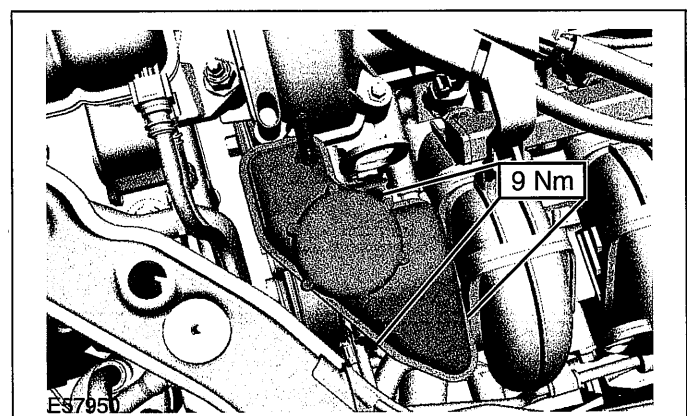
Using the special tool, install the power steering pump pulley.



35. Install new power steering fluid reservoir O-ring seals.

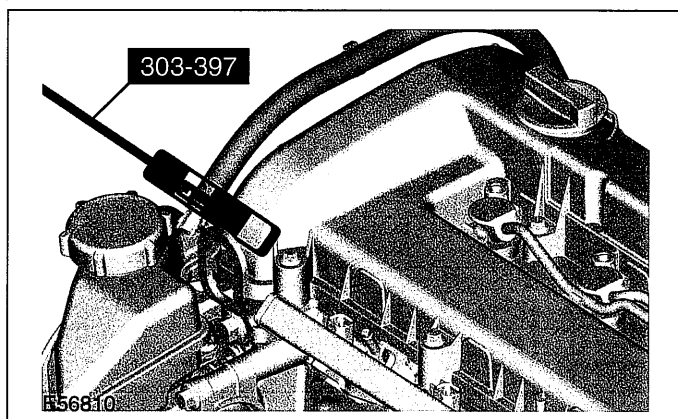


36. Install the power steering fluid reservoir.



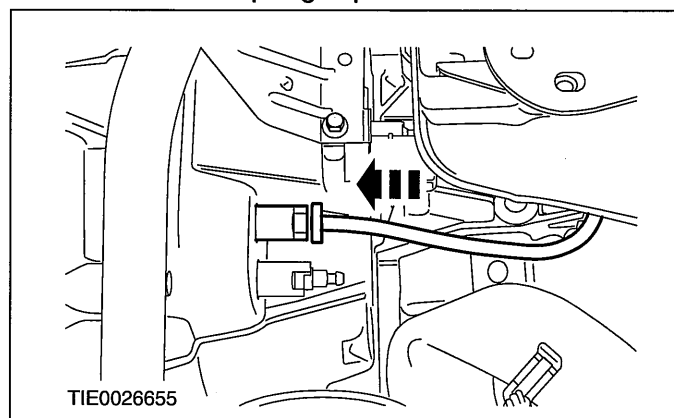
INSTALLATION

37. Using the special tool, connect the steering gear to power steering fluid reservoir return line to the power steering fluid reservoir.

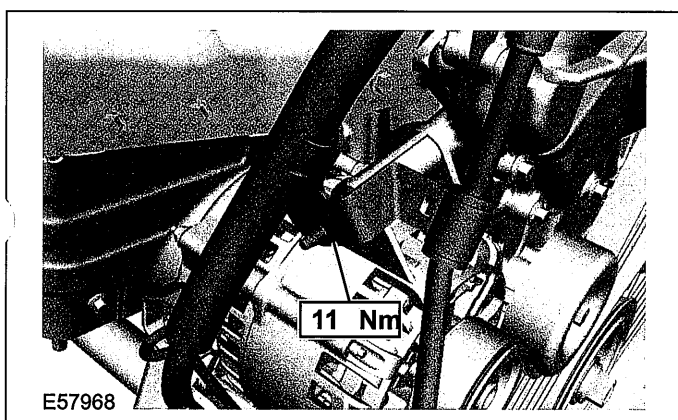


- Connect the clutch slave cylinder supply line.

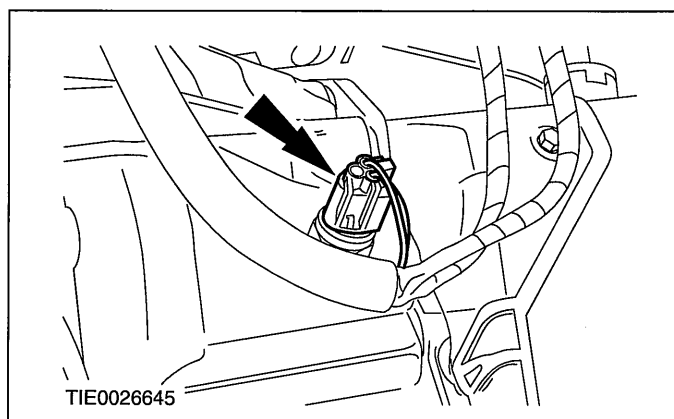
- Install the spring clip.



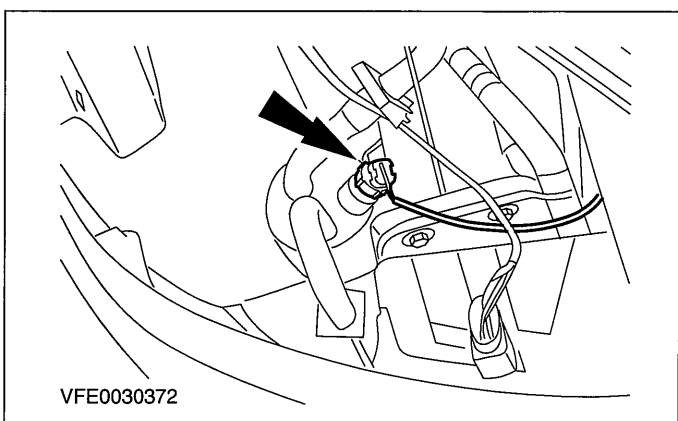
38. Attach the steering gear to power steering fluid reservoir return line support bracket to the generator.



41. Connect the reversing lamp switch electrical connector.

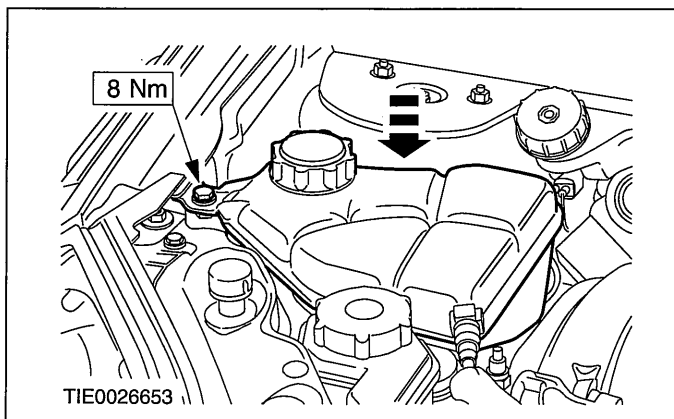


39. Connect the A/C low pressure switch connector.



42. Lower the vehicle.

43. Install the coolant expansion tank.

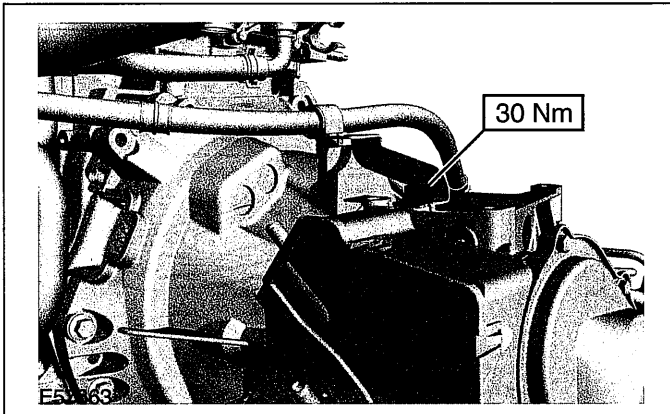


40. **⚠ CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

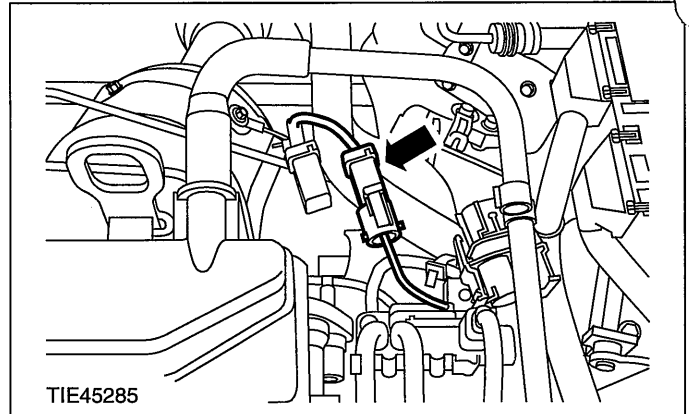
NOTE: Make sure the spring clip is correctly seated.

INSTALLATION

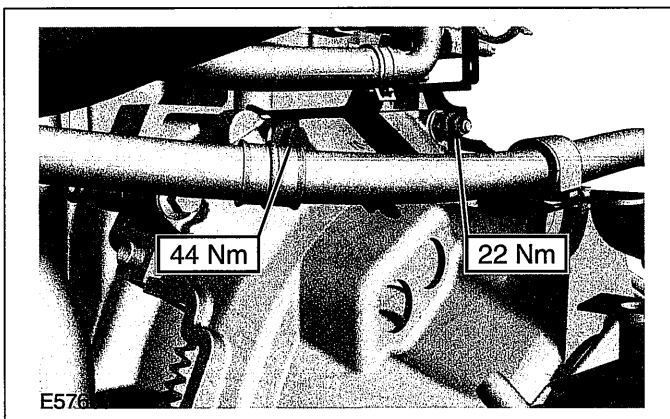
- 44. Attach the power steering high-pressure line retaining bracket to the transaxle.**



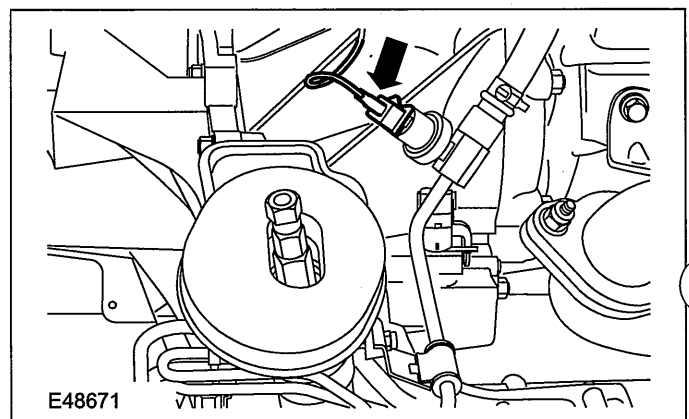
- 47. Connect the catalyst monitor sensor electrical connector.**



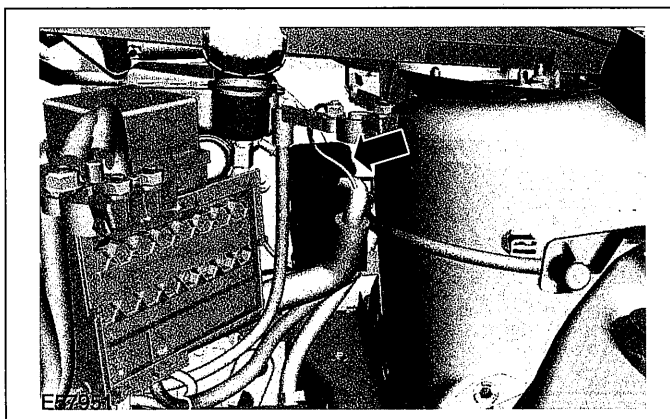
- 45. Install the engine wiring harness bracket.**



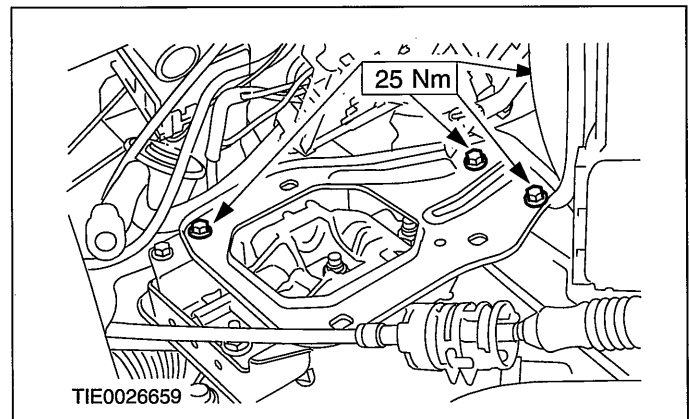
- 48. Connect the power steering pump switch electrical connector.**



- 46. Connect the engine wiring harness electrical connector.**

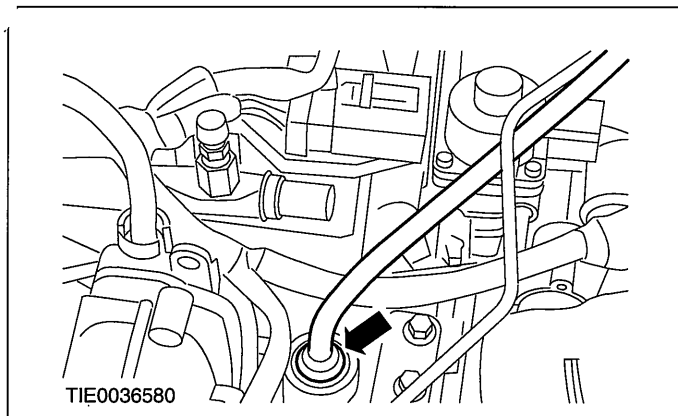


- 49. Install the battery tray support bracket.**

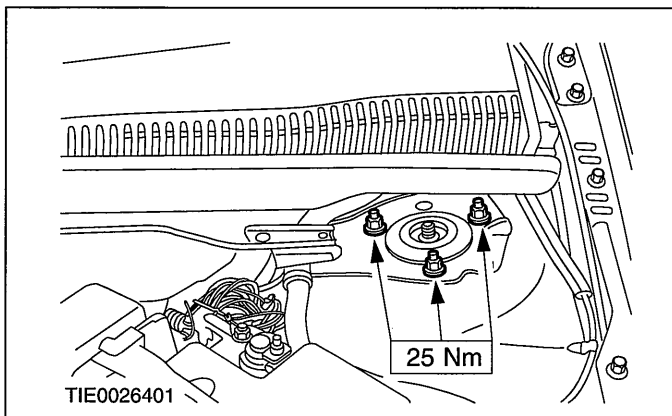


INSTALLATION

- 50. Connect the brake booster vacuum line to the intake manifold.**

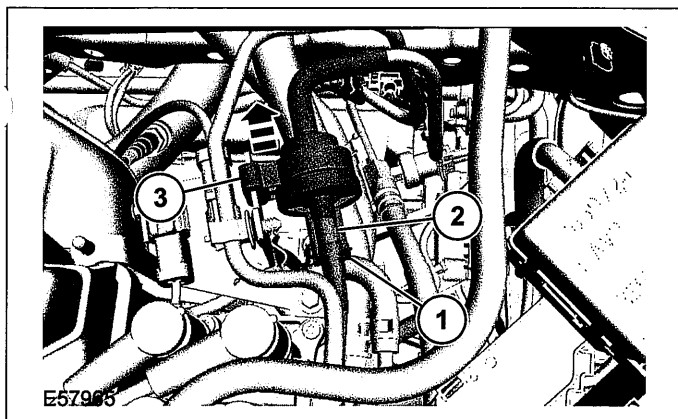


- 53. Tighten the strut and spring assembly top mount nuts.**

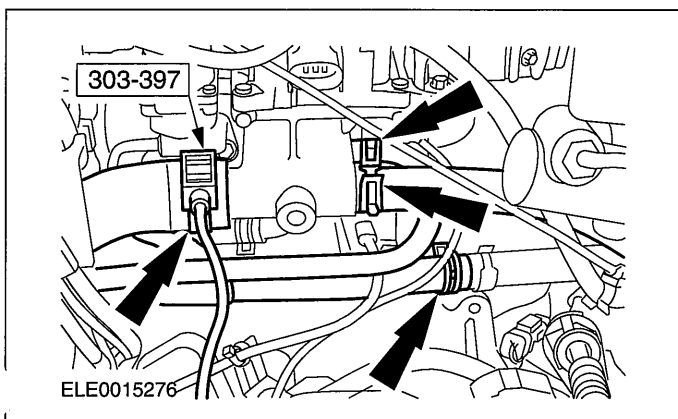


- 51. Attach the evaporative emission (EVAP) valve from EVAP valve support bracket.**

1. Connect the EVAP valve electrical connector.
2. Connect the low pressure line to the EVAP valve.
3. Push the EVAP valve onto the support bracket.



- 52. Using the special tool, connect the coolant hose to the coolant outlet connector.**



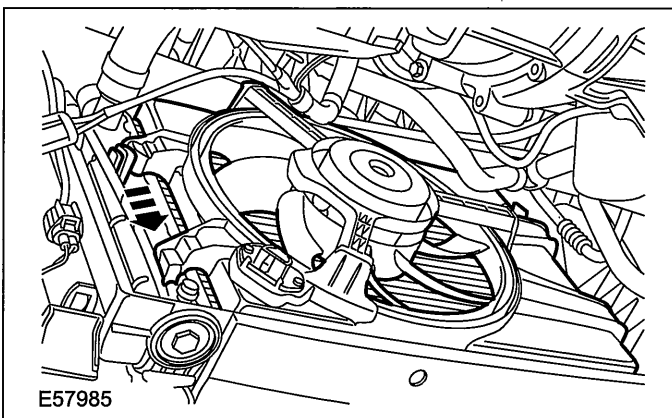
- 54. Install the right-hand headlamp assembly.**

For additional information, refer to:
Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

- 55. Attach the exhaust flexible pipe to the exhaust manifold.**

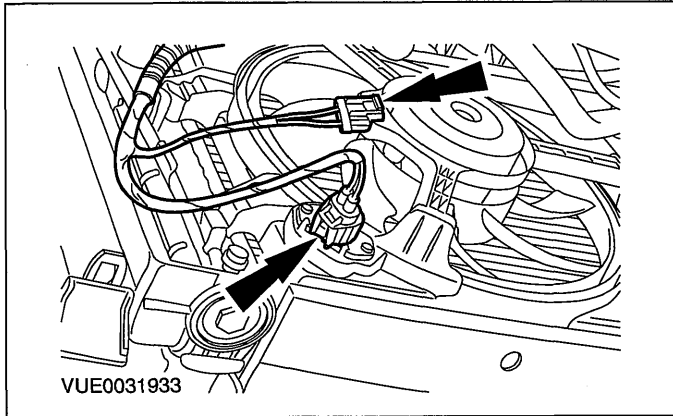
For additional information, refer to: Exhaust Flexible Pipe - 2.0L Duratec-HE (MI4) (309-00 Exhaust System, Removal and Installation).

- 56. Install the cooling fan motor and shroud.**



INSTALLATION

- 57. Connect the cooling fan motor and cooling fan resistor electrical connectors.**



- 58. Install the accessory drive belt.**

For additional information, refer to:
Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

- 59. Adjust the gearshift cables.**

For additional information, refer to:
Gearshift Cable Adjustment (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).

- 60. Bleed the hydraulic clutch system.**

For additional information, refer to: **Clutch System Bleeding (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).**

- 61. Install the battery tray.**

For additional information, refer to: **Battery Tray - 2.0L Duratec-HE (MI4) (414-01 Battery, Mounting and Cables, Removal and Installation).**

- 62. Install the air cleaner.**

For additional information, refer to: **Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).**

- 63. Fill and bleed the cooling system.**

For additional information, refer to: **Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).**

SECTION 303-03A Engine Cooling — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-03A-2
DESCRIPTION AND OPERATION	
Engine Cooling — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-03A-4
Overview.....	303-03A-4
Components.....	303-03A-5
DIAGNOSIS AND TESTING	
Engine Cooling.....	303-03A-8
Inspection and Verification.....	303-03A-8
Symptom Chart.....	303-03A-8
Component Tests.....	303-03A-16
GENERAL PROCEDURES	
Cooling System Draining, Filling and Bleeding — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(24 122 0) 303-03A-19
Draining.....	303-03A-19
Filling and Bleeding.....	303-03A-19
REMOVAL AND INSTALLATION	
Water Pump — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(24 404 0) 303-03A-21
Thermostat — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(24 454 0) 303-03A-24
Radiator.....	(24 254 0) 303-03A-26

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Motorcraft Super Plus 2000 antifreeze	WSS-M97B4 4-D

Antifreeze - All vehicles used in climates where daytime ambient air temperature does not regularly exceed +46°C (+115°F)

Specific gravity (providing no other additive is in the coolant)	Approximate percentage of anti- freeze (by volume)	Remains fluid to	Solidifies at
1.061 at +15°C (+59°F)	50%	-25°C (-13°F)	-30°C (-22°F)

Antifreeze - Vehicles with 1.25L/1.4L/1.6L engine used in climates where daytime ambient air temperature regularly exceeds +46°C (+115°F)

Specific gravity (providing no other additive is in the coolant)	Approximate percentage of antifreeze (by volume)
1.0278 at +35°C (+95°F)	25%

Cooling System Refill Capacities

Description	Liters
Cooling system, including heater system and coolant expansion tank (all except vehicles with diesel engine)	5.0

Cooling System Pressure Specification

Description	Pressure kpa (psi)
Radiator pressure test	138 (20)
Coolant expansion tank cap release pressure	120 to 150 (17-21)

Torque Specifications - vehicles with 1.25L/1.4L/1.6L engine

Description	Nm	lb-ft	lb-in
Radiator retaining nut	10	-	89
Thermostat housing retaining bolts	10	-	89
Water pump retaining bolts	10	-	89
Water pump pulley retaining bolts	24	18	-
Generator retaining bolts	45	33	-
Generator electrical connector retaining nut	8	-	71
Timing belt lower cover retaining bolts	9	-	80

Torque Specifications - vehicles with 1.3L engine

Description	Nm	lb-ft	lb-in
Radiator retaining nut	10	-	89
Water pump retaining bolts	10	-	89
Water pump pulley retaining bolts	12	9	-

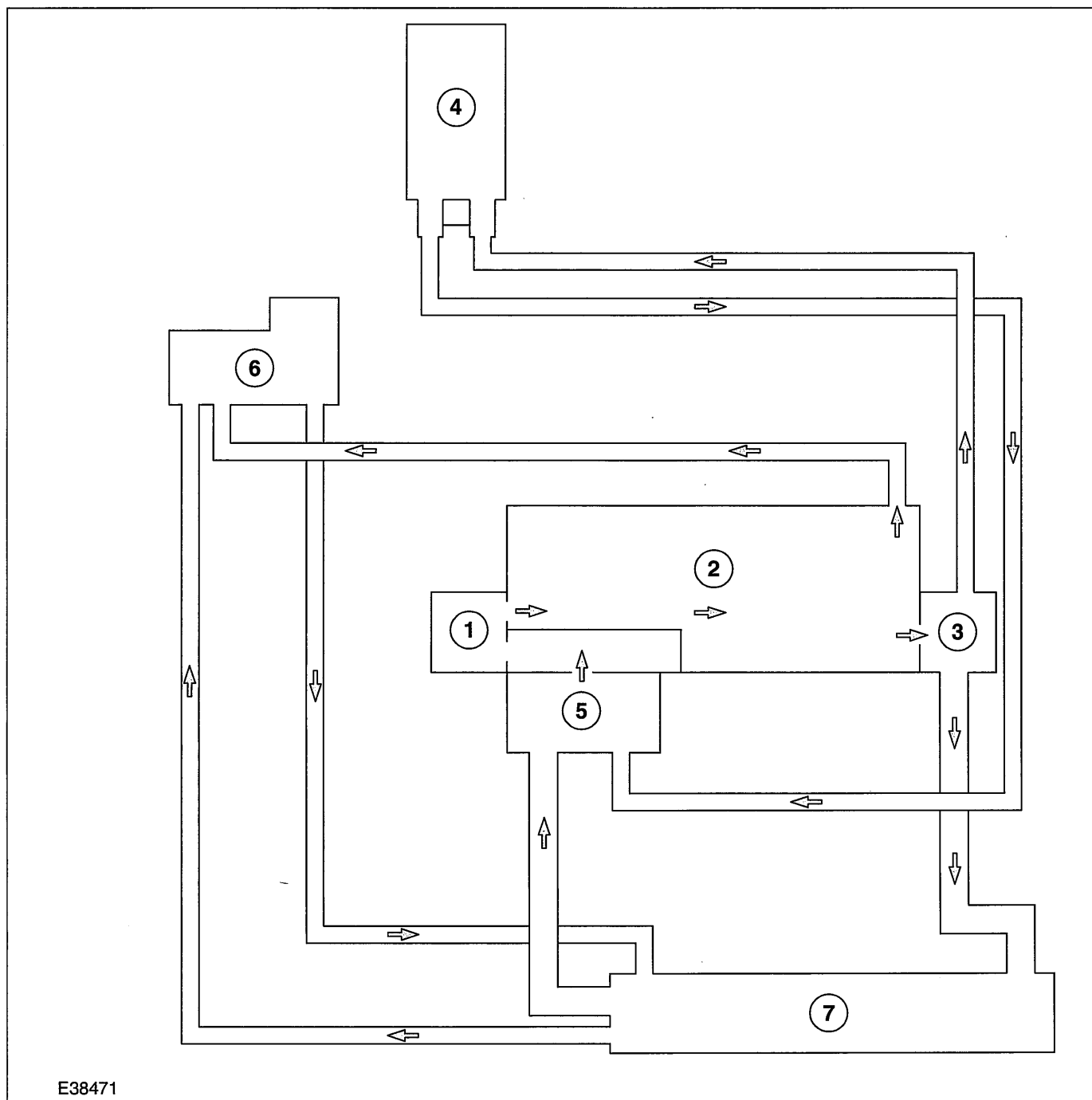
SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Thermostat housing retaining bolts	10	-	89

DESCRIPTION AND OPERATION

Engine Cooling — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

Overview



E38471

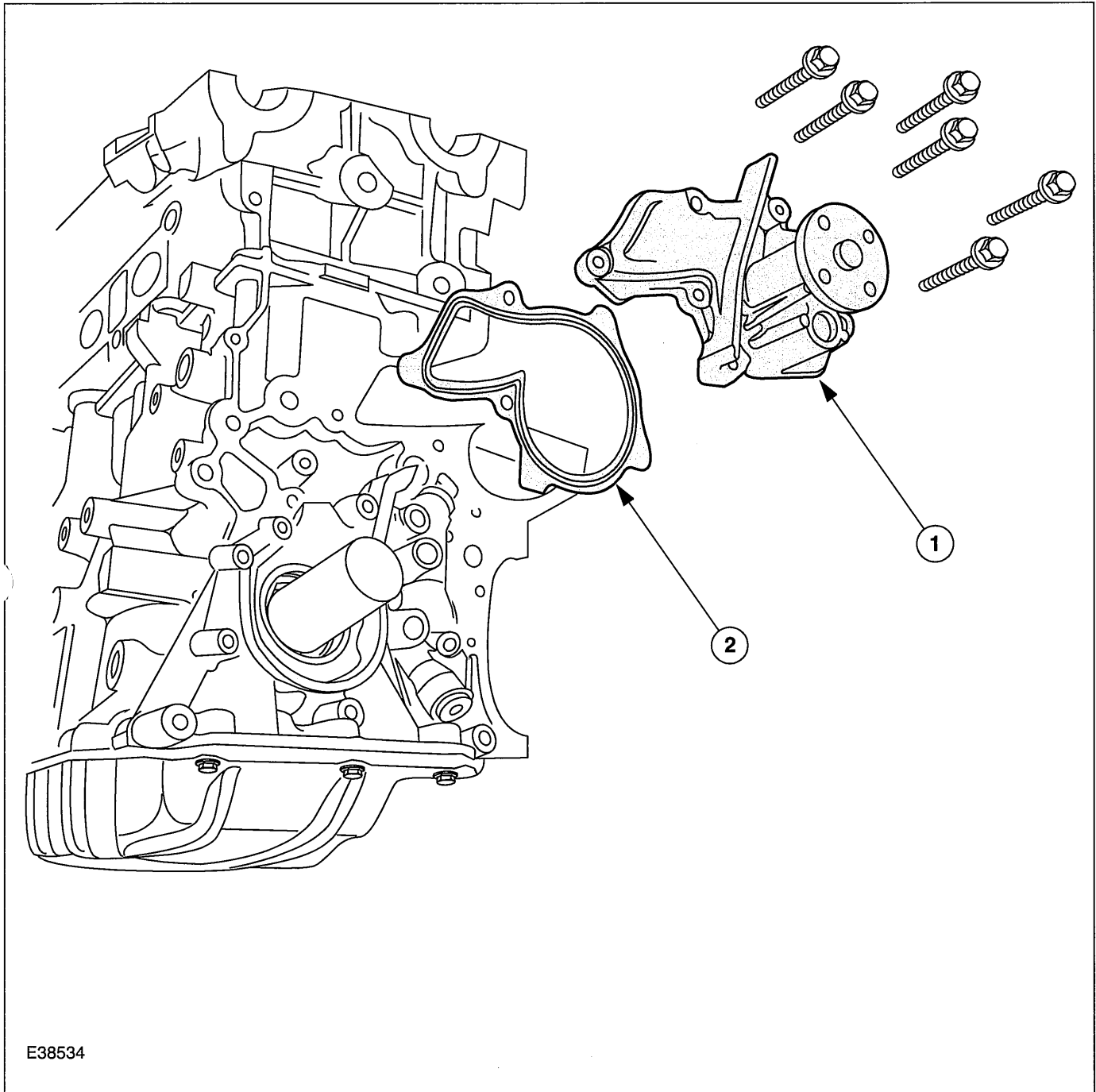
Item	Description
1	Coolant pump
2	Engine
3	Water outlet housing

Item	Description
4	Heater heat exchanger
5	Thermostat housing
6	Coolant expansion tank
7	Radiator

DESCRIPTION AND OPERATION

Components

Coolant pump



E38534

Item	Description
1	Coolant pump
2	Coolant pump gasket

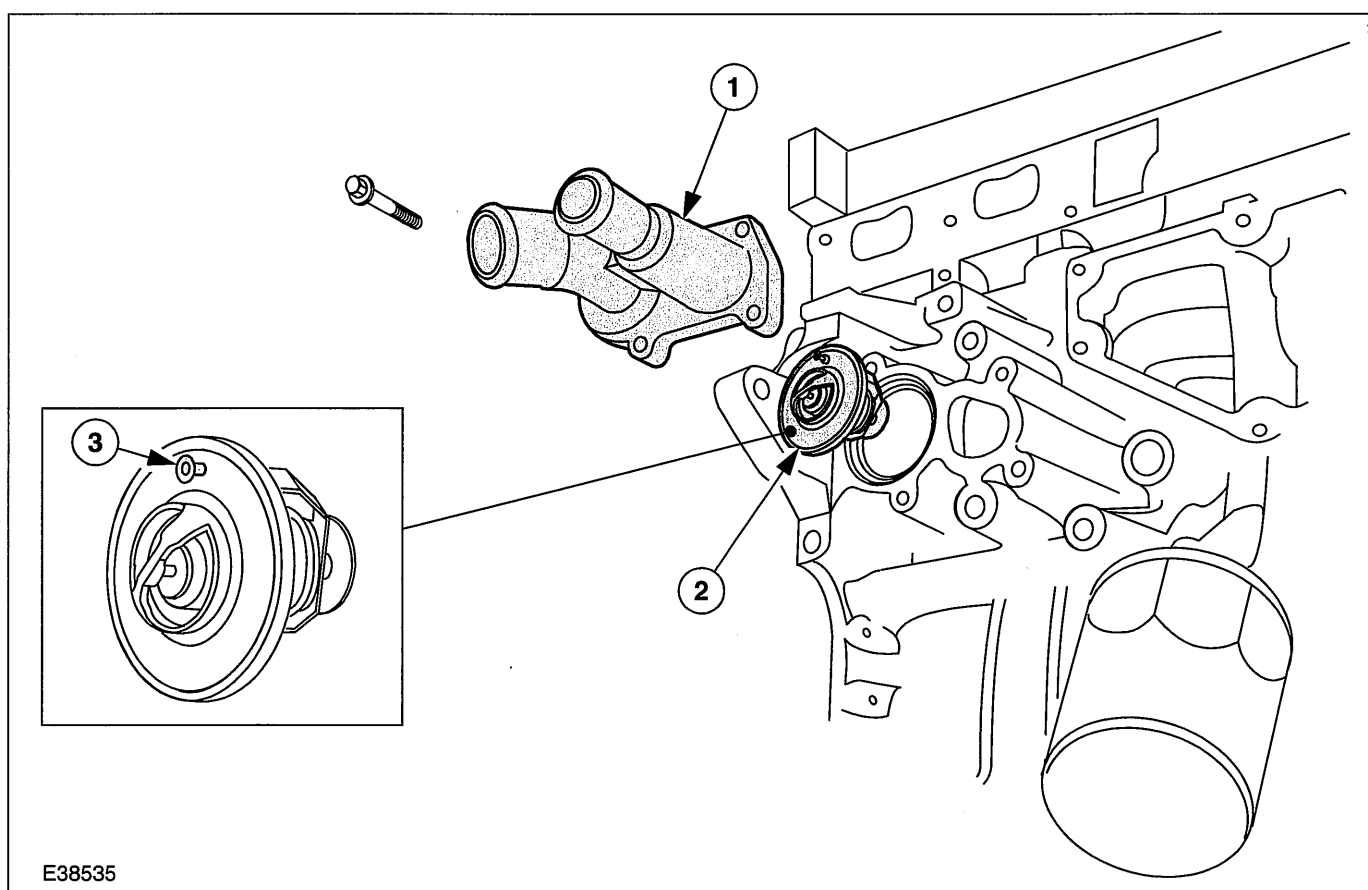
It is driven through a pulley by the accessory drive belt.

The gasket for the coolant pump must not be reused.

The coolant pump is secured to the engine block at the timing gear end.

DESCRIPTION AND OPERATION

Thermostat and thermostat housing



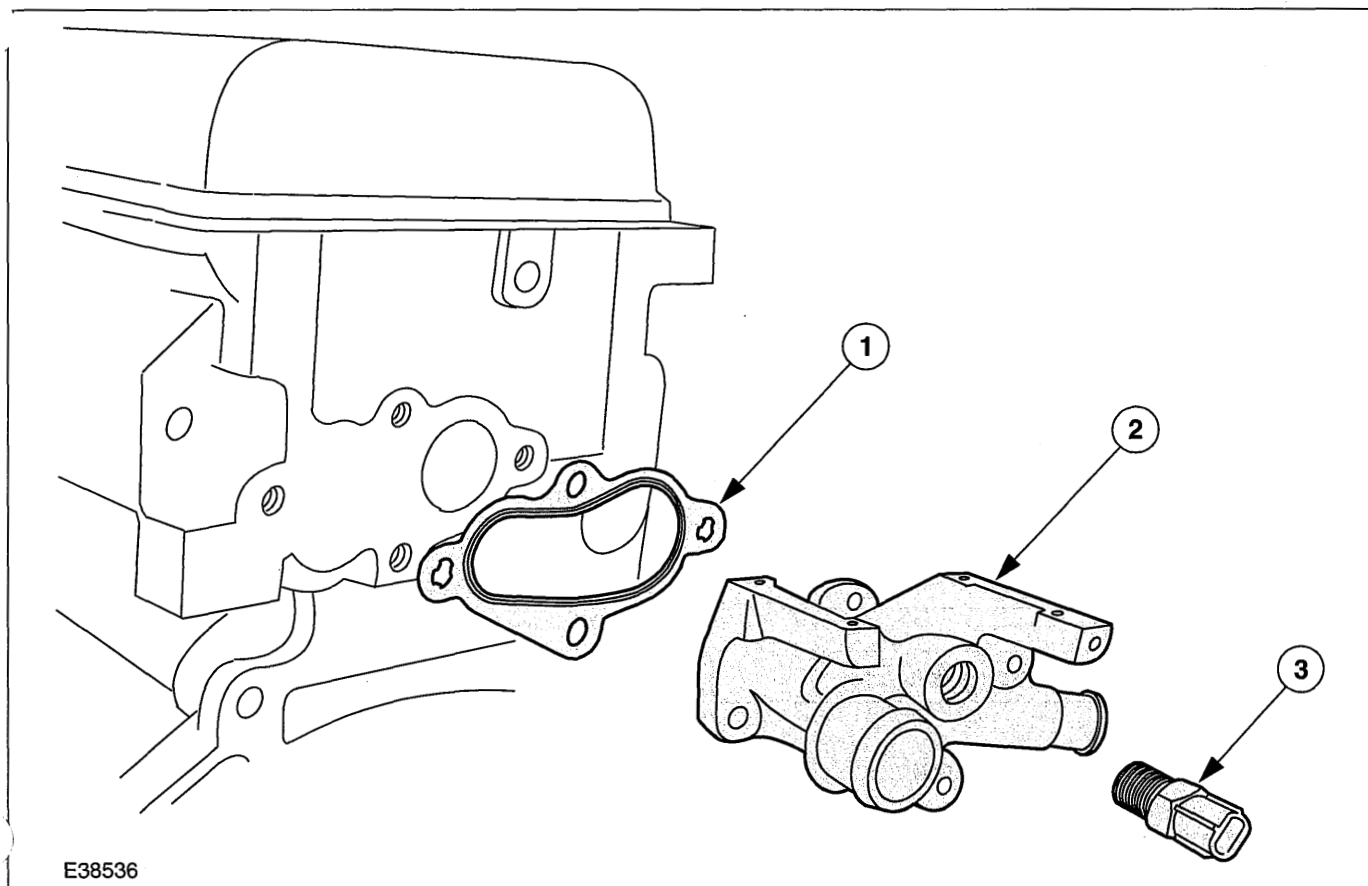
Item	Description
1	Thermostat housing
2	Thermostat
3	Venting pin

The thermostat and thermostat housing are located on the side of the engine block.

When installing the thermostat, make sure that the venting pin is at the top.

DESCRIPTION AND OPERATION

Water outlet housing



Item	Description
1	Gasket
2	Water outlet housing
3	Engine Coolant Temperature (ECT) sensor

The water outlet housing is located on the cylinder head nearest the transmission.

Among other things, it is used to mount the Electronic Ignition (EI) coil.

In addition, the ECT sensor is located in the housing.

DIAGNOSIS AND TESTING

Engine Cooling

Special Tool(s)

IA24001A	Pressure Tester, Cooling System 303-396 (24-001 A)
IA2400101A	Adapter for 303-396 303-396-01

General Equipment

Worldwide Diagnostic System (WDS)

Visual Inspection Chart

Mechanical	Electrical
– Coolant leak(s) – Coolant level – Air in system – Gaskets/seals – Hose(s)/hose joints – Coolant expansion tank cap and seal – Coolant expansion tank – Radiator – Water pump – Thermostat – Thermostat housing – Accessory drive belt	– Fuse(s) – Relay(s) – Wiring harness – Electrical connector(s) – Cooling fan motor – Engine coolant temperature (ECT) sensor – Cylinder head temperature (CHT) sensor – Powertrain control module (PCM)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Loss of coolant	• Hose(s)/hose joint(s).	• INSPECT the hoses and hose joints. INSTALL a new hose(s) as necessary.
	• Radiator.	• INSPECT the radiator for leaks. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new radiator as necessary. REFER to: Radiator (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).

DIAGNOSIS AND TESTING

Symptom

Possible Sources

Action

• Water pump.	• INSPECT the water pump for leaks. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new water pump or water pump gasket as necessary. REFER to: Water Pump - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation) / Water Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).
• Thermostat housing.	• INSPECT the thermostat housing for leaks. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new thermostat housing or thermostat housing gasket as necessary. REFER to: Thermostat - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation) / Thermostat - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Coolant expansion tank cap or seal.	• CHECK the coolant expansion tank cap for tightness. If OK, CARRY OUT the Coolant Expansion Tank Cap Pressure Test Component Test in this section.
	• Coolant expansion tank.	• INSPECT the seal face on the coolant expansion tank for damage. INSTALL a new coolant expansion tank as necessary.
	• Heater core.	• CHECK the heater core for leaks.
	• Engine.	• INSPECT the engine, cylinder head, cylinder block and cylinder head gasket. REFER to: Cylinder Head (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The engine overheats (signs of coolant boiling)	Cooling system does not hold pressure.	- CARRY OUT the Coolant Expansion Tank Cap Test Component Test in this section. - INSPECT the coolant expansion tank for damage. INSTALL a new coolant expansion tank as necessary. - INSPECT the water pump or water pump gasket for damage. INSTALL a new water pump or water pump gasket as necessary. REFER to: Water Pump - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation) / Water Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation). - INSPECT the engine, cylinder head, cylinder block and cylinder head gasket. REFER to: Cylinder Head (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).
	Radiator.	INSPECT the radiator for blockage or damage. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new radiator as necessary. REFER to: Radiator (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Air in system.	• BLEED the cooling system. REFER to: Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).
	• Coolant expansion tank cap or seal.	• CHECK the coolant expansion tank cap for tightness. If OK, CARRY OUT the Coolant Expansion Tank Cap Pressure Test Component Test in this section.
	• Coolant expansion tank.	• INSPECT the seal face on the coolant expansion tank for damage. INSTALL a new coolant expansion tank as necessary.

DIAGNOSIS AND TESTING

Symptom

Possible Sources

Action

Coolant level/condition.	- CHECK the coolant level. REFILL the cooling system as necessary. REFER to: Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures). - CHECK the coolant condition. If the coolant is in poor condition drain and refill with new coolant. REFER to: Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).
Coolant concentration.	REFER to: Specifications (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Specifications).
Radiator grille.	INSPECT the radiator grille for air restrictions or damage. REPAIR or INSTALL new parts as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Water pump.	- CARRY OUT the Pressure Test Component Test in this section. INSPECT the water pump for leaks. INSTALL a new water pump or water pump gasket as necessary. - REFER to: Water Pump - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation) / Water Pump - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).
	Thermostat.	- CARRY OUT the Thermostat Test Component Test in this section. INSTALL a new thermostat as necessary. - REFER to: Thermostat - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation) / Thermostat - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).
	Accessory drive belt	- CHECK the accessory drive belt for correct operation. - REFER to: Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Cooling fan motor.	CHECK the operation of the cooling fan motor. REFER to WDS.
	Engine.	INSPECT the engine, cylinder head, cylinder block and cylinder head gasket. REFER to: Cylinder Head (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).
The engine does not reach normal operating temperature.	ECT sensor.	CHECK the ECT sensor. REFER to WDS.
	Temperature gauge.	CHECK the instrument cluster engine temperature gauge. REFER to: Instrument Cluster - Vehicles Built Up To: 10/2005 (413-01 Instrument Cluster, Diagnosis and Testing) / Instrument Cluster - Vehicles Built From: 10/2005 (413-01 Instrument Cluster, Diagnosis and Testing).
	Thermostat.	CARRY OUT the Thermostat Test Component Test in this section. INSTALL a new thermostat as necessary. REFER to: Thermostat - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation) / Thermostat - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).

DIAGNOSIS AND TESTING

Component Tests

Pressure Test

▲ WARNING:When releasing the system pressure, cover the expansion tank cap with a thick cloth to prevent the possibility of coolant scalding. Failure to follow this instruction may result in personal injury.

1. Remove the coolant expansion tank cap.
2. Install the special tools to the coolant expansion tank.
3. Pressurize the system to the coolant expansion tank cap release pressure.

REFER to: Specifications (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Specifications).

4. Observe the cooling system pressure tester gauge reading for approximately two minutes. The pressure should not drop during this time. If the system holds pressure, proceed to step 6. If the system does not hold pressure, check it thoroughly for coolant leaks.
5. Check the engine for coolant leaks. Drain the cooling system, repair any coolant leaks found and fill and bleed the cooling system as necessary.

REFER to: Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).

6. Recheck the system by repeating steps 3 and 4 at least twice.

Radiator Leak Test, Removed From Vehicle

⚠ CAUTION:Radiator internal pressure must not exceed 130 kpa (20 psi) or damage may result.

Clean the radiator thoroughly before leak testing it, to prevent contamination of the water in the test tank. Leak test the radiator in clean water with 138 kpa (20 psi) air pressure. Check it thoroughly for air leaks. INSTALL a new radiator if necessary.

REFER to: Radiator (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).

Coolant Expansion Tank Cap Pressure Test

▲ WARNING:When releasing the system pressure, cover the expansion tank cap with a thick cloth to prevent the possibility of coolant scalding. Failure to follow this instruction may result in personal injury.

1. Remove the coolant expansion tank cap.
2. Use water to clean the area of the rubber seal and pressure relief valve. Install the pressure tester and adapter and immerse the coolant expansion tank cap in water.

NOTE:If the plunger of the pump is depressed too quickly, an erroneous pressure reading will result.

3. Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing, and note the highest pressure reading obtained.
4. Release pressure by turning the pressure relief screw counterclockwise. Tighten the pressure relief screw and repeat step 3 at least twice to make sure the pressure test reading is repeatable and within acceptable gauge reading limits of the coolant expansion tank cap.
5. If the pressure test gauge readings are not within the acceptable gauge reading limits, INSTALL a new coolant expansion tank cap.

Thermostat Test

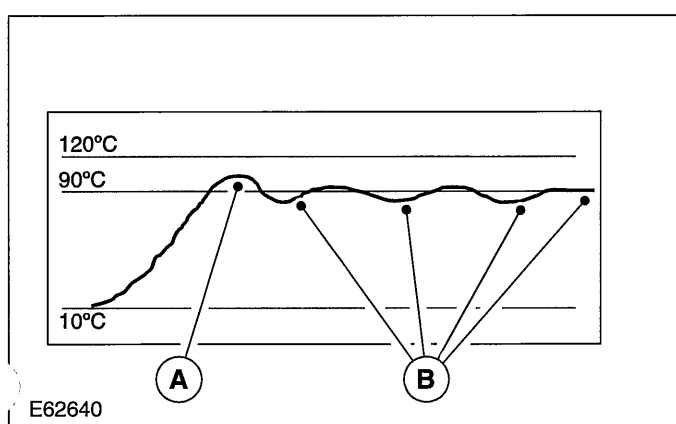
1. Connect the WDS to the data link connector (DLC).
2. Using the WDS datalogger function, SELECT the following sensors (as applicable to the application):
 - IAT - intake air temperature (IAT) sensor
 - ECT - engine coolant temperature (ECT) sensor
 - CHT - cylinder head temperature (CHT) sensor
 - LOAD - engine load
 - VSS - vehicle speed sensor (VSS)

DIAGNOSIS AND TESTING

- RPM - engine speed
- DSRPM - desired engine speed

The IAT sensor output is useful if the engine being tested is cold or after an over-night cold soak. The ECT sensor or CHT sensor and the IAT sensor should either indicate the same value or be within 1 to 2 degrees Celsius of each other.

The ECT sensor output is important to display as it indicates the engine warm-up and opening temperature for the thermostat. It will initially indicate a slightly higher reading just before the thermostat opens and then drops back before settling to a near flat line output (see graphic below).



Item	Description
A	Thermostat opens
B	Thermostat settles into a cyclic open and closure pattern

⚠ CAUTION: If the ECT sensor output reaches the 120°C default line under normal cooling system pressure, internal damage may be caused to the engine and a diagnostic trouble code (DTC) will be set in the PCM. The test should be stopped and the cause located and corrected. If the cooling system does not pressurize, the coolant will boil at 100°C which may also damage the engine. **CARRY OUT** the Coolant Expansion Tank Cap Pressure Test Component Test in this section.

If the WDS only allows the ECT sensor to be displayed in volts, refer to the following table for corresponding Celsius values:

Volts	°Celsius
1.33	60
1.02	70

Volts	°Celsius
0.78	80
0.60	90
0.46	100
0.35	110
0.27	120

The CHT sensor output is useful to examine the cylinder head temperature rise during the warm-up cycle and later during the normal light throttle cruise test. This sensor output may vary between vehicles with manual transmission and vehicles with automatic transmission and should be used for reference only.

The LOAD display is used for reference as it is necessary to maintain a stable load line during the test. It is necessary to carry out the test under normal light throttle cruise driving conditions and average loads, typically 40% to 70% of the load value.

The VSS output is used for reference but can help to identify misfires and sensors which fail during the warm-up cycle.

The RPM display indicates the engine speed and can be compared with the DSRPM.

The DSRPM is the desired or calculated idle speed which the PCM commands the engine to reach. If the thermostat opens too early (before the correct opening temperature has been reached), the engine will not reach this value.

When using the WDS in data logger mode, the signals recorded should remain within the DEFAULT values set by the WDS.

3. ⚠ WARNING: Make sure that the WDS is placed in the vehicle so that it does not interfere with the safe operation of the vehicle. Do not place the WDS in the deployment path of any air bag. Failure to follow these instructions may result in personal injury.

NOTE: The road test is best carried out with the aid of another technician in the vehicle to enable the vehicle to be driven safely while the sensor outputs are monitored within datalogger. If there is only one technician available, the WDS can be set up (using the record/capture mode camera icon) before leaving the workshop to record a 16 km (10 mile) test.

DIAGNOSIS AND TESTING

NOTE: The results from the test are more conclusive if the engine is cold when the test is started.

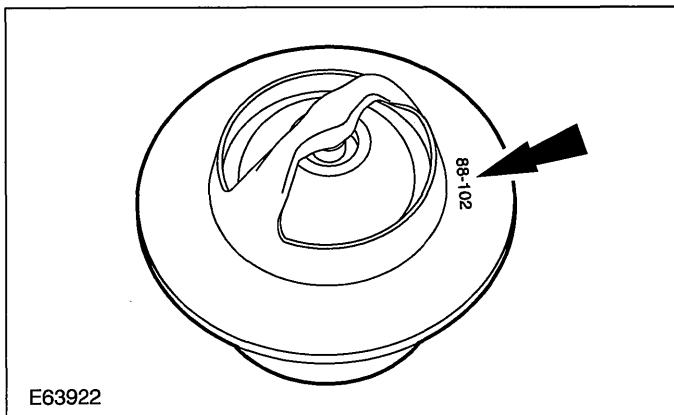
Carry out a road test.

REFER to: Road/Roller Testing (100-00 General Information, Description and Operation).

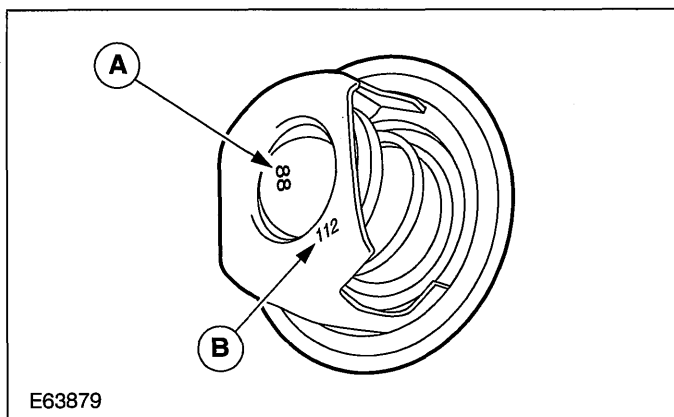
4. Drive the vehicle at a constant throttle opening and set speed until the ECT value settles into a shallow rise and fall signal, close to a straight line. This indicates that the thermostat is functioning correctly.

NOTE: Some thermostats indicate the temperature(s) in Celsius and Fahrenheit.

The graphic below shows the location and an example of the opening temperature (88°C) and fully open temperature (102°C) of a thermostat.



The graphic below shows an alternative method used to show the opening temperature (88°C) and fully open temperature (112°C) of a thermostat.



Item	Description
A	Opening temperature
B	Fully open temperature

NOTE: Generally, most thermostats maintain a coolant temperature between 88°C (190°F) and 92°C (198°F) although dual stage electric

thermostats may increase the coolant temperature up to 100°C (212°F) under light engine load conditions.

The engine should start cleanly and the ECT value will rise quite quickly with smooth progression. If the ECT signal appears unstable or erratic, the ECT sensor, electrical connector and wiring harness to the PCM need to be visually inspected for damage, chafing or water ingress.

The temperature should rise to approximately 90°C for a thermostat that has an 88°C value. The signal value will then fall as cooler coolant enters the engine.

If the ECT value fails to maintain a constant value and falls back to lower figures, typically between 60°C (140°F) and 70°C (150°F), the thermostat and its sealing function within the thermostat housing must be checked.

5. INSTALL a new thermostat.

REFER to: Thermostat - 1.3L Duratec-8V (Rocam) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation)
/ Thermostat - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation).

6. Carry out another road test from step 1 using the same criteria to confirm that the concern has been rectified.
7. Using the WDS, clear the PCM keep alive memory (KAM) or electrically erasable programmable read only memory (EEPROM) so that new drive values can be learnt.

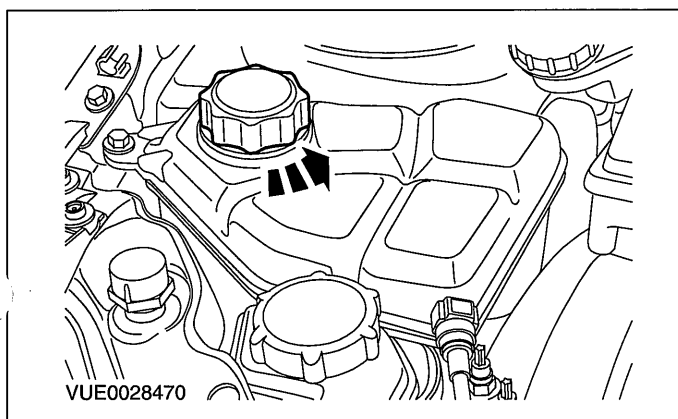
GENERAL PROCEDURES

Cooling System Draining, Filling and Bleeding — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(24 122 0)

Draining

1. **▲WARNING:**When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn.

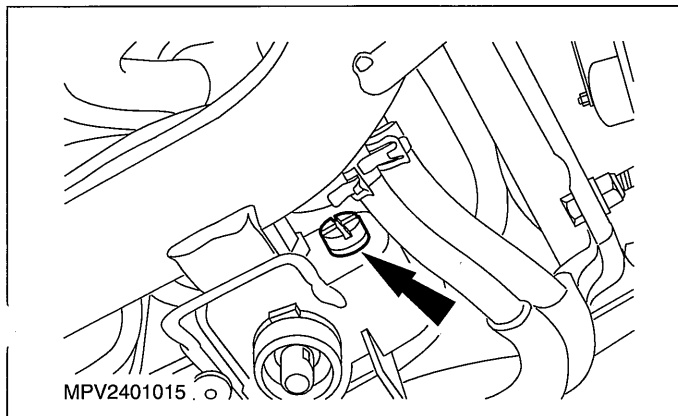


2. Remove the coolant expansion tank cap.
3. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

4. Drain the cooling system.

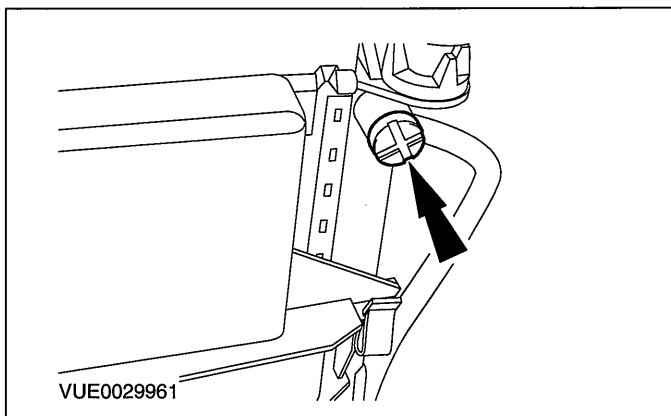
- Allow the coolant to drain into a suitable container.



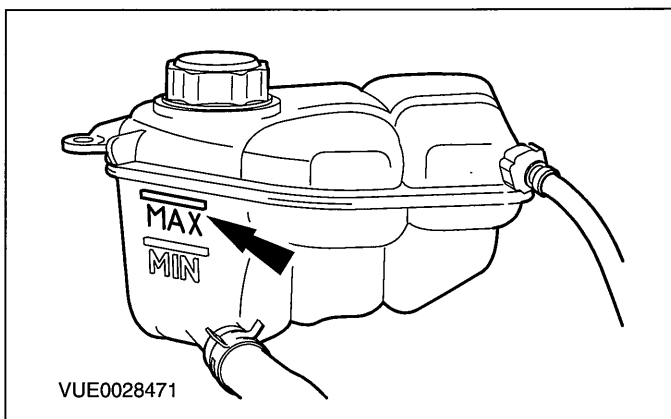
5. Install the radiator drain plug.
6. Lower the vehicle.

Filling and Bleeding

1. Remove the radiator bleed plug (if equipped).



2. Fill the coolant expansion tank until coolant is expelled from the radiator bleed point or stabilizes at the MAX mark (whichever occurs first).
3. Install the radiator bleed plug (if equipped).
4. Fill the coolant expansion tank to the MAX mark (if necessary).



5. Start and run the engine at 3000 revolutions per minute (RPM) for two minutes.
6. Fill the coolant expansion tank completely.
7. Install the coolant expansion tank cap.
8. Start and run the engine at 3000 RPM for another two minutes.

GENERAL PROCEDURES

9. Switch the engine off.

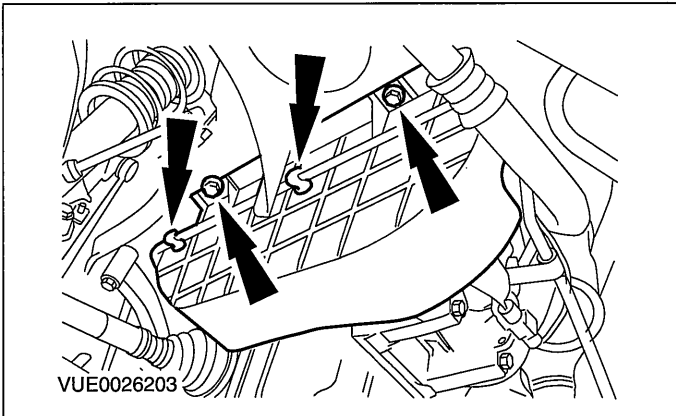
REMOVAL AND INSTALLATION

Water Pump — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(24 404 0)

Removal

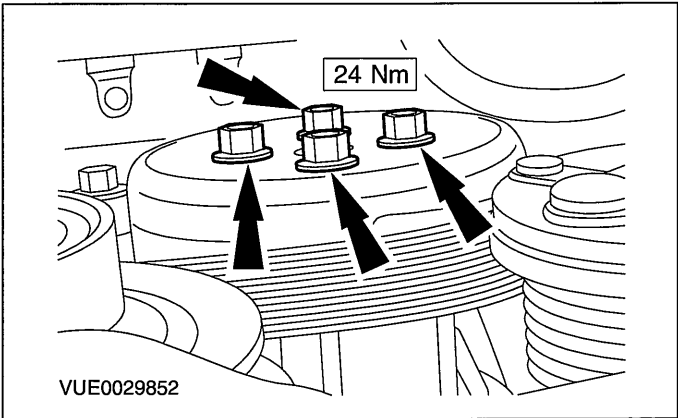
Vehicles built up to 04/2005

1. Disconnect the battery ground cable.
For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).
2. Remove the air cleaner.
For additional information, refer to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).
3. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).
4. Remove the crankshaft pulley splash shield.

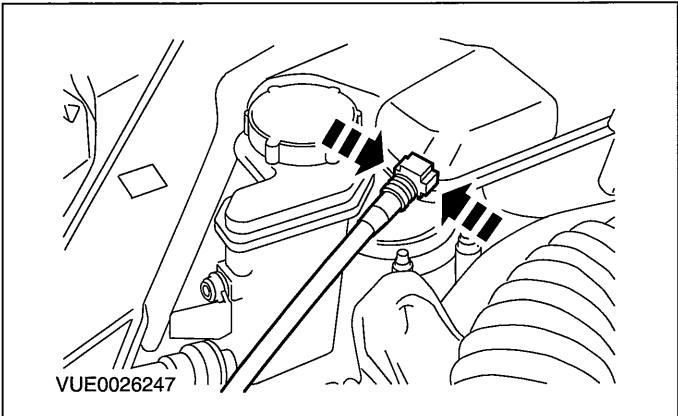


5. **▲WARNING:**Do not remove the water pump pulley retaining bolts at this stage as the pulley is under tension from the accessory drive belt. Failure to follow this instruction may result in personal injury.

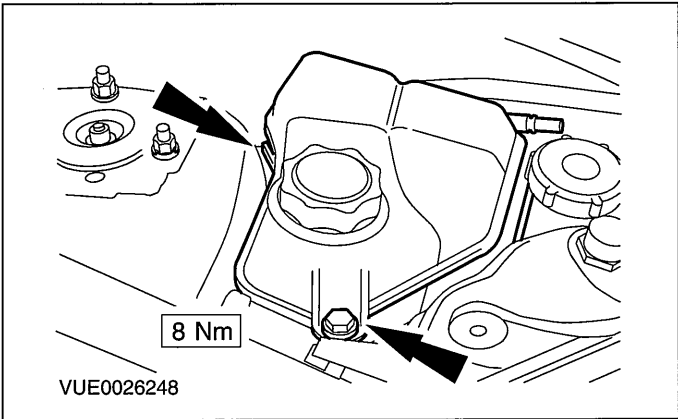
Loosen the water pump pulley retaining bolts.



6. Lower the vehicle.
7. Disconnect the degas hose from the coolant expansion tank.



8. Detach the coolant expansion tank and secure it to one side.



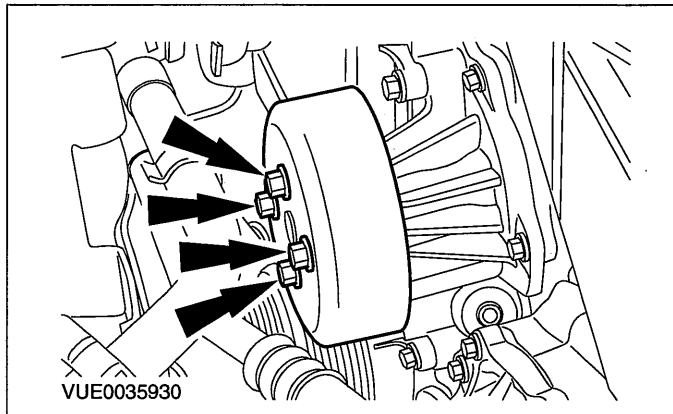
REMOVAL AND INSTALLATION

9. Remove the generator.

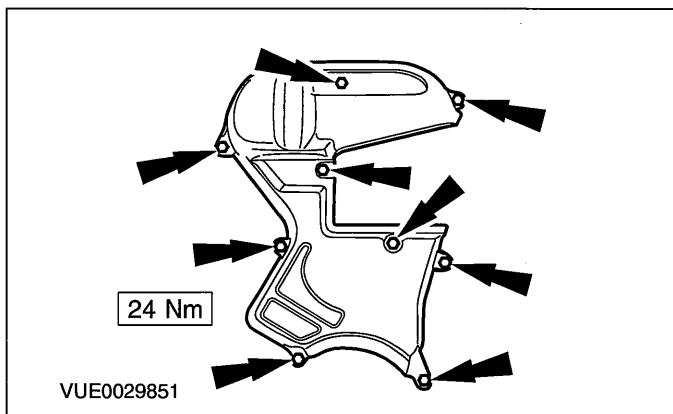
For additional information, refer to:

Generator - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (414-02 Generator and Regulator, Removal and Installation).

10. Remove the water pump pulley.



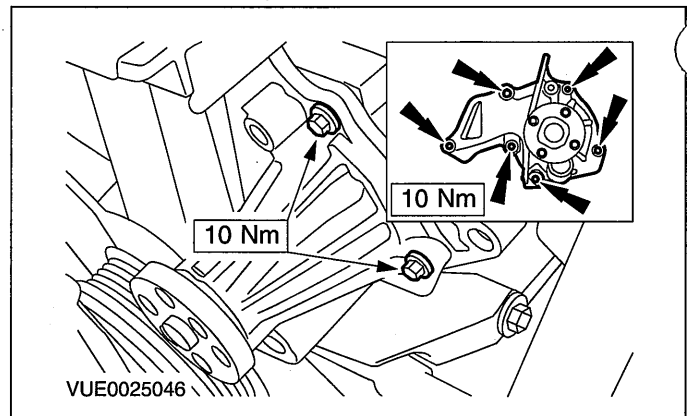
11. Remove the timing belt cover (cover shown removed for clarity).



12. ⚠ CAUTION: Protect the timing belt and lower cover from contamination by the coolant.

Remove the water pump.

- Discard the gasket.



Vehicles built 04/2005 onwards

13. Remove the timing belt.

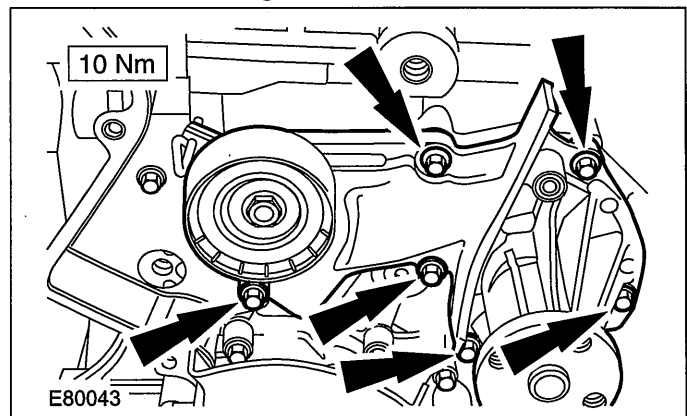
For additional information, refer to: Timing Belt (303-01 Engine - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), In-vehicle Repair).

14. Drain the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-03 Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), General Procedures).

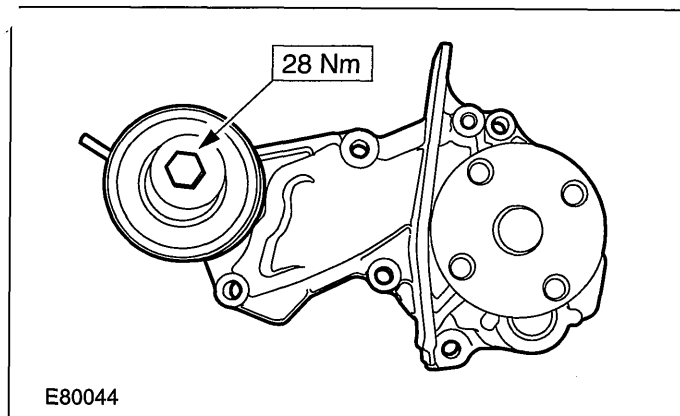
15. Remove the water pump and the timing belt tensioner.

- Discard the gasket.



REMOVAL AND INSTALLATION

16. Remove the timing belt tensioner from the water pump.



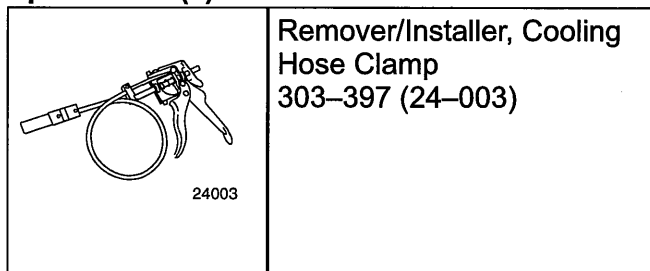
Installation

1. **NOTE:** Install a new water pump gasket.
To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Thermostat — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V
(Sigma)/1.6L Duratec-16V (Sigma)(24 454 0)

Special Tool(s)



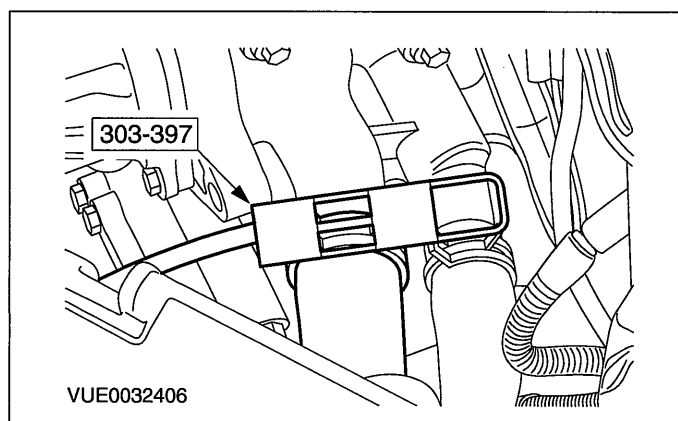
Removal

1. Drain the cooling system.

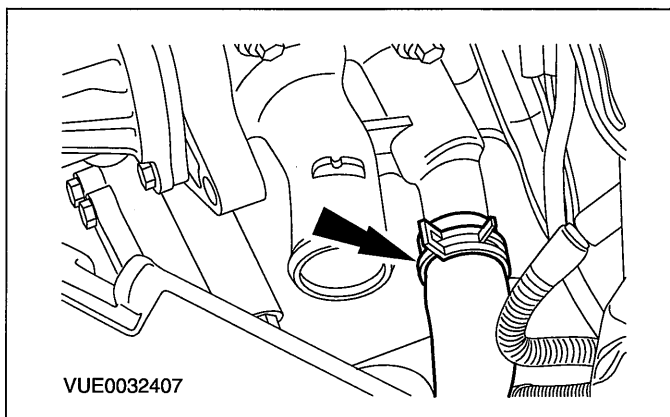
For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Remove the generator. For additional information, refer to Section 414-02 [Generator and Regulator].

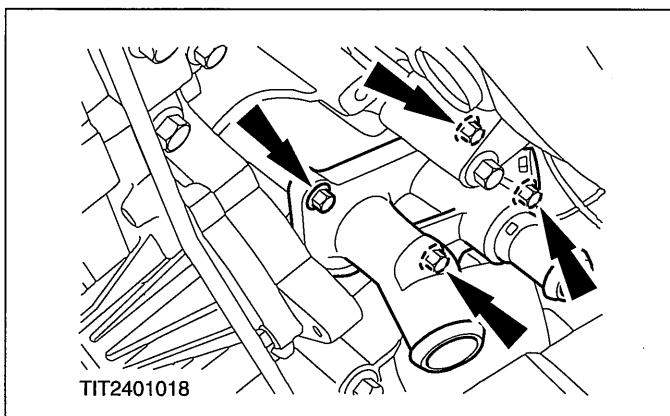
3. Using the special tool, disconnect the radiator lower hose from the thermostat housing.



4. Disconnect the heater hose from the thermostat housing.

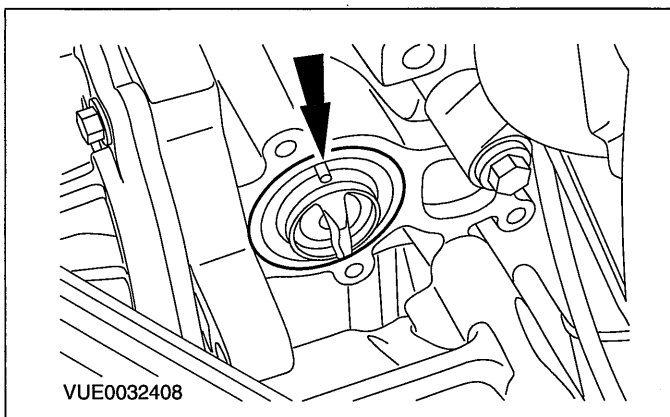


5. Remove the thermostat housing.



6. NOTE: The thermostat is installed with the jiggle pin at the top.

Remove the thermostat.

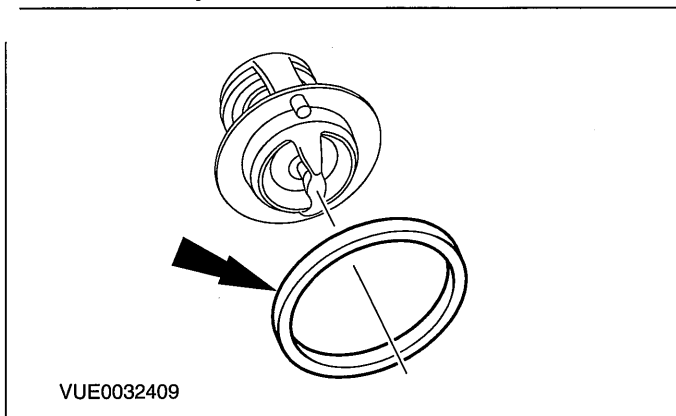


Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

- Make sure the rubber seal is located correctly.



REMOVAL AND INSTALLATION

Radiator(24 254 0)

Special Tool(s)



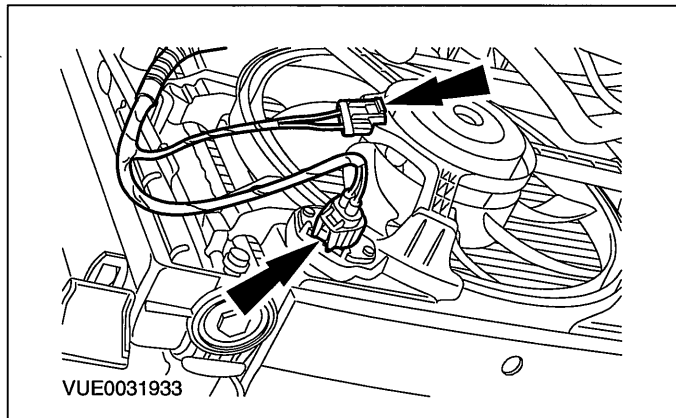
Removal

1. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].

2. Drain the cooling system.

For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

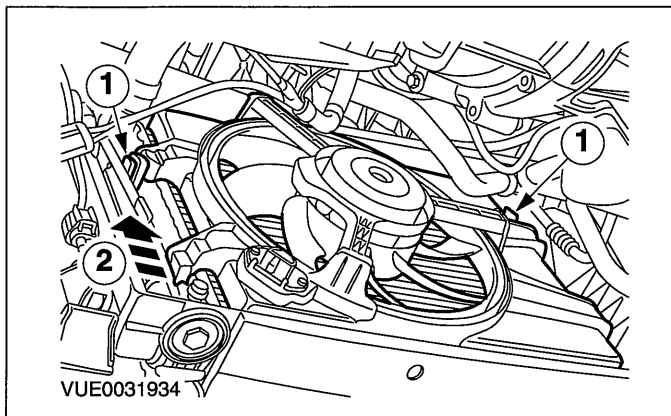
3. Disconnect the cooling fan motor and cooling fan resistor electrical connectors.



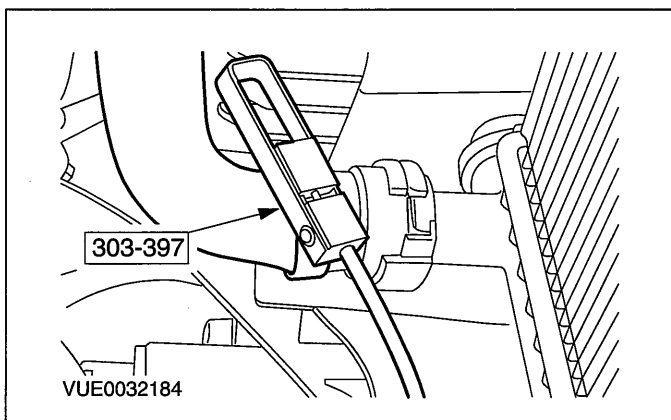
4. Remove the cooling fan motor and shroud.

1. Release the cooling fan motor and shroud from the retaining brackets.

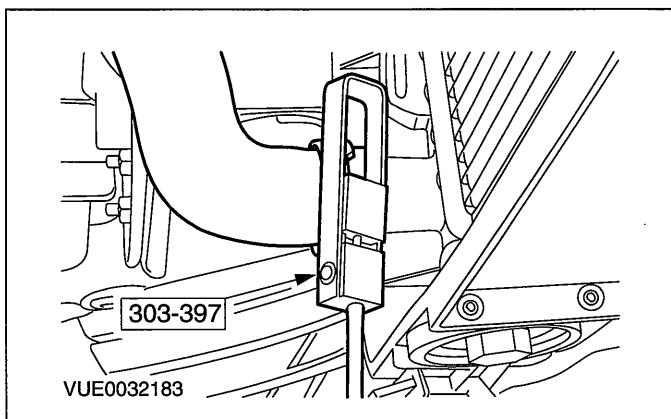
2. Push the cooling fan motor and shroud upwards and then downwards to remove.



5. Using the special tool, disconnect the radiator upper hose.



6. Using the special tool, disconnect the radiator lower hose.

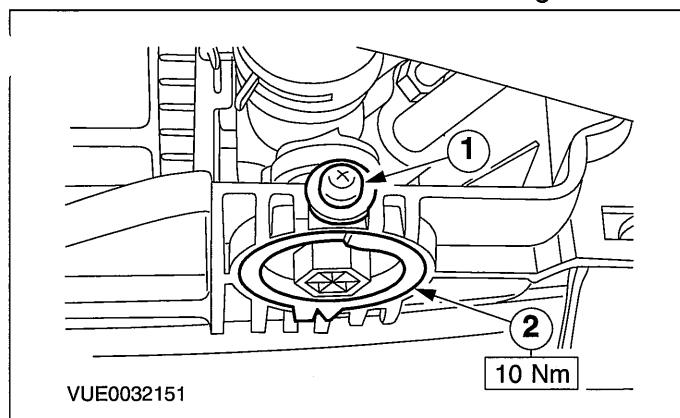


7. Remove the radiator retainers.

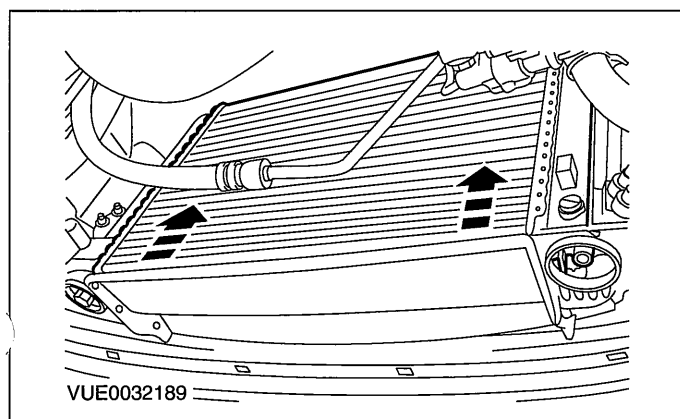
1. Remove the radiator retainer locking screws.

REMOVAL AND INSTALLATION

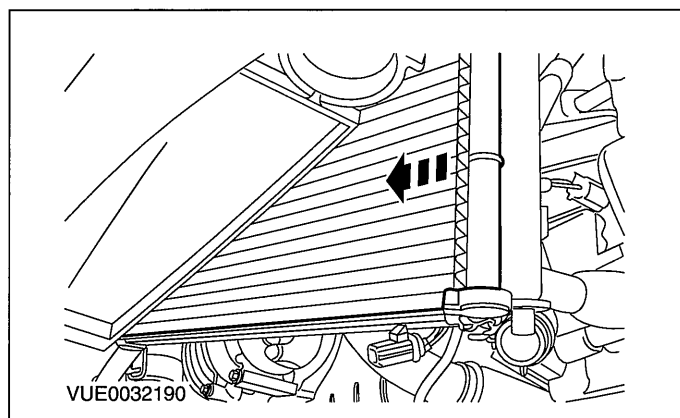
2. Remove the radiator retainers and grommets.



8. Detach the radiator and the air conditioning (A/C) condenser from the support panel.



9. **⚠ CAUTION:** Support the condenser by positioning it on the support panel.
Slide the A/C condenser to detach it from the radiator



10. Remove the radiator.

Installation

1. To install, reverse the removal procedure.

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SECTION 303-03B Engine Cooling — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-03B-2
DESCRIPTION AND OPERATION	
Engine Cooling.....	303-03B-3
System Overview.....	303-03B-3
Components.....	303-03B-4
Coolant.....	303-03B-7
Changing Coolant.....	303-03B-7
Fail-Safe Cooling.....	303-03B-8
DIAGNOSIS AND TESTING	
Engine Cooling.....	303-03B-9
Inspection and Verification.....	303-03B-9
Symptom Chart.....	303-03B-9
Component Tests.....	303-03B-13
GENERAL PROCEDURES	
Cooling System Draining, Filling and Bleeding..... (24 122 0)	303-03B-17
Draining.....	303-03B-17
Filling and Bleeding.....	303-03B-17
REMOVAL AND INSTALLATION	
Coolant Pump..... (24 404 0)	303-03B-19
Thermostat Housing.....	303-03B-21
Coolant Outlet Connector.....	303-03B-24
Radiator..... (24 254 0)	303-03B-26

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

Description	Specification
Motorcraft Super Plus 2000 antifreeze	WSS-M97B4 4-D

Antifreeze

Specific gravity (providing no other additive is in the coolant)	Approximate percentage of anti- freeze (by volume)	Remains fluid to	Solidifies at
1.061 at +15°C	50%	-25°C (-13°F)	-30°C (-22°F)

Cooling System Refill Capacities

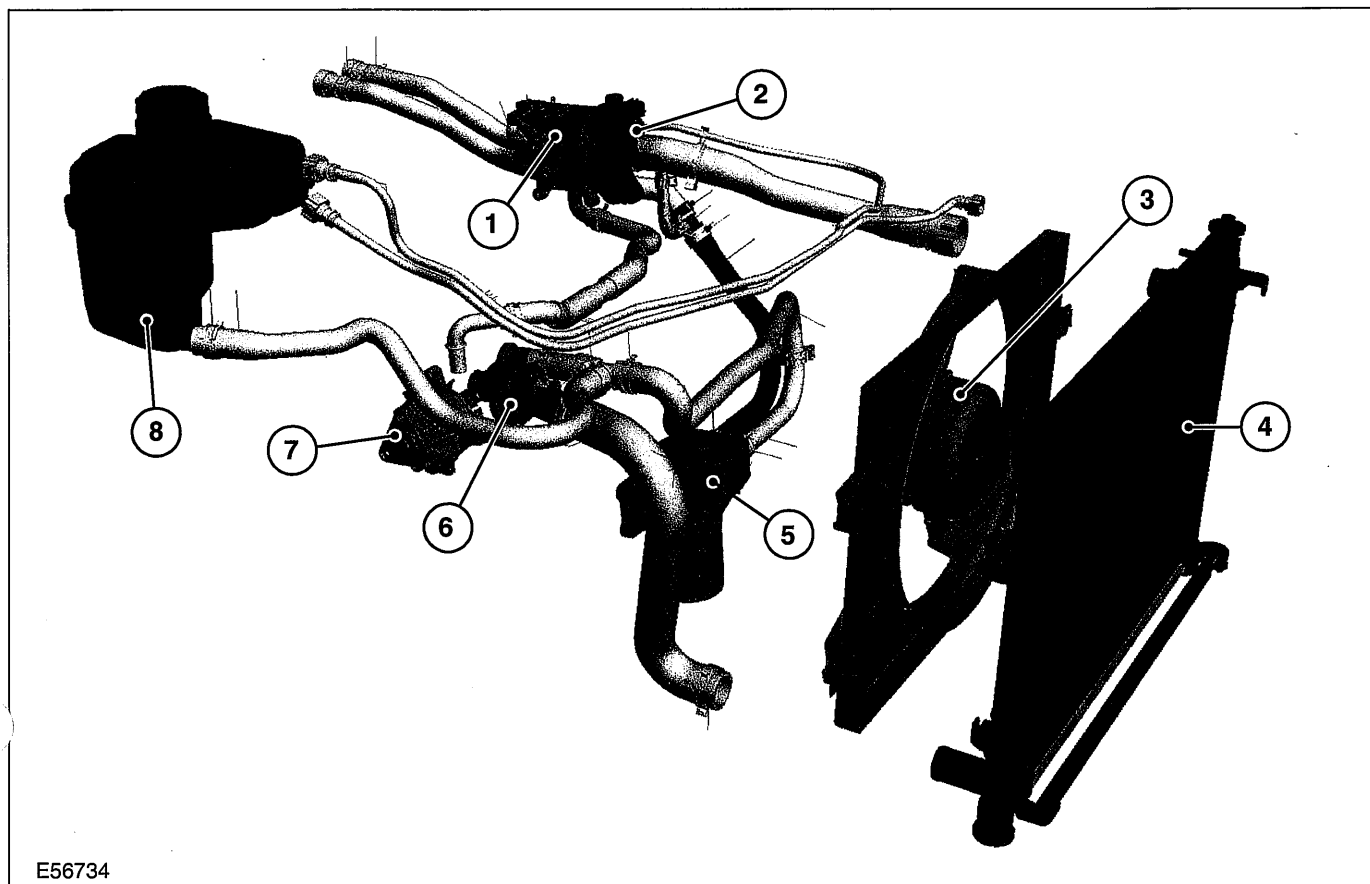
Description	Liters
Cooling system, including heater system and coolant expansion tank	4.0

Cooling System Pressure Specification

Description	Pressure kpa (psi)
Radiator pressure test	138 (20)
Coolant expansion tank cap release pressure	120 to 150 (17-21)

Torques

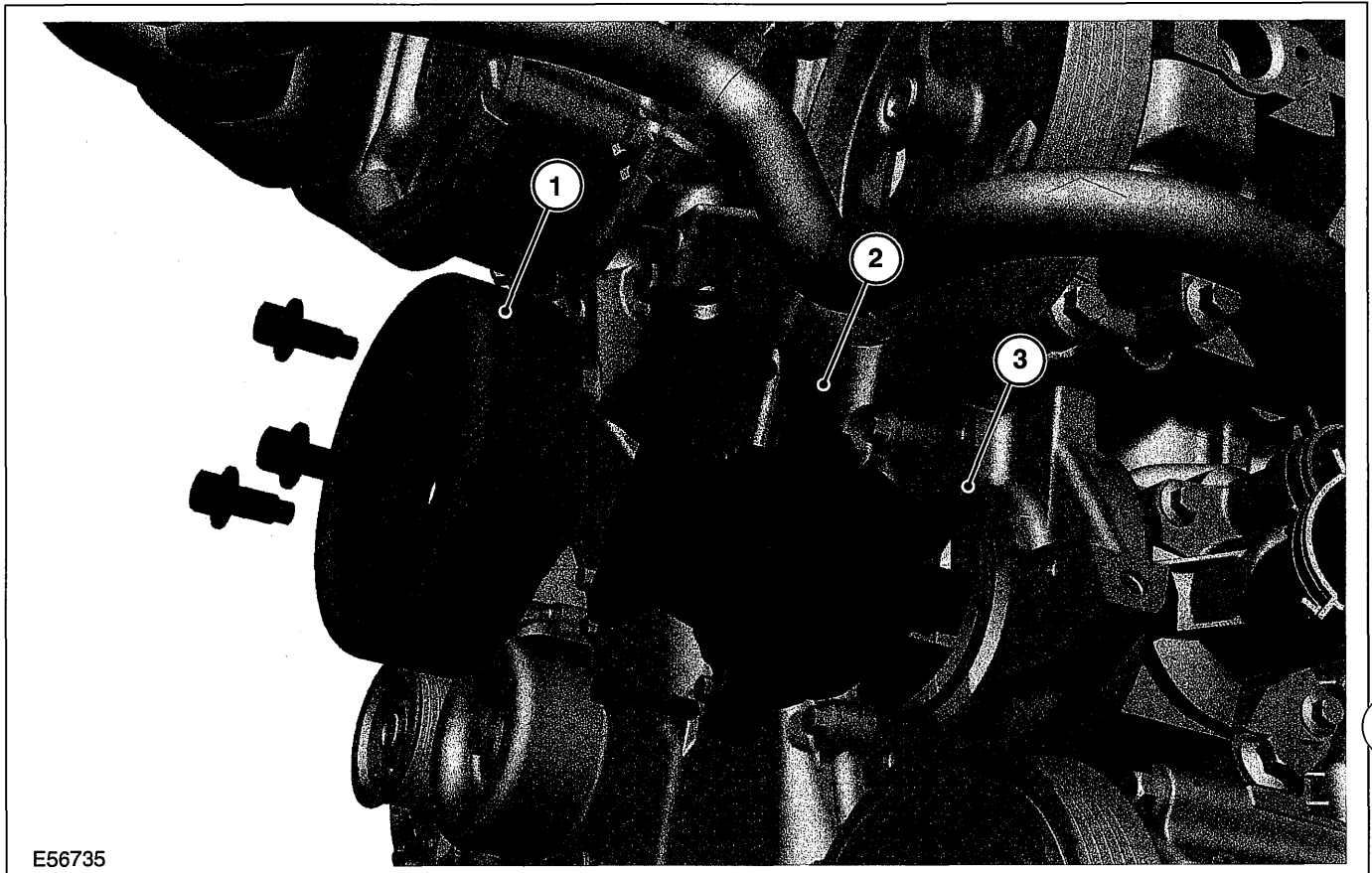
Description	Nm	lb-ft	lb-in
Radiator retaining nut	10	-	89
Thermostat housing retaining bolts	10	-	89
Coolant pump retaining bolts	10	-	89
Coolant pump pulley retaining bolts	20	15	-
Coolant outlet connector retaining bolts	10	-	89
Ignition coil pack retaining bolts	6	-	53

DESCRIPTION AND OPERATION**Engine Cooling****System Overview**

E56734

Item	Description
1	Coolant outlet connector
2	Exhaust gas recirculation (EGR) valve
3	Cooling fan motor
4	Radiator

Item	Description
5	Oil cooler
6	Thermostat housing
7	Coolant pump
8	Coolant expansion tank

DESCRIPTION AND OPERATION**Components****Coolant Pump**

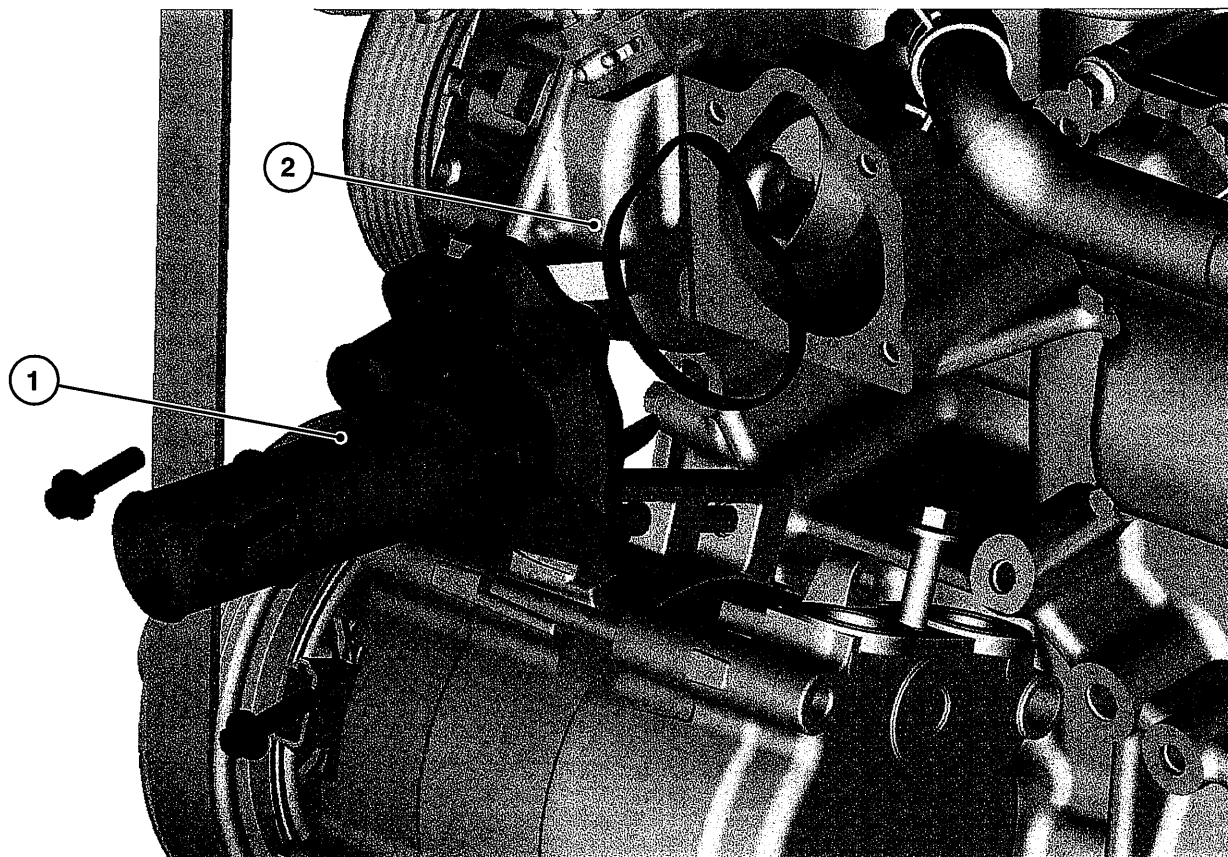
E56735

Item	Description
1	Coolant pump pulley
2	Coolant pump
3	Coolant pump gasket

The coolant pump is of a conventional design and is driven by the water pump pulley and accessory drive belt.

It is driven through a pulley by the accessory drive belt.

The coolant pump gasket must not be reused.

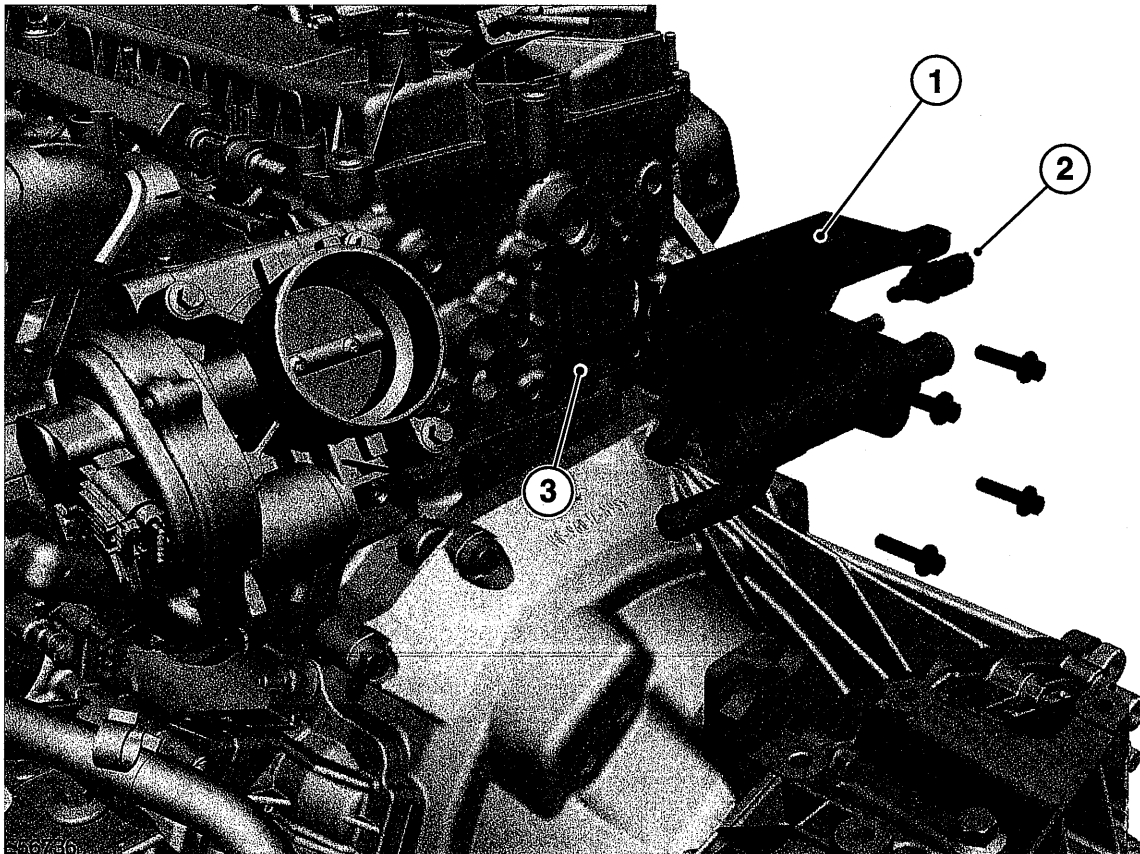
DESCRIPTION AND OPERATION**Thermostat Housing**

E56737

Item	Description
1	Thermostat housing
2	Thermostat housing gasket

The thermostat and thermostat housing are located on the side of the engine block.

The thermostat is built into the thermostat housing and cannot be serviced as a separate component.

DESCRIPTION AND OPERATION**Coolant Outlet Connector**

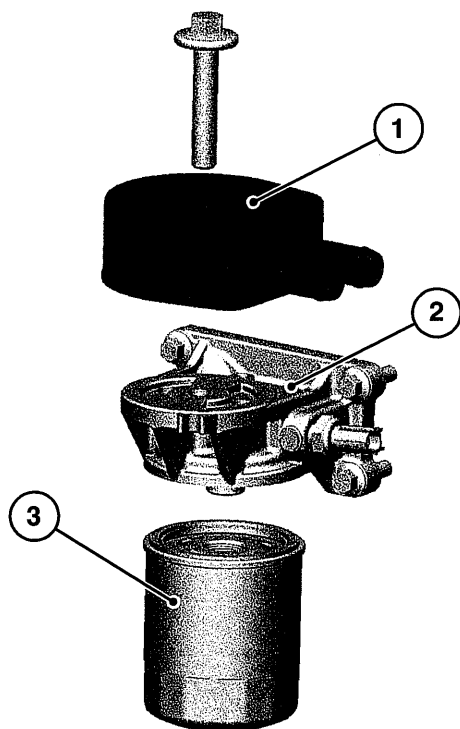
Item	Description
1	Coolant outlet connector
2	Engine coolant temperature (ECT) sensor
3	Coolant outlet connector gasket

The coolant outlet connector is located on the cylinder head above the transmission.

The ECT sensor is located in the coolant outlet connector.

DESCRIPTION AND OPERATION

Oil Cooler



E57484

Item	Description
1	Oil cooler
2	Oil filter adaptor
3	Oil filter

The oil cooler is an oil to water type and is a full flow system.

The oil cooler and oil filter are fitted to an adaptor which is mounted on the cylinder block.

The coolant supply for the oil cooler is through the thermostat by-pass hose.

Coolant Recovery System

A pressurized coolant expansion tank system is used which continuously separates the air from the cooling system and replenishes the system through the coolant expansion tank outlet hose.

A continuous vent from the engine and radiator to the coolant expansion tank prevents air locks from forming in the cooling system.

No manual bleed points are provided on the system.

The coolant expansion tank serves as the location for:

- Service fill.
- Coolant expansion during warm-up.
- Air separation during operation.
- System pressurization by the coolant pressure cap.

Coolant

▲ WARNING: Coolant contains monoethylene glycol and other constituents which are toxic if taken internally and can be absorbed into the skin after prolonged contact. Failure to follow this instruction may result in personal injury.

Coolant concentration should be checked through the neck of the expansion tank with a hydrometer. The acceptable range of specific gravity (sg) of correctly balanced fluids is between 1.06 and 1.07kg/l, which represents a coolant concentration between 40% and 55%. If the concentration falls below 40% there is insufficient low temperature protection and the corrosion resistance will be inadequate. In such cases the concentration must be brought back to specification.

The coolant used is the orange-colored Motorcraft Super Plus 2000. Motorcraft Super Plus 2000 is a non silicated organic acid technology (OAT) coolant, and must not be mixed with other coolant types. For cooling system top up, only use coolant which meets the correct specification and is compatible with the existing coolant.

Changing Coolant

▲ WARNING: When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth to prevent the possibility of coolant scalding. Failure to follow this instruction may result in personal injury.

⚠ CAUTION: When draining the coolant or changing any cooling system components, it is imperative that no coolant comes into contact with the camshaft drive belt or accessory drive belt. If necessary the belt should be removed. Contamination of the belt may result in premature belt failure.

NOTE: Providing the coolant has not been contaminated with other fluids or foreign matter, the robust corrosion resistance properties of this

DESCRIPTION AND OPERATION

coolant means that it can be re-used after changing an aluminium cooling system component, although the concentration should always be checked and maintained within specification.

This coolant should be changed after a period of 10 years or 150 000 miles, whichever occurs first. Refill the cooling system with coolant which meets the correct specification and is compatible with the existing coolant.

If the engine temperature still continues to rise, stage 3 of the strategy will commence. This will result in the engine being totally disabled before major engine damage or seizure occurs. The MIL will begin to flash, indicating to the driver that the engine will be switched off after 30 seconds. This allows the driver time to choose a suitable parking place.

Fail-Safe Cooling

The vehicle has a strategy built into the powertrain control module (PCM) that will control the engine if the engine starts to overheat.

If the engine starts to overheat, stage 1 of the strategy will commence. The ECT sensor transmits a signal to the PCM which then moves the temperature gauge pointer into the red zone.

If the engine is not switched off and the temperature continues to rise, the malfunction indicator lamp (MIL) is illuminated. This indicates to the driver that the engine is approaching critical limits and should stop. At this point DTC P1285 is set in the PCM which can be retrieved using WDS.

If the MIL and temperature gauge are ignored by the driver, stage 2 of the strategy will commence. The PCM will start to control the engine by cutting out two cylinders and restricting the RPM to below 3000 RPM. The MIL will remain illuminated. This indicates that long term engine damage may occur and vehicle emissions will be affected. At this point DTC P1299 is set in the PCM which can be retrieved using WDS.

Air is drawn into the deactivated cylinders which helps to control the temperature of the engine internal components. The deactivated cylinders are alternated to allow even cooling of all the cylinders.

NOTE: If the driver is using a high percentage of throttle travel (for example, an overtaking maneuver) when the PCM starts engine deactivation (stage 2), the deactivation will be delayed for 10 seconds.

NOTE: After 2-cylinder operation has begun, the engine will not revert to 4-cylinder operation, even if the temperature should fall, until the ignition is switched off and then on again.

NOTE: The MIL can only be extinguished by using WDS after the fault has been rectified and the DTC cleared.

DIAGNOSIS AND TESTING**Engine Cooling****Special Tool(s)**

IA24001A	Pressure Tester, Cooling System 303-396 (24-001 A)
IA2400101A	Adaptor for 303-396 303-396-01

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Coolant leak(s) • Coolant level • Gasket(s) or seal(s) • Core plug(s) • Hose(s) or hose joints • Coolant expansion tank cap and seal • Coolant expansion tank • Radiator • Coolant pump • Thermostat housing • Heater core • Accessory drive belt • Coolant outlet connector	• Fuse(s) • Relay(s) • Wiring harness • Electrical connector(s) • Engine coolant temperature (ECT) sensor • Cooling fan motor • Powertrain control module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Loss of coolant	• Hose(s) or hose joint(s).	• INSPECT the hoses and hose joints. INSTALL a new hose(s) as necessary.
	• Radiator.	• INSPECT the radiator for leaks. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new radiator as necessary. REFER to: Radiator (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Coolant pump.	INSPECT the coolant pump for leaks. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new coolant pump or coolant pump gasket as necessary. REFER to: Coolant Pump (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).
	Thermostat housing.	INSPECT the thermostat housing for leaks. CARRY OUT the Pressure Test Component Test in this section. INSTALL a new thermostat housing and thermostat housing gasket as necessary. REFER to: Thermostat Housing (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).
	Coolant expansion tank cap or seal(s).	CHECK the coolant expansion tank cap for tightness and damage. INSTALL a new coolant expansion cap as necessary.
	Coolant expansion tank.	INSPECT the coolant expansion tank for damage. INSTALL a new coolant expansion tank as necessary.
	Heater core.	CHECK the heater core for leaks.
	Engine.	INSPECT the engine, cylinder head, cylinder block and cylinder head gasket. REFER to: Cylinder Head (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The engine overheats (signs of coolant boiling)	Cooling system does not hold pressure.	- INSPECT the coolant expansion tank for damage. INSTALL a new coolant expansion tank as necessary. - INSPECT the coolant pump or coolant pump gasket for damage. INSTALL a new coolant pump or coolant pump gasket as necessary. REFER to: Coolant Pump (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation). - INSPECT the engine, cylinder head, cylinder block and cylinder head gasket. REFER to: Cylinder Head (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair).
	Air in cooling system.	BLEED the cooling system. REFER to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).
	Coolant expansion tank cap or seal(s).	CHECK the coolant expansion tank cap for tightness and damage. INSTALL a new coolant expansion cap as necessary.
	Coolant expansion tank.	INSPECT the coolant expansion tank for damage. INSTALL a new coolant expansion tank as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Coolant level or condition.	- CHECK the coolant level. REFILL the cooling system as necessary. REFER to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures). - CHECK the coolant condition and concentration REFER to: Specifications (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Specifications). If the coolant is contaminated or the concentration is below specifications, drain and refill with new coolant. REFER to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).
	Radiator grille.	INSPECT the radiator grille for air restrictions or damage. REPAIR or INSTALL new parts as necessary.
	Coolant pump.	CARRY OUT the Pressure Test Component Test in this section. INSPECT the coolant pump for leaks. INSTALL a new coolant pump or coolant pump gasket as necessary. REFER to: Coolant Pump (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).
	Thermostat.	CARRY OUT the Thermostat Test Component Test in this section. INSTALL a new thermostat housing and thermostat housing gasket as necessary. REFER to: Thermostat Housing (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Accessory drive belt.	• CHECK the condition of the accessory drive belt. REFER to: Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).
	• Cooling fan.	• CHECK the operation of the cooling fan. REFER to WDS.
	• Engine.	• INSPECT the engine, cylinder head, cylinder block and cylinder head gasket. REFER to: Cylinder Head (303-01 Engine - 1.3L Duratec-8V (Rocam), In-vehicle Repair).
• The engine does not reach normal operating temperature.	• ECT sensor.	• CHECK the ECT sensor. REFER to WDS.
	• Temperature gauge.	• CHECK the instrument cluster engine temperature gauge. REFER to: Instrument Cluster - Vehicles Built Up To: 10/2005 (413-01 Instrument Cluster, Diagnosis and Testing) / Instrument Cluster - Vehicles Built From: 10/2005 (413-01 Instrument Cluster, Removal and Installation).
	• Thermostat.	• CARRY OUT the Thermostat Test Component Test in this section. INSTALL a new thermostat housing and thermostat housing gasket as necessary. REFER to: Thermostat Housing (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).

Component Tests**Pressure Test**

▲ WARNING:When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth to prevent the possibility of coolant scalding. Failure to follow this instruction may result in personal injury.

NOTE:If the coolant expansion tank cap is rotated counterclockwise by 1/2 a full turn, the pressurized coolant will be vented to the underside of the coolant expansion tank cap.

1. Remove the coolant expansion tank cap.
2. Install the special tools 303-396 and 303-396-01 to the coolant expansion tank.
3. Pressurize the system to the coolant expansion tank cap release pressure.

REFER to: Specifications (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Specifications).

DIAGNOSIS AND TESTING

4. Observe the cooling system pressure tester gauge reading for approximately two minutes. The pressure should not drop during this time. If the system holds pressure, proceed to Step 7. If the system does not hold pressure, check it thoroughly for coolant leaks.
5. Check the engine for coolant leaks. Drain the cooling system, repair any coolant leaks found and fill and bleed the cooling system as necessary.

REFER to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).

6. Recheck the system by repeating Steps 3 and 4 at least twice.

Radiator Leak Test, Removed From Vehicle

⚠ CAUTION: Radiator internal pressure must not exceed 138 kpa (20 psi) or damage may result.

Clean the radiator thoroughly before leak testing it, to prevent contamination of the water in the test tank. Leak test the radiator in clean water with 138 kpa (20 psi) air pressure. Check it thoroughly for air leaks. INSTALL a new radiator if necessary.

REFER to: Radiator (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).

Coolant Expansion Tank Cap Pressure Test

▲ WARNING: When releasing the system pressure, cover the expansion tank cap with a thick cloth to prevent the possibility of coolant scalding. Failure to follow this instruction may result in personal injury.

1. Remove the coolant expansion tank cap.
2. Use water to clean the area of the rubber seal and pressure relief valve. Install the pressure tester and adapter and immerse the coolant expansion tank cap in water.

NOTE: If the plunger of the pump is depressed too quickly, an erroneous pressure reading will result.

3. Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing, and note the highest pressure reading obtained.
4. Release pressure by turning the pressure relief screw counterclockwise. Tighten the pressure relief screw and repeat step 3 at least twice to

make sure the pressure test reading is repeatable and within acceptable gauge reading limits of the coolant expansion tank cap.

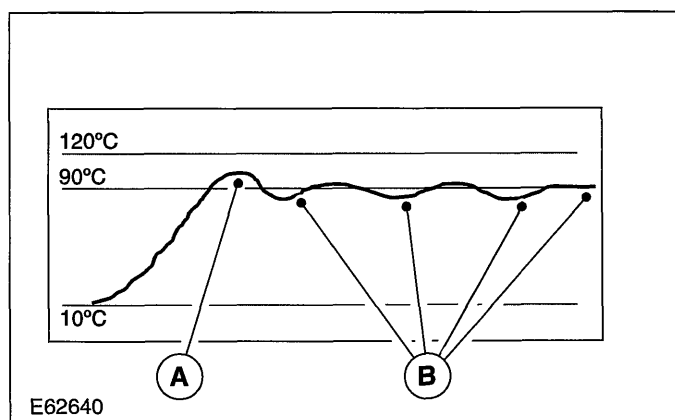
5. If the pressure test gauge readings are not within the acceptable gauge reading limits, INSTALL a new coolant expansion tank cap.

Thermostat Test

1. Connect the WDS to the data link connector (DLC).
2. Using the WDS datalogger function, SELECT the following sensors (as applicable to the application):
 - IAT - intake air temperature (IAT) sensor
 - ECT - engine coolant temperature (ECT) sensor
 - CHT - cylinder head temperature (CHT) sensor
 - LOAD - engine load
 - VSS - vehicle speed sensor (VSS)
 - RPM - engine speed
 - DSRPM - desired engine speed

The IAT sensor output is useful if the engine being tested is cold or after an over-night cold soak. The ECT sensor or CHT sensor and the IAT sensor should either indicate the same value or be within 1 to 2 degrees Celsius of each other.

The ECT sensor output is important to display as it indicates the engine warm-up and opening temperature for the thermostat. It will initially indicate a slightly higher reading just before the thermostat opens and then drops back before settling to a near flat line output (see graphic below).



Item	Description
A	Thermostat opens
B	Thermostat settles into a cyclic open and closure pattern

DIAGNOSIS AND TESTING

⚠ CAUTION: If the ECT sensor output reaches the 120°C default line under normal cooling system pressure, internal damage may be caused to the engine and a diagnostic trouble code (DTC) will be set in the PCM. The test should be stopped and the cause located and corrected. If the cooling system does not pressurize, the coolant will boil at 100°C which may also damage the engine. **CARRY OUT** the Coolant Expansion Tank Cap Pressure Test Component Test in this section.

If the WDS only allows the ECT sensor to be displayed in volts, refer to the following table for corresponding Celsius values:

Volts	°Celsius
1.33	60
1.02	70
0.78	80
0.60	90
0.46	100
0.35	110
0.27	120

The CHT sensor output is useful to examine the cylinder head temperature rise during the warm-up cycle and later during the normal light throttle cruise test. This sensor output may vary between vehicles with manual transmission and vehicles with automatic transmission and should be used for reference only.

The LOAD display is used for reference as it is necessary to maintain a stable load line during the test. It is necessary to carry out the test under normal light throttle cruise driving conditions and average loads, typically 40% to 70% of the load value.

The VSS output is used for reference but can help to identify misfires and sensors which fail during the warm-up cycle.

The RPM display indicates the engine speed and can be compared with the DSRPM.

The DSRPM is the desired or calculated idle speed which the PCM commands the engine to reach. If the thermostat opens too early (before the correct opening temperature has been reached), the engine will not reach this value.

When using the WDS in data logger mode, the signals recorded should remain within the DEFAULT values set by the WDS.

- ⚠ WARNING:** Make sure that the WDS is placed in the vehicle so that it does not interfere with the safe operation of the vehicle. Do not place the WDS in the deployment path of any air bag. Failure to follow these instructions may result in personal injury.

NOTE: The road test is best carried out with the aid of another technician in the vehicle to enable the vehicle to be driven safely while the sensor outputs are monitored within datalogger. If there is only one technician available, the WDS can be set up (using the record/capture mode camera icon) before leaving the workshop to record a 16 km (10 mile) test.

NOTE: The results from the test are more conclusive if the engine is cold when the test is started.

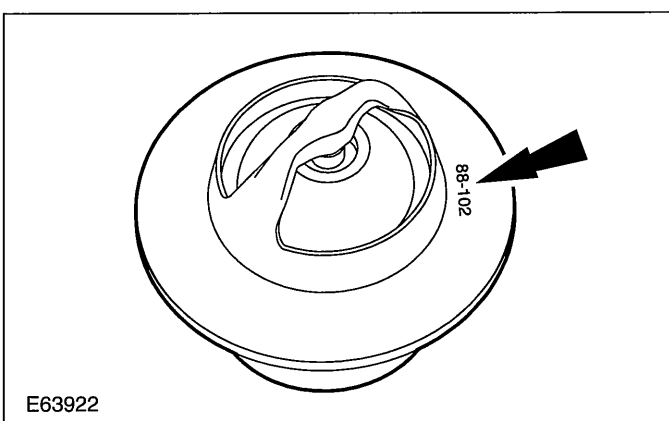
Carry out a road test.

REFER to: Road/Roller Testing (100-00 General Information, Description and Operation).

- Drive the vehicle at a constant throttle opening and set speed until the ECT value settles into a shallow rise and fall signal, close to a straight line. This indicates that the thermostat is functioning correctly.

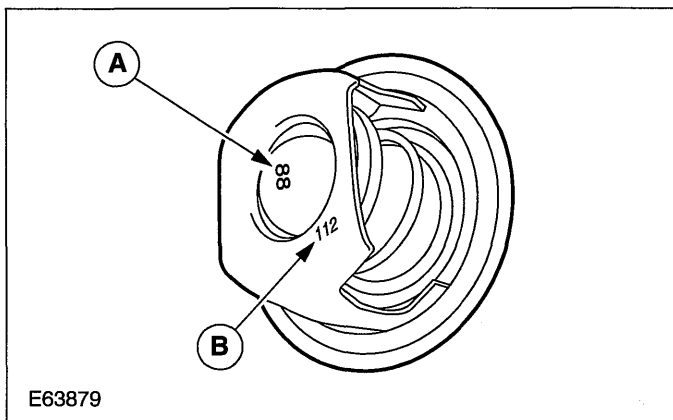
NOTE: Some thermostats indicate the temperature(s) in Celsius and Fahrenheit.

The graphic below shows the location and an example of the opening temperature (88°C) and fully open temperature (102°C) of a thermostat.



The graphic below shows an alternative method used to show the opening temperature (88°C) and fully open temperature (112°C) of a thermostat.

DIAGNOSIS AND TESTING



Item	Description
A	Opening temperature
B	Fully open temperature

NOTE: Generally, most thermostats maintain a coolant temperature between 88°C (190°F) and 92°C (198°F) although dual stage electric thermostats may increase the coolant temperature up to 100°C (212°F) under light engine load conditions.

The engine should start cleanly and the ECT value will rise quite quickly with smooth progression. If the ECT signal appears unstable or erratic, the ECT sensor, electrical connector and wiring harness to the PCM need to be visually inspected for damage, chafing or water ingress.

The temperature should rise to approximately 90°C for a thermostat that has an 88°C value. The signal value will then fall as cooler coolant enters the engine.

If the ECT value fails to maintain a constant value and falls back to lower figures, typically between 60°C (140°F) and 70°C (150°F), the thermostat and its sealing function within the thermostat housing must be checked.

5. INSTALL a new thermostat housing and thermostat housing gasket as necessary.

REFER to: Thermostat Housing (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), Removal and Installation).

6. Carry out another road test from step 1 using the same criteria to confirm that the concern has been rectified.
7. Using the WDS, clear the PCM keep alive memory (KAM) or electrically erasable programmable read only memory (EEPROM) so that new drive values can be learnt.

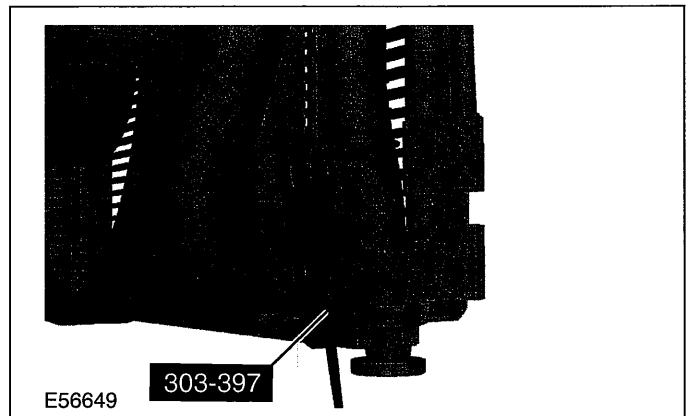
GENERAL PROCEDURES

Cooling System Draining, Filling and Bleeding(24 122 0)

Special Tool(s)



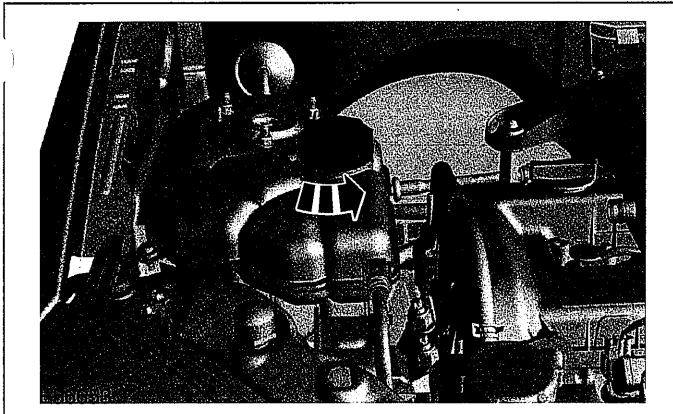
- Allow the coolant to drain into a suitable container.



Draining

1. **▲WARNING:**When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

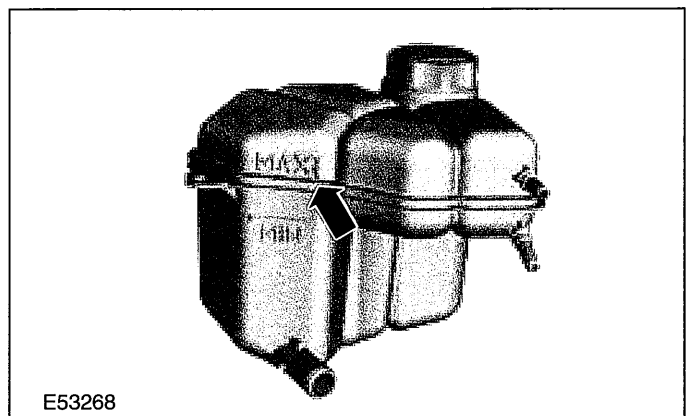
Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn.



5. Install the radiator lower hose.
6. Lower the vehicle.

Filling and Bleeding

1. Fill the coolant expansion tank to the MAX mark.



2. Remove the coolant expansion tank cap.
3. Raise and support the vehicle.
For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).
4. Using the special tool, disconnect the radiator lower hose to drain the cooling system.

2. **NOTE:**Do not allow the engine to reach normal operating temperature.

Start the engine, run the engine briefly at 2500 revolutions per minute (RPM) for 10 seconds to prime the heater circuit.

3. Switch the engine off.
4. Fill the coolant expansion tank 15 mm over the MAX mark.
5. Install the coolant expansion tank cap.
6. Start the engine, maintain the engine speed at 2500 RPM for eight minutes or until the engine reaches normal operating temperature.

GENERAL PROCEDURES

7. Maintain the engine speed at 2500 RPM for three minutes after the engine has reached normal operating temperature.
8. Increase the engine speed to 4000 RPM for five seconds.
9. Decrease the engine speed to 2500 RPM for three minutes.
10. Increase the engine speed to 4000 RPM for five seconds.
11. Decrease the engine speed to 2500 RPM for three minutes.
12. Switch the engine off.
13. Check the cooling system for leaks.
14. Allow the engine to cool.
15. Fill the coolant expansion tank to the MAX mark.

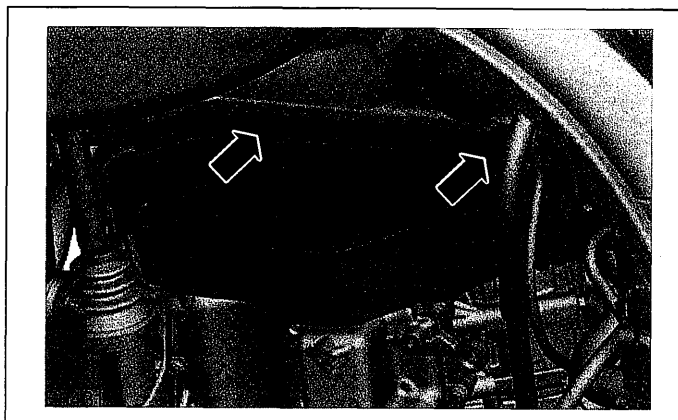
REMOVAL AND INSTALLATION

Coolant Pump(24 404 0)

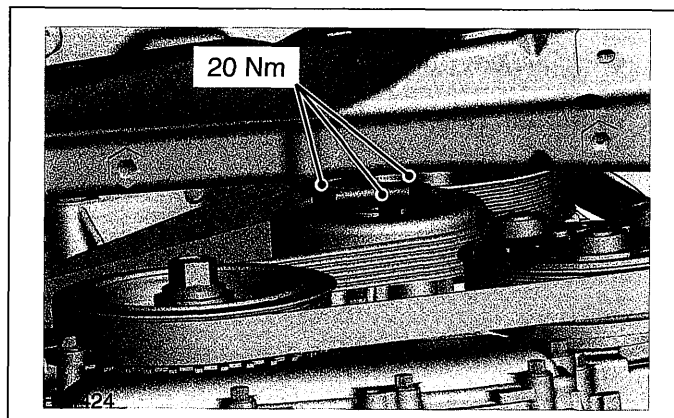
1. Drain the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).

2. Remove the crankshaft pulley splash shield.



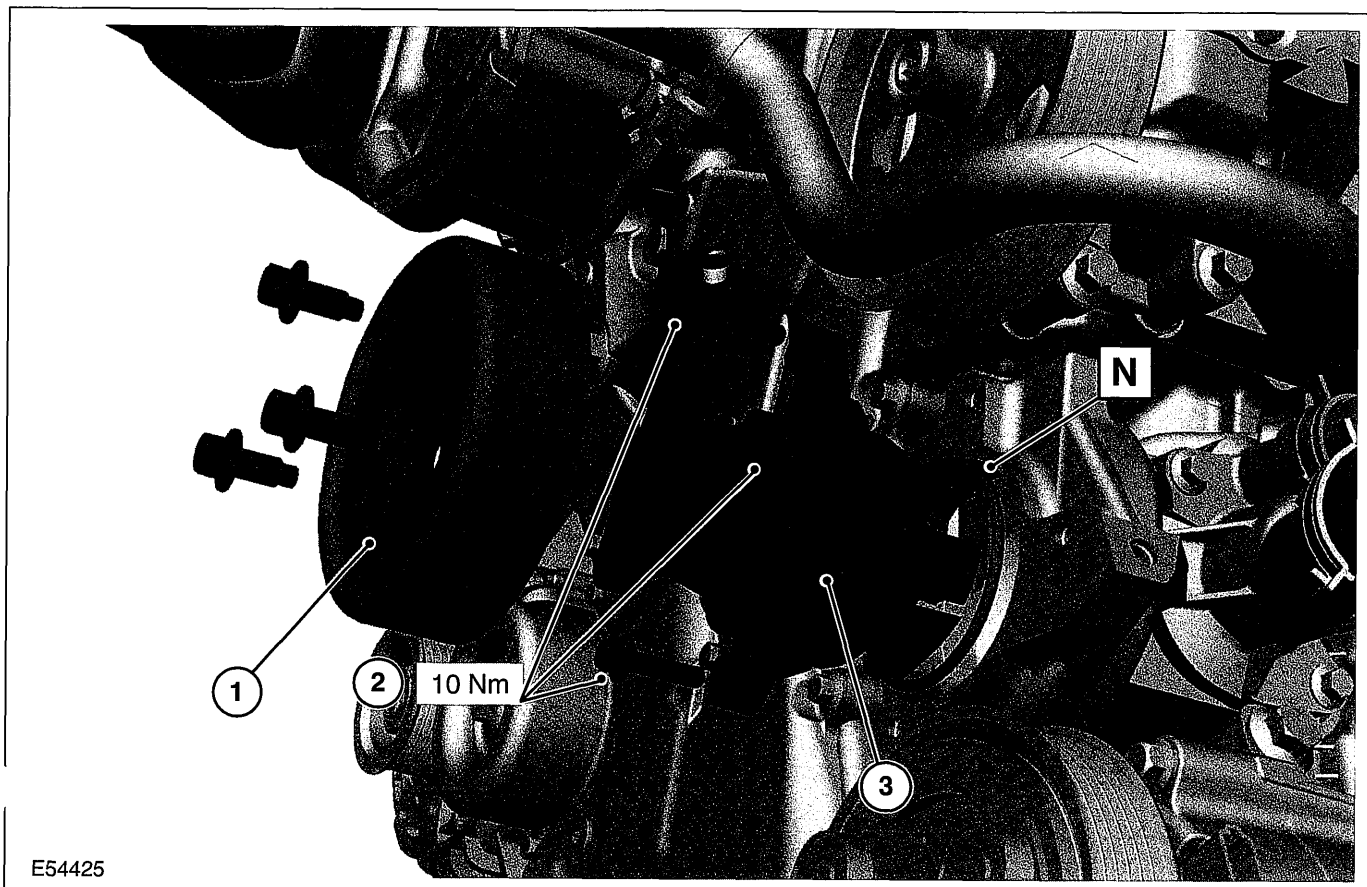
3. Loosen the coolant pump pulley retaining bolts.



4. Remove the accessory drive belt.

For additional information, refer to: Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

5. Remove the components in the order indicated in the following illustration(s) and table(s).



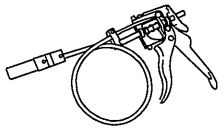
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REMOVAL AND INSTALLATION

Item	Description
1	Coolant pump pulley
2	Coolant pump retaining bolts
3	Coolant pump
4	Coolant pump gasket

6. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Thermostat Housing****Special Tool(s)**

 24003	Remover/Installer, Coolant Hose Clamp 303-397
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1. Drain the cooling system.

For additional information, refer to: **Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).**

2. Lower the vehicle.**3. Remove the right-hand headlamp assembly.**

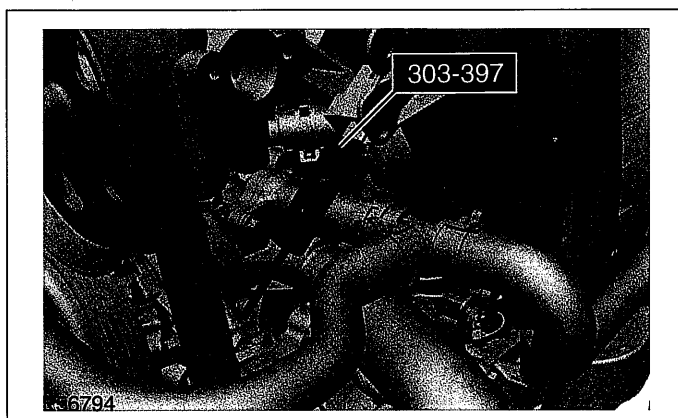
For additional information, refer to:
Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

4. Remove the components in the order indicated in the following illustration(s) and table(s).

REMOVAL AND INSTALLATION

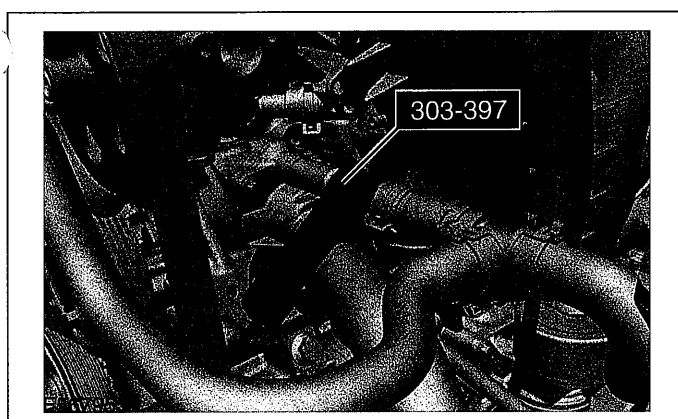
Item 1 Thermostat housing to coolant expansion tank and heater core return coolant hose

1. Using the special tool, disconnect the thermostat housing to coolant expansion tank and heater core return coolant hose.



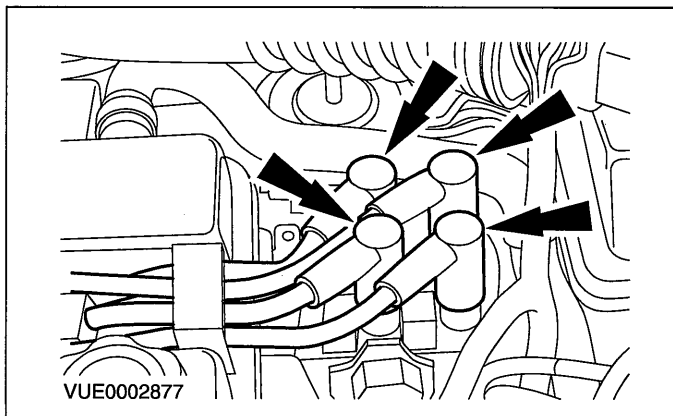
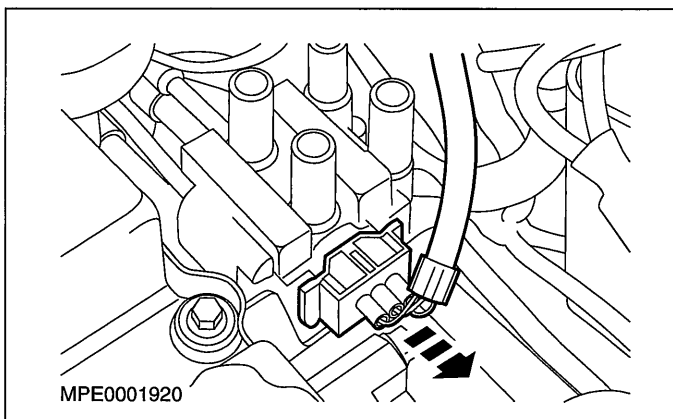
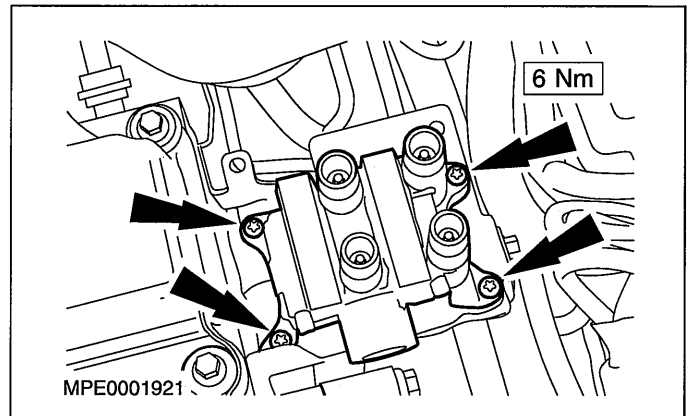
Item 2 Radiator lower to thermostat housing coolant hose

1. Using the special tool, disconnect the radiator lower to thermostat housing coolant hose.

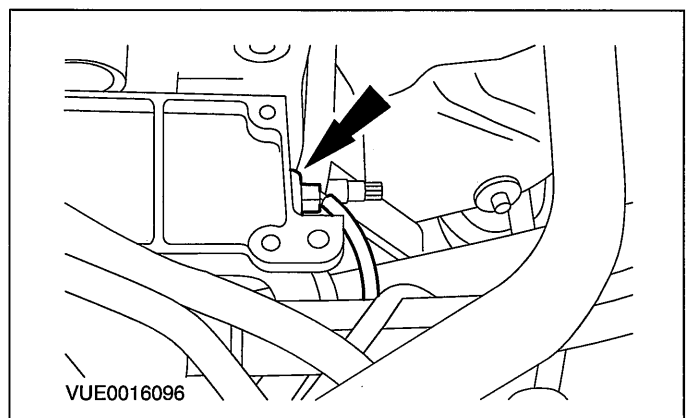


REMOVAL AND INSTALLATION**Coolant Outlet Connector****Removal****1. Remove the air cleaner.**

For additional information, refer to: **Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).**

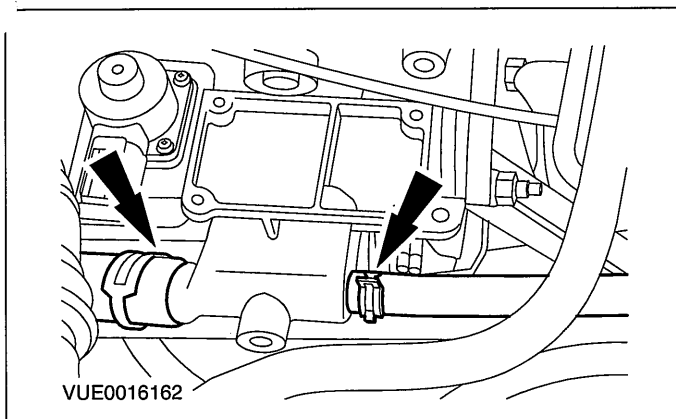
2. Disconnect the spark plug wires from the ignition coil pack.**3. Disconnect the ignition coil pack electrical connector.****4. Remove the ignition coil pack.****5. Drain the cooling system.**

For additional information, refer to: **Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).**

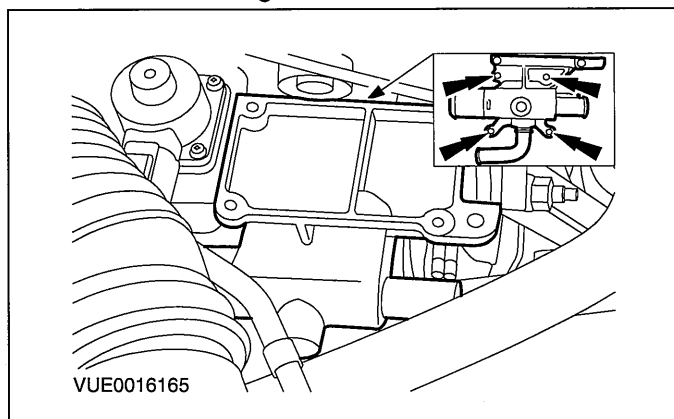
6. Disconnect the engine coolant temperature (ECT) sensor electrical connector.

REMOVAL AND INSTALLATION

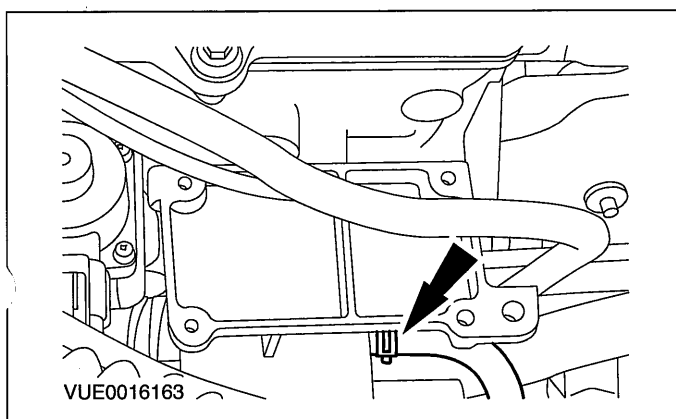
7. Disconnect the radiator hose and the heater hose from the coolant outlet connector.



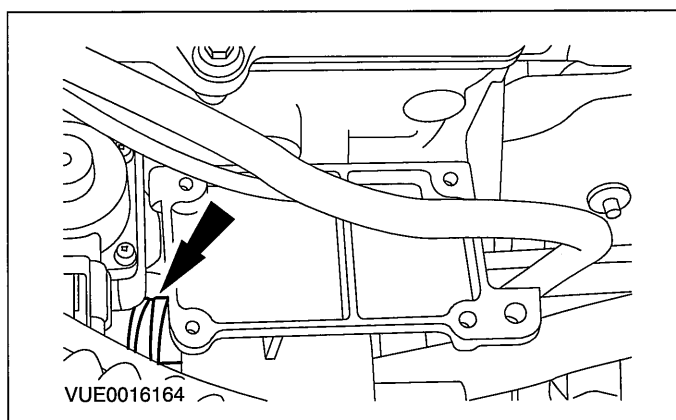
- Discard the gasket.



8. Disconnect the coolant expansion tank hose from the coolant outlet connector.



9. Disconnect the thermostat housing coolant hose from the coolant outlet connector.

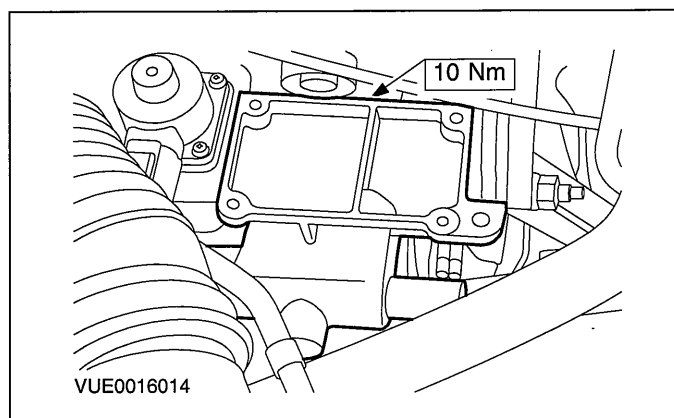


10. Remove the coolant outlet connector.

Installation

1. **NOTE:** Install a new coolant outlet connector gasket.

To install, reverse the removal procedure.



REMOVAL AND INSTALLATION

Radiator(24 254 0)

Removal

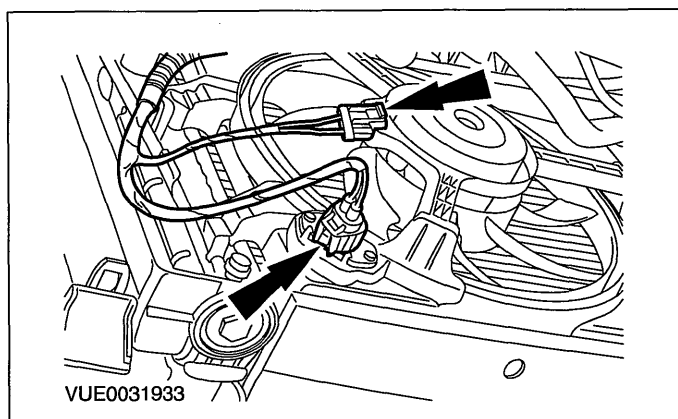
1. Disconnect the battery ground cable.

For additional information, refer to: **Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).**

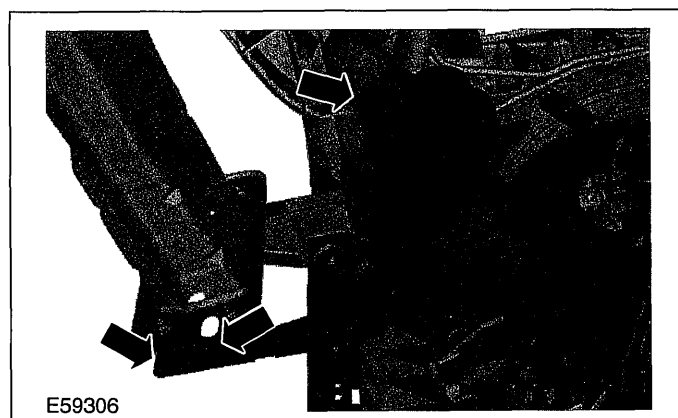
2. Drain the cooling system.

For additional information, refer to: **Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).**

3. Disconnect the cooling fan motor and cooling fan resistor electrical connectors.



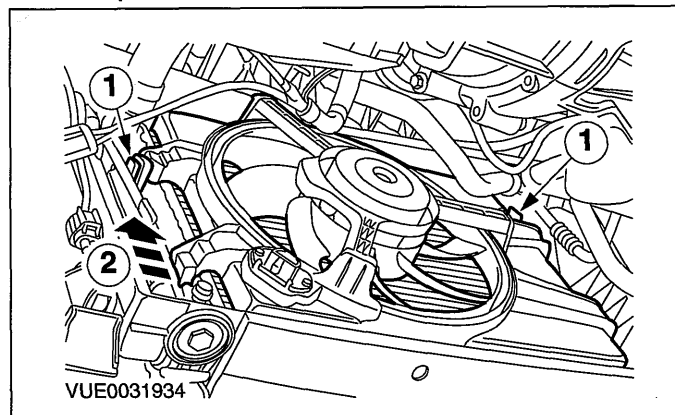
4. Remove the air cleaner intake pipe resonator.



5. Remove the cooling fan motor and shroud.

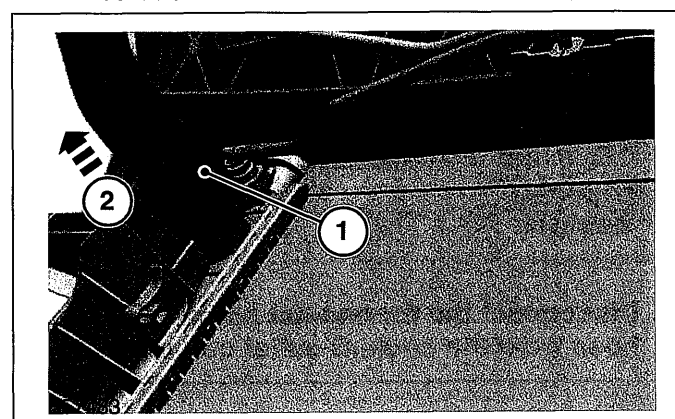
1. Release the cooling fan motor and shroud from the retaining brackets.

2. Push the cooling fan motor and shroud upwards and then downwards to remove.



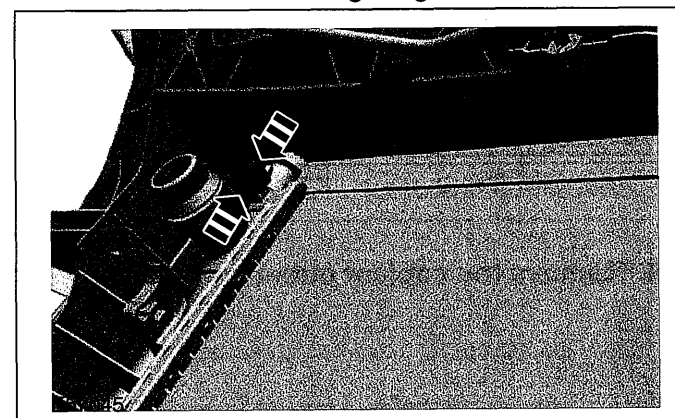
6. Disconnect the radiator upper hose.

1. Pull out the quick release spring clip.
2. Pull the radiator upper hose from the quick release connector.



7. Disconnect the radiator degas hose from the radiator.

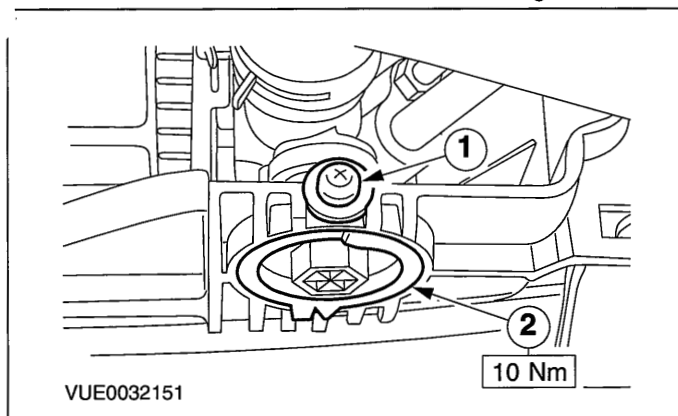
- Release the locking tangs.



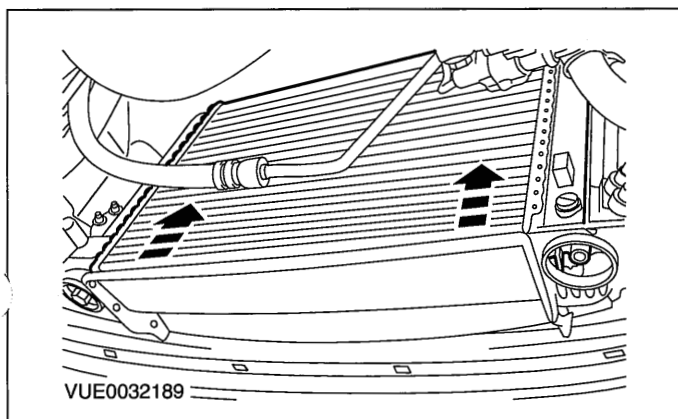
8. Remove the radiator retainers.

REMOVAL AND INSTALLATION

1. Remove the radiator retainer locking screws.
2. Remove the radiator retainers and grommets.

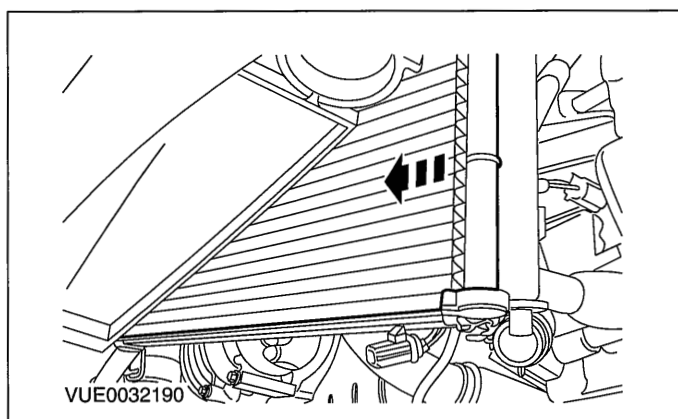


9. Detach the radiator and the air conditioning (A/C) condenser from the support panel.



10. **⚠ CAUTION:** Support the A/C condenser by positioning it on the support panel.

Slide the A/C condenser to detach it from the radiator



11. Remove the radiator.

Installation

1. To install, reverse the removal procedure.



SECTION 303-04A Fuel Charging and Controls — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-04A-2
DIAGNOSIS AND TESTING	
Fuel Charging and Controls.....	303-04A-3
Principles Of Operation.....	303-04A-3
Inspection and Verification.....	303-04A-3
REMOVAL AND INSTALLATION	
Throttle Body.....	(23 198 0) 303-04A-4
Fuel Charging Wiring Harness.....	(36 437 0) 303-04A-5
Fuel Injection Supply Manifold.....	(23 450 0) 303-04A-7

**Fuel Charging and Controls — 1.25L
Duratec-16V (Sigma)/1.4L Duratec-16V
(Sigma)/1.6L Duratec-16V (Sigma)**

303-04A-2

303-04A-2

SPECIFICATIONS

General Specifications

Condition	Specification
Regulated fuel pressure	380 kpa (55 psi)
Maximum idle increase for high generator load	100 rpm
Air conditioning idle upspeed at low ambient temperatures	100 rpm
Air conditioning idle upspeed at high ambient temperatures	150 rpm
Power steering idle speed upspeed	50 rpm

Torque Specifications

Description	Nm	lb-ft	lb-in
Throttle body retaining bolts	10	-	89
Fuel pressure regulator retaining bolts	10	-	89
Fuel injection supply manifold retaining bolts	15	11	-

DIAGNOSIS AND TESTING

Fuel Charging and Controls

Principles Of Operation

REFER to: Acceleration Control (310-02A,
Diagnosis and Testing).

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Fuel leak(s) – Blocked or contaminated fuel filter – Fuel rail – Vacuum line(s) – Throttle body	– Wiring harness – Electrical connector(s) – Fuel injector(s) – Throttle body

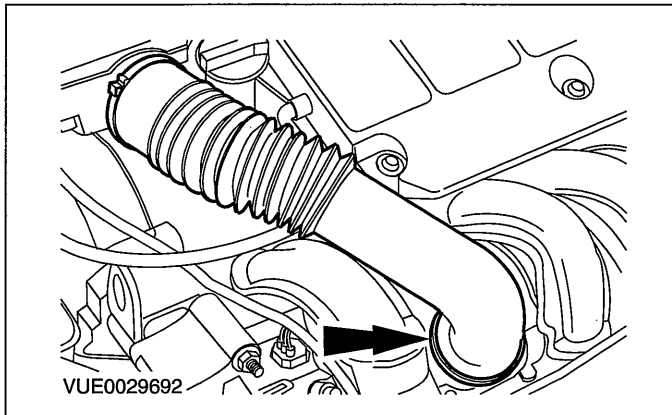
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to WDS.

REMOVAL AND INSTALLATION

Throttle Body(23 198 0)

Removal

1. Disconnect the air cleaner outlet pipe from the throttle body.

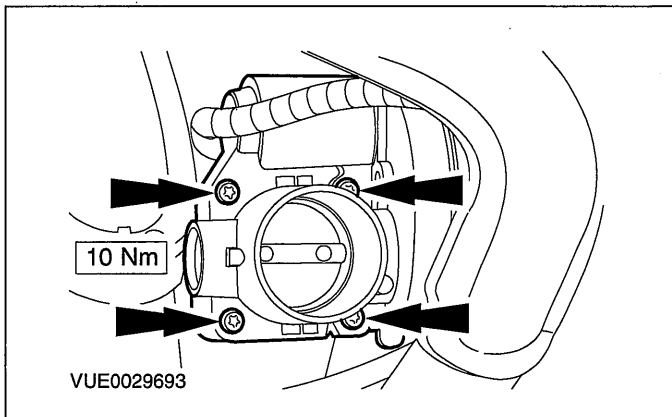


2. **NOTE:** Do not press the accelerator pedal during the initialization period as this will prevent the complete initialization of the throttle body.

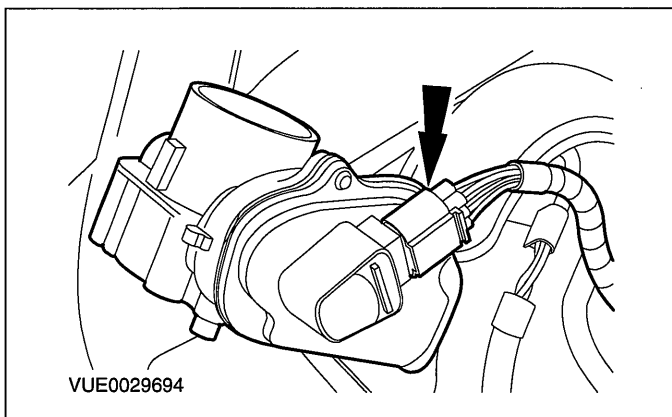
Turn the ignition key to position II and wait for one minute to initialize the throttle body.

3. Turn the ignition key to the OFF position.

2. Remove the throttle body retaining bolts.



3. Disconnect the throttle body electrical connector and remove the throttle body.



Installation

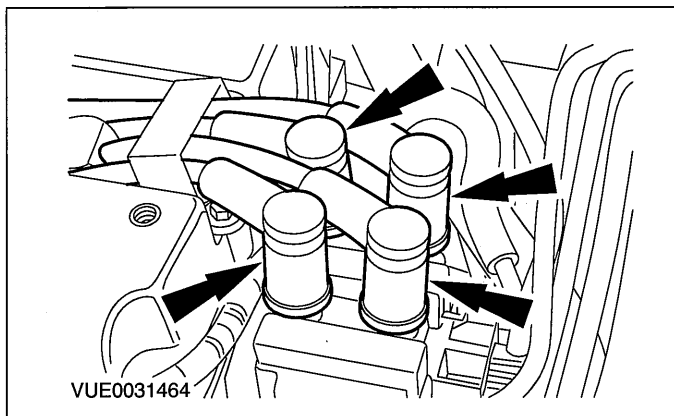
1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

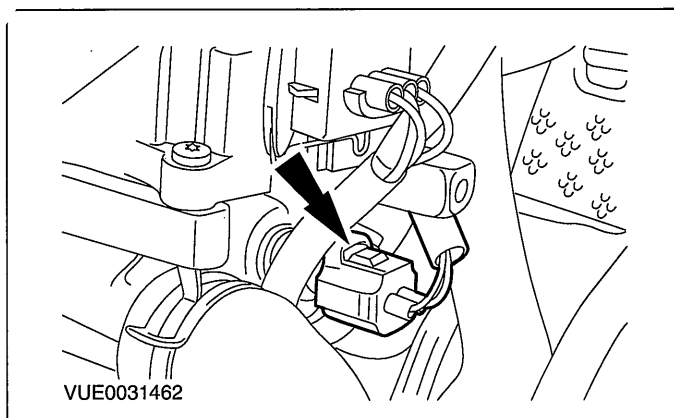
Fuel Charging Wiring Harness(36 437 0)

Removal

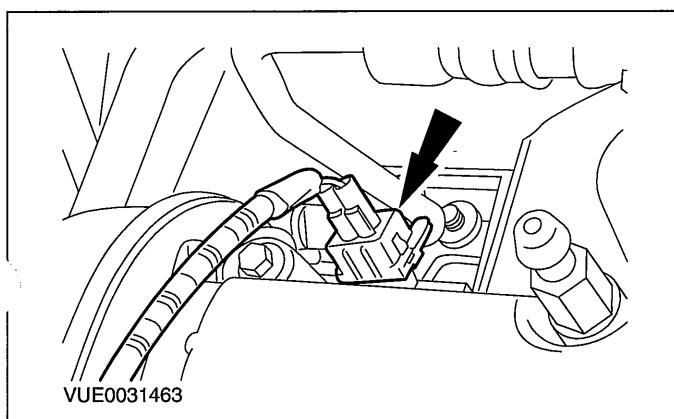
1. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
2. Disconnect the spark plug wires from the ignition coil.



3. Disconnect the engine coolant temperature (ECT) sensor electrical connector.

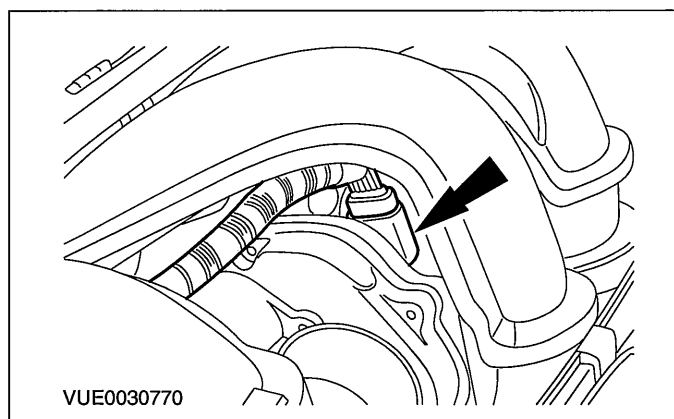


4. Disconnect the camshaft position (CMP) sensor electrical connector.

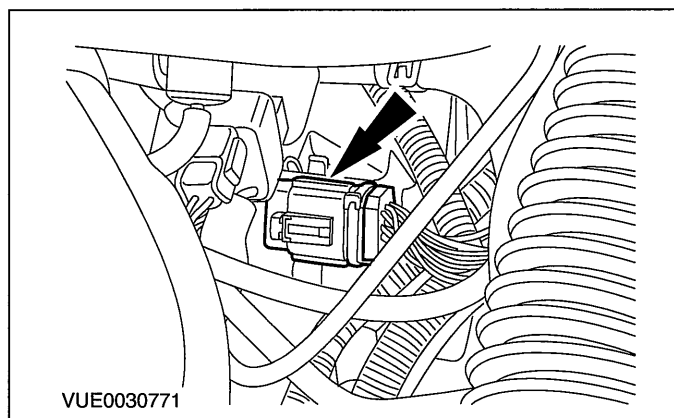


5. **NOTE:** It is necessary to lift the red locking tab before the electrical connector can be disconnected.

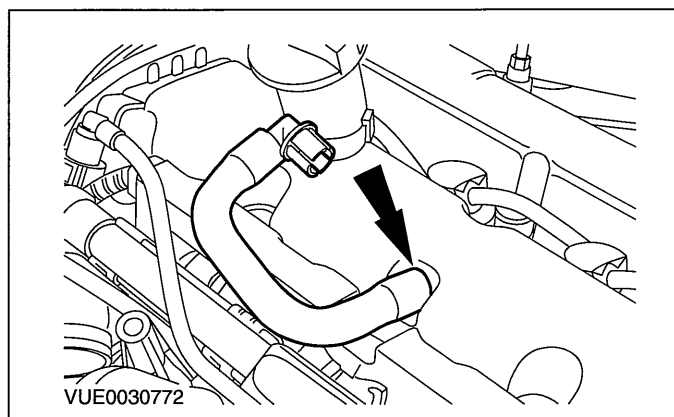
Disconnect the throttle body electrical connector.



6. Disconnect the fuel charging wiring harness electrical connector.

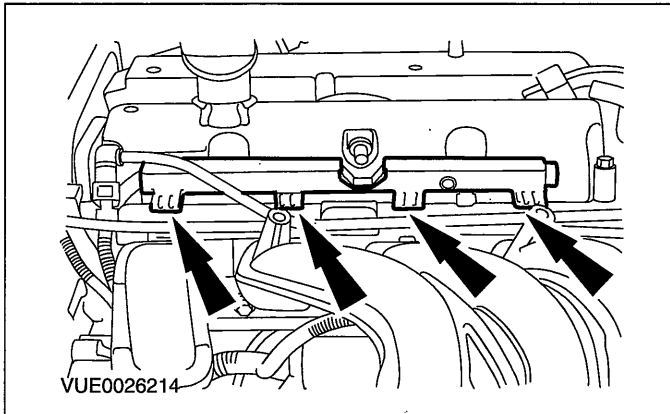


7. Remove the positive crankcase ventilation (PCV) hose.



REMOVAL AND INSTALLATION

8. Disconnect the fuel injector electrical connectors and remove the fuel charging wiring harness.



Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

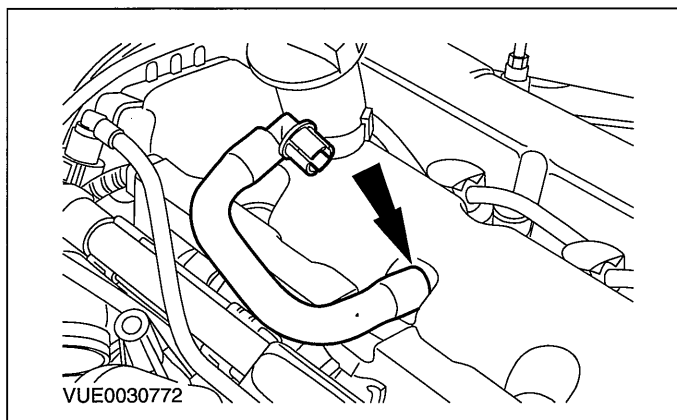
Fuel Injection Supply Manifold(23 450 0)

Removal

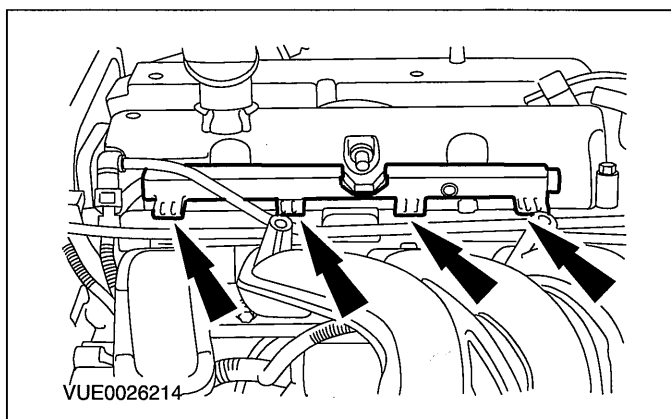
WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and can ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

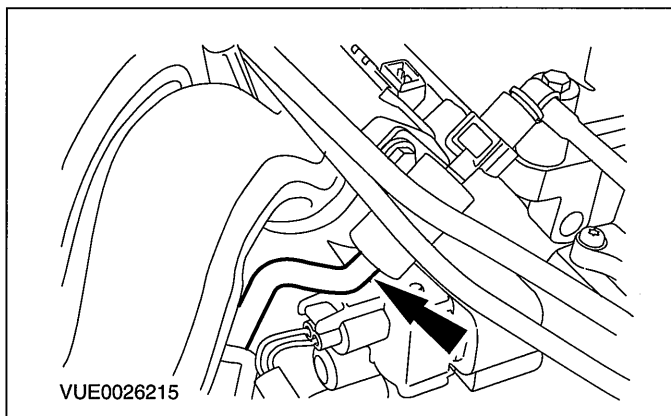
1. Release the fuel system pressure. For additional information, refer to Section 310-00 [Fuel System - General Information].
2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
3. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
4. Remove the positive crankcase ventilation (PCV) hose.



5. Disconnect the fuel injector electrical connectors and position the wiring harness to one side.



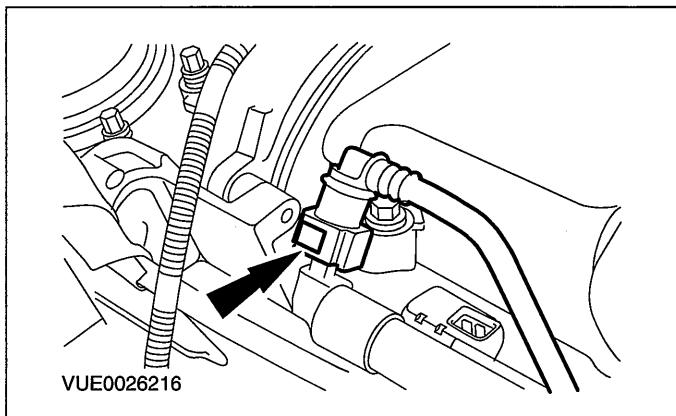
6. Disconnect the vacuum line from the fuel pressure regulator.



7. **NOTE:** Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

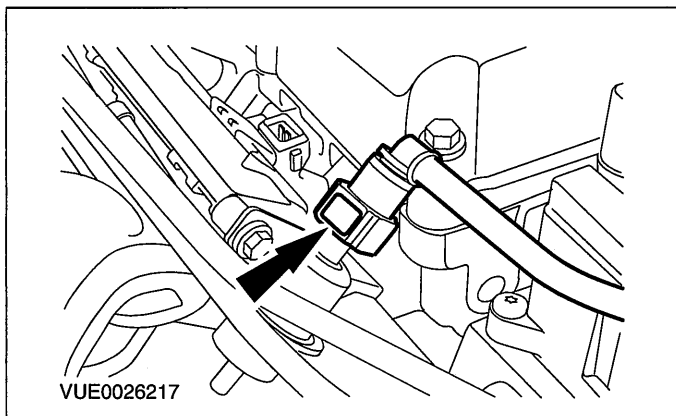
REMOVAL AND INSTALLATION

Disconnect the fuel supply line from the fuel injection supply manifold. For additional information, refer to Section 310-00 [Fuel System - General Information].

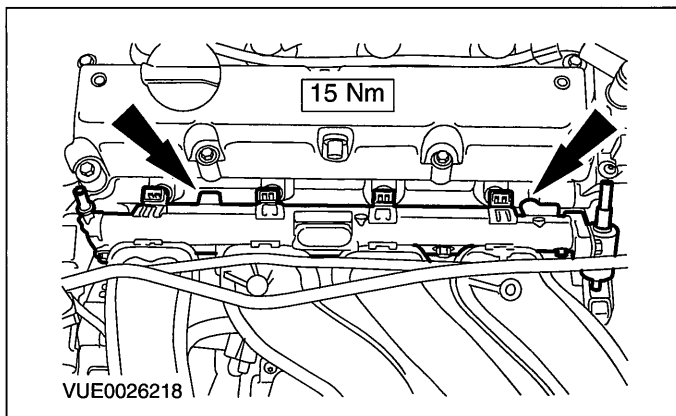


8. **NOTE:** Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

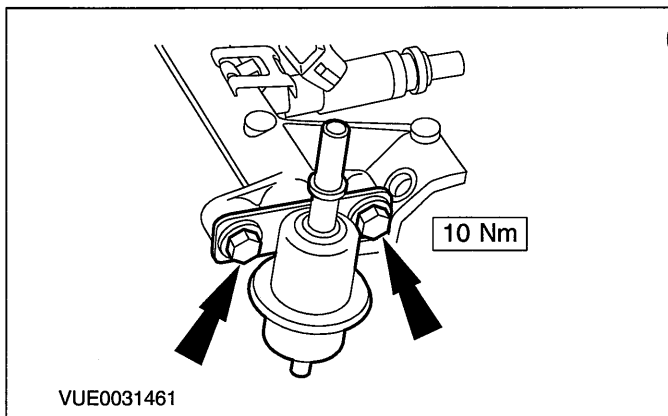
Disconnect the fuel return line from the fuel injection supply manifold. For additional information, refer to Section 310-00 [Fuel System - General Information].



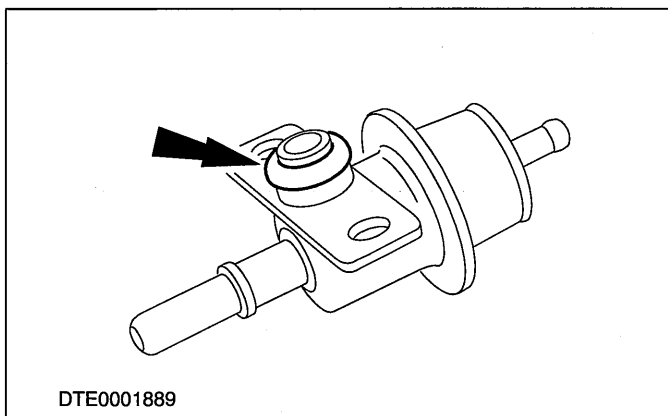
9. Remove the fuel injection supply manifold.



10. Remove the fuel pressure regulator.



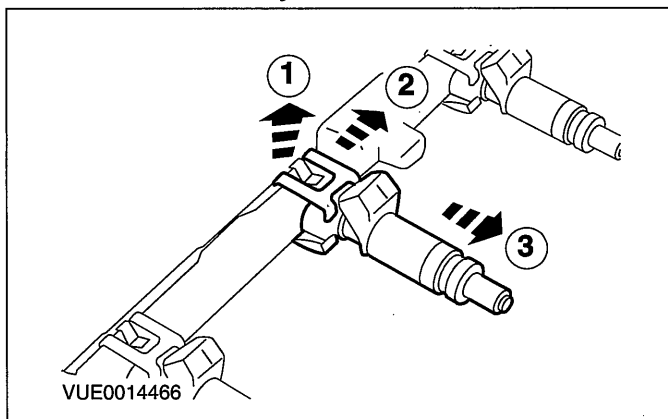
11. Remove and discard the O-ring seal.



12. **NOTE:** Discard the fuel injector O-ring seals.

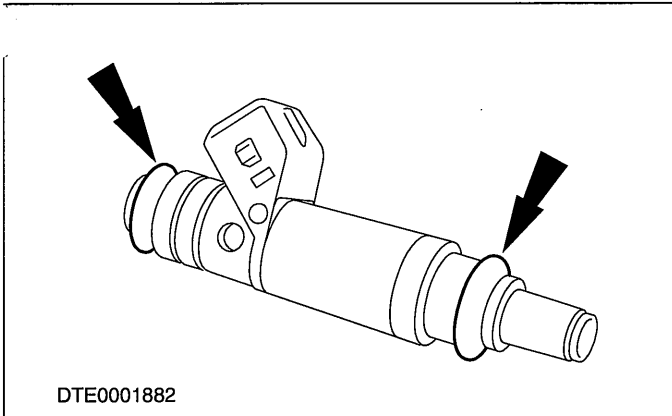
Remove the fuel injectors from the fuel injection supply manifold.

1. Lift the retaining clip.
2. Slide the retaining clip.
3. Pull the fuel injector.



REMOVAL AND INSTALLATION

13. Remove and discard the O-ring seals.



Installation

WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and can ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

1. NOTE: Install new fuel injector O-ring seals.

NOTE: Install a new fuel pressure regulator O-ring seal.

NOTE: Lubricate the O-ring seals with clean engine oil to aid installation.

To install, reverse the removal procedure.



SECTION 303-04B Fuel Charging and Controls — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-04B-2
DESCRIPTION AND OPERATION	
Fuel Charging and Controls.....	303-04B-3
DIAGNOSIS AND TESTING	
Fuel Charging and Controls.....	303-04B-5
Principles of Operation.....	303-04B-5
Inspection and Verification.....	303-04B-8
Symptom Chart.....	303-04B-9
REMOVAL AND INSTALLATION	
Throttle Body.....	303-04B-24
Fuel Injectors..... (23 455 0)	303-04B-26
Fuel Rail.....	303-04B-27

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Throttle body retaining bolts	10	—	89
Fuel injection supply manifold retaining bolts	25	18	—

Fuel Charging and Controls

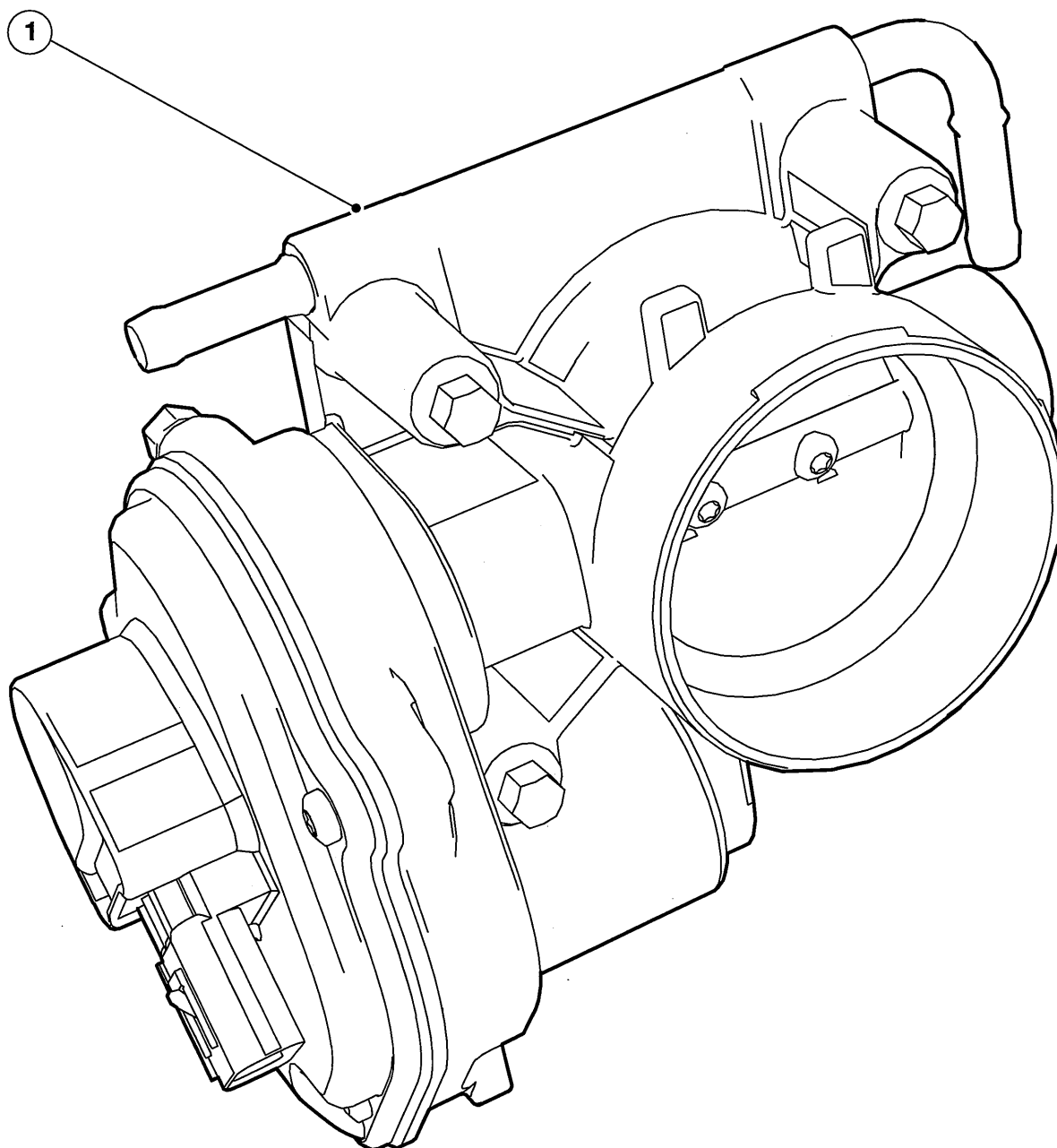


The fuel injectors are fitted directly into the fuel injection supply manifold and are retained by the fuel injector retaining clips. Sealing between the

DESCRIPTION AND OPERATION

fuel injector to fuel injection supply manifold and the intake manifold is achieved by means of upper and lower O-ring seals.

The fuel injectors are activated sequentially by the powertrain control module (PCM) which modifies the fuel quantity by adjusting fuel injector opening times according to the engine operating conditions.



E48343

Item	Description
1	Throttle body

Throttle Body

The throttle butterfly position is controlled by a signal from the PCM which receives an input from the accelerator pedal position sensor. The system is fully electronic and does not use any cables.

The signal from the PCM is used to control a DC motor within the throttle body which is connected to the throttle butterfly through gears.

The throttle body also gives inputs back to the PCM. This information allows the PCM to compensate for factors such as carbon build up within the throttle body and throttle body wear. The throttle body also provides information to the PCM to enable the flagging of a DTC.

DIAGNOSIS AND TESTING**Fuel Charging and Controls****General Equipment**

Worldwide Diagnostic System (WDS)

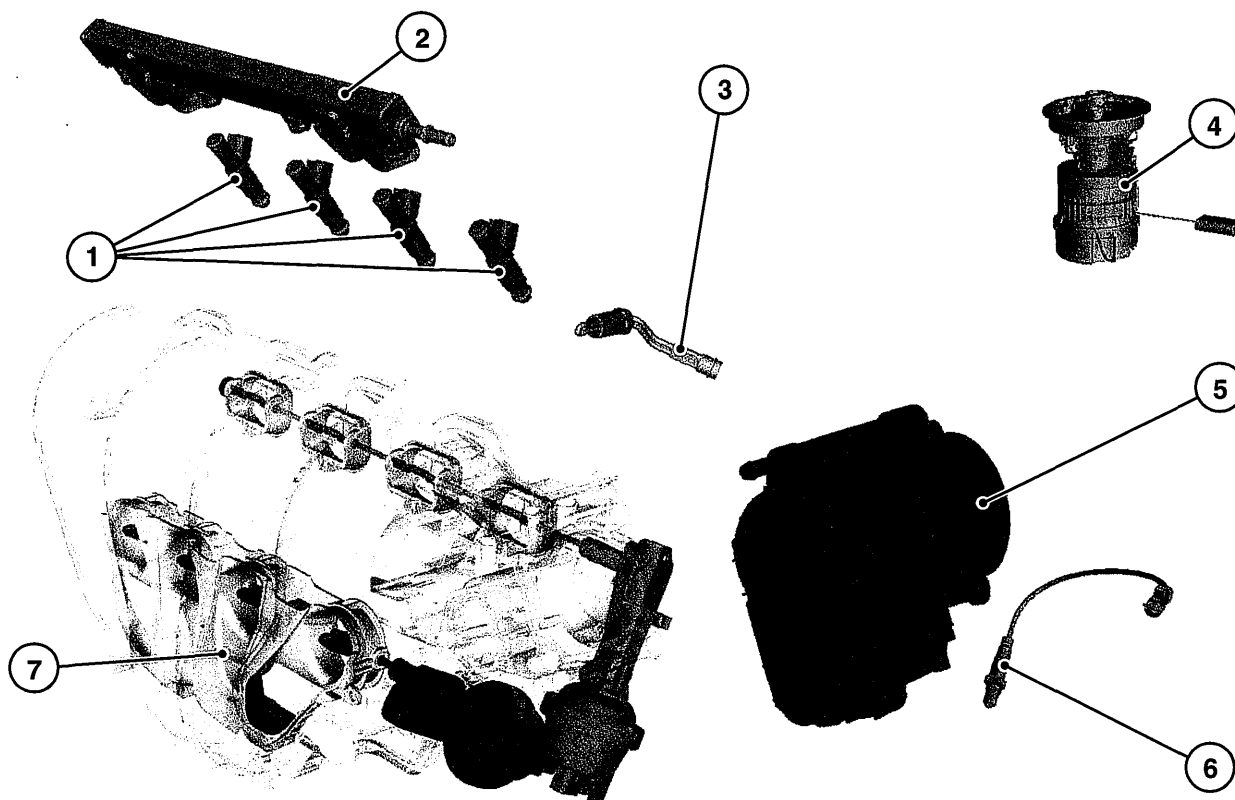
Principles of Operation**Ethanol equipped vehicles**

Ethanol, is derived from cellulose waste. A large proportion of Ethanol is distilled from corn, wheat and sugar cane crops. The product that is to be used in this vehicle is called Ethanol E85. E85 is a mixture of 15% gasoline and 85% Ethanol. Ethanol is a clear liquid and when fully burnt the combustion gasses remaining are Carbon Dioxide and water. This makes the use of Ethanol a good environmental proposition. One drawback with pure Ethanol is that it is corrosive to certain rubber and plastic materials.

The introduction of Ethanol E85 has required some major internal changes to the fuel supply and delivery system. Some earlier vehicles used an Ethanol mixture called Ethanol E15. This fuel was made up of 15% Ethanol and 85% gasoline. At this mixture ratio, no changes to the fuel charging or delivery system were required, as no degradation would occur with the cylinder head valves or material content of the components, although some performance loss would be noticeable.

The components used by vehicles running Ethanol appear to be the same in construction as those that use unleaded fuel only. The changes are mainly to do with the materials used and increases in fuel flow rates.

Ethanol has a much higher octane rating than standard fuel which means that the ignition and fuel injection calibrations for a vehicle that is capable of using Ethanol E85 must be adapted suitably.



E59684

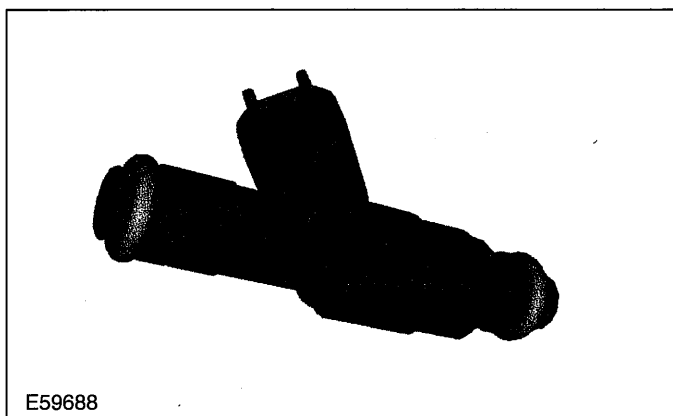
Item	Description
1	Fuel injectors
2	Fuel rail

Item	Description
3	Block heater
4	Fuel pump module

DIAGNOSIS AND TESTING

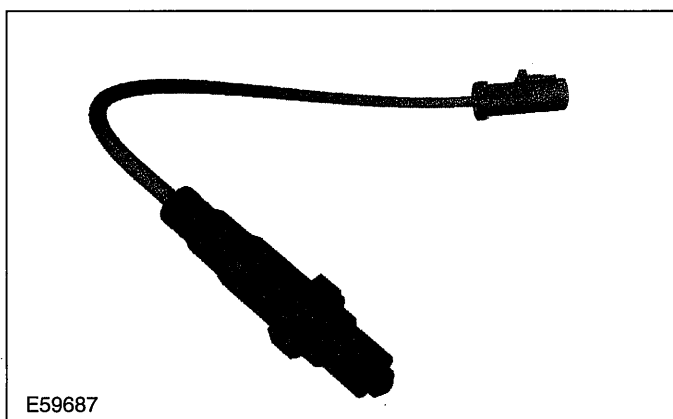
Item	Description
5	Throttle body
6	Heated Oxygen sensor (HO2s)
7	Intake manifold

Fuel injectors



To maintain the same or similar power output to that of the unleaded fuel vehicle, the fuel injectors have been replaced with high flow fuel injectors.

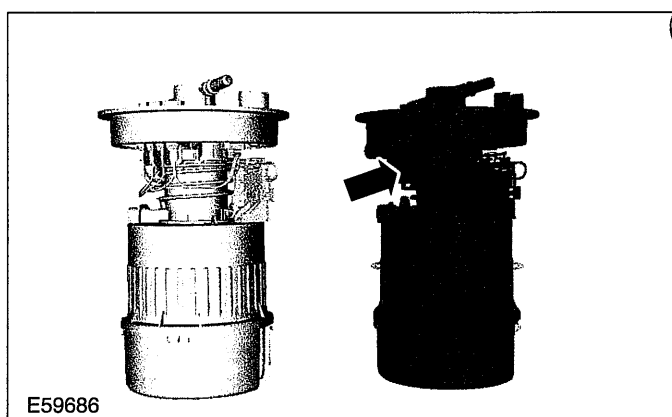
Fuel composition monitoring



The quantity of Ethanol E85 in relation to the quantity of unleaded fuel contained in the fuel tank at any one time is not monitored at the fuel tank. The Ethanol percentage volume can only decrease from its maximum 85% (pure Ethanol E85), to zero (100% unleaded fuel).

The fuel charging system compensates for the changes in fuel composition using the signal received by the power train control module (PCM) from the HO2s. The PCM adapts the fueling and ignition calibrations to suit the current fuel tank content composition.

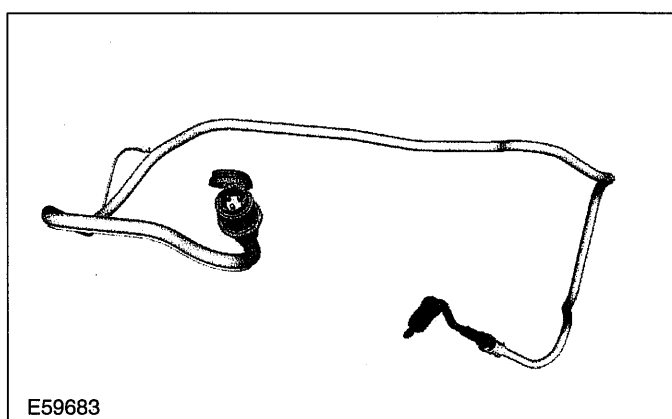
Fuel supply



The fuel supply for all petrol fueled variants is equipped with a return-less fuel system. This means that the fuel delivery pressure at the fuel injectors, is monitored and controlled by the fuel tank module. This control is achieved by switching the fuel pump on and off.

The fuel pump module for both the Ethanol E85 variant vehicle and the unleaded fueled vehicle are very similar. Visually the only difference is the fuel pump electrical connections which on the Ethanol E85 variant is sealed. This is not the only difference, both fuel pump modules have different fuel level sensor resistor card values.

Cold start

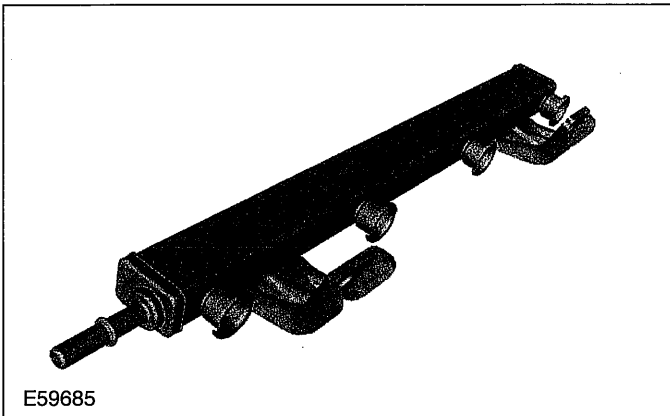


To overcome the problems relating to cold start inherent with Ethanol E85 vehicles (temperatures down to -29 degrees centigrade), a block heater has been installed into the engine coolant system.

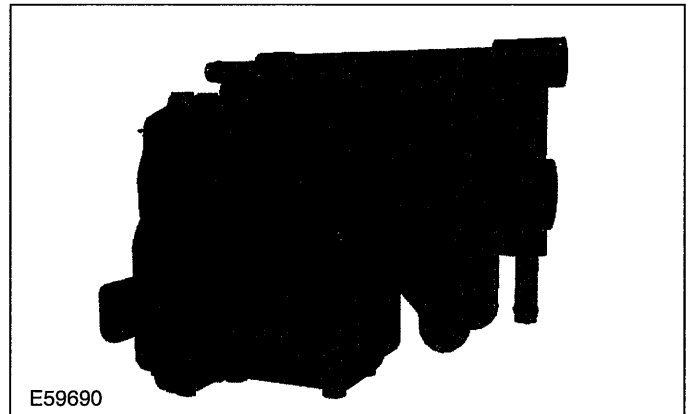
The block heater is located to the rear of the engine under the exhaust manifold. The block heater is fitted with a dedicated harness which terminates at an external plug connector fitted into the radiator grill.

DIAGNOSIS AND TESTING

The block heater can be connected to an external power supply, which will pre-heat the engine coolant contained within the cylinder block. The heated coolant will radiate heat to the fuel rail, which will warm the contained fuel. Sufficient warmed fuel is stored in the fuel rail to allow the engine to start and continue running correctly, until the engine combustion generates sufficient heat to maintain correct operating conditions.

Fuel rail

The fuel rail on Ethanol E85 vehicles is the same as non Ethanol E85 variants. The fuel rail function is to supply a reservoir of fuel at equal pressure for all four fuel injectors.

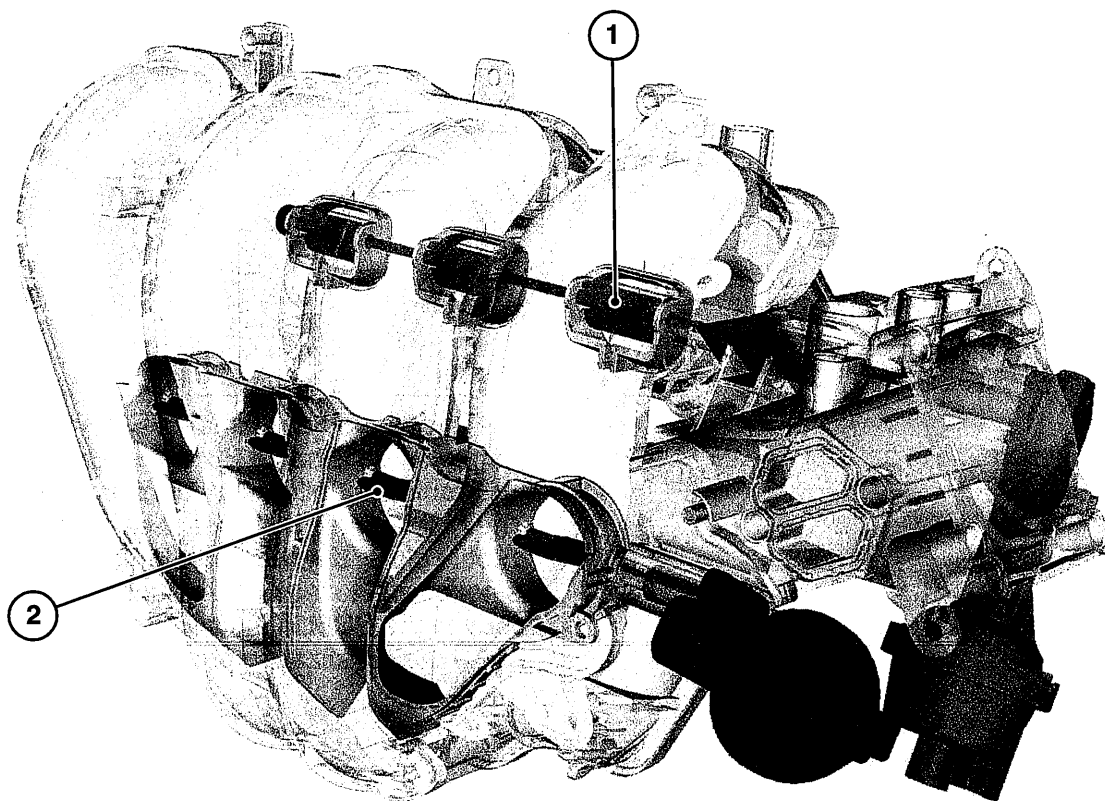
Throttle body

The throttle body on Ethanol E85 vehicles is the same as non Ethanol E85 variants. This is a fully electronic controlled and monitored component. The PCM adapts to the wear characteristics of the throttle plate. If a new throttle body is installed, it is necessary to teach the values of the new throttle body to the PCM. If installing a new throttle body, follow the initialization procedure.

REFER to: Throttle Body (303-04C, Removal and Installation).

DIAGNOSIS AND TESTING

Intake manifold



E59689

Item	Description
1	Intake manifold tuning (IMT) swirl plates
2	Intake manifold runner control (IMRC) throttle plates

The intake manifold for both Ethanol E85 and standard unleaded fueled vehicles is the same construction.

Built into the intake manifold, are the IMRC throttle plates and IMT swirl plates.

Under low demand throttle conditions, the air charge is delivered to the cylinder head intake ports through the primary air intake chambers. The clean flow of the air charge is disturbed by the IMT swirl plates to assist in the mixing of the air fuel mixture at the fuel injectors.

During high demand throttle conditions, the IMRC throttle plates are opened and the air charge is allowed to use both primary and secondary intake chambers. This means a higher volume of air charge can be accommodated by the intake manifold. During this high demand throttle condition, the IMT swirl plates are fully open so as not to restrict the air charge flow.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Fuel leak(s) – Vacuum line(s) – Gasket(s) – Seal(s) – Fuel injector(s) – Throttle body – Fuel rail – Fuel supply line	– Powertrain control module (PCM) – Wiring harness – Electrical connector(s) – Throttle body – Fuel injector(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

DIAGNOSIS AND TESTING

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
Engine does not crank	PATS.	CHECK the PATS LED extinguishes within 3 seconds when the ignition is turned on. REFER to: Anti-Theft - Passive (419-01B, Diagnosis and Testing).
	Starting system.	REFER to: Starting System (303-06, Diagnosis and Testing).
	Ignition switch.	REFER to the Wiring Diagrams.
	Powertrain control module (PCM).	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
Engine cranks but does not start	Inertia fuel shutoff (IFS) switch.	RESET the IFS switch.
	Low fuel system pressure.	Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	Fuel lines damaged or blocked.	INSPECT the fuel lines. INSTALL new components as necessary. TEST the system for normal operation.
	Fuel filter blocked.	INSTALL a new fuel filter.
	Fuel pump module.	REFER to: Fuel System - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/2.0L Duratec-HE (MI4)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (310-00 Fuel System - General Information, Diagnosis and Testing).
	Crankshaft position (CKP) sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Camshaft position (CMP) sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	PCM.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Fuel rail fuel pressure sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Fuel injectors.	• INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	• Incorrect valve timing.	• CHECK the valve timing.
	• Low cylinder compression.	• TEST the cylinder compression.
• Poor starting	• Low fuel system pressure.	• Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	• Fuel system leak.	• CHECK the system for fuel leak(s). REPAIR the system as necessary.
	• Fuel system restriction.	• INSPECT the fuel system. INSTALL new components as necessary. TEST the system for normal operation.
	• Fuel filter blocked.	• INSTALL a new fuel filter.
	• Air cleaner element blocked.	• INSTALL a new air cleaner element.
	• Incorrect engine oil.	• INSTALL a new engine oil filter and engine oil.
	• Incorrect power steering fluid.	• DRAIN and REFILL the power steering system with the correct fluid. REFER to: Power Steering System Flushing - Vehicles With: Electro-Hydraulic Power Steering (EHPS) (211-00, General Procedures).
	• CKP sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Engine coolant temperature (ECT) sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Fuel injector(s).	• INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	• Fuel rail fuel pressure sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Catalytic converter blocked.	• REMOVE and visually INSPECT the catalytic converter as necessary. REFER to: Catalytic Converter - 1.8L Duratec-HE (MI4)/2.0L Duratec-HE (MI4) (309-00, Removal and Installation).
	• Low cylinder compression.	• TEST the engine cylinder compression.
• Engine starts but immediately stops	• Air cleaner element blocked.	• INSTALL a new air cleaner element.
	• CKP sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• CMP sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• PCM.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Low fuel system pressure.	• Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	• Fuel system restriction.	• INSPECT the fuel system. INSTALL new components as necessary. TEST the system for normal operation.
	• Fuel filter blocked.	• INSTALL a new fuel filter.
• Poor idling	• Air cleaner element blocked.	• INSTALL a new air cleaner element.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. REFER to: Fuel Tank Draining (310-00A, General Procedures).
		- INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new fuel rail. REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
	Low fuel system pressure.	Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	Fuel filter blocked.	INSTALL a new fuel filter.
	EGR valve sticking open.	REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
	Fuel injectors.	INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	CKP sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Knock sensor (KS).	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Fuel injection supply manifold fuel pressure sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• Engine stumbling	• Engine ignition.	• REFER to: Engine Ignition (303-07B, Diagnosis and Testing).
	• Fuel injectors.	• INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	• Low fuel system pressure.	• Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	• Fuel rail fuel pressure sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• EGR valve sticking open.	• REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
• Engine lacks power	• Engine ignition.	• REFER to: Engine Ignition (303-07B, Diagnosis and Testing).
	• Brakes binding.	• CHECK the braking system. REFER to: Brake System (206-00, Diagnosis and Testing).
	• Vehicle overloaded, or excessive wind resistance (roof racks, towing etc).	• ADVISE the customer about the effects of overloading the vehicle and wind resistance on the fuel consumption.
	• Air cleaner element blocked.	• INSTALL a new air cleaner element as necessary.
	• Low fuel system pressure.	• Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	• Kinked or restricted fuel lines.	• INSPECT the fuel lines. INSTALL new components as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom

Possible Sources

Action

Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. REFER to: Fuel Tank Draining (310-00A, General Procedures). INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new rail. REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
Fuel filter blocked.	INSTALL a new fuel filter.
EGR valve sticking open.	REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
Vehicle speed sensor (VSS).	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
ECT sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
Fuel injectors.	INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
Fuel rail fuel pressure sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
Incorrect valve timing.	CHECK the valve timing.
Low cylinder compression.	CHECK the cylinder compression.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Catalytic converter blocked.	REMOVE and visually INSPECT the catalytic converter for damage. INSTALL a new catalytic converter as necessary. REFER to: Catalytic Converter - 1.8L Duratec-HE (MI4)/2.0L Duratec-HE (MI4) (309-00, Removal and Installation).
Black smoke at idle	Air cleaner element blocked.	INSTALL a new air cleaner element as necessary.
	Fuel injectors.	INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	ECT sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Fuel rail fuel pressure sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Catalytic converter blocked.	REMOVE and visually INSPECT the catalytic converter for damage. INSTALL a new catalytic converter as necessary. REFER to: Catalytic Converter - 1.8L Duratec-HE (MI4)/2.0L Duratec-HE (MI4) (309-00, Removal and Installation).
	Incorrect valve timing.	CHECK the valve timing.
Excessive black smoke during acceleration	Air cleaner element blocked.	INSTALL a new air cleaner element as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. REFER to: Fuel Tank Draining (310-00A, General Procedures). INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new fuel rail. REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
	EGR valve sticking open.	REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
	CKP sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	KS.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Fuel injectors.	INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	Fuel rail fuel pressure sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Catalytic converter blocked.	REMOVE and visually INSPECT the catalytic converter for damage. INSTALL a new catalytic converter as necessary. REFER to: Catalytic Converter - 1.8L Duratec-HE (MI4)/2.0L Duratec-HE (MI4) (309-00, Removal and Installation).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Black smoke at cruising speeds	Air cleaner element blocked.	INSTALL a new air cleaner element.
	EGR valve sticking open.	REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
	ECT sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Fuel injectors.	INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	Fuel rail fuel pressure sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Catalytic converter blocked.	- REMOVE and visually INSPECT the catalytic converter for damage. INSTALL a new catalytic converter as necessary. - REFER to: Catalytic Converter - 1.8L Duratec-HE (MI4)/2.0L Duratec-HE (MI4) (309-00, Removal and Installation).
Blue smoke	Engine burning oil.	CARRY OUT a controlled oil consumption test over 1000 km (600 miles). CONFIRM that the oil consumption is less than 0.1 litre per 1000 km (600 miles).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. REFER to: Fuel Tank Draining (310-00A, General Procedures). INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new fuel rail. REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
	Positive crankcase ventilation (PCV) system.	INSPECT for visible signs of damage or blockage. CLEAN, REPAIR or INSTALL new parts as necessary.
	Worn or damaged valve guide(s), piston ring(s), cylinder bore(s), cylinder head or gasket.	REMOVE the cylinder head. INSPECT the cylinder head, pistons and cylinder bores for signs of wear or damage. REFER to: Cylinder Head (303-01C, In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
White smoke	Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. REFER to: Fuel Tank Draining (310-00A, General Procedures). INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new fuel injection supply manifold. REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
	Coolant in the combustion chamber.	CARRY OUT a cooling system pressure test. REFER to: Engine Cooling (303-03C, Diagnosis and Testing). REMOVE the cylinder head. INSPECT the cylinder head, cylinder head gasket and cylinder bores for wear or damage. REFER to: Cylinder Head (303-01C, In-vehicle Repair).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Engine misfire	Engine ignition.	REFER to: Engine Ignition (303-07B, Diagnosis and Testing).
	Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. - REFER to: Fuel Tank Draining (310-00A, General Procedures). - INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new fuel rail. - REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
	Low fuel system pressure.	- Check the fuel system pressure. - REFER to: Fuel System Pressure Check (310-00A, General Procedures).
	EGR valve sticking open.	REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
	Engine operating temperature too high.	REFER to: Engine Cooling (303-03C, Diagnosis and Testing).
	ECT sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	CKP sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	CMP sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	KS.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Fuel injectors.	INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	Fuel rail fuel pressure sensor.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	Low cylinder compression.	CHECK the engine compression.
	Worn or damaged valve(s), tappet(s) or camshaft(s).	- REMOVE the cylinder head. INSPECT the cylinder head, valves, tappets and camshafts for signs of wear or damage. - REFER to: Cylinder Head (303-01C, In-vehicle Repair).
	Damaged cylinder head gasket.	- REMOVE the cylinder head. INSPECT the cylinder head gasket and cylinder bores for wear or damage. - REFER to: Cylinder Head (303-01C, In-vehicle Repair).
Engine knock at idle	Low engine oil level.	CHECK the engine oil level. REFILL as necessary.
	Incorrect or contaminated fuel.	- CHECK for signs of contamination such as strange odors from the fuel tank. - If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean gasoline. - REFER to: Fuel Tank Draining (310-00A, General Procedures). - INSTALL a new fuel filter. - INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out. - INSTALL a new fuel rail. - REFER to: Fuel Injection Supply Manifold (303-04C, Removal and Installation).
	KS.	Carry out a full engine diagnosis using the guided diagnostic menu in WDS.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• CKP sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Fuel injector(s).	• INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	• Incorrect valve timing.	• CHECK the valve timing.
	• Excessive carbon build up.	• REMOVE the cylinder head. INSPECT the cylinder head and pistons for signs carbon build up. REFER to: Cylinder Head (303-01C, In-vehicle Repair).
	• Worn or damaged oil pump. • Worn or damaged timing chain or sprocket. • Major mechanical engine failure.	• INSPECT the engine components.
• Engine knock during acceleration	• KS.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Fuel injectors.	• INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	• Major mechanical engine failure.	• REFER to: Engine (303-01 Engine - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
NOTE:Before proceeding with any of the actions in relation to the possible sources for excessive fuel consumption, a fuel consumption test located in the toolbox menu of WDS must be performed. • Excessive fuel consumption	• Brakes binding.	• CHECK the braking system. REFER to: Brake System (206-00, Diagnosis and Testing).
	• Vehicle overloaded, or excessive wind resistance (roof racks, towing etc).	• ADVISE the customer about the effects of overloading the vehicle and wind resistance on the fuel consumption.
	• Air cleaner element blocked.	• INSTALL a new air cleaner element.

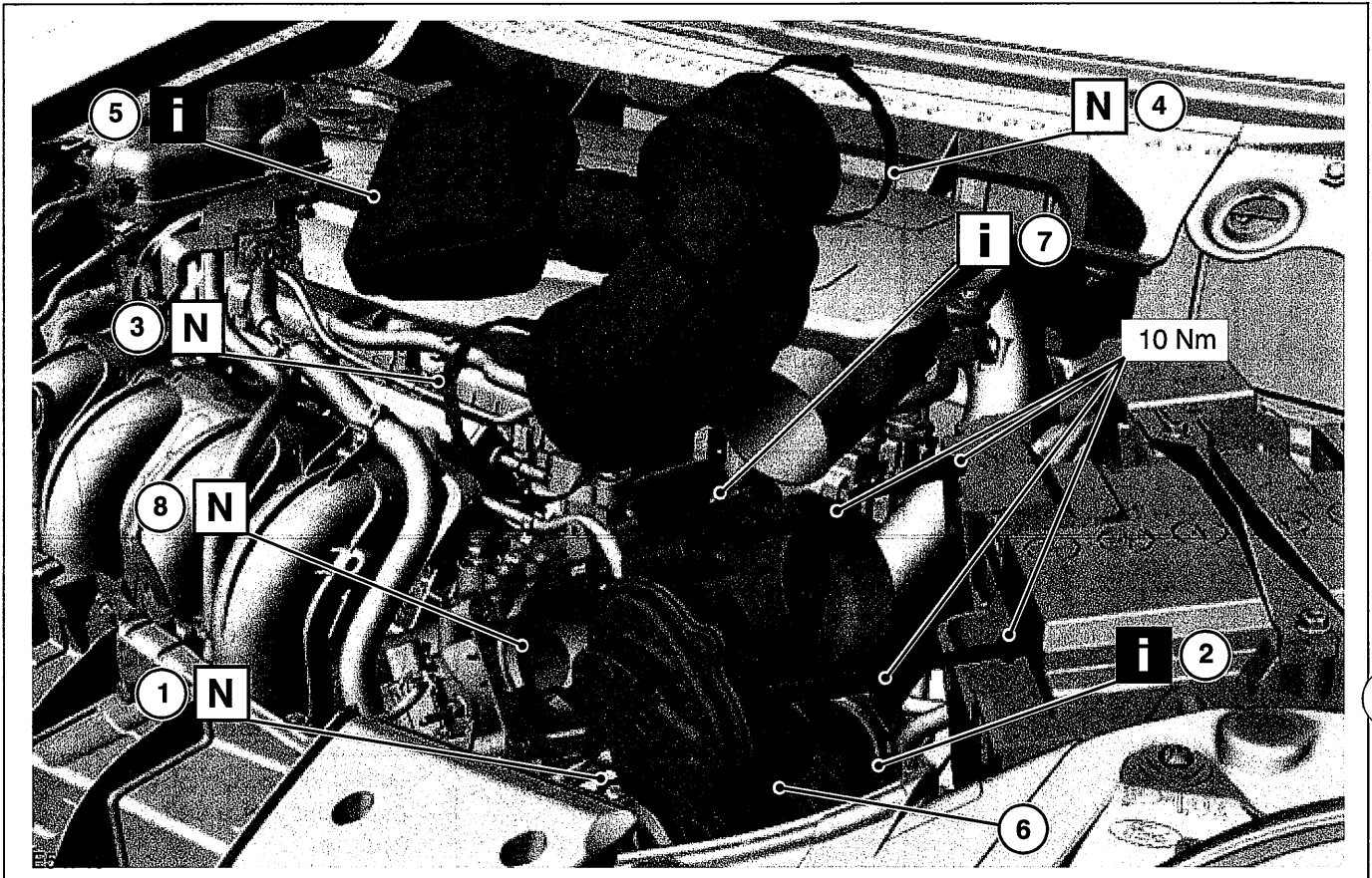
DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Fuel system leak(s).	• CHECK the system for fuel leak(s). REPAIR or INSTALL new parts as necessary.
	• Fuel filter blocked.	• INSTALL a new fuel filter.
	• Incorrect engine oil.	• INSTALL a new oil filter and engine oil.
	• Generator.	• REFER to WDS.
	• EGR valve sticking open.	• REFER to: Engine Emission Control (303-08 Engine Emission Control - 2.0L Duratec-HE (MI4), Diagnosis and Testing).
	• Slipping clutch.	• REFER to: Manual Transaxle and Clutch (308-00, Diagnosis and Testing).
	• ECT sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Fuel injectors.	• INSPECT the fuel injectors. CLEAN the fuel injectors or INSTALL a new set of injectors as required only after the checks have been carried out.
	• PCM calibration.	• Using WDS, CHECK for the availability of a calibration update.
	• Incorrect valve timing.	• CHECK the valve timing.
	• Low cylinder compression.	• CHECK the engine compression.
• Engine cuts out during hard acceleration	• CMP sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• CKP sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Fuel rail fuel pressure sensor.	• Carry out a full engine diagnosis using the guided diagnostic menu in WDS.
	• Low fuel system pressure.	• Check the fuel system pressure. REFER to: Fuel System Pressure Check (310-00A, General Procedures).

REMOVAL AND INSTALLATION

Throttle Body

1. Remove the components in the order indicated in the following illustration(s) and table(s).



Item	Description
1	Air cleaner intake pipe retaining clip
2	Air cleaner intake pipe See Removal Detail
3	Air cleaner outlet pipe retaining clip
4	Air cleaner outlet pipe retaining clip
5	Air cleaner outlet pipe and resonator See Removal Detail
6	Throttle body electrical connector
7	Throttle body

Item	Description
	See Installation Detail
8	Throttle body gasket

2. To install, reverse the removal procedure.
3. **NOTE:** Do not press the accelerator pedal during the initialization period as this will prevent the complete initialization of the throttle body.

Turn the ignition key to position II and wait for one minute to initialize the throttle body.
4. Turn the ignition key to the OFF position.

Removal Details

Item 2 Air cleaner intake pipe

1. Detach the air cleaner intake pipe from the air cleaner intake pipe duct.

REMOVAL AND INSTALLATION**Item 5 Air cleaner outlet pipe and resonator**

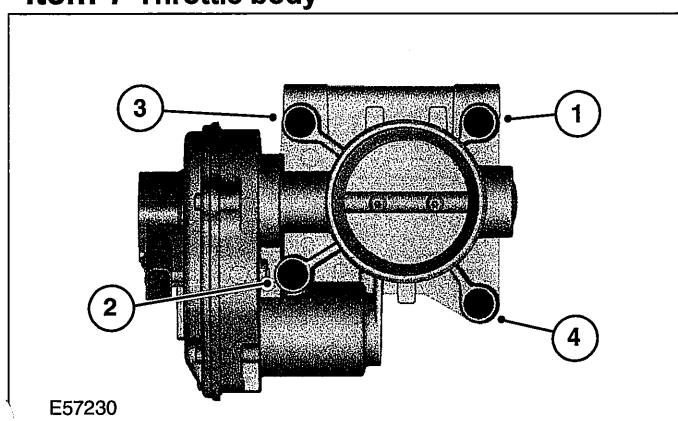
1. Detach the air cleaner outlet pipe resonator

from the air cleaner and remove the air cleaner outlet pipe.

Installation Details**Item 7 Throttle body**

NOTE: Do not fully tighten the throttle body retaining bolts at this stage.

1. Install each throttle body retaining bolt three full turns by hand.

Item 7 Throttle body

1. Tighten the throttle body retaining bolts in the sequence shown.

REMOVAL AND INSTALLATION**Fuel Injectors(23 455 0)**

1. Remove the fuel injection supply manifold.

For additional information, refer to Fuel
Injection Supply Manifold - in this section.

REMOVAL AND INSTALLATION

Fuel Rail

Materials

Name	Specification
Engine Oil - 5W-30	WSS-M2C913-B

WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

1. Release the fuel system pressure.

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

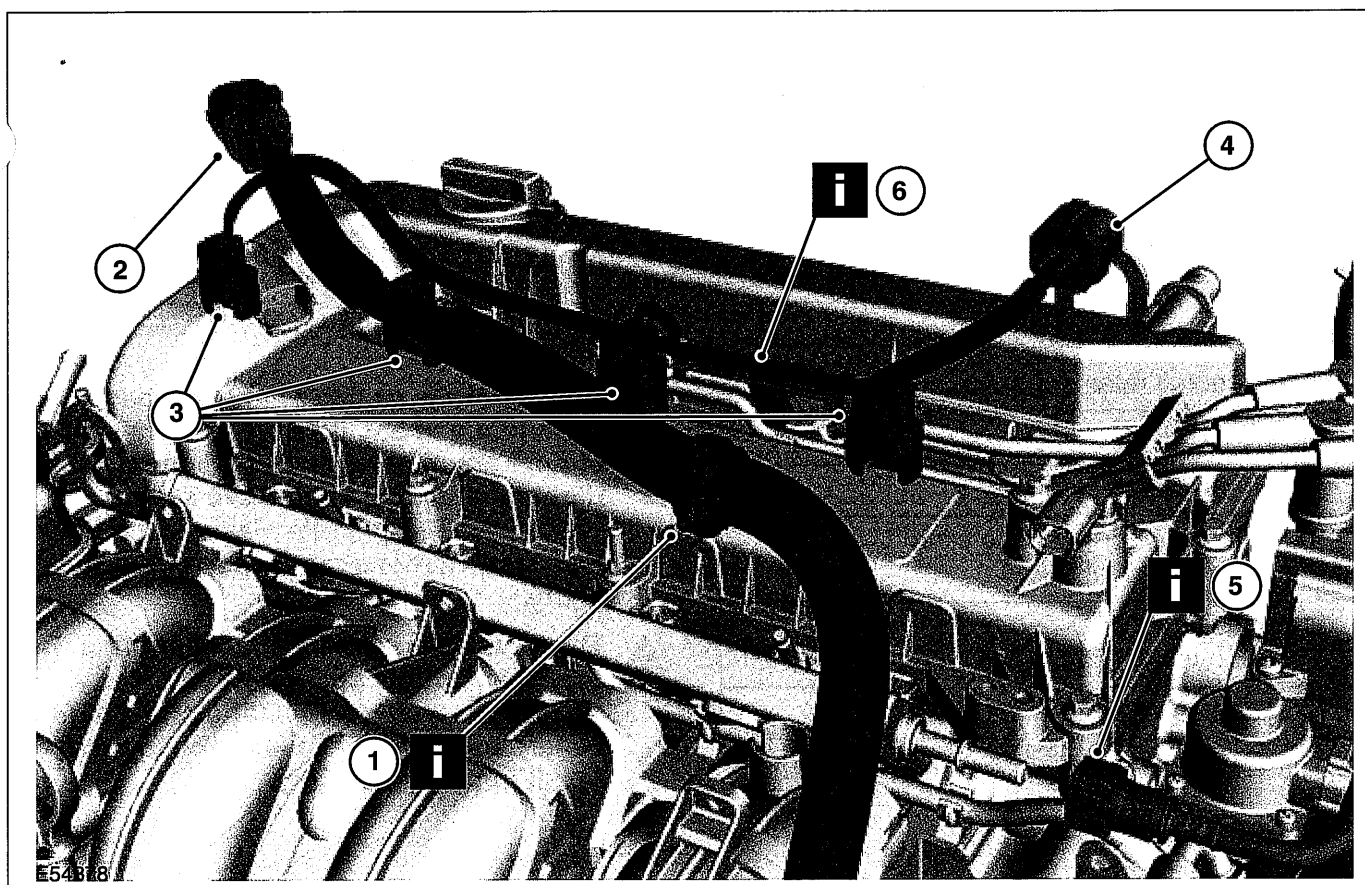
2. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

3. Remove the air cleaner assembly.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

4. Remove the components in the order indicated in the following illustration(s) and table(s).



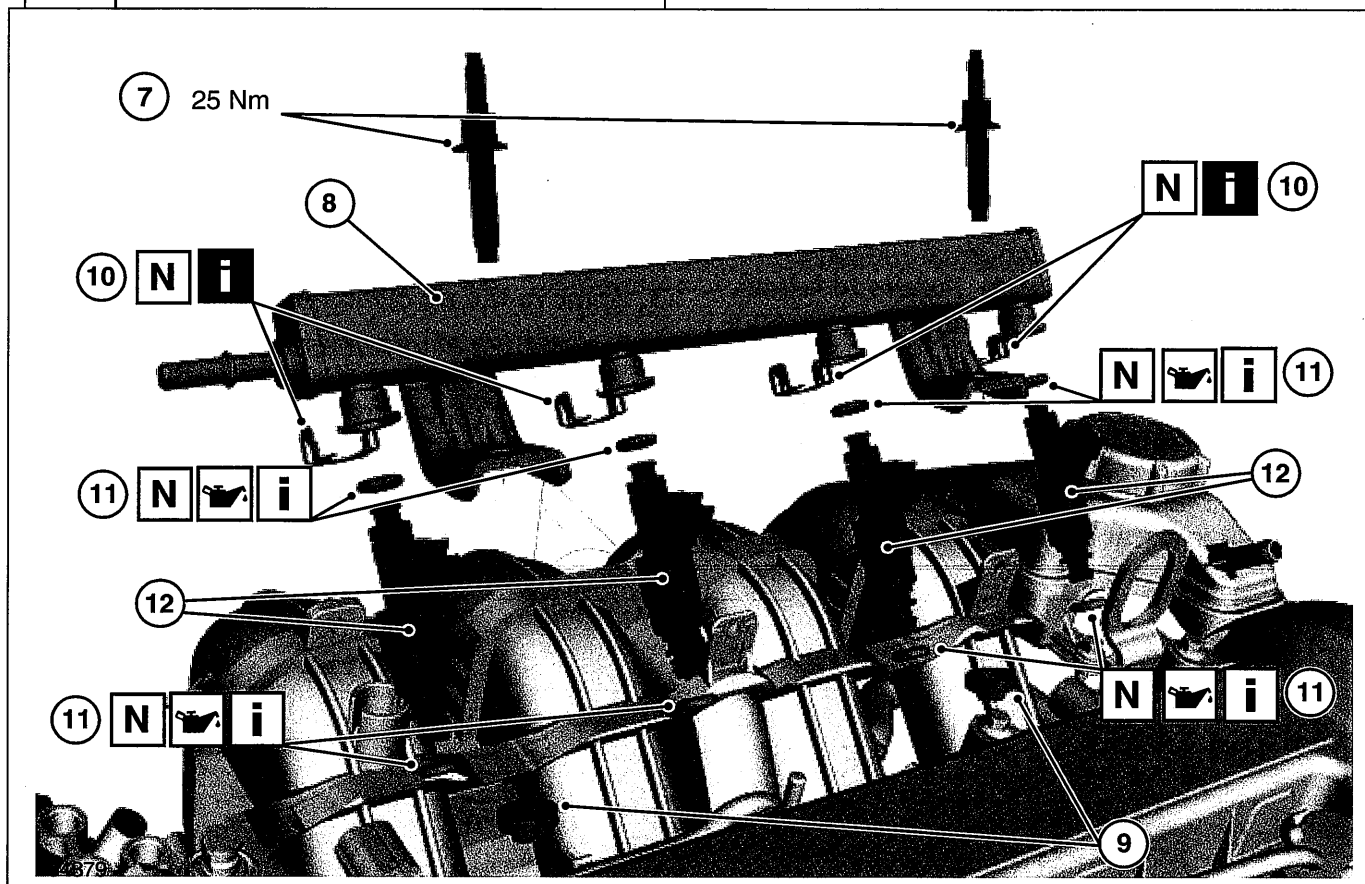
Item	Description
1	Fuel charging wiring harness retaining clip See Removal Detail
2	Fuel charging wiring harness electrical connector

Item	Description
3	Fuel injector electrical connector(s)
4	Camshaft position sensor (CMP) electrical connector

REMOVAL AND INSTALLATION

Item	Description
5	Fuel rail fuel supply line See Removal Detail
6	Fuel charging wiring harness retaining clip

Item	Description
	See Removal Detail



Item	Description
7	Fuel rail retaining bolts
8	Fuel rail
9	Fuel rail spacers
10	Fuel injector retaining clips See Removal Detail
11	Fuel injector O-ring seals See Installation Detail
12	Fuel injectors

WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

5. To install, reverse the removal procedure.

Removal Details

Item 1 Fuel charging wiring harness retaining clip

1. Detach the fuel charging wiring harness retaining clip from the intake manifold.

REMOVAL AND INSTALLATION**Item 5 Fuel rail fuel supply line**

1. Disconnect the fuel supply line from the fuel rail.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).

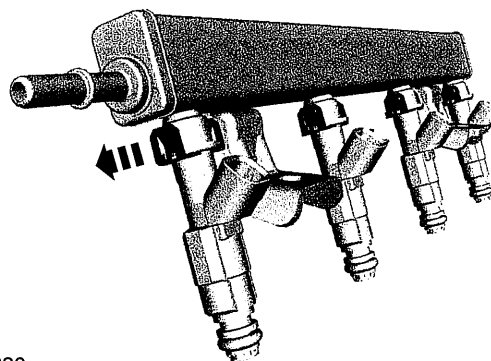
Item 6 Fuel charging wiring harness retaining clip

1. Detach the fuel charging wiring harness retaining clip from the fuel rail retaining bolt.

Item 10 Fuel injector retaining clips

1. Remove the fuel injector retaining clips.

- Discard the fuel injector retaining clips.



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Installation Details**Item 11 Fuel injector O-ring seals**

1. Lubricate the fuel injector O-ring seals with clean engine oil.

SECTION 303-05 Accessory Drive

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-05-2
DESCRIPTION AND OPERATION	
Accessory Drive — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-05-3
Accessory Drive — 2.0L Duratec-HE (MI4).....	303-05-4
2.0L Duratec HE (MI4) engine.....	303-05-4
DIAGNOSIS AND TESTING	
Accessory Drive.....	303-05-5
Inspection and Verification.....	303-05-5
Accessory Drive Belt Concerns.....	303-05-5
Symptom Chart.....	303-05-10
Component Tests.....	303-05-16
REMOVAL AND INSTALLATION	
Accessory Drive Belt — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning..... (21 567 0)	303-05-18
Accessory Drive Belt — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning..... (21 567 0)	303-05-21
Power Steering Pump Belt — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning..... (21 567 0)	303-05-24
Accessory Drive Belt — 2.0L Duratec-HE (MI4)..... (21 567 0)	303-05-26

SPECIFICATIONS**Torque Specifications - vehicles with 1.3L Duratec-8V (Rocam) engine**

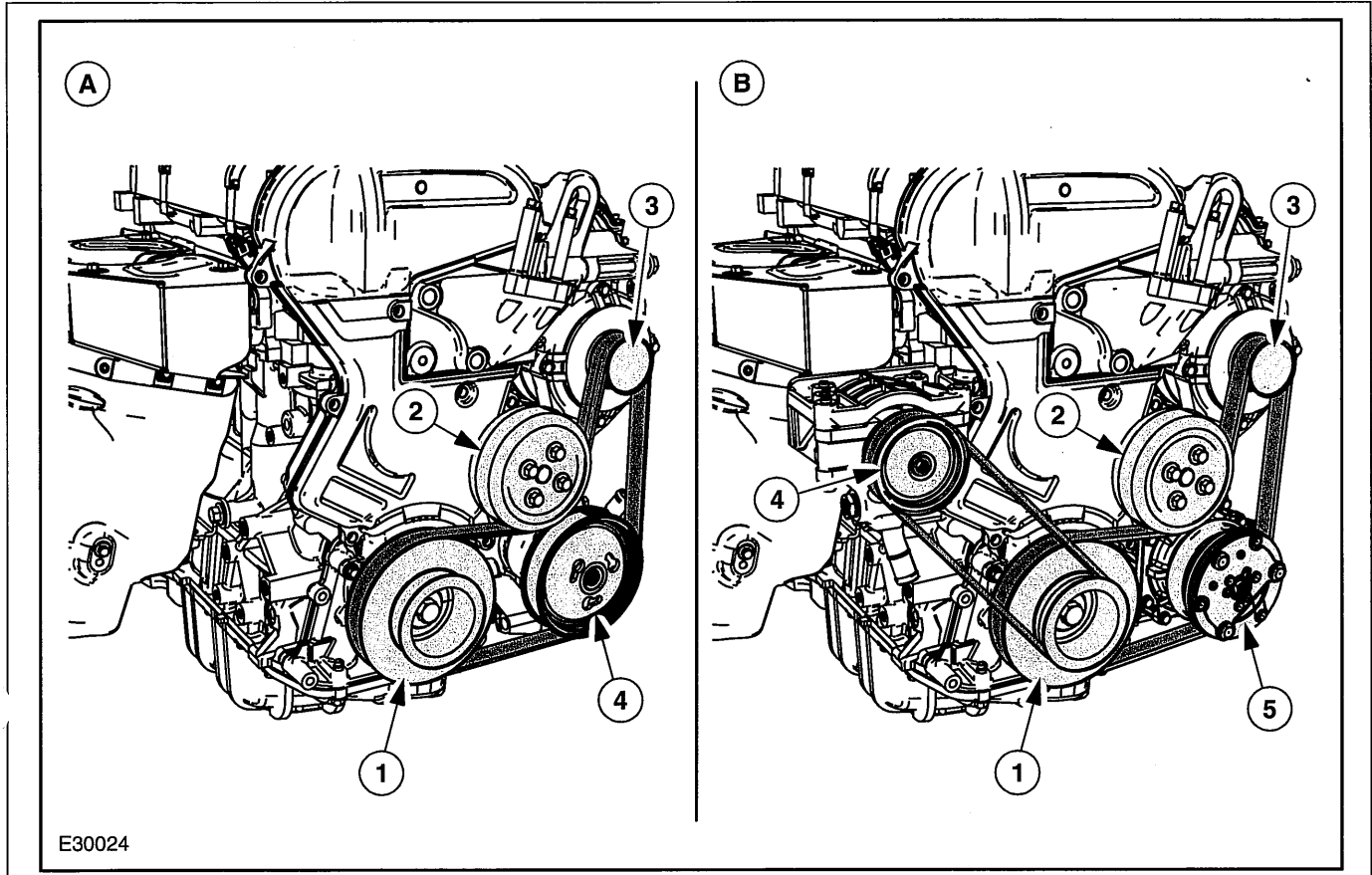
Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner retaining bolt	25	18	-
Accessory drive belt idler pulley retaining bolt	25	18	-
Accessory drive bracket assembly retaining bolts	30	22	-

Torque Specifications - vehicles with 1.4L Duratorq-TDCi (DV)/1.6L Duratorq-TDCi (DV) Diesel engine

Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner retaining bolts	25	18	-

Torque Specifications - vehicles with 2.0L Duratec-HE (MI4) engine

Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner retaining bolts	25	18	-

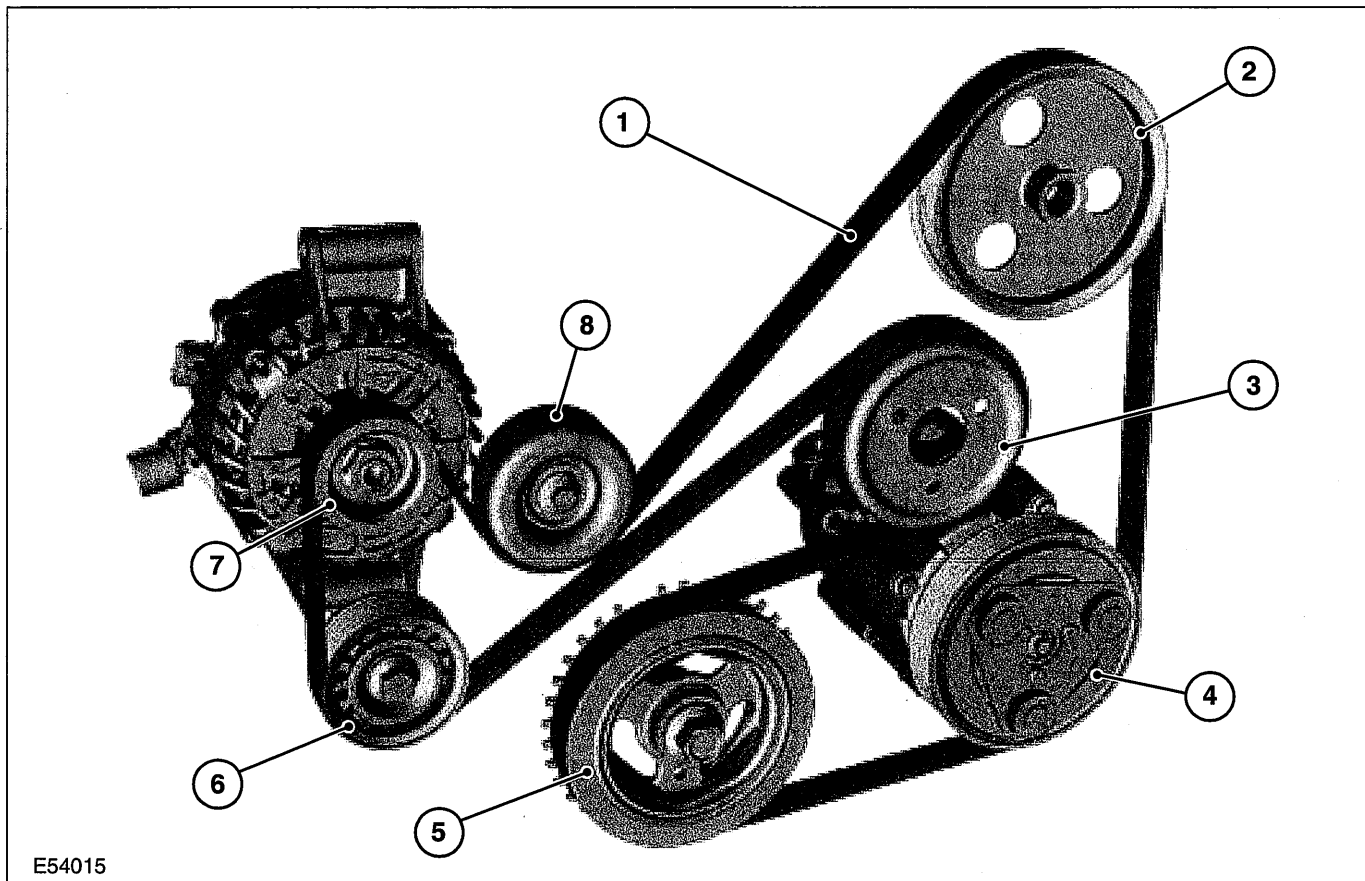
DESCRIPTION AND OPERATION**Accessory Drive — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)****Overview**

Item	Description
A	Vehicles without air conditioning
B	Vehicles with air conditioning
1	Crankshaft pulley
2	Coolant pump
3	Generator
4	Power steering pump
5	Air conditioning compressor

Both versions are elastic multi-ribbed belts and do not need a tensioning pulley. Re-tensioning is not required.

Vehicles without air conditioning have one drive belt, which drives the generator, the coolant pump and the power steering pump.

Vehicles with air conditioning have two drive belts, the longer of which drives the generator, the coolant pump and the air conditioning compressor. The shorter drive belt drives only the power steering pump.

DESCRIPTION AND OPERATION**Accessory Drive — 2.0L Duratec-HE (MI4)****2.0L Duratec HE (MI4) engine**

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Item	Description
1	Accessory drive belt
2	Power steering pump pulley
3	Coolant pump pulley
4	Air conditioning (A/C) compressor pulley
5	Crankshaft pulley
6	Accessory drive belt tensioner pulley
7	Generator pulley
8	Accessory drive belt idler pulley

DIAGNOSIS AND TESTING

Accessory Drive

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
- Damaged or contaminated accessory drive belt - Damaged or contaminated pulley(s) - Incorrect accessory drive belt - Incorrect fitment of the accessory drive belt - Accessory drive belt tensioner - Accessory drive belt idler pulley - Generator - Power steering pump - Power steering pump leakage - Air conditioning (A/C) compressor - Pulley(s) - Loose hardware

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

Accessory Drive Belt Concerns

⚠ CAUTION: Do not lubricate the accessory drive belt, accessory drive belt tensioner or idler pulley(s) as potential damage to the accessory drive belt material construction, accessory drive belt tensioner damping mechanism, accessory drive belt tensioner pulley bearing and idler pulley(s) bearing may occur.

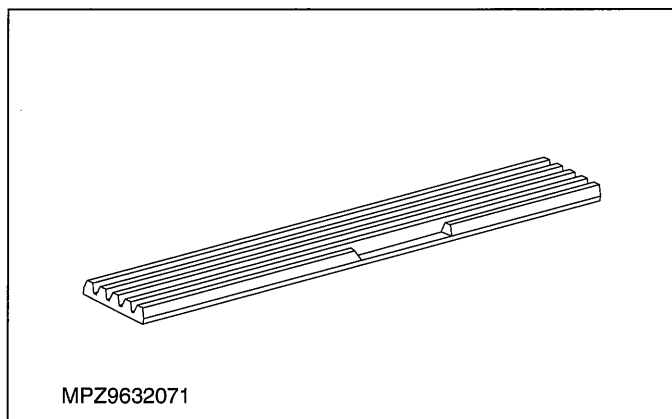
Cracking

Accessory drive belts are made from rubber which hardens with time and can develop cracks. As the belt runs on the back of some of the pulleys, the cracks are opened up. Small cracks are not considered to be a failure of the belt. Only if the crack is deep enough to reach the bottom of the groove to expose the cord or any chunks are found to be missing from the belt, is the belt condition considered to be unacceptable.

1. Check the accessory drive belt for cracks. If the damage exceeds the acceptable limit, install a new accessory drive belt.
- REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).
- REFER to: Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

Chunking

Chunking describes the condition where long lengths of rubber become detached from the ribs of the belt. This is considered to be a failure of the belt.

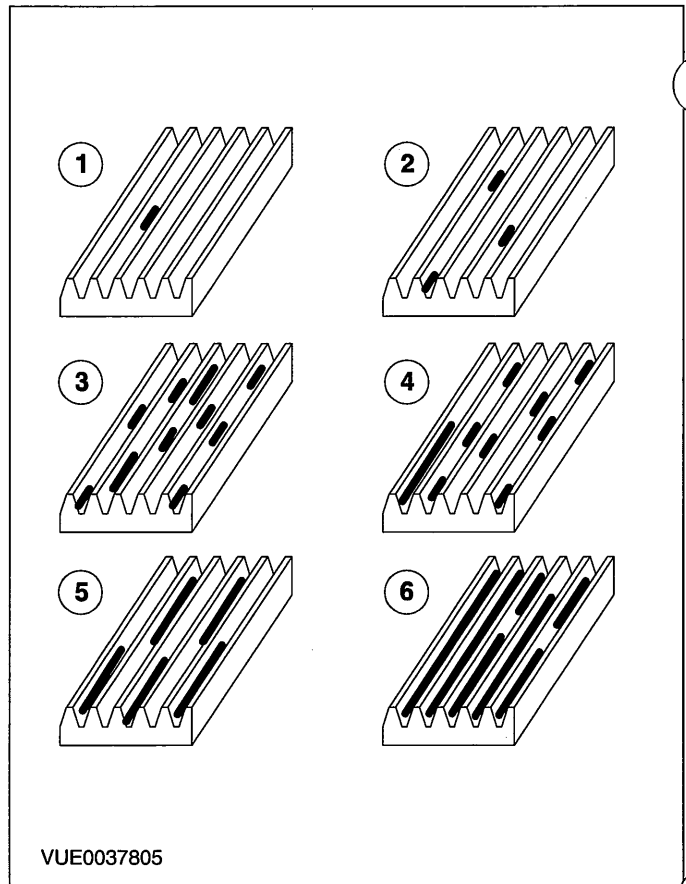


DIAGNOSIS AND TESTING

2. Check the accessory drive belt for damage. If any chunks are found to be missing, install a new accessory drive belt.
- REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).
- REFER to: Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

Pilling

Pilling is dust that forms in between the ribs of the belt from rubber that is worn off the belt when it is new. There may also be loose particles left on the belt during the manufacturing process. These are worn off and form into small balls of rubber that then get trapped in the grooves of the belt. This condition will usually clear itself within 4800 km - 8000 km (3000 miles - 5000 miles) of normal driving.



3. Check the accessory drive belt for pilling. The condition of the belt should be compared against the illustration.

1. Small scattered pills. Not considered a concern. No action required.
2. Small scattered pills. Not considered a concern. No action required.

DIAGNOSIS AND TESTING

3. Longer pills up to 50% of the rib height.
Possible noise concern. INSTALL a new belt if noise is apparent.

REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
/ Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

4. Longer pills up to 50% of the rib height.
Possible noise concern. INSTALL a new belt if noise is apparent.

REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation)
/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
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/ Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

DIAGNOSIS AND TESTING

5. Heavy deposits in the grooves. Possible noise and stability concern. **INSTALL** a new belt.

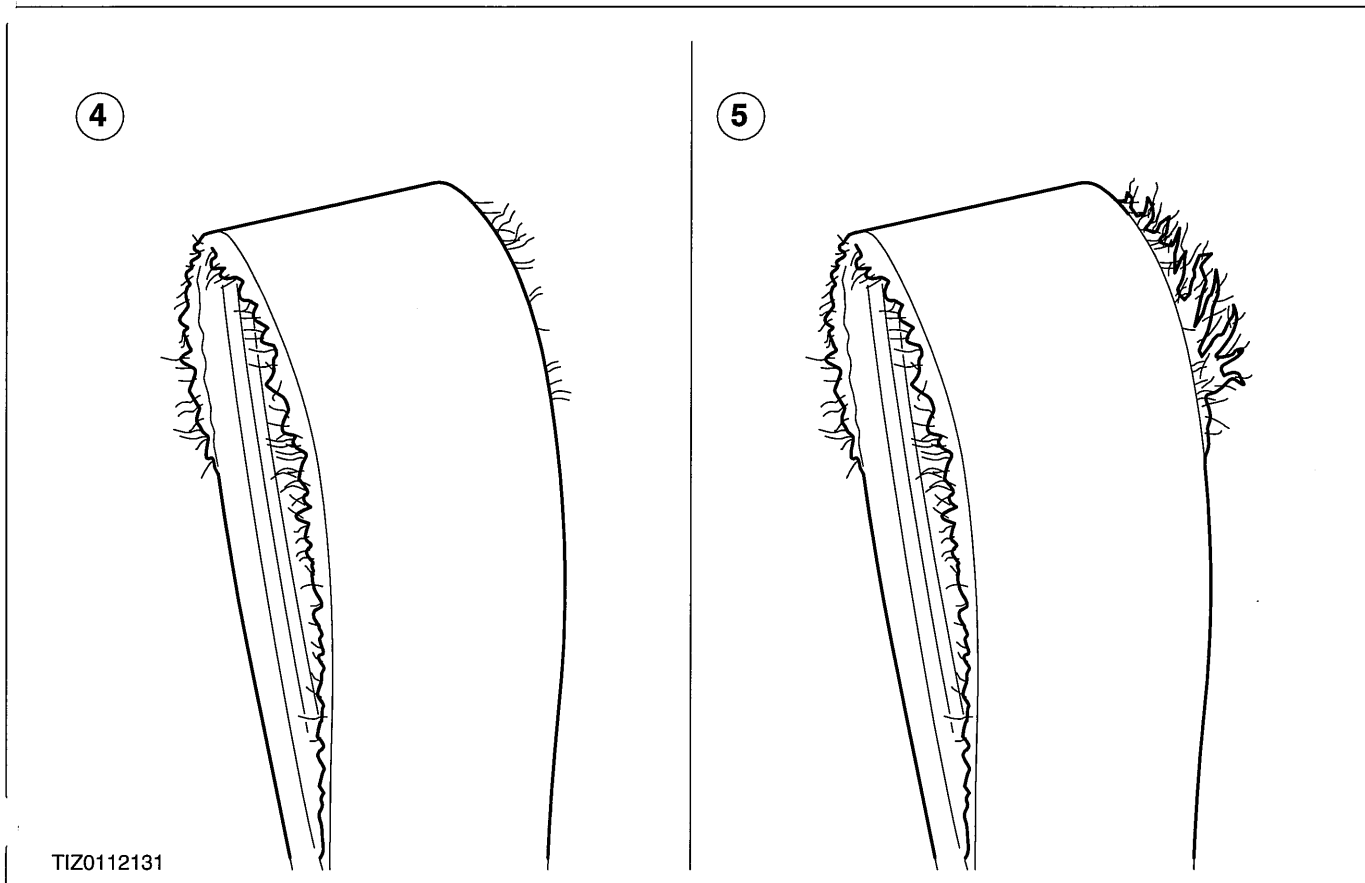
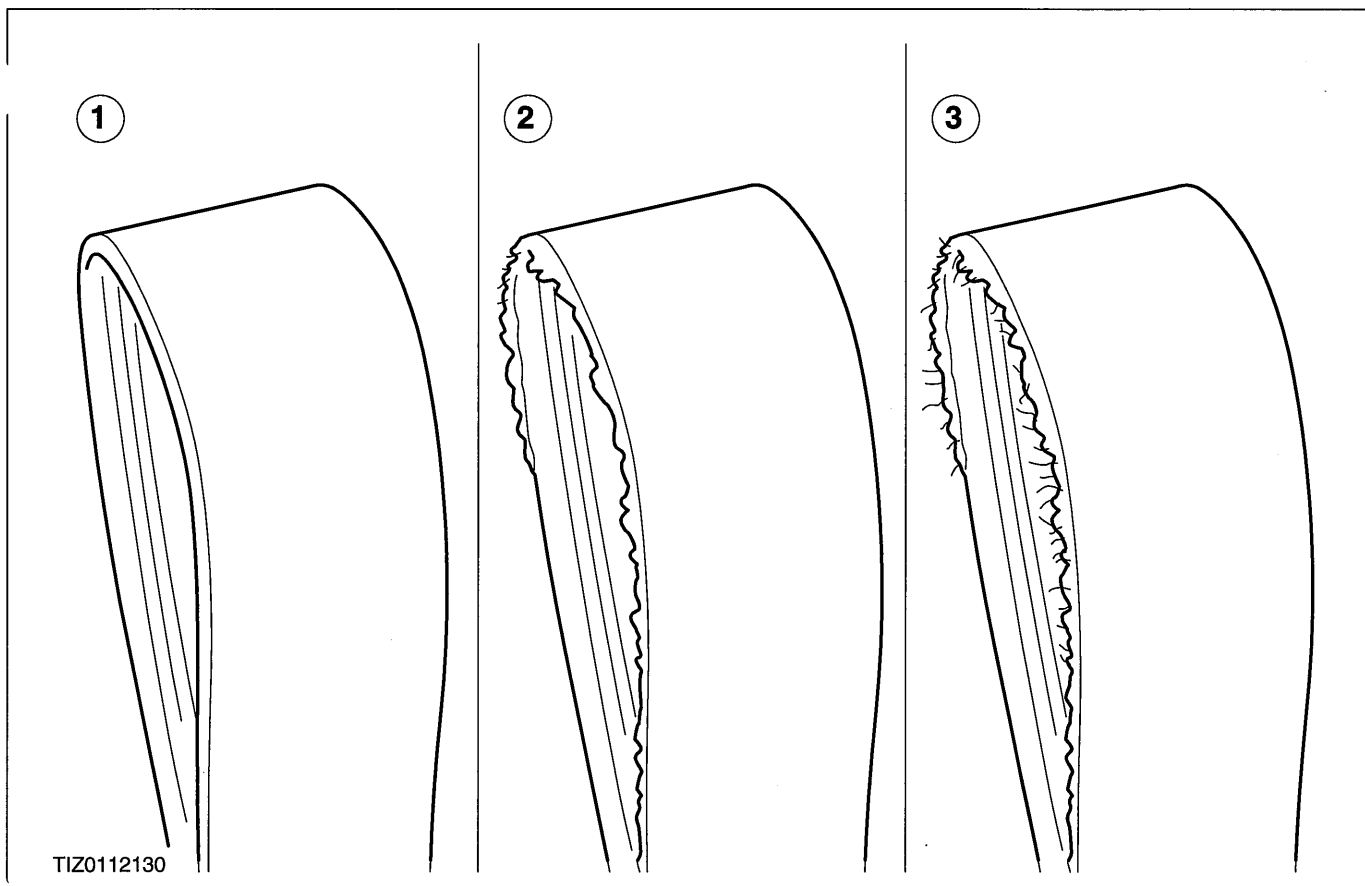
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 / Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
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 / Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)
 / Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

6. Heavy deposits in the grooves. Possible noise and stability concern. **INSTALL** a new belt.

REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation)
 / Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)
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 / Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)
 / Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

Fraying - Vehicles without accessory drive belt tensioner built up to 02/2003

Due to the manufacturing process, the belt edge may appear frayed, but this frayed appearance does not necessarily affect the durability or performance of the belt. If a concern is raised during a service or repair over the level of fraying, the condition of the belt should be compared against the illustrations.

DIAGNOSIS AND TESTING

4. Check the accessory drive belt for fraying.

1. No fraying (new belt). Not considered a concern. No action required.

DIAGNOSIS AND TESTING

2. Fraying just starting. Not considered a concern. No action required.
3. Slight fraying. Not considered a concern. No action required.
4. High amount of fraying without cord cuts. **INSTALL** a new accessory drive belt.

REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)

/ Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

5. High amount of fraying with cord cuts. **INSTALL** a new accessory drive belt.

REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)

/ Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation)

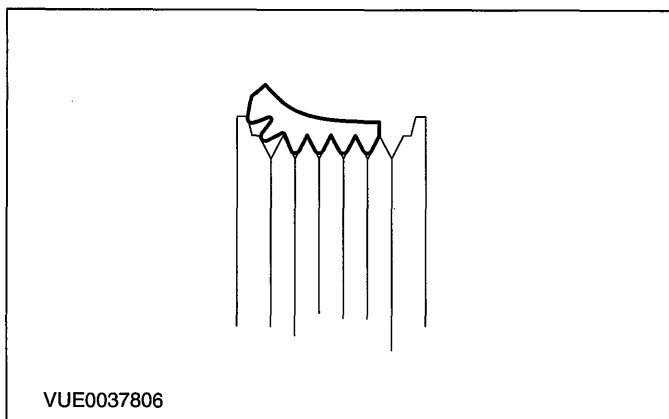
/ Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation)

/ Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

Incorrect fitment

Belt noise can be generated by the belt being incorrectly fitted on the pulley as shown in the following illustration. Make sure that all the V grooves on the belt contact correctly with the pulley.



5. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Accessory drive belt noise	Accessory drive system - Vehicles with accessory drive belt tensioner	CHECK the system with the engine running and the accessory drive belt removed (only run the engine for a very short period). If a noise is apparent, the cause is not the accessory drive system. If a noise is not apparent, the cause is the accessory drive system. CHECK where the noise is coming from. Use a stethoscope or other listening device to determine the source of the noise. INSTALL new components as necessary. TEST the system for normal operation.
	Accessory drive system - Vehicles without accessory drive belt tensioner	Use a stethoscope or other listening device to determine the source of the noise. INSTALL new components as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Accessory drive belt incorrectly installed.	CHECK the accessory drive belt is correctly installed in the pulley grooves. INSTALL a new accessory drive belt as necessary. REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 2.0L Duratec-HE (M14) (303-05 Accessory Drive, Removal and Installation). TEST the system for normal operation.
	Pulley(s).	CHECK the pulley(s) for damage, freedom of rotation, stone entrapment and alignment. INSTALL new components as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Lubricant or other contamination.	CHECK the accessory drive belt for contamination or damage. RECTIFY the source of the leak and INSTALL a new accessory drive belt. REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Power Steering Pump Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
NOTE:Squeal is defined as a continuous shriek, most noticeable when the engine is being accelerated or with electrical load. Accessory drive belt squeal	Accessory drive belt tensioner worn, damaged or contaminated with oil.	- CHECK the accessory drive belt tensioner for correct operation, damage or contamination. REFER to the Accessory Drive Belt Tensioner Component Test in this procedure. INSTALL a new accessory drive belt tensioner as necessary. - REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (303-05, Removal and Installation) / Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation). - TEST the system for normal operation.
NOTE:Whine is defined as a continuous noise at the same frequency, generally associated with plastic pulleys. Accessory drive belt whine	Poor surface finish on accessory drive belt idler pulley flat surface(s).	- REMOVE the accessory drive belt. - REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 2.0L Duratec-HE (M14) (303-05 Accessory Drive, Removal and Installation). - INSPECT the idler pulley(s) for surface finish. INSTALL a new idler pulley(s) as necessary. - TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Accessory drive belt idler pulley bearing failure.	REMOVE the accessory drive belt. REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 2.0L Duratec-HE (M14) (303-05 Accessory Drive, Removal and Installation). INSPECT the idler pulley(s) for smooth rotation. INSTALL a new idler pulley(s) as necessary. TEST the system for normal operation.
NOTE:Chirp is defined as a twittering noise, often intermittent Accessory drive belt chirp	Pulley misalignment (usually evident at idle).	- CHECK that the accessory drive belt is running centrally on the flat pulleys. TEST the system for normal operation. - CHECK the pulleys for excessive end float and bent flanges. - With the engine running at idle, use a stethoscope to identify the source of the noise. INSTALL new components as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
NOTE: Rattle is defined as a metallic knocking noise Accessory drive belt rattle	Accessory drive belt tensioner hitting the end stops.	- CHECK the accessory drive belt tensioner for correct operation or damage. REFER to the Accessory Drive Belt Tensioner Component Test in this procedure. INSTALL a new accessory drive belt tensioner as necessary. - REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (303-05, Removal and Installation) / Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation). TEST the system for normal operation.
	Loose components or hardware.	CHECK the components or hardware for correct installation and tighten as necessary. TEST the system for normal operation.
Accessory drive belt fraying	Accessory drive belt.	CHECK the extent of the fraying by referring to the illustrations shown in the Visual Inspection section. Only INSTALL a new accessory drive belt if the fraying is within the criteria quoted in the Visual Inspection section. TEST the system for normal operation.
	Pulley(s).	CHECK the pulley(s) for damage, freedom of rotation and alignment. INSTALL new components as necessary. TEST the system for normal operation.

Component Tests**Accessory Drive Belt Tensioner - Static Check**

The accessory drive belt tensioner may be checked statically as follows:

1. Inspect the area surrounding the accessory drive belt tensioner for lubricant or other contamination. Rectify any leaks before installing a new accessory drive belt tensioner. If the accessory drive belt tensioner is contaminated, do not attempt to clean it as the damping mechanism inside may be damaged. INSTALL a new accessory drive belt tensioner as necessary.

DIAGNOSIS AND TESTING

- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (303-05, Removal and Installation).
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).

TEST the system for normal operation.

2. Detach the accessory drive belt in the area of the accessory drive belt tensioner.
3. **NOTE: The accessory drive belt tensioner has a damping feature, which is usually a friction device, therefore some friction within the system is normal.**

Using the correct tool, move the accessory drive belt tensioner from its relaxed position through its full stroke and back to the relaxed position to make sure there is no excessive stick, grab or bind, and to make sure there is tension on the accessory drive belt tensioner spring.

4. Rotate the accessory drive belt tensioner pulley and check for damage, freedom of rotation and alignment. **INSTALL** a new accessory drive belt tensioner as necessary.
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (303-05, Removal and Installation).
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).

TEST the system for normal operation.

5. If the accessory drive belt tensioner meets the above criteria, proceed to test the accessory drive belt tensioner dynamically. If the accessory drive belt tensioner does not meet the above criteria, **INSTALL** a new accessory drive belt tensioner.
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (303-05, Removal and Installation).
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).

TEST the system for normal operation.

Accessory Drive Belt Tensioner - Dynamic Check

The accessory drive belt tensioner may be checked dynamically as follows:

1. With the engine running, observe the accessory drive belt tensioner movement. The accessory drive belt tensioner should move (respond) when the engine is accelerated rapidly or when the A/C clutch cycles ON and OFF (the degree of movement can be up to 4 mm). If the accessory drive belt tensioner movement is not constant without engine acceleration or A/C clutch cycling, a pulley or shaft is possibly bent, out of round, or the damping mechanism inside the accessory drive belt tensioner may be damaged. **INSTALL** a new accessory drive belt tensioner as necessary.
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (303-05, Removal and Installation).
- REFER to: Accessory Drive Belt Tensioner - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).

TEST the system for normal operation.

2. Excessive accessory drive belt rideout (uneven depth of grooves in the accessory drive belt) may cause excessive accessory drive belt tensioner movement. Check the condition by installing a new accessory drive belt.
- REFER to: Accessory Drive Belt - 1.3L Duratec-8V (Rocam) (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.4L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 1.6L Duratorq-TDCi (DV) Diesel (303-05 Accessory Drive, Removal and Installation).
- REFER to: Accessory Drive Belt - 2.0L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation).

TEST the system for normal operation.

REMOVAL AND INSTALLATION

Accessory Drive Belt — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning(21 567 0)

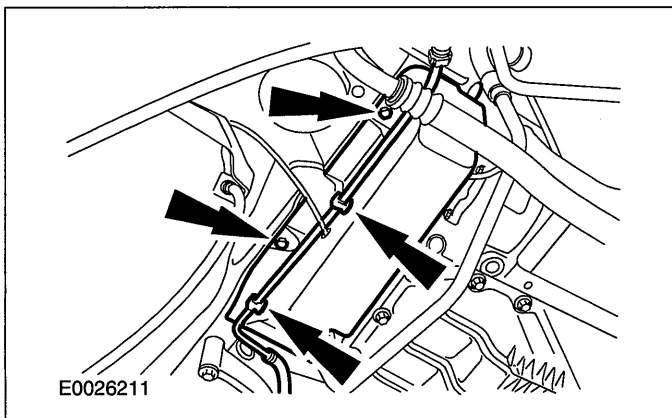
General Equipment

Knife

Removal

⚠ CAUTION: The accessory drive belt must not be reused as it is designed to be stretched onto the pulleys only once. Failure to follow this instruction may lead to premature failure of the belt.

1. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. Detach the power steering line and remove the crankshaft pulley splash shield.



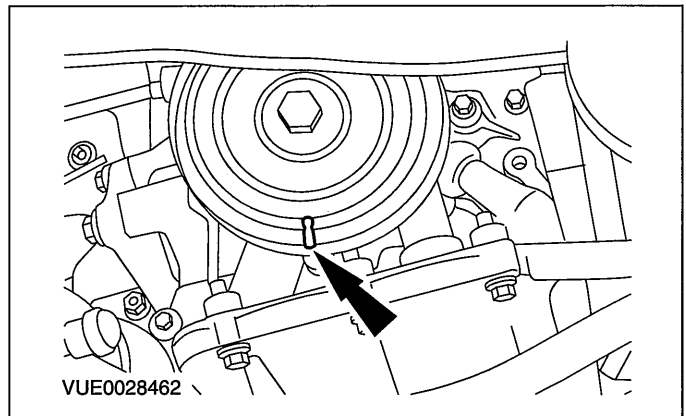
3. Using a suitable knife, cut both accessory drive belts and remove.

Installation

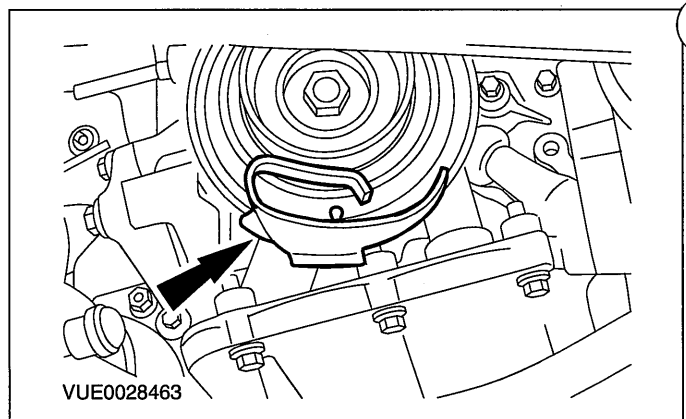
NOTE: Install a new accessory drive belt and power steering pump belt.

1. Wipe clean all of the pulleys to make sure that the accessory drive belt does not slip during installation.

2. Using paint or typing correction fluid, mark the crankshaft pulley at the 6 o'clock position.



3. Install the installation tool (supplied in the parts kit) to the crankshaft pulley at the 6 o'clock position.

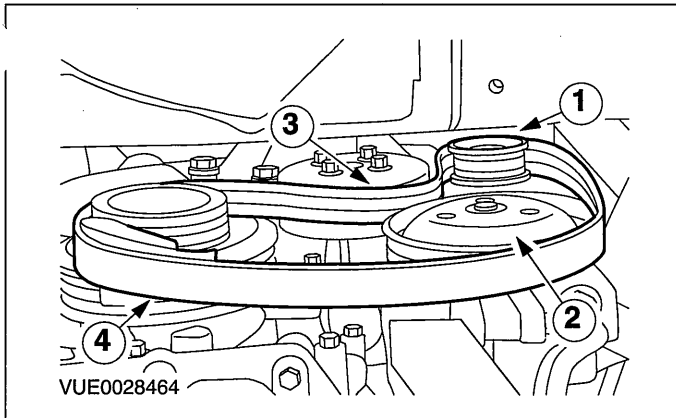


4. Install the accessory drive belt.

1. Install the belt around the generator pulley.
2. Install the belt around the air conditioning compressor pulley.
3. Install the belt around the water pump pulley.

REMOVAL AND INSTALLATION

4. Install the belt around the installation tool.

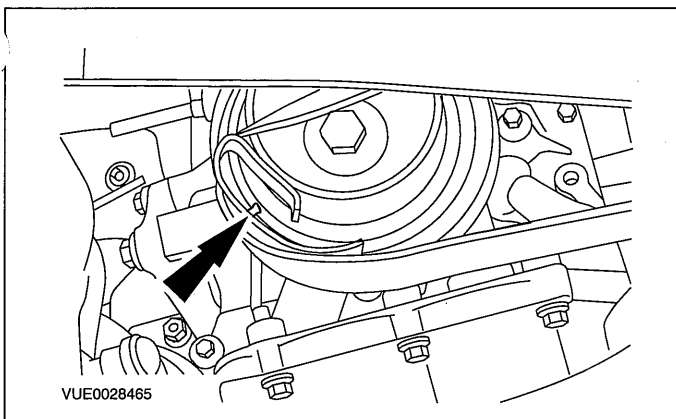


5. Make sure that the accessory drive belt is correctly positioned in the grooves of the pulleys.

6. **NOTE:** Only turn the engine in the normal direction of rotation.

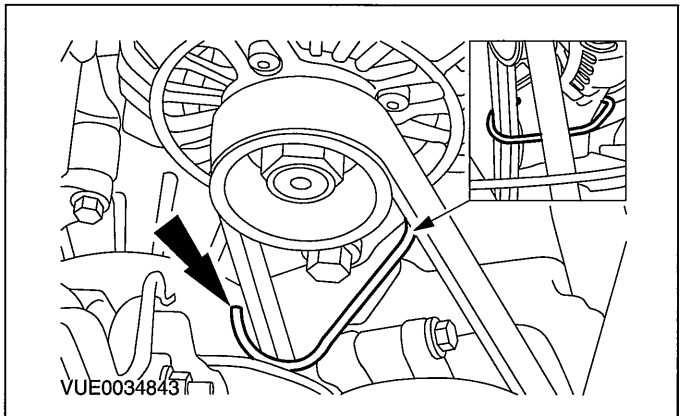
NOTE: Guide the accessory drive belt onto the pulleys as the engine is rotated.

Turn the engine until the paint mark is at the 8 o'clock position.

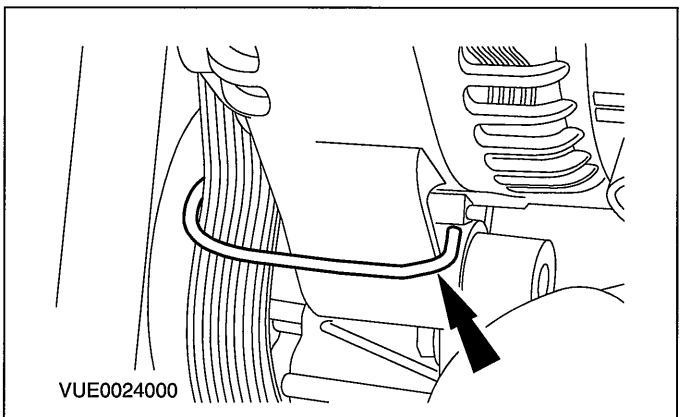


7. **NOTE:** The curved end of the tool fits around the belt and the cranked end of the tool fits around the generator mounting bracket.

Install the belt guide tool (supplied in the parts kit) to the accessory drive belt (shown from above for clarity).



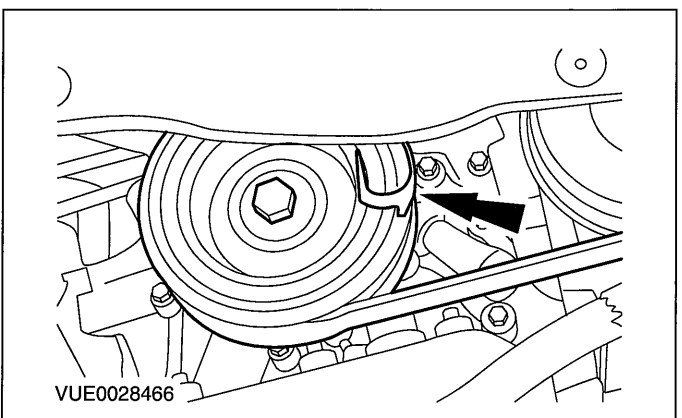
8. Install the belt guide tool to the generator mounting bracket.



9. **NOTE:** Only turn the engine in the normal direction of rotation.

NOTE: Guide the accessory drive belt onto the pulleys as the engine is rotated.

Turn the engine until the paint mark is at the 3 o'clock position



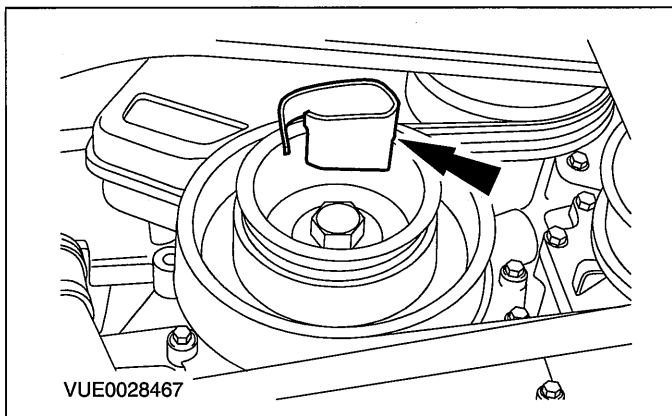
10. Remove the installation tool from the crankshaft pulley.

REMOVAL AND INSTALLATION

- 11. NOTE:** Only turn the engine in the normal direction of rotation.

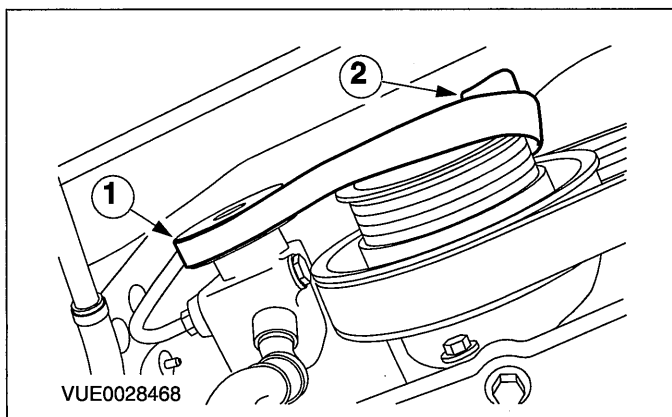
Turn the engine through 360 degrees.

- 12. Check that the accessory drive belt is correctly positioned in the grooves of the pulleys.**
- Repeat the installation procedure if the accessory drive belt is misaligned.
- 13. Remove the belt guide tool from the accessory drive belt.**
- Discard the belt guide tool.
- 14. Install the installation tool to the crankshaft pulley at the 12 o'clock position.**



- 15. Install the power steering pump belt.**

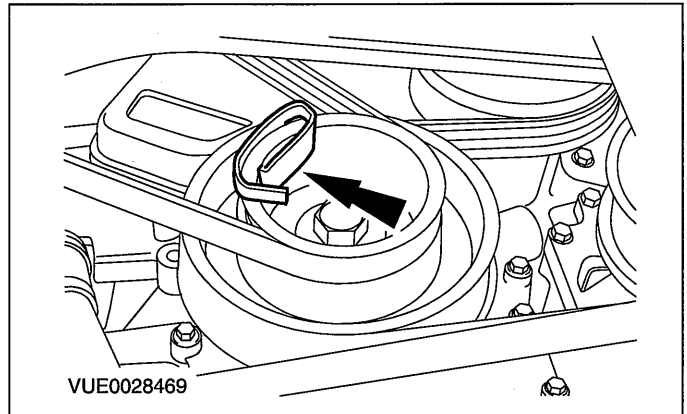
- Install the power steering pump belt around the power steering pump pulley.
- Install the power steering pump belt around the installation tool.



- 16. Make sure that the power steering pump belt is correctly positioned in the grooves of the pulleys.**
- 17. NOTE:** Only turn the engine in the normal direction of rotation.

NOTE: Guide the power steering pump belt onto the pulleys as the engine is rotated.

Turn the engine until the tool is at the 9 o'clock position.



- 18. Remove the installation tool from the crankshaft pulley.**

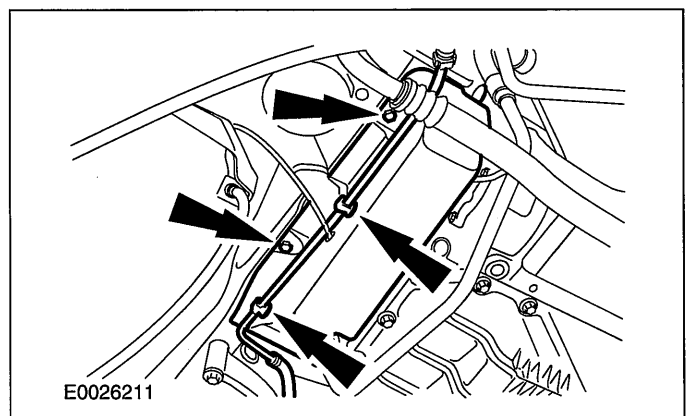
- 19. NOTE:** Only turn the engine in the normal direction of rotation.

Turn the engine through 360 degrees.

- 20. Check that the power steering pump belt is correctly positioned in the grooves of the pulleys.**

- Repeat the installation procedure if the power steering pump belt is misaligned.
- Discard the installation tool.

- 21. Install the crankshaft pulley splash shield.**



- 22. Lower the vehicle.**

REMOVAL AND INSTALLATION

Accessory Drive Belt — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles Without: Air Conditioning(21 567 0)

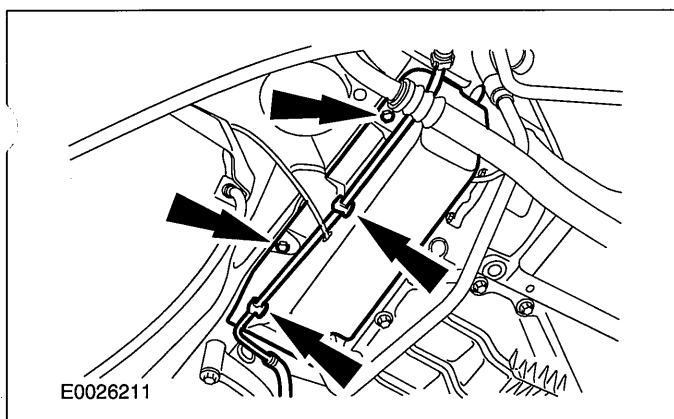
General Equipment

Knife

Removal

⚠ CAUTION: The accessory drive belt must not be reused as it is designed to be stretched onto the pulleys only once. Failure to follow this instruction may lead to premature failure of the belt.

1. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. Detach the power steering line and remove the crankshaft pulley splash shield.



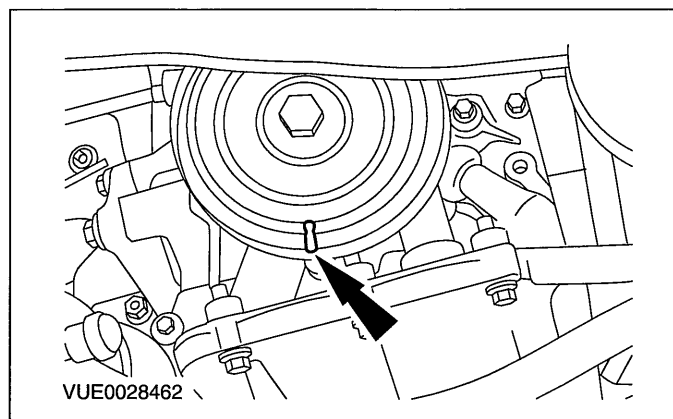
3. Using a suitable knife, cut the accessory drive belt and remove.

Installation

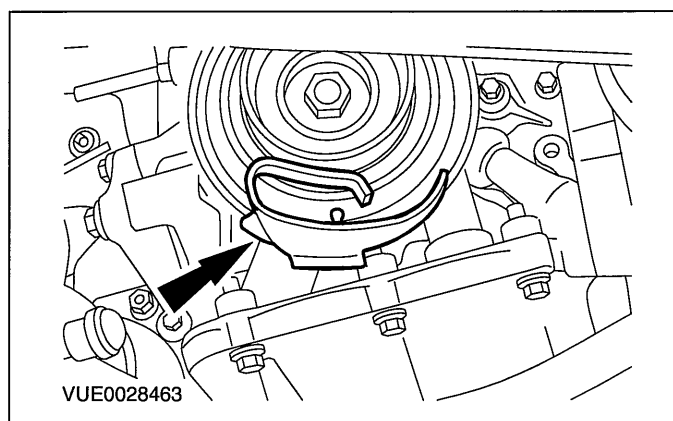
NOTE: Install a new accessory drive belt.

1. Wipe clean all of the pulleys to make sure that the accessory drive belt does not slip during installation.

2. Using paint or typing correction fluid, mark the crankshaft pulley at the 6 o'clock position.



3. Install the installation tool (supplied in the parts kit) to the crankshaft pulley at the 6 o'clock position.

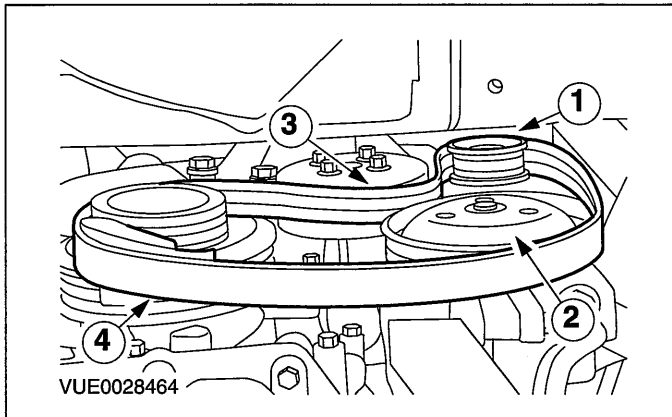


4. Install the accessory drive belt.

1. Install the belt around the generator pulley.
2. Install the belt around the power steering pump pulley.
3. Install the belt around the water pump pulley.

REMOVAL AND INSTALLATION

4. Install the belt around the installation tool.

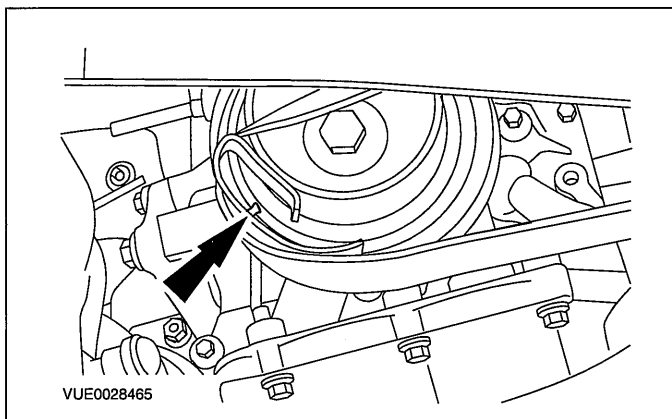


5. Make sure that the accessory drive belt is correctly positioned in the grooves of the pulleys.

6. **NOTE:** Only turn the engine in the normal direction of rotation.

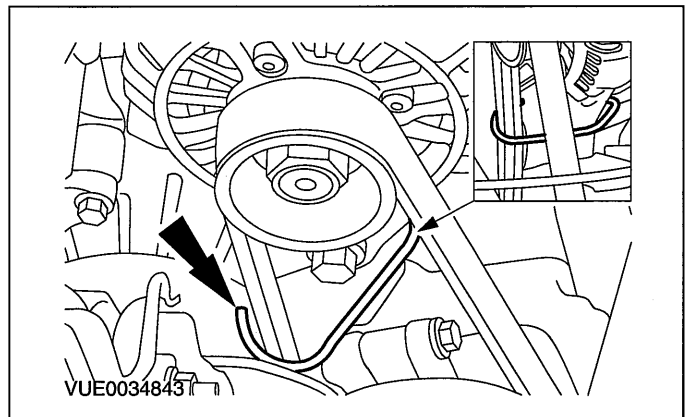
NOTE: Guide the accessory drive belt onto the pulleys as the engine is rotated.

Turn the engine until the paint mark is at the 8 o'clock position.

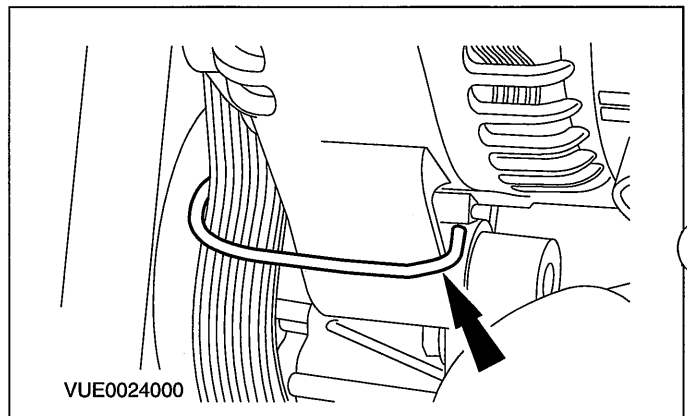


7. **NOTE:** The curved end of the tool fits around the belt and the cranked end of the tool fits around the generator mounting bracket.

Install the belt guide tool (supplied in the parts kit) to the accessory drive belt (shown from above for clarity).



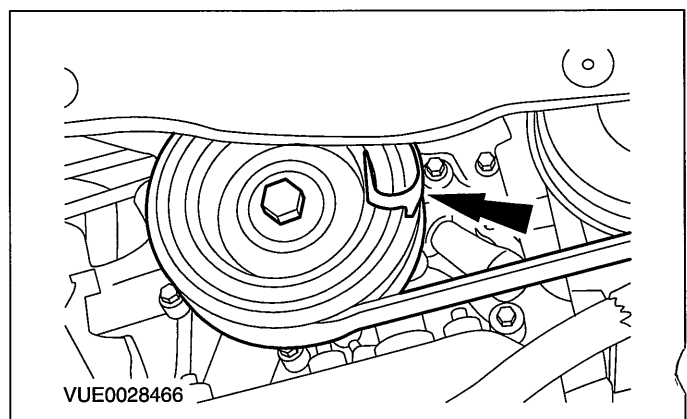
8. Install the belt guide tool to the generator mounting bracket.



9. **NOTE:** Only turn the engine in the normal direction of rotation.

NOTE: Guide the accessory drive belt onto the pulleys as the engine is rotated.

Turn the engine until the paint mark is at the 3 o'clock position



10. Remove the installation tool from the crankshaft pulley.

REMOVAL AND INSTALLATION

11. **NOTE:** Only turn the engine in the normal direction of rotation.

Turn the engine through 360 degrees.

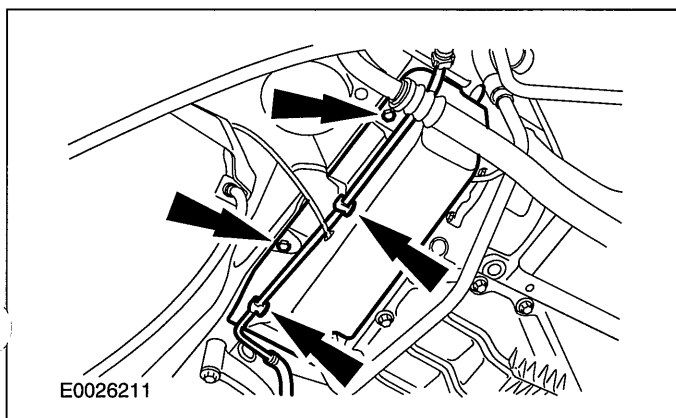
12. Check that the accessory drive belt is correctly positioned in the grooves of the pulleys.

- Repeat the installation procedure if the accessory drive belt is misaligned.
- Discard the installation tool.

13. Remove the belt guide tool from the accessory drive belt.

- Discard the belt guide tool.

14. Install the crankshaft pulley splash shield and attach the power steering line.



15. Lower the vehicle.

REMOVAL AND INSTALLATION

Power Steering Pump Belt — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning(21 567 0)

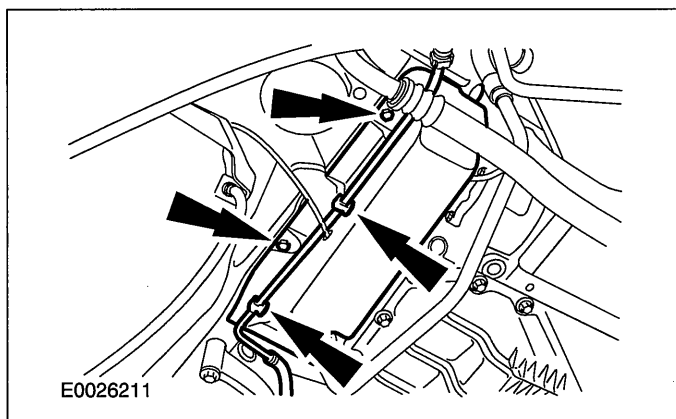
General Equipment

Knife

Removal

⚠ CAUTION: The power steering pump belt must not be reused as it is designed to be stretched onto the pulleys only once. Failure to follow this instruction may lead to premature failure of the belt.

1. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. Detach the power steering line and remove the crankshaft pulley splash shield.



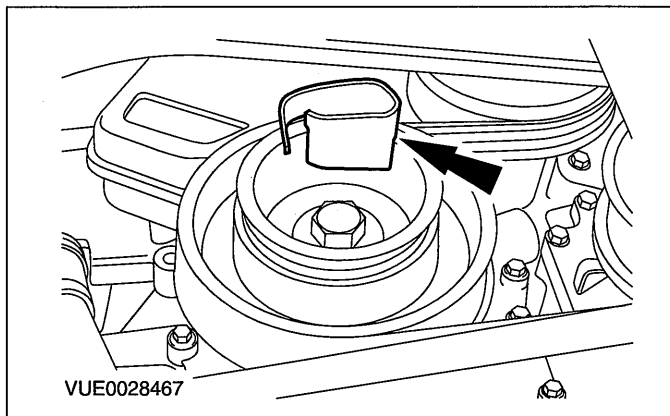
3. Using a suitable knife, cut the power steering pump belt and remove.

Installation

NOTE: Install a new power steering pump belt.

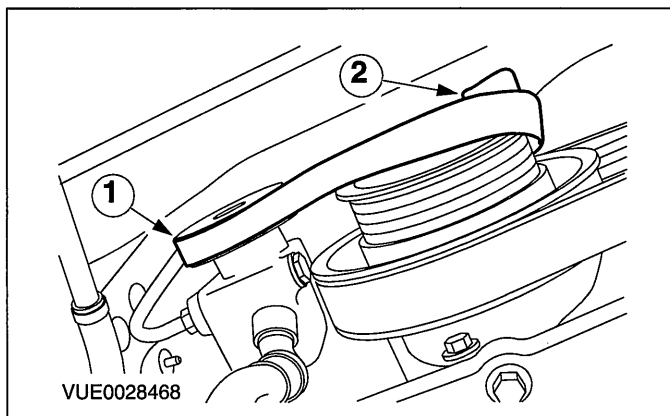
1. Wipe clean both of the pulleys to make sure that the power steering pump belt does not slip during installation.

2. Install the installation tool (supplied in the parts kit) to the crankshaft pulley at the 12 o'clock position.



3. Install the power steering pump belt.

1. Install the belt around the power steering pump pulley.
2. Install the belt around the installation tool.



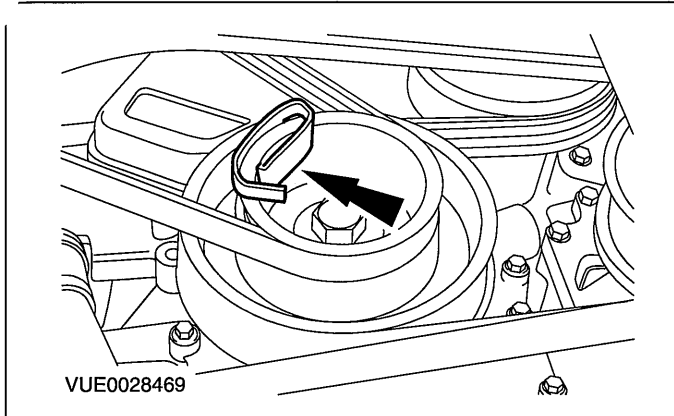
4. Make sure that the power steering pump belt is correctly positioned in the grooves of the pulleys.

5. **NOTE:** Only turn the engine in the normal direction of rotation.

NOTE: Guide the power steering pump belt onto the pulleys as the engine is rotated.

REMOVAL AND INSTALLATION

Turn the engine until the installation tool is at the 9 o'clock position.



6. Remove the installation tool from the crankshaft pulley.

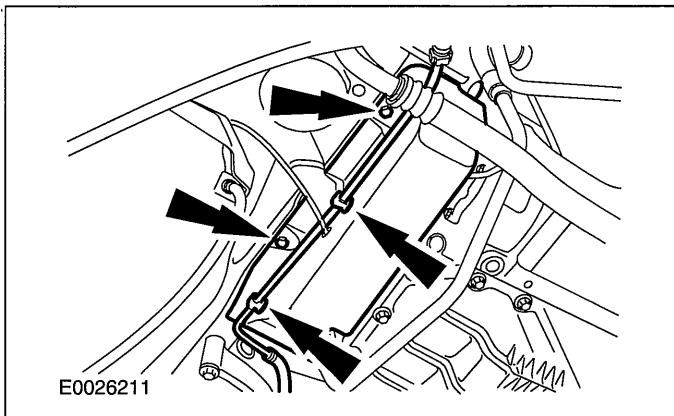
7. **NOTE:** Only turn the engine in the normal direction of rotation.

Turn the engine through 360 degrees.

8. Check that the power steering pump belt is correctly positioned in the grooves of the pulleys.

- Repeat the installation procedure if the power steering pump belt is misaligned.
- Discard the installation tool.

9. Install the crankshaft pulley splash shield.



10. Lower the vehicle.

REMOVAL AND INSTALLATION**Accessory Drive Belt — 2.0L Duratec-HE (M14)(21 567 0)****Removal**

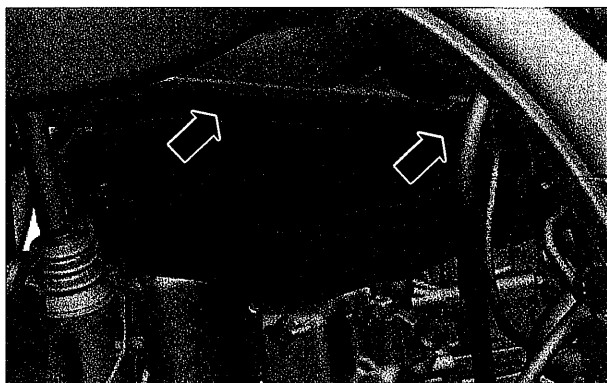
1. Disconnect the battery ground cable.

For additional information, refer to: **Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures)**.

2. Raise and support the vehicle.

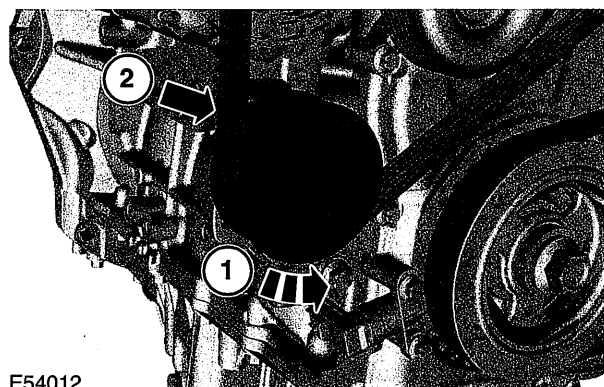
For additional information, refer to: **Lifting (100-02 Jacking and Lifting, Description and Operation)**.

3. Remove the crankshaft pulley splash shield.

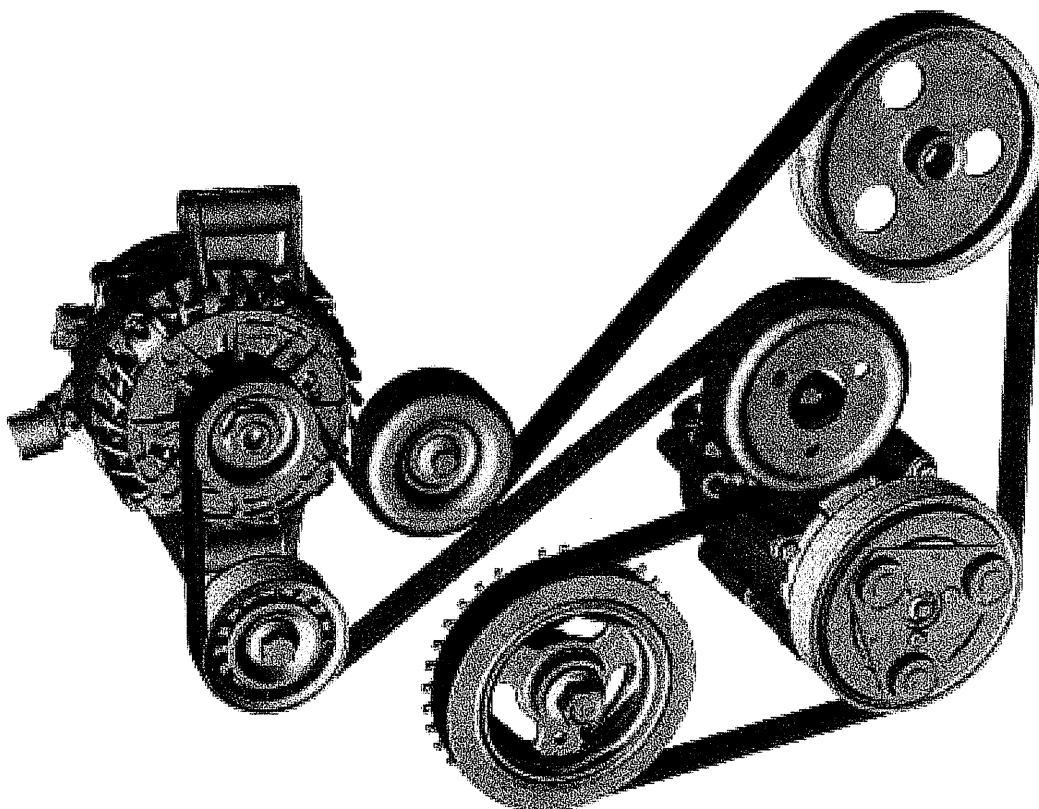


4. Remove the accessory drive belt.

1. Rotate the accessory drive belt tensioner counterclockwise.
2. Remove the accessory drive belt.

**Installation**

1. To install, reverse the removal procedure.



E54017

SECTION 303-06 Starting System

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-06-2
Torque Specifications - vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engines.....	303-06-2
Torque Specifications - vehicles with 1.4L Duratorq-TDCi (DV)/1.6L Duratorq-TDCi (DV) Diesel engines.....	303-06-2
Torque Specifications - vehicles with 2.0L Duratec-HE (MI4) engine.....	303-06-2
DESCRIPTION AND OPERATION	
Starting System.....	303-06-3
Starting system.....	303-06-3
DIAGNOSIS AND TESTING	
Starting System.....	303-06-4
Inspection and Verification.....	303-06-4
Symptom Chart.....	303-06-4
Pinpoint Tests.....	303-06-6
REMOVAL AND INSTALLATION	
Starter Motor — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)..... (26 204 0)	303-06-11
Starter Motor — 2.0L Duratec-HE (MI4).....	303-06-12

SPECIFICATIONS

Torque Specifications - vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engines

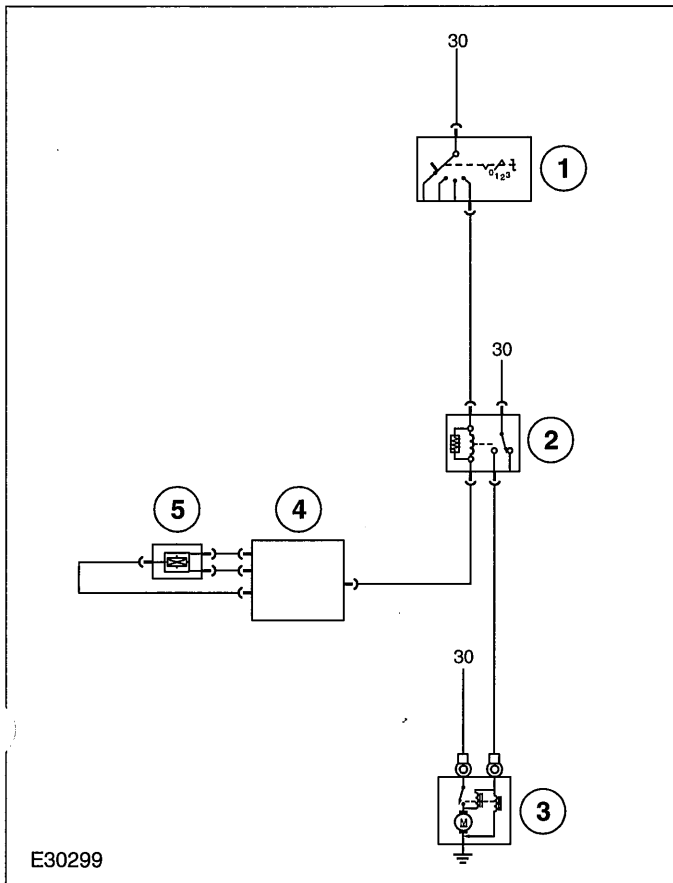
Description	Nm	lb-ft	lb-in
Ignition switch to starter motor cable retaining nut	7	-	62
Starter motor positive cable retaining nut	12	9	-
Starter motor retaining bolts	35	26	-

Torque Specifications - vehicles with 1.4L Duratorq-TDCi (DV)/1.6L Duratorq-TDCi (DV) Diesel engines

Description	Nm	lb-ft	lb-in
Ignition switch to starter motor cable retaining nut	6	-	53
Starter motor positive cable retaining nut	12	9	-
Starter motor retaining bolts	25	18	-

Torque Specifications - vehicles with 2.0L Duratec-HE (MI4) engine

Description	Nm	lb-ft	lb-in
Ignition switch to starter motor cable retaining nut	6	-	53
Starter motor positive cable retaining nut	12	9	-
Starter motor wiring harness support bracket retaining nuts	20	15	-
Starter motor retaining studs	25	18	-

DESCRIPTION AND OPERATION**Starting System****Starting system**

E30299

- The solenoid applies battery current to the starter.
- The starter turns the crankshaft until the engine starts. The key can then be released and it automatically returns to position II.

The system incorporates the "Smart Starting" strategy. This makes starting faster and protects the starter.

If the driver fails to release the key immediately after the engine starts, the PCM interrupts activation of the starter relay and thus switches off the electric starter motor.

The speed signal provided by the CKP sensor is used for monitoring the starting procedure.

Item	Description
1	Ignition/starter switch
2	Starter relay
3	Electric starter motor
4	Powertrain control module (PCM)
5	Sensor, - crankshaft position (CKP)

The purpose of the starting system is to turn the engine crankshaft at a speed which enables the engine to start.

The engine is started as follows:

- Ignition/starter switch in position III.
- The starter relay is activated by the PCM .
- The solenoid is supplied with voltage.
- The solenoid engages the starter motor pinion with the flywheel ring gear.

DIAGNOSIS AND TESTING**Starting System**

Refer to Wiring Diagrams Section 303-06, for schematic and connector information.

General Equipment

Worldwide Diagnostic System (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
Fuse(s)
Wiring harness

Electrical
Electrical connector(s)
Relay
Central junction box (CJB)
Switch(es)
Battery
Starter motor
Powertrain Control Module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
The engine does not crank/the relay does click	Battery.	REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
	Starter motor.	CARRY OUT the starter motor Component Test using WDS.
	Relay.	CARRY OUT the relay Component Test. REFER to the wiring diagrams.
	Circuit(s).	GO to Pinpoint Test A.
	PCM.	REFER to WDS.
The engine does not crank/the relay does not click	Battery.	REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
	Fuse.	INSTALL a new fuse as necessary. If the fuse fails again check for short to ground.
	Passive anti-theft system (PATS).	REFER to: Anti-Theft - Passive (419-01 Anti-Theft - Passive, Diagnosis and Testing).
	Starter motor.	CARRY OUT the starter motor Component Test using WDS.
	Ignition switch.	GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• The engine cranks slowly	• Relay.	• CARRY OUT the relay Component Test. REFER to the wiring diagrams.
	• Circuit(s).	• GO to Pinpoint Test B.
	• Battery.	• REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).
• Unusual starter noise	• Starter motor.	• CARRY OUT the starter motor Component Test using WDS.
	• Circuit(s).	• GO to Pinpoint Test C.
	• Starter motor.	• REMOVE the starter motor. REFER to: (303-06 Starting System) Starter Motor - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (Removal and Installation), Starter Motor - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation). INSPECT the starter motor gear for damage. INSTALL a new starter motor as necessary.
• The starter spins but the engine does not crank	• Flywheel ring gear.	• INSPECT the flywheel for damage.
	• Starter motor.	• REMOVE the starter motor.REFER to: (303-06 Starting System) Starter Motor - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (Removal and Installation), Starter Motor - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation). INSPECT the starter motor gear for damage. INSTALL a new starter motor as necessary.
	• Flywheel ring gear.	• INSPECT the flywheel for damage.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• The starter stops cranking the engine before the engine starts	• PCM.	• REFER to WDS.

Pinpoint Tests

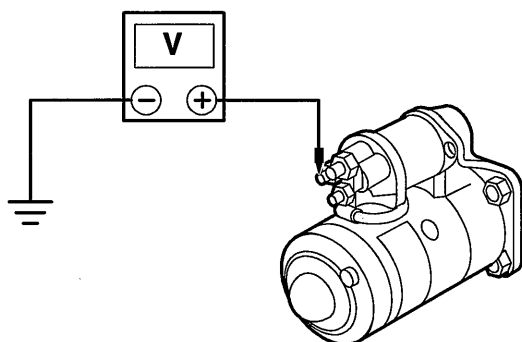
NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST A : THE ENGINE DOES NOT CRANK/THE RELAY DOES CLICK

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A1: CHECK VOLTAGE TO STARTER SOLENOID



VUE0019332

1 Ignition switch in position III.

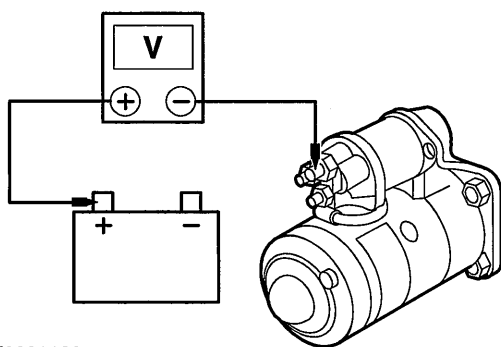
2 Measure the voltage between starter motor terminal 50, harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to A2.

→ **No**
GO to A3.

A2: CHECK THE VOLTAGE DROP



VUV2601160

1 Measure the voltage between starter motor terminal 30, component side and the battery positive terminal.

• Is the voltage less than 0.5 volts?

→ **Yes**
GO to A4.

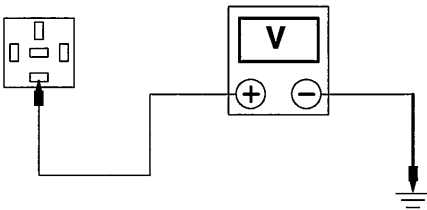
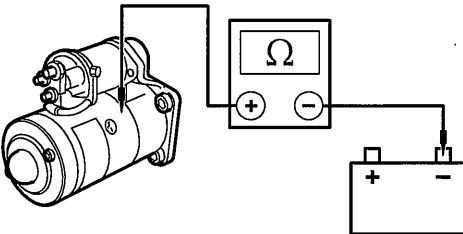
→ **No**
CLEAN and TIGHTEN all battery positive cable connections. TEST the system for normal operation. If the concern persists, INSTALL a new battery starter motor solenoid cable.

REFER to: Battery to Starter Motor Solenoid Cable - 1.3L Duratec-8V (Rocam) (414-01 Battery, Mounting and Cables, Removal and Installation)

/ Battery to Starter Motor Solenoid Cable - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (414-01 Battery, Mounting and Cables, Removal and Installation).

TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A3: CHECK CIRCUIT 29-BB17 (OG/BK) FOR OPEN	
 VUE0018285	1 Ignition switch in position 0.
	2 Disconnect Starter Relay C423.
	3 Measure the voltage between starter relay C423 pin 3, circuit 29-BB17 (OG/BK), harness side and ground. - Is the voltage greater than 10 volts? → Yes REPAIR circuit 50-BB10 (GY/BK). TEST the system for normal operation. → No REPAIR circuit 29-BB17 (OG/BK). TEST the system for normal operation.
A4: CHECK THE STARTER MOTOR GROUND CIRCUIT FOR OPEN	
 TIV2601016	1 Measure the resistance between the starter motor casing and battery ground terminal. - Is the resistance less than 0.5 ohms? → Yes INSTALL a new starter motor. REFER to: Starter Motor - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-06 Starting System, Removal and Installation) / Starter Motor - 1.4L Duratorq-TDCi (DV) Diesel (303-06 Starting System, Removal and Installation). INSPECT the starter motor gear for damage. INSTALL a new starter motor as necessary. → No CLEAN and TIGHTEN all battery and engine ground cable connections. TEST the system for normal operation.

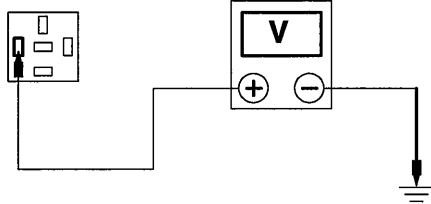
PINPOINT TEST B : THE ENGINE DOES NOT CRANK/RELAY DOES NOT CLICK

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE SWITCHED POWER TO THE STARTER RELAY	
	1 Disconnect Starter Relay C423.
	2 Ignition switch in position III.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VUE0018265

3 Measure the voltage between the starter motor relay C423 pin 1, harness side and ground.

- Is the voltage greater than 10 volts?

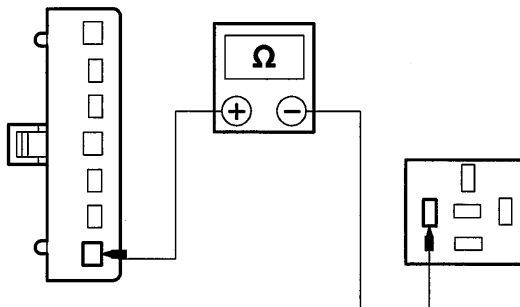
→ **Yes**
GO to B3.

→ **No**
GO to B2.

B2: CHECK CIRCUIT 50-BB16 (GY/BK) FOR OPEN

1 Ignition switch in position 0.

2 Disconnect Ignition Switch C329.



VUE0012329

3 Measure the resistance between the ignition switch C329 pin 7, circuit 50-BB16 (GY/BK), harness side and the starter relay C423 pin 1, circuit 50-BB16 (GY/BK), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new ignition switch.

REFER to: Ignition Switch (211-05 Steering Column Switches, Removal and Installation).
TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B3: CHECK CIRCUIT 91S-BB16 (BK/RD) FOR OPEN

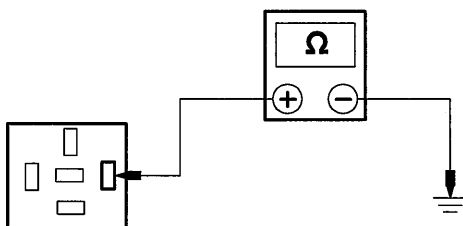
1 Ignition switch in position II.

2 Measure the resistance between the starter relay C423 pin 2, circuit 91S-BB16 (BK/RD), harness side and ground.

- Is the resistance less than 5 ohms?

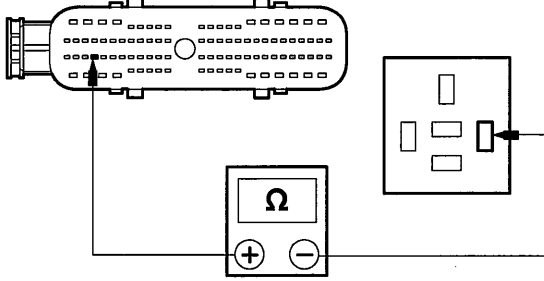
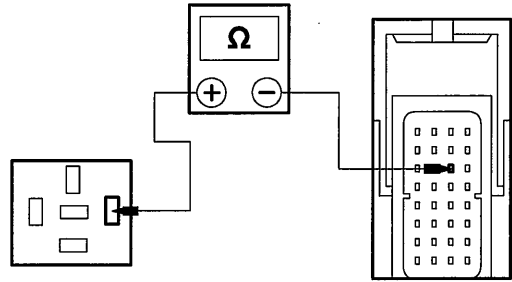
→ **Yes**
INSTALL a new starter relay. TEST the system for normal operation.

→ **No**
All except vehicles with diesel engine, GO to B4.
Vehicles with diesel engine, GO to B5.



VUE0013833

DIAGNOSIS AND TESTING

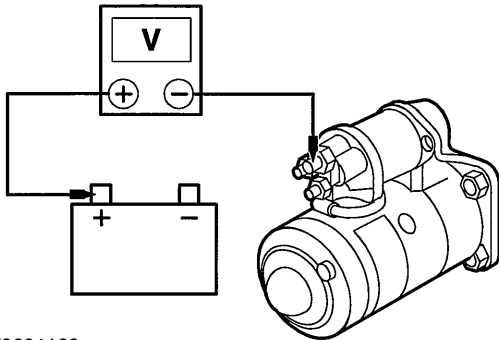
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B4: CHECK CIRCUIT 91S-BB16 (BK/RD) FOR OPEN	
 VUE0029942	1 Ignition switch in position 0.
	2 Disconnect PCM C343.
	3 Measure the resistance between the starter relay C423 pin 2, circuit 91S-BB16 (BK/RD), harness side and PCM C343 pin F30, 91S-BB16 (BK/RD), harness side. - Is the resistance less than 5 ohms? → Yes CHECK the PATS system. REFER to WDS. → No REPAIR the circuit. TEST the system for normal operation.
B5: CHECK CIRCUIT 91S-BB16 (BK/RD) FOR OPEN	
 VUE0029849	1 Ignition switch in position 0.
	2 Disconnect PCM C372.
	3 Measure the resistance between the starter relay C423 pin 2, circuit 91S-BB16 (BK/RD), harness side and the PCM C372 pin C3, 91S-BB16 (BK/RD), harness side. - Is the resistance less than 5 ohms? → Yes CHECK the PATS system. REFER to WDS. → No Repair the circuit. Test the system for normal operation.

PINPOINT TEST C : THE ENGINE CRANKS SLOWLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK FOR VOLTAGE DROP	
	1 Ignition switch in position III.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUV2601160

DETAILS/RESULTS/ACTIONS

- 2 Measure the voltage between the starter motor terminal 30, component side and the battery positive terminal.

- Is the voltage less than 0.5 volts?

→ **Yes**

GO to C2.

→ **No**

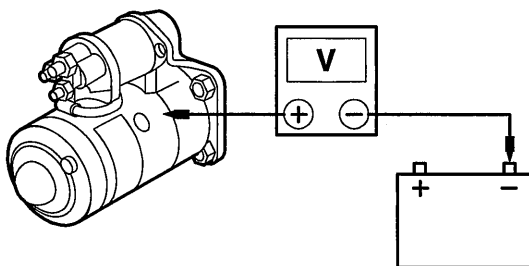
CLEAN and TIGHTEN all battery positive cable connections. TEST the system for normal operation. If the concern persists, INSTALL a new battery to starter motor solenoid cable.

REFER to: Battery to Starter Motor Solenoid Cable - 1.3L Duratec-8V (Rocam) (414-01 Battery, Mounting and Cables, Removal and Installation)

/ Battery to Starter Motor Solenoid Cable - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (414-01 Battery, Mounting and Cables, Removal and Installation).

Test the system for normal operation.

C2: CHECK FOR GROUND CONNECTION



VUV9510063

- 1 Ignition switch in position III.

- 2 Measure the voltage between the starter motor case and the battery ground terminal.

- Is the voltage less than 0.5 volts?

→ **Yes**

CHECK the battery.

REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).

TEST the system for normal operation.

→ **No**

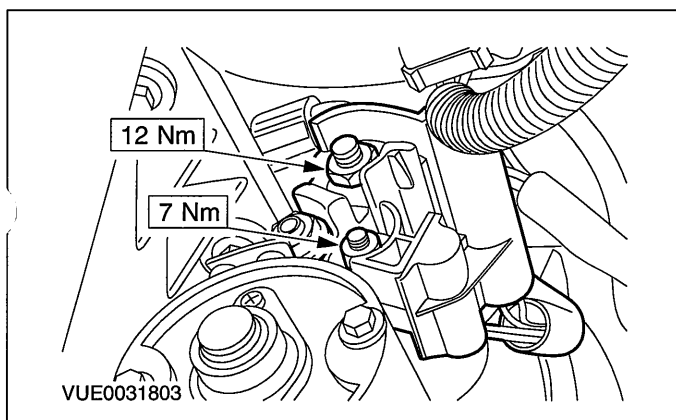
CLEAN and TIGHTEN all battery ground cable connections, starter motor mounting and body to ground straps. TEST the system for normal operation. If the concern persists, INSTALL a new battery ground cable. Test the system for normal operation.

REMOVAL AND INSTALLATION

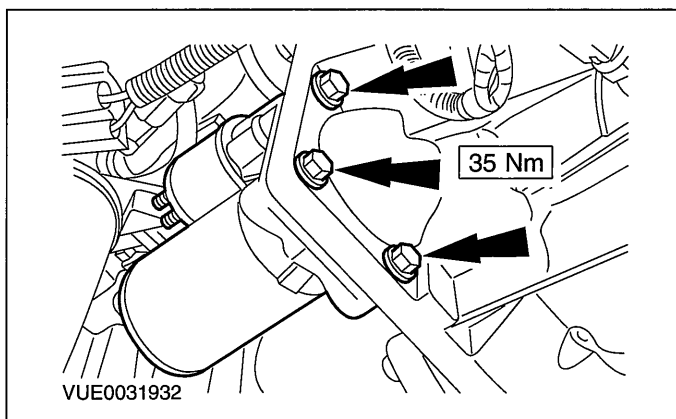
Starter Motor — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(26 204 0)

Removal

1. **Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].**
2. **Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].**
3. **Disconnect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables (oil filter shown removed for clarity).**



4. **Remove the starter motor retaining bolts and remove the starter motor.**

**Installation**

1. **To install, reverse the removal procedure.**

REMOVAL AND INSTALLATION

Starter Motor — 2.0L Duratec-HE (M14)

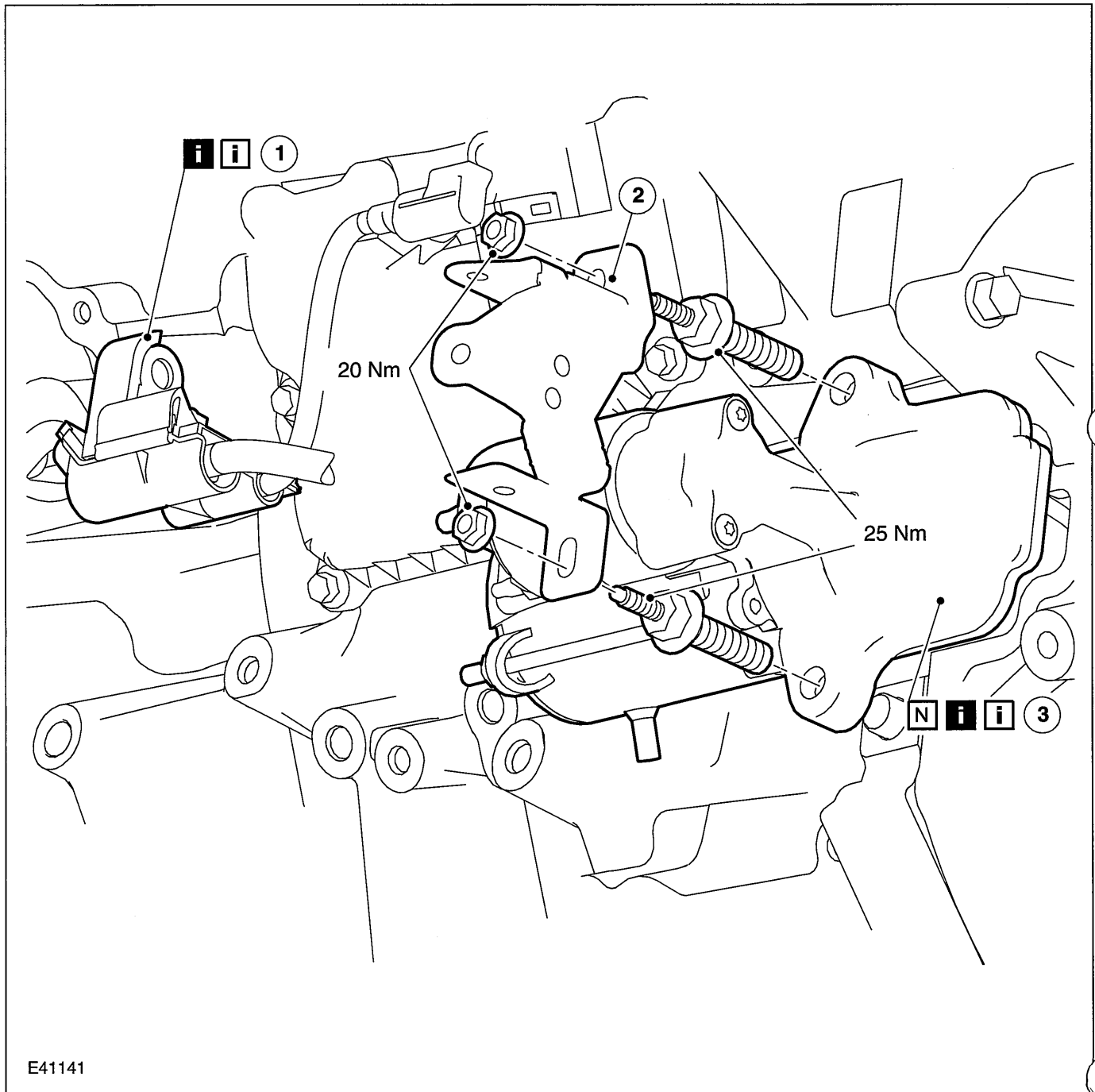
1. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

3. Remove the components in the order indicated in the following illustration(s) and table(s).



E41141

Item	Description	Item	Description
1	Starter motor electrical connectors See Removal Detail		

REMOVAL AND INSTALLATION

Item	Description
	See Installation Detail
2	Starter motor wiring harness support bracket

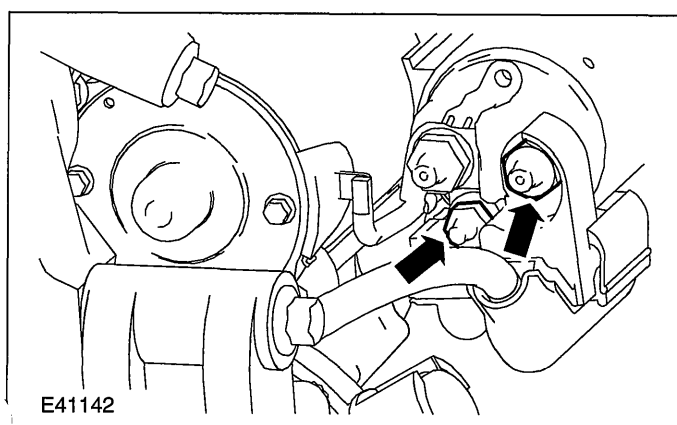
Item	Description
3	Starter motor See Removal Detail See Installation Detail

4. To install, reverse the removal procedure.

Removal Details

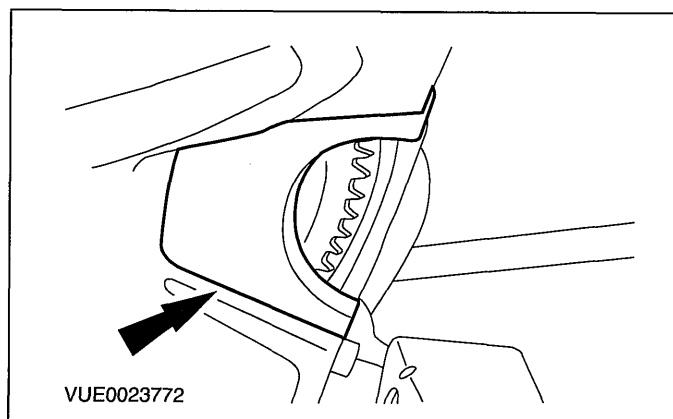
Item 1 Starter motor electrical connectors

1. Disconnect the ignition switch and battery to starter motor solenoid cables.



Item 3 Starter motor

1. Discard the starter motor gasket.

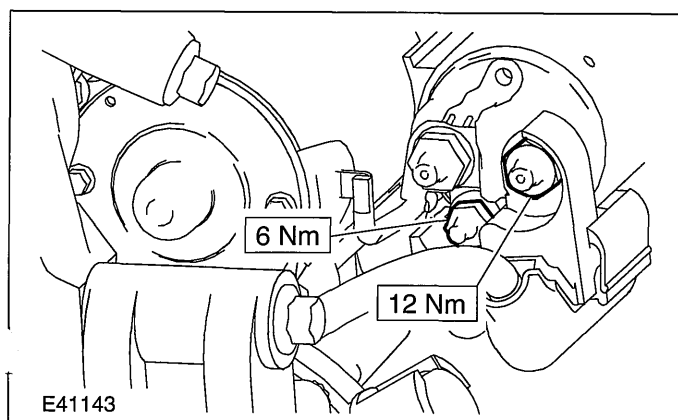


Installation Details

Item 1 Starter motor electrical connectors

1. **NOTE:** Clean the electrical connectors before connecting the cables. Failure to follow this instruction may cause a high resistance between the electrical connectors and the starter motor solenoid.

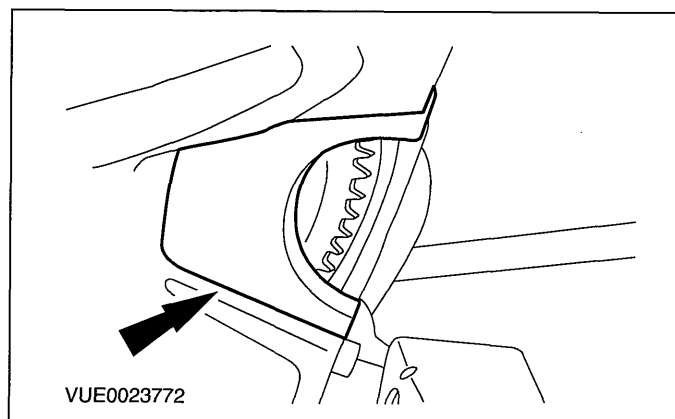
Connect the ignition switch and battery to starter motor solenoid cables.



Item 3 Starter motor

1. **NOTE:** Clean the mating surfaces before installing the new starter motor gasket.

Install a new starter motor gasket into the transaxle housing prior to installing the starter motor.



SECTION 303-07A Engine Ignition

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-07A-2
DIAGNOSIS AND TESTING	
Engine Ignition.....	303-07A-3
Inspection and Verification.....	303-07A-3

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Ignition coil retaining bolts	6	-	53
Spark plugs	15	11	-

DIAGNOSIS AND TESTING**Engine Ignition****Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Spark plug wire(s) – Spark plug(s) – Ignition coil pack	– Wiring harness – Electrical connector(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern remains after visual inspection, use WDS to diagnose the system.



SECTION 303-07B Engine Ignition — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-07B-2
DIAGNOSIS AND TESTING	
Engine Ignition.....	303-07B-3
Inspection and Verification.....	303-07B-3
Symptom Chart.....	303-07B-3

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Ignition coil pack retaining bolts	6	—	53
Spark plug(s)	12	9	—

DIAGNOSIS AND TESTING**Engine Ignition****General Equipment**

Worldwide Diagnostic System (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Wiring harness • Electrical connector(s) • Spark plug(s) • Spark plug wire(s) • Ignition coil pack • Powertrain control module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Engine misfire	• Spark plug(s). • Spark plug wire(s).	• CARRY OUT a KV test using WDS.
	• Ignition coil pack. • PCM. • PCM calibration.	• REFER to WDS.
• Engine stumbling	• Spark plug(s). • Spark plug wire(s).	• CARRY OUT a KV test using WDS.
	• Ignition coil pack. • PCM. • PCM calibration.	• REFER to WDS.
• Engine lacks power	• Spark plug(s). • Spark plug wire(s).	• CARRY OUT a KV test using WDS.
	• Ignition coil pack.	• REFER to WDS.



SECTION 303-08A Engine Emission Control — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-08A-2
DESCRIPTION AND OPERATION	
Engine Emission Control.....	303-08A-3
Positive Crankcase Ventilation (PCV) - 1.3L Duratec 8V.....	303-08A-3
PCV - 1.4L/1.6L Duratec 16V.....	303-08A-5
DIAGNOSIS AND TESTING	
Engine Emission Control.....	303-08A-6
Inspection and Verification.....	303-08A-6
Symptom Chart.....	303-08A-6
REMOVAL AND INSTALLATION	
Crankcase Vent Oil Separator.....	303-08A-7

**Engine Emission Control — 1.3L Duratec-8V
(Rocam)/1.25L Duratec-16V (Sigma)/1.4L
Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)**

303-08A-2

303-08A-2

SPECIFICATIONS

Torque Specifications

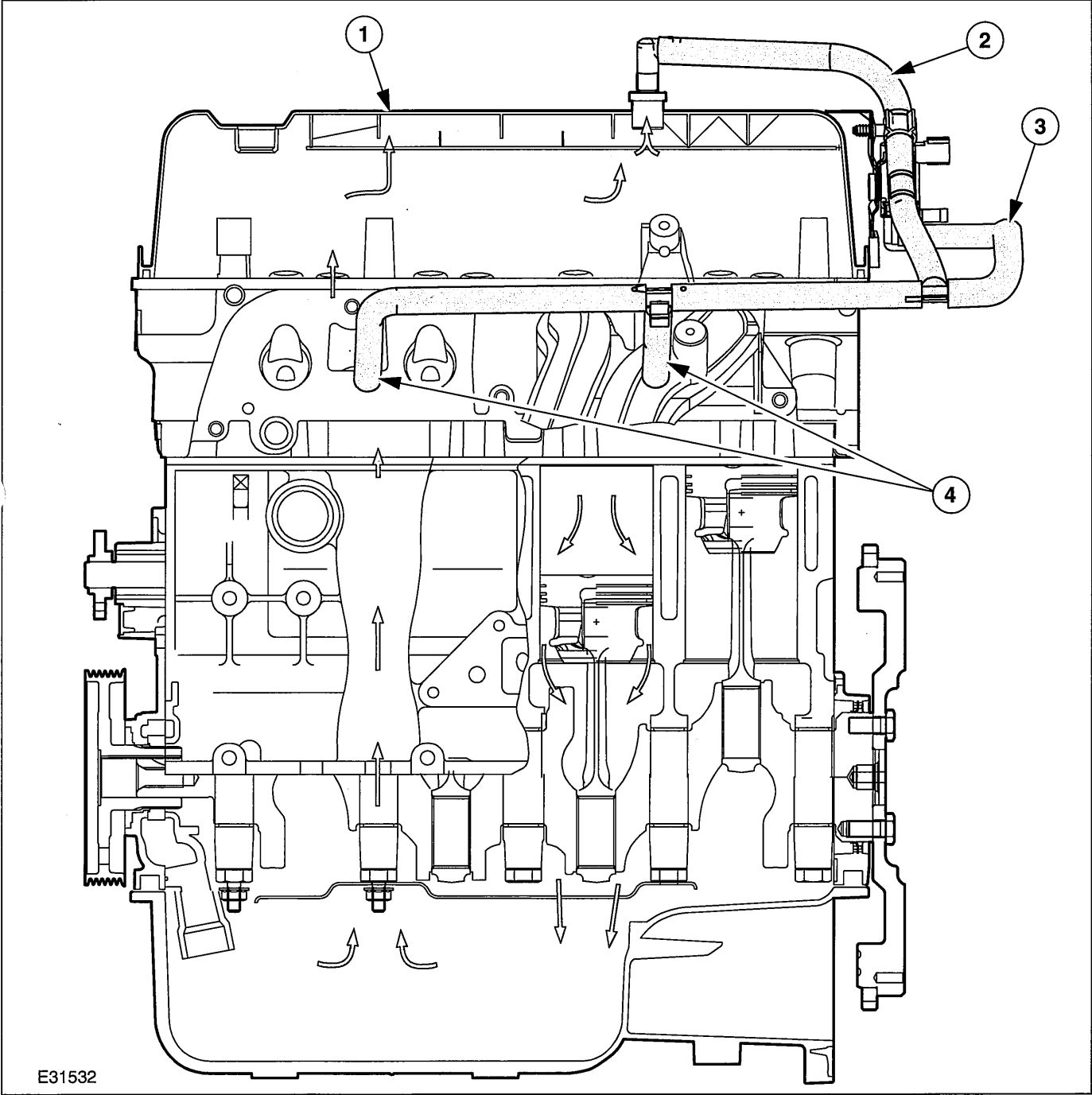
Description	Nm	lb-ft	lb-in
Crankcase vent oil separator retaining bolts	10	-	89

DESCRIPTION AND OPERATION

Engine Emission Control

Positive Crankcase Ventilation (PCV) - 1.3L Duratec 8V

Overview



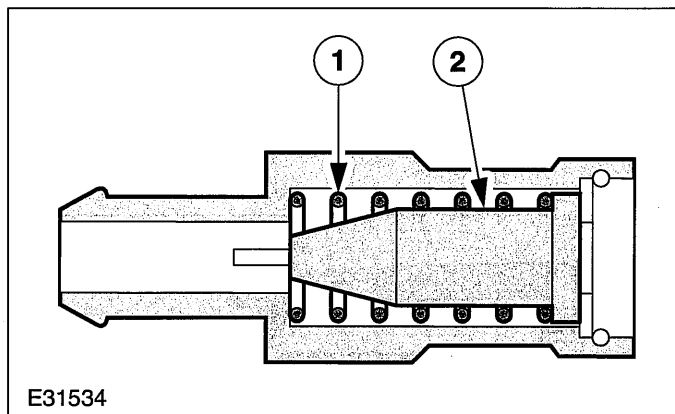
Side view

Item	Description
1	Cylinder head cover with integrated oil separator
2	From PCV valve

Item	Description
3	From Evaporative Emission (EVAP) solenoid valve
4	To the intake manifold

DESCRIPTION AND OPERATION

PCV valve



Sectional view

Item	Description
1	Spring
2	Pistons

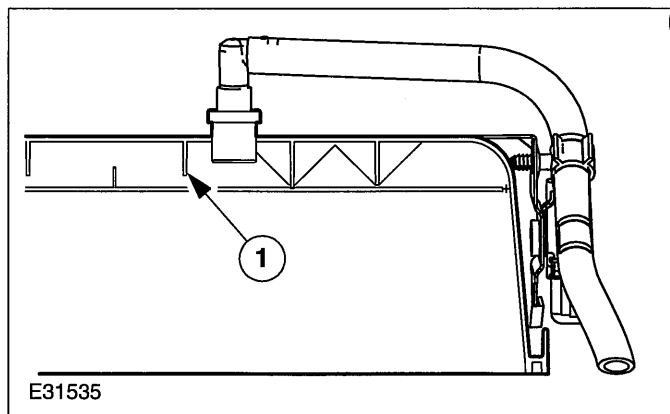
The PCV valve is located on the upper side of the cylinder head cover.

The crankcase gases are sucked by the PCV valve into the intake manifold.

The PCV valve is opened by the vacuum in the intake manifold.

The amount of crankcase gases depends on the engine speed. The quantity sucked in is determined by the spring and the shape of the piston.

Deflection panel



Side view

Item	Description
1	Deflection plate

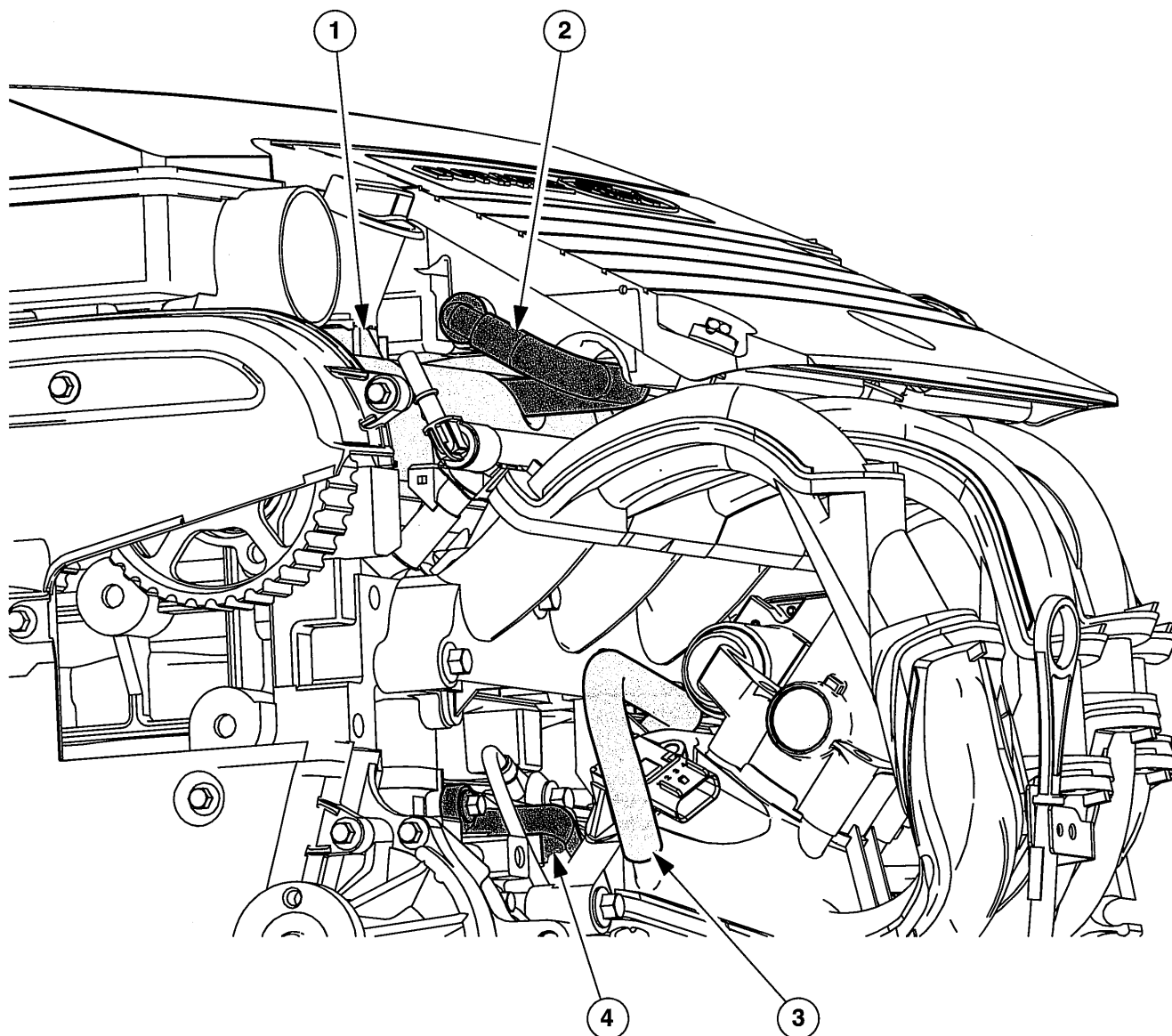
The deflection plate is integrated into the cylinder head cover.

It prevents oil from being sucked in and burned in the combustion process.

The oil drops condense on the deflection plate and are then returned to the oil circuit.

DESCRIPTION AND OPERATION

PCV - 1.4L/1.6L Duratec 16V



E38735

Item	Description
1	Valve cover
2	Hose from valve cover to air cleaner housing
3	Hose from PCV oil separator to intake manifold
4	PCV oil separator with integral PCV valve

The crankcase gases are freed of oil in the valve cover and in the PCV oil separator in order to prevent the oil from being sucked in and burned.

The PCV valve is located in the PCV oil separator.

The crankcase gases are sucked by the PCV valve into the intake manifold.

The PCV valve is opened by the vacuum in the intake manifold.

The amount of crankcase gases depends on the engine speed.

DIAGNOSIS AND TESTING

Engine Emission Control

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
Positive crankcase ventilation (PCV) valve
PCV separator

Mechanical
Hose(s)/hose joints
Gasket(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom Chart

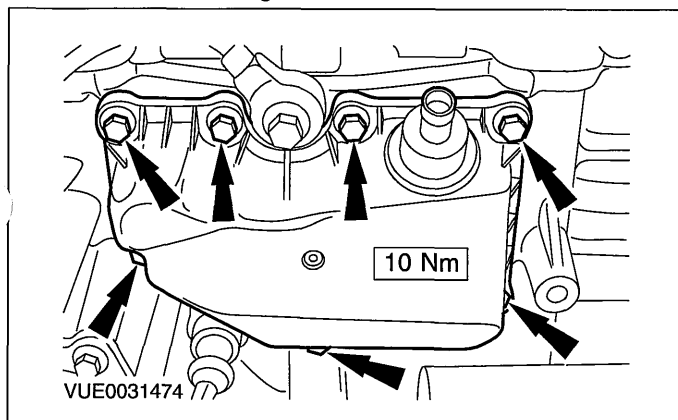
Symptom	Possible Sources	Action
Excessive crankcase pressure	- Blocked PCV valve. - Blocked PCV separator. - Blocked PCV hose.	CLEAN or INSTALL new PCV components as necessary. TEST the system for normal operation. If the concern persists, REFER to Section 303-00 [Engine System - General Information].
Oil in the air intake system	Restriction in PCV separator.	CLEAN or INSTALL a new PCV separator. TEST the system for normal operation.
	PCV valve permanently open.	INSTALL a new PCV valve. TEST the system for normal operation.

REMOVAL AND INSTALLATION

Crankcase Vent Oil Separator

Removal

1. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
2. Remove the intake manifold. For additional information, refer to Section 303-01A [Engine -- 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)] / 303-01B [Engine -- 1.4L Duratorq-TDCi (DV) Diesel] / 303-01C [Engine -- 1.3L Duratec-8V (Rocam)] / 303-01D [Engine -- 2.0L Duratec-HE (MI4)] / 303-01E [Engine -- 1.6L Duratorq-TDCi (DV) Diesel].
3. Remove the crankcase vent oil separator.
 - Discard the gasket.



Installation

1. **NOTE:** Install a new crankcase vent oil separator gasket.
To install, reverse the removal procedure.



SECTION 303-08B Engine Emission Control — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

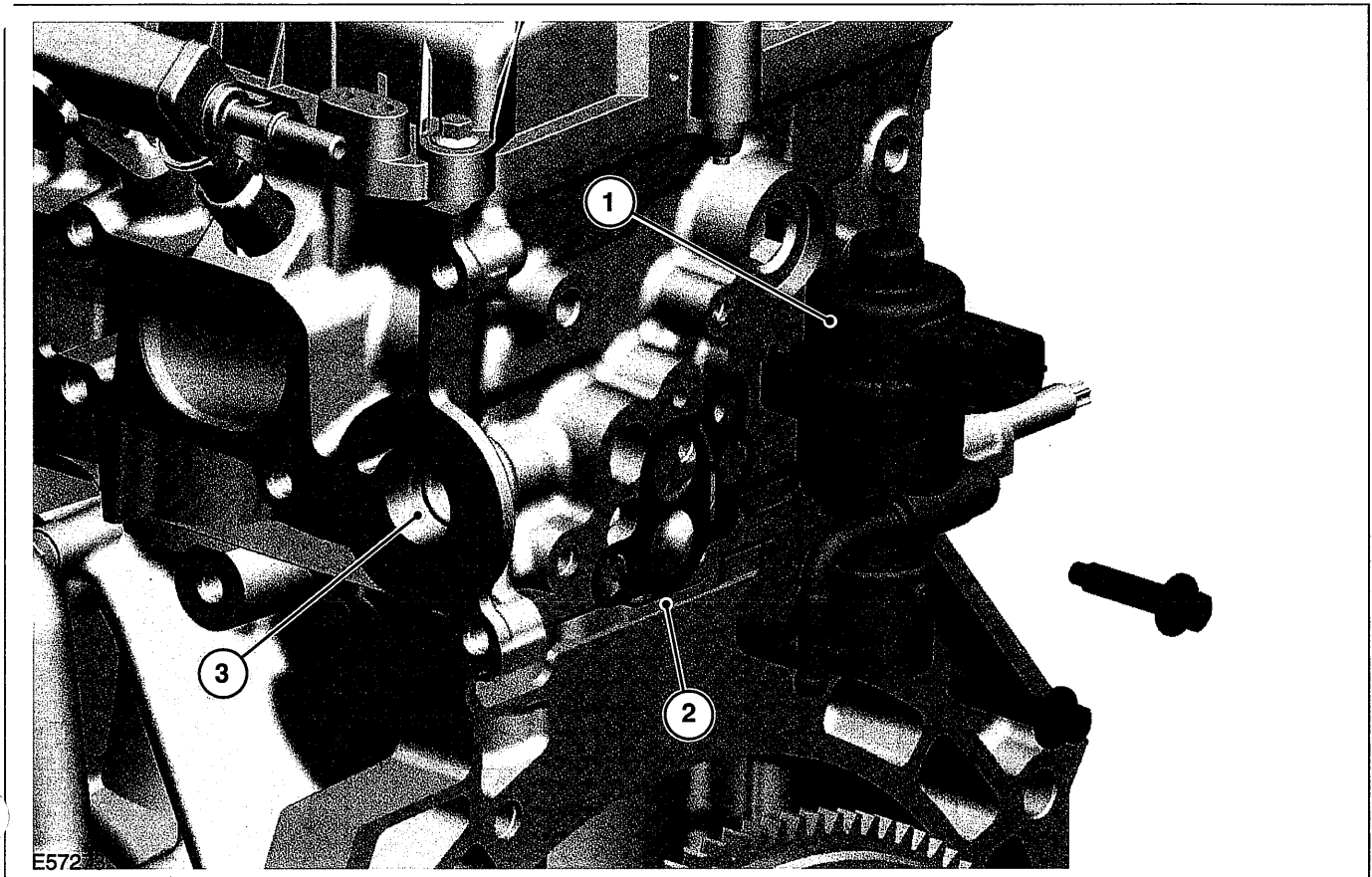
CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-08B-2
DESCRIPTION AND OPERATION	
Engine Emission Control.....	303-08B-3
DIAGNOSIS AND TESTING	
Engine Emission Control.....	303-08B-6
Inspection and Verification.....	303-08B-6
Symptom Chart.....	303-08B-6
REMOVAL AND INSTALLATION	
Exhaust Gas Recirculation (EGR) Valve.....	303-08B-8
Crankcase Vent Oil Separator.....	303-08B-10

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Exhaust gas recirculation (EGR) valve bolts	25	18	–
EGR valve outlet tube union	55	41	–
Crankcase vent oil separator retaining bolts	10	–	89

DESCRIPTION AND OPERATION

Engine Emission Control



Item	Description
1	Exhaust gas recirculation (EGR) valve
2	EGR valve gasket
3	EGR outlet

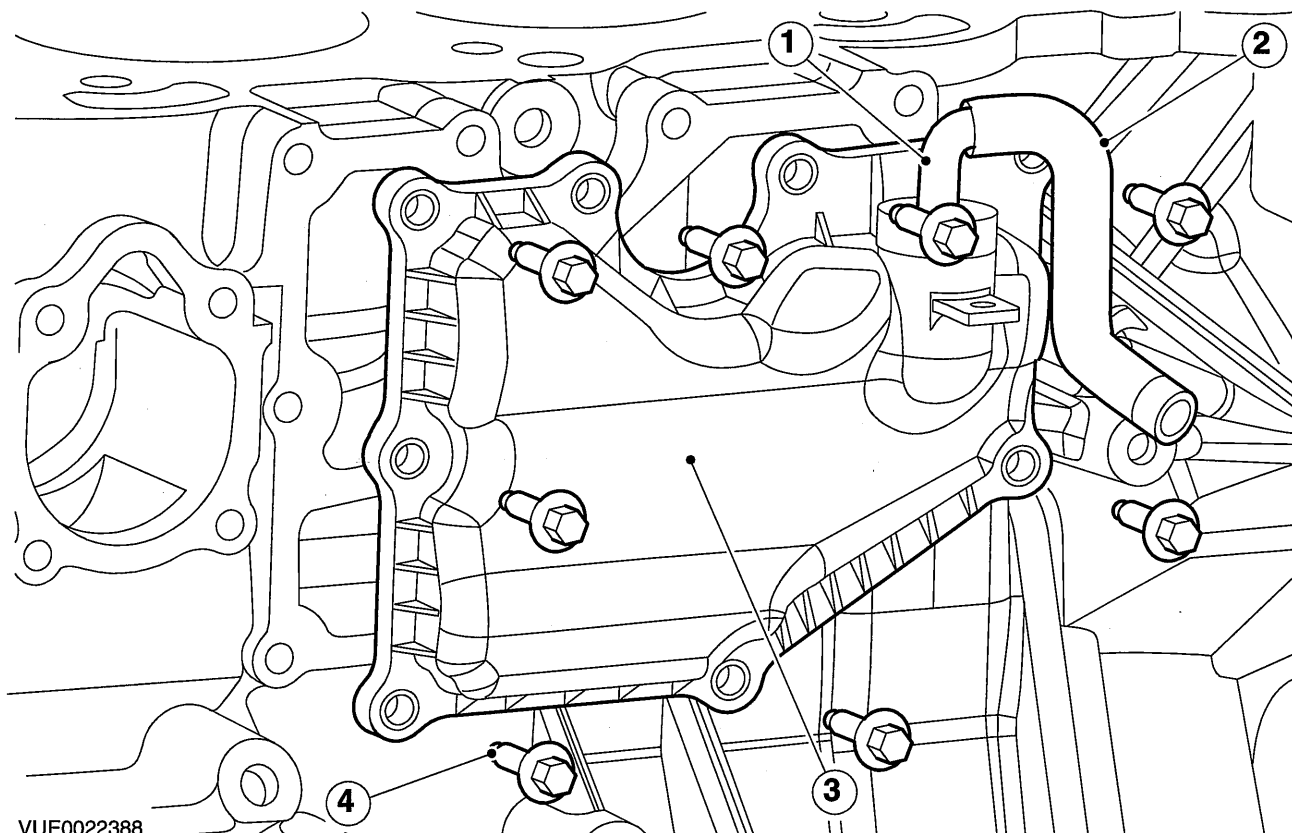
The exhaust gas recirculation (EGR) system allows a measured quantity of exhaust gas to be directed back to the intake manifold. The exhaust gas is

introduced to the incoming charge in the intake manifold, where it dilutes the air fuel mixture and lowers the peak gas temperature, reducing nitrogen oxide exhaust emissions.

The exhaust gas is drawn through a passage within the cylinder head from the exhaust manifold to the intake manifold by the EGR valve.

The EGR valve is controlled by an input from the powertrain control module (PCM).

DESCRIPTION AND OPERATION



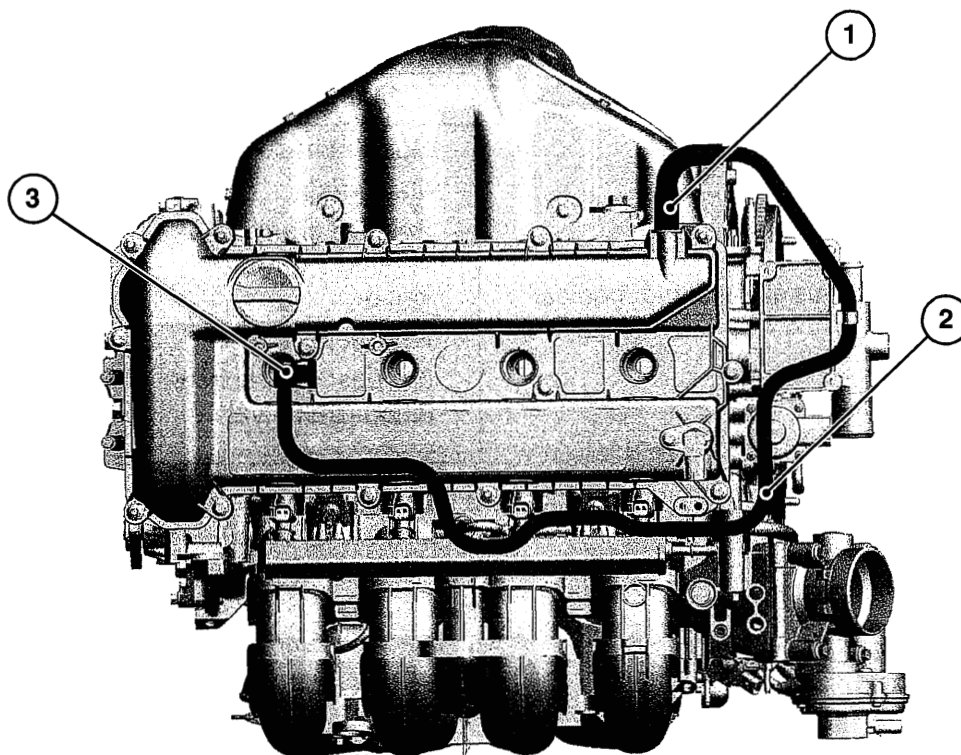
Item	Description
1	Positive crankcase ventilation (PCV) valve
2	PCV hose
3	Crankcase vent oil separator
4	Crankcase vent oil separator retaining bolt

The positive crankcase ventilation (PCV) system consists of a valve mounted in the crankcase vent oil separator (attached to the cylinder block) and

two hoses. One PCV hose connects the PCV valve to the intake manifold, the other PCV hose connects the valve cover to the air cleaner.

Under idle and part throttle conditions, the crankcase vapor flows through the intake manifold into the combustion chambers where the vapor is burnt during combustion.

DESCRIPTION AND OPERATION



E57308

Item	Description
1	PCV hose to valve cover connector
2	PCV hose
3	PCV hose to air cleaner connector

Under full throttle conditions, the crankcase vapor flows from the valve cover into the air cleaner through the PCV hose.

DIAGNOSIS AND TESTING

Engine Emission Control

General Equipment

Worldwide Diagnostic System (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Hose(s)/hose joints – Gasket(s) – Positive crankcase ventilation (PCV) valve – PCV separator – Exhaust gas recirculation (EGR) valve	– Electrical connector(s) – Wiring harness – Fuse(s) – Relay – EGR valve – Powertrain control module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Poor engine performance	• EGR valve.	• Using WDS, CHECK the EGR Valve Duty Cycle input signal to the EGR vacuum regulator valve. If the result is 0%, REMOVE the EGR valve. REFER to Exhaust Gas Recirculation (EGR) Valve - in this section. INSPECT the EGR valve and valve seat for damage. Make sure that the EGR valve is in the closed position. If the EGR valve is not closed. INSTALL a new EGR valve. TEST the system for normal operation. If the result is not 0% continue the engine diagnostic using WDS.
• Excessive crankcase pressure	• Blocked or damaged PCV hose(s). • Blocked crankcase vent oil separator.	• CHECK the PCV system components for blockages, CLEAN or INSTALL new components as necessary.

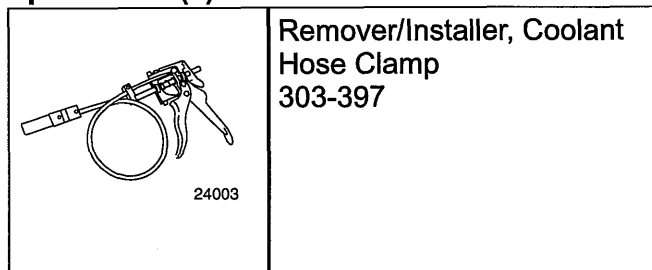
DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Worn or damaged engine components.	REFER to Section 303-01A [Engine -- 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)] / 303-01B [Engine -- 1.4L Duratorq-TDCi (DV) Diesel] / 303-01C [Engine -- 1.3L Duratec-8V (Rocam)] / 303-01D [Engine -- 2.0L Duratec-HE (MI4)] / 303-01E [Engine -- 1.6L Duratorq-TDCi (DV) Diesel].

REMOVAL AND INSTALLATION

Exhaust Gas Recirculation (EGR) Valve

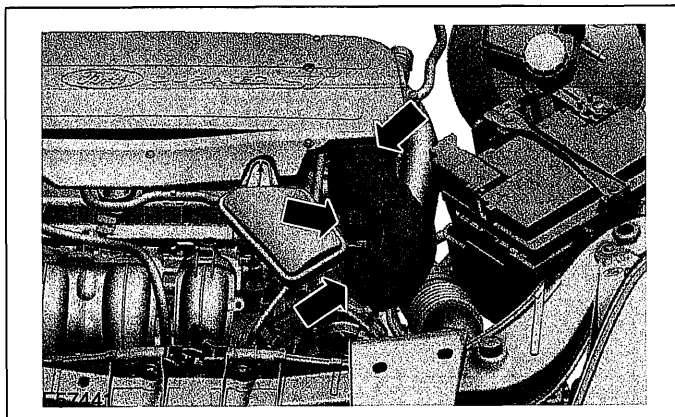
Special Tool(s)



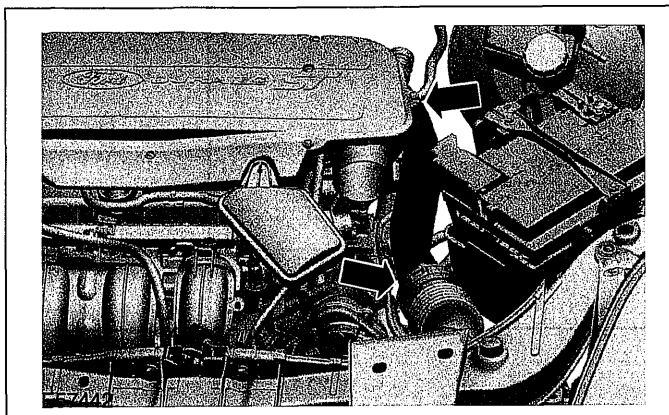
1. Drain the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - 2.0L Duratec-HE (MI4), General Procedures).

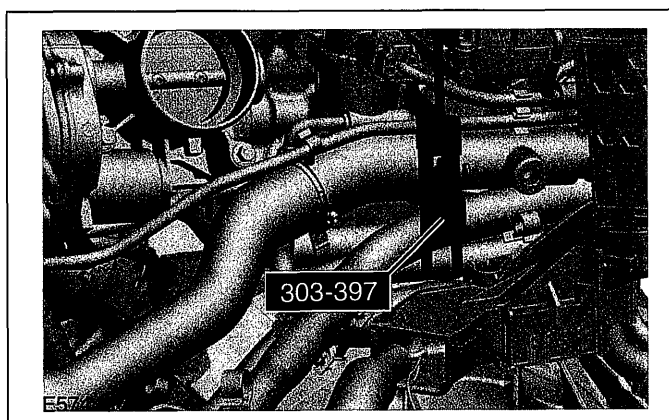
2. Remove the air cleaner outlet pipe.



3. Remove the air cleaner intake tube.

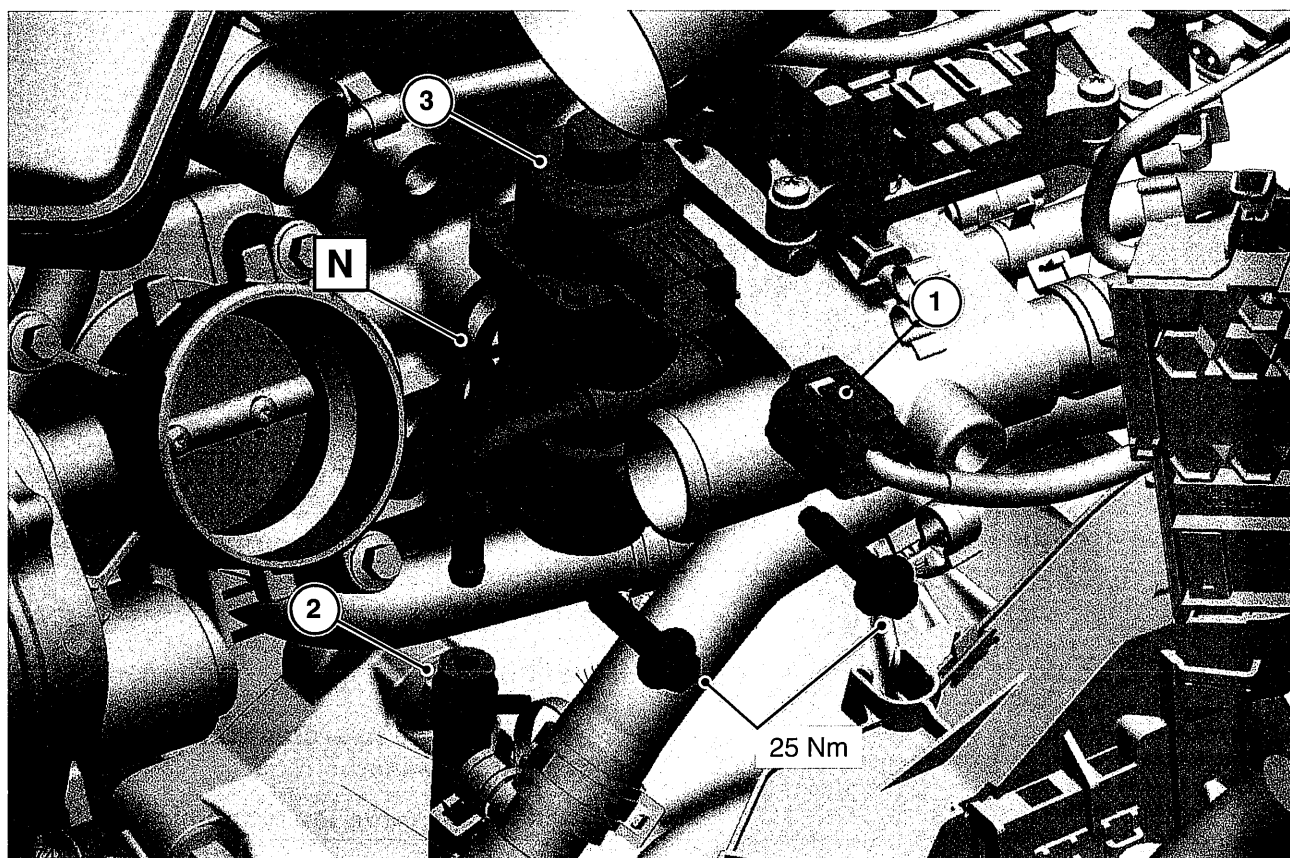


4. Using the special tool, disconnect the radiator upper coolant hose from the coolant outlet connector.



5. Remove the components in the order indicated in the following illustration(s) and table(s).

REMOVAL AND INSTALLATION



Item	Description
1	EGR valve electrical connector
2	EGR valve coolant hose See Removal Detail
3	EGR valve

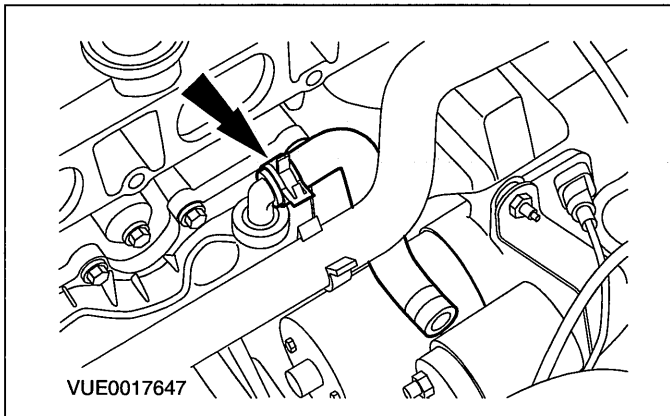
6. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Crankcase Vent Oil Separator

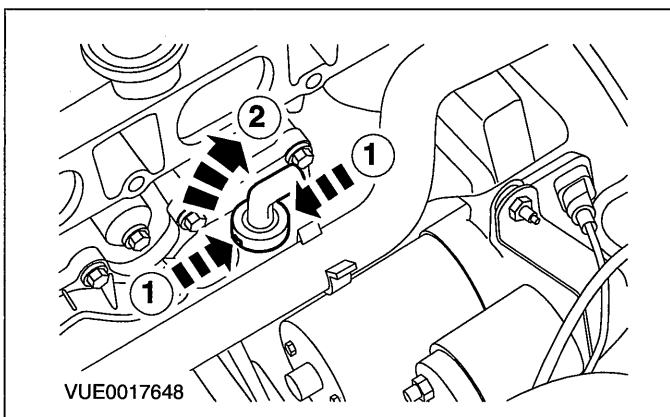
Removal

1. Remove the intake manifold. For additional information, refer to Section 303-01A [Engine -- 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)] / 303-01B [Engine -- 1.4L Duratorq-TDCi (DV) Diesel] / 303-01C [Engine -- 1.3L Duratec-8V (Rocam)] / 303-01D [Engine -- 2.0L Duratec-HE (MI4)] / 303-01E [Engine -- 1.6L Duratorq-TDCi (DV) Diesel].
2. Disconnect the positive crankcase ventilation (PCV) hose from the PCV valve.



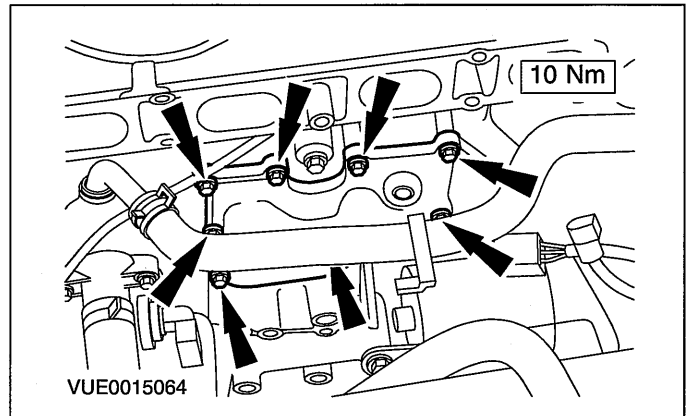
3. Remove the PCV valve from the crankcase vent oil separator.

1. Push in the locking tangs.
2. Twist the PCV valve to remove.



4. Remove the crankcase vent oil separator.

- Discard the gasket.



Installation

1. **NOTE:** Install a new crankcase vent oil separator gasket.

To install, reverse the removal procedure.

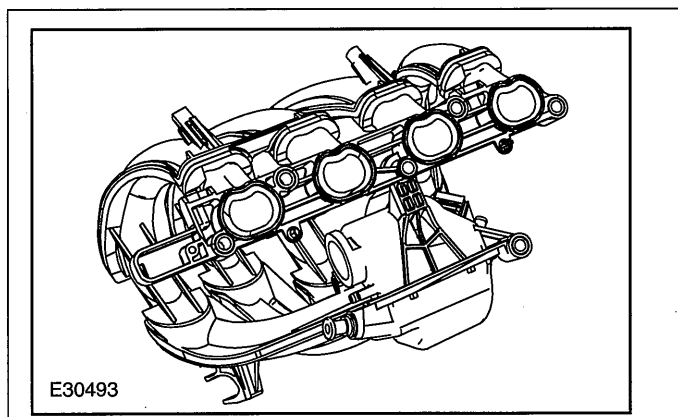
SECTION 303-12 Intake Air Distribution and Filtering

VEHICLE APPLICATION:2006.0 Fiesta

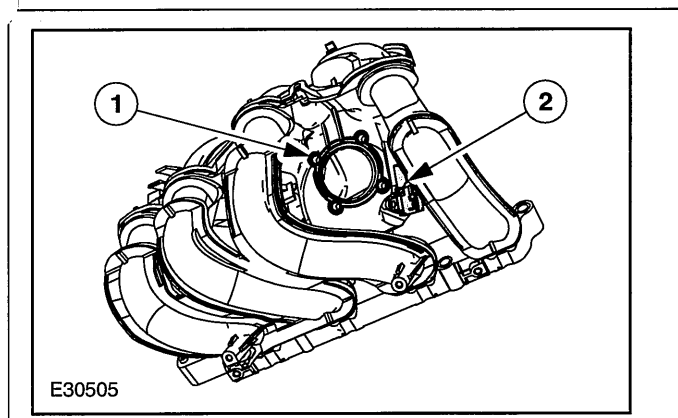
CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-12-2
DESCRIPTION AND OPERATION	
Intake Air Distribution and Filtering — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-12-3
Intake manifold.....	303-12-3
Intake Air Distribution and Filtering — 2.0L Duratec-HE (MI4).....	303-12-4
2.0L Duratec HE (MI4) engine.....	303-12-4
DIAGNOSIS AND TESTING	
Intake Air Distribution and Filtering.....	303-12-7
Inspection and Verification.....	303-12-7
Symptom Chart.....	303-12-7
REMOVAL AND INSTALLATION	
Air Cleaner — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)..... (23 174 0)	303-12-12
Air Cleaner — 2.0L Duratec-HE (MI4).....	303-12-13

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Air cleaner intake pipe retaining bolt - vehicles with 1.4L Duratorq-TDCi (DV) diesel engine	4	-	35
Air cleaner retaining screws - vehicles with 1.4L Duratorq-TDCi (DV) diesel engine	5	-	44
Air cleaner outlet hose retaining clip - vehicles with 1.6L Duratorq-TDCi (DV) diesel engine	4	-	35
Air cleaner intake pipe duct retaining bolts - vehicles with 1.6L Duratorq-TDCi (DV) diesel engine	5	-	44
Charge air cooler hose retaining clamps - 1.6L Duratorq-TDCi (DV) diesel engine	5	-	44
Charge air cooler retaining bolts - 1.6L Duratorq-TDCi (DV) diesel engine	10	-	89
Radiator support bracket retaining bolts - 1.6L Duratorq-TDCi (DV) diesel engine	25	18	-

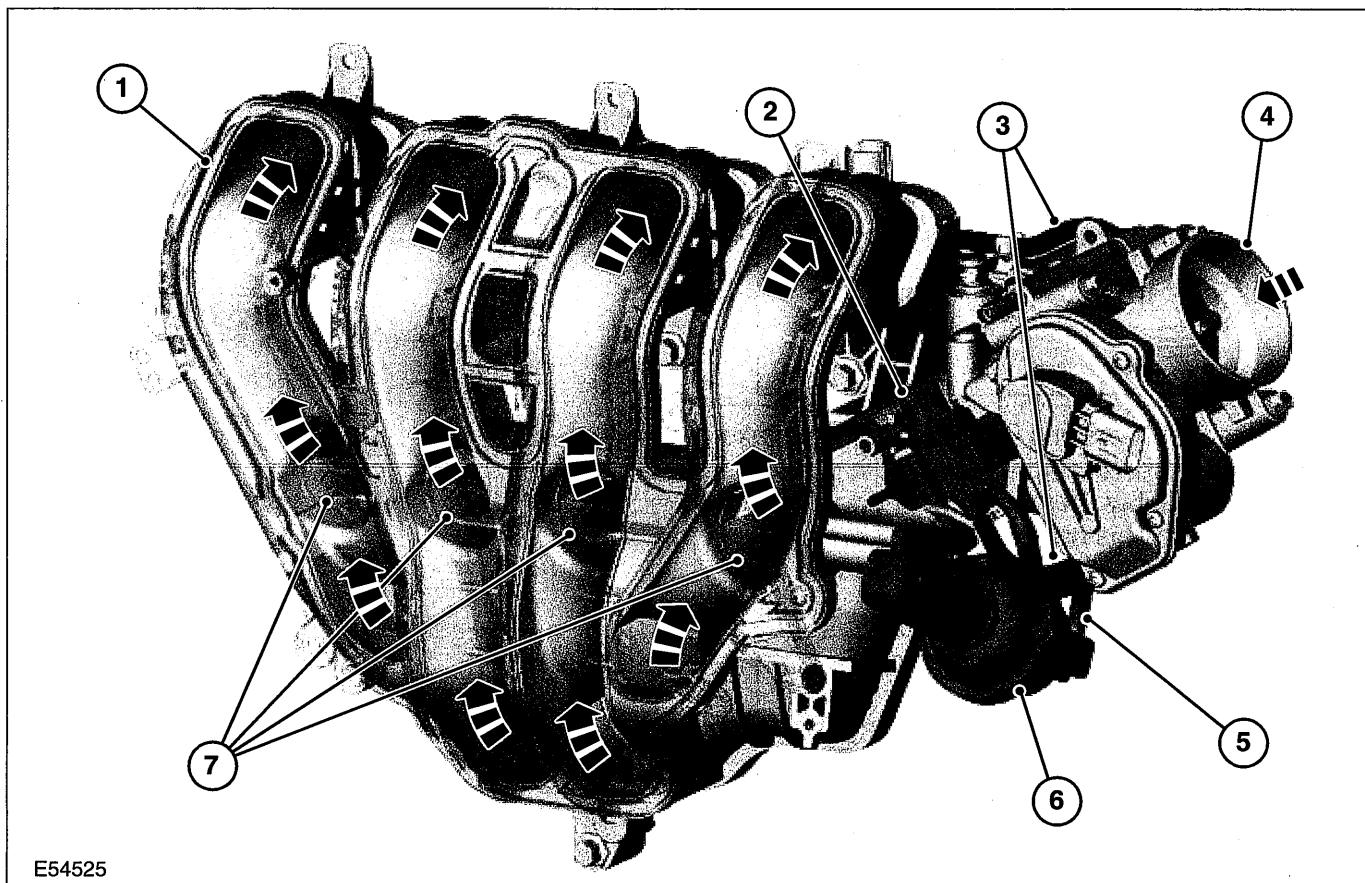
DESCRIPTION AND OPERATION**Intake Air Distribution and Filtering — 1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)****Intake manifold**

The 1.4l and 1.6l versions feature a revised intake manifold. The overall length of the intake pipes has been increased, but the pipes are of equal length on all cylinders. This has resulted in increased torque in the lower engine speed range and a reduction in noise levels.



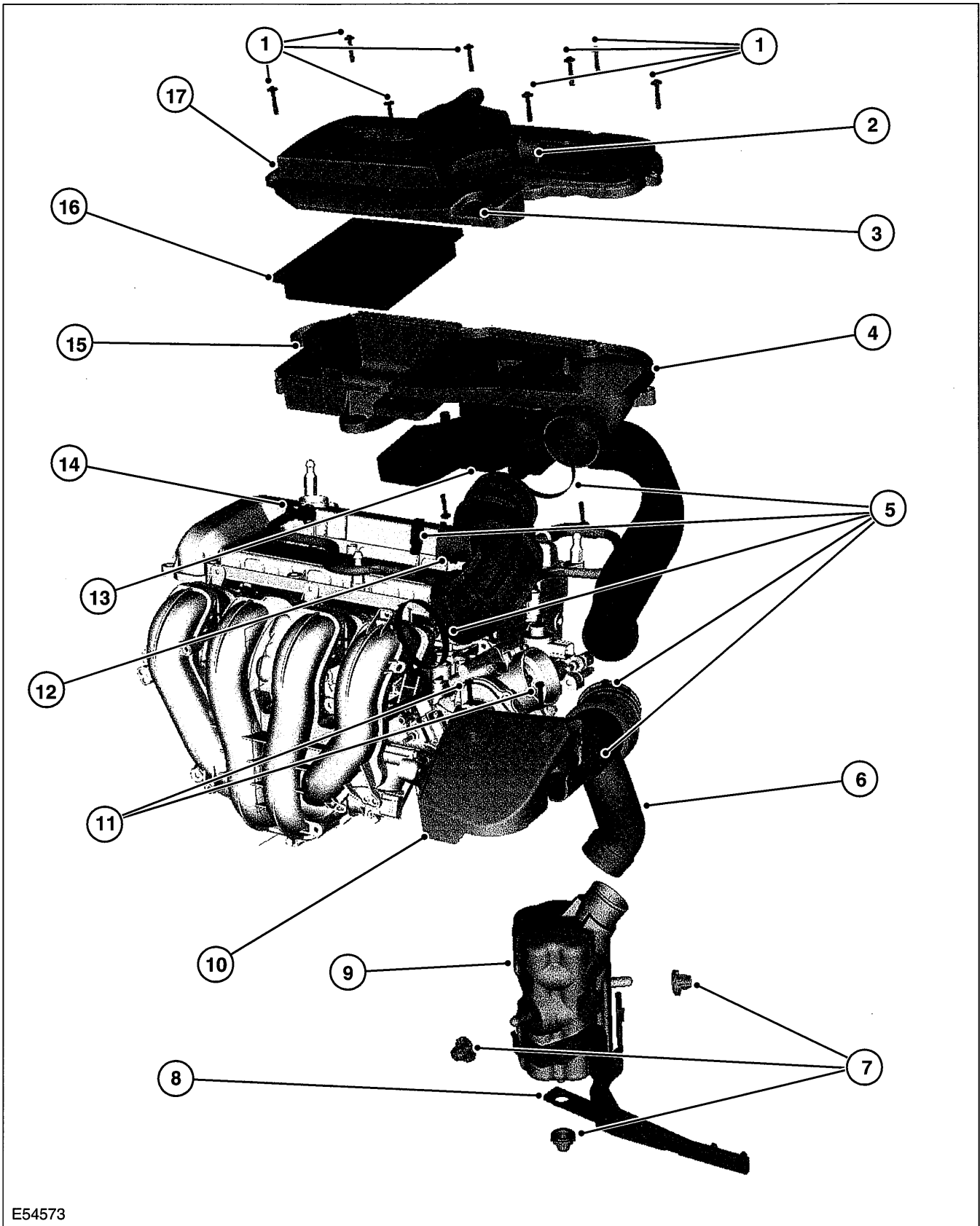
Item	Description
1	Mounting for the throttle valve unit
2	T-MAP sensor

The mounting for the electronic throttle valve is located inside the intake manifold between the intake pipes of cylinders 1 and 2. The T-MAP sensor, which is used on both the 1.4l and 1.6l versions, is situated next to the throttle valve unit.

DESCRIPTION AND OPERATION**Intake Air Distribution and Filtering — 2.0L Duratec-HE (MI4)****2.0L Duratec HE (MI4) engine****Intake manifold and ancillary components**

Item	Description
1	Intake manifold
2	Intake manifold tuning valve solenoid
3	Intake manifold tuning valve
4	Intake manifold tuning valve solenoid to intake manifold vacuum pipe

Item	Description
5	Intake manifold tuning valve solenoid to intake manifold tuning valve vacuum pipe
6	Intake manifold tuning valve actuator
7	Intake manifold tuning valve flaps

DESCRIPTION AND OPERATION**Air intake system**

DESCRIPTION AND OPERATION

Item	Description
1	Air cleaner housing cover retaining bolts
2	Air cleaner housing outlet pipe resonator
3	Air cleaner housing outlet pipe resonator grommet
4	Air cleaner housing
5	Air cleaner pipe retaining clamps
6	Air cleaner intake pipe
7	Air cleaner intake pipe resonator isolators
8	Air cleaner intake pipe resonator retaining bracket
9	Air cleaner intake pipe resonator
10	Air cleaner intake pipe duct
11	Air cleaner intake pipe duct retaining bolts
12	Air cleaner outlet pipe
13	Air cleaner housing resonator
14	Positive crankcase ventilation (PCV) hose
15	PCV hose foam filter
16	Air cleaner element
17	Air cleaner housing cover

DIAGNOSIS AND TESTING**Intake Air Distribution and Filtering****Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Visual Inspection Chart

Mechanical	Electrical
– Air cleaner element – Air cleaner intake pipe – Air cleaner outlet pipe – Charge air cooler (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine) – Charge air cooler intake hose (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine) – Charge air cooler outlet hose (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine)	– Mass air flow (MAF) sensor – Manifold absolute pressure (MAP) sensor (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine) – Electrical connector(s)

Symptom Chart

Symptom	Possible Sources	Action
• Excessive intake air noise	• Detached air cleaner pipe(s). • Detached turbocharger pipe(s) (Vehicles with Duratorq-TDCi (DV) Diesel engine or 1.6L Duratorq-TDCi (DV) Diesel engine). • Detached charge air cooler hose(s) (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine).	• CHECK the pipe(s) for security and leaks to atmosphere. INSTALL new intake air components as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Oil in the air intake system	- Blocked or damaged positive crankcase ventilation (PCV) valve. - Blocked or damaged PCV pipe(s)/hose(s). - Blocked or damaged crankcase vent oil separator.	- Vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engine. REFER to: Crankcase Vent Oil Separator (303-08 Engine Emission Control - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Removal and Installation). - Vehicles with 2.0L Duratec-HE (MI4) engine. REFER to: Crankcase Vent Oil Separator (303-08C Engine Emission Control - 2.0L Duratec-HE (MI4), Removal and Installation).
	Turbocharger (Vehicles with Duratorq-TDCi (DV) Diesel engine or 1.6L Duratorq-TDCi (DV) Diesel engine).	- Vehicles with 1.4L Duratorq-TDCi (DV) Diesel engine. REFER to: Turbocharger (303-04 Fuel Charging and Controls - Turbocharger - 1.4L Duratorq-TDCi (DV) Diesel, Removal and Installation). - Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine. REFER to: Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel (303-04 Fuel Charging and Controls - Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel, Removal and Installation).
Water in the air cleaner	Detached air cleaner intake pipe.	CHECK the air cleaner intake pipe for security. INSTALL new intake air system components as necessary. TEST the system for normal operation.
	Blocked air cleaner drain.	CLEAN the air cleaner drain. TEST the system for normal operation.
Engine lacks power	Air cleaner element blocked.	INSPECT the air cleaner for signs of blockage. INSTALL a new air cleaner element as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Charge air cooler pipe(s) (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine).	• INSPECT the charge air cooler pipes for damage. INSTALL a new charge air cooler pipe(s) as necessary.
	• Charge air cooler blocked (Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine).	• INSPECT the charge air cooler for blockage. INSTALL a new charge air cooler as necessary. REFER to: Charge Air Cooler - 1.6L Duratorq-TDCi (DV) Diesel (303-12 Intake Air Distribution and Filtering, Removal and Installation).

DIAGNOSIS AND TESTING

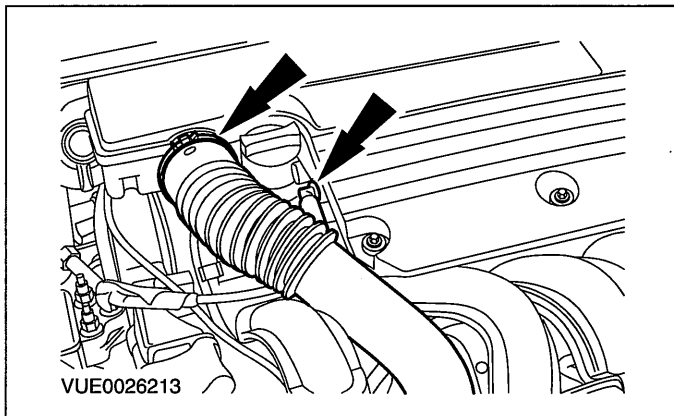
Symptom	Possible Sources	Action
	Fuel charging and controls	- Vehicles with 1.3L Duratec-8V (Rocam) engine. REFER to: Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.3L Duratec-8V (Rocam), Diagnosis and Testing). - Vehicles with 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engine. REFER to: Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Diagnosis and Testing). - Vehicles with 1.4L Duratorq-TDCi (DV) Diesel engine. REFER to: Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.4L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing). - Vehicles with 2.0L Duratec-HE (MI4) engine. REFER to: Fuel Charging and Controls (303-04 Fuel Charging and Controls - 2.0L Duratec-HE (MI4), Diagnosis and Testing). - Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine. REFER to: Fuel Charging and Controls (303-04 Fuel Charging and Controls - 1.6L Duratorq-TDCi (DV) Diesel, Diagnosis and Testing).

DIAGNOSIS AND TESTING

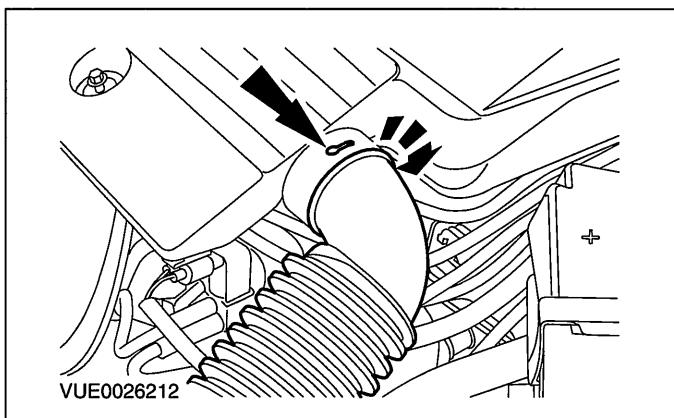
Symptom	Possible Sources	Action
	• Turbocharger (Vehicles with Duratorq-TDCi (DV) Diesel engine or 1.6L Duratorq-TDCi (DV) Diesel engine).	• Vehicles with 1.4L Duratorq-TDCi (DV) Diesel engine. REFER to: Turbocharger (303-04 Fuel Charging and Controls - Turbocharger - 1.4L Duratorq-TDCi (DV) Diesel, Removal and Installation). • Vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine. REFER to: Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel (303-04 Fuel Charging and Controls - Turbocharger - 1.6L Duratorq-TDCi (DV) Diesel, Removal and Installation).

REMOVAL AND INSTALLATION**Air Cleaner — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(23 174 0)****Removal**

1. **Disconnect the air cleaner outlet pipe and the positive crankcase ventilation (PCV) hose from the air cleaner.**

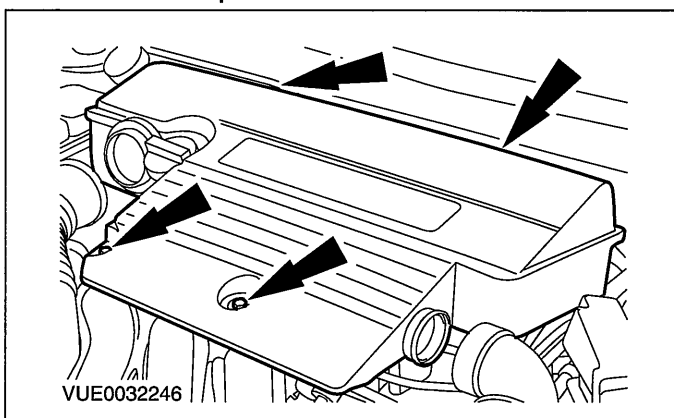


2. **Disconnect the air intake hose from the air cleaner.**



3. **Remove the air cleaner.**

- Remove the retaining bolts and lift the air cleaner up at the rear to remove.

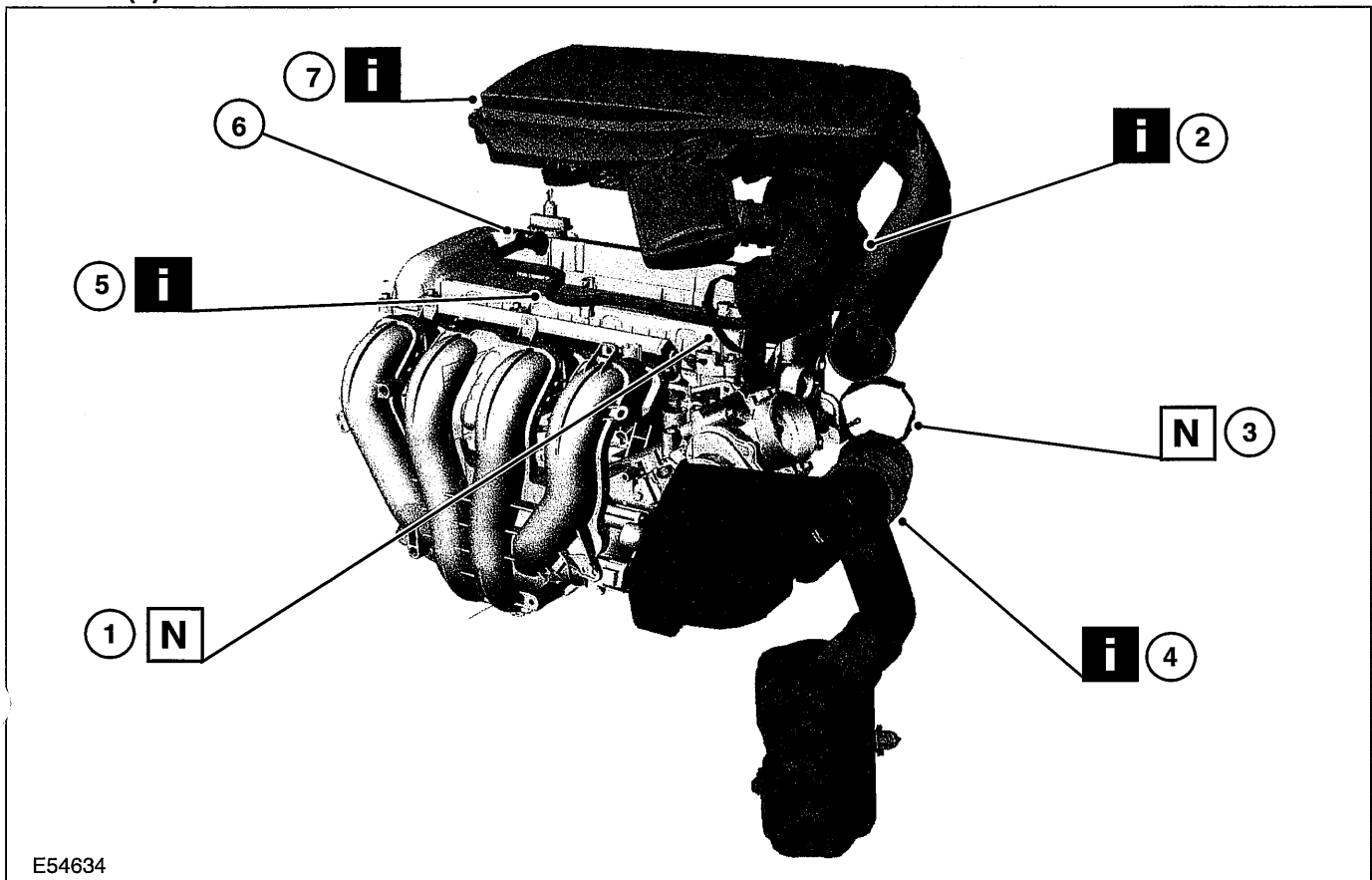
**Installation**

1. **NOTE: Locate the rear isolators onto the rear mounting pegs and push down.**

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Air Cleaner — 2.0L Duratec-HE (MI4)**

1. Remove the components in the order indicated in the following illustration(s) and table(s).



E54634

Item	Description
1	Air cleaner outlet pipe retaining clip
2	Air cleaner outlet pipe See Removal Detail
3	Air cleaner intake pipe retaining clip
4	Air cleaner intake pipe See Removal Detail

Item	Description
5	Positive crankcase ventilation (PCV) hose See Removal Detail
6	PCV hose connector
7	Air cleaner See Removal Detail

2. To install, reverse the removal procedure.

Removal Details**Item 2 Air cleaner outlet pipe**

1. Detach the air cleaner outlet pipe from the throttle body.

Item 4 Air cleaner intake pipe

1. Detach the air cleaner intake pipe from the air cleaner.

Item 5 Positive crankcase ventilation (PCV) hose

1. Detach the PCV hose from the air cleaner.

REMOVAL AND INSTALLATION**Item 7 Air cleaner**

1.  **CAUTION:** Make sure the air cleaner is removed from the air cleaner mountings in a vertical direction. Failure to follow this instruction may cause damage to the air cleaner and air cleaner mountings.

Detach the air cleaner from the air cleaner mountings and remove the air cleaner.

SECTION 303-13 Evaporative Emissions

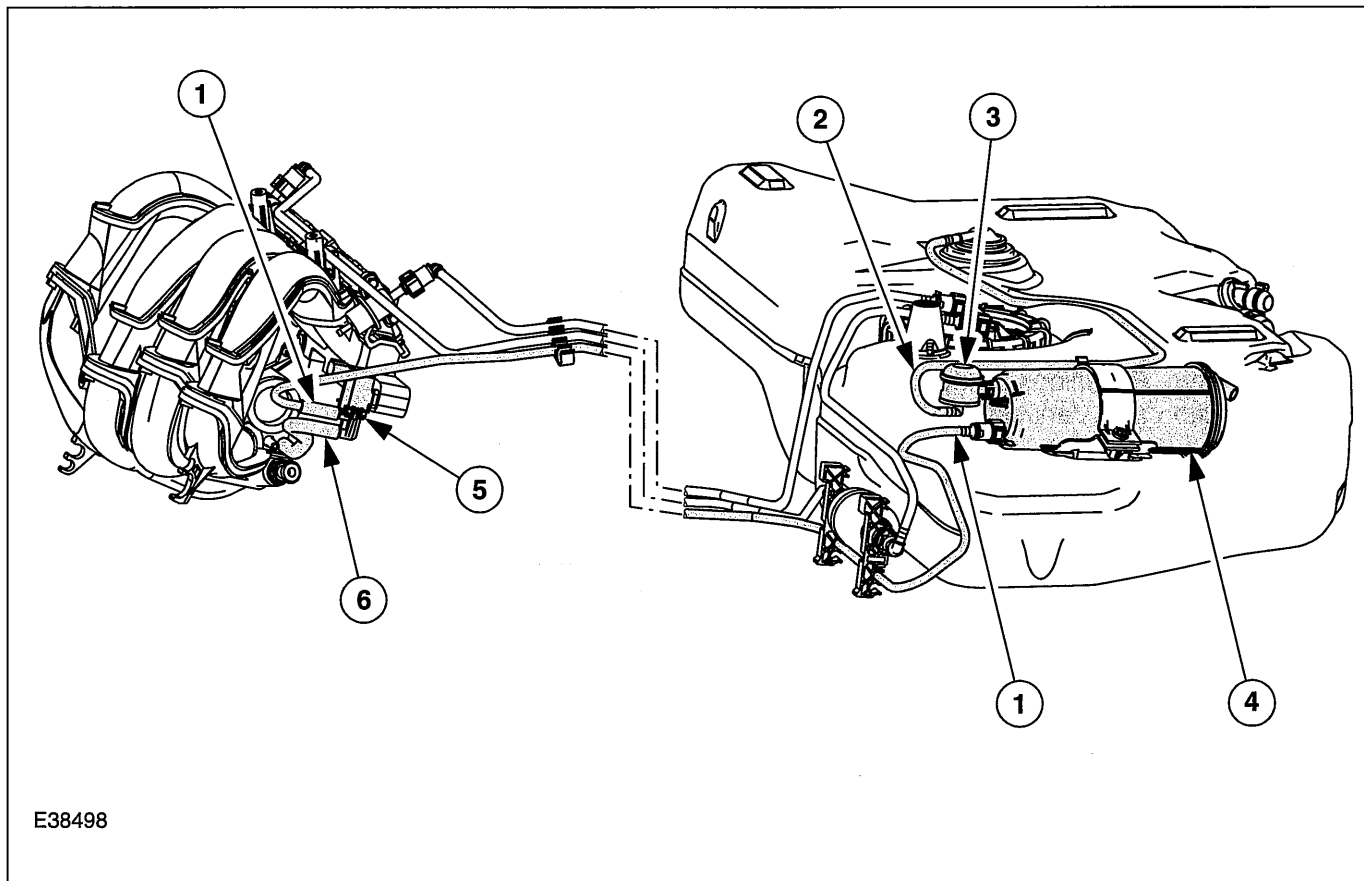
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Evaporative Emissions.....	303-13-2
Overview.....	303-13-2
DIAGNOSIS AND TESTING	
Evaporative Emissions.....	303-13-3
Inspection and Verification.....	303-13-3
REMOVAL AND INSTALLATION	
Evaporative Emission Canister — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma). (29 250 0)	303-13-4

DESCRIPTION AND OPERATION

Evaporative Emissions

Overview



E38498

Item	Description
1	From activated charcoal canister
2	From fuel tank
3	Non-return valve
4	Carbon canister
5	Evaporative Emission (EVAP) solenoid valve
6	To the intake manifold

The EVAP collection system prevents fuel vapours from reaching the atmosphere.

To achieve this, the fuel vapours are led from the fuel tank into the activated charcoal canister, and temporarily stored there.

Under part load the Powertrain Control Module (PCM) activates the EVAP solenoid valve. This causes the fuel vapours to be passed on to the intake system of the engine.

DIAGNOSIS AND TESTING**Evaporative Emissions****Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Vacuum line(s) – Evaporative emission (EVAP) system canister – EVAP system hose(s) – EVAP system canister purge valve	– Fuse(s) – Wiring harness – Electrical connector(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to WDS to diagnose the system.

REMOVAL AND INSTALLATION

Evaporative Emission Canister — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(29 250 0)

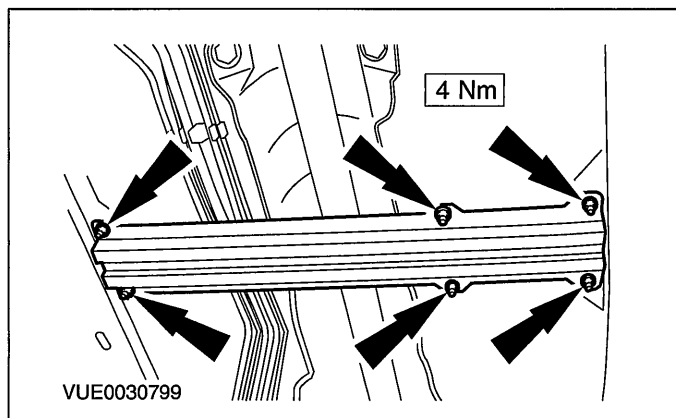
General Equipment

Transmission jack

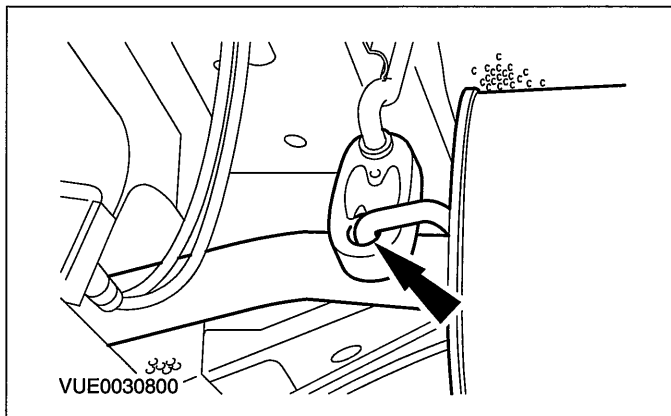
Removal**WARNINGS:**

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

1. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. Remove the floor panel crossmember.

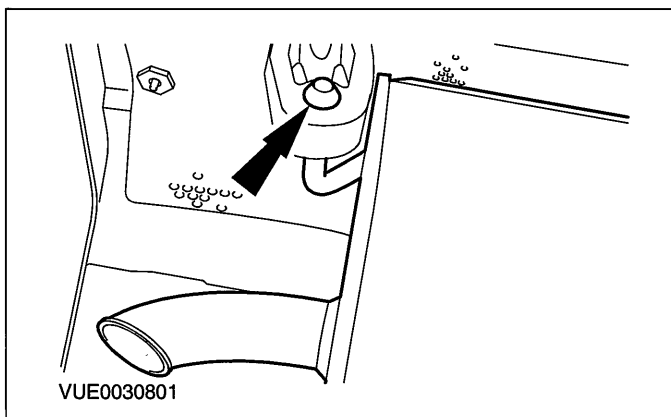


3. Detach the exhaust system from the center exhaust hanger insulator.

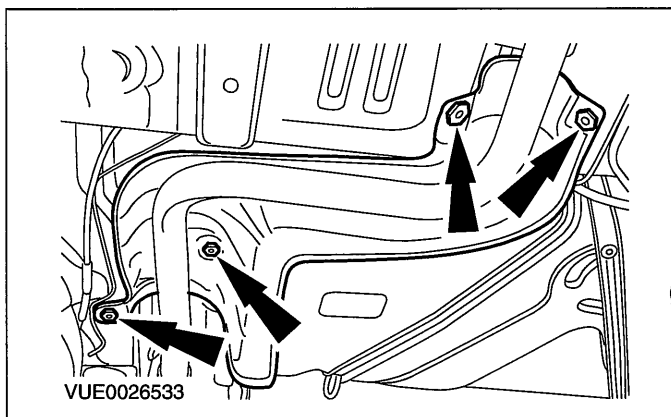


4. **NOTE:**When detaching the exhaust system allow the system to be supported by the rear suspension assembly.

Detach the exhaust system from the rear exhaust hanger insulator.



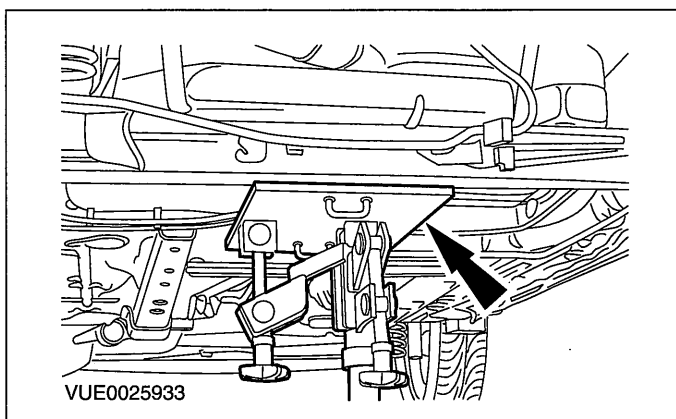
5. Remove the exhaust system heat shield.



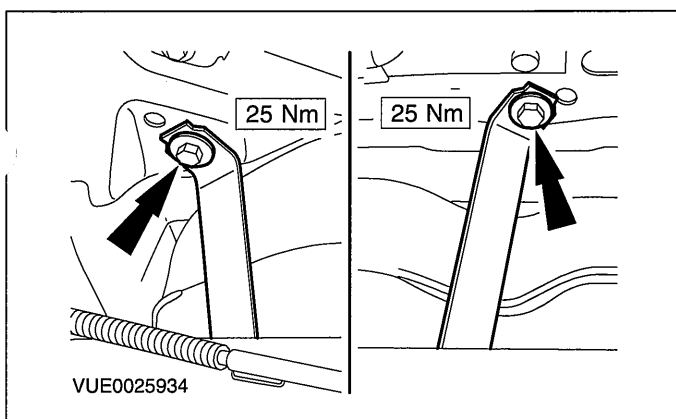
REMOVAL AND INSTALLATION

6. **⚠ CAUTION:** Use a suitable packing material to prevent damage to the underside of the fuel tank.

Using a suitable transmission jack, support the fuel tank.

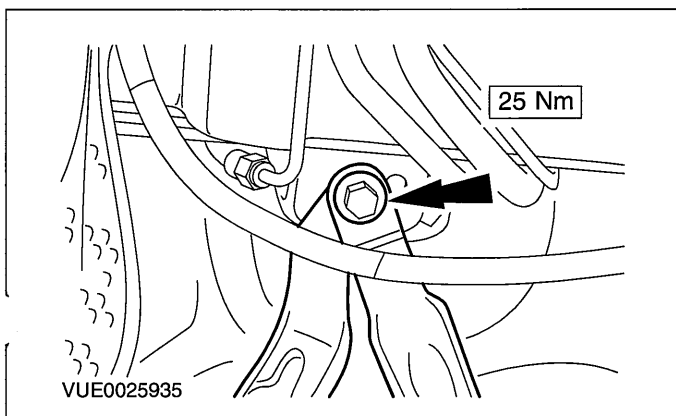


7. Remove the fuel tank support strap rear retaining bolts.



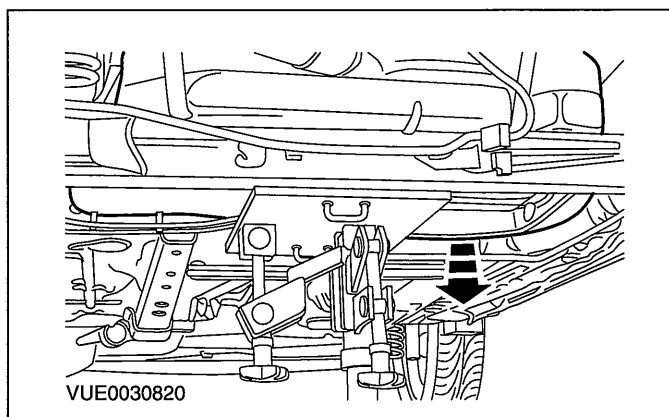
8. **NOTE:** Make note of the positions of the support straps to make sure they are positioned in exactly the same positions when installing (left-hand over right-hand).

Remove the fuel tank support straps.

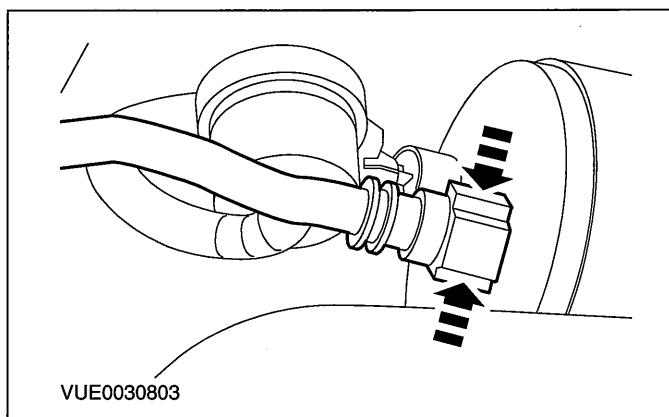


9. **⚠ CAUTION:** When lowering the fuel tank, make sure that excessive strain is not placed on the fuel lines and electrical connectors.

Partially lower the fuel tank.

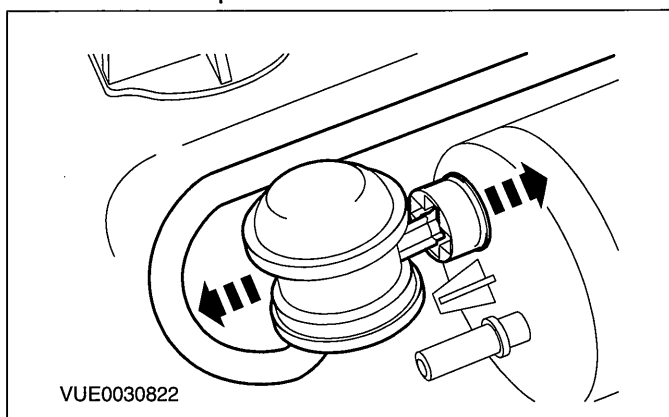


10. Disconnect the fuel tank vent pipe from the evaporative emission canister. For additional information, refer to Section 310-00 [Fuel System - General Information].



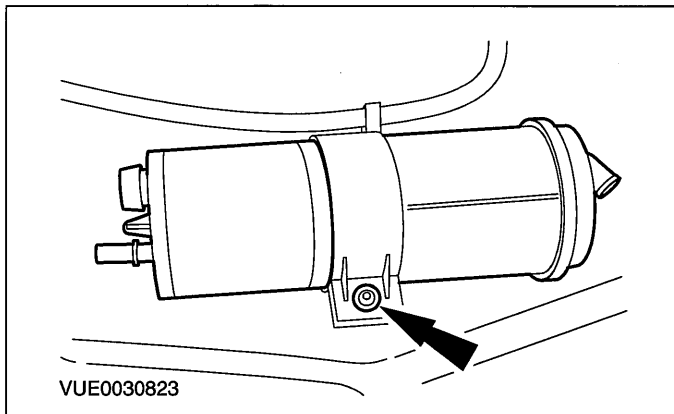
11. Disconnect the back pressure valve from the evaporative emission canister.

- Hold the cap against the canister and pull the back pressure valve.



REMOVAL AND INSTALLATION

12. Remove the evaporative emissions canister from the fuel tank.

**Installation****1. WARNINGS:**

▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

NOTE: When installing the fuel tank make sure the fuel lines do not get kinked or trapped.

To install, reverse the removal procedure.

SECTION 303-14 Electronic Engine Controls

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	303-14-2
DESCRIPTION AND OPERATION	
Electronic Engine Controls — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-14-4
Overview.....	303-14-4
Throttle Control Unit (TCU).....	303-14-6
CPP switch.....	303-14-7
(Brake Pedal Position) BPP switch.....	303-14-8
APP sensor.....	303-14-8
Electronic Engine Controls — 2.0L Duratec-HE (MI4).....	303-14-10
System Overview, 2.0L Duratec HE (MI4) Engine.....	303-14-10
Components.....	303-14-11
DIAGNOSIS AND TESTING	
Electronic Engine Controls.....	303-14-14
Principles of Operation.....	303-14-14
MIL Code List.....	303-14-17
Inspection and Verification.....	303-14-21
REMOVAL AND INSTALLATION	
Powertrain Control Module (PCM) — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)..... (29 200 0)	303-14-22
Powertrain Control Module (PCM) — 2.0L Duratec-HE (MI4), Vehicles With: PCM Security Shield.....	303-14-24
Powertrain Control Module (PCM) — 2.0L Duratec-HE (MI4), Vehicles Without: PCM Security Shield.....	303-14-27
Heated Oxygen Sensor (HO2S)..... (29 220 0)	303-14-30
Crankshaft Position (CKP) Sensor.....	303-14-32
Knock Sensor (KS).....	303-14-35

SPECIFICATIONS**Torque Specifications - vehicles with 1.3L Duratec-8V (Rocam) engine**

Description	Nm	lb-ft	lb-in
Powertrain control module (PCM) retaining bolts	3	-	27
Knock sensor (KS) retaining bolt	20	15	-
Crankshaft position (CKP) sensor retaining bolt	10	-	89
Camshaft position (CMP) sensor retaining bolt	6	-	53
Throttle position (TP) sensor screws	5	-	44
Idle air control (IAC) valve retaining bolts	10	-	89
Ignition coil pack retaining bolts	6	-	53
Exhaust manifold heatshield retaining bolts	10	-	89
Heated oxygen sensor (HO2S)	47	35	-
Catalyst monitor sensor (CMS)	47	35	-

Torque Specifications - vehicles with 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engine

Description	Nm	lb-ft	lb-in
Powertrain control module (PCM) retaining bolts	3	-	27
Knock sensor (KS) retaining bolt	20	15	-
Cylinder head temperature (CHT) sensor	25	18	-
Crankshaft position (CKP) sensor retaining bolt	10	-	89
Camshaft position (CMP) sensor retaining bolt	10	-	89
Engine coolant temperature (ECT) sensor	20	15	-
Idle air control (IAC) valve	10	-	89
Heated oxygen sensor (HO2S)	47	35	-
Catalyst monitor sensor (CMS)	47	35	-

Torque Specifications - vehicles with 1.4L Duratorq-TDCi (DV) Diesel engine

Description	Nm	lb-ft	lb-in
Powertrain control module (PCM) retaining nuts and retaining bolts	10	-	89
Timing belt upper cover retaining bolts	4	-	35
Timing belt lower cover retaining bolts	6	-	53
Camshaft position (CMP) sensor retaining bolt	5	-	44
Crankshaft position (CKP) sensor retaining bolt	8	-	71
Crankshaft pulley retaining bolt	a	-	-

a)

For additional information, refer to: Crankshaft Position (CKP) Sensor - 1.4L Duratorq-TDCi (DV) Diesel (303-14 Electronic Engine Controls, Removal and Installation).

SPECIFICATIONS**Torque Specifications - vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine**

Description	Nm	lb-ft	lb-in
Powertrain control module (PCM) retaining nuts and retaining bolts	10	-	89
Timing belt upper cover retaining bolts	4	-	35
Timing belt lower cover retaining bolts	6	-	53
Camshaft position (CMP) sensor retaining bolt	5	-	44
Crankshaft position (CKP) sensor retaining bolt	8	-	71
Crankshaft pulley retaining bolt	a	-	-

a)

For additional information, refer to: Crankshaft Position (CKP) Sensor - 1.6L Duratorq-TDCi (DV) Diesel (303-14 Electronic Engine Controls, Removal and Installation).

Torque Specifications - vehicles with 2.0L Duratec-HE (MI4) engine

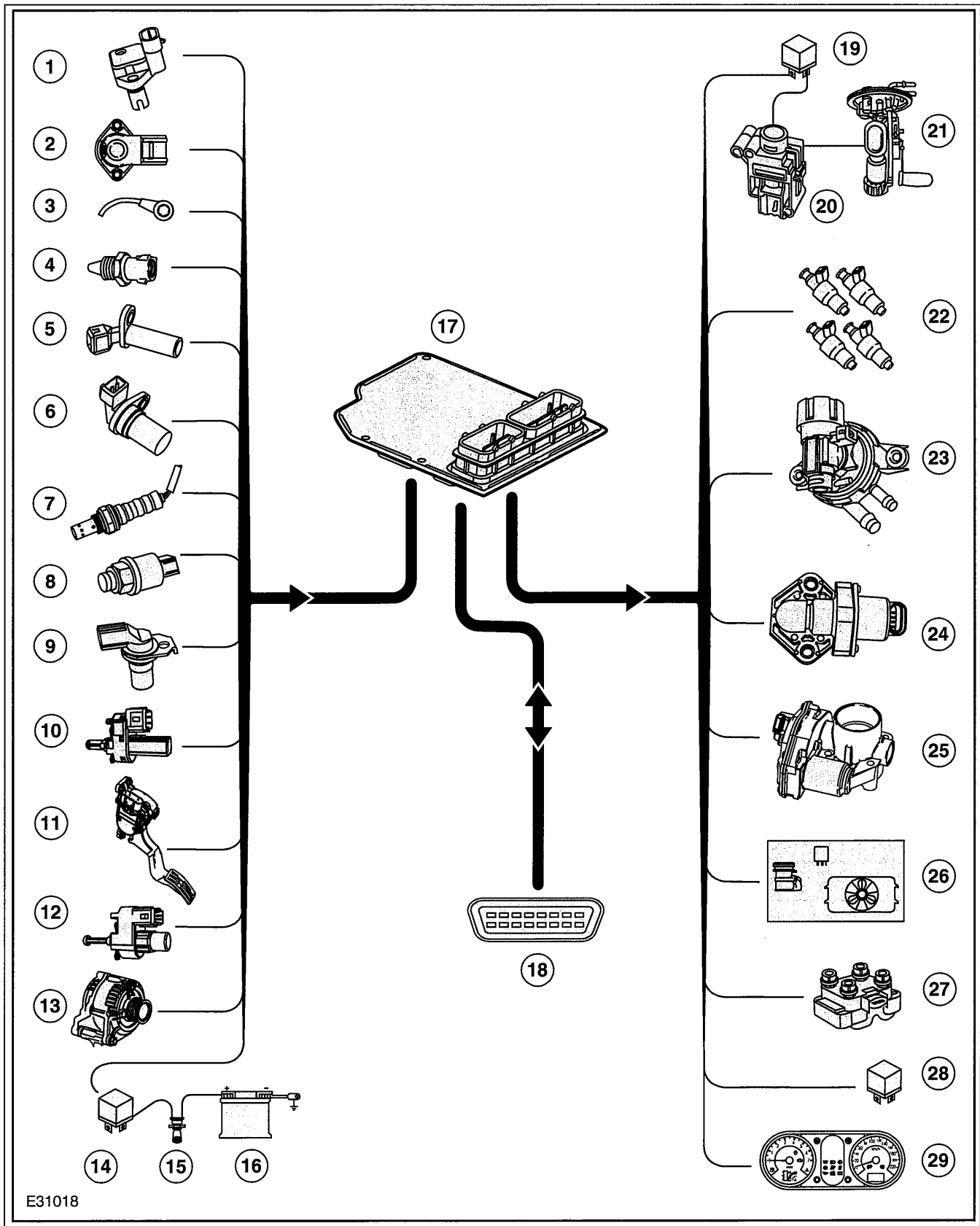
Description	Nm	lb-ft	lb-in
Powertrain control module (PCM) retaining bolts	10	-	89
PCM mounting bracket retaining bolts	25	18	-
Knock sensor (KS) retaining bolt	20	15	-
Crankshaft position (CKP) sensor retaining bolt	7	-	62
Camshaft position (CMP) sensor retaining bolt	6	-	53
Ignition coil pack retaining bolts	6	-	53
Exhaust manifold heatshield retaining bolts	10	-	89
Heated oxygen sensor (HO2S)	47	35	-
Catalyst monitor sensor (CMS)	47	35	-

DESCRIPTION AND OPERATION

Electronic Engine Controls — 1.25L Duratec-16V (Sigma)/1.4L
Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

Overview

DESCRIPTION AND OPERATION

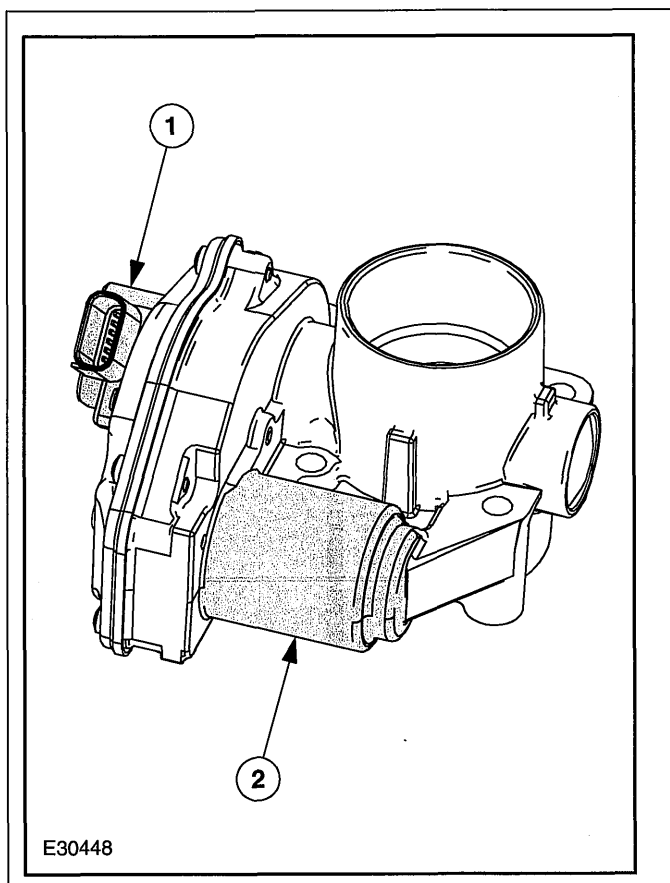


Item	Description
1	Temperature and Manifold Absolute Pressure (T-MAP) sensor
2	Throttle Position (TP) sensor

Item	Description
3	Knock Sensor (KS)
4	Sensor - Engine Coolant Temperature (ECT)

DESCRIPTION AND OPERATION

Item	Description
5	Crankshaft Position (CKP) sensor
6	Camshaft Position (CMP) sensor
7	Heated Oxygen Sensor (HO2S)
8	Power Steering Pressure (PSP) sensor
9	Vehicle Speed Sensor (VSS) (only on vehicles without Anti-lock Braking System (ABS))
10	Brake Pedal Position (BPP) switch
11	Accelerator Pedal Position (APP) sensor
12	Clutch Pedal Position (CPP) switch
13	Generator
14	Current supply relay
15	Ignition key
16	Battery
17	Powertrain Control Module (PCM)
18	Data Link Connector (DLC)
19	Fuel Pump (FP) relay
20	Inertia fuel shut-off switch
21	Fuel Pump Driver Module (FPDM)
22	Fuel injectors
23	Evaporative emissions (EVAP) solenoid valve
24	Idle Air Control (IAC) valve
25	Throttle Control Unit (TCU)
26	Air Conditioning (A/C) compressor clutch / blower switch
27	Injector Driver Module (IDM)
28	Start inhibit relay
29	Instrument cluster

Throttle Control Unit (TCU)**Components**

Item	Description
1	TP sensor
2	Electric motor

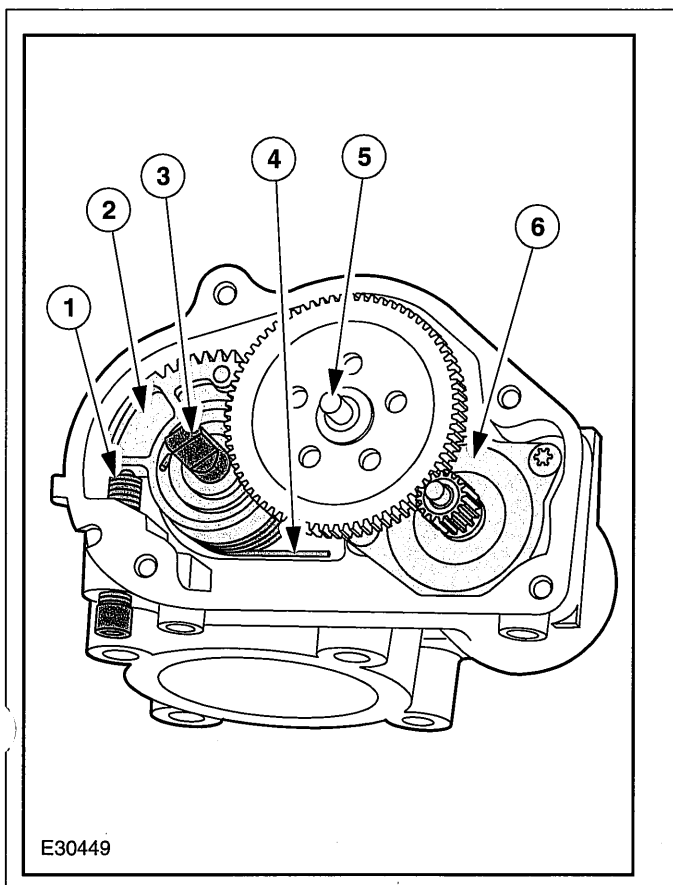
The electronically controlled throttle control unit (TCU) consists of the following components:

- Housing
- Throttle flap
- Throttle flap spindle
- Gear set
- Electric motor with pinion
- TP sensor
- Stop screw
- Throttle flap return spring

DESCRIPTION AND OPERATION

Function

⚠ CAUTION: The throttle control unit (TCU) must not be dismantled. No adjustments or repairs can be made to the TCU.



E30449

Item	Description
1	Stop screw
2	Toothed segment
3	Throttle flap spindle
4	Throttle flap return spring
5	Intermediate shaft with gear
6	Electric motor with pinion

The APP sensor sends the data containing the driver's acceleration requirement to the PCM. This information depends directly on the movement of the accelerator pedal.

The PCM processes this information and converts it into an output signal for the throttle control unit (TCU). This output signal is the control for the electric motor.

The electric motor moves the throttle flap spindle by means of the gear set.

The throttle flap position is adjusted and monitored in a closed control loop. The TP sensor provides the PCM with the information on the actual position of the throttle flap.

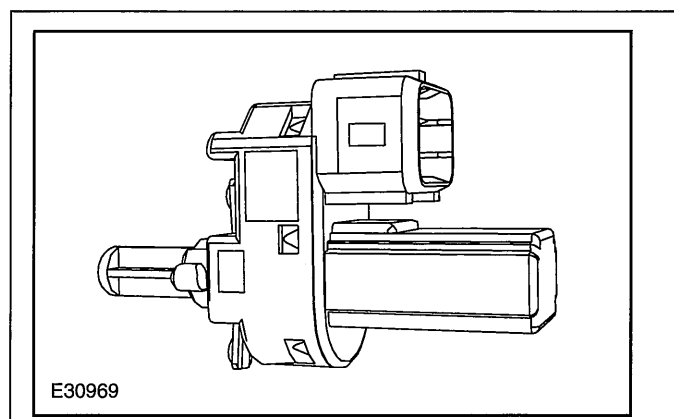
Standby function

If a fault develops in the throttle control unit (TCU), a standby function is carried out. This standby function allows a slight opening of the throttle flap, so that enough air passes through to allow limited engine operation.

For this purpose, there is an throttle flap adjustment screw on the throttle housing. The return spring closes the throttle flap until the stop of the toothed segment touches the stop screw. In this way a defined throttle flap gap is formed for limp home mode.

The stop screw has a spring loaded pin, which holds the throttle flap open for limp home mode. In normal operating mode, this spring loaded pin is pushed in by the force of the electric motor when the throttle flap must be closed past the limp home position (e.g. for idle speed control or overrun shutoff).

CPP switch



E30969

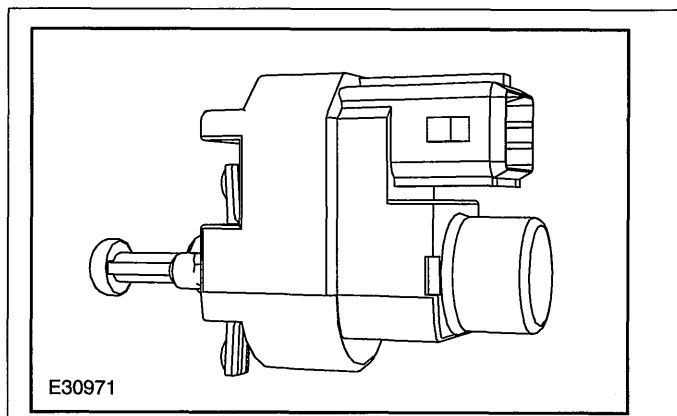
The CPP switch is located directly on the pedal box.

The engine management recognises gearshifts through the CPP switch and thus improves engine running characteristics.

The CPP switch passes a ground signal to the PCM when the clutch pedal is depressed (disengaged).

DESCRIPTION AND OPERATION

(Brake Pedal Position) BPP switch



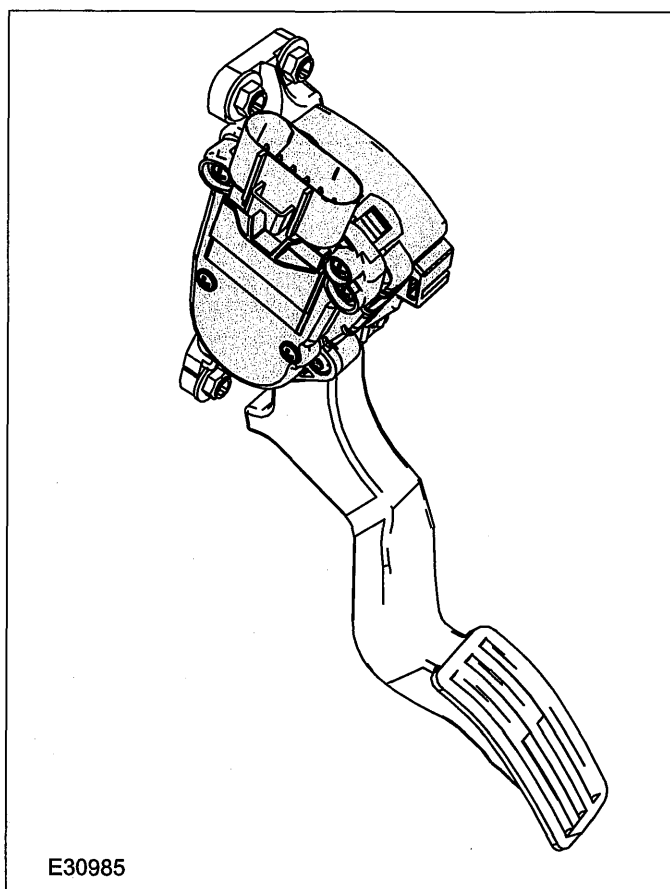
There are two brake pedal switches at the pedal box: the brake lamp switch and the BPP switch. The brake lamp switch only serves to switch on the brake lamps. The BPP switch is used for engine management purposes.

The BPP switch provides the PCM with the information that the vehicle will be decelerated.

The BPP switch is closed in the rest state (brake pedal not depressed) and sends a ground signal to the PCM.

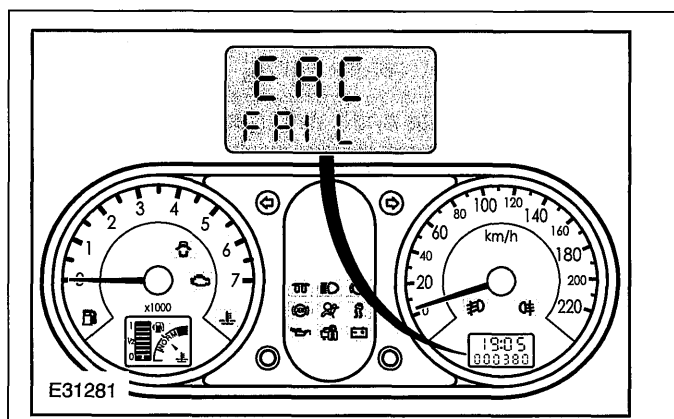
If when the APP sensor has failed, the BPP is operated, the engine will be controlled to run at idle speed by the PCM.

APP sensor



In order that the engine power output can be matched to that required by the driver, the PCM needs to know the position of the APP sensor.

The APP sensor is a variable resistor whose resistance varies with the accelerator position. It is a sliding contact potentiometer (2 potentiometers in total).



If a fault occurs in the APP sensor or the throttle control unit (TCU) during vehicle operation, then this will be **briefly** indicated by a digital display in the instrument cluster after the ignition is switched on, and a trouble code will be stored in the PCM.

DESCRIPTION AND OPERATION

If one potentiometer fails, the engine will run with reduced power (maximum torque 80 Nm), if both potentiometers fail, the engine will run with reduced power (maximum torque 55 Nm).

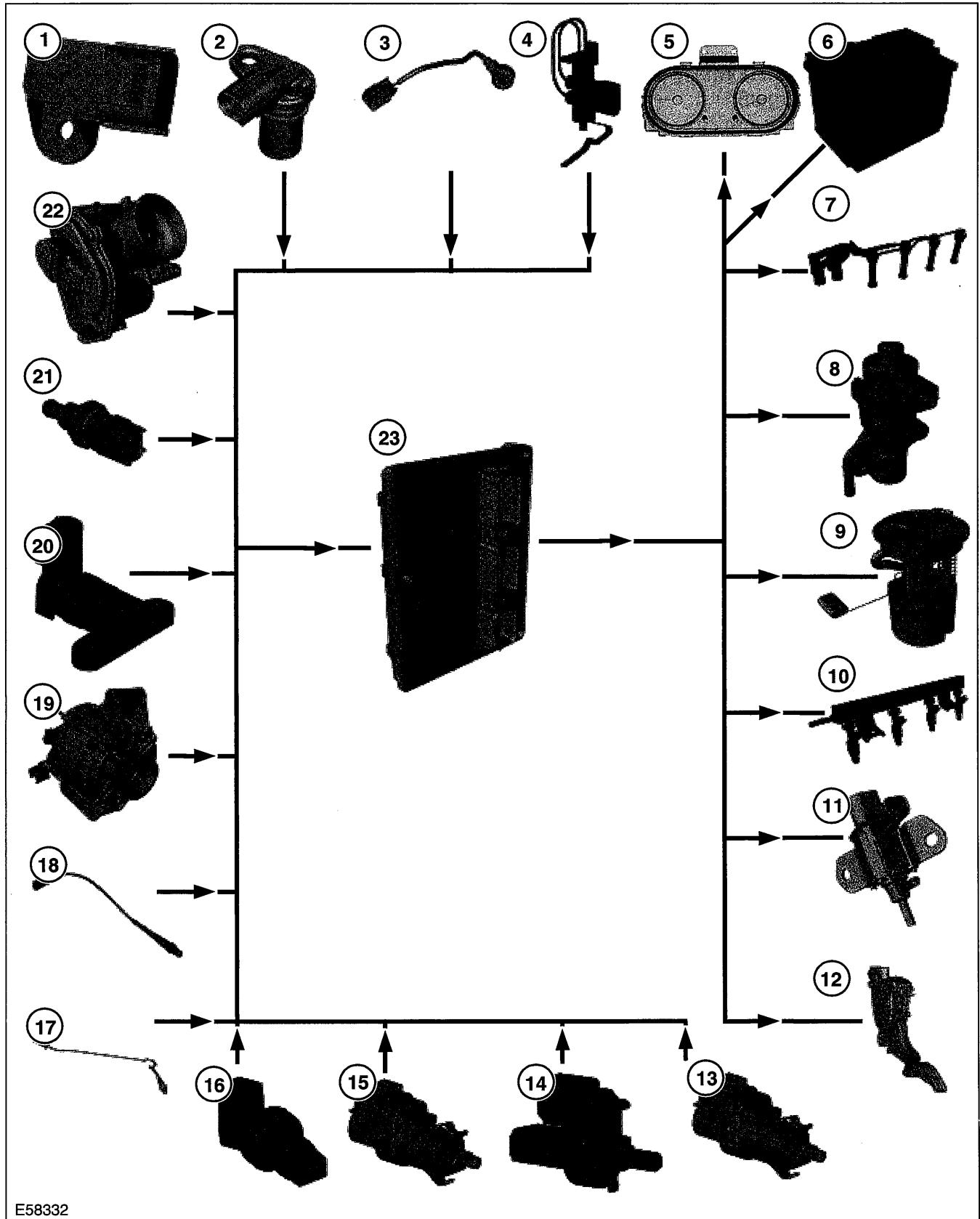
This warning may also be indicated if the engine does not start. The cause may be a poor state of charge of the battery.

The warning indication normally disappears once the battery is re-charged.

DESCRIPTION AND OPERATION

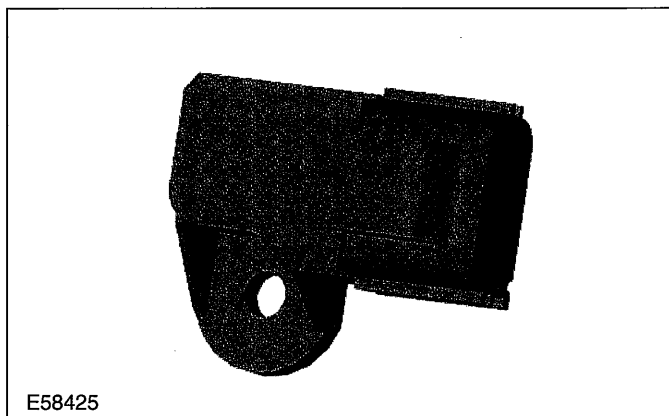
Electronic Engine Controls — 2.0L Duratec-HE (MI4)

System Overview, 2.0L Duratec HE (MI4) Engine

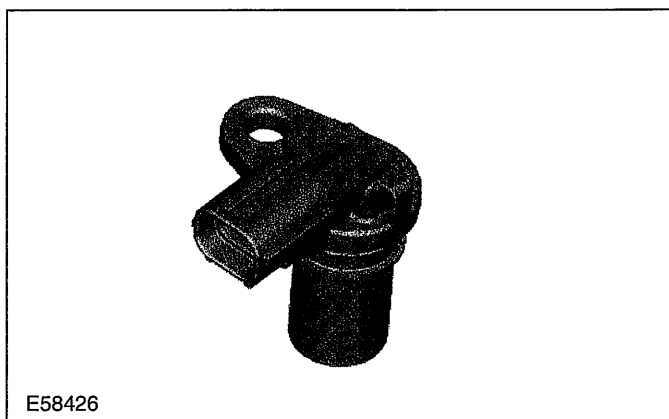


DESCRIPTION AND OPERATION

Item	Description
1	Manifold absolute pressure and temperature (MAPT) sensor
2	Camshaft position (CMP) sensor
3	Knock sensor (KS)
4	Ambient air temperature sensor
5	Instrument cluster
6	Battery
7	Spark plug wires
8	Exhaust gas recirculation (EGR) valve
9	Fuel pump module
10	Fuel rail and fuel injectors
11	Intake manifold tuning valve solenoid
12	Accelerator pedal position (APP) sensor
13	Clutch pedal position (CPP) switch
14	Brake pedal position (BPP) switch
15	Stoptlamp switch
16	Power steering pressure (PSP) switch
17	Catalyst monitor sensor
18	Heated oxygen sensor (HO2S)
19	Generator (input signal)
20	Crankshaft position (CKP) sensor
21	Engine coolant temperature (ECT) sensor
22	Throttle position (TP) sensor (part of throttle body)
23	Powertrain control module (PCM)

Components**MAPT sensor**

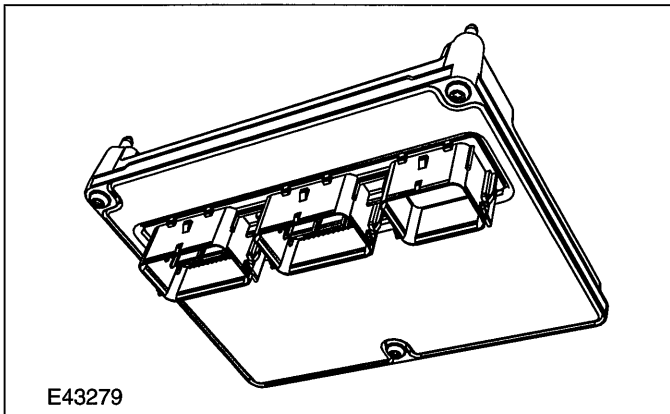
The MAPT sensor is attached to the housing of the intake manifold valve behind the throttle body. The signal from the MAPT sensor is used to modify the ignition and fuel delivery.

CMP sensor

The CMP sensor is located on the right-hand side of the valve cover above the intake camshaft. The CMP sensors send signals to the PCM which are then used by the PCM to calculate the position of the camshaft.

DESCRIPTION AND OPERATION

Powertrain control module (PCM)



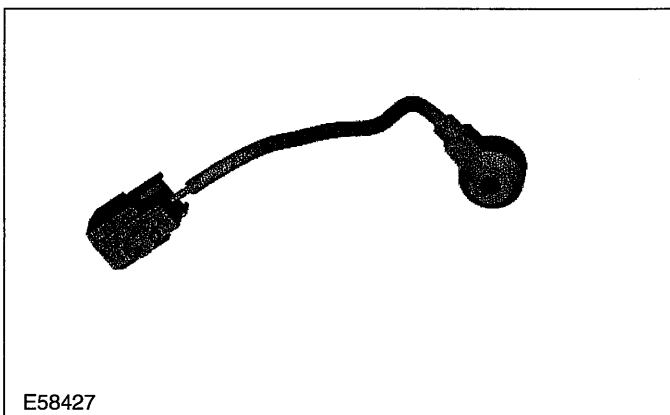
The powertrain control module is located within the engine compartment below the battery and is secured to the left-hand chassis rail by means of a mounting bracket. On right-hand drive vehicles the PCM is protected by a security shield which is secured to the retaining bracket by a shear-head bolt. In order to disconnect the PCM electrical connectors it is necessary to remove the security shield.

The PCM monitors and processes the signals from the sensors and compares these with stored parameters. The PCM uses this information to calculate the output signals to the actuators.

Communications between the PCM and other control units (for example, the stability assist and the instrument cluster) including the DLC for diagnosis of the system, take place on the controller area network (CAN).

Diagnosis can be carried out through the DLC using the Worldwide Diagnostic System (WDS) diagnostic equipment.

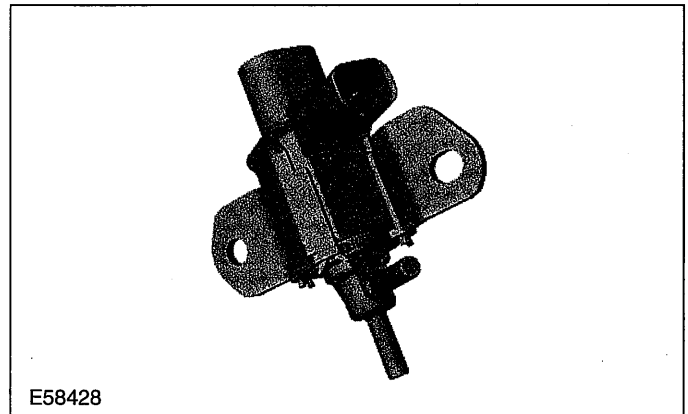
Knock sensor (KS)



The knock sensor is located on the cylinder block between cylinders 2 and 3.

The KS detects engine vibrations caused by knock and produces an output voltage signal in proportion to the knock. The PCM uses the voltage signal to control knock by retarding the ignition timing.

Intake manifold tuning valve solenoid



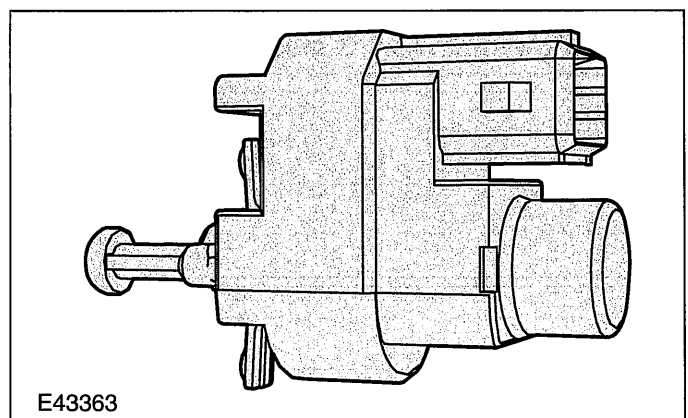
The solenoid for the intake manifold tuning system is located on the transmission side of the cylinder head.

Vacuum is supplied by a central vacuum connection from the intake manifold.

The solenoid for the intake manifold tuning system is supplied with either the maximum voltage or zero voltage, i.e. the valves are either fully open or fully closed.

Actuation depends on the engine speed and the engine load.

BPP switch



The BPP switch and the stoplamp switch are located on the pedal box and provide the PCM with the information that the brake pedal has been pressed and that the vehicle is therefore being decelerated.

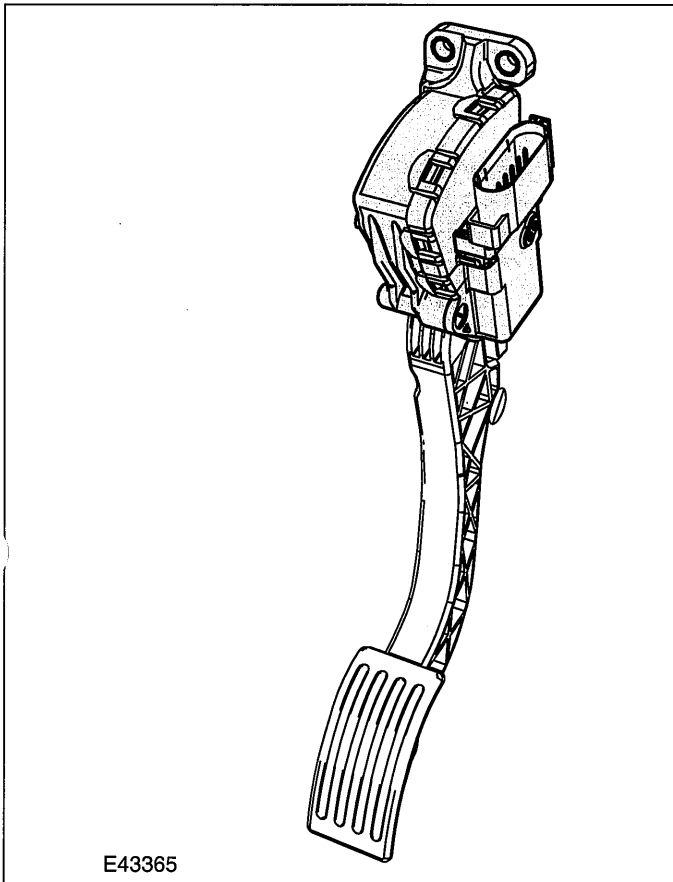
DESCRIPTION AND OPERATION

The BPP switch is connected to the instrument cluster via a CAN bus. In its rest state the switch is closed and sends a ground signal to the PCM.

The signal from the BPP switch is used in the event of failure of the APP sensor for the emergency operating mode.

When the brake pedal is pressed again the engine speed drops to idle speed. When the brake pedal returns to its rest position the engine speed is increased again.

Accelerator pedal position (APP) sensor



The PCM requires the pedal position from the APP sensor in order to regulate the power output of the engine according to the driver request for power.

The APP sensor is a double contact-less inductive sensor.

If a concern occurs with the APP sensor while driving, a diagnostic trouble code (DTC) is stored in the PCM.

If both sensors of the APP sensor fail, the engine is regulated to a maximum engine speed of up to 4000 rev/min after a single operation of the BPP switch and the stop lamp switch and a subsequent comparative plausibility test. The vehicle can only be accelerated to a maximum speed of 56 km/h.

DIAGNOSIS AND TESTING**Electronic Engine Controls****General Equipment**

Worldwide Diagnostic System (WDS)

Principles of Operation

For Principles of Operation on the electronic accelerator control system

REFER to: Acceleration Control (310-02A, Diagnosis and Testing).

European On-Board Diagnostics (EOBD)

EOBD is a diagnostic system integrated into the powertrain control module (PCM). This system continuously monitors vehicle emission components. The system includes a malfunction indicator lamp (MIL) which indicates when there is a concern that can affect emissions or the system malfunctions. Data stored within the module DTC memory can be accessed using a generic scan tool or WDS.

EOBD is mandated within European Union regulations from the year 2000 for passenger vehicles with petrol engines and from 2003 onwards for passenger vehicles with diesel engines.

EOBD Functions:

- Establishes when and how emissions control faults must be indicated.
- Actuates emission control malfunction indicator lamp (MIL) and fault memory.
- Indicates operating conditions in which the concern occurred (freeze frame data).
- Standardized output of operating data such as engine speed, engine coolant temperature etc.
- Standardized names and abbreviations for components and systems.
- Standardized DTCs for all manufacturers.
- Standardized communication with the diagnostic equipment.
- Standardized 16-pin data link connector (DLC) in area of the instrument panel.
- Concern display must be possible using a generic scan tool.

EOBD consists of the following elements:

Warm-up Cycle

The warm-up cycle is an operation that consists of key on, engine start and a coolant temperature increase of 22°C, exceeding 71°C on completion.

Drive Cycle

A drive cycle commences when the engine is started (cold or warm) and ends when the engine is switched off.

Trip

A trip begins when the engine is started and is complete when all the EOBD monitors have completed a self-test. This may take place over a number of drive cycles. On diesel variants, the information gathered from one drive cycle is not carried over to a subsequent cycle or cycles.

When a concern has been rectified, particularly after electronic engine control components have been changed, the DTC memory, which is part of the EEPROM must be cleared of all trouble codes. When the DTC memory has been cleared, the code P1000 (known as the readiness code) is set in the PCM memory, which indicates that since the EEPROM has been cleared, not all of the monitoring systems have completed their tests. P1000 can only be cleared by carrying out a trip, which includes driving the vehicle under variable conditions of speed, load and time so that all of the monitors are completed. As P1000 will not illuminate the MIL it is not necessary to carry out the trip before returning the vehicle to the customer.

Freeze Frame Data

When a concern is detected, various data is stored depending on application including:

- Diagnostic trouble code.
- Vehicle speed.
- Engine coolant temperature.
- Engine speed.
- Engine load.
- Mixture formation trim value (trim value for engine wear) (All except vehicles with diesel engine).
- State of oxygen sensor control (open and closed loop) (All except vehicles with diesel engine).
- Distance covered since the concern was first registered.

DIAGNOSIS AND TESTING

Monitors

The purpose of the monitors is to continuously check the operation of the emission related sensors and actuators. It then establishes if they are operating within specified tolerances. All monitors carry out their functions in such a way as to be unnoticeable by the driver of the vehicle. Each one is carried out under specific conditions of load, speed and engine temperature. The Comprehensive Component Monitor, Combustion Misfire Monitor and Air/Fuel Ratio Monitor operate continuously. The remaining monitors are only invoked under certain operating conditions. On diesel variants, all of the monitors operate under normal driving conditions: There are no monitors which intervene and cause special operating modes to enable the monitors to work. Some diesel monitors are non-continuous. This means that in a drive cycle, monitoring is done as and when suitable driving conditions exist and potential faults are accumulated and compared with acceptance criteria. Examples of this type are the turbocharger boost pressure and exhaust gas recirculation (EGR) monitors on vehicles with common rail fuel injection.

Comprehensive Component Monitor (CCM)

When the CCM detects a component operating out of tolerance, it sets a Diagnostic Trouble Code (DTC), which is stored in the EEPROM. If the same concern is confirmed during the next trip the MIL will be switched on. The CCM monitors many components, sub-systems and signals. The following is a list of those that can effect emissions depending on application:

- Electronic Ignition (EI) System.
- Crankshaft Position (CKP) Sensor.
- Ignition Coil.
- Electronic Throttle Control Unit.
- Camshaft Position (CMP) Sensor.
- Air Conditioning (A/C) Clutch.
- Idle Air Control (IAC) Valve.
- Mass Air Flow (MAF) Sensor.
- Manifold Absolute Pressure (MAP) Sensor.
- Intake Air Temperature (IAT) Sensor.
- Engine Coolant Temperature (ECT) Sensor.
- Cylinder Head Temperature (CHT) Sensor.
- Heated Oxygen Sensor (HO2S).
- Catalyst Monitor Sensor.
- Charge Air Temperature Sensor.
- Knock Sensor (KS).
- Throttle Position (TP) Sensor.
- Vehicle Speed Sensor (VSS).
- Boost Pressure Sensor.
- Cam-Crank Phasing Sensor.
- EEPROM.
- High Pressure Fuel Injection Pump.
- Exhaust Gas Recirculation (EGR) Valve Monitor.
- Fuel Injectors.
- Turbocharger.
- Combustion Noise Monitor.
- Barometric Pressure (BARO) Sensor.

Combustion Misfire Monitor (All except vehicles with diesel engine)

The combustion misfire monitor operates independently of the others, and can detect misfires caused by the ignition system, fuel system or mechanical engine components. As each cylinder fires, a characteristic crankshaft acceleration is produced. The monitor detects irregularities in the acceleration pattern using the crankshaft position (CKP) sensor, thus detecting the misfire. It can also detect which cylinder has misfired. Combustion misfires can be categorized as follows:

Type A: These can cause catalytic converter damage due to excessive internal temperatures. If a certain number of misfires occur over a pre-determined number of engine revolutions, the MIL will be switched on to alert the driver of the concern.

Type B: These can lead to an increase in emissions to a point above the EOBD threshold. If the misfire is detected during a second trip, over a pre-determined number of engine revolutions, the MIL will be switched on. If the misfire does not occur over the next three trips, the MIL will be extinguished

Air/Fuel Ratio (AFR) Monitor (All except vehicles with diesel engine)

The HO2S fitted before the catalytic converter (upstream) measures the oxygen content of the exhaust gas and the variations in it. This then enables the PCM to adjust the opening times of the fuel injectors to maintain the correct AFR. This is known as Short Term Fuel Trim (STFT). If the same variation is registered a pre-determined number of times, a permanent correction factor is applied. This is known as Long Term Fuel Trim (LTFT), which is stored in the EEPROM. When the correction factors exceed pre-determined limits a DTC will be set in the EEPROM. If a concern is

DIAGNOSIS AND TESTING

detected in either the STFT or LTFT, and it is still present on a second trip, the MIL will be switched on.

Heated Oxygen Sensor (HO2S) Monitor (All except vehicles with diesel engine)

This monitors the operation of the pre (upstream) and post (downstream) catalytic converter HO2S sensors. It will detect deviations in air/fuel ratios (AFR) and sensor faults.

The HO2S will cause emission increase when its response time increases too much. To diagnose a sensor a period is measured and the number of lean/rich transitions are counted. The sum of valid periods is then calculated. To avoid non-representative measurements, the period is valid only if the HO2S has been below a low threshold and above a high threshold between 2 consecutive lean/rich transitions. A failure is declared when the sum of the measured periods exceeds the sum of the corresponding limit (held within the PCM) and the MIL is illuminated.

Catalytic Converter Efficiency Monitor (All except vehicles with diesel engine)

The efficiency of a catalytic converter is measured by its ability to store and later release oxygen to convert harmful gases. The efficiency is reduced if the converter becomes contaminated as it ages, and at high gas flow rates, because the exhaust gas does not remain in the converter long enough to complete the conversion process.

This monitor checks for the oxygen storage capacity (OSC) of the catalytic converter. During a controlled period, the catalyst monitor sensor signal is analyzed to evaluate the OSC of the catalyst. It represents the quantity of oxygen that is really used for the oxidation-reduction reaction by the catalytic converter. If a fault has occurred with the catalyst monitor sensor during the catalyst diagnosis, a sensor diagnosis is carried out. During the controlled diagnosis phase, the catalyst monitor sensor activity is measured and is compared to the OSC of the catalyst. If this activity is high (low OSC) the MIL will be illuminated. If throughout the controlled phase, repeated several times, the downstream sensor output has not moved, the closed loop mode is delayed in order to test the sensor. If the catalyst monitor sensor is set to rich, the injection time is forced to lean and conversely if the downstream sensor is set to lean, the injection time is forced to rich until the sensor

switches over or until the end of a delay. If this delay expires or the sensor does not switch, the sensor is treated as failed.

Combustion Noise Monitor (Vehicles with common rail fuel injection)

In diesel variants, the Combustion Noise Monitor is used to trim the fuel injection pulse lengths. Each fuel injector has an associated set of correction data that is determined during a production end of line test. The Combustion Noise Monitor is used to determine how the fuel injector characteristic changes from this initial calibration over the life of the fuel injector.

EGR Monitor (Vehicles with diesel engine)

The functionality of the EGR system is checked by comparing either the MAP sensor output or EGR valve lift potentiometer output (depending upon application) with expected values.

Diagnostic Requirements

Vehicles equipped with EOBD, can be diagnosed using the WDS. In order for the EOBD system to be invoked, a number of criteria must be met. After any repair, which could affect emissions, a trip must be carried out on the vehicle, to make sure that engine management system operates correctly.

Malfunction Indicator Lamp (MIL)

The MIL is located in the instrument cluster and is fitted to alert the driver to the fact that an abnormal condition has developed in the engine management system, that is having an adverse effect on emissions. In cases of misfires which are likely to cause catalytic converter damage, it is switched on immediately. With all other faults it will illuminate continuously from the second trip after the condition occurred. Under normal operation it should illuminate at key-on and go out almost as soon as the engine is started.

Diagnostic Trouble Codes (DTCs)

The DTCs given by the PCM are standardized, which means that generic scan tools can read results from all vehicles.

DIAGNOSIS AND TESTING

- The DTC is always a 5 digit alphanumeric code, for example "P0100".
- The first digit of a code (letter) identifies the system which has set the code. Provision has been made for a total of four systems to be identified although only the 'P' code is required for EOBD.
 - 'B' for the body
 - 'C' for the chassis
 - 'P' for the powertrain
 - 'U' for the network communications systems
- All of the "x0xxx" codes are standardized codes. However, any manufacturer can use additional codes over and above the standardized codes. These will be labelled "x1xxx"
- The third digit of a code (numeric) identifies the sub-system which has set the code.
 - 'Px1xx' for metering of fuel and air supply
 - 'Px2xx' for metering of fuel and air supply
 - 'Px3xx' for ignition system – combustion misfires
 - 'Px4xx' for auxiliary emission control equipment
 - 'Px5xx' for vehicle speed, idle setting and other related inputs
 - 'Px6xx' for trip computer and other related outputs
 - 'Px7xx' for transmission.
 - 'Px8xx' for transmission.
 - 'Px9xx' category to be determined
 - 'Px0xx' category to be determined
- When a concern occurs, the actions taken include storage of the relevant information and actuation of the MIL occurs in line with the relevant legislation.

MIL Code List

MIL Code	Description
P0030	Heated oxygen sensor (HO2S) heater open circuit
P0031	HO2S heater low voltage
P0032	HO2S heater high voltage
P0036	Catalyst monitor sensor heater open circuit
P0037	Catalyst monitor sensor heater low voltage
P0038	Catalyst monitor sensor heater high voltage
P0053	HO2S heater resistance out of limits
P0054	Catalyst monitor sensor heater resistance out of limits
P0106	Manifold absolute pressure (MAP) sensor plausibility malfunction
P0107	MAP sensor circuit low input
P0108	MAP sensor circuit high input
P0109	MAP sensor temporary malfunction
P0112	Intake air temperature (IAT) circuit low input
P0113	IAT circuit high input
P0114	IAT intermittent failure
P0116	Engine coolant temperature (ECT) signal stuck at low level
P0117	ECT circuit low input
P0118	ECT circuit high input

DIAGNOSIS AND TESTING

MIL Code	Description
P0119	ECT intermittent failure
P0122	Throttle position (TP) sensor circuit 1 low input
P0123	TP sensor circuit 1 high input
P0130	HO2S circuit open circuit
P0131	HO2S circuit low voltage
P0132	HO2S circuit high voltage
P0133	HO2S circuit slow response
P0134	HO2S low amplitude
P0136	Catalyst monitor sensor circuit open circuit
P0137	Catalyst monitor sensor circuit low voltage
P0138	Catalyst monitor sensor circuit high voltage
P0139	Catalyst monitor sensor circuit slow response
P0171	Fuel system error, lean limit
P0171	Fuel system error , NOx emissions
P0172	Fuel system error , rich limit
P0172	Fuel system error, HC/CO emissions
P0201	Cylinder No. 1 - injector circuit open circuit
P0202	Cylinder No. 2 - injector circuit open circuit
P0203	Cylinder No. 3 - injector circuit open circuit
P0204	Cylinder No. 4 - injector circuit open circuit
P0222	TP sensor circuit 2 low input
P0223	TP sensor circuit 2 high input
P0231	Fuel pump input low voltage
P0232	Fuel pump input high voltage
P0261	Cylinder No. 1 - injector circuit low voltage
P0262	Cylinder No. 1 - injector circuit high voltage
P0264	Cylinder No. 2 - injector circuit low voltage
P0265	Cylinder No. 2 - injector circuit high voltage
P0267	Cylinder No. 3 - injector circuit low voltage
P0268	Cylinder No. 3 - injector circuit high voltage
P0270	Cylinder No. 4 - injector circuit low voltage
P0271	Cylinder No. 4 - injector circuit high voltage
P0300	Random misfire detected
P0301	Cylinder No. 1 misfire detected
P0302	Cylinder No. 2 misfire detected

DIAGNOSIS AND TESTING

MIL Code	Description
P0303	Cylinder No. 3 misfire detected
P0304	Cylinder No. 4 misfire detected
P0315	Flywheel segment adaptation at the Limit
P0324	Knock sensor (KS) communication error or implausible signal
P0325	KS implausible signal
P0335	Crankshaft position (CKP) sensor implausible signal
P0336	CKP sensor missing teeth
P0336	CKP sensor loss of synchronization
P0336	CKP sensor no signal
P0340	Camshaft position (CMP) sensor no signal
P0341	CMP sensor implausible signal
P0351	Ignition coil A primary malfunction
P0352	Ignition coil B primary malfunction
P0420	Catalyst system efficiency below threshold
P0444	Evaporative mission canister purge valve open circuit
P0458	Evaporative mission canister purge valve low voltage
P0459	Evaporative mission canister purge valve high voltage
P0460	Fuel tank level malfunction from instrument cluster
P0500	Vehicle speed sensor (VSS) signal malfunction
P0500	Vehicle speed via CAN (VS CAN) implausible signal
P0503	VSS signal too high
P0511	Idle air control (IAC) valve circuit malfunction
P0560	Battery system voltage malfunction high voltage
P0562	Battery system voltage malfunction open circuit
P0571	Brake switch plausibility error
P0603	Powertrain control module (PCM) error NVMY or EEPROM error
P0604	PCM error RAM error
P0605	PCM error checksum error
P0610	VID block checksum not correct or not programmed
P0617	Starter relay malfunction
P0620	Generator circuit malfunction
P0625	Generator low voltage
P0626	Generator high voltage
P0628	Fuel pump primary circuit low voltage
P0629	Fuel pump primary circuit high voltage

DIAGNOSIS AND TESTING

MIL Code	Description
P0641	Transmission sensor power supply 1 noisy signal
P0642	Transmission sensor power supply 1 low voltage
P0643	Transmission sensor power supply 1 high voltage
P0646	Air conditioning (A/C) clutch relay circuit low voltage
P0647	A/C clutch relay circuit high voltage
P0651	Transmission sensor power supply 2 noisy signal
P0652	Transmission sensor power supply 2 low voltage
P0653	Transmission sensor power supply 2 high voltage
P0654	Engine run output circuit malfunction
P0686	Main relay malfunction low voltage
P0687	Main relay malfunction high voltage
P0691	Cooling fan 1 control circuit low voltage
P0692	Cooling fan 1 control circuit high voltage
P0693	Cooling fan 2 control circuit low voltage
P0694	Cooling fan 2 control circuit high voltage
P0704	Clutch switch implausible signal
P1000	EOBD system readiness test not complete
P1500	Vehicle speed sensor (VSS) output circuit malfunction
P1632	Generator command malfunction
P1794	Battery voltage malfunction too high or too low
P2100	Engine throttle body H-bridge malfunction
P2107	Safety failure level 3
P2108	Safety failure level 2 error
P2119	Engine throttle body throttle flap malfunction
P2122	Accelerator pedal position (APP) sensor circuit 1 low input
P2123	APP sensor circuit 1 high input
P2127	APP sensor circuit 2 low input
P2128	APP sensor circuit 2 high input
P2128	APP sensor circuits 1 and 2 plausibility error
P2135	TP sensor circuits 1 and 2 plausibility error
P2176	Engine throttle body adaptive algorithm failed
P2280	Air cleaner obstruction or leakage
P2282	Air leakage between throttle and inlet valves
U0001	Control Area Network (CAN) bus-off or mute
U0101	CAN missing frame from TCU

DIAGNOSIS AND TESTING

MIL Code	Description
U0121	CAN missing frame from ABS
U0122	CAN missing frame from ESP
U0155	CAN missing frame from HEC
B1213	Number of Passive Anti-Theft System (PATS) programmed keys is below minimum
B1600	PATS ignition key transponder signal is not received
B1601	PATS received incorrect key-code from ignition key transponder
B1602	PATS received invalid format of key-code from ignition key transponder
B1681	PATS transceiver module signal is not received
B2103	PATS immobilizer antenna not connected
B2139	PATS immobilizer challenge response doesn't match
B2141	PATS immobilizer no PCM-ID transferred
B2431	PATS immobilizer transponder programming failure
U2510	PATS immobilizer problem with messages on data link

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

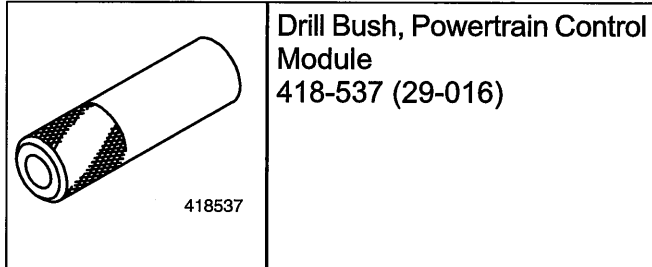
Mechanical	Electrical
– Sensors – Actuators	– Fuse(s) – Wiring harness – Electrical connector(s) – Powertrain control module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to WDS or equivalent scan tool for further diagnostics.

REMOVAL AND INSTALLATION

Powertrain Control Module (PCM) — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(29 200 0)

Special Tool(s)



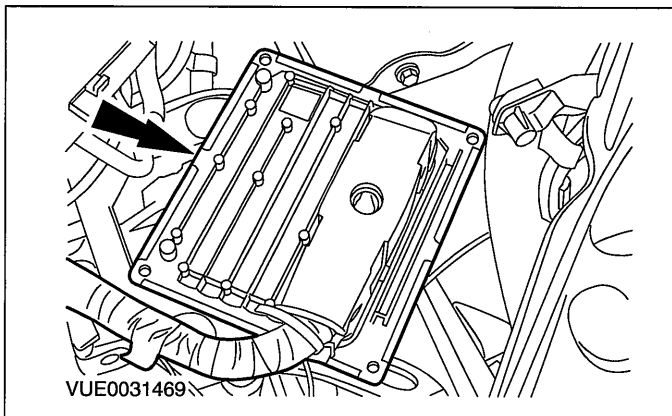
Removal

NOTE: If a new PCM is being installed connect WDS. Upload the PCM configuration information using the programmable modules installation routine prior to commencing the removal of the PCM.

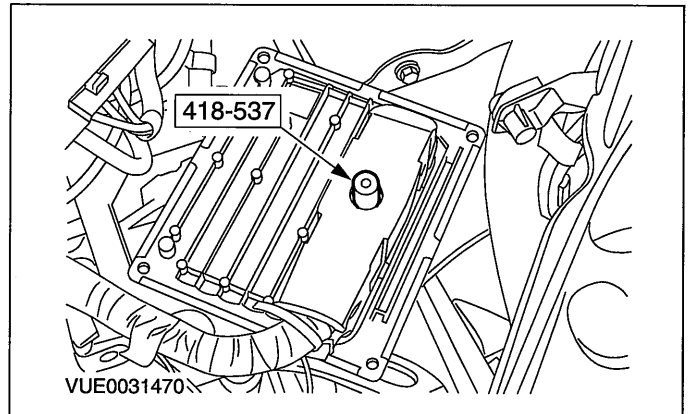
1. Remove the battery tray.

For additional information, refer to: Battery Tray (414-01, Removal and Installation).

2. Position the PCM on the battery tray support panel.



3. Insert the special tool into the PCM electrical connector.

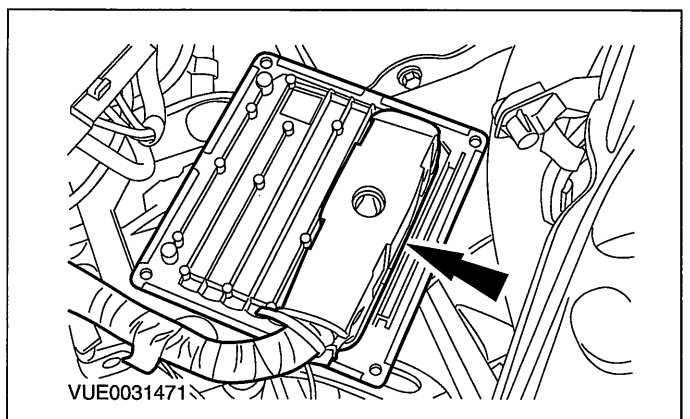


4. **⚠ CAUTION:** Make sure the special tool is used to guide the drill bit. Failure to follow this instruction may result in damage to the electrical connector.

Using the special tool as a guide, drill into the shear bolt using a 6mm drill bit, until the head is removed.

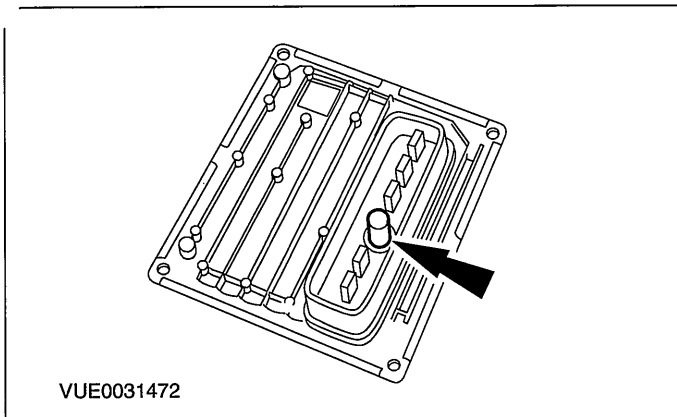
5. Remove the special tool from the PCM electrical connector and clean all foreign material from the electrical connector.

6. Disconnect the PCM electrical connector and remove the PCM.



REMOVAL AND INSTALLATION

7. Remove the remains of the shear bolt from the PCM using grips.



4. If a new PCM is being installed connect WDS. Download the PCM configuration information using the programmable modules installation routine.

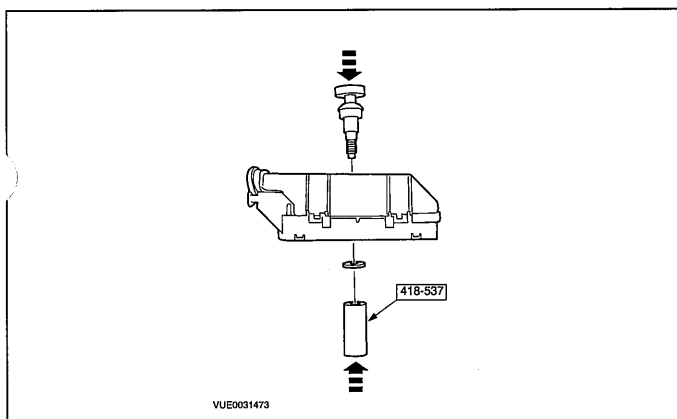
5. **NOTE:** Do not press the accelerator pedal during the initialization period as this will prevent the complete initialization of the throttle body.

Turn the ignition key to position II and wait for one minute to initialize the throttle body.

6. Turn the ignition key to the OFF position.

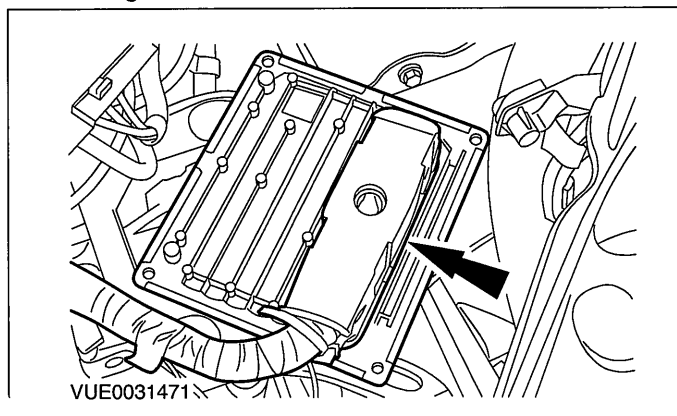
Installation

1. Install a new shear bolt and securing clip, using the special tool to push the clip onto the shank of the bolt.



2. Install the PCM electrical connector to the PCM.

- Tighten the bolt until the head shears off.



3. Install the battery tray.

For additional information, refer to: Battery Tray (414-01, Removal and Installation).

REMOVAL AND INSTALLATION**Powertrain Control Module (PCM) — 2.0L Duratec-HE (MI4),
Vehicles With: PCM Security Shield**

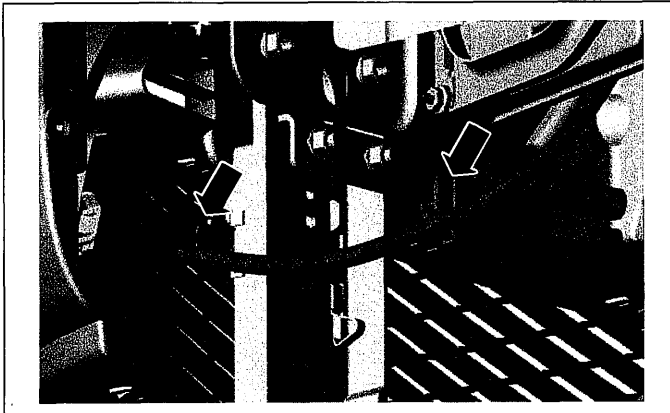
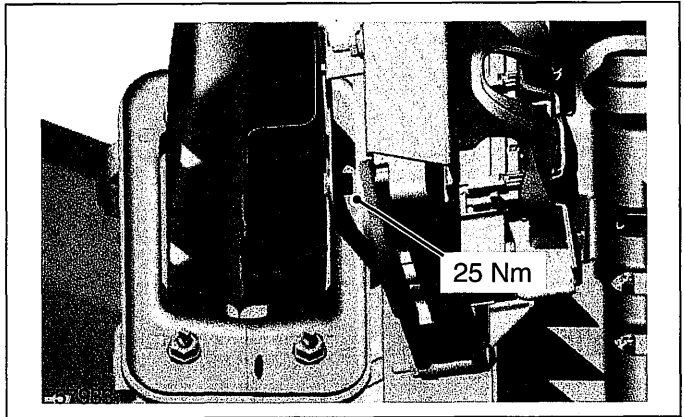
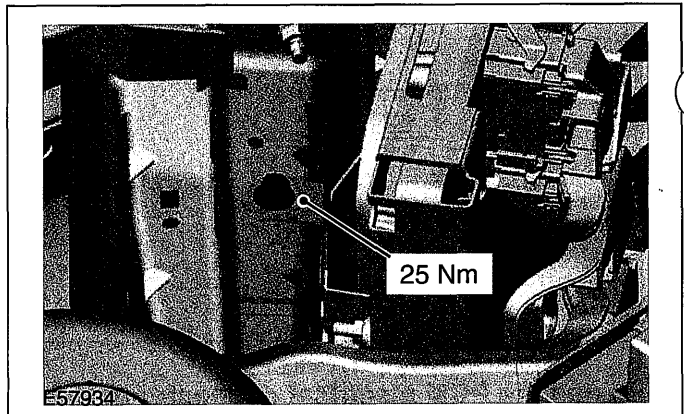
NOTE: If a new PCM is being installed connect the Worldwide Diagnostic System (WDS). Upload the PCM configuration information using the programmable modules installation routine prior to commencing the removal of the PCM.

1. Remove the battery tray.

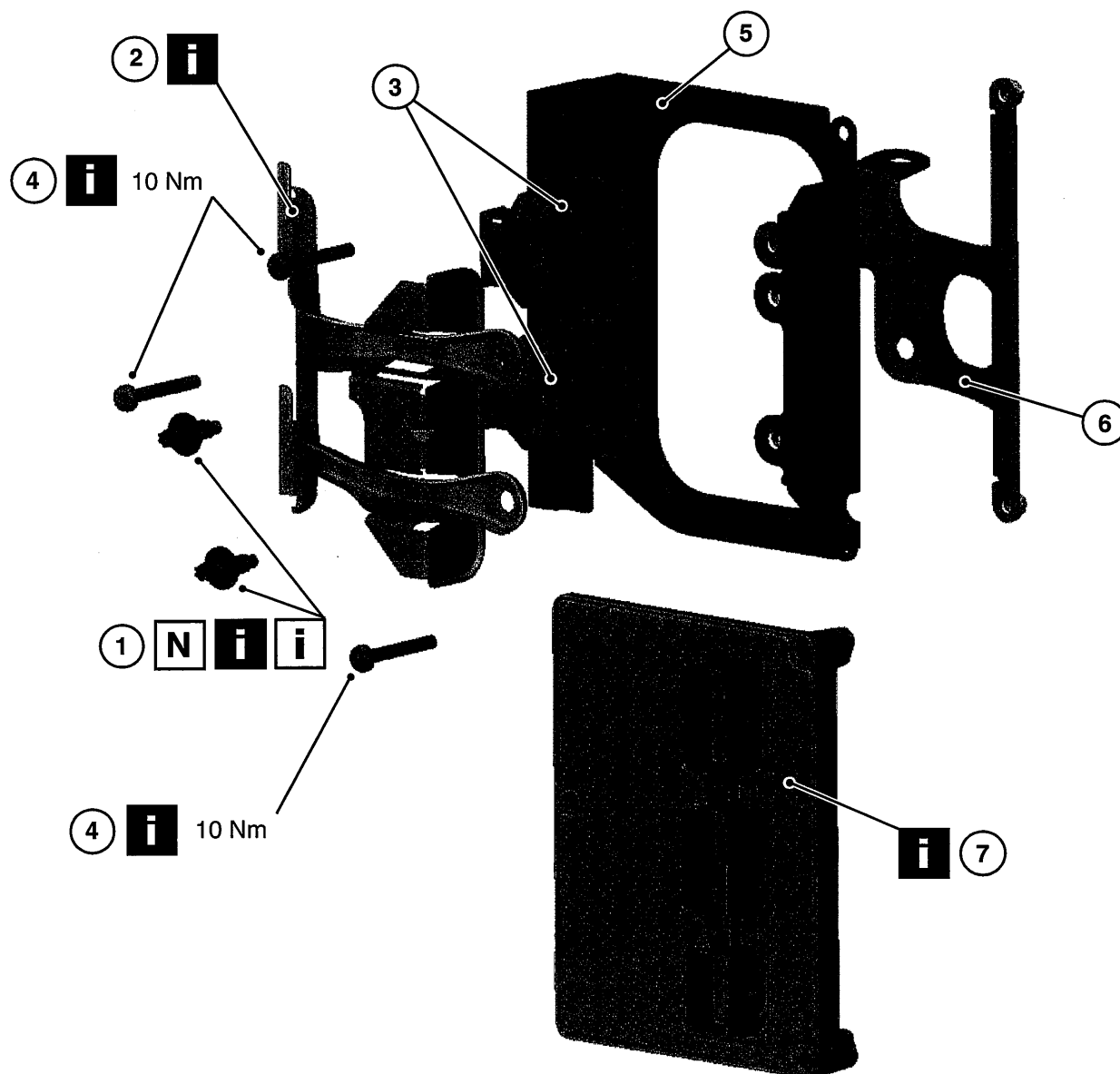
For additional information, refer to: **Battery Tray (414-01, Removal and Installation).**

2. Raise and support the vehicle.

For additional information, refer to: **Lifting (100-02 Jacking and Lifting, Description and Operation).**

3. Disconnect the ambient air temperature sensor electrical connector and detach the wiring harness from the retaining clip.**4. Remove the PCM mounting bracket lower retaining bolt.****5. Lower the vehicle.****6. Remove the PCM mounting bracket upper retaining bolt.****7. Position the PCM, PCM retaining bracket and PCM mounting bracket on the battery tray support panel.****8. Remove the components in the order indicated in the following illustration(s) and table(s).**

REMOVAL AND INSTALLATION



E57935

Item	Description
1	PCM security shield shear bolts See Removal Detail See Installation Detail
2	PCM security shield See Removal Detail
3	PCM electrical connectors
4	PCM retaining bolts See Removal Detail
5	PCM retaining bracket

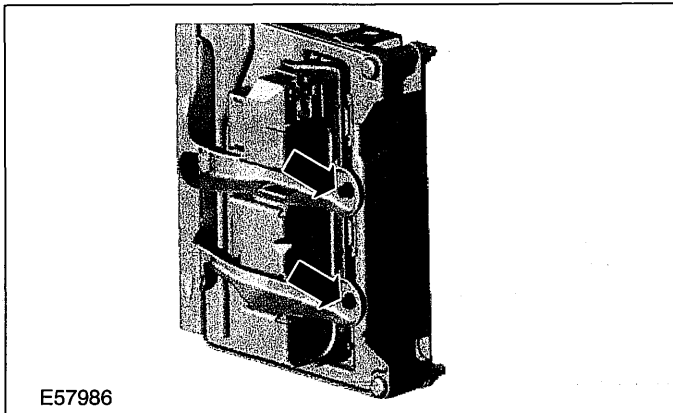
Item	Description
6	PCM mounting bracket
7	PCM See Removal Detail

9. To install, reverse the removal procedure.

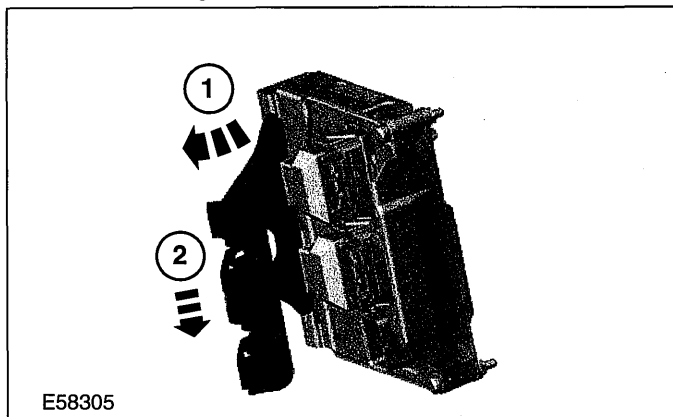
NOTE: If a new PCM is being installed connect WDS. Download the PCM configuration information using the programmable modules installation routine after the installation of the PCM.

REMOVAL AND INSTALLATION**Removal Details****Item 1 PCM security shield shear bolts****1. Remove the PCM security shield shear bolts.**

- Drill a 3 mm pilot hole in the center of the PCM security shield shear bolts.
- Drill a 8 mm hole in the PCM security shield shear bolts and remove the PCM security shield.

**Item 2 PCM security shield****1. Remove the PCM security shield.**

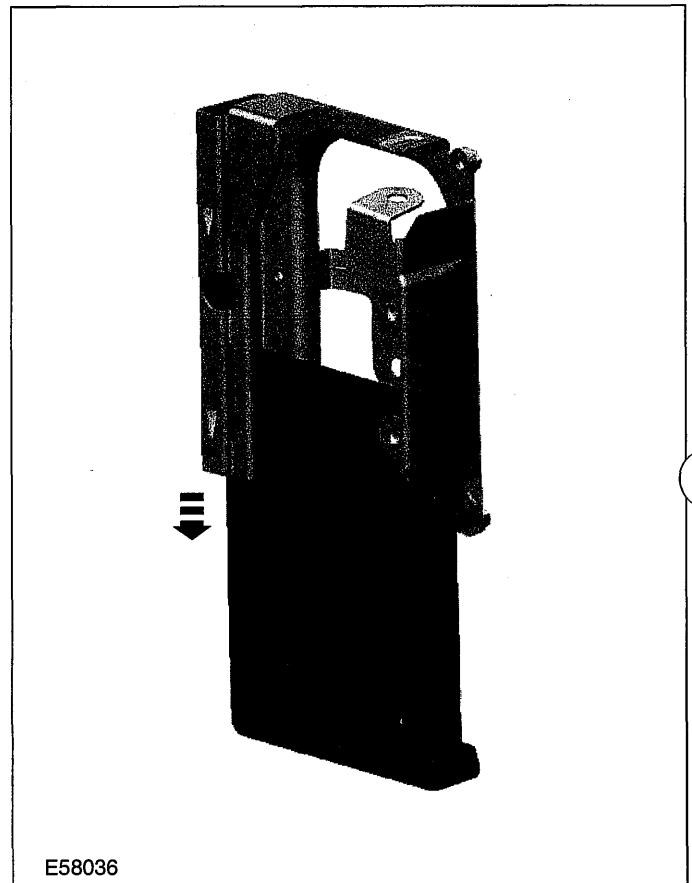
1. Swing the PCM security shield away from the PCM retaining bracket.
2. Slide the PCM security shield from the PCM retaining bracket.

**Item 4 PCM retaining bolts**

1. Support the PCM, PCM retaining bracket and PCM mounting bracket while removing the PCM retaining bolts.

Item 7 PCM

1. Remove the PCM from the PCM retaining bracket.

**Installation Details****Item 1 PCM security shield shear bolts**

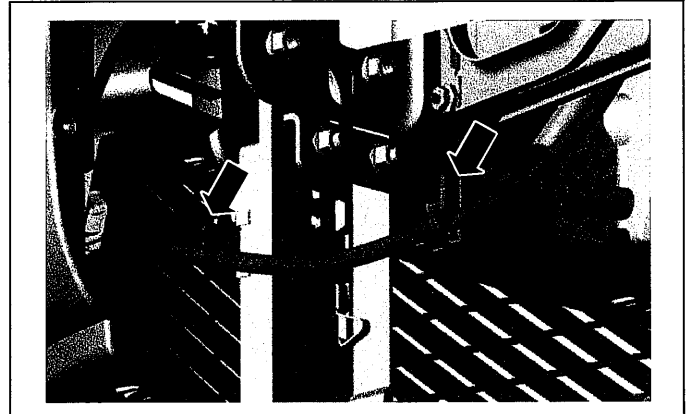
1. Tighten the PCM security shield shear bolts until the head of the bolt shears off.

REMOVAL AND INSTALLATION**Powertrain Control Module (PCM) — 2.0L Duratec-HE (MI4),
Vehicles Without: PCM Security Shield**

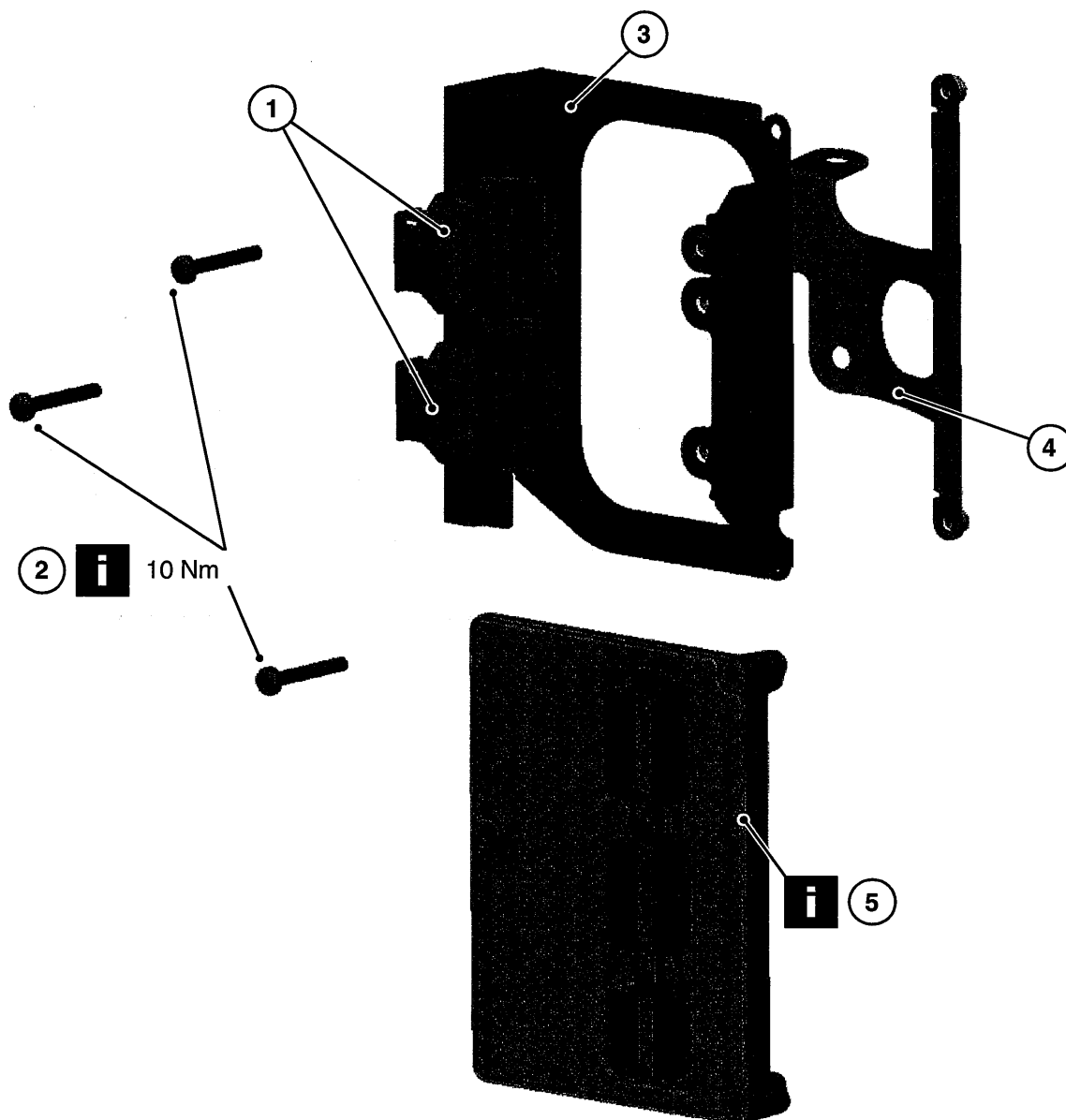
NOTE: If a new PCM is being installed connect WDS. Upload the PCM configuration information using the programmable modules installation routine prior to commencing the removal of the PCM.

1. Disconnect the battery ground cable.

For additional information, refer to: **Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).**

2. Disconnect the ambient air temperature sensor electrical connector and detach the wiring harness from the retaining clip.**3. Remove the components in the order indicated in the following illustration(s) and table(s).**

REMOVAL AND INSTALLATION



E57956

Item	Description
1	PCM electrical connectors
2	PCM retaining bolts See Removal Detail
3	PCM retaining bracket
4	PCM mounting bracket
5	PCM

Item	Description
	See Removal Detail

4. To install, reverse the removal procedure.

NOTE: If a new PCM is being installed connect WDS. Download the PCM configuration information using the programmable modules installation routine after the installation of the PCM.

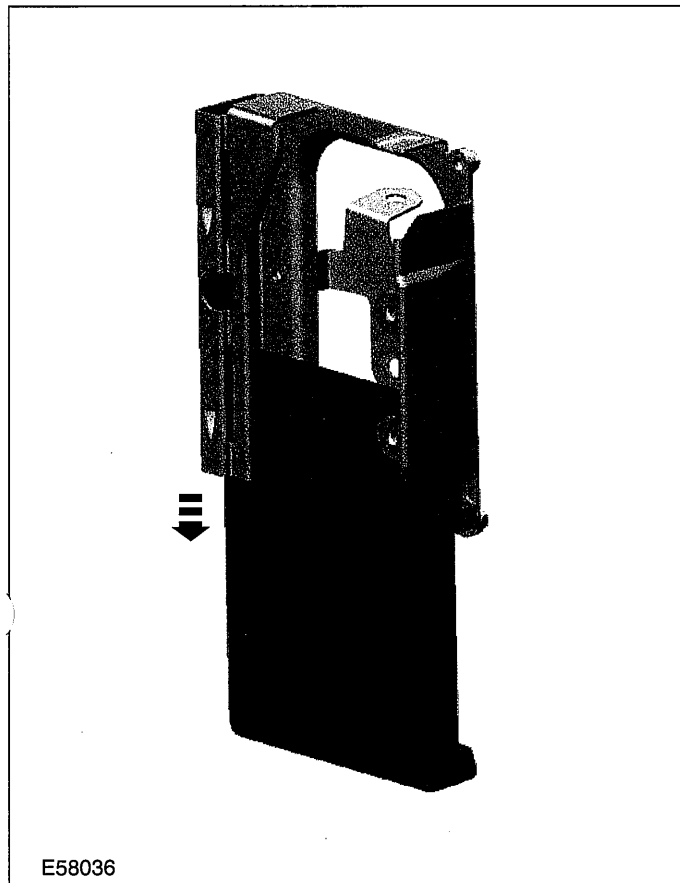
Removal Details

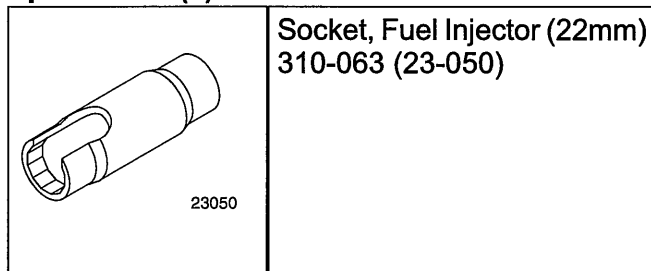
REMOVAL AND INSTALLATION**Item 2 PCM retaining bolts**

1. Support the PCM and PCM retaining bracket while removing the PCM retaining bolts.

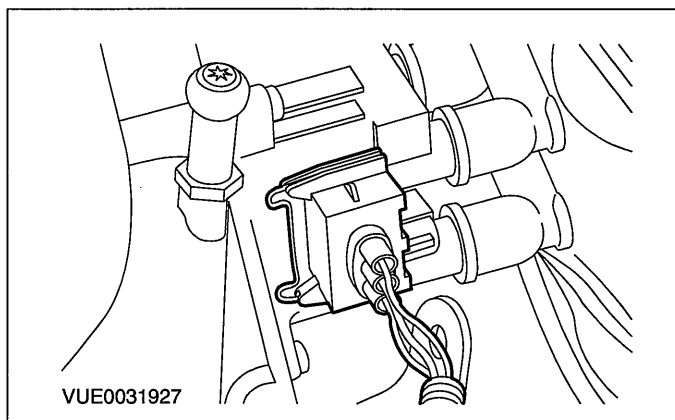
Item 5 PCM

1. Remove the PCM from the PCM retaining bracket.

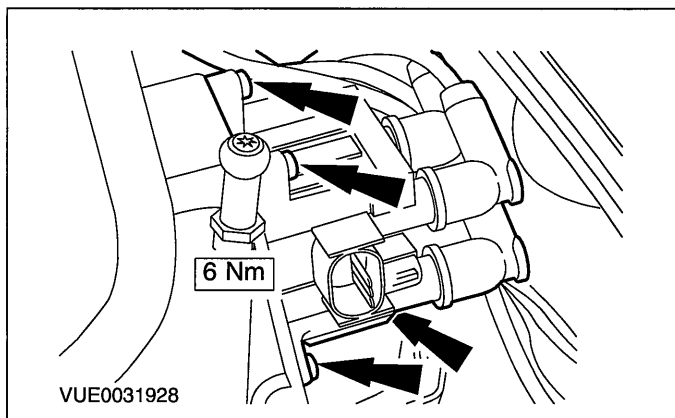


REMOVAL AND INSTALLATION**Heated Oxygen Sensor (HO2S)(29 220 0)****Special Tool(s)****Removal**

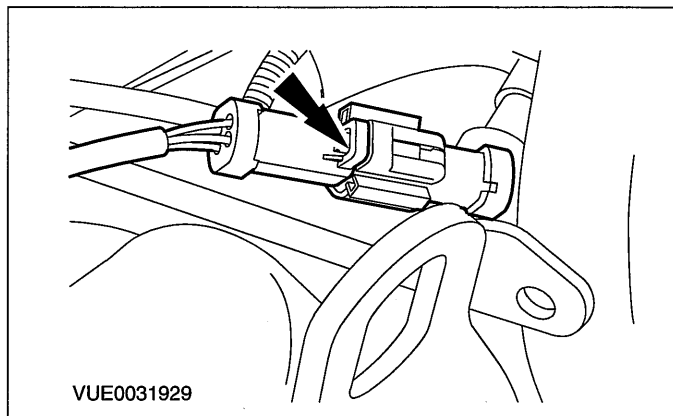
1. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
2. Disconnect the ignition coil pack electrical connector.



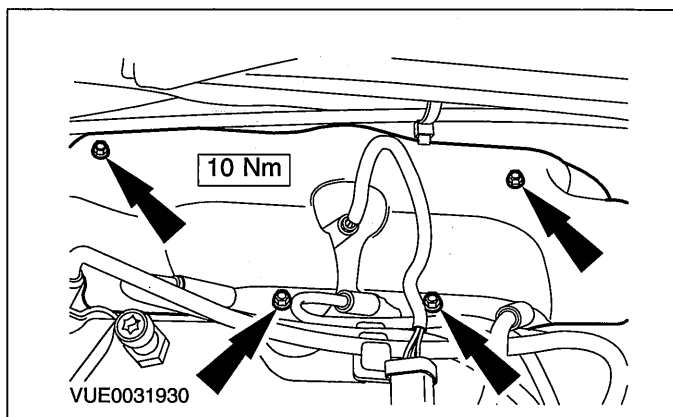
3. Detach the ignition coil pack and position it to one side



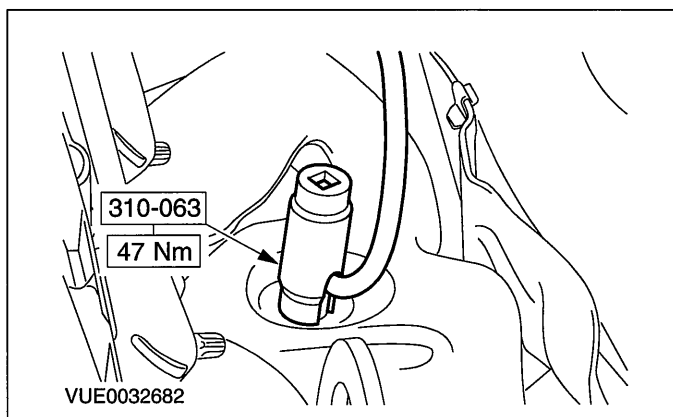
4. Disconnect the HO2S electrical connector.



5. Remove the exhaust manifold heat shield.



6. Using the special tool, remove the HO2S.

**Installation**

CAUTION: When installing a new HO2S, it is possible that the new component will be supplied with a longer cable than the one removed. It is important that the cable is routed and secured in such a way that it

REMOVAL AND INSTALLATION

cannot be damaged by heat or moving components and will not cause a noise, vibration or harshness (NVH) issue.

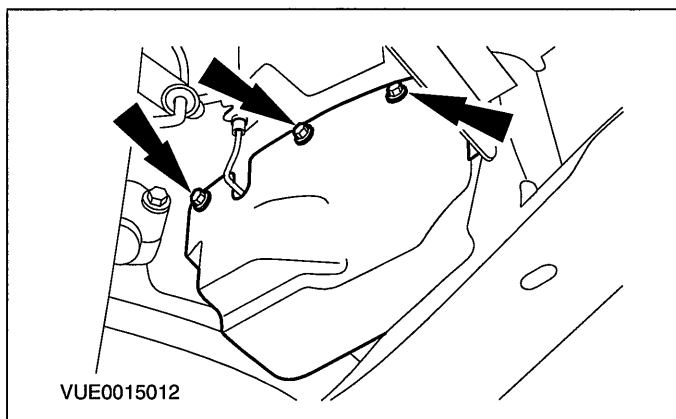
1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Crankshaft Position (CKP) Sensor****General Equipment**

Bolt, M6 x 18 mm
CKP alignment tool

1. Raise and support the vehicle.

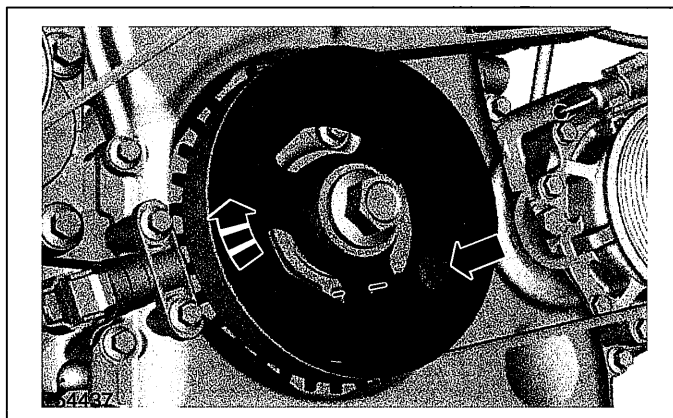
For additional information, refer to: Lifting
(100-02, Description and Operation).

2. Remove the splash shield**3. CAUTIONS:**

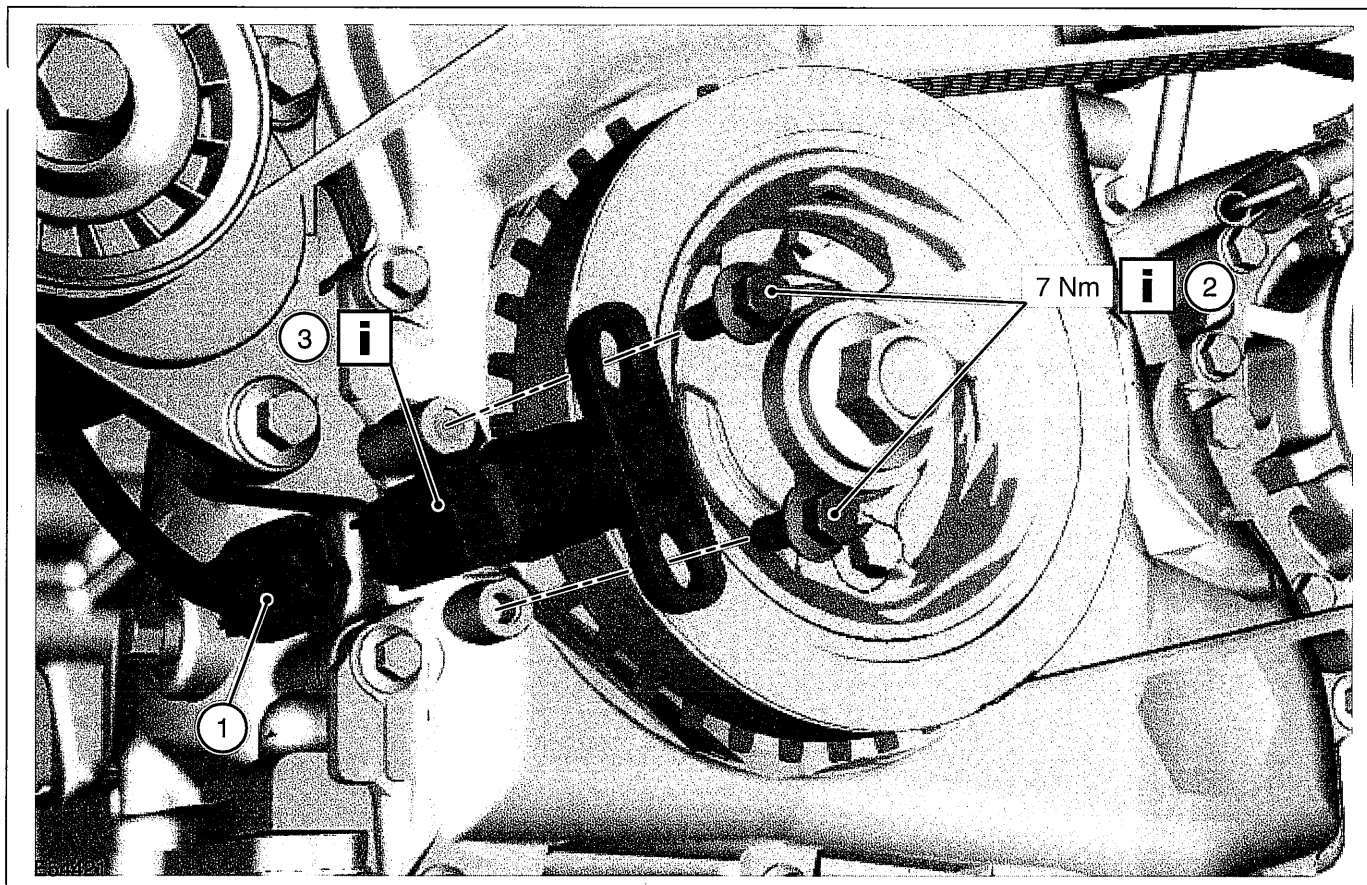
⚠ Only turn the crankshaft pulley in the
normal direction of rotation.

⚠ Tighten the M6 x 18 mm bolt finger-tight
only.

Rotate the crankshaft pulley clockwise until
the crankshaft pulley timing bolt, M6 x 18
mm can be installed through the crankshaft
pulley timing hole into the engine front cover.

**4. Remove the components in the order
indicated in the following illustration(s) and
table(s).**

REMOVAL AND INSTALLATION



Item	Description
1	CKP sensor electrical connector
2	CKP sensor retaining bolts See Installation Detail
3	CKP sensor

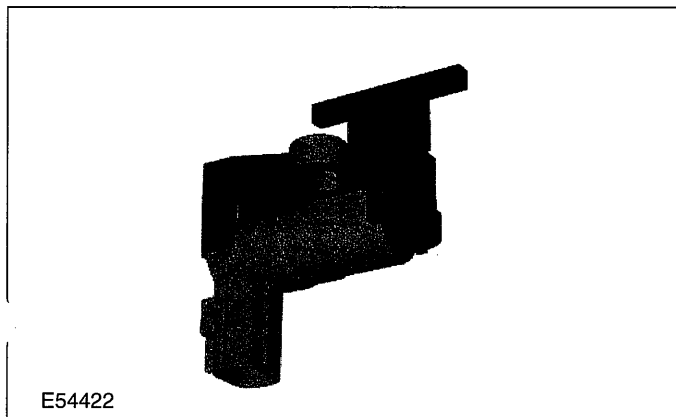
Item	Description
	See Installation Detail

5. To install, reverse the removal procedure.

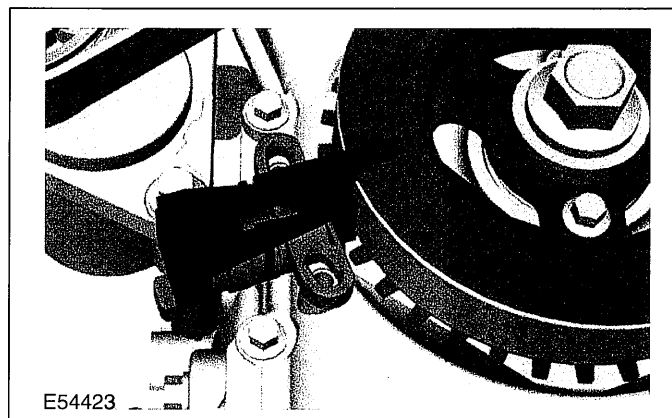
Installation Details

Item 3 CKP sensor

1. Install the CKP sensor alignment tool to the CKP sensor.



2. Align the CKP sensor with the crankshaft pulley sensor ring.

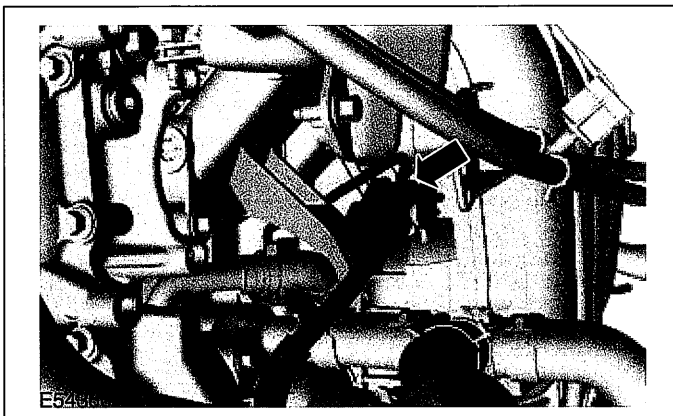


REMOVAL AND INSTALLATION**Item 2 CKP sensor retaining bolts**

1. Install the CKP sensor retaining bolts.
2. Remove the CKP sensor alignment tool.

REMOVAL AND INSTALLATION**Knock Sensor (KS)**

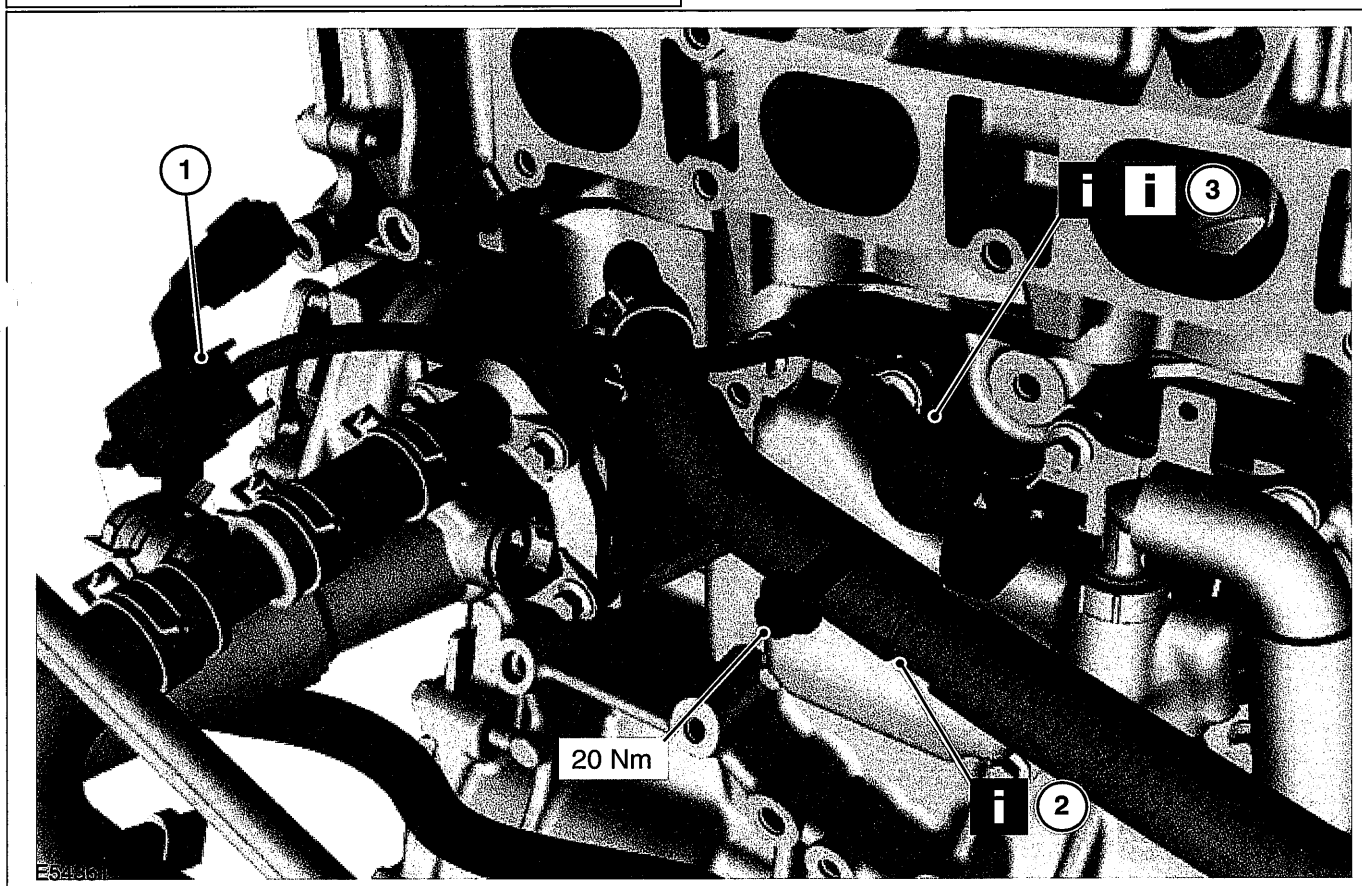
1. Detach the KS electrical connector from the intake manifold.



2. Remove the intake manifold.

For additional information, refer to: Intake Manifold (303-01 Engine - 2.0L Duratec-HE (MI4), In-vehicle Repair).

3. Remove the components in the order indicated in the following illustration(s) and table(s).



Item	Description
1	KS electrical connector
2	Coolant hose See Removal Detail
3	KS

Item	Description
	See Removal Detail See Installation Detail

4. To install, reverse the removal procedure.

Removal Details

REMOVAL AND INSTALLATION**Item 2 Coolant hose**

1. Detach the coolant hose from the coolant hose retaining clip and position it to one side.

Item 3 KS

NOTE: Make a note of the position of the KS and make sure it is positioned in the same position when installed.

Installation Details**Item 3 KS**

NOTE: Prior to installing the KS, clean the engine block and KS mating surfaces.

NOTE: Make sure the KS is installed in the same position as removed.

SECTION 307-01 Automatic Transmission/Transaxle — Vehicles With: 4-Speed Automatic Transmission (AW81-40)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	307-01-3
DESCRIPTION AND OPERATION	
Automatic Transaxle.....	307-01-5
Transmission cross-section.....	307-01-5
Torque converter with Torque Converter Clutch (TCC).....	307-01-6
Fluid pump and stator shaft.....	307-01-7
Planetary gearset.....	307-01-8
Clutches and brakes.....	307-01-9
Intermediate gear stage and differential assembly.....	307-01-11
Main control body.....	307-01-12
Internal gearshift mechanism.....	307-01-13
Fluid circuit.....	307-01-14
Identification Tags.....	307-01-16
Type plate.....	307-01-16
Transmission Ranges and Power Flow.....	307-01-18
Transmission ratio and power flow route - 1st gear.....	307-01-18
Transmission ratio and power flow route - 2nd gear.....	307-01-20
Transmission ratio and power flow route - 3rd gear.....	307-01-22
Transmission ratio and power flow route - 4th gear.....	307-01-24
Transmission ratio and power flow route - reverse gear.....	307-01-26
Transaxle Electronic Control System.....	307-01-28
Overview.....	307-01-28
Transmission control unit.....	307-01-29
Gearshift strategies.....	307-01-30
Selector lever positions.....	307-01-33
Signal transmission on the CAN databus.....	307-01-34
Sensors.....	307-01-37
Actuators.....	307-01-40
DIAGNOSIS AND TESTING	
Automatic Transaxle.....	307-01-45
Inspection and Verification.....	307-01-45
Diagnostic Trouble Code Chart.....	307-01-45
Line Pressure Test.....	307-01-47
Stall Speed Test.....	307-01-48
Time Lag Test.....	307-01-49

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-2

307-01-2

GENERAL PROCEDURES

Transmission Fluid Level Check.....	307-01-51
Transmission Fluid Drain and Refill.....	307-01-53

IN-VEHICLE REPAIR

Transmission Range (TR) Sensor.....	307-01-55
Halfshaft Seal LH.....	307-01-58
Halfshaft Seal RH.....	307-01-59
Turbine Shaft Speed (TSS) Sensor.....	307-01-60
Vehicle Speed Sensor (VSS).....	307-01-61

REMOVAL AND INSTALLATION

Transaxle.....	307-01-62
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**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-3

307-01-3

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

▲ WARNING: Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

	Specifications
Automatic transmission fluid	WSS-M2C 924-A
Grease	WSD-M1C 230-A

Capacities

	Litres
Automatic transmission fluid (including cooler and tubes)	5.75

Torque Specifications

Item	Nm	lb-ft	lb-in
Transaxle to engine flange retaining bolts	47	35	-
Engine ground cable to transaxle retaining nut	25	18	-
Torque converter retaining nuts	27	20	-
Starter motor retaining bolts	47	35	-
Engine and transaxle rear mount retaining bolt	80	59	-
Lower arm to the wheel knuckle	48	35	-
tie-rod end to the wheel knuckle	48	35	-
Exhaust flexible pipe to catalytic converter	44	32	-
Engine support insulator bolts	48	35	-
Ignition switch to starter motor solenoid cable	7	-	62
Battery to starter motor solenoid cable	12	9	-
Fluid level indicator tube to transaxle retaining bolt	25	18	-
Selector lever cable bracket retaining bolts	20	15	-
Ground cable to transaxle retaining bolt	25	18	-
Engine rear mount outer retaining nuts	48	35	-
Engine rear mount center retaining nut	90	66	-
Battery tray retaining bolts	25	18	-
Strut and spring assembly top mount nuts	25	18	-
Transaxle drain plug	17	13	-
Turbine shaft speed (TSS) sensor retaining bolt	5	-	44
Vehicle speed sensor (VSS) retaining stud bolt	13	10	-
Vehicle speed sensor (VSS) heat shield retaining nut	13	10	-

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-4

307-01-4

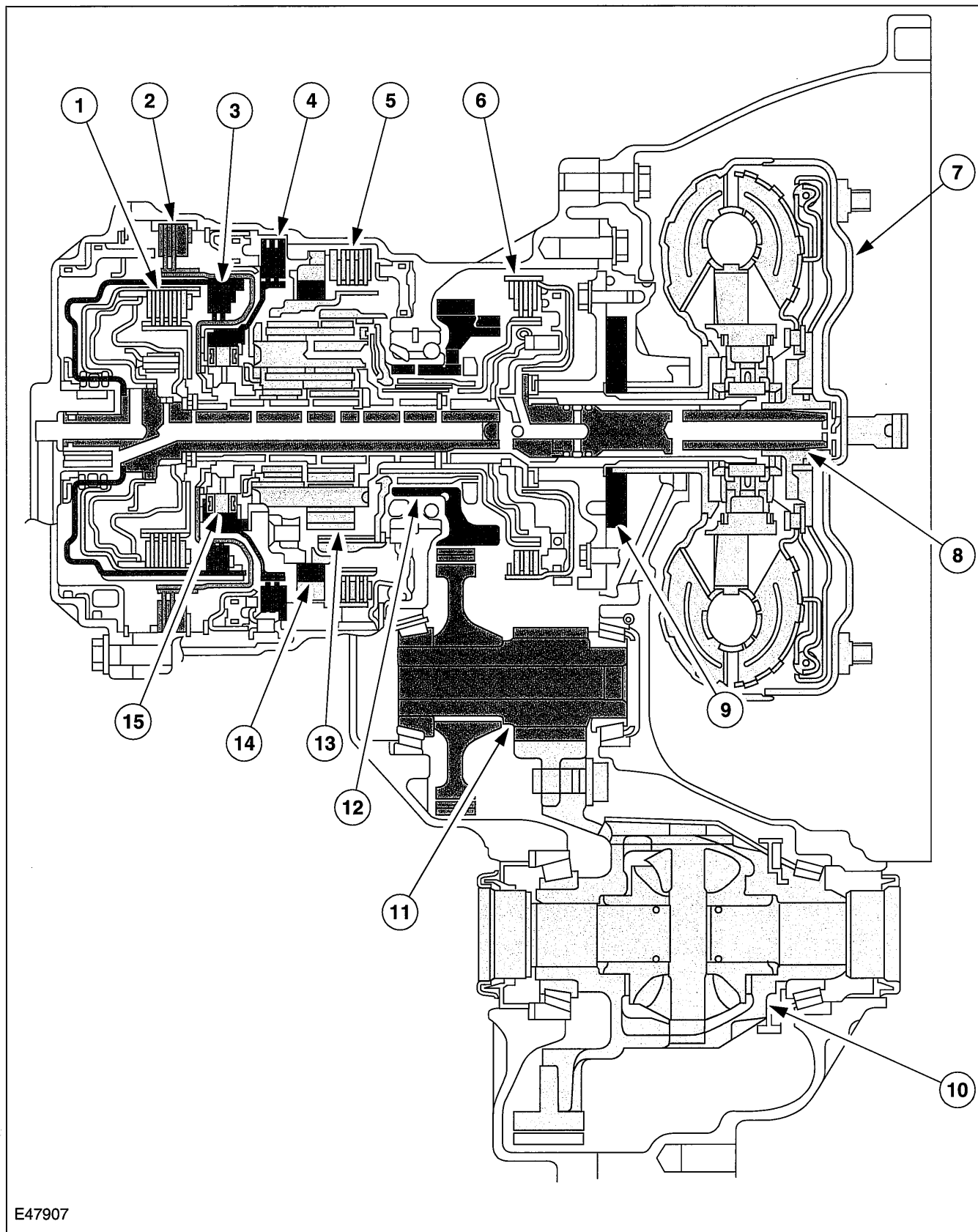
SPECIFICATIONS

Item	Nm	lb-ft	lb-in
Transmission range (TR) sensor to selector shaft locking nut	7	-	62
Transmission range (TR) sensor retaining bolts	5	-	44
Manual shift lever retaining nut	13	10	-

DESCRIPTION AND OPERATION

Automatic Transaxle

Transmission cross-section

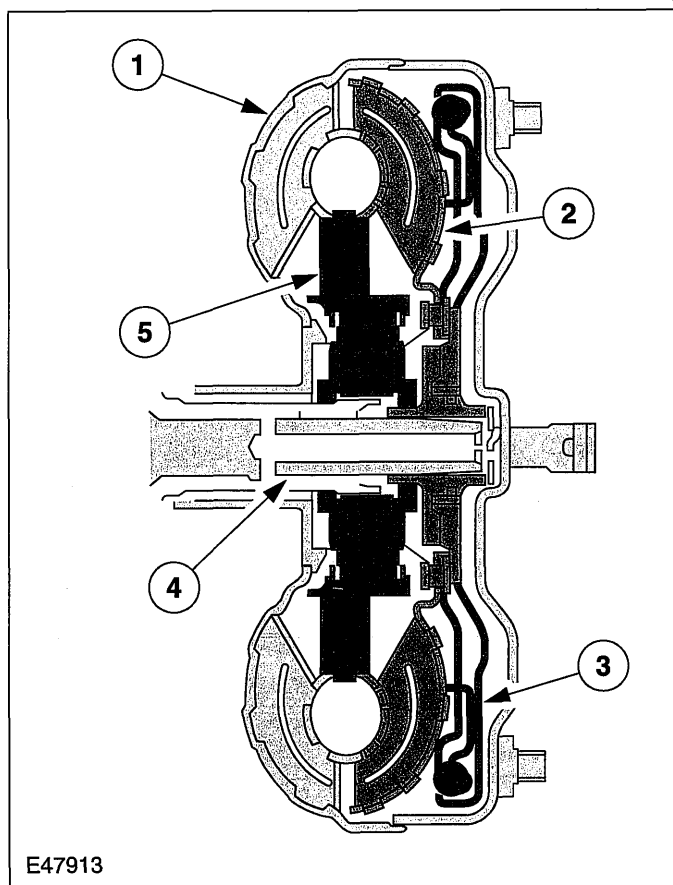


E47907

DESCRIPTION AND OPERATION

Item	Description
1	1st - 3rd gear clutch
2	4th gear brake
3	Reverse gear clutch
4	2nd - 4th gear brake
5	Reverse gear brake
6	3rd/4th gear clutch
7	Torque converter
8	Transmission input shaft
9	Fluid pump
10	Differential assembly
11	Intermediate gear stage
12	Output wheel, planetary gearset
13	Planetary gearset
14	1st gear one-way clutch
15	2nd gear one-way clutch

Torque converter with Torque Converter Clutch (TCC)



Item	Description
1	Torque converter housing and impeller
2	Turbine wheel
3	TCC
4	Transmission input shaft
5	Stator with roller-type one-way clutch

The torque converter hydraulically transmits the output torque from the engine to the input shaft of the transmission.

The stator increases the torque up to the clutch point (approx. 90 % speed difference between the impeller and the turbine wheel).

In order to increase the efficiency of the automatic transmission, the torque converter is also equipped with a hydraulically activated TCC

The TCC is applied with slip to ensure soft engagement.

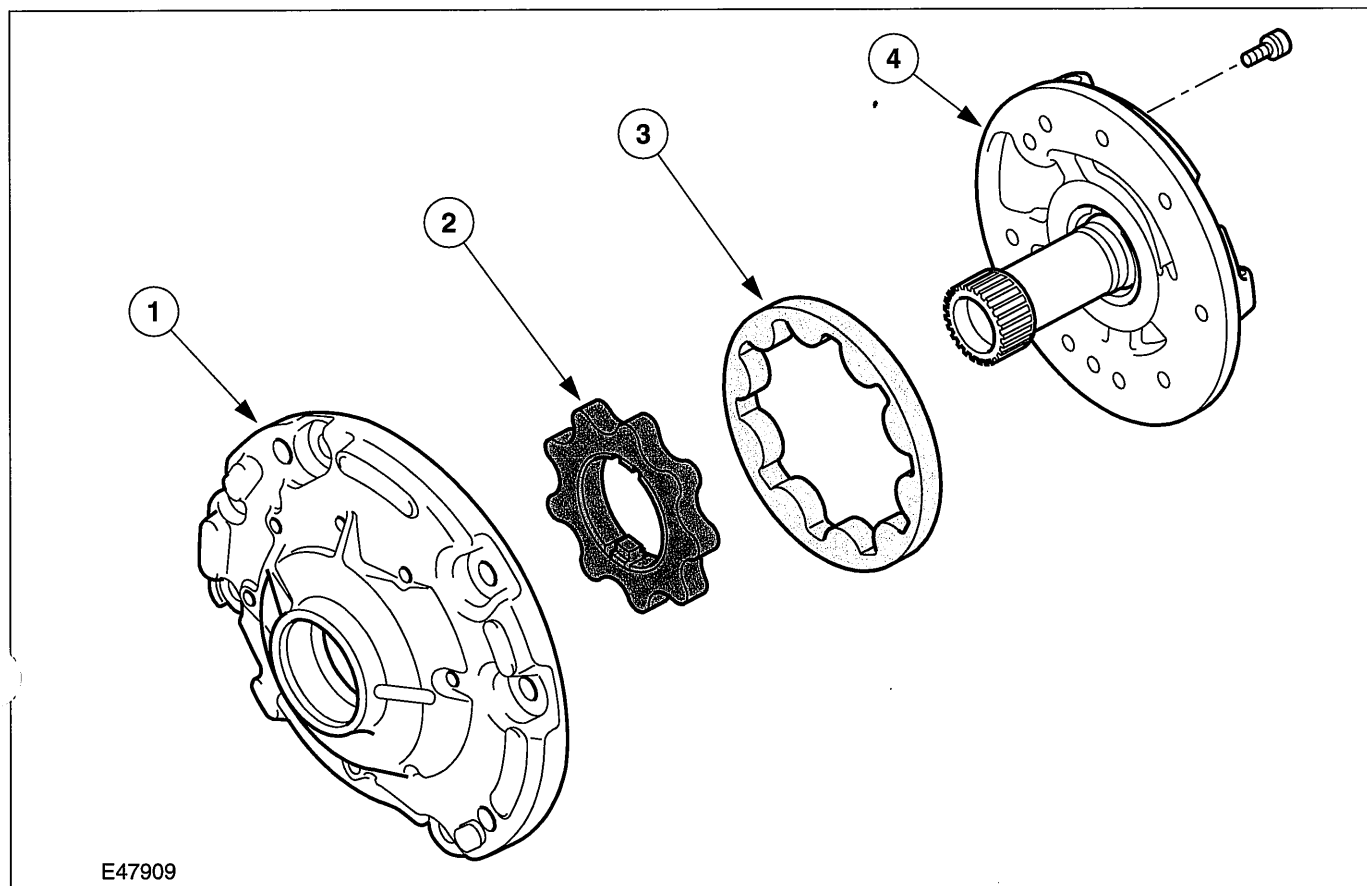
When the TCC is engaged, the torque is transmitted directly from the crankshaft via the torque converter housing to the transmission input shaft.

DESCRIPTION AND OPERATION

The TCC is engaged depending on the current driving situation when the selector lever is in position "D" and 3rd or 4th gear is engaged.

When 4th gear is disabled (O/D Off) the TCC is engaged in 3rd gear depending on the current driving situation.

Fluid pump and stator shaft



Item	Description
1	Fluid pump housing
2	Inner rotor, fluid pump
3	Outer rotor, fluid pump
4	Stator shaft

The fluid pump is a G-rotor oil pump.

It sucks up transmission fluid from the oil pan, builds up the oil pressure and then supplies it under high pressure to the main control body.

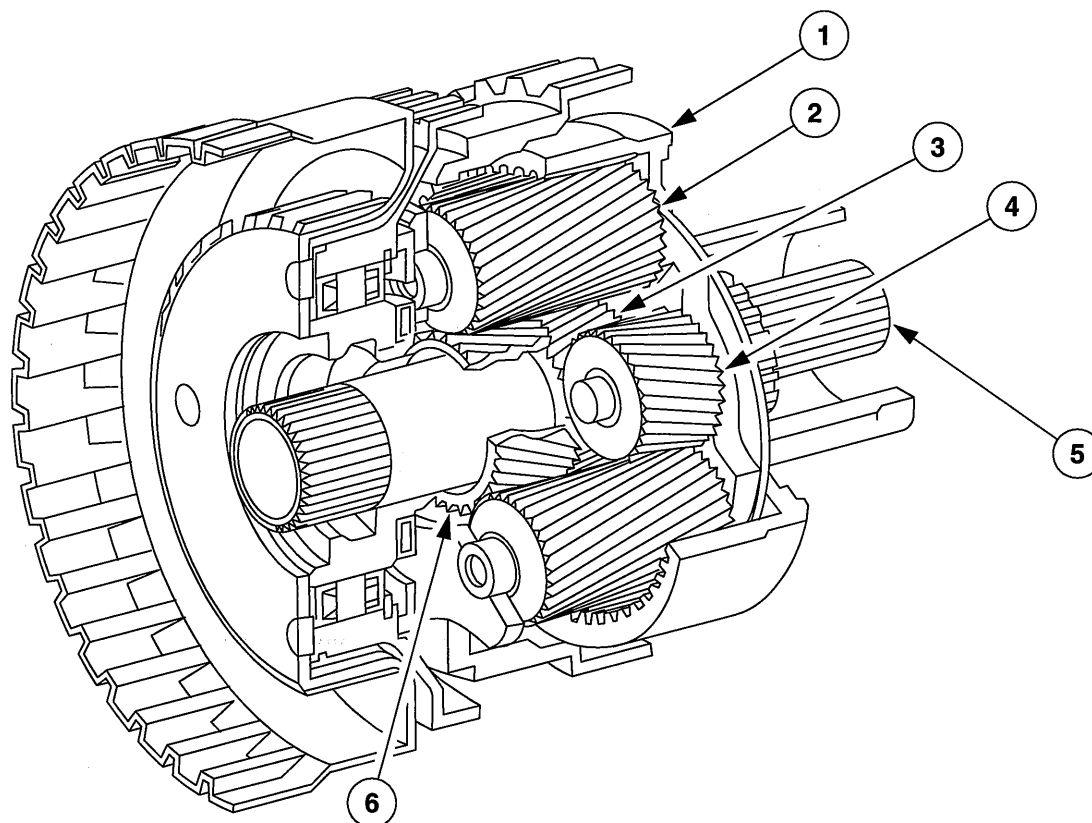
The fluid pump is driven by the crankshaft via the torque converter housing.

The fluid pump housing is bolted to the transmission housing.

The stator shaft is bolted to the fluid pump. It engages via teeth in the stator of the torque converter and acts as a support for the latter.

DESCRIPTION AND OPERATION

Planetary gearset



E48033

Item	Description
1	Annulus
2	Long planet gear
3	Small sun gear
4	Short planet gear
5	Transmission input shaft
6	Large sun gear

A Ravigneaux planetary gearset is a two-stage gearset with a shared planet gear carrier and one annulus.

The following connections exist between the individual components:

- small sun gear - short planet gears - long planet gears- annulus,
- large sun gear - long planet gears - annulus.

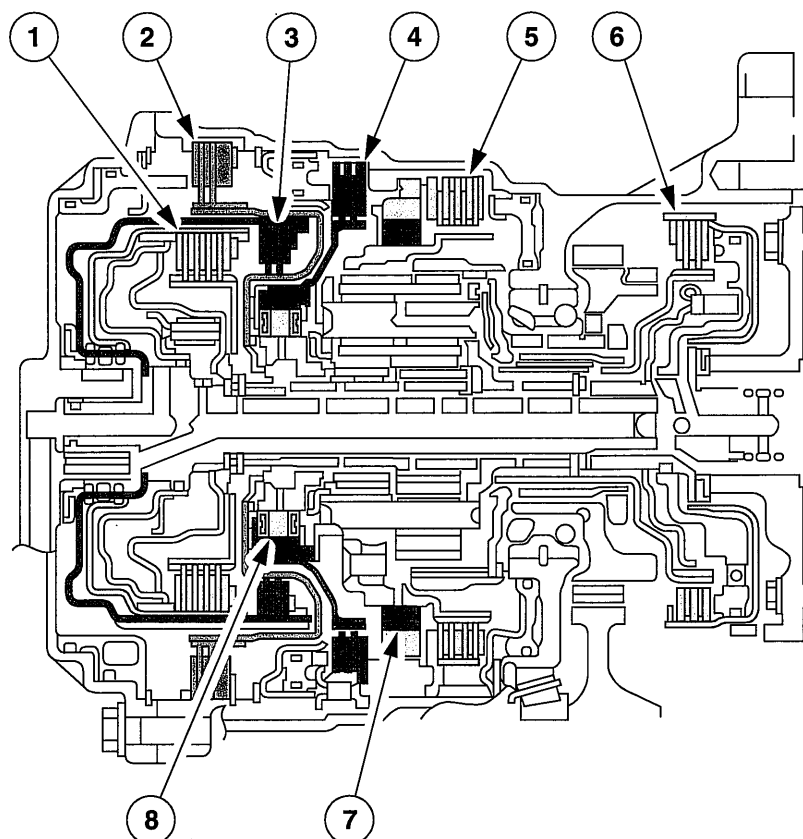
The different transmission ratios are selected by actuating and releasing the individual clutches and brakes.

The drive is transmitted from the transmission input shaft via the corresponding clutch either onto the small sun gear (1st - 3rd gear) or the planet gear carrier (3rd and 4th gear) or the large sun gear (reverse gear).

The output always flows through the annulus.

DESCRIPTION AND OPERATION

Clutches and brakes



E48041

Item	Description
1	1st - 3rd gear clutch
2	4th gear brake
3	Reverse gear clutch
4	2nd - 4th gear brake
5	Reverse gear brake
6	3rd/4th gear clutch
7	1st gear one-way clutch
8	2nd gear one-way clutch

The transmission is equipped with three clutches and five brakes.

The clutches are multi-plate clutches.

The brakes are three multi-plate brakes and two one-way sprag clutches.

The clutches serve to transmit the torque from the transmission input shaft to certain components of the planetary gearset.

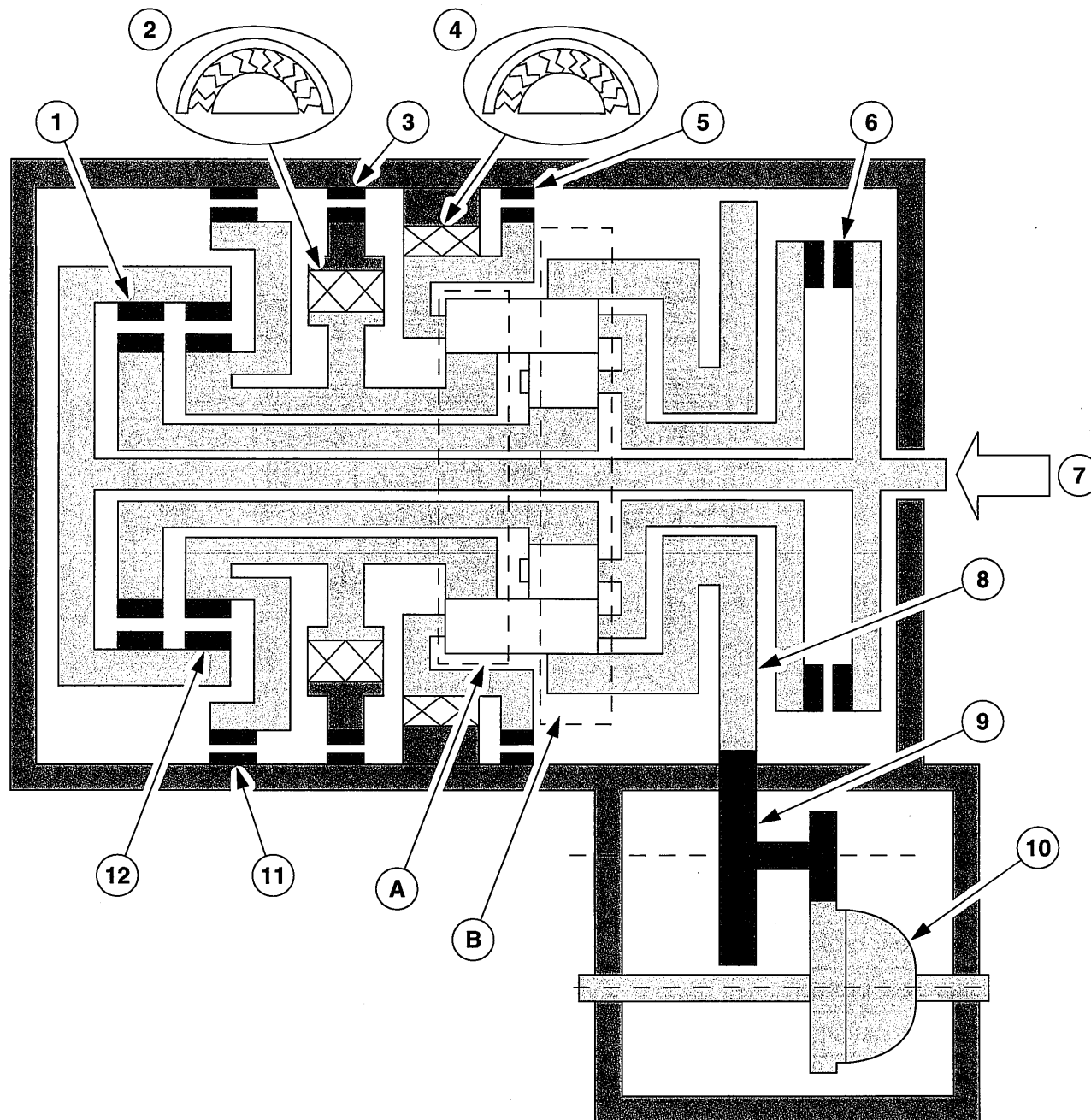
The brakes serve to hold certain components of the planetary gearset.

In order to achieve a given transmission ratio, it is necessary for at least one component of the planetary gearset to be held while the torque is transmitted to another component.

These combinations produce the different transmission ratios for the individual gears.

DESCRIPTION AND OPERATION

Overview of operation



E47959

Item	Description
1	1st - 3rd gear clutch
2	2nd gear one-way clutch
3	2nd - 4th gear brake
4	1st gear one-way clutch
5	Reverse gear brake
6	3rd/4th gear clutch
7	From the torque converter

Item	Description
8	Output wheel, planetary gearset
9	Intermediate gear stage
10	Differential assembly
11	4th gear brake
12	Reverse gear clutch
A	Planetary gearset, rear
B	Planetary gearset, front

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-11

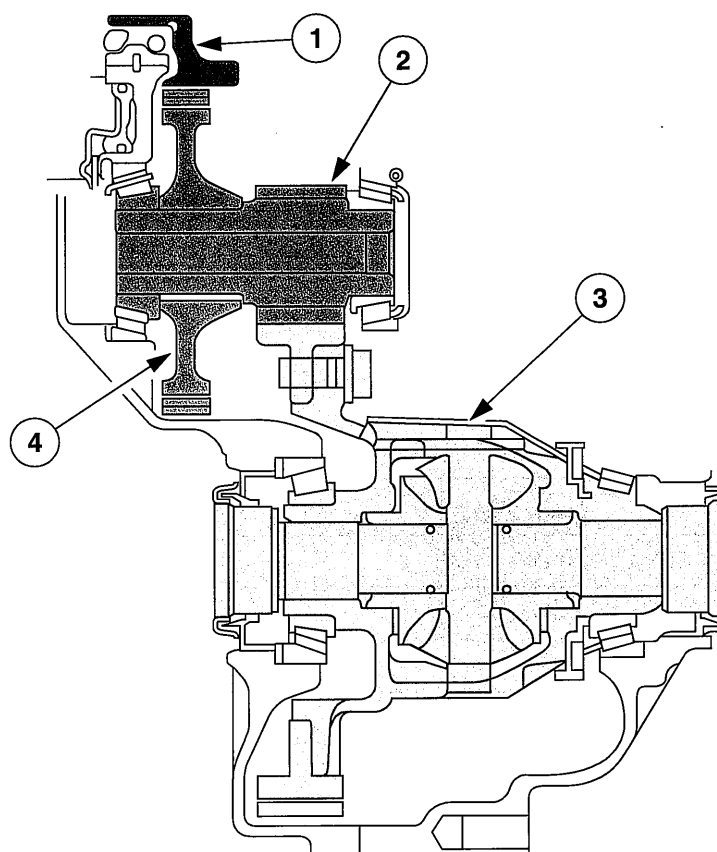
307-01-11

DESCRIPTION AND OPERATION

Component	Connects	P/N	R	1	2	3	4
1st - 3rd gear clutch	Transmission input shaft to small sun gear			X	X	X	
3rd/4th gear clutch	Transmission input shaft to planet gear carrier					X	X
Reverse gear clutch	Transmission input shaft to large sun gear		X				
2nd - 4th gear brake	Transmission housing to large sun gear				X	X	X
4th gear brake	Transmission housing to 2nd gear one-way clutch				X*		X
Reverse gear brake	Transmission housing to planet gear carrier		X	X**			
1st gear one-way clutch	Transmission housing to planet gear carrier			X			
2nd gear one-way clutch	4th gear brake to large sun gear				X		

* Only in selector lever position 2
** Only in selector lever position 1

Intermediate gear stage and differential assembly



E48042

DESCRIPTION AND OPERATION

Item	Description
1	Output wheel, planetary gearset
2	Output wheel, intermediate gear stage
3	Differential assembly
4	Input wheel, intermediate gear stage

The annulus of the planetary gearset is fixedly connected to the output wheel of the planetary gearset.

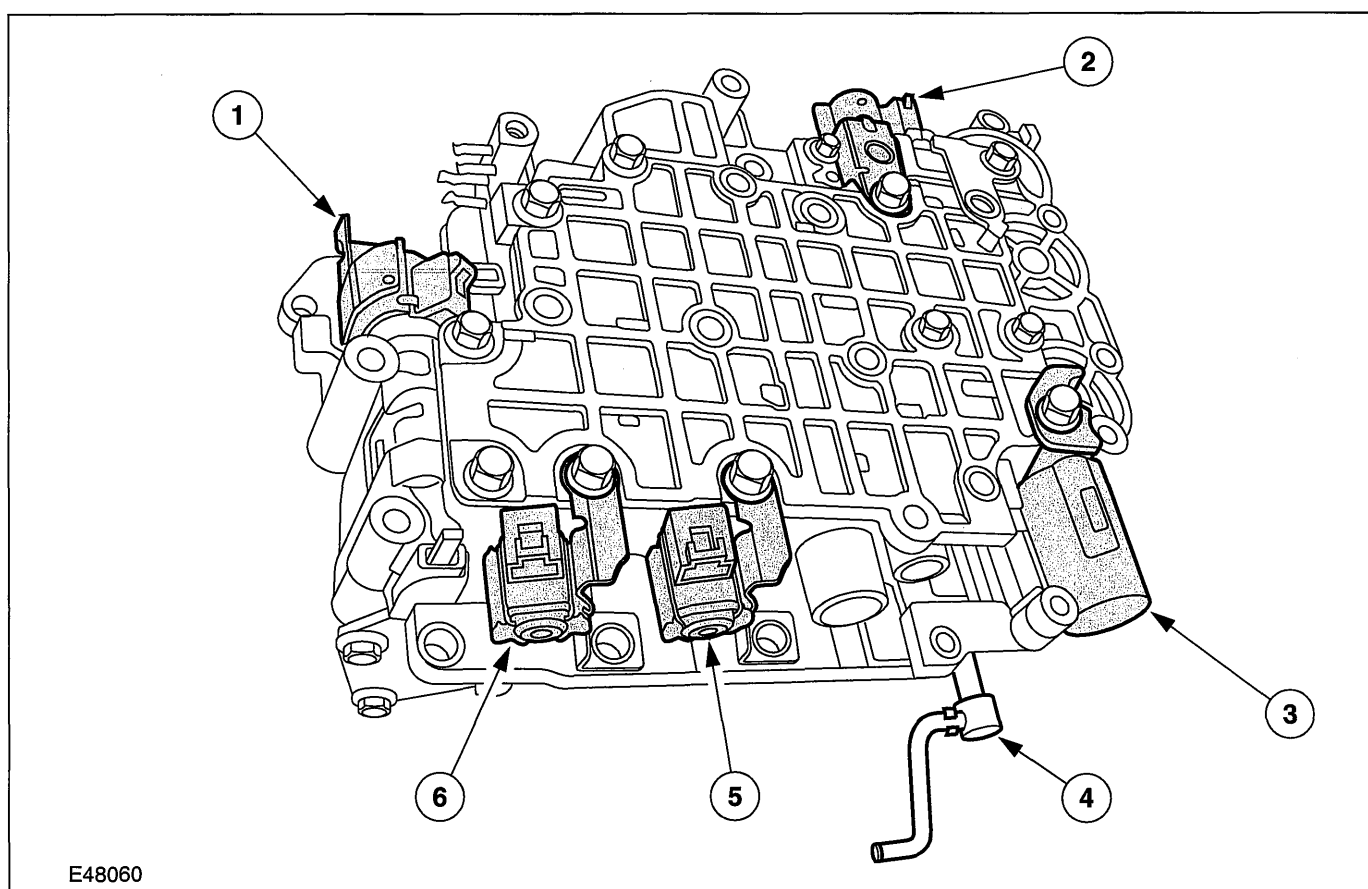
The output wheel of the planetary gearset drives the input wheel of the intermediate gear stage.

The output wheel of the intermediate gear stage drives the spur gear of the differential assembly.

The differential assembly transmits the torque via the halfshafts to the front wheels.

Any differences in rotational speed between the two halfshafts are compensated by the differential.

Main control body



Item	Description
1	Shift timing solenoid valve
2	Shift solenoid valve, TCC
3	Main regulating valve
4	Manual selector lever
5	SSB shift solenoid valve
6	SSA shift solenoid valve

The hydraulic pressure is distributed to the individual clutches and brakes in the main control body.

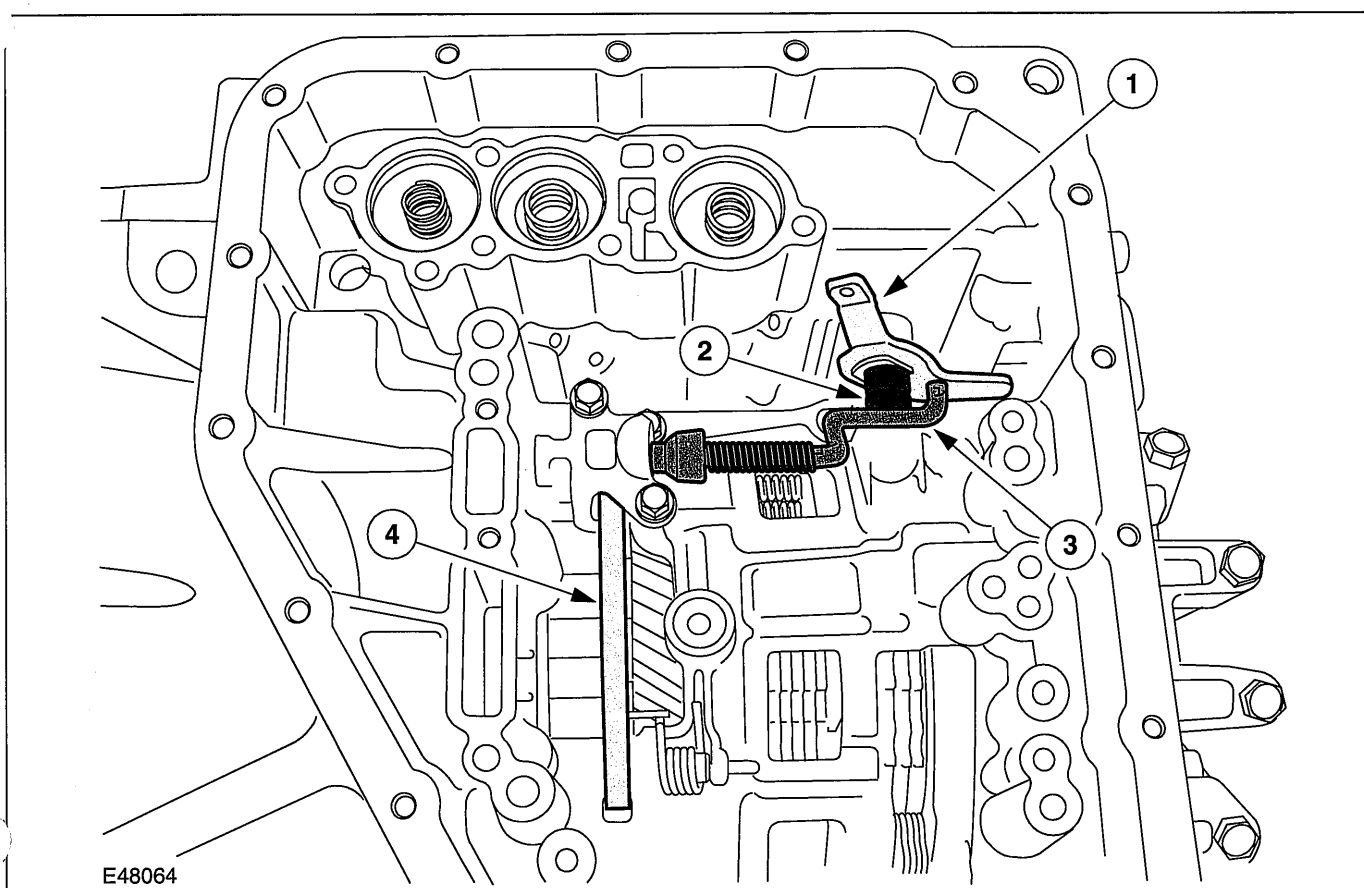
The hydraulic lines and pressures are electronically regulated by a proportional solenoid valve (main regulating valve) and four shift solenoid valves.

In addition, the manual selector slide in the main control body provides a hydraulic emergency running programme which allows the vehicle to be driven in 3rd gear with the selector lever in position "D", "2" or "1" and in reverse gear with the selector lever in position "R" if key components or the transmission control unit fail.

The manual selector slide is actuated by the driver via the selector lever, the selector lever cable, the selector shaft lever and the internal gearshift mechanism.

DESCRIPTION AND OPERATION

Internal gearshift mechanism



Item	Description
1	Stepped cam with actuating lever for the manual selector slide
2	Selector shaft
3	Actuating rod for the parking pawl with cone
4	Parking pawl

The mechanical parking lock secures the vehicle against rolling away.

When the vehicle is stationary it is engaged purely mechanically via the selector lever when the selector lever position "P" is engaged.

The movement of the selector lever is transmitted via the selector lever cable to the selector shaft lever.

The movement is then transferred via the selector shaft to the stepped cam.

The actuating lever for the manual selector slide forms part of the stepped cam, and it is used to actuate the manual selector slide in the main control body.

The actuating rod for the parking pawl with cone is hooked into the stepped cam.

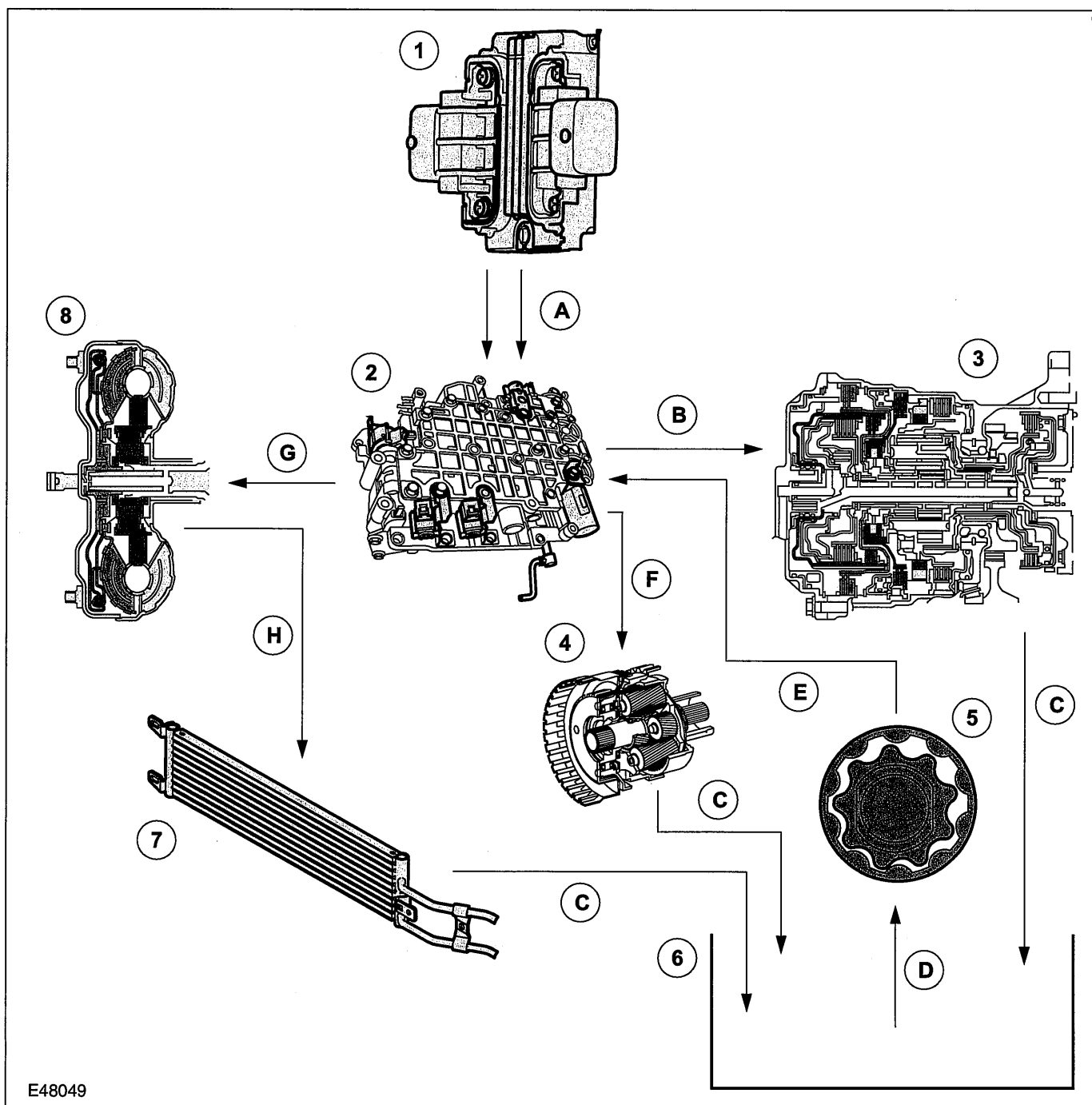
The cone displaces the parking pawl when the selector lever position "P" is engaged.

The parking pawl engages in the teeth on the output wheel of the planetary gearset.

Accordingly, the differential is blocked via the intermediate shaft, and the vehicle is secured and cannot roll away.

DESCRIPTION AND OPERATION

Fluid circuit



E48049

Item	Description
1	Transmission control unit
2	Solenoid valves and main control body
3	Clutches and brakes
4	Planetary gearset
5	Fluid pump
6	Oil pan
7	Fluid cooler

Item	Description
8	Torque converter
A	Electric actuation of the solenoid valves
B	Actuating pressure of the clutches and brakes
C	To the oil pan
D	From the oil pan
E	Fluid pump pressure

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-15

307-01-15

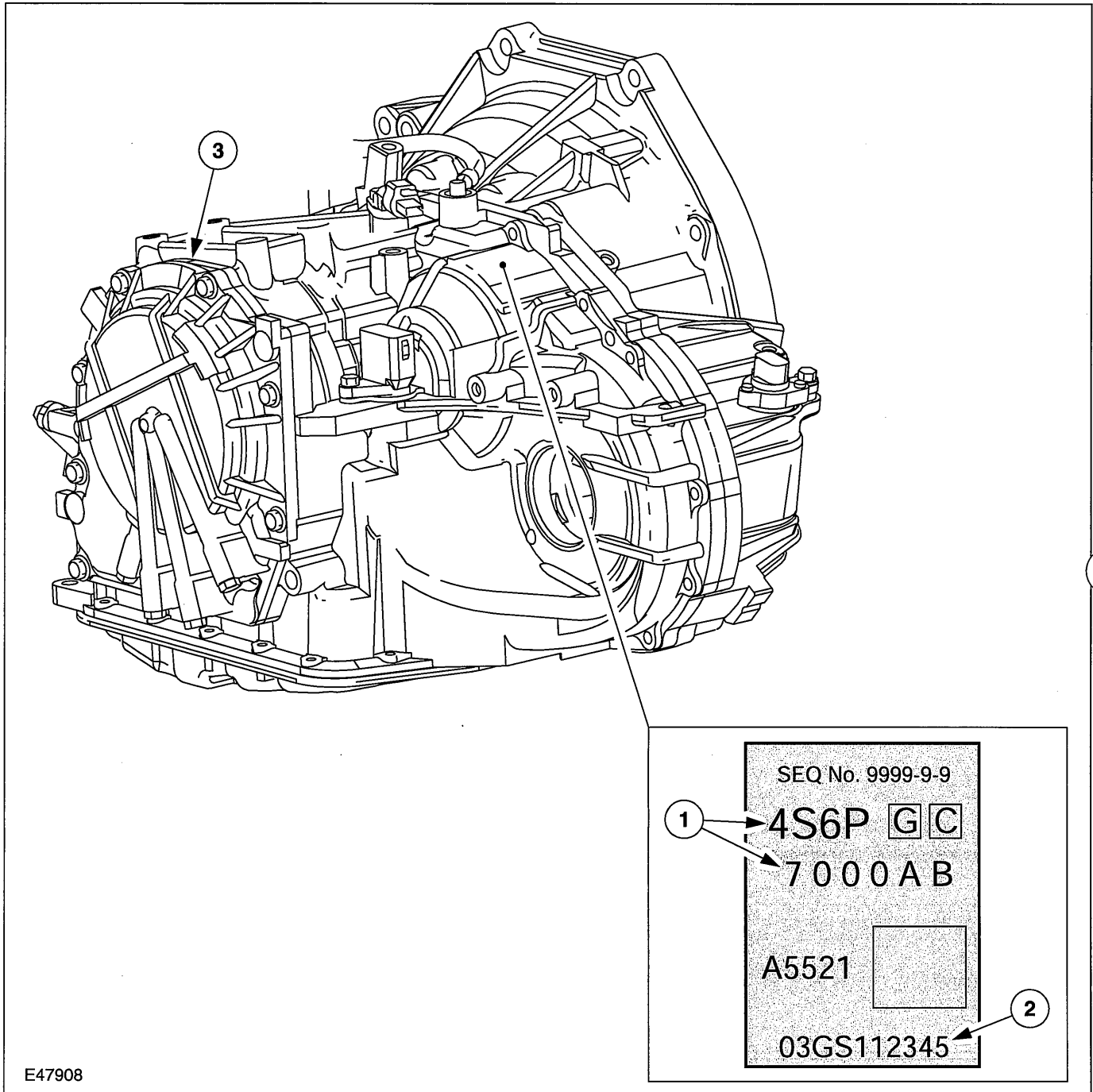
DESCRIPTION AND OPERATION

Item	Description
F	Lubrication
G	To the torque converter
H	To the fluid cooler

DESCRIPTION AND OPERATION

Identification Tags

Type plate



E47908

Item	Description
1	Ford part number
2	Serial number
3	Stamped serial number

The serial number and the Ford part number are shown on a sticker on the transmission housing.

In addition, the serial number is also stamped on the transmission housing.

Serial number (example: 03GS112345)

- **03**: Year of manufacture 2003
- **G**: Month of manufacture: July
- **S**: Model code for 80-series

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-17

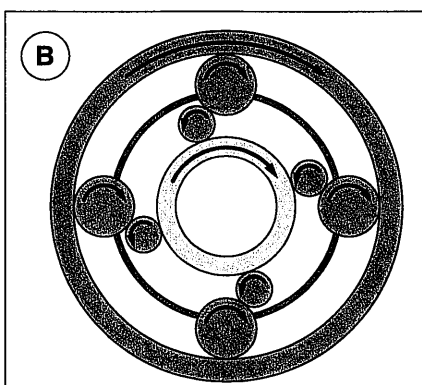
307-01-17

DESCRIPTION AND OPERATION

- 1: production line 1
- 12345: Serial number

Code letter (part of the serial number)	Month of manufacture
A	January
B	February
C	March
D	April
E	May
F	June
G	July
H	August
J	September
K	October
L	November
M	December

Transmission ratio and power flow route - 1st gear



DESCRIPTION AND OPERATION

Item	Description
1	From the torque converter
2	Transmission input shaft
3	1st - 3rd gear clutch
4	Small sun gear
5	1st gear one-way clutch
6	Planet gear carrier
7	Reverse gear brake
8	Short planet gear
9	Long planet gear
10	Annulus and output wheel of the planetary gearset
11	Intermediate gear stage
12	Differential assembly
A	Planetary gearset, rear
B	Planetary gearset, front

Drive is transmitted from the torque converter (1) to the transmission input shaft (2) and via the 1st-3rd gear clutch (3) to the small sun gear (4).

The planet gear carrier (6) is held by the 1st gear one-way clutch (5).

NOTE:In selector lever position "1" the planet gear carrier is also held by the reverse gear brake (7) (engine braking).

The short planet gears (8) are driven by the small sun gear in the opposite direction of rotation to the output from the engine.

The short planet gears drive the long planet gears (9) in the same direction of rotation as the output from the engine.

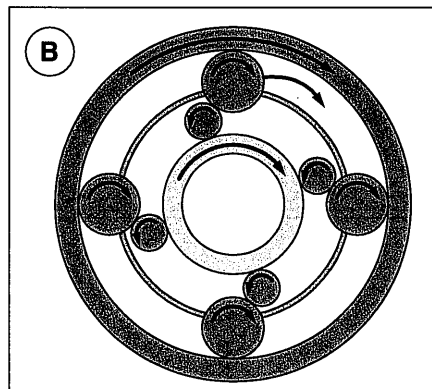
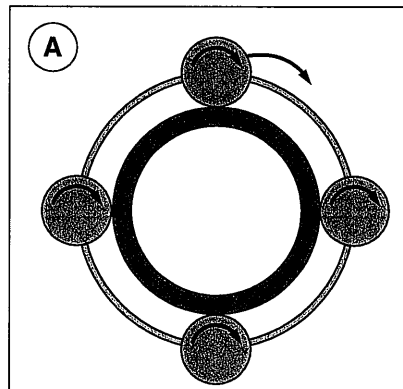
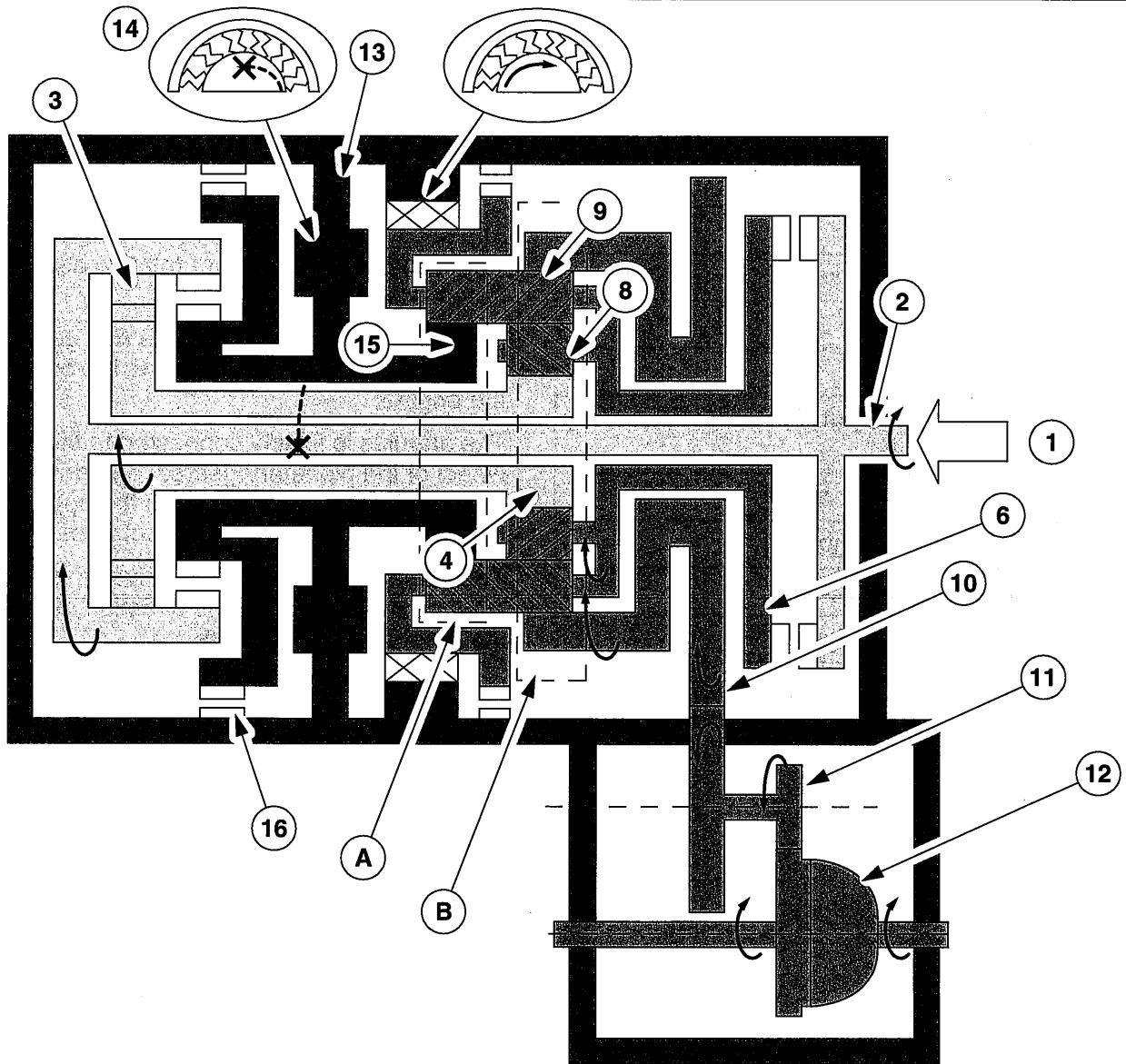
The long planet gears drive the ring gear (10) in the same direction of rotation as the output from the engine.

The annulus is fixedly connected to the output wheel of the planetary gearset and drives the intermediate gear stage (11) in the opposite direction of rotation to the output from the engine.

The intermediate gear stage drives the differential assembly (12) in the same direction of rotation as the output from the engine.

DESCRIPTION AND OPERATION

Transmission ratio and power flow route - 2nd gear



E47962

DESCRIPTION AND OPERATION

Item	Description
1	From the torque converter
2	Transmission input shaft
3	1st - 3rd gear clutch
4	Small sun gear
6	Planet gear carrier
8	Short planet gear
9	Long planet gear
10	Annulus and output wheel of the planetary gearset
11	Intermediate gear stage
12	Differential assembly
13	2nd - 4th gear brake
14	2nd gear one-way clutch
15	Large sun gear
16	4th gear brake
A	Planetary gearset, rear
B	Planetary gearset, front

Drive is transmitted from the torque converter (1) to the transmission input shaft (2) and via the 1st-3rd gear clutch (3) to the small sun gear (4).

The large sun gear (15) is held by the 2nd gear one-way clutch (14) and the 2nd-4th gear brake (13).

NOTE:In selector lever position "2" the large sun gear is also held by the 4th gear brake (16) (engine braking).

The short planet gears (8) are driven by the small sun gear in the opposite direction of rotation to the output from the engine.

The short planet gears drive the long planet gears (9) in the same direction of rotation as the output from the engine.

The long planet gears are supported by the large sun gear which is being held, and they drive the planet gear carrier (6) in the same direction of rotation as the output from the engine.

The long planet gears drive the ring gear (10) in the same direction of rotation as the output from the engine.

The annulus is fixedly connected to the output wheel of the planetary gearset and drives the intermediate gear stage (11) in the opposite direction of rotation to the output from the engine.

The intermediate gear stage drives the differential assembly (12) in the same direction of rotation as the output from the engine.

DESCRIPTION AND OPERATION

Item	Description
1	From the torque converter
2	Transmission input shaft
3	1st - 3rd gear clutch
4	Small sun gear
6	Planet gear carrier
10	Annulus and output wheel of the planetary gearset
11	Intermediate gear stage
12	Differential assembly
13	2nd - 4th gear brake
14	2nd gear one-way clutch
15	Large sun gear
17	3rd/4th gear clutch
A	Planetary gearset, rear
B	Planetary gearset, front

The drive is transmitted from the torque converter (1) on the one hand to the transmission input shaft (2) and via the 1st-3rd gear clutch (3) to the small sun gear (4), and on the other hand from the transmission input shaft via the 3rd/4th gear clutch (17) to the planet gear carrier (6).

As the drive is transmitted to two components simultaneously, there are no relative movements within the planetary gearset. The planetary gearset rotates as a complete unit.

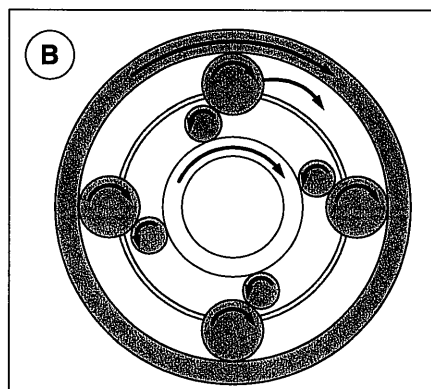
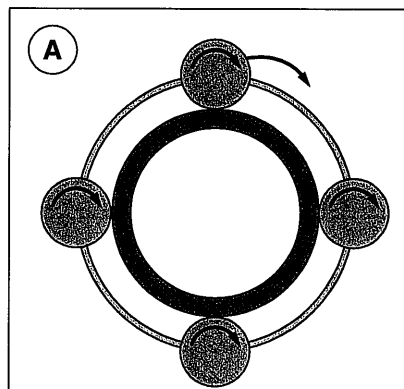
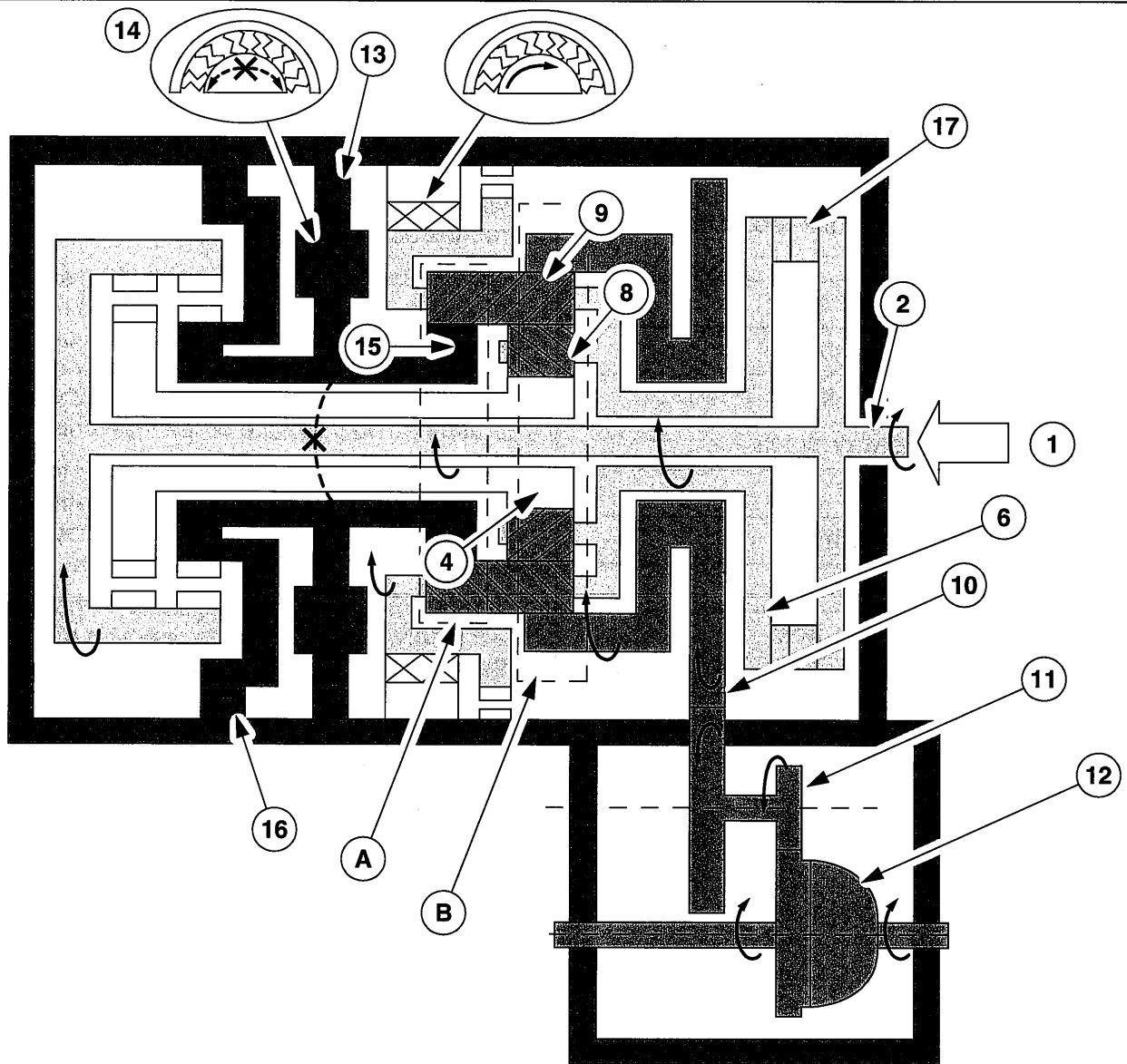
NOTE:The 2nd-4th gear brake (13) remains engaged, but the large sun gear (15) can rotate in the same direction of rotation as the output from the engine by means of the 2nd gear one-way clutch (14), as a result of which the 2nd-4th gear brake has no influence on the transmission ratio.

The Annulus (10) is fixedly connected to the output wheel of the planetary gearset and drives the intermediate gear stage (11) in the opposite direction of rotation to the output from the engine.

The intermediate gear stage drives the differential assembly (12) in the same direction of rotation as the output from the engine.

DESCRIPTION AND OPERATION

Transmission ratio and power flow route - 4th gear



E47964

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-25

307-01-25

DESCRIPTION AND OPERATION

Item	Description
1	From the torque converter
2	Transmission input shaft
4	Small sun gear
6	Planet gear carrier
8	Short planet gear
9	Long planet gear
10	Annulus and output wheel of the planetary gearset
11	Intermediate gear stage
12	Differential assembly
13	2nd - 4th gear brake
14	2nd gear one-way clutch
15	Large sun gear
16	4th gear brake
17	3rd/4th gear clutch
A	Planetary gearset, rear
B	Planetary gearset, front

Drive is transmitted from the torque converter (1) to the transmission input shaft (2) and via the 3rd/4th gear clutch (17) to the planet gear carrier (6).

The large sun gear (15) is held by the 4th gear brake (16), the 2nd gear one-way clutch (14) and the 2nd-4th gear brake (13).

NOTE:The short planet gears (8) and the small sun gear (4) co-rotate, but they have no influence on the transmission ratio.

The long planet gears (9) drive the annulus (10) in the same direction of rotation as the output from the engine.

The annulus is fixedly connected to the output wheel of the planetary gearset and drives the intermediate gear stage (11) in the opposite direction of rotation to the output from the engine.

The intermediate gear stage drives the differential assembly (12) in the same direction of rotation as the output from the engine.

DESCRIPTION AND OPERATION

Item	Description
1	From the torque converter
2	Transmission input shaft
4	Small sun gear
6	Planet gear carrier
7	Reverse gear brake
8	Short planet gear
9	Long planet gear
10	Annulus and output wheel of the planetary gearset
11	Intermediate gear stage
12	Differential assembly
15	Large sun gear
18	Reverse gear clutch
A	Planetary gearset, rear
B	Planetary gearset, front

Drive is transmitted from the torque converter (1) to the transmission input shaft (2) and via the reverse gear clutch (18) to the large sun gear (15).

The planet gear carrier (6) is held by the reverse gear brake (7).

The large sun gear drives the long planet gears (9) in the opposite direction of rotation to the output from the engine.

NOTE: The short planet gears (8) and the small sun gear (4) co-rotate, but they have no influence on the transmission ratio.

The long planet gears drive the annulus (10) in the opposite direction of rotation to the output from the engine.

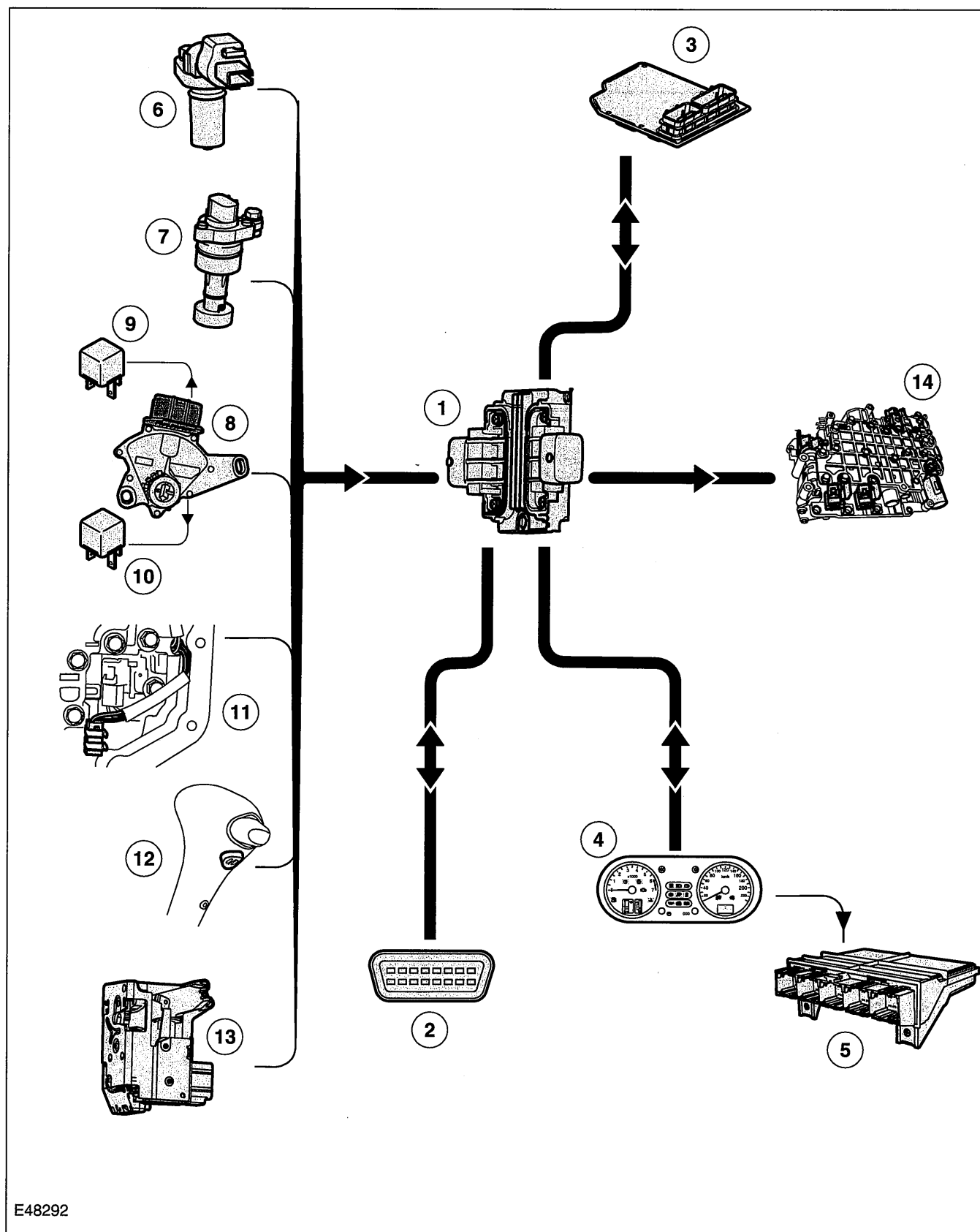
The annulus is fixedly connected to the output wheel of the planetary gearset and drives the intermediate gear stage (11) in the same direction of rotation as the output from the engine.

The intermediate gear stage drives the differential assembly (12) in the opposite direction of rotation to the output from the engine.

DESCRIPTION AND OPERATION

Transaxle Electronic Control System

Overview

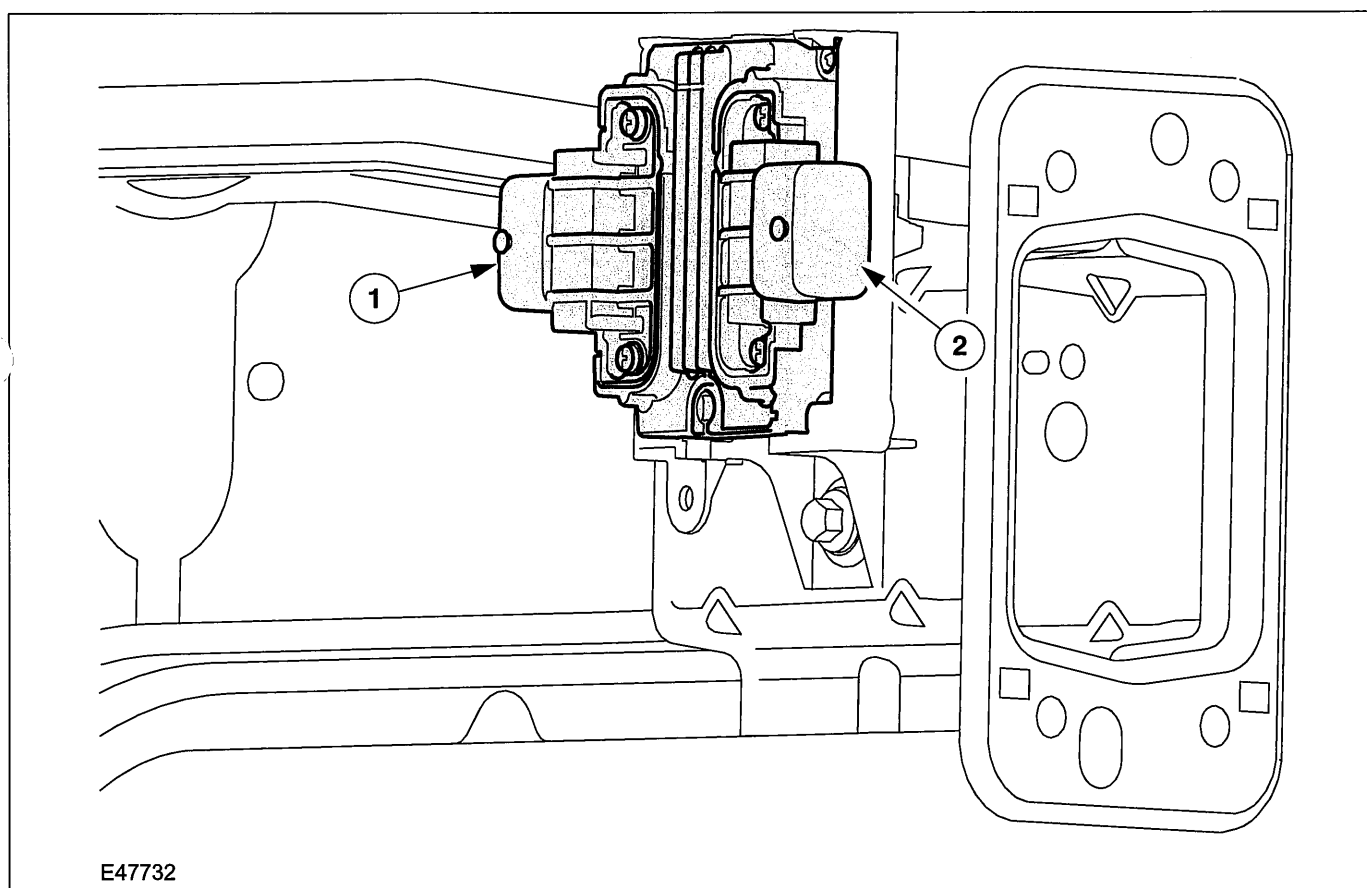


DESCRIPTION AND OPERATION

Item	Description
1	Transmission control unit
2	Data Link Connector (DLC)
3	Powertrain Control Module (PCM)
4	Instrument cluster
5	Generic Electronic Module (GEM)
6	Turbine Shaft Speed (TSS) sensor
7	Output Shaft Speed (OSS) sensor

Item	Description
8	Transmission Range (TR) sensor
9	Starter inhibit relay
10	Backup lamp relay
11	Transmission Fluid Temperature (TFT) sensor
12	Overdrive switch
13	Driver's side door ajar switch
14	Solenoid valves in the main control body

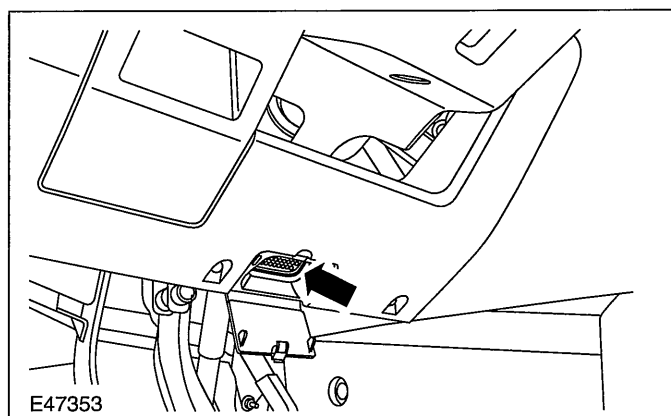
Transmission control unit



Item	Description
1	Electrical connector, vehicle wiring harness
2	Electrical connector, transmission wiring harness

The transmission control unit is located in the engine compartment on the left-hand side member.

The transmission control unit evaluates incoming signals and controls the actuators accordingly.

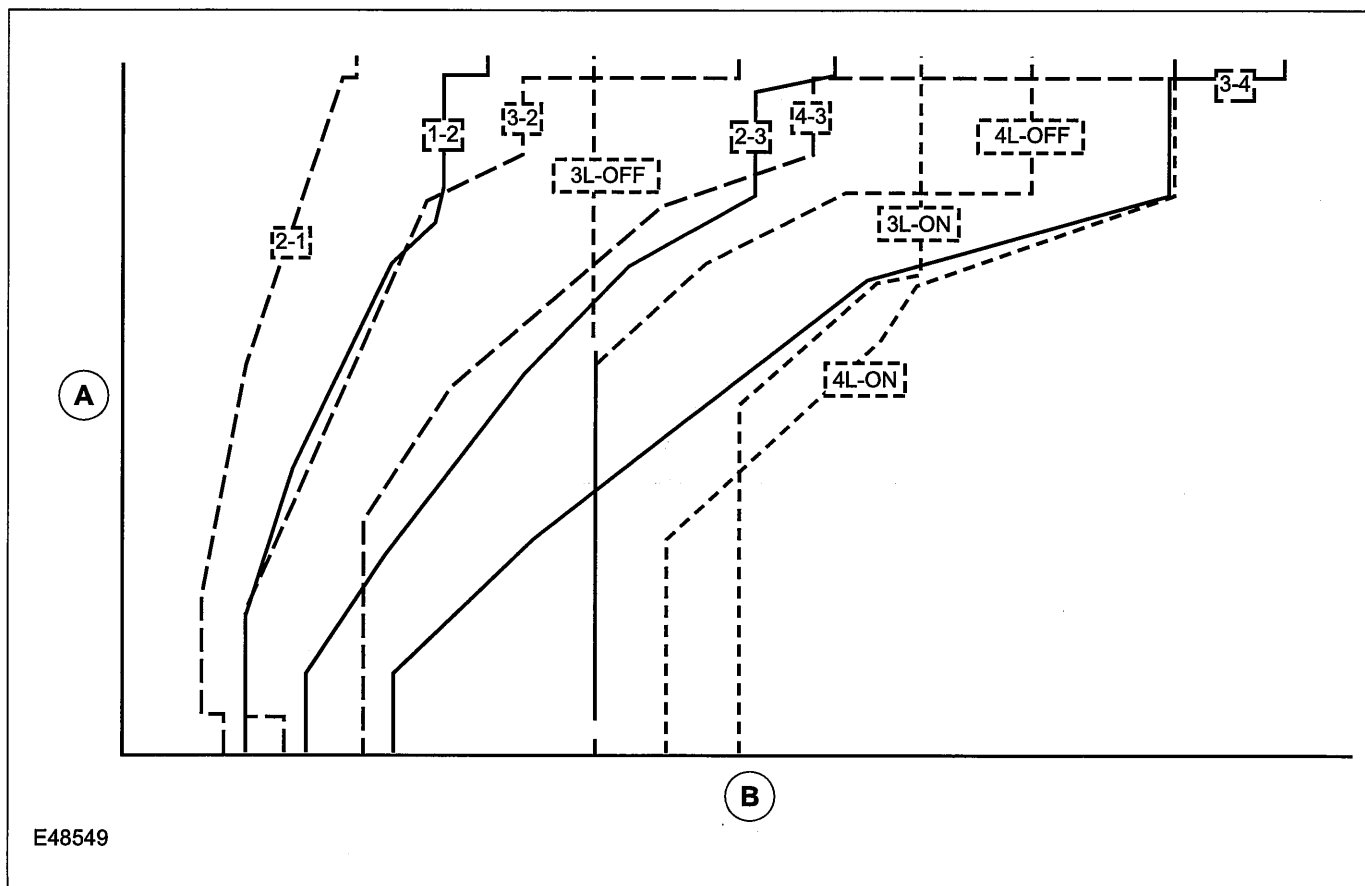


DESCRIPTION AND OPERATION

The transmission control unit can be diagnosed with WDS via the DLC.

Gearshift strategies

Gearshift control



Item	Description
A	Accelerator pedal position
B	Vehicle speed

The current ratio is selected by the transmission control unit either in accordance with the requirements for low fuel consumption or in order to meet the required driving performance.

The gearshift timing is selected in accordance with a gearshift map which is programmed into the control unit as a function of the accelerator pedal position and the vehicle speed.

For kick-down (accelerator pedal pressed down at least 95 %) the next lowest gear is selected, as long as the engine speed allows it. All gearshift timings are set by the transmission control unit to the upper shift characteristic.

The driver can feel the kickdown point in the accelerator pedal as a slight increase in resistance to the operation of the pedal.

This is influenced by the following variables:

- accelerator pedal position and actuation,
- vehicle speed,
- brake pedal position,
- selector lever position.

The following are actuated:

- SSA shift solenoid valve,
- SSB shift solenoid valve.

Hill climb mode

When the vehicle is in hill climb mode or towing a trailer, the transmission control delays gearshifts to prevent frequent shifting back and forth between the gears.

DESCRIPTION AND OPERATION

The transmission control unit determines hill climb mode or trailer operation from the change in throttle valve position supplied by the PCM in relation to the acceleration of the vehicle.

Depending on the driving resistance, the transmission control unit chooses between two gearshift maps which have been specially programmed for this purpose and in which the shift timings are again chosen as a function of the accelerator pedal position and the vehicle speed..

Hill descent mode

The hill descent mode is used to take better advantage of engine braking during hill descents.

A 'hill descent' situation is recognised by the transmission control unit if the vehicle is accelerating without operation of the accelerator pedal.

If in addition the brake is also depressed then the transmission control unit automatically shifts back from 4th into 3rd gear.

Cold start mode

In order to reach operating temperature as quickly as possible under low ambient temperatures, gearshifts into 4th gear and engagement of the torque converter clutch (TCC) are suppressed if one of the following conditions is met:

- Transmission fluid temperature below +20 °C
- Coolant temperature below - 40°C

The following are actuated:

- SSA shift solenoid valve,
- SSB shift solenoid valve,
- Shift solenoid valve, TCC.

Overheating protection mode

The overheating protection mode serves to protect the transmission against overheating and the serious damage that this can cause.

If the transmission fluid temperature reaches a temperature of around 135 °C, the transmission control employs a shift pattern designed to prevent a further increase in the transmission fluid temperature.

When the transmission fluid temperature drops back below approx. 125 °C, the transmission control exits the overheating protection mode.

The MIL warning lamp is actuated by the transmission control unit if the transmission fluid temperature reaches approximately 140 °C.

The MIL warning lamp goes out again when the transmission fluid temperature drops back to below around 130 °C.

Main line pressure control

In order to ensure the highest possible efficiency of the automatic transmission and to limit the power losses from the fluid pump, the main line pressure is adapted accordingly by the main regulating valve as a function of the accelerator pedal position (driver torque demand) and the selector lever position.

This is influenced by the following variables:

- Accelerator pedal position and actuation
- Selector lever position

The following are actuated:

- Main regulating valve

Engagement of the TCC

The TCC is engaged in 3rd and 4th gear depending on the current driving situation.

Engagement is controlled in accordance with the shift map stored in the control unit.

This is influenced by the following variables:

- Accelerator pedal position and actuation,
- Vehicle speed,
- Selector lever position,
- Transmission fluid temperature,
- Coolant temperature.

The following are actuated:

- Shift solenoid valve, TCC.

Torque reduction during gearshifts

In order to improve the quality of gearshifts and to avoid gearshift judder, the engine torque is reduced by the PCM in response to a request from the transmission control unit during gearshifts.

The engine torque is also reduced during engagement and disengagement of the TCC.

DESCRIPTION AND OPERATION

This is influenced by the following variables:

- Engine speed,
- Engine load,
- Transmission input speed,
- Vehicle speed.

The following are actuated:

- PCM (torque reduction request signal via the CAN databus).

Pressure control during gearshifts

In order to ensure that the engagement of the clutches and brakes is as judder-free as possible, the main line pressure is reduced during gearshifts.

This is influenced by the following variables:

- Engine speed,
- Engine load,
- Transmission input speed,
- Vehicle speed.

The following are actuated:

- Main regulating valve.

Shift timing adaptation during upshifts

In order to ensure that the engagement of the clutches and brakes is as judder-free as possible, the timing of the gearshift processes is monitored during upshifts.

In the event of any discrepancy from the target values, the main line pressure is adapted accordingly during the next gearshift.

The shift timing adaptation during upshifts is only active at transmission fluid temperatures between 50 °C and 120 °C.

This is influenced by the following variables:

- Engine load,
- Accelerator pedal position,
- Transmission input speed,
- Vehicle speed,
- Transmission fluid temperature,
- Selector lever position.

The following are actuated:

- Main regulating valve.

Shift timing adaptation during shifts from 3rd to 4th gear

The shift from 3rd gear into 4th gear is the only gearshift during which a clutch is disengaged and a brake is engaged simultaneously.

In order to control the synchronized switching of the two components as exactly as possible, the shift timing solenoid valve is actuated accordingly.

In order to ensure that this particular gearshift is performed as judder-free as possible throughout the service life of the transmission, the gearshift is monitored by the two rotational speed sensors and the actuation of the shift timing solenoid valve is adapted accordingly.

The shift timing adaptation for gearshifts from 3rd gear into 4th gear is only active at transmission fluid temperatures between 30 °C and 120 °C.

This is influenced by the following variables:

- Engine load,
- Accelerator pedal position,
- Transmission input speed,
- Vehicle speed,
- Transmission fluid temperature,
- Selector lever position.

The following are actuated:

- Shift timing solenoid valve.

Shift timing adaptation during shifts from 4th to 3rd gear

The shift from 4th gear into 3rd gear is the only gearshift during which a brake is disengaged and a clutch is engaged simultaneously.

In order to control the engagement of the clutch as precisely as possible, the main regulating valve is actuated accordingly in order to build up the actuating pressure at exactly the right time.

In order to ensure that this particular gearshift is performed as judder-free as possible throughout the service life of the transmission, the gearshift is monitored by the two rotational speed sensors and the actuation of the main regulating valve is adapted accordingly.

The shift timing adaptation for gearshifts from 4th gear into 3rd gear is only active at transmission fluid temperatures between 20 °C and 120 °C.

DESCRIPTION AND OPERATION

This is influenced by the following variables:

- Engine load,
- Accelerator pedal position,
- Transmission input speed,
- Vehicle speed,
- Transmission fluid temperature,
- Selector lever position.

The following are actuated:

- Main regulating valve.

Reverse gear safety strategy

The transmission control unit prevents shifts into reverse gear while the vehicle is driving forwards, as otherwise serious transmission damage can be caused.

The reverse gear safety strategy is active when reverse gear is engaged with the selector lever at vehicle speeds in excess of 11 km/h.

In this case the transmission control unit actuates the shift timing solenoid valve, as a result of which the actuating pressure does not reach the reverse gear clutch or the reverse gear brake.

The reverse gear safety strategy is deactivated when the vehicle speed is below 9 km/h. The actuating pressure can then reach the reverse gear clutch and the reverse gear brake and the gearshift into reverse gear is performed.

This is influenced by the following variables:

- Vehicle speed,
- Selector lever position.

The following are actuated:

- Shift timing solenoid valve.

Avoidance of gearshift judder during engagement of a transmission range

In order to prevent gearshift judder when moving the selector lever from N to D, the transmission control unit initially shifts into 2nd gear instead of 1st gear, and then immediately shifts back into 1st gear before the gearshift process is finished.

This reduces the amount of gearshift judder during engagement of a forward drive range.

This is influenced by the following variables:

- Selector lever position,
- Accelerator pedal position,
- Transmission input speed,

- Vehicle speed,
- Transmission fluid temperature.

The following are actuated:

- SSA shift solenoid valve,
- SSB shift solenoid valve.

Torque reduction when pulling away

In order to protect the clutches against excessively high torque when pulling away, the PCM reduces the engine torque in response to a request from the transmission control.

If the accelerator pedal is depressed while the vehicle is pulling away, then the transmission control unit sends a corresponding signal requesting a torque reduction via the CAN databus.

This is influenced by the following variables:

- Selector lever position,
- Accelerator pedal position,
- Engine speed,
- Transmission input speed,
- Vehicle speed.

The following are actuated:

- PCM (torque reduction request signal via the CAN databus).

Selector lever positions

Selector lever position "P"

No gear is engaged in selector lever position "P".

The parking pawl is engaged manually via the selector lever cable and the selector shaft.

Selector lever position "R"

The reverse gear is engaged in selector lever position "R".

Selector lever position "N"

No gear is engaged in selector lever position "N".

The powertrain is not blocked.

DESCRIPTION AND OPERATION

Selector lever position "D"

In selector lever position "D" the transmission control will allow all gears to be engaged provided the overdrive switch is not operated.

If the overdrive switch is pressed then the transmission control prevents gearshifts into 4th gear or shifts back into 3rd gear.

Selector lever position "2"

Only the second gear is engaged when the selector lever is in position "2". Gearshifts into 1st gear are not permitted.

If the selector lever is moved to position "2" at higher speeds than are permitted for second gear, then the transmission control delays the downshift until the vehicle speed has slowed down enough.

In selector lever position "2" engine braking is effective when the vehicle is coasting.

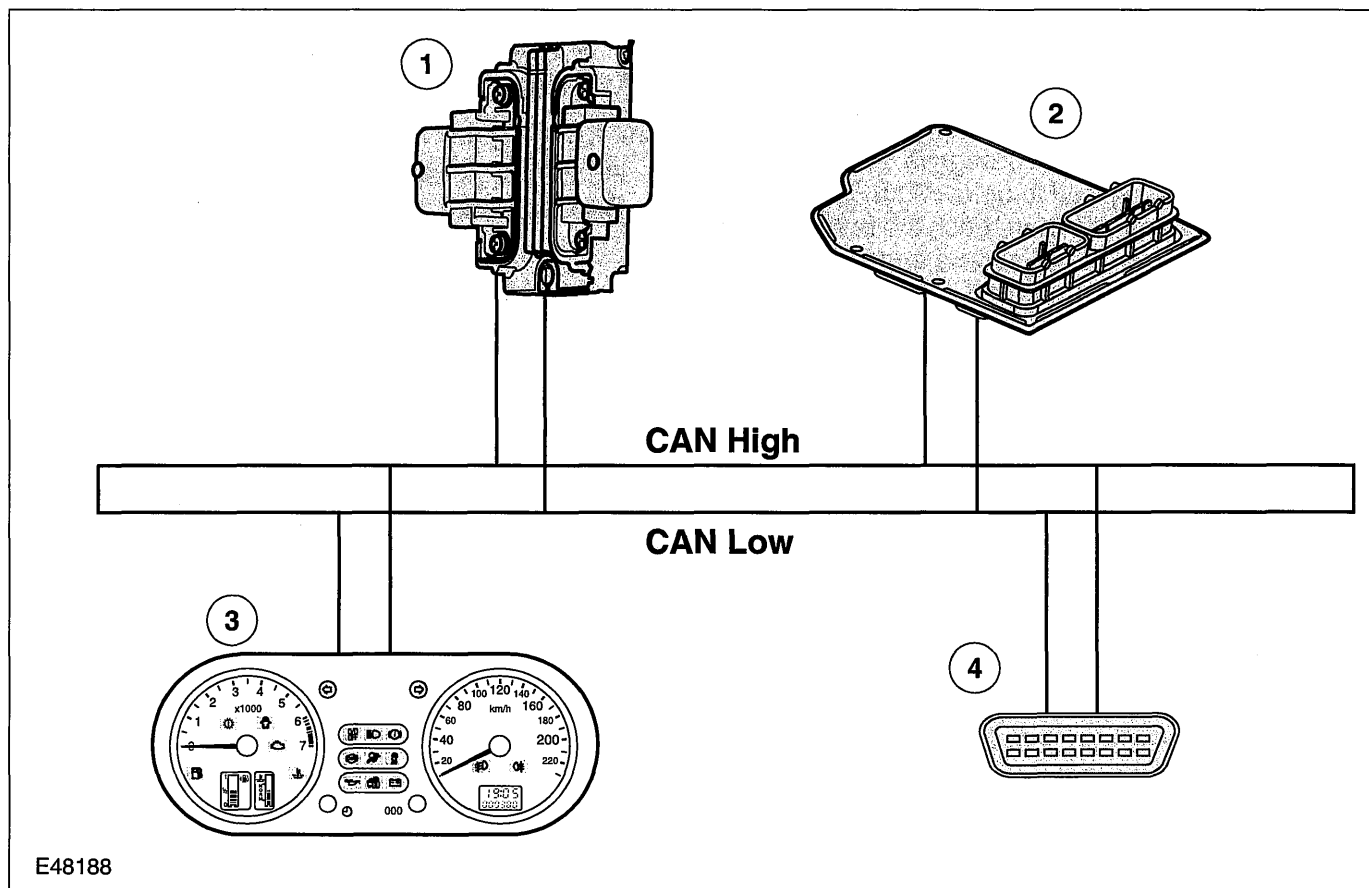
Selector lever position "1"

Only the first gear is engaged when the selector lever is in position "1".

If the selector lever is moved to position "1" at higher speeds than are permitted for first gear, then the transmission control delays the downshift until the vehicle speed has slowed down enough.

In selector lever position "1" engine braking is effective when the vehicle is coasting.

Signal transmission on the CAN databus



Item	Description
1	Transmission control unit
2	PCM

Item	Description
3	Instrument cluster
4	DLC

DESCRIPTION AND OPERATION

Engine speed

The engine speed is detected by the crankshaft position (CKP) sensor and passed on to the PCM.

The engine speed is transmitted from the PCM via the CAN databus to the transmission control unit.

The transmission control unit uses this signal for:

- Torque reduction during gearshifts,
- Pressure control during gearshifts.

Engine load

The PCM determines a load signal which is transmitted via the CAN databus to the transmission control unit.

The transmission control unit uses this signal for:

- Torque reduction during gearshifts,
- Pressure control during gearshifts,
- Shift timing adaptation during upshifts,
- Shift timing adaptation during shifts from 3rd to 4th gear,
- Hill climb mode,
- Hill descent mode.

Torque reduction request signal

Before performing a gearshift, the transmission control unit sends a signal via the CAN databus to the PCM requesting a torque reduction.

The PCM then reduces the engine torque, ensuring that the gearshift is as smooth and judder-free as possible.

Brake signal

The PCM receives a signal from the stoplamp switch when the brake pedal is depressed.

This signal is transmitted via the CAN databus to the transmission control unit.

The transmission control unit uses this signal for:

- Gearshift control,
- Engagement of the TCC

Accelerator pedal position

The PCM receives the current accelerator pedal position signal from the Accelerator Pedal Position (APP) sensor.

This signal is transmitted via the CAN databus to the transmission control unit.

The transmission control unit uses this signal for:

- Controlling the main line pressure,
- Gearshift control,
- Engagement of the TCC,
- Shift timing adaptation during upshifts,
- Shift timing adaptation during shifts from 3rd to 4th gear,
- Shift timing adaptation during shifts from 4th to 3rd gear,
- Avoidance of gearshift judder during engagement of a transmission range,
- Torque reduction when pulling away.

Coolant temperature

The coolant temperature is detected by the Engine Coolant Temperature (ECT) sensor and passed on to the PCM.

This signal is transmitted via the CAN databus to the transmission control unit.

The transmission control unit uses this signal for:

- Cold start mode,
- Engagement of the TCC

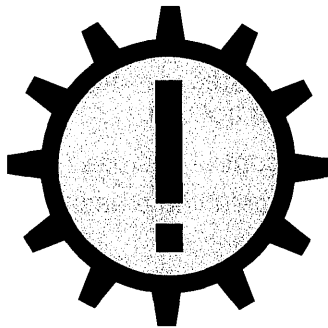
Selector lever position

The transmission control unit transmits the selector lever position to the instrument cluster.

The instrument cluster uses the signal to send a request for a warning tone to the GEM when the selector lever is not in position "P" and the driver's door is opened.

DESCRIPTION AND OPERATION

Actuation of the MIL warning lamp

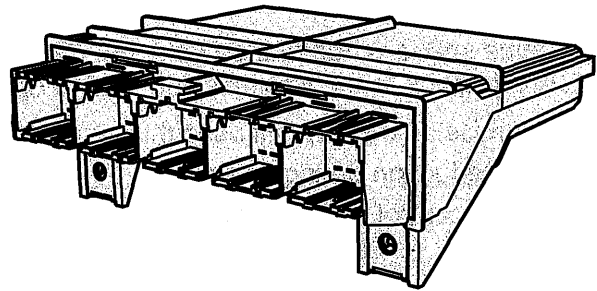


E38687

The MIL warning lamp is actuated by the instrument cluster if there are serious faults in the transmission control or if the transmission fluid temperature is excessively high.

The information required to actuate the MIL warning lamp is sent by the transmission control unit to the instrument cluster.

Warning tone request



E38701

The transmission control unit sends a warning tone request to the instrument cluster if the following conditions are met:

- The selector lever is not in position "P",
- The driver's door is open.

The instrument cluster passes on the warning tone request to the GEM. The GEM generates the warning tone.

Actuation of the overdrive indicator lamp



E48217

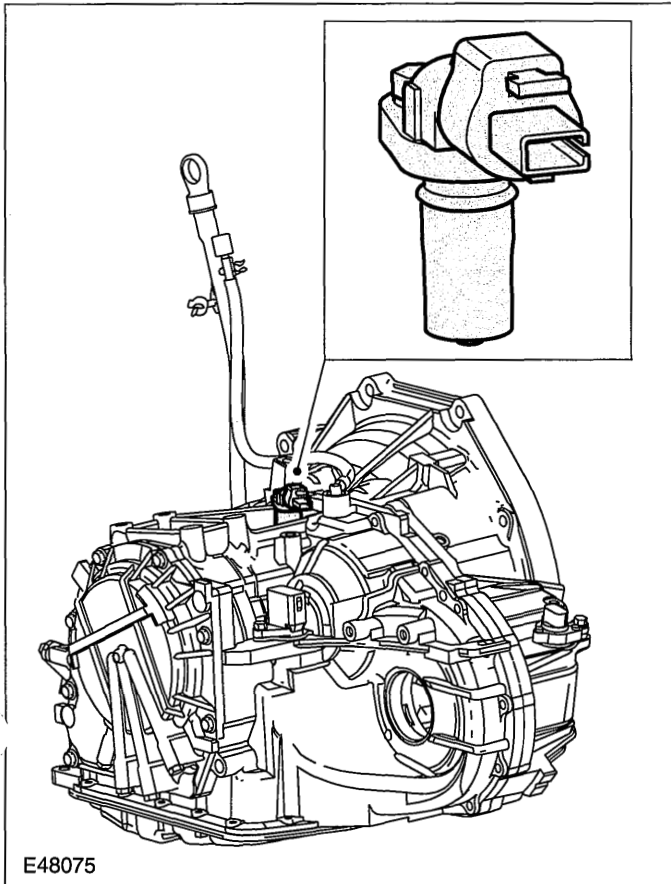
The overdrive indicator lamp is located on the instrument panel.

The information required to actuate the overdrive indicator lamp is sent from the transmission control unit when the overdrive switch on the selector lever is pressed.

DESCRIPTION AND OPERATION

Sensors

TSS sensor



The TSS sensor is an inductive pickup.

It measures the transmission input speed via the outer plate carrier of the 3rd/4th gear clutch and sends the signal to the transmission control unit.

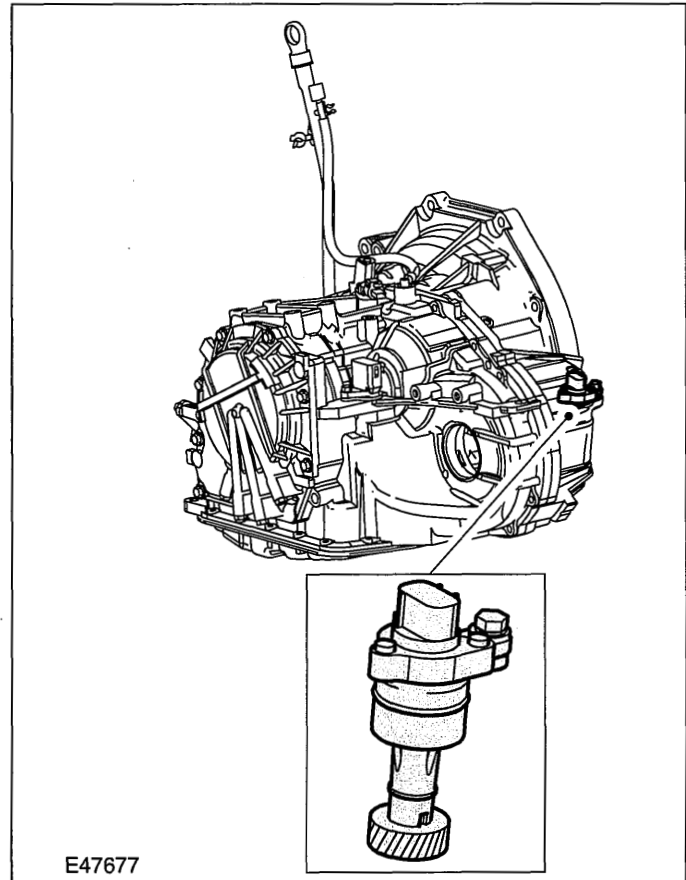
The transmission control unit uses this signal for:

- Torque reduction during gearshifts,
- Pressure control during gearshifts,
- Shift timing adaptation during upshifts,
- Shift timing adaptation during shifts from 3rd to 4th gear,
- Shift timing adaptation during shifts from 4th to 3rd gear,
- Avoidance of gearshift judder during engagement of a transmission range,
- Torque reduction when pulling away.

Consequences of signal failure:

- No TCC,
- no torque reduction,
- no shift timing adaptation,
- no 4th gear.

OSS sensor



The OSS sensor is a Hall sensor.

It is mechanically connected via a gear to the input wheel of the differential assembly.

It measures the vehicle speed via the input wheel of the differential assembly and sends the signal to the transmission control unit.

The transmission control unit uses this signal for:

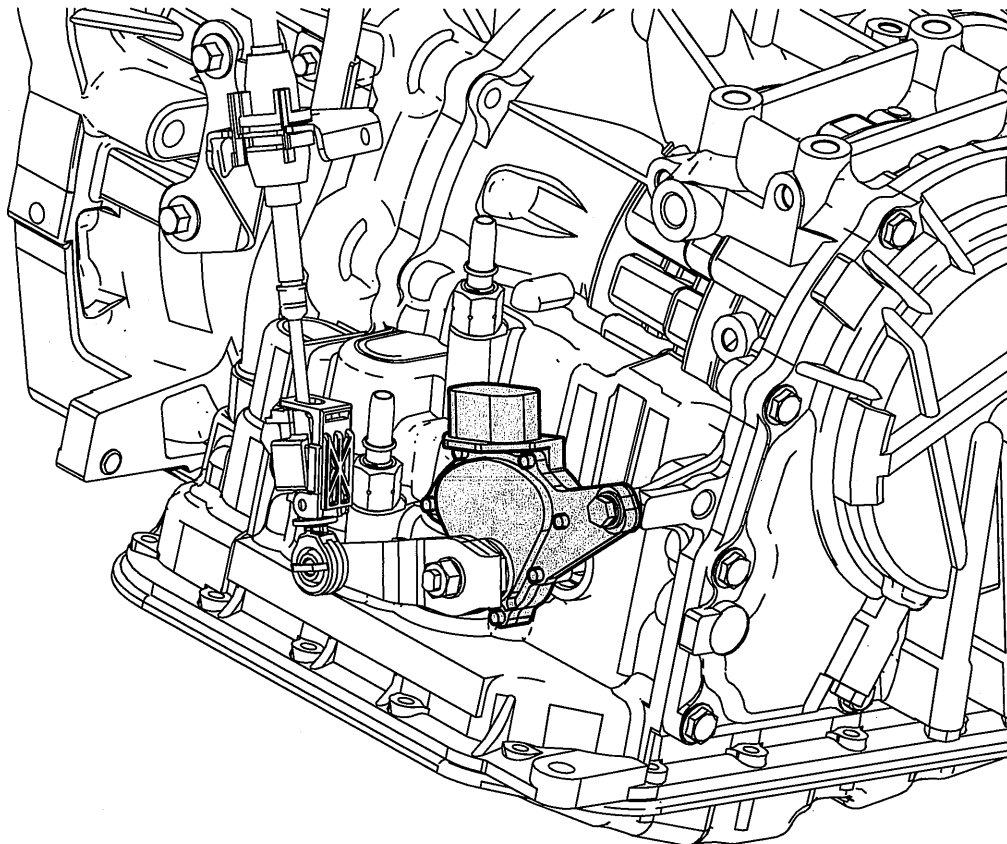
- Gearshift control,
- Engagement of the TCC,
- Torque reduction during gearshifts,
- Pressure control during gearshifts,
- Shift timing adaptation during upshifts,
- Shift timing adaptation during shifts from 3rd to 4th gear,
- Shift timing adaptation during shifts from 4th to 3rd gear,
- Reverse gear safety strategy,
- Avoidance of gearshift judder during engagement of a transmission range,
- Torque reduction when pulling away,
- Hill climb mode,
- Hill descent mode.

DESCRIPTION AND OPERATION

Consequences of signal failure:

- No TCC,
- no torque reduction,
- no shift timing adaptation,
- no 4th gear.

TR sensor



E47676

The TR sensor serves to signal the currently selected transmission range to the transmission control unit.

It is a switch which transmits the selected transmission range directly to the transmission control unit.

In addition, the starter inhibit relay is actuated by the PCM via the TR sensor when the selector lever is in the positions "P" or "N".

In selector lever position "R" the backup lamp relay is also actuated via the TR sensor.

The transmission control unit uses this signal for:

- Controlling the main line pressure,
- Gearshift control,
- Engagement of the TCC,
- Shift timing adaptation during upshifts,
- Shift timing adaptation during shifts from 3rd to 4th gear,

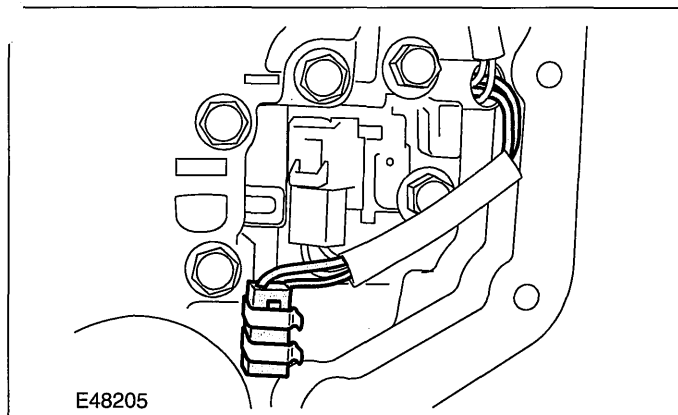
- Shift timing adaptation during shifts from 4th to 3rd gear,
- Reverse gear safety strategy,
- Avoidance of gearshift judder during engagement of a transmission range,
- Torque reduction when pulling away.

Consequences of signal failure:

- No TCC,
- no shift timing adaptation.

DESCRIPTION AND OPERATION

TFT sensor



The TFT sensor is located in the oil pan on the main control body and is part of the transmission wiring harness.

It measures the current transmission fluid temperature and sends the signal to the transmission control unit.

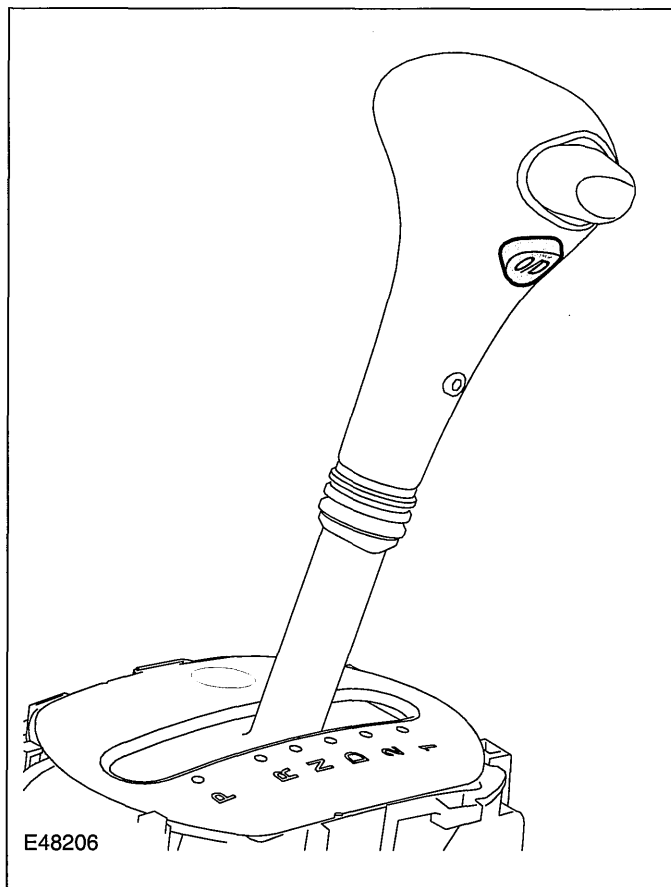
The transmission control unit uses this signal for:

- Cold start mode,
- Engagement of the TCC,
- Shift timing adaptation during upshifts,
- Shift timing adaptation during shifts from 3rd to 4th gear,
- Shift timing adaptation during shifts from 4th to 3rd gear,
- Overheating protection mode.

Consequences of signal failure:

- No TCC,
- no shift timing adaptation,
- no 4th gear.

Overdrive switch



The overdrive switch is located on the selector lever.

It allows the driver to suppress or enable gearshifts into 4th gear when "D" is selected.

The signal from the overdrive switch is transmitted to the transmission control unit.

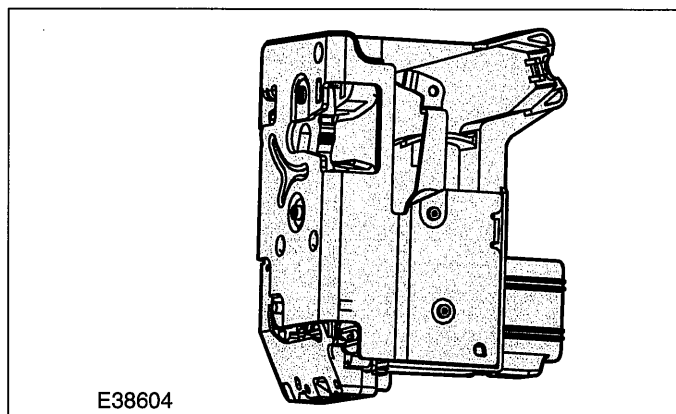
When gearshifts into 4th gear are suppressed, the transmission control unit sends a corresponding signal via the CAN databus to the instrument cluster. The instrument cluster then actuates the overdrive indicator lamp.

Consequences of signal failure:

- no suppression of gearshifts into 4th gear.

DESCRIPTION AND OPERATION

Driver's side door ajar switch



The door ajar switch is located in the door lock on the driver's side.

When the door is closed a ground connection is signalled to the transmission control unit.

When the door is opened this ground connection is interrupted.

The transmission control unit uses the signal from the driver's side door ajar switch to warn the driver if the selector lever is not in position "P" and the driver's door is open.

In this case the transmission control unit transmits the warning tone request via the CAN databus to the instrument cluster.

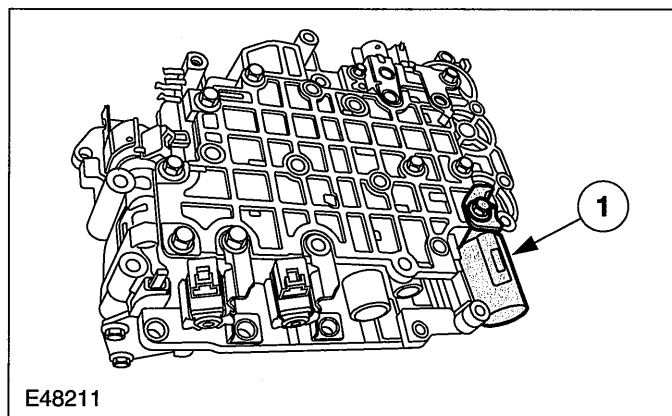
The instrument cluster passes this request on to the GEM, which then generates a warning tone.

Consequences of signal failure:

- no warning tone request.

Actuators

Main regulating valve



Item	Description
1	Main regulating valve

The main regulating valve is a proportional valve which converts the applied electric current into a proportional hydraulic pressure.

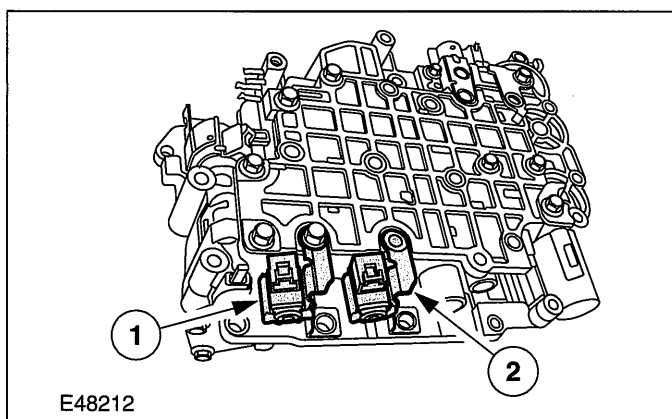
The currentless state corresponds to maximum pressure.

The main regulating valve is used to determine the main line pressure and therefore the actuating pressure for the clutches and brakes.

Consequences of signal failure:

- hydraulic emergency running mode.

SSA and SSB shift solenoid valves



Item	Description
1	SSA
2	SSB

DESCRIPTION AND OPERATION

The SSA and SSB shift solenoid valves are used to switch the different hydraulic paths in the main control body.

They are actuated by the transmission control unit according to the required gear.

In their currentless state they are open.

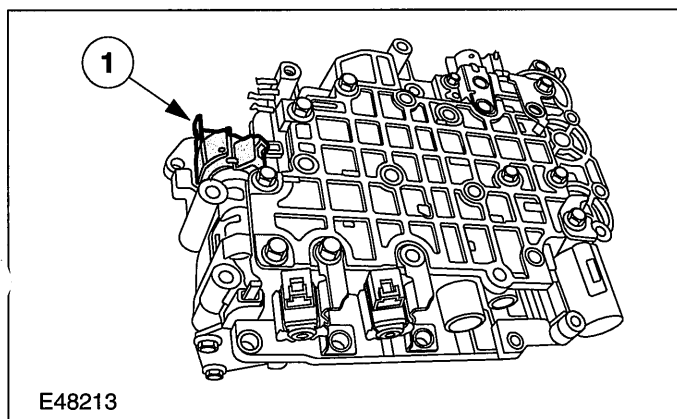
Consequences of signal failure:

- hydraulic emergency running mode.

Actuation of the SSA and SSB shift solenoid valves

gear	SSA	SSB
1st gear	On	On
2nd gear	On	Off
3rd gear	Off	Off
4th gear	Off	On

Shift timing solenoid valve



Item	Description
------	-------------

1	Shift timing solenoid valve
---	-----------------------------

The shift timing solenoid valve is used to precisely control the timing of the engagement and disengagement of the 1st-3rd gear clutch.

In addition, it is also used to prevent engagement of reverse gear if the driver moves the selector lever to "R" while the vehicle is driving forwards at a speed in excess of 11 km/h.

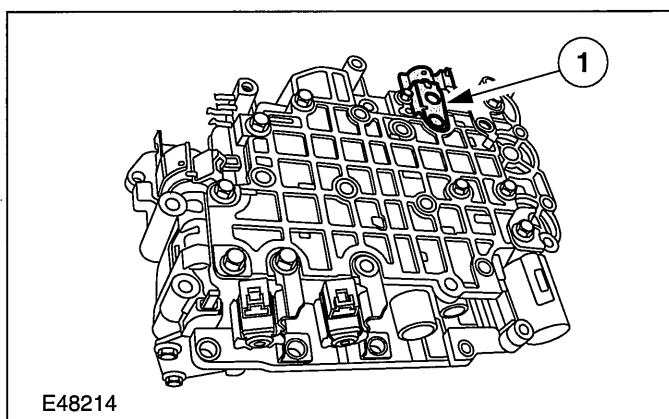
It is actuated by the transmission control unit according to requirements.

In its currentless state the solenoid valve is closed.

Consequences of signal failure:

- hydraulic emergency running mode.

Shift solenoid valve, TCC



Item	Description
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1	Shift solenoid valve, TCC
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The TCC shift solenoid valve is used to engage or disengage the TCC.

It is actuated by the transmission control unit according to requirements.

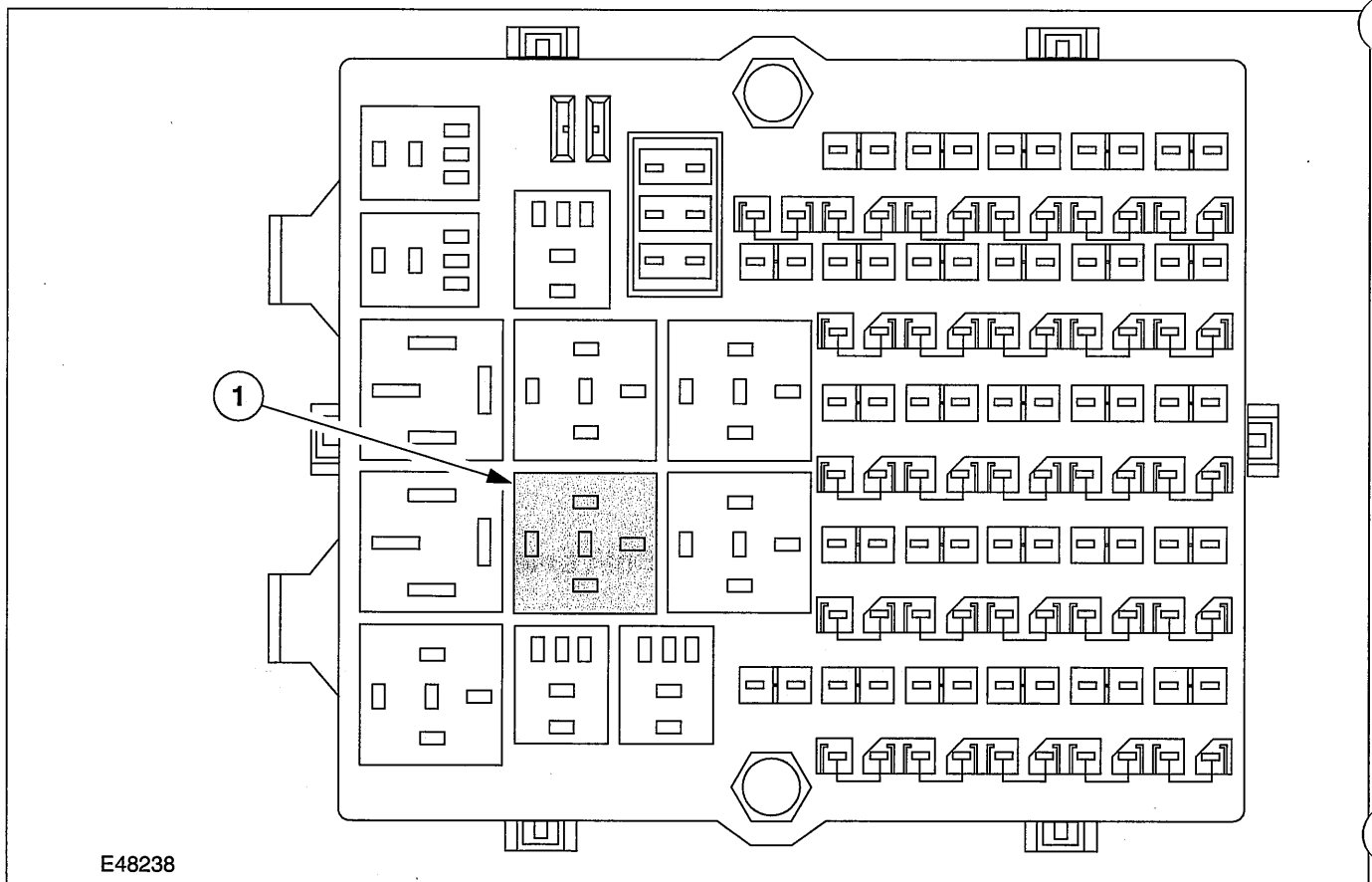
In its currentless state the solenoid valve is open and the TCC is not engaged.

Consequences of signal failure:

- Engagement of the TCC.

DESCRIPTION AND OPERATION

Starter inhibit relay



Item	Description
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1	Starter inhibit relay
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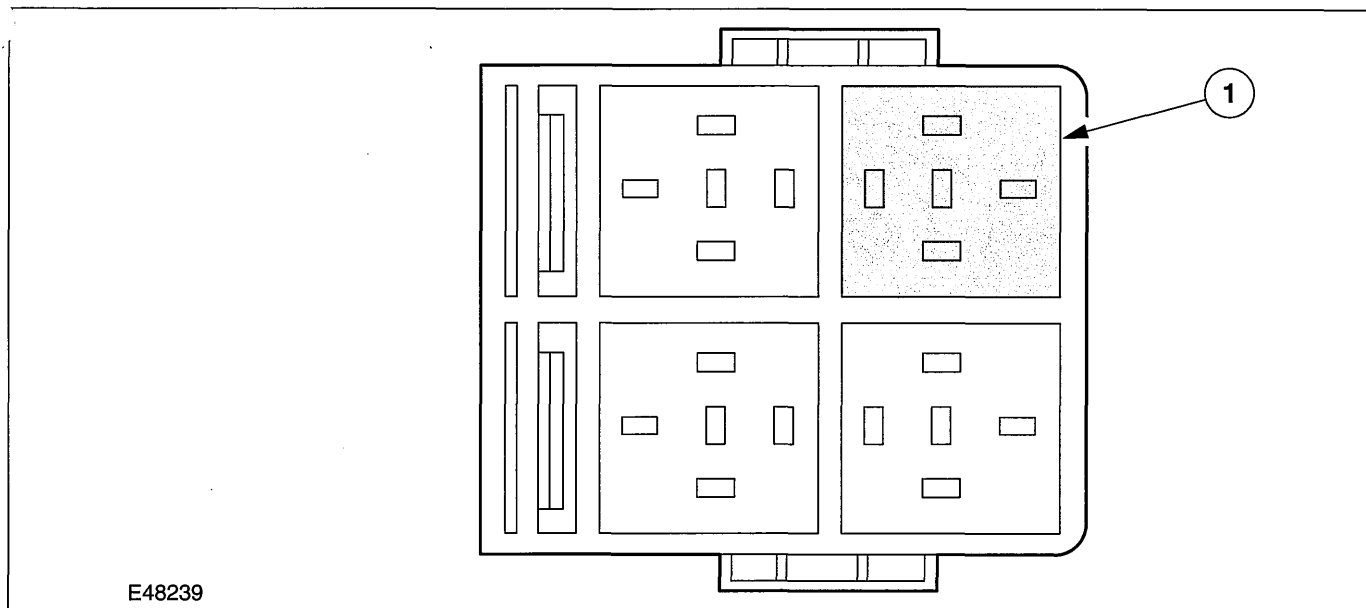
NOTE: The engine cannot be started if the electrical connector is disconnected from the TR sensor.

The starter inhibit relay is located in the central junction box (CJB).

In the selector lever positions "P" and "N" a ground signal is directed from the PCM via the TR sensor to the starter inhibit relay, as a result of which the starter inhibit relay is actuated.

DESCRIPTION AND OPERATION

Backup lamp relay



Item	Description
1	Backup lamp relay

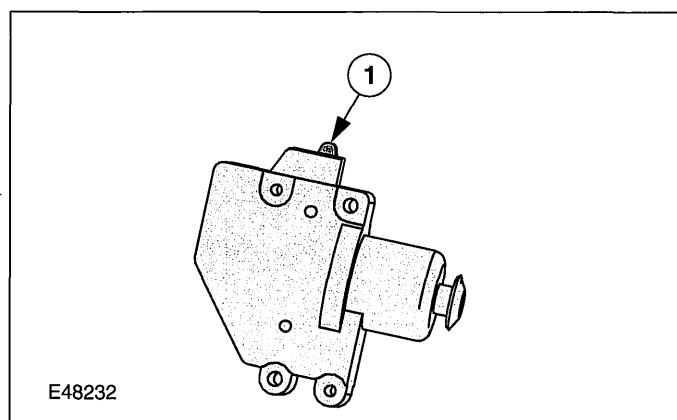
The backup lamp relay is located in the relay box in the engine compartment.

When the selector lever is in position "R" the backup lamp relay receives a ground signal from the TR sensor and actuates the backup lamps as a result.

Consequences of signal failure:

- backup lamps inoperative.

Selector lever lock solenoid



Item	Description
1	Locking pin

The selector lever lock solenoid is part of the selector lever.

When the ignition is switched on, the selector lever lock solenoid is actuated by depressing the brake pedal (signal from the stoplamp switch). This results in the locking pin being pulled back, and the selector lever can be moved out of "P".

The ground connection to the solenoid for the ignition key removal inhibitor is also made via the selector lever lock solenoid in all selector lever positions except "P".

Consequences of signal failure:

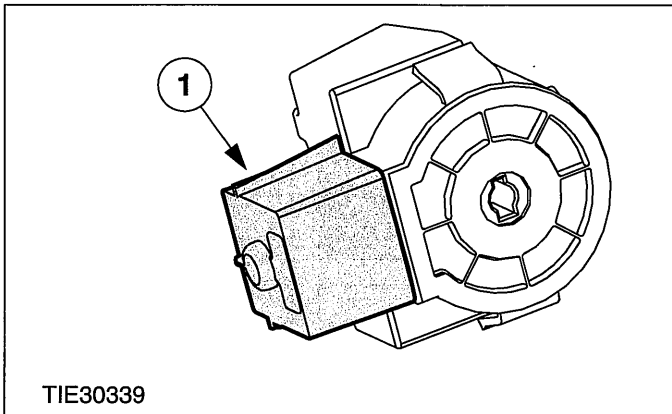
- If the signal from the stoplamp switch is missing or the ground connection is interrupted, then the selector lever can no longer be moved out of the position "P".

The selector lever lock can be manually released by removing the cover and pressing a suitable object into the opening on the selector lever until the selector lever can be moved out of the position "P".

The selector lever then re-locks if it is moved back to "P".

DESCRIPTION AND OPERATION

Solenoid for the ignition key removal inhibitor



Item	Description
------	-------------

1	Solenoid for the ignition key removal inhibitor
---	---

The solenoid for the ignition key removal inhibitor is integrated in the ignition lock.

With the selector lever in position "P", the ground connection via the selector lever lock solenoid is interrupted.

The ignition key can be turned to "0" and removed from the ignition lock.

In all other selector lever positions the ground connection is made via the selector lever lock solenoid.

The locking pin of the solenoid for the ignition key removal inhibitor engages in the ignition lock.

The ignition key cannot be turned to "0" and removed from the ignition lock.

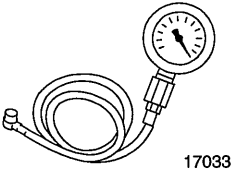
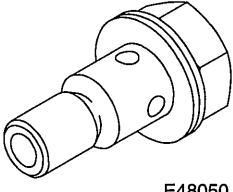
Consequences of signal failure:

- A short to ground will make it impossible to remove the ignition key from the ignition lock.
- A break in the electrical circuit will make it possible to remove the ignition key from the ignition lock in all selector lever positions.

DIAGNOSIS AND TESTING

Automatic Transaxle

Special Tool(s)

 17033	Hydraulic Pressure Gauge (0 - 60 bar) 307-201
 E48050	Adapter for 307-201 307-201-01

General Equipment

Worldwide Diagnostic System (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Damaged shift mechanism • Transaxle fluid leaks • Damaged transaxle casing	• Fuse(s) • Electrical connector(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Diagnostic Trouble Code Chart.

Diagnostic Trouble Code Chart

Diagnostic Trouble Code Charts

Symptom	Possible Sources	Action
• A207 Checksum error	• Transmission control module (TCM) . • Circuit(s).	• REFER to WDS.
• E516 CAN bus OFF sensor error	• CAN bus.	• REFER to WDS.
• D900 CAN bus no communication error	• CAN bus.	• REFER to WDS.
• P0706 Transmission range (TR) sensor error	• Inhibitor switch. • Inhibitor switch circuit(s).	• REFER to WDS.
• P0707 Transmission range (TR) sensor circuit low input	• Inhibitor switch. • Inhibitor switch circuit(s).	• REFER to WDS.
• P0712 Transmission fluid temperature circuit - low input	• Transmission fluid temperature sensor. • Circuit(s).	• REFER to WDS.
• P0713 Transmission fluid temperature circuit - high input	• Transmission fluid temperature sensor. • Circuit(s).	• REFER to WDS.
• P0717 Input speed sensor circuit no signal	• Input speed sensor. • Circuit(s).	• REFER to WDS.

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-46

307-01-46

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• P0722 Vehicle speed sensor (VSS) circuit no signal	• Vehicle speed sensor (VSS). • Circuit(s).	• REFER to WDS.
• P0740 Torque converter clutch solenoid failure	• Lock-up duty solenoid. • Circuit(s).	• REFER to WDS.
• P0741 Torque converter clutch (TCC) system.	• TCC system stuck off.	• REFER to WDS.
• P0742 Torque converter clutch (TCC) system.	• TCC system stuck on. • Circuit(s).	• REFER to WDS.
• P0743 Torque converter clutch solenoid failure	• Lock-up duty solenoid. • Circuit(s).	• REFER to WDS.
• P0727 Engine revolution speed error	• Powertrain control module (PCM). • Circuit(s).	• REFER to WDS.
• P1746 Pressure control solenoid A open circuit	• Line pressure control solenoid. • Circuit(s).	• REFER to WDS.
• P1747 Pressure control solenoid A short circuit	• Line pressure control solenoid. • Circuit(s).	• REFER to WDS.
• P0972 Shift solenoid A performance	• Shift solenoid A open circuit. • Circuit(s). • Internal mechanical/hydraulic failure.	• REFER to WDS.
• P0973 Shift solenoid A electrical	• Shift solenoid A short circuit. • Circuit(s).	• REFER to WDS.
• P0974 Shift solenoid A electrical	• Shift solenoid A. • Circuit(s).	• REFER to WDS.
• P0975 Shift solenoid B performance	• Shift solenoid B. • Circuit(s). • Internal mechanical/hydraulic failure.	• REFER to WDS.
• P0976 Shift solenoid B	• Shift solenoid B short circuit. • Circuit(s).	• REFER to WDS.
• P0977 Shift solenoid B	• Shift solenoid B open circuit. • Circuit(s).	• REFER to WDS.
• P0787 Timing solenoid electrical	• Timing solenoid short circuit. • Circuit(s).	• REFER to WDS.
• P0788 Timing solenoid electrical	• Timing solenoid open circuit. • Circuit(s).	• REFER to WDS.
• P0115 Engine coolant signal error	• Reported engine failure.	• REFER to WDS.
• P1719 Engine torque signal error	• Reported engine failure.	• REFER to WDS.
• P1783 Transmission over temperature condition	• Temperature sensor failure.	• REFER to WDS.

DIAGNOSIS AND TESTING

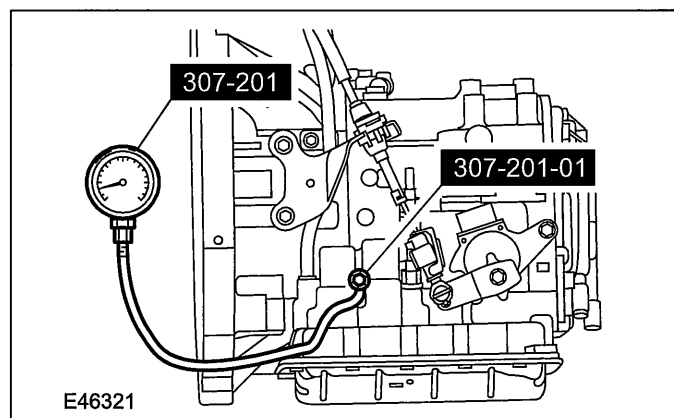
Symptom	Possible Sources	Action
• C1750 Accelerator pedal position signal malfunction	• Accelerator pedal position sensor.	• REFER to WDS.
• U2516 CAN bus off transmit error	• CAN bus.	• REFER to WDS.
• U1900 CAN Communication bus fault error	• CAN bus.	• REFER to WDS.
• 5750 Throttle open malfunction	• CAN bus.	• REFER to WDS.

Line Pressure Test

CAUTIONS:

- ⚠ Carry out the line pressure test before carrying out the stall speed test. If line pressure is low at idle, do not carry out the stall speed test or further transaxle damage will occur.
- ⚠ Do not maintain wide open throttle (WOT) in any range for more than five seconds.
- ⚠ After testing each of the following ranges 'D' (DRIVE) and 'R' (REVERSE), move the selector lever to 'N' (NEUTRAL) and run the engine at 1000 rpm for approximately 1 minute to allow the torque converter to cool.

NOTE: Make sure that the self test and electrical repairs have been carried out, or test results may be incorrect.



1. Connect the special tools to the line pressure test point.
2. Start the engine and check the line pressures. Refer to the line pressure chart to determine if line pressure is within specification.
3. If the line pressure is not within specification, refer to the line pressure diagnosis chart.

Line Pressure Chart

Range	Idle		Stall	
	Mpa	bar	Mpa	bar
D	0.37 - 0.41	3.82 - 4.11	1.15 - 1.27	11.5 - 12.7
R	0.59 - 0.68	5.88 - 6.76	1.58 - 1.83	15.88 - 18.24

Line Pressure Diagnosis Chart

Test Results	Possible Source
Higher than specification in 'D' (DRIVE) and 'R' (REVERSE)	Pressure control solenoid inoperative or open wire harness. Pressure regulator valve sticking.

DIAGNOSIS AND TESTING

Test Results	Possible Source
Lower than specification in 'D' (DRIVE) and 'R' (REVERSE)	Pressure control solenoid inoperative or open wire harness. Pressure regulator valve sticking. Worn oil pump. Oil strainer blocked. Fluid leak from each clutch hydraulic circuit.
Lower than specification in 'D' (DRIVE)	Drive hydraulic circuit failure. Forward clutch failure.
Lower than specification in 'R' (REVERSE)	Reverse hydraulic circuit failure. Reverse clutch failure. First and reverse brake failure.

Stall Speed Test

This test checks the operation of the following components:

- torque converter
- forward clutch
- low one way clutch assembly
- engine performance

WARNINGS:

- ▲ **Apply the parking brake firmly while carrying out each stall test.**
- ▲ **Apply the foot brake firmly while carrying out each stall test.**

CAUTIONS:

- ⚠ **Always carry out the line pressure test before carrying out the stall speed test. If the line pressure is low at idle, do not carry out the stall speed test or further transaxle damage will occur.**
- ⚠ **After testing each of the following ranges 'D' (DRIVE) and 'R' (REVERSE), move the selector lever to 'N' (NEUTRAL) and run the engine at 1000 rpm for approximately one minute to allow the torque converter to cool.**

⚠ **Do not maintain wide open throttle (WOT) in any range for more than five seconds.**

⚠ **If the engine speed (rpm) recorded by the tachometer exceeds maximum specified rpm, release the accelerator pedal immediately. Clutch or band slippage is indicated.**

NOTE:The stall speed test should be carried out with the engine and transaxle at normal operating temperatures (50°C to 80°C).

NOTE:Prolonged use of this procedure may set DTC P0712. After carrying out the stall speed test, run the OBD test and clear the DTCs.

1. Connect a tachometer to the engine.
2. Press the accelerator pedal to the floor WOT in each selected range. Record the rpm reached in each selected range and refer to the stall speed chart.
3. If the stall speed is not within specification, refer to the stall speed diagnosis chart.

Stall Speed Chart

Engine 1.6L	Speed (rpm)
'D' (DRIVE)	2500 ± 150
'R' (REVERSE)	2420 ± 150

Stall Speed Diagnosis Chart

Test Results	Possible Source
Lower than specification in 'D' (DRIVE) and 'R' (REVERSE)	Low engine power. Torque converter one-way clutch failure.

DIAGNOSIS AND TESTING

Test Results	Possible Source
Higher than specification in 'D' (DRIVE)	Pressure control solenoid inoperative. Pressure regulator valve sticking. Forward clutch failure (slipping). One-way clutch No.2 failure.
Higher than specification in 'R' (REVERSE)	Pressure control solenoid inoperative. Pressure regulator valve sticking. Reverse clutch failure (slipping). First and reverse brake failure (slipping).
Lower than specification in 'D' (DRIVE)	Drive hydraulic circuit failure. Forward clutch failure.
Lower than specification in 'R' (REVERSE)	Pressure control solenoid inoperative. Pressure regulator valve sticking. Worn oil pump. Oil strainer blocked. Fluid leak from each clutch hydraulic circuit.

Time Lag Test

Time lag is the time between moving the selector lever from 'N' (NEUTRAL) to 'D' (DRIVE) or 'N' (NEUTRAL) to 'R' (REVERSE). With the parking brake applied the vehicle must not move if the selector lever is moved from 'N' (NEUTRAL) to 'D' (DRIVE) or 'N' (NEUTRAL) to 'R' (REVERSE). Drive is engaged when the vehicle starts to rise.

▲ WARNING:Apply the parking brake firmly while carrying out each test.

⚠ CAUTION:After testing each of the following ranges 'D' (DRIVE) and 'R' (REVERSE), move the selector lever to 'N' (NEUTRAL) and run the engine at 1000 rpm for approximately 1 minute to allow the torque converter to cool.

1. Using a suitable stop watch, measure the time lag three times and calculate the average time. Record the time lag and refer to the time lag chart.
2. If the time lag is not within specification, refer to the time lag diagnosis chart.

Time Lag Chart

Range	Time
'N' (NEUTRAL) to 'D' (DRIVE)	less than 1.0 seconds
'N' (NEUTRAL) to 'R' (REVERSE)	less than 1.2 seconds

Time Lag Diagnosis Chart

Test Results	Possible Source
Lower than specification in 'N' (NEUTRAL) to 'D' (DRIVE)	Pressure control solenoid inoperative. Pressure regulator valve sticking. Forward clutch failure (slipping). Timing solenoid failure. Drive hydraulic circuit failure.

**Automatic Transmission/Transaxle —
Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-01-50

307-01-50

DIAGNOSIS AND TESTING

Test Results	Possible Source
Lower than specification in 'N' (NEUTRAL) to 'R' (REVERSE)	Pressure control solenoid inoperative. Pressure regulator valve sticking. Reverse clutch failure (slipping). First and reverse brake failure (slipping). Reverse hydraulic circuit failure.

GENERAL PROCEDURES

Transmission Fluid Level Check

General Equipment

Worldwide diagnostic system (WDS)

Materials

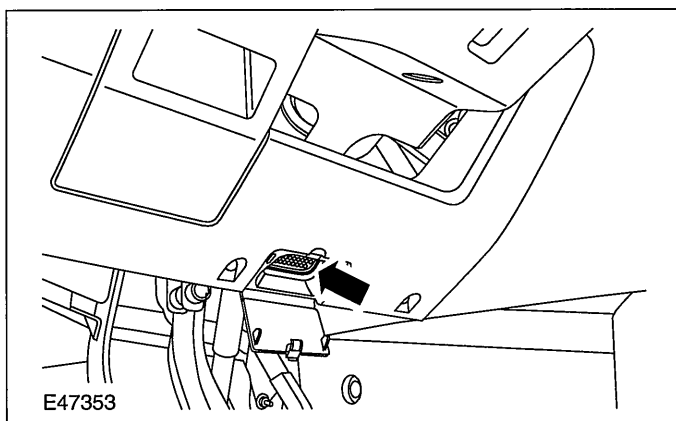
Name	Specification
Automatic transmission fluid	WSS-M2C924-A

▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

1. **NOTE:** Make sure that the transmission is not in emergency operation mode.

Connect the worldwide diagnostic system (WDS) to the data link connector (DLC).



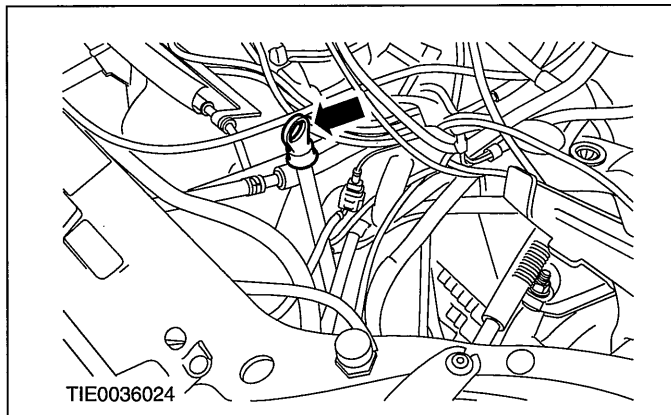
2. ▲ **WARNING:** Make sure that the parking brake control lever is in the fully applied position. Failure to follow this instruction may result in personal injury.

Start the engine.

3. Move the transmission selector lever through all the gear ranges, allow sufficient time for each position to engage.
4. Move the transmission selector lever to the "P" (PARK) position.

5. Using WDS, check that the transmission fluid temperature is between 50°C and 60°C.

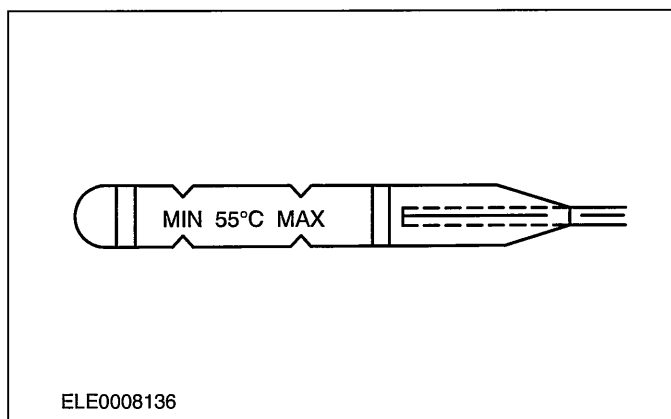
6. Remove the transmission fluid level indicator.



7. Check the transmission fluid level and top up with clean automatic transmission fluid if necessary.

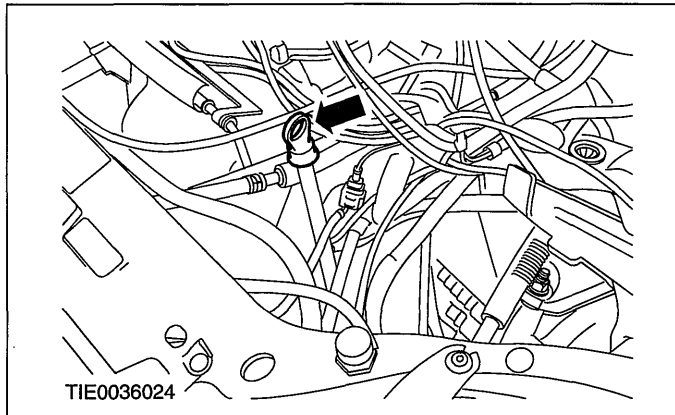
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation). See - Transmission Fluids.

- Make sure that, with the transmission in the "P" (PARK) position, the oil level is between the "MIN" and "MAX" mark.



GENERAL PROCEDURES

8. Install the transmission fluid level indicator.



9. Switch the engine off.

10. Disconnect the WDS from the DLC.

GENERAL PROCEDURES

Transmission Fluid Drain and Refill

Materials

Name	Specification
Automatic transmission fluid	WSS-M2C924-A

▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

1. Raise and support the vehicle.

For additional information, refer to: Jacking (100-02 Jacking and Lifting, Description and Operation)
/ Lifting (100-02 Jacking and Lifting, Description and Operation).

2. NOTE: If an internal transaxle concern is suspected, drain the fluid through a paper filter. A small amount of metal or friction particles may be found from normal wear. However, if excessive metal or friction particles are present, a detailed inspection of the transaxle will be required.

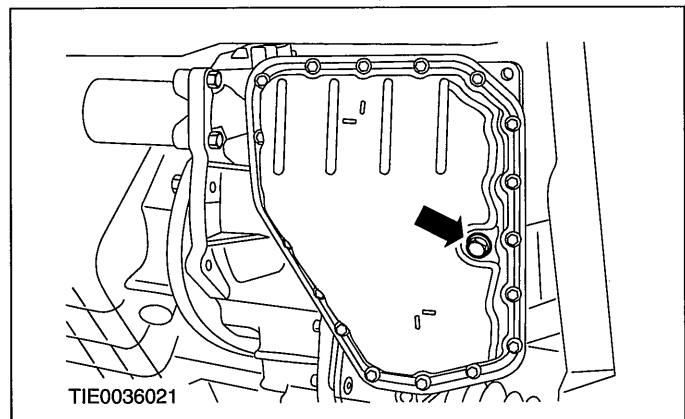
Drain the transaxle.

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

- Allow the fluid to drain into a suitable container.

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

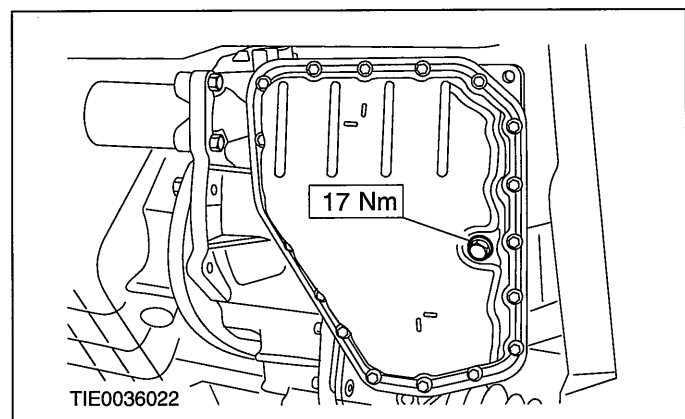
- Discard the drain plug seal.



3. NOTE: Install a new drain plug seal.

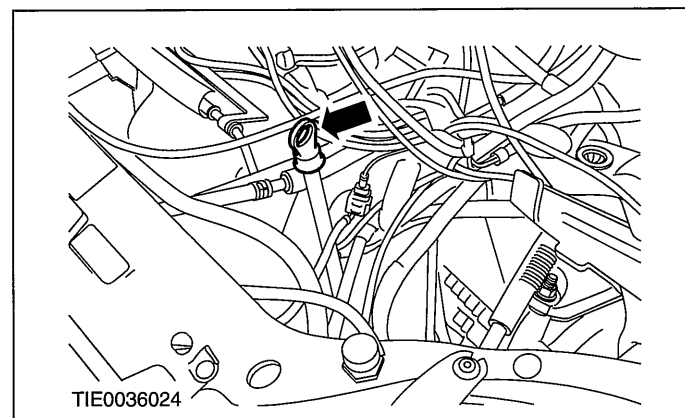
NOTE: Clean the drain plug thread.

Install the drain plug.



4. Lower the vehicle.

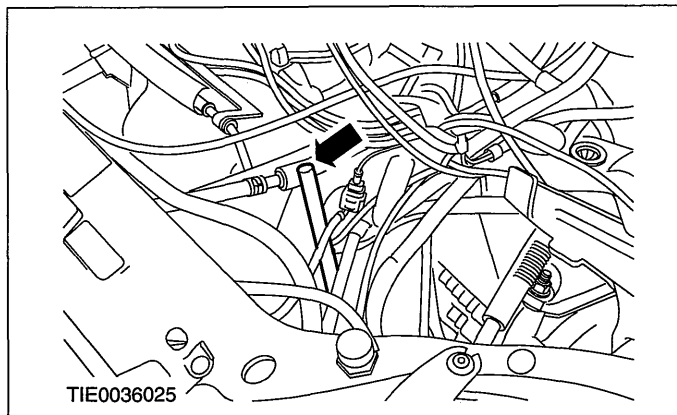
5. Remove the transmission fluid level indicator.



GENERAL PROCEDURES

- 6. Fill the transaxle with automatic transmission fluid.**

**For additional information, refer to:
Specifications (307-01 Automatic
Transmission/Transaxle - Vehicles With:
4-Speed Automatic Transmission
(AW81-40), Specifications).**



- 7. Check the transmission fluid level.**

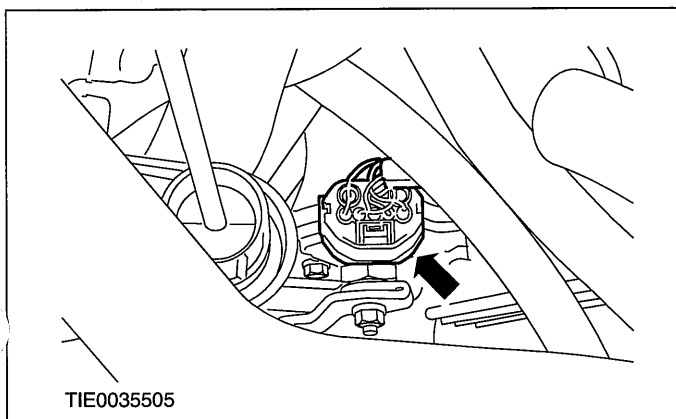
**For additional information, refer to:
Transmission Fluid Level Check (307-01
Automatic Transmission/Transaxle -
Vehicles With: 4-Speed Automatic
Transmission (AW81-40), General
Procedures).**

IN-VEHICLE REPAIR

Transmission Range (TR) Sensor

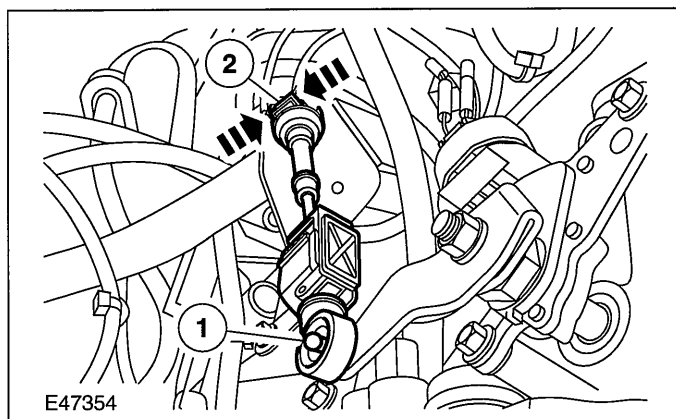
Removal

1. Shift the transmission selector lever to the "N" (NEUTRAL) position.
2. Raise and support the vehicle.
For additional information, refer to: Jacking (100-02 Jacking and Lifting, Description and Operation)
/ Lifting (100-02 Jacking and Lifting, Description and Operation).
3. Disconnect the transmission range (TR) sensor electrical connector.



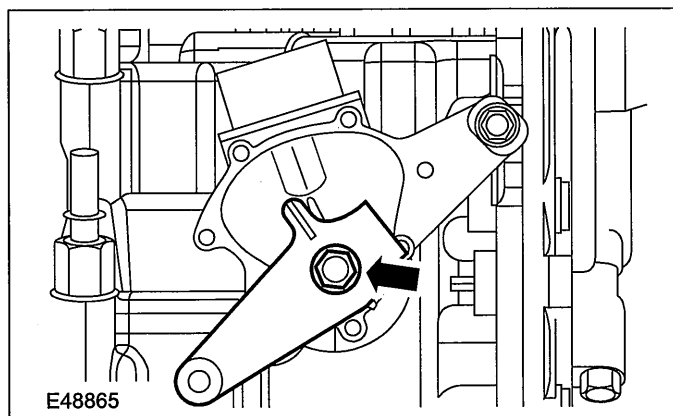
4. Detach the selector lever cable from the manual shift lever.

1. Detach the selector lever cable from the manual shift lever.
2. Detach the selector lever cable from the selector lever cable bracket.



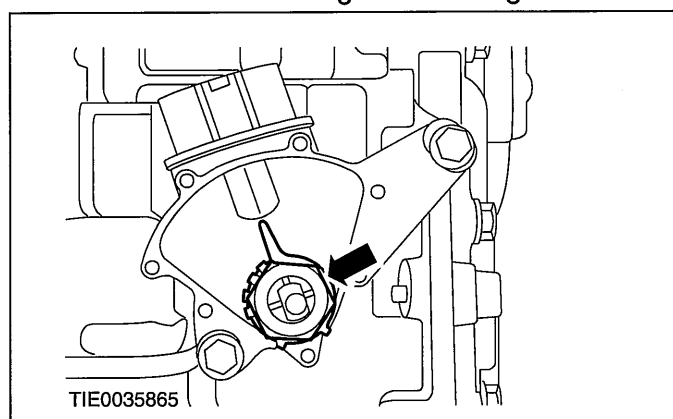
5. **CAUTION:** Hold the manual shift lever while loosening or tightening the manual shift lever locking nut to prevent rotational torque being transmitted to the TR sensor and shift mechanism.

Remove the manual shift lever (automatic transaxle shown removed for clarity).



6. Remove the nut and locking washer (automatic transaxle shown removed for clarity).

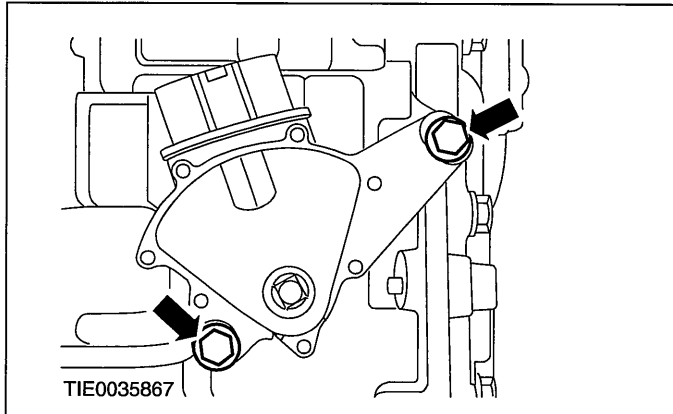
- Unbend the locking washer tangs.



7. **NOTE:** The TR sensor retaining bolts can be reused three times. Mark the retaining bolts to indicate usage.

IN-VEHICLE REPAIR

Remove the TR sensor (automatic transaxle shown removed for clarity).

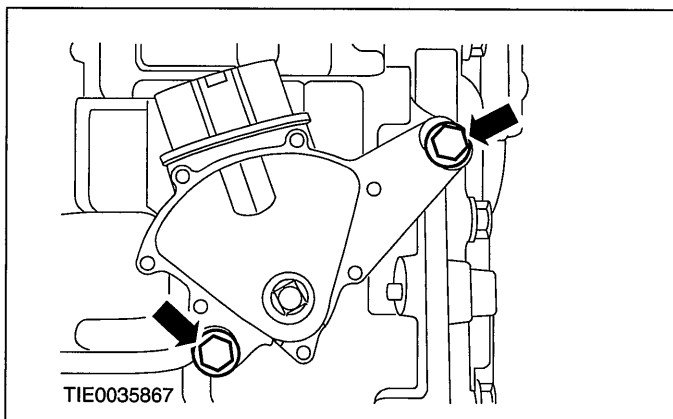


Installation

1. **NOTE:**The transmission range (TR) sensor retaining bolts can be reused three times. Check the retaining bolts and install new bolts if necessary.

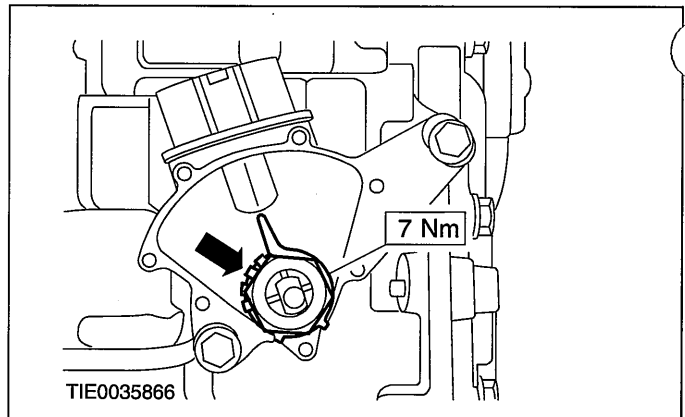
NOTE:Do not tighten the TR sensor retaining bolts at this stage.

Install the TR sensor (automatic transaxle shown removed for clarity).



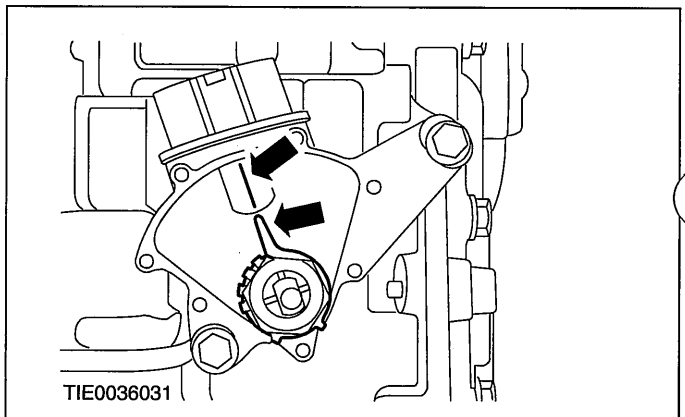
2. Install the locking washer and nut (automatic transaxle shown removed for clarity).

- Bend the locking washer tangs.

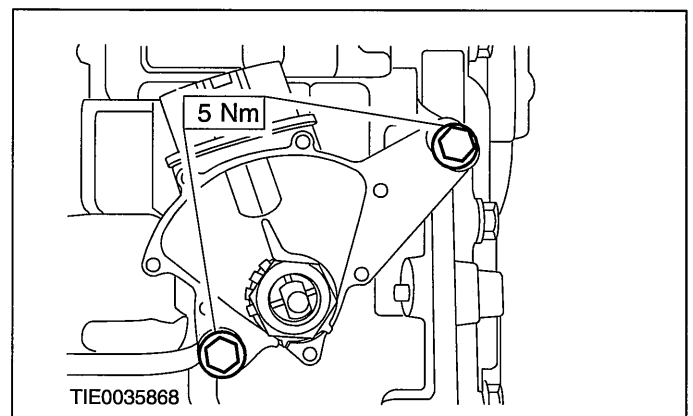


3. **CAUTION:** Check that the manual shift lever is in the "N" (NEUTRAL) position.

Adjust the TR sensor to align the locking washer pointer to the "N" (NEUTRAL) position scribed on the TR sensor body.



4. Tighten the TR sensor retaining bolts (automatic transaxle shown removed for clarity).



5. **CAUTIONS:**

Do not use air tools to tighten the manual shift lever locking nut.

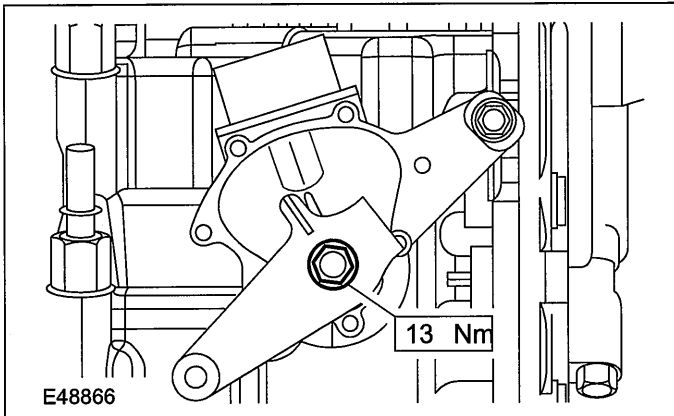
IN-VEHICLE REPAIR

 Hold the manual shift lever while tightening the manual shift lever locking nut to prevent rotational torque being transmitted to the TR sensor and shift mechanism.

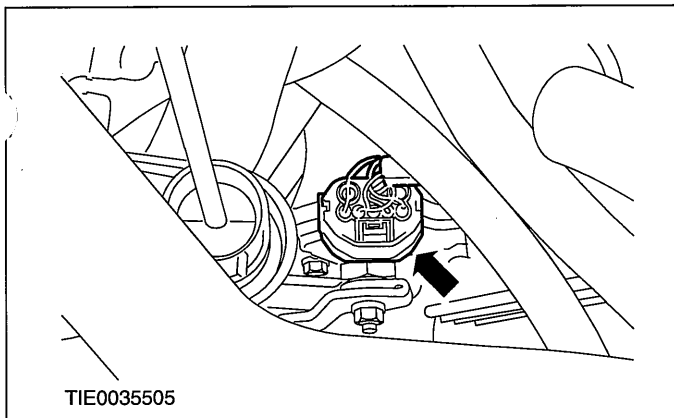
Install the manual shift lever (automatic transaxle shown removed for clarity).

8. Lower the vehicle.

9. Check the selector lever cable adjustment by moving the transmission selector lever through all gear ranges.

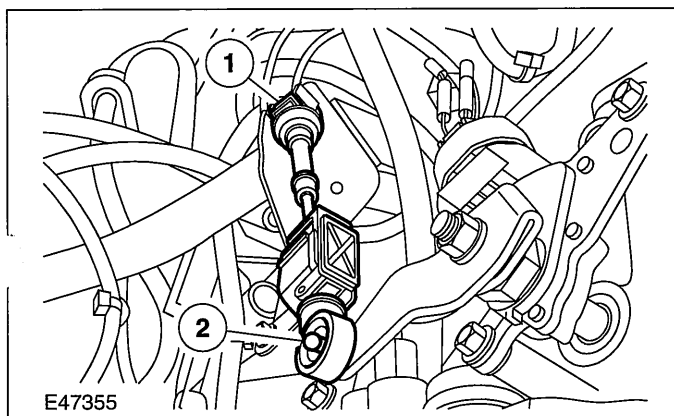


6. Connect the TR sensor electrical connector.



7. Attach the selector lever cable to the manual shift lever.

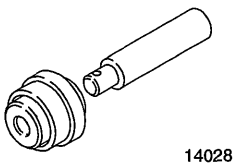
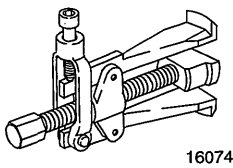
1. Attach the selector lever cable to the selector lever cable bracket.
2. Attach the selector lever cable to the manual shift lever.



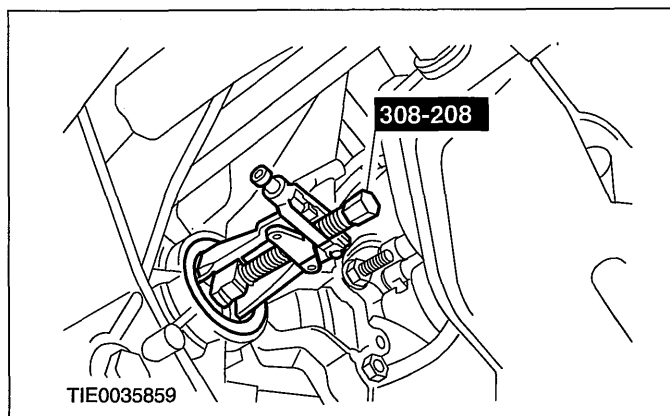
IN-VEHICLE REPAIR

Halfshaft Seal LH

Special Tool(s)

 14028	Installer, Front Wheel Hub Seal 204-066 (14-028)
 16074	Remover, Halfshaft Seal 308-208 (16-074)

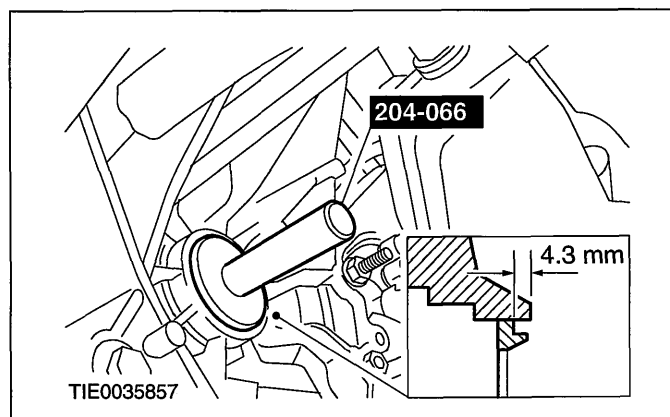
- Discard the seal.



Installation

1. **NOTE:** Install a new halfshaft seal.

Using the special tool, install the halfshaft seal.



Removal

▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

1. Remove the left-hand halfshaft.

For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

2. Using the special tool, remove the halfshaft seal.

- Allow the fluid to drain into a suitable container.

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

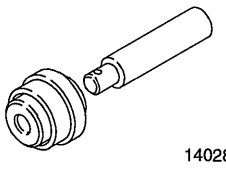
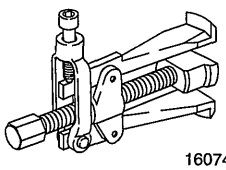
2. Install the left-hand halfshaft.

For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

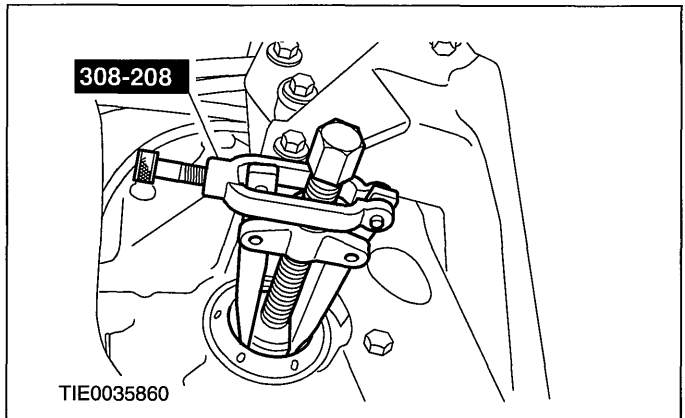
IN-VEHICLE REPAIR

Halfshaft Seal RH

Special Tool(s)

	Installer, Front Wheel Hub Seal 204-066 (14-028)
	Remover, Halfshaft Seal 308-208 (16-074)

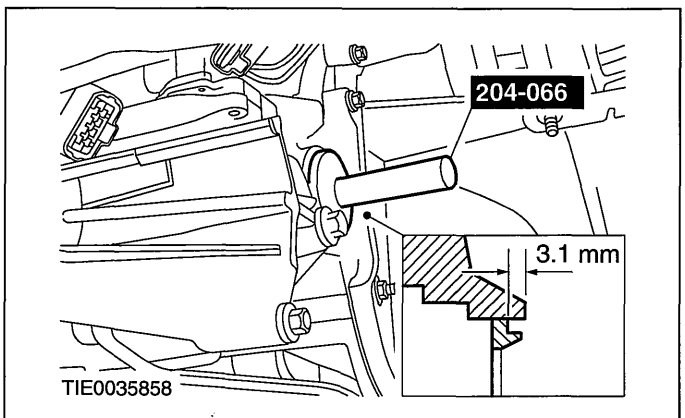
- Discard the seal.



Installation

1. **NOTE:** Install a new halfshaft seal.

Using the special tool, install the halfshaft seal.



Removal

▲ WARNING: Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

1. Remove the right-hand halfshaft.

For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

2. Using the special tool, remove the halfshaft seal.

- Allow the fluid to drain into a suitable container.

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

2. Install the right-hand halfshaft.

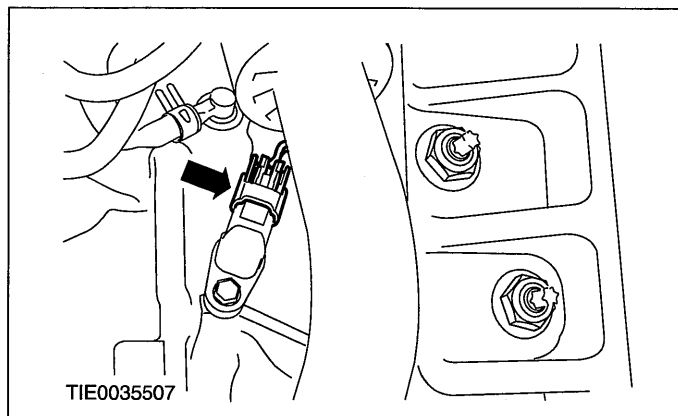
For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

IN-VEHICLE REPAIR

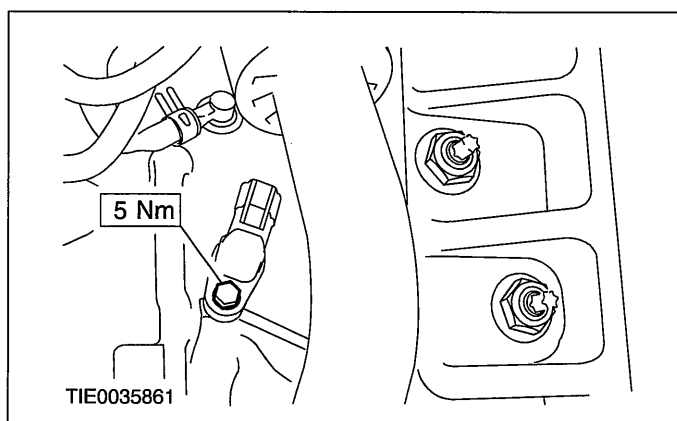
Turbine Shaft Speed (TSS) Sensor

Removal

1. Disconnect the turbine shaft speed (TSS) sensor electrical connector.



2. Remove the TSS sensor.



Installation

1. **NOTE:**Inspect the O-ring seal for damage.
Install a new O-ring seal if necessary.

NOTE:Apply a light coat of petroleum jelly to the O-ring seal before installation.

To install, reverse the removal procedure.

IN-VEHICLE REPAIR

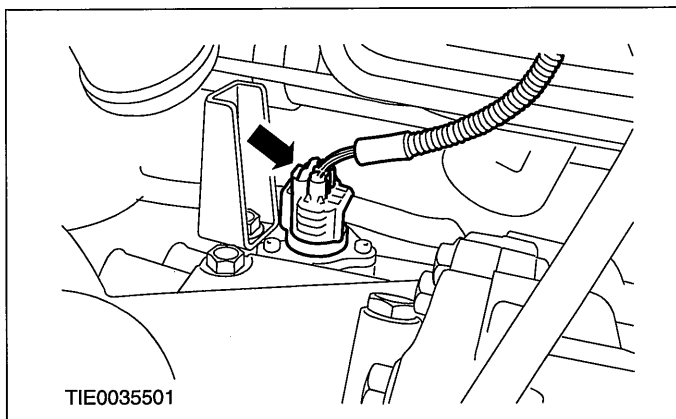
Vehicle Speed Sensor (VSS)

Removal

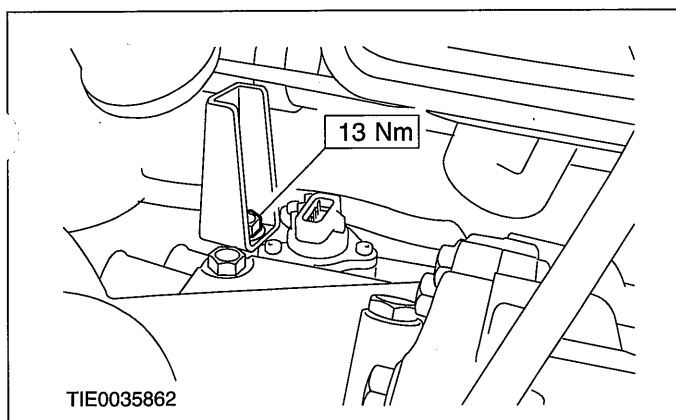
1. Disconnect the vehicle speed sensor (VSS) electrical connector.

NOTE:Apply a light coat of petroleum jelly to the O-ring seal before installation.

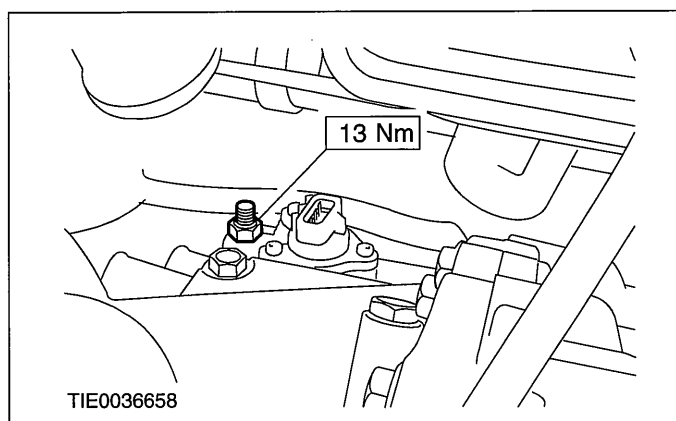
To install, reverse the removal procedure.



2. Remove the VSS heat shield.



3. Remove the VSS.



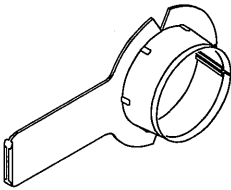
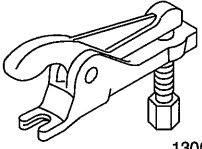
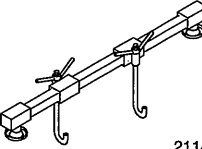
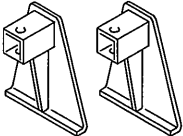
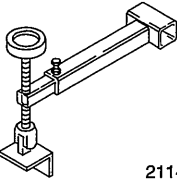
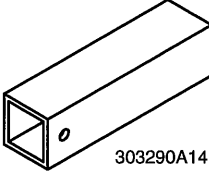
Installation

1. **NOTE:**Inspect the O-ring seal for damage. Install a new O-ring seal if necessary.

REMOVAL AND INSTALLATION

Transaxle

Special Tool(s)

 E47098	Protector, Halfshaft Seal 205-775
 13006	Separator, Ball Joint 211-020 (13-006)
 21140	Support Bar, Engine 303-290A
 2114001	Adapter for 303-290A 303-290-01 (21-140-01)
 2114003	Adapter for 303-290A 303-290-03A (21-140-03A)
 303290A14	Adapter for 303-290A 303-290A-14

General Equipment

Securing strap

General Equipment

Transmission jack	
Worldwide diagnostic system (WDS)	
Materials	
Name	Specification
Grease	WSD-M1C230-A

Removal

▲ WARNING: Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

1. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

2. Disconnect the powertrain control module (PCM) electrical connector.

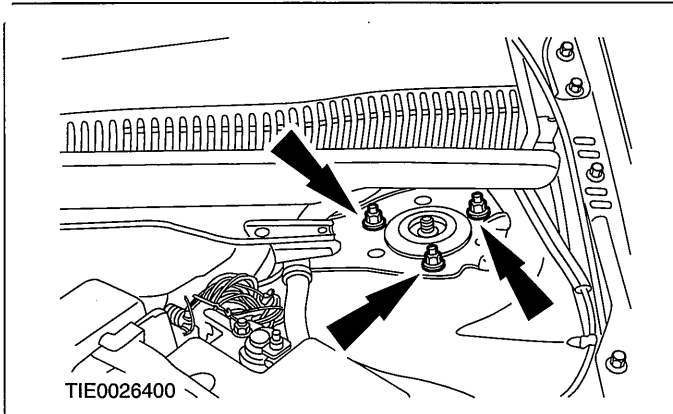
For additional information, refer to: Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation).

3. Remove the battery tray.

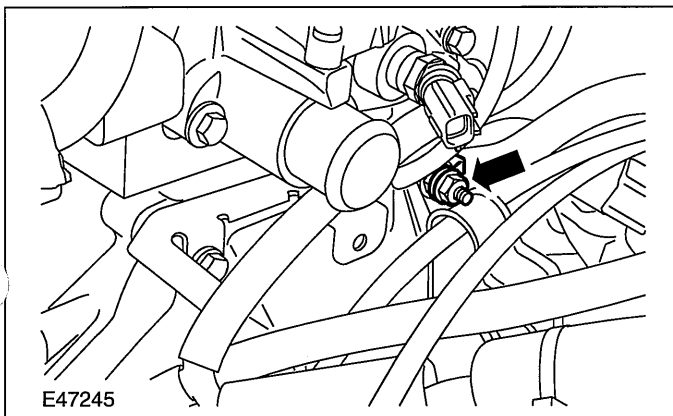
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

REMOVAL AND INSTALLATION

4. Loosen the strut and spring assembly top mount nuts by three turns on both sides.

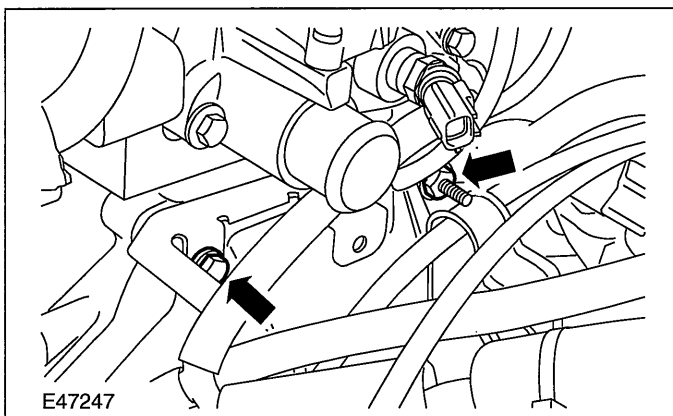


5. Detach the engine ground cable from the transaxle.

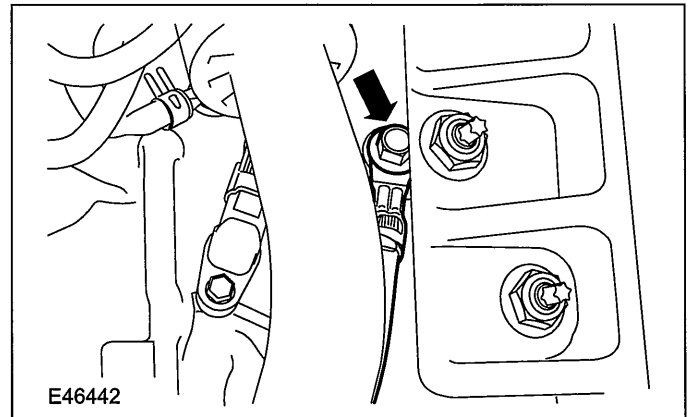


6. Remove the transaxle upper retaining bolts.

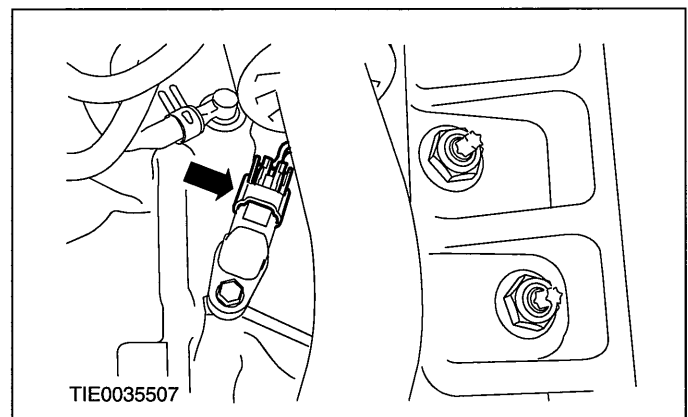
- Detach the engine wiring harness bracket from the transaxle.



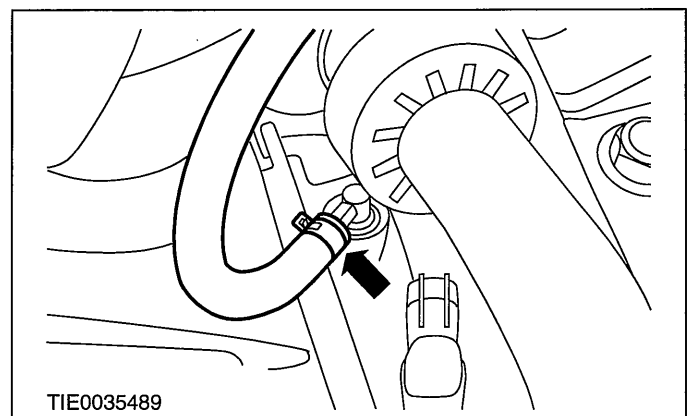
7. Detach the ground cable from the transaxle.



8. Disconnect the turbine shaft speed (TSS) sensor electrical connector.

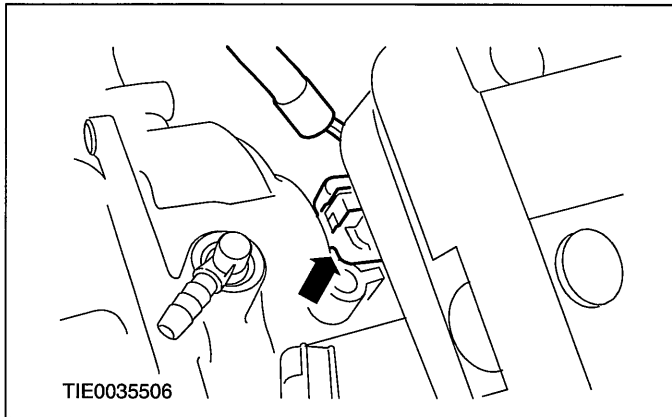


9. Disconnect the transaxle breather hose.

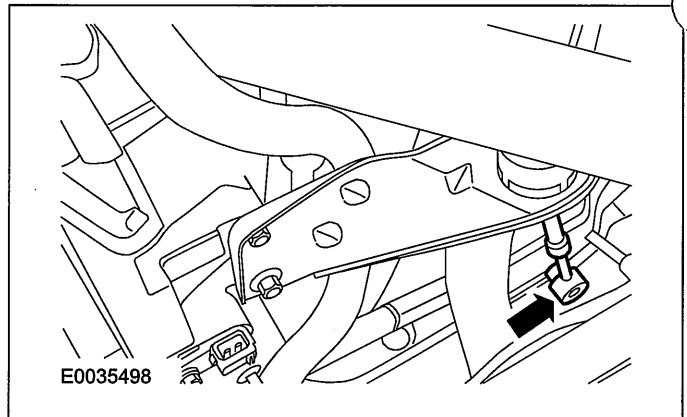


REMOVAL AND INSTALLATION

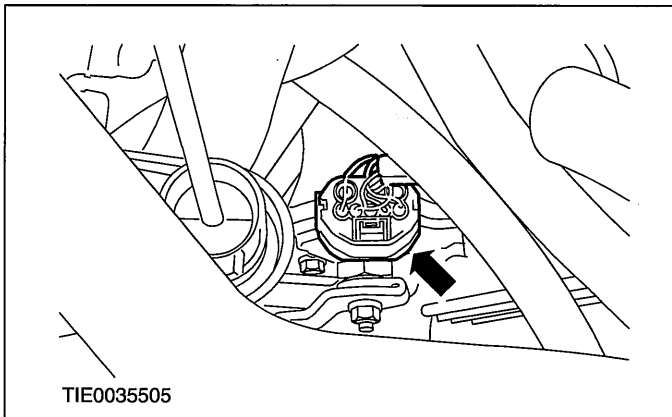
10. Disconnect the transaxle wiring harness electrical connector.



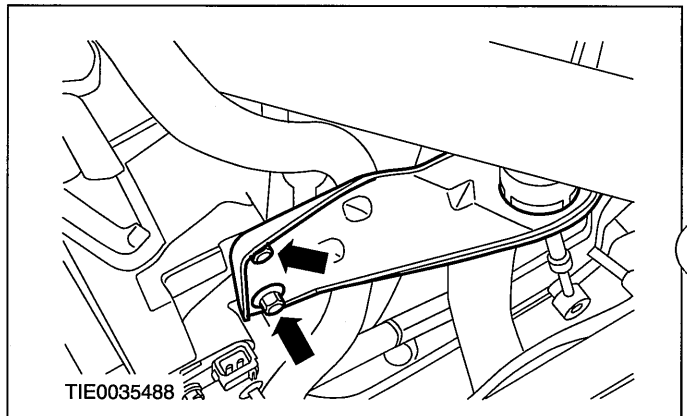
14. Detach the selector lever cable from the manual shift lever.



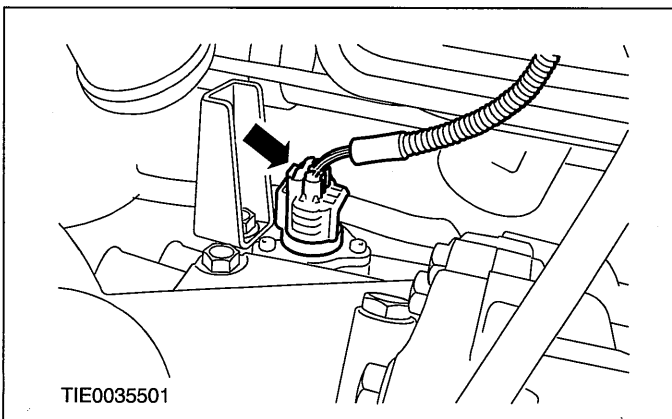
11. Disconnect the transmission range (TR) sensor electrical connector.



15. Detach the selector lever cable retaining bracket from the transaxle and position it to one side.



12. Disconnect the vehicle speed sensor (VSS) electrical connector.



16. Remove the transmission fluid level indicator tube.

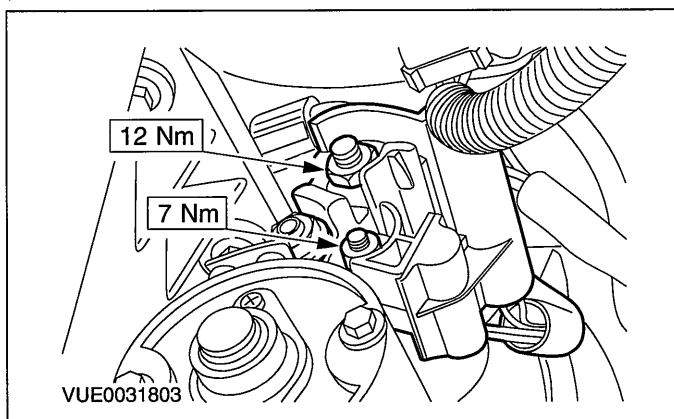


13. Remove the front wheels and tires.

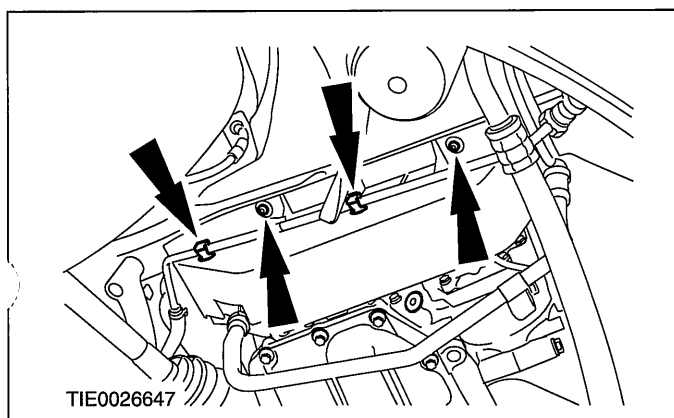
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

REMOVAL AND INSTALLATION

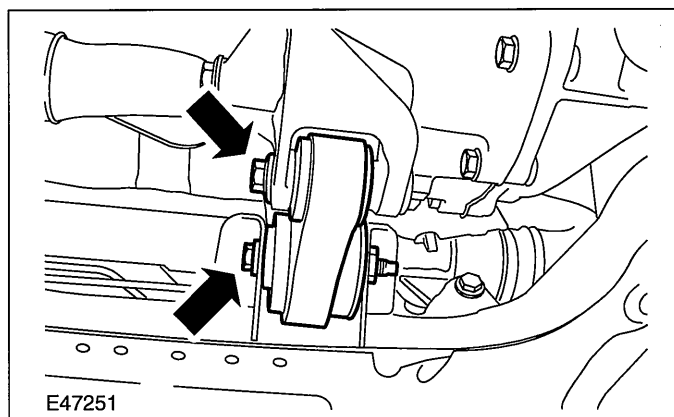
17. Disconnect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables.



18. Remove the accessory drive belt cover.

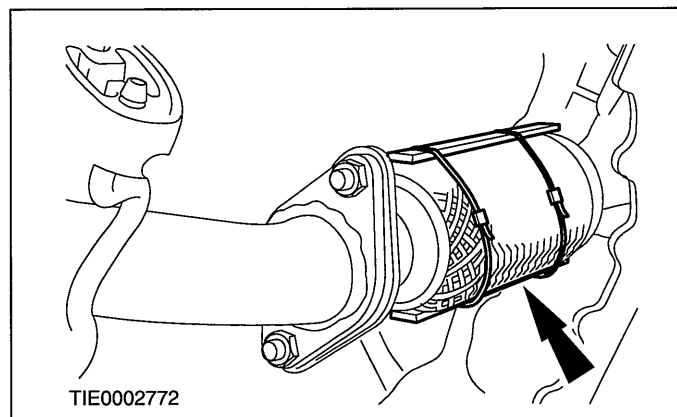


19. Remove the engine support insulator.



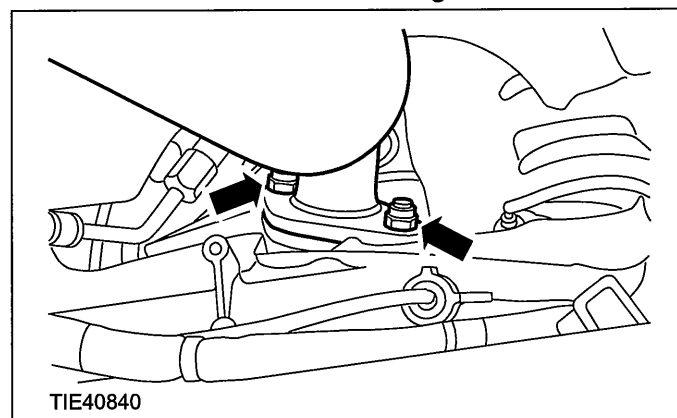
20. **CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a suitable support wrap or suitable splint.



21. Detach the exhaust flexible pipe from the catalytic converter.

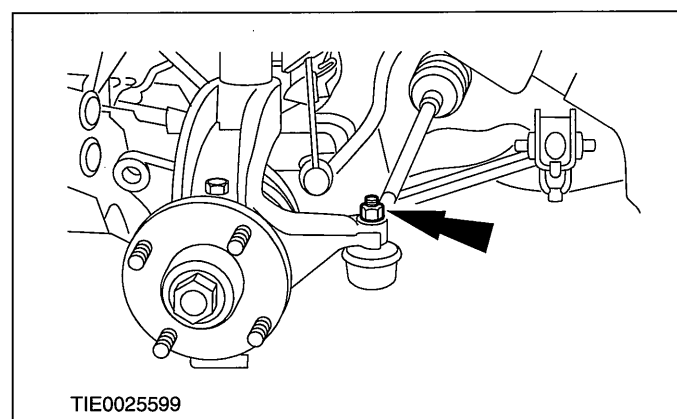
- Discard the nuts and the gasket.



22. **CAUTION:** Leave the tie-rod end retaining nut in place to protect the ball joint stud.

NOTE: Use a 5mm Allen key to prevent the ball joint stud from rotating.

Loosen the right-hand tie-rod end retaining nut.

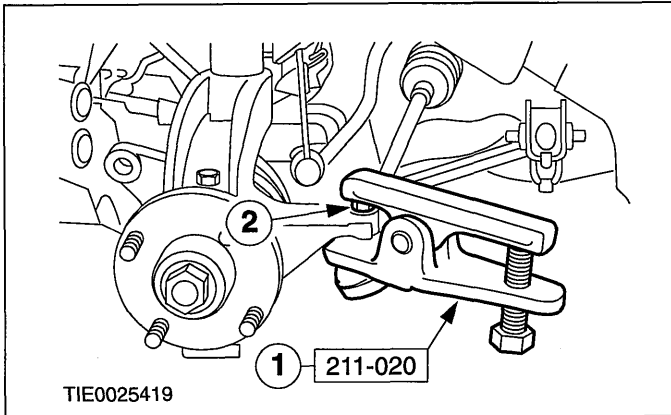


REMOVAL AND INSTALLATION

23. **⚠ CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

Using the special tool, detach the right-hand tie-rod end from the wheel knuckle.

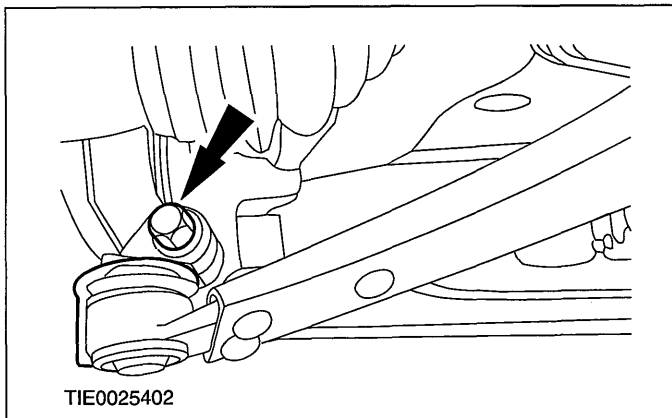
1. Release the tie-rod end.
2. Remove and discard the tie-rod end retaining nut.



24. **⚠ CAUTION:** Protect the ball joint seal.

Detach the lower arm from the wheel knuckle on both sides.

- Remove the heat shield.



25. CAUTIONS:

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

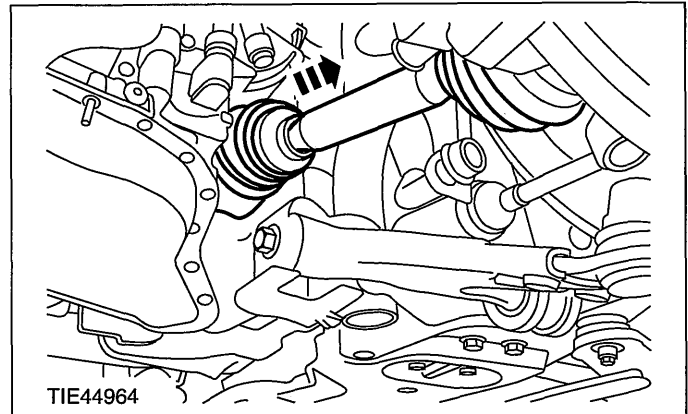
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).
See - Transmission Fluids.

Using a suitable tire lever, detach the left-hand halfshaft from the transaxle and secure it to one side.

- Allow the oil to drain into a suitable container.

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

- Discard the snap ring.



26. CAUTIONS:

⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

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

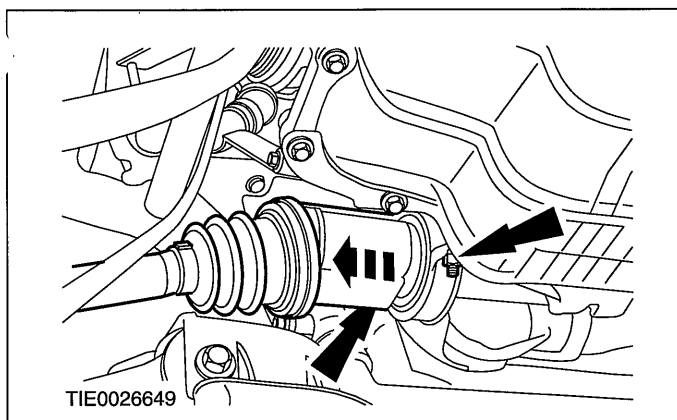
Detach the right-hand halfshaft and the intermediate shaft from the transaxle and secure it to one side.

- Discard the center bearing cap and locknuts.
- Allow the oil to drain into a suitable container.

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

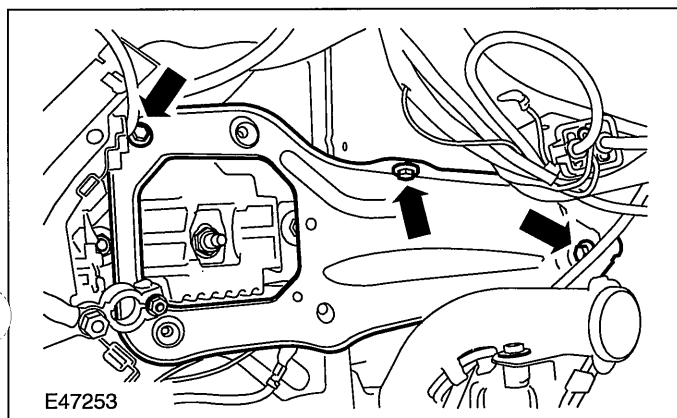
REMOVAL AND INSTALLATION

See - Transmission Fluids.



27. Lower the vehicle.

28. Remove the battery tray support bracket.



29. **▲WARNING:**When releasing the transmission fluid, take care to prevent scolding. Failure to follow this instruction may result in personal injury.

⚠ CAUTION:Plug the transmission fluid cooler feed and return lines to prevent fluid loss or dirt ingress.

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

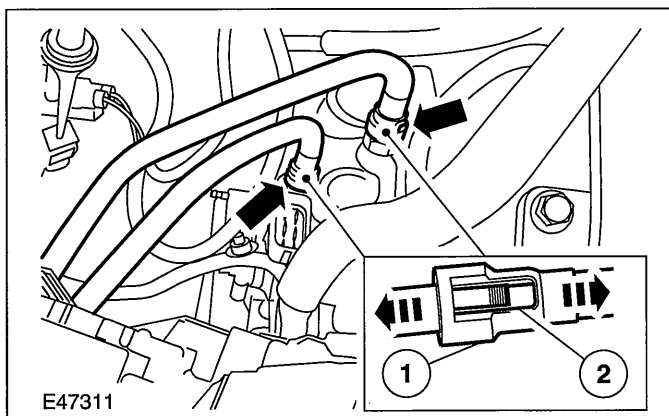
NOTE:Mark the position of the feed and return lines to aid installation.

Detach the transmission fluid cooler lines from the transmission.

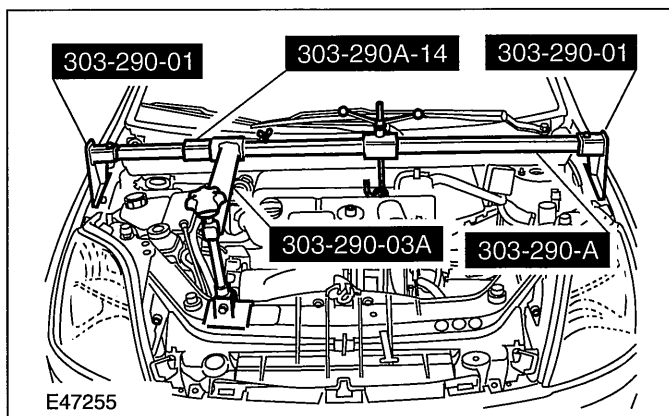
1. Push the transmission fluid cooler line quick release connector onto the transmission.
2. Press together the retaining tabs and detach the transmission fluid cooler line from the transmission.

- Allow the fluid to drain into a suitable container.

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

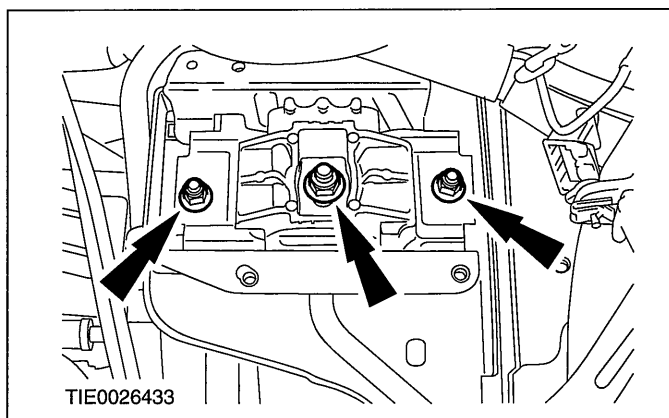


30. Install the special tools.



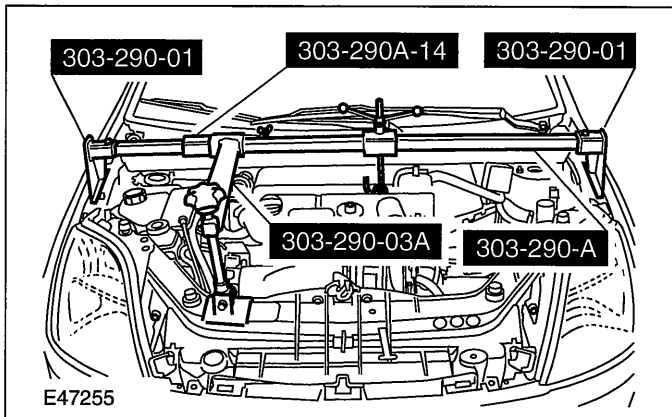
31. Remove the engine and transaxle rear mount.

- Discard the nuts.

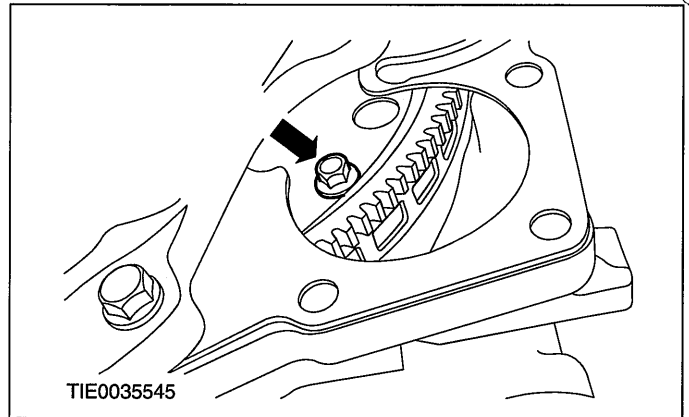


REMOVAL AND INSTALLATION

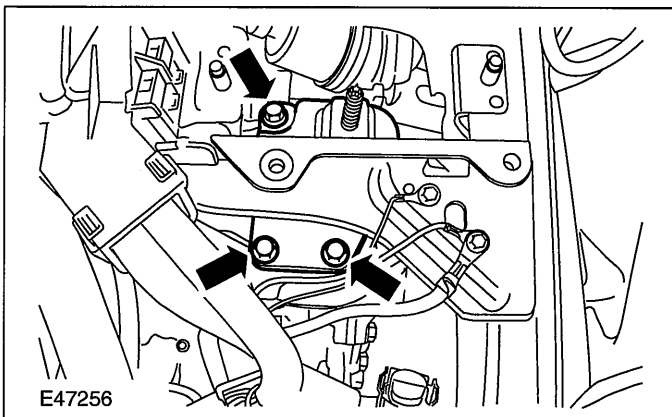
- 32. Using the special tools, lower the engine and transaxle assembly.**



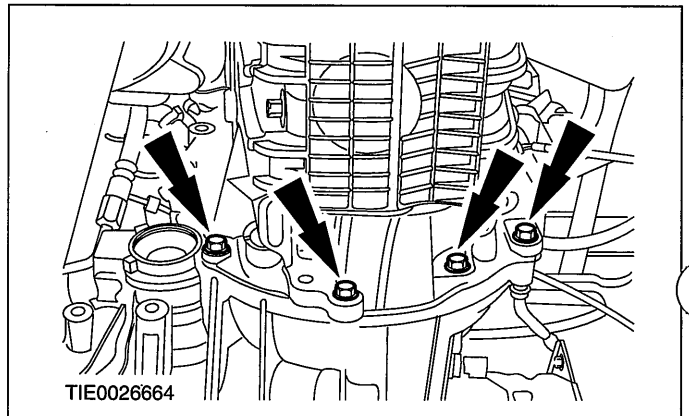
- Rotate the torque converter to gain access to the nuts.
- Discard the nuts.



- 33. Remove the engine and transaxle rear mount retaining bracket.**



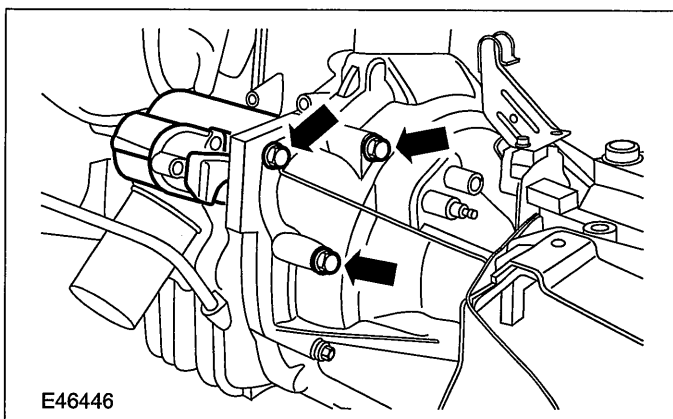
- 37. Remove the transaxle lower retaining bolts.**



- 34. Raise and support the vehicle.**

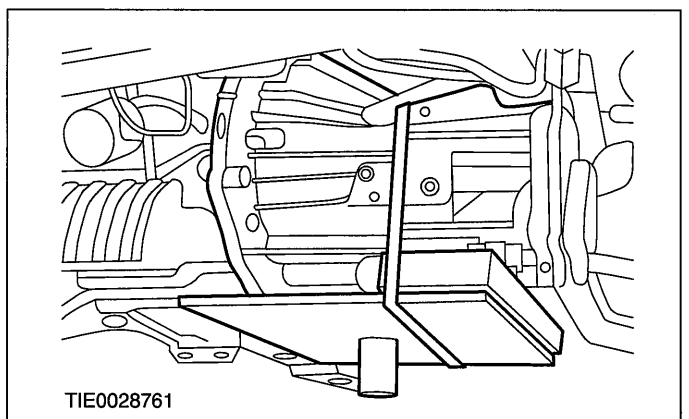
For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

- 35. Remove the starter motor.**



- 38. NOTE: Secure the transaxle with a securing strap to the transmission jack.**

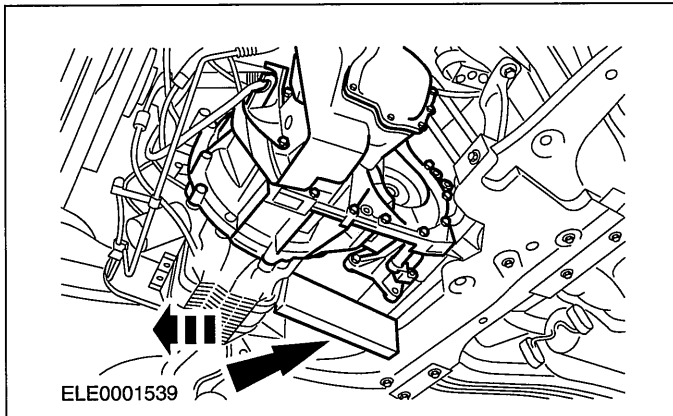
Using a suitable transmission jack, support the transaxle.



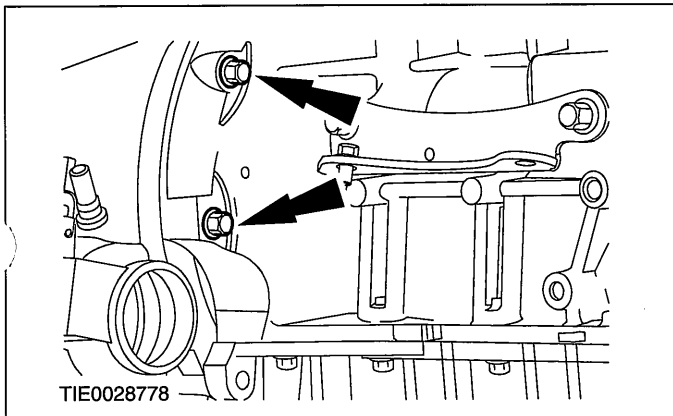
- 36. Remove the torque converter retaining nuts.**

REMOVAL AND INSTALLATION

39. Tilt the engine and transaxle assembly forwards and insert a suitable wooden block.



40. Remove the transaxle right-hand retaining bolts.



41. **⚠ CAUTION:** Make sure the torque converter remains in the transaxle.
Using the transmission jack and remove the transaxle.

Installation

1. **⚠ CAUTION:** The torque converter must remain at the correct installation depth during the entire installation.

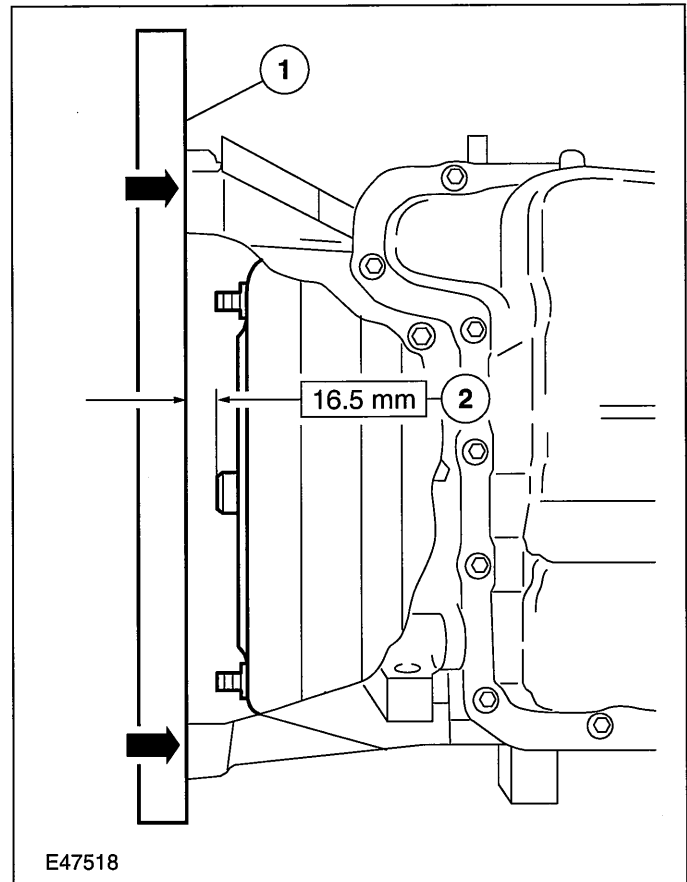
NOTE: Before installing the bolts in the transmission, the torque converter studs must be aligned with the holes in the drive plate.

Install the torque converter.

- Lubricate the torque converter centering spigot with grease.
2. **⚠ CAUTION:** The torque converter hub must engage fully with the oil pump drive gear.

Check the installation depth of the torque converter.

1. Lay a straight edge on the transaxle flange.
2. Check the installation depth between the transaxle flange and the torque converter centering spigot.



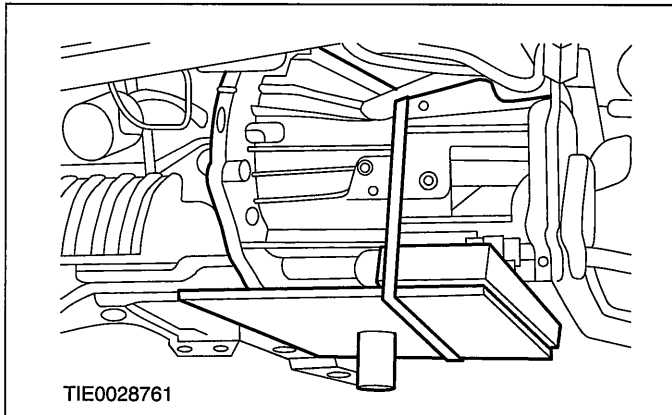
3. **⚠ CAUTION:** The torque converter must remain at the correct installation depth during the entire installation.

NOTE: Secure the transmission with the securing strap.

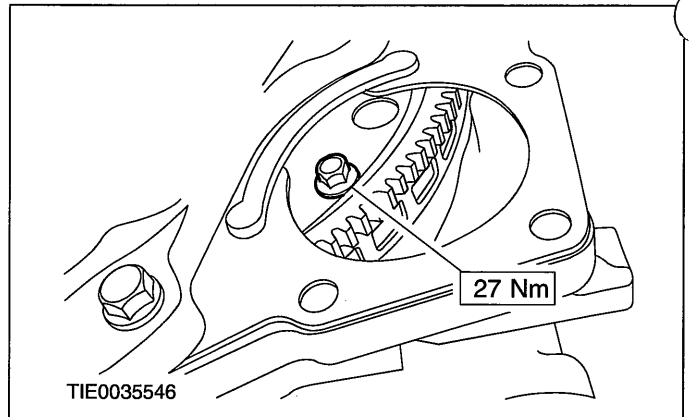
NOTE: Make sure that the two locating dowels are installed.

REMOVAL AND INSTALLATION

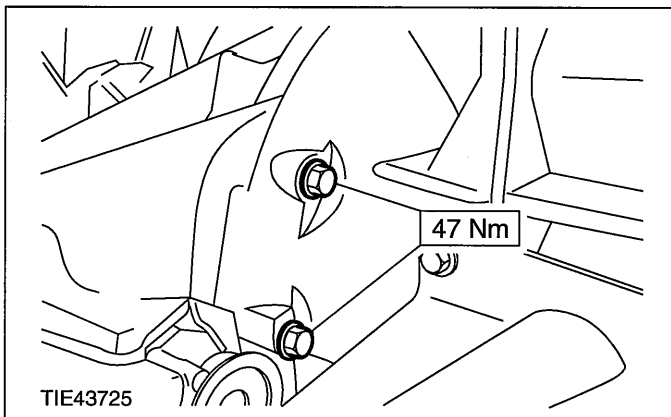
Using a suitable transmission jack, install the transaxle.



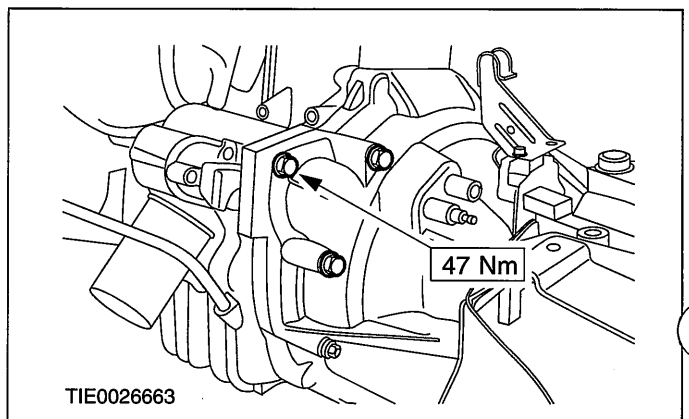
1. Rotate the torque converter to gain access to the nut bolts.



4. Install the transaxle right-hand retaining bolts.



10. Install the starter motor.

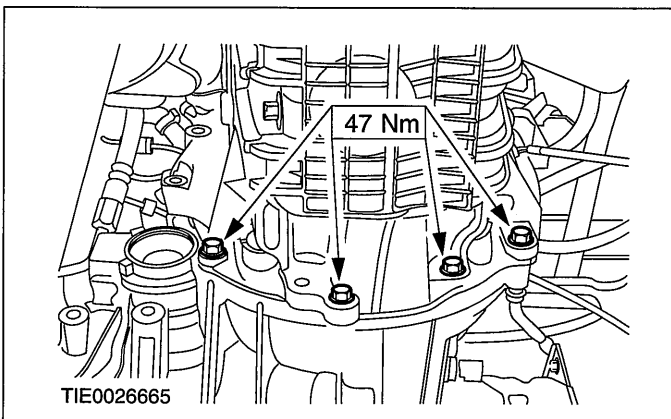


5. Remove the wooden block.

6. Remove the securing strap.

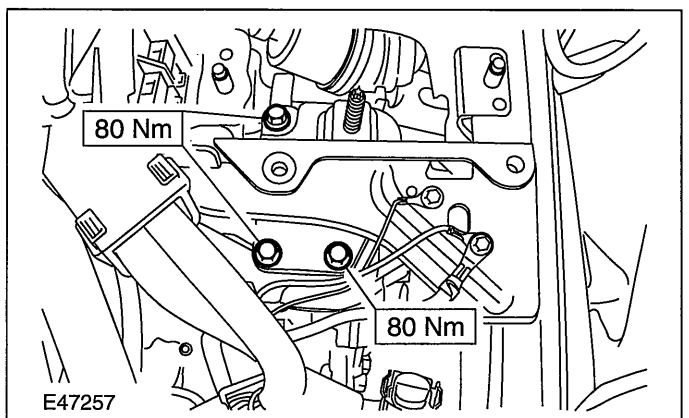
7. Remove the transmission jack.

8. Install the transaxle lower retaining bolts.



11. Lower the vehicle.

12. Install the engine and transaxle rear mount retaining bracket.

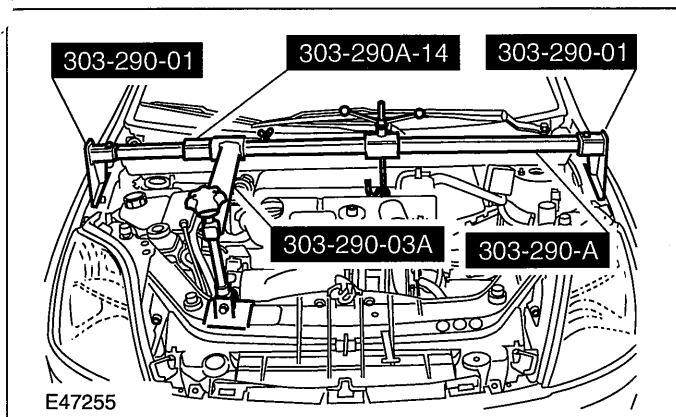


9. **NOTE:** Install new torque converter retaining nuts.

Install the torque converter retaining nuts.

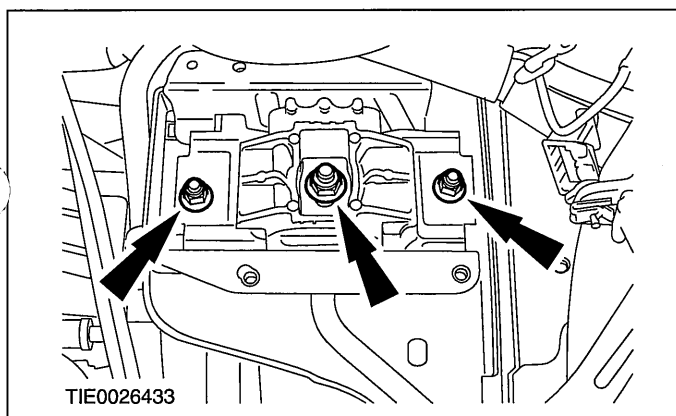
REMOVAL AND INSTALLATION

13. Using the special tools, raise the engine and transaxle assembly.

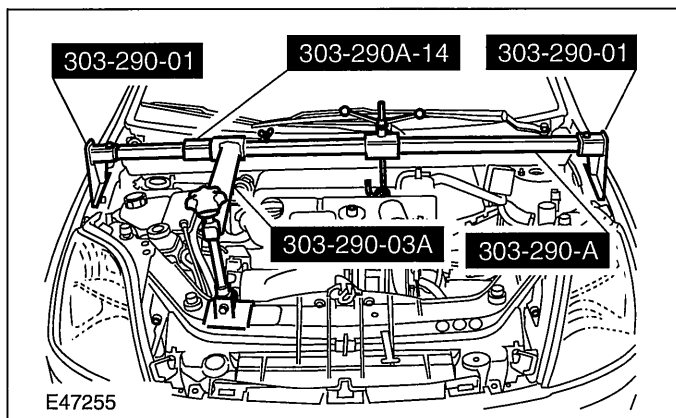


14. **NOTE:** Do not tighten the engine rear mount retaining nuts at this stage.

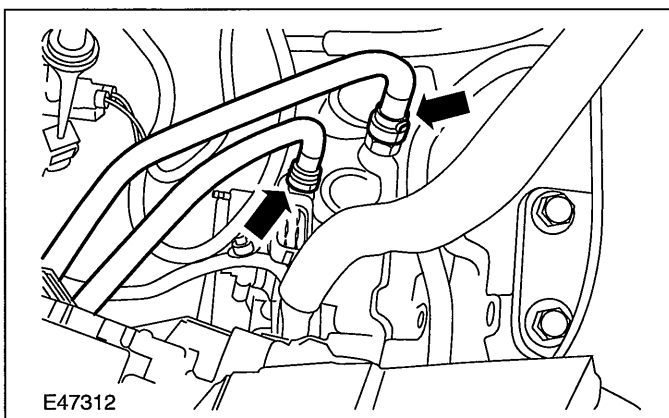
NOTE: Install new engine rear mount retaining nuts.
Install the engine rear mount retaining nuts.



15. Remove the special tools.



16. Attach the transmission fluid cooler feed and return lines to the automatic transmission.



17. Raise and support the vehicle.

For additional information, refer to: **Lifting**
(100-02 Jacking and Lifting, Description
and Operation).

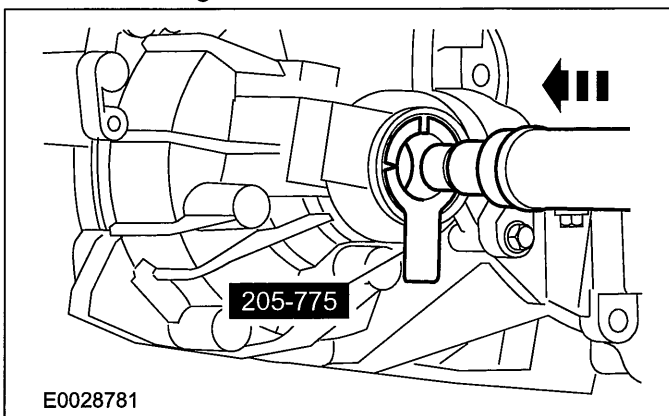
18. **CAUTIONS:**

⚠ The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft seal.

Attach the right-hand halfshaft and the intermediate shaft to the transaxle.

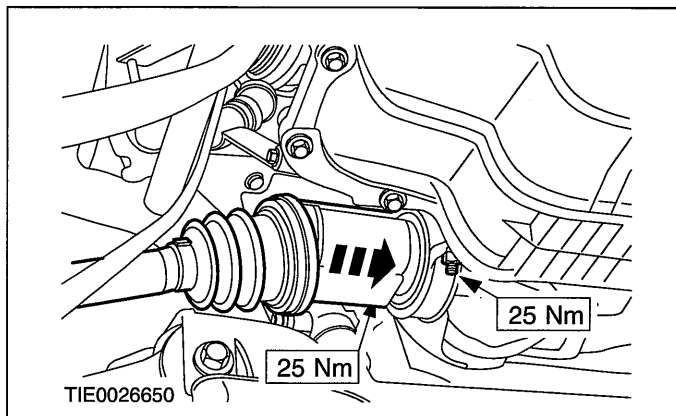
- Remove the protective sleeve before fully installing the halfshaft.



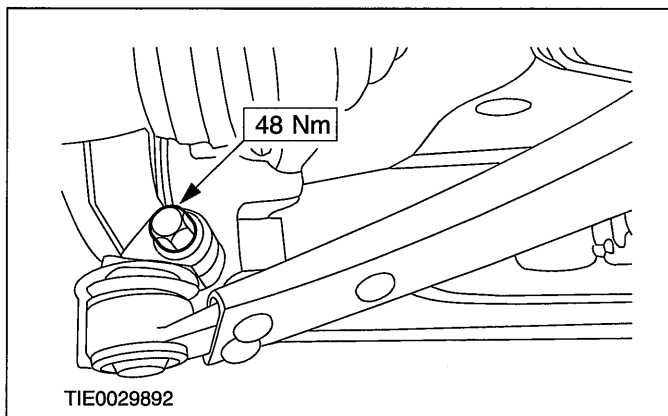
19. **NOTE:** Install a new center bearing cap and locknuts.

REMOVAL AND INSTALLATION

Install the intermediate shaft center bearing cap.



Attach the lower arm to the wheel knuckle on both sides.



20. CAUTIONS:

⚠ The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

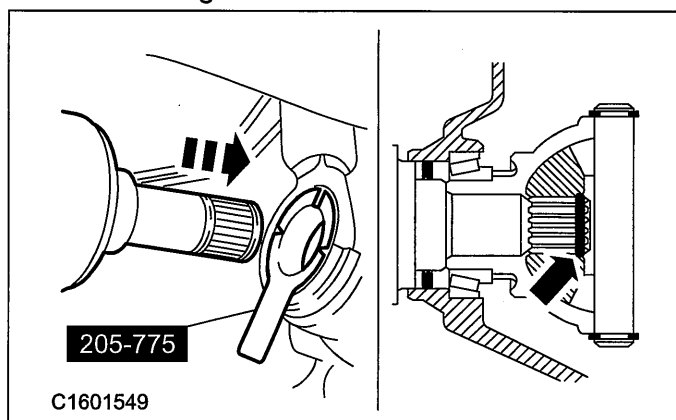
⚠ Do not damage the halfshaft seal.

⚠ Make sure the snap ring is correctly seated.

NOTE: Install a new snap ring.

Attach the left-hand halfshaft to the transaxle.

- Remove the protective sleeve before fully installing the halfshaft.



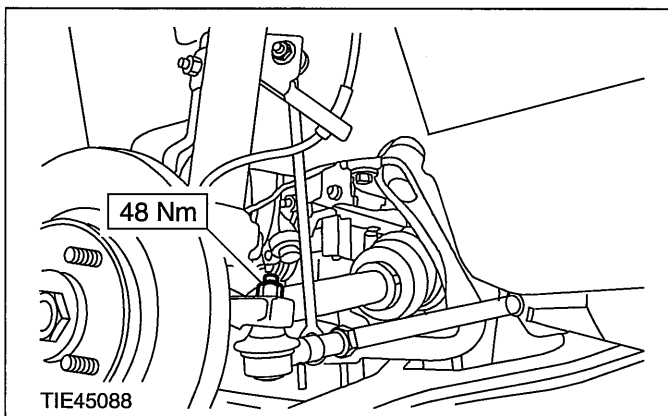
21. ⚠ **CAUTION:** Make sure that the heat shield is installed to prevent damage to the ball joint.

NOTE: The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

22. ⚠ **WARNING:** Install a new tie-rod end retaining nut. Failure to follow this instruction may result in personal injury.

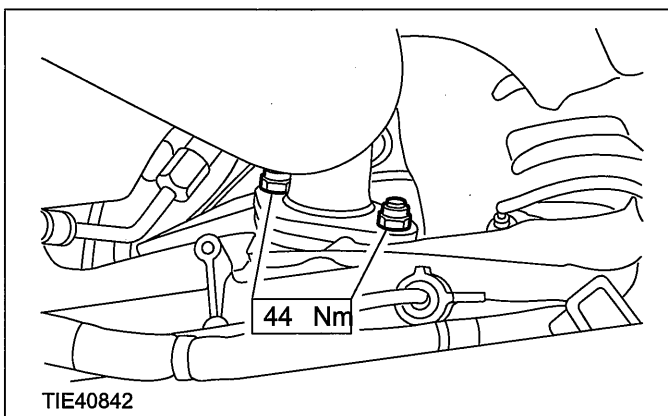
NOTE: Use a 5 mm Allen key to prevent the ball joint stud from rotating.

Attach the right-hand tie-rod end to the wheel knuckle.



23. **NOTE:** Install new exhaust flange nuts and a new exhaust flange gasket.

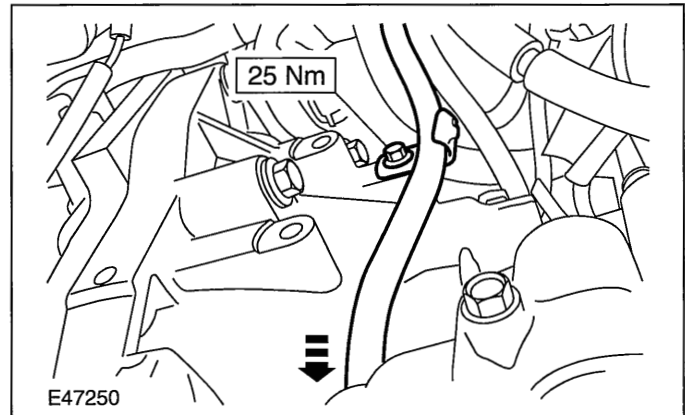
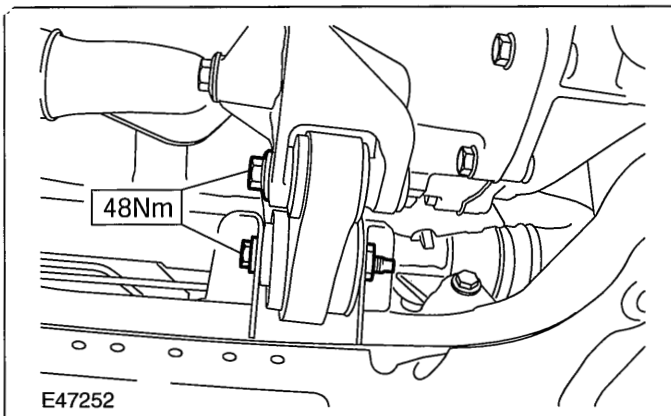
Attach the exhaust flexible pipe to the catalytic converter.



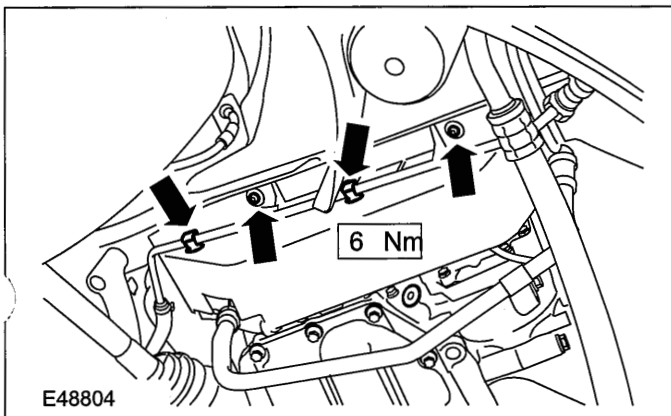
REMOVAL AND INSTALLATION

24. Remove the exhaust flexible pipe support.
25. Install the engine support insulator.

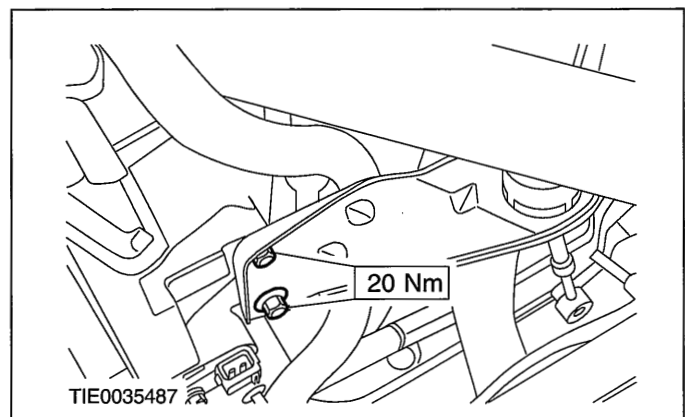
Install the transmission fluid level indicator tube to the transaxle.



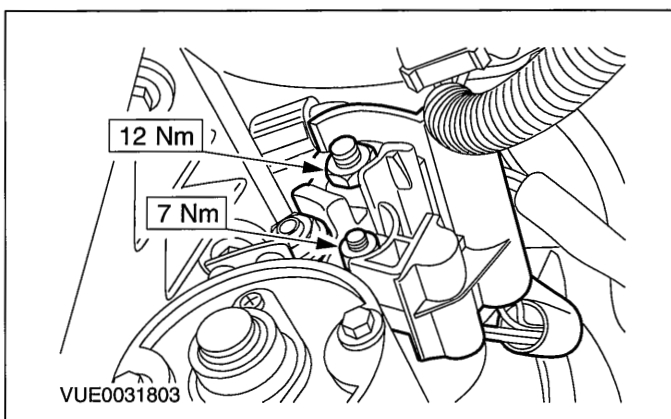
26. Install the accessory drive belt cover.



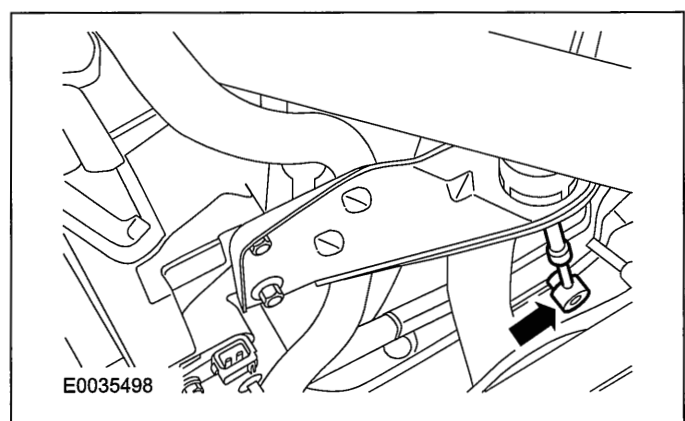
29. Attach the selector lever cable retaining bracket to the transaxle.



27. Connect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables.



30. Attach the selector lever cable to the manual shift lever.



28. **CAUTION:** Make sure the transmission fluid level indicator tube is fully located in the transmission housing.

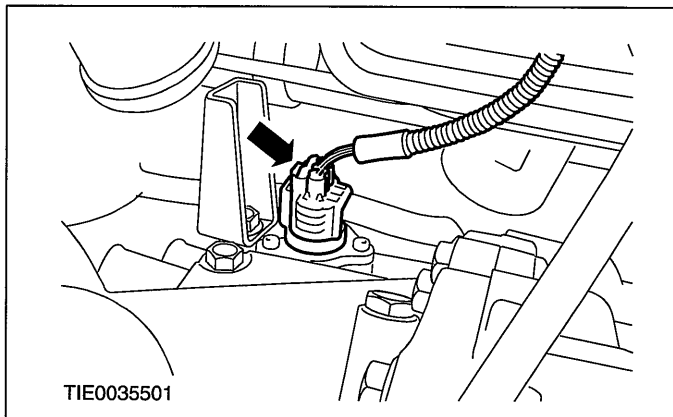
31. Adjust the selector lever cable.

For additional information, refer to: Selector Lever Cable Adjustment (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).

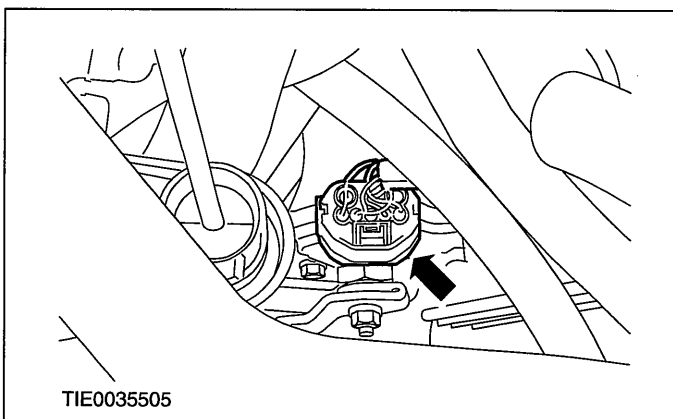
REMOVAL AND INSTALLATION

32. Lower the vehicle.

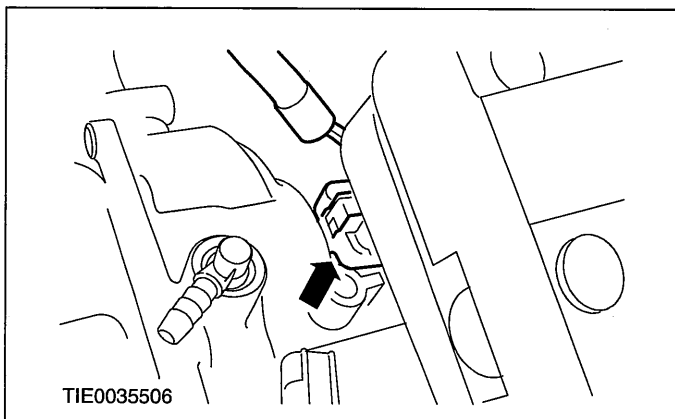
33. Connect the vehicle speed sensor (VSS) electrical connector.



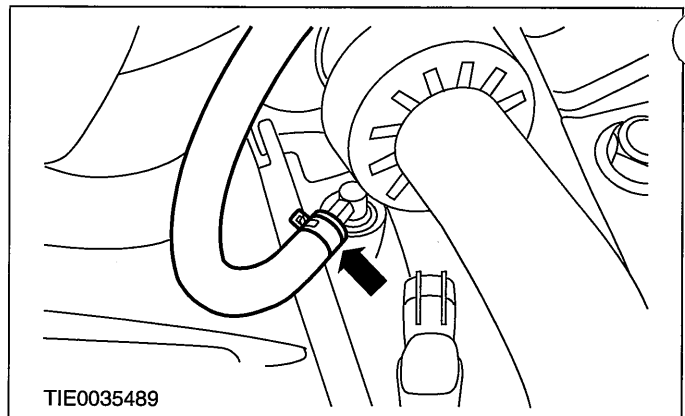
34. Connect the transmission range (TR) sensor electrical connector.



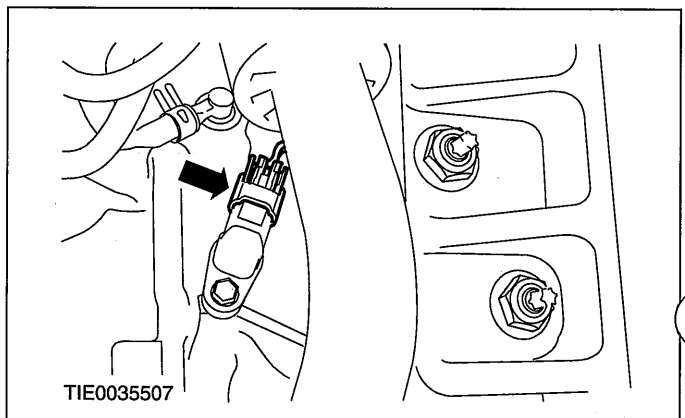
35. Connect the transaxle wiring harness electrical connector.



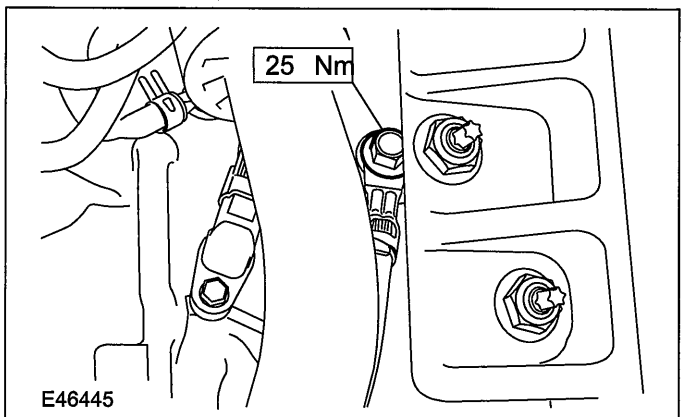
36. Connect the transaxle breather hose.



37. Connect the turbine shaft speed (TSS) sensor electrical connector.

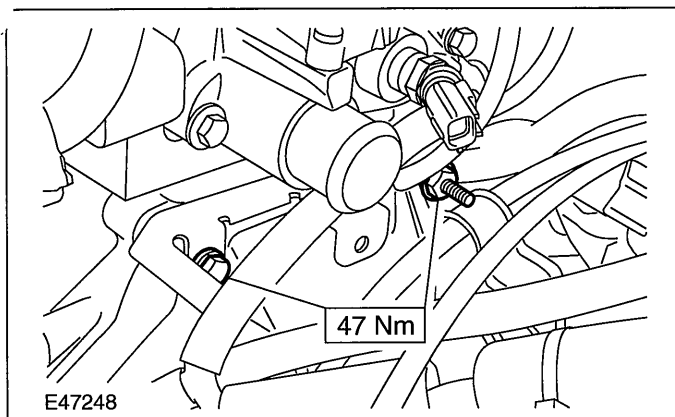


38. Attach the ground cable to the transaxle.

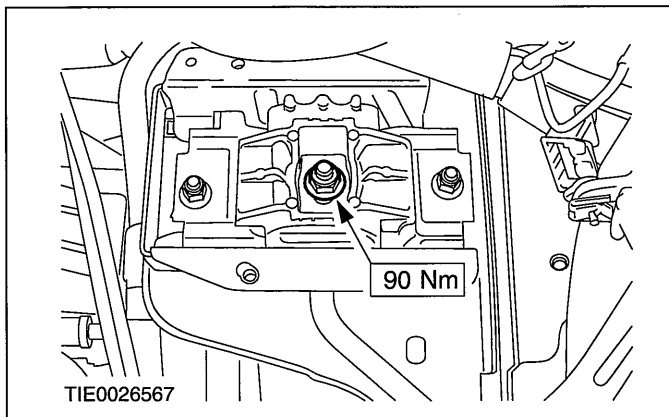


REMOVAL AND INSTALLATION

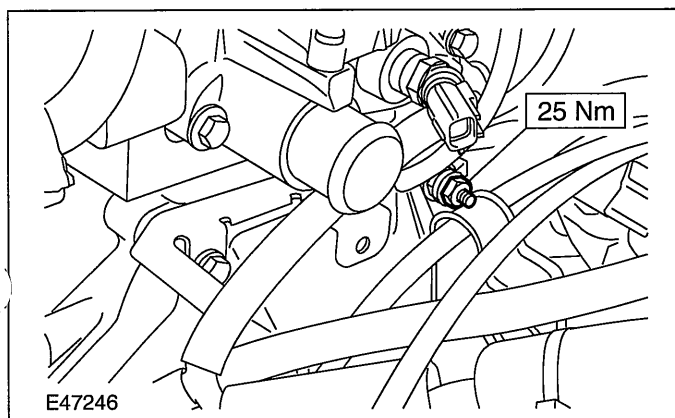
39. Install the engine wiring harness support brackets.



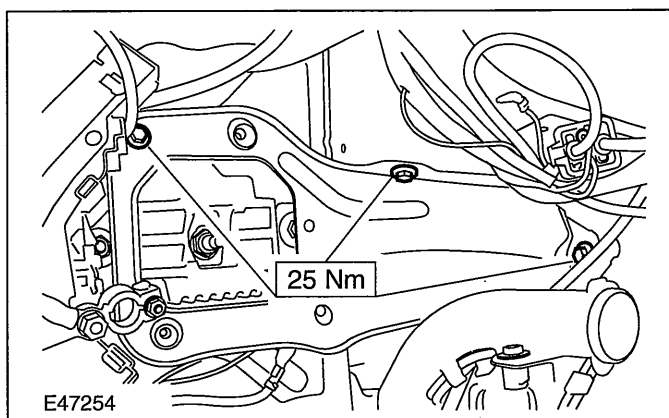
42. Tighten the engine rear mount center retaining nut.



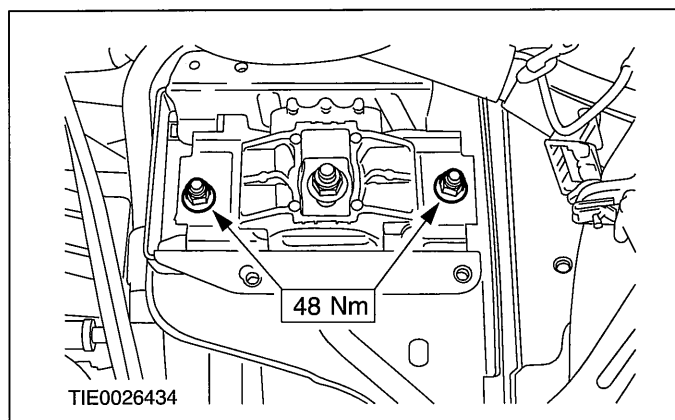
40. Attach the engine ground cable to the transaxle.



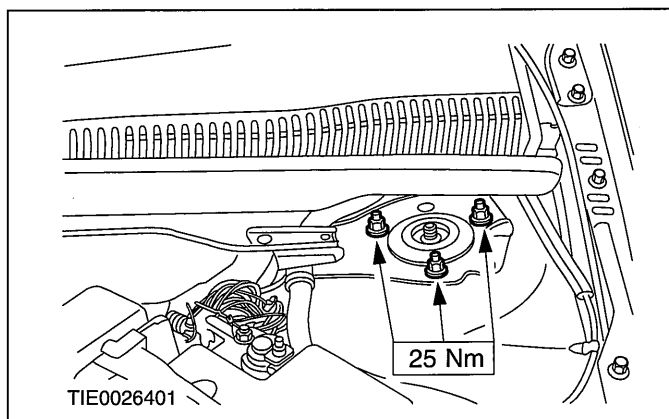
43. Install the battery tray support bracket.



41. Tighten the engine rear mount outer retaining nuts.



44. Tighten the strut and spring assembly top mount retaining nuts on both sides.



45. Install the front wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

REMOVAL AND INSTALLATION

46. Install the battery tray.

For additional information, refer to: **Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).**

47. Connect the powertrain control module (PCM) electrical connector to the PCM.

For additional information, refer to: **Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation).**

48. Install the air cleaner.

For additional information, refer to: **Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).**

49. Check the transmission fluid level and top up with clean automatic transmission fluid if necessary.

For additional information, refer to: **Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).**

50. NOTE: Only carry out the following step when a new transaxle has been installed.

Using worldwide diagnostic system (WDS), reset the transmission control module (TCM).

SECTION 307-02 Transmission/Transaxle Cooling — Vehicles With: 4-Speed Automatic Transmission (AW81-40)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	307-02-2
DESCRIPTION AND OPERATION	
Transaxle Cooling.....	307-02-3
Cooling circuit.....	307-02-3
REMOVAL AND INSTALLATION	
Transmission Fluid Cooler.....	(17 834 0) 307-02-4
Transmission Fluid Cooler Tubes.....	(17 857 0) 307-02-6

**Transmission/Transaxle Cooling — Vehicles
With: 4-Speed Automatic Transmission
(AW81-40)**

307-02-2

307-02-2

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

▲ WARNING: Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

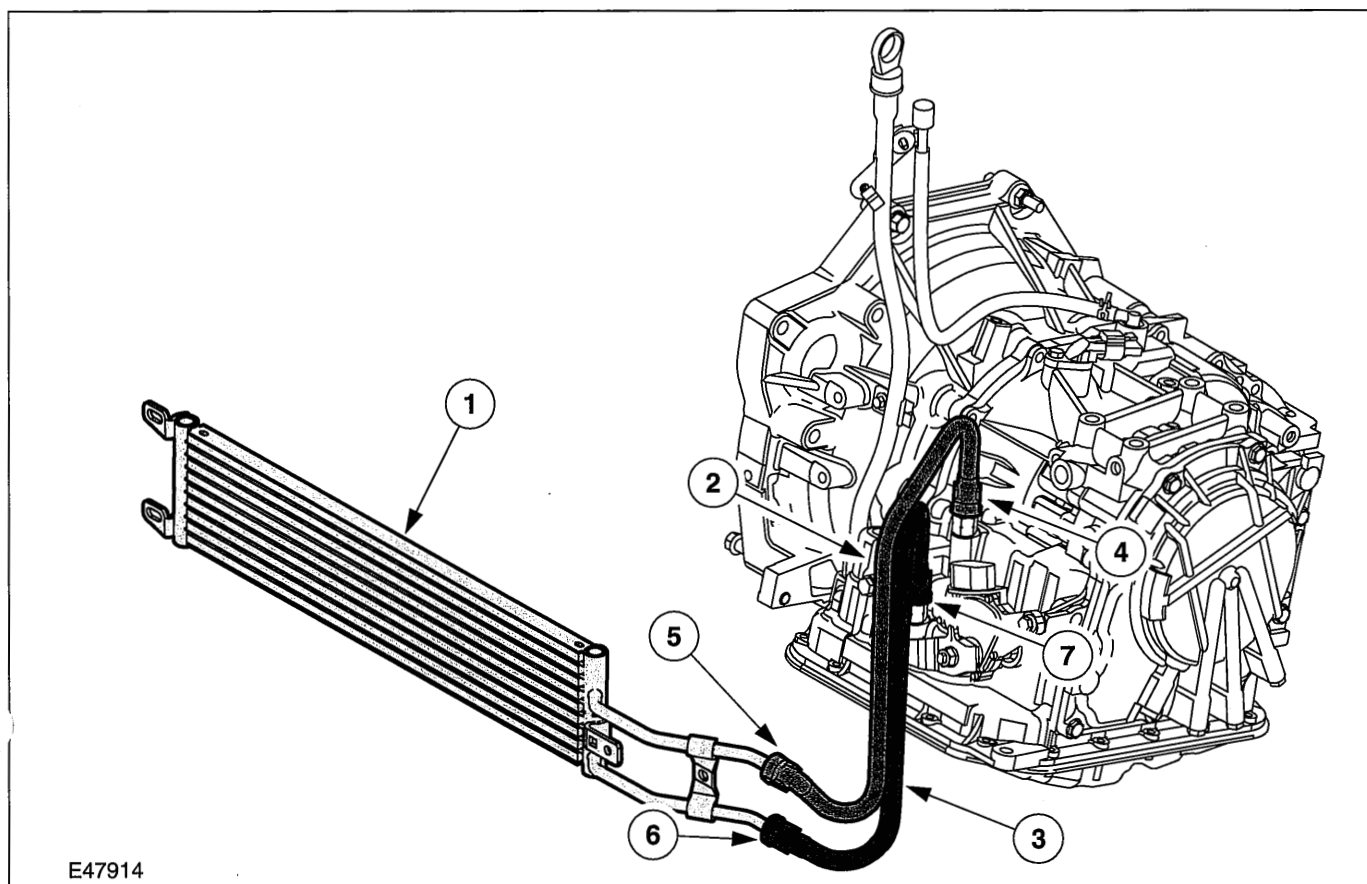
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).
See - Transmission Fluids.

Item	Specification
Automatic transmission fluid	WSS-M2C924-A

DESCRIPTION AND OPERATION

Transaxle Cooling

Cooling circuit

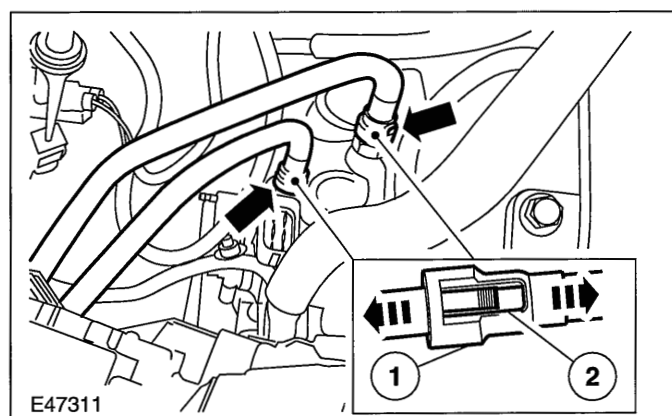


Item	Description
1	Transmission fluid cooler
2	To the transmission fluid cooler
3	From the transmission fluid cooler
4	Red markings
5	Yellow markings
6	Blue markings
7	Black markings

The transmission fluid cooler is positioned in front of the radiator.

It is connected to the transmission by means of two hose lines with quick-release couplings.

The quick-release couplings are colour-coded to prevent them from being mixed up.



Item	Description
1	Quick-release coupling
2	Colour coding

The bumper needs to be disassembled in order to remove the transmission fluid cooler.

To release the quick-release couplings, first press the quick-release coupling together and press it towards the radiator or transmission connector and then pull it back to release it.

REMOVAL AND INSTALLATION

Transmission Fluid Cooler(17 834 0)

Removal

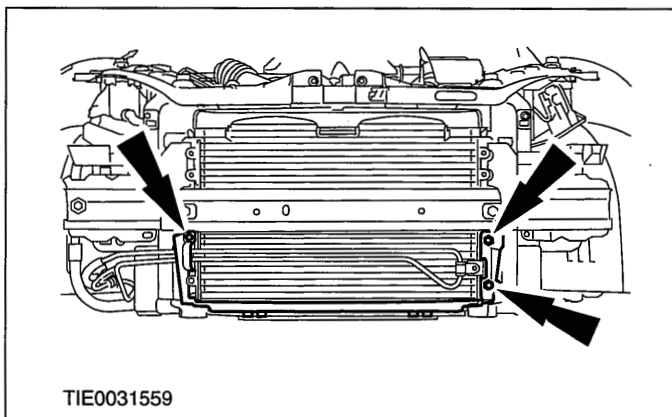
- ▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

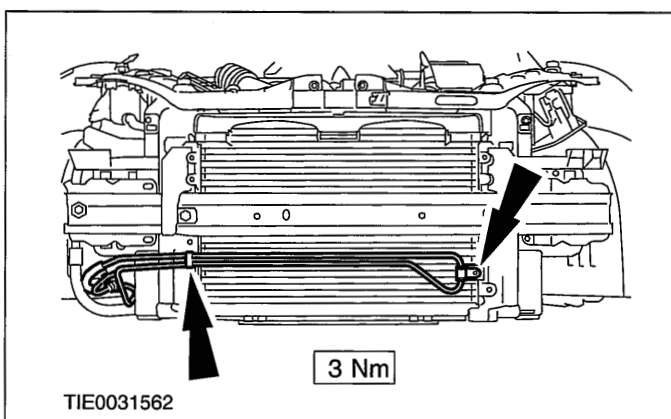
1. Remove the front bumper cover.

For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

2. Remove the radiator air deflector.



3. Detach the power steering fluid line from the radiator grille.



4. ▲ **WARNING:** When releasing the transmission fluid, take care to prevent scolding. Failure to follow this instruction may result in personal injury.

- ⚠ **CAUTION:** Plug the transmission fluid cooler lines to prevent fluid loss or dirt ingress.

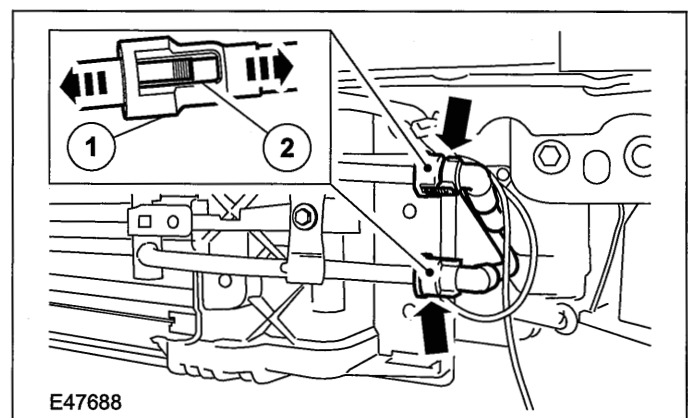
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation). See - Transmission Fluids.

NOTE: Mark the position of the feed and return lines to aid installation.

Detach the transmission fluid lines from the transmission fluid cooler.

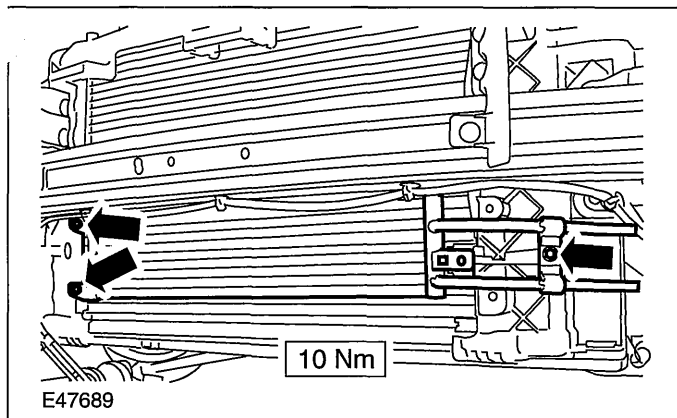
1. Push the transmission fluid cooler line quick release connector toward the transmission fluid cooler.
 2. Press together the retaining tabs and detach the transmission fluid line from the transmission fluid cooler.
- Allow the fluid to drain into a suitable container.

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



REMOVAL AND INSTALLATION

5. Remove the transmission fluid cooler.



Installation

1. **NOTE:** Make sure the transmission fluid cooler lines are installed in the correct positions.

To install, reverse the removal procedure.

2. Check the transmission fluid level and top up with clean automatic transmission fluid if necessary.

For additional information, refer to:

Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).

REMOVAL AND INSTALLATION

Transmission Fluid Cooler Tubes(17 857 0)

Removal

- ▲ **WARNING:** Refer to the Material Safety Data Sheets for the Automatic Transmission Fluid E-AW. Failure to follow this instruction may result in personal injury. Certain Transmission and Power Steering fluids supplied to Ford contain additives which may cause skin irritation or other skin reactions after contact.

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

1. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

2. ▲ **WARNING:** When releasing the transmission fluid, take care to prevent scolding. Failure to follow this instruction may result in personal injury.

- ⚠ **CAUTION:** Plug the transmission fluid cooler lines to prevent fluid loss or dirt ingress.

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

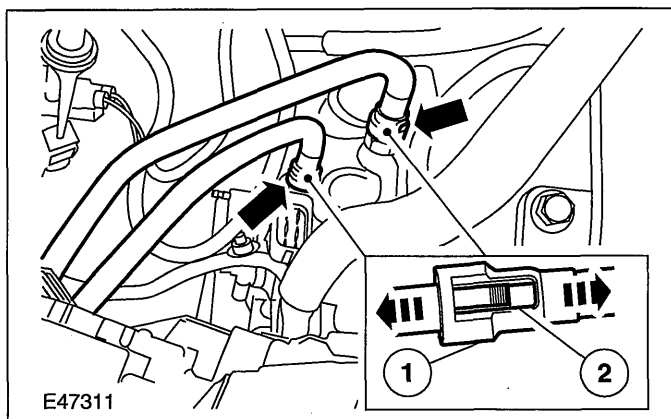
NOTE: Mark the position of the feed and return lines to aid installation.

Detach the transmission fluid cooler lines from the transmission.

1. Push the transmission fluid cooler line quick release connector toward the transmission.
 2. Press together the retaining tabs and detach the transmission fluid cooler line from the automatic transmission.
- Allow the fluid to drain into a suitable container.

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

See - Transmission Fluids.



3. ▲ **WARNING:** When releasing the transmission fluid, take care to prevent scolding. Failure to follow this instruction may result in personal injury.

- ⚠ **CAUTION:** Plug the transmission fluid cooler lines to prevent fluid loss or dirt ingress.

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

NOTE: Mark the position of the feed and return lines to aid installation.

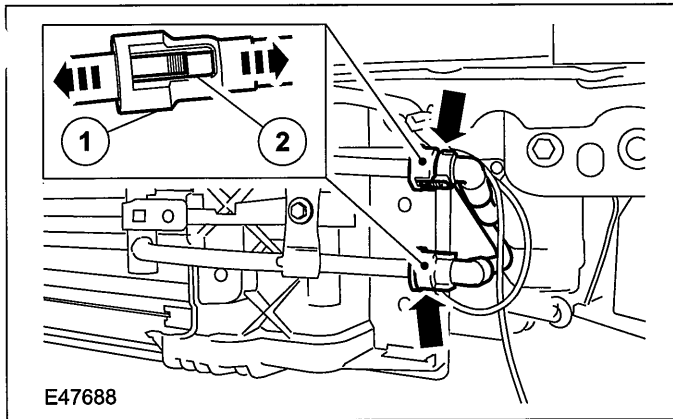
Remove the transmission fluid cooler lines.

1. Push the transmission fluid cooler line quick release connector toward the transmission fluid cooler.
 2. Press together the retaining tabs and detach the transmission fluid cooler line from the transmission fluid cooler.
- Allow the fluid to drain into a suitable container.

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

REMOVAL AND INSTALLATION

See - Transmission Fluids.



Installation

1. **NOTE:** Make sure the transmission fluid cooler lines are installed in the correct positions.
To install, reverse the removal procedure.
2. Check the transmission fluid level and top up with clean automatic transmission fluid if necessary.

For additional information, refer to:
Transmission Fluid Level Check (307-01
Automatic Transmission/Transaxle -
Vehicles With: 4-Speed Automatic
Transmission (AW81-40), General
Procedures).

SECTION 307-05 Automatic Transmission/Transaxle External Controls — Vehicles With: 4-Speed Automatic Transmission (AW81-40)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	307-05-2
DESCRIPTION AND OPERATION	
External Controls.....	307-05-3
Selector lever cable.....	307-05-3
GENERAL PROCEDURES	
Selector Lever Cable Adjustment.....	307-05-5
REMOVAL AND INSTALLATION	
Brake Shift Interlock Actuator.....	307-05-6
Selector Lever Cable.....	307-05-7
Selector Lever.....	307-05-10
Selector Lever Bezel.....	307-05-12
Selector Lever Knob.....	307-05-13
DISASSEMBLY AND ASSEMBLY	
Selector Lever.....	307-05-14

**Automatic Transmission/Transaxle External
Controls — Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

307-05-2

307-05-2

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Grease	S-M1C1021-A

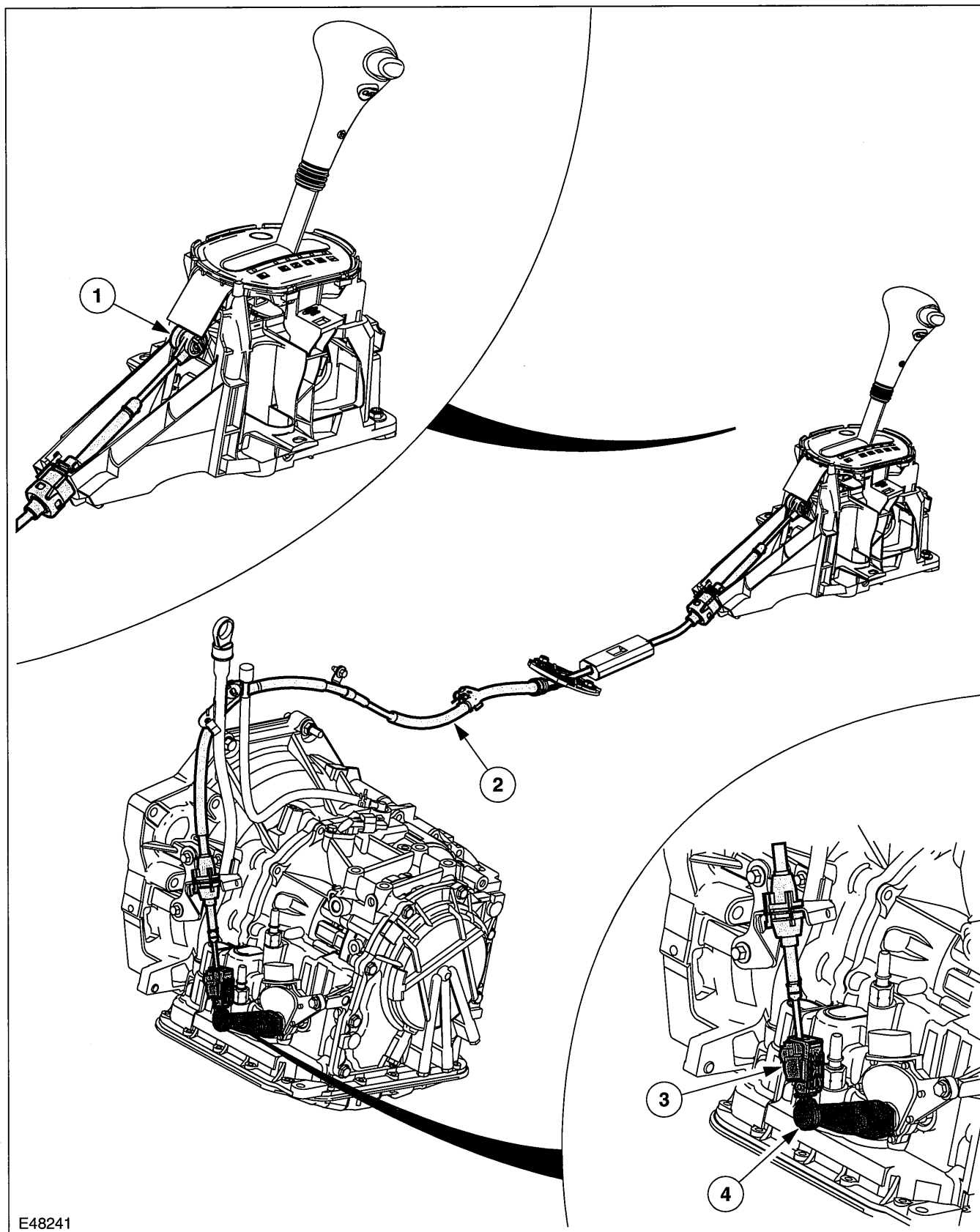
Torque Specifications

Description	Nm	lb-ft	lb-in
Selector lever cable grommet	9	—	80
Selector lever assembly	9	—	80

DESCRIPTION AND OPERATION

External Controls

Selector lever cable



E48241

DESCRIPTION AND OPERATION

Item	Description
1	Ball head
2	Selector lever cable
3	Adjustment device
4	Selector shaft lever

The selector lever cable is clipped onto a ball head on the selector lever.

At the transmission end it is clipped onto the ball head on the selector shaft lever.

The cable is moved in an axial direction by operation of the selector lever.

The selector shaft lever converts the axial motion into a rotation of the selector shaft.

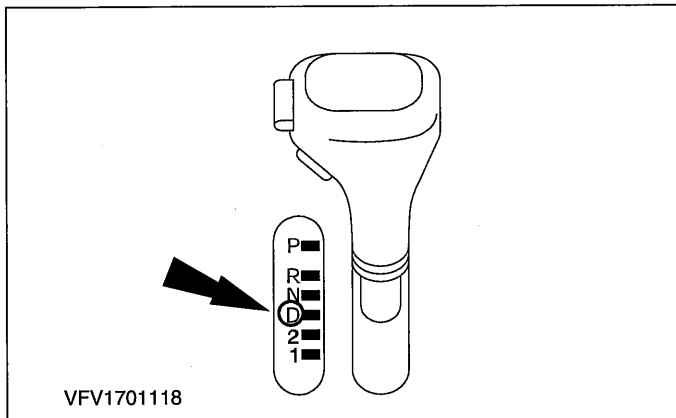
The adjustment device for the selector lever cable is located at the transmission end of the cable.

GENERAL PROCEDURES

Selector Lever Cable Adjustment

Adjustment

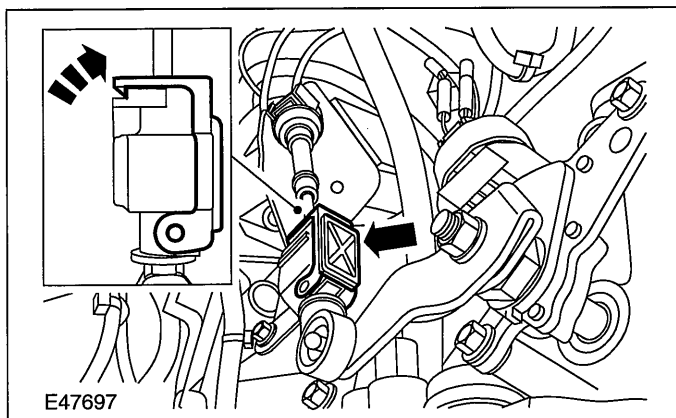
1. Shift the selector lever to the "D" (DRIVE) position.



2. Raise and support the vehicle.

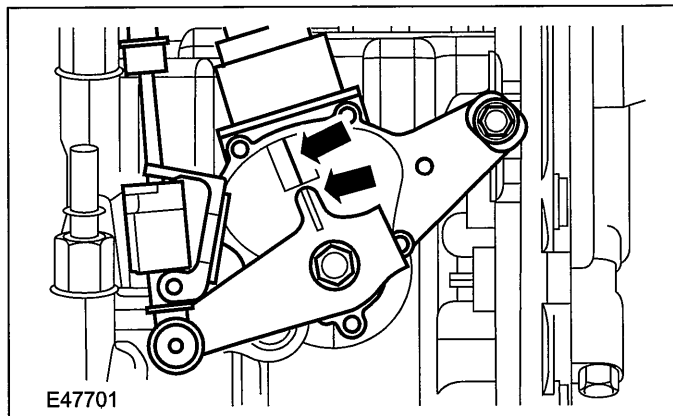
For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

3. Release the selector lever cable adjustment mechanism locking clip.



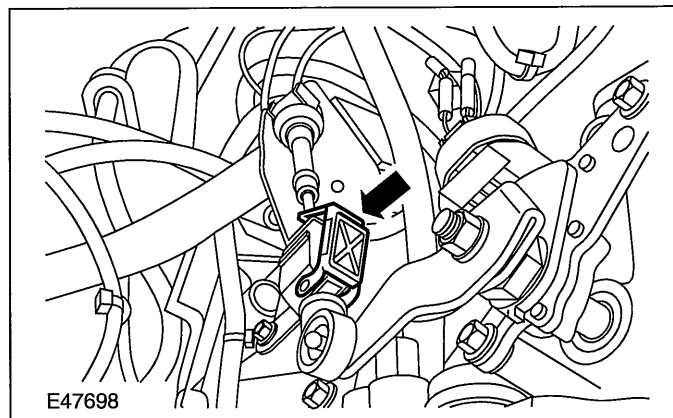
4. NOTE: In the "D" (DRIVE) position the transmission range (TR) sensor locking washer pointer will be aligned with the line scribed on the TR sensor body.

Move the transaxle selector lever to the "D" (DRIVE) position.



5. NOTE: Ensure that the selector lever cable adjustment mechanism is locked.

Press in the selector lever cable adjustment mechanism locking clip fully.



6. Lower the vehicle.

7. Start the engine and move the selector lever through all the gear positions. Wait until each gear engages when moving through the gear positions.

8. Check that the selector lever position indicator corresponds to the position of the selector lever, repeat the adjustment procedure if necessary.

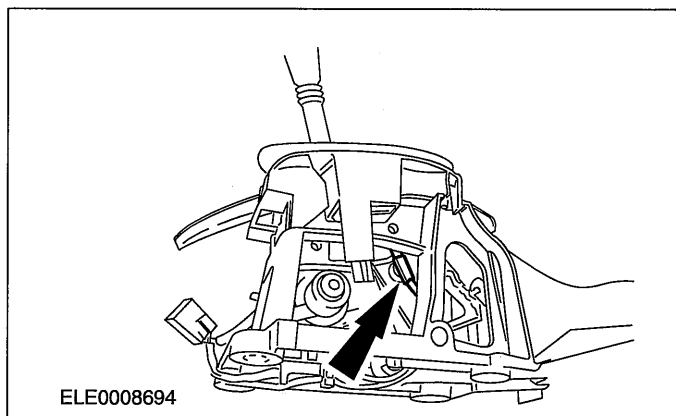
9. Move the selector lever into the "P" (PARK) position and switch off the engine.

REMOVAL AND INSTALLATION

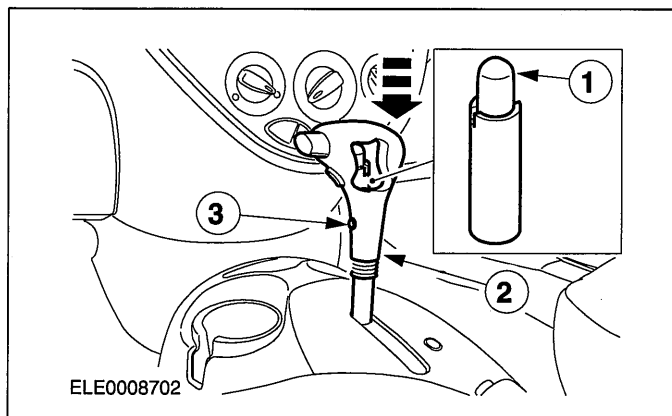
Brake Shift Interlock Actuator

Removal

1. Remove the floor console.
2. Disconnect the overdrive (O/D) switch electrical connector (selector lever assembly shown removed for clarity).



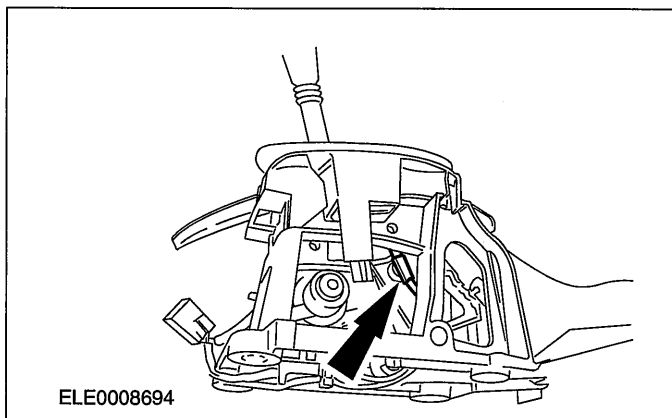
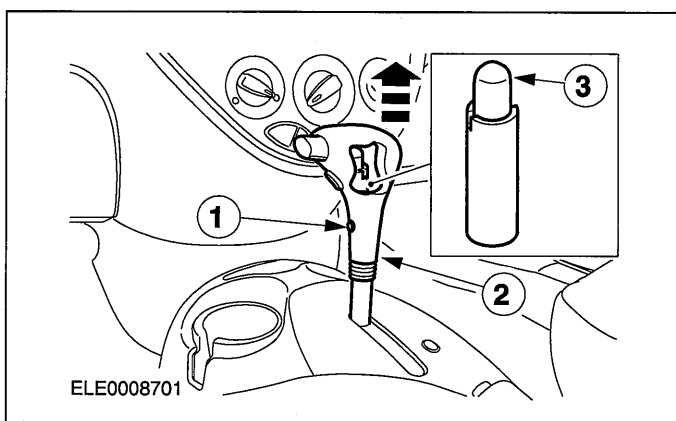
3. Install the bolt.



2. Connect the O/D switch electrical connector (selector lever assembly shown removed for clarity).

3. Remove the brake shift interlock actuator.

1. Remove the bolt.
2. Remove the knob.
3. Remove the brake shift interlock actuator.



3. Install the floor console.

Installation

1. Install the brake shift interlock actuator.

1. Install the brake shift interlock actuator.
2. Position the knob.

REMOVAL AND INSTALLATION

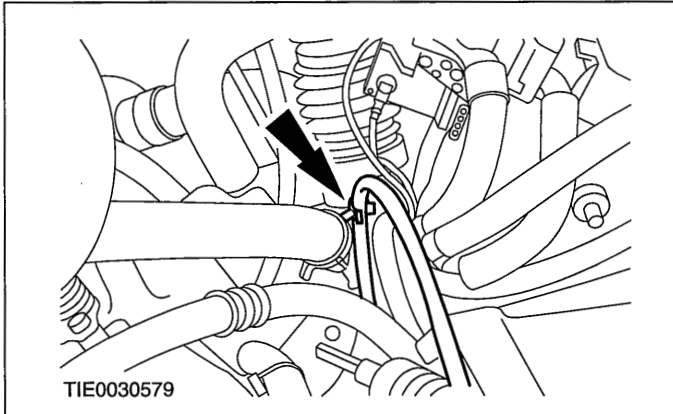
Selector Lever Cable

General Equipment

Draw cord

Removal

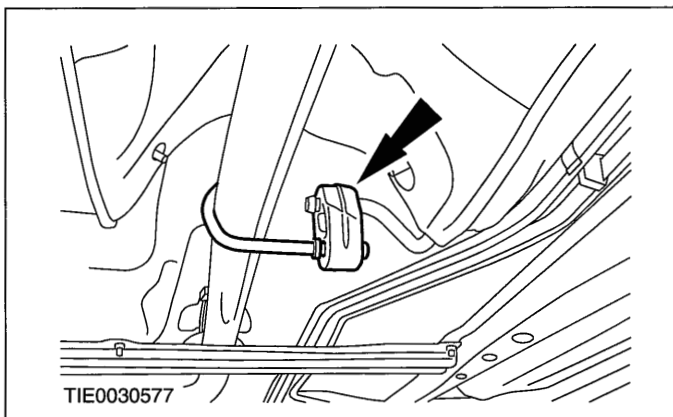
1. Detach the selector cable from the retaining clip.



2. Raise and support the vehicle.

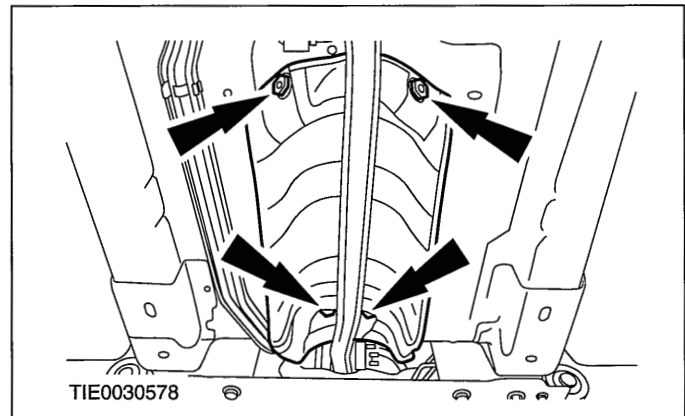
For additional information, refer to: Lifting
(100-02 Jacking and Lifting, Description
and Operation).

3. Remove the exhaust front hanger insulator.

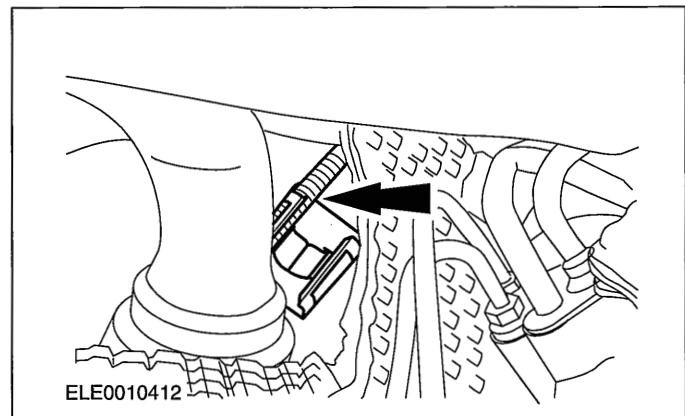


4. Detach the exhaust heat shield from the floor panel.

- Slide the heat shield backwards.

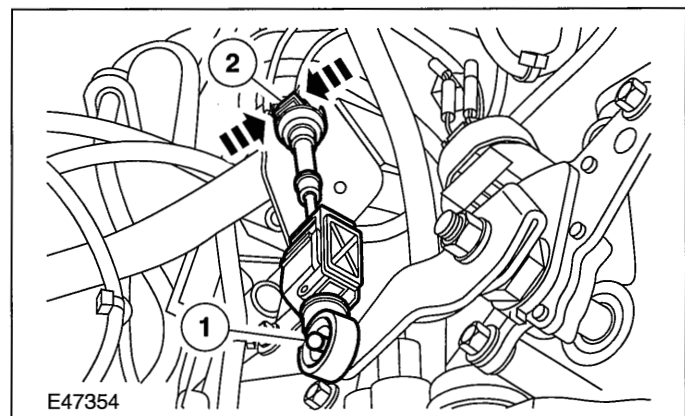


5. Unclip the selector lever cable from the right-hand side of the bracket.



6. Detach the selector lever cable from the manual shift lever.

1. Detach the selector lever cable from the manual shift lever.
2. Detach the selector lever cable from the selector lever cable bracket.



REMOVAL AND INSTALLATION

7. Attach a suitable length of draw cord to the transaxle end of the selector lever cable and secure it to the transaxle.

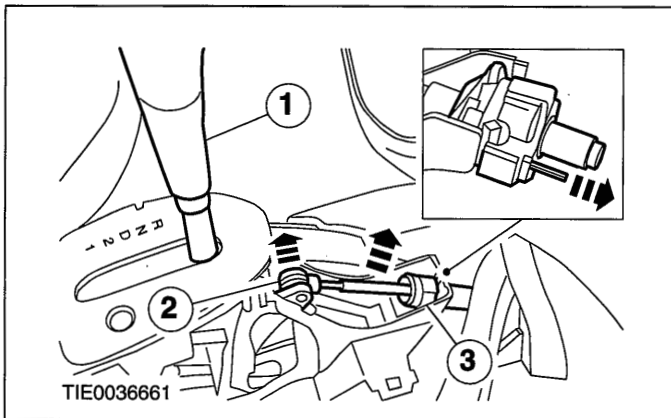
8. Lower the vehicle.

9. Remove the floor console.

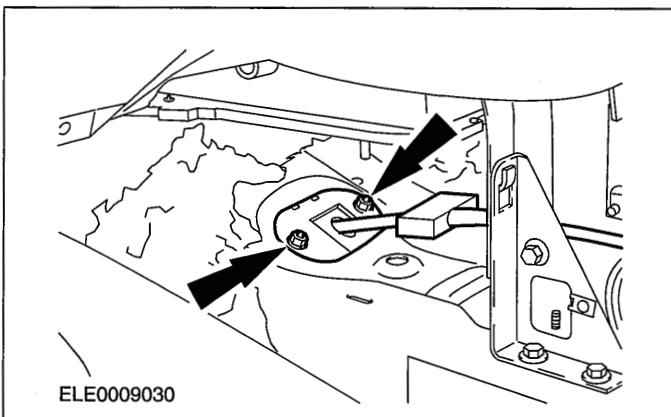
For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).

10. Detach the selector lever cable from the transmission selector lever.

1. Shift the selector lever to the "P" (PARK) position.
2. Detach the selector lever cable.
3. Pull the selector lever cable locking pin and detach the selector lever cable outer sleeve.



11. Remove the selector lever cable grommet.



12. Remove the selector lever cable.

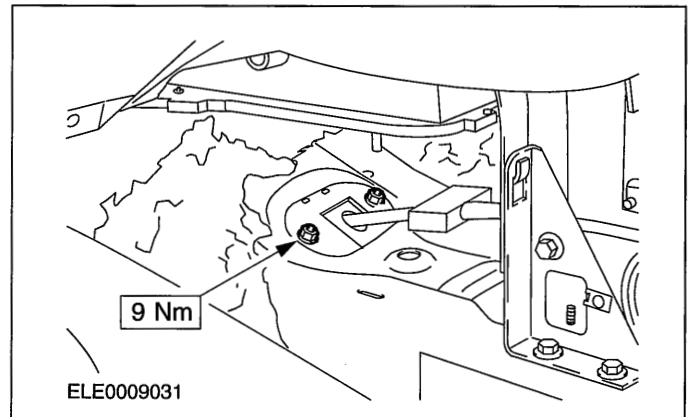
- Pull the cable and draw cord through the floor panel.

Installation

1. Attach the draw cord to the transaxle end of the selector lever cable.

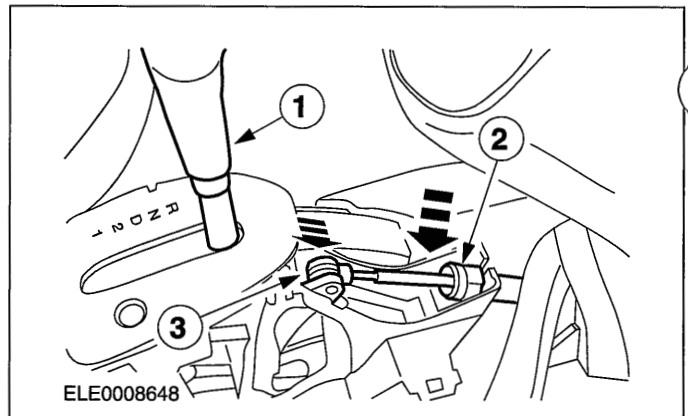
2. Using the draw cord, pull the selector lever cable through the floor panel.

3. Install the selector lever cable grommet.



4. Attach the selector lever cable to the selector lever.

1. Shift the selector lever to the "P" (PARK) position.
2. Attach the selector lever cable outer sleeve.
3. Attach the selector lever cable.



5. Install the floor console.

For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).

6. Raise and support the vehicle.

For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

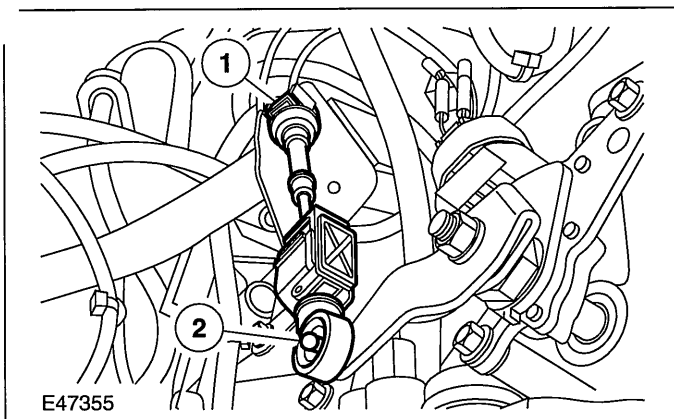
7. Remove the draw cord.

8. Attach the selector lever cable to the manual shift lever.

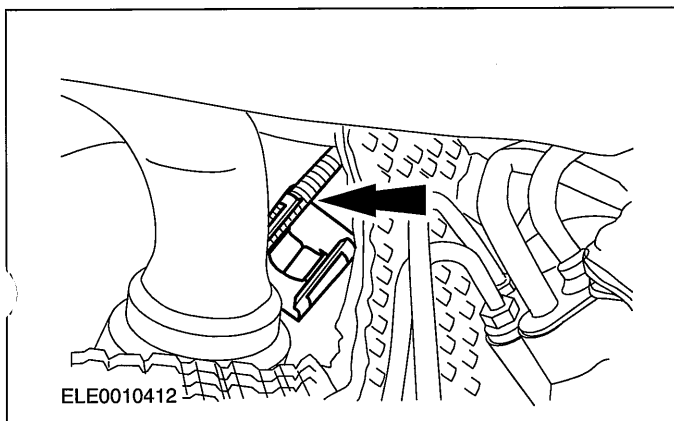
1. Attach the selector lever cable to the selector lever cable bracket.

REMOVAL AND INSTALLATION

2. Attach the selector lever cable to the manual shift lever.

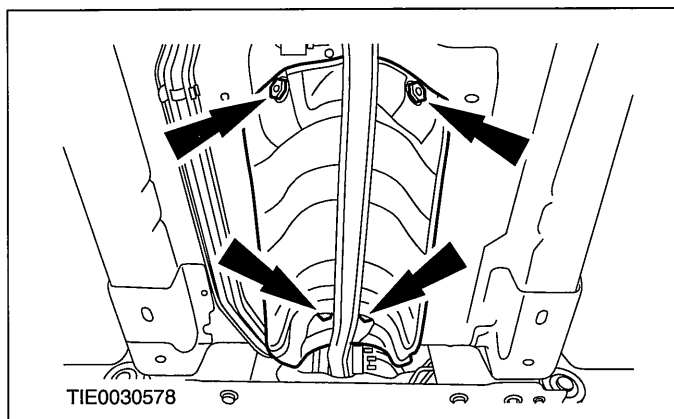


9. Clip the selector lever cable into the right-hand side of the bracket.

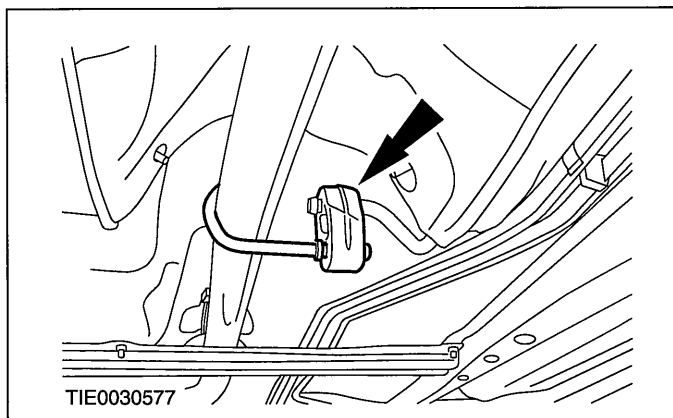


10. Attach the exhaust heat shield to the floor panel.

- Slide the heat shield forwards.

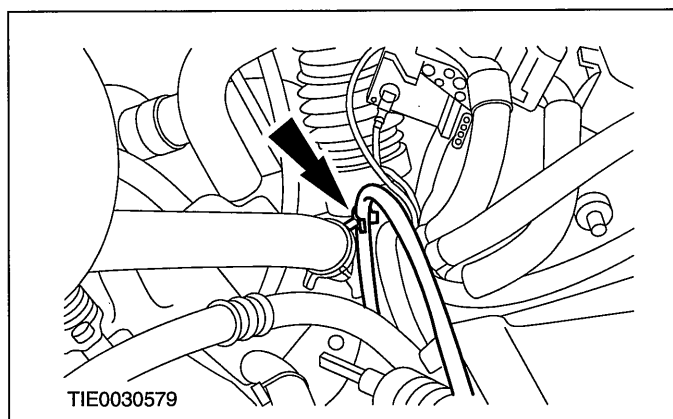


11. Install the exhaust front hanger insulator.



12. Lower the vehicle.

13. Attach the selector cable to the retaining clip.



14. Adjust the selector lever cable.

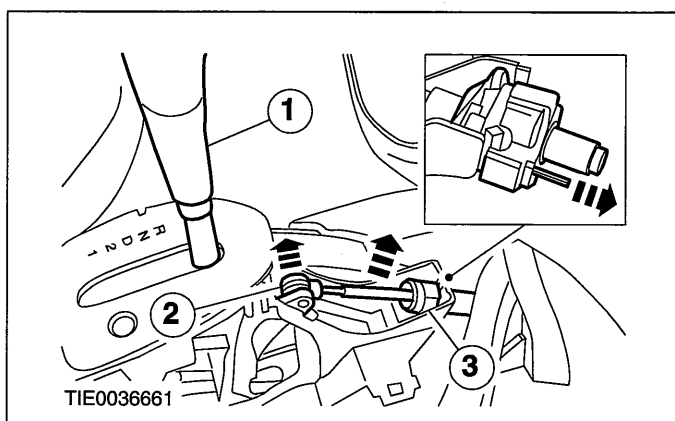
For additional information, refer to: Selector Lever Cable Adjustment (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40), General Procedures).

REMOVAL AND INSTALLATION

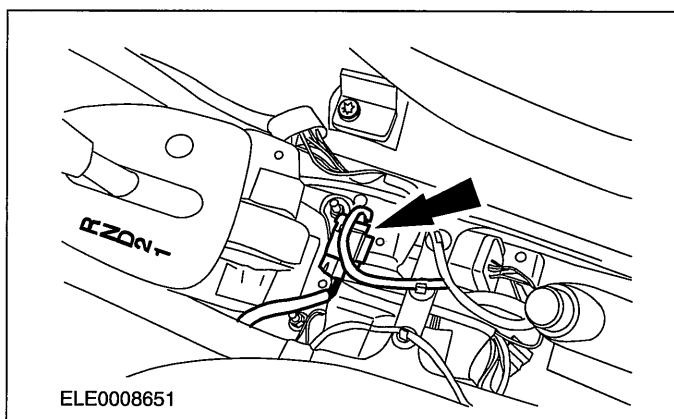
Selector Lever

Removal

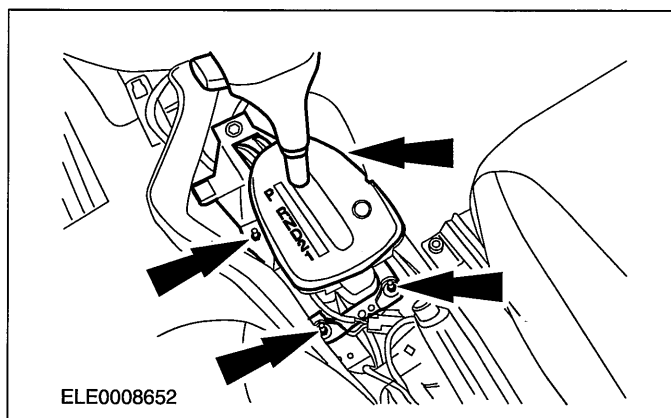
1. Remove the floor console.
2. Detach the selector lever cable from the transmission selector lever.
 1. Shift the selector lever to the "P" (PARK) position.
 2. Detach the selector lever cable.
 3. Pull the selector lever cable locking pin and detach the selector lever cable outer sleeve.



3. Disconnect the transmission selector lever electrical connector.

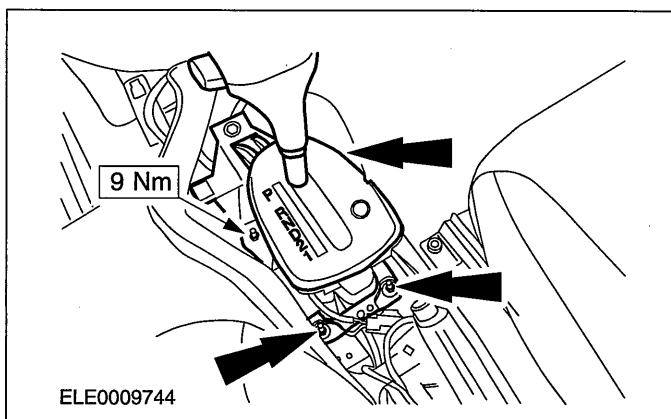


4. Remove the transmission selector lever.

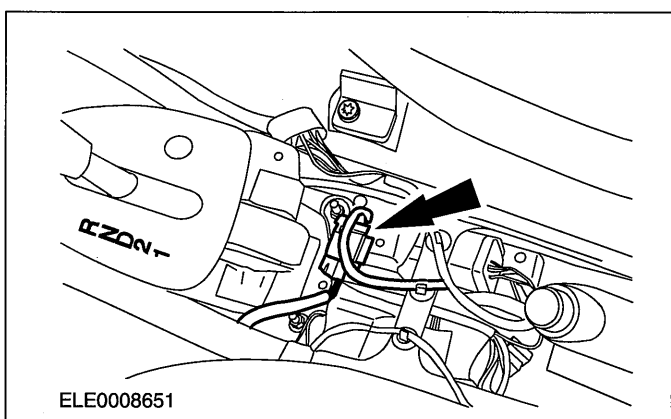


Installation

1. Install the transmission selector lever.



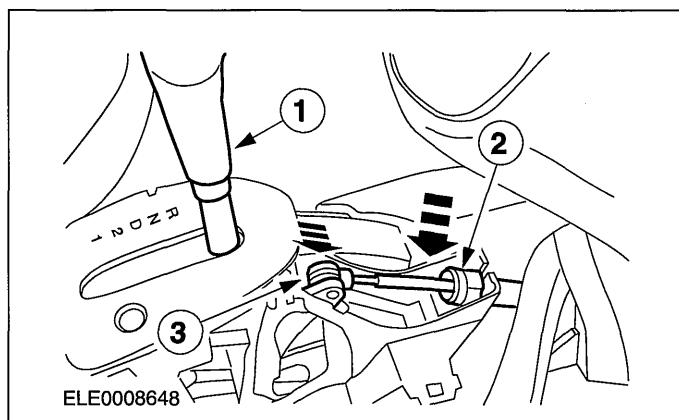
2. Connect the transmission selector lever electrical connector.



3. Attach the selector lever cable to the transmission selector lever.

REMOVAL AND INSTALLATION

1. Shift the selector lever to the "P" (PARK) position.
2. Attach the selector lever cable outer sleeve.
3. Attach the selector lever cable.



4. Install the floor console.
5. Adjust the selector lever cable.

**For additional information, refer to Selector
Lever Cable Adjustment - in this section.**

REMOVAL AND INSTALLATION

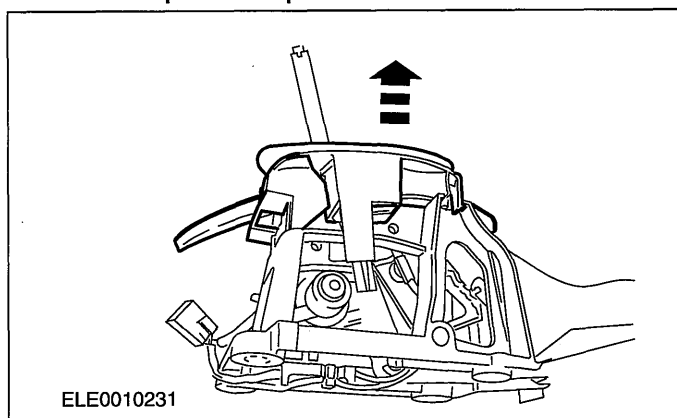
Selector Lever Bezel

Removal

1. Remove the transmission selector lever knob.

For additional information, refer to
Transmission Selector Lever Knob - in this
section.

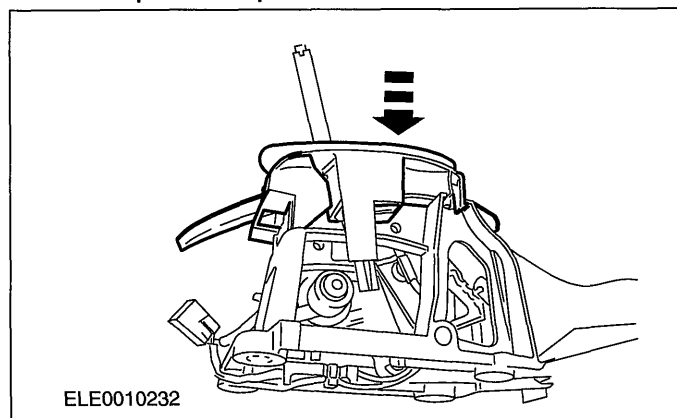
2. Remove the selector lever bezel (selector lever assembly shown removed for clarity).
 - Unclip the bezel.
 - Unclip the lamp.



Installation

1. Install the selector lever bezel (selector lever assembly shown removed for clarity).

- Clip the bezel.
- Clip the lamp.



2. Install the transmission selector lever knob.

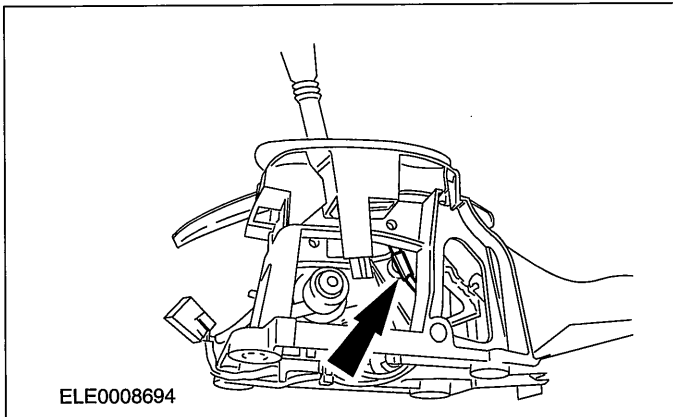
For additional information, refer to
Transmission Selector Lever Knob - in this
section.

REMOVAL AND INSTALLATION

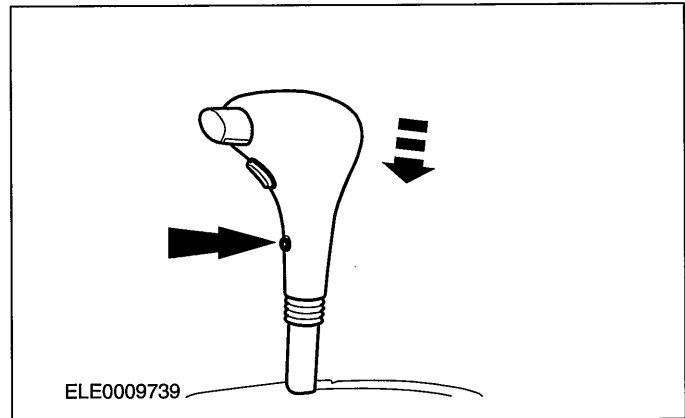
Selector Lever Knob

Removal

1. Remove the floor console.
2. Disconnect the overdrive (O/D) switch electrical connector (selector lever assembly shown removed for clarity).



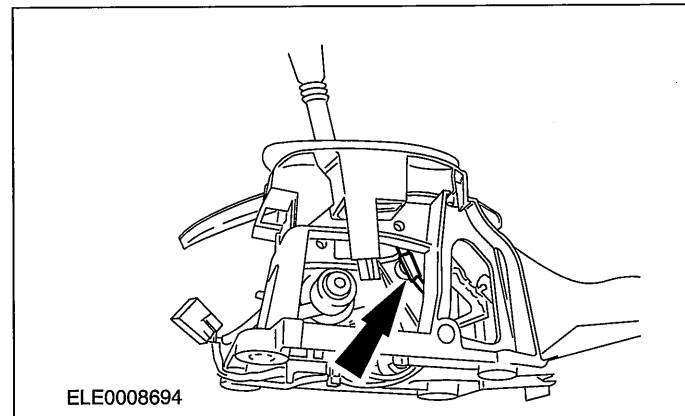
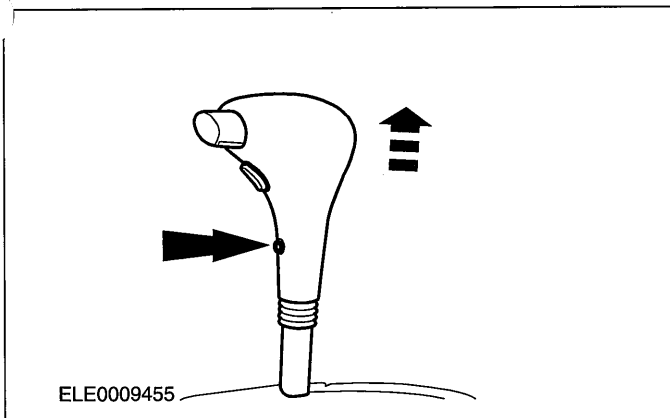
- Install the bolt.



2. Connect the O/D switch electrical connector (selector lever assembly shown removed for clarity).

3. Remove the selector lever knob.

- Remove the bolt.



3. Install the floor console.

Installation

1. Install the selector lever knob.
 - Position the knob.

DISASSEMBLY AND ASSEMBLY

Selector Lever

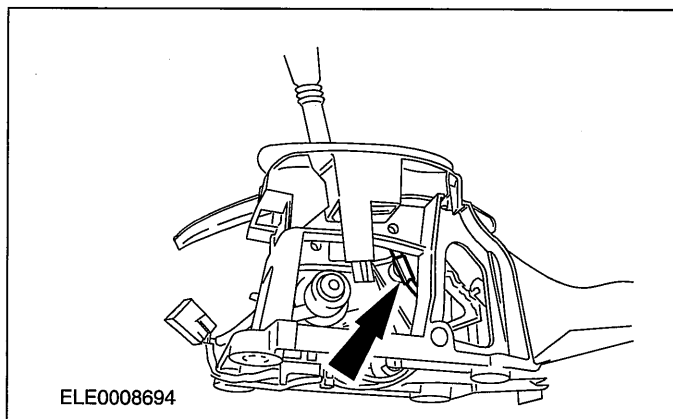
Materials

Name	Specification
Grease	S-M1C1021-A

Disassembly

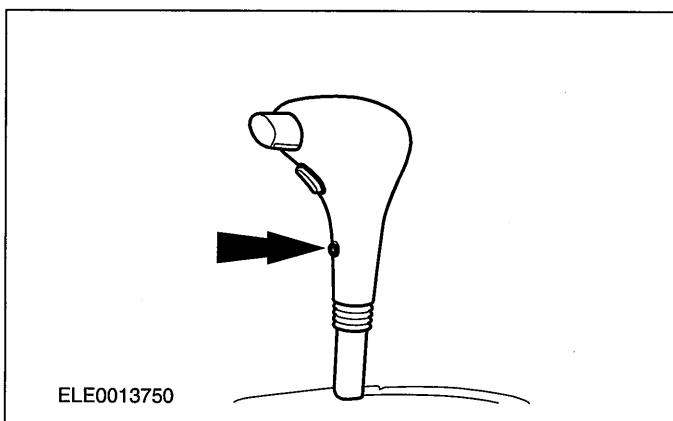
NOTE: Use vice jaw protectors for all work to be done in the vice.

1. Disconnect the overdrive (O/D) switch electrical connector.



2. Remove the selector lever knob.

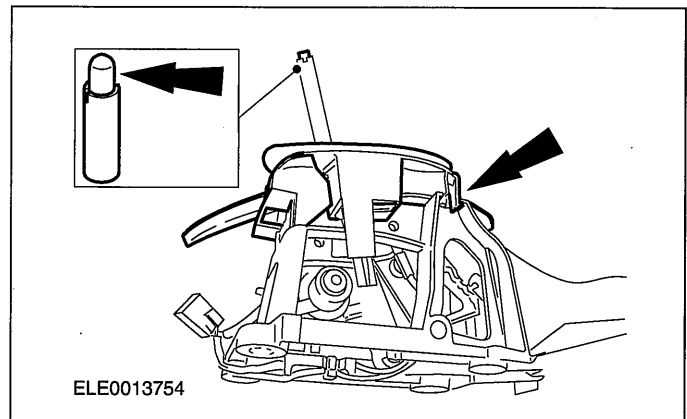
- Remove the bolt.



3. Disassemble the selector lever.

- Remove the brake shift interlock actuator.
- Remove the selector lever bezel.
- Unclip the bezel.

- Unclip the lamp.



Assembly

1. To assemble, reverse the disassembly procedure.

- Coat all sliding and turning parts with grease.

SECTION 308-00 Manual Transmission/Transaxle and Clutch - General Information

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	308-00-2
Clutch Dimensions.....	308-00-2
DIAGNOSIS AND TESTING	
Manual Transaxle and Clutch.....	308-00-3
Inspection and Verification.....	308-00-3
Gear shifting concerns.....	308-00-3
Transaxle noise concerns.....	308-00-3
Oil leakage concerns.....	308-00-3
GENERAL PROCEDURES	
Gearshift Cable Adjustment..... (16 513 0)	308-00-11
Clutch System Bleeding..... (16 843 0)	308-00-12

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

Description	Specifications
Manual transmission fluid	WSD-M2C 200-C
High melting point grease	ESD-M1C2 20-A
Super DOT 4 brake fluid	ESD-M6C5 7-A

Capacities

Description	Litres
Manual transmission fluid: 10 - 15 mm below the lower edge of the fluid filler plug	2.3

Clutch Dimensions

Description	mm
Pedal travel	135 ± 5
Worn clutch disc discard thickness*	7
Clutch disc diameter: 1.25L/1.4L Duratec-16V (Sigma)	190
Clutch disc diameter: 1.6L Duratec-16V (Sigma)	210
Clutch disc diameter: 2.0L Duratec-HE (MI4)	220
Clutch disc diameter: 1.4L/1.6L Duratorq-TDCi (DV) Diesel	210
Clutch disc diameter: 1.3L Duratec-8V (Rocam)	190
* When the discard thickness has been reached, install a new clutch disc.	

DIAGNOSIS AND TESTING**Manual Transaxle and Clutch****General Equipment**

Ultraviolet fluid leak detection equipment
--

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
• Oil leaks. • Visibly damaged or worn components. • Loose or missing nuts or bolts.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not evident, verify the symptom and REFER to Symptom Chart.

The following checks should be carried out before repairing or installing a new transaxle.

The inspection and verification of manual transaxle concerns can be considered in three main areas.

Gear shifting concerns

1. Check the operation of the clutch: Lay a block of wood approximately 25 mm thick under the clutch pedal and depress the clutch pedal as far as the stop. If first or second gear can be

selected with the engine running and the parking brake applied, without any concerns, the clutch is OK.

2. If the gear(s) cannot be selected, REFER to Symptom Chart.

Transaxle noise concerns

1. Check the engine and transaxle support for insufficient gap between the transaxle and the body.
2. Road test the vehicle.

REFER to: Road/Roller Testing (100-00 General Information, Description and Operation).

3. If a noise occurs in various gears at the same engine speed, check if the noise also occurs in the neutral position. If it does, the noise is not caused by the transaxle.
4. REFER to Symptom Chart.

Oil leakage concerns

1. Check the transaxle fluid level. If necessary, drain off any excess fluid.
2. Clean the transaxle and the adjacent areas carefully and road test the vehicle.

REFER to: Road/Roller Testing (100-00 General Information, Description and Operation).

3. Using suitable ultraviolet fluid leak detection equipment, locate the leak and check whether the leaking fluid is transaxle fluid, brake fluid (from the hydraulically operated clutch) or engine oil.
4. REFER to Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• Clutch slippage	• Clutch master cylinder. • Clutch slave cylinder. • Clutch pressure plate. • Clutch disc. • Engine or transaxle housing oil or fluid leak(s).	• GO to Pinpoint Test A.
• Clutch chatter or shudder	• Engine and transaxle mounts.	• REFER to: Noise, Vibration and Harshness (NVH) (100-04, Diagnosis and Testing).
	• Clutch pressure plate. • Clutch disc. • Flywheel.	• GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• Clutch drag	• Insufficient brake fluid.	• FILL the brake master cylinder reservoir to the MAX mark. INSPECT the brake and clutch hydraulic systems for leaks. REPAIR as necessary.
	• Air in the clutch hydraulic system.	• BLEED the system. REFER to: Clutch System Bleeding (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).
	• Clutch pedal free travel. • Clutch pressure plate. • Clutch disc. • Crankshaft end play.	• GO to Pinpoint Test C.
• Clutch pedal pulsation	• Clutch pressure plate. • Clutch disc.	• INSTALL a new clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).
	• Crankshaft end play.	• CHECK the crankshaft end play. REFER to: Crankshaft End Play (303-00 Engine System - General Information, General Procedures).
• Hard shifting	• Clutch drag.	• GO to Pinpoint Test C.
	• Gearshift cable adjustment	• CHECK the gearshift cable adjustment. REFER to: Gearshift Cable Adjustment (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).
	• External controls.	• CHECK the external controls for wear or damage. INSTALL new components as necessary.
	• Gear wheels.	• DISASSEMBLE the transaxle. REFER to: Transaxle (308-03 Manual Transmission/Transaxle, Disassembly). INSTALL new components as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Selector mechanism.	DISASSEMBLE the transaxle. REFER to: Transaxle (308-03 Manual Transmission/Transaxle, Disassembly). INSTALL new components as necessary.
	Synchronizer(s).	DISASSEMBLE the transaxle. REFER to: Transaxle (308-03 Manual Transmission/Transaxle, Disassembly). INSTALL new components as necessary.
Excessive noise	Engine vibrations inadequately damped.	REFER to: Noise, Vibration and Harshness (NVH) (100-04, Diagnosis and Testing).
	Transaxle fluid level low.	CHECK the transaxle for leaks. TOP UP the transmission fluid.
	Engine or transaxle is in contact with the chassis or body.	REFER to: Powertrain/Drivetrain Mount Neutralizing (100-04 Noise, Vibration and Harshness, General Procedures).
	Engine and transaxle out of alignment.	REFER to: Powertrain/Drivetrain Mount Neutralizing (100-04 Noise, Vibration and Harshness, General Procedures).
	External controls.	CHECK the external controls for wear or damage. INSTALL new components as necessary.
	Gear wheels and bearings.	DISASSEMBLE the transaxle. REFER to: Transaxle (308-03 Manual Transmission/Transaxle, Disassembly). INSTALL new components as necessary.
	- Clutch pedal. - Clutch release bearing.	GO to Pinpoint Test D.
Fluid leakage	- Clutch master cylinder. - Clutch slave cylinder. - Clutch hydraulic lines.	INSPECT the brake and clutch hydraulic systems for leaks. REPAIR as necessary.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Halfshaft seal.	INSTALL a new halfshaft seal. REFER to: (308-03 Manual Transmission/Transaxle) Halfshaft Seal LH (In-vehicle Repair), Halfshaft Seal RH (In-vehicle Repair).
	Fluid leak between the transaxle housing sections.	- DISASSEMBLE the transaxle and clean the mating faces. CHECK the mating faces for damage. SEAL the transaxle with sealant. - REFER to: Transaxle (308-03 Manual Transmission/Transaxle, Assembly).

PINPOINT TEST A : CLUTCH SLIPPAGE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A1: TEST CLUTCH SLIPPAGE	
	- Lock the wheels and apply the parking brake. - Start the engine and engage fourth gear. - Run the engine at approximately 2000 rpm. - Release the clutch pedal slowly. - Does the engine stall when the clutch pedal is fully released? → Yes Clutch OK. → No GO to A2.
A2: CHECK THE CLUTCH PEDAL OPERATION	
	- Depress clutch pedal and allow it to return. - Does the pedal return to the initial position? → Yes GO to A3. → No GO to A4.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A3: CHECK THE CLUTCH DISC AND PRESSURE PLATE	
	1 Remove the clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation). Is the clutch disc or pressure plate contaminated with oil or hydraulic fluid? → Yes CHECK the engine and transaxle for leaks. INSTALL new components as necessary. TEST the system for normal operation. → No INSTALL a new clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation). TEST the system for normal operation.
A4: CHECK THE CLUTCH HYDRAULIC SYSTEM	
	1 Release the clutch slave cylinder bleed nipple. Does the pedal return to the initial position? → Yes INSTALL a new clutch slave cylinder. REFER to: Clutch Slave Cylinder (308-02 Clutch Controls, Removal and Installation). TEST the system for normal operation. → No INSTALL a new clutch master cylinder. REFER to: Clutch Master Cylinder (308-02 Clutch Controls, Removal and Installation). TEST the system for normal operation.

PINPOINT TEST B : CLUTCH CHATTER OR SHUDDER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: TEST FOR CLUTCH SHUDDER	
	1 Start the engine.
	2 Engage the clutch and select fourth gear.
	3 Run the engine at approximately 2000 rpm.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Release the clutch pedal slowly. Does the clutch take up the drive smoothly? → Yes Clutch is OK. → No GO to B2.
B2: CHECK THE CLUTCH DISC AND PRESSURE PLATE FOR OIL OR HYDRAULIC FLUID CONTAMINATION	
	1 Remove the clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation). Is the clutch disc and pressure plate contaminated with oil or hydraulic fluid? → Yes CHECK the engine and transaxle for leaks. INSTALL new components as necessary. TEST the system for normal operation. → No GO to B3.
B3: CHECK THE CLUTCH DISC AND PRESSURE PLATE	
	1 Visually check the clutch disc and pressure plate. Is the clutch disc and pressure plate worn or damaged? → Yes INSTALL a new clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation). TEST the system for normal operation. → No CARRY OUT the flywheel clutch surface inspection. REFER to: Flywheel Inspection (303-00 Engine System - General Information, General Procedures). TEST the system for normal operation.

DIAGNOSIS AND TESTING

PINPOINT TEST C : CLUTCH DRAG

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

C1: CHECK THE OPERATION OF THE CLUTCH PEDAL

	1 Bleed the clutch system. REFER to: Clutch System Bleeding (308-00, General Procedures). Does the clutch properly disengage after bleeding? → Yes Clutch system is OK. → No GO to C2.
--	---

C2: CHECK THE CLUTCH DISC AND PRESSURE PLATE FOR OIL OR HYDRAULIC FLUID CONTAMINATION

	1 Remove the clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation). Is the clutch disc and pressure plate contaminated with oil or hydraulic fluid? → Yes CHECK the engine and transaxle for leaks. INSTALL new components as necessary. TEST the system for normal operation. → No GO to C3.
--	---

C3: CHECK THE CLUTCH DISC AND PRESSURE PLATE

	1 Visually check the clutch disc and pressure plate. Is the clutch disc and pressure plate worn or damaged? → Yes INSTALL a new clutch disc and pressure plate. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation). TEST the system for normal operation. → No GO to C4.
--	---

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C4: CHECK THE INPUT SHAFT SPLINES	
	1 Check that the clutch disc slides freely on the input shaft splines. Does the clutch disc stick on the input shaft? → Yes CHECK the clutch disc and input shaft splines for damage. INSTALL new components as necessary. TEST the system for normal operation. → No MEASURE the crankshaft end play. REFER to: Crankshaft End Play (303-00 Engine System - General Information, General Procedures).

PINPOINT TEST D : EXCESSIVE NOISE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: STATIC CHECK	
	1 Depress and release the clutch pedal. Is the noise apparent when the clutch is operated? → Yes LUBRICATE the clutch and brake pedal shaft. TEST the system for normal operation. → No GO to D2.
D2: DYNAMIC CHECK	
	1 Start the engine. 2 Depress the clutch pedal. Is the noise apparent when the clutch pedal is depressed? → Yes REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing). → No INSTALL a new clutch slave cylinder and release bearing assembly. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation), Clutch Slave Cylinder (308-02 Clutch Controls, Removal and Installation). TEST the system for normal operation.

GENERAL PROCEDURES

Gearshift Cable Adjustment(16 513 0)

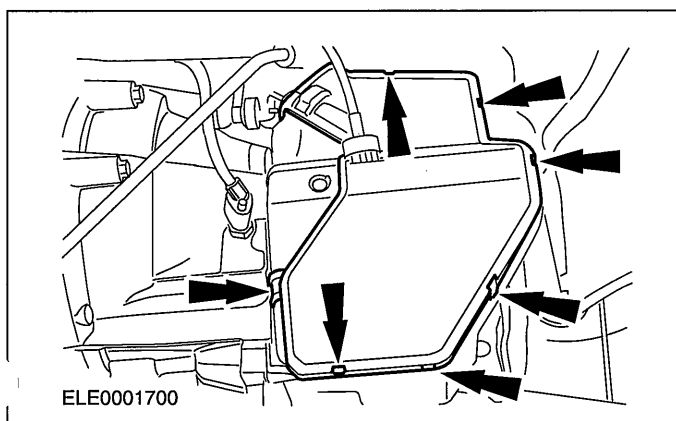
All vehicles

1. Select the 3rd gear.
2. Raise and support the vehicle.

For additional information, refer to: Jacking
(100-02 Jacking and Lifting, Description
and Operation).

For additional information, refer to: Lifting
(100-02 Jacking and Lifting, Description
and Operation).

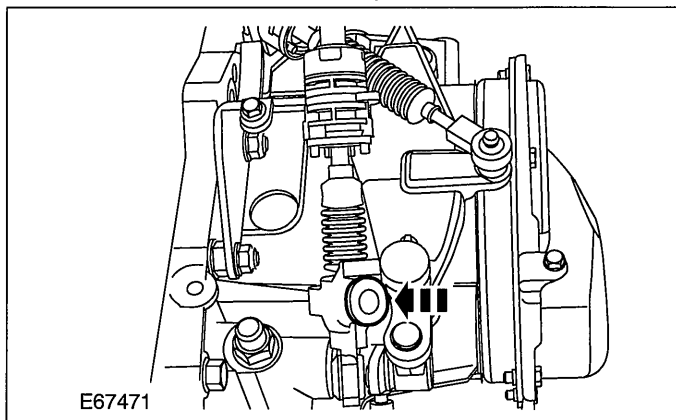
3. Remove the gearshift cables cover.



Vehicles built up to 08/2003

4. Release the selector cable adjuster locking insert (gearshift cable box shown removed for clarity).

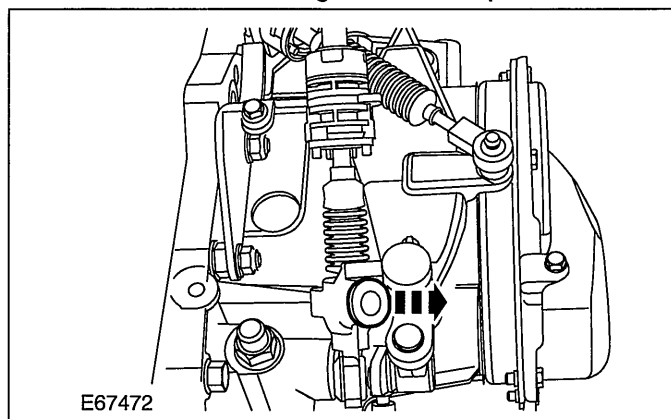
- Press down the orange colored clip.



Vehicles built 08/2003 onwards

5. Release the selector cable adjuster locking insert (gearshift cable box shown removed for clarity).

- Pull out the orange colored clip.

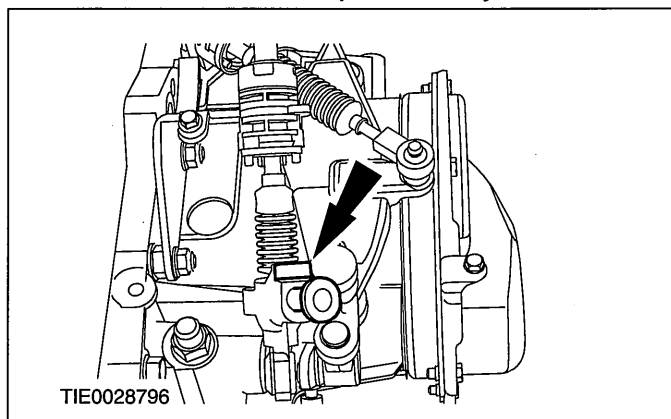


All vehicles

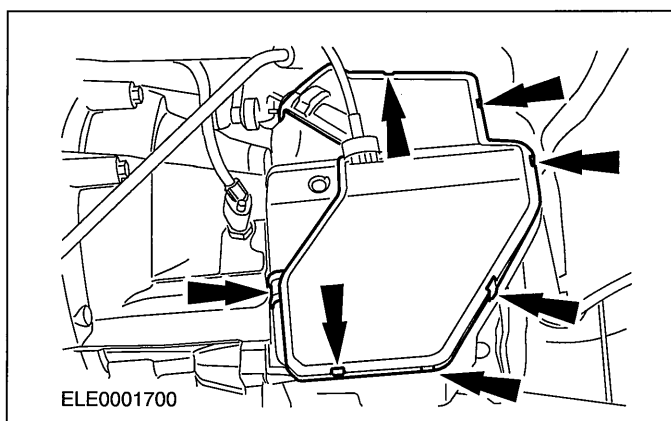
6. **NOTE:** Make sure that the selector cable adjuster locking insert returns to the locked position.

Lock the selector cable adjuster.

- Press down the clip on the adjuster.



7. Install the gearshift cables cover.

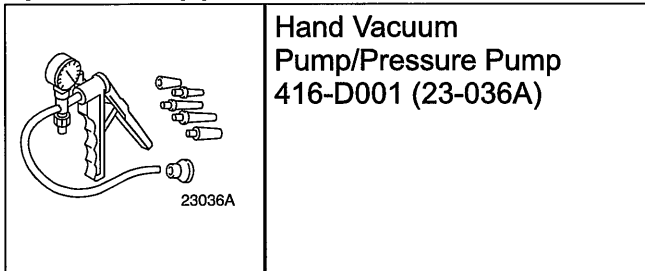


8. Lower the vehicle.

GENERAL PROCEDURES

Clutch System Bleeding(16 843 0)

Special Tool(s)



Materials

Name	Specification
Super DOT 4 Brake Fluid	ESD-M6C57-A

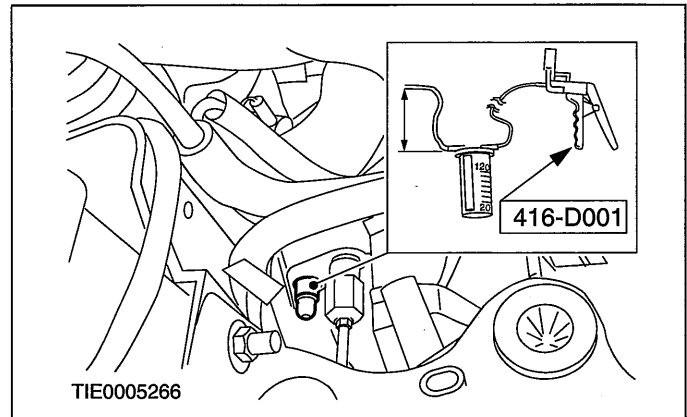
▲ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

NOTE: If proprietary brake bleeding equipment is available, this can be used to bleed the clutch system, following the method below. The maximum pressure must not exceed 1.5 bar.

NOTE: The clutch control system is self-venting. The components are arranged in such a way that small amounts of air trapped in the system are removed automatically during clutch operation.

1. Remove the air cleaner, if necessary. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
2. Remove the battery, if necessary. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
3. Remove the battery tray, if necessary.
4. Drain the brake fluid reservoir.
5. Raise and support the vehicle, if necessary. For additional information, refer to Section 100-02 [Jacking and Lifting].
6. Fill the reservoir of the special tool with approximately 100 ml of new brake fluid.
7. **NOTE:** Make sure that the special tool reservoir is positioned lower than the bleed nipple.
Install the special tool.
8. Using the special tool, bleed the clutch system.
 - Pump approximately 80 ml of brake fluid into the clutch system.
9. Close the bleed nipple.
10. Remove the special tool.
11. Lower the vehicle, if necessary.
12. In order to remove any small amounts of trapped air remaining in the system, operate the clutch pedal several times (maximum five times), using the full clutch pedal travel.
13. Check the fluid level in the brake fluid reservoir and top up to the MAX mark with brake fluid if necessary.
14. Install the battery tray, if necessary.
15. Install the battery, if necessary. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
16. Install the air cleaner, if necessary. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].
17. Test the clutch control system for normal operation.



GENERAL PROCEDURES

- Start the engine, depress the clutch pedal, wait two seconds, then carefully engage reverse gear. If there are any abnormal noises, or reverse gear is difficult to engage, repeat the clutch system bleeding procedure.
- 18. Initialize the door window motors, if necessary. For additional information, refer to Section 501-11 [Glass, Frames and Mechanisms].**

C

Q

O

SECTION 308-01 Clutch

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	308-01-2
DESCRIPTION AND OPERATION	
Clutch.....	308-01-3
Self-adjusting clutch.....	308-01-3
DIAGNOSIS AND TESTING	
Clutch.....	308-01-6
REMOVAL AND INSTALLATION	
Clutch Disc and Pressure Plate..... (16 724 4)	308-01-7

SPECIFICATIONS**Torque Specifications**

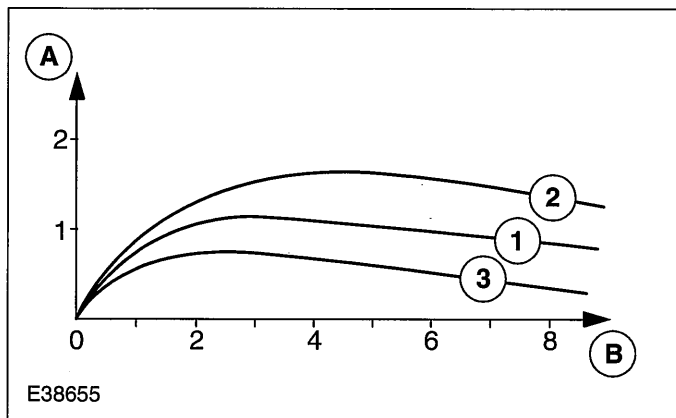
Item	Nm	lb-ft	lb-in
Clutch pressure plate retaining bolts	29	21	-

DESCRIPTION AND OPERATION

Clutch

Self-adjusting clutch

Advantages of the self-adjusting clutch



Item

Description

1	Conventional clutch - condition when new
2	Conventional clutch - after wear
3	Self-adjusting clutch

The self-adjusting clutch has the following advantages over conventionally designed clutches:

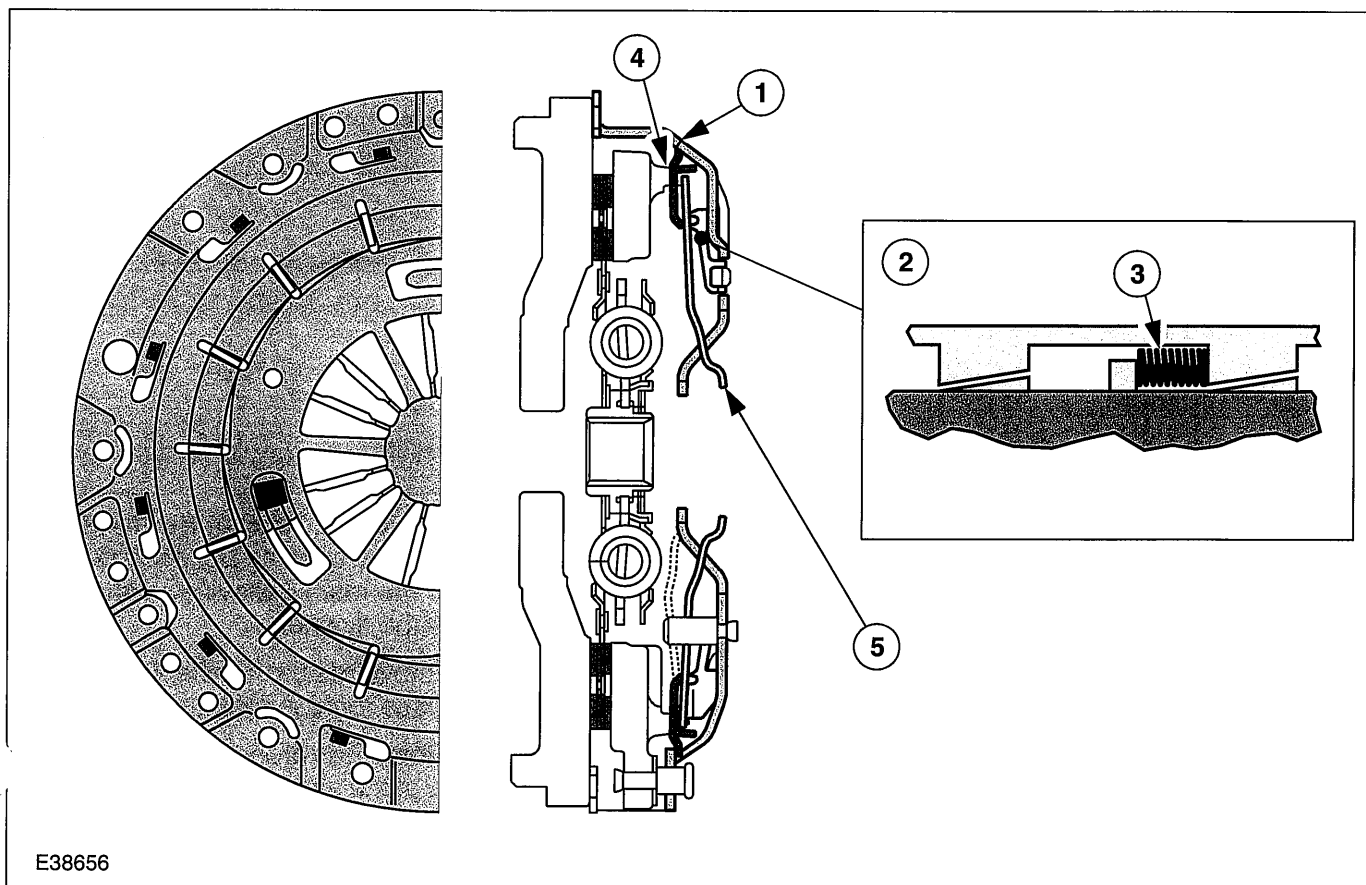
- lower release forces, which remain constant over the service life and thus ensure high driving comfort throughout the entire service life
- increased wear reserve and therefore greater service life due to the automatic wear adjustment

Item

Description

A	Release force in kN
B	Release travel in mm

Function



DESCRIPTION AND OPERATION

Item	Description
1	Cover
2	Adjusting ring (ramp ring)
3	Spring
4	Sensing Belleville washer
5	Main Belleville washer

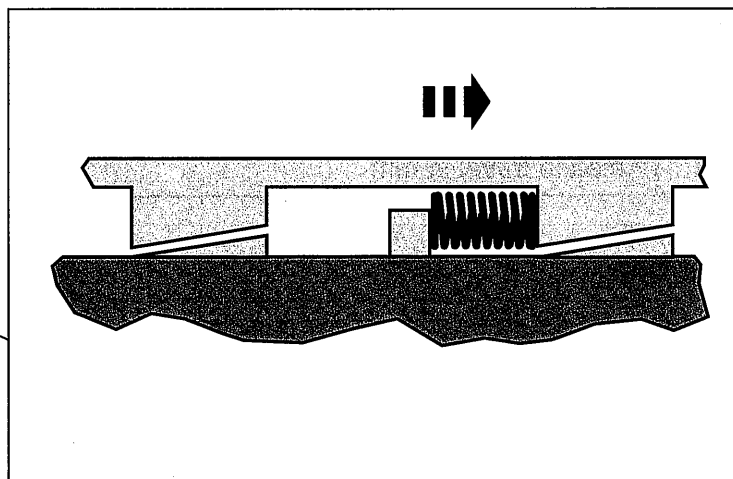
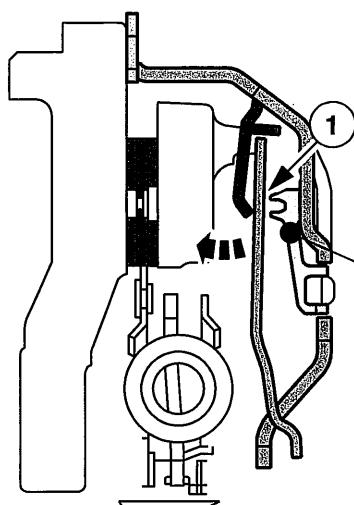
A conventional clutch responds to clutch wear with an increase in the release force, which ultimately has to be delivered by the driver to press down the clutch pedal.

This increase in the release force after clutch wear is used on the self-adjusting clutch as the key indicator for adjusting the clutch.

The main distinction to a conventional clutch is that the main Belleville washer is not riveted in a fixed manner to the cover, but instead is supported by a so-called sensing Belleville washer. In addition an adjusting ring (ramp ring) is used to compensate the wear of the clutch lining.

The sensing Belleville washer is hooked into the clutch cover at the outside and, with the inner tongues, forms the bearing for the main Belleville washer.

The sensing Belleville washer is designed to deliver a slightly greater opposing force under normal conditions than the maximum required release force.



E38734

Item	Description
1	Air gap

If when the clutch is operated the release force is less than the opposing force of the sensing Belleville washer, then the pivot bearing point of the main Belleville washer remains in the same position.

If however the release force increases due to lining wear, then the opposing force of the sensing Belleville washer is exceeded.

If the opposing force of the sensing Belleville washer is exceeded, the sensing Belleville washer and therefore also the main Belleville washer are displaced towards the flywheel.

This displacement towards the flywheel has the effect that the release force is reduced again.

Once the release force has dropped to the level of the opposing force of the sensing Belleville washer again (equilibrium of forces), the displacement of the components towards the flywheel stops.

DESCRIPTION AND OPERATION

When the sensing Belleville washer is displaced this results in an air gap between the main Belleville washer and the clutch cover.

The adjusting ring (ramp ring) arranged around the circumference immediately compensates for the air gap. To do this, springs press the adjusting ring and therefore the ramp against the main Belleville washer.

This results in a balancing of the clutch actuation mechanism, which keeps the forces required to operate the clutch constant throughout the entire service life of the clutch.

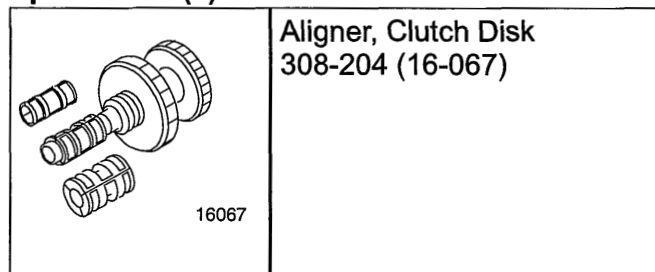
DIAGNOSIS AND TESTING**Clutch**

REFER to: Manual Transaxle and Clutch (308-00,
Diagnosis and Testing).

REMOVAL AND INSTALLATION

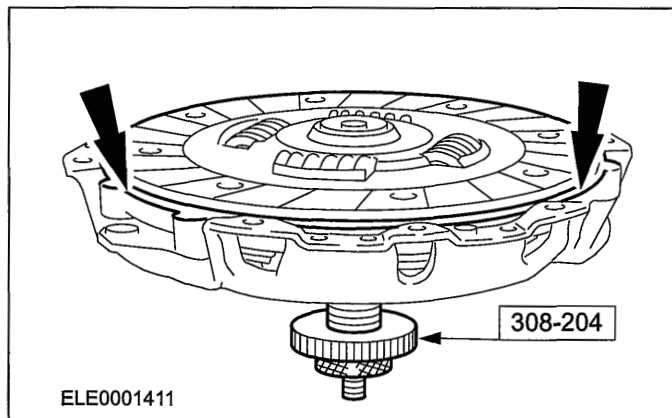
Clutch Disc and Pressure Plate(16 724 4)

Special Tool(s)



Installation

1. Using the special tool, centralize the clutch disc on the pressure plate.



Removal

1. Remove the transaxle. For additional information, refer to: (308-03A Manual Transmission/Transaxle - Vehicles With: 5-Speed Manual Transaxle (iB5))
Transaxle - 1.6L Duratec-16V (Sigma)/1.6L Duratec-16V Ti-VCT (Sigma) (Removal),
Transaxle - 1.8L Duratec-HE (MI4) (Removal).

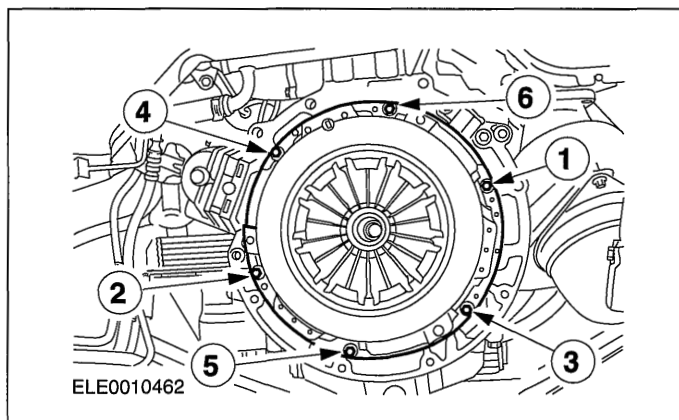
2. **⚠ CAUTION:** Loosen the clutch pressure plate retaining bolts by two turns at a time in the sequence shown.

Remove the clutch disc and pressure plate.

- Discard the bolts.

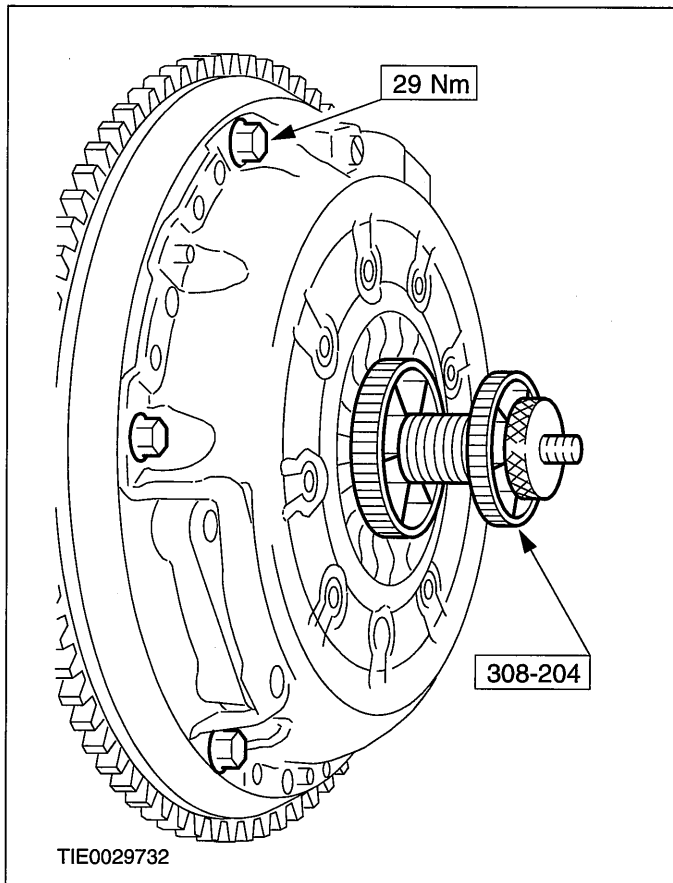
2. **⚠ CAUTION:** Tighten the clutch pressure plate retaining bolts finger tight and then evenly by two turns at a time in the sequence shown to the specified torque.

NOTE: Install new clutch pressure plate retaining bolts.



REMOVAL AND INSTALLATION

Using the special tool, install the clutch disc and pressure plate.



3. Remove the special tool.

4. Install the transaxle. For additional information, refer to: (308-03A Manual Transmission/Transaxle - Vehicles With: 5-Speed Manual Transaxle (iB5))

**Transaxle - 1.6L Duratec-16V (Sigma)/1.6L Duratec-16V Ti-VCT (Sigma) (Installation),
Transaxle - 1.8L Duratec-HE (MI4) (Installation).**

SECTION 308-02 Clutch Controls

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	308-02-2
DESCRIPTION AND OPERATION	
Clutch Controls.....	308-02-3
Overview.....	308-02-3
Function.....	308-02-4
DIAGNOSIS AND TESTING	
Clutch Controls.....	308-02-5
REMOVAL AND INSTALLATION	
Clutch Slave Cylinder.....	(16 862 4) 308-02-6
Clutch Master Cylinder.....	(16 856 0) 308-02-7

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

	Specificat ions
High-temperature grease	ESDM-1C2 20-A

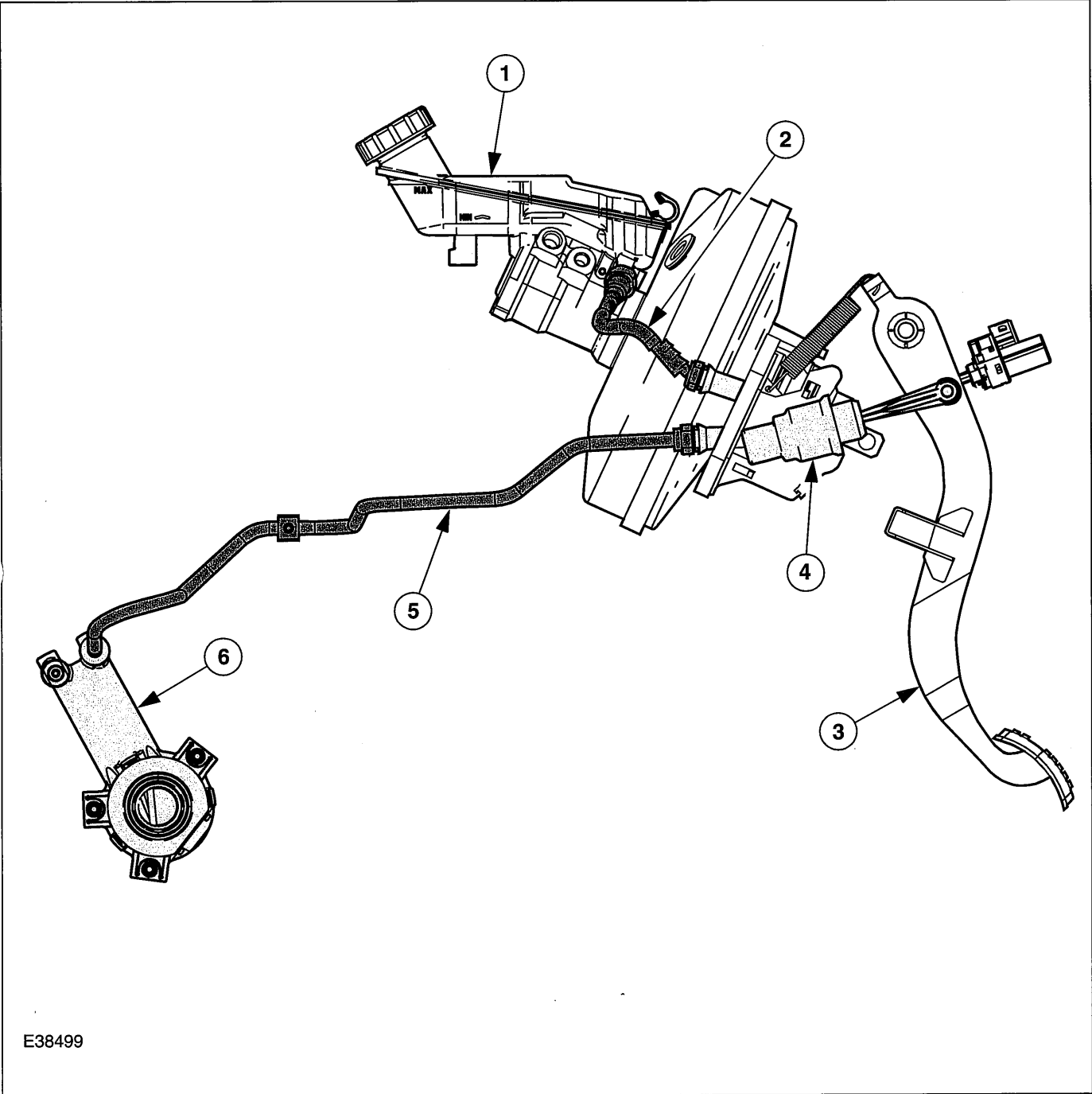
Torque Specifications

Item	Nm	lb-ft	lb-in
Clutch slave cylinder retaining bolts	10	-	89
Clutch master cylinder retaining bolts	8	-	71
Pedal pivot shaft retaining nut	25	18	-

DESCRIPTION AND OPERATION

Clutch Controls

Overview



E38499

Item	Description
1	Brake fluid reservoir
2	Supply line
3	Clutch Pedal
4	Master cylinder

Item	Description
5	Pressure line
6	Slave cylinder with choke assembly

The hydraulic clutch is supplied from a separate chamber in the brake fluid reservoir.

DESCRIPTION AND OPERATION

Because of this separate chamber, the braking system remains operational if a leak occurs in the hydraulic clutch system.

Function

Pressure is created in the master cylinder when the clutch pedal is operated.

The hydraulic fluid in the master cylinder is put under pressure and fed through the pressure pipe to the slave cylinder.

The displaced hydraulic fluid moves the piston in the slave cylinder and this in turn slides the release bearing axially.

The release bearing pushes the bearing inner ring against the tongues of the diaphragm spring.

The spring induced grip between the clutch disc and the flywheel is broken.

When the clutch pedal is released the diaphragm spring presses the piston in the slave cylinder back to its starting position. The spring induced grip between the clutch disc and the flywheel is created again.

A spring in the slave cylinder ensures preload on the release bearing.

The release bearing is always touching the pressure plate because of this preload. The extra travel caused by clutch lining wear is compensated for by the preload.

There is a choke assembly in the slave cylinder which helps to increase smoothness when pulling away.

Because of the choke assembly, the pressure drop of the fluid leaving the slave cylinder and returning to the reservoir is delayed.

Because of this, the clutch closing time is delayed when the clutch pedal is released suddenly, and a soft and comfortable clutch engagement is achieved.

Choking does not occur during clutch disengagement.



CAUTION: Vehicles with an automated shift manual (ASM) transmission have a slave cylinder without a choke assembly. The slave cylinders must not be exchanged for one another.

NOTE: The clutch pedal travel cannot be adjusted.

The release bearing is an interference fit in the slave cylinder and cannot be renewed separately.

DIAGNOSIS AND TESTING**Clutch Controls**

REFER to: Manual Transaxle and Clutch (308-00,
Diagnosis and Testing).

REMOVAL AND INSTALLATION

Clutch Slave Cylinder(16 862 4)

Materials	
Name	Specification
High-temperature grease	ESDM-1C220-A

Removal

1. Remove the transaxle. For additional information, refer to: (308-03 Manual Transmission/Transaxle)

Transaxle - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (Removal),

Transaxle - 1.3L Duratec-8V (Rocam) (Removal),

Transaxle - 2.0L Duratec-HE (MI4) (Removal),

Transaxle - 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel (Removal).

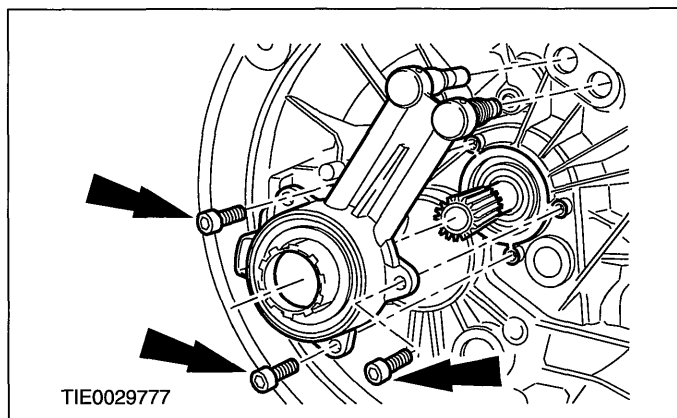
2. Clean any grease and foreign material from the input shaft.

3. CAUTIONS:

⚠ If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

⚠ Using suitable adhesive tape, cover the input shaft splines to prevent damage to the input shaft oil seal.

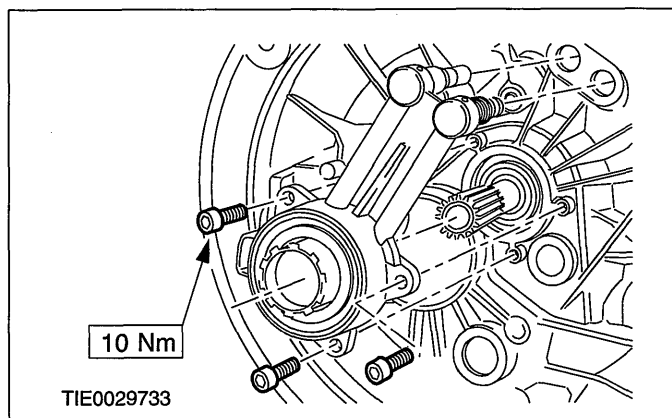
Remove the clutch slave cylinder.



⚠ If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

⚠ Do not apply grease on any area of the clutch slave cylinder.

Install the clutch slave cylinder.



2. Remove the adhesive tape from the input shaft splines.

3. Coat the input shaft splines with a thin layer of high-temperature grease.

4. Install the transaxle. For additional information, refer to: (308-03 Manual Transmission/Transaxle)

Transaxle - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (Installation),

Transaxle - 1.3L Duratec-8V (Rocam) (Installation),

Transaxle - 2.0L Duratec-HE (MI4) (Installation),

Transaxle - 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel (Installation).

Installation

1. CAUTIONS:

REMOVAL AND INSTALLATION

Clutch Master Cylinder(16 856 0)

Removal

CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

All vehicles

1. Using a suitable syringe, remove brake fluid from the brake fluid reservoir until the brake fluid level is at the MIN mark.

Right-hand drive vehicles

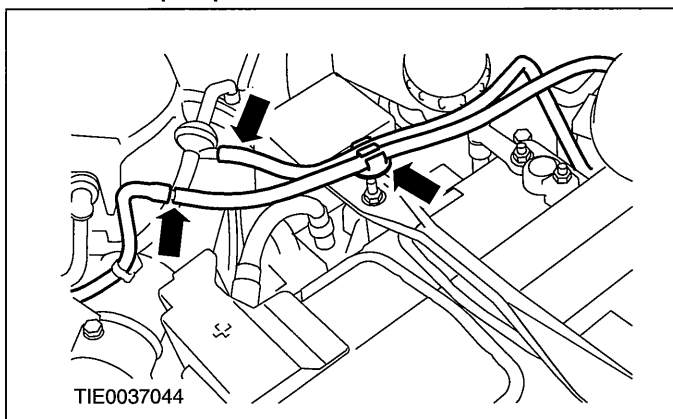
2. Remove the air cleaner. For additional information, refer to: (303-12 Intake Air Distribution and Filtering)

Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (Removal and Installation),
 Air Cleaner - 1.3L Duratec-8V (Rocam) (Removal and Installation),
 Air Cleaner - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation),
 Air Cleaner - 2.0L Duratec-HE (MI4) (Removal and Installation),
 Air Cleaner - 1.6L Duratorq-TDCi (DV) Diesel (Removal and Installation).

Left-hand drive vehicles

3. Disconnect the two vacuum hoses.

- Detach the vacuum hoses from the battery clamp clip.



4. Remove the battery tray. For additional information, refer to:

Battery Tray (414-01, Removal and Installation),

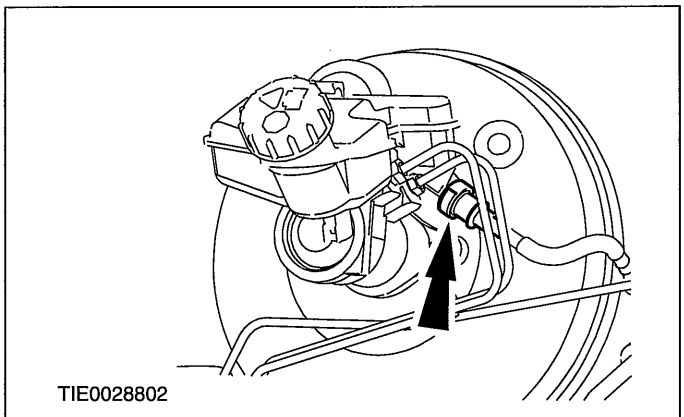
Battery Tray - 2.0L Duratec-HE (MI4) (414-01 Battery, Mounting and Cables, Removal and Installation).

All vehicles

5. **NOTE:** Plug the brake fluid reservoir to prevent fluid loss or dirt ingress.

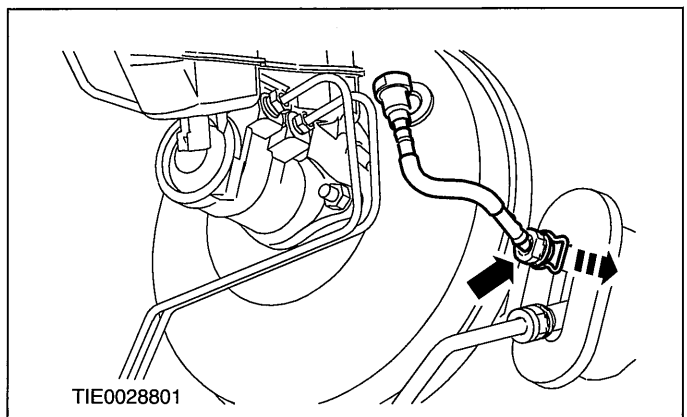
Disconnect the clutch master cylinder supply hose from the brake fluid reservoir.

- Push the clip to release the clutch master cylinder supply hose.



6. Remove the clutch master cylinder supply hose.

- Release the clutch master cylinder supply hose retaining clip.
- Allow the fluid to drain into a suitable container.

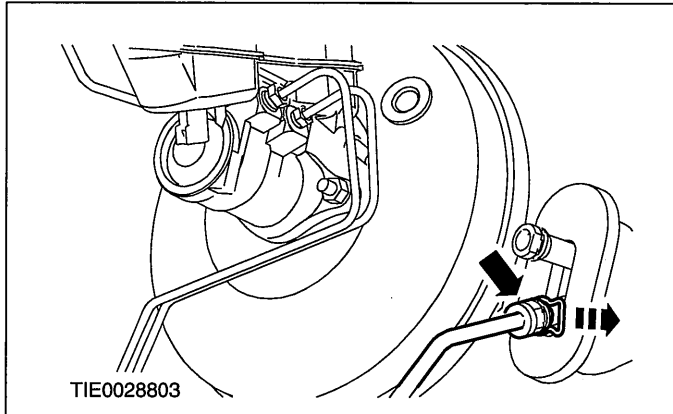


7. **NOTE:** Plug the clutch slave cylinder supply line to prevent fluid loss or dirt ingress.

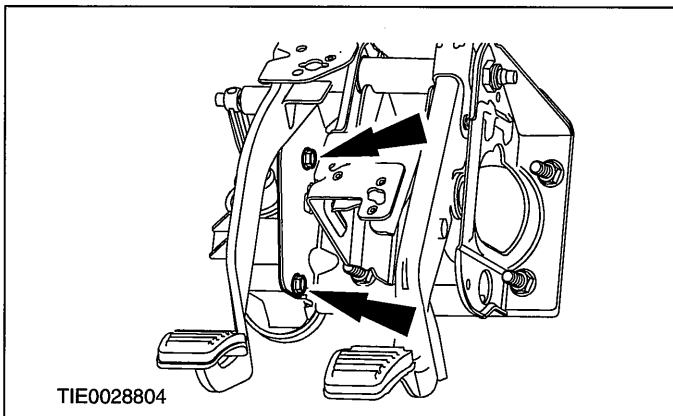
REMOVAL AND INSTALLATION

Disconnect the clutch slave cylinder supply line from the clutch master cylinder and position it to one side.

- Release the clutch slave cylinder supply line retaining clip.



8. Remove the clutch master cylinder retaining bolts.

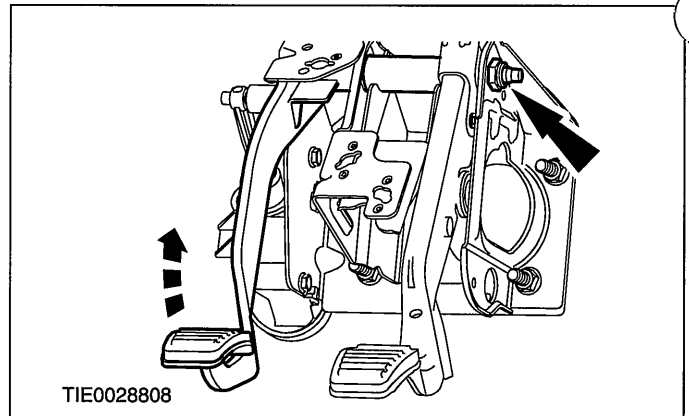


9. NOTE: Remove the clutch master cylinder and the clutch pedal as an assembly.

Remove the clutch master cylinder and the clutch pedal assembly.

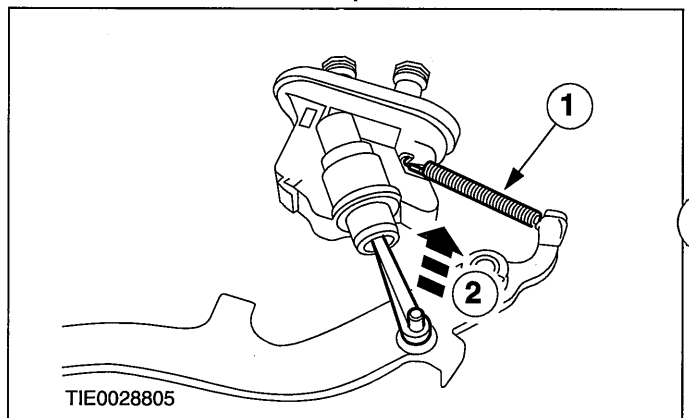
- Remove the pedal pivot shaft retaining nut and remove the pivot shaft.

- Rotate the clutch master cylinder and clutch pedal assembly counterclockwise.



10. Remove the clutch master cylinder.

1. Remove the clutch pedal return spring.
2. Detach the clutch master cylinder actuating rod from the clutch pedal.



Installation

All vehicles

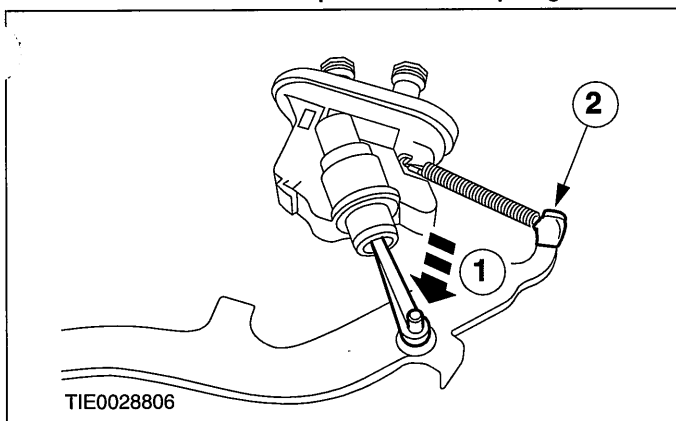
1. NOTE: Using suitable tape, secure the clutch pedal return spring in position.

Install the clutch master cylinder.

1. Attach the clutch master cylinder actuating rod to the clutch pedal.

REMOVAL AND INSTALLATION

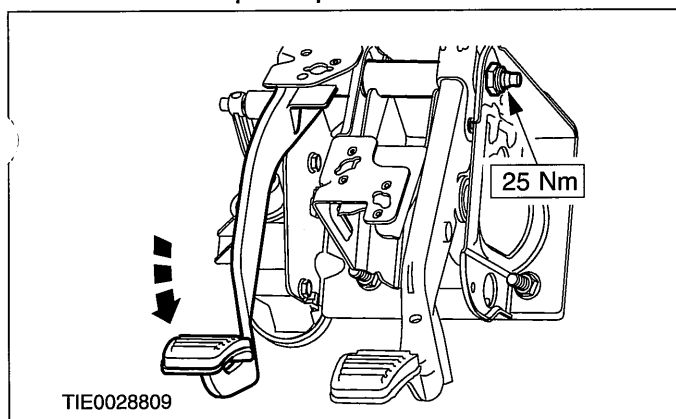
2. Install the clutch pedal return spring.



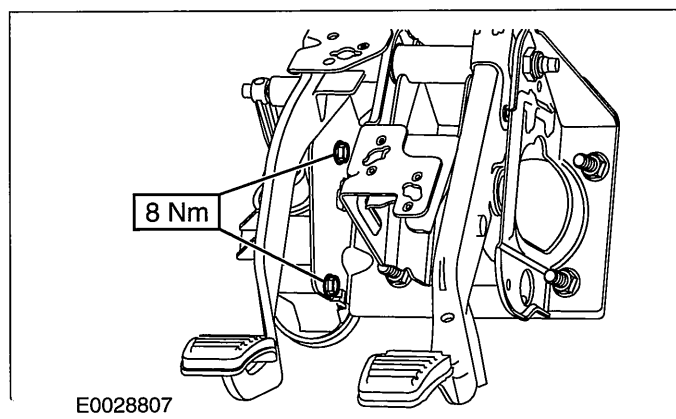
2. **NOTE:** Install the clutch master cylinder and the clutch pedal as an assembly.

Install the clutch master cylinder and the clutch pedal assembly.

- Rotate the clutch master cylinder and the clutch pedal assembly clockwise.
- Install the pedal pivot shaft.

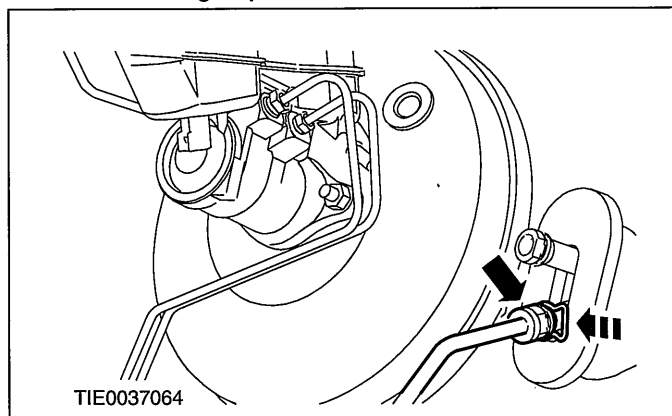


3. Install the clutch master cylinder retaining bolts.



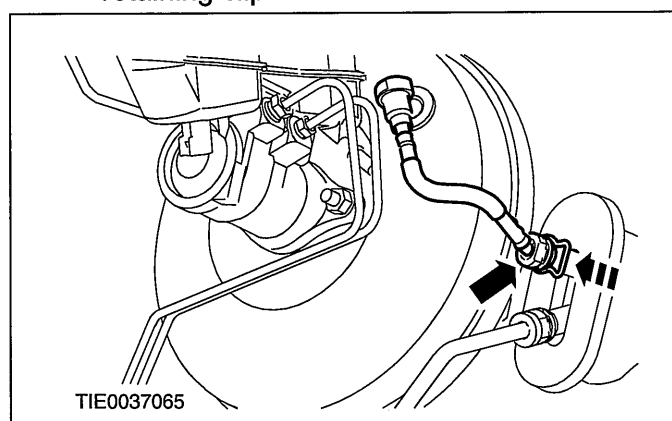
4. Connect the clutch slave cylinder supply line to the clutch master cylinder.

- Install the clutch slave cylinder supply line retaining clip.

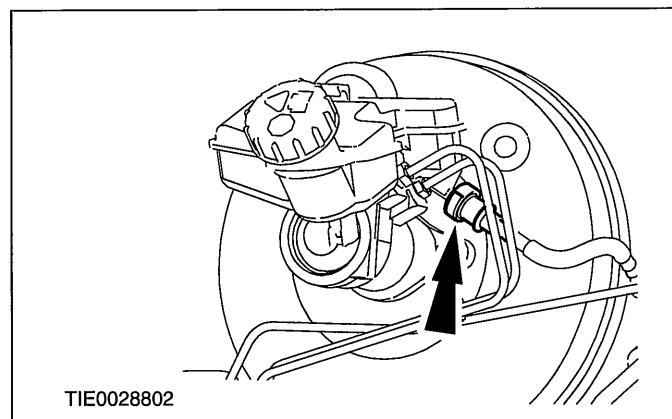


5. Connect the clutch master cylinder supply hose to the clutch master cylinder.

- Install the clutch master cylinder supply hose retaining clip.



6. Connect the clutch master cylinder supply hose to the brake fluid reservoir.



REMOVAL AND INSTALLATION

7. Bleed the clutch system. For additional information, refer to: (308-00 Manual Transmission/Transaxle and Clutch - General Information)

Clutch System Bleeding (General Procedures),
Clutch System Bleeding - Vehicles With:
Automated Gearshift (General Procedures).

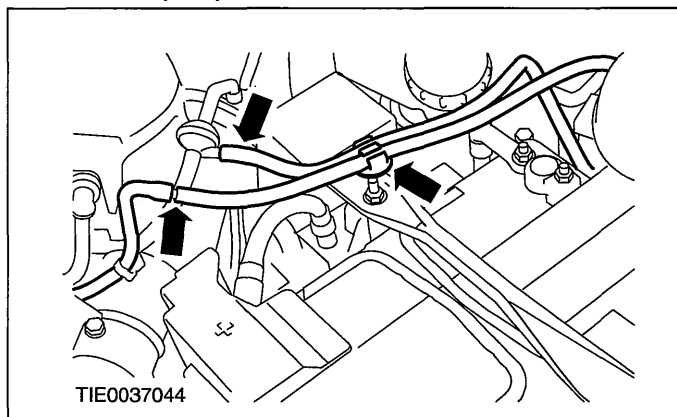
Left-hand drive vehicles

8. Install the battery tray. For additional information, refer to:

Battery Tray (414-01, Removal and Installation),
Battery Tray - 2.0L Duratec-HE (MI4) (414-01 Battery, Mounting and Cables, Removal and Installation).

9. Connect the two vacuum hoses.

- Attach the vacuum hoses to the battery clamp clip.



Right-hand drive vehicles

10. Install the air cleaner. For additional information, refer to: (303-12 Intake Air Distribution and Filtering)

Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (Removal and Installation),
Air Cleaner - 1.3L Duratec-8V (Rocam) (Removal and Installation),
Air Cleaner - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation),
Air Cleaner - 2.0L Duratec-HE (MI4) (Removal and Installation).

SECTION 308-03 Manual Transmission/Transaxle

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	308-03-3
Required shim thickness.....	308-03-3
DESCRIPTION AND OPERATION	
Manual Transaxle.....	308-03-5
General.....	308-03-5
Transmission construction.....	308-03-6
Internal shift mechanism.....	308-03-11
Power transmission in the individual gears.....	308-03-15
DIAGNOSIS AND TESTING	
Manual Transaxle.....	308-03-17
GENERAL PROCEDURES	
Bearing Check.....	308-03-18
IN-VEHICLE REPAIR	
Halfshaft Seal LH.....	(14 303 0) 308-03-20
Halfshaft Seal RH.....	(14 304 0) 308-03-21
Vehicle Speed Sensor (VSS).....	(33 654 0) 308-03-22
REMOVAL	
Transaxle — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(16 114 0) 308-03-23
Transaxle — 2.0L Duratec-HE (MI4).....	(16 114 0) 308-03-30
DISASSEMBLY	
Transaxle.....	(16 118 8) 308-03-35
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES	
Output Shaft.....	308-03-41
Input Shaft.....	308-03-46
Differential.....	(16 118 6) 308-03-48
Selector Plate.....	(16 284 8) 308-03-50
ASSEMBLY	
Transaxle.....	(16 118 8) 308-03-52

INSTALLATION

Transaxle — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(16 114 0)	308-03-62
Transaxle — 2.0L Duratec-HE (MI4).....	(16 114 0)	308-03-69

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

Description	Specifications
High-temperature grease	ESDM-1C2 20-A
Manual transmission fluid	WSD-M2C 200-C
Super DOT 4 brake fluid	ESD-M6C5 7-A
Sealer, transaxle housing to clutch housing	WSK-M2G 348-A5

Description	Specifications
Sealer, fifth gear end cap	WSE-M4G 323-A4

Capacities

Description	Litres
Manual transmission fluid (just below the bottom of the filler hole)	2.3

Transaxle ratios

	1.25L	1.3L	1.4L	1.6L	1.4L Diesel	1.6L Diesel	2.0L
First gear	3.58	3.58	3.58	3.15	3.58	3.58	3.58
Second gear	1.93	1.93	1.93	1.93	1.93	1.93	2.04
Third gear	1.28	1.28	1.28	1.28	1.28	1.28	1.41
Fourth gear	0.95	0.95	0.95	0.95	0.95	0.95	1.11
Fifth gear	0.76	0.76	0.76	0.76	0.76	0.76	0.88
Reverse gear	3.62	3.62	3.62	3.62	3.62	3.62	3.62
Final drive	4.25	3.82/4.06	4.06	4.25	3.37	3.37	3.82

Required shim thickness

Description	mm
Measuring shim	3.8
Shim availability (in increments of 0.1 mm)	0.1 - 0.7

Required snap ring thickness

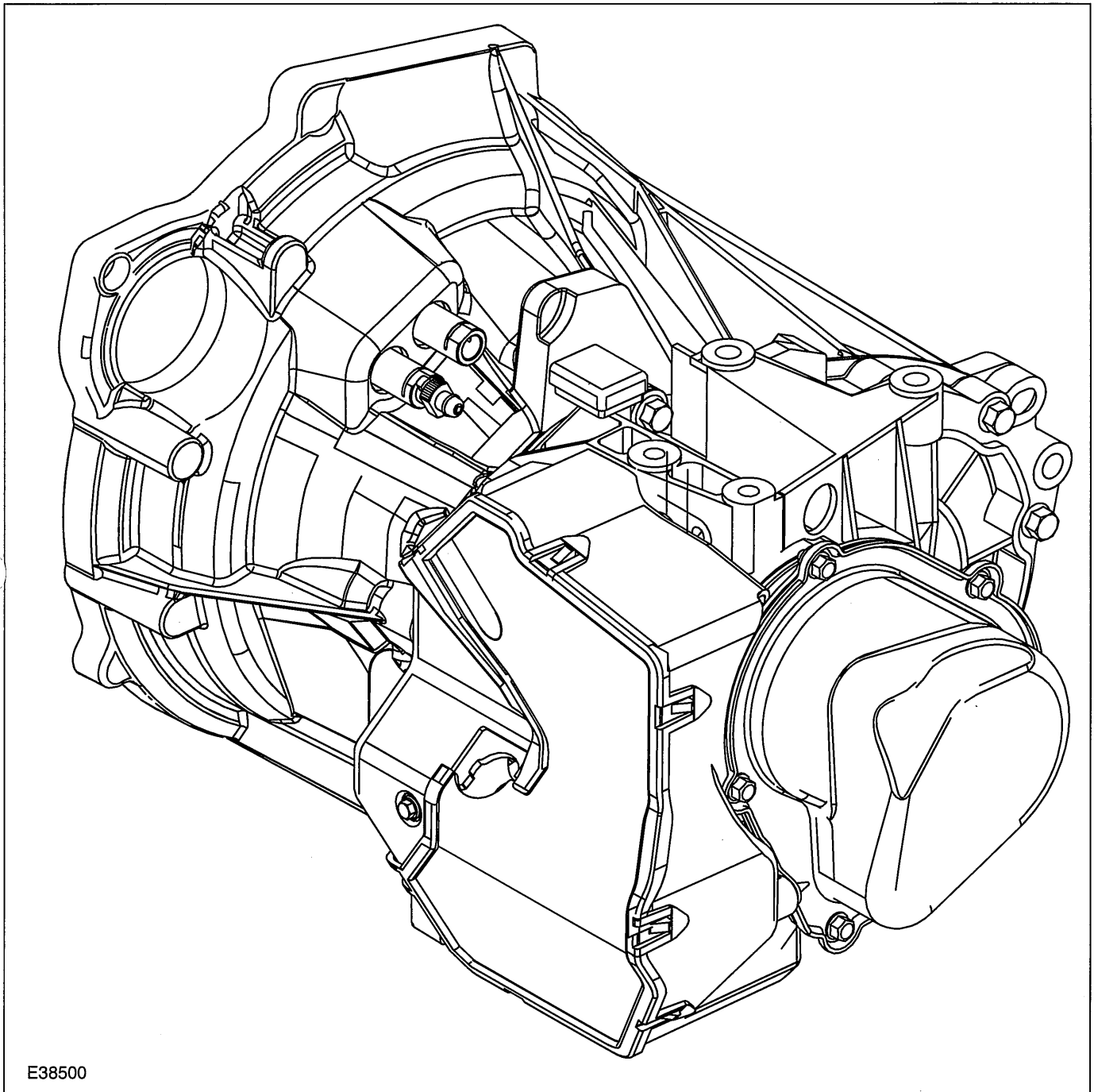
Description	mm
Snap ring fifth gear	1.48

Torque Specifications

Item	Nm	lb-ft	lb-in
Clutch slave cylinder retaining bolts	10	-	89
Selector gate retaining bolts	22	16	-
Transaxle housing retaining bolts	25	21	-
Fifth gear housing to transaxle housing retaining bolts	17	13	-
Selector mechanism to transaxle retaining bolts	22	16	-
Reversing lamp switch	12	9	-

SPECIFICATIONS

Item	Nm	lb-ft	lb-in
Transaxle housing final drive cover retaining bolts	12	9	-
Transaxle to engine retaining bolts	47	35	-
Engine support insulator to engine retaining bolt	48	35	-
Engine support insulator to subframe retaining bolts	48	35	-
Engine rear mount outer retaining nuts	48	35	-
Exhaust flexible pipe retaining nuts	44	32	-
Wiring harness retaining bracket retaining nut	22	16	-
Power steering high-pressure line retaining bracket retaining bolt	25	21	-
Lower arm ball joint to the wheel knuckle retaining nut	52	38	-
Engine rear mount center retaining nut	90	66	-
Intermediate shaft center bearing retaining nuts	25	18	-
Strut and spring assembly top mount retaining nuts	48	35	-
Transmission fluid filler plug	35	26	-
Starter motor retaining bolts	35	26	-
Starter motor wiring harness retaining bracket retaining nuts	20	15	-

DESCRIPTION AND OPERATION**Manual Transaxle****General**

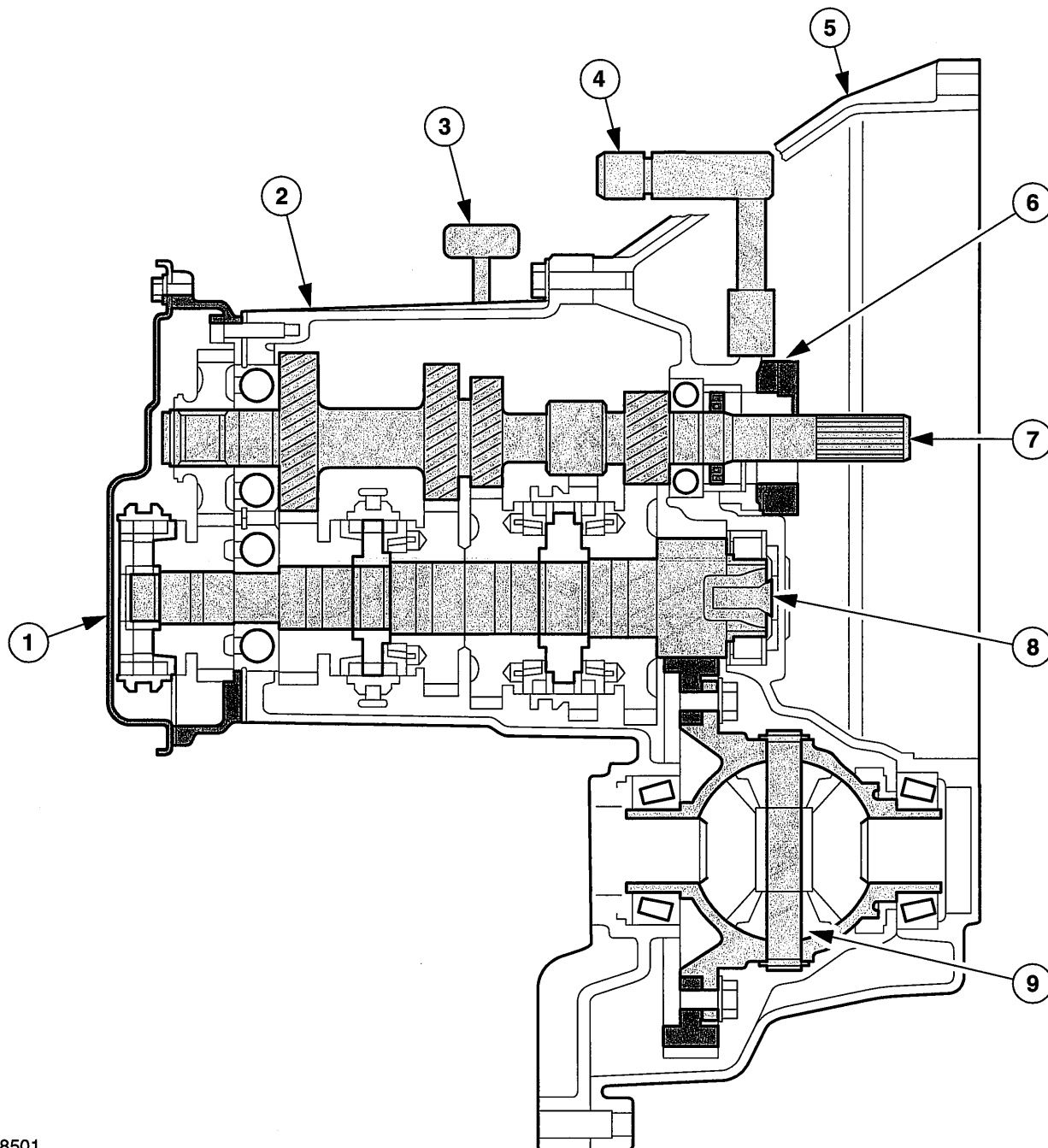
E38500

The iB5 manual transmission is a two shaft transmission.

All gear wheels are helical toothed, synchronised (except reverse gear) and run in plain bearings.

1st and 2nd gears are double synchronised.

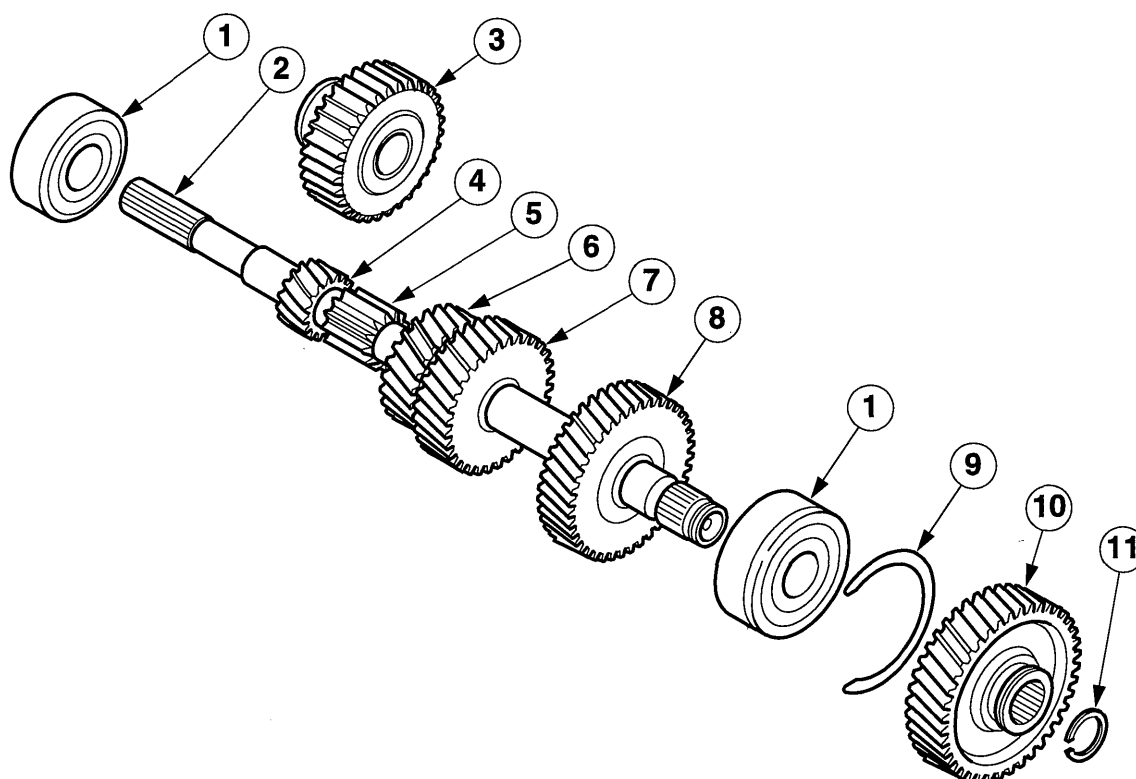
There is no need to change the oil.

DESCRIPTION AND OPERATION**Transmission construction**

E38501

Item	Description
1	5th gear housing
2	Transmission side housing halves
3	Breather
4	Hydraulic clutch connection
5	Clutch side housing halves

Item	Description
6	Slave cylinder with integral release bearing
7	Input shaft
8	Output shaft
9	Differential assembly

DESCRIPTION AND OPERATION**Input shaft**

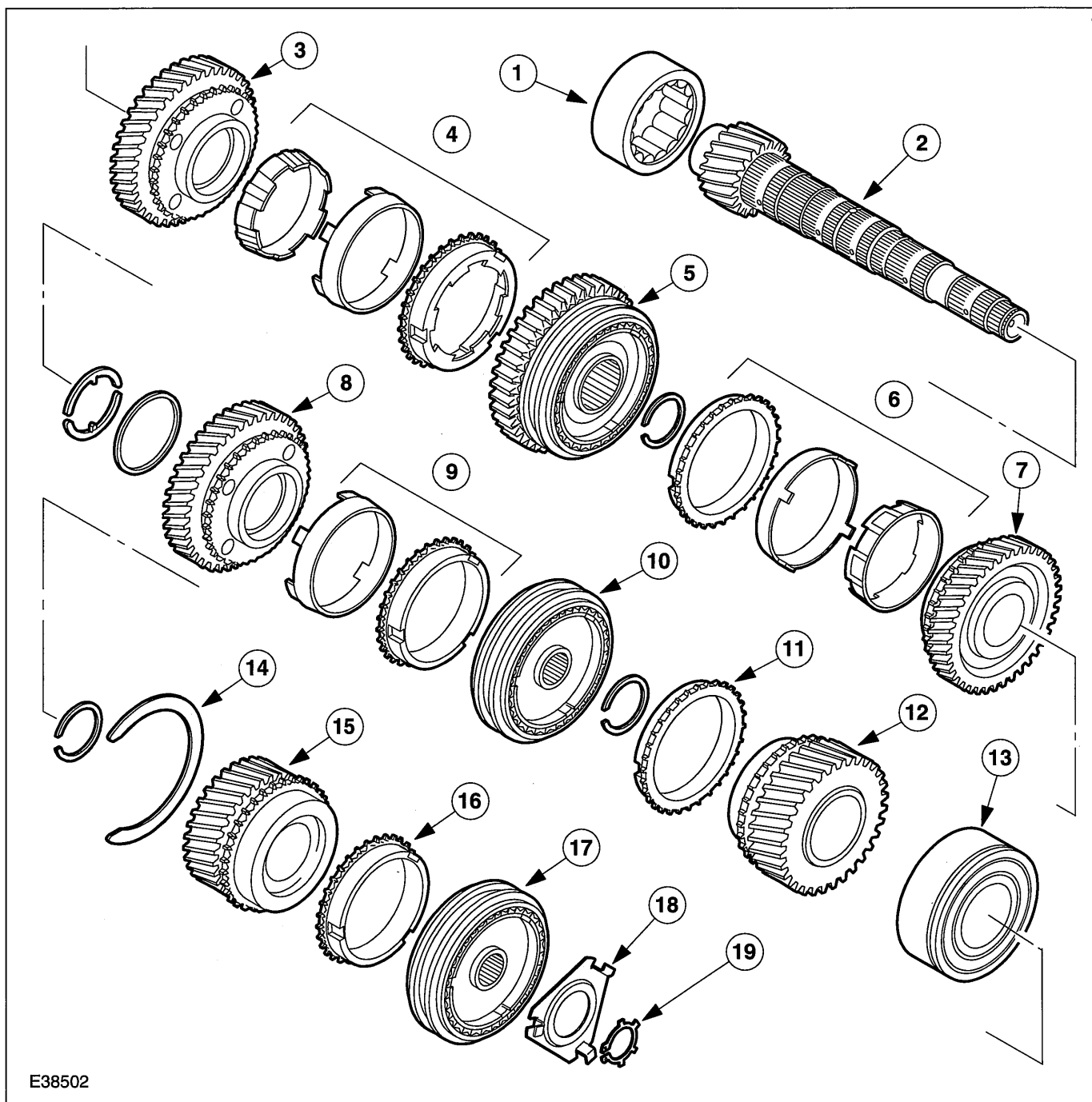
W1601033

Item	Description
1	Ball bearing
2	Input shaft
3	Reverse gear idler
4	1st gear wheel
5	Reverse gear wheel

Item	Description
6	2nd gear wheel
7	3rd gear wheel
8	4th gear wheel
9	Snap ring
10	5th gear wheel
11	Snap ring

DESCRIPTION AND OPERATION

Output shaft



E38502

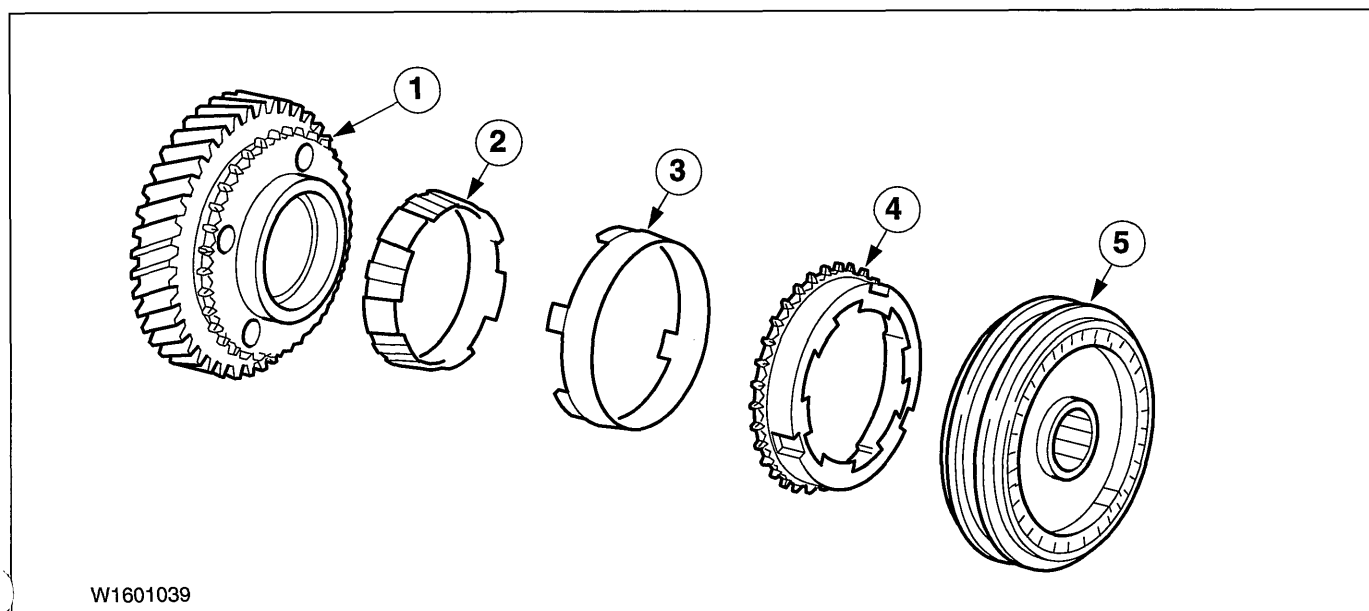
Item	Description
1	Open cylinder roller bearing
2	Output shaft with differential drive wheel
3	1st gear wheel
4	1st gear double synchronisation
5	Synchroniser - 1st/2nd gear with reverse gear wheel
6	2nd gear double synchronisation

Item	Description
7	2nd gear wheel
8	3rd gear wheel
9	3rd gear simple synchronisation
10	Synchroniser assembly - 3rd/4th gear
11	4th gear simple synchronisation
12	4th gear wheel
13	Ball bearing (closed both sides)

DESCRIPTION AND OPERATION

Item	Description
14	Snap ring
15	5th gear wheel
16	5th gear simple synchronisation

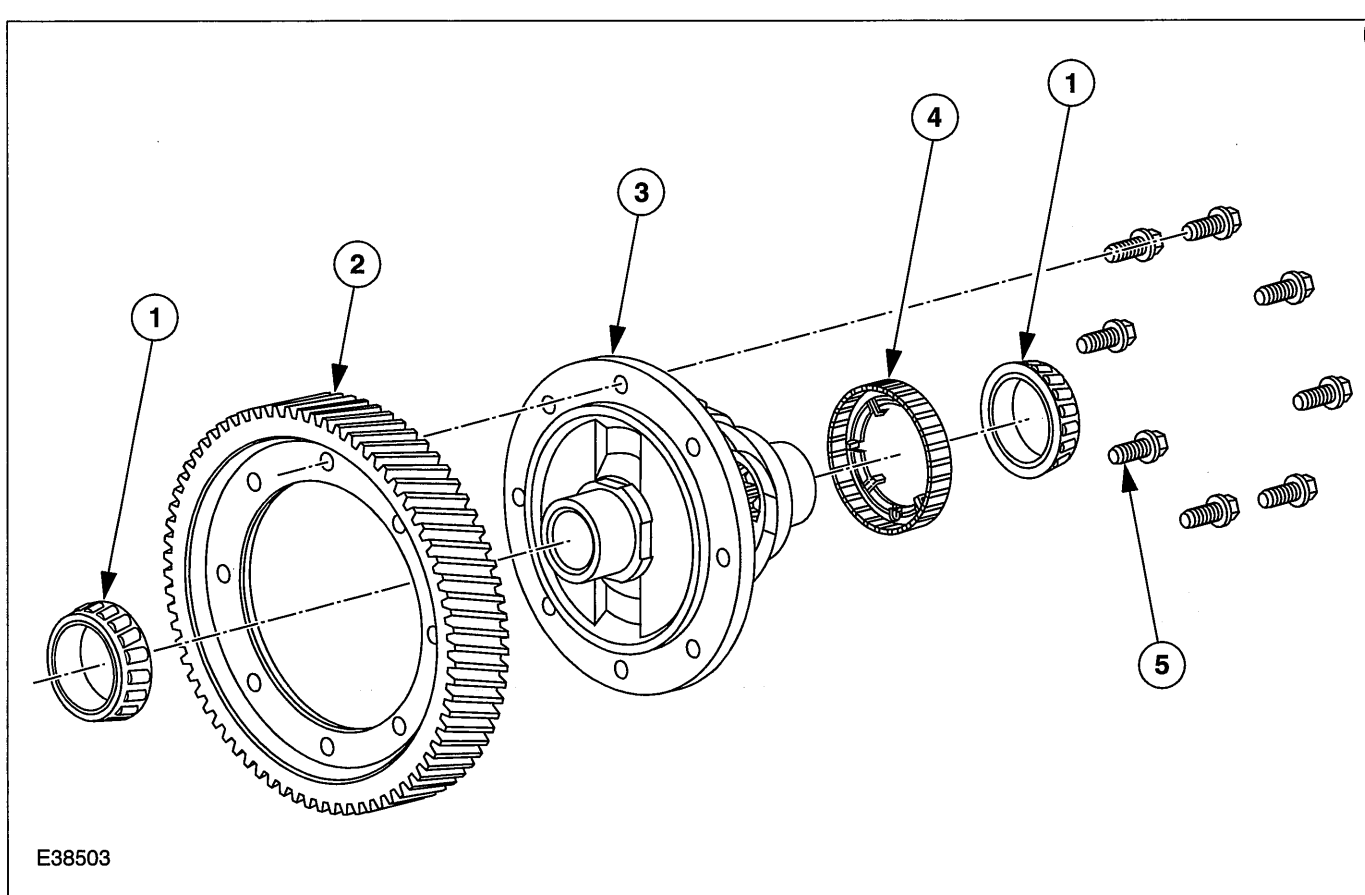
Item	Description
17	5th gear synchroniser assembly
18	Retaining plate
19	Snap ring

Double synchronisation

Item	Description
1	Gearwheel
2	Inner synchroniser ring
3	Conical ring
4	Outer synchroniser ring
5	Synchroniser hub

1st and 2nd gears are double synchronised.

The effective synchronisation surface for double synchronisation is almost twice that of simple synchronisation. Because of this, the speeds of the gearwheels are equalised much faster, which considerably improves gearshifting comfort.

DESCRIPTION AND OPERATION**Differential assembly**

E38503

Item	Description
1	Bearing
2	Crown wheel
3	Differential assembly
4	Sender wheel - Vehicle Speed Sensor (VSS)
5	Crown wheel bolts

The differential assembly is built into the transmission housing.

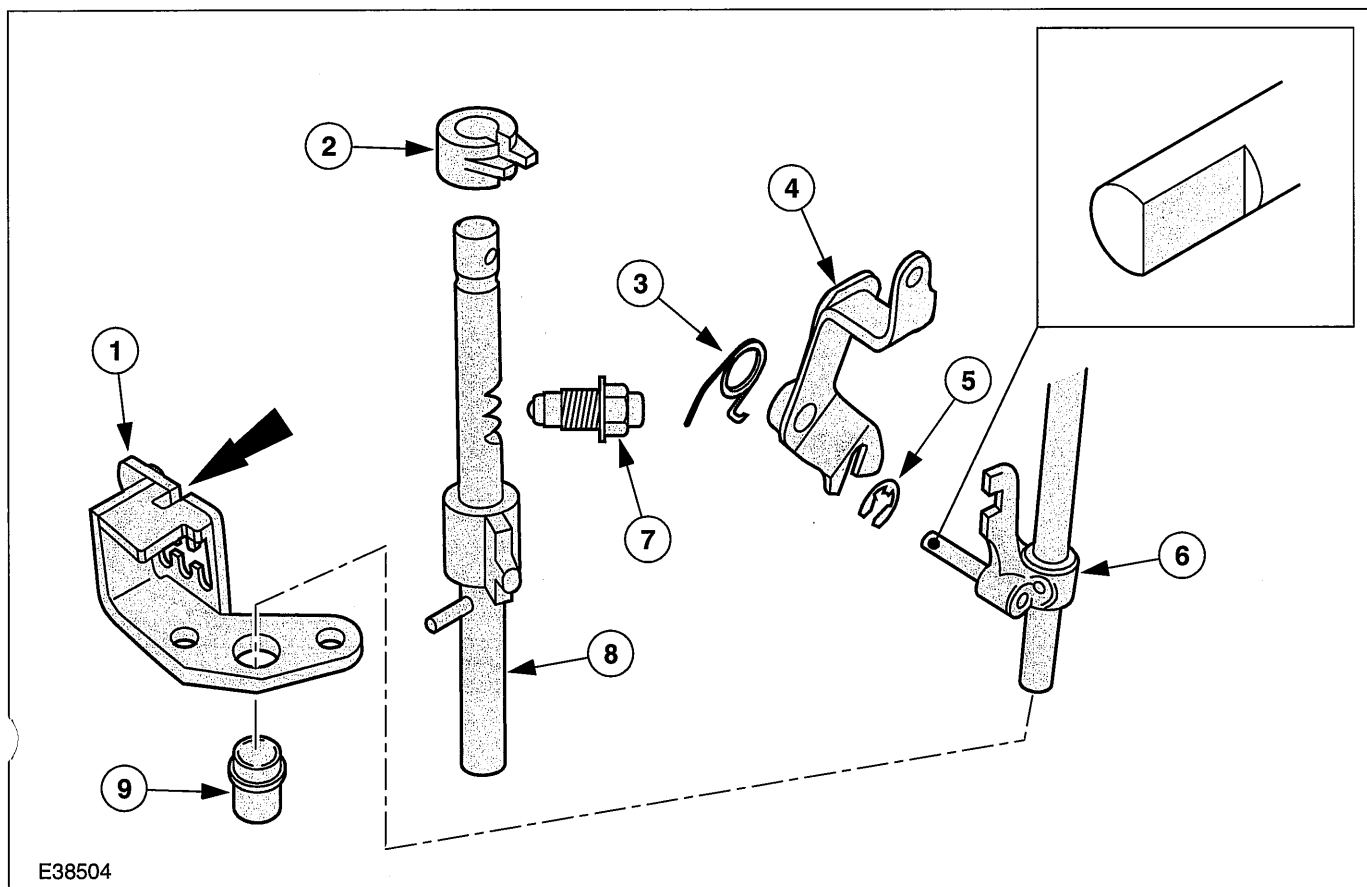
The drive torque is transmitted to the differential by the crown wheel which is bolted to it.

The differential assembly contains differential pinion gears mounted on a spindle and the axle halfshaft pinion gears which connect to the front wheel axle halfshafts through helical gearing.

The axle halfshaft pinion gears can revolve around the differential pinion gears when the road wheel speeds are different (e.g. when cornering).

On vehicles without Anti-lock Brake System (ABS) a VSS detects the speed of the differential assembly at the VSS sender wheel.

On vehicles with ABS the VSS sender wheel is also installed. The VSS is however not installed in this case. A plug with an O-ring closes the corresponding bore instead.

DESCRIPTION AND OPERATION**Internal shift mechanism****Layout**

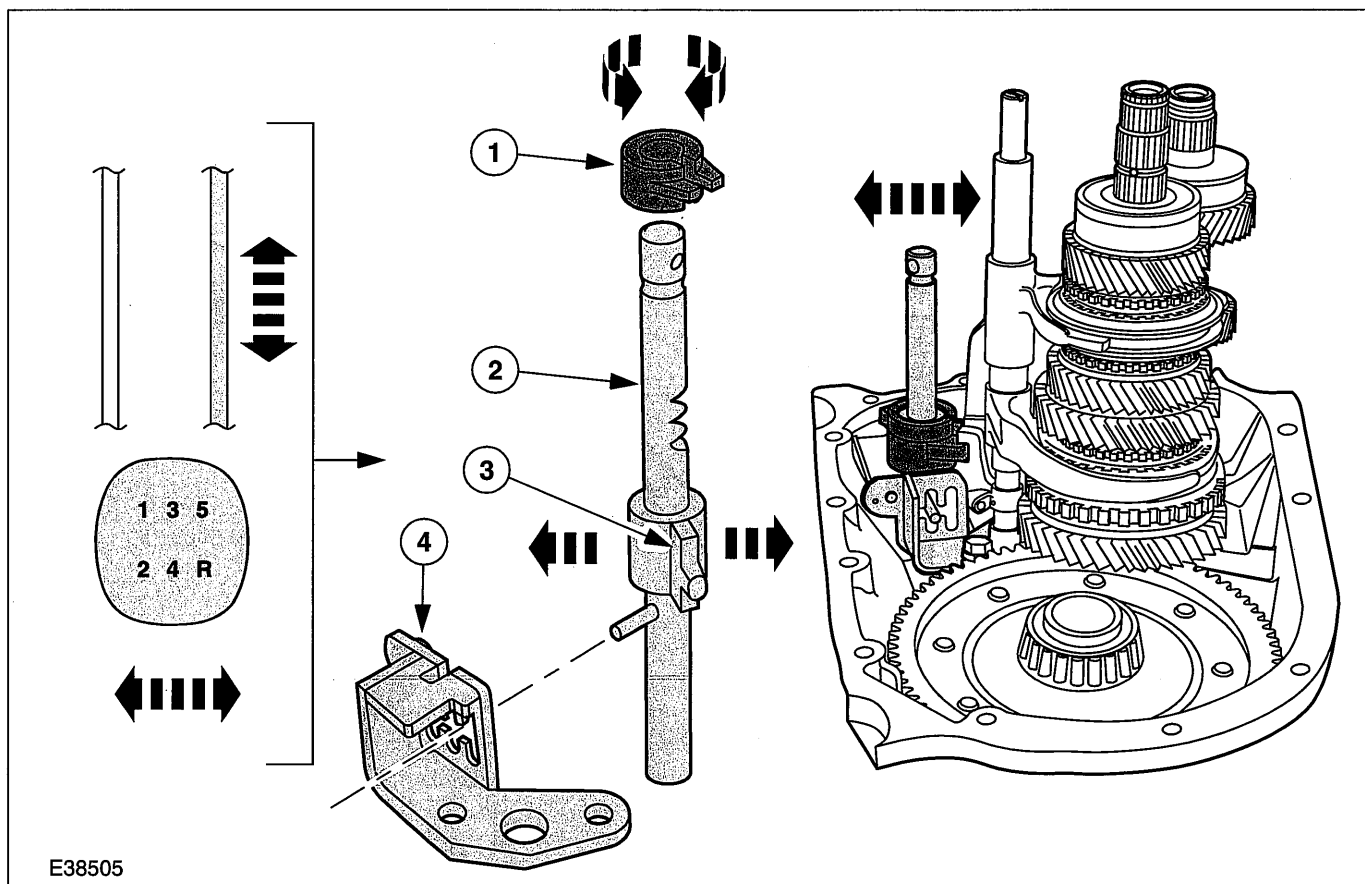
Item	Description
1	Selector gate
2	Shift locking bush
3	Return spring from reverse gear position
4	Reverse gear selector shaft
5	Snap ring
6	Shift rod - 5th gear/reverse gear
7	Selector interlock

Item	Description
8	Selector shaft
9	Guide sleeve

The shift locking bush prevents two gears from being engaged at the same time.

The selector interlock maintains engagement of the selected gear.

Both the shift and the select process is performed through the selector shaft.

DESCRIPTION AND OPERATION**Select movement**

Item	Description
1	Shift locking bush
2	Selector shaft
3	Selector boss
4	Selector gate

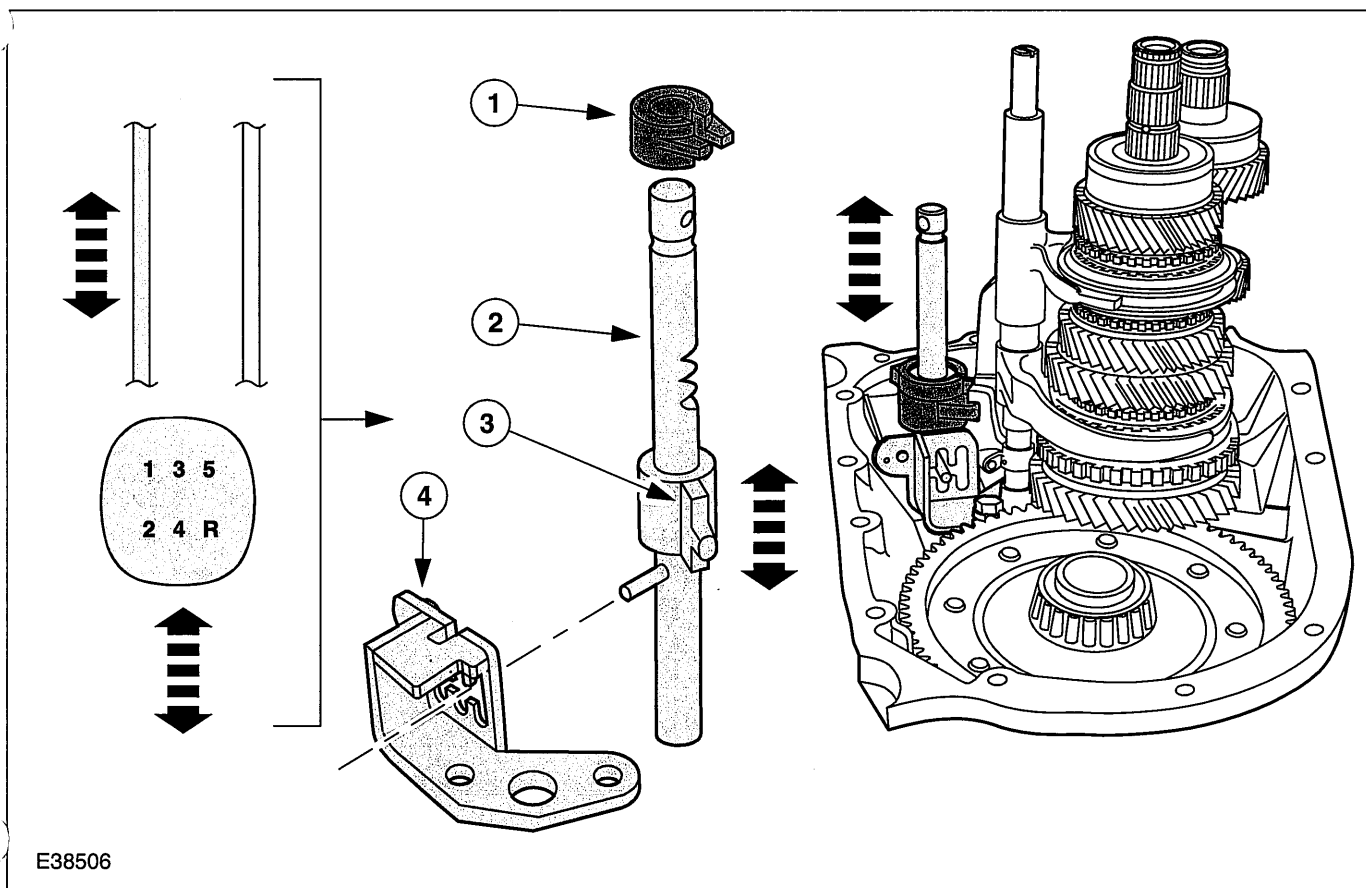
The axial movement of the selector cable is transferred at the transmission to the selector shaft which can turn in its bearing.

If the gearshift lever is moved to the left or right, the selector shaft and the selector boss both turn together in the corresponding direction.

As this happens, the selector shaft is guided by a pin in the selector gate.

The selector boss selects the required selector fork.

At the same time the shift locking bush prevents access to other gear combinations.

DESCRIPTION AND OPERATION**Shift movement**

E38506

Item	Description
1	Shift locking bush
2	Selector shaft
3	Selector boss
4	Selector gate

After the gear pair to be shifted has been selected, the shift movement takes place.

Here the axial movement of the shift cable at the transmission produces an axial movement of the selector shaft.

If the gearshift lever is moved forwards or backwards, the selector shaft and the selector boss both move vertically together.

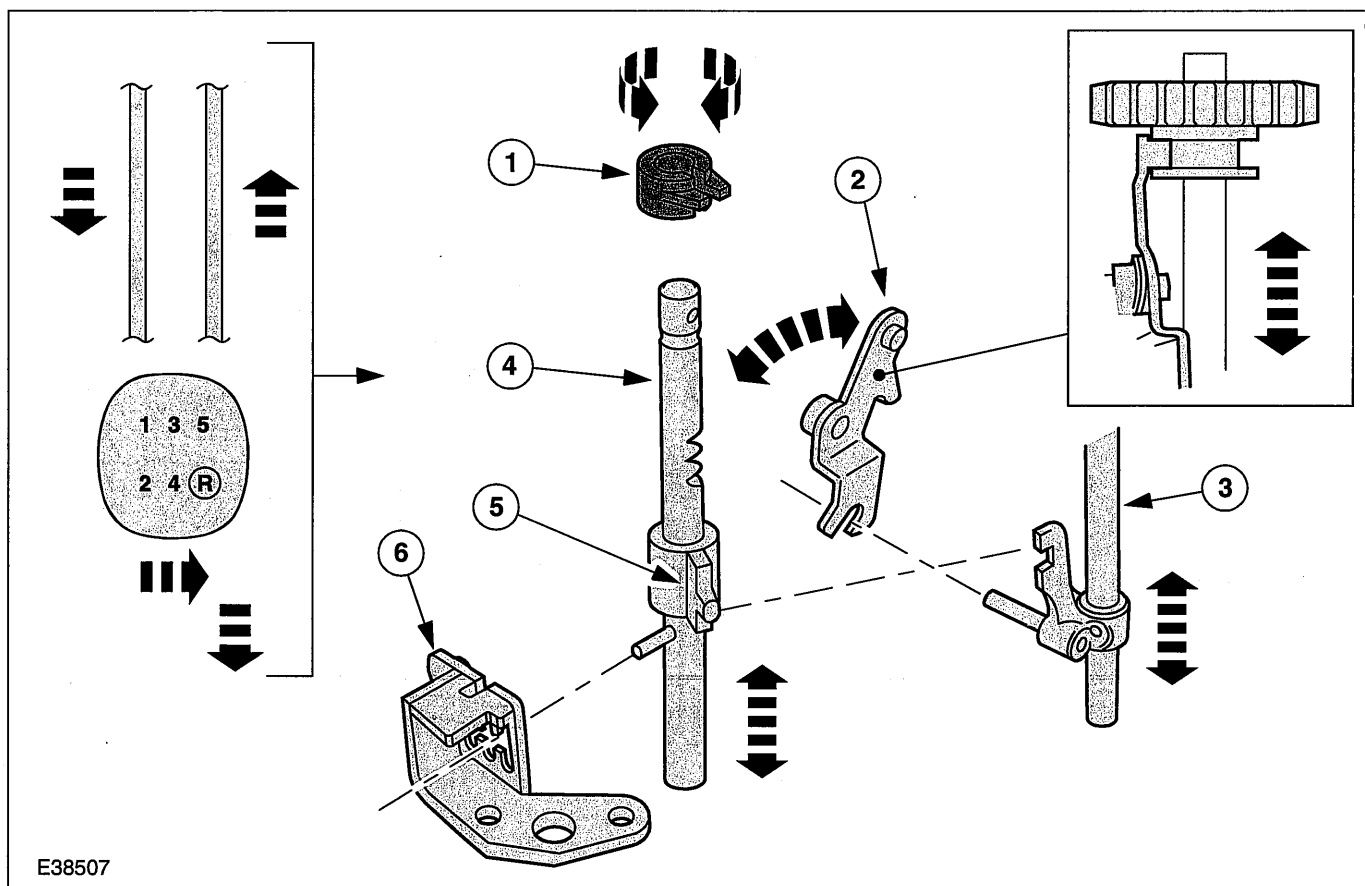
As this happens, the selector shaft is guided by a pin in the selector gate.

The selector boss shifts the required selector fork.

At the same time the shift locking bush prevents access to other gear combinations.

DESCRIPTION AND OPERATION

Engage reverse gear



E38507

Item	Description
1	Shift locking bush
2	Reverse gear selector shaft
3	Shift rod - 5th gear/reverse gear
4	Selector shaft
5	Selector boss
6	Selector gate

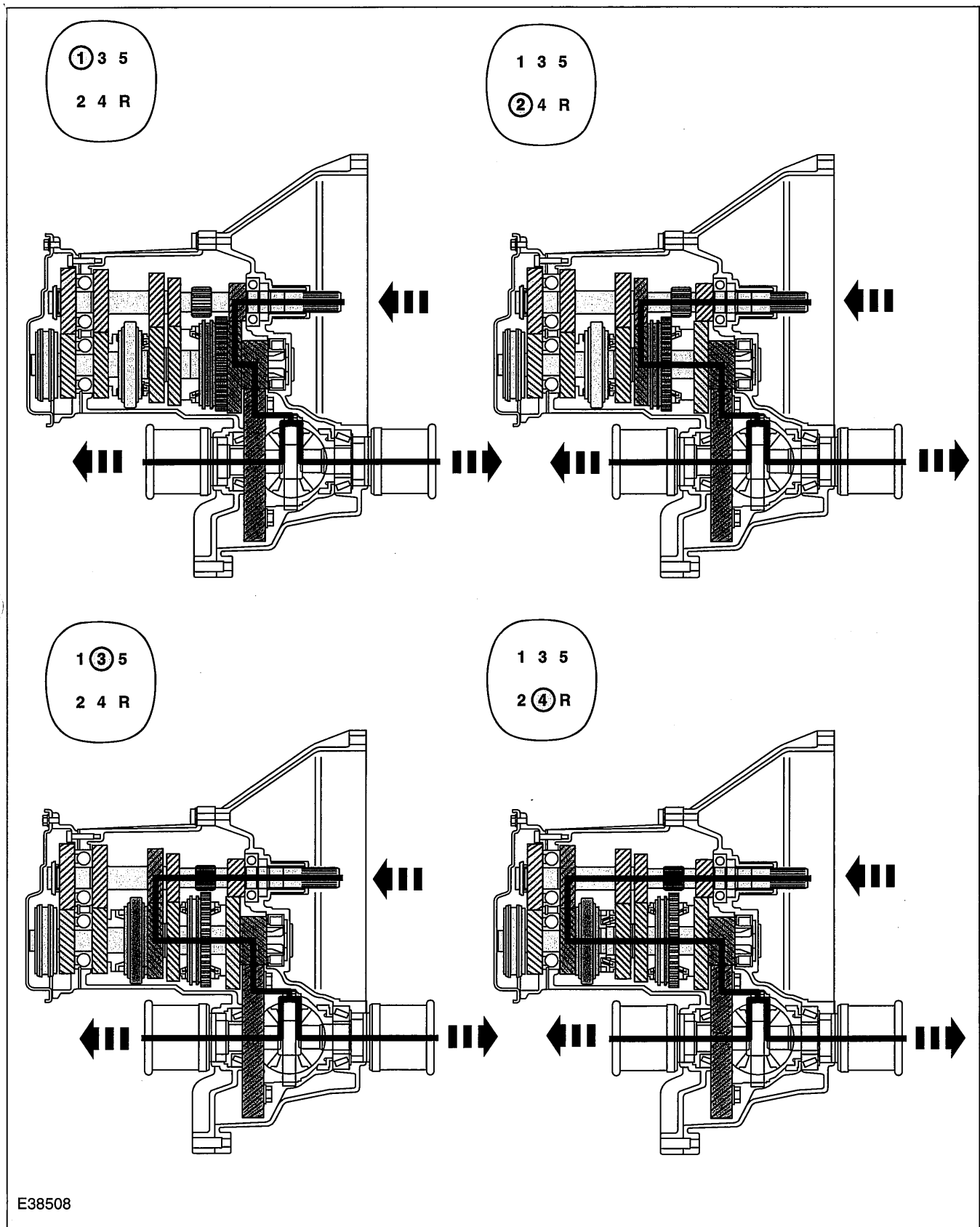
In order to select reverse gear, the gearshift lever must be moved to the right over and past the reverse gear inhibit device. As this occurs the axial movement of the selector cable is transferred to the selector shaft which can turn in its bearing.

When shifting into reverse gear, the gearshift lever is moved backwards. The selector boss engages in the 5th gear/reverse gear shift rod, which in turn engages the reverse gear selector shaft.

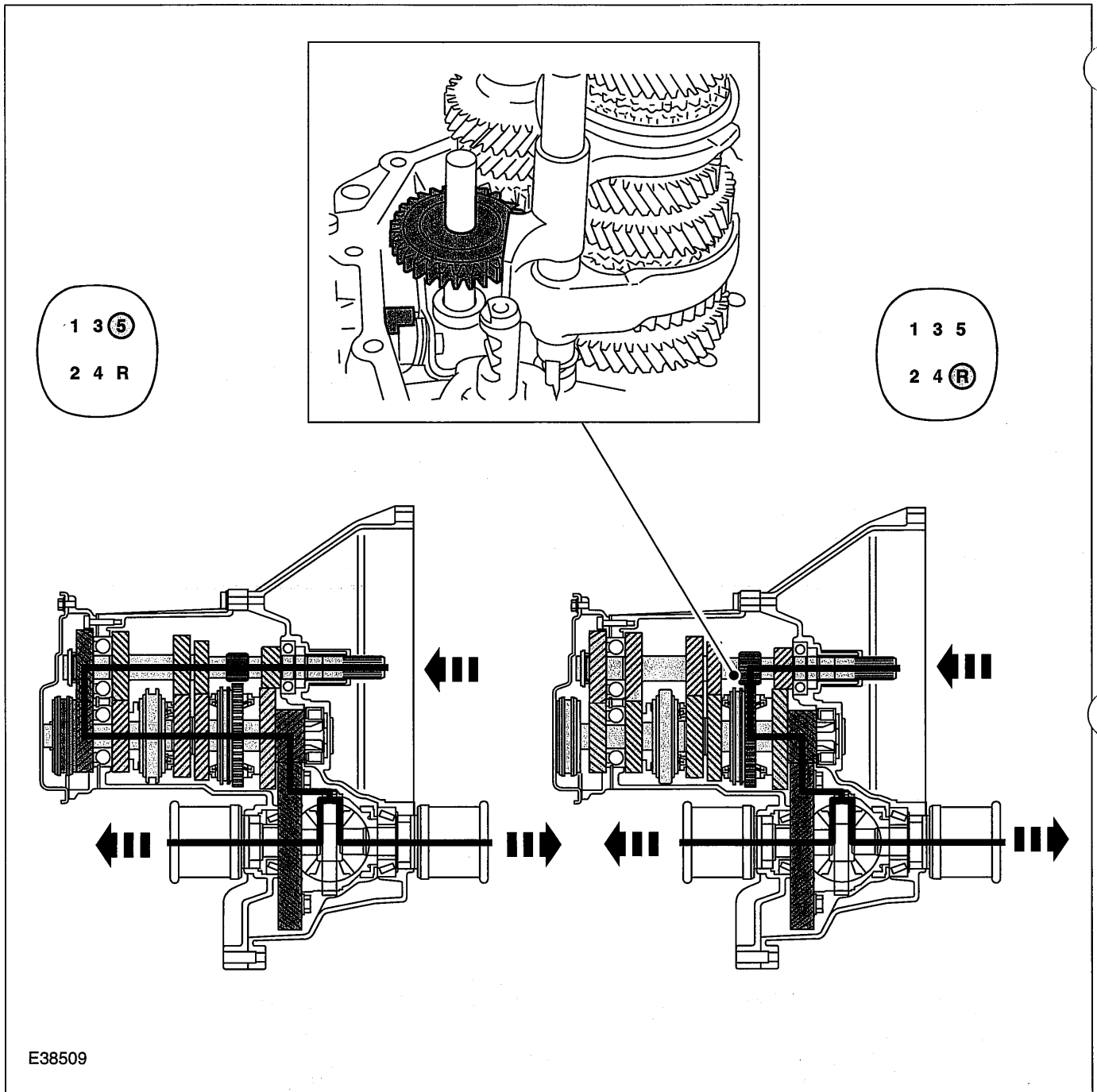
During the select and shift process the selector shaft is guided through the selector gate by a pin.

The reverse gear idler is slid by the reverse gear selector shaft and reverse gear is engaged.

At the same time the shift locking bush prevents access to other gear combinations.

DESCRIPTION AND OPERATION**Power transmission in the individual gears**

DESCRIPTION AND OPERATION



DIAGNOSIS AND TESTING**Manual Transaxle**

REFER to: Manual Transaxle and Clutch (308-00
Manual Transmission/Transaxle and Clutch -
General Information, Diagnosis and Testing).

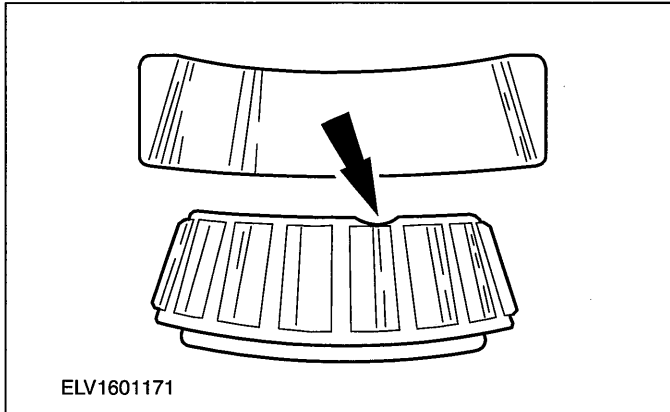
GENERAL PROCEDURES

Bearing Check

1. **NOTE:** Establish the cause of the damage and resolve it.

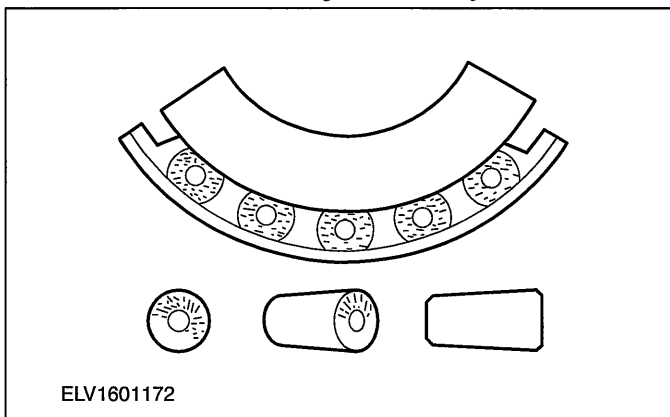
Check whether the bearing cage is damaged at the top, side or at the openings is damaged because of the unprofessional use of a special tool or of the wrong tool.

- Install a new bearing if necessary.



2. Check whether the ends of the taper rollers are discoloured as a result of inadequate lubrication or overheating, possibly through excessive pre-load.

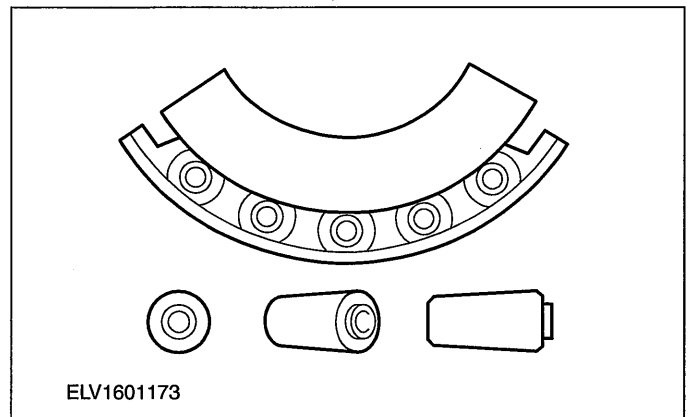
- Install a new bearing and new seals if necessary.
- Check the bearing is correctly lubricated.



3. Check whether the ends of the taper rollers are worn away due to incorrect installation, excessive pre-load or faulty bearing seating.

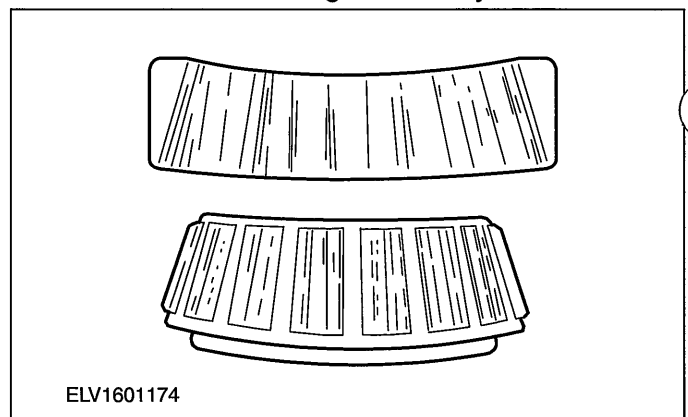
- Install a new bearing and new seals if necessary.

- Check the bearing is correctly lubricated.



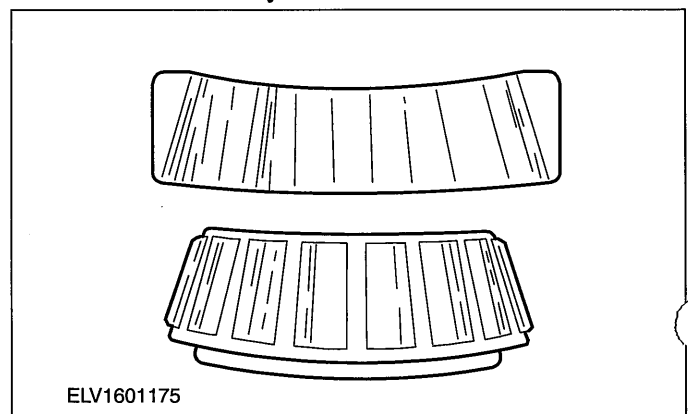
4. Check whether the bearing surfaces are grey or grey/black with deposits between the rollers.

- Install a new bearing and new seals if necessary.
- Check the bearing is correctly lubricated.



5. Check whether the bearing ring surfaces are grooved caused by static impact.

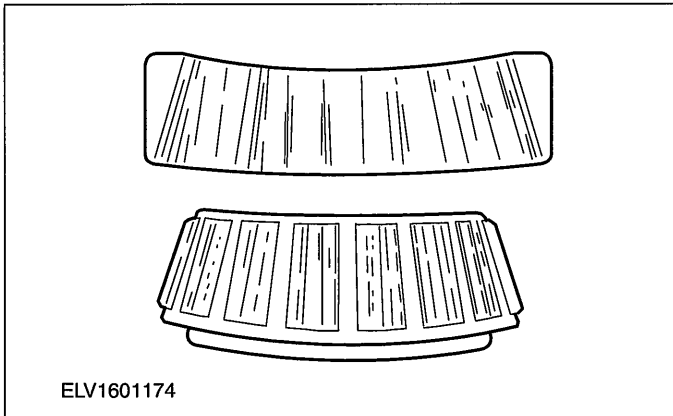
- Install a new bearing if its surface is rough, or if it is noisy.



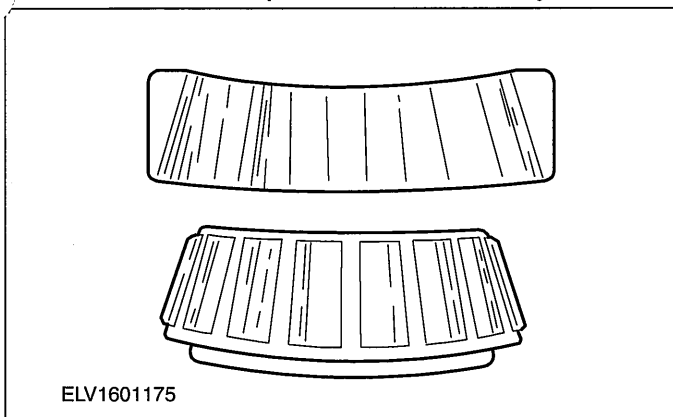
GENERAL PROCEDURES**6. NOTE: Overheating can cause loss of surface hardness.**

Check for a dark blue colour caused by overheating (yellow or brown is normal) due to excessive pre-load or inadequate lubrication.

- Install a new bearing, new seals and check other components as necessary.

**7. Check the surfaces for abrasion due to metal fatigue.**

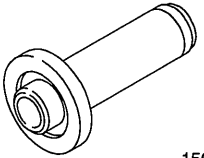
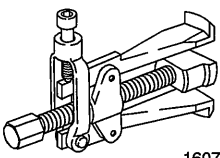
- Install a new bearing and clean all other affected components as necessary.



IN-VEHICLE REPAIR

Halfshaft Seal LH(14 303 0)

Special Tool(s)

 15058	Installer, Drive Pinion Seal 205-115 (15-058)
 16074	Remover, Halfshaft Seal 308-208 (16-074)

Materials

Name	Specification
Manual transmission fluid	WSD-M2C200-C

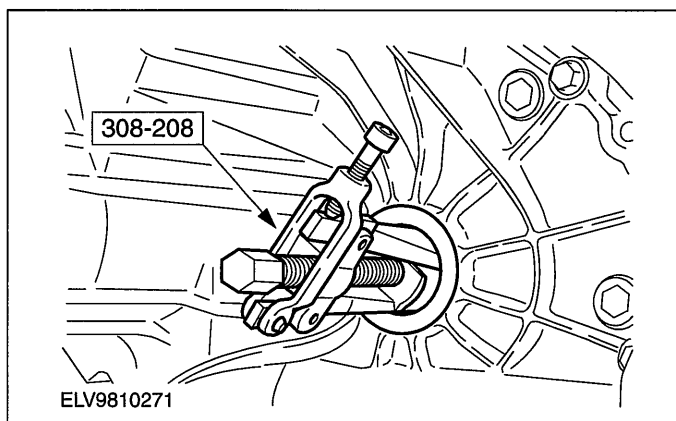
Removal

1. Remove the left-hand halfshaft.

For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

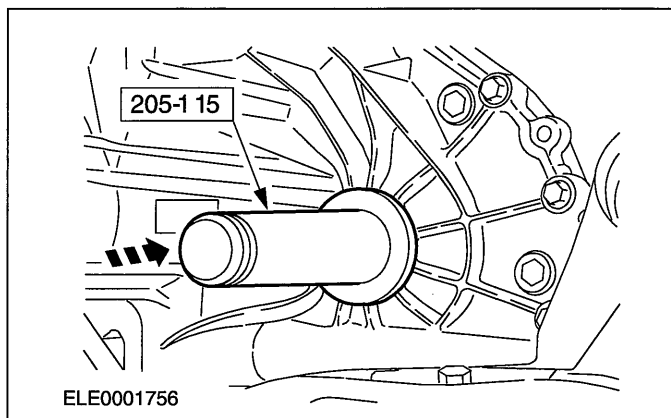
2. Using the special tool, remove the halfshaft seal.

- Discard the seal.



Installation

1. Using the special tool, install the halfshaft seal.



2. Install the left-hand halfshaft.

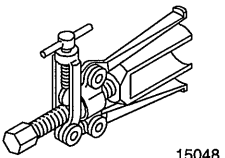
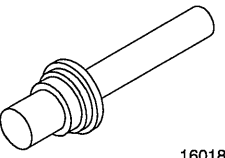
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

3. With the vehicle on a level surface, fill the transaxle with transmission fluid until the fluid level is just below the bottom of the filler hole.

IN-VEHICLE REPAIR

Halfshaft Seal RH(14 304 0)

Special Tool(s)

 15048	Remover, Drive Pinion Seal 205-078 (15-048)
 16018	Installer, Halfshaft Seal 308-039 (16-018)

Materials

Name	Specification
Manual transmission fluid	WSD-M2C200-C

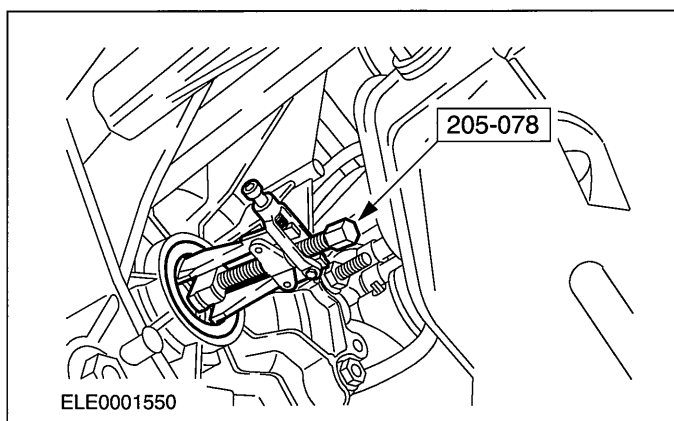
Removal

1. Remove the right-hand halfshaft.

For additional information, refer to: **Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).**

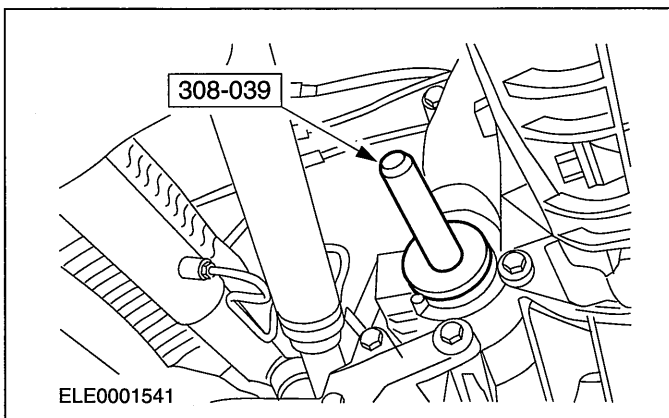
2. Using the special tool, remove the halfshaft seal.

- Discard the seal.



Installation

1. Using the special tool, install the halfshaft seal.



2. Install the right-hand halfshaft.

For additional information, refer to: **Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).**

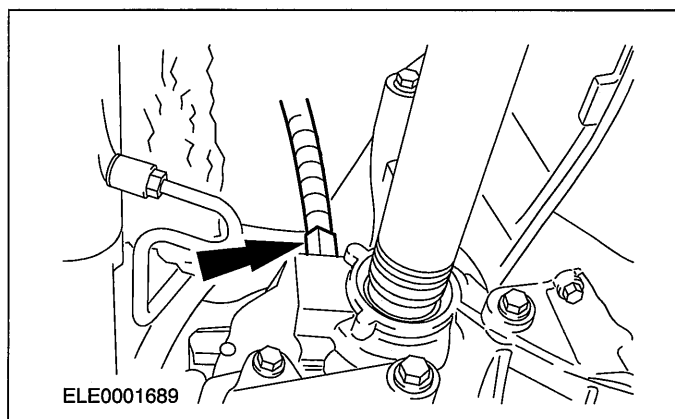
3. With the vehicle on a level surface, fill the transaxle with transmission fluid until the fluid level is just below the bottom of the filler hole.

IN-VEHICLE REPAIR**Vehicle Speed Sensor (VSS)(33 654 0)****Removal**

1. Raise and support the vehicle. For additional information, refer to: (100-02)

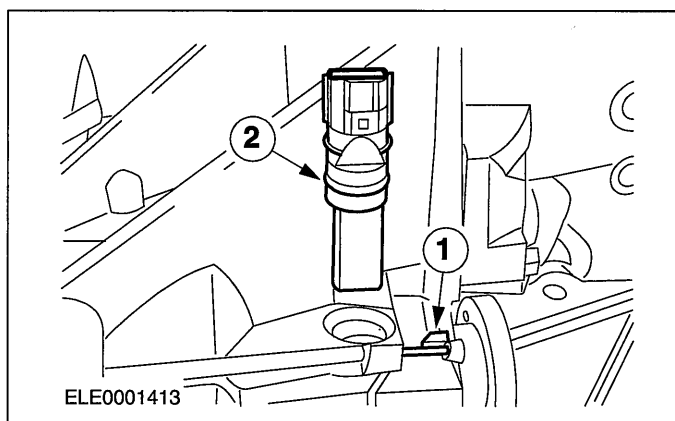
**Jacking (Description and Operation),
Lifting (Description and Operation).**

2. Disconnect the vehicle speed sensor (VSS) electrical connector.

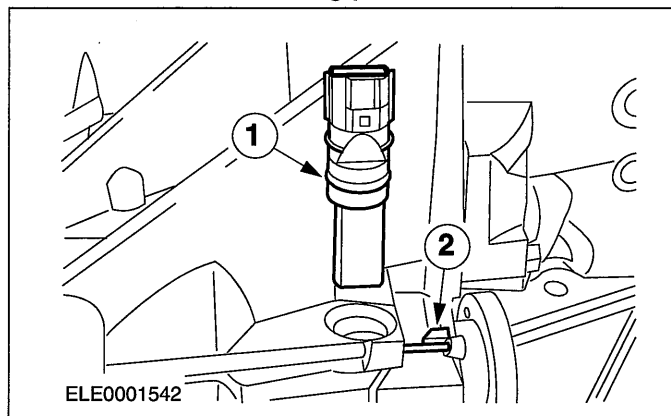


3. Remove the VSS.

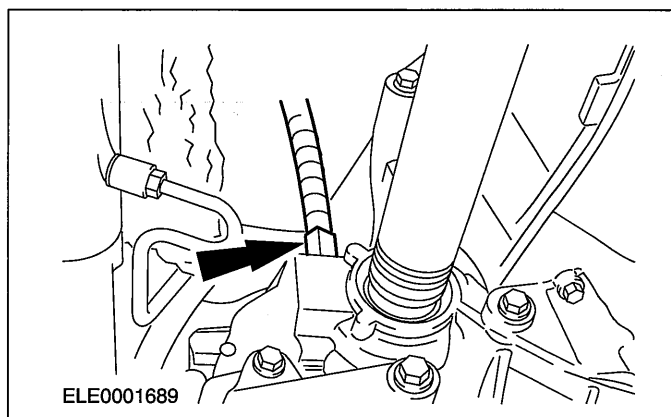
1. Remove the retaining pin.
2. Remove the VSS.



2. Insert the retaining pin.



2. Install VSS connector.



3. Lower the vehicle.

Installation

1. Install VSS.

1. Insert the VSS.

REMOVAL**Transaxle — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(16 114 0)****Special Tool(s)**

21140	Support Bar, Engine 303-290A (21-140A)
2114001	Adapter for 303-290A 303-290-01 (21-140-01)
2114002	Adapter for 303-290A 303-290-02 (21-140-02)
2114003	Adapter for 303-290A 303-290-03A (21-140-03A)
16089	Remover, Halfshaft 308-256 (16-089)

General Equipment

Retaining strap

Transmission jack

Removal

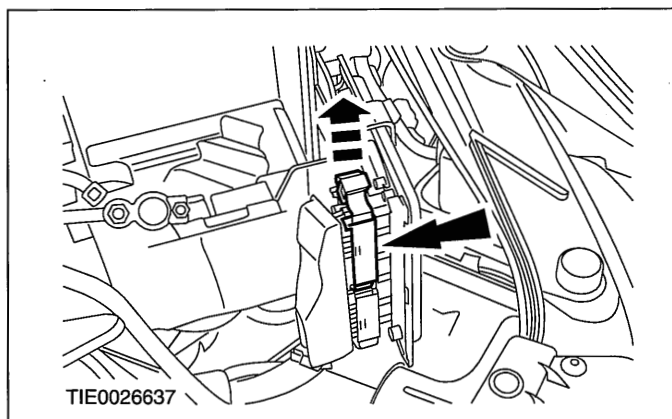
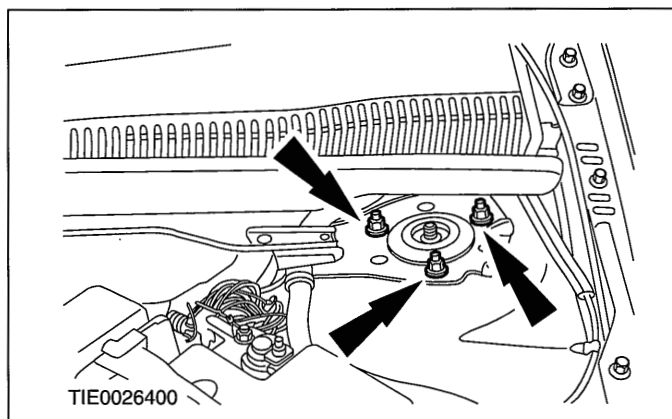
All vehicles

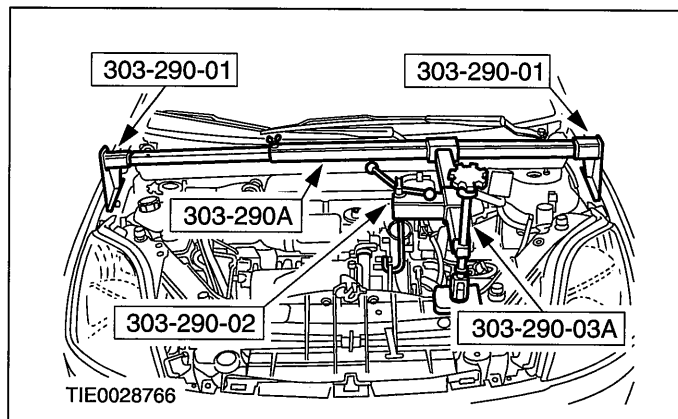
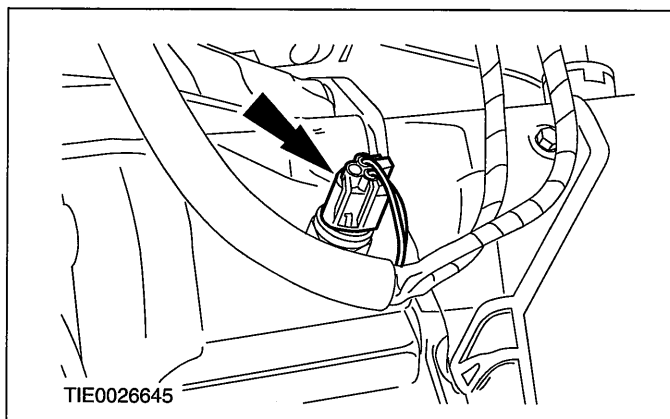
1. Remove the air cleaner.

For additional information, refer to: **Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-12 Intake Air Distribution and Filtering, Removal and Installation).**

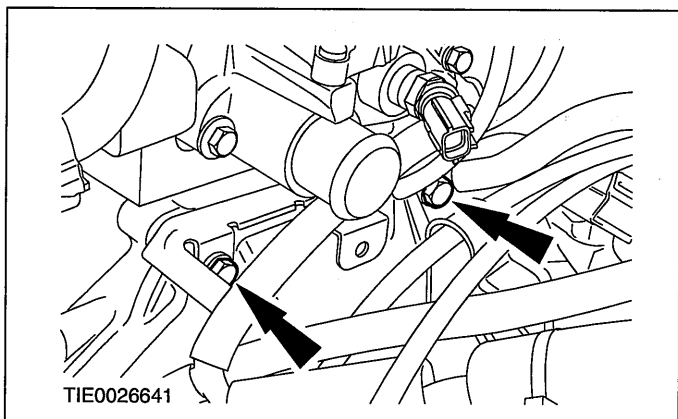
2. Remove the battery tray.

For additional information, refer to: **Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).**

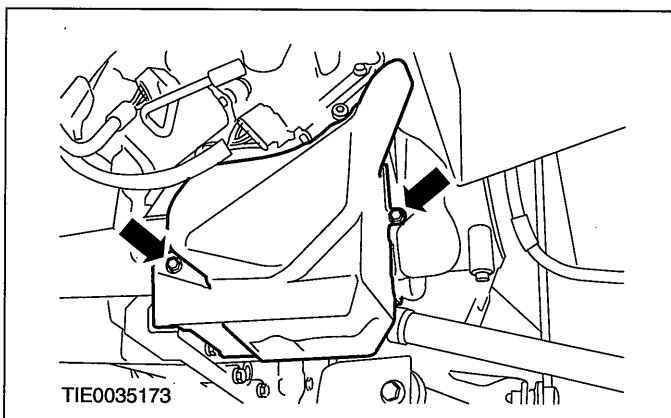
3. Disconnect the powertrain control module (PCM) electrical connector.**4. Loosen the strut and spring assembly top mount nuts by three turns on both sides.**

REMOVAL**5. Install the special tools.****9. Disconnect the reversing lamp switch electrical connector.****6. Remove the transaxle upper retaining bolts.**

- Detach the engine wiring harness bracket from the transaxle.



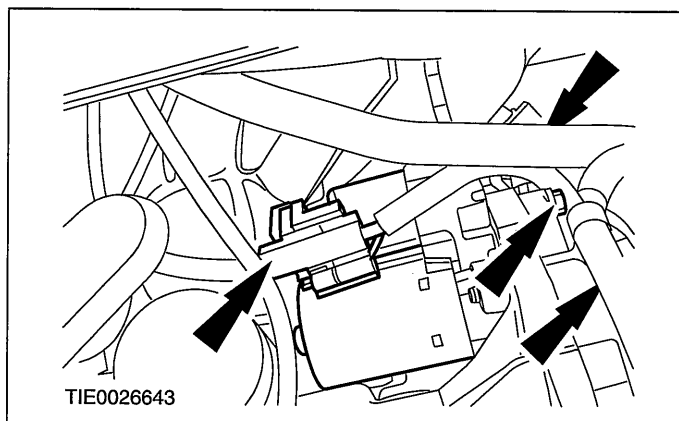
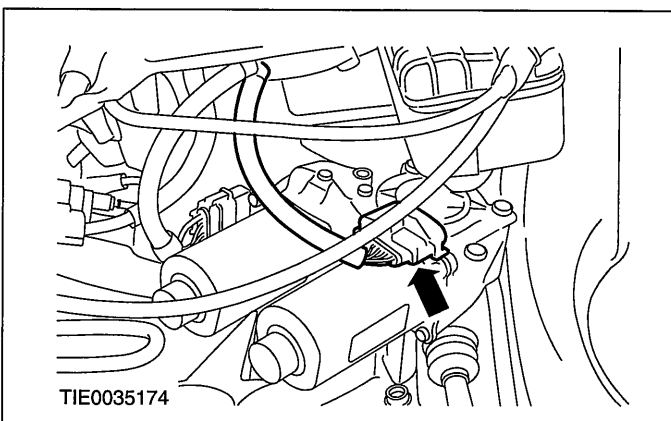
Vehicles with automated gearshift

10. Remove the gearshift actuator cover.**7. Remove the front wheels and tires.**

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

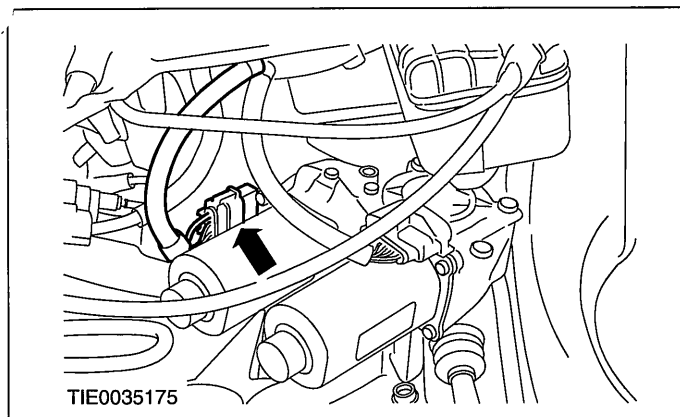
8. Remove the starter motor.

- Detach the starter motor electrical connector from the starter motor.

**11. Disconnect the gearshift actuator electrical connector (colored black).**

REMOVAL

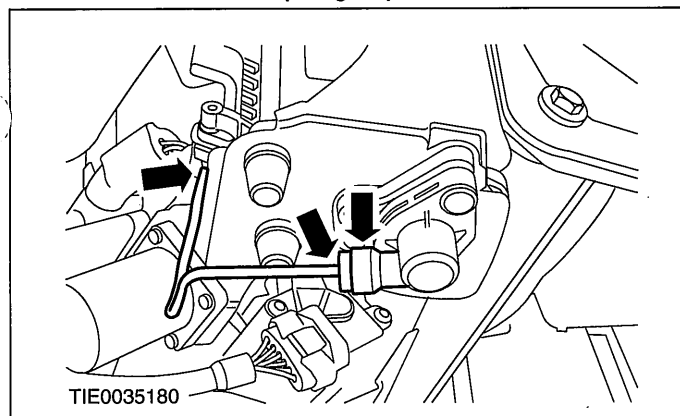
12. Disconnect the gearshift actuator electrical connector (colored grey).



13. **⚠ CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

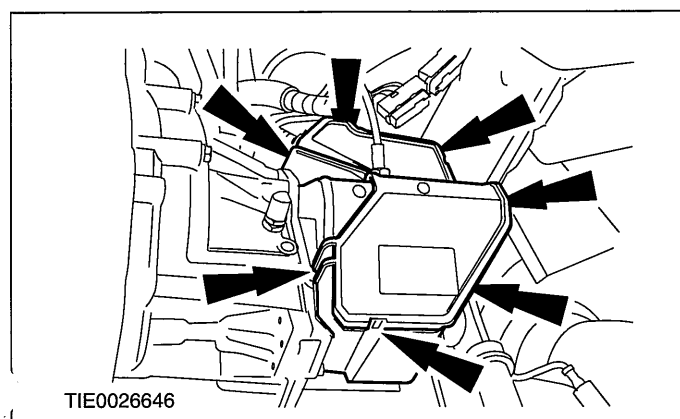
Disconnect the clutch slave cylinder supply line.

- Remove the spring clip.



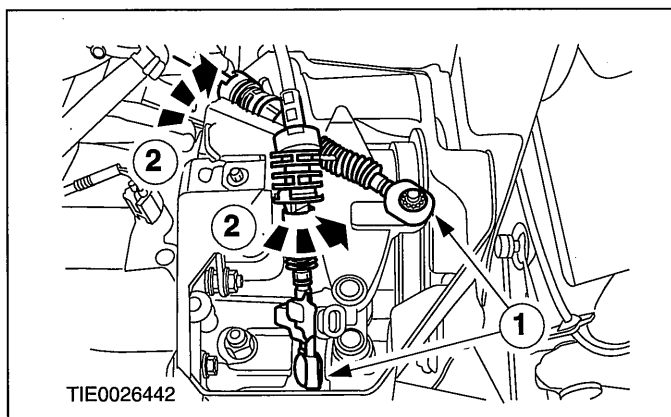
Vehicles without automated gearshift

14. Remove the gearshift cables cover.



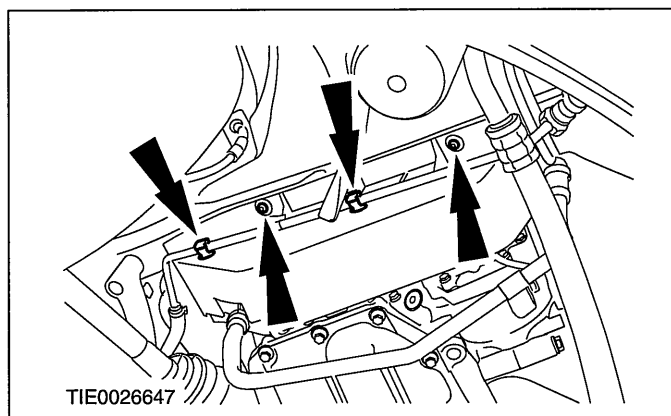
15. Detach the gearshift cables from the transaxle.

1. Detach the gearshift cables and the selector cable from the selector levers.
2. Turn the abutment sleeve clockwise and detach the cables from the bracket.

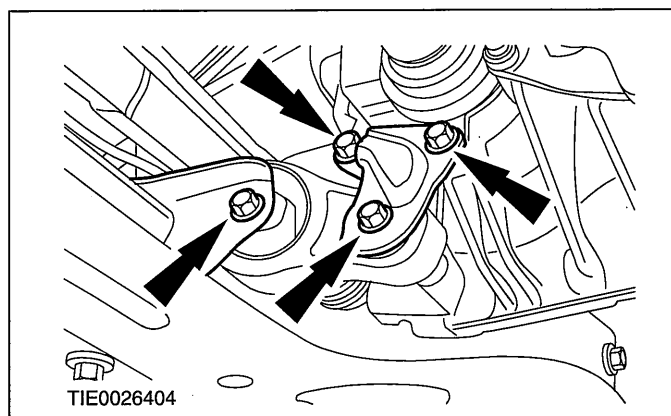


All vehicles

16. Remove the accessory drive belt cover.



17. Remove the engine support insulator.

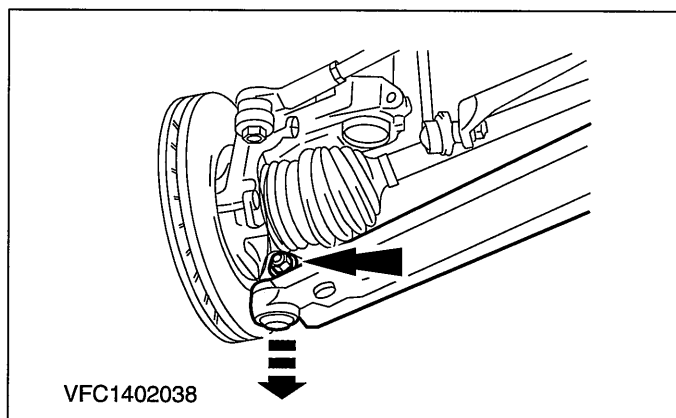


18. **⚠ CAUTION:** Protect the ball joint seal using a soft cloth to prevent damage.

Detach the lower arm from the wheel knuckle on both sides.

REMOVAL

- Remove the heat shield.

**19. CAUTIONS:**

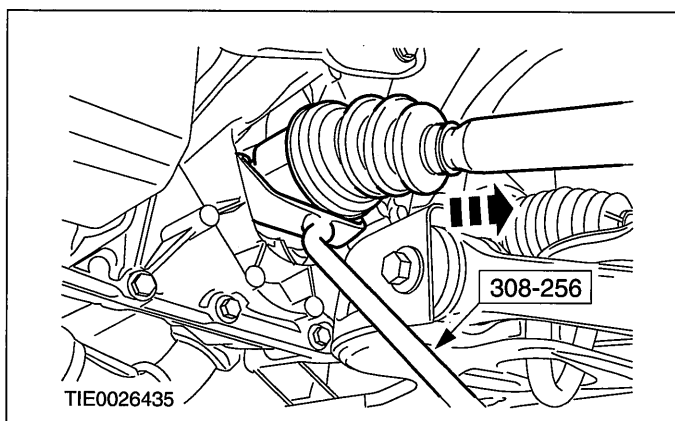
⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft oil seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

Using the special tool, detach the left-hand halfshaft from the transaxle and secure it to one side.

- Discard the snap ring.
- Allow the oil to drain into a suitable container.

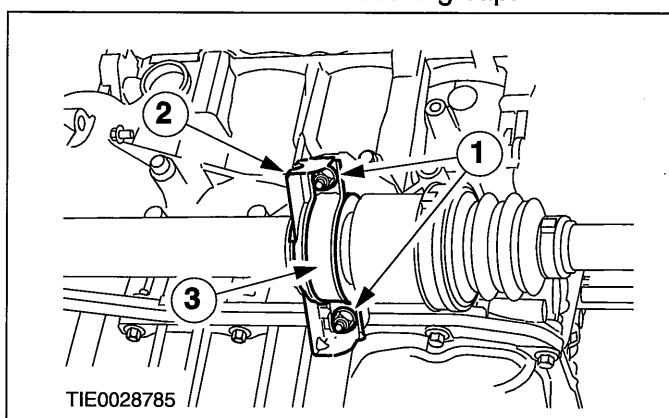


20. NOTE: Discard the intermediate shaft center bearing cap and locknuts.

Remove the intermediate shaft center bearing cap.

1. Remove the locknuts.
2. Detach the heat shield.

3. Remove the center bearing cap.

**21. CAUTIONS:**

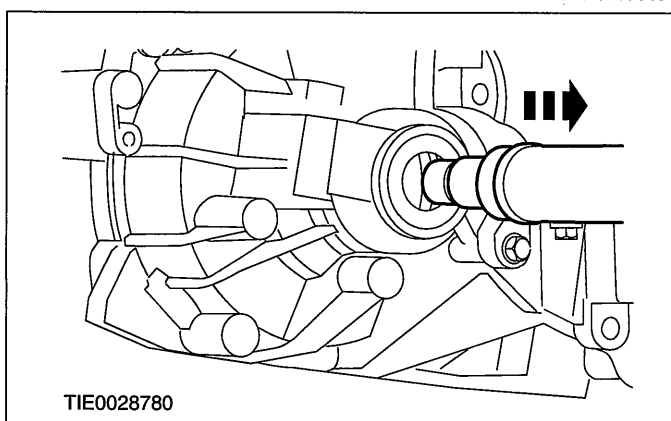
⚠ Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

⚠ Do not damage the halfshaft oil seal.

NOTE: Plug the transaxle to prevent oil loss or dirt ingress.

Detach the halfshaft and the intermediate shaft from the transaxle and secure it to one side.

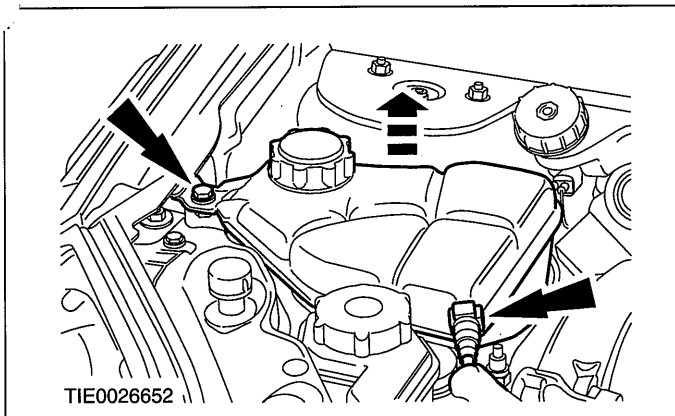
- Allow the oil to drain into a suitable container.



22. Lower the vehicle.

REMOVAL

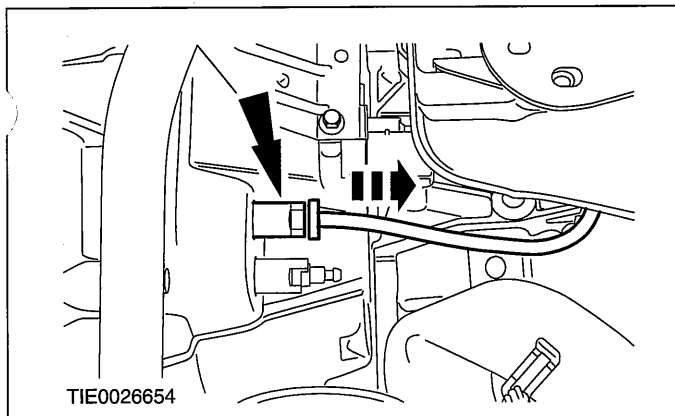
23. Detach the coolant expansion tank from the bracket and position it to one side.



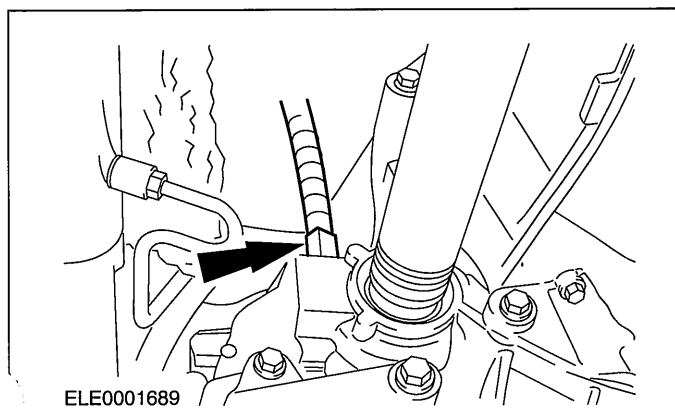
24. **CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

Disconnect the clutch slave cylinder supply line.

- Remove the spring clip.

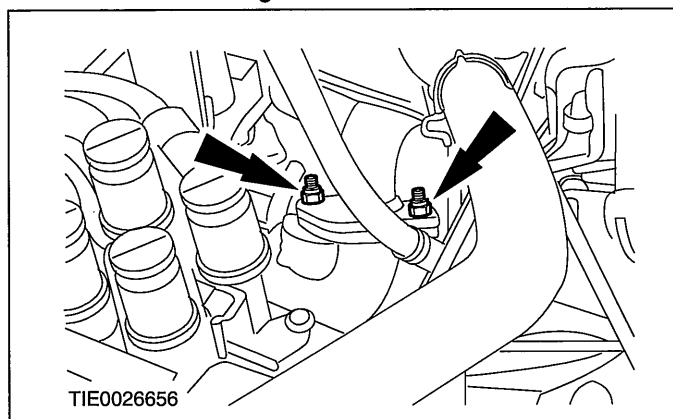


25. Disconnect the vehicle speed sensor (VSS) electrical connector (if equipped).

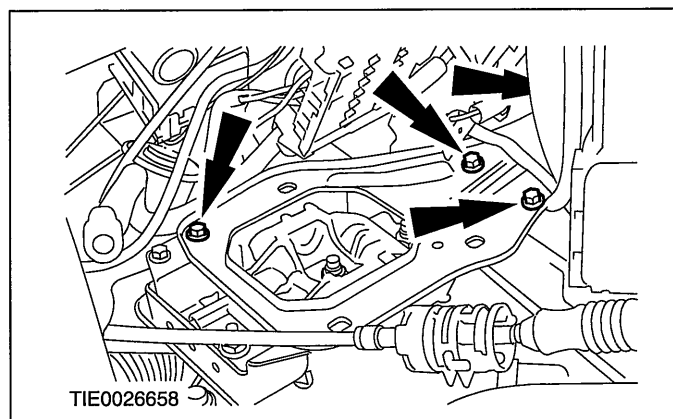


26. Detach the exhaust flexible pipe from the catalytic converter.

- Discard the gasket.

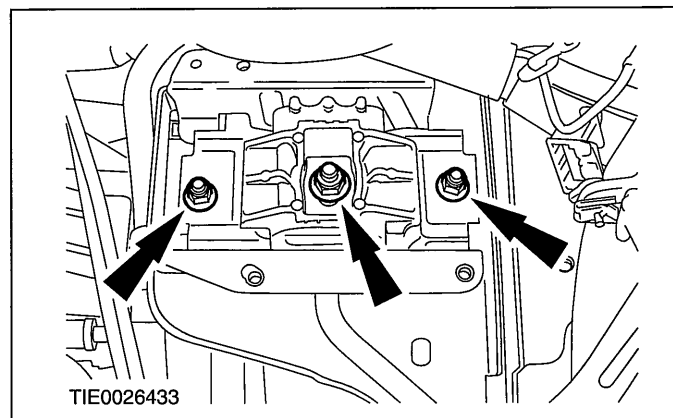


27. Remove the battery tray support bracket.



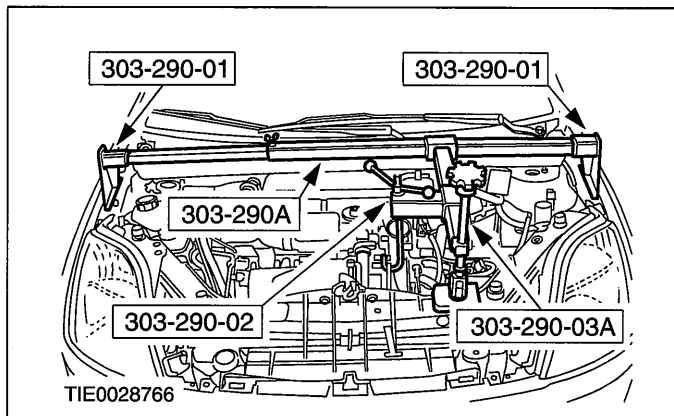
28. Remove the engine and transaxle rear mount.

- Discard the nuts.

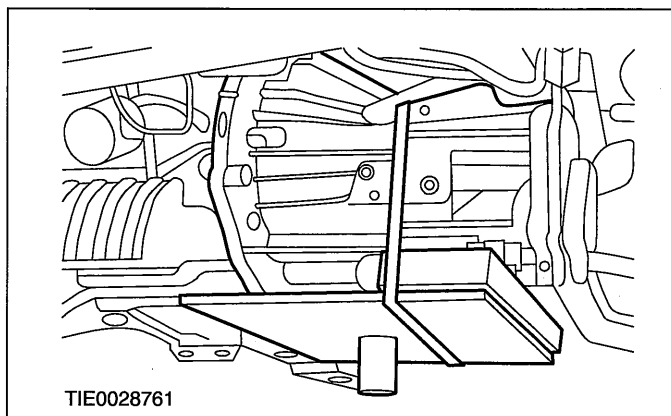


REMOVAL

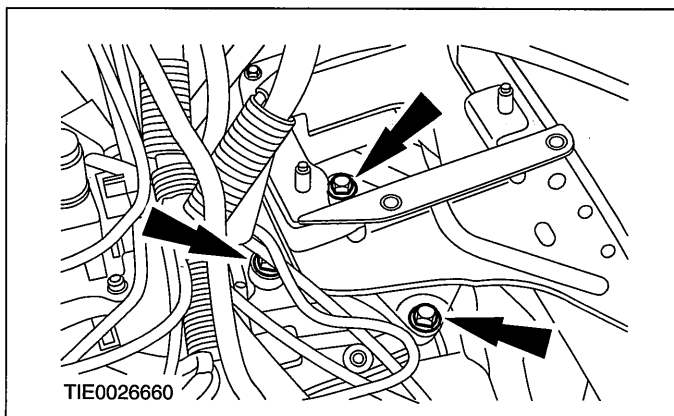
- 29. Using the special tools, lower the engine and transaxle assembly.**



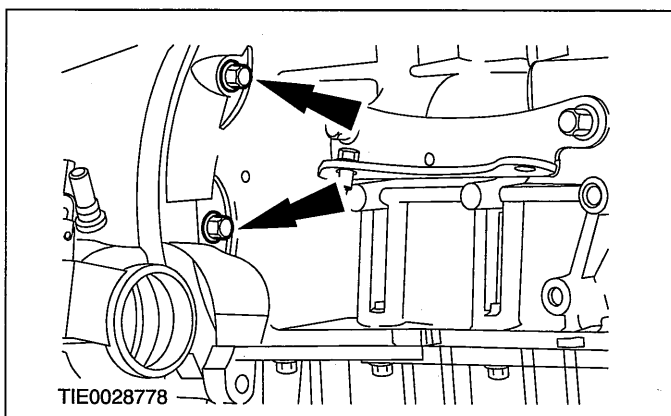
- Using a suitable transmission jack, support the transaxle.**



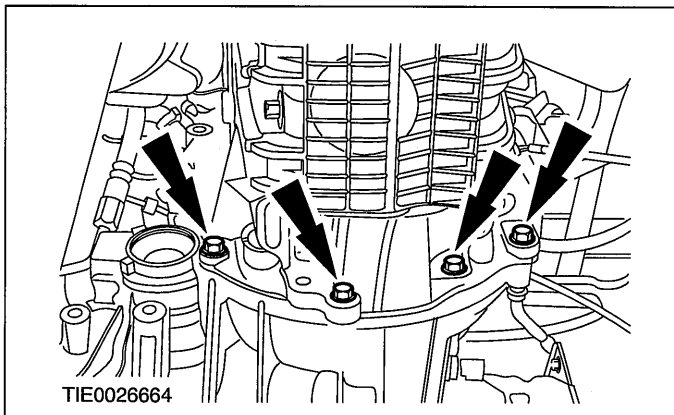
- 30. Remove the engine and transaxle rear mount retaining bracket.**



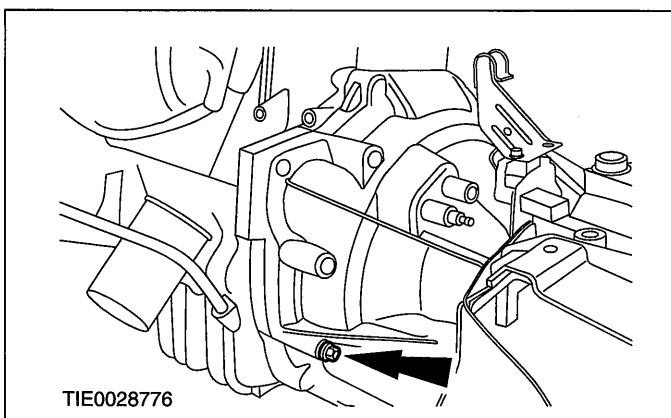
- 33. Remove the transaxle right-hand retaining bolts.**



- 31. Remove the transaxle lower retaining bolts.**



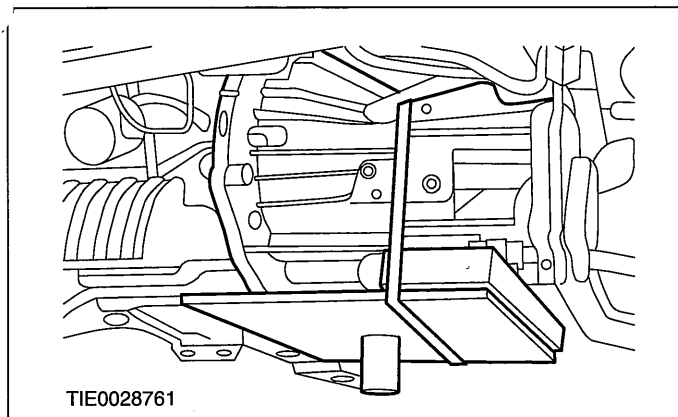
- 34. Remove the transaxle left-hand retaining bolt.**



- 32. NOTE: Secure the transaxle with a retaining strap on the transmission jack.**

REMOVAL

35. Using a suitable transmission jack, remove the transaxle.



REMOVAL**Transaxle — 2.0L Duratec-HE (MI4)(16 114 0)****Special Tool(s)**

21140	Support Bar, Engine 303-290A (21-140A)
2114001	Adapter for 303-290A 303-290-01 (21-140-01)
2114003	Adapter for 303-290A 303-290-03A (21-140-03A)
2114005	Adapter for 303-290A 303-290-05A (21-140-05A)
2114006	Adapter for 303-290A 303-290-06 (21-140-06)

General Equipment

Retaining strap

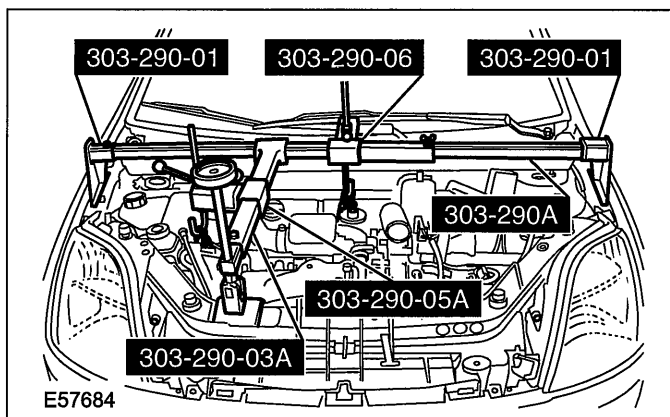
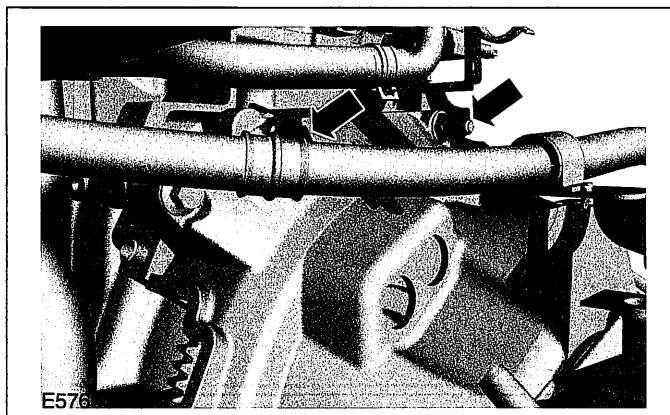
Transmission jack

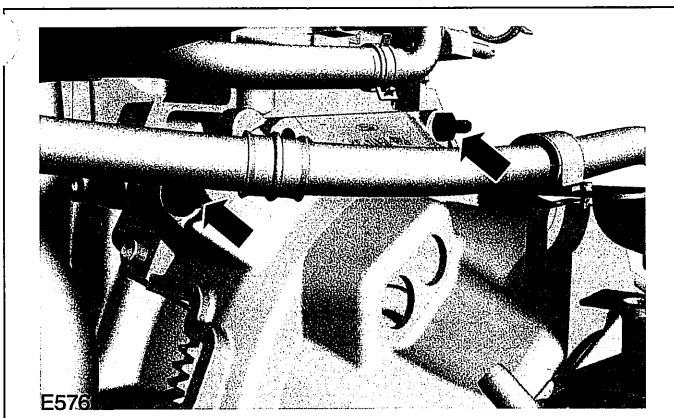
Removal**1. Remove the air cleaner.**

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

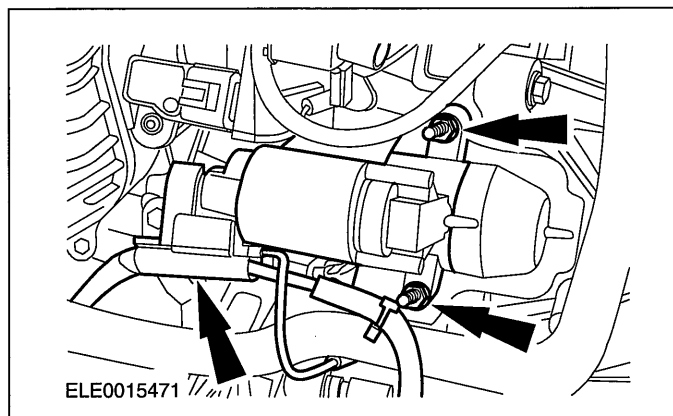
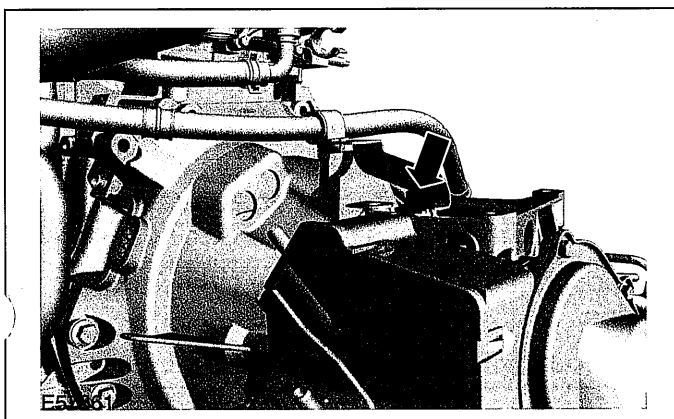
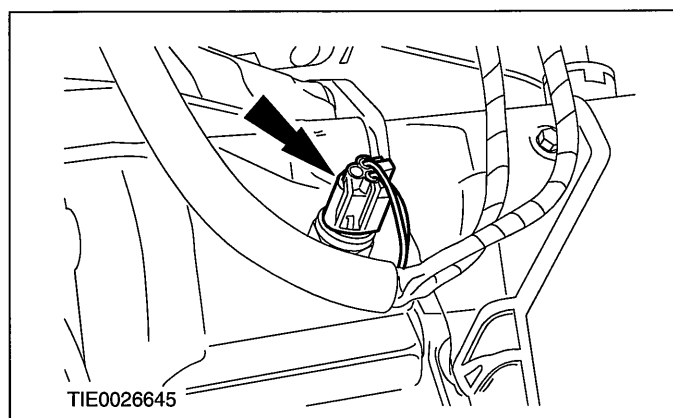
2. Remove the battery tray.

For additional information, refer to: Battery Tray - 2.0L Duratec-HE (MI4) (414-01 Battery, Mounting and Cables, Removal and Installation).

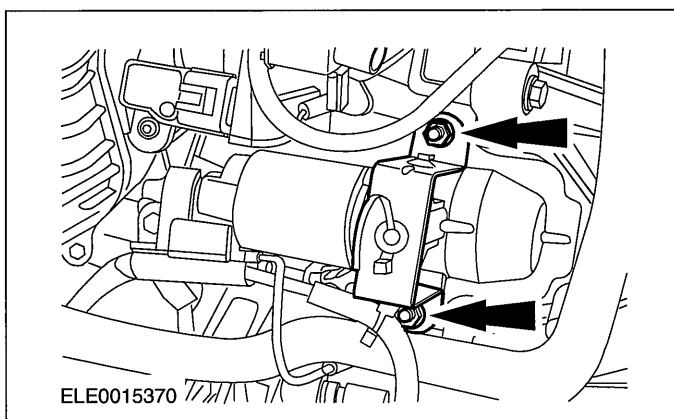
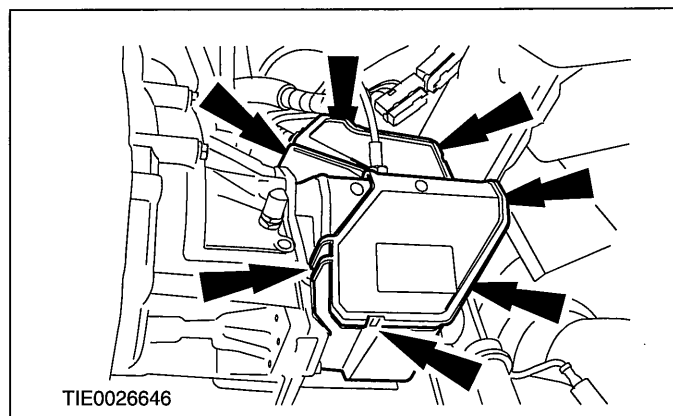
3. Install the special tools.**4. Remove the engine wiring harness bracket.**

REMOVAL**5. Remove the transaxle upper retaining bolts.**

- Detach the wiring harness from the retaining bracket.

**6. Detach the power steering high-pressure line retaining bracket from the transaxle.****10. Disconnect the reversing lamp switch electrical connector.****7. Remove the front wheels and tires.**

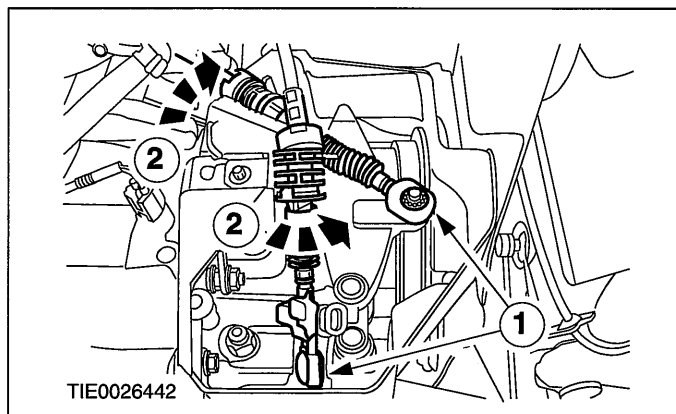
For additional information, refer to: **Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).**

8. Remove the wiring harness retaining bracket.**9. Remove the starter motor.****11. Remove the gearshift cables cover.****12. Detach the gearshift cables from the transaxle.**

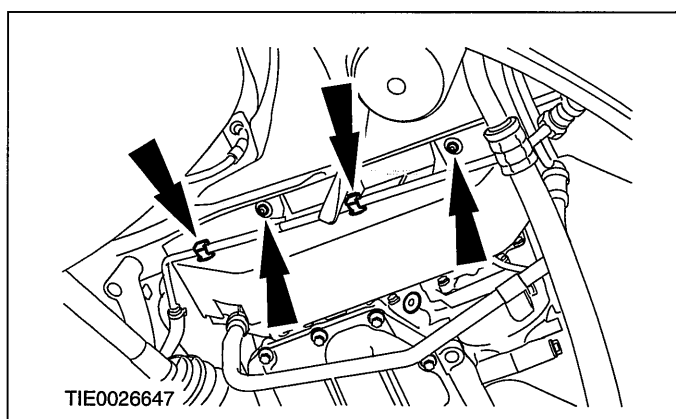
1. Detach the gearshift cables and the selector cable from the selector levers.

REMOVAL

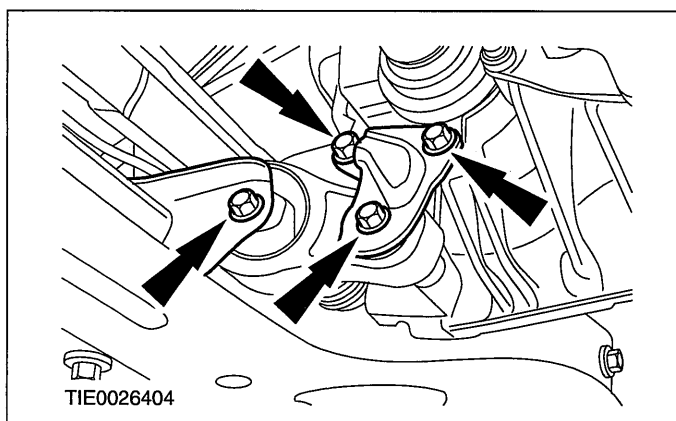
2. Turn the abutment sleeve clockwise and detach the cables from the bracket.



13. Remove the accessory drive belt cover.



14. Remove the engine support insulator.



15. Remove the left-hand halfshaft.

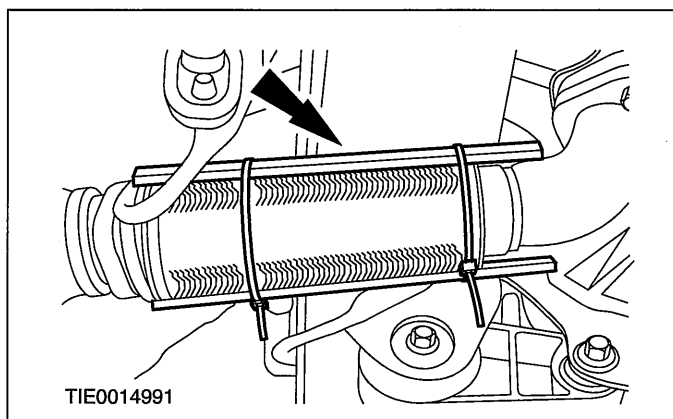
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

16. Remove the right-hand halfshaft.

For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

17. **CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a suitable support wrap or suitable splint.

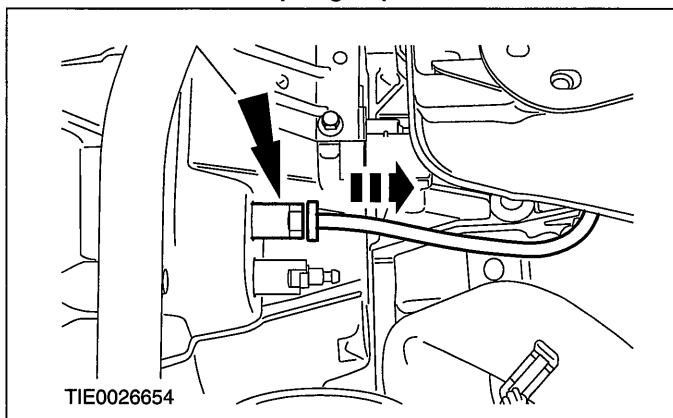


18. Lower the vehicle.

19. **CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

Disconnect the clutch slave cylinder supply line.

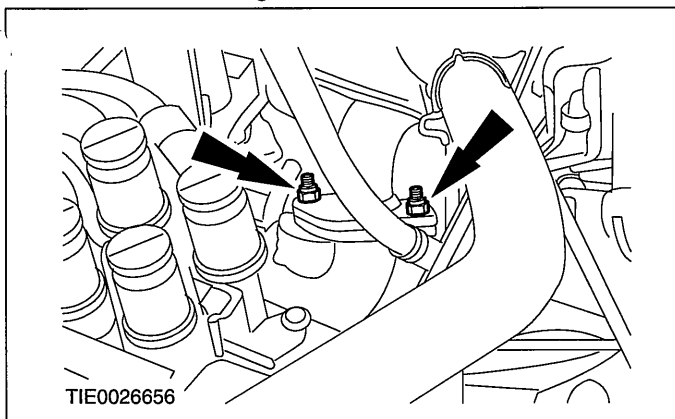
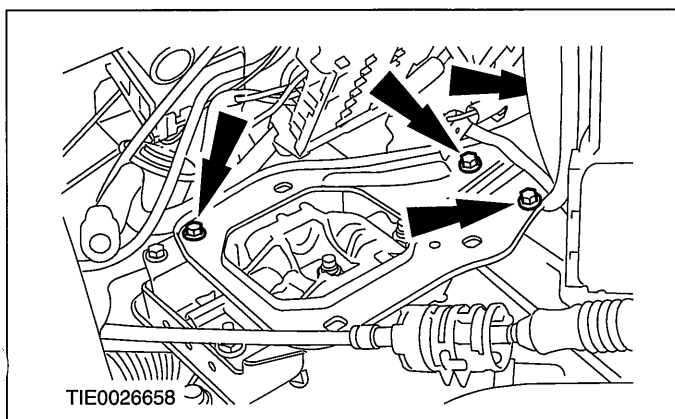
- Remove the spring clip.



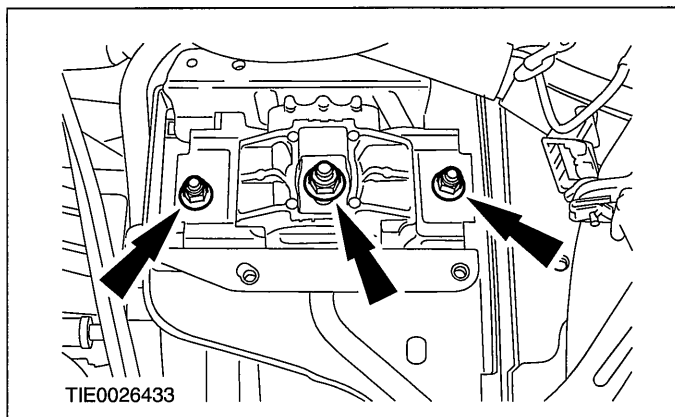
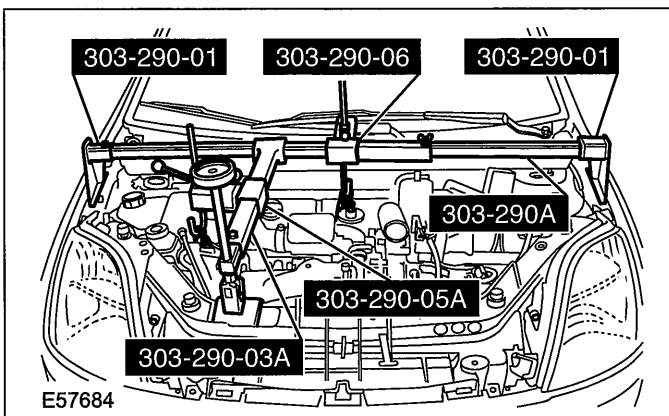
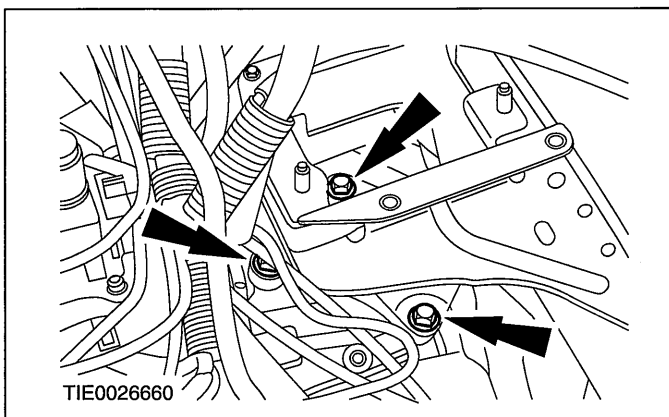
20. Detach the exhaust flexible pipe from the catalytic converter.

REMOVAL

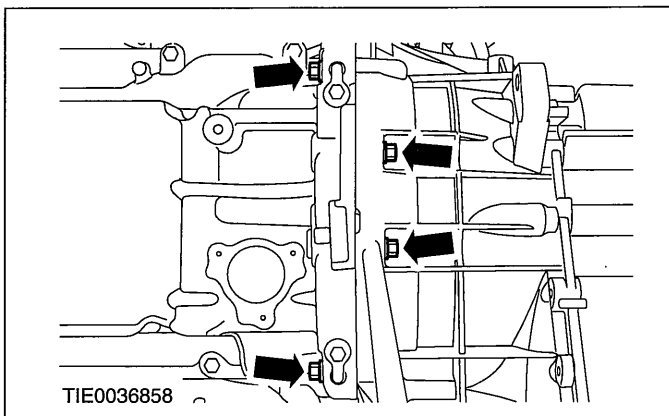
- Discard the gasket.

**21. Remove the battery tray support bracket.****22. Remove the engine and transaxle rear mount.**

- Discard the nuts.

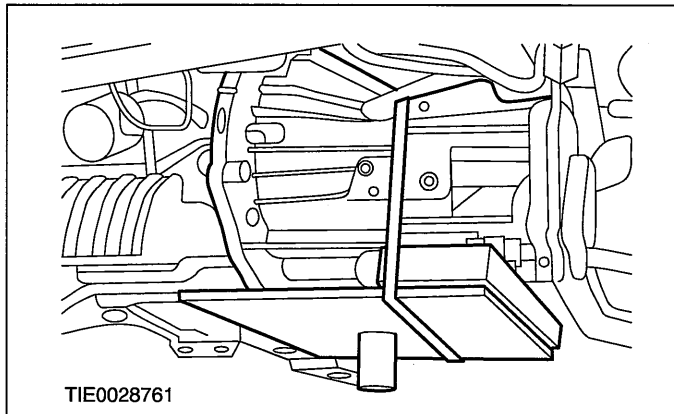
**23. Using the special tools, lower the engine and transaxle assembly.****24. Remove the engine and transaxle rear mount retaining bracket.****25. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)**

**Jacking (Description and Operation),
Lifting (Description and Operation).**

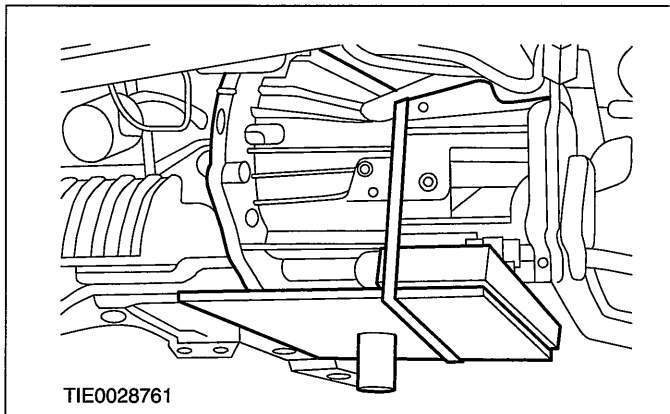
26. Remove the transaxle lower retaining bolts.**27. NOTE: Secure the transaxle with a retaining strap on the transmission jack.**

REMOVAL

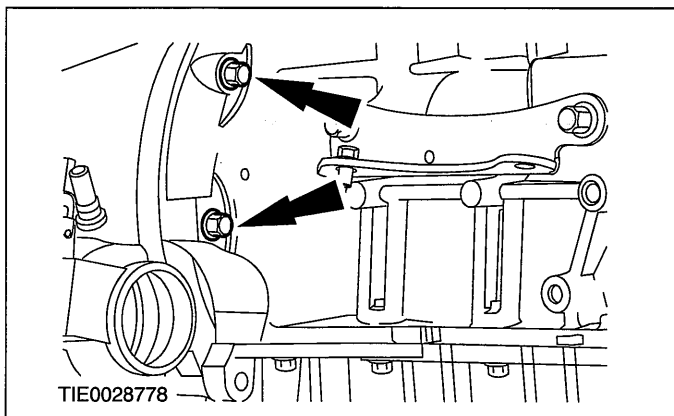
Using a suitable transmission jack, support the transaxle.



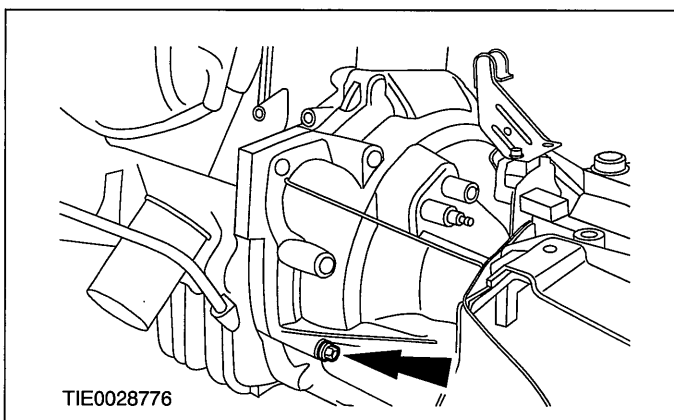
30. Using a suitable transmission jack, remove the transaxle.



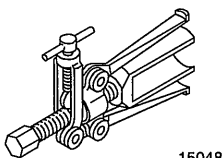
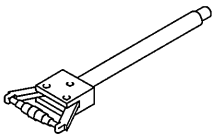
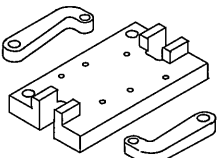
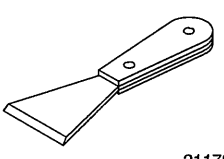
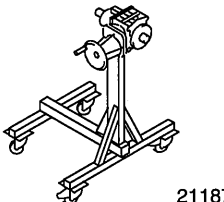
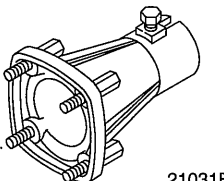
28. Remove the transaxle right-hand retaining bolts.



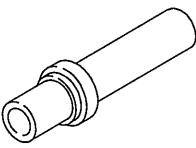
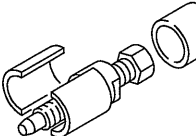
29. Remove the transaxle left-hand retaining bolt.



DISASSEMBLY**Transaxle(16 118 8)****Special Tool(s)**

 15048	Remover, Drive Pinion Seal 205-078 (15-048)
 15074	Remover, Differential Bearing Cone 205-176 (15-074)
 15105A	Mounting Bracket, Engine/Differential 205-329 (15-105A)
 21179	Separator, Oil Pan 303-428 (21-179)
 21187	Mounting Stand 303-435 (21-187)
 21031B	Mounting Bracket for 303-435 303-435-06 (21-031B)

Special Tool(s)

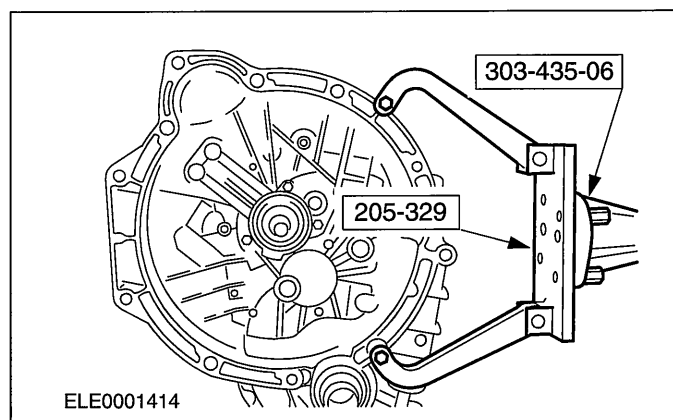
 16015	Installer, Extension Housing Bushing/Seal 308-045 (16-015)
 16035	Remover, Input Shaft Fifth Gear 308-082 (16-035)

General Equipment

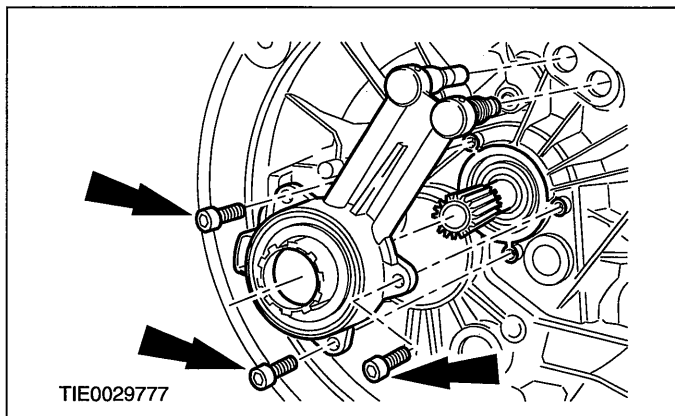
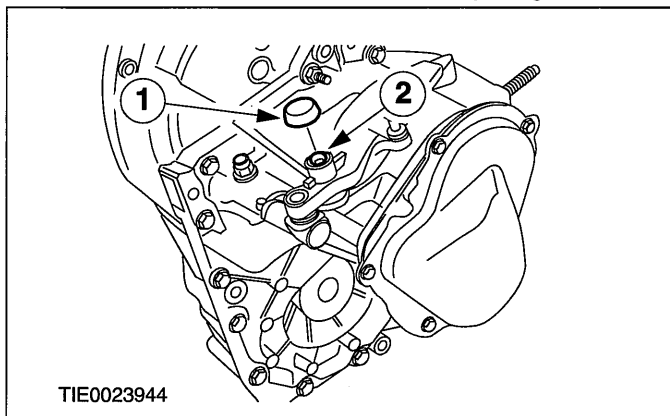
Blanking plugs
Drift

CAUTIONS:

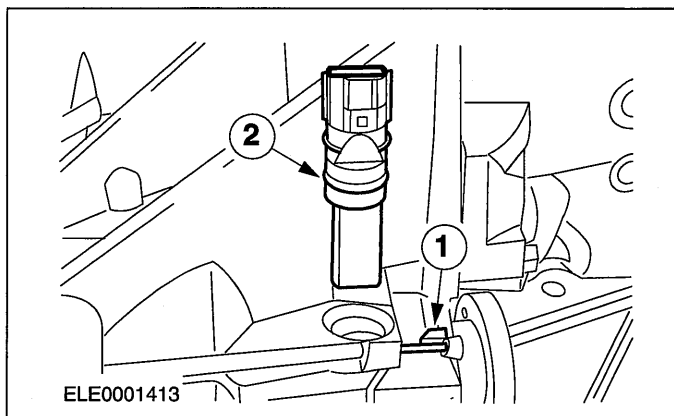
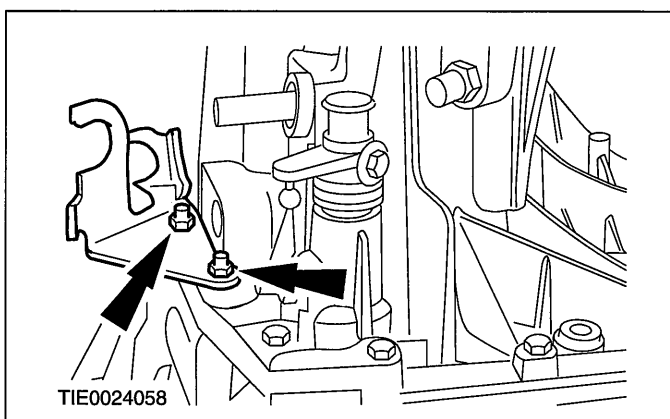
- ⚠ Use vise protectors.
 - ⚠ Use a copper or plastic mallet to prevent damage.
1. Using the special tools, mount the transaxle on the mounting stand.



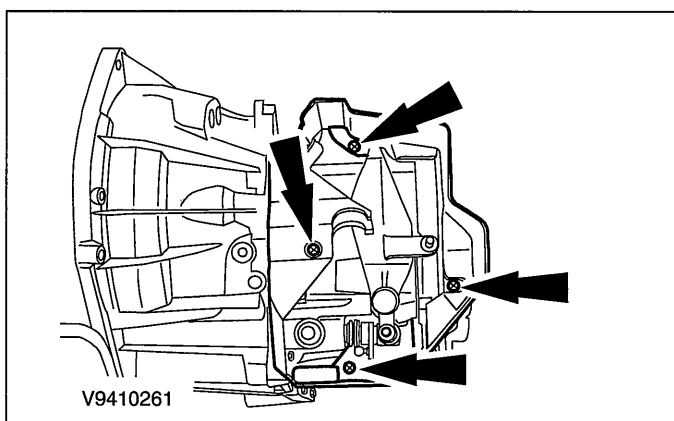
2. Clean any grease and foreign material from the input shaft.

DISASSEMBLY**3. Remove the clutch slave cylinder.****2. Remove and discard the snap ring.****4. Remove the vehicle speed sensor (VSS) (if equipped).**

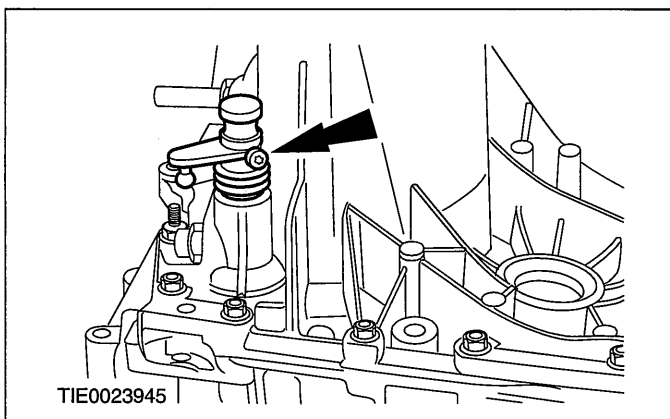
1. Remove the retaining pin.
2. Pull out the VSS.

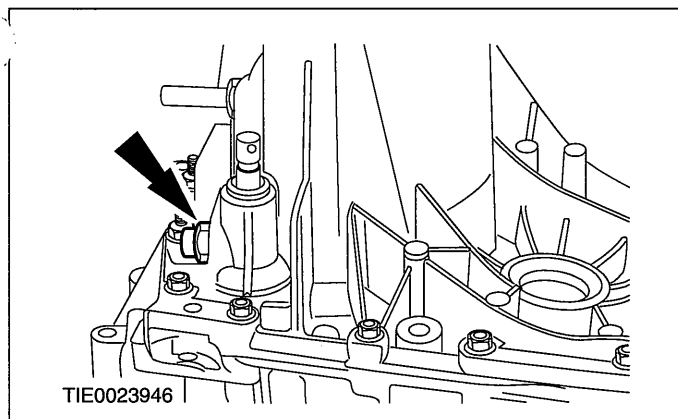
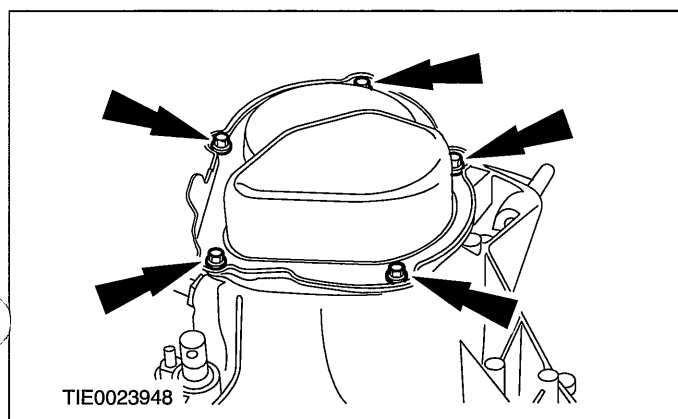
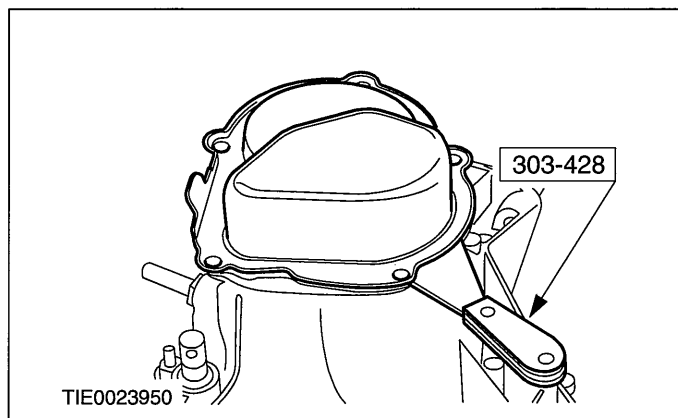
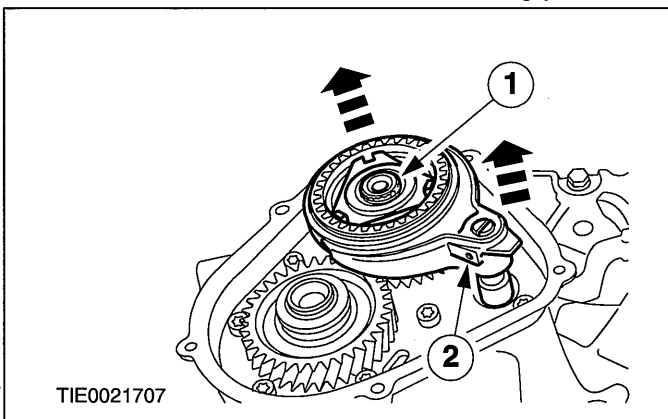
**7. Remove the gearshift cable bracket.****8. Remove the selector lever.**

- Remove the bellows.

5. Remove the selector mechanism cover.**6. Remove the gearshift lever.**

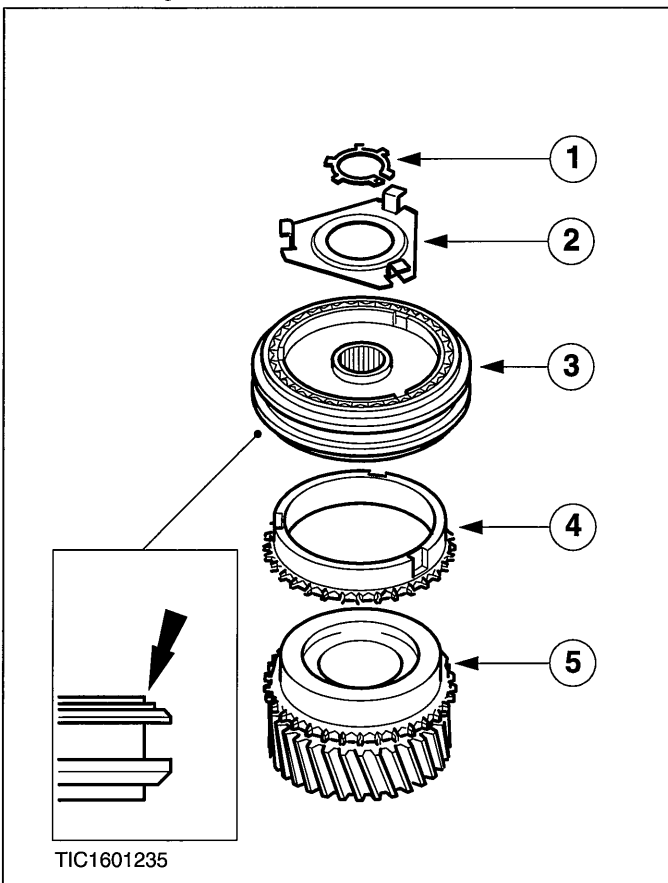
1. Remove the protective cap (if equipped).



DISASSEMBLY**9. Remove the selector interlock mechanism.****10. Remove the fifth gear housing cover retaining bolts.****11. Using the special tool, remove the fifth gear housing cover.****12. Remove the fifth gear synchroniser assembly, the selector fork and the fifth gear.****1. Remove and discard the snap ring.****2. Remove and discard the retaining pin.****13. NOTE: To aid assembly mark the position of the fifth gear synchroniser assembly.**

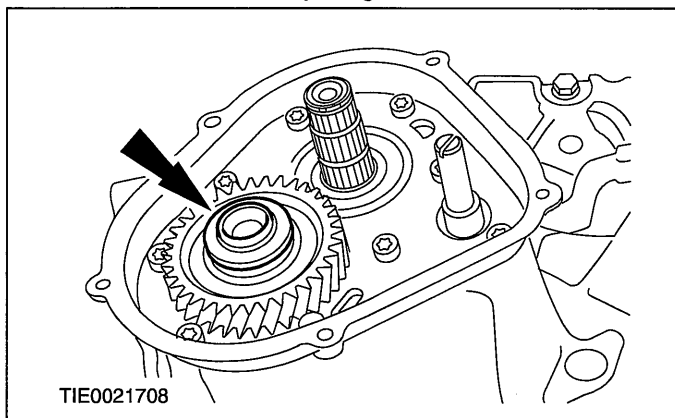
Disassemble the fifth gear and synchroniser assembly.

1. Snap ring.
2. Retaining plate.
3. Synchroniser assembly.
4. Synchroniser ring.
5. Fifth gear.

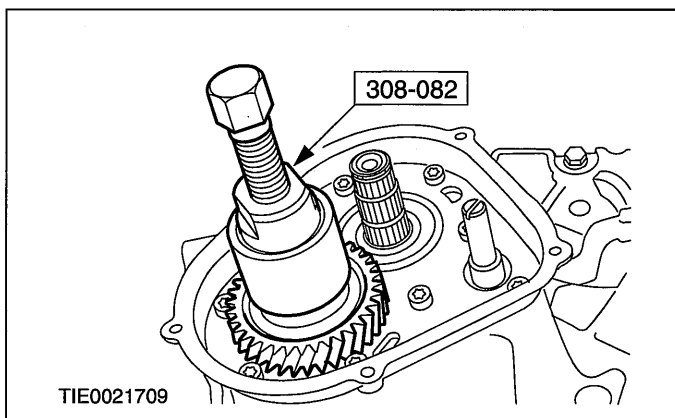
**14. Remove the fifth gear snap ring.**

DISASSEMBLY

- Discard the snap ring.

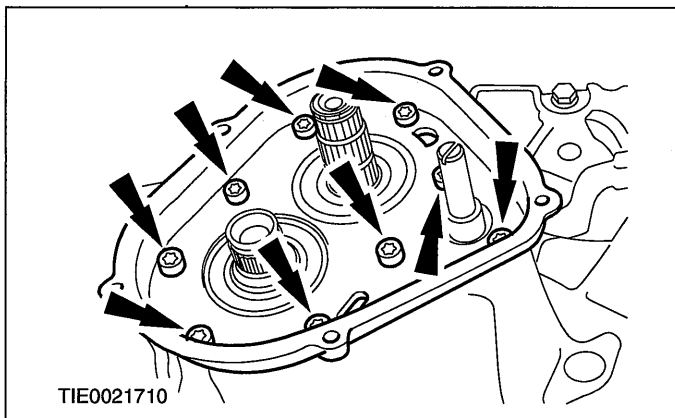


- 15. Using the special tool, remove the fifth gear.**



- 16. Remove the fifth gear housing.**

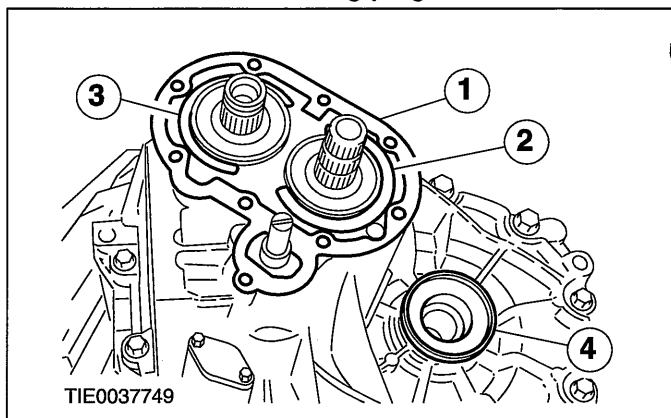
- Discard the bolts.



- 17. Remove the fifth gear housing gasket, the snap rings and the blanking plug.**

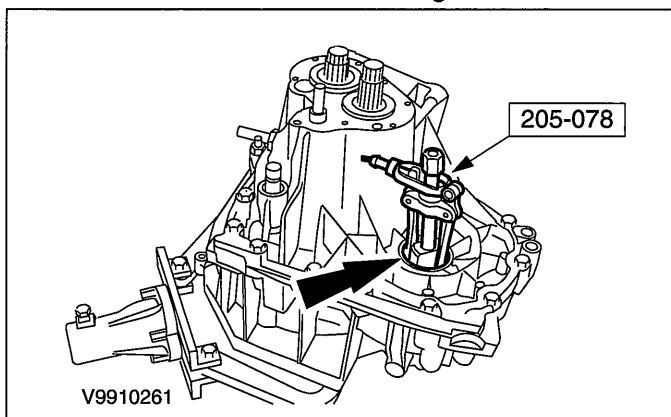
1. Remove and discard the gasket.
2. Remove the output shaft snap ring.
3. Remove the input shaft snap ring.

- 4. Pull out the blanking plug.**



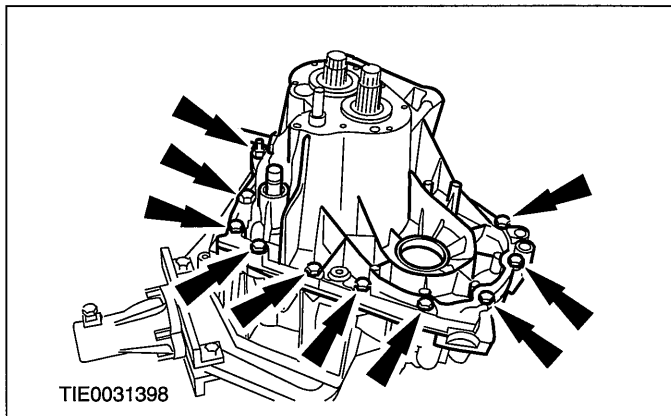
- 18. Using the special tool, remove both halfshaft oil seals (left-hand side shown).**

- Only remove the reversing lamp switch if there is evidence of leakage.



- 19. Separate the two halves of the transaxle housing (14 bolts).**

- Carefully separate the transaxle housing.

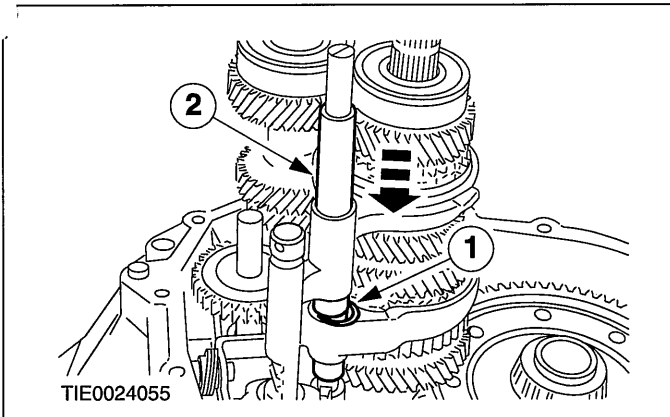


- 20. Remove the selector shaft guide sleeve upper snap ring.**

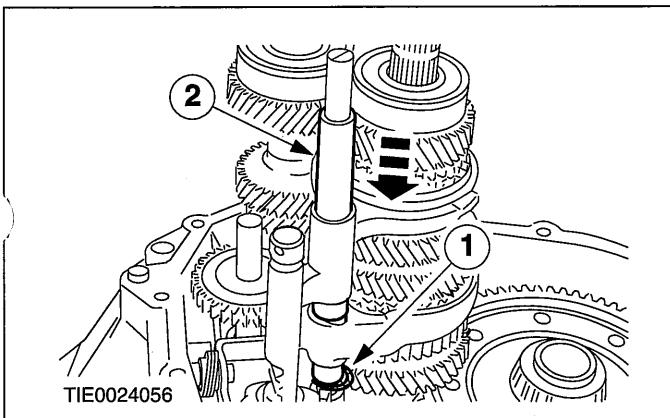
1. Remove and discard the upper snap ring.

DISASSEMBLY

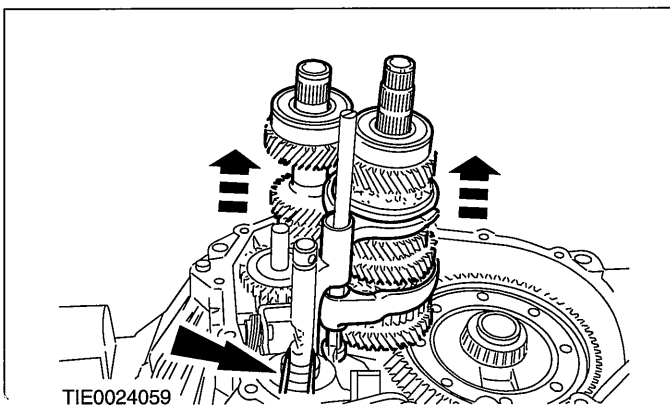
2. Slide the selector shaft guide sleeve downwards.

**21. Remove the selector shaft guide sleeve.**

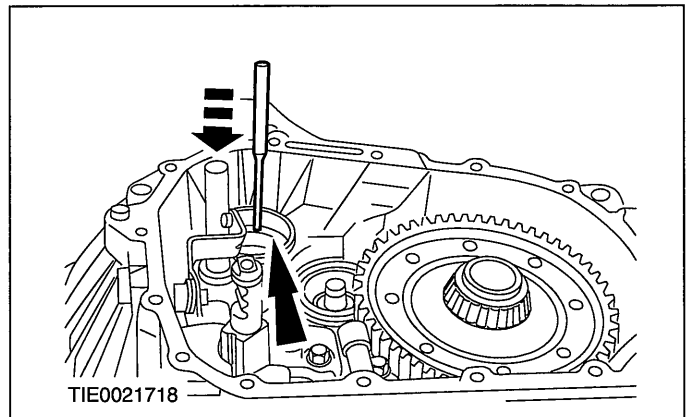
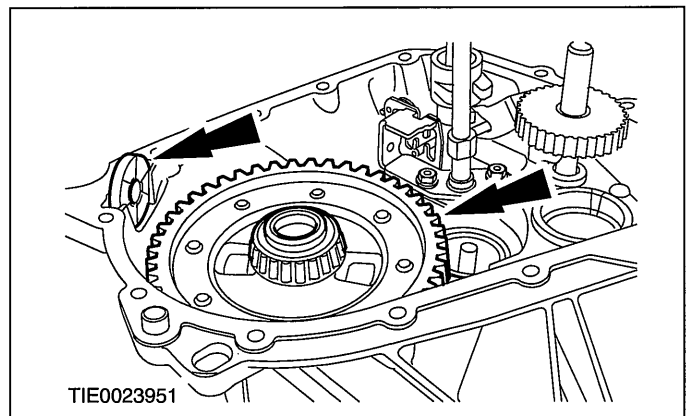
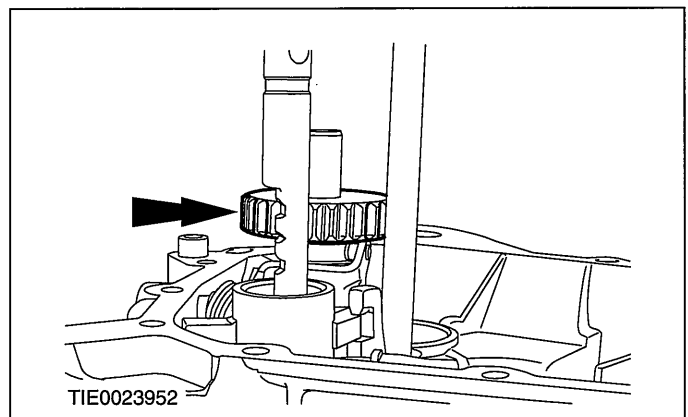
1. Remove and discard the selector shaft guide sleeve lower snap ring.
2. Remove the selector shaft guide sleeve.

**22. NOTE: Install a rubber band to the second selector shaft to aid disassembly.**

Remove the input shaft, the output shaft and the selector forks as an assembly.



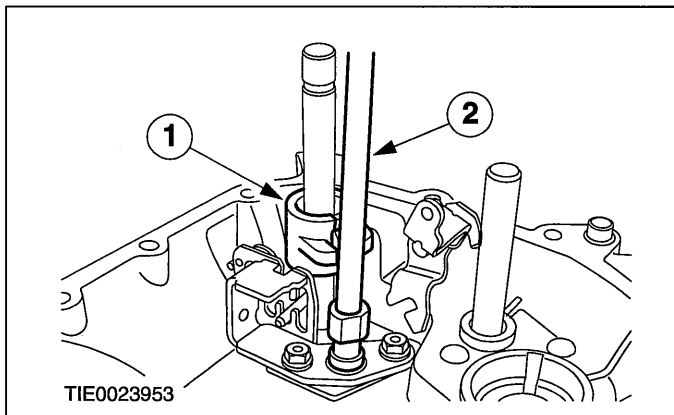
23. Using a suitable drift remove and discard the input shaft oil seal.

**24. Remove the differential assembly and the permanent magnet.****25. Remove the reverse gear idler.****26. Remove the selector shaft and the shift lock.**

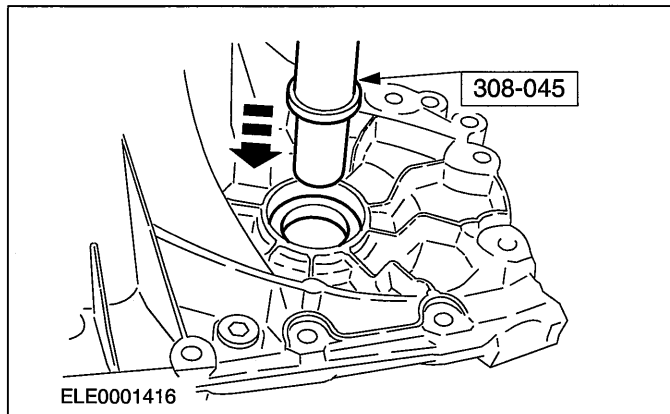
1. Remove the shift lock.

DISASSEMBLY

2. Remove the fifth and reverse gear selector shaft.

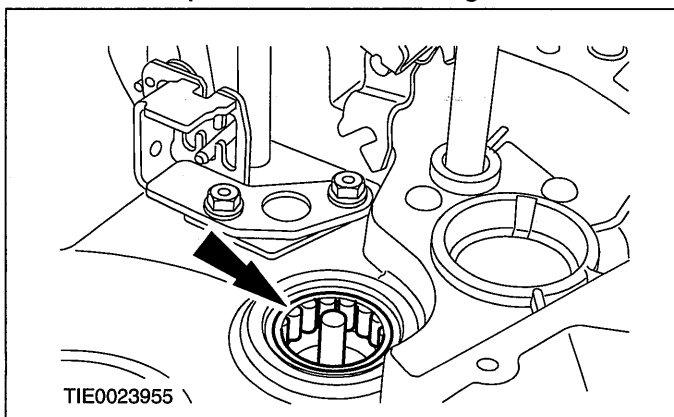


29. Using the special tool, remove the differential bearing cup.



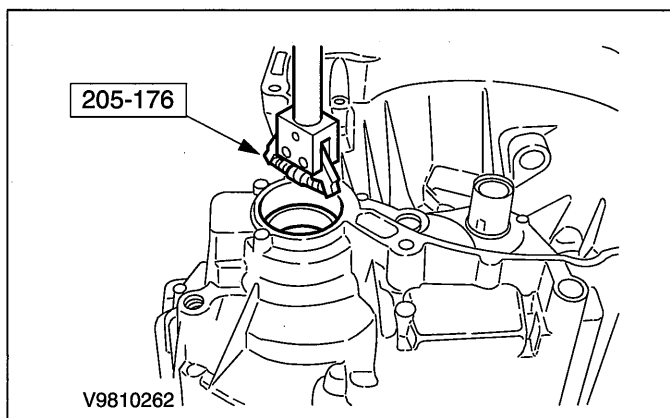
27. Remove the output shaft roller bearing.

- Remove the rollers and the roller cage from the output shaft roller bearing.



30. **NOTE:** Install the special tool in the transaxle housing grooves.

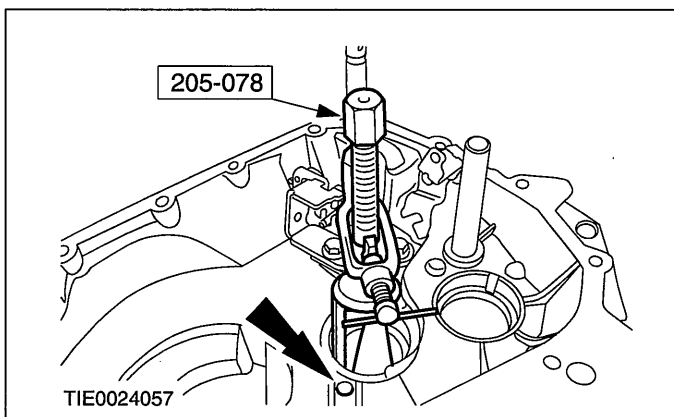
Using the special tool, remove the differential bearing cup.



28. **CAUTION:** Only use the special tool as shown, failure to do so may result in the blanking plug being pressed out of the housing.

Using the special tool, remove the output shaft roller bearing outer race.

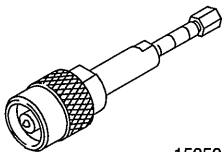
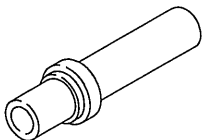
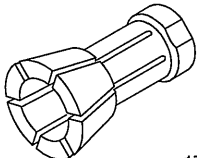
- Remove the oil funnel.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Output Shaft

Special Tool(s)

	Remover, Bearing (Main Tool) 205-295 (15-050A)
	Installer, Extension Housing Bushing Oil Seal 308-045 (16-015)
	Collet for 205-295 307-217 (17-048)

General Equipment

Two-leg puller

Press

Materials

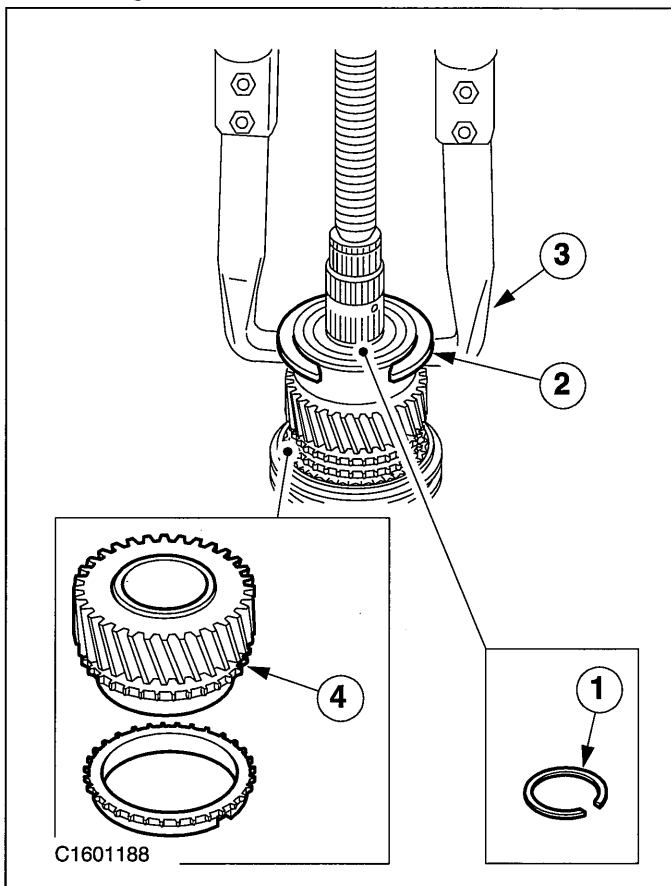
Name	Specification
Transmission Oil	WSD-M2C200-C

Disassembly

1. Remove the ball bearing and the fourth gear.

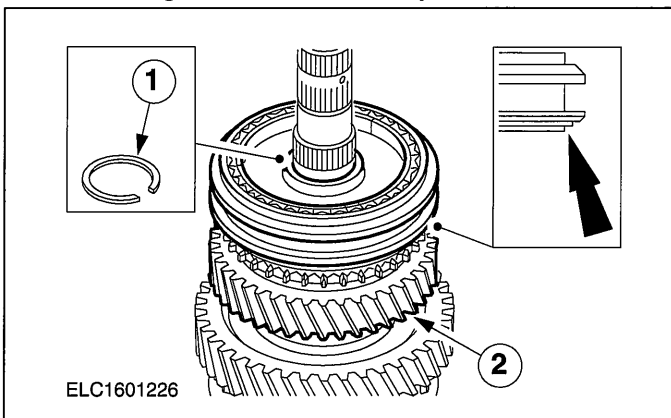
1. Remove and discard the small snap ring.
2. Install the output shaft snap ring .
3. Using a suitable two-leg puller, remove the ball bearing.
 - Discard the output shaft snap ring and the ball bearing.

4. Remove the fourth gear and the synchronizer ring.



2. Remove the third and fourth gear synchronizer assembly.

1. Remove and discard the snap ring.
2. Remove the gear synchronizer, third and fourth gear synchronizer assembly and the third gear as an assembly.

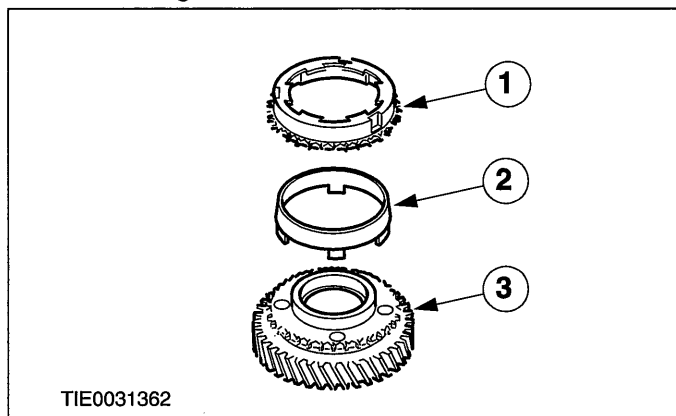


3. Third gear synchronizer assembly.

1. Outer synchronizer ring.
2. Synchronizer cone.

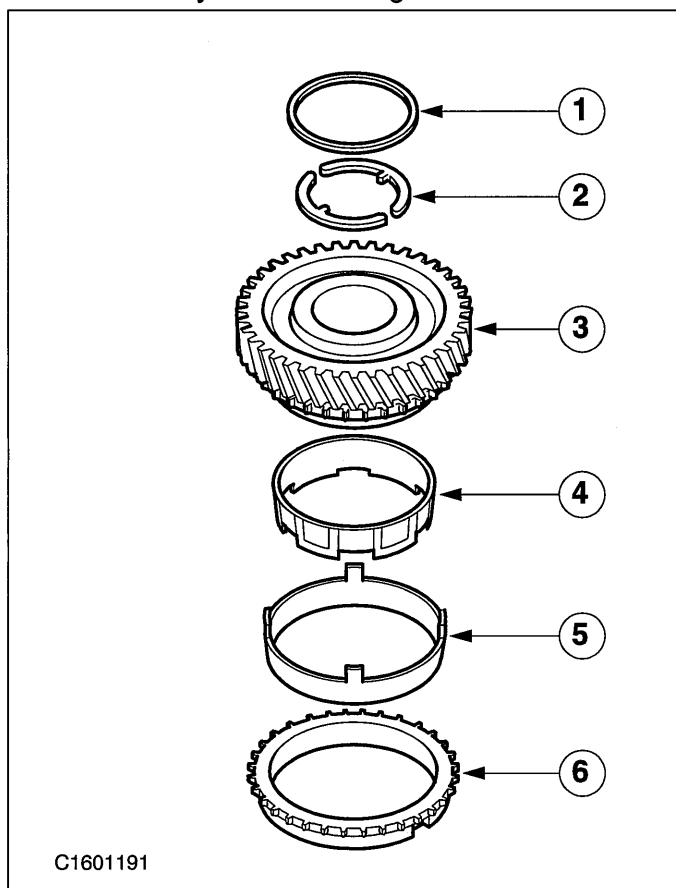
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

3. Third gear.

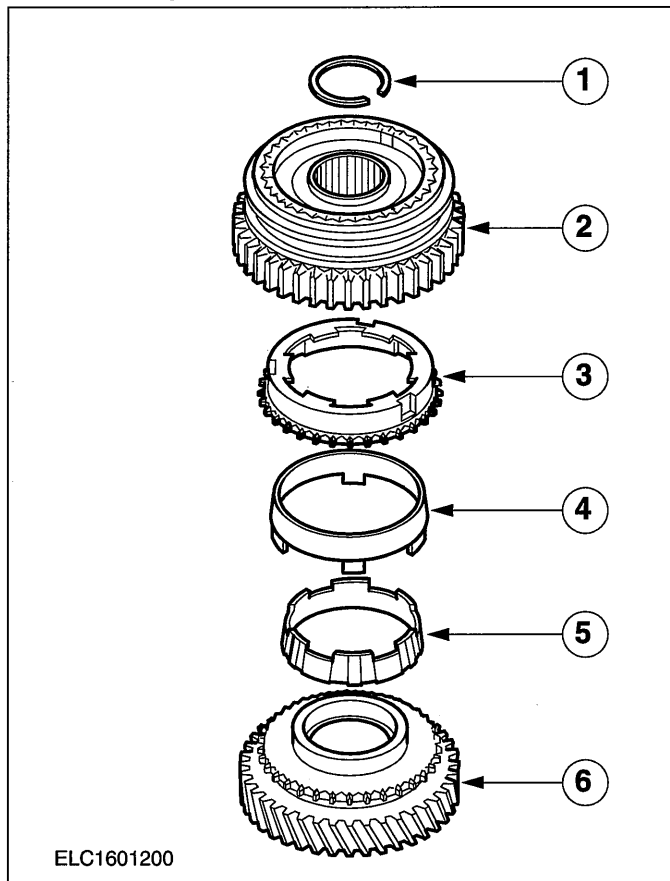


4. Remove the second gear synchronizer assembly

1. Retaining ring.
2. Snap rings.
3. Second gear.
4. Inner synchronizer ring.
5. Synchronizer cone.
6. Outer synchronizer ring.



1. Remove and discard the snap ring.
2. Remove the first and second gear synchronizer clutch and the reverse gear .
3. Outer synchronizer ring.
4. Synchronizer cone.
5. Inner synchronizer ring.
6. First gear.



6. **CAUTION:** To aid assembly mark the position of the selector ring in relation to the synchronizer hub.

Disassemble the synchronizer clutch.

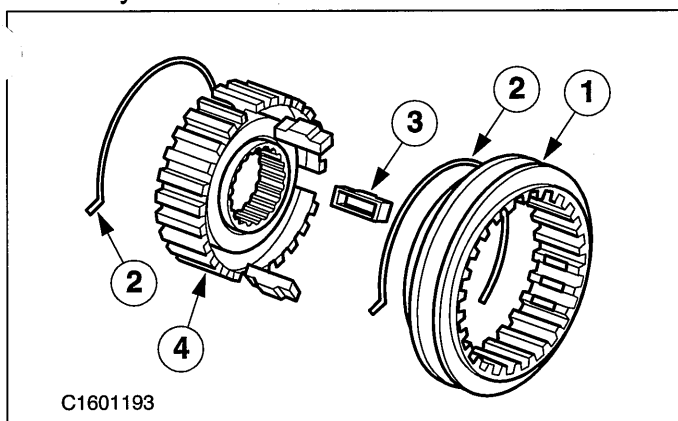
1. Selector ring.
2. Synchronizer spring.
3. Synchronizer lock.

5. NOTE: Remove the synchronizer assembly and the first gear as an assembly.

Remove the first and reverse gear , the gear synchronizer and synchronizer assembly.

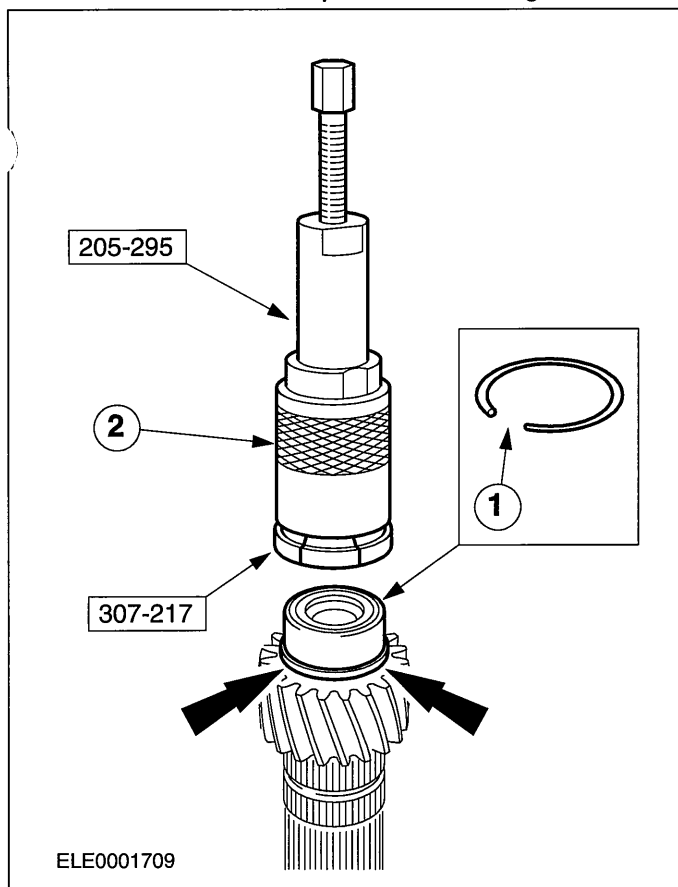
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

4. Synchronizer hub.



7. Using the special tools, remove the output shaft bearing cone.

1. Remove and discard the output shaft bearing cone snap ring.
2. Install the special tools underneath the bearing cone.
 - Discard the output shaft bearing cone.



Assembly

1. Coat the synchronizer assembly with clean transmission oil before assembly.

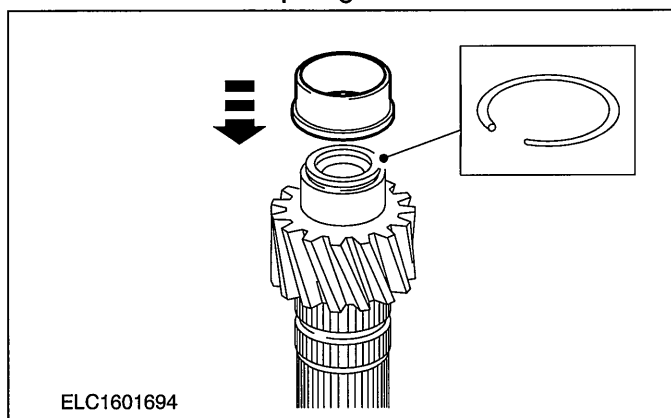
2. Carefully clean and check all running surfaces and coat them with clean transmission oil before assembly.

3. NOTE: Install a new output shaft bearing cone snap ring.

NOTE: Install a new output shaft bearing cone.

Install the output shaft bearing cone.

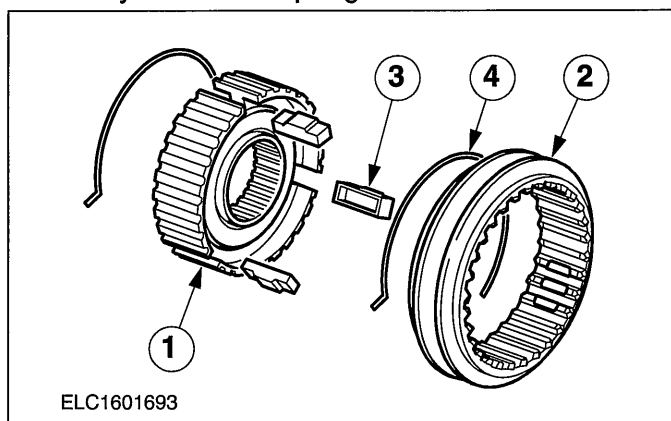
- Evenly heat the bearing cone to approximately 80°C and install it onto the output shaft.
- Install the snap ring.



4. NOTE: Assemble the synchronizer clutch to the marks.

Assemble the synchronizer clutch.

1. Synchronizer hub.
2. Selector ring.
3. Synchronizer lock.
4. Synchronizer spring.



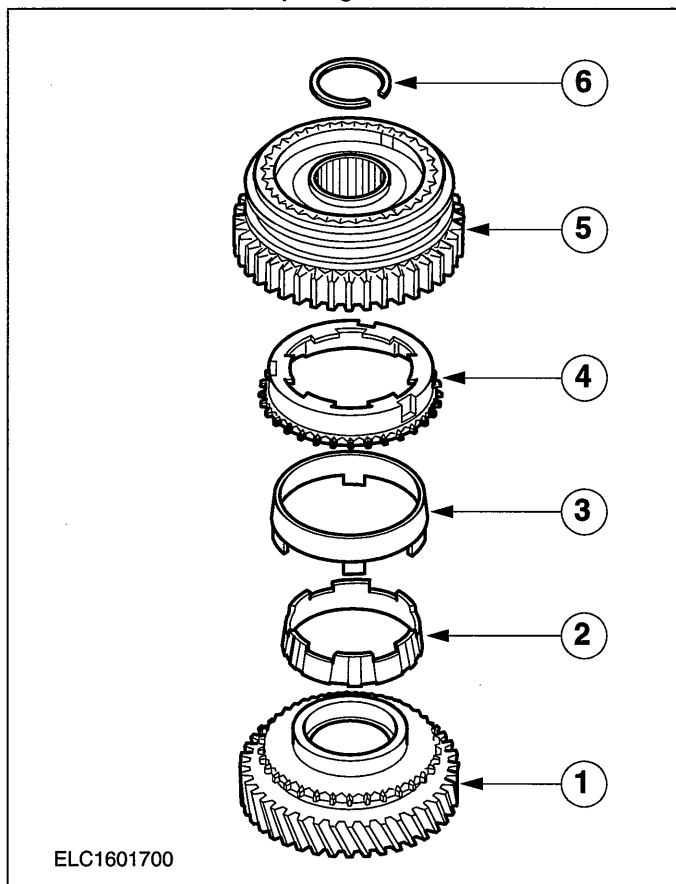
5. NOTE: Use a new first and reverse gear snap ring.

Install the first and reverse gear, the gear synchronizer and synchronizer assembly.

1. First gear.
2. Inner synchronizer ring.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

3. Synchronizer cone.
4. Outer synchronizer ring.
5. Install the first and second gear synchronizer clutch and the reverse gear.
6. Install the snap ring.

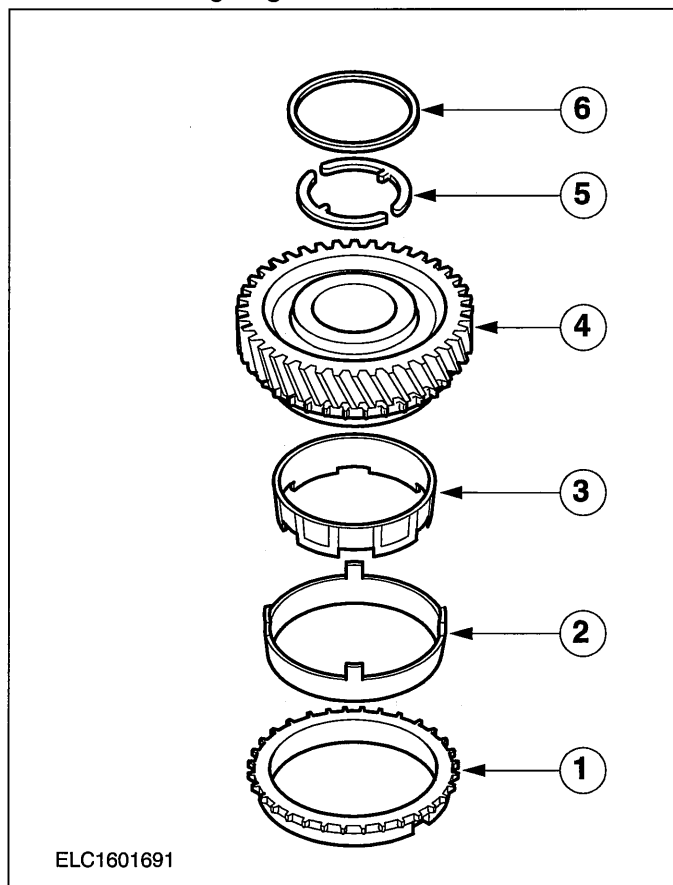


6. NOTE: Assemble the synchronizer assembly before installation on the output shaft.

Install the second gear synchronizer assembly.

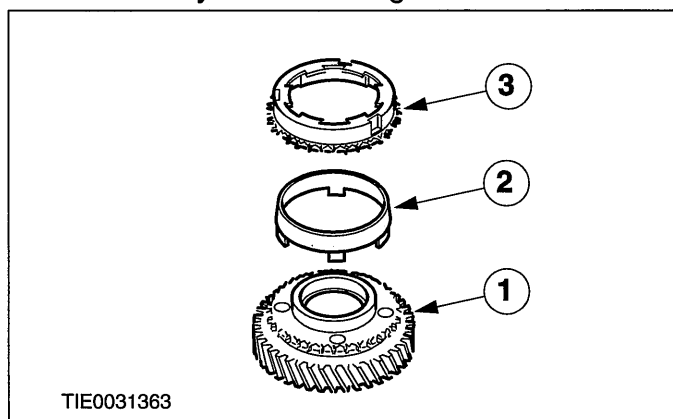
1. Outer synchronizer ring.
2. Synchronizer cone.
3. Inner synchronizer ring.
4. Second gear.
5. Snap rings.

6. Retaining ring.



7. Third gear synchronizer assembly.

1. Third gear.
2. Synchronizer cone.
3. Outer synchronizer ring.



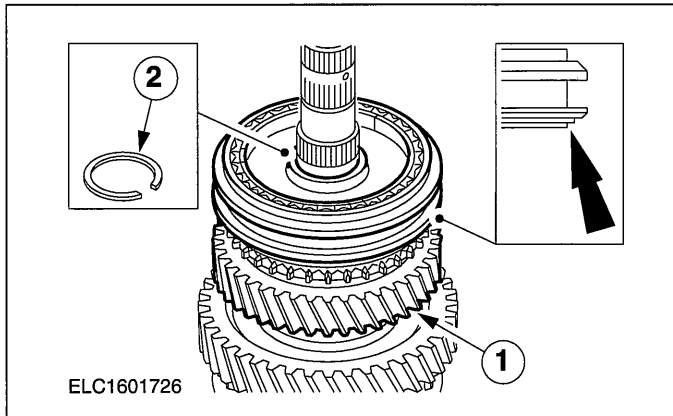
8. NOTE: Install a new third and fourth gear synchronizer assembly snap ring.

NOTE: Install the selector ring with the annular groove facing downwards and the small hub collar facing upwards.

Install the third and fourth gear synchronizer assembly.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

1. Install the gear synchronizer, third and fourth gear synchronizer assembly and the third gear.
2. Install the snap ring.

**9. NOTE: Install a new snap ring.**

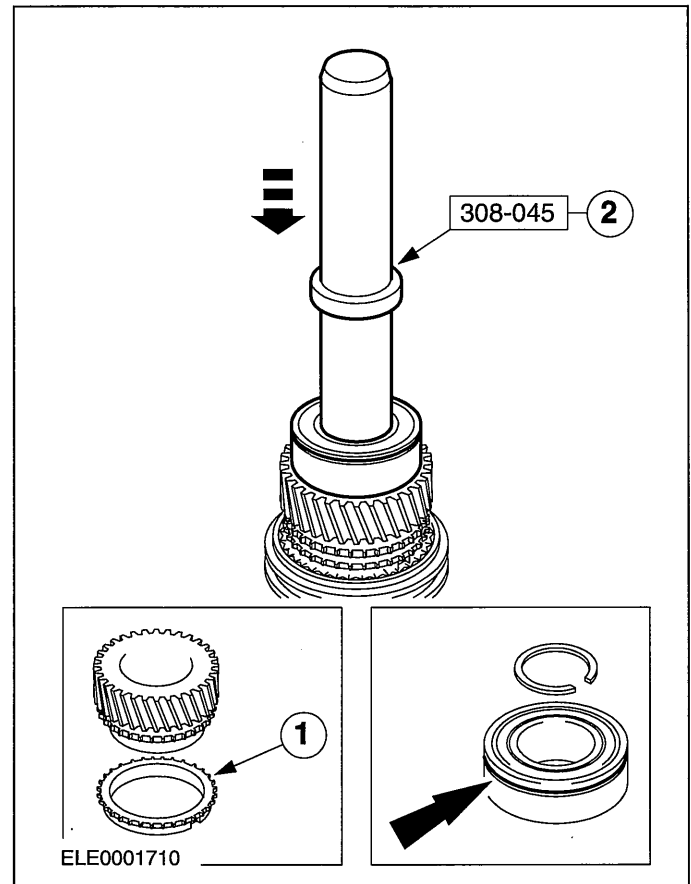
NOTE: Install a new ball bearing.

NOTE: Install the ball bearing with the annular groove facing outwards.

Using the special tool and a suitable press, install the fourth gear and the ball bearing.

1. Install the synchronizer ring and the fourth gear.
2. Using a suitable press, install the ball bearing.

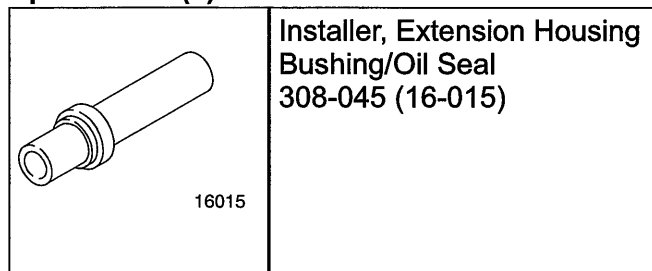
- Install the snap ring.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Input Shaft

Special Tool(s)



General Equipment

Two-leg puller
Press

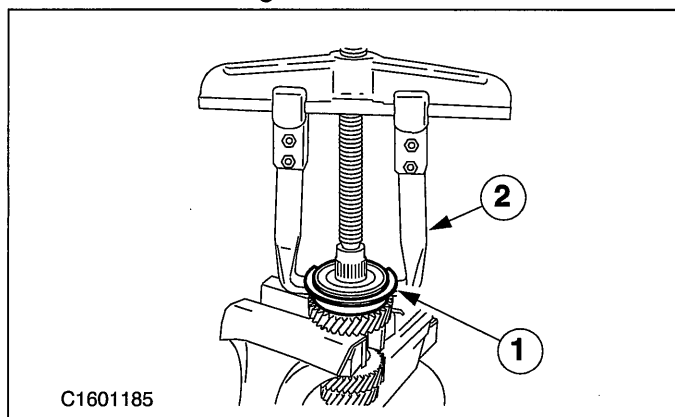
Materials

Name	Specification
Transmission Oil	WSD-M2C200-C

Disassembly

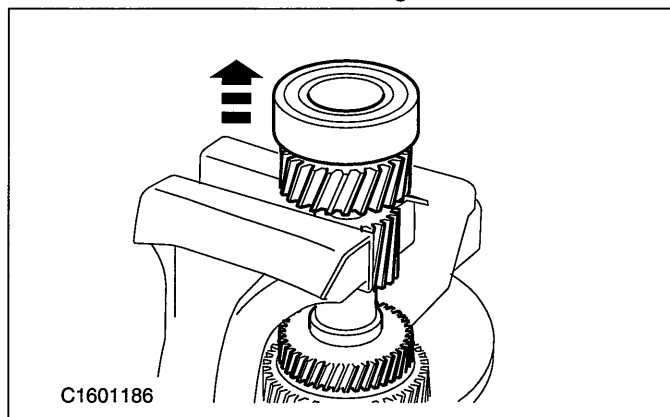
1. Using a suitable two-leg puller, remove the ball bearing.

1. Install the input shaft snap ring.
2. Remove the ball bearing.
 - Discard the input shaft snap ring and the ball bearing.



2. Using a suitable two-leg puller remove the ball bearing.

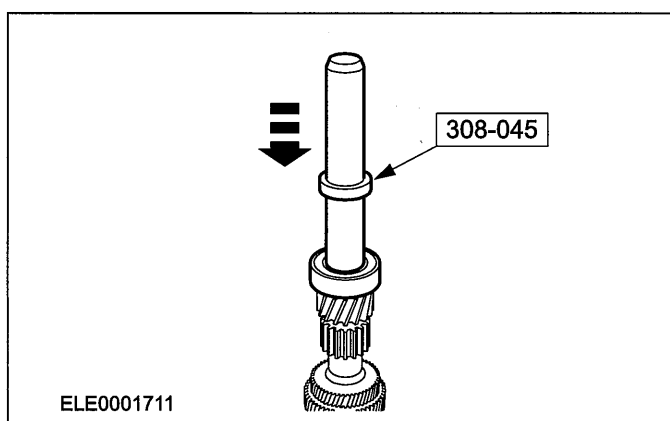
- Discard the ball bearing.



Assembly

1. Coat all components with clean transmission oil before assembly.
2. NOTE: Install a new ball bearing.

Using the special tool and a suitable press, install the ball bearing.

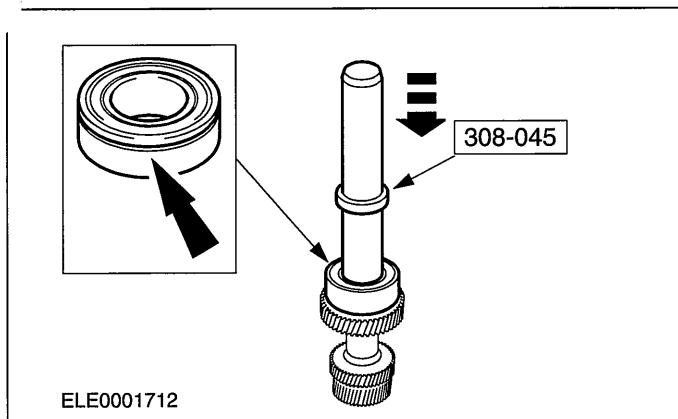


3. NOTE: Install a new ball bearing.

NOTE: The ball bearing groove must face outwards.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

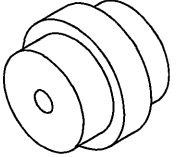
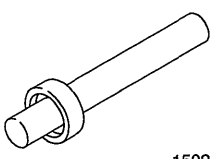
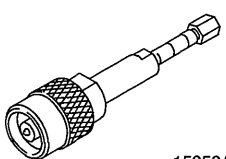
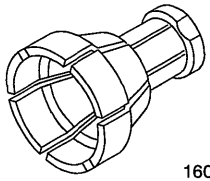
Using the special tool and a suitable press ,
install the ball bearing.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Differential(16 118 6)

Special Tool(s)

 1403801	Adapter for 204-158 (Thrust Pad) 204-158-01 (14-038-01)
 15025A	Installer, Differential Bearing 205-062 (15-025A)
 15050A	Remover, Bearing (Main Tool) 205-295 (15-050A)
 16062	Collet for 205-295 308-197 (16-062)

General Equipment

Press

Drift

Materials

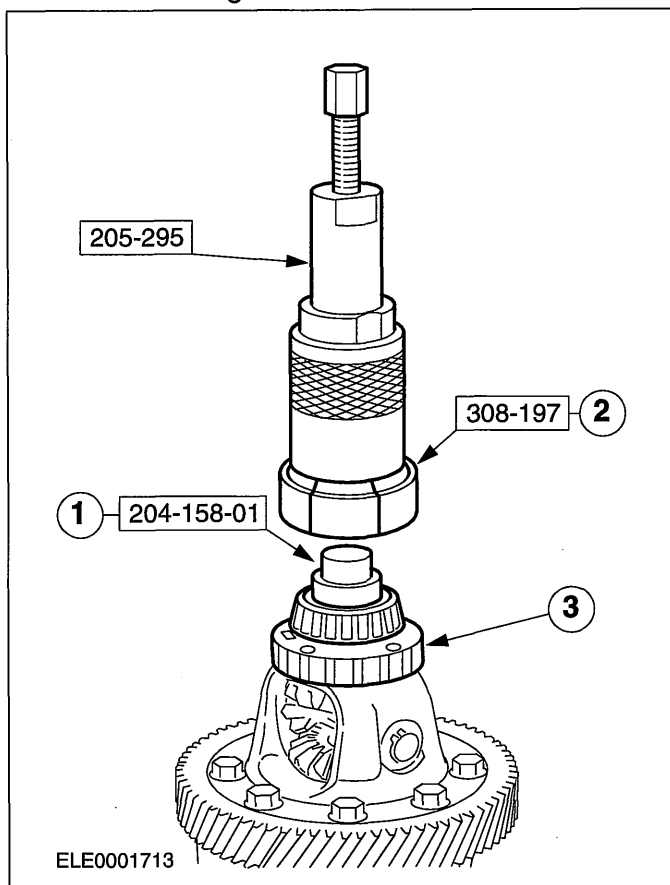
Name	Specification
Transmission Oil	WSD-M2C200-C

Disassembly

1. Using the special tools, remove the differential taper roller bearings.

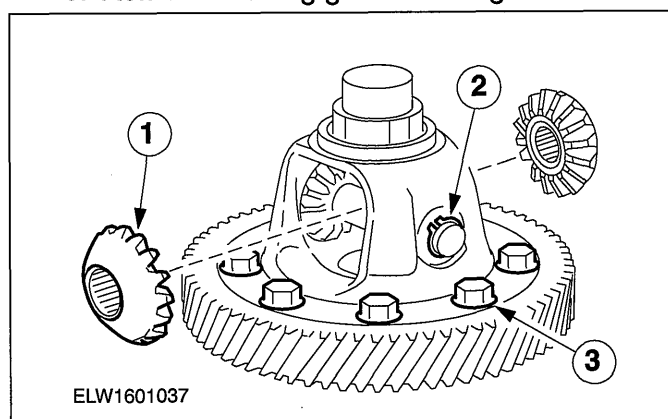
1. Install the special tool.
2. Remove the differential taper roller bearings.

3. Remove the vehicle speed sensor (VSS) sensor ring.



2. Remove the differential pinions and the ring gear.

1. Rotate the differential pinions approximately 90 degrees in the differential case and remove them.
2. Remove and discard the snap ring and using a suitable drift, drive out the pin.
 - Remove the two differential pinions and plastic thrust elements.
3. Remove the ring gear retaining bolts.



DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Assembly

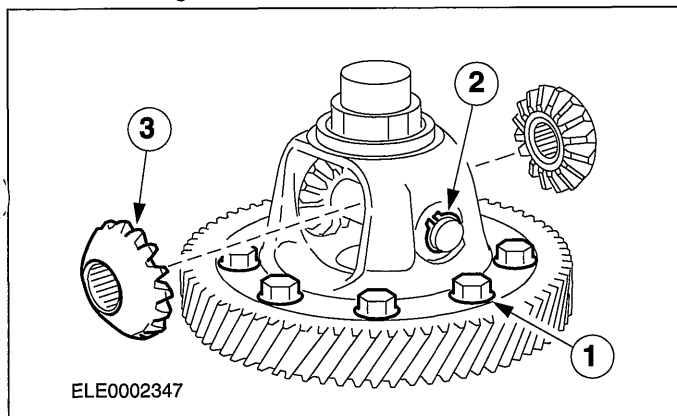
1. **NOTE:** Do not lubricate the differential bearings.

Carefully clean and check all components and coat them with clean transmission oil before assembly.

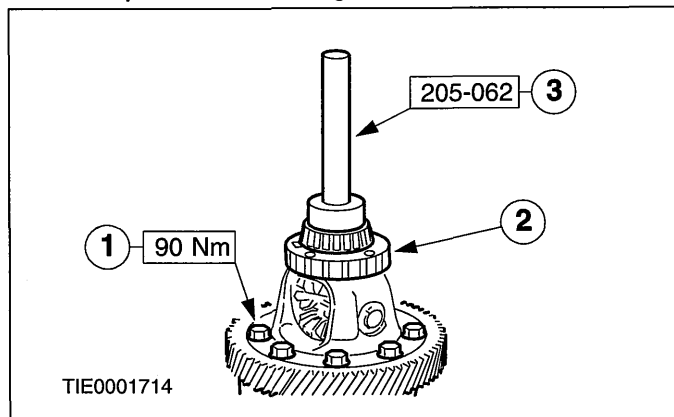
2. **NOTE:** Install a new differential pinion snap ring.

Install the ring gear and the differential pinions.

- Using the old bolts, carefully attach the ring gear to the differential case.
 - Discard the ring gear bolts.
- Install the two differential pinions, plastic thrust elements and using a suitable drift, install the pin and snap ring.
- Install the differential pinions and rotate them 90 degrees in the differential case.



3. Using the special tool, install the differential taper roller bearings.



3. **NOTE:** Install new ring gear retaining bolts.

NOTE: Do not rest the differential on the lower differential taper roller bearing.

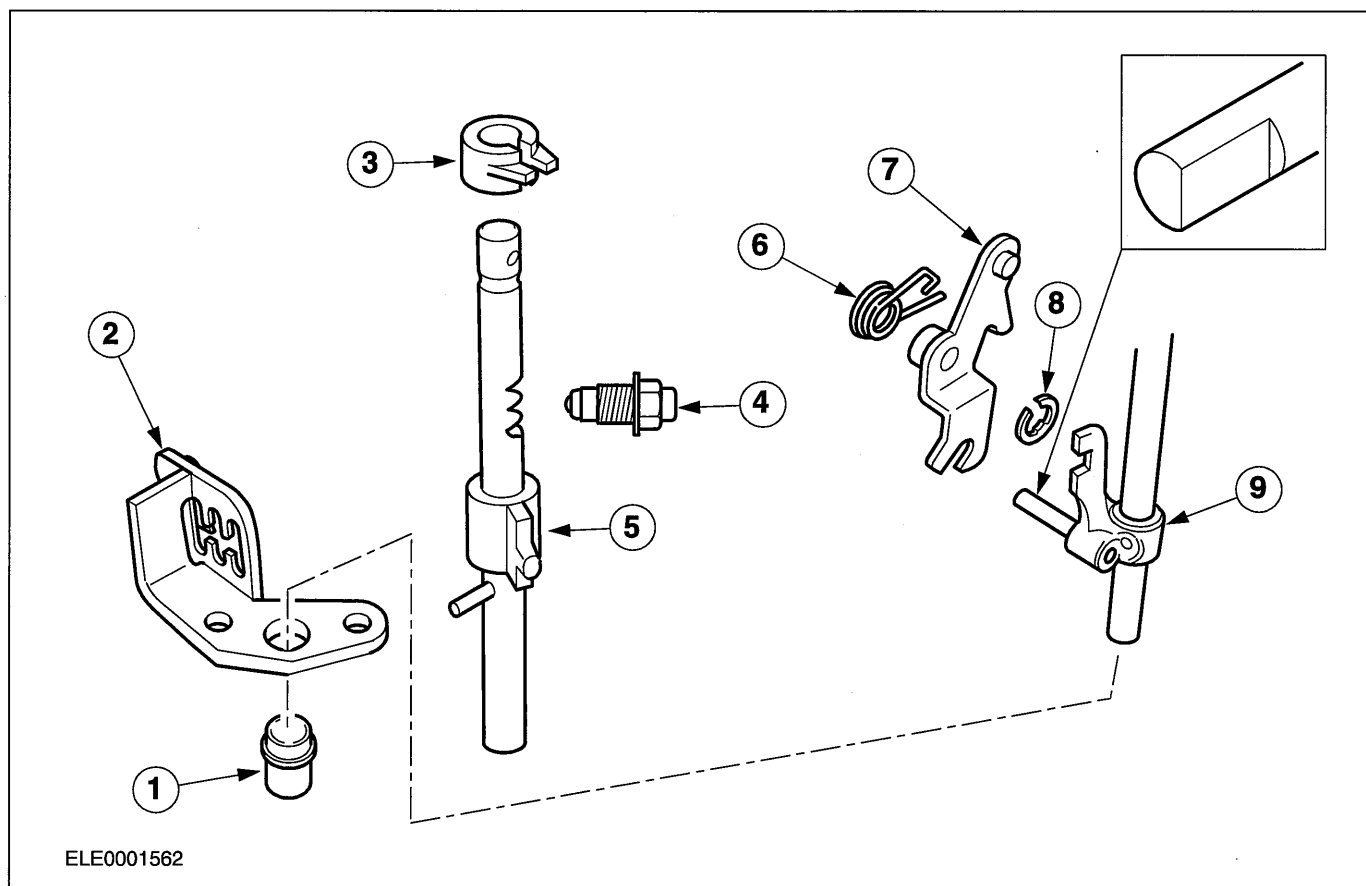
Using the special tool, install the differential taper roller bearings and tighten the ring gear retaining bolts.

- Install new ring gear retaining bolts and tighten the bolts working diagonally.
- Install the vehicle speed sensor (VSS) sensor ring.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

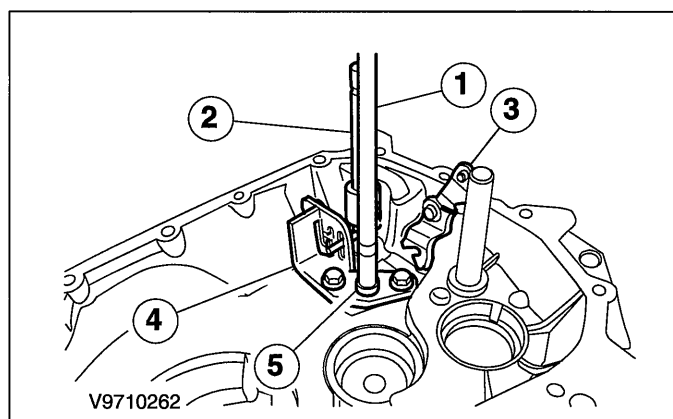
Selector Plate(16 284 8)

Overview, selector mechanism



Item	Description
1	Fifth and reverse gear selector shaft guide sleeve
2	Selector plate
3	Shift lock
4	Selector shaft interlock mechanism
5	Selector shaft
6	Reverse gear selector lever return spring
7	Reverse gear selector lever
8	Snap-ring
9	Fifth and reverse gear selector shaft

5. Fifth and reverse gear selector shaft guide sleeve.



Assembly

1. Install the selector mechanism.

1. Selector shaft.
2. Reverse gear selector lever.
3. Fifth and reverse gear selector shaft guide sleeve.

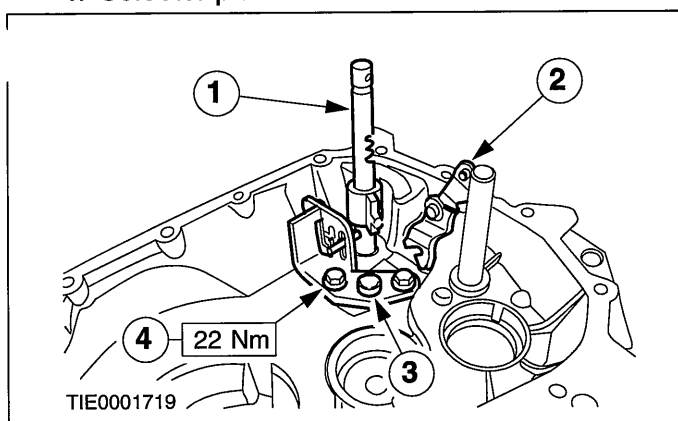
Disassembly

1. Remove the selector mechanism.

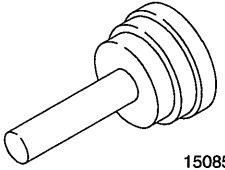
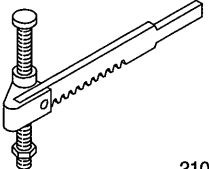
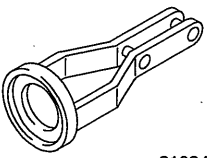
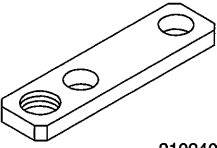
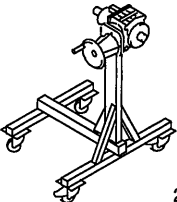
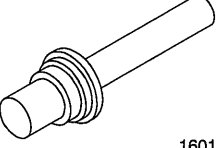
1. Fifth and reverse gear selector shaft.
2. Selector shaft.
3. Reverse gear selector lever .
4. Selector plate.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

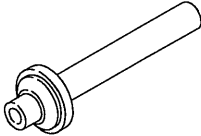
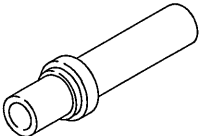
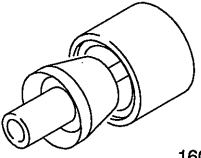
4. Selector plate.



ASSEMBLY**Transaxle(16 118 8)****Special Tool(s)**

 15085	Installer, Wheel Hub Bearing Cone/Seal 205-296 (15-085)
 21024	Compressor, Valve Spring 303-060 (21-024)
 2102402	Adapter for 303-060 303-060-02 (21-024-02)
 2102407	Adapter for 303-060 303-060-07 (21-024-07)
 21187	Mounting Stand 303-435 (21-187)
 16018	Installer, Halfshaft Seal 308-039 (16-018)

Special Tool(s)

 16020	Installer, Input Shaft Bearing Cone 308-041 (16-020)
 16015	Installer, Extension Housing Bushing/Seal 308-045 (16-015)
 16031	Installer, Input Shaft Snap Ring 308-076 (16-031)

General Equipment

Press
Dial indicator gauge
Magnetic stand for dial indicator gauge
Blanking plugs
M8 x 50 mm bolt
Thread die

Materials

Name	Specification
Sealant	ESEE-M4G1008-A
Transmission Oil	WSD-M2C200-C
Oil Pan Sealer	WSK-M2G348-A5
Silicon Sealer	WSE-M4G323-A4
High Temperature Grease	ESDM-1C220-A

1. Clean and check all parts carefully before reassembly.

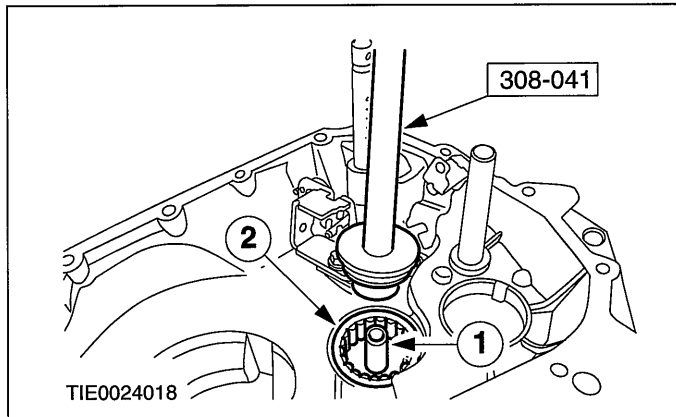
- Apply clean transmission oil to all running surfaces.

ASSEMBLY

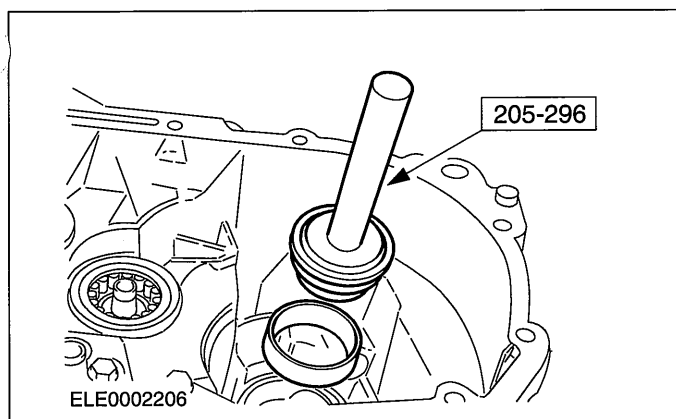
2. **⚠ CAUTION:** Make sure the output shaft roller bearing is installed with the scribed text uppermost.

Using the special tool, install the output shaft roller bearing and the output shaft bearing cup.

1. Install the oil funnel.
2. Install the output shaft roller bearing.



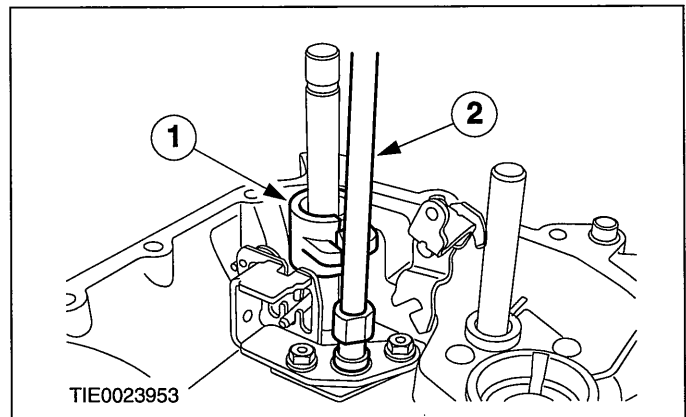
3. Using the special tool, install the differential bearing cup.



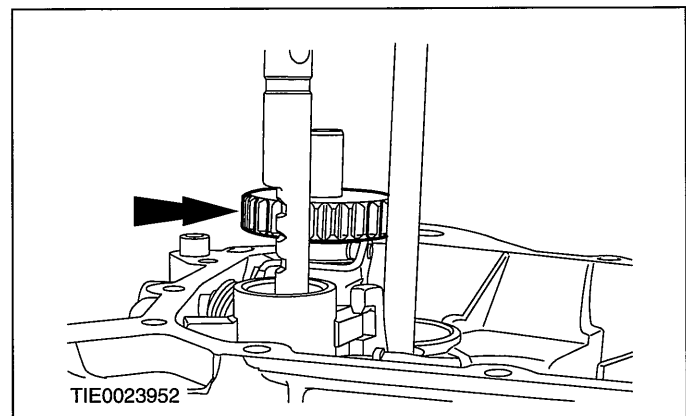
4. Install the fifth and reverse gear selector shaft, and the shift lock.

1. Install the shift lock.

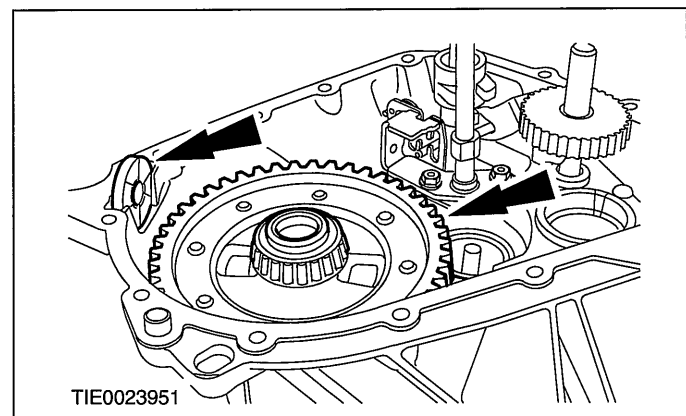
2. Install the fifth and reverse gear selector shaft.



5. Install the reverse gear idler.



6. Install the differential assembly and the permanent magnet.

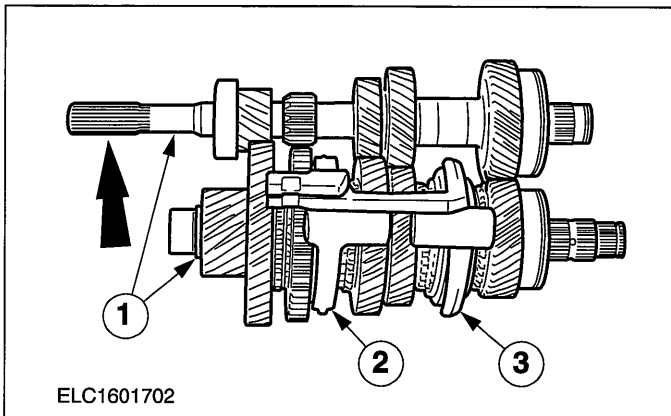


7. Prepare the input and output shaft for installation.

1. Engage the input shaft and output shaft.
2. Move the first and second gear shift forks to the installation position.

ASSEMBLY

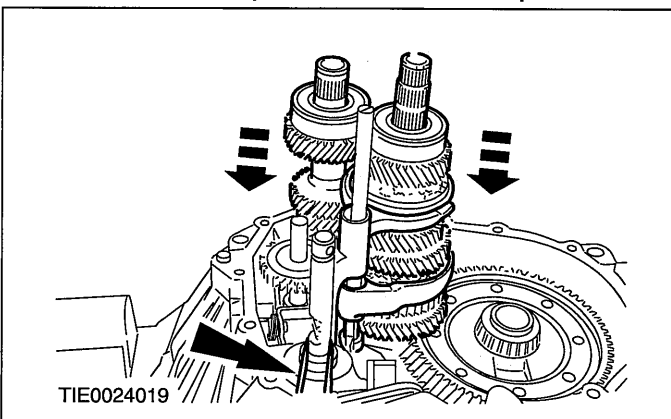
3. Move the third and fourth gear shift forks to the installation position.



8. **NOTE:** Install a rubber band to the second selector shaft to aid assembly.

Install the input shaft, the output shaft and the selector forks.

- Insert the input shaft to a depth of approximately 50 mm and move it slightly to one side.
- Insert the output shaft to the level of the input shaft and engage the gear wheels.
- Install the input shaft and the output shaft.

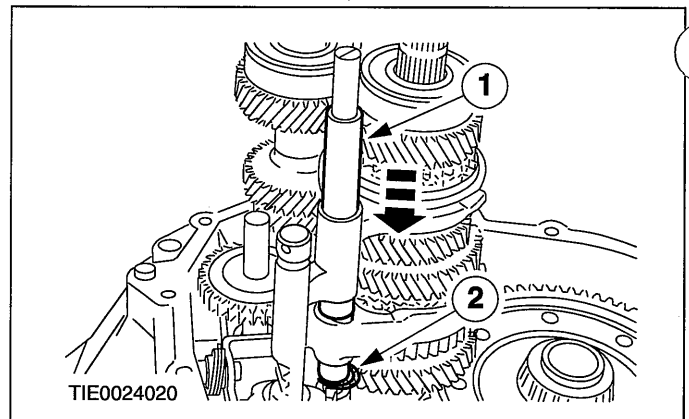


9. **NOTE:** Install a new snap ring.

Install the selector shaft guide sleeve lower snap ring.

1. Install the guide sleeve.

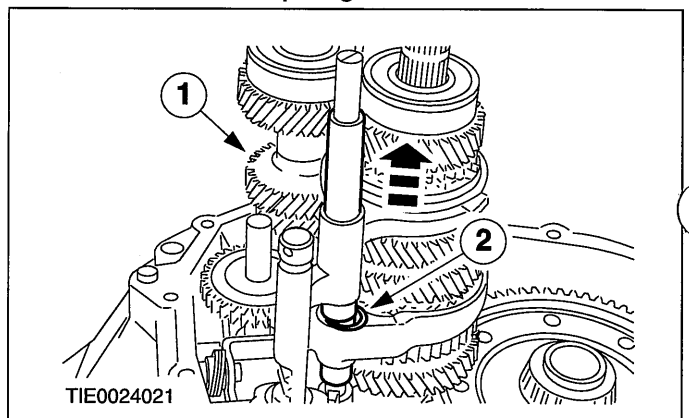
2. Install the snap ring.



10. **NOTE:** Install a new snap ring.

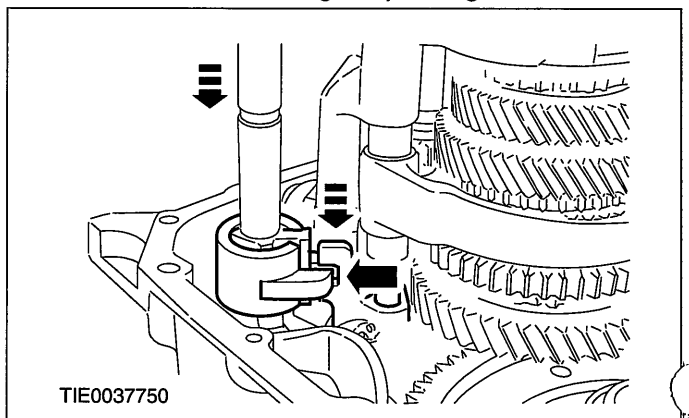
Install the selector shaft guide sleeve upper snap ring.

1. Lift the guide sleeve.
2. Install the snap ring.



11. Move the inner gearshift linkage to the fifth gear.

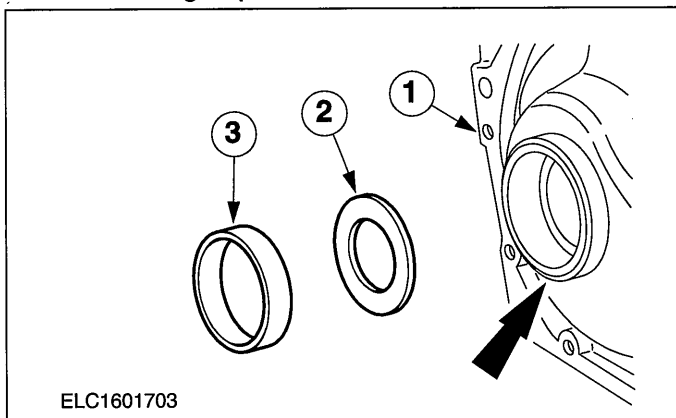
- Before pressing it downwards, turn the selector shaft clockwise until it reaches the reverse and fifth gear passage.



12. Install the 3.8 mm thick measuring shim and secure it with a punch mark.

ASSEMBLY

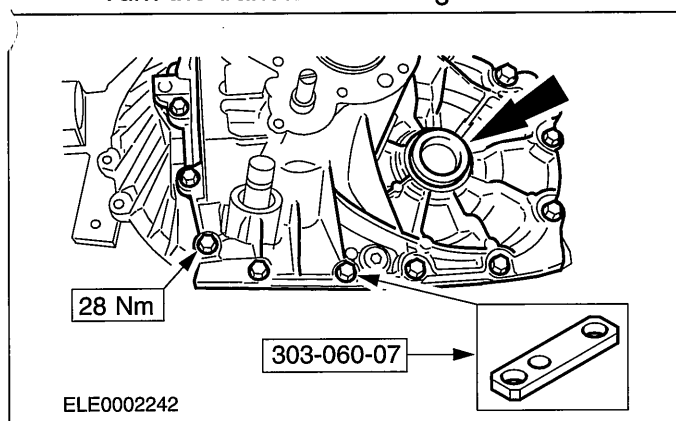
1. Transaxle housing.
2. Measuring shim.
3. Bearing cup.



- 13. NOTE:** Make sure that the transaxle housing mating surfaces are clean.

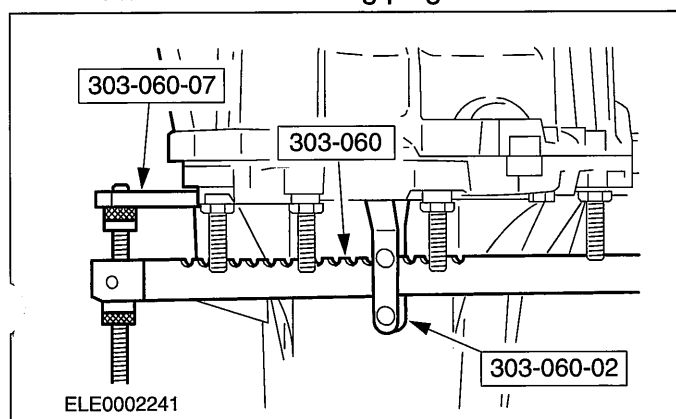
Assemble the transaxle housing.

- Using a M8 x 50 mm bolt install the special tool.
- Install the blanking plugs.
- Install the bolts.
- Turn the transaxle 180 degrees.



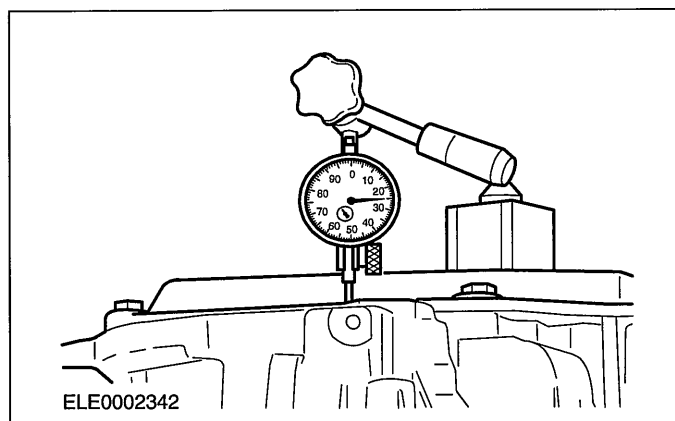
14. Install the special tools.

- Remove the blanking plugs.



15. Prepare the differential for measuring.

- Turn the differential assembly approximately ten times to settle the bearings.
- Position the dial indicator gauge and magnetic stand and set the dial indicator gauge to zero.
- Pre-tension the dial indicator gauge by a minimum of 1 mm.



16. NOTE: Carry out the measuring procedure three times and calculate the average value.

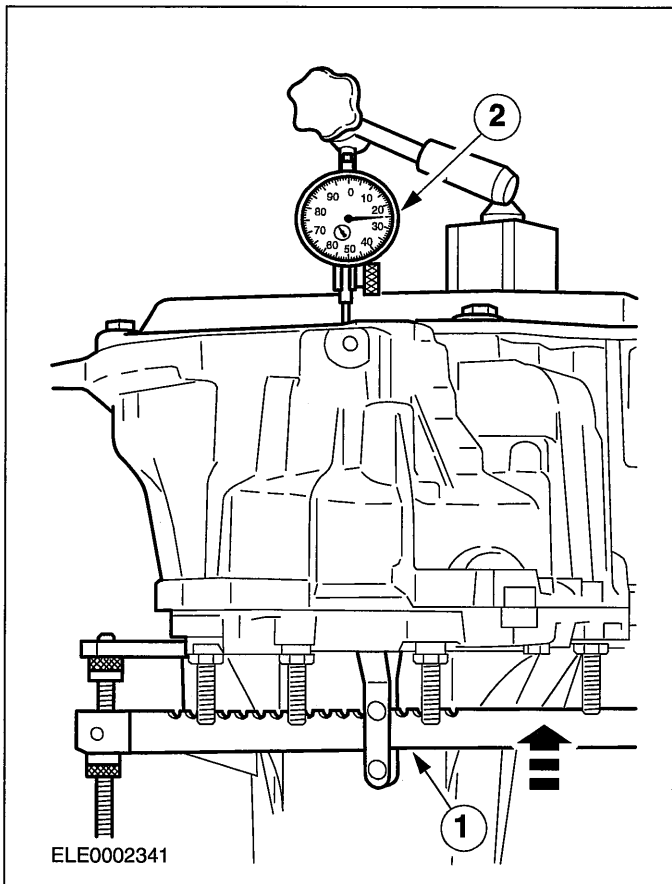
NOTE: The adjusting shims are available from 0.1 mm to 1.1 mm in steps of 0.1 mm.

Measure the differential end float.

1. Using the special tool, lift the differential assembly.
 2. Note the resulting measurement.
- Example: $0.73 \text{ mm} + 0.74 \text{ mm} + 0.72 \text{ mm}$ divided by three = 0.73 mm.
 - The value of the thickness of the shim should be rounded down to the nearest tenth of a millimeter below if the value ends

ASSEMBLY

in 0.05 mm and below, and rounded up to the nearest tenth of a millimeter if the value ends in 0.06 mm and above.



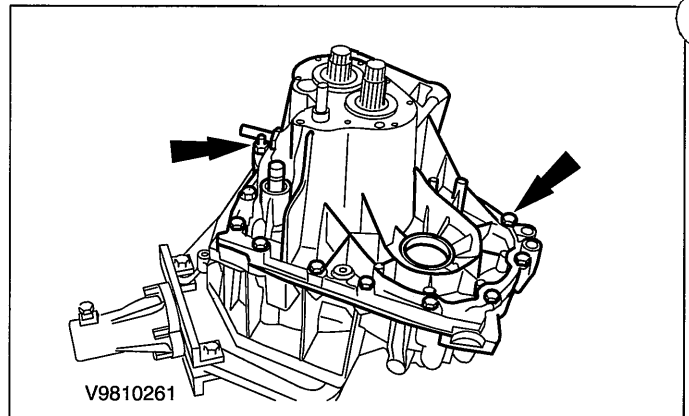
17. Calculate the required adjusting shim thickness.

- Thickness of adjusting shim = measuring shim (3.80 mm) + average value (0.73 mm) + bearing pre-load (0.14 mm) – thickness of the Belleville washers (4.42 mm)
- Example: Adjusting shim = 3.80 mm + 0.73 mm + 0.14 mm – 4.42 mm = 0.25 mm.
- The thickness of the adjusting shim becomes 0.2 mm (rounded down from 0.25 mm).

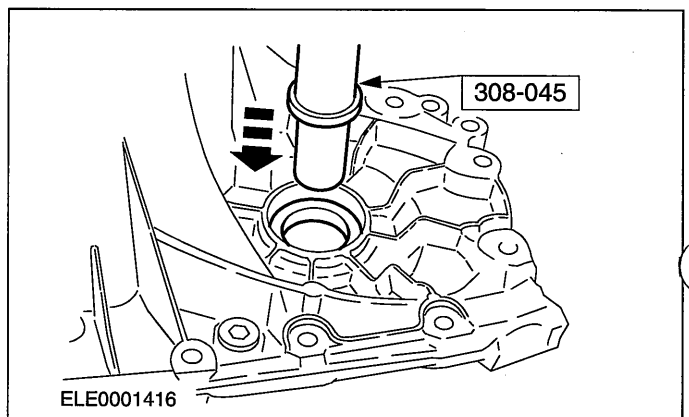
18. Separate the transaxle housing.

- Install the blanking plugs.
- Turn the transmission approximately 180 degrees.

- Remove the dial indicator gauge, the magnetic stand and the special tools.



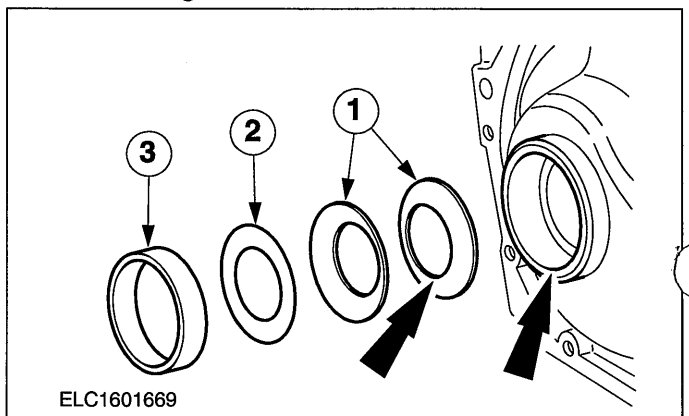
19. Using the special tool, remove the differential bearing cup and the measuring shim.



20. **CAUTION:** The Belleville washers must be installed with the inner diameter of both washers touching.

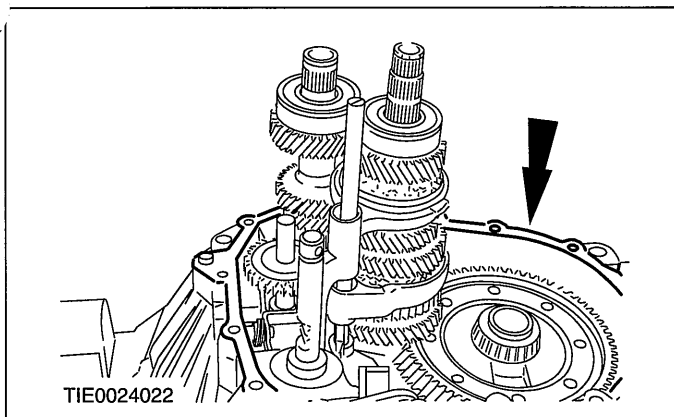
Install the measured adjusting shim.

1. Install the Belleville washers.
 2. Install the measured adjusting shim.
 3. Install the bearing cone.
- Using a suitable center punch, secure the bearing cone.

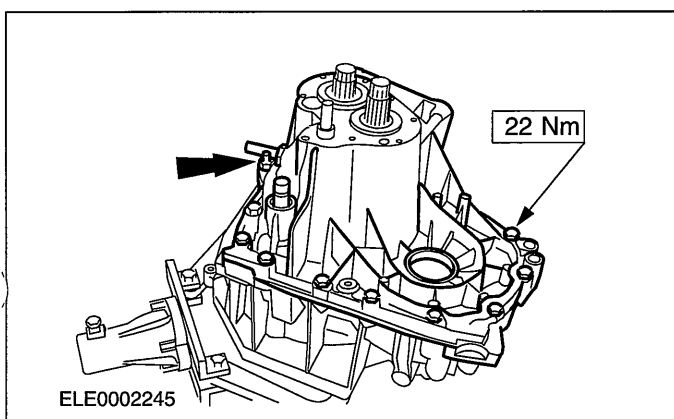


ASSEMBLY

21. Apply sealer on the inside edge of the transaxle housing mating face.

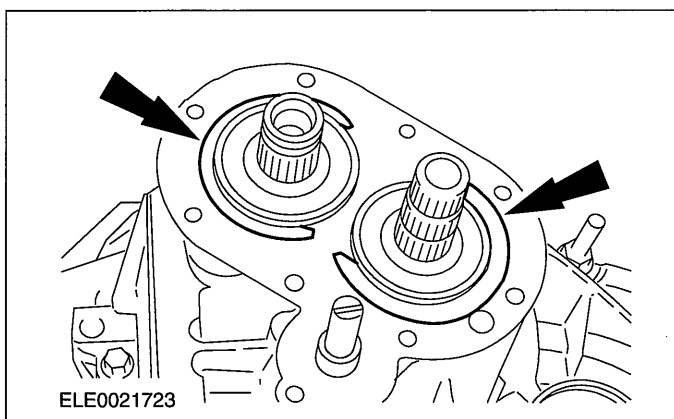


22. Assemble the transaxle housing and tighten the bolts.



23. **NOTE:** Install new input and output shaft snap rings.

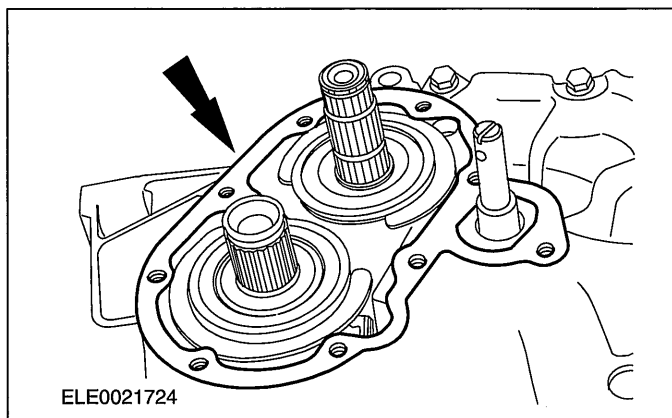
Raise the input and output shafts slightly and install the snap rings.



24. Using a suitable thread die, clean all the hole threads in the fifth gear housing.

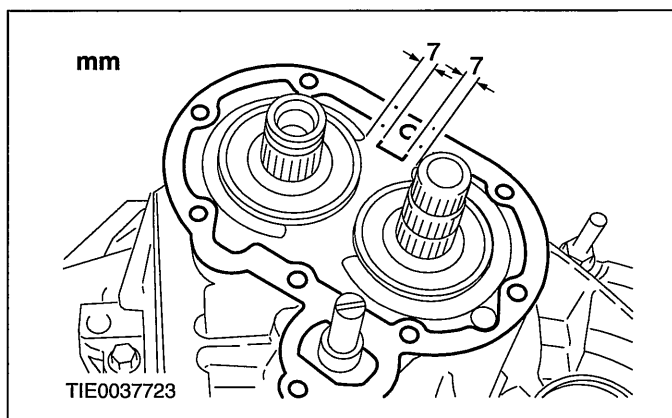
25. **NOTE:** Install a new fifth gear housing gasket.

- Install the fifth gear housing gasket.



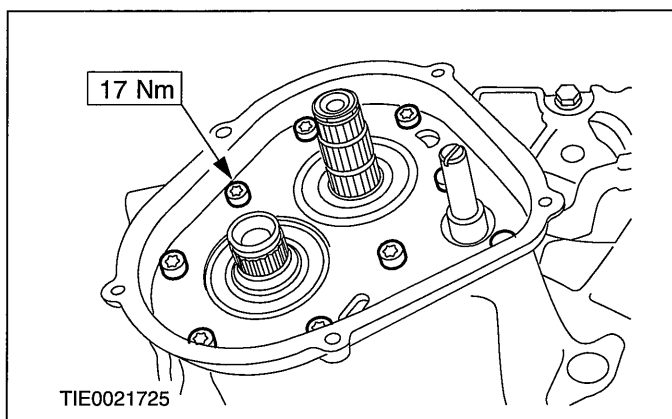
26. **CAUTION:** Make sure the snap rings are in the correct position. Failure to follow this instruction may cause damage to the fifth gear housing.

Turn the snap rings to the position shown.



27. **NOTE:** Install new fifth gear housing retaining bolts.

Install the fifth gear housing.

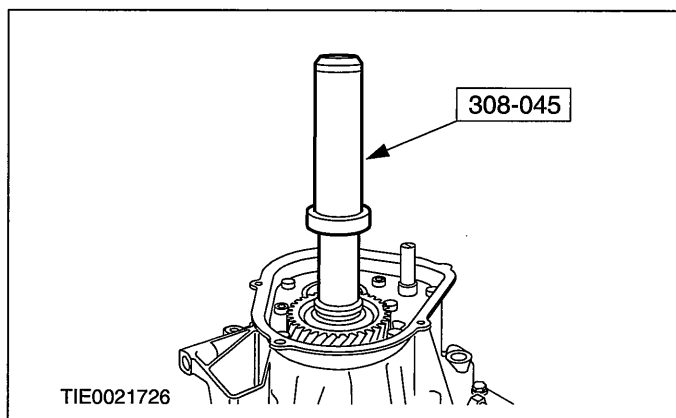


28. Remove the transaxle from the mounting stand.

ASSEMBLY

29. **NOTE:**The transaxle housing must not contact the press table. Support the input shaft splines.

Using the special tool and a suitable press, install the fifth gear.

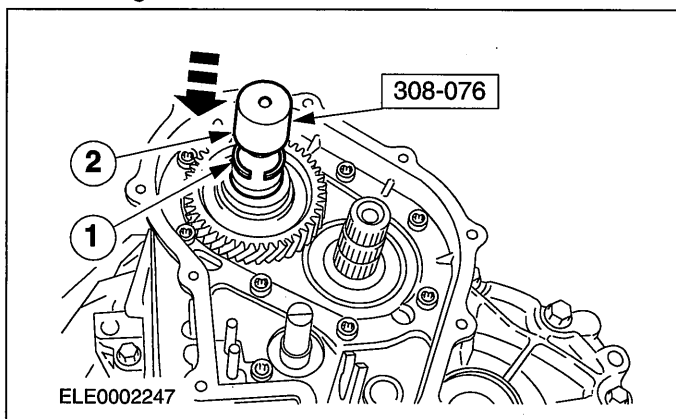


30. Mount the transaxle on the mounting stand.

31. **NOTE:**Install a new fifth gear snap ring.

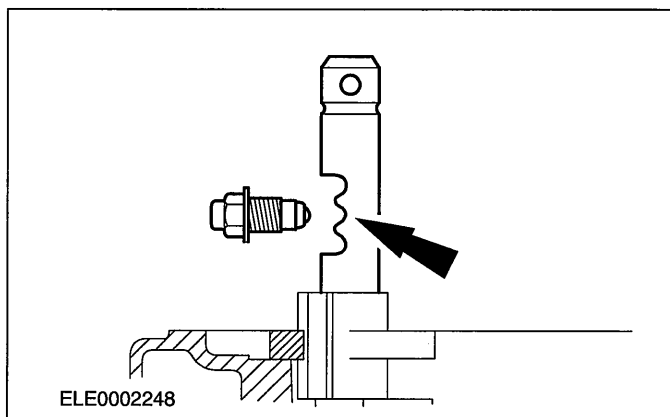
Install the fifth gear snap ring.

1. Install the snap ring onto the special tool.
2. Install the special tool and push on the snap ring.



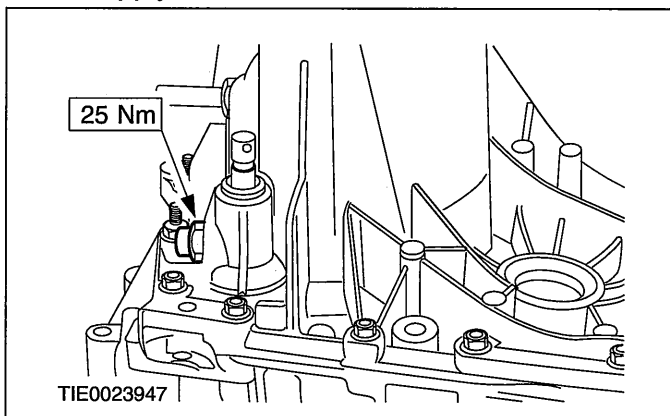
32. Make sure that the selector shaft is in the neutral position.

- Correct installation position for the selector shaft interlock mechanism.



33. Install the selector shaft interlock mechanism.

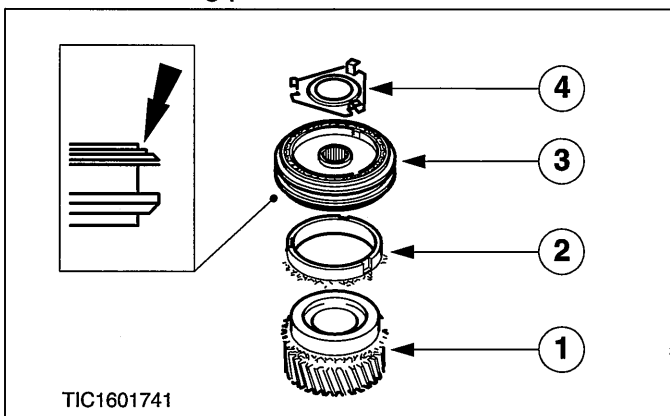
- Apply sealant to the thread.



34. **NOTE:**Align the gear synchronizer to the marks.

Assemble the fifth gear synchronizer.

1. Fifth gear.
2. Synchronizer ring.
3. Synchronizer assembly.
4. Retaining plate.



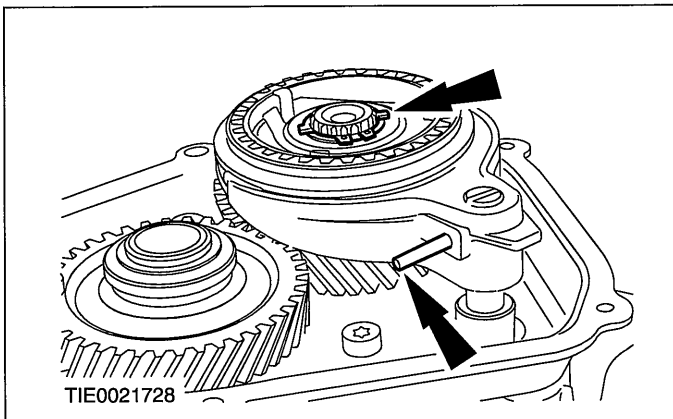
ASSEMBLY

35. NOTE: Install a new fifth gear synchronizer assembly snap ring.

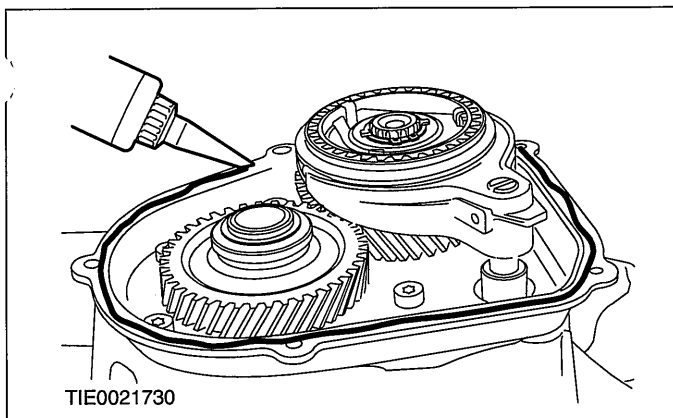
NOTE: Use a new selector fork retaining pin.

Install the fifth gear synchronizer assembly and the selector fork.

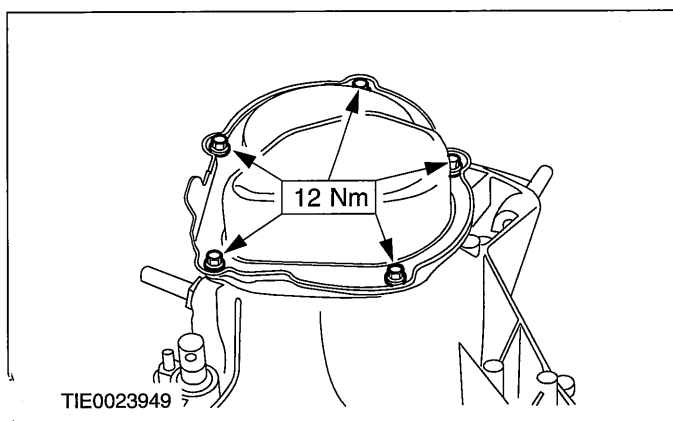
- Install the retaining pin.
- Install the snap ring.



36. Apply sealer evenly to the inside edge of the fifth gear housing mating face.

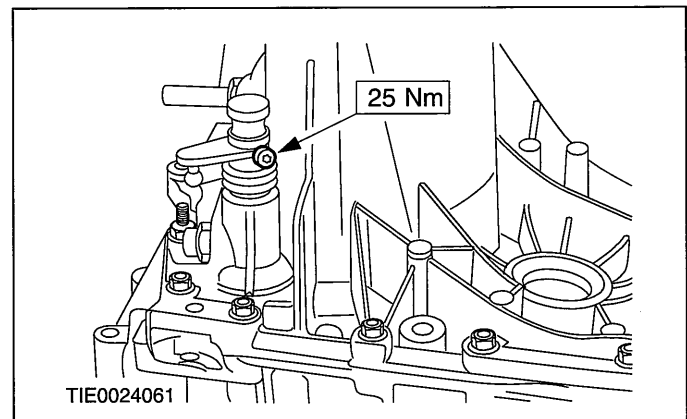


37. Install the fifth gear housing cover.



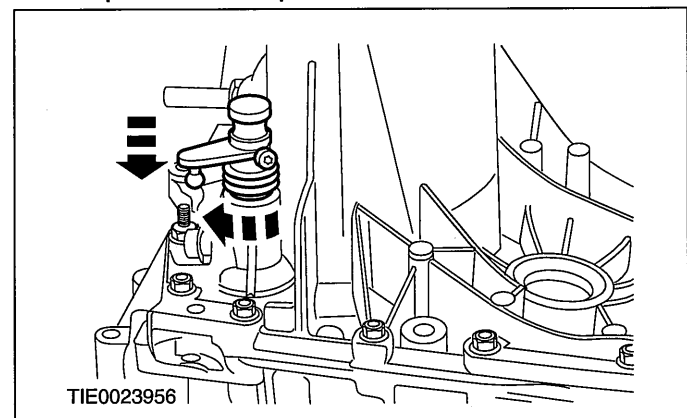
38. Install the selector lever.

- Install the bellows.



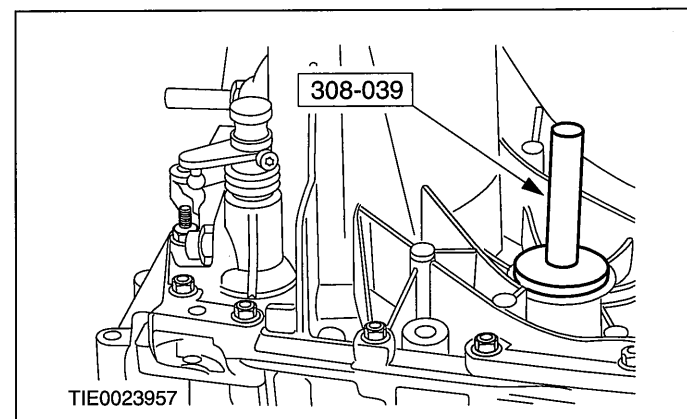
39. Engage the fifth gear.

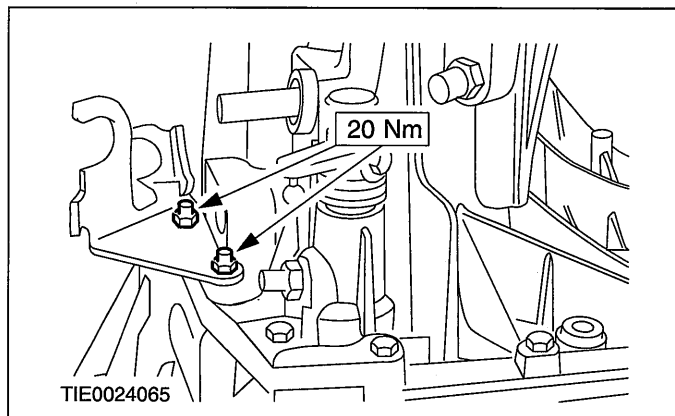
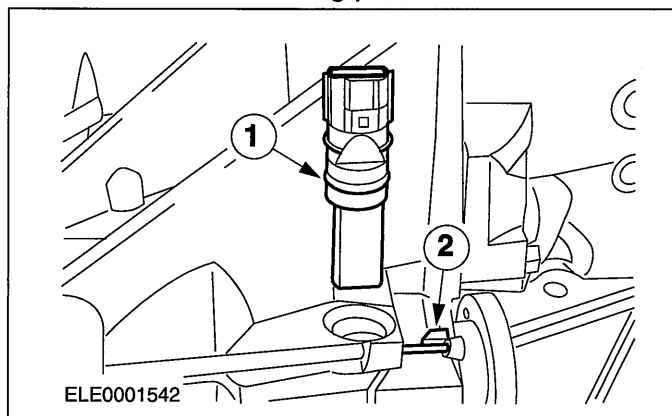
- Turn the selector shaft clockwise as far as possible and push the shaft in.



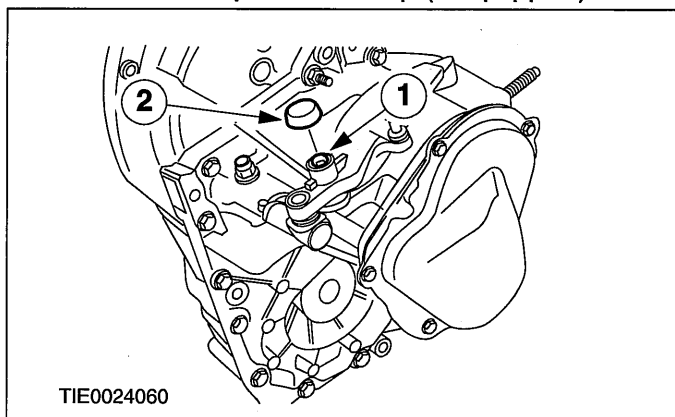
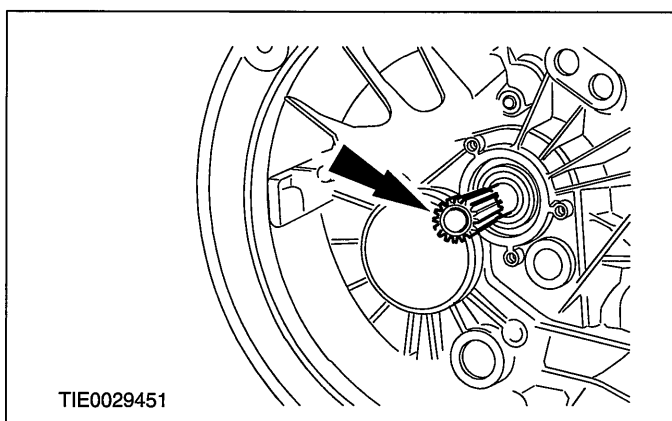
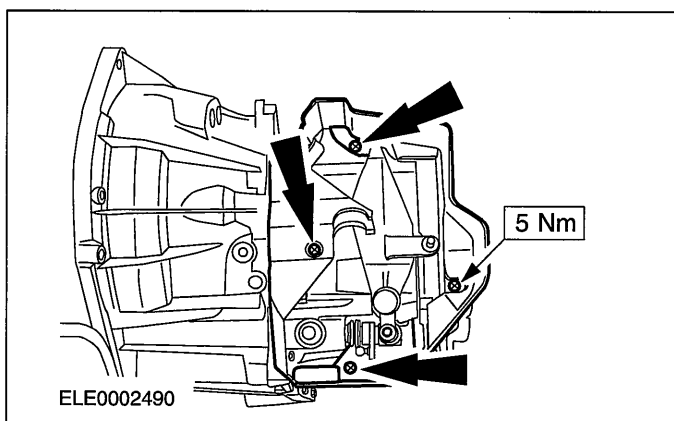
40. NOTE: Install new halfshaft oil seals.

Using the special tools, install both halfshaft oil seals (left-hand side shown).



ASSEMBLY**41. Install the gearshift cable bracket.****2. Install the retaining pin.****42. NOTE: Install a new snap ring.****Install the gearshift lever.**

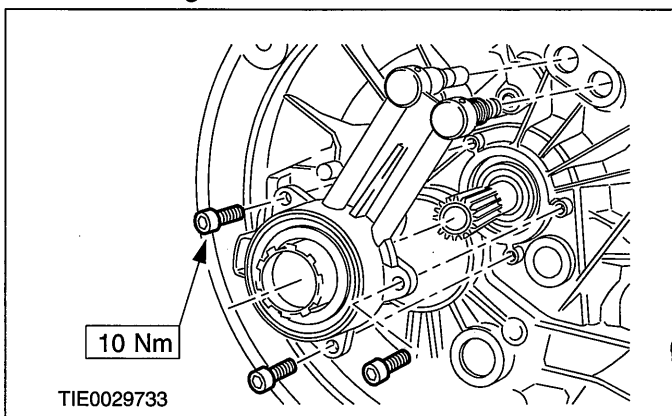
1. Install the snap ring.
2. Install the protective cap (if equipped).

**45. ⚠ CAUTION: Using suitable adhesive tape, cover the input shaft splines to prevent damage to the input shaft oil seal.****Position the input shaft oil seal.****43. Install the selector mechanism cover.****44. Install the vehicle speed sensor (VSS) (if equipped).**

1. Push in the VSS.

46. ⚠ CAUTION: Do not apply grease on any parts of the clutch slave cylinder.**Install the clutch slave cylinder.**

- Tighten the bolts evenly. In doing so, press the input shaft oil seal into the transmission housing.



ASSEMBLY

47. Remove the adhesive tape from the input shaft splines.
48. Coat the input shaft splines with a thin layer of grease.

INSTALLATION

Transaxle — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(16 114 0)

Special Tool(s)

 21140	Support Bar, Engine 303-290A (21-140A)
 2114001	Adapter for 303-290A 303-290-01 (21-140-01)
 2114002	Adapter for 303-290A 303-290-02 (21-140-02)
 2114003	Adapter for 303-290A 303-290-03A (21-140-03A)

General Equipment

Retaining strap
Transmission jack

Materials

Name	Specification
Manual transmission fluid	WSD-M2C200-C

Installation

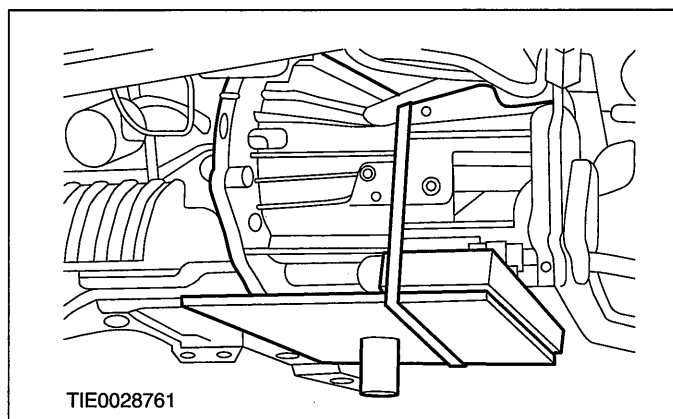
All vehicles

1. CAUTIONS:

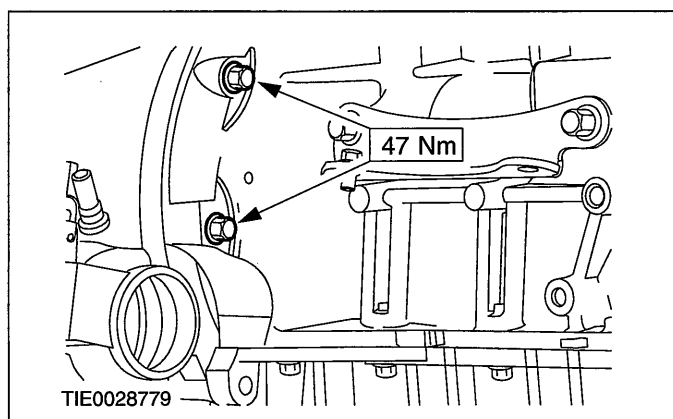
⚠ Use suitable retaining straps to secure the transaxle on the transmission jack.

⚠ Make sure that the two locating dowels are installed.

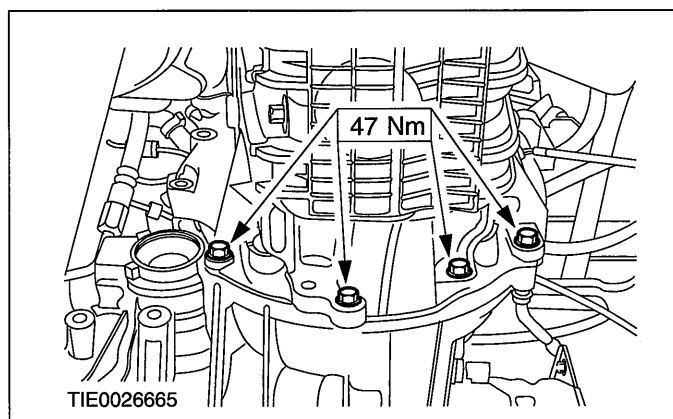
Using a suitable transmission jack, install the transaxle.

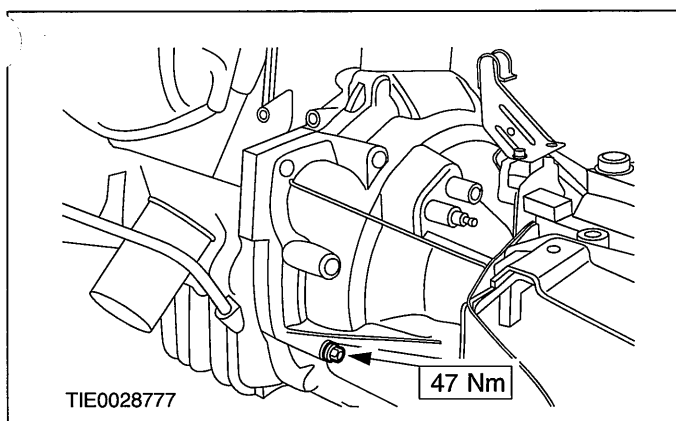
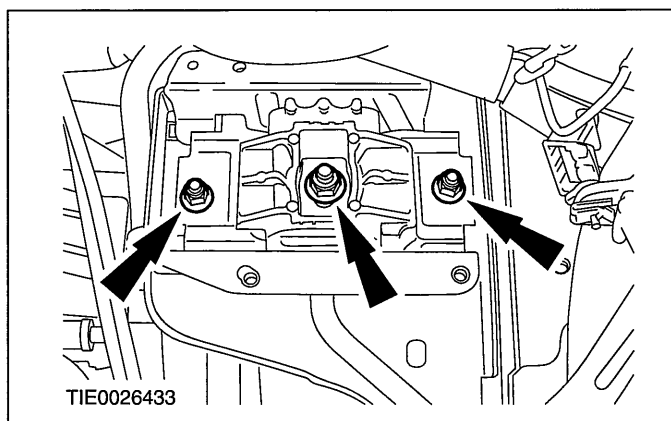
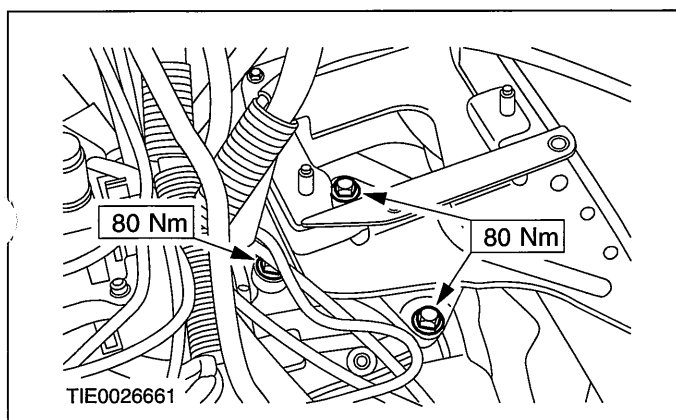
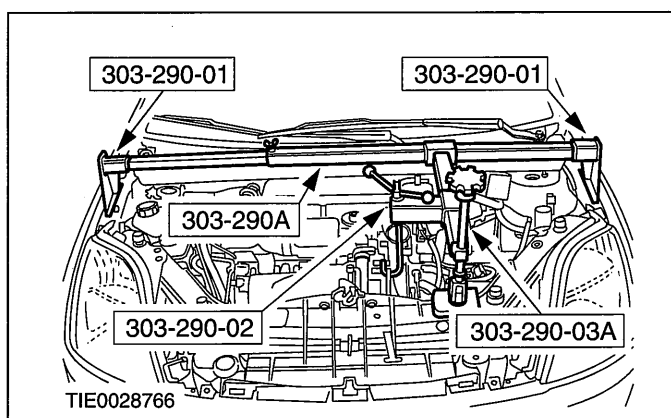


2. Install the transaxle right-hand retaining bolts.

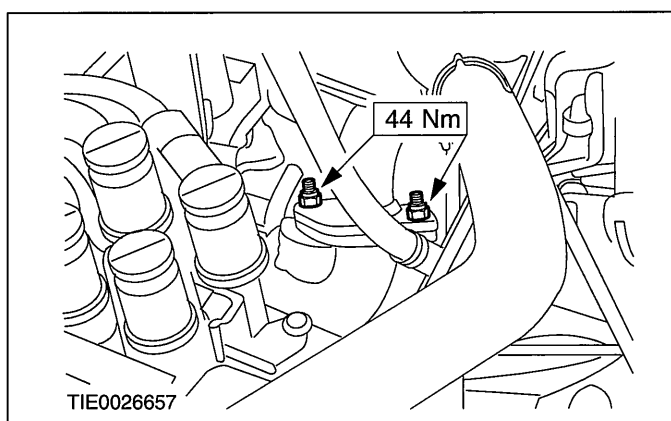
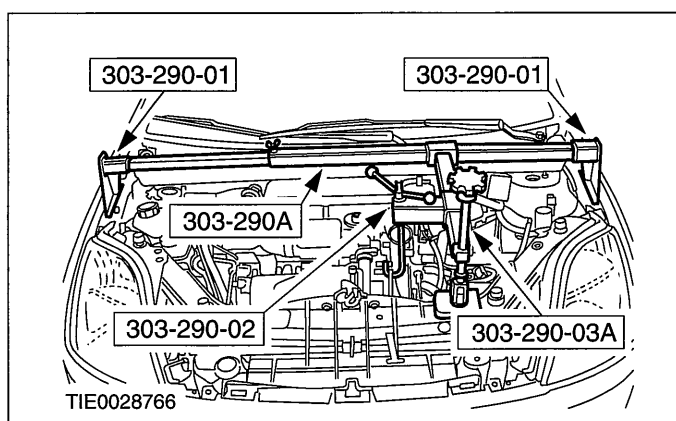


3. Install the transaxle lower retaining bolts.



INSTALLATION**4. Install the transaxle left-hand retaining bolt.****Install the engine rear mount.****5. Remove the retaining strap.****6. Remove the transmission jack.****7. Install the engine and transaxle rear mount retaining bracket.****11. Remove the special tools.****12. NOTE: Install new exhaust flange nuts and a new exhaust flange gasket.**

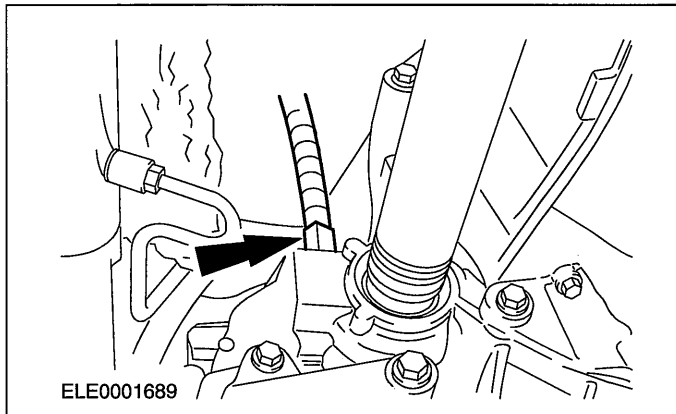
Attach the exhaust flexible pipe to the catalytic converter.

**8. Lower the vehicle.****9. Using the special tools, raise the engine and transaxle assembly.****10. NOTE: Do not tighten the engine rear mount retaining nuts at this stage.**

NOTE: Install new engine rear mount retaining nuts.

INSTALLATION

13. Connect the vehicle speed sensor (VSS) electrical connector (if equipped).

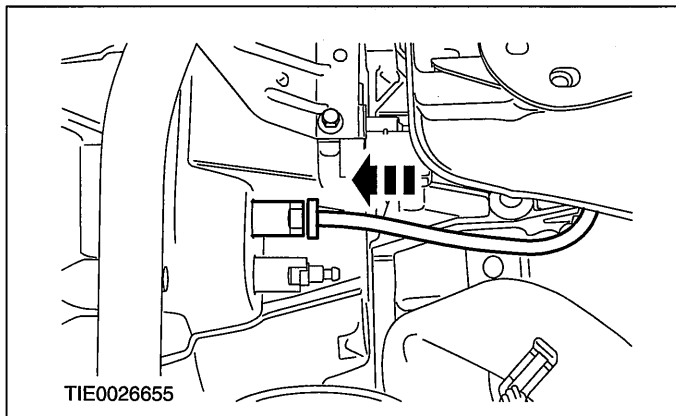


14. **CAUTION:** If brake fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.

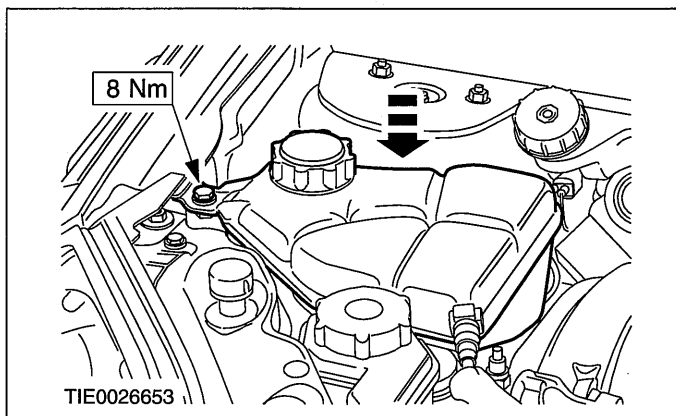
NOTE: Make sure the spring clip is correctly seated.

Connect the clutch slave cylinder supply line.

- Install the spring clip.



15. Attach the coolant expansion tank to the bracket.



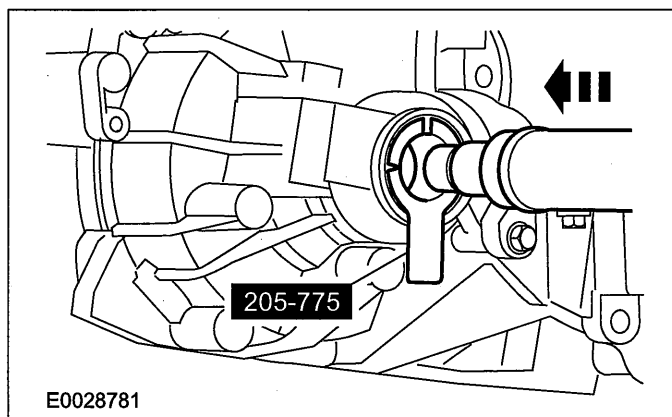
16. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

17. CAUTIONS:

CAUTION: Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

CAUTION: Do not damage the halfshaft oil seal.

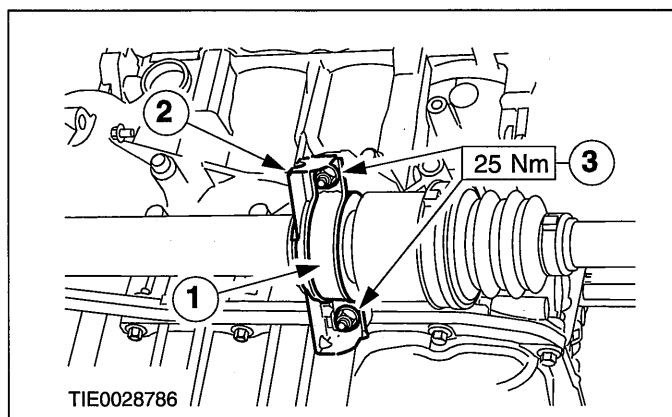
Attach the right-hand halfshaft and the intermediate shaft to the transaxle.



18. **NOTE:** Install a new center bearing cap and locknuts.

Install the intermediate shaft center bearing cap.

1. Install the center bearing cap.
2. Attach the heat shield.
3. Install the locknuts.



19. CAUTIONS:

CAUTION: Support the halfshaft. The inner joint must not be bent more than 18 degrees. The outer joint must not be bent more than 45 degrees.

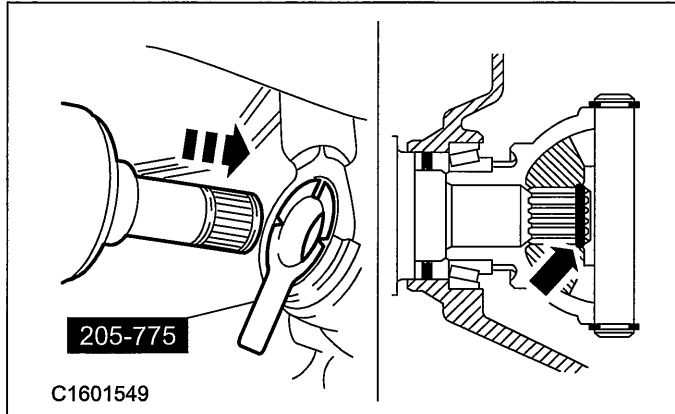
INSTALLATION

⚠ Do not damage the halfshaft oil seal.

⚠ Make sure the snap ring is correctly seated.

NOTE: Install a new snap ring.

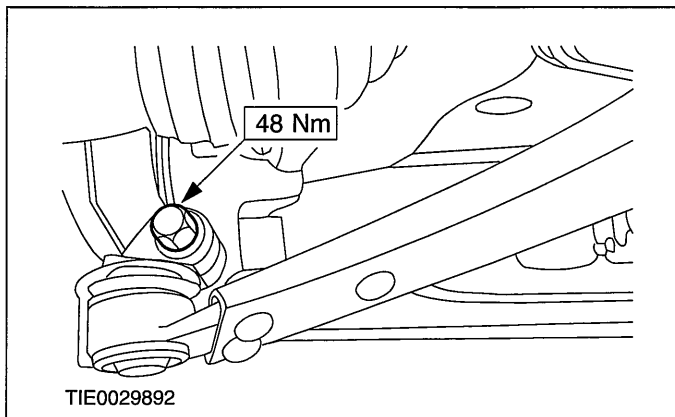
Attach the left-hand halfshaft to the transaxle.



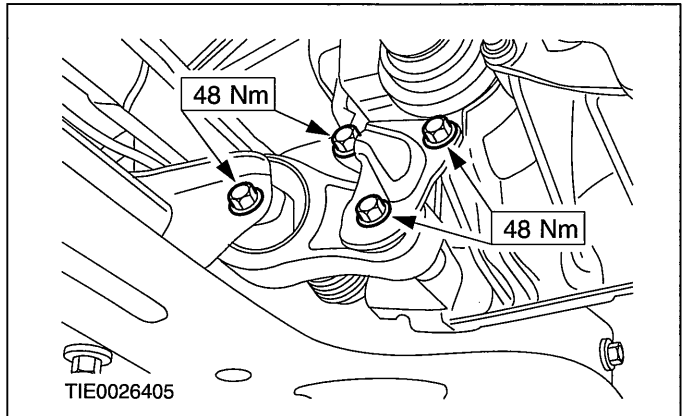
20. ⚠ **CAUTION:** Make sure that the heat shield is installed to prevent damage to the ball joint.

NOTE: The lower arm pinch bolt must be installed from the rear of the wheel knuckle.

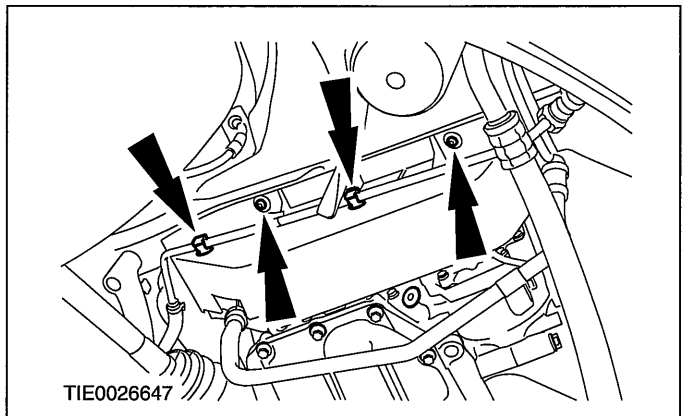
Attach the lower arm to the wheel knuckle on both sides.



21. Install the engine support insulator.

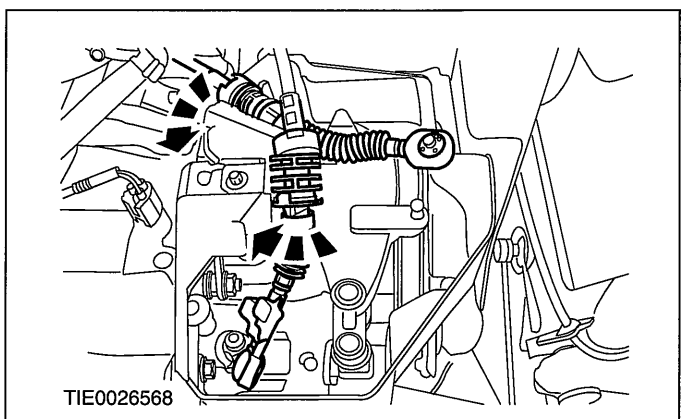


22. Install the accessory drive belt cover.



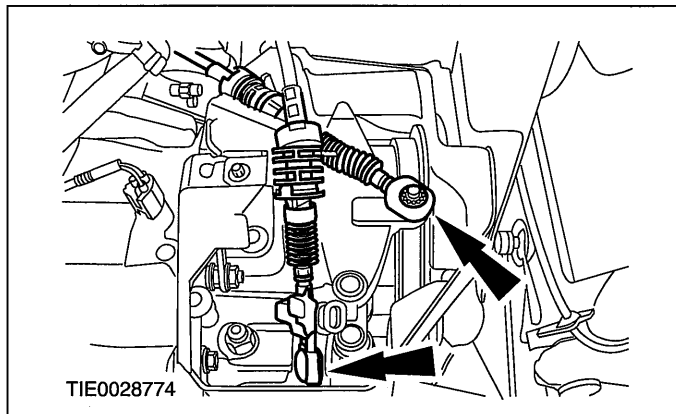
Vehicles without automated gearshift

23. Attach the gearshift cables to the bracket and turn the abutment sleeves counterclockwise.



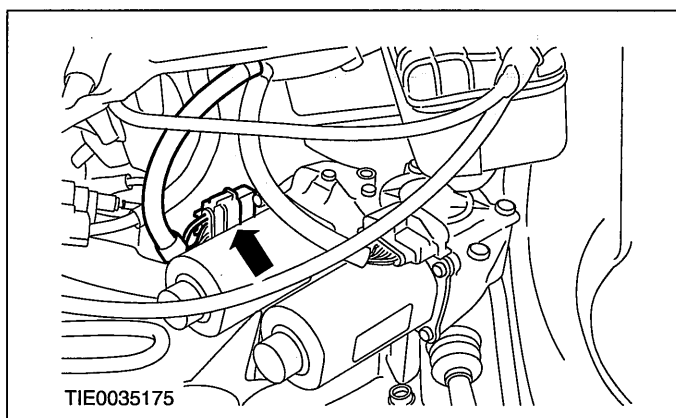
INSTALLATION

- 24. Attach the gearshift cables to the selector levers.**

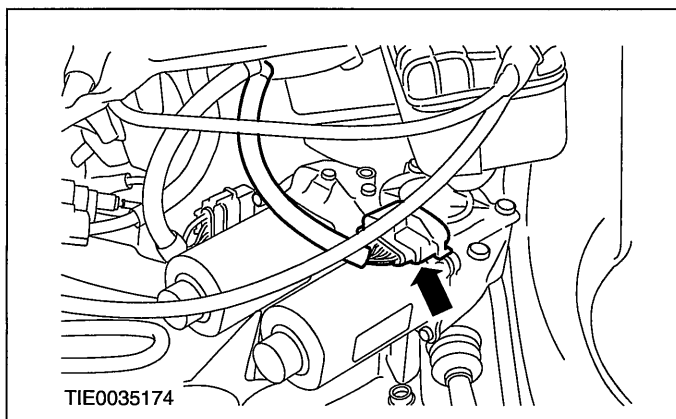


Vehicles with automated gearshift

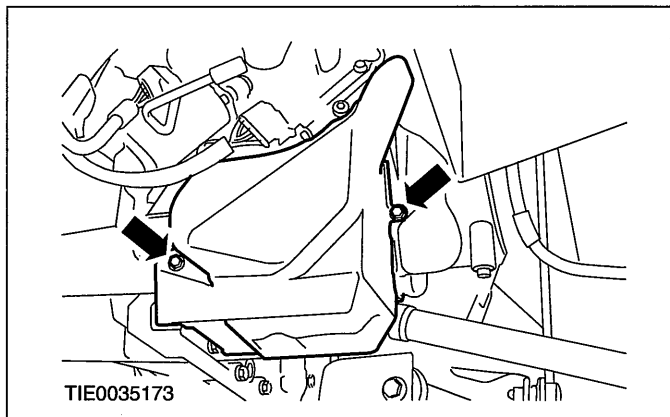
- 25. Connect the gearshift actuator electrical connector (colored grey).**



- 26. Connect the gearshift actuator electrical connector (colored black).**

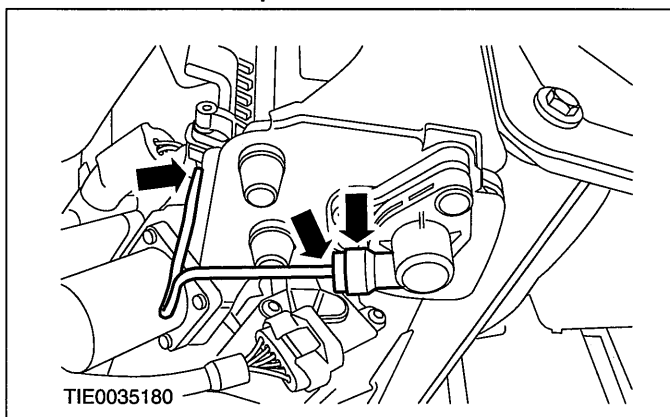


- 27. Install the gearshift actuator cover.**



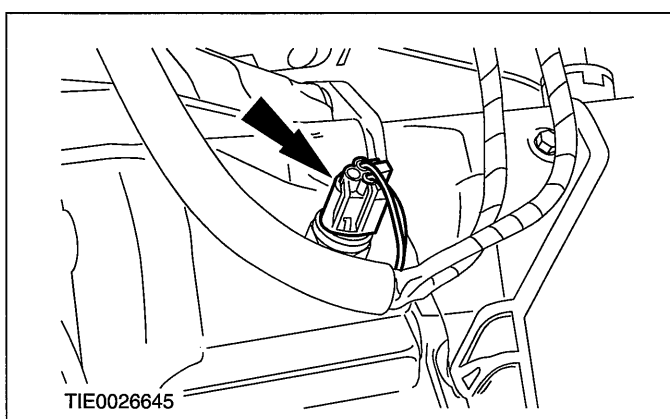
- 28. Connect the clutch slave cylinder supply line.**

- Install the clip.



All vehicles

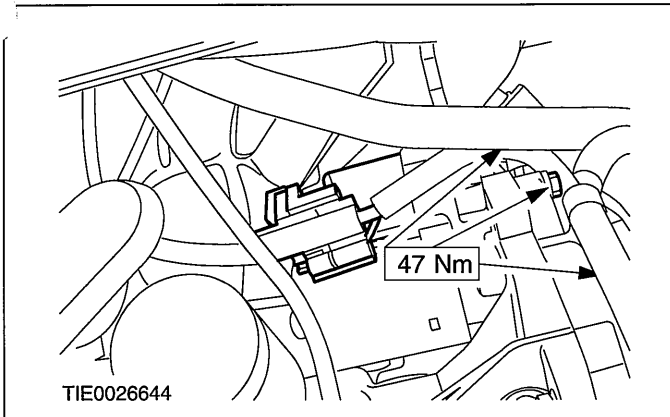
- 29. Connect the reversing lamp switch electrical connector.**



- 30. Install the starter motor.**

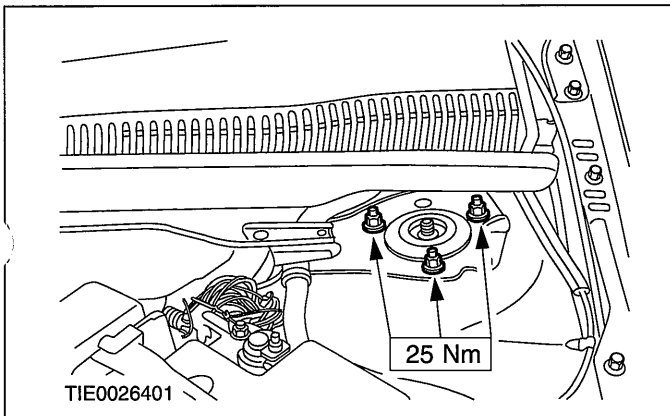
INSTALLATION

- Attach the starter motor electrical connector to the starter motor.



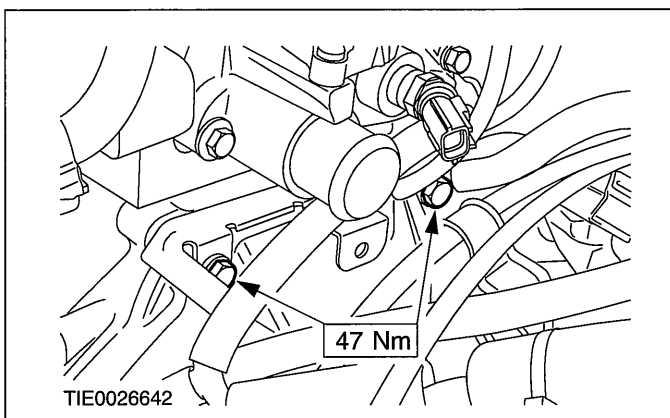
31. Lower the vehicle.

32. Tighten the strut spring assembly top mount nuts on both sides.

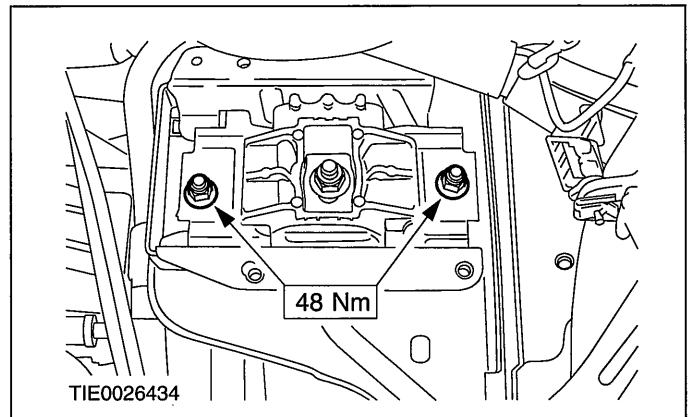


33. Install the transaxle upper retaining bolts.

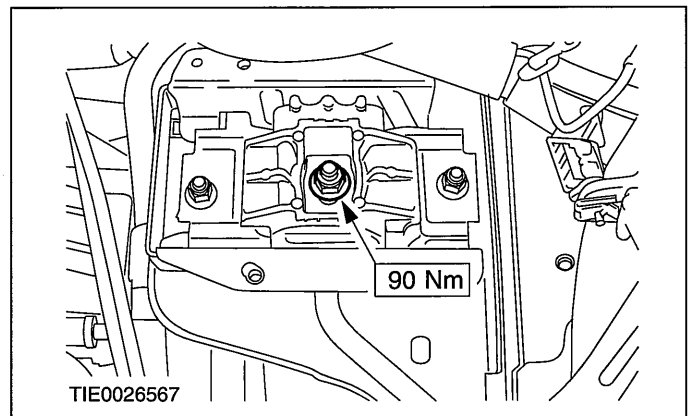
- Attach the engine wiring harness bracket to the transaxle.



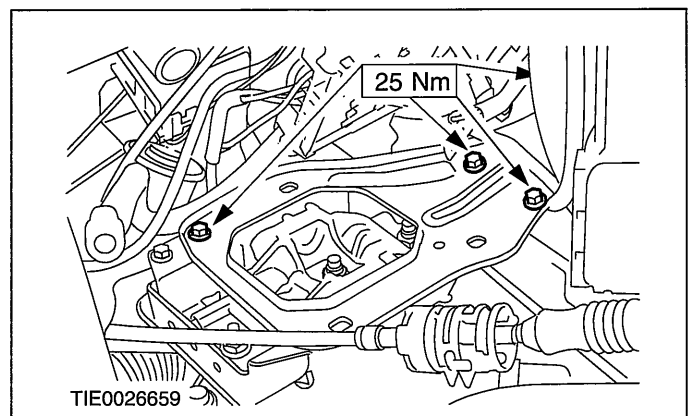
34. Tighten the engine rear mount outer retaining nuts.



35. Tighten the engine rear mount center retaining nut.

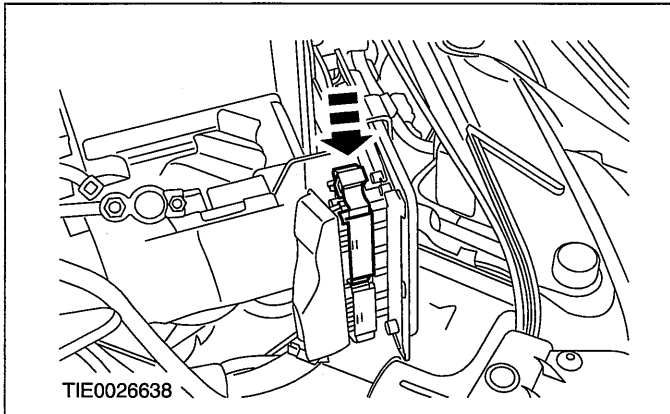


36. Install the battery tray support bracket.



INSTALLATION

37. Connect the powertrain control module (PCM) electrical connector to the PCM.



38. Install the front wheels and tires. For additional information, refer to Section 204-04 [Wheels and Tires].

Vehicles without automated gearshift

39. Adjust the gearshift cables. For additional information, refer to Section 308-00 [Manual Transmission/Transaxle and Clutch - General Information].
40. Bleed the clutch system. For additional information, refer to Section 308-00 [Manual Transmission/Transaxle and Clutch - General Information].

All vehicles

41. Install the battery tray. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
42. With the vehicle on a level surface, fill the transaxle until the oil level is just below the bottom of the filler hole.

Vehicles with automated gearshift

43. **⚠ CAUTION:** The worldwide diagnostic system (WDS) gearshift actuator bleed option must be carried out if any part of the clutch hydraulic system is opened or any new components are installed.

NOTE: When the WDS gearshift actuator bleed option is selected, the learn transmission and learn clutch parameter options will automatically be completed.

Bleed the clutch system. For additional information, refer to Section 308-00 [Manual Transmission/Transaxle and Clutch - General Information].

INSTALLATION**Transaxle — 2.0L Duratec-HE (MI4)(16 114 0)****Special Tool(s)**

21140	Support Bar, Engine 303-290A (21-140A)
2114001	Adapter for 303-290A 303-290-01 (21-140-01)
2114003	Adapter for 303-290A 303-290-03A (21-140-03A)
2114005	Adapter for 303-290A 303-290-05A (21-140-05A)
2114006	Adapter for 303-290A 303-290-06 (21-140-06)

General Equipment

Retaining strap

Transmission jack

Materials

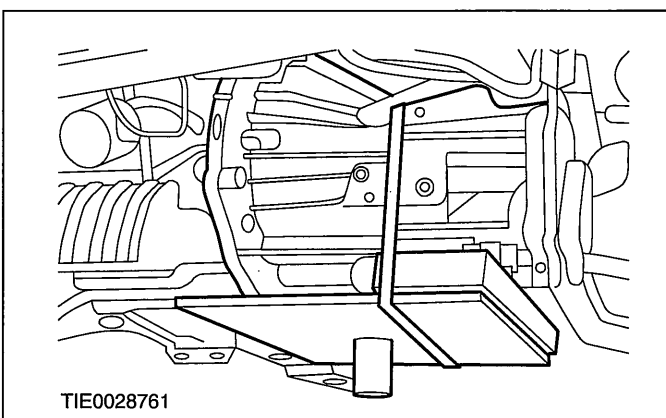
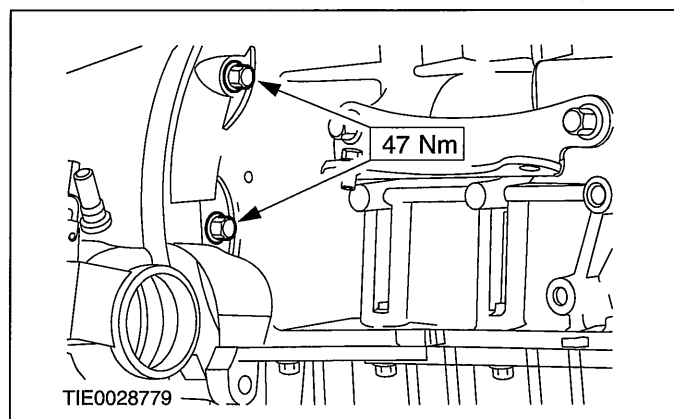
Name	Specification
Manual transmission fluid	WSD-M2C200-C

Installation**1. CAUTIONS:**

⚠ Use suitable retaining straps to secure the transaxle on the transmission jack.

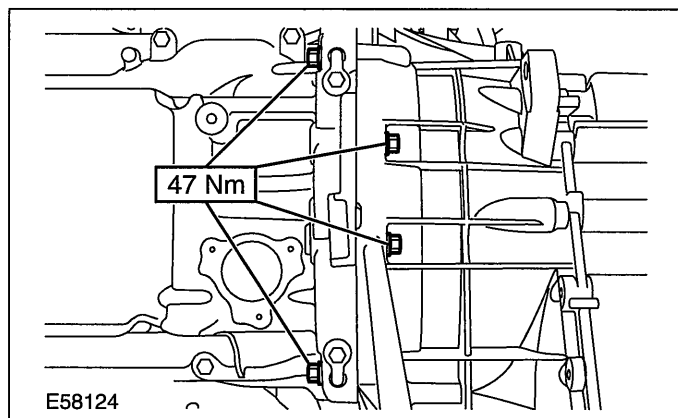
⚠ Make sure that the two locating dowels are installed.

Using a suitable transmission jack, install the transaxle.

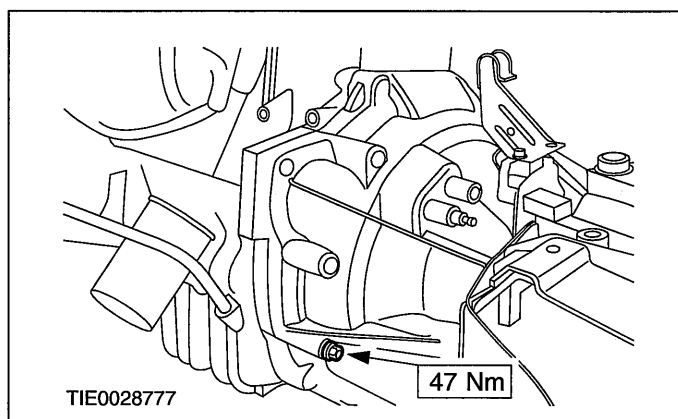
**2. Install the transaxle right-hand retaining bolts.**

INSTALLATION

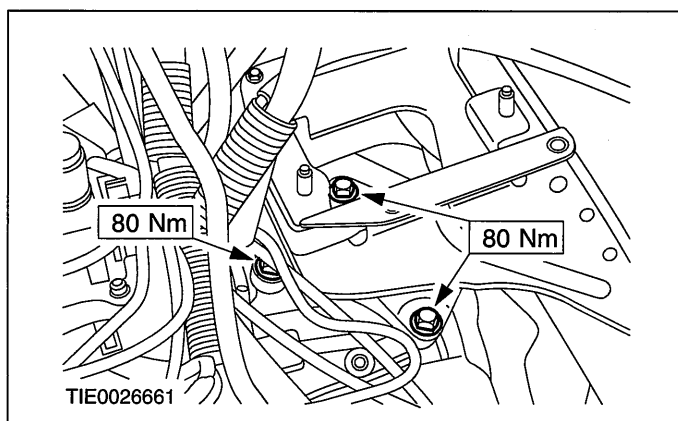
3. Install the transaxle lower retaining bolts.



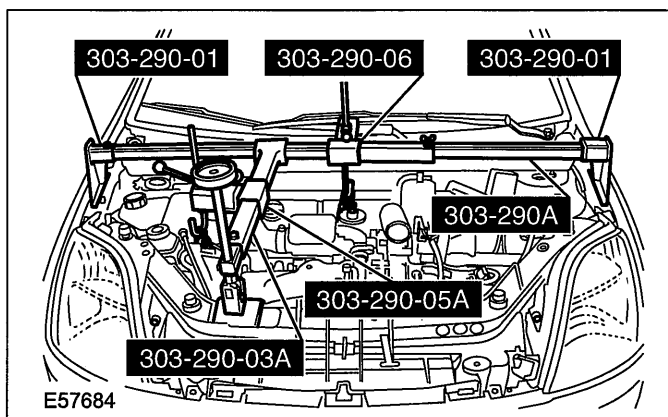
4. Install the transaxle left-hand retaining bolt.



5. Remove the retaining strap.
6. Remove the transmission jack.
7. Lower the vehicle.
8. Install the engine and transaxle rear mount retaining bracket.

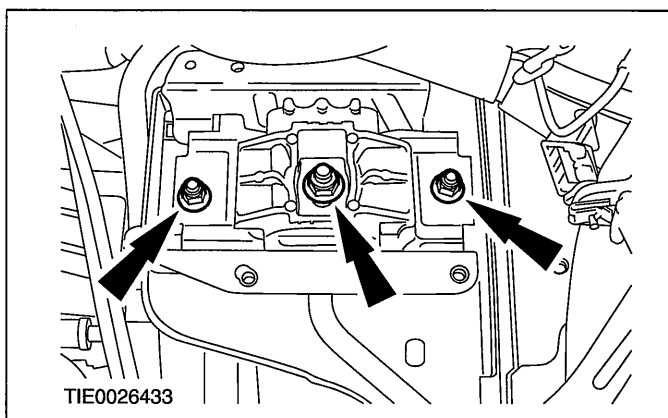


9. Using the special tools, raise the engine and transaxle assembly.

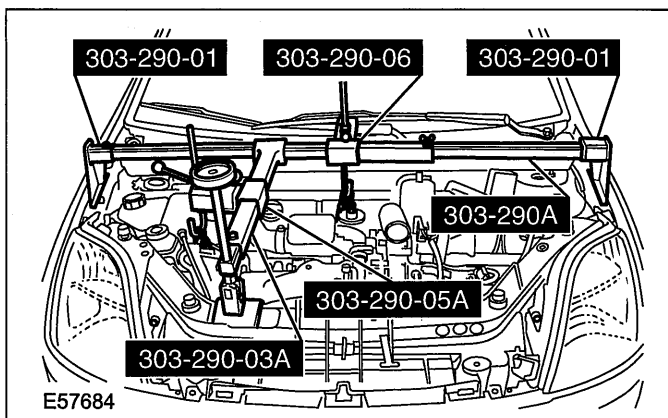


10. **NOTE:** Do not tighten the engine rear mount retaining nuts at this stage.

NOTE: Install new engine rear mount retaining nuts. Install the engine rear mount.



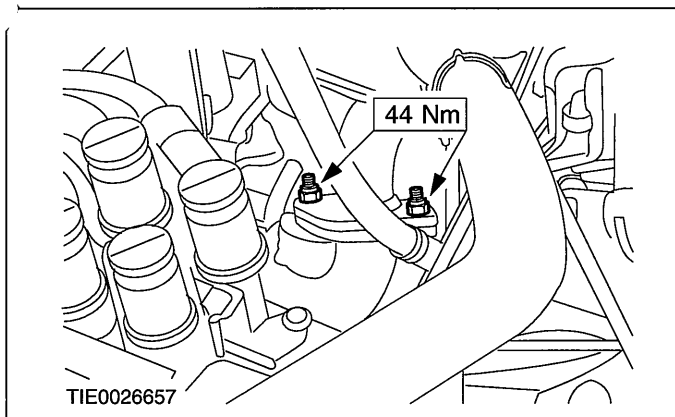
11. Remove the special tools.



12. **NOTE:** Install new exhaust flange nuts and a new exhaust flange gasket.

INSTALLATION

Attach the exhaust flexible pipe to the catalytic converter.

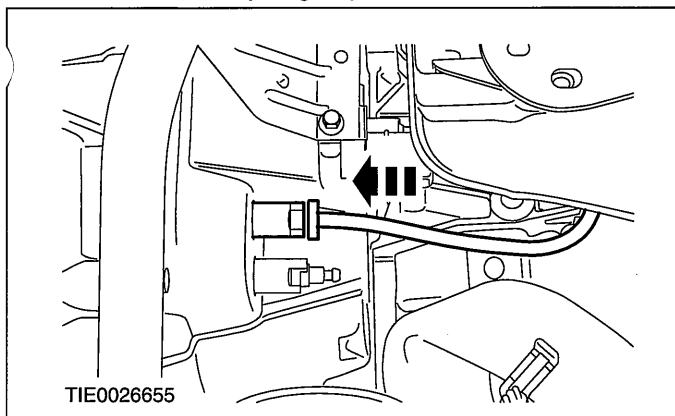


13. **⚠ CAUTION:** If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

NOTE: Make sure the spring clip is correctly seated.

Connect the clutch slave cylinder supply line.

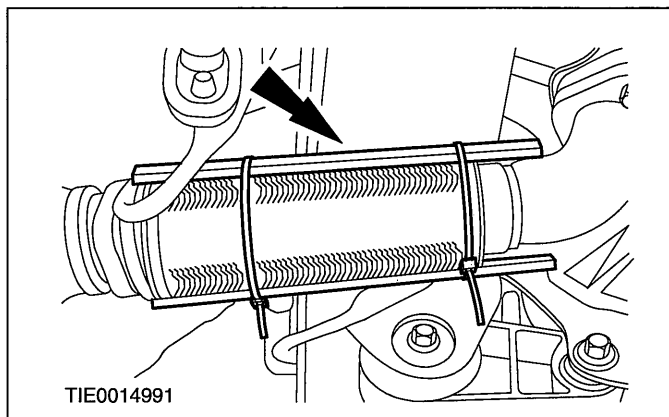
- Install the spring clip.



14. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

15. Remove the support wrap or suitable splint from the exhaust flexible pipe.



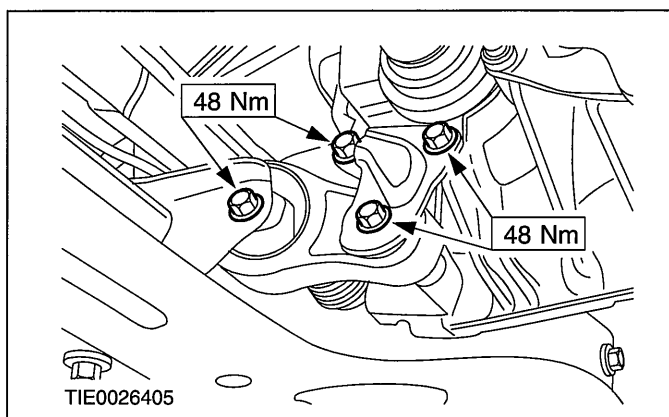
16. Install the right-hand halfshaft.

For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

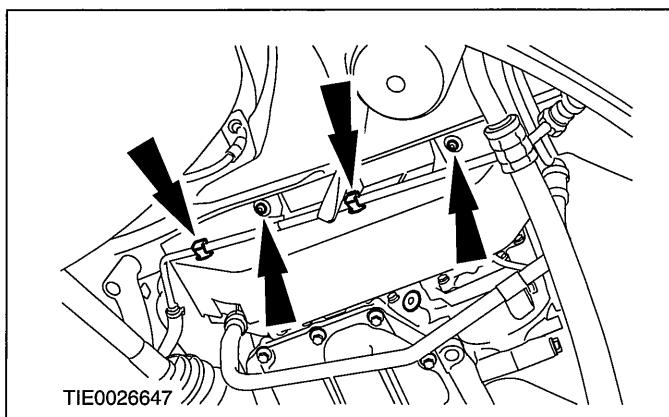
17. Install the left-hand halfshaft.

For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

18. Install the engine support insulator.

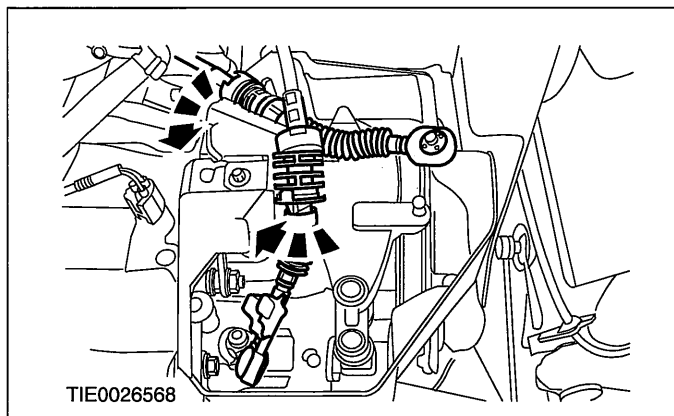


19. Install the accessory drive belt cover.

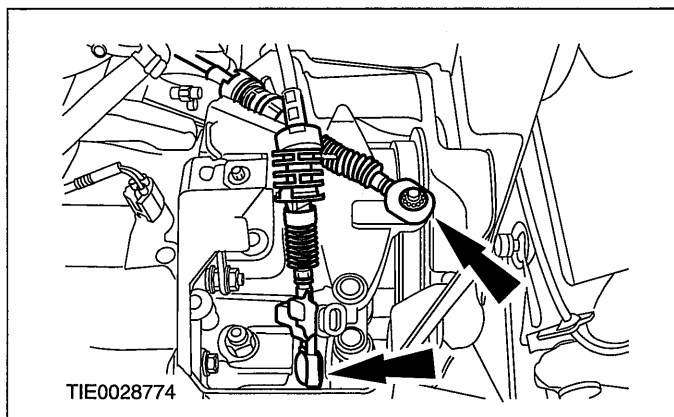


INSTALLATION

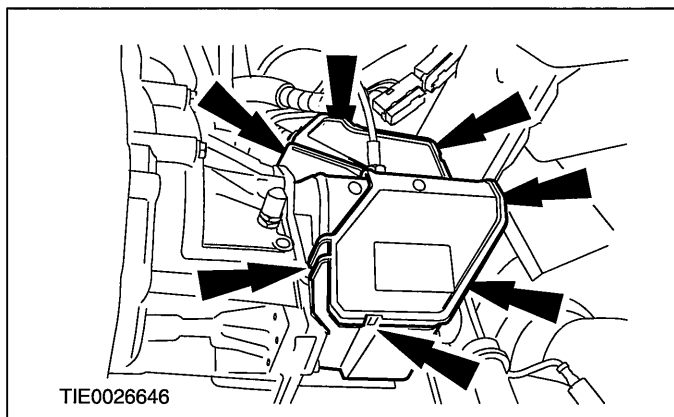
20. Attach the gearshift cables to the bracket and turn the abutment sleeves counterclockwise.



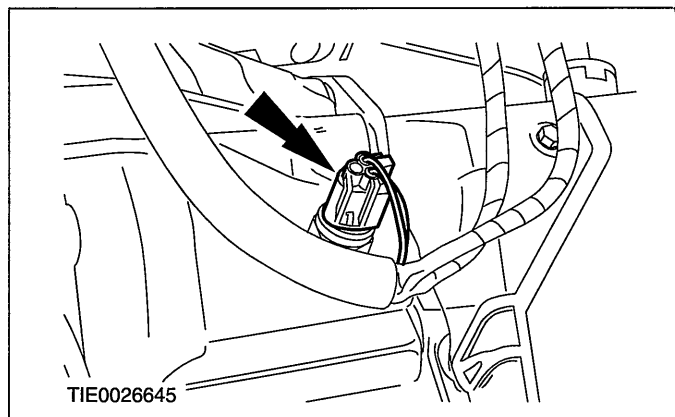
21. Attach the gearshift cables to the selector levers.



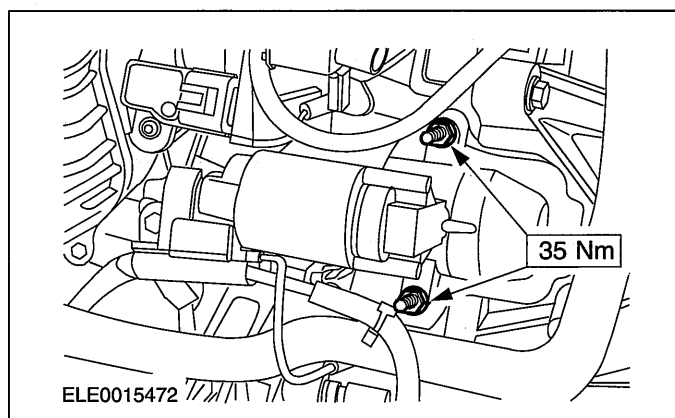
22. Install the gearshift cables cover.



23. Connect the reversing lamp switch electrical connector.

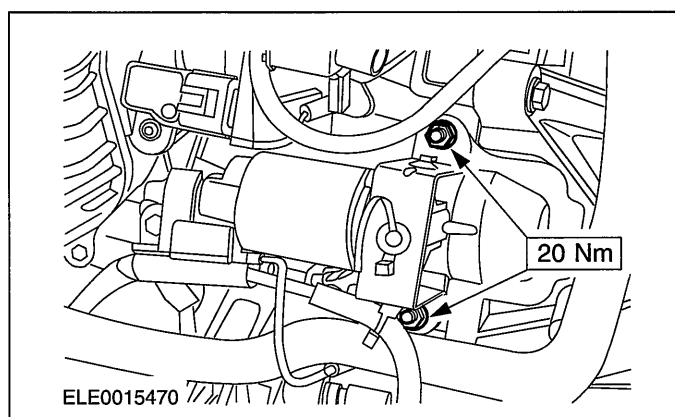


24. Install the starter motor.



25. Install the wiring harness retaining bracket.

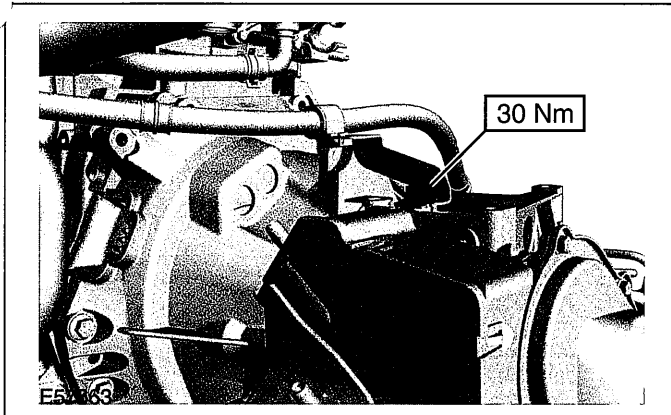
- Attach the wiring harness to the retaining bracket.



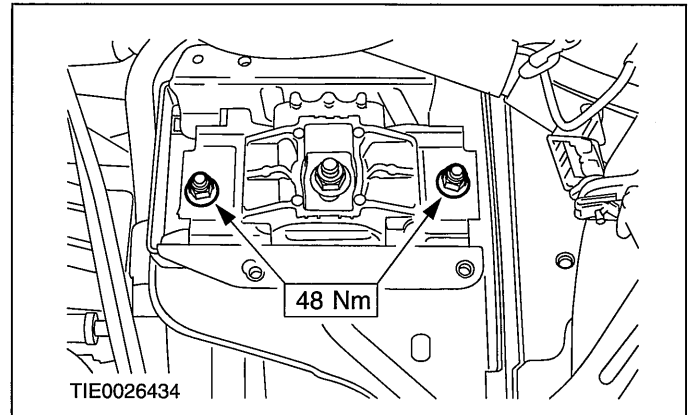
26. Lower the vehicle.

INSTALLATION

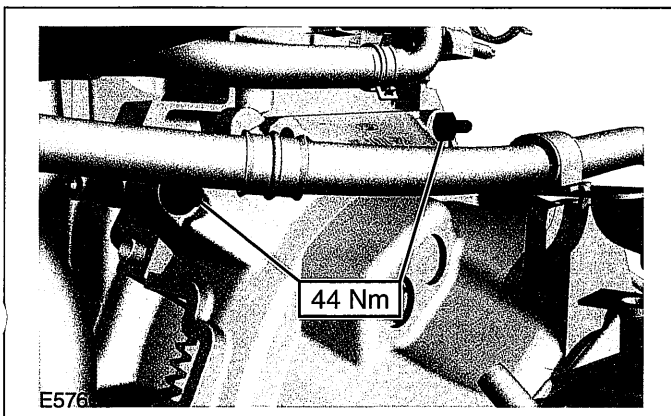
27. Attach the power steering high-pressure line retaining bracket to the transaxle.



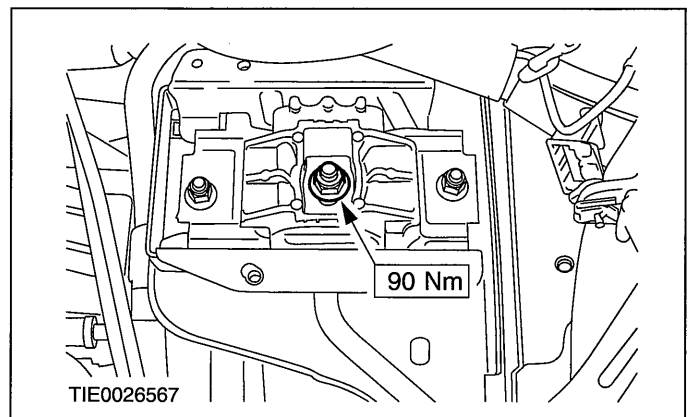
30. Tighten the engine rear mount outer retaining nuts.



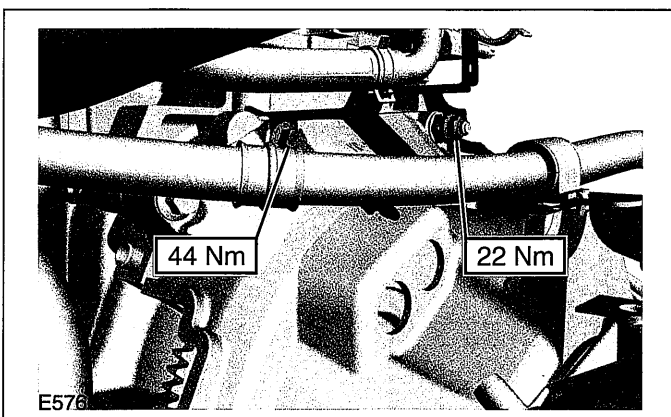
28. Install the transaxle upper retaining bolts.



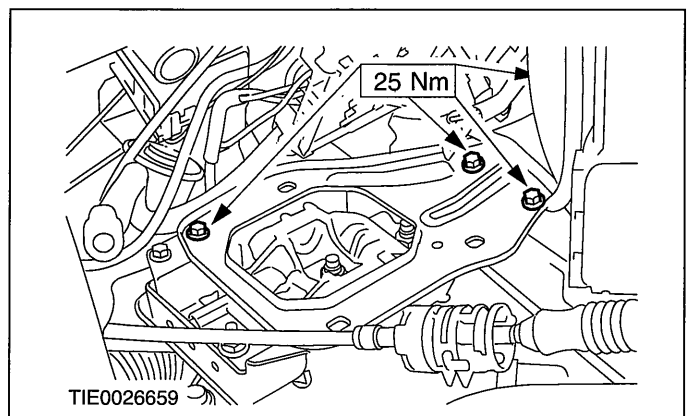
31. Tighten the engine rear mount center retaining nut.



29. Install the engine wiring harness bracket.



32. Install the battery tray support bracket.



33. Install the front wheels and tires.

For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

INSTALLATION**34. Adjust the gearshift cables.**

For additional information, refer to:
Gearshift Cable Adjustment (308-00
Manual Transmission/Transaxle and
Clutch - General Information, General
Procedures).

35. Bleed the clutch system.

For additional information, refer to: Clutch
System Bleeding (308-00 Manual
Transmission/Transaxle and Clutch -
General Information, General Procedures).

36. Install the battery tray.

For additional information, refer to: Battery
Tray - 2.0L Duratec-HE (M14) (414-01
Battery, Mounting and Cables, Removal
and Installation).

37. With the vehicle on a level surface, fill the transaxle until the fluid level is just below the bottom of the filler hole.

SECTION 308-06 Manual Transmission/Transaxle External Controls

VEHICLE APPLICATION: 2006.0 Fiesta

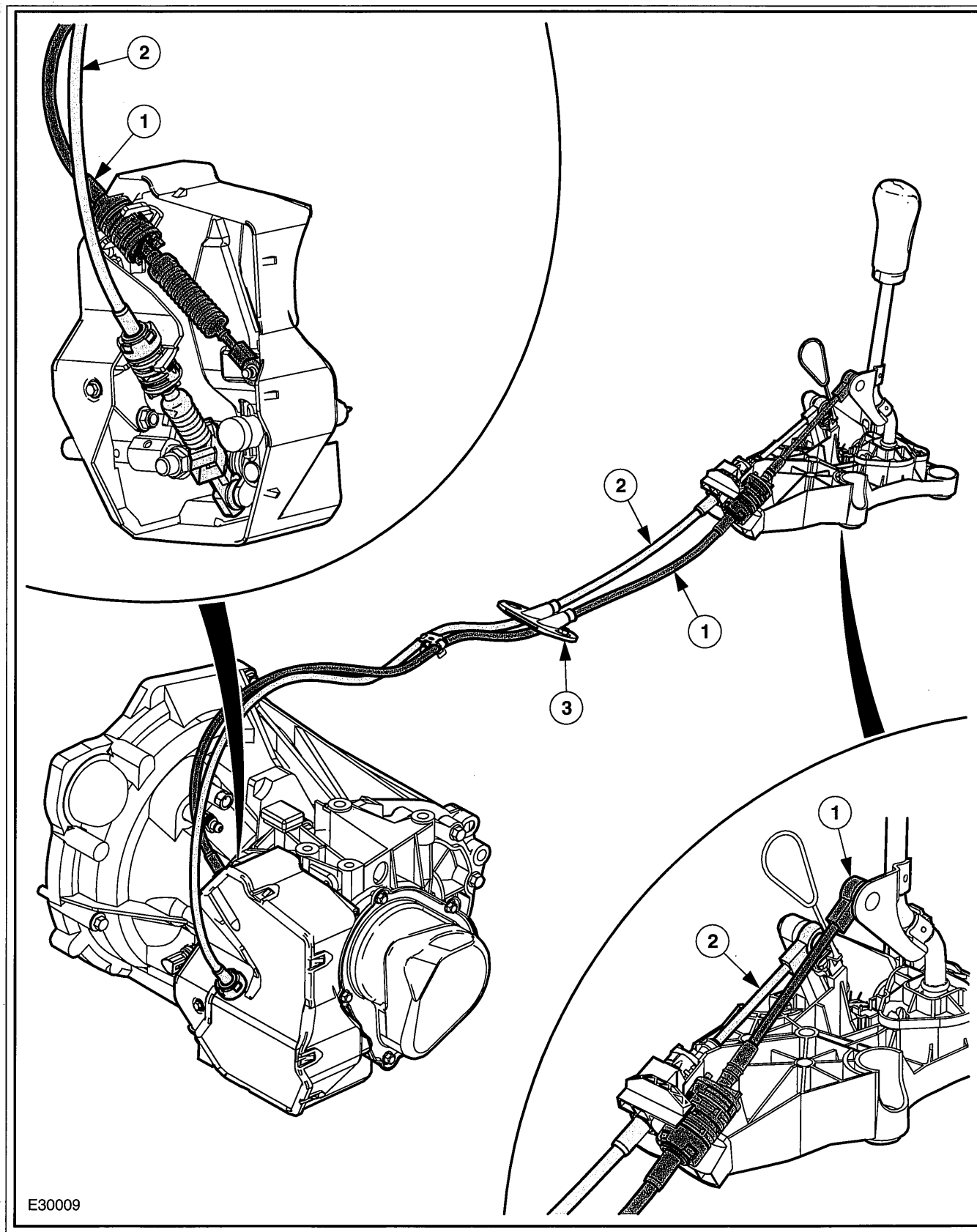
CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	308-06-2
DESCRIPTION AND OPERATION	
External Controls.....	308-06-3
DIAGNOSIS AND TESTING	
External Controls.....	308-06-5
Inspection and Verification.....	308-06-5
Symptom Chart.....	308-06-5
Pinpoint Tests.....	308-06-5
REMOVAL AND INSTALLATION	
Gearshift Lever..... (16 524 0)	308-06-7
Gearshift Cables..... (16 575 0)	308-06-8

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Shift and selector cable bushing.	9		80
Gearshift mechanism to floor assembly	9		80
Exhaust flange bolts	47	35	
Gearshift lever	5		44

DESCRIPTION AND OPERATION

External Controls



DESCRIPTION AND OPERATION

Item	Description
1	Shift cable
2	Selector cable
3	Body duct

The selector cable is moved in an axial direction when a gear is selected with the gear lever. In the internal gearshift mechanism, this axial movement translates into the selection of the shift slot.

The shift cable is also moved in an axial direction when a gear is selected with the gear lever. In the internal gearshift mechanism, this axial movement is used to engage the corresponding gear.

The selector cable is marked black and the shift cable is marked white.

DIAGNOSIS AND TESTING**External Controls****Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.
3. Make sure that the gearshift cables are correctly routed and not under any tension from other components.
4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
External controls do not operate freely.	Gearshift cables incorrectly adjusted.	ADJUST the gearshift cables. REFER to: Gearshift Cable Adjustment - Vehicles With: 5-Speed Manual Transaxle (iB5) (308-00 Manual Transmission/Transaxle and Clutch - General Information, General Procedures).
	- Gearshift lever damaged. - Selector mechanism damaged. - Gearshift cables damaged.	GO to Pinpoint Test A.

Pinpoint Tests**PINPOINT TEST A : STIFF GEARSHIFT**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE GEARSHIFT LEVER	
	1 Detach the gearshift cables from the gearshift lever. - Is the gearshift lever difficult to operate? → Yes Install a new gearshift lever. REFER to: Gearshift Lever (308-06 Manual Transmission/Transaxle External Controls, Removal and Installation). → No GO to A2.
A2: CHECK THE GEARSHIFT CABLES	
	1 Attach the gearshift cables to the gearshift lever.

DIAGNOSIS AND TESTING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

2 Detach the gearshift cables from the transaxle.

- Is the gearshift lever difficult to operate?

→ **Yes**

Install new gearshift cables.

REFER to: Gearshift Cables (308-06 Manual Transmission/Transaxle External Controls, Removal and Installation).

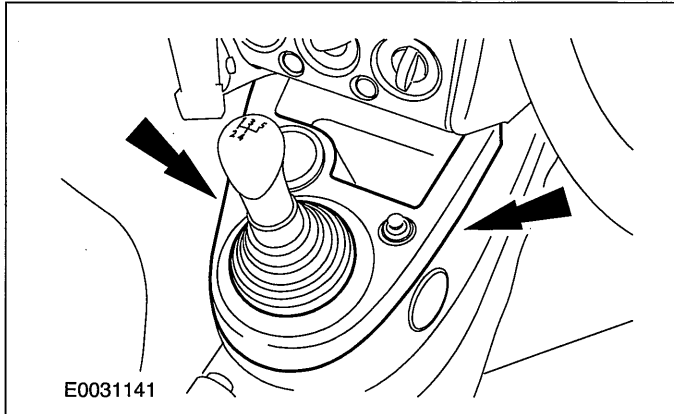
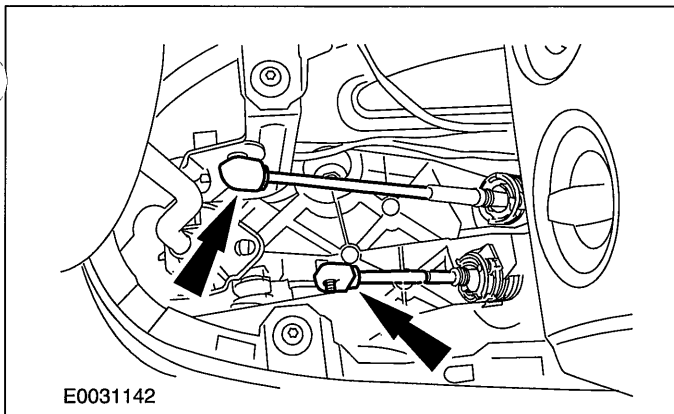
→ **No**

Install a new selector mechanism.

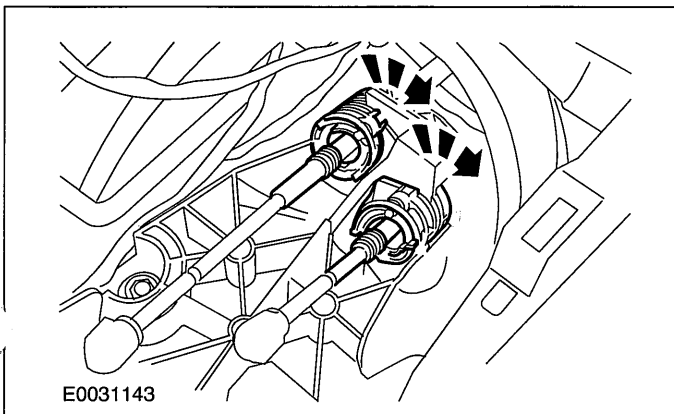
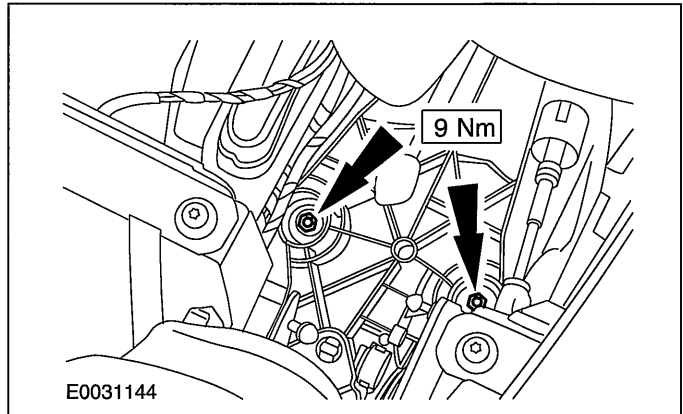
REFER to: Transaxle (308-03 Manual Transmission/Transaxle, Disassembly).

REMOVAL AND INSTALLATION**Gearshift Lever(16 524 0)****Removal****1. Remove the gearshift lever trim panel.**

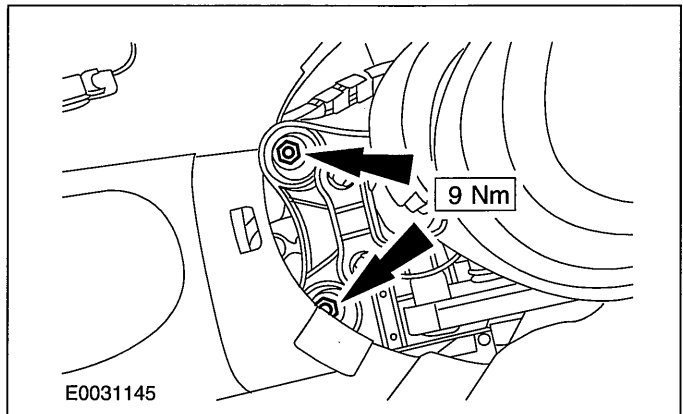
- Disconnect the cigar lighter electrical connector.

**2. Detach the gearshift cables from the gearshift lever.****3. Detach the gearshift cables from the retaining bracket.**

- Turn the abutment sleeves clockwise.

**4. Remove the gearshift lever front retaining bolts.****5. Remove the gearshift lever.**

- Remove the bolts.

**Installation**

1. To install, reverse the removal procedure.
2. Adjust the gearshift cables. For additional information, refer to Section 308-00 [Manual Transmission/Transaxle and Clutch - General Information].

REMOVAL AND INSTALLATION

Gearshift Cables(16 575 0)

Removal

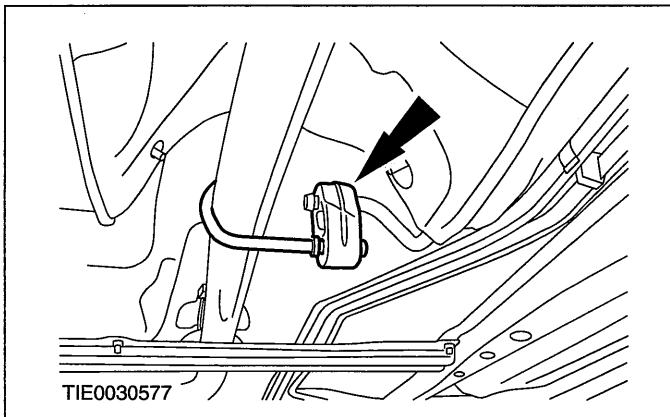
1. Remove the gearshift lever.

For additional information, refer to Gearshift Lever in this section.

2. Remove the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].

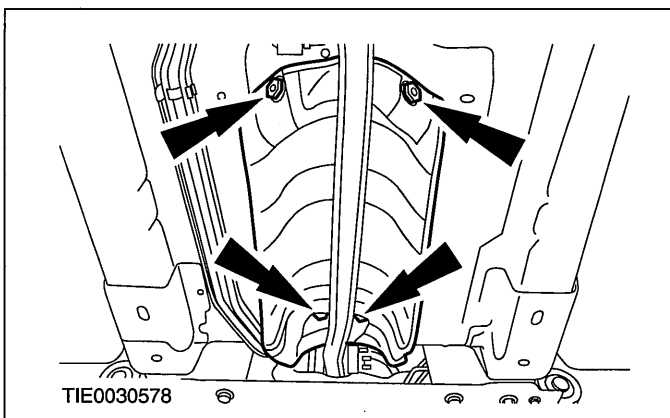
3. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

4. Remove the exhaust front hanger insulator.

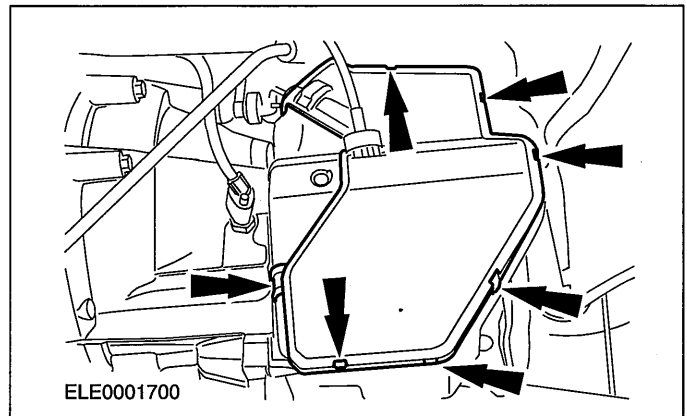


5. Detach the exhaust heat shield from the floor panel.

- Slide the heat shield backwards.

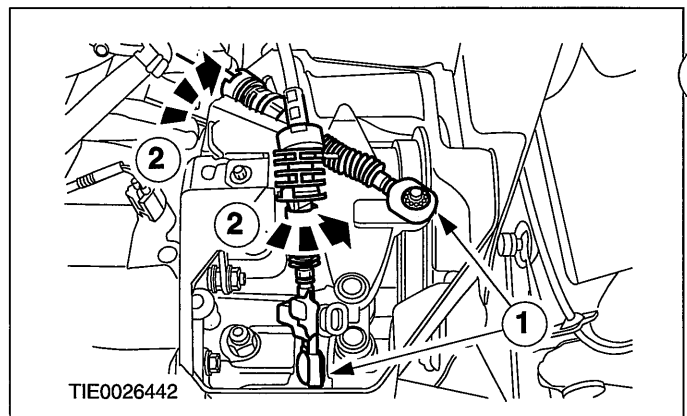


6. Remove the gearshift cables cover.

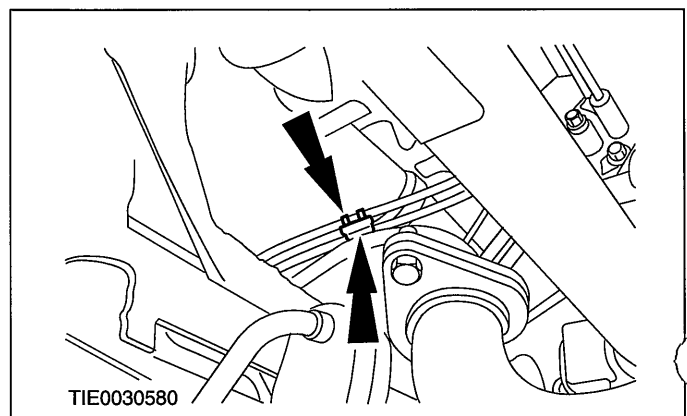


7. Detach the gearshift cables from the transaxle.

1. Detach the gearshift cable and the selector cable from the selector levers.
2. Turn the abutment sleeves clockwise and detach the cables from the bracket.

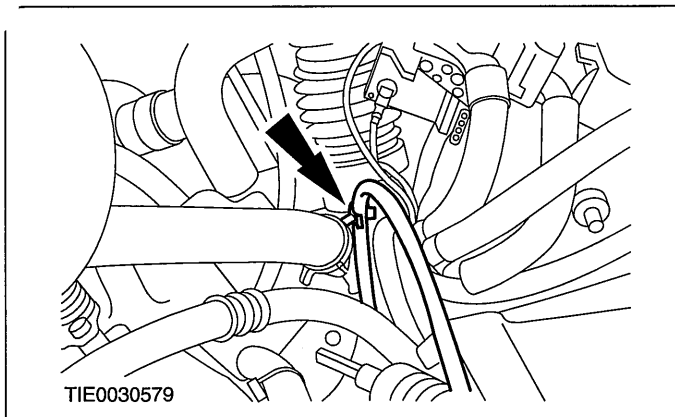


8. Detach the gearshift cables from the retaining clip.

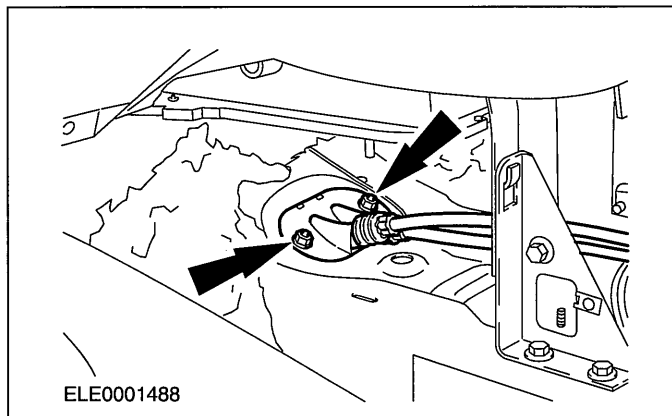


REMOVAL AND INSTALLATION

9. Detach the selector cable from the retaining clip.

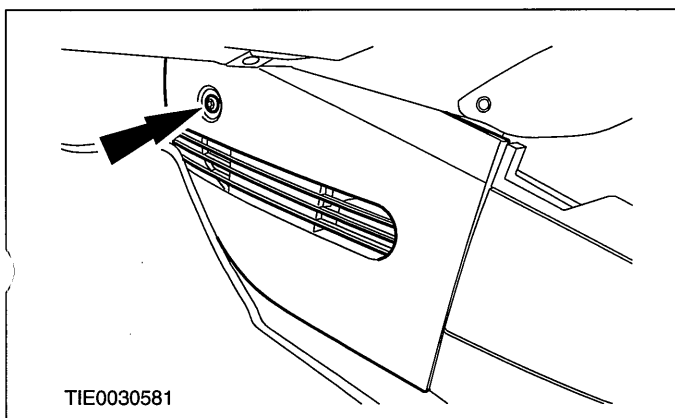


13. Detach the gearshift cables bushing from the floor panel and pull the cables through to the vehicle interior.

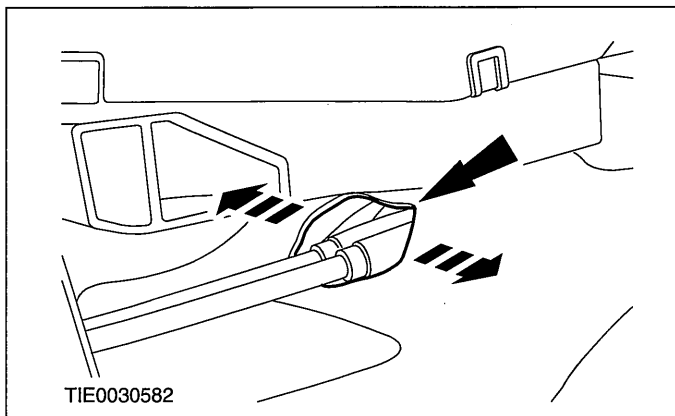


10. Lower the vehicle.

11. Remove the air distribution channel.

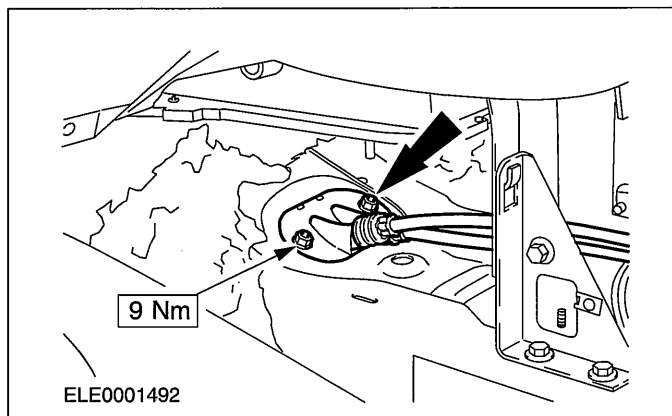


12. Cut the floor covering and the sound deadening material to gain access to the gearshift cable bushing.

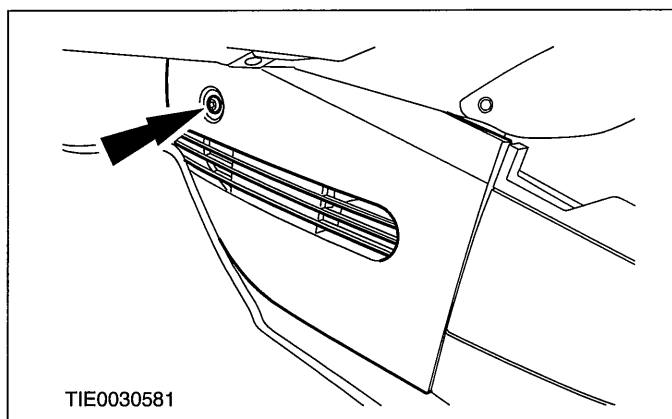
**Installation**

1. **NOTE:** Do not bend or kink the gearshift cables.

Feed the gearshift cables through the floor panel and attach the gearshift cables bushing.

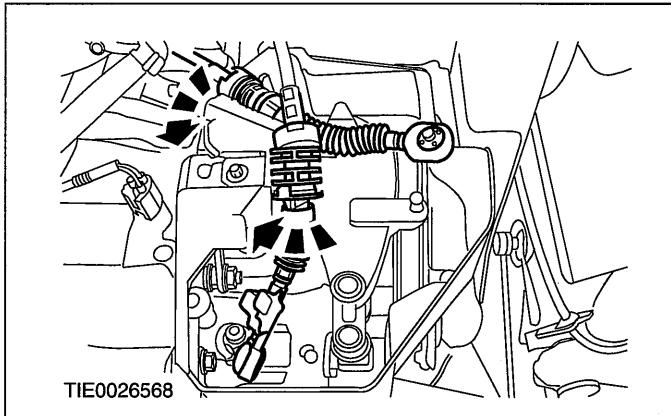


2. Install the air distribution channel.

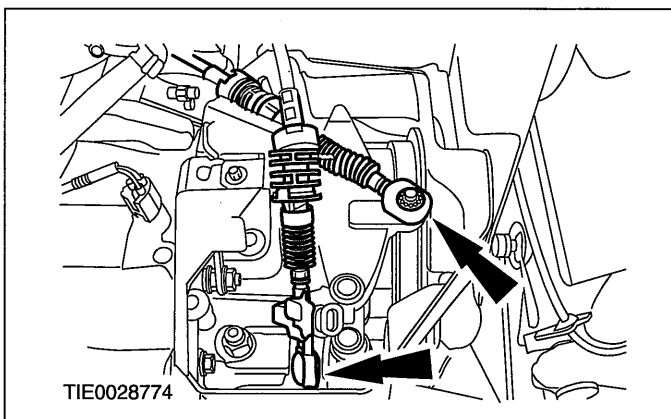


REMOVAL AND INSTALLATION

3. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
4. Attach the gearshift cables to the bracket and turn the abutment sleeves counterclockwise.

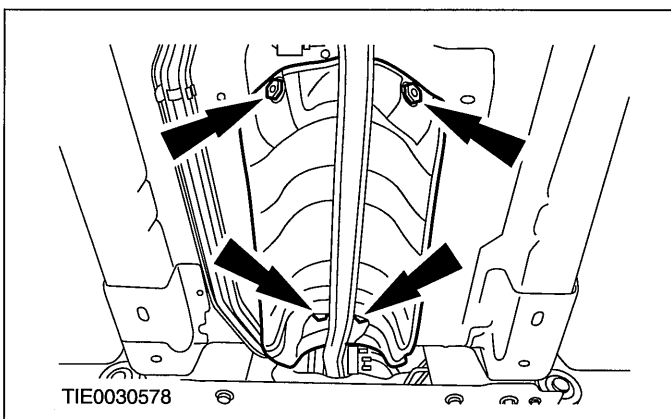


5. Attach the gearshift cables to the selector levers.

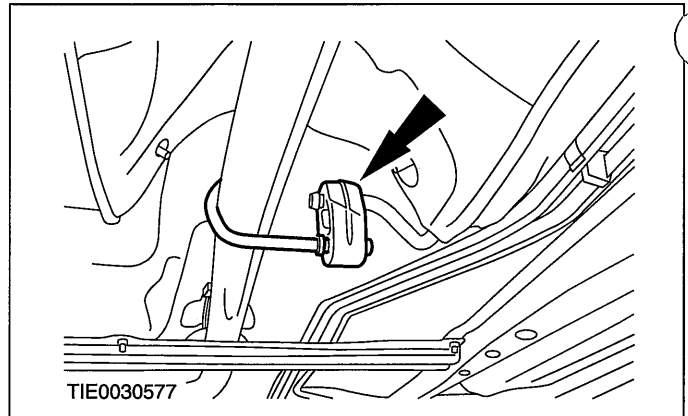


6. Attach the exhaust heat shield to the floor panel.

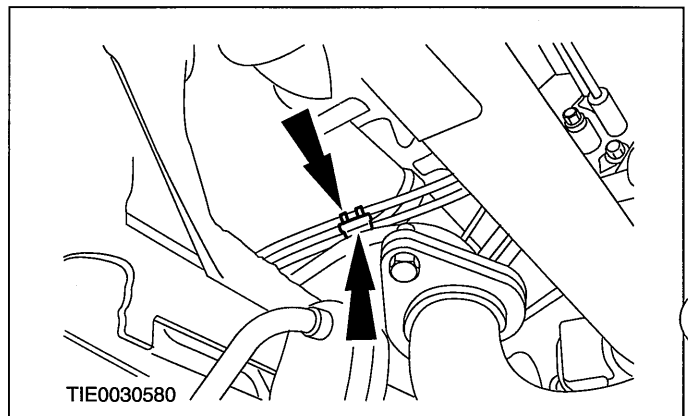
- Slide the heat shield forwards.



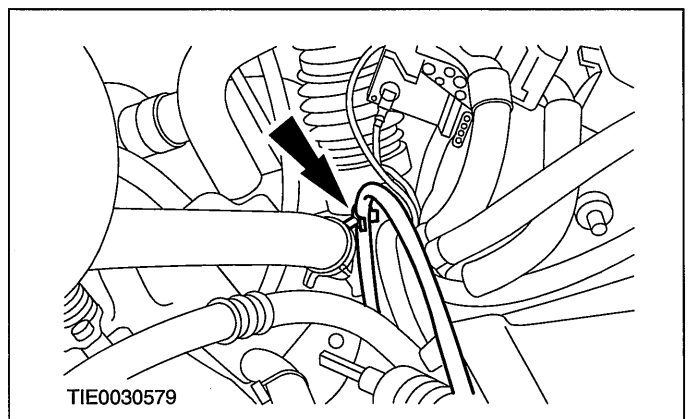
7. Install the exhaust front hanger insulator.



8. Attach the gearshift cables to the retaining clip.



9. Attach the selector cable to the retaining clip.



10. Install the gearshift lever.

For additional information, refer to Gearshift Lever in this section.

11. Install the air cleaner. For additional information, refer to Section 303-12 [Intake Air Distribution and Filtering].

REMOVAL AND INSTALLATION

12. Adjust the gearshift cables. For additional information, refer to Section 308-00 [Manual Transmission/Transaxle and Clutch - General Information].



SECTION 309-00 Exhaust System

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	309-00-2
DESCRIPTION AND OPERATION	
Exhaust System.....	309-00-4
Exhaust system - 1.3l, 1.4l and 1.6l petrol engines and 1.4l diesel engines.....	309-00-4
REMOVAL AND INSTALLATION	
Catalytic Converter — 2.0L Duratec-HE (MI4).....	309-00-6
Exhaust Flexible Pipe — 2.0L Duratec-HE (MI4).....	309-00-8

SPECIFICATIONS**Lubricants, Fluids, Sealers and Adhesives**

	Specificat ion
Lubricant	ESE-M99B 144-B

	Specificat ion
Anti-seize grease	SA-M1C91 07-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Catalytic converter to exhaust flexible pipe retaining nuts - All except vehicles with diesel engine	47	35	-
Catalytic converter to turbocharger retaining nuts - Vehicles with 1.4L diesel engine	25	18	-
Catalytic converter to turbocharger retaining clamp - Vehicles with 1.6L diesel engine	25	18	-
Catalytic converter to muffler and tailpipe assembly clamp retaining nut - Vehicles with 2.0L engine	40	30	-
Exhaust flexible pipe to catalytic converter clamp retaining nut - Vehicles with diesel engine	40	30	-
Exhaust flexible pipe to exhaust manifold retaining nuts	47	35	-
Turbocharger heat shield upper retaining screws - Vehicles with 1.4L diesel engine	3	-	27
Turbocharger heat shield lower retaining bolts - Vehicles with 1.4L diesel engine	12	9	-
Catalytic converter heat shield retaining screws - Vehicles with 1.6L diesel engine	4	-	35
Exhaust flexible pipe to muffler and tailpipe assembly retaining nuts - Vehicles with diesel engine	47	35	-
Catalytic converter support bracket to engine block retaining nuts - Vehicles with 1.4L or 1.6L engine	47	35	-
Catalytic converter support bracket to engine block retaining nuts - Vehicles with 1.3L or 1.4L diesel engine	25	18	-
Catalytic converter support bracket to engine block retaining bolts - Vehicles with 1.6L diesel engine	25	18	-
Catalytic converter to support bracket retaining nuts	25	18	-
Catalytic converter to catalytic converter support bracket retaining bolts - Vehicles with 1.6L diesel engine	25	18	-
Catalytic converter to muffler and tailpipe assembly retaining nuts - Vehicles with 1.6L diesel engine	48	35	-
Heated oxygen sensor (HO2S)	47	35	-
Catalytic monitor sensor	47	35	-

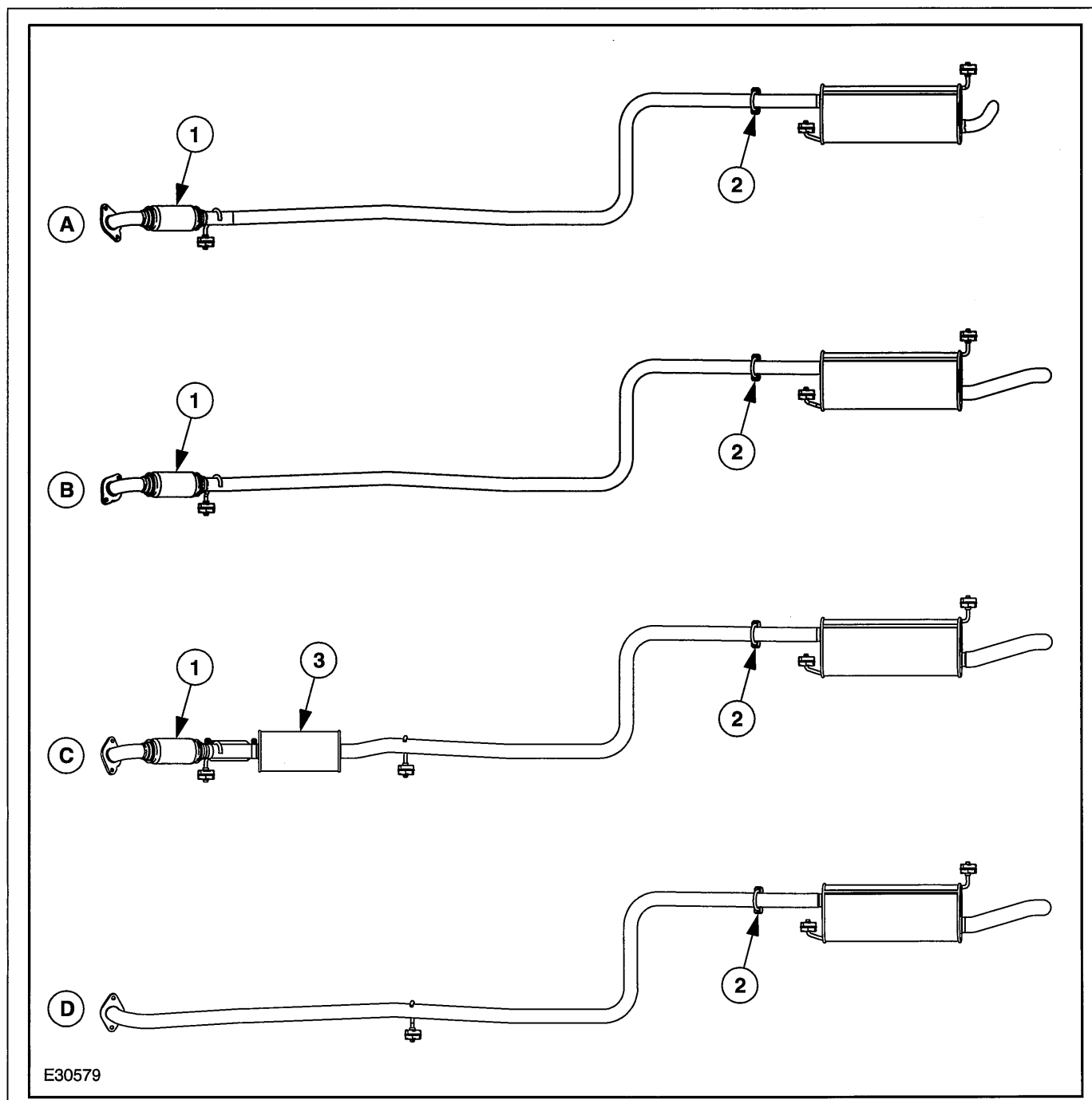
SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Exhaust flexible pipe to front muffler pipe heat shield retaining bolts – Vehicles with 1.6L engine	8	-	71
Exhaust flexible pipe clamp retaining nut – Vehicles with diesel engine	47	35	-
Rear muffler clamp retaining nuts – All except vehicles with diesel engine	47	35	-

DESCRIPTION AND OPERATION

Exhaust System

Exhaust system - 1.3l, 1.4l and 1.6l petrol engines and 1.4l diesel engines



Item	Description
A	1.3l Duratec 8V SOHC
B	1.4l Duratec 16V DOHC
C	1.6l Duratec 16V DOHC
D	1.4l DuraTorq TDCi
1	Flexible pipe

Item	Description
2	Servicing clamp
3	Front muffler

DESCRIPTION AND OPERATION

All exhaust systems are single-part systems. The final muffler can be renewed separately in service. In this case the pipe needs to be cut through, and the new final muffler needs to be secured with a servicing clamp.

REMOVAL AND INSTALLATION

Catalytic Converter — 2.0L Duratec-HE (MI4)

Materials

Name	Specification
Grease	SA-M1C9107-A

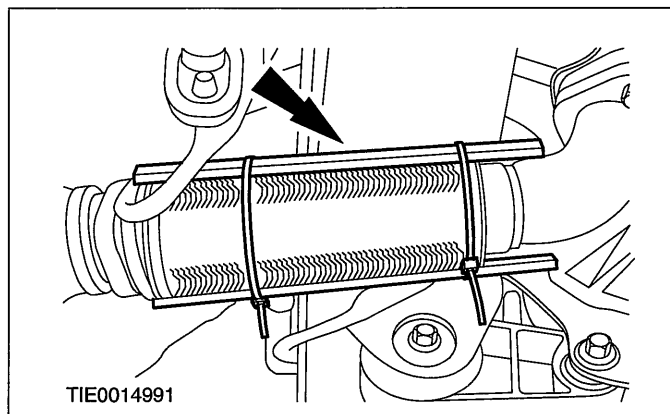
NOTE: If installing a new catalytic converter to the original exhaust system, a new muffler and tailpipe assembly must also be installed.

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

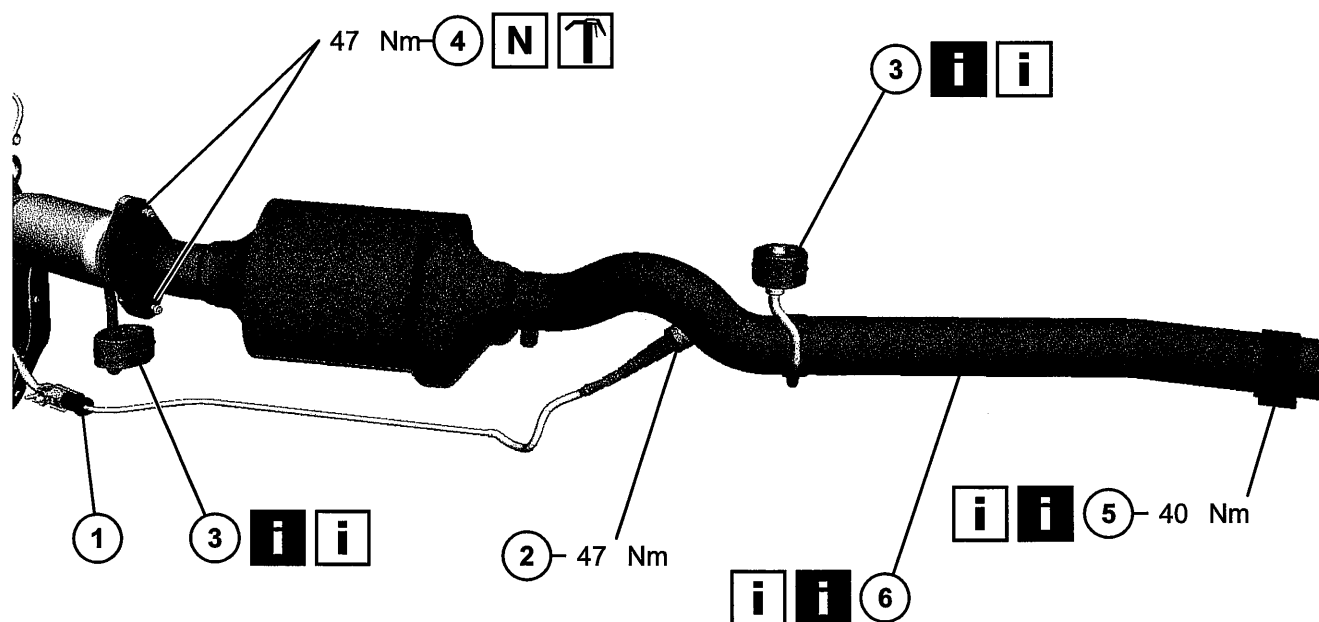
Jacking (Description and Operation),
Lifting (Description and Operation).

2. **CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a support wrap or splint.



3. Remove the components in the order indicated in the following illustration(s) and table(s).



E57228

Item	Description
1	Catalytic converter monitor sensor electrical connector
2	Catalytic converter monitor sensor
3	Exhaust hanger insulator

Item	Description
	See Removal Detail See Installation Detail
4	Catalytic converter to exhaust flexible pipe retaining nuts

REMOVAL AND INSTALLATION

Item	Description
5	Catalytic converter to muffler and tailpipe assembly retaining clamp See Removal Detail See Installation Detail
6	Catalytic converter.

Item	Description
	See Removal Detail See Installation Detail

4. To install, reverse the removal procedure.

Removal Details**Item 3 Exhaust hanger insulator**

 **CAUTION:**Take care when removing the exhaust hanger insulator to prevent damage.

Item 5 Catalytic converter to muffler and tailpipe assembly retaining clamp

NOTE:Discard the catalytic converter to muffler and tailpipe assembly clamp retaining nut.

Item 6 Catalytic converter.

 **CAUTION:**Using cable ties, support the muffler and tailpipe assembly to prevent damage to the exhaust hanger insulators.

NOTE:Discard the catalytic converter to exhaust flexible pipe gasket.

Installation Details**Item 6 Catalytic converter.**

NOTE:Remove the cable ties.

NOTE:Install a new catalytic converter to exhaust flexible pipe gasket.

Item 5 Catalytic converter to muffler and tailpipe assembly retaining clamp

NOTE:Install a new catalytic converter to muffler and tailpipe assembly clamp retaining nut.

Item 3 Exhaust hanger insulator

 **CAUTION:**Take care when installing the exhaust hanger insulator to prevent damage.

NOTE:Check the exhaust hanger insulator for damage. Install a new exhaust hanger insulator if required.

REMOVAL AND INSTALLATION

Exhaust Flexible Pipe — 2.0L Duratec-HE (M14)

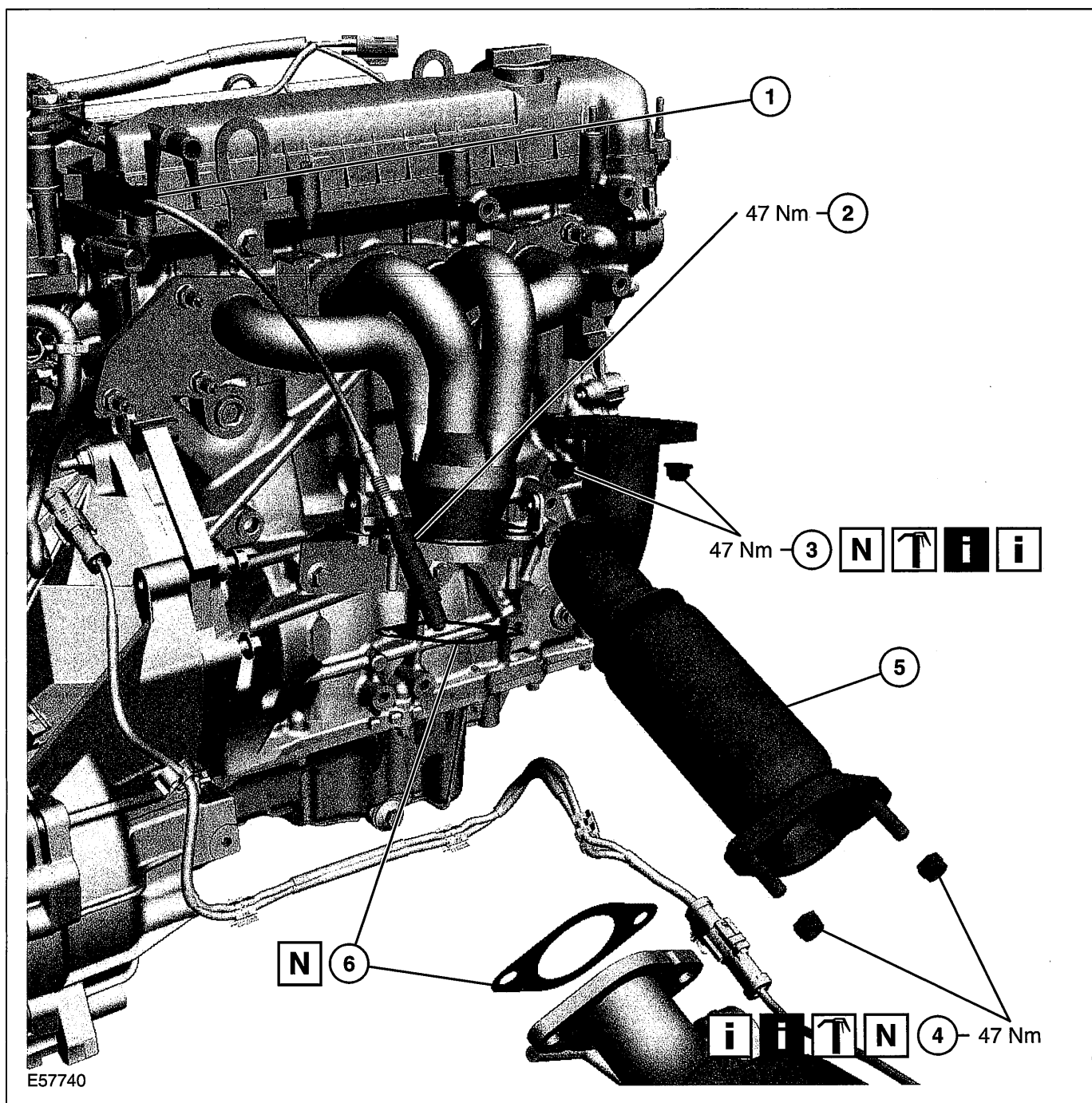
Materials

Name	Specification
Grease	SA-M1C9107-A

1. Raise and support the vehicle. For additional information, refer to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

2. Remove the components in the order indicated in the following illustration(s) and table(s).



REMOVAL AND INSTALLATION

Item	Description
1	Heated oxygen sensor (HO2S) electrical connector
2	HO2S
3	Exhaust flexible pipe to exhaust manifold retaining nuts See Removal Detail See Installation Detail
4	Exhaust flexible pipe to muffler and tailpipe assembly retaining nuts

Item	Description
	See Removal Detail See Installation Detail
5	Exhaust flexible pipe
6	Exhaust flexible pipe gaskets

3. To install, reverse the removal procedure.

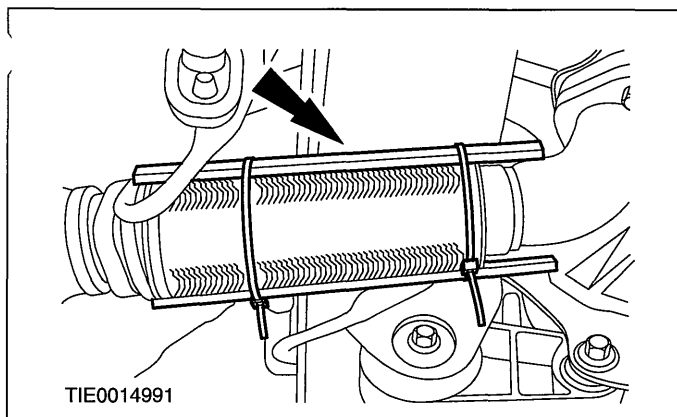
⚠ CAUTION: Never use jointing compound forward of the catalytic converter.

Removal Details

Item 3 Exhaust flexible pipe to exhaust manifold retaining nuts

1. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a support wrap or splint.

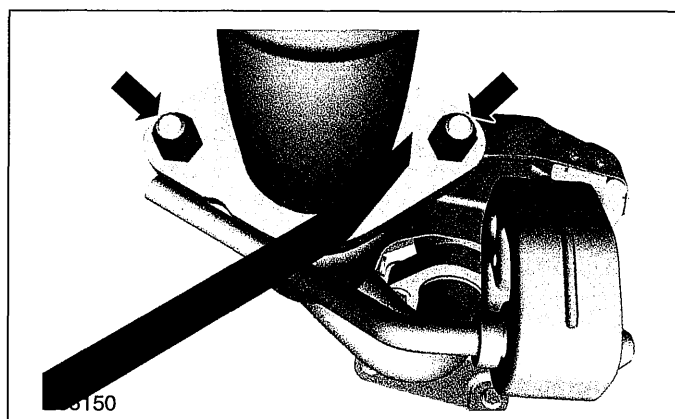


Item 4 Exhaust flexible pipe to muffler and tailpipe assembly retaining nuts

1. **⚠ CAUTION:** Twisting the exhaust flexible pipe more than 2 degrees may cause damage resulting in failure.

NOTE: Use a pry-bar to prevent the exhaust flexible pipe from twisting when removing the exhaust flexible pipe to catalytic converter retaining nuts.

Remove the exhaust flexible pipe to catalytic converter retaining nuts.



Installation Details

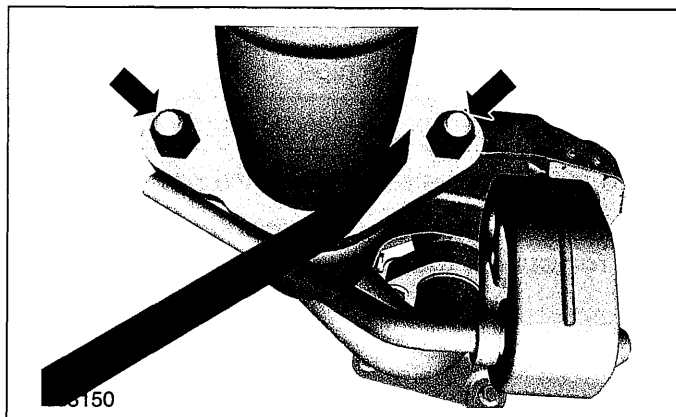
Item 4 Exhaust flexible pipe to muffler and tailpipe assembly retaining nuts

1. **⚠ CAUTION:** Twisting the exhaust flexible pipe more than 2 degrees may cause damage resulting in failure.

NOTE: Use a pry-bar to prevent the exhaust flexible pipe from twisting when installing the exhaust flexible pipe to catalytic converter retaining nuts.

REMOVAL AND INSTALLATION

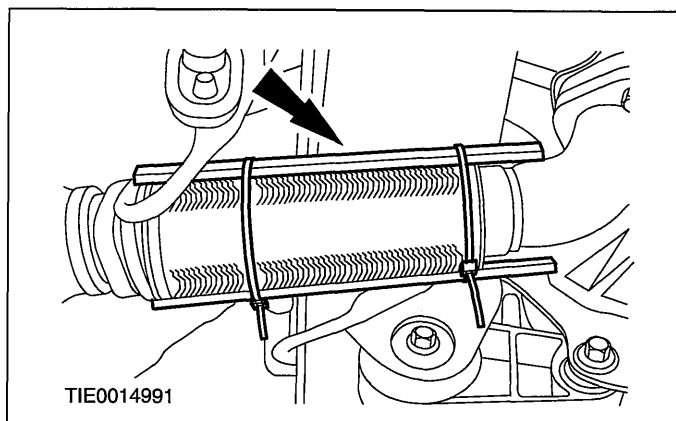
Install the exhaust flexible pipe to catalytic converter retaining nuts.



Item 3 Exhaust flexible pipe to exhaust manifold retaining nuts

1. **⚠ CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Remove the exhaust flexible pipe support wrap or splint.



SECTION 310-00 Fuel System - General Information

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS **PAGE**

DIAGNOSIS AND TESTING

Fuel System — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/2.0L Duratec-HE (MI4)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	310-00-2
Inspection and Verification.....	310-00-2

GENERAL PROCEDURES

Fuel System Pressure Release.....	(23 420 0)	310-00-3
Fuel Tank Draining.....	(23 551 0)	310-00-4
Quick Release Coupling.....		310-00-5
Fuel System Pressure Check — 2.0L Duratec-HE (MI4).....		310-00-10

DIAGNOSIS AND TESTING

Fuel System — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/2.0L Duratec-HE (MI4)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Fuel level – Fuel leak(s) – Fuel line(s) – Fuel filter (if equipped) – Fuel tank – Fuel tank filler pipe – Fuel filler cap	– Electrical connector(s) – Wiring harness – Inertia fuel shutoff (IFS) switch – Fuel pump module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to WDS.

GENERAL PROCEDURES**Fuel System Pressure Release(23 420 0)****Release****1. WARNINGS:**

▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

▲ The fuel system remains pressurized for a long time after the ignition is switched off. The fuel pressure must be released before attempting any repairs. Failure to follow this instruction may result in personal injury.

Remove the fuel pump fuse.

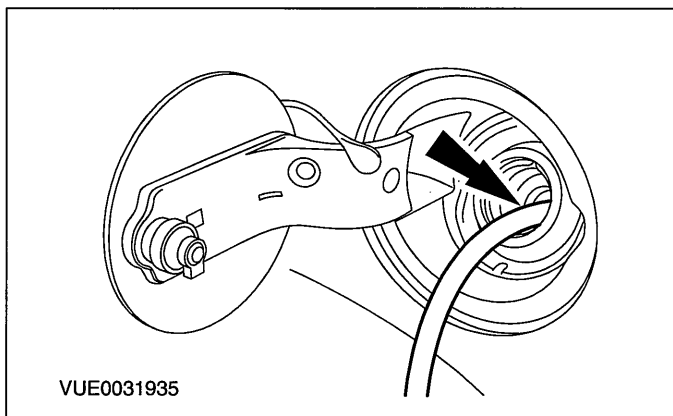
2. Start the engine and allow to idle until the engine stalls.
3. Crank the engine for approximately five seconds to make sure the fuel injection supply manifold pressure has been released.
4. Install the fuel pump fuse.

GENERAL PROCEDURES**Fuel Tank Draining(23 551 0)****General Equipment**

Fuel tank draining equipment

Draining**WARNINGS:**

- ▲ **Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.**
 - ▲ **The fuel system remains pressurized for a long time after the ignition is switched off. The fuel pressure must be relieved before attempting any repairs. Failure to follow these instructions may result in personal injury.**
- 1. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].**
 - 2. Remove the fuel tank filler cap.**
 - 3. Using fuel tank draining equipment, drain the fuel from the fuel tank using a 12.5mm nylon drain tube.**



GENERAL PROCEDURES**Quick Release Coupling****General Equipment**

Flat-bladed screwdriver

Disconnection**WARNINGS:**

▲ Do not carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and can ignite. Failure to follow these instructions may result in personal injury.

▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ **CAUTION:** Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines.

NOTE: Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

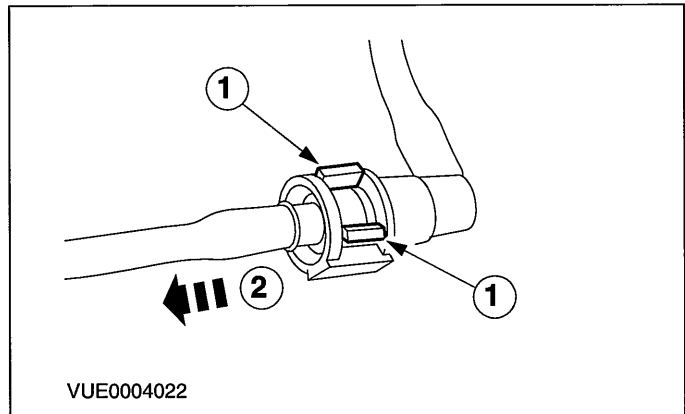
1. Release the fuel system pressure.

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

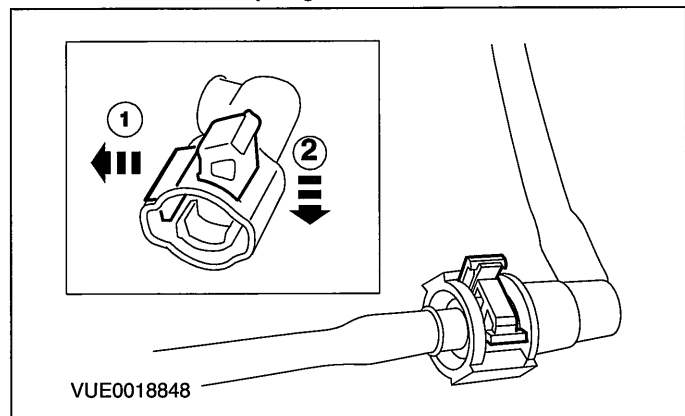
2. Disconnect the fuel line quick release coupling.

1. Press the fuel line quick release coupling locking tangs.

2. Disconnect the fuel line quick release coupling.

**3. Disconnect the fuel line quick release coupling.**

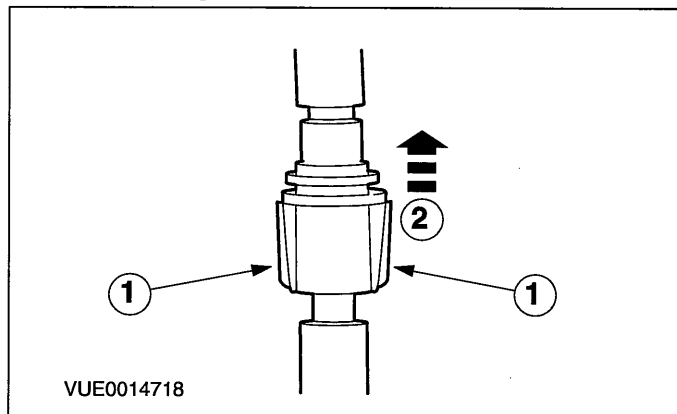
1. Pull the fuel line quick release coupling locking tang.
2. Push the clip through the fuel line quick release coupling to release the fuel line.

**4. Disconnect the fuel line quick release coupling.**

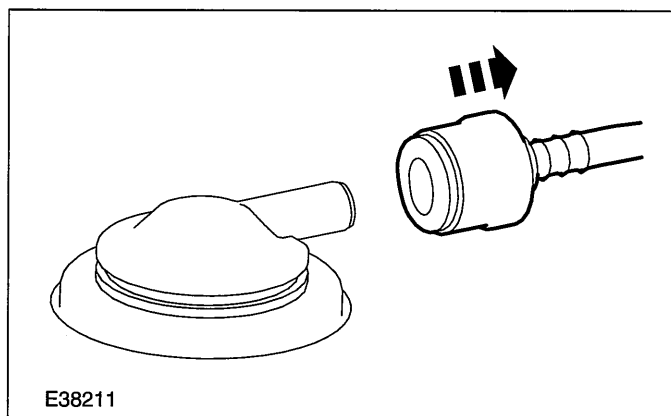
1. Press the fuel line quick release coupling locking tangs.

GENERAL PROCEDURES

2. Disconnect the fuel line quick release coupling.

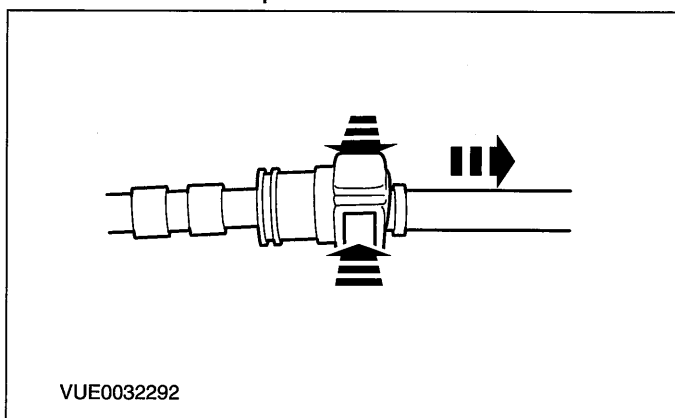


7. Disconnect the fuel tank vent line quick release coupling.



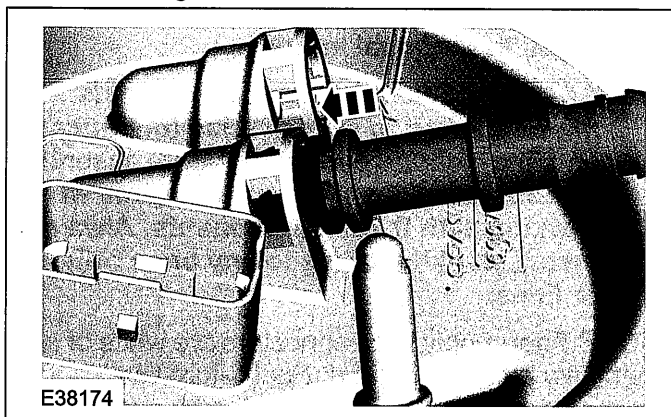
5. Disconnect the fuel line quick release coupling.

- Press the fuel line quick release coupling buttons and pull the fuel line to disconnect.



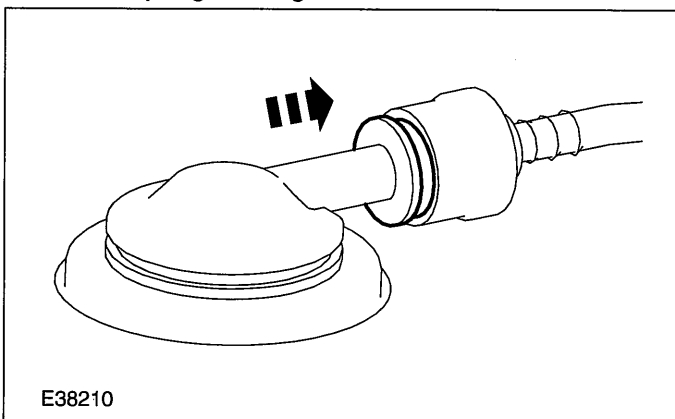
8. Release the fuel line quick release coupling.

- Press the fuel line quick release coupling locking release collar.

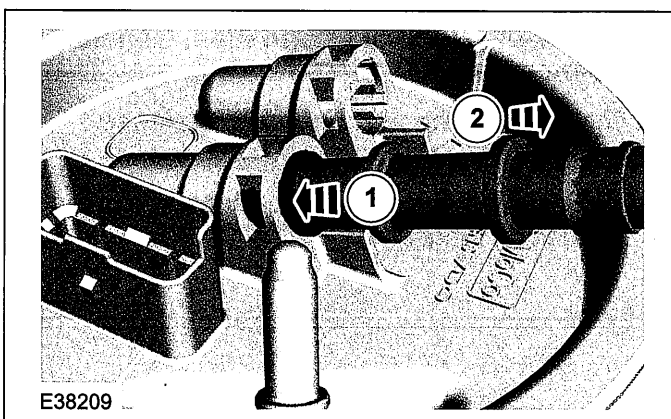


6. Release the fuel tank vent line quick release coupling.

- Press the fuel tank vent line quick release coupling locking release collar.

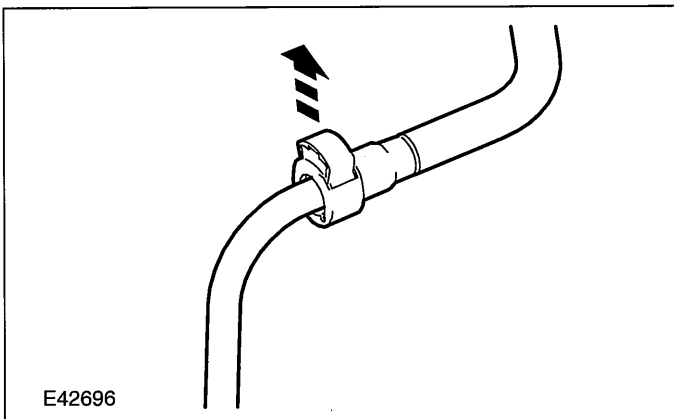


9. Disconnect the fuel line quick release coupling.



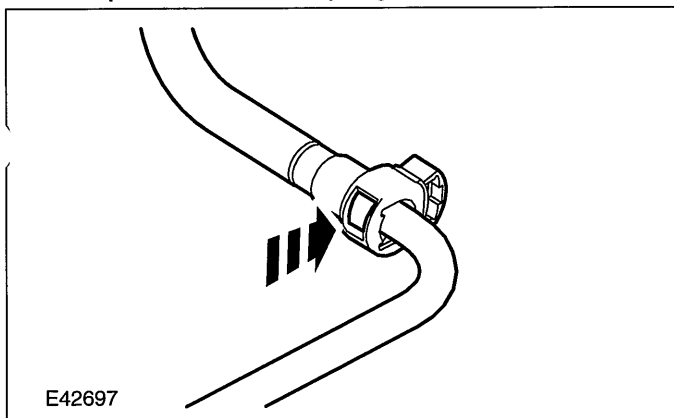
GENERAL PROCEDURES

10. Using a suitable Flat-bladed screwdriver release the fuel line quick release coupling secondary locking tang.

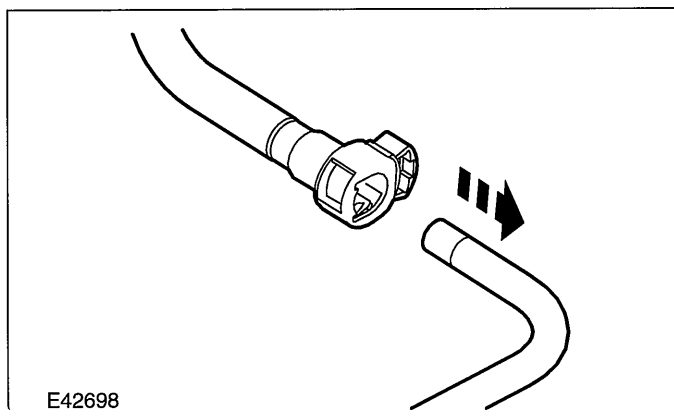


11. Operate the fuel line quick release coupling primary locking tang.

- Push the fuel line quick release coupling primary locking tang into from the fuel line quick release coupling.



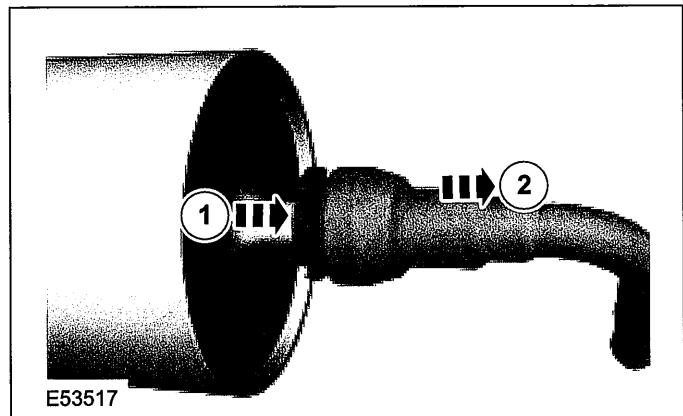
12. Disconnect the fuel line from the fuel line quick release coupling.



13. Disconnect the fuel line from the fuel filter.

1. Press the collar into the connector body.

2. Disconnect the fuel line from the fuel filter.



Connect

WARNINGS:

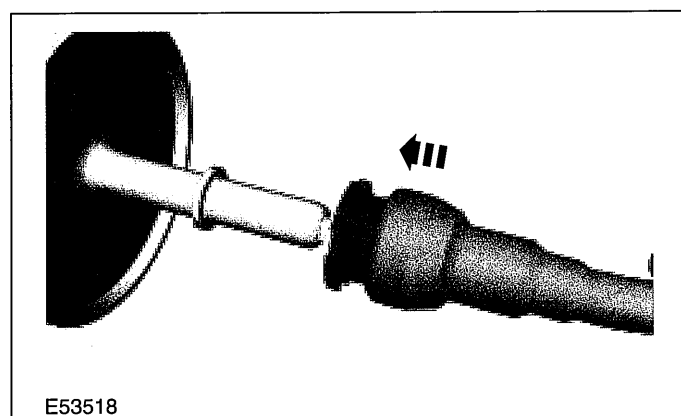
▲ Do not carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and can ignite. Failure to follow these instructions may result in personal injury.

▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines.

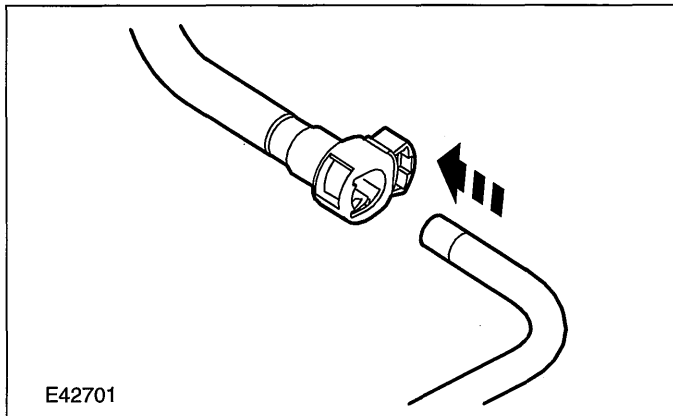
NOTE: Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

1. Push the connector on to the fuel filter.



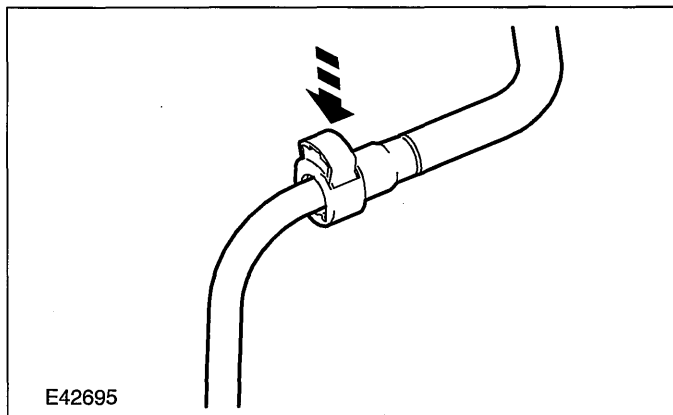
GENERAL PROCEDURES

2. Install the fuel line to the fuel line quick release coupling.



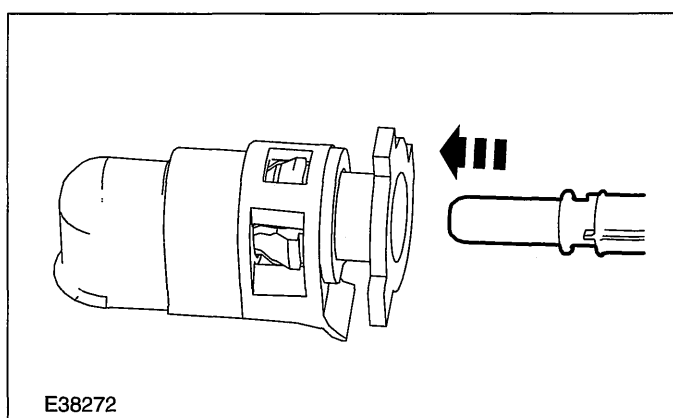
3. **CAUTION:** Make sure the quick release coupling primary locking tang clicks into place when installing.

Insert the fuel line quick release coupling secondary locking tang into the fuel line quick release coupling.



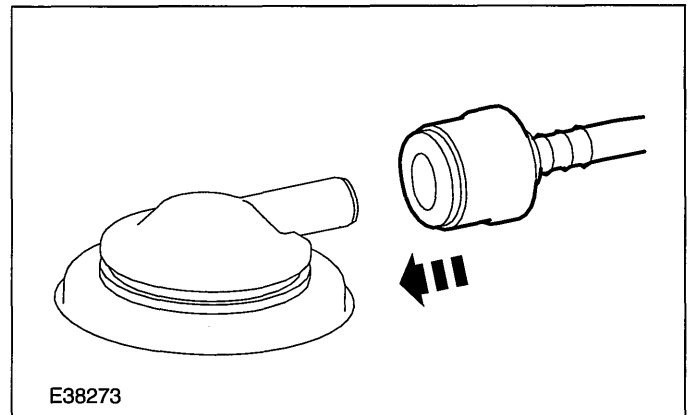
4. **CAUTION:** After installation, to make sure that the fuel line is fully seated, pull on the line.

Install the fuel line quick release coupling.



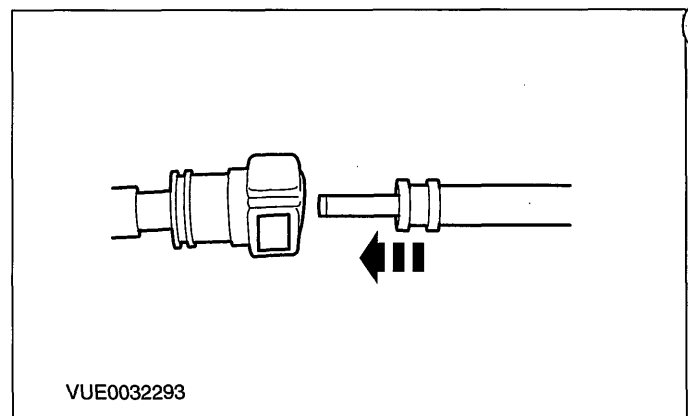
5. **CAUTION:** After installation, to make sure that the vent line is fully seated, pull on the line.

Install the fuel tank vent line quick release coupling.



6. **CAUTION:** Make sure the fuel line clicks into place when installing the line. To make sure that the fuel line is fully seated, pull on the line.

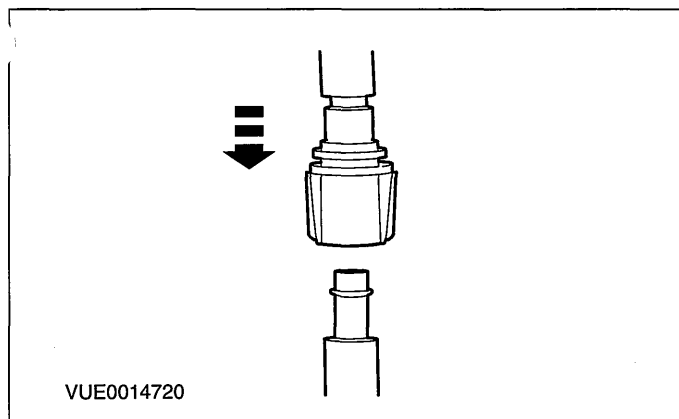
Install the fuel line quick release coupling.



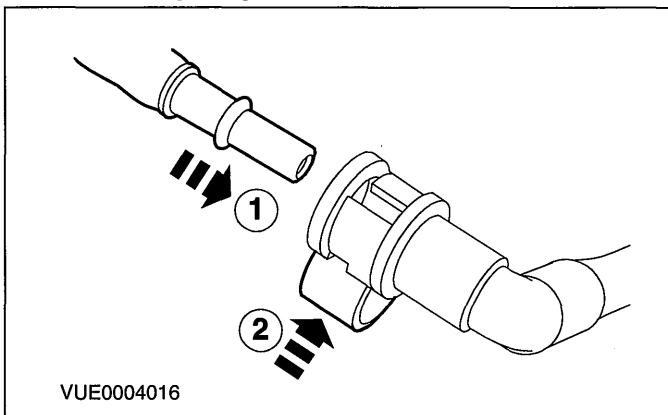
7. **NOTE:** Make sure the collar on the fuel line is inserted fully into the fuel line quick release coupling.

GENERAL PROCEDURES

Install the fuel line quick release coupling.



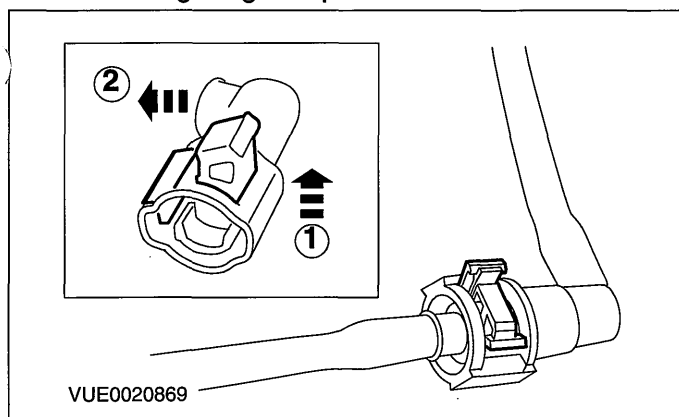
2. Press the fuel line quick release coupling locking tang into position.



8. **NOTE:**Make sure the collar on the fuel line is inserted fully into the fuel line quick release coupling before the locking tang is locked.

Install the fuel line quick release coupling.

1. Install the fuel line quick release coupling locking tang.
2. Rotate the fuel line quick release coupling locking tang into position.



9. **NOTE:**Make sure the collar on the fuel line is inserted fully into the fuel line quick release coupling before the locking tang is locked.

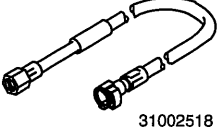
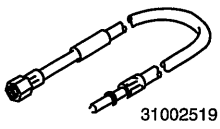
Install the fuel line quick release coupling.

1. Install the fuel line quick release coupling.

GENERAL PROCEDURES

Fuel System Pressure Check — 2.0L Duratec-HE (MI4)

Special Tool(s)

 31002518	Test Hose for 310-025 310-025-18 (23-024-10)
 31002519	Test Hose for 310-025 310-025-19A (23-024-11A)

General Equipment

Worldwide Diagnostic System (WDS) (418-F224)

1. **▲WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

Release the fuel system pressure.

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

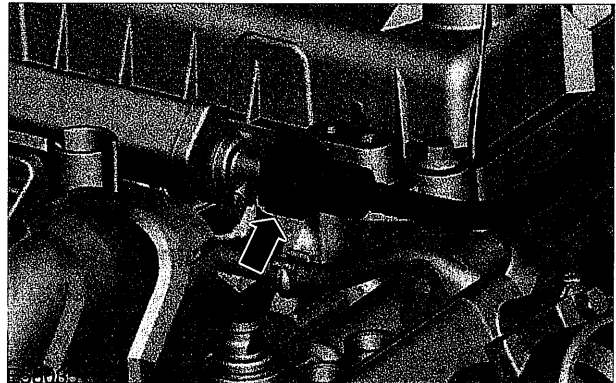
2. Remove the air cleaner assembly.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

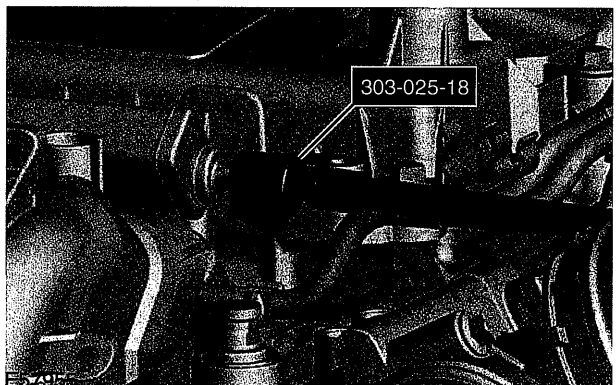
3. **NOTE:** Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

Disconnect the fuel supply line from the fuel rail.

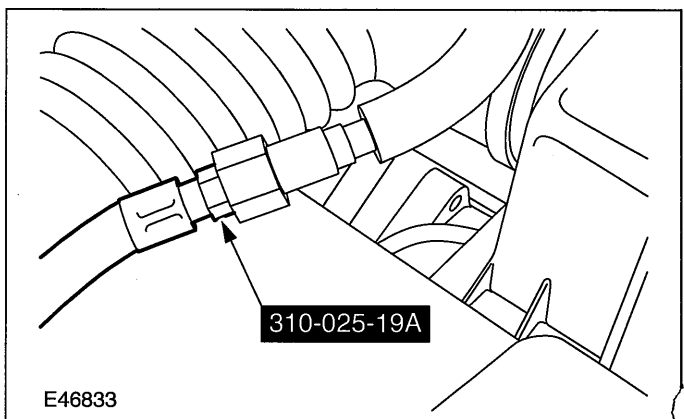
For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



4. Connect the special tool to the fuel rail.

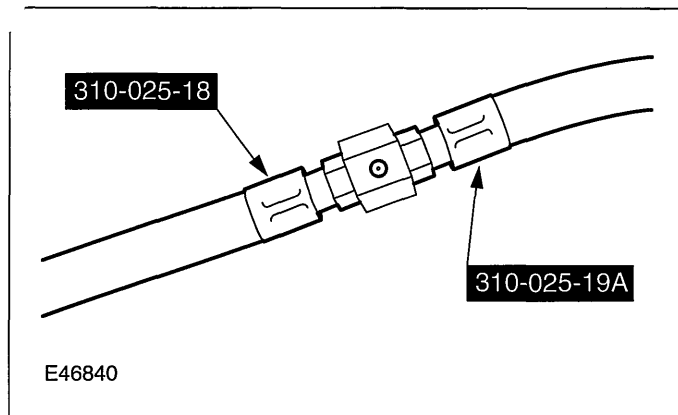


5. Connect the special tool to the fuel rail fuel supply line.

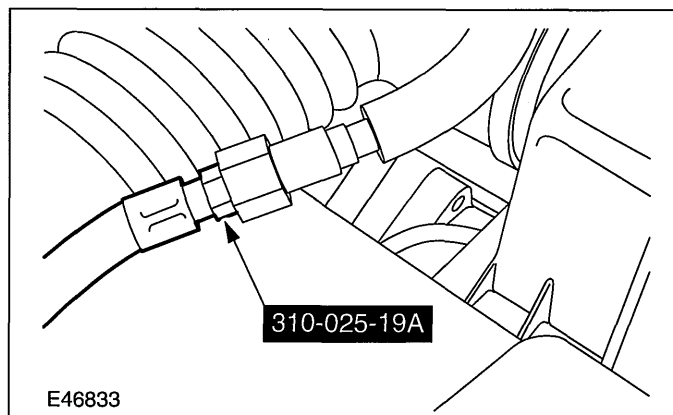


GENERAL PROCEDURES

6. Connect the WDS pressure/vacuum transducer adapter to the special tools.



12. Disconnect the special tool from the fuel rail fuel supply line.



7. Connect the WDS pressure/vacuum transducer to the WDS pressure/vacuum transducer adapter.

8. **NOTE:** The fuel system pressure should be 3.8 ± 0.2 bar after key on and it should maintain this pressure when the engine is running.

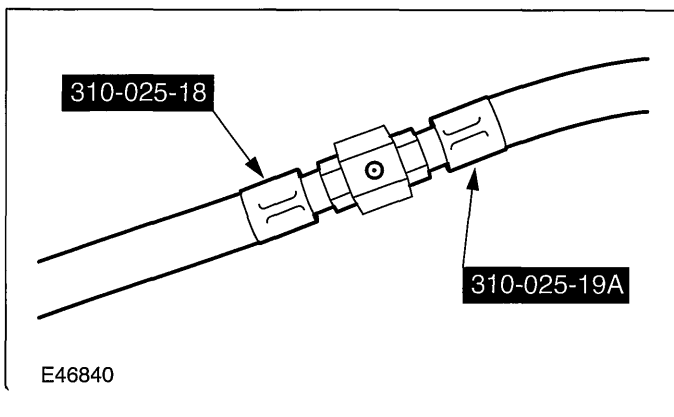
Using the digital multimeter function in WDS, start the engine and measure the fuel system pressure.

9. Release the fuel system pressure.

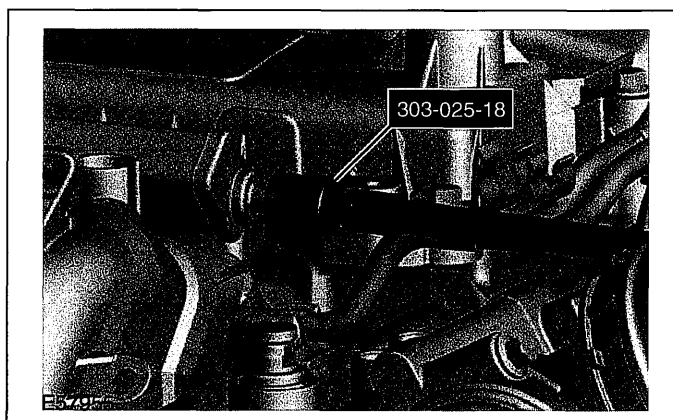
For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

10. Disconnect the WDS pressure/vacuum transducer from the WDS pressure/vacuum transducer adapter.

11. Disconnect the WDS pressure/vacuum transducer adapter from the special tools.



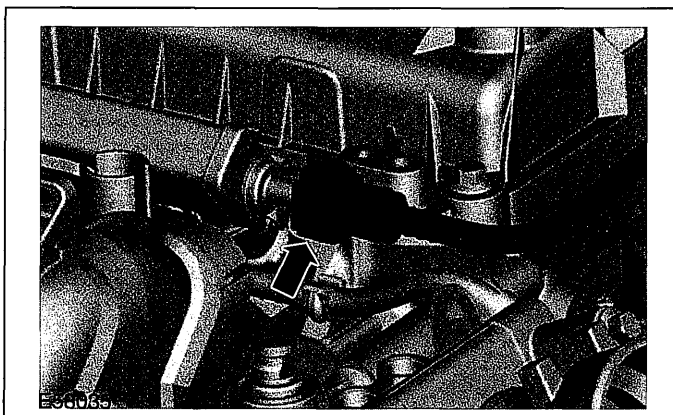
13. Disconnect the special tool from the fuel rail.



14. **NOTE:** Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

Connect the fuel supply line to the fuel rail.

For additional information, refer to: Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



GENERAL PROCEDURES**15. Install the air cleaner assembly.**

For additional information, refer to: Air
Cleaner - 2.0L Duratec-HE (M14) (303-12
Intake Air Distribution and Filtering,
Removal and Installation).

SECTION 310-01 Fuel Tank and Lines

VEHICLE APPLICATION:2006.0 Fiesta

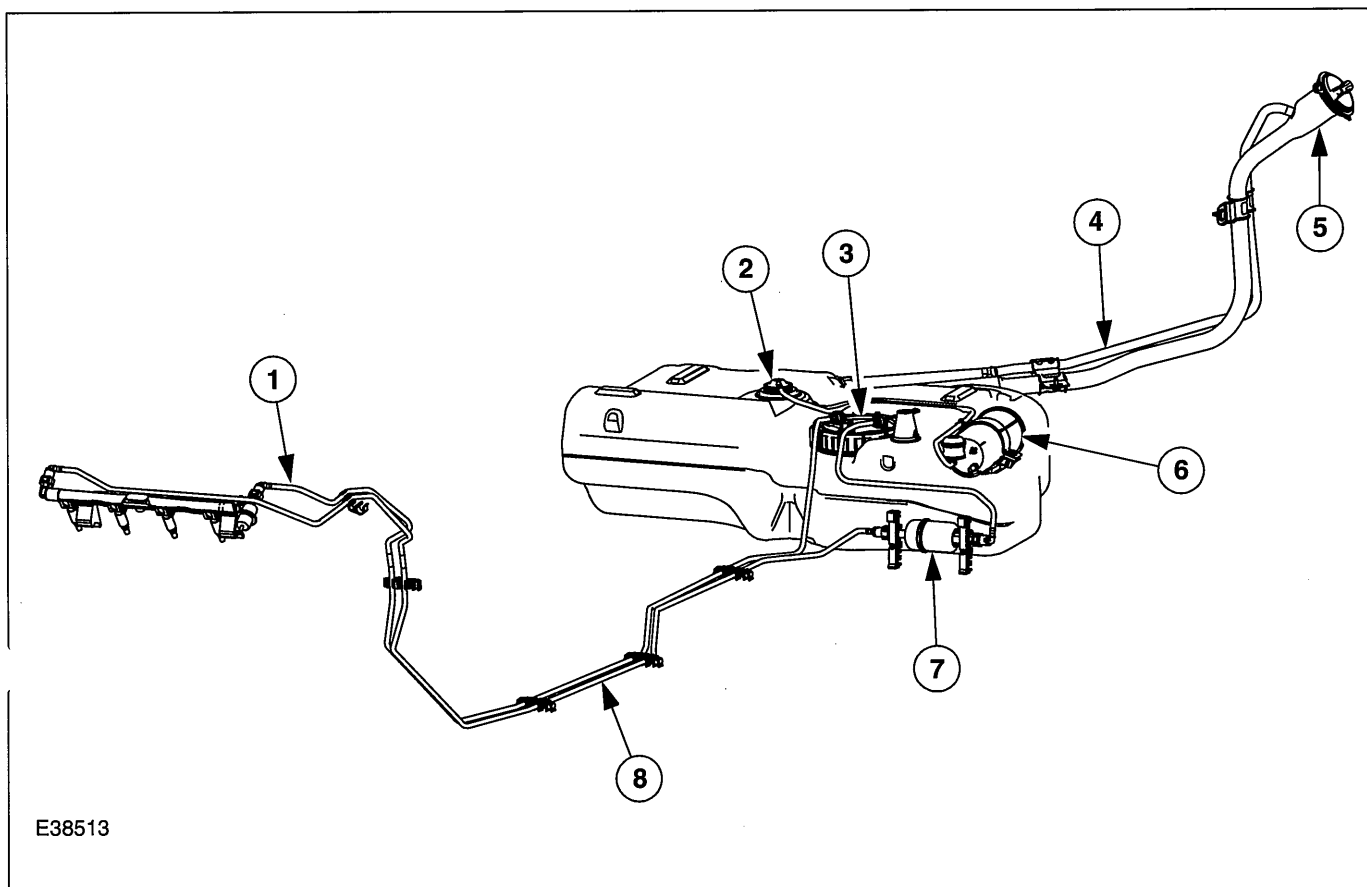
CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	310-01-2
DESCRIPTION AND OPERATION	
Fuel Tank and Lines — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	310-01-3
Overview.....	310-01-3
DIAGNOSIS AND TESTING	
Fuel Tank and Lines.....	310-01-5
REMOVAL AND INSTALLATION	
Fuel Tank..... (23 554 0)	310-01-6
Fuel Pump Module..... (23 534 0)	310-01-11
Fuel Tank Filler Pipe..... (23 572 0)	310-01-12
Fuel Level Sensor.....	310-01-14
Fuel Level Resistor Card.....	310-01-15

SPECIFICATIONS**Torque Specifications**

Description	Nm	lb-ft	lb-in
Fuel tank support strap retaining bolts	25	18	-
Fuel tank filler pipe retaining bolts	9	-	80
Fuel pump module locking ring - All except vehicles with diesel engine	85	63	-
Fuel level sensor locking ring - Vehicles with diesel engine	85	63	-
Floor panel crossmember	4	-	35

DESCRIPTION AND OPERATION

Fuel Tank and Lines — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

Overview

E38513

Item	Description
1	Fuel return line
2	Non-return valve, Evaporative Emission (EVAP) system
3	Fuel pump unit
4	Tank breather pipe
5	Tank filler neck
6	Activated charcoal canister
7	Fuel filter
8	Fuel feed line

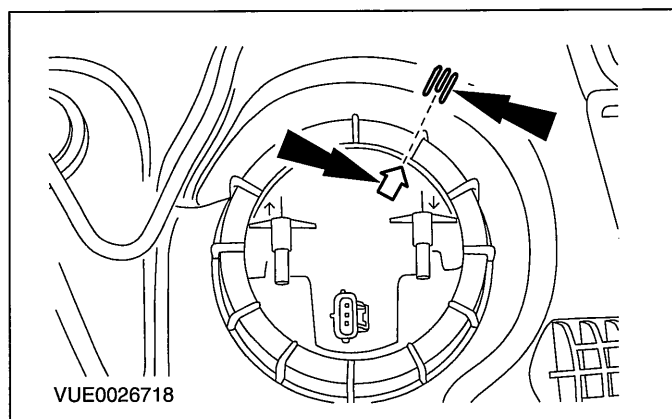
The fuel tank holds 45 litres.

The fuel pump unit is located in the fuel tank. It consists of the fuel pump and the sender for the fuel gauge.

The fuel pump is electrically controlled through the fuel cut-off safety switch.

In the event of an accident, the fuel cut-off safety switch interrupts the power supply so that no more fuel can be supplied.

It is located behind a cover on the right-hand A-pillar in the footwell next to the central junction box.



The fuel tank must be removed before the fuel pump unit can be removed.

DESCRIPTION AND OPERATION

Care must be taken on installation, that the arrows on the fuel tank and the fuel pump unit point at each other.

If the alignment is wrong, then the fuel level shown may be incorrect.

DIAGNOSIS AND TESTING**Fuel Tank and Lines**

All except vehicles with diesel engine,

REFER to: Fuel System - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/2.0L Duratec-HE (MI4)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (310-00 Fuel System - General Information, Diagnosis and Testing).

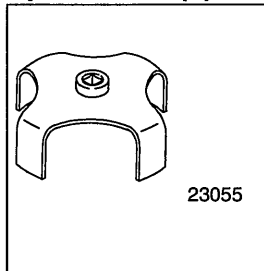
Vehicles with diesel engine,

REFER to: Fuel System - 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel (310-00 Fuel System - General Information, Diagnosis and Testing).

REMOVAL AND INSTALLATION

Fuel Tank(23 554 0)

Special Tool(s)

	Wrench, Sender Unit, Fuel Tank 310-069 (23-055)
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General Equipment

Transmission jack

Removal

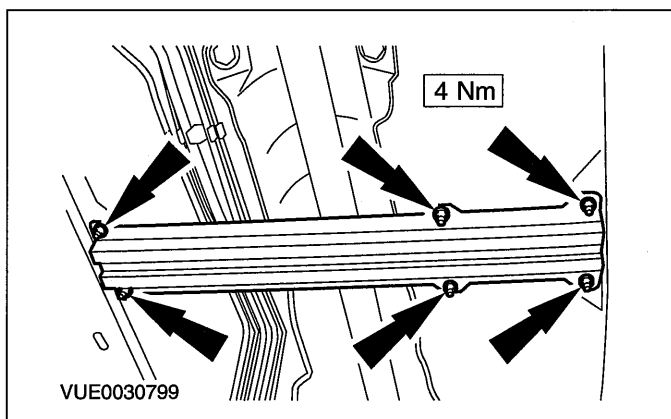
All vehicles

WARNINGS:

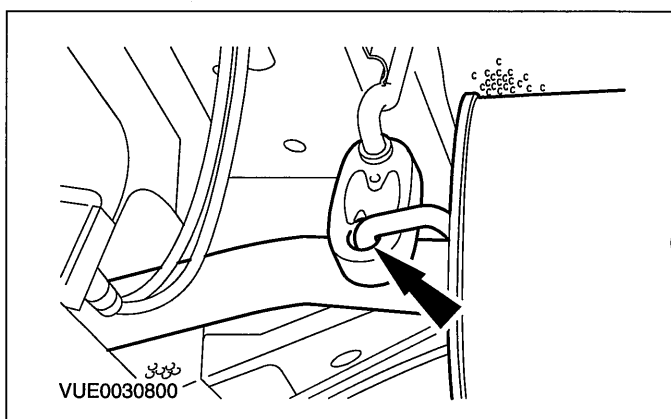
- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

1. Release the fuel system pressure. For additional information, refer to Section 310-00 [Fuel System - General Information].
2. Drain the fuel tank. For additional information, refer to Section 310-00 [Fuel System - General Information].
3. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].

4. Remove the floor panel crossmember.

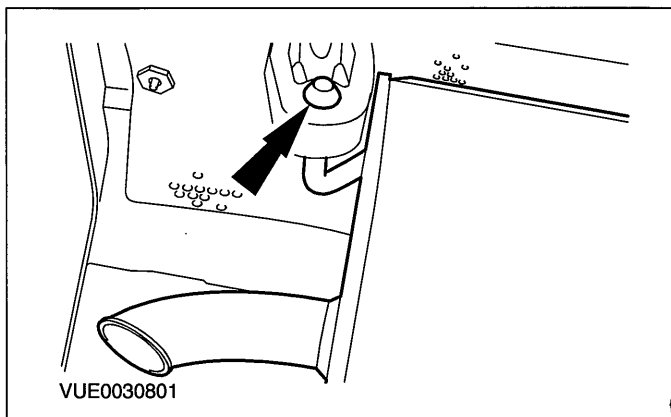


5. Detach the exhaust system from the center exhaust hanger insulator.



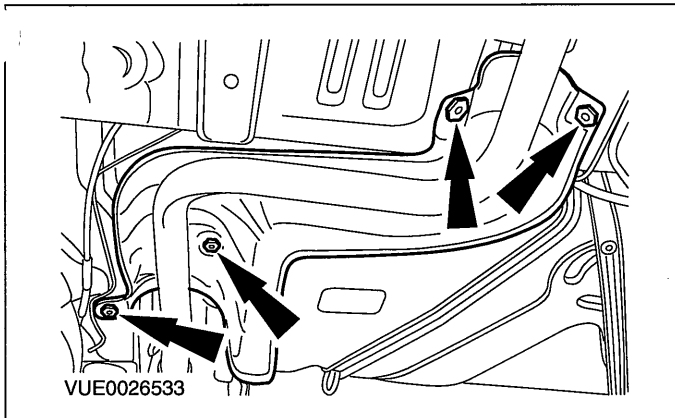
6. NOTE:When detaching the exhaust system allow the system to be supported by the rear suspension assembly.

Detach the exhaust system from the rear exhaust hanger insulator.

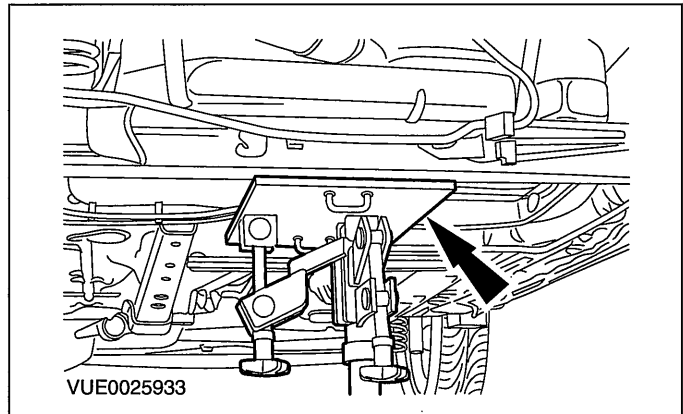


REMOVAL AND INSTALLATION

7. Remove the exhaust system heat shield.



Using a suitable transmission jack, support the fuel tank.

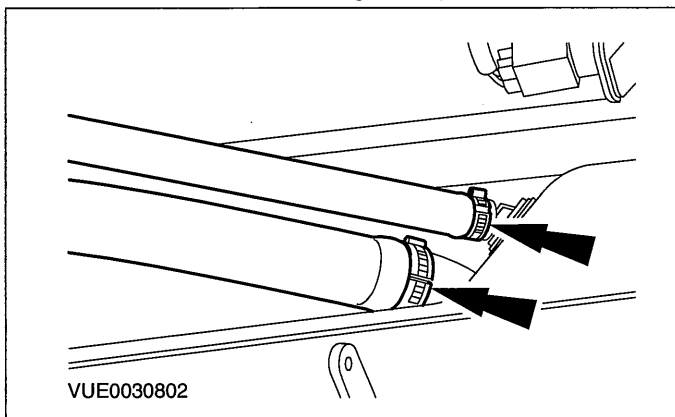


8. **CAUTION:** When removing the fuel tank vent and filler pipes, do not use any sharp edge tools to lever off the pipes. Failure to follow this instruction may cause damage to the pipes.

NOTE: Make note of the positions of the retaining clamps to make sure they are positioned in exactly the same positions when installing.

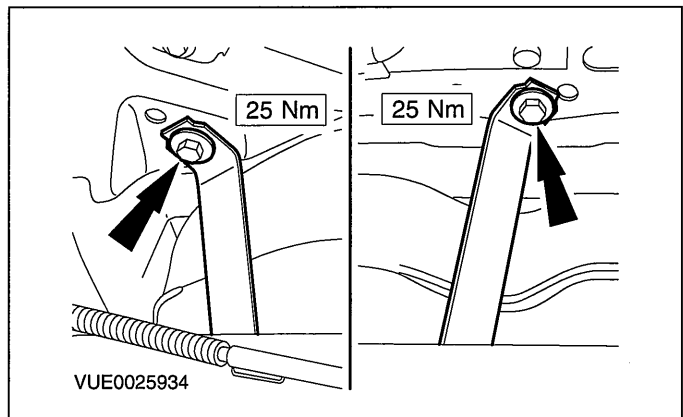
Disconnect the fuel tank filler pipe and the fuel tank vent pipe from the fuel tank.

- Discard the retaining clamps.



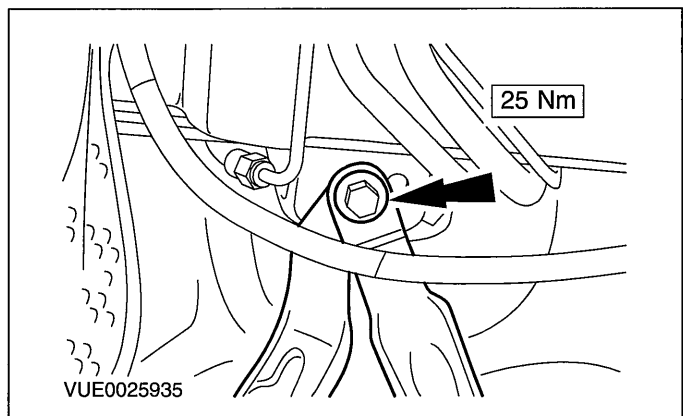
9. **CAUTION:** Use a suitable packing material to prevent damage to the underside of the fuel tank.

10. Remove the fuel tank support strap rear retaining bolts.



11. **NOTE:** Make note of the positions of the support straps to make sure they are positioned in exactly the same positions when installing (left-hand over right-hand).

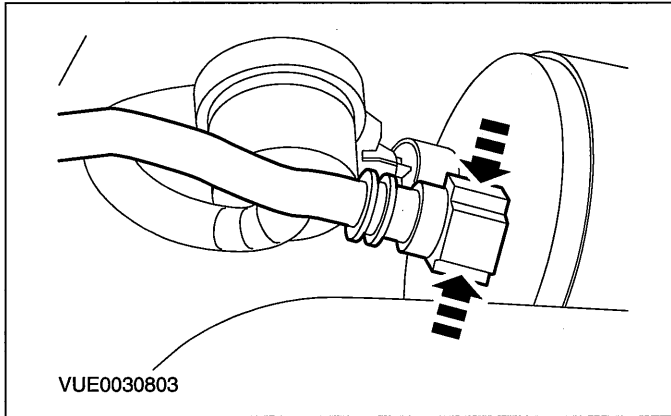
Remove the fuel tank support straps.



REMOVAL AND INSTALLATION

All except vehicles with diesel engine

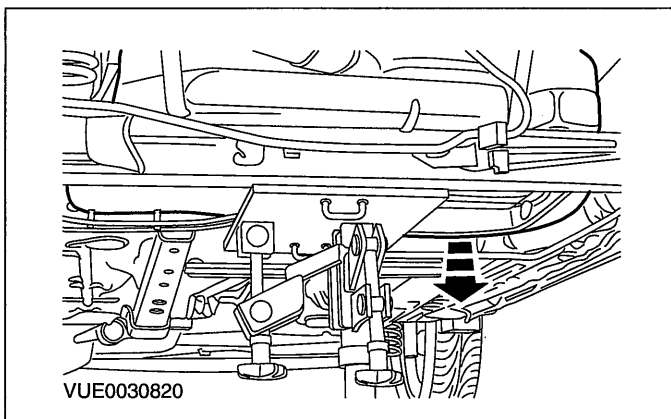
12. Disconnect the fuel tank vent pipe from the evaporative emission canister. For additional information, refer to Section 310-00 [Fuel System - General Information].



All vehicles

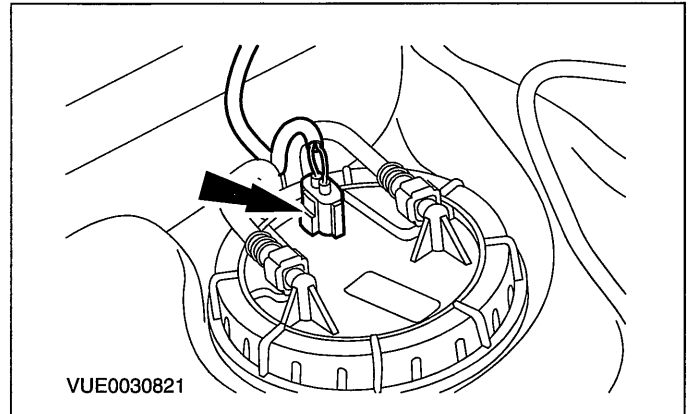
13. **CAUTION:** When lowering the fuel tank, make sure that excessive strain is not placed on the fuel lines and electrical connectors.

Partially lower the fuel tank.



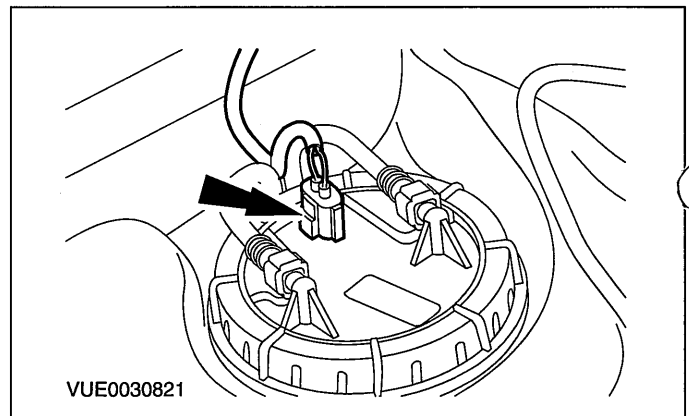
All except vehicles with diesel engine

14. Disconnect the fuel pump module electrical connector.



Vehicles with diesel engine

15. Disconnect the fuel level sensor electrical connector.

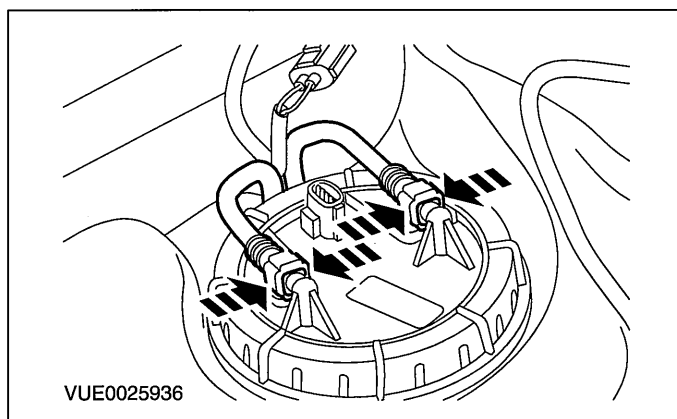


All vehicles

16. **NOTE:** Make note of the color of the fuel lines to make sure they are connected in exactly the same positions when installing. Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.

REMOVAL AND INSTALLATION

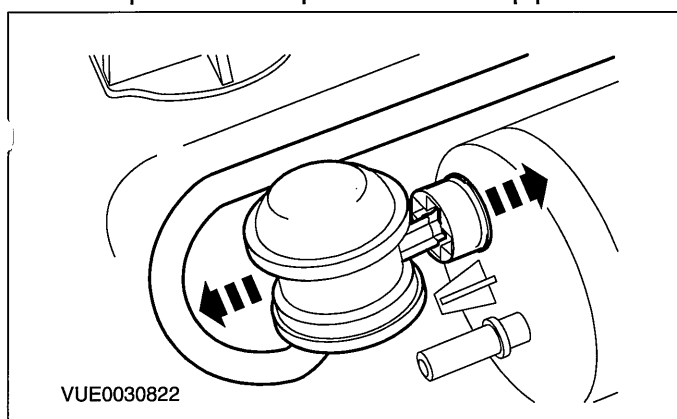
Disconnect the fuel supply and fuel return lines from the fuel tank. For additional information, refer to Section 310-00 [Fuel System - General Information].



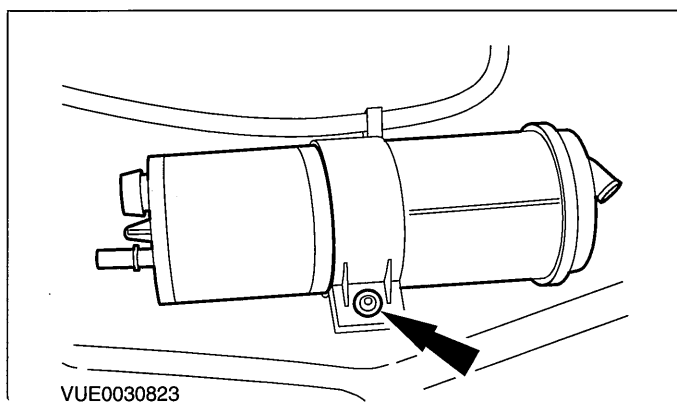
All except vehicles with diesel engine

17. Disconnect the evaporative emissions canister pipe.

- Squeeze the clip to release the pipe.



18. Remove the evaporative emissions canister from the fuel tank.

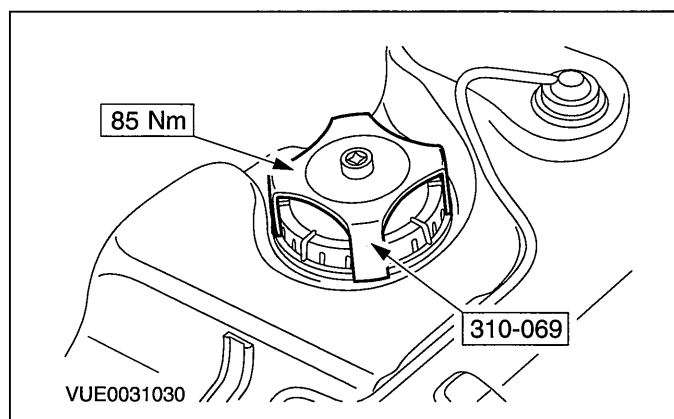


All vehicles

19. Remove the fuel tank assembly.

All except vehicle with diesel engine

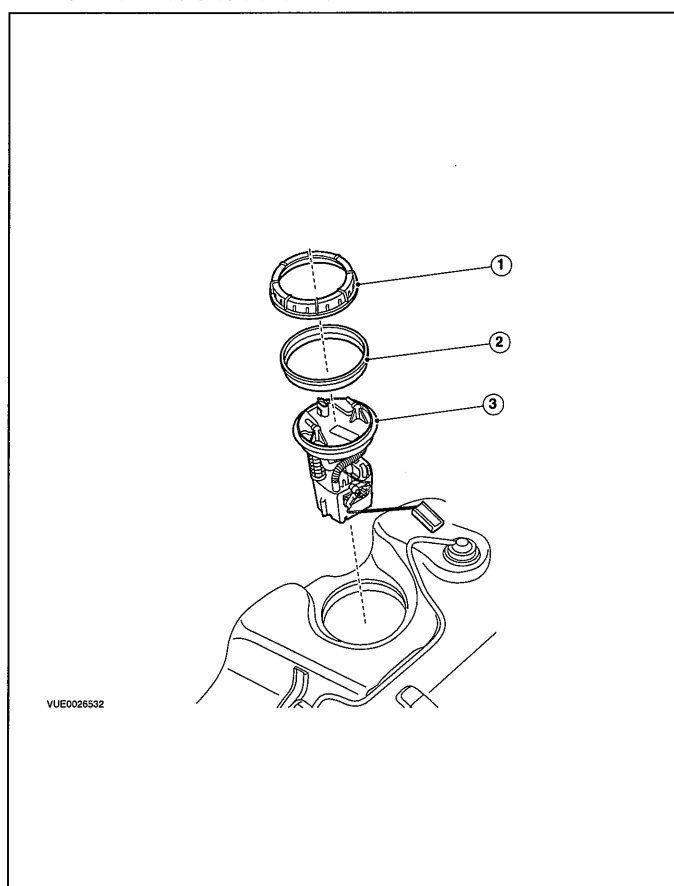
20. Using the special tool, loosen the fuel pump module locking ring.



21. **CAUTION:** Make sure that the float or arm are not damaged while removing or installing the fuel pump module.

Remove the fuel pump module.

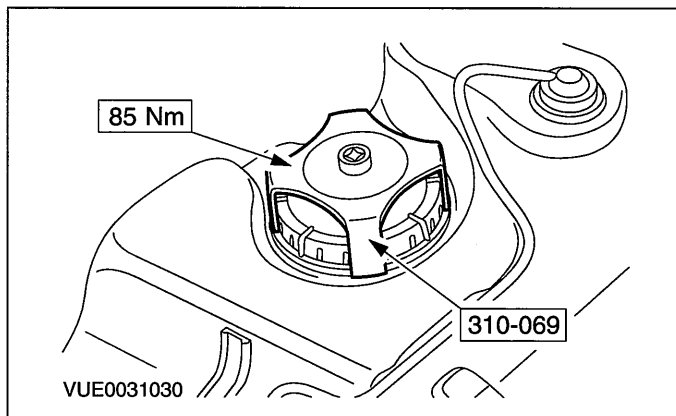
1. Remove the locking ring.
2. Remove the O-ring seal.
 - Discard the O-ring seal.
3. Lift the module from the fuel tank.



REMOVAL AND INSTALLATION

Vehicles with diesel engine

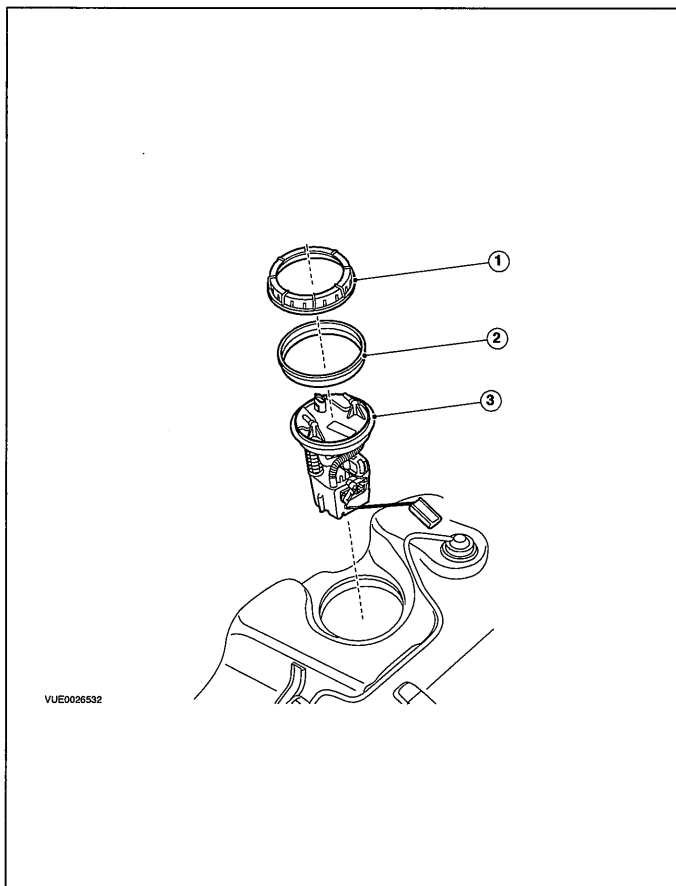
22. Using the special tool, loosen the fuel level sensor locking ring.



23. **CAUTION:** Make sure that the float or arm are not damaged while removing or installing the fuel level sensor.

Remove the fuel level sensor.

1. Remove the locking ring.
2. Remove the O-ring seal.
 - Discard the O-ring seal.
3. Lift the sensor from the fuel tank.



Installation

WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

CAUTIONS:

- ⚠ Make sure the fuel lines are connected in the correct fuel-flow direction. Fuel supply line connectors are white or are identified by a white band. Fuel return line connectors are red or are identified by a red band.
- ⚠ Make sure that the fuel supply and fuel return lines click into place when installing the lines. To make sure that the fuel lines are fully seated, pull on the lines.

NOTE: Install a new O-ring seal.

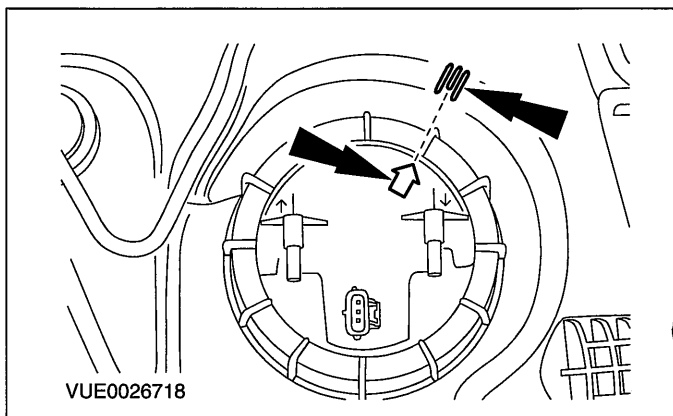
NOTE: When installing the fuel tank make sure the fuel lines do not get kinked or trapped.

NOTE: Install new fuel filler and vent pipe retaining clamps.

NOTE: The fuel filler and vent pipe retaining clamps must be installed in the same position as removed.

1. **NOTE:** Make sure that the arrows on the fuel tank and the fuel pump module or fuel level sensor are aligned correctly.

To install, reverse the removal procedure.



REMOVAL AND INSTALLATION**Fuel Pump Module(23 534 0)****Removal**

1. Remove the fuel pump module.

For additional information, refer to Fuel Tank
- in this section.

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

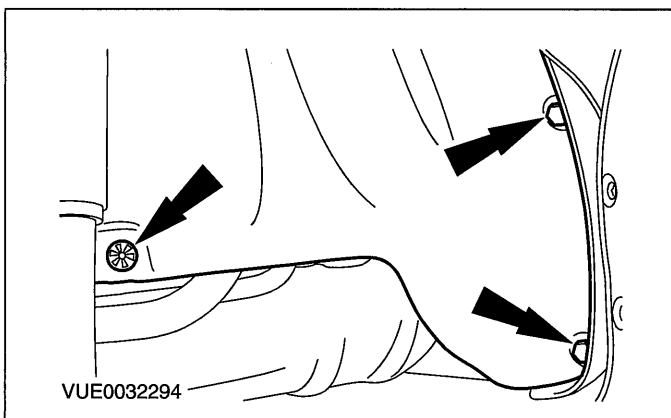
Fuel Tank Filler Pipe(23 572 0)

Removal

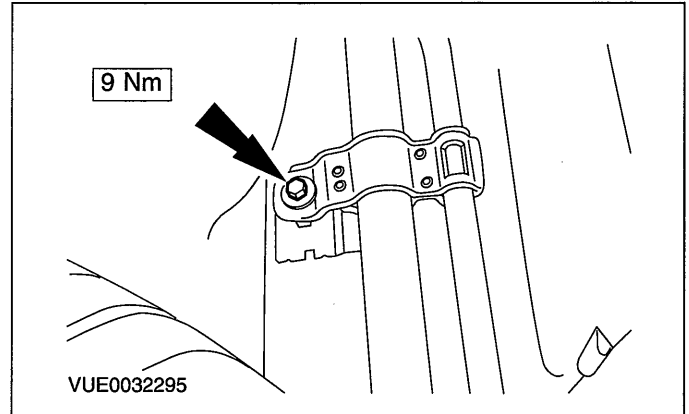
WARNINGS:

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapours are always present and can ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

1. Disconnect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].
2. Drain the fuel tank. For additional information, refer to Section 310-00 [Fuel System - General Information].
3. Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
4. Remove the left-hand rear fender splash shield (road wheel shown removed for clarity).



5. Remove the fuel tank filler pipe upper retaining bolt.

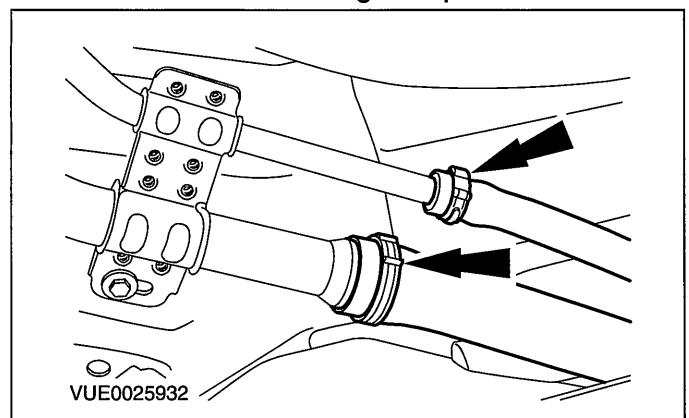


6. **CAUTION:** When disconnecting the fuel tank vent and fuel tank filler pipes, do not use any sharp edge tools to lever off the pipes. Failure to follow this instructions may cause damage to the pipes.

NOTE: Make note of the positions of the retaining clamps to make sure they are positioned in exactly the same positions when installing.

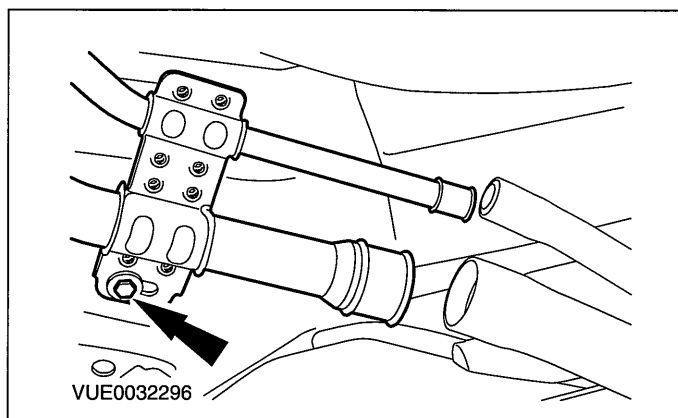
Disconnect the fuel tank filler pipe and the fuel tank vent pipe from the fuel tank.

- Discard the retaining clamps.



REMOVAL AND INSTALLATION

7. Remove the fuel tank filler pipe lower retaining bolt and remove the fuel tank filler pipe.

**Installation****WARNINGS:**

- ▲ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapours are always present and can ignite. Failure to follow these instructions may result in personal injury.
- ▲ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

NOTE: Install new fuel tank filler pipe and vent pipe retaining clamps.

NOTE: The fuel tank filler pipe and vent pipe retaining clamps must be installed in the same position as removed.

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Fuel Level Sensor****Removal**

1. Remove the fuel level sensor.

For additional information, refer to Fuel Tank
in this section.

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Fuel Level Resistor Card

Removal

All except vehicles with diesel engine

1. Remove the fuel pump and sender unit.

For additional information, refer to: Fuel Tank (310-01 Fuel Tank and Lines, Removal and Installation).

Vehicles with diesel engine

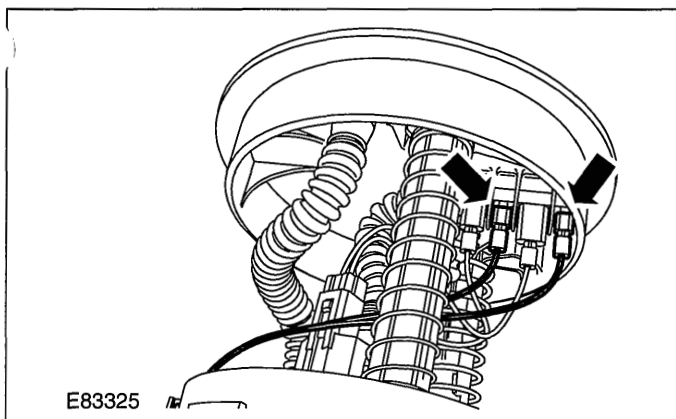
2. Remove the fuel level sensor.

For additional information, refer to: Fuel Tank (310-01 Fuel Tank and Lines, Removal and Installation).

All vehicles

3. **NOTE:** Diesel engine variants only have 2 wires.

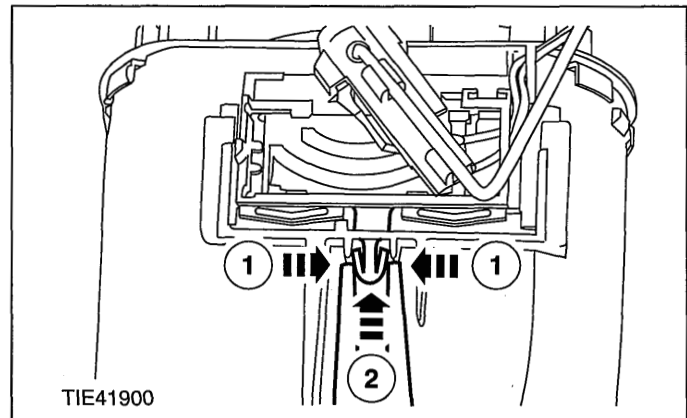
Disconnect the fuel level resistor card electrical connectors.



4. Using needle nose pliers, remove the fuel level resistor card.

1. Press the locking tangs.
2. Remove the fuel level resistor card.

- Discard the fuel level resistor card



Installation

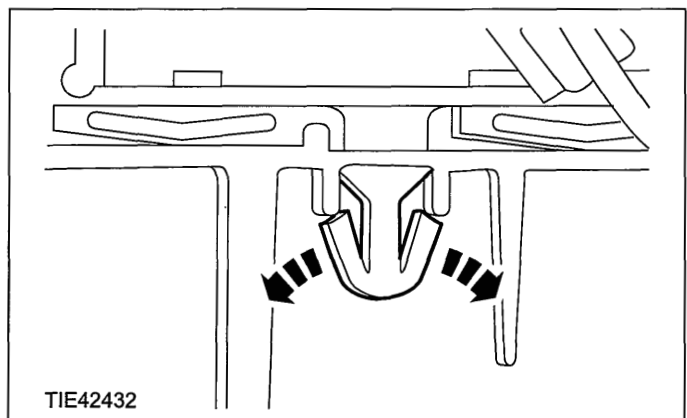
All vehicles

1. **CAUTION:** Do not touch the fuel level resistor card surface with tools or hands. Failure to follow this instruction may result in damage to the fuel level resistor card.

NOTE: Make sure that the locking tangs are in the fully locked position.

NOTE: Make sure that the wiring harness is routed around the fuel line, in line with the original installation.

Install the new fuel level resistor card into the fuel pump and sender unit or the fuel level sensor.

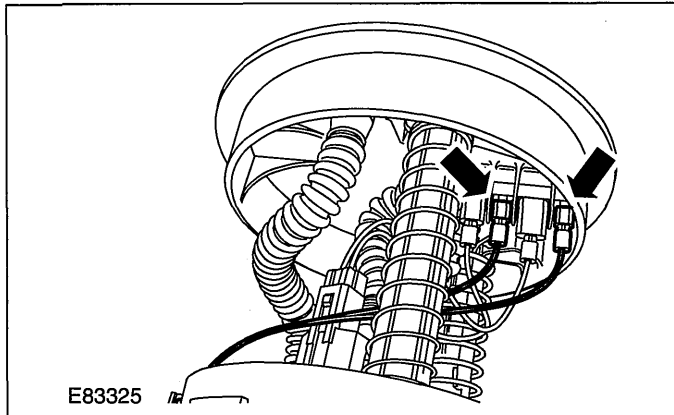


2. **NOTE:** It is not important which electrical connector is connected to which fuel level resistor card related pin in the top flange.

NOTE: Diesel engine variants only have 2 wires.

REMOVAL AND INSTALLATION

Connect the fuel level resistor card electrical connectors.



3. Make sure that the float rod and arm are able to sweep their full ranges without contacting or fouling on any wires.

Vehicles with diesel engine

4. **NOTE:** Install a new fuel level sensor gasket.

Install the fuel level sensor.

For additional information, refer to: Fuel Tank (310-01 Fuel Tank and Lines, Removal and Installation).

All except vehicles with diesel engine

5. **NOTE:** Install a new fuel pump and sender unit gasket.

Install the fuel pump and sender unit.

For additional information, refer to: Fuel Tank (310-01 Fuel Tank and Lines, Removal and Installation).

SECTION 310-02A Acceleration Control — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DESCRIPTION AND OPERATION

Acceleration Control.....	310-02A-2
1.3L Duratec 8V.....	310-02A-2
1.4L/1.6L Duratec 16V.....	310-02A-2

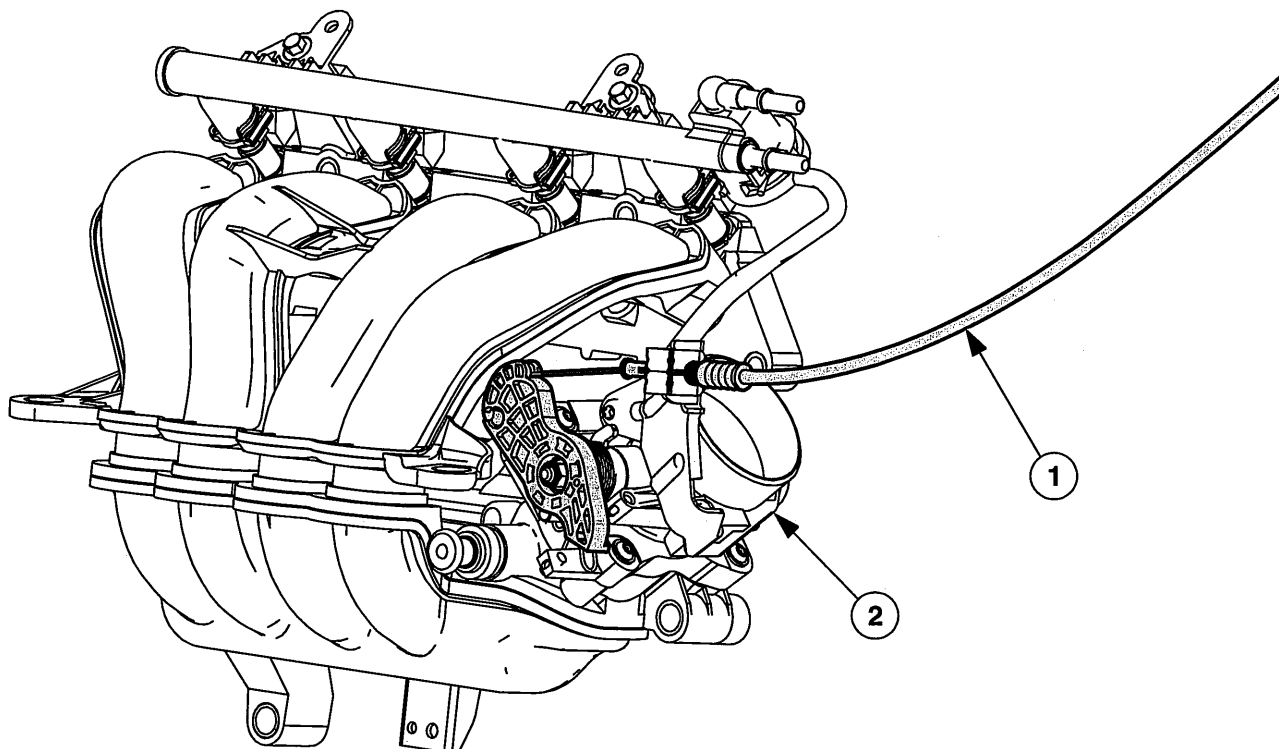
DIAGNOSIS AND TESTING

Acceleration Control.....	310-02A-3
Principles of Operation.....	310-02A-3
Diagnostic Trouble Codes.....	310-02A-4
Inspection and Verification.....	310-02A-6
Symptom Chart.....	310-02A-6

DESCRIPTION AND OPERATION

Acceleration Control

1.3L Duratec 8V



E38720

Item	Description
1	Accelerator cable
2	Throttle body

The throttle is cable operated on the 1.3L Duratec 8V engine.

There are two different throttle bodies, depending on the power of the variant.

Because the throttle flap opening angle is different, the way in which the cable is controlled at the throttle flap varies slightly between the two different variants.

1.4L/1.6L Duratec 16V

The 1.4L/1.6L Duratec 16V engines have an electronically controlled throttle flap control unit.

For information on the electronically controlled throttle flap control unit, please refer to Section 303-14.

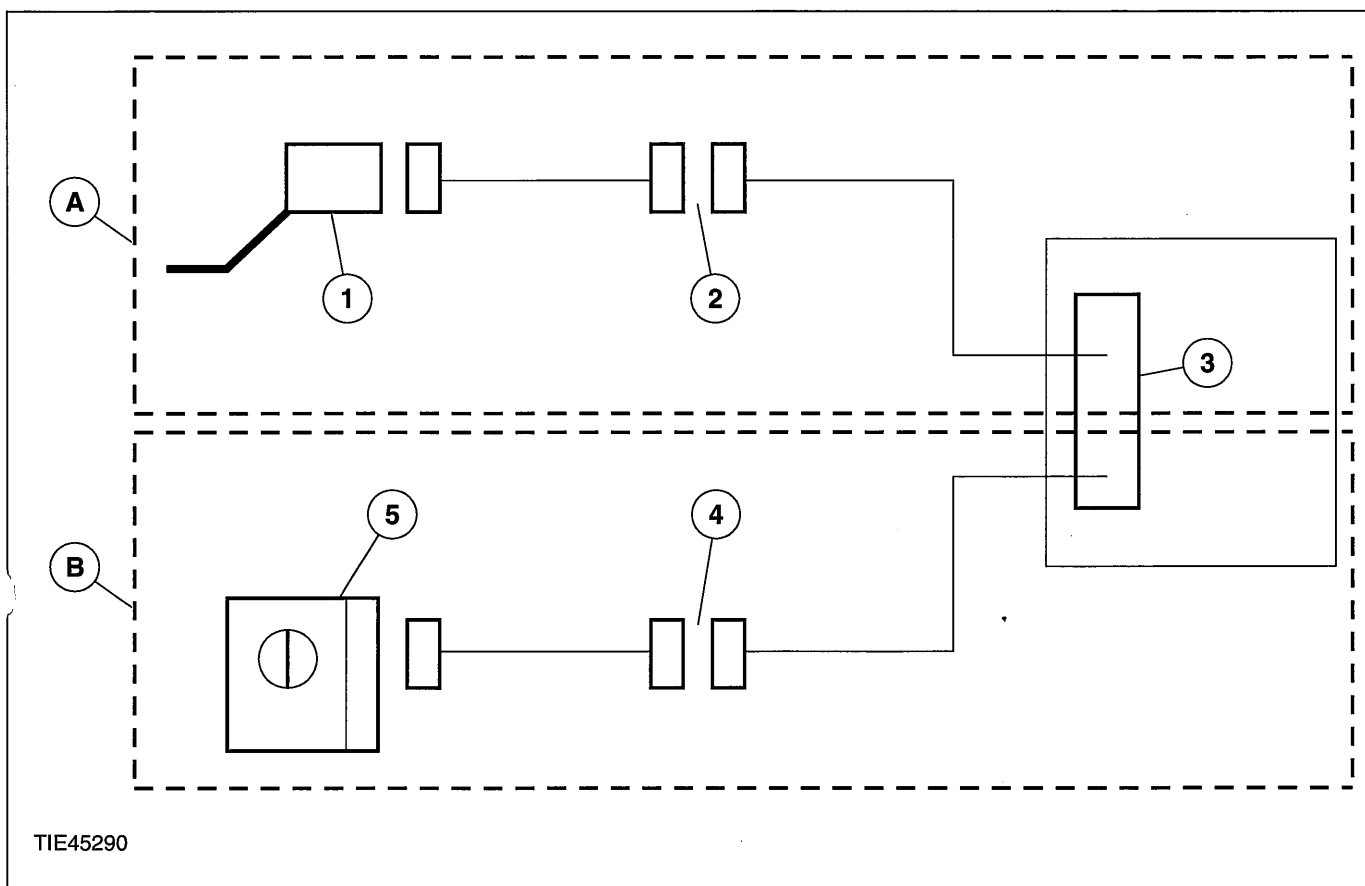
DIAGNOSIS AND TESTING

Acceleration Control

Principles of Operation

System Overview

Electronic Accelerator Control System Overview



Item	Description
A	Area "A"- accelerator pedal to powertrain control (PCM) module circuit
B	Area "B"- electronic throttle body to PCM circuit
1	Accelerator pedal
2	42-way electrical connector
3	PCM
4	16-way inline electrical connector
5	Electronic throttle body

Description

The system consists primarily of two circuits connected to the PCM. The two circuits are the accelerator pedal to PCM and the electronic throttle body to PCM.

Accelerator Pedal

The accelerator pedal contains two sensors that measure the movement of the pedal and output a voltage corresponding to the pedal position.

DIAGNOSIS AND TESTING

Electronic Throttle Body

The electronic throttle body is similar to a mechanical throttle body used on a cable accelerator system. Instead of the cable moving the throttle plate open and closed, it uses an internal electrical motor that is driven by the PCM. The electronic throttle body has two sensors that measure the throttle plate position. The sensors output a voltage to the PCM corresponding to the plate position.

When the electronic throttle body motor is not in use, the throttle plate sits slightly open in a default position (not idle position). This position is maintained by two internal springs. One acts upwards and one downwards. Screws on the electronic throttle body will not adjust the idle speed, the idle speed is controlled by the PCM.

PCM

The PCM reads the voltage from the pedal and converts this signal into a driver request. The driver request is realized by opening or closing the throttle body. To do this, the PCM increases or decreases power to the electronic throttle body motor. The PCM then checks the signal from the electronic throttle body throttle position (TP) sensor, to make sure that the requested position has been achieved. The PCM also monitors all the sensors to make sure that the system is functioning as expected. All electronic accelerator control system faults will be detected by the PCM and set a diagnostic trouble code (DTC) which triggers the electronic accelerator control fail message accordingly. For safety reasons, some faults will also reduce the vehicle performance.

Diagnostic Trouble Codes

Description

When a component electrical error is set it means that the PCM is not receiving the expected signal. This means that the concern may lie between the component and the PCM. All wiring and electrical connectors should be checked before a new component is installed. Also note that general vehicle electrical issues can have an effect on other systems. Battery voltage and relay concerns should be rectified first.

Accelerator Pedal Codes

These are the DTCs relating to the pedal circuit. They do not imply necessarily that the accelerator pedal is at fault, but it will in any case relate to area "A" (see system overview).

- P2120 – Accelerator pedal sensor 1 electrical error
- P2122 – Accelerator pedal sensor 1 electrical error short to ground or open circuit
- P2123 – Accelerator pedal sensor 1 electrical error short to battery
- P2125 – Accelerator pedal sensor 2 electrical error
- P2127 – Accelerator pedal sensor 2 electrical error short to ground or open circuit
- P2128 – Accelerator pedal sensor 2 electrical error short to battery
- P2138 – Accelerator pedal sensor 1 & 2 ratio error

Electronic Throttle Body Circuit Codes

These are the DTCs relating to the electronic throttle body circuit. They do not imply necessarily that the electronic throttle body is the concern, but it will in any case relate to area "B" (see system overview).

- P0120 – Throttle position (TP) sensor 1 electrical error
- P0122 – (TP) sensor 1 electrical error short to ground
- P0123 – (TP) sensor 1 electrical error short to battery or line break
- P0220 – (TP) sensor 2 electrical error
- P0222 – (TP) sensor 2 electrical error short to ground or open circuit
- P0223 – (TP) sensor 2 electrical error short to battery
- P2135 – (TP) sensor ratio error
- P2119 – Throttle plate convergence error
 - This is when the throttle plate has not moved to the requested position in the required time. This could be caused by the following:
 - The electronic throttle body motor is not receiving the necessary voltage. Check the electronic throttle body motor wiring. The PCM is not receiving the correct throttle plate position signal from the electronic throttle body. Check the TP sensor wiring from the

DIAGNOSIS AND TESTING

PCM to the electronic throttle body including the electrical connectors in area "B" (see system overview).

- There is an obstruction inside the throttle body bore. Remove the air cleaner outlet pipe and check for obstructions.
- There is an obstruction inside the electronic throttle body. Remove the air cleaner outlet pipe and check that the plate moves freely against the springs and returns to a slightly open position. If it does not, install a new electronic throttle body.
- P2176 – Throttle plate adaptation error
 - When the ignition is turned off, the throttle body carries out an adaptation cycle and spring check. This can be audible after a short delay (up to 30 seconds) following the ignition key being turned to position 0 and can be visually observed with the air cleaner outlet pipe removed. The throttle plate is moved through a series of positions to check the TP sensor value and relearn the electronic throttle body characteristics. If a concern is detected during this test, P2176 DTC will be set. If there are already any of the other DTCs, the adaptation test could potentially fail. Therefore the other DTCs should be resolved first (e.g. low battery voltage) and a retest can be carried out by clearing the DTCs and keying on and off again. Check the whole area "B" (see system overview) for any concerns and if no concern is found, install a new electronic throttle body.
- P2100 – H bridge error
 - A fault has been detected on the circuit connecting the electronic throttle body motor and the PCM. Check for any other non-electronic accelerator control related DTCs and rectify them first. Check area "B" (see system overview) and if no failure is found, install a new PCM.

PCM Related Codes

The PCM continuously monitors all the sensors. It also checks that the monitor is functioning as expected. If there is a fault with the monitor, the following DTCs will be set.

- P2107 – Processor monitoring on the main controller fault.
- P2108 -Analogue to digital converter
 - Inferred intake mass air flow lower than expected
 - Engine speed monitor ratio error
 - Pedal ratio monitor error
 - TP sensor ratio monitor error
 - Fault in torque generation
 - Fault present in engine speed limitation

Multiple sensor faults can make the PCM assume that there is a monitor fault. If other DTCs exist, rectify these first. These DTCs indicate a failure in area "A" or "B" and they are also related to the manifold absolute pressure and temperature (MAPT) sensor and the crankshaft position (CKP) sensor. If no other failures are found, install a new PCM.

Indirect Codes

There are two brake pedal switches located under the brake pedal. Check that both of these are connected and functioning correctly. A brake pedal switch concern will only cause the "EAC FAIL" message to be displayed, it will not lead to a limited performance mode. Follow WDS instructions.

- P0571 – Brake switch error

If the voltage to the accelerator pedal and the electronic throttle body cannot be regulated correctly, the components may not operate as expected. Therefore it is important to detect if there is a concern in the supply voltage

- P0641 – Sensor voltage supply circuit 1 noisy signal
- P0642 – Sensor voltage supply circuit 1 short to ground or open circuit
- P0643 – Sensor voltage supply circuit 1 short to battery
- P0651 – Sensor voltage supply circuit 2 noisy signal
- P0652 – Sensor voltage supply circuit 2 short to ground or open circuit

DIAGNOSIS AND TESTING

- P0653 – Sensor voltage supply circuit 2 short to battery
 - Check the power supply to the PCM (battery voltage, relays, wiring harness and electrical connectors as well as fuses). If no concern is found, install a new PCM.
- P1712 – Electronic gear shift torque demand is not a plausible signal (ASM only)
 - Follow WDS instructions.

NOTE: If the vehicle is in a limited performance mode, a system related DTC and the electronic accelerator control fail light message will illuminate. If there is a performance issue without these items the electronic accelerator control system is running correctly but another issue may exist elsewhere on the vehicle.

Be aware that installing new system related components without these DTCs will not improve the vehicle behavior for general issues such as:

- high fuel consumption
- poor idle quality
- poor or no engine start

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Accelerator pedal – Linkage – Accelerator cable – Throttle body	• Fuse(s) • Relay(s) • Wiring harness • Electrical connector(s) • Accelerator pedal • Throttle body • Powertrain control module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to Symptom Chart.

Symptom Chart

Symptom Chart - Vehicles With 1.3L Engine

Symptom	Possible Sources	Action
• Accelerator pedal is hard to depress or has a rough/raspy or sticky feel	• Damaged accelerator cable.	• INSTALL a new accelerator cable.
	• Accelerator cable incorrectly installed.	• CHECK the accelerator cable for correct installation.
	• Worn or damaged throttle body.	• INSTALL a new throttle body. REFER to: Throttle Body (303-04A, Removal and Installation).
• Accelerator pedal does not return freely	• Weak or broken throttle body return spring.	• INSTALL a new throttle body. REFER to: Throttle Body (303-04A, Removal and Installation).
	• Worn or damaged throttle body.	• INSTALL a new throttle body. REFER to: Throttle Body (303-04A, Removal and Installation).
• High engine idle speed	• Damaged accelerator cable.	• INSTALL a new accelerator cable.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Accelerator cable incorrectly installed.	CHECK the accelerator cable for correct installation.

Symptom Chart - Vehicles With 1.25L, 1.4L or 1.6L Engine

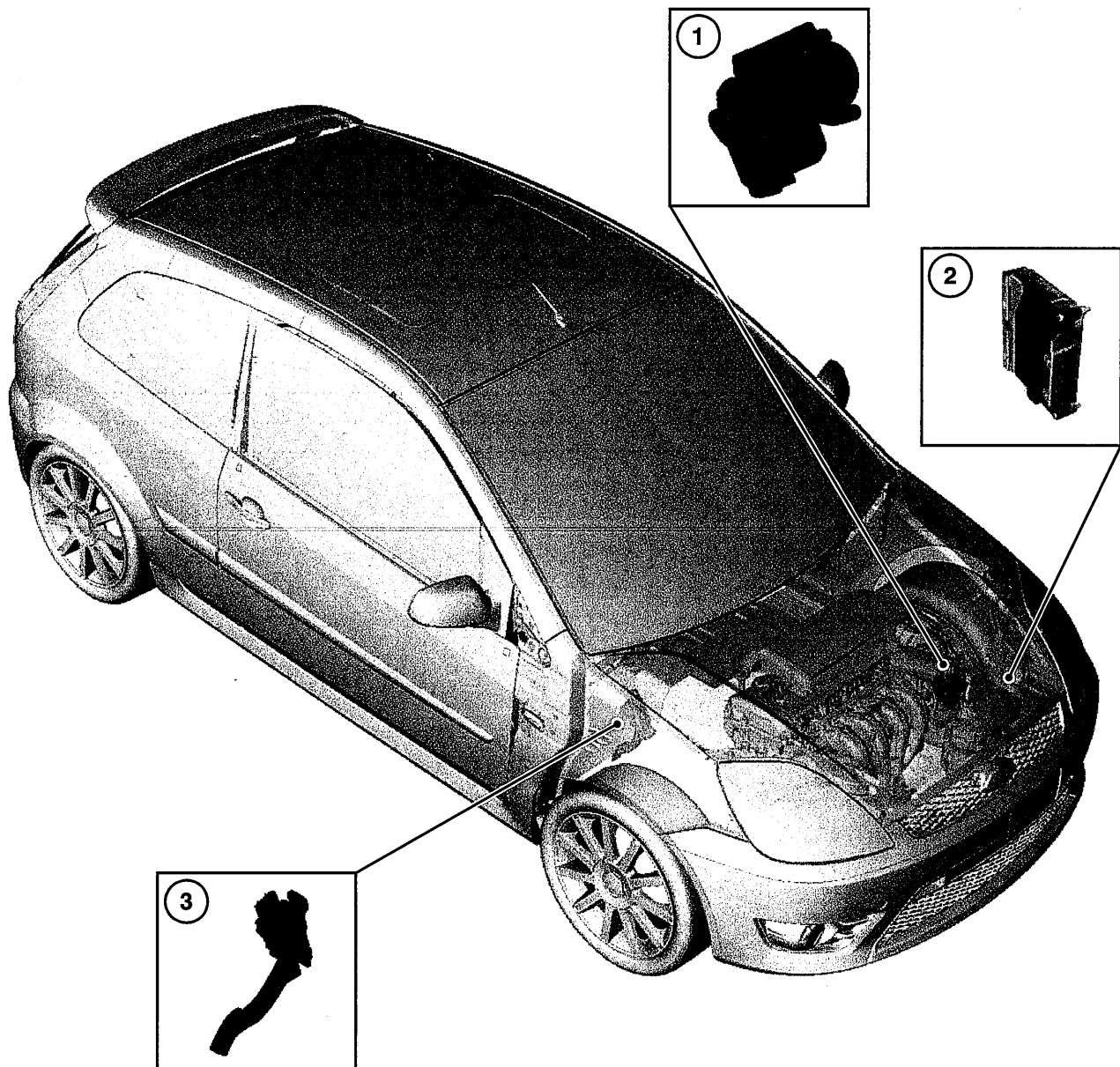
Symptom	Possible Sources	Action
Accelerator pedal is hard to depress or has a rough/raspy or sticky feel	Accelerator pedal incorrectly installed.	CHECK the accelerator pedal for correct installation.
	Worn or damaged accelerator pedal.	INSTALL a new accelerator pedal.
Accelerator pedal does not return freely	Accelerator pedal incorrectly installed.	CHECK the accelerator pedal for correct installation.
	Worn or damaged accelerator pedal.	INSTALL a new accelerator pedal.
High engine idle speed	Damaged accelerator pedal.	REFER to WDS to diagnose the system.
	Throttle body.	REFER to WDS to diagnose the system.
	PCM calibration.	REFER to WDS to diagnose the system.
Poor idling	Throttle body.	REFER to WDS to diagnose the system.
	PCM calibration.	REFER to WDS to diagnose the system.



SECTION 310-02B Acceleration Control — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Acceleration Control.....	310-02B-2
DIAGNOSIS AND TESTING	
Acceleration Control.....	310-02B-4
Inspection and Verification.....	310-02B-4
Symptom Chart.....	310-02B-4

DESCRIPTION AND OPERATION**Acceleration Control**

E58380

Item	Description
1	Throttle body
2	Powertrain control module (PCM)
3	Accelerator pedal

The accelerator pedal incorporates two sensors, accelerator pedal position (APP) sensor 1, and APP sensor 2. Movement of the accelerator pedal generates a percentage of reference voltage (0-5V)

on APP sensor 1 and a percentage of duty-cycle output on APP sensor 2 corresponding to that accelerator pedal position.

The PCM reads the output from both the APP sensors and converts the signals into a driver requested torque. To achieve the driver requested torque, the PCM controls the position of the throttle plate, ignition timing and fuel injection timing to produce the appropriate demanded engine torque output. The PCM monitors the actual throttle plate

DESCRIPTION AND OPERATION

position from the throttle position (TP) sensors to make sure that the requested position has been achieved.

NOTE: Do not install a new accelerator pedal unless a relevant accelerator pedal DTC has been stored in the PCM. For additional information refer to WDS.

The accelerator pedal is a non-serviceable component which cannot be adjusted and therefore must not be disassembled or tampered with.

The throttle body is directly controlled by the PCM and has two TP sensors, TP 1 and TP 2. The TP sensors output a voltage to the PCM that corresponds to the actual throttle plate position. When the throttle body motor is not being powered up, the throttle plate sits open at approximately 8 degrees from the closed in-bore position. This position (also referred to as the default position), is maintained within the throttle body by two internal compression return springs acting in opposing directions, these springs are a non-serviceable item.

The PCM continuously monitors both APP sensors and both TP sensors to make sure that the system is functioning as expected. All acceleration control system concerns will be detected by the PCM and the appropriate diagnostic trouble code (DTC) set. The malfunction indicator lamp (MIL), located in the instrument cluster will also be illuminated if a concern is apparent. As the acceleration control system is of a safety-critical nature, it is possible that a system concern will result in a reduced vehicle performance and a DTC stored in the PCM. For additional information refer to WDS.

DIAGNOSIS AND TESTING**Acceleration Control****Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to Symptom Chart.

Visual Inspection Chart

Mechanical	Electrical
– Accelerator pedal – Electronic throttle body	• Fuse(s) • Wiring harness(s) • Electrical connector(s) • Accelerator pedal • Electronic throttle body • Powertrain control module (PCM)

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Accelerator pedal is hard to depress or has a rough/raspy or sticky feel	• Adjacent hardware, wiring harness(s), trim(s), carpet or mat(s) incorrectly installed.	• CHECK the accelerator pedal and adjacent parts for correct installation.
	• Worn or damaged accelerator pedal.	• INSTALL a new accelerator pedal.
• Accelerator pedal does not return freely	• Adjacent hardware, wiring harness(s), trim(s), carpet or mat(s) incorrectly installed.	• CHECK the accelerator pedal and adjacent parts for correct installation.
	• Worn or damaged accelerator pedal.	• INSTALL a new accelerator pedal.
• High engine idle speed	• Damaged accelerator pedal.	• REFER to WDS to diagnose the system.
	• Electronic throttle body.	• REFER to WDS to diagnose the system.
	• PCM calibration.	• REFER to WDS to diagnose the system.
• Poor idling	• Electronic throttle body.	• REFER to WDS to diagnose the system.
	• PCM calibration.	• REFER to WDS to diagnose the system.

SECTION 206-05 Parking Brake and Actuation

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

Parking Brake Switch.....	206-05-2
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C-340

TO PARKING BRAKE SWITCH

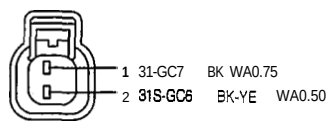
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SECTION 206-06 Hydraulic Brake Actuation

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Low Brake Fluid Warning Indicator Switch.....	206-06-2





XR3T-14A464-AA

C-305

TO **BRAKE** FLUIDLEVEL SWITCH

HARNES 14401

SECTION 206-09A Anti-Lock Control

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

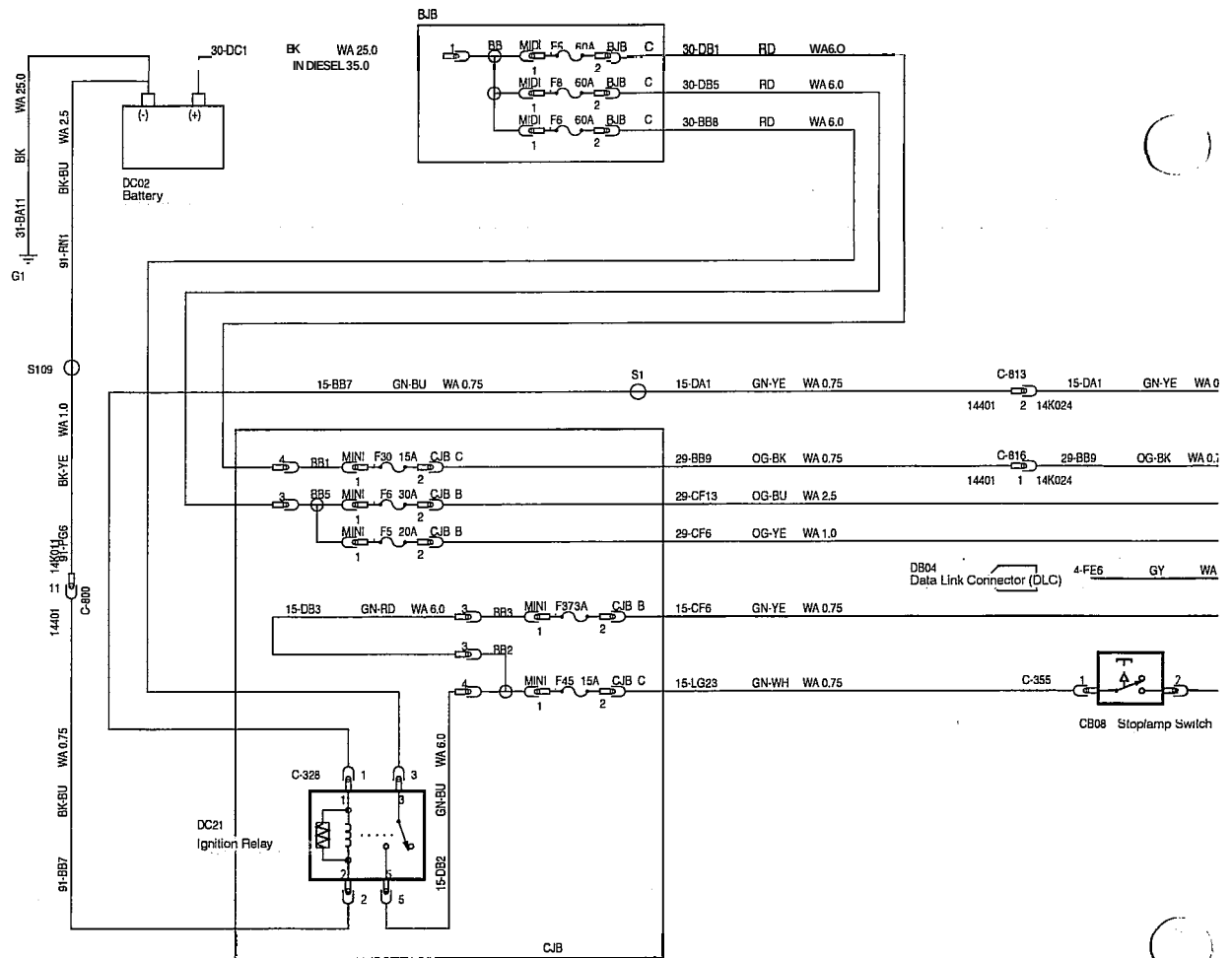
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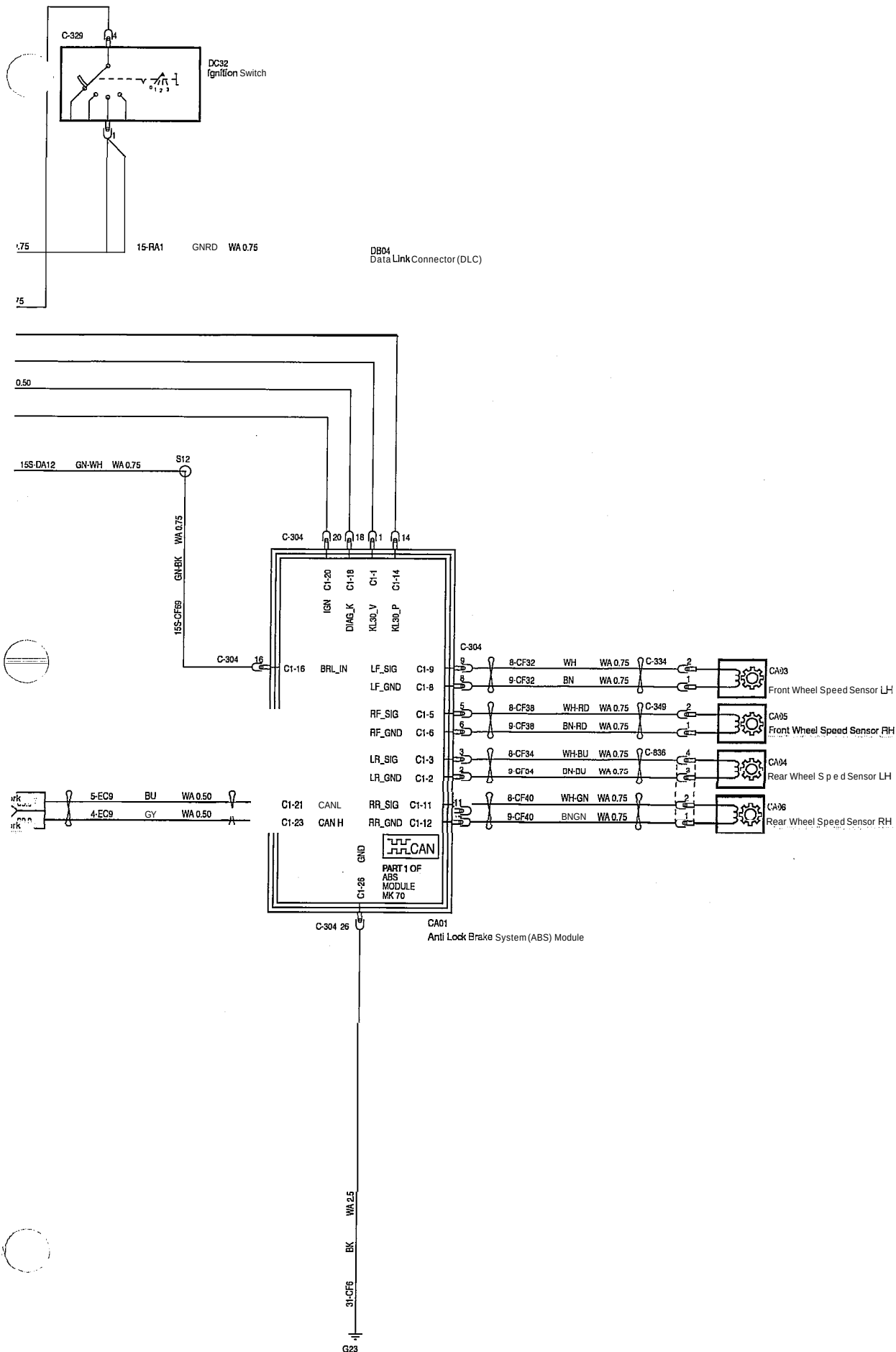
Anti-Lock Control..... 206-09A-2

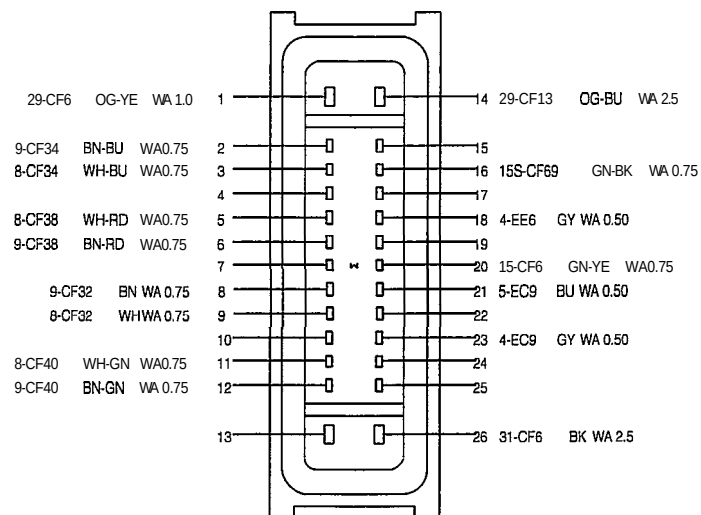
CONNECTORS

Anti-Lock Brake System (ABS) Module..... 206-09A-4
Front Wheel Speed Sensor LH..... 206-09A-5
Front Wheel Speed Sensor RH..... 206-09A-6
Anti-Lock Brake System (ABS) Module..... 206-09A-7

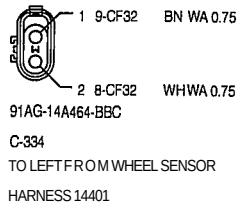


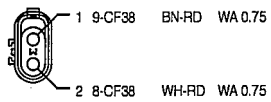
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 TO ABS MODULE MK70
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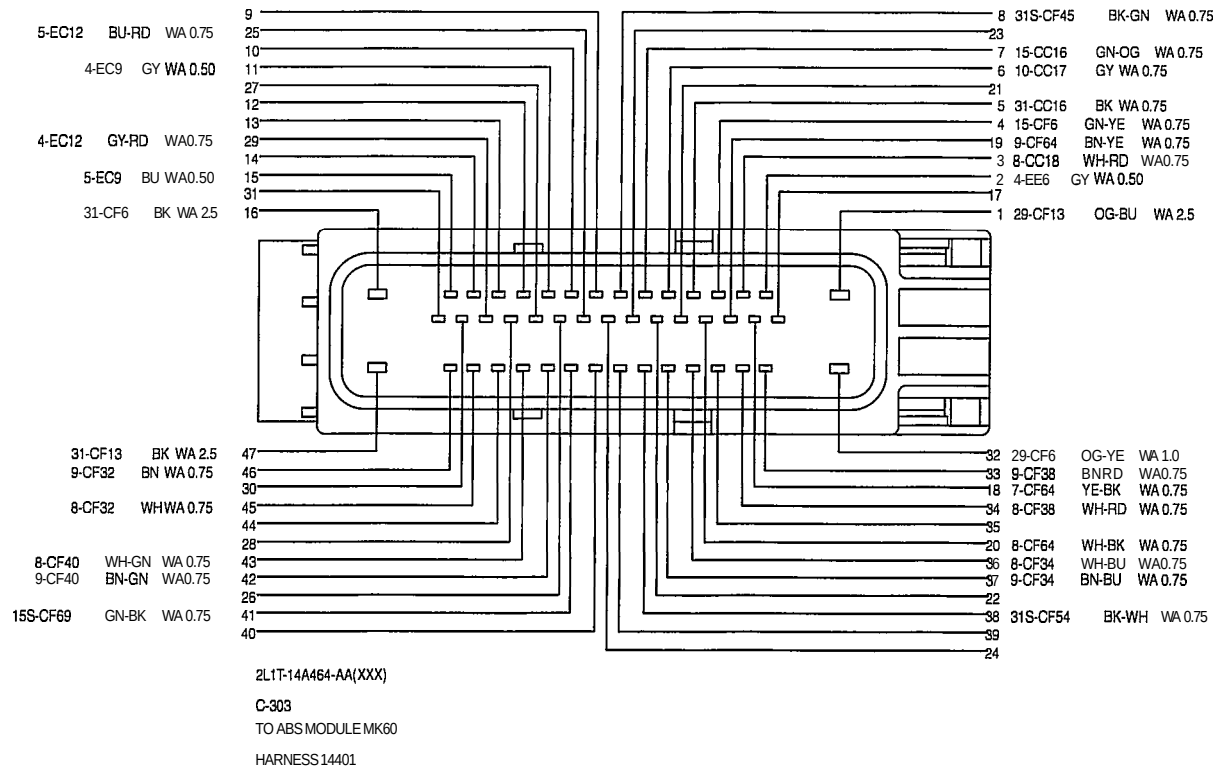


91AG-14A464-BBC

C-349

TO RIGHT FRONT WHEEL SENSOR

HARNESS 14401

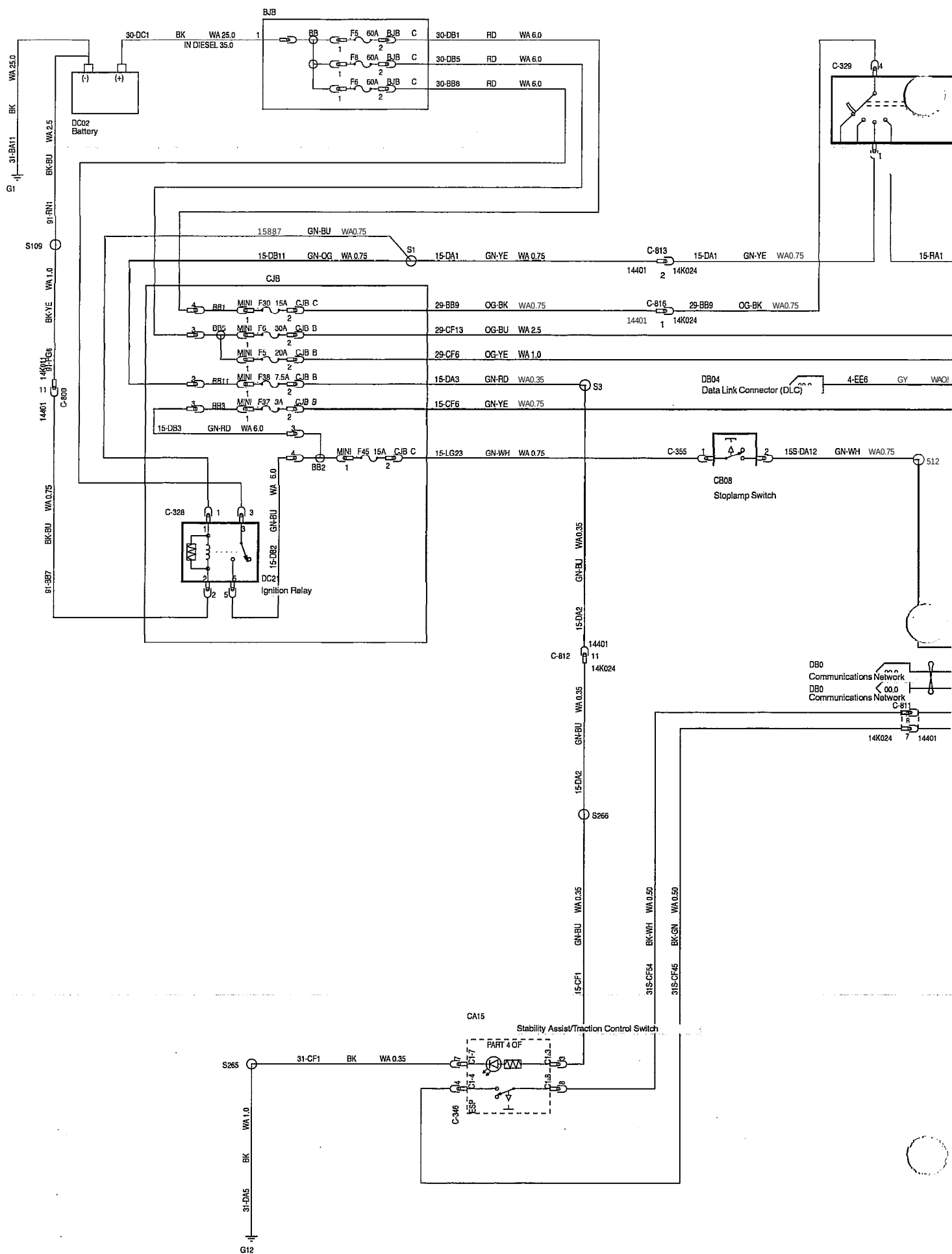


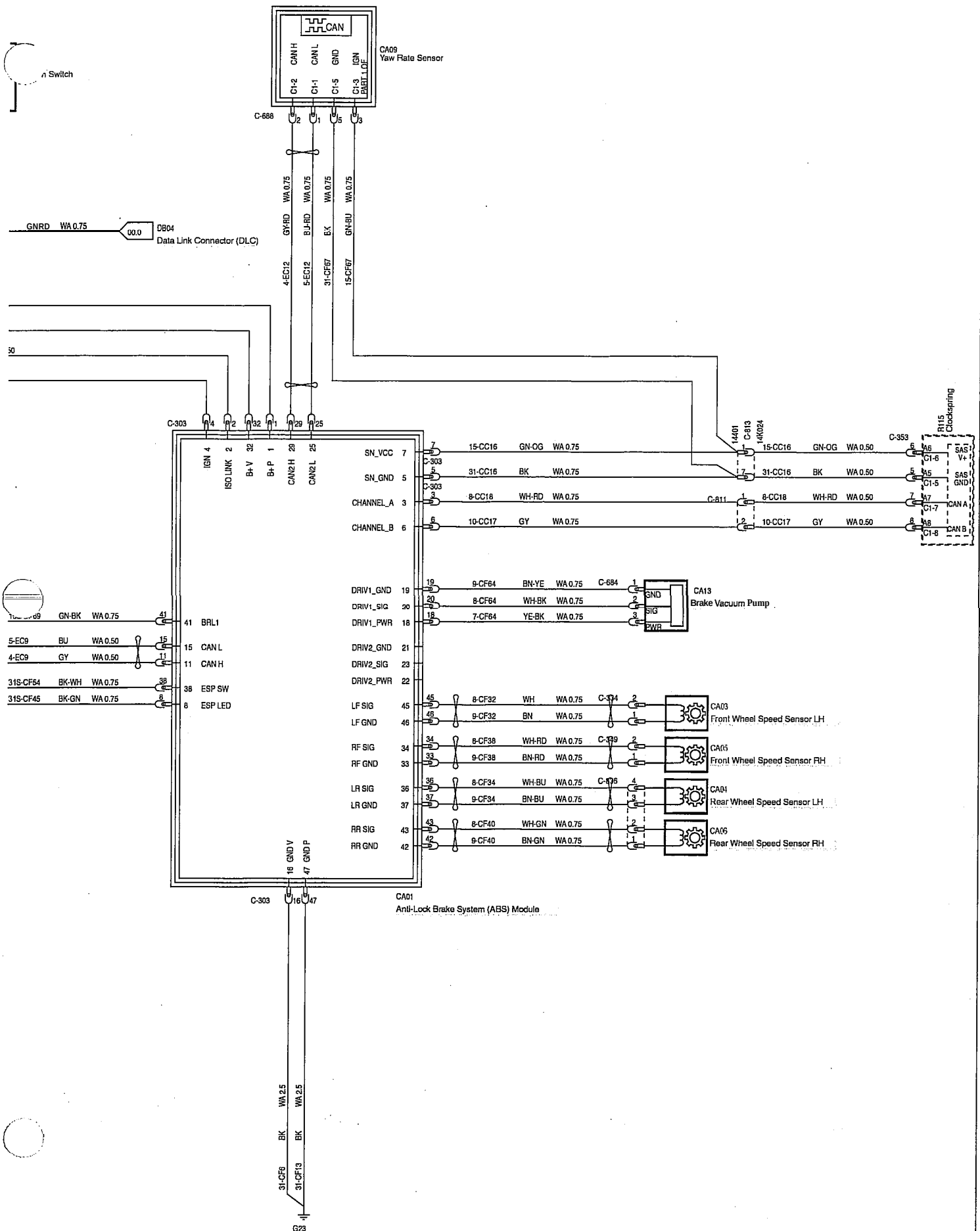


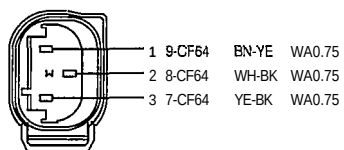
SECTION 206-09B Anti-Lock Control - Stability Assist

VEHICLE APPLICATION:2006.0 Fiesta

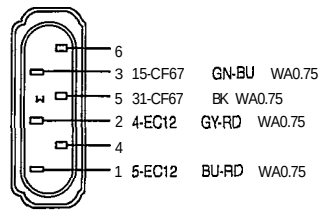
CONTENTS	PAGE
SCHEMATICS	
Anti-Lock Control - Stability Assist.....	206-09B-2
CONNECTORS	
Brake Master Cylinder Primary Pressure Transducer.....	206-09B-4
Yaw Rate Sensor.....	206-09B-5







98AG-14A464-RCA
C-684
TO PRIMARY BRAKE PRESSURE SENSOR
HARNESS 14401



98AG-14A464-RFA

C-688

TO YAWRATE ACCELERATION

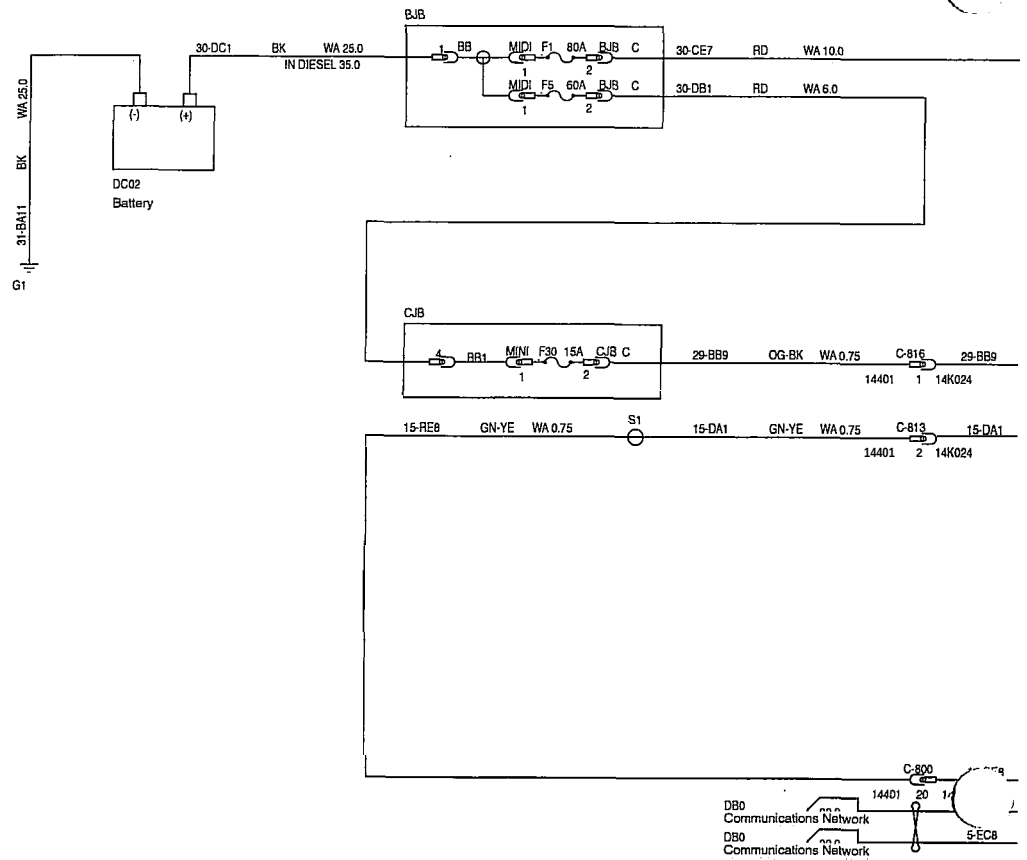
HARNESS14401

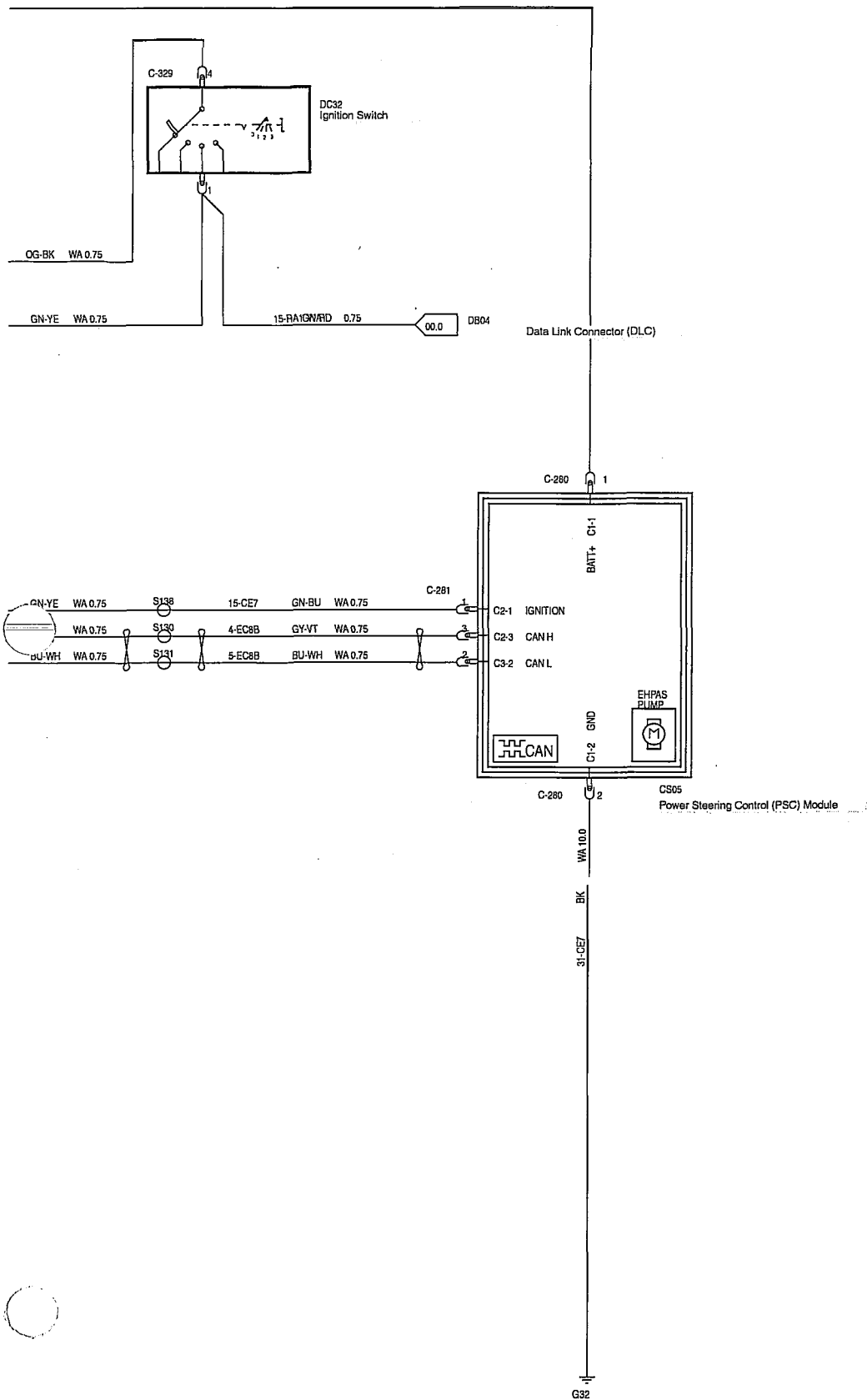


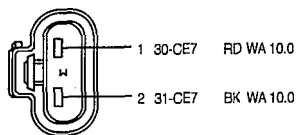
SECTION 211-02 Power Steering

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SCHEMATICS	
Electro-Hydraulic Power Steering (EHPS).....	211-02-2
CONNECTORS	
Power Steering Control (PSC) Module.....	211-02-4
Power Steering Control (PSC) Module.....	211-02-5





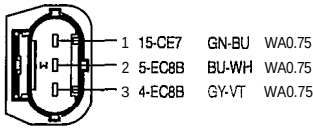


256T-14A464-HBC

C-280

TO EHPAS MODULE

HARNESS 14K011



3M5T-14A464-GCC

C-281

TO EHPAS MODULE

HARNESS 14K011



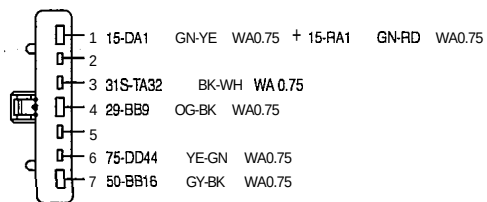


SECTION 211-05 Steering Column Switches

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Ignition Switch.....	211-05-2
Steering Column Multifunction Switch.....	211-05-3
Hazard Flasher Switch.....	211-05-4
Ignition Relay.....	211-05-5
Hazard Flasher Switch.....	211-05-6

PIN 1 => 15-RA1 GN-RD0.75 WA + 15-DA1 GN-YE0.75 WA

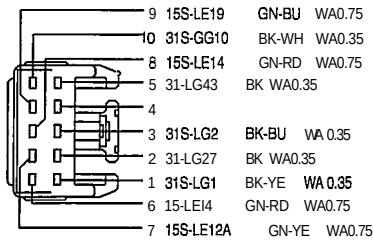


98AG-14489-ZGB

C-329

TO IGNITION SWITCH

HARNESS 14K024

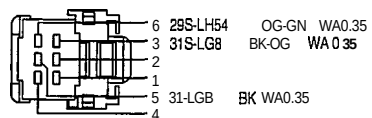


4S7T-14489-VJA

C-357

TO MULTIFUNCTION SIGNAL SWITCH

HARNESS14K024



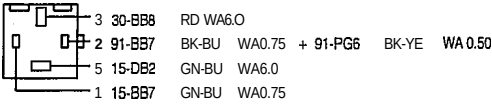
2S6T-14489-FA

C-321

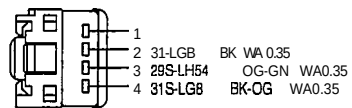
TO HAZARD SWITCH

HARNESS 14K024

PIN2 => 91-PG6 BK-YE 0.50 WA + 91-BB7 BK-BU 0.75 WA



2S6T-14A481-CB
C-328
TO IGNITION RELAY
HARNESS 14401



1L2T-14489-GB

C-341

TO HAZARD SWITCH

HARNESS 14K024

SECTION 303-03A Engine Cooling — 1.4L Duratorq-TDCi (DV) Diesel

VEHICLE APPLICATION:2006.0 Fiesta

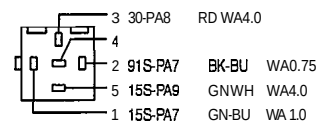
CONTENTS

PAGE

CONNECTORS

Cooling Fan Relay.....	303-03A-2
Cooling Fan Resistor.....	303-03A-3
High Speed Cooling Fan Relay.....	303-03A-4
Cooling Fan Motor.....	303-03A-5

PIN 1 => 15S-PA7 GN-BU 0.75 WA
PIN 5 => 15S-PA6 GN-YE 4.0 WA

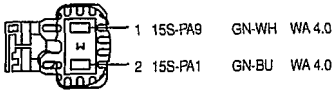


2S6T-14A481-BA

G407

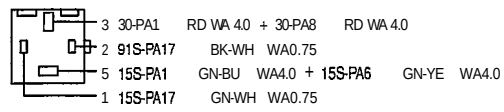
TO ENGINE COOLING FAN RELAY

HARNESS 14401 OR 12A522



94BG-14A464-ABA
C-408
TO ENGINE COOLINGFAN RESISTOR
HARNES14K011

PIN3 => 30-PA8 RD 4.0 WA + 30-PA1 RD 4.0 WA
PIN5 => 15S-PA6 GN-YE 4.0 WA + 15S-PA1 GNBU 4.0 WA



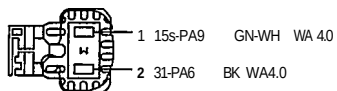
2S6T-14A481-C8

G412

TO HIGH SPEED ENGINE COOLING FAN RELAY

HARNESS 14K011 OR 12A522

PIN 1 => 15s-PA6 GN-YE 4.0 WA



94BG-14A464-ABA

C-406

TO ENGINE COOLING FAN MOTOR (A/C)

HARNESS 14K011 OR 12A522

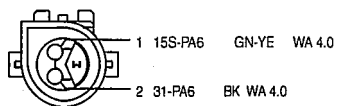




SECTION 303-03B Engine Cooling — 2.0L Duratec-HE

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Cooling Fan Motor.....	303-03B-2



89FG-14A464-EBA

C419

TO ENGINE COOLING FAN MOTOR (LESS A/C)

HARNESS14K011

**SECTION 303-03C Engine Cooling — 1.6L
Duratorq-TDCi (DV) Diesel**

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Cooling Fan Relay.....	303-03C-2
Cooling Fan Resistor.....	303-03C-3
High Speed Cooling Fan Relay.....	303-03C-4
Cooling Fan Motor.....	303-03C-5

303-03C-2 Cooling Fan Relay
Information not available at this time

303-03C-3 Cooling Fan Resistor
Information not available at this time



303-03C-4 High Speed Cooling Fan Relay
Information not available at this time

303-03C-5 Cooling Fan Motor
Information not available at this time





SECTION 303-04A Fuel Charging and Controls — 1.3L Duratec-8V (Rocam)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Fuel Pressure Regulator.....	303-04A-2
Fuel Injector 1.....	303-04A-3
Fuel Injector 2.....	303-04A-4
Fuel Injector 3.....	303-04A-5
Fuel Injector 4.....	303-04A-6

303-04A-2 Fuel Pressure Regulator
Information not available at this time

303-04A-3 Fuel Injector 1
Information not available at this time



303-04A-4 Fuel Injector 2
Information not available at this time

303-04A-5 Fuel Injector 3
Information not available at this time



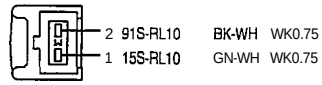
303-04A-6 Fuel Injector⁴

Information not available at this time

**SECTION 303-04B Fuel Charging and Controls — 1.25L
Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L
Duratec-I6V (Sigma)**

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Fuel Injector 1.....	303-04B-2
Fuel Injector 2.....	303-04B-3
Fuel Injector 3.....	303-04B-4
Fuel Injector 4.....	303-04B-5
Fuel Pressure Regulator.....	303-04B-6
Fuel Injector 1.....	303-04B-7
Fuel Injector 2.....	303-04B-8
Fuel Injector 3.....	303-04B-9
Fuel Injector 4.....	303-04B-10

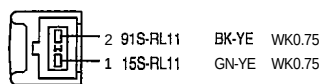


97AG-14A464-HBA

G765

TO INJECTOR1 VALVE SOLENOID (1.3)

HARNESS 9H589



97AG-14A464-HBA

C-766

TO INJECTOR 2 VALVE SOLENOID (1.3)

HARNESS 9H589



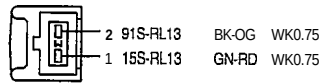
2	91S-RL12	BK-BU	WK0.75
1	15S-RL12	GN-BU	WK0.75

97AG-14A464-HBA

6767

TO INJECTOR 3 VALVE SOLENOID (1.3)

HARNESS 9H589

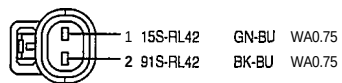


97AG-14A464-HBA

C-768

TO INJECTOR 4 VALVE SOLENOID (1.3)

HARNESS 9H589

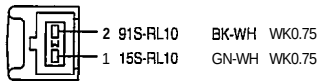


2S6T-14A464-DNA

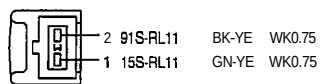
C-705

TO FUEL PRESSURE REGULATOR

HARNES14K011



97AG-14A464-KBA
G479
TO INJECTOR 1 VALVE SOLENOID(1.4/1.6)
HARNES9H589

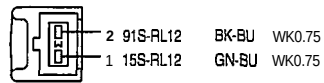


97AG-14A464-KBA

C-480

TO INJECTOR 2 VALVE SOLENOID (1.411.6)

HARNESS 9H589



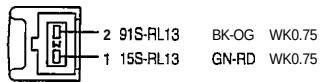
97AG-14A464-KBA

C-481

TO INJECTOR 3 VALVE SOLENOID (1.4/1.6)

HARNESS9H589





97AG-14A464-KBA

C-482

TO INJECTOR 4 VALVE SOLENOID (1.411.6)

HARNESS 9H589

**SECTION 303-04C Fuel Charging and Controls — 1.4L
Duratorq-TDCi (DV) Diesel**

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Fuel Pressure Regulator.....	303-04C-2
Fuel Injector 1.....	303-04C-3
Fuel Injector 2.....	303-04C-4
Fuel Injector 3.....	303-04C-5
Fuel Injector 4.....	303-04C-6
Fuel Metering Valve.....	303-04C-7
Fuel Heater.....	303-04C-8

303-04C-2 Fuel Pressure Regulator
Information not available at this time

303-04C-3 Fuel Injector 1
Information not available at this time



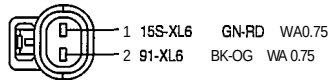
303-04C-4 Fuel Injector 2

Information not available at this time

303-04C-5 Fuel Injector 3
Information not available at this time



303-04C-6 Fuel Injector 4
Information not available at this time

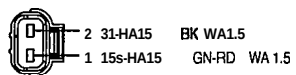


2S6T-14A464-DJA

C-455

TO INTAKE AIR THROTTLE VALVE SOLENOID (DIESEL IV EOB)

HARNESS14K011



1M5T-14A464-FCA

C-655

TO DIESEL FUEL HEATER

HARNESS 14K011

SECTION 303-04D Fuel Charging and Controls - Turbocharger — 1.4L Duratorq-TDCi (DV) Diesel

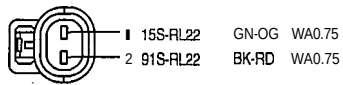
VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

Turbocharger Variable Vane Actuator..... 303-04D-2



2S6T-14A464-DLA

G749

TO VARIABLE TURBO CONTROL VALVE SOLONOID

HARNESS14K011

SECTION 303-04E Fuel Charging and Controls — 2.0L
Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Fuel Injector	303-04E-2
Fuel Injector 2.....	303-04E-3
Fuel Injector 3.....	303-04E-4
Fuel Injector 4.....	303-04E-5



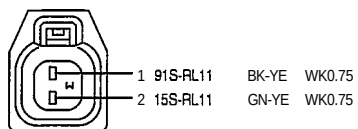
- | | | | |
|---|----------|-------|--------|
| 1 | 91S-RL10 | BK-WH | WK0.75 |
| 2 | 15S-RL10 | GN-WH | WK0.75 |

1X4T-14A464-AAB

C-261

TO INJECTOR 1 VALVE SOLENOID (ST150)

HARNESS 12A522



1X4T-14A464-AAB

C-262

TO INJECTOR 2 VALVE SOLENOID (ST150)

HARNESS 12A522





- | | | | |
|---|----------|-------|--------|
| 1 | 91S-RL12 | BK-BU | WK0.75 |
| 2 | 15S-RL12 | GN-BU | WK0.75 |

1X4T-14A464-AAB

C-263

TO INJECTOR 3 VALVE SOLENOID (ST150)

HARNESS 12A522



1	91S-RL13	BK-OG	WK0.75
2	15S-RL13	GN-RD	WK0.75

1X4T-14A464-AAB

C-264

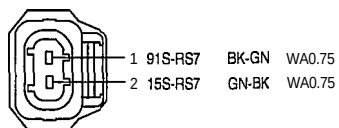
TO INJECTOR 4 VALVE SOLENOID (ST150)

HARNES12A522

SECTION 303-04F Fuel Charging and Controls — 1.6L Duratorq-TDCi (DV) Diesel

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Fuel Metering Valve.....	303-04F-2
Fuel Metering Valve.....	303-04F-3
Fuel Injector 1.....	303-04F-4
Fuel Injector 2.....	303-04F-5
Fuel Injector 3.....	303-04F-6
Fuel Injector 4.....	303-04F-7



1L2T-14A464-TA

C242

TO FUEL PUMP METERING UNIT

HARNESS 14K011



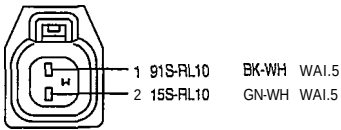
1	15S-RL50	GN-BU	WA0.75
2	91S-RL50	BK-BU	WA0.75

2S6T-14A464-DPA

G704

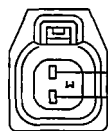
TO FUEL FLOW REGULATOR VALVE SOLENOID

HARNESS14K011



3S7T-14A464-BA_DUMMY
C-270
TO INJECTOR 1 VALVE SOLONOID (DV6)
HARNESS 14K01





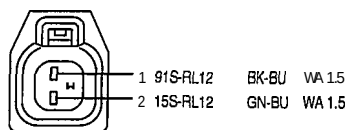
- | | | | |
|---|----------|-------|--------|
| 1 | 91S-RL11 | BK-YE | WA 1.5 |
| 2 | 15S-RL11 | GN-YE | WA 1.5 |

3S7T-14A464-BA_DUMMY

C-271

TO INJECTOR 2 VALVE SOLONOID (DV6)

HARNESS 14K011



3S7T-14A464-BA_DUMMY

C272

TO INJECTOR 3 VALVE SOLENOID (DV6)

HARNESS 14K011





- | | | | |
|---|----------|-------|-------|
| 1 | 91S-RL13 | BK-OG | WA1.5 |
| 2 | 15S-RL13 | GN-RD | WA1.5 |

3S7T-14A464-BA_DUMMY

G273

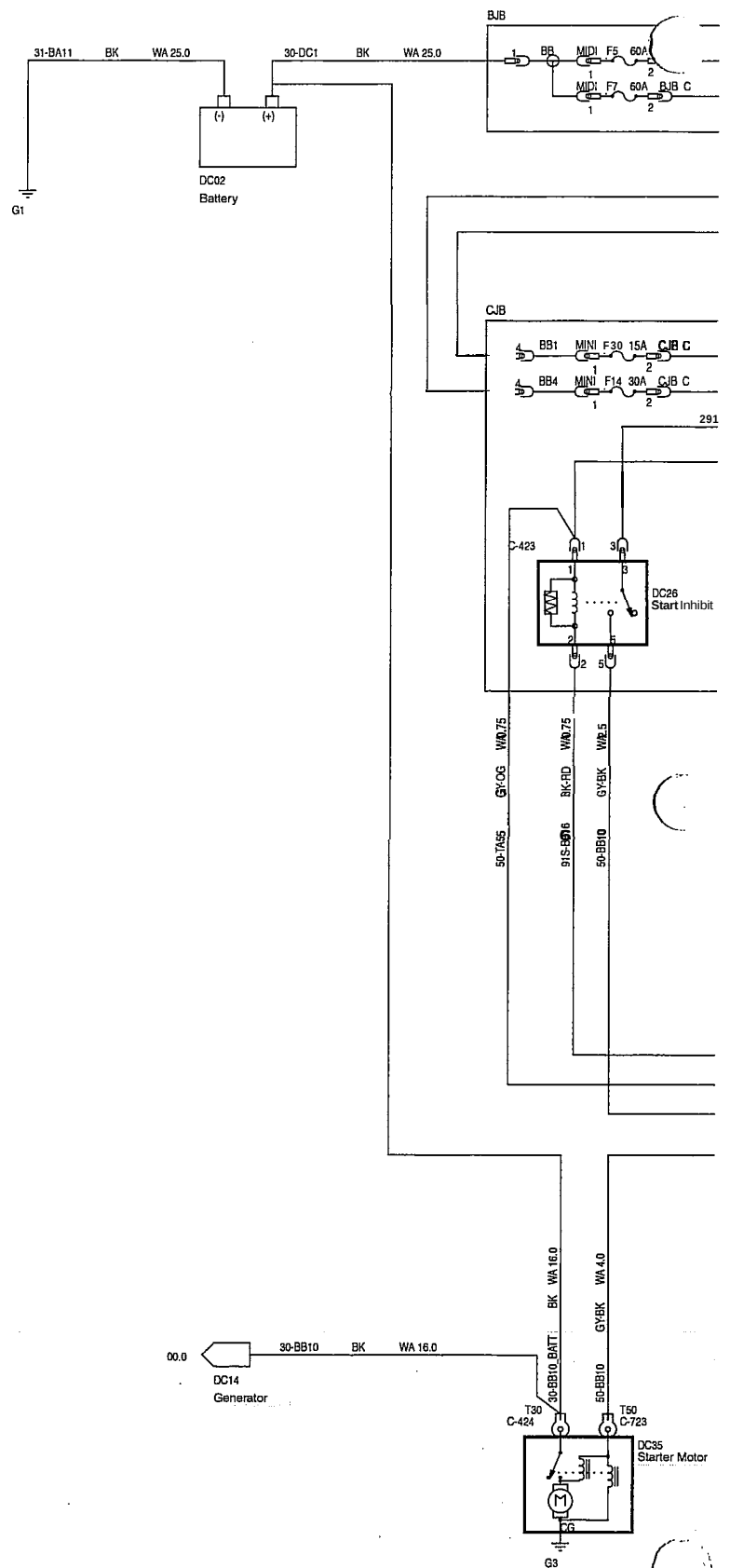
TO INJECTOR 4 VALVE SOLENOID (DV6)

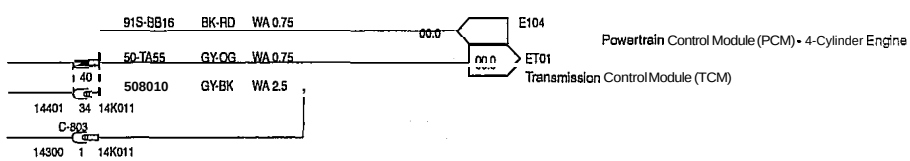
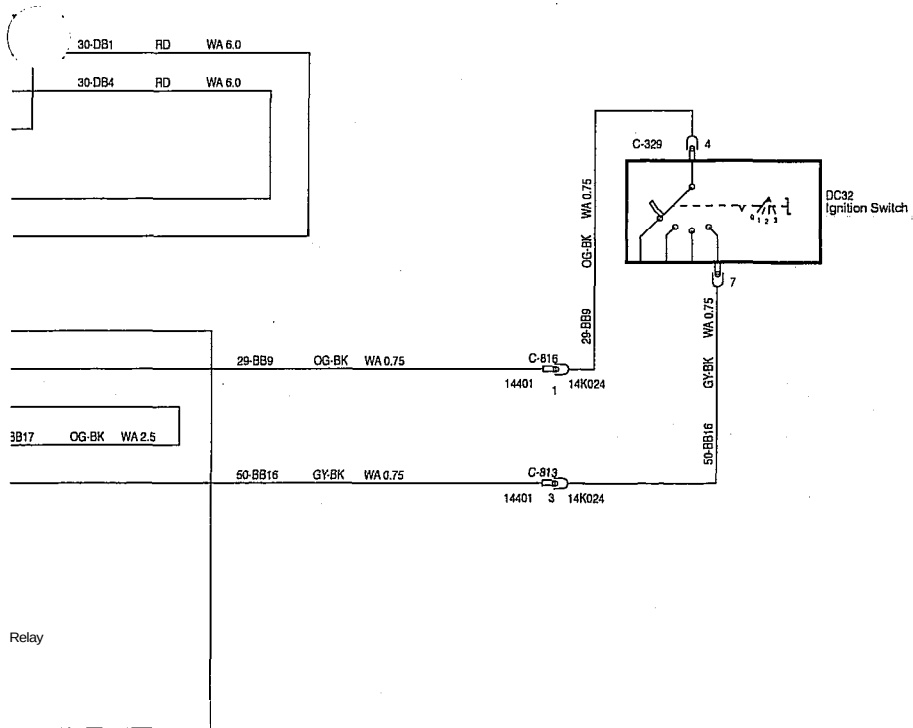
HARNESS 14K011

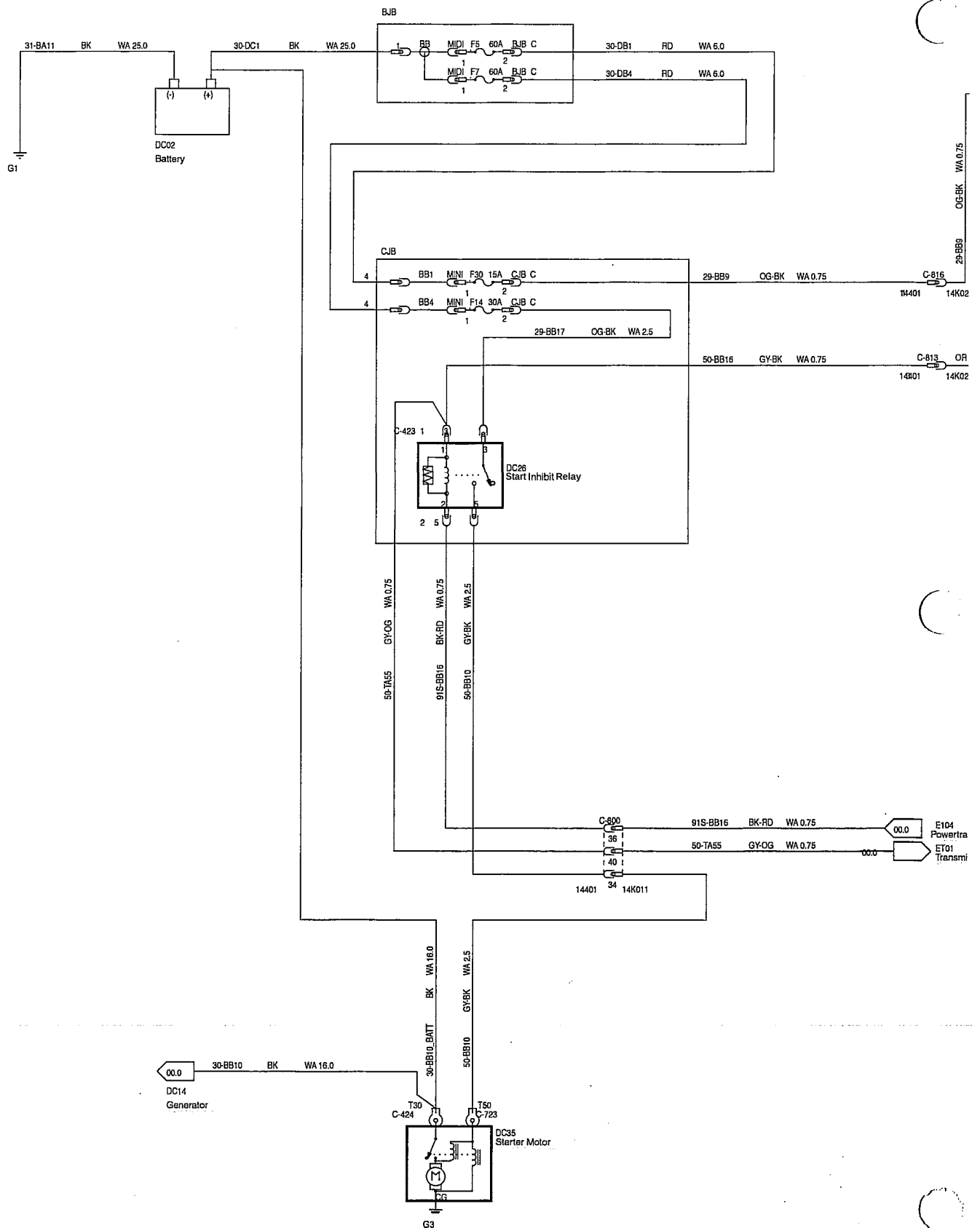
SECTION 303-06 Starting System

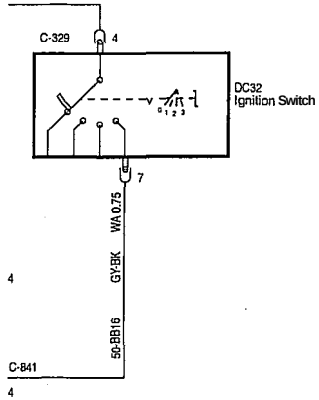
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SCHEMATICS	
Starting System — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-06-2
Starting System — 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel.....	303-06-4
Starting System — Vehicles With: 4-Speed Automatic Transmission (AW81-40).....	303-06-6
CONNECTORS	
Start Inhibit Relay.....	303-06-8
Starter Motor.....	303-06-9
Starter Motor.....	303-06-10

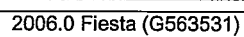


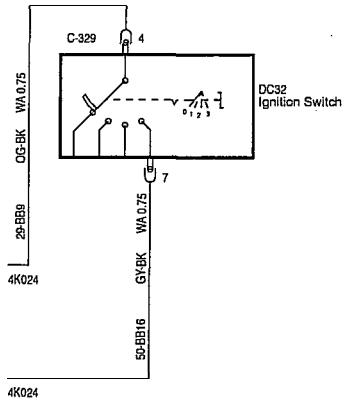






In Control Module (PCM) - 4-Cylinder Engine
 ssion Control Module (TCM)





Transmission Range (TR) Sensor

Transmission Control Module (TCM)

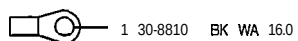
PIN 1 => 50-TA55 GY-OG 0.75 WA + 50-BB16 GY-BK 0.75 WA



C-423

TO STARTER INHIBIT RELAY

HARNESS 14401



1 30-8810 BK WA 16.0

93BB-14463-AB

C-424

TO STARTER MOTOR



 150-BB10 GY-BK WA 4.0

93BB-14463-AB

G723

TO STARTER MOTOR

HARNESS14300

SECTION 303-07A Engine Ignition

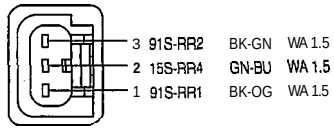
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

Ignition Coil.....	303-07A-2
Ignition Coil.....	303-07A-3

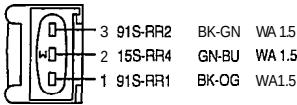


1W7F-14A464-LA

C-330

TO IGNITION TRANSFORMER(SIGMA)

HARNESS 14K011



89FG-14A464-HCB
C247
TO IGNITION TRANSFORMER (SOHC)
HARNESS 14K011

C

C

C

**SECTION 303-07B Glow Plug System — 1.4L
Duratorq-TDCi (DV) Diesel**

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Glow Plug 1.....	303-07B-2
Glow Plug 2.....	303-07B-3
Glow Plug 3.....	303-07B-4
Glow Plug 4.....	303-07B-5
Glow Plug Relay.....	303-07B-6

303-07B-2 Glow Plug 1

Information not available at this time

303-07B-3 Glow Plug 2
Information not available at this time

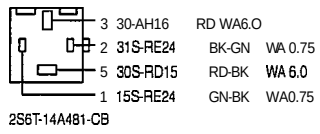


303-07B-4 Glow Plug 3
Information not available at this time

303-07B-5 Glow Plug 4
Information not available at this time



PIN1=> 15S-HA15 GN-RD 1.5 WA t 15S-RE24 GN-BK 1.5 WA



2S6T-14A481-CB

C-452

TO GLOW PLUG RELAY

HARNESS 14K011

SECTION 303-07C Engine Ignition — 2.0L Duratec-HE (MI4)

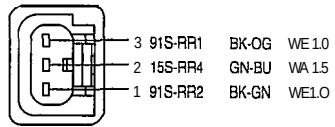
VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

Ignition Coil.....	303-07C-2
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1W7T-14A464-LA

C-246

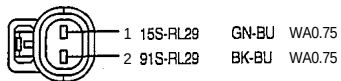
TO IGNITION TRANSFORMER (ST150)

HARNESS 12A522

SECTION 303-08A Engine Emission Control — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Exhaust Gas Recirculation (EGR) Valve.....	303-08A-2
Electronic Exhaust Gas Recirculation (EGR) Valve.....	303-08A-3

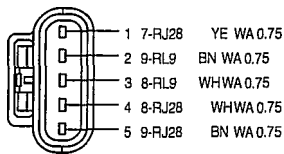


256T-14A464-DKA

C-657

TO VACUUM EGR VALVE SOLENOID

HARNES14K011



4S6T-14A464-FA
C-459
TO ELECTRICAL EGR (DIESEL IV EOBD / DV6)
HARNESS14K011



SECTION 303-08B Engine Emission Control — 1.4L Duratorq-TDCi (DV) Diesel

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

Electronic Exhaust Gas Recirculation (EGR) Valve.....	303-08B-2
---	-----------



303-08B-2 Electronic Exhaust Gas Recirculation (EGR) Valve
Information not available at this time

SECTION 303-08C Engine Emission Control — 2.0L Duratec-HE (MI4)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Electronic Exhaust Gas Recirculation (EGR) Valve.....	303-08C-2
Electronic Exhaust Gas Recirculation (EGR) Valve.....	303-08C-3

303-08C-2 Electronic Exhaust Gas Recirculation (EGR) Valve
Information not available at this time

303-08C-3 Electronic Exhaust Gas Recirculation (**EGR**) Valve
Information not available at this time





SECTION 303-08D Engine Emission Control — 1.6L Duratorq-TDCi (DV) Diesel

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

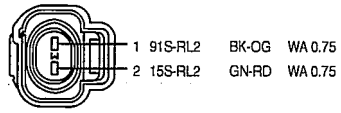
Electronic Exhaust Gas Recirculation (EGR) Valve..... 303-08D-2

303-08D-2 Electronic Exhaust Gas Recirculation (EGR) Valve
Information not available at this time

SECTION 303-13 Evaporative Emissions

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Evaporative Emission Canister Vent Solenoid.....	303-13-2
Evaporative Emission Canister Purge Valve.....	303-13-3

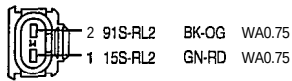


1S7T-14A464-HA

C-622

TO CANISTER PURGE VALVE SOLENOID

HARNESS 14K011 OR 9H589



3S7T-14A464-MA
C-265
TO SONIC PURGE VALVE SOLENOID (ST150)
HARNES 12A522

C

C

C

SECTION 303-14 Electronic Engine Controls

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

SCHEMATICS

Engine Control — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-14-5
Engine Control — 1.4L Duratorq-TDCi (DV) Diesel. VIN Plate Emission Level Code: S....	303-14-9
Engine Control — 1.4L Duratorq-TDCi (DV) Diesel. VIN Plate Emission Level Code: 7....	303-14-13
Engine Control — 1.6L Duratec-16V (Sigma), Vehicles With: Automatic Transmission....	303-14-17
Engine Control — 1.6L Duratorq-TDCi (DV) Diesel.....	303-14-21
Engine Control — 2.0L Duratec-ST (M14).....	303-14-25

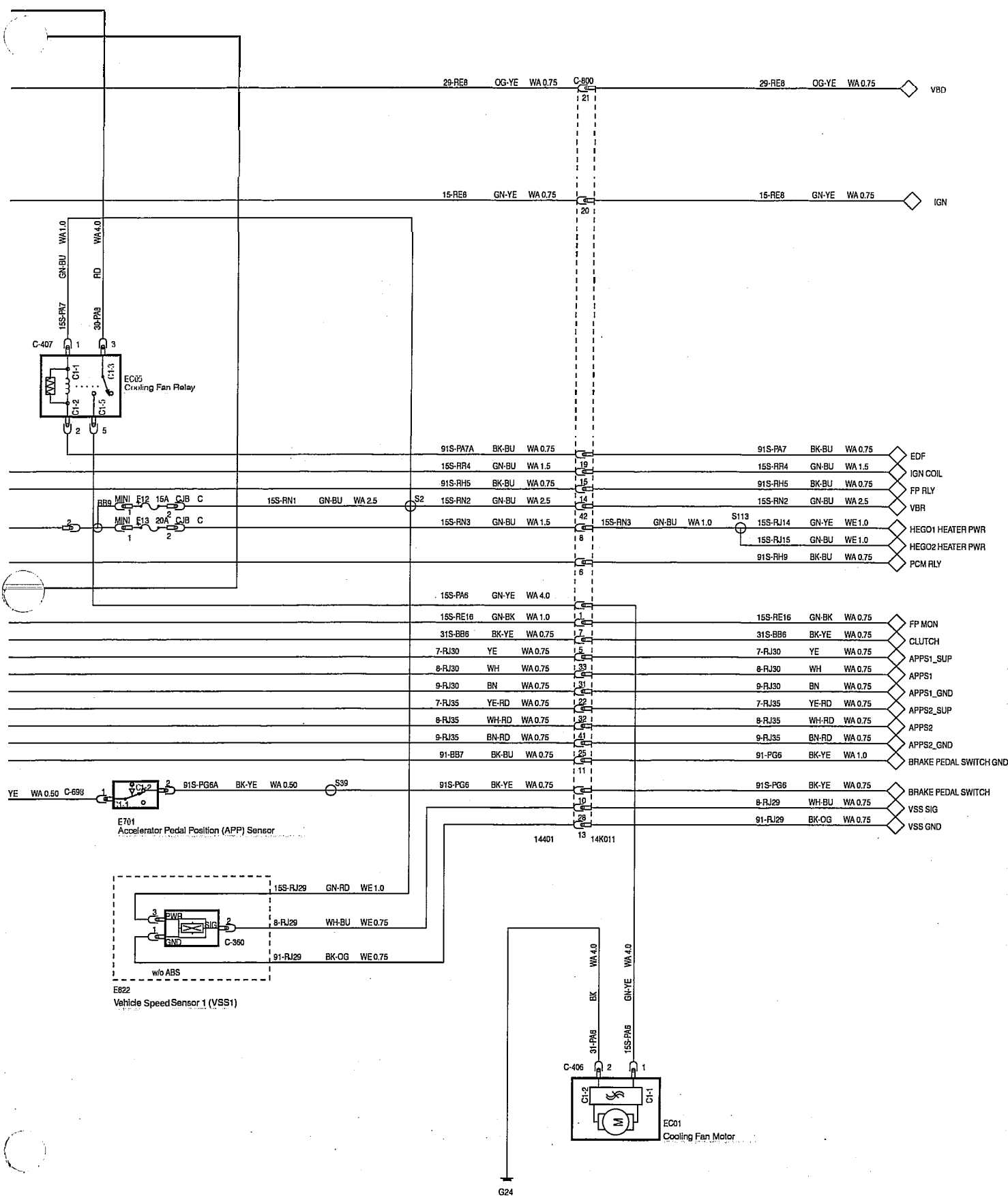
CONNECTORS

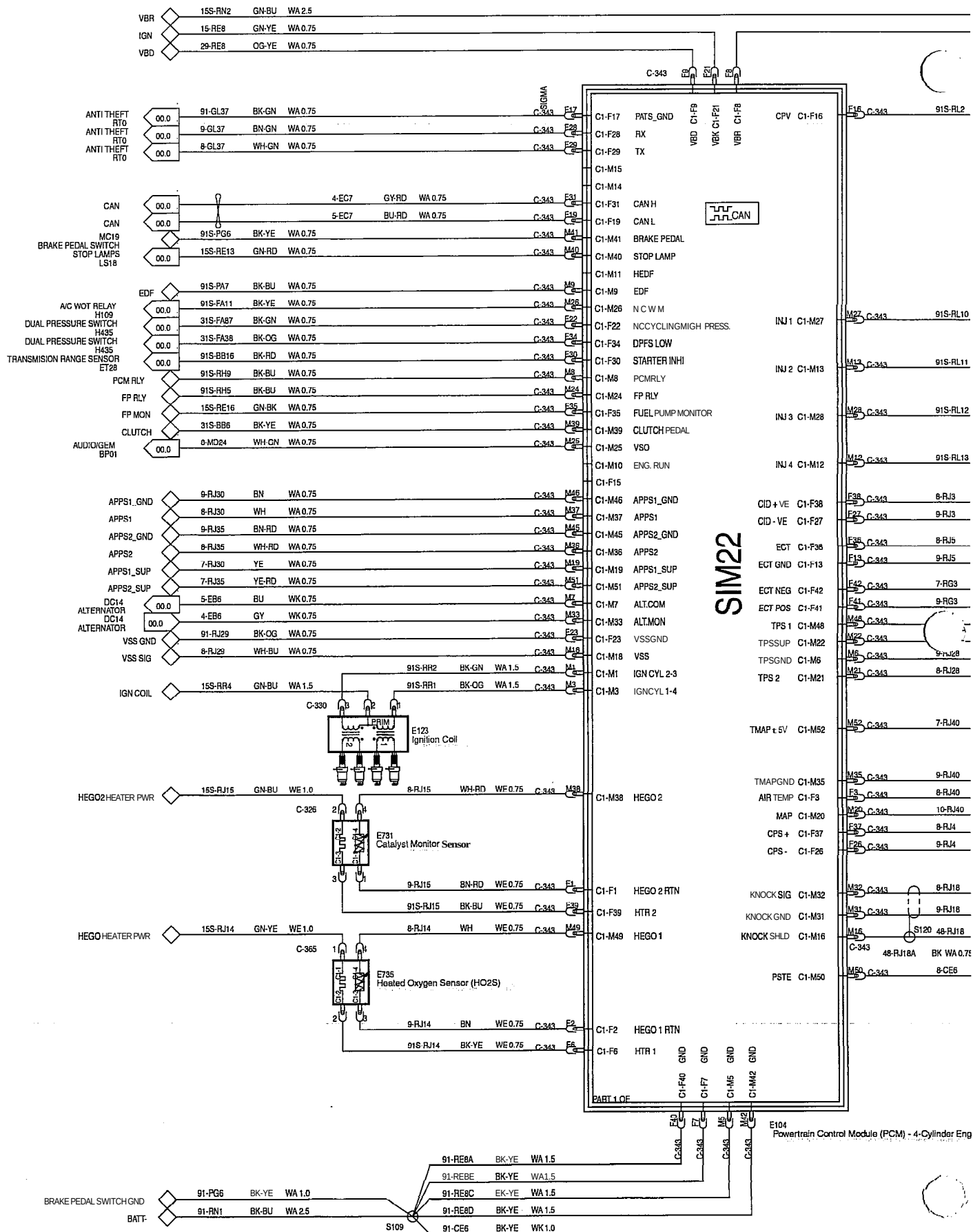
Accelerator Pedal Position (APP) Sensor.....	303-14-27
Turbocharger Boost Pressure Sensor.....	303-14-28
Brake Pedal Position (BPP) Switch.....	303-14-29
Camshaft Position (CMP) Sensor.....	303-14-30
Clutch Pedal Position (CPP) Switch.....	303-14-31
Crankshaft Position (CKP) Sensor.....	303-14-32
Throttle Position (TP) Sensor.....	303-14-33
Engine Coolant Temperature (ECT) Sensor.....	303-14-34
Fuel Rail Pressure (FRP) Sensor — 1.6L Duratorq-TDCi (DV) Diesel.....	303-14-35
Fuel Temperature Sensor.....	303-14-36
Heated Oxygen Sensor 1 (HO2S1) — 1.3L Duratec-8V (Rocam).....	303-14-37
Heated Oxygen Sensor 2 (HO2S2).....	303-14-38
Idle Air Control (IAC) Valve.....	303-14-39
Manifold Absolute Pressure (MAP) Sensor.....	303-14-40
Intake Air Temperature (IAT) Sensor.....	303-14-41
Knock Sensor (KS).....	303-14-42
Mass Air Flow (MAF) Sensor.....	303-14-43
Power Steering Pressure (PSP) Switch.....	303-14-44
Manifold Absolute Pressure (MAP) Sensor.....	303-14-45
Throttle Control Unit.....	303-14-46
Intake Air Temperature (IAT) Sensor.....	303-14-47
Powertrain Control Module (PCM) Relay.....	303-14-48
Powertrain Control Module (PCM) — 1.4L Duratorq-TDCi (DV) Diesel.....	303-14-49
Engine Oil Pressure (EOP) Switch.....	303-14-50
Vehicle Speed Sensor 1 (VSS1).....	303-14-51
Vehicle Speed Sensor 2 (VSS2).....	303-14-52
Heated Oxygen Sensor 1 (HO2S1) — 2.0L Duratec-ST (Zetec).....	303-14-53
Heated Oxygen Sensor 2 (HO2S2) — 2.0L Duratec-ST (Zetec).....	303-14-54
Camshaft Position (CMP) Sensor — 2.0L Duratec-ST (Zetec).....	303-14-55
Powertrain Control Module (PCM).....	303-14-56
Powertrain Control Module (PCM).....	303-14-57
Powertrain Control Module (PCM).....	303-14-58

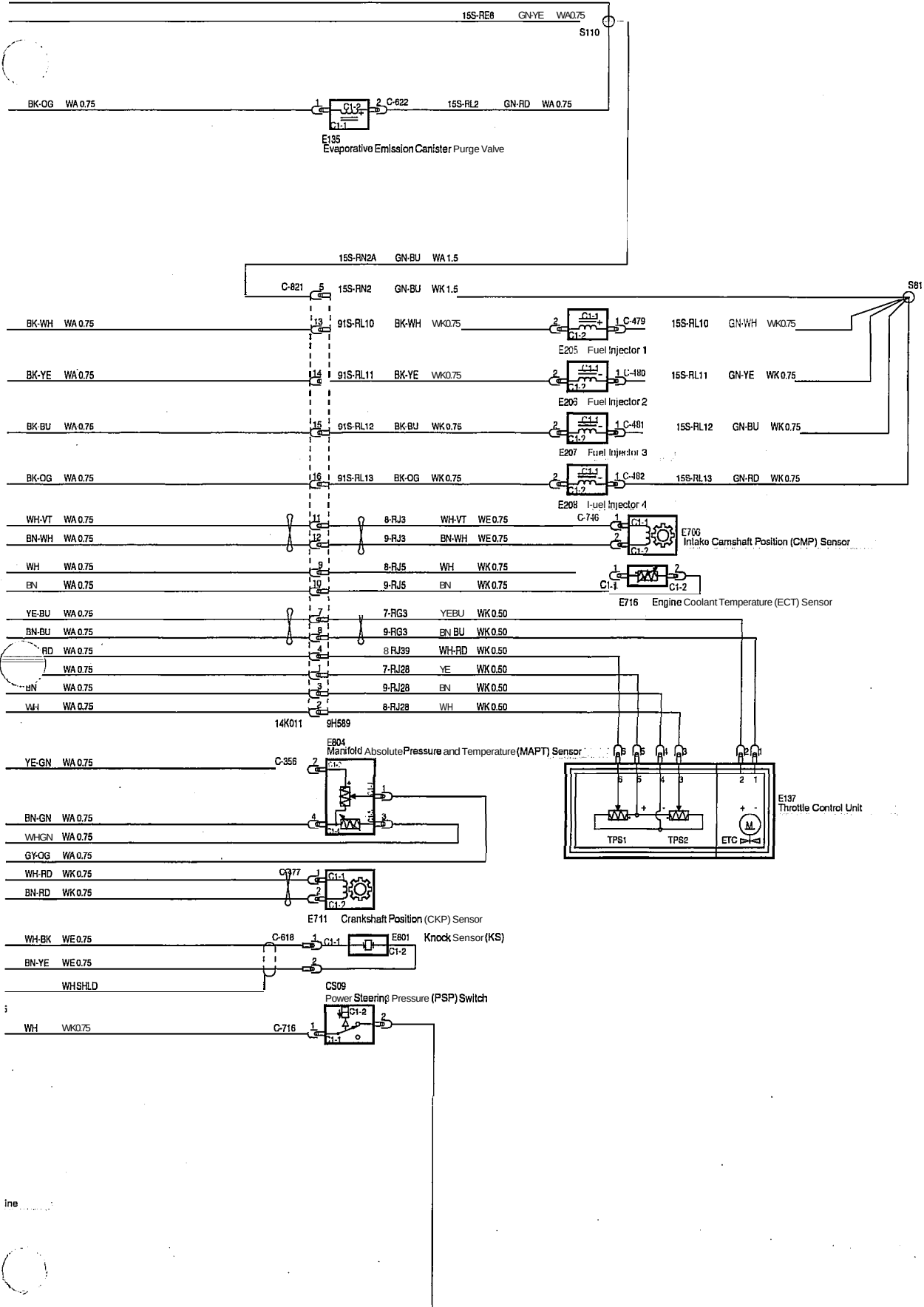
Powertrain Control Module (PCM).....	303-14-59
Powertrain Control Module (PCM).....	303-14-60
Powertrain Control Module (PCM).....	303-14-61
Powertrain Control Module (PCM).....	303-14-62
Powertrain Control Module (PCM).....	303-14-63
Powertrain Control Module (PCM).....	303-14-64
Powertrain Control Module (PCM).....	303-14-65
Powertrain Control Module (PCM).....	303-14-67
Throttle Control Unit.....	303-14-68
Mass Air Flow (MAF) Sensor.....	303-14-69
Engine Oil Pressure (EOP) Switch.....	303-14-70
Engine Oil Pressure (EOP) Switch.....	303-14-71
Engine Coolant Temperature (ECT) Sensor.....	303-14-72
Camshaft Position (CMP) Sensor.....	303-14-73
Camshaft Position (CMP) Sensor.....	303-14-74
Knock Sensor (KS).....	303-14-75
Crankshaft Position (CKP) Sensor.....	303-14-76
Throttle Position (TP) Sensor.....	303-14-77
Crankshaft Position (CKP) Sensor.....	303-14-78
Heated Oxygen Sensor 1 (HO2S1).....	303-14-79
Manifold Absolute Pressure and Temperature (MAPT) Sensor.....	303-14-80
Mass Air Flow (MAF) Sensor.....	303-14-81



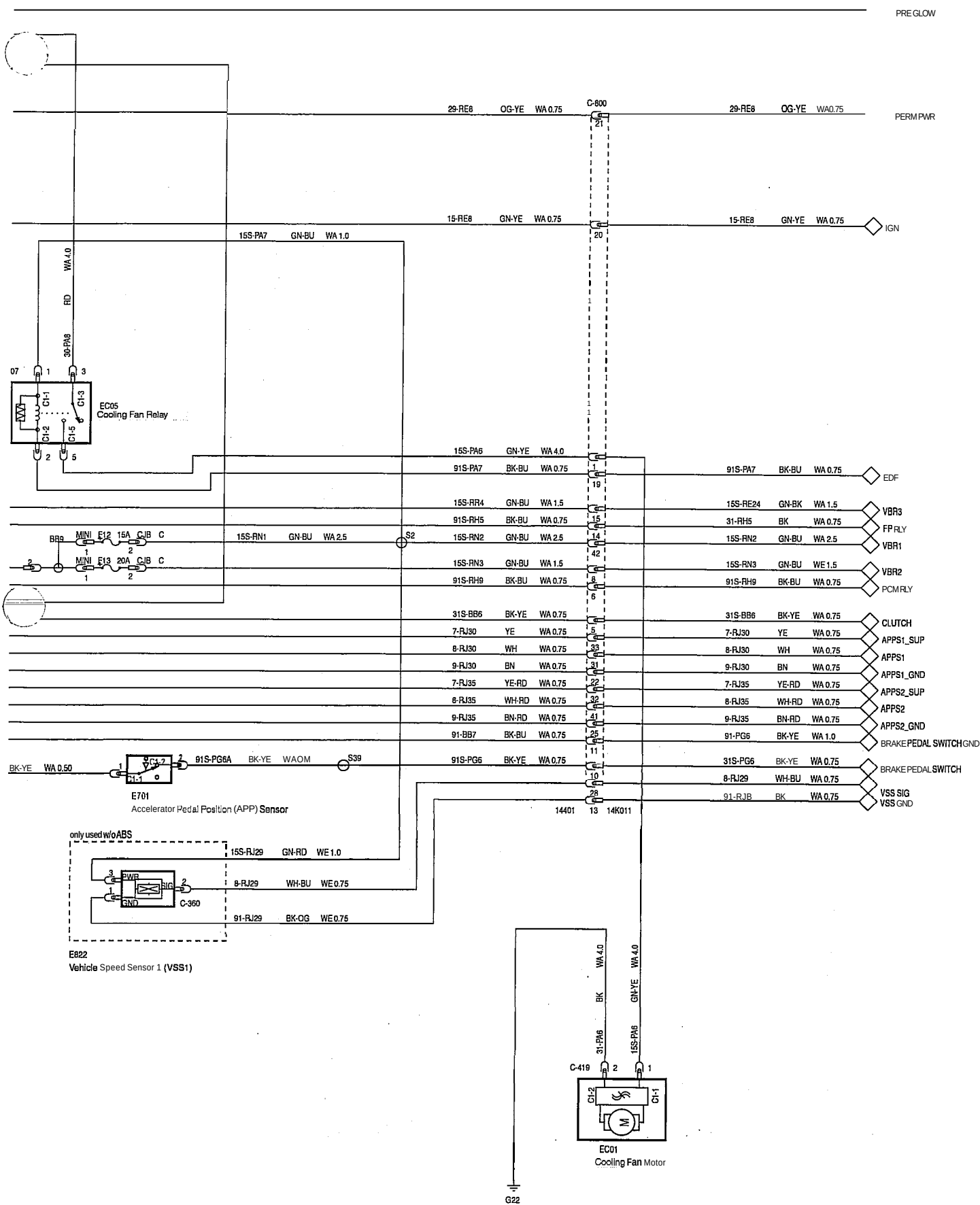


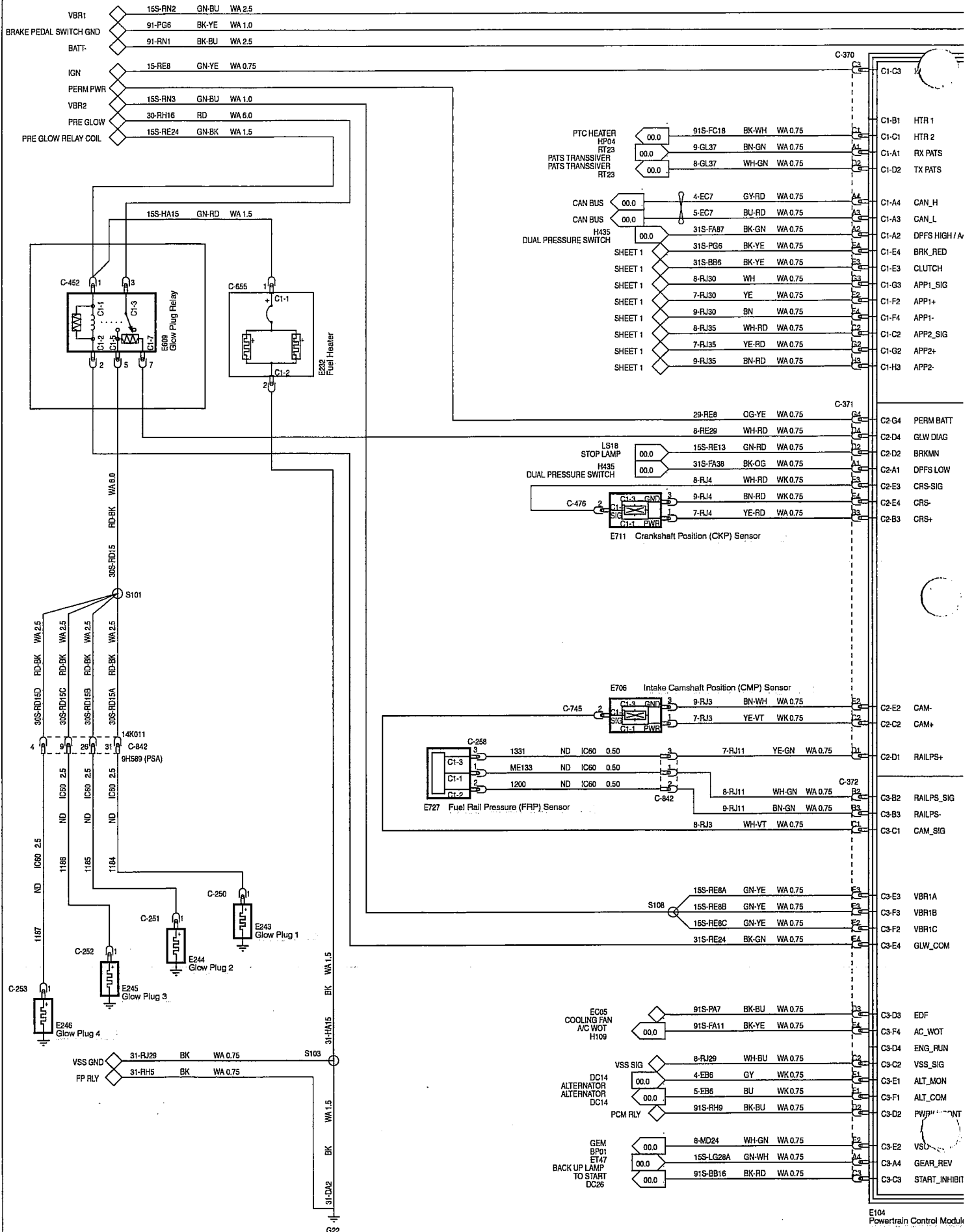


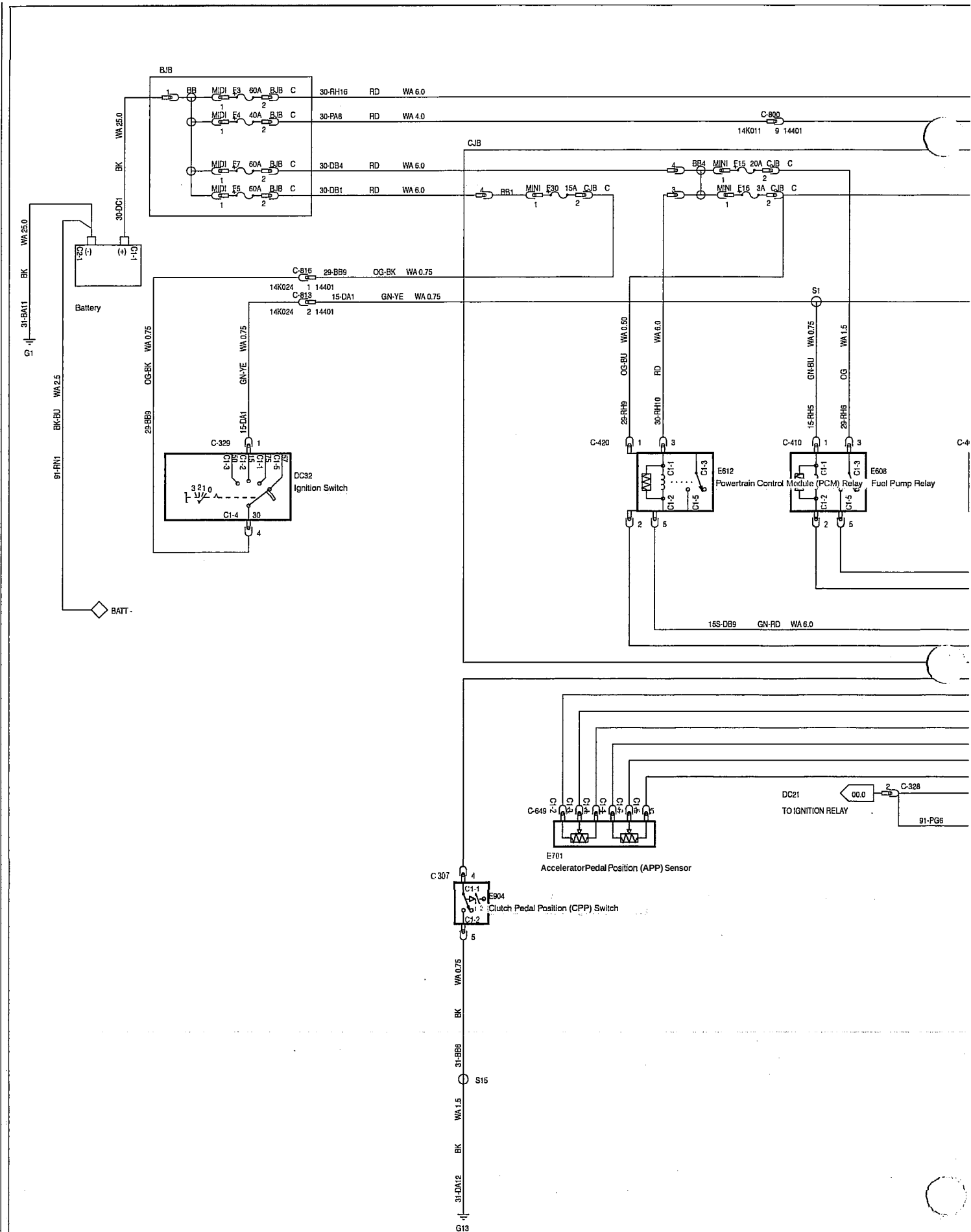


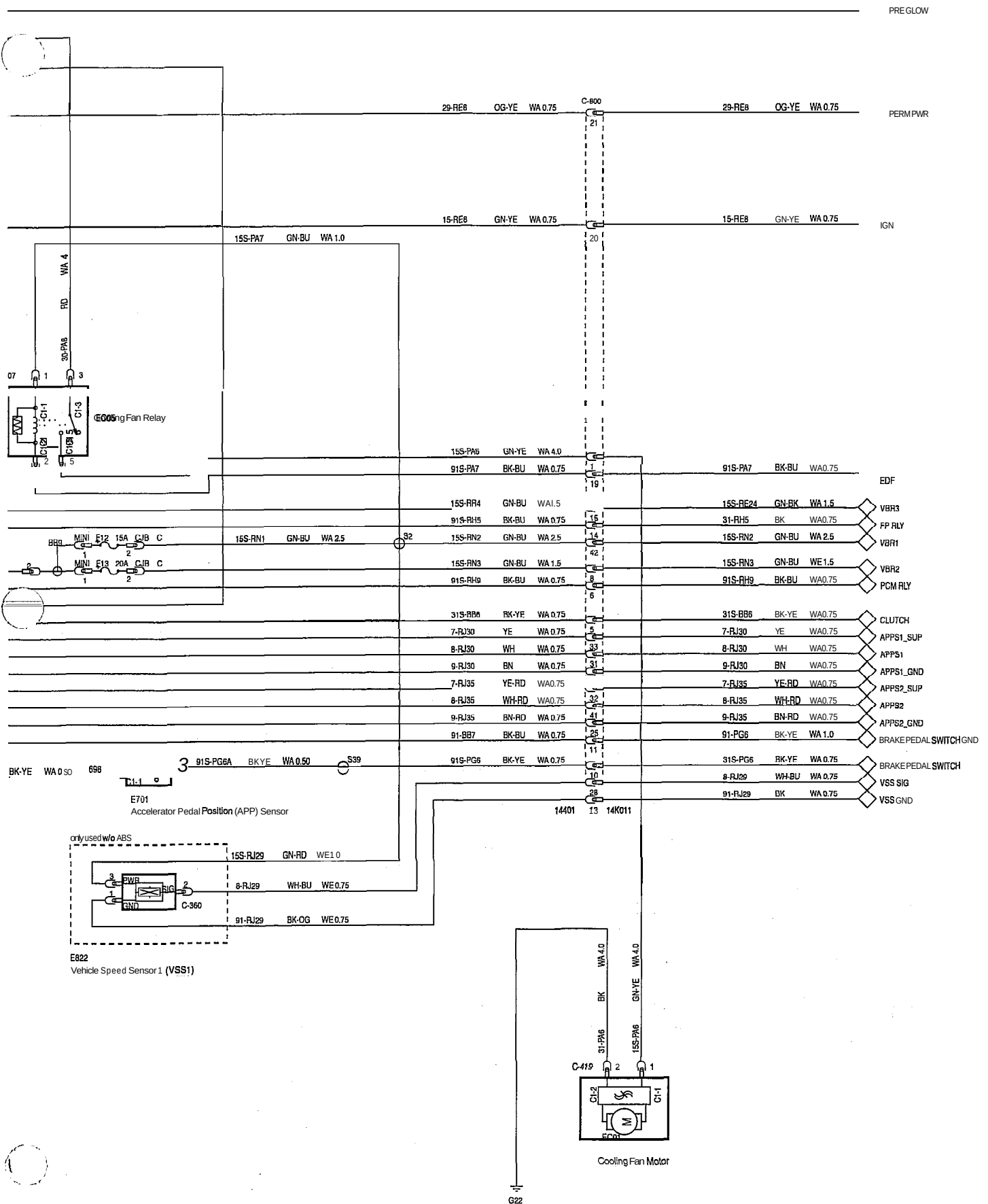


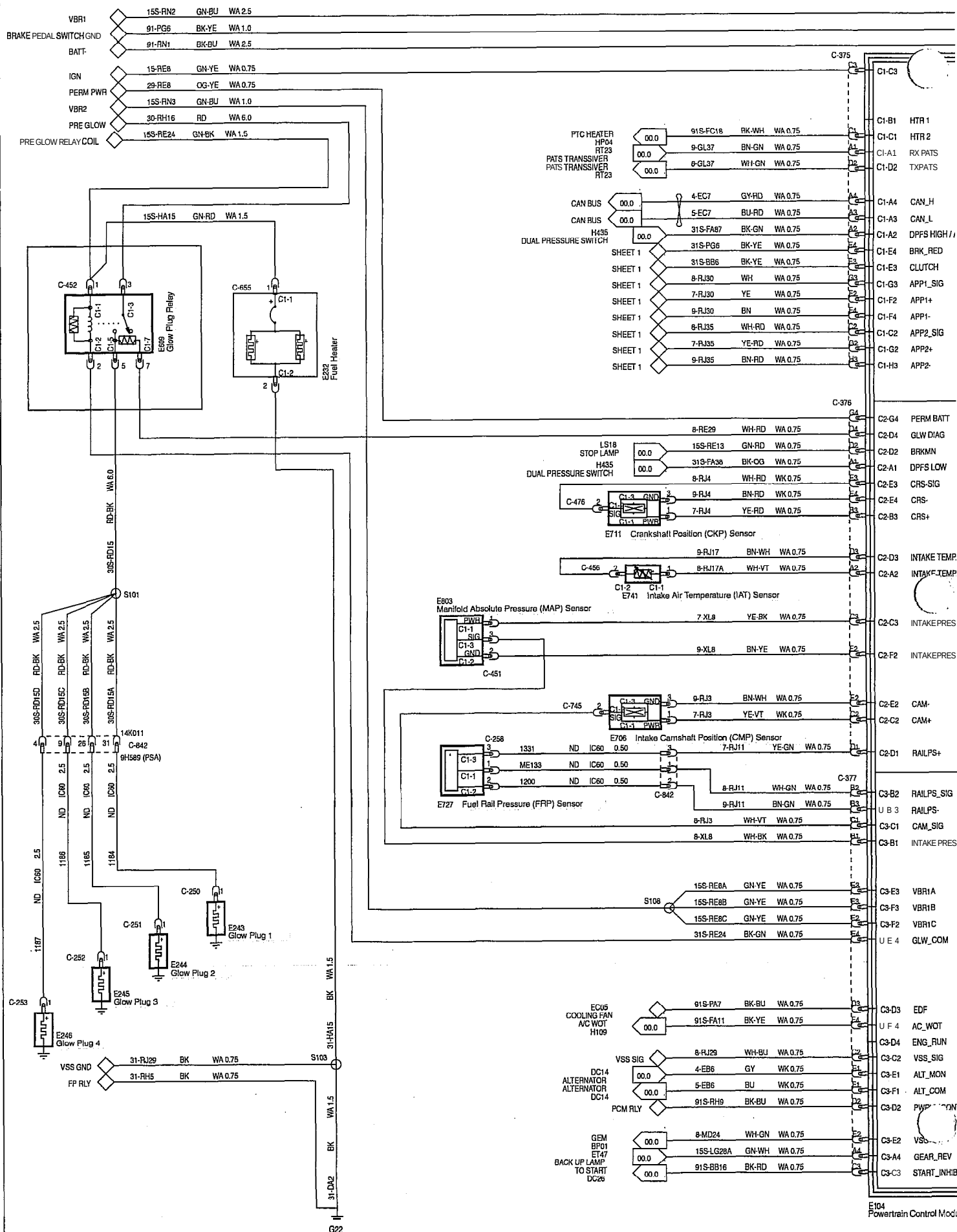


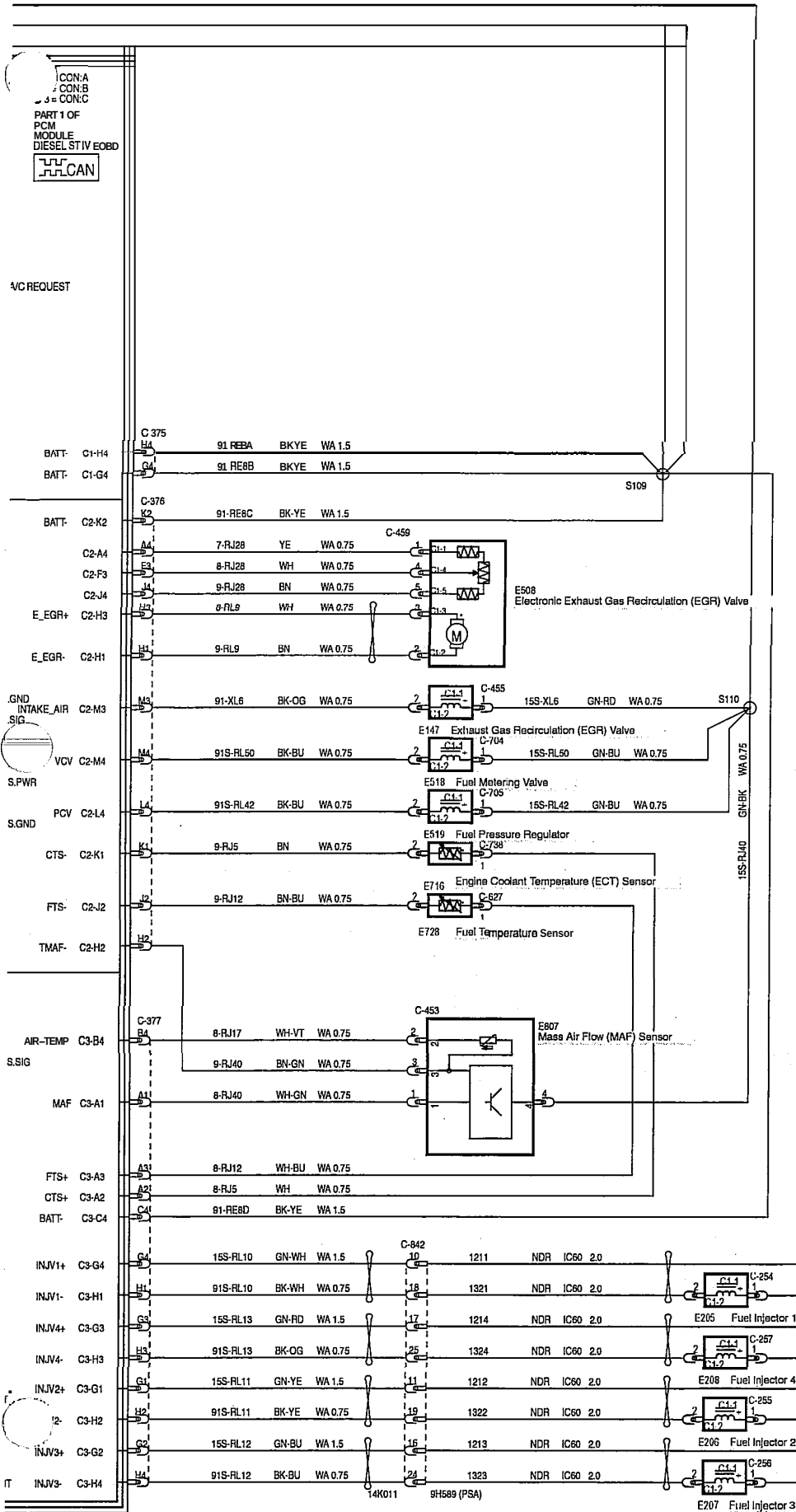








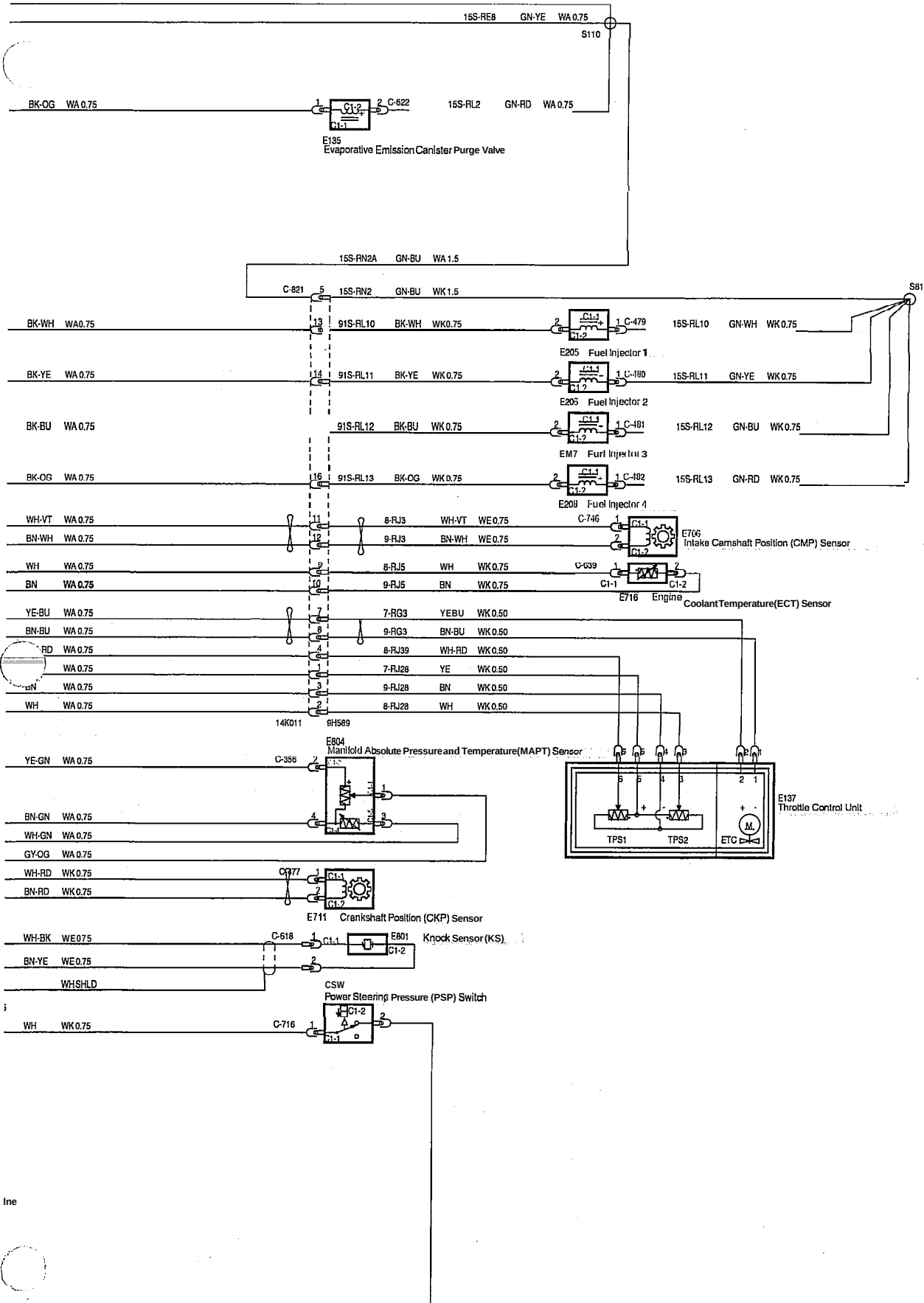


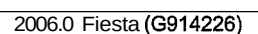


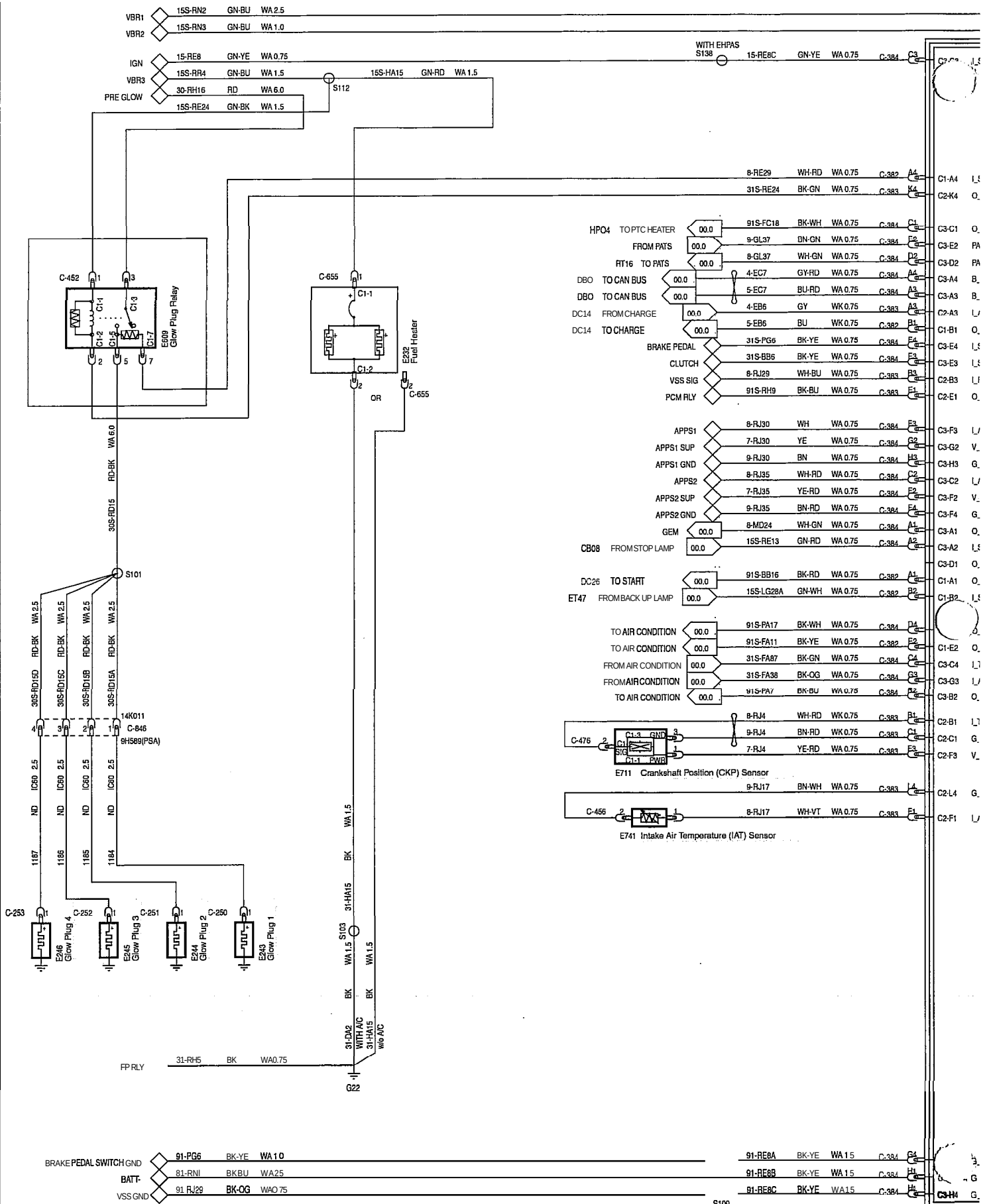
1a (PCM) - 4-Cylinder Engine

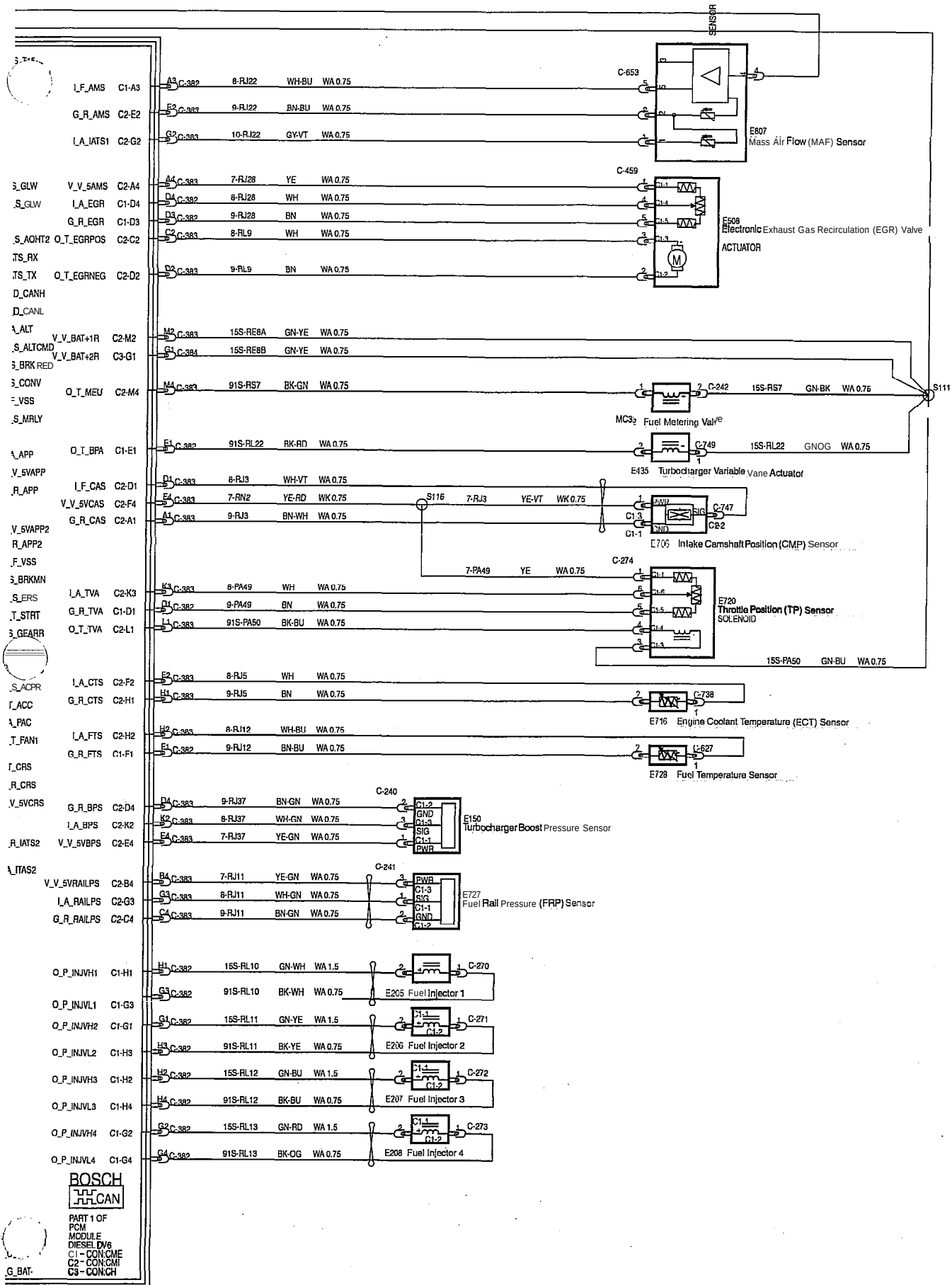






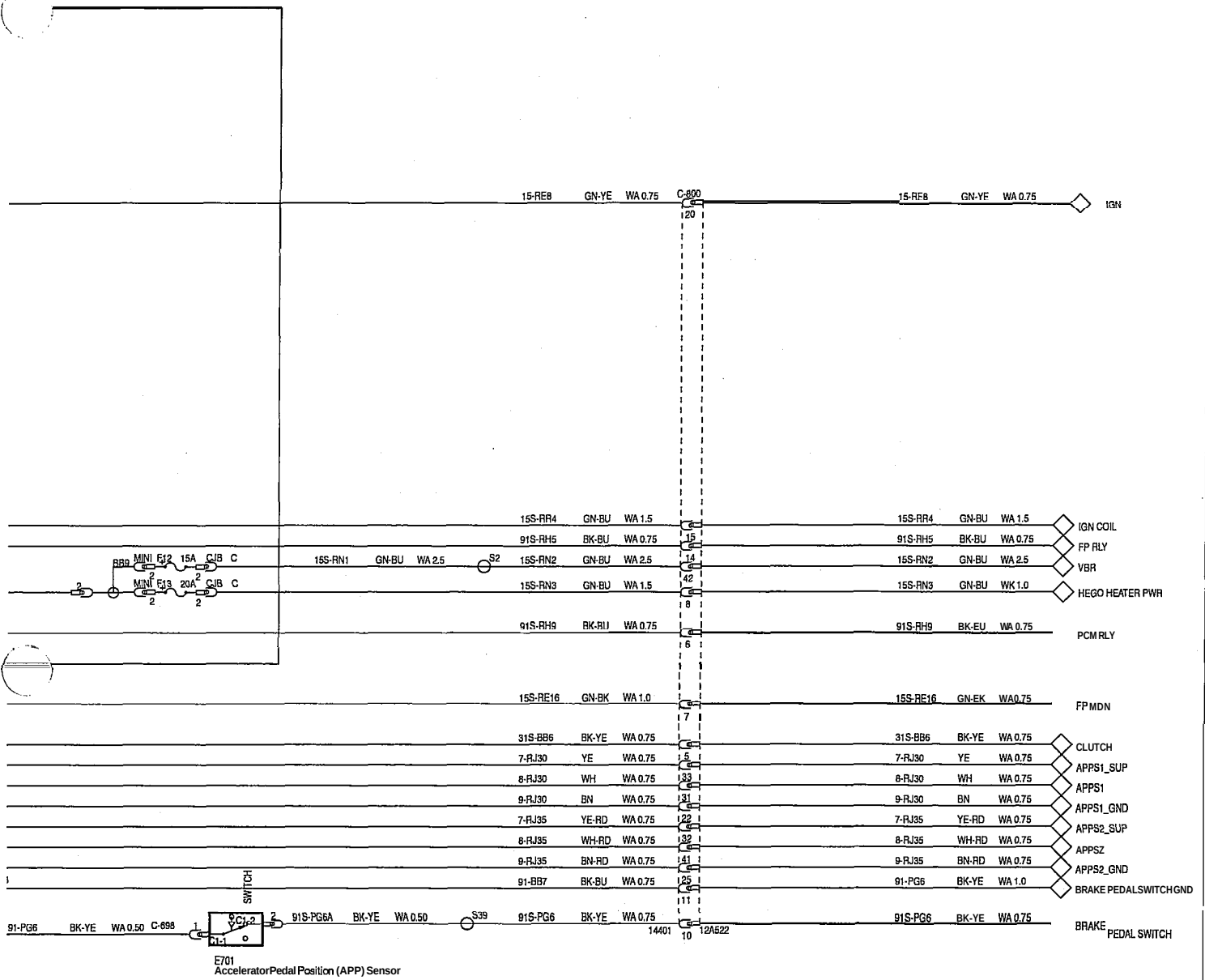


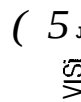


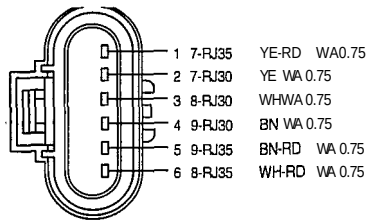


Control Module (PCM) - 4-Cylinder Engine







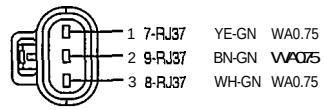


XW4T-14A464-BRA

C-649

TO ACCL. PEDAL DEMAND SENSOR

HARNESS 14401



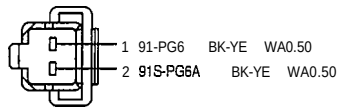
2S6T-14A464-DSA

C-240

TO BOOST PRESSURE SENSOR (DV6)

HARNESS 14K011



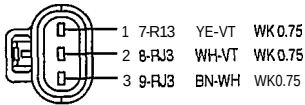


F5VB-14489-EA

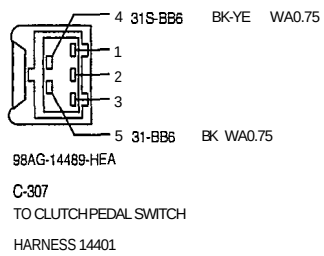
C-698

TO BRAKE PEDAL SWITCH

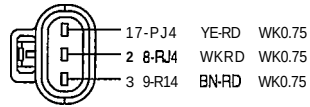
HARNESS14401



2S6T-14A464-DSA
G745
TO CAMSHAFT POSITION SENSOR (DIESEL III EOB / IV EOB)
HARNES14K011



PIN1 => 7-RJ4 YE-RD 0.75 WA



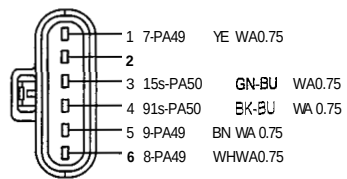
1M5T-14A464-FAB

C-476

TO CRANKSHAFT POSITION SENSOR (DIESEL)

HARNESS 14K011



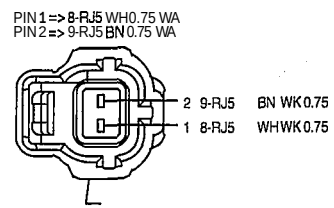


3M5T-14A464-FGA

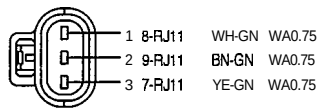
C274

TO EGR THROTTLE POSITION SENSOR (DV6)

HARNESS 14K011



C-639
 TO ENGINE COOLANT TEMPERATURE SENSOR
 HARNESS 14K011 OR 9H589

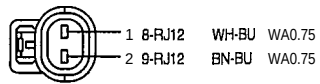


2S6T-14A464-DRA

C-241

TO FUEL RAIL PRESSURE SENSOR (DV6)

HARNESS 14K011

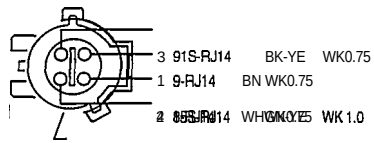


2S6T-14A464-DMA

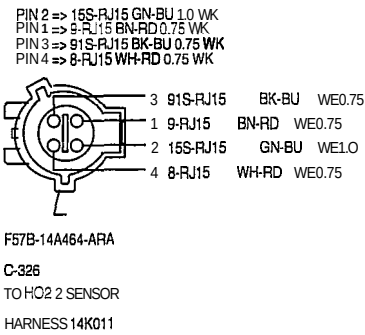
C-627

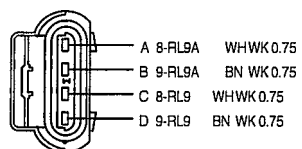
TO FUEL RAIL TEMP SENSOR

HARNESS 14K011



F57B-14A464-BJA
C-325
TO HO2 1 SENSOR (1.3)
HARNESS14K011



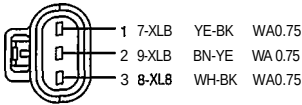


YS6T-14A464-ADA

C-478

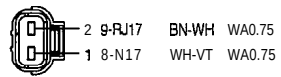
TO IDLE SPEED VALVE SOLENOID (STEPPER MOTOR)

HARNESS 9H589



2S6T-14A464-DSA
C-451
TO INTAKE AIR PRESSURE SENSOR(DIESEL/VEOBD)
HARNESS 14K011

PIN1=> 8-RJ17A WH-VT 0.75 WA



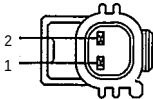
1M5T-14A464-FCA

C-456

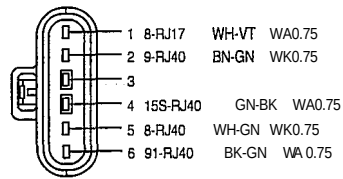
TO INTAKE AIR TEMP SENSEOR (DIESEL IV EOBD / DV6)

HARNESS 14K011

9-RJ18 BN-YE WE0.75
8-RJ18 WH-BK WE0.75



97BG-14A624-YBB
C-618
TO KNOCK 1 SENSOR
HARNESS 14K011

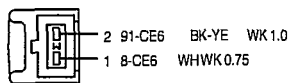


256T-14A464-DTA

C-654

TO MASS AIR FLOW SENSOR (DIESEL III EOBD)

HARNESS 14K011



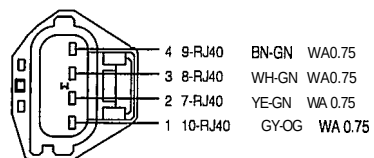
97AG-14A464-HBA

C-716

TO POWER STEERING PRESSURE SWITCH

HARNES 14K011 OR 12A522



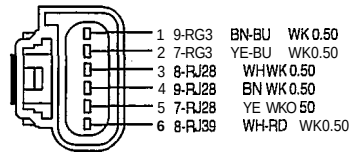


4M5T-14A464-YDA

C-260

TO TEMP MANIFOLD ABSOLUTE PRESSURE SENSOR (ST150)

HARNESS 12A522

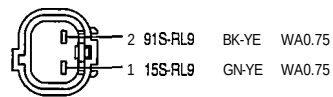


3L2T-14A464-BA(XXX)

C-638

TO THROTTLECONTROLUNIT (SIGMA)

HARNESS9H589

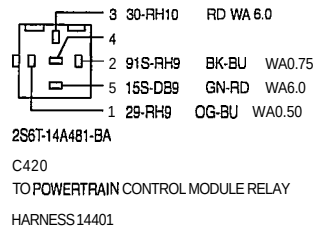


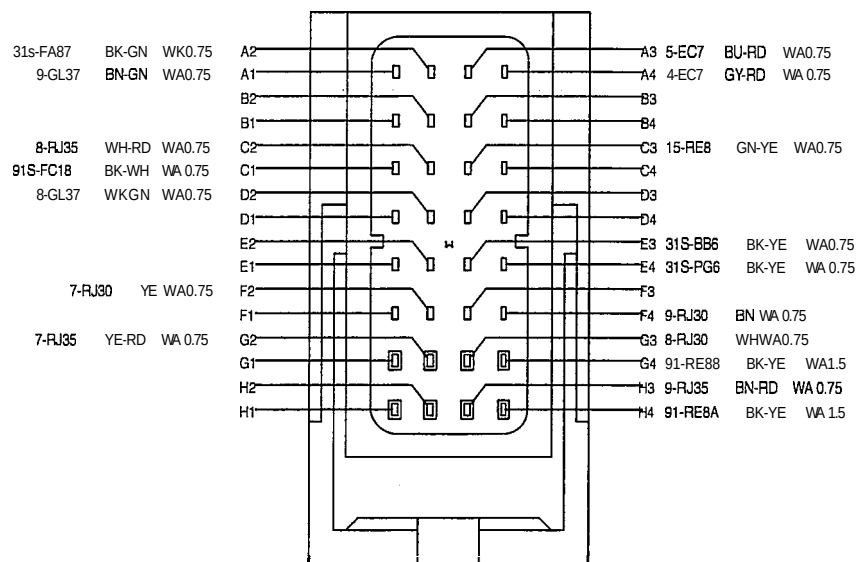
XF2T-14A464-YC

C-266

TO VARIABLE INTAKE SYSTEM VALVE SOLONOID (ST150)

HARNESS 12A522



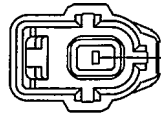


1M5T-14A464-ALB

C-370

TO PCM (CONN:A) (DIESEL III EOB D)

HARNESS 14K011



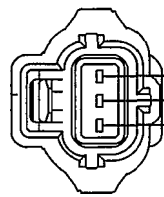
1 31S-GC20 BK-OG WK0.75

F65B-14A464-CA

C-735

TO OIL PRESSURE SWITCH(1.3/ST150)

HARNESS 14K011 OR 12A522



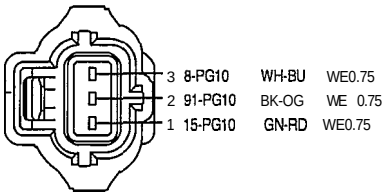
- | | | | |
|---|----------|-------|--------|
| 3 | 15S-RJ29 | GN-RD | WE1.0 |
| 2 | 8-RJ29 | WH-BU | WE0.75 |
| 1 | 91-RJ29 | BK-OG | WE0.75 |

F6DB-14A464-AGA(XXX)

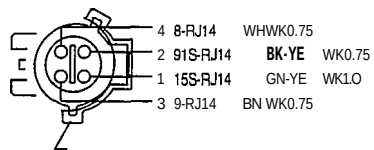
C-360

TO VEHICLE SPEED SENSOR

HARNESS 14401



F6DB-14A464-AGA(XXX)
C-432
VEHICLESPEED SENSOR 2
HARNESS14K011

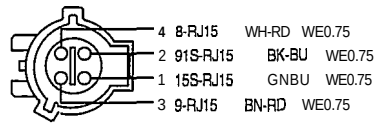


1F1T-14A464-JA(XXX)

C-244

TO HO2 1 SENSOR (ST150)

HARNESS 12A522

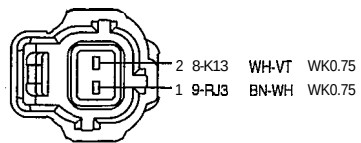


1F1T-14A464-FA(XXX)

C-243

TO HO2 2 SENSOR (ST150)

HARNESS 9K499

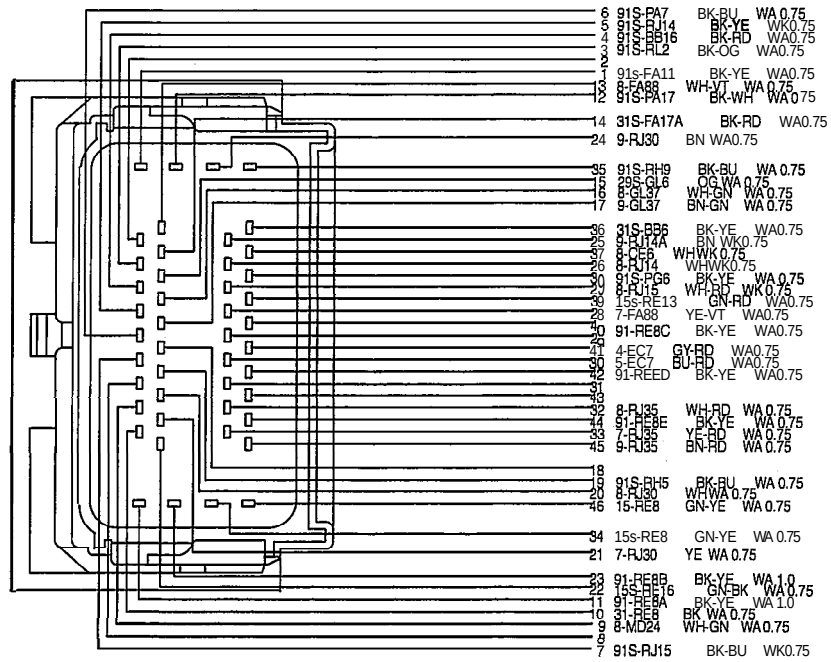


F7RB-14A464-AA

C-268

TO CAMSHAFT POSITIONSENSOR (ST150)

HARNESS12A522

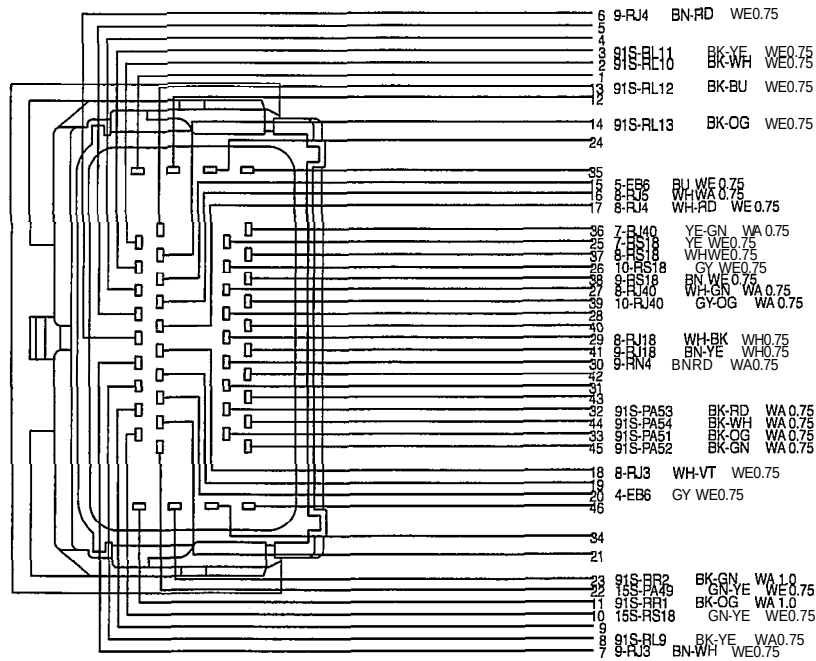


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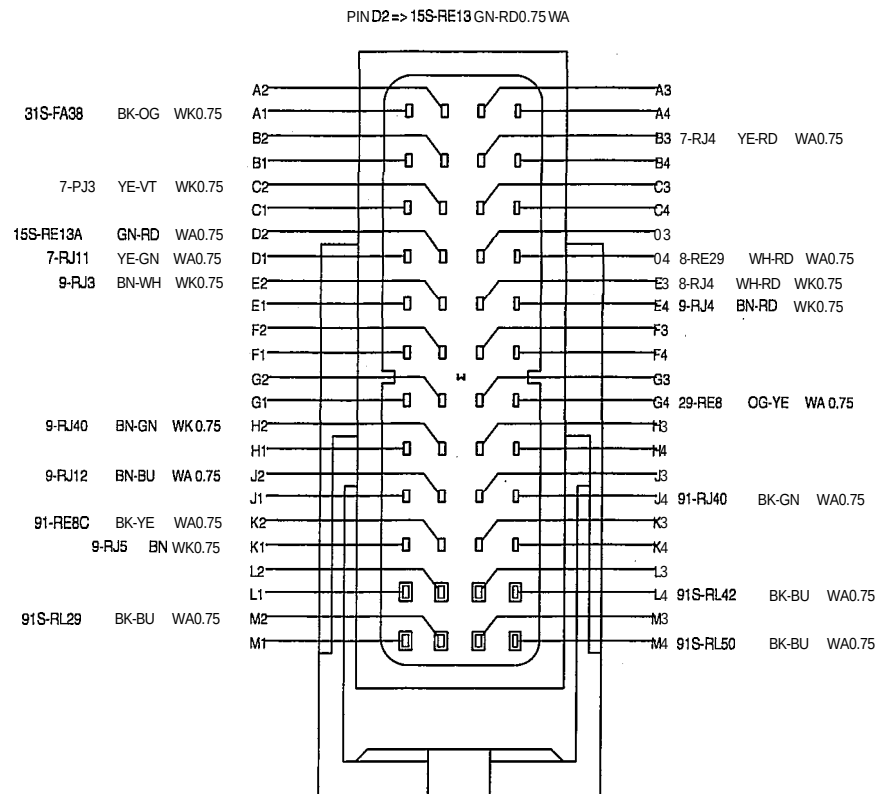
C-380

TO PCM (CONN:A)(ST150)

HARNESS 12A522



2L1T-14A464-TD(XXX)
 C-381
 TO PCM (CONN8)(ST150)
 HARNESS12A522

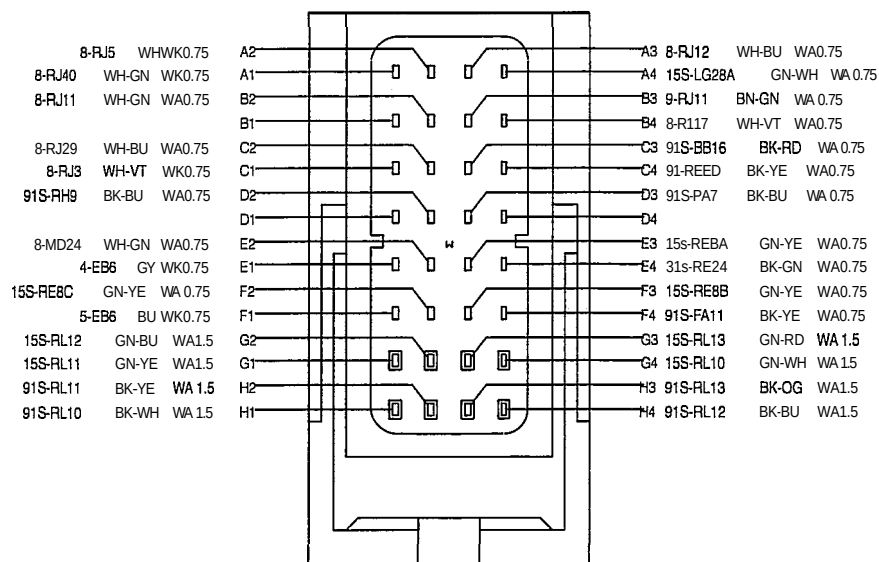


1M5T-14A484-CLB

G371

TO PCM (CONN:B) (DIESEL III EOBD)

HARNESS 14K011

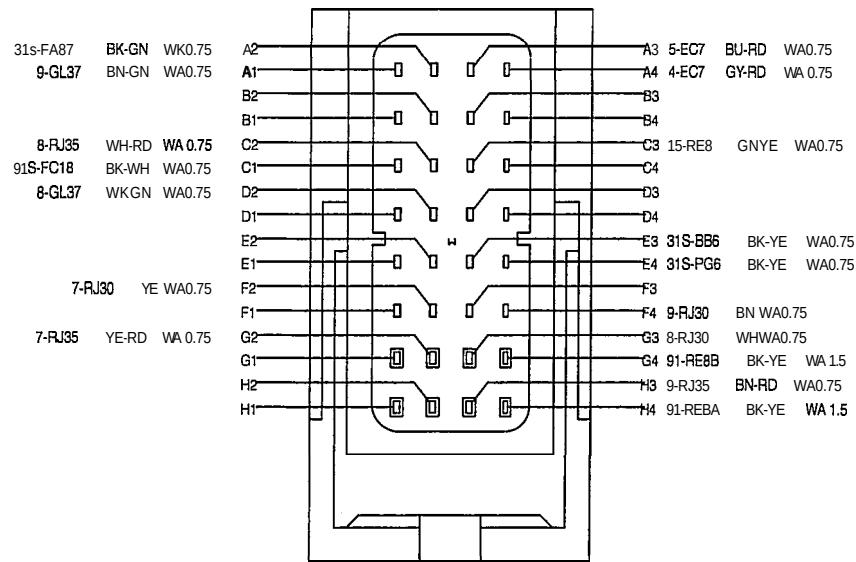


1M5T-14A464-BLB

G372

TO PCM (CONN:C) (DIESEL III EOB)

HARNESS 14K011

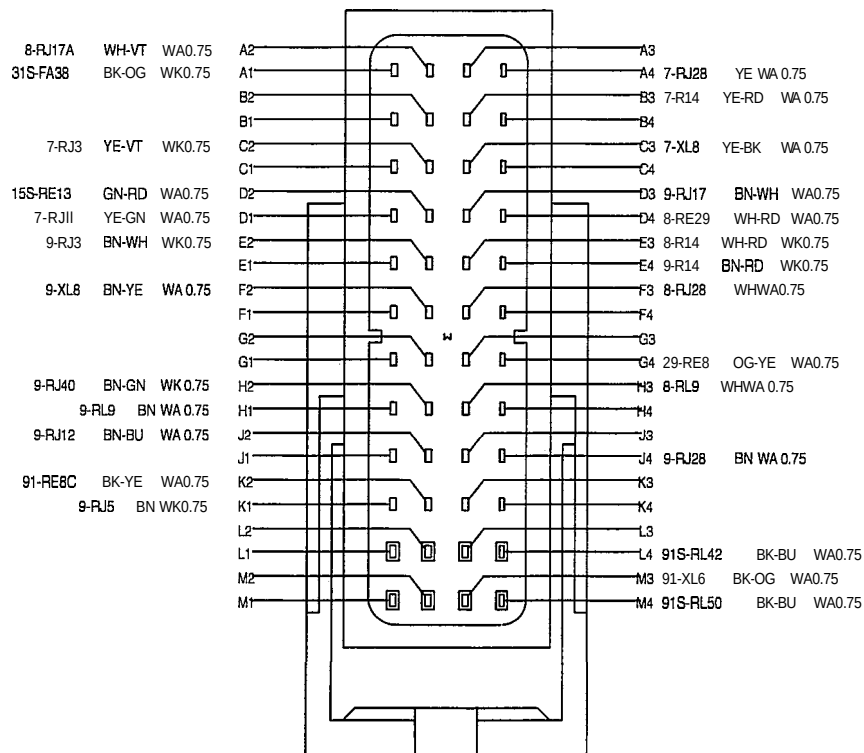


1M5T-14A464-ALB

G375

TO PCM (CONN:A) (DIESEL IV EOBD)

HARNESS 14K011

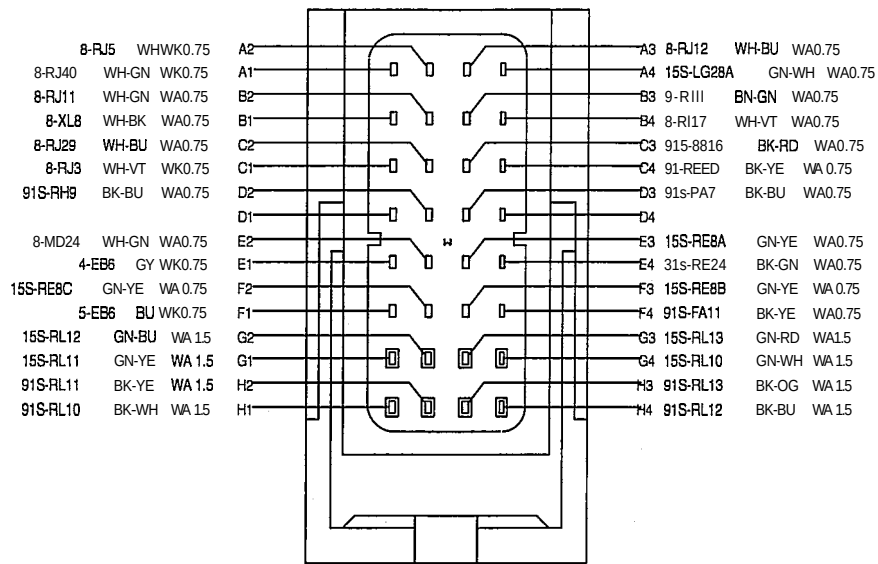


1M5T-14A464-CLB

C-376

TO PCM (CONN:B) (DIESEL/V EOB)

HARNESS 14K011

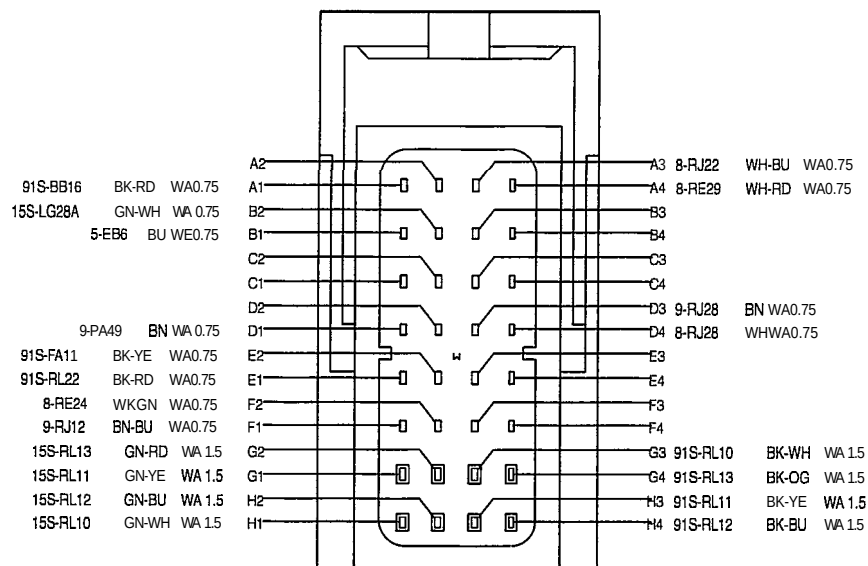


1M5T-14A464-BLB

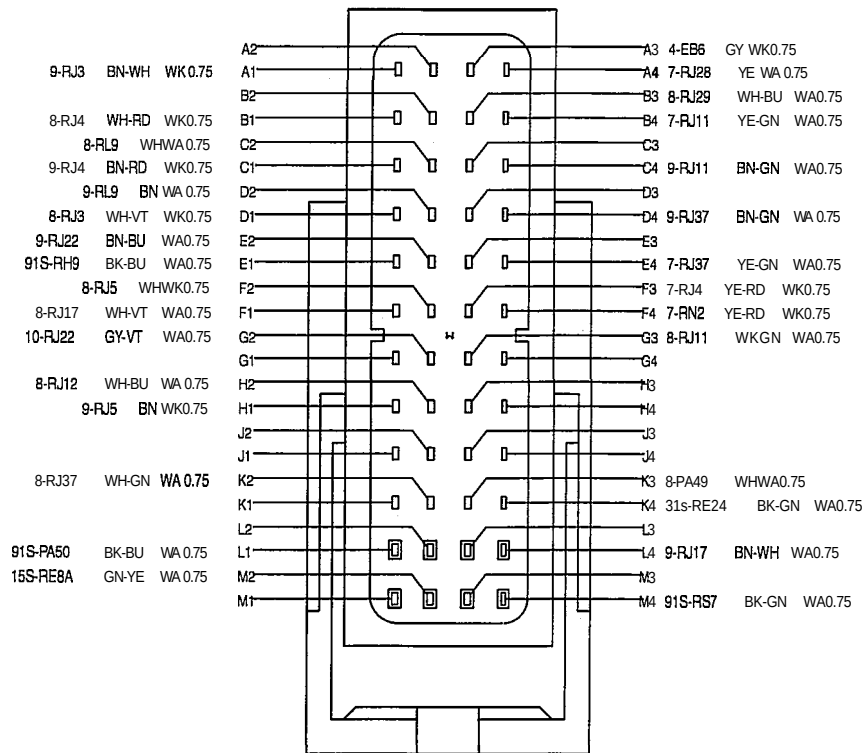
C-377

TO PCM (CONN:C) (DIESEL / V E OBD)

HARNESS 14K011



1MST-14A464-BRA
C-382
TO PCM (CONN:CME) (DV6)
HARNESS 14K011

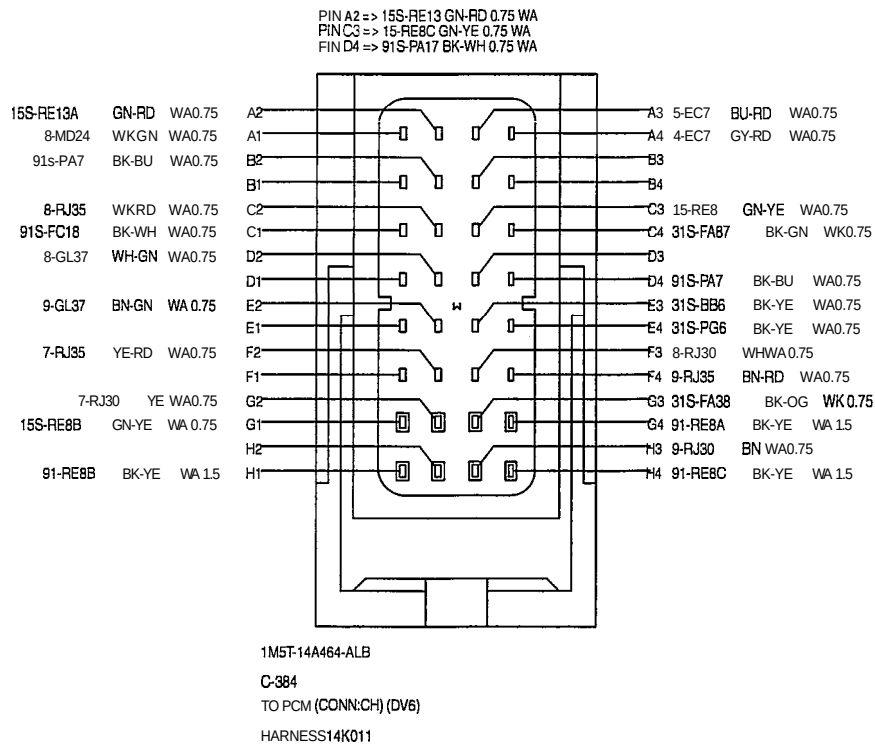


1M5T-14A464-CLB

C-383

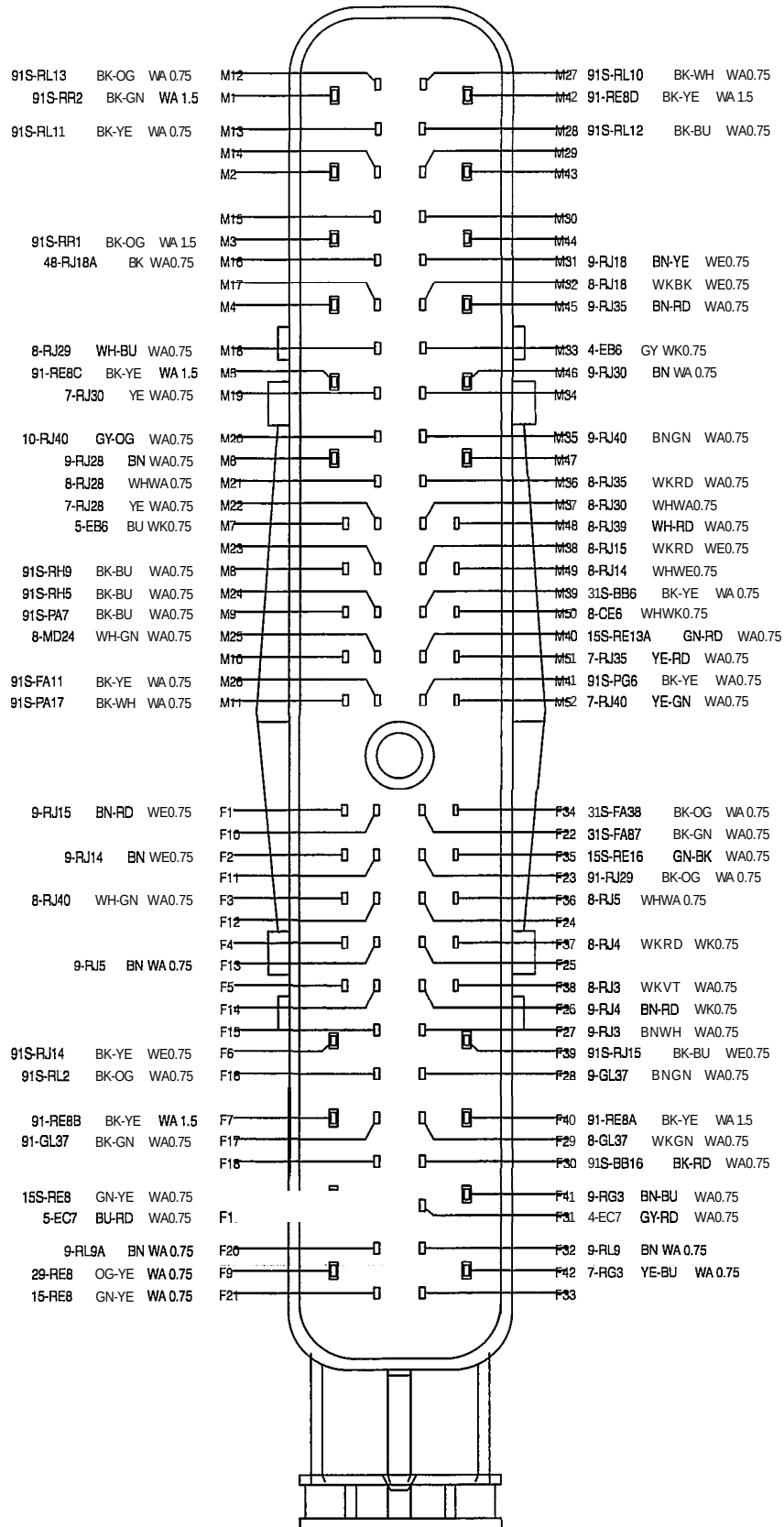
TO PCM (CONN:CM1) (DV6)

HARNESS 14K011





PIN M40 => 15S-RE13GN-RD 0.75 WA
 PIN F13 => 9-RJ5 BN 0.75 WK
 PIN F36 => 8-RJ5 WH 0.75 WK
 PIN F42 => 8-RL9A WH 0.75 WA
 PIN F41 => 8-RL9 WH 0.75 WA
 PIN F6 => 91S-RJ14 BK-YE 0.75 WK
 PIN F2 => 9-RJ14 BN 0.75 WK
 PIN M49 => 8-RJ14 WH 0.75 WK
 PIN F39 => 91S-RJ15 BK-BU 0.75 WK
 PIN F1 => 9-RJ15 BN-RD 0.75 WK
 PIN M38 => 8-RJ15 WH-RD 0.75 WK

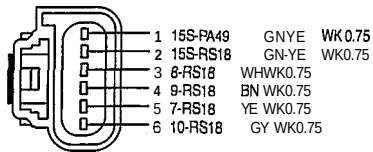


286T-14A464-PCB(XXX)

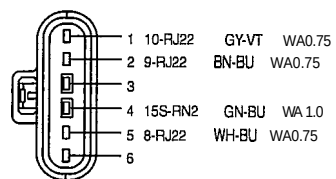
C-343

TO PCM (SOHC) (SIGMA)

HARNESS 14K011



3L2T-14A464-BA(XXX)
C-640
TO THROTTLE COMROL UNIT (ST 150)
HARNESS 12A522



3M5T-14A464-DGA

C-653

TO MASS AIR FLOW SENSOR (DV6)

HARNESS 14K011

 1 31S-GC20 BK-OG WE0.75

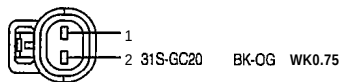
92BG-14474-ZGA

C-736

TO CL PRESSURE SWITCH (L4116)

HARNESS14K011



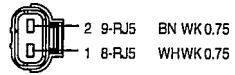


2S6T-14A464-DLA

C737

TO OIL PRESSURE SWITCH(DIESEL)

HARNESS14K011



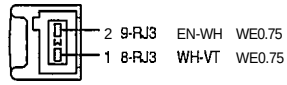
1M5T-14A464-FCA

C-738

TO ENGINE COOLANT TEMPERATURE SENSOR (DIESEL)

HARNESS 14K011

PIN 2 => 9-RJ3 EN-WH WE0.75 WA
PIN 1 => 8-RJ3 WH-VT WE0.75 WA

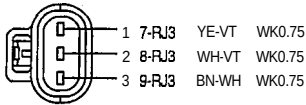


98AG-14A464-MBA

G746

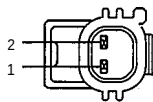
TO CAMSHAFT POSITION SENSOR (PETROL)

HARNESS 14K011 OR 9H589 OR 12A522



3M5T-14A464-ECA
C-747
TO CAMSHAFT POSITION SENSOR (DV6)
HARNESS 14K011

8-RJ18 WH-EK WE0.75
9-RJ18 EN-YE WE0.75

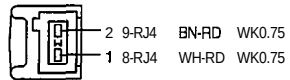


98AG-14A624-ABB

G619

TO KNOCK 1 SENSOR (ST1S)

HARNESS 12A522

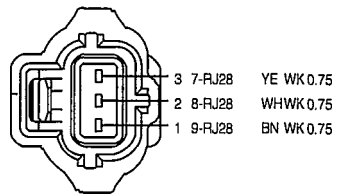


98AG-14A464-MBA

C-477

TO CRANKSHAFT POSITION SENSOR (PETROL)

HARNESS 14K011

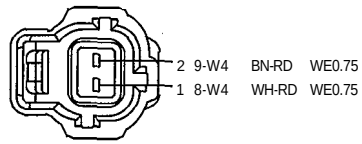


F6DB-14A464-AGA(XXX)

C-484

TO THROTTLE POSITION TPS SENSOR

HARNESS 9H589



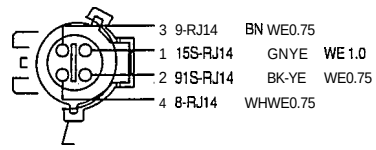
F7RB-14A464-AA

C-485

TO CRANKSHAFT POSITION SENSOR (ST150)

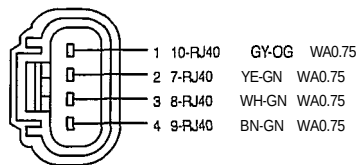
HARNESS14300



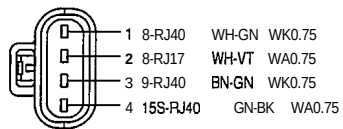


F4SB-14A464-AJC
C-365
TO HO21 SENSOR (1.6)
HARNESS14K011

PIN 1 => 10-RJ40 GY-OG 0.75 WK
PIN 3 => 8-RJ40 WH-GN 0.75 WK
PIN 4 => 9-RJ40 BN-GN 0.75 WK
PIN 2 => 7-RJ40 YE-GN 0.75 WK



YF1T-14A464-CA
C-356
TO TEMP MANIFOLD ABSOLUTE PRESSURE SENSOR
HARNESS 9H589 OR 14K011



3M5T-14A464-FDB

C-453

TO MASS AIR FLOW SENSOR (DIESEL IV EOB)

HARNESS14K011



SECTION 307-01A Automatic Transmission/Transaxle — Vehicles With: 4-Speed Automatic Transmission (AW81-40)

VEHICLE APPLICATION: 2006.0 Fiesta

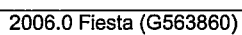
CONTENTS

PAGE

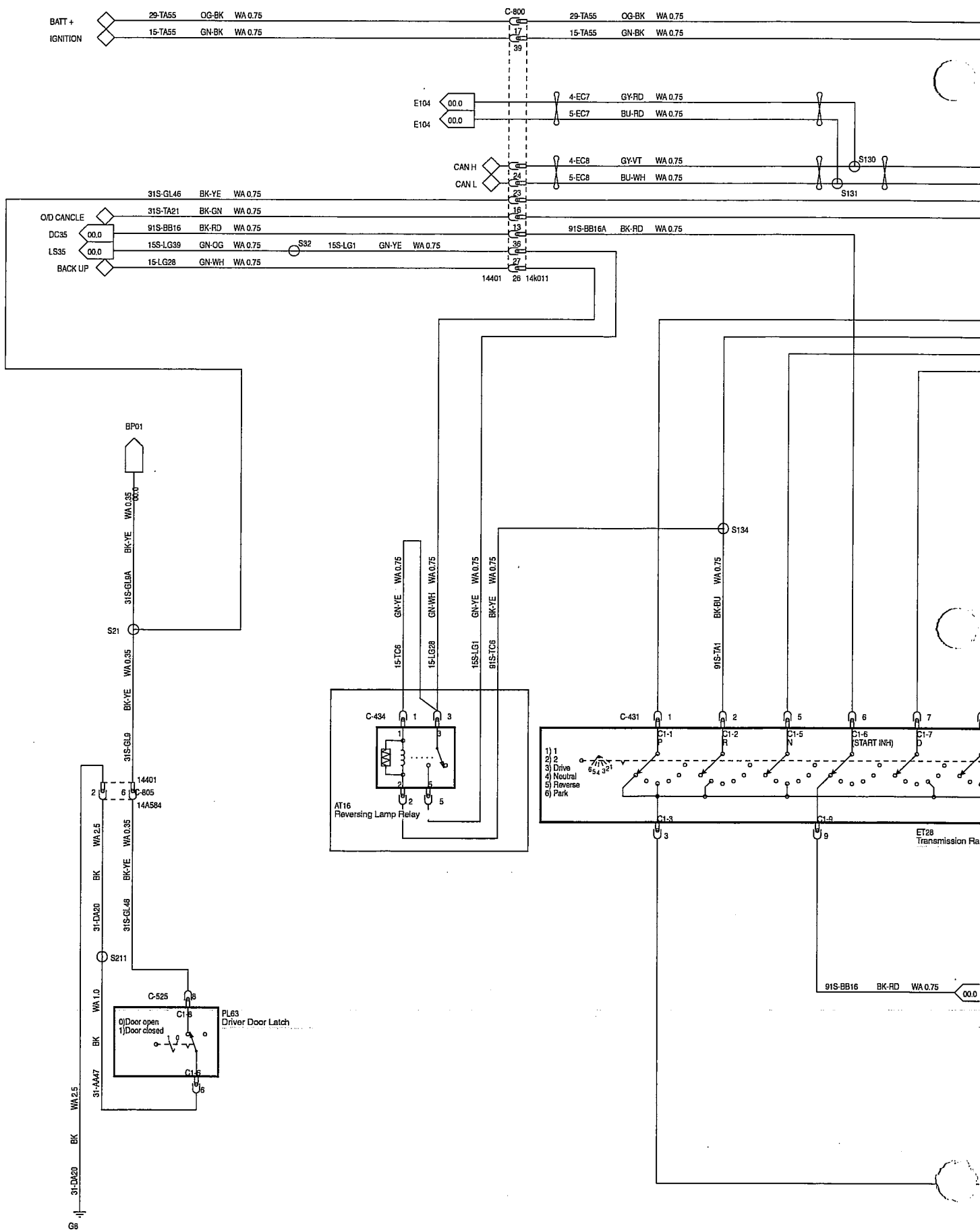
SCHEMATICS

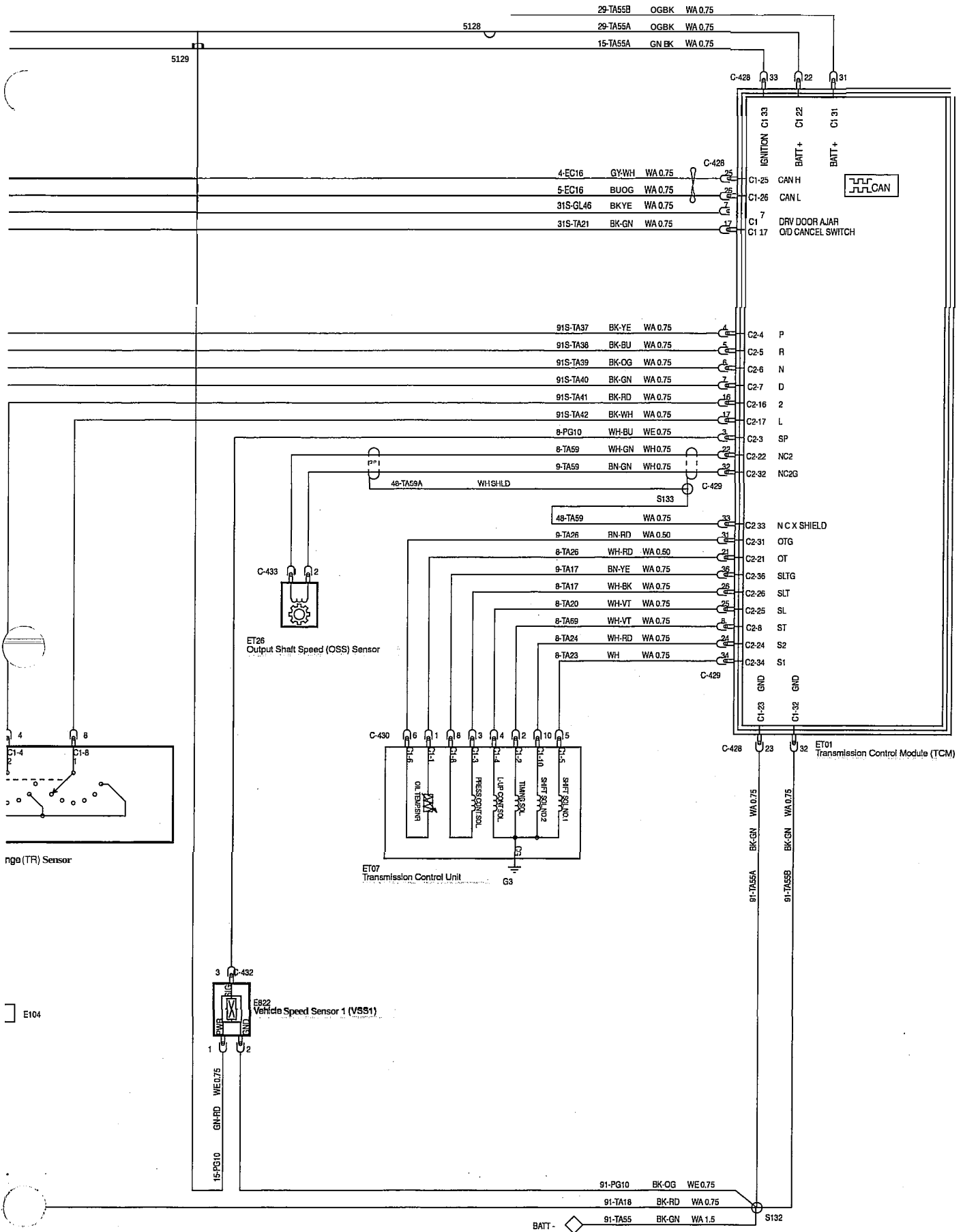
Automatic Transmission/Transaxle — LHD.....	307-01A-4
Automatic Transmission/Transaxle — RHD.....	307-01A-8

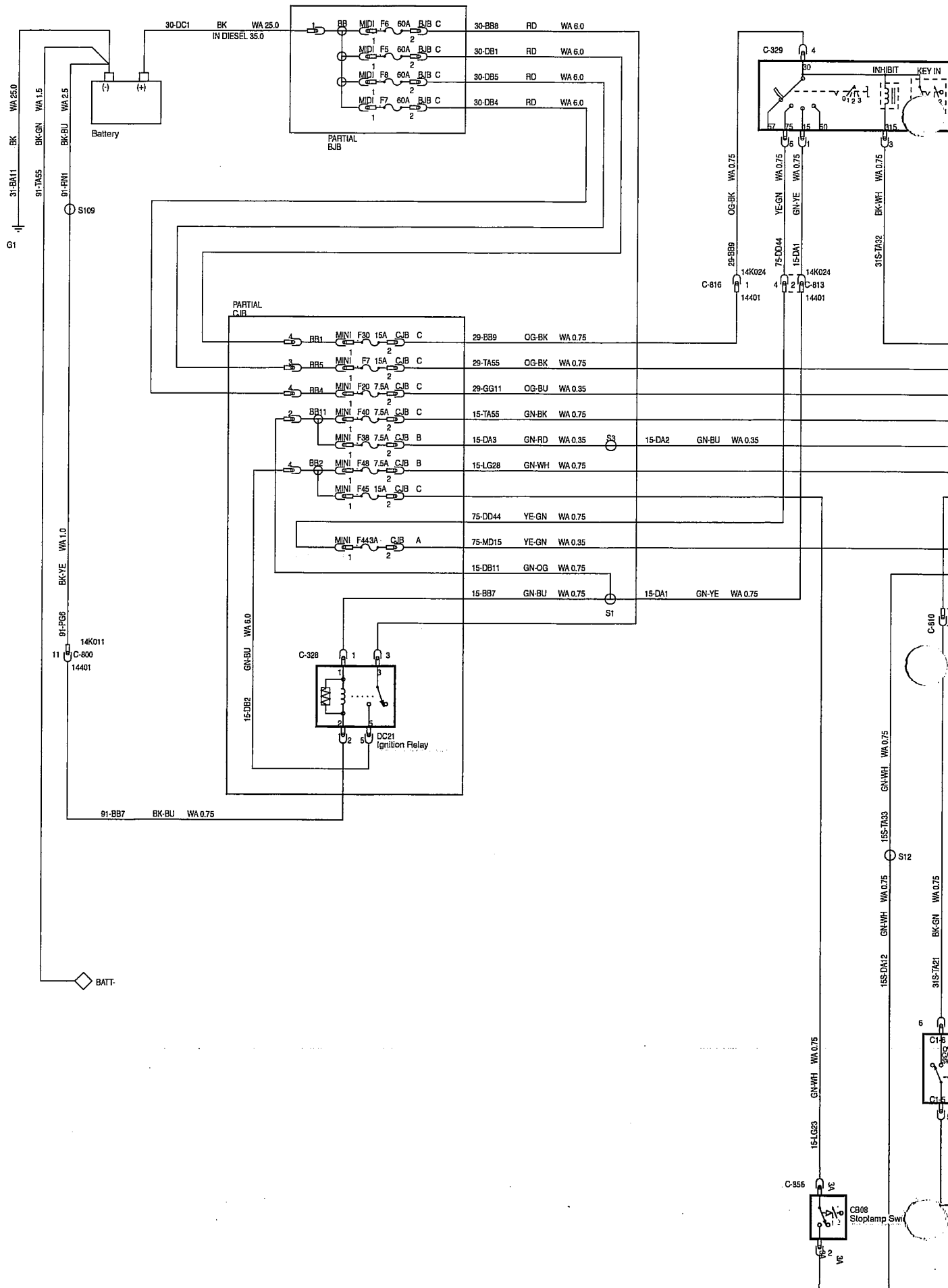


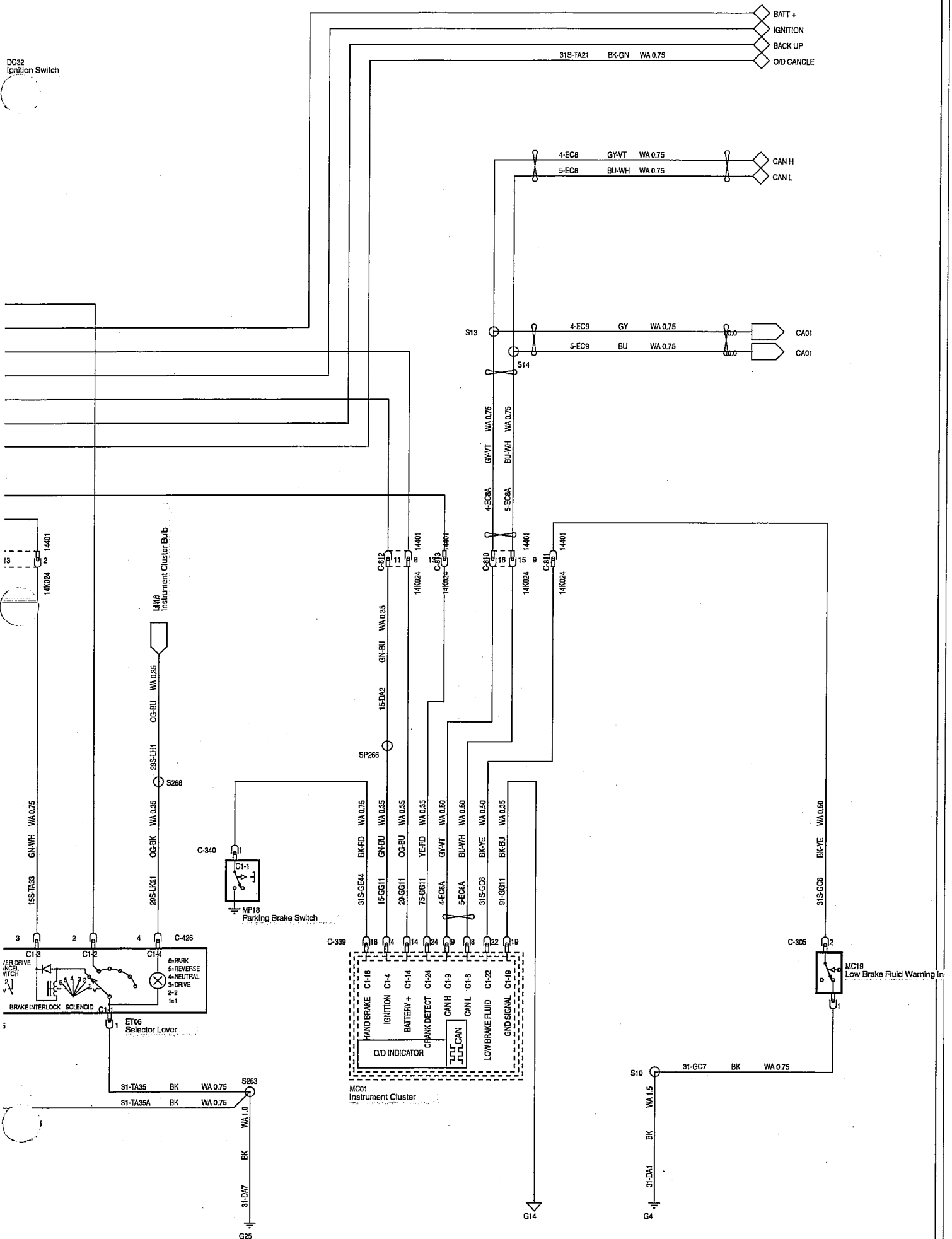




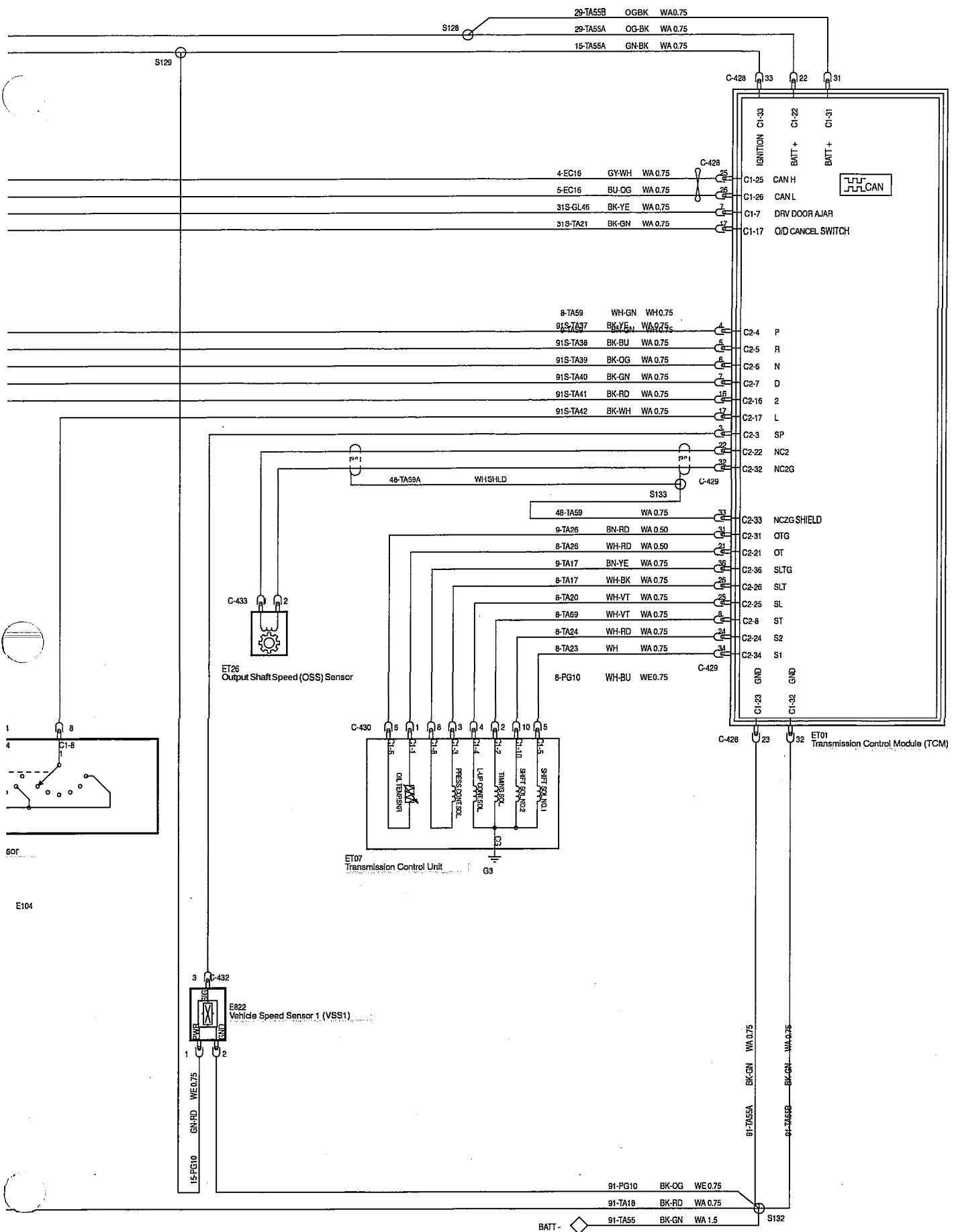














SECTION 307-01B Automatic Transmission/Transaxle — Vehicles With: 4-Speed Automatic Transmission (AW81-40)

VEHICLE APPLICATION:2006.0 Fiesta

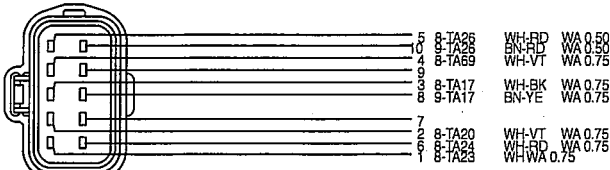
CONTENTS

PAGE

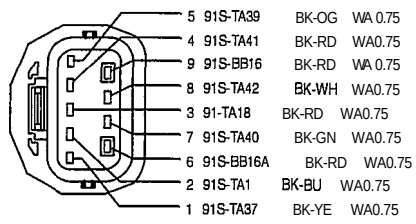
CONNECTORS

Transmission Control Module (TCM).....	307-01B-2
Transmission Control Module (TCM).....	307-01B-3
Transmission Range (TR) Sensor.....	307-01B-4

307-01B-2 Transmission Control Module (TCM)
Information not available at this time



5M6T-14A464-DA
C-430
TO TRANSMISSION HARDWARE UNIT
HARNESS 14K011



4S6T-14A464-CA

C-431

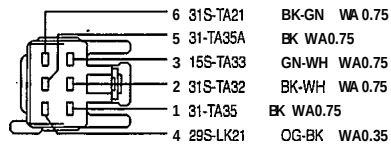
TO TRANSMISSION RANGE SENSOR

HARNESS 14K011

**SECTION 307-05 Automatic Transmission/Transaxle
External Controls — Vehicles With: 4-Speed Automatic
Transmission (AW81-40)**

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Selector Lever.....	307-05-2
Transmission Shift Motor.....	307-05-3
Transmission Select Motor.....	307-05-4
Transmission Control Switch (TCS).....	307-05-5
Selector Lever.....	307-05-6

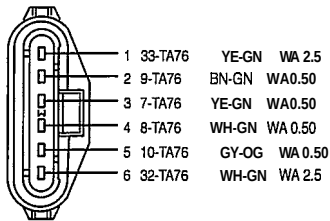


97BG-14489-YFB

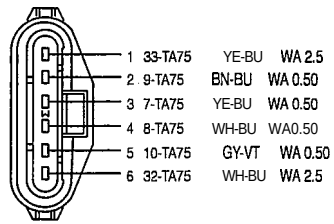
C-426

TO TRANSMISSION LEVER UNIT

HARNESS 14K024



2S6T-14A464-JB
G677
TO TRANSMISSIONSHIFT MOTOR
HARNESS 14K011



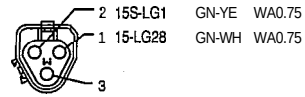
2S6T-14A464-KB

C-678

TO TRANSMISSION SELECT MOTOR

HARNESS14K011

PIN 2 => 15S-LG5 GN-RD 0.75 WA

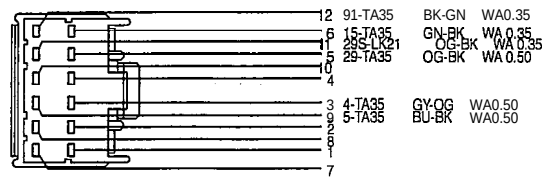


91AG-14A464-BCC

G425

TO TRANSMISSIONSWITCH

HARNESS14K011 OR 12A522



F50B-14489-GA

C-679

TO TRANSMISSION LEVER UNIT

HARNESS14K024

SECTION 308-11 Manual Transmission/Transaxle Automated Gearshift System

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

SCHEMATICS

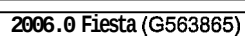
Manual Transmission/Transaxle - Automated Gearshift System — LHD.....	308-11-4
Manual Transmission/Transaxle - Automated Gearshift System — RHD	308-11-8

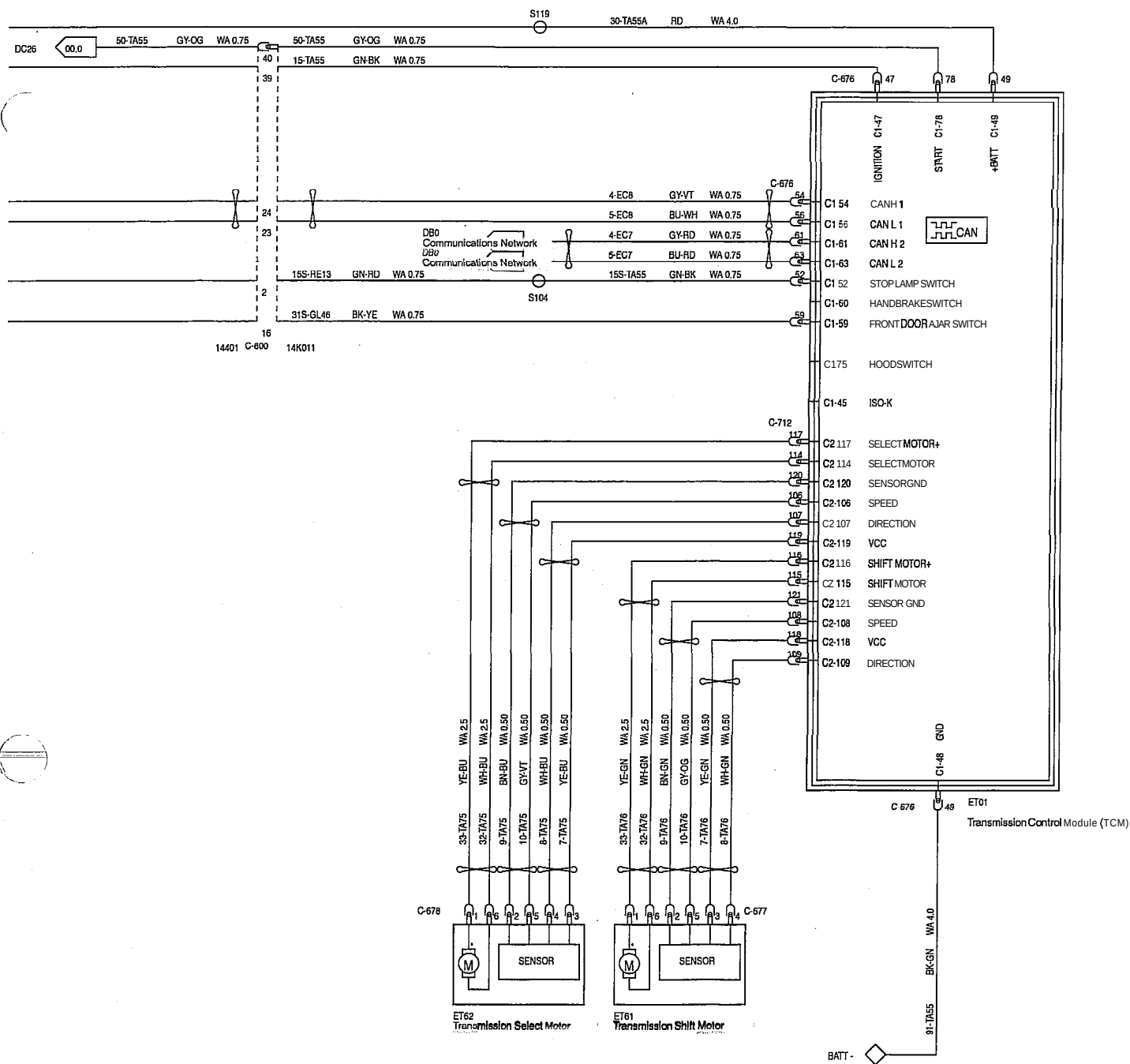


START 15-TA55 GN-BK WA0.75

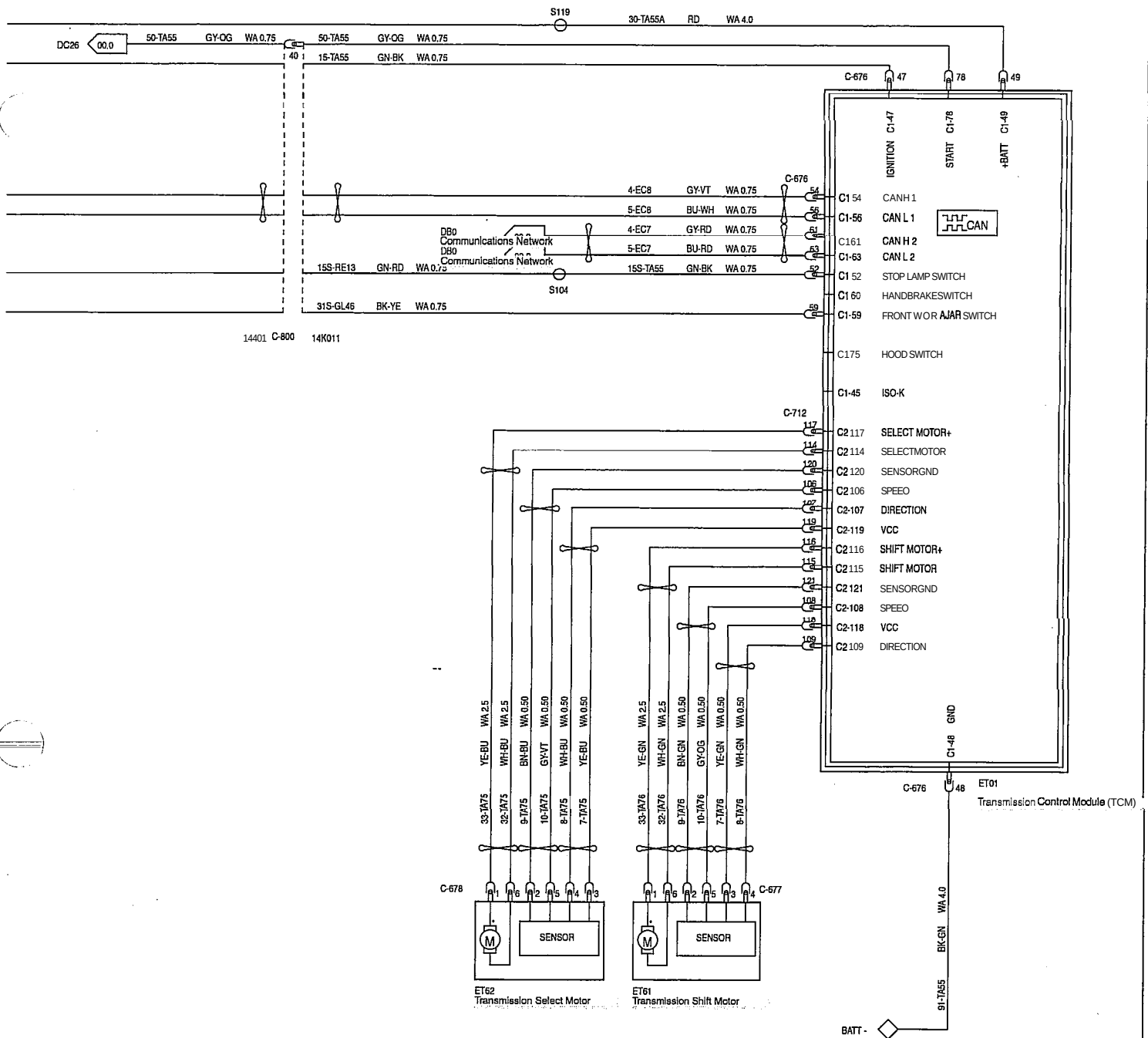
CANH			4-EC8	GY-VT	WA0.75
CANL			CECB	BU-WH	WA0.75

STOPLAMP 15S-RE13 GN RD WA 0.75









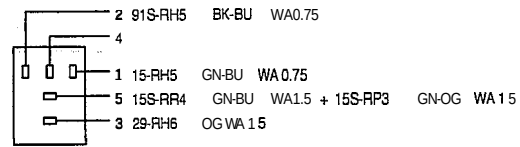


SECTION 310-01 Fuel Tank and Lines

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Fuel Pump Relay.....	310-01-2
Fuel Pump and Sender Unit.....	310-01-3
Inertia Fuel Shutoff (IFS) Switch.....	310-01-4

PIN5=> 15S-RP3 GN-OG 1.5 WA + 15S-RR4 GN-BU 1.5 WA

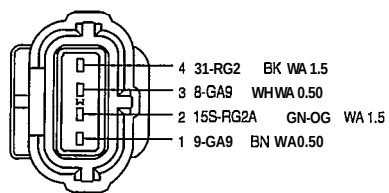


2S6T-14A481-AA

C-410

TO FUEL PUMP RELAY

HARNESS 14401

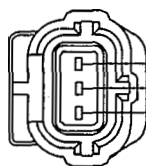


2S6T-14A464-TAA

C-315

TO FUEL TANK UNIT

HARNESS 14401



- | | | | |
|---|---------|-------|-------|
| 1 | 15S-RG2 | GN-OG | WA1.5 |
| 2 | | | |
| 3 | 15S-RP3 | GN-OG | WA1.5 |

YC3T-14A464-DA

C-331

TO INERTIA FUEL SHUT OFF SWITCH

HARNESS 14401

SECTION 412-00 Climate Control System - General Information

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

SPECIFICATIONS

Specifications..... 412-00-2

DIAGNOSIS AND TESTING

Climate Control System..... 412-00-4
Inspection and Checking..... 412-00-4
Refrigerant Circuit - Quick Check..... 412-00-4
Fault Memory Interrogation without WDS - vehicles with electronic automatic temperature control (EATC)..... 412-00-5
Fault Code Table..... 412-00-6
Symptom Chart..... 412-00-7
System Checks..... 412-00-9
Component Tests..... 412-00-85

GENERAL PROCEDURES

Air Conditioning (NC) Clutch Air Gap Adjustment..... (34 628 6) 412-00-86
Air Conditioning (NC) System Recovery. Evacuation and Charging..... (34 620 2) 412-00-87
Refrigerant Oil Adding..... (34 621 1) 412-00-90
Air Distribution System Cleaning..... 412-00-91
Contaminated Refrigerant Handling..... (34 620 9) 412-00-93
Spring Lock Coupling..... 412-00-94
Electronic Leak Detection..... (34 620 7) 412-00-96
Fluorescent Dye Leak Detection..... 412-00-97
Vacuum Leak Detection..... (34 620 3) 412-00-98

SPECIFICATIONS

Lubricants, sealants and adhesives

Material	Specification
Refrigerant R134a	WSH-M17B19-A
Refrigerant oil	WSH-M1C231-B

Refrigerant fill quantities

	Grams
Air conditioning (vehicles with condenser coils of 3.0 mm diameter)	650 ± 13
Air conditioning (vehicles with condenser coils of 1.2 mm diameter)	470 ± 13
Air conditioning (vehicles with 1.6L Duratorq-TDCi (DV6) diesel engine)	520 ± 13

Refrigerant oil fill quantities

	millilitres
Air conditioning	207
Air conditioning (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine)	200

Addition of refrigerant oil when new components are installed

	millilitres
Air conditioning compressor (if the amount of refrigerant oil taken from the compressor is less than 90 ml)	add 90
Air conditioning compressor (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine) (if the amount of refrigerant oil taken from the compressor is less than 50 ml)	add 50.
Air conditioning compressor (if the amount of refrigerant oil taken from the compressor is between 90 ml and 150 ml))	Add same quantity + 30.
Air conditioning compressor (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine) (if the amount of refrigerant oil taken from the compressor is between 50 ml and 150 ml))	Add same quantity + 30.
Air conditioning compressor (if the amount of refrigerant oil taken from the compressor is more than 150 ml)	Add the same quantity.
Air conditioning condenser	add 30.
Air conditioning evaporator	add 90.
Air conditioning evaporator (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine)	add 50.
Renewal of all lines	Add same quantity +2.
Renewal of all lines and components	add 0.
Always, if refrigerant was drained.	Add the same quantity.
Accumulator/dehydrator	Add same quantity +90.
Accumulator/dehydrator (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine)	Add same quantity +50.

Air conditioning clutch

	mm
Clutch gap, A/C compressor	0,35 - 0,75

SPECIFICATIONS**Tightening torques**

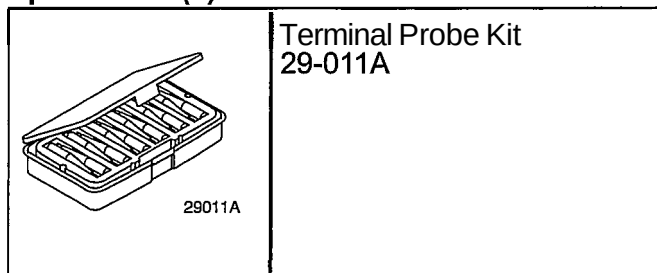
Description	Nm	lb/ft	lb/in
Bolt, A/C compressor drive plate	13	10	-

DIAGNOSIS AND TESTING

Climate Control System

Refer to Wiring Diagrams Section 412-02A, for schematic and connector information.

Special Tool(s)



Terminal Probe Kit
29-011A

General Equipment

Digital Multimeter (compatible with K-type thermocouple)
Worldwide Diagnostic System (WDS)
Refrigerant center
Thermometer - Fluke 80 PK-8 (FSE number 260 4102 001 07)

Inspection and Checking

1. VERIFY customer concern.
2. Visually CHECK for any obvious mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Coolant level • Refrigerant lines • Drive belt • Condenser • Refrigerant compressor	• Fuses • Wiring harness • Connectors

3. RECTIFY any obvious causes for a concern found during the visual inspection before performing any further tests. CHECK the operation of the system.
4. If the concern persists after the visual inspection, PERFORM a fault diagnosis on the electronic engine management with WDS and RECTIFY any displayed faults in accordance with the displayed fault description. CHECK the operation of the system.
5. For vehicles with no stored **fault(s)**, PROCEED in accordance with the symptom chart according to the fault symptom.

6. Following checking or elimination of the fault and after completion of operations, the fault memories of all vehicle modules must be READ OUT and any stored faults must be DELETED. READ OUT all fault memories again following a road test.

Refrigerant Circuit - Quick Check

▲ WARNING: The air conditioning system is filled with refrigerant R134a. Observe "Health and Safety Precautions". For further information

REFER to: Gesundheits- und Sicherheitsvorkehrungen (100-00, Description and Operation).

Refrigerant circuit check

▲ WARNING: Under certain circumstances, refrigerant lines and A/C components may be extremely hot or cold. Exercising care, touch the refrigerant lines or A/C components in order to check this. Failure to observe this instruction can lead to injury.

The refrigerant line from the refrigerant compressor to the condenser must be hot.

- The refrigerant line from the A/C condenser to the fixed orifice tube must be warm, but not so hot as the refrigerant line mentioned above.
- Determine the difference in temperature upstream and downstream of the A/C condenser by measuring the temperatures at the refrigerant lines. The temperature difference should be more than 20° C, depending on the ambient temperature. If the temperature difference is less, check the condenser for contamination or damage to the fins as well as operation of the radiator fan.
- The refrigerant line between the fixed orifice tube and the evaporator must be cold from the point where the fixed orifice tube is installed. Depending on the weather, the line may also be iced up on the outside.
- The refrigerant line between the evaporator and the A/C compressor including the accumulator must be cold.

DIAGNOSIS AND TESTING

Evaporator outlet temperature test

To test the power of the A/C system, the temperature of the evaporator outlet line must be measured. To do this, the following preconditions must be met:

- Open all windows.
- Set the air distribution to the defrost/dashboard position and open all the ventilation nozzles.
- Deactivate recirculated air function.
- Select lowest blower switch setting.
- Select lowest temperature setting.

NOTE: The temperature measurement cannot be done with a thermometer which makes no contact. Incorrect readings could be made because of reflections from surfaces.

Connect temperature sensor (Fluke 80 PK-8) to the refrigerant line from the evaporator to the accumulator in the area of the accumulator (metal line). Connect the temperature sensor to the multimeter.

Start the engine and allow it to run at idle speed for several minutes.

Switch on the air-conditioning system.

After three minutes, measure the surface temperature of the evaporator outlet line.

If the temperature measured is 2° C or lower (vehicles with automatic transmission: 5° C or lower) the A/C system is OK. If the temperature is higher, the A/C system may be under-filled.

Frequent faults and their causes

Should a customer express concern about poor cooling performance of the A/C system it must be ensured that the temperature control valve actuation is OK.

- No or poor cooling performance:
 - Blockage or narrowing in a refrigerant line or in the accumulator: The location of the blockage or narrowing can easily be found by comparing temperatures at the refrigerant lines and at the accumulator. The blockage or restriction is located at the point where the temperature difference is identified. **Note:** A temperature difference in the area of the fixed orifice tube is normal. Once the

location of the blockage or restriction has been detected, check the relevant component and renew if necessary.

- Cooling power suddenly deteriorates (returns to normal after the compressor has been switched off for about 5 minutes):
 - The cause is an iced-up fixed orifice tube because of moisture in the refrigerant circuit. In order to ensure that moisture is completely removed from the refrigerant circuit, evacuation time must be extended to 2-3 hours and the dehydrator must be renewed. For further information

REFER to: Klimaanlage enfleren, evakuieren und befüllen (412-00, General Procedures).

Fault Memory Interrogation without WDS - vehicles with electronic automatic temperature control (EATC)

The climate control system features a self-diagnosis function which can detect and store both current permanent faults as well as intermittent faults which have occurred during normal operation of the vehicle. It is also possible to read out these faults via the display of the EATC module. To start self-diagnosis or to read out the fault memory, the ignition key must be turned to the "ON" position and the battery voltage must be between 9 V and 16 V.

Activation of self-diagnosis

On the EATC module, briefly PRESS the "OFF" and "FOOTWELL" buttons simultaneously for at least 2 seconds, then PRESS "AUTO" within 1.5 seconds. The self-diagnosis which then starts lasts a few seconds. An animated display appears in the EATC display during this time. Any faults detected are displayed in the form of trouble codes. Example: first of all, "93" flashes for 2 seconds, then "42" flashes for 2 seconds - DTC 9342 = internal control unit fault. If no faults are stored, then all of the segments in the display are actuated. The following table gives information on the possible DTCs and their corresponding meanings. By PRESSING the "DEFROST" button, the fault memory is cleared and diagnosis mode is ended. To end the diagnostic mode without clearing the DTCs, PRESS any other EATC button.

DIAGNOSIS AND TESTING

Read out stored faults

On the EATC module, briefly PRESS the "OFF" and "FOOTWELL" buttons simultaneously for at least 2 seconds, then PRESS "HEADROOM" within 1.5 seconds. Any stored intermittent faults are output on the EATC display and should be written down for safety. By PRESSING the "DEFROST" button, the fault memory is cleared and diagnosis mode is ended. To end diagnosis mode without clearing the DTCs, PRESS any other button on the EATC module.

Reading out the EATC software version

On the EATC module, briefly PRESS the "OFF" and "FOOTWELL" buttons simultaneously for at least 2 seconds, then PRESS "A/C" within 1.5 seconds. The SW version is output on the EATC display. The output mode is ended by PRESSING any button.

Fault Code Table

Self-test code	Description	Action
B1200 19200	Internal control unit fault	CLEAR the fault memory. If the fault occurs again after a functional test, RENEW the EATC module.
B1242 19242	Fault in the circuit of the recirculated air flap actuator	GO to Pinpoint Test G.
B1251 19251	Break in circuit for interior temperature sensor	GO to Pinpoint Test M.
B1253 19253	Short in circuit for interior temperature sensor (short to ground)	GO to Pinpoint Test M.
B1261 19261	Short circuit in sun load sensor circuit (short to ground)	GO to Pinpoint Test L.
B1263 /9263	Circuit of actuator for air distribution flap faulty	GO to Pinpoint Test H.
B1342 19342	Internal control unit fault	CLEAR the fault memory. If the fault occurs again after a functional test, RENEW the EATC module.
B1676 19676	Power supply voltage outside tolerance	CHECK charging system. For further information REFER to: Charging System (414-00, Diagnosis and Testing). If the charging system is OK, GO to Pinpoint Test O.
B2266 /A266	Circuit of temperature control flap actuator faulty	GO to Pinpoint Test I.
B2297 /A299	Break in circuit for footwell air outlet temperature sensor	GO to Pinpoint Test J.
B2298 /A307	Short in circuit for footwell air outlet temperature sensor (short to ground)	GO to Pinpoint Test J.

DIAGNOSIS AND TESTING

Self-test code	Description	Action
A297	Break in circuit for center vents air outlet temperature sensor	GO to Pinpoint Test K.
A298	Short in circuit for center vents air outlet temperature sensor (short to ground)	GO to Pinpoint Test K.
B2308 /A308	Fault in the circuit of the interior temperature sensor blower	GO to Pinpoint Test N.
B2516 /A516	Circuit of blower control faulty	GO to Pinpoint Test B.
B2818 /A818	Circuit of A/C demand signal faulty (short circuit to voltage)	GO to Pinpoint Test P.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
Blower inoperative/incorrect function - vehicles without electronic automatic temperature control (EATC)	- Fuse - Circuit(s) - Blower motor - Blower switch - Blower resistor assembly	GO to Pinpoint Test A.
Blower inoperative/incorrect function - vehicles with electronic automatic temperature control (EATC)	- Fuse - Circuit(s) - Blower motor - Blower control module - Electronic automatic temperature control (EATC) module	GO to Pinpoint Test B.
Blower operating continuously - vehicles without electronic automatic temperature control (EATC)	- Circuit(s) - Blower switch - Blower resistor assembly	GO to Pinpoint Test C.
Air conditioning inoperative (blower motor function OK)	- Fuse(s) - Circuit(s) - Air conditioning clutch - A/C clutch diode - Air conditioning clutch relay - Refrigerant low-pressure switch - Refrigerant high-pressure switch - Refrigerant pressure transducer - Control panel - climate control system - Electronic automatic temperature control (EATC) module - Powertrain control module (PCM) - Refrigerant circuit - Refrigerant quantity	GO to Pinpoint Test D.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Air conditioning operating continuously	- Circuit(s) - Air conditioning clutch - Air conditioning clutch relay - Powertrain control module (PCM) - Refrigerant low-pressure switch - Refrigerant high-pressure switch - Control panel - climate control system - Electronic automatic temperature control (EATC) module	GO to Pinpoint Test E.
Electronic automatic temperature control (EATC) module inoperative (no display on the control unit)	- Fuse(s) - Circuit(s) - Electronic automatic temperature control (EATC) module	GO to Pinpoint Test O.
Air recirculation flap(s) inoperative (air conditioning function OK)	- Circuit(s) - Air recirculation flap(s) - Operating cables for recirculated air flaps - Recirculated air flap actuator - Control panel - climate control system - Electronic automatic temperature control (EATC) module	- Vehicles without electronic automatic temperature control (EATC) GO to Pinpoint Test F. - Vehicles with electronic automatic temperature control (EATC) GO to Pinpoint Test G.
Malfunction of air distribution flap - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Air distribution flap - Actuator - air distribution flap - Electronic automatic temperature control (EATC) module	GO to Pinpoint Test H.
Malfunction of temperature control flap - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Temperature control flap - Temperature control flap actuator - Electronic automatic temperature control (EATC) module	GO to Pinpoint Test I.
Fault in footwell air outlet temperature sensor circuit - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Air outlet temperature sensor, footwell	GO to Pinpoint Test J.
Fault in centre vent air outlet temperature sensor circuit - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Air outlet temperature sensor, centre nozzles	GO to Pinpoint Test K.
Sun load sensor circuit faulty - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Sun load sensor	GO to Pinpoint Test L.

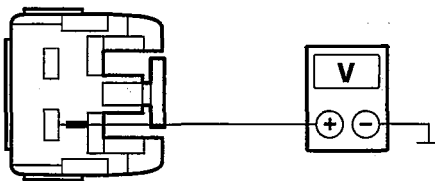
DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Passenger compartment temperature sensor circuit faulty - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Passenger compartment temperature sensor	GO to Pinpoint Test M.
Passenger compartment temperature sensor blower circuit faulty - vehicles with electronic automatic temperature control (EATC)	- Circuit(s) - Passenger compartment temperature sensor	GO to Pinpoint Test N.
Circuit of A/C demand signal short circuit to voltage	- Circuit(s) - Electronic automatic temperature control (EATC) module - Powertrain control module (PCM)	GO to Pinpoint Test P.
Condensation water from the air conditioning system in the footwell	- Outlet line - Rubber grommet	CHECK condition of the outlet line and the rubber grommet and REPAIR if necessary.

System Checks**PINPOINT TEST A : BLOWER MOTOR FAULTY ■ INOPERATIVE**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK ALL SPEED SETTINGS OF THE BLOWER MOTOR	
	☐ Ignition switch in position II.
	☒ Move the blower switch through all its positions. - Is the blower motor inoperative in all the switch positions? → Yes GO to A2. → No - The blower motor is inoperative in switch positions 1,2 and/or 3: GO to A9. - The blower motor is only inoperative in switch position 4: GO to A8.
A2: CHECK FUSE F49	
	☒ Ignition switch in position 0.

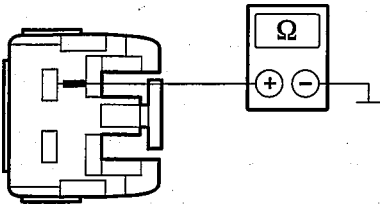
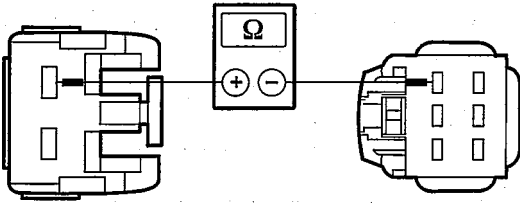
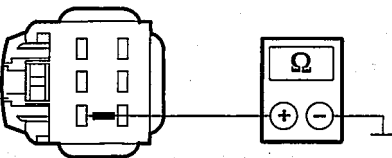
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK fuse F49 (CJB). - Is the fuse OK? → Yes GO to A3. → No INSTALL A NEW fuse F49 (30 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
A3: CHECK THE VOLTAGE AT FUSE F49	
	☐ Connect fuse F49 (CJB). ☐ Ignition switch in position II. ☐ Measure the voltage between fuse F49 (30 A) and ground. - Does the meter display battery voltage? → Yes GO to A4. → No REPAIR the voltage supply to fuse F49 using the Wiring Diagrams. CHECK the operation of the system.
A4: CHECK VOLTAGE AT THE BLOWER MOTOR	
 VFE0028910	☐ Ignition switch in position 0. ☐ Disconnect connector C322 from blower motor. ☐ Ignition switch in position II. ☐ Measure the voltage between the blower motor, connector C322, pin 1, circuit 15-FA18 (GNI0G), wiring harness side and ground. - Does the meter display battery voltage? → Yes GO to A5. → No LOCATE and REPAIR break in circuit 15-FA18 (GNI0G), between blower motor and fuse F49 using the Wiring Diagrams. CHECK the operation of the system.
A5: CHECK GROUND CONNECTION OF BLOWER MOTOR	
	☐ Ignition switch in position 0. ☐ Set the blower switch to position 4.

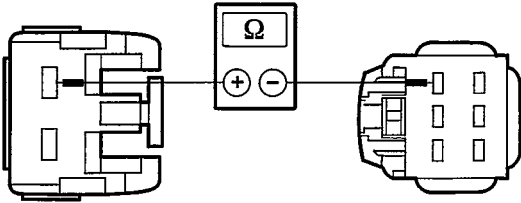
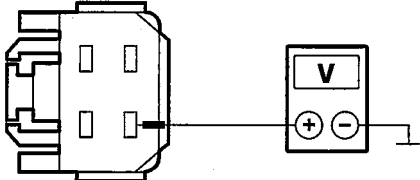
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

 E0028911	3 Measure the resistance between the blower motor, connector C322, pin 2, circuit 31S-FA18 (BWRD), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes RENEW the blower motor. CHECK the operation of the system. → No GO to A6.
A6: CHECK CIRCUIT BETWEEN THE BLOWER MOTOR AND THE BLOWER SWITCH FOR OPEN CIRCUIT	
 VFE0028912	1 Disconnect connector C324 from blower switch. 2 Measure the resistance between the blower motor, connector C322, pin 2, circuit 31S-FA18 (BWRD), wiring harness side and the blower switch, connector C324, pin 1, circuit 31S-FA33 (BWOE), wiring harness side. Is a resistance of less than 2 Ohm registered? → Yes GO to A7. → No LOCATE and REPAIR the break in circuit 31S-FA18 (BWRD) between the blower motor and soldered connection S269 using the Wiring Diagrams. CHECK the operation of the system.
A7: CHECK THE GROUND CONNECTION OF THE BLOWER SWITCH	
 VFE0028894	1 Measure the resistance between the blower switch, connector C324, pin 3, circuit 31-FA25 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes INSTALL A NEW blower switch. CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 31-FA25 (BK) between the blower switch and ground connection G30 using the Wiring Diagrams. CHECK the operation of the system.

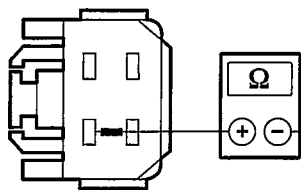
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A8: CHECK CIRCUIT BETWEEN THE BLOWER MOTOR AND THE BLOWER SWITCH FOR OPEN CIRCUIT	
	Ignition switch in position 0.
	2 Disconnect connector C324 from blower switch.
	3 Disconnect connector C322 from blower motor.
 VFE0028912	4 Measure the resistance between the blower motor, connector C322, pin 2, circuit 31S-FA18 (BWRD), wiring harness side and the blower switch, connector C324, pin 1, circuit 31S-FA33 (BWOE), wiring harness side. Is a resistance of less than 2 Ohm registered? → Yes INSTALL A NEW blower switch. CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 31S-FA33 (BWOE) between soldered connection S269 and the blower switch using the Wiring Diagrams. CHECK the operation of the system.
A9: CHECK VOLTAGE AT BLOWER RESISTOR ASSEMBLY	
	1 Ignition switch in position 0.
	2 Disconnect connector C323 from blower resistor assembly.
	3 Set the blower switch to position 0.
	4 Ignition switch in position II.
 VFE0028913	5 Measure the voltage between the blower resistor, connector C323, pin 4, circuit 31S-FA1 (BWBU), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to A10. → No LOCATE and REPAIR the break in circuit 31S-FA1 (BWBU) between soldered connection S269 and the blower resistor assembly using the Wiring Diagrams. CHECK the operation of the system.
A10: CHECK THE GROUND CONNECTION OF BLOWER RESISTOR ASSEMBLY - STAGE 1	
	1 Ignition switch in position 0.
	2 Set the blower switch to position 1.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VFE0028918

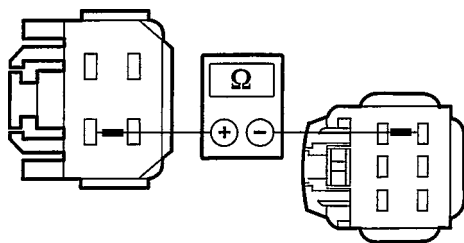
3 Measure the resistance between the blower resistor, connector C323, pin 2, circuit 31S-FA30 (BWH), wiring harness side and ground.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**
GO to A12.

→ **No**
GO to A11.

A11: CHECK CIRCUIT BETWEEN THE BLOWER RESISTOR ASSEMBLY AND THE BLOWER SWITCH FOR OPEN CIRCUIT



VFE0028917

1 Disconnect connector C324 from blower switch.

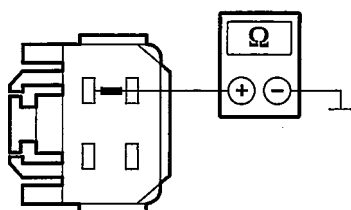
2 Measure the resistance between the blower resistor assembly, connector C323, pin 2, circuit 31S-FA30 (BWH), wiring harness side and the blower switch, connector C324, pin 4, circuit 31S-FA30 (BK/WH), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**
INSTALL A NEW blower switch. CHECK the operation of the system.

→ **No**
LOCATE and REPAIR the break in circuit 31S-FA30 (BWH) between the blower resistor assembly and the blower switch using the Wiring Diagrams. CHECK the operation of the system.

A12: CHECK THE GROUND CONNECTION OF BLOWER RESISTOR ASSEMBLY - STAGE 2



VFE0028914

1 Set the blower switch to position 2.

2 Measure the resistance between the blower resistor assembly, connector C323, pin 1, circuit 31s-FA31 (BK/YE), wiring harness side and ground.

- Is a resistance of less than 2 Ohm registered?

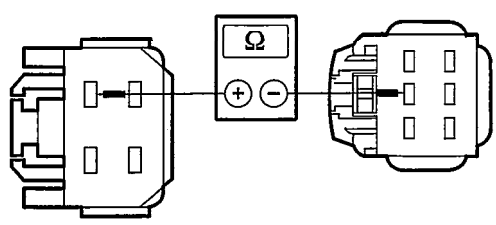
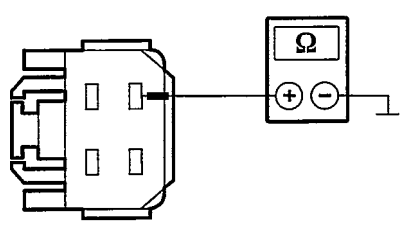
→ **Yes**
GO to A14.

→ **No**
GO to A13.



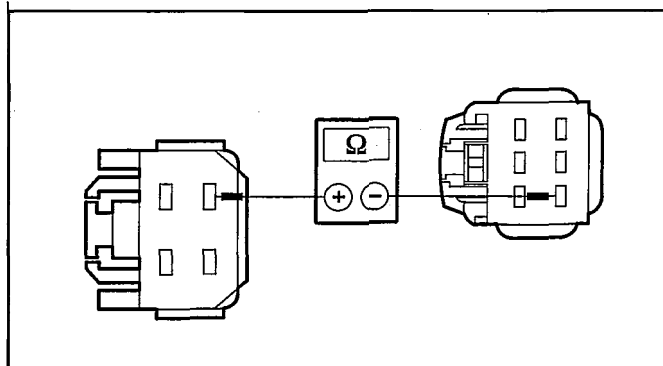


DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A13: CHECK CIRCUIT BETWEEN THE BLOWER RESISTOR ASSEMBLY AND THE BLOWER SWITCH FOR OPEN CIRCUIT	
 VFE0028915	1 Disconnect connector C324 from blower switch. 2 Measure the resistance between the blower resistor assembly, connector C323, pin 1, circuit 31s-FA31 (BWE), wiring harness side and the blower switch, connector C324, pin 2, circuit 31S-FA31 (BWE), wiring harness side. • Is a resistance of less than 2 Ohm registered? → Yes INSTALL A NEW blower switch. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 31S-FA31 (BWE) between the blower resistor assembly and the blower switch using the Wiring Diagrams. CHECK the operation of the system.
A14: CHECK THE GROUND CONNECTION OF BLOWER RESISTOR ASSEMBLY - STAGE 3	
 VFE0028916	1 Set the blower switch to position 3. 2 Measure the resistance between the blower resistor assembly, connector C323, pin 3, circuit 31s-FA32 (BWBU), wiring harness side and ground. • Is a resistance of less than 2 Ohm registered? → Yes RENEW the blower resistor assembly. CHECK the operation of the system. → No GO to A15.
A15: CHECK CIRCUIT BETWEEN THE BLOWER RESISTOR ASSEMBLY AND THE BLOWER SWITCH FOR OPEN CIRCUIT	
	1 Disconnect connector C324 from blower switch.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028919

DETAILS/RESULTS/ACTIONS

- 2** Measure the resistance between the blower resistor assembly, connector C323, pin 3, circuit 31s-FA32 (BWBU), wiring harness side and the blower switch, connector C324, pin 6, circuit 31S-FA32 (BWBU), wiring harness side.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
INSTALL A NEW blower switch. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the break in circuit 31S-FA32 (BWBU) between the blower resistor assembly and the blower switch using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST B : BLOWER INOPERATIVE/INCORRECT FUNCTION - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

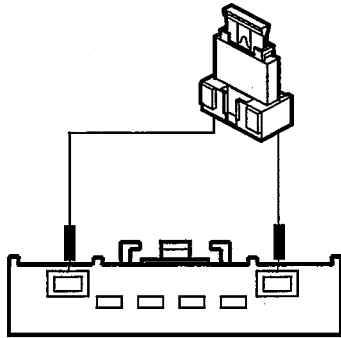
B1: CHECK FUSE F49

- 1** Ignition switch in position 0.
- 2** CHECK fuse F49 (CJB).
- Is the fuse OK?
- **Yes**
GO to B2.
- **No**
RENEW fuse F49 (30 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

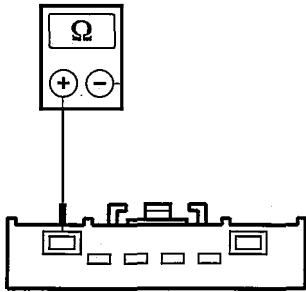
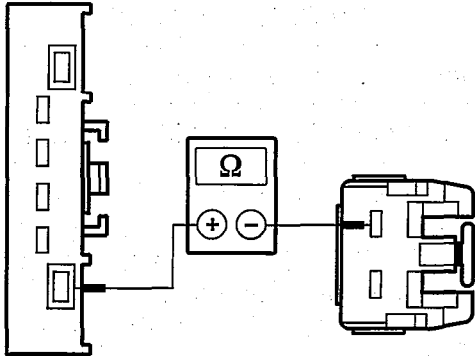
B2: CHECK THE VOLTAGE AT FUSE F49

- ☐ Connect fuse F49 (CJB).
- 2** Ignition switch in position II.
- 3** Measure the voltage between fuse F49 (30 A) and ground.
- Is battery voltage measured?
- **Yes**
GO to B3.
- **No**
REPAIR the voltage supply to fuse F49 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B3: CHECK FUSE F38	
	☒ 1 Ignition switch in position 0.
	☐ CHECK fuse F38 (CJB). • Is the fuse OK? → Yes GO to B4. → No INSTALL A NEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
B4: CHECK THE VOLTAGE AT FUSE F38	
	☒ 1 Connect fuse F38 (CJB).
	☐ Ignition switch in position II.
	☒ 3 Measure the voltage between fuse F38 (7.5 A) and ground. • Does the meter display battery voltage? → Yes GO to B5. → No REPAIR the voltage supply to fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
B5: CHECK THE CIRCUIT OF THE BLOWER MOTOR	
⚠ CAUTION: The test should be performed for a maximum of 10 seconds to prevent damage to the blower motor.	
	☐ Ignition switch in position 0.
	☒ 2 Disconnect Connector C362 from blower control module.
 E56128	☐ Using a fused test cable, bridge the blower control module, connector C362 , between pin 1, circuit 31S-FA18 (BWRD), wiring harness side and pin 6, circuit 31-FA18 (BK), wiring harness side.

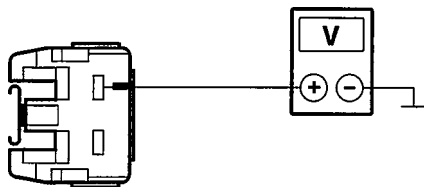
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Ignition switch in position II. Does the blower motor run at full speed? → Yes GO to B9. → No GO to B6.
B6: CHECK THE GROUND CONNECTION OF THE BLOWER CONTROL MODULE	
 VFE0037960	☐ Ignition switch in position 0. ☐ Measure the resistance between the blower control module, connector C362, pin 6, circuit 31-FA18 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to B7. → No LOCATE and RECTIFY the break in circuit 31-FA18 (BK) between the blower control module and ground connection G30 using the Wiring Diagrams. CHECK the operation of the system.
B7: CHECK THE CIRCUIT BETWEEN THE BLOWER MOTOR AND THE BLOWER CONTROL MODULE FOR OPEN CIRCUIT	
 E56129	1 Disconnect connector C322 of blower motor. 2 Measure the resistance between the blower motor, connector C322, pin 2, circuit 31S-FA18 (BK/RD), wiring harness side and the blower control module, connector C362, pin 1, circuit 31S-FA18 (BWRD), wiring harness side. Is a resistance of less than 2 ohms registered? → Yes GO to B8. → No LOCATE and REPAIR the break in circuit 31S-FA18 (BWRD) between the blower motor and the blower control module using the Wiring Diagrams. CHECK the operation of the system.
B8: TEST THE VOLTAGE AT THE BLOWER MOTOR	
	1 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VFE0022394

- 2 Measure the voltage between the blower motor, connector C322, pin 1, circuit 15-FA18 (GN/OG), wiring harness side and ground.

• Is battery voltage measured?

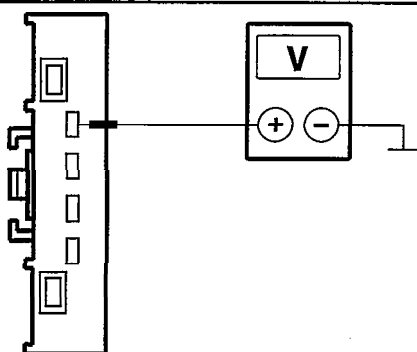
→ **Yes**

RENEW the blower motor. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in the circuit between the blower motor and fuse F49 using the Wiring Diagrams. CHECK the operation of the system.

B9: CHECK THE VOLTAGE AT THE BLOWER CONTROL MODULE



E56130

- 1 Measure the voltage between the blower control module, connector C362, pin 2, circuit 15-FA45 (GN/RD), wiring harness side and ground.

• Is battery voltage measured?

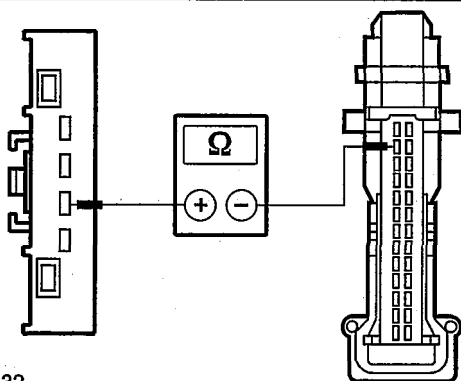
→ **Yes**

GO to B10.

→ **No**

LOCATE and RECTIFY the break in the circuit between the blower control module and fuse F38 using the Wiring Diagrams. CHECK the operation of the system.

B10: CHECK THE CIRCUIT BETWEEN THE BLOWER CONTROL MODULE AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT



E56132

- 1 Ignition switch in position 0.

- 2 Disconnect Connector C367 of EATC module.

- 3 Measure the resistance between the blower control module, connector C362, pin 4, circuit 49s-FA18 (BUNE), wiring harness side and the EATC module, connector C367, pin 15, circuit 49s-FA18 (BUNE), wiring harness side.

• Is a resistance of less than 2 ohms registered?

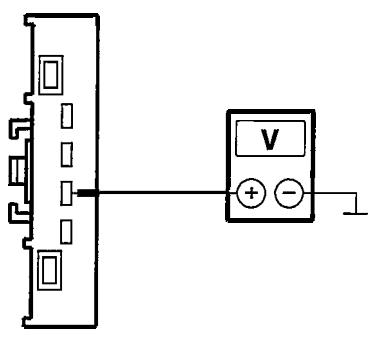
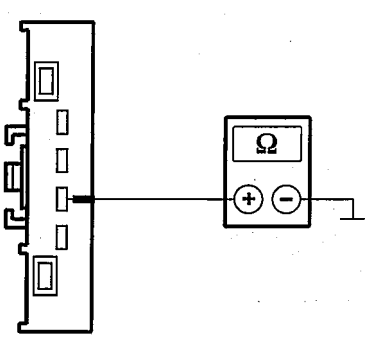
→ **Yes**

GO to B11.

→ **No**

LOCATE and REPAIR the break in circuit 45S-FA18 (BUNE) between the blower control module and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B11: CHECK THE CIRCUIT BETWEEN THE BLOWER CONTROL MODULE AND THE EATC MODULE FOR SHORT TO VOLTAGE	
 E64250	1 Ignition switch in position II. 2 Measure the voltage between the blower control module, connector C362, pin 4, circuit 49s-FA18 (BUNE), wiring harness side and ground. - Is a voltage measured? → Yes GO to B12. → No LOCATE and REPAIR the short to voltage in circuit 45s-FA18 (BUNE) between the blower control module and the EATC module using the Wiring Diagrams. CHECK the operation of the system.
B12: CHECK THE CIRCUIT BETWEEN THE BLOWER CONTROL MODULE AND THE EATC MODULE FOR SHORT TO GROUND	
 E64251	1 Ignition switch in position 0. ☐ Measure the resistance between the blower control module, connector C362, pin 4, circuit 49s-FA18 (BUNE), wiring harness side and ground. - Is a resistance of more than 10,000 ohms measured? → Yes RENEW the blower control module. CHECK the operation of the system. If the system is still inoperative, RENEW the EATC module. → No LOCATE and REPAIR the short to ground in circuit 45s-FA18 (BUNE) between the blower control module and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST C : BLOWER MOTOR OPERATING CONTINUOUSLY - **VEHICLES** WITHOUT ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK BLOWER SWITCH	
	☐ Ignition switch in position 0.
	2 Disconnect connector C324 from blower switch.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Check function of blower motor. Does the blower motor run continuously? → Yes GO to C2. → No INSTALL A NEW blower switch. CHECK the operation of the system.
C2: CHECK CIRCUITS AT BLOWER RESISTOR ASSEMBLY	
	☐ Ignition switch in position 0.
	☐ Disconnect connector C323 from blower resistor assembly.
	☐ Ignition switch in position II.
	☐ Check function of blower motor. Does the blower motor run continuously? → Yes LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S269 with the aid of the Wiring Diagrams. CHECK the operation of the system. → No LOCATE and REPAIR the short to ground in the circuits between the blower resistor assembly and the blower switch using the wiring diagrams. CHECK the operation of the system.

PINPOINT TEST D : AIR CONDITIONING INOPERATIVE (BLOWER MOTOR FUNCTION OK)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK FUSE F4	
	☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

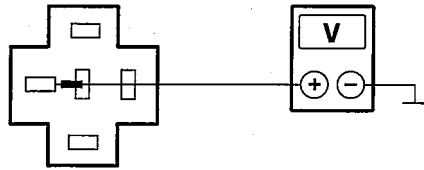
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F4 (CJB). Is the fuse OK? → Yes GO to D2. → No INSTALL A NEW fuse F4 (10 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams. - All except vehicles with diesel engines: In addition, CHECK and if necessary RENEW the air conditioning clutch diode. CHECK the operation of the system.
D2: CHECK THE VOLTAGE AT FUSE F4	
	1 Connect fuse F4 (CJB). 2 Measure the voltage between fuse, F4 (10 A) and ground. Does the meter display battery voltage? → Yes GO to D3. → No REPAIR the voltage supply to fuse F4 using the Wiring Diagrams. CHECK the operation of the system.
D3: CHECK FUSE F12	
	1 CHECK fuse F12 (CJB). Is the fuse OK? → Yes GO to D4. → No INSTALL A NEW fuse F12 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
D4: CHECK THE VOLTAGE AT FUSE F12	
	1 Connect fuse F12 (CJB). 2 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the voltage between fuse F12 (15 A) and ground. - Does the meter display battery voltage? → Yes - Vehicles without electronic automatic temperature control (EATC): GO to D5. - Vehicles with electronic automatic temperature control (EATC): GO to D7. → No REPAIR the voltage supply to fuse F12 using the Wiring Diagrams. CHECK the operation of the system.
D5: CHECK FUSE F38	
	1 Ignition switch in position 0. 2 CHECK fuse F38 (CJB). Is the fuse OK? → Yes GO to D6. → No RENEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
D6: CHECK THE VOLTAGE AT FUSE F38	
	1 Connect fuse F38 (CJB). 2 Ignition switch in position II. 3 Measure the voltage between fuse F38 (7.5 A) and ground. Is battery voltage measured? → Yes GO to D7. → No REPAIR the voltage supply to fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
D7: CHECK THE VOLTAGE AT THE AIR CONDITIONING CLUTCH RELAY	
	1 Ignition switch in position 0. ☐ Disconnect Air conditioning clutch relay from socket C403 (relay box - engine compartment).

DIAGNOSIS AND TESTING

TEST CONDITIONS



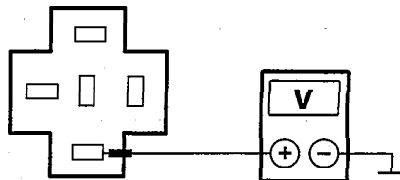
VFE0028925

DETAILS RESULTS ACTIONS

- 3 Measure the voltage between the air conditioning clutch relay, socket C403, pin 3, circuit 29-FA12 (OG/BU), wiring harness side and ground.
- Does the meter display battery voltage?
- **Yes**
GO to D8.
- **No**
LOCATE and RECTIFY the break in circuit 29-FA12 (OG/BU) between the air conditioning clutch relay and fuse F4 using the Wiring Diagrams. CHECK the operation of the system.

D8: CHECK THE CONTROL VOLTAGE AT THE AIR CONDITIONING CLUTCH RELAY

Ignition switch in position II.



E58486

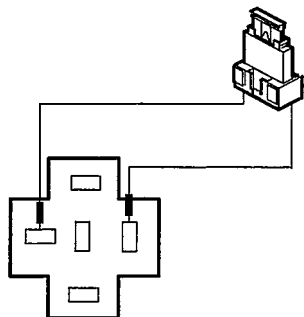
- Measure the voltage between the air conditioning clutch relay, socket C403, pin 1, circuit 15S-FA11 (GNNE), wiring harness side and ground.
- Does the meter display battery voltage?
- **Yes**
GO to D9.
- **No**
LOCATE and RECTIFY the break in circuit 15S-FA11 (GNNE) between the air conditioning clutch relay and soldered connection S110 (vehicles with 2.0L Duratec-HE (M14) engine: S302) using the Wiring Diagrams. CHECK the operation of the system.

D9: CHECK THE AIR CONDITIONING CLUTCH CIRCUIT

☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028926

DETAILS/RESULTS/ACTIONS

- 2 Use a fused test cable (10 A) at the A/C clutch relay to bridge between socket C403, pin 3, circuit 29-FA12 (OG/BU), wiring harness side and pin 5, circuit 15s-FA1 (GNIBU) (vehicles with diesel engine: circuit 15s-FA6 (GNNE)), wiring harness side.

- Does the air conditioning clutch work?

→ Yes

GO to D16.

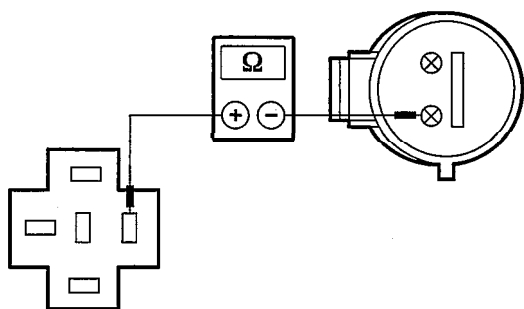
→ No

- All, except vehicles with 2.0L Duratec-HE (MI4) engine or 1.6L diesel engine:
GO to D10.

- Vehicles with 2.0L Duratec-HE (MI4) engine:
GO to D12.

- Vehicles with 1.6L diesel engine:
GO to D14.

D10: CHECK THE CIRCUIT BETWEEN THE A/C CLUTCH RELAY AND THE A/C CLUTCH FOR OPEN CIRCUIT - ALL VEHICLES, EXCEPT THOSE WITH 2.0L DURATEC-HE (MI4) ENGINE OR 1.6L DIESEL ENGINE



VFE0028927

- 1 Disconnect connector C401 from air conditioning clutch.

- 2 Measure the resistance between the air conditioning clutch relay, socket C403, pin 5, circuit 15s-FA1 (GN/BU) (vehicles with 1.4L diesel engine: circuit 15s-FA6 (GNNE)), wiring harness side and air conditioning clutch, connector C401, pin 1, circuit 15s-FA6 (GNNE), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ Yes

GO to D11.

→ No

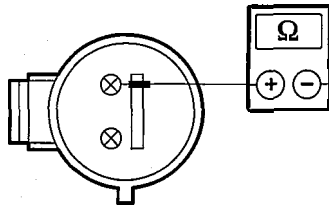
LOCATE and REPAIR the open circuit between the air conditioning clutch relay and air conditioning clutch using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D11 : CHECK THE GROUND CONNECTION OF THE A/C CLUTCH - ALL VEHICLES EXCEPT THOSE WITH 2.0L DURATEC-HE (MI4) ENGINE OR 1.6L DIESEL ENGINE



VFE0028906

- ☐ Measure the resistance between the air conditioning clutch, connector C401, pin 2, circuit 31-FA6 (BK), wiring harness side and ground.

- Is a resistance of less than 2 Ohm registered?

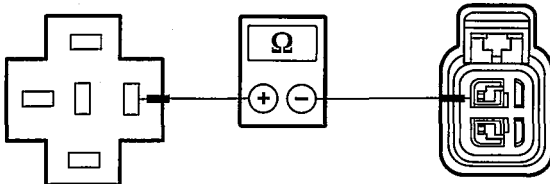
→ **Yes**

INSTALL A NEW air conditioning clutch.
CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the air conditioning clutch and ground connection G22 (vehicles with 1.4L diesel engine: ground connection G24) with the aid of the Wiring Diagrams. CHECK the operation of the system.

D12: CHECK THE CIRCUIT BETWEEN THE A/C CLUTCH RELAY AND THE A/C CLUTCH FOR OPEN CIRCUIT - VEHICLES WITH 2.0L DURATEC-HE (MI4) ENGINE



E57636

- 1** Disconnect connector C398 from air conditioning clutch.

Measure the resistance between the A/C clutch relay, socket C403, pin 5, circuit 15s-FA1 (GN/BU), wiring harness side and the A/C clutch, connector C398, pin 1, circuit 15s-FA6 (GNNE), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

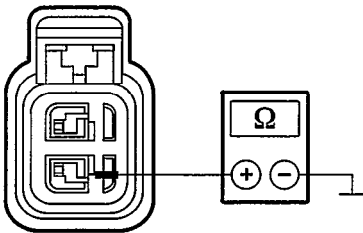
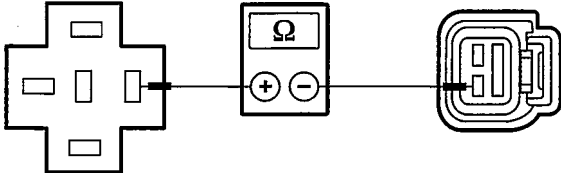
→ **Yes**

GO to D13.

→ **No**

LOCATE and REPAIR the open circuit between the air conditioning clutch relay and air conditioning clutch using the Wiring Diagrams. CHECK the operation of the system.

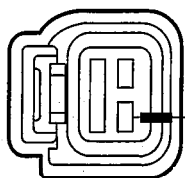
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
D13: CHECK THE GROUND CONNECTION OF THE A/C CLUTCH - VEHICLES WITH 2.0L DURATEC-HE (MI4) ENGINE  E57637	1 Measure the resistance between the air conditioning clutch, connector C398, pin 2, circuit 31-FA6 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes RENEW the air conditioning clutch. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the air conditioning clutch and ground connection G22 with the aid of the Wiring Diagrams. CHECK the operation of the system.
D14: CHECK CIRCUIT BETWEEN A/C CLUTCH RELAY AND A/C CLUTCH FOR OPEN CIRCUIT - VEHICLES WITH 1.6L DIESEL ENGINE  E57638	1 Disconnect connector C399 from air conditioning clutch. 2 Measure the resistance between the A/C clutch relay, socket C403, pin 5, circuit 15S-FA6 (GNNE), wiring harness side and the A/C clutch, connector C399, pin 1, circuit 15S-FA6 (GNNE), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to D15. → No LOCATE and RECTIFY the break in circuit 15S-FA6 (GNNE) between the air conditioning clutch relay and the A/C clutch using the Wiring Diagrams. CHECK the operation of the system.

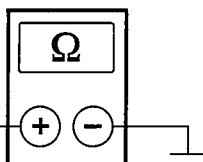
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D15: CHECK THE GROUND CONNECTION OF THE A/C CLUTCH - VEHICLES WITH 1.6L DIESEL ENGINE

E57639



- 1** Measure the resistance between the air conditioning clutch, connector C399, pin 2, circuit 31-FA6 (BK), wiring harness side and ground.

Is a resistance of less than 2 Ohms registered?

→ **Yes**

RENEW the air conditioning clutch. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the open circuit in circuit 31-FA6 (BK) between the A/C clutch and ground connection G22 using the Wiring Diagrams. CHECK the operation of the system.

D16: CHECK THE GROUND CONNECTION OF THE AIR CONDITIONING CLUTCH RELAY

☐ Ignition switch in position III.

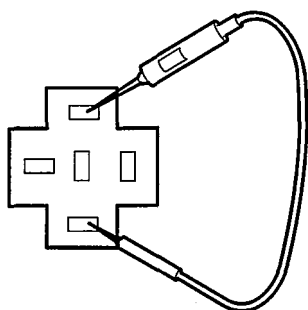
2 Run the engine at idle speed.

3 Switch on the blower.

4 Switch on the air-conditioning system.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028922

DETAILS/RESULTS/ACTIONS



CAUTION: It is imperative that a test lamp with a nominal voltage of **12 V** and a nominal power rating of **1.2 W** is used during the following test. Otherwise the powertrain control module (PCM) could be damaged, or the test could deliver incorrect results.

- 5** Use a test lamp (12 V, 1.2 W) to check the voltage at the air conditioning clutch relay, socket **C403**, between pin 1, circuit **15S-FA11** (GNNE), wiring harness side and pin 2, circuit **91S-FA11** (BKIYE), wiring harness side.

- Does the test lamp illuminate?

→ Yes

RENEW the air conditioning clutch relay.
CHECK the operation of the system.

- All except vehicles with diesel engines:
In addition, CHECK and if necessary RENEW the air conditioning clutch diode. CHECK the operation of the system.

→ No

- All, except vehicles with diesel engine or 2.0L Duratec-HE (M14) engine:
GO to D17.

- Vehicles with 2.0L Duratec-HE (M14) engine:
GO to D19.

- Vehicles with 1.4L diesel engine:
GO to **D28**.

- Vehicles with 1.6L diesel engine:
GO to D30.

D17: CHECK A/C REQUEST SIGNAL AT PCM - ALL, EXCEPT VEHICLES WITH DIESEL ENGINE OR 2.0L DURATEC-HE (M14) ENGINE

1 Ignition switch in position 0.

2 Disconnect connector C343 from the PCM.

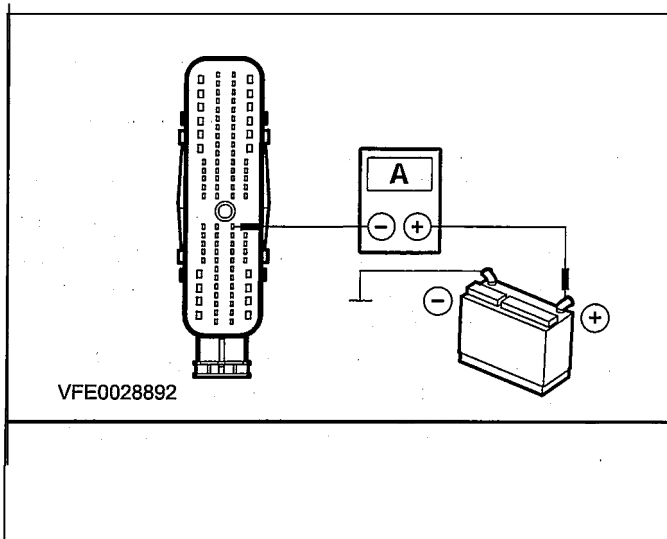
3 Ignition switch in position II.

4 Switch on the blower.

5 Switch on the air-conditioning system.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA.

6 Measure the current between the PCM, connector C343, pin F22, circuit 31S-FA87 (BWGN), wiring harness side and battery voltage.

- Is a current of more than 8 mA measured?

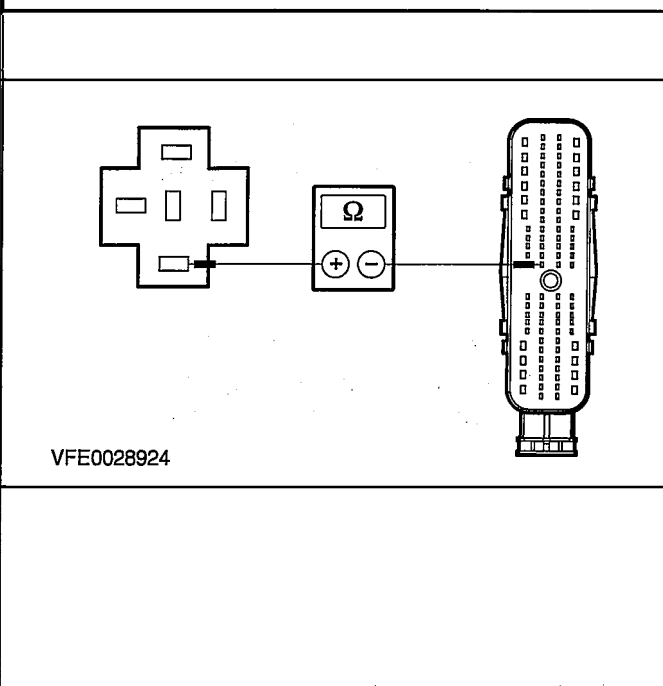
→ Yes
GO to D18.

→ No
GO to D32.

D18: CHECK THE CIRCUIT BETWEEN THE **A/C** CLUTCH RELAY AND THE PCM FOR OPEN CIRCUIT - ALL VEHICLES, EXCEPT THOSE **WITH** DIESEL ENGINE OR **2.0L** DURATEC-HE (**M14**) ENGINE

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.



1 Ignition switch in position 0.

2 Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91S-FA11 (BK/YE), wiring harness side and the PCM, connector C343, pin M26, circuit 91S-FA11 (BK/YE), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ Yes
CHECK PCM with WDS. RENEW PCM if necessary. CHECK the operation of the system.

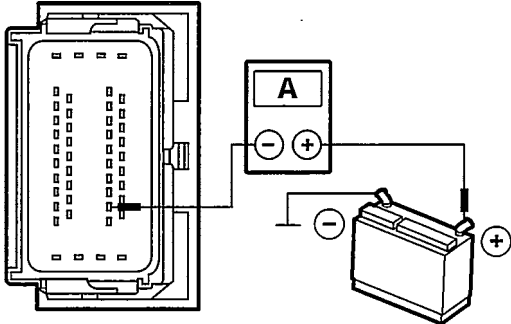
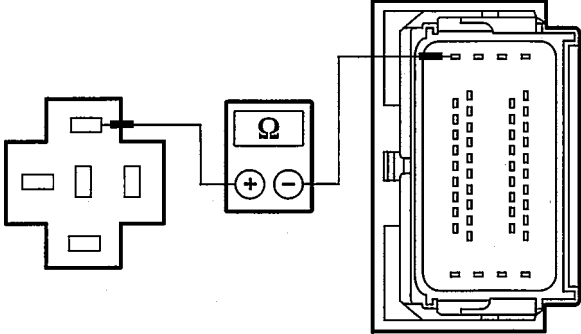
→ No
LOCATE and RECTIFY the break in circuit 91S-FA11 (BK/YE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

D19: CHECK THE **A/C** REQUEST SIGNAL AT THE PCM - **VEHICLES WITH 2.0L** DURATEC-HE (**M14**) ENGINE

1 Ignition switch in position 0.

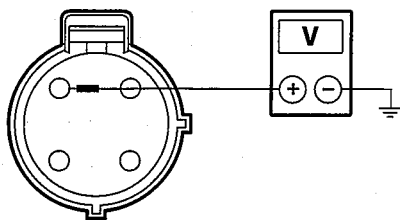
2 Disconnect connector C380 from PCM.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E57640	☒ 3 Ignition switch in position II. ☒ 4 Switch on the blower. ☐ Switch on the air-conditioning system. CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA. ☒ 6 Measure the current between the PCM, connector C380, pin 14, circuit 31S-FA17A (BWRD), wiring harness side and battery voltage. - Is a current of more than 8 mA measured? → Yes GO to D20. → No GO to D32.
D20: CHECK THE CIRCUIT BETWEEN THE A/C CLUTCH RELAY AND THE PCM FOR OPEN CIRCUIT - VEHICLES WITH 2.0L DURATEC-HE (M14) ENGINE	
 E57641	☐ Ignition switch in position 0. ☒ 2 Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91S-FA11 (BKNE), wiring harness side and the PCM, connector C380, pin 1, circuit 91S-FA11 (BKNE), wiring harness side. - Is a resistance of less than 2 Ohms registered? → Yes GO to D21. → No LOCATE and RECTIFY the break in circuit 91S-FA11 (BKNE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
D21: CHECK THE VOLTAGE AT THE REFRIGERANT PRESSURE TRANSDUCER	
	☒ 1 Connect connector C380 from PCM. ☐ Disconnect Connector C427 from refrigerant pressure transducer. ☒ 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0011401

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the refrigerant pressure transducer, connector C427, pin 2, circuit 7-FA88 (YEM), wiring harness side and ground.

- Is the voltage measured between 4.8 Volts and 5.1 Volts?

→ Yes

GO to D24.

→ No

- No voltage measured:

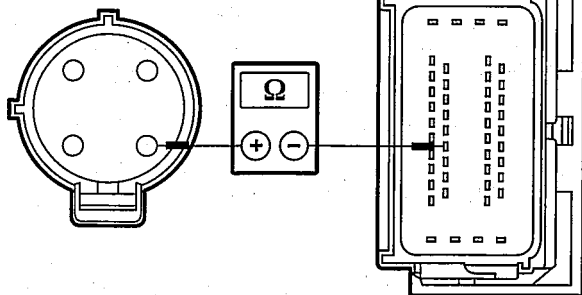
GO to D22.

- The voltage measured is more than 6 Volts:
GO to D23.

D22: CHECK FOR OPEN CIRCUIT BETWEEN THE REFRIGERANT PRESSURE TRANSDUCER AND THE PCM

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.



E57642

m Ignition switch in position 0.

☐ Disconnect connector C380 from PCM.

- ☐ Measure the resistance between the refrigerant pressure transducer, connector C427, pin 2, circuit 7-FA88 (YEM), wiring harness side and PCM, connector C380, pin 28, circuit 7-FA88 (YEM), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

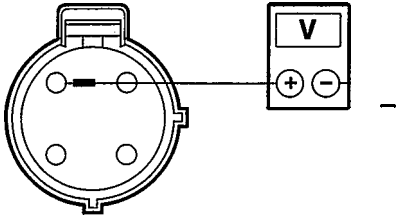
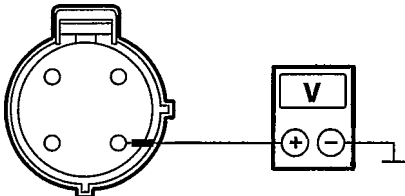
→ Yes

Use WDS to CHECK the operation of the PCM, if necessary RENEW the PCM. CHECK the operation of the system.

→ No

LOCATE and REPAIR the break in circuit 7-FA88 (YE/VT) between the refrigerant pressure transducer and the PCM using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D23: CHECK THE CIRCUIT BETWEEN THE REFRIGERANT PRESSURE TRANSDUCER AND THE PCM FOR A SHORT TO VOLTAGE SUPPLY	
NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.	
NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.	
	☐ 1 Ignition switch in position 0.
	☐ Disconnect connector C380 from PCM.
	☐ 3 Ignition switch in position II.
 E0011401	☐ Measure the voltage between the refrigerant pressure transducer, connector C427, pin 2, circuit 7-FA88 (Y E M), wiring harness side and ground. - Is a voltage measured? → Yes LOCATE and REPAIR the short to voltage in circuit 7-FA88 (Y E M) between the refrigerant pressure transducer and the PCM using the Wiring Diagrams. CHECK the operation of the system. → No Use WDS to CHECK the operation of the PCM, if necessary RENEW the PCM. CHECK the operation of the system.
D24: CHECK THE CONTROL VOLTAGE AT THE REFRIGERANT PRESSURE TRANSDUCER	
 VFE0038807	☐ Measure the voltage between the refrigerant pressure transducer, connector C427, pin 3, circuit 8-FA88 (WH/VT), wiring harness side and ground. - Is a voltage of approx. 4 volts measured? → Yes GO to D27. → No - No voltage measured: GO to D25. - The voltage measured is more than 5.5 Volts: GO to D26.

DIAGNOSIS AND TESTING

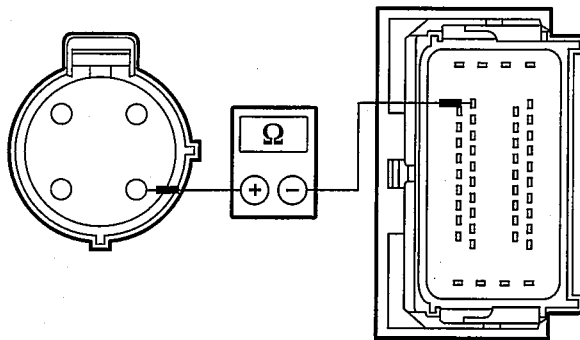
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D25: CHECK FOR OPEN CIRCUIT BETWEEN THE REFRIGERANT PRESSURE TRANSDUCER AND THE PCM

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.



E57643

☐ Ignition switch in position 0.

2 Disconnect connector C380 from PCM.

3 Measure the resistance between the refrigerant pressure transducer, connector C427, pin 3, circuit 8-FA88 (WH/VT), wiring harness side and PCM, connector C380, pin 13, circuit 8-FA88 (WH/VT), wiring harness side.

• Is a resistance of less than 2 Ohms registered?

→ Yes

Use WDS to CHECK the operation of the PCM, if necessary RENEW the PCM. CHECK the operation of the system.

→ No

LOCATE and REPAIR the break in circuit 8-FA88 (WH/VT) between the refrigerant pressure transducer and the PCM using the Wiring Diagrams. CHECK the operation of the system.

D26: CHECK THE CIRCUIT BETWEEN THE REFRIGERANT PRESSURE TRANSDUCER AND THE PCM FOR A SHORT TO VOLTAGE SUPPLY

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

1 Ignition switch in position 0.

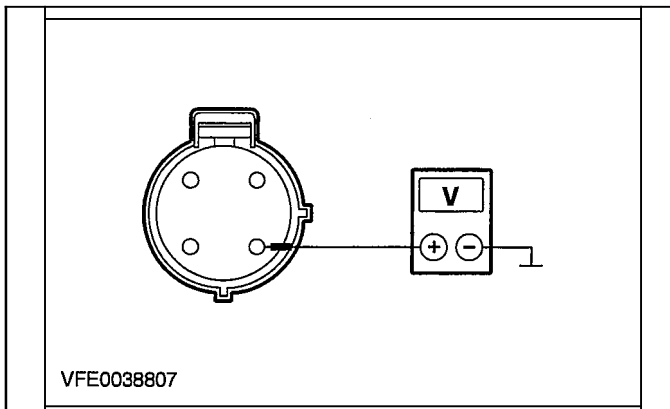
☐ Disconnect connector C380 from PCM.

3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- 4 Measure the voltage between the refrigerant pressure transducer, connector C427, pin 3, circuit 8-FA88 (WHM), wiring harness side and ground.

• Is a voltage measured?

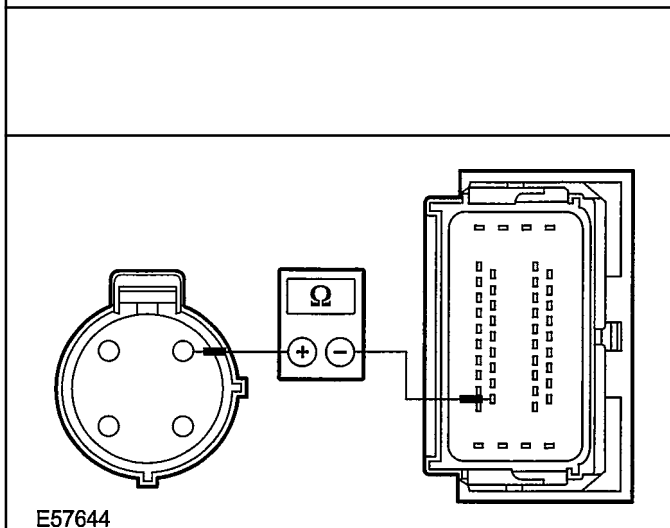
→ **Yes**

LOCATE and REPAIR the short to voltage in circuit 8-FA88 (WH/VT) between the refrigerant pressure transducer and the PCM using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

Use WDS to CHECK the operation of the PCM, if necessary RENEW the PCM. CHECK the operation of the system.

D27: CHECK FOR OPEN CIRCUIT BETWEEN THE REFRIGERANT PRESSURE TRANSDUCER AND THE PCM



- 1 Ignition switch in position 0.

☐ Disconnect connector C380 from PCM.

- 3 Measure the resistance between the refrigerant pressure transducer, connector C427, pin 1, circuit 9-FA88 (BN/WH), wiring harness side and PCM, connector C380, pin 25, circuit 9-RJ14A (BN), wiring harness side.

• Is a resistance of less than 2 Ohms registered?

→ **Yes**

RENEW the refrigerant pressure transducer. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in circuit 9-FA88 (BNNVH) between the refrigerant pressure transducer and soldered connection S307 using the Wiring Diagrams. CHECK the operation of the system.

D28: CHECK THE A/C REQUEST SIGNAL AT THE PCM

☐ Ignition switch in position 0.

- 2 Disconnect Connector C370 (vehicles with electronic exhaust gas recirculation valve (EGR): C375) from PCM.

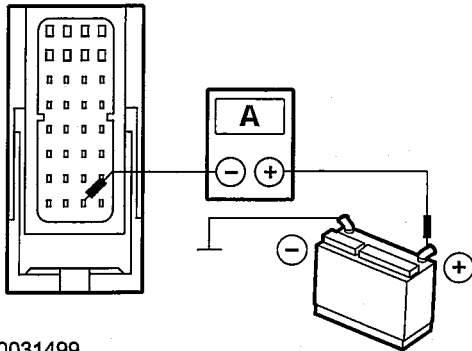
3 Ignition switch in position II.

4 Switch on the blower.

5 Switch on the A/C.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0031499

DETAILS/RESULTS/ACTIONS

⚠ CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA.

- ☐ Measure the current between the PCM, connector C370 (vehicles with electronic exhaust gas recirculation valve (EGR): C375), pin A2, circuit 31s-FA87 (BWGN), wiring harness side and battery voltage.

- Is a current of more than 8 mA measured?

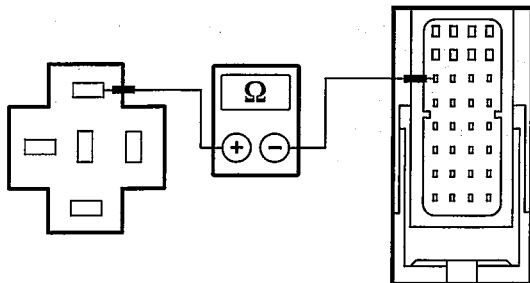
→ **Yes**
GO to D29.

→ **No**
GO to D32.

D29: CHECK FOR OPEN CIRCUIT BETWEEN AIR CONDITIONING CLUTCH RELAY AND PCM

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.



E57645

1 Ignition switch in position 0.

2 Disconnect Connector C372 (vehicles with electronic exhaust gas recirculation valve (EGR): C377) from PCM.

3 Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91S-FA11 (BK/YE), wiring harness side and the PCM, connector C372 (vehicles with electronic exhaust gas recirculation valve (EGR): C377), pin F4, circuit 91S-FA11 (BWE), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**
CHECK PCM with WDS. RENEW PCM if necessary. CHECK the operation of the system.

→ **No**
LOCATE and RECTIFY the break in circuit 91S-FA11 (BWE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

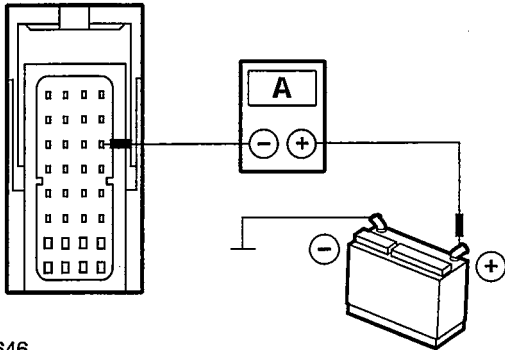
DIAGNOSIS AND TESTING

TEST CONDITIONS

/ S/A Tl I

D30: CHECK THE **A/C** REQUEST SIGNAL AT THE PCM • VEHICLES **WITH 1.6L DIESEL ENGINE**

- 1 Ignition switch in position 0.
- 2 Disconnect connector C384 from PCM.
- 3 Ignition switch in position II.
- 4 Switch on the blower.
- 5 Switch on the A/C.



E57646

CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 **mA**.

- 6 Measure the current between the PCM, connector **C384**, pin C4, circuit 31S-FA87 (BKIGN), wiring harness side and battery voltage.

- Is a current of more than 8 **mA** measured?
- Yes
GO to D31.
- No
GO to D32.

D31: CHECK CIRCUIT BETWEEN **A/C** CLUTCH RELAY AND PCM FOR OPEN CIRCUIT - **VEHICLES WITH 1.6L DIESEL ENGINE**

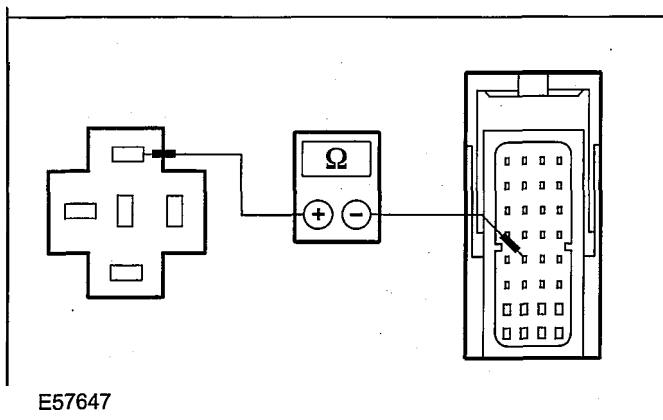
NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

- 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91S-FA11 (BWE), wiring harness side and the PCM, connector C384, pin E2, circuit 91S-FA11 (BWE), wiring harness side.
 - Is a resistance of less than 2 Ohms registered?
 - **Yes**
CHECK PCM with WDS. RENEW PCM if necessary. CHECK the operation of the system.
 - **No**
LOCATE and RECTIFY the break in circuit 91S-FA11 (BWE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

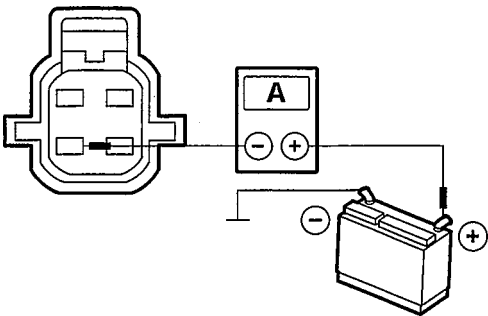
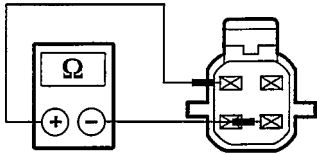
D32: CHECK THE QUANTITY OF REFRIGERANT IN THE SYSTEM

- 1 Ignition switch in position 0.
- ☐ Check the quantity of refrigerant in the system.
REFER to: Specifikationen (412-00, Specifications).
 - Is the quantity of refrigerant in the system in accordance with the manufacturer's specifications?
 - **Yes**
 - All, except vehicles with 2.0L Duratec-HE (MI4) engine:
GO to D33.
 - Vehicles with 2.0L Duratec-HE (MI4) engine:
GO to D35.
 - **No**
FILL the system with the correct quantity of refrigerant. REFER to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00, General Procedures).
CHECK the operation of the system.

D33: CHECK THE A/C REQUEST SIGNAL AT THE REFRIGERANT HIGH-PRESSURE SWITCH

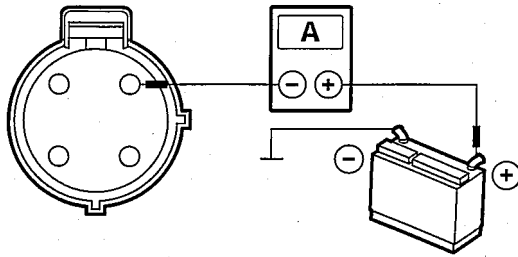
- 1 Disconnect connector C405 from refrigerant high-pressure switch.
 - 2 Ignition switch in position II.
 - 3 Switch on the blower.
- ☐ Switch on the air-conditioning system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0028907	CAUTION:In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA. Measure the current between the refrigerant high-pressure switch, connector C405, pin 4, circuit 31S-FA17A (BWRD), wiring harness side and battery voltage. Is a current of more than 8 mA measured? → Yes GO to D34. → No GO to D35.
D34: CHECK REFRIGERANT HIGH-PRESSURE SWITCH	
NOTE:Make certain that the refrigerant pressure is in the range between 3.0 and 10.5 bar (temperature dependent). If the pressure is higher, perform a refrigerant circuit Quick Check. If the pressure is lower, check the refrigerant circuit for leaks.	
 VFE0028893	Ignition switch in position 0. 2 Measure the resistance at the refrigerant high-pressure switch, connector C405, between pin 1 and pin 4, component side. Is a resistance of less than 2 Ohm registered? → Yes LOCATE and RECTIFY the break in circuit 31S-FA87 (BWGN) between the PCM and the refrigerant high-pressure switch using the Wiring Diagrams. CHECK the operation of the system. → No RENEW the refrigerant high-pressure switch. CHECK the operation of the system.
D35: CHECK THE A/C REQUEST SIGNAL AT THE REFRIGERANT LOW-PRESSURE SWITCH	
	Ignition switch in position 0.
	2 Disconnect connector C402 from refrigerant low-pressure switch.
	Ignition switch in position II.
	Switch on the blower.
	Switch on the air-conditioning system.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028909

DETAILS/RESULTS/ACTIONS

CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA.

6 Measure the current between the refrigerant low-pressure switch, connector C402, pin 1, circuit 31S-FA17 (BWRD), wiring harness side and battery voltage.

• Is a current of more than 8 mA measured?

→ **Yes**

GO to D36.

→ **No**

- Vehicles without electronic automatic temperature control (EATC):

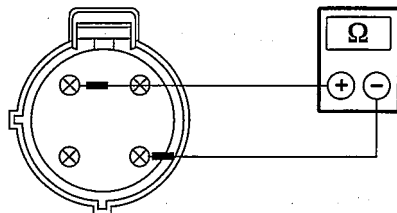
GO to D37.

- Vehicles with electronic automatic temperature control (EATC):

GO to D42.

D36: CHECK REFRIGERANT LOW-PRESSURE SWITCH

NOTE: Make certain that the refrigerant pressure is in the range between 3.0 and 10.5 bar (temperature dependent). If the pressure is higher, perform a refrigerant circuit Quick Check. If the pressure is lower, check the refrigerant circuit for leaks.



VFE0024372

1 Ignition switch in position 0.

Measure the resistance at the refrigerant low-pressure switch, connector C402, between pin 1 and pin 4, component side.

• Is a resistance of less than 2 Ohm registered?

→ **Yes**

- All, except vehicles with 2.0L Duratec-HE (MI4) engine:

LOCATE and REPAIR the break in circuit 31S-FA17A (BWRD) between the refrigerant high-pressure switch and the refrigerant low-pressure switch using the Wiring Diagrams. CHECK the operation of the system.

- Vehicles with 2.0L Duratec-HE (MI4) engine: LOCATE and REPAIR the break in circuit 31S-FA17A (BWRD) between the refrigerant low-pressure switch and the PCM using the Wiring Diagrams. CHECK the operation of the system.

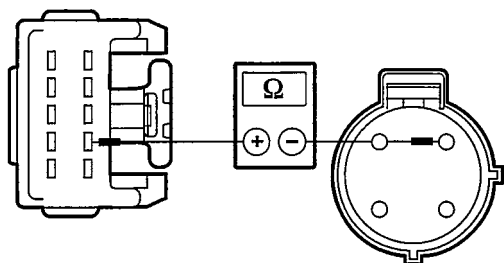
→ **No**

RENEW the refrigerant low-pressure switch. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS

D37: CHECK CIRCUIT BETWEEN CONTROL PANEL OF CLIMATE CONTROL SYSTEM AND REFRIGERANT LOW-PRESSURE SWITCH FOR OPEN CIRCUIT

VFE0028897

1 Ignition switch in position 0.

2 Disconnect connector C302 from the control panel of the climate control system.

3 Measure the resistance between the control panel for the climate control system, connector C302, pin 2, circuit 31S-FA17 (BWRD), wiring harness side and the refrigerant low-pressure switch, connector C402, pin 1, circuit 31S-FA17 (BWRD), wiring harness side.

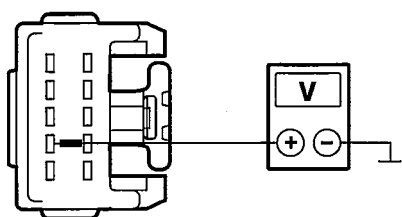
- Is a resistance of less than 2 Ohm registered?

→ **Yes**

GO to D38.

→ **No**

LOCATE and REPAIR the break in circuit 31S-FA17 (BWRD) between the control panel for the climate control system and the refrigerant low-pressure switch using the Wiring Diagrams. CHECK the operation of the system.

D38: CHECK THE VOLTAGE AT THE CONTROL PANEL FOR THE CLIMATE CONTROL SYSTEM

VFE0028905

1 Measure the voltage between the control panel for the climate control system, connector C302, pin 7, circuit 29-FA10 (OG/GN), wiring harness side and ground.

- Is battery voltage measured?

→ **Yes**

GO to D39.

→ **No**

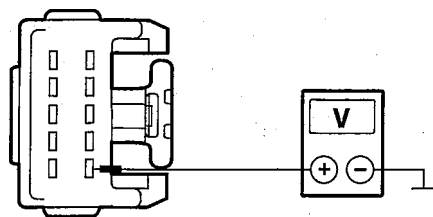
LOCATE and RECTIFY the open circuit between the control panel for the climate control system and fuse F4 using the Wiring Diagrams. CHECK the operation of the system.

D39: CHECK THE VOLTAGE AT THE CONTROL PANEL FOR THE CLIMATE CONTROL SYSTEM

1 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028895

DETAILS/RESULTS/ACTIONS

- 2** Measure the voltage between the control panel for the climate control system, connector C302, pin 1, circuit 15-FA90 (GN/BK), wiring harness side and ground.

- Does the meter display battery voltage?

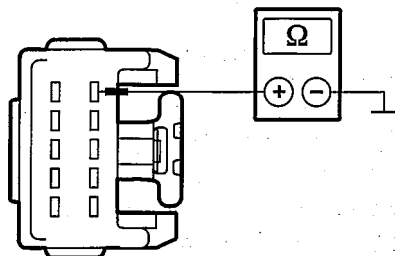
→ **Yes**
GO to D40.

→ **No**
LOCATE and RECTIFY the open circuit between the control panel for the climate control system and soldered connection S266 using the Wiring Diagrams. CHECK the operation of the system.

D40: CHECK FOR OPEN CIRCUIT BETWEEN THE CONTROL PANEL FOR THE CLIMATE CONTROL SYSTEM AND THE BLOWER SWITCH

- 1** Ignition switch in position 0.

- 2** Set the blower switch to position 1.



E51566

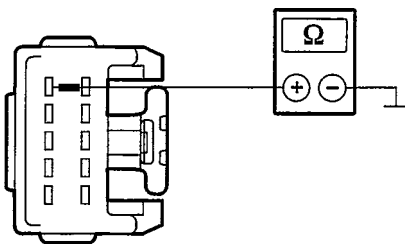
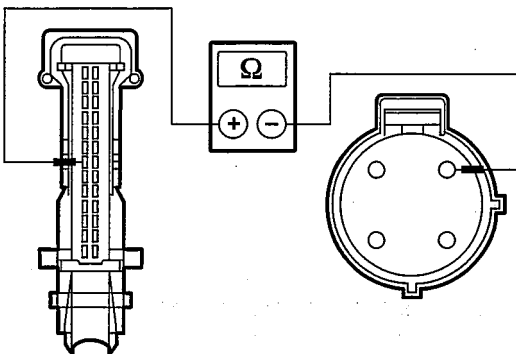
- ☐ Measure the resistance between the control panel for the climate control system, connector C302, pin 5, circuit 31S-FA13 (BWOOG), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

→ **Yes**
GO to D41.

→ **No**
LOCATE and RECTIFY the break in circuit 31S-FA13 (BWOOG) between the control panel for the climate control system and the blower switch using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS		RESULTS	ACTIONS
D41: CHECK THE GROUND CONNECTION OF THE CONTROL PANEL FOR THE CLIMATE CONTROL SYSTEM					
 VFE0028896			1 Measure the resistance between the control panel for the climate control system, connector C302, pin 10, circuit 31-LH27 (BK), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the control panel for the climate control system. CHECK the operation of the system. → No LOCATE and REPAIR the open circuit between the control panel for the climate control system and ground connection G12 using the Wiring Diagrams. CHECK the operation of the system.		
D42: CHECK CIRCUIT BETWEEN EATC MODULE AND REFRIGERANT LOW-PRESSURE SWITCH FOR OPEN CIRCUIT					
 E64252			1 Ignition switch in position 0.		
			2 Disconnect Connector C366 of EATC module.		
			3 Measure the resistance between the EATC module, connector C366, pin 7, circuit 31S-FA17 (BWRD), wiring harness side and the refrigerant low-pressure switch, connector C402, pin 1, circuit 31S-FA17 (BWRD), wiring harness side. • Is a resistance of less than 2 Ohm registered? → Yes CHECK the EATC module, if necessary INSTALL a new one. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 31S-FA17 (BWRD) between the EATC module and the refrigerant low-pressure switch using the Wiring Diagrams. CHECK the operation of the system.		

PINPOINT TEST E : AIR CONDITIONING OPERATING CONTINUOUSLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CHECK AIR CONDITIONING CLUTCH RELAY	
	1 Ignition switch in position 0.
	2 Disconnect air conditioning clutch relay from socket C403 (relay box, engine compartment).

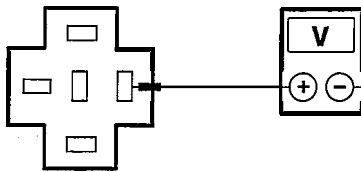
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS

- | | |
|---------------------------|--|
| 3 | Ignition switch in position III. |
| 4 | Run the engine at idle speed. |
| 5 | Check operation of air conditioning clutch. <ul style="list-style-type: none"> Does the air conditioning clutch work? |
| → Yes
GO to E2. | |
| → No
GO to E3. | |

E2: CHECK CIRCUIT BETWEEN AIR CONDITIONING CLUTCH RELAY AND AIR CONDITIONING CLUTCH FOR SHORT TO VOLTAGE



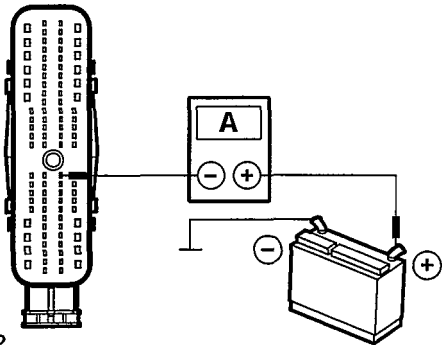
VFE0033613

- | | |
|--|--|
| 1 | Measure the voltage between the air conditioning clutch relay, socket C403, pin 5, circuit 15S-FA1 (GN/BU) (vehicles with diesel engine: 15s-FA6 (GNNE)), wiring harness side and ground. <ul style="list-style-type: none"> Is a voltage measured? |
| → Yes
LOCATE and REPAIR the short to voltage in the circuit between the air conditioning clutch relay and air conditioning clutch using the Wiring Diagrams. | |
| → No
INSTALL A NEW air conditioning clutch.
CHECK the operation of the system. | |

E3: CHECK OPERATION OF AIR CONDITIONING CLUTCH RELAY

- | | |
|---|--------------------------------|
| 1 | Ignition switch in position 0. |
|---|--------------------------------|

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Check the air conditioning clutch relay according to the component check at the end of this section. - Is the air conditioning clutch relay OK? → Yes -All, except vehicles with diesel engine or 2.0L Duratec-HE (MI4) engine: GO to E4. - Vehicles with 1.4L diesel engine: GO to E6. - Vehicles with 1.6L diesel engine: GO to E8. -Vehicles with 2.0L Duratec-HE (MI4) engine: GO to E10. → No RENEW the air conditioning clutch relay. CHECK the operation of the system. - All except vehicles with diesel engines: In addition, CHECK and if necessary RENEW the air conditioning clutch diode. CHECK the operation of the system.
E4: CHECK A/C REQUEST SIGNAL AT THE POWERTRAIN CONTROL MODULE (PCM) - ALL, EXCEPT VEHICLES WITH DIESEL ENGINE OR 2.0L DURATEC-HE (MI4) ENGINE	
	1 ☐ Disconnect connector C343 from the PCM. ☐ Ignition switch in position II. ☐ Switch on the blower. ☐ Switch off the air conditioning system.
 VFE0028892	⚠ CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA. ☐ Measure the current between the PCM, connector C343, pin F22, circuit 31S-FA87 (BWGN), wiring harness side and battery voltage. Is a current of more than 8 mA measured? → Yes GO to E11. → No GO to E5.

DIAGNOSIS AND TESTING

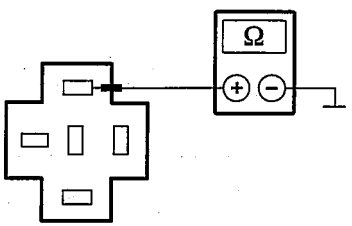
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E5: CHECK CIRCUIT BETWEEN AIR CONDITIONING CLUTCH RELAY AND PCM FOR SHORT TO GROUND - ALL, EXCEPT VEHICLES WITH DIESEL ENGINE

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

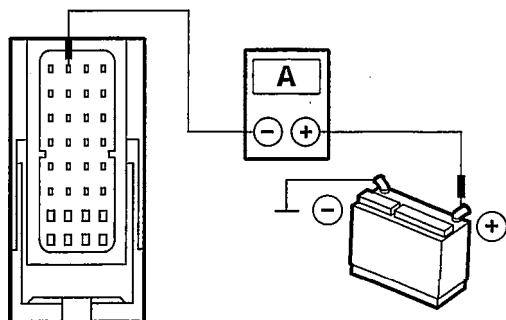
 VFE46149	1 Ignition switch in position 0. 2 Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91s-FA11 (BK/YE), wiring harness side and ground. Is a resistance of more than 10,000 Ohm measured? → Yes CHECK PCM with WDS. RENEW PCM if necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in circuit 91S-FA11 (BK/YE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
---	---

E6: CHECK THE A/C REQUEST SIGNAL AT THE POWERTRAIN CONTROL MODULE (PCM) - VEHICLES WITH 1.4L DIESEL ENGINE

	1 Disconnect Connector C370 (vehicles with electronic exhaust gas recirculation valve (EGR): C375) from PCM.
	Ignition switch in position II.
	3 Switch on the blower.
	Switch off the air conditioning system.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E64646

DETAILS/RESULTS/ACTIONS

CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA.

Measure the current between the PCM, connector C370 (vehicles with electronic exhaust gas recirculation valve (EGR): C375), pin A2, circuit 31S-FA87 (BWGN), wiring harness side and battery voltage.

- Is a current of more than 8 mA measured?
- **Yes**
GO to E11.
- **No**
GO to E7.

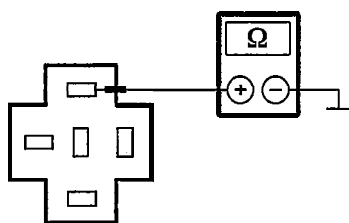
E7: CHECK CIRCUIT BETWEEN AIR CONDITIONING CLUTCH RELAY AND PCM FOR SHORT TO GROUND - VEHICLES WITH 1.4L DIESEL ENGINE

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

Ignition switch in position 0.

Disconnect Connector C372 (vehicles with electronic exhaust gas recirculation valve (EGR): C377) from PCM.



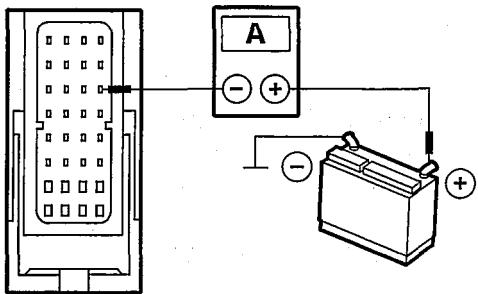
VFE46149

Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91S-FA11 (BK/YE), wiring harness side and ground.

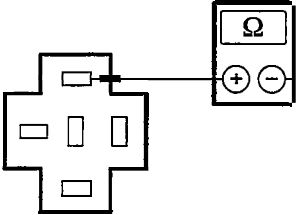
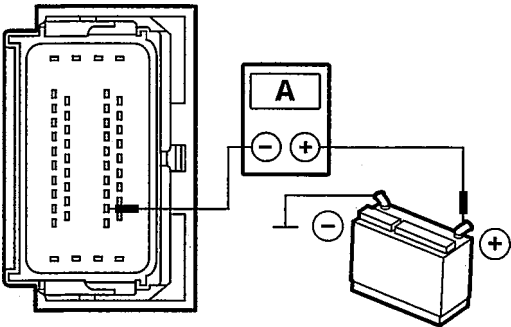
Is a resistance of more than 10,000 Ohm measured?

- **Yes**
CHECK PCM with WDS. RENEW PCM if necessary. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the short to ground in circuit 91S-FA11 (BK/YE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

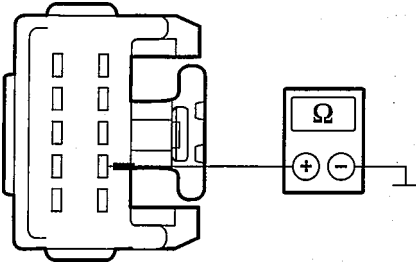
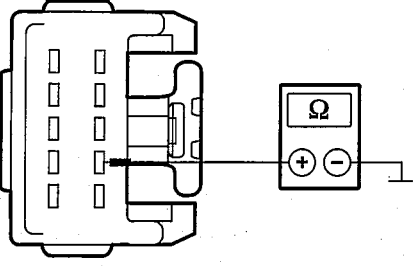
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E8: CHECK THE A/C REQUEST SIGNAL AT THE POWERTRAIN CONTROL MODULE (PCM) - VEHICLES WITH 1.6L DIESEL ENGINE	
	1 Disconnect connector C384 from PCM. 2 Ignition switch in position II. 3 Switch on the blower. 4 Switch off the air conditioning system.
 E64647	A CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA. ☐ Measure the current between the PCM, connector C384, pin C4, circuit 31S-FA87 (BWGN), wiring harness side and battery voltage. • Is a current of more than 8 mA measured? → Yes GO to E11. → No GO to E9.
E9: CHECK CIRCUIT BETWEEN AIR CONDITIONING CLUTCH RELAY AND PCM FOR SHORT TO GROUND - VEHICLES WITH 1.6L DIESEL ENGINE	
NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.	
NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.	
	1 Ignition switch in position 0.
	2 Disconnect connector C382 from PCM.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE46149	Measure the resistance between the air conditioning clutch relay, socket C403, pin 2, circuit 91S-FA11 (BWE), wiring harness side and ground. • Is a resistance of more than 10,000 ohms measured? → Yes CHECK PCM with WDS. RENEW PCM if necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in circuit 91s-FA11 (BWE) between the air conditioning clutch relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
E10: CHECK THE A/C REQUEST SIGNAL AT THE POWERTRAIN CONTROL MODULE (PCM) - VEHICLES WITH 2.0L DURATEC-HE (M14) ENGINE	
	☐ Disconnect connector C380 from PCM. Ignition switch in position II. ☐ Switch on the blower. ☐ Switch off the air conditioning system.
 E57640	CAUTION: In order to avoid damaging the vehicle, the measuring device should be operated in a measuring range up to a maximum of 200 mA. Measure the current between the PCM, connector C380, pin 14, circuit 31S-FA17A (BWRD), wiring harness side and battery voltage. • Is a current of more than 8 mA measured? → Yes - Vehicles without electronic automatic temperature control: GO to E11. - Vehicles with electronic automatic temperature control: GO to E13. → No GO to E5.
E11: CHECK CIRCUIT BETWEEN CONTROL PANEL FOR CLIMATE CONTROL SYSTEM AND PCM FOR SHORT TO GROUND	
	Ignition switch in position 0.

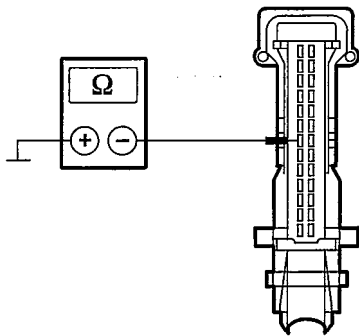
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033615	2 Disconnect connector C302 from the control panel of the climate control system. 3 Measure the resistance between the control panel for the climate control system, connector C302, pin 2, circuit 31s-FA17 (BWRD), wiring harness side and ground. Is a resistance of more than 10,000 Ohm measured? → Yes CHECK and if necessary RENEW the control panel for the climate control system. CHECK the operation of the system. → No GO to E12.
E12: CHECK CIRCUIT BETWEEN CONTROL PANEL FOR CLIMATE CONTROL SYSTEM AND REFRIGERANT LOW-PRESSURE SWITCH FOR SHORT TO GROUND	
 VFE0033615	1 Disconnect Connector C402 from the refrigerant low-pressure switch. 2 Measure the resistance between the control panel for the climate control system, connector C302, pin 2, circuit 31S-FA17 (BWRD), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes GO to E15. → No LOCATE and REPAIR short to ground in circuit 31S-FA17 (BWRD) between the control panel for the climate control system and the refrigerant low-pressure switch using the Wiring Diagrams. CHECK the operation of the system.
E13: CHECK CIRCUIT BETWEEN ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE AND PCM FOR SHORT TO GROUND	
	1 Ignition switch in position 0. 2 Disconnect Connector C366 of EATC module.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



E64253

3 Measure the resistance between the EATC module, connector C366, pin 7, circuit 31S-FA17 (BWRD), wiring harness side and ground.

- Is a resistance of more than 10,000 ohms measured?

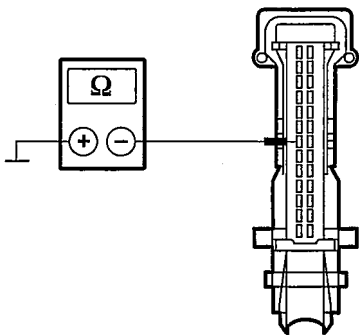
→ **Yes**

CHECK the EATC module, if necessary
INSTALL a new one. CHECK the operation of the system.

→ **No**

GO to E14.

E14: CHECK CIRCUIT BETWEEN EATC MODULE AND REFRIGERANT LOW-PRESSURE SWITCH FOR SHORT TO GROUND



E64253

1 Disconnect connector C402 from refrigerant low-pressure switch.

2 Measure the resistance between the EATC module, connector C366, pin 7, circuit 31S-FA17 (BWRD), wiring harness side and ground.

- Is a resistance of more than 10,000 Ohm measured?

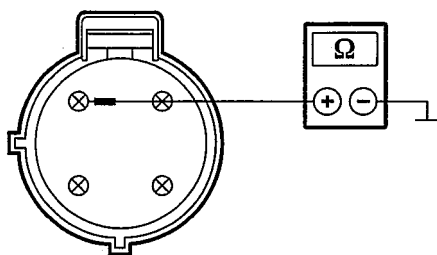
→ **Yes**

GO to E15.

→ **No**

LOCATE and REPAIR short to ground in circuit 31S-FA17 (BWRD) between the EATC module and the refrigerant low-pressure switch using the Wiring Diagrams. CHECK the operation of the system.

E15: CHECK REFRIGERANT LOW-PRESSURE SWITCH



VFE0033616

1 Measure the resistance between the refrigerant low-pressure switch, connector C402, pin 1, component side and ground.

- Is a resistance of more than 10,000 Ohm measured?

→ **Yes**

- Vehicles with 2.0L Duratec-HE (MI4) engine:
RENEW the refrigerant low-pressure switch.
CHECK the operation of the system.

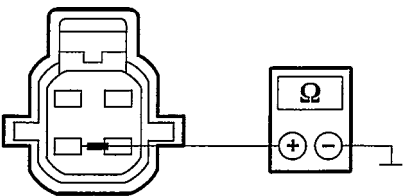
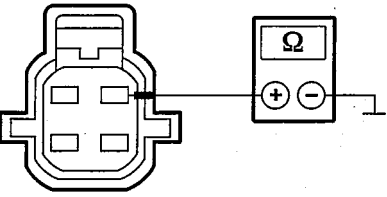
- All, except vehicles with 2.0L Duratec-HE (MI4) engine:

GO to E16.

→ **No**

RENEW the refrigerant low-pressure switch.
CHECK the operation of the system.

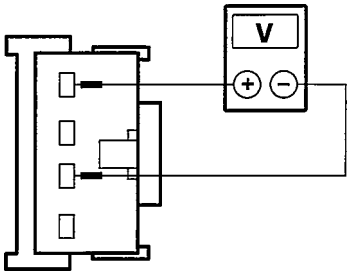
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E16: CHECK CIRCUIT BETWEEN REFRIGERANT HIGH-PRESSURE SWITCH AND REFRIGERANT LOW-PRESSURE SWITCH FOR SHORT TO GROUND	
 VFE0033617	1 Disconnect connector C405 from refrigerant high-pressure switch. 2 Measure the resistance between refrigerant high-pressure switch, connector C405, pin 4, circuit 31S-FA17A (BWRD), wiring harness side and ground. • Is a resistance of more than 10,000 Ohm measured? → Yes GO to E17. → No LOCATE and REPAIR short to ground in circuit 31S-FA17A (BWRD) between the refrigerant high-pressure switch and the refrigerant low-pressure switch using the Wiring Diagrams. CHECK the operation of the system.
E17: CHECK CIRCUIT BETWEEN REFRIGERANT HIGH-PRESSURE SWITCH AND REFRIGERANT LOW-PRESSURE SWITCH FOR SHORT TO GROUND	
 VFE0033618	1 Measure the resistance between refrigerant high-pressure switch, connector C405, pin 1, circuit 31S-FA87 (BWGN), wiring harness side and ground. • Is a resistance of more than 10,000 Ohm measured? → Yes RENEW the refrigerant high-pressure switch. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in circuit 31S-FA87 (BWGN) between the refrigerant high-pressure switch and the PCM using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST F : RECIRCULATED AIR FLAPS INOPERATIVE (AIR CONDITIONING SYSTEM OK)
- VEHICLES WITHOUT ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

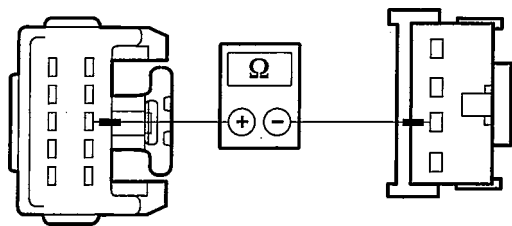
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: CHECK VOLTAGE AT RECIRCULATED AIR FLAP ACTUATOR	
	Ignition switch in position 0. 2 Disconnect connector C611 from recirculated air flap actuator.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0028920	☐ Ignition switch in position II. 4 Measure the voltage at the recirculated air flap actuator, connector C611, between pin 4, circuit 15s-FA76 (GN/RD) and pin 2, circuit 31S-FA76 (BWOG), wiring harness side.
	5 Actuate the recirculated air switch several times during the measurement. Is a voltage of more than 10 V measured with alternating polarity? → Yes CHECK the mountings and the operation of the recirculated air flaps and recirculated air flap actuation cables. If the recirculated air flaps and the recirculated air flap actuation cables are OK, RENEW the recirculated air flap actuator. CHECK the operation of the system. → No GO to F2.
F2: CHECK FOR OPEN CIRCUIT BETWEEN RECIRCULATED AIR FLAP ACTUATOR AND CONTROL PANEL OF CLIMATE CONTROL SYSTEM	
	1 Ignition switch in position 0. 2 Disconnect connector C302 from the control panel of the climate control system.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028898

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the control panel of the climate control system, connector C302, pin 3, circuit 31s-FA76 (BWOG), wiring harness side and the recirculated air flap actuator, connector C611, pin 2, circuit 31s-FA76 (BWOG), wiring harness side.

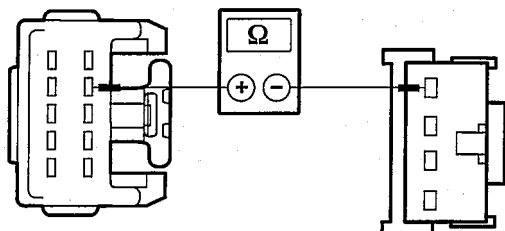
- Is a resistance of less than 2 Ohm registered?

→ **Yes**

GO to F3.

→ **No**

LOCATE and REPAIR the break in circuit 31s-FA76 (BWOG) between the control panel for the climate control system and the recirculated air flap actuator using the Wiring Diagrams. CHECK the operation of the system.

F3: CHECK FOR OPEN CIRCUIT BETWEEN RECIRCULATED AIR FLAP ACTUATOR AND CONTROL PANEL OF CLIMATE CONTROL SYSTEM


VFE0028901

- 1** Measure the resistance between the control panel for the climate control system, connector C302, pin 4, circuit 15s-FA76 (GNIRD), wiring harness side and the recirculated air flap actuator, connector C611, pin 4, circuit 15s-FA76 (GNIRD), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**

GO to F4.

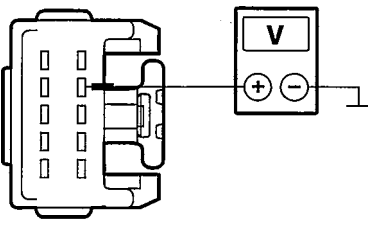
→ **No**

LOCATE and REPAIR the break in circuit 15s-FA76 (GNIRD) between the control panel for the climate control system and the recirculated air flap actuator using the Wiring Diagrams. CHECK the operation of the system.

F4: CHECK CIRCUIT BETWEEN RECIRCULATED AIR FLAP ACTUATOR AND CONTROL PANEL OF CLIMATE CONTROL SYSTEM FOR SHORT TO VOLTAGE

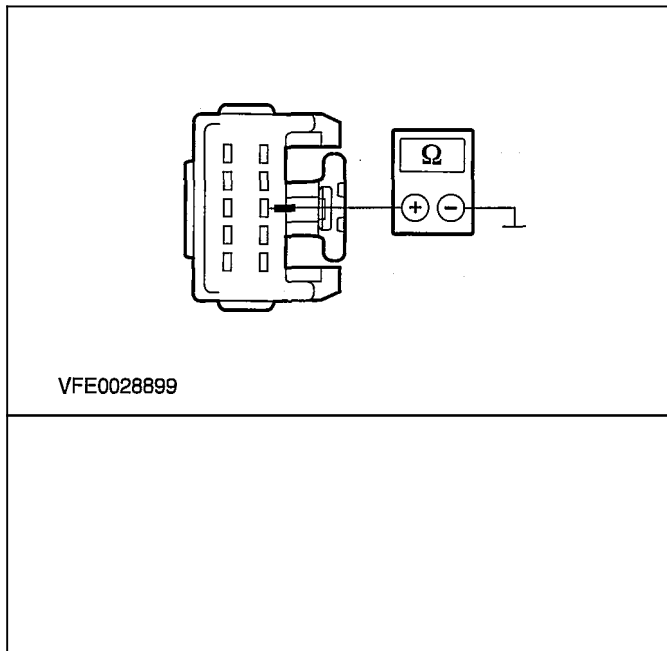
- 1** Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0028903	2 Measure the voltage between the control panel for climate control system, connector C302, pin 4, circuit 15s-FA76 (GNIRD), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

☐ Measure the resistance between the control panel for the climate control system, connector C302, pin 3, circuit 31s-FA76 (BWOOG), wiring harness side and ground.

- Is a resistance greater than 10,000 Ohms measured in both cases?

→ Yes

CHECK and if necessary RENEW the control panel for the climate control system. CHECK the operation of the system.

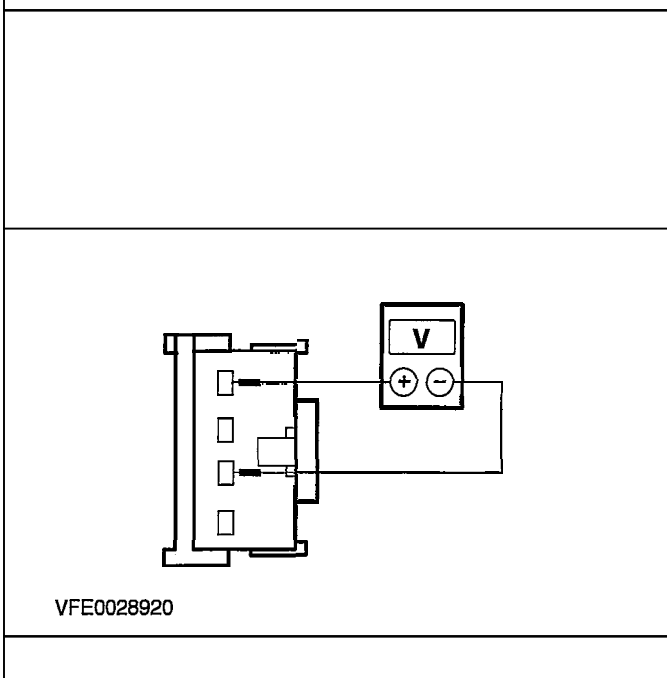
→ No

LOCATE and RECTIFY the short to ground in the relevant circuit between the control panel for the climate control system and the recirculated air flap actuator using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST G : RECIRCULATED AIR FLAPS INOPERATIVE (AIR CONDITIONING SYSTEM OK) - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

G1: CHECK VOLTAGE AT RECIRCULATED AIR FLAP ACTUATOR

1 Ignition switch in position 0.

2 Disconnect connector C611 from recirculated air flap actuator.

3 Ignition switch in position II.

4 Measure the voltage at the recirculated air flap actuator, connector C611, between pin 4, circuit 32-FA76 (WH/BU), and Pin 2, circuit 33-FA76 (YE/BU) wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 5 Actuate the recirculated air switch several times during the measurement.

- Is a voltage of more than 10 V measured with alternating polarity?

→ **Yes**

CHECK the mountings and the operation of the recirculated air flaps and recirculated air flap actuation cables. If the recirculated air flaps and the recirculated air flap actuation cables are OK, RENEW the recirculated air flap actuator. CHECK the operation of the system.

→ **No**

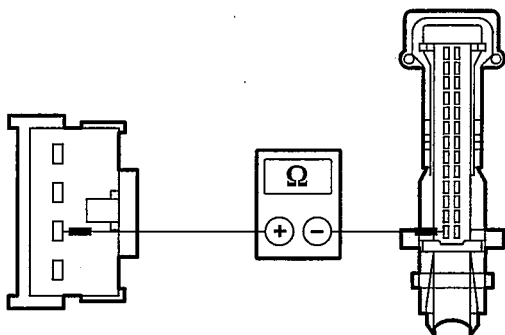
GO to G2.

G2: CHECK THE CIRCUIT BETWEEN THE RECIRCULATED AIR FLAP ACTUATOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT

- 1 Ignition switch in position 0.

- 2 Disconnect Connector C366 of EATC module.

- 3 Measure the resistance between the recirculated air flap actuator, connector C611, pin 2, circuit 33-FA76 (YE/BU), wiring harness side and the EATC module, connector C366, pin 1, circuit 33-FA76 (YE/BU), wiring harness side.



E64254

- 4 Measure the resistance between the recirculated air flap actuator, connector C611, pin 4, circuit 32-FA76 (WHIBU), wiring harness side and the EATC module, connector C366, pin 2, circuit 32-FA76 (WHIBU), wiring harness side.

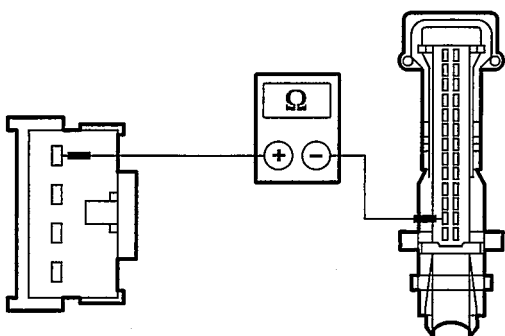
- Is a resistance of less than 2 ohms measured in both cases?

→ **Yes**

GO to G3.

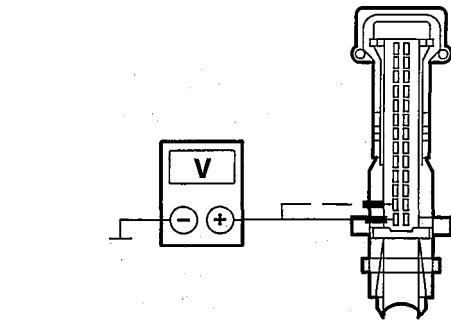
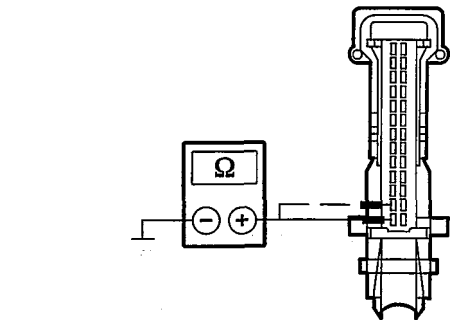
→ **No**

LOCATE and REPAIR the break in the relevant circuit between the recirculated air flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.



E64255

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G3: CHECK THE CIRCUIT BETWEEN THE RECIRCULATED AIR FLAP ACTUATOR AND THE EATC MODULE FOR SHORT TO VOLTAGE	
 VFE0038599	1 Ignition switch in position II. ☐ Measure the voltage between the EATC module, connector C366, pin 1, circuit 33-FA76 (YEIBU), wiring harness side and ground.
	3 Measure the voltage between the EATC module, connector C366, pin 2, circuit 32-FA76 (WH/BU), wiring harness side and ground. Is a voltage measured during any of these measurements? → Yes LOCATE and REPAIR the short to voltage in the relevant circuit between the recirculated air flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system. → No GO to G4.
G4: CHECK THE CIRCUIT BETWEEN THE RECIRCULATED AIR FLAP ACTUATOR AND THE EATC MODULE FOR SHORT TO GROUND	
 VFE0038600	1 Ignition switch in position 0. 2 Measure the resistance between the EATC module, connector C366, pin 1, circuit 33-FA76 (YEIBU), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 3 Measure the resistance between the EATC module, connector C366, pin 2, circuit 32-FA76 (WH/BU), wiring harness side and ground.
- Is a resistance greater than 10,000 ohms measured in both cases?
- **Yes**
CHECK the EATC module, if necessary
INSTALL a new one. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the short in the relevant circuit between the recirculated air flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

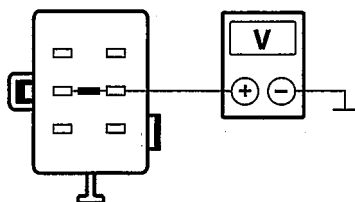
PINPOINT TEST H : MALFUNCTION OF AIR DISTRIBUTION FLAP - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

NOTE: Ensure that the air distribution flap is mechanically OK.

H1: CHECK VOLTAGE AT AIR DISTRIBUTION FLAP ACTUATOR



VFE0030336

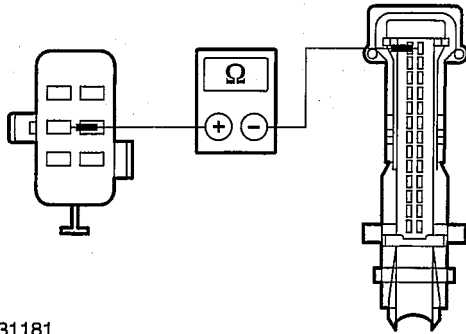
- ☐ Ignition switch in position 0.
- 2 Disconnect connector C368 from air distribution flap actuator.
- 3 Ignition switch in position II.
- 4 Measure the voltage between the air distribution flap actuator, connector C368, pin 2, circuit 15-FB19 (GNNE), wiring harness side and ground.
- Is battery voltage measured?
- **Yes**
GO to H3.
- **No**
GO to H2.

H2: CHECK THE CIRCUIT BETWEEN THE AIR DISTRIBUTION FLAP ACTUATOR AND THE EATC MODULE FOR OPEN CIRCUIT

- ☐ Ignition switch in position 0.
- ☐ Disconnect Connector C366 from EATC module.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0031181

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the EATC module, connector C366, pin 26, circuit 15-FBI9 (GNNE), wiring harness side and the air distribution flap actuator, connector C368, pin 2, circuit 15-FBI9 (GNNE), wiring harness side.

• Is a resistance of less than 2 ohms registered?

→ **Yes**

CHECK the EATC module, if necessary
INSTALL a new one. CHECK the operation of the system.

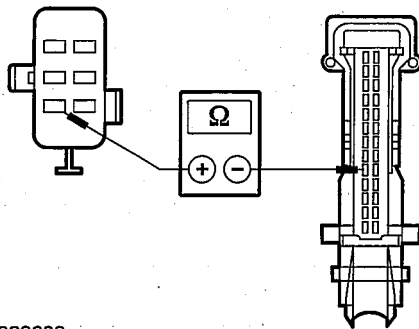
→ **No**

LOCATE and REPAIR the break in circuit 15-FB19 (GNNE) between the EATC module and the air distribution flap actuator using the Wiring Diagrams. CHECK the operation of the system.

H3: CHECK THE CIRCUITS BETWEEN THE AIR DISTRIBUTION FLAP ACTUATOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT

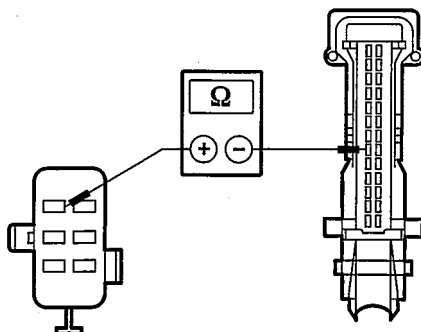
1 Ignition switch in position 0.

2 Disconnect Connector C366 from EATC module.



VFE0038603

- 3** Measure the resistance between the air distribution flap actuator, connector C368, pin 1, circuit 31S-FB20 (BWBU), wiring harness side and the EATC module, connector C366, pin 5, circuit 31S-FB20 (BWBU), wiring harness side.



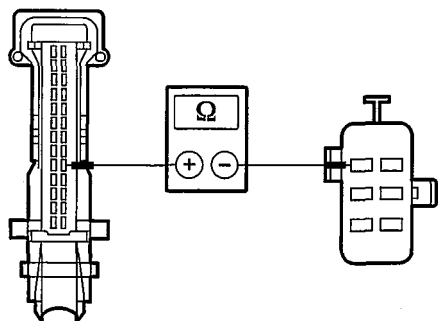
VFE0038604

- ☐ Measure the resistance between the air distribution flap actuator, connector C368, pin 3, circuit 31S-FB21 (BWOOG), wiring harness side and the EATC module, connector C366, pin 6, circuit 31S-FB21 (BWOOG), wiring harness side.

DIAGNOSIS AND TESTING

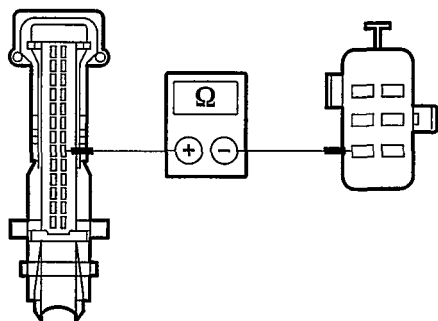
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VFE0038605

- 5 Measure the resistance between the air distribution flap actuator, connector C368, pin 4, circuit 31S-FB22 (BWGN), wiring harness side and the EATC module, connector C366, pin 18, circuit 31S-FB22 (BWGN), wiring harness side.



VFE0038606

- 6 Measure the resistance between the air distribution flap actuator, connector C368, pin 6, circuit 31S-FB23 (BWRD), wiring harness side and the EATC module, connector C366, pin 19, circuit 31S-FB23 (BWRD), wiring harness side.

- Is a resistance of less than 2 ohms measured in all of the cases?

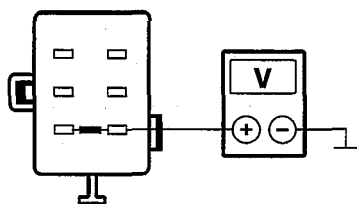
→ Yes

GO to H4.

→ No

LOCATE and REPAIR the break in the relevant circuit between the air distribution flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

H4: CHECK THE CIRCUITS BETWEEN THE AIR DISTRIBUTION FLAP ACTUATOR AND THE EATC MODULE FOR SHORT TO VOLTAGE



VFE0030395

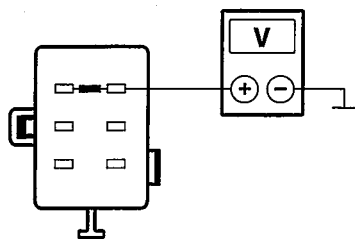
- 1 Ignition switch in position II.

- Measure the voltage between the air distribution flap actuator, connector C368, pin 1, circuit 31S-FB20 (BWBU), wiring harness side and ground.

DIAGNOSIS AND TESTING

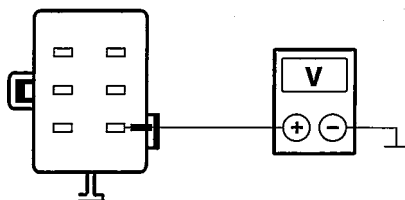
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



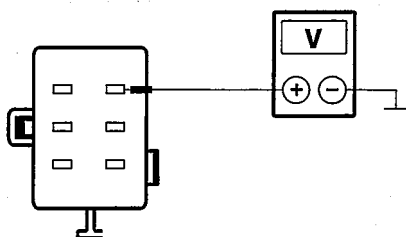
VFE0030396

- 3 Measure the voltage between the air distribution flap actuator, connector C368, pin 3, circuit 31S-FB21 (BWOG), wiring harness side and ground.



VFE0030397

- 4 Measure the voltage between the air distribution flap actuator, connector C368, pin 4, circuit 31S-FB22 (BWGN), wiring harness side and ground.



VFE0030398

- 5 Measure the voltage between the air distribution flap actuator, connector C368, pin 6, circuit 31S-FB23 (BWRD), wiring harness side and ground.

- Is a voltage measured during any of these measurements?

→ Yes

LOCATE and REPAIR the short to voltage in the relevant circuit between the air distribution flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

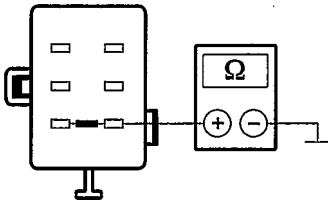
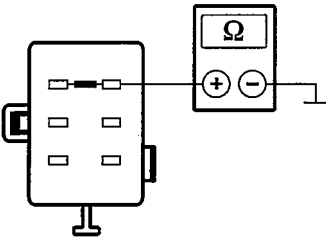
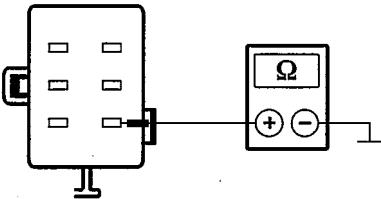
→ No

GO to H5.

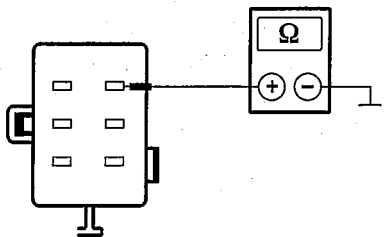
H5: CHECK THE CIRCUITS BETWEEN THE AIR DISTRIBUTION FLAP ACTUATOR AND THE EATC MODULE FOR SHORT TO GROUND

- 1 Ignition switch in position 0.

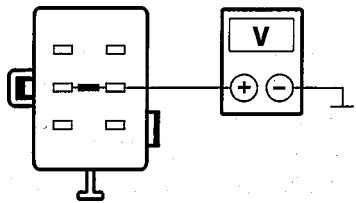
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0030399	☐ Measure the resistance between the air distribution flap actuator, connector C368, pin 1, circuit 31S-FB20 (BWBU), wiring harness side and ground.
 VFE0030443	3 Measure the resistance between the air distribution flap actuator, connector C368, pin 3, circuit 31S-FB21 (BWOOG), wiring harness side and ground.
 VFE0030444	4 Measure the resistance between the air distribution flap actuator, connector C368, pin 4, circuit 31S-FB22 (BWGN), wiring harness side and ground.

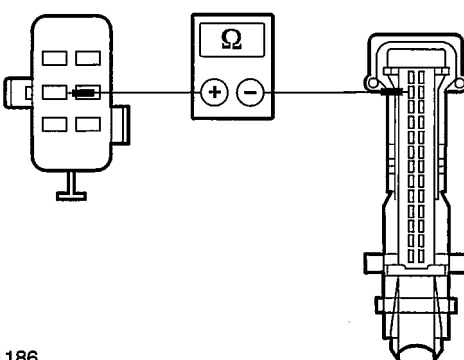
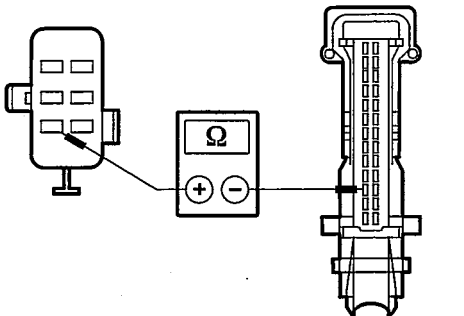
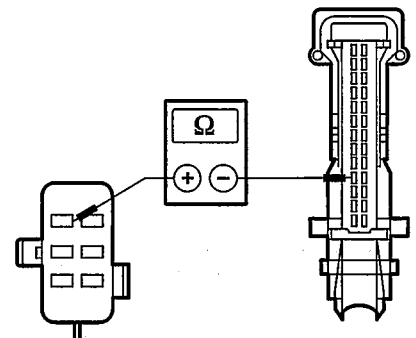
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0030445	5 Measure the resistance between the air distribution flap actuator, connector C368, pin 6, circuit 31S-FB23 (BWRD), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured in all of the measurements? → Yes CHECK the air distribution flap for ease of movement and proper function. If the air distribution flap is OK, RENEW the air distribution flap actuator. CHECK the operation of the system. → No LOCATE and REPAIR the short in the relevant circuit between the air distribution flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST I : MALFUNCTION OF TEMPERATURE CONTROL FLAP - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

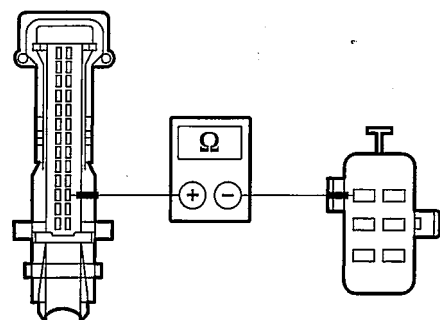
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Ensure that the temperature control flap is mechanically OK.	
I1: CHECK VOLTAGE AT TEMPERATURE CONTROL FLAP ACTUATOR	
	□ Ignition switch in position 0.
	2 Disconnect Connector C369 from air temperature control flap actuator.
	3 Ignition switch in position II.
 VFE0030336	4 Measure the voltage between the temperature control flap actuator, connector C369, pin 2, circuit 15-FB9 (GN/RD), wiring harness side and ground. Is battery voltage measured? → Yes GO to 13 → No GO to 12
12: CHECK THE CIRCUIT BETWEEN THE TEMPERATURE CONTROL FLAP ACTUATOR AND THE EATC MODULE FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

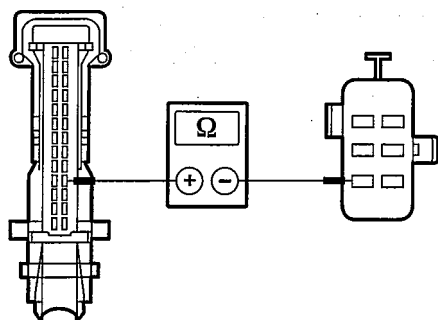
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E0031186	2 Disconnect Connector C366 from EATC module. Measure the resistance between the EATC module, connector C366, pin 12, circuit 15-FB9 (GN/rd), wiring harness side and the temperature control flap actuator, connector C369, pin 2, circuit 15-FB9 (GNIRD), wiring harness side. Is a resistance of less than 2 ohms registered? → Yes CHECK the EATC module, if necessary INSTALL a new one. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 15-FB9 (GNIRD) between the EATC module and the temperature control flap actuator using the Wiring Diagrams. CHECK the operation of the system.
13: CHECK THE CIRCUITS BETWEEN THE TEMPERATURE CONTROL FLAP ACTUATOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT	
 VFE0038607	1 Ignition switch in position 0. 2 Disconnect Connector C366 from EATC module. 3 Measure the resistance between the temperature control flap actuator, connector C369, pin 1, circuit 31S-FB10 (BWGN), wiring harness side and the EATC module, connector C366, pin 3, circuit 31S-FB10 (BK/GN), wiring harness side.
 VFE0038608	4 Measure the resistance between the temperature control flap actuator, connector C369, pin 3, circuit 31S-FB11 (BWRD), wiring harness side and the EATC module, connector C366, pin 4, circuit 31S-FB11 (BWRD), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038609



VFE0038610

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the temperature control flap actuator, connector C369, pin 4, circuit 31S-FB12 (BWWH), wiring harness side and the EATC module, connector C366, pin 16, circuit 31S-FB12 (BK/WH), wiring harness side.

Measure the resistance between the temperature control flap actuator, connector C369, pin 6, circuit 31S-FB13 (BK/YE), wiring harness side and the EATC module, connector C366, pin 17, circuit 31S-FB13 (BK/YE), wiring harness side.

- Is a resistance of less than 2 ohms measured in all of the cases?

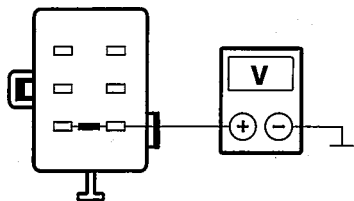
→ **Yes**
GO to 14.

→ **No**
LOCATE and REPAIR the break in the relevant circuit between the temperature control flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

14 CHECK THE CIRCUITS BETWEEN THE TEMPERATURE CONTROL FLAP ACTUATOR AND THE EATC MODULE FOR SHORT TO VOLTAGE

- 1** Ignition switch in position II.

Measure the voltage between the air temperature control flap actuator, connector C369, pin 1, circuit 31S-FB10 (BWGN), wiring harness side and ground.

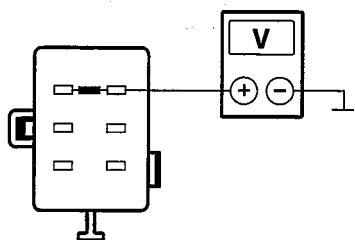


VFE0030395

DIAGNOSIS AND TESTING

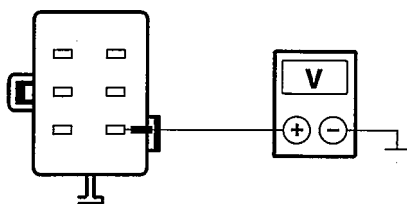
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



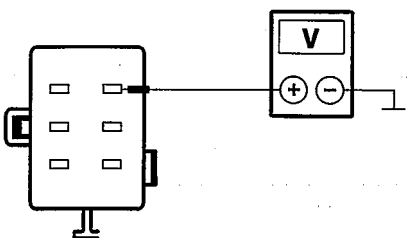
VFE0030396

- 3 Measure the voltage between the air temperature control flap actuator, connector C369, pin 3, circuit 31s-FB11 (BWRD), wiring harness side and ground.



VFE0030397

- 4 Measure the voltage between the air temperature control flap actuator, connector C369, pin 4, circuit 31S-FB12 (BK/WH), wiring harness side and ground.



VFE0030398

- 5 Measure the voltage between the air temperature control flap actuator, connector C369, pin 6, circuit 31S-FB13 (BK/YE), wiring harness side and ground.

- Is a voltage measured during any of these measurements?

→ **Yes**

LOCATE and REPAIR the short to voltage in the relevant circuit between the temperature control flap actuator and the EATC module using the Wiring Diagrams. CHECK operation of system.

→ **No**

GO to I5.

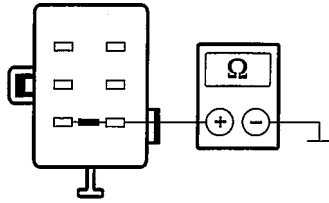
15: CHECK THE CIRCUITS BETWEEN THE TEMPERATURE CONTROL FLAP ACTUATOR AND THE EATC MODULE FOR SHORT TO GROUND

- 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

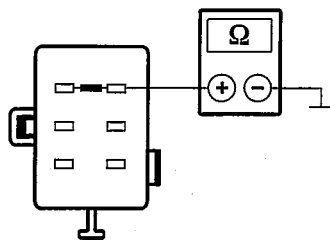
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



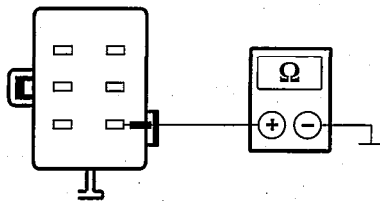
VFE0030399

- 2 Measure the resistance between the air temperature control flap actuator, connector C369, pin 1, circuit 31S-FB10 (BWGN), wiring harness side and ground.



VFE0030443

- 3 Measure the resistance between the air temperature control flap actuator, connector C369, pin 3, circuit 31S-FB11 (BWRD), wiring harness side and ground.

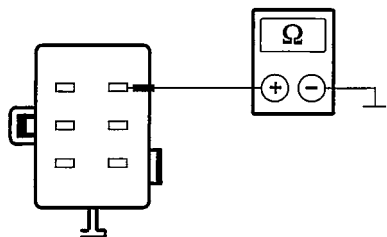


VFE0030444

- 4 Measure the resistance between the air temperature control flap actuator, connector C369, pin 4, circuit 31S-FB12 (BK/WH), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0030445

DETAILS/RESULTS/ACTIONS

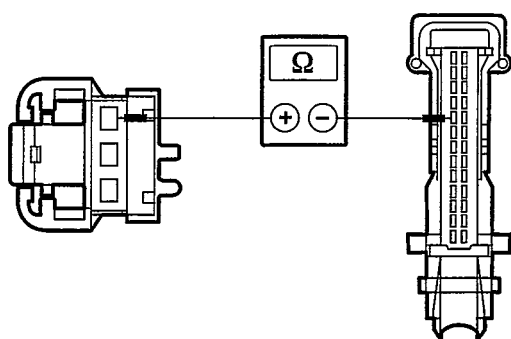
- ☐ Measure the resistance between the air temperature control flap actuator, connector C369, pin 6, circuit 31S-FB13 (BK/YE), wiring harness side and ground.
- Is a resistance of more than 10,000 ohms measured in all of the measurements?
- **Yes**
RENEW the temperature control flap actuator. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the short to ground in the relevant circuit between the temperature control flap actuator and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST J : FAULT IN FOOTWELL AIR OUTLET TEMPERATURE SENSOR CIRCUIT - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

J1: CHECK THE CIRCUIT BETWEEN THE FOOTWELL AIR OUTLET TEMPERATURE SENSOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT



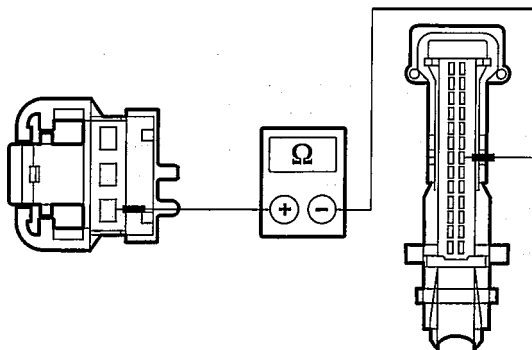
E64256

- ☐ Ignition switch in position 0.
- ☐ Disconnect Connector C367 from EATC module.
- ☒ Disconnect Connector C363 from footwell air outlet temperature sensor.
- ☐ Measure the resistance between the footwell air outlet temperature sensor, connector C363, pin 1, circuit 8-FA97 (WH/BU), wiring harness side and the EATC module, connector C367, pin 9, circuit 8-FA97 (WH/BU), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



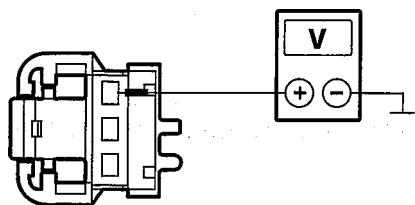
E64257

- 5 Measure the resistance between the footwell outlet temperature sensor, connector C363, pin 3, circuit 9-FA97 (BNIBU), wiring harness side and the EATC module, connector C367, pin 20, circuit 9-FA48A (BN/GN), wiring harness side.

- Is a resistance of less than 2 ohms measured in both cases?

→ **Yes**
GO to J2.

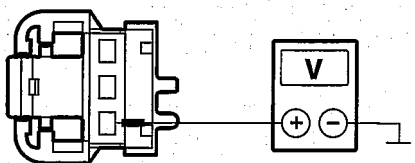
→ **No**
LOCATE and REPAIR the break in the relevant circuit between the footwell air outlet temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

J2: CHECK THE CIRCUIT BETWEEN THE FOOTWELL AIR OUTLET TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO VOLTAGE


E64258

- 1 Ignition switch in position II.

- 2 Measure the voltage between the footwell air outlet temperature sensor, connector C363, pin 1, circuit 8-FA97 (WH/BU), wiring harness side and ground.



E64259

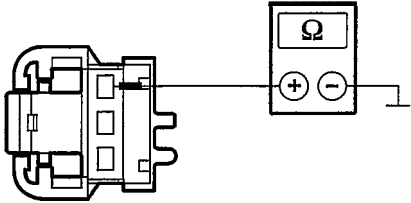
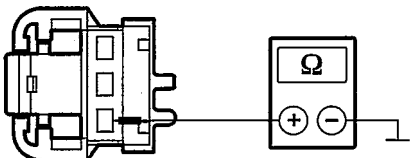
- 3 Measure the voltage between the footwell air outlet temperature sensor, connector C363, pin 3, circuit 9-FA97 (BN/BU), wiring harness side and ground.

- Is a voltage measured during any of these measurements?

→ **Yes**
LOCATE and REPAIR the short to voltage in the relevant circuit between the footwell air outlet temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

→ **No**
GO to J3.

DIAGNOSIS AND TESTING

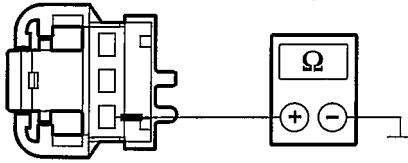
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J3: CHECK THE CIRCUIT BETWEEN THE FOOTWELL AIR OUTLET TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO GROUND	
 E64260	1 Ignition switch in position 0. 2 Measure the resistance between the footwell air outlet temperature sensor, connector C363, pin 1, circuit 8-FA97 (WHIBU), wiring harness side and ground.
 E64261	3 Measure the resistance between the footwell air outlet temperature sensor, connector C363, pin 3, circuit 9-FA97 (BN/BU), wiring harness side and ground. Is a resistance greater than 10,000 ohms measured in both cases? → Yes RENEW the footwell air outlet temperature sensor. CHECK the operation of the system. → No LOCATE and REPAIR the short in the relevant circuit between the footwell air outlet temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST K : FAULT IN CENTER VENTS AIR OUTLET TEMPERATURE SENSOR CIRCUIT - VEHICLES **WITH** ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
KI: CHECK THE GROUND CONNECTION OF THE CENTERVENTS AIR OUTLET TEMPERATURE SENSOR	
	1 Ignition switch in position 0. 2 Disconnect Connector C364 from center vents air outlet temperature sensor.

DIAGNOSIS AND TESTING

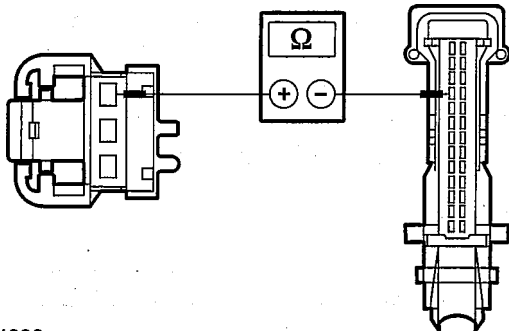
TEST CONDITIONS



E64261

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the center vents air outlet temperature sensor, connector C364, pin 3, circuit 9-FA96 (BNIRD), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
 - **Yes**
GO to K2.
 - **No**
LOCATE and REPAIR the break in circuit 9-FA96 (BNIRD) between the center vents air outlet temperature sensor and soldered connection S262 using the Wiring Diagrams. CHECK the operation of the system.

K2: CHECK THE CIRCUIT BETWEEN THE CENTER VENTS AIR OUTLET TEMPERATURE SENSOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT

E64262

- 1** Disconnect Connector C367 from EATC module.
- ☐ Measure the resistance between the center vents air outlet temperature sensor, connector C364, pin 1, circuit 8-FA96 (WHIRD), wiring harness side and the EATC module, connector C367, pin 10, circuit 8-FA96 (WHIRD), wiring harness side.
- Is a resistance of less than 2 ohms registered?
- **Yes**
GO to K3.
 - **No**
LOCATE and REPAIR the break in circuit 8-FA96 (WHIRD) between the center vents air outlet temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

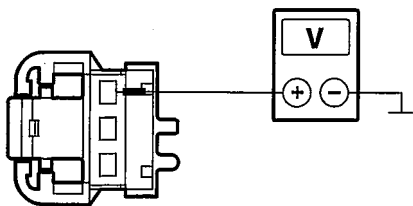
K3: CHECK THE CIRCUIT BETWEEN THE CENTER VENTS AIR OUTLET TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO VOLTAGE

- 1** Ignition switch in position II.

DIAGNOSIS AND TESTING

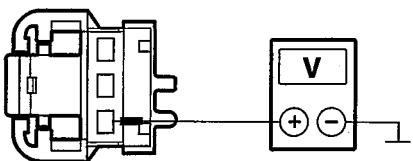
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



E64258

- 2** Measure the voltage between the center vents air outlet temperature sensor, connector C364, pin 1, circuit 8-FA96 (WH/RD), wiring harness side and ground.



E64259

- ☐ Measure the voltage between the center vents air outlet temperature sensor, connector C364, pin 3, circuit 9-FA96 (BN/RD), wiring harness side and ground.

- Is a voltage measured during any of these measurements?

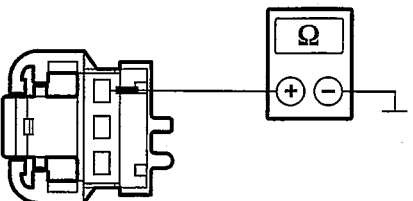
→ **Yes**

LOCATE and REPAIR the short to voltage in the relevant circuit between the center vents air outlet temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to K4.

K4: CHECK THE CIRCUIT BETWEEN THE CENTERVENTS AIR OUTLETTEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO GROUND



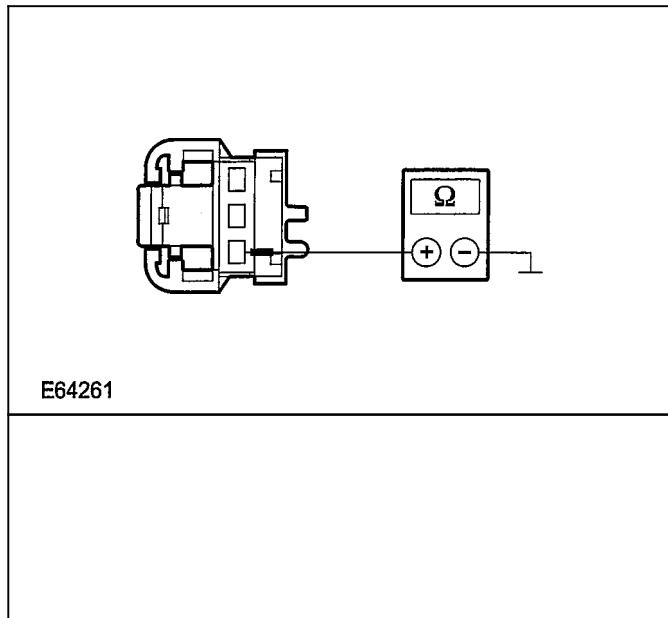
E64260

- 1** Ignition switch in position 0.

- 2** Measure the resistance between the center vents air outlet temperature sensor, connector C364, pin 1, circuit 8-FA96 (WH/RD), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

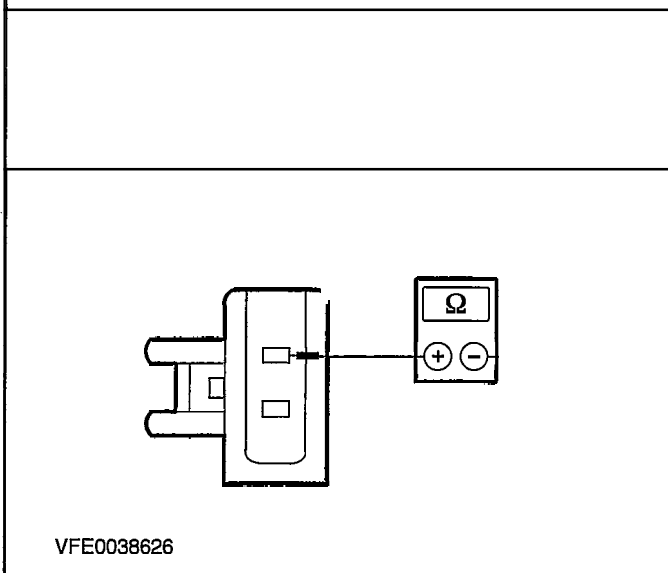
- ☐ Measure the resistance between the center vents air outlet temperature sensor, connector C364, pin 3, circuit 9-FA96 (BN/RD), wiring harness side and ground.
- Is a resistance greater than 10,000 ohms measured in both cases?
- **Yes**
RENEW the centre vents air outlet temperature sensor. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the short in the relevant circuit between the center vents air outlet temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST L : SUN LOAD SENSOR CIRCUIT FAULTY - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

L1: CHECK THE GROUND CONNECTION OF THE SUN LOAD SENSOR



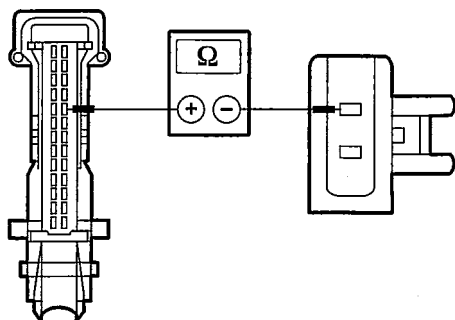
- 1 Ignition switch in position 0.
- ☐ Disconnect Connector C389 from sun load sensor.
- ☐ Measure the resistance between the sun load sensor, connector C389, pin 1, circuit 9-FA53 (BN/BU), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
GO to L2.
- **No**
LOCATE and REPAIR the break in circuit 9-FA53 (BNIBU) between the sun load sensor and soldered connection S262 using the Wiring Diagrams: CHECK the operation of the system.

L2: CHECK THE CIRCUIT BETWEEN THE SUN LOAD SENSOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT

- 1 Disconnect Connector C367 from EATC module.

DIAGNOSIS AND TESTING

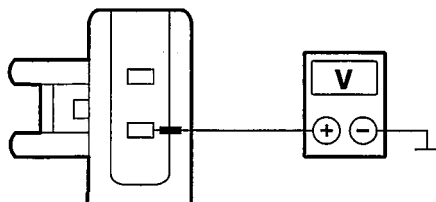
TEST CONDITIONS



VFE0038627

DETAILS/RESULTS/ACTIONS

- 2** Measure the resistance between the sun load sensor, connector C389, pin 2, circuit 8-FA53 (WHIBU), wiring harness side and the EATC module, connector C367, pin 22, circuit 8-FA53 (WHIBU), wiring harness side.
- Is a resistance of less than 2 ohms registered?
 - **Yes**
GO to L3.
 - **No**
LOCATE and REPAIR the break in circuit 8-FA53 (WHIBU) between the sun load sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

L3: CHECK THE CIRCUIT BETWEEN THE SUN LOAD SENSOR AND THE EATC MODULE FOR SHORT TO VOLTAGE

VFE0038628

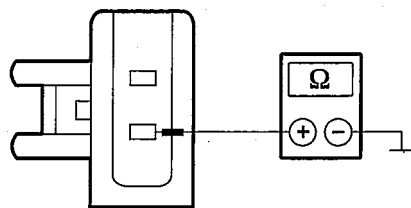
- 1** Ignition switch in position II.
- ☐ Measure the voltage between the sun load sensor, connector C389, pin 2, circuit 8-FA53 (WHIBU), wiring harness side and ground.
- Is a voltage measured?
 - **Yes**
LOCATE and REPAIR the short to voltage supply in circuit 8-FA53 (WHIBU) between the sun load sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.
 - **No**
GO to L4.

L4: CHECK THE CIRCUIT BETWEEN THE SUN LOAD SENSOR AND THE EATC MODULE FOR SHORT TO GROUND

- 1** Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038629

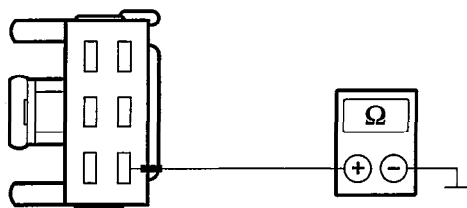
DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the sun load sensor, connector C389, pin 2, circuit 8-FA53 (WHIBU), wiring harness side and ground.
- Is a resistance of more than 10,000 ohms measured?
- **Yes**
INSTALL a new sun load sensor. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the short in circuit 8-FA53 (WHIBU) between the sun load sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

**PINPOINT TEST M : FAULT IN PASSENGER COMPARTMENT TEMPERATURE SENSOR CIRCUIT
- VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)**

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

M1: CHECK GROUND CONNECTION OF PASSENGER COMPARTMENT TEMPERATURE SENSOR


VFE0024459

- 1** Ignition switch in position 0.
- ☐ Disconnect Connector C388 from passenger compartment temperature sensor.
- ☐ Measure the resistance between the passenger compartment temperature sensor, connector C388, pin 6, circuit 9-FA48 (BNIGN), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
GO to M2.
- **No**
LOCATE and REPAIR the break in circuit 9-FA48 (BNIGN) between the passenger compartment temperature sensor and soldered connection S262 using the Wiring Diagrams. CHECK the operation of the system.

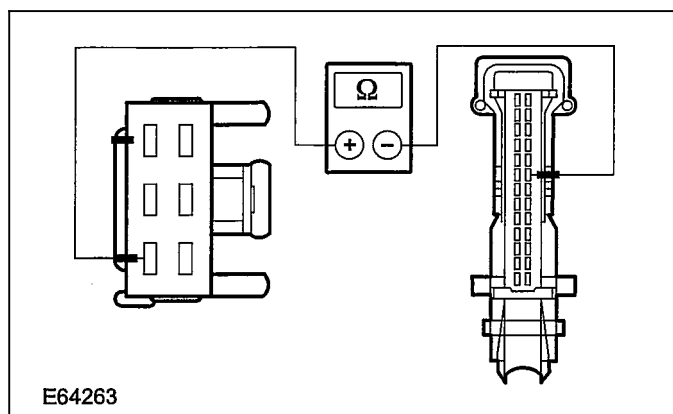
M2: CHECK THE CIRCUIT BETWEEN THE PASSENGER COMPARTMENT TEMPERATURE SENSOR AND THE ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE FOR OPEN CIRCUIT

- 1** Disconnect Connector C367 from EATC module.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



Measure the resistance between the passenger compartment temperature sensor, connector C388, pin 4, circuit 8-FA48 (WHIGN), wiring harness side and the EATC module, connector C367, pin 21, circuit 8-FA48 (WHIGN), wiring harness side.

Is a resistance of less than 2 ohms registered?

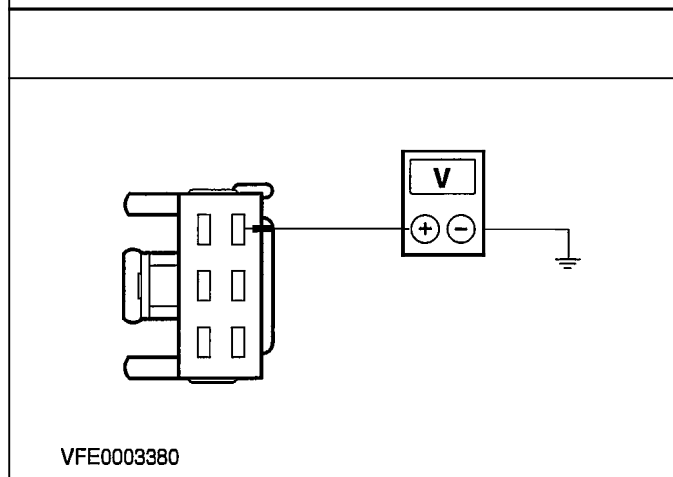
→ **Yes**

GO to M3.

→ **No**

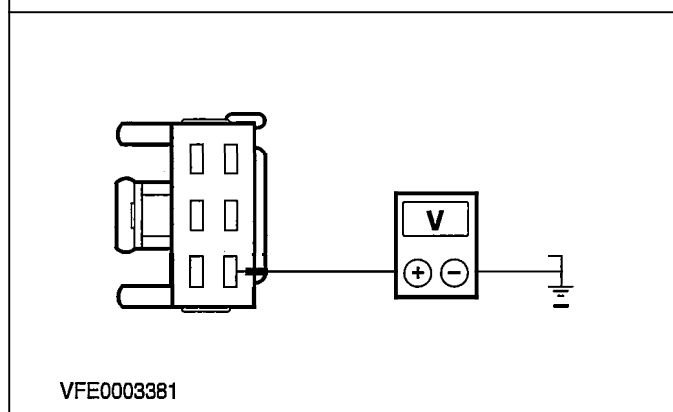
LOCATE and RECTIFY the open circuit in circuit 8-FA48 (WHIGN) between the passenger compartment temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

M3: CHECK THE CIRCUIT BETWEEN THE PASSENGER COMPARTMENT TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO VOLTAGE



☐ Ignition switch in position II.

☐ Measure the voltage between the passenger compartment temperature sensor, connector C388, pin 4, circuit 8-FA48 (WHIGN), wiring harness side and ground.



Measure the voltage between the passenger compartment temperature sensor, connector C388, pin 6, circuit 9-FA48 (BN/GN), wiring harness side and ground.

- Is a voltage measured during any of these measurements?

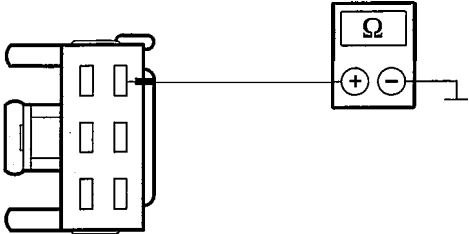
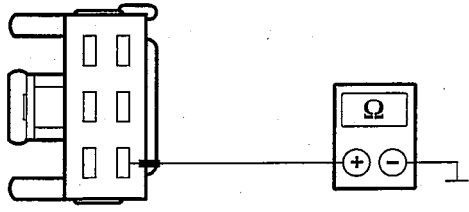
→ **Yes**

LOCATE and RECTIFY the short to voltage supply in the relevant circuit between the passenger compartment temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to M4.

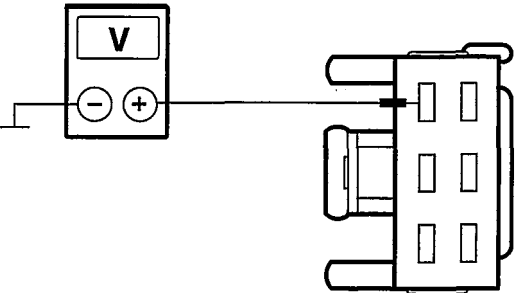
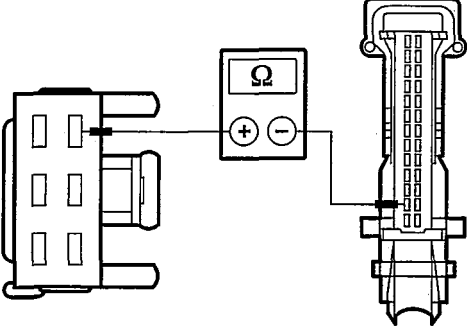
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M4: CHECK THE CIRCUIT BETWEEN THE PASSENGER COMPARTMENT TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO GROUND	
 VFE0024122	1 Ignition switch in position 0. 2 Measure the resistance between the passenger compartment temperature sensor, connector C388, pin 4, circuit 8-FA48 (WHIGN), wiring harness side and ground.
 VFE0024459	3 Measure the resistance between the passenger compartment temperature sensor, connector C388, pin 6, circuit 9-FA48 (BN/GN), wiring harness side and ground. Is a resistance greater than 10,000 ohms measured in both cases? → Yes INSTALL A NEW passenger compartment temperature sensor. CHECK the operation of the system. → No LOCATE and REPAIR the short circuit in the affected circuit between the passenger compartment temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST N : FAULT IN PASSENGER COMPARTMENT TEMPERATURE SENSOR BLOWER CIRCUIT - VEHICLES **WITH** ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

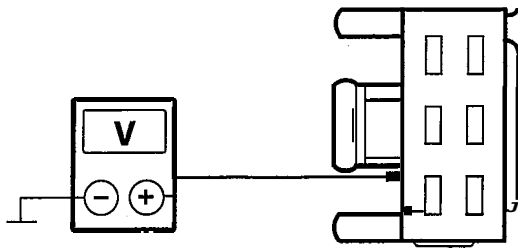
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N1: CHECK THE VOLTAGE AT THE PASSENGER COMPARTMENT TEMPERATURE SENSOR	
	Ignition switch in position 0.
	2 Disconnect Connector C388 from passenger compartment temperature sensor.
	Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0029210	☐ Measure the voltage between the passenger compartment temperature sensor, connector C388, pin 1, circuit 15-FA48 (GN/BK), wiring harness side and ground. Is battery voltage measured? → Yes GO to N2. → No LOCATE and REPAIR the break in circuit 15-FA48 (GNIBK) between the passenger compartment temperature sensor and soldered connection S262 using the Wiring Diagrams. CHECK the operation of the system.
N2: CHECK THE CIRCUIT BETWEEN THE PASSENGER COMPARTMENT TEMPERATURE SENSOR AND THE EATC MODULE FOR OPEN CIRCUIT	
 E64264	1 Ignition switch in position 0. 2 Disconnect Connector C367 from EATC module. 3 Measure the resistance between the passenger compartment temperature sensor, connector C388, pin 3, circuit 31s-FA48 (BWGN), wiring harness side and the EATC module, connector C367, pin 2, circuit 31s-FA48 (BWGN), wiring harness side. Is a resistance of less than 2 ohms registered? → Yes GO to N3. → No LOCATE and RECTIFY the open circuit in circuit 31S-FA48 (BWGN) between the passenger compartment temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.
N3: CHECK THE CIRCUIT BETWEEN THE PASSENGER COMPARTMENT TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO VOLTAGE	
	1 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0029206

DETAILS/RESULTS/ACTIONS

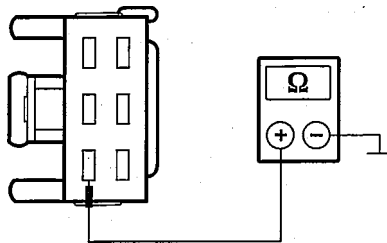
- 2** Measure the voltage between the passenger compartment temperature sensor, connector C388, pin 3, circuit 31s-FA48 (BWGN), wiring harness side and ground.

- Is a voltage measured?

→ **Yes**

LOCATE and RECTIFY the short to voltage supply in circuit 31s-FA48 (BWGN) between the passenger compartment temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

→ **No**
GO to N4.

N4: CHECK THE CIRCUIT BETWEEN THE PASSENGER COMPARTMENT TEMPERATURE SENSOR AND THE EATC MODULE FOR SHORT TO GROUND


VFE0036131

- 1** Ignition switch in position 0.

- ☐ Measure the resistance between the passenger compartment temperature sensor, connector C388, pin 3, circuit 31s-FA48 (BWGN), wiring harness side and ground.

- Is a resistance of more than 10,000 ohms measured?

→ **Yes**

INSTALL A NEW passenger compartment temperature sensor. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the short circuit in circuit 31S-FA48 (BWGN) between the passenger compartment temperature sensor and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST O : ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE INOPERATIVE (NO DISPLAY ON THE CONTROL UNIT)

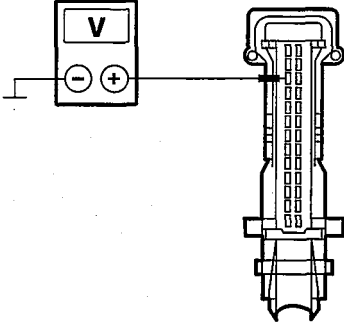
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

O1: CHECK FUSE F4

- 1** Ignition switch in position 0.

DIAGNOSIS AND TESTING

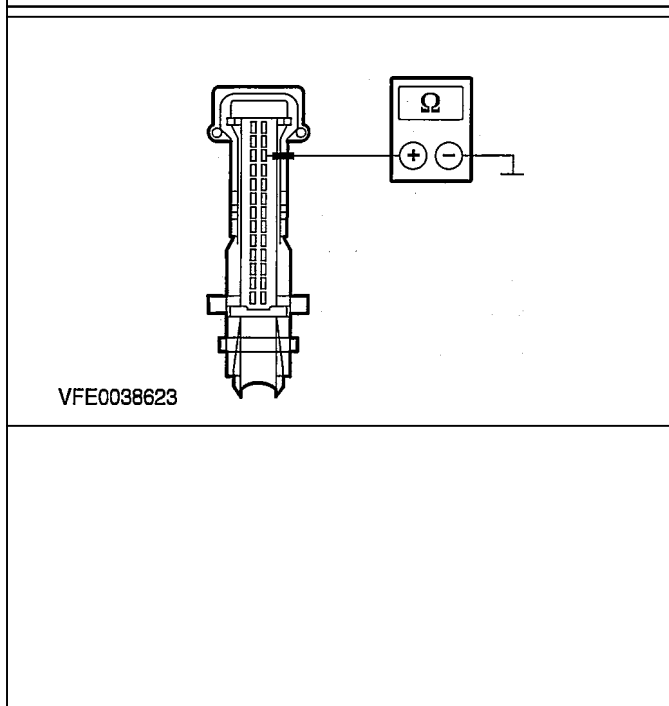
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F4 (CJB). Is the fuse OK? → Yes GO to 02. → No RENEW fuse F4 (10 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
02: CHECK THE VOLTAGE AT FUSE F4	
	Disconnect fuse F4 (CJB). 2 Measure the voltage between fuse F4 (10 A) and ground. Is battery voltage measured? → Yes GO to 03. → No REPAIR the voltage supply to fuse F4 using the Wiring Diagrams. CHECK the operation of the system.
03: CHECK VOLTAGE AT ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE	
 VFE0038621	1 Disconnect Connector C366 from EATC module. 2 Measure the voltage between the EATC module, connector C366, pin 11, circuit 29-FA43 (OGIWH), wiring harness side and ground. Is battery voltage measured? → Yes GO to 04. → No LOCATE and RECTIFY the break in the circuit between fuse F4 and the EATC module using the Wiring Diagrams. CHECK operation of system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

04: CHECK THE GROUND CONNECTION OF THE EATC MODULE



- 1 Measure the resistance between the EATC module, connector C366, pin 24, circuit 31-FA43 (BK), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

→ Yes

CHECK connection between EATC module and CAN bus.

REFER to: Kommunikations-Netzwerk-gebaut ab 0812005 (418-00, Diagnosis and Testing).

If the connection with CAN bus is OK - RENEW the EATC module. CHECK the operation of the system.

→ No

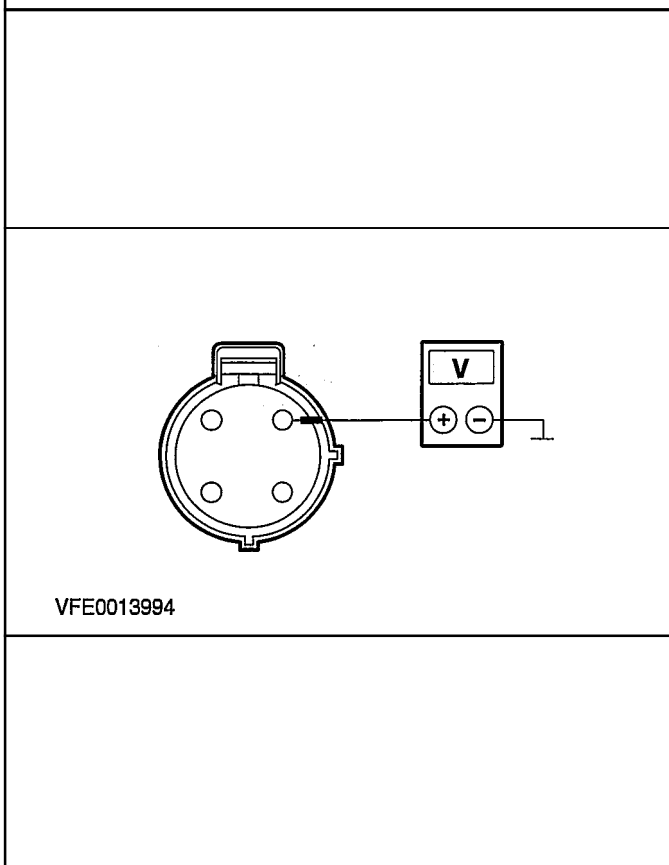
LOCATE and RECTIFY the break in the circuit between the EATC module and ground connection G12 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST P : CIRCUIT OF A/C DEMAND SIGNAL SHORT CIRCUIT TO VOLTAGE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

P1: CHECK CIRCUIT BETWEEN REFRIGERANT LOW-PRESSURE SWITCH AND EATC MODULE FOR SHORT TO VOLTAGE



- 1 Ignition switch in position 0.

- 2 Disconnect Connector C402 from the refrigerant low-pressure switch.

- 3 Ignition switch in position II.

- 4 Measure the voltage between the refrigerant low-pressure switch, connector 402, pin 1, circuit 31S-FA17 (BWRD), wiring harness side and ground.

- Is a voltage measured?

→ Yes

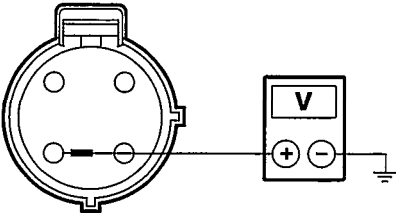
LOCATE and REPAIR short to voltage in circuit 31S-FA17 (BWRD) between the refrigerant low-pressure switch and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

→ No

- Vehicles with 2.0L Duratec-HE (MI4) engine: GO to P6.

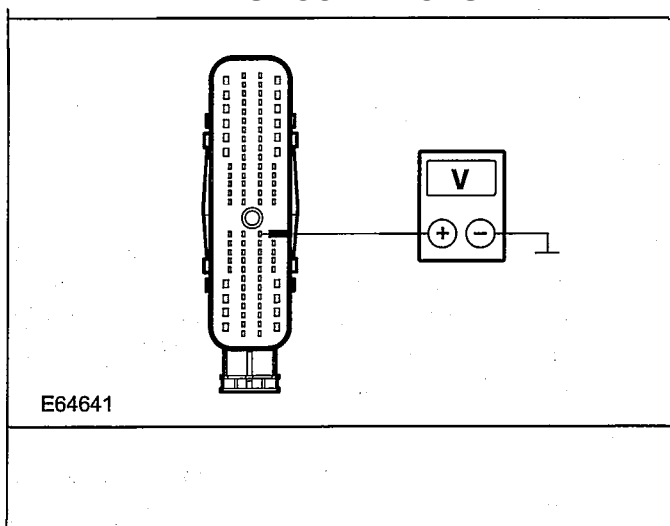
- All, except vehicles with 2.0L Duratec-HE (MI4) engine: GO to P2.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
P2: CHECK CIRCUIT BETWEEN REFRIGERANT LOW-PRESSURE SWITCH AND REFRIGERANT HIGH-PRESSURE SWITCH FOR SHORT TO VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect Connector C405 from the refrigerant high-pressure switch.
	3 Ignition switch in position II.
 E0011398	4 Measure the voltage between the refrigerant low-pressure switch, connector 402, pin 4, circuit 31S-FA17A (BWRD), wiring harness side and ground. - Is a voltage measured? → Yes LOCATE and REPAIR short to voltage in circuit 31S-FA17A (BWRD) between the refrigerant low-pressure switch and the refrigerant high-pressure switch using the Wiring Diagrams. CHECK the operation of the system. → No -All, except vehicles with diesel engine or 2.0L Duratec-HE (MI4) engine: GO to P3. - Vehicles with 1.4L diesel engine: GO to P4. - Vehicles with 1.6L diesel engine: GO to P5.
P3: CHECK CIRCUIT BETWEEN THE POWERTRAIN CONTROL MODULE (PCM) AND THE REFRIGERANT HIGH-PRESSURE SWITCH FOR SHORT TO VOLTAGE - ALL, EXCEPT VEHICLES WITH DIESEL ENGINE OR 2.0L DURATEC-HE (MI4) ENGINE	
	1 Ignition switch in position 0.
	2 Disconnect connector C343 from the PCM.
	3 Ignition switch in position II.

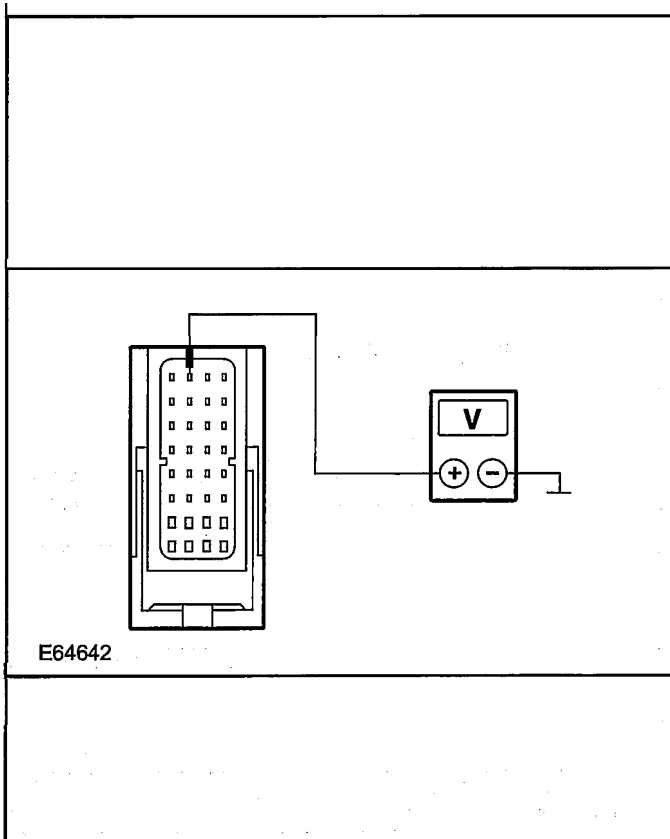
DIAGNOSIS AND TESTING

TEST CONDITIONS

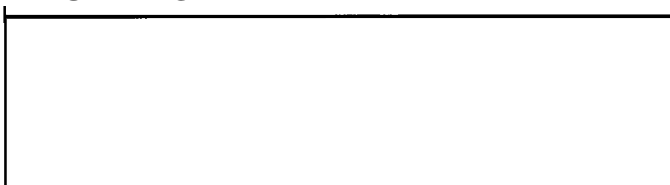


DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the PCM, connector C343, pin F22, circuit 31S-FA87 (BWGN), wiring harness side and ground.
 - Is a voltage measured?
 - **Yes**
LOCATE and RECTIFY the short to voltage in circuit 31S-FA87 (BWGN) between the refrigerant high-pressure switch and the PCM using the Wiring Diagrams. CHECK the operation of the system.
 - **No**
CHECK the PCM and RENEW if necessary. CHECK the operation of the system.

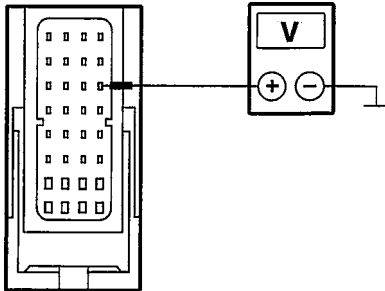
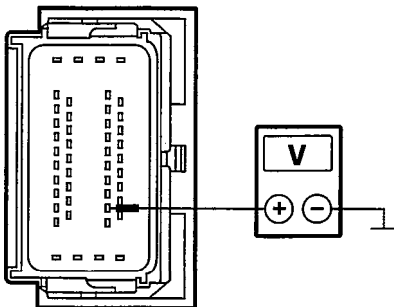
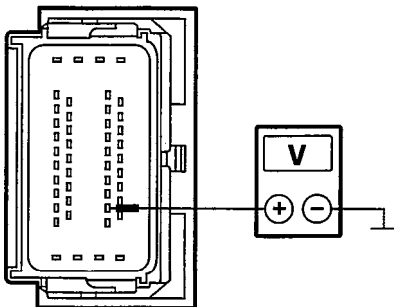
P4: CHECK CIRCUIT BETWEEN THE POWERTRAIN CONTROL MODULE (PCM) AND THE REFRIGERANT HIGH-PRESSURE SWITCH FOR SHORT TO VOLTAGE - VEHICLES WITH 1.4L DIESEL ENGINE


- 1 Ignition switch in position 0.
- 2 Disconnect Connector C370 (vehicles with electronic exhaust gas recirculation valve (EGR): C375) from PCM.
- 3 Ignition switch in position II.
- 4 Measure voltage between the PCM, connector C370 (vehicles with electronic exhaust gas recirculation valve (EGR): C375), pin A2, circuit 31S-FA87 (BWGN), wiring harness side and ground.
 - Is a voltage measured?
 - **Yes**
LOCATE and RECTIFY the short to voltage in circuit 31S-FA87 (BWGN) between the refrigerant high-pressure switch and the PCM using the Wiring Diagrams. CHECK the operation of the system.
 - **No**
CHECK the PCM and RENEW if necessary. CHECK the operation of the system.

P5: CHECK CIRCUIT BETWEEN THE POWERTRAIN CONTROL MODULE (PCM) AND THE REFRIGERANT HIGH-PRESSURE SWITCH FOR SHORT TO VOLTAGE - VEHICLES WITH 1.6L DIESEL ENGINE


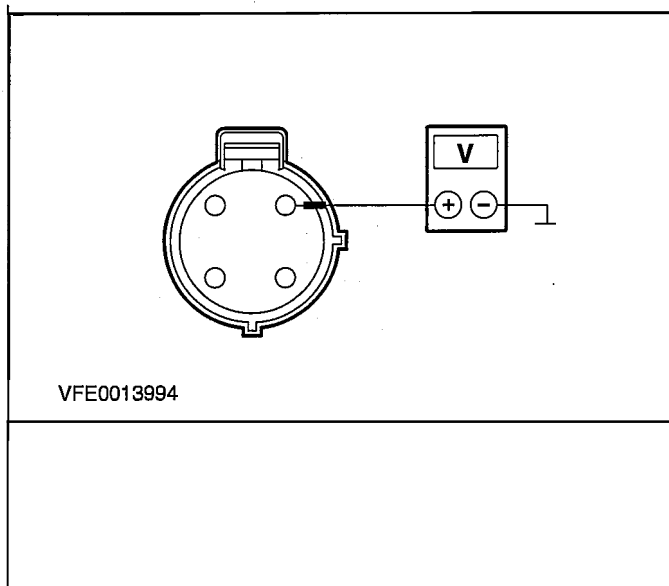
- 1 Ignition switch in position 0.
- 2 Disconnect connector C384 from the PCM.
- 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS			
 E64643		4 Measure the voltage between the PCM, connector C384, pin C4, circuit 31S-FA87 (BWGN), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and RECTIFY the short to voltage in circuit 31s-FA87 (BWGN) between the refrigerant high-pressure switch and the PCM using the Wiring Diagrams. CHECK the operation of the system. → No CHECK the PCM and RENEW if necessary. CHECK the operation of the system.			
P6: CHECK CIRCUIT BETWEEN THE POWERTRAIN CONTROL MODULE (PCM) AND THE REFRIGERANT LOW-PRESSURE SWITCH FOR SHORT TO VOLTAGE - VEHICLES WITH 2.0L DURATEC-HE (MI4) ENGINE					
 E64644		1 Ignition switch in position 0.			
		Disconnect connector C380 from the PCM.			
		☐ Ignition switch in position II.			
 E64644		4 Measure the voltage between the PCM, connector C380, pin 14, circuit 31S-FA17A (BWRD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and REPAIR short to voltage in circuit 31S-FA17A (BWRD) between the refrigerant low-pressure switch and the PCM using the Wiring Diagrams. CHECK the operation of the system. → No CHECK the PCM and RENEW if necessary. CHECK the operation of the system.			
		P7: CHECK THE EATC MODULE			
				Ignition switch in position 0.	
Disconnect Connector C366 from EATC module.					
Ignition switch in position II.					

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the refrigerant low-pressure switch, connector 402, pin 1, circuit 31S-FA17 (BWRD), wiring harness side and ground.

- Is a voltage measured?

→ Yes

LOCATE and REPAIR short to voltage in circuit 31S-FA17 (BWRD) between the refrigerant low-pressure switch and the EATC module using the Wiring Diagrams. CHECK the operation of the system.

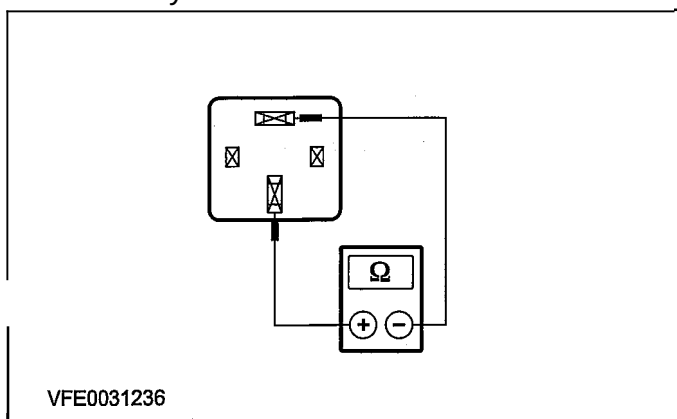
→ No

CHECK the EATC module, if necessary INSTALL a new one. CHECK the operation of the system.

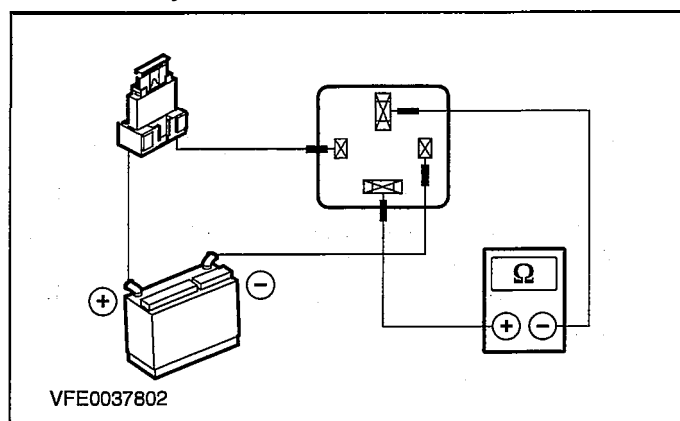
Component Tests

Air conditioning clutch relay

1. Check the normally open contact in the unswitched state:
 - Measure the resistance at the air conditioning clutch relay, between pin 3 and pin 5, component side.
 - Is a resistance of more than 10,000 Ohm measured?
 - If yes, go to 2.
 - If no, RENEW the air conditioning clutch relay.



- Use a test cable to connect pin 2 of the air conditioning clutch relay, component side, to the battery negative terminal.
- Measure the resistance at the air conditioning clutch relay, between pin 3 and pin 5, component side.
- Is a resistance of less than 2 Ohm registered?
 - If yes, then the air conditioning clutch relay is OK.
 - If no, RENEW the air conditioning clutch relay.



2. Check the normally open contact in the switched state:

Use a fused test cable (1 A) to connect pin 1 of the air conditioning clutch relay, component side, to the battery positive terminal.

GENERAL PROCEDURES

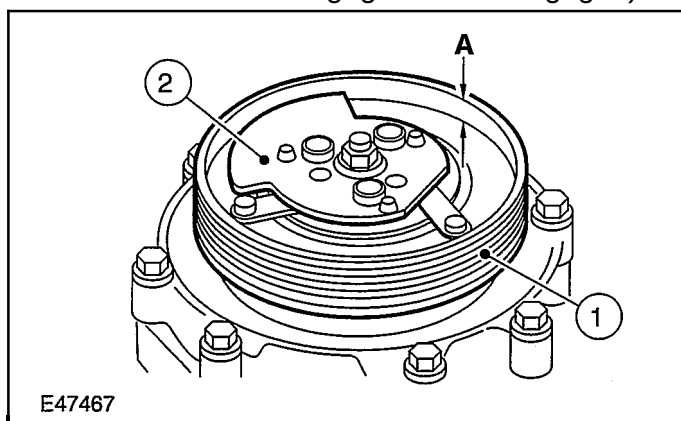
Air Conditioning (A/C) Clutch Air Gap Adjustment(34 628 6)

Materials	
Name	Specification
Spacer washer set	

■ Measurement for recessed pulley

Check the air gap **A** between the drive plate and the pulley at 60 degree intervals around the circumference of the pulley, while operating the **A/C** clutch several times by means of a **5A** fused jumper wire connected between the battery positive terminal, **A/C** clutch and battery ground. For additional information, refer to Specifications in this section.

1. Belt pulley
2. Drive plate
- Air gap A (the difference measured between the A/C clutch engaged and disengaged)

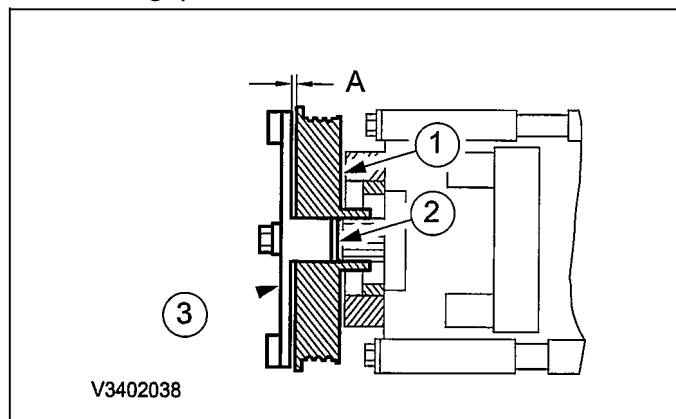


2. Measurement for non recessed pulley

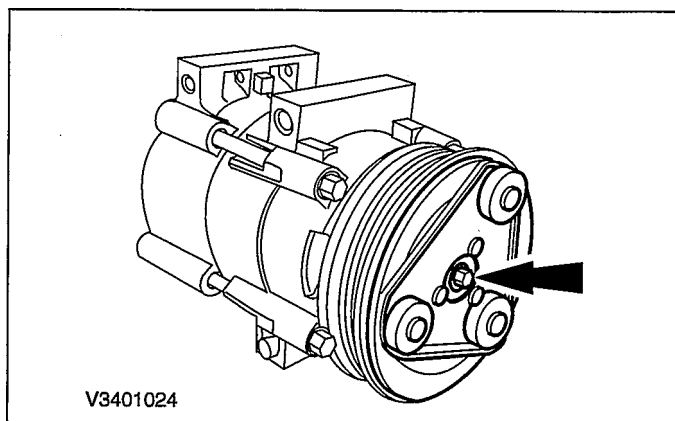
Check the air gap A between the drive plate and the pulley at 60 degrees intervals around the circumference. For additional information, refer to Specifications in this section.

1. Belt pulley
2. Spacer washer
3. Drive plate

- Air gap A



3. Remove the drive plate.



4. Correct air gap **A** as necessary using spacer washers.
5. Install the drive plate. For additional information, refer to Specifications in this section.
6. **Check air gap A as described in step 1 or step 2. Repeat steps 3-5 if necessary.**

GENERAL PROCEDURES

Air Conditioning (A/C) System Recovery, Evacuation and Charging (34 620 2)

General Equipment

Refrigerant centre

Refrigerant analyzer

1. **NOTE:** This step is not necessary for vehicles equipped with the 1.6L Duratorq-TDCi (DV) diesel engine.

Remove the right-hand headlamp.

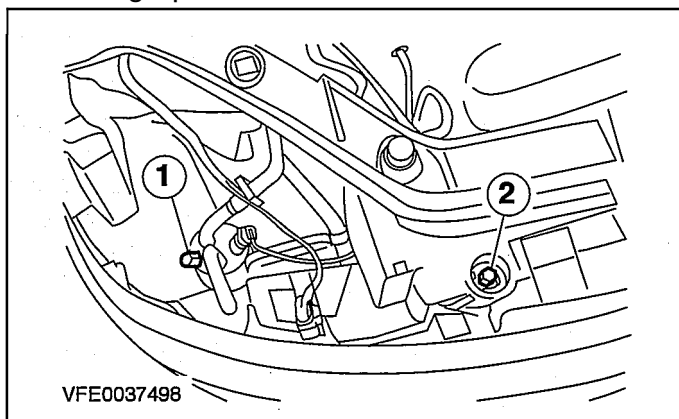
For additional information, refer to:
Headlamps (417-01, Removal and Installation).

2. **⚠ CAUTION:** The refrigerant analyzer must be used before recovery, otherwise the refrigerant center may become contaminated. Contaminated refrigerant must be disposed of as hazardous waste. Always follow the manufacturer's instructions when using the refrigerant center and the refrigerant analyzer.

NOTE: All vehicles except those with the 1.6L Duratorq-TDCi (DV) diesel engine

Unscrew and remove the protective caps from the **A/C** charging connections.

1. Low-pressure connection
2. High-pressure connection

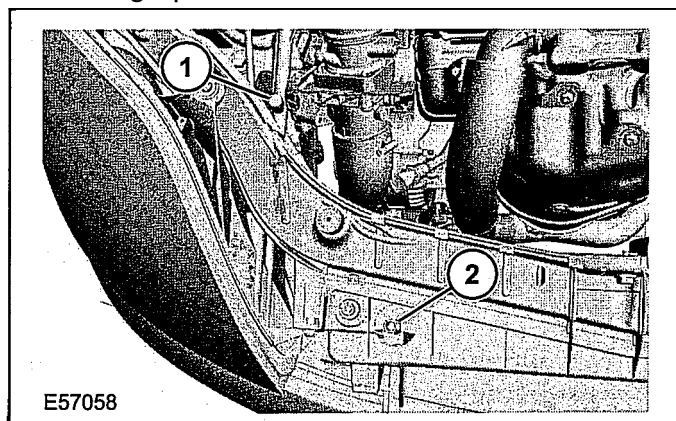


3. **⚠ CAUTION:** The refrigerant analyzer must be used before recovery, otherwise the refrigerant center may become contaminated. Contaminated refrigerant must be disposed of as hazardous waste. Always follow the manufacturer's instructions when using the refrigerant center and the refrigerant analyzer.

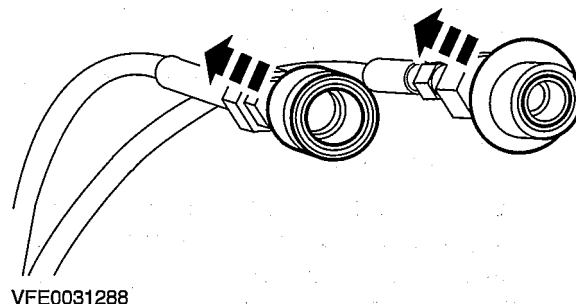
NOTE: Vehicles with the 1.6L Duratorq-TDCi (DV) diesel engine

Unscrew and remove the protective caps from the **A/C** charging connections.

1. Low-pressure connection
2. High-pressure connection



4. Pull back the catches of the quick-fit unions on the refrigerant centre lines.



5. **NOTE:** Larger inner diameter for high-pressure side. Smaller inner diameter for low-pressure side.

Connect the refrigerant centre lines to the **A/C** charging connections.

6. **⚠ WARNING:** When recovering the refrigerant do not allow it to enter the atmosphere under any circumstances. Failure to follow these instructions may result in personal injury.

GENERAL PROCEDURES

NOTE: When removing components of the air conditioning system, calculate the residual quantity of refrigerant oil.

For additional information, refer to: Refrigerant Oil Adding (412-00, General Procedures).

Recover the refrigerant from the **A/C** system via the low-pressure connection in accordance with the refrigerant centre manufacturer's instructions.

7. CAUTIONS:

 **The A/C** system must be evacuated for about 30 minutes before recharging, to ensure that it operates correctly.

 **If** moisture was able to enter an open system over an extended period (several hours), install a new **accumulator/dehydrator** and increase the evacuation time to 2-3 hours.

Evacuate the **A/C** system according to the refrigerant centre manufacturer's instructions.

8. **NOTE:** If an air conditioning system that was filled with refrigerant is being evacuated, some refrigerant will still be in the refrigerant oil in the compressor. This remaining refrigerant may evaporate, causing a slight increase in pressure during the leak test. **The** system is leak-free provided, that this pressure increase does not exceed 20 mbar (2 **kPa**, 0.29 psi).

Perform the leak test.

1. For the leak test, close the hand valves on the pressure gauge set, switch off the refrigerant centre vacuum pump and observe the low pressure gauge.
2. Locate any leaks in the **A/C** refrigerant circuit using a leak tester. For additional information, refer to: (412-00)

Flourescent Dye Leak Detection
(General Procedures),
Electronic Leak Detection
(General Procedures).

9. Top up with refrigerant oil.

For additional information, refer to:
Refrigerant Oil Adding (412-00,
General Procedures).

 **CAUTION:** The air conditioning system must always be evacuated before charging. Failure to observe this instruction can cause damage to the **A/C** system.

10. **NOTE:** Depending on the type of refrigerant centre and the equipment (with or without heated filling cylinder), the air conditioning system is either charged with liquid via the high-pressure connection or with gas through the low-pressure connection.

NOTE: Charge quantity on sticker in engine compartment.

Charging the **A/C** system (with liquid) via the high-pressure connection.

1. Open the shut-off valve on the high-pressure side.
2. Switch the refrigerant centre to "Fill" mode and fill with the prescribed quantity of liquid refrigerant (**R134a**).

 **CAUTION:** Only gaseous charging of the air conditioning system is performed via the low-pressure connection. Failure to follow these instructions may cause damage to the compressor.

Charging the **A/C** system via the low-pressure connection.

1. Open the shut-off valve on the low-pressure side.
2. Switch the refrigerant centre to "Fill" mode and charge with gaseous refrigerant.
3. Top up with the remaining amount of refrigerant whilst the air conditioning is switched on. For this purpose, run the engine at approx. 1200-1500 rpm. Switch the air conditioning to maximum cooling power and fresh air mode. Set the blower to maximum speed. Fill with the remainder of the prescribed fill capacity.

12.  **WARNING:** Do not detach the high-pressure hose when the air conditioning is switched on. Failure to follow these instructions may result in personal injury.

Disconnecting the refrigerant centre.

1. Close the shut-off valves.
2. Switch off the refrigerant centre.
3. Disconnect the service unit line from the **A/C** charging connection.
4. Attach the protective caps to the filling valves.

GENERAL PROCEDURES

13. **NOTE:** This step is not necessary for vehicles equipped with the 1.6L Duratorq-TDCi (DV) diesel engine.

Install the right-hand headlamp.

For additional information, refer to: Headlamps (417-01, Removal and Installation).

GENERALPROCEDURES**Refrigerant Oil Adding(34 621 1)**

 **CAUTION:Collect** the refrigerant oil in a clean measuring cylinder.

NOTE:**This** step only needs to be carried out when replacing the A/C compressor.

NOTE:Rotate the compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

Drain the refrigerant oil from the defective **A/C** compressor and dispose of it.

2.  **CAUTION:**If the refrigerant oil is not to be reused within 15 minutes of draining it from the new compressor, store it in a closed and sealed container to prevent ingress of moisture.

NOTE:The refrigerant oil from the new A/C compressor needs to be drained because the fill capacities at the factory are not always the same.

NOTE:Rotate the compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

Drain the refrigerant oil from the new **A/C** compressor.

3. CAUTIONS:

 **The** amount of refrigerant oil topped up must not exceed the refrigerant oil **fill** capacity.

 **If** other **A/C** components are being renewed in addition to the **A/C** compressor, there is no need to top up with additional refrigerant oil, apart from filling the compressor.

Add the calculated quantity of new refrigerant oil. See: Specifications (**412-00** Heating, Ventilation, Air-Conditioning - General information, Specifications).

GENERAL PROCEDURES

Air Distribution System Cleaning

General Equipment

Spray gun with hose	
Materials	
Name	Specification
Odour eliminating agent (240 ml) (TOX Number 142040)	

All vehicles

▲WARNING: Avoid contact with eyes and skin; wear gloves and respiratory protection. Ensure that you perform this operation in a well ventilated room. Keep all vehicle doors and windows open for the duration of the operation. Do not inhale vapors under any circumstances. Do not smoke and avoid open fire and unprotected light sources. Avoid contact with eyes and skin; wear gloves and respiratory protection. Ensure that you perform this operation in a well ventilated room. Keep all vehicle doors and windows open for the duration of the operation. Do not inhale vapors under any circumstances. Do not smoke and avoid open fire and unprotected light sources. Failure to observe this instruction can lead to injuries.

NOTE: The odour eliminating agent can remove deposits in the heater housing but cannot prevent odours that are distributed by the ventilation system, for example those caused by damp carpets.

Precisely locate the musty or damp odour.

2. Disconnect the low pressure switch connector.
3. Turn on the ignition.
4. Open all ventilation nozzles.
5. Set the temperature control to maximum heating power.
6. Set the blower motor control switch to the highest setting.
7. Set the air distribution control to the fresh air position.
8. Start the engine and let it warm up to operating temperature.

9. To dry out the system, switch off the air conditioning system and ventilate the vehicle for approx. **15** minutes.

10. Switch off the engine.

Only Focus to MY 2004.75 and Galaxy

11. Remove the blower motor.

Only Ka, Fiesta 96 to MY 2002.25 and Puma

12. Remove the blower motor resistor

Only Fiesta from MY 2002.25, Focus C-Max and Focus from MY 2004.75 with pollen filter

13. Remove the pollen filter.

Only Fiesta from MY 2002.25, Focus C-Max and Focus from MY 2004.75 without pollen filter

14. Remove the pollen filter housing cover.

All vehicles

15. Fill the spray gun with the odour eliminating agent (**240 ml**).

16. **▲WARNING:** The maximum pressure of **13.5 bar** must not be exceeded. Failure to observe this instruction can lead to injuries.

Use the tyre inflator to apply pressure of **5.5** to **10 bar** (operating pressure) to the spray gun.

17. Insert the hose of the spray gun as far as possible into the opening created by removal of the above component and point it in the direction of the evaporator.
18. By moving the hose, spray the odour eliminating agent over the entire surface of the evaporator.
19. Spray all of the odour eliminating agent into the opening.
 - Allow the odour eliminating agent to take effect for 10 minutes.
20. Install the components in reverse order.
21. Start the engine, switch off the air conditioning system and ventilate the vehicle for **approx. 15** minutes.
22. Open all ventilation **nozzles**.

GENERALPROCEDURES

23. Set the temperature control to maximum heating power.
24. Set the blower motor control switch to the highest setting.
25. Set the air distribution control to the fresh air position.
26. Switch off the engine.
27. Connect the low pressure switch connector.
28. Ventilate the vehicle with the doors open for another 30 minutes.

GENERALPROCEDURES**Contaminated Refrigerant Handling(34 620 9)**

 **CAUTION:**Any R134a or R12 refrigerant which is contaminated with unsuitable refrigerant should be extracted only by means of a suitable servicing unit designed for the purpose of collecting and storing contaminated refrigerant, so that the spread to other vehicles can be prevented.

- Use refrigerant identification equipment to check that there is contaminated refrigerant in the air conditioning system.
- 2. Inform the customer about the additional cost to repairing the system caused by the contamination.
- 3. Extract the contaminated refrigerant.

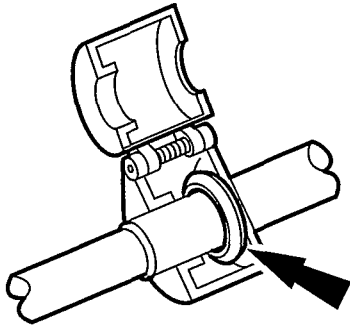
GENERAL PROCEDURES

Spring Lock Coupling

1. **NOTE:** Select special tool to suit the line diameter.

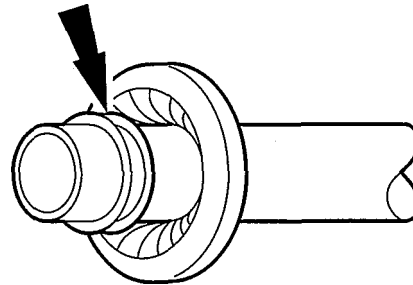
Fit the special tool.

- Fit the special tool so that the inner collar can be guided into the clamping spring.



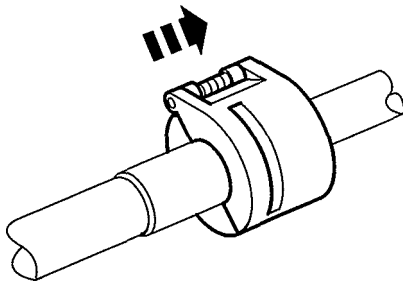
ELM3402005

- Check the clamping spring for damage.
- Carefully pull out any damaged clamping springs using a thin piece of wire and install new one.



ELM3402007

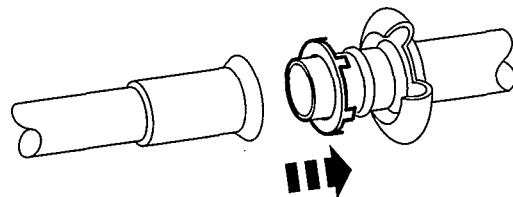
2. Press the special tool into the clamping spring.



VFE0021643

5. **NOTE:** Clean the connections using refrigerant oil and a lint-free cloth.

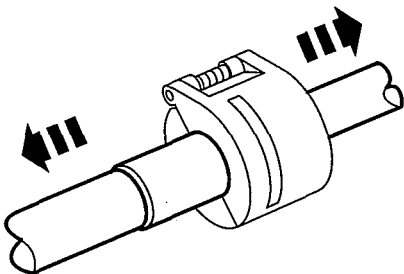
Press the indicator ring into the clamping spring.



VFE0021645

3. Disconnect the refrigerant line.

- Discard the O-ring seals.



VFE0021644

6. **NOTE:** Install new refrigerant line O-ring seals.

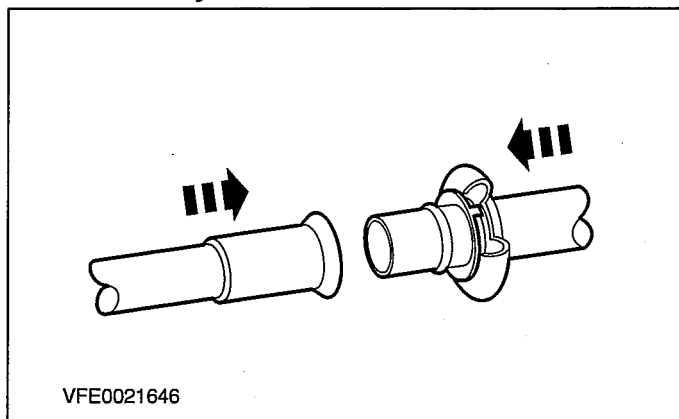
NOTE: Coat the refrigerant line O-ring seals in clean refrigerant oil prior to installation.

Connect the refrigerant lines.

4. Connect the refrigerant line.

GENERAL PROCEDURES

- Check that the clamping spring engages correctly.



GENERAL PROCEDURES**Electronic Leak Detection(34 620 7)****General Equipment**

Automatic Calibration Halogen Leak Detector
Manifold Gauge Set
Refrigerant Identifier

▲ WARNING: Good ventilation before leak detection is necessary in the area where it is to be performed. If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Odors from other chemicals such as antifreeze, diesel fuel, disc brake cleaner, or other cleaning solvents can cause the same problem. While leak detection air movement must be prevented.

1. **▲ CAUTION:** The refrigerant identification equipment must be used before the manifold gauge set is installed, otherwise the manifold gauge may become contaminated. Contaminated refrigerant must be disposed of as special waste. The manufacturer's instructions must be followed when working with the service unit.

NOTE: Both manifold gauges should indicate 4,1-5,5 bar at 24°C with the engine off.

Attach the manifold gauge set to the service gauge port valves.

1. For the leak test, close the manual valves on the gauge set.
2. If little or no pressure is indicated, charge the system with approx. 300g of refrigerant.

For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

2. Use **R-134a** Automatic Calibration Halogen Leak Detector to leak test the refrigerant system. Follow the instructions included with leak detector for handling and operation techniques.
3. If a leak is found, recover the **A/C** system.

For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

GENERALPROCEDURES

Fluorescent Dye Leak Detection

General Equipment

UV Spot Lamp
Manifold Gauge Set
Fluorescent Dye Injector

NOTE:Vehicles built 0711999 onwards have a fluorescent tracer dye tablet inserted into the air conditioning (A/C) system. If tracer dye is present, there is a green cross on the suction accumulator.

NOTE:On vehicles built up to 0711999 tracer dye must be added.

1. Using the dye injector, add 7.4 **ml** of Fluorescent Tracer Dye.

NOTE:Some vehicles may have signs of refrigerant oil at the spring lock couplers. This may be caused from the assembly process which applies to the fittings before installation to aid in assembly. When a spring lock coupler is suspected of leaking, always wipe the fitting clean and verify the leak with R-134a Automatic Calibration Halogen Leak Detector.

NOTE:The exact location of leaks can be pinpointed by the bright yellow - green glow of the tracer dye. Since more than one leak may exist, always inspect each component.

2. Check for leaks using a 120 Watt UV Spot Lamp. Always scan all components, fittings and lines of the **A/C** system.
3. After the leak is found and repaired, remove any traces of dye with a general purpose oil solvent.
4. Verify the repair by operating the system for some minutes and inspecting with the UV lamp again.

GENERAL PROCEDURES**Vacuum Leak Detection(34 620 3)**

1. Drain the air conditioning (NC) system.

For additional information, refer to Air
Conditioning (A/C) System Recovery,
Evacuation and Charging in this section.

SECTION 412-01 Air Distribution and Filtering

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

DESCRIPTION AND OPERATION

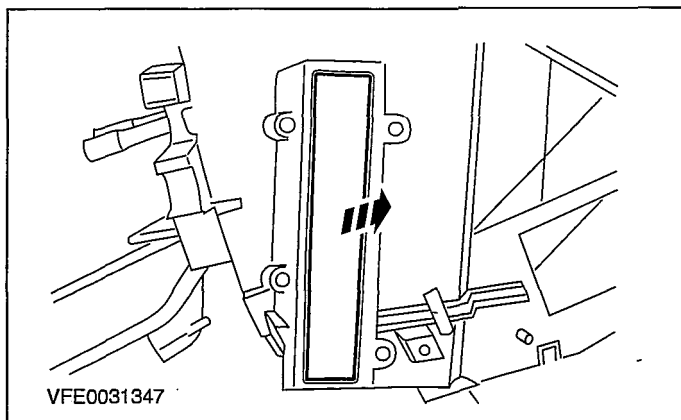
Air Distribution.....	412-01-2
Pollen filter.....	412-01-2

DIAGNOSIS AND TESTING

Air Distribution and Filtering.....	412-01-3
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REMOVAL AND INSTALLATION

Pollen Filter..... (34 350 0)	412-01-4
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DESCRIPTION AND OPERATION**Air Distribution****Pollen filter**

The purpose of the pollen filter is to remove particles which are 0,003 mm or larger from the air taken in.

If installed, it is located in the heat exchanger/evaporator housing.

It is accessible from the left-hand footwell.

The pollen filter must be renewed in accordance with the service intervals.

DIAGNOSIS AND TESTING**Air Distribution and Filtering**

REFER to Section 412-00 [Climate Control System
- General Information].

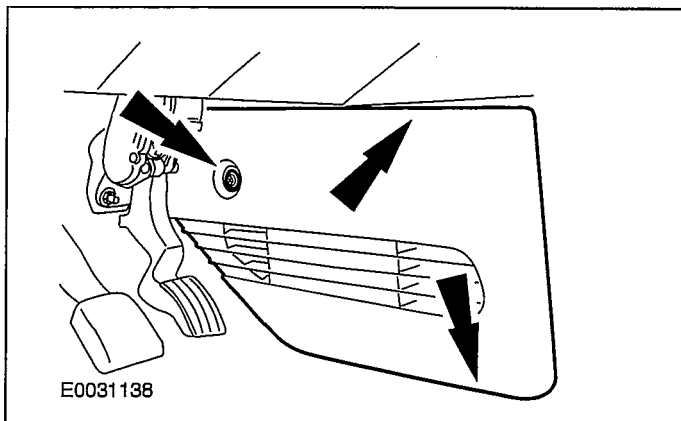
REMOVAL AND INSTALLATION

Pollen Filter(34 350 0)

Removal

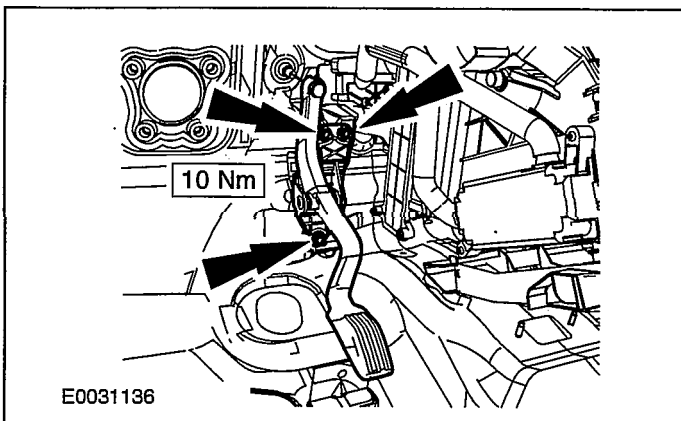
All vehicles

- Detach the centre console side trim on the left-hand side.



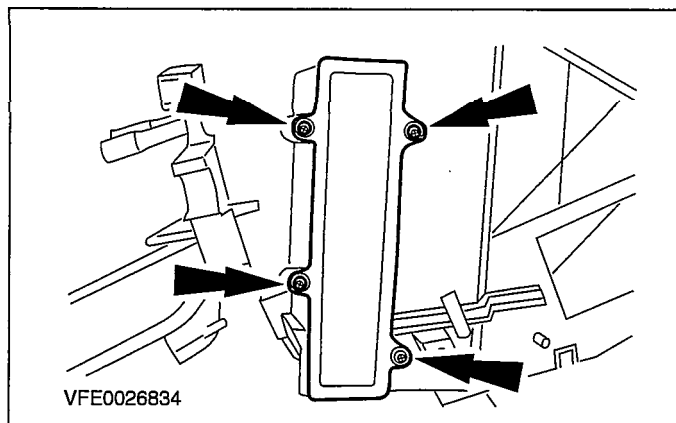
Left-hand drive vehicles

- 2. Detach the accelerator pedal with its bracket from the bulkhead and lay it to one side (vehicle with petrol engine shown).

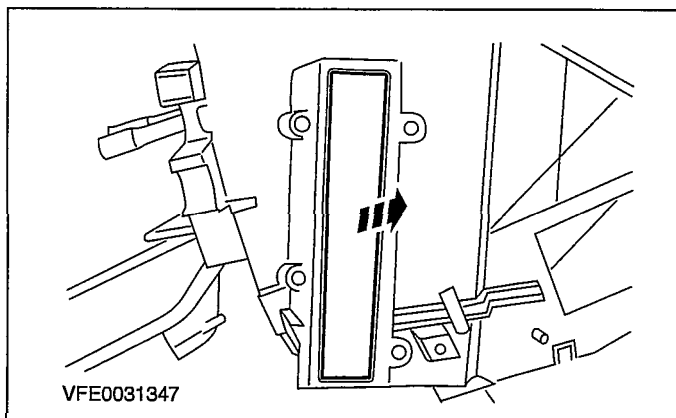


All vehicles

- 3. Remove the pollen filter housing cover.



- 4. Remove the pollen filter.



Installation

- 1. Reinstall the components in reverse order.

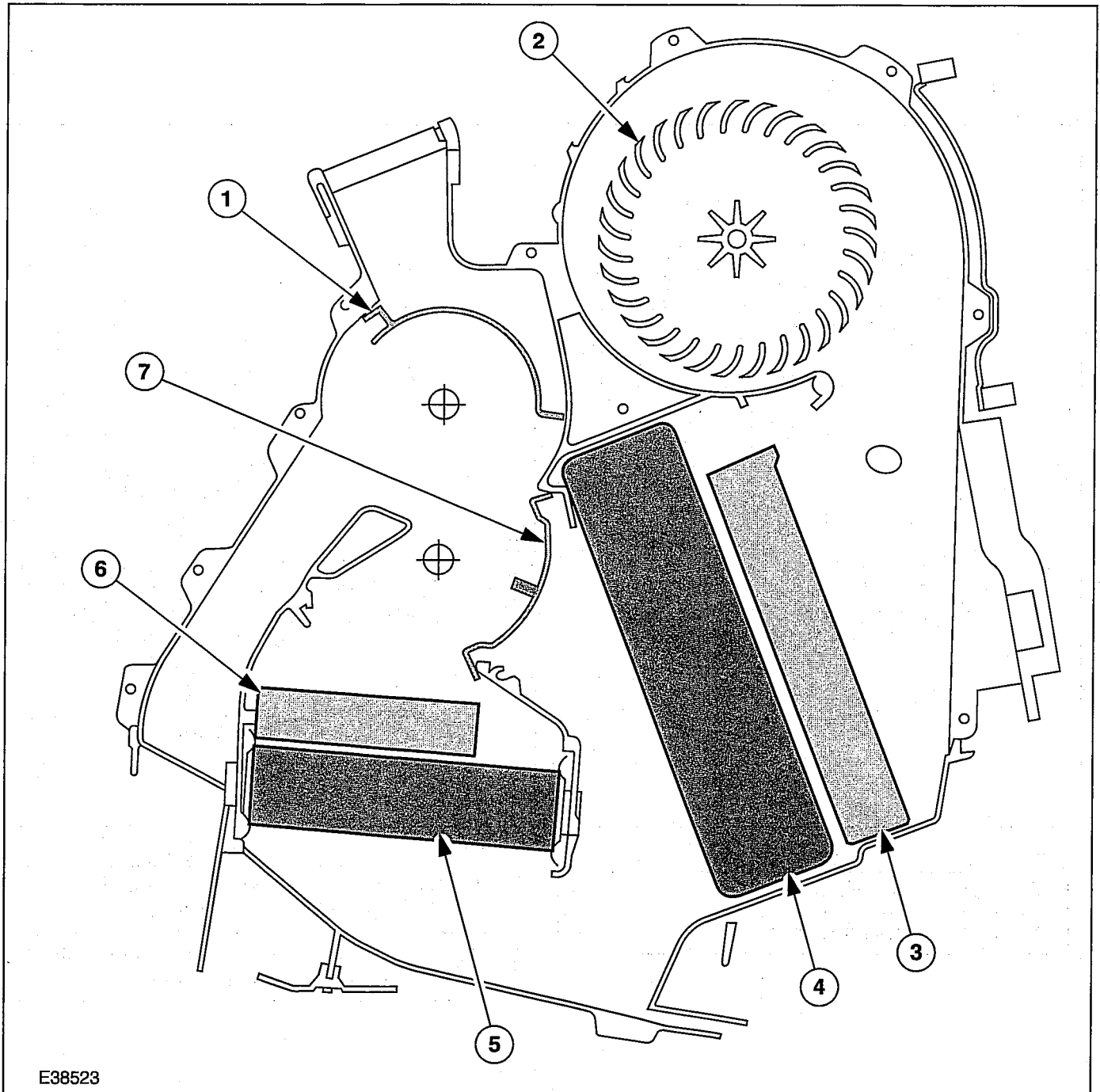
SECTION 412-02 Heating and Ventilation

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	412-02-2
DESCRIPTION AND OPERATION	
Heating and Ventilation.....	412-02-3
Heater/Evaporator Core Housing.....	412-02-3
DIAGNOSIS AND TESTING	
Heating and Ventilation.....	412-02-6
REMOVAL AND INSTALLATION	
Blower Motor.....	(34 374 0) 412-02-7
Heater Core.....	(34 364 0) 412-02-9
Heater Core and Evaporator Core Housing.....	(34 354 0; 34 354 6; 34 354 7) 412-02-10
DISASSEMBLY AND ASSEMBLY	
Heater Core and Evaporator Core Housing.....	412-02-23

SPECIFICATIONS**Torque Specifications**

Item	Nm	lb-ft	lb-in
Bolts, reinforcing element	20	15	-
Bolts, heater core /evaporator housing to reinforcing element	5	-	44
Nut, heater core /evaporator housing	1	-	9
Bolts, electric booster heater	1	-	9

DESCRIPTION AND OPERATION**Heating and Ventilation****Heater/Evaporator Core Housing****Overview**

Item	Description
1	Air distribution door
2	Blower motor
3	Pollen filter (optional)

Item	Description
4	Evaporator core (only vehicles with Air Conditioning (A/C))
5	Heater core

DESCRIPTION AND OPERATION

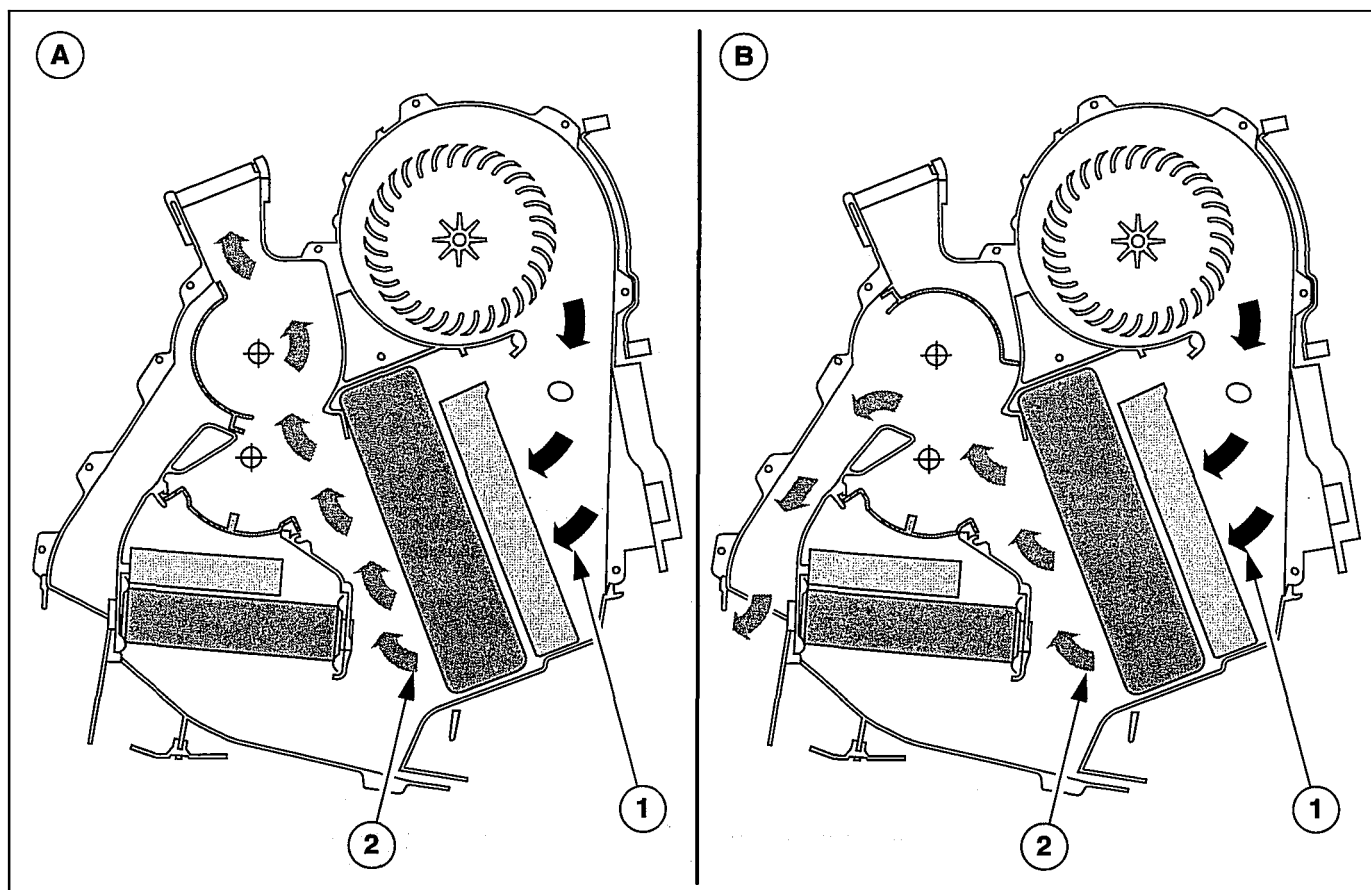
Item	Description
6	Electric booster heater (only vehicles with diesel engine)
7	Temperature control air distribution door

On vehicles with A/C, adjustment of the air inlet blend doors is performed via control cables operated by an actuator motor.

Vehicles without air conditioning do not feature recirculated air

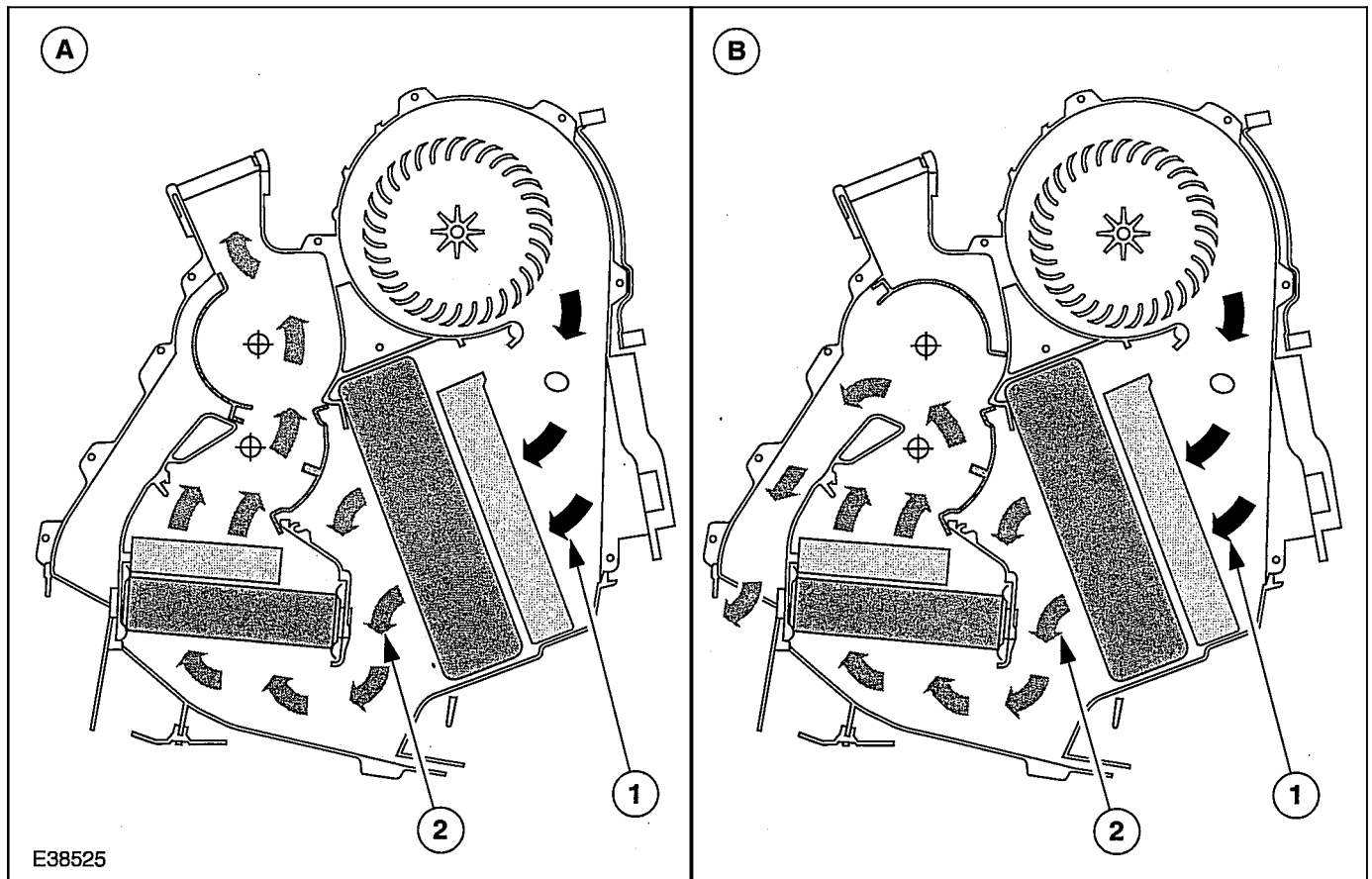
On vehicles built from 08/2005 with Electronic Automatic Temperature Control (EATC), the actuator motors used for adjustment of the air distribution door and the temperature control air distribution door are controlled via the climate control assembly.

Cold air distribution



Item	Description
A	Cold air to the vents
B	Cold air to the footwell

Item	Description
1	Air flow upstream of the pollen filter / evaporator core (if equipped)
2	Air flow downstream of the pollen filter / evaporator core (if equipped)

DESCRIPTION AND OPERATION**Warm air distribution**

Item	Description
A	Warm air to the vents
B	Warm air to the footwell
1	Air flow upstream of the pollen filter 1 evaporator core (if equipped)
2	Air flow downstream of the pollen filter 1 evaporator core (if equipped)

Item	Description
A	Warm air to the vents
B	Warm air to the footwell
1	Air flow upstream of the pollen filter 1 evaporator core (if equipped)
2	Air flow downstream of the pollen filter 1 evaporator core (if equipped)

DIAGNOSIS AND TESTING

Heating and Ventilation

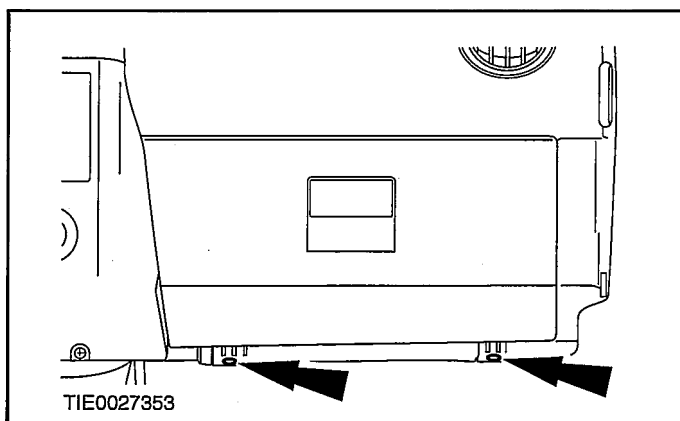
REFER to Section 412-00 [Climate Control System
- General Information].

REMOVAL AND INSTALLATION

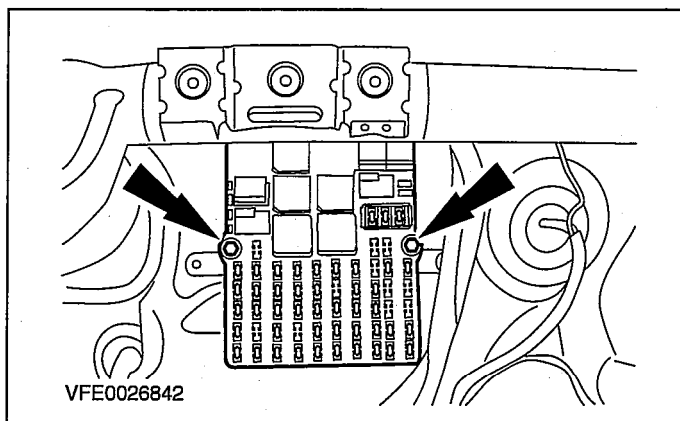
Blower Motor(34 374 0)

Removal

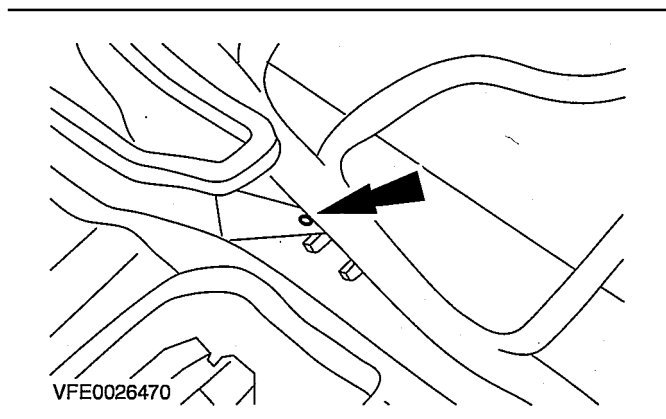
1. Remove the glove box.



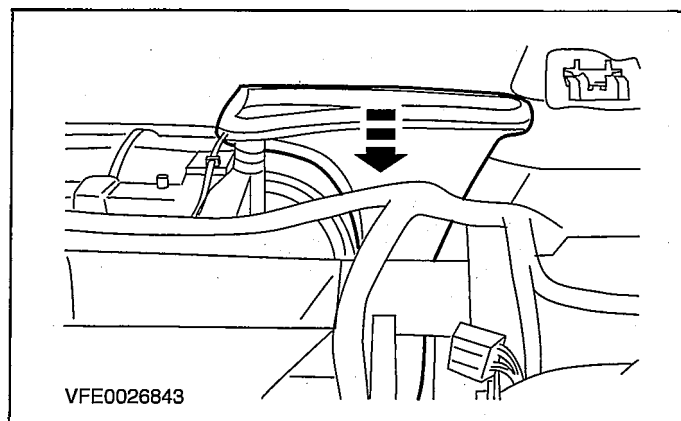
2. Detach the central junction box from the bulkhead and lay it to one side (shown without the crash padding for clarity).



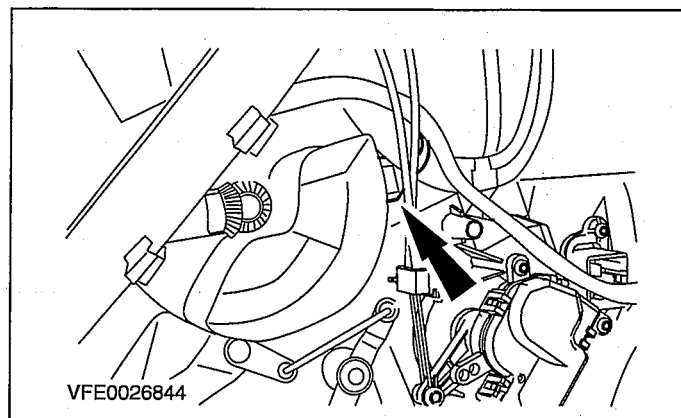
3. Unscrew and remove the bolt from the defrost air duct (shown without the crash padding for clarity).



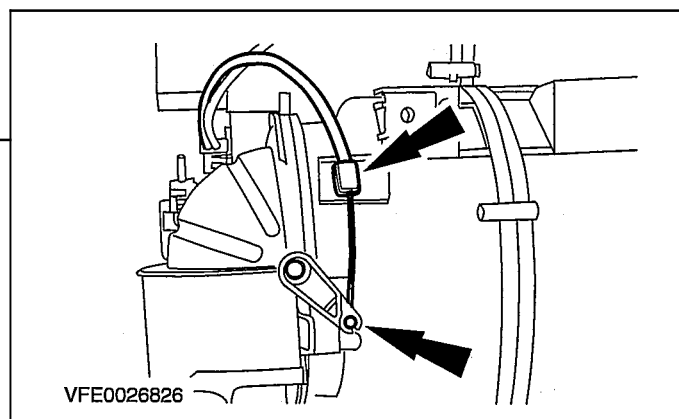
4. Remove the defrost air duct (shown without the crash padding for clarity).



5. Disconnect the blower motor connector (LHD vehicle shown).

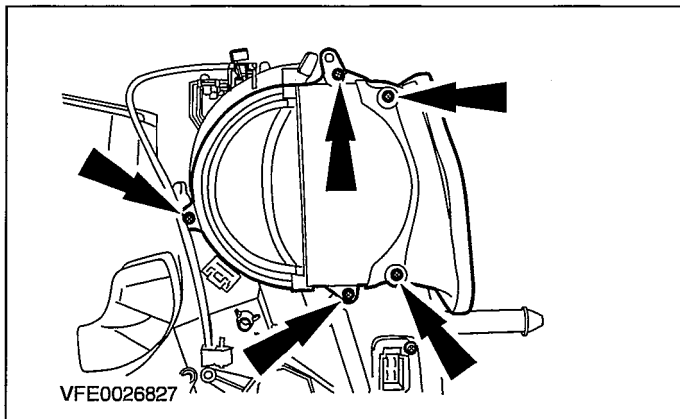


6. Detach the air intake flap actuation cable.

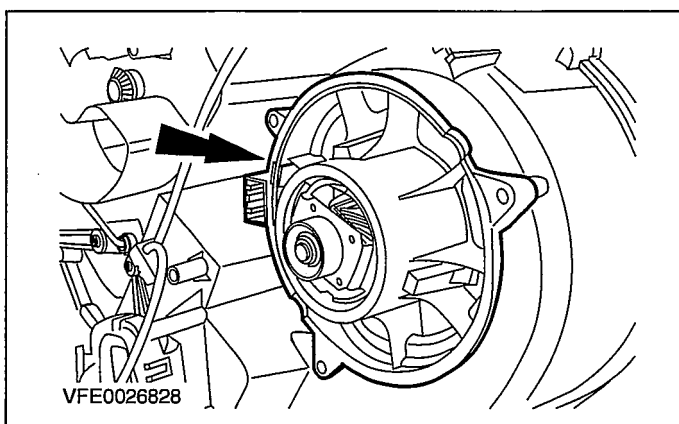


REMOVAL AND INSTALLATION

7. Remove the air intake flap (shown with the heater housing removed for clarity).



8. Remove the blower motor.

**Installation**

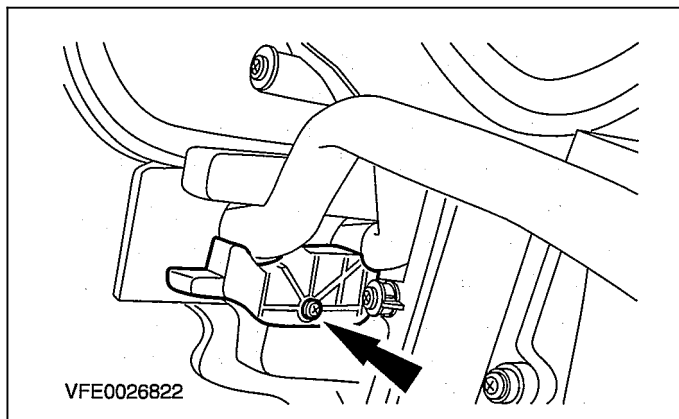
1. Reinstall the components in reverse order.

REMOVAL AND INSTALLATION**Heater Core(34 364 0)****Removal**

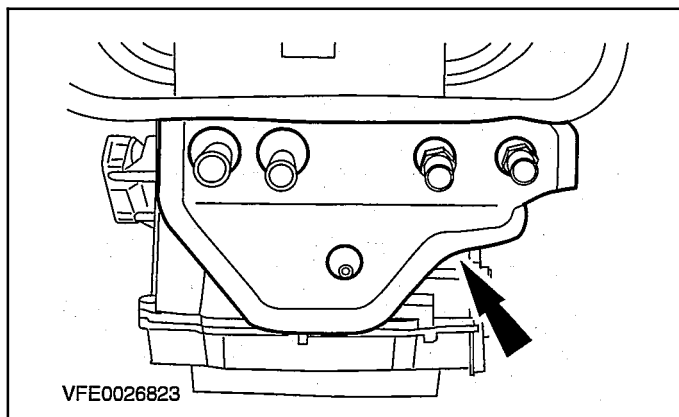
- **Remove the heater core / evaporator housing.**

For additional information, refer to Heater core / evaporator housing in this section.

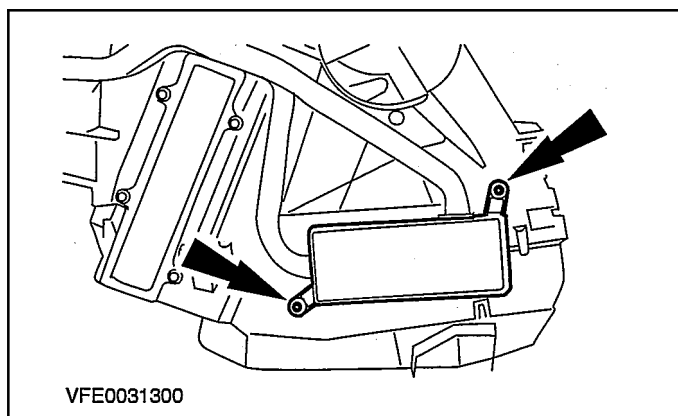
- 2. Remove the bracket for the coolant pipes.**



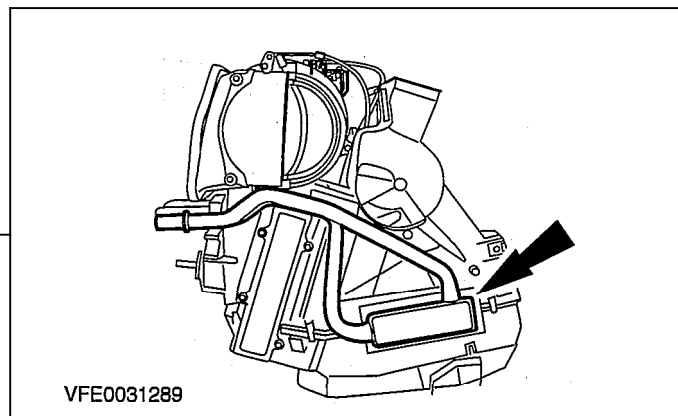
- 3. Remove the heater core / evaporator housing gasket.**



- 4. Remove the heater core cover.**



- 5. Remove the heater core.**

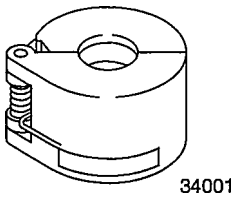
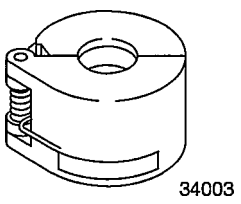
**Installation**

- **Reinstall the components in reverse order.**

REMOVAL AND INSTALLATION

Heater Core and Evaporator Core Housing(34 354 0; 34 354 6; 34 354 7)

Special Tool(s)

 34001	Remover, quick-release coupling 1/2" (blue) 412-027 (34-001)
 34003	Remover, quick-release coupling 5/8" (black) 412-038 (34-003)

Removal**All vehicles**

1. Drain the cooling system. For additional information, refer to:

Cooling System Draining, Filling and

Bleeding - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-I6V (Sigma) (303-03

Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-I6V (Sigma)/1.4L Duratec-I6V (Sigma)/1.6L Duratec-I6V (Sigma), General Procedures),

Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - **1.4L Duratorq-TDCi (DV) Diesel, General Procedures),**

Cooling System Draining, Filling and Bleeding (**303-03 Engine Cooling - 2.0L Duratec-HE (M14), General Procedures),**

Cooling System Draining, Filling and Bleeding (303-03 Engine Cooling - **1.6L Duratorq-TDCi (DV) Diesel, General Procedures).**

2. Remove the right-hand **headlamp** assembly.

For additional information, refer to:

Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

3. Drain the air conditioning system.

For additional information, refer to: Air Conditioning **(A/C)** System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

4. Remove the instrument panel.

For additional information, refer to: Instrument Panel - Vehicles Built Up To: I012005 (501-12 Instrument Panel and Console, Removal and Installation).

5. Remove the air cleaner. For additional information, refer to: (303-12 Intake Air Distribution and Filtering)

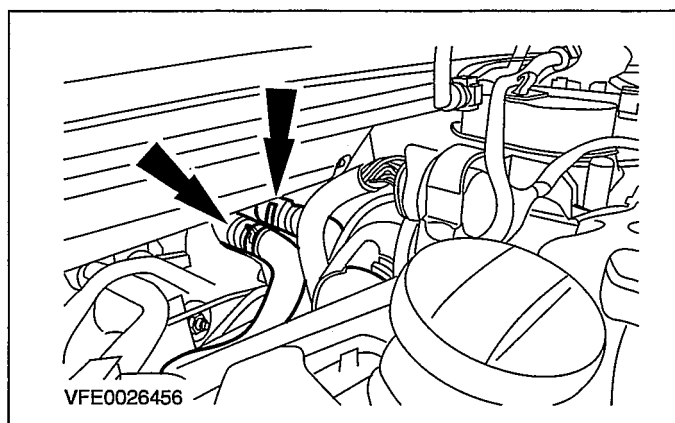
Air Cleaner - **1.25L Duratec-I6V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-I6V (Sigma) (Removal and Installation),**

Air Cleaner - **1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation),**

Air Cleaner - **2.0L Duratec-HE (M14) (Removal and Installation),**

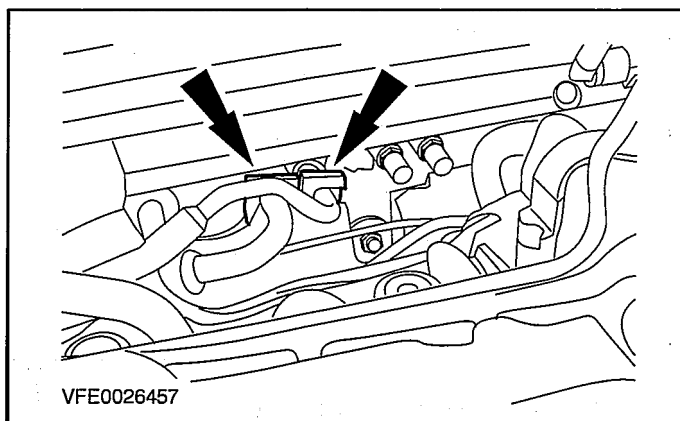
Air Cleaner - **1.6L Duratorq-TDCi (DV) Diesel (Removal and Installation).**

6. Detach the **coolant** hoses **from** the heater core.

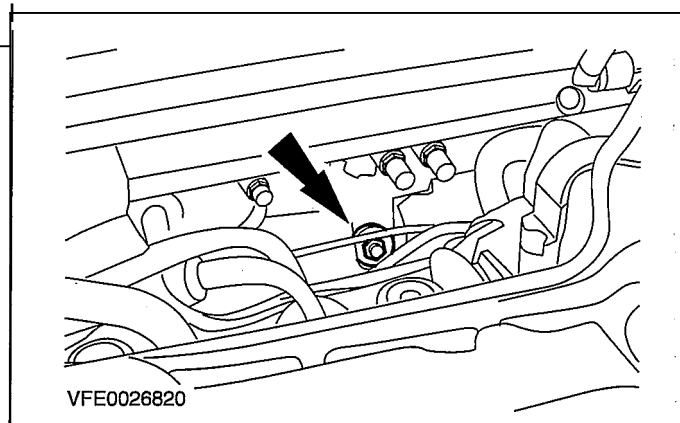


REMOVAL AND INSTALLATION

7. Remove the retaining clips of the quick-release couplings on the refrigerant lines.

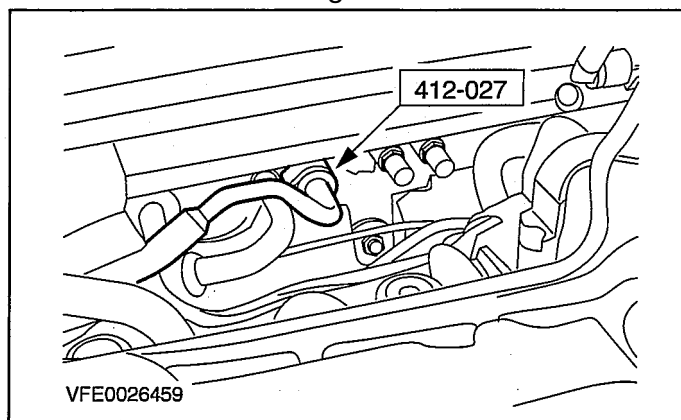


10. Unscrew and remove the nut from the heater core and evaporator core housing.

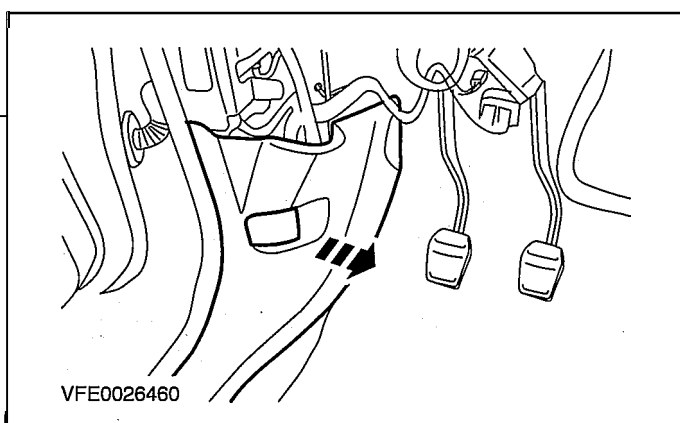


8. Using the special tool, detach the left-hand refrigerant line from the evaporator core.

- Discard the O-ring seals.

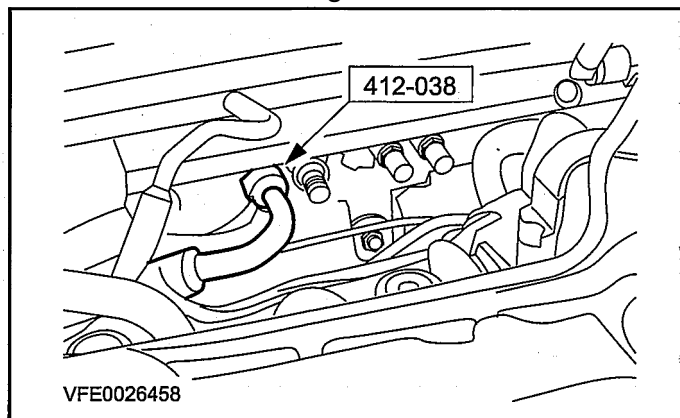


11. Unclip part of the left-hand **footwell** trim.

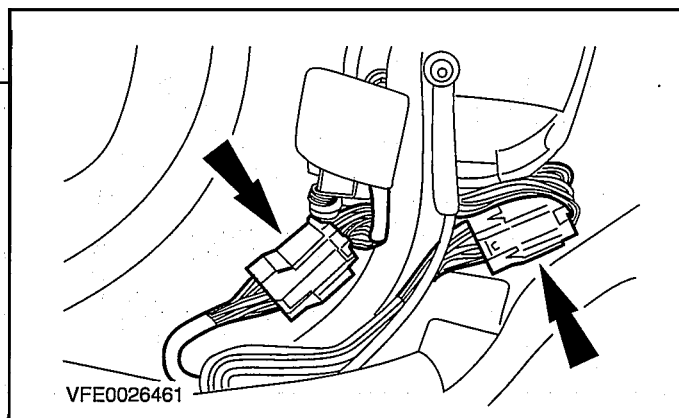


9. Using the special tool, detach the right-hand refrigerant line from the evaporator core.

- Discard the O-ring seals.

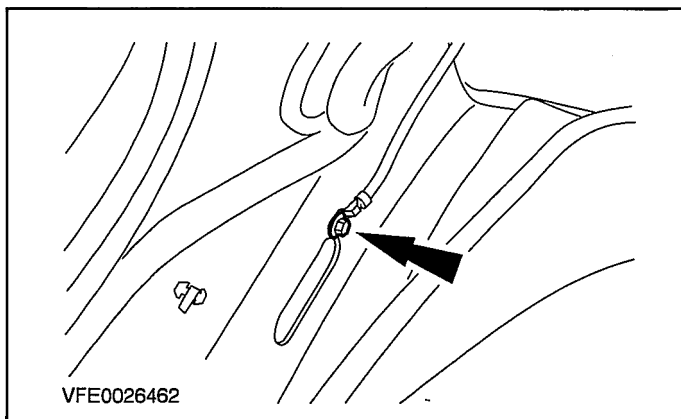


12. Disconnect the left-hand electrical connector of the instrument panel wiring harness (the **footwell** trim is shown removed for clarity).

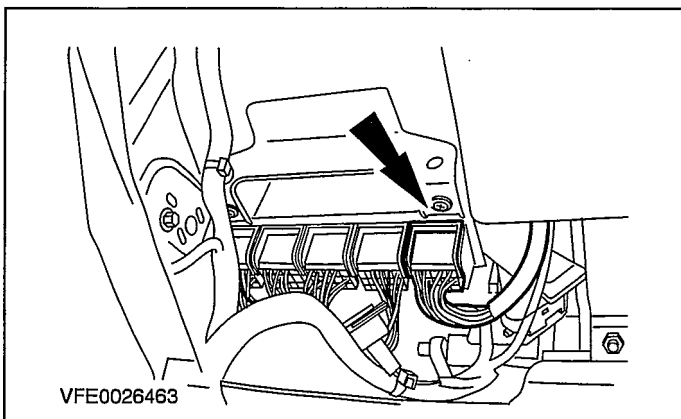


REMOVAL AND INSTALLATION

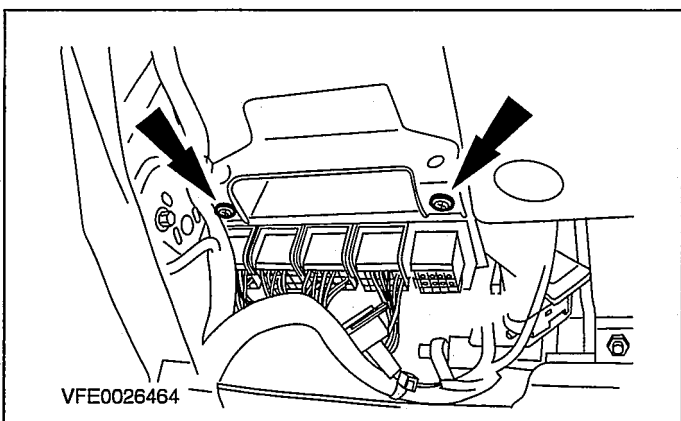
13. Remove the ground strap bolt in the left-hand footwell.



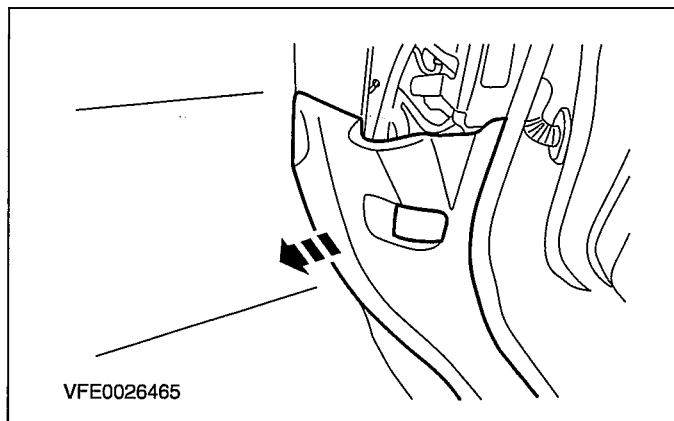
14. Disconnect the electrical connector of the generic electronic module (GEM).



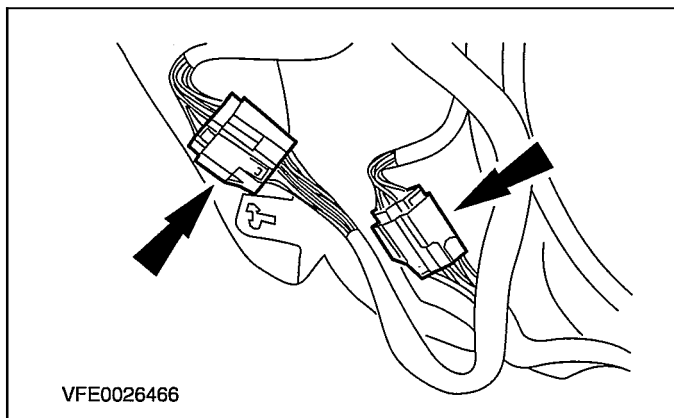
15. Detach the GEM from the in-vehicle crossbeam and lay it to one side.



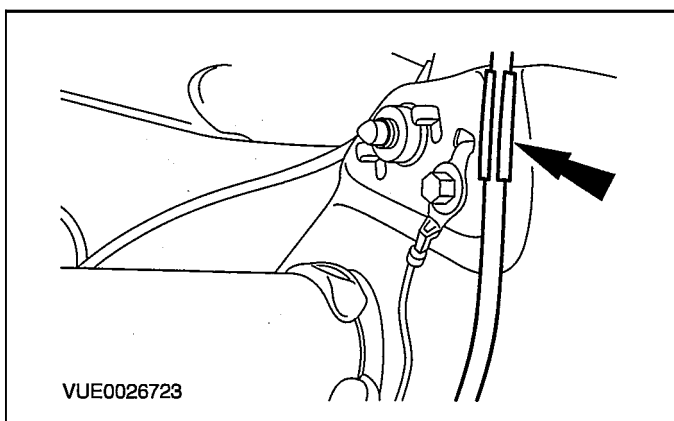
16. Unclip part of the right-hand footwell trim.



17. Disconnect the right-hand electrical connector of the instrument panel wiring harness (the footwell trim is shown removed for clarity).

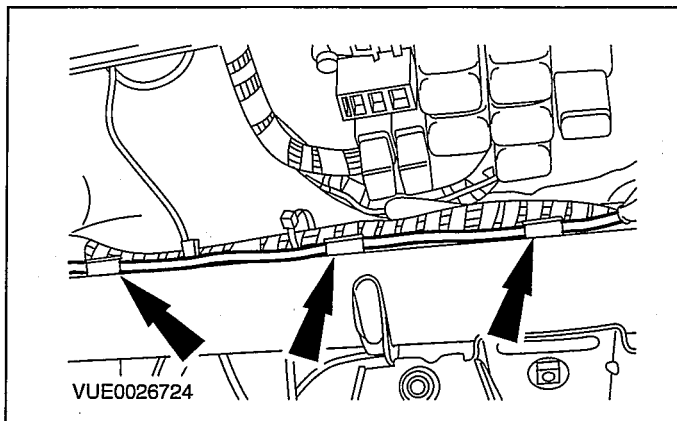


18. Detach the antenna cable from the right-hand upper clip on the in-vehicle crossbeam.

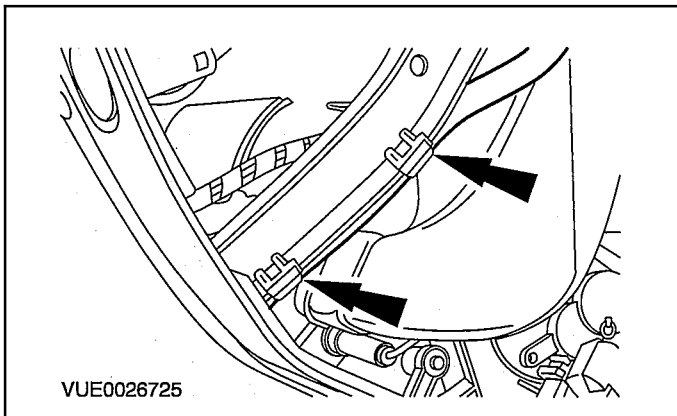


REMOVAL AND INSTALLATION

19. Detach the antenna cable from the right-hand lower clips on the in-vehicle crossbeam.

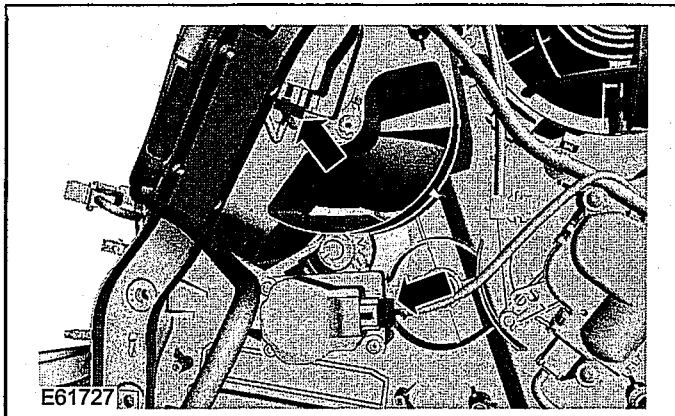


20. Detach the antenna cable from the central clips on the in-vehicle crossbeam.



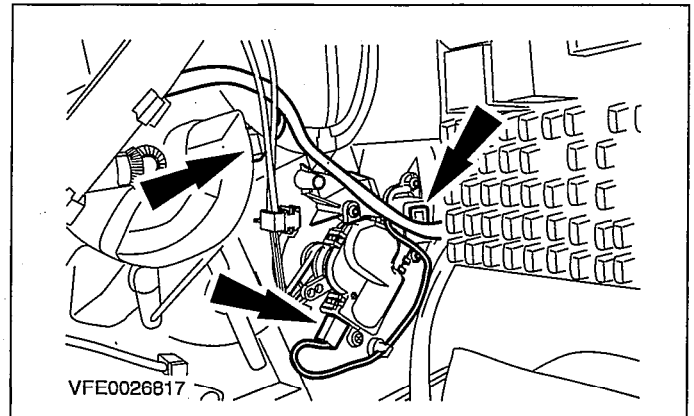
Vehicles with electronic automatic temperature control (EATC)

21. Disconnect the electrical connectors for the **footwell vent/duct** blend door actuator and the temperature blend door actuator.



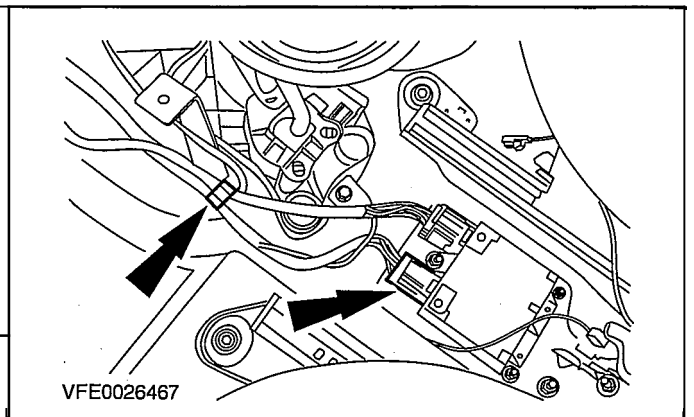
All vehicles

22. Disconnect the electrical connectors for the blower motor, blower motor resistor and air inlet blend door actuator.

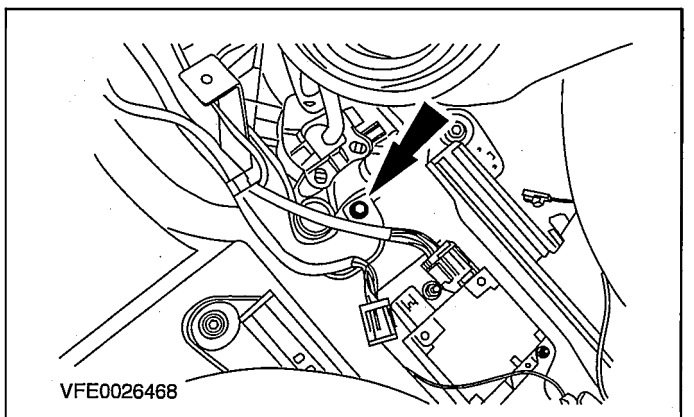


23. Disconnect the electrical connector from the **airbag** module.

- Unclip the wiring harness.

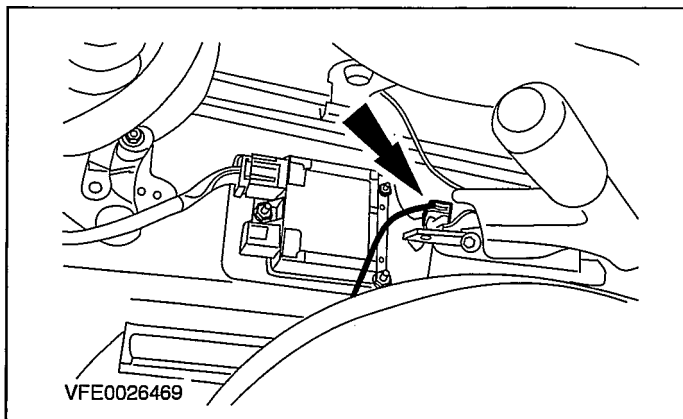


24. Unscrew and remove the ground cable bolt from the **airbag** module.

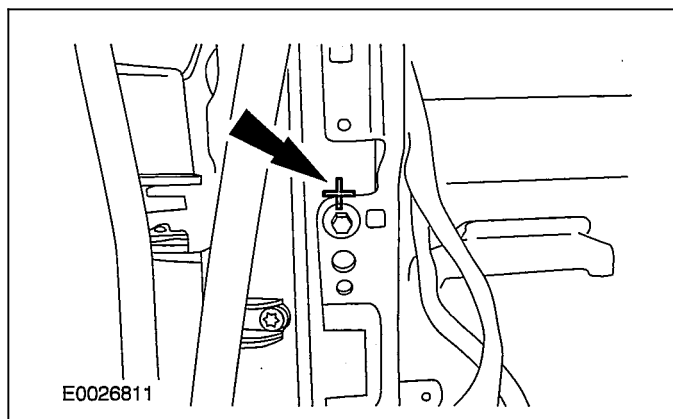


REMOVAL AND INSTALLATION

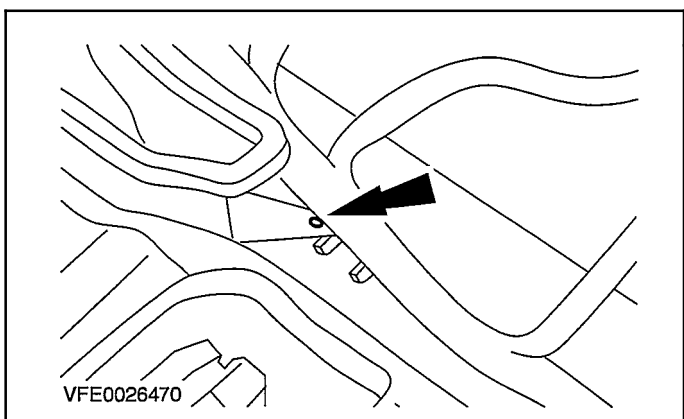
25. Disconnect the electrical connector of the handbrake warning lamp switch.



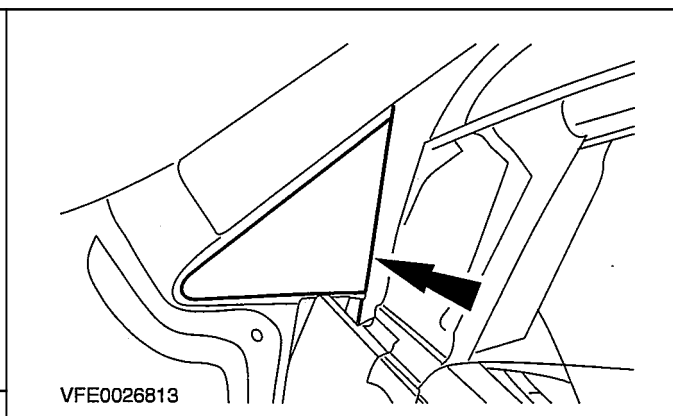
28. Mark the position of the in-vehicle crossbeam relative to the A-pillars (left-hand side shown).



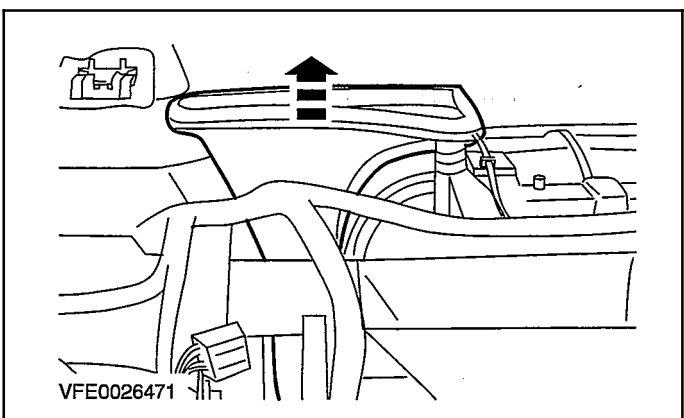
26. Remove the bolts of the windshield air duct (left-hand side shown).



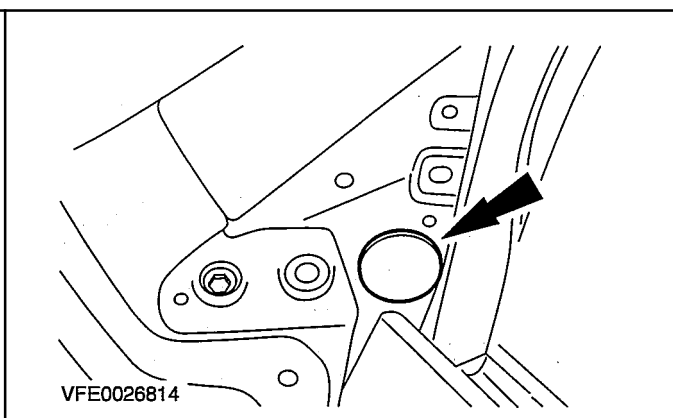
29. Remove the A-pillar outer trims (left-hand side shown).



27. Remove the windshield air ducts (left-hand side shown).

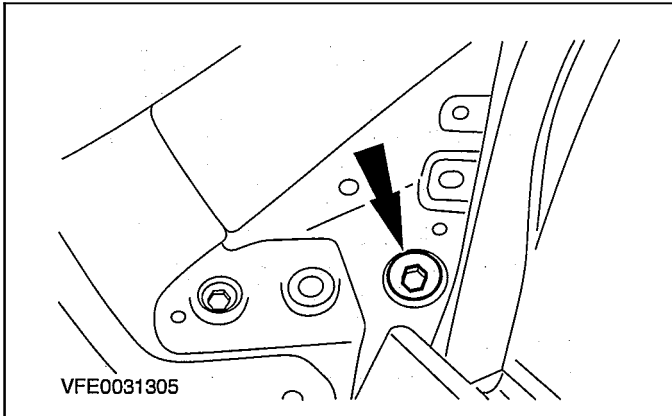


30. Remove the caps (left side shown).

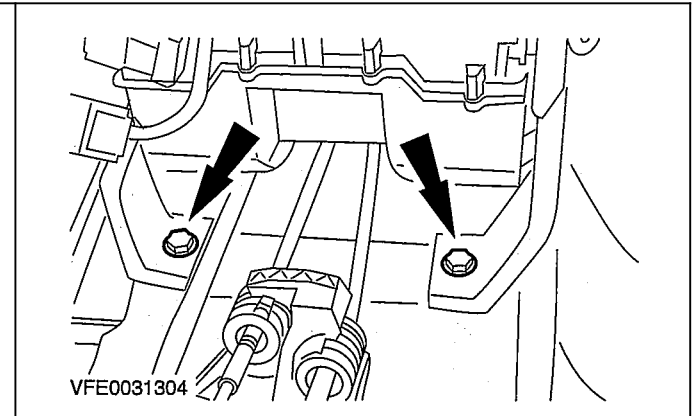


REMOVAL AND INSTALLATION

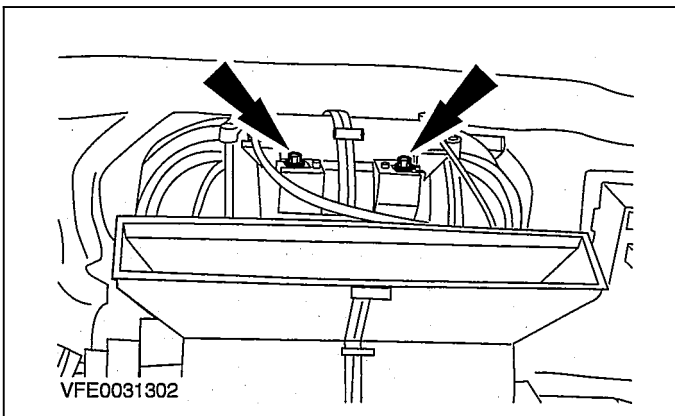
31. Remove the in-vehicle crossbeam side bolts.



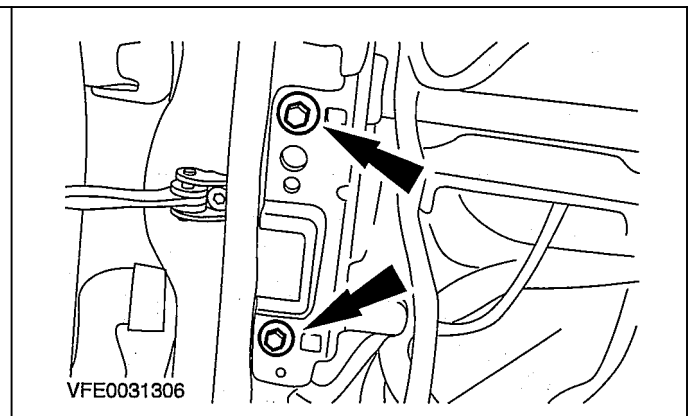
34. Remove the in-vehicle crossbeam lower bolts.



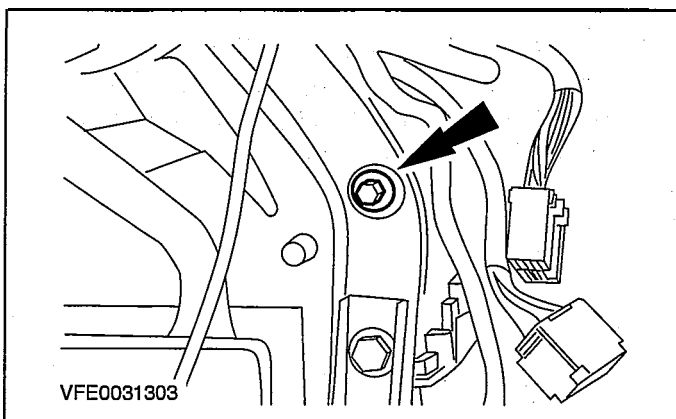
32. Remove the upper bolts of the heater core and evaporator core housing.



35. Remove the in-vehicle crossbeam upper bolts.

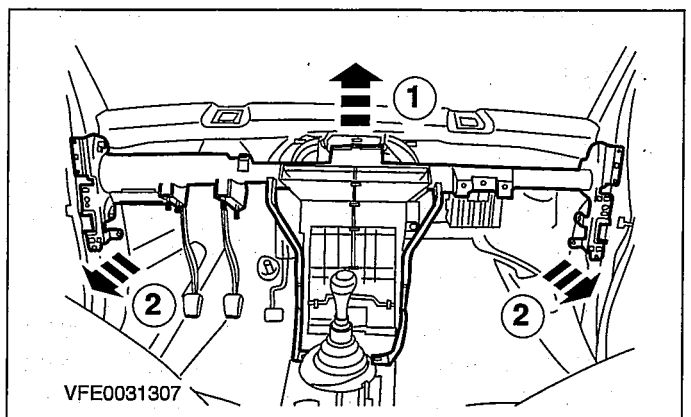


33. Remove the side bolts from the heater core and evaporator core housing (left side shown).



36. Remove the in-vehicle crossbeam.

1. Lift the in-vehicle crossbeam.
2. Pull the in-vehicle crossbeam rearwards.

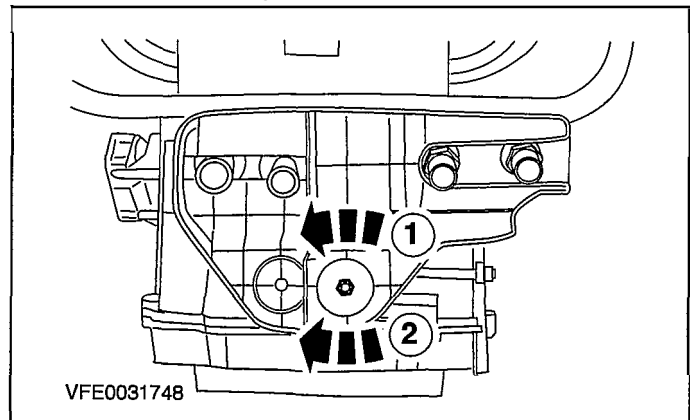
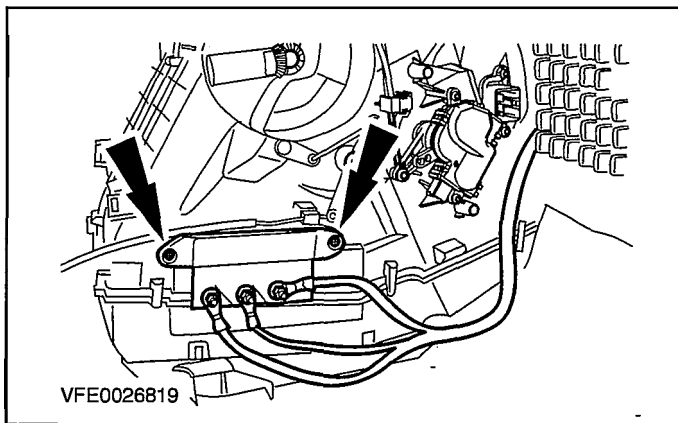


37. **▲WARNING:** Before performing any work on the electrical booster heater, make certain that the surface of its heating element has cooled to ambient temperature. Failure to observe this instruction can lead to injury.

REMOVAL AND INSTALLATION

Detach the electrical booster heater from the heater core and evaporator core housing and lay it to one side (if equipped).

2. Undo the adjustment nut one turn.

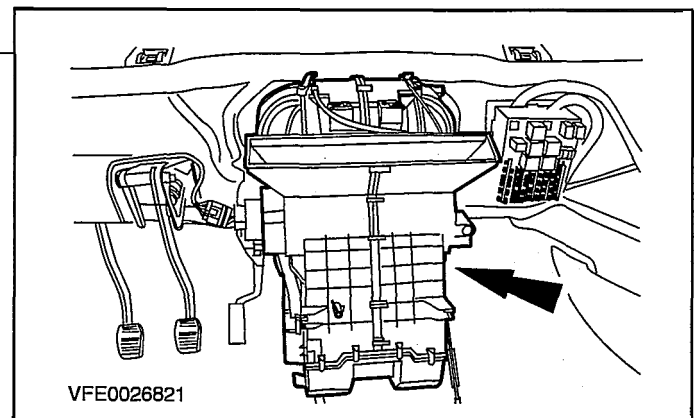
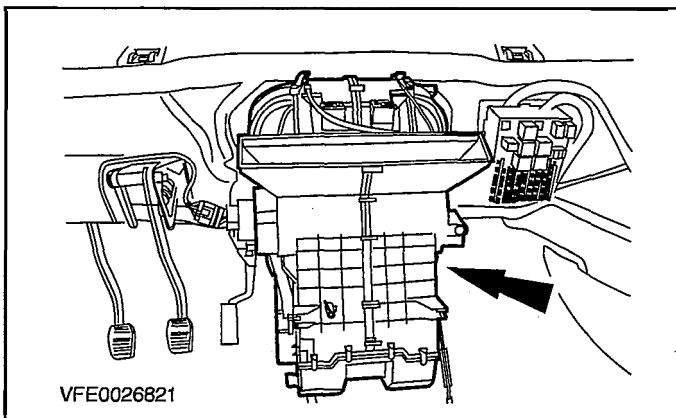


38. **CAUTION:** Make sure that the water drain tube is not damaged when laying down the housing.

Remove the heater core and evaporator core housing.

2. **CAUTION:** Make certain that the rubber grommet of the heater core and evaporator core housing water drain tube is correctly located in the vehicle floor.

Install the heater core and evaporator core housing.



installation

All vehicles

1. **CAUTION:** Ensure that the adjustment nut for the heater core and evaporator core housing is freely accessible.

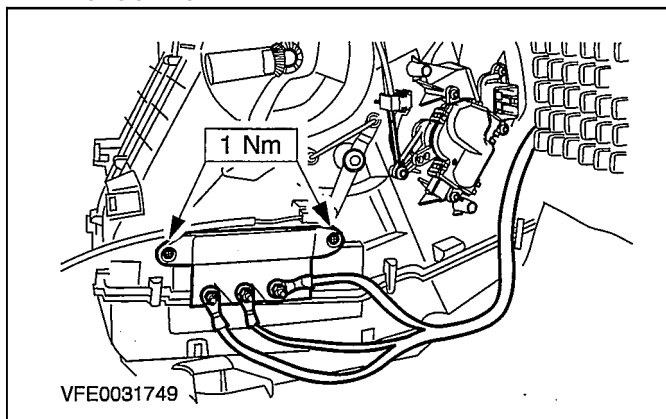
Screw on the adjustment nut for the heater core and evaporator core housing (the heater core and evaporator core housing seal is shown removed for clarity).

■ Tighten the adjustment nut to the stop.

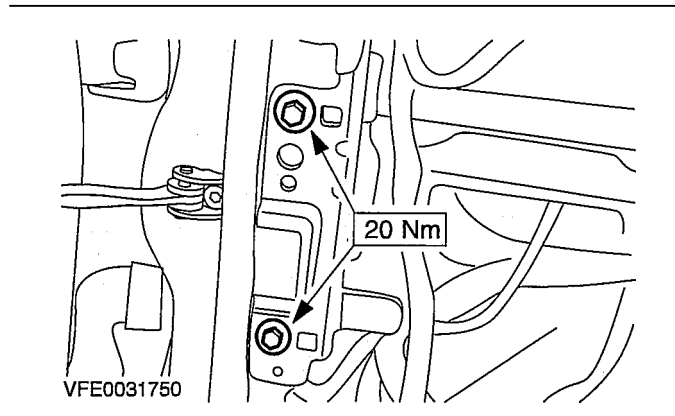
3. **CAUTION:** Ensure that the rubber grommet for the wiring harness of the electrical additional heater is correctly located in the bulkhead.

REMOVAL AND INSTALLATION

Attach the electrical additional heater to the heater core and evaporator core housing (if equipped).

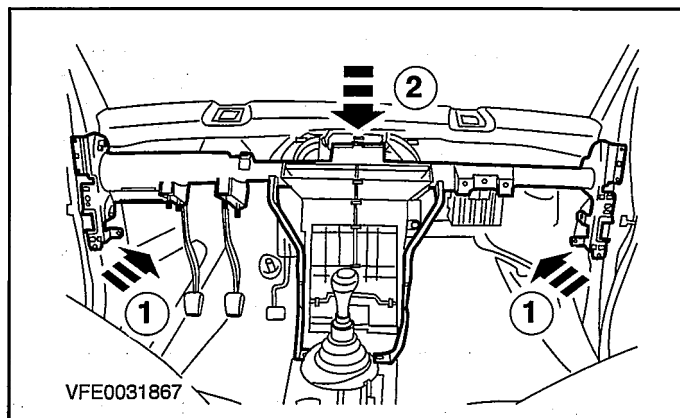


6. Install the upper bolts on the in-vehicle crossbeam.

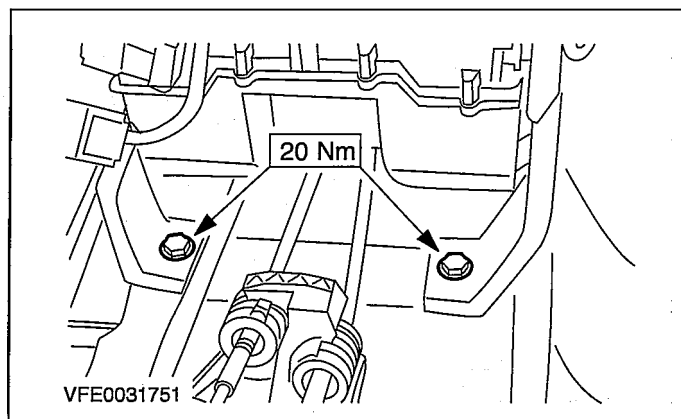


4. Install the in-vehicle crossbeam.

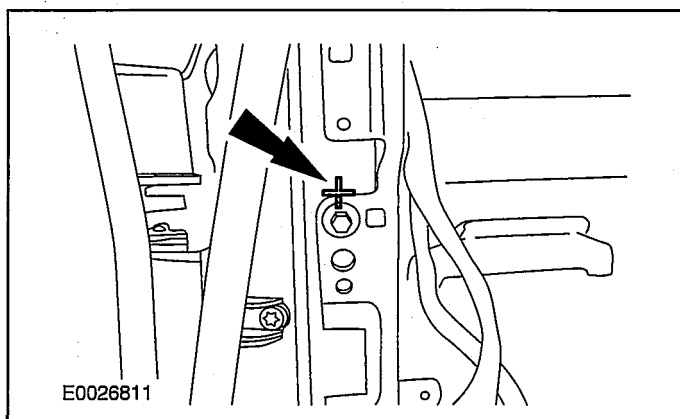
1. Slide the in-vehicle crossbeam forwards.
2. Lower the in-vehicle crossbeam.



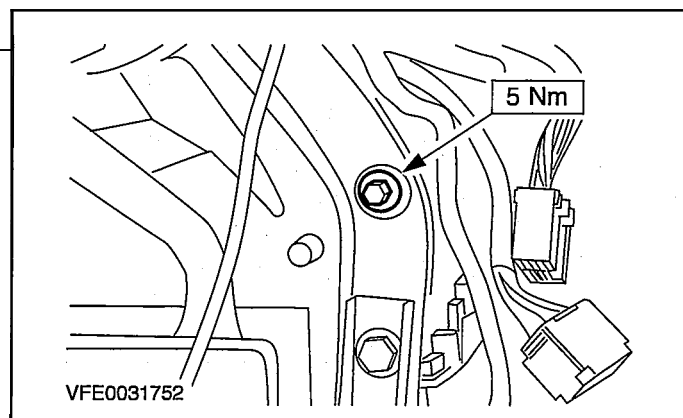
7. Install the lower bolts on the in-vehicle crossbeam.



5. Align the in-vehicle crossbeam to the A-pillars (left-hand side shown).

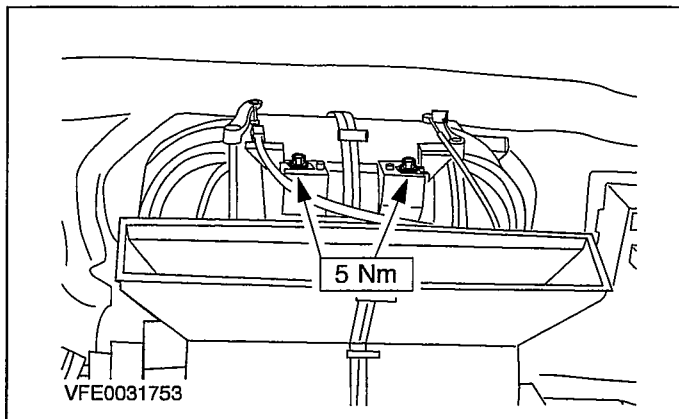


8. Install the side bolts on the heater core and evaporator core housing (left-hand side shown).

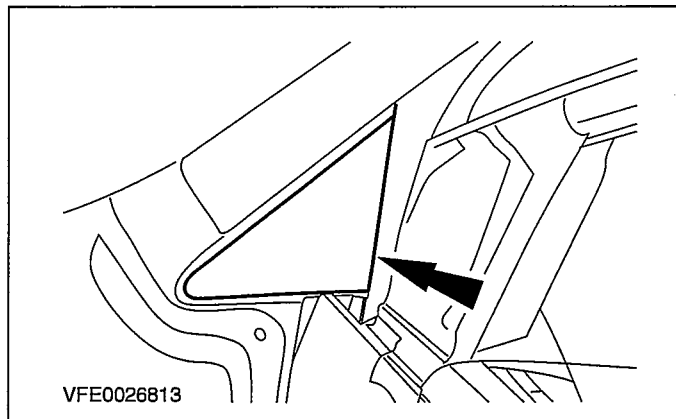


REMOVAL AND INSTALLATION

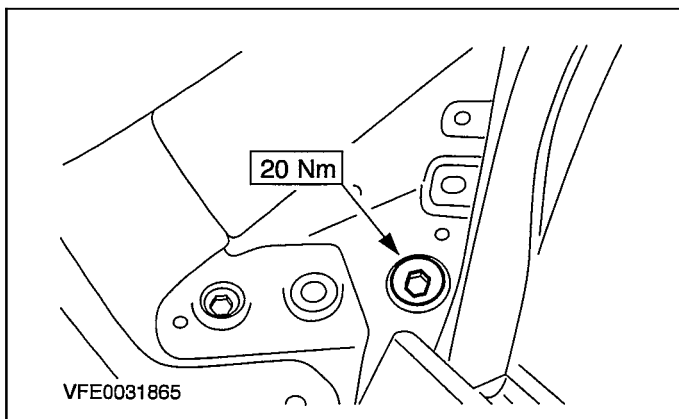
9. Install the upper bolts on the heater core and evaporator core housing.



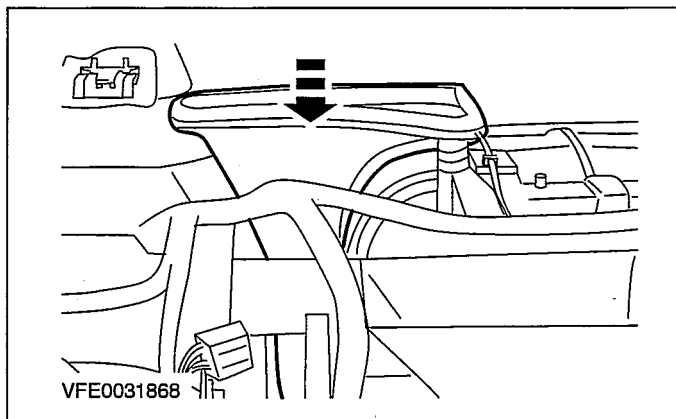
12. Install the outer A-pillar trims (left-hand side shown).



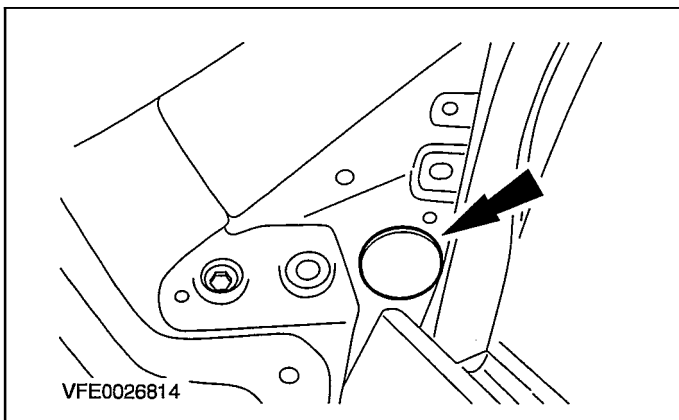
10. Install the side bolts on the in-vehicle crossbeam.



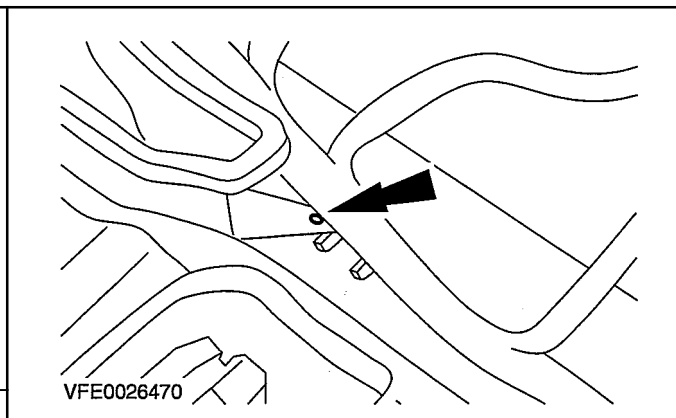
13. Install the windshield air ducts (left-hand side shown).



11. Install the caps (left-hand side shown).

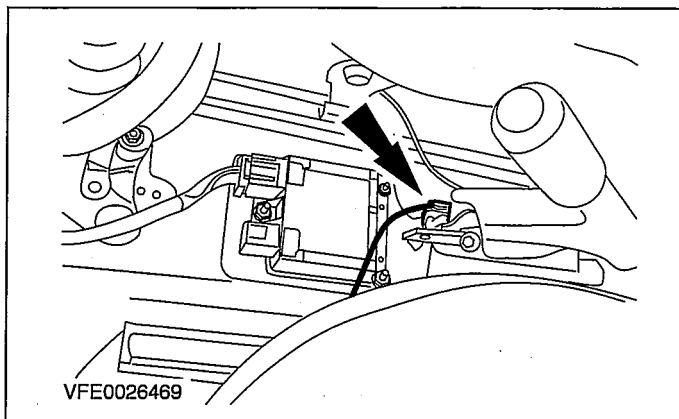


14. Install the bolts of the windshield air ducts (left-hand side shown).

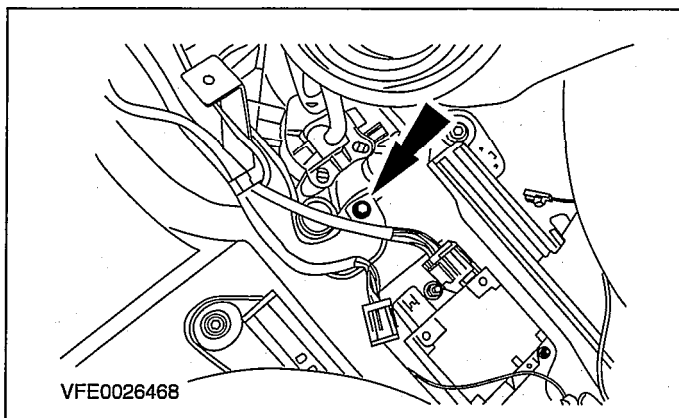


REMOVAL AND INSTALLATION

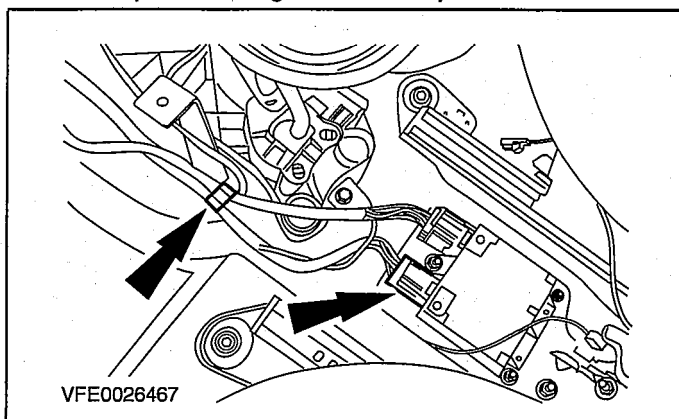
15. Connect the electrical connector of the handbrake warning lamp switch.



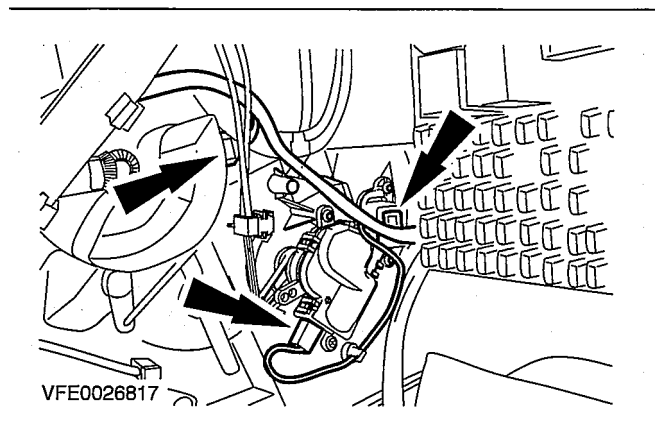
16. Install the ground cable bolt for the **airbag** module.



17. Connect the **airbag** module connector.
- Clip the wiring harness in place.

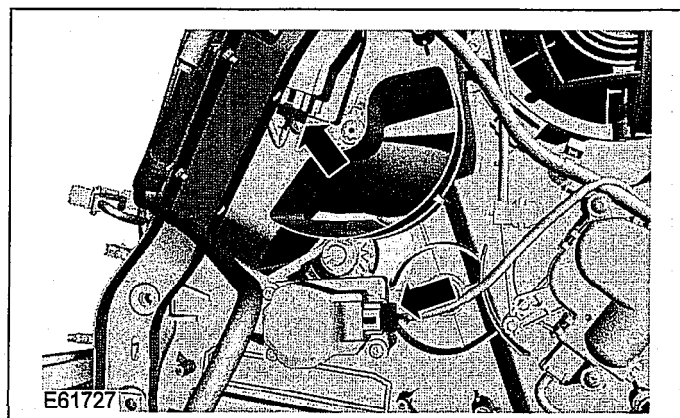


18. Connect the electrical connectors for the blower motor, the blower motor resistor and the air inlet blend door actuator.



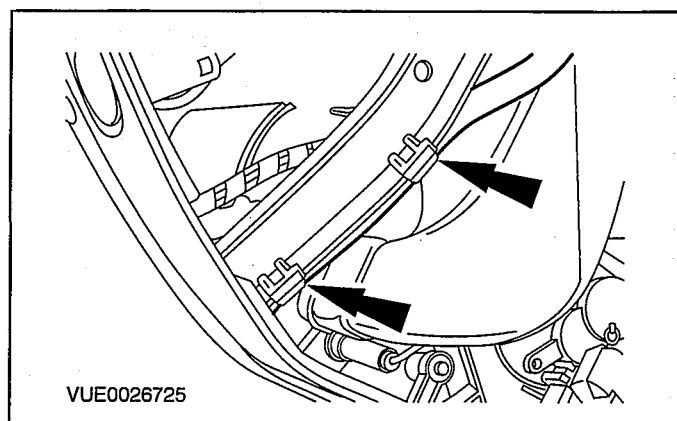
Vehicles with electronic automatic temperature control (EATC)

19. Connect the electrical connectors for the **footwell vent/duct** blend door actuator and the temperature blend door actuator.



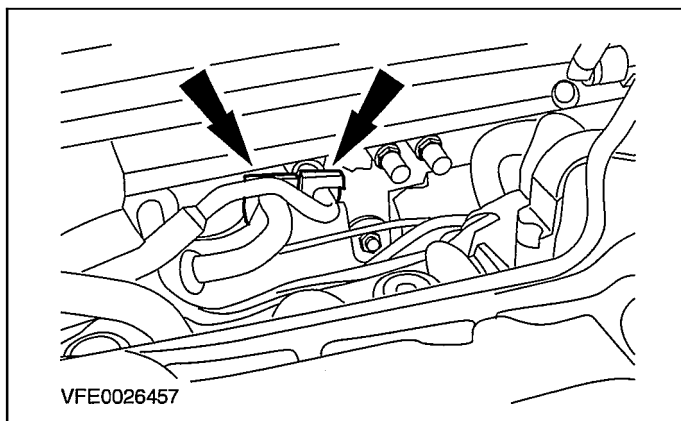
All vehicles

20. Attach the antennacable to the middle clips on the in-vehicle crossbeam.

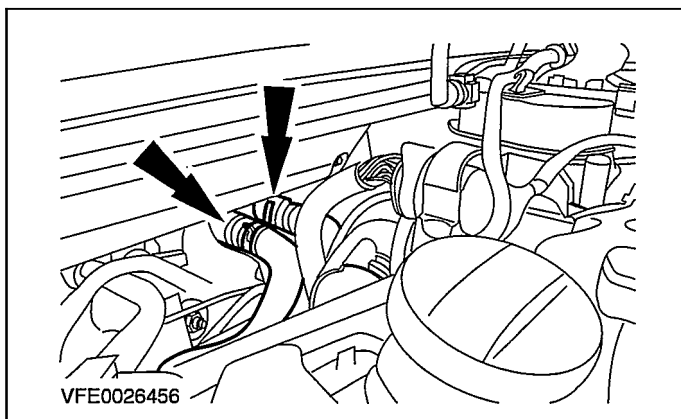


REMOVAL AND INSTALLATION

33. **Install** the retaining **clips** on the **quick-release couplings** on the refrigerant lines.



34. Attach the **coolant** hoses to the heater core.



35. **Install** the air cleaner. For additional information, refer to: (303-12 Intake Air Distribution and Filtering)

Air Cleaner - 1.25L Duratec-16V (Sigma)/1.4L Duratec-I6V (Sigma)/1.6L Duratec-16V (Sigma) (Removal and Installation),

Air Cleaner - 1.4L Duratorq-TDCi (DV) Diesel (Removal and Installation),

Air Cleaner - 2.0L Duratec-HE (M14) (Removal and Installation),

Air Cleaner - 1.6L Duratorq-TDCi (DV) Diesel (Removal and Installation).

36. **Install** the instrument panel.

For additional information, refer to:

Instrument Panel - Vehicles Built Up To: 1012005 (501-12 Instrument Panel and Console, Removal and Installation).

37. **Fill** the air conditioning system.

For **additional** information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 **Climate Control System - General Information, General Procedures**).

38. **Install** the right-hand **headlamp** assembly.

For additional information, refer to: **Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).**

39. **Fill** and bleed the **cooling** system. For additional information, refer to:

Cooling System Draining, Filling and Bleeding - 1.3L Duratec-8V (Rocam)/1.25L

Duratec-I6V (Sigma)/1.4L Duratec-16V

(Sigma)/1.6L Duratec-I6V (Sigma) (303-03

Engine Cooling - 1.3L Duratec-8V

(Rocam)/1.25L Duratec-I6V (Sigma)/1.4L

Duratec-I6V (Sigma)/1.6L Duratec-16V

(Sigma), General Procedures),

Cooling System Draining, Filling and

Bleeding (303-03 Engine Cooling - 1.4L

Duratorq-TDCi (DV) Diesel, General Procedures),

Cooling System Draining, Filling and

Bleeding (303-03 Engine Cooling - 2.0L

Duratec-HE (M14), General Procedures),

Cooling System Draining, Filling and

Bleeding (303-03 Engine Cooling - 1.6L

Duratorq-TDCi (DV) Diesel, General Procedures).

DISASSEMBLY AND ASSEMBLY

Heater Core and Evaporator Core Housing

Disassembly

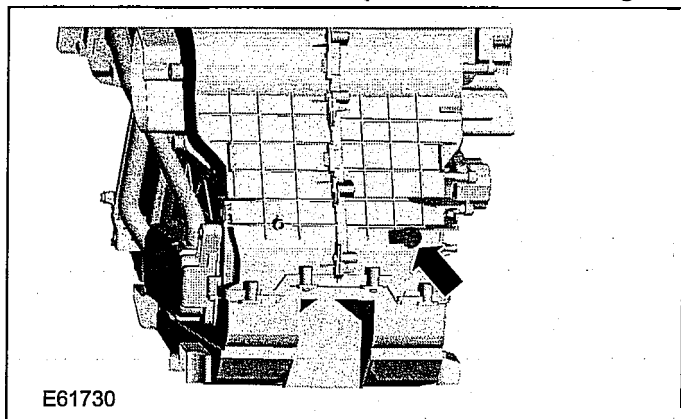
All vehicles

- Remove the heater core and evaporator core housing.

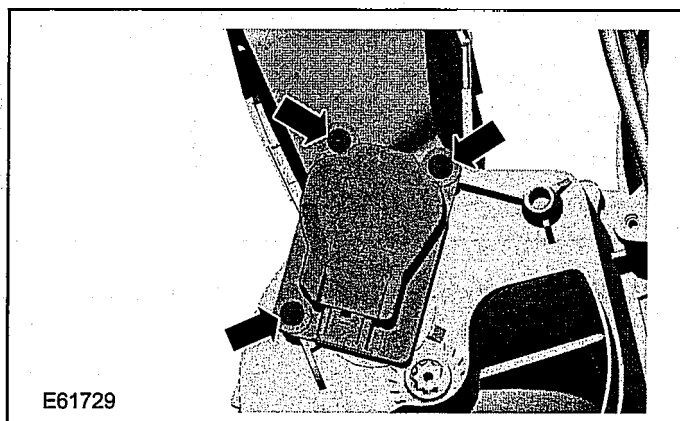
For additional information, refer to: Heater Core and Evaporator Core Housing (412-02 Heating and Ventilation, Removal and Installation).

Vehicles with electronic automatic temperature control (EATC)

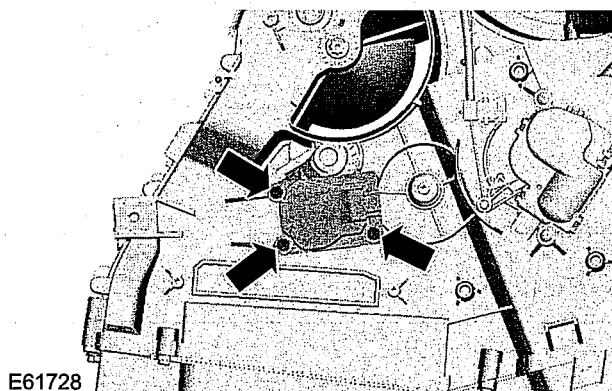
2. Remove the **footwell** air discharge temperature sensor.
 - Rotate the sensor in a clockwise direction through 90 degrees and pull it out of the heater core and evaporator core housing.



3. Remove the **footwell** vent/duct blend door actuator.

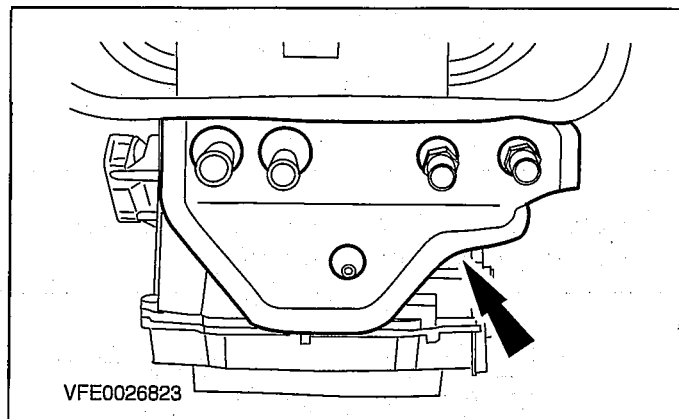


4. Remove the temperature blend door actuator.

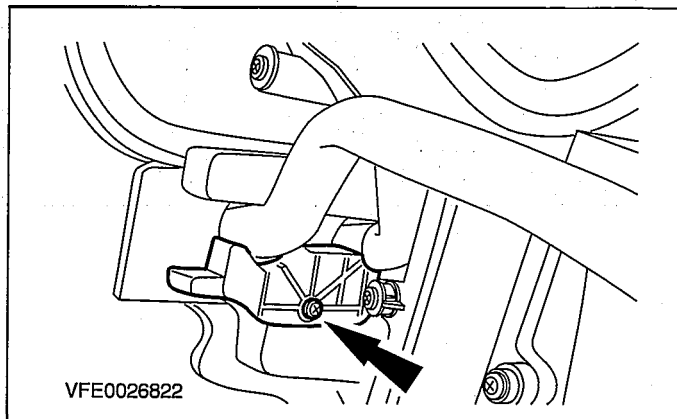


All vehicles

5. Remove the heater core and evaporator core housing gasket.

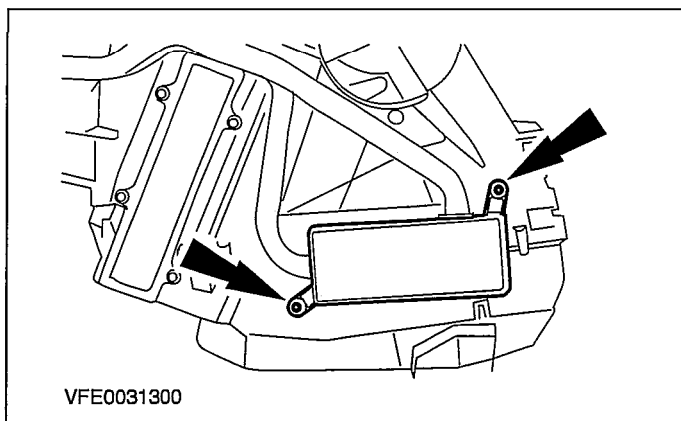


6. Remove the bracket for the coolant pipes.

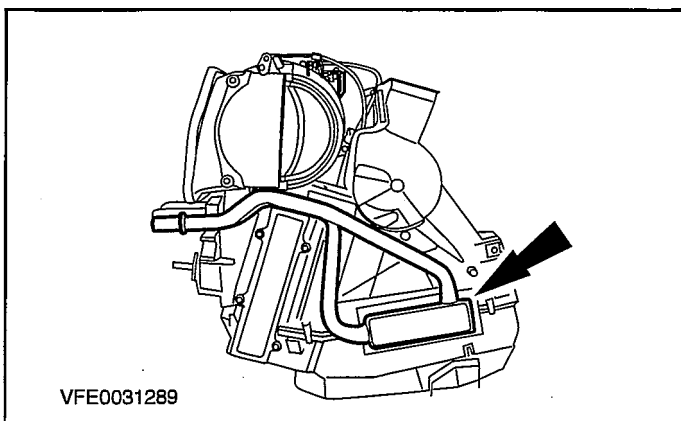


DISASSEMBLY AND ASSEMBLY

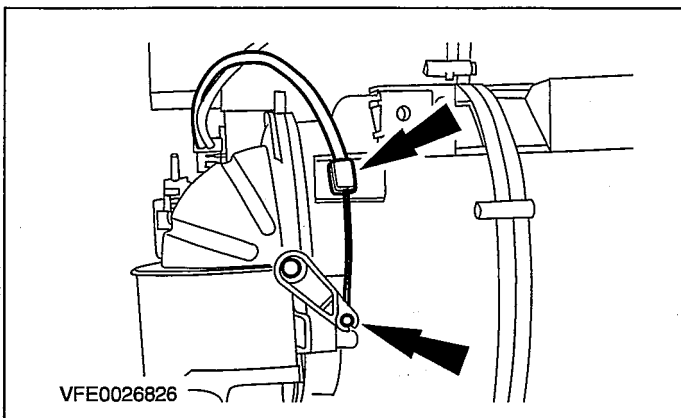
7. Remove the heater core cover.



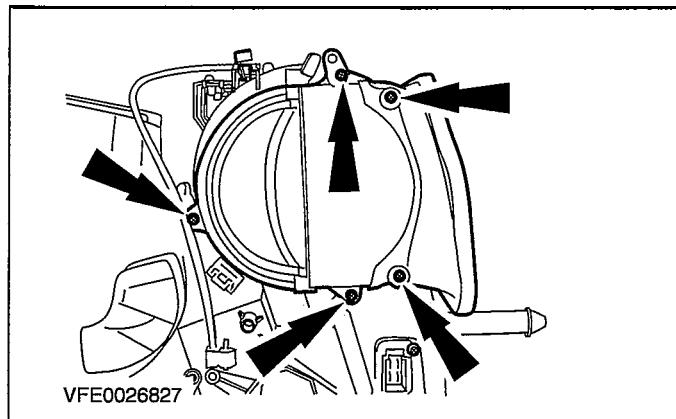
8. Remove the heater core.



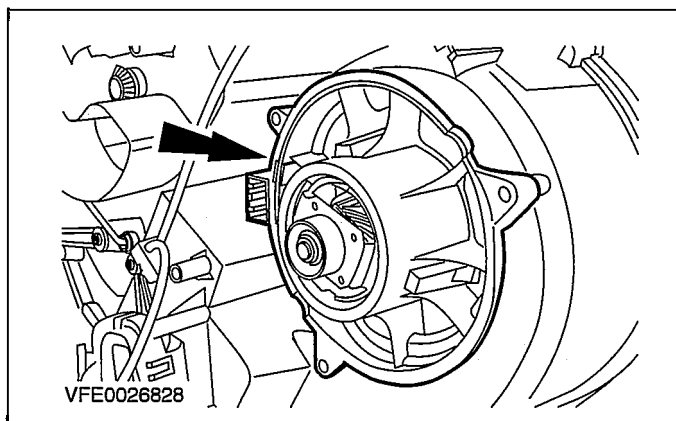
9. Detach the air inlet blend door operating cables (right-hand side shown).



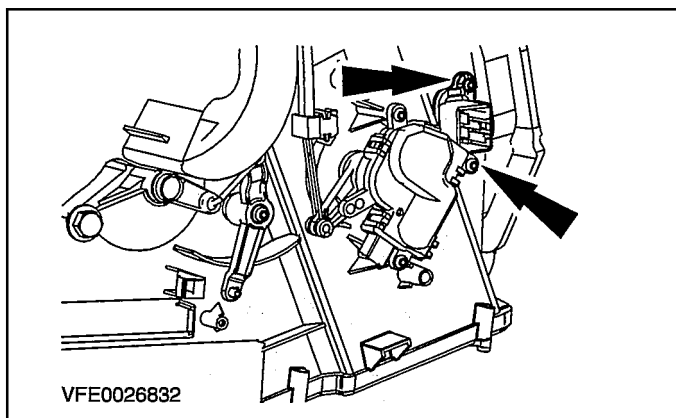
10. Remove the air inlet blend doors with the fresh air ducting (right-hand side shown).



11. Remove the blower motor.



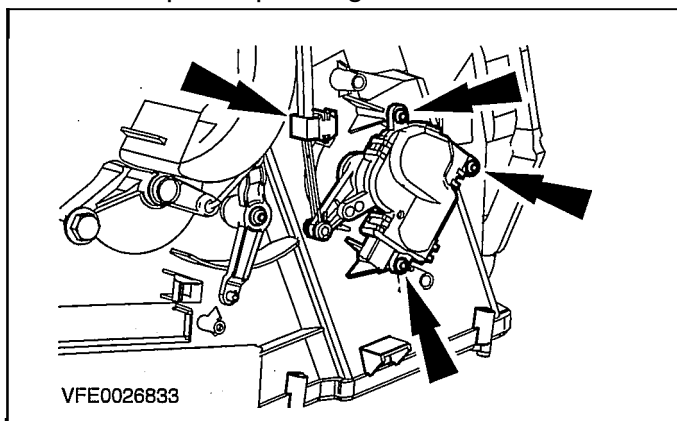
12. Remove the blower motor resistor.



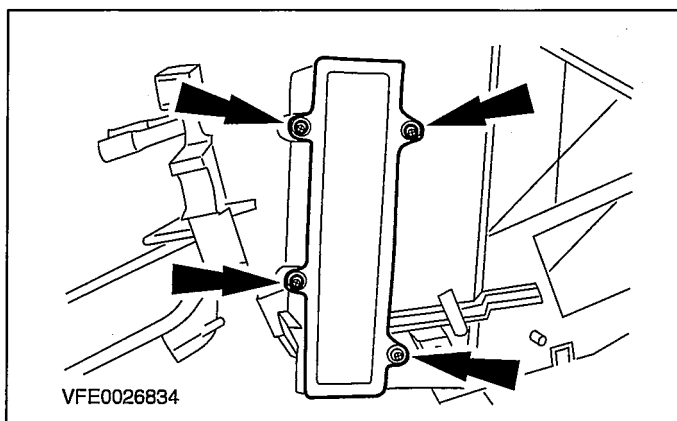
13. Remove the air inlet blend door actuator.

DISASSEMBLY AND ASSEMBLY

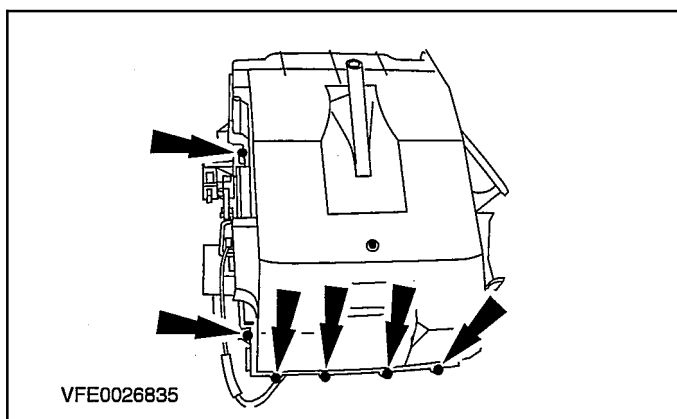
- Unclip the operating cables.



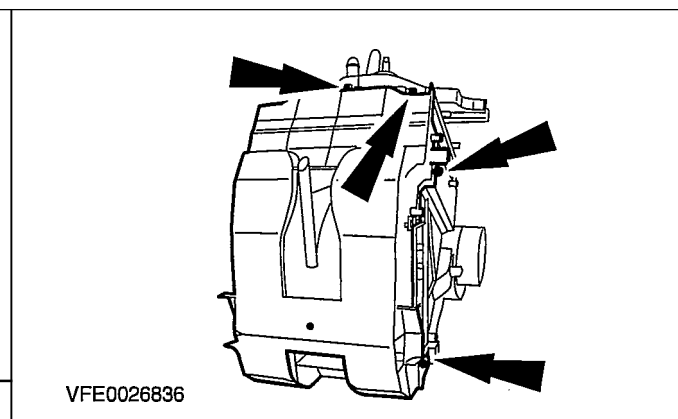
14. Remove the pollen filter housing cover.



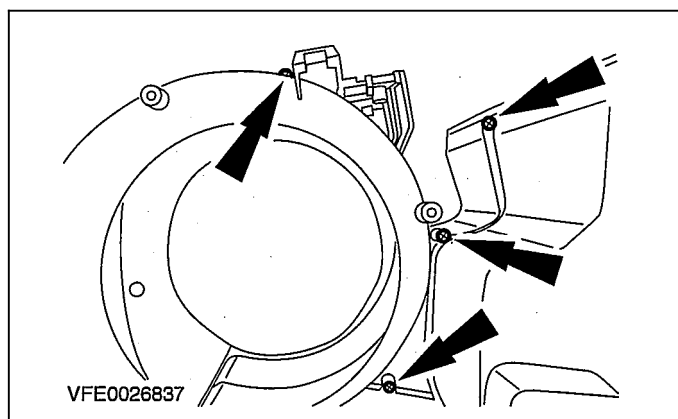
15. Remove the bolts of the heater core and evaporator core lower housing.



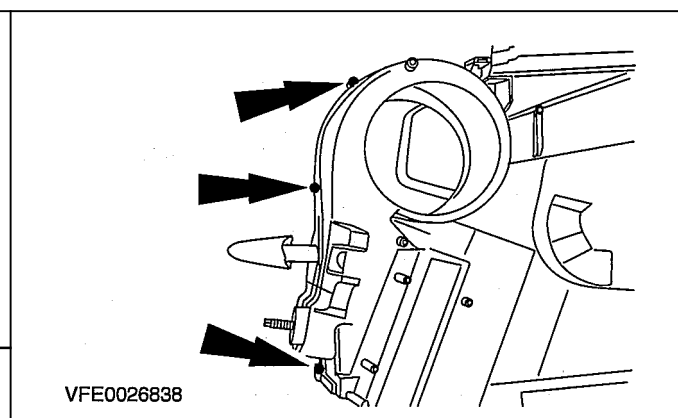
16. Remove the heater core and evaporator core lower housing.



17. Remove the upper bolts of the heater core and evaporator core housing.

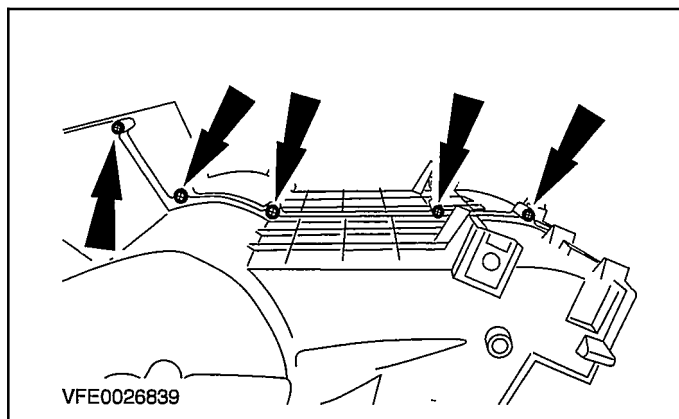


18. Remove the front bolts of the heater core and evaporator core housing.

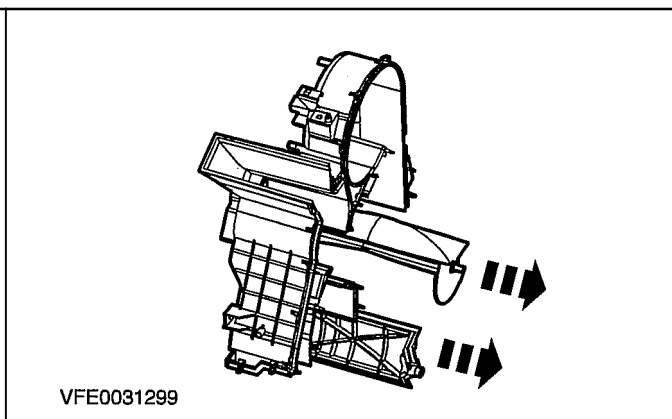


DISASSEMBLY AND ASSEMBLY

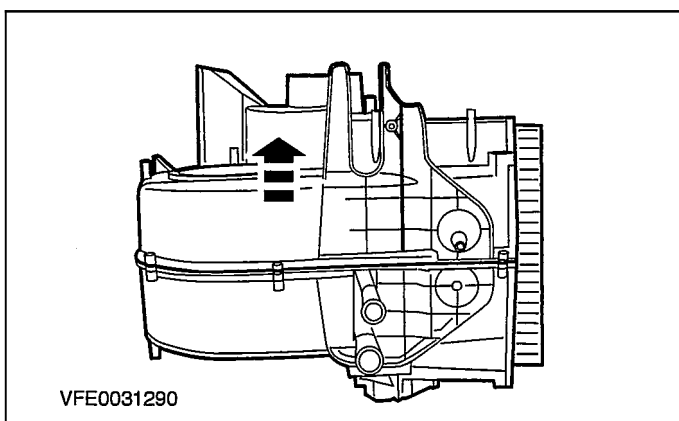
19. Remove the rear bolts of the heater core and evaporator core housing.



22. Remove the temperature blend door and the footwell vent/duct blend door.

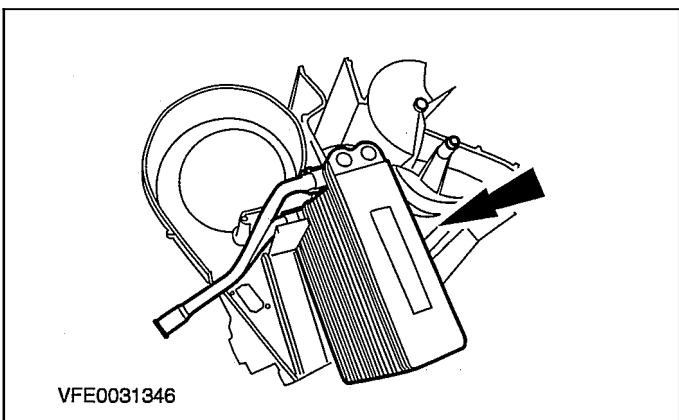


20. Separate the heater core and evaporator core housing.

**Assembly**

1. To assemble, reverse the disassemble procedure.

21. Remove the evaporator core.



SECTION 412-03 Air Conditioning

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	412-03-2
DESCRIPTION AND OPERATION	
Air Conditioning.....	412-03-3
Overview.....	412-03-3
DIAGNOSIS AND TESTING	
Air Conditioning.....	412-03-7
REMOVAL AND INSTALLATION	
Clutch and Clutch Field Coil.....	(34 628 0) 412-03-8
Evaporator Core.....	(34 622 4) 412-03-10
Evaporator Core Orifice.....	(34 624 4) 412-03-13
Low-Pressure Cutoff Switch.....	(34 629 0) 412-03-16
High-pressure Cutoff Switch.....	(34 631 0) 412-03-17
Condenser Core.....	(34 632 4) 412-03-18
Suction Accumulator.....	(34 630 4) 412-03-20
Air Conditioning (A/C) Compressor — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/2.0L Duratec-HE (MI4)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(34 626 4) 412-03-22
Compressor Manifold and Tube Assembly.....	412-03-24
Condenser to Evaporator Line.....	(34 645 4) 412-03-26
Evaporator Outlet Line.....	(34 644 4) 412-03-28

SPECIFICATIONS**A/C compressor**

	Type
A/C compressor (vehicles with 1.4L Duratorq-TDCi (DV) diesel engine)	SD6V12 (Sanden)
A/C compressor (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine)	SD7V16 (Sanden)
A/C compressor (vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) petrol engine)	FVS 090
A/C compressor (vehicles with 2.0L Duratec-HE (MI4) petrol engine)	FS 10

Evaporator core orifice

	Colour/Type
Evaporator core orifice	Red/fixed
Evaporator core orifice (vehicles with 1.6L Duratorq-TDCi (DV) diesel engine)	Blue/fixed
Evaporator core orifice (vehicles with automatic transmission)	brown/variable

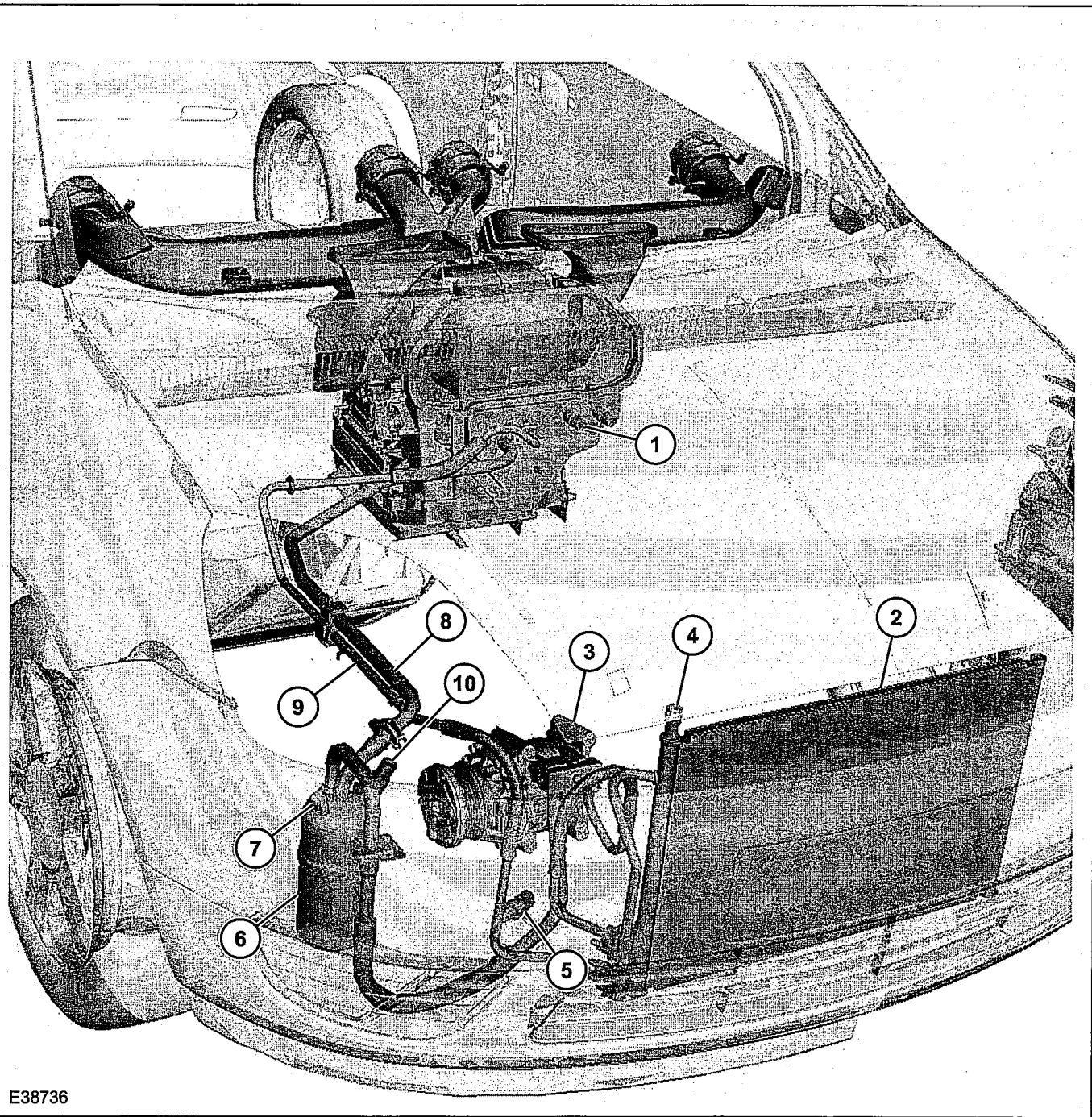
Tightening torques

Description	Nm	lb.ft	lb.in
Bolt, refrigerant line to A/C compressor	20	15	
Bolt, A/C compressor	20	15	
Bolt, A/C compressor drive plate	13	10	-
High-pressure cutoff switch	8	-	71
Low-pressure cutoff switch	2.5	-	23
Nut, refrigerant line to condenser	8		71
Bolt, accumulator/dehydrator	8	-	71
Nut, accumulator refrigerant line to A/C compressor	8	-	71
Nut, condenser to evaporator line	8	-	71

DESCRIPTION AND OPERATION

Air Conditioning

Overview



E38736

1.4L/1.6L Duratec 16V

Item	Description
1	Heater1Evaporator Core Housing
2	Condenser
3	A/C compressor
4	High pressure charging connection

Item	Description
5	Air conditioning high-pressure switch
6	Suction accumulator
7	Low pressure charging connection
8	Evaporator core outlet pipe

DESCRIPTION AND OPERATION

Item	Description
9	Condenser-to-evaporator core pipe
10	Air conditioning low-pressure switch

The location of the components varies slightly depending on the engine version.

Vehicles with 1.25L, 1.3L, 1.4L or 1.6L petrol engines are equipped with an output-regulated spiral compressor (FVS 090).

Vehicles with 2.0L petrol engines are equipped with an unregulated piston compressor (FS 10).

Vehicles with 1.4L or 1.6L diesel engines are equipped with an output-regulated swash plate compressor (Sanden SD6V12 / SD7V16).

Vehicles with 1.6L diesel engines are equipped with a thinner condenser with a thickness of 12 mm compared to 16 mm. This results in modified air conditioning charging capacities, which can be found in the specification list in Group 412-00.

On vehicles with 1.6L diesel engines, the low-pressure filler connection is located in the evaporator core outlet pipe and is accessible without removing the right-hand headlamp.

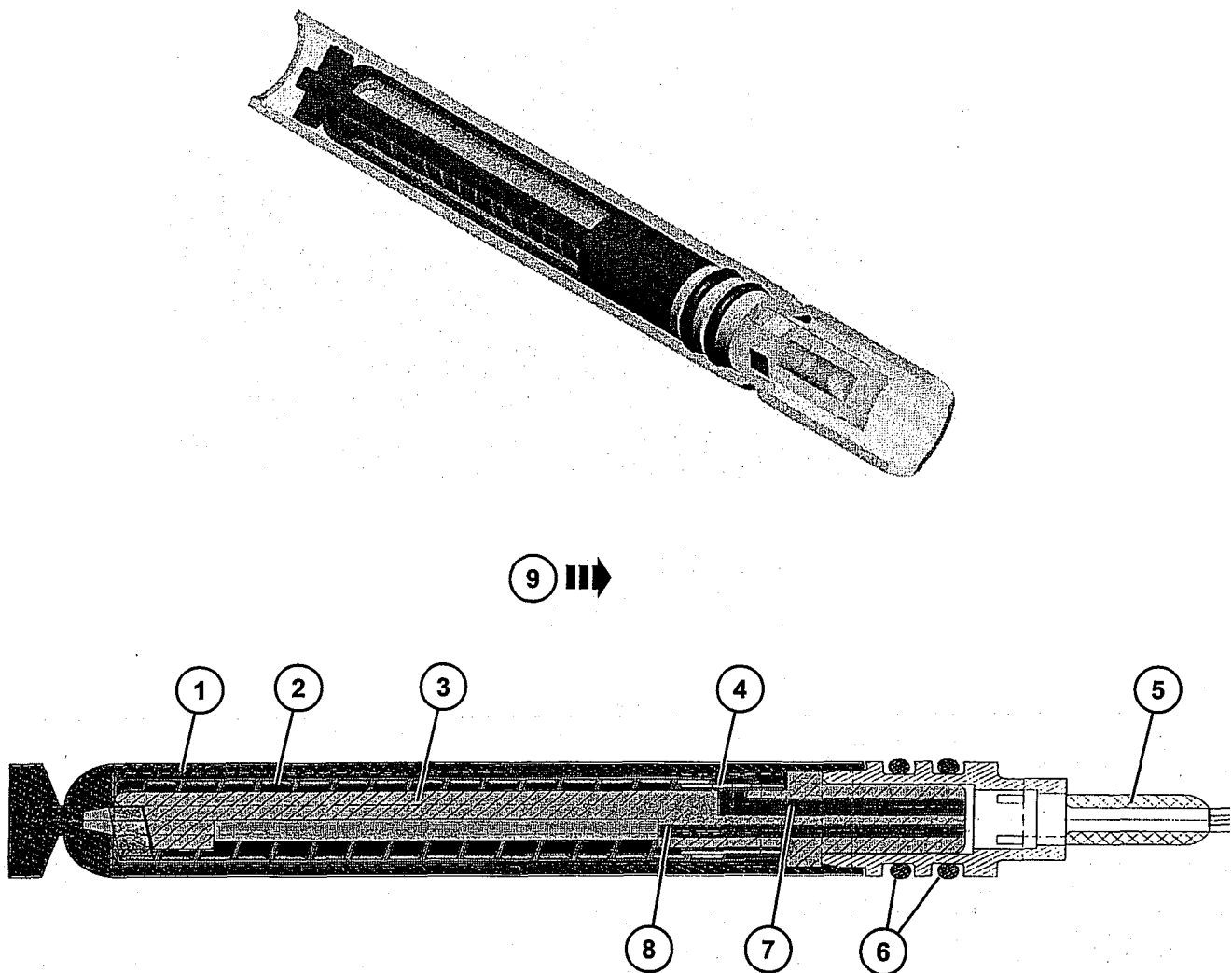
An evaporator core orifice is used for all engine versions with manual transmission.

Variable evaporator core orifice

A variable evaporator core orifice, which is located at the position of the evaporator core orifice in the condenser-to-evaporator core pipe, is used for engine versions with automatic transmission. This is necessary, as otherwise the lower idle speed (in position D) and the increased thermal radiation of the additional transmission fluid cooler affecting the condenser, would result in reduced cooling performance.

Generally, a high refrigerant temperature results in a narrow cross-section of the variable evaporator core orifice and thus an increased air conditioning cooling performance, particularly at idling speed.

DESCRIPTION AND OPERATION

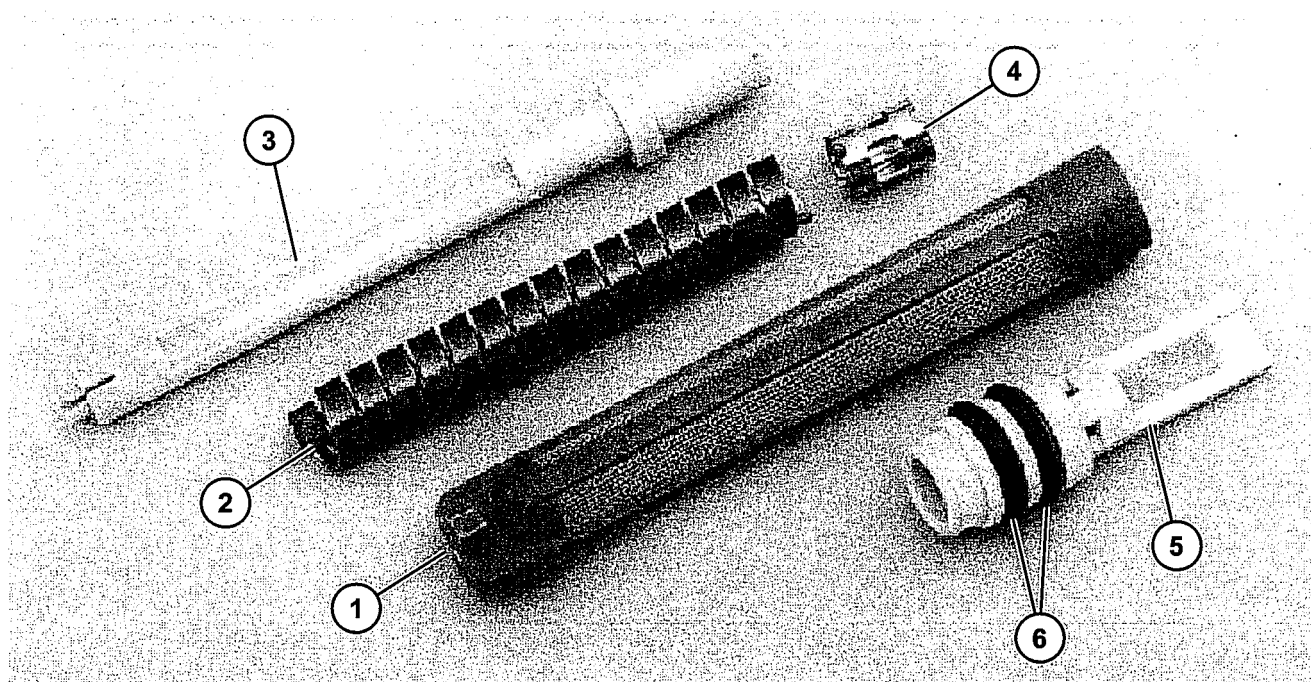


E58206

Item	Description
1	Filter
2	Bi-metal spring
3	Valve housing
	Metering orifice

Item	Description
5	Diffuser
6	O-ring seals
7	Variable orifice
8	Calibrated orifice
9	Direction of flow / installation direction

DESCRIPTION AND OPERATION



E58216

Item	Description
1	Filter
2	Bi-metal spring
3	Valve housing
4	Metering orifice
5	Diffuser
6	O-ring seals

In addition to a calibrated orifice with fixed flow rate, the valve housing features a variable orifice. The flow of refrigerant through the variable orifice is regulated by the refrigerant temperature. Depending upon temperature, the bi-metal spring turns the metering orifice, resulting in the variable orifice being opened to a greater or lesser degree and thus regulating the flow rate to the evaporator core.

DIAGNOSIS AND TESTING**Air Conditioning**

REFER to Section 412-00 [Climate Control System
- General Information].

REMOVAL AND INSTALLATION

Clutch and Clutch Field Coil(34 628 0)

Removal

All vehicles

1. Remove the auxiliary drive belt. For additional information, refer to: (303-05)

Accessory Drive Belt - **1.4L**

Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Air Conditioning (Removal and Installation),

Accessory Drive Belt - **1.3L**

Duratec-8V (Rocam) (Removal and Installation),

Accessory Drive Belt - **1.4L**

Duratorq-TDCi (DV) Diesel (Removal and Installation),

Power Steering Pump Belt -

1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), vehicles **With: Air Conditioning** (Removal and Installation),

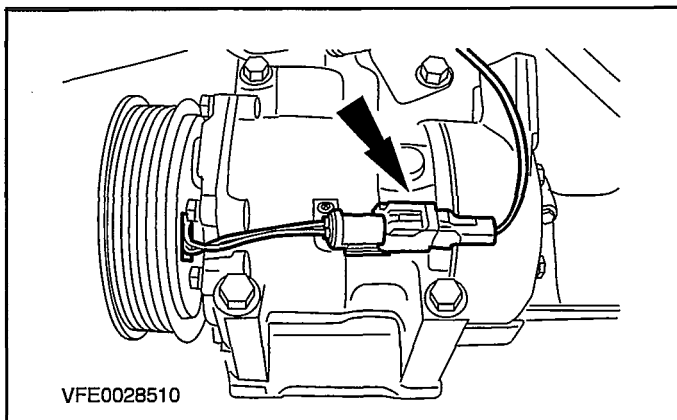
Accessory Drive Belt - **2.0L**

Duratec-HE (M14) (Removal and Installation),

Accessory Drive Belt - **1.6L**

Duratorq-TDCi (DV) Diesel (Removal and Installation).

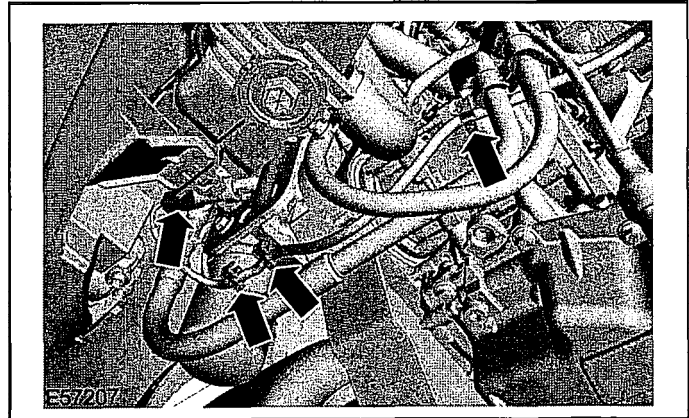
2. Detach the **A/C** compressor clutch connector.



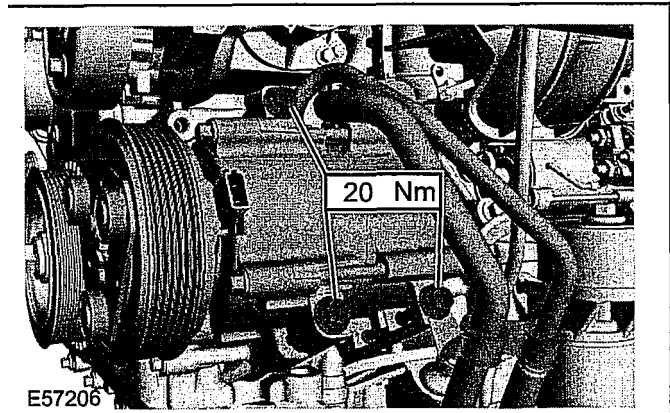
Vehicles with 2.0L engine

3. Disconnect the pressure cutoff switch electrical connector.

- Unclip the pressure cutoff switch wiring harness and lay it to the side.



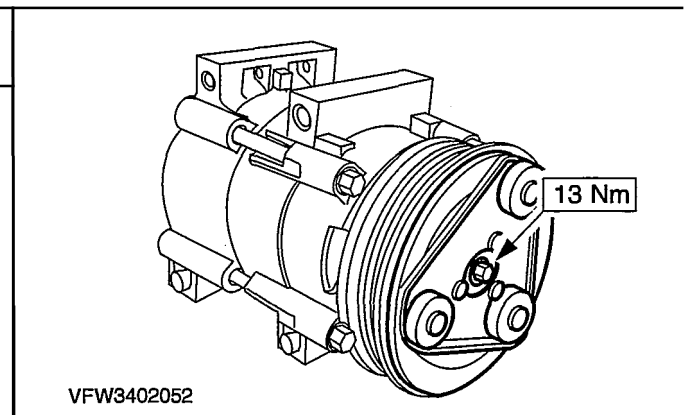
4. Detach the A/C compressor from the engine block, lower it and secure it at the side.



All vehicles

NOTE: Mark the installation position of the A/C compressor clutch connector in relation to the compressor housing.

5. Remove the **A/C** compressor driveplate (A/C compressor shown removed for clarity).

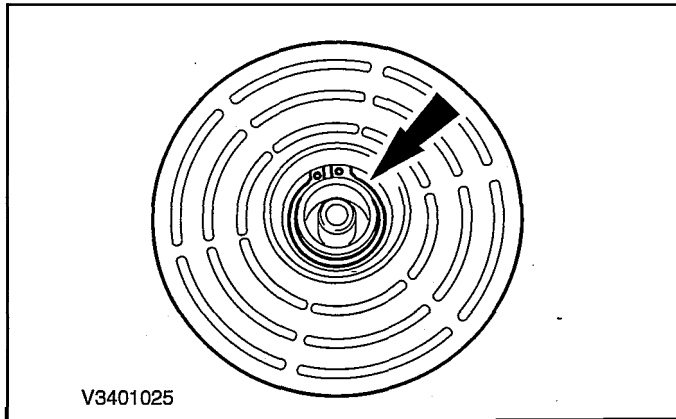


REMOVAL AND INSTALLATION

6. **NOTE:** If necessary, remove a seized **A/C** compressor pulley using a suitable remover.

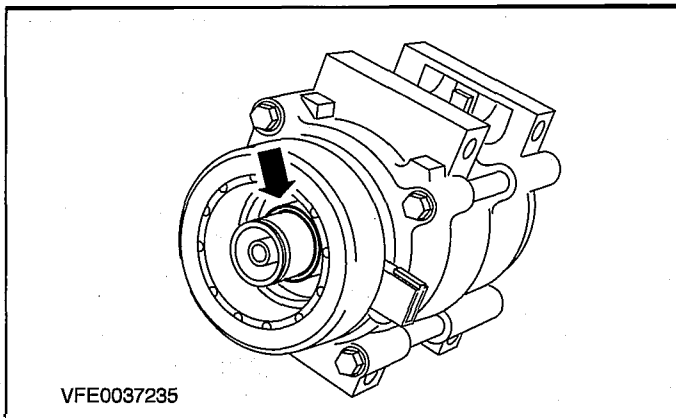
Remove the **A/C** compressor pulley.

- Remove the spacer washers.
- Discard the pulley snap ring.



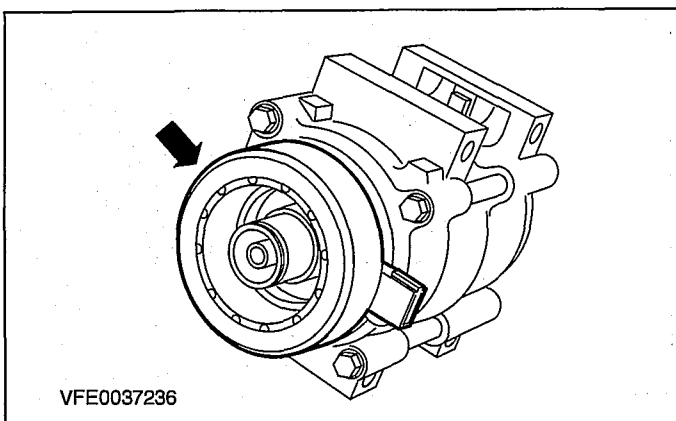
7. Remove the solenoid coil snap ring.

- Discard the solenoid coil snap ring.



8. **NOTE:** Mark the installation position of the **A/C** compressor clutch connector in relation to the compressor housing.

Remove the solenoid coil.

**Installation**

CAUTION: Do not skew the solenoid coil when installing in the **A/C** compressor.

NOTE: Installation position of the A/C compressor clutch connector in relation to the compressor housing.

NOTE: Install new snap rings on the A/C compressor pulley and the solenoid coil.

1. To assemble, reverse the disassembly procedure.

2. Check the **A/C** clutch air gap.

For additional information, refer to:

Air Conditioning (**A/C**) Clutch Air Gap Adjustment (412-00, General Procedures).

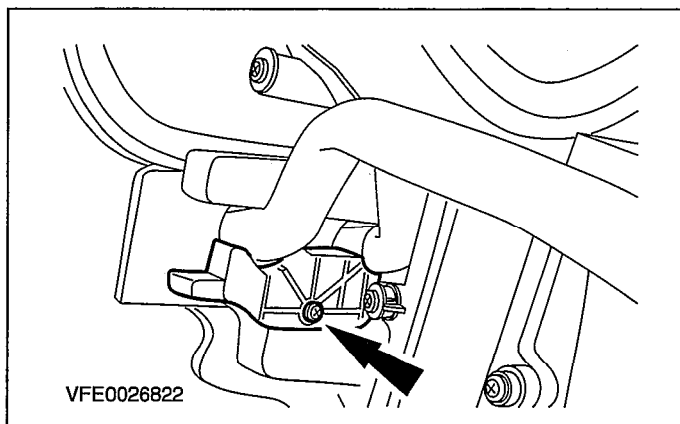
REMOVAL AND INSTALLATION

Evaporator Core(34 622 4)

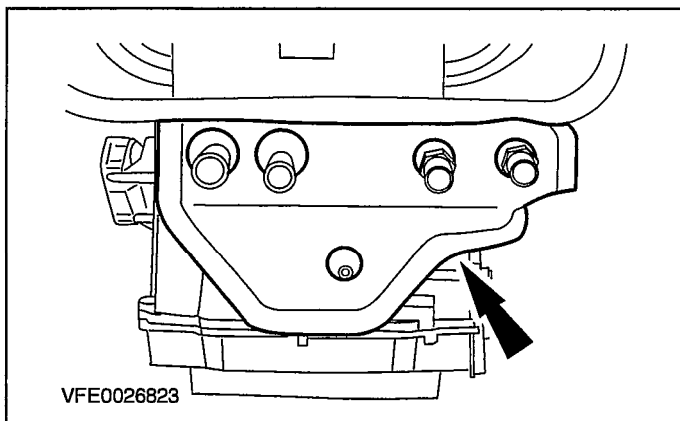
Removal

- Remove the heater core / evaporator housing. For additional information, refer to Section 412-02A [Heating and Ventilation] ■ 412-02B [Auxiliary Heating] / 412-02C [Auxiliary Climate Control].

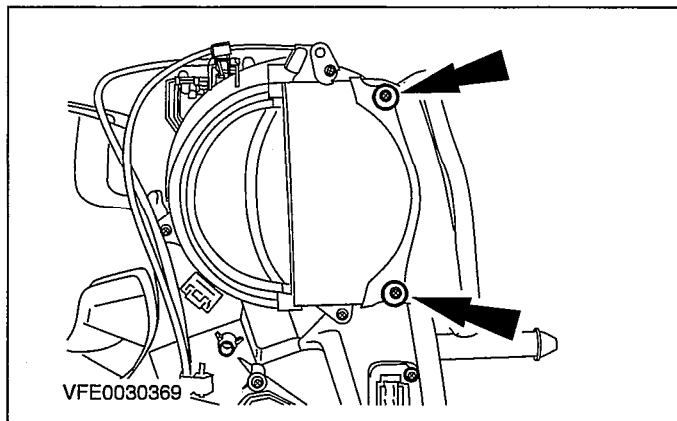
2. Remove the bracket for the coolant pipes.



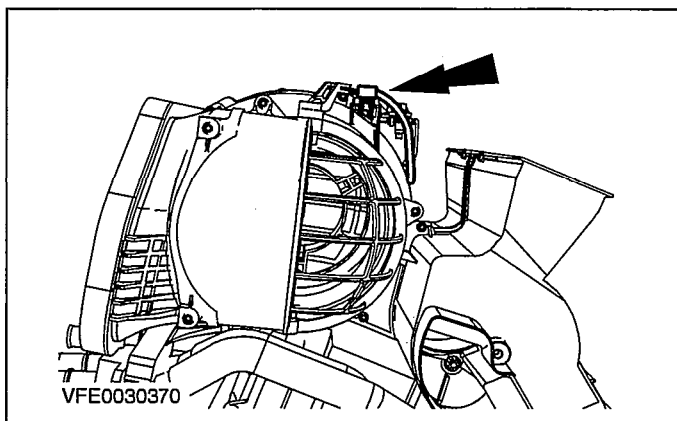
3. Remove the heater core / evaporator housing gasket.



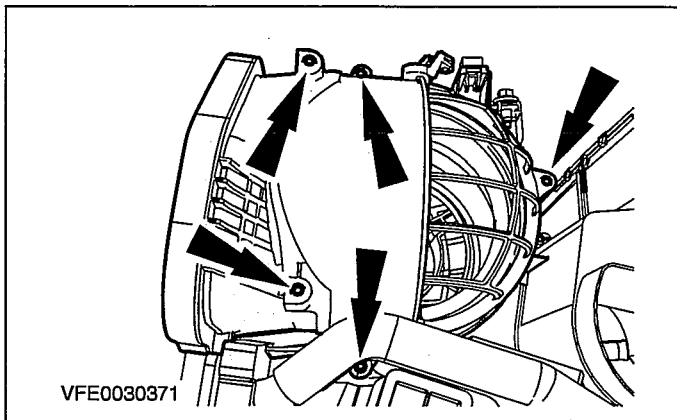
4. Remove the right-hand bolts of the fresh air duct.



5. Unclip the operating cable of the left-hand air inlet flap from the heater core / evaporator housing.

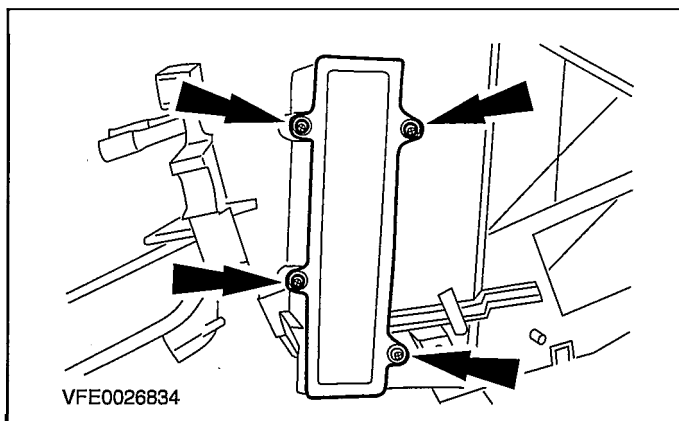


6. Detach the left-hand air inlet flap from the fresh air duct and lay it to one side.
 - Remove the fresh air duct.

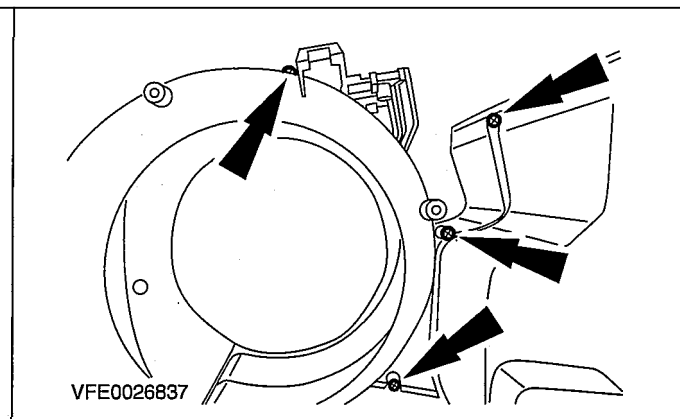


REMOVAL AND INSTALLATION

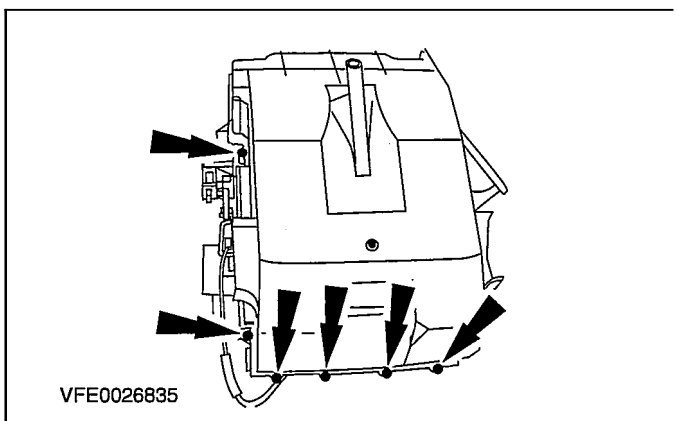
7. Remove the pollen filter housing cover.



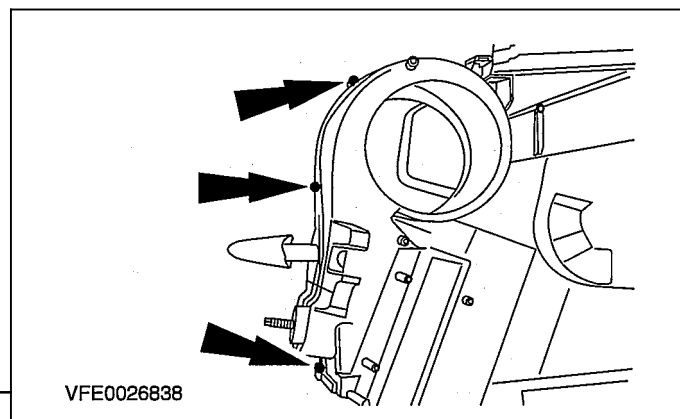
10. Remove the upper bolts of the heater core / evaporator housing.



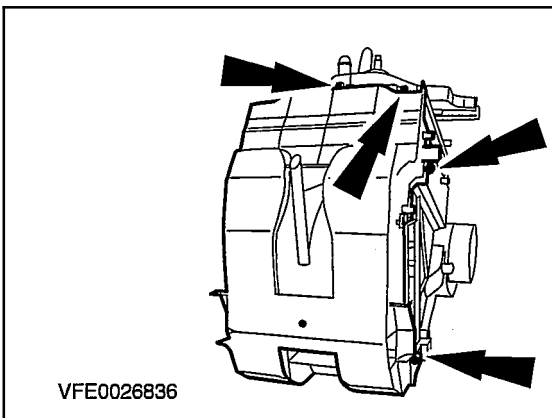
8. Remove the bolts of the heater core / evaporator lower housing.



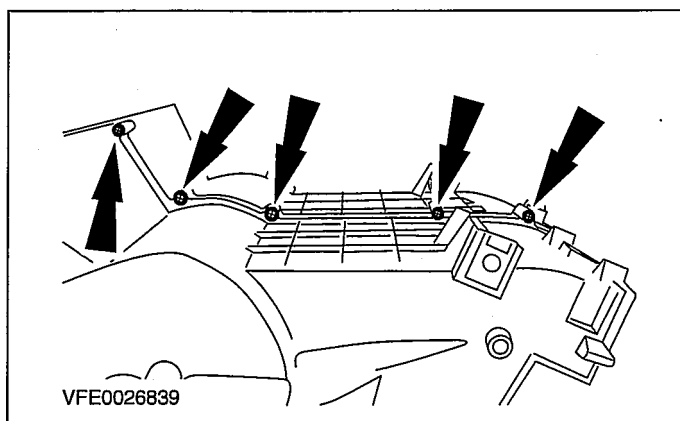
11. Remove the front bolts of the heater core / evaporator housing.



9. Remove the heater core / evaporator lower housing.

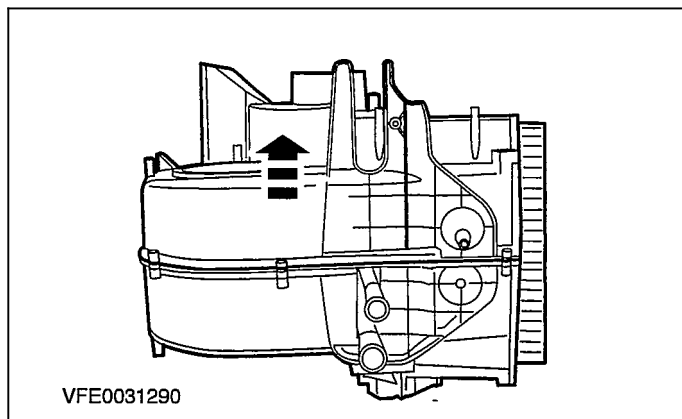


12. Remove the rear bolts of the heater core / evaporator housing.

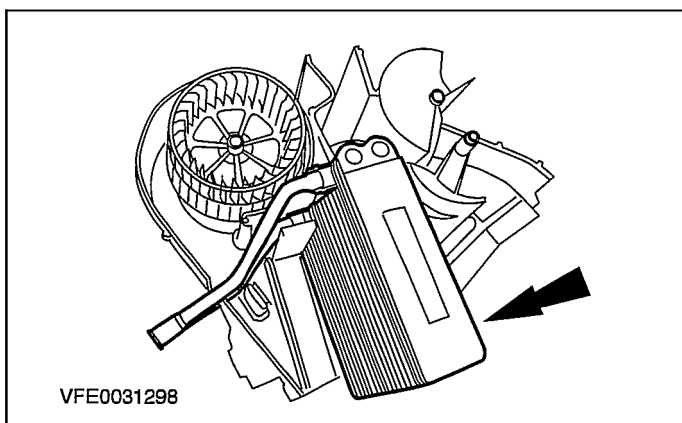


REMOVAL AND INSTALLATION

13. Separate the heater core / evaporator housing.



14. Remove the evaporator.

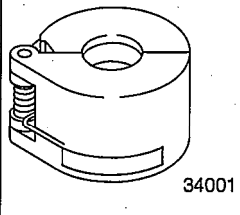
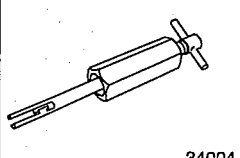
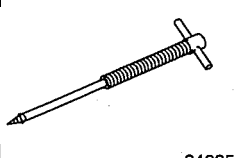
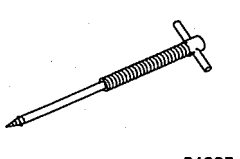
**Installation**

- Reinstall the components in reverse order.

REMOVAL AND INSTALLATION

Evaporator Core Orifice(34 624 4)

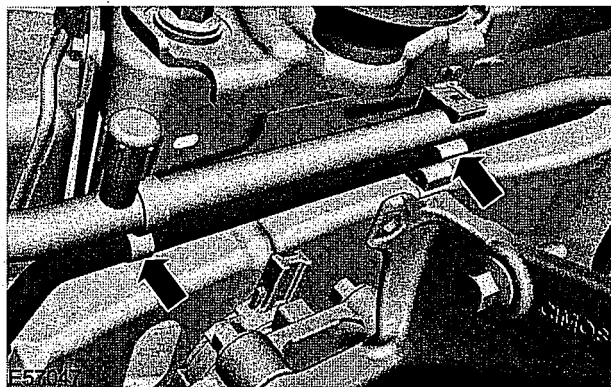
Special Tool(s)

 34001	Remover, quick-release coupling 1/2" (blue) 412-027 (34-001)
 34004	Remover/Installer, Fixed Orifice 412-034 (34-004)
 34005	Remover, Broken Orifice 412-035 (34-005)
 34005	Adapter for 412-034 412-034-01

Removal

RHD vehicles

1. **Unclip** the condensert to evaporator line from the side member.



All vehicles

2. Remove the air **cleaner** housing. For additional information, refer to:

Air Cleaner - 1.25L Duratec-I6V (Sigma)/1.4L Duratec-I6V (Sigma)/1.6L Duratec-I6V (Sigma) (303-12 **Intake Air Distribution and Filtering, Removal and Installation**),

Air Cleaner - 1.3L Duratec-8V (Rocam) (303-12 **Intake Air Distribution and Filtering, Removal and Installation**),

Air Cleaner - 1.4L Duratorq-TDCi(DV) Diesel (303-12 **Intake Air Distribution and Filtering, Removal and Installation**),

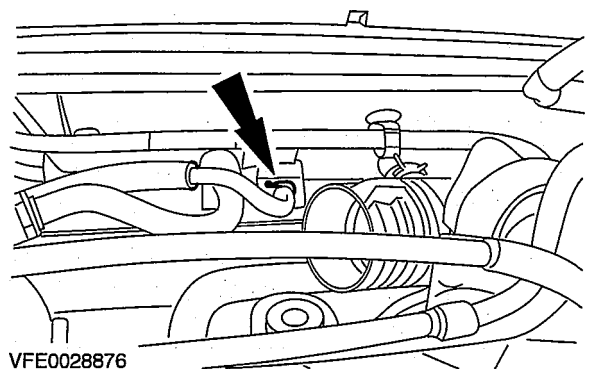
Luftfilter - 2.0L Duratec-HE (M14) (303-12, **Removal and Installation**),

Luftfilter - 1.6L Duratorq-TDCi(DV) Diesel (303-12, **Removal and Installation**).

3. Evacuate the air conditioning (A/C) system.

For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - **General Information, General Procedures**).

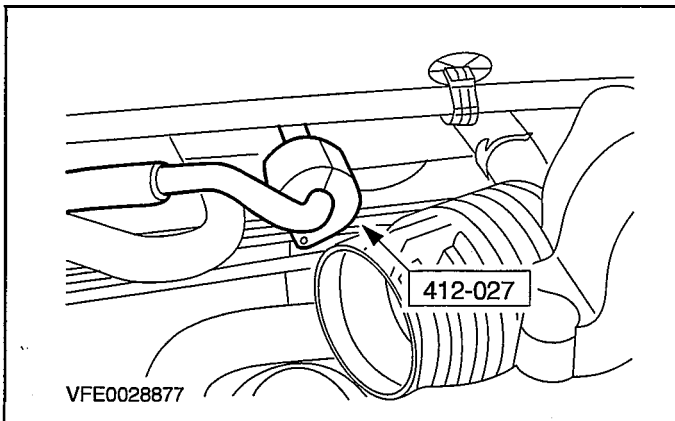
4. Remove the retaining clip of the refrigerant line **quick-release** coupling.



5. **CAUTION:** Close off the refrigerant line and the evaporator to prevent dirt ingress. Detach the refrigerant line from the evaporator.

REMOVAL AND INSTALLATION

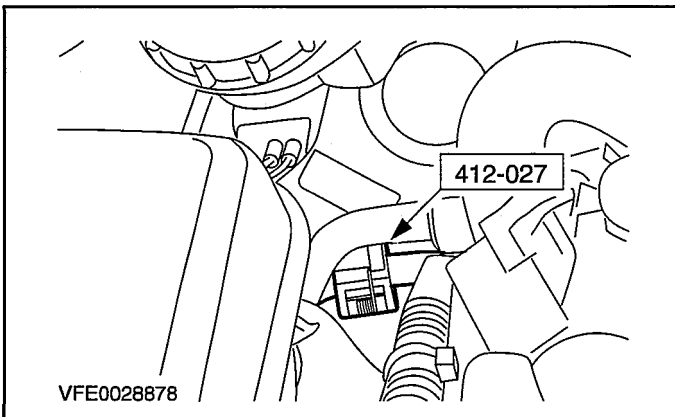
- Discard the O-rings.



6. **CAUTION:** Close off the refrigerant line to prevent dirt ingress.

Remove the refrigerant line with the fixed orifice tube.

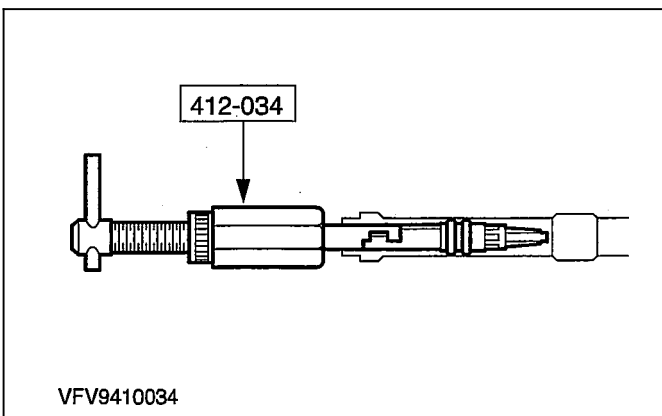
- Discard the O-rings.



Vehicles with manual transmission

7. Using the special tool, remove the fixed orifice tube.

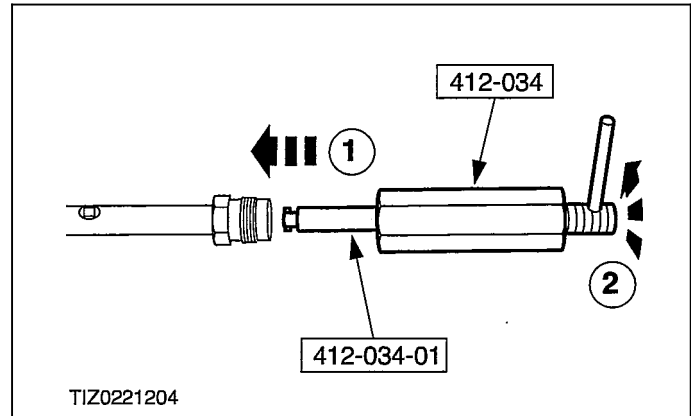
- Hook the special tool into the fixed orifice tube, turn it clockwise and remove the fixed orifice tube.



Vehicles with automatic transmission

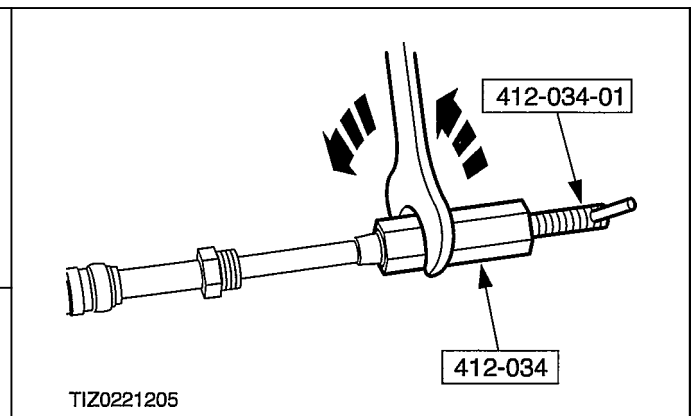
8. Hook the special tool into the fixed orifice tube.

1. Insert the special tool with adapter into the fixed orifice tube.
2. By turning the adapter a quarter turn, hook it into the fixed orifice tube.



9. Remove the fixed orifice tube.

- Turn the special tool, holding the adapter at the same time.

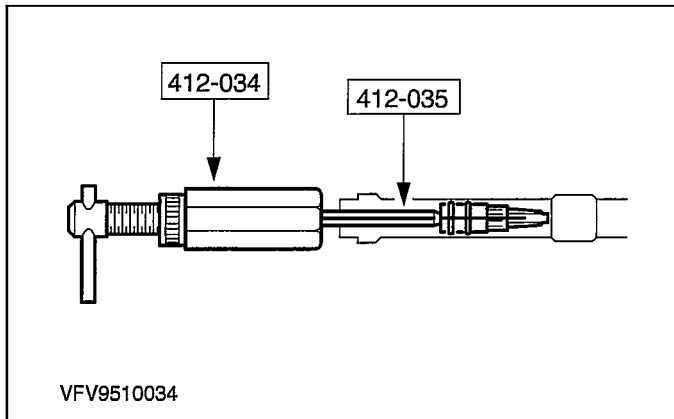


All vehicles

10. **NOTE:** This step is only necessary if the fixed orifice tube is faulty.

REMOVAL AND INSTALLATION

Using the special tools, remove the broken fixed orifice tube.

**Installation**

1. NOTE: Install new refrigerant line O-rings.

NOTE: Coat the refrigerant line O-rings with clean refrigerant oil before installation.

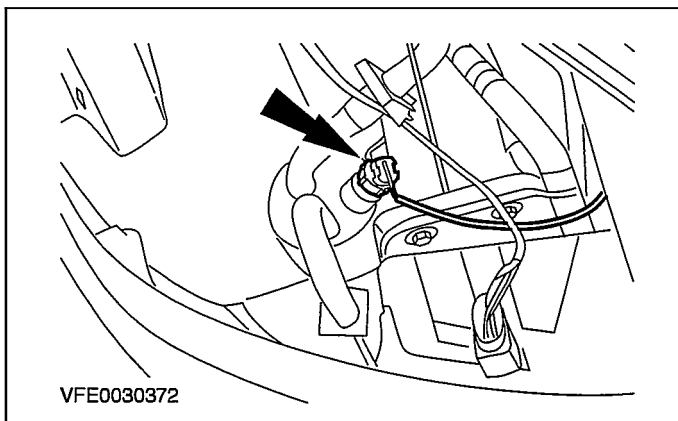
Install the components in the reverse order.

REMOVAL AND INSTALLATION**Low-Pressure Cutoff Switch(34 629 0)****Removal**

1. Remove the right-hand headlamp.

For additional information, refer to:
Headlamps (417-01, Removal and
Installation).

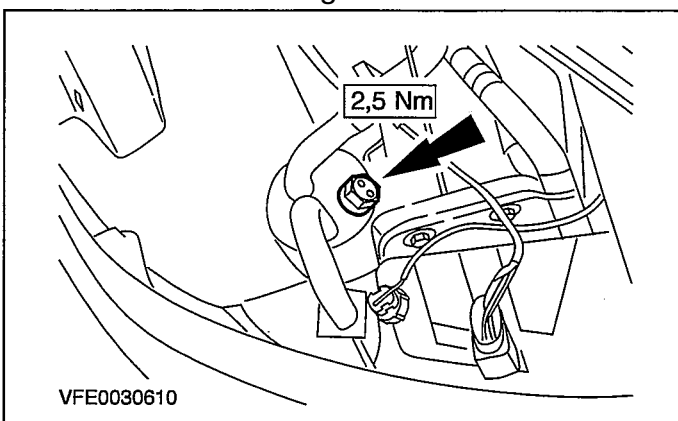
2. Disconnect the low pressure switch
connector.



3. **▲WARNING:** Make certain that the valve of the low pressure switch is completely closed after removal of the low pressure switch, to prevent refrigerant from escaping. Failure to observe this instruction can lead to injury.

Remove the low pressure switch.

- Discard the O-rings.

**Installation**

- **NOTE:** Install new O-rings on the low pressure switch.

NOTE: Coat the low pressure switch O-rings with clean refrigerant oil before installation.

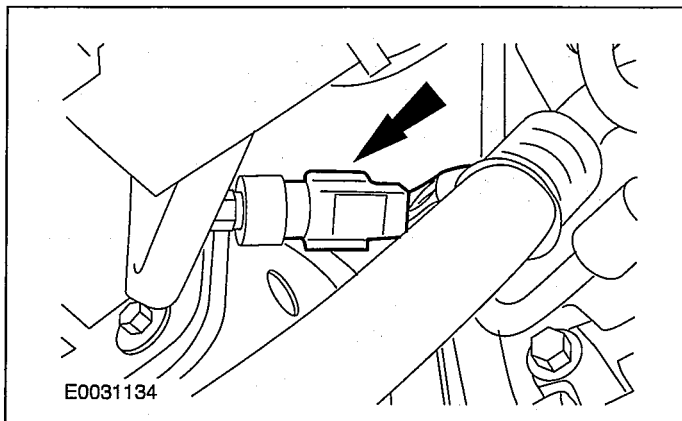
Reinstall the components in reverse order.

REMOVAL AND INSTALLATION

High-Pressure Cutoff Switch(34 631 0)

Removal

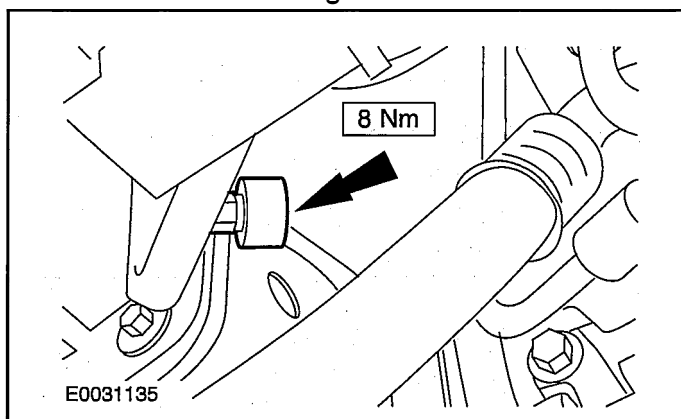
1. Raise the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
2. Disconnect the high-pressure switch electrical connector.



3. **▲WARNING:** Make certain that the valve of the high pressure switch is completely closed after removal of the high pressure switch, to prevent refrigerant from escaping. Failure to observe this instruction can lead to injury.

Remove the high pressure switch.

- Discard the O-rings.



Installation

1. **NOTE:** Install new O-rings on the high pressure switch.

NOTE: Coat the high pressure switch O-rings with clean refrigerant oil before installation.

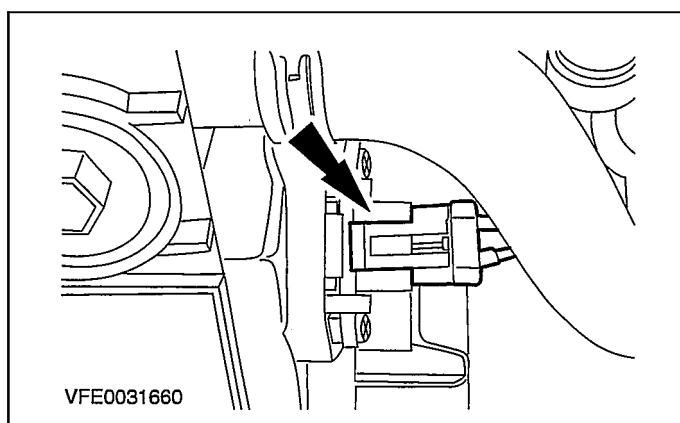
Reinstall the components in reverse order.

REMOVAL AND INSTALLATION

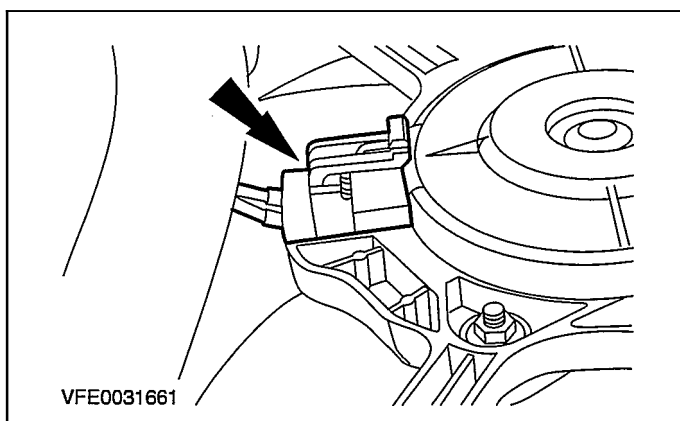
Condenser Core(34 632 4)

Removal

1. Drain the air conditioning system. For additional information, refer to Section 412-00 [Climate Control System - General Information].
2. Raise the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].
3. Disconnect the radiator fan resistor connector.



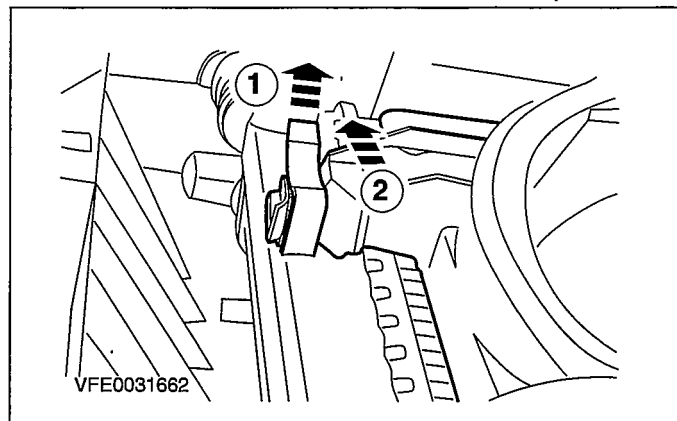
4. Disconnect the radiator fan connector.



5. Unclip the radiator fan from the left-hand clip.

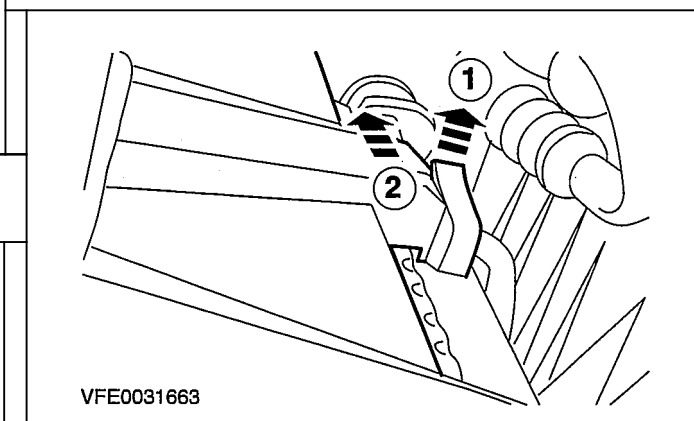
1. Pull back the clip.

2. Press the radiator fan out of the clip.



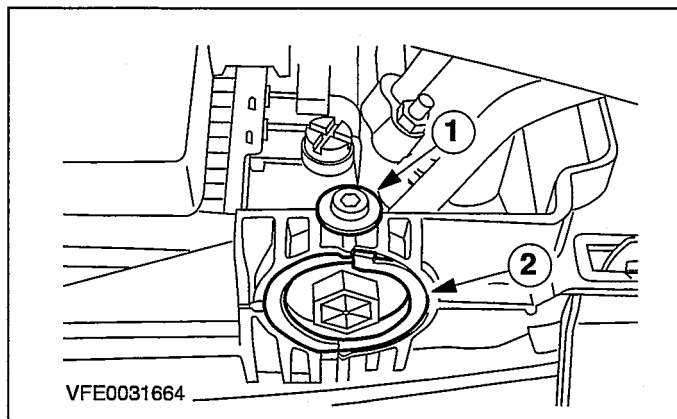
6. Remove the radiator fan.

1. Pull back the clip.
2. Press the radiator fan out of the clip and remove it.



7. Remove the radiator bracket bolts (right-hand side shown).

1. Remove the security bolts.
2. Unscrew the bolts.

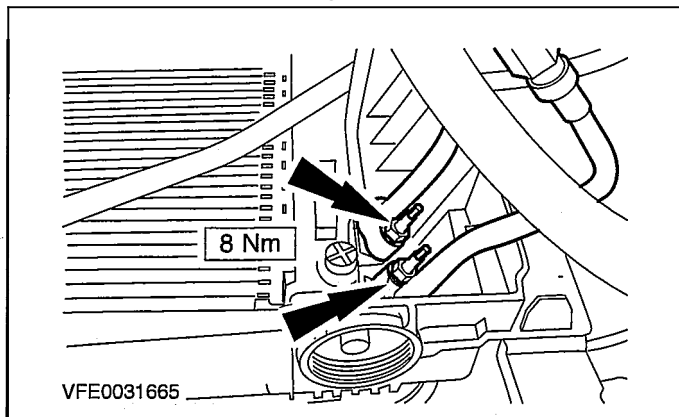


REMOVAL AND INSTALLATION

8. **⚠ CAUTION:** Close off the refrigerant lines and the **A/C** condenser to prevent dirt from entering.

Detach the refrigerant lines from the condenser.

- Discard the O-rings.



Installation

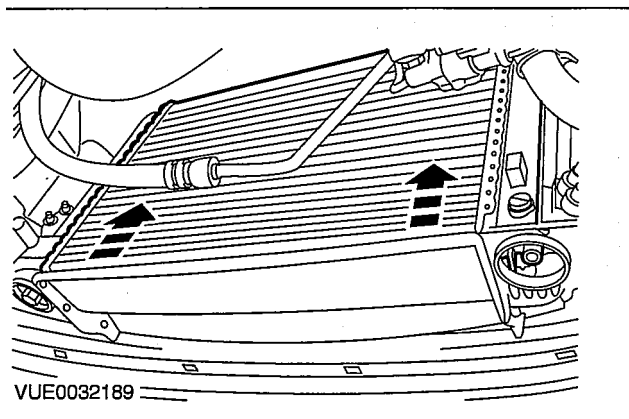
1. **⚠ CAUTION:** Do not damage the foam seals of the condenser.

NOTE: Install new O-rings on the refrigerant lines.

NOTE: Coat the refrigerant line O-rings with clean refrigerant oil before installation.

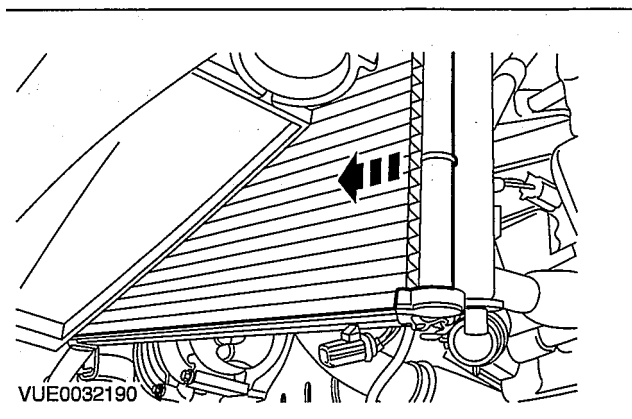
Reinstall the components in reverse order.

9. Detach the radiator and condenser from the front panel.



10. **⚠ CAUTION:** Do not damage the foam seals of the condenser.

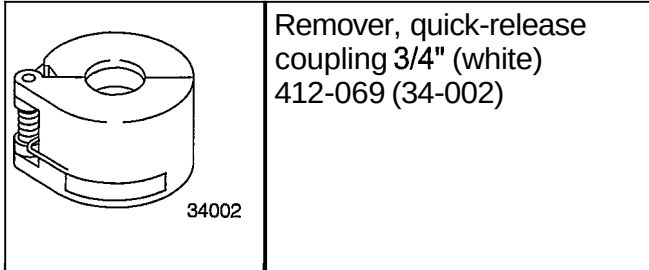
Remove the condenser.



REMOVAL AND INSTALLATION

Suction Accumulator(34 630 4)

Special Tool(s)



Removal

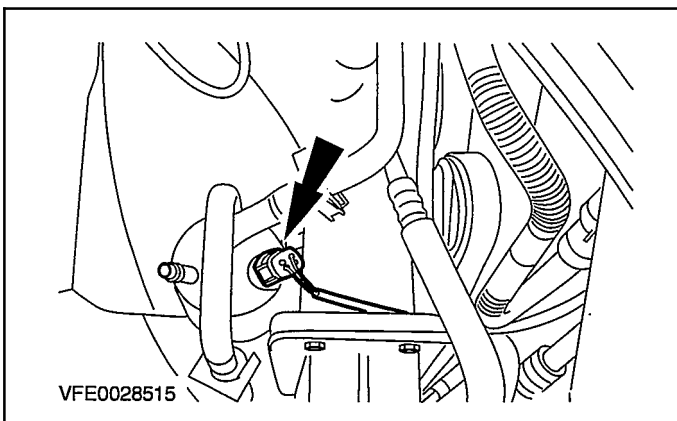
1. Remove the right-hand **headlamp** assembly.

For additional information, refer to:
Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

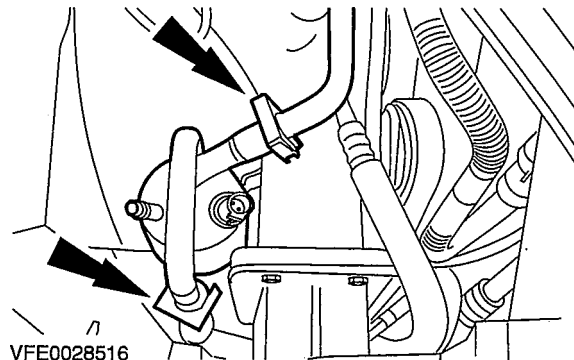
2. Drain the air conditioning system.

For additional information, refer to: Air Conditioning (**A/C**) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. Disconnect the low-pressure cutoff switch electrical connector.



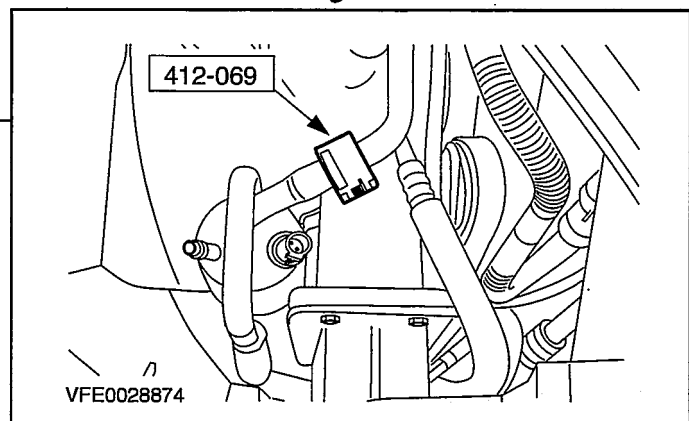
4. Remove the refrigerant line quick release coupling securing clips.



5. **CAUTION:** Close off the refrigerant lines and the suction accumulator to prevent contamination.

Using the special tool, disconnect the upper refrigerant line from the suction accumulator.

- Discard the O-ring seals.



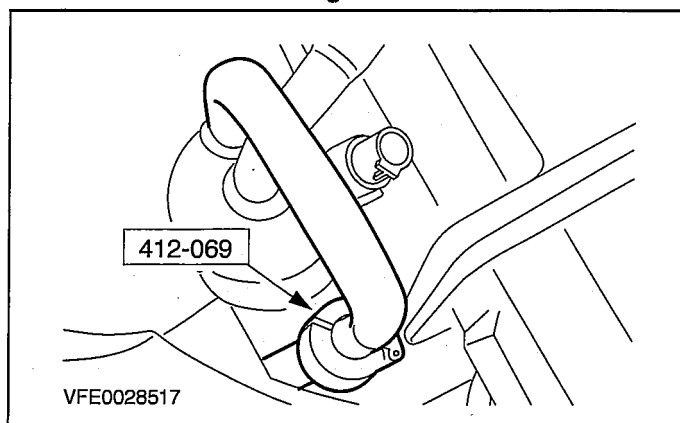
6. **CAUTION:** Close off the refrigerant lines and the suction accumulator to prevent contamination.

Using the special tool, disconnect the lower refrigerant line from the suction accumulator.

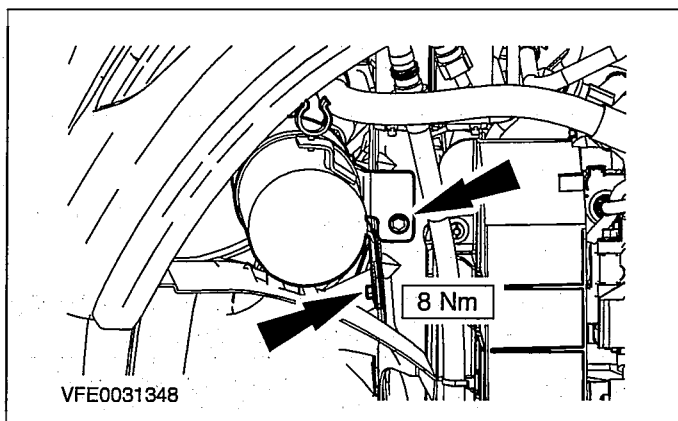
- Unclip the refrigerant line.

REMOVAL AND INSTALLATION

- Discard the O-ring seals.

**7. Raise and support the vehicle.**

For additional information, refer to: **Lifting (100-02 Jacking and Lifting, Description and Operation).**

8. Remove the suction accumulator.**Installation**

- **NOTE:** Install new refrigerant line O-ring seals.

NOTE: Lubricate the refrigerant line O-ring seals with clean refrigerant oil before installation.

To install reverse the removal procedure.

REMOVAL AND INSTALLATION

Air Conditioning (A/C) Compressor — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/2.0L Duratec-HE (MI4)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(34 626 4)

Removal

All vehicles

■ Drain the **A/C** system.

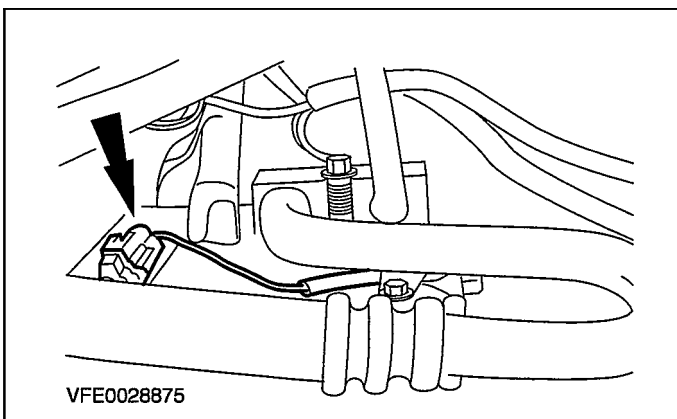
For additional information, refer to: Air Conditioning (**A/C**) System Recovery, Evacuation and Charging (412-00 **Climate Control** System - General Information, General Procedures).

2. Remove the accessory drive belt. For additional information, refer to: (303-05 Accessory Drive)

Accessory Drive **Belt** - **1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)**, Vehicles With: Air Conditioning (**Removal and Installation**),

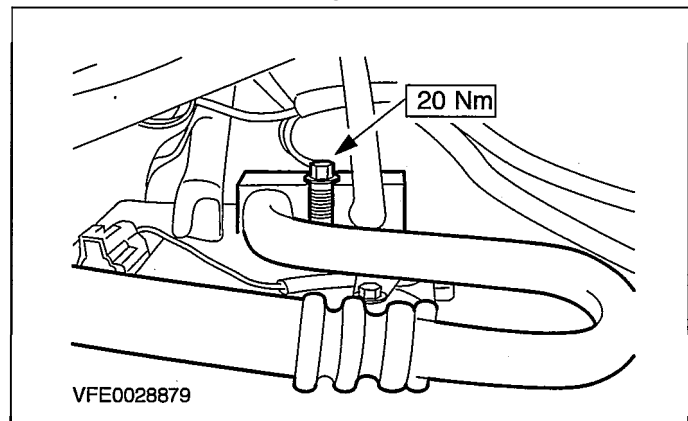
Accessory Drive Belt - **1.3L Duratec-8V (Rocam) (Removal and Installation)**,
 Accessory Drive Belt - **2.0L Duratec-HE (MI4) (Removal and Installation)**,
 Accessory Drive **Belt** - **1.6L Duratorq-TDCi (DV) Diesel (Removal and Installation)**.

3. Disconnect the **A/C** clutch connector (1.3L engine shown).



Disconnect the refrigerant lines from the **A/C** compressor (**1.3L** engine shown).

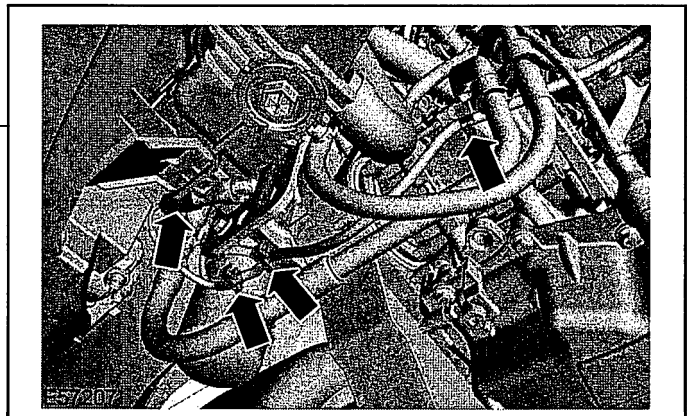
- Discard the O-ring seals.



Vehicles with 2.0L engine

5. Disconnect the high-pressure cutoff switch electrical connector.

- a. Unclip the high-pressure cutoff switch wiring harness and position it to one side.

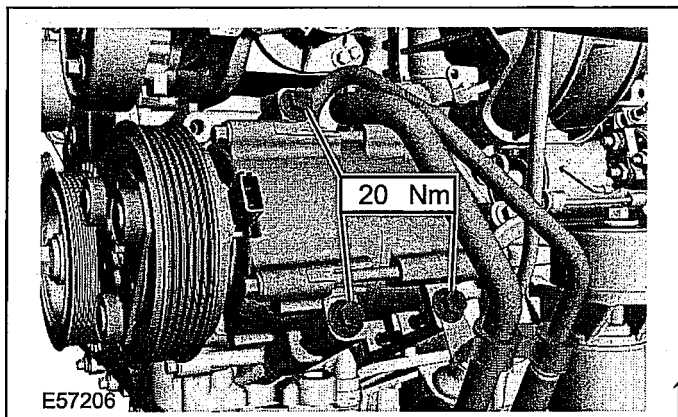


4. **CAUTION:** Close off the refrigerant lines and the **A/C** compressor to prevent contamination.

NOTE: On vehicles with a 2.0L engine, this step should only be carried out once the **A/C** compressor has been detached.

REMOVAL AND INSTALLATION

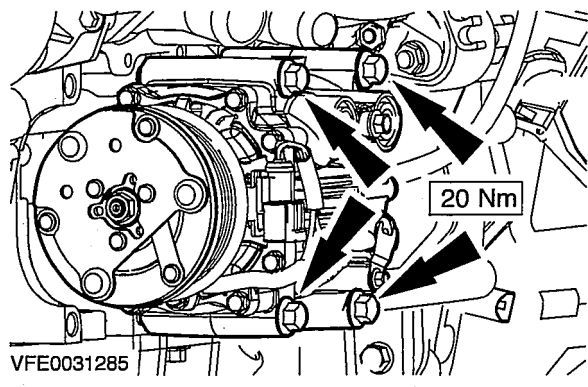
6. Detach the **A/C** compressor from the engine, lower it and secure it to one side.



Vehicles with 1.25l, 1.4l or 1.6l engine

7. **CAUTION:** Support the **A/C** compressor before removing the retaining bolts and secure it to one side to prevent load being placed on the refrigerant lines.

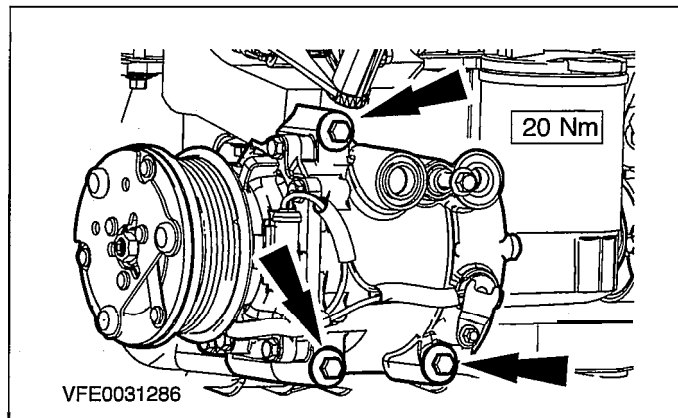
Remove the **A/C** compressor.



Vehicles with 1.3l engine

8. **CAUTION:** Support the **A/C** compressor before removing the retaining bolts and secure it to one side to prevent load being placed on the refrigerant lines.

Remove the **A/C** compressor.



Installation

1. **NOTE:** Install new refrigerant line O-ring seals.

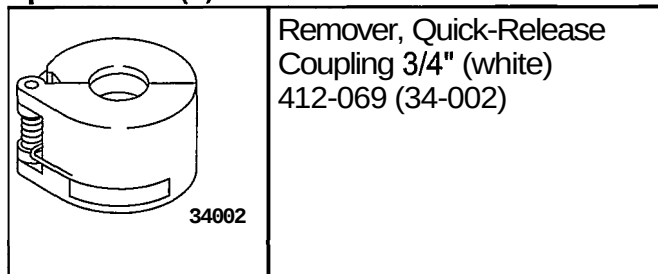
NOTE: Lubricate the refrigerant line O-ring seals with clean refrigerant oil before installation.

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Compressor Manifold and Tube Assembly

Special Tool(s)



Removal

All vehicles

1. Drain the air conditioning system.

For additional information, refer to:
Air Conditioning (A/C) System Recovery,
Evacuation and Charging (412-00).

Vehicles with 100 PS diesel engine

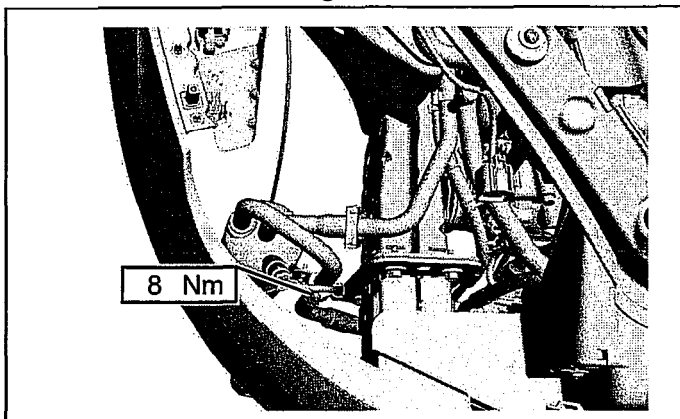
2. Remove the right-hand head lamp unit.

For additional information, refer to:
Headlamps (417-01, Removal and
Installation).

3. **⚠ CAUTION:** Close off the refrigerant lines and the dehydrator to prevent contamination.

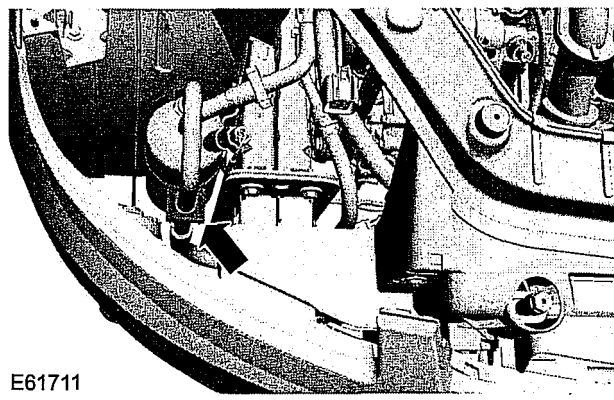
Detach the connection block and the compressor refrigerant lines from the dehydrator.

- Discard the O-rings.



All, except vehicles with 100 PS diesel engine

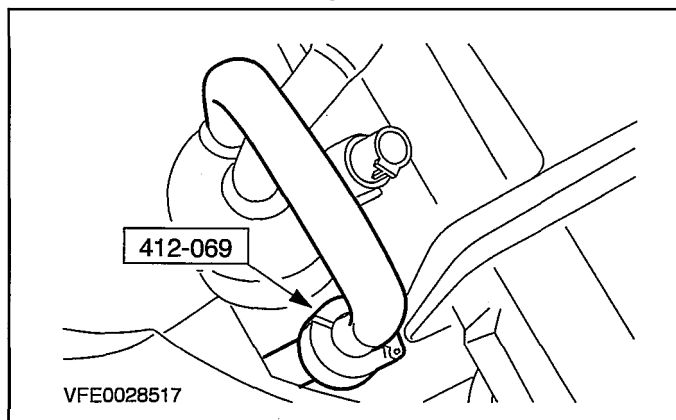
4. Remove the retaining clip of the A/C line quick-fit connector.



5. **⚠ CAUTION:** Close off the refrigerant lines and the dehydrator to prevent contamination.

Detach the connection block and the compressor refrigerant lines from the dehydrator.

- Discard the O-rings.



All vehicles

6. Raise vehicle for access

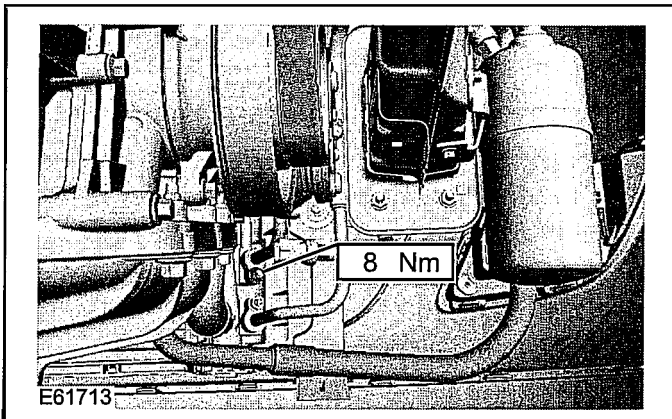
For additional information, refer to:
Lifting (100-02, Description and Operation).

7. **⚠ CAUTION:** Close off the refrigerant line and the condenser core to prevent contamination.

Detach the connection block and the compressor refrigerant lines from the condenser.

REMOVAL AND INSTALLATION

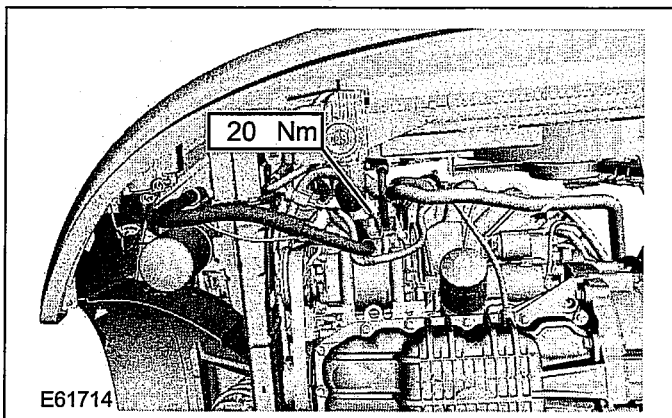
- Discard the O-rings.



8. **⚠ CAUTION:** Close off the compressor to prevent contamination.

Remove the connection block and the A/C compressor refrigerant lines.

- Discard the O-rings.

**Installation**

1. **NOTE:** Install new refrigerant line O-rings.

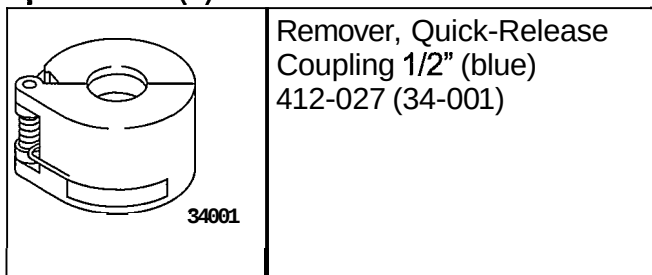
NOTE: Coat the O-rings for the refrigerant lines with clean refrigerant oil prior to installation.

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Condenser to Evaporator Line(34 645 4)

Special Tool(s)



Removal

All vehicles

1. Drain the air conditioning system.

For **additional** information, refer to:
Air Conditioning (A/C) System Recovery,
Evacuation and Charging (412-00).

2. Remove the air filter housing. For additional information, refer to: (303-12 Intake Air Distribution and **Filtering**)

Air Cleaner - ■ **1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)** (Removal and **Installation**),

Air Cleaner - ■ **1.3L Duratec-8V (Rocam)** (Removal and **Installation**),

Air Cleaner - ■ **1.4L Duratorq-TDCi(DV) Diesel** (Removal and **Installation**),

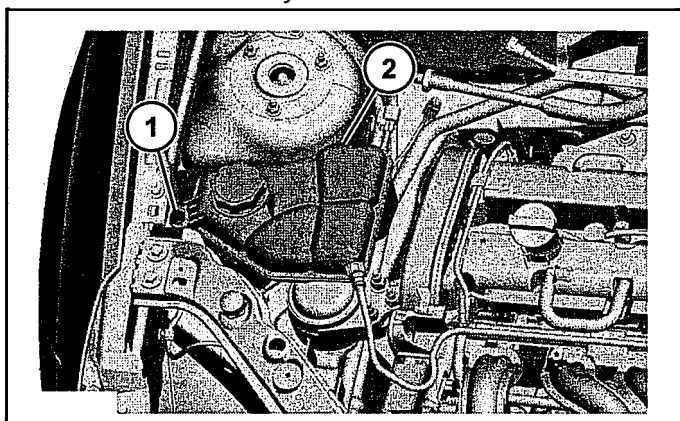
Air Cleaner - ■ **2.0L Duratec-HE (M14)** (Removal and **Installation**),

Air Cleaner - ■ **1.6L Duratorq-TDCi(DV) Diesel** (**Removal** and **Installation**).

3. Detach the coolant expansion tank from the **wheel** housing.

1. Remove the bolt.

2. Unhook the coolant expansion tank from the bracket and lay it to one side.



Vehicles with 100 PS diesel engine

4. Remove the right-hand head **lamp** unit.

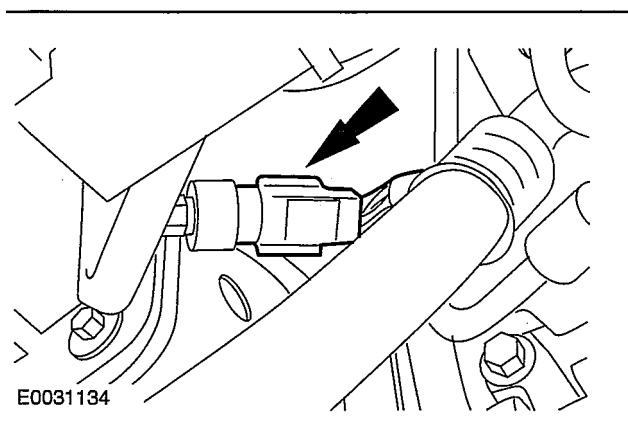
For additional information, refer to:
Headlamps (417-01, Removal and **Installation**).

All vehicles

5. Raise vehicle for access

For additional information, refer to:
Lifting (**100-02**, Description and Operation).

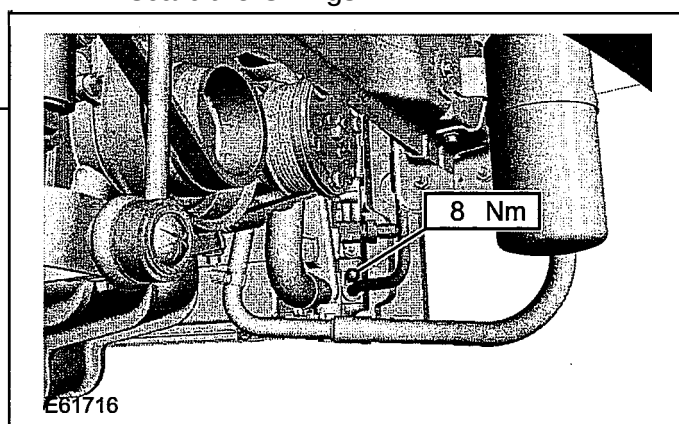
6. Disconnect the high-pressure switch electrical connector.



7. **CAUTION:** Close off the refrigerant line and the condenser core to prevent contamination.

Disconnect the condenser to evaporator line from the A/C condenser.

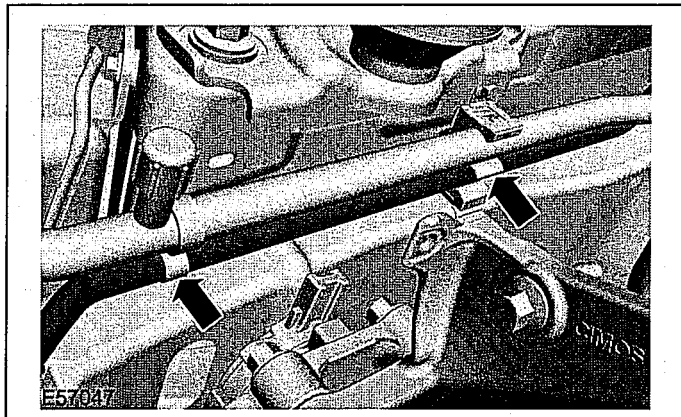
- Discard the O-rings.



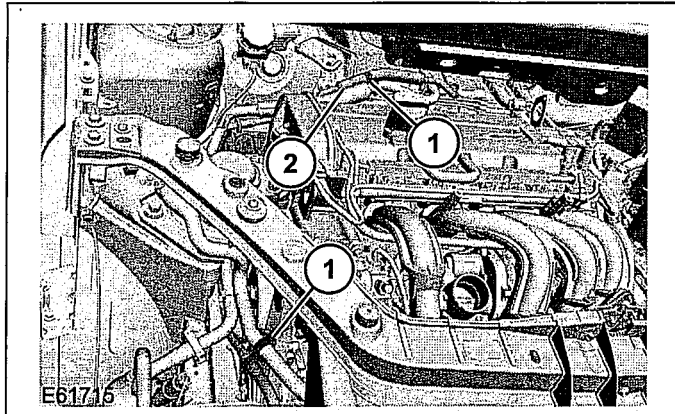
8. Lower the vehicle.

REMOVAL AND INSTALLATION

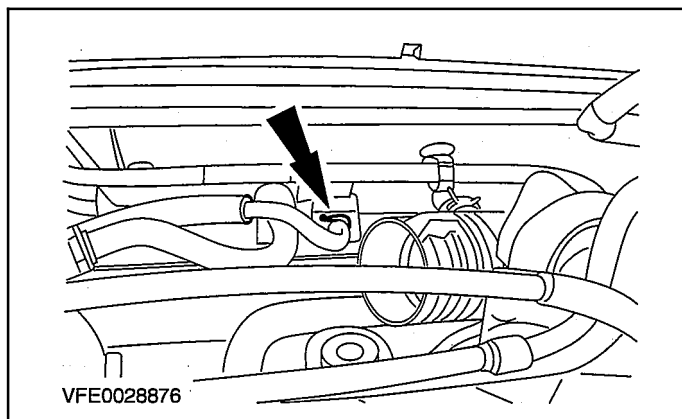
9. Unclip the condenser to evaporator line from the side member.



2. Remove the refrigerant line upwards, in the direction of the bulkhead.



10. Remove the retaining clip of the **A/C** line quick-fit connector.



Installation

■ **NOTE:** Install new refrigerant line O-rings.

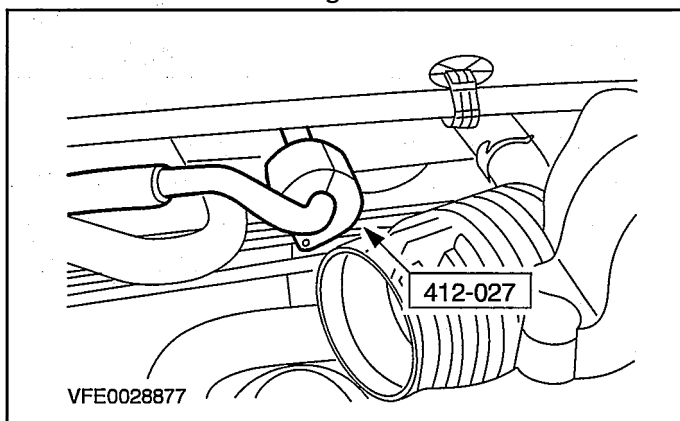
NOTE: Coat the O-rings for the refrigerant lines with clean refrigerant oil prior to installation.

To install, reverse the removal procedure.

11. **⚠ CAUTION:** Close off the refrigerant line and the evaporator core to prevent contamination.

Disconnect the condenser to evaporator line from the **A/C** evaporator core.

- Discard the O-rings.



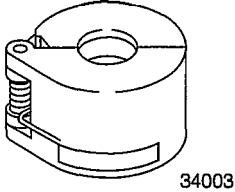
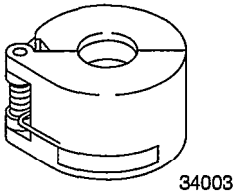
12. Remove the condenser to evaporator line.

- Unclip the refrigerant line.

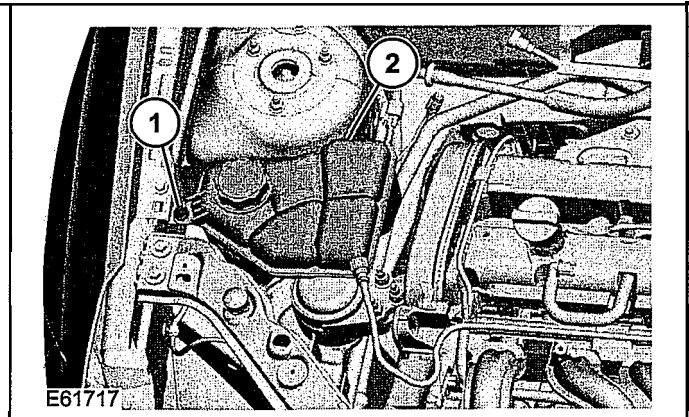
REMOVAL AND INSTALLATION

Evaporator Outlet Line(34 644 4)

Special Tool(s)

 34003	Remover, Quick-Release Coupling 5/8" (black) 412-081 (34-003)
 34003	Remover, Quick-Release Coupling 3/4" (white) 412-069 (34-002)

2. Unhook the coolant expansion tank from the bracket and lay it to one side.



Removal

All vehicles

1. Drain the air conditioning system.

For additional information, refer to:
Air Conditioning (A/C) System Recovery,
Evacuation and Charging (412-00).

2. Remove the air filter housing. For additional information, refer to: (303-12 Intake Air Distribution and Filtering)

Air Cleaner - **1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)** (Removal and Installation),

Air Cleaner - **1.3L Duratec-8V (Rocam)** (Removal and Installation),

Air Cleaner - **1.4L Duratorq-TDCi (DV) Diesel** (Removal and Installation),

Air Cleaner - **2.0L Duratec-HE(MI4)** (Removal and Installation),

Air Cleaner - **1.6L Duratorq-TDCi (DV) Diesel** (Removal and Installation).

3. Detach the coolant expansion tank from the wheel housing.

1. Remove the bolt.

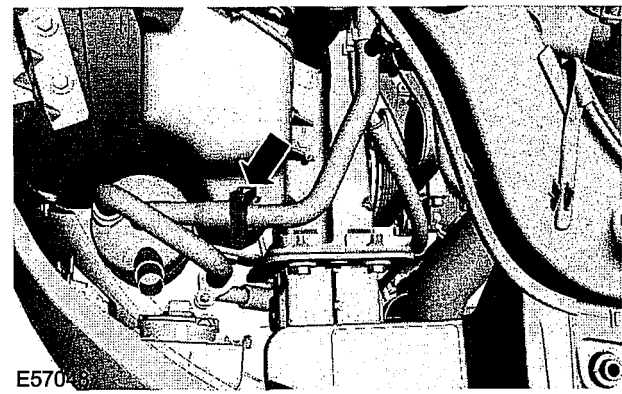
Vehicles with 100 PS diesel engine

4. Remove the right-hand head lamp unit.

For additional information, refer to:
Headlamps (417-01, Removal and Installation).

All vehicles

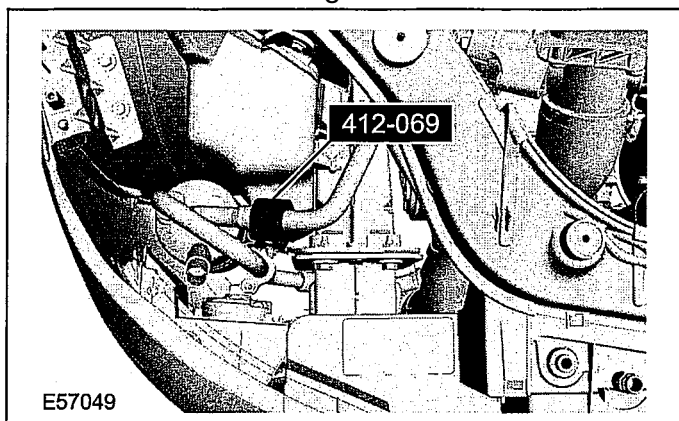
5. Remove the retaining clip of the **A/C** line quick-fit connector.



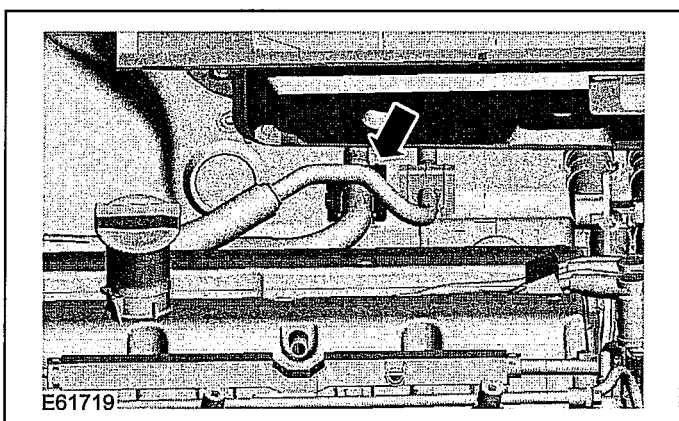
6. **CAUTION:** Close off the refrigerant line and the dehydrator to prevent contamination. Disconnect the evaporator refrigerant outlet line from the dehydrator using the special tool.

REMOVAL AND INSTALLATION

- Discard the O-rings.

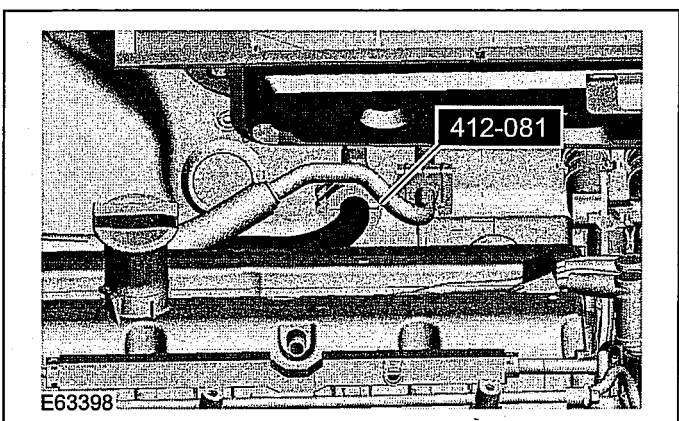


7. Remove the retaining clip of the **A/C** line quick-fit connector.

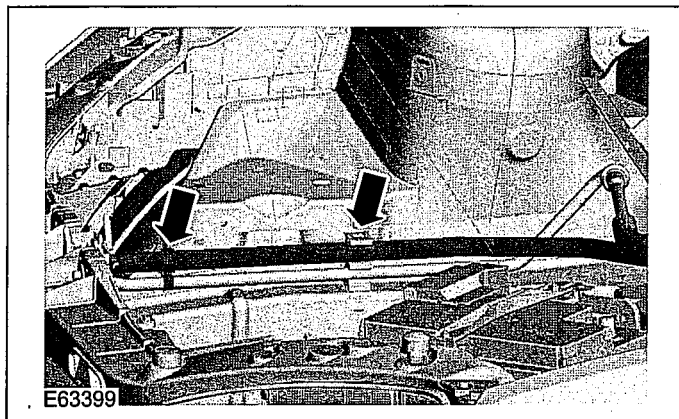


8. **⚠ CAUTION:** Close off the refrigerant line and the evaporator core to prevent contamination.

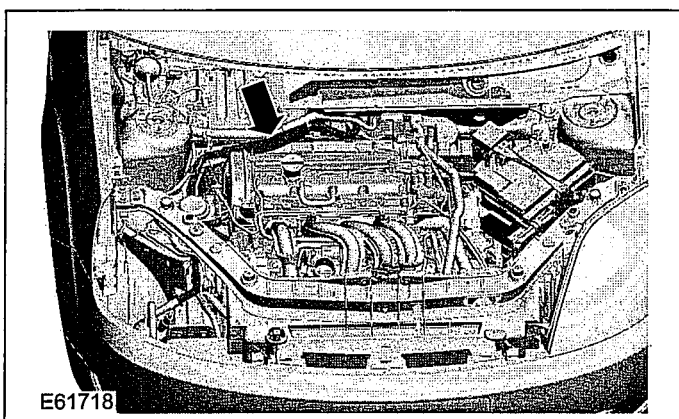
Detach the evaporator refrigerant outlet line from the evaporator.



9. Unclip the evaporator refrigerant outlet line from the side member.



10. Remove the evaporator refrigerant outlet line.



Installation

1. **NOTE:** Install new refrigerant line O-rings.

NOTE: Coat the O-rings for the refrigerant lines with clean refrigerant oil prior to installation.

To install, reverse the removal procedure.



SECTION 412-04 Control Components

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	412-04-2
DESCRIPTION AND OPERATION	
Control Components.....	412-04-3
Climate control Assembly.....	412-04-3
Overview of heater/evaporator core housing - vehicles with EATC.....	412-04-6
In-vehicle temperature sensor - vehicles with EATC.....	412-04-7
DIAGNOSIS AND TESTING	
Control Components.....	412-04-8
REMOVAL AND INSTALLATION	
Climate Control Assembly..... (34 300 0)	412-04-9
Climate Control Assembly — Vehicles Built From: 1012005..... (34 300 0)	412-04-13
Blower Motor Switch..... (33 574 0)	412-04-15
Air Inlet Blend Door Actuator.....	412-04-19
Temperature Blend Door Actuator..... (34 590 0)	412-04-20
Footwell Vent/Duct Blend Door Actuator.....	412-04-21
Center Register Air Discharge Temperature Sensor.....	412-04-26
Footwell Air Discharge Temperature Sensor.....	412-04-27

SPECIFICATIONS**Tightening Torques**

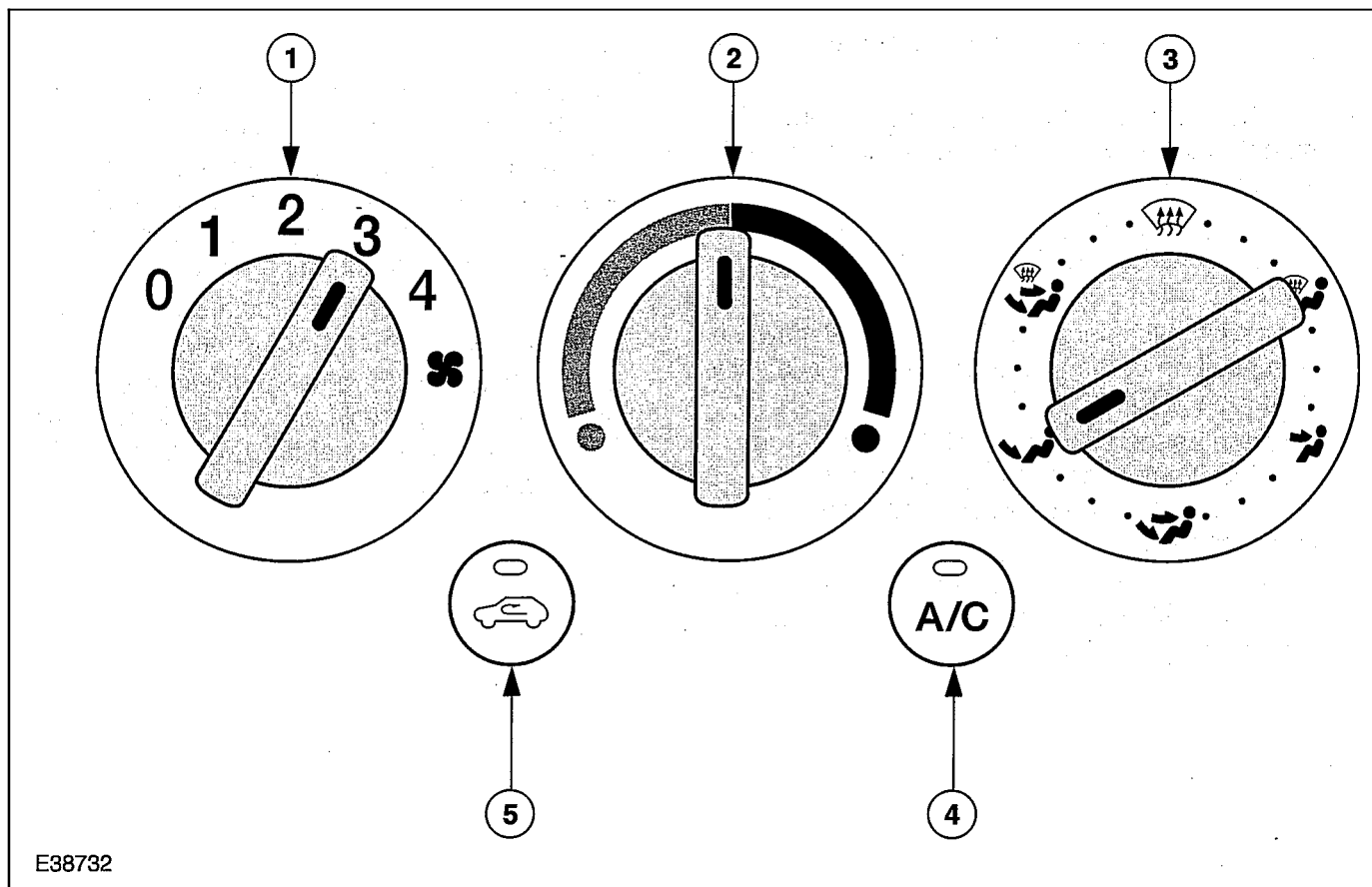
Item	Nm	lb-ft	lb-in
Bolts - dashboard crossmember	20	15	-
Bolts - heater/evaporator housing to dashboard crossmember	5	-	44

DESCRIPTION AND OPERATION

Control Components

Climate control Assembly

Vehicles with manual temperature control



E38732

Item	Description
1	Blower switch
2	Temperature control switch
3	Air distribution control
4	A/C switch
5	Recirculated air switch.

Blower switch

- The air flow speed is adjusted using the blower switch.
- The blower motor switch is connected to a three-stage blower resistor by means of which it can be switched to four speeds.
- The blower is switched off in position 0.

Temperature control switch

- **NOTE:** The heating capacity depends on the engine coolant temperature.

The temperature control actuates the temperature control flap in the heater core housing via a **Bowden** cable and correspondingly more or less warm air is mixed with the surrounding air.

Air distribution control

- The air distribution control actuates the air distribution door in the heater core housing via a **Bowden** cable and air is guided accordingly to the air nozzles.

A/C switch

- **NOTE:** A cover is installed in place of the air conditioning switch on vehicles without air conditioning.

DESCRIPTION AND OPERATION

Vehicles with air conditioning are equipped with a heater control module which is integrated in the climate control assembly.

- Among other things, this heater control module informs the Powertrain Control Module (PCM) when the air conditioning switch is operated.
- The air conditioning system is switched on via the air conditioning switch.
- This pre-supposes that the blower switch is not in position 0.
- The heater control module sends a request signal to the PCM, which then switches on the A/C compressor.
- An orange Light Emitting Diode (LED) in the A/C switch indicates that the air conditioning is switched on.
- If the switch is operated when the blower switch is in position 0, the request signal is not initially sent to the PCM.
- As soon as the blower switch is moved from position 0 however, the request signal is transmitted and the PCM switches the A/C compressor on.
- When the ignition is switched off, the status of the air conditioning system is stored ready for the next engine start.

Recirculated air switch.

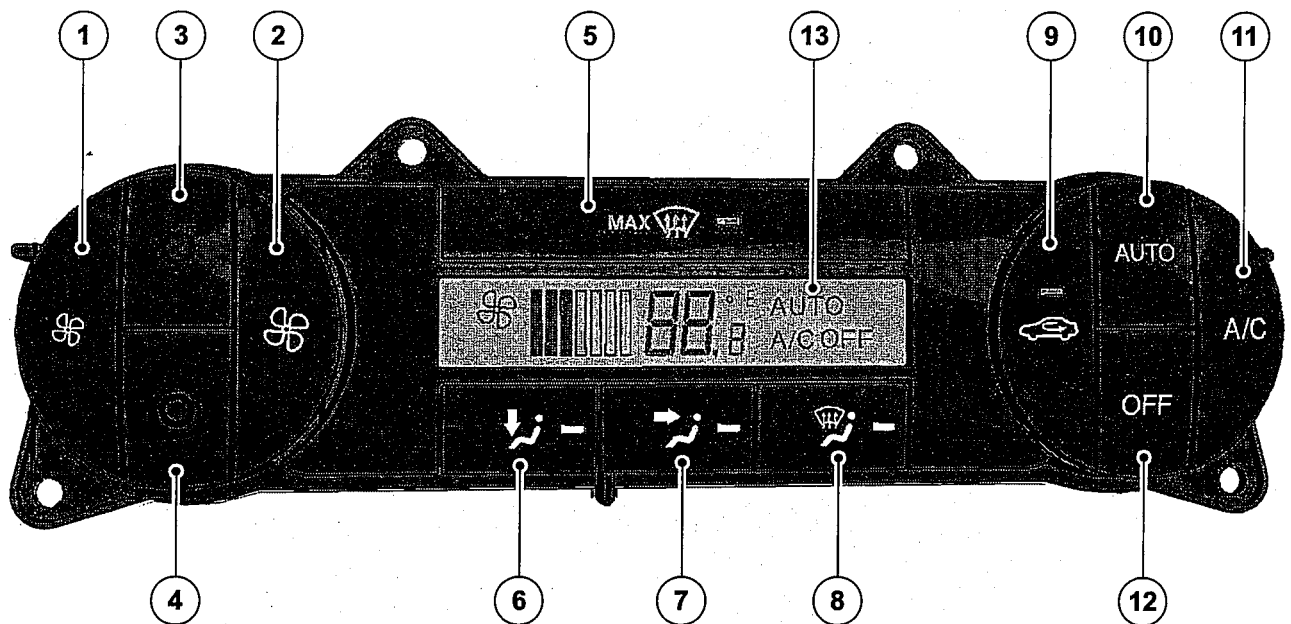
- **NOTE:** A cover is installed instead of the recirculated air switch on vehicles without air conditioning.

The purpose of the recirculated air switch is to switch between recirculated air and fresh air.

- Air inlet blend doors are integrated in the heater core housing in order to switch the recirculated air.
- These air inlet blend doors are operated by an electric motor in the heater core housing.
- When the recirculated air switch is operated, the servo motor in the heater core housing is actuated by the heater control module and opens or closes the air inlet blend doors.
- An orange LED in the recirculated air switch indicates recirculated air operation.
- The state is not stored when the ignition is switched off while recirculated air is in operation. Fresh air operation is started when the ignition is switched on again.

DESCRIPTION AND OPERATION

Vehicles with Electronic Automatic Temperature Control (EATC)



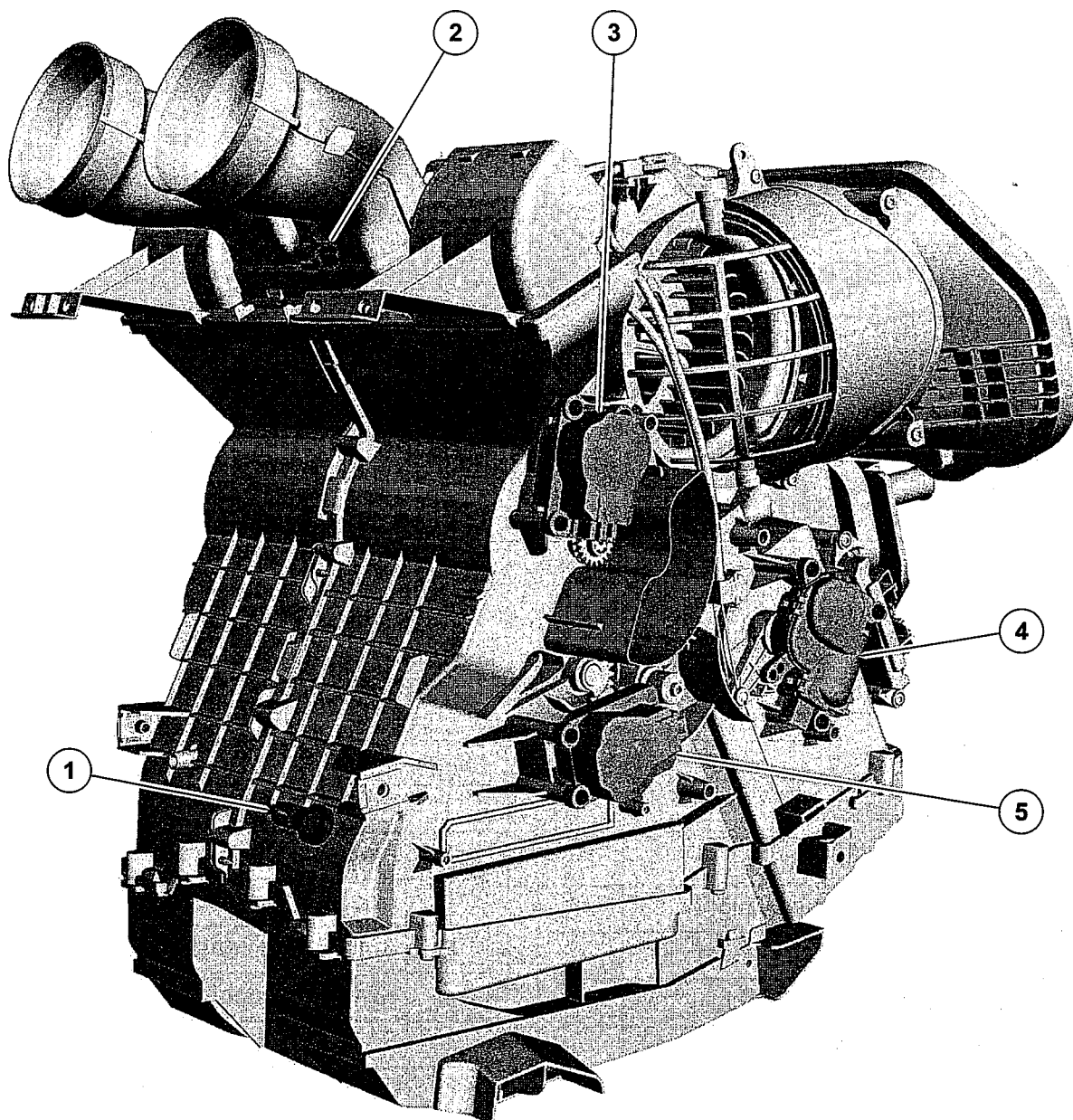
E64271

Item	Description
1	Blower speed lower
2	Blower speed higher
3	Blower air temperature higher
4	Blower air temperature lower
5	Defrost/demist windshield
6	Air distribution, footwell

Item	Description
7	Air distribution, face level
8	Air distribution, windshield
9	Recirculated air mode
10	Automatic climate control mode
11	Switch air conditioning on/off
12	Switch off automatic climate control
13	Climate control assembly display

DESCRIPTION AND OPERATION

Overview of heater/evaporator core housing - vehicles with EATC



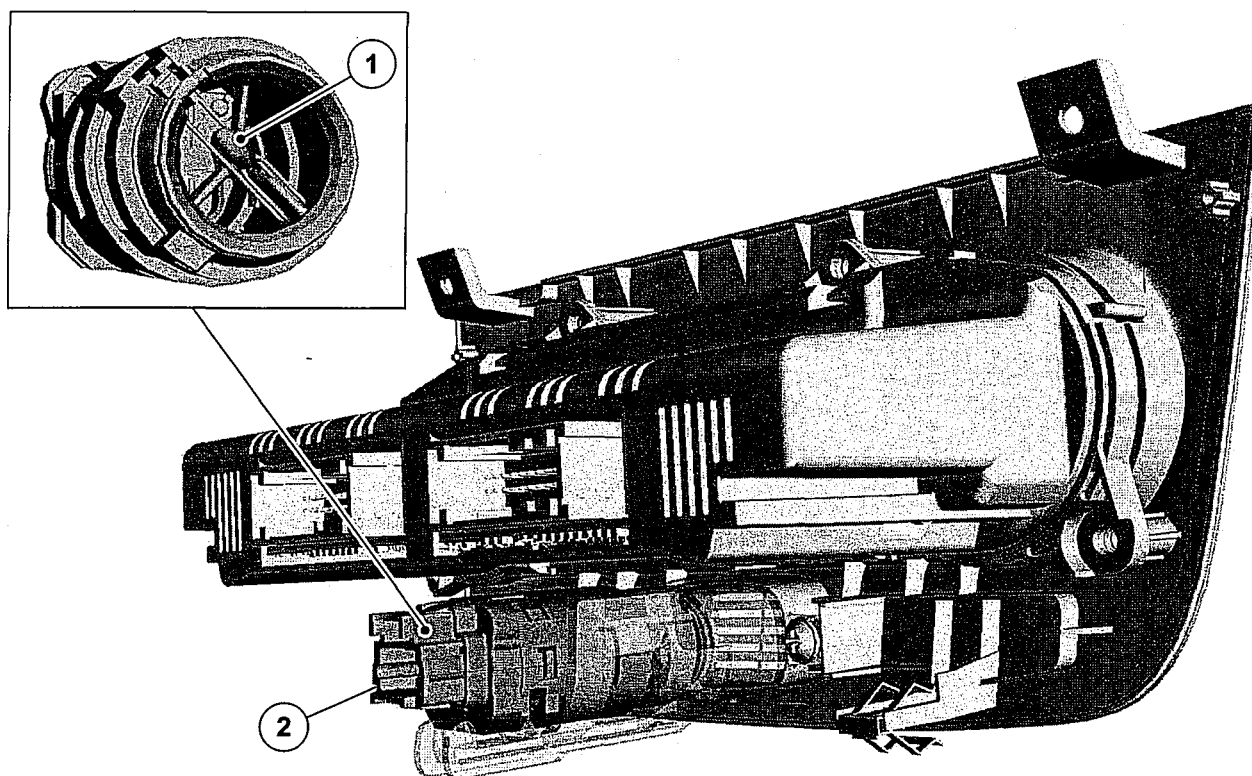
E64272

Item	Description
1	Air outlet temperature sensor, footwell
2	Air outlet temperature sensor, centre nozzles

Item	Description
3	Footwell ventilation actuator/air vent distribution door
4	Actuator - air distribution door
5	Temperature control air distribution door actuator

DESCRIPTION AND OPERATION

In-vehicle temperature sensor - vehicles with EATC



E64410

Item	Description
1	Sensor element
2	In-vehicle temperature sensor with integrated fan

In order to achieve optimum measurement values, an integrated blower draws air from the interior into the in-vehicle temperature sensor.

The measured values are transmitted to the control module installed in the climate control assembly, which requires these in order to regulate the in-vehicle temperature.

Like the other air discharge temperature sensors, the in-vehicle temperature sensor is an Negative Temperature Coefficient (NTC) resistor.

DIAGNOSIS AND TESTING**Control Components**

REFER to Section 412-00 [Climate Control System
- General Information].

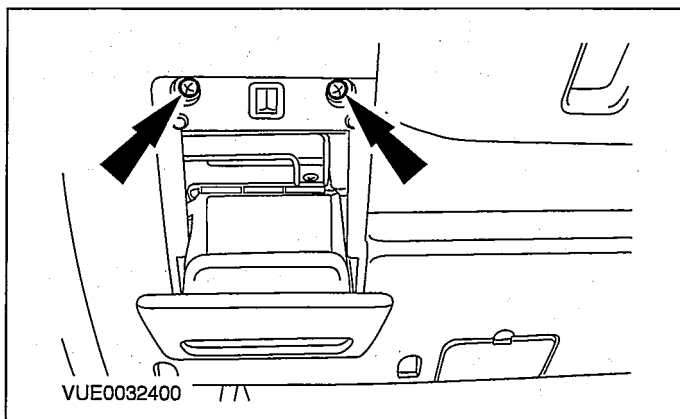
REMOVAL AND INSTALLATION

Climate Control Assembly(34 300 0)

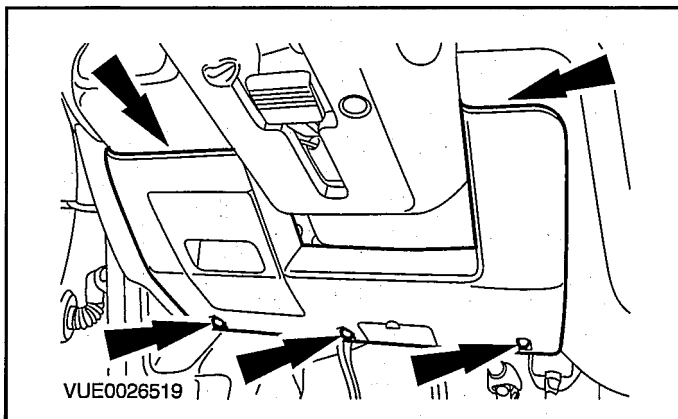
Removal

All vehicles

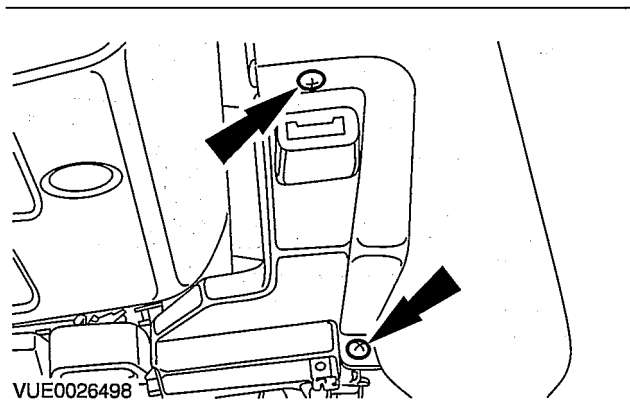
1. Open the stowage compartment and unscrew and remove the bolts from the lower **fascia/crash** padding trim.



2. Remove the **lower fascia/crash** padding trim.



3. Unscrew and remove the left-hand bolts from the fascial crash padding console.

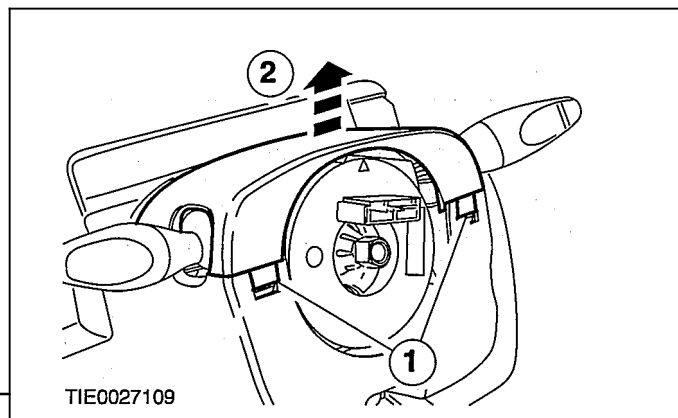


RHD vehicles

4. **NOTE:** Turn the steering wheel to gain access to the clips on the upper steering column trim.

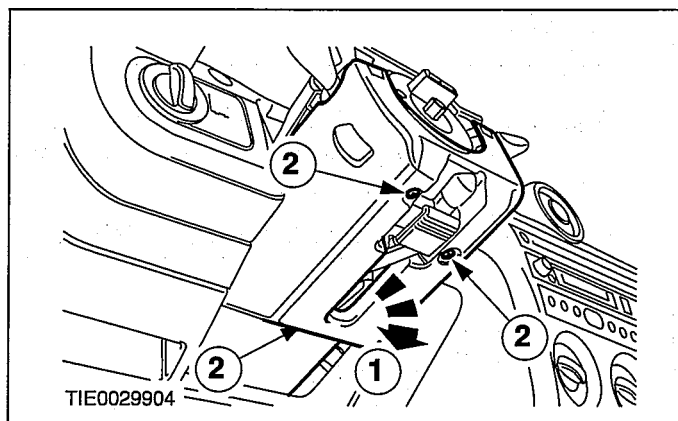
Detach the upper steering column trim from the lower steering column trim (steering wheel shown removed for clarity).

1. Use a narrow screwdriver to release the clips.
2. Detach the trim.



5. Remove the lower steering column trim (steering wheel shown removed for clarity).

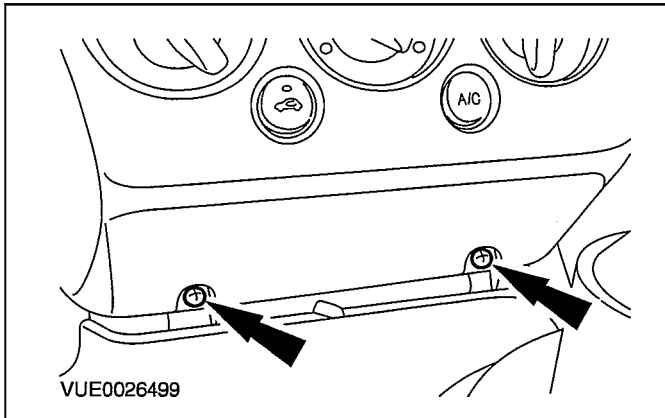
1. Release the steering column locking lever.
2. Unscrew the bolts.



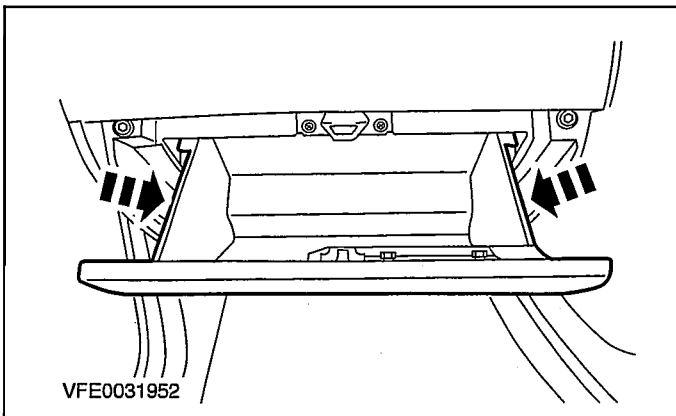
REMOVAL AND INSTALLATION

All vehicles

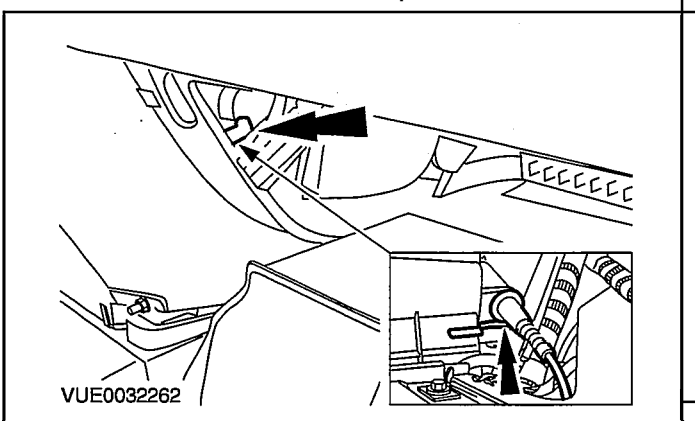
6. Unscrew and remove the lower bolts from the fascialcrash padding console.



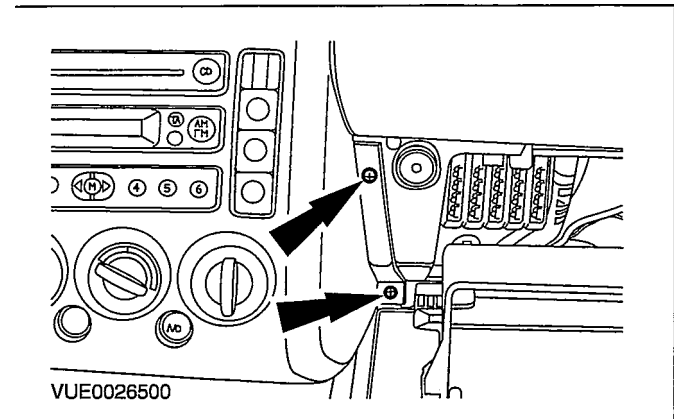
7. Fully open the glove compartment.
 - Press the sides towards the centre to release the glove compartment from the stops.



8. Detach the shaft of the air distribution flap from the adjusting mechanism on the heater core evaporator housing.
 - Release the catch and pull out the shaft.

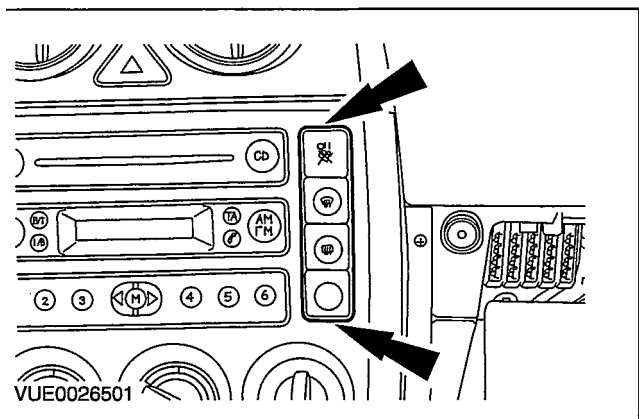


9. Unscrew and remove the right-hand bolts from the fascialcrash padding console.

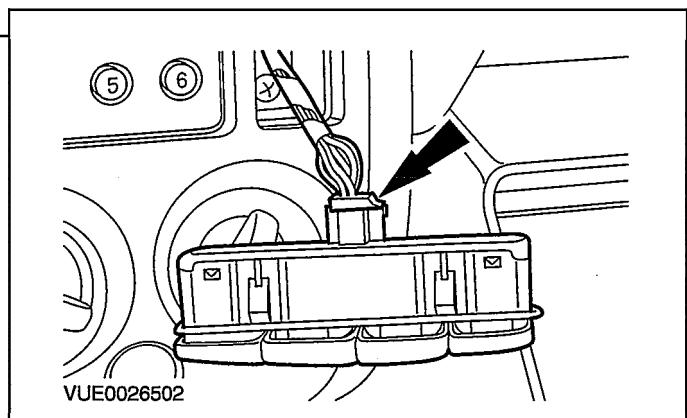


10. **CAUTION:** Support the screwdriver on suitable padding to avoid damaging the fascialcrash padding console.

Detach the switches from the fascia/crash padding console.

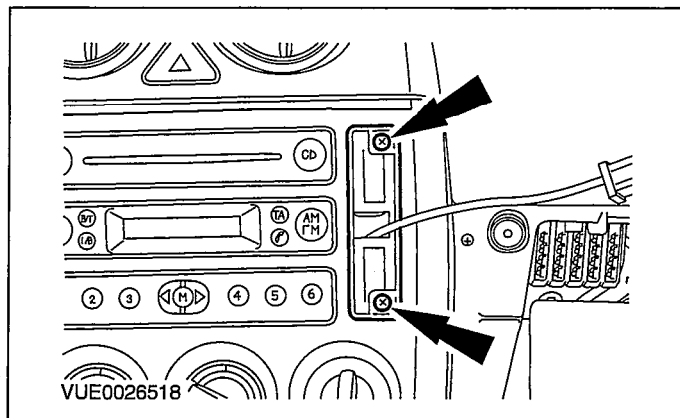


11. Unplug the connector and remove the switches.



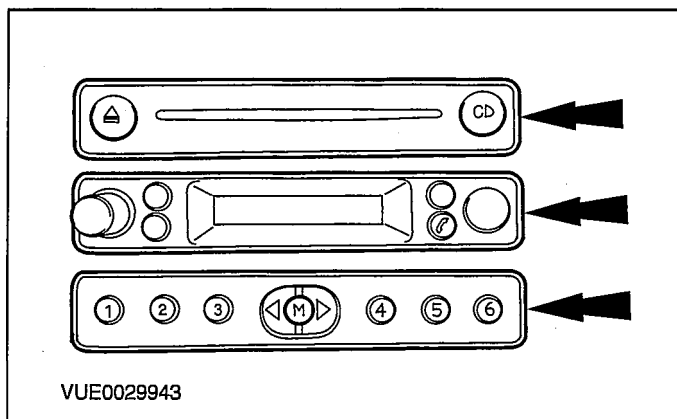
REMOVAL AND INSTALLATION

12. Unscrew and remove the upper bolts from the fascia/crash padding console.

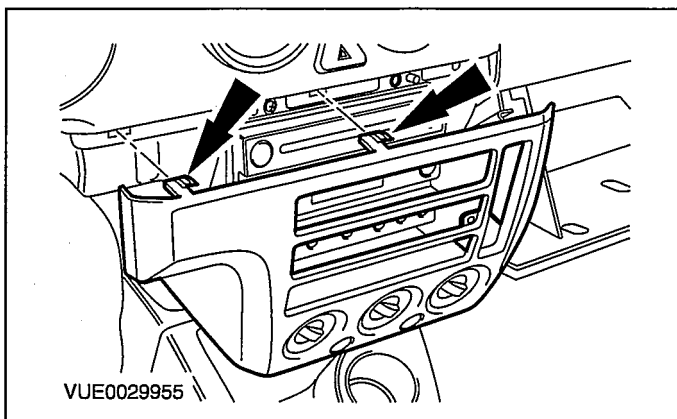


13. **CAUTION:** Use adhesive tape on the three segments of the audio unit to ensure that the audio unit is not damaged during removal of the **fascia/crash** padding console.

Cover the front of the three segments of the audio unit with adhesive tape.

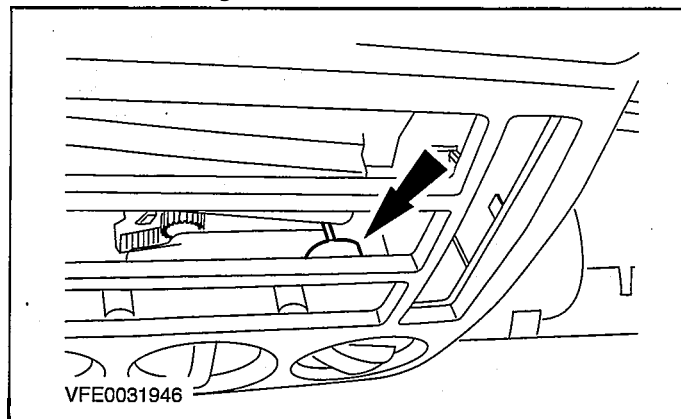


14. Pull the **fascia/crash** padding console forwards to gain access to the heater/air conditioning control unit.

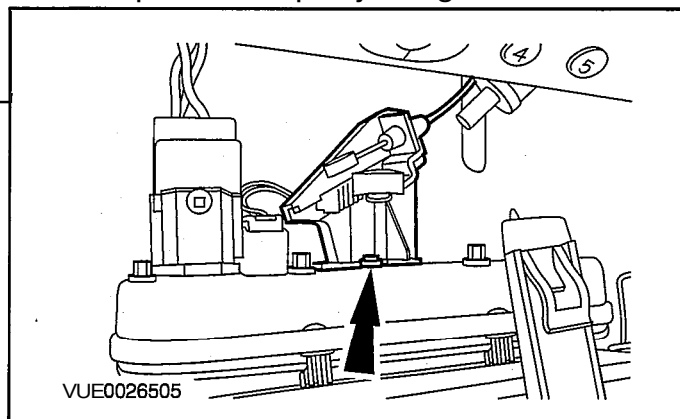


15. Detach the shaft of the air distribution flap from the heater/air conditioning control unit.

- Turn the air distribution rotary control while detaching the shaft.



16. Unscrew and remove the bolt for the temperature flap adjusting mechanism.



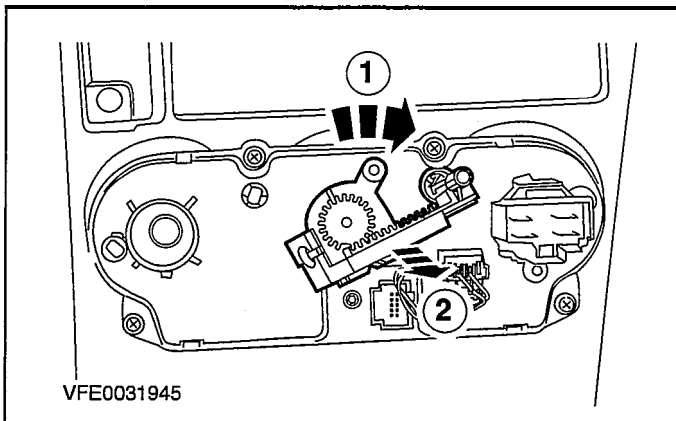
17. **CAUTION:** Do not kink the actuation cable for the temperature flap adjusting mechanism.

Detach the temperature flap adjusting mechanism from the heater/air conditioning control unit (heater/air conditioning control unit shown from the rear for clarity).

1. Rotate the adjusting mechanism clockwise.

REMOVAL AND INSTALLATION

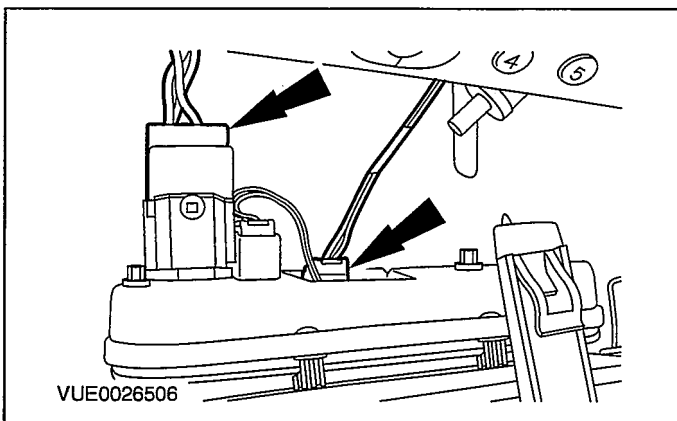
2. Pull out the adjusting mechanism.



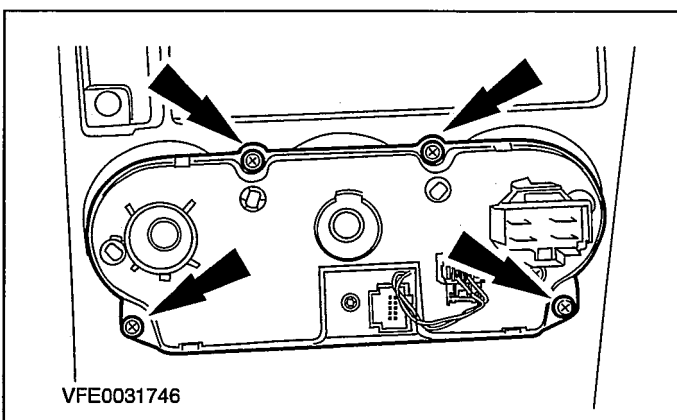
⚠ **Do** not kink the actuation cable for the temperature flap adjusting mechanism.

Refit the components in reverse order.

18. Unplug the connector from the heater/air conditioning control unit and remove the **fascia/crash** padding console.



19. Remove the heater/air conditioning control unit.



Installation

1. CAUTIONS:

⚠ **Ensure** that the shaft of the air distribution flap engages properly in the adjusting mechanism on the heater core / evaporator housing.

REMOVAL AND INSTALLATION

Climate Control Assembly — Vehicles Built From:
10/2005(34 300 0)

Removal

All vehicles

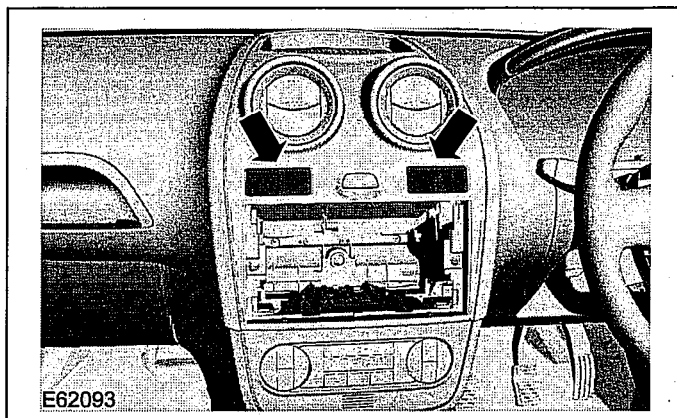
■ Remove the audio unit.

For additional information, refer to: Audio Unit -Vehicles Built From: **10/2005** (415-01 Audio Unit, Removal and Installation).

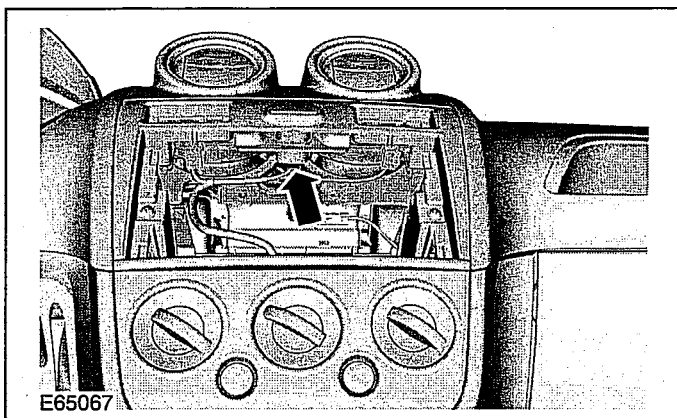
2.  **CAUTION:**Support the screwdriver on suitable padding to avoid damage to the dashboard console.

Remove the dashboard console switches.

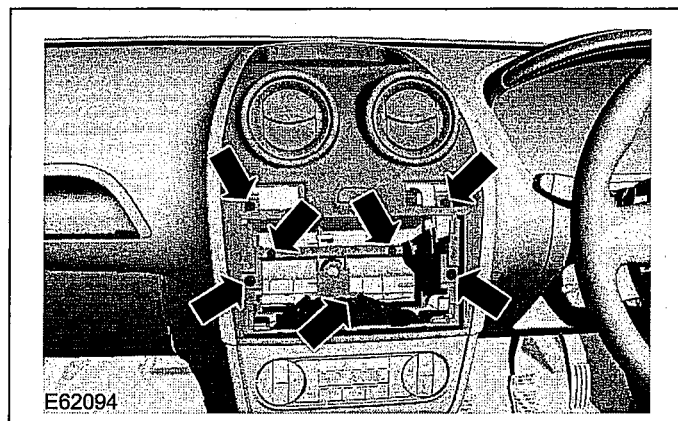
- Disconnect the electrical connector.



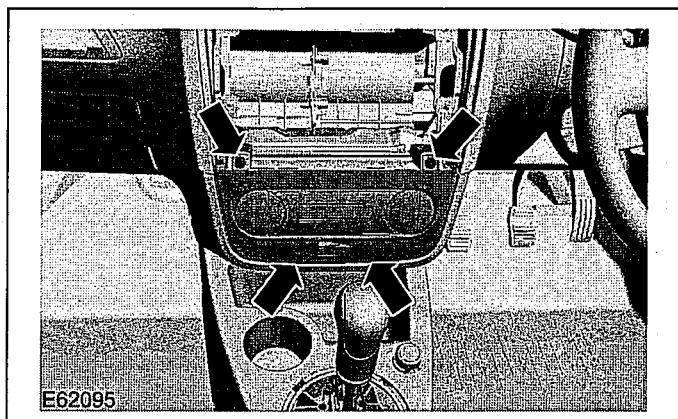
3. Disconnect the hazard warning switch connector.



4. Remove the dashboard console.



5. Detach the surround for the air conditioning system control panel and the air conditioning system control panel from the dashboard.

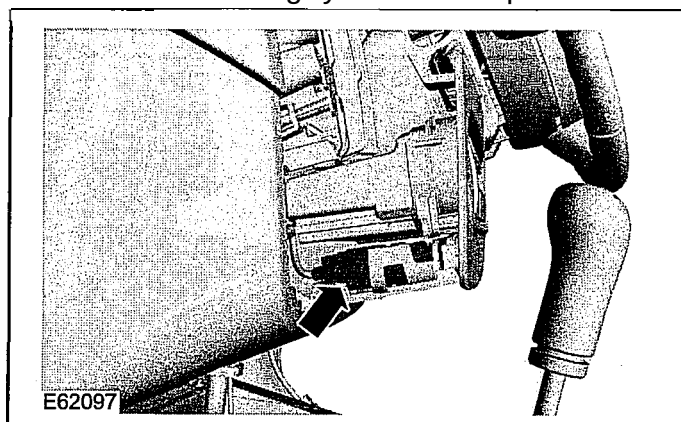


Vehicles with automatic temperature control (EATC)

6. Remove the surround for the air conditioning system control panel and the air conditioning system control panel.

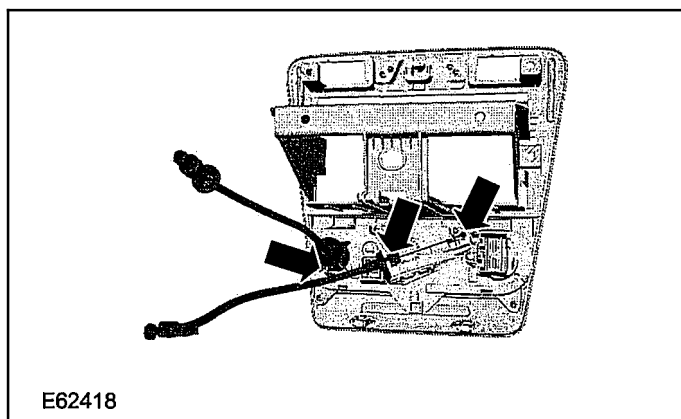
REMOVAL AND INSTALLATION

- Detach the passenger compartment temperature sensor from the surround for the air conditioning system control panel.



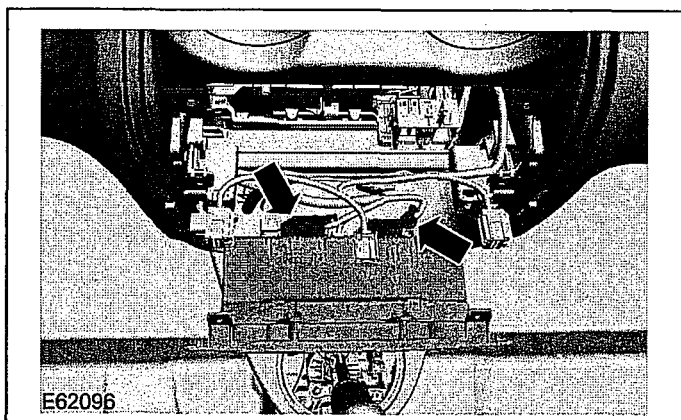
Vehicles with manual temperature control

7. Detach the shaft for the **footwell** ventilation/air guidance air distribution flap and the temperature control air distribution flap actuation cable from the air conditioning system control panel.

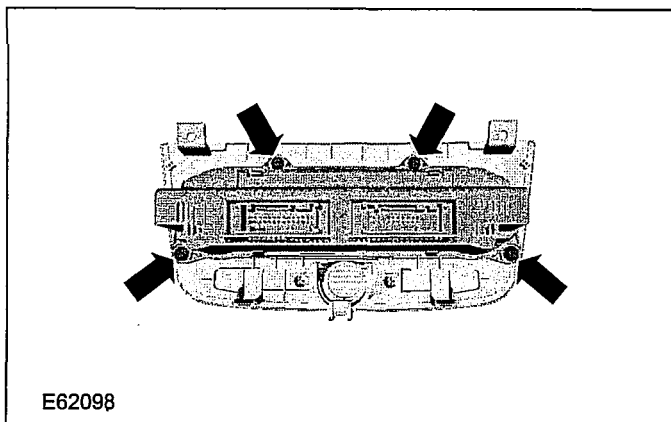


All vehicles

8. Disconnect the connector for the air conditioning system control panel.



9. Remove the air conditioning system control panel.



Installation

■ CAUTIONS:

⚠ Ensure that the shaft of the air **distribution flap engages properly in the adjusting mechanism on the heater / evaporator housing.**

⚠ Do not kink the actuation cable for the temperature flap adjusting mechanism.

To install, reverse the removal procedure.

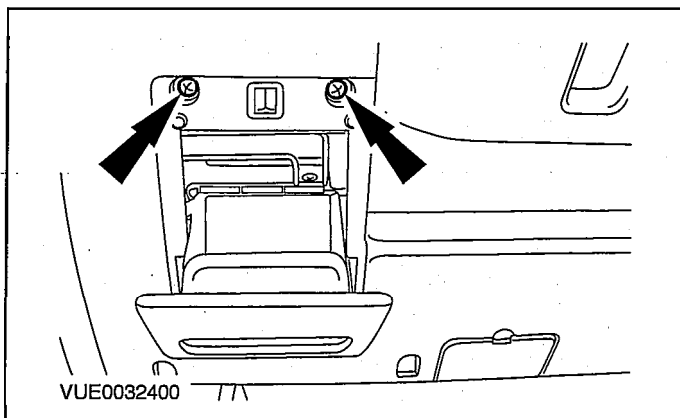
REMOVAL AND INSTALLATION

Blower Motor Switch(33 574 0)

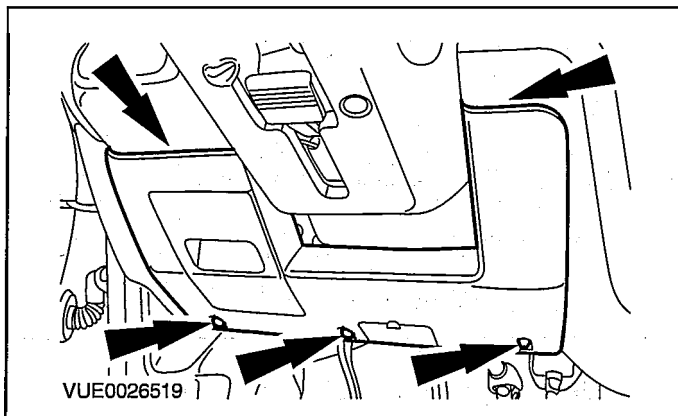
Removal

All vehicles

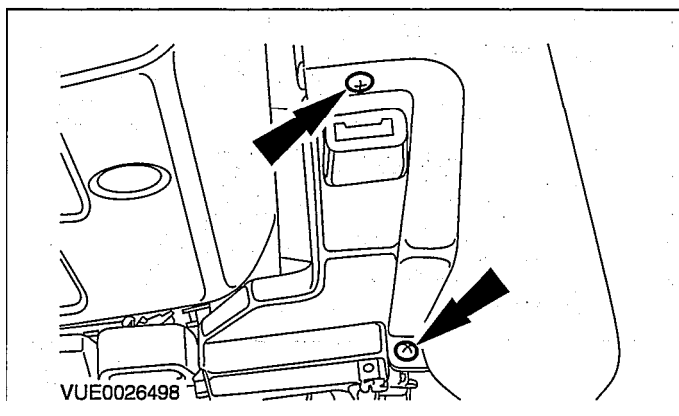
1. Open the stowage compartment and unscrew and remove the bolts from the lower fascialcrash padding trim.



2. Remove the lower fascialcrashpadding trim.



3. Unscrew and remove the left-hand bolts from the fascialcrash padding console.

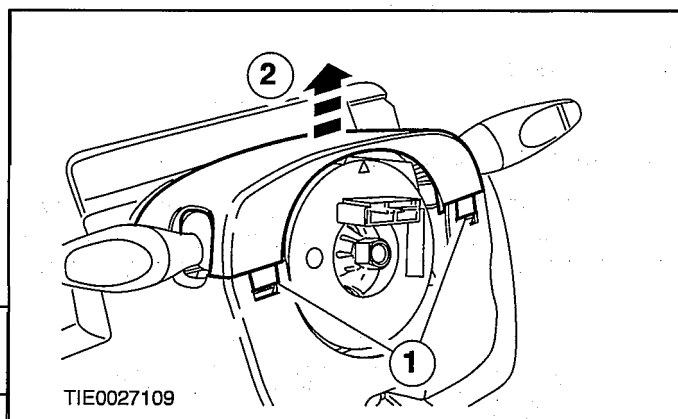


RHD vehicles

4. **NOTE:** Turn the steering wheel to gain access to the clips on the upper steering column trim.

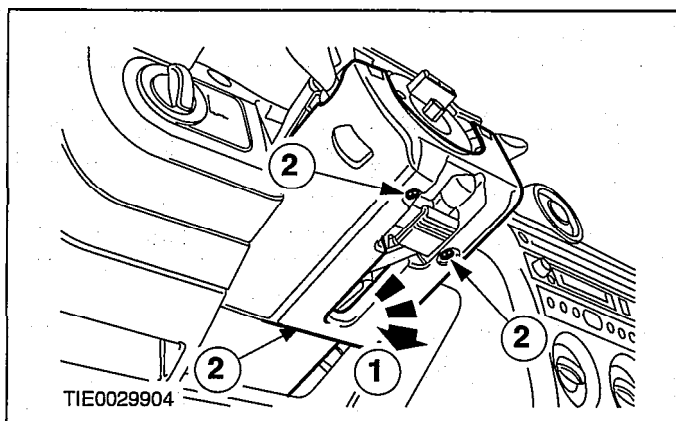
Detach the upper steering column trim from the lower steering column trim (steering wheel shown removed for clarity).

1. Use a narrow screwdriver to release the clips.
2. Detach the trim.



5. Remove the lower steering column trim (steering wheel shown removed for clarity).

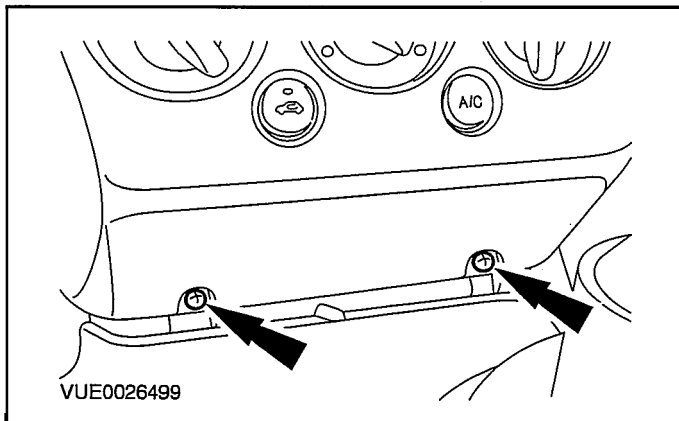
1. Release the steering column locking lever.
2. Unscrew the bolts.



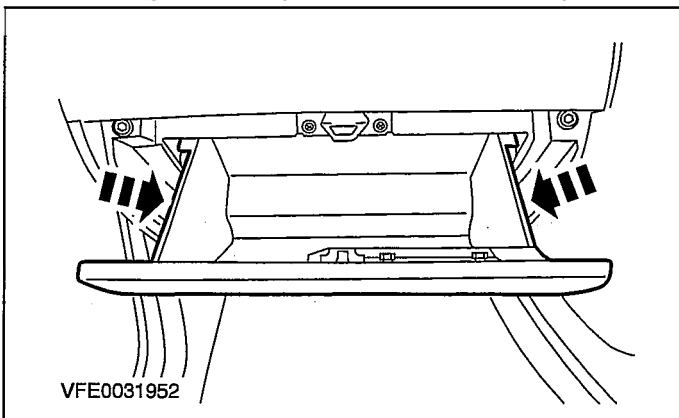
REMOVAL AND INSTALLATION

All vehicles

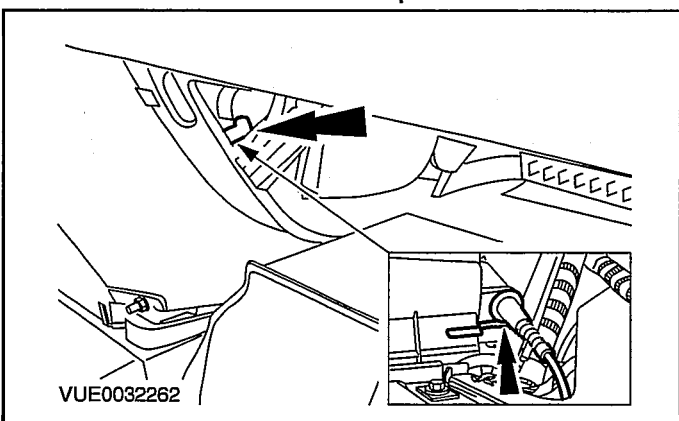
6. Unscrew and remove the lower bolts from the fascialcrash padding console.



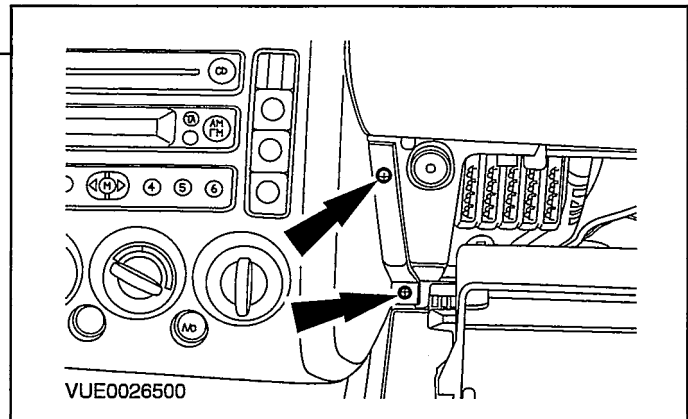
7. Fully open the glove compartment.
 - Press the sides towards the centre to release the glove compartment from the stops.



8. Detach the shaft of the air distribution flap from the adjusting mechanism on the heater core / evaporator housing.
 - Release the catch and pull out the shaft.

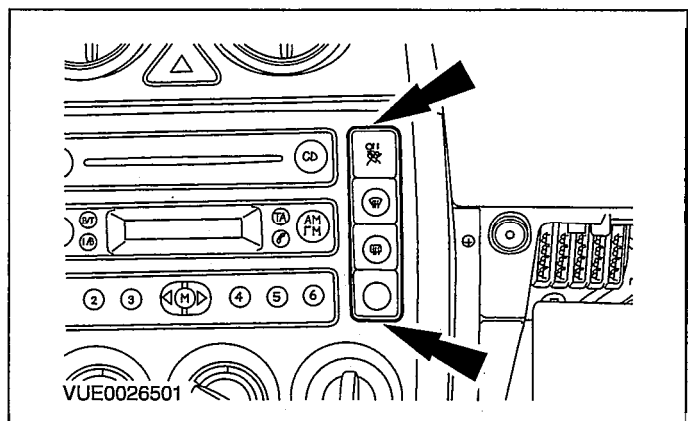


9. Unscrew and remove the right-hand bolts from the fascialcrash padding console.

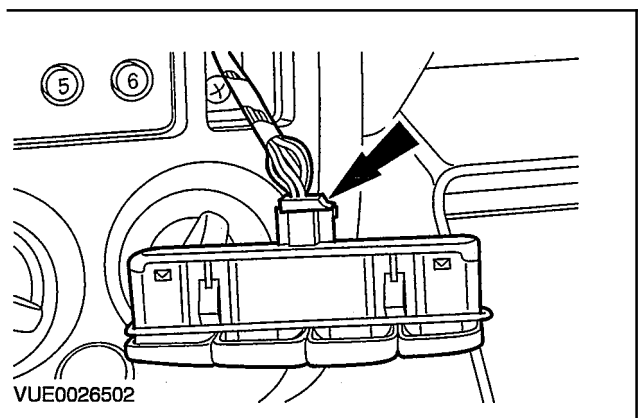


10. **CAUTION:** Support the screwdriver on suitable padding to avoid damaging the fascialcrash padding console.

Detach the switches from the fascialcrash padding console.

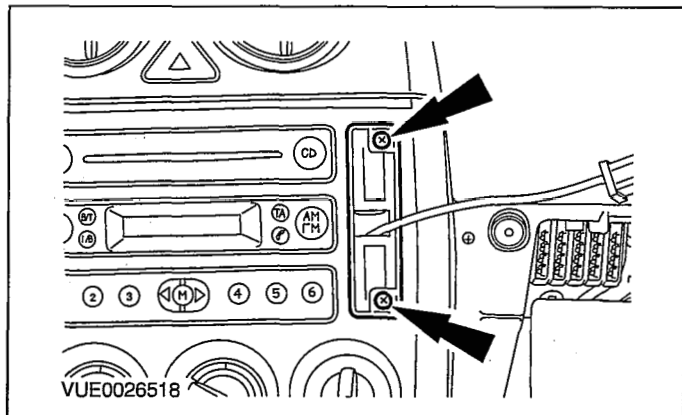


11. **Unplug the connector and remove the switches.**



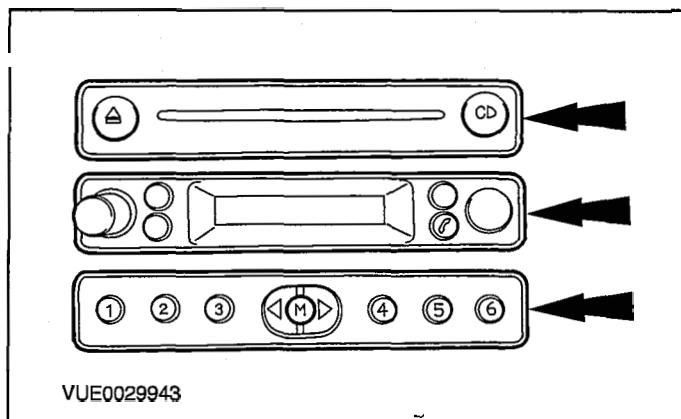
REMOVAL AND INSTALLATION

12. Unscrew and remove the upper bolts from the **fascia/crash** padding console.

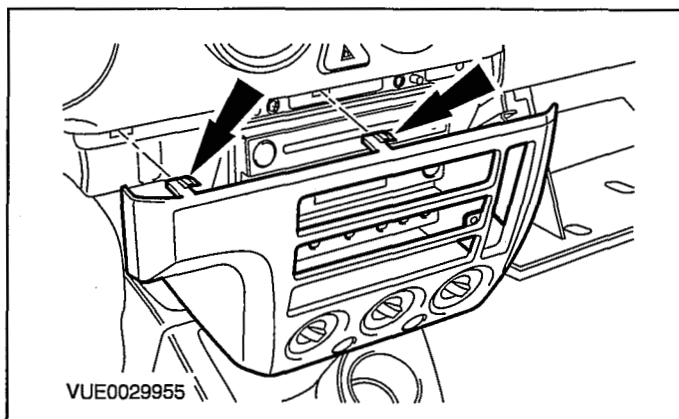


13. **CAUTION:** Use adhesive tape on the three segments of the audio unit to ensure that the audio unit is not damaged during removal of the **fascia/crash** padding console.

Cover the front of the three segments of the audio unit with adhesive tape.

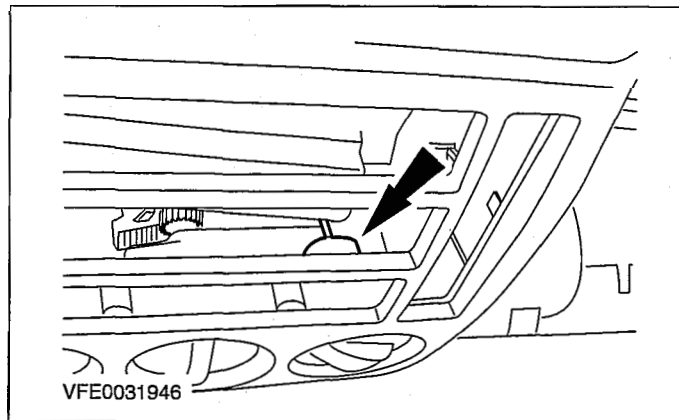


14. Pull the fascialcrash padding console forwards to gain access to the heater/air conditioning control unit.

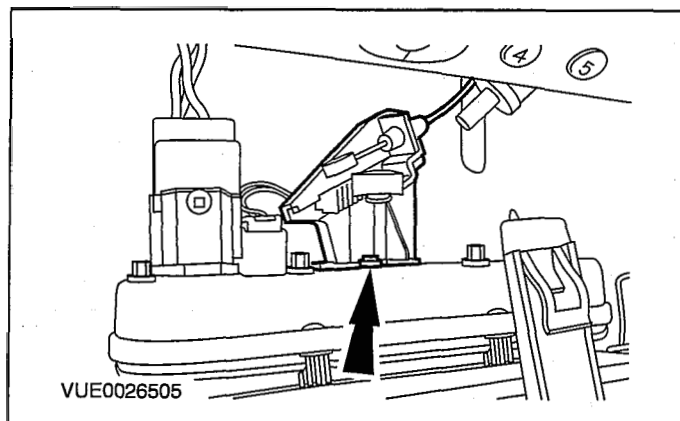


15. Detach the shaft of the air distribution flap from the heater/air conditioning control unit.

- Turn the air distribution rotary control while detaching the shaft.



16. Unscrew and remove the bolt for the temperature flap adjusting mechanism.



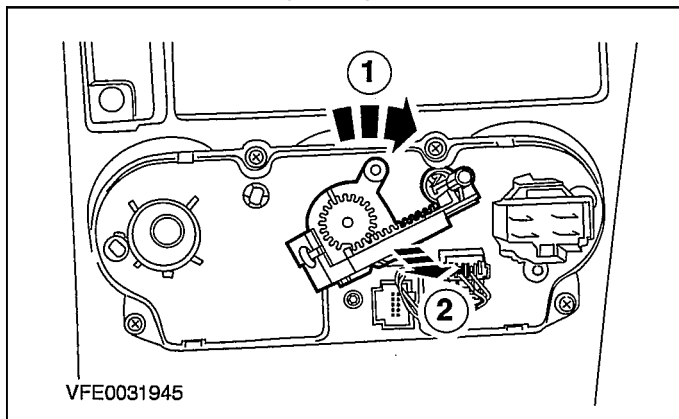
17. **CAUTION:** Do not kink the actuation cable for the temperature flap adjusting mechanism.

Detach the temperature flap adjusting mechanism from the heater/air conditioning control unit (**heater/air** conditioning control unit shown from the rear for clarity).

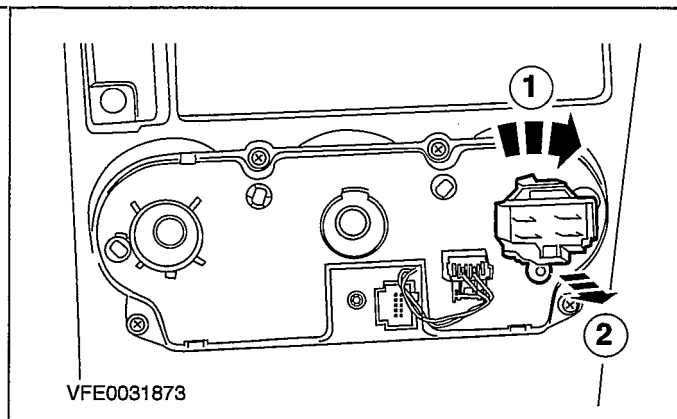
1. Rotate the adjusting mechanism clockwise.

REMOVAL AND INSTALLATION

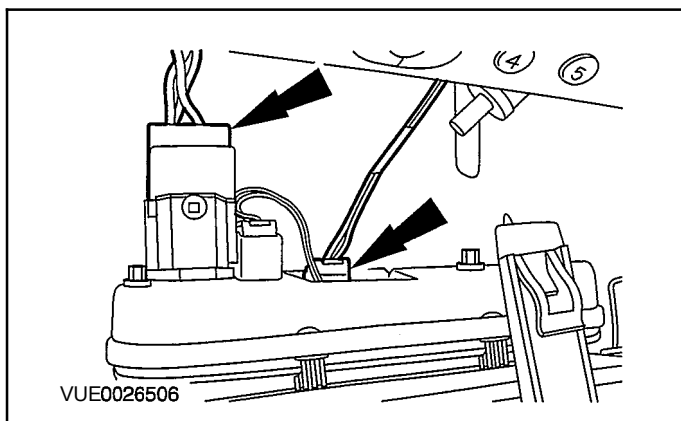
2. Pull out the adjusting mechanism.



2. Pull out the switch.



18. Unplug the connector from the heater/air conditioning control unit and remove the fascia/crash padding console.



Installation

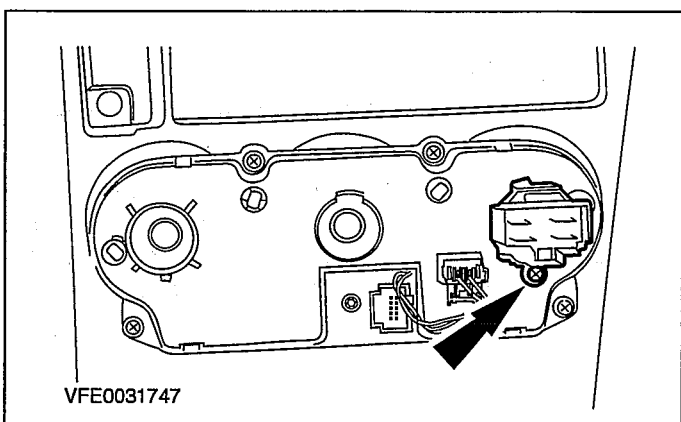
■ CAUTIONS:

⚠ **Ensure** that the shaft of the air distribution flap engages properly in the adjusting mechanism on the heater core / evaporator housing.

⚠ **Do not** kink the actuation cable for the temperature flap adjusting mechanism.

Refit the components in reverse order.

19. Unscrew and remove the bolt from the blower motor switch.



20. Remove the blower motor switch.

■ Rotate the switch clockwise.

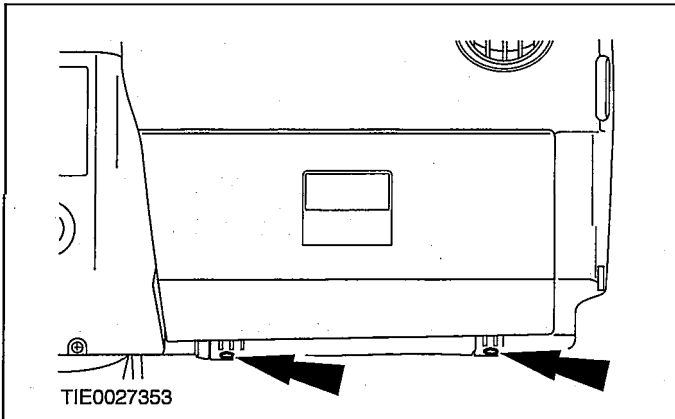
REMOVAL AND INSTALLATION

Air Inlet Blend Door Actuator

Removal

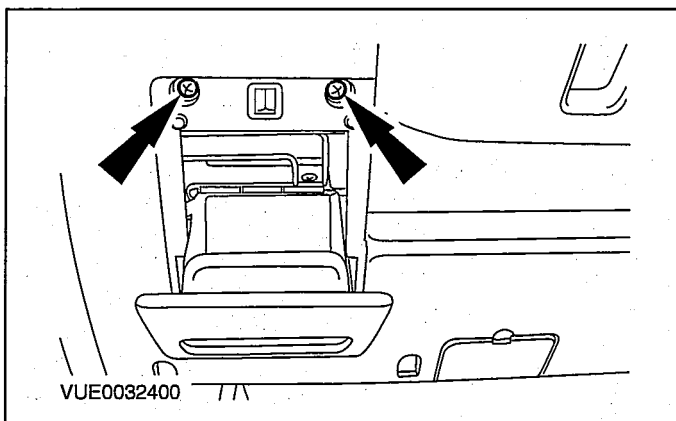
Left-hand drive vehicles.

- Remove the glove compartment.

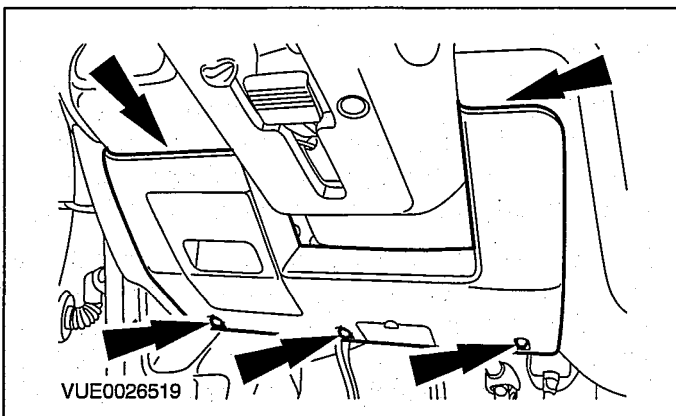


RHD vehicles

- 2. Open the stowage space and remove the screws for the dashboard lower trim.



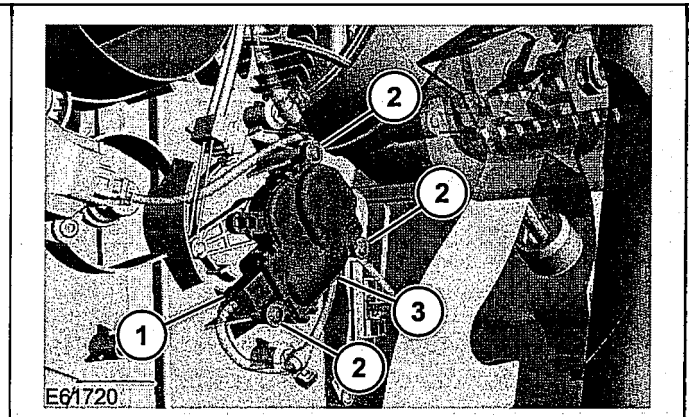
- 3. Detach the dashboard lower trim from the dashboard.



All vehicles

- 4. Remove the actuator - air distribution flap.

1. Disconnect the connector for the air distribution flap actuator.
2. Remove the screws.
3. Remove the air distribution flap actuator from the flap shaft.



Installation

1. **NOTE:** After installing the air distribution flap actuator, initialise the air distribution flap actuator using the air conditioning system control panel. To do this, press the "Footwell" and "OFF" buttons simultaneously, then press the "Auto" button.

To install, reverse the removal procedure.

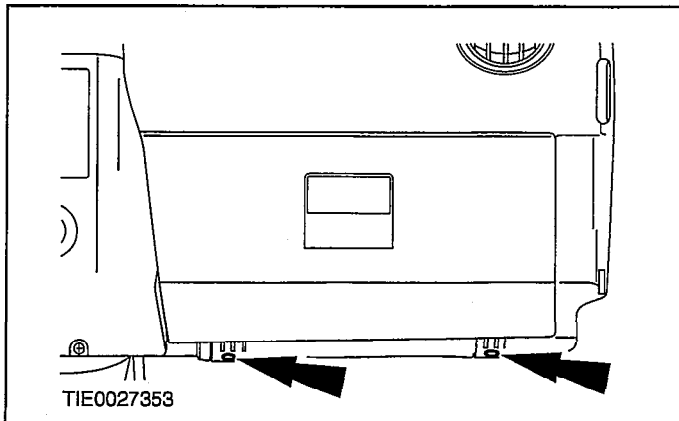
REMOVAL AND INSTALLATION

Temperature Blend Door Actuator(34 590 0)

Removal

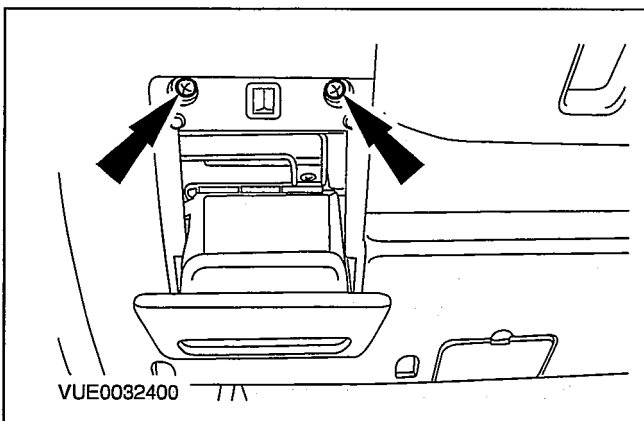
Left-hand drive vehicles.

- Remove the glove compartment.

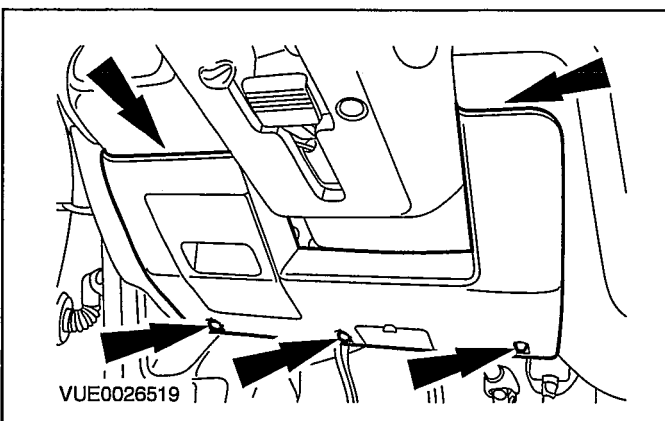


RHD vehicles

2. Open the stowage space and remove the screws for the dashboard lower trim.

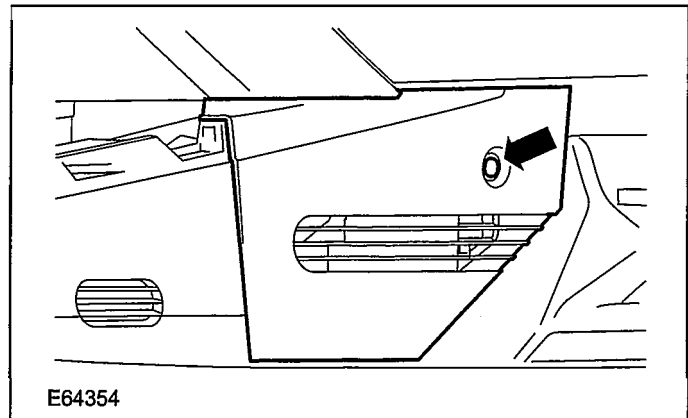


3. Detach the dashboard lower trim from the dashboard.



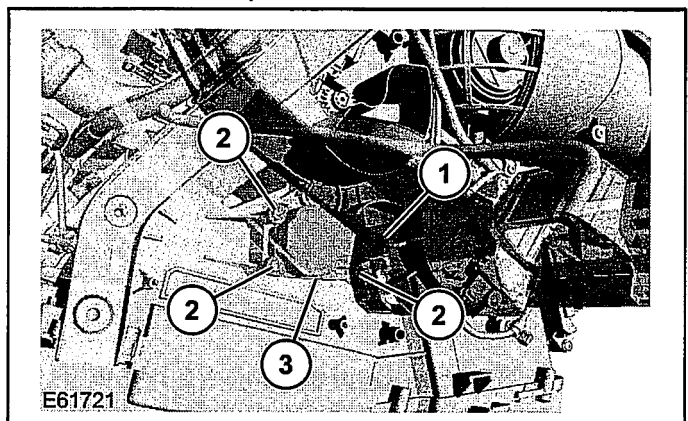
All vehicles

4. Detach the centre console side trim on the right-hand side.



5. Remove the temperature control flap actuator.

1. Disconnect the electrical connector of the temperature control flap actuator.
2. Remove the screws.
3. Pull off the temperature control flap actuator from the flap shaft.



Installation

1. **NOTE:** During installation of the temperature control flap actuator, ensure that the end positions of both toothed segments are correctly positioned in relation to each other.

NOTE: After installing the temperature control flap actuator, initialize the temperature control flap actuator using the air conditioning system control panel. To do this, press the "Footwell" and "OFF" buttons simultaneously, then press the "Auto" button.

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Footwell Vent/Duct Blend Door Actuator

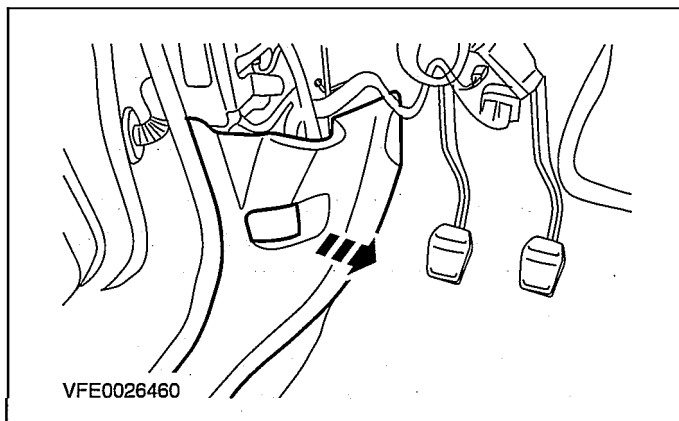
Removal

1. Remove the instrument panel.

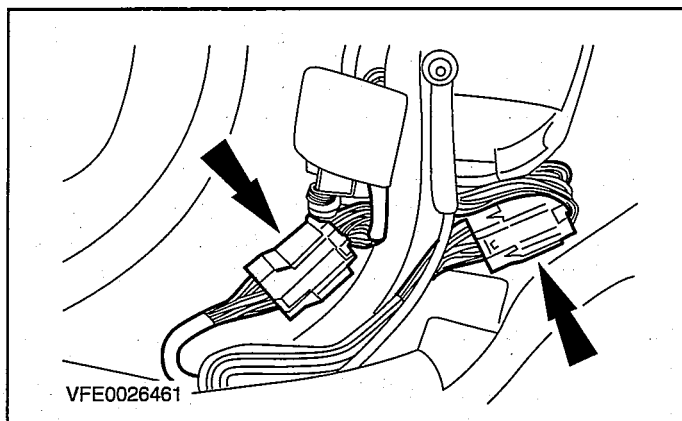
For additional information, refer to:

Instrument panel (501-12, Removal and Installation).

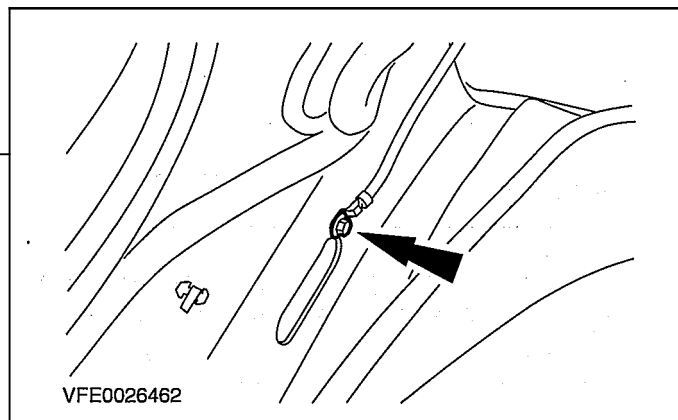
2. Unclip part of the left-hand **footwell** trim.



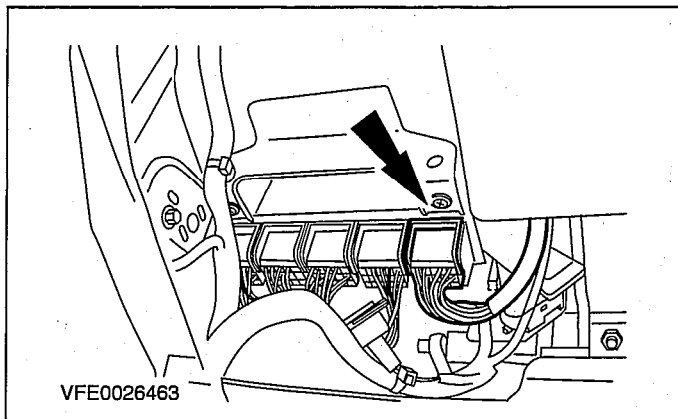
3. Disconnect the left-hand connector of the instrument panel wiring harness (the **footwell** trim is shown removed for clarity).



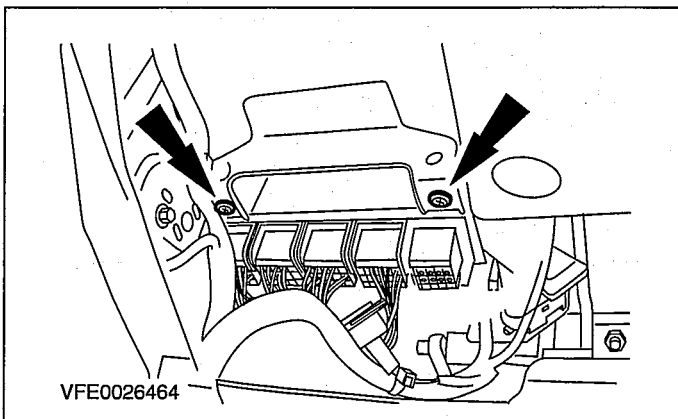
4. Remove the ground strap bolt in the left-hand footwell.



5. Disconnect the connector of the generic electronic module (GEM).

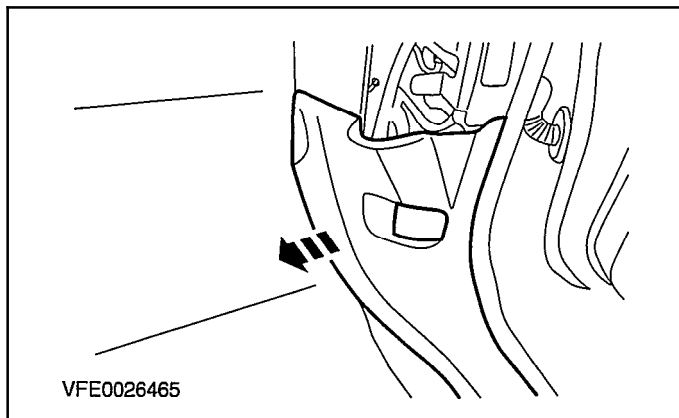


6. Detach the GEM from the dashboard crossmember and lay it to one side.

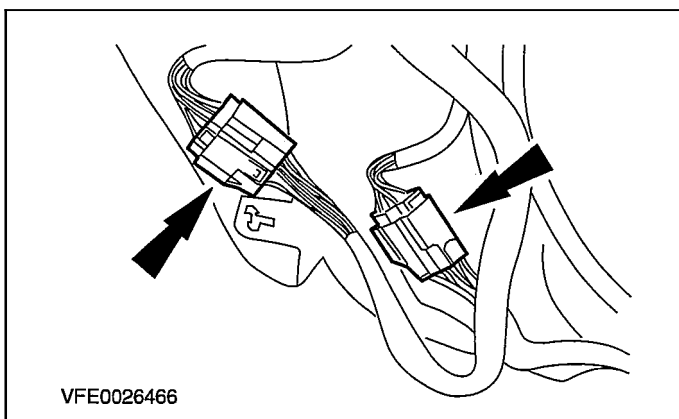


REMOVAL AND INSTALLATION

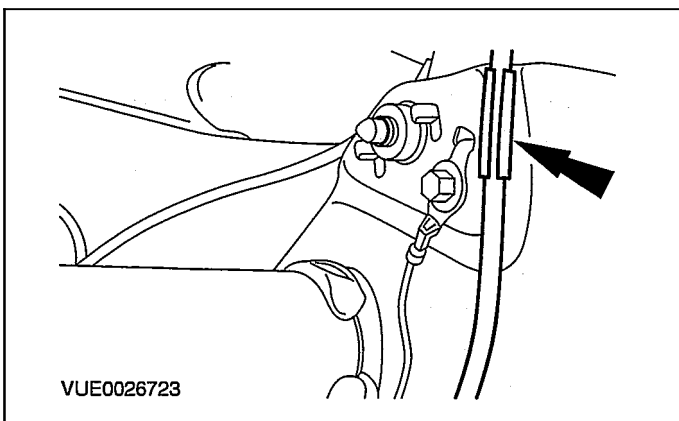
7. Unclip part of the right-hand **footwell** trim.



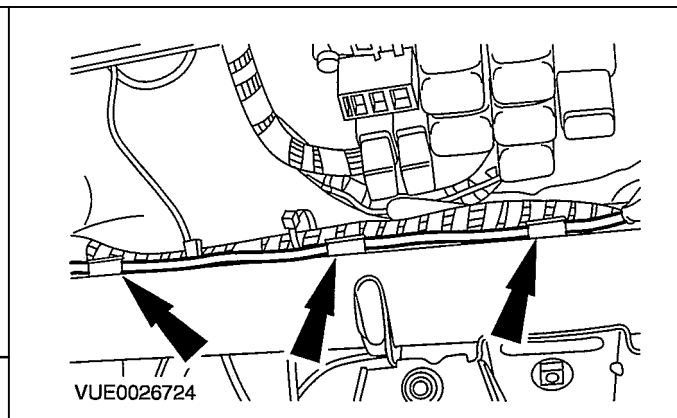
8. Disconnect the right-hand connector of the instrument panel wiring harness (the **footwell** trim is shown removed for clarity).



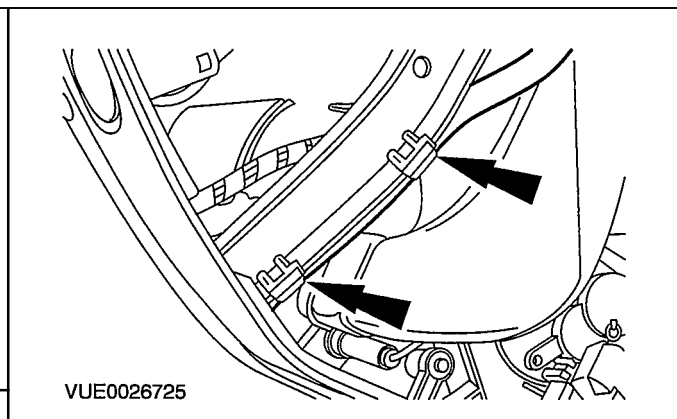
9. Detach the antenna cable from the right-hand upper clip on the dashboard crossmember.



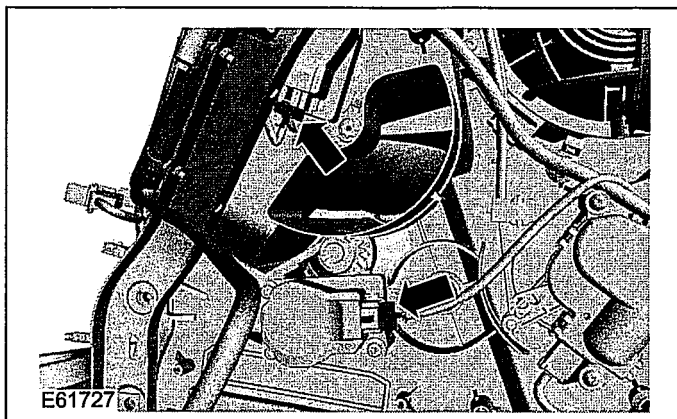
10. Detach the antenna cable from the right-hand lower clips on the dashboard crossmember.



11. Detach the antenna cable from the centre clips on the dashboard crossmember.

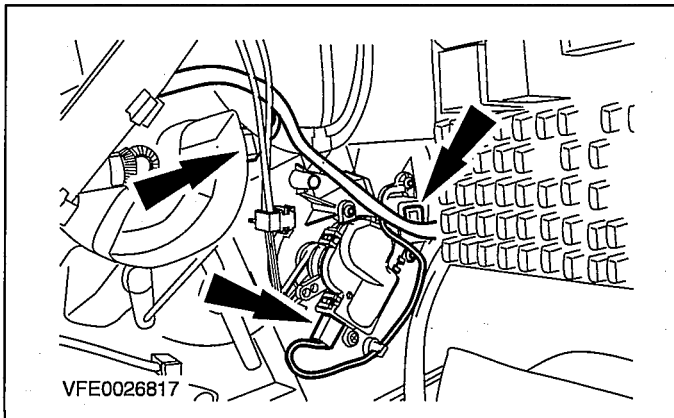


12. Remove the connector of the air duct actuator for the **footwell ventilation/air** distribution flap and the connector of the temperature control actuator for the air distribution flap.

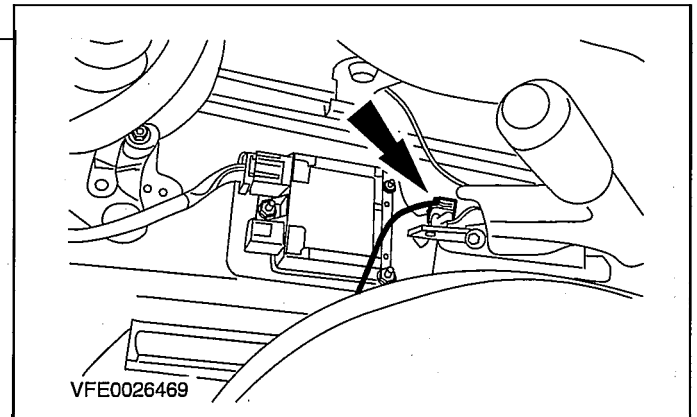


REMOVAL AND INSTALLATION

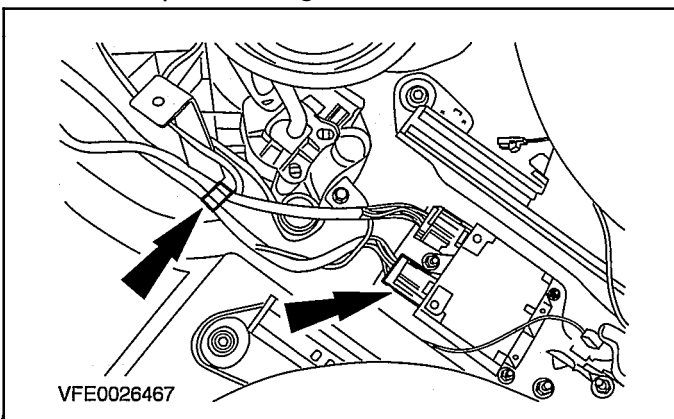
13. Remove the blower motor connector, blower motor resistor connector and air distribution flap actuator connector.



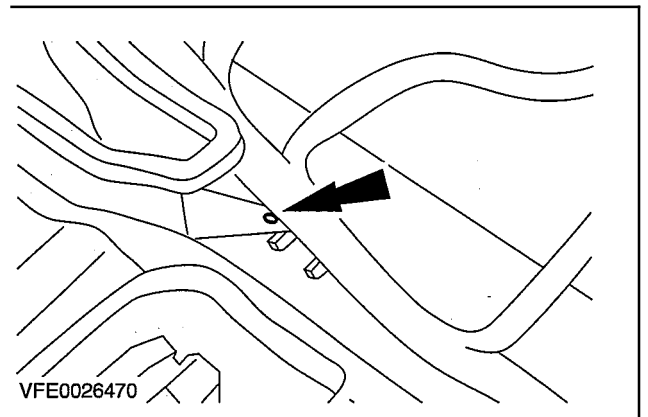
16. Disconnect the connector of the handbrake warning lamp switch.



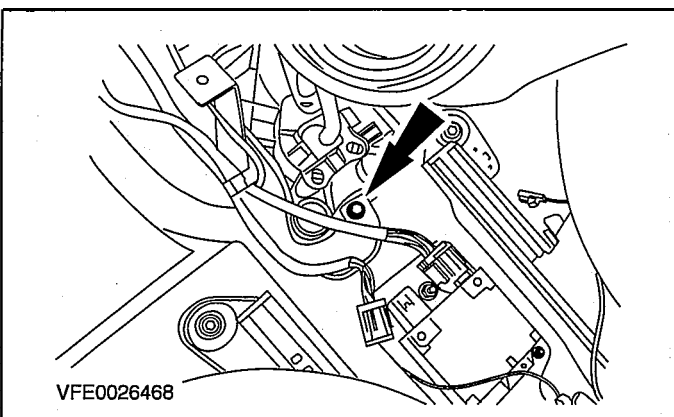
14. Disconnect the **airbag** module connector.
- Unclip the wiring harness.



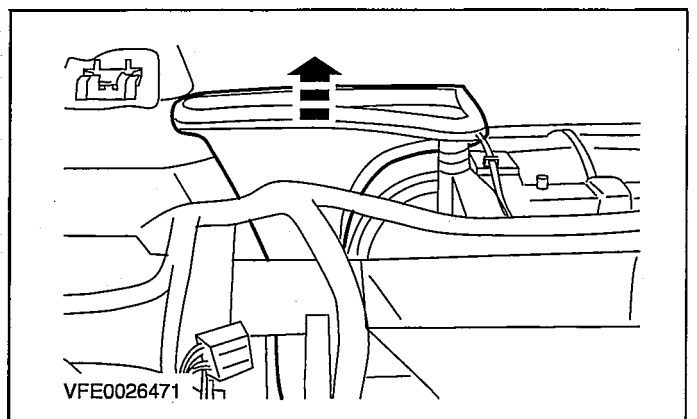
17. Remove the bolts of the windshield air ducts (left-hand side shown).



15. Unscrew and remove the ground cable bolt from the **airbag** module.

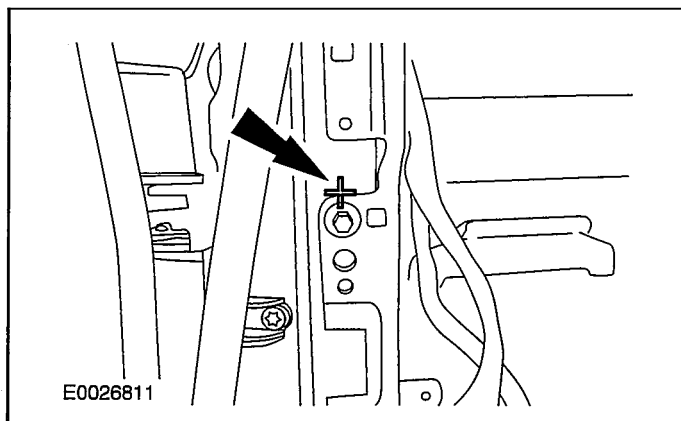


18. Remove the windshield air ducts (left-hand side shown).

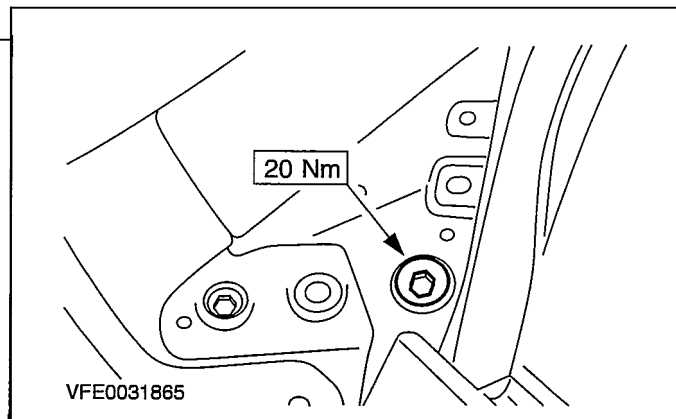


REMOVAL AND INSTALLATION

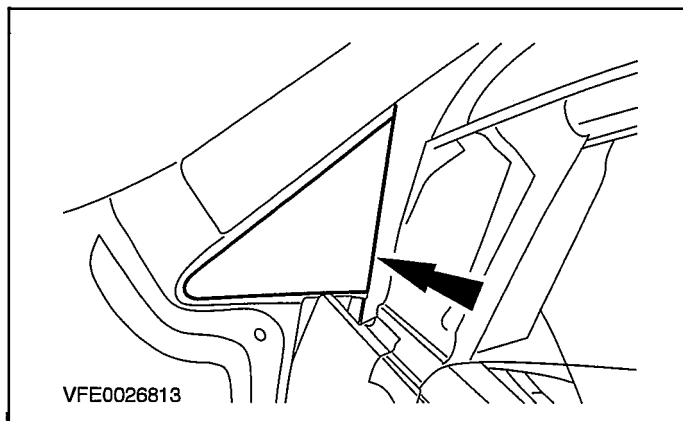
19. Mark the position of the dashboard crossmember relative to the A-pillars (left-hand side shown).



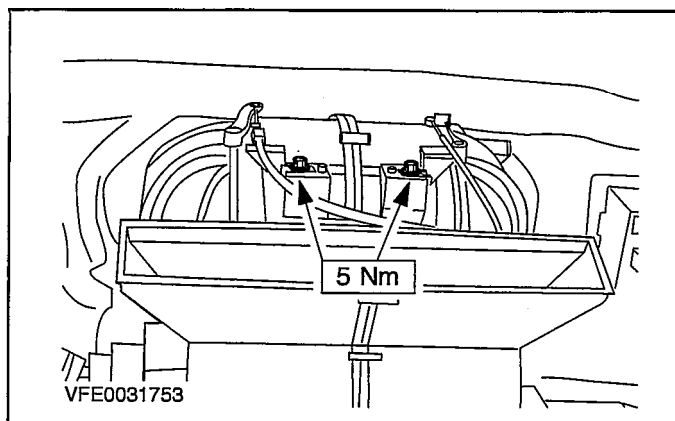
22. Remove the side bolts of the dashboard crossmember.



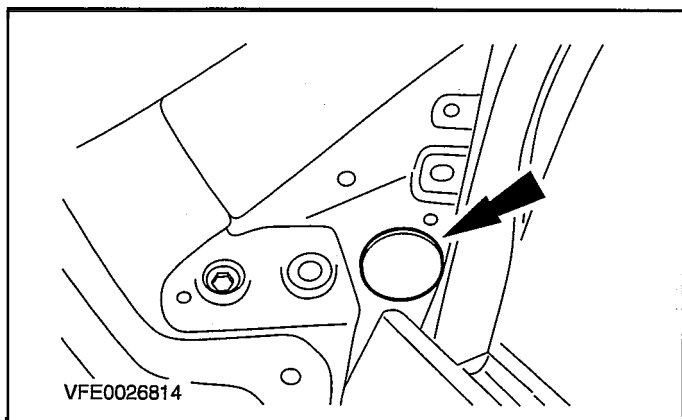
20. Remove the A-pillar outer trims (left-hand side shown).



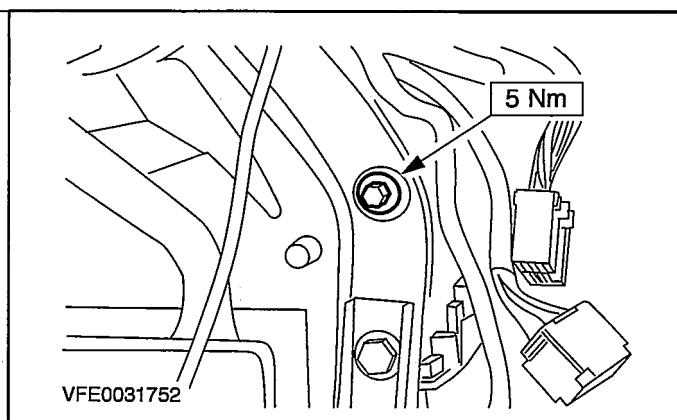
23. Remove the upper bolts of the heater core evaporator housing.



21. Remove the caps (left side shown).

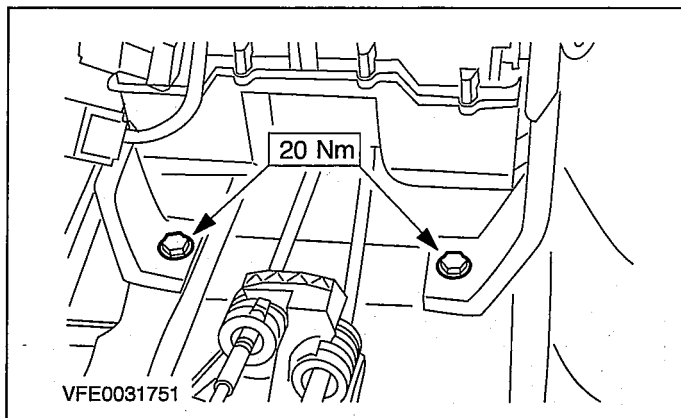


24. Remove the side bolts from the heater core evaporator housing (left side shown).

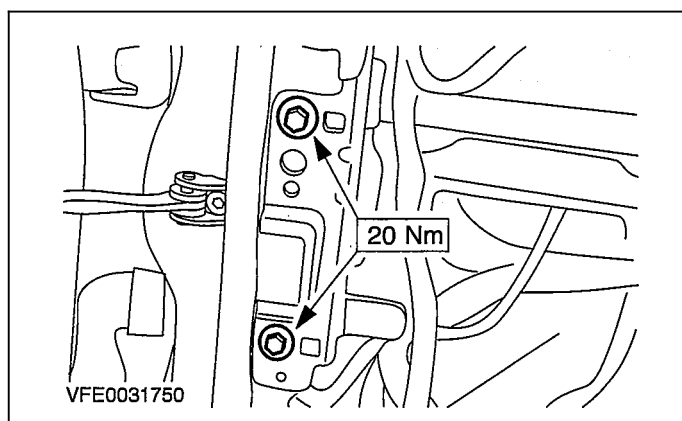


REMOVAL AND INSTALLATION

- 25. Remove the lower bolts of the dashboard crossmember.**

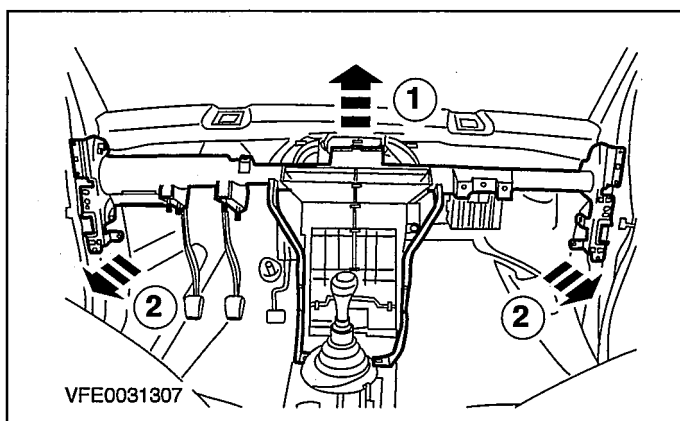


- 26. Remove the dashboard crossmember upper bolts.**



- 27. Remove the dashboard crossmember.**

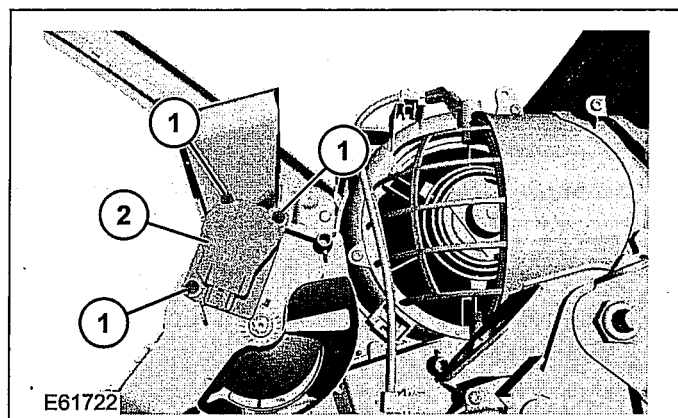
1. Lift the dashboard crossmember.
2. Pull the dashboard crossmember rearwards.



- 28. Remove the air duct actuator for the footwell ventilation/air distribution flap.**

1. Remove the screws.

2. Remove the air duct actuator for the footwell ventilation/air distribution flap from the flap shaft.

**Installation**

- To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Center Register Air Discharge Temperature Sensor

Removal

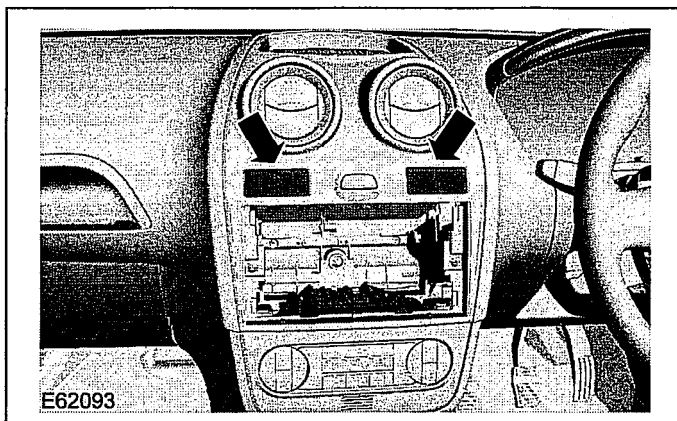
1. Detach the audio unit.

For additional information, refer to:
Audio Unit - Vehicles Built From: 1012005
(415-01, Removal and Installation).

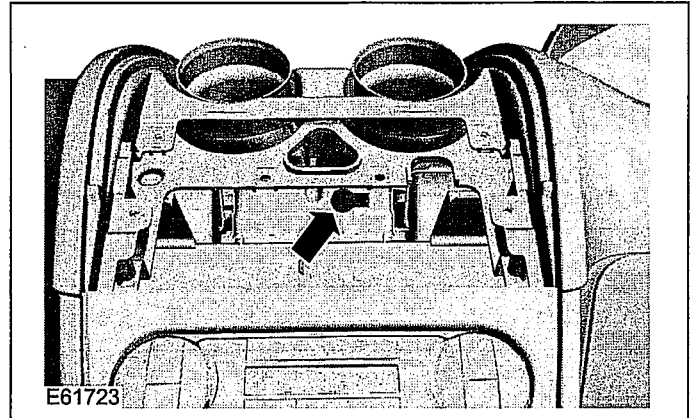
2. **⚠ CAUTION:** Support the screwdriver on suitable padding to avoid damaging the dashboard console.

Remove the dashboard console switch.

1. Detach the connector.



- Turn the sensor clockwise through 90 degrees and pull it out of the heater core/evaporator housing.

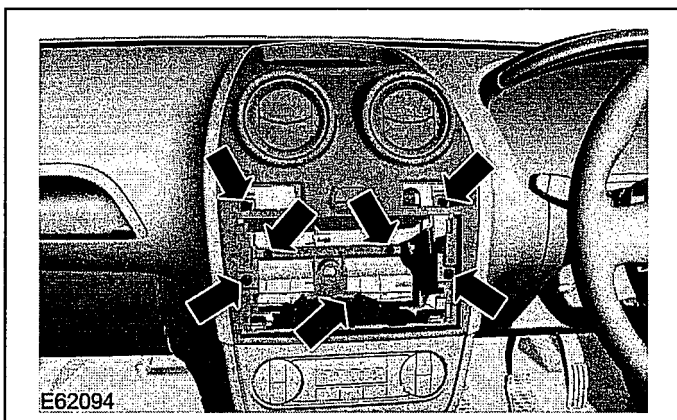


Installation

- To install, reverse the removal procedure.

3. Remove the dashboard console.

- Disconnect the hazard warning switch connector.



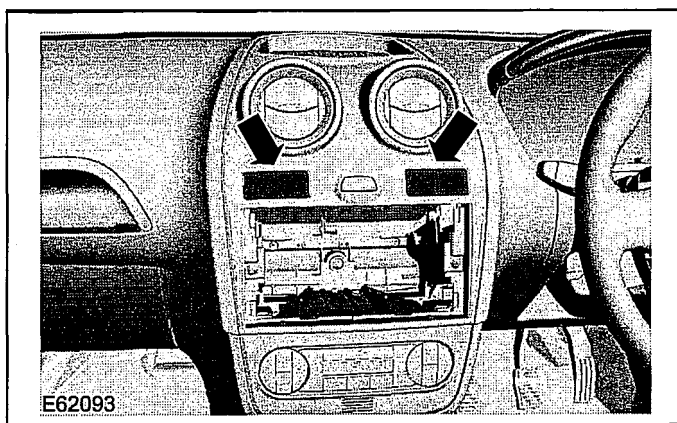
4. Remove the air outlet temperature sensor, centre nozzles.

REMOVAL AND INSTALLATION**Footwell Air Discharge Temperature Sensor****Removal****1. Detach the audio unit.**

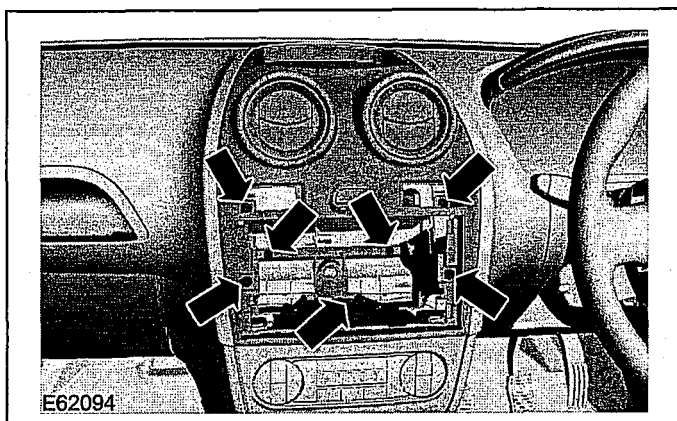
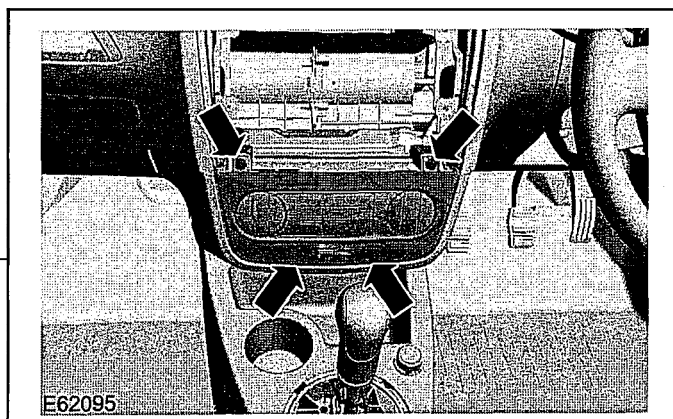
For additional information, refer to:
Audio Unit - Vehicles Built From: **0812005**
(415-01. Removal and Installation).

2. ⚠ CAUTION: Support the screwdriver on suitable padding to avoid damaging the dashboard console.

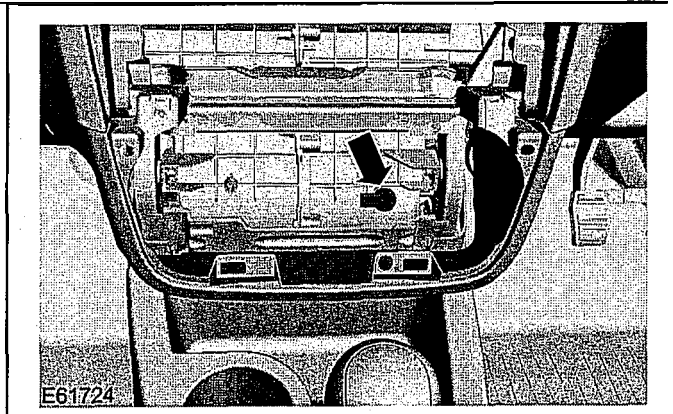
Remove the dashboard console switch.

1. Detach the connector.**3. Remove the dashboard console.**

- Disconnect the hazard warning switch connector.

**4. Detach the surround for the air conditioning system control panel and the air conditioning system control panel from the dashboard and pull forwards.****5. Remove the air outlet temperature sensor, footwell.**

- Turn the sensor clockwise through 90 degrees and pull it out of the heater core/evaporator housing.

**Installation****1. To install, reverse the removal procedure.**

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SECTION 413-00 Instrument Cluster and Panel Illumination

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Instrument Cluster and Panel Illumination — Vehicles Built Up To: 1012005.....	413-00-2
Inspection and Verification.....	413-00-2
Symptom Chart.....	413-00-2
Pinpoint Tests.....	413-00-3
Instrument Cluster and Panel Illumination — Vehicles Built From: 1012005.....	413-00-13
Inspection and Verification.....	413-00-13
Symptom Chart.....	413-00-13
Pinpoint Tests.....	413-00-14

DIAGNOSIS AND TESTING

Instrument Cluster and Panel Illumination — Vehicles Built Up To:
1012005

.Refer to Wiring Diagrams Section 413-00, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Wiring harness
- Electrical connector(s)
- Light emitting diode(s) LED(s)
- Bulb(s)

Electrical
- Switch(es)
- Instrument cluster
- Audio unit
- Navigation system display
- Climate control assembly
- Digital versatile disc (DVD) player
- Selector lever
- Gearshift lever

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• The control illumination is inoperative	• Fuse. • Headlamp switch. • Circuit.	• GO to Pinpoint Test A.
• The Instrument cluster illumination is inoperative	• Circuit(s). • Instrument cluster.	• GO to Pinpoint Test B.
• The climate control/integrated control panel illumination is inoperative - vehicles without air conditioning (A/C)	• Fuse(s). • Circuit(s). • Climate control assembly.	• GO to Pinpoint Test C.
• The climate control/integrated control panel illumination is inoperative - vehicles with A/C	• Fuse(s). • Circuit(s). • Climate control assembly.	• GO to Pinpoint Test D.
• The audio unit illumination is inoperative	• Fuse(s). • Circuit(s). • Audio unit.	• GO to Pinpoint Test E.
• The hazard lamp switch illumination is inoperative	• Fuse(s). • Circuit(s). • Hazard lamp switch.	• GO to Pinpoint Test F.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The multifunction switch assembly illumination is inoperative (air bag deactivation warning, stability assist, front window defrost or rear window defrost)	- Fuse(s). - Circuit(s). - Multifunction switch assembly.	GO to Pinpoint Test G.
The navigation system display module illumination is inoperative	- Fuse(s). - Circuit(s). - Navigation System Display Module.	GO to Pinpoint Test H.
The selector lever illumination is inoperative - vehicles with 4-speed automatic transaxle (AW81-40LE)	- Fuse(s). - Circuit(s). - Selector lever.	GO to Pinpoint Test I.
The gearshift lever illumination is inoperative - vehicles with automated gearshift	- Fuse(s). - Circuit(s). - Gearshift lever.	GO to Pinpoint Test J.
The DVD player illumination is inoperative	- Fuse(s). - Circuit(s). - DVD player.	GO to Pinpoint Test K.

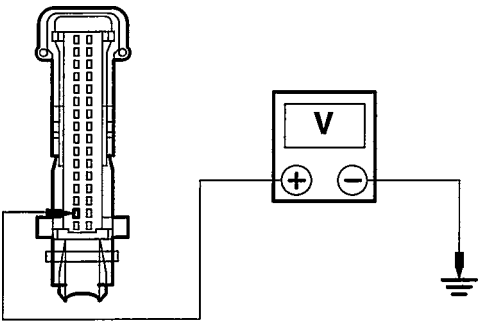
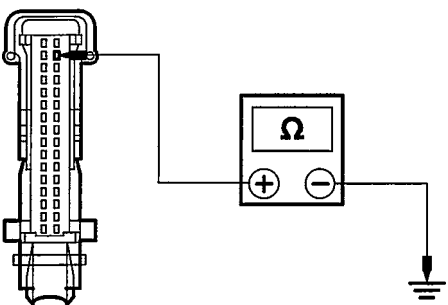
Pinpoint Tests**PINPOINT TEST A : THE CONTROL ILLUMINATION IS INOPERATIVE**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE OPERATION OF THE PARKING LAMPS	
	☒ Place the side lamps in the ON position. Does the parking lamps and license plate lamps illuminate? → Yes INSTALL a new headlamp switch. TEST the system for normal operation. → No Diagnose the exterior lighting system. REFER to: Parking, Rear and License Plate Lamps (417-01 Exterior Lighting, Diagnosis and Testing). TEST the system for normal operation.

PINPOINT TEST B : THE INSTRUMENT CLUSTER ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
BI: CHECK THE INSTRUMENT CLUSTER FOR POWER	
	☒ Disconnect Instrument Cluster C332. ☐ Turn the headlamp switch to the ON position.

DIAGNOSIS AND TESTING

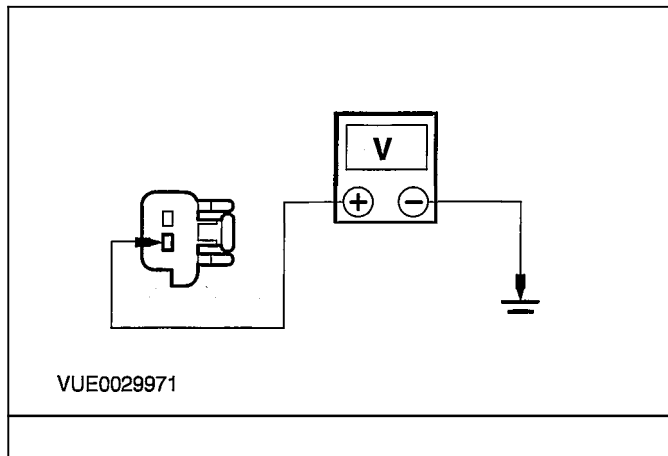
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0030286	3 Measure the voltage between the instrument cluster C332 pin 15, circuit 29S-LK19 (OGIBU), harness side and ground. - Is the voltage greater than 10 volts? → Yes GO to B2. → No REPAIR circuit 29S-LK19 (OGIBU). TEST the system for normal operation.
B2: CHECK THE INSTRUMENT CLUSTER FOR GROUND	
 VUE0030285	1 Measure the resistance between the instrument cluster C332 pin 18, circuit 31-GG11 (BK), harness side and ground. - Is the resistance less than 5 ohms? → Yes INSTALL a new instrument cluster. REFER to: Instrument Cluster - Vehicles Built Up To: 1012005 (413-01 instrument Cluster, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 31-GG11 (BK). TEST the system for normal operation.

PINPOINT TEST C : THE CLIMATE CONTROL/INTEGRATED CONTROL PANEL ILLUMINATION IS INOPERATIVE - VEHICLES WITHOUT AIR CONDITIONING (A/C)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
CI: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR POWER	
	1 Disconnect Climate Control Assembly Illumination C620. ☐ Turn the headlamp switch to the ON position.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

Measure the voltage between the climate control assembly illumination C620 pin 1, circuit 29S-LH27 (OGIGN), harness side and ground.

- Is the voltage greater than 10 volts?

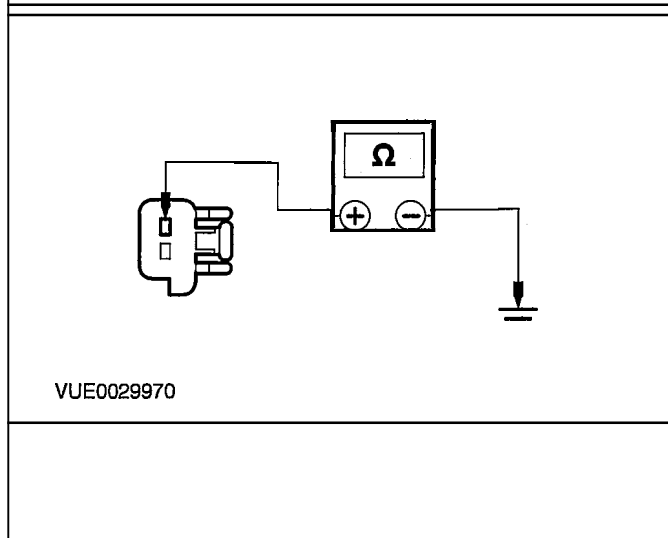
→ **Yes**

GO to C2.

→ **No**

REPAIR circuit 29S-LH27 (OGIGN). TEST the system for normal operation.

C2: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR GROUND



Measure the resistance between climate control assembly illumination C620 pin 2, circuit 31-LH27 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new climate control assembly.

REFER to: Climate Control Assembly (412-04 Control Components, Removal and Installation).

TEST the system for normal operation.

→ **No**

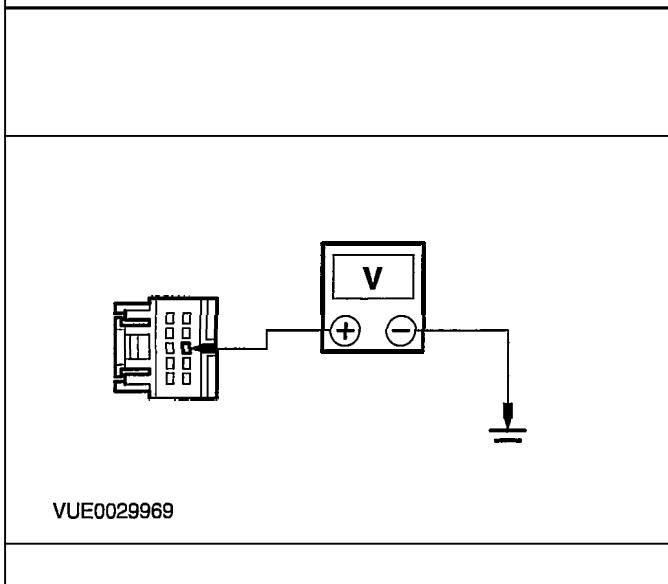
REPAIR circuit 31-LH27 (BK). TEST the system for normal operation.

PINPOINT TEST D : THE CLIMATE CONTROL/INTEGRATED CONTROL PANEL ILLUMINATION IS INOPERATIVE - VEHICLES WITH A/C

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D1: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR POWER



☐ Disconnect Climate Control Assembly C302.

Turn the headlamp switch to the ON position.

Measure the voltage between the climate control assembly C302 pin 8, circuit 29S-LH27 (OGIGN), harness side and ground.

- Is the voltage greater than 10 volts?

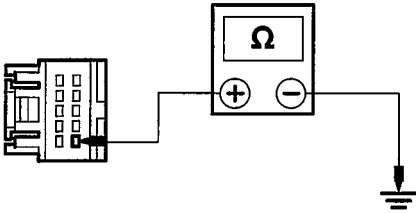
→ **Yes**

GO to D2.

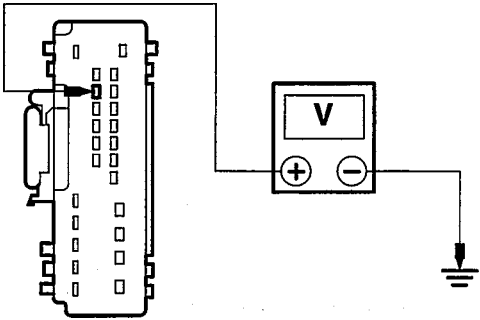
→ **No**

REPAIR circuit 29S-LH27 (OGIGN). TEST the system for normal operation.

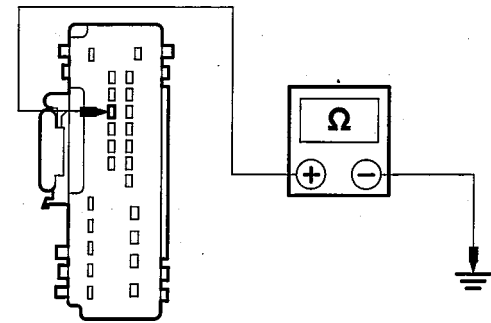
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D2: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR GROUND	
 VUE0029968	1 Measure the resistance between climate control assembly C302 pin 10, circuit 31-LH27 (BK), harness side and ground. - Is the resistance less than 5 ohms? → Yes INSTALL a new climate control assembly. REFER to: Climate Control Assembly (412-04 Control Components, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 31-LH27 (BK). TEST the system for normal operation.

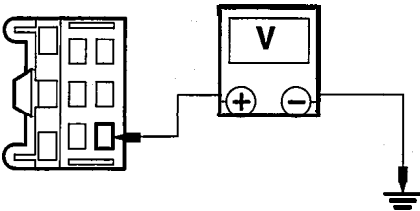
PINPOINT TEST E : THE AUDIO UNIT ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CHECK THE AUDIO UNIT ILLUMINATION FOR POWER	
 VUE0029967	1 Disconnect Audio Unit C344. 2 Turn the headlamp switch to the ON position. 3 Measure the voltage between the audio unit C344 pin 3, circuit 29S-LK34 (OGIBK) or vehicles with cellular phone, circuit 29S-LK34 (VT/YE), harness side and ground. - Is the voltage greater than 10 volts? → Yes GO to E2. → No REPAIR circuit 29S-LK34 (OGIBK). TEST the system for normal operation.

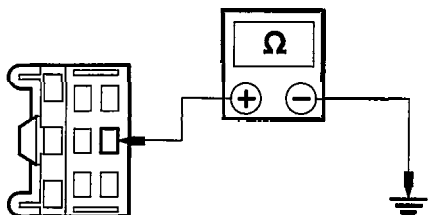
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
E2: CHECK THE AUDIO UNIT ILLUMINATION FOR GROUND			
 VUE0029966	☐ Measure the resistance between the audio unit C344 pin 4, circuit 31-LK34 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 31-LK34 (BK). TEST the system for normal operation.		

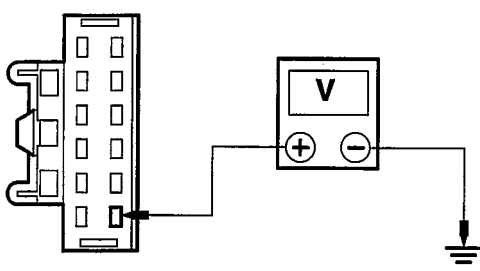
PINPOINT TEST F : THE HAZARD LAMP SWITCH ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
F1: CHECK THE HAZARD LAMP SWITCH ILLUMINATION FOR POWER			
 VUE0030290	1 Disconnect Hazard Lamp Switch C321.		
	2 Turn the headlamp switch to the ON position.		
	3 Measure the voltage between the hazard lamp switch C321 pin 6, circuit 29S-LH54 (OGIGN), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to F2. → No REPAIR circuit 29S-LH54 (OG/GN). TEST the system for normal operation.		

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F2: CHECK THE HAZARD LAMP SWITCH ILLUMINATION FOR GROUND	
 VUE0030291	1 Measure the resistance between the hazard lamp switch C321 pin 5, circuit 31-LG8 (BK), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new hazard lamp switch. TEST the system for normal operation. → No REPAIR circuit 31-LG8 (BK). TEST the system for normal operation.

PINPOINT TEST G : THE MULTIFUNCTION SWITCH ASSEMBLY ILLUMINATION IS INOPERATIVE (AIR BAG DEACTIVATION WARNING, STABILITY ASSIST, FRONT WINDOW DEFROST OR REAR WINDOW DEFROST)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: CHECK THE MULTIFUNCTION SWITCH ASSEMBLY ILLUMINATION FOR POWER	
 VUE0030292	☐ Disconnect Multifunction Switch Assembly C714.
	☐ Turn the headlamp switch to the ON position.
	3 Measure the voltage between the multifunction switch assembly C714 pin 12, circuit 29S-DK1 (OGNE), harness side and ground. • Is the voltage greater than 10 volts? → Yes GO to G2. → No REPAIR circuit 29S-DK1 (OGNE). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G2: CHECK THE MULTIFUNCTION SWITCH ASSEMBLY ILLUMINATION FOR GROUND	
VUE0030293	1 Measure the resistance between the multifunction switch assembly C714 pin 9, circuit 31-DK1 (BK), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new multifunction switch assembly. TEST the system for normal operation. → No REPAIR circuit 31-DK1 (BK). TEST the system for normal operation.

PINPOINT TEST H : THE NAVIGATION SYSTEM DISPLAY MODULE ILLUMINATION IS INOPERATIVE

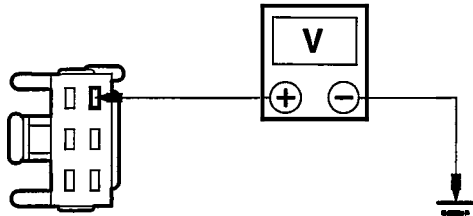
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: CHECK THE NAVIGATION SYSTEM DISPLAY MODULE ILLUMINATION FOR POWER	
E65740	1 Disconnect Navigation System Display Module C717. 2 Turn the headlamp switch to the ON position. 3 Measure the voltage between the navigation system display module C717 pin 6, circuit 29S-LK34 (OG/BK), harness side and ground. • Is the voltage greater than 10 volts? → Yes GO to H2. → No REPAIR circuit 29S-LK34 (OG/BK). TEST the system for normal operation.
H2: CHECK THE NAVIGATION SYSTEM DISPLAY MODULE ILLUMINATION FOR GROUND	
E65739	1 Measure the resistance between the navigation system display module C717 pin 8, circuit 91-MD15 (BWGN), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new navigation system display module. TEST the system for normal operation. → No REPAIR circuit 91-MD15 (BWGN). TEST the system for normal operation.

DIAGNOSIS AND TESTING

PINPOINT TEST I : THE SELECTOR LEVER ILLUMINATION IS INOPERATIVE - **VEHICLES WITH 4-SPEED AUTOMATIC TRANSAXLE (AW81-40LE)**

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

I1: CHECK THE SELECTOR LEVER ILLUMINATION FOR POWER

E65881

1 Disconnect Selector Lever C426.

☐ Turn the headlamp switch to the ON position.

3 Measure the voltage between the selector lever C426 pin 4, circuit 29S-LK21 (OGIBK), harness side and ground.

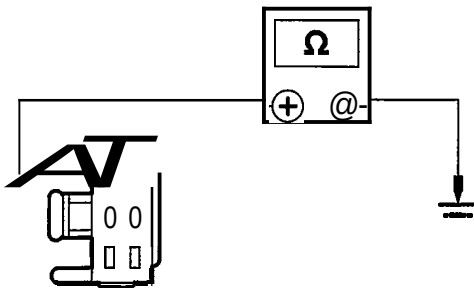
• Is the voltage greater than 10 volts?

→ **Yes**

GO to 12

→ No

REPAIR circuit 29S-LK21 (OGIBK). TEST the system for normal operation.

12: CHECK THE SELECTOR LEVER ILLUMINATION FOR GROUND

E65882

1 Measure the resistance between the selector lever C426 pin 1, circuit 31-TA35 (BK), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new selector lever.

REFER to: Selector Lever (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40), Removal and Installation).

TEST the system for normal operation.

→ No

REPAIR circuit 31-TA35 (BK). TEST the system for normal operation.

PINPOINT TEST J : THE GEARSHIFT LEVER ILLUMINATION IS INOPERATIVE - **VEHICLES WITH AUTOMATED GEARSHIFT**

TEST CONDITIONS

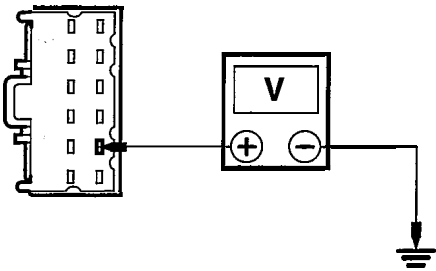
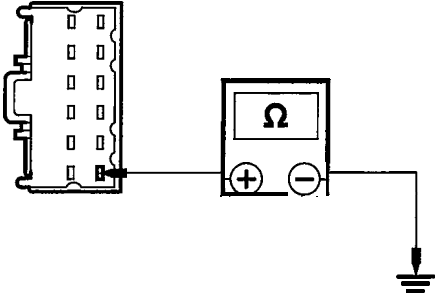
DETAILS/RESULTS/ACTIONS

J1: CHECK THE GEARSHIFT LEVER ILLUMINATION FOR POWER

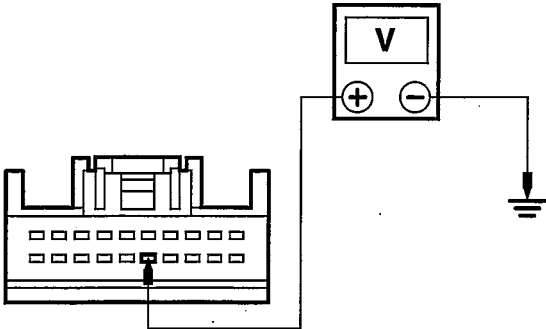
Disconnect Gearshift Lever C679.

☐ Turn the headlamp switch to the ON position.

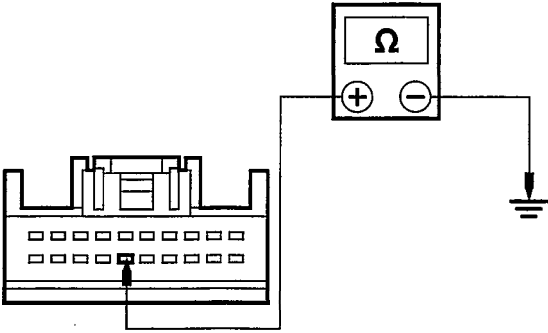
DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
 E65879		3 Measure the voltage between the gearshift lever C679 pin 11, circuit 29S-LK21 (OGIBK), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to J2. → No REPAIR circuit 29S-LK21 (OG/BK). TEST the system for normal operation.
J2: CHECK THE GEARSHIFT LEVER ILLUMINATION FOR GROUND		
 E65880		Measure the resistance between the gearshift lever C679 pin 12, circuit 91-TA35 (BWGN), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new gearshift lever. REFER to: Gearshift Lever (308-06 Manual Transmission/Transaxle External Controls, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 91-TA35 (BWGN). TEST the system for normal operation.

PINPOINT TEST K : THE DVD PLAYER ILLUMINATION IS INOPERATIVE

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
K1: CHECK THE DVD PLAYER ILLUMINATION CIRCUIT FOR POWER		
		1 Disconnect DVD Player C437.
		2 Turn the headlamp switch to the ON position.
 E0037523		3 Measure the voltage between the DVD player C437 pin 15, circuit 29S-LK17 (OGIBK), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to K2. → No REPAIR circuit 29S-LK17 (OG-BK). Test the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K2: CHECK THE DVD PLAYER ILLUMINATION CIRCUIT FOR GROUND	
 E0037524	Measure the resistance between the DVD player C437 pin 16, 31-LK17 (BK), harness side and ground. • Is the resistance less than 1 ohm? → Yes INSTALL a new DVD player. Test the system for normal operation. → No Repair the circuit(s) 31-LK17 (BK). Test the system for normal operation.

DIAGNOSIS AND TESTING

Instrument Cluster and Panel Illumination — Vehicles Built From:
10/2005

Refer to Wiring Diagrams Section 413-00, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Wiring harness
- Electrical connector(s)
- Light emitting diode(s) LED(s)
- Bulb(s)

Electrical
- Switch(es)
- Instrument cluster
- Audio unit
- Navigation system display
- Climate control assembly
- Digital versatile disc (DVD) player
- Selector lever
- Gearshift lever

3. If an obvious cause for an **observed** or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• The control illumination is inoperative	• Fuse. • Headlamp switch. • Circuit.	• GO to Pinpoint Test A.
• The Instrument cluster illumination is inoperative	• Circuit(s). • Instrument cluster.	• GO to Pinpoint Test B.
• The climate control/integrated control panel illumination is inoperative - vehicles without air conditioning (A/C)	• Fuse(s). • Circuit(s). • Climate control assembly.	• GO to Pinpoint Test C.
• The climate control/integrated control panel illumination is inoperative - vehicles with A/C with manual temperature control	• Fuse(s). • Circuit(s). • Climate control assembly.	• GO to Pinpoint Test D.
• The climate control/integrated control panel illumination is inoperative - vehicles with electronic automatic temperature control (EATC)	• Fuse(s). • Circuit(s). • Climate control assembly.	• GO to Pinpoint Test E.
• The audio unit illumination is inoperative	• Fuse(s). • Circuit(s). • Audio unit.	• GO to Pinpoint Test F.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• The hazard lamp switch illumination is inoperative	• Fuse(s). • Circuit(s). • Hazard lamp switch.	• GO to Pinpoint Test G.
• The selector lever illumination is inoperative - vehicles with 4-speed automatic transaxle (AW81-40LE)	• Fuse(s). • Circuit(s). • Selector lever	• GO to Pinpoint Test H.
• The gearshift lever illumination is inoperative - vehicles with automated gearshift	• Fuse(s). • Circuit(s). • Gearshift lever.	• GO to Pinpoint Test I.
• The heated windshield switch and heated rear window switch assembly illumination is inoperative	• Fuse(s). • Circuit(s). • Heated windshield switch and heated rear window switch assembly.	• GO to Pinpoint Test J.
• The stability assist switch and passenger air bag deactivation switch illumination is inoperative	• Fuse(s). • Circuit(s). • Stability assist switch and passenger air bag deactivation switch	• GO to Pinpoint Test K.
• The DVD player illumination is inoperative	• Fuse(s). • Circuit(s). • DVD player.	• GO to Pinpoint Test L.

Pinpoint Tests

NOTE: Use a digital multimeter for all electrical measurements.

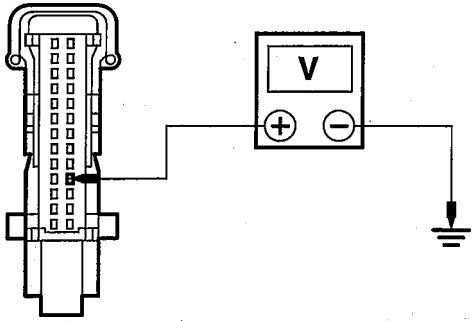
PINPOINT TEST L : THE CONTROL ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE OPERATION OF THE PARKING LAMPS	
	☐ Place the side lamps in the ON position. • Does the parking lamps and license plate lamps illuminate? → Yes INSTALL a new headlamp switch. TEST the system for normal operation. → No Diagnose the exterior lighting system. REFER to: Parking, Rear and License Plate Lamps (417-01 Exterior Lighting, Diagnosis and Testing). TEST the system for normal operation.

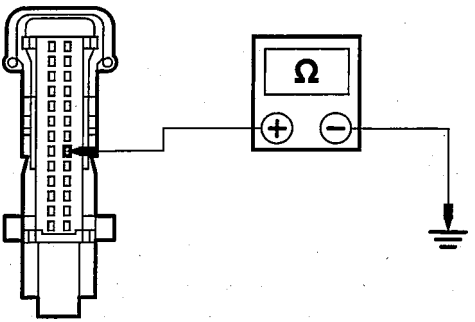
DIAGNOSIS AND TESTING

PINPOINT TEST M : THE INSTRUMENT CLUSTER ILLUMINATION IS INOPERATIVE

TEST CONDITIONS**DETAILS/RESULTS/ACTIONS****B1: CHECK THE INSTRUMENT CLUSTER FOR POWER**

	1 Disconnect Instrument Cluster C339. 2 Turn the headlamp switch to the ON position.
 E65911	3 Measure the voltage between the instrument cluster C339 pin 17, circuit 29S-LK19 (OGIBU), harness side and ground. • Is the voltage greater than 10 volts? → Yes GO to B2. → No REPAIR circuit 29S-LK19 (OGIBU). TEST the system for normal operation.

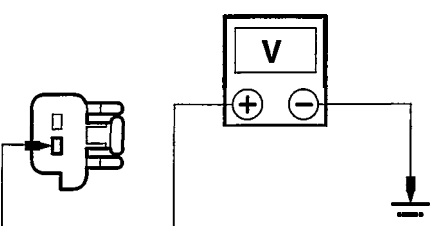
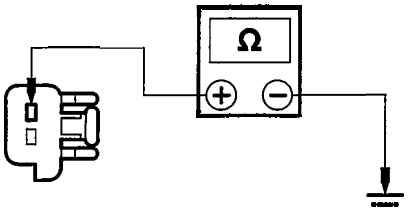
B2: CHECK THE INSTRUMENT CLUSTER FOR GROUND

 E65912	☐ Measure the resistance between instrument the instrument cluster C339 pin 19, circuit 91-GG11 (BWBU), harness side and ground. • Is the resistance less than 5 ohms → Yes INSTALL a new instrument cluster. REFER to: Instrument Cluster - Vehicles Built From: 1012005 (413-01 Instrument Cluster, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 91-GG11 (BWBU). TEST the system for normal operation.
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PINPOINT TEST N : THE CLIMATE **CONTROL/INTEGRATED** CONTROL PANEL ILLUMINATION IS INOPERATIVE • VEHICLES WITHOUT AIR CONDITIONING (A/C)**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS****C1: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR POWER**

	1 Disconnect Climate Control Assembly Illumination C620.
	☐ Turn the headlamp switch to the ON position.

DIAGNOSIS AND TESTING

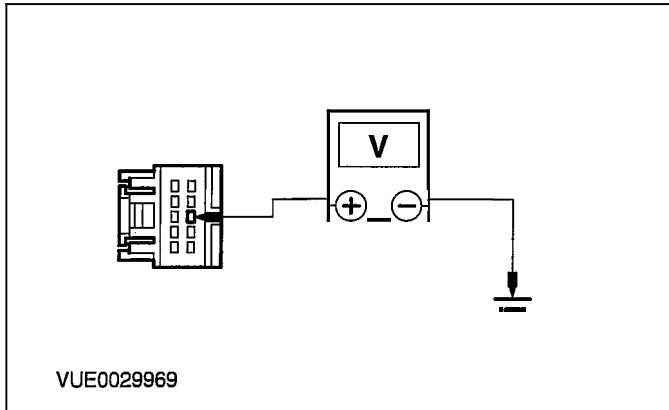
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0029971	Measure the voltage between the climate control assembly illumination C620 pin 1, circuit 29S-LH27 (OGIGN), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to C2. → No REPAIR circuit 29S-LH27 (OGIGN). TEST the system for normal operation.
C2: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR GROUND	
 VUE0029970	Measure the resistance between climate control assembly illumination C620 pin 2, circuit 31-LH27 (BK), harness side and ground. is the resistance less than 5 ohms? → Yes INSTALL a new climate control assembly. REFER to: Climate Control Assembly - Vehicles Built From: 1012005 (412-04 Control Components, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 31-LH27 (BK). TEST the system for normal operation.

PINPOINT TEST O : THE CLIMATE CONTROL/INTEGRATED CONTROL PANEL ILLUMINATION IS INOPERATIVE - VEHICLES WITH A/C WITH MANUAL TEMPERATURE CONTROL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR POWER	
	1 Disconnect Climate Control Assembly C302. 2 Turn the headlamp switch to the ON position.

DIAGNOSIS AND TESTING

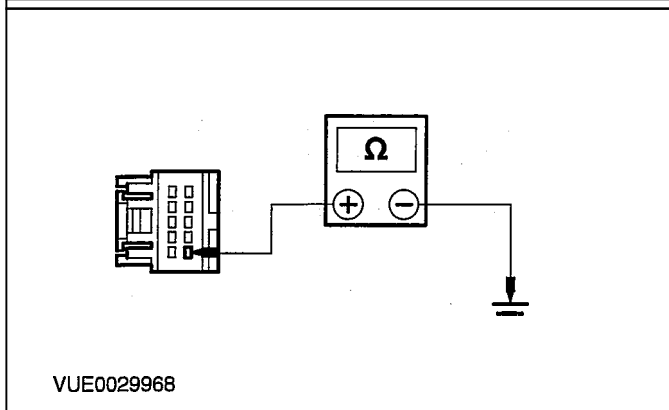
TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 3** Measure the voltage between the climate control assembly C302 pin 8, circuit 29S-LH27 (OGIGN), harness side and ground.
- Is the voltage greater than 10 volts?
- **Yes**
GO to D2.
- **No**
REPAIR circuit 29S-LH27 (OGIGN). TEST the system for normal operation.

D2: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR GROUND



- 1** Measure the resistance between climate control assembly C302 pin 10, circuit 31-LH27 (BK), harness side and ground.
- Is the resistance less than 5 ohms?
- **Yes**
INSTALL a new climate control assembly.
REFER to: Climate Control Assembly - Vehicles Built From: 1012005 (412-04 Control Components, Removal and Installation).
TEST the system for normal operation.
- **No**
REPAIR circuit 31-LH27 (BK). TEST the system for normal operation.

PINPOINT TEST P : THE CLIMATE CONTROL/INTEGRATED CONTROL PANEL ILLUMINATION IS INOPERATIVE - VEHICLES WITH ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC)

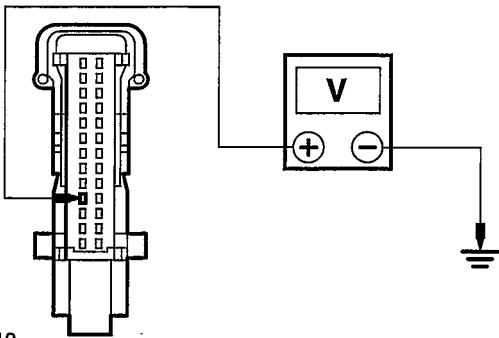
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

EI: CHECK THE CLIMATE CONTROL ASSEMBLY ILLUMINATION FOR POWER

- 1** Disconnect Climate Control Assembly C367.
- 2** Turn the headlamp switch to the ON position.

DIAGNOSIS AND TESTING

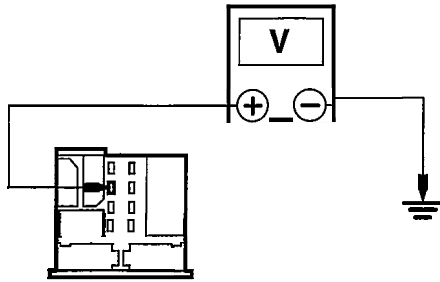
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E65919	3 Measure the voltage between the climate control assembly C367 pin 3, circuit 29S-LH27 (OGIGN), harness side and ground. - Is the voltage greater than 10 volts? → Yes GO to E2. → No REPAIR circuit 29S-LH27 (OGIGN). TEST the system for normal operation.

PINPOINT TEST Q : THE AUDIO UNIT ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: CHECK THE AUDIO UNIT ILLUMINATION FOR POWER	
	☐ Disconnect Audio Unit C775. 2 Turn the headlamp switch to the ON position.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E65913

DETAILS/RESULTS/ACTIONS

☐ Measure the voltage between the audio unit C775 pin 14, circuit 29S-LK34 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

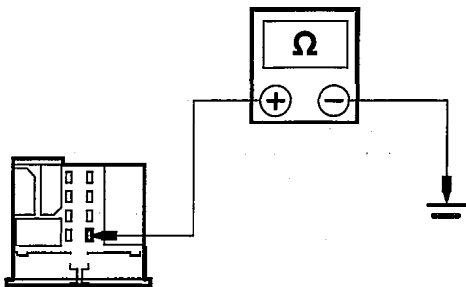
→ **Yes**

GO to F2.

→ **No**

REPAIR circuit 29S-LK34 (OG/BK). TEST the system for normal operation.

'2: CHECK THE AUDIO UNIT ILLUMINATION FOR GROUND



E65914

☐ Measure the resistance between the audio unit C775 pin 12, circuit 91-MD15 (BWGN), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new audio unit.

REFER to: Audio Unit - Vehicles Built From:
10/2005 (415-01 Audio Unit, Removal and Installation).

TEST the system for normal operation.

→ **No**

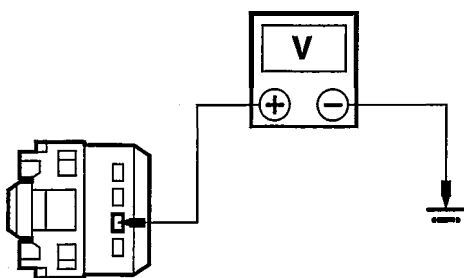
REPAIR circuit 31-LK34 (BK). TEST the system for normal operation.

PINPOINT TEST R : THE HAZARD LAMP SWITCH ILLUMINATION IS INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

G1: CHECK THE HAZARD LAMP SWITCH ILLUMINATION FOR POWER



E65916

1 Disconnect Hazard Lamp Switch C341.

2 Turn the headlamp switch to the ON position.

☐ Measure the voltage between the hazard lamp switch C341 pin 3, circuit 29S-LH54 (OG/IGN), harness side and ground.

• Is the voltage greater than 10 volts?

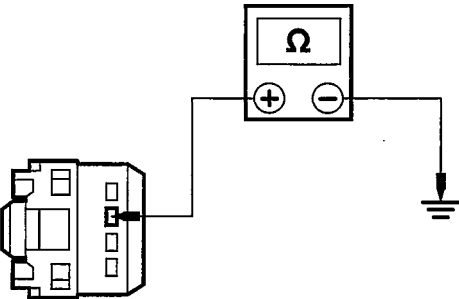
→ **Yes**

GO to G2.

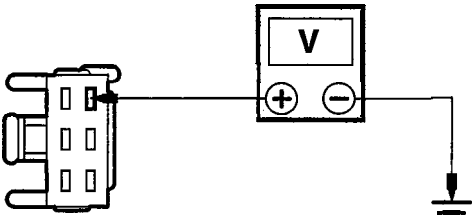
→ **No**

REPAIR circuit 29S-LH54 (OG/GN). TEST the system for normal operation.

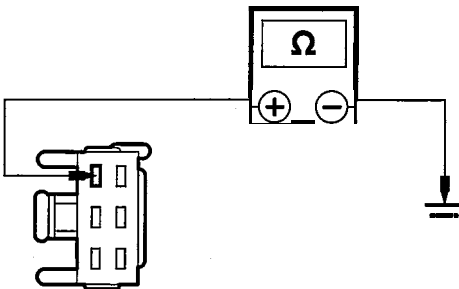
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G2: CHECK THE HAZARD LAMP SWITCH ILLUMINATION FOR GROUND	
 E65917	Measure the resistance between the hazard lamp switch C341 pin 2, circuit 31-LG8 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new hazard lamp switch. TEST the system for normal operation. → No REPAIR circuit 31-LG8 (BK). TEST the system for normal operation.

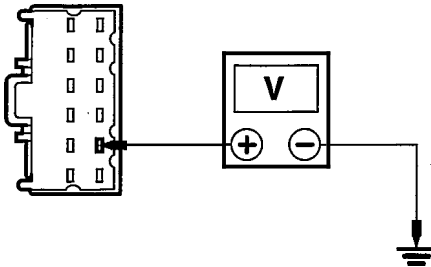
PINPOINT TEST S : THE SELECTOR LEVER ILLUMINATION IS INOPERATIVE - VEHICLES WITH 4-SPEED AUTOMATIC TRANSAXLE (AW81-40LE)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: CHECK THE SELECTOR LEVER ILLUMINATION FOR POWER	
 E65881	Disconnect Selector Lever C426.
	Turn the headlamp switch to the ON position.
	☐ Measure the voltage between the selector lever C426 pin 4, circuit 29S-LK21 (OGIBK), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to H2. → No REPAIR circuit 29S-LK21 (OGIBK). TEST the system for normal operation.

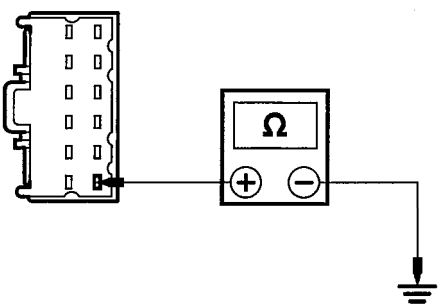
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
H2: CHECK THE SELECTOR LEVER ILLUMINATION FOR GROUND			
 E65882	1 Measure the resistance between the selector lever C426 pin 1, circuit 31-TA35 (BK), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new selector lever. REFER to: Selector Lever (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40), Removal and Installation). • TEST the system for normal operation. → No REPAIR circuit 31-TA35 (BK). TEST the system for normal operation.		

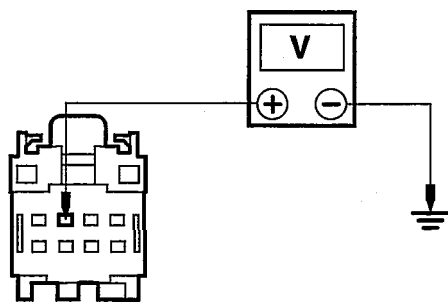
PINPOINT TEST T : THE GEARSHIFT LEVER ILLUMINATION IS INOPERATIVE - VEHICLES WITH AUTOMATED GEARSHIFT

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
I1: CHECK THE GEARSHIFT LEVER ILLUMINATION FOR POWER			
 E65879	1 Disconnect Gearshift Lever C679.		
	2 Turn the headlamp switch to the ON position.		
	3 Measure the voltage between the gearshift lever C679 pin 11, circuit 29S-LK21 (OG/BK), harness side and ground. • Is the voltage greater than 10 volts? → Yes GO to 12 → No REPAIR circuit 29S-LK21 (OG/BK). TEST the system for normal operation.		

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I2: CHECK THE GEARSHIFT LEVER ILLUMINATION FOR GROUND	
 E65880	1 Measure the resistance between the gearshift lever C679 pin 12, circuit 91-TA35 (BWGN), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new gearshift lever. REFER to: Gearshift Lever (308-06 Manual Transmission/Transaxle External Controls, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 91-TA35 (BWGN). TEST the system for normal operation.

PINPOINT TEST U : THE HEATED WINDSHIELD SWITCH AND HEATED REAR WINDOW SWITCH ASSEMBLY ILLUMINATION IS INOPERATIVE

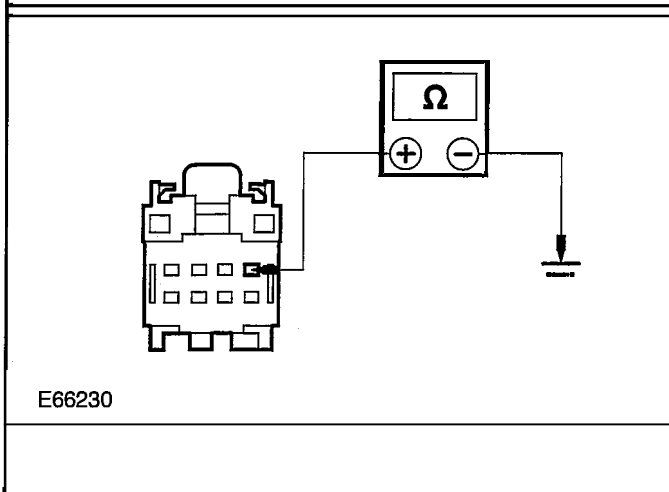
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: CHECK THE HEATED WINDSHIELD SWITCH AND HEATED REAR WINDOW SWITCH ASSEMBLY ILLUMINATION FOR POWER	
	Disconnect Heated Windshield Switch and Heated Rear Window Switch Assembly C345. Turn the headlamp switch to the ON position.
 E66229	Measure the voltage between the heated windshield switch and heated rear window switch assembly C345 pin 2, circuit 29S-HB1 (OGIBU), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to J2. → No REPAIR the circuit 29S-HB1 (OG/BU). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

J2: CHECK THE HEATED WINDSHIELD SWITCH AND HEATED REAR WINDOW SWITCH ASSEMBLY ILLUMINATION FOR GROUND



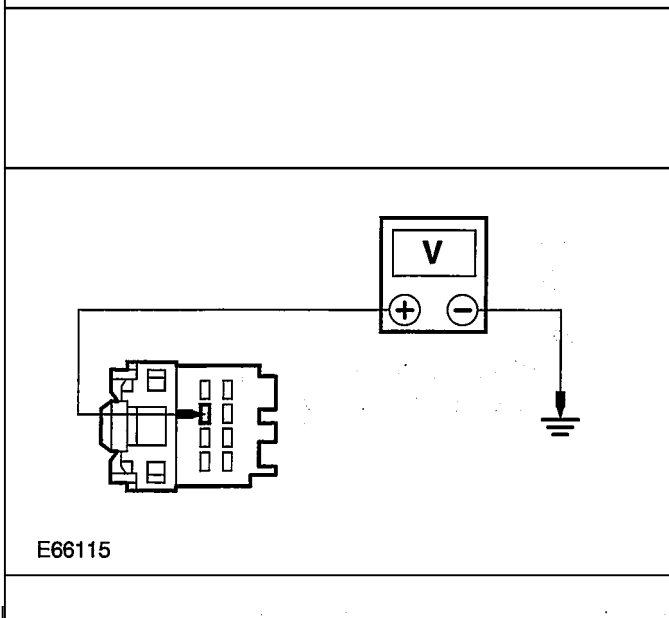
- 1 Measure the resistance between the heated windshield switch and heated rear window switch assembly C345 pin 4, circuit 31-HB1 (BK), harness side and ground.
 - Is the resistance less than 5 ohms?
 - Yes
INSTALL a new heated windshield switch and heated rear window switch assembly. TEST the system for normal operation.
 - No
REPAIR circuit 31-HB1 (BK). TEST the system for normal operation.

PINPOINT TEST V : THE STABILITY ASSIST SWITCH AND PASSENGER AIR BAG DEACTIVATION SWITCH ILLUMINATION IS INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

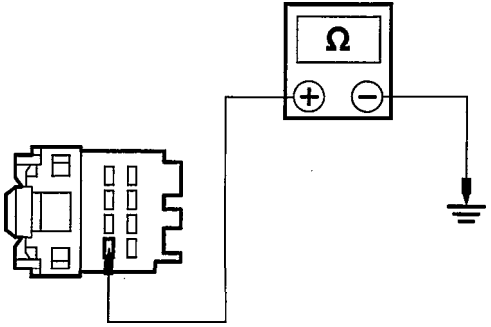
K I: CHECK THE STABILITY ASSIST SWITCH AND PASSENGER AIR BAG DEACTIVATION SWITCH ILLUMINATION FOR POWER



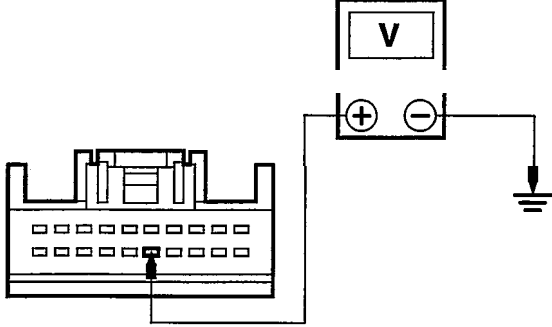
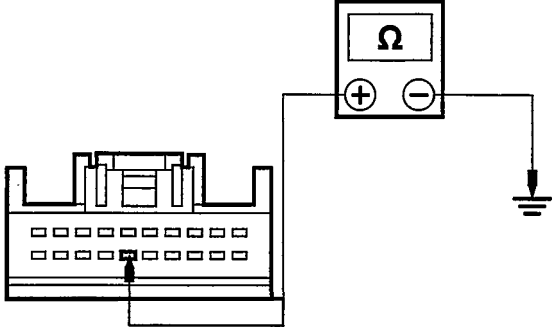
Disconnect Stability Assist Switch and Passenger Air Bag Deactivation Switch C346.

- 2 Turn the headlamp switch to the ON position.
- Measure the voltage between the stability assist switch and passenger air bag deactivation switch C346 pin 2, circuit 29S-CF1 (OGIBU), harness side and ground.
 - Is the voltage greater than 10 volts?
 - Yes
GO to K2.
 - No
REPAIR the circuit 29S-CF1 (OGIBU). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K2: CHECK THE STABILITY ASSIST SWITCH AND PASSENGER AIR BAG DEACTIVATION SWITCH ILLUMINATION FOR GROUND	
 E66116	Measure the resistance between the stability assist switch and passenger air bag deactivation switch C346 pin 4, circuit 31-CF1 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new stability assist switch and passenger air bag deactivation switch. → No REPAIR circuit 31-CF1 (BK). TEST the system for normal operation.

PINPOINT TEST W : THE DVD PLAYER ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L1: CHECK THE DVD PLAYER ILLUMINATION CIRCUIT FOR POWER	
 E0037523	1 Disconnect DVD Player C437. 2 Turn the headlamp switch to the ON position.
	3 Measure the voltage between the DVD player C437 pin 15, circuit 29S-LK17 (OG/BK), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to L2. → No REPAIR circuit 29S-LK17 (OG-BK). Test the system for normal operation.
L2: CHECK THE DVD PLAYER ILLUMINATION CIRCUIT FOR GROUND	
 E0037524	1 Measure the resistance between the DVD player C437 pin 16, 31-LK17 (BK), harness side and ground. Is the resistance less than 1 ohm? → Yes INSTALL a new DVD player. Test the system for normal operation. → No Repair the circuit(s) 31-LK17 (BK). Test the system for normal operation.

SECTION 413-01 Instrument Cluster

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DIAGNOSIS AND TESTING	
Instrument Cluster — Vehicles Built Up To: 1012005.....	413-01-2
Inspection and Verification.....	413-01-2
Self-Diagnostic Mode.....	413-01-2
Configuration of Instrument Cluster.....	413-01-4
Instrument Cluster — Vehicles Built From: 1012005.....	413-01-5
Inspection and Verification.....	413-01-5
Self-Diagnostic Mode. Vehicles with low series instrument cluster.....	413-01-5
Self-Diagnostic Mode. Vehicles with mid or high series instrument cluster.....	413-01-8
Configuration of the Instrument Cluster.....	413-01-10
REMOVAL AND INSTALLATION	
Instrument Cluster — Vehicles Built Up To: 1012005..... (33 214 0)	413-01-12
Instrument Cluster — Vehicles Built From: 1012005..... (33 214 0)	413-01-13



DIAGNOSIS AND TESTING

Instrument Cluster — Vehicles Built Up To: 1012005

Refer to Wiring Diagrams Section 413-01, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Engine oil filter – Engine oil level – Engine coolant temperature (ECT) sensor – Engine coolant level – Thermostat – Collapsed or damaged fuel tank – Door adjustment	– Fuse(s) – Wiring harness – Electrical connector(s) – Instrument cluster – Light emitting diode(s) (LED)(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** If none of the following warning indicators are operating correctly this may indicate a concern with the generic electronic module (GEM). If only one or two of the following warning indicators are not operating correctly this may indicate an instrument cluster concern.

Verify the following warning indicators are working correctly:

- Charging.
 - Turn signals.
 - Headlamps.
5. If the cause is not visually evident, verify the symptom and enter the instrument cluster Self-Diagnostic Mode.

Self-Diagnostic Mode

NOTE: The instrument cluster tripmeter reset button is located on the right-hand side of the instrument cluster lens.

1. To enter the instrument cluster Self-Diagnostic Mode simultaneously press and hold the tripmeter reset button and turn the ignition switch to position II.
2. When TEST is displayed in the LCD, release the tripmeter reset button.
3. To navigate through or skip any of the instrument cluster self-diagnostic mode tests press the tripmeter RESET button. If the reset button is depressed for more than 3 seconds between tests, the instrument cluster will exit the self-diagnostic mode.
4. The self-diagnostic mode is deactivated when the ignition switch is turned to the OFF position.
5. If the self-diagnostic mode cannot be accessed, use WDS to diagnose the instrument cluster.

NOTE: Additional tests are available after the following self-diagnostic mode tests, but are not applicable for this diagnostic.

Self-Diagnostic Mode

Test	Odometer Display	Gauge/Indicator/Display Tested	Description
1. Gauge drive and displays	GAGE	Tachometer, speedometer, temperature and fuel	Both pointers move from the rest position (zero) to below the rest position and then back to the rest position (the pointers will not carry out a full sweep as in previous vehicles). All segments of the engine temperature and fuel level liquid crystal displays (LCD) are illuminated.

DIAGNOSIS AND TESTING

Test	Odometer Display	Gauge/Indicator/Display Tested	Description
2. Fill in all LCD	All segments illuminated	Odometer LCD	Fills in LCD of odometer.
3. Indicator LED(s)	bulb	Indicators and warning indicators	Illuminates all the warning indicators that are controlled by the instrument cluster.
4. ROM level	r XXXX FAIL	Instrument cluster read only memory (ROM)	Displays the instrument cluster ROM level and type.
5. Non-volatile memory level	nrXXXX	Instrument cluster non-volatile memory	Displays the instrument cluster ROM level and type as stored in the non-volatile memory.
6. Not required	EE XX FAIL	Checksum fault	Not required.
7. Not required	CF1 XX	Configuration	Not required.
8. Not required	CF2 XX	Configuration	Not required.
9. Not required	CF3 XX	Configuration	Not required.
10. Diagnostic trouble code (DTC)	dtc then XXXX NONE	DTCs	If any DTCs are displayed. REFER to WDS to diagnose the instrument cluster. A new DTC code will be displayed with each press of the reset button.
11. Vehicle speed m.p.h.	E XXXX	Speedometer	Displays the speed signal input in m.p.h. Dashes in odometer display if no signal received.
12. Vehicle speed km/h	XXXX	Speedometer	Displays the speed signal input in km/h. Dashes in odometer display if no signal received.
13. Not required	SGXXXX	Speedometer driver gauge count	Not required.
14. Engine speed	t XXXX	Tachometer	Displays the tachometer input signal (RPM). Dashes in odometer display if no signal received.
15. Not required	tGXXXX	Tachometer driver gauge count	Not required.
16. Fuel volume	F1 XXX	Fuel sender system	Displays the fuel volume signal input. 000 - 009 Short circuit. 010 - 254 Normal range. 255 open circuit
17. Not required	FP1 XXX	Input	Not required.
18. Not required	FPt XXX	Input	Not required.
19. Fuel level	FGXXXX	Fuel LCD	Displays the number of segments illuminated in the Fuel LCD.

DIAGNOSIS AND TESTING

Test	Odometer Display	Gauge/Indicator/Display Tested	Description
20. Engine coolant temperature	XXX C	Engine coolant temperature	Displays the last engine coolant temperature signal input in 1/10 degree C.
21. Engine temperature	CGXXXX	Temperature LCD	Displays the number of segments illuminated in the temperature LCD.
22. Odometer input	odoXXX	Odometer display	Displays the odometer input received. 0 - 254 valid odometer input. 255 invalid odometer input.
23. Not required	trn -X	Input	Not required.
24. Not required	IUd XX	Input	Not required.
25. Battery voltage	bAtXXX	Battery Voltage	Displays battery voltage input.
26. Brake fluid switch	bf -X	Brake fluid level input	-O Good fluid level. -G Low fluid level.
27. Handbrake switch	hb -X	Handbrake input	-O Handbrake off. -G Handbrake on.
28. Illumination	SLP -X	Parking light input	-b Parking lights on. -O Parking lights off.
29. Not required	LCXXXX	LCD duty cycle	Not required.
30. Crank sense	Cr -X	Crank sense circuit	Displays the crankshaft sensor input to the instrument cluster. -b Input high. -O Input low.

6. REFER to WDS to continue diagnostics.

Configuration of Instrument Cluster

The **instrument cluster** is a programmable module, which must be configured by selecting the Programmable Module Installation Routine on WDS.

NOTE: When the new instrument cluster has been configured with the odometer value, its configuration cannot be decreased or matched. A new configuration will result in an increase in the value by a minimum of two units.

NOTE: The odometer value must be recorded from the original instrument cluster before removal.

If the odometer value cannot be obtained from the instrument cluster (display failure) the customer should supply the approximate value.

The following features will need to be configured when a new instrument cluster is installed:

- Malfunction Indicator Lamp (MIL)
- Anti-lock Brake System (ABS) warning indicator
- Anti-Lock Control - Stability Assist indicator
- Odometer display
- Automated Gearshift System indicator
- Passive Anti-Theft System (PATs) indicator

DIAGNOSIS AND TESTING

Instrument Cluster — Vehicles Built From: 1012005

General Equipment

Worldwide Diagnostic System (WDS)

Self-Diagnostic Mode. Vehicles with low series instrument cluster

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

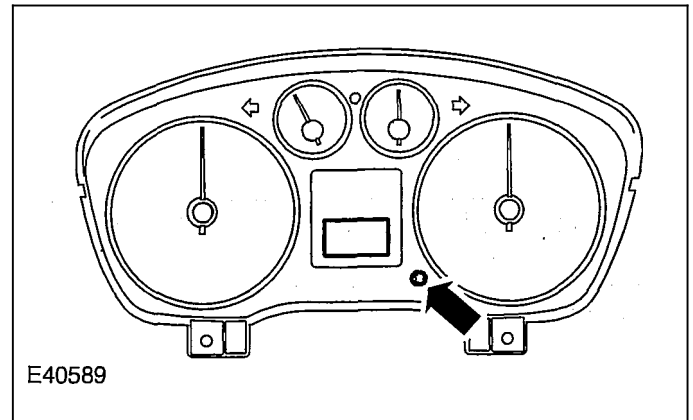
Mechanical	Electrical
– Engine oil filter – Engine oil level – Engine coolant temperature (ECT) sensor – Engine coolant level – Thermostat – Collapsed or damaged fuel tank – Door adjustment	– Fuse(s) – Wiring harness – Electrical connector(s) – Instrument cluster – Light emitting diode(s) (LED)(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** If none of the following warning indicators are operating correctly this may indicate a concern with the central junction box (CJB). If only one or two of the following warning indicators are not operating correctly this may indicate an instrument cluster concern.

Verify the following warning indicators are working correctly:

- Charging.
 - Turn signals.
 - Headlamps.
5. If the cause is not visually evident, verify the symptom and enter the instrument cluster Self-Diagnostic Mode.



NOTE: The instrument cluster tripmeter reset button is located on the right-hand side of the instrument cluster lens.

1. To enter the instrument cluster Self-Diagnostic Mode. Simultaneously press and hold the tripmeter RESET button and turn the ignition switch from position 0, to position II.
2. Entry to the Self-Diagnostic Mode is confirmed when 'tEST' is displayed in the odometer tripmeter liquid crystal display (LCD). The tripmeter reset button must be released within three seconds of 'tEST' being displayed or the instrument cluster will exit the Self-Diagnostic mode.
3. To navigate through or skip any of the instrument cluster Self-Diagnostic Mode tests, press the tripmeter RESET button. If the reset button is depressed for more than 3 seconds' between tests, the instrument cluster will exit the Self-Diagnostic Mode.
4. The Self-Diagnostic Mode is deactivated when the ignition switch is turned to the OFF position or low battery voltage is detected.
5. If input data to the instrument cluster is missing or invalid, the tripmeter LCD will display '----'
6. If the Self-Diagnostic Mode cannot be accessed, use WDS to diagnose the instrument cluster.

NOTE: Additional tests are available after the following Self-Diagnostic Mode tests, but are not applicable for this diagnostic.

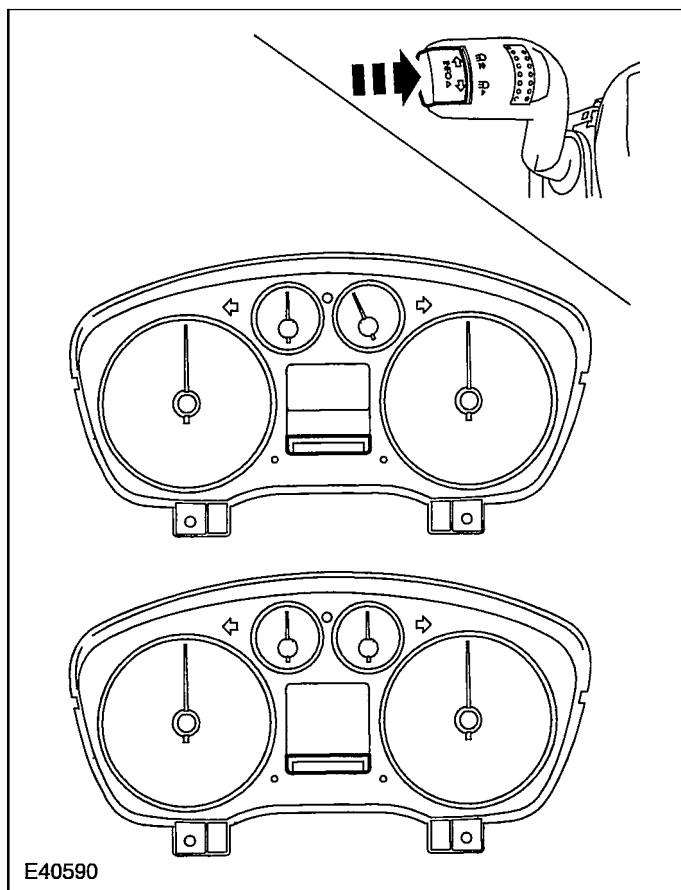
DIAGNOSIS AND TESTING

Test	Odometer Display	Gauge/Indicator/Display Tested	Description
1. Self-Diagnostic entry	tEst	Instrument cluster	Establishes Self-Diagnostic Mode.
2. Gauge sweep	gAgE	Tachometer, speedometer, temperature and fuel	All gauges go through a full up and down pointer sweep smoothness check. The pointers should take 3 seconds to achieve full sweep and 3 seconds to return to the rest position.
3. Odometer LCD	888888	Odometer LCD	Fills in the LCDs of the odometer display.
4. Indicator LED(s)	LeD	Indicators and warning indicators	Illuminates all the LED warning indicators that are controlled by the instrument cluster.
5. ROM level	r XXXX /FAIL	Instrument cluster read only memory (ROM)	Displays the instrument cluster ROM level and type.
6. Not required	ErXXXX	-	Not required.
7. Not required	E XX /FAIL	-	Not required.
8. Manufacturing date	dtXXXX	Instrument cluster manufacturing date	Displays the instrument cluster date of manufacture.
9. Diagnostic trouble code (DTC)	• dtc then XXX ▪ nonE	DTCs	Display the individual DTCs at 1 second intervals. REFER to WDS to diagnose the instrument cluster.
10. Vehicle speed m.p.h.	SPXXXX	Speedometer	Displays the speed signal input in miles per hour.
11. Vehicle speed km/h	SPXXXX	Speedometer	Displays the speed signal input in kilometers per hour.
12. Not required		-	Not required.
13. Engine speed	tAXXXX	Tachometer	Displays the engine speed input signal (RPM)
14. Not required	tgXXXX	-	Not required.
15. Odometer count	od XXX	Odometer	Displays the odometer rolling count
16. Fuel volume	F XXX	Fuel sender system	• Displays the fuel volume signal input. • 000 - 009 Short circuit • 010 - 254 Normal range • 255 open circuit
17. Not required	FgXXXX	-	Not required.
18. Not required	FL XX	-	Not required.

DIAGNOSIS AND TESTING

Test	Odometer Display	Gauge/Indicator/Display Tested	Description
19. Fuel level percentage	FP XX	Fuel gauge	- Displays the fuel average percentage level. - Range of display 00 to 64 64 being 100% full - FF will be displayed for invalid data
20. Engine coolant temperature (ETC)	XXX C	ECT	- Displays the engine coolant temperature as a decimal. - Range 0 to 254 255 would indicate invalid data
21. Not required	XXX Cg	-	Not required.
22. Battery voltage	btXXX	Battery voltage	Displays battery voltage input.
23. to 28. Not required	A0-XX to A5-XX	-	Not required.
29. to 42. Not required	PA-HH to Pn-HH	-	Not required.
43. to 46. Not required	P1 XX to P4 XX	-	Not required.
47. Distance to empty	dtEXXX	Trip computer	Displays the distance to fuel tank empty.
48. Fuel economy	rAFEXX	Trip computer	Displays the rolling average fuel economy in miles per UK gallon.

DIAGNOSIS AND TESTING

Self-Diagnostic Mode. Vehicles with mid or high series instrument cluster

NOTE: The set button is located on the steering column left hand multifunction switch.

1. To enter the instrument cluster Self-Diagnostic Mode. Simultaneously press and hold the SET button and turn the ignition switch from position 0, to position II.
2. Entry to the Self-Diagnostic Mode is confirmed when 'TEST' is displayed in the odometer tripmeter liquid crystal display (LCD). The tripmeter set button must be released within three seconds of 'TEST' being displayed or the instrument cluster will exit the Self-Diagnostic Mode.
3. To navigate through or skip any of the instrument cluster Self-Diagnostic Mode tests, press the SET button. If the set button is depressed for more than 3 seconds between tests, the instrument cluster will exit the Self-Diagnostic Mode.
4. The Self-Diagnostic Mode is deactivated when the ignition switch is turned to the OFF position or low battery voltage is detected.
5. If input data to the instrument cluster is missing or invalid, the tripmeter LCD will display '----'.
6. If the Self-Diagnostic Mode cannot be accessed, use WDS to diagnose the instrument cluster.

NOTE: Additional tests are available after the following Self-Diagnostic Mode tests, but are not applicable for this diagnostic.

Self-Diagnostic Mode

Test	Odometer Display	Gauge/Indicator/ Display Tested	Description
1. Self-Diagnostic entry	• TEST • no display	Instrument cluster	Establishes Self-Diagnostic Mode.
2. Gauge sweep	• GAUGESWEEP • no display	Tachometer, speedometer, temperature and fuel	All gauges go through a full up and down pointer sweep smoothness check. The pointers should take 3 seconds to achieve full sweep and 3 seconds to return to the rest position.
3. Odometer LCD	Filled in black	odometer LCD O	Fills in the LCD,s of the odometer display.
4. Indicator LED(s)	• LED TEST • no display	Indicators and warning indicators	Illuminates all the LED warning indicators that are controlled by the instrument cluster.

DIAGNOSIS AND TESTING

Test	Odometer Display	Gauge/Indicator/ Display Tested	Description
5. ROM level	- ROM LEVEL - XXXX / FAIL	Instrument cluster read only memory (ROM)	Displays the instrument cluster ROM level and type.
6. Not required	- NVM TARGET ROM - X X X X	-	Not required.
7. Not required	- NVM EEPROM LVL - XXXX / FAIL	-	Not required.
8. Manufacturing date	- MANUFACTURE - HOURS XXXX	Instrument cluster manufacturing date	Displays the instrument cluster date of manufacture.
9. Diagnostic trouble code (DTC)	- DTC #NN - XXXX.	DTCs	Display the individual DTCs at 1 second intervals. REFER to WDS to diagnose the instrument cluster.
10. Vehicle speed m.p.h.	- ROAD SPEED - XXX.X MPH	Speedometer	Displays the speed signal input in miles per hour.
11. Vehicle speed km/h	- ROAD SPEED - XXX.X KM/H	Speedometer	Displays the speed signal input in kilometers per hour.
12. Not required	- SPEEDO - XXXX	-	Not required.
13. Engine speed	- ENGINE SPEED - XXXX	Tachometer	Displays the engine speed input signal (RPM)
14. Not required	- TACHO GAUGE - XXXX	-	Not required.
15. Odometer count	- ODO ROLL COUNT - XXX	Odometer	Displays the odometer rolling count
16. Fuel volume	- FUEL AID INPUT - XXX	Fuel sender system	- Displays the fuel volume signal input. 000 - 009 Short circuit 010 - 254 Normal range 255 open circuit
17. Not required	- FUEL GAUGE - X X X X	-	Not required.
18. Not required	- FUEL FLOW - X X X X	-	Not required.

DIAGNOSIS AND TESTING

Test	Odometer Display	Gauge/Indicator/ Display Tested	Description
19. Fuel level percentage	- FUEL PERCENT - XXXX	Fuel gauge	- Displays the fuel average percentage level. - Range of display 00 to 64 64 being 100% full - FF will be displayed for invalid data
20. Engine coolant temperature (ECT)	- ENGINE TEMP - XXX C	ECT	- Displays the engine coolant temperature as a decimal. - Range 0 to 254 255 would indicate invalid data
21. Not required	- TEMP GAUGE - XXXX	-	Not required.
22. Battery voltage	BATTERY XX.X	Battery voltage	Displays battery voltage input.
23. to 28. Not required	- AID INPUT 00 to A/D INPUT 05 - XX	-	Not required.
29. to 42. Not required	- PORT A to PORT N - XX	-	Not required.
43. to 46. Not required	- PERSONALITY 01 to PERSONALITY 04 - XX	-	Not required.
47. Distance to empty	- DIST. TO EMPTY - XXX MILES	Trip computer	Displays the distance to fuel tank empty.
48. Fuel economy	- RAFE - XXXMPG	Trip computer	Displays the rolling average fuel economy in miles per UK gallon.

7. The self-diagnostic mode is to act as a guide to establish if the concern is instrument cluster related. Before any other action is taken REFER to WDS to continue diagnostics.

Configuration of the Instrument Cluster

The instrument cluster is a programmable module, which must be configured by selecting the Programmable Module Installation Routine on WDS.

NOTE: When the new instrument cluster has been configured with the odometer value, its configuration cannot be decreased or matched. A

DIAGNOSIS AND TESTING

new configuration will result in an increase in the displayed odometer value by a minimum of two units.

NOTE: The odometer value must be recorded from the original instrument cluster before removal.

If the odometer value cannot be obtained from the original instrument cluster (display failure) the customer should supply the approximate value.

The following features will need to be configured when a new instrument cluster is installed:

- Anti-lock Brake System (ABS)
- Trip computer
- Parking aid
- Belt minder
- Safety belt not fastened
- Right-hand drive
- Overspeed warning
- Reverse warning
- Turbocharger boost pressure
- Washer fluid sensor
- Navigation
- Fuel cap release
- Engine type
- Display language

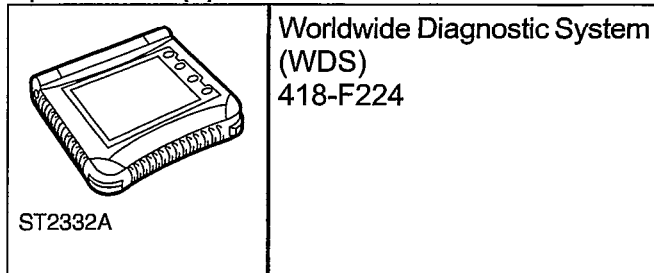
In addition the new instrument cluster will require the original odometer value to be entered.

After the installation and configuration of a new instrument cluster. The passive anti-theft system (PATS) will require programming by selecting the Security Access routine on WDS.

REMOVAL AND INSTALLATION

Instrument Cluster — Vehicles Built Up To: 10/2005(33 214 0)

Special Tool(s)

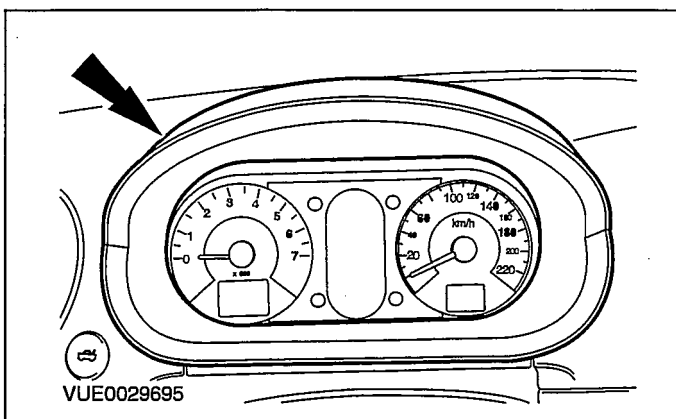


Removal

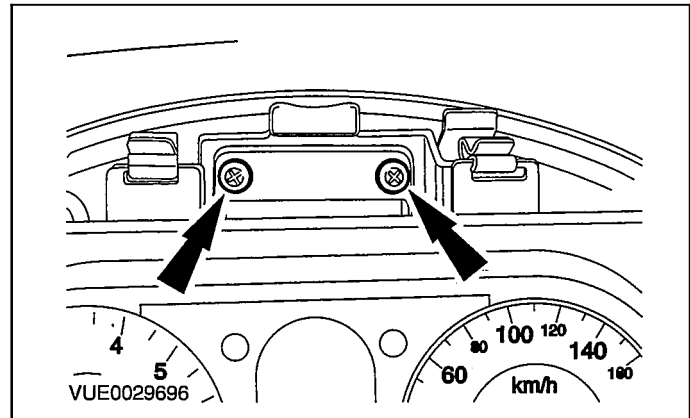
1. **NOTE:** If a new instrument cluster is to be installed, connect WDS and upload the instrument cluster configuration information **using the programmable modules installation routine**, prior to commencing the removal of the instrument cluster.

NOTE: If a new instrument cluster is to be installed, the odometer value must be recorded from the original instrument cluster before removal as this will be required when configuring the new instrument cluster. If the odometer value cannot be obtained from the instrument cluster (display failure). The customer should supply the approximate value.

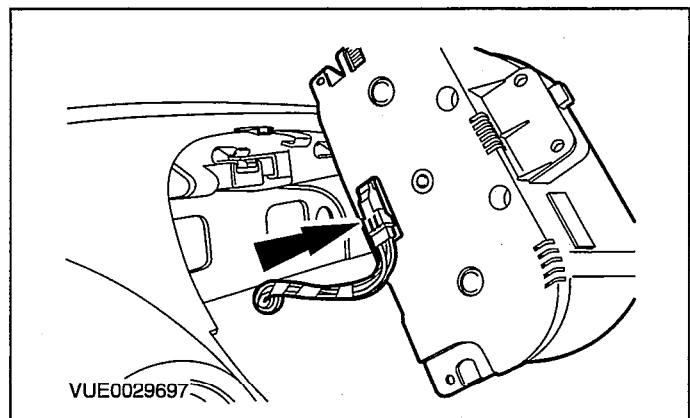
Remove the instrument cluster finish panel. (Steering wheel shown removed for clarity).



2. Detach the instrument cluster from the instrument panel.



3. **Disconnect the electrical connector and** remove the instrument cluster.



Installation

- **NOTE:** If a new instrument cluster is being installed, connect WDS and configure the new instrument cluster to the PATS system after the installation of the instrument cluster.

NOTE: If a new instrument cluster is being installed connect WDS and download the instrument cluster configuration information using the programmable modules installation routine after the installation of the instrument cluster.

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Instrument Cluster — Vehicles Built From: 10/2005(33 214 0)

General Equipment

Worldwide Diagnostic System (WDS)

Thin-bladed screwdriver

Round-ended steel rule

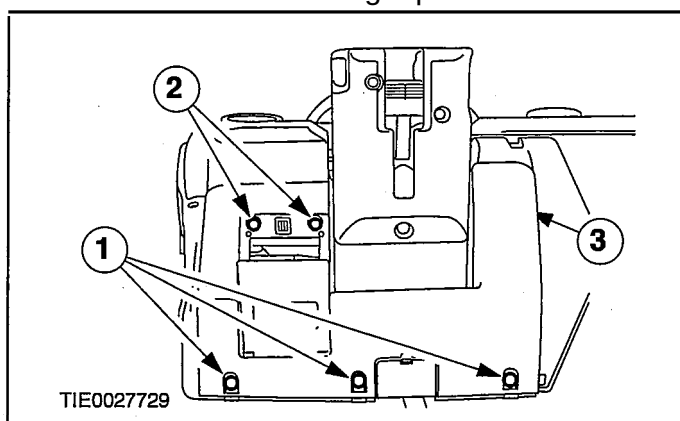
Removal

NOTE: If a new instrument cluster is to be installed, connect WDS and upload the instrument cluster configuration information using the programmable modules installation routine, prior to commencing the removal of the instrument cluster.

NOTE: If a new instrument cluster is to be installed, the odometer value must be recorded from the original instrument cluster before removal as this will be required when configuring the new instrument cluster. If the odometer value cannot be obtained from the instrument cluster (display failure), the customer should supply the approximate value.

1. Remove the instrument panel lower panel.

1. Remove the lower retaining screws.
2. Remove the upper retaining screws from the stowage compartment.
3. Release the retaining clip.



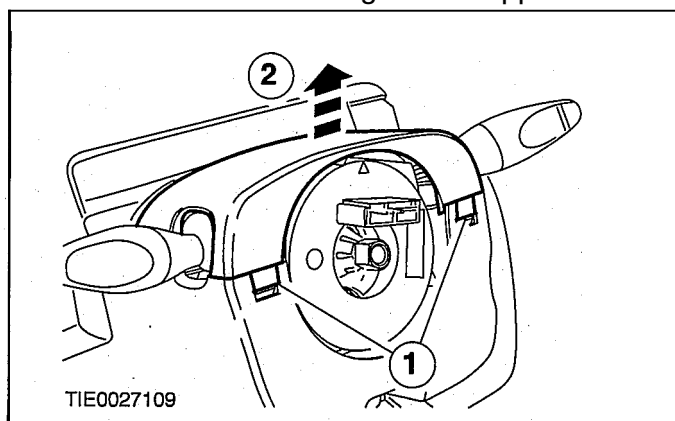
2. Using the locking lever, lower the steering column.

3. **NOTE:** Turn the steering wheel to access the steering column upper shroud retaining clips.

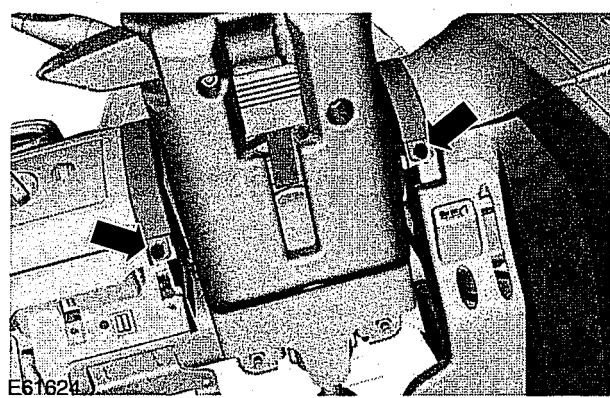
Remove the steering column upper shroud (steering wheel shown **removed** for clarity).

1. Using a thin-bladed screwdriver, release the **two** retaining clips.

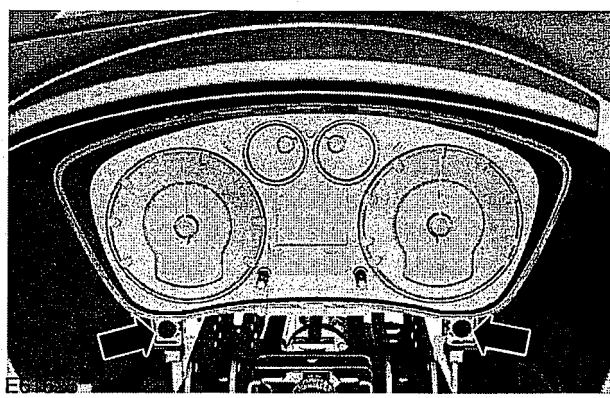
2. Remove the steering column upper shroud.



4. Remove the instrument cluster finish panel.

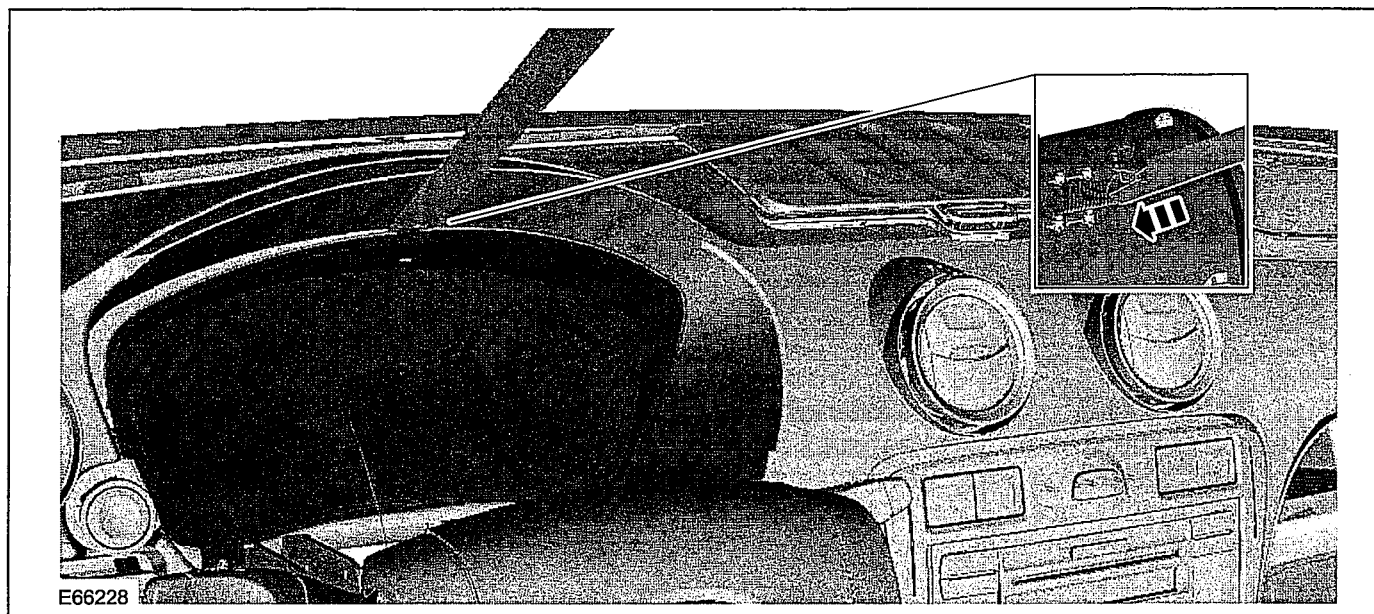


5. Remove the instrument cluster retaining screws (steering wheel shown removed for clarity).

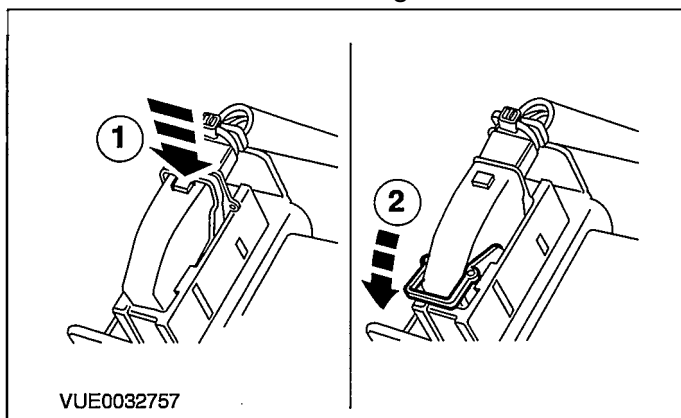


6. Using a suitable round-ended steel rule, detach the instrument cluster from the instrument panel (steering wheel shown removed for clarity).

REMOVAL AND INSTALLATION

**7. Disconnect the electrical connector and remove the instrument cluster.**

1. Press the locking tang.
2. Detach the self-locating electrical connector.

**Installation**

1. **NOTE:** If a new instrument cluster is being installed, connect WDS and configure the new instrument cluster to the PATS system after the installation of the instrument cluster.

NOTE: If a new instrument cluster is being installed connect WDS and download the instrument cluster configuration information using the programmable modules installation routine **after** the installation of the instrument cluster.

To install, reverse the removal procedure.

SECTION 413-06 Horn

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	413-06-2
DIAGNOSIS AND TESTING	
Horn — Vehicles Built Up To: I012005.....	413-06-3
Inspection and Verification.....	413-06-3
Symptom Chart.....	413-06-3
Pinpoint Tests.....	413-06-3
Horn — Vehicles Built From: 1012005.....	413-06-13
Inspection and Verification.....	413-06-13
Symptom Chart.....	413-06-13
Pinpoint Tests.....	413-06-13

SPECIFICATIONS**Toraue Specifications**

Description	Nm	lb-ft	lb-in
Horn retaining nut	26	19	-

DIAGNOSIS AND TESTING**Horn — Vehicles Built Up To: 1012005**

Refer to Wiring Diagrams Section 413-06, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Wiring harness

Electrical
- Electrical connector(s)
- Horn switch
- Horn
- Clockspring
- Generic Electronic Module (GEM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• The horn is inoperative	• Fuse(s). • Circuit(s). • Horn switch. • Horn. • Clockspring. • GEM.	• GO to Pinpoint Test A.
• The horn is always on	• Clockspring. • Horn switch. • Circuit(s). • GEM.	• GO to Pinpoint Test B.

Pinpoint Tests

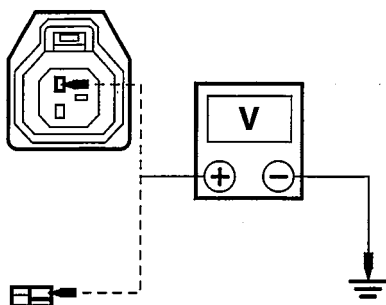
NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST A : THE HORN IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
AI: CHECK THE HORN FOR POWER	
	1 Disconnect Horn C413 - All Except Vehicles with 2.0L Duratec-HE (M14) engine or 1.6L Duratorq-TDCi (DV) Diesel engine. 2 Disconnect Horn C414 - Vehicles with 2.0L Duratec-HE (M14) engine or 1.6L Duratorq-TDCi (DV) Diesel engine.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E65097

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the horn C413 pin 1 or C414 pin 1, circuit 29S-GJ6 (OGNE), harness side and ground while pressing the horn switch.

- Is the voltage greater than 10 volts?

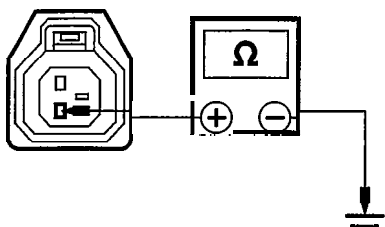
→ Yes

All Except Vehicles with 2.0L Duratec-HE (M14) engine or 1.6L Duratorq-TDCi (DV) Diesel engine, INSTALL a new horn. TEST the system for normal operation.
Vehicles with 2.0L Duratec-HE (M14) engine or 1.6L Duratorq-TDCi (DV) Diesel engine, GO to A2.

→ No

GO to A3.

A2: CHECK THE HORN GROUND CIRCUIT 31-GJ6 (BK)



E65236

- 1** Measure the resistance between the horn C414 pin 2, circuit 31-GJ6 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

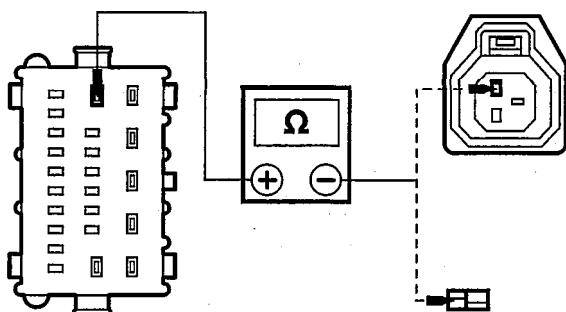
→ Yes

INSTALL a new horn. TEST the system for normal operation.

→ No

REPAIR the circuit. TEST the system for normal operation.

A3: CHECK CIRCUIT 29S-GJ6 (OGNE) FOR OPEN CIRCUIT



E65305

- 1** Disconnect GEM C319.

- ☐ Measure the resistance between the GEM C319 pin 7, circuit 29S-GJ6 (OGNE), harness side and the horn C413 pin 1 or C414 pin 1, circuit 29S-GJ6 (OGNE), harness side.

- Is the resistance less than 5 ohms?

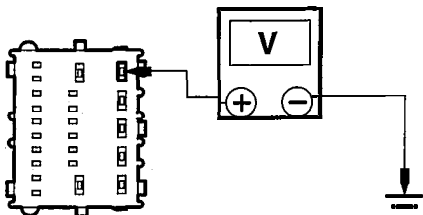
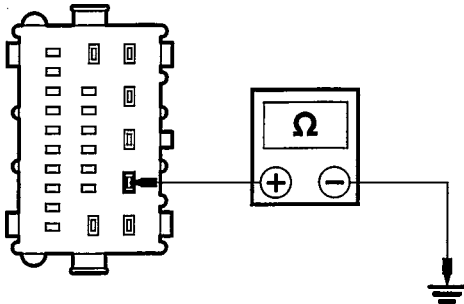
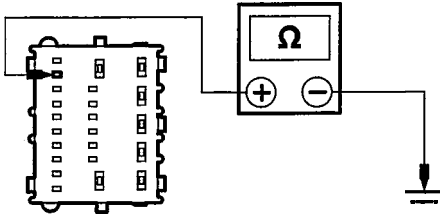
→ Yes

GO to A4.

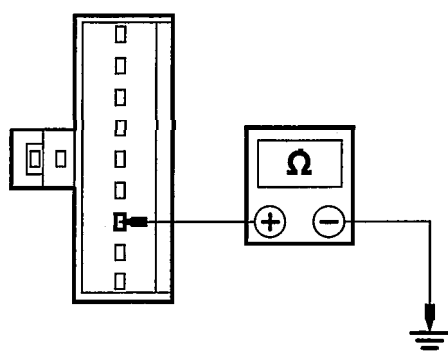
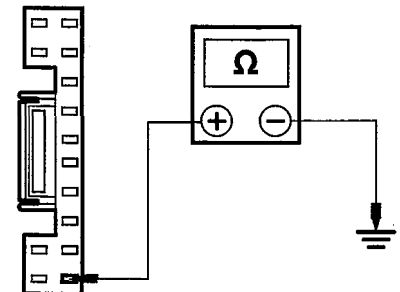
→ No

REPAIR the circuit. TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A4: CHECK THE GEM FOR POWER  VUE0030288	1 Measure the voltage between the GEM C319 pin 5, circuit 29-GJ8 (OG), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to A5. → No REPAIR circuit 29-GJ8 (OG). TEST the system for normal operation.
A5: CHECK THE GEM GROUND CIRCUIT 31-DK20 (BK)  E65306	1 Disconnect GEM C316. 2 Measure the resistance between the GEM C316 pin 2, circuit 31-DK20 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes GO to A6. → No REPAIR the circuit. TEST the system for normal operation.
A6: CHECK THE HORN SWITCH CIRCUIT FOR OPEN CIRCUIT  VUE0030287	1 Disconnect GEM C320. 2 Measure the resistance between the GEM C320 pin 22, circuit 31S-GJ7 (BWBU), harness side and ground while pressing the horn switch. Is the resistance less than 5 ohms? → Yes INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation. → No GO to A7.

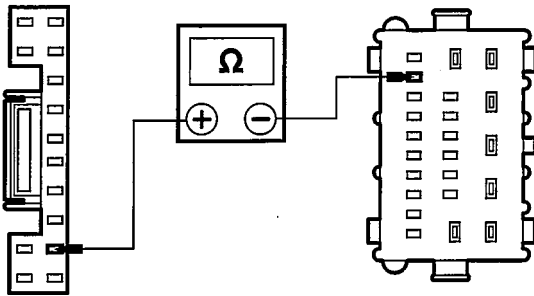
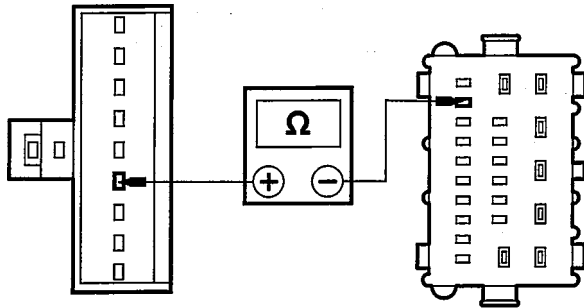
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A7: CHECK THE HORN SWITCH GROUND CIRCUIT	
	1 Disconnect Clockspring C763 - Vehicles Without Stability Assist.
	2 Disconnect Clockspring C353 - Vehicles With Stability Assist.
  E65112	1 ☐ Measure the resistance between the clockspring C763 pin 7, circuit 31-GJ9 (BK) (vehicles without stability assist) or C353 pin 14, circuit 31-GJ9 (BK) (vehicles with stability assist), harness side and ground. • Is the resistance less than 5 ohms? → Yes GO to A8. → No REPAIR circuit 31-GJ9 (BK). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A8: CHECK CIRCUIT **31S-GJ7** (BWBU) FOR OPEN CIRCUIT

E65307

- 1 Measure the resistance between the clockspring C763 pin 6, circuit **31S-GJ7** (BWBU) (vehicles without stability assist) or C353 pin 13, circuit **31S-GJ7** (BWBU) (vehicles with stability assist), harness side and the GEM C320 pin 22, circuit **31S-GJ7** (BWBU), harness side.

- Is the resistance less than 5 ohms?

→ Yes
GO to A9.

→ No
REPAIR the circuit. TEST the system for normal operation.

A9: CHECK THE **CLOCKSPRING** CIRCUIT FOR OPEN CIRCUIT

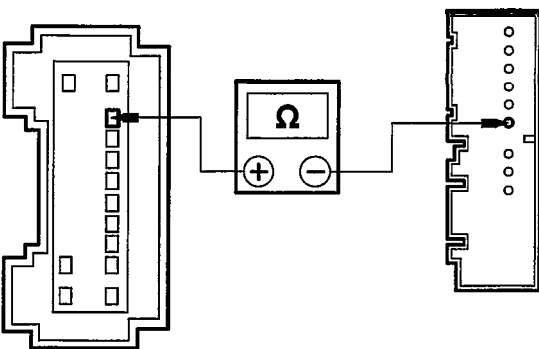
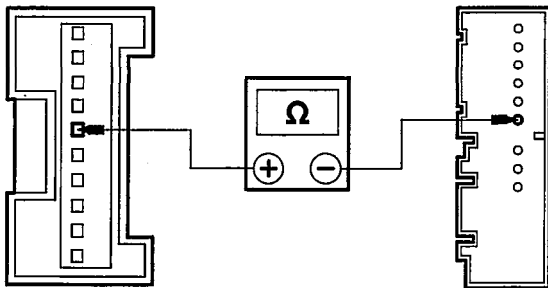
▲ WARNING: To deactivate the driver air bag, refer to the procedure in section 501-**20B** for the correct air bag deactivation procedure. Failure to follow this instruction, may result in personal injury.

- 1 Remove the driver air bag module.

REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUE0030301

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the driver air bag connector, clockspring side and the clockspring C763 pin 6, circuit 31S-GJ7 (BWBU) (vehicles without stability assist) or C353 pin 13, circuit 31S-GJ7 (BWBU) (vehicles with stability assist) component side.

- Is the resistance less than 5 ohms?

→ **Yes**

GO to A10.

→ **No**

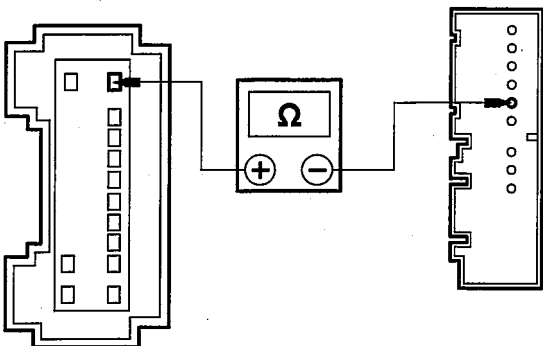
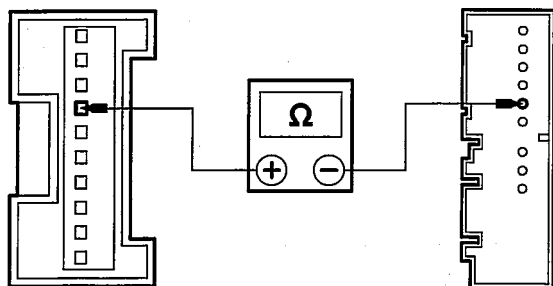
INSTALL a new clockspring.

REFER to: Clockspring (501-20 Supplemental Restraint System, Removal and Installation).
TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A10: CHECK THE CLOCKSPring CIRCUIT FOR OPEN CIRCUIT

VUE0030302

- 1 Measure the resistance between the driver air bag connector, clockspring side and clockspring C763 pin 7, circuit 31-GJ9 (BK) (vehicles without stability assist) or C353 pin 14, circuit 31-GJ9 (BK) (vehicles with stability assist) component side.

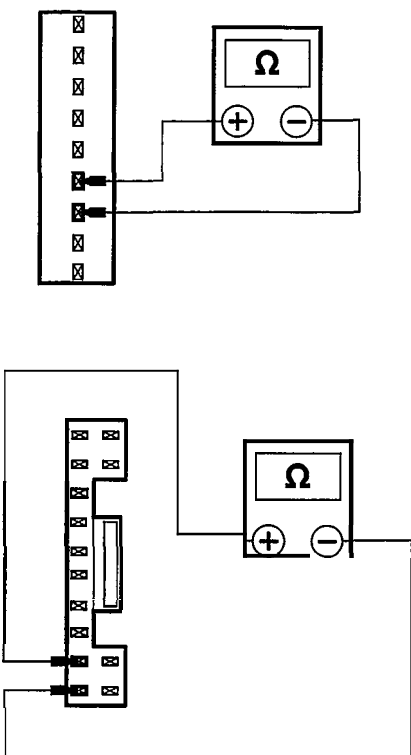
- Is the resistance less than 5 ohms?

→ **Yes**
GO to A11.

→ **No**
INSTALL a new clockspring.

REFER to: Clockspring (501-20 Supplemental Restraint System, Removal and Installation).
TEST the system for normal operation.

DIAGNOSIS AND TESTING

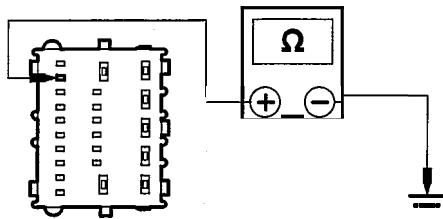
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A II: CHECK THE HORN SWITCH CIRCUIT FOR OPEN CIRCUIT	
 E65211	☐ Measure the resistance between the clockspring pin 6 and pin 7 (vehicles without stability assist) or pin 13 and pin 14 (vehicles with stability assist) component side while pressing the horn switch. Is the resistance less than 5 ohms? → Yes INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation. → No INSTALL a driver air bag module. REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation). TEST the system for normal operation.

PINPOINT TEST B : THE HORN IS ALWAYS ON

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE HORN SWITCH CIRCUIT FOR SHORT TO GROUND	
	1 Disconnect GEM C320. Does the horn stop sounding with C320 disconnected? → Yes GO to B2. → No INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation.
B2: CHECK CIRCUIT 31S-GJ7 (BWBU) FOR SHORT TO GROUND	
	☐ Disconnect Clockspring C763 - Vehicles Without Stability Assist.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUE0030287

DETAILS RESULTS ACTIONS

- 2** Disconnect Clockspring C353 - Vehicles With Stability Assist.
- 3** Measure the resistance between the GEM C320 pin 22, circuit 31S-GJ7 (BWBU), harness side and ground.
- Is the resistance greater than 10,000 ohms?
- **Yes**
GO to B3.
- **No**
REPAIR the circuit. TEST the system for normal operation.

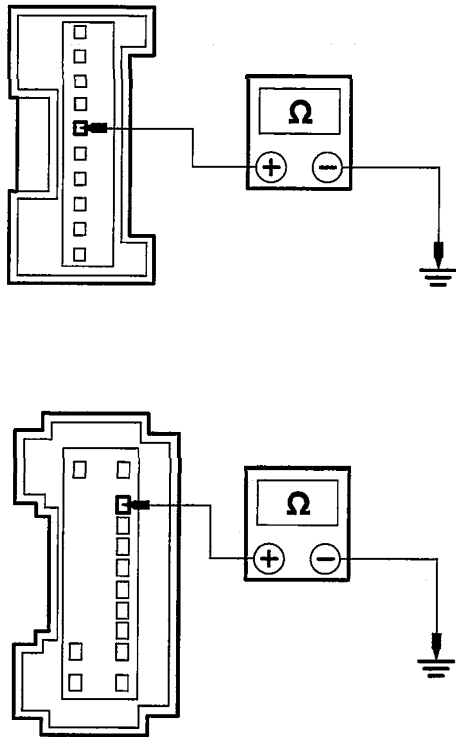
B3: CHECK CLOCKSPRING FOR SHORT TO GROUND

▲ WARNING: To deactivate the driver air bag, refer to the procedure in section 501-20B for the correct air bag deactivation procedure. Failure to follow this instruction, may result in personal injury.

- ☐ Remove the driver air bag module.
- REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUE0030296

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the clockspring C763 pin 6, circuit 31S-GJ7 (BWBU) (vehicles without stability assist) or C353 pin 13, circuit 31S-GJ7 (BWBU) (vehicles with stability assist) component side and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

INSTALL a new driver air bag module.

REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

TEST the system for normal operation.

→ No

INSTALL a new clockspring.

REFER to: Clockspring (501-20 Supplemental Restraint System, Removal and Installation).

TEST the system for normal operation.

DIAGNOSIS AND TESTING**Horn — Vehicles Built From: 1012005**

Refer to Wiring Diagrams Section 413-06, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Wiring harness

Electrical
- Electrical connector(s)
- Horn switch
- Horn
- Clockspring
- Generic Electronic Module (GEM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• The horn is inoperative	• Fuse(s). • Circuit(s). • Horn switch. • Horn. • Clockspring. • GEM.	• GO to Pinpoint Test A.
^a The horn is always on	• Clockspring. • Horn switch. • Circuit(s). • GEM.	• GO to Pinpoint Test B.

Pinpoint Tests

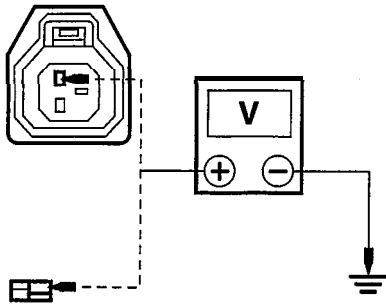
NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST C : THE HORN IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE HORN FOR POWER	
	1 Disconnect Horn C413 - All Except Vehicles with 2.0L Duratec-HE (M14) engine or 1.6L Duratorq-TDCi (DV) Diesel engine.
	2 Disconnect Horn C414 - Vehicles with 2.0L Duratec-HE (M14) engine or 1.6L Duratorq-TDCi (DV) Diesel engine.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E65097

DETAILS/RESULTS/ACTIONS

- 3 Measure the voltage between the horn C413 pin 1 or C414 pin 1, circuit 29S-GJ6 (OGNE), harness side and ground while pressing the horn switch.

- Is the voltage greater than 10 volts?

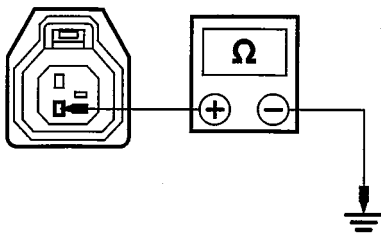
→ **Yes**

All Except Vehicles with 2.0L Duratec-HE (MI4) engine or 1.6L Duratorq-TDCi (DV) Diesel engine, INSTALL a new horn. TEST the system for normal operation.
Vehicles with 2.0L Duratec-HE (MI4) engine or 1.6L Duratorq-TDCi (DV) Diesel engine, GO to A2.

→ **No**

GO to A3.

A2: CHECK THE HORN GROUND CIRCUIT 31-GJ6 (BK)



E65236

- 1 Measure the resistance between the horn C414 pin 2, circuit 31-GJ6 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

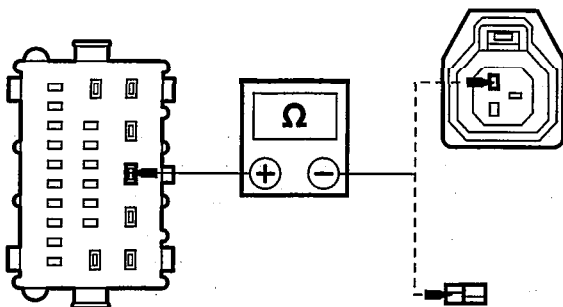
→ **Yes**

INSTALL a new horn. TEST the system for normal operation.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

A3: CHECK CIRCUIT 29S-GJ6 (OGNE) FOR OPEN CIRCUIT



E65105

- ☐ Disconnect GEM C317.

- 2 Measure the resistance between the GEM C317 pin 3, circuit 29S-GJ6 (OG/YE), harness side and the horn C413 pin 1 or C414 pin 1, circuit 29S-GJ6 (OGNE), harness side.

- Is the resistance less than 5 ohms?

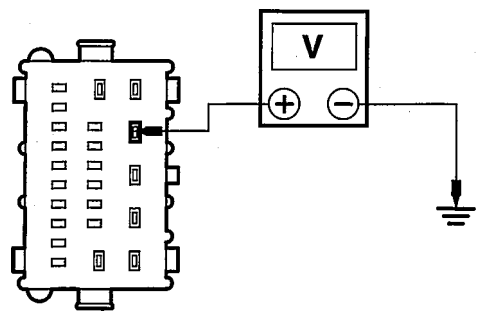
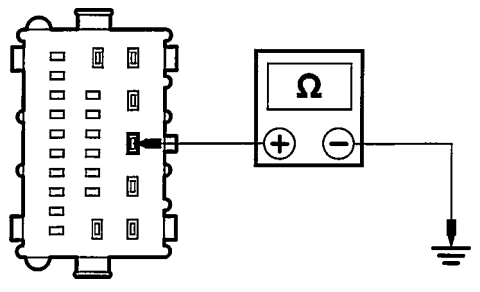
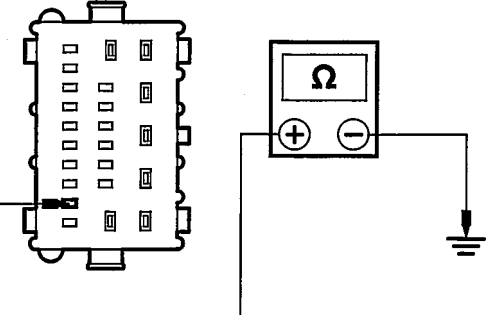
→ **Yes**

GO to A4.

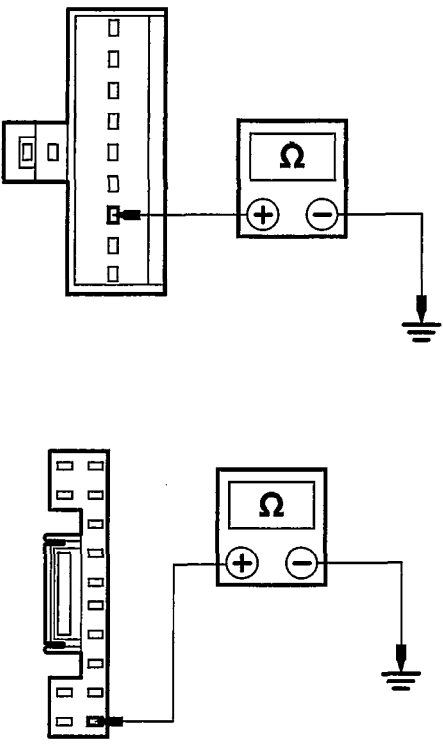
→ **No**

REPAIR the circuit. TEST the system for normal operation.

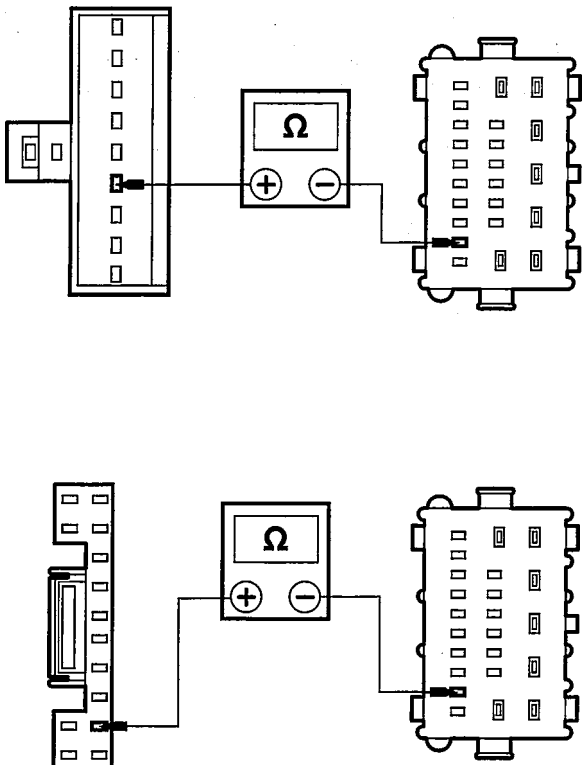
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A4: CHECK THE GEM FOR POWER  E65098	☐ Measure the voltage between the GEM C317 pin 4, circuit 29-GJ8 (OG), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to A5. → No REPAIR circuit 29-GJ8 (OG). TEST the system for normal operation.
A5: CHECK THE GEM GROUND CIRCUIT 31-DK20 (BK)  E65248	1 Disconnect GEM C318. 2 Measure the resistance between the GEM C318 pin 3, circuit 31-DK20 (BK), harness side and ground. - Is the resistance less than 5 ohms? → Yes GO to A6. → No REPAIR the circuit. TEST the system for normal operation.
A6: CHECK THE HORN SWITCH CIRCUIT FOR OPEN  E65106	1 Disconnect GEM C320. 2 Measure the resistance between the GEM C320 pin 15, circuit 31S-GJ7 (BWBU), harness side and ground while pressing the horn switch. - Is the resistance less than 5 ohms? → Yes INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation. → No GO to A7.

DIAGNOSIS AND TESTING

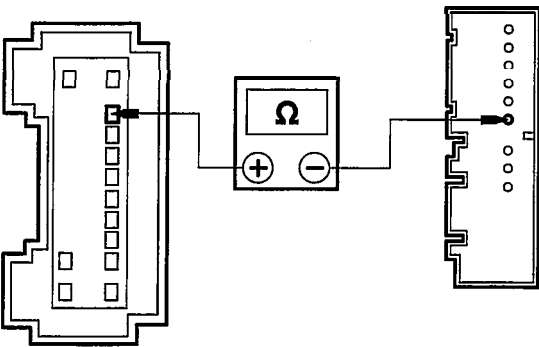
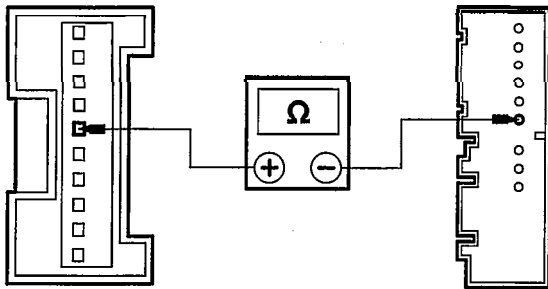
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A7: CHECK THE HORN SWITCH GROUND CIRCUIT	
	☒ 1 Disconnect Clockspring C763 - Vehicles Without Stability Assist. ☒ Disconnect Clockspring C353 - Vehicles With Stability Assist.
 E65112	☐ Measure the resistance between the clockspring C763 pin 7, circuit 31-GJ9 (BK) (vehicles without stability assist) or C353 pin 14, circuit 31-GJ9 (BK) (vehicles with stability assist), harness side and ground. Is the resistance less than 5 ohms? → Yes GO to A8. → No REPAIR circuit 31-GJ9 (BK). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A8: CHECK CIRCUIT 31S-GJ7 (BK/BU) FOR OPEN CIRCUIT  E65109	1 Measure the resistance between the clockspring C763 pin 6, circuit 31S-GJ7 (BWBU) (vehicles without stability assist) or C353 pin 13, circuit 31S-GJ7 (BWBU) (vehicles with stability assist), harness side and the GEM C320 pin 15, circuit 31S-GJ7 (BWBU), harness side. • Is the resistance less than 5 ohms? → Yes GO to A9. → No REPAIR the circuit. TEST the system for normal operation.
A9: CHECK THE CLOCKSPRING CIRCUIT FOR OPEN CIRCUIT ▲ WARNING: To deactivate the driver air bag, refer to the procedure in section 501-20B for the correct air bag deactivation procedure. Failure to follow this instruction, may result in personal injury.	1 Remove the driver air bag module. REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUE0030301

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the driver air bag connector, clockspring side and the clockspring C763 pin 6, circuit 31S-GJ7 (BWBU) (vehicles without stability assist) or C353 pin 13, circuit 31S-GJ7 (BWBU) (vehicles with stability assist) component side.

- Is the resistance less than 5 ohms?

→ **Yes**

GO to A10.

→ **No**

INSTALL a new clockspring.

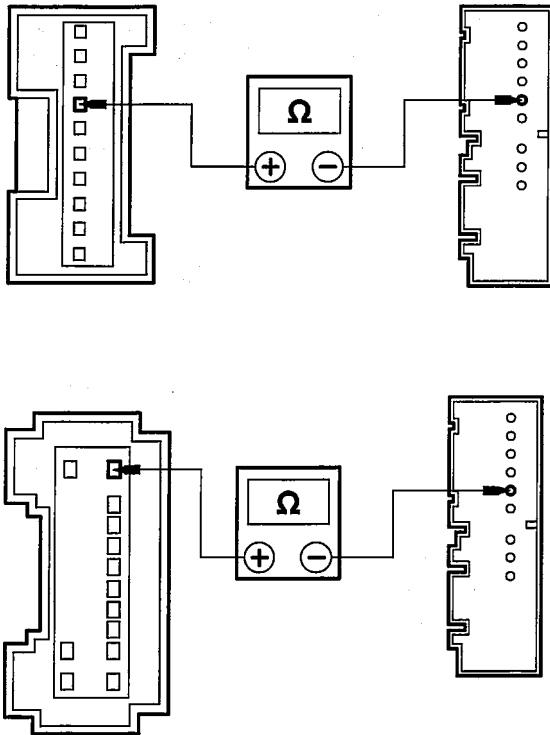
REFER to: Clockspring (501-20 Supplemental Restraint System, Removal and Installation).
TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A10: CHECK THE CLOCKSPrING CIRCUIT FOR OPEN CIRCUIT



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- 1 Measure the resistance between the driver air bag connector, clockspring side and clockspring C763 pin 7, circuit 31-GJ9 (BK) (vehicles without stability assist) or C353 pin 14, circuit 31-GJ9 (BK) (vehicles with stability assist) component side.

- Is the resistance less than 5 ohms?

→ **Yes**

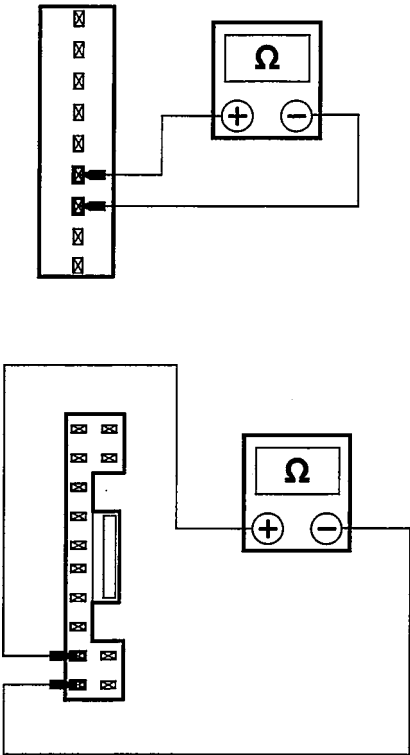
GO to A11.

→ **No**

INSTALL a new clockspring.

REFER to: Clockspring (501-20 Supplemental Restraint System, Removal and Installation).
TEST the system for normal operation.

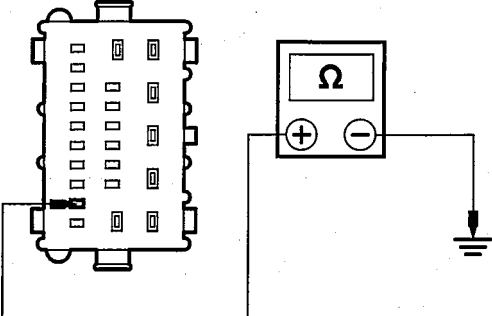
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A II: CHECK THE HORN SWITCH CIRCUIT FOR OPEN CIRCUIT	
 E65211	1 Measure the resistance between the clockspring pin 6 and pin 7 (vehicles without stability assist) or pin 13 and pin 14 (vehicles with stability assist) component side while pressing the horn switch. Is the resistance less than 5 ohms? → Yes INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (A19-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation. → No INSTALL a driver air bag module. REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation). TEST the system for normal operation.

PINPOINT TEST D : THE HORN IS ALWAYS ON

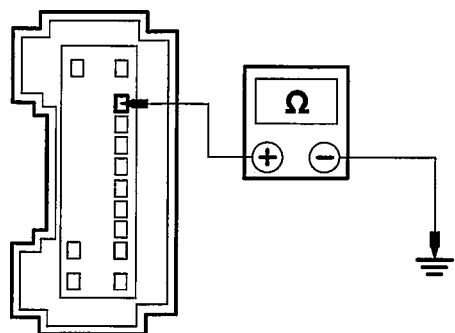
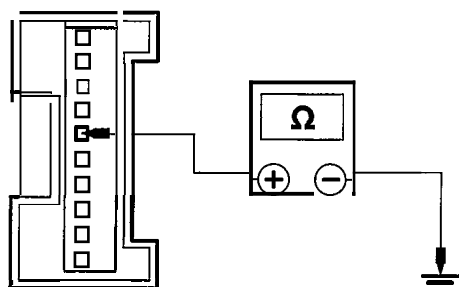
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE HORN SWITCH CIRCUIT FOR SHORT TO GROUND	
	1 Disconnect GEM C320. Does the horn stop sounding with C320 disconnected? → Yes GO to B2. → No INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation.
B2: CHECK CIRCUIT 31S-GJ7 (BKIBU) FOR SHORT TO GROUND	
	☐ Disconnect Clockspring C763 - Vehicles Without Stability Assist.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E65106	2 Disconnect Clockspring C353 - Vehicles With Stability Assist. Measure the resistance between the GEM C320 pin 15, circuit 31S-GJ7 (BWBU), harness side and ground. Is the resistance greater than 10,000 ohms? → Yes GO to B3. → No REPAIR the circuit. TEST the system for normal operation.
B3: CHECK THE CLOCKSPRING FOR SHORT TO GROUND	
WARNING:To deactivate the driver air bag, refer to the procedure in section 501-20B for the correct air bag deactivation procedure. Failure to follow this instruction, may result in personal injury.	
	1 Remove the driver air bag module. REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

DIAGNOSIS AND TESTING

TEST CONDITIONS



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DETAILS RESULTS ACTIONS

- 2 Measure the resistance between the clockspring C763 pin 6, circuit 31S-GJ7 (BWBU) (vehicles without stability assist) or C353 pin 13, circuit 31S-GJ7 (BWBU) (vehicles with stability assist) component side and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

INSTALL a new driver air bag module.

REFER to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

TEST the system for normal operation.

→ No

INSTALL a new clockspring.

REFER to: Clockspring (501-20 Supplemental Restraint System, Removal and Installation).

TEST the system for normal operation.

SECTION 413-08 Information and Message Center

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Information and Message Center..... 413-08-2

REMOVAL AND INSTALLATION

Message Center..... (33 367 0) 413-08-3

DIAGNOSIS AND TESTING

Information and Message Center

NOTE: The information and message center and the instrument cluster are one component and can not be diagnosed separately.

REFER to Section 413-01 [Instrument Cluster].

REMOVAL AND INSTALLATION**Message Center(33 367 0)**

NOTE: The message center and the instrument cluster are one component and can not be removed separately.

- 1. Remove the instrument cluster. For additional information, refer to Section 413-01 [Instrument Cluster].**

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SECTION 413-09 Warning Devices

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Warning Devices.....	413-09-2
Inspection and Verification.....	413-09-2

REMOVAL AND INSTALLATION

Low Washer Fluid Warning Indicator Switch.....	(33 607 0)	413-09-3
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DIAGNOSIS AND TESTING

Warning Devices

Refer to Wiring Diagrams Section 413-09, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

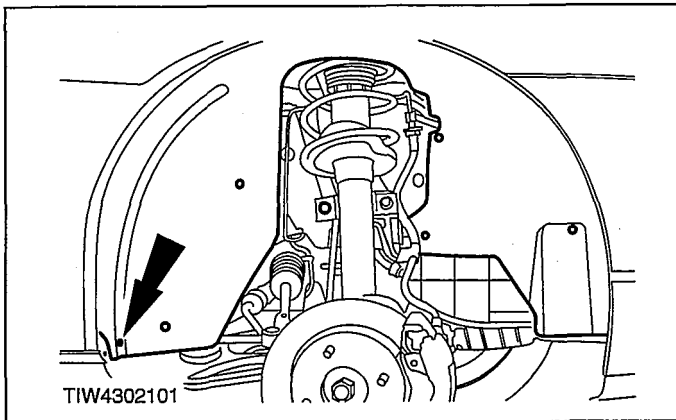
Visual Inspection Chart

Mechanical	Electrical
- Door ajar switch(es)	- Fuse(s) - Wiring harness - Electrical connector(s) - Switch(es) - Generic electronic module (GEM) - Instrument cluster

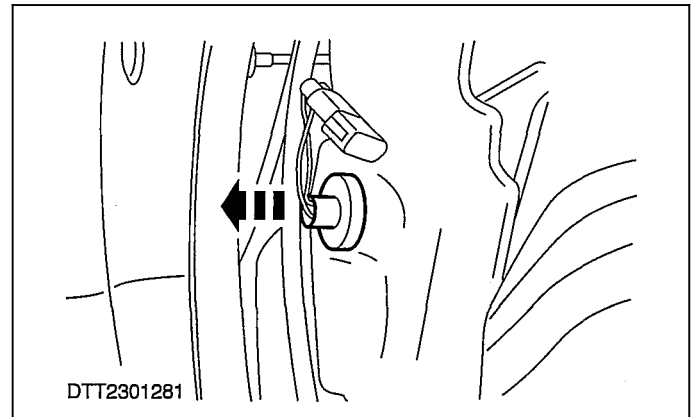
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to WDS to diagnose the system.

REMOVAL AND INSTALLATION**Low Washer Fluid Warning Indicator Switch(33 607 0)****Removal**

1. Loosen the right-hand side front wheel nuts.
2. Raise and support the vehicle. For additional information, refer to Section **100-02** [Jacking and Lifting].
3. Remove the right-hand side wheel.
4. Remove the fender splash shield.

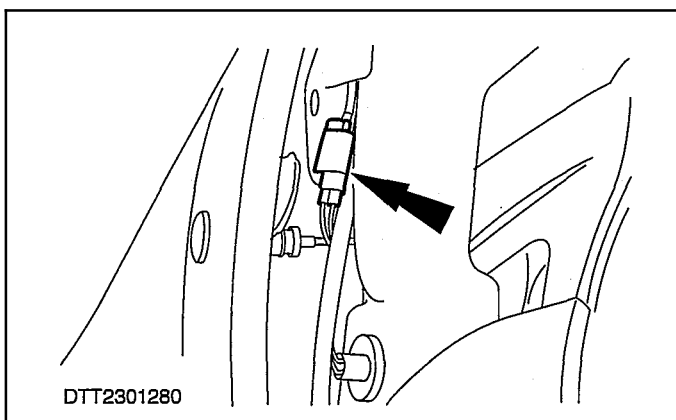


Remove the switch.

**Installation**

1. To install, reverse the removal procedure.

5. Disconnect the low washer fluid level switch electrical connector.



6. **NOTE:** Drain the windshield washer fluid into a suitable container.



SECTION 413-13 Parking Aid

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Parking Aid.....	413-13-2
Inspection and Verification.....	413-13-2
Parking Aid Module Reset Procedure.....	413-13-2
Self-Diagnostic Mode.....	413-13-2
Symptom Chart.....	413-13-3
Pinpoint Test.....	413-13-3
Component Tests.....	413-13-6

DIAGNOSIS AND TESTING

Parking Aid

Refer to Wiring Diagrams Section 413-13, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
– Fuse(s) - Relay(s) - Wiring harness - Electrical connector(s) - Parking aid sensor(s) - Parking aid display and speaker - Reversing lamp switch - Parking aid module - Parking aid resistance plug

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Parking Aid Module Reset Procedure.

Parking Aid Module Reset Procedure

1. Turn the ignition key to position 0.

2. Disconnect the parking aid resistance plug.
3. Turn the ignition key to position II.
4. Select the reverse gear and then deselect the reverse gear.
5. Turn the ignition key to position 0.
6. Connect the parking aid resistance plug.
7. TEST the system for normal operation. If the cause persists, refer to the Self-Diagnostic Mode.

Self-Diagnostic Mode

1. To enter the parking aid module Self-Diagnostic Mode, turn the ignition key to position 0, remove the parking aid resistance plug and make sure the vehicle is in neutral gear.
2. Make sure that no obstacle is within 2 meters of the rear of the vehicle.
3. Turn the ignition key to position II and select reverse gear.
4. Self-Diagnostic Mode will be indicated by an audible tone for three seconds from the parking aid speaker, and is paused for one second.
5. If a concern is detected with a parking aid sensor, the parking aid module will indicate this by emitting an audible tone sequence from the parking aid speaker.
6. If there is a concern with more than one parking aid sensor, a second sequence will be emitted after the first.
7. To exit the Self-Diagnostic Mode, select neutral, turn the ignition key to position 0 and install the parking aid resistance plug.

Audible Tone Sequence

Audible Tone Sequence	Description	Action
ON for three seconds, pause for one second	Opening sequence for concern diagnostics	
ON and OFF once, pause for one second	Right-hand outer sensor concern	REFER to the Component Test in this procedure.
ON and OFF twice, pause for one second	Right-hand inner sensor concern	REFER to the Component Test in this procedure.
ON and OFF three times, pause for one second	Left-hand inner sensor concern	REFER to the Component Test in this procedure.
ON and OFF four times, pause for one second	Left-hand outer sensor concern	REFER to the Component Test in this procedure.

DIAGNOSIS AND TESTING

Audible Tone Sequence	Description	Action
ON for seventy five milliseconds, pause for seventy five milliseconds	Module concern. Low battery voltage. Short in parking aid resistance plug circuit.	GO to Pinpoint Test A.

8. If the concern remains after the Self-Diagnostic Mode, refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
A continuous audible tone is emitted	- Parking aid sensor(s). - Parking aid module. - Parking aid resistance plug.	REFER to the Self-Diagnostic Mode.
The parking aid speaker has a continuous or intermittent tone when the reverse gear is selected	- Parking aid sensor(s) dirty or iced over. - Parking aid sensor(s) incorrectly installed.	- CLEAN the rear parking aid sensor(s). - INSTALL the rear parking aid sensor(s) correctly.
Parking aid is inoperative/does not operate correctly	- Parking aid module. - Reversing lamp switch. - Circuit(s). - Parking aid speaker. - Parking aid resistance plug.	GO to Pinpoint Test A. .

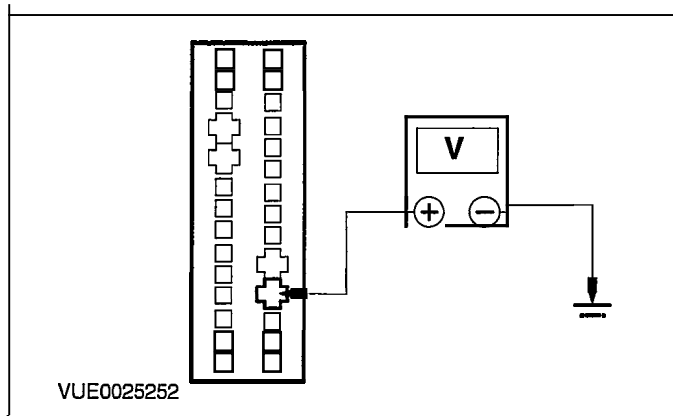
Pinpoint Test**PINPOINT TEST A : PARKING AID IS INOPERATIVE/DOES NOT OPERATE CORRECTLY****TEST CONDITIONS****DETAILS RESULTS ACTIONS**

A1: CHECK THE REVERSING LAMP SWITCH	
	1 Ignition switch in position II.
	2 Select reverse gear.
	- Is the reversing lamp working? → Yes GO to A2. . → No REFER to Section 417-01 [Exterior Lighting].
A2: CHECK THE PARKING AID MODULE POWER SUPPLY	
	1 Ignition switch in position 0.
	2 Disconnect Parking Aid Module C1015.
	3 Ignition switch in position II.
	4 Select reverse gear.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



☐ Measure the voltage between the parking aid module C1015 pin 18, (RD), harness side and ground.

• Is the voltage greater than 10 volts?

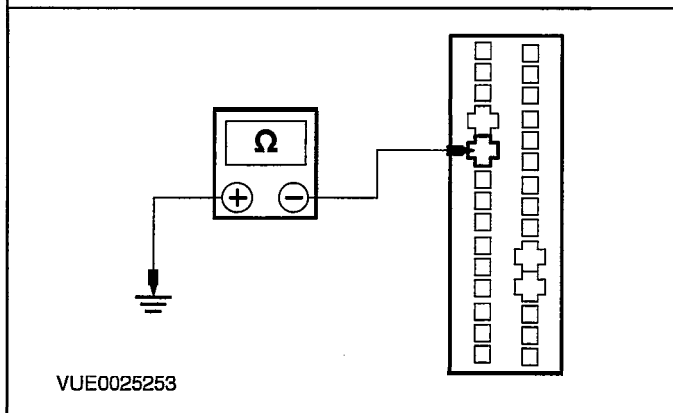
→ **Yes**

GO to A3. .

→ **No**

CHECK and REPAIR the circuit between the parking aid module C1015 pin 18, (RD), harness side and C800 pin 27, (GNNE), harness side. IF the circuit is OK, INSTALL a new parking aid module. TEST the system for normal operation.

A3: CHECK THE PARKING AID MODULE GROUND CIRCUIT



1 Ignition switch in position 0.

2 Measure the resistance between the parking aid module C1015 pin 10, (BN), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**

GO to A4. .

→ **No**

CHECK and REPAIR the circuit between the parking aid module C1015 pin 10, (BN) harness side and ground. IF the circuit is OK, INSTALL a new parking aid module. TEST the system for normal operation.

A4: CHECK THE PARKING AID SPEAKER CIRCUIT

1 Disconnect Parking Aid Speaker C1016.

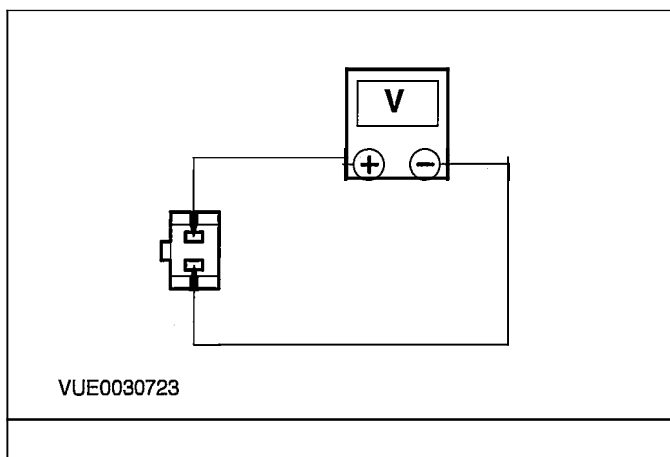
2 Connect Parking Aid Module C1015.

3 Ignition switch in position II.

4 Select reverse gear.

DIAGNOSIS AND TESTING

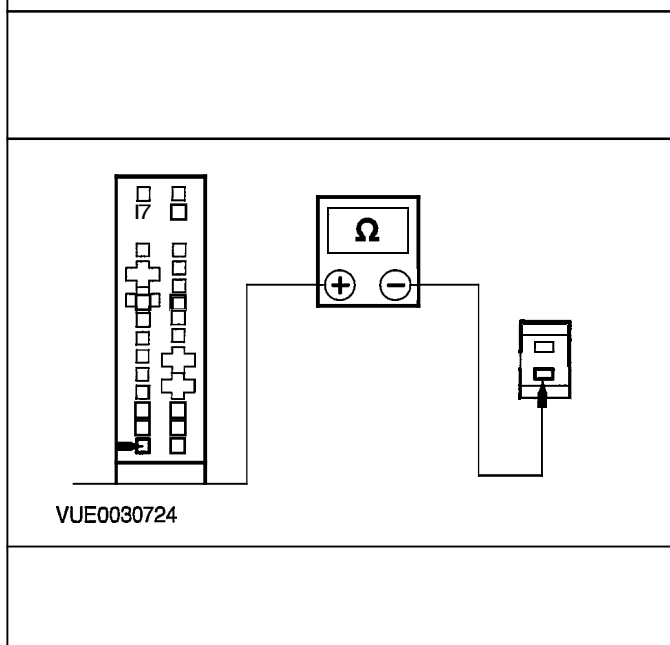
TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

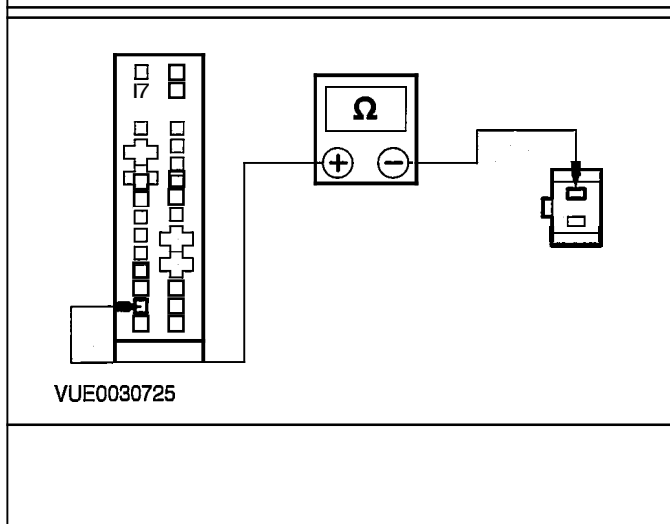
- 5** Place an obstacle within one meter of the parking aid sensor. Measure the voltage between the parking aid speaker C1016 pin 1, (BN), harness side and parking aid speaker C1016 pin 2, (BN/RD), harness side.
- Is the voltage greater than 10 volts?
- **Yes**
INSTALL a new parking aid speaker. TEST the system for normal operation.
- **No**
GO to A5. .

A5: CHECK THE PARKING AID SPEAKER CIRCUIT FOR OPEN



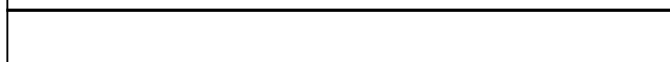
- ☐ Ignition switch in position 0.
- 2** Disconnect Parking Aid Module C1015.
- ☐ Measure the resistance between the parking aid module C1015 pin 1, (BN), harness side and the parking aid speaker C1016 pin 1, (BN), harness side.
- Is the resistance less than 5 ohms?
- **Yes**
GO to A6. .
- **No**
REPAIR the circuit between the parking aid module C1015 pin 1, (BN), harness side and the parking aid speaker C1016 pin 1, (BN), harness side. TEST the system for normal operation.

A6: CHECK THE PARKING AID SPEAKER CIRCUIT FOR OPEN



- 1** Measure the resistance between the parking aid module C1015 pin 2, (BNIRD), harness side and the parking aid speaker C1016 pin 2, (BN/RD), harness side.
- Is the resistance less than 5 ohms?
- **Yes**
GO to A7. .
- **No**
REPAIR the circuit between the parking aid module C1015 pin 2, (BNIRD), harness side and the parking aid speaker C1016 pin 2, (BN/RD), harness side. TEST the system for normal operation.

A7: CHECK THE PARKING AID RESISTANCE PLUG CIRCUIT FOR SHORT TO GROUND

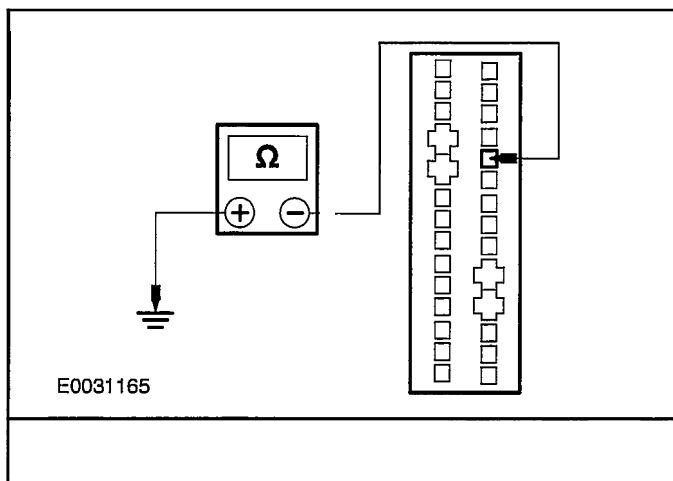


- 1** Disconnect Parking Aid Resistance Plug.

DIAGNOSIS AND TESTING

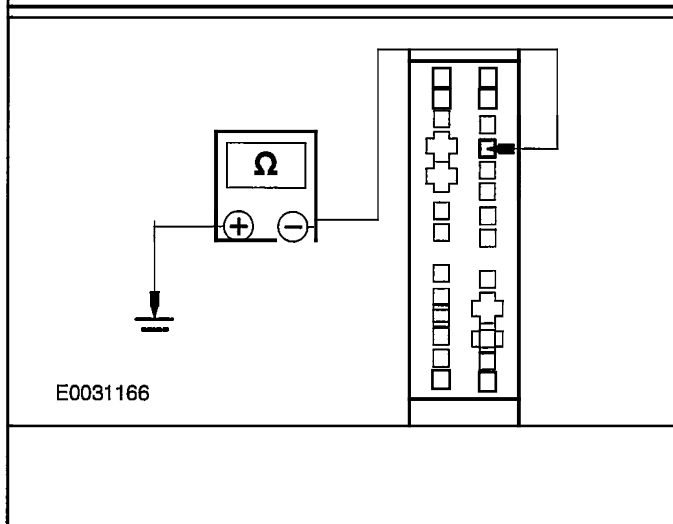
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- 2 Measure the resistance between the parking aid module C1015 pin 24, (PK), harness side and ground.
- Is the resistance greater than 10,000 ohms?
 - **Yes**
GO to A8.
 - **No**
CHECK and REPAIR the circuit between the parking aid module C1015 pin 24, (PK), harness side and ground. If the circuit is OK, INSTALL a new parking aid resistance plug. TEST the system for normal operation.

A8: CHECK THE PARKING AID RESISTANCE PLUG CIRCUIT FOR SHORT TO GROUND



- 1 Measure the resistance between the parking aid module C1015 pin 25, (PK), harness and ground.
- Is the resistance greater than 10,000 ohms?
 - **Yes**
INSTALL a new parking aid module. TEST the system for normal operation.
 - **No**
CHECK and REPAIR the circuit between the parking aid module C1015 pin 25, (PK), harness and ground. If the circuit is OK, INSTALL a new parking aid resistance plug. TEST the system for normal operation.

Component Tests

Parking Aid Sensor Wiring Harness

NOTE: Refer to the Wiring Diagram, Section 413-13 for Schematic and Connector information.

NOTE: Check the parking aid wiring harness for short to ground, short to battery or damage.

- Test the parking aid sensor wiring harness using the following table as a guide to meter lead placement as well as expected values.

Parking Aid Sensor C1019	Parking Aid Module C1014	Expected Value	Action
Pin 1	Pin 4	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation

DIAGNOSIS AND TESTING

Parking Aid Sensor C1019	Parking Aid Module C1014	Expected Value	Action
Pin 2	Pin 10	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Pin 3	Pin 11	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Parking Aid Sensor C1020	Parking Aid Module C1014	Expected Value	Action
Pin 1	Pin 3	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Pin 2	Pin 10	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation

DIAGNOSIS AND TESTING

Parking Aid Sensor C1020	Parking Aid Module C1014	Expected Value	Action
Pin 3	Pin 11	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Parking Aid Sensor C1021	Parking Aid Module C1014	Expected Value	Action
Pin 1	Pin 2	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Pin 2	Pin 10	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Pin 3	Pin 11	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Parking Aid Sensor C1022	Parking Aid Module C1014	Expected Value	Action
Pin 1	Pin 1	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation

DIAGNOSIS AND TESTING

Parking Aid Sensor C1022	Parking Aid Module C1014	Expected Value	Action
Pin 2	Pin 10	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation
Pin 3	Pin 11	Less than 5 ohms	If the resistance is greater than 5 ohms, CHECK and REPAIR the circuit. If the circuit is OK, INSTALL a new parking aid sensor. TEST the system for normal operation



SECTION 414-00 Charging System - General Information

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Charging System.....	414-00-2
'Smart charge' generator control system.....	414-00-2
DIAGNOSIS AND TESTING	
Charging System.....	414-00-5
Inspection and Verification.....	414-00-5
Symptom Chart.....	414-00-6
Component Tests.....	414-00-7
GENERALPROCEDURES	
Battery Charging.....	(31 003 0) 414-00-12

DESCRIPTION AND OPERATION

Charging System

'Smart charge' generator control system

General

The generator creates electrical current to supply the vehicle electrical system and maintain the battery in a charged condition. The generator is driven by the accessory drive belt.

For additional information, refer to: Accessory Drive
- **1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)** (303-05 Accessory Drive, Description and Operation)

/ Accessory Drive - **1.4L Duratorq-TDCi (DV) Diesel** (303-05 Accessory Drive, Description and Operation)

/ Accessory Drive - **1.3L Duratec-8V (Rocam)** (303-05 Accessory Drive, Description and Operation)

/ Accessory Drive - **1.6L Duratorq-TDCi (DV) Diesel** (303-05 Accessory Drive, Description and Operation)

/ Accessory Drive - **2.0L Duratec-HE (MI4)** (303-05 Accessory Drive, Description and Operation).

When the engine is started, the generator begins to generate alternating current (AC) which it converts to direct current (DC) internally. The DC current is supplied to the battery and vehicle electrical loads at a voltage controlled by the voltage regulator (located on the back of the generator). The charging system voltage is controlled by the powertrain control module (PCM). The battery is more efficiently charged with a higher voltage when the battery is cold and a lower voltage when the battery is warm. The PCM is able to adjust the charging voltage according to battery temperature, which it calculates based on intake air temperature (IAT) and engine coolant temperature (ECT).

The PCM simultaneously monitors and controls the voltage output of the generator. When the current consumption is high or the battery is excessively discharged, the system is able to increase the idle speed. To minimize the engine drag when starting the engine, the PCM deactivates the generator. When the engine has started, the PCM then progressively increases the output of the generator.

The PCM controls the operation of the charging system warning indicator which is located in the instrument cluster. The PCM is therefore responsible for turning the warning indicator off after the engine is started and illuminating it under fault conditions, the warning indicator will also be illuminated by the PCM at key-on, engine-off, and stall conditions.

The smart charging system consists of the following functions:

- Battery temperature estimation and charging voltage control
- Generator load feed forward
- Generator deactivation during engine crank
- Idle speed increase under low voltage / high electrical load conditions (to increase alternator output and reduce battery discharge)
- Low voltage electrical load deactivation
- Over-voltage activation of electrical loads

By continually calculating the battery temperature and controlling generator output voltage the battery charging current is optimized. The generator load feed forward function gives the PCM advance warning of impending electrical load, and hence impending changes in alternator torque. Using this information, the PCM is able to achieve a greater degree of idle stability. The PCM also controls the generator activation during crank, and the idle speed increase functions. The passenger junction box (PJB) controls the two remaining smart charging functions, low voltage electrical load deactivation and over-voltage activation of electrical loads. When the battery voltage drops below the low voltage threshold, the PJB disables the following components in this order with a 5 second delay between each load deactivation:

- Heated windshield
- Heated rear window
- Air conditioning

The PJB re-enables all previously disabled electrical loads when the battery voltage is above the low voltage threshold. The order for re-enabling loads is air conditioning, then the heated rear window, then the heated windshield, with a 5 second delay between each load reactivation. When re-enabled, the electrical loads are returned to normal mode, therefore the component is switched off awaiting a PJB input signal from the switch. Over-voltage activation of electrical loads

DESCRIPTION AND OPERATION

is enabled when the PJB recognizes the battery voltage is above the over-voltage threshold for a 20 second period, and the charging system warning indicator is on.

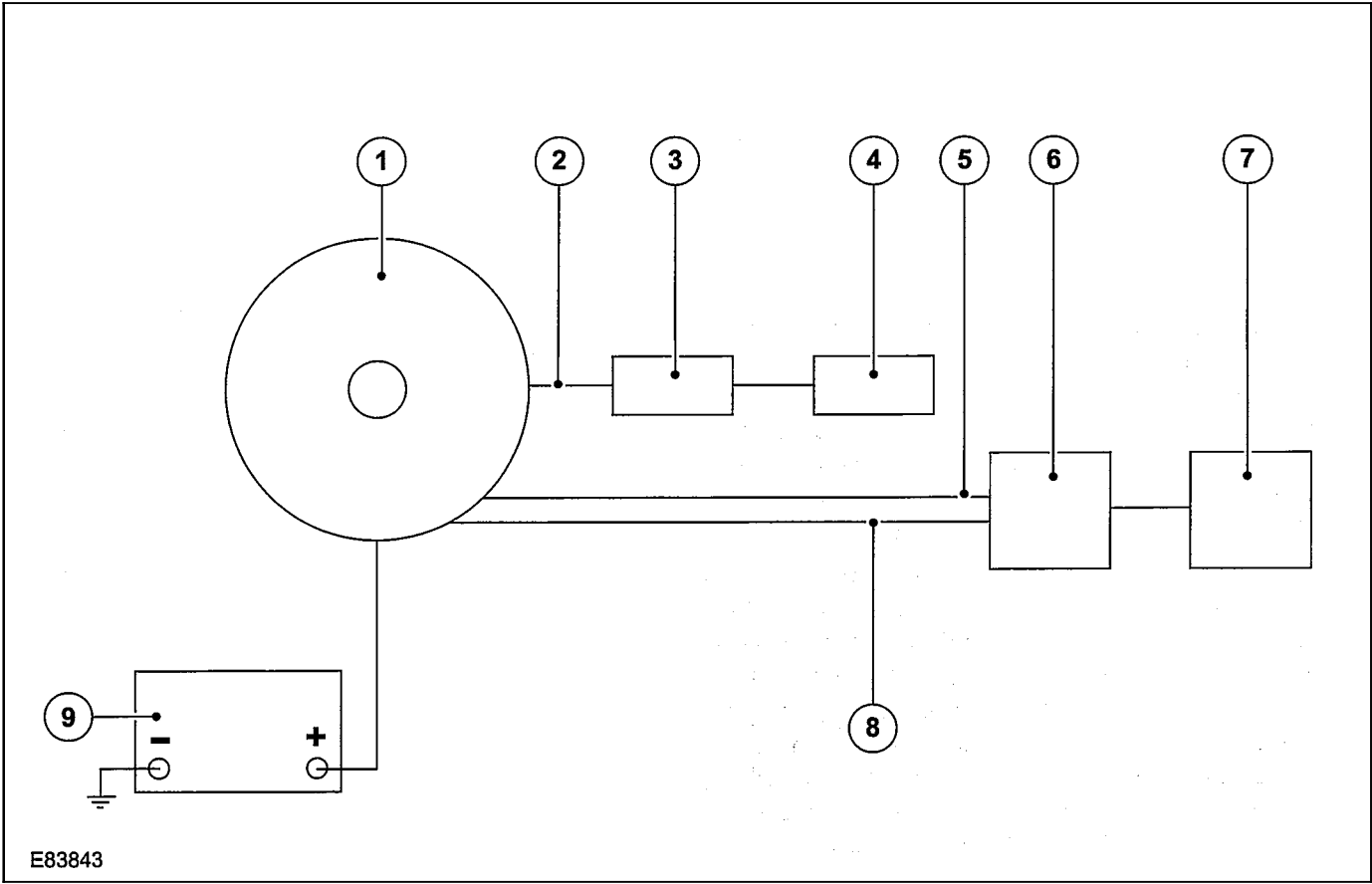
When the threshold is reached the PJB activates the following components in this order with a 5 second delay between each load:

- Heated rear window
- Heated windshield

The purpose of this is to reduce the voltage back within specification, and reduce any overcharging damage to the battery. The PJB returns the electrical loads to normal mode if the battery voltage drops below the high voltage threshold for a 20 second period. This is in order to prevent

excessive battery drain. The order for returning loads to normal mode is heated windshield then heated rear window, with a 5 second delay between each load reactivation. A cycling condition may occur where loads are repeatedly activated and deactivated as the voltage levels increase and decrease. This behavior is to be expected in a continuous over-voltage fault condition, and serves to minimize both damage to the battery due to overcharging, and the battery current drain due to activation of the heated rear window and heated windshield. In normal mode, the electrical loads are switched off awaiting a PJB input signal from the switch. The low voltage threshold is approximately 10.3 volts and the over-voltage threshold is approximately 16 volts.

Schematic of the 'Smart charge' generator control system



	Description
1	Generator
2	Battery voltage sensing line
3	3 Amp fuse
4	Battery junction box (BJB)

Item	Description
5	Generator required output signal from the PCM
6	PCM
7	Instrument cluster

DESCRIPTION AND OPERATION

Item	Description
8	Generator operation monitoring signal to the PCM
9	Battery

Starting the generator during engine starting

In the "smart charge" generator control system", the generator is deactivated during engine starting. The generator is only switched on after the engine has started.

Switching on is done electronically by the PCM. The generator power is then increased smoothly to the value required.

Increased idle speed

At idle with high generator load, the idle speed is increased in order to increase the generator power.

The system can increase the idle speed in steps by up to 150 rev/min above the base idle speed.

Diagnosis

There is a self-test facility for the Smart Charge - System, stored in the PCM and which can be accessed through the WDS. If a fault occurs in the system, the charging system warning indicator is illuminated by the PCM. If voltage regulation fails, the generator operates with a fixed charging voltage of approximately 13.5 Volts.

With fixed charging voltage the generator operates as usual and still delivers enough current for the vehicle systems. After the ignition is switched on, the PCM switches on the charging system warning indicator to check that it operates. After the engine starts the charging system warning indicator is switched off again. During the engine run condition, the charging system warning indicator will only illuminate if the PCM identifies that there is a fault present for a 20 second period. (Voltage out of range, internal generator fault, or PCM to generator communication fault).

DIAGNOSIS AND TESTING

Charging System

Refer to Wiring Diagrams Section 414-02, for schematic and connector information.

General **Equipment**

Surface charge dissipation unit (SCD ²)
Micro390 battery tester

Inspection and Verification

WARNINGS:

▲ Batteries contain sulphuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near batteries to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

▲ Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and

protect your eyes. Always provide ventilation. Failure to follow these instructions may result in personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
- Accessory drive belt - Generator - Generator decoupler (if equipped)	- Fuse(s) - Wiring harness - Electrical connector(s) - Battery junction box (BJB) - Battery - Battery cables - Charging system warning indicator

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. Check the operation of the charging system warning indicator lamp, located in the instrument cluster. Normal operation is as follows:

Normal Charging System Voltages

Ignition Switch Position	I Circuit	Generator B+ Circuit	Battery	Engine to battery ground	Charging System Warning Indicator Operation
Position 0	0V	10-12V	10-12V	0V	OFF
Position II	0V	10-12V	10-12V	0V	Illuminated
Position II with the engine running	13-15V	13-15V	13-15V	0V	OFF

5. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

DIAGNOSIS AND TESTING

Symptom Chart

Symptom	Possible Sources	Action
The charging system warning indicator is on with the engine running (The charging system voltage does not increase)	Accessory drive belt.	CHECK the accessory drive belt condition, REFER to: Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).
	- Circuit. - Generator. - Voltage regulator.	CARRY OUT the generator tests, REFER to the Generator On-Vehicle Tests in Component Tests in this section.
The charging system warning indicator is off with the ignition switch in the RUN position and the engine off	Bulb.	INSTALL a new bulb.
	Ignition switch.	CHECK the ignition switch.
	- Circuit. - Generator.	CARRY OUT the generator tests, REFER to the Generator On-Vehicle Tests in Component Tests in this section.
Radio interference	- Circuit. - Generator.	REFER to the WDS
The generator is noisy	Accessory drive belt.	REFER to: Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).
	Loose generator mounting bolts.	TIGHTEN the generator mounting bolts.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	Generator.	INSTALL a new generator. REFER to: Generator - 1.3L Duratec-8V(Rocam) (414-02 Generator and Regulator, Removal and Installation) / Generator - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (414-02 Generator and Regulator, Removal and Installation) / Generator - 1.4L Duratorq-TDCi (DV) Diesel (414-02 Generator and Regulator, Removal and Installation) / Generator - 2.0L Duratec-HE (M14) (414-02 Generator and Regulator, Removal and Installation) / Generator - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Air Conditioning (414-02 Generator and Regulator, Removal and Installation) / Generator - 1.6L Duratorq-TDCi (DV) Diesel, Vehicles Without: Air Conditioning (414-02 Generator and Regulator, Removal and Installation).
Vehicle electrical systems inoperative	Battery.	CARRY OUT the battery test, REFER to the Battery Test in Component Tests in this section.
The engine cranks slowly	Battery.	CARRY OUT the battery test, REFER to the Battery Test in Component Tests in this section.
	- Battery cable(s). - Starter motor.	REFER to: Starting System (303-06 Starting System, Diagnosis and Testing).

Component Tests

Generator On-Vehicle Tests * No-Load Test

- Turn off all electrical loads and the ignition switch.
- Switch the multimeter to the voltage function.

- Connect the leads of the multimeter across the battery terminals.
- Read the voltage (base voltage).
- Start the engine.
- Run the engine at 1500 rpm with no electrical load.
- Read the voltage. The voltage should be in the range of 14.1 volts to 15.1 volts. If the voltage increase is less than 2.5 volts above the base

DIAGNOSIS AND TESTING

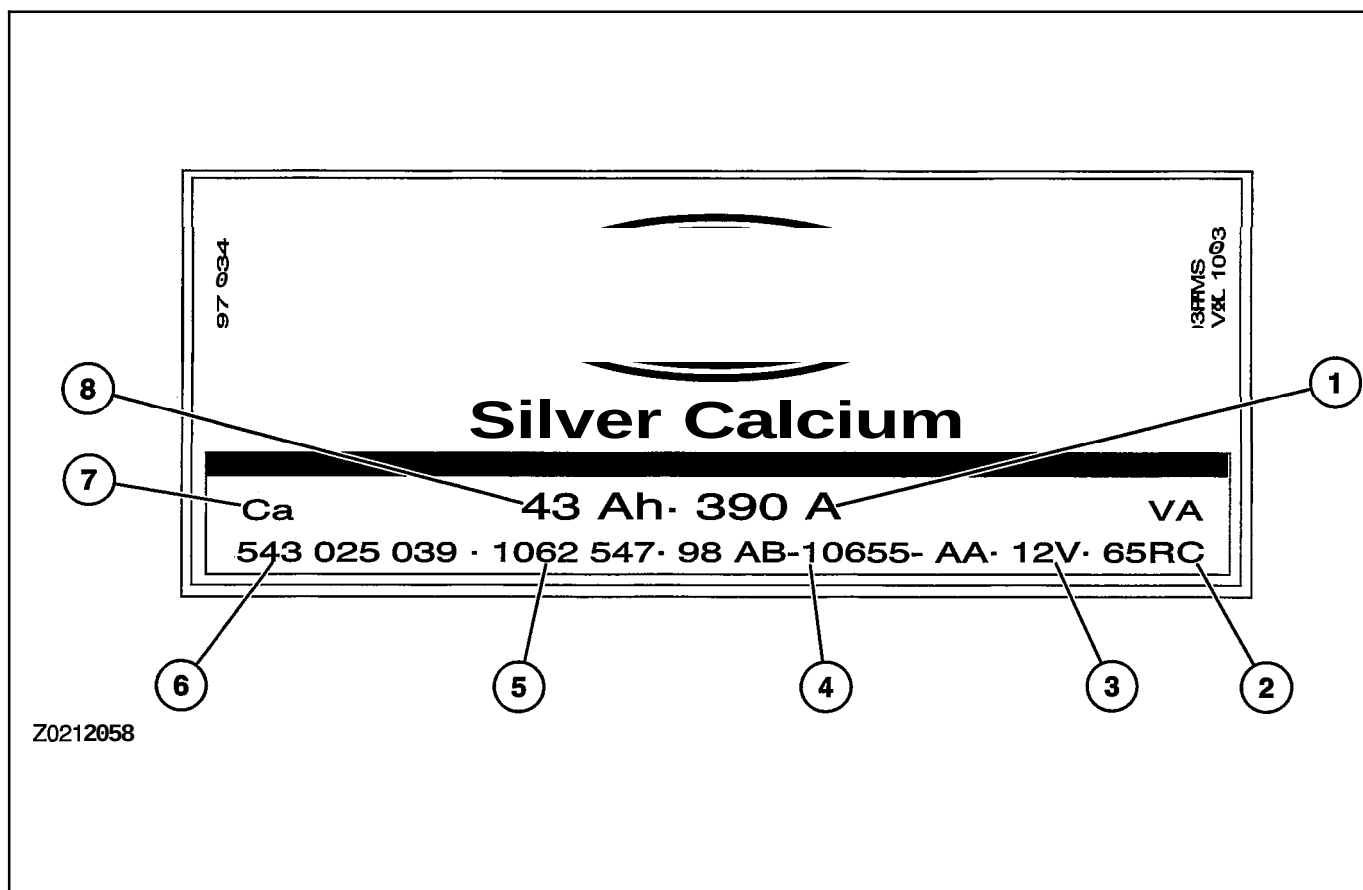
voltage, carry out the Load Test. If the voltage increase is greater than 2.5 volts, REFER to the WDS.

2. Increase the engine speed to 2000 rpm. The voltage should increase a minimum of 0.5 volts above the base voltage. If the voltage does not increase as specified, REFER to the WDS. If the voltage increases as specified, the charging system is charging correctly. REFER to the Symptom Chart.

Generator On-Vehicle Tests - Load Test

1. With the engine running, turn on the air conditioning (if equipped), turn the blower motor to high speed and the headlamps to high beam.

Battery Identification

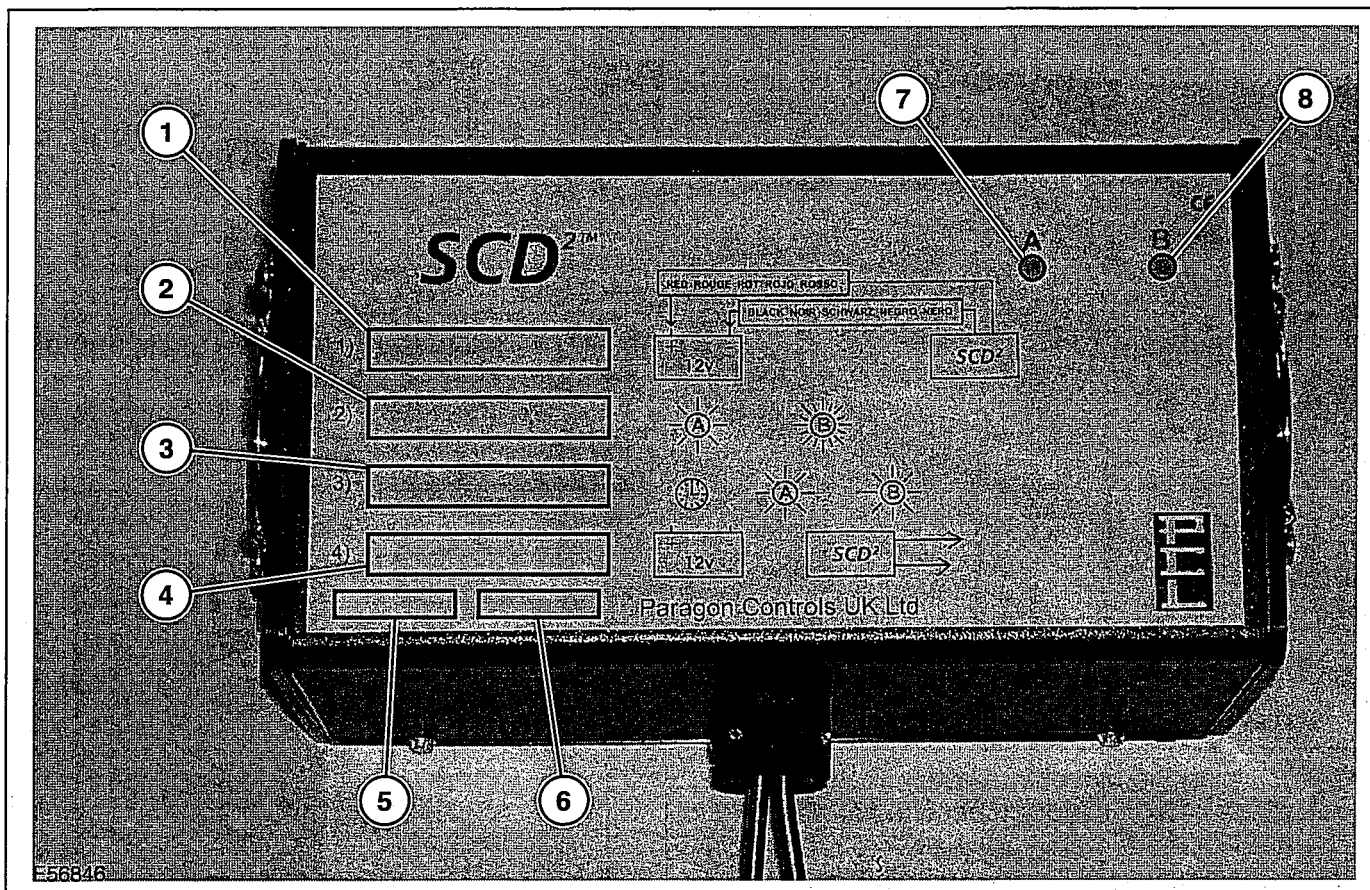


Item	Description
1	Cold crank amp (CCA) rating
2	Reserve capacity (RC) rating (minutes)
3	Battery voltage
4	Ford Part number

Item	Description
5	FINIS code
6	EN number (European Norm)
7	Battery type: Ca = Silver/Calcium; Sb = Lead/Antimony
8	Amp hour rating

DIAGNOSIS AND TESTING

Battery Surface Charge Removal

Surface charge dissipation unit (SCD²)

Item	Description
1	Connect black lead to battery - Connect red lead to battery +
2	Red A indicator illuminates and green B indicator flashes
3	Wait until green B indicator illuminates
4	Disconnect from battery
5	Max 18v
6	-20°C to +55°C
7	Red indicator (A)
8	Green indicator (B)

CAUTION: Prior to testing any battery, the surface discharge must be dissipated. This includes batteries that are returned disconnected from the vehicle. If the battery is holding a surface charge, the battery tester will give false readings.

NOTE: The SCD² tool eliminates the need to dissipate the battery's surface charge via the manual process of loading the battery via the

operation of the vehicles electrical systems. It also removes the variability in the process and makes sure that the actual dissipation of the surface charge is qualified prior to testing.

1. Connect the black lead to the battery negative terminal and the red lead to the battery positive terminal.
2. The red indicator (A) illuminates and the green indicator (B) flashes.
3. Wait until the green indicator (B) fully illuminates, then disconnect from the battery.

Alternative Method To Dissipate The Battery Surface Charge

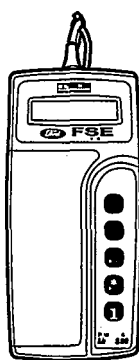
1. Leave the battery to stand for a minimum of six hours without charging or discharging or remove the surface charge through partial loading as follows:
 - Turn the ignition key to position II and switch on the headlamps (main beam), heated windshield (if equipped), heated rear window (if equipped) and the heater blower motor

DIAGNOSIS AND TESTING

(position II). Leave the vehicle in this condition for a minimum of 60 seconds to dissipate the battery surface charge.

- Turn the ignition key to position 0 and switch off the headlamps, heated windshield (if equipped), heated rear window (if equipped) and the heater blower motor. Leave the vehicle in this condition for a minimum of five minutes before testing battery condition.

Battery Test



TIZ0212063

NOTE: Using the Micro390 Battery Tester: To fully determine battery condition once the surface charge has been dissipated, the Micro390 battery tester must be used. For the Micro390 battery tester to operate, it requires a minimum of 5.5 volts charge to be present on the test battery. Therefore, if the Micro390 does not operate when connected to a test battery, then a charge of less than 5.5 volts is present. In this instance, the battery must be charged in line with the battery charging instructions prior to testing. In the event of a conflict of results between the charge eye indicator and the battery tester, the battery tester result must always be used. The charge eye indicator is for guidance only.

1. Connect the battery tester to the battery.
 - Connect the red clip to the battery positive (+) terminal and the black clip to the battery negative (-) terminal.

XXX CCA (SAE)

SET CCA RATING

TIZ0212059

2. **NOTE:** The label affixed to the top of batteries progressively from 0611998 identifies the battery CCA rating. Remove the battery if the label is obscured.

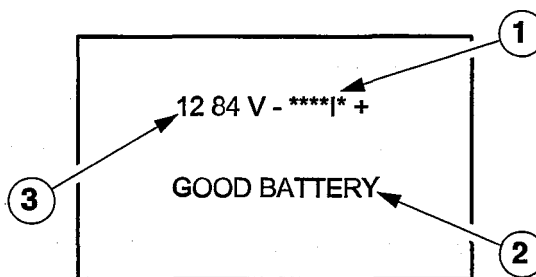
Use the "Arrow" buttons on the battery tester to scroll to the battery's labelled CCA rating.

XXX CCA (SAE)

TESTING

TIZ0212060

3. Press the "Test" button that corresponds to the correct battery temperature.
 - If the battery temperature is above zero degrees centigrade: press the "sun" button. If the battery temperature is below zero degrees centigrade: press the "Ice-crystal" button.



TIZ0212061

4. Carry out the action based upon the test result displayed and the following table.
 1. Charge level bar graph.

DIAGNOSIS AND TESTING

2. Test result.
3. Battery voltage.

5. Press the "information" button and carefully note the six-digit "Test Code" on the job card for claim submission and audit purposes (graphic shows an example of the code only).

7CA JLK

TIZ0212062

Battery tester results and required actions

Tester Reading	Action
GOOD BATTERY	Return to service
GOOD RECHARGE	Fully charge the battery and return to service*
CHARGE & RETEST	Fully charge the battery and retest
REPLACE BATTERY or BAD CELL BATTERY	 WARNING: Do not recharge the battery. Make sure that the surface charge was removed. If so, disconnect the battery from the vehicle and retest. If the result remains after surface charge removal, install a new battery.
UNABLE TO TEST	Disconnect the battery from the vehicle and retest.

*In addition, it is advisable to check the vehicle electrical system. Check that the generator is functioning correctly and that all key-off loads (luggage compartment lamps, glove compartment lamp and interior lamps) are not staying on.

GENERAL PROCEDURES

Battery Charging(31 003 0)

■ **WARNINGS:**

▲ **Keep** batteries out of reach of children. Batteries contain sulphuric acid, avoid contact with skin, eyes or clothing. Shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or the eyes, flush immediately with water for a minimum of **15** minutes and seek prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

▲ **Batteries** normally produce explosive gases which can cause personal injury, therefore do not allow flames, sparks or lighted substances to come near the battery. When charging or working near the battery always shield your face and protect your eyes. Always provide adequate ventilation. Failure to follow these instructions may result in personal injury.

▲ **Always** observe all manufacturers instructions when using any charging equipment. Failure to follow this instruction may result in personal injury.

▲ **Connect** the charger to the battery before switching the charger on. Failure to follow this instruction may result in personal injury.

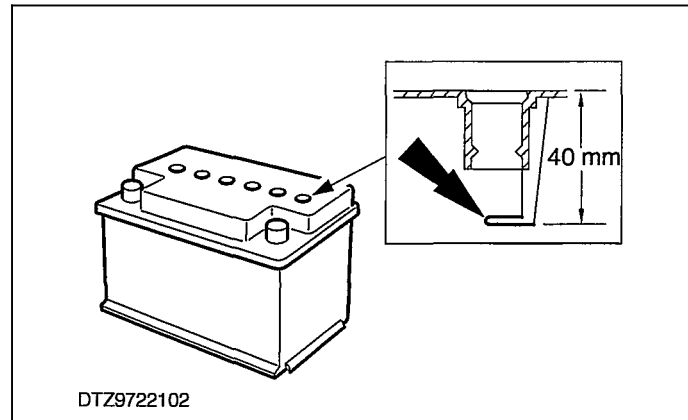
▲ **Switch** the charger off before disconnecting the charger from the battery. Failure to follow this instruction may result in personal injury.

CAUTIONS:

- ⚠ Batteries should not be charged in the vehicle.
- ⚠ Do not rely on the generator to recharge a discharged battery as it would take in excess of eight hours of continuous driving with no additional loads placed on the charging system.

NOTE: The maximum level mark is approximately 40mm below the top of the battery.

Place the battery on a level surface and check the electrolyte level through the casing, reaches the indicated maximum mark.



- ▲ **WARNING:** It is important not to overfill a battery, as this can cause acid leakage and corrosion damage to the vehicle. Failure to follow this instruction may result in personal injury.
- 2. If the level is below the maximum mark, remove the vent covers and top up the **cell(s)** to the correct level.
- 3. Cold batteries will not readily accept a charge. Therefore batteries should be allowed to warm up to approximately 5°C. (41°F.) before charging. This may require four to eight hours at room temperature depending on the initial temperature and the battery size.
- 4. A battery which has been completely discharged may be slow to accept a charge initially, and in some cases may not accept a charge at the normal charger setting. When batteries are in this condition, charging can be started by use of the dead battery switch on chargers that have this facility equipped.
- 5. To determine whether a battery is accepting a charge, follow the manufacturer's instructions for the charger, for use of the dead battery switch. If the switch is the spring-loaded type, it should be held in the ON position for up to three minutes.
- 6. After releasing the dead battery switch and with the charger still on, measure the battery voltage. If it shows **12** volts or higher, the battery is accepting a charge and is capable of being recharged. However, it may require

GENERAL PROCEDURES

up to two hour of charging with batteries colder than **5°C (41°F)** before the charge rate is high enough to show a charge on an ammeter. It has been found that all non-damaged batteries can be charged by this procedure. If a battery cannot be charged by this procedure, a new one should be installed.

7. A rapid recharger procedure has been developed for recharging batteries that have passed the Load Test and only need a recharge. This can be due to in-service no-start battery failures (vehicle will not crank due to low battery state of charge) or battery discharged in vehicle due to key-off loads.
8. With the cables then disconnected, the battery can be rapidly recharged by using either of the following methods:
 - Carry out a two hour charge using 20A constant current (manual setting on charger).
 - Carry out a two hour charge using a constant potential (automatic setting on charger).



SECTION 414-01 Battery, Mounting and Cables

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS	PAGE
SPECIFICATIONS	
Specifications.....	414-01-2
DIAGNOSIS AND TESTING	
Battery.....	414-01-3
GENERAL PROCEDURES	
Battery Disconnect.....	414-01-4
REMOVAL AND INSTALLATION	
Battery Tray..	(44 271 4) 414-01-5
Battery to Starter Motor Solenoid Cable — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	(36 206 0) 414-01-8
Battery Tray — 2.0L Duratec-HE (MI4).....	(44 271 4) 414-01-10
Battery Cables — 2.0L Duratec-HE (MI4).....	414-01-12



SPECIFICATIONS**Battery Specifications**

Ah Rating	Battery Type	Build date that Ca battery can be installed from
43	Silver Calcium (Ca)	08/1995
50	Silver Calcium (Ca)	08/1995
60	Silver Calcium (Ca)	08/1995

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery clamp retaining nuts	8	-	71
Battery positive terminal retaining nut	5	-	44
Battery positive terminal cable retaining nut	12	9	-
Battery ground terminal retaining nut	5		44
Battery ground terminal cable retaining nut	8		71
Battery tray retaining bolts	12	9	-
Generator positive cable retaining nut - vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engines	8	-	71
Generator positive cable retaining nut - vehicles with 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel/2.0L Duratec-HE (MI4) engines	15	11	-
Starter motor positive cable retaining nut - all vehicles	12	9	-
Ignition switch to starter motor cable retaining nut - vehicles with 1.4L Duratorq-TDCi (DV) Diesel// 1.6L Duratorq-TDCi (DV) Diesel/2.0L Duratec-HE (MI4) engines	6	-	53
Ignition switch to starter motor cable retaining nut - vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/ 1.6L Duratec-16V (Sigma) engines	7		62

DIAGNOSIS AND TESTING**Battery**

REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).

GENERAL PROCEDURES

Battery Disconnect

Disconnect

WARNINGS:

▲ Batteries normally produce explosive gases which may cause personal injury, therefore do not allow flames, sparks or lighted substances to come near the battery. When charging or working near the battery always shield your face and protect your eyes. Always provide adequate ventilation. Failure to follow these instructions may result in personal injury.

▲ Batteries contain sulphuric acid, avoid contact with skin eyes or clothing. Shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately for a minimum of 15 minutes and seek prompt medical attention. If swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

▲ Audio unit key code saving devices must not be used when working on supplemental restraint or fuel systems. When using these devices the vehicle electrical system is still live but with a reduced current flow. Failure to follow this instruction may result in personal injury.

⚠ **CAUTION:** Make sure the engine is not running before disconnecting the battery ground cable to avoid damage to the vehicle electrical system.

NOTE: This procedure should be used to disconnect the battery while carrying out repairs that refer to the battery being disconnected.

1. Obtain and record the audio unit **keycode** and preset radio frequencies.
2. Disconnect the battery ground cable.

Connect

WARNINGS:

▲ Batteries normally produce explosive gases which may cause personal injury, therefore do not allow flames, sparks or lighted substances to come near the

battery. When charging or working near the battery always shield your face and protect your eyes. Always provide adequate ventilation. Failure to follow these instructions may result in personal injury.

▲ Batteries contain sulphuric acid, avoid contact with skin eyes or clothing. Shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately for a minimum of 15 minutes and seek prompt medical attention. If swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

⚠ **CAUTION:** Make sure all electrical systems are switched OFF before connecting the battery ground cable to avoid damage to the vehicle electrical system.

1. Connect the battery ground cable.
2. Enter the audio unit **keycode** and preset radio frequencies.
3. Reset the clock to the correct time.

REMOVAL AND INSTALLATION

Battery Tray(44 271 4)

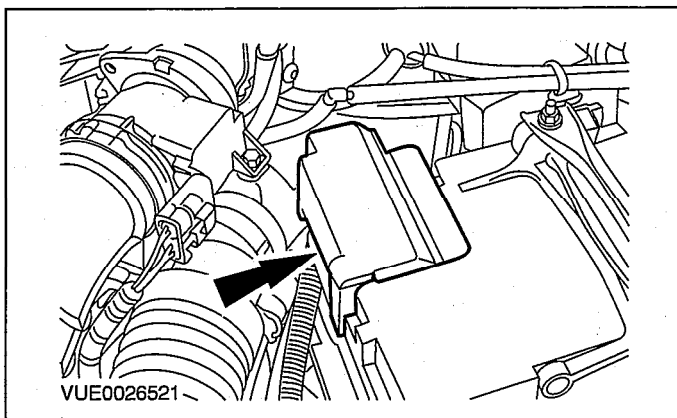
Removal

All vehicles

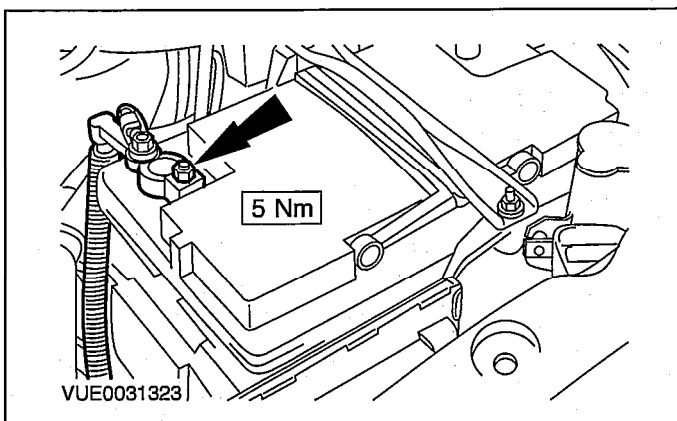
1. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Open the battery positive terminal cover.

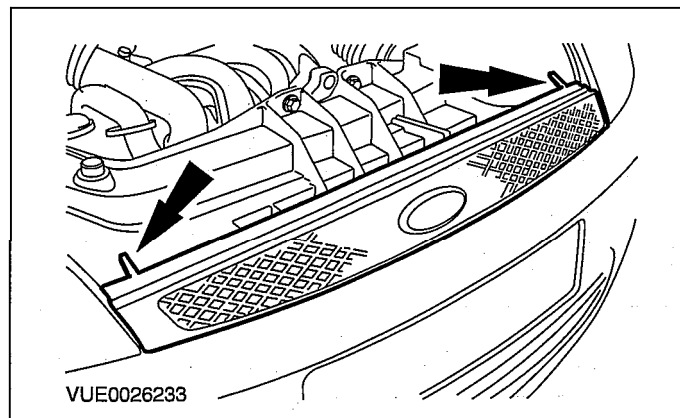


3. Disconnect the battery positive cable and position it to one side.

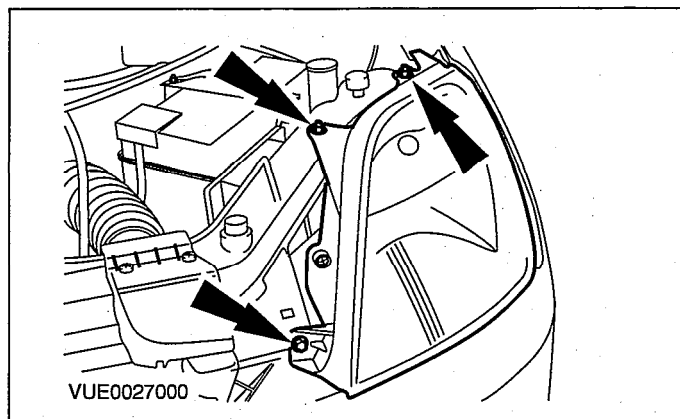


All except vehicles with diesel engine

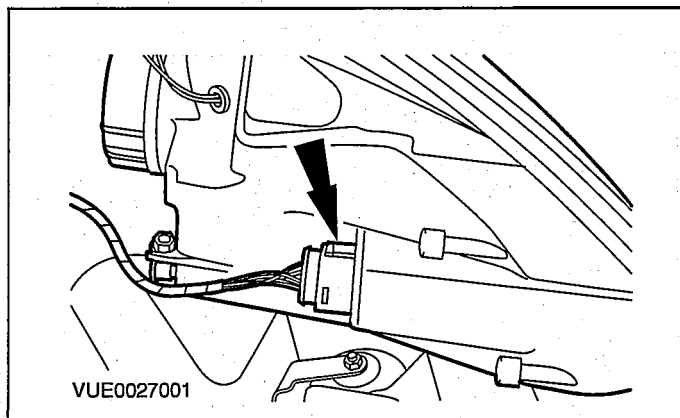
4. Remove the radiator grill.



5. Detach the left-hand **headlamp** assembly.

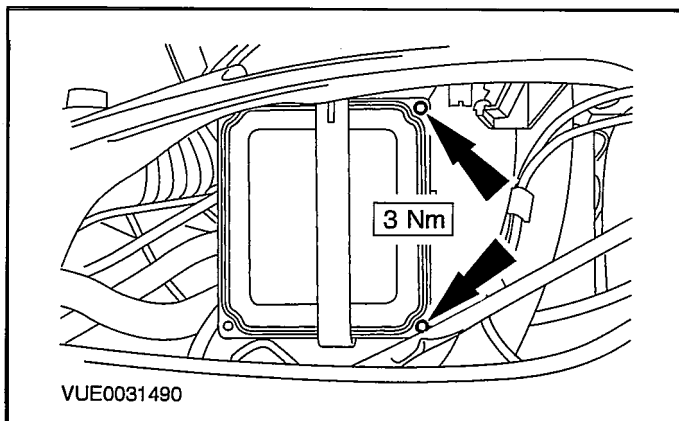


6. Disconnect the electrical connector and remove the **headlamp** assembly.

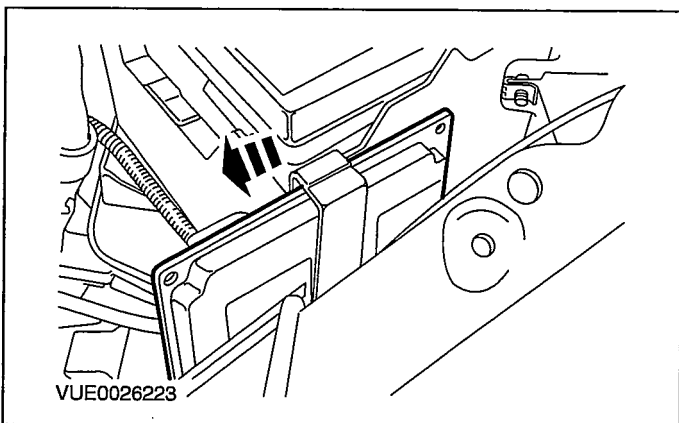


REMOVAL AND INSTALLATION

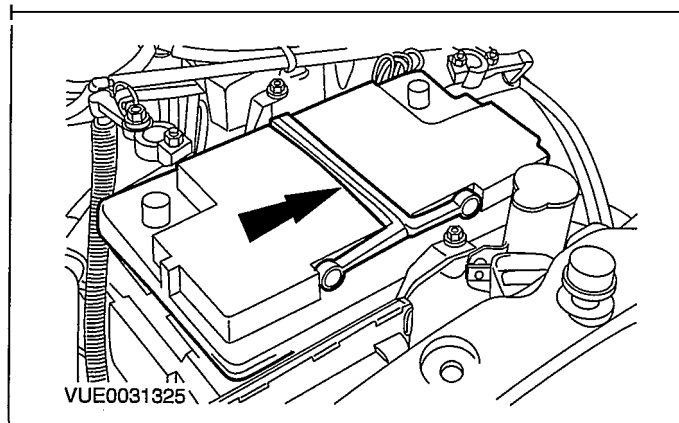
7. Remove the powertrain control module (PCM) retaining screws.



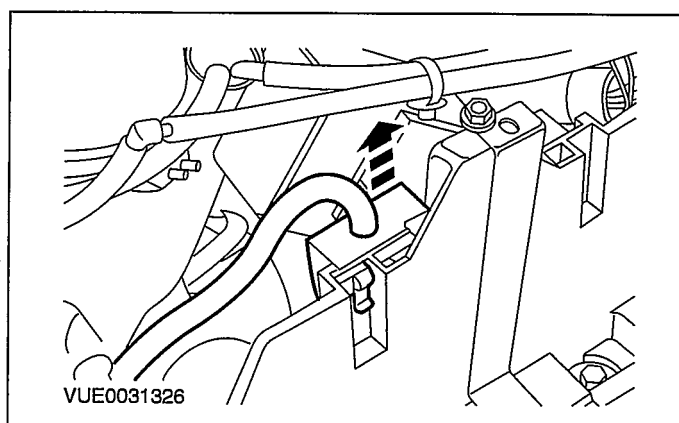
8. Detach the PCM from the retaining bracket.



10. Remove the battery.



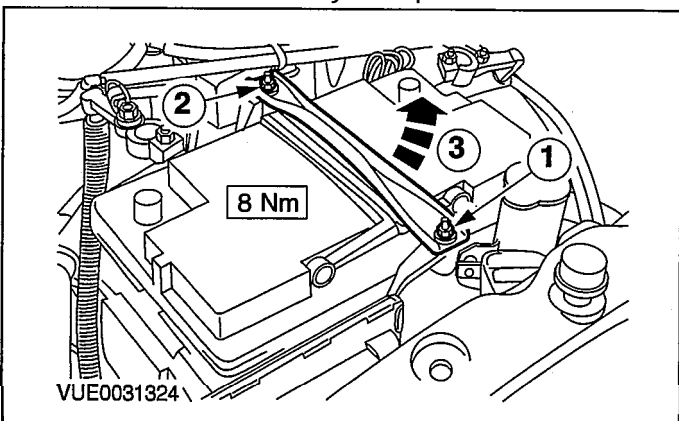
11. Detach the battery junction box (BJB) from the battery tray and position it to one side.



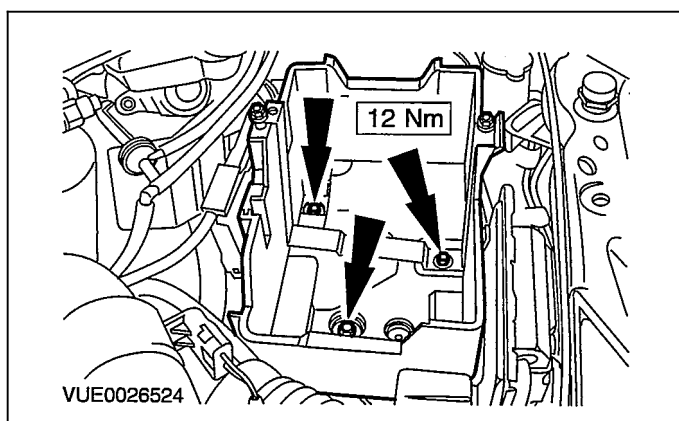
All vehicles

9. Detach the battery clamp from the battery tray and position it to one side.

1. Remove the battery clamp front retaining nut.
2. Remove the battery clamp rear retaining nut.
3. Unhook the battery clamp.



12. Remove the battery tray.



Installation

CAUTION: If installing a new battery, only install the specified battery type.

For additional information, refer to: Specifications (414-01 Battery, Mounting and Cables, Specifications).

REMOVAL AND INSTALLATION

 **CAUTION:** When installing the battery clamp, make sure that the rear retaining nut is tightened first. Failure to follow this instruction may result in damage to the battery.

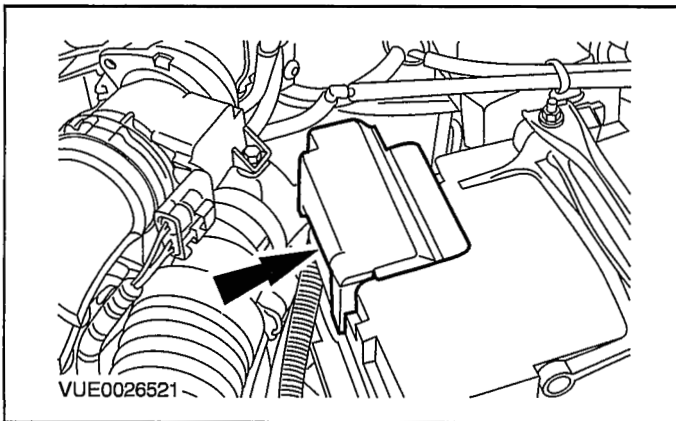
To install, reverse the removal procedure.

REMOVAL AND INSTALLATION**Battery to Starter Motor Solenoid Cable — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(36 206 0)****Removal**

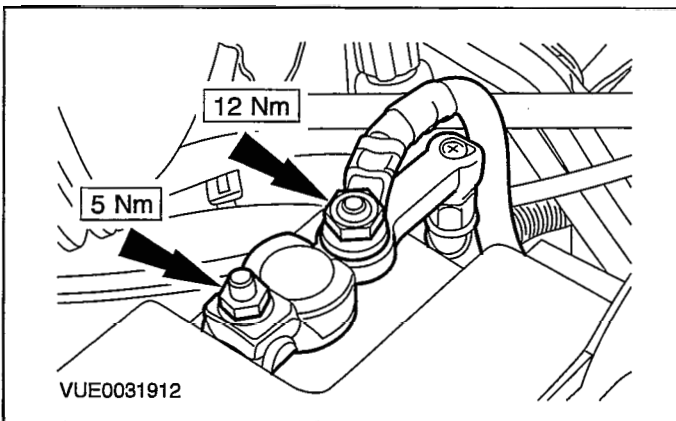
1. Disconnect the battery ground cable.

For additional information, refer to Battery Disconnect in this section.

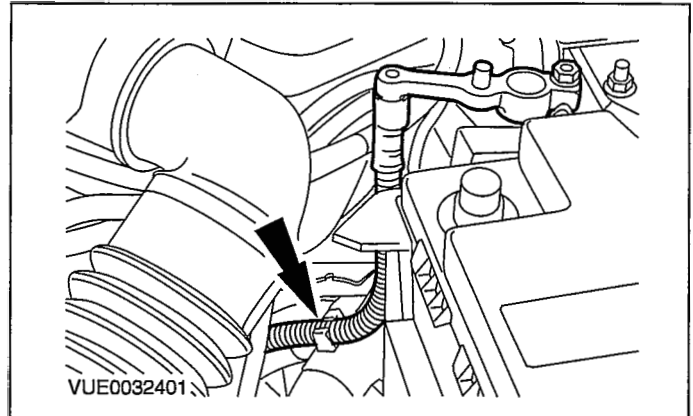
2. Open the battery positive terminal cover.



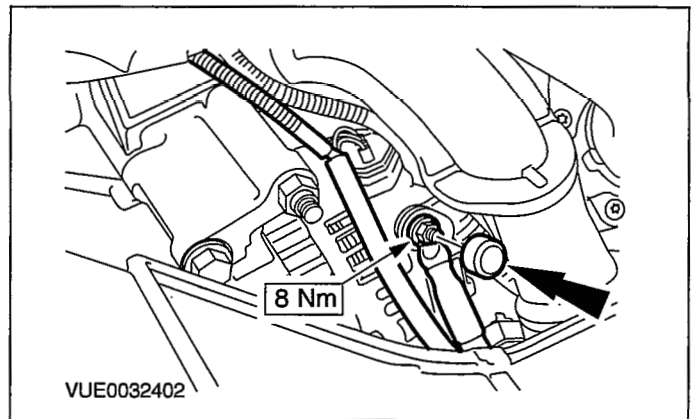
3. Disconnect the battery positive cables.



4. Detach the battery to starter motor solenoid cable from the retaining clip on the wiring harness cover.



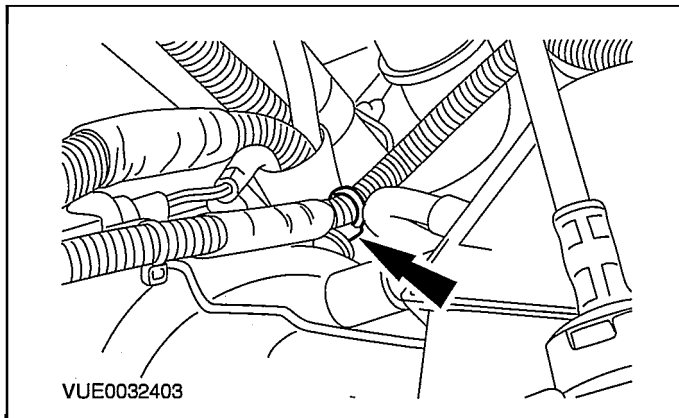
5. Remove the protective cap and disconnect the generator electrical connector.



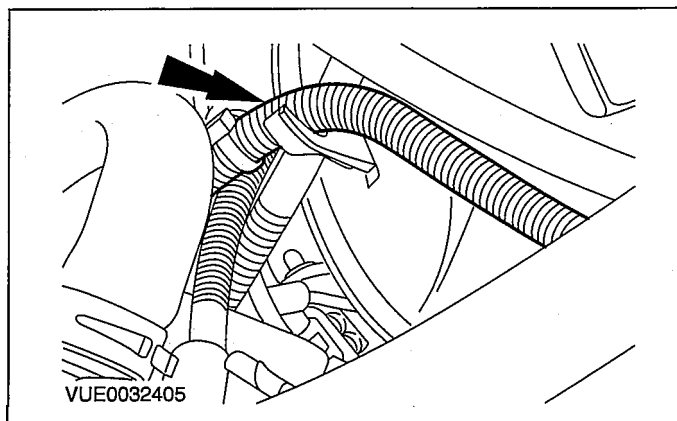
6. Raise and support the vehicle. For additional information, refer to Section **100-02** [Jacking and Lifting].

REMOVAL AND INSTALLATION

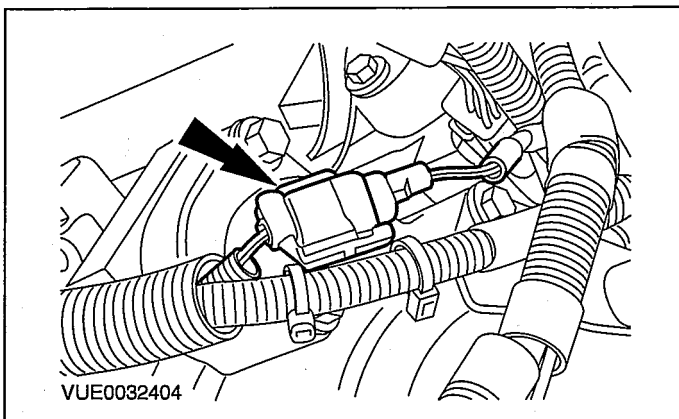
7. Detach the battery to starter motor solenoid cable from the retaining clip.



10. Detach the battery to starter motor solenoid cable from the retaining clip on the intake manifold.



8. Disconnect the starter motor solenoid cable electrical connector.

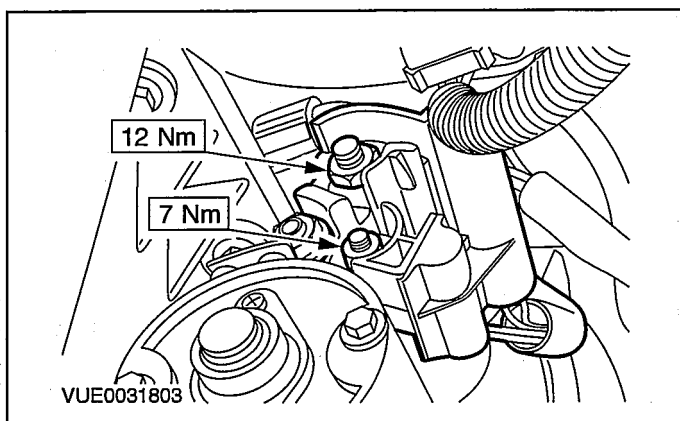


11. Remove the battery to starter motor solenoid cable.

Installation

- To install, reverse the removal procedure.

9. Disconnect the ignition switch to starter motor solenoid and battery to starter motor solenoid cables (oil filter shown removed for clarity).



REMOVAL AND INSTALLATION

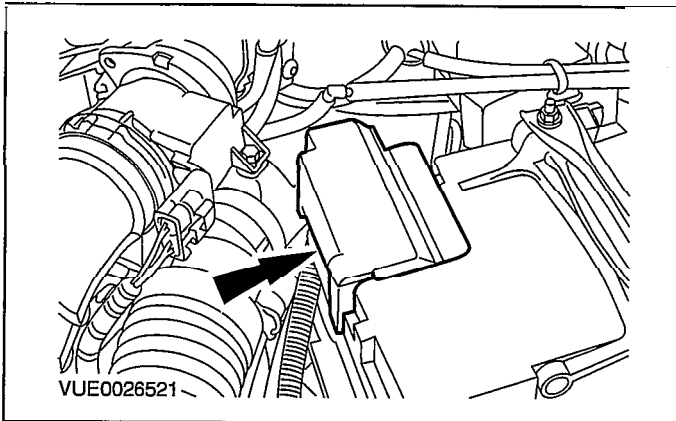
Battery Tray — 2.0L Duratec-HE (MI4)(44 271 4)

Removal

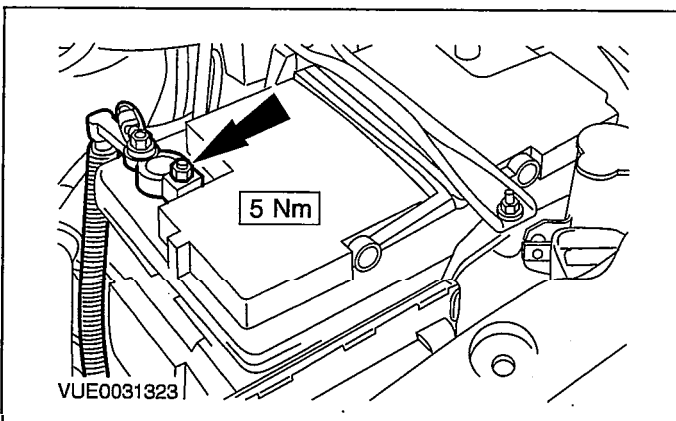
1. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Open the battery positive terminal cover.



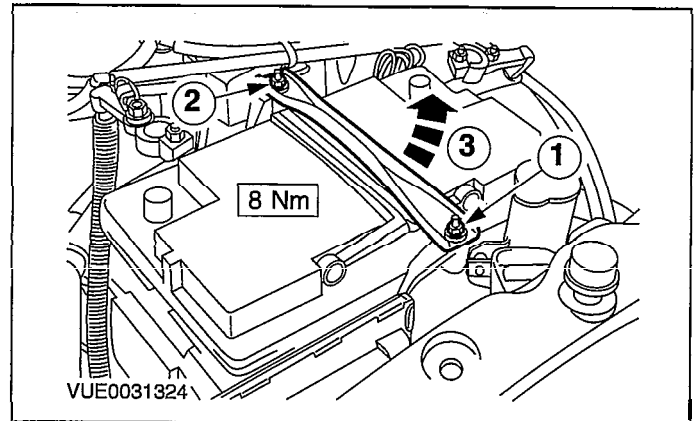
3. Disconnect the battery positive cable and position it to one side.



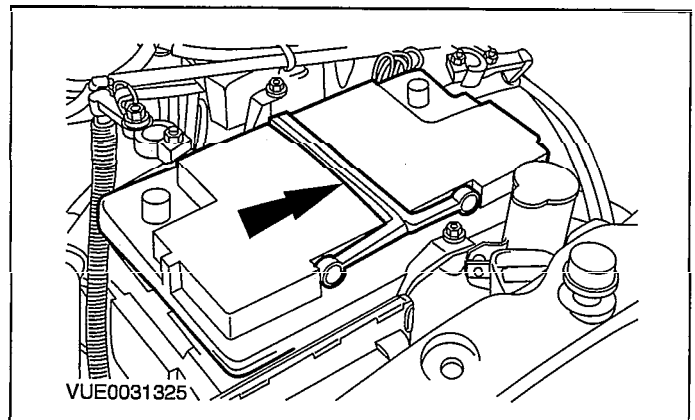
4. Detach the battery clamp from the battery tray and position it to one side.

1. Remove the battery clamp front retaining nut.
2. Remove the battery clamp rear retaining nut.

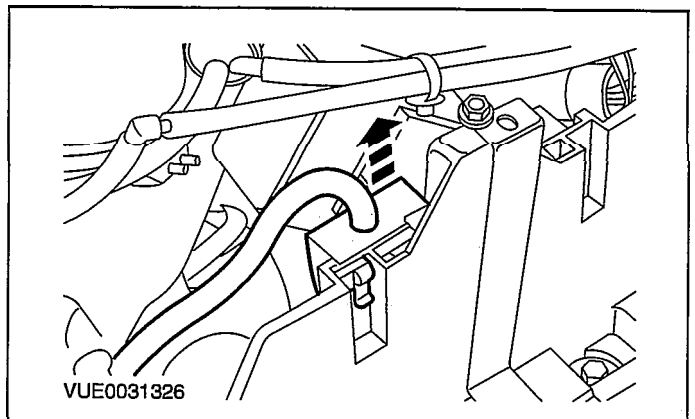
3. Unhook the battery clamp.



5. Remove the battery.

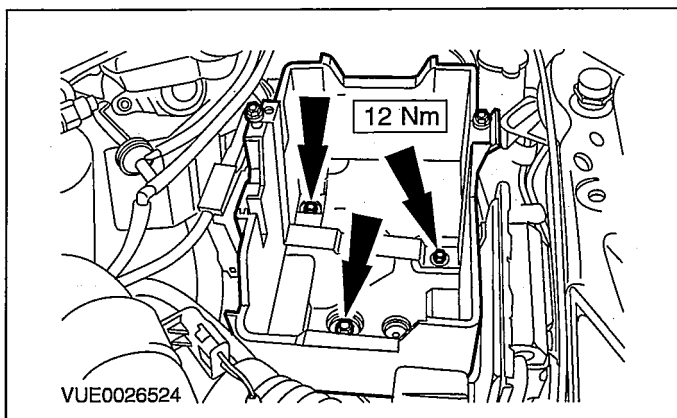


6. Detach the battery junction box (BJB) from the battery tray and position it to one side.



REMOVAL AND INSTALLATION

7. Remove the battery tray.

**Installation**

- ⚠ CAUTION:** If installing a new battery, only install the specified battery type.

For additional information, refer to:
Specifications (414-01 Battery, Mounting and Cables, Specifications).

1. **⚠ CAUTION:** When installing the battery clamp, make sure that the rear retaining nut is tightened first. Failure to follow this instruction may result in damage to the battery.

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Battery Cables — 2.0L Duratec-HE (MI4)

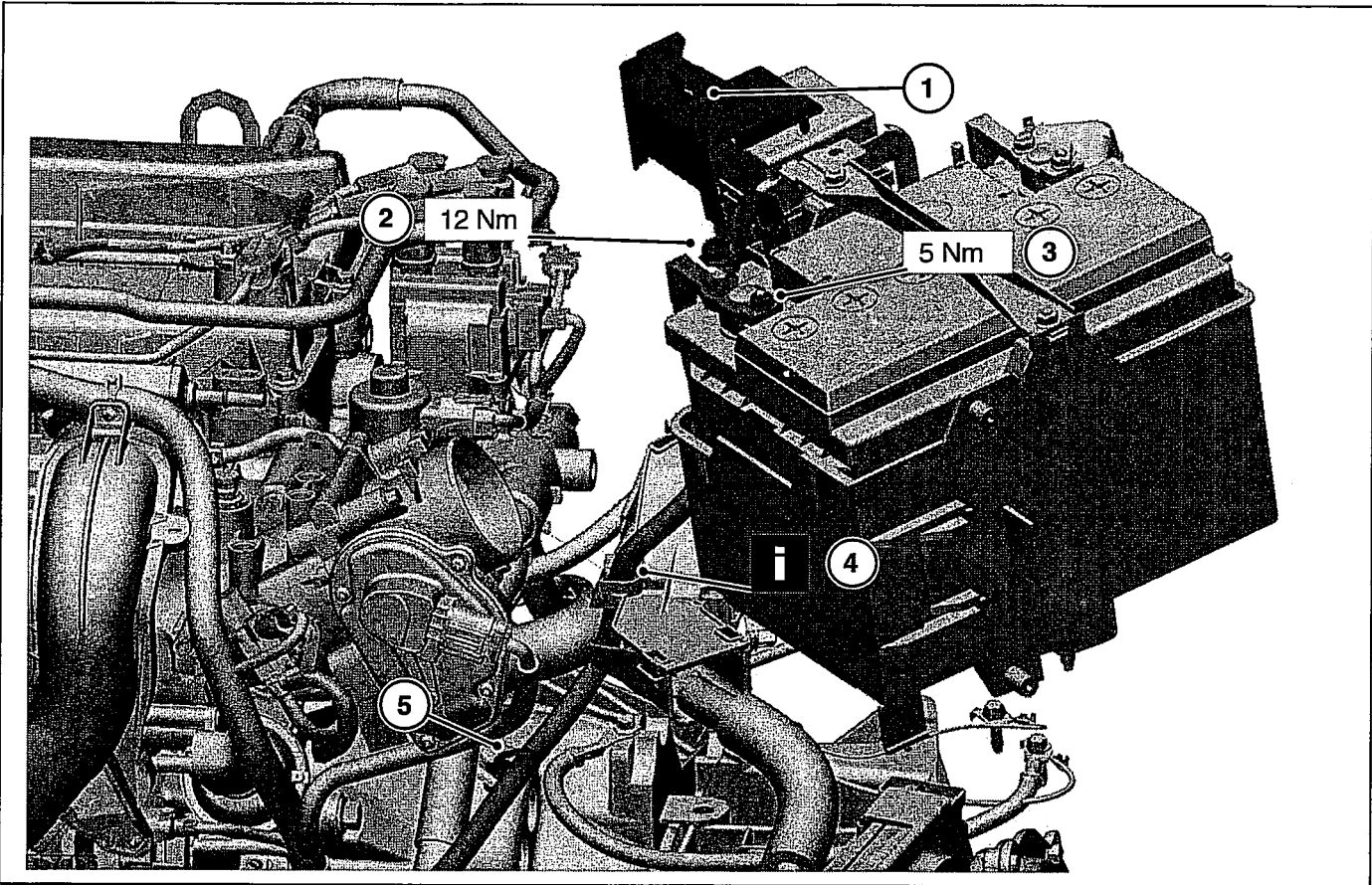
1. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the air cleaner.

For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (MI4) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

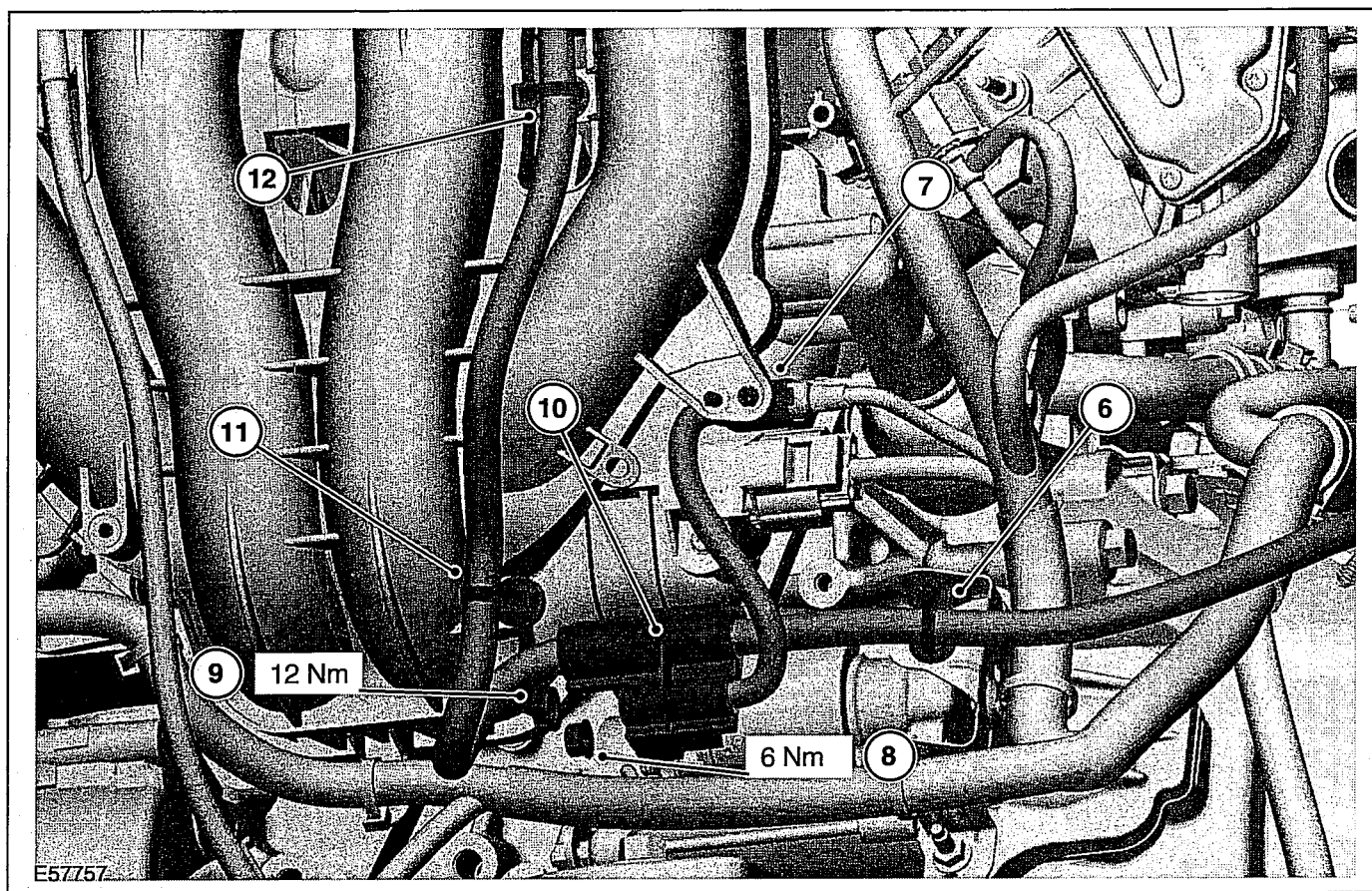
3. Remove the components in the order indicated in the following illustration(s) and table(s).



Item	Description
1	Battery positive terminal clamp cover
2	Battery junction box (BJB) cable electrical connector to battery cable retaining nut

Item	Description
3	Battery positive terminal clamp
4	Wiring harness support See Removal Detail
5	Battery cable retaining clip

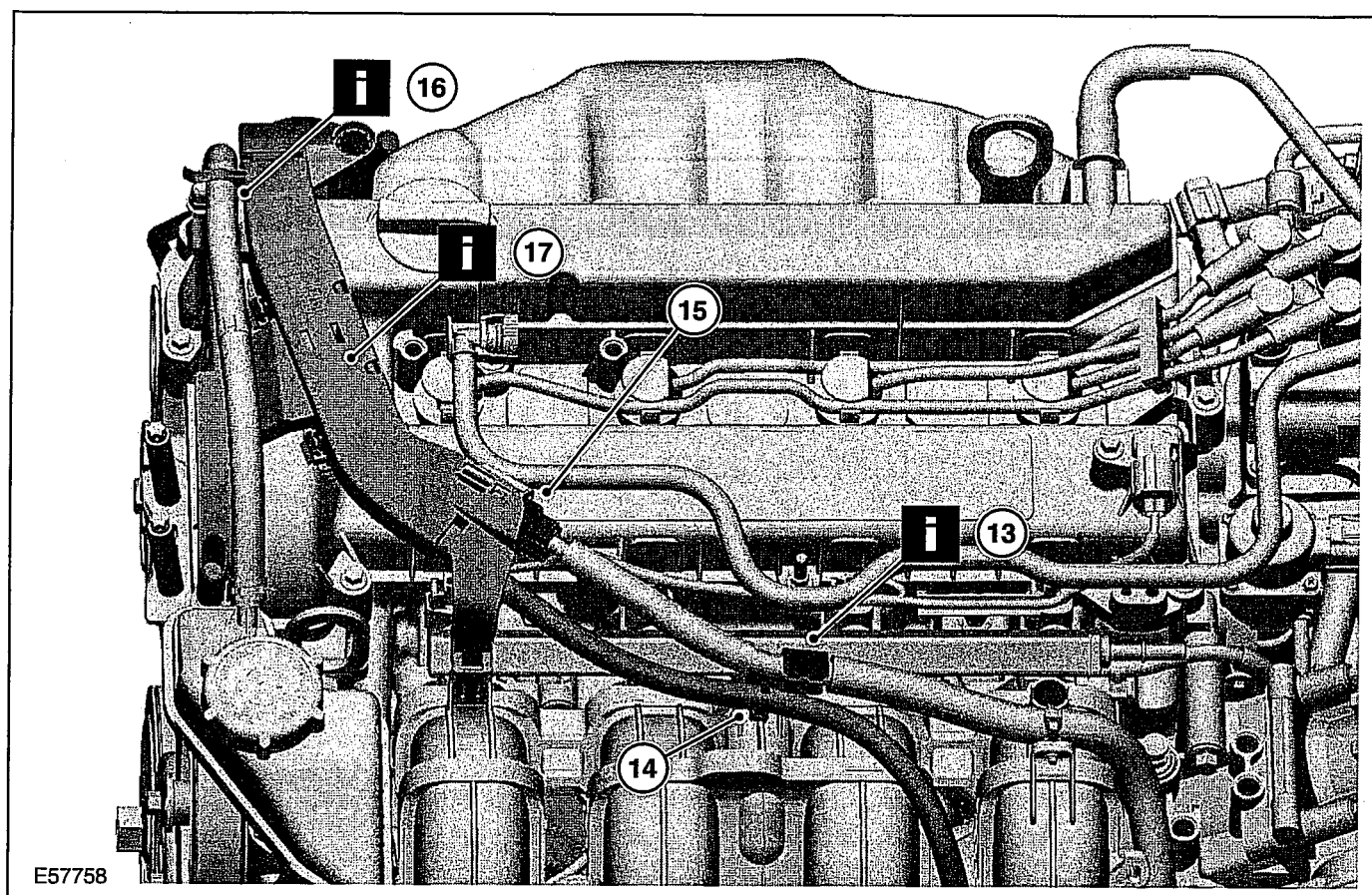
REMOVAL AND INSTALLATION



Item	Description
6	Battery cable retaining clip
7	Starter motor solenoid inline electrical connector
8	Starter motor solenoid cable electrical connector retaining nut

Item	Description
9	Starter motor battery positive cable electrical connector retaining nut
10	Starter motor solenoid electrical connector
11	Battery cable retaining clip
12	Battery cable retaining clip

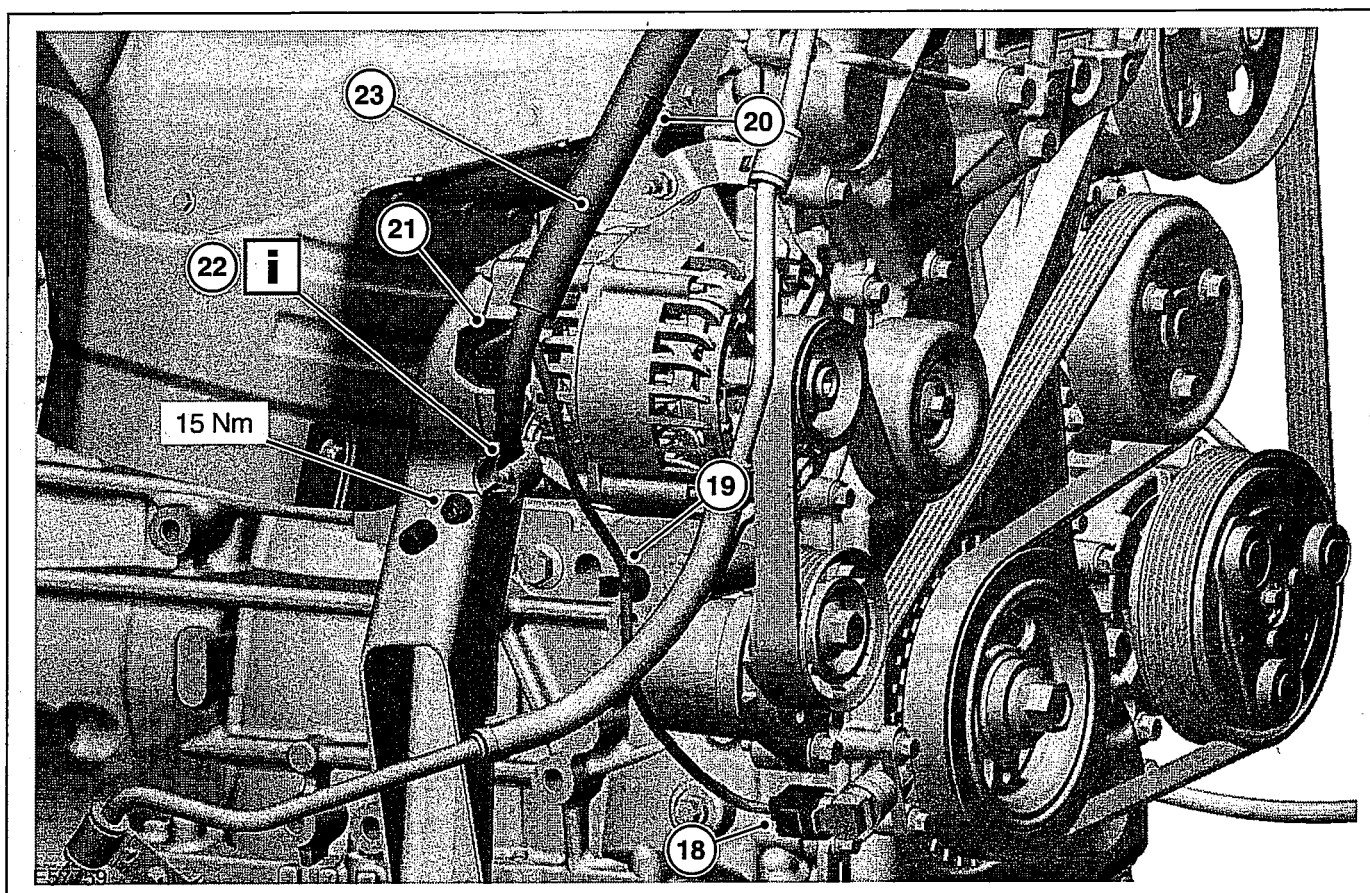
REMOVAL AND INSTALLATION



Item	Description
13	Engine wiring harness retaining clip See Removal Detail
14	Battery cable retaining clip
15	Engine wiring harness electrical connector

Item	Description
16	Power steering line retaining clip See Removal Detail
17	Battery cable inline fuse holder See Removal Detail

REMOVAL AND INSTALLATION



Item	Description
18	Crankshaft position (CKP) sensor electrical connector
19	CKP wiring harness retaining clip
20	Battery cable retaining clip
21	Generator electrical connector

Item	Description
22	Battery cable to generator electrical connector See Installation Detail
23	Battery cable

4. To install, reverse the removal procedure.

Removal Details

Item 4 Wiring harness support

1. Detach the battery cable from the wiring harness support.

Item 13 Engine wiring harness retaining clip

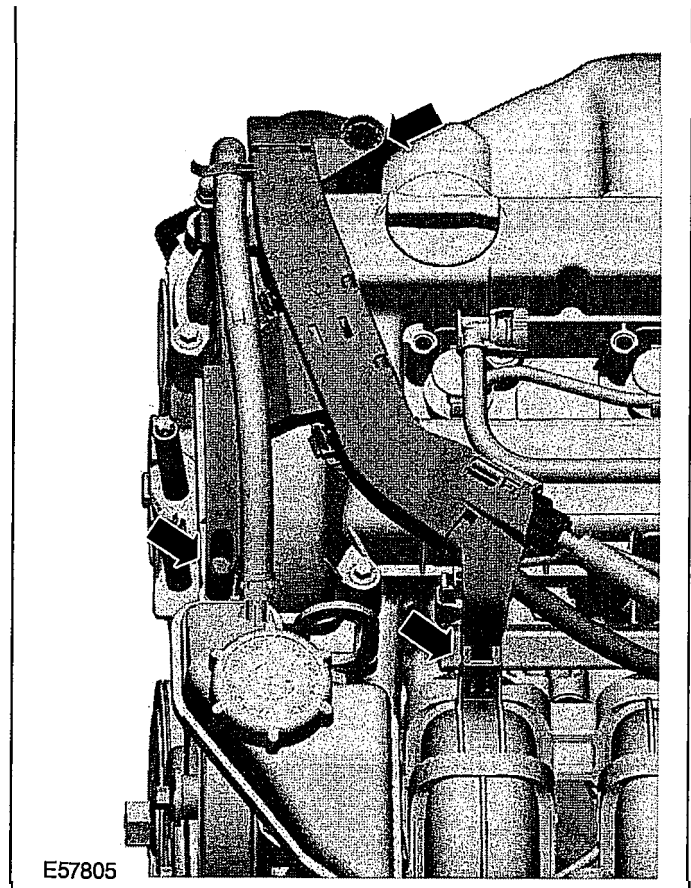
1. Detach the engine wiring harness from the battery cable retaining clip

Item 16 Power steering line retaining clip

1. Detach the power steering line from the battery cable inline fuse holder

REMOVAL AND INSTALLATION**Item 17** Battery cable inline fuse holder

1. Detach the battery cable inline fuse holder from the valve cover and intake manifold.

**Installation Details****Item 22** Battery cable to generator electrical connector

NOTE: The battery cable to generator electrical connector must follow the profile of the generator as closely as possible.

SECTION 414-02 Generator and Regulator

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

SPECIFICATIONS

Specifications.....	414-02-2
Torque Specifications - vehicles with 1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) engines.....	414-02-2
Torque Specifications - vehicles with - 1.4L Duratorq-TDCi (DV) Diesel engine.....	414-02-2
Torque Specifications - vehicles with 1.6L Duratorq-TDCi (DV) Diesel engine.....	414-02-2
Torque Specifications - vehicles with 2.0L Duratec-HE (M14) engine.....	414-02-2

DIAGNOSIS AND TESTING

Generator.....	414-02-3
----------------	----------

REMOVAL AND INSTALLATION

Generator — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)..... (31 414 0)	414-02-4
Generator — 2.0L Duratec-HE (M14).....	414-02-8

SPECIFICATIONS

Torque Specifications - **vehicles** with **1.25L Duratec-16V (Sigma)/1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)** engines

Description	Nm	lb-ft	lb-in
Generator retaining bolts	45	33	-
Generator electrical connector retaining nut	8	-	71

Torque Specifications - **vehicles** with - **1.4L Duratorq-TDCi(DV) Diesel** engine

Description	Nm	lb-ft	lb-in
Generator retaining bolts	45	33	-
Generator electrical connector retaining nut	15	11	-
Air conditioning (A/C) compressor retaining bolts	25	18	-
Accessory drive belt idler pulley retaining bolt	45	33	-

Torque Specifications - **vehicles** with **1.6L Duratorq-TDCi(DV) Diesel** engine

Description	Nm	lb-ft	lb-in
Generator retaining bolts	45	33	-
Generator electrical connector retaining nut	15	11	-
Air conditioning (A/C) compressor retaining bolts	25	18	
Accessory drive belt tensioner retaining bolts	25	18	
Turbocharger heatshield retaining bolts	3		27

Torque Specifications - **vehicles** with **2.0L Duratec-HE (M14)** engine

Description	Nm	lb-ft	lb-in
Generator retaining bolts	48	35	-
Generator electrical connector retaining nut	15	11	-

DIAGNOSIS AND TESTING**Generator**

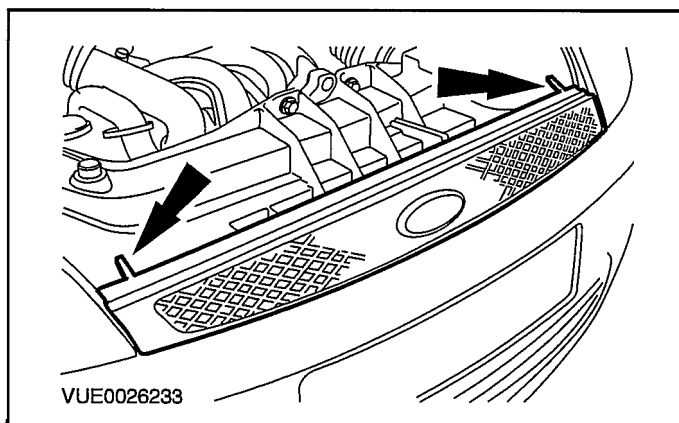
REFER to Section 414-00 [Charging System - General Information].

REMOVAL AND INSTALLATION

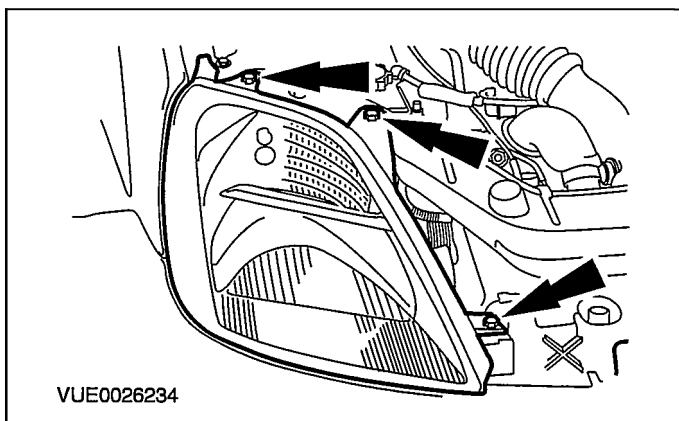
Generator — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)(31 414 0)

Removal

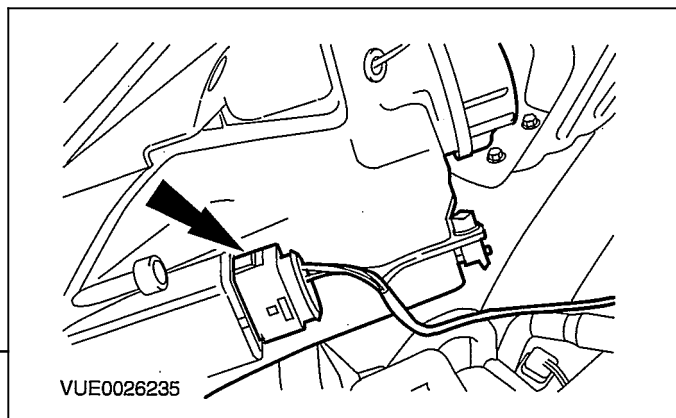
1. Disconnect the battery ground cable. For additional information, refer to Section **414-01** [Battery, Mounting and Cables].
2. Remove the accessory drive belt. For additional information, refer to Section **303-05** [Accessory Drive].
3. Lower the vehicle.
4. Remove the radiator grille.



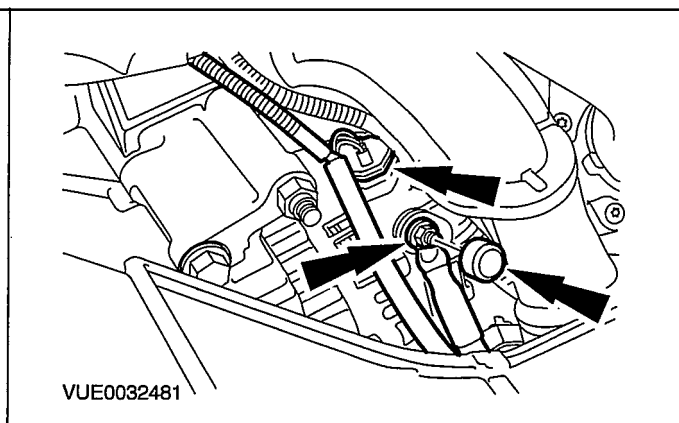
5. Detach the right-hand headlamp.



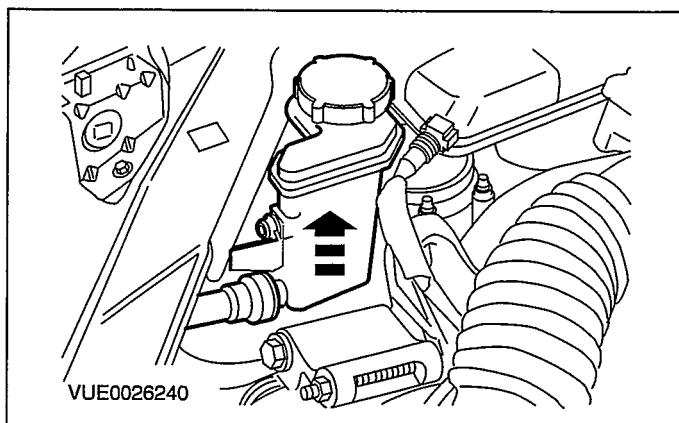
6. Disconnect the electrical connector and remove the headlamp.



7. Remove the protective cap and disconnect the generator electrical connectors.



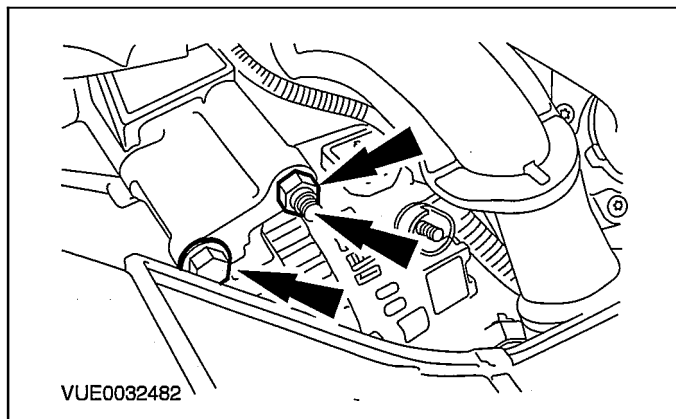
8. Detach the power steering reservoir and position it to one side.



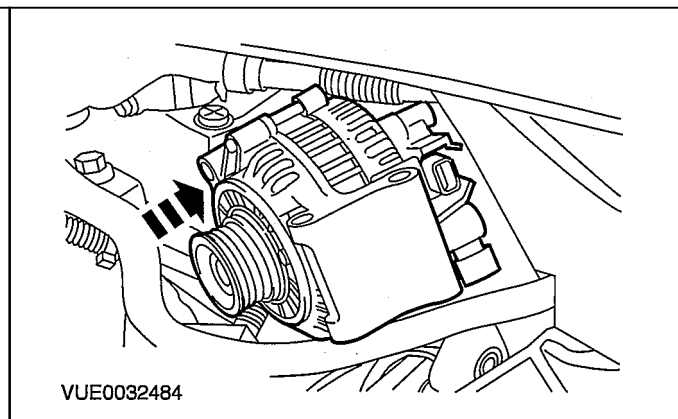
9. **NOTE:** It is not possible to fully remove the retaining bolt from the generator at this stage.

REMOVAL AND INSTALLATION

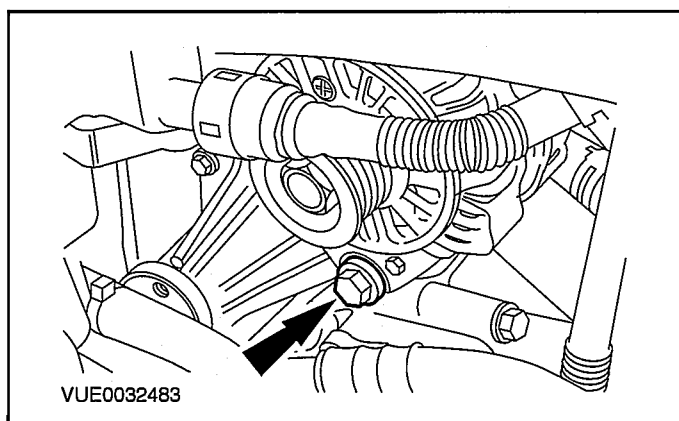
Remove the generator upper retaining nut, bolt and stud.



Install the generator through the **headlamp** aperture.

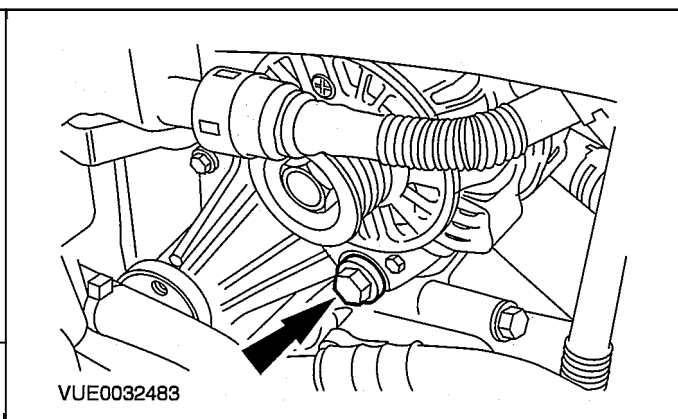


10. Remove the generator lower retaining bolt.

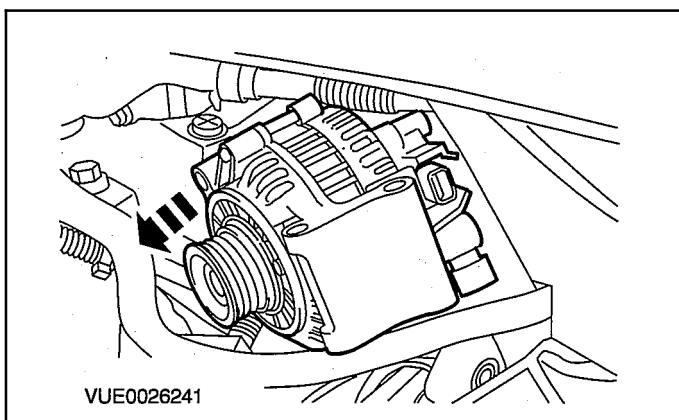


2. **NOTE:** Do not tighten the generator lower retaining bolt at this stage.

Install the generator lower retaining bolt.

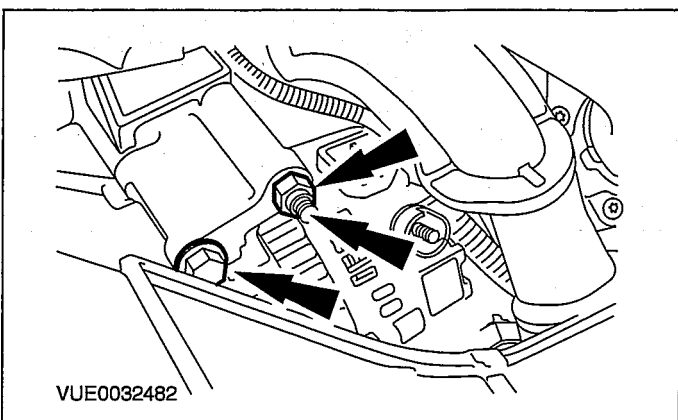


11. Remove the generator through the **headlamp** aperture.



3. **NOTE:** Do not tighten the generator upper retaining nut and bolt at this stage.

Install the generator upper retaining nut, bolt and stud.

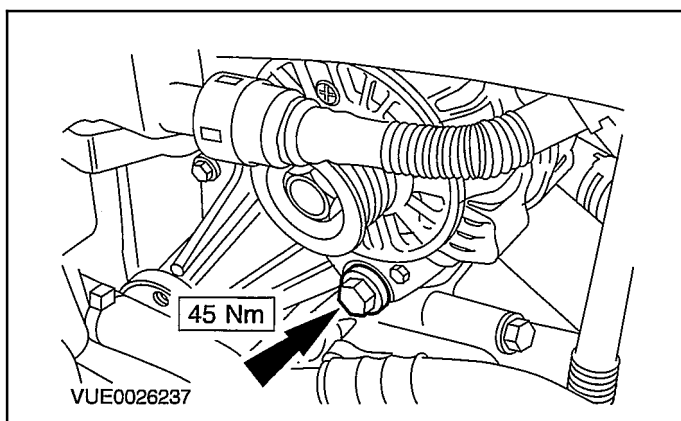


Installation

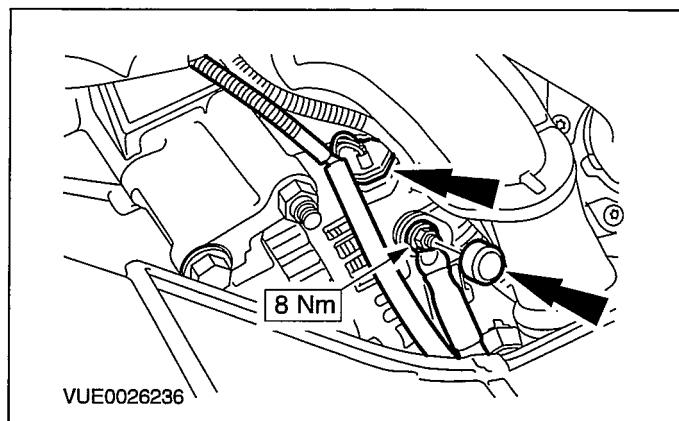
■ **NOTE:** Install the generator upper retaining bolt into the generator prior to installing the generator.

REMOVAL AND INSTALLATION

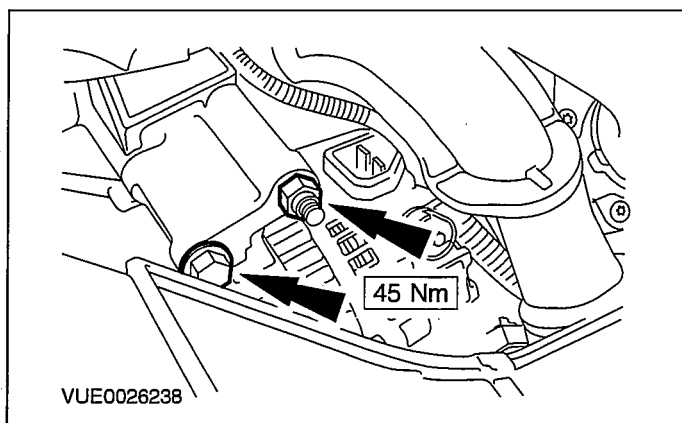
4. Tighten the generator lower retaining bolt.



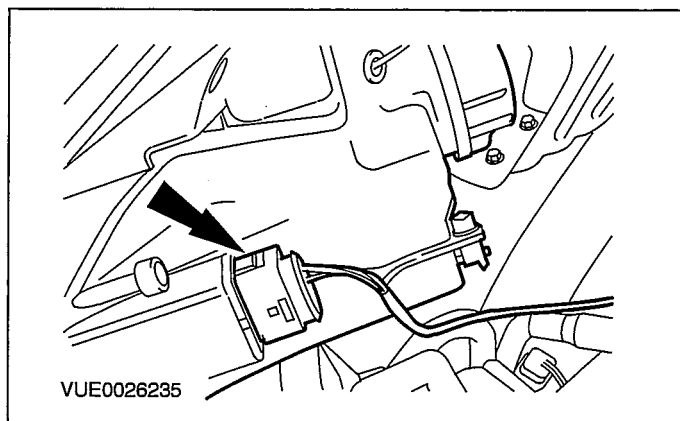
7. Connect the generator electrical connectors and install the protective cap.



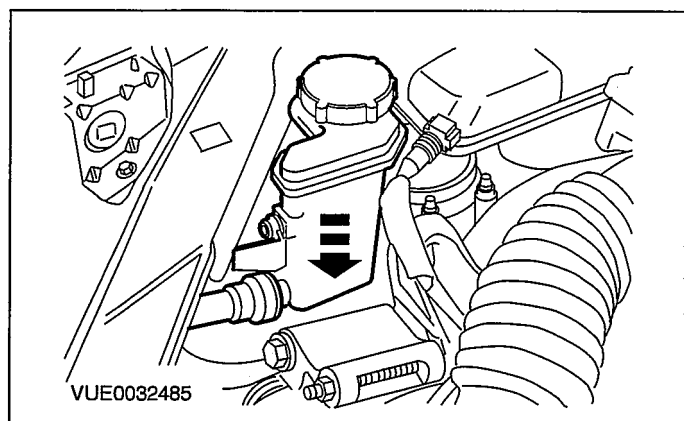
5. Tighten the generator upper retaining nut and bolt.



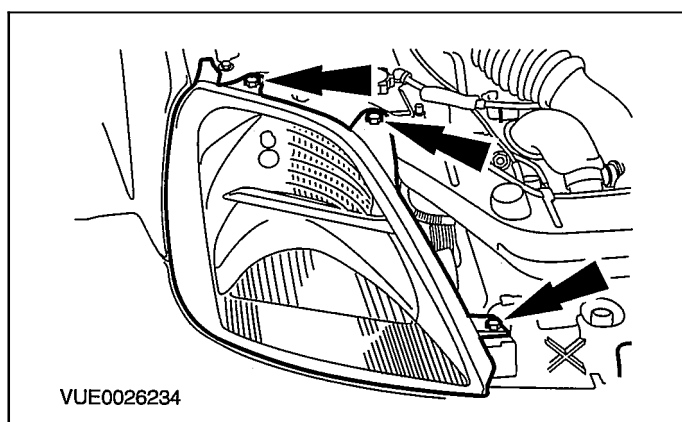
8. Connect the electrical connector and install the headlamp.



6. Install the power steering reservoir.

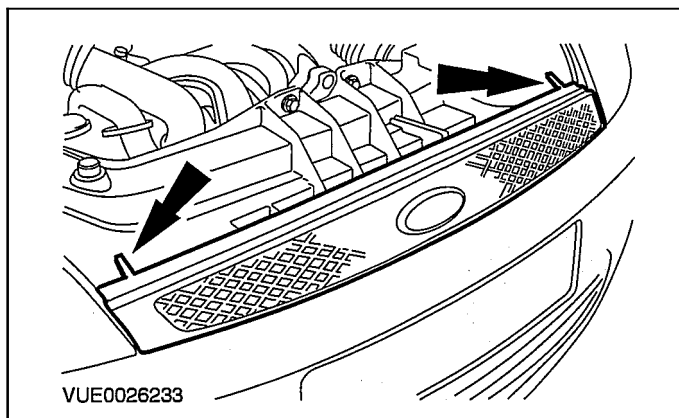


9. Install the right-hand headlamp.



REMOVAL AND INSTALLATION

- 10. Install the radiator grille.**



- 11. Raise and support the vehicle.**
- 12. Install a new accessory drive belt. For additional information, refer to Section 303-05 [Accessory Drive].**
- 13. Connect the battery ground cable. For additional information, refer to Section 414-01 [Battery, Mounting and Cables].**

REMOVAL AND INSTALLATION

Generator — 2.0L Duratec-HE (M14)

Materials	
Name	Specification
Grease	SA-M1C9107-A

1. Disconnect the battery ground cable.

For additional information, refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the air cleaner.

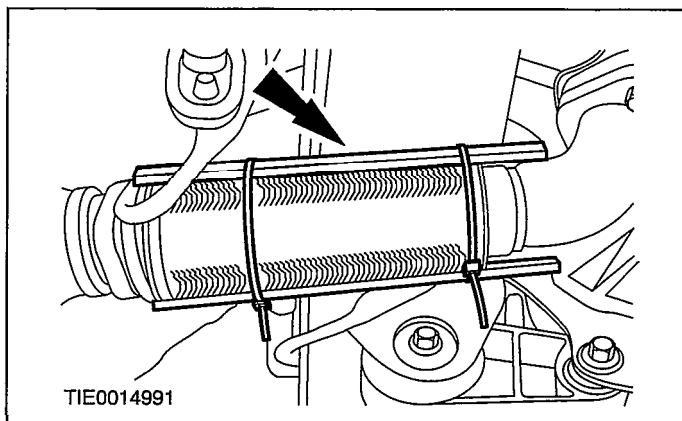
For additional information, refer to: Air Cleaner - 2.0L Duratec-HE (M14) (303-12 Intake Air Distribution and Filtering, Removal and Installation).

3. Remove the **accessory** drive belt.

For additional information, refer to: Accessory Drive Belt - 2.0L Duratec-HE (M14) (303-05 Accessory Drive, Removal and Installation).

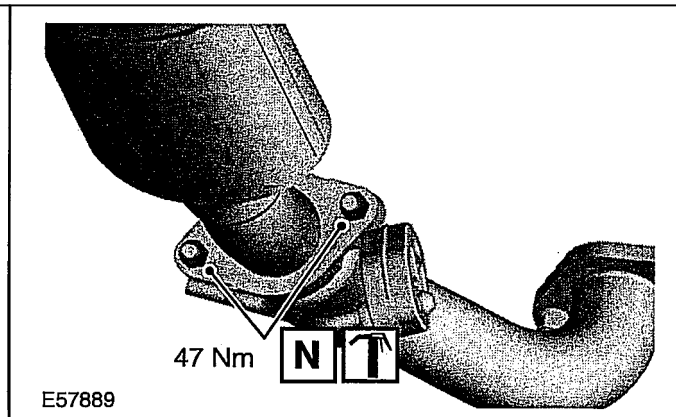
4. **CAUTION:** Over bending of the exhaust flexible pipe may cause damage resulting in failure.

Support the exhaust flexible pipe with a support wrap or splint.

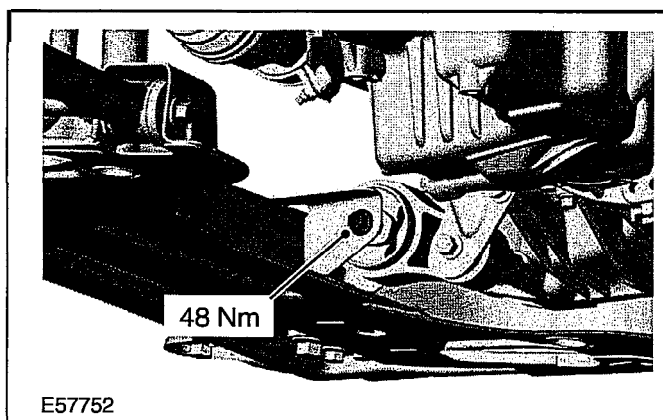


5. Disconnect the catalytic converter from the exhaust flexible **pipe**.

- Discard the gasket.



6. Remove the engine support insulator retaining bolt.



7. Remove the components in the order indicated in the following **illustration(s)** and **table(s)**.

REMOVAL AND INSTALLATION

	Description
	See Installation Detail
4	Crankshaft position (CKP) sensor wiring harness retaining clip See Removal Detail
5	CKP sensor electrical connector
6	Intermediate shaft center bearing cap
7	Intermediate shaft center bearing cap retaining bracket retaining bolts

Item	Description
	Intermediate shaft center bearing cap retaining bracket
9	Generator See Removal Detail
10	Generator cooling duct See Removal Detail

NOTE: Install a new catalytic converter to exhaust flexible pipe gasket.

8. To install, reverse the removal procedure.

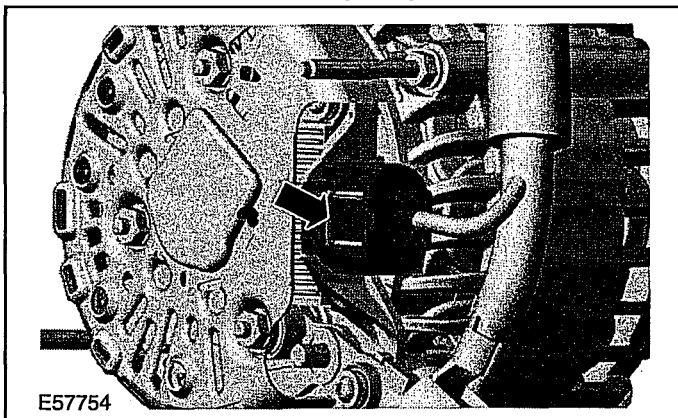
Removal Details

Item 1 Generator wiring harness retaining clip

1. Detach the generator wiring harness from the retaining clip.

Item 2 Generator electrical connector

1. Disconnect the generator electrical connector (generator cooling duct shown removed for clarity).
 - Release the locking tang.

**Item 4** Crankshaft position (CKP) sensor wiring harness retaining clip

1. Detach the **CKP** sensor wiring harness retaining clip from the generator.

Item 9 Generator

- _With the aid of another technician, push the engine towards the radiator and remove the generator and generator cooling duct.

Item 10 Generator cooling duct

- _Remove the generator cooling duct from the generator.

Installation Details

Item 3 Battery cable to generator electrical connector

NOTE: The battery cable to generator electrical connector must follow the profile of the generator as closely as possible.

SECTION 415-00 Information and Entertainment System - General Information

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Audio System — Vehicles Built Up To: 10/2005.....	415-00-2
Inspection and Verification.....	415-00-2
Self-Diagnostic Mode.....	415-00-8
Symptom Chart.....	415-00-9
Pinpoint Tests.....	415-00-10
Audio System — Vehicles Built From: 10/2005.....	415-00-20
Inspection and Verification.....	415-00-20
Self-Diagnostic Mode - 5000C, 6000CD, 6006CDC Audio Units.....	415-00-20
Self-Diagnostic Mode - 1500RDS Audio Unit.....	415-00-20
Diagnostic Trouble Code (DTC) Index Chart.....	415-00-21
Symptom Chart.....	415-00-23
Pinpoint Tests.....	415-00-24

DIAGNOSIS AND TESTING

Audio System — Vehicles Built Up To: 10/2005

Refer to Wiring Diagrams Section 415-01, for schematic and connector information.

Refer to Wiring Diagrams Section 415-03, for schematic and connector information.

Refer to Wiring Diagrams Section 415-07, for schematic and connector information.

Inspection and Verification

NOTE: If the code is entered incorrectly 3 times, the system will lock out. The component can only be unlocked by the manufacturer.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
– Audio unit – Cassette player – Compact disc (CD) player – Digital Versatile Disc (DVD) Player – Antenna mast or base	– Fuse(s) – Wiring harness – Electrical connector(s) – Speaker(s) – Audio unit – Cassette player – CD player – DVD Player – Antenna cable – Audio control switch (if equipped) – Central junction box (CJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If an obvious cause is not found, codes may be shown in the audio unit display. Check the audio unit display for the following Error Codes:
 - for vehicles with 6006E or 9006 audio unit refer to the CD Error Codes - vehicles with Vehicles with 6006E or 9006 Audio Unit
 - for vehicles with 4500 audio unit refer to the CD Error Codes - vehicles with 4500 Audio Unit
5. If no error codes are displayed on the audio unit refer to the Self-Diagnostic Mode.

CD Error Codes Vehicles with 6006E Audio Unit

Error Codes

Error Code	Error Description	Error Rectification
E1	Communications Error	Install a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

E2	Overtemp Error	The Audio unit is too hot, it will not work until it has cooled down. Check the heater duct(s) are not bleeding hot air on to the audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). If the concern persists, INSTALL a new audio unit. TEST the system for normal operation.
E3	Mechanical Error	PRESS and HOLD the LOAD and EJECT buttons simultaneously. WAIT until the audio unit has checked through the CDs currently in the unit. TEST the system for normal operation. If the concern persists, DISCONNECT the audio unit power connector. WAIT 20 seconds and then CONNECT the audio unit power connector. WAIT until the audio unit has checked through the CDs currently in the unit. TEST the system for normal operation. If the error code is still displayed, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E4	Focus Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed, INSERT a different CD. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

E5	Overcurrent Error	Install a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
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CD Error Codes - vehicles with 4500 Audio Unit**Error Codes**

Error Code	Error Description	Error Rectification
E-2B	CD Read Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-2C	Jump Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

E-2D	HF Detector Error	DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. WAIT until the audio unit has checked through the CDs currently in the unit. TEST the system for normal operation. If the error code is still displayed, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-2E	CD Decoder Hardware Error	DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. WAIT until the audio unit has checked through the CDs currently in the unit. TEST the system for normal operation. If the error code is still displayed, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-8x	Load/Eject Error	DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. WAIT until the audio unit has checked through the CDs currently in the unit. TEST the system for normal operation. If the error code is still displayed, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

E-23	Sledge Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-24	Focus Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-25	Spindle Motor Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

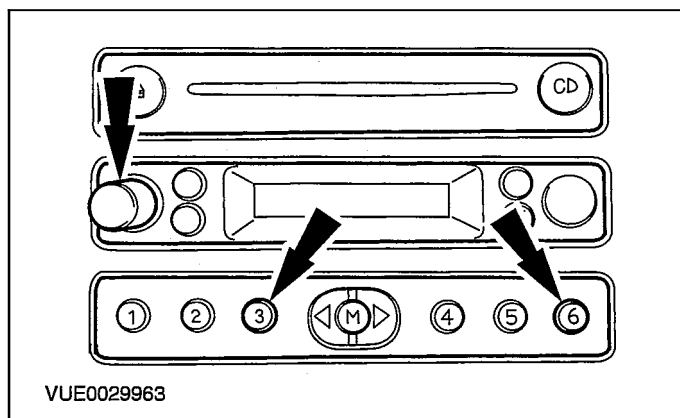
DIAGNOSIS AND TESTING

E-26	Radial Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-27	PLL Lock Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E-28	Subcode Timeout Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

E-29	Subcode Not Found Error	CD is upside down or dirty. Clean the CD and try it again, if the error code is still displayed. DISCONNECT the audio unit power connector. WAIT 30 seconds and then CONNECT the audio unit power connector. If the error code is still displayed. INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
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Self-Diagnostic Mode



1. To enter the audio unit Self-Diagnostic Mode, switch the audio unit ON. Press the preset buttons 3 and 6 together for at least 2 seconds.
2. Release the preset buttons 3 and 6 and the audio unit will enter the Self-Diagnostic Mode. On entering the Self-Diagnostic Mode, the audio unit will automatically search the FM band to carry out the waveband check, starting at the lowest frequency until it finds a signal.
3. To exit the audio unit Self-Diagnostic Mode, press the preset button 6.

Self-Diagnostic Mode * Model 2500

Test	Syntax Displayed	Description
1. FM waveband check.	Numeric value (of station found) or Er2 if no signal received.	Tests the signal from the antenna cable.
2. Volume.	No display shown. Audio unit volume preset at 15.	Tests the traffic announcement preset volume and volume control.
3. Test speaker circuit.	RF.	Tests the right-hand front speaker circuit.
4. Test speaker circuit.	LF.	Tests the left-hand front speaker circuit.
End of the audio unit Self-Diagnostic Mode.	END.	Displayed until the audio unit preset button 6 is pressed or Self-Diagnostic Mode times out.

Self-Diagnostic Mode - Models 3500,4500 and 6006

Test	Syntax Displayed	Description
1. FM waveband check.	Numeric value (of station found) or NOT FOUND if no signal received.	Tests the signal from the antenna cable.

DIAGNOSIS AND TESTING

Test	Syntax Displayed	Description
2. Volume.	No display shown. Audio unit volume preset at 15.	Tests the traffic announcement preset volume and volume control.
3. Test speaker circuit.	4CH RF for four channel system 2CH RF for two channel system.	Tests the right-hand front speaker circuit.
4. Test speaker circuit.	4CH LF for four channel system 2CH LF for two channel system.	Tests the left-hand front speaker circuit.
5. Test speaker circuit.	4CH RR.	Tests the right-hand rear speaker circuit.
6. Test speaker circuit.	4CH LR.	Test the left-hand rear speaker circuit.
7. Test compact disc auto-changer circuit (if equipped).	- CDDJ OK if communications are achieved. - NO CDDJ if no communications are achieved.	Tests the compact disc auto-changer circuit.
End of the audio unit Self-Diagnostic Mode.	END.	Displayed until the audio unit preset button 6 is pressed or Self-Diagnostic Mode times out.

4. If the concern is still evident after the self-diagnostic mode, refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
The audio unit is inoperative/does not operate correctly	- Fuse(s). - Circuit(s). - Audio unit.	GO to Pinpoint Test A.
The display is blank - radio and cassette player or CD player operate	Audio unit.	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
Poor reception	- Antenna. - Antenna cable. - Audio unit.	GO to Pinpoint Test B.
Poor quality/distorted sound from one or more speakers (not all speakers)	- Speaker(s). - Circuit(s). - Audio unit.	GO to Pinpoint Test C.
No sound from all speakers	- Audio unit. - Circuit(s). - Speaker(s).	GO to Pinpoint Test D.

DIAGNOSIS AND TESTING

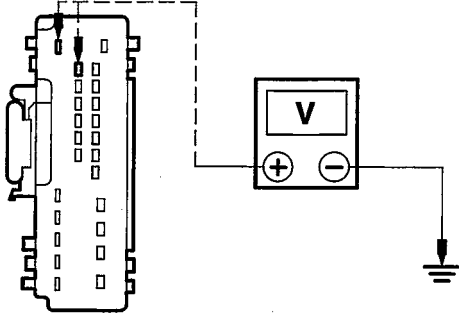
Symptom	Possible Sources	Action
The CD player is inoperative/does not operate correctly	Audio unit.	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
No sound from one or more of the speakers (not all speakers)	- Circuit(s). - Speaker(s). - Audio unit.	GO to Pinpoint Test E.
The audio remote control is inoperative/does not operate correctly	- Circuit(s). - Audio remote control. - Audio unit.	GO to Pinpoint Test F.
The digital versatile disc (DVD) player is inoperative/does not operate correctly	- DVD player - Circuit(s) - Fuse(s)	GO to Pinpoint Test G

Pinpoint Tests

NOTE: Use a digital multimeter for all electrical measurements.

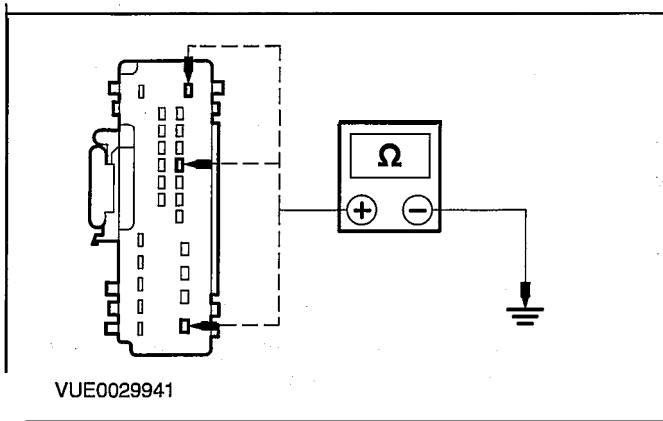
PINPOINT TEST A : THE AUDIO UNIT IS **INOPERATIVE/DOES NOT OPERATE CORRECTLY**
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A1: CHECK AUDIO UNIT FOR POWER	
 VUE0029940	1 Disconnect Audio Unit C344.
	2 Ignition switch in position II.
	3 Measure the voltage between the audio unit C344 pin 1, circuit 29-MD15 (OGIBK), harness side and ground; and between the audio unit C344 pin 2, circuit 75-MD15 (YE/GN), harness side and ground. - Are the voltages greater than 10 volts? → Yes GO to A2. → No REPAIR circuit 29-MD15 (OGIBK) or circuit 75-MD15 (YEIGN). TEST the system for normal operation.
A2: CHECK AUDIO UNIT FOR GROUND	
	Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the audio unit C344 pin 13, circuit 91-MD15 (BWGN), harness side and ground; and between the audio unit C344 pin 17, circuit 91-MD34 (BK/YE), harness side and ground; and between the audio unit C344 pin 24, circuit 91-MD15A (BWGN), harness and ground.

- Are the resistances less than 1 ohm?

→ **Yes**

INSTALL a new audio unit.

REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation).

TEST the system for normal operation.

→ **No**

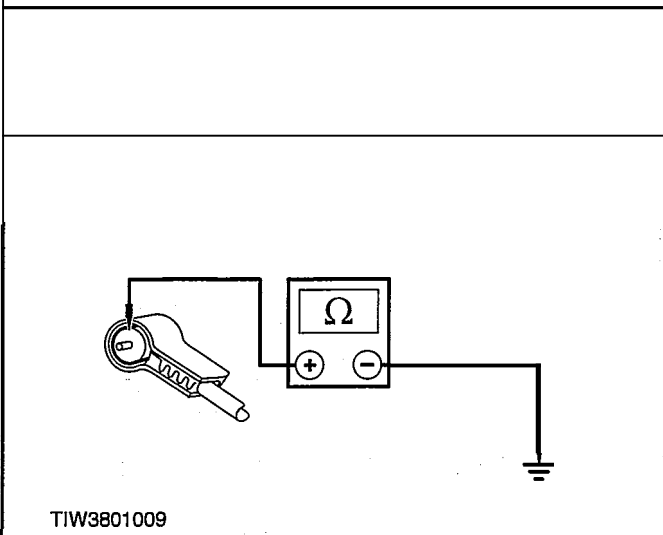
REPAIR circuit 91-MD15 (BWGN) or 91-MD34 (BK/YE) or 91-MD15A (BWGN). TEST the system for normal operation.

PINPOINT TEST B : POOR RECEPTION

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

B1: CHECK THE ANTENNA CABLE SHIELD



- 1 Ignition switch in position 0.

- 2 Disconnect Audio Unit Antenna Connector.

- 3 Measure the resistance between the antenna cable ground connector (shield) and ground.

- Is the resistance less than 1 ohm?

→ **Yes**

GO to B2.

→ **No**

CLEAN and TIGHTEN the antenna mast base connection to the body. If the concern persists, INSTALL a new antenna cable.

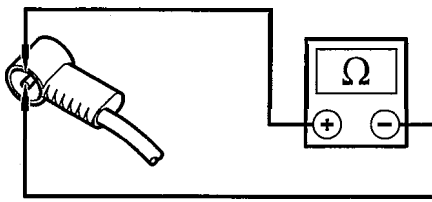
REFER to: Antenna Cable (415-02 Antenna, Removal and Installation).

TEST the system for normal operation.

B2: CHECK THE ANTENNA CENTER CONDUCTOR FOR OPEN

- 1 Remove the antenna mast.

DIAGNOSIS AND TESTING

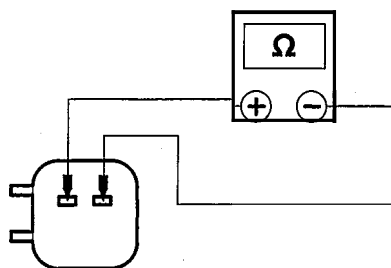
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
TIW3801010	☐ 2 Measure the resistance of the center conductor, between the ends of the antenna cable. Is the resistance less than 1 ohm? → Yes GO to B3. → No INSTALL a new antenna cable. REFER to: Antenna Cable (415-02 Antenna, Removal and Installation). TEST the system for normal operation.
B3: CHECK ANTENNA CABLE FOR SHORT	
V3801158 	☐ Measure the resistance between the antenna center conductor and the antenna ground (shield). Is the resistance greater than 10,000 ohms (open circuit)? → Yes CLEAN and TIGHTEN the ground connections at the base of the antenna and battery ground cable to body. If the concern persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 10/2005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation. → No INSTALL a new antenna cable. REFER to: Antenna Cable (415-02 Antenna, Removal and Installation). TEST the system for normal operation.

PINPOINT TEST C : POOR QUALITY/DISTORTED SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
CI: CHECK THE SPEAKER RESISTANCE	
	☐ Disconnect Inoperative Speaker.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUE0029964

DETAILS/RESULTS/ACTIONS

2 Measure the resistance between the inoperative speaker pin 1 and pin 2, component side.

- Is the resistance approximately **4 ohms**?

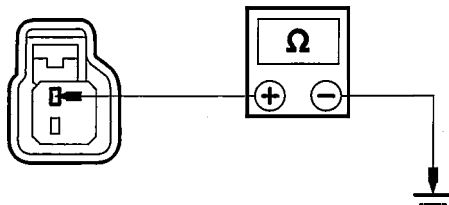
→ **Yes**

GO to **C2**.

→ **No**

INSTALL a new speaker. TEST the system for normal operation.

C2: CHECK SPEAKER INPUT FOR SHORT TO GROUND



VUE0029843

1 Disconnect Audio Unit C344.

Measure the resistance between the inoperative speaker connector pin 1, harness side and ground.

- Is the resistance greater than 10,000 ohms (open circuit)?

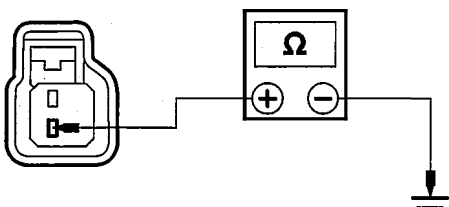
→ **Yes**

GO to **C3**.

→ **No**

REPAIR the inoperative speaker input circuit. TEST the system for normal operation.

C3: CHECK SPEAKER RETURN FOR SHORT TO GROUND



VUE0029844

1 Measure the resistance between the inoperative speaker connector pin 2, harness side and ground.

- Is the resistance greater than 10,000 ohms (open circuit)?

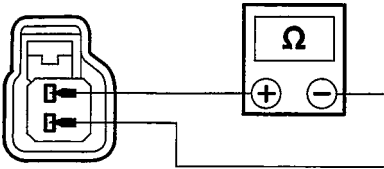
→ **Yes**

GO to **C4**.

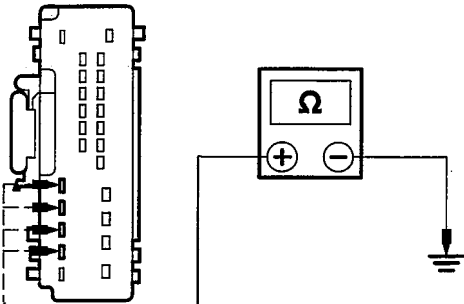
→ **No**

REPAIR the inoperative speaker input circuit. TEST the system for normal operation.

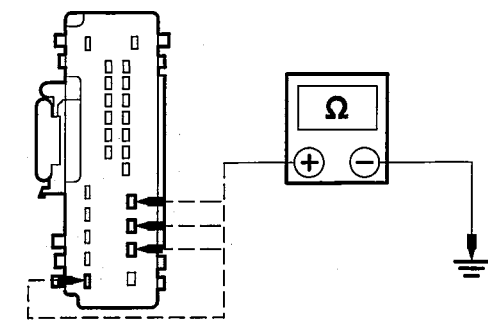
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C4: CHECK SPEAKER CIRCUIT FOR SHORT	
 VUE0029842	1 Measure the resistance between the inoperative speaker connector pin 1, harness side and pin 2, harness side. Is the resistance greater than 10,000 ohms (open circuit)? → Yes INSTALL a new speaker. TEST the system for normal operation. If the concern persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation. → No REPAIR the circuit(s). TEST the system for normal operation.

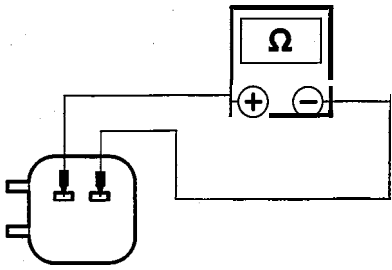
PINPOINT TEST D : NO SOUND FROM ALL SPEAKERS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK SPEAKER INPUT CIRCUIT FOR SHORT TO GROUND	
 VUE0029936	1 Ignition switch in position 0.
	2 Disconnect Audio Unit C344.
	3 Measure the resistance between the following audio unit connector pins and ground: (Front left speaker) C344 pin 8, circuit 8-MD10 (WH/BK), harness side and ground. (Rear left speaker) C344 pin 9, circuit 8-MD11 (WH/VT), harness side and ground. (Front right speaker) C344 pin 11, circuit 8-MD17 (WH/RD), harness side and ground. (Rear right speaker) C344 pin 10, circuit 8-MD18 (WH), harness side and ground. - Are the resistances greater than 10,000 ohms (open circuit)? → Yes GO to D2. → No REPAIR the circuit(s). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D2: CHECK SPEAKER RETURN CIRCUIT FOR SHORT TO GROUND	
 VUE0029935	1 Measure the resistance between the following audio connector pins and ground. – (Front left speaker) C344 pin 21, circuit 10-MDIO (GY/BK), harness side and ground. – (Rear left speaker) C344 pin 22, circuit 10-MD11 (GY/VT), harness side and ground. – (Front right speaker) C344 pin 12, circuit 10-MD17 (GY/RD), harness side and ground. – (Rear right speaker) C344 pin 23, circuit 10-MD18 (GY), harness side and ground. • Are the resistances greater than 10,000 ohms (open circuit)?
	→ Yes INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation. → No REPAIR the circuit(s). TEST the system for normal operation.

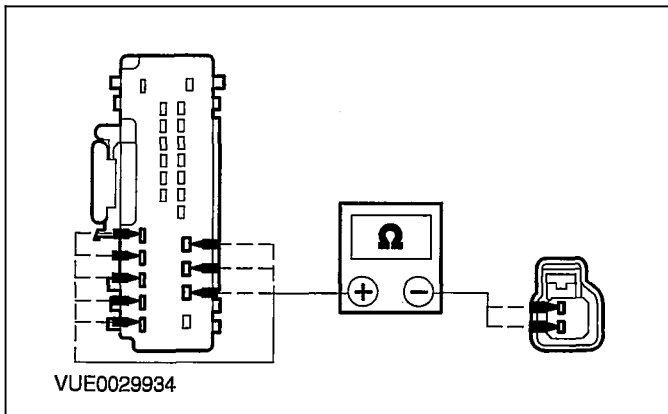
PINPOINT TEST E : NO SOUND FROM ONE OR MORE OF THE SPEAKERS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CHECK THE SPEAKER RESISTANCE	
 VUE0029964	1 Disconnect Inoperative Speaker. 2 Measure the resistance between the inoperative speaker pin 1 and pin 2, component side. • Is the resistance approximately 4 ohms? → Yes GO to E2. → No INSTALL a new speaker(s). TEST the system for normal operation.
E2: CHECK SPEAKER CIRCUIT RESISTANCE	
	1 Disconnect Audio Unit C344.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



Measure the resistance between the audio unit C344 and the inoperative speaker(s) connector pins.

- (Front left speaker) C344 pin 8, circuit 8-MD10 (WH/BK), harness side and C527 pin 1, circuit 8-MD28 (WH), harness side.
- (Front left speaker) C344 pin 21, circuit 10-MD10 (GY/BK), harness side and C527 pin 2, circuit 10-MD28 (GY), harness side.
- (Front right speaker) C344 pin 11, circuit 8-MD17 (WH/RD), harness side and C528 pin 1, circuit 8-MD28 (WH), harness side.
- (Front right speaker) C344 pin 12, circuit 10-MD17 (GY/RD), harness side and C528 pin 2, circuit 10-MD28 (GY), harness side.
- (Rear left speaker) C344 pin 9, circuit 8-MD11 (WH/NT), harness side and C533 pin 1, circuit 8-MD29 (WHM), harness side.
- (Rear left speaker) C344 pin 22, circuit 10-MD11 (GYM), harness side and C533 pin 2, circuit 10-MD29 (GY/WH), harness side.
- (Rear right speaker) C344 pin 10, circuit 8-MD18 (WH), harness side and C534 pin 1, circuit 8-MD29 (WH/NT), harness side.
- (Rear right speaker) C344 pin 23, circuit 10-MD18 (GY), harness side and C534 pin 2, circuit 10-MD29 (GY/WH), harness side.

- Is the resistance less than 1 ohm?

→ **Yes**

INSTALL a new speaker. TEST the system for normal operation. If the concern persists, INSTALL a new audio unit.

REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation).

Test the system for normal operation.

→ **No**

REPAIR the relevant circuit. TEST the system for normal operation.

PINPOINT TEST F : THE AUDIO REMOTE CONTROL IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

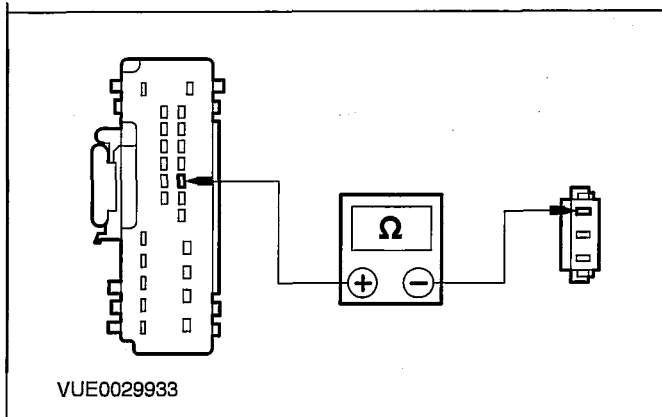
F1: CHECK THE CIRCUIT 8-MD26 FOR OPEN

☐ Disconnect Audio Unit C344.

☐ Disconnect Audio Remote Control C681.

DIAGNOSIS AND TESTING

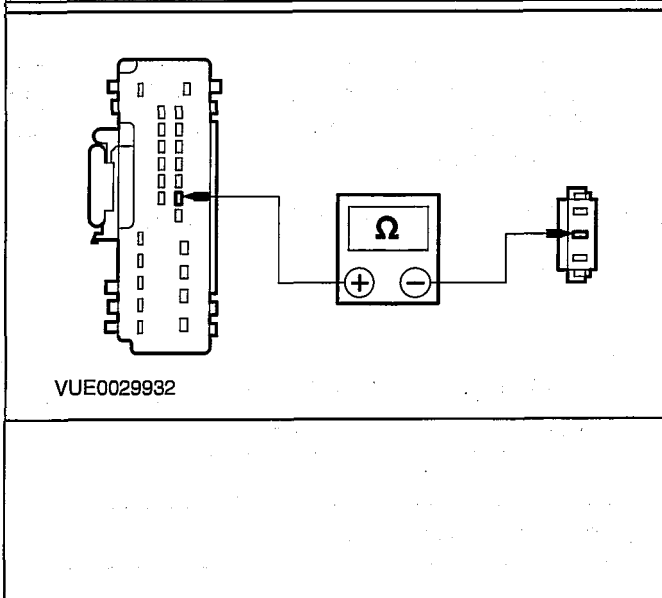
TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 3** Measure the resistance between the audio unit C344 pin 18, circuit 8-MD26 (WHIBK), harness side and the audio remote control C681 pin 1, circuit 8-MD26 (WH/BK), harness side.
- Is the resistance less than 1 ohm?
 - **Yes**
GO to F2.
 - **No**
REPAIR the circuit. TEST the system for normal operation.

F2: CHECK CIRCUIT 9-MD26 (BN/YE) FOR OPEN

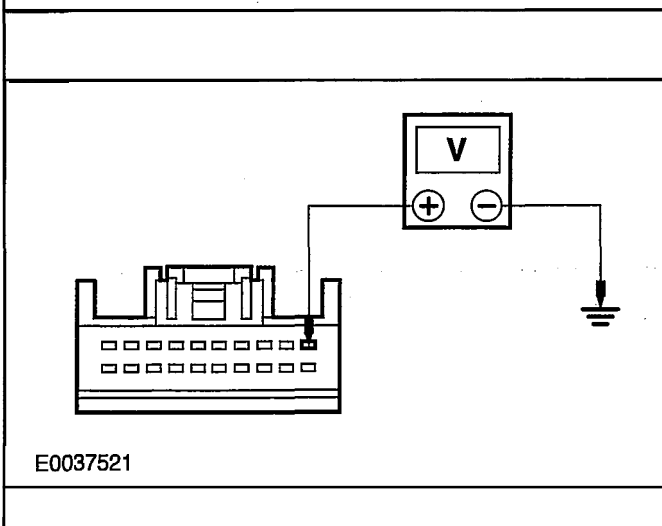


- 1** Measure the resistance between the audio unit C344 pin 19, circuit 9-MD26 (BNNE), harness side and the audio remote control C681 pin 2, circuit 9-MD26 (BNNE), harness side.
- Is the resistance less than 1 ohm?
 - **Yes**
INSTALL a new audio remote control. If the concern persists, INSTALL a new audio unit.
REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation).
TEST the system for normal operation.
 - **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST G : THE DVD PLAYER IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

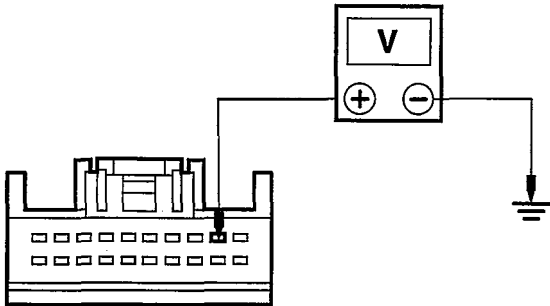
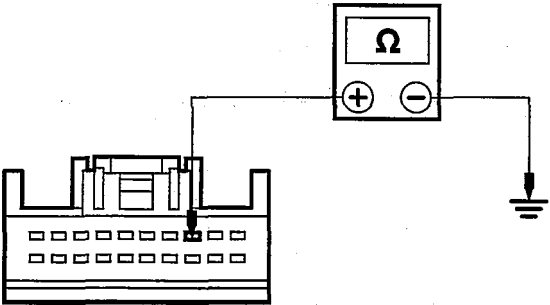
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

G1: CHECK THE DVD PLAYER FOR POWER



- 1** Disconnect DVD Player C437.
- 2** Measure the voltage between the DVD player C437 pin 1, circuit 29-MD8 (OG), harness side and ground.
- Is the voltage greater than 10 volts?
 - **Yes**
GO to G2.
 - **No**
REPAIR circuit 29-MD8 (OG). TEST the system for normal operation. If the concern persists, install a new CJB. Test the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G2: CHECK THE DVD PLAYER FOR SWITCHED POWER	
 E0037522	☐ Ignition switch in position II.
	☐ Measure the voltage between the DVD player C437 pin 2, circuit 75-MD8 (YEIBU), harness side and ground. - Is the voltage greater than 10 volts? → Yes GO to G3. → No REPAIR circuit 75-MD8 (YE/BU). Test the system for normal operation.
G3: CHECK THE DVD PLAYER FOR GROUND	
 E0037520	Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

☐ Measure the resistance between the DVD player C437 pin 3, circuit 31-MD8 (BK), harness side and ground.

- Is the resistance less than 1 ohm?

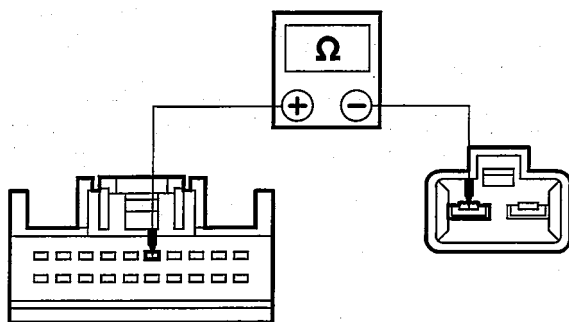
→ **Yes**

Right-hand drive vehicles: GO to G4.

Left-hand drive vehicles: INSTALL a new DVD player. Test the system for normal operation.

→ **No**

REPAIR circuit 31-MD8 (BK). Test the system for normal operation.

G4: CHECK FROM THE DVD PLAYER TO HOOD SWITCH FOR OPEN

E0037536

1 Measure the resistance between the DVD player C437 PIN 5, 31S-GL7A (BK-YE) and the hood switch C604 pin 1, 31S-GL7A (BK-YE).

- Is the voltage greater than 1 ohm?

→ **Yes**

INSTALL a new DVD player. Test the system for normal operation.

→ **No**

REPAIR circuit 31S-GL7A (BK/YE). Test the system for normal operation.

DIAGNOSIS AND TESTING

Audio System — Vehicles Built From: 1012005

Refer to Wiring Diagrams Section 415-01, for schematic and connector information.

Refer to Wiring Diagrams Section 415-03, for schematic and connector information.

Refer to Wiring Diagrams Section 415-07, for schematic and connector information.

General Equipment

Worldwide Diagnostic System (WDS)

Inspection and Verification

NOTE: If the keycode is entered incorrectly 3 times, the system will lock out. The component can only be unlocked by the manufacturer.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
- Audio unit - Antenna - Foreign objects contacting speaker - Trim poorly fitted/resonance - Audio control switch (if equipped) - Digital versatile disc (DVD) player	- Fuse(s) - Wiring harness - Electrical connector(s) - Speaker(s) - Audio unit - Audio control switch (if equipped) - DVD player - Antenna cable - Central junction box (CJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Self-Diagnostic Mode.

Self-Diagnostic Mode - 5000C, 6000CD, 6006CDC Audio Units

NOTE: The audio unit must be in radio mode before entering the Self-Diagnostic Mode.

1. To enter the audio unit Self-Diagnostic Mode, switch the audio unit ON and press the preset buttons 3 and 5 together for more than 2 seconds.
2. Release the preset buttons 3 and 5 and the audio unit will enter the Self-Diagnostic Mode.

Self-Diagnostic Mode

Message Displayed	Circuit Tested
1. 4CH RF for four channel system 2CH RF for two channel system.	Right-hand front speaker circuit.
2. 4CH LF for four channel system 2CH LF for two channel system.	Left-hand front speaker circuit.
3. 4CH RR for four channel system.	Right-hand rear speaker circuit.
4. 4CH LR for four channel system.	Left-hand rear speaker circuit.

3. If the cause is not evident after the Self-Diagnostic Mode, connect the WDS to the data link connector (DLC).
4. Retrieve the Diagnostic Trouble Code (DTC)s and refer to the DTC Index Chart.

Self-Diagnostic Mode - 1500RDS Audio Unit

NOTE: The audio unit must be in radio mode before entering the Self-Diagnostic Mode.

1. To enter the audio unit Self-Diagnostic Mode, switch the audio unit ON. Within four seconds press the preset buttons 1 and 3 together.
2. Release the preset buttons 1 and 3 and the audio unit will enter the Self-Diagnostic Mode.

Self-Diagnostic Mode

Message Displayed	Circuit Tested
1. 2CH RF for two channel system.	Right-hand front speaker circuit.
2. 2CH LF for two channel system.	Left-hand front speaker circuit.
3. FM frequency received.	Antenna cable.

DIAGNOSIS AND TESTING

3. If the cause is not evident after the Self-Diagnostic Mode, connect the WDS to the data link connector (DLC).
4. Retrieve the Diagnostic Trouble Code (DTC)s and refer to the DTC Index Chart.

Diagnostic Trouble Code (DTC) Index Chart

DTC	Description/Condition	Possible Source	Action
B1342	Audio unit internal failure	Audio unit	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).
B2401	Tape player failure	Audio unit	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).
B2402	Audio unit overheated	Audio unit	Allow the audio unit to cool and check for DTC B2402 . If the concern persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).
B2403	CD player internal failure	Audio unit	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).
B2404	Audio control switch circuit failure	Audio control switch	GO to Pinpoint Test E.

DIAGNOSIS AND TESTING

DTC	Description/Condition	Possible Source	Action
B2405	Audio unit overheated	Audio unit	Allow the audio unit to cool and check for DTC B2405. If the concern persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).
B2406	CD player internal failure	Audio unit	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).
B2408	Speaker line short circuit	Speaker(s)	GO to Pinpoint Test D.
B2477	Module configuration failure	Audio unit and central junction box (CJB)	REFER to the WDS.
P1628	Module ignition supply input	CJB	REFER to the WDS.

DIAGNOSIS AND TESTING

DTC	Description/Condition	Possible Source	Action
U0155	Controller area network (CAN) communication lost	CAN	REFER to: Communications Network - Vehicles Built From: 1012005 (418-00 Module Communications Network, Diagnosis and Testing).
U0238	CAN communication lost	CAN	REFER to: Communications Network - Vehicles Built From: 1012005 (418-00 Module Communications Network, Diagnosis and Testing).
U0187	CAN communication lost with CDDJ	CAN	REFER to: Communications Network - Vehicles Built From: 10/2005 (418-00 Module Communications Network, Diagnosis and Testing).
U0140	CAN communication lost with body control module	CAN	REFER to: Communications Network - Vehicles Built From: 1012005 (418-00 Module Communications Network, Diagnosis and Testing).

1. If the cause is still evident, refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
The audio unit is inoperative/does not operate correctly	- Circuit. - Audio unit.	GO to Pinpoint Test A.
The display is blank - radio and cassette player operate	Audio unit.	INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• The display is blank - radio and CD player operate	• Audio unit.	• INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
• Poor reception	• Antenna. • Antenna cable. • Audio unit.	• GO to Pinpoint Test B.
• Poor quality/distorted sound from one or more speakers (not all speakers)	• Speaker(s). • Circuit. • Audio unit.	• GO to Pinpoint Test C.
• No sound from all speakers	• Audio unit.	• INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
• No sound from one or more of the speakers (not all speakers)	• Speaker(s). • Circuit. • Audio unit.	• GO to Pinpoint Test D.
• The audio control switch is inoperative/does not operate correctly.	• Circuit. • Audio control switch. • Audio unit.	• GO to Pinpoint Test E.
• The digital versatile disc (DVD) player is inoperative/does not operate correctly	• Circuit(s). • DVD player.	• GO to Pinpoint Test F.
• No sound from headphone(s)	• Headphone(s). • DVD player.	• Using a known good headphone, check the headphone in the right-hand and left-hand sockets. If sound is heard from each headphone socket, INSTALL a new headphone(s). If no sound is heard from the headphone socket(s), INSTALL a new DVD player. TEST the system for normal operation.
• The audio unit clock is not displayed	• Audio unit connector. • Audio unit. • Instrument cluster.	• REFER to: Instrument Cluster - Vehicles Built From: 1012005 (413-01 Instrument Cluster, Diagnosis and Testing).

Pinpoint Tests

NOTE: Use a digital multimeter for all electrical measurements.

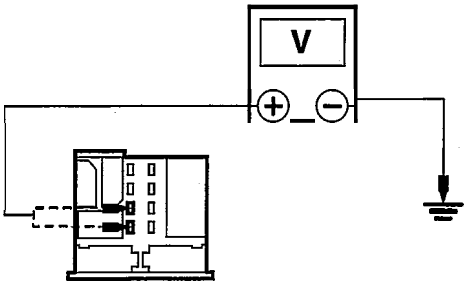
DIAGNOSIS AND TESTING

PINPOINT TEST H : THE AUDIO UNIT IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

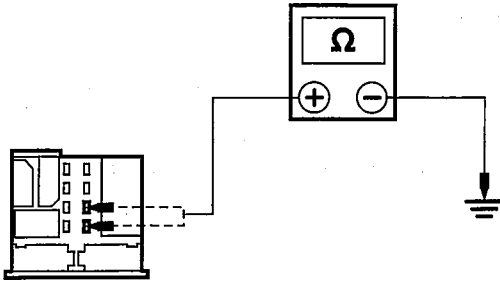
TEST CONDITIONS

DETAILS RESULTS ACTIONS

A1: CHECK THE AUDIO UNIT FOR POWER

	Disconnect Audio Unit C775.
 E65961	☐ Ignition switch in position I. 3 Measure the voltage between the audio unit C775 pin 15, circuit 29-MD15 (OGIBK), harness side and ground, and between the audio unit C775 pin 16, circuit 75-MD15 (YEIGN), harness side and ground. • Are the voltages greater than 10 volts? → Yes GO to A2. → No REPAIR circuit 29-MD15 (OG/BK) or circuit 75-MD15 (YEIGN). TEST the system for normal operation.

A2: CHECK THE AUDIO UNIT GROUND CIRCUITS FOR OPEN CIRCUIT

	Ignition switch in position 0.
 E65962	☐ Measure the resistance between the audio unit C775 pin 11, circuit 91-MD34 (BK/YE), harness side and ground, and between the audio unit C775 pin 12, circuit 91-MD15 (BWGN), harness side and ground. • Are the resistances less than 1 ohm? → Yes INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 91-MD34 (BK/YE) or circuit 91-MD15 (BWGN). TEST the system for normal operation.

PINPOINT TEST I : POOR RECEPTION

TEST CONDITIONS

DETAILS RESULTS ACTIONS

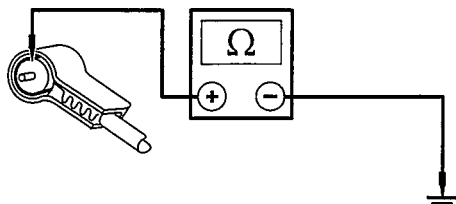
B1: CHECK THE ANTENNA CABLE SHIELD

	☐ Ignition switch in position 0.
	2 Disconnect the antenna cable from the audio unit.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



TIW3801009

- 3 Measure the resistance between the antenna cable ground connector (shield), and ground.

Is the resistance less than 1 ohm?

→ **Yes**

GO to B2.

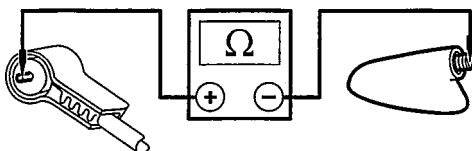
→ **No**

CLEAN and TIGHTEN the antenna base connection to the body. If the concern persists, INSTALL a new antenna cable.

REFER to: Antenna Cable (415-02 Antenna, Removal and Installation).

TEST the system for normal operation.

B2: CHECK THE ANTENNA CENTER CONDUCTOR FOR OPEN CIRCUIT



TIW3801010

- 1 Remove the antenna mast.

- 2 Measure the resistance of the center conductor between the ends of the antenna cable.

Is the resistance less than 1 ohm?

→ **Yes**

GO to B3.

→ **No**

INSTALL a new antenna cable.

REFER to: Antenna Cable (415-02 Antenna, Removal and Installation).

TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B3: CHECK THE ANTENNA CABLE FOR SHORT V3801158	☐ Measure the resistance between the antenna center conductor and the antenna ground (shield). Is the resistance greater than 10,000 ohms (open circuit)? → Yes CLEAN and TIGHTEN the ground connections at the base of the antenna and battery negative cable to the body. If concern the persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation. → No INSTALL a new antenna cable. REFER to: Antenna Cable (415-02 Antenna, Removal and Installation). TEST the system for normal operation. If the concern persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).

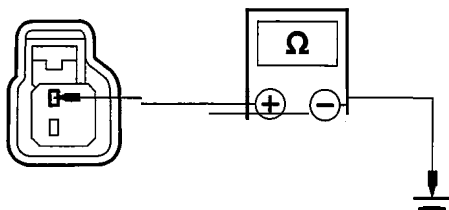
PINPOINT TEST J : POOR QUALITY/DISTORTED SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
CI: CHECK THE SPEAKER RESISTANCE VUE0029964	1 Disconnect Inoperative Speaker. 2 Measure the resistance between the inoperative speaker pin 1 and pin 2, component side. Is the resistance approximately 4.0 ohms? → Yes GO to C2. → No INSTALL a new speaker. TEST the system for normal operation.
C2: CHECK THE SPEAKER INPUT FOR SHORT TO GROUND	☐ Disconnect Audio Unit C775.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VUE0029843

2 Measure the resistance between the inoperative speaker connector pin 1, harness side and ground.

- Is the resistance greater than 10,000 ohms (open circuit)?

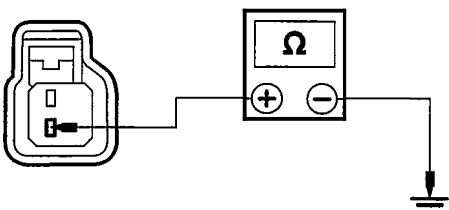
→ **Yes**

GO to C3.

→ **No**

REPAIR the inoperative speaker input circuit. TEST the system for normal operation.

C3: CHECK THE SPEAKER RETURN FOR SHORT TO GROUND



VUE0029844

1 Measure the resistance between the inoperative speaker connector pin 2, harness side and ground.

- Is the resistance greater than 10,000 ohms (open circuit)?

→ **Yes**

INSTALL a new speaker. TEST the system for normal operation. If the concern persists, INSTALL a new audio unit.

REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation).

→ **No**

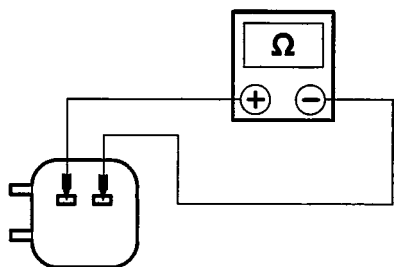
REPAIR the speaker return circuit. TEST the system for normal operation.

PINPOINT TEST K : NO SOUND FROM ONE OR MORE OF THE SPEAKERS (NOT ALL SPEAKERS)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D1: CHECK THE SPEAKER RESISTANCE



VUE0029964

Disconnect Inoperative Speaker.

1 Measure the resistance between the inoperative speaker pin 1 and pin 2, component side.

- Is the resistance approximately 4.0 ohms?

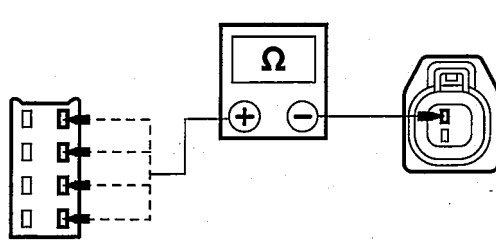
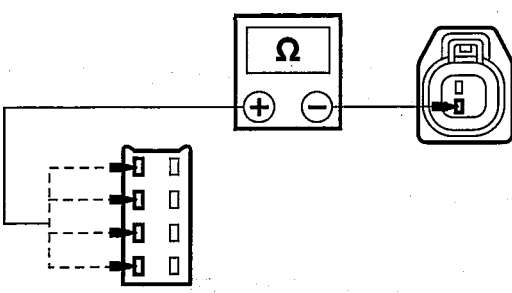
→ **Yes**

GO to D2.

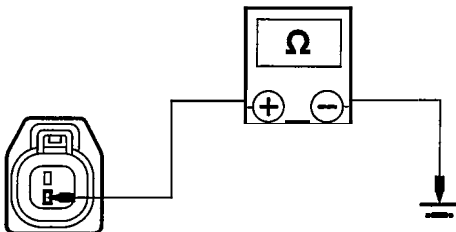
→ **No**

INSTALL a new speaker(s). TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D2: CHECK THE INOPERATIVE SPEAKER(S) CONNECTOR PIN 1 CIRCUIT	
 E66028	1 Disconnect Audio Unit C776. 2 Measure the resistance between the following audio unit C776 pins, harness side and the inoperative speaker(s) connector pin 1, harness side: – (Left front speaker) C527 pin 1, circuit 8-MD28 (WH) to C776 pin 3, circuit 8-MD10 (WH/BK). – (Right front speaker) C528 pin 1, circuit 8-MD28 (WH) to C776 pin 2, circuit 8-MD17 (WH/RD). – (Left rear speaker) C533 pin 1, circuit 8-MD29 (WHNT) to C776 pin 4, circuit 8-MD11 (WHNT). – (Right rear speaker) C534 pin 1, circuit 8-MD29 (WHNT) to C776 pin 1, circuit 8-MD18 (WH). • Is the resistance less than 1 ohm? → Yes GO to D3. → No REPAIR the circuit in question. TEST the system for normal operation.
D3: CHECK THE INOPERATIVE SPEAKER(S) CONNECTOR PIN 2 CIRCUIT	
 E66039	1 Measure the resistance between the following audio unit C776 pins, harness side and the inoperative speaker(s) connector pin 2, harness side: – (Left front speaker) C527 pin 2, circuit 10-MD28 (GY) to C776 pin 7, circuit 10-MD10 (GY/BK). – (Right front speaker) C528 pin 2, circuit 10-MD28 (GY) to C776 pin 6, circuit 10-MD17 (GY/RD). – (Left rear speaker) C533 pin 2, circuit 10-MD29 (GYNVH) to C776 pin 8, circuit 10-MD11 (GYNVH). – (Right rear speaker) C534 pin 2, 10-MD29 (GYNVH) to C776 pin 5, 10-MD18 (GY). • Is the resistance less than 1 ohm? → Yes GO to D4. → No REPAIR the circuit in question. TEST the system for normal operation.

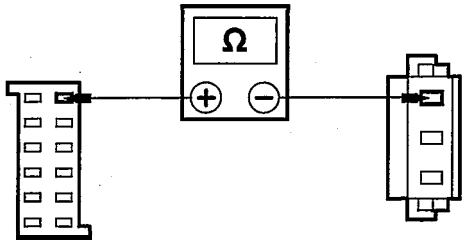
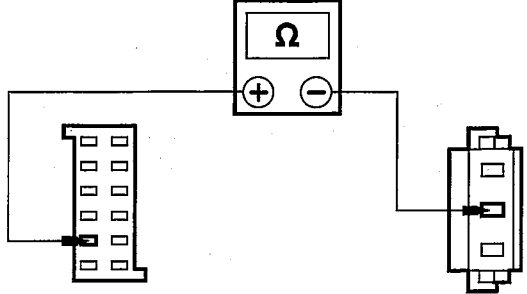
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D4: CHECK THE INOPERATIVE SPEAKER(S) CIRCUIT FOR SHORT TO GROUND  E66046	1 Measure the resistance between the following inoperative speaker(s) connector pin 1, harness side and ground: – (Left front speaker) C527 pin 1, circuit 8-MD28 (WH), to ground. – (Right front speaker) C528 pin 1, circuit 8-MD28 (WH), to ground. – (Left rear speaker) C533 pin 1, circuit 8-MD29 (WHM), to ground. – (Right rear speaker) C534 pin 1, 8-MD29 (WHM), to ground. • Is the resistance greater than 10,000 ohms (open circuit)? → Yes INSTALL a new speaker. TEST the system for normal operation. → No REPAIR the circuit in question. TEST the system for normal operation.

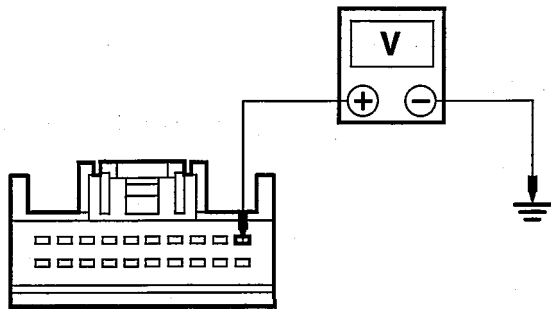
PINPOINT TEST L : THE AUDIO CONTROL SWITCH IS **INOPERATIVE/DOES** NOT OPERATE CORRECTLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CHECK THE AUDIO UNIT OPERATES CORRECTLY USING THE AUDIO UNIT CONTROLS	1 Operate the audio unit using the audio unit controls. • Does the audio unit operate correctly using the audio controls? → Yes GO to E2. → No INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). TEST the system for normal operation.
E2: CHECK CIRCUIT 8-MD26 (WHIBK) FOR OPEN CIRCUIT	1 Disconnect Audio Unit C777. 2 Disconnect Audio Control Switch C681.

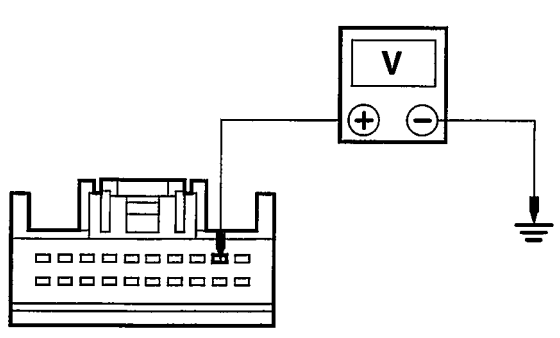
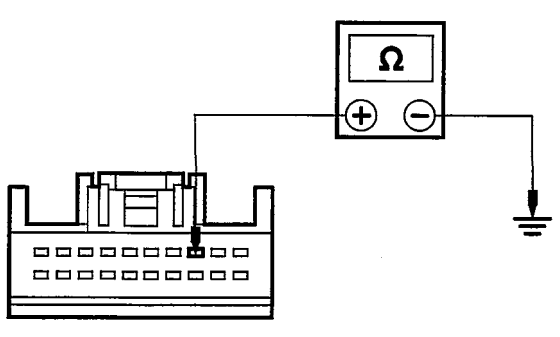
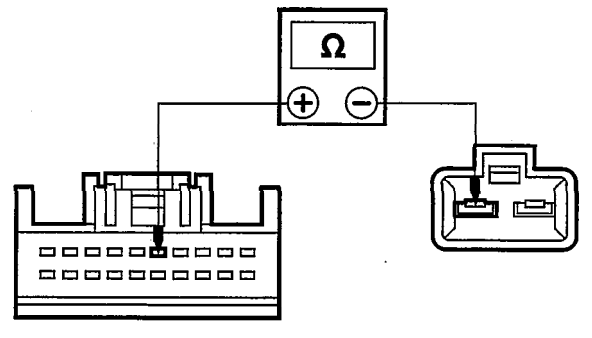
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E66047	☐ Measure the resistance between the audio unit C777 pin 6, circuit 8-MD26 (WHIBK) harness side and the audio control switch C681 pin 1, circuit 8-MD26 (WHIBK) harness side. Is the resistance less than 1 ohm? → Yes GO to E3, → No REPAIR the circuit. TEST the system for normal operation.
E3: CHECK CIRCUIT 9-MD26 (BNNE) FOR OPEN CIRCUIT	
 E66054	1 Measure the resistance between the audio unit C777 pin 8, circuit 9-MD26 (BNNE) harness side and the audio control switch C681 pin 2, circuit 9-MD26 (BNNE) harness side. Is the resistance less than 1 ohm? → Yes INSTALL a new audio control switch. TEST the system for normal operation. If the concern persists, INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). → No REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST M : THE DIGITAL VERSATILE DISC (DVD) PLAYER IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: CHECK THE DVD PLAYER FOR POWER  E0037521	1 Disconnect DVD Player C437. 2 Measure the voltage between the DVD player C437 pin 1, circuit 29-MD8 (OG), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to F2. → No REPAIR circuit 29-MD8 (OG). TEST the system for normal operation. If the concern persists, INSTALL a new CJB. Test the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F2: CHECK THE DVD PLAYER FOR SWITCHED POWER	
 E0037522	1 Ignition switch in position II. 2 Measure the voltage between the DVD player C437 pin 2, circuit 75-MD8 (YEIBU), harness side and ground. - Is the voltage greater than 10 volts? → Yes GO to F3. → No REPAIR circuit 75-MD8 (YEIBU). Test the system for normal operation.
F3: CHECK THE DVD PLAYER FOR GROUND	
 E0037520	1 Ignition switch in position 0. 2 Measure the resistance between the DVD player C437 pin 3, circuit 31-MD8 (BK), harness side and ground. - Is the resistance less than 1 ohm? → Yes Right-hand drive vehicles: GO to F4. Left-hand drive vehicles: INSTALL a new DVD player. Test the system for normal operation. → No REPAIR circuit 31-MD8 (BK). Test the system for normal operation.
F4: CHECK THE DVD PLAYER TO HOOD SWITCH FOR OPEN CIRCUIT	
 E0037536	1 Disconnect Hood Switch C604. 2 Measure the resistance between the DVD player C437 pin 5, circuit 31S-GL7A (BK/YE) and the hood switch C604 pin 1, circuit 31S-GL7A (BWE), harness side. - Is the resistance less than 1 ohm? → Yes INSTALL a new DVD player. Test the system for normal operation. → No REPAIR circuit 31S-GL7A (BWE). Test the system for normal operation.

SECTION 415-01 Audio Unit

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Audio System..... 415-01-2

REMOVAL AND INSTALLATION

Audio Unit — Vehicles Built Up To: 1012005..... **(38 222 0)** 415-01-3

Audio Unit — Vehicles Built From: 1012005..... **(38 222 0)** 415-01-4

DIAGNOSIS AND TESTING**Audio System**

REFER to Section 415-00 [Information and Entertainment System - General Information].

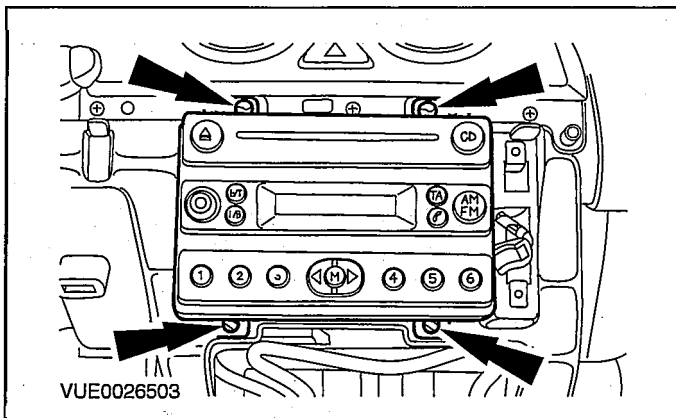
REMOVAL AND INSTALLATION

Audio Unit — Vehicles Built Up To: 10/2005(38 222 0)

Removal

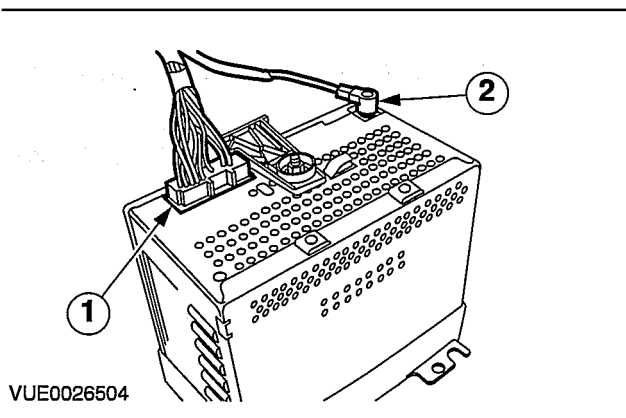
NOTE: It is not necessary to remove the audio unit in order to obtain the serial number. To obtain the serial number, simultaneously PRESS buttons 2 and 6. The serial number will be shown in the audio unit display.

1. Remove the climate control assembly. For additional information, refer to Section 412-04 [Control Components].
2. Detach the audio unit from the instrument panel.

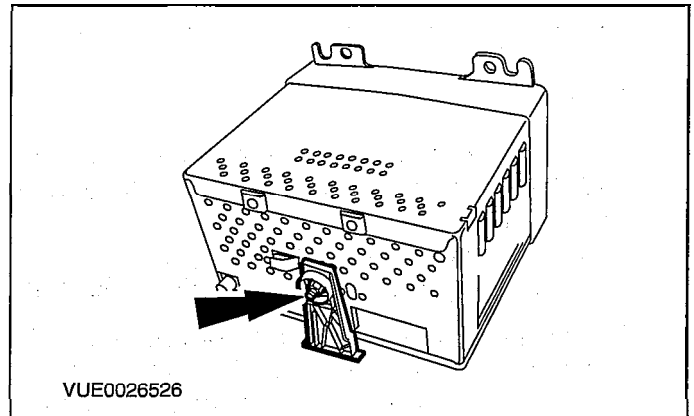


3. Disconnect the electrical connectors and remove the audio unit.

1. Disconnect the electrical connector.
2. Disconnect the antenna cable connector.



4. Remove the audio unit rear support.



Installation

CAUTIONS:

⚠ To prevent damage to the new audio unit while installing the climate control and audio unit trim panel, apply masking tape to the three sections of the audio unit.

⚠ To prevent possible damage to the audio unit while connecting the electrical connector, make sure that the antenna cable connector is connected first.

⚠ The audio unit wiring harness must not become trapped when installing the audio unit.

NOTE: The audio unit rear support must engage with the audio unit support bracket.

To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Audio Unit — Vehicles Built From: 10/2005(38 222 0)

General Equipment

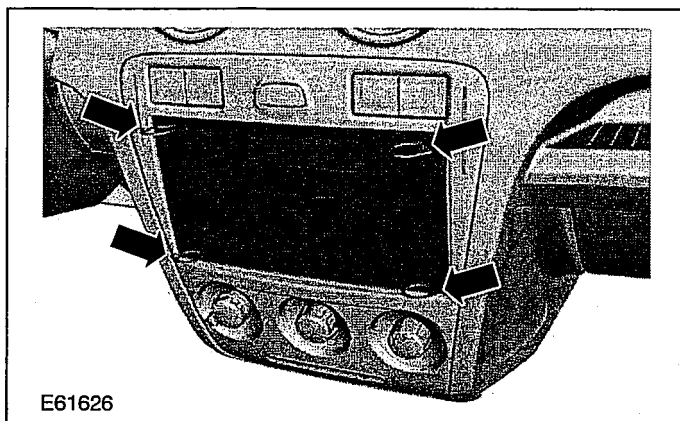
Audio unit removal tools (GV3301)

Removal

1. If a new audio unit is to be installed, connect WDS and upload the audio unit configuration information using the Programmable Modules Installation Routine, prior to commencing the removal of the audio unit.

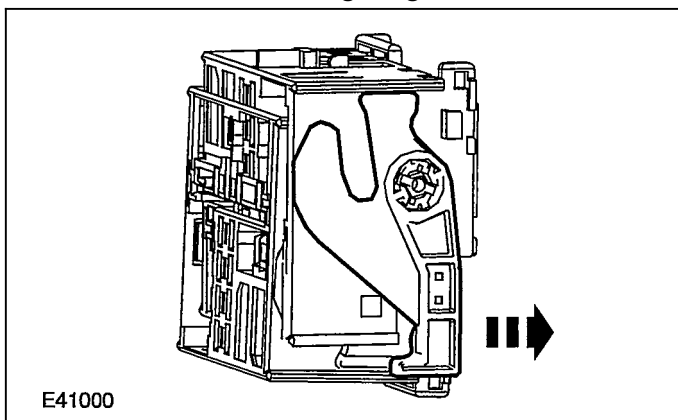
NOTE:When installing the audio unit removal tools, make sure that the wording on the audio unit removal tools is followed, TOP L indicates the top of the tool, left-hand side of the audio unit and TOP R indicates the top of the tool, right-hand side of the audio unit.

2. Using the audio unit removal tools, detach the audio unit from the instrument panel.

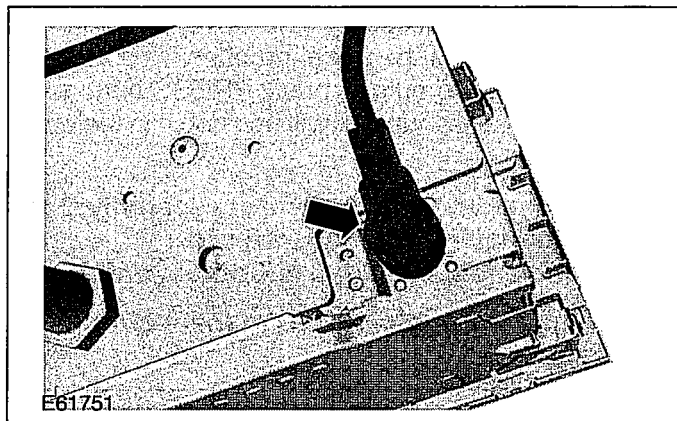


3. Disconnect the audio unit electrical connector.

- Release the locking tangs.



4. Disconnect the antenna cable electrical connector and remove the audio unit.



Installation

1. CAUTIONS:

⚠ To prevent possible damage to the audio unit while connecting the audio unit electrical connector, make sure that the antenna cable electrical connector is connected first.

⚠ The audio unit wiring harness must not become trapped when installing the audio unit.

NOTE: Remove the audio unit removal tools from the audio unit by releasing the spring clips before installing the original audio unit.

NOTE:When installing a new audio unit, the audio unit must be configured by selecting the Programmable Module Installation Routine on WDS.

To install, reverse the removal procedure.

SECTION 415-02 Antenna

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DIAGNOSIS AND TESTING	
Antenna.....	415-02-2
REMOVAL AND INSTALLATION	
. Antenna Cable.....	415-02-3

DIAGNOSIS AND TESTING**Antenna**

REFER to Section 415-00 [Information and Entertainment System - General Information].

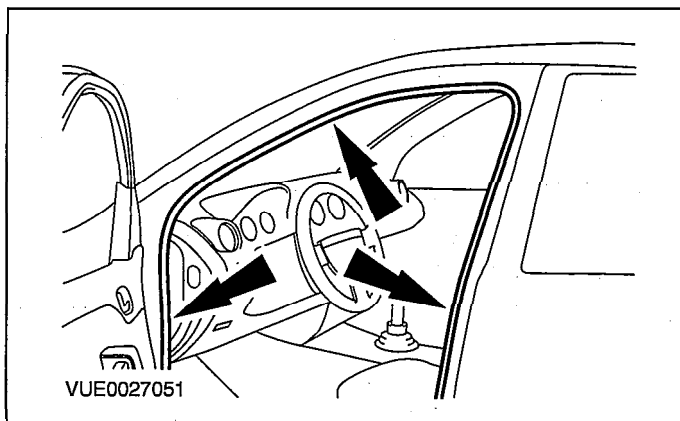
REMOVAL AND INSTALLATION**Antenna Cable****General Equipment**

Two suitable draw cords, each with a minimum length of one meter

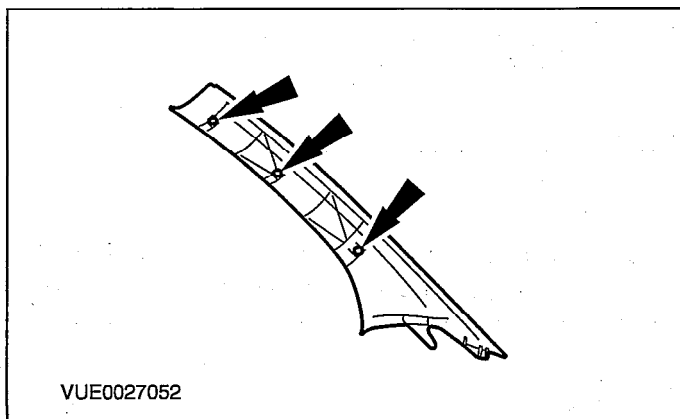
Removal

All vehicles

- **Detach the front door opening weatherstrips.**

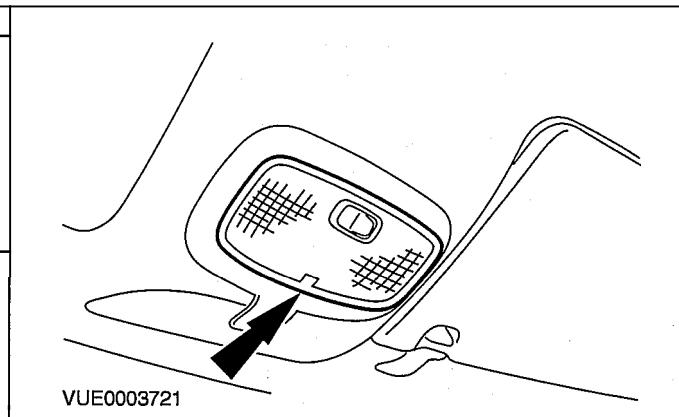


- 2. Remove the A-pillar trim panels (A-pillar trim shown removed to show location of retaining clips).**

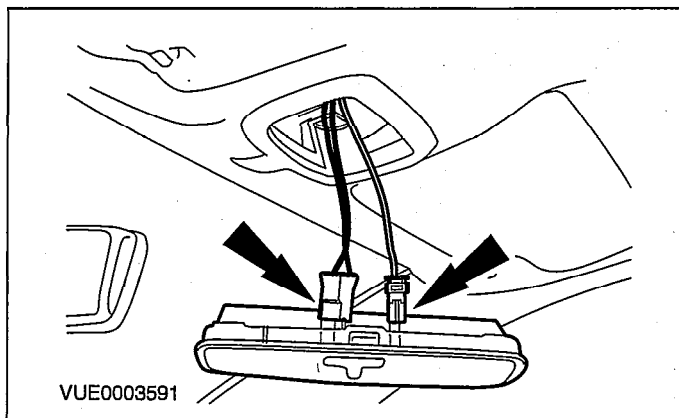


Vehicles without roof opening panel

- 3. Detach the interior lamp.**

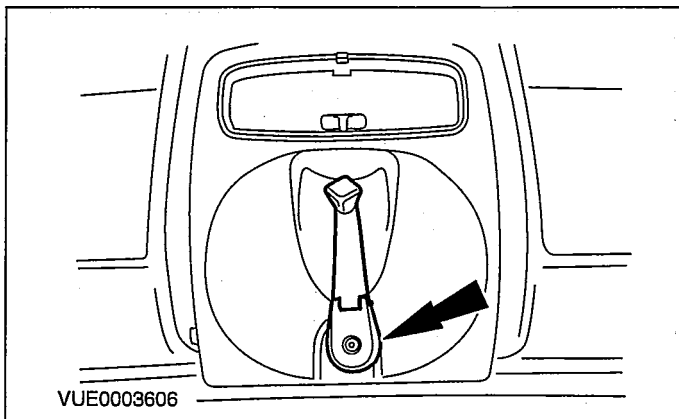


- 4. Disconnect the electrical connectors and remove the interior lamp.**



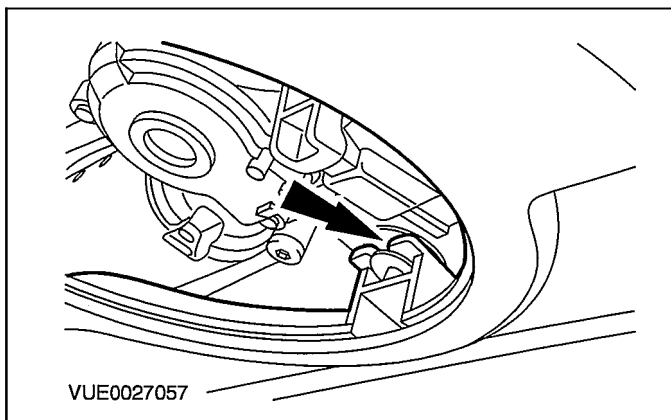
Vehicles with manual roof opening panel

- 5. Remove the roof opening panel regulator handle.**

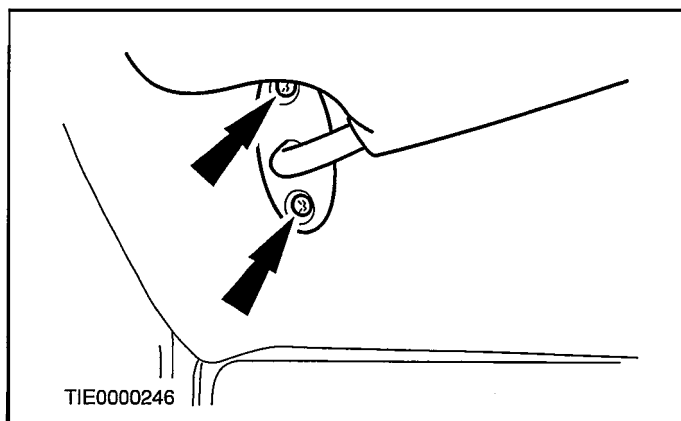


REMOVAL AND INSTALLATION**Vehicles with overhead console**

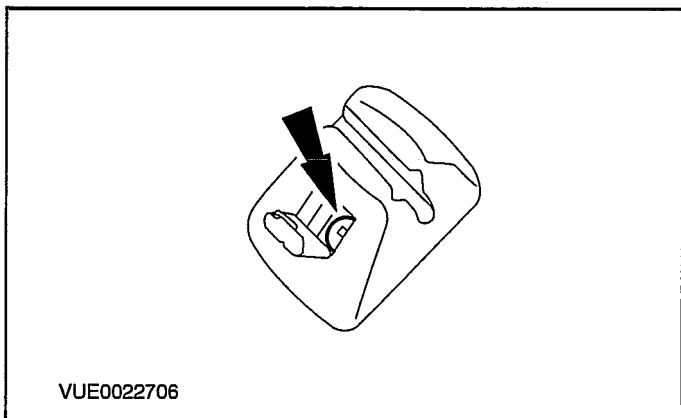
6. Remove the overhead console. For additional information, refer to Section 501-12 [Instrument Panel and Console].
7. Detach the headliner at the rear of the overhead console opening.

**All vehicles**

8. Remove the sun visors.



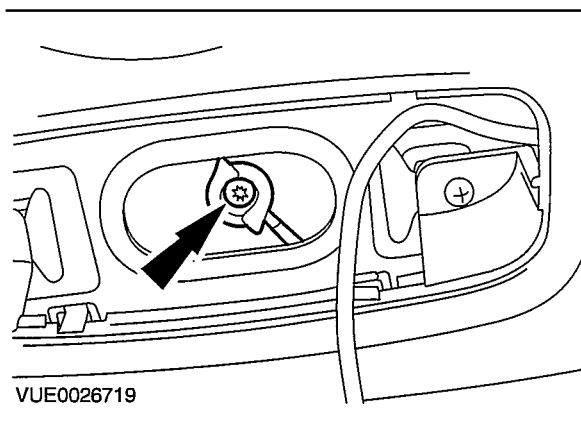
9. Remove the sun visor retaining clips.



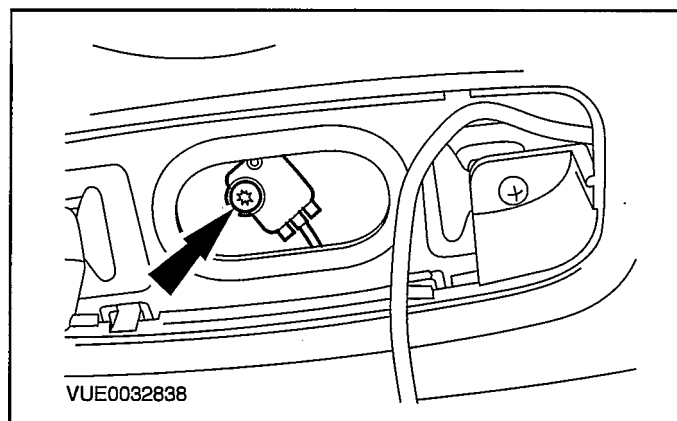
10. Carefully detach the front edge of the headliner to allow access to the antenna cable.

Vehicles without navigation system

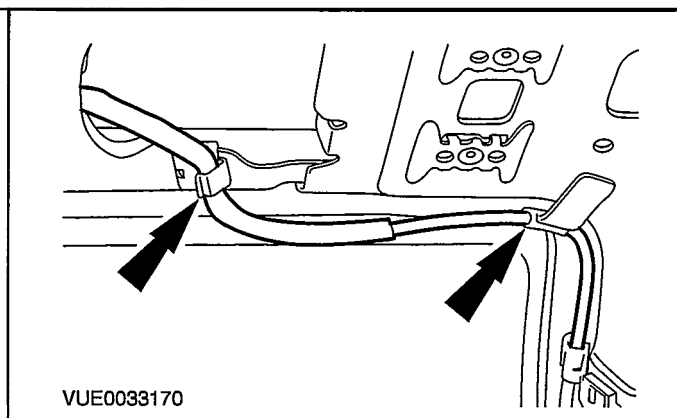
11. Disconnect the antenna cable from the antenna base.

**Vehicles with navigation system**

12. Disconnect the antenna cable from the antenna base.

**All vehicles**

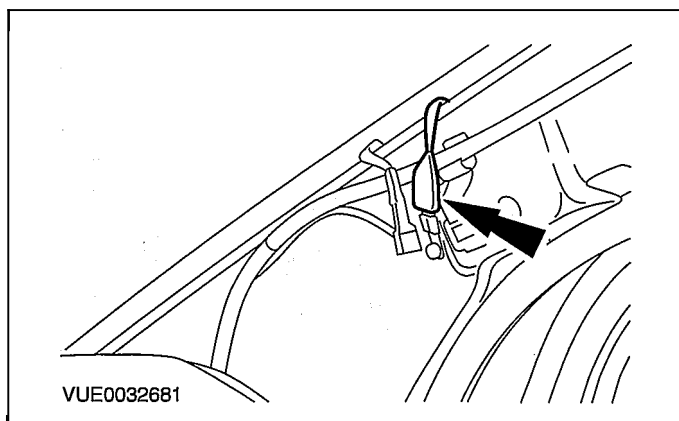
13. Detach the antenna cable from the roof panel (headliner shown removed for clarity).



REMOVAL AND INSTALLATION

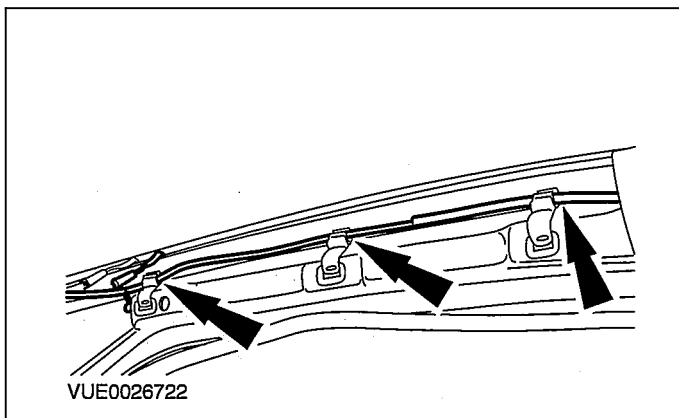
Vehicles with heated windshield

14. Disconnect the heated windshield ground connector.



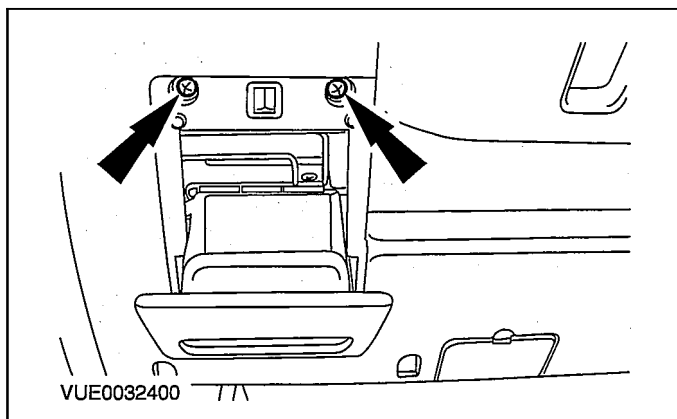
All vehicles

15. Detach the antenna cable from the A-pillar

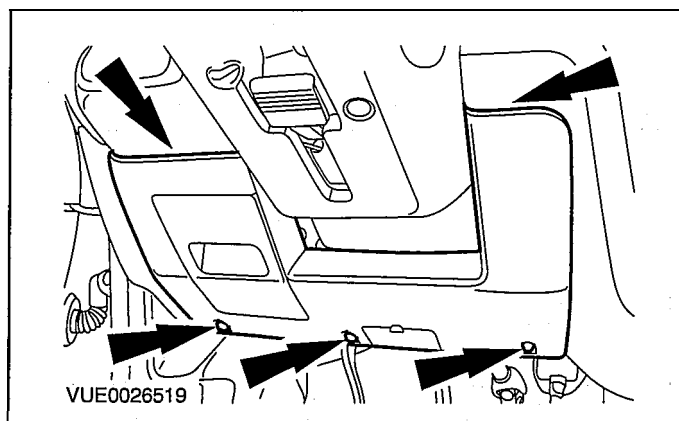


Right-hand drive vehicles

16. Open the stowage compartment and remove the instrument panel lower panel retaining screws.



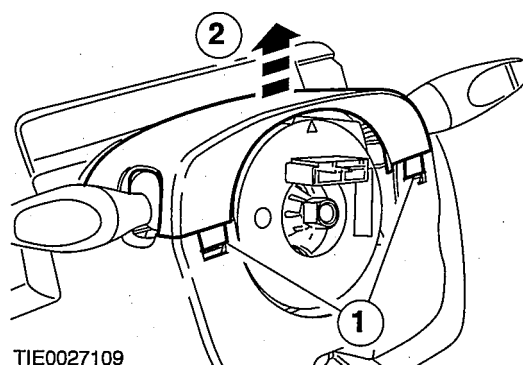
17. Remove the instrument panel lower panel.



18. **NOTE:** Turn the steering wheel to access the steering column upper shroud retaining clips.

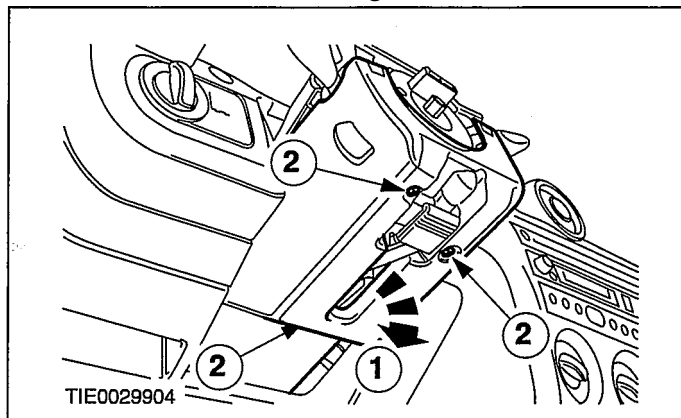
Detach the steering column upper shroud from the **steering** column lower shroud (steering wheel shown removed for clarity).

1. Using a thin bladed screwdriver, release the two clips (one each side).
2. Detach the shroud.



19. Remove the steering column lower shroud (steering wheel shown removed for clarity).

1. Release the steering column locking lever.
2. Remove the retaining screws.

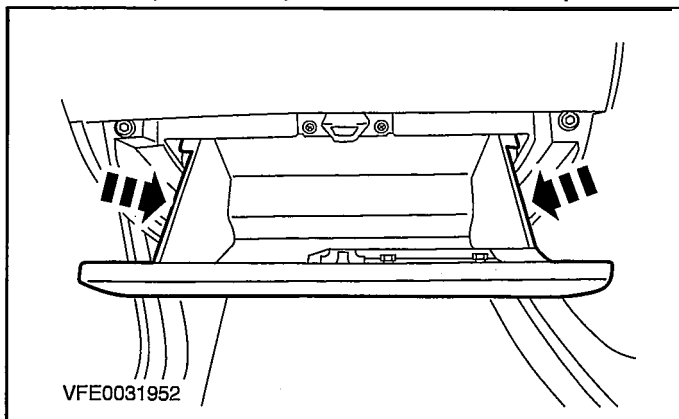


REMOVAL AND INSTALLATION

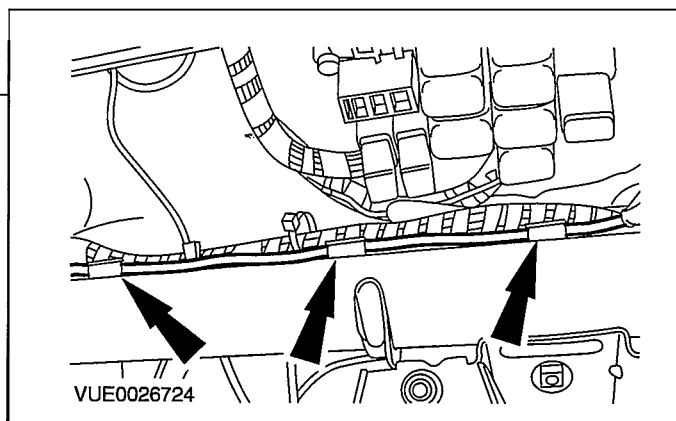
Left-hand drive vehicles

20. Fully open the glove compartment.

- Press the sides towards the center to release the glove compartment from the stops.



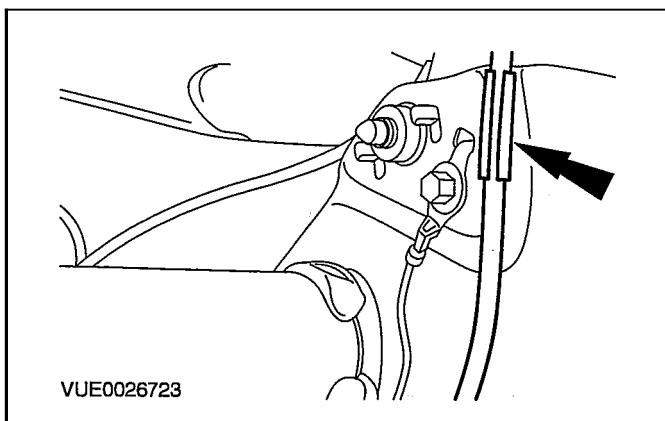
Detach the antenna cable from the retaining clips at the back of the cross-vehicle beam.



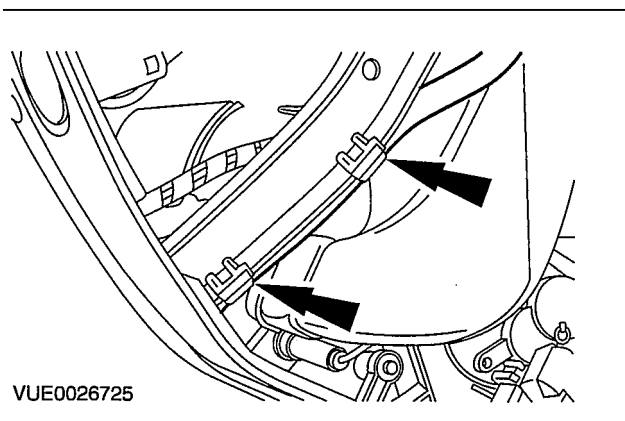
All vehicles

21. **NOTE:** Do not remove the antenna cable retaining clip from the cross-vehicle beam.

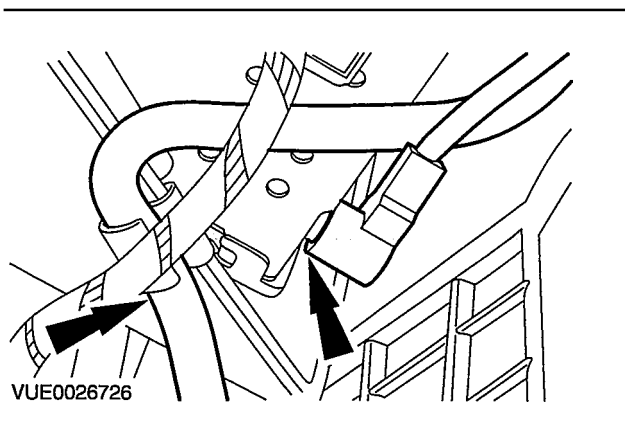
Detach the antenna cable from the retaining clip (instrument panel shown removed for clarity).



23. Detach the antenna cable from the clips behind the cross-vehicle beam support bracket.



24. Detach the antenna cable from the clip and disconnect the antenna cable from the audio unit.

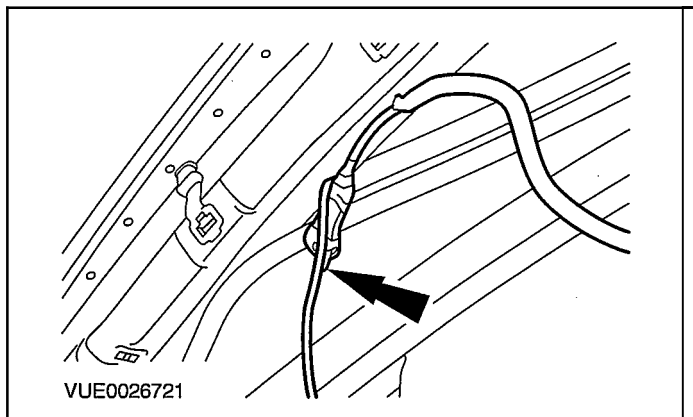


22. **NOTE:** Do not remove the antenna cable retaining clips cross-vehicle beam.

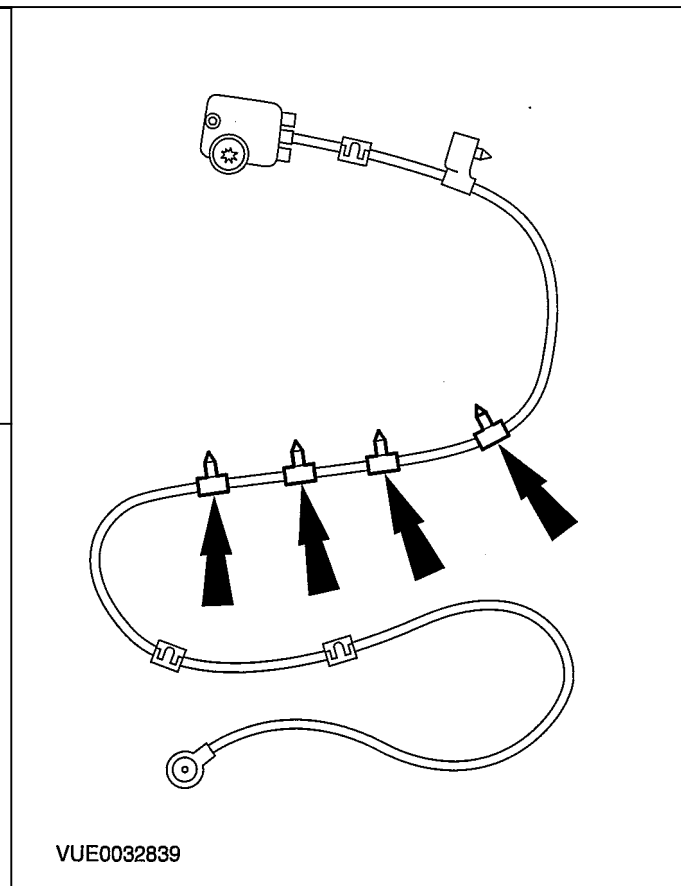
REMOVAL AND INSTALLATION

25. Attach a suitable draw cord to the antenna base end of the antenna cable.

Remove and discard the retaining clips from the antenna cable.



26. Pull the antenna cable along the roof panel towards the A-pillar to expose the suitable draw cord .
27. Attach the second suitable draw cord to the audio unit end of the antenna cable and pull the cable from behind the instrument panel to expose the connector and the draw cord.
28. Detach the suitable draw cords and remove the antenna cable.

**Installation**

1. **NOTE:**When installing a new antenna cable, some of the retaining clips are not required.

2. To install, reverse the removal procedure.

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SECTION 417-01 Exterior Lighting

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

SPECIFICATIONS

Specifications.....	417-01-3
---------------------	----------

DESCRIPTION AND OPERATION

Exterior Lighting.....	417-01-4
Front lighting.....	417-01-4
Rear lighting.....	417-01-6
Rear lighting - Fiesta built from 0812005.....	417-01-7
Autolamps - vehicles built from 0812005.....	417-01-8

DIAGNOSIS AND TESTING

Headlamps — Vehicles Built Up To: 1012005.....	417-01-9
Inspection and Checking.....	417-01-9
Symptom Chart.....	417-01-9
System Checks.....	417-01-10
Headlamps — Vehicles Built From: 1012005.....	417-01-32
Inspection and Checking.....	417-01-32
Symptom Chart.....	417-01-32
System Checks.....	417-01-33
Stoplamps.....	417-01-67
Inspection and Checking.....	417-01-67
Symptom Chart.....	417-04-67
System Checks.....	417-01-68
Turn Signal and Hazard Lamps.....	417-01-82
Inspection and Checking.....	417-01-82
Symptom Chart.....	417-01-82
System Check.....	417-01-83
Parking, Rear and License Plate Lamps.....	417-01-119
Inspection and Checking.....	417-01-119
Symptom Chart.....	417-01-119
System Checks.....	417-01-120
Reversing Lamps — Vehicles Built Up To: 1012005.....	417-01-141
Inspection and Checking.....	417-01-141
Symptom Chart.....	417-01-141
System Checks.....	417-01-142
Reversing Lamps — Vehicles Built From: 1012005.....	417-01-159
Inspection and Checking.....	417-01-159
Symptom Chart.....	417-01-159
System Checks.....	417-01-160
Fog Lamps.....	417-01-172
Inspection and Checking.....	417-01-172
Symptom Chart.....	417-01-172
System Checks.....	417-01-172
Headlamp Leveling.....	417-01-200

Inspection and Checking	417-01-200
Symptom Chart	417-01-200
System Checks	417-01-200

GENERAL PROCEDURES

Headlamp Adjustment.....	(32 113 0)	417-01-208
Headlamp Masking — Vehicles Built Up To: 1012005.....		417-01-209
Headlamp Masking — Vehicles Built From: 1012005.....		417-01-215
Front Fog Lamp Adjustment.....		417-01-221

REMOVAL AND INSTALLATION

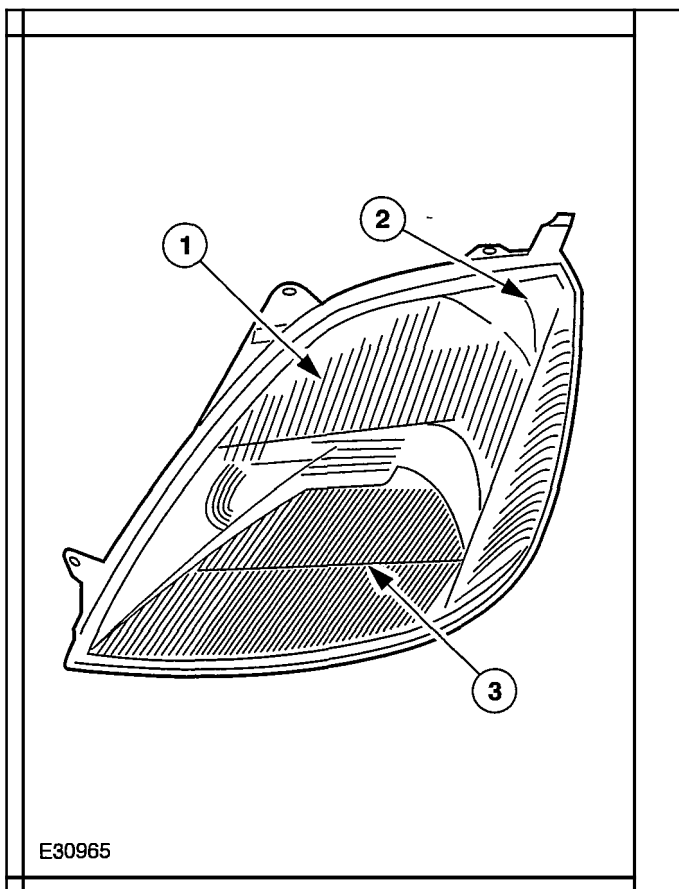
Front Fog Lamp — Vehicles Built Up To: 1112004.....	(32 281 0)	417-01-222
Front Fog Lamp — Vehicles Built From: 1112004.....	(32 281 0)	417-01-223
Headlamp Switch.....	(35 514 0)	417-01-224
Headlamp Assembly.....	(32 115 0)	417-01-225
Rear Lamp Assembly — Vehicles Built Up To: 1012005.....	(32 305 0)	417-01-227

SPECIFICATIONS**Exterior Lighting**

Component	Design
Headlamps	Complex reflector system, aligned by positioning the reflector
Fog lamps	Reflector system, aligned by positioning the reflector

Headlamps - Align (both sides)

Component	X value
Headlamps	$X = 10 \text{ cm}/10 \text{ m} = 0.34' = 1,0 \%$
Fog lamps	$X = 22 \text{ cm}/10 \text{ m} = 1.16' = 2,2 \%$

DESCRIPTION AND OPERATION**Exterior Lighting****Front lighting****Front headlamps**

The headlamps form a unit with the front turn signal lamps and the side lamps. They are made entirely of plastic and can only be replaced as a whole unit.

The motors for the electric headlamp leveling system are integrated in the headlamp unit.

The reflectors are free shape reflectors. The free shape technology allows the full reflector to be utilized.

In this technology, every point of the freely calculated reflector is allocated to illuminating a certain part of the road in front of the vehicle. As a result it is possible to optimize the light distribution through the form of the reflector alone.

The plastic cover is only there for protection.

Conventional H4 bulbs are used in the main headlamps.

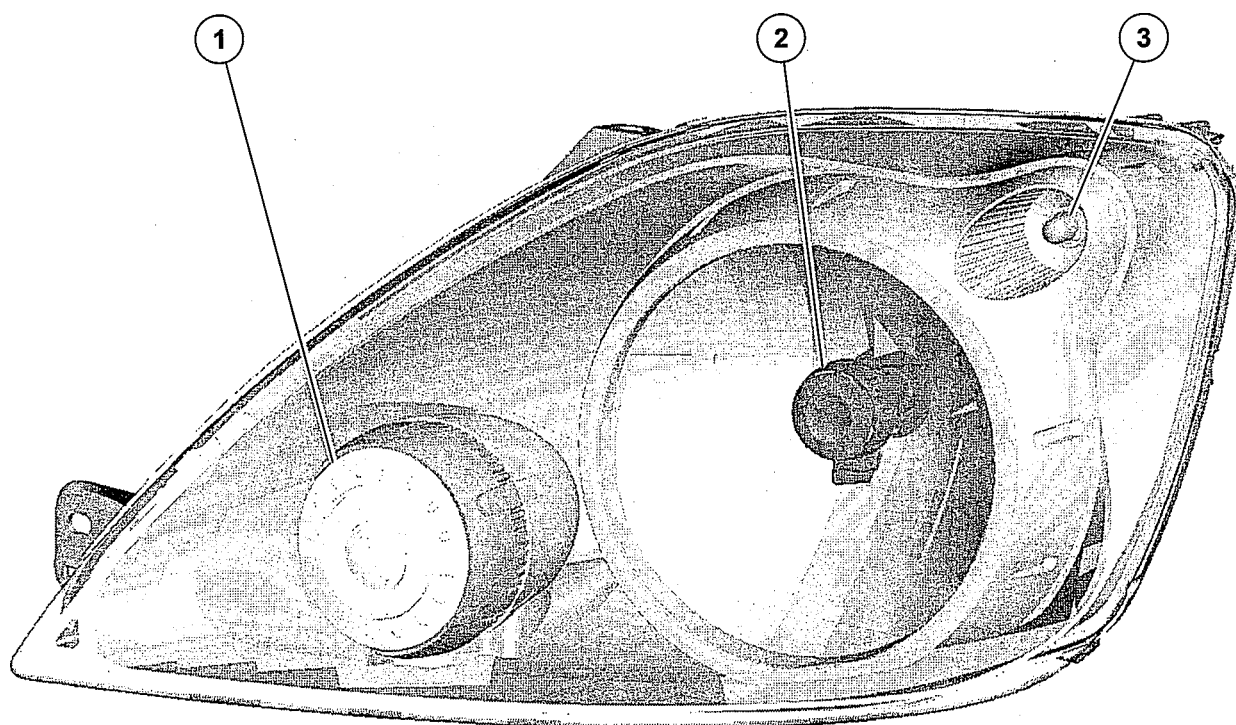
The turn signal lamps are yellow and have a special base in order to prevent any confusion.

Glass base bulbs are used for the side lamps.

Item	Description
1	Turn signal lamp
2	Side lamp
3	Main headlamp

DESCRIPTION AND OPERATION

Front headlamp - Fiesta built from 0812005



E64275

Item	Description
1	Turn signal lamp
2	Main headlamp
3	Side lamp

The headlamps form a unit with the front turn signal lamps and the side lamps. They are made entirely of plastic and can only be replaced as a whole unit.

The motors for the electric headlamp leveling system are integrated in the headlamp unit.

The reflectors are free shape reflectors. The free shape technology allows the full reflector to be utilized.

In this technology, every point of the freely calculated reflector is allocated to illuminating a certain part of the road in front of the vehicle. As a result it is possible to optimize the light distribution through the form of the reflector alone.

The plastic cover is only there for protection.

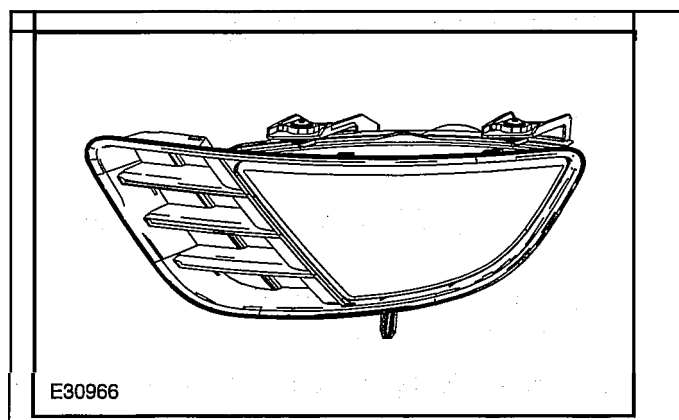
Conventional H4 bulbs are used in the main headlamps.

The turn signal lamps are integrated in the headlamps and have their own reflector with a yellow plastic cover. Colorless bulbs are used.

Glass base bulbs are used for the side lamps.

The headlamp must be removed in order to replace the bulbs.

Front fog lamps



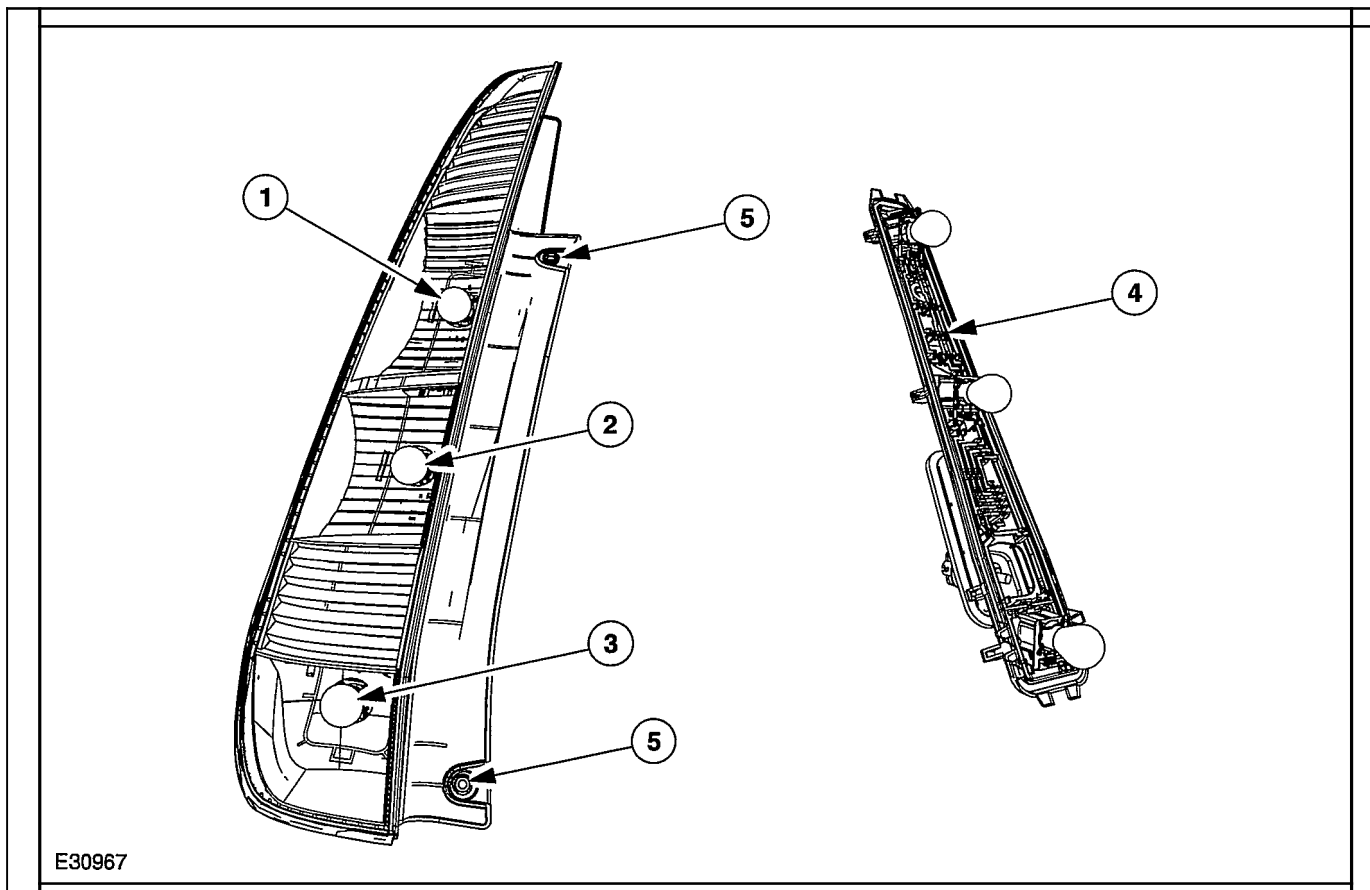
E30966

The fog lights are mounted in the lower part of the front bumper.

H11 bulbs are used.

DESCRIPTION AND OPERATION

Rear lighting



Item	Description
1	Stop/side lamp
2	Turn signal lamp
3	Rear fog lamp
4	Bulb carrier
5	Securing bolts

As well as the rear lamps, the rear lamp clusters incorporate all rearward facing lights with exception of the license plate lamp and the additional high-mounted stoplamp.

The rear lamps can only be replaced as a complete unit.

They incorporate a bulb carrier with the bulb sockets.

The bulb carrier is connected to the wiring harness via a compact connector.

The rear lamp cluster should be detached from the vehicle before replacing any bulbs.

Side lamp

The side lamp is a combined bulb which also includes the stoplamp.

Stoplamp

The additional high-mounted **stoplamp** is mounted in the middle of the tailgate above the rear window and also incorporates the washer nozzle for the rear window. A glass base bulb is used.

The stoplamps are switched on via the **stoplamp** switch on the brake pedal as soon as the brake pedal is actuated.

Turn signal lamps

The turn signal lamps serve as direction indicators and for the hazard warning lights. A yellow bulb is used.

DESCRIPTION AND OPERATION

The function of the turn signal lamps is controlled by the GEM, as a result of which the conventional turn signal/hazard warning relay is no longer required.

The sound generator for the acoustic turn signal check is integrated in the multifunction switch.

Reversing lamp

The reversing lamp serves to illuminate the road when reversing and is switched on by the reversing lamp switch when reverse gear is engaged.

There is only a reversing lamp on the passenger side of the vehicle, i.e. on the right-hand side for a LHD vehicle and on the left-hand side for a RHD vehicle.

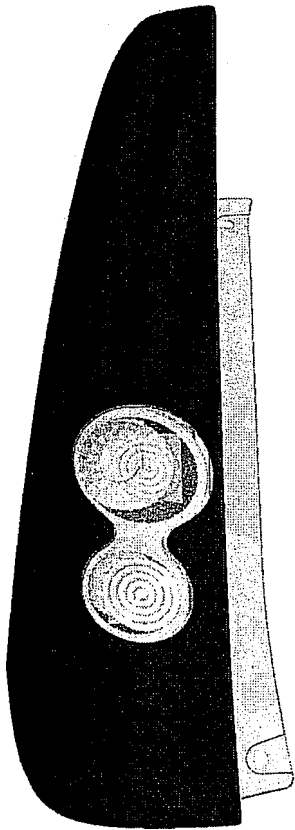
Rear fog lamp

The rear fog lamp serves for greater visibility of the vehicle from behind for following road users and can only be switched on when at least the side lamps are switched on.

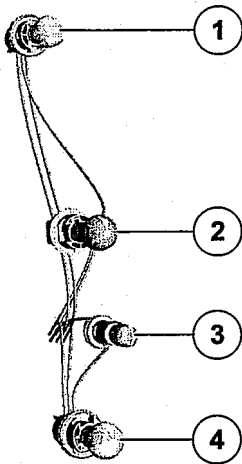
This is achieved via the mechanical design of the light switch, which will only allow the lever to be pulled if it was moved to at least "P" beforehand.

The rear fog lamp is always installed on the driver's side, i.e. on the opposite side to the reversing lamp

Rear lighting - Fiesta built from 0812005



E64276



Item	Description
1	Stop/side lamp
2	Turn signal lamp
3	Reversing lamp
4	Rear fog lamp

The rear lamps can only be replaced as a complete unit.

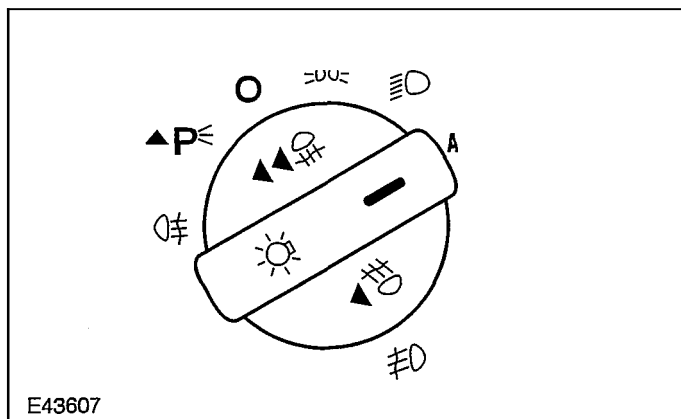
They contain individual holders for the bulbs.

The holders are connected to the wiring harnesses via individual connectors.

DESCRIPTION AND OPERATION

The rear lamp cluster should be detached from the vehicle before replacing any bulbs.

Autolamps - vehicles built from 08/2005

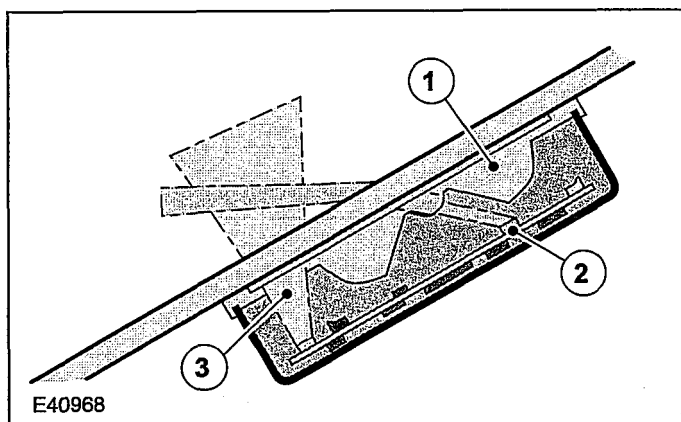


The low beam headlamps and side lamps are switched on automatically if all of the following conditions are satisfied:

- Ignition switch in the "II" or "III" position
- Light switch in the "AUTO" position
- Determined ambient light conditions below a stored threshold value

The low beam and the side lamps are switched on or off by the Generic Electronic Module (GEM) according to the input signals of the combined rain sensor/light sensor. This takes place in the GEM by activating the low beam relay and the autolamp relay (side lamps/license plate lamps).

Combined rain sensor/light sensor - vehicles built from 08/2005



Item	Description
1	Lens
2	Front light sensor
3	Ambient light sensor

The combined rain sensor/light sensor is attached to the windshield, near to the interior rear view mirror.

The ambient light sensor determines the general light intensity. For this purpose, it records the light over as wide an angle as possible, without taking the direction of incidence into account.

The front light sensor determines the light intensity directly in front of the vehicle.

If both the ambient light sensor and the front light sensor detect a sudden reduction in light intensity at the same time, then an algorithm-based calculation is used to determine the fact that the vehicle has entered a tunnel.

In this case the request for switching on the external lighting and the indicator lamp in the instrument cluster is transmitted to the GEM.

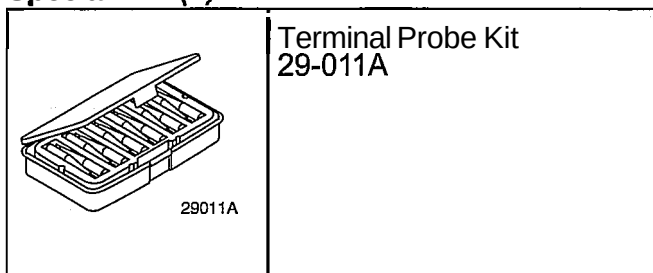
If the sun is shining and the vehicle is suddenly thrown into the shade by a large truck, the two sensors will register different light intensities. In this case, the algorithm-based calculation will not result in the lights being switched on.

DIAGNOSIS AND TESTING

Headlamps — Vehicles Built Up To: 1012005

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)



Terminal Probe Kit
29-011A

Visual Inspection Chart

Electrical system
• Fuse(s) • Lamp(s) • Connector(s) • Switches • Wiring harness

Inspection and Checking

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Dipped beam and main beam are inoperative	• Fuse • Circuit(s) • Headlamp switch • Turn signal switch • Central junction box (CJB)	• GO to Pinpoint Test A.
• The dipped beam is inoperative	• Circuit(s) • Dipped beam relay • Turn signal switch • Central junction box (CJB)	• GO to Pinpoint Test B.
• The main beam is inoperative	• Circuit(s) • Main beam relay • Turn signal switch • Central junction box (CJB)	• GO to Pinpoint Test C.
• One dipped beam is inoperative	• Fuse • Circuit(s) • Left/right-hand headlamp • Central junction box (CJB)	• GO to Pinpoint Test D.
• One main beam is inoperative	• Fuse • Circuit(s) • Left/right-hand headlamp • Central junction box (CJB)	• GO to Pinpoint Test E.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• The headlamps illuminate continuously	• Circuit(s) • Dipped beam relay • Main beam relay • Turn signal switch • Headlamp switch • Instrument cluster • Central junction box (CJB)	• GO to Pinpoint Test F.
• The headlamp flasher is inoperative	• Circuit(s) • Turn signal switch	• GO to Pinpoint Test G.
• The main beam warning lamp is inoperative	• Circuit(s) • Instrument cluster	• REFER to: Instrument Cluster - Vehicles Built Up To: 1012005 (413-01 Instrument Cluster, Diagnosis and Testing).

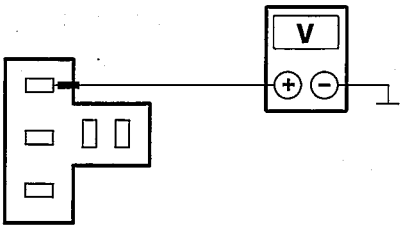
System Checks

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST A : DIPPED BEAM AND MAIN BEAM INOPERATIVE

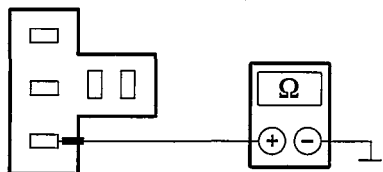
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FUSE F40 (CJB)	
	☒ Ignition switch in position 0.
	☐ CHECK fuse F40 (10 A) (CJB). • Is the fuse OK? → Yes GO to A2. → No INSTALL A NEW fuse F40 (10 A) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE AT FUSE F40 (CJB)	
	☒ Connect fuse F40 (10 A) (CJB).
	☒ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the voltage between fuse F40 (10 A) and ground. Does the meter display battery voltage? → Yes GO to A3. → No LOCATE and RECTIFY the break in the voltage supply to fuse F40 (CJB) using the Wiring Diagrams, if necessary CHECK and INSTALL A NEW CJB. CHECK the operation of the system.
A3: CHECK THE VOLTAGE AT THE DIPPED BEAM RELAY	
	1 Ignition switch in position 0. 2 Disconnect dipped beam relay from socket C417. 3 Ignition switch in position II. 4 SWITCH ON dipped beam
 VFE0033861	5 Measure the voltage between the dipped beam relay, socket C417, pin 1, circuit 15S-LE19 (GN/BU), CJB side and ground. Does the meter display battery voltage? → Yes GO to A4. → No GO to A5.
A4: CHECK THE GROUND CONNECTION OF THE DIPPED BEAM RELAY AND THE MAIN BEAM RELAY	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033862

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the dipped beam relay, socket C417, pin 2, circuit 31-LEI9 (BK), CJB side and ground.

• Is less than 2 ohms measured?

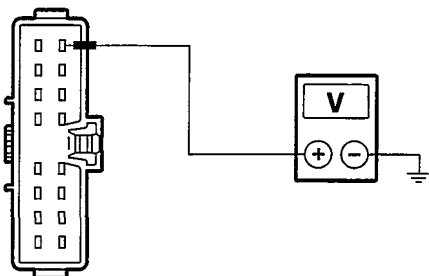
→ **Yes**

LOCATE and RECTIFY the break in the circuit 30-DB1 (RD), between fuse FE (BJB) and the CJB using the Wiring Diagrams, CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY break in circuit 31-DA12 (BK), between soldered connection S15 and ground G13 using the Wiring Diagrams. CHECK the operation of the system.

A5: CHECK THE VOLTAGE AT THE HEADLAMP SWITCH



VFE0001471

- 1 Ignition switch in position 0.

- 2 Disconnect headlamp switch from connector C338.

- 3 Measure the voltage between the headlamp switch, connector C338, pin 8, circuit 15-LE29 (GN/BK), wiring harness side and ground.

• Does the meter display battery voltage?

→ **Yes**

GO to A6.

→ **No**

LOCATE and RECTIFY the break in the circuit between fuse F40 (CJB) and the headlamp switch using the Wiring Diagrams. CHECK the operation of the system.

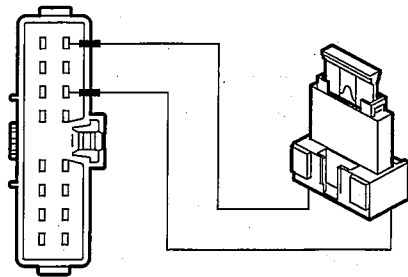
A6: CHECK THE HEADLAMP SWITCH

- 1 Ignition switch in position 0.

- 2 Connect dipped beam relay to socket C417.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016100

DETAILS/RESULTS/ACTIONS

- 3 Using a fused test cable (10 A) at the headlamp switch, bridge between connector C338, pin 8, circuit 15-LE29 (GN/BK) and pin 6, circuit 15S-LE14 (GN/RD), wiring harness side.

- 4 Ignition switch in position II.

- 5 Check the operation of the dipped beam.

- Does the dipped beam illuminate?

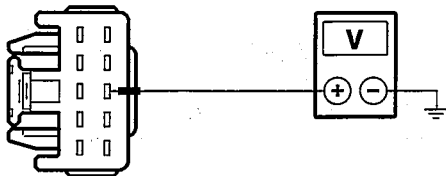
→ **Yes**

INSTALL A NEW headlamp switch. CHECK the operation of the system.

→ **No**

GO to A7.

A7: CHECK THE VOLTAGE AT THE TURN SIGNAL SWITCH



VFE0000204

- 1 Ignition switch in position 0.

- 2 Connect headlamp switch to connector C338.

- 3 Disconnect turn signal switch from connector C357.

- 4 Ignition switch in position II.

- 5 SWITCH ON dipped beam

- 6 Measure the voltage between turn signal switch, connector C357, pin 8, circuit 15S-LE14 (GN/RD), wiring harness side and ground.

- Does the meter display battery voltage?

→ **Yes**

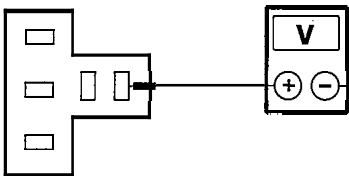
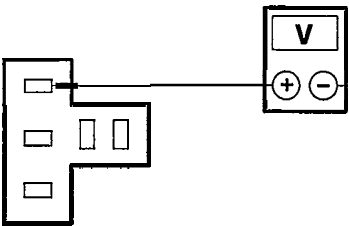
INSTALL A NEW turn signal switch. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the headlamp switch and the turn signal switch using the Wiring Diagrams. CHECK the operation of the system.

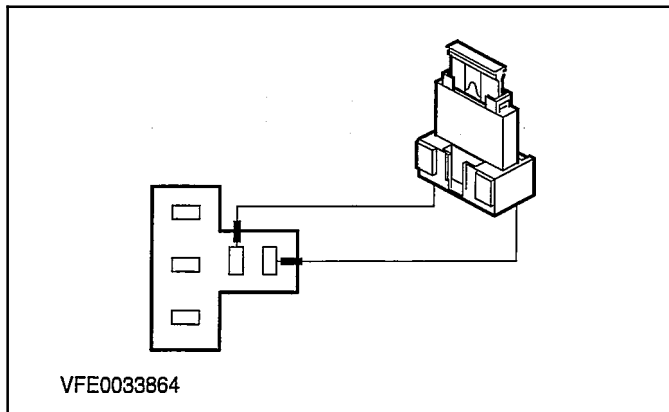
DIAGNOSIS AND TESTING

PINPOINT TEST B : THE DIPPED BEAM IS INOPERATIVE

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
B1: TEST THE VOLTAGE AT THE DIPPED BEAM RELAY (POWER CIRCUIT)		
 VFE0033863	☐ Ignition switch in position 0.	
	2 Disconnect dipped beam relay from socket C417.	
	3 Ignition switch in position II.	
	☐ Measure the voltage between the dipped beam relay, socket C417, pin 3, circuit 30-LE20 (RD), CJB side and ground. • Does the meter display battery voltage? → Yes GO to B2. → No LOCATE and RECTIFY the break in the circuit between the CJB and the dipped beam relay using the Wiring Diagrams, INSTALL A NEW CJB if necessary. CHECK the operation of the system.	
B2: CHECK THE VOLTAGE AT THE DIPPED BEAM RELAY (CONTROL CIRCUIT)		
 VFE0033861	1 SWITCH ON dipped beam.	
	☐ Measure the voltage between the dipped beam relay, socket C417, pin 1, circuit 15S-LE19 (GN/BU), CJB side and ground. • Does the meter display battery voltage? → Yes GO to B3. → No GO to B5.	
B3: CHECK THE POWER CIRCUIT OF THE DIPPED BEAM RELAY FOR OPEN CIRCUIT		
	1 Ignition switch in position 0.	

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2** Connect a fused jumper wire (20 A) at the dipped beam relay, socket C417, between pin 3 circuit 30-LE20 (RD) and pin 5, circuit 15S-DB7 (GNNE), CJB side.

- 3** Ignition switch in position II.

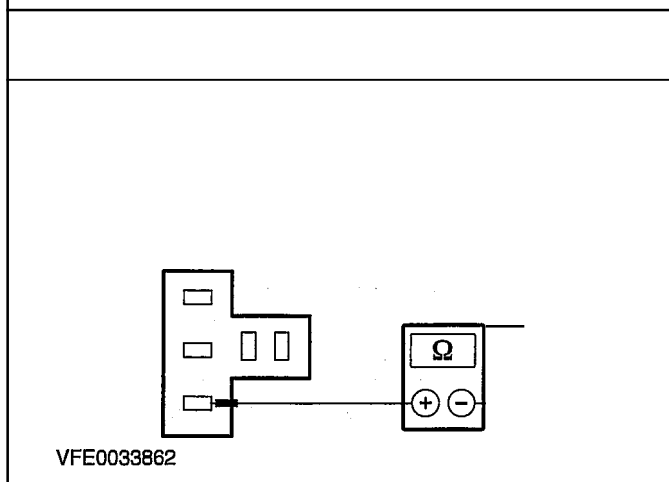
- 4** Check the dipped beam.

- Does the dipped beam illuminate?

→ **Yes**
GO to B4.

→ **No**
LOCATE and RECTIFY the break in the circuit between the dipped beam relay and the bridge (CJB) using the Wiring Diagrams, INSTALL A NEW CJB if necessary. CHECK the operation of the system.

B4: CHECK THE GROUND CONNECTION OF THE DIPPED BEAM RELAY



- 1** Ignition switch in position 0.

- 2** Measure the resistance between the dipped beam relay, socket C417, pin 2, circuit 31-LE19 (BK), CJB side and ground.

- Is less than 2 ohms measured?

→ **Yes**
INSTALL A NEW dipped beam relay. CHECK the operation of the system.

→ **No**
LOCATE and RECTIFY the break in the circuit between the dipped beam relay and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.

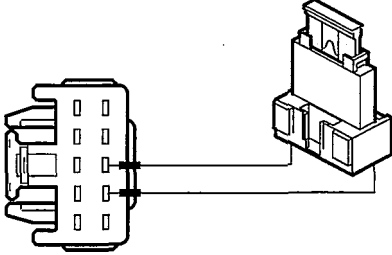
B5: CHECK TURN SIGNAL SWITCH

- 1** Ignition switch in position 0.

- ☐ Disconnect turn signal switch from connector C357.

- 3** Connect dipped beam relay to socket C417.

DIAGNOSIS AND TESTING

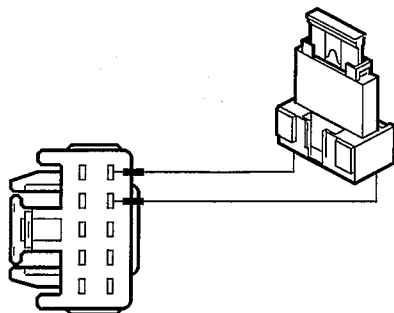
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0016101	4 Connect a fused jumper wire (10 A) at the turn signal switch, connector C357, between pin 8, circuit 15S-LE14 (GN/RD) and pin 9, circuit 15S-LE19 (GN/BU), wiring harness side.
	5 Ignition switch in position II. 6 SWITCH ON dipped beam. 7 Check the dipped beam. Does the dipped beam illuminate? → Yes INSTALL A NEW turn signal switch. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the turn signal switch and the dipped beam relay using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST C : THE MAIN BEAM IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK THE MAIN BEAM WARNING LAMP	
	___ Ignition switch in position II. 2 SWITCH ON main beam. ☐ Check the main beam warning lamp. Does the main beam warning lamp illuminate? → Yes GO to C3. → No GO to C2.
C2: CHECK TURN SIGNAL SWITCH	
	1 Ignition switch in position 0. 2 Disconnect turn signal switch from connector C357.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016107

DETAILS/RESULTS/ACTIONS

- ☐ Connect a fused jumper wire (10 A) at the turn signal switch, connector C357, between pin 6, circuit 15-LE14 (GN/RD) and pin 7, circuit 15S-LE12A (GNNE), wiring harness side.

4 Ignition switch in position II.

5 Check main beam.

- Does the main beam illuminate?

→ **Yes**

INSTALL A NEW turn signal switch. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the turn signal switch and soldered connection S274 using the Wiring Diagrams. CHECK the operation of the system.

C3: CHECK THE VOLTAGE AT THE MAIN BEAM RELAY (CONTROL CIRCUIT)

☐ Ignition switch in position 0.

2 Disconnect main beam relay from socket C411.

3 Ignition switch in position II.

4 SWITCH ON main beam.

☒ Measure the voltage between the main beam relay, socket C411, pin 1, circuit 15S-LE12 (GNNE), CJB side and ground.

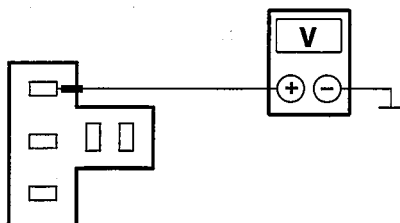
- Does the meter display battery voltage?

→ **Yes**

GO to C4.

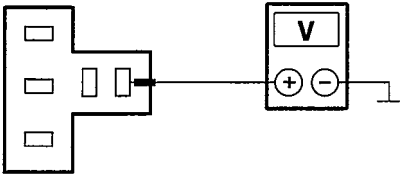
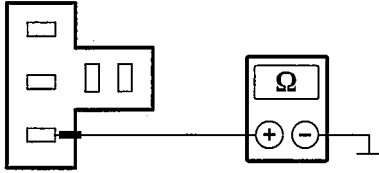
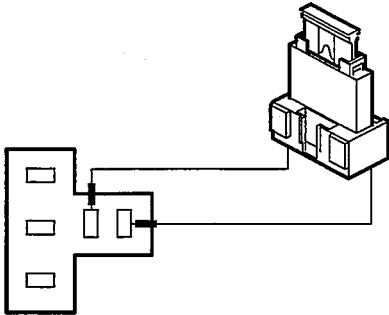
→ **No**

LOCATE and RECTIFY the break in the circuit between soldered connection S274 and the main beam relay using the Wiring Diagrams, INSTALL A NEW CJB if necessary. CHECK the operation of the system.



VFE0033861

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C4: TEST THE VOLTAGE AT THE MAIN BEAM RELAY (POWER CIRCUIT)	
 VFE0033863	1 Measure the voltage between the main beam relay, socket C411, pin 3, circuit 30-LEI3 (RD), CJB side and ground. Does the meter display battery voltage? → Yes GO to C5. → No LOCATE and RECTIFY the break in the circuit between the CJB (bridge) and the main beam relay using the Wiring Diagrams, INSTALL A NEW CJB if necessary. CHECK the operation of the system.
C5: CHECK THE GROUND CONNECTION OF THE MAIN BEAM RELAY	
 VFE0033862	1 Ignition switch in position 0. 2 Measure the resistance between the main beam relay, socket C411, pin 2, circuit 31-LEI2 (BK), CJB side and ground. Is less than 2 ohms measured? → Yes GO to C6. → No LOCATE and RECTIFY the break in the circuit between the main beam relay and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.
C6: CHECK THE POWER CIRCUIT OF THE MAIN BEAM RELAY FOR OPEN CIRCUIT	
 VFE0033864	1 Ignition switch in position 0. 2 Connect a fused jumper wire (20 A) at the main beam relay, socket C411, between pin 3 circuit 30-LEI3 (RD) and pin 5, circuit 15S-DB6 (GN/WH), CJB side.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

	4 Check main beam. Does the main beam illuminate? → Yes INSTALL A NEW main beam relay. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the main beam relay and the CJB (bridge) using the Wiring Diagrams, INSTALL A NEW CJB if necessary. CHECK the operation of the system.
--	---

PINPOINT TEST D : ONE DIPPED BEAM IS INOPERATIVE**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS****D1: DETERMINE THE FAULT CONDITION**

	1 Ignition switch in position II.
	2 SWITCH ON dipped beam
	3 Determine the fault condition. Is the left-hand dipped beam inoperative? → Yes GO to D2. → No The right-hand dipped beam is inoperative: GO to D6.

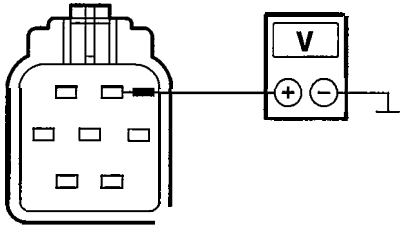
D2: CHECK FUSE F9 (CJB)

	1 Ignition switch in position 0.
	2 CHECK fuse F9 (10 A) (CJB). Is the fuse OK? → Yes GO to D3. → No INSTALL A NEW fuse F9 (10 A). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

D3: CHECK THE VOLTAGE AT FUSE F9 (CJB)

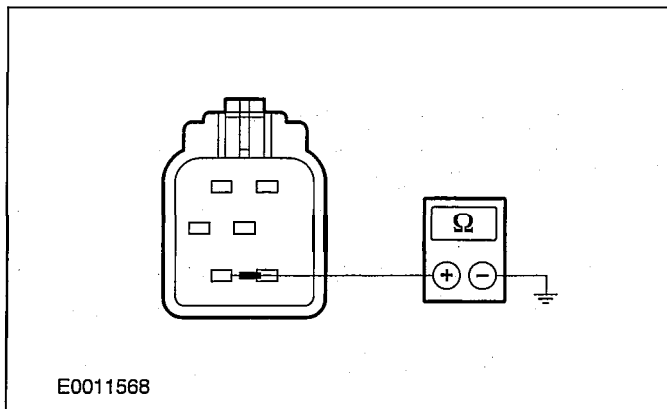
	☐ Connect fuse F9 (10 A) (CJB).
	2 Ignition switch in position II.
	3 SWITCH ON dipped beam

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Measure the voltage between fuse F9 (10 A) and ground. Does the meter display battery voltage? → Yes GO to D4. → No LOCATE and RECTIFY the break in the voltage supply to fuse F9 (CJB) using the Wiring Diagrams, if necessary CHECK and INSTALL A NEW CJB. CHECK the operation of the system.
D4: CHECK VOLTAGE AT THE LEFT-HAND HEADLAMP	
	1 Ignition switch in position 0. ☐ Disconnect left-hand headlamp from connector C416. 3 Ignition switch in position II. 4 SWITCH ON dipped beam.
 VFE0016224	5 Measure the voltage between left-hand headlamp, connector C416, pin 2, circuit 15S-LE16 (GN/OG), wiring harness side and ground. Does the meter display battery voltage? + Yes GO to D5. → No LOCATE and RECTIFY the break in the circuit between fuse F9 (CJB) and the headlamp using the Wiring Diagrams. CHECK the operation of the system.
D5: CHECK GROUND CONNECTION OF THE LEFT-HAND HEADLAMP	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between left-hand headlamp, connector C416, pin 6, circuit 31-LE31 (BK), wiring harness side and ground.
 - Is less than 2 ohms measured?
 - **Yes**
CHECK and if necessary INSTALL A NEW left-hand headlamp. CHECK the operation of the system.
 - **No**
LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S10 using the Wiring Diagrams. CHECK the operation of the system.

D6: CHECK FUSE F10 (CJB)

- 1 Ignition switch in position 0.
- 2 CHECK fuse F10 (10 A) (CJB).
 - Is the fuse OK?
 - **Yes**
GO to D7.
 - **No**
INSTALL A NEW fuse F10 (10 A). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

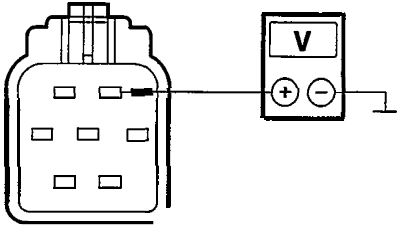
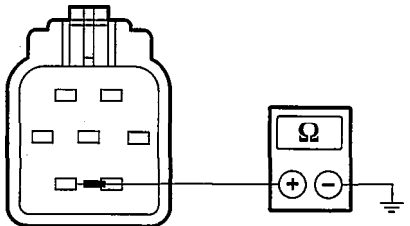
D7: CHECK THE VOLTAGE AT FUSE F10 (CJB)

- ☐ Connect fuse F10 (10 A) (CJB).
- 2 Ignition switch in position II.
- ☐ SWITCH ON dipped beam
- 4 Measure the voltage between fuse F10 (10 A) and ground.
 - Does the meter display battery voltage?
 - **Yes**
GO to D8.
 - **No**
LOCATE and RECTIFY the break in the voltage supply to the fuse using the Wiring Diagrams, if necessary CHECK and INSTALL A NEW CJB. CHECK the operation of the system.

D8: CHECK VOLTAGE AT THE RIGHT-HAND HEADLAMP

- 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0016224	☐ Disconnect right-hand headlamp from connector C422. ☐ Ignition switch in position II. ☐ SWITCH ON dipped beam. Measure the voltage between right-hand headlamp, connector C422, pin 2, circuit 15S-LE23 (GN/WH), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to D9. → No LOCATE and RECTIFY the break in the circuit between fuse F10 (CJB) and the headlamp using the Wiring Diagrams. CHECK the operation of the system.
D9: CHECK GROUND CONNECTION OF THE RIGHT-HAND HEADLAMP	
 E0011568	☐ Ignition switch in position 0. ☐ Measure the resistance between right-hand headlamp, connector C422, pin 6, circuit 31-LE30 (BK), wiring harness side and ground. Is less than 2 ohms measured? → Yes CHECK and if necessary INSTALL A NEW right-hand headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S11 using the Wiring Diagrams. CHECK the operation of the system.

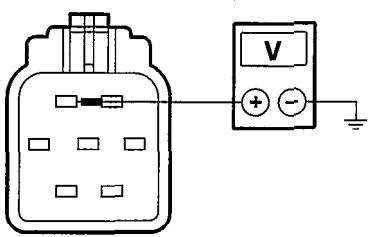
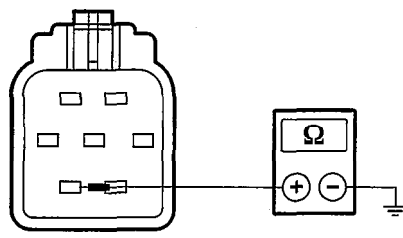
PINPOINT TEST E : ONE MAIN BEAM IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: DETERMINE THE FAULT CONDITION	
	☐ Ignition switch in position II. ☐ SWITCH ON main beam.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Determine the fault condition. Is the left-hand main beam inoperative? → Yes GO to E2. → No The right-hand main beam is inoperative: GO to E6.
E2: CHECK FUSE F52 (CJB)	
	☐ Ignition switch in position 0. ☐ CHECK fuse F52 (10 A) (CJB). Is the fuse OK? → Yes GO to E3. → No INSTALL A NEW fuse F52 (10 A). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
E3: CHECK THE VOLTAGE AT FUSE F52 (CJB)	
	- Connect fuse F52 (10 A) (CJB). - Ignition switch in position II. - SWITCH ON main beam. - Measure the voltage between fuse F52 (10 A) and ground. - Does the meter display battery voltage? → Yes GO to E4. → No LOCATE and RECTIFY the break in the voltage supply to fuse F52 (CJB) using the Wiring Diagrams, if necessary CHECK and INSTALL A NEW CJB. CHECK the operation of the system.
E4: CHECK VOLTAGE AT THE LEFT-HAND HEADLAMP	
	☐ Ignition switch in position 0. ☐ Disconnect left-hand headlamp from connector C416. ☐ Ignition switch in position II. SWITCH ON main beam.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
 E0011505	5 Measure the voltage between left-hand headlamp, connector C416, pin 1, circuit 15S-LE15 (GN/BK), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to E5. → No LOCATE and RECTIFY the break in the circuit between fuse F52 (CJB) and the left headlamp using the Wiring Diagrams. CHECK the operation of the system.
E5: CHECK GROUND CONNECTION OF THE LEFT-HAND HEADLAMP	
 E0011568	1 Ignition switch in position 0. Measure the resistance between left-hand headlamp, connector C416, pin 6, circuit 31-LE31 (BK), wiring harness side and ground. Is less than 2 ohms measured? → Yes CHECK and if necessary INSTALL A NEW headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S10 using the Wiring Diagrams. CHECK the operation of the system.
E6: CHECK FUSE F53 (CJB)	
	Ignition switch in position 0. CHECK fuse F53 (10 A) (CJB). Is the fuse OK? → Yes GO to E7. → No INSTALL A NEW fuse F53 (10 A). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
E7: CHECK THE VOLTAGE AT FUSE F53 (CJB)	
	Connect fuse F53 (10 A) (CJB). Ignition switch in position II. ☐ SWITCH ON main beam.

DIAGNOSIS AND TESTING

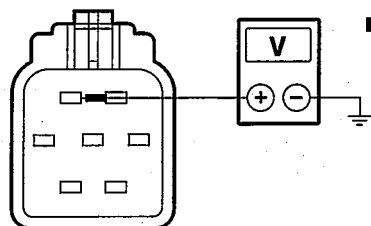
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between fuse F53 (10 A) and ground.
- Does the meter display battery voltage?
- **Yes**
GO to E8.
- **No**
LOCATE and RECTIFY the break in the voltage supply to fuse F53 (CJB) using the Wiring Diagrams, if necessary CHECK and INSTALL A NEW CJB. CHECK the operation of the system.

E8: CHECK VOLTAGE AT THE RIGHT-HAND HEADLAMP

- ☐ 1 Ignition switch in position 0.
- ☐ 2 Disconnect right-hand headlamp from connector C422.
- ☐ 3 Ignition switch in position II.
- ☐ 4 SWITCH ON main beam.



E0011505

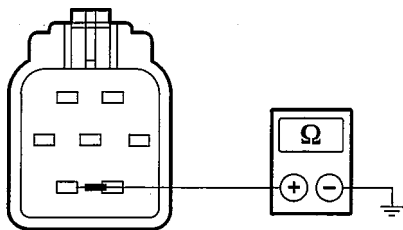
- ☐ 5 Measure the voltage between right-hand headlamp, connector C422, pin 1, circuit 15S-LE22 (GNIOG), wiring harness side and ground.
- Does the meter display battery voltage?
- **Yes**
GO to E9.
- **No**
LOCATE and RECTIFY the break in the circuit between fuse F53 (CJB) and the right-hand headlamp using the Wiring Diagrams. CHECK the operation of the system.

E9: CHECK GROUND CONNECTION OF THE RIGHT-HAND HEADLAMP

- ☐ 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0011568

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between right-hand headlamp, connector C422, pin 6, circuit 31-LE30 (BK), wiring harness side and ground.
- Is less than 2 ohms measured?
- **Yes**
CHECK and if necessary INSTALL A NEW headlamp. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S11 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST F : THE HEADLAMPS ILLUMINATE CONTINUOUSLY

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

F1: DETERMINE THE FAULT CONDITION

- 1** Determine the fault condition.
- Is the main beam permanently switched on?
- **Yes**
GO to F7.
- **No**
Dipped beam permanently switched on: GO to F2.

F2: NARROW DOWN THE CAUSE OF THE SHORT TO BATTERY VOLTAGE

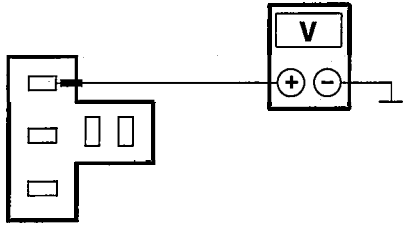
NOTE: Switch off dipped beam.

- 1** Ignition switch in position 0.
- 2** Disconnect dipped beam relay from socket C417.
- 3** Ignition switch in position II.
- ☐ Check the dipped beam.
- Does the dipped beam illuminate?
- **Yes**
GO to F3.
- **No**
GO to F4.

F3: NARROW DOWN THE CAUSE OF THE SHORT TO BATTERY VOLTAGE

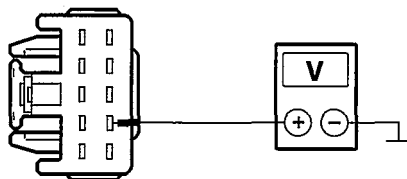
- 1** Ignition switch in position 0.
- 2** Disconnect fuse F9 (10 A) (CJB).

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☒ 3 Disconnect fuse F10 (10 A) (CJB). ☐ Ignition switch in position II. ☒ 5 Check the dipped beam. - Does the dipped beam illuminate on one side? → Yes - Left-hand dipped beam illuminates: LOCATE and RECTIFY the short to battery voltage in circuit 15s-LE16 (GN/OG), which is connected to the output of fuse F9 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. - Right-hand dipped beam illuminates: LOCATE and RECTIFY the short to battery voltage in circuit 15S-LE23 (GN/WH), which is connected to the output of fuse F10 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. → No LOCATE and RECTIFY the short to battery voltage in circuit 15S-DB7 (GNNE), between dipped beam relay and CJB, using the Wiring Diagrams, if necessary INSTALL A NEW CJB. CHECK the operation of the system.
F4: CHECK THE VOLTAGE AT THE DIPPED BEAM RELAY (CONTROL CIRCUIT)	
 VFE0033861	☒ 1 Measure the voltage between the dipped beam relay, socket C417, pin 1, circuit 15s-LE19 (GNIBU), CJB side and ground. Does the meter display battery voltage? → Yes GO to F5. → No INSTALL A NEW dipped beam relay. CHECK the operation of the system.
F5: CHECK CONTROL CIRCUIT 15S-LE19 (GN/BU) FOR SHORT TO BATTERY VOLTAGE	
	☒ 1 Ignition switch in position 0. ☒ 2 Disconnect turn signal switch from connector C357. ☒ 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016044

DETAILS/RESULTS/ACTIONS

- 4 Measure voltage between turn signal switch, connector C357, pin 9, circuit 15s-LEI9 (GNIBU), wiring harness side and ground.

• Does the meter display battery voltage?

→ **Yes**

LOCATE and RECTIFY the short to battery voltage in the circuit between the turn signal switch and the dipped beam relay using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to F6.

F6: CHECK THE HEADLAMP SWITCH

- ☐ Ignition switch in position 0.

- 2 Disconnect headlamp switch from connector C338.

- ☐ Connect turn signal switch with connector C357.

- 4 Connect dipped beam relay to socket C417.

- ☐ Ignition switch in position II.

- 6 Check the dipped beam.

• Does the dipped beam illuminate?

→ **Yes**

LOCATE and RECTIFY short to battery voltage in circuit 15s-LEI4 (GN/RD) between headlamp switch and turn signal switch using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

INSTALL A NEW headlamp switch. CHECK the operation of the system.

F7: NARROW DOWN THE CAUSE OF THE SHORT TO BATTERY VOLTAGE

NOTE: Main beam is switched off.

- 1 Ignition switch in position 0.

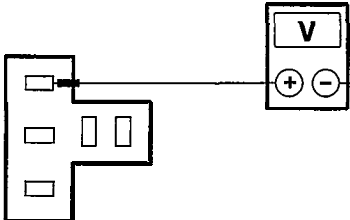
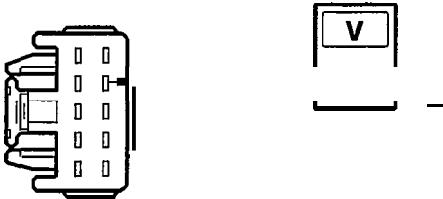
- 2 Disconnect main beam relay from socket C411.

- 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

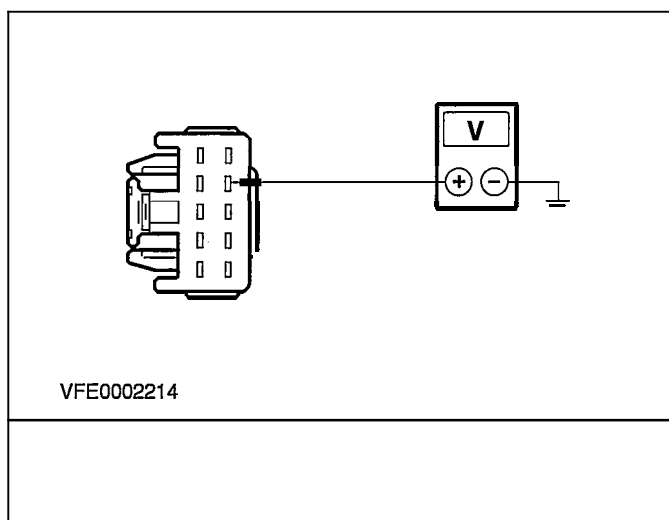
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Check the main beam. Does the main beam illuminate? → Yes GO to F8. → No GO to F9.
F8: NARROW DOWN THE CAUSE OF THE SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect fuse F52 (10 A) (CJB).
	Disconnect fuse F53 (10 A) (CJB).
	4 Ignition switch in position II.
	5 Check the main beam. - Does main beam illuminate on one side? → Yes - Left-hand main beam illuminates: LOCATE and RECTIFY the short to battery voltage in circuit 15S-LE15 (GN/BK), which is connected to the output of fuse F52 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. - Right-hand main beam illuminates: LOCATE and RECTIFY the short to battery voltage in circuit 15S-LE22 (GN/OG), which is connected to the output of fuse F53 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. → No LOCATE and RECTIFY the short to battery voltage in circuit 15S-DB6 (GN/WH), between main beam relay and CJB, using the Wiring Diagrams, if necessary INSTALL A NEW CJB. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F9: CHECK THE VOLTAGE AT THE MAIN BEAM RELAY (CONTROL CIRCUIT)	
 VFE0033861	1 Measure the voltage between the main beam relay, socket C411, pin 1, circuit 15S-LE12 (GNNE), CJB side and ground. • Does the meter display battery voltage? → Yes GO to F10. → No INSTALL A NEW main beam relay. CHECK the operation of the system.
F10: CHECK CONTROL CIRCUIT 15s-LE12 (GNNE) FOR SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0. 2 Disconnect turn signal switch from connector C357. 3 Ignition switch in position II.
 VFE0002214	4 Measure the voltage between turn signal switch, connector C357, pin 7, circuit 15S-LE12A (GNNE), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to F11. → No INSTALL A NEW turn signal switch. CHECK the operation of the system.
F11: CHECK THE INSTRUMENT CLUSTER	
	1 Ignition switch in position 0. 2 Disconnect instrument cluster from connector C332. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

Measure the voltage between turn signal switch, connector C357, pin 7, circuit 15s-LEI2A (GNNE), wiring harness side and ground.

- Does the meter display battery voltage?

→ **Yes**

LOCATE and RECTIFY the short to battery voltage in the circuit(s) connected to soldered connection S274 using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

CHECK the instrument cluster using WDS, INSTALL A NEW ONE if necessary. CHECK the operation of the system.

PINPOINT TEST G : THE HEADLAMP FLASHER IS INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

G1: DETERMINE THE FAULT CONDITION



1 Ignition switch in position II.

2 Determine the fault condition.

☐ SWITCH ON main beam.

- Is the main beam permanently switched on?

→ **Yes**

GO to G2.

→ **No**

GO to Pinpoint Test C.

G2: LOCATE THE FAULT



1 Ignition switch in position 0.

2 Disconnect turn signal switch from connector C357.

3 Ignition switch in position II.

☐ Measure the voltage between turn signal switch, connector C357, pin 6, circuit 15-LEI4 (GN/RD), wiring harness side and ground.

- Does the meter display battery voltage?

→ **Yes**

INSTALL A NEW turn signal switch. CHECK the operation of the system.

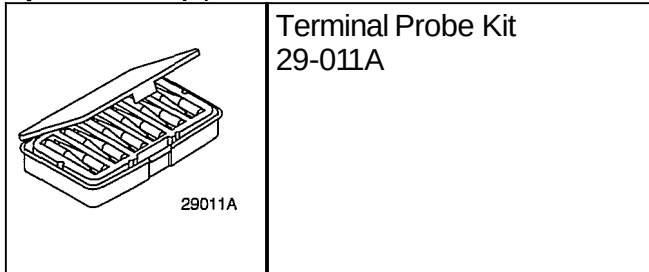
→ **No**

LOCATE and RECTIFY the break in the circuit between the headlamp switch and the turn signal switch using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Headlamps — Vehicles Built From: 1012005

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)**Inspection and Checking**

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections to the module to be removed, so that communication between the module and WDS is ensured.

NOTE: If the generic electronic module (GEM) is changed, the new one must be reinitialised. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to:

Module Configuration (418-01, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built From: 1012005 (419-10, Diagnosis and Testing).

1. Verify the customer concern.
2. Visually check for any obvious mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• CHECK the wind-shield for damage/cracks in the vicinity of the rain sensor. • CHECK that the rain sensor retaining frame is correctly attached to the wind-shield.	• Fuse(s) • Lamp(s) • Connector(s) • Switches • Wiring loom

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Dipped beam and main beam inoperative	• Fuse • Circuit(s) • Headlamp switch • Steering column multifunction switch. • Central junction box (CJB)	• GO to Pinpoint Test A.
• The dipped beam is inoperative	• Circuit(s) • Dipped beam relay • Steering column multifunction switch. • Central junction box (CJB)	• GO to Pinpoint Test B.
• The automatic headlamps are inoperative (dipped beam OK)	• Circuit(s) • Headlamp switch • Rain sensor • Central junction box (CJB) • Generic Electronic Module (GEM)	• GO to Pinpoint Test C.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The main beam is inoperative	- Circuit(s) - Main beam relay - Steering column multifunction switch. - Central junction box (CJB)	GO to Pinpoint Test D.
One dipped beam is inoperative	- Fuse - Circuit(s) - Left/right-hand headlamp - Central junction box (CJB)	GO to Pinpoint Test E.
One main beam is inoperative	- Fuse - Circuit(s) - Left/right-hand headlamp - Central junction box (CJB)	GO to Pinpoint Test F.
The headlamps illuminate continuously	- Circuit(s) - Dipped beam relay - Main beam relay - Steering column multifunction switch. - Headlamp switch - Instrument cluster - Central junction box (CJB)	GO to Pinpoint Test G.
The headlamp flasher is inoperative	- Circuit(s) - Steering column multifunction switch.	GO to Pinpoint Test H.
The main beam warning lamp is inoperative	- Circuit(s) - Instrument cluster	REFER to: Instrument Cluster - Vehicles Built From: 10/2005 (413-01, Diagnosis and Testing).
The headlamp delayed switch-off function is inoperative (dipped beam/main beam and automatic headlamps OK)	Generic Electronic Module (GEM)	REFER to: Module Configuration (418-01, Diagnosis and Testing).

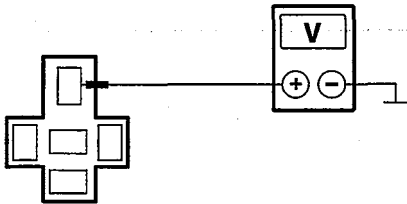
System Checks

NOTE: Use a digital multimeter for all electrical measurements.

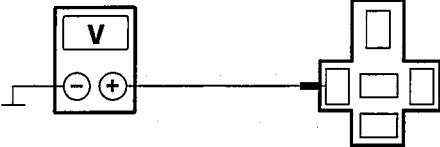
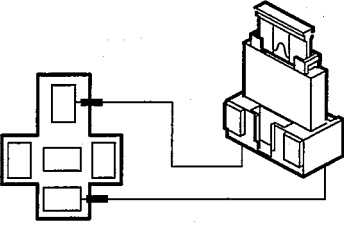
PINPOINT TEST H : DIPPED BEAM AND MAIN BEAM INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
AI: CHECK FUSE F31 (10 A) (CJB).	
	1 Ignition switch in position 0.

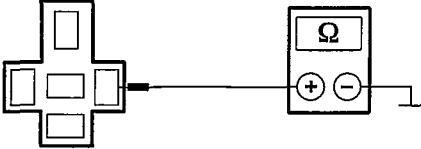
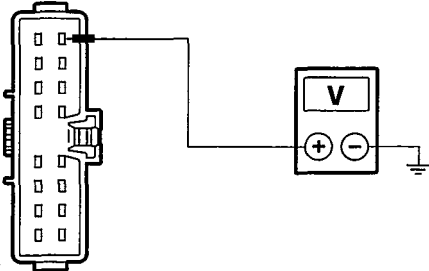
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK fuse F31 (10 A) (CJB). Is the fuse OK.? → Yes GO to A2. → No RENEW fuse F31 (10 A) (CJB) and CHECK the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE SUPPLY TO FUSE F31 (10A) (CJB) FOR OPEN CIRCUIT	
	☐ 1 Connect fuse F31 (10 A) (CJB). ☐ 2 Ignition switch in position II. ☐ 3 Measure the voltage between fuse F31 (10 A) (CJB) and ground. Does the meter display battery voltage? → Yes GO to A3. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F31 (10 A) (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.
A3: CHECK THE VOLTAGE SUPPLY TO THE AUTOMATIC HEADLAMPS RELAY (PIN 3) FOR OPEN CIRCUIT	
	☐ Ignition switch in position 0. ☐ Disconnect Automatic headlamps relay from socket C418.
 VFE0036754	☐ Measure the voltage between the automatic headlamps relay, socket C418, pin 3, circuit 15-LE29A (GN/BK), CJB side and ground. Does the meter display battery voltage? → Yes GO to A4. → No LOCATE and RECTIFY the break in the circuit between fuse F31 and the automatic headlamps relay using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

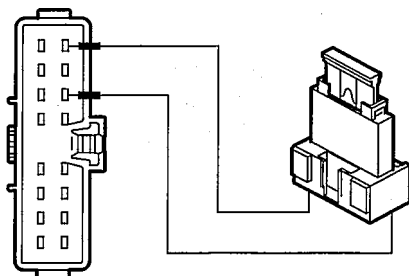
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A4: CHECK THE VOLTAGE SUPPLY TO THE AUTOMATIC HEADLAMPS RELAY (PIN 1) FOR OPEN CIRCUIT	
 VFE0026275	☒ 1 Ignition switch in position II. ☒ Measure the voltage between the automatic headlamps relay, socket C418, pin 1, circuit 15-LE36 (GN/WH), CJB side and ground. • Does the meter display battery voltage? → Yes GO to A5. → No LOCATE and RECTIFY the break in the circuit between soldered connection S1 and the automatic headlamps relay using the Wiring Diagrams. CHECK the operation of the system.
A5: NARROW DOWN THE CAUSE OF THE FAULT	
 VFE0036753	☐ Ignition switch in position 0. ☒ 2 Connect a fused jumper wire (10 A) to the automatic headlamps relay, socket C418, between pin 3, circuit 15-LE29A (GN/BK) and pin 5, circuit 15-LE29 (GN/BK), CJB side.
	☒ 3 Ignition switch in position II. ☒ 4 SWITCH ON dipped beam. ☐ CHECK the operation of the dipped beam. • Does the dipped beam illuminate? → Yes GO to A6. → No GO to A7.
A6: CHECK THE GROUND CONNECTION OF THE AUTOMATIC HEADLAMPS RELAY FOR OPEN CIRCUIT	
	☒ 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS	RESULTS	ACTIONS
 VFE0026280		2	Measure the resistance between the automatic headlamps relay, socket C418, pin 2, circuit 31-LE36 (BK), CJB side and ground.	Is a resistance of less than 2 ohms registered? → Yes RENEW the automatic headlamps relay. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the automatic headlamps relay and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.
A7: CHECK VOLTAGE SUPPLY OF THE HEADLAMP SWITCH FOR OPEN CIRCUIT				
		☐ Ignition switch in position 0.		
		☐ Connect Automatic headlamps relay to socket C418.		
		☐ Disconnect headlamp switch from connector C338.		
 VFE0001471		5	Measure voltage between headlamp switch, connector C338, pin 8, circuit 15-LE29 (GN/BK)/15-LE14 (GN/RD), wiring harness side and ground.	Does the meter display battery voltage? → Yes GO to A8. → No LOCATE and RECTIFY the break in the circuit between the automatic headlamps relay and the headlamp switch using the Wiring Diagrams. CHECK the operation of the system.
A8: CHECK THE HEADLAMP SWITCH				
		☐ Ignition switch in position 0.		

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016100

DETAILS/RESULTS/ACTIONS

- 2 Connect a fused jumper wire (10 A) to the headlamp switch, connector C338, between pin 8, circuit 15-LE29 (GN/BK)/15-LE14 (GNIRD) and pin 6, circuit 15s-LE14 (GNIRD), wiring harness side.

- ☐ Ignition switch in position II.

(4) CHECK the operation of the dipped beam.

- Does the dipped beam illuminate?

→ **Yes**

INSTALL A NEW headlamp switch. CHECK the operation of the system.

→ **No**

GO to A9.

A9: CHECK CIRCUIT 15S-LE14 (GNIRD) BETWEEN THE HEADLAMP SWITCH AND THE STEERING COLUMN MULTIFUNCTION SWITCH FOR OPEN CIRCUIT

- 1 Ignition switch in position 0.

- 2 Connect Headlamp switch to connector C338.

- 3 Disconnect steering column multifunction switch from connector C357.

- (4) Ignition switch in position II.

- 5 SWITCH ON dipped beam

- 6 Measure the voltage between steering column multifunction switch, connector C357, pin 8, circuit 15S-LE14 (GNIRD), wiring harness side and ground.

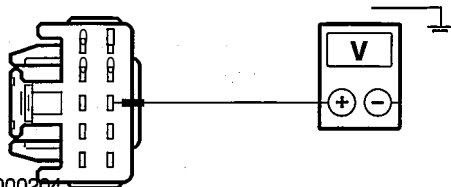
- Does the meter display battery voltage?

→ **Yes**

GO to A10.

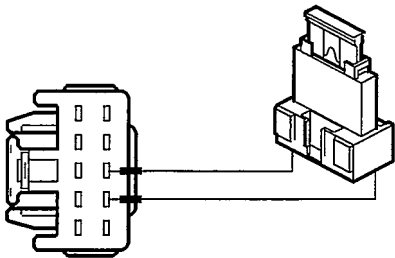
→ **No**

LOCATE and REPAIR the open circuit between the headlamp switch and the steering column multifunction switch using the Wiring Diagrams. CHECK the operation of the system.



VFE0000204

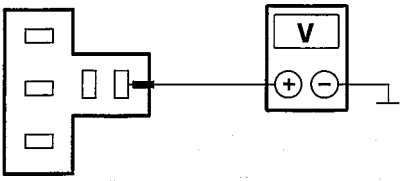
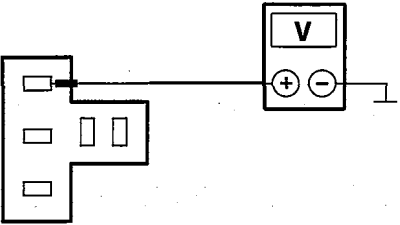
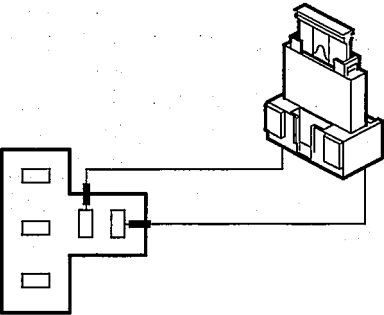
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A10: CHECK THE STEERING COLUMN MULTIFUNCTION SWITCH	
 VFE0016101	1 Ignition switch in position 0.
	2 Connect a fused jumper wire (10 A) at the steering column multifunction switch, connector C357, between pin 8, circuit 15s-LEI4 (GN/IRD) and pin 9, circuit 15s-LEI9 (GN/BU), wiring harness side.
	3 Ignition switch in position II.
	4 CHECK the operation of the dipped beam. Does the dipped beam illuminate? → Yes INSTALL a new steering column multifunction switch. CHECK the operation of the system. → No LOCATE and RECTIFY break in circuit 31-DA12 (BK), between soldered connection S15 and ground G13 using the Wiring Diagrams. CHECK the operation of the system.

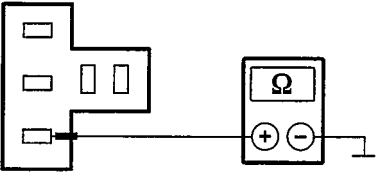
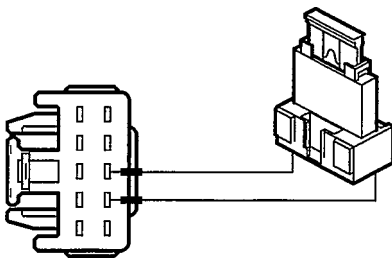
PINPOINT TEST I : THE DIPPED BEAM IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
BI: CHECK VOLTAGE SUPPLY OF DIPPED BEAM RELAY (LOAD CURRENT CIRCUIT) FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect dipped beam relay from socket C417.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033863	☐ Measure the voltage between the dipped beam relay, socket C417, pin 3, circuit 30-LE20 (RD), CJB side and ground. Does the meter display battery voltage? → Yes GO to B2. → No LOCATE and RECTIFY the break in the circuit between the jumper (CJB) and the dipped beam relay using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
B2: NARROW DOWN THE CAUSE OF THE FAULT	
 VFE0033861	1 SWITCH ON dipped beam. ☐ Measure the voltage between the dipped beam relay, socket C417, pin 1, circuit 15S-LE19 (GN/BU), CJB side and ground. Does the meter display battery voltage? → Yes GO to B3. → No GO to B5.
B3: CHECK THE LOAD CURRENT CIRCUIT OF THE DIPPED BEAM RELAY FOR OPEN CIRCUIT	
 VFE0033864	1 Ignition switch in position 0. ☐ Connect a fused jumper wire (20 A) at the dipped beam relay, socket C417, between pin 3 circuit 30-LE20 (RD) and pin 5, circuit 15S-DB7 (GNNE), CJB side. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK the dipped beam. Does the dipped beam illuminate? → Yes GO to B4. → No LOCATE and RECTIFY the break in the circuit between dipped beam relay and bridge (CJB) using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
B4: CHECK THE GROUND CONNECTION OF THE DIPPED BEAM RELAY FOR OPEN CIRCUIT	
 VFE0033862	- Ignition switch in position 0. - Measure the resistance between the dipped beam relay, socket C417, pin 2, circuit 31-LEI9 (BK), CJB side and ground. - Is a resistance of less than 2 ohms registered? → Yes INSTALL A NEW dipped beam relay. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the dipped beam relay and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.
B5: CHECK THE STEERING COLUMN MULTIFUNCTION SWITCH	
 VFE0016101	- Ignition switch in position 0. ☐ Disconnect steering column multifunction switch from connector C357. - Connect Dipped beam relay to socket C417. ☐ Connect a fused jumper wire (10 A) at the steering column multifunction switch, connector C357, between pin 8, circuit 15s-LEI4 (GN/RD) and pin 9, circuit 15s-LEI9 (GN/BU), wiring harness side. ☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

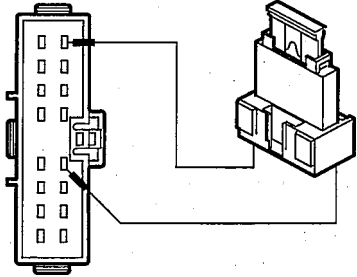
	☐ SWITCH ON dipped beam.
	☐ CHECK the dipped beam. Does the dipped beam illuminate? → Yes INSTALL a new steering column multifunction switch. CHECK the operation of the system.
	→ No LOCATE and REPAIR the open circuit between the steering column multifunction switch and the dipped beam relay using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST J : THE AUTOMATIC HEADLAMPS ARE INOPERATIVE (DIPPED BEAM OK)

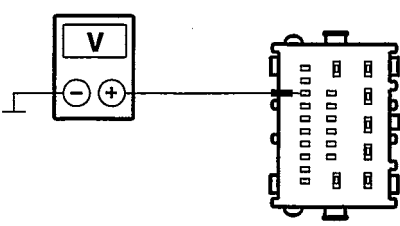
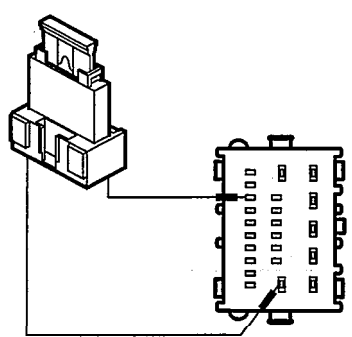
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

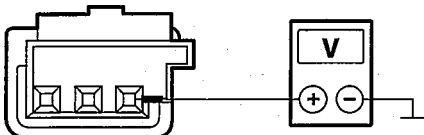
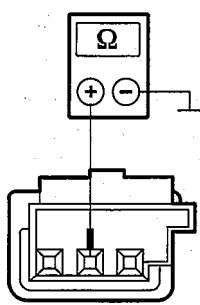
C1: CHECK THE HEADLAMP SWITCH

 VFE0028649	1 Ignition switch in position 0.
	2 Disconnect headlamp switch from connector C338.
	☐ Connect a fused jumper wire (10 A) to the headlamp switch, connector C338, between pin 8, circuit 15-LE29 (GN/BK)/15-LE14 (GNIRD) and pin 4, circuit 15S-LE14B (GNIRD), wiring harness side.
	4 Ignition switch in position II.
	5 Cover rain sensor with a light-proof material to simulate darkness.
	☐ CHECK the operation of the dipped beam. Does the dipped beam illuminate? → Yes INSTALL A NEW headlamp switch. CHECK the operation of the system.
	→ No GO to C2.

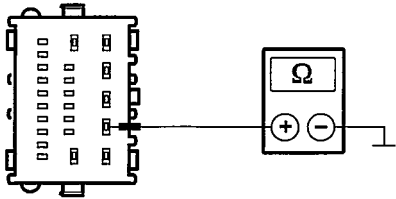
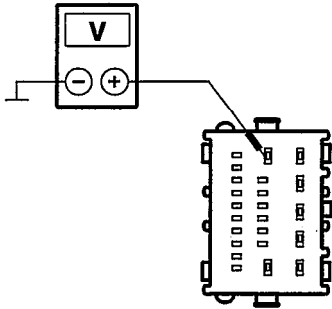
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C2: CHECK CIRCUIT 15S-LE14B (GNIRD) BETWEEN THE HEADLAMP SWITCH AND THE GENERIC ELECTRONIC MODULE (GEM) FOR OPEN CIRCUIT	
 VFE64512	1 Ignition switch in position 0. 2 Connect Headlamp switch to connector C338. 3 Disconnect Generic electronic module (GEM) from connector C320. 4 Ignition switch in position II. 5 SWITCH ON the automatic headlamps at the headlamp switch.
	6 Measure the voltage between generic electronic module (GEM), connector C320, pin 21, circuit 15S-LE14B (GNIRD), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to C3. → No LOCATE and RECTIFY the break in the circuit between the headlamp switch and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.
C3: CHECK CIRCUIT 15S-LE14A (GNIRD) BETWEEN THE GENERIC ELECTRONIC MODULE (GEM) AND THE HEADLAMP SWITCH FOR OPEN CIRCUIT	
 VFE64513	1 Ignition switch in position 0. 2 Connect a fused jumper wire (10 A) at the generic electronic module (GEM), connector C320, between pin 21, circuit 15S-LE14B (GNIRD) and pin 6, circuit 15S-LE14A (GNIRD), wiring harness side.
	3 Ignition switch in position II. 4 SWITCH ON the automatic headlamps at the headlamp switch.

DIAGNOSIS AND TESTING

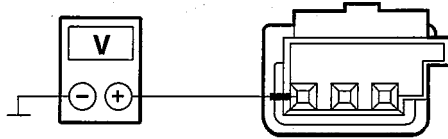
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 CHECK the operation of the dipped beam. Does the dipped beam illuminate? → Yes GO to C4. → No LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the headlamp switch using the Wiring Diagrams. CHECK the operation of the system.
C4: CHECK VOLTAGE SUPPLY OF RAIN SENSOR FOR OPEN CIRCUIT	
	1 Ignition switch in position 0. 2 Disconnect Rain sensor from connector C754. 3 Ignition switch in position II.
 VFE0038444	4 Measure the voltage between the rain sensor, connector C754, pin 1, circuit 15-LE55 (GN/OG), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to C5. → No LOCATE and RECTIFY break in circuit between soldered connection S3 and the rain sensor using the Wiring Diagrams. CHECK the operation of the system.
C5: CHECK THE GROUND CONNECTION OF THE RAIN SENSOR FOR OPEN CIRCUIT	
 VFE0038446	1 Ignition switch in position 0. ☐ Measure the resistance between the rain sensor, connector C754, pin 2, circuit 31-LE55 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes GO to C6. → No LOCATE and RECTIFY break in circuit between rain sensor and soldered connection S264 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C6: CHECK THE GROUND CONNECTION TO THE GENERIC ELECTRONIC MODULE (GEM) FOR OPEN CIRCUIT	
 VFE0028651	☐ Measure the resistance between the generic electronic module (GEM), connector C320, pin 2, circuit 91-DK20 (BWRD), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes GO to C7. → No LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the soldered connection S264 using the Wiring Diagrams. CHECK the operation of the system.
C7: CHECK THE VOLTAGE SUPPLY TO THE GENERIC ELECTRONIC MODULE (GEM) FOR OPEN CIRCUIT	
 VFE64514	1 Disconnect Generic electronic module (GEM) from connector C316. 2 Ignition switch in position II. 3 Measure the voltage between the generic electronic module (GEM), connector C316, pin 7, circuit 29-LE29A (OG/BK), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to C8. → No LOCATE and RECTIFY the break in the circuit between fuse F17 and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.
C8: NARROW DOWN THE CAUSE OF THE FAULT	
	1 Ignition switch in position 0. 2 Connect Generic electronic module (GEM) to connector C316. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038449

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the rain sensor, connector C754, pin 3, circuit 8-LE55 (WH/BK), wiring harness side and ground.

- Does the meter display battery voltage?

→ Yes

GO to C9.

→ No

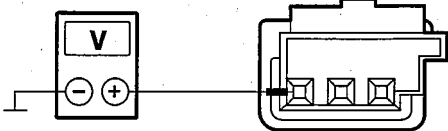
GO to C10.

C9: CHECK SIGNAL CABLE OF RAIN SENSOR FOR SHORT TO BATTERY VOLTAGE

- 1 Ignition switch in position 0.

- 2 Disconnect Generic electronic module (GEM) from connector C316.

- 3 Ignition switch in position II.



VFE0038449

- 4 Measure the voltage between the rain sensor, connector C754, pin 3, circuit 8-LE55 (WH/BK), wiring harness side and ground.

- Does the meter display battery voltage?

→ Yes

LOCATE and RECTIFY the short to battery voltage in the circuit between the generic electronic module (GEM) and the sensor using the Wiring Diagrams. CHECK the operation of the system.

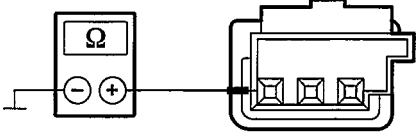
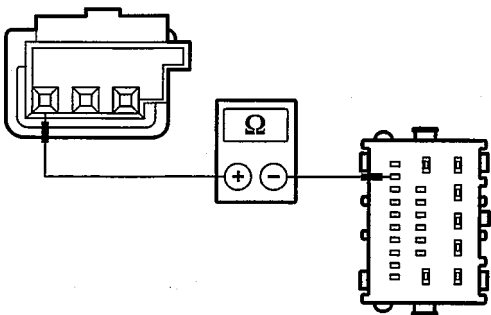
→ No

RENEW the generic electronic module (GEM). CHECK the operation of the system.

C10: CHECK SIGNAL CABLE OF RAIN SENSOR FOR SHORT TO GROUND

- 1 Ignition switch in position 0.

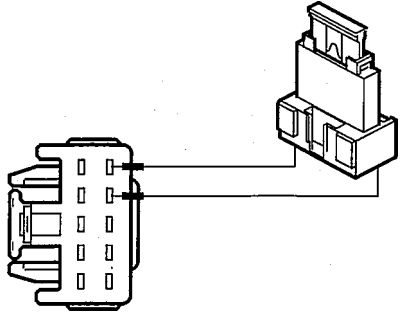
DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
 VFE64515		2 Measure the resistance between the rain sensor, connector C754, pin 3, circuit 8-LE55 (WHIBK), wiring harness side and ground. • Is a resistance of more than 10,000 ohms measured? → Yes GO to C11. → No LOCATE and RECTIFY the short to ground in the circuit between CJB and the rain sensor using the Wiring Diagrams. CHECK the operation of the system.
C II : CHECK SIGNAL CABLE OF RAIN SENSOR FOR OPEN CIRCUIT		
 VFE64282		1 Measure the resistance between the generic electronic module (GEM), connector C316, pin 22, circuit 8-LE55 (WHIBK), wiring harness side and the rain sensor, connector C754, pin 3, circuit 8-LE55 (WHIBK), wiring harness side. • Is a resistance of less than 2 ohms registered? → Yes RENEW the rain sensor. CHECK the operation of the system. If the concern remains, RENEW the generic electronic module (GEM). CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the rain sensor using the Wiring Diagrams. CHECK the operation of the system.

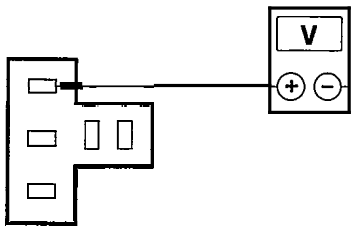
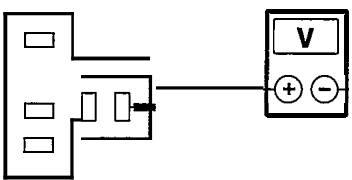
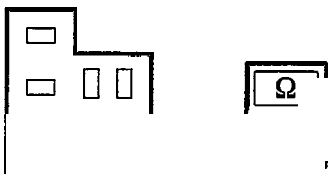
PINPOINT TEST K : THE MAIN BEAM IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D I : CHECK THE MAIN BEAM WARNING LAMP	
	1 Ignition switch in position II.
	SWITCH ON main beam.
	3 CHECK the main beam warning lamp. • Does the main beam warning lamp illuminate? → Yes GO to D3. → No GO to D2.

DIAGNOSIS AND TESTING

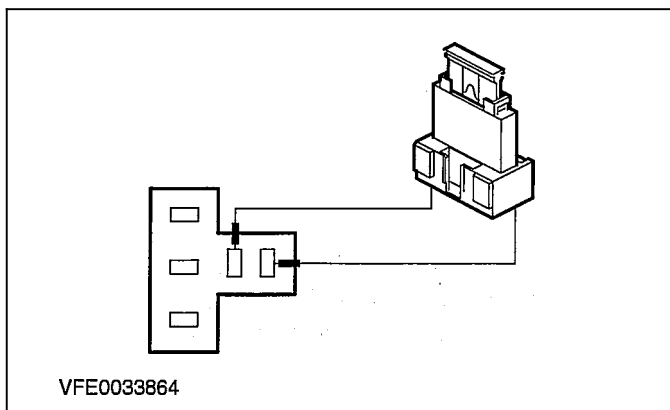
TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
D2: CHECK THE STEERING COLUMN MULTIFUNCTION SWITCH			
 VFE0016107	☐ Ignition switch in position 0.		
	2 Disconnect steering column multifunction switch from connector C357.		
	3 Connect a fused jumper wire (10 A) at the steering column multifunction switch, connector C357, between pin 6, circuit 15-LE14 (GNIRD) and pin 7, circuit 15S-LE12A (GNNE), wiring harness side.		
	☐ Ignition switch in position II.		
	5 CHECK the main beam.		
	- Does the main beam illuminate? → Yes INSTALL a new steering column multifunction switch. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the steering column multifunction switch and soldered connection S274 using the Wiring Diagrams. CHECK the operation of the system.		
D3: CHECK VOLTAGE SUPPLY OF MAIN BEAM RELAY (CONTROL CIRCUIT) FOR OPEN CIRCUIT			
	1 Ignition switch in position 0.		
	2 Disconnect main beam relay from socket C411.		
	3 Ignition switch in position II.		
	4 SWITCH ON main beam.		

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033861	Measure the voltage between the main beam relay, socket C411, pin 1, circuit 15s-LEI2 (GNNE), CJB side and ground. Does the meter display battery voltage? → Yes GO to D4. → No LOCATE and RECTIFY the break in the circuit between soldered connection S274 and the main beam relay using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
D4: CHECK VOLTAGE SUPPLY OF MAIN BEAM RELAY (LOAD CURRENT CIRCUIT) FOR OPEN CIRCUIT	
 VFE0033863	1 Measure the voltage between the main beam relay, socket C411, pin 3, circuit 30-LEI3 (RD), CJB side and ground. Does the meter display battery voltage? → Yes GO to D5. → No LOCATE and RECTIFY the break in the circuit between the CJB (jumper) and the main beam relay using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
D5: CHECK THE GROUND CONNECTION OF THE MAIN BEAM RELAY FOR OPEN CIRCUIT	
 VFE0033862	☐ Ignition switch in position 0. 2 Measure the resistance between the main beam relay, socket C411, pin 2, circuit 31-LEI2 (BK), CJB side and ground. Is a resistance of less than 2 ohms registered? → Yes GO to D6. → No LOCATE and RECTIFY the break in the circuit between the main beam relay and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.
D6: CHECK THE LOAD CURRENT CIRCUIT OF THE MAIN BEAM RELAY FOR OPEN CIRCUIT	
	☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2** Connect a fused jumper wire (20 A) at the main beam relay, socket C411, between pin 3, circuit 30-LEI3 (RD) and pin 5, circuit 15S-DB6 (GN/WH), CJB side.

- 3** Ignition switch in position II.

- 4** CHECK the main beam.

- Does the main beam illuminate?

→ **Yes**

INSTALL A NEW main beam relay. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between main beam relay and the CJB (jumper) using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.

PINPOINT TEST L : ONE DIPPED BEAM IS INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E1: DETERMINE THE FAULT CONDITION

- 1** Ignition switch in position II.

- ☐ SWITCH ON dipped beam

- Is the left-hand dipped beam inoperative?

→ **Yes**

GO to E2.

→ **No**

The right-hand dipped beam is inoperative: GO to E6.

E2: CHECK FUSE F9 (10 A) (CJB).

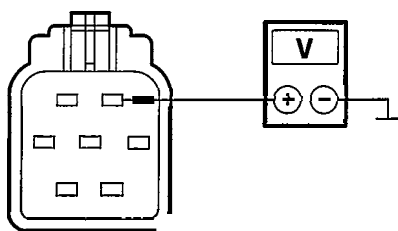
- ☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F9 (10 A) (CJB). Is the fuse OK.? → Yes GO to E3. → No RENEW fuse F9 (10 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
E3: CHECK THE VOLTAGE SUPPLY TO FUSE F9 (10A) (CJB) FOR OPEN CIRCUIT	
	1 Connect fuse F9 (10 A) (CJB).
	2 Ignition switch in position II.
	SWITCH ON dipped beam
	4 Measure the voltage between fuse F9 (10 A) (CJB) and ground. Does the meter display battery voltage? → Yes GO to E4. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F9 (10 A) (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.
E4: CHECK THE VOLTAGE SUPPLY TO THE LEFT-HAND HEADLAMP FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect left-hand headlamp from connector C416.
	3 Ignition switch in position II.
	4 SWITCH ON dipped beam.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016224

DETAILS/RESULTS/ACTIONS

Measure the voltage between left-hand headlamp, connector C416, pin 2, circuit 15S-LE16 (GN/OG), wiring harness side and ground.

- Does the meter display battery voltage?

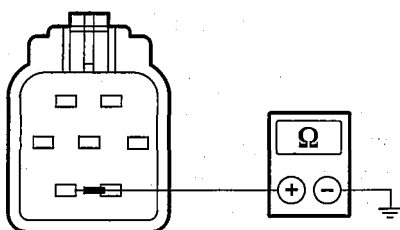
→ **Yes**

GO to E5.

→ **No**

LOCATE and RECTIFY the break in the circuit between fuse F9 (CJB) and the left headlamp using the Wiring Diagrams. CHECK the operation of the system.

E5: CHECK GROUND CONNECTION OF LEFT-HAND HEADLAMP FOR OPEN CIRCUIT



E0011568

- ☐ Ignition switch in position 0.

- 2** Measure the resistance between the left-hand headlamp, connector C416, pin 6, circuit 31-LE31 (BK), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

→ **Yes**

CHECK and if necessary INSTALL A NEW left-hand headlamp. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the left-hand headlamp and soldered connection S10 using the Wiring Diagrams. CHECK the operation of the system.

E6: CHECK FUSE F10 (10 A) (CJB).

- ☐ Ignition switch in position 0.

CHECK fuse F10 (10 A) (CJB).

- Is the fuse OK.?

→ **Yes**

GO to E7.

→ **No**

RENEW fuse F10 (10 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

E7: CHECK THE VOLTAGE SUPPLY TO FUSE F10 (10A) (CJB) FOR OPEN CIRCUIT

- ☐ Connect fuse F10 (10 A) (CJB).

- ☐ Ignition switch in position II.

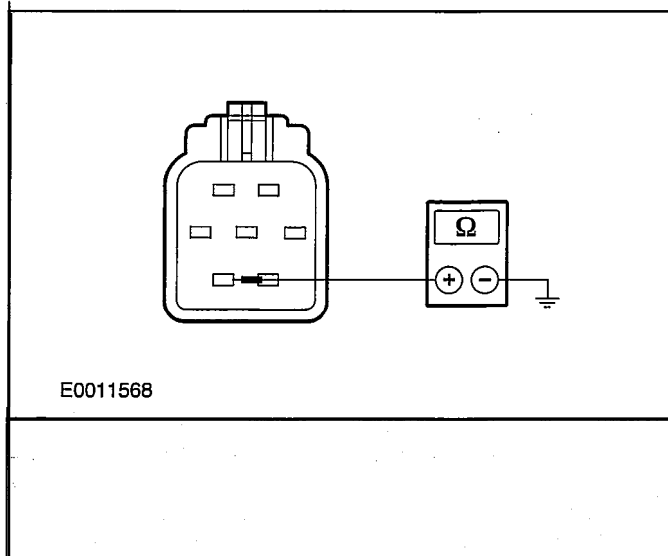
- ☐ SWITCH ON dipped beam

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSIREULTSIACCTIONS
	4 Measure the voltage between fuse F10 (10 A) (CJB) and ground. Does the meter display battery voltage? → Yes GO to E8. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F10 (10 A) (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.
E8: CHECK THE VOLTAGE SUPPLY TO THE RIGHT-HAND HEADLAMP FOR OPEN CIRCUIT	
	1 Ignition switch in position 0. 2 Disconnect Right-hand headlamp from connector C422. 3 Ignition switch in position II. 4 SWITCH ON dipped beam.
VFE0016224	Measure the voltage between the right-hand headlamp, connector C422, pin 2, circuit 15S-LE23 (GN/WH), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to E9. → No LOCATE and RECTIFY the break in the circuit between fuse F10 (CJB) and the right-hand headlamp using the Wiring Diagrams. CHECK the operation of the system.
E9: CHECK GROUND CONNECTION OF RIGHT-HAND HEADLAMP FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between right-hand headlamp, connector C422, pin 6, circuit 31 LE30 (BK), wiring harness side and ground.
 - Is a resistance of less than 2 ohms registered?
 - **Yes**
CHECK and if necessary RENEW the right-hand headlamp. CHECK the operation of the system.
 - **No**
LOCATE and RECTIFY the break in the circuit between the right-hand headlamp and soldered connection S11 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST M : ONE MAIN BEAM IS INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

F1: DETERMINE THE FAULT CONDITION

- 1 Ignition switch in position II.
- ☐ SWITCH ON main beam.
- 3 Determine the fault condition.
 - Is the left-hand main beam inoperative?
 - **Yes**
GO to F2.
 - **No**
The right-hand main beam is inoperative: GO to F6.

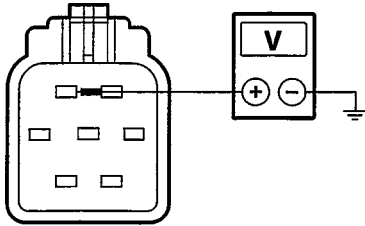
F2: CHECK FUSE F52 (10 A) (CJB).

- 1 Ignition switch in position 0.
- 2 CHECK fuse F52 (10 A) (CJB).
 - Is the fuse OK.?
 - **Yes**
GO to F3.
 - **No**
RENEW fuse F52 (10 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

F3: CHECK THE VOLTAGE SUPPLY TO FUSE F52 (10A) (CJB) FOR OPEN CIRCUIT

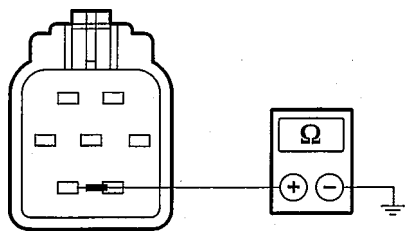
- 1 Connect fuse F52 (10 A) (CJB).
- ☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 SWITCH ON main beam. 4 Measure the voltage between fuse F52 (10 A) (CJB) and ground. • Does the meter display battery voltage? → Yes GO to F4. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F52 (10 A) (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.
F4: CHECK THE VOLTAGE SUPPLY TO THE LEFT-HAND HEADLAMP FOR OPEN CIRCUIT	
	1 Ignition switch in position 0. 2 Disconnect left-hand headlamp from connector C416. 3 Ignition switch in position II. 4 SWITCH ON main beam.
 E0011505	5 Measure the voltage between the left-hand headlamp, connector C416, pin 1, circuit 15S-LE 15 (GN/BK), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to F5. → No LOCATE and RECTIFY the break in the circuit between fuse F52 (CJB) and the left headlamp using the Wiring Diagrams. CHECK the operation of the system.
F5: CHECK GROUND CONNECTION OF LEFT-HAND HEADLAMP FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0011568

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the left-hand headlamp, connector C416, pin 6, circuit 31-LE31 (BK), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
CHECK and if necessary INSTALL A NEW headlamp. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S10 using the Wiring Diagrams. CHECK the operation of the system.

F6: CHECK FUSE F53 (10 A) (CJB).

- 1 Ignition switch in position 0.
- 2 CHECK fuse F53 (10 A) (CJB).
- Is the fuse OK.?
- **Yes**
GO to F7.
- **No**
RENEW fuse F53 (10 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

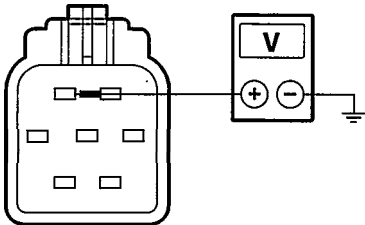
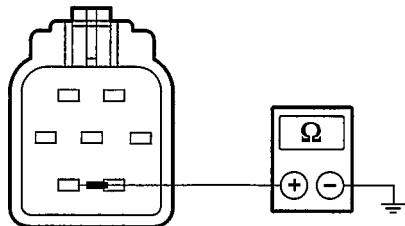
F7: CHECK THE VOLTAGE SUPPLY TO FUSE F53 (10A) (CJB) FOR OPEN CIRCUIT

- ☐ Connect fuse F53 (10 A) (CJB).
- 2 Ignition switch in position II.
- 3 SWITCH ON main beam.
- 4 Measure the voltage between fuse F53 (10 A) (CJB) and ground.
- Does the meter display battery voltage?
- **Yes**
GO to F8.
- **No**
LOCATE AND RECTIFY the break in the voltage supply of fuse F53 (10 A) (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.

F8: CHECK THE VOLTAGE SUPPLY TO THE RIGHT-HAND HEADLAMP FOR OPEN CIRCUIT

- 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E0011505	Disconnect Right-hand headlamp from connector C422.
	3 Ignition switch in position II. SWITCH ON main beam. Measure the voltage between the right-hand headlamp, connector C422, pin 1, circuit 15S-LE22 (GNIOG), wiring harness side and ground. - Does the meter display battery voltage? → Yes GO to F9. → No LOCATE and RECTIFY the break in the circuit between fuse F53 (CJB) and the right-hand headlamp using the Wiring Diagrams. CHECK the operation of the system.
F9: CHECK GROUND CONNECTION OF RIGHT-HAND HEADLAMP FOR OPEN CIRCUIT	
 E0011568	Ignition switch in position 0.
	Measure the resistance between right-hand headlamp, connector C422, pin 6, circuit 31-LE30 (BK), wiring harness side and ground. - Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary INSTALL A NEW headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S II using the Wiring Diagrams. CHECK the operation of the system.

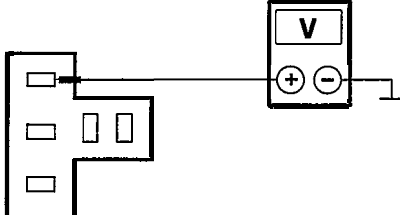
PINPOINT TEST N : THE HEADLAMPS ILLUMINATE CONTINUOUSLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: DETERMINE VEHICLE EQUIPMENT LEVEL	
	1 Determine vehicle equipment level. - Does the vehicle have automatic headlamps? → Yes GO to G9. → No GO to G2.

DIAGNOSIS AND TESTING

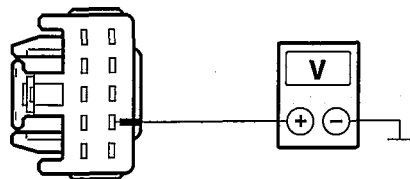
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G2: DETERMINE THE FAULT CONDITION	
	☐ 1 SWITCH OFF the headlamp switch.
	☐ Ignition switch in position II.
	☐ CHECK both headlamps.
	Is the main beam on continuously? → Yes GO to G16. → No Dipped beam permanently switched on: GO to G3;
G3: NARROW DOWN THE SOURCE OF THE SHORT TO BATTERY VOLTAGE	
	☐ Ignition switch in position 0.
	☐ 2 Disconnect dipped beam relay from socket C417.
	☐ 3 Ignition switch in position II.
	☐ 4 CHECK the dipped beam. Does the dipped beam illuminate? → Yes GO to G4. → No GO to G5.
G4: NARROW DOWN THE SOURCE OF THE SHORT TO BATTERY VOLTAGE	
	☐ 1 Ignition switch in position 0.
	☐ Disconnect fuse F9 (10 A) (CJB).
	☐ 3 Disconnect fuse F10 (10 A) (CJB).
	☐ 4 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
	5 CHECK the dipped beam. Is dipped beam illuminated on one side? → Yes - Left-hand dipped beam lit: LOCATE and RECTIFY the short to battery voltage in circuit 15s-LE16 (GN/OG), which is connected to the output of fuse F9 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. - Right-hand dipped beam lit: LOCATE and RECTIFY the short to battery voltage in circuit 15S-LE23 (GN/WH), which is connected to the output of fuse F10 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. → No LOCATE and RECTIFY short to battery voltage in circuit 15S-DB7 (GNNE) between dipped beam relay and CJB using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
G5: CHECK THE VOLTAGE AT THE DIPPED BEAM RELAY (CONTROL CIRCUIT)	
 VFE0033861	1 Measure the voltage between the dipped beam relay, socket C417, pin 1, circuit 15s-LE19 (GN/BU), CJB side and ground. Does the meter display battery voltage? → Yes GO to G6. → No INSTALL A NEW dipped beam relay. CHECK the operation of the system.
G6: CHECK CONTROL CIRCUIT 15S-LE19 (GN/BU) FOR SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0. 2 Disconnect steering column multifunction switch from connector C357. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016044

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between steering column multifunction switch, connector C357, pin 9, circuit 15s-LEI9 (GN/BU), wiring harness side and ground.

- Does the meter display battery voltage?

→ **Yes**

LOCATE and RECTIFY the short to battery voltage in the circuit between the steering column multifunction switch and the dipped beam relay using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to G7.

G7: CHECK THE HEADLAMP SWITCH

- 1 Ignition switch in position 0.

- 2 Disconnect headlamp switch from connector C338.

- 3 Connect Steering column multifunction switch to connector C357.

a Connect Dipped beam relay to socket C417.

- 5 Ignition switch in position II.

- 6 CHECK the dipped beam.

- Does the dipped beam illuminate?

→ **Yes**

- Vehicles without automatic headlamps: LOCATE and RECTIFY short to battery voltage in circuit 15s-LEI4 (GNIRD) between headlamp switch and steering column multifunction switch using the Wiring Diagrams. CHECK the operation of the system.
- Vehicles with automatic headlamps: GO to G8.

→ **No**

INSTALL A NEW headlamp switch. CHECK the operation of the system.

G8: CHECK THE GENERIC ELECTRONIC MODULE (GEM).

- 1 Ignition switch in position 0.

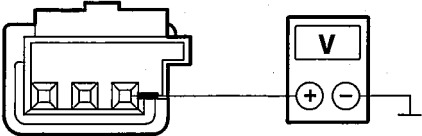
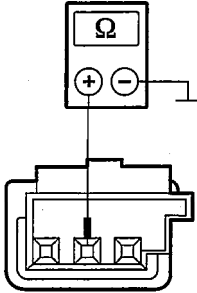
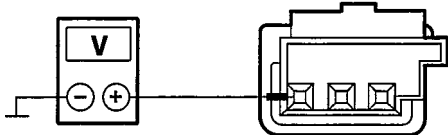
- 2 Disconnect Generic electronic module (GEM) from connector C320.

- 3 Ignition switch in position II.

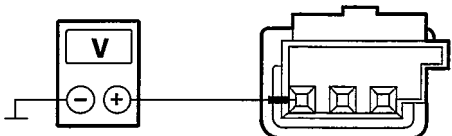
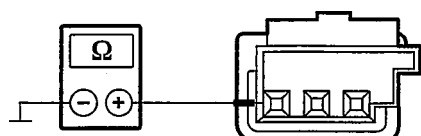
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK the dipped beam. Does the dipped beam illuminate? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to the headlamp switch, connector C338, pin 6 using the Wiring Diagrams. CHECK the operation of the system. → No RENEW the generic electronic module (GEM). CHECK the operation of the system.
G9: DETERMINE THE FAULT CONDITION	
NOTE: Light up the rain sensor so that the automatic headlamps do not respond.	
	☐ Ignition switch in position II. ☐ 2 Move the headlamp switch to the automatic headlamps and off positions in turn. ☐ 3 CHECK both headlamps in each position. Does the dipped beam illuminate continuously when the headlamp switch is in the off position? → Yes GO to G3. → No Dipped beam illuminates continuously when the automatic headlamps are SWITCHED ON: GO to G10.
G10: CHECK VOLTAGE SUPPLY OF RAIN SENSOR FOR OPEN CIRCUIT	
	☐ 1 Ignition switch in position 0. ☐ Disconnect Rain sensor from connector C754. ☐ Ignition switch in position II.

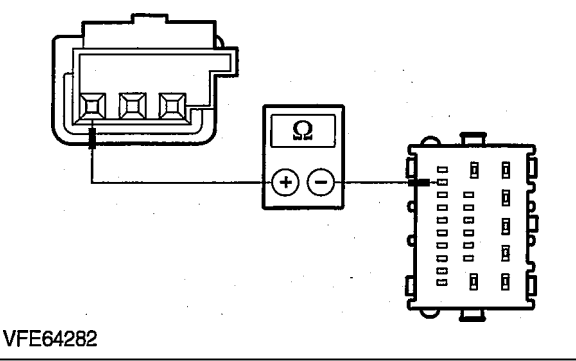
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0038444	☐ Measure the voltage between the rain sensor, connector C754, pin 1, circuit 15-LE55 (GN/OG), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to G11. → No LOCATE and RECTIFY break in circuit between soldered connection S3 and the rain sensor using the Wiring Diagrams. CHECK the operation of the system.
G11: CHECK THE GROUND CONNECTION OF THE RAIN SENSOR FOR OPEN CIRCUIT	
 VFE0038446	1 Ignition switch in position 0. 2 Measure the resistance between the rain sensor, connector C754, pin 2, circuit 31-LE55 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes GO to G12. → No LOCATE and RECTIFY break in circuit between rain sensor and soldered connection S264 using the Wiring Diagrams. CHECK the operation of the system.
G12: NARROW DOWN THE SOURCE OF THE SHORT TO BATTERY VOLTAGE	
 VFE0038449	1 Ignition switch in position II. ☐ Measure the voltage between the rain sensor, connector C754, pin 3, circuit 8-LE55 (WH/BK), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to G13. → No GO to G14.
G13: CHECK SIGNAL CABLE OF RAIN SENSOR FOR SHORT TO BATTERY VOLTAGE	
	☐ Ignition switch in position 0. 2 Disconnect Generic electronic module (GEM) from connector C316.

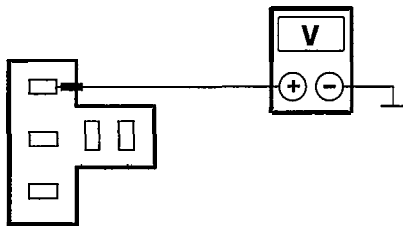
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0038449	3 Ignition switch in position II. Measure the voltage between the rain sensor, connector C754, pin 3, circuit 8-LE55 (WH/BK), wiring harness side and ground. Does the meter display battery voltage? → Yes LOCATE and RECTIFY the short to battery voltage in the circuit between the generic electronic module (GEM) and the rain sensor using the Wiring Diagrams. CHECK the operation of the system. → No RENEW the generic electronic module (GEM). CHECK the operation of the system.
G14: CHECK SIGNAL CABLE OF RAIN SENSOR FOR SHORT TO GROUND	
 VFE64515	1 Ignition switch in position 0. 2 Measure the resistance between the rain sensor, connector C754, pin 3, circuit 8-LE55 (WH/BK), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes GO to G15. → No LOCATE and RECTIFY the short to ground in the circuit between CJB and the rain sensor using the Wiring Diagrams. CHECK the operation of the system.

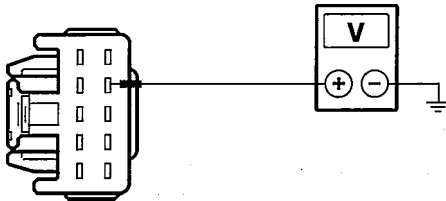
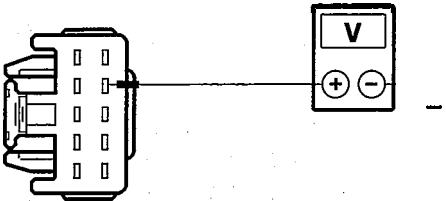
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G15: CHECK SIGNAL CABLE OF RAIN SENSOR FOR OPEN CIRCUIT	
 VFE64282	1 Measure the resistance between the generic electronic module (GEM), connector C316, pin 22, circuit 8-LE55 (WHIBK), wiring harness side and the rain sensor, connector C754, pin 3, circuit 8-LE55 (WHIBK), wiring harness side. • Is a resistance of less than 2 ohms registered? → Yes RENEW the rain sensor. CHECK the operation of the system. If the concern remains, RENEW the generic electronic module (GEM). CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the rain sensor using the Wiring Diagrams. CHECK the operation of the system.
G16: NARROW DOWN THE SOURCE OF THE SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0. 2 Disconnect main beam relay from socket C411. 3 Ignition switch in position II. 4 CHECK the main beam. • Does the main beam illuminate? → Yes GO to G17. → No GO to G18.
G17: NARROW DOWN THE SOURCE OF THE SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0. 2 Disconnect fuse F52 (10 A) (CJB). ☐ Disconnect fuse F53 (10 A) (CJB). 4 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
	5 CHECK the main beam. - Does the main beam illuminate on one side? → Yes - left-hand main beam illuminates: LOCATE and RECTIFY the short to battery voltage in circuit 15S-LE15 (GN/BK), which is connected to the output of fuse F52 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. - Right-hand main beam lit: LOCATE and RECTIFY the short to battery voltage in circuit 15S-LE22 (GN/OG), which is connected to the output of fuse F53 (10 A) (CJB), using the Wiring Diagrams. CHECK the operation of the system. → No LOCATE and RECTIFY short to battery voltage in circuit 15S-DB6 (GN/WH) between main beam relay and CJB using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
G18: CHECK THE VOLTAGE AT THE MAIN BEAM RELAY (CONTROL CIRCUIT)	
 VFE0033861	1 Measure the voltage between the main beam relay, socket C411, pin 1, circuit 15S-LE12 (GNNE), CJB side and ground. Does the meter display battery voltage? → Yes GO to G19. → No INSTALL A NEW main beam relay. CHECK the operation of the system.
G19: CHECK CONTROL CIRCUIT 15S-LE12 (GNNE) FOR SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect steering column multifunction switch from connector C357.
	3 Ignition switch in position II.

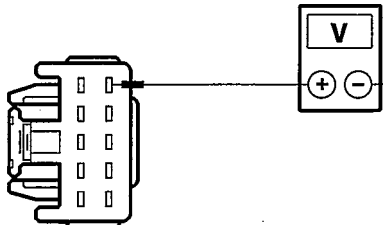
DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
 VFE0002214		4 Measure the voltage between the steering column multifunction switch, connector C357, pin 7, circuit 15S-LE12A (GNNE), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to G20. → No INSTALL a new steering column multifunction switch. CHECK the operation of the system.
G20: CHECK INSTRUMENT CLUSTER		
		1 Ignition switch in position 0. 2 Disconnect Instrument cluster from connector C332. 3 Ignition switch in position II.
 VFE0002214		4 Measure the voltage between the steering column multifunction switch, connector C357, pin 7, circuit 15S-LE12A (GNNE), wiring harness side and ground. • Does the meter display battery voltage? → Yes LOCATE and RECTIFY short to battery voltage in the circuits connected to soldered connection S274 using the Wiring Diagrams. CHECK the operation of the system. → No INSTALL a new instrument cluster. CHECK the operation of the system. REFER to: Instrument Cluster - Vehicles Built From: 1012005 (413-01, Diagnosis and Testing).

PINPOINT TEST O : THE HEADLAMP FLASHER IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position II.
	2 Determine the fault condition.

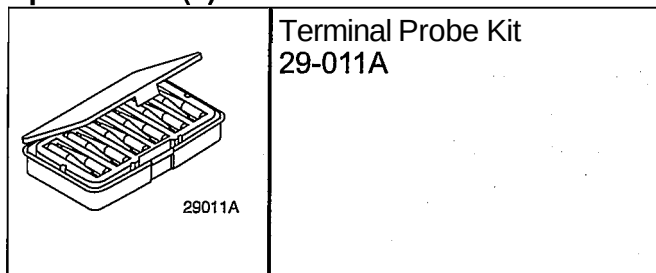
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ SWITCH ON main beam. Is the main beam on continuously? → Yes GO to H2. → No GO to Pinpoint Test D.
H2: CHECK THE STEERING COLUMN MULTIFUNCTION SWITCH	
	☐ 1 Ignition switch in position 0. ☐ 2 Disconnect steering column multifunction switch from connector C357. ☐ 3 Ignition switch in position II.
 VFE0016037	☐ 4 Measure the voltage between the steering column multifunction switch, connector C357, pin 6, circuit 15-LEI4 (GN/RD), wiring harness side and ground. Does the meter display battery voltage? → Yes INSTALL a new steering column multifunction switch. CHECK the operation of the system. → No LOCATE and REPAIR the open circuit between the headlamp switch and the steering column multifunction switch using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Stoplamps

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical (or mechanical) damage.

Visual Inspection

Mechanical	Electrical
• Stop lamp switch adjustment	• Fuse(s) • Lamp(s) • Connector(s) • Switches • Wiring loom

Inspection and Checking

NOTE:Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

NOTE:If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to: (418-00)

Communications Network - Vehicles Built Up
To: 1012005 (Diagnosis and Testing),
Communications Network - Vehicles Built From:
1012005 (Diagnosis and Testing).

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Stop lamps are inoperative	Fuse • Circuit(s) • Stop lamp switch • Central junction box (CJB)	• GO to Pinpoint Test A.
• One or more stop lamps are inoperative	Circuit(s) • Left/right-hand rear lamp assembly • Additional high-mounted stop lamp	• GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Stop lamps illuminate continuously	- Circuit(s) - Stop lamp switch - Anti-lock brake system module (ABS) - Electronic stability program (ESP) module - Transmission control module (TCM) (vehicles with automatic clutch and gearshift actuation) - Transmission selector lever assembly - Trailer control unit - Powertrain control module (PCM)	GO to Pinpoint Test C.

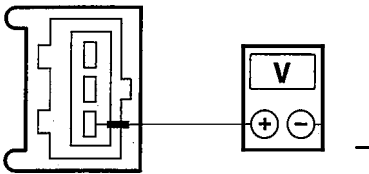
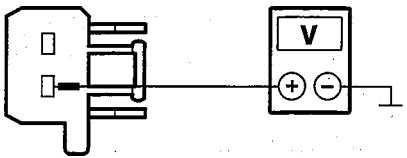
System Checks

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST P : STOP LAMPS ARE INOPERATIVE

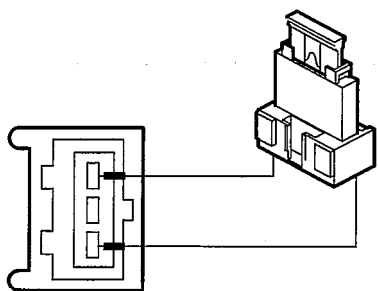
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FUSE F45 (15 A) (CJB).	
	- Ignition switch in position 0. - Disconnect fuse F45 (15 A) (CJB). - CHECK fuse F45 (15 A) (CJB). - Is the fuse OK? → Yes GO to A2. → No RENEW fuse F45 (15 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE SUPPLY TO FUSE F45 (15 A) (CJB)	
	- Connect fuse F45 (15 A) (CJB). - Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the voltage between fuse F45 (15 A) (CJB) and ground. Does the meter display battery voltage? → Yes GO to A3. → No LOCATE and RECTIFY the break in the voltage supply to fuse F45 (15 A) (CJB) using the Wiring Diagrams, if necessary CHECK and INSTALL A NEW CJB. CHECK the operation of the system.
A3: CHECK VOLTAGE AT STOP LAMP SWITCH	
	1 Ignition switch in position 0. 2 Disconnect stop lamp switch from connector C355. 3 Ignition switch in position II.
 VFE0007210	4 Vehicles built before 1012004: Measure the voltage between the stop lamp switch, connector C355, pin 1, circuit 15-LG23 (GNNVH), wiring harness side and ground.
 VFE0033865	☐ Vehicles built from 1012004: Measure the voltage between the stop lamp switch, connector C355, pin 1, circuit 15-LG23 (GNNVH), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to A4. → No LOCATE and RECTIFY the break in circuit 15-LG23 (GN/WH) between fuse F45 (15 A) (CJB) and the stop lamp switch using the Wiring Diagrams. CHECK the operation of the system.
A4: EXCLUDE THE STOP LAMP SWITCH AS THE CAUSE OF THE FAULT	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

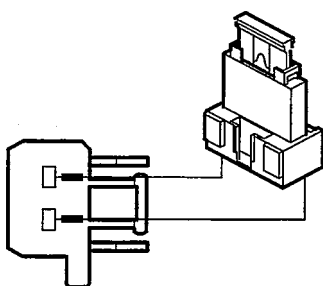
TEST CONDITIONS



VFE0014283

DETAILS/RESULTS/ACTIONS

- 2** Vehicles built before 10/12/2004: Connect a fused jumper wire (15 A) at the stop lamp switch, connector C355, between pin 1, circuit 15-LG23 (GNNVH) and pin 3, circuit 15S-DA12 (GNNVH), wiring harness side.



VFE0038423

- 3** Vehicles built from 10/12/2004: Connect a fused jumper wire (15 A) at the stop lamp switch, connector C355, between pin 1, circuit 15-LG23 (GNNVH) and pin 2, circuit 15S-DA12 (GNNVH), wiring harness side.

- 4** Ignition switch in position II.

- 5** CHECK the operation of the stop lamps.

- Do the stop lamps illuminate?

→ **Yes**

INSTALL A NEW stop lamp switch. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in circuit 15S-DA12 (GN/WH) between the stop lamp switch and soldered connection S12 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST Q : ONE OR MORE STOP LAMPS ARE INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

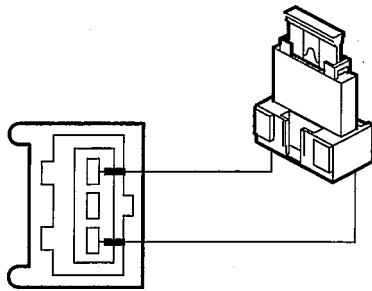
B1: DETERMINE THE FAULT CONDITION

- 1** Ignition switch in position 0.

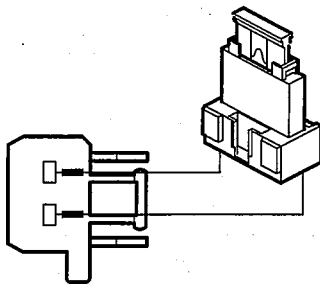
— Disconnect stop lamp switch from connector C355.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0014283



VFE0038423

DETAILS/RESULTS/ACTIONS

3 Vehicles built before 1012004: Connect a fused jumper wire (15 A) at the stop lamp switch, connector C355, between pin 1, circuit 15-LG23 (GNNVH) and pin 3, circuit 15S-DA12 (GNNVH), wiring harness side.

4 Vehicles built from 1012004: Connect a fused jumper wire (15 A) at the stop lamp switch, connector C355, between pin 1, circuit 15-LG23 (GNNVH) and pin 2, circuit 15S-DA12 (GNNVH), wiring harness side.

5 Ignition switch in position II.

6 DETERMINE the fault conditions.

7 CHECK the stop lamps.

- Is only one stop lamp inoperative?

→ **Yes**

- Left-hand stop lamp is inoperative: GO to B2.
- Right-hand stop lamp is inoperative: GO to B5.
- Additional high-mounted stop lamp is inoperative: GO to B8.

→ **No**

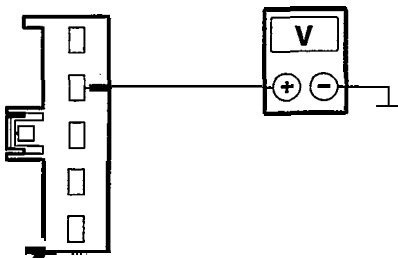
Left-hand stop lamp and additional high-mounted stop lamp inoperative: LOCATE and REPAIR the break in circuit 31-DA14 (BK) between soldered connection S24 and ground connection G17 using the Wiring Diagrams. CHECK the operation of the system.

B2: DETERMINE THE FAULT CONDITION

1 Ignition switch in position 0.

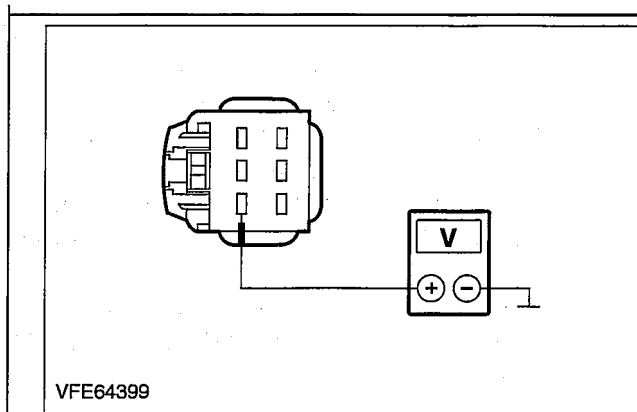
2 SWITCH ON parking lamps.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	CHECK left-hand rear parking lamp. Does the left-hand rear parking lamp illuminate? → Yes GO to B3. → No GO to B4.
B3: CHECK THE VOLTAGE SUPPLY TO THE LEFT-HAND STOP LAMP	
NOTE: The jumper wire used in the first step is still connected.	
	Ignition switch in position 0. Disconnect Left-hand rear lamp assembly. - Vehicles without trailer socket: from connector C333 - Vehicles with trailer socket: from connector C333a Ignition switch in position II.
 VFE0033868	Vehicles built before 0812005, measure voltage between: - Vehicles without trailer socket: left-hand rear lamp assembly, connector C333, pin 2, circuit 15S-LG14 (GN/RD), wiring harness side and ground. - Vehicles with trailer socket, vehicles built before 0312004: left-hand rear lamp assembly, connector C333a, pin 2, circuit (BWRD), wiring harness side and ground. - Vehicles with trailer socket, vehicles built after 0312004: left-hand rear lamp assembly, connector C333a, pin 2, circuit (GN), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- ☐ Vehicles built after 08/2005, measure voltage between:
- Vehicles without trailer socket: left-hand rear lamp assembly, connector C333, pin 3, circuit 15S-LG14 (GNIRD), wiring harness side and ground.
 - Vehicles with trailer socket: left-hand rear lamp assembly, connector C333a, pin 3, circuit (GN), wiring harness side and ground.

• Does the meter display battery voltage?

→ **Yes**

Check and if necessary RENEW the left-hand rear lamp assembly. CHECK the operation of the system.

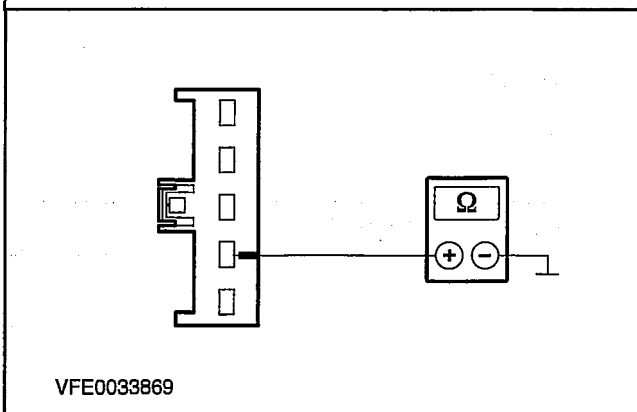
→ **No**

LOCATE and RECTIFY the break in the circuit(s) between soldered connection S12 and the left-hand rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.

B4: CHECK THE GROUND CONNECTION OF THE LEFT-HAND REAR LAMP ASSEMBLY

1 Ignition switch in position 0.

- ☐ Disconnect Left-hand rear lamp assembly.
- Vehicles without trailer socket: from connector C333
 - Vehicles with trailer socket: from connector C333a

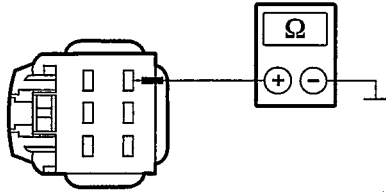


Measure the resistance between the left-hand rear lamp assembly, vehicles built before 08/2005:

- Vehicles without trailer socket: Connector C333, pin 4, circuit 31-LF23 (BK), wiring harness side and ground.
- Vehicles with 13-pin trailer socket, vehicles built after 03/2004: Connector C333a, pin 4, circuit (BN), wiring harness side and ground.
- All other vehicles with trailer socket: connector C333a, pin 4, circuit (GN), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE64389

DETAILS RESULTS ACTIONS

- 4** Measure the resistance between the left-hand rear lamp assembly, vehicles built after 08/12/2005:
- Vehicles without trailer socket: connector C333, pin 4, circuit 31-LF23 (BK), wiring harness side and ground.
 - Vehicles with 13-pin trailer socket: connector C333a, pin 4, circuit (BN), wiring harness side and ground.
 - All other vehicles with trailer socket: connector C333a, pin 4, circuit (GN), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
CHECK and if necessary RENEW the left-hand rear lamp assembly. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit(s) between the left-hand rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK the operation of the system.

B5: DETERMINE THE FAULT CONDITION

- 1** SWITCH ON parking lamps.
- 2** CHECK right-hand rear parking lamp.
- Does the right-hand rear parking lamp illuminate?
- **Yes**
GO to B6.
- **No**
GO to B7.

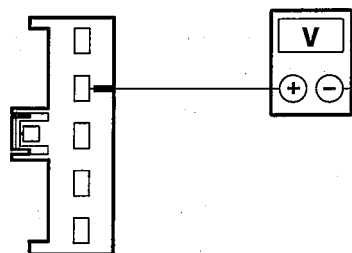
B6: CHECK THE VOLTAGE SUPPLY TO THE RIGHT-HAND STOP LAMP

NOTE: The jumper wire used in the first step is still connected.

- 1** Ignition switch in position 0.
- 2** Disconnect Right-hand rear lamp assembly.
- Vehicles without trailer socket: from connector C348
 - Vehicles with trailer socket: from connector C348a
- 3** Ignition switch in position II.

DIAGNOSIS AND TESTING

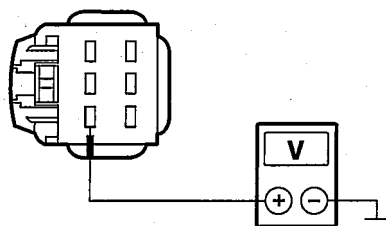
TEST CONDITIONS



VFE0033868

DETAILS/RESULTS/ACTIONS

- 4** Vehicles built before 08/12/2005, measure voltage between:
- Vehicles without trailer socket: right-hand rear lamp assembly, connector **C348**, pin 2, circuit **15S-LG21** (GNIBK), wiring harness side and ground.
 - Vehicles with trailer socket, built before 03/12/2004: right-hand rear lamp assembly, connector **C348a**, pin 2, circuit (GN), wiring harness side and ground.
 - Vehicles with trailer socket, built after 03/12/2004: right-hand rear lamp assembly, connector **C348a**, pin 2, circuit (BWRD), wiring harness side and ground.



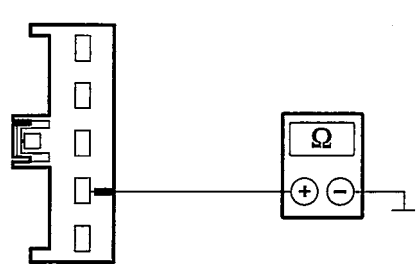
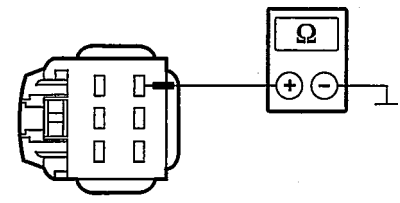
VFE64399

- 5** Vehicles built after 08/12/2005, measure voltage between:
- Vehicles without trailer socket: right-hand rear lamp assembly, connector **C348**, pin 3, circuit **15S-LG21** (GNIBK), wiring harness side and ground.
 - Vehicles with trailer socket: right-hand rear lamp assembly, connector **C348a**, pin 3, circuit (BWRD), wiring harness side and ground.
- Does the meter display battery voltage?
- **Yes**
CHECK and if necessary RENEW the right-hand rear lamp assembly. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit(s) between soldered connection S12 and the right-hand rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.

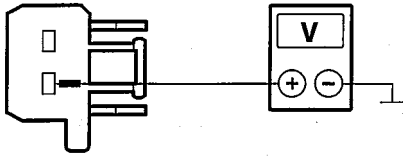
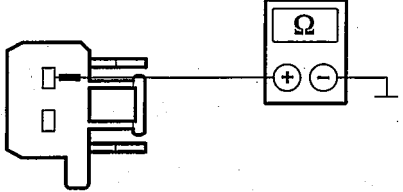
B7: CHECK THE GROUND CONNECTION TO THE RIGHT-HAND REAR LAMP ASSEMBLY

- 1** Ignition switch in position 0.
- 2** Disconnect Right-hand rear lamp assembly.
- Vehicles without trailer socket: from connector **C348**
 - Vehicles with trailer socket: from connector **C348a**

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033869	3 Measure the resistance between the right-hand rear lamp assembly, vehicles built before 0812005: – Vehicles without trailer socket: connector C348, pin 4, circuit 31-LF24 (BK), wiring harness side and ground. – Vehicles with trailer socket, built before 0312004: connector C348a, pin 4, circuit (BK), wiring harness side and ground. – Vehicles with trailer socket, built after 0312004: connector C348a, pin 4, circuit (BN), wiring harness side and ground.
 VFE64389	4 Measure the resistance between the right-hand rear lamp assembly, vehicles built after 0812005: – Vehicles without trailer socket: connector C348, pin 4, circuit 31-LF24 (BK), wiring harness side and ground. – Vehicles with trailer socket: connector C348a, pin 4, circuit (BN), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the right-hand rear lamp assembly. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit(s) between the right-hand rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
B8: CHECK THE VOLTAGE TO THE ADDITIONAL HIGH-MOUNTED STOP LAMP	
NOTE: The jumper wire used in the first step is still connected.	
	☐ Ignition switch in position 0.
	☐ Disconnect Additional high-mounted stop lamp from connector C550.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033865	4 Measure the voltage between the additional high-mounted stop lamp, connector C550, pin 1: – Vehicles without anti-theft alarm system: circuit 15S-LG6 (GNNE), wiring harness side and ground. – Vehicles with anti-theft alarm system: circuit 31-LG6S (BK), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to B9. → No LOCATE and RECTIFY the break in the circuit(s) between soldered connection S12 and the additional high-mounted stop lamp using the Wiring Diagrams. CHECK the operation of the system.
B9: CHECK GROUND CONNECTION OF ADDITIONAL HIGH-MOUNTED STOP LAMP	
 VFE0033866	1 Ignition switch in position 0. 2 Measure the resistance between the additional high-mounted stop lamp, connector C550, pin 2, circuit 31-LG6 (BK), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the additional high-mounted stop lamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the additional high-mounted stop lamp and soldered connection S201 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST R : STOP LAMPS ILLUMINATE CONTINUOUSLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: EXCLUDE THE STOP LAMP SWITCH AS THE CAUSE OF THE FAULT	
	☐ Ignition switch in position 0.
	2 Disconnect stop lamp switch from connector C355.
	☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 CHECK the stop lamps. - Do the stop lamps illuminate continuously? → Yes - Vehicles with manual transmission: GO to C4. - Vehicles with 4-speed automatic transmission (AW81-40-LE): GO to C2. - Vehicles with Durashift EST GO to C3. → No INSTALL A NEW stop lamp switch. CHECK the operation of the system.
C2: RULE OUT TRANSMISSION SELECTOR LEVER ASSEMBLY AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect fuse F33 (7.5 A) (CJB).
	3 Ignition switch in position II.
	CHECK the stop lamps. Do the stop lamps illuminate continuously? → Yes GO to C4. → No INSTALL A NEW transmission selector lever assembly. CHECK the operation of the system.
C3: RULE OUT THE TRANSMISSION CONTROL MODULE (TCM) AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect Fuse. - Vehicles built before 0812005: F41 (7.5 A) (CJB) - Vehicles built after 0812005: F40 (7.5 A) (CJB)
	3 Disconnect fuse FB (60 A) (BJB).
	Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 CHECK the stop lamps. • Do the stop lamps illuminate continuously? → Yes GO to C4. → No CHECK the transmission control unit (TCM) using WDS and INSTALL A NEW ONE if necessary. CHECK the operation of the system.
C4: DETERMINE THE MODEL VARIANT	
	Ignition switch in position 0.
	2 Connect following components. – Vehicles with 4-speed automatic transmission (AW81-40-LE): fuse F33 (7.5 A) (CJB) – Vehicles with Durashift EST, built before 0812005: fuse F41 (7.5 A) (CJB) – Vehicles with Durashift EST, built after 0812005: fuse F40 (7.5 A) (CJB) – Vehicles with Durashift EST fuse FB (60 A) (BJB)
	3 DETERMINE the model variant. • Is the vehicle fitted with an anti-lock brake system (ABS) or electronic stability program (ESP)? → Yes GO to C5. → No GO to C6.
C5: ELIMINATE THE ABS MODULE/ESP MODULE AS CAUSE FOR THE SHORT TO BATTERY VOLTAGE	
	Disconnect fuse F5 (20 A) (CJB).
	2 Disconnect fuse F6 (30 A) (CJB).
	Disconnect fuse F37 (3 A) (CJB).
	4 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 CHECK the stop lamps. Do the stop lamps illuminate continuously? → Yes GO to C6. → No CHECK the ABS module/ESP module using WDS and RENEW if necessary. REFER to: Anti-Lock Control (206-09A, Diagnosis and Testing), Anti-Lock Control - Traction Control (206-09B, Diagnosis and Testing), Anti-Lock Control - Stability Assist (206-09C, Diagnosis and Testing). CHECK operation of system.
C6: DETERMINE THE MODEL VARIANT	
	1 Ignition switch in position 0.
	2 Connect fuse F5 (20 A) (CJB).
	3 Connect fuse F6 (30 A) (CJB).
	☐ Connect fuse F37 (3 A) (CJB).
	5 DETERMINE the model variant. Is the vehicle equipped with a trailer socket? → Yes GO to C7. → No GO to C8.
C7: RULE OUT TRAILER CONTROL UNIT AS CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Disconnect following components. - Vehicles built before 1012002: fuse F31 (20 A) (CJB) - Vehicles built from 1012002 to 1012004: fuse F56 (20 A) (CJB) - Vehicles built from 1012004: fuse F3 (20 A) (CJB)
	2 Ignition switch in position II.

DIAGNOSIS AND TESTING

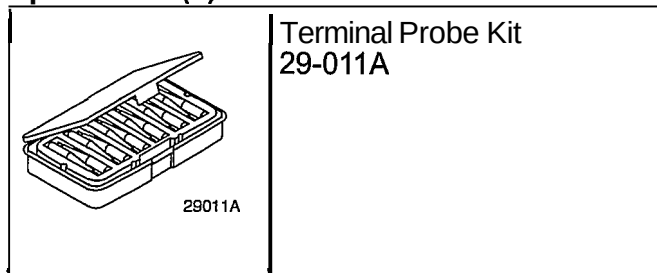
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☒ 3 CHECK the stop lamps. Do the stop lamps illuminate continuously? → Yes GO to C8. → No INSTALL A NEW trailer control unit. CHECK the operation of the system.
C8: RULE OUT THE POWERTRAIN CONTROL MODULE (PCM) AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	☒ 1 Ignition switch in position 0.
	☒ 2 Connect following components. - Vehicles built before 1012002: fuse F31 (20 A) (CJB) - Vehicles built from 1012002 to 1012004: fuse F56 (20 A) (CJB) - Vehicles built from 1012004: fuse F3 (20 A) (CJB)
	☒ 3 Disconnect Powertrain control module. 1.25L 1.4L 1.6L Duratec-I6V (Sigma): from connector C343 1.4L Duratorq-TDCi (DV): from connector C371 1.6L Duratorq-TDCi (DV): from connector C384 2.0L Duratec-ST (MI4) from connector C380
	☐ Ignition switch in position II.
	☐ CHECK the stop lamps. Do the stop lamps illuminate continuously? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S12 using the Wiring Diagrams. CHECK the operation of the system. → No CHECK the PCM module using WDS, INSTALL A NEW ONE if necessary. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Turn Signal and Hazard Lamps

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)



Inspection and Checking

NOTE:Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

NOTE:If the generic electronic module (GEM) is changed, the new one must be configured. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to:

Module Configuration (418-01, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built Up To: I012005 (419-10, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built From: I012005 (419-10, Diagnosis and Testing).

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection

Electrical
• Fuse(s) • Lamp(s) • Connector(s). • Switches • Wiring loom • Trailer control unit

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• All turn signal lamps inoperative/flash continuously/illuminate continuously	• Circuit(s) • Fuse(s) • Turn signal switch • Central junction box (CJB) • Generic Electronic Module (GEM)	• GO to Pinpoint Test A.
• Onelseveral turn signal lamps are inoperative	• Circuit(s) • Headlamp • Turn signal lamp (side) • Left/right-hand rear lamp assembly • Trailer control unit	• GO to Pinpoint Test B.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• One or more turn signal lamps flash continuously:	• Circuit(s) • Headlamp • Turn signal lamp (side) • Left/right-hand rear lamp assembly • Trailer control unit	• GO to Pinpoint Test C.
• One/several turn signal lamps illuminate continuously	• Circuit(s) • Headlamp • Turn signal lamp (side) • Left/right-hand rear lamp assembly • Trailer control unit	• GO to Pinpoint Test D.
• The hazard warning system is not working properly.	• Circuit(s) • Fuse(s) • Hazard warning lamp switch • Central junction box (CJB) • Generic Electronic Module (GEM)	• GO to Pinpoint Test E.

System Check

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST S : ALL TURN SIGNAL LAMPS INOPERATIVE/FLASH CONTINUOUSLY/ILLUMINATE CONTINUOUSLY

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
A1: CHECK FUSE F24 (20 A) (CJB).			
	1	Ignition switch in position 0.	
	2	Disconnect Fuse F24 (20 A) (CJB).	
	3	CHECK Fuse F24 (20 A) (CJB).	
		• Is the fuse OK.?	
		→ Yes	GO to A2.
		→ No	RENEW fuse F24 (20 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE SUPPLY TO FUSE F24 (20A) (CJB) FOR OPEN CIRCUIT			
	1	Connect Fuse F24 (20 A) (CJB).	
	2	Ignition switch in position II.	

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
	3 Measure the voltage between fuse F24 (20 A) (CJB) and ground. Is battery voltage measured? → Yes GO to A3. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F24 (20 A) (CJB) using the Wiring Diagrams. CHECK and RENEW the CJB if necessary. CHECK the operation of the system.
A3: CHECK FUSE F25 (15 A) (CJB).	
	☐ Ignition switch in position 0. ☐ Disconnect fuse F25 (15 A) (CJB). 3 CHECK fuse F25 (15 A) (CJB). Is the fuse OK.? → Yes GO to A4. → No RENEW fuse F25 (15 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A4: CHECK THE VOLTAGE SUPPLY TO FUSE F25 (15A) (CJB) FOR OPEN CIRCUIT	
	1 Connect fuse F25 (15 A) (CJB). 2 Ignition switch in position II. 3 Measure the voltage between fuse F25 (15 A) (CJB) and ground. Is battery voltage measured? → Yes GO to A5. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F25 (15 A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.
A5: CHECK FUSE F27 (CJB).	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

- 2** Disconnect fuse F27 (CJB).
- Vehicles built before 0112004: 10 A
 - Vehicles built from 0112004: 15 A

- 3** CHECK fuse F27 (CJB).
- Vehicles built before 0112004: 10 A
 - Vehicles built from 0112004: 15 A
- Is the fuse OK.?
- **Yes**
GO to A6.
- **No**
RENEW fuse F27 (10 A or 15 A) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

A6: CHECK THE VOLTAGE SUPPLY TO FUSE F27 (CJB) FOR OPEN CIRCUIT

- ☐ Connect fuse F27 (CJB).
- Vehicles built before 0112004: 10 A
 - Vehicles built from 0112004: 15 A

- 2** Ignition switch in position II.

- 3** Measure the voltage between fuse:
- Vehicles built before 0112004: F27 (10 A) (CJB) and ground.
 - Vehicles built from 0112004: F27 (15 A) (CJB) and ground.
- Is battery voltage measured?
- **Yes**
GO to A7.
- **No**
LOCATE and RECTIFY the break in the voltage supply to fuse F27 (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.

A7: CHECK FUSE F38 (7.5 A) (CJB).

- ☐ Ignition switch in position 0.

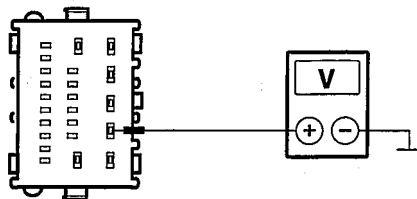
- 2** Disconnect fuse F38 (7.5 A) (CJB).

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK fuse F38 (7.5 A) (CJB). Is the fuse OK.? → Yes GO to A8. → No RENEW fuse F38 (7.5 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A8: CHECK THE VOLTAGE SUPPLY TO FUSE F38 (7.5 A) (CJB) FOR OPEN CIRCUIT	
	☐ 1 Connect fuse F38 (7.5 A) (CJB).
	☐ 2 Ignition switch in position II.
	☐ 3 Measure the voltage between fuse F38 (7.5 A) (CJB) and ground. Is battery voltage measured? → Yes GO to A9. → No LOCATE AND RECTIFY the break in the voltage supply to fuse F38 (7.5 A) (CJB) using the Wiring Diagrams. If necessary CHECK and RENEW the CJB. CHECK the operation of the system.
A9: CHECK THE VOLTAGE SUPPLY TO THE GENERIC ELECTRONIC MODULE (GEM)	
	☐ 1 Ignition switch in position 0.
	☐ 2 Disconnect Generic electronic module (GEM) from connector C318.
	☐ 3 Disconnect Generic electronic module (GEM) from connector C319.
	☐ 4 Ignition switch in position II.

DIAGNOSIS AND TESTING

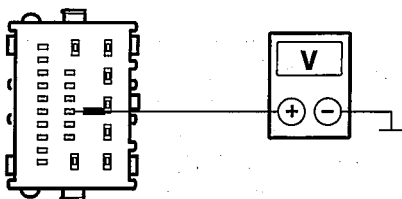
TEST CONDITIONS



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DETAILS/RESULTS/ACTIONS

- 5 Measure the voltage between the generic electronic module (GEM), connector C318, pin 2, circuit 29-AA80 (OG/WH), wiring harness side and ground.



VFE0028650

- 6 Measure the voltage between the generic electronic module (GEM), connector C319, pin 10, circuit 15-DK20 (GN/OG), wiring harness side and ground.

- Is battery voltage measured in all cases?

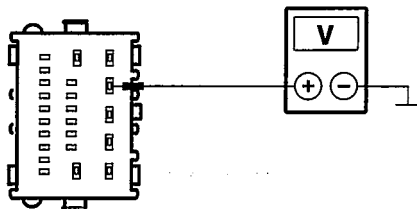
→ Yes

- Vehicles built before 0812005: GO to A10.
- Vehicles built from 0812005: GO to A11.

→ No

LOCATE and RECTIFY the break in the relevant circuit between the fuse and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.

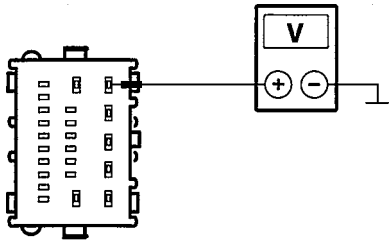
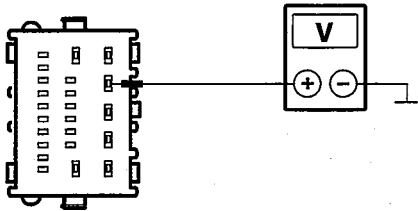
A10: CHECK VOLTAGE SUPPLY TO THE GENERIC ELECTRONIC MODULE (GEM), VEHICLES BUILT BEFORE 0812005



VFE0028519

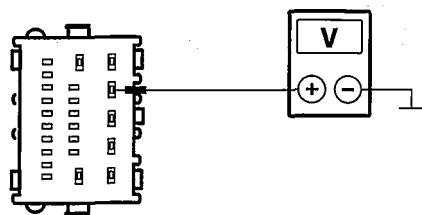
- 1 Measure the voltage between the generic electronic module (GEM), connector C318, pin 4, circuit 29-LG26 (OG), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0029403	2 Measure the voltage between the generic electronic module (GEM), connector C319, pin 5, circuit 29-GJ8 (OG), wiring harness side and ground. Is battery voltage measured in all cases? → Yes GO to A12. → No LOCATE and RECTIFY the break in the relevant circuit between the fuse and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.
A II : CHECK VOLTAGE SUPPLY TO THE GENERIC ELECTRONIC MODULE (GEM), VEHICLES BUILT FROM 0812005	
	1 Ignition switch in position 0.
	☐ Disconnect Generic electronic module (GEM) from connector C316.
	3 Disconnect Generic electronic module (GEM) from connector C317.
	4 Ignition switch in position II.
 VFE0028519	5 Measure the voltage between the generic electronic module (GEM), connector C316, pin 4, circuit 29-LG26 (OG), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028519

DETAILS/RESULTS/ACTIONS

- 6 Measure the voltage between the generic electronic module (GEM), connector C317, pin 4, circuit 29-GJ8 (OG), wiring harness side and ground.

- Is battery voltage measured in all cases?

→ Yes

GO to A12.

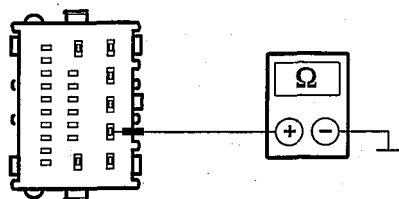
→ No

LOCATE and RECTIFY the break in the relevant circuit between the fuse and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.

A12: CHECK THE GROUND CONNECTION OF THE GENERIC ELECTRONIC MODULE (GEM).

- 1 Ignition switch in position 0.

- 2 Disconnect Generic electronic module (GEM) from connector C320.



VFE0028651

- 3 Measure the resistance between the generic electronic module (GEM), connector C320, pin 2, circuit 91-DK20 (BWRD), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

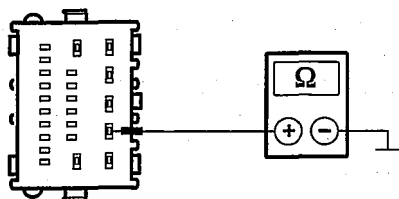
→ Yes

GO to A13.

→ No

LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and ground connection G14 using the Wiring Diagrams. CHECK the operation of the system.

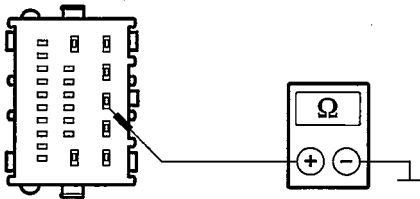
A13: CHECK THE GROUND CONNECTION OF THE GENERIC ELECTRONIC MODULE (GEM).



VFE0028651

- 1 Vehicles built before 08/12/2005: Measure the resistance between the generic electronic module (GEM), connector C316, pin 2, circuit 31-DK20 (BK), wiring harness side and ground.

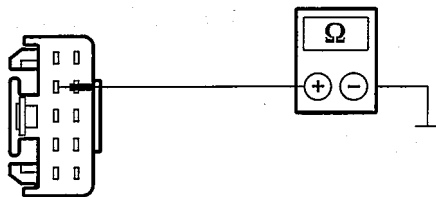
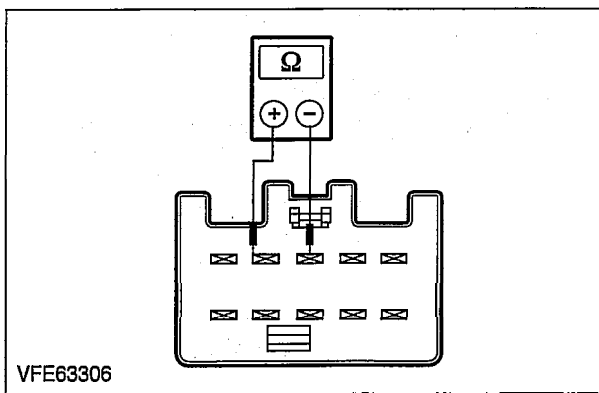
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0038372	2 Vehicles built from 0812005: Measure the resistance between the generic electronic module (GEM), connector C318, pin 3, circuit 31-DK20 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes GO to A14. → No LOCATE and RECTIFY the break in the circuit between generic electronic module (GEM) and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.
A14: DETERMINE THE FAULT CONDITION	
	1 Connect Generic Electronic Module (GEM). - Vehicles built before 0812005: to connectors C316, C318, C319 and C320 - Vehicles built from 0812005: to connectors C316, C317, C318, C319 and C320 2 Ignition switch in position II. 3 Switch off the turn signals. ☐ CHECK the turn signal lamps. - Do all turn signal lamps on the left and right-hand side illuminate continuously? → Yes RENEW the generic electronic module (GEM). CHECK the operation of the system. → No - All turn signal lamps are inoperative: GO to A15. - All turn signal lamps flash continuously: GO to A18.
A15: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position II. 2 CHECK the turn signal lamps. 3 Switch on LEFT-HAND TURN SIGNAL.

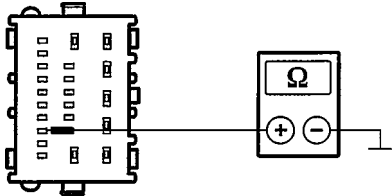
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS

	4 Switch on RIGHT-HAND TURN SIGNAL. Are all of the turn signal lamps inoperative? → Yes GO to A16. → No GO to Pinpoint Test B.
A16: CHECK GROUND CONNECTION OF TURN SIGNAL LAMP SWITCH FOR OPEN CIRCUIT	
	☐ Ignition switch in position 0. ☐ Disconnect Turn signal switch from connector C357.
 VFE0016129	☐ Measure the resistance between the turn signal switch, connector C357, pin 2, circuit 31-LG27 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes GO to A17. → No LOCATE and RECTIFY the break in the circuit between the turn signal switch and soldered connection S263 using the Wiring Diagrams. CHECK the operation of the system.
A17: EXCLUDE THE TURN SIGNAL SWITCH AS THE CAUSE OF THE FAULT	
 VFE63306	1 SWITCH ON the right-hand turn signal. ☐ Measure the resistance at the turn signal switch, connector C357 between pin 2, component side and pin 3, component side. Is a resistance of less than 2 ohms registered? → Yes RENEW the generic electronic module (GEM). CHECK the operation of the system. → No RENEW the turn signal switch. CHECK the operation of the system.
A18: CHECK THE HAZARD WARNING LAMP SWITCH	
	1 Ignition switch in position 0. 2 Disconnect Hazard warning lamp switch. - Vehicles built before 0812005: from connector C321 - Vehicles built from 0812005: from connector C341

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Ignition switch in position II. 4 CHECK the turn signal lamps. Do all turn signal lamps flash continuously? → Yes GO to A19. → No RENEW the hazard warning lamp switch. CHECK the operation of the system.
A19: CHECK CIRCUIT 31S-LG8 (BK/OG) FOR SHORT TO GROUND	
	1 Disconnect Generic electronic module (GEM) from connector C320.
 VFE0033867	2 Measure the resistance between the generic electronic module (GEM), connector C320, pin 16, circuit 31S-LG8 (BWOOG), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes RENEW the generic electronic module (GEM). CHECK the operation of the system. → No
	LOCATE AND RECTIFY the short to ground in the circuit between the hazard warning lamp switch and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.

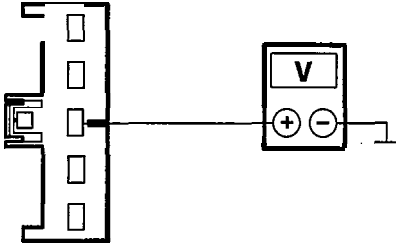
PINPOINT TEST T : ONE/SEVERAL TURN SIGNAL LAMPS ARE INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
BI: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position II.
	2 CHECK the turn signal lamps.
	☐ DETERMINE which turn signal lamp is inoperative.
	4 Switch on LEFT-HAND TURN SIGNAL.

DIAGNOSIS AND TESTING

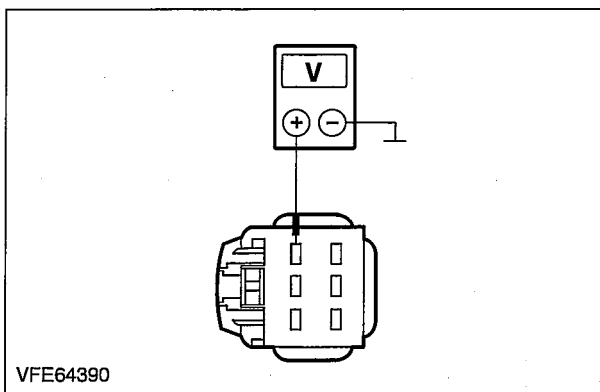
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 Switch on RIGHT-HAND TURN SIGNAL. - Is one left-hand turn signal lamp inoperative? → Yes - Left-hand (side) turn signal lamp and left-hand front turn signal lamp are inoperative: GO to B2. - Left-hand rear turn signal lamp is inoperative: GO to B3. - Left-hand rear turn signal lamp and right-hand rear turn signal lamp are inoperative, vehicles with trailer socket: GO to B7. - Left-hand front turn signal lamp is inoperative: GO to B11. - Left-hand (side) turn signal lamp is inoperative: GO to B12. → No - Right-hand (side) turn signal lamp and right-hand front turn signal lamp are inoperative: GO to B13. - Right-hand rear turn signal lamp is inoperative: GO to B14. - Right-hand front turn signal lamp is inoperative: GO to B18. - Right-hand (side) turn signal lamp is inoperative: GO to B19.
B2: CHECK GROUND CONNECTION OF LEFT-HAND FRONT TURN SIGNAL LAMPS FOR OPEN CIRCUIT	
	Ignition switch in position 0. 2 SWITCH ON the parking lamps. CHECK left-hand front parking lamp. Does the parking lamp illuminate? → Yes RENEW the generic electronic module (GEM). CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 31-DA1 (BK) between soldered connection S10 and ground connection G4 using the Wiring Diagrams. CHECK the operation of the system.
B3: CHECK THE GROUND CONNECTION OF THE LEFT-HAND REAR LAMP ASSEMBLY	
	Ignition switch in position 0. ☐ SWITCH ON the parking lamps.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 CHECK rear parking lamp. Does the parking lamp illuminate? → Yes GO to B4. → No - Vehicles without trailer socket: LOCATE and RECTIFY the break in circuit 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - Vehicles with 13-pin trailer socket, built from 0312004: LOCATE and RECTIFY the break in the circuit (BN) between the rear lamp assembly and soldered connection S1008 using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - All other vehicles with trailer socket: LOCATE and RECTIFY the break in circuit (GN) or 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
B4: CHECK VOLTAGE SUPPLY TO LEFT-HAND REAR LAMP ASSEMBLY	
	1 Disconnect Rear lamp assembly. - Vehicles without trailer socket: from connector C333 - Vehicles with trailer socket: from connector C333a 2 Ignition switch in position II. ☐ Switch on LEFT-HAND TURN SIGNAL.
 VFE0033870	4 Vehicles built before 0812005: Measure voltage between left-hand rear lamp assembly - Vehicles without trailer socket: connector C333, pin 3, circuit 49-LG12 (BU), wiring harness side and ground. - Vehicles with trailer socket: connector C333a, pin 3, circuit (GY/WH), wiring harness side and ground.

DIAGNOSIS AND TESTING

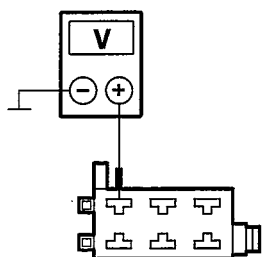
TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 5 Vehicles built from 0812005: Measure voltage between left-hand rear lamp assembly
- Vehicles without trailer socket: connector C333, pin 1, circuit 49-LG12 (BU), wiring harness side and ground.
 - Vehicles with trailer socket: connector C333a, pin 1, circuit (GY/WH), wiring harness side and ground.
- Does the meter display fluctuating battery voltage?
- **Yes**
- CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system.
- **No**
- Vehicles without trailer socket: LOCATE and REPAIR the break in circuit 49-LG12 (BU), between the generic electronic module (GEM) and the rear lamp assembly, using the Wiring Diagrams. CHECK and RENEW generic electronic module (GEM) if necessary. CHECK the operation of the system.
 - Vehicles with trailer socket: GO to B5.

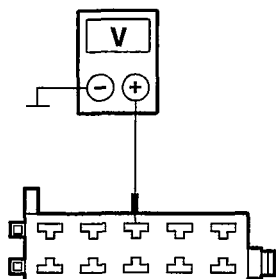
B5: CHECK THE CONTROL CIRCUIT 49-LG12 (BU) OR (WH) AT THE TRAILER CONTROL UNIT FOR OPEN CIRCUIT



- 1 Ignition switch in position 0.
- 2 Disconnect Trailer control unit.
- Vehicles built before 0312004: from connector C1030
 - Vehicles built from 0312004: from connector C1041
- 3 Ignition switch in position II.
- 4 Switch on LEFT-HAND TURN SIGNAL.
- 5 Vehicles built before 0312004: Measure the voltage between the trailer control unit, connector C1030, pin 1, circuit (WH), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

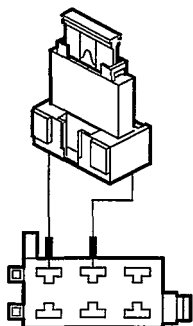


VFE63307

DETAILS/RESULTS/ACTIONS

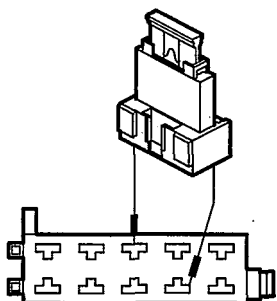
- 6 Vehicles built from 0312004: Measure the voltage between the trailer control unit, connector C1041, pin 5, circuit (WH), wiring harness side and ground.
- Does the meter display fluctuating battery voltage?
- **Yes**
GO to B6.
- **No**
LOCATE and RECTIFY the break in the circuit 49-LG12 (BU) or (WH) between generic electronic module (GEM) and the trailer control unit using the Wiring Diagrams. CHECK and RENEW generic electronic module (GEM) if necessary. CHECK the operation of the system.

B6: CHECK THE TRAILER CONTROL UNIT



VFE0033874

- ☐ Ignition switch in position 0.
- ☐ Vehicles built before 0312004: Connect a fused jumper wire (20 A) at the trailer control unit, connector C1030, between pin 1, circuit (WH) and pin 3, circuit (GY/WH), wiring harness side.
- ☐ Vehicles built from 0312004: Connect a fused jumper wire (20 A) at the trailer control unit, connector C1041, between pin 5, circuit (WH) and pin 8, circuit (GYNVH), wiring harness side.



VFE63308

- ☐ Ignition switch in position II.
- ☐ Switch on LEFT-HAND TURN SIGNAL.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	6 CHECK the left-hand rear turn signal lamp. Is the left-hand rear turn signal lamp operational? → Yes RENEW the trailer control unit. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit (GY/WH) between the trailer control unit and rear lamp assembly using the wiring diagrams. CHECK the operation of the system.
B7: CHECK FUSE	
	☐ Ignition switch in position 0. 2 Disconnect following components. - Vehicles built before 1012002: Fuse F31 (20 A) (CJB) - Vehicles built from 1012002 to 1012004: Fuse F56 (20 A) (CJB) - Vehicles built from 1012004: Fuse F3 (20 A) (CJB) 3 CHECK fuse F31, F56 or F3 (20 A) (CJB). - Is the fuse OK.? → Yes GO to B8. → No RENEW fuse F31 (20 A), F56 (20 A) or F3 (20 A) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
B8: CHECK VOLTAGE AT FUSE	
	Connect Fuse. - Vehicles built before 1012002: Fuse F31 (20 A) (CJB) - Vehicles built from 1012002 to 1012004: Fuse F56 (20 A) (CJB) - Vehicles built from 1012004: Fuse F3 (20 A) (CJB) 2 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between:
- Vehicles built before 1012002: Fuse F31 (20 A) (CJB) and ground.
 - Vehicles built from 1012002 to 1012004: Fuse F56 (20 A) (CJB) and ground.
 - Vehicles built from 1012004: Fuse F3 (20 A) (CJB) and ground.

• Does the meter display battery voltage?

→ **Yes**

GO to B9.

→ **No**

- Vehicles built before 1012002: RECTIFY the break in the voltage supply of fuse F31 (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.

- Vehicles built from 1012002 to 1012004: RECTIFY the break in the voltage supply of fuse F56 (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.

- Vehicles built from 1012004: RECTIFY the break in the voltage supply of fuse F3 (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.

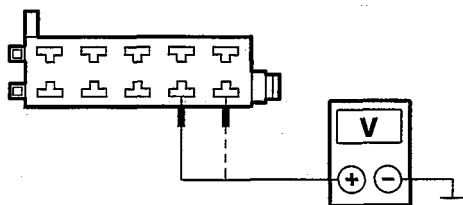
B9: CHECK THE VOLTAGE SUPPLY OF THE TRAILER CONTROL UNIT

☐ Ignition switch in position 0.

2 ☐ Disconnect trailer control unit from connector C1041.

☐ Ignition switch in position II.

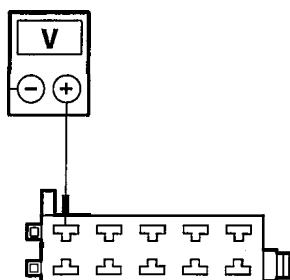
☐ Vehicles built before 0312004: Measure the voltage between the trailer control unit, connector C1041, pin 8, circuit (RD), wiring harness side and pin 10, circuit (RD), wiring harness side and ground.



VFE0033871

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE63309

DETAILS RESULTS ACTIONS

- 5 Vehicles built from 0312004: Measure the voltage between the trailer control unit, connector C1041, pin 1, circuit (RD), wiring harness side and ground.

- Is battery voltage measured in all cases?

→ Yes

GO to B10.

→ No

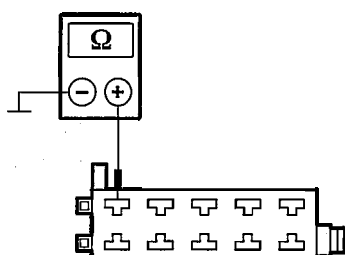
- Vehicles built before 1012002: LOCATE and RECTIFY the break in the circuit between fuse F31 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system.

- Vehicles built between 1012002 and 1012004: LOCATE and RECTIFY the break in the circuit between fuse F56 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system.

- Vehicles built from 1012004: LOCATE and RECTIFY the break in the circuit between fuse F3 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system.

B10: TEST THE GROUND CONNECTION OF THE TRAILER CONTROL UNIT

- ☐ Ignition switch in position 0.



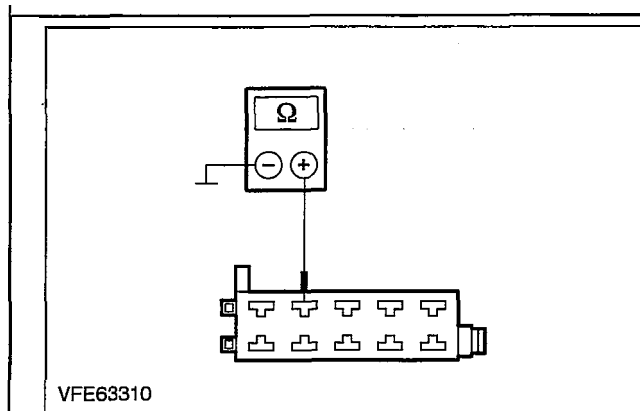
VFE0033872

- 2 Vehicles built before 0312004: Measure the resistance between the trailer control unit, connector C1041, pin 1, circuit (BN), wiring harness side and ground.

DIAGNOSIS AND TESTING

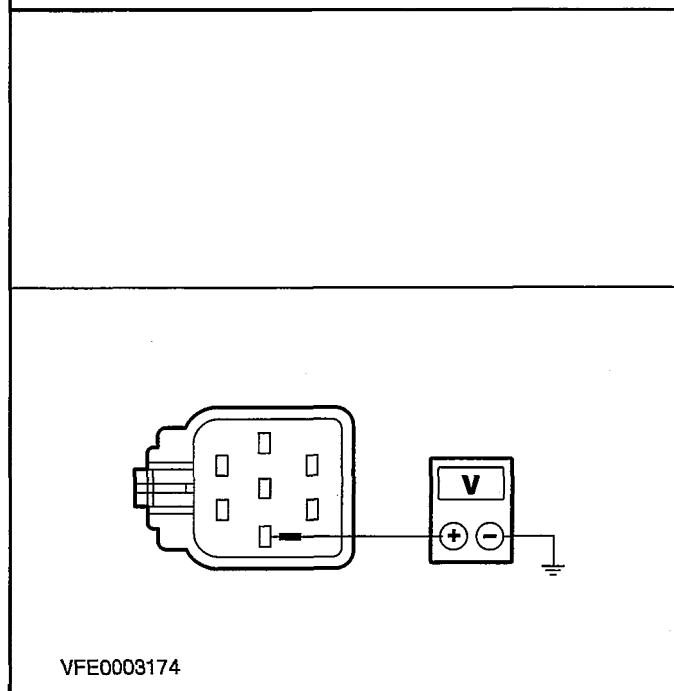
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- ☐ Vehicles built from 0312004: Measure the resistance between the trailer control unit, connector C1041, pin 3, circuit (BN), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
RENEW the trailer control unit. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit between the trailer control unit and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.

B11: CHECK THE LEFT-HAND FRONT TURN SIGNAL LAMP



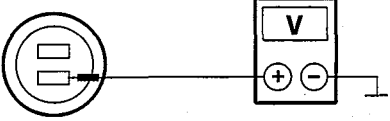
- 1 Ignition switch in position 0.
- ☐ Disconnect left-hand headlamp from connector C416.
- ☐ Ignition switch in position II.
- ☐ Switch on LEFT-HAND TURN SIGNAL.
- ☐ Measure the voltage between the left-hand headlamp, connector C416, pin 3, circuit 49-LG11 (BU/OG), wiring harness side and ground.
- Does the meter display fluctuating battery voltage?
- **Yes**
LOCATE and RECTIFY the break in circuit 31-LE31 (BK), between the headlamp and soldered connection S10 using the wiring diagrams. CHECK and INSTALL NEW headlamps if necessary. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the headlamp using the Wiring Diagrams. CHECK the operation of the system.

B12: CHECK THE VOLTAGE SUPPLY TO THE LEFT-HAND (SIDE) TURN SIGNAL LAMP



- 1 Ignition switch in position 0.
- ☐ Disconnect Left-hand (side) turn signal lamp from connector C337.
- ☐ Ignition switch in position II.
- 4 Switch on LEFT-HAND TURN SIGNAL.

DIAGNOSIS AND TESTING

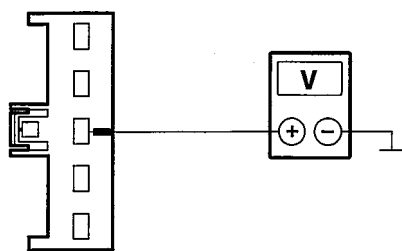
TEST CONDITIONS	DETAILSRESULTSIACTIONS
 VFE0030173	5 Measure the voltage between the left-hand (side) turn signal lamp, connector C337, pin 1, circuit 49-LG13 (BU/RD), wiring harness side and ground. Does the meter display fluctuating battery voltage? → Yes LOCATE and RECTIFY the break in circuit 31-LG13 (BK) between the (side) turn signal lamp and soldered connection S10 using the Wiring Diagrams. CHECK the turn signal lamp (side) and RENEW as necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the (side) turn signal lamp using the Wiring Diagrams. CHECK the turn signal lamp (side) and RENEW as necessary. CHECK the operation of the system.
B13: CHECK GROUND CONNECTION OF RIGHT-HAND FRONT TURN SIGNAL LAMPS FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 SWITCH ON the parking lamps.
	☐ CHECK right-hand front parking lamp. Does the parking lamp illuminate? → Yes RENEW the generic electronic module (GEM). CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 31-DA4 (BK) between soldered connection S11 and ground connection G5 using the Wiring Diagrams. CHECK the operation of the system.
B14: CHECK THE GROUND CONNECTION OF THE RIGHT-HAND REAR LAMP ASSEMBLY	
	1 Ignition switch in position 0.
	☐ SWITCH ON the parking lamps.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 CHECK rear parking lamp. - Does the parking lamp illuminate? → Yes GO to B15. → No - Vehicles without trailer socket: LOCATE and RECTIFY the break in circuit 31-LF24 (BK), between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - Vehicles with trailer socket built before 0312004: LOCATE and RECTIFY the break in circuit (BK) or 31-LF24 (BK) between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - Vehicles with trailer socket built from 0312004: LOCATE and RECTIFY the break in circuit (BN) or 31-LF24 (BK) between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
B15: CHECK VOLTAGE SUPPLY TO RIGHT-HAND REAR LAMP ASSEMBLY	
	1 Ignition switch in position 0. 2 Disconnect Rear lamp assembly. - Vehicles without trailer socket: from connector C348 - Vehicles with trailer socket: from connector C348a 3 Ignition switch in position II. 4 Switch on RIGHT-HAND TURN SIGNAL.

DIAGNOSIS AND TESTING

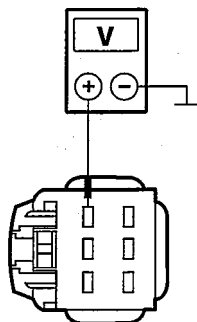
TEST CONDITIONS



VFE0033870

DETAILS/RESULTS/ACTIONS

- 5 Vehicles built before 0812005, measure voltage between right-hand rear lamp assembly:
- Vehicles without trailer socket: connector C348, pin 3, circuit 49-LG19 (BUIRD), wiring harness side and ground.
 - Vehicles with trailer socket: connector C348a, pin 3, circuit (GNNE), wiring harness side and ground.



VFE64390

- 6 Vehicles built from 0812005: Measure voltage between right-hand rear lamp assembly:
- Vehicles without trailer socket: connector C348, pin 1, circuit 49-LG19 (BUIRD), wiring harness side and ground.
 - Vehicles with trailer socket: connector C348a, pin 1, circuit (GNNE), wiring harness side and ground.

- Does the meter display fluctuating battery voltage?

→ Yes

CHECK and if necessary INSTALL A NEW rear lamp assembly. CHECK the operation of the system.

→ No

- Vehicles without trailer socket: LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the rear lamp assembly using the Wiring Diagrams. CHECK and RENEW generic electronic module (GEM) if necessary. CHECK the operation of the system.

- Vehicles with trailer socket: GO to B16.

B16: CHECK THE CONTROL CIRCUIT 49-LG19 (BUIRD) OR (GN/RD) AT THE TRAILER CONTROL UNIT FOR OPEN CIRCUIT

- 1 Ignition switch in position 0.

- 2 Disconnect Trailer control unit.

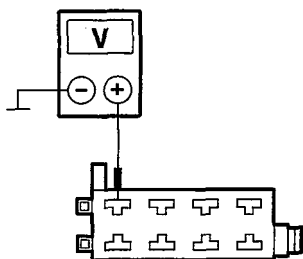
- Vehicles built before 0312004: from connector C1035
- Vehicles built from 0312004: from connector C1041

- 3 Ignition switch in position II.

- ☐ SWITCH ON the right-hand turn signal.

DIAGNOSIS AND TESTING

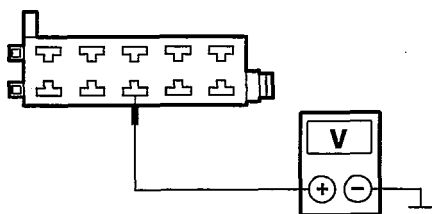
TEST CONDITIONS



VFE0033875

DETAILS/RESULTS/ACTIONS

Vehicles built before 0312004: Measure the voltage between the trailer control unit, connector C1035, pin 1, circuit (GNIRD), wiring harness side and ground.



VFE63311

6 Vehicles built from 0312004: Measure the voltage between the trailer control unit, connector C1041, pin 6, circuit (GNIRD), wiring harness side and ground.

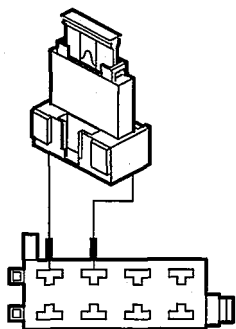
- Does the meter display fluctuating battery voltage?

→ **Yes**
GO to B17.

→ **No**
LOCATE and RECTIFY the break in circuit 49-LG19 (BU/RD) or (GNIRD) between the generic electronic module (GEM) and the trailer control unit using the Wiring Diagrams. CHECK and RENEW generic electronic module (GEM) if necessary. CHECK the operation of the system.

B17: CHECK THE TRAILER CONTROL UNIT

1 Ignition switch in position 0.

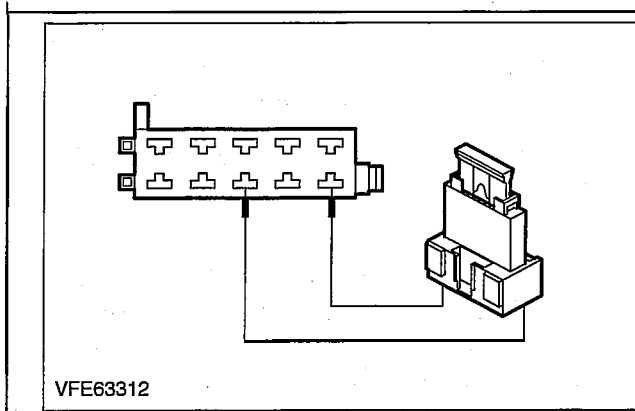


VFE0033876

2 Vehicles built before 0312004: Connect a fused jumper wire (20 A) at the trailer control unit, connector C1035, between pin 1, circuit (GNIRD) and pin 3, circuit (GNNE), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS RESULTS ACTIONS

- ☐ Vehicles built from 03/12/2004: Connect a fused jumper wire (20 A) at the trailer control unit, connector C1041, between pin 6, circuit (GN/RD) and pin 10, circuit (GNNE), wiring harness side.

4 Ignition switch in position II.

☐ Switch on RIGHT-HAND TURN SIGNAL.

6 CHECK the operation of the right-hand rear turn signal lamp.

- Does the turn signal lamp work?

→ **Yes**

RENEW the trailer control unit. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit (GYNE) between the trailer control unit and rear lamp assembly using the wiring diagrams. CHECK the operation of the system.

B18: CHECK THE RIGHT-HAND FRONT TURN SIGNAL LAMP

1 Ignition switch in position 0.

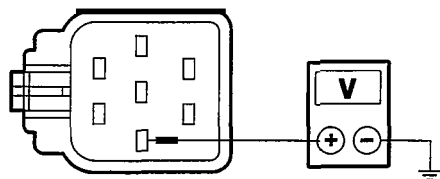
☐ Disconnect right-hand headlamp from connector C422.

☐ Ignition switch in position II.

4 Switch on RIGHT-HAND TURN SIGNAL.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0003174

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the right-hand headlamp, connector C422, pin 3, circuit 49-LG18 (BU), wiring harness side and ground.

- Does the meter display fluctuating battery voltage?

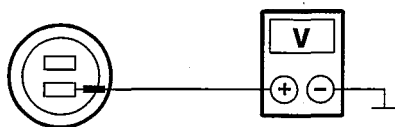
→ Yes

LOCATE and RECTIFY the break in circuit 31-LE30 (BK), between the headlamp and soldered connection S11 using the wiring diagrams. CHECK and INSTALL NEW headlamps if necessary. CHECK the operation of the system.

→ No

LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the headlamp using the Wiring Diagrams. CHECK the operation of the system.

B19: CHECK VOLTAGE AT RIGHT-HAND (SIDE) TURN SIGNAL LAMP



VFE0030173

- 1 Ignition switch in position 0.

- 2 Disconnect Right-hand (side) turn signal lamp from connector C352.

- 3 Ignition switch in position II.

- 4 Switch on RIGHT-HAND TURN SIGNAL.

- 5 Measure the voltage between right-hand turn signal lamp (side), connector C352, pin 1, circuit 49-LG20 (BU/WH), wiring harness side and ground.

- Does the meter display fluctuating battery voltage?

→ Yes

LOCATE and RECTIFY the break in circuit 31-LG20 (BK) between the turn signal lamp (side) and soldered connection S11 using the Wiring Diagrams. CHECK the turn signal lamp (side) and RENEW as necessary. CHECK the operation of the system.

→ No

LOCATE and RECTIFY the break in the circuit between the generic electronic module (GEM) and the (side) turn signal lamp using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

PINPOINT TEST U : ONE OR MORE TURN SIGNAL LAMPS FLASH CONTINUOUSLY:

TEST CONDITIONS

DETAILS RESULTS ACTIONS

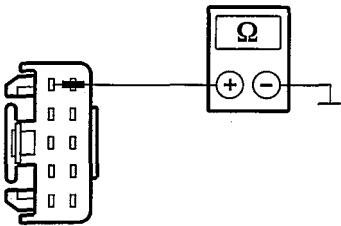
C1: DETERMINE THE FAULT CONDITION

	1 Ignition switch in position II. CHECK the turn signal lamps. - Does one or more turn signal lamp on the left-hand side flash continuously? → Yes - All left-hand turn signal lamps flash continuously: GO to C2. - Left-hand (side) turn signal lamp and left-hand front turn signal lamp are flashing continuously: RENEW the generic electronic module (GEM). CHECK the operation of the system. - Left-hand rear turn signal lamp flashes continuously: RENEW the generic electronic module (GEM). CHECK the operation of the system. → No - All right-hand turn signal lamps flash continuously: GO to C2. - Right-hand (side) turn signal lamp and right-hand front turn signal lamp are flashing continuously: RENEW the generic electronic module (GEM). CHECK the operation of the system. - Right-hand rear turn signal lamp flashes continuously: RENEW the generic electronic module (GEM). CHECK the operation of the system.
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C2: EXCLUDE THE TURN SIGNAL SWITCH AS THE CAUSE OF THE FAULT

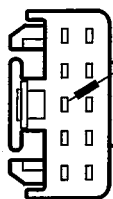
	1 Ignition switch in position 0. 2 Disconnect Turn signal switch from connector C357. Ignition switch in position II.
--	---

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK the turn signal lamps. - Do the turn signal lamps on one side flash continuously? → Yes - All left-hand turn signal lamps flash continuously: GO to C3. - All right-hand turn signal lamps flash continuously: GO to C4. → No RENEW the turn signal switch. CHECK the operation of the system.
C3: CHECK CIRCUIT 31S-LG1 (BK/YE) FOR SHORT TO GROUND	
	☐ Ignition switch in position 0. 2 Disconnect Generic electronic module (GEM) from connector C320.
 VFE0028669	3 Measure the resistance between the turn signal switch, connector C357, pin 1, circuit 31S-LG1 (BK/YE), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes RENEW the generic electronic module (GEM). CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in the circuit between the generic electronic module (GEM) and the turn signal switch using the Wiring Diagrams. CHECK the operation of the system.
C4: CHECK CIRCUIT 31S-LG2 (BK/BU) FOR SHORT TO GROUND	
	1 Ignition switch in position 0. ☐ Disconnect Generic electronic module (GEM) from connector C320.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0025221

DETAILS/RESULTS/ACTIONS

- 3 Measure the resistance between the turn signal switch, connector C357, pin 3, circuit 31S-LG2 (BWBU), wiring harness side and ground.

- Is a resistance of more than 10,000 ohms measured?

→ **Yes**

CHECK and if necessary INSTALL A NEW generic electronic module (GEM). CHECK the operation of the system.

→ **No**

LOCATE AND RECTIFY the short to ground in the circuit between the turn signal switch and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST V : ONE/SEVERAL TURN SIGNAL LAMPS ILLUMINATE CONTINUOUSLY

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D1: DETERMINE THE FAULT CONDITION

- 1 Ignition switch in position II.

- 2 CHECK the turn signal lamps.

- Are all turn signal lamps continuously lit on one side?

→ **Yes**

RENEW the generic electronic module (GEM). CHECK the operation of the system.

→ **No**

GO to D2.

D2: ELIMINATE THE GEM (GENERIC ELECTRONIC MODULE) AS CAUSE OF THE SHORT TO BATTERY VOLTAGE

- ☐ Ignition switch in position 0.

- 2 Disconnect Fuse F24 (20 A).

- 3 Disconnect Fuse F25 (15 A).

- 4 Disconnect Fuse F27.

= Vehicles built before 03/2004: 10 A

= Vehicles built from 03/2004: 15 A

- 5 Disconnect Fuse F38 (7.5 A).

- 6 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

7 CHECK all turn signal lamps.

- Is at least one turn signal lamp lit continuously?

→ **Yes**

- Left-hand (side) turn signal lamp and left-hand front turn signal lamp are lit continuously: LOCATE and RECTIFY the short to battery voltage in circuits 49-LG13 (BU/RD) or 49-LG11 (BUIOG), between the generic electronic module (GEM) and the (side) turn signal lamp or the **headlamp** using the Wiring Diagrams. CHECK the operation of the system.
- Left-hand rear turn signal lamp is lit continuously, vehicles without trailer socket: LOCATE and REPAIR the short to battery voltage in circuit 49-LG12 (BU), between the generic electronic module (GEM) and the rear lamp assembly, using the Wiring Diagrams. CHECK the operation of the system.
- Left-hand rear turn signal lamp is lit continuously, vehicles with trailer socket: GO to D3.
- Right-hand (side) turn signal lamp and right-hand front turn signal lamp are lit continuously: LOCATE and RECTIFY the short to battery voltage in circuits 49-LG18 (BU) or 49-LG20 (BU/WH), between the generic electronic module (GEM) and the (side) turn signal lamp or the **headlamp** using the Wiring Diagrams. CHECK the operation of the system.
- Right-hand rear turn signal lamp is lit continuously, vehicles without trailer socket: LOCATE and REPAIR the short to battery voltage in circuit 49-LG19 (BUIRD), between the generic electronic module (GEM) and the rear lamp assembly, using the Wiring Diagrams. CHECK the operation of the system.
- Right-hand rear turn signal lamp is lit continuously, vehicles with trailer socket: GO to D5.

→ **No**

RENEW the generic electronic module (GEM).
CHECK the operation of the system.

D3: CHECK CIRCUIT (GY/WH) FOR SHORT TO BATTERY VOLTAGE

1 Ignition switch in position 0.

☐ Connect Fuse F24 (20 A).

☐ Connect Fuse F25 (15 A).

DIAGNOSIS AND TESTING

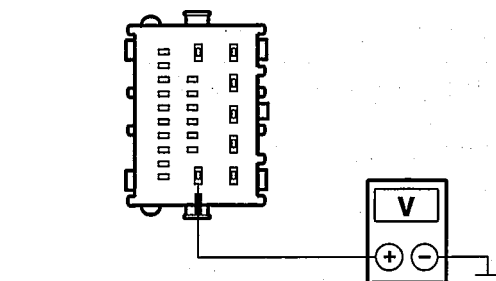
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- | |
|--|
| <p>4 Connect Fuse F27.</p> <ul style="list-style-type: none"> – Vehicles built before 0312004: 10 A – Vehicles built from 0312004: 15 A |
| <p>☐ Connect Fuse F38 (7.5 A).</p> |
| <p>6 Disconnect Trailer control unit from.</p> <ul style="list-style-type: none"> – Vehicles built before 0312004: Connector C1030 – Vehicles built from 0312004: Connector C1041 |
| <p>7 Ignition switch in position II.</p> |
| <p>8 CHECK the left-hand rear turn signal lamp.</p> <ul style="list-style-type: none"> • Does the left-hand rear turn signal lamp illuminate continuously? <p>→ Yes
LOCATE and RECTIFY the short to battery voltage in circuit (GY/WH) between the trailer control unit and rear lamp assembly using the wiring diagrams. CHECK the operation of the system.</p> <p>→ No
GO to D4.</p> |

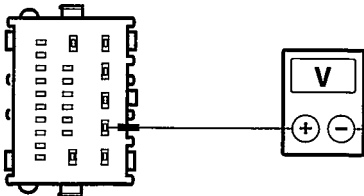
D4: EXCLUDE THE TRAILER CONTROL UNIT AS THE CAUSE OF THE FAULT

- | |
|--|
| <p>1 Ignition switch in position 0.</p> |
| <p>2 Disconnect Generic electronic module (GEM) from connector C316.</p> |
| <p>3 Vehicles built before 0812005: Measure the voltage between the generic electronic module (GEM), connector C316, pin 6, circuit 49-LG12 (BU), wiring harness side and ground.</p> |



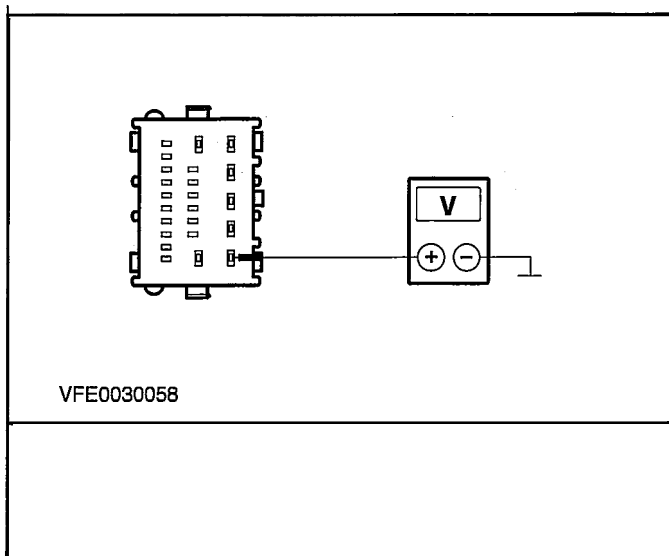
VFE63313

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0028502	☐ Vehicles built from 0812005: Measure the voltage between the generic electronic module (GEM), connector C316, pin 2, circuit 49-LG12 (BU), wiring harness side and ground. Is battery voltage measured? → Yes LOCATE and RECTIFY the short to battery voltage in the circuit(s) between the generic electronic module (GEM) and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system. → No RENEW the trailer control unit. CHECK the operation of the system.
D5: CHECK CIRCUIT (GNNE) FOR SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	☐ Connect Fuse F24 (20 A).
	3 Connect Fuse F25 (15 A).
	4 Connect Fuse F27. – Vehicles built before 0312004: 10 A – Vehicles built from 0312004: 15 A
	5 Connect Fuse F38 (7.5 A).
	6 Disconnect Trailer control unit from. – Vehicles built before 0312004: Connector C1035 – Vehicles built from 0312004: Connector C1041
	7 Ignition switch in position II.
	☐ CHECK the right-hand rear turn signal lamp. Does the right-hand rear turn signal illuminate continuously? → Yes LOCATE and RECTIFY the short to battery voltage in circuit (GNNE) between the trailer control unit and rear lamp assembly using the wiring diagrams. CHECK the operation of the system. → No GO to D6.
D6: EXCLUDE THE TRAILER CONTROL UNIT AS THE CAUSE OF THE FAULT	
	1 Ignition switch in position 0.
	Disconnect Generic electronic module (GEM) from connector C316.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

3 Measure the voltage between the generic electronic module (GEM), connector C316, pin 1, circuit 49-LG19 (BU/RD), wiring harness side and ground.

• Is battery voltage measured?

→ **Yes**

LOCATE and RECTIFY the short to battery voltage in the circuit(s) between the generic electronic module (GEM) and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

RENEW the trailer control unit. CHECK the operation of the system.

PINPOINT TEST W : THE HAZARD WARNING SYSTEM IS NOT WORKING PROPERLY.

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E1: DETERMINE THE FAULT CONDITION

1 Ignition switch in position II.

2 SWITCH ON the hazard warning lights.

3 CHECK the turn signal lamps.

• Are all turn signal lamps illuminated continuously?

→ **Yes**

RENEW the generic electronic module (GEM). CHECK the operation of the system.

→ **No**

- All turn signal lamps are flashing: GO to E2.
- Turn signal lamps do not flash: GO to E5.

E2: DETERMINE THE FAULT CONDITION

1 Ignition switch in position II.

2 Switch off the HAZARD WARNING LIGHTS.

3 CHECK the turn signal lamps.

• Do all turn signal lamps illuminate continuously?

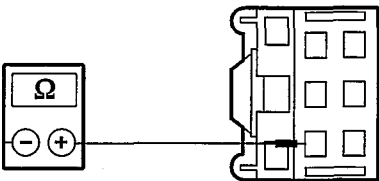
→ **Yes**

RENEW the generic electronic module (GEM). CHECK the operation of the system.

→ **No**

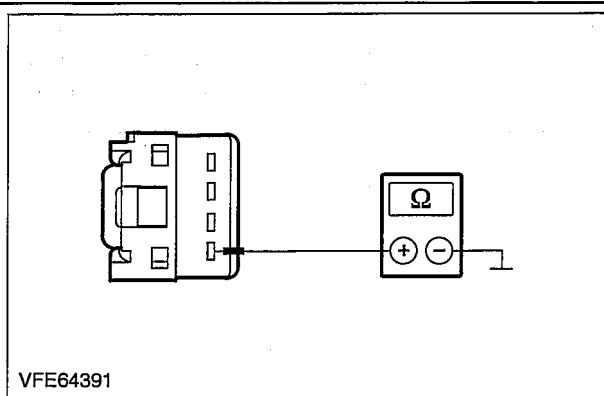
All turn signal lamps are flashing: GO to E3.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E3: EXCLUDE THE HAZARD WARNING SWITCH AS THE CAUSE OF THE FAULT	
	☒ 1 Ignition switch in position 0.
	☐ Disconnect Hazard warning lamp switch. - Vehicles built before 0812005: from connector C321 - Vehicles built from 0812005: from connector C341
	☐ Ignition switch in position II.
	☐ CHECK the turn signal lamps. • Do the turn signal lamps flash? → Yes GO to E4. → No RENEW the hazard warning lamp switch. CHECK the operation of the system.
E4: CHECK CIRCUIT 31S-LG8 (BK/OG) FOR SHORT TO GROUND	
	☐ Ignition switch in position 0.
	☒ 2 Disconnect Generic electronic module (GEM) from connector C320.
 VFE0028668	☐ Vehicles built before 0812005: Measure the resistance between the hazard warning lamp switch, connector C321, pin 3, circuit 31S-LG8 (BWOOG), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 4** Vehicles built from 0812005: Measure the resistance between the hazard warning lamp switch, connector C341, pin 4, circuit 31S-LG8 (BWOOG), wiring harness side and ground.
- Is a resistance of more than 10,000 ohms measured?
- **Yes**
RENEW the generic electronic module (GEM).
CHECK the operation of the system.
- **No**
LOCATE AND RECTIFY the short to ground in the circuit between the hazard warning lamp switch and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.

E5: NARROW DOWN THE FAULT CONDITION

- 1** CHECK the left-hand turn signal lamps.
- ☐ Switch on LEFT-HAND TURN SIGNAL.
- 3** CHECK the right-hand turn signal lamps.
- 4** SWITCH ON the right-hand turn signal.
- Do the left and right-hand turn signal lamps work correctly?
- **Yes**
GO to E6.
- **No**
RENEW the generic electronic module (GEM).
CHECK the operation of the system.

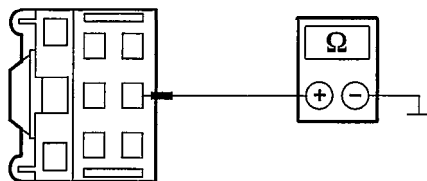
E6: CHECK THE GROUND CONNECTION OF THE HAZARD WARNING LAMP SWITCH FOR OPEN CIRCUIT

- 1** Ignition switch in position 0.
- ☐ Disconnect Hazard warning lamp switch.
- Vehicles built before 0812005: from connector C321
 - Vehicles built from 0812005: from connector C341

DIAGNOSIS AND TESTING

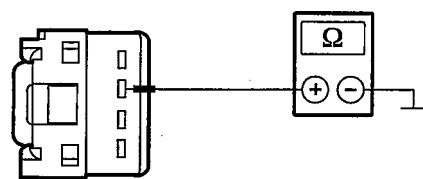
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VFE0028665

- ☐ Vehicles built before 0812005: Measure the resistance between the hazard warning lamp switch, connector C321, pin 5, circuit 31-LG8 (BK), wiring harness side and ground.



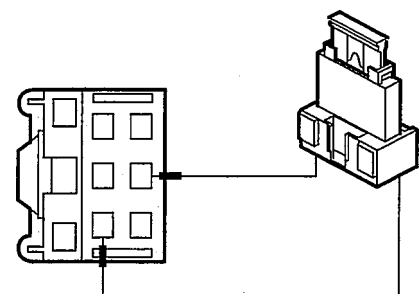
VFE64392

- 4** Vehicles built from 0812005: Measure the resistance between the hazard warning lamp switch, connector C341, pin 2, circuit 31-LG8 (BK), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

→ **Yes**
GO to E7.

→ **No**
LOCATE and RECTIFY the break in the circuit between the hazard warning lamp switch and soldered connection S265 using the Wiring Diagrams. CHECK the operation of the system.

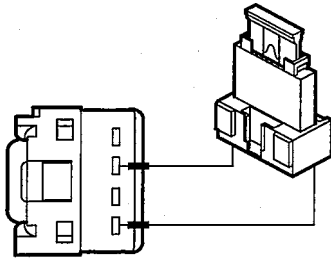
E7: EXCLUDE THE HAZARD WARNING LAMP SWITCH AS THE CAUSE OF THE FAULT

VFE0028667

- 1** Vehicles built before 0812005: Connect a fused jumper wire (7.5 A) at the hazard warning lamp switch, connector C321, between pin 3, circuit 31S-LG8 (BWOOG) and pin 5, circuit 31-LG8 (BK), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE64393

DETAILS/RESULTS/ACTIONS

- ☐ Vehicles built from 0812005: Connect a fused jumper wire (7.5 A) at the hazard warning lamp switch, connector C341, between pin 4, circuit 31S-LG8 (BWOOG) and pin 2, circuit 31-LG8 (BK), wiring harness side.

3 Ignition switch in position II.

4 CHECK the turn signal lamps.

- Do the turn signal lamps work?

→ **Yes**

RENEW the hazard warning lamp switch.
CHECK the operation of the system.

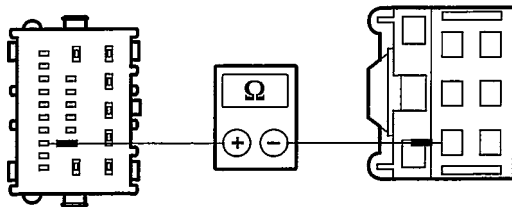
→ **No**

GO to E8.

E8: CHECK CONTROL CIRCUIT 31S-LG8 (BKIOG) FOR OPEN CIRCUIT

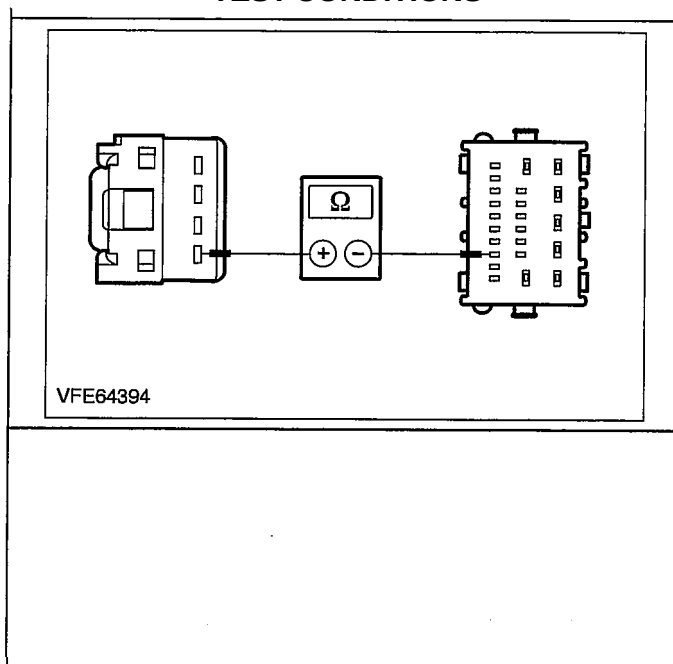
1 Ignition switch in position 0.

- ☐ Disconnect Generic electronic module (GEM) from connector C320.



VFE0028666

- 3** Vehicles built before 0812005: Measure the resistance between the hazard warning lamp switch, connector C321, pin 3, circuit 31S-LG8 (BWOOG), wiring harness side and the generic electronic module (GEM), connector C320, pin 16, circuit 31S-LG8 (BWOOG), wiring harness side.

DIAGNOSIS AND TESTING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

4 Vehicles built from 08/12/2005: Measure the resistance between the hazard warning lamp switch, connector C341, pin 4, circuit 31S-LG8 (BWO), wiring harness side and the generic electronic module (GEM), connector C320, pin 16, circuit 31S-LG8 (BWO), wiring harness side.

- Is a resistance of less than 2 ohms registered?

→ **Yes**

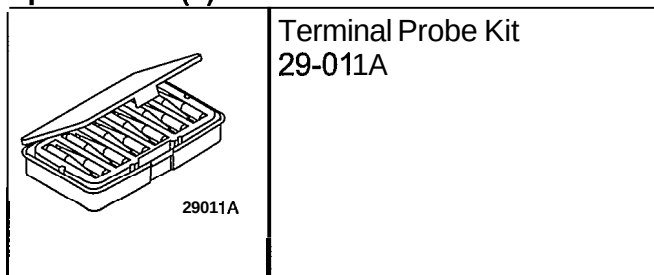
RENEW the generic electronic module (GEM).
CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the hazard warning lamp switch and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING**Parking, Rear and License Plate Lamps**

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)

Terminal Probe Kit
29-011A

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Fuse(s) • Lamp(s) • Connector(s) • Switches • Wiring loom

Inspection and Checking

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections which were separated in the vehicle, so that communication between the module and WDS is ensured.

NOTE: If the generic electronic module (GEM) is changed, the new one must be configured. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to:

Module Configuration (418-01, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built Up To: 10/2005 (419-10, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built From: 10/2005 (419-10, Diagnosis and Testing).

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Parking lamps, rear lamps and license lamps are inoperative	• Fuse(s) • Circuit(s) • Headlight switch • Central junction box (CJB) • Rain sensor • Generic Electronic Module (GEM) • Gasket for license plate lamp	• GO to Pinpoint Test A.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
One or more parking lamps, rear lamps or license plate lamps are inoperative	- Fuse(s) - Circuit(s) - Left/right-hand headlamp - Left/right-hand rear lamp assembly - Left/right-hand license plate lamp - Central junction box (CJB) - Generic Electronic Module (GEM) - Rain sensor - Gasket for license plate lamp	GO to Pinpoint Test B.
Parking lamps, rear lamps and license plate lamps lit continuously.	- Circuit(s) - Headlight switch - Generic Electronic Module (GEM) - Central junction box (CJB)	GO to Pinpoint Test C.

System Checks

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST X : PARKING LAMPS, REAR LAMPS AND LICENSE LAMPS ARE INOPERATIVE

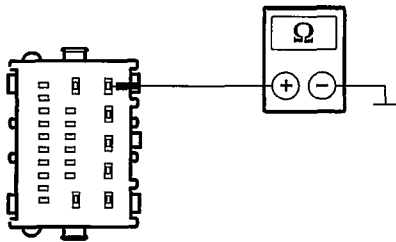
TEST CONDITIONS**DETAILS/RESULTS/ACTIONS****A1: DETERMINE THE FAULT CONDITION**

	1 A failure of the license plate lamps is not necessarily caused by an electrical defect. Due to a high level of heat emitted from the bulb in the – license plate lamp, the gasket for the – license plate lamp may become deformed or melt. If there is a problem, a comprehensive visual inspection of the license plate lamp or the tailgate handle should first be performed, looking in particular for any traces of corrosion caused by the penetration of water. Can traces of corrosion be seen in the area of the license plate lamps? → Yes Install modified gaskets for the license plate lamps. Check the operation of the system. → No GO to A2.
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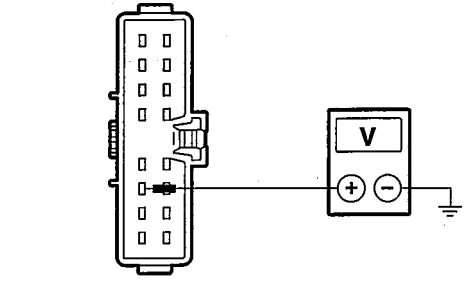
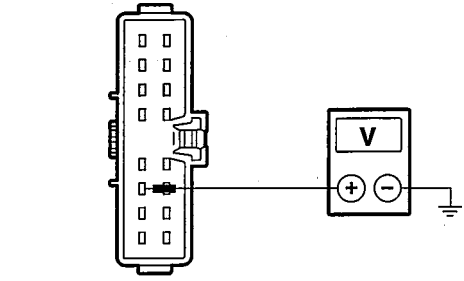
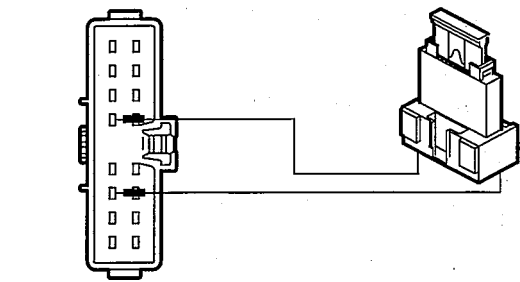
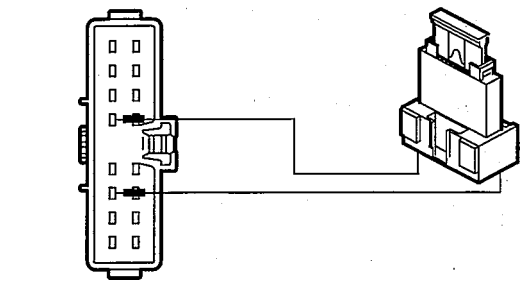
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A2: DETERMINE VEHICLE EQUIPMENT LEVEL	
	1 Determine vehicle equipment level. • Does the vehicle have automatic headlights? → Yes GO to A3. → No GO to A5.
A3: DETERMINE THE FAULT CONDITION	
NOTE: Cover rain sensor with a light-proof material to simulate darkness.	
	1 Ignition switch in position II. 2 CHECK the parking lights after each test step. 3 SWITCH ON dipped beam. 4 SWITCH OFF the dipped beam. 5 SWITCH ON automatic headlights at the headlamp switch. • Are the parking lamps only inoperative when the switch is in the automatic headlights position? → Yes GO to A4. → No GO to A5.
A4: CHECK THE VOLTAGE SUPPLY TO THE PARKING LAMPS (AUTOMATIC HEADLIGHTS) FOR OPEN CIRCUIT	
	1 Ignition switch in position 0. 2 Disconnect Generic electronic module (GEM) from connector C316. 3 Headlamp switch in OFF POSITION.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0030060	4 Measure the resistance between the generic electronic module (GEM), connector C316, pin 5, circuit 29S-LF25 (OG/GN), wiring harness side and ground. Is a resistance of less than 10,000 ohms registered? → Yes REFER to: Headlamps (417-01, Diagnosis and Testing). → No LOCATE and RECTIFY the break in the circuit between soldered connection S16 and the generic electronic module (GEM) using the Wiring Diagrams. CHECK the operation of the system.
A5: CHECK FUSE F17 (15 A) (CJB).	
	Ignition switch in position 0. 2 Disconnect fuse F17 (15 A) (CJB). CHECK fuse F17 (15 A) (CJB). Is the fuse OK? → Yes GO to A6. → No RENEW fuse F17 (15 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A6: CHECK THE VOLTAGE AT FUSE F17 (15 A) (CJB)	
	☐ Connect fuse F17 (15 A) (CJB). 2 Ignition switch in position II. 3 Measure the voltage between fuse F17 (15 A) (CJB) and ground. Does the meter display battery voltage? → Yes GO to A7. → No LOCATE and RECTIFY the break in the voltage supply to fuse F17 (15 A) (CJB) using the Wiring Diagrams, if necessary CHECK and RENEW the CJB. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A7: CHECK VOLTAGE AT HEADLIGHT SWITCH	
 VFE0010045	☐ Ignition switch in position 0.
	☐ Disconnect headlight switch from connector C338.
	☐ Ignition switch in position II.
 VFE0010045	Measure the voltage between the headlight switch, connector C338, pin 11, circuit 29-LE29 (OGIBK), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to A8. → No LOCATE and RECTIFY the break in the circuit(s) between fuse F17 (15 A) (CJB) and the headlamp switch using the Wiring Diagrams. CHECK the operation of the system.
A8: CHECK HEADLIGHT SWITCH	
 VFE0016144	☐ Ignition switch in position 0.
	☐ Connect a fused jumper wire (15 A) at the headlamp switch, connector C338, between pin 11, circuit 29-LE29 (OGIBK) and pin 13, circuit 29S-DB8 (OGIBU), wiring harness side.
	☐ Ignition switch in position II.
 VFE0016144	☐ CHECK the parking lamps.
	Do the parking lamps illuminate? → Yes INSTALL A NEW headlight switch. CHECK the operation of the system.
	→ No LOCATE and RECTIFY the break in circuit 29S-DB8 (OGIBU), between headlight switch and CJB (bridge) using the wiring diagrams, and if necessary INSTALL A NEW CJB. CHECK the operation of the system.

DIAGNOSIS AND TESTING

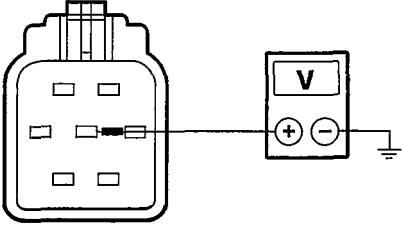
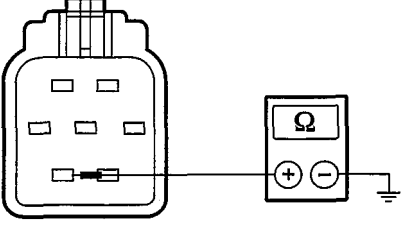
PINPOINT TEST Y : ONE OR MORE PARKING LAMPS, REAR LAMPS OR LICENSE PLATE LAMPS ARE INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: DETERMINE THE FAULT CONDITION	
	1 A failure of the license plate lamps is not necessarily caused by an electrical defect. Due to a high level of heat emitted from the bulb in the – license plate lamp, the gasket for the – license plate lamp may become deformed or melt. If there is a problem, a comprehensive visual inspection of the license plate lamp or the tailgate handle should first be performed, looking in particular for any traces of corrosion caused by the penetration of water. • Can traces of corrosion be seen in the area of the license plate lamp? → Yes Install modified gaskets for the license plate lamps. Check the operation of the system. → No GO to B2.
B2: DETERMINE THE FAULT CONDITION	
	1 SWITCH ON the side lights. 2 DETERMINE the fault conditions. • Is one left-hand parking lamp and/or the license plate lamp(s) inoperative? → Yes - Front left-hand parking lamp (all other lamps OK): GO to B5. - Front left-hand parking lamp and left-hand rear lamp: GO to B3. - Left-hand rear lamp (all other lamps OK): GO to B11. - Licence plate lamp(s) (all other lamps OK): GO to B17. → No - Front right-hand parking lamp (all other lamps OK): GO to B8. - Front right-hand parking lamp and rear right-hand lamp: GO to B4. - Right-hand rear lamp (all other lamps OK): GO to B14.
B3: CHECK FUSE F22 (7.5 A) (CJB).	
	Ignition switch in position 0. ☐ Disconnect fuse F22 (7.5 A) (CJB).

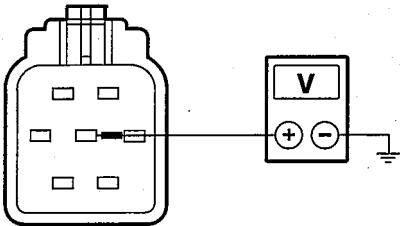
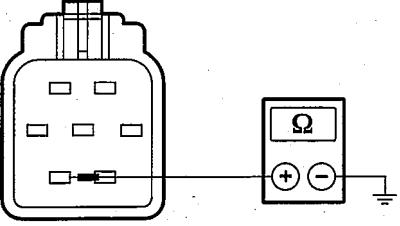
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 CHECK fuse F22 (7.5 A) (CJB). Is the fuse OK? → Yes CHECK and if necessary RENEW the CJB. CHECK the operation of the system. → No RENEW fuse F22 (7.5 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
B4: CHECK FUSE F23 (7.5 A) (CJB).	
	1 Ignition switch in position 0.
	2 Disconnect fuse F23 (7.5 A) (CJB).
	3 CHECK fuse F23 (7.5 A) (CJB). Is the fuse OK? → Yes CHECK and if necessary RENEW the CJB. CHECK the operation of the system. → No RENEW fuse F23 (7.5 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
B5: CHECK LEFT-HAND HEADLAMP	
	1 Ignition switch in position II.
	2 SWITCH ON the left-hand turn signal.
	3 CHECK left-hand turn signal lamp Does left-hand turn signal operate? → Yes GO to B6. → No GO to B7.
B6: CHECK VOLTAGE AT THE FRONT LEFT-HAND PARKING LAMP	
	1 Ignition switch in position 0.
	2 Disconnect left-hand headlamp from connector C416.
	3 SWITCH ON the side lights.

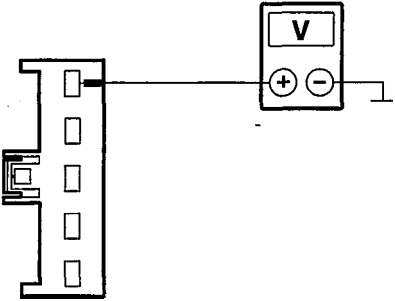
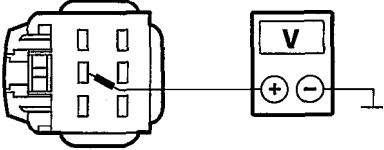
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E0011567	4 Measure the voltage at left-hand headlamp, connector C416, between pin 4, circuit 29S-LF7 (OG/BU), wiring harness side and ground. Does the meter display battery voltage? → Yes CHECK and if necessary RENEW the headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between fuse F22 (7.5 A) (CJB) and the left-hand headlamp using the Wiring Diagrams. CHECK the operation of the system.
B7: CHECK GROUND CONNECTION AT LEFT-HAND HEADLAMP	
	1 Ignition switch in position 0. 2 Disconnect left-hand headlamp from connector C416.
 E0011568	3 Measure the resistance between the left-hand headlamp, connector C416, pin 6, circuit 31-LE31 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the left-hand headlamp and soldered connection S10 using the wiring diagrams. CHECK the operation of the system.
B8: CHECK THE RIGHT-HAND HEADLAMP	
	1 Ignition switch in position II. 2 SWITCH ON the right-hand turn signal. 3 CHECK right-hand turn signal lamp. Does right-hand turn signal work? → Yes GO to B9. → No GO to B10.
B9: CHECK VOLTAGE AT THE FRONT RIGHT-HAND PARKING LAMP	
	1 Ignition switch in position 0. 2 Disconnect right-hand headlamp from connector C422.

DIAGNOSIS AND TESTING

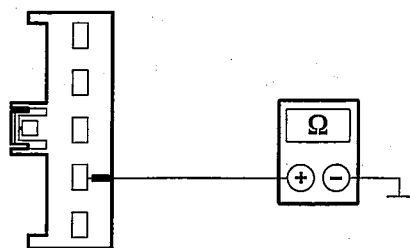
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E0011567	3 SWITCH ON the side lights. 4 Test voltage between right-hand headlamp connector C422, pin 4, circuit 29S-LF16 (OG/GN), wiring harness side and ground. Does the meter display battery voltage? → Yes CHECK and if necessary RENEW the headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between fuse F23 (7.5 A) (CJB) and the right-hand headlamp using the Wiring Diagrams. CHECK the operation of the system.
B10: CHECK GROUND CONNECTION AT THE RIGHT-HAND HEADLAMP	
 E0011568	1 Ignition switch in position 0. 2 Disconnect right-hand headlamp from connector C422. ☐ Measure the resistance between the right-hand headlamp, connector C422, pin 6, circuit 31-LE30 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the headlamp. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the right-hand headlamp and soldered connection S11 using the wiring diagrams. CHECK the operation of the system.
B11: CHECK THE LEFT-HAND REAR LAMP ASSEMBLY	
	1 Ignition switch in position II. 2 SWITCH ON the left-hand turn signal. 3 Check left-hand rear turn signal lamp. Is the left-hand rear turn signal operative? → Yes GO to B12. → No GO to B13.
B12: CHECK THE VOLTAGE AT THE LEFT-HAND REAR LAMP ASSEMBLY	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

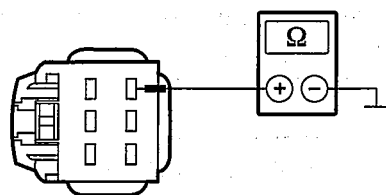
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Disconnect Left-hand rear lamp assembly. - Vehicles without trailer socket: from connector C333 - Vehicles with trailer socket: from connector C333a
 VFE0033877	☐ SWITCH ON the side lights. ☐ Measure the voltage at the left-hand rear lamp assembly, vehicles built before 0812005: - Vehicles without trailer socket, built before 0812005: connector C333, between pin 1, circuit 29S-LF11 (OG/WH), wiring harness side and ground. - Vehicles with trailer socket, built before 0312004: connector C333a, between pin 1, circuit (GY/BK), wiring harness side and ground. - Vehicles with trailer socket, built from 0312004 to 0812005: connector C333a, between pin 1, circuit (OGANH), wiring harness side and ground.
 VFE64388	5 Measure the voltage at the left-hand rear lamp assembly, vehicles built from 0812005: - Vehicles without trailer socket: connector C333, between pin 2, circuit 29S-LF11 (OGANH), wiring harness side and ground. - Vehicles with trailer socket: connector C333a, between pin 2, circuit (OG/WH), wiring harness side and ground. • Does the meter display battery voltage? → Yes CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between fuse F22 (7.5 A) (CJB) and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.
B13: CHECK THE GROUND CONNECTION OF THE LEFT-HAND REAR LAMP ASSEMBLY	
	☐ Ignition switch in position 0. 2 Disconnect Left-hand rear lamp assembly. - Vehicles without trailer socket: from connector C333 - Vehicles with trailer socket: from connector C333a

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033869



VFE64389

DETAILS/RESULTS/ACTIONS

3 Measure the resistance between the left-hand rear lamp assembly, vehicles built before 0812005:

- Vehicles without trailer socket: Connector C333, pin 4, circuit 31-LF23 (BK), wiring harness side and ground.
- Vehicles with 13-pin trailer socket, built from 0312004: Connector C333a, pin 4, circuit (BN), wiring harness side and ground.
- All other vehicles with trailer socket: connector C333a, pin 4, circuit (GN), wiring harness side and ground.

4 Measure the resistance between the left-hand rear lamp assembly, vehicles built from 0812005:

- Vehicles without trailer socket: Connector C333, pin 4, circuit 31-LF23 (BK), wiring harness side and ground.
- Vehicles with 13-pin trailer socket: Connector C333a, pin 4, circuit (BN), wiring harness side and ground.
- All other vehicles with trailer socket: connector C333a, pin 4, circuit (GN), wiring harness side and ground.

• Is a resistance of less than 2 ohms registered?

→ **Yes**

CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system.

→ **No**

- Vehicles without trailer socket: LOCATE and RECTIFY the break in circuit 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK the operation of the system.

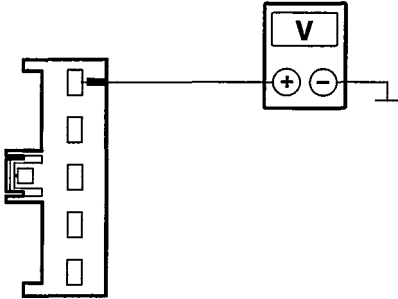
- Vehicles with 13-pin trailer socket, built from 0312004: LOCATE and RECTIFY the break in the circuit (BN) between the rear lamp assembly and soldered connection S1008 using the Wiring Diagrams. CHECK the operation of the system.

- All other vehicles with trailer socket: LOCATE and RECTIFY the break in circuit(s) (GN) or 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK the operation of the system.

B14: CHECK THE RIGHT-HAND REAR LAMP ASSEMBLY

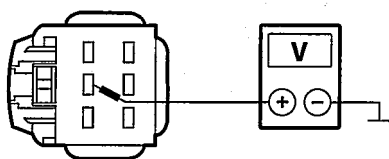
1 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 SWITCH ON the right-hand turn signal. 3 CHECK right-hand turn signal lamp. Does right-hand turn signal work? → Yes GO to B15. → No GO to B16.
B15: CHECK THE VOLTAGE AT THE RIGHT-HAND REAR LAMP ASSEMBLY	
	1 Ignition switch in position 0. ☐ Disconnect Right-hand rear lamp assembly. - Vehicles without trailer socket: from connector C348 - Vehicles with trailer socket: from connector C348a 3 SWITCH ON the side lights.
 VFE0033877	4 Measure the voltage at the right-hand rear lamp assembly, vehicles built before 0812005: - Vehicles without trailer socket: connector C348, between pin 1, circuit 29S-LF20 (OG), wiring harness side and ground. - Vehicles with trailer socket, built before 0312004: connector C348a, between pin 1, circuit (GY/RD), wiring harness side and ground. - Vehicles with trailer socket, built from 0312004 to 0812005: connector C348a, between pin 1, circuit (OG), wiring harness side and ground.

DIAGNOSIS AND TESTING

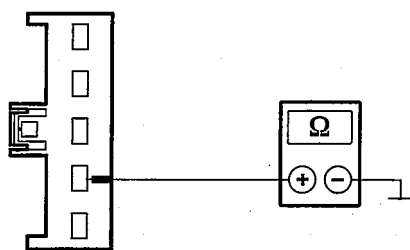
TEST CONDITIONS



VFE64388

DETAILS/RESULTS/ACTIONS

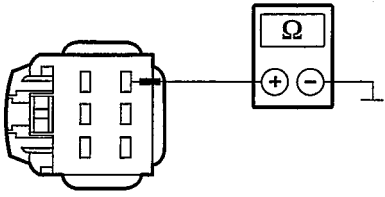
- 5** Measure the voltage at the right-hand rear lamp assembly, vehicles built from 0812005:
- Vehicles without trailer socket: connector C348, between pin 2, circuit 29S-LF20 (OG), wiring harness side and ground.
 - Vehicles with trailer socket: connector C348a, between pin 2, circuit (OG), wiring harness side and ground.
- Does the meter display battery voltage?
- **Yes**
CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit(s) between fuse F23 (7.5 A) (CJB) and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.

B16: CHECK THE GROUND CONNECTION OF THE RIGHT-HAND REAR LAMP ASSEMBLY

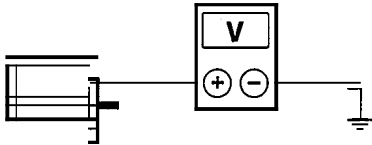
VFE0033869

- 1** Ignition switch in position 0.
- 2** Disconnect Right-hand rear lamp assembly.
- Vehicles without trailer socket: from connector C348
 - Vehicles with trailer socket: from connector C348a
- 3** Measure the resistance between the right-hand rear lamp assembly, vehicles built before 0812005:
- Vehicles without trailer socket: Connector C348, between pin 4, circuit 31-LF24 (BK), wiring harness side and ground.
 - Vehicles with trailer socket, built before 0312004: connector C348a, between pin 4, circuit (BK), wiring harness side and ground.
 - Vehicles with trailer socket built from 0312004: connector C348a, between pin 4, circuit (BN), wiring harness side and ground.

DIAGNOSIS AND TESTING

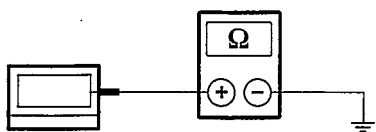
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE64389	4 Measure the resistance between the right-hand rear lamp assembly, vehicles built from 0812005: – Vehicles without trailer socket: Connector C348, between pin 4, circuit 31-LF24 (BK), wiring harness side and ground. – Vehicles with trailer socket: connector C348a, between pin 4, circuit (BN), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit(s) between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
B17: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position II. ☐ SWITCH ON the side lights. • Are both license plate lamps inoperative? → Yes GO to B18. → No - Left-hand license plate lamp is inoperative: GO to B21. - Right-hand license plate lamp is inoperative: GO to B22.
B18: CHECK FUSE F33 (7.5 A) (CJB).	
	1 Ignition switch in position 0. ☐ Disconnect fuse F33 (7.5 A) (CJB). 3 CHECK Fuse F33 (7.5 A) (CJB). • Is the fuse OK? → Yes GO to B19. → No RENEW fuse F33 (7.5 A) (CJB). If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
B19: CHECK THE VOLTAGE AT FUSE F33 (7.5 A) (CJB)	
	☒ 1 Connect fuse F33 (7.5 A) (CJB).
	☐ Ignition switch in position II.
	☐ SWITCH ON the side lights.
	☐ Measure the voltage between fuse F33 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to B20. → No LOCATE and RECTIFY the break in the voltage supply to fuse F33 (7.5 A) (CJB) using the Wiring Diagrams, if necessary CHECK and RENEW the CJB. CHECK the operation of the system.
B20: TEST THE VOLTAGE SUPPLY OF THE LICENSE PLATE LAMPS	
	☐ Ignition switch in position 0.
	☒ 2 Disconnect right-hand license plate lamp from connector C760.
	☒ 3 SWITCH ON the side lights.
 VFE0003181	☐ Measure the voltage between the right-hand license plate lamp, connector C760, pin 1, circuit 29S-LF22 (OG/BK), wiring harness side and ground. Does the meter display battery voltage? → Yes LOCATE and RECTIFY the break in circuit 31-DA25 (BK) between soldered connection S201 and soldered connection S24 using the Wiring Diagrams. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit(s) between fuse F33 (7.5 A) (CJB) and the left-hand license plate lamp using the Wiring Diagrams. CHECK the operation of the system.
B21: CHECK GROUND CONNECTION OF LEFT-HAND LICENSE PLATE LAMP	
	☒ 1 Ignition switch in position 0.
	☐ Disconnect left-hand license plate lamp from connector C759.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0003180

DETAILS/RESULTS/ACTIONS

- 3** Measure the resistance between the left-hand license lamp, connector C759, pin 1, circuit 31-LF21 (BK), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

→ **Yes**

CHECK and if necessary RENEW the license plate lamp. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the license plate lamp and soldered connection S201 using the wiring diagrams. Check the operation of the system.

B22: CHECK VOLTAGE SUPPLY TO RIGHT-HAND LICENSE PLATE LAMP

- 1** Ignition switch in position 0.

- 2** Disconnect right-hand license plate lamp from connector C760.

- ☐ Ignition switch in position II.

- 4** SWITCH ON the side lights.

- 5** Measure the voltage between the right-hand license plate lamp, connector C760, pin 1, circuit 29S-LF22 (OG/BK), wiring harness side and ground.

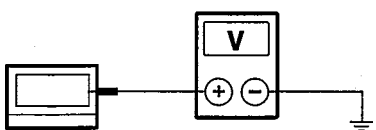
- Is battery voltage measured?

→ **Yes**

GO to B23.

→ **No**

LOCATE and RECTIFY the break in the circuit between the left-hand license plate lamp and the right-hand license plate lamp using the wiring diagrams. Check the operation of the system.



VFE0003181

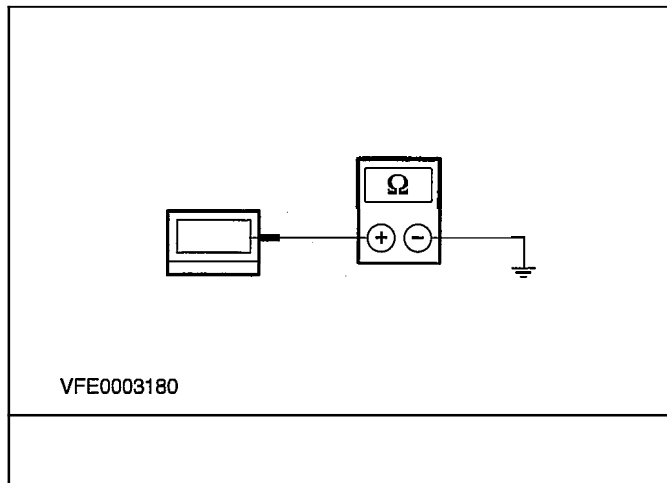
B23: CHECK GROUND CONNECTION OF RIGHT-HAND LICENSE PLATE LAMP

- 1** Ignition switch in position 0.

- 2** Disconnect right-hand license plate lamp from connector C761.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS RESULTS ACTIONS

- 3** Measure the resistance between the right-hand license plate lamp, connector C761, pin 1, circuit 31-LF22 (BK), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
CHECK and INSTALL A NEW license plate lamp. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit between the right-hand license plate lamp and soldered connection S201 using the wiring diagrams. Check the operation of the system.

PINPOINT TEST Z : PARKING LAMPS, REAR LAMPS AND LICENSE PLATE LAMPS LIT CONTINUOUSLY.

TEST CONDITIONS

DETAILS RESULTS ACTIONS

C1: DETERMINE THE FAULT CONDITION

- 1** Ignition switch in position 0.
- 2** Disconnect fuse F22 (7.5 A) (CJB).
- 3** Disconnect fuse F23 (7.5 A) (CJB).
- 4** Disconnect fuse F33 (7.5 A) (CJB).
- 5** Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

6 CHECK the parking lamps.

- Are the left-hand parking lamps illuminated continuously?

→ **Yes**

- Vehicles without trailer socket: LOCATE AND RECTIFY the short to battery voltage in the circuits connected to fuse F22 (7.5 A) (CJB), output side, using the Wiring Diagrams. CHECK the operation of the system.

- Vehicles with trailer socket built before 0312004: LOCATE AND RECTIFY the short to battery voltage in the circuits connected to fuse F22 (7.5 A) (CJB), output side, using the Wiring Diagrams. CHECK the operation of the system. If the concern persists, CHECK and if necessary INSTALL A NEW trailer control unit. CHECK the operation of the system.

- Vehicles with trailer socket built from 0312004: LOCATE and RECTIFY short to battery voltage in the circuits connected to soldered connection S1006 using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

- Right-hand parking lights are lit continuously, vehicles without trailer socket: LOCATE AND RECTIFY the short to battery voltage in the circuits connected to fuse F23 (7.5 A) (CJB), output side, using the Wiring Diagrams. CHECK the operation of the system.

- Right-hand parking lamps lit continuously, vehicles with trailer socket built before 0312004: LOCATE AND RECTIFY the short to battery voltage in the circuits connected to fuse F23 (7.5 A) (CJB), output side, using the Wiring Diagrams. CHECK the operation of the system. If the concern persists, CHECK and if necessary INSTALL A NEW trailer control unit. CHECK the operation of the system.

- Right-hand parking lamps lit continuously, vehicles with trailer socket built from 0312004: LOCATE and RECTIFY short to battery voltage in the circuits connected to soldered connection S1007 using the Wiring Diagrams. CHECK the operation of the system.

- License plate lamps lit continuously, vehicles built before 0812005: GO to C2.

DIAGNOSIS AND TESTING

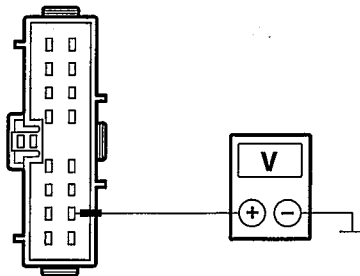
TEST CONDITIONS	DETAILSRESULTSIACTIONS
	- License plate lamps lit continuously, vehicles built from 0812005: LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S9 using the Wiring Diagrams. CHECK the operation of the system. - No malfunction detected: GO to C3.
C2: CHECK THE GENERIC ELECTRONIC MODULE (GEM).	
	1 Ignition switch in position 0.
	2 Disconnect Fuse F24 (20 A) (CJB).
	3 Disconnect Fuse F25 (15 A) (CJB).
	4 Disconnect Fuse F27. - Vehicles built before 0312004: 10 A (CJB) - Vehicles built from 0312004: 15 A (CJB)
	5 Disconnect Fuse F38 (7.5 A) (CJB).
	6 Ignition switch in position II. Do the license plate lamps illuminate continuously? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S9 using the wiring diagrams. CHECK the operation of the system. → No RENEW the GEM. CHECK the operation of the system.
C3: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0.
	2 Connect fuse F22 (7.5 A) (CJB).
	3 Disconnect headlight switch from connector C338 .
	4 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 CHECK the parking lamps. - Are the left-hand parking lamps illuminated continuously? → Yes - Vehicles with daytime running lights, built from 0812005: GO to C4. - Vehicles with automatic headlamps: GO to C4. - All other vehicles: LOCATE AND RECTIFY short to battery voltage in circuits 29S-DB8 (OG/BU) or 29S-DD33 (OG), which are connected to the corresponding bridge in the CJB, using the Wiring Diagrams. CHECK the operation of the system. → No - Vehicles without daytime running lights: INSTALL A NEW headlight switch. CHECK the operation of the system. - Vehicles with daytime running lights: GO to C5.
C4: CHECK THE GENERIC ELECTRONIC MODULE (GEM).	
	1 Ignition switch in position 0. 2 Disconnect Fuse F17 (15 A) (CJB). 3 Disconnect Fuse F24 (20 A) (CJB). ☐ Disconnect Fuse F25 (15 A) (CJB). 5 Disconnect Fuse F27 (15 A) (CJB). 6 Disconnect Fuse F38 (7.5 A) (CJB). 7 Ignition switch in position II. Do the left-hand parking lamps illuminate continuously? → Yes LOCATE and RECTIFY short to battery voltage in the circuits connected to soldered connection S16 using the Wiring Diagrams. CHECK the operation of the system. → No RENEW the GEM. CHECK the operation of the system.
C5: CHECK HEADLIGHT SWITCH	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033878

DETAILS/RESULTS/ACTIONS

- 2 Measure the voltage between the headlamp switch, connector C338, pin 15, circuit 15-LE32 (GN/WH), wiring harness side and ground.

• Is battery voltage measured?

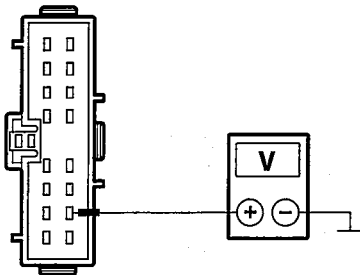
→ **Yes**

- Vehicles built before 08/2005: GO to C6.
- Vehicles built from 08/2005: GO to C7.

→ **No**

INSTALL A NEW headlight switch. CHECK the operation of the system.

C6: DETERMINE THE FAULT CONDITION



VFE0033878

- 1 Disconnect Fuse F40 (10 A) (CJB).

- 2 Measure the voltage between the headlamp switch, connector C338, pin 15, circuit 15-LE32 (GN/WH), wiring harness side and ground.

• Is battery voltage measured?

→ **Yes**

LOCATE AND RECTIFY the short to battery voltage in the circuits connected to fuse F40 (15 A) (CJB), output side, using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

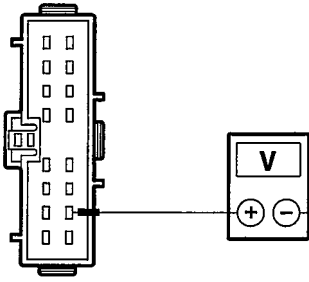
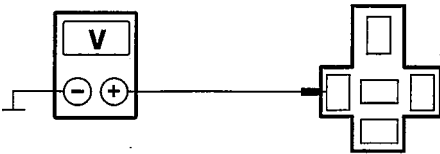
LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S1 using the Wiring Diagrams. CHECK the operation of the system. If the concern persists:

REFER to: ~~Daytime Running Lamps (DRL)~~
(417-04, Diagnosis and Testing).

C7: DETERMINE THE FAULT CONDITION

- 1 Disconnect Automatic headlamps relay from socket C418.

DIAGNOSIS AND TESTING

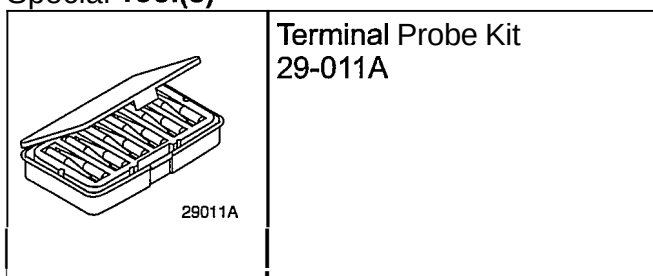
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033878	2 Measure the voltage between the headlamp switch, connector C338, pin 15, circuit 15-LE32 (GN/WH), wiring harness side and ground. Is battery voltage measured? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to the automatic headlamps relay, socket C418, pin 5 using the Wiring Diagrams. CHECK the operation of the system. → No GO to C8.
C8: RULE OUT THE AUTOMATIC HEADLAMPS RELAY AS A SOURCE OF THE FAULT	
 VFE0026275	1 Measure the voltage between the automatic headlamps relay, socket C418, pin 1, circuit 15-LE36 (GNNVH), socket side and ground. Is battery voltage measured? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S1 using the Wiring Diagrams. CHECK the operation of the system. If the concern persists: REFER to: Tagfahrlicht (DRL) (417-04, Diagnosis and Testing).
	→ No RENEW the automatic headlamps relay. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Reversing Lamps — Vehicles Built Up To: 1012005

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)



Terminal Probe Kit
29-011A

NOTE: If the generic electronic module (GEM) is changed, the new one must be configured. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to:

Communications Network - Vehicles Built Up To: 1012005 (418-00, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built Up To: 1012005 (419-10, Diagnosis and Testing).

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Inspection and Checking

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

REFER to: Module Configuration (418-01, Diagnosis and Testing).

Visual Inspection

Electrical
• Fuse(s) • Lamp(s) • Connector(s) • Switches • Wiring loom

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the cause of the concern cannot be determined with a visual inspection, proceed to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• The reversing lamp is inoperative	• Fuse • Circuit(s) • Rear lamp assembly • Reversing lamp switch • Reversing lamp relay • Transmission range sensor • Trailer control unit • Central junction box (CJB)	• GO to Pinpoint Test A.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The reversing lamp is lit continuously	- Circuit(s) - Reversing lamp switch - Reversing lamp relay - Powertrain control module (PCM) - Audio/navigation control panel - Generic Electronic Module (GEM) - Transmission range sensor - Transmission control module (TCM).	GO to Pinpoint Test B.

System Checks

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST AA : THE REVERSING LAMP IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FUSE F48 (7.5 A) (CJB).	
	☒ 1 Ignition switch in position 0.
	☒ 2 Disconnect fuse F48 (7.5 A) (CJB).
	☐ CHECK Fuse F48 (7.5 A) (CJB). Is the fuse OK.? → Yes GO to A2. → No RENEW fuse F48 (7.5 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE SUPPLY TO FUSE F48 (7.5 A) (CJB) FOR OPEN CIRCUIT	
	☒ 1 Connect fuse F48 (7.5 A) (CJB).
	☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS

3 Measure the voltage between fuse F48 (7.5 A) (CJB) and ground.

• Is battery voltage measured?

→ **Yes**

- Vehicles with manual transmission and with Durashift EST GO to A3.
- Vehicles with 4-speed automatic transmission (AW81-40): GO to A6.

→ **No**

LOCATE AND RECTIFY the break in the voltage supply to fuse F48 (7.5 A) (CJB) using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.

A3: CHECK VOLTAGE SUPPLY TO THE REVERSING LAMP SWITCH FOR OPEN CIRCUIT

Ignition switch in position 0.

2 Disconnect reversing lamp switch from connector C425.

3 Ignition switch in position II.

Measure the voltage between the reversing lamp switch, connector C425, pin 1, circuit 15-LG28 (GN/WH), wiring harness side and ground.

• Is battery voltage measured?

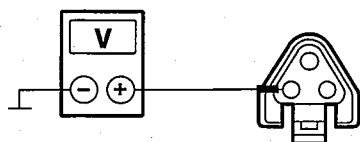
→ **Yes**

GO to A4.

→ **No**

LOCATE and RECTIFY the break in the circuit between fuse F48 (CJB) and the reversing lamp switch using the wiring diagrams. CHECK the operation of the system.

VFE0013674

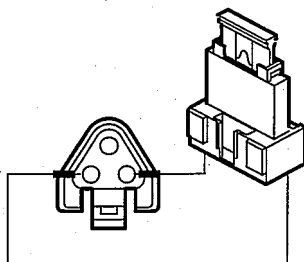


A4: CHECK REVERSING LAMP SWITCH

1 Ignition switch in position 0.

2 Connect a fused jumper wire (7.5 A) at the reversing lamp switch, connector C425, between pin 1, circuit 15-LG28 (GN/WH) and pin 2, circuit 15S-LG5 (GN/RD) (diesel engine) or 15S-LG1 (GNNE) (petrol engine), wiring harness side.

VFE0013668

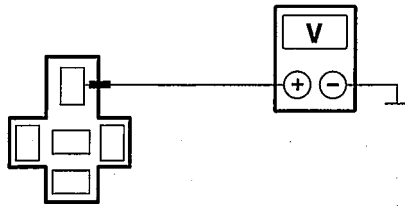


DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Ignition switch in position II. ☐ CHECK the operation of the reversing lamp. - Does the reversing lamp illuminate? → Yes INSTALL A NEW reversing lamp switch. CHECK the operation of the system. → No - Vehicles without trailer socket: GO to A5. - Vehicles with trailer socket: GO to A12.
A5: CHECK THE GROUND CONNECTION OF THE REAR LAMP ASSEMBLY FOR OPEN CIRCUIT	
	☐ Ignition switch in position 0. ☐ SWITCH ON the parking lamps. 3 Check the rear parking lamp. - Does the parking lamp illuminate? → Yes LOCATE and RECTIFY the break in circuits 15S-LG5 (GN/RD), 15S-LG1 (GNNE) and 15S-LG39 (GN/OG), between the reversing lamp switch and the rear lamp assembly using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. → No - LHD: LOCATE and RECTIFY the break in circuit 31-LF24 (BK), between the right-hand rear lamp assembly and ground G18 using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - RHD: LOCATE and RECTIFY the break in circuit 31-LF23 (BK) between the left-hand rear lamp assembly and soldered connection S24 using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
A6: CHECK VOLTAGE SUPPLY TO THE REVERSING LAMP RELAY FOR OPEN CIRCUIT	
	1 Ignition switch in position 0. ☐ Disconnect reversing lamp relay from socket C434. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0036754

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the reversing lamp relay, socket C434, pin 3, circuit 15-LG28 (GNWH), wiring harness side and ground.

• Does the meter display battery voltage?

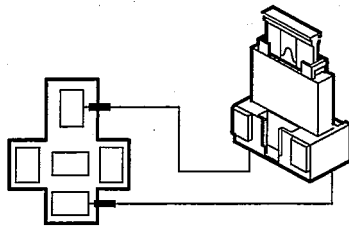
→ **Yes**

GO to A7.

→ **No**

LOCATE and RECTIFY the break in the circuit between fuse F48 (CJB) and the reversing lamp relay using the Wiring Diagrams. CHECK the operation of the system.

A7: NARROW DOWN THE CAUSE OF THE FAULT



VFE0036753

- ☐ Ignition switch in position 0.

- 2** Connect a fused jumper wire (7.5 A) at reversing lamp relay, socket C434, between pin 3, circuit 15-LG28 (GNWH), wiring harness side and pin 5, circuit 15S-LG1 (GNNE), wiring harness side.

- 3** Ignition switch in position II.

- 4** CHECK the operation of the reversing lamp.

• Does the reversing lamp illuminate?

→ **Yes**

GO to A9.

→ **No**

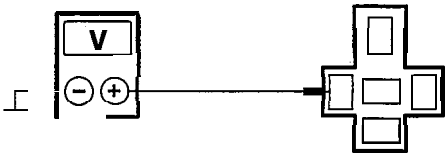
- Vehicles without trailer socket: GO to A8.
- Vehicles with trailer socket: GO to A12.

A8: CHECK THE GROUND CONNECTION OF THE REAR LAMP ASSEMBLY FOR OPEN CIRCUIT

- 1** Ignition switch in position 0.

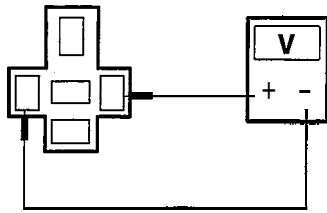
- ☐ SWITCH ON the parking lamps.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Check the rear parking lamp. - Does the parking lamp illuminate? → Yes LOCATE and RECTIFY the break in circuits 15S-LG1 (GNNE) or 15S-LG39 (GN/OG) between the reversing lamp switch and the rear lamp assembly using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. → No - LHD: LOCATE and RECTIFY the break in circuit 31-LF24 (BK), between the right-hand rear lamp assembly and ground G18 using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - RHD: LOCATE and RECTIFY the break in circuit 31-LF23 (BK) between the left-hand rear lamp assembly and soldered connection S24 using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
A9: CHECK CIRCUIT 15S-TC6 (GNNE) FOR OPEN CIRCUIT	
 VFE0026275	1 Measure the voltage between the reversing lamp relay, socket C434, pin 1, circuit 15S-TC6 (GNNE), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to A10. → No LOCATE and RECTIFY the break in the circuit between pin 1 and pin 3 on the reversing lamp relay using the Wiring Diagrams. If necessary RENEW the engine compartment relay box. CHECK the operation of the system.
A10: CHECK REVERSING LAMP RELAY	
	1 ENGAGE reverse gear

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038790

DETAILS/RESULTS/ACTIONS

- 2 Measure the voltage between the reversing lamp relay, socket C434, pin 1, circuit 15S-TC6 (GNNE), wiring harness side and pin 2, circuit 91S-TC6 (BKNE), wiring harness side.

• Does the meter display battery voltage?

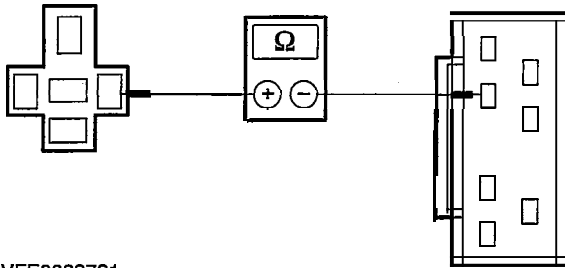
→ **Yes**

RENEW the reversing lamp relay. CHECK the operation of the system.

→ **No**

GO to A11.

A11: CHECK CONTROL WIRE 91S-TC6 (BKIYE) AND 91S-TA1 (BK/BU) OF REVERSING LAMP RELAY FOR OPEN CIRCUIT



VFE0038791

- 1 Ignition switch in position 0.

- 2 Disconnect Transmission range sensor from connector C431.

- 3 Measure the resistance between the reversing lamp relay, socket C434, pin 2, circuit 91-TC6 (BKNE), wiring harness side and the transmission range sensor, connector C431, pin 2, circuit 91S-TA1 (BWBU), wiring harness side.

• Is a resistance of less than 2 ohms registered?

→ **Yes**

RENEW the transmission range sensor. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuit between the reversing lamp relay and the transmission range sensor using the Wiring Diagrams. CHECK the operation of the system.

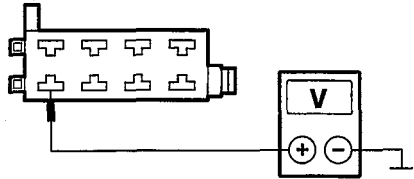
A12: CHECK THE TRAILER CONTROL UNIT

- 1 Ignition switch in position 0.

- 2 Connect Following component.

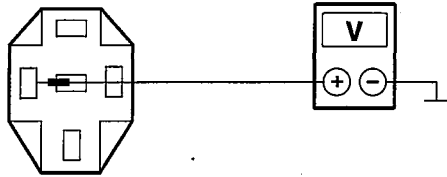
- Vehicles with manual transmission and Durashift EST Reversing lamp switch to connector C425
- Vehicles with 4 speed automatic transmission (AW81-40): reversing lamp relay to socket C434

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSIREULTSIACTIONS
 VFE0033913	☐ Disconnect Following component. - Vehicles built before 0312004: Trailer control unit from connector C1035 - Vehicles built from 0312004: Trailer relay, reversing lamp from socket C1044
	☐ Ignition switch in position II.
	☐ Engage reverse gear.
	☐ Vehicles built before 0312004.
	☐ Measure the voltage between the trailer control unit C1035, pin 2, circuit (VT/OG), wiring harness side and ground.
	☒ Vehicles built from 0312004.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0016095

DETAILS/RESULTS/ACTIONS

Measure the voltage between the trailer relay, reversing lamp, connector C1044, circuit (BWBU), socket side and ground.

- Is battery voltage measured?

→ Yes

- Vehicles built before 0312004: GO to A13.
- Vehicles built from 0312004: GO to A20.

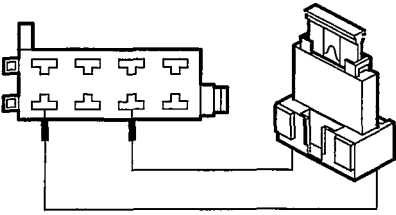
→ No

- Vehicles built before 0312004: Vehicles with manual transmission and Durashift EST LOCATE and RECTIFY the break in the circuits between the reversing lamp switch and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system.
- Vehicles built from 0312004: Vehicles with manual transmission and Durashift EST LOCATE and RECTIFY the break in the circuits between the reversing lamp switch and the trailer relay, reversing lamp using the Wiring Diagrams. CHECK the operation of the system.
- Vehicles built before 0312004: Vehicles with 4 speed automatic transmission (AW81-40): LOCATE and RECTIFY the break in the circuits between the reversing lamp relay and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system.
- Vehicles built from 0312004: Vehicles with 4 speed automatic transmission (AW81-40): LOCATE and RECTIFY the break in the circuits between the reversing lamp relay and the trailer relay, reversing lamp using the Wiring Diagrams. CHECK the operation of the system.

A13: CHECK THE TRAILER CONTROL UNIT

- 1 Ignition switch in position 0.

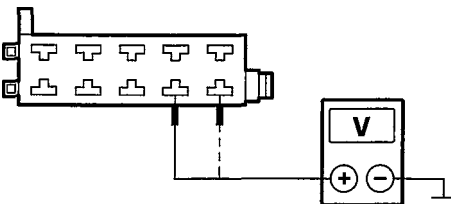
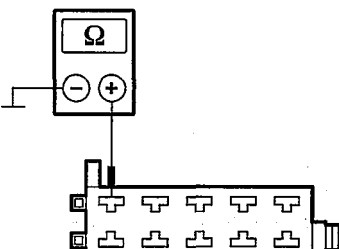
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033914	2 Connect a fused jumper wire (7.5 A) at the trailer control unit, connector C1035, between pin 2, circuit (VT/OG) and pin 6, circuit (BWBU), wiring harness side.
	3 Ignition switch in position II. 4 CHECK the operation of the reversing lamp. - Does the reversing lamp illuminate? → Yes - Vehicles built before 1012002: GO to A14. - Vehicles built from 1012002: GO to A16. → No GO to A20.
A14: CHECK FUSE F31 (20 A) (CJB).	
	1 Ignition switch in position 0. 2 Disconnect fuse F31 (20 A) (CJB). 3 CHECK Fuse F31 (20 A) (CJB). Is the fuse OK.? → Yes GO to A15. → No RENEW fuse F31 (20 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A15: CHECK THE VOLTAGE SUPPLY TO FUSE F31 (20 A) (CJB) FOR OPEN CIRCUIT	
	1 Connect fuse F31 (20 A) (CJB). 2 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the voltage between fuse F31 (20 A) (CJB) and ground. Is battery voltage measured? → Yes GO to A18. → No LOCATE AND RECTIFY the break in the voltage supply to fuse F31 (20 A) (CJB) using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
A16: CHECK FUSE F56 (20 A) (CJB).	
	1 Ignition switch in position 0.
	2 Disconnect fuse F56 (20 A) (CJB).
	3 CHECK Fuse F56 (20 A) (CJB). Is the fuse OK.? → Yes GO to A17. → No RENEW fuse F56 (20 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A17: CHECK THE VOLTAGE SUPPLY TO FUSE F56 (20 A) (CJB) FOR OPEN CIRCUIT	
	1 Connect fuse F56 (20 A) (CJB).
	2 Ignition switch in position II.
	3 Measure the voltage between fuse F56 (20 A) (CJB) and ground. Is battery voltage measured? → Yes GO to A18. → No LOCATE AND RECTIFY the break in the voltage supply to fuse F56 (20 A) (CJB) using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
A18: CHECK THE VOLTAGE SUPPLY TO THE TRAILER CONTROL UNIT FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect trailer control unit from connector C1041.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033871	__ Ignition switch in position II. 1 Measure the voltage between the trailer control unit, connector C1041, pin 8, circuit (RD), wiring harness side and pin 10, circuit (RD), wiring harness side and ground. - Is battery voltage measured in both cases? → Yes GO to A19. → No - Vehicles built before 1012002: LOCATE and RECTIFY break in the relevant circuit between fuse F31 (CJB) and the trailer control unit using the Wiring Diagrams. If necessary CHECK and RENEW the central junction box (CJB). CHECK the operation of the system. - Vehicles built from 1012002: LOCATE and RECTIFY the break in the relevant circuit between fuse F56 (CJB) and the trailer control unit using the Wiring Diagrams. If necessary CHECK and RENEW the central junction box (CJB). CHECK the operation of the system.
A19: CHECK THE GROUND CONNECTION OF THE TRAILER CONTROL UNIT FOR OPEN CIRCUIT	
 VFE0033872	☐ Ignition switch in position 0. 2 Measure the resistance between the trailer control unit, connector C1041, pin 1, circuit (BN), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes RENEW the trailer control unit. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the relevant circuit (BN) between the trailer control unit and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
A20: CHECK GROUND CONNECTION TO REAR LAMP ASSEMBLY FOR OPEN CIRCUIT	
	1 Ignition switch in position 0. 2 Connect Following component. - Vehicles built before 0312004: Trailer control unit to connector C1035 - Vehicles built from 0312004: Trailer relay, reversing lamp to socket C1044 3 SWITCH ON the parking lamps (side lamps).

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 4** Check the rear parking lamps (side lamps).
- Are the parking lamps (side lamps) illuminated?
- **Yes**
- Vehicles built before 03/12/2004: LOCATE and RECTIFY the break in circuits (BWBU) (LHD) or (BWBU) and (VTNE) (RHD) between the trailer control unit and the rear lamp assembly using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
 - Vehicles built from 03/12/2004: LOCATE and RECTIFY the break in circuits (BWBU) and (WH/BK) (LHD) or (BWBU) and (VTNE) (RHD) between the trailer relay, reversing lamp and the rear lamp assembly using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
- **No**
- LHD: LOCATE and RECTIFY the break in circuits (BK), (BN) or 31-LF24 (BK) between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
 - RHD: LOCATE and RECTIFY the break in circuits (GN), (BN) or 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.

PINPOINT TEST AB : THE REVERSING LAMP IS LIT CONTINUOUSLY

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

B1: CHECK REVERSING LAMP SWITCH

- 1** Ignition switch in position 0.
- 2** Disconnect Following component.
- Vehicles with manual transmission and with Durashift **EST**: reversing lamp switch from connector C425
 - Vehicles with 4-speed automatic transmission (**AW81-40**): reversing lamp relay from socket C434
- 3** Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Check the reversing lamp. - Does the reversing lamp remain continuously lit? → Yes - Vehicles without trailer socket: GO to B4. - Vehicles built before 0312004: Vehicles with trailer socket: GO to B2. - Vehicles built from 0312004: Vehicles with trailer socket: GO to B4. → No - Vehicles with manual transmission and with Durashift EST INSTALL A NEW reversing lamp switch. CHECK the operation of the system. - Vehicles with 4-speed automatic transmission (AW81-40): GO to B7.
B2: RULE OUT TRAILER CONTROL UNIT AS CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect Following fuse. - Vehicles built before 1012002: Fuse F31 (20 A) (CJB) - Vehicles built from 1012002: Fuse F56 (20 A) (CJB)
	3 Ignition switch in position II.
	4 Check the reversing lamp. Does the reversing lamp remain continuously lit? → Yes GO to B3. → No RENEW the trailer control unit. CHECK the operation of the system.
B3: NARROW DOWN THE FAULT CONDITION	
	1 Ignition switch in position 0.
	2 Disconnect trailer control unit from connector C1035.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Check the reversing lamp. Does the reversing lamp remain continuously lit? → Yes LOCATE and RECTIFY the short to battery voltage in circuits (BWBU) or (VTNE) between the trailer control unit and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system. → No GO to B4.
B4: RULE OUT THE GENERIC ELECTRONIC MODULE (GEM) AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	☐ Ignition switch in position 0. ☐ Disconnect fuse F20 (CJB). ☐ Disconnect fuse F24 (CJB). ☐ Disconnect fuse F25 (CJB). 5 Disconnect fuse F26 (CJB). 6 Disconnect fuse F27 (CJB). ☐ Disconnect fuse F38 (CJB). 8 Disconnect fuse F46 (CJB). 9 Disconnect fuse F47 (CJB). 10 Ignition switch in position II. 11 CHECK the reversing lamp. Does the reversing lamp remain continuously lit? → Yes GO to B5. → No RENEW the generic electronic module (GEM). CHECK the operation of the system.
B5: RULE OUT AUDIO/NAVIGATION CONTROL UNIT AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0. 2 Connect fuse F20 (CJB). 3 Connect fuse F24 (CJB). ☐ Connect fuse F25 (CJB).

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 Connect fuse F26 (CJB). 6 Connect fuse F27 (CJB). 7 Connect fuse F38 (CJB). 8 Connect fuse F46 (CJB). 9 Connect fuse F47 (CJB). 10 Disconnect fuse F18 (CJB). 11 Disconnect fuse F44 (CJB). ☐ Ignition switch in position II. 13 CHECK the reversing lamp. - Does the reversing lamp remain continuously lit? → Yes - Vehicles with diesel engines: GO to B6. - Vehicles with petrol engines: LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S32 using the Wiring Diagrams. CHECK the operation of the system. → No - RENEW the audio/navigation control panel - CHECK the operation of the system.
B6: RULE OUT THE POWERTRAIN CONTROL MODULE (PCM) AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0. 2 Connect fuse F18 (CJB). 3 Connect fuse F44 (CJB). 4 Disconnect powertrain control module from connectors C370, C371 and C372. 5 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

	☐ CHECK the reversing lamp. Does the reversing lamp remain continuously lit? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S32 using the Wiring Diagrams. CHECK the operation of the system. → No INSTALL the powertrain control module (PCM). CHECK the operation of the system.
--	---

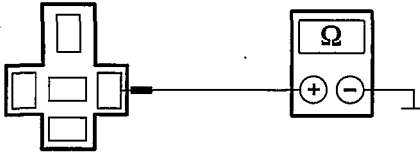
B7: RULE OUT TRANSMISSION RANGE SENSOR AS POSSIBLE CAUSE FOR A SHORT TO GROUND

	☐ Ignition switch in position 0.
	☐ Connect reversing lamp relay to socket C434.
	☒ 3 Disconnect Transmission range sensor from connector C431.
	☒ 4 Ignition switch in position II.
	☒ 5 CHECK the reversing lamp. Does the reversing lamp remain continuously lit? → Yes GO to B8. → No RENEW the transmission range sensor. CHECK the operation of the system.

B8: RULE OUT TRANSMISSION CONTROL MODULE (TCM) AS POSSIBLE CAUSE FOR A SHORT TO GROUND

	☒ 1 Ignition switch in position 0.
	☐ Disconnect Transmission control module (TCM) from connector C429.
	☒ 3 Ignition switch in position II.
	☐ CHECK the reversing lamp. Does the reversing lamp remain continuously lit? → Yes GO to B9. → No RENEW the transmission control module (TCM). CHECK the operation of the system.

DIAGNOSIS AND TESTING

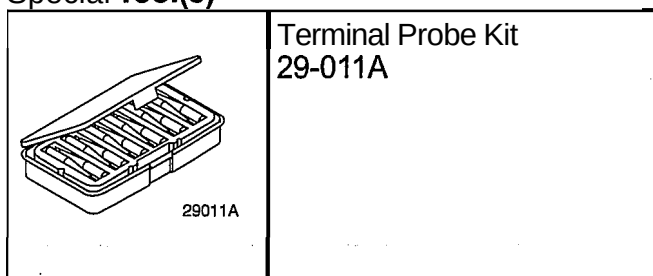
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B9: CHECK REVERSING LAMP RELAY	
	☒ 1 Ignition switch in position 0.
	☐ Disconnect reversing lamp relay from socket C434.
	☒ 3 Ignition switch in position II.
 VFE0026280	☐ Measure the resistance between the reversing lamp relay, socket C434, pin 2, circuit 91S-TC6 (BK/YE), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured?
	→ Yes RENEW the reversing lamp relay. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S134 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Reversing Lamps — Vehicles Built From: 10/2005

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)



NOTE: If the generic electronic module (GEM) is changed, the new one must be configured. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to:

Communications Network - Vehicles Built From:
10/2005 (418-00, Diagnosis and Testing),
Generic Electronic Module (GEM) - Vehicles Built
From: 10/2005 (419-10, Diagnosis and Testing).

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Inspection and Checking

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

NOTE: If the powertrain control module (PCM) is changed, the new one must be programmed. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module.

REFER to: Module Configuration (418-01, Diagnosis and Testing).

Visual Inspection

Electrical
• Fuse(s) • Lamp(s) • Connector(s) • Switches - Wiring loom

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.
4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Reversing lamps inoperative	• Fuse • Circuit(s) • Rear lamp assembly • Reversing lamp switch • Reversing lamp relay • Shift lever position sensor • Trailer control unit • Central junction box (CJB)	• GO to Pinpoint Test A.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Reversing lamps on permanently	- Circuit(s) - Reversing lamp switch - Reversing lamp relay - Powertrain control module (PCM) - Audio/navigation control panel - Generic Electronic Module (GEM) - Shift lever position sensor - Transmission control module (TCM).	GO to Pinpoint Test B.

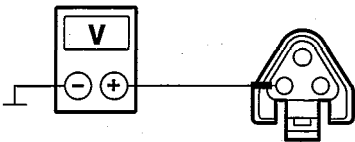
System Checks

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST AC : REVERSING LAMPS INOPERATIVE

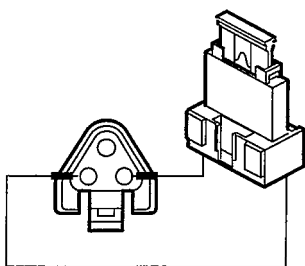
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
AI: NARROW DOWN THE FAULT CONDITION	
	1 Ignition switch in position II.
	2 Engage reverse gear.
	3 CHECK the reversing lamps. - Is the left-hand reversing lamp inoperative? → Yes The left-hand reversing lamp is inoperative: GO to A12. → No - The right-hand reversing lamp is inoperative: GO to A14. - Both reversing lamps are inoperative: GO to A2.
A2: CHECK FUSE F48 (7.5 A) (CJB).	
	1 Ignition switch in position 0.
	2 Disconnect fuse F48 (7.5 A) (CJB).
	3 CHECK fuse F48 (7.5 A) (CJB). - Is the fuse OK.? → Yes GO to A3. → No RENEW fuse F48 (7.5 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A3: CHECK THE VOLTAGE SUPPLY TO FUSE F48 (7.5 A) (CJB) FOR OPEN CIRCUIT	
	☒ 1 Connect fuse F48 (7.5 A) (CJB).
	☐ Ignition switch in position II.
	☒ 3 Measure the voltage between fuse F48 (7.5 A) (CJB) and ground. - Does the meter display battery voltage? → Yes - Vehicles with manual transmission and with Durashift EST GO to A4. - Vehicles with 4-speed automatic transmission (AW81-40): GO to A6. → No LOCATE AND RECTIFY the break in the voltage supply to fuse F48 (7.5 A) (CJB) using the Wiring Diagrams. If necessary RENEW the CJB. CHECK the operation of the system.
A4: CHECK VOLTAGE SUPPLY TO THE REVERSING LAMP SWITCH FOR OPEN CIRCUIT	
	☒ 1 Ignition switch in position 0.
	☒ 2 Disconnect reversing lamp switch from connector C425.
	☐ Ignition switch in position II.
 VFE0013674	☒ 4 Measure the voltage between the reversing lamp switch, connector C425, pin 1, circuit 15-LG28 (GN/WH), wiring harness side and ground. - Does the meter display battery voltage? → Yes GO to A5. → No LOCATE and RECTIFY the break in the circuit between fuse F48 (7.5 A) (CJB) and the reversing lamp switch using the Wiring Diagrams. CHECK the operation of the system.
A5: CHECK REVERSING LAMP SWITCH	
	☒ 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0013668

DETAILS/RESULTS/ACTIONS

- 2 Connect a fused jumper wire (7.5 A) to the reversing lamp switch, connector C425, between pin 1, circuit 15-LG28 (GN/WH) and
- On petrol engines: pin 2, circuit 15S-LG1 (GNNE), wiring harness side.
 - On diesel engines: pin 2, circuit 15S-LG5 (GN/RD), wiring harness side.

☐ Ignition switch in position II.

4 CHECK the operation of the reversing lamps.

- Do the reversing lamps illuminate?

→ Yes

INSTALL A NEW reversing lamp switch.
CHECK the operation of the system.

→ No

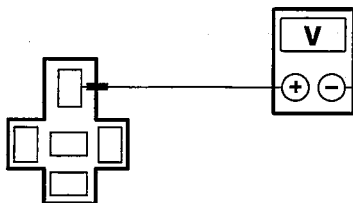
LOCATE and RECTIFY the break in the circuits between the reversing lamp switch and soldered connection S32 using the Wiring Diagrams. CHECK the operation of the system.

A6: CHECK VOLTAGE SUPPLY TO THE REVERSING LAMP RELAY FOR OPEN CIRCUIT

1 Ignition switch in position 0.

2 Disconnect reversing lamp relay from socket C434.

3 Ignition switch in position II.



VFE0036754

4 Measure the voltage between the reversing lamp relay, socket C434, pin 3, circuit 15-LG28 (GN/WH)/15-TC6 (GN/YE), socket side and ground.

- Does the meter display battery voltage?

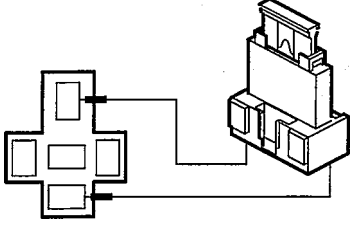
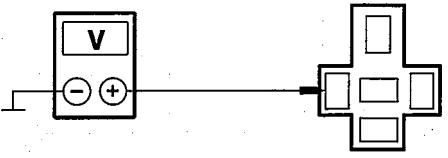
→ Yes

GO to A7.

→ No

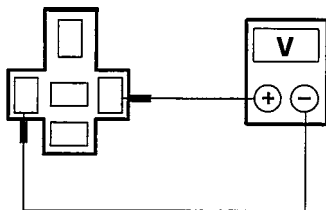
LOCATE and RECTIFY the break in the circuit between fuse F48 (7.5 A) (CJB) and the reversing lamp relay using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS		RESULTS	ACTIONS
A7: NARROW DOWN THE CAUSE OF THE FAULT					
 VFE0036753		☒ 1 Ignition switch in position 0.			
		☐ Connect a fused jumper wire (7.5 A) at reversing lamp relay, socket C434, between pin 3, circuit 15-LG28 (GN/WH)/15-TC6 (GNNE), socket side and pin 5, circuit 15S-LG1 (GNNE), socket side.			
		☐ Ignition switch in position II.			
		4 CHECK the reversing lamps. • Do the reversing lamps illuminate? → Yes GO to A8. → No LOCATE and RECTIFY the break in the circuits between the reversing lamp relay and soldered connection S32 using the Wiring Diagrams. CHECK the operation of the system.			
A8: CHECK CIRCUIT 15S-TC6 (GNNE) FOR OPEN CIRCUIT					
 VFE0026275		1 Measure the voltage between the reversing lamp relay, socket C434, pin 1, circuit 15-TC6 (GNNE), socket side and ground. • Does the meter display battery voltage? → Yes GO to A9. → No LOCATE and RECTIFY the break in the circuit at the reversing lamp relay, socket C434, between pin 1 and pin 3 using the Wiring Diagrams. If necessary RENEW the engine compartment relay box. CHECK the operation of the system.			
A9: CHECK THE REVERSING LAMP RELAY					
		1 ENGAGE reverse gear			

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038790

DETAILS/RESULTS/ACTIONS

- 2 Measure the voltage between the reversing lamp relay, socket C434, pin 1, circuit 15-TC6 (GNNE), socket side and pin 2, circuit 91S-TC6 (BK/YE), socket side.

- Does the meter display battery voltage?

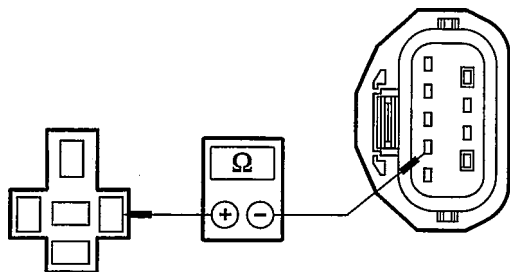
→ Yes

RENEW the reversing lamp relay. CHECK the operation of the system.

→ No

GO to A10.

A10: CHECK THE CONTROL CIRCUIT BETWEEN THE SHIFT LEVER POSITION SENSOR AND THE REVERSING LAMP RELAY FOR OPEN CIRCUIT



VFE64396

- 1 Ignition switch in position 0.

- 2 Disconnect Shift lever position sensor from connector C431.

- 3 Measure the resistance between the reversing lamp relay, socket C434, pin 2, circuit 91S-TC6 (BK/YE), socket side and the shift lever position sensor, connector C431, pin 2, circuit 91S-TA1 (BWBU), wiring harness side.

- Is a resistance of less than 2 ohms registered?

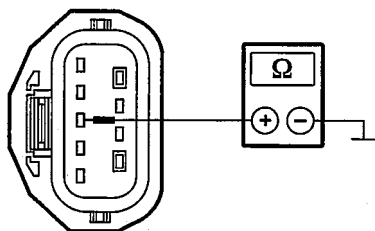
→ Yes

GO to A11.

→ No

LOCATE and RECTIFY the break in the circuit between the reversing lamp relay and the shift lever position sensor using the Wiring Diagrams. CHECK the operation of the system.

A11: RULE OUT THE SHIFT LEVER POSITION SENSOR AS THE CAUSE OF THE FAULT



VFE64397

- 1 Measure the resistance between the shift lever position, connector C431, pin 3, circuit 91-TA18 (BWRD), wiring harness side and ground.

- Is a resistance of less than 2 ohms registered?

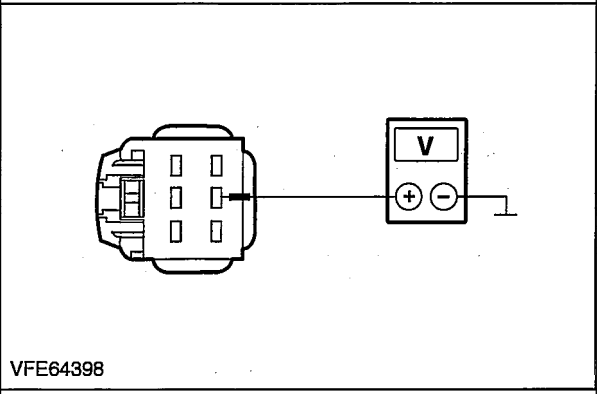
→ Yes

RENEW the shift lever position sensor. CHECK the operation of the system.

→ No

LOCATE and RECTIFY the break in the circuit between the shift lever position sensor and soldered connection S132 using the Wiring Diagrams. CHECK the operation of the system.

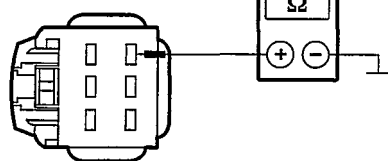
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A12: CHECK THE VOLTAGE SUPPLY TO THE LEFT-HAND REAR LAMP ASSEMBLY FOR OPEN CIRCUIT	
	☒ 1 Ignition switch in position 0.
	☒ 2 Disconnect Left-hand rear lamp assembly. – Vehicles without trailer socket: from connector C333 – Vehicles with trailer socket: from connector C333a
	☐ Ignition switch in position II.
	☐ Engage reverse gear.
 VFE64398	☐ Measure the voltage between the left-hand rear lamp assembly – Vehicles without trailer socket: connector C333, pin 5, circuit 15S-LG39B (GN/OG), wiring harness side and ground. – Vehicles with trailer socket: Connector C333a, pin 5, circuit (VT/YE), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to A13. → No LOCATE and RECTIFY the break in the circuits between soldered connection S32 and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.
A13: CHECK THE GROUND CONNECTION TO THE LEFT-HAND REAR LAMP ASSEMBLY FOR OPEN CIRCUIT	
	☒ 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VFE64389

- 2** Measure the resistance between left-hand rear lamp assembly
- Vehicles without trailer socket: connector C333, pin 4, circuit 31-LF23 (BK), wiring harness side and ground.
 - Vehicles with trailer socket: connector C333a, pin 4, circuit (BN), wiring harness side and ground.

• Is a resistance of less than 2 ohms registered?

→ **Yes**

CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the break in the circuits between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK the operation of the system.

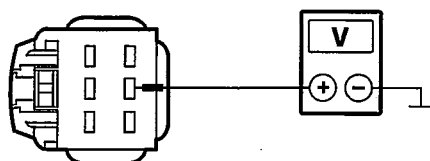
A14: CHECK VOLTAGE SUPPLY TO THE RIGHT-HAND REAR LAMP ASSEMBLY FOR OPEN CIRCUIT

☐ Ignition switch in position 0.

- ☐ Disconnect Right-hand rear lamp assembly.
- Vehicles without trailer socket: from connector C348
 - Vehicles with trailer socket: from connector C348a

☐ Ignition switch in position II.

4 Engage reverse gear.



VFE64398

- ☐ Measure the voltage between the right-hand rear lamp assembly
- Vehicles without trailer socket: connector C348, pin 5, circuit 15S-LG39A (GN/OG), wiring harness side and ground.
 - Vehicles with trailer socket: connector C348a, pin 5, circuit (WH/BK), wiring harness side and ground.

• Does the meter display battery voltage?

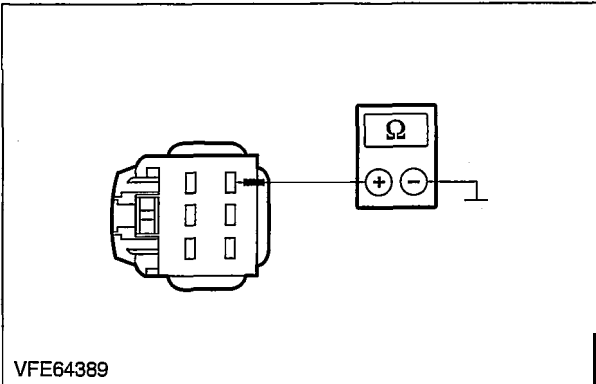
→ **Yes**

GO to A15.

→ **No**

LOCATE and RECTIFY the break in the circuits between soldered connection S32 and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A15: CHECK THE GROUND CONNECTION TO THE RIGHT-HAND REAR LAMP ASSEMBLY FOR OPEN CIRCUIT	
 VFE64389	☐ Ignition switch in position 0.
	2 Measure the resistance between the right-hand rear lamp assembly – Vehicles without trailer socket: connector C348, pin 4, circuit 31-LF24 (BK), wiring harness side and ground. – Vehicles with trailer socket: connector C348a, pin 4, circuit (WH/BK), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuits between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST AD : REVERSING LAMPS ON PERMANENTLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK REVERSING LAMP SWITCH	
	1 Ignition switch in position 0.
	2 Disconnect Corresponding component, – Vehicles with manual transmission and with Durashift EST reversing lamp switch from connector C425 – Vehicles with 4-speed automatic transmission (AW81-40): reversing lamp relay from socket C434
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
	CHECK the reversing lamps. - Do the reversing lamps illuminate continuously? → Yes GO to B2. → No - Vehicles with manual transmission and with Durashift EST INSTALL A NEW reversing lamp switch. CHECK the operation of the system. - Vehicles with 4-speed automatic transmission (AW81-40): GO to B5.
B2: RULE OUT THE GENERIC ELECTRONIC MODULE (GEM) AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect fuse F8 (7.5 A) (CJB).
	3 Disconnect fuse F17 (15 A) (CJB).
	4 Disconnect fuse F24 (20 A) (CJB).
	5 Disconnect fuse F25 (15 A) (CJB).
	6 Disconnect fuse F26 (20 A) (CJB).
	7 Disconnect fuse F27 (15 A) (CJB).
	8 Disconnect fuse F38 (7.5 A) (CJB).
	9 Disconnect fuse F46 (20 A) (CJB).
	Disconnect fuse F47 (10 A) (CJB).
	11 Ignition switch in position II.
	12 CHECK the reversing lamps. Do the reversing lamps illuminate continuously? → Yes GO to B3. → No RENEW the generic electronic module (GEM). CHECK the operation of the system.
B3: ELIMINATE THE AUDIO/NAVIGATION CONTROL PANEL AS THE CAUSE OF A SHORT TO BATTERY VOLTAGE	
	1 Ignition switch in position 0.
	2 Connect fuse F8 (7.5 A) (CJB).
	Connect fuse F17 (15 A) (CJB).

DIAGNOSIS AND TESTING

TEST CONDITIONS

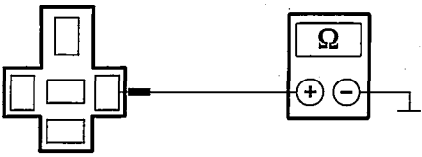
DETAILS RESULTS ACTIONS

	☐ 4 Connect fuse F24 (20 A) (CJB).
	☐ 5 Connect fuse F25 (15 A) (CJB).
	☐ 6 Connect fuse F26 (20 A) (CJB).
	☐ Connect fuse F27 (15 A) (CJB).
	☐ Connect fuse F38 (7.5 A) (CJB).
	☐ 9 Connect fuse F46 (20 A) (CJB).
	☐ 10 Connect fuse F47 (10 A) (CJB).
	☐ 11 Disconnect fuse F18 (15 A) (CJB).
	☐ Disconnect fuse F44 (3 A) (CJB).
	☐ 13 Ignition switch in position II.
	☐ 14 CHECK the reversing lamps.
	Do the reversing lamps illuminate continuously?
	→ Yes - Vehicles with diesel engines: GO to B4. - Vehicles with petrol engines: LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S32 using the Wiring Diagrams. CHECK the operation of the system.
	→ No RENEW the audio/navigation control panel CHECK the operation of the system.
B4: RULE OUT THE POWERTRAIN CONTROL MODULE (PCM) AS POSSIBLE CAUSE FOR A SHORT TO BATTERY VOLTAGE	
	☐ 1 Ignition switch in position 0.
	☐ 2 Connect fuse F18 (15 A) (CJB).
	☐ 3 Connect fuse F44 (3 A) (CJB).
	☐ 4 Disconnect Powertrain control module (PCM) from connector C372, C377 or C384.
	☐ 5 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK the reversing lamps. Do the reversing lamps illuminate continuously? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S32 using the Wiring Diagrams. CHECK the operation of the system. → No INSTALL the powertrain control module (PCM). CHECK the operation of the system.
B5: ELIMINATE THE SHIFT LEVER POSITION SENSOR AS CAUSE FOR THE SHORT TO GROUND	
	1 Ignition switch in position 0.
	2 Connect reversing lamp relay to socket C434.
	3 Disconnect Shift lever position sensor from connector C431.
	4 Ignition switch in position II.
	5 CHECK the reversing lamps. Do the reversing lamps illuminate continuously? → Yes GO to B6. → No RENEW the shift lever position sensor. CHECK the operation of the system.
B6: RULE OUT THE TRANSMISSION CONTROL MODULE (TCM) AS POSSIBLE CAUSE FOR A SHORT TO GROUND	
	1 Ignition switch in position 0.
	2 Disconnect Transmission control module (TCM) from connector C429.
	3 Ignition switch in position II.
	4 CHECK the reversing lamps. Do the reversing lamps illuminate continuously? → Yes GO to B7. → No RENEW the transmission control module (TCM). CHECK the operation of the system.

DIAGNOSIS AND TESTING

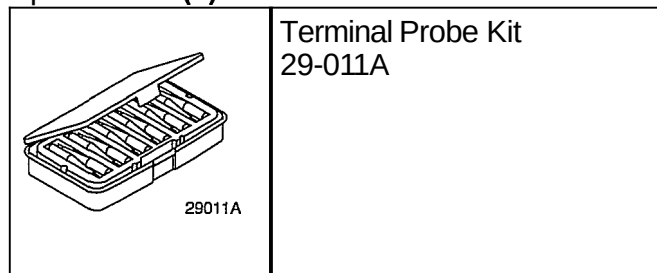
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B7: RULE OUT THE CONTROL CIRCUIT OF THE REVERSING LAMP RELAY AS THE SOURCE OF THE FAULT	
	1 Ignition switch in position 0. 2 Disconnect reversing lamp relay from socket C434.
 VFE0026280	3 Measure the resistance between the reversing lamp relay, socket C434, pin 2, circuit 91S-TC6 (BK/YE), socket side and ground. Is a resistance of more than 10,000 ohms measured? → Yes RENEW the reversing lamp relay. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S134 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Fog Lamps

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)



Inspection and Checking

NOTE: Before reading out the vehicle-specific data, remake all the electrical connections in the vehicle, so that communication between the module and WDS is ensured.

NOTE: If the instrument cluster is changed, the new one must be reinitialised. For this purpose, the vehicle-specific data is read out of the module to be replaced using WDS and is transferred to the new module. REFER to: (413-01)

Instrument Cluster - Vehicles Built Up To:
10/2005 (Diagnosis and Testing),
Instrument Cluster - Vehicles Built From:
10/2005 (Diagnosis and Testing).

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Fog lamps are inoperative	• Fuse • Circuit(s) • Headlight switch	• GO to Pinpoint Test A.
• Rear fog lamp(s) or front fog lamps inoperative	• Circuit(s) • Headlight switch	• GO to Pinpoint Test B.
• Individual fog lamps inoperative	• Circuit(s) • Right/left-hand front fog lamp. • Rear lamp assembly	• GO to Pinpoint Test C.
• Rear fog lamp(s) or front fog lamps illuminate continuously	• Circuit(s) • Headlight switch	• GO to Pinpoint Test D.

System Checks

NOTE: Use a digital multimeter for all electrical measurements.

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection

Electrical
• Fuse(s) • Lamp(s) • Connector(s). • Switches • Wiring loom

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.

4. If the concern is not visually evident, refer to the Symptom Chart.

NOTE: A mechanical interlock in the headlight switch allows the fog lamps to be turned on only when the headlight switch is in the "Dipped beam ON" position.

DIAGNOSIS AND TESTING

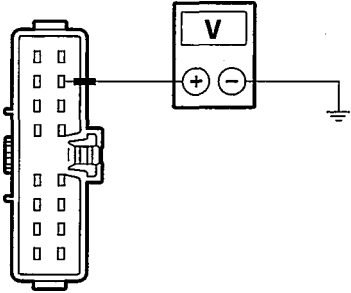
PINPOINT TEST AE : FOG LAMPS ARE INOPERATIVE

TEST CONDITIONS

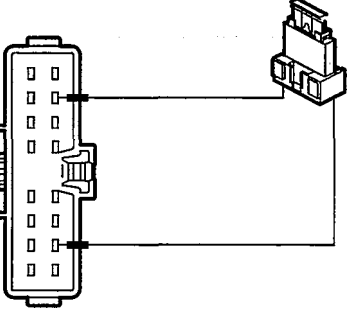
DETAILS/RESULTS/ACTIONS

A1: CHECK FUSE F50 (20 A) (CJB).	
	1 Ignition switch in position 0.
	2 Disconnect Fuse F50 (20 A) (CJB).
	3 CHECK fuse F50 (20 A) (CJB). Is the fuse OK.? → Yes GO to A2. → No RENEW fuse F50 (20 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE SUPPLY TO FUSE F50 (20A) (CJB) FOR OPEN CIRCUIT	
	1 Connect Fuse F50 (20 A) (CJB).
	2 Ignition switch in position II.
	☐ Measure the voltage between fuse F50 (20 A) (CJB) and ground. Is battery voltage measured? → Yes GO to A3. → No LOCATE AND RECTIFY the break in the voltage supply of fuse F50 (20 A) (CJB) using the Wiring Diagrams. CHECK the operation of the system.
A3: CHECK THE VOLTAGE AT THE HEADLIGHT SWITCH	
	1 Ignition switch in position 0.
	2 Disconnect headlight switch from connector C338.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0003184	4 Measure the voltage between the headlamp switch, connector C338, pin 7, circuit 15-LD10 (GN/OG), wiring harness side and ground. Is battery voltage measured? → Yes INSTALL A NEW headlight switch. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between fuse F50 (20A) (CJB) and the headlamp switch using the Wiring Diagrams. CHECK the operation of the system.

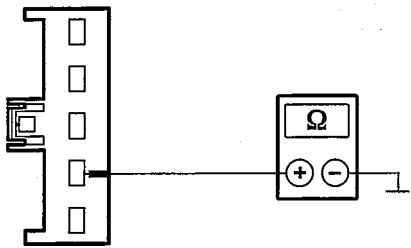
PINPOINT TEST AF : REAR FOG LAMP(S) OR FRONT FOG LAMPS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
BI: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position II.
	2 Check operation of the fog lamps.
	3 Switch on the front fog lamps.
	☐ Switch on rear fog lamp(s) Do the front fog lamps illuminate? → Yes GO to B2. → No GO to B23.
B2: CHECK THE HEADLIGHT SWITCH	
	☐ Ignition switch in position 0.
	☐ Disconnect headlight switch from connector C338.
 E0024110	3 Connect a fused jumper wire (20 A) at the headlamp switch, connector C338, between pin 7, circuit 15-LD10 (GNIOG) and pin 2, circuit 15S-LD6A (GNNE), wiring harness side.

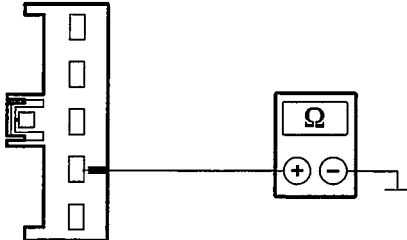
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

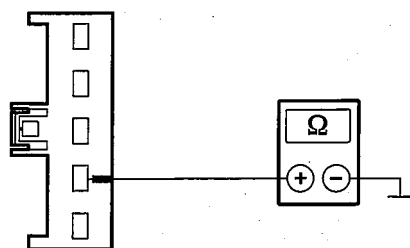
	☐ Ignition switch in position II. 5 Switch on rear fog lamp(s) - Does/Do the rear fog lamp(s) illuminate? → Yes INSTALL A NEW headlight switch. CHECK the operation of the system. → No - LHDIRHD without trailer socket, built from 0812005: LOCATE and RECTIFY the break in the circuits between the headlamp switch and soldered connection S19 using the Wiring Diagrams. CHECK the operation of the system. - LHD, vehicles without trailer socket, built before 0812005: GO to B3. - RHD, vehicles without trailer socket, built before 0812005: GO to B4. - LHD, vehicles with trailer socket, built before 0812005: GO to B5. - RHD, vehicles with trailer socket, built before 0812005: GO to B14.
B3: CHECK GROUND CONNECTION OF REAR FOG LAMP (LHD)	
	☐ Ignition switch in position 0. 2 Disconnect left-hand rear lamp assembly from connector C333.
 VFE0033869	3 Measure the resistance between the left-hand rear lamp assembly, connector C333, pin 4, circuit 31-LF23 (BK), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes LOCATE and RECTIFY the break in circuit 15S-LD6A (GNNE) or 15S-LD6 (GNNE) between the headlight switch and the rear lamp assembly using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
	→ No LOCATE and RECTIFY the break in circuit 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the wiring diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B4: CHECK GROUND CONNECTION OF REAR FOG LAMP (RHD)	
	1 Ignition switch in position 0. 2 Disconnect right-hand rear lamp assembly from connector C348.
 VFE0033869	3 Measure the resistance between the right-hand rear lamp assembly, connector C348, pin 4, circuit 31-LF24 (BK), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes LOCATE and RECTIFY the break in circuit 15S-LD6A (GNNE) or 15S-LD6 (GNNE) between the headlight switch and the rear lamp assembly using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 31-LF24 (BK), between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
B5: CHECK GROUND CONNECTION OF REAR FOG LAMP (LHD)	
	1 Ignition switch in position 0. 2 Disconnect left-hand rear lamp assembly from connector C333a.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033869

DETAILS/RESULTS/ACTIONS

- 3** Measure the resistance between the left-hand rear lamp assembly, connector C333a, pin 4:
- Vehicles built from 0312004, with 13-pin trailer socket: circuit (BN), wiring harness side and ground.
 - All other models: circuit (GN), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?

→ **Yes**

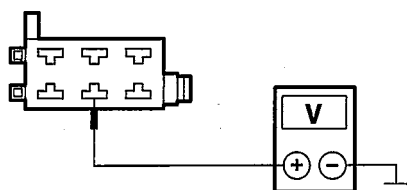
GO to B6.

→ **No**

- Vehicles built from 0312004, with 13-pin trailer socket: LOCATE and RECTIFY the break in circuit (BN) between the rear lamp assembly and soldered connection S1008 using the Wiring Diagrams. CHECK the operation of the system.
- All other models: LOCATE and RECTIFY the break in circuit (GN) or 31-LF23 (BK) between the rear lamp assembly and soldered connection S24 using the Wiring Diagrams. CHECK the operation of the system.

B6: CHECK CIRCUITS 15S-LD6(A) (GNNE) OR (RDNVH) FOR OPEN CIRCUIT

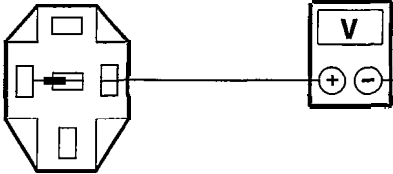
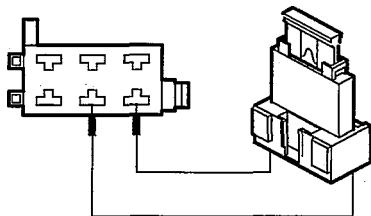
- ☐ Ignition switch in position 0.
- ☐ Connect **Headlamp** switch to connector C338.
- ☐ Disconnect Vehicles built before 0312004: Trailer control unit from connector C1030.
- 4** Disconnect Vehicles built from 0312004: Rear fog lamp cut-off relay from socket C1043.
- 5** Ignition switch in position II.
- 6** Switch on the REAR FOG LIGHT.



VFE0033879

- ☐ Vehicles built before 0312004: Measure the voltage between the trailer control unit, connector C1030, pin 4, circuit (RDNVH), wiring harness side and ground.

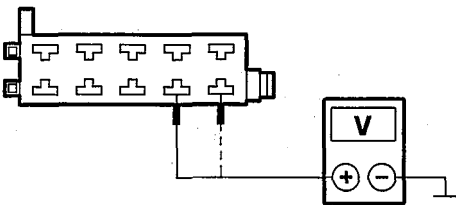
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0016095	Vehicles built from 0312004: Measure the voltage between the rear fog lamp cut-off relay, socket C1043, circuit (RDANH), wiring harness side and ground. - Is battery voltage measured? → Yes - Vehicles built before 0312004: GO to B7. - Vehicles built from 0312004: GO to B12. → No - Vehicles built before 0312004: LOCATE and RECTIFY the break in circuit(s) 15S-LD6(A) (GNNE) or (RDNVH) between the headlamp switch and the trailer control unit using the Wiring Diagrams. CHECK the operation of the system. - Vehicles built from 0312004: LOCATE and RECTIFY the break in circuit(s) 15S-LD6(A) (GNNE) or (RD/WH) between the headlamp switch and the rear fog lamp cut-off relay using the Wiring Diagrams. CHECK the operation of the system.
B7: CHECK THE TRAILER CONTROL UNIT	
	Ignition switch in position 0. Connect Left-hand rear lamp assembly to connector C333a.
 VFE0033880	Connect a fused jumper wire (20 A) at the trailer control unit, connector C1030, between pin 4, circuit (RDNVH) and pin 6, circuit (VT/YE), wiring harness side.
	4 Ignition switch in position II.

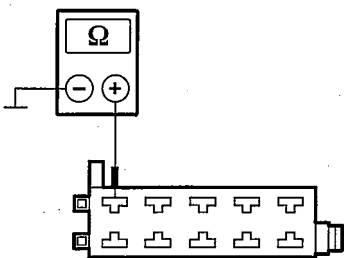
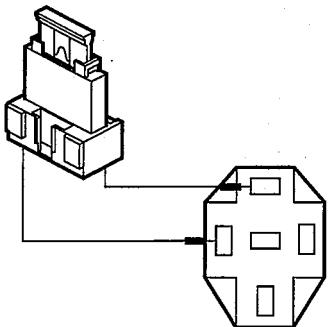
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 Switch on the REAR FOG LIGHT. Does the rear fog lamp illuminate? → Yes GO to B8. → No LOCATE and RECTIFY the break in circuit (VTNE) between the trailer control unit and rear lamp assembly using the wiring diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
B8: CHECK FUSE	
	1 Ignition switch in position 0. 2 Disconnect Fuse. - Vehicles built before 1012002: F31 (20 A) (CJB) - Vehicles built from 1012002: F56 (20 A) (CJB) ☐ CHECK Fuse. - Vehicles built before 1012002: F31 (20 A) (CJB) - Vehicles built from 1012002: F56 (20 A) (CJB) - Is the fuse OK.? → Yes GO to B9. → No INSTALL A NEW fuse F31 (20 A) or F56 (20 A) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
B9: CHECK VOLTAGE AT FUSE	
	1 Connect Fuse. - Vehicles built before 1012002: F31 (20 A) (CJB) - Vehicles built from 1012002: F56 (20 A) (CJB) 2 Ignition switch in position II.

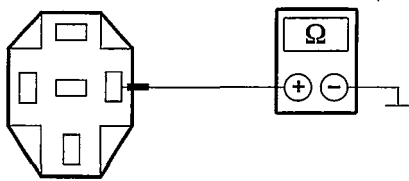
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the voltage between: - Vehicles built before 10/2002: Fuse F31 (20 A) (CJB) and ground. - Vehicles built from 10/2002: F56 (20 A) (CJB) and ground. • Is battery voltage measured? → Yes GO to B10. → No - Vehicles built before 10/2002: RECTIFY the break in the voltage supply of fuse F31 (20A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system. - Vehicles built from 10/2002: RECTIFY the break in the voltage supply of fuse F56 (20A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.
B10: CHECK THE VOLTAGE SUPPLY OF THE TRAILER CONTROL UNIT	
	☐ Ignition switch in position 0. 2 Disconnect trailer control unit from connector C1041. 3 Ignition switch in position II.
 VFE0033871	4 Measure the voltage between the trailer control unit, connector C1041, pin 8, circuit (RD), wiring harness side and pin 10, circuit (RD), wiring harness side and ground. • Is battery voltage registered following both measurements? → Yes GO to B11. → No - Vehicles built before 10/2002: LOCATE and RECTIFY the break in the circuit between fuse F31 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - Vehicles built from 10/2002: LOCATE and RECTIFY the break in the circuit between fuse F56 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.

DIAGNOSIS AND TESTING

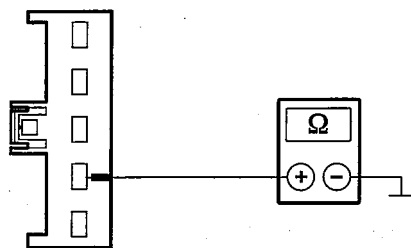
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B11: CHECK THE GROUND CONNECTION OF THE TRAILER CONTROL UNIT	
 VFE0033872	☐ Ignition switch in position 0. 2 Measure the resistance between the trailer control unit, connector C1041, pin 1, circuit (BN), wiring harness side and ground. Is a resistance of less than 2 ohms registered? → Yes RENEW the trailer control unit. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit (BN) between the trailer control unit and ground connection G18 using the wiring diagrams. CHECK the operation of the system.
B12: CHECK THE REAR FOG LAMP CUT-OFF RELAY	
 VFE63314	1 Ignition switch in position 0. 2 Connect Left-hand rear lamp assembly to connector C333a. 3 Connect a fused jumper wire (20 A) at the rear fog lamp cut-off relay, socket C1043, between circuit (RD/WH) and circuit (VT/YE), socket side.
	4 Ignition switch in position II. 5 Switch on the REAR FOG LIGHT. Does the rear fog lamp illuminate? → Yes GO to B13. → No LOCATE and RECTIFY the break in the circuit (VTNE) between the rear fog lamp cut-off relay and the rear lamp assembly using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B13: CHECK THE GROUND CONNECTION OF THE REAR FOG LAMP CUT-OFF RELAY	
 E0031110	1 Ignition switch in position 0. 2 Measure the resistance between the rear fog lamp cut-off relay, socket C1043, circuit (BN), wiring harness side and ground. • is a resistance of less than 2 ohms registered? → Yes RENEW the rear fog lamp cut-off relay. CHECK the operation of the system. → No - Vehicles with 7 pin trailer socket: LOCATE and RECTIFY the break in circuit (BN) or 31-LF24 (BK) between the rear lamp cut-off relay and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system. - Vehicles with 13 pin trailer socket: LOCATE and RECTIFY the break in circuit (BN) between the rear fog lamp cut-off relay and soldered connection S1008 using the Wiring Diagrams. CHECK the operation of the system.
	B14: CHECK GROUND CONNECTION OF REAR FOG LAMP (RHD) ☐ Ignition switch in position 0. 2 Disconnect right-hand rear lamp assembly from connector C348a.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033869

DETAILS RESULTS ACTIONS

- 3 Measure the resistance between the right-hand rear lamp assembly, connector C348a, pin 4:
- Vehicles built before 0312004: circuit (BK), wiring harness side and ground.
 - Vehicles built from 0312004: circuit (BN), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?

→ Yes

GO to B15.

→ No

- Vehicles built before 0312004: LOCATE and RECTIFY the break in circuit (BK) or 31-LF24 (BK) between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
- Vehicles built from 0312004: LOCATE and RECTIFY the break in circuit (BN) or 31-LF24 (BK) between the rear lamp assembly and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.

B15: CHECK CIRCUITS 15S-LD6(A) (GNNE), (VT/OG), (BK/BU) AND (RDNVH) FOR OPEN CIRCUIT

1 Ignition switch in position 0.

2 Connect Headlamp switch to connector C338.

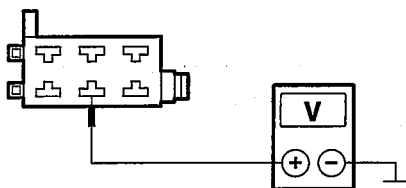
3 Disconnect Vehicles built before 03/2004: Trailer control unit from connector C1030.

4 Disconnect Vehicles built from 0312004: Rear fog lamp cut-off relay from socket C1043.

5 Ignition switch in position II.

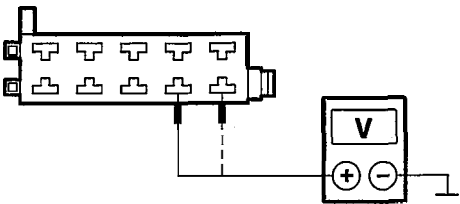
6 Switch on the REAR FOG LAMP.

7 Vehicles built before 0312004: Measure the voltage between the trailer control unit, connector C1030, pin 4, circuit (RDNVH), wiring harness side and ground.

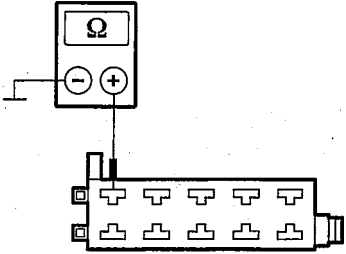
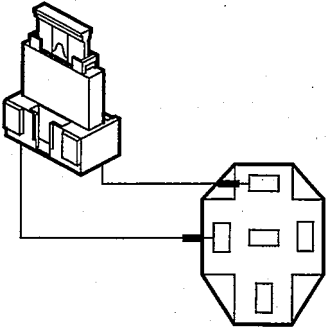


VFE0033879

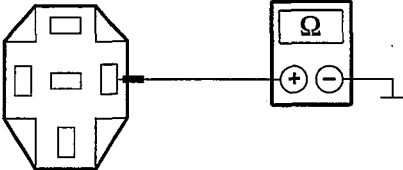
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
	☐ Measure the voltage between: - Vehicles built before 1012002: Fuse F31 (20 A) (CJB) and ground. - Vehicles built from 1012002: F56 (20 A) (CJB) and ground. • Is battery voltage measured? → Yes GO to B19. → No - Vehicles built before 1012002: RECTIFY the break in the voltage supply to fuse F31 (20 A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system. - Vehicles built from 1012002: RECTIFY the break in the voltage supply of fuse F56 (20A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.
B19: CHECK THE VOLTAGE SUPPLY OF THE TRAILER CONTROL UNIT	
	☐ 1 Ignition switch in position 0. ☐ Disconnect trailer control unit from connector C1041. ☐ Ignition switch in position II.
 VFE0033871	☐ 4 Measure the voltage between the trailer control unit, connector C1041, pin 8, circuit (RD), wiring harness side and pin 10, circuit (RD), wiring harness side and ground. • Is battery voltage registered following both measurements? → Yes GO to B20. → No - Vehicles built before 1012002: LOCATE and RECTIFY the break in the circuit between fuse F31 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - Vehicles built from 1012002: LOCATE and RECTIFY the break in the circuit between fuse F56 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.

DIAGNOSIS AND TESTING

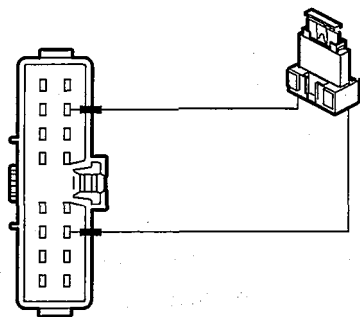
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B20: CHECK THE GROUND CONNECTION OF THE TRAILER CONTROL UNIT	
 VFE0033872	1 Ignition switch in position 0. 2 Measure the resistance between the trailer control unit, connector C1041, pin 1, circuit (BN), wiring harness side and ground. • Is a resistance of less than 2 ohms registered? → Yes RENEW the trailer control unit. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the relevant circuit (BN) between the trailer control unit and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
B21: CHECK REAR FOG LAMP CUT-OFF RELAY	
 VFE63314	1 Ignition switch in position 0. 2 Connect Right-hand rear lamp assembly to connector C348a. 3 Connect a fused jumper wire (20 A) at the rear fog lamp cut-off relay, socket C1043, between circuit (RD/WH) and circuit (VT/YE), socket side.
	4 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	5 Switch on the REAR FOG LAMP. Does the rear fog lamp illuminate? → Yes GO to B22. → No LOCATE and RECTIFY the break in circuit (VT/YE) or (WH/BK) between the rear fog lamp cut-off relay and the rear lamp assembly using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
B22: CHECK THE GROUND CONNECTION OF THE REAR FOG LAMP CUT-OFF RELAY	
 E0031110	☐ Ignition switch in position 0. ☐ Measure the resistance between the rear fog lamp cut-off relay, socket C1043, circuit (BN), wiring harness side and ground. - Is a resistance of less than 2 ohms registered? → Yes RENEW the rear fog lamp cut-off relay. CHECK the operation of the system. → No - Vehicles with 7 pin trailer socket: LOCATE and RECTIFY the break in circuit (BN) or 31-LF24 (BK) between the rear fog lamp cut-off relay and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system. - Vehicles with 13 pin trailer socket: LOCATE and RECTIFY the break in circuit (BN) between the rear fog lamp cut-off relay and soldered connection S1008 using the Wiring Diagrams. CHECK the operation of the system.
B23: CHECK THE HEADLIGHT SWITCH	
	1 Ignition switch in position 0. 2 Disconnect headlight switch from connector C338.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0024111

DETAILS/RESULTS/ACTIONS

- 3 Connect a fused jumper wire (20 A) at the headlamp switch, connector C338, between pin 7, circuit 15-LD10 (GN/OG) and pin 3, circuit 15S-LD5A (GNIBU) wiring harness side.

- 4 Ignition switch in position II.

- 5 CHECK the front fog lamps.

- Do the front fog lamps illuminate?

→ Yes

INSTALL A NEW headlight switch. CHECK the operation of the system.

→ No

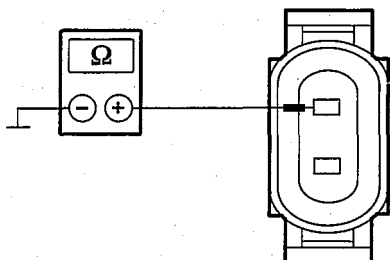
- Vehicles built before 1012004: GO to B24.
- Vehicles built from 1012004: LOCATE and RECTIFY the break in circuit 15S-LD5(A) (GN/BU) between the headlamp switch and soldered connection S38 using the Wiring Diagrams. CHECK the operation of the system.

B24: CHECK THE GROUND CONNECTION OF THE FRONT FOG LAMPS

- 1 Ignition switch in position 0.

- 2 Disconnect right-hand front fog lamp from connector C421.

- 3 Vehicles built before 0812005: Measure the resistance between right-hand front fog lamp, connector C421, pin 2, circuit 31-LD17 (BK), wiring harness side and ground.

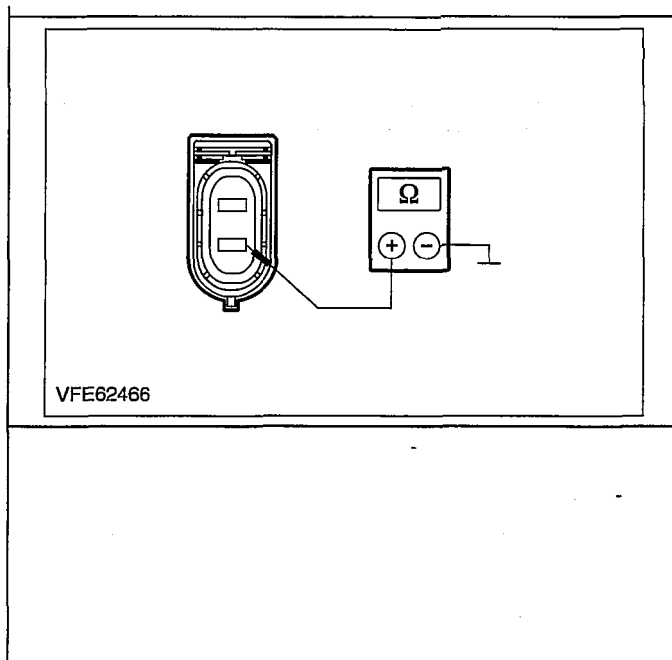


VFE0028648

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- 4** Vehicles built from 08/2005: Measure the resistance between right-hand front fog lamp, connector C421, pin 2, circuit 31-LD17 (BK), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
LOCATE and RECTIFY the break in circuit 15S-LD5A (GNIBU) or 15S-LD5 (GNIBU), between the headlight switch and soldered connection S241 using the wiring diagrams. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the break in the circuit between soldered connection S242 and ground connection G4 using the wiring diagrams. CHECK the operation of the system.

PINPOINT TEST AG : INDIVIDUAL FOG LAMPS INOPERATIVE

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

C1: DETERMINE THE FAULT CONDITION

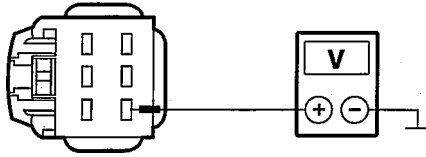
- 1** Ignition switch in position II.
- ☐ DETERMINE the fault conditions.
- ☐ SWITCH ON the fog lamps.
- Is one of the rear fog lamps inoperative?
- **Yes**
- One rear fog lamp is inoperative, vehicles built before 08/2005: GO to Pinpoint Test B.
 - One rear fog lamp is inoperative, vehicles without trailer socket, built from 08/2005: GO to C2.
- **No**
- Left-hand front fog lamp not working: GO to C4.
 - Right-hand front fog lamp not working: GO to C5.

C2: CHECK THE POWER SUPPLY TO THE REAR FOG LAMP FOR OPEN CIRCUIT

- 1** Ignition switch in position 0.
- 2** Disconnect Rear lamp assembly.
- left from connector C333
 - right from connector C348
- ☐ Ignition switch in position II.
- ☐ SWITCH ON the fog lamps.

DIAGNOSIS AND TESTING

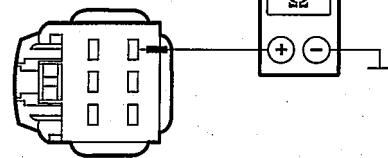
TEST CONDITIONS



VFE64395

DETAILS/RESULTS/ACTIONS

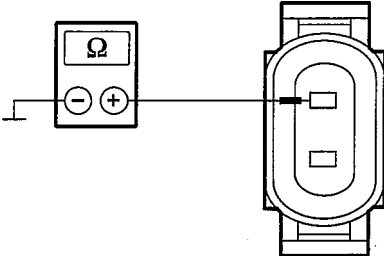
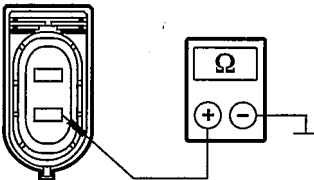
- 5** Measure the voltage between the rear lamp assembly
- left, connector **C333**, pin 6, circuit **15S-LD6A** (GNNE), wiring harness side and ground.
 - right, connector **C348**, pin 6, circuit **15S-LD6B** (GNNE), wiring harness side and ground.
- Is battery voltage measured?
- **Yes**
GO to C3.
- **No**
- Left-hand rear lamp assembly: LOCATE and RECTIFY the break in circuit **15S-LD6A** (GNNE) between the rear lamp assembly and soldered connection **S19** using the Wiring Diagrams. CHECK the operation of the system.
 - Right-hand rear lamp assembly: LOCATE and RECTIFY the break in circuit **15S-LD6B** (GNNE) between the front fog lamp and soldered connection **S19** using the Wiring Diagrams. CHECK the operation of the system.

C3: CHECK THE GROUND CONNECTION TO THE REAR LAMP ASSEMBLY FOR OPEN CIRCUIT

VFE64389

- 1** Ignition switch in position 0.
- 2** Measure the resistance between the rear lamp assembly
- left, connector **C333**, pin 4, circuit **31-LF23** (BK), wiring harness side and ground.
 - right, connector **C348**, pin 4, circuit **31-LF24** (BK), wiring harness side and ground.
- Is a resistance of less than 2 ohms registered?
- **Yes**
CHECK and if necessary RENEW the rear lamp assembly. CHECK the operation of the system.
- **No**
- Left-hand rear lamp assembly: LOCATE and RECTIFY the break in circuit **31-LF23** (BK) between the rear fog lamp and soldered connection **S24** using the Wiring Diagrams. CHECK the operation of the system.
 - Right-hand rear lamp assembly: LOCATE and RECTIFY the break in circuit **31-LF24** (BK) between the front fog lamp and ground connection **G18** using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

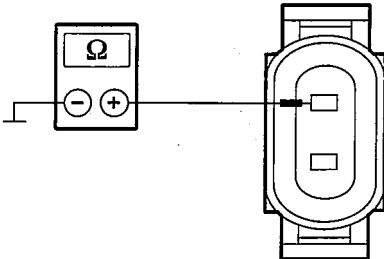
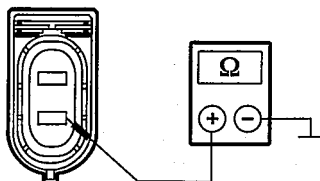
TEST CONDITIONS		DETAILS/RESULTS/ACTIONS	
C4: CHECK THE GROUND CONNECTION OF THE LEFT-HAND FRONT FOG LAMP			
		1 Ignition switch in position 0.	
		2 Disconnect left-hand front fog lamp from connector C415.	
		3 Vehicles built before 0812005: Measure the resistance between left-hand front fog lamp, connector C415, pin 2, circuit 31-LD11 (BK), wiring harness side and ground.	
VFE0028648			
		4 Vehicles built from 0812005: Measure the resistance between left-hand front fog lamp, connector C415, pin 2, circuit 31-LD11 (BK), wiring harness side and ground.	
VFE62466		- Is a resistance of less than 2 ohms registered? → Yes - Vehicles built before 1012004: LOCATE and RECTIFY the break in circuit 15S-LD11 (GN/WH) between soldered connection S241 and the front fog lamp using the Wiring Diagrams. If necessary CHECK and INSTALL A NEW front fog lamp. CHECK the operation of the system. - Vehicles built from 1012004: LOCATE and RECTIFY the break in circuit 15S-LD11 (GN/WH) between soldered connection S38 and the front fog lamp using the Wiring Diagrams. If necessary CHECK and INSTALL A NEW front fog lamp. CHECK the operation of the system. → No - Vehicles built before 1012004: LOCATE and RECTIFY the break in circuit 31-LD11 (BK) between the front fog lamp and soldered connection S242 using the Wiring Diagrams. CHECK the operation of the system. - Vehicles built from 1012004: LOCATE and RECTIFY the break in circuit 31-LD11 (BK) between the front fog lamp and soldered connection S10 using the Wiring Diagrams. CHECK the operation of the system.	

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS

C5: CHECK THE GROUND CONNECTION OF THE RIGHT-HAND FRONT FOG LAMP

	1 Ignition switch in position 0. 2 Disconnect right-hand front fog lamp from connector C421.
 VFE0028648	3 Vehicles built before 0812005: Measure the resistance between the right-hand front fog lamp, connector C421, pin 2, circuit 31-LD17 (BK), wiring harness side and ground.
 VFE62466	☐ Vehicles built from 0812005: Measure the resistance between the right-hand front fog lamp, connector C421, pin 2, circuit 31-LD17 (BK), wiring harness side and ground. • Is a resistance of less than 2 ohms registered?
	→ Yes - Vehicles built before 1012004: LOCATE and RECTIFY the break in circuit 15S-LD17 (GNNVH) between soldered connection S241 and the front fog lamp using the Wiring Diagrams. If necessary CHECK and INSTALL A NEW front fog lamp. CHECK the operation of the system. - Vehicles built from 1012004: LOCATE and RECTIFY the break in circuit 15S-LD17 (GN/WH) between soldered connection S38 and the front fog lamp using the Wiring Diagrams. If necessary CHECK and INSTALL A NEW front fog lamp. CHECK the operation of the system. → No - Vehicles built before 1012004: LOCATE and RECTIFY the break in circuit 31-LD17 (BK) between the front fog lamp and soldered connection S242 using the Wiring Diagrams. CHECK the operation of the system. - Vehicles built from 1012004: LOCATE and RECTIFY the break in circuit 31-LD17 (BK) between the front fog lamp and soldered connection S11 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

PINPOINT TEST AH : REAR FOG LAMP(S) OR FRONT FOG LAMPS ILLUMINATE CONTINUOUSLY

TEST CONDITIONS

DETAILS RESULTS ACTIONS

D1: RULE OUT THE HEADLAMP SWITCH AS A CAUSE OF THE FAULT

	Ignition switch in position 0.
	☐ 2 Disconnect Headlamp switch from connector C338.
	☐ Ignition switch in position II.
	☐ 4 CHECK fog lamps. Do the front fog lamps or the rear fog lamp(s) illuminate continuously? → Yes GO to D2. → No INSTALL A NEW headlight switch. CHECK the operation of the system.

D2: EXCLUDE THE INSTRUMENT CLUSTER AS THE CAUSE OF THE FAULT

	☐ 1 Ignition switch in position 0.
	☐ Disconnect Fuse F20 (7.5 A) (CJB).
	☐ 3 Disconnect Fuse F33 (7.5 A) (CJB).
	☐ 4 Disconnect Fuse F38 (7.5 A) (CJB).
	☐ 5 Disconnect Fuse F44 (3 A) (CJB).
	☐ 6 Ignition switch in position II.

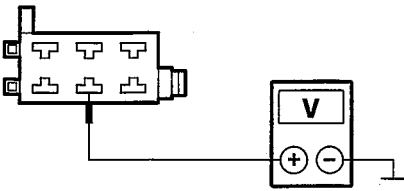
DIAGNOSIS AND TESTING**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

	7 CHECK fog lamps. - Does/Do the rear fog lamp(s) illuminate continuously? → Yes - Vehicles without trailer socket: LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S281 using the wiring diagrams. CHECK the operation of the system. - Vehicles with trailer socket, built before 0312004: GO to D3. - Vehicles with trailer socket, built from 0312004 to 0812005: GO to D9. → No - Front fog lamps continuously lit: LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S280 using the Wiring Diagrams. CHECK the operation of the system. - No fog lamp illuminates permanently: REFER to: Instrument Cluster - Vehicles Built Up To: 10/2005 (413-01 Instrument Cluster, Diagnosis and Testing), Kombiinstrument - gebaut ab 0812005 (413-01, Diagnosis and Testing).
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D3: EXCLUDE THE TRAILER CONTROL UNIT AS THE CAUSE OF THE FAULT

	1 Ignition switch in position 0.
	2 Connect Fuse F20 (7.5 A) (CJB).
	3 Connect Fuse F33 (7.5 A) (CJB).
	☐ Connect Fuse F38 (7.5 A) (CJB).
	5 Connect Fuse F44 (3 A) (CJB).
	6 Disconnect Fuse. - Vehicles built before 1012002: F31 (20 A) (CJB) - Vehicles built from 10/2002: F56 (20 A) (CJB)
	7 Ignition switch in position II.

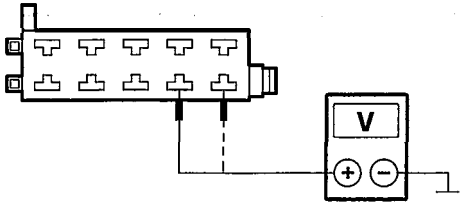
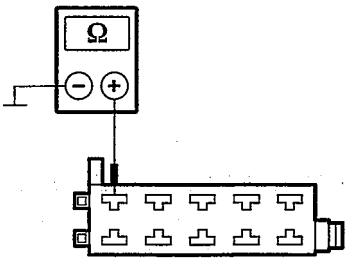
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	8 Check the rear fog lamp. - Does the rear fog lamp illuminate continuously? → Yes - LHD: LOCATE and REPAIR the short to battery voltage in circuits (VTIYE) between the trailer control unit and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system. - RHD: LOCATE and RECTIFY the short to battery voltage in circuits (VTIYE) or (BWBU) between the trailer control unit and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system. → No GO to D4.
D4: CHECK CONTROL CIRCUIT FOR SHORT TO BATTERY VOLTAGE	
 VFE0033879	1 Measure the voltage between the trailer control unit, connector C1030, pin 4, circuit (RD/WH), wiring harness side and ground. Is battery voltage measured? → Yes LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S281 using the wiring diagrams. CHECK the operation of the system. → No GO to D5.
D5: CHECK FUSE	
	1 Ignition switch in position 0. ☐ Disconnect Fuse. - Vehicles built before 1012002: F31 (20 A) (CJB) - Vehicles built from 1012002: F56 (20 A) (CJB)

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Fuse. Vehicles built before 1012002: F31 (20 A) Vehicles built from 1012002: F56 (20 A) (CJB) * Is the fuse OK.? → Yes GO to D6. → No INSTALL A NEW fuse F31 (20 A) or F56 (20 A) (CJB) and check the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
D6: CHECK VOLTAGE AT FUSE	
	☐ Connect Fuse. - Vehicles built before 1012002: F31 (20 A) (CJB) - Vehicles built from 1012002: F56 (20 A) (CJB) ☐ Ignition switch in position II. ☐ Measure the voltage between: - Vehicles built before 1012002: Fuse F31 (20 A) (CJB) and ground. - Vehicles built from 1012002: F56 (20 A) (CJB) and ground. • Is battery voltage measured? → Yes GO to D7. → No - Vehicles built before 1012002: RECTIFY the break in the voltage supply of fuse F31 (20A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system. - Vehicles built from 1012002: RECTIFY the break in the voltage supply of fuse F56 (20A) (CJB) using the Wiring Diagrams. CHECK and INSTALL A NEW CJB if necessary. CHECK the operation of the system.
D7: CHECK THE VOLTAGE SUPPLY OF THE TRAILER CONTROL UNIT	
	☒ Ignition switch in position 0. ☐ Disconnect trailer control unit from connector C1041. ☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033871	4 Measure the voltage between the trailer control unit, connector C1041, pin 8, circuit (RD), wiring harness side and pin 10, circuit (RD), wiring harness side and ground. - Is battery voltage registered following both measurements? → Yes GO to D8. → No - Vehicles built before 1012002: LOCATE and RECTIFY the break in the circuit between fuse F31 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system. - Vehicles built from 1012002: LOCATE and RECTIFY the break in the circuit between fuse F56 (20 A) (CJB) and the trailer control unit using the Wiring Diagrams. CHECK and INSTALL A NEW rear lamp assembly if necessary. CHECK the operation of the system.
D8: CHECK THE GROUND CONNECTION OF THE TRAILER CONTROL UNIT	
 VFE0033872	1 Ignition switch in position 0. 2 Measure the resistance between the trailer control unit, connector C1041, pin 1, circuit (BN), wiring harness side and ground. Is less than 2 Ohm measured? → Yes RENEW the trailer control unit. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the relevant circuit (BN) between the trailer control unit and ground connection G18 using the Wiring Diagrams. CHECK the operation of the system.
D9: EXCLUDE THE LOAD CURRENT CIRCUIT AS THE CAUSE OF THE FAULT	
	1 Ignition switch in position 0. 2 Disconnect Rear fog lamp cut-off relay from socket C1043. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

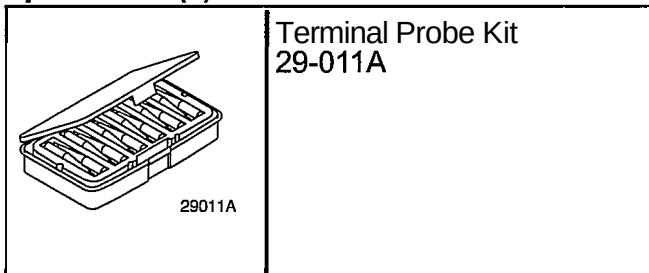
- | | |
|--|---|
| | <div><p>☐ Check the rear fog lamp.</p><ul style="list-style-type: none">• Does the rear fog lamp illuminate continuously?<p>→ Yes</p><ul style="list-style-type: none">- LHD: LOCATE and REPAIR the short to battery voltage in circuits (VT/YE) between the rear fog lamp cut-off relay and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.- RHD: LOCATE and REPAIR the short to battery voltage in circuits (VT/YE) or (WH/BK) between the rear fog lamp cut-off relay and the rear lamp assembly using the Wiring Diagrams. CHECK the operation of the system.<p>→ No</p><p>LOCATE and RECTIFY the short to battery voltage in the circuits connected to soldered connection S281 using the Wiring Diagrams. CHECK the operation of the system.</p></div> |
|--|---|

DIAGNOSIS AND TESTING

Headlamp Leveling

Refer to Wiring Diagrams Section 417-01, for schematic and connector information.

Special Tool(s)



Inspection and Checking

1. Verify the customer concern.

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection

Electrical
• Fuse(~) • Connector(s) • Switches • Wiring harness

3. Resolve any obvious causes or concerns found during the visual inspection before carrying out any further tests.

4. If the concern is not visually evident, refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Symptom	Possible Sources	Action
• Headlamp leveling system is inoperative/malfunctioning	• Circuit(s) • Headlight switch • Left/right-hand headlamp	• GO to Pinpoint Test A.

System Checks

NOTE: Use a digital multimeter for all electrical measurements.

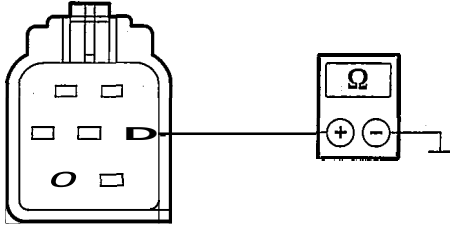
PINPOINT TEST AI : HEADLAMP LEVELING SYSTEM IS INOPERATIVE/MALFUNCTIONING

TEST CONDITIONS

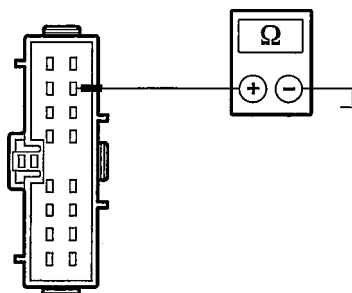
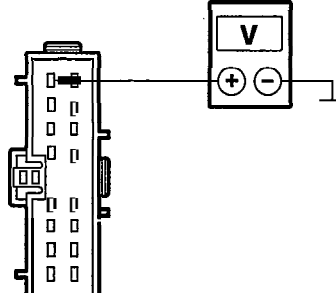
DETAILS/RESULTS/ACTIONS

AI: DETERMINE THE FAULT CONDITION	
	1 Determine the fault condition. • Is the headlamp leveling system inoperative for both headlamps? → Yes - Inoperative: GO to A3. - Malfunctioning: GO to A2. → No - Left-hand side inoperative: GO to A12. - Right-hand side inoperative: GO to A14. - Left or right-hand side malfunctioning: CHECK headlamp range adjustment unit and if necessary INSTALL A NEW headlamp. CHECK the operation of the system.

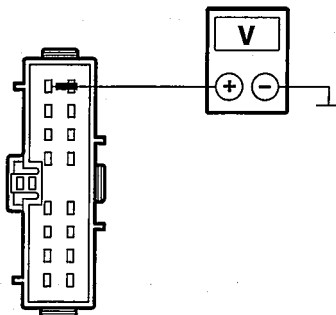
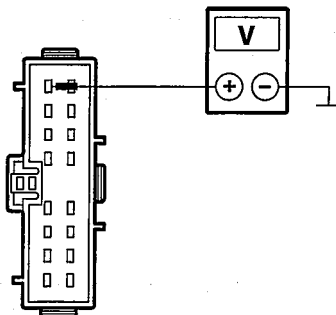
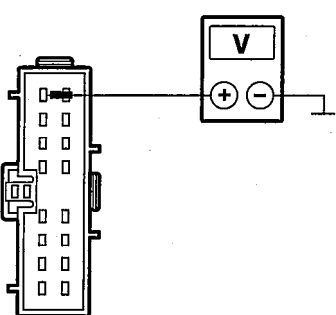
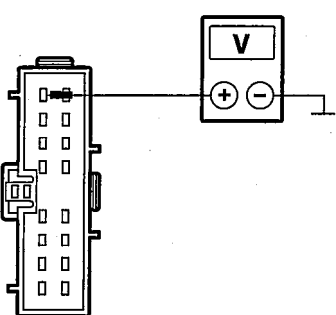
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A2: CHECK THE HEADLAMP ADJUST VARIABLE RESISTOR	
NOTE: Switch off the lights.	
	1 Ignition switch in position 0. 2 Disconnect left-hand headlamp from connector C416 . 3 CHANGE the SETTING of the headlamp leveling system during the measurement (UP/DOWN).
 VFE0030133	4 Measure the resistance between left-hand headlamp, connector C416, pin 5, circuit 64S-LE45 (BU), wiring harness side and ground. • Does the registered resistance vary with change to the variable resistor? → Yes GO to A3. → No INSTALL A NEW headlight switch. CHECK the operation of the system.
A3: CHECK THE VOLTAGE SUPPLY OF THE HEADLIGHT SWITCH	
	1 Ignition switch in position II. 2 Operate the headlamp flasher and check that it works correctly. • Is the headlamp flasher operating correctly? → Yes GO to A4. → No RECTIFY the break in the voltage supply of the headlight switch using the wiring diagrams. CHECK the operation of the system. REFER to: Headlamps (417-01 Exterior Lighting, Diagnosis and Testing).
A4: CHECK THE GROUND CONNECTION OF THE HEADLIGHT SWITCH	
	1 Ignition switch in position 0. 2 Disconnect headlight switch from connector C338 .

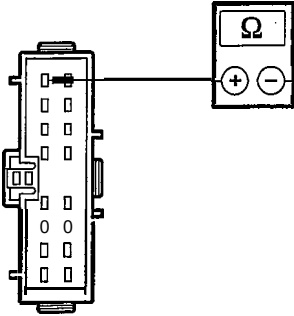
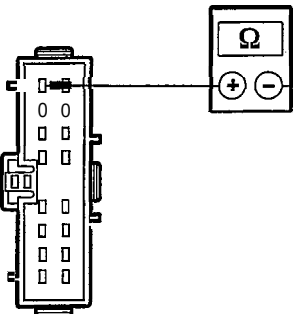
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
 VFE0033915	☐ Measure the resistance between the headlight switch, connector C338, pin 10, circuit 31-LE29 (BK), wiring harness side and ground. Is the resistance less than 2 Ohm? → Yes GO to A5. → No LOCATE and RECTIFY the break in the circuit between the headlight switch and soldered connection S263 using the wiring diagrams. CHECK the operation of the system.
A5: CHECK THE HEADLIGHT SWITCH	
	☐ Check the headlight switch (variable resistor, headlamp leveling system) according to the component checks in the wiring diagrams. - Check headlight switch connector C338 at pins 1, 8 and 10. - Is the headlight switch OK? → Yes GO to A6. → No INSTALL A NEW headlight switch. CHECK the operation of the system.
A6: CHECK CONTROL CIRCUIT OF HEADLAMP LEVELLING SYSTEM FOR SHORT TO BATTERY VOLTAGE	
NOTE: Keep the testing rig for use during further voltage measurements.	
	☐ 1 Ignition switch in position 0. ☐ Connect left-hand headlamp to connector C416 ☐ Ignition switch in position II.
 VFE0033916	☐ 4 Measure the voltage between the headlight switch, connector C338, pin 1, circuit 64S-LE5 (BU/RD), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to A7. → No GO to A9.

DIAGNOSIS AND TESTING

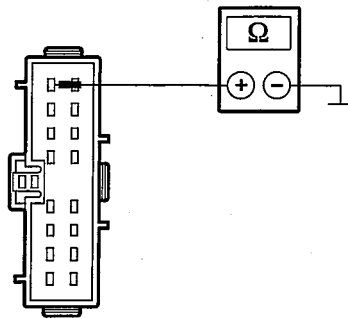
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A7: CHECK LEFT-HAND HEADLAMP ASSEMBLY FOR SHORT TO BATTERY VOLTAGE	
 VFE0033916	1 Ignition switch in position 0.
	2 Disconnect left-hand headlamp from connector C416 .
	3 Ignition switch in position II.
 VFE0033916	4 Measure the voltage between the headlight switch, connector C338, pin 1, circuit 64S-LE5 (BUIRD), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to A8. → No CHECK and if necessary INSTALL A NEW left-hand headlamp. CHECK the operation of the system.
A8: CHECK RIGHT-HAND HEADLAMP ASSEMBLY FOR SHORT TO BATTERY VOLTAGE	
 VFE0033916	1 Ignition switch in position 0.
	2 Disconnect right-hand headlamp from connector C422 .
	3 Ignition switch in position II.
 VFE0033916	4 Measure the voltage between the headlight switch, connector C338, pin 1, circuit 64S-LE5 (BU/RD), wiring harness side and ground. • Does the meter display battery voltage? → Yes LOCATE and RECTIFY short to battery voltage in circuit(s) 64S-LE5 (BUIRD), 64S-LE45 (BU) or 64S-LE46 (BUIRD), between the headlight switch and the left-hand or right-hand headlamp using the wiring diagrams. CHECK the operation of the system. → No CHECK and if necessary INSTALL A NEW right-hand headlamp. CHECK the operation of the system.
A9: CHECK CONTROL CIRCUIT OF HEADLAMP LEVELLING SYSTEM FOR SHORT TO GROUND	
NOTE: Keep the testing rig for use during further resistance measurements.	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033917	Measure the resistance between the headlight switch, connector C338, pin 1, circuit 64S-LE5 (BUIRD), wiring harness side and ground. Is the resistance greater than 10,000 Ohms? → Yes LOCATE and RECTIFY short to ground in circuit(s) 64S-LE5 (BUIRD), 64S-LE45 (BU) or 64S-LE46 (BU/RD), between the headlight switch and the left-hand or right-hand headlamp using the wiring diagrams. CHECK the operation of the system. → No GO to A10.
A10: CHECK LEFT-HAND HEADLAMP ASSEMBLY FOR SHORT TO GROUND	
 VFE0033917	Disconnect left-hand headlamp from connector C416 . 2 Measure the resistance between the headlight switch, connector C338, pin 1, circuit 64S-LE5 (BU/RD), wiring harness side and ground. Is the resistance greater than 10,000 Ohms? → Yes CHECK and if necessary INSTALL A NEW left-hand headlamp. CHECK the operation of the system. → No GO to A11.
A11: CHECK RIGHT-HAND HEADLAMP ASSEMBLY FOR SHORT TO GROUND	
	Disconnect right-hand headlamp from connector C422 .

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033917

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the headlight switch, connector C338, pin 1, circuit 64S-LE5 (BUIRD), wiring harness side and ground.

• Is the resistance greater than 10,000 Ohms?

→ **Yes**

CHECK and if necessary INSTALL A NEW right-hand headlamp. CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY short to ground in circuit(s) 64S-LE5 (BUIRD), 64S-LE45 (BU) or 64S-LE46 (BUIRD), between the headlight switch and the left-hand or right-hand headlamp using the wiring diagrams. CHECK the operation of the system.

A12: CHECK CONTROL VOLTAGE AT THE LEFT-HAND HEADLAMP

- 1 Ignition switch in position 0.

- 2 Disconnect left-hand headlamp from connector C416 .

- 3 Ignition switch in position II.

- 4 SWITCH ON dipped beam.

- 5 CHANGE the SETTING of the headlamp leveling system during the measurement (UP/DOWN).

- 6 Measure the voltage between left-hand headlamp, connector C416, pin 5, circuit 64S-LE45 (BU), wiring harness side and ground.

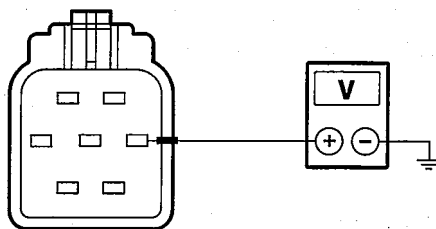
• Does the voltage measured change in accordance with the position set?

→ **Yes**

GO to A13.

→ **No**

LOCATE and RECTIFY the break in the circuit between the headlamp and intermediate connector C810 using the wiring diagrams. CHECK the operation of the system.



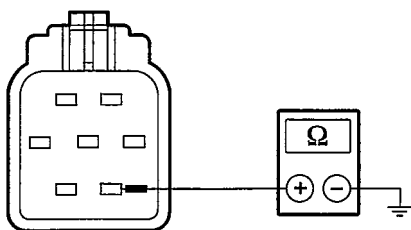
VFE0005897

A13: CHECK GROUND CONNECTION OF THE LEFT-HAND HEADLAMP

- 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0011503

DETAILS/RESULTS/ACTIONS

Measure the resistance between left-hand headlamp, connector C416, pin 7, circuit 31-LE45 (BK), wiring harness side and ground.

- Is less than 2 Ohm measured?

→ Yes

CHECK and if necessary INSTALL A NEW headlamp and adjustment unit. CHECK the operation of the system.

→ No

LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S10 using the wiring diagrams. CHECK the operation of the system.

A14: CHECK VOLTAGE AT THE RIGHT-HAND HEADLAMP

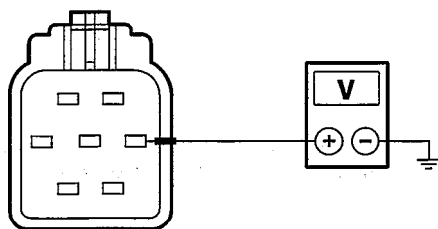
1 Ignition switch in position 0.

2 Disconnect right-hand headlamp from connector C422 .

3 Ignition switch in position II.

4 SWITCH ON dipped beam.

5 CHANGE the SETTING of the headlamp leveling system during the measurement (UP/DOWN).



VFE0005897

6 Measure the voltage between right-hand headlamp, connector C422, pin 5, circuit 64S-LE46 (BU/RD), wiring harness side and ground.

- Does the voltage measured change in accordance with the position set?

→ Yes

GO to A15.

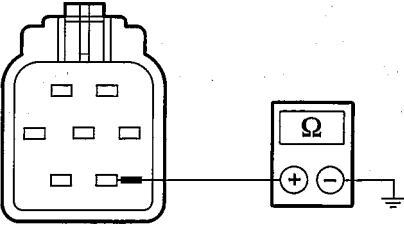
→ No

LOCATE and RECTIFY the break in the circuit between the headlamp and intermediate connector C810 using the wiring diagrams. CHECK the operation of the system.

A15: CHECK GROUND CONNECTION OF THE RIGHT-HAND HEADLAMP

1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E0011503	☐ Measure the resistance between right-hand headlamp, connector C422, pin 7, circuit 31-LE46 (BK), wiring harness side and ground. • Is less than 2 Ohm measured? → Yes CHECK and if necessary INSTALL A NEW headlamp and adjustment unit. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S11 using the wiring diagrams. CHECK the operation of the system.

GENERAL PROCEDURES

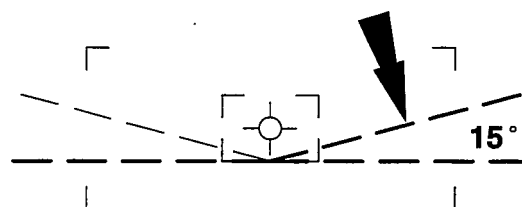
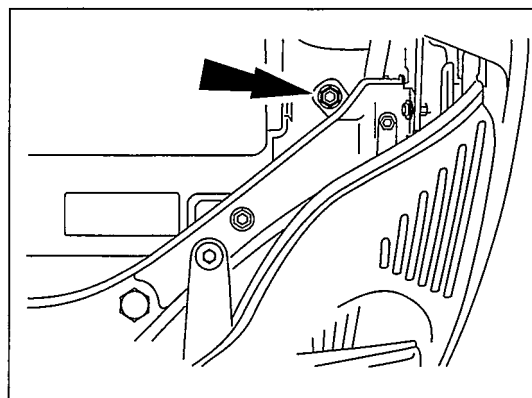
Headlamp Adjustment(32 113 0)

General Equipment

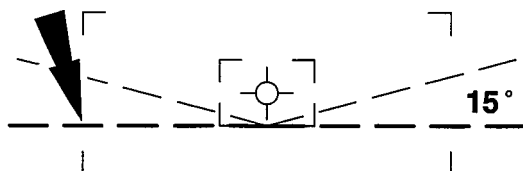
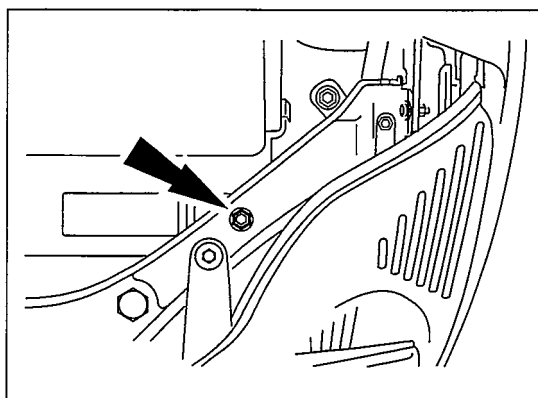
Beam setting equipment

1. Place the vehicle on a level surface.
2. Check that the tyre pressures meet the specifications and that the vehicle is not excessively laden.
3. Switch on the dipped beam.
4. Repeatedly operate the **headlamp** levelling switch and then set it to "0".
5. Set up the measuring screen of the beam setting device to the correct **headlamp** setting value.
6. Adjust the dipped beam so that the light/dark boundary touches the horizontal line.

Adjust the dipped beam so that the rising line of the **light/dark** boundary lies in the intersection point of the horizontal line and the 15° line (LHD variant shown).



VFE0030364



VFE0030363

7. **NOTE:** A diffused part of the dipped beam may lie above the 15° line.

GENERAL PROCEDURES

Headlamp Masking — Vehicles Built Up To: 1012005

All vehicles

NOTE: The templates are different for LHD and RHD vehicles. The templates are different for the left and right-hand headlamps.

1. Print out the corresponding templates at the end of this operation.

2. Measure dimension **X** on the printout of the template.

3. Calculate the enlargement/reduction factor **Y** for the photocopier using the following formula: $Y = Z \div X \times 100$.

- X = measurement on the printout of the template in mm
- Y = enlargement/reduction factor in %
- Z = original dimension in mm = 25

4. **Enlarge/reduce** the printout with a photocopier by the calculated percentage.

- Compare dimension X on the photocopy with the original dimension.

5. Cut out the prepared template for the headlamp.

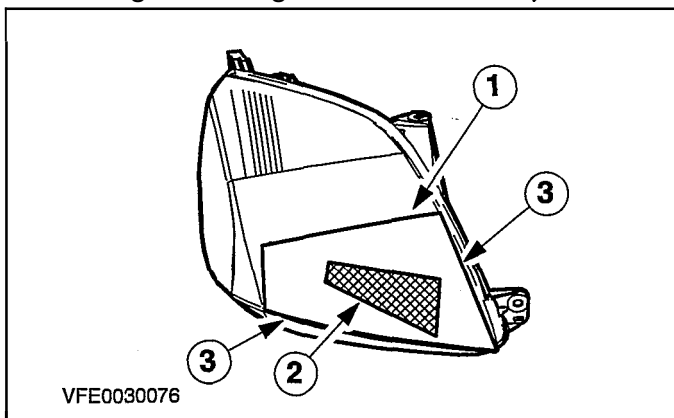
6. Cut out the shaded areas.

LHD vehicles

7. **NOTE: Right-hand headlamp only.**

Align the template on the lens of the headlamp.

1. Template
2. Area to be masked
3. Alignment edges on the headlamp lens



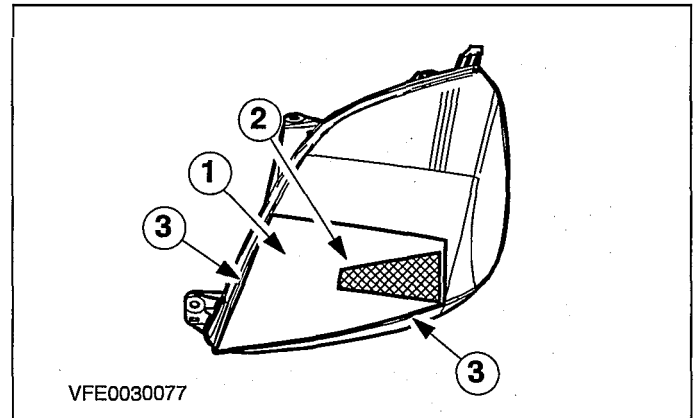
8. **NOTE: Left-hand headlamp only.**

Align the template on the lens of the headlamp.

1. Template

2. Area to be masked

3. Alignment edges on the headlamp lens

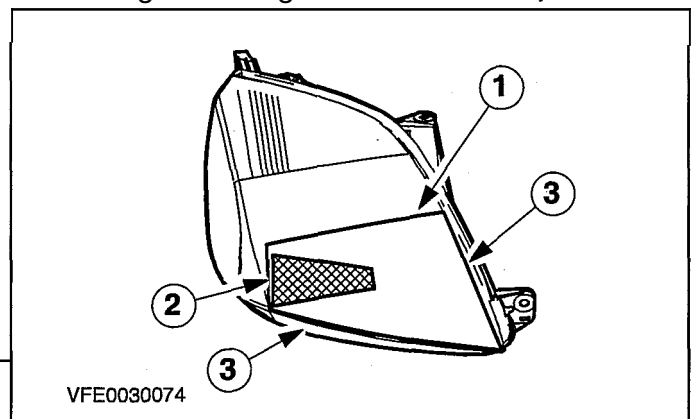


RHD vehicles

9. **NOTE: Right-hand headlamp only.**

Align the template on the lens of the headlamp.

1. Template
2. Area to be masked
3. Alignment edges on the headlamp lens



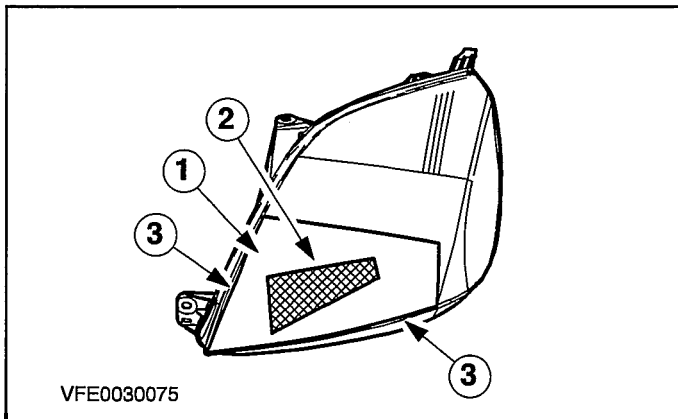
10. **NOTE: Left-hand headlamp only.**

Align the template on the lens of the headlamp.

1. Template
2. Area to be masked

GENERAL PROCEDURES

3. Alignment edges on the headlamp lens



All vehicles

11. **CAUTION:** Do not damage the surface of the headlamp.

Copy the outline of the template with a suitable pen onto the **headlamp** lens.

12. Remove the template.

13. **NOTE:** Make sure that the marked area is not exceeded.

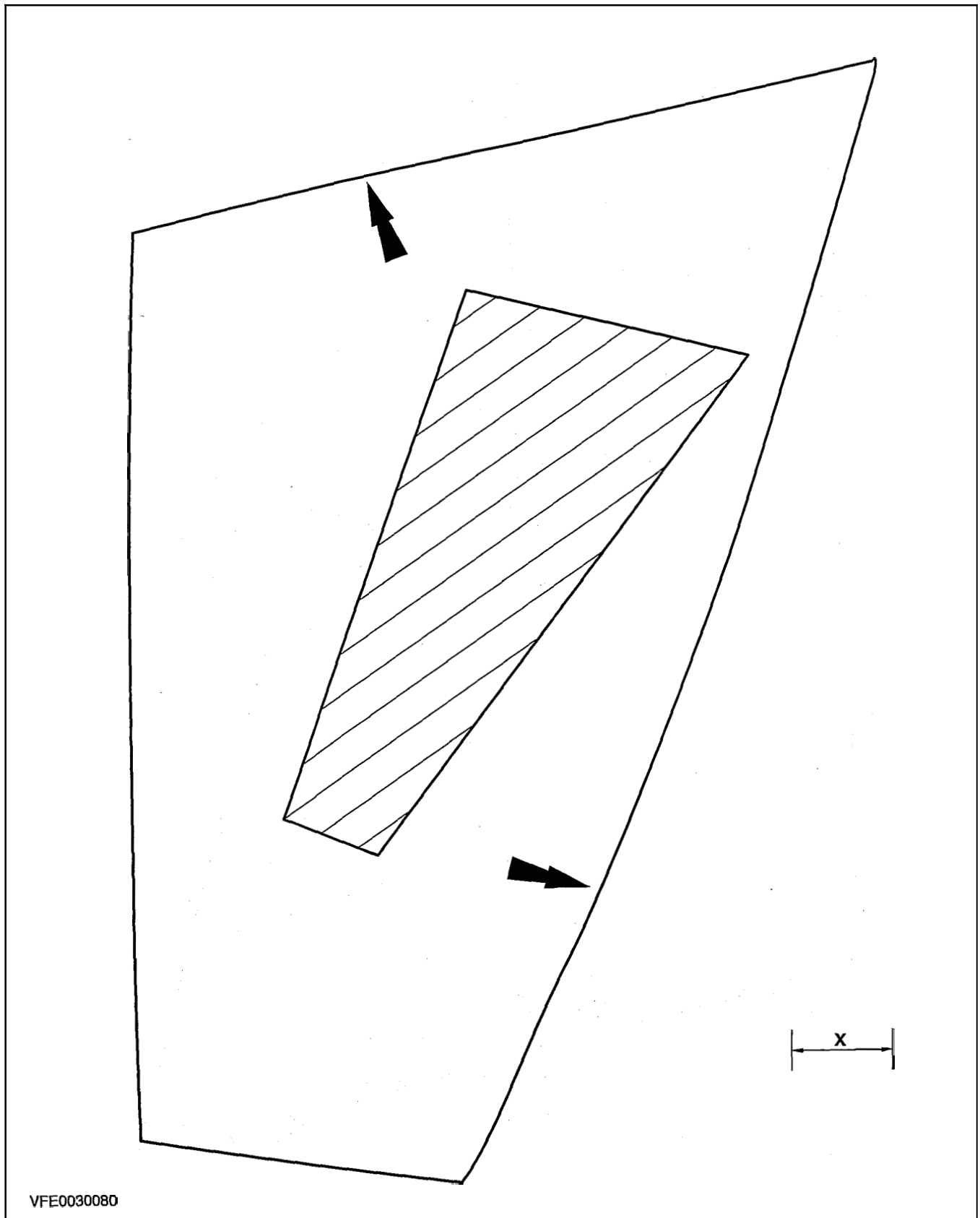
Mask the marked area with opaque black adhesive tape.

14. Repeat steps 11 to 13 for the **headlamp** on the other side.

15. Template for LHD vehicles, right-hand **headlamp**

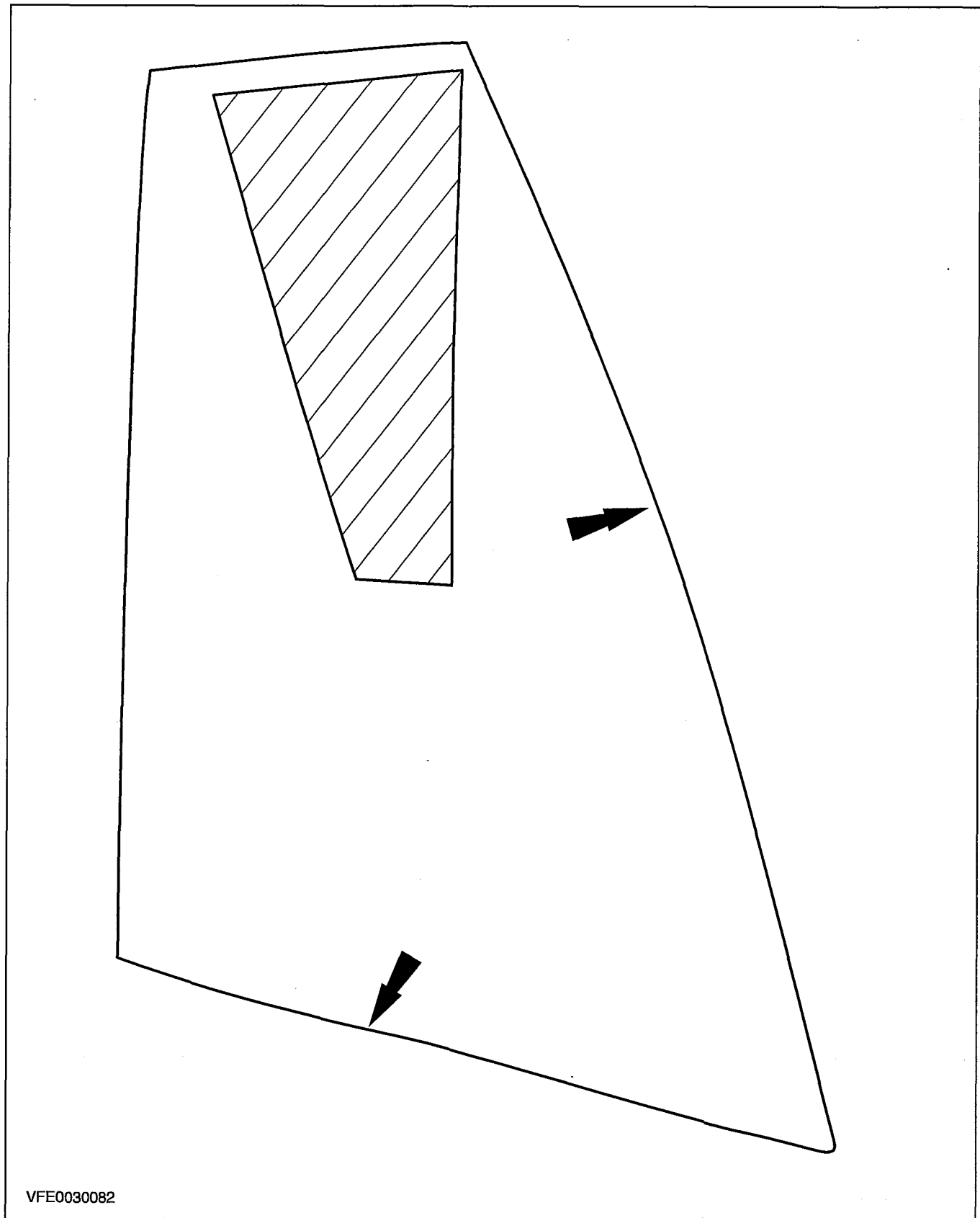
- Alignment edges

GENERAL PROCEDURES



16. Template for LHD vehicles, left-hand headlamp

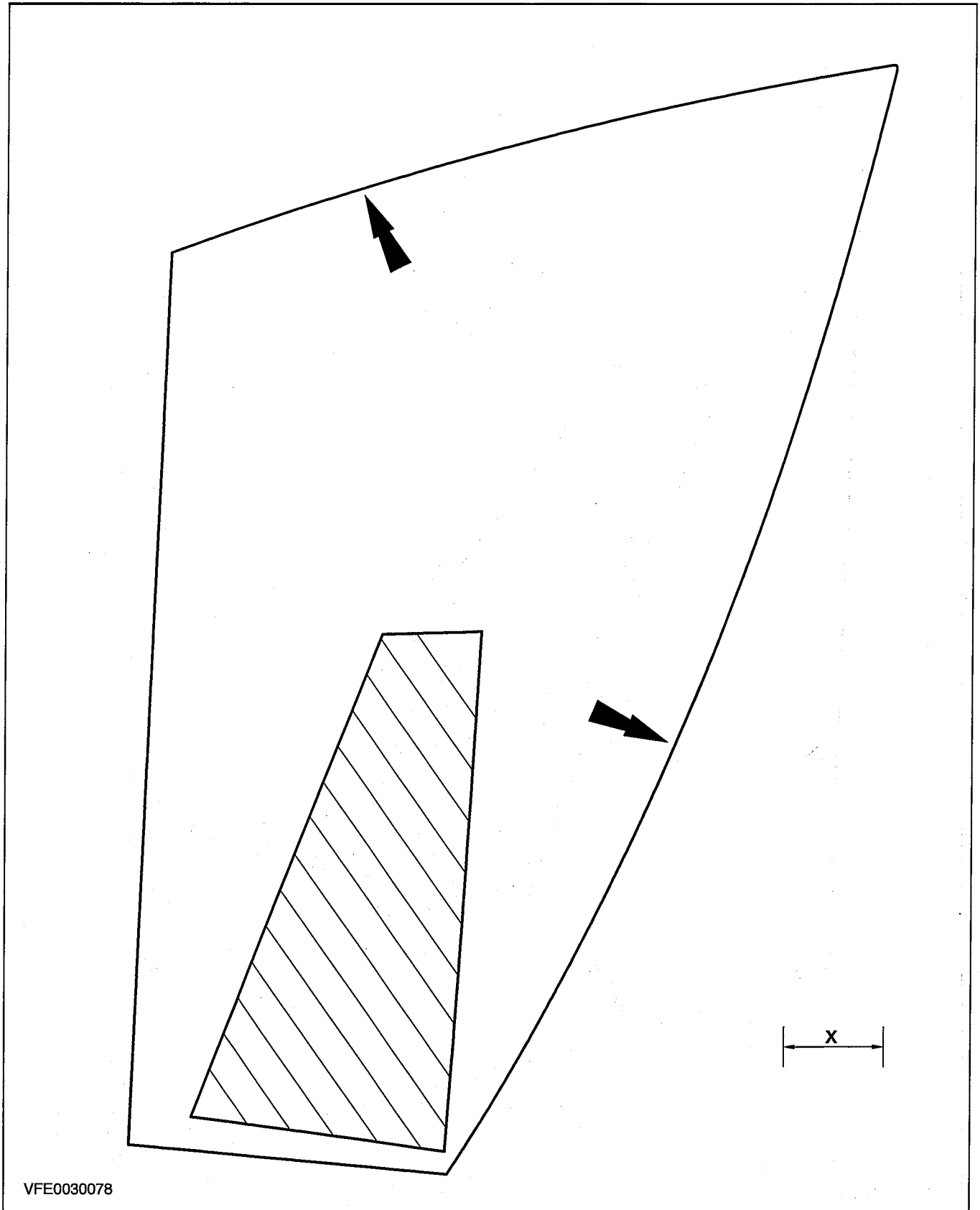
- Alignment edges

GENERAL PROCEDURES

17. Template for RHD vehicles, right-hand headlamp

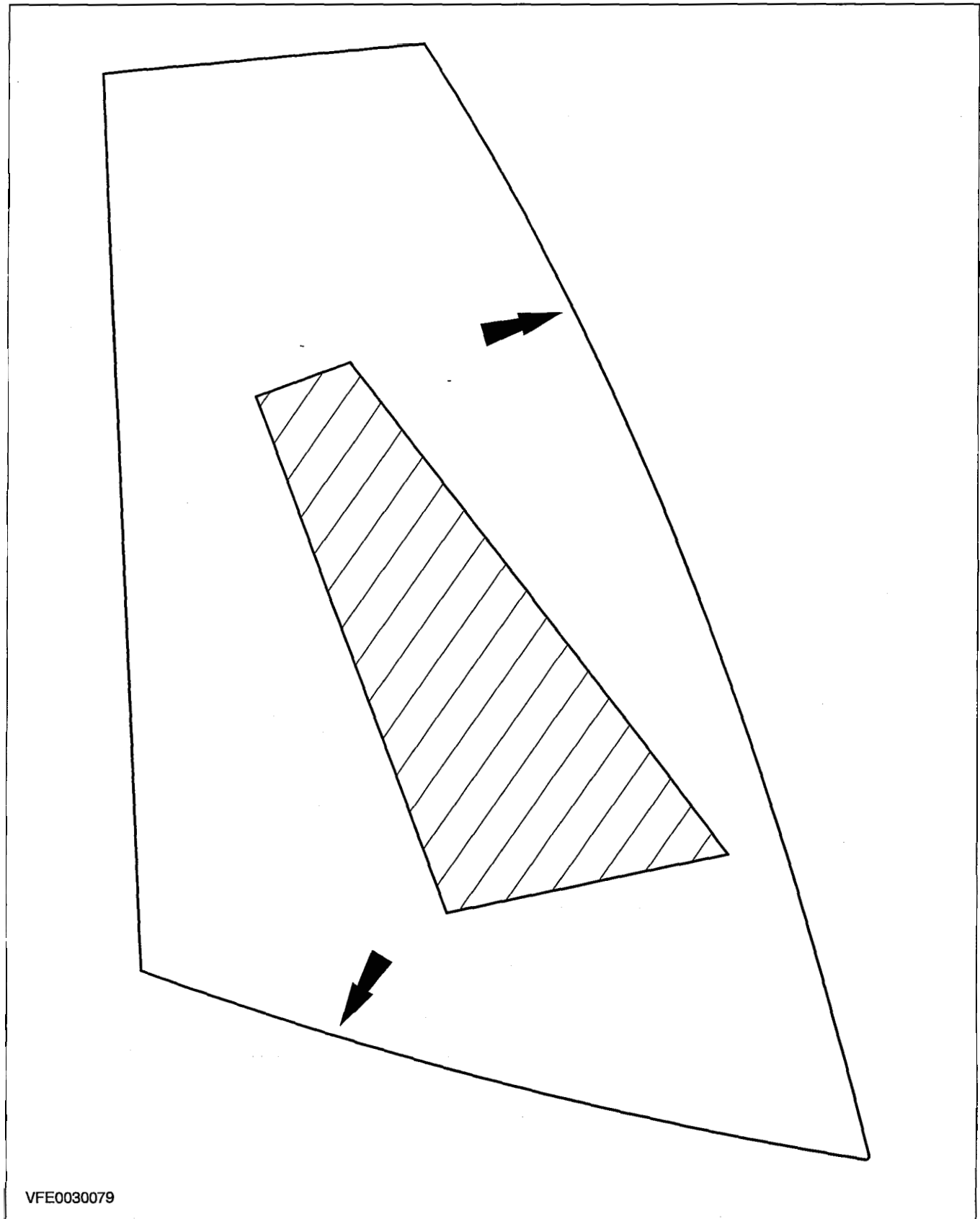
- Alignment edges

GENERAL PROCEDURES



18. Template for RHD vehicles, left-hand headlamp

- Alignment edges

GENERAL PROCEDURES

GENERAL PROCEDURES

Headlamp Masking — Vehicles Built From: 10/2005

All vehicles

NOTE: The templates are different for LHD and RHD vehicles. The templates are different for the left and right-hand headlamps.

■ **Print out the corresponding templates at the end of this operation.**

2. Measure dimension X on the printout of the template.

3. Calculate the **enlargement/reduction** factor Y for the photocopier using the following formula: **$Y = Z \div X \times 100$** .

- X = measurement on the printout of the template in mm
- Y = enlargement/reduction factor in %
- Z = original dimension in mm = 100

4. **Enlarge/reduce** the printout with a photocopier by the calculated percentage.

- Compare dimension X on the photocopy with the original dimension.

5. Cut out the prepared templates for the headlamps.

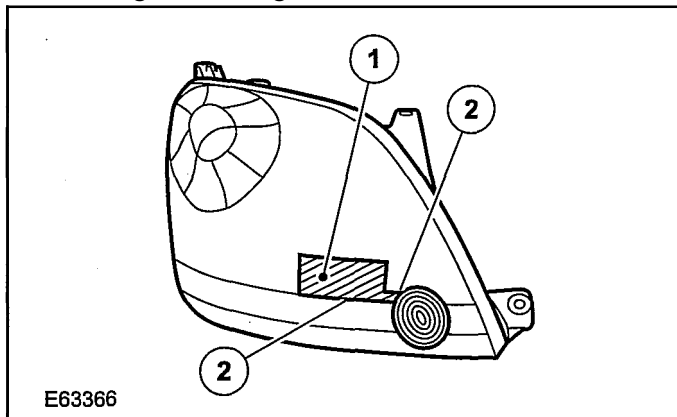
Left-hand drive vehicles

6. **NOTE: Right-hand headlamp only.**

Align the template on the lens of the headlamp.

■ **Template**

2. Alignment edges on the headlamp lens

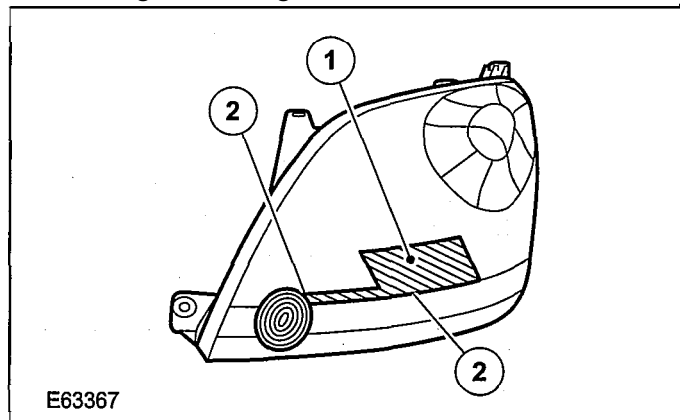


7. **NOTE: Left-hand headlamp only.**

Align the template on the lens of the headlamp.

■ **Template**

2. Alignment edges on the headlamp lens



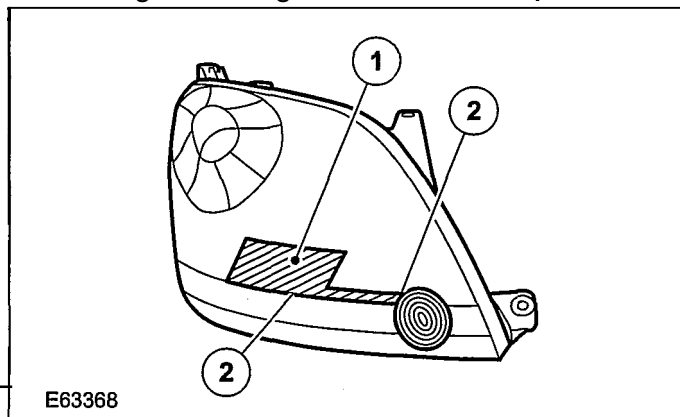
RHD vehicles

8. **NOTE: Right-hand headlamp only.**

Align the template on the lens of the headlamp.

1. Template

2. Alignment edges on the headlamp lens



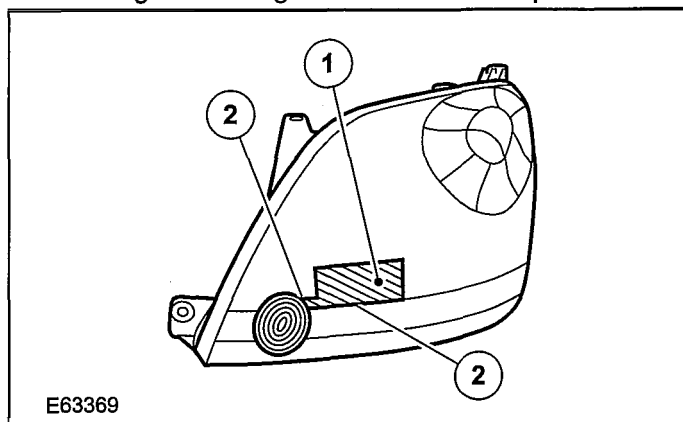
9. **NOTE: Left-hand headlamp only.**

Align the template on the lens of the headlamp.

1. Template

GENERALPROCEDURES

2. Alignment edges on the headlamp lens



All vehicles

10. **⚠CAUTION:** Do not damage the **headlamp** surface.

Copy the outline of the template with a suitable pen onto the **headlamp** lens.

11. Remove the template.

12. **NOTE:** Make sure not to go past the marked area.

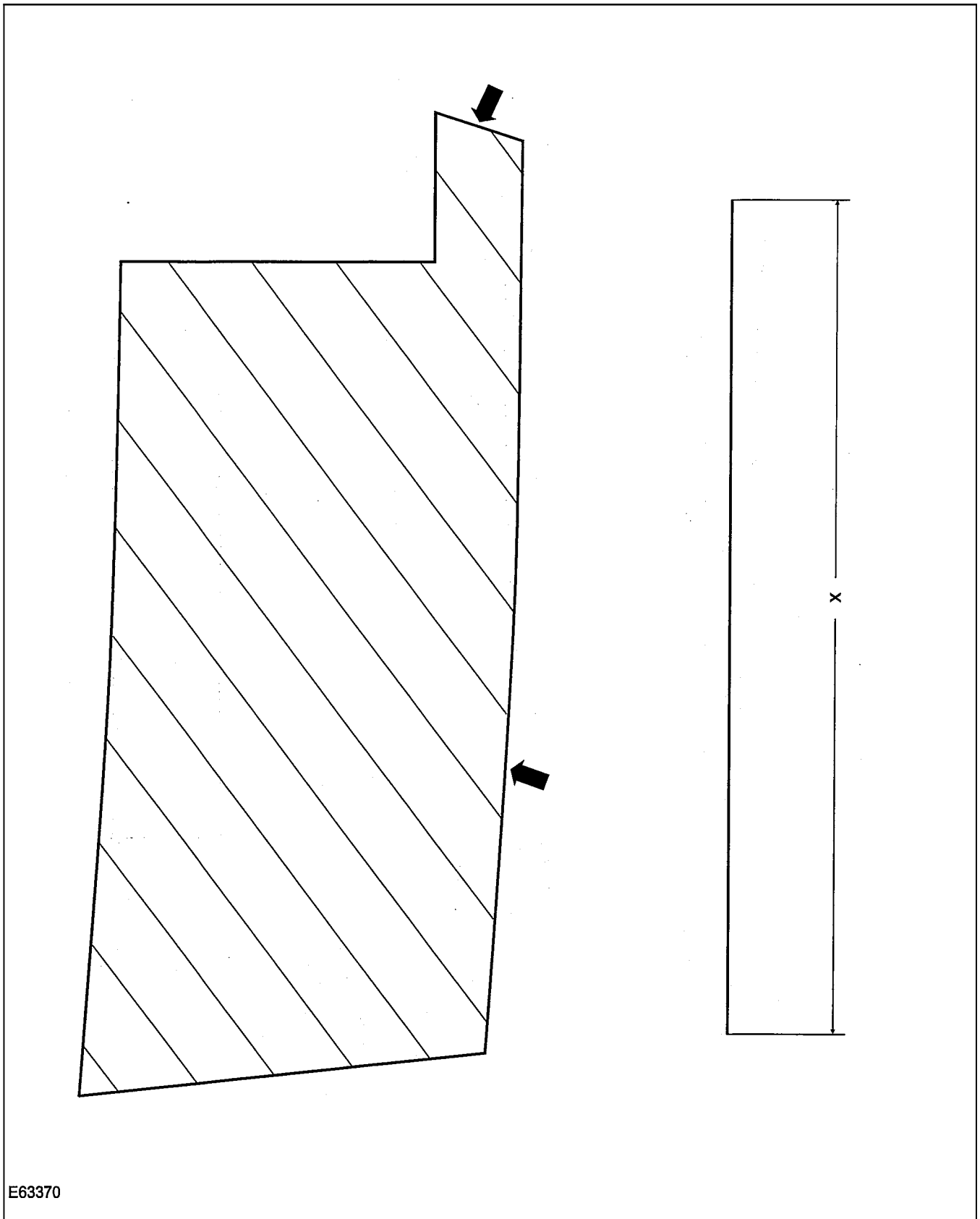
Mask the marked area with opaque black adhesive tape.

13. Repeat steps **10** to **12** for the **headlamp** on the other side.

14. Template for LHD vehicles, right-hand **headlamp**

- Alignment edges

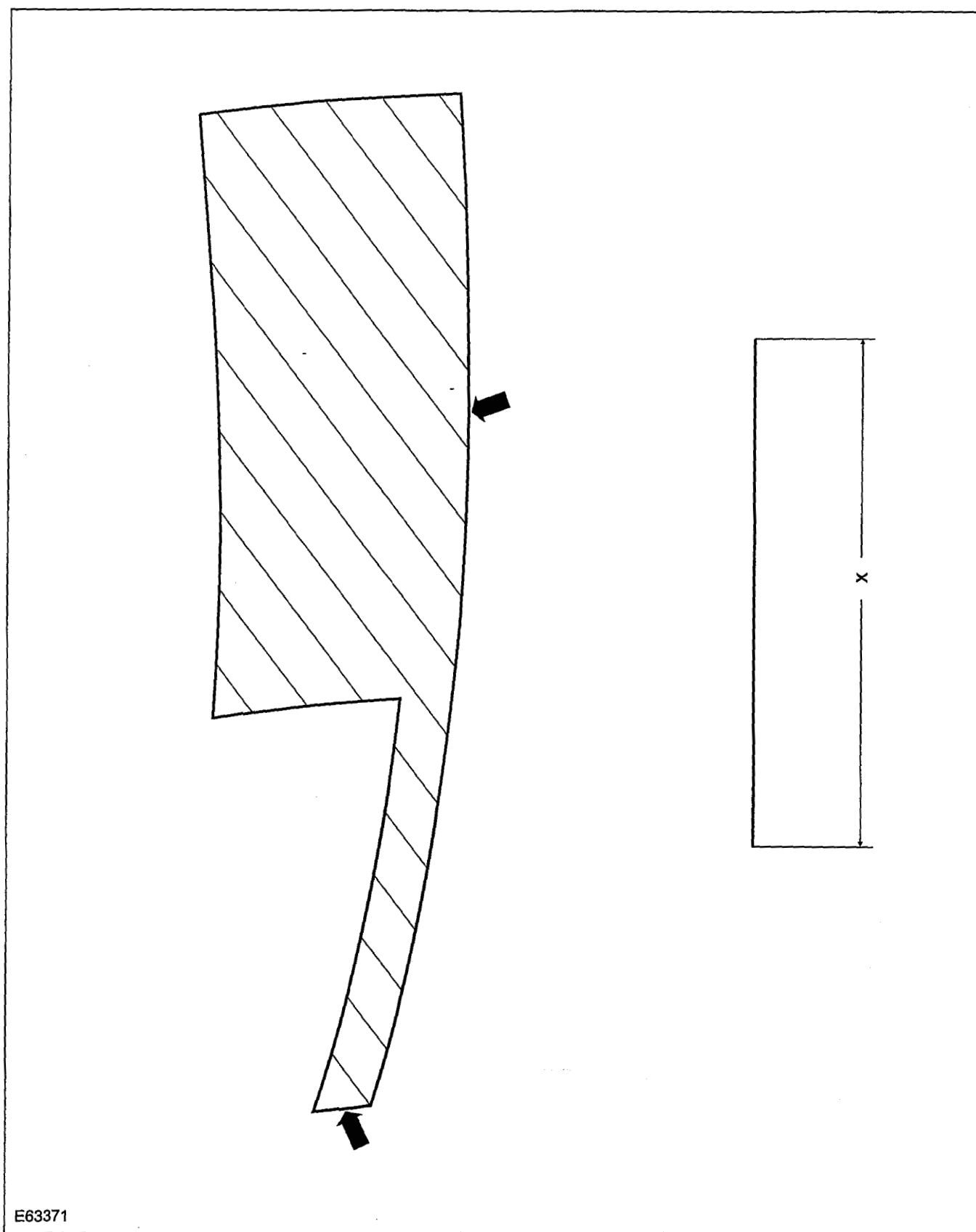
GENERAL PROCEDURES



15. Template for LHD vehicles, left-hand headlamp

- Alignment edges

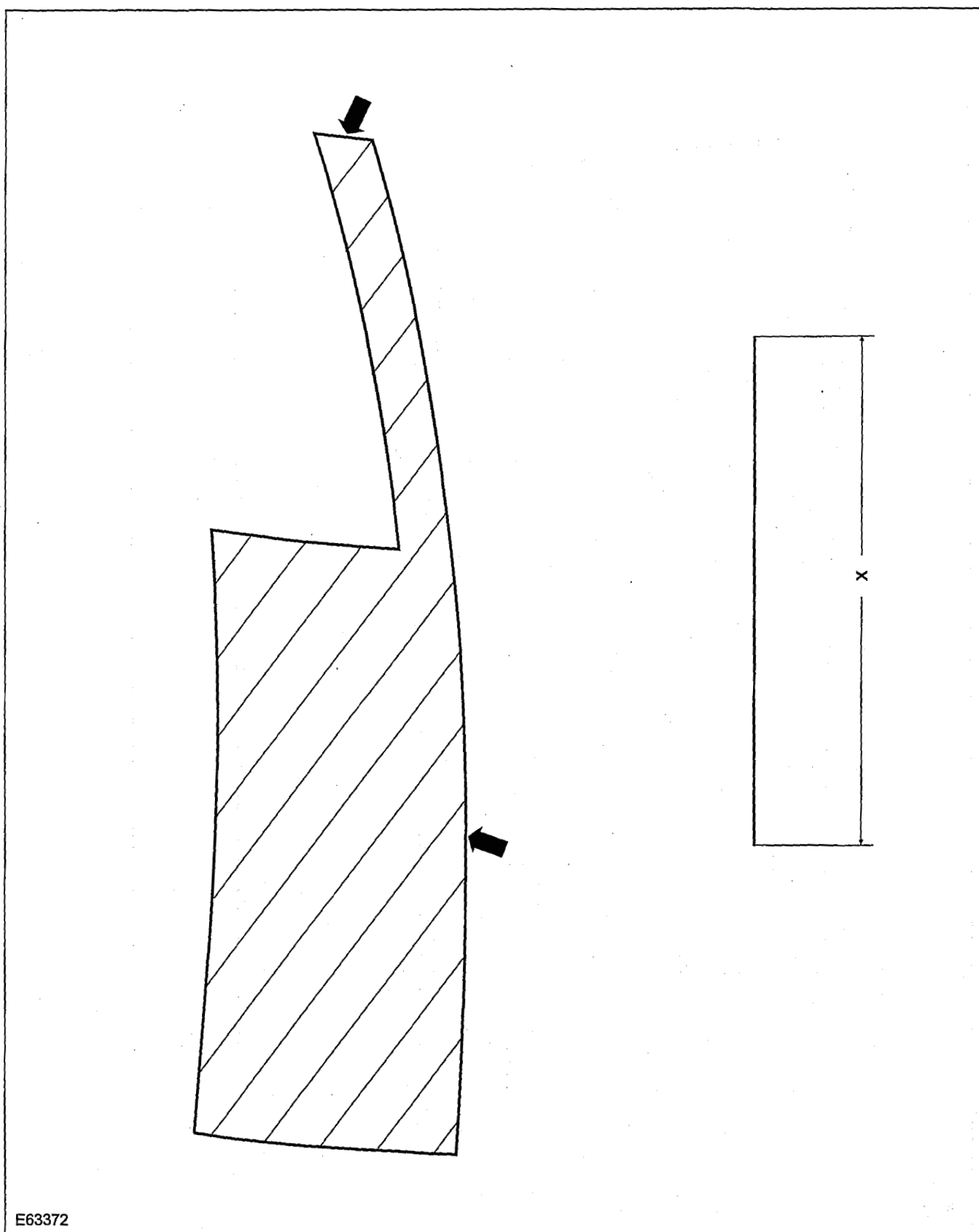
GENERAL PROCEDURES



16. Template for RHD vehicles, right-hand headlamp

- Alignment edges

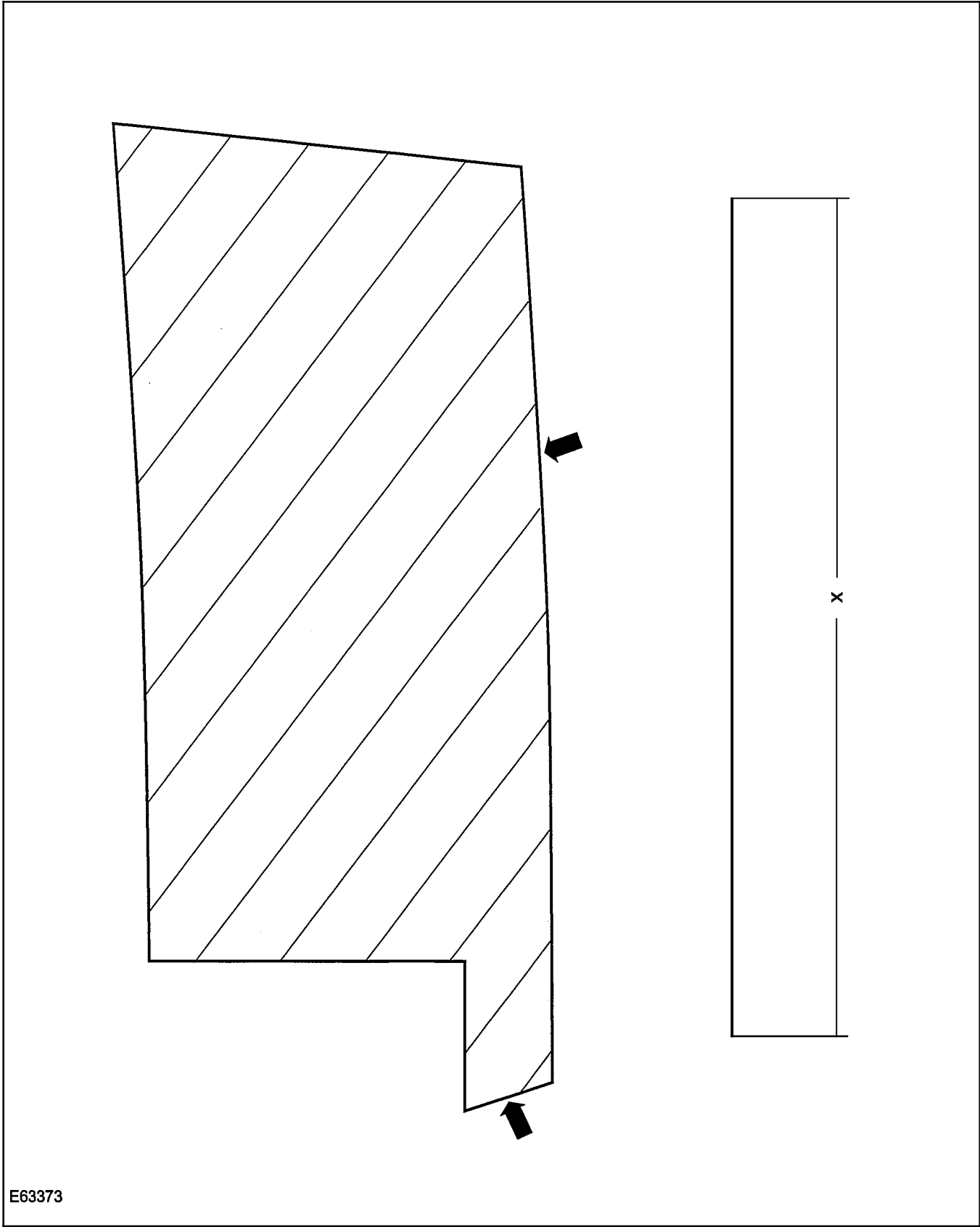
GENERAL PROCEDURES



17. Template for RHD vehicles, left-hand headlamp

- Alignment edges

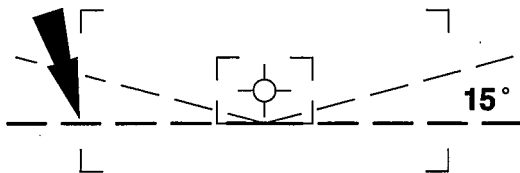
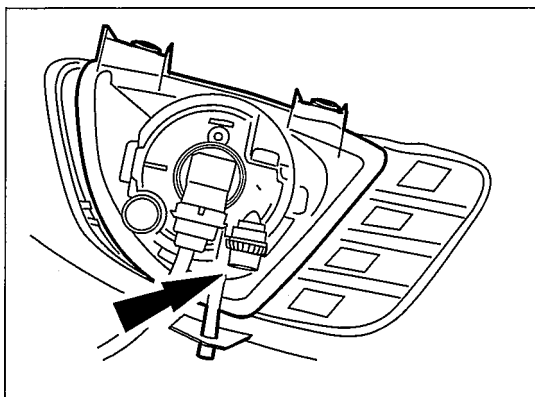
GENERAL PROCEDURES



GENERALPROCEDURES**Front Fog Lamp Adjustment****General Equipment**

Beam setting equipment

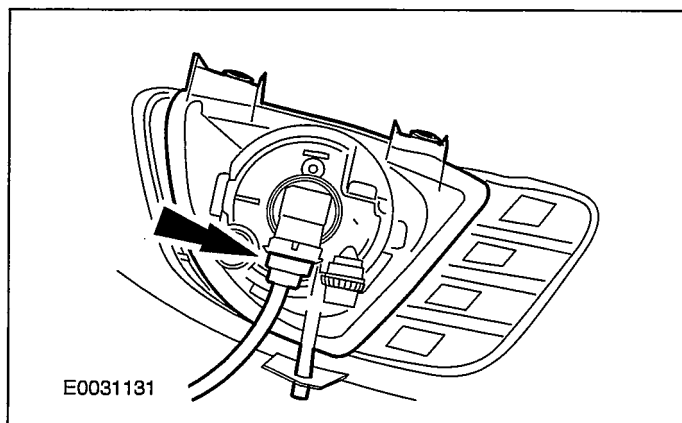
- Place the vehicle on a level surface.
2. Check that the tyre pressures meet the specifications and that the vehicle is not excessively laden.
3. Switch on the front fog lamps.
4. Set up the measuring screen of the beam setting device to the correct setting value for the front fog lamps.
5. Adjust the front fog lamps so that the **light/dark** boundary touches the horizontal line.



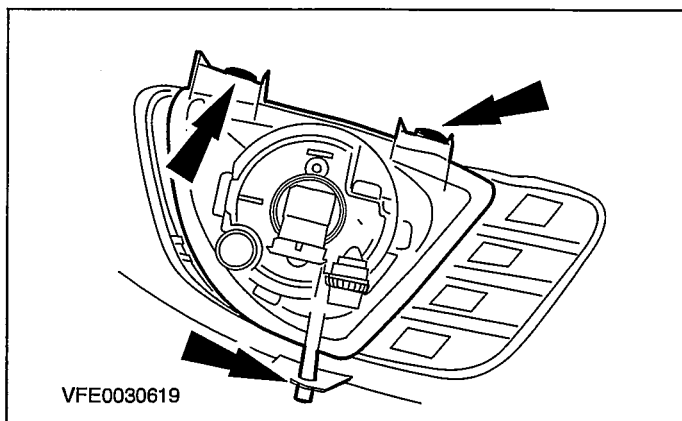
VFE0026810

REMOVAL AND INSTALLATION**Front Fog Lamp — Vehicles Built Up To: 11/2004(32 281 0)****Removal**

1. **Raise the vehicle.** For additional information, refer to Section 100-02 [Jacking and Lifting].
2. **Disconnect the fog lamp electrical connector.**



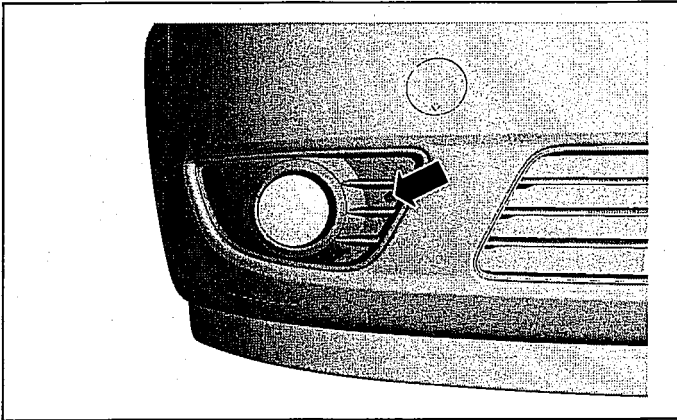
3. **Remove the fog lamp assembly.**

**Installation**

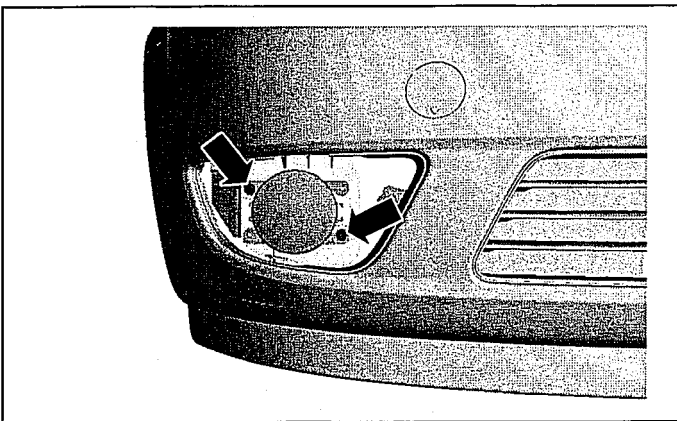
1. **Install the components in reverse order.**
2. **Adjust the fog lamps.**
For additional information, refer to Adjust the fog lamps. in this section.

REMOVAL AND INSTALLATION**Front Fog Lamp — Vehicles Built From: 11/2004(32 281 0)****Removal**

1. Remove the fog lamp bezel.

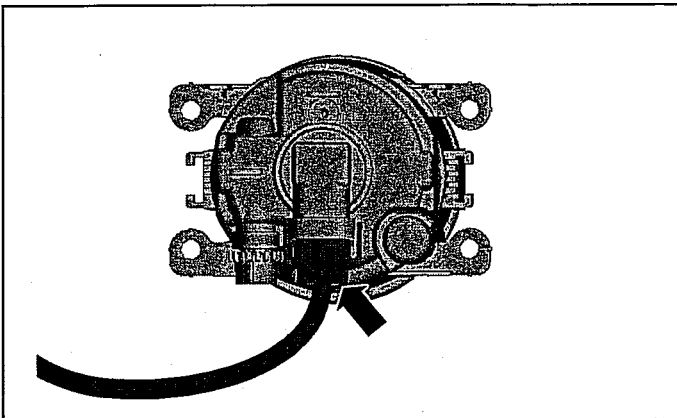


2. Detach the fog lamp from the fog lamp bracket.



3. Remove the fog lamp assembly.

- Pull off the fog lamp connector.

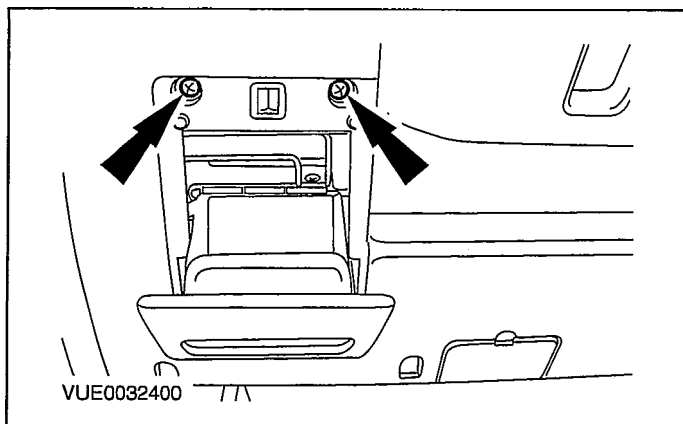
**Installation**

1. To assemble, reverse the disassembly procedure.
2. Adjust the fog lamp beam alignment.

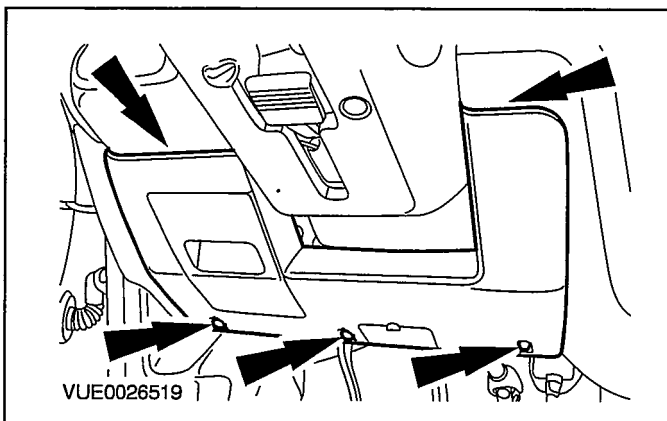
For additional information, refer to:
Front Fog Lamp Adjustment (417-01,
General Procedures).

REMOVAL AND INSTALLATION**Headlamp Switch(35 514 0)****Removal**

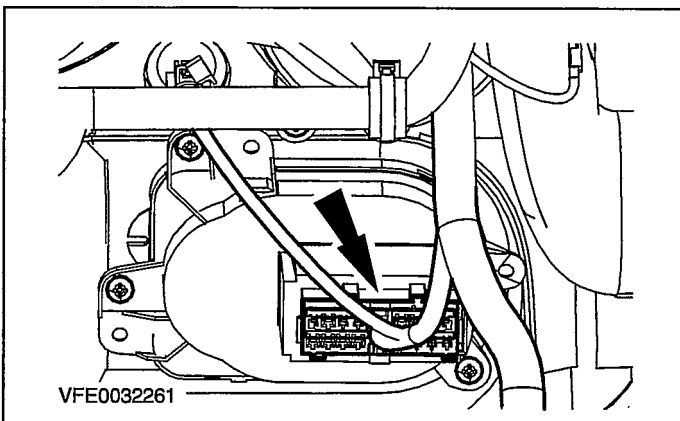
1. Open the stowage space and remove the screws for the facia crash padding lower trim.



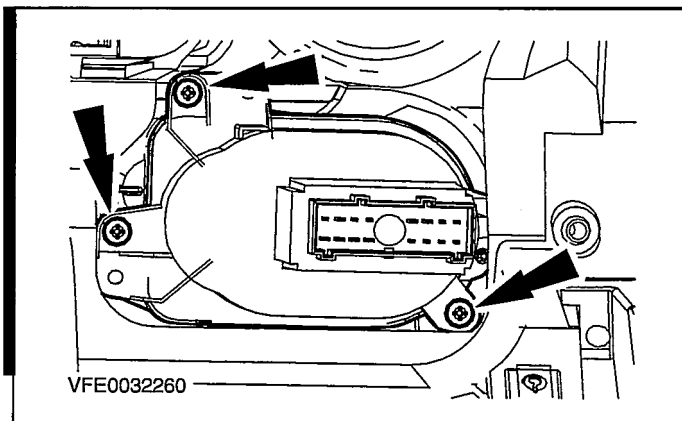
2. Detach the lower fascia/crash padding cover.



3. Disconnect the headlamp switch electrical connector.



4. Remove the headlamp switch.

**Installation**

1. Install the components in the reverse order.

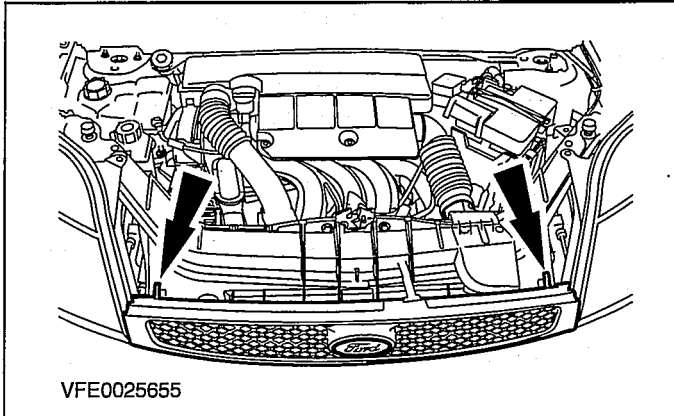
REMOVAL AND INSTALLATION

Headlamp Assembly(32 115 0)

Removal

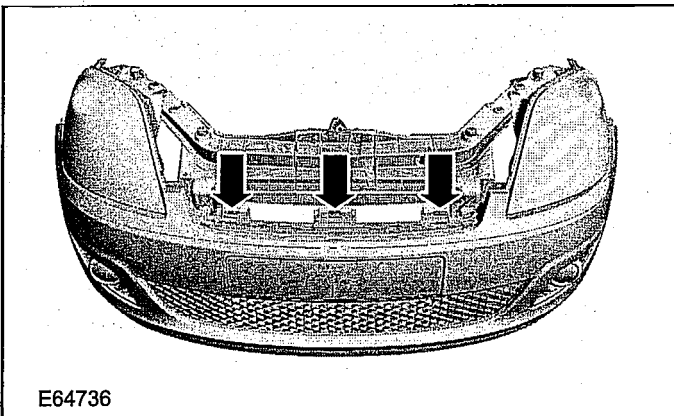
All vehicles

1. Remove the radiator grille.



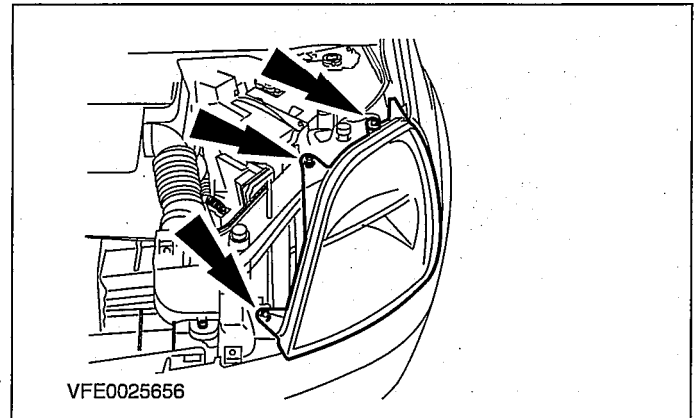
Vehicles built from 0812005

2. Partially detach the front bumper cover from the hood lock panel.
 - Pull the front bumper cover forward to gain access to the lower headlamp bolt.

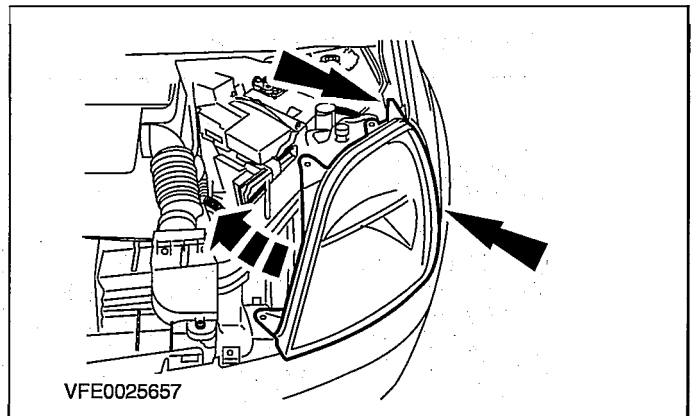


All vehicles

3. Unscrew and remove the **headlamp** bolts.

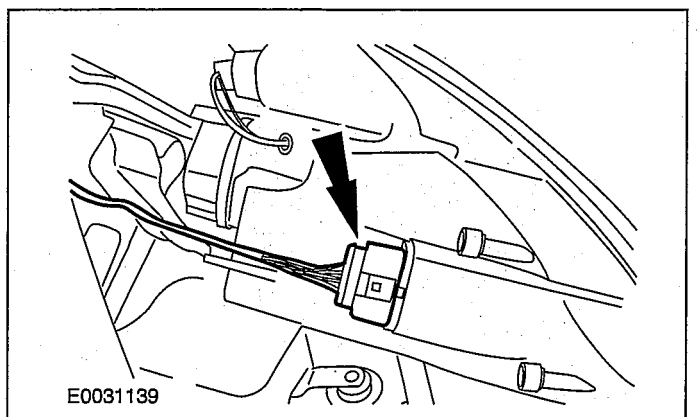


4. **CAUTION:** Do not damage the fixing points of the headlamps during removal.

Detach the **headlamp** from the hood lock panel.

5. Remove the **headlamp** assembly.

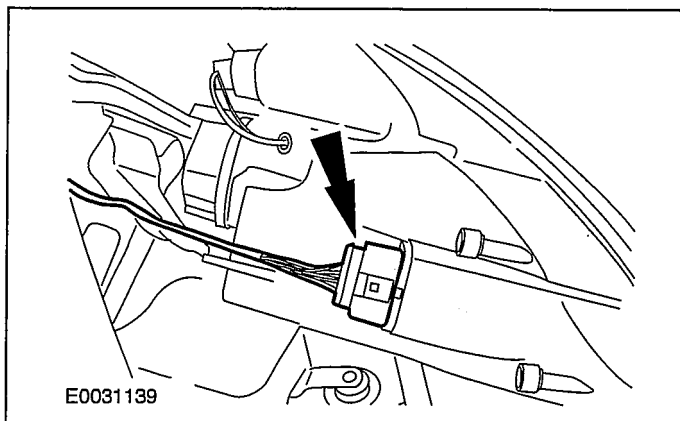
- Disconnect the **headlamp** electrical connector.



REMOVAL AND INSTALLATION**Installation**

All vehicles

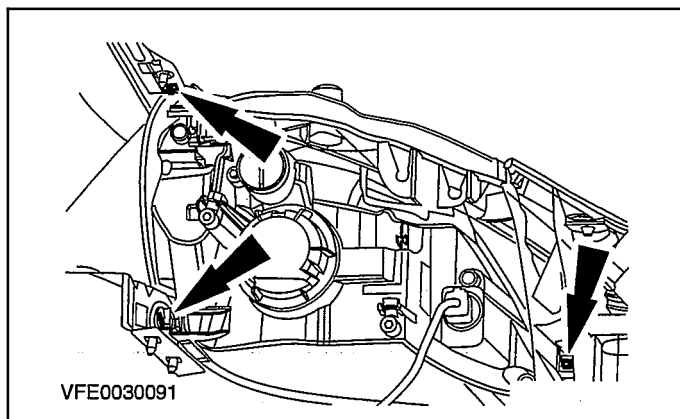
1. Connect the **headlamp** connector.



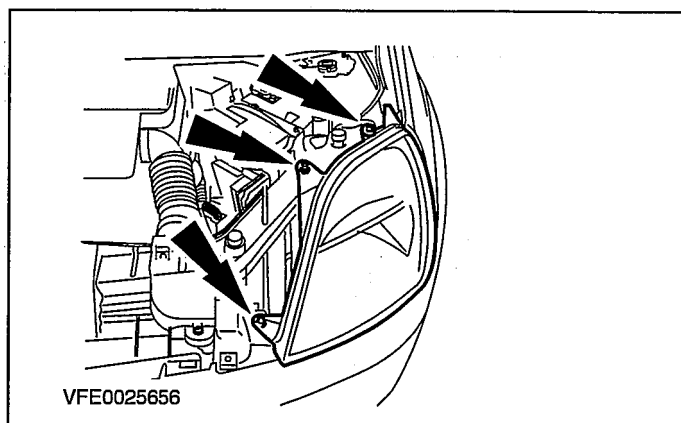
2. **NOTE:** Clean the lens with a damp cloth to prevent the build-up of electrostatic charge, which could cause dust to stick to the plastic lens.

NOTE: Check that the headlamp is engaged at the fixing points.

Install the **headlamp** assembly.

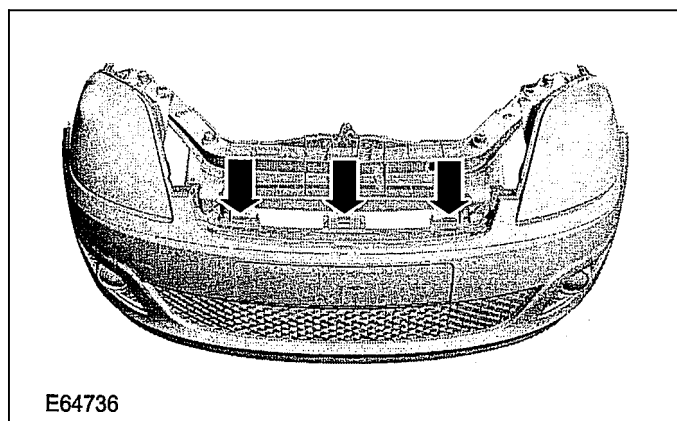


3. Screw in the **headlamp** bolts.



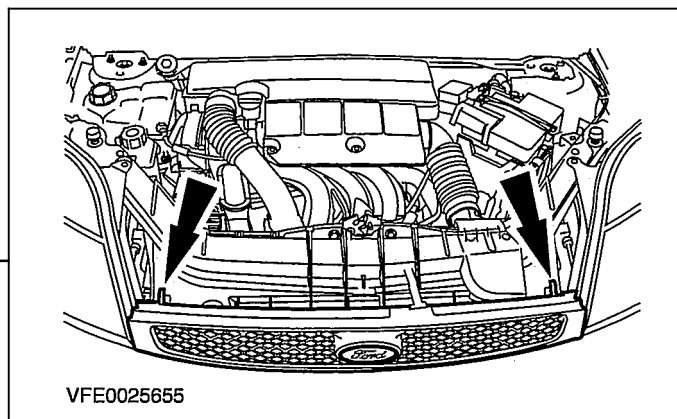
Vehicles built from 0812005

4. Fit the front bumper cover.



All vehicles

5. Install the radiator grill.



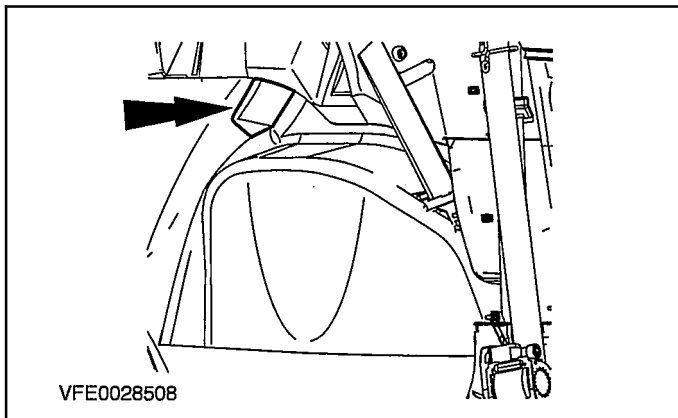
6. Adjust the headlamp.

For additional information, refer to:

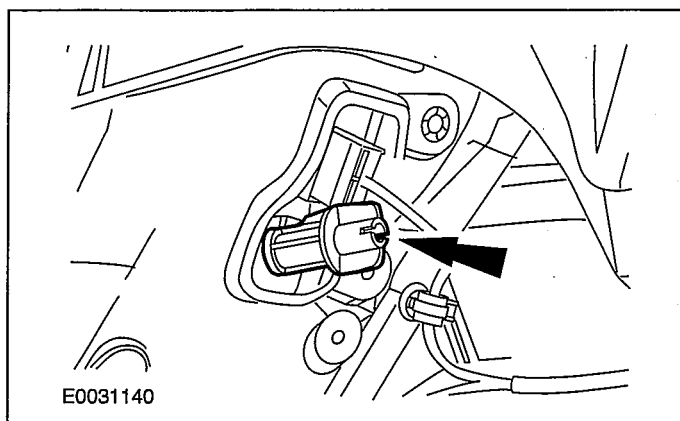
Headlamp Adjustment (417-01
Exterior Lighting, General Procedures).

REMOVAL AND INSTALLATION**Rear Lamp Assembly — Vehicles Built Up To: 10/2005(32 305 0)****Removal**

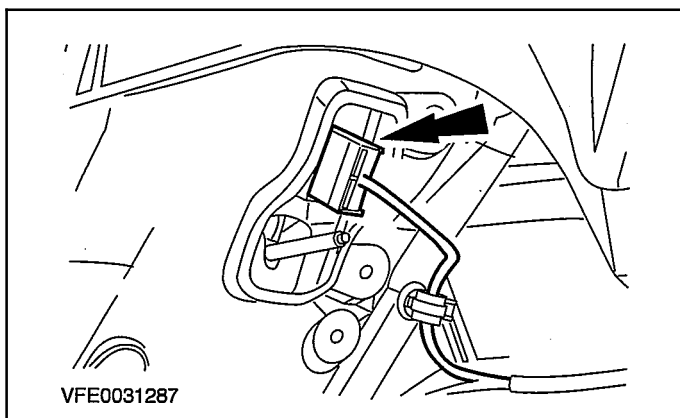
- Partially release the inner wheel arch trim panel and press it to one side.



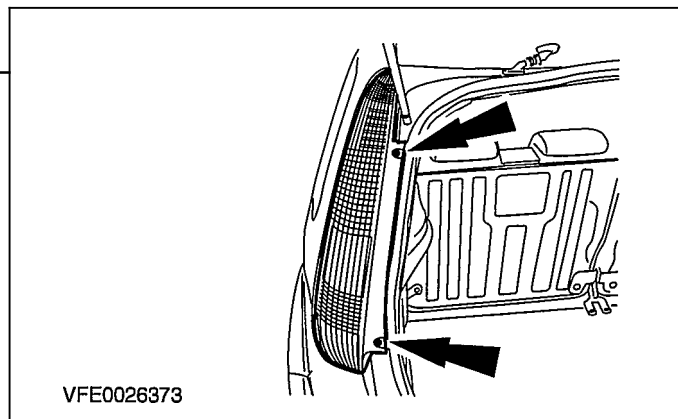
2. Unscrew the nut for the rear lamp assembly.



3. Disconnect the connector from the rear lamp assembly.

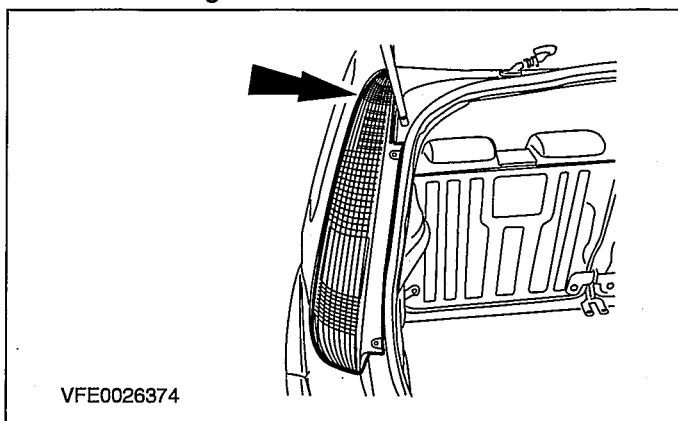


4. Unscrew the bolts from the rear lamp assembly.



5. Remove the rear lamp assembly.

- Pull out the rear lamp assembly from the mounting.

**Installation**

1. Install the components in the reverse order.



SECTION 417-02 Interior Lighting

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DIAGNOSIS AND TESTING	
Interior Lighting — Vehicles Built Up To: 1012005.....	417-02-2
Inspection and Verification.....	417-02-2
Symptom Chart.....	417-02-2
Pinpoint Tests.....	417-02-3
Interior Lighting — Vehicles Built From: 1012005.....	417-02-11
Inspection and Verification.....	417-02-11
Symptom Chart.....	417-02-11
Pinpoint Tests.....	417-02-12

DIAGNOSIS AND TESTING**Interior Lighting — Vehicles Built Up To: 1012005**

Refer to Wiring Diagrams Section 417-02, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Transportation fuse pack

Electrical
- Wiring harness
- Electrical connector(s)
- Lamp(s)
- Switch(es)
- Generic Electronic Module (GEM)

3. If an obvious cause for an **observed** or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
The front interior lamp is inoperative	- Fuse. - Bulb. Circuit(s). - Interior lamp switch. - Front interior lamp. - GEM.	GO to Pinpoint Test A.
The rear interior lamp is inoperative (Fusion only)	- Fuse. - Bulb. Circuit(s). - Interior lamp switch. - Rear interior lamp. - GEM.	GO to Pinpoint Test B.
Right-hand rear map reading lamp is inoperative (Fusion only)	- Fuse. - Bulb. Circuit(s). - Map reading lamp. - GEM.	GO to Pinpoint Test C.
Left-hand rear map reading lamp is inoperative (Fusion only)	- Fuse. - Bulb. Circuit(s). - Map reading lamp. - GEM.	GO to Pinpoint Test D.
The luggage compartment lamp is inoperative	- Fuse. - Bulb. Circuit(s). - Luggage compartment lamp switch. - Luggage compartment lamp. - GEM.	GO to Pinpoint Test E.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The interior lamp does not automatically turn off after 10 minutes when the lamp is in the ILLUMINATED ENTRY position	- GEM. - Circuit.	CHECK circuit 31S-LC7 (BWBU) for short to ground. If the circuit is OK, INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multi-function Electronic Modules, Removal and Installation). TEST the system for normal operation.
The interior lamp does not automatically turn off after 30 minutes when the lamp is in the ON position	GEM.	INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multi-function Electronic Modules, Removal and Installation). TEST the system for normal operation.

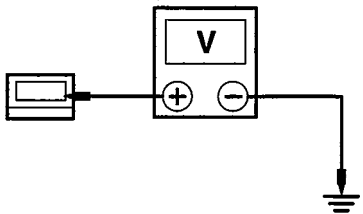
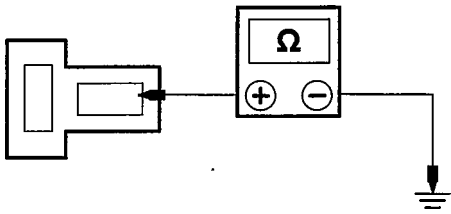
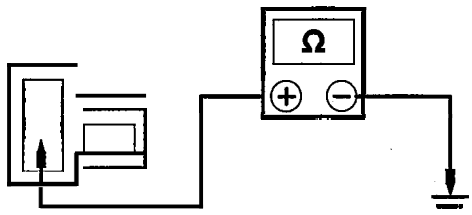
Pinpoint Tests

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST A : THE FRONT INTERIOR LAMP IS INOPERATIVE

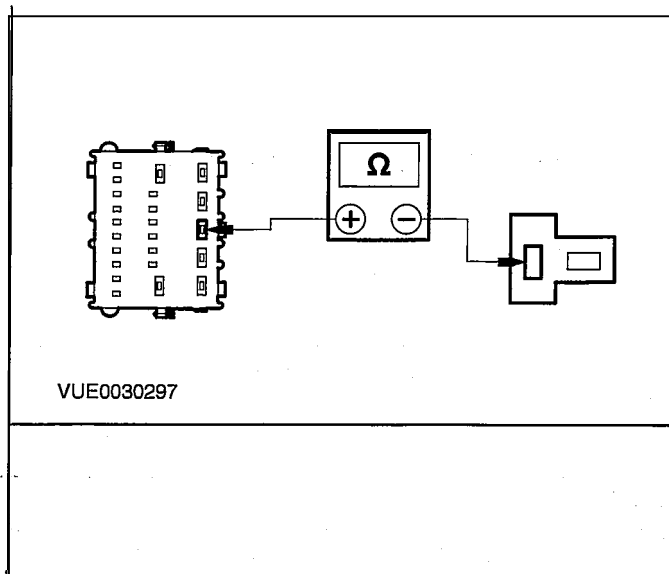
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE OPERATION OF THE FRONT INTERIOR LAMP	
	(Check the operation of the front interior lamp in both the ON and ILLUMINATED ENTRY positions. Is the front interior lamp inoperative in both positions? → Yes GO to A2. → No If inoperative in the ON position, GO to A3. If inoperative in the ILLUMINATED ENTRY position, GO to A4.
A2: CHECK THE FRONT INTERIOR LAMP FOR POWER	
	1 Disconnect Front Interior Lamp C750.
	2 Ignition switch in position II.
	3 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0003764	4 Measure the voltage between the front interior lamp C750 pin 1, circuit 29-LC7 (OGIBU), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to A3. → No REPAIR circuit 29-LC7 (OGIBU). TEST the system for normal operation.
A3: CHECK THE FRONT INTERIOR LAMP FOR GROUND	
 VUE0003763	1 Disconnect Front Interior Lamp C751. 2 Measure the resistance between the front interior lamp C751 pin 2, 31-LC7A (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new front interior lamp. TEST the system for normal operation. → No REPAIR circuit 31-LC7A (BK). TEST the system for normal operation.
A4: CHECK THE FRONT INTERIOR LAMP FOR GROUND WITH THE DRIVER DOOR OPEN	
 VUE0003766	1 Disconnect Front Interior Lamp C751. 2 Open the driver door. 3 Measure the resistance between the front interior lamp C751 pin 1, 31S-LC7 (BWBU), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new front interior lamp. TEST the system for normal operation. → No GO to A5.
A5: CHECK CIRCUIT 31s-LC7 FOR OPEN CIRCUIT	
	1 Disconnect GEM C316.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the front interior lamp C751 pin 1, 31S-LC7 (BWBU), harness side and the GEM C316 pin 3, circuit 31S-LC7 (BWBU), harness side.
 - Is the resistance less than 5 ohms?
 - **Yes**
INSTALL a new GEM.
REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation).
TEST the system for normal operation.
 - **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST B : THE REAR INTERIOR LAMP IS INOPERATIVE (FUSION ONLY)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

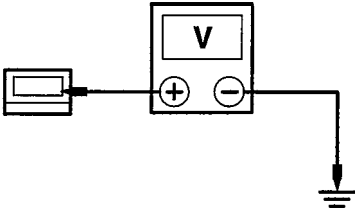
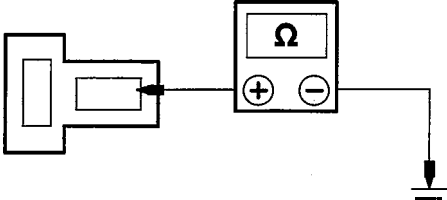
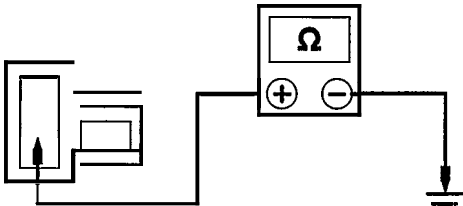
B1: CHECK THE OPERATION OF THE REAR INTERIOR LAMP

- ☐ Check the operation of the rear interior lamp in both the ON and ILLUMINATED ENTRY positions.
 - Is the rear interior lamp inoperative in both positions?
 - **Yes**
GO to B2.
 - **No**
If inoperative in the ON position, GO to B3.
If inoperative in the ILLUMINATED ENTRY position, GO to B4.

B2: CHECK THE REAR INTERIOR LAMP FOR POWER

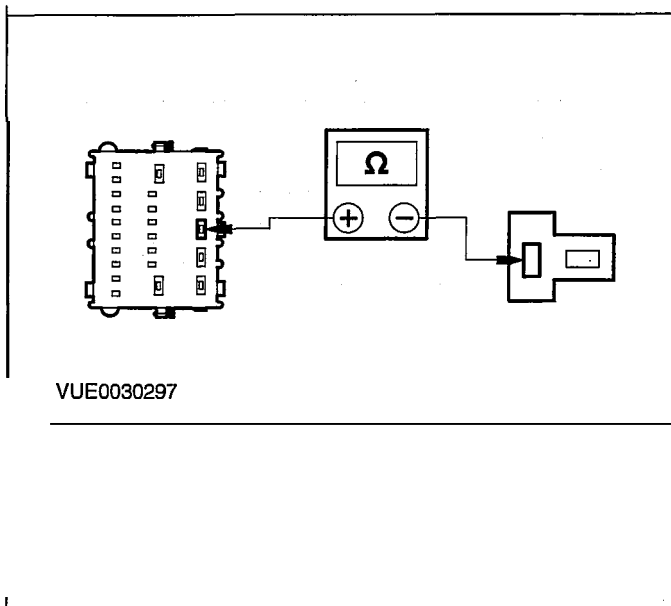
- 1** Disconnect Rear Interior Lamp C752.
- ☐ Ignition switch in position II.
- 3** Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
 VUE0003764		4 Measure the voltage between the rear interior lamp C752 pin 1, circuit 29-LC17 (OGNE), harness side and ground. • Is the voltage greater than 10 volts? → Yes GO to B3. → No REPAIR circuit 29-LC17 (OGNE). TEST the system for normal operation.
B3: CHECK THE REAR INTERIOR LAMP FOR GROUND		
 VUE0003763		☐ Disconnect Rear Interior Lamp C753. 2 Measure the resistance between the rear interior lamp C753 pin 2, 31-LC17 (BK), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new rear interior lamp. TEST the system for normal operation. → No REPAIR circuit 31-LC17 (BK). TEST the system for normal operation.
B4: CHECK THE REAR INTERIOR LAMP FOR GROUND WITH THE DRIVER DOOR OPEN		
 VUE0003766		☐ Disconnect Rear Interior Lamp C753. ☐ Open the driver door. 3 Measure the resistance between the rear interior lamp C753 pin 1, 31S-LC17 (BK/YE), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new rear interior lamp. TEST the system for normal operation. → No GO to B5.
B5: CHECK CIRCUIT 31s-LC17 (BK/YE) AND CIRCUIT 31s-LC7 (BKIBU) FOR OPEN CIRCUIT		
		☐ Disconnect GEM C316.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the rear interior lamp C753 pin 1, 31S-LC17 (BK/YE), harness side and the GEM C316 pin 3, circuit 31s-LC7 (BWBU), harness side.

• Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new GEM.

REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation).

TEST the system for normal operation.

→ **No**

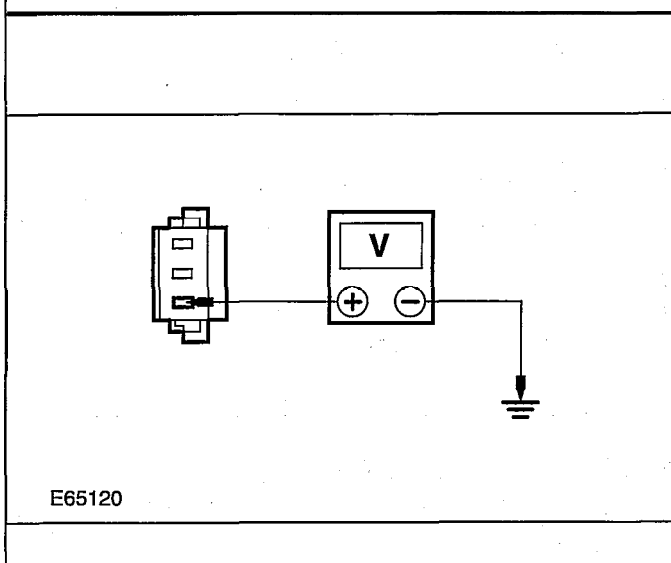
REPAIR circuit 31s-LC17 (BK/YE) or circuit 31SLC7 (BWBU) as necessary. TEST the system for normal operation.

PINPOINT TEST C : RIGHT-HAND REAR MAP READING LAMP IS INOPERATIVE (FUSION ONLY)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

C1: CHECK THE RIGHT-HAND REAR MAP READING LAMP FOR POWER



- ☐ Disconnect Right-Hand Rear Map Reading Lamp C490.

- 2 Measure the voltage between the right-hand rear map reading lamp C490 pin 1, circuit 29-LB21 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

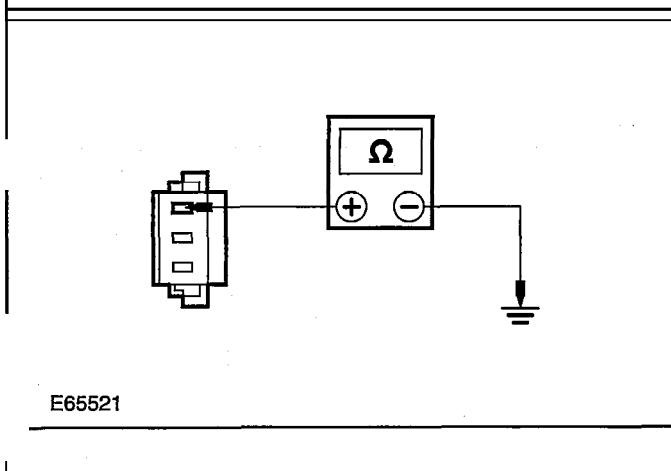
→ **Yes**

GO to C2.

→ **No**

REPAIR circuit 29-LB21 (OG/BK). TEST the system for normal operation.

C2: CHECK THE RIGHT-HAND REAR MAP READING LAMP FOR GROUND



- 1 Measure the resistance between the right-hand rear map reading lamp C490 pin 3, 31-LB21 (BK), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new right-hand rear map reading lamp. TEST the system for normal operation.

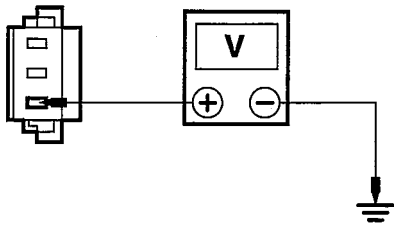
→ **No**

REPAIR circuit 31-LB21 (BK). TEST the system for normal operation.

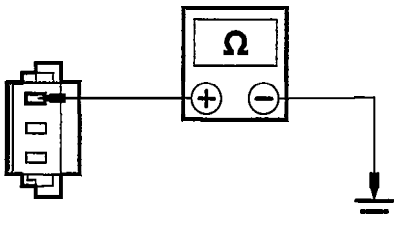
DIAGNOSIS AND TESTING

PINPOINT TEST D : LEFT-HAND REAR MAP READING LAMP IS INOPERATIVE (FUSION ONLY)

TEST CONDITIONS**DETAILS/RESULTS/ACTIONS****D1: CHECK THE LEFT-HAND REAR MAP READING LAMP FOR POWER**

	Disconnect Left-Hand Rear Map Reading Lamp C491.
 E65120	Measure the voltage between the left-hand rear map reading lamp C491 pin 1, circuit 29-LBI4 (OG), harness side and ground. • Is the voltage greater than 10 volts? → Yes GO to D2. → No REPAIR circuit 29-LBI4 (OG). TEST the system for normal operation.

D2: CHECK THE LEFT-HAND REAR MAP READING LAMP FOR GROUND

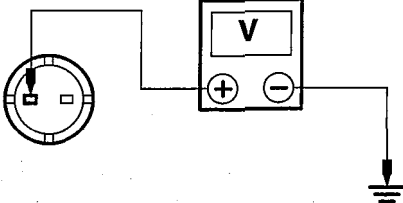
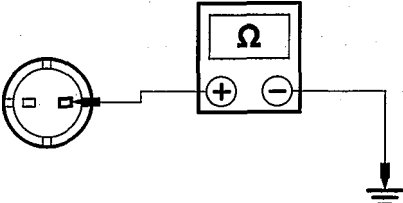
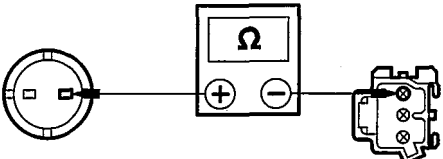
 E65521	Measure the resistance between the left-hand rear map reading lamp C491 pin 3, 31-LB14 (BK), harness side and ground. • Is the resistance less than 5 ohms? → Yes INSTALL a new left-hand rear map reading lamp. TEST the system for normal operation. → No REPAIR circuit 31-LB14 (BK). TEST the system for normal operation.
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PINPOINT TEST E : THE LUGGAGE COMPARTMENT LAMP IS INOPERATIVE

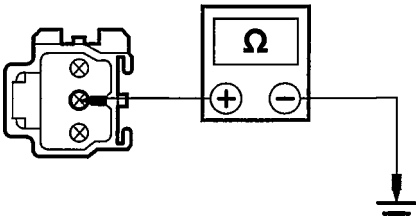
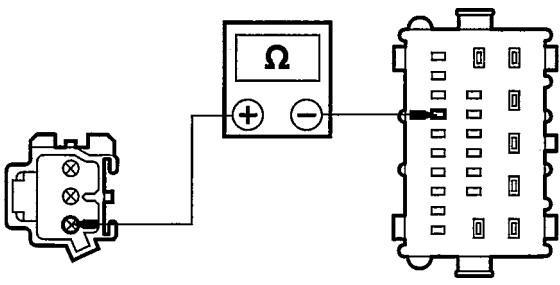
TEST CONDITIONS**DETAILS/RESULTS/ACTIONS****E1: CHECK THE LUGGAGE COMPARTMENT LAMP FOR POWER**

	1 Disconnect Luggage Compartment Lamp C576.
	2 Ignition switch in position II.
	3 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0030298	4 Measure the voltage between the luggage compartment lamp C576 pin 1, circuit 29-LB25 (OGIBU), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to E2. → No REPAIR circuit 29-LB25 (OGIBU). TEST the system for normal operation.
E2: CHECK THE LUGGAGE COMPARTMENT LAMP FOR GROUND	
 VUE0030299	☐ Open the liftgate. 2 Measure the resistance between the luggage compartment lamp C576 pin 2, circuit 31S-LB25 (BWBU), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new luggage compartment lamp. TEST the system for normal operation. → No GO to E3.
E3: CHECK CIRCUIT 31S-LB25 (BK/BU) OR CIRCUIT 31-LB25S (BK) FOR OPEN CIRCUIT	
 VUE0030300	1 Disconnect Liftgate Switch C565. 2 Measure the resistance between the luggage compartment lamp C576 pin 2, circuit 31S-LB25 (BWBU), harness side and the liftgate switch C565 pin 3, circuit 31S-LB25 (BWBU) or circuit 31-LB25S (BK) - vehicles with anti-theft alarm, harness side. Is the resistance less than 5 ohms? → Yes INSTALL a new liftgate switch. TEST the system for normal operation. → No REPAIR circuit 31S-LB25 (BWBU) or circuit 31-LB25S (BK) as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E4: CHECK THE LIFTGATE SWITCH FOR GROUND  E65735	1 Measure the resistance between the liftgate switch C565 pin 2, circuit 31-GL20 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new liftgate switch. TEST the system for normal operation. If the concern persists, GO to E5. → No REPAIR circuit 31-GL20 (BK). TEST the system for normal operation.
E5: CHECK CIRCUIT 31S-GL20 (BKIRD) OR CIRCUIT 31-GL20S (BK) FOR OPEN CIRCUIT  E65738	1 Measure the resistance between the liftgate switch C565 pin 1, circuit 31S-GL20 (BWRD) or circuit 31-GL20S (BK) - vehicles with anti-theft alarm, harness side and the GEM C316 pin 20, circuit 31S-GL20 (BWRD), harness side. Is the resistance less than 5 ohms? → Yes INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation. → No REPAIR circuit 31S-GL20 (BWRD) or circuit 31-GL20S (BK) as necessary. TEST the system for normal operation.

DIAGNOSIS AND TESTING**Interior Lighting — Vehicles Built From: 1012005**

Refer to Wiring Diagrams Section 417-02, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Transportation fuse pack

Electrical
- Wiring harness
- Electrical connector(s)
- Lamp(s)
- Switch(es)
- Generic Electronic Module (GEM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
The front interior lamp is inoperative	- Fuse. - Bulb. - Circuit(s). - Interior lamp switch. - Front interior lamp. - GEM.	GO to Pinpoint Test A.
The rear interior lamp is inoperative (Fusion only)	- Fuse. - Bulb. - Circuit(s). - Interior lamp switch. - Rear interior lamp. - GEM.	GO to Pinpoint Test B.
Right-hand rear map reading lamp is inoperative (Fusion only)	- Fuse. - Bulb. - Circuit(s). - Map reading lamp. - GEM.	GO to Pinpoint Test C.
Left-hand rear map reading lamp is inoperative (Fusion only)	- Fuse. - Bulb. - Circuit(s). - Map reading lamp. - GEM.	GO to Pinpoint Test D.
The luggage compartment lamp is inoperative	- Fuse. - Bulb. - Circuit(s). - Luggage compartment lamp switch. - Luggage compartment lamp. - GEM.	GO to Pinpoint Test E.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
The interior lamp does not automatically turn off after 10 minutes when the lamp is in the ILLUMINATED ENTRY position	- GEM. - Circuit.	CHECK circuit 31s-LC7 (BKIBU) for short to ground. If the circuit is OK, INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multi-function Electronic Modules, Removal and Installation). TEST the system for normal operation.
The interior lamp does not automatically turn off after 30 minutes when the lamp is in the ON position	GEM.	INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multi-function Electronic Modules, Removal and Installation). TEST the system for normal operation.

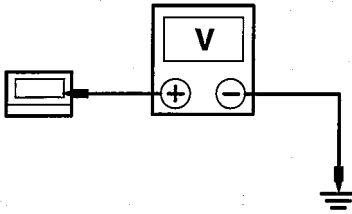
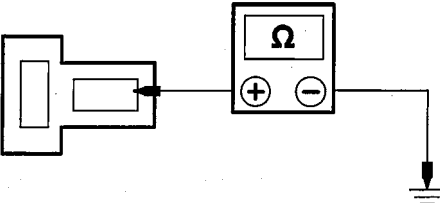
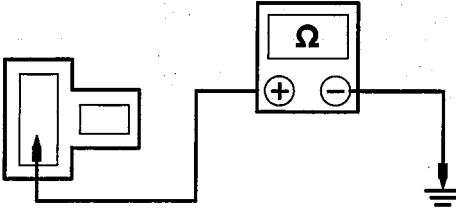
Pinpoint Tests

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST F : THE FRONT INTERIOR LAMP IS INOPERATIVE

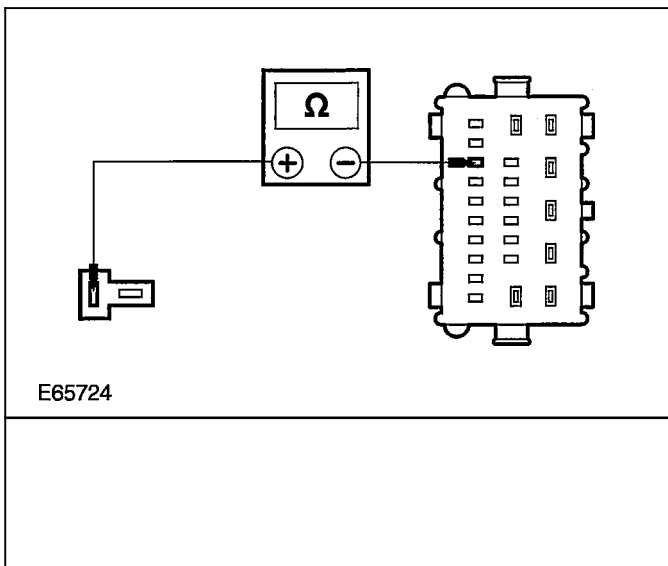
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE OPERATION OF THE FRONT INTERIOR LAMP	
	- Check the operation of the front interior lamp in both the ON and ILLUMINATED ENTRY positions. - Is the front interior lamp inoperative in both positions? → Yes GO to A2. → No If inoperative in the ON position, GO to A3. If inoperative in the ILLUMINATED ENTRY position, GO to A4.
A2: CHECK THE FRONT INTERIOR LAMP FOR POWER	
	- Disconnect Front Interior Lamp C750. - Ignition switch in position II. - Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0003764	4 Measure the voltage between the front interior lamp C750 pin 1, circuit 29-LC7 (OGIBU), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to A3. → No REPAIR circuit 29-LC7 (OGIBU). TEST the system for normal operation.
A3: CHECK THE FRONT INTERIOR LAMP FOR GROUND	
 VUE0003763	1 Disconnect Front Interior Lamp C751. ☐ Measure the resistance between the front interior lamp C751 pin 2, 31-LC7 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new front interior lamp. TEST the system for normal operation. → No REPAIR circuit 31-LC7 (BK). TEST the system for normal operation.
A4: CHECK THE FRONT INTERIOR LAMP FOR GROUND WITH THE DRIVER DOOR OPEN	
 VUE0003766	1 Disconnect Front Interior Lamp C751. 2 Open the driver door. 3 Measure the resistance between the front interior lamp C751 pin 1, 31s-LC7 (BWBU), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new front interior lamp. TEST the system for normal operation. → No GO to A5.
A5: CHECK CIRCUIT 31s-LC7 FOR OPEN CIRCUIT	
	1 Disconnect GEM C316.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2** Measure the resistance between the front interior lamp C751 pin 1, 31s-LC7 (BWBU), harness side and the GEM C316 pin 21, circuit 31s-LC7 (BWBU), harness side. CHECK
- Is the resistance less than 5 ohms?
- **Yes**
INSTALL a new GEM.
REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation).
TEST the system for normal operation.
- **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST G : THE REAR INTERIOR LAMP IS INOPERATIVE (FUSION ONLY)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

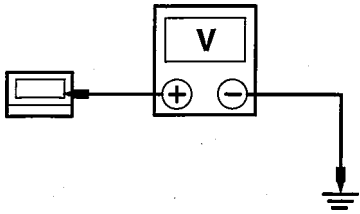
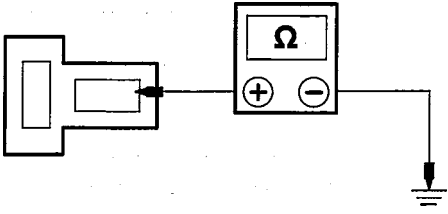
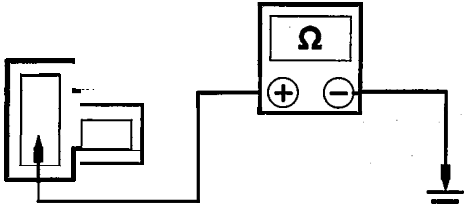
B1: CHECK THE OPERATION OF THE REAR INTERIOR LAMP

- ☐ Check the operation of the rear interior lamp in both the ON and ILLUMINATED ENTRY positions.
- Is the rear interior lamp inoperative in both positions?
- **Yes**
GO to B2.
- **No**
If inoperative in the ON position, GO to B3.
If inoperative in the ILLUMINATED ENTRY position, GO to B4.

B2: CHECK THE REAR INTERIOR LAMP FOR POWER

- ☐ Disconnect Rear Interior Lamp C752.
- 2** Ignition switch in position II.
- 3** Ignition switch in position 0.

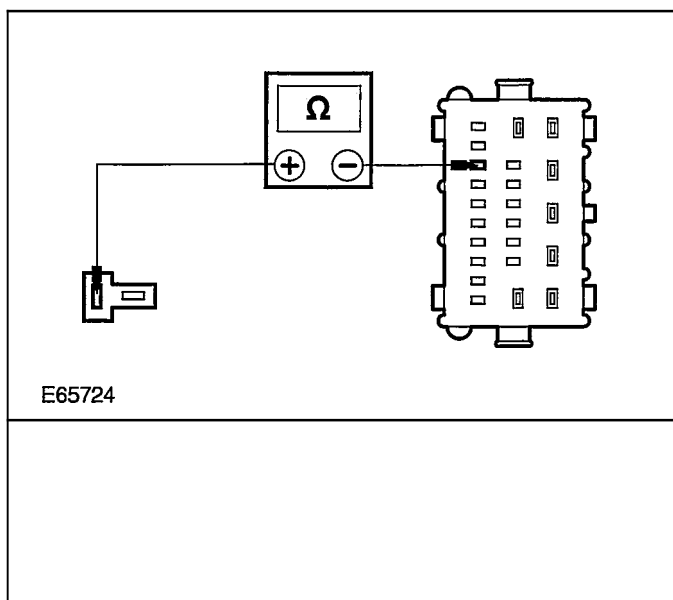
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
 VUE0003764	Measure the voltage between the rear interior lamp C752 pin 1, circuit 29-LC17 (OGNE), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to B3. → No REPAIR circuit 29-LC17 (OGNE). TEST the system for normal operation.
B3: CHECK THE REAR INTERIOR LAMP FOR GROUND	
 VUE0003763	1 Disconnect Rear Interior Lamp C753. ☐ Measure the resistance between the rear interior lamp C753 pin 2, 31-LC17 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new rear interior lamp. TEST the system for normal operation. → No REPAIR circuit 31-LC17 (BK). TEST the system for normal operation.
B4: CHECK THE REAR INTERIOR LAMP FOR GROUND WITH THE DRIVER DOOR OPEN	
 VUE0003766	Disconnect Rear Interior Lamp C753. ☐ Open the driver door. Measure the resistance between the rear interior lamp C753 pin 1, 31S-LC17 (BK/YE), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new rear interior lamp. TEST the system for normal operation. → No GO to B5.
B5: CHECK CIRCUIT 31s-LC17 (BK/YE) AND CIRCUIT 31s-LC7 (BK/BU) FOR OPEN CIRCUIT	
	1 Disconnect GEM C316.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



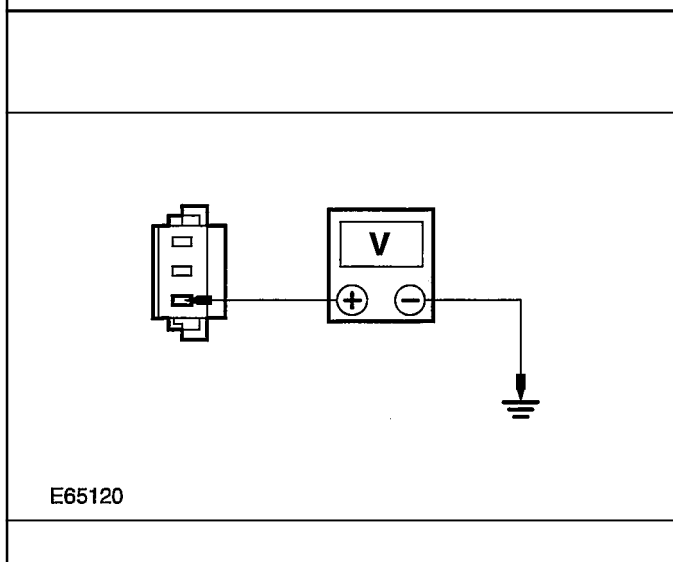
- ☐ Measure the resistance between the rear interior lamp C753 pin 1, 31S-LC17 (BK/YE), harness side and the GEM C316 pin 3, circuit 31s-LC7 (BWBU), harness side.
- Is the resistance less than 5 ohms?
 - **Yes**
INSTALL a new GEM.
REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation).
TEST the system for normal operation.
 - **No**
REPAIR circuit 31S-LC17 (BKNE) or circuit 31SLC7 (BWBU) as necessary. TEST the system for normal operation.

PINPOINT TEST H : RIGHT-HAND REAR MAP READING LAMP IS INOPERATIVE (FUSION ONLY)

TEST CONDITIONS

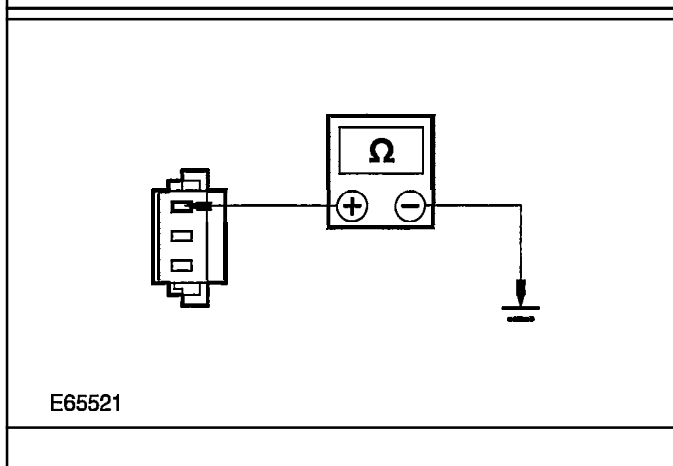
DETAILS/RESULTS/ACTIONS

C1: CHECK THE RIGHT-HAND REAR MAP READING LAMP FOR POWER



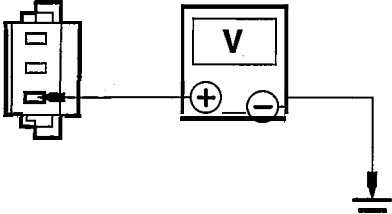
- 1** Disconnect Right-Hand Rear Map Reading Lamp C490.
- Measure the voltage between the right-hand rear map reading lamp C490 pin 1, circuit 29-LB21 (OGIBK), harness side and ground.
- Is the voltage greater than 10 volts?
 - **Yes**
GO to C2.
 - **No**
REPAIR circuit 29-LB21 (OGIBK). TEST the system for normal operation.

C2: CHECK THE RIGHT-HAND REAR MAP READING LAMP FOR GROUND

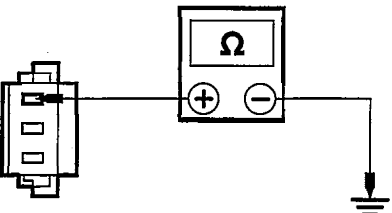


- Measure the resistance between the right-hand rear map reading lamp C490 pin 3, 31-LB21 (BK), harness side and ground.
- Is the resistance less than 5 ohms?
 - **Yes**
INSTALL a new right-hand rear map reading lamp. TEST the system for normal operation.
 - **No**
REPAIR circuit 31-LB21 (BK). TEST the system for normal operation.

DIAGNOSIS AND TESTING**PINPOINT TEST I : LEFT-HAND REAR MAP READING LAMP IS INOPERATIVE (FUSION ONLY)****TEST CONDITIONS****DETAILS/RESULTS/ACTIONS****D1: CHECK THE LEFT-HAND REAR MAP READING LAMP FOR POWER**

	1 Disconnect Left-Hand Rear Map Reading Lamp C491.
 E65120	2 Measure the voltage between the left-hand rear map reading lamp C491 pin 1, circuit 29-LB14 (OG), harness side and ground. - Is the voltage greater than 10 volts? → Yes GO to D2. → No REPAIR circuit 29-LB14 (OG). TEST the system for normal operation.

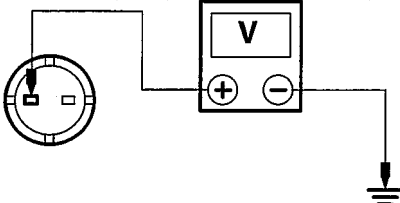
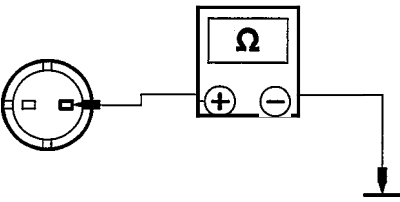
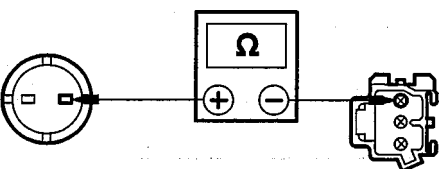
D2: CHECK THE LEFT-HAND REAR MAP READING LAMP FOR GROUND

 E65521	1 Measure the resistance between the left-hand rear map reading lamp C491 pin 3, 31-LB14 (BK), harness side and ground. - Is the resistance less than 5 ohms? → Yes INSTALL a new left-hand rear map reading lamp. TEST the system for normal operation. → No REPAIR circuit 31-LB14 (BK). TEST the system for normal operation.
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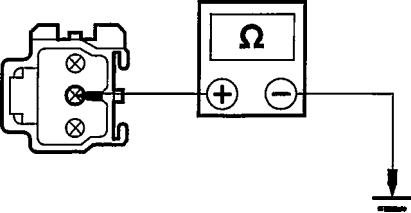
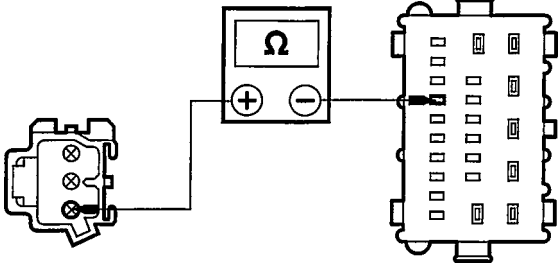
PINPOINT TEST J : THE LUGGAGE COMPARTMENT LAMP IS INOPERATIVE**TEST CONDITIONS****DETAILS/RESULTS/ACTIONS****E1: CHECK THE LUGGAGE COMPARTMENT LAMP FOR POWER**

	1 Disconnect Luggage Compartment Lamp C576.
	2 Ignition switch in position II.
	3 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0030298	4 Measure the voltage between the luggage compartment lamp C576 pin 1, circuit 29-LB25 (OGIBU), harness side and ground. Is the voltage greater than 10 volts? → Yes GO to E2. → No REPAIR circuit 29-LB25 (OGIBU). TEST the system for normal operation.
E2: CHECK THE LUGGAGE COMPARTMENT LAMP FOR GROUND	
 VUE0030299	1 Open the liftgate. 2 Measure the resistance between the luggage compartment lamp C576 pin 2, circuit 31S-LB25 (BWBU), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new luggage compartment lamp. TEST the system for normal operation. → No GO to E3.
E3: CHECK CIRCUIT 31S-LB25 (BK/BU) FOR OPEN CIRCUIT	
 VUE0030300	1 Disconnect Liftgate Switch C565. 2 Measure the resistance between the luggage compartment lamp C576 pin 2, circuit 31S-LB25 (BWBU), harness side and the liftgate switch C565 pin 3, circuit 31S-LB25 (BWBU), harness side. Is the resistance less than 5 ohms? → Yes INSTALL a new liftgate switch. TEST the system for normal operation. If the concern persists, GO to E4. → No REPAIR the circuit. TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E4: CHECK THE LIFTGATE SWITCH FOR GROUND  E65735	1 Measure the resistance between the liftgate switch C565 pin 2, circuit 31-GL20 (BK), harness side and ground. Is the resistance less than 5 ohms? → Yes INSTALL a new liftgate switch. TEST the system for normal operation. If the concern persists, GO to E5. → No REPAIR circuit 31-GL20 (BK). TEST the system for normal operation.
E5: CHECK CIRCUIT 31S-GL20 (BK/RD) FOR OPEN CIRCUIT  E65738	1 Measure the resistance between the liftgate switch C565 pin 1, circuit 31S-GL20 (BWRD), harness side and the GEM C316 pin 20, circuit 31S-GL20 (BWRD), harness side. Is the resistance less than 5 ohms? → Yes INSTALL a new GEM. REFER to: Generic Electronic Module (GEM) (419-10 Multifunction Electronic Modules, Removal and Installation). TEST the system for normal operation. → No REPAIR the circuit. TEST the system for normal operation.



SECTION 418-00 Module Communications Network

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DESCRIPTION AND OPERATION

Communications Network.....	418-00-2
General.....	418-00-2
Network Components.....	418-00-3

DIAGNOSIS AND TESTING

Communications Network — Vehicles Built Up To: 1012005.....	418-00-7
Inspection and Checking.....	418-00-7
Symptom Chart.....	418-00-7
System Checks.....	418-00-9
Component Tests.....	418-00-97
Communications Network — Vehicles Built From: 1012005.....	418-00-98
Inspection and Testing.....	418-00-98
Symptom chart.....	418-00-98
Pinpoint Tests.....	418-00-100
Component Tests.....	418-00-208

DESCRIPTION AND OPERATION

Communications Network

General

In a communications network (data bus system), various modules of different systems are connected to one another via one or several lines.

The sole purpose of the data bus system is the transmission of data between the connected modules themselves, as well as between the connected modules and the Worldwide Diagnostic System (WDS).

In a data bus system, complete data blocks are transmitted instead of single in/out pulses. In addition to the actual information, these data blocks also contain data regarding the address of the module to be addressed, the size of the data block and information for monitoring the content of each individual data block.

Data bus systems offer various advantages:

- Simplified data transmission between the modules due to a standardized protocol
- Fewer sensors and connectors
- Improved diagnostic options
- Lower costs

The WDS is connected to the various bus systems and to the power supply via the standard 16-pin Data Link Connector (DLC). The signal for the module programming is also transmitted via the DLC.

If, in a data bus system, there is a break in one or both lines or a short to ground or short to voltage is present, then communication between the modules and with the WDS is faulty or is no longer possible at all.

In order to be able to establish communication with one another, the modules of the individual systems must use the same language. This language is called a protocol.

At present, Ford uses three different data bus systems. Depending upon model and equipment level, all three data bus systems are used. Each of these data bus systems has its own protocol.

Data bus systems:

- Standard Corporate Protocol (SCP) bus. This consists of two twisted wires. It is used for communication between the Powertrain Control Module (PCM) and the WDS via the DLC. Depending upon engine version and year of

manufacture, a third wire (ACP bus) is used for programming the PCM. This bus is only used in conjunction with the SCP bus.

- International Organization for Standardization ISO 9141 bus. This consists of a single wire and is used exclusively for communication between the modules and the WDS. The fault memories of the various modules are read out via the ISO 9141 bus.
- Controller Area Network (CAN) bus. This consists of two twisted wires and operates serially (data is transmitted sequentially). It is used for communication between the modules themselves and between the modules and the WDS. The modules are connected to the data bus in parallel. New modules can be incorporated easily, without modifying the other wiring or modules. The transmitted data is received by every module connected to the CAN bus. As each data packet has an identifier, in which the priority of the message is determined as well as the content identification, each module can detect whether or not the data is relevant for its own information processing. This enables several modules to be addressed with a particular data packet and supplied with data simultaneously. For this purpose, it is ensured that important data (for example from the Anti-lock Brake System (ABS)) is transmitted first. The other modules are only able to submit their data to the data bus **after** the high-priority messages have been received.

In order to guarantee a high degree of error protection, two 120 Ohm terminating resistors are installed in the CAN bus. These are integrated in the first module connected to the CAN bus and in the last module connected to the CAN bus respectively and are used for suppression as well as the elimination of voltage peaks. In order to ensure correct functioning of the data bus system, the modules must always be connected with an integral terminating resistor.

The advantages of the CAN bus are:

- Minimization of wiring requirements
- High degree of error protection (fault / fail-proof)
- Robustness
- Good extendibility
- Prioritization of messages
- Inexpensive

DESCRIPTION AND OPERATION

- Automatic repetition of faulty messages
- Independent system monitoring and option for automatic disconnection of faulty modules from the data bus.

In vehicles built from MY 2003.75, an additional second CAN bus system is used depending upon vehicle model. The only significant difference is a lower transmission rate and it is mainly used for the convenience electronics at present. In order to be able to differentiate between individual CAN bus systems, the CAN bus system with the high transmission rate is designated as high-speed (HS) CAN bus and the CAN bus system with the lower transmission rate as mid-speed (MS) CAN bus. As in all CAN bus systems, two 120 Ohm terminating resistors are also installed in the MS CAN bus in order to increase the error protection. In order to enable communication between the modules on the HS CAN bus and the modules on the MS CAN bus, one module is connected to both data bus systems. The connection of both data bus systems is designated as gateway. In this gateway, the received data is converted to the transmission rate required for the relevant data bus and is transmitted. This ensures an optimal distribution of information between both data bus systems.

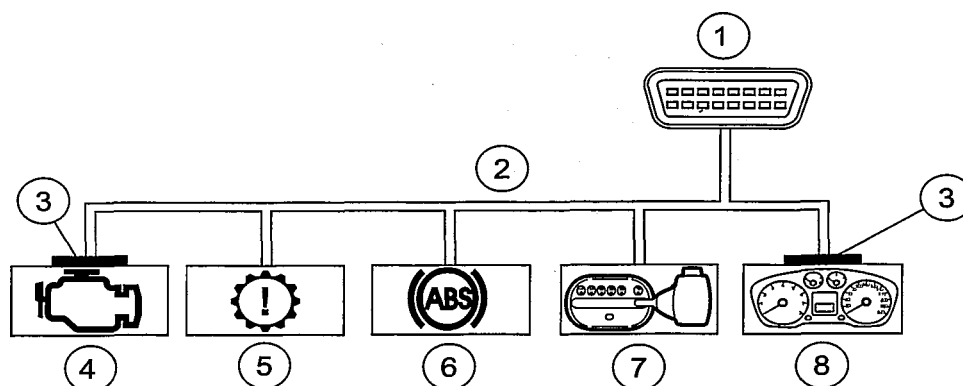
Due to the increased number of modules and the resulting ever-increasing data transmission, a second CAN bus (mid-speed CAN bus (MS CAN)) is used in the Fiesta and in the Fusion built from MY 2006. This operates at a lower speed and is mainly used for communication relating to the convenience electronics. A gateway is used in order to enable data exchange between the HS CAN bus and the MS CAN bus. The gateway serves as interface between the two CAN data bus systems and is installed in the electronic instrument cluster. The modules connected to the two CAN data bus systems depend upon the equipment level of the vehicle. One 120 Ohm terminating resistor of the HS CAN bus is installed in the PCM and in the electronic instrument cluster respectively. One 120 Ohm terminating resistor of the MS CAN bus is installed in the Generic Electronic Module (GEM) and in the electronic instrument cluster respectively. These terminating resistors are used for suppression of the data bus system. In order to be able to ensure correct functioning of the data bus system, the modules must always be connected with an integral terminating resistor.

The number of modules connected to the two data bus systems depend upon the equipment level of the vehicle.

Network Components

The ISO 9141 and the CAN bus are used in the Fiesta built from MY2002.25 and in the Fusion.

CAN bus - vehicles built up to MY 2006



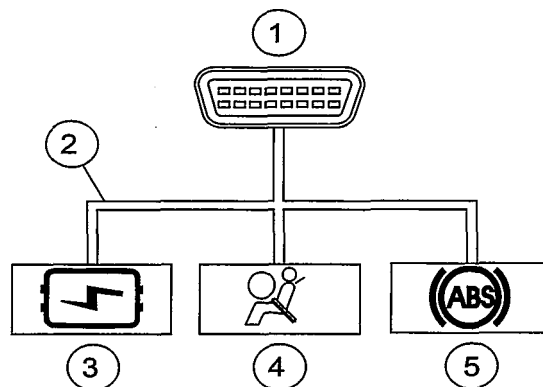
E57610

DESCRIPTION AND OPERATION

Item	Description
1	DLC.
2	High-speed CAN bus.
3	Terminating resistors.
4	PCM.
5	Automatic transmission module - vehicles with automatic transmission / Transmission Control Module (TCM) - vehicles with automatic clutch and gearshift mechanism
6	ABS module or ESP module

Item	Description
7	Transmission selector unit - vehicles with automatic clutch and gearshift mechanism
8	Electronic instrument cluster.

One 120 Ohm terminating resistor is installed in the PCM and in the electronic instrument cluster respectively. These terminating resistors are used for suppression of the bus system. In order to be able to ensure correct functioning of the bus system, the modules must always be connected with an integral terminating resistor.

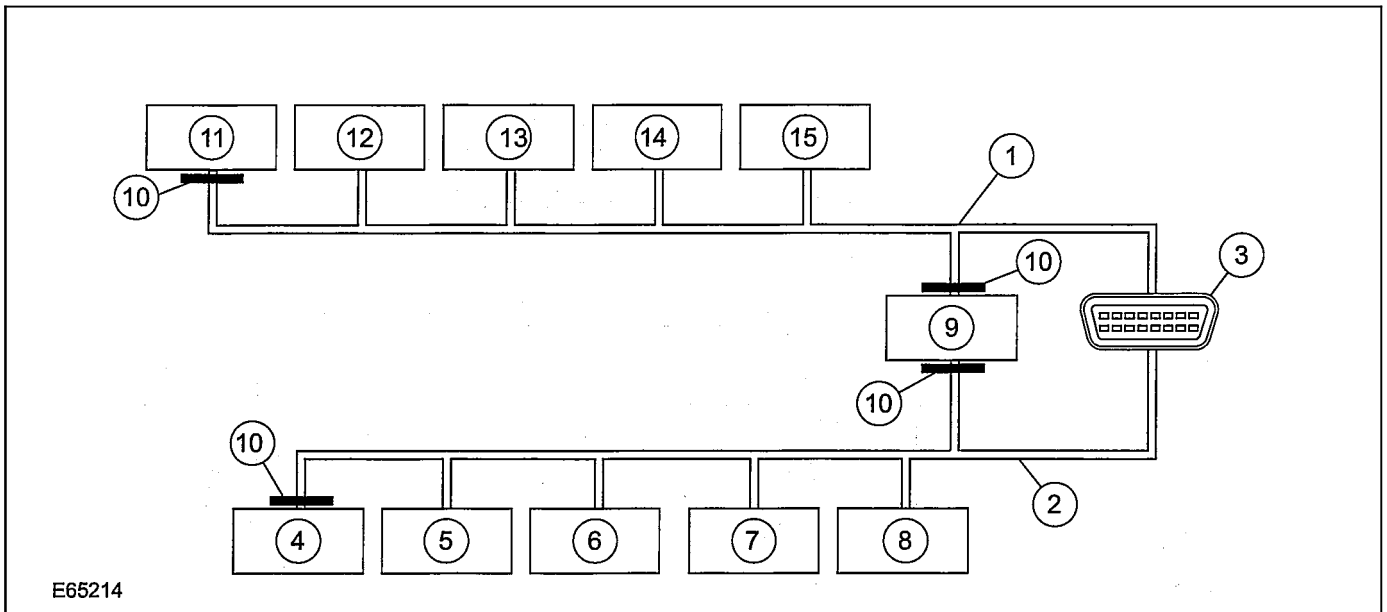
ISO 9141 bus - vehicles built up to MY 2006

E57609

Item	Description
1	DLC.
2	ISO 9141 bus.
3	GEM
4	Restraints Control Module (RCM)
5	ABS module or ESP module

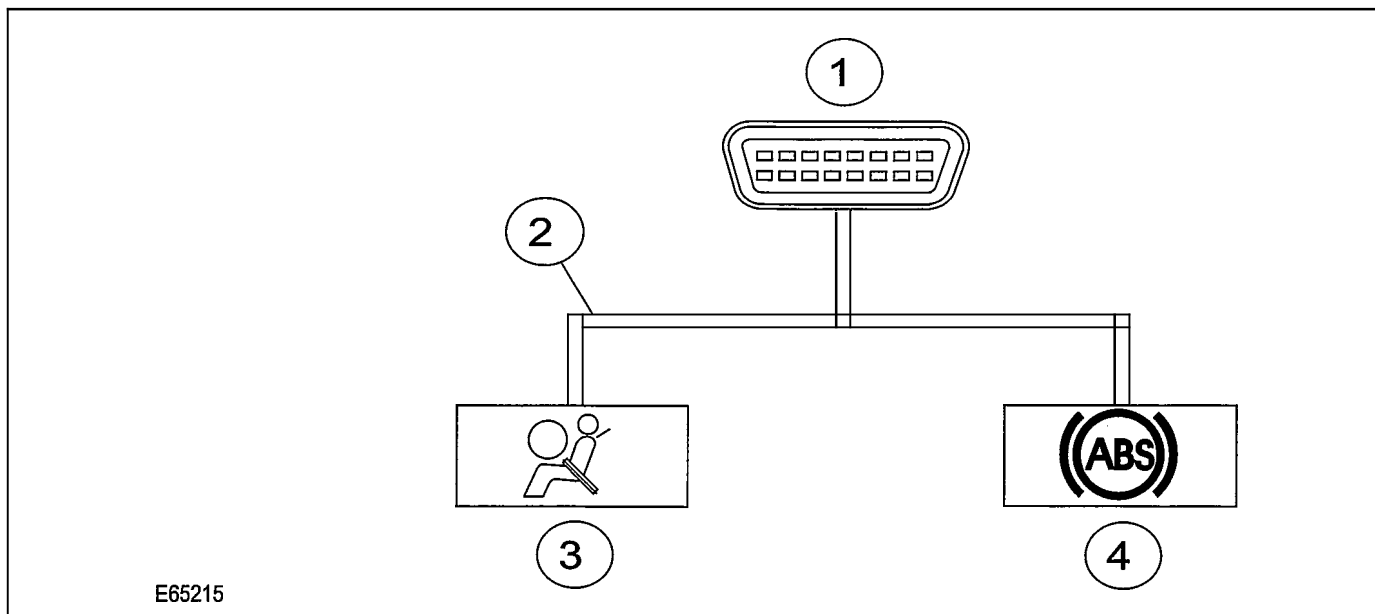
The modules connected to the ISO 9141 bus depend upon the equipment level of the vehicle. The ISO 9141 bus is used solely for reading out the fault memory of the modules connected to the bus.

The ISO 9141 bus connects the various modules to the WDS via the DLC.

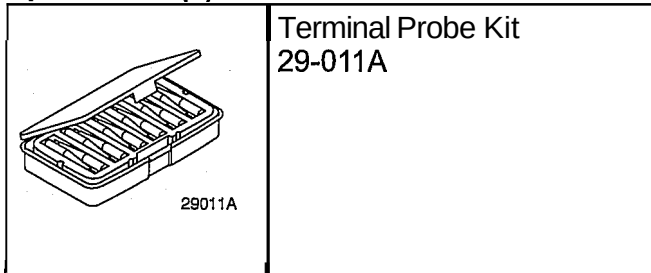
CF ION AN OPERATION**CAN bus - vehicles built from MY 2006**

Item	Description
1	Mid-speed CAN bus (MS-CAN).
2	High-speed CAN bus (HS CAN).
3	DLC.
4	PCM.
5	Automatic transmission module - vehicles with automatic transmission/ TCM - vehicles with automatic clutch and gearshift mechanism.
6	Transmission selector unit - vehicles with automatic clutch and gearshift mechanism

Item	Description
7	Electro-hydraulic Power Steering (EHPS).
8	ABS module or ESP module
9	Electronic instrument cluster.
10	Terminating resistors.
11	GEM
12	Bluetooth/voice control module.
13	Radio tuner.
14	Electronic Automatic Temperature Control (EATC) module
15	RCM

DESCRIPTION AND OPERATION**ISO 9141 bus - vehicles built from MY 2006**

Item	Description
1	DLC.
2	ISO 9141 bus.
3	RCM
4	ABS module or ESP module

DIAGNOSIS AND TESTING**Communications Network — Vehicles Built Up To: 1012005****Special Tool(s)**

Terminal Probe Kit
29-011A

General Equipment

Digital Multimeter

Worldwide Diagnostic System (WDS)

Visual Inspection**Electrical**

- Fuse(s).
- Wiring harness.
- Plugs.

Inspection and Checking

1. CHECK the concern.
2. Visually CHECK for any obvious mechanical or electrical damage.
3. RECTIFY any obvious causes for a concern found during the visual inspection before performing any further tests. CHECK the operation of the system.
4. If the concern persists after the visual inspection, PERFORM a fault diagnosis with WDS and RECTIFY any displayed faults in accordance with the displayed fault description. CHECK the operation of the system.
5. For vehicles with no stored **fault(s)**, PROCEED in accordance with the symptom chart according to the fault symptom.
6. Following checking or elimination of the fault and after completion of operations, the fault memories of all vehicle modules must be READ OUT and any stored faults must be DELETED. READ OUT all fault memories again following a road test.

Symptom Chart**Symptom Chart**

Symptom	Possible Sources	Action
• Safety restraint control module (RCM) not communicating with the diagnostic unit	• Fuse(s). • Circuit(s). • Restraints control module (RCM).	• GO to Pinpoint Test A.
• ABS module or ESP module not communicating with the diagnostic unit	• Fuse(s). • Circuit(s). • ABS module or ESP module.	• GO to Pinpoint Test B.
• Generic electronic module (GEM) not communicating with the diagnostic tester	• Fuse(s). • Circuit(s). • Generic electronic module (GEM).	• GO to Pinpoint Test D.
• Powertrain control module (PCM) not communicating with the diagnostic tester	• Fuse(s). • Circuit(s). • PCM.	• GO to Pinpoint Test E.
• Power steering pump module not communicating with the diagnostic tester	• Fuse(s). • Circuit(s). • Power steering pump module.	• GO to Pinpoint Test C.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Instrument cluster not communicating with the diagnostic unit	- Fuse(s). - Circuit(s). - Instrument cluster.	GO to Pinpoint Test F.
Transmission control module (TCM) not communicating with the diagnostic tester	- Fuse(s). - Circuit(s). - TCM.	- Vehicles with automatic clutch and gearshift actuation: GO to Pinpoint Test G. - Vehicles with automatic transmission: GO to Pinpoint Test H.
Faulty communication between the modules (ISO 9141 bus)	- Circuit(s). - Generic electronic module (GEM). - Restraints control module (RCM). - ABS module or ESP module.	GO to Pinpoint Test I.
Faulty communication between the modules (CAN bus)	- Circuit(s). - Instrument cluster. - ABS module or ESP module. - Transmission control module (TCM) - vehicles with automatic clutch and gearshift actuation. - Transmission selector unit - vehicles with automatic clutch and gearshift actuation. - Transmission control unit (TCM) - vehicles with automatic transmission - Power steering pump module. - Powertrain control module (PCM).	GO to Pinpoint Test J.

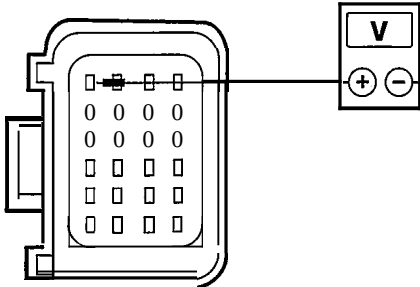
DIAGNOSIS AND TESTING

System Checks

PINPOINT TEST A : SAFETY RESTRAINT CONTROL MODULE (RCM) NOT COMMUNICATING WITH THE DIAGNOSTIC UNIT

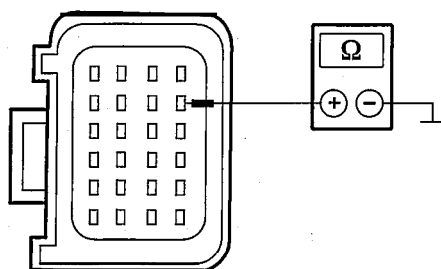
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
WARNINGS:	
▲ The backup power supply must be depleted to prevent the risk of accidental airbag deployment. After disconnecting the battery, wait at least 1 minute before starting work on the safety restraint system. Failure to observe this instruction can lead to injury.	
▲ Do not program any keycodes while working on the safety restraint system in order to prevent the risk of accidental deployment of safety restraint system components. Failure to observe this instruction can lead to injury.	
▲ Only test the connectors of airbags or other safety restraint systems using the correct test probe adapter. Failure to observe this instruction can lead to injury.	
A1: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS	
	1 Ignition switch in position 0.
	☐ Connect the diagnostic tool.
	3 Select the generic electronic module (GEM) with the diagnostic tester.
	- Is it possible to establish communication with the GEM? → Yes GO to A2. → No GO to Pinpoint Test I.
A2: CHECK FUSE F39	
	1 Ignition switch in position 0.
	2 CHECK fuse F39 (CJB). - Is the fuse OK? → Yes GO to A3. → No INSTALL A NEW fuse F39 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
A3: CHECK THE VOLTAGE AT FUSE F39	
	☐ Connect fuse F39 (CJB).
	2 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS		RESULTS	ACTIONS
		3		Measure the voltage between fuse F39 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to A4. → No REPAIR the voltage supply to fuse F39 using the Wiring Diagrams. CHECK the operation of the system.	
A4: CHECK THE VOLTAGE AT THE SAFETY RESTRAINT CONTROL MODULE (RCM)					
				Ignition switch in position 0.	
		2		Disconnect the ground cable from the battery.	
		3		Disconnect connector C500 from safety restraint control module (RCM).	
		4		Connect the ground cable to the battery.	
				Ignition switch in position II.	
 VFE0028954		6		Measure the voltage between the safety restraint control module (RCM), connector C500, pin 1, circuit 15-JA10 (GN/OG), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to A5. → No LOCATE and REPAIR the break in circuit 15-JA10 (GN/OG) between the safety restraint control module (RCM) and fuse F39 using the Wiring Diagrams. CHECK the operation of the system.	
A5: CHECK THE GROUND CONNECTION OF THE SAFETY RESTRAINT CONTROL MODULE (RCM)					
				Ignition switch in position 0.	

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0028956

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the safety restraint control module (RCM), connector C500, pin 20, circuit 91-JA10 (BWRD), wiring harness side and ground.

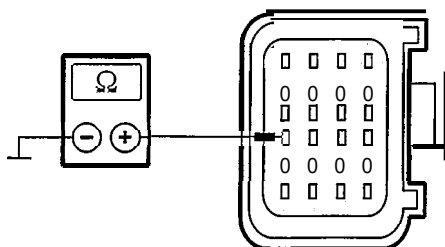
- Is a resistance of less than 2 Ohm registered?

→ **Yes**

- Vehicles built for Japan:
GO to A6.
- All, except vehicles built for Japan:
GO to A7.

→ **No**

LOCATE and REPAIR the break in circuit 91-JA10 (BWRD) between the safety restraint control module (RCM) and ground connection G21 using the Wiring Diagrams. CHECK the operation of the system.

A6: CHECK THE GROUND CONNECTION OF THE SAFETY RESTRAINT CONTROL MODULE (RCM)

E47291

- ☐ Measure the resistance between the safety restraint control module (RCM), connector C500, pin 21, circuit 91-JA47A (BWOG), wiring harness side and ground.

- Is a resistance of less than 2 Ohm registered?

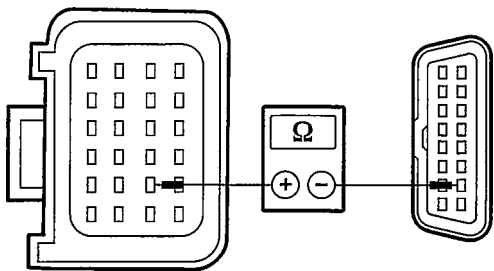
→ **Yes**

GO to A7.

→ **No**

LOCATE and REPAIR the break in the circuit between the safety restraint control module (RCM) and ground connection G21 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A7: CHECK FOR OPEN CIRCUIT BETWEEN THE SAFETY RESTRAINT CONTROL MODULE (RCM) AND THE DATA LINK CONNECTOR (DLC)	
 VFE0033752	1 Measure the resistance between the safety restraint control module (RCM), connector C500, pin 17, circuit 4-EE7 (GYIRD), wiring harness side and the DLC, C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side. - Is a resistance of less than 2 Ohm registered? → Yes CHECK and if necessary RENEW the safety restraint control module (RCM). CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 4-EE7 (GYIRD) between the safety restraint control module (RCM) and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

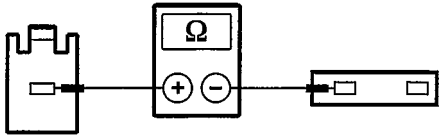
PINPOINT TEST B : ABS MODULE OR ESP MODULE NOT COMMUNICATING **WITH** THE DIAGNOSTIC **UNIT**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS	
	1 Ignition switch in position 0. - Connect the diagnostic tool. - Select the generic electronic module (GEM) with the diagnostic tester. - Is it possible to establish communication with the GEM? → Yes GO to B2. → No GO to Pinpoint Test I.
B2: CHECK FUSE F5	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

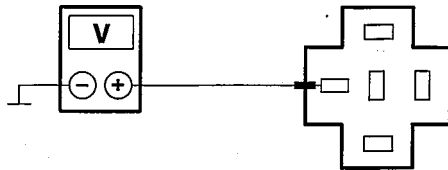
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ CHECK fuse F5 (CJB). - Is the fuse OK? → Yes GO to B3. → No INSTALL A NEW fuse F5 (20 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
B3: CHECK THE VOLTAGE AT FUSE F5	
	☐ 1 Connect fuse F5 (CJB). ☐ 2 Measure the voltage between fuse F5 (20 A) and ground. - Does the meter display battery voltage? → Yes GO to B7. → No GO to B4.
B4: CHECK FUSE FH	
	☐ 1 Ignition switch in position 0. ☐ 2 CHECK fuse FH (BJB). - Is the fuse OK? → Yes GO to B5. → No RENEW fuse FH (60 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
B5: CHECK THE VOLTAGE AT FUSE FH	
	☐ Connect fuse FH (BJB). ☐ 2 Measure the voltage between fuse FH (60 A) and ground. - Does the meter display battery voltage? → Yes GO to B6. → No REPAIR the voltage supply to fuse FH using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B6: CHECK FOR OPEN CIRCUIT BETWEEN FUSE FH AND FUSE F5	
 E51763	1 Disconnect connector C1001 from BJB. ☐ Measure resistance between BJB, connector C1001, circuit 30S-DB5 (RD), wiring harness side and fuse F5 (CJB), wiring harness side. Is a resistance of less than 2 Ohm registered? → Yes CHECK the BJB and INSTALL a new one as necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 30-DB8 (RD) between fuse FH and fuse F5 using the Wiring Diagrams. CHECK the operation of the system.
B7: CHECK FUSE F37	
	1 CHECK fuse F37 (CJB). Is the fuse OK? → Yes GO to B8. → No INSTALL A NEW fuse F37 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
B8: CHECK THE VOLTAGE AT FUSE F37	
	1 Connect fuse F37 (CJB).
	2 Ignition switch in position II.
	☐ Measure the voltage between fuse F37 (3 A) and ground. Does the meter display battery voltage? → Yes - Vehicles with ABS built up to 0312004 or with electronic stability program (ESP) GO to B15. - Vehicles with ABS built from 0412004 onwards GO to B20. → No GO to B9.
B9: CHECK THE VOLTAGE AT THE IGNITION RELAY	
	☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0037103

DETAILS/RESULTS/ACTIONS

- 2** Disconnect ignition relay from socket C328.
- 3** Measure the voltage between the ignition relay, socket C328, pin 3, circuit 30-BB8 (RD), wiring harness side and ground.
 - Does the meter display battery voltage?
 - **Yes**
GO to B12.
 - **No**
GO to B10.

B10: CHECK FUSE FF

- 1** Ignition switch in position 0.
- ☐ CHECK fuse FF (BJB).
 - Is the fuse OK?
 - **Yes**
GO to B11.
 - **No**
RENEW fuse FF (60 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

B11: CHECK THE VOLTAGE AT FUSE FF

- 1** Connect fuse FF (BJB).
- ☐ Measure the voltage between fuse FF (60 A) and ground.
 - Does the meter display battery voltage?
 - **Yes**
LOCATE and REPAIR the break in circuit 30-BB8 (RD) between the ignition relay and fuse FF using the Wiring Diagrams. CHECK the operation of the system.
 - **No**
REPAIR the voltage supply to fuse FF using the Wiring Diagrams. CHECK the operation of the system.

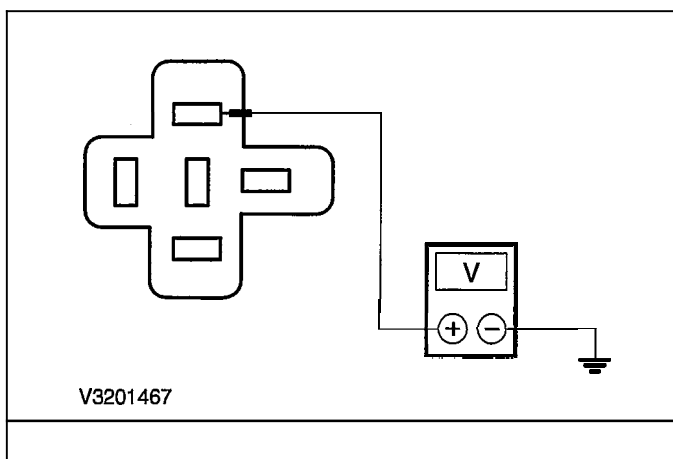
B12: CHECK THE VOLTAGE AT THE IGNITION RELAY

- 1** Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



2 Measure the voltage between the ignition relay, socket C328, pin 1, circuit 15-BB7 (GN/BU), wiring harness side and ground.

• Does the meter display battery voltage?

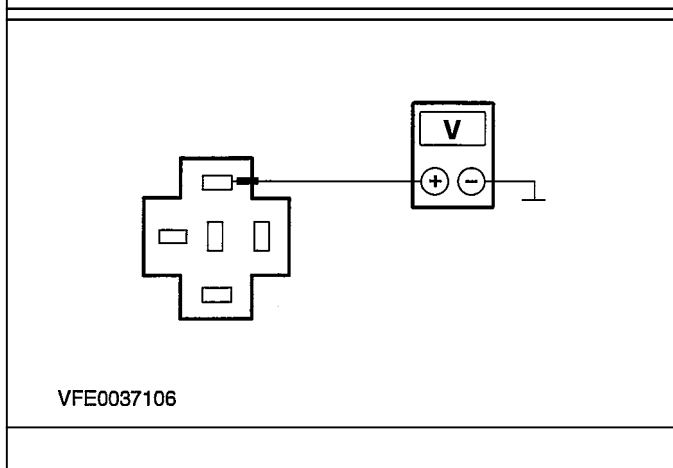
→ **Yes**

GO to B13.

→ **No**

LOCATE and RECTIFY the break in the circuit between the ignition relay and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

B13: CHECK GROUND CONNECTION AT IGNITION RELAY



1 Measure the resistance between the ignition relay, socket C328, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and ground.

• Is a resistance of less than 2 Ohm registered?

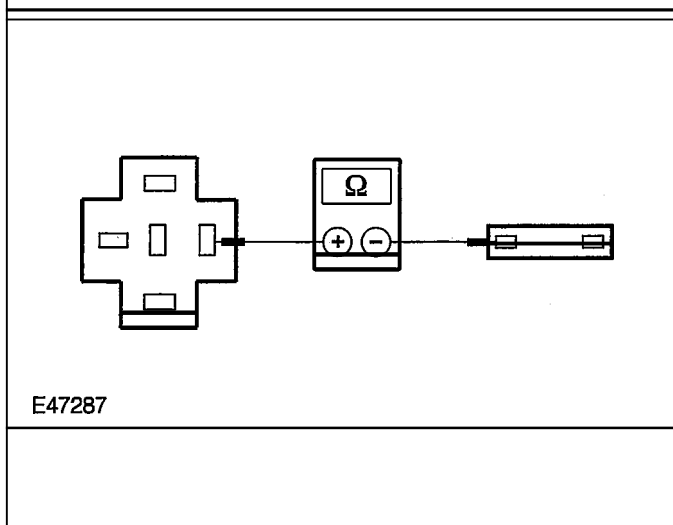
→ **Yes**

GO to B14.

→ **No**

LOCATE and RECTIFY the break in the circuit between the ignition relay and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.

B14: CHECK CIRCUIT BETWEEN THE IGNITION RELAY AND FUSE F37 FOR OPEN CIRCUIT



1 Measure the resistance between the ignition relay, socket C328, pin 5, circuit 15-DB2 (GN/BU), wiring harness side and fuse F37 (CJB).

• Is a resistance of less than 2 Ohm registered?

→ **Yes**

CHECK and if necessary RENEW the ignition relay. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the open circuit between the ignition relay and fuse F37 using the Wiring Diagrams. CHECK the operation of the system.

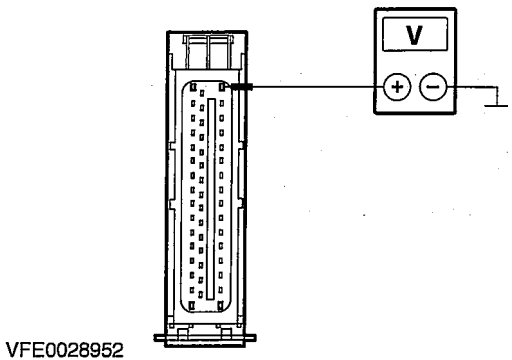
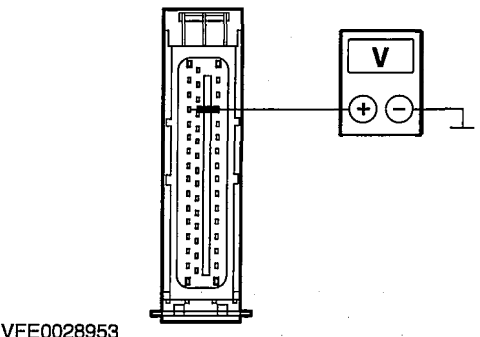
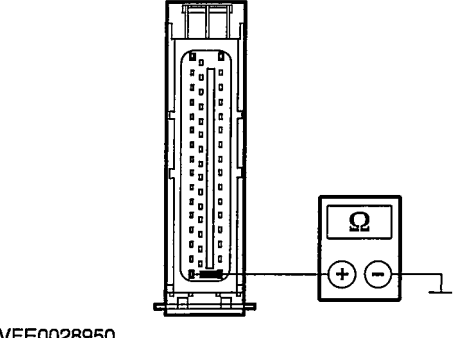
B15: CHECK THE VOLTAGE AT THE ABS MODULE OR ESP MODULE



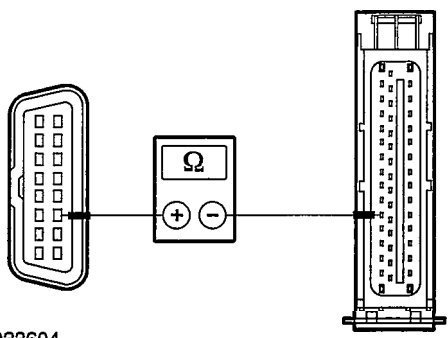
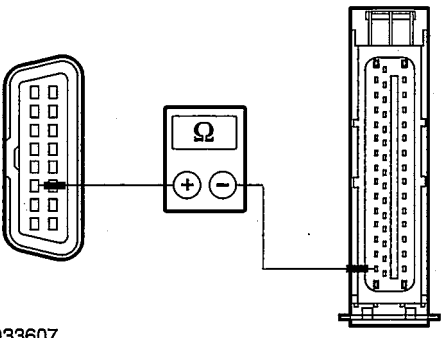
1 Ignition switch in position 0.

2 Disconnect Connector C303 from ABS module or ESP module.

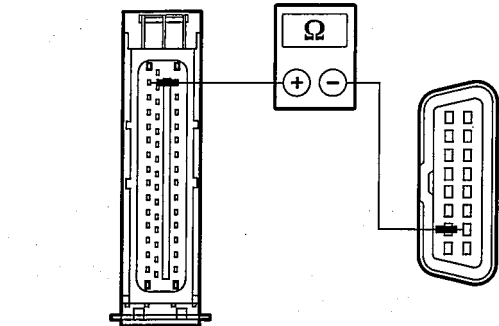
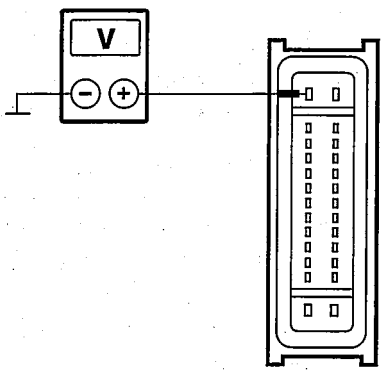
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0028952	3 Measure the voltage between the ABS module or ESP module, connector C303, pin 32, circuit 29-CF6 (OGNE), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to B16. → No LOCATE and REPAIR break in circuit 29-CF6 (OGNE) between the ABS module or ESP module and fuse F5 using the Wiring Diagrams. CHECK the operation of the system.
B16: CHECK THE VOLTAGE AT THE ABS MODULE OR ESP MODULE	
 VFE0028953	1 Ignition switch in position II. 2 Measure the voltage between the ABS module or ESP module, connector C303, pin 4, circuit 15-CF6 (GNNE), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to B17. → No LOCATE and REPAIR break in circuit 15-CF6 (GNNE) between the ABS module or ESP module and fuse F37 using the Wiring Diagrams. CHECK the operation of the system.
B17: CHECK THE GROUND CONNECTION OF THE ABS MODULE OR ESP MODULE	
 VFE0028950	☐ Ignition switch in position 0. ☐ Measure the resistance between the ABS module or ESP module, connector C303, pin 16, circuit 31-CF6 (BK), wiring harness side and ground; Is a resistance of less than 2 Ohm registered? → Yes GO to B18. → No LOCATE and REPAIR the break in the circuit between the ABS module or ESP module and ground connection G23 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

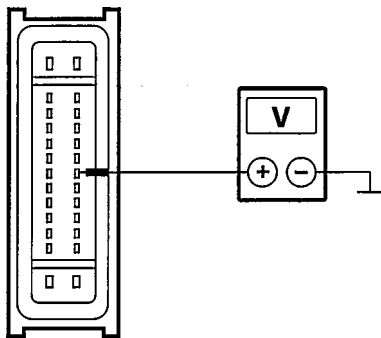
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B18: CHECK FOR OPEN CIRCUIT BETWEEN THE ABS MODULE OR ESP MODULE AND THE DLC  VFE0033604	1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/IRD), wiring harness side and the ABS module or ESP module, connector C303, pin 11, circuit 4-EC9 (GY), wiring harness side.
 VFE0033607	2 Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and the ABS module or ESP module, connector C303, pin 15, circuit 5-EC9 (BU), wiring harness side. • Is a resistance of less than 2 Ohms measured in both cases? → Yes GO to B19. → No LOCATE and REPAIR the break in the relevant circuit between the ABS module or ESP module and DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B19: CHECK FOR OPEN CIRCUIT BETWEEN THE ABS MODULE OR ESP MODULE AND THE DATA LINK CONNECTOR (DLC)	
 VFE0033753	1 Measure the resistance between the ABS module or ESP module, connector C303, pin 2, circuit 4-EE6 (GY), wiring harness side and DLC, C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side. • Is a resistance of less than 2 Ohm registered? → Yes CHECK and if necessary RENEW the ABS module or ESP module. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the ABS module or ESP module and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.
B20: CHECK THE VOLTAGE AT THE ABS MODULE	
 E51764	☐ Ignition switch in position 0. 2 Disconnect connector C304 from ABS module. 3 Measure the voltage between the ABS module, connector C304, pin 1, circuit 29-CF6 (OGNE), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to B21. → No LOCATE and REPAIR the break in circuit 29-CF6 (OGNE) between the ABS module and fuse F5 using the Wiring Diagrams. CHECK the operation of the system.
B21: CHECK THE VOLTAGE AT THE ABS MODULE	
	☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

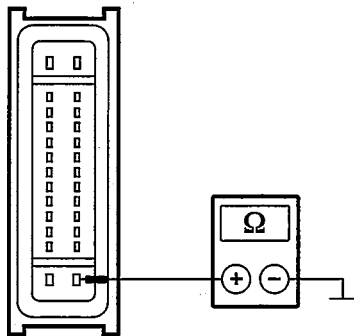


E51765

DETAILS/RESULTS/ACTIONS

- 2 Measure the voltage between the ABS module, connector C304, pin 20, circuit 15-CF6 (GNNE), wiring harness side and ground.
- Does the meter display battery voltage?
 - **Yes**
GO to B22.
 - **No**
LOCATE and REPAIR the break in circuit 15-CF6 (GNNE) between the ABS module and fuse F37 using the Wiring Diagrams. CHECK the operation of the system.

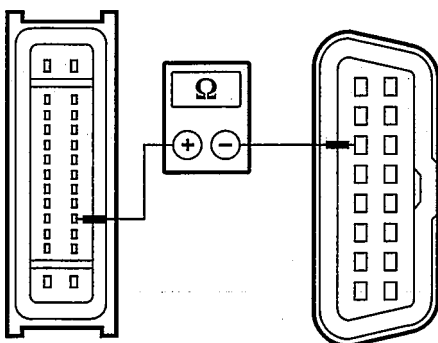
B22: CHECK THE GROUND CONNECTION OF THE ABS MODULE



E51766

- 1 Ignition switch in position 0.
- 2 Measure the resistance between the ABS module, connector C304, pin 26, circuit 31-CF6 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohm registered?
 - **Yes**
GO to B23.
 - **No**
LOCATE and REPAIR the break in the circuit between the ABS module and ground connection G23 using the wiring diagrams. CHECK the operation of the system.

B23: CHECK FOR OPEN CIRCUIT BETWEEN THE ABS MODULE AND THE DLC

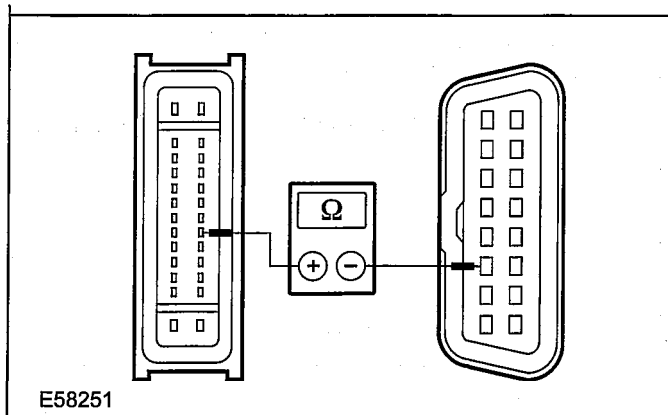


E58250

- 1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and the ABS module, connector C304, pin 23, circuit 4-EC9 (GY), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



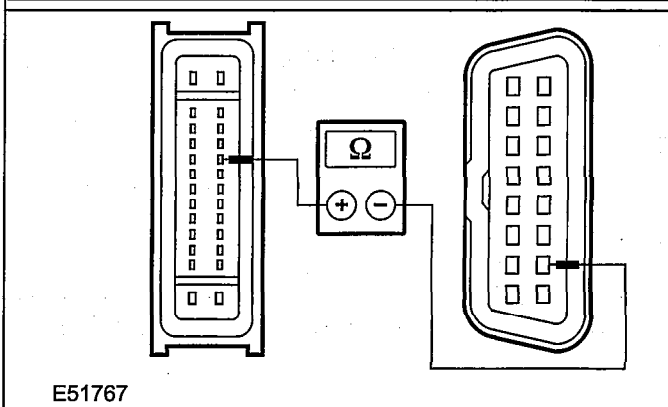
DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and the ABS module, connector C304, pin 21, circuit 5-EC9 (BU), wiring harness side.

- Is a resistance of less than 2 Ohms measured in both cases?

→ **Yes**
GO to B24.

→ **No**
LOCATE and REPAIR the break in the corresponding circuit between the ABS module and the DLC using the Wiring Diagrams. CHECK the operation of the system.

B24: CHECK THE CIRCUIT BETWEEN THE ABS MODULE AND THE DATA LINK CONNECTOR (DLC) FOR OPEN CIRCUIT


- 1 Measure the resistance between the ABS module, connector C304, pin 18, circuit 4-EE6 (GY), wiring harness side and DLC, connector C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**
CHECK the ABS module and if necessary INSTALL a new one. CHECK the operation of the system.

→ **No**
LOCATE and REPAIR the break in the circuit between the ABS module and soldered connection S270 using the wiring diagrams. CHECK the operation of the system.

PINPOINT TEST C : POWER STEERING PUMP MODULE NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

CI: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS

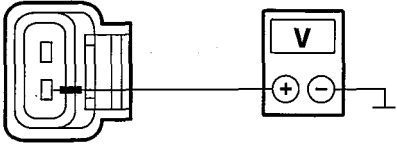
- ☐ Ignition switch in position 0.

- 2 Connect the diagnostic tool.

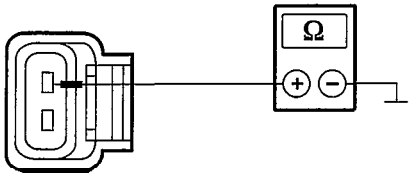
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
	3 Select the generic electronic module (GEM) with the diagnostic tester. Is it possible to establish communication with the GEM? → Yes GO to C2. → No GO to Pinpoint Test J.		
C2: TEST FUSE FA			
	☐ Ignition switch in position 0.		
	2 CHECK Fuse FA (BJB). Is the fuse OK? → Yes GO to C3. → No RENEW fuse FA (80 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.		
C3: TEST VOLTAGE AT FUSE FA			
	1 Connect Fuse FA (BJB).		
	2 Measure the voltage between fuse FA (80A) and ground. Is battery voltage measured? → Yes GO to C4. → No REPAIR the voltage supply to fuse FA with the aid of the Wiring Diagrams. CHECK the operation of the system.		
C4: CHECK THE VOLTAGE AT THE POWER STEERING PUMP MODULE			
	1 Disconnect Connector C280 from the power steering pump module.		

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
 VFE0037902	☐ Measure the voltage between the power steering pump module, connector C280, pin 1, circuit 30-CE7 (RD), wiring harness side and ground. * Is battery voltage measured? → Yes GO to C5. → No LOCATE and REPAIR the break in circuit 30-CE7 (RD), between the power steering pump module and fuse FA using the Wiring Diagrams. CHECK the operation of the system.
C5: CHECK THE VOLTAGE AT THE POWER STEERING PUMP MODULE	
	1 Disconnect Connector C281 from the power steering pump module.
	2 Ignition switch in position II.
	3 Measure the voltage between the power steering pump module, connector C281, pin 1, circuit 15-CE7 (GNIBU), wiring harness side and ground. • Is battery voltage measured? → Yes GO to C6. → No LOCATE and REPAIR the break in circuit 15-CE7 (GNIBU), between the power steering pump module and soldered connection S138 using the Wiring Diagrams. CHECK the operation of the system.
C6: CHECK THE GROUND CONNECTION OF THE POWER STEERING PUMP MODULE	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0037904	2 Measure the resistance between the power steering pump module, connector C280, pin 2, circuit 31-CE7 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to C7. → No LOCATE and REPAIR the break in circuit 31-CE7 (BK), between the power steering pump module and ground connection G32 using the Wiring Diagrams. CHECK the operation of the system.
C7: CHECK FOR OPEN CIRCUIT BETWEEN THE POWER STEERING PUMP MODULE AND THE DATA LINK CONNECTOR (DLC)	
	1 Measure the resistance between the power steering pump module, connector C281, pin 3, circuit 4-EC8B (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to C8. → No LOCATE and REPAIR the break in circuit 4-EC8B (GY/VT) between the power steering pump module and soldered connection S130 using the Wiring Diagrams. CHECK the operation of the system.

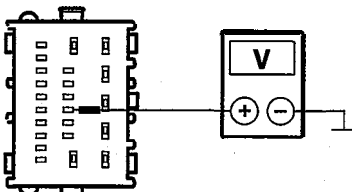
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C8: CHECK FOR OPEN CIRCUIT BETWEEN THE POWER STEERING PUMP MODULE AND THE DATA LINK CONNECTOR (DLC)	
	1 Measure the resistance between the power steering pump module, connector C281, pin 2, circuit 5-EC8B (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the power steering pump module. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 5-EC8B (BU/WH) between the power steering pump module and soldered connection S131 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST D : GENERIC ELECTRONIC MODULE (GEM) NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER

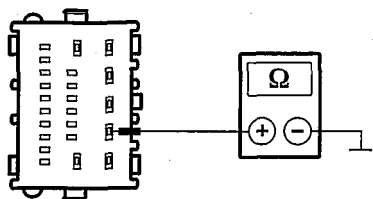
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0. 2 Connect the diagnostic tool. 3 Select the safety restraint control module (RCM) with the diagnostic tester. • Is it possible to establish communication with the safety restraint control module (RCM)? → Yes GO to D2. → No GO to Pinpoint Test I.
D2: CHECK FUSE F38	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F38 (CJB). Is the fuse OK? → Yes GO to D3. → No INSTALL A NEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
D3: CHECK THE VOLTAGE AT FUSE F38	
	1 Connect fuse F38 (CJB). 2 Ignition switch in position II. 3 Measure the voltage between fuse F38 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to D4. → No REPAIR the voltage supply to fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
D4: CHECK THE VOLTAGE AT THE GEM	
	1 Ignition switch in position 0. 2 Disconnect connector C319 (white) from GEM. Ignition switch in position II.
 VFE0028972	3 Measure the voltage between the GEM, connector C319 (white), pin 10, circuit 15-DK20 (GNIOG), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to D5. → No LOCATE and REPAIR the break in circuit 15-DK20 (GNIOG) between the GEM and soldered connection S3 using the Wiring Diagrams. CHECK the operation of the system.
D5: TEST THE GEM GROUND CONNECTION	
	1 Ignition switch in position 0. 2 Disconnect connector C316 (black) from GEM.

DIAGNOSIS AND TESTING

TEST CONDITIONS

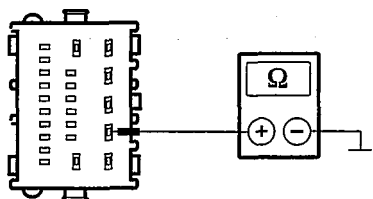


VFE0028971

DETAILS/RESULTS/ACTIONS

- 3** Measure the resistance between the GEM, connector C316 (black), pin 2, circuit 31-DK20 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
GO to D6.
- **No**
LOCATE and REPAIR the break in circuit 31-DK20 (BK) between the GEM and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.

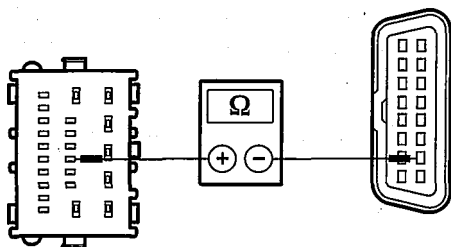
D6: TEST THE GEM GROUND CONNECTION



VFE0028975

- 1** Disconnect connector C320 (brown) from GEM.
- ☐ Measure the resistance between the GEM, connector C320 (brown), pin 2, circuit 91-DK20 (BWRD), wiring harness side and ground.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
GO to D7.
- **No**
LOCATE and RECTIFY the break in circuit 91-DK20 (BWRD) between the GEM and ground connection G14 using the Wiring Diagrams. CHECK the operation of the system.

D7: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.



VFE0033612

- 1** Measure the resistance between GEM, connector C320 (brown), pin 10, circuit 4-EE11 (GY/WH), wiring harness side and DLC, C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
TEST the GEM and RENEW as necessary. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the break in the circuit between the GEM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

PINPOINT TEST E : POWERTRAIN CONTROL MODULE (PCM) NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER

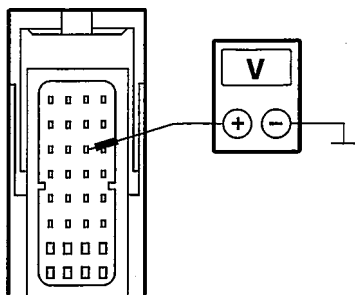
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS	
	☐ 1 Ignition switch in position 0.
	☐ 2 Connect the diagnostic tool.
	☐ 3 Select the instrument cluster with the diagnostic tester. Is it possible to establish communication with the instrument cluster? → Yes GO to E2. → No GO to Pinpoint Test J.
E2: CHECK FUSE F16	
	☐ 1 Ignition switch in position 0.
	☐ 2 CHECK fuse F16 (CJB). Is the fuse OK? → Yes GO to E3. → No INSTALL A NEW fuse F16 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
E3: CHECK THE VOLTAGE AT FUSE F16	
	☐ Connect fuse F16 (CJB).
	☐ 2 Measure the voltage between fuse F16 (3 A) and ground. Does the meter display battery voltage? → Yes GO to E4. → No REPAIR the voltage supply to fuse F16 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E4: CHECK FUSE F12	
	1 CHECK fuse F12 (CJB). Is the fuse OK? → Yes GO to E5. → No INSTALL A NEW fuse F12 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
E5: CHECK THE VOLTAGE AT FUSE F12	
	1 Connect fuse F12 (CJB). ☐ Ignition switch in position II. ☐ Measure the voltage between fuse F12 (15 A) and ground. - Does the meter display battery voltage? → Yes - Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: GO to E14. - Vehicles with 2.0L engine: GO to E15. - Vehicles with diesel engine: GO to E24. → No - Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: GO to E9. - Vehicles with 2.0L engine: GO to E8. - Vehicles with 1.6L diesel engine: GO to E7. - Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): GO to E6. - Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): GO to E10.
E6: CHECK THE VOLTAGE AT THE PCM	
	☐ Ignition switch in position 0. 2 Disconnect connector C370 from the PCM. 3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E57723

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the PCM, connector C370, pin C3, circuit 15-RE8 (GNNE), wiring harness side and ground.

• Does the meter display battery voltage?

→ **Yes**

GO to E26.

→ **No**

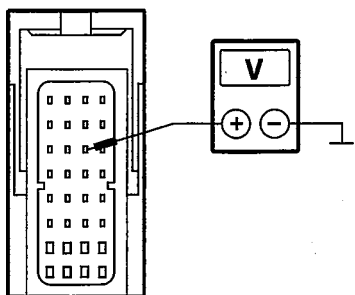
LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

E7: CHECK THE VOLTAGE AT THE PCM

- 1** Ignition switch in position 0.

- ☐ Disconnect connector C384 from PCM.

- 3** Ignition switch in position II.



E57723

- 4** Measure the voltage between the PCM, connector C384, pin C3, circuit 15-RE8C (GNNE), wiring harness side and ground.

• Is battery voltage measured?

→ **Yes**

GO to E26.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

E8: CHECK THE VOLTAGE AT THE PCM

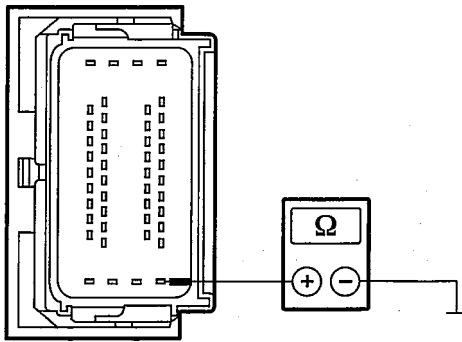
- 1** Ignition switch in position 0.

- 2** Disconnect connector C380 from PCM.

- 3** Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E57706

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the PCM, connector C380, pin 46, circuit 15-RE8 (GNNE), wiring harness side and ground.

• Is battery voltage measured?

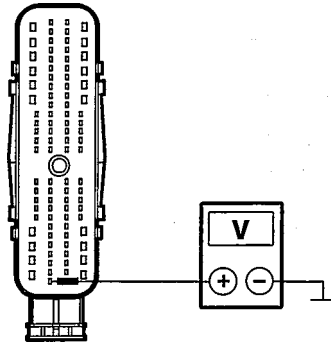
→ **Yes**

GO to E26.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

E9: CHECK THE VOLTAGE AT THE PCM



VFE0028931

- 1 Ignition switch in position 0.

- 2 Disconnect connector C343 from PCM.

- 3 Ignition switch in position II.

- Measure the voltage between the PCM, connector C343, pin F21, circuit 15-RE8 (GNNE), wiring harness side and ground.

• Is battery voltage measured?

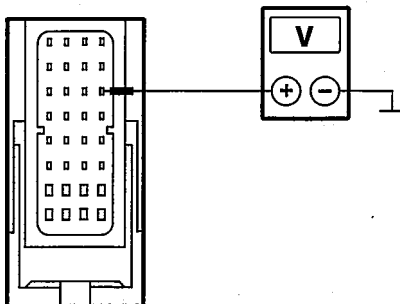
→ **Yes**

GO to E26.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

E10: CHECK THE VOLTAGE AT THE PCM



E57718

- Disconnect connector C375 from PCM.

- Ignition switch in position II.

- 3 Measure the voltage between the PCM, connector C375, pin C3, circuit 15-RE8 (GNNE), wiring harness side and ground.

• Is battery voltage measured?

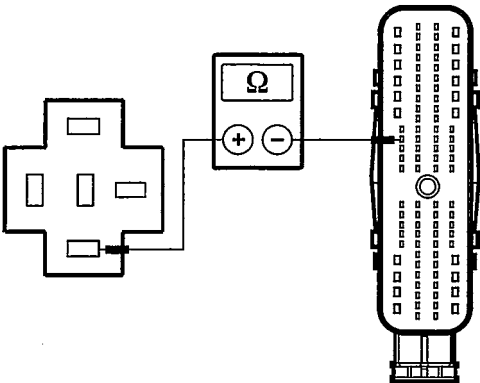
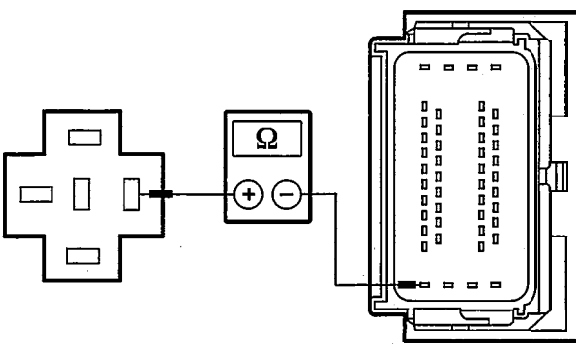
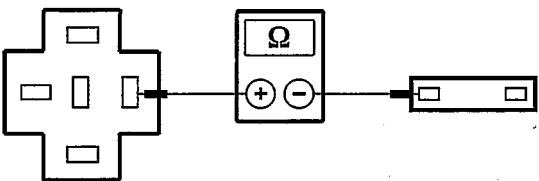
→ **Yes**

GO to E26.

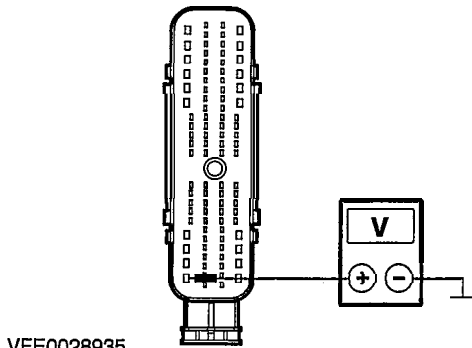
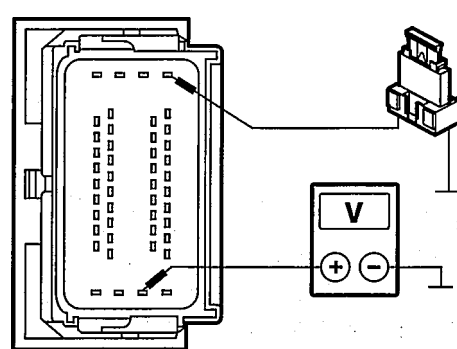
→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

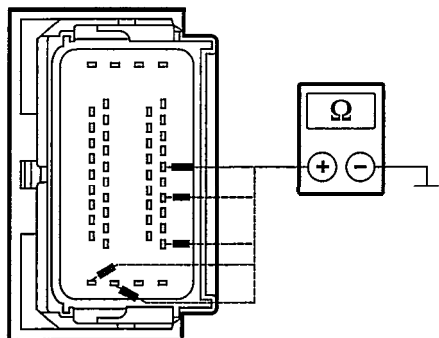
TEST CONDITIONS	DETAILS RESULTS ACTIONS
E11: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM  E47286	1 Disconnect connector C343 from the PCM. 2 Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BKIBU), wiring harness side and PCM, connector C343, pin M8, circuit 91S-RH9 (BWBU), wiring harness side. - Is a resistance of less than 2 Ohms registered? → Yes GO to E13. → No LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
E12: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM  E57705	☐ Disconnect connector C380 from PCM. 2 Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C380, pin 35, circuit 91S-RH9 (BWBU), wiring harness side. - Is a resistance of less than 2 Ohm registered? → Yes GO to E13. → No LOCATE and REPAIR the break in the circuit between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
E13: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND FUSE F12  E47287	1 Measure the resistance between the PCM module relay, socket C420, Pin 5, circuit 15S-DB9 (GN/RD), wiring harness side and fuse F12 (CJB), wiring harness side. - Is a resistance of less than 2 Ohm registered? → Yes GO to E32. → No LOCATE and REPAIR the open circuit between the PCM module relay and fuse F12 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS		RESULTS	ACTIONS
E14: CHECK THE VOLTAGE AT THE PCM					
 VFE0028935		1 Ignition switch in position 0.			
		2 Disconnect connector C343 from the PCM.			
		3 Measure the voltage between the PCM, connector C343, pin F9, circuit 29-RE8 (OGNE), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to E20. → No LOCATE and REPAIR the break in circuit 29-RE8 (OGNE) between PCM and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.			
E15: CHECK THE VOLTAGE AT THE PCM					
 E57707		☐ Ignition switch in position 0.			
		2 Use a fused test lead (1 A) at the PCM, connector C380, pin 35, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.			
		3 Measure the voltage between the PCM, connector C380, pin 34, circuit 15s-RE8 (GNNE), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to E16. → No LOCATE and REPAIR the open circuit between the PCM and fuse F12 using the Wiring Diagrams. CHECK the operation of the system.			
E16: CHECK THE GROUND CONNECTION OF THE PCM					
		1 Ignition switch in position 0.			
		2 Measure the resistance between the PCM, connector C380, pin 11, circuit 91-RE8A (BK/YE), wiring harness side and ground.			

DIAGNOSIS AND TESTING

TEST CONDITIONS



E57708

DETAILS/RESULTS/ACTIONS

- 3** Measure the resistance between the PCM, connector C380, pin 23, circuit 91-RE8B (BWE), wiring harness side and ground.

- 4** Measure the resistance between the PCM, connector C380, pin 40, circuit 91-RE8C (BWE), wiring harness side and ground.

- 5** Measure the resistance between the PCM, connector C380, pin 42, circuit 91-RE8D (BWE), wiring harness side and ground.

- ☐ Measure the resistance between the PCM, connector C380, pin 44, circuit 91-RE8E (BK/YE), wiring harness side and ground.

- Is a resistance of less than 2 Ohms measured in all of the cases?

→ **Yes**

GO to E17.

→ **No**

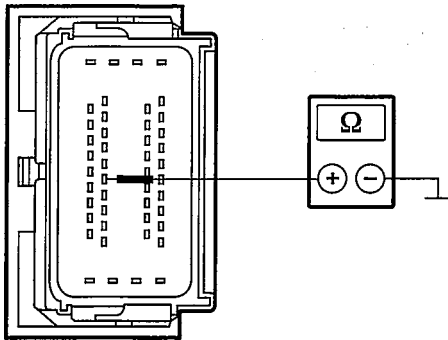
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S301 using the Wiring Diagrams. CHECK the operation of the system.
- If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S301 and ground connection G1 using the wiring diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS

E17: CHECK THE GROUND CONNECTION OF THE PCM



E57709

- ☐ Measure the resistance between the PCM, connector C380, pin 10, circuit 31-RE8 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohms registered?
 - **Yes**
GO to E18.
 - **No**
LOCATE and REPAIR the break in the circuit between the PCM and ground connection G22 using the Wiring Diagrams. CHECK the operation of the system.

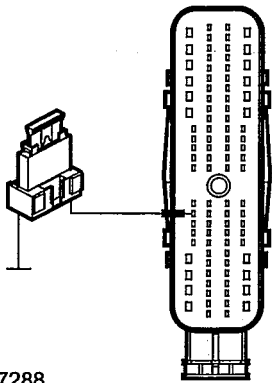
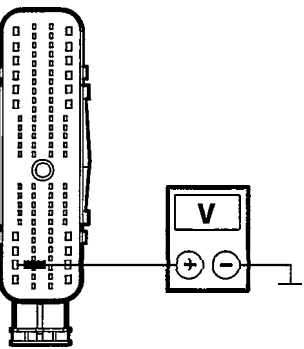
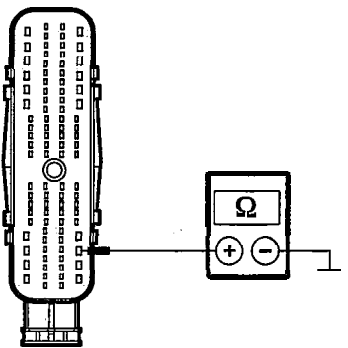
E18: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

- 1** Measure the resistance between the PCM, connector C380, pin 41, circuit 4-EC7 (GYRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYRD), wiring harness side.
- Is a resistance of less than 2 Ohm registered?
 - **Yes**
GO to E19.
 - **No**
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E19: CHECK CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

- 1** Measure the resistance between the PCM, connector C380, pin 30, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side.
- Is a resistance of less than 2 Ohm registered?
 - **Yes**
CHECK the PCM and RENEW if necessary. CHECK the operation of the system.
 - **No**
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

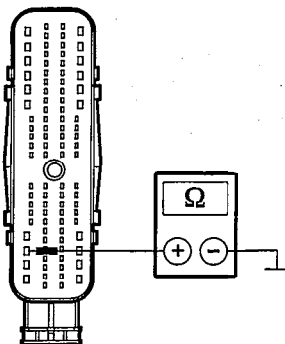
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E20: CHECK THE VOLTAGE AT THE PCM	
 E47288	1 Use a fused test lead (1 A) at the PCM, connector C343, pin M8, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.
 VFE0028934	2 Measure the voltage between the PCM, connector C343, pin F8, circuit 15s-RE8 (GNNE), wiring harness side and ground. - Does the meter display battery voltage? → Yes GO to E21. → No LOCATE and REPAIR the open circuit between the PCM and fuse F12 using the Wiring Diagrams. CHECK the operation of the system.
E21: CHECK THE GROUND CONNECTION OF THE PCM	
 VFE0028932	1 Ignition switch in position 0. 2 Measure the resistance between the PCM, connector C343, pin F40, circuit 91-RE8A (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

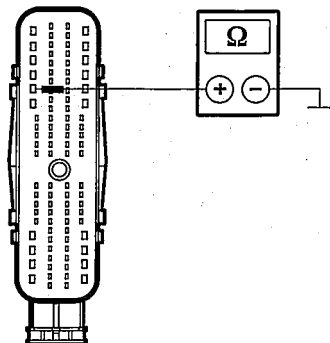
DETAILS/RESULTS/ACTIONS

VFE0028933



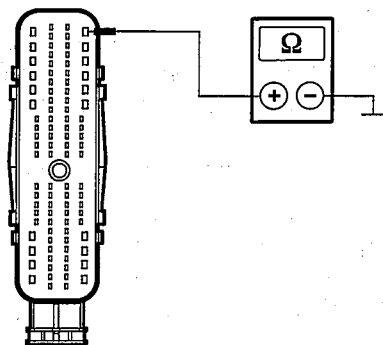
- 3** Measure the resistance between the PCM, connector C343, pin F7, circuit 91-RE8B (BWE), wiring harness side and ground.

VFE0028929



- ☐ Measure the resistance between the PCM, connector C343, pin M5, circuit 91-RE8C (BWE), wiring harness side and ground.

VFE0028928



- 5** Measure the resistance between the PCM, connector C343, pin M42, circuit 91-RE8D (BWE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
 - **Yes**
GO to E22.
 - **No**
 - If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the circuit between soldered connection S109 and ground connection G1 using the Wiring Diagrams. CHECK the operation of the system.

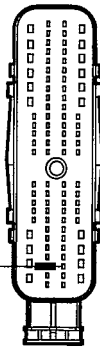
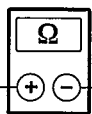
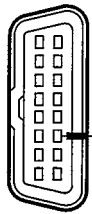
E22: CHECK CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

- 1** Disconnect connector C343 from the PCM.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



VFE0033605

- 2 Measure the resistance between the PCM, connector C343, pin F31, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

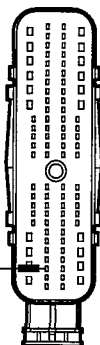
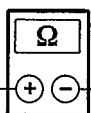
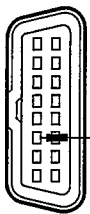
→ **Yes**

GO to E23.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E23: CHECK CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT



VFE0033608

- 1 Measure the resistance between the PCM, connector C343, pin F19, circuit 5-EC7 (BU/RD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**

CHECK the PCM and RENEW if necessary. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E24: CHECK FUSE F13

- Ignition switch in position 0.

- 2 CHECK fuse F13 (CJB).

- Is the fuse OK?

→ **Yes**

GO to E25.

→ **No**

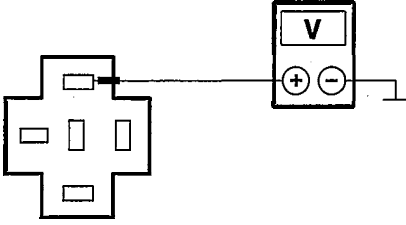
INSTALL A NEW fuse F13 (20 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

E25: CHECK THE VOLTAGE AT FUSE F13

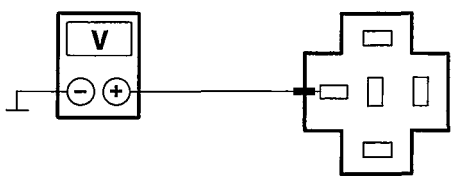
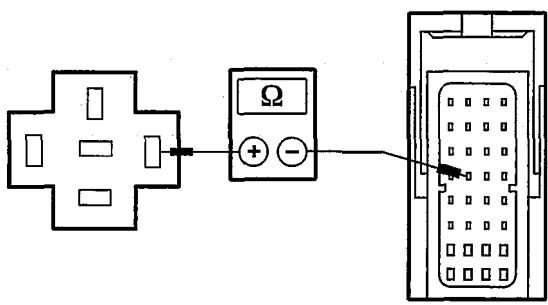
- ☐ Connect fuse F13 (CJB).

- 2 Ignition switch in position II.

DIAGNOSIS AND TESTING

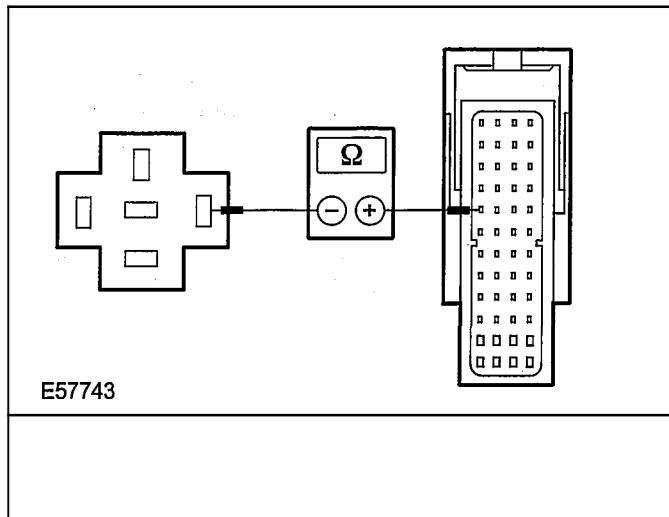
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Measure the voltage between fuse F13 (20 A) and ground. - Does the meter display battery voltage? → Yes - Vehicles with 1.6L diesel engine: GO to E34. - Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): GO to E33. - Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): GO to E38. → No GO to E26.
E26: CHECK THE VOLTAGE AT THE PCM MODULE RELAY	
	Ignition switch in position 0. Disconnect PCM module relay from socket C420.
 VFE0037106	Measure the voltage between the PCM module relay, socket C420, pin 1, circuit 29-RH9 (OGIBU), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to E27. → No LOCATE and REPAIR the break in circuit 29-RE9 (OGIBU) between the PCM module relay and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E27: CHECK THE VOLTAGE AT THE PCM MODULE RELAY  VFE0037103	☐ Measure the voltage between the PCM module relay, socket C420, pin 3, circuit 30-RH10 (RD), wiring harness side and ground. - Does the meter display battery voltage? → Yes - Vehicles with 1.6L diesel engine: GO to E29. - Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): GO to E30. - Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): GO to E28. - Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: GO to E11. - Vehicles with 2.0L petrol engine: GO to E12. → No LOCATE and REPAIR the open circuit between the PCM module relay and fuse FB using the Wiring Diagrams. CHECK the operation of the system.
E28: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM  E57710	☐ Disconnect connector C377 from PCM. ☐ Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C377, pin D2, circuit 91S-RH9 (BWBU), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to E31. → No LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
E29: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM	1 ☐ Disconnect connector C383 from PCM.

DIAGNOSIS AND TESTING

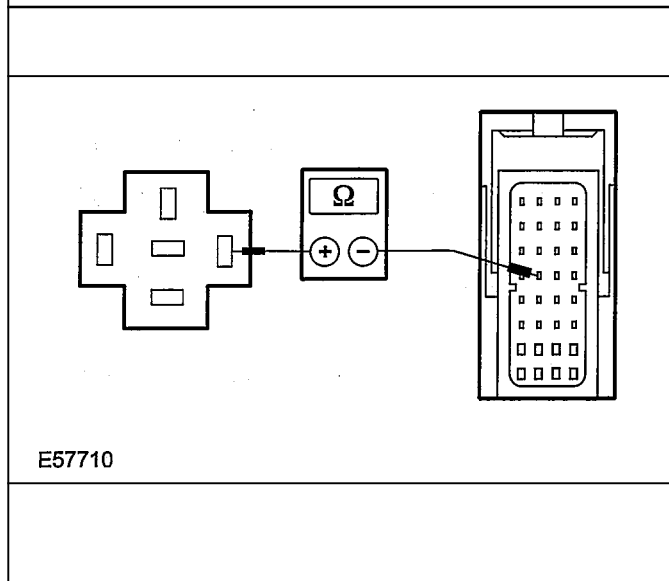
TEST CONDITIONS



DETAILS RESULTS ACTIONS

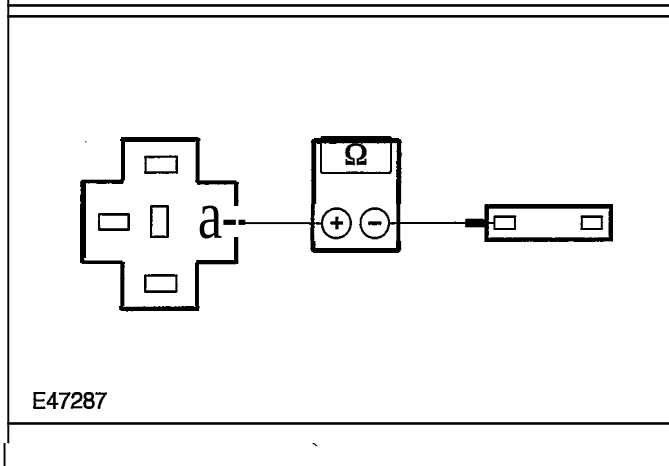
- 2 Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C383, pin E1, circuit 91S-RH9 (BWBU), wiring harness side.
 - Is a resistance of less than 2 Ohms registered?
 - **Yes**
GO to E31.
 - **No**
LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams.
CHECK the operation of the system.

E30: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM



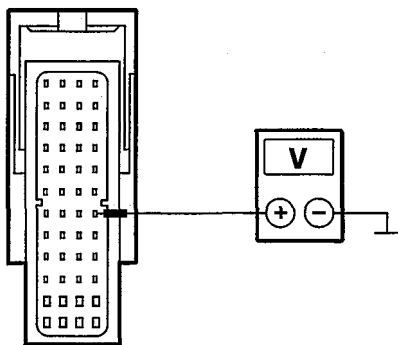
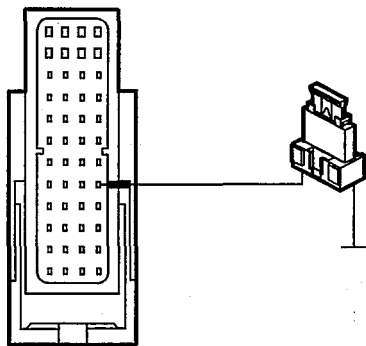
- 1 Disconnect connector C372 from the PCM.
- 2 Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C372, pin D2, circuit 91S-RH9 (BWBU), wiring harness side.
 - Is a resistance of less than 2 Ohm registered?
 - **Yes**
GO to E31.
 - **No**
LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams.
CHECK the operation of the system.

E31: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND FUSE F13



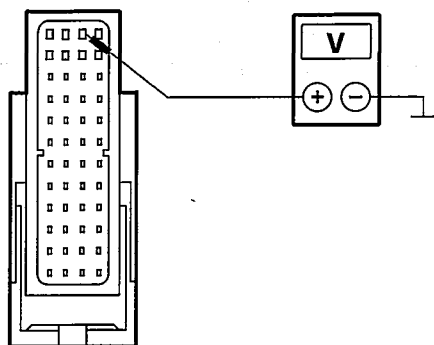
- 1 Measure the resistance between the PCM module relay, socket C420, Pin 5, circuit 15S-DB9 (GN/RD), wiring harness side and fuse F13 (CJB), wiring harness side.
 - Is a resistance of less than 2 Ohm registered?
 - **Yes**
GO to E32.
 - **No**
CHECK CJB and RENEW as necessary.
CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E32: CHECK THE PCM MODULE RELAY	1 Check the PCM module relay according to the component test at the end of this section. • Is the PCM module relay OK? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No RENEW the PCM module relay. CHECK the operation of the system.
E33: CHECK THE VOLTAGE AT THE PCM  E57744	1 Ignition switch in position 0. 2 Disconnect connector C371 from the PCM. 3 Measure the voltage between the PCM, connector C371, pin G4, circuit 29-RE8 (OGNE), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to E43. → No LOCATE and REPAIR the break in circuit 29-RE8 (OGNE) between PCM and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.
E34: CHECK THE VOLTAGE AT THE PCM  E57711	1 Ignition switch in position 0. 2 Disconnect connector C383 from PCM. 3 Use a fused test lead (1 A) at the PCM, connector C383, pin E1, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E57712

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the PCM, connector C383, pin M2, circuit 15S-RE8A (GN/NE), wiring harness side and ground.

- 5 Measure the voltage between the PCM, connector C384, pin G1, circuit 15S-RE8B (GN/YE), wiring harness side and ground.

- Is battery voltage measured in both cases?

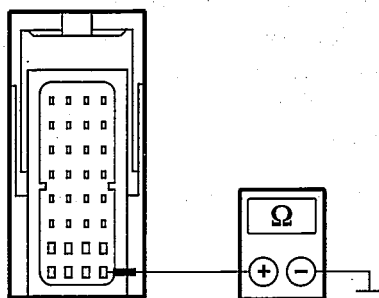
→ **Yes**
GO to E35.

→ **No**

- If battery voltage is not measured during one measurement:
LOCATE and RECTIFY the break in the corresponding circuit between the PCM and solder point S111 with the aid of the Wiring Diagrams. CHECK the operation of the system.
- If battery voltage is not measured during both measurements:
LOCATE and REPAIR the break in circuit 15S-RN3 (GN/BU) between soldered connection S111 and fuse F13 using the Wiring Diagrams. CHECK the operation of the system.

E57713

E35: CHECK THE GROUND CONNECTION OF THE PCM



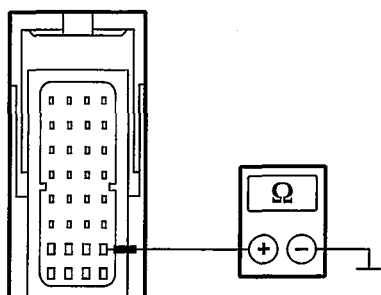
E57714

- 1 Measure the resistance between the PCM, connector C384, pin H4, circuit 91-RE8C (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

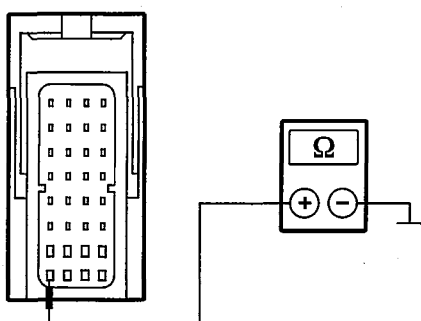
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



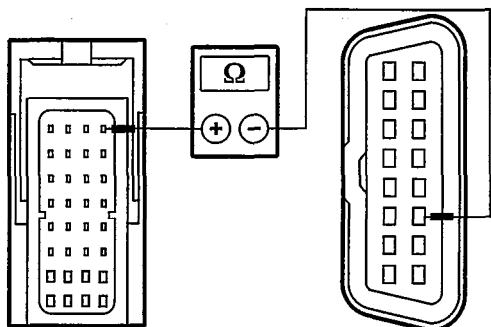
E57715

- 2 Measure the resistance between the PCM, connector C384, pin G4, circuit 91-RE8A (BK/YE), wiring harness side and ground.



E57716

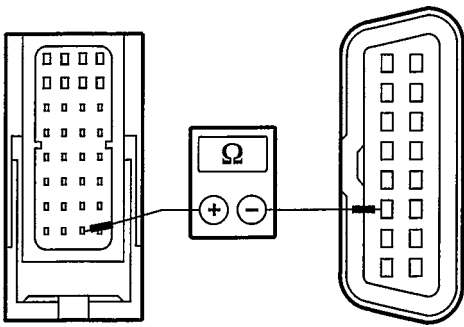
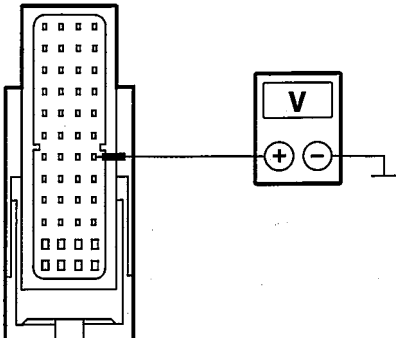
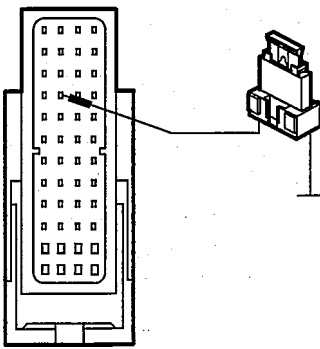
- 3 Measure the resistance between the PCM, connector C384, pin H1, circuit 91-RE8B (BK/YE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
- **Yes**
GO to E36.
- **No**
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S109 and ground connection G1 using the wiring diagrams. CHECK the operation of the system.

E36: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

E58252

- 1 Measure the resistance between the PCM, connector C384, pin A4, circuit 4-EC7 (GY/RD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to E37.
- **No**
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

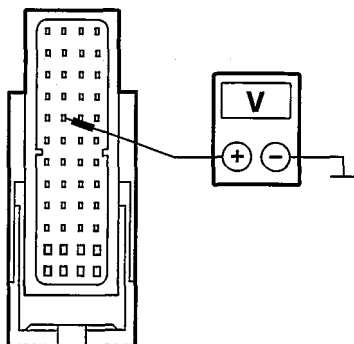
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
E37: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
 E58253	1 Measure the resistance between the PCM, connector C384, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
E38: CHECK THE VOLTAGE AT THE PCM	
 E57717	1 Ignition switch in position 0. ☐ Disconnect connector C376 from PCM. ☐ Measure the voltage between the PCM, connector C376, pin G4, circuit 29-RE8 (OGNE), wiring harness side and ground. Is battery voltage measured? → Yes GO to E39. → No LOCATE and REPAIR the break in circuit 29-RE8 (OGNE) between PCM and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.
E39: CHECK THE VOLTAGE AT THE PCM	
 E57719	Disconnect connector C377 from PCM. Use a fused test lead (1 A) at the PCM, connector C377, pin D2, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.

DIAGNOSIS AND TESTING

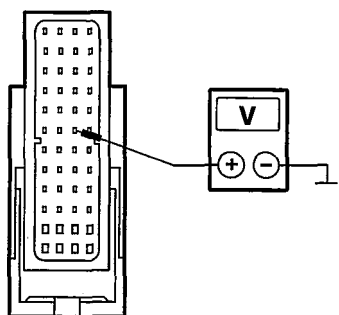
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



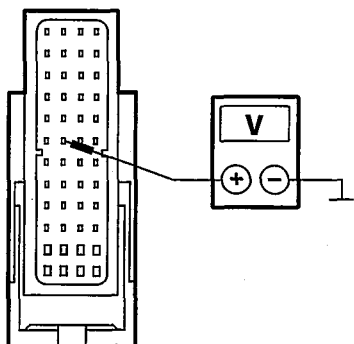
E57720

- ☐ Measure the voltage between the PCM, connector C377, pin E3, circuit 15S-RE8A (GNNE), wiring harness side and ground.



E57722

- ☐ Measure the voltage between the PCM, connector C377, pin F3, circuit 15S-RE8B (GNNE), wiring harness side and ground.



E57721

- 5** Measure the voltage between the PCM, connector C377, pin F2, circuit 15S-RE8C (GNNE), wiring harness side and ground.
- Is battery voltage measured in all cases?
 - **Yes**
GO to E40.
 - **No**
 - If battery voltage is not measured during a measurement:
LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S108 using the Wiring Diagrams. CHECK the operation of the system.
 - If battery voltage is not measured during all measurements:
LOCATE and REPAIR the break in circuit 15S-RN3 (GN/BU) between soldered connection S108 and fuse F13 using the Wiring Diagrams. CHECK the operation of the system.

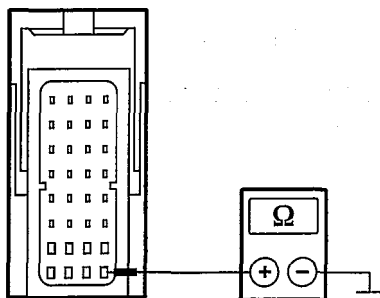
E40: CHECK THE GROUND CONNECTION OF THE PCM

- 1** Ignition switch in position 0.

DIAGNOSIS AND TESTING

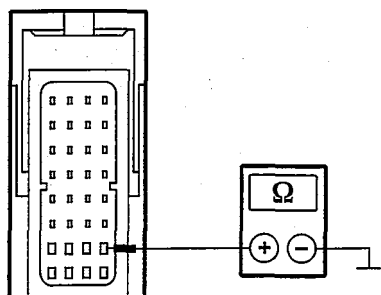
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



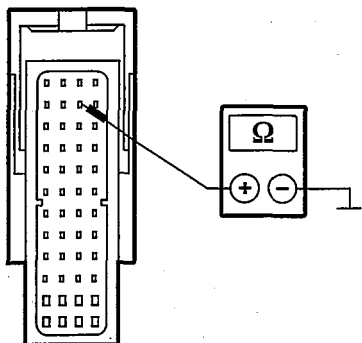
E57714

- ☒ 2 Measure the resistance between the PCM, connector C375, pin H4, circuit 91-RE8A (BK/YE), wiring harness side and ground.



E57724

- ☐ Measure the resistance between the PCM, connector C375, pin G4, circuit 91-RE8B (BK/YE), wiring harness side and ground.

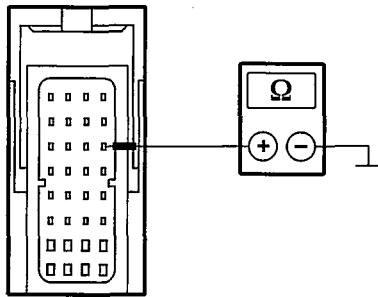


E57745

- ☒ 4 Measure the resistance between the PCM, connector C376, pin K2, circuit 91-RE8C (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

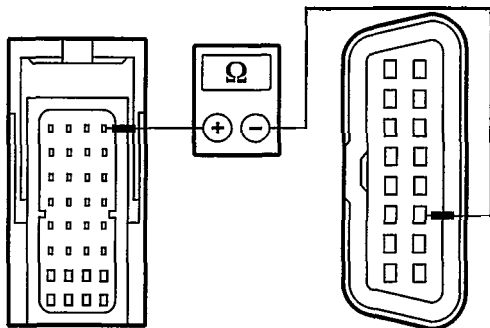


E57746

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the PCM, connector C377, pin C4, circuit 91-RE8D (BK/YE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
- **Yes**
GO to E41.
- **No**
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S109 and ground connection G1 using the wiring diagrams. CHECK the operation of the system.

E41: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT



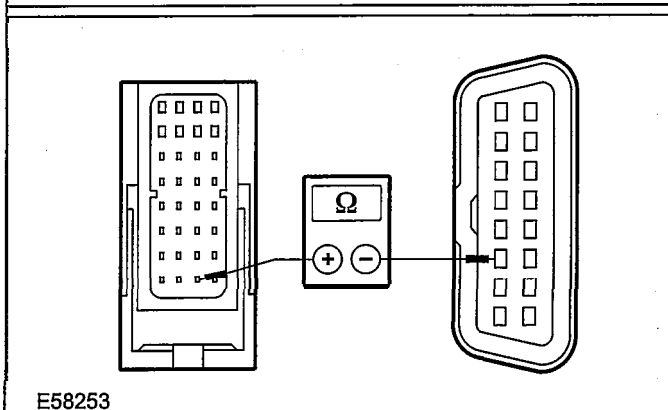
E58252

- 1 Measure the resistance between the PCM, connector C375, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to E42.
- **No**
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E42: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

E58253

- 1 Measure the resistance between the PCM, connector C375, pin A3, circuit 5-EC7 (BU/RD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

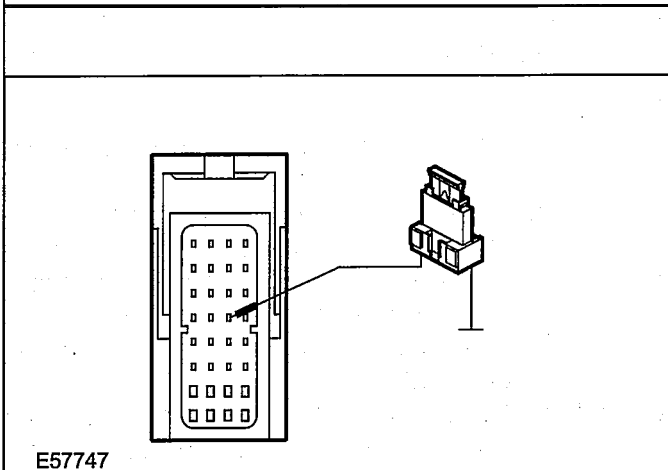
- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK the PCM and RENEW if necessary.
CHECK the operation of the system.

→ **No**

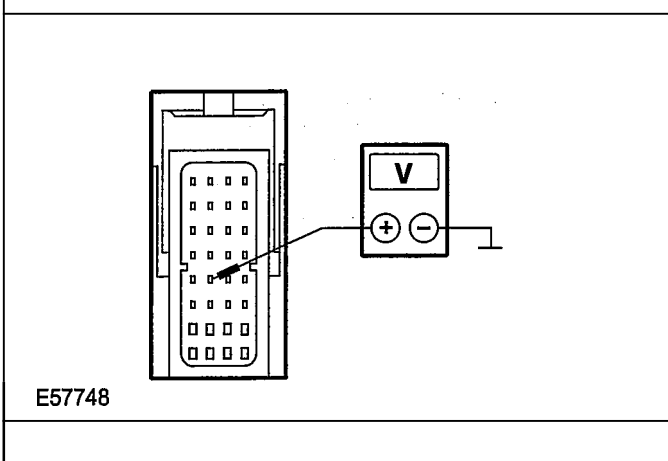
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E43: CHECK THE VOLTAGE AT THE PCM

E57747

- 1 Disconnect connector C372 from the PCM.

- 2 Use a fused test lead (1 A) at the PCM, connector C372, pin D2, to bridge circuit 91S-RH9 (BK/BU), wiring harness side and ground.



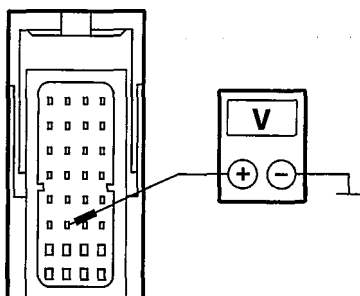
E57748

- 3 Measure the voltage between the PCM, connector C372, pin E3, circuit 15S-RE8A (GN/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

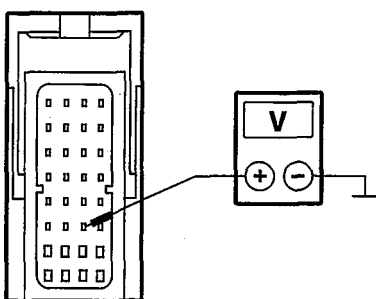
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



E57749

- ☐ Measure the voltage between the PCM, connector C372, pin F3, circuit 15S-RE8B (GN/YE), wiring harness side and ground.



E57750

- ☐ Measure the voltage between the PCM, connector C372, pin F2, circuit 15S-RE8C (GN/YE), wiring harness side and ground.

- Is battery voltage measured in all cases?

→ Yes

GO to E44.

→ No

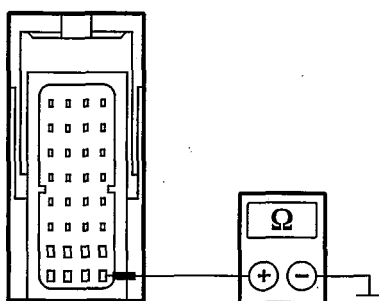
- If battery voltage is not measured during a measurement:

LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S108 using the Wiring Diagrams. CHECK the operation of the system.

- If battery voltage is not measured during all measurements:

LOCATE and REPAIR the break in circuit 15S-RN3 (GN/BU) between soldered connection S108 and fuse F13 using the Wiring Diagrams. CHECK the operation of the system.

E44: CHECK THE GROUND CONNECTION OF THE PCM



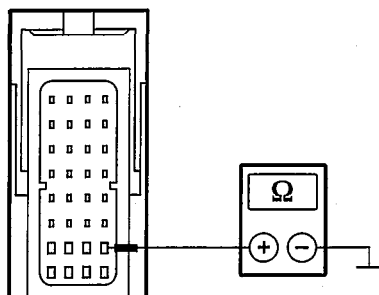
E57714

- ☐ Ignition switch in position 0.

- ☐ Measure the resistance between the PCM, connector C370, pin H4, circuit 91-RE8A (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

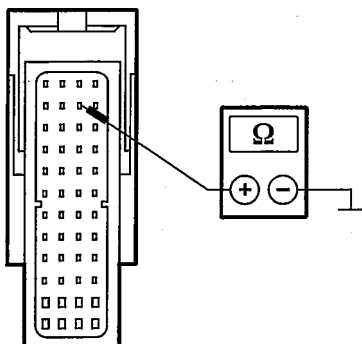
TEST CONDITIONS



E57724

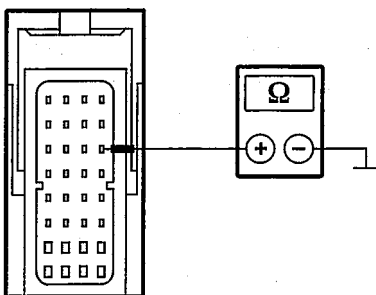
DETAILS/RESULTS/ACTIONS

Measure the resistance between the PCM, connector C370, pin G4, circuit 91-RE8B (BKNE), wiring harness side and ground.



E57745

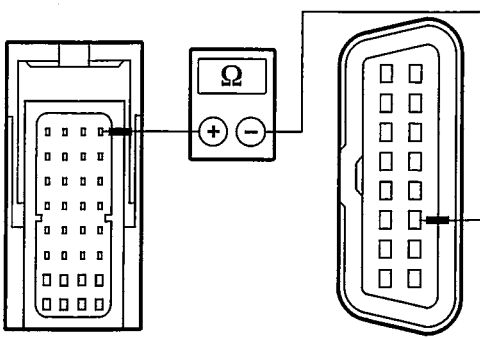
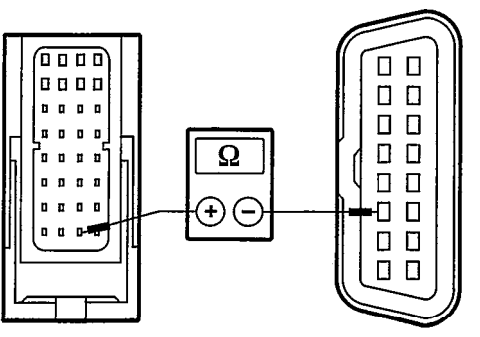
- 4 Measure the resistance between the PCM, connector C371, pin K2, circuit 91-RE8C (BKNE), wiring harness side and ground.



E57746

- Measure the resistance between the PCM, connector C372, pin C4, circuit 91-RE8D (BK/YE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
 - **Yes**
GO to E45.
 - **No**
 - If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S109 and ground connection G1 using the wiring diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E45: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58252	1 Measure the resistance between the PCM, connector C370, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to E46. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
E46: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	☐ Measure the resistance between the PCM, connector C370, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST F : INSTRUMENT CLUSTER NOT COMMUNICATING WITH THE DIAGNOSTIC UNIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS	☐ Ignition switch in position 0. 2 Connect the diagnostic tool. 3 Select the powertrain control module (PCM) with the diagnostic tester. Is it possible to establish communication with the PCM? → Yes GO to F2. → No GO to Pinpoint Test J.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F2: CHECK FUSE F20	
	☐ 1 Ignition switch in position 0.
	☐ 2 CHECK fuse F20 (CJB). Is the fuse OK? → Yes GO to F3. → No INSTALL A NEW fuse F20 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
F3: CHECK THE VOLTAGE AT FUSE F20	
	☐ Connect fuse F20 (CJB).
	☐ Measure the voltage between fuse F20 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to F4. → No REPAIR the voltage supply to fuse F20 using the Wiring Diagrams. CHECK the operation of the system.
F4: CHECK FUSE F44	
	☐ CHECK fuse F44 (CJB).
	Is the fuse OK? → Yes GO to F5. → No INSTALL A NEW fuse F44 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
F5: CHECK THE VOLTAGE AT FUSE F44	
	☐ 1 Connect fuse F44 (CJB).
	☐ Ignition switch in position I.

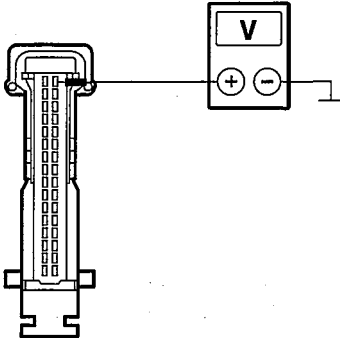
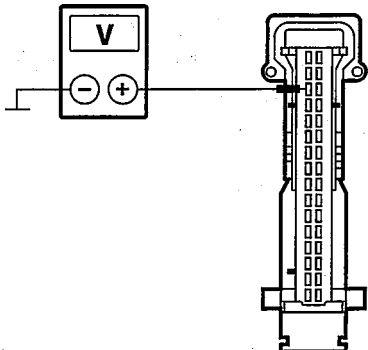
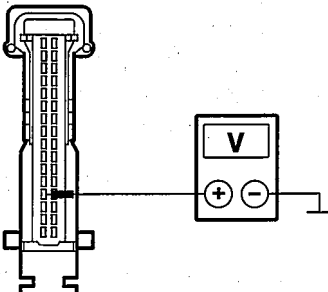
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Measure the voltage between fuse F44 (3 A) and ground. Does the meter display battery voltage? → Yes GO to F6. → No REPAIR the voltage supply to fuse F44 using the Wiring Diagrams. CHECK the operation of the system.
F6: CHECK FUSE F38	
	☐ 1 Ignition switch in position 0. ☐ CHECK fuse F38 (CJB). Is the fuse OK? → Yes GO to F7. → No INSTALL A NEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
F7: CHECK THE VOLTAGE AT FUSE F38	
	☐ 1 Connect fuse F38 (CJB). ☐ 2 Ignition switch in position II. ☐ 3 Measure the voltage between fuse F38 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to F8. → No REPAIR the voltage supply to fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
F8: CHECK THE VOLTAGE AT THE INSTRUMENT CLUSTER	
	☐ Ignition switch in position 0. ☐ 2 Disconnect connector C332 from instrument cluster.

DIAGNOSIS AND TESTING

TEST CONDITIONS

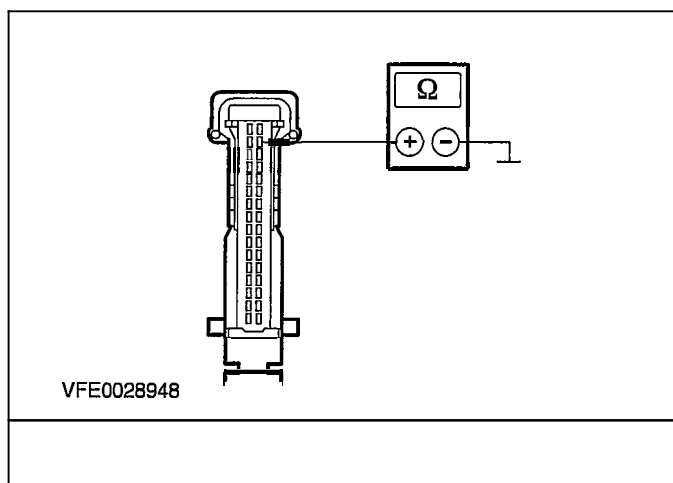
DETAILS/RESULTS/ACTIONS

 VFE0028947	3 Measure the voltage between the instrument cluster, connector C332, pin 17, circuit 29-GG11 (OGIBU), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to F9. → No LOCATE and REPAIR the break in circuit 29-GG11 (OGIBU) between the instrument cluster and fuse F20 using the Wiring Diagrams. CHECK the operation of the system.
F9: CHECK THE VOLTAGE AT THE INSTRUMENT CLUSTER	
 E51768	1 Ignition switch in position I. 2 Measure the voltage between the instrument cluster, connector C332, pin 3, circuit 75-GG11 (YE/RD), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to F10. → No LOCATE and REPAIR the break in circuit 75-GG11 (YE/RD) between the instrument cluster and fuse F44 using the Wiring Diagrams. CHECK the operation of the system.
F10: CHECK THE VOLTAGE AT THE INSTRUMENT CLUSTER	
 VFE0028946	1 Ignition switch in position II. 2 Measure the voltage between the instrument cluster, connector C332, pin 13, circuit 15-GG11 (GN/BU), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to F11. → No LOCATE and RECTIFY the break in the circuit between the instrument cluster and fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
F11: CHECK THE GROUND CONNECTION OF THE INSTRUMENT CLUSTER	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- ☐ Measure the resistance between the instrument cluster, connector C332, pin 18, circuit 31-GG11 (BK), wiring harness side and ground.

- Is a resistance of less than 2 Ohm registered?

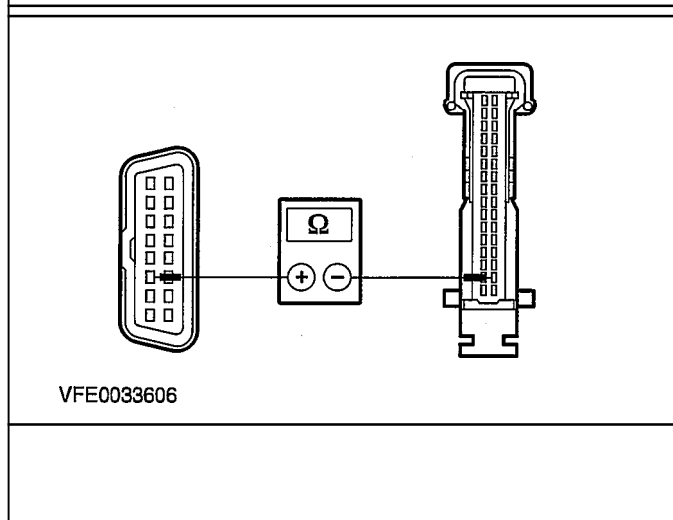
→ **Yes**

GO to F12.

→ **No**

LOCATE and REPAIR the open circuit between the instrument cluster and ground connection G25 (vehicles built from 0112004: G14) using the Wiring Diagrams. CHECK the operation of the system.

F12: CHECK THE CIRCUIT BETWEEN THE INSTRUMENT CLUSTER AND THE DLC FOR CONTINUITY



- ☐ Measure the resistance between the instrument cluster, connector C332, pin 31, circuit 5-EC8A (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

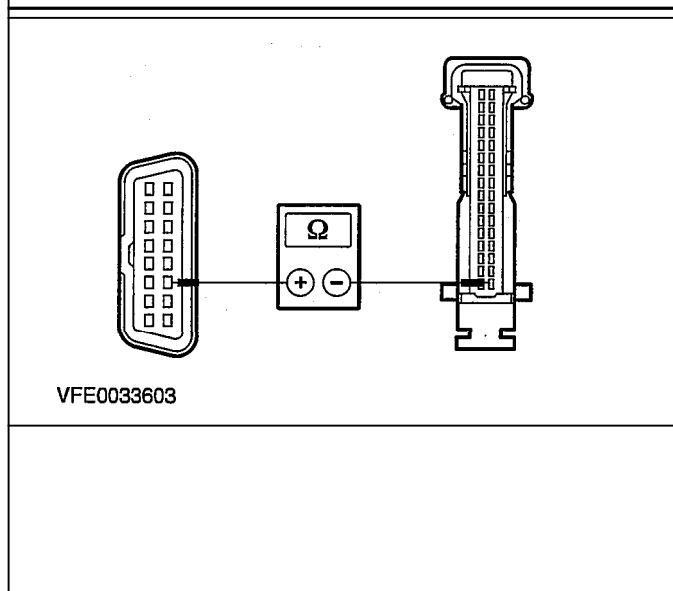
→ **Yes**

GO to F13.

→ **No**

LOCATE and RECTIFY the break in the circuit between the instrument cluster and soldered connection S272 using the Wiring Diagrams. CHECK the operation of the system.

F13: CHECK THE CIRCUIT BETWEEN THE INSTRUMENT CLUSTER AND THE DLC FOR CONTINUITY



Measure the resistance between the instrument cluster, connector C332, pin 32, circuit 4-EC8A (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK and if necessary RENEW the instrument cluster. CHECK the operation of the system.

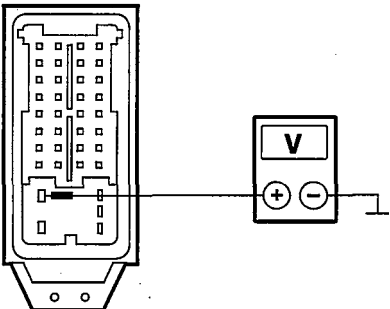
→ **No**

LOCATE and RECTIFY the break in the circuit between the instrument cluster and soldered connection S273 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING**PINPOINT TEST G : TRANSMISSION CONTROL MODULE (TCM) NOT COMMUNICATING WITH DIAGNOSTIC TESTER - VEHICLES WITH AUTOMATIC CLUTCH AND GEARSHIFT ACTUATION****TEST CONDITIONS****DETAILS/RESULTS/ACTIONS**

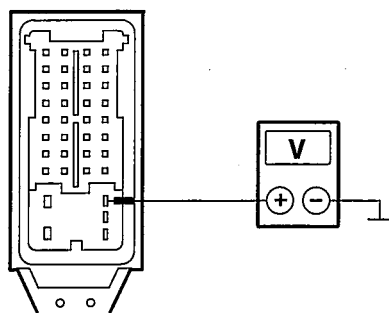
G1: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS	
	1 Ignition switch in position 0.
	2 Connect the diagnostic tool.
	☐ Select the powertrain control module (PCM) with the diagnostic tester. Is it possible to establish communication with the PCM? → Yes GO to G2. → No GO to Pinpoint Test J.
G2: CHECK FUSE FB	
	1 Ignition switch in position 0.
	2 CHECK fuse FB (BJB). Is the fuse OK? → Yes GO to G3. → No RENEW fuse FB (60 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
G3: CHECK THE VOLTAGE AT FUSE FB	
	1 Connect fuse FB (BJB).
	2 Measure the voltage between fuse FB (60 A) and ground. Does the meter display battery voltage? → Yes GO to G4. → No REPAIR the voltage supply to fuse FB using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G4: CHECK FUSE F41	1 CHECK fuse F41 (CJB). Is the fuse OK? → Yes GO to G5. → No INSTALL A NEW fuse F41 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
G5: CHECK THE VOLTAGE AT FUSE F41	1 Connect fuse F41 (CJB). ☐ Ignition switch in position II. ☐ Measure the voltage between fuse F41 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to G6. → No REPAIR the voltage supply to fuse F41 using the Wiring Diagrams. CHECK the operation of the system.
G6: CHECK VOLTAGE AT TCM  VFE0033754	☐ Ignition switch in position 0. ☐ Disconnect connector C676 from TCM. ☐ Measure the voltage between the TCM, connector C676, pin 49, circuit 30-TA55A (RD), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to G7. → No LOCATE and REPAIR the break in the circuit between the TCM and fuse FB using the Wiring Diagrams. CHECK the operation of the system.
G7: CHECK VOLTAGE AT TCM	1 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS

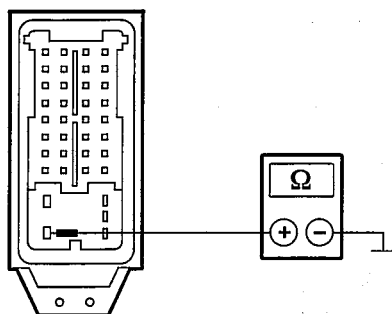


VFE0033755

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the TCM, connector C676, pin 47, circuit 15-TA55 (GNIBK), wiring harness side and ground.
- Does the meter display battery voltage?
- **Yes**
GO to G8.
- **No**
LOCATE and REPAIR the break in circuit 15-TA55 (GNIBK) between TCM and fuse F41 using the Wiring Diagrams. CHECK the operation of the system.

G8: CHECK GROUND CONNECTION OF TCM



VFE0033756

- 1 Ignition switch in position 0.
- 2 Measure the resistance between the TCM, connector C676, pin 48, circuit 91-TA55 (BWGN), wiring harness side and ground.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
CHECK the TCM and RENEW if necessary. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the break in circuit 91-TA55 (BWGN) between TCM and battery negative using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST H : TRANSMISSION CONTROL MODULE (TCM) NOT COMMUNICATING WITH DIAGNOSTIC UNIT - VEHICLES WITH AUTOMATIC TRANSMISSION

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

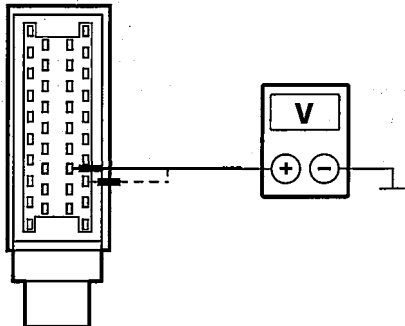
H1: DETERMINE THE CONDITIONS UNDER WHICH THE FAULT OCCURS

- 1 Ignition switch in position 0.
- 2 Connect the diagnostic tool.
- 3 Select the powertrain control module (PCM) with the diagnostic tester.
- Is it possible to establish communication with the PCM?
- **Yes**
GO to H2.
- **No**
GO to Pinpoint Test J.

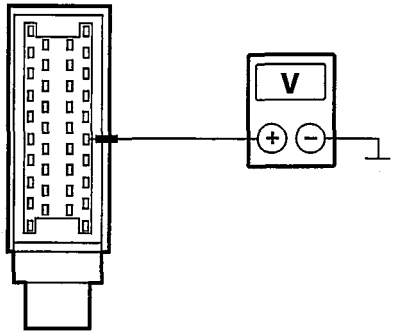
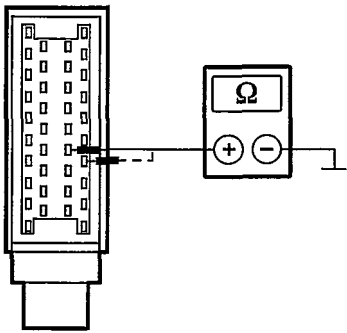
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H2: CHECK FUSE F7	
	1 Ignition switch in position 0.
	2 CHECK fuse F7 (CJB). Is the fuse OK? → Yes GO to H3. → No INSTALL A NEW fuse F7 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
H3: CHECK THE VOLTAGE AT FUSE F7	
	1 Connect fuse F7 (CJB).
	2 Measure the voltage between fuse F7 (15 A) and ground. Does the meter display battery voltage? → Yes GO to H4. → No REPAIR the voltage supply to fuse F7 using the Wiring Diagrams. CHECK the operation of the system.
H4: CHECK FUSE F41	
	☐ CHECK fuse F41 (CJB). Is the fuse OK? → Yes GO to H5. → No INSTALL A NEW fuse F41 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
H5: CHECK THE VOLTAGE AT FUSE F41	
	1 Connect fuse F41 (CJB).
	2 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the voltage between fuse F41 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to H6. → No REPAIR the voltage supply to fuse F41 using the Wiring Diagrams. CHECK the operation of the system.
H6: CHECK VOLTAGE AT TCM	
	1 Ignition switch in position 0. 2 Disconnect connector C428 from automatic transmission module.
 E47283	3 Measure the voltage between the TCM, connector C428, pin 22, circuit 29-TA55A (OGIBK), wiring harness side and ground.
	4 Measure the voltage between the TCM, connector C428, pin 31, circuit 29-TA55B (OG/BK), wiring harness side and ground. - Is battery voltage measured in both cases? → Yes GO to H7. → No - If battery voltage is not measured during a measurement: LOCATE and REPAIR the break in the relevant circuit between the TCM and soldered connection S128 using the Wiring Diagrams. CHECK the operation of the system. - If battery voltage is not measured during both measurements: LOCATE and REPAIR the break in the circuit between soldered connection S128 and fuse F7 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H7: CHECK VOLTAGE AT TCM  E47284	☐ Ignition switch in position II. ☐ Measure the voltage between the TCM, connector C428, pin 33, circuit 15-TA55A (GN/BK), wiring harness side and ground. • Does the meter display battery voltage? → Yes GO to H8. → No LOCATE and REPAIR the break in the circuit between the TCM and fuse F41 using the Wiring Diagrams. CHECK the operation of the system.
H8: CHECK GROUND CONNECTION OF TCM  E47285	1 Ignition switch in position 0. 2 Measure the resistance between the TCM, connector C428, pin 23, circuit 91-TA55A (BWGN), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

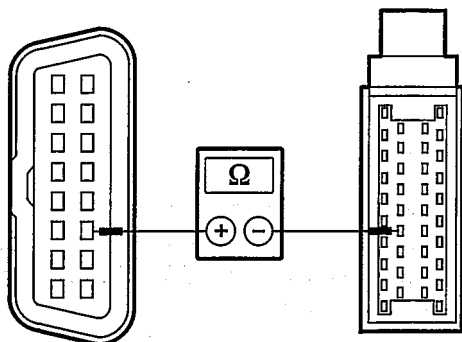
3 Measure the resistance between the TCM, connector C428, pin 32, circuit 91-TA55B (BK/GN), wiring harness side and ground.

- Is a resistance of less than 2 Ohms measured in both cases?

→ **Yes**
GO to H9.

→ **No**

- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the TCM and soldered connection S132 using the Wiring Diagrams. CHECK the operation of the system.
- If a resistance of more than 2 Ohms is measured in both of the measurements: LOCATE and REPAIR the break in the relevant circuit between soldered connection S132 and battery negative using the Wiring Diagrams. CHECK the operation of the system.

H9: CHECK THE CIRCUIT BETWEEN THE TCM AND THE DLC FOR CONTINUITY.

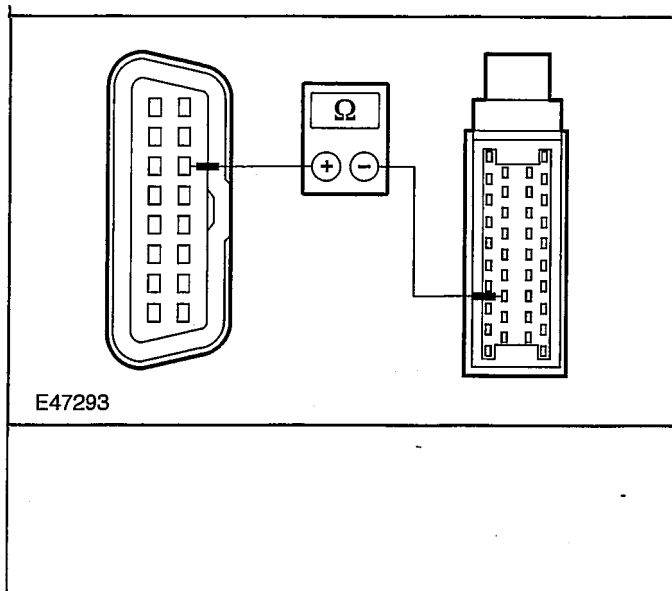
E47292

Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and the TCM, connector C428, pin 25, circuit 4-EC16 (GY/WH), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



☐ Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and the TCM, connector C428, pin 26, circuit 5-EC16 (BU/IOG), wiring harness side.

- Is a resistance of less than 2 Ohms measured in both cases?

→ **Yes**

CHECK the TCM and RENEW if necessary. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in the relevant circuit between the TCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST I : FAULTY COMMUNICATION BETWEEN THE MODULES (ISO 9141 BUS)

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

I1: CHECK FUSE F18

1 Ignition switch in position 0.

2 CHECK fuse F18 (CJB).

- Is the fuse OK?

→ **Yes**

GO to 12

→ **No**

INSTALL A NEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

I2: CHECK THE VOLTAGE AT FUSE F18

1 Connect fuse F18 (CJB).

2 Measure the voltage between fuse F18 (15 A) and ground.

- Does the meter display battery voltage?

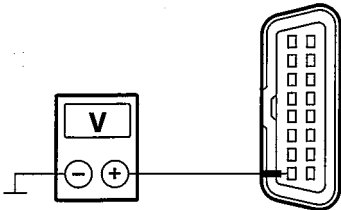
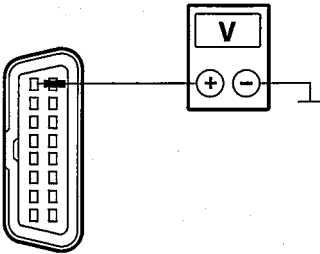
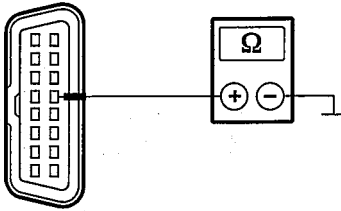
→ **Yes**

GO to 13

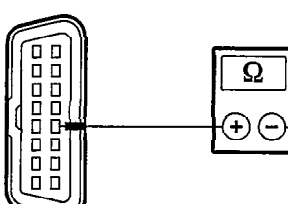
→ **No**

REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSRESULTSIACTIONS
I3: CHECK THE VOLTAGE AT THE DATA LINK CONNECTOR (DLC)	
 VFE0028957	1 Measure the voltage between the DLC, connector C308, pin 16, circuit 29-RAI (OG), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to 14. → No LOCATE and REPAIR the open circuit between the DLC and fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
I4: CHECK THE VOLTAGE AT THE DLC	
 VFE0028963	1 Ignition switch in position II. ☐ Measure the voltage between the DLC, connector C308, pin 9, circuit 15-RA1 (GNIRD), wiring harness side and ground. Does the meter display battery voltage? → Yes GO to 15. → No LOCATE and REPAIR the break in circuit 15-RA1 (GNIRD) between the DLC and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
I5: CHECK THE GROUND CONNECTION OF THE DLC	
 VFE0028965	1 Ignition switch in position 0. 2 Measure the resistance between the DLC, connector C308, pin 4, circuit 31-RA1 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes GO to 16. → No LOCATE and REPAIR the open circuit between the DLC and ground connection G25 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
16: CHECK THE GROUND CONNECTION OF THE DLC  VFE0028964	1 Measure the resistance between the DLC, connector C308, pin 5, circuit 91-RA1 (BK/OG), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes GO to 17. → No LOCATE and REPAIR the break in circuit 91-RA1 (BWOOG) between the DLC and ground connection G31 using the Wiring Diagrams. CHECK the operation of the system.
17: PERFORM NETWORK TEST	1 Disconnect Connector C303 from ABS module - vehicles built up to 0312004 / or ESP module. 2 Disconnect Vehicles with ABS - vehicles built from 0412004 onwards: connector C304 from ABS module. 3 Connect the diagnostic tool. 4 Select the vehicle with the diagnostic tester. Is it possible to establish a connection between the vehicle and the generic electronic module (GEM)? → Yes CHECK and if necessary RENEW the ABS module or electronic stability program module (ESP). CHECK the operation of the system. → No GO to 18.
18: PERFORM NETWORK TEST (SAFETY RESTRAINT CONTROL MODULE (RCM))	
WARNINGS: ▲ After disconnecting the battery, wait for at least one minute before working on the supplementary restraint system to prevent the risk of accidental airbag deployment. Failure to observe this instruction can lead to injury. ▲ Do not program any keycodes while working on the safety restraint system in order to prevent the risk of accidental deployment of safety restraint system components. Failure to observe this instruction can lead to injury. ▲ Always use adapters for terminal probe kit when testing any connectors of the airbag systems or of any other safety restraint systems. Failure to observe this instruction can lead to injury.	
	1 Disconnect ground cable from battery.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

2 Disconnect connector C500 from safety restraint control module (RCM).

3 Connect ground cable from battery.

4 Select the vehicle with the diagnostic tester.

- Is it possible to establish a connection between the vehicle and the generic electronic module (GEM)?

→ **Yes**

CHECK and if necessary RENEW the safety restraint control module (RCM). CHECK the operation of the system.

→ **No**

GO to I9.

I9: TEST THE ISO 9141 BUS FOR A SHORT TO VOLTAGE SUPPLY

1 Ignition switch in position 0.

2 Disconnect connector C320 (brown) from GEM.

3 Ignition switch in position II.

4 Measure the voltage between the DLC, connector C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side and ground.

- Is a voltage measured?

→ **Yes**

LOCATE and REPAIR the short to voltage in the circuits connected to soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

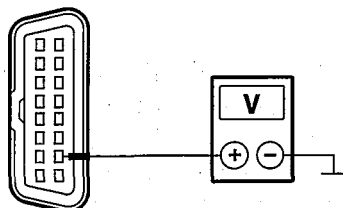
→ **No**

GO to I10.

I10: CHECK THE ISO 9141 BUS FOR A SHORT TO GROUND

1 Ignition switch in position 0.

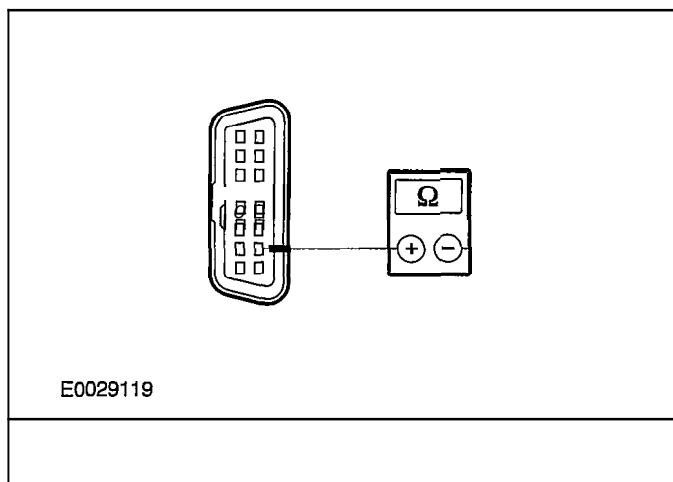
E0029118



DIAGNOSIS AND TESTING

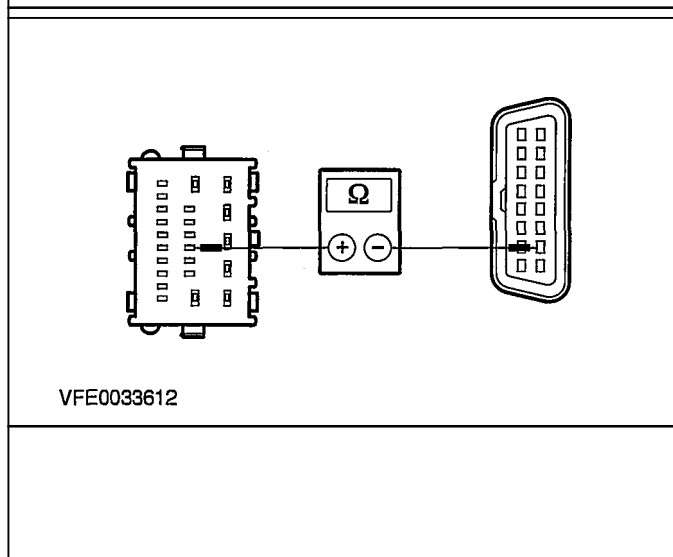
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- ☐ Measure the resistance between the DLC, connector C308, pin 7, circuit 4-EE10 (GYBK), wiring harness side and ground.
- Is a resistance of more than 10,000 Ohm measured?
- **Yes**
GO to 111
- **No**
LOCATE and REPAIR the short to ground in the circuits connected to soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

III : CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.



- Measure the resistance between GEM, connector C320 (brown), pin 10, circuit 4-EE11 (GY/WH), wiring harness side and DLC, C308, pin 7, circuit 4-EE10 (GYBK), wiring harness side.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
TEST the GEM and RENEW as necessary. CHECK the operation of the system.
- **No**
LOCATE and REPAIR the break in circuit 4-EE10 (GYBK) between the DLC and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST J : FAULTY COMMUNICATION BETWEEN THE MODULES - CAN BUS

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

NOTE:The number of modules connected to the CAN bus depends on the equipment levels of the vehicle. Therefore not every vehicle will have all the modules mentioned below.

J1: CHECK FUSE F18

1 Ignition switch in position 0.

2 CHECK fuse F18 (CJB).

- Is the fuse OK?

→ **Yes**
GO to J2.

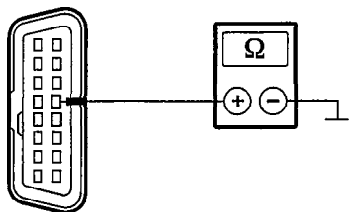
→ **No**
INSTALL A NEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J2: CHECK THE VOLTAGE AT FUSE F18	1 Connect fuse F18 (CJB). 2 Measure the voltage between fuse F18 (15 A) and ground. - Does the meter display battery voltage? → Yes GO to J3. → No REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
J3: CHECK THE VOLTAGE AT THE DATA LINK CONNECTOR (DLC) VFE0028957	1 Measure the voltage between the DLC, connector C308, pin 16, circuit 29-RA1 (OG), wiring harness side and ground. - Does the meter display battery voltage? → Yes GO to J4. → No LOCATE and REPAIR the open circuit between the DLC and fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
J4: CHECK THE VOLTAGE AT THE DLC VFE0028963	1 Ignition switch in position II. 2 Measure the voltage between the DLC, connector C308, pin 9, circuit 15-RA1 (GNIRD), wiring harness side and ground. - Does the meter display battery voltage? → Yes GO to J5. → No LOCATE and REPAIR the break in circuit 15-RA1 (GNIRD) between the DLC and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
J5: CHECK THE GROUND CONNECTION OF THE DLC	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS

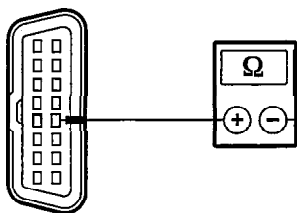


VFE0028965

DETAILS/RESULTS/ACTIONS

- 2** Measure the resistance between the DLC, connector C308, pin 4, circuit 31-RA1 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
GO to J6.
- **No**
LOCATE and REPAIR the open circuit between the DLC and ground connection G25 using the Wiring Diagrams. CHECK the operation of the system.

J6: CHECK THE GROUND CONNECTION OF THE DLC



VFE0028964

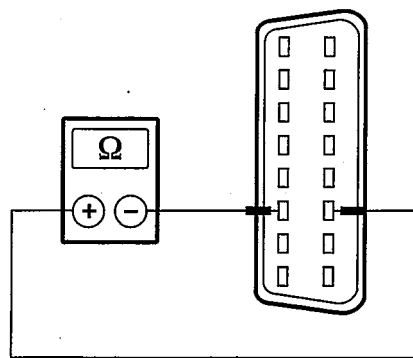
- 1** Measure the resistance between the DLC, connector C308, pin 5, circuit 91-RA1 (BWO), wiring harness side and ground.
- Is a resistance of less than 2 Ohm registered?
- **Yes**
GO to J7.
- **No**
LOCATE and REPAIR the break in circuit 91-RA1 (BWO) between the DLC and ground connection G31 using the Wiring Diagrams. CHECK the operation of the system.

J7: CHECK THE CAN BUS FOR SHORT CIRCUIT

- ☐ Disconnect the ground cable from the battery.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E45951

DETAILS RESULTS ACTIONS

- 2** Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

- Is a resistance of between 55 and 65 Ohms measured?

→ **Yes**

- Vehicles without automatic clutch and gear-shift actuation:
GO to J14.
- Vehicles with automatic clutch and gearshift actuation:
GO to J8.

→ **No**

- A resistance of between 115 and 125 Ohms is measured:
GO to J17.
- A resistance of between 115 and 125 Ohms is not measured:
GO to J35.

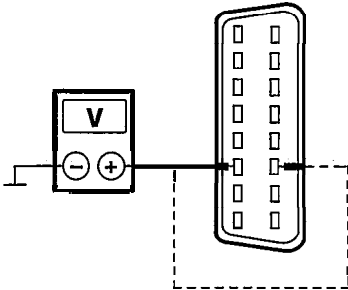
J8: PERFORM NETWORK TEST

- 1** Connect the ground cable to the battery.

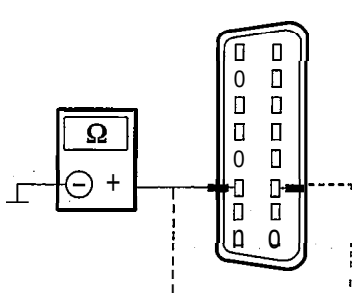
- 2** Connect the diagnostic tool.

- ☐ Disconnect a listed component, then perform the following test step:
- Vehicles with ABS built up to 0312004 or vehicles with electronic stability program (ESP): Connector 303 from ABS module or ESP module
 - Vehicles with ABS built from 0412004 onwards: connector C304 from ABS module
 - connector C679 from von transmission selector unit
 - connector C332 from instrument cluster
 - Connector C281 from the power steering pump module

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Select the vehicle with the diagnostic tester. Is it possible to establish communication with the PCM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: Key in the OFF position. DISCONNECT the next component (go to test step 3). - If all the listed components are disconnected: GO to J9.
J9: CHECK THE CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
	1 Ignition switch in position 0. 2 Disconnect connector C676 from transmission control module (TCM). 3 Disconnect Vehicles with 1.6L diesel engine: connector C384 from PCM. Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from PCM. 5 Disconnect Vehicles with 1.4L petrol engine: connector C343 from PCM. 6 Ignition switch in position II. 7 Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.
 VFE0038142	

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	8 Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/IRD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system. → No GO to J10.
J10: CHECK THE CAN BUS FOR A SHORT TO GROUND	
 VFE0038143	1 Ignition switch in position 0. ☐ Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.
	☐ Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground. Is a resistance greater than 10,000 Ohms measured in both cases? → Yes GO to J11. → No LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 3** Disconnect a listed component, then perform the following test step:
- Vehicles with ABS built up to 0312004 or vehicles with electronic stability program (ESP): Connector 303 from ABS module or ESP module
 - Vehicles with ABS built from 0412004 onwards: connector C304 from ABS module
 - Vehicles with automatic transmission: connector C428 from automatic transmission module
 - connector C332 from instrument cluster

- 4** Select the vehicle with the diagnostic tester.
- Is it possible to establish communication with the PCM?
- **Yes**
The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system.
- **No**
- If not all the listed components are disconnected:
Key in the OFF position. DISCONNECT the next component (go to test step 3).
 - If all the listed components are disconnected:
GO to J15.

J15: CHECK THE CAN BUS FOR A SHORT TO VOLTAGE SUPPLY

Ignition switch in position 0.

- 2** Disconnect Vehicles with 1.6L diesel engine: connector C384 from PCM.

Disconnect Vehicles with 2.0L petrol engine: connector C380 from PCM.

- 4** Disconnect Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): connector C375 from PCM.

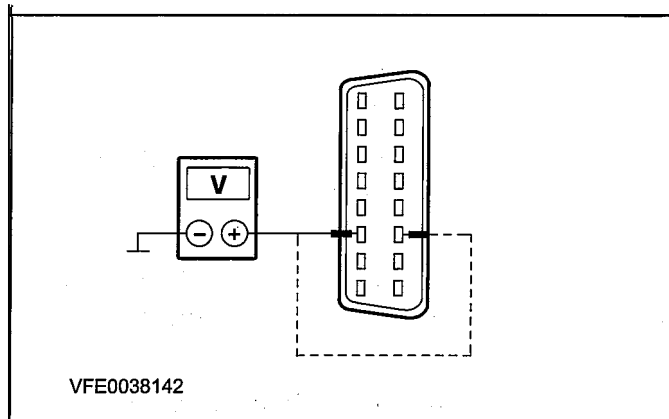
- 5** Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from PCM.

- 6** Disconnect Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: connector C343 from PCM.

- 7** Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 8 Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/IRD), wiring harness side and ground.

- 9 Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground.

- Is a voltage measured?

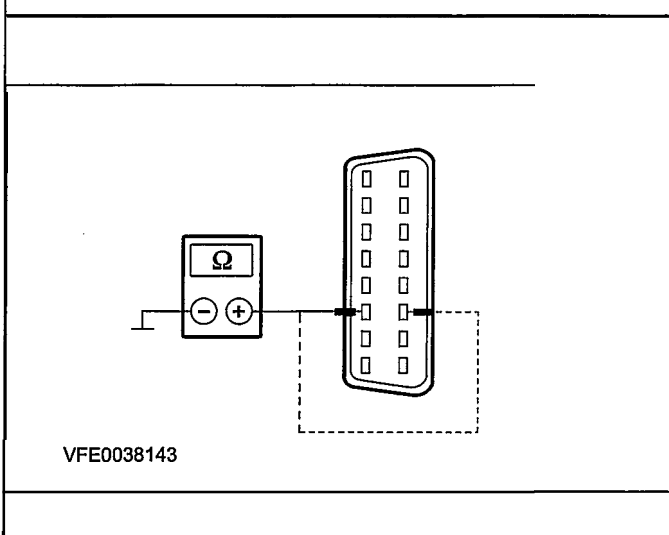
→ **Yes**

LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to J16.

J16: CHECK THE CAN BUS FOR A SHORT TO GROUND



- 1 Ignition switch in position 0.

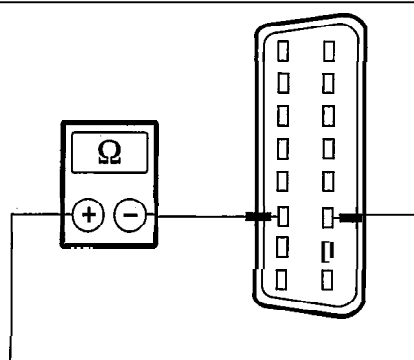
- Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground. • Is a resistance greater than 10,000 Ohms measured in both cases? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.
J17: CHECK INSTRUMENT CLUSTER	
	1 Disconnect connector C332 from instrument cluster.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E45951

DETAILS/RESULTS/ACTIONS

Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BUIRD), wiring harness side.

- Is a resistance of between 115 and 125 Ohms measured?

→ **Yes**

GO to J18.

→ **No**

- Vehicles with automatic clutch and gearshift actuation:

GO to J20.

- Vehicles with 1.6L diesel engine without automatic clutch and gearshift actuation:

GO to J29.

- Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR) and without automatic clutch and gearshift actuation:

GO to J27.

- Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR) and without automatic clutch and gearshift actuation:

GO to J33.

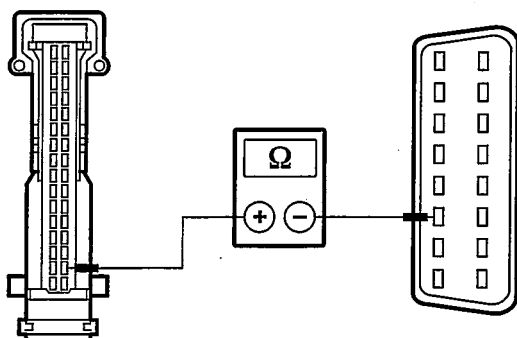
- Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine without automatic clutch and gearshift actuation:

GO to J31.

- Vehicles with 2.0L diesel engine without automatic clutch and gearshift actuation:

GO to J25.

J18: CHECK THE CIRCUIT BETWEEN THE INSTRUMENT CLUSTER AND THE DLC FOR CONTINUITY



VFE58689

- ☐ Measure the resistance between the instrument cluster, connector C332, pin 31, circuit 5-EC8A (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

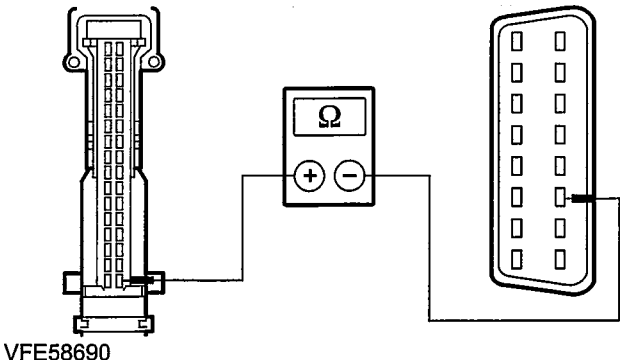
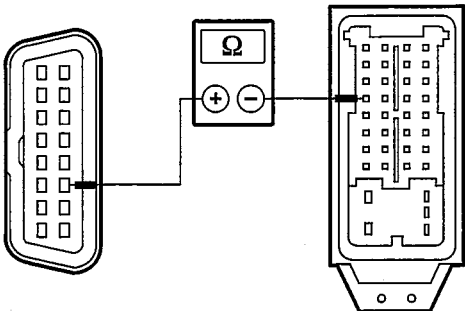
→ **Yes**

GO to J19.

→ **No**

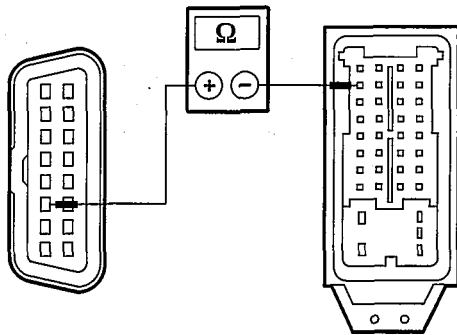
LOCATE and REPAIR the break in the circuit between the instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
J19: CHECK THE CIRCUIT BETWEEN THE INSTRUMENT CLUSTER AND THE DLC FOR CONTINUITY  VFE58690	1 Measure the resistance between the instrument cluster, connector C332, pin 32, circuit 4-EC8A (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohm registered? → Yes CHECK and if necessary RENEW the instrument cluster. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
J20: CHECK THE CIRCUIT BETWEEN THE TCM AND THE DLC FOR CONTINUITY.  VFE0033757	1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side and the TCM, connector C676, pin 54, circuit 4-EC8 (GYM), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033758

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and the TCM, connector C676, pin 56, circuit 5-EC8 (BU/WH), wiring harness side.

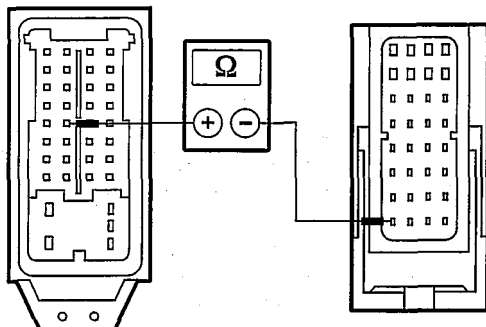
Is a resistance of less than 2 Ohms measured in all of the cases?

→ **Yes**

- Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): GO to J22.
- Vehicles with 1.4L petrol engine: GO to J23.
- Vehicles with 1.6L diesel engine: GO to J21.

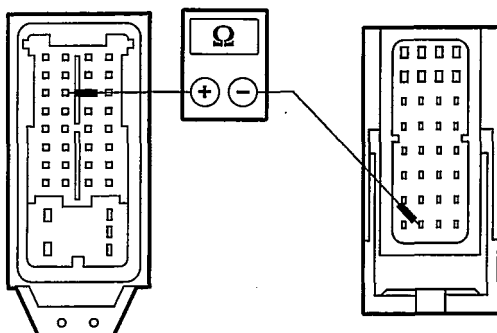
→ **No**

LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.

J21: CHECK THE CIRCUIT BETWEEN THE TCM AND THE PCM FOR CONTINUITY.

E58254

- 1** Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GYIRD), wiring harness side and the PCM, connector C384, pin A4, circuit 4-EC7 (GYIRD), wiring harness side.



E58255

- 2** Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BUIRD), wiring harness side and the PCM, connector C384, pin A3, circuit 5-EC7 (BUIRD), wiring harness side.

- Is a resistance of less than 2 Ohms measured in all of the cases?

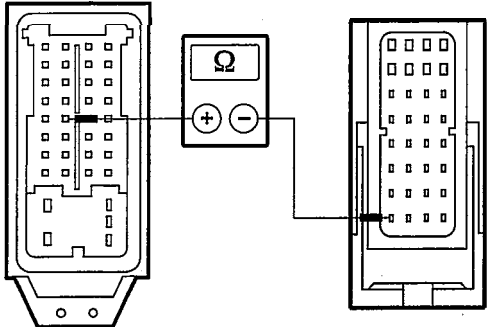
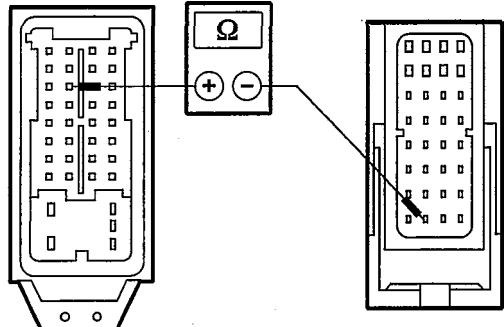
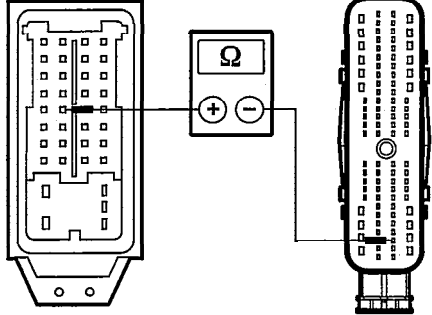
→ **Yes**

GO to J24.

→ **No**

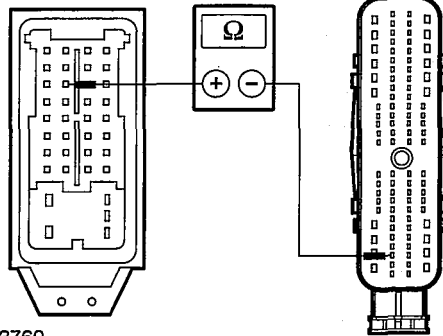
LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J22: CHECK THE CIRCUIT BETWEEN THE TCM AND THE PCM FOR CONTINUITY.  E58254	1 Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GYIRD), wiring harness side and the PCM, connector C370, pin A4, circuit 4-EC7 (GYIRD), wiring harness side.
 E58255	2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BUIRD), wiring harness side and the PCM, connector C370, pin A3, circuit 5-EC7 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms measured in all of the cases? → Yes GO to J24. → No LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.
J23: CHECK THE CIRCUIT BETWEEN THE TCM AND THE PCM FOR CONTINUITY.  VFE0033759	1 Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/RD), wiring harness side and the PCM, connector C343, pin F31, circuit 4-EC7 (GYIRD), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS

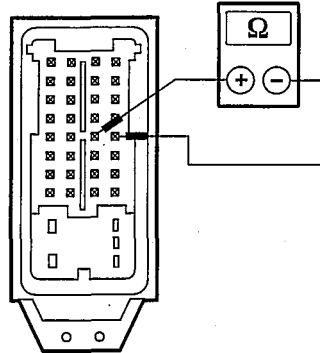


VFE0033760

DETAILS RESULTS ACTIONS

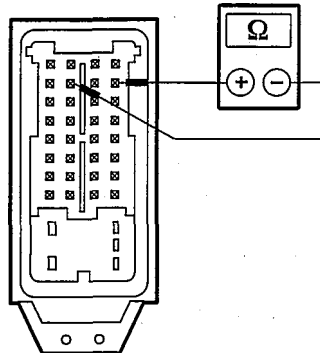
- 2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BUIRD), wiring harness side and the PCM, connector C343, pin F19, circuit 5-EC7 (BUIRD), wiring harness side.
- Is a resistance of less than 2 Ohms measured in all of the cases?
- **Yes**
GO to J24.
- **No**
LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.

J24: CHECK THE TCM FOR BREAKS



VFE0033765

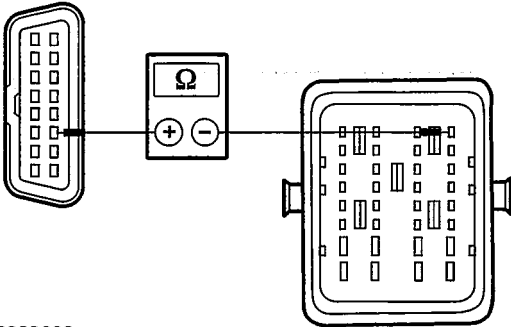
- 1 Measure the resistance at TCM, connector C676, between pin 54 and pin 61, component side.



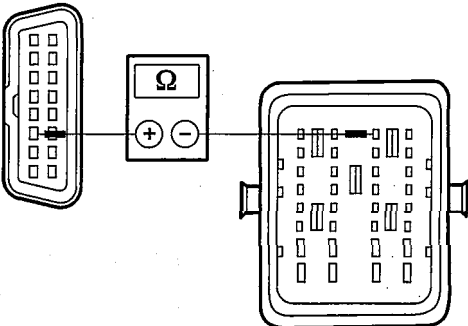
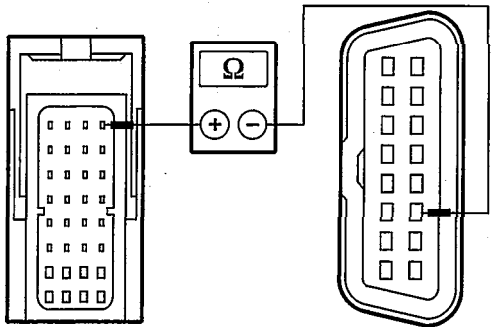
VFE0033766

- Measure the resistance at TCM, connector C676, between pin 56 and pin 63, component side.
- Is a resistance of less than 2 Ohms measured in both cases?
- **Yes**
CHECK the PCM and RENEW if necessary. CHECK the operation of the system.
- **No**
CHECK the TCM and RENEW as necessary. CHECK the operation of the system.

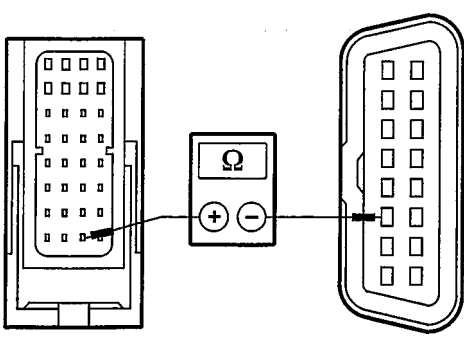
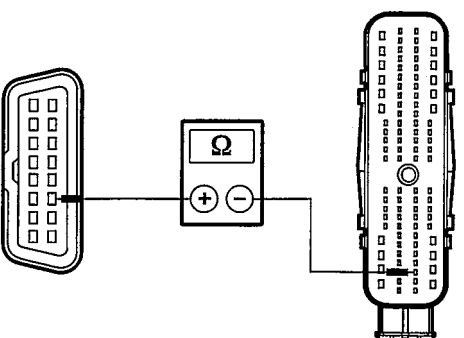
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J25: CHECK CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
	☒ 1 Measure the resistance between the PCM, connector C380, pin 41, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to J26. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
J26: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
	☐ Measure the resistance between the PCM, connector C380, pin 30, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
J27: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
 VFE0033609	☐ Disconnect connector C370 from the PCM. ☐ Measure the resistance between the PCM, connector C370, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to J28. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J28: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  VFE0033610	1 Measure the resistance between the PCM, connector C370, pin A3, circuit 5-EC7 (BU/RD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
J29: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58252	1 Disconnect connector C384 from PCM. 2 Measure the resistance between the PCM, connector C384, pin A4, circuit 4-EC7 (GY/RD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to J30. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

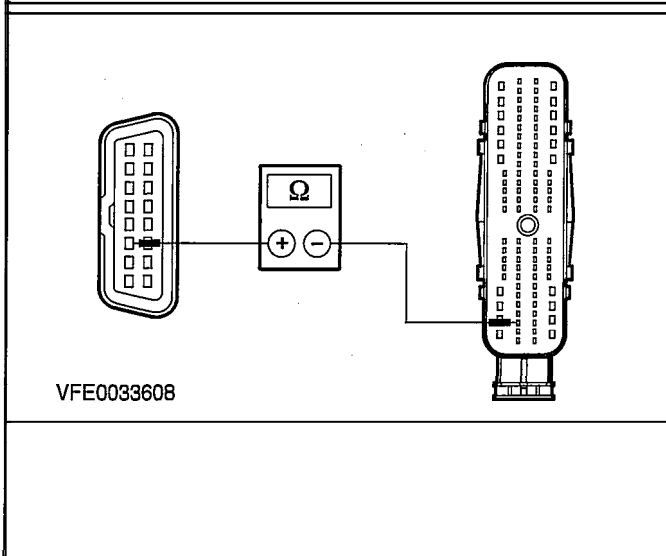
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J30: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	1 Measure the resistance between the PCM, connector C384, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
J31: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  VFE0033605	1 Disconnect connector C343 from PCM. 2 Measure the resistance between the PCM, connector C343, pin F31, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to J32. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

J32: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

- 1 Measure the resistance between the PCM, connector C343, pin F19, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side.

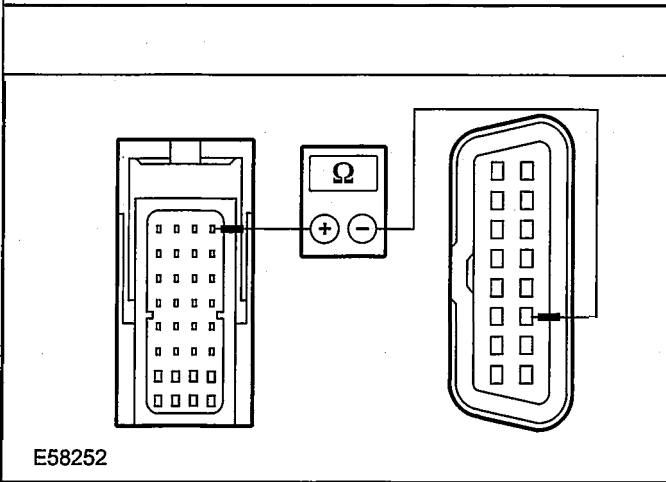
- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK the PCM and RENEW if necessary.
CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

J33: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

- 1 Disconnect connector C375 from PCM.

- ☐ Measure the resistance between the PCM, connector C375, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

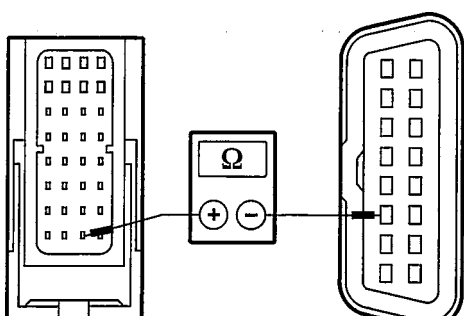
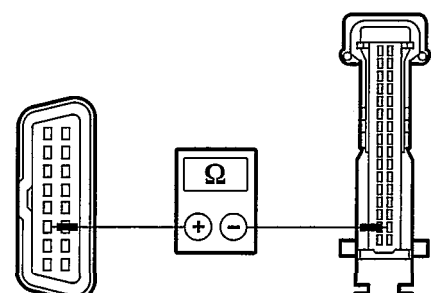
→ **Yes**

GO to J34.

→ **No**

LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

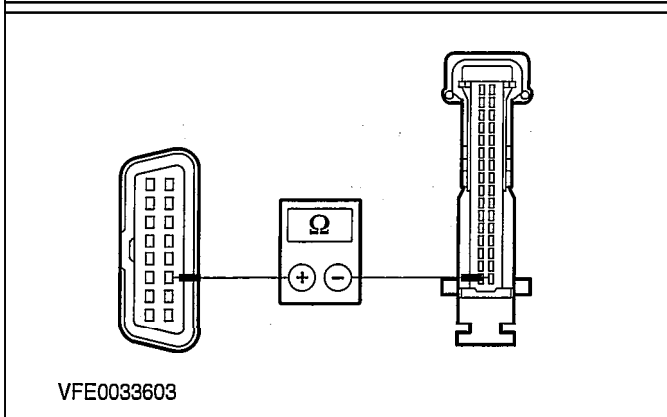
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J34: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	Measure the resistance between the PCM, connector C375, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
J35: CHECK THE CIRCUIT BETWEEN THE INSTRUMENT CLUSTER AND THE DLC FOR CONTINUITY  VFE0033606	Disconnect connector C332 from instrument cluster. 2 Measure the resistance between the instrument cluster, connector C332, pin 31, circuit 5-EC8A (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to J36. → No LOCATE and REPAIR the break in the circuit between the instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

J36: CHECK THE CIRCUIT BETWEEN THE INSTRUMENT CLUSTER AND THE DLC FOR CONTINUITY

- 1 Measure the resistance between the instrument cluster, connector C332, pin 32, circuit 4-EC8A (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side.

- Is a resistance of less than 2 Ohm registered?

→ **Yes**

- Vehicles without automatic clutch and gear-shift actuation:
GO to J37.
- Vehicles with automatic clutch and gearshift actuation:
GO to J41.

→ **No**

LOCATE and REPAIR the break in the circuit between the instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.

J37: PERFORM NETWORK TEST

NOTE: The number of modules connected to the CAN bus depends on the equipment levels of the vehicle. Therefore not every vehicle will have all the modules mentioned below.

- 1 Connect the ground cable to the battery.

- 2 Connect the diagnostic tool.

- 3 Disconnect a listed component, then perform the following test step:
 - Vehicles with ABS built up to 0312004 or vehicles with electronic stability program (ESP): Connector 303 from ABS module or ESP module
 - Vehicles with ABS built from 0412004 onwards: connector C304 from ABS module
 - Vehicles with automatic transmission: connector C428 from automatic transmission module

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

4 Select the vehicle with the diagnostic tester.

- Is it possible to establish communication with the PCM?

→ **Yes**

The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system.

→ **No**

- If not all the listed components are disconnected:
Key in the OFF position. DISCONNECT the next component (go to test step 3).
- If all the listed components are disconnected:
GO to J38.

J38: CHECK THE CAN BUS FOR A SHORT TO VOLTAGE SUPPLY

1 Ignition switch in position 0.

2 Disconnect Vehicles with 1.6L diesel engine: connector C384 from PCM.

☐ Disconnect Vehicles with 2.0L petrol engine: connector C380 from PCM.

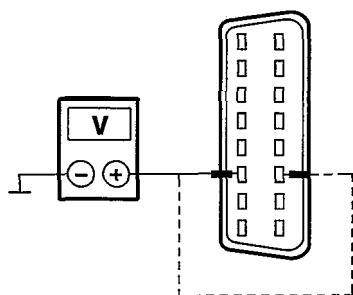
4 Disconnect Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): connector C375 from PCM.

☐ Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from PCM.

☐ Disconnect Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: connector C343 from PCM.

7 Ignition switch in position II.

☐ Measure the voltage between the DLC, connector C308, pin 6, circuit 4-ECI (GY/RD), wiring harness side and ground.



VFE0038142

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and ground.

• Is a voltage measured?

→ **Yes**

LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

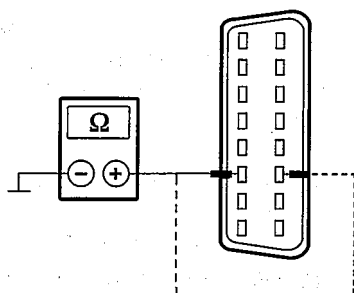
→ **No**

GO to J39.

J39: CHECK THE CAN BUS FOR A SHORT TO GROUND

- 1** Ignition switch in position 0.

- 2** Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.



VFE0038143

- 3** Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and ground.

- Is a resistance greater than 10,000 Ohms measured in both cases?

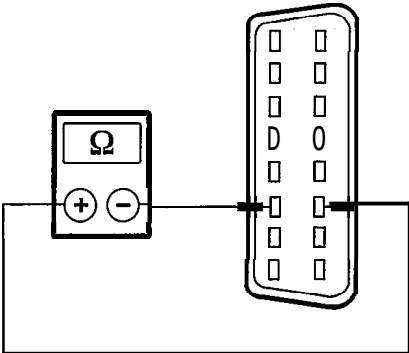
→ **Yes**

GO to J40.

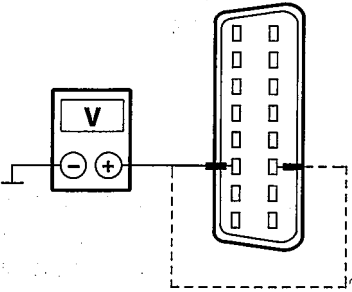
→ **No**

LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

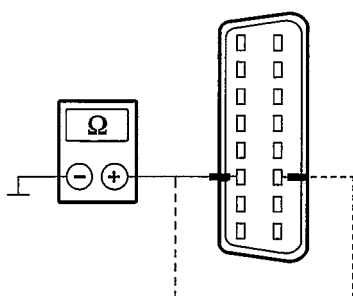
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J40: CHECK THE CAN BUS FOR SHORT CIRCUIT  E45951	1 Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-ECI (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance greater than 10,000 Ohms measured in both cases? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the short in the CAN Bus using the Wiring Diagrams. CHECK the operation of the system.
J41: PERFORM NETWORK TEST	1 Connect the ground cable to the battery. 2 Connect the diagnostic tool. 3 Disconnect a listed component, then perform the following test step: - Vehicles with ABS built up to 0312004 or vehicles with electronic stability program (ESP): Connector 303 from ABS module or ESP module - Vehicles with ABS built from 0412004 onwards: connector C304 from ABS module - Vehicles with automatic clutch and gearshift actuation: connector C679 from transmission selector unit - connector C332 from instrument cluster - Connector C281 from the power steering pump module 4 Select the vehicle with the diagnostic tester. - Is it possible to establish communication with the PCM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: Key in the OFF position. DISCONNECT the next component (go to test step 3). - If all the listed components are disconnected: GO to J42.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J42: CHECK THE CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
 VFE0038142	1 Ignition switch in position 0. ☐ Disconnect connector C676 from transmission control module (TCM). 3 Disconnect Vehicles with 1.6L diesel engine: connector C384 from PCM. ☐ Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from PCM. 5 Disconnect Vehicles with 1.4L petrol engine: connector C343 from PCM.
	6 Ignition switch in position II.
	7 Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.
	8 Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground. Is a voltage measured?
	→ Yes LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system. → No GO to J43.
J43: CHECK THE CAN BUS FOR A SHORT TO GROUND	
	☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038143

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the DLC, connector C308, pin 6, circuit 4-ECI (GY/RD), wiring harness side and ground.

- 3** Measure the resistance between the DLC, connector C308, pin 14, circuit 5-ECI (BU/RD), wiring harness side and ground.

- Is a resistance greater than 10,000 Ohms measured in both cases?

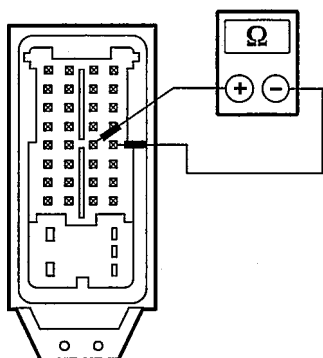
→ **Yes**

GO to J44.

→ **No**

LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

J44: CHECK THE TCM FOR BREAKS

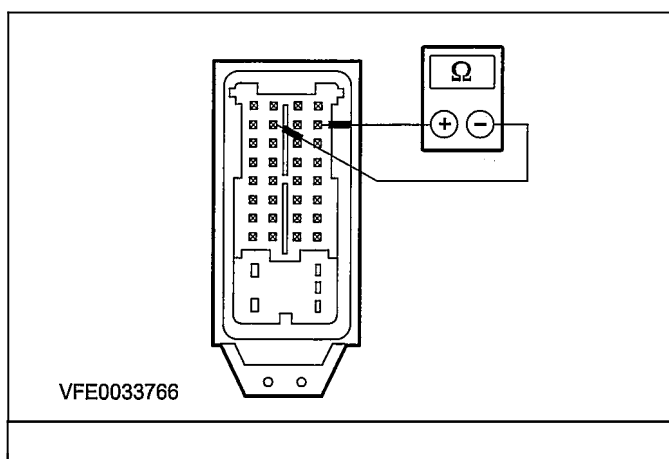


VFE0033765

- 1** Measure the resistance at TCM, connector C676, between pin 54 and pin 61, component side.

DIAGNOSIS AND TESTING

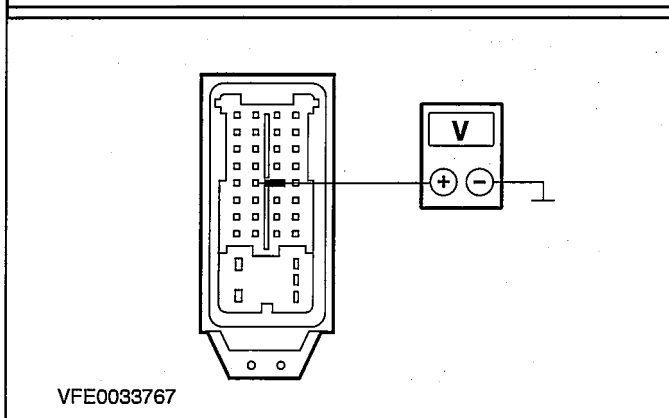
TEST CONDITIONS



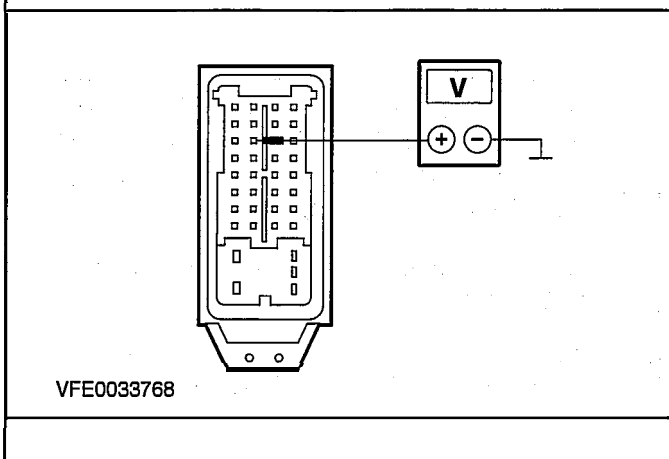
DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance at TCM, connector C676, between pin 56 and pin 63, component side.
- Is a resistance of less than 2 Ohms measured in both cases?
- **Yes**
GO to J45.
- **No**
CHECK the TCM and RENEW as necessary.
CHECK the operation of the system.

J45: CHECK THE CAN BUS BETWEEN TCM AND PCM FOR SHORT TO VOLTAGE

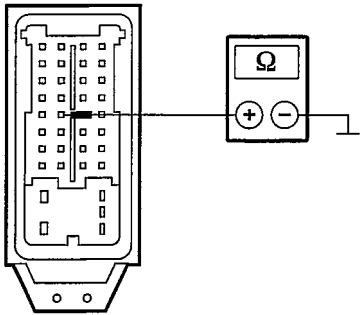
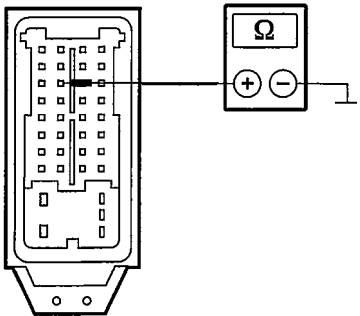
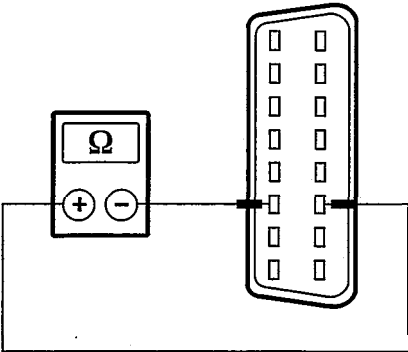


- Measure the voltage between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/RD) and ground.



- 2 Measure the voltage between the TCM, connector C676, pin 63, circuit 5-EC7 (BU/RD) and ground.
- Is a voltage measured?
- **Yes**
LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams.
CHECK the operation of the system.
- **No**
GO to J46.

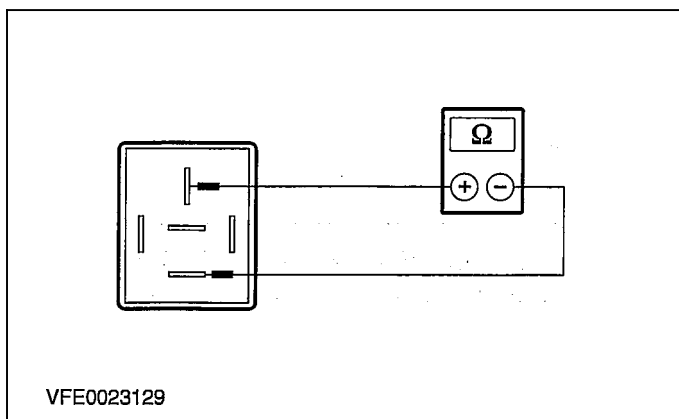
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J46: CHECK THE CAN BUS BETWEEN TCM AND PCM FOR SHORT TO GROUND  VFE0033769	1 Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/RD) and ground.
 VFE0033770	2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BUIRD) and ground. Is a resistance greater than 10,000 Ohms measured in both cases? → Yes GO to J47. → No LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.
J47: CHECK THE CAN BUS FOR SHORT CIRCUIT	
 E45951	1 Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance greater than 10,000 Ohms measured in both cases? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the short in the CAN Bus using the Wiring Diagrams. CHECK the operation of the system.

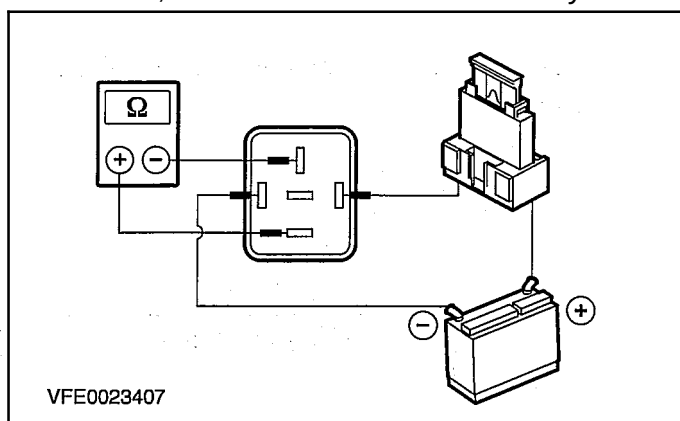
DIAGNOSIS AND TESTING

Component Tests

PCM module relay



1. Check the normally open contact in the unswitched state:
 1. Measure the resistance at the PCM module relay, between pin 3, component side and pin 5, component side.
 2. Is a resistance of more than 10,000 Ohm measured?
 3. If yes, go to 2.
 4. If no, RENEW the PCM module relay.

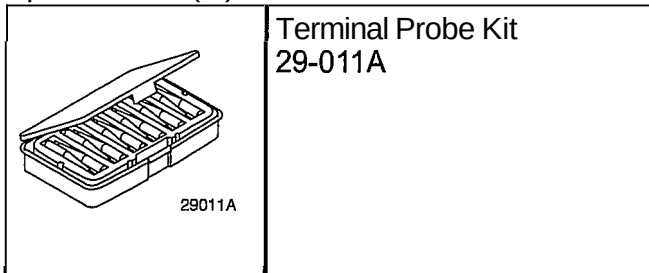


2. Check the normally open contact in the switched state:
 1. Use a fused test cable (1 A) to connect pin 1 of the PCM module relay, component side, to the battery positive terminal.
 2. Use a test cable to connect pin 2 of the PCM module relay, component side, to the battery negative terminal.
 3. Measure the resistance at the PCM module relay, between pin 3, component side and pin 5, component side.
 4. Is a resistance of less than 2 Ohm registered?
 5. If yes, then the PCM module relay is OK.
 6. If no, RENEW the PCM module relay.

DIAGNOSIS AND TESTING

Communications Network — Vehicles Built From: 1012005

Special Tool(～)



Terminal Probe Kit
29-011A

General Equipment

Digital Multimeter
Worldwide Diagnostic System (WDS)

Visual Inspection

Electrical
– Fuse(s). – Wiring harness. – Electrical connectors.

Inspection and Testing

1. CHECK the concern.
2. Visually CHECK for any obvious mechanical or electrical damage.
3. RECTIFY any obvious causes for a concern found during the visual inspection before performing any further tests. CHECK the operation of the system.
4. If the concern persists after the visual inspection, PERFORM a fault diagnosis with WDS and RECTIFY any displayed faults in accordance with the displayed fault description. CHECK the operation of the system.
5. For vehicles with no stored **fault(s)**, PROCEED in accordance with the symptom chart according to the fault symptom.
6. Following checking or elimination of the fault and after completion of operations, the fault memories of all vehicle modules must be READ OUT and any stored faults must be DELETED. READ OUT all fault memories again following a road test.

Symptom chart

Symptom chart

Symptom	Possible Sources	Action
• Bluetooth/voice control module not communicating with the diagnostic tester.	• Fuse(s). • Circuit(s). • Bluetooth/voice control module.	• GO to Pinpoint Test A.
• Generic electronic module (GEM) not communicating with the diagnostic tester.	• Fuse(s). • Circuit(s). • Generic electronic module (GEM).	• GO to Pinpoint Test G.
• ABS module or ESP module not communicating with the diagnostic tester.	• Fuse(s). • Circuit(s). • ABS module or ESP module.	• GO to Pinpoint Test E.
• Electronic automatic temperature control (EATC) module not communicating with diagnostic tester.	• Fuse(s). • Circuit(s). • Electronic automatic temperature control (EATC) module.	• GO to Pinpoint Test C.
• Powertrain control module (PCM) not communicating with the diagnostic tester	• Fuse(s). • Circuit(s). • PCM	• GO to Pinpoint Test H.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Restraints control module (RCM) not communicating with the diagnostic tester.	- Fuse(s). - Circuit(s). - Restraints control module (RCM).	GO to Pinpoint Test D.
Audio system control panel not communicating with the diagnostic tester.	- Fuse(s). - Circuit(s). - Audio system control panel.	GO to Pinpoint Test B.
Power steering pump module not communicating with the diagnostic tester.	- Fuse(s). - Circuit(s). - Power steering pump module.	GO to Pinpoint Test F.
Electronic instrument cluster not communicating with the diagnostic tester.	- Fuse(s). - Circuit(s). - Electronic instrument cluster.	GO to Pinpoint Test I.
Transmission control module (TCM) not communicating with the diagnostic tester.	- Fuse(s). - Circuit(s). - TCM.	-Vehicles with automatic clutch and gearshift actuation:GO to Pinpoint Test J. - Vehicles with automatic transmission: GO to Pinpoint Test K.
Faulty communication between the modules (ISO 9141 bus).	- Circuit(s). - Generic electronic module (GEM). - Restraints control module (RCM). - ABS module or ESP module.	GO to Pinpoint Test L.
Faulty communication between the modules (HS CAN bus).	- Circuit(s). - Electronic instrument cluster. - ABS module or ESP module. - Transmission control module (TCM) - vehicles with automatic clutch and gearshift actuation. - Transmission selector unit - vehicles with automatic clutch and gearshift actuation. - Transmission control unit (TCM) - vehicles with automatic transmission - Power steering pump module. - Powertrain control module (PCM).	GO to Pinpoint Test M.
Faulty communication between the modules (MS CAN bus).	- Circuit(s). - Electronic instrument cluster. - Audio system control panel. - Electronic automatic temperature control (EATC) module. - Generic electronic module (GEM). - Bluetooth/voice control module.	GO to Pinpoint Test N.

DIAGNOSIS AND TESTING

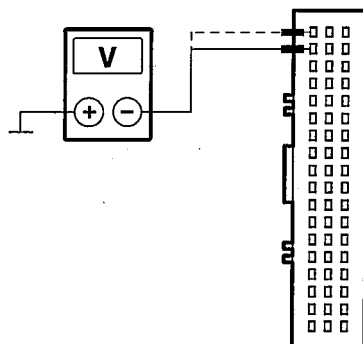
Pinpoint Tests

PINPOINT TEST K : BLUETOOTH/VOICE CONTROL MODULE NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK COMMUNICATIONS WITH THE GENERIC ELECTRONIC MODULE (GEM)	
	☐ Ignition switch in position 0.
	☐ Connect the diagnostic tool.
	☐ Select the generic electronic module (GEM) with the diagnostic tester.
	Is it possible to establish communication with the GEM? → Yes GO to A2. → No GO to Pinpoint Test N.
A2: CHECK FUSE F18	
	1 Ignition switch in position 0.
	2 CHECK fuse F18 (CJB).
	Is the fuse OK? → Yes GO to A3. → No RENEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
A3: CHECK THE VOLTAGE AT FUSE F18	
	1 Connect fuse F18 (CJB).
	☐ Measure the voltage between fuse F18 (15 A) and ground.
	Is battery voltage measured? → Yes GO to A4. → No REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
A4: CHECK THE VOLTAGE AT THE BLUETOOTH/VOICE CONTROL MODULE	
	1 Disconnect Connector C796 from bluetooth/voice control module.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E61587

DETAILS | RESULTS | ACTIONS

- 2 Measure the voltage between the bluetooth/voice control module, connector C796, pin 17, circuit 29-MC12A (OG/YE), wiring harness side and ground.

- 3 Measure the voltage between the bluetooth/voice control module, connector C796, pin 18, circuit 29-MC12 (OG/NE), wiring harness side and ground.

- Is battery voltage measured in both cases?

→ **Yes**

GO to A5.

→ **No**

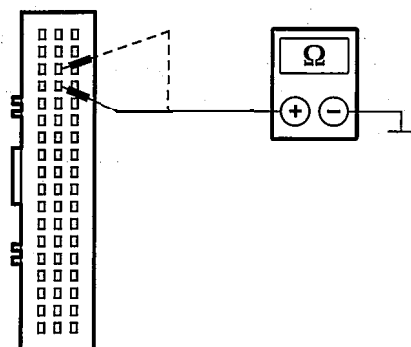
- If battery voltage is not measured during one measurement:

LOCATE and RECTIFY the break in the affected circuit between the bluetooth/voice control module and soldered connection S384 using the Wiring Diagrams. CHECK the operation of the system.

- If battery voltage is not measured during both measurements:

LOCATE and RECTIFY the break in the circuit between soldered connection S384 and the CJB using the Wiring Diagrams. CHECK the operation of the system.

A5: CHECK THE GROUND CONNECTION AT THE BLUETOOTH/VOICE CONTROL MODULE



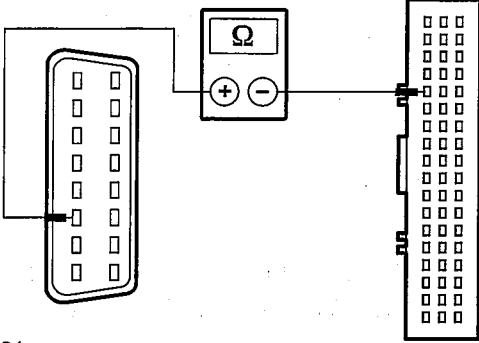
E61589

- 1 Measure the resistance between the bluetooth/voice control module, connector C796, pin 33, circuit 91-MC12A (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 Measure the resistance between the bluetooth/voice control module, connector C796, pin 34, circuit 91-MC12 (BK/YE), wiring harness side and ground. - Is a resistance of less than 2 Ohms measured in both cases? → Yes GO to A6. → No - If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and RECTIFY the break in the affected circuit between the bluetooth/voice control module and soldered connection S387 using the Wiring Diagrams. CHECK the operation of the system. - If a resistance greater than 2 Ohm is measured in both cases: LOCATE and RECTIFY the open circuit in the relevant circuit between soldered connection S387 and ground connection G12 using the Wiring Diagrams. CHECK the operation of the system.
A6: CHECK FOR OPEN CIRCUIT BETWEEN THE BLUETOOTH/VOICE CONTROL MODULE AND THE DATA LINK CONNECTOR (DLC)	
E61590	1 Measure the resistance between the bluetooth/voice control module, connector C796, pin 15, circuit 5-XL10A (BU), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to A7. → No LOCATE and REPAIR the break in circuit 5-XL10A (BU) between the bluetooth/voice control module and soldered connection S382 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A7: CHECK FOR OPEN CIRCUIT BETWEEN THE BLUETOOTH/VOICE CONTROL MODULE AND THE DLC	
 E61591	1 Measure the resistance between the bluetooth/voice control module, connector C796, pin 14, circuit 4-XL10A (GY), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the bluetooth/voice control module. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 4-XL10A (GY) between the bluetooth/voice control module and soldered connection S383 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST L : AUDIO SYSTEM CONTROL PANEL NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER.

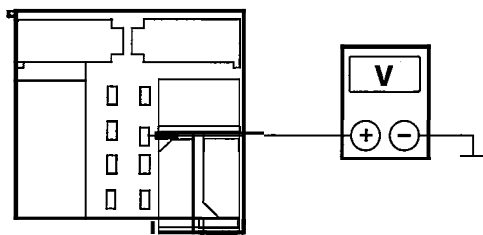
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK COMMUNICATIONS WITH THE GENERIC ELECTRONIC MODULE (GEM)	
	1 Ignition switch in position 0. 2 Connect the diagnostic tool. 3 Select the generic electronic module (GEM) with the diagnostic tester. • Is it possible to establish communication with the GEM via the MS CAN BUS? → Yes GO to B2. → No GO to Pinpoint Test N.
B2: CHECK FUSE F18	
	1 CHECK fuse F18 (CJB). • Is the fuse OK? → Yes GO to B3. → No RENEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B3: CHECK THE VOLTAGE AT FUSE F18	
	☐ 1 Connect fuse F18 (CJB).
	☐ 2 Measure the voltage between fuse F18 (15 A) and ground. Is battery voltage measured? → Yes GO to B4. → No REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
B4: CHECK FUSE F44	
	☐ 1 CHECK fuse F44 (CJB).
	Is the fuse OK? → Yes GO to B5. → No RENEW fuse F44 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
B5: CHECK THE VOLTAGE AT FUSE F44	
	☐ 1 Connect fuse F44 (CJB).
	☐ 2 Ignition switch in position I.
	☐ 3 Measure the voltage between fuse F44 (3 A) and ground. Is battery voltage measured? → Yes GO to B6. → No REPAIR the voltage supply to fuse F44 using the Wiring Diagrams. CHECK the operation of the system.
B6: CHECK VOLTAGE AT AUDIO SYSTEM CONTROL PANEL	
	☐ 1 Ignition switch in position 0.
	☐ Disconnect connector C775 from audio system control panel.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E54982

DETAILS RESULTS ACTIONS

Measure the voltage between the audio system control panel, connector **C775**, pin 15, circuit 29-MD15 (OG/BK), wiring harness side and ground.

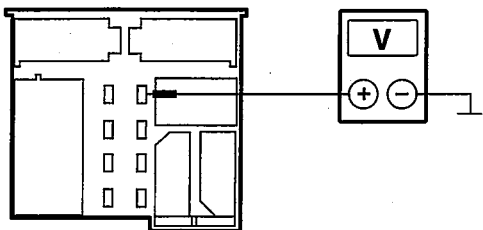
- Is battery voltage measured?

→ **Yes**

GO to B7.

→ **No**

LOCATE and REPAIR the open circuit between the audio/navigation control panel and fuse **F18** using the Wiring Diagrams. CHECK the operation of the system.

B7: CHECK VOLTAGE AT AUDIO SYSTEM CONTROL PANEL

E54983

1 Ignition switch in position I.

2 Measure the voltage between the audio system control panel, connector **C775**, pin 16, circuit 75-MD15 (YE/GN), wiring harness side and ground.

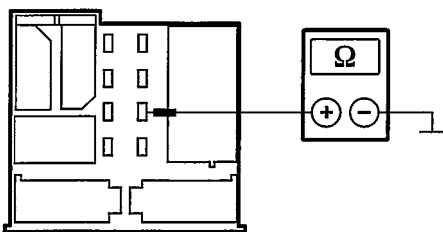
- Is battery voltage measured?

→ **Yes**

GO to B8.

→ **No**

LOCATE and REPAIR the open circuit between the audio system control panel and fuse **F44** using the Wiring Diagrams. CHECK the operation of the system.

B8: CHECK GROUND CONNECTION OF AUDIO SYSTEM CONTROL PANEL

E61594

1 Ignition switch in position 0.

2 Measure the resistance between the audio system control panel, connector **C775**, pin 11, circuit 91-MD34 (BK/YE), wiring harness side and ground.

- Is a resistance of less than 2 Ohms registered?

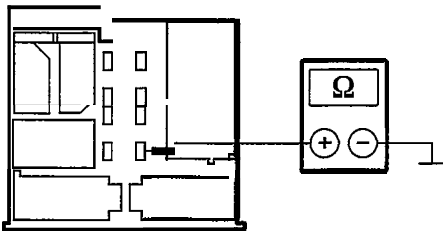
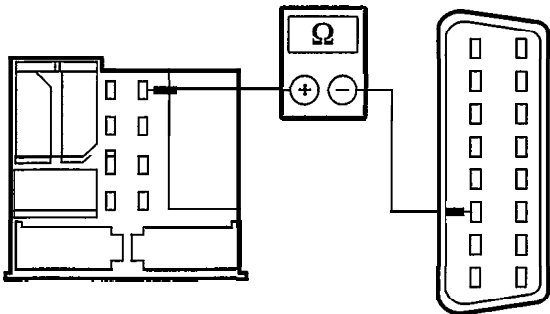
→ **Yes**

GO to B9.

→ **No**

LOCATE and REPAIR the relevant open circuit between the audio system control panel and ground connection **G12** using the Wiring Diagrams. CHECK the operation of the system.

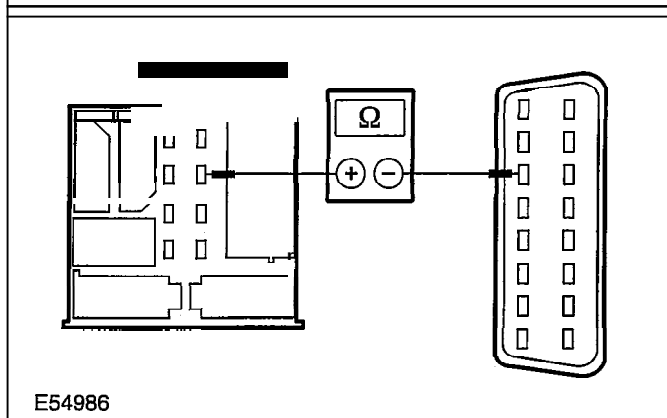
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B9: CHECK GROUND CONNECTION OF AUDIO SYSTEM CONTROL PANEL  E54984	Measure the resistance between the audio system control panel, connector C775, pin 12, circuit 91-MDI5 (BWGN), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → Yes GO to B10. → No LOCATE and REPAIR the relevant open circuit between the audio system control panel and ground connection G16 using the Wiring Diagrams. CHECK the operation of the system.
B10: CHECK FOR OPEN CIRCUIT BETWEEN THE AUDIO SYSTEM CONTROL PANEL AND THE DLC  E54985	Measure the resistance between the audio system control panel, connector C775, pin 9, circuit 4-XL10 (GY), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to B11. → No LOCATE and REPAIR the open circuit between the audio system control panel and soldered connection S286 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

B II: CHECK FOR OPEN CIRCUIT BETWEEN THE AUDIO SYSTEM CONTROL PANEL AND THE DLC

- 1 Measure the resistance between the audio system control panel, connector C775, pin 10, circuit 5-XL10 (BU), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK and if necessary RENEW the audio system control panel. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the open circuit between the audio system control panel and soldered connection S285 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST M : ELECTRONIC AUTOMATIC TEMPERATURE CONTROL (EATC) MODULE NOT COMMUNICATING WITH DIAGNOSTIC TESTER.

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

C1: CHECK COMMUNICATION WITH THE GENERIC ELECTRONIC MODULE (GEM)

- 1 Ignition switch in position 0.

- 2 Connect the diagnostic tool.

- ☐ Select the generic electronic module (GEM) with the diagnostic tester.

- Is it possible to establish communication with the GEM?

→ **Yes**

GO to C2.

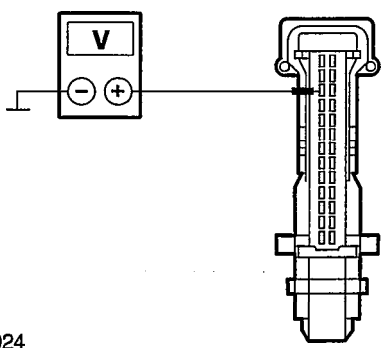
→ **No**

GO to Pinpoint Test N.

C2: CHECK FUSE F4

- 1 Ignition switch in position 0.

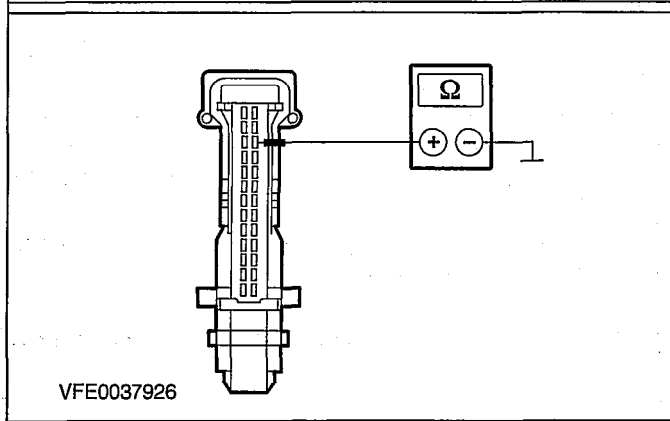
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F4 (BJB). Is the fuse OK? → Yes GO to C3. → No RENEW fuse F4 (10 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
C3: CHECK THE VOLTAGE AT FUSE F4	
	1 Connect fuse F4 (BJB). 2 Measure the voltage between fuse F4 (10 A) and ground. Is battery voltage measured? → Yes GO to C4. → No REPAIR the voltage supply to fuse F4 using the Wiring Diagrams. CHECK the operation of the system.
C4: CHECK VOLTAGE AT THE EATC MODULE	
 VFE0037924	1 Ignition switch in position 0. 2 Disconnect Connector C366 from EATC module. 3 Measure the voltage between the EATC module, connector C366, pin 11, circuit 29-FA43 (OG/WH), wiring harness side and ground. Is battery voltage measured? → Yes GO to C5. → No LOCATE and REPAIR the open circuit between the EATC module and fuse F4 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

C5: CHECK GROUND CONNECTION OF THE EATC MODULE

- 1 Measure the resistance between the EATC module, connector C366, pin 24, circuit 31-FA43 (BK), wiring harness side and ground.

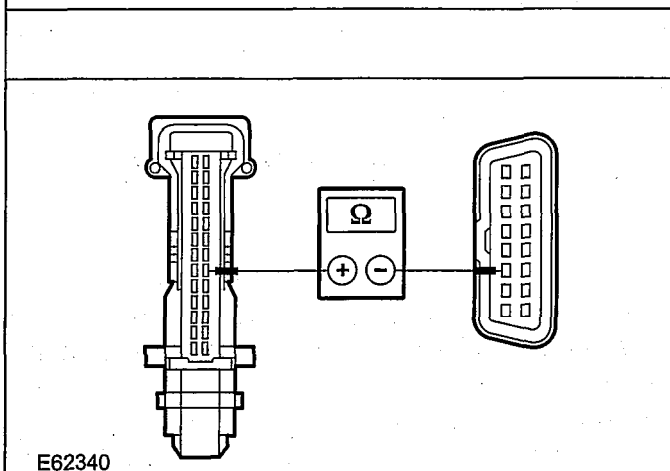
- Is a resistance of less than 2 Ohms registered?

→ **Yes**
GO to C6.

→ **No**
LOCATE and REPAIR the break in the affected circuit between the EATC module and ground connection G12 using the Wiring Diagrams. CHECK the operation of the system.

C6: CHECK FOR OPEN CIRCUIT BETWEEN THE EATC MODULE AND THE DATA LINK CONNECTOR (DLC)

⚠ CAUTION: The following measurement may only be performed using the WDS digital multi-meter. Failure to observe this instruction can lead to damage.



- 1 Disconnect Connector C367 from EATC module.

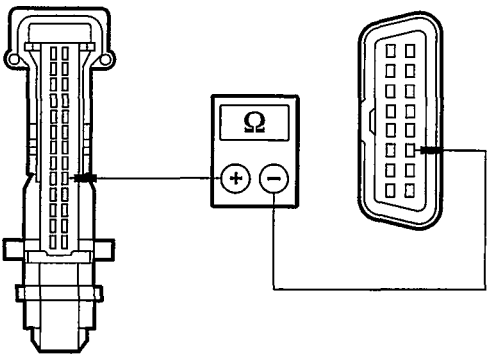
- 2 Measure the resistance between the EATC module, connector C367, pin 19, circuit 5-EC10 (BU), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side.

Is a resistance of less than 2 Ohms registered?

→ **Yes**
GO to C7.

→ **No**
LOCATE and RECTIFY the break in circuit 5-EC10 (BU) between the EATC module and soldered connection S287 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C7: CHECK FOR OPEN CIRCUIT BETWEEN THE EATC MODULE AND THE DLC	
CAUTION: The following measurement may only be performed using the WDS digital multi-meter. Failure to observe this instruction can lead to damage.	
 E62341	☐ Measure the resistance between the EATC module, connector C367, pin 18, circuit 4-EC10 (GY), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (BUIRD), wiring harness side. - Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the EATC module. CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 4-EC10 (GY) between the EATC module and soldered connection S289 using the Wiring Diagrams. CHECK the operation of the system.

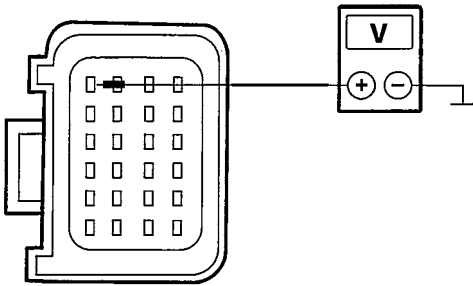
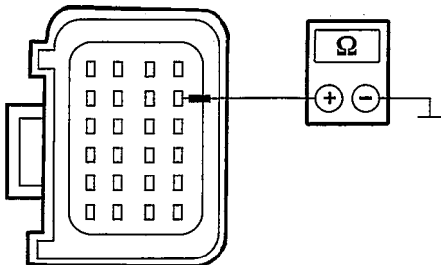
PINPOINT TEST N : RESTRAINTS CONTROL MODULE (RCM) NOT COMMUNICATING **WITH** THE DIAGNOSTIC TESTER.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
WARNINGS: ▲ The backup power supply must be depleted to prevent the risk of accidental airbag deployment. After disconnecting the battery, wait at least 1 minute before starting work on the safety restraint system. Failure to follow these instructions may result in personal injury. ▲ Do not program any keycodes while working on the safety restraint system in order to prevent the risk of accidental deployment of safety restraint system components. Failure to follow these instructions may result in personal injury. ▲ Only test the connectors of airbags or other safety restraint systems using the correct test probe adapter. Failure to follow these instructions may result in personal injury.	
DI: DETERMINE THE FAULT CONDITION	
	☒ 1 Ignition switch in position 0. ☐ Connect the diagnostic tool.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Select the generic electronic module (GEM) with the diagnostic tester. Is it possible to establish communication with the GEM? → Yes GO to D2. → No GO to Pinpoint Test L.
D2: CHECK FUSE F39	
	1 Ignition switch in position 0. 2 CHECK fuse F39 (CJB). Is the fuse OK? → Yes GO to D3. → No RENEW fuse F39 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
D3: CHECK THE VOLTAGE AT FUSE F39	
	1 Connect fuse F39 (CJB). 2 Ignition switch in position II. 3 Measure the voltage between fuse F39 (7.5 A) and ground. Is battery voltage measured? → Yes GO to D4. → No REPAIR the voltage supply to fuse F39 using the Wiring Diagrams. CHECK the operation of the system.
D4: CHECK THE VOLTAGE AT THE RESTRAINTS CONTROL MODULE (RCM)	
	1 Ignition switch in position 0. ☐ Connect the ground cable to the battery. 5 Ignition switch in position II.

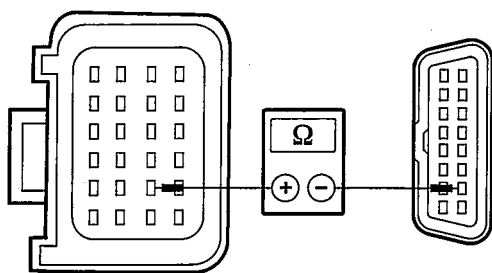
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0028954	6 Measure the voltage between the restraints control module (RCM), connector C500 (vehicles built for Japan: connector C500A), pin 1, circuit 15-JA10 (GN/OG), wiring harness side and ground. Is battery voltage measured? → Yes GO to D5. → No LOCATE and REPAIR the break in circuit 15-JA10 (GN/OG) between the restraints control module (RCM) and fuse F39 using the Wiring Diagrams. CHECK the operation of the system.
D5: CHECK THE GROUND CONNECTION OF THE RESTRAINTS CONTROL MODULE (RCM)	
 VFE0028956	☐ Ignition switch in position 0. 2 Measure the resistance between the restraints control module (RCM), connector C500 (vehicles built for Japan: connector C500A), pin 20, circuit 91-JA10 (BWRD), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to D6. → No LOCATE and REPAIR the break in circuit 91-JA10 (BWRD) between the restraints control module (RCM) and ground connection G21 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

D6: CHECK FOR OPEN CIRCUIT BETWEEN THE RESTRAINTS CONTROL MODULE (RCM) AND THE DATA LINK CONNECTOR (DLC)

VFE0033752

- 1 Measure the resistance between the restraints control module (RCM), connector C500 (vehicles built for Japan: connector C500A), pin 17, circuit 4-EE7 (GYIRD), wiring harness side and the DLC, C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side.

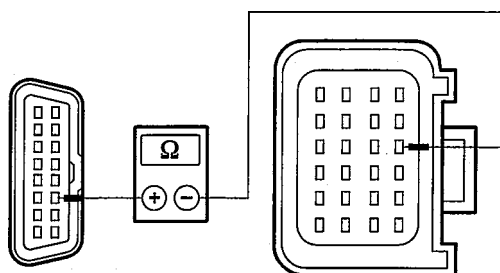
- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to D7.

→ **No**

LOCATE and REPAIR the break in circuit 4-EE7 (GYIRD) between the restraints control module (RCM) and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

D7: CHECK FOR OPEN CIRCUIT BETWEEN THE RESTRAINTS CONTROL MODULE (RCM) AND THE DLC

E65372

- 1 Measure the resistance between the DLC, connector C308, pin 11, circuit 5-EC2 (BUIRD), wiring harness side and the restraints control module (RCM), connector C500 (vehicles built for Japan: connector C500A), pin 4, circuit 5-XL11 (BUIRD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

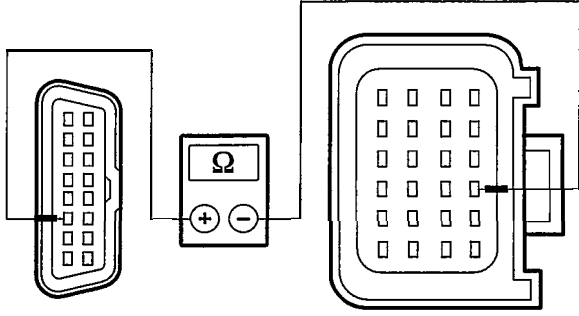
→ **Yes**

GO to D8.

→ **No**

LOCATE and REPAIR the break in circuit 5-XL11 (BUIRD) between the restraints control module (RCM) and soldered connection S279 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D8: CHECK FOR OPEN CIRCUIT BETWEEN THE RESTRAINTS CONTROL MODULE (RCM) AND THE DLC	
 E65373	1 Measure the resistance between the DLC, connector C308, pin 3, circuit 4-EC2 (GYIRD), wiring harness side and the restraints control module (RCM), connector C500 (vehicles built for Japan: connector C500A), pin 3, circuit 4-XL11 (GYIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the restraints control module (RCM). CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 4-XL11 (GYIRD) between the restraints control module (RCM) and soldered connection S288 using the Wiring Diagrams. CHECK the operation of the system.

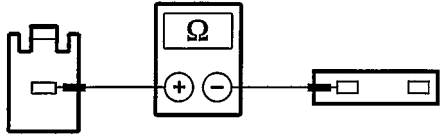
PINPOINT TEST O : ABS MODULE OR ESP MODULE NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0. 2 Connect the diagnostic tool. 3 Select the generic electronic module (GEM) with the diagnostic tester. • Is it possible to establish communication with the GEM? → Yes GO to E2. → No GO to Pinpoint Test L.
E2: CHECK FUSE F5	
	1 Ignition switch in position 0.

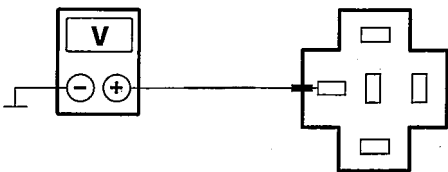
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F5 (CJB). Is the fuse OK? → Yes GO to E3. → No RENEW fuse F5 (20 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
E3: CHECK THE VOLTAGE AT FUSE F5	
	1 Connect fuse F5 (CJB). 2 Measure the voltage between fuse F5 (20 A) and ground. Is battery voltage measured? → Yes GO to E7. → No GO to E4.
E4: CHECK FUSE FH	
	☐ Ignition switch in position 0. A CHECK fuse FH (BJB). Is the fuse OK? → Yes GO to E5. → No RENEW fuse FH (60 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
E5: CHECK THE VOLTAGE AT FUSE FH	
	1 Connect fuse FH (BJB). 2 Measure the voltage between fuse FH (60 A) and ground. Is battery voltage measured? → Yes GO to E6. → No REPAIR the voltage supply to fuse FH using the Wiring Diagrams. CHECK the operation of the system.

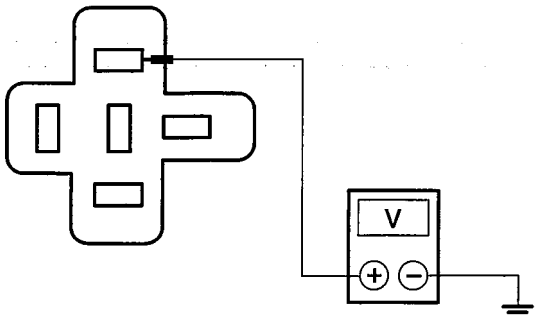
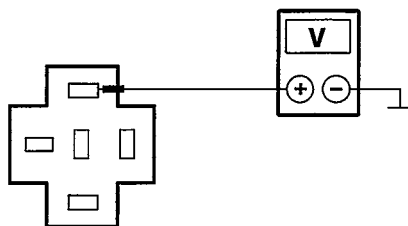
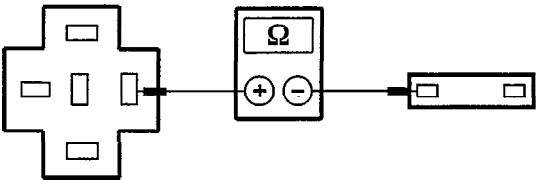
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E6: CHECK FOR OPEN CIRCUIT BETWEEN FUSE FH AND FUSE F5	
 E51763	☐ Disconnect connector C1001 from BJB.
	2 Measure resistance between BJB, connector C1001, circuit 30-DB5 (RD), wiring harness side and fuse F5 (CJB), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the BJB and INSTALL a new one as necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 30-DB8 (RD) between fuse FH and fuse F5 using the Wiring Diagrams. CHECK the operation of the system.
E7: CHECK FUSE F37	
	1 CHECK fuse F37 (CJB).
	Is the fuse OK? → Yes GO to E8. → No RENEW fuse F37 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
E8: CHECK THE VOLTAGE AT FUSE F37	
	1 Connect fuse F37 (CJB).
	Ignition switch in position II.
	3 Measure the voltage between fuse F37 (3 A) and ground. - Is battery voltage measured? → Yes - Vehicles with ABS and electronic stability program (ESP): GO to E15. - Vehicles with ABS without electronic stability program (ESP): GO to E22. → No GO to E9.
E9: CHECK THE VOLTAGE AT THE IGNITION RELAY	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0037103	2 Disconnect ignition relay from socket C328. 3 Measure the voltage between the ignition relay, socket C328, pin 3, circuit 30-BB8 (RD), wiring harness side and ground. Is battery voltage measured? → Yes GO to E12. → No GO to E10.
E10: CHECK FUSE FF	
	☐ Ignition switch in position 0. CHECK fuse FF (BJB). Is the fuse OK? → Yes GO to E11. → No RENEW fuse FF (60 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
E11: CHECK THE VOLTAGE AT FUSE FF	
	1 Connect fuse FF (BJB). 2 Measure the voltage between fuse FF (60 A) and ground. Is battery voltage measured? → Yes LOCATE and REPAIR the break in circuit 30-BB8 (RD) between the ignition relay and fuse FF using the Wiring Diagrams. CHECK the operation of the system. → No REPAIR the voltage supply to fuse FF using the Wiring Diagrams. CHECK the operation of the system.
E12: CHECK THE VOLTAGE AT THE IGNITION RELAY	
	1 Ignition switch in position II.

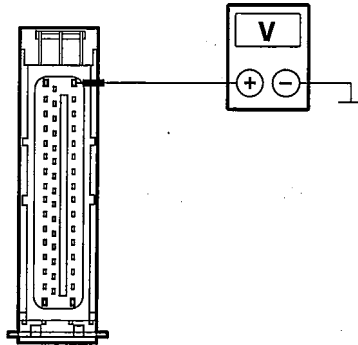
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 V3201467	2 Measure the voltage between the ignition relay, socket C328, pin 1, circuit 15-BB7 (GN/BU), wiring harness side and ground. Is battery voltage measured? → Yes GO to E13. → No LOCATE and RECTIFY the break in the circuit between the ignition relay and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
E13: CHECK GROUND CONNECTION AT IGNITION RELAY	
 VFE0037106	1 Measure the resistance between the ignition relay, socket C328, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to E14. → No LOCATE and RECTIFY the break in the circuit between the ignition relay and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
E14: CHECK CIRCUIT BETWEEN THE IGNITION RELAY AND FUSE F37 FOR OPEN CIRCUIT	
 E47287	Measure the resistance between the ignition relay, socket C328, pin 5, circuit 15-DB2 (GN/BU), wiring harness side and fuse F37 (CJB). Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the ignition relay. CHECK the operation of the system. → No LOCATE and REPAIR the open circuit between the ignition relay and fuse F37 using the Wiring Diagrams. CHECK the operation of the system.
E15: CHECK THE VOLTAGE AT THE ELECTRONIC STABILITY PROGRAM MODULE	
	1 Ignition switch in position 0. 2 Disconnect Connector C303 from electronic stability program module..

DIAGNOSIS AND TESTING

TEST CONDITIONS

VFE0028952



DETAILS RESULTS ACTIONS

- 3 Measure the voltage between the electronic stability program module, connector C303, pin 32, circuit 29-CF6 (OGNE), wiring harness side and ground.

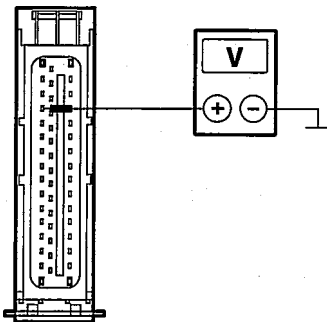
- Is battery voltage measured?

→ **Yes**
GO to E16.

→ **No**
LOCATE and REPAIR the break in circuit 29-CF6 (OGNE) between the electronic stability program module and fuse F5 using the Wiring Diagrams. CHECK the operation of the system.

E16: CHECK THE VOLTAGE AT THE ELECTRONIC STABILITY PROGRAM MODULE

VFE0028953



- 1 Ignition switch in position II.

- 2 Measure the voltage between the electronic stability program module, connector C303, pin 4, circuit 15-CF6 (GNNE), wiring harness side and ground.

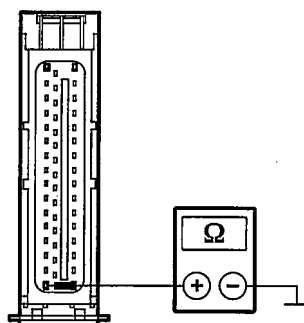
- Is battery voltage measured?

→ **Yes**
GO to E17.

→ **No**
LOCATE and REPAIR the break in circuit 15-CF6 (GNNE) between the electronic stability program module and fuse F37 using the Wiring Diagrams. CHECK the operation of the system.

E17: CHECK THE GROUND CONNECTION OF THE ELECTRONIC STABILITY PROGRAM MODULE

VFE0028950



- 1 Ignition switch in position 0.

- 2 Measure the resistance between the electronic stability program module, connector C303, pin 47, circuit 31-CF13 (BK), wiring harness side and ground.

- Is a resistance of less than 2 Ohms registered?

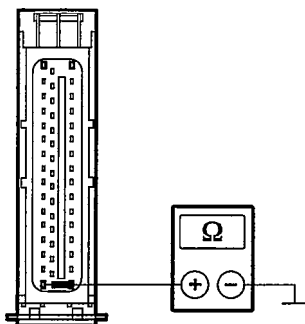
→ **Yes**
GO to E18.

→ **No**
LOCATE and REPAIR the break in circuit 31-CF13 (BK) between the electronic stability program module and ground connection G23 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E18: CHECK THE GROUND CONNECTION OF THE ELECTRONIC STABILITY PROGRAM MODULE

VFE0028950

- 1 Measure the resistance between the electronic stability program module, connector C303, pin 16, circuit 31-CF6 (BK), wiring harness side and ground.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to E19.

→ **No**

LOCATE and REPAIR the break in circuit 31-CF6 (BK) between the electronic stability program module and ground connection G23 using the Wiring Diagrams. CHECK the operation of the system.

E19: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC STABILITY PROGRAM MODULE AND THE DLC

VFE0033604

- 1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and the electronic stability program module, connector C303, pin 11, circuit 4-EC9 (GY), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to E20.

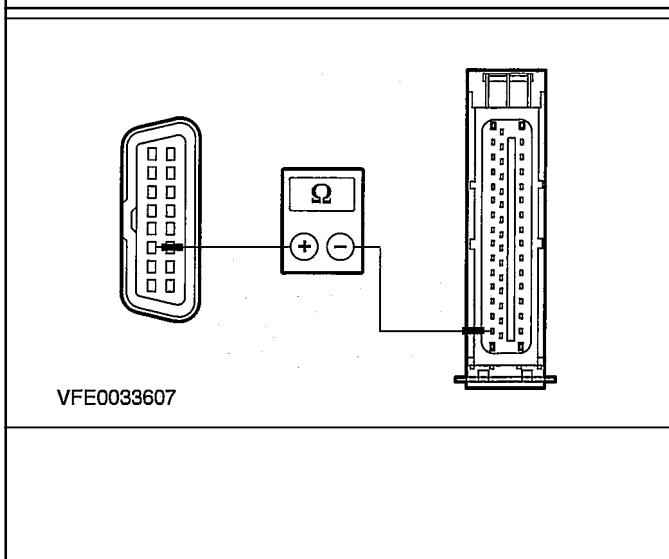
→ **No**

LOCATE and REPAIR the break in the circuit between the electronic stability program module and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E20: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC STABILITY PROGRAM MODULE AND THE DLC

- 1 Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and the electronic stability program module, connector C303, pin 15, circuit 5-EC9 (BU), wiring harness side.

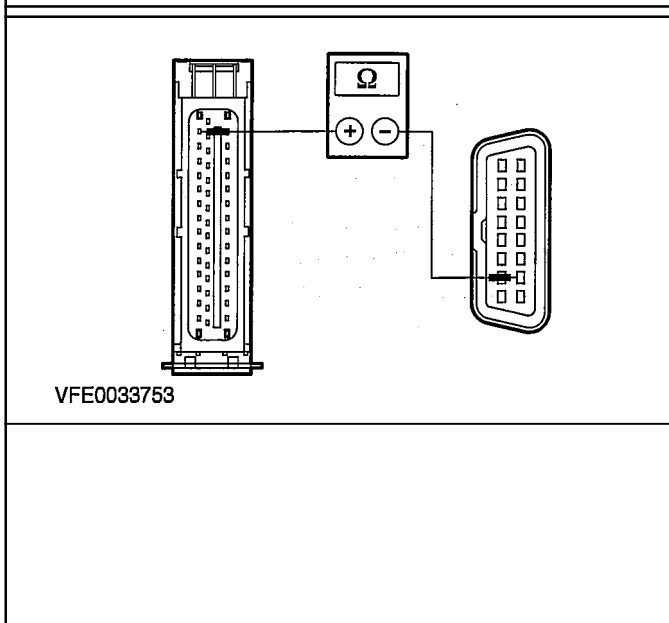
- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to E21.

→ **No**

LOCATE and REPAIR the break in the circuit between the electronic stability program module and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E21: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC STABILITY PROGRAM MODULE AND THE DATA LINK CONNECTOR (DLC)

- 1 Measure the resistance between the electronic stability program module, connector C303, pin 2, circuit 4-EE6 (GY), wiring harness side and DLC, connector C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK and if necessary RENEW the electronic stability program module. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in the circuit between the electronic stability program module and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

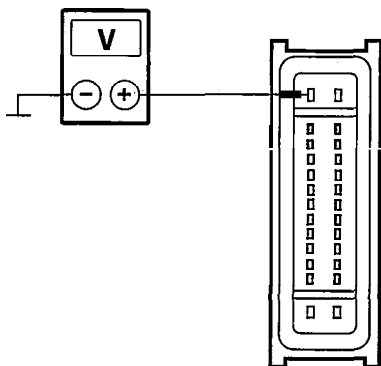
E22: CHECK THE VOLTAGE AT THE ABS MODULE

- 1 Ignition switch in position 0.

- 2 Disconnect connector C304 from ABS module.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E51764

DETAILS/RESULTS/ACTIONS

Measure the voltage between the ABS module, connector C304, pin 1, circuit 29-CF6 (OGNE), wiring harness side and ground.

- Is battery voltage measured?

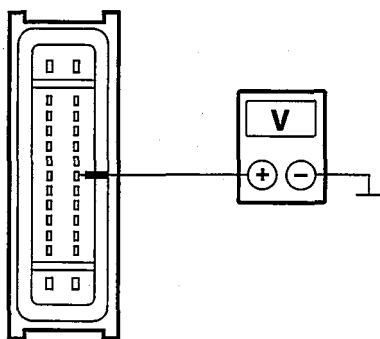
→ **Yes**

GO to E23.

→ **No**

LOCATE and REPAIR the break in circuit 29-CF6 (OGNE) between the ABS module and fuse F5 using the Wiring Diagrams. CHECK the operation of the system.

E23: CHECK THE VOLTAGE AT THE ABS MODULE



E51765

- ☐ Ignition switch in position II.

- 2** Measure the voltage between the ABS module, connector C304, pin 20, circuit 15-CF6 (GNNE), wiring harness side and ground.

- Is battery voltage measured?

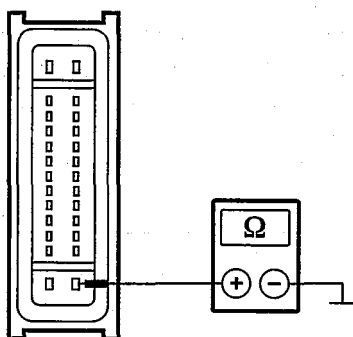
→ **Yes**

GO to E24.

→ **No**

LOCATE and REPAIR the break in circuit 15-CF6 (GNNE) between the ABS module and fuse F37 using the Wiring Diagrams. CHECK the operation of the system.

E24: CHECK THE GROUND CONNECTION OF THE ABS MODULE



E51766

- 1** Ignition switch in position 0.

- T** Measure the resistance between the ABS module, connector C304, pin 26, circuit 31-CF6 (BK), wiring harness side and ground.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to E25.

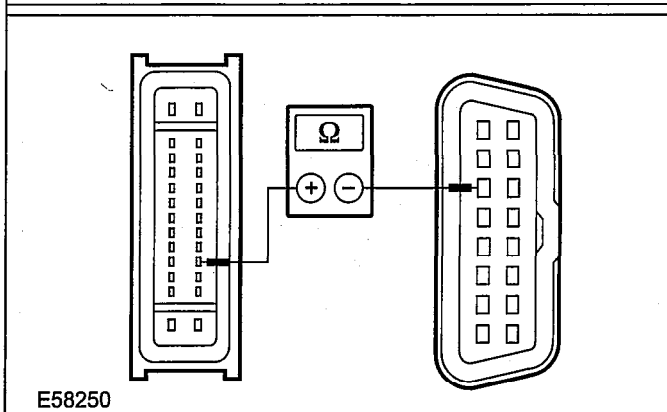
→ **No**

LOCATE and REPAIR the break in circuit 31-CF6 (BK) between the ABS module and ground connection G23 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

E25: CHECK FOR OPEN CIRCUIT BETWEEN THE ABS MODULE AND THE DLC

- 1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and the ABS module, connector C304, pin 23, circuit 4-EC9 (GY), wiring harness side.

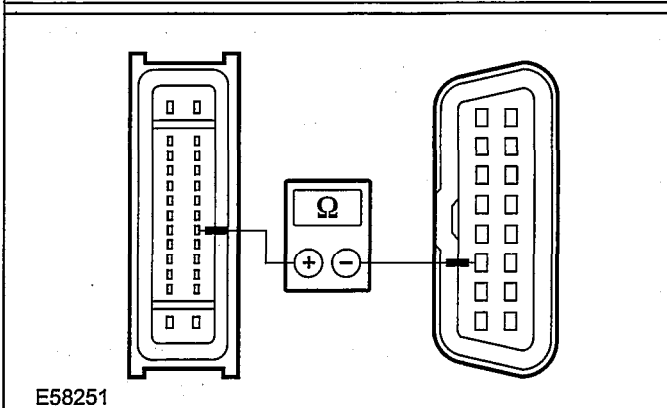
- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to E26.

→ **No**

LOCATE and REPAIR the break in the circuit between the ABS module and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E26: CHECK FOR OPEN CIRCUIT BETWEEN THE ABS MODULE AND THE DLC

- 1 Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and the ABS module, connector C304, pin 21, circuit 5-EC9 (BU), wiring harness side.

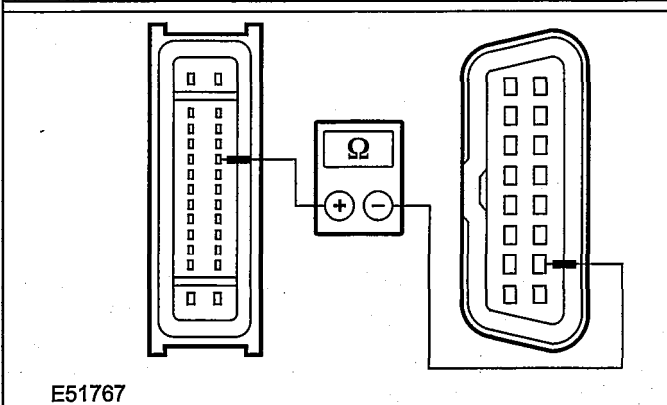
- Is a resistance of less than 2 Ohms registered?

→ **Yes**

GO to E27.

→ **No**

LOCATE and REPAIR the break in the circuit between the ABS module and the DLC using the Wiring Diagrams. CHECK the operation of the system.

E27: CHECK FOR OPEN CIRCUIT BETWEEN THE ABS MODULE AND THE DATA LINK CONNECTOR (DLC)

- 1 Measure the resistance between the ABS module, connector C304, pin 18, circuit 4-EE6 (GY), wiring harness side and DLC, connector C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK the ABS module and if necessary INSTALL a new one. CHECK the operation of the system.

→ **No**

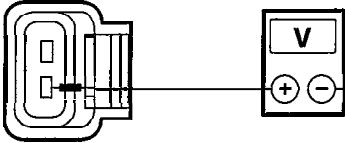
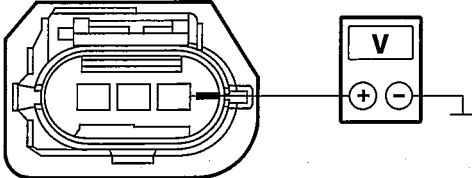
LOCATE and REPAIR the break in the circuit between the ABS module and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

PINPOINT TEST P : POWER STEERING PUMP MODULE NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER.

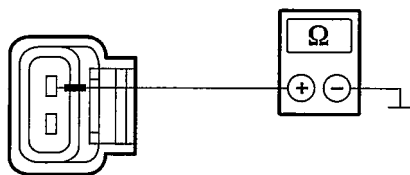
TEST CONDITIONS	DETAILS RESULTS ACTIONS
F1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0.
	2 Connect the diagnostic tool.
	☐ Select the powertrain control module (PCM) with the diagnostic tester. Is it possible to establish communication with the PCM?
	→ Yes GO to F2. → No GO to Pinpoint Test M.
F2: TEST FUSE FA	
	1 Ignition switch in position 0.
	☐ CHECK Fuse FA (BJB). Is the fuse OK?
	→ Yes GO to F3. → No RENEW fuse FA (80 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
F3: TEST VOLTAGE AT FUSE FA	
	1 Connect Fuse FA (BJB).
	☐ Measure the voltage between fuse FA (80A) and ground. Is battery voltage measured?
	→ Yes GO to F4. → No REPAIR the voltage supply to fuse FA using the Wiring Diagrams. CHECK the operation of the system.
F4: CHECK THE VOLTAGE AT THE POWER STEERING PUMP MODULE	
	1 Disconnect Connector C280 from the power steering pump module.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS	RESULTS	ACTIONS
 VFE0037902		2	Measure the voltage between the power steering pump module, connector C280, pin 1, circuit 30-CE7 (RD), wiring harness side and ground.	Is battery voltage measured? → Yes GO to F5. → No LOCATE and REPAIR the break in circuit 30-CE7 (RD), between the power steering pump module and fuse FA using the Wiring Diagrams. CHECK the operation of the system.
F5: CHECK THE VOLTAGE AT THE POWER STEERING PUMP MODULE				
		1	Disconnect Connector C281 from the power steering pump module.	
		2	Ignition switch in position II.	
 VFE0037903		3	Measure the voltage between the power steering pump module, connector C281, pin 1, circuit 15-CE7 (GNIBU), wiring harness side and ground.	Is battery voltage measured? → Yes GO to F6. → No LOCATE and REPAIR the break in circuit 15-CE7 (GN/BU), between the power steering pump module and soldered connection S138 using the Wiring Diagrams. CHECK the operation of the system.
F6: CHECK THE GROUND CONNECTION OF THE POWER STEERING PUMP MODULE				
		1	Ignition switch in position 0.	

DIAGNOSIS AND TESTING

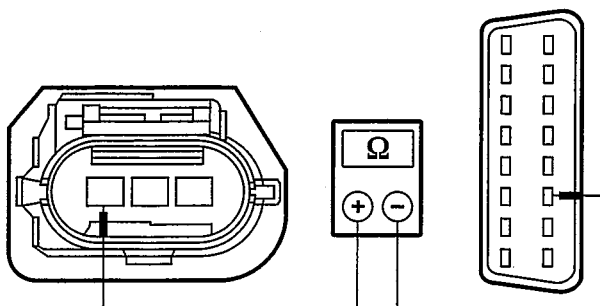
TEST CONDITIONS



VFE0037904

DETAILS/RESULTS/ACTIONS

- ☐ Measure the resistance between the power steering pump module, connector C280, pin 2, circuit 31-CE7 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to F7.
- **No**
LOCATE and REPAIR the break in circuit 31-CE7 (BK), between the power steering pump and ground connection G32 using the Wiring Diagrams. CHECK the operation of the system.

F7: CHECK FOR OPEN CIRCUIT BETWEEN THE POWER STEERING PUMP MODULE AND THE DATA LINK CONNECTOR (DLC)

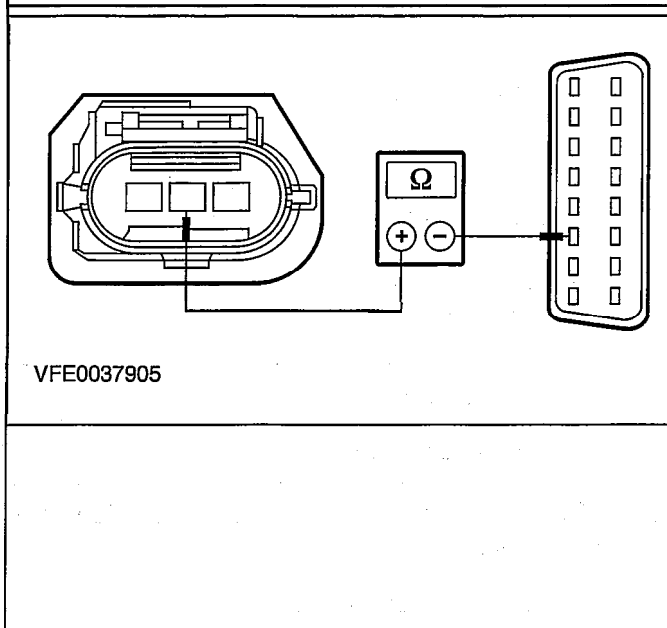
VFE0037906

- 1 Measure the resistance between the power steering pump module, connector C281, pin 3, circuit 4-EC8B (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to F8.
- **No**
LOCATE and REPAIR the break in circuit 4-EC8B (GYM) between the power steering pump module and soldered connection S130 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

F8: CHECK FOR OPEN CIRCUIT BETWEEN THE POWER STEERING PUMP MODULE AND THE DATA LINK CONNECTOR (DLC)

- 1 Measure the resistance between the power steering pump module, connector C281, pin 2, circuit 5-EC8B (BUWH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

CHECK and if necessary RENEW the power steering pump module. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the break in circuit 5-EC8B (BUWH) between the power steering pump module and soldered connection S131 using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST Q : GENERIC ELECTRONIC MODULE (GEM) NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER.

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

G1: DETERMINE THE FAULT CONDITION

- 1 Ignition switch in position 0.

- 2 Connect the diagnostic tool.

- 3 Select the restraints control module (RCM) with the diagnostic tester.

- Is it possible to establish communication with the restraints control module (RCM)?

→ **Yes**

GO to G2.

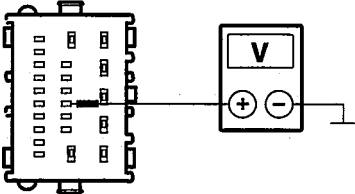
→ **No**

GO to Pinpoint Test N.

G2: CHECK FUSE F38

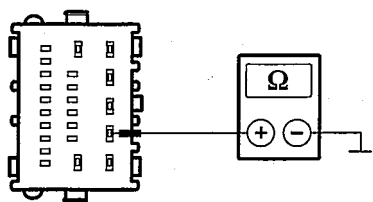
- 1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK fuse F38 (CJB). Is the fuse OK? → Yes GO to G3. → No RENEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
G3: CHECK THE VOLTAGE AT FUSE F38	
	☐ Connect fuse F38 (CJB). 2 Ignition switch in position II. 3 Measure the voltage between fuse F38 (7.5 A) and ground. Is battery voltage measured? → Yes GO to G4. → No REPAIR the voltage supply to fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
G4: CHECK THE VOLTAGE AT THE GEM	
	1 Ignition switch in position 0. 2 Disconnect connector C319 (white) from GEM. 3 Ignition switch in position II.
 VFE0028972	4 Measure the voltage between the GEM, connector C319 (white), pin 10, circuit 15-DK20 (GNI0G), wiring harness side and ground. Is battery voltage measured? → Yes GO to G5. → No LOCATE and REPAIR the break in circuit 15-DK20 (GNI0G) between the GEM and soldered connection S3 using the Wiring Diagrams. CHECK the operation of the system.
G5: TEST THE GEM GROUND CONNECTION	
	1 Ignition switch in position 0. 2 Disconnect connector C318 (black) from GEM.

DIAGNOSIS AND TESTING

TEST CONDITIONS

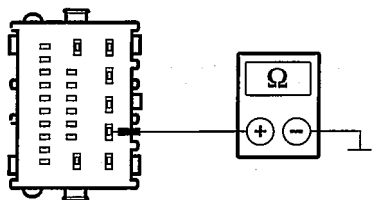


VFE0028971

DETAILS/RESULTS/ACTIONS

- 3** Measure the resistance between the GEM, connector C318 (black), pin 3, circuit 31-DK20 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to G6.
- **No**
LOCATE and REPAIR the break in circuit 31-DK20 (BK) between the GEM and soldered connection S15 using the Wiring Diagrams. CHECK the operation of the system.

G6: TEST THE GEM GROUND CONNECTION



VFE0028975

- 1** Disconnect connector C320 (brown) from GEM.
- 2** Measure the resistance between the GEM, connector C320 (brown), pin 2, circuit 91-DK20 (BWRD), wiring harness side and ground.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to G7.
- **No**
LOCATE and RECTIFY the break in the circuit between the GEM and ground connection G14 using the Wiring Diagrams. CHECK the operation of the system.

G7: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.

- 1** Measure the resistance between the GEM, connector C320 (brown), pin 23, circuit 4-EC14 (GY/OG), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to G8.
- **No**
LOCATE and REPAIR the break in the circuit between the GEM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G8: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.	
	☐ Measure the resistance between the GEM, connector C320 (brown), pin 22, circuit 5-EC14 (BU/BK), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes TEST the GEM and RENEW as necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the GEM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST R : POWERTRAIN CONTROL MODULE (PCM) NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0. 2 Connect the diagnostic tool. ☐ Select the electronic instrument cluster with the diagnostic tester. • Is it possible to establish communications with the electronic instrument cluster? → Yes GO to H2. → No GO to Pinpoint Test M.
H2: CHECK FUSE F16	
	1 Ignition switch in position 0. 2 CHECK fuse F16 (CJB). • Is the fuse OK? → Yes GO to H3. → No RENEW fuse F16 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS		RESULTS	ACTIONS
H3: CHECK THE VOLTAGE AT FUSE F16					
		☐ 1 Connect fuse F16 (CJB).			
		☐ 2 Measure the voltage between fuse F16 (3 A) and ground. Is battery voltage measured? → Yes GO to H4. → No REPAIR the voltage supply to fuse F16 using the Wiring Diagrams. CHECK the operation of the system.			
H4: CHECK FUSE F12					
		☐ 1 CHECK fuse F12 (CJB).			
		Is the fuse OK? → Yes GO to H5. → No RENEW fuse F12 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.			
H5: CHECK THE VOLTAGE AT FUSE F12					
		☐ 1 Connect fuse F12 (CJB).			
		☐ Ignition switch in position II.			

DIAGNOSIS AND TESTING

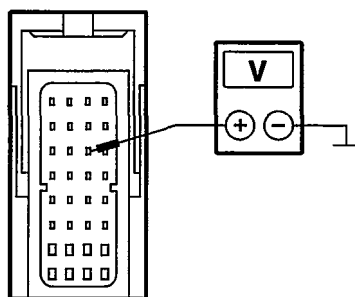
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between fuse F12 (15 A) and ground.
- Is battery voltage measured?
- **Yes**
- Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine:
GO to H14.
 - Vehicles with 2.0L engine:
GO to H15.
 - Vehicles with diesel engine:
GO to H24.
- **No**
- Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine:
GO to H9.
 - Vehicles with 2.0L engine:
GO to H8.
 - Vehicles with 1.6L diesel engine:
GO to H7.
 - Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR):
GO to H6.
 - Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR):
GO to H10.

H6: CHECK THE VOLTAGE AT THE PCM

- 1** Ignition switch in position 0.
- 2** Disconnect connector C370 from the PCM.
- ☐ Ignition switch in position II.



E57723

- ☐ Measure the voltage between the PCM, connector C370, pin C3, circuit 15-RE8 (GNNE), wiring harness side and ground.
- Is battery voltage measured?
- **Yes**
GO to H26.
- **No**
LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

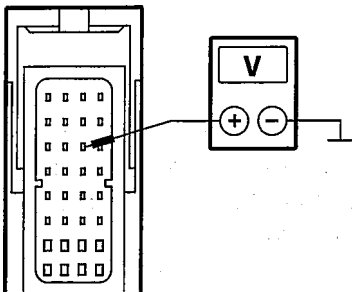
H7: CHECK THE VOLTAGE AT THE PCM

- ☐ Ignition switch in position 0.

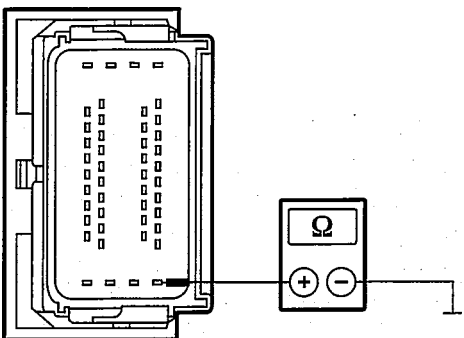
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

 E57723	2 Disconnect connector C384 from the PCM. ☐ Ignition switch in position II. ☐ Measure the voltage between the PCM, connector C384, pin C3, circuit 15-RE8C (GNNE), wiring harness side and ground. - Is battery voltage measured? → Yes GO to H26. → No - LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
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H8: CHECK THE VOLTAGE AT THE PCM

 E57706	1 Ignition switch in position 0. 2 Disconnect connector C380 from the PCM. ☐ Ignition switch in position II. 4 Measure the voltage between the PCM, connector C380, pin 46, circuit 15-RE8 (GN/YE), wiring harness side and ground. Is battery voltage measured? → Yes GO to H26. → No LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
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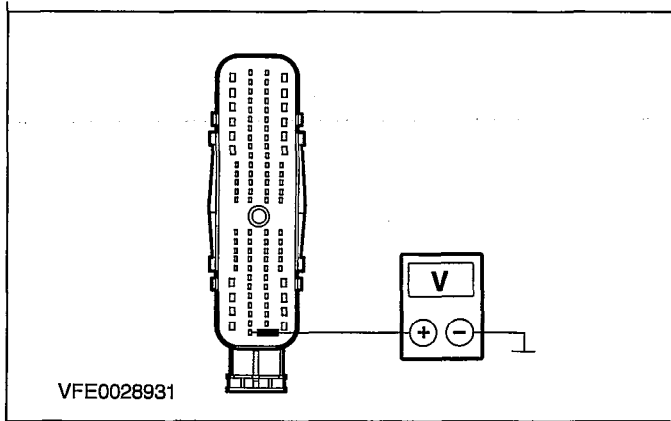
H9: CHECK THE VOLTAGE AT THE PCM

	1 Ignition switch in position 0. 2 Disconnect connector C343 from the PCM. 3 Ignition switch in position II.
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DIAGNOSIS AND TESTING

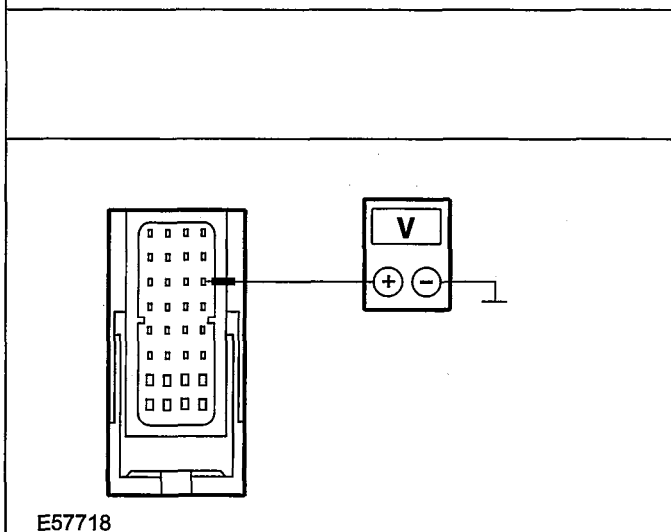
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



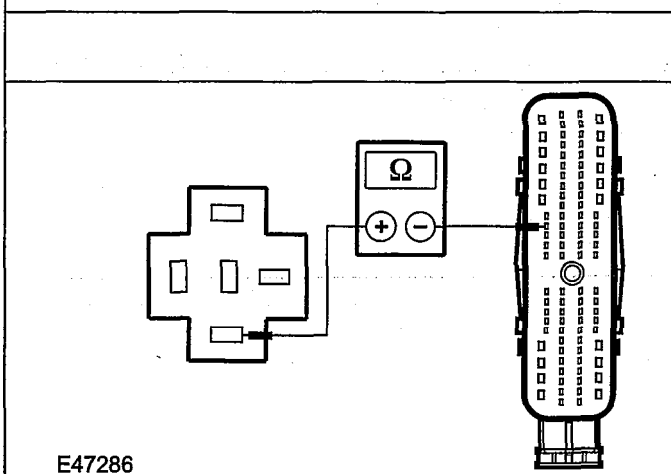
- 4 Measure the voltage between the PCM, connector C343, pin F21, circuit 15-RE8 (GN/YE), wiring harness side and ground.
 - Is battery voltage measured?
 - **Yes**
GO to H26.
 - **No**
LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

H10: CHECK THE VOLTAGE AT THE PCM



- 1 Disconnect connector C375 from the PCM.
- 2 Ignition switch in position II.
- 3 Measure the voltage between the PCM, connector C375, pin C3, circuit 15-RE8 (GN/YE), wiring harness side and ground.
 - Is battery voltage measured?
 - **Yes**
GO to H26.
 - **No**
LOCATE and REPAIR the break in the circuit between the PCM and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

H11: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM



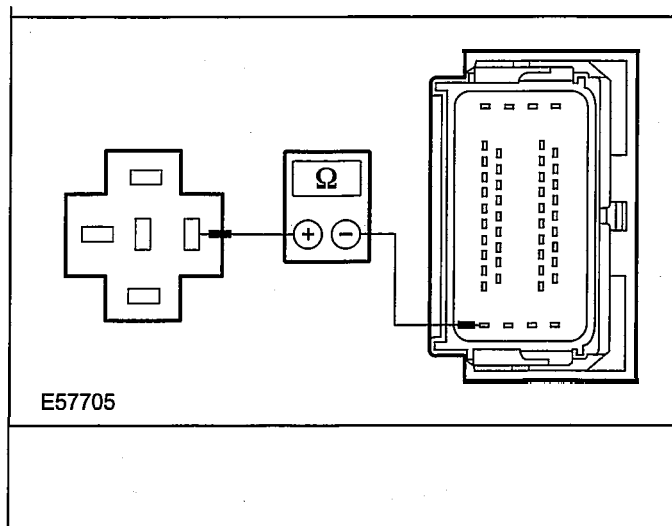
- 1 Disconnect connector C343 from the PCM.
- 2 Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C343, pin M8, circuit 91S-RH9 (BKIBU), wiring harness side.
 - Is a resistance of less than 2 Ohms registered?
 - **Yes**
GO to H13.
 - **No**
LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

H12: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM

- 1 Disconnect connector C380 from the PCM.

DIAGNOSIS AND TESTING

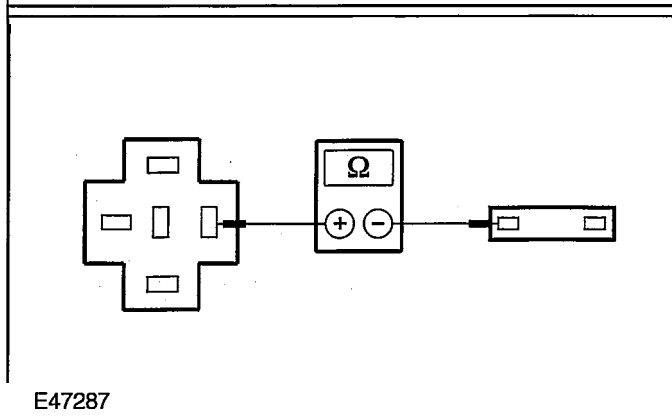
TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

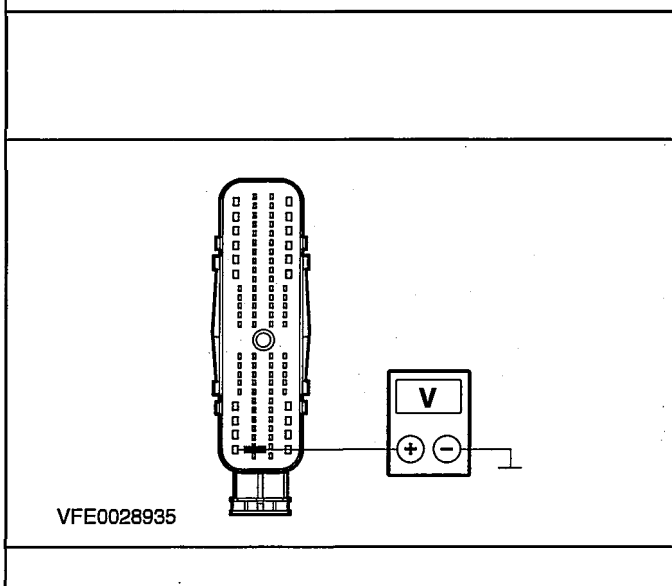
- 2 Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C380, pin 35, circuit 91S-RH9 (BWBU), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
 - **Yes**
GO to H13.
 - **No**
LOCATE and REPAIR the break in the circuit between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

H13: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND FUSE F12



- 1 Measure the resistance between the PCM module relay, socket C420, Pin 5, circuit 15S-DB9 (GN/RD), wiring harness side and fuse F12 (CJB), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
 - **Yes**
GO to H32.
 - **No**
LOCATE and REPAIR the open circuit between the PCM module relay and fuse F12 using the Wiring Diagrams. CHECK the operation of the system.

H14: CHECK THE VOLTAGE AT THE PCM

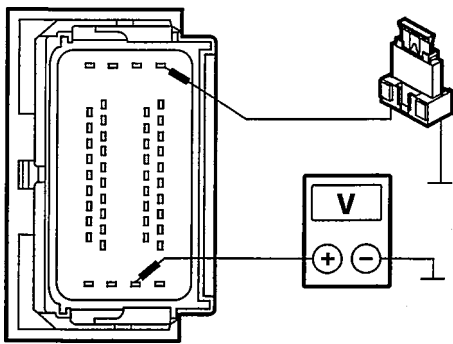
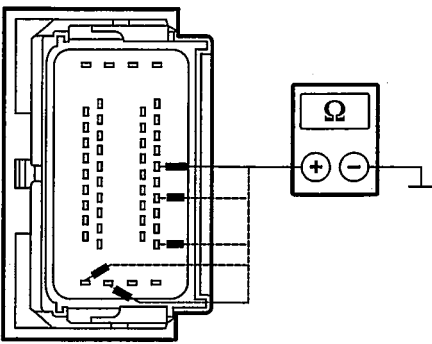


- 1 Ignition switch in position 0.
- 2 Disconnect connector C343 from the PCM.
- 3 Measure the voltage between the PCM, connector C343, pin F9, circuit 29-RE8 (OGNE), wiring harness side and ground.
- Is battery voltage measured?
 - **Yes**
GO to H20.
 - **No**
LOCATE and REPAIR the break in circuit 29-RE8 (OGNE) between PCM and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.

H15: CHECK THE VOLTAGE AT THE PCM

- ☐ Ignition switch in position 0.

DIAGNOSIS AND TESTING

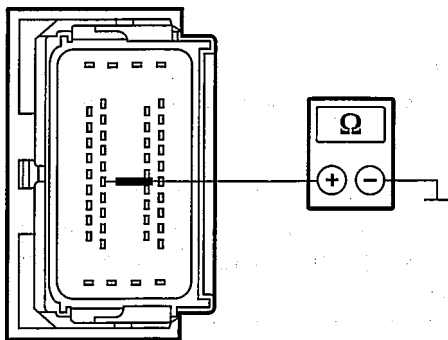
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E57707	☐ Use a fused test lead (1 A) at the PCM, connector C380, pin 35, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground. 3 Measure the voltage between the PCM, connector C380, pin 34, circuit 15s-RE8 (GN/YE), wiring harness side and ground. Is battery voltage measured? → Yes GO to H16. → No LOCATE and REPAIR the open circuit between the PCM and fuse F12 using the Wiring Diagrams. CHECK the operation of the system.
H16: CHECK THE GROUND CONNECTION OF THE PCM	
 E57708	1 Ignition switch in position 0. 2 Measure the resistance between the PCM, connector C380, pin 11, circuit 91-RE8A (BK/YE), wiring harness side and ground. 3 Measure the resistance between the PCM, connector C380, pin 23, circuit 91-RE8B (BK/YE), wiring harness side and ground.
	4 Measure the resistance between the PCM, connector C380, pin 40, circuit 91-RE8C (BK/YE), wiring harness side and ground. 5 Measure the resistance between the PCM, connector C380, pin 42, circuit 91-RE8D (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 6** Measure the resistance between the PCM, connector C380, pin 44, circuit 91-RE8E (BK/YE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
- **Yes**
GO to H17.
- **No**
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S301 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S301 and ground connection G1 using the Wiring Diagrams. CHECK the operation of the system.

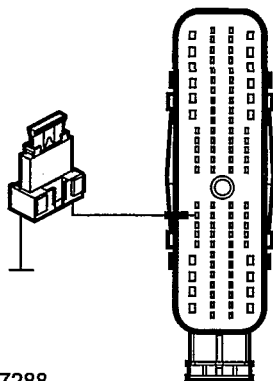
H17: CHECK THE GROUND CONNECTION OF THE PCM

E57709

- 1** Measure the resistance between the PCM, connector C380, pin 10, circuit 31-RE8 (BK), wiring harness side and ground.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to H18.
- **No**
LOCATE and REPAIR the break in the circuit between the PCM and ground connection G22 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H18: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	1 Measure the resistance between the PCM, connector C380, pin 41, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to H19. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H19: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	1 Measure the resistance between the PCM, connector C380, pin 30, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H20: CHECK THE VOLTAGE AT THE PCM	Use a fused test lead (1 A) at the PCM, connector C343, pin M8, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.

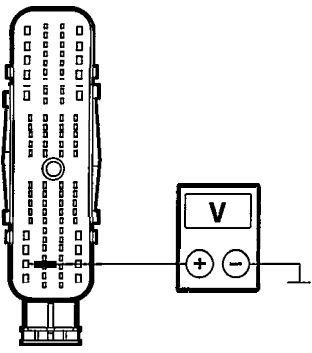
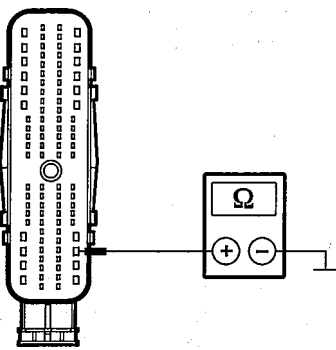
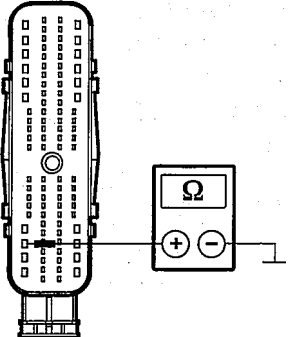


E47288

DIAGNOSIS AND TESTING

TEST CONDITIONS

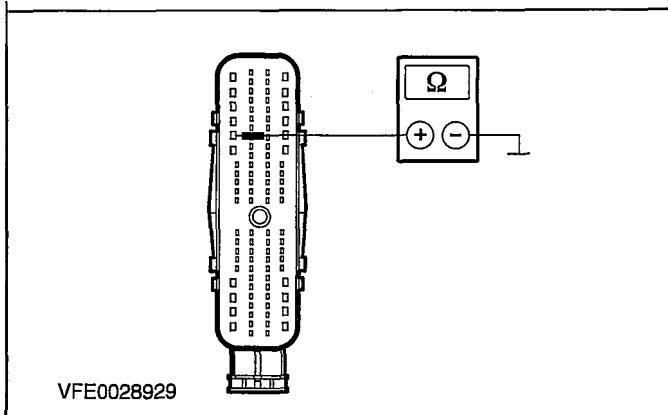
DETAILS/RESULTS/ACTIONS

 VFE0028934	2 Measure the voltage between the PCM, connector C343, pin F8, circuit 15s-RE8 (GNNE), wiring harness side and ground. Is battery voltage measured? → Yes GO to H21. → No LOCATE and REPAIR the open circuit between the PCM and fuse F12 using the Wiring Diagrams. CHECK the operation of the system.
H21: CHECK THE GROUND CONNECTION OF THE PCM	
 VFE0028932	1 Ignition switch in position 0. 2 Measure the resistance between the PCM, connector C343, pin F40, circuit 91-RE8A (BWE), wiring harness side and ground.
 VFE0028933	3 Measure the resistance between the PCM, connector C343, pin F7, circuit 91-RE8B (BWE), wiring harness side and ground.

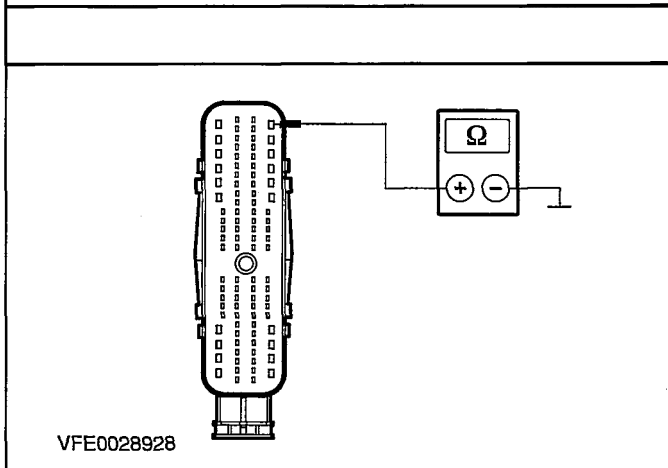
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



Measure the resistance between the PCM, connector C343, pin M5, circuit 91-RE8C (BK/YE), wiring harness side and ground.



5 Measure the resistance between the PCM, connector C343, pin M42, circuit 91-RE8D (BK/YE), wiring harness side and ground.

- Is a resistance of less than 2 Ohms measured in all of the cases?

→ **Yes**

GO to H22.

→ **No**

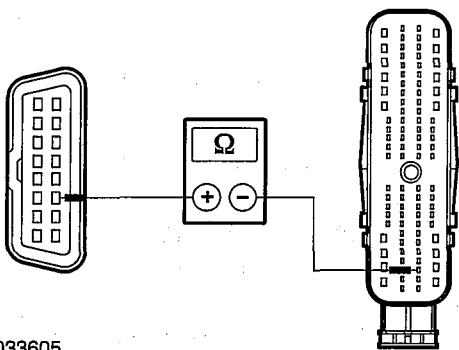
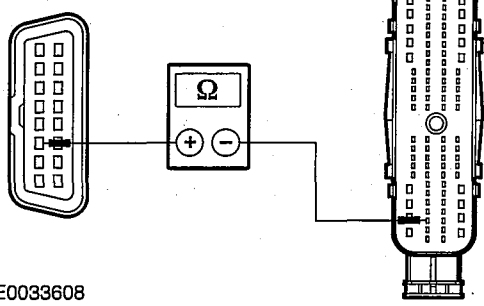
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.

- If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the circuit between soldered connection S109 and ground connection G1 using the Wiring Diagrams. CHECK the operation of the system.

H22: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT

1 Disconnect connector C343 from the PCM.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0033605	2 Measure the resistance between the PCM, connector C343, pin F31, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to H23. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H23: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
 VFE0033608	1 Measure the resistance between the PCM, connector C343, pin F19, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H24: CHECK FUSE F13	
	1 Ignition switch in position 0. 2 CHECK fuse F13 (CJB). Is the fuse OK? → Yes GO to H25. → No RENEW fuse F13 (20 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
H25: CHECK THE VOLTAGE AT FUSE F13	
	1 Connect fuse F13 (CJB). 2 Ignition switch in position II.

DIAGNOSIS AND TESTING

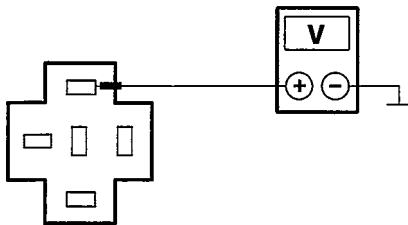
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 3** Measure the voltage between fuse F13 (20 A) and ground.
- Is battery voltage measured?
- **Yes**
- Vehicles with 1.6L diesel engine:
GO to H34.
 - Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR):
GO to H33.
 - Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR):
GO to H38.
- **No**
GO to H26.

H26: CHECK THE VOLTAGE AT THE PCM MODULE RELAY

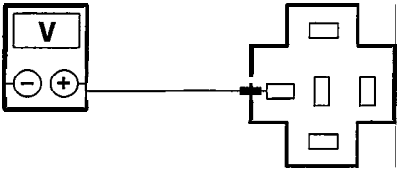
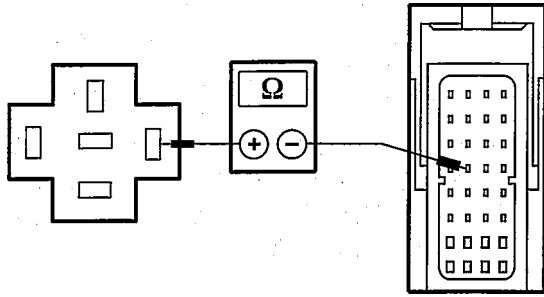
- 1** Ignition switch in position 0.
- 2** Disconnect PCM module relay from socket C420.



VFE0037106

- 3** Measure the voltage between the PCM module relay, socket C420, pin 1, circuit 29-RH9 (OGIBU), wiring harness side and ground.
- Is battery voltage measured?
- **Yes**
GO to H27.
- **No**
LOCATE and REPAIR the break in circuit 29-RH9 (OGIBU) between the PCM module relay and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.

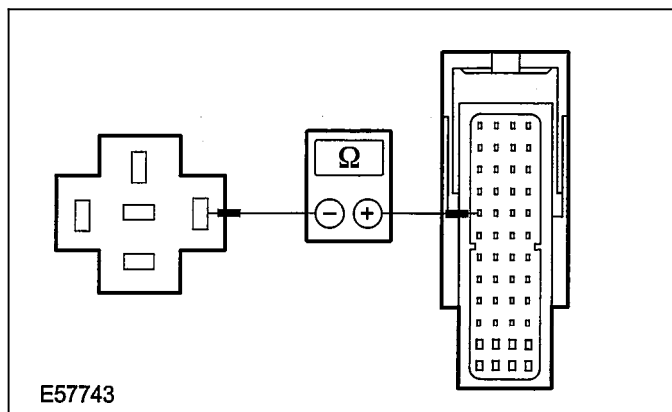
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H27: CHECK THE VOLTAGE AT THE PCM MODULE RELAY  VFE0037103	1 Measure the voltage between the PCM module relay, socket C420, pin 3, circuit 30-RH10 (RD), wiring harness side and ground. - Is battery voltage measured? → Yes - Vehicles with 1.6L diesel engine: GO to H29. - Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): GO to H30. - Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): GO to H28. - Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: GO to H11. - Vehicles with 2.0L petrol engine: GO to H12. → No LOCATE and REPAIR the open circuit between the PCM module relay and fuse FB using the Wiring Diagrams. CHECK the operation of the system.
H28: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM  E57710	1 Disconnect connector C377 from the PCM. ☐ Measure the resistance between the PCM module relay, socket C420, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector C377, pin D2, circuit 91S-RH9 (BWBU), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to H31. → No LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.
H29: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM	1 Disconnect connector C383 from the PCM.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



Measure the resistance between the PCM module relay, socket **C420**, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector **C383**, pin E1, circuit 91S-RH9 (BWBU), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

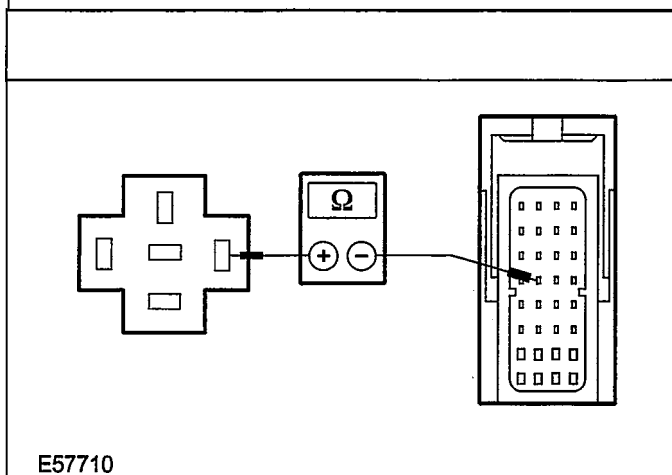
→ **Yes**

GO to H31.

→ **No**

LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

H30: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND THE PCM



Disconnect connector **C372** from the PCM.

- ☐ Measure the resistance between the PCM module relay, socket **C420**, pin 2, circuit 91S-RH9 (BWBU), wiring harness side and PCM, connector **C372**, pin D2, circuit 91S-RH9 (BWBU), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

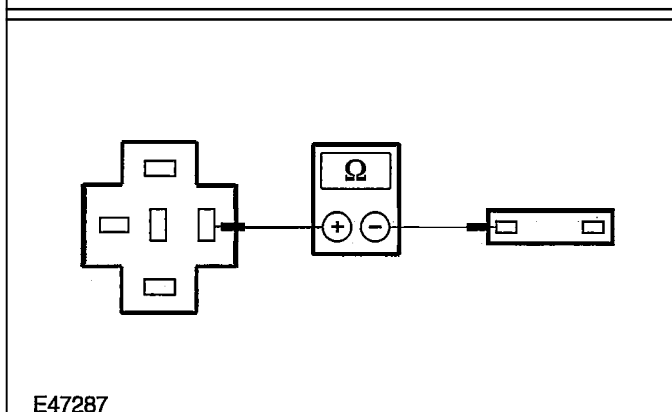
→ **Yes**

GO to H31.

→ **No**

LOCATE and REPAIR the break in circuit 91S-RH9 (BWBU) between the PCM module relay and the PCM using the Wiring Diagrams. CHECK the operation of the system.

H31: CHECK FOR OPEN CIRCUIT BETWEEN THE PCM MODULE RELAY AND FUSE F13



Measure the resistance between the PCM module relay, socket **C420**, Pin 5, circuit 15S-DB9 (GNIRD), wiring harness side and fuse **F13** (CJB), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

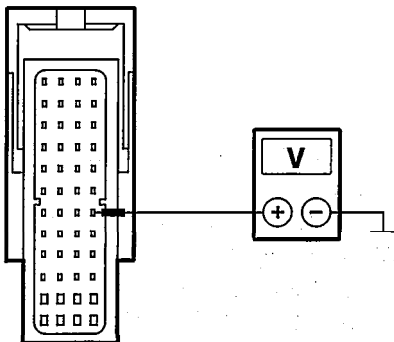
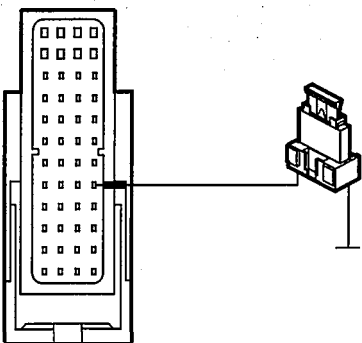
→ **Yes**

GO to H32.

→ **No**

CHECK **CJB** and RENEW as necessary. CHECK the operation of the system.

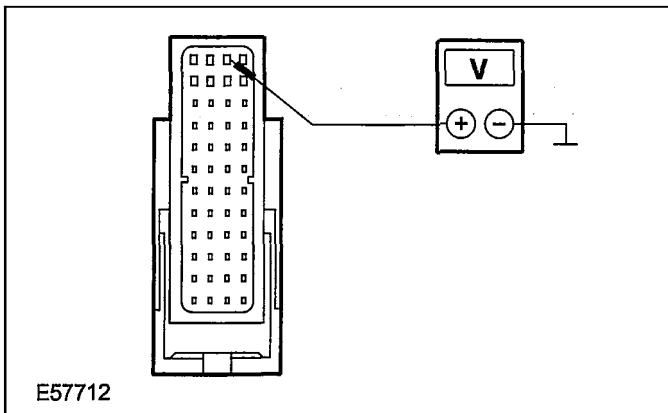
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H32: CHECK THE PCM MODULE RELAY	1 Check the PCM module relay according to the component test at the end of this section. • Is the PCM module relay OK? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No RENEW the PCM module relay. CHECK the operation of the system.
H33: CHECK THE VOLTAGE AT THE PCM  E57744	1 Ignition switch in position 0. 2 Disconnect connector C371 from the PCM. 3 Measure the voltage between the PCM, connector C371, pin G4, circuit 29-RE8 (OGNE), wiring harness side and ground. • Is battery voltage measured? → Yes GO to H43. → No LOCATE and REPAIR the break in circuit 29-RE8 (OGNE) between PCM and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.
H34: CHECK THE VOLTAGE AT THE PCM  E57711	1 Ignition switch in position 0. 2 Disconnect connector C383 from the PCM. 3 Use a fused test lead (1 A) at the PCM, connector C383, pin E1, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.

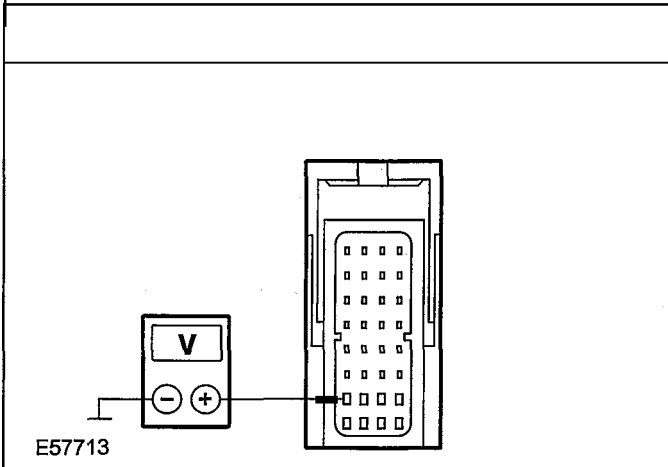
DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



- 4 Measure the voltage between the PCM, connector C383, pin M2, circuit 15S-RE8A (GNNE), wiring harness side and ground.



- 5 Measure the voltage between the PCM, connector C384, pin G1, circuit 15S-RE8B (GN/YE), wiring harness side and ground.

- Is battery voltage measured in both cases?

→ **Yes**

GO to H35.

→ **No**

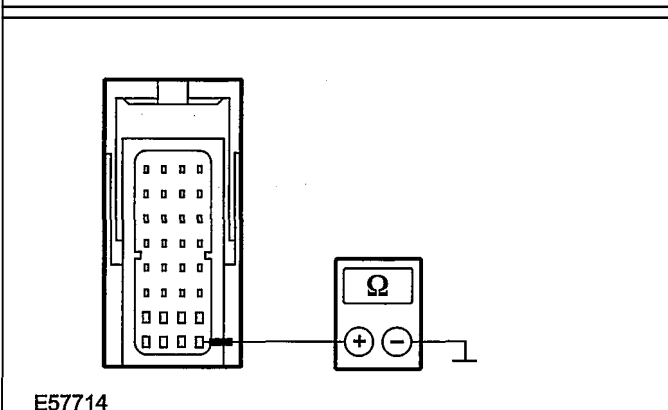
- If battery voltage is not measured during one measurement:

LOCATE and RECTIFY the break in the corresponding circuit between the PCM and solder point S111 using the Wiring Diagrams. CHECK the operation of the system.

- If battery voltage is not measured during both measurements:

LOCATE and REPAIR the break in circuit 15S-RN3 (GN/BU) between soldered connection S111 and fuse F13 using the Wiring Diagrams. CHECK the operation of the system.

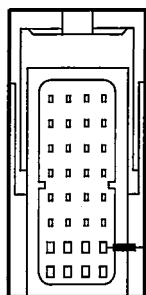
H35: CHECK THE GROUND CONNECTION OF THE PCM



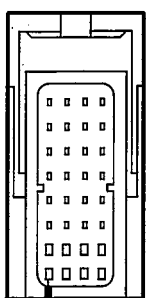
- Measure the resistance between the PCM, connector C384, pin H4, circuit 91-RE8C (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E57715



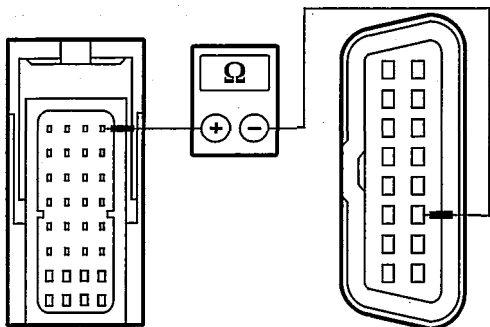
E57716

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the PCM, connector C384, pin G4, circuit 91-RE8A (BKNE), wiring harness side and ground.

- 3 Measure the resistance between the PCM, connector C384, pin H1, circuit 91-RE8B (BKNE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
- **Yes**
GO to H36.
- **No**
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S109 and ground connection G1 using the Wiring Diagrams. CHECK the operation of the system.

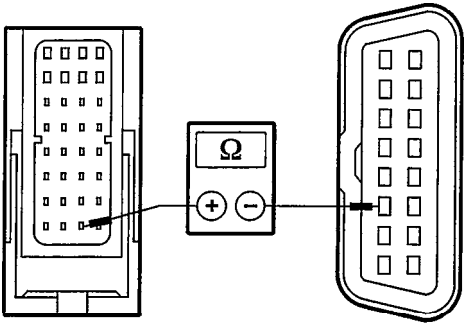
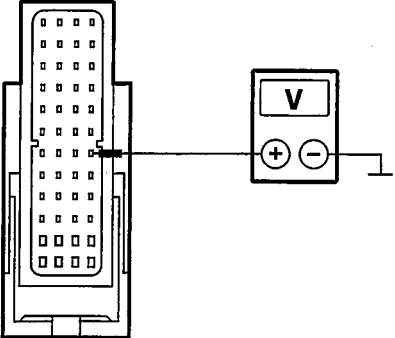
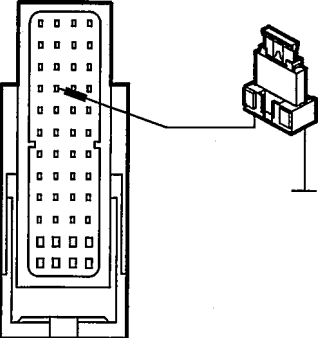
H36: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT



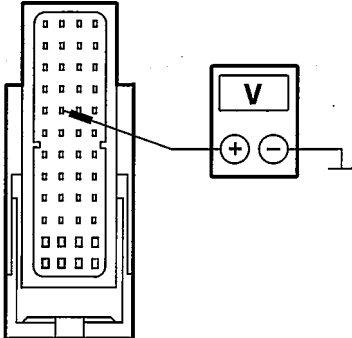
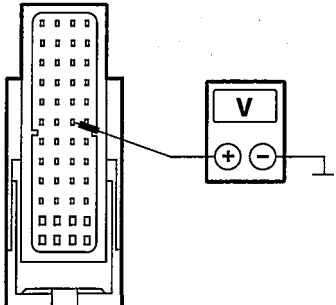
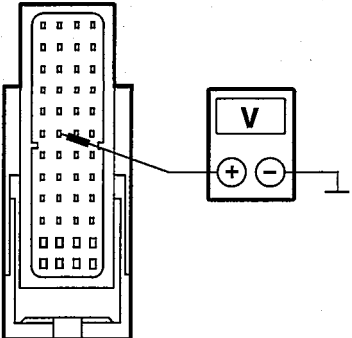
E58252

- Measure the resistance between the PCM, connector C384, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to H37.
- **No**
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H37: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	☐ Measure the resistance between the PCM, connector C384, pin A3, circuit 5-EC7 (BU/RD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H38: CHECK THE VOLTAGE AT THE PCM  E57717	- Ignition switch in position 0. - Disconnect connector C376 from the PCM. - Measure the voltage between the PCM, connector C376, pin G4, circuit 29-RE8 (OGNE), wiring harness side and ground. - Is battery voltage measured? → Yes GO to H39. → No LOCATE and REPAIR the break in circuit 29-RE8 (OGNE) between PCM and fuse F16 using the Wiring Diagrams. CHECK the operation of the system.
H39: CHECK THE VOLTAGE AT THE PCM  E57719	- Disconnect connector C377 from the PCM. - Use a fused test lead (1 A) at the PCM, connector C377, pin D2, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground

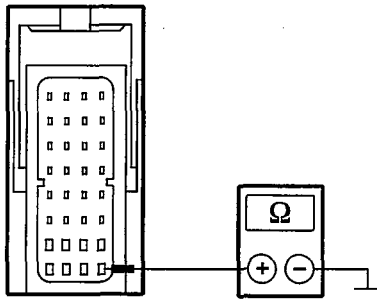
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E57720	3 Measure the voltage between the PCM, connector C377, pin E3, circuit 15S-RE8A (GNNE), wiring harness side and ground.
 E57722	4 Measure the voltage between the PCM, connector C377, pin F3, circuit 15S-RE8B (GNNE), wiring harness side and ground.
 E57721	5 Measure the voltage between the PCM, connector C377, pin F2, circuit 15S-RE8C (GNNE), wiring harness side and ground. - Is battery voltage measured in all cases? → Yes GO to H40. → No - If battery voltage is not measured during a measurement: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S108 using the Wiring Diagrams. CHECK the operation of the system. - If battery voltage is not measured during all measurements: LOCATE and REPAIR the break in circuit 15S-RN3 (GN/BU) between soldered connection S108 and fuse F13 using the Wiring Diagrams. CHECK the operation of the system.
H40: CHECK THE GROUND CONNECTION OF THE PCM	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

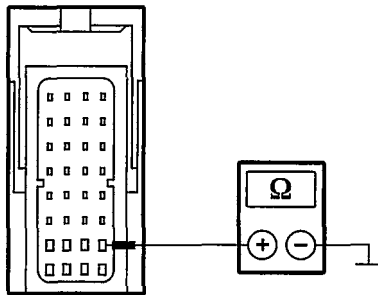
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



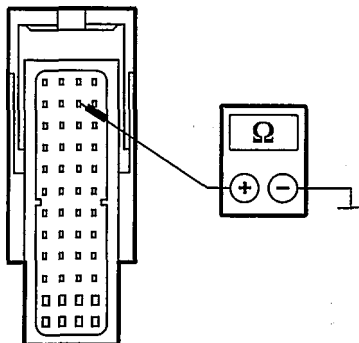
E57714

- ☐ Measure the resistance between the PCM, connector C375, pin H4, circuit 91-RE8A (BK/YE), wiring harness side and ground.



E57724

- 3** Measure the resistance between the PCM, connector C375, pin G4, circuit 91-RE8B (BK/YE), wiring harness side and ground.

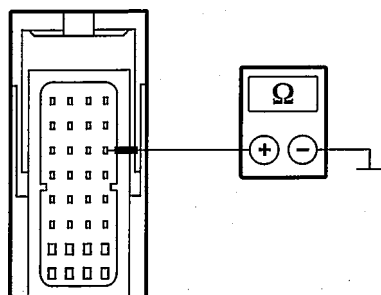


E57745

- 4** Measure the resistance between the PCM, connector C376, pin K2, circuit 91-RE8C (BK/NE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS

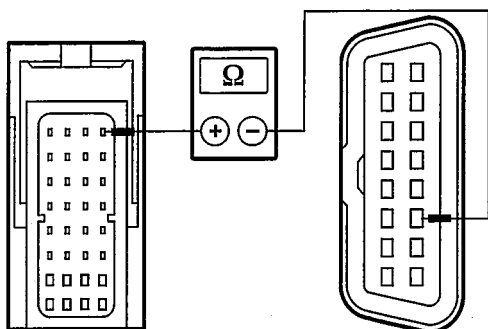


E57746

DETAILS RESULTS ACTIONS

- 5 Measure the resistance between the PCM, connector C377, pin C4, circuit 91-RE8D (BK/YE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
- **Yes**
GO to H41.
- **No**
- If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S109 and ground connection G1 using the Wiring Diagrams. CHECK the operation of the system.

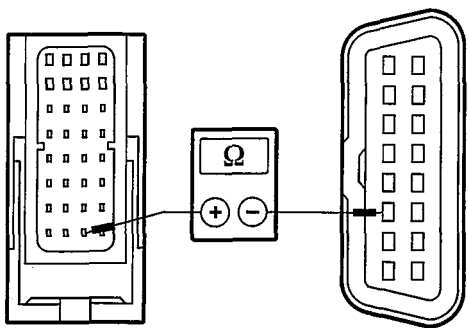
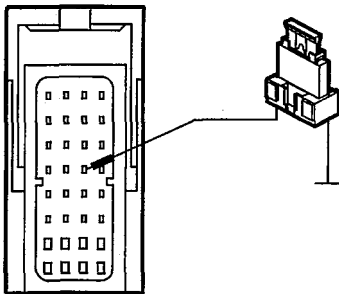
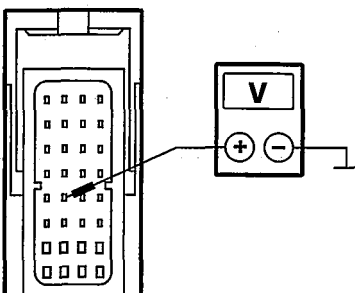
H41: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT



E58252

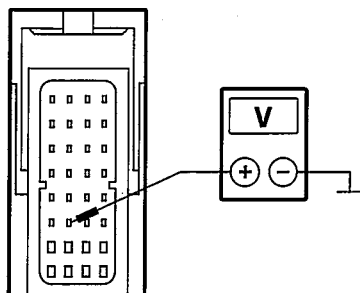
- Measure the resistance between the PCM, connector C375, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side.
- Is a resistance of less than 2 Ohms registered?
- **Yes**
GO to H42.
- **No**
LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

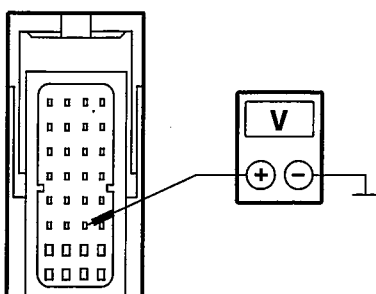
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H42: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	1 Measure the resistance between the PCM, connector C375, pin A3, circuit 5-EC7 (BU/RD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H43: CHECK THE VOLTAGE AT THE PCM  E57747	1 Disconnect connector C372 from the PCM. ☐ Use a fused test lead (1 A) at the PCM, connector C372, pin D2, to bridge circuit 91S-RH9 (BWBU), wiring harness side and ground.
 E57748	☐ Measure the voltage between the PCM, connector C372, pin E3, circuit 15S-RE8A (GN/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E57749



E57750

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the PCM, connector C372, pin F3, circuit 15S-RE8B (GN/YE), wiring harness side and ground.

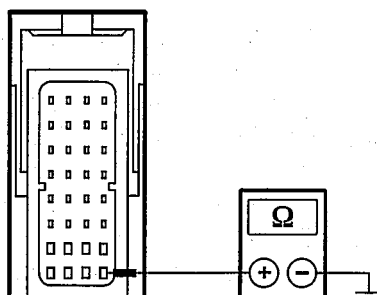
- 5 Measure the voltage between the PCM, connector C372, pin F2, circuit 15S-RE8C (GN/YE), wiring harness side and ground.

- Is battery voltage measured in all cases?

→ **Yes**
GO to H44.

→ **No**
- If battery voltage is not measured during a measurement:
LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S108 using the Wiring Diagrams. CHECK the operation of the system.
- If battery voltage is not measured during all measurements:
LOCATE and REPAIR the break in circuit 15S-RN3 (GN/BU) between soldered connection S108 and fuse F13 using the Wiring Diagrams. CHECK the operation of the system.

H44: CHECK THE GROUND CONNECTION OF THE PCM



E57714

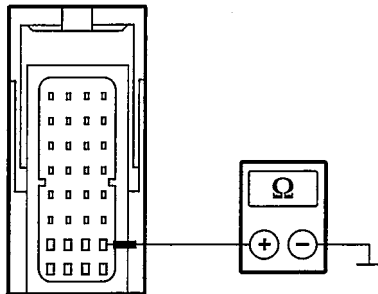
- 1 Ignition switch in position 0.

- 2 Measure the resistance between the PCM, connector C370, pin H4, circuit 91-RE8A (BK/YE), wiring harness side and ground.

DIAGNOSIS AND TESTING

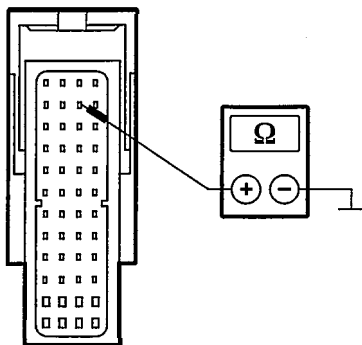
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



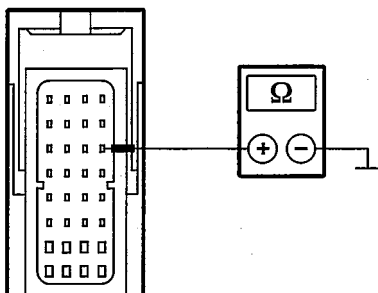
E57724

- 3 Measure the resistance between the PCM, connector C370, pin G4, circuit 91-RE8B (BK/YE), wiring harness side and ground.



E57745

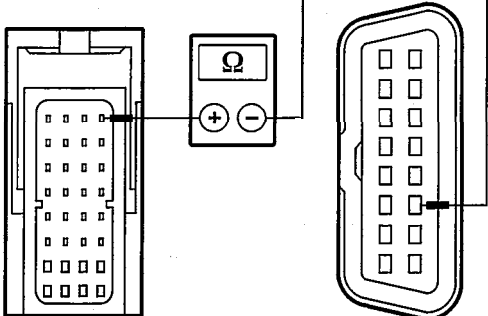
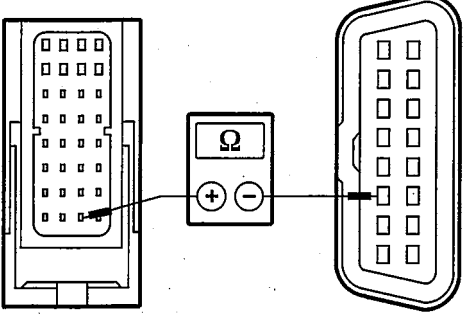
- 4 Measure the resistance between the PCM, connector C371, pin K2, circuit 91-RE8C (BK/NE), wiring harness side and ground.



E57746

- 5 Measure the resistance between the PCM, connector C372, pin C4, circuit 91-RE8D (BK/NE), wiring harness side and ground.
- Is a resistance of less than 2 Ohms measured in all of the cases?
 - **Yes**
GO to H45.
 - **No**
 - If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the PCM and soldered connection S109 using the Wiring Diagrams. CHECK the operation of the system.
 - If a resistance of more than 2 Ohms is measured in all of the measurements: LOCATE and REPAIR the break in the affected circuit between soldered connection S109 and ground connection G1 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H45: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58252	1 Measure the resistance between the PCM, connector C370, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to H46. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
H46: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	1 Measure the resistance between the PCM, connector C370, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST S : ELECTRONIC INSTRUMENT CLUSTER NOT COMMUNICATING WITH THE DIAGNOSTIC TESTER.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0.
	2 Connect the diagnostic tool.

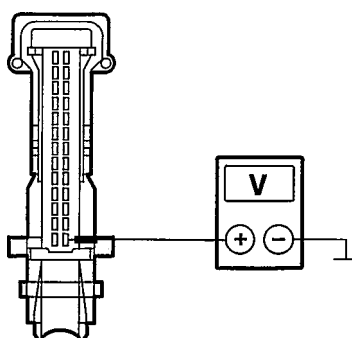
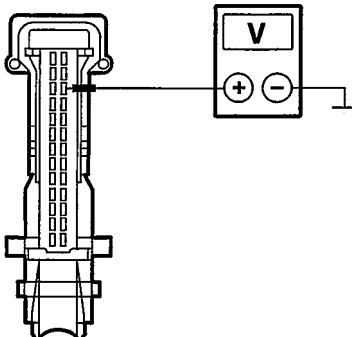
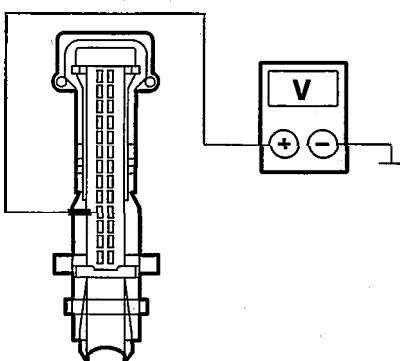
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Select the powertrain control module (PCM) with the diagnostic tester. Is it possible to establish communication with the PCM? → Yes GO to 12 → No GO to Pinpoint Test M.
12: CHECK FUSE F20	
	1 Ignition switch in position 0. ☐ CHECK fuse F20 (CJB). Is the fuse OK? → Yes GO to 13 → No RENEW fuse F20 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
13: CHECK THE VOLTAGE AT FUSE F20	
	1 Connect fuse F20 (CJB). ☐ Measure the voltage between fuse F20 (7.5 A) and ground. Is battery voltage measured? → Yes GO to 14 → No REPAIR the voltage supply to fuse F20 using the Wiring Diagrams. CHECK the operation of the system.
14: CHECK FUSE F44	
	1 CHECK fuse F44 (CJB). Is the fuse OK? → Yes GO to 15. → No RENEW fuse F44 (3 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

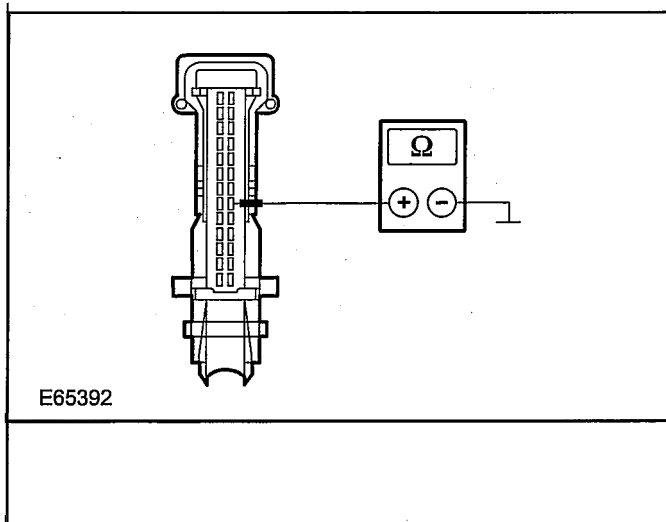
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
15: CHECK THE VOLTAGE AT FUSE F44	
	☐ 1 Connect fuse F44 (CJB).
	☐ Ignition switch in position I.
	☐ Measure the voltage between fuse F44 (3 A) and ground.
	• Is battery voltage measured? → Yes GO to 16. → No REPAIR the voltage supply to fuse F44 using the Wiring Diagrams. CHECK the operation of the system.
16: CHECK FUSE F38	
	☐ 1 Ignition switch in position 0.
	☐ 2 CHECK fuse F38 (CJB).
	• Is the fuse OK? → Yes GO to 17. → No RENEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
17: CHECK THE VOLTAGE AT FUSE F38	
	☐ 1 Connect fuse F38 (CJB).
	☐ 2 Ignition switch in position II.
	☐ Measure the voltage between fuse F38 (7.5 A) and ground.
	• Is battery voltage measured? → Yes GO to 18. → No REPAIR the voltage supply to fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
18: CHECK THE VOLTAGE AT THE ELECTRONIC INSTRUMENT CLUSTER	
	☐ 1 Ignition switch in position 0.
	☐ 2 Disconnect Electronic instrument cluster connector C339.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
 E65379	3 Measure the voltage between the instrument cluster, connector C339, pin 14, circuit 29-GG11 (OGIBU), wiring harness side and ground. Is battery voltage measured? → Yes GO to 19. → No LOCATE and REPAIR the break in circuit 29-GG11 (OGIBU) between the electronic instrument cluster and fuse F20 using the Wiring Diagrams. CHECK the operation of the system.
19: CHECK THE VOLTAGE AT THE ELECTRONIC INSTRUMENT CLUSTER	
 E65374	1 Ignition switch in position I. ☐ Measure the voltage between the electronic instrument cluster, connector C339, pin 24, circuit 75-GG11 (YE/RD), wiring harness side and ground. Is battery voltage measured? → Yes GO to 110. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and fuse F44 using the Wiring Diagrams. CHECK the operation of the system.
110: CHECK THE VOLTAGE AT THE ELECTRONIC INSTRUMENT CLUSTER	
 E65375	☐ Ignition switch in position II. 2 Measure the voltage between the electronic instrument cluster, connector C339, pin 4, circuit 15-GG11 (GN/BU), wiring harness side and ground. Is battery voltage measured? → Yes GO to 111. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and fuse F38 using the Wiring Diagrams. CHECK the operation of the system.
III: CHECK THE GROUND CONNECTION OF THE ELECTRONIC INSTRUMENT CLUSTER	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the electronic instrument cluster, connector C339, pin 19, circuit 91-GG11 (BWBU), wiring harness side and ground.

- Is a resistance of less than 2 Ohms registered?

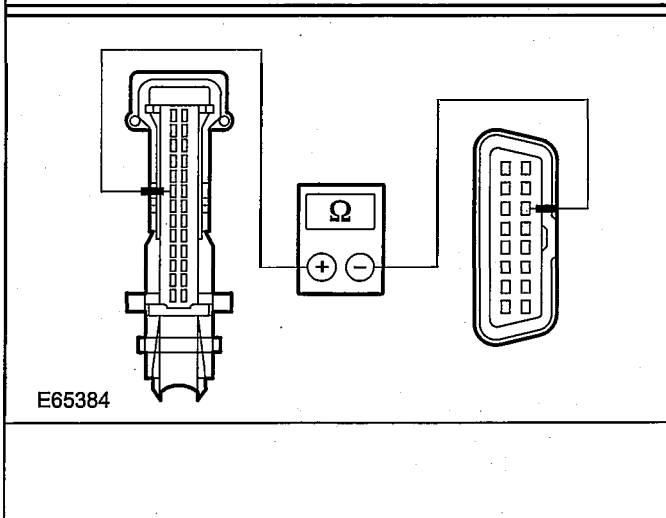
→ **Yes**

GO to 112.

→ **No**

LOCATE and RECTIFY the open circuit between the electronic instrument cluster and ground connection G14 using the Wiring Diagrams. CHECK the operation of the system.

112: CHECK THE CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC FOR OPEN CIRCUIT (HS CAN BUS)



- Measure the resistance between the electronic instrument cluster, connector C339, pin 8, circuit 5-EC8A (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

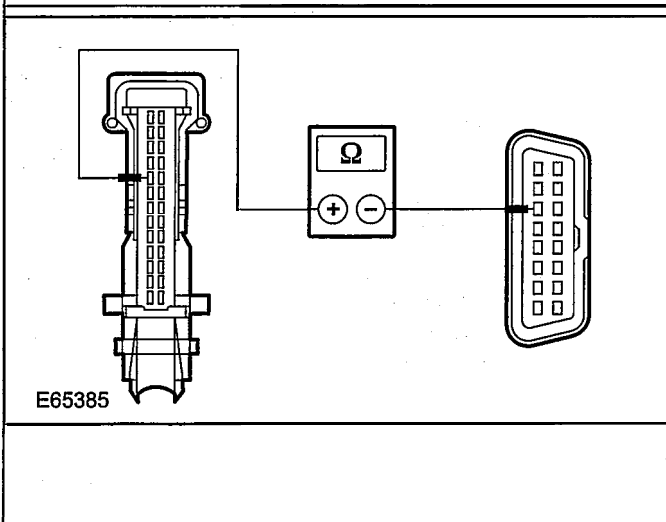
→ **Yes**

GO to 113.

→ **No**

LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.

113: CHECK THE CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC FOR OPEN CIRCUIT (HS CAN BUS)



- Measure the resistance between the electronic instrument cluster, connector C339, pin 9, circuit 4-EC8A (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

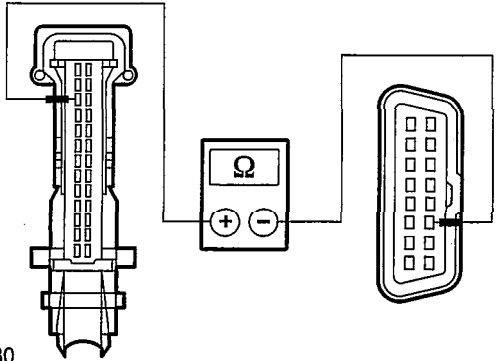
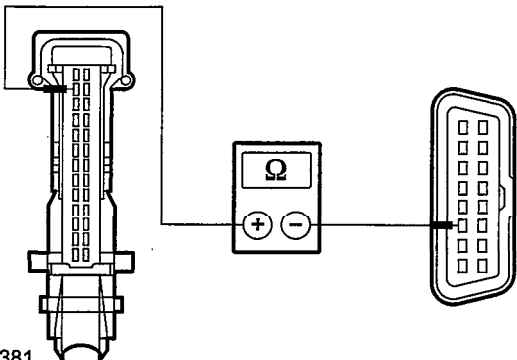
→ **Yes**

GO to 114.

→ **No**

LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I14: CHECK THE CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC FOR OPEN CIRCUIT (MS CAN BUS)	
 E65380	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 11, circuit 5-EC8D (BU/WH), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to I13. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
I15: CHECK THE CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC FOR OPEN CIRCUIT (MS CAN BUS)	
 E65381	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 12, circuit 4-EC8D (GY/VT), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the electronic instrument cluster. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.

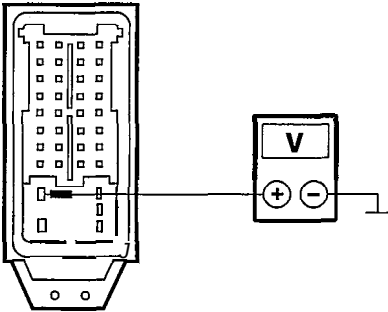
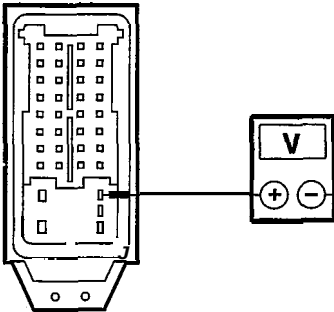
PINPOINT TEST T : TRANSMISSION CONTROL MODULE (TCM) NOT COMMUNICATING WITH DIAGNOSTIC TESTER - VEHICLES WITH AUTOMATIC CLUTCH AND GEARSHIFT ACTUATION

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0. 2 Connect the diagnostic tool.

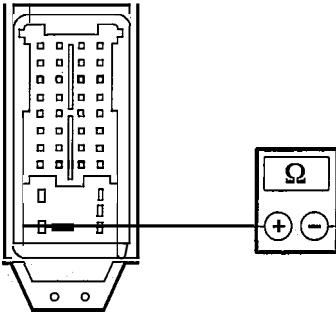
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Select the powertrain control module (PCM) with the diagnostic tester. Is it possible to establish communication with the PCM? → Yes GO to J2. → No GO to Pinpoint Test M.
J2: CHECK FUSE FB	
	1 Ignition switch in position 0. 2 CHECK fuse FB (BJB). Is the fuse OK? → Yes GO to J3. → No RENEW fuse FB (60 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
J3: CHECK THE VOLTAGE AT FUSE FB	
	1 Connect fuse FB (BJB). 2 Measure the voltage between fuse FB (60 A) and ground. Is battery voltage measured? → Yes GO to J4. → No REPAIR the voltage supply to fuse FB using the Wiring Diagrams. CHECK the operation of the system.
54: CHECK FUSE F41	
	1 CHECK fuse F41 (CJB). Is the fuse OK? → Yes GO to J5. → No RENEW fuse F41 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J5: CHECK THE VOLTAGE AT FUSE F41	
	1 Connect fuse F41 (CJB).
	☐ Ignition switch in position II.
	☐ Measure the voltage between fuse F41 (7.5 A) and ground.
	Is battery voltage measured? → Yes GO to J6. → No REPAIR the voltage supply to fuse F41 using the Wiring Diagrams. CHECK the operation of the system.
J6: CHECK VOLTAGE AT TCM	
 VFE0033754	1 Ignition switch in position 0.
	☐ Disconnect connector C676 from TCM.
	Measure the voltage between the TCM, connector C676, pin 49, circuit 30-TA55A (RD), wiring harness side and ground.
	• Is battery voltage measured? → Yes GO to J7. → No LOCATE and REPAIR the break in the circuit between the TCM and fuse FB using the Wiring Diagrams. CHECK the operation of the system.
J7: CHECK VOLTAGE AT TCM	
 VFE0033755	☐ Ignition switch in position II.
	☐ Measure the voltage between the TCM, connector C676, pin 47, circuit 15-TA55 (GNIBK), wiring harness side and ground.
	• Is battery voltage measured? → Yes GO to J8.
	→ No LOCATE and REPAIR the break in circuit 15-TA55 (GNIBK) between TCM and fuse F41 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J8: CHECK GROUND CONNECTION OF TCM	
 VFE0033756	1 Ignition switch in position 0.
	☐ Measure the resistance between the TCM, connector C676, pin 48, circuit 91-TA55 (BWGN), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → Yes CHECK the TCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in circuit 91-TA55 (BWGN) between TCM and battery negative using the Wiring Diagrams. CHECK the operation of the system.

PINPOINT TEST U : TRANSMISSION CONTROL MODULE (TCM) NOT COMMUNICATING WITH DIAGNOSTIC TESTER - VEHICLES WITH AUTOMATIC TRANSMISSION.

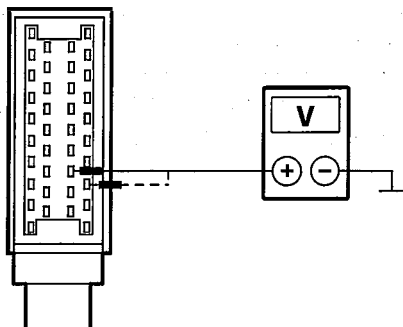
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K1: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0.
	2 Connect the diagnostic tool.
	3 Select the powertrain control module (PCM) with the diagnostic tester. • Is it possible to establish communication with the PCM? → Yes GO to K2. → No GO to Pinpoint Test M.
K2: CHECK FUSE F7	
	1 Ignition switch in position 0.
	2 CHECK fuse F7 (CJB). • Is the fuse OK? → Yes GO to K3. → No RENEW fuse F7 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS	RESULTS	ACTIONS
K3: CHECK THE VOLTAGE AT FUSE F7			
	1	Connect fuse F7 (CJB).	
	2	Measure the voltage between fuse F7 (15 A) and ground. Is battery voltage measured? → Yes GO to K4. → No REPAIR the voltage supply to fuse F7 using the Wiring Diagrams. CHECK the operation of the system.	
K4: CHECK FUSE F40			
	1	CHECK fuse F40 (CJB). Is the fuse OK? → Yes GO to K5. → No RENEW fuse F40 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.	
K5: CHECK THE VOLTAGE AT FUSE F40			
		☐ Connect fuse F40 (CJB).	
	2	Ignition switch in position II.	
		☐ Measure the voltage between fuse F40 (7.5 A) and ground. Is battery voltage measured? → Yes GO to K6. → No REPAIR the voltage supply to fuse F40 using the Wiring Diagrams. CHECK the operation of the system.	
K6: CHECK VOLTAGE AT TCM			
	1	Ignition switch in position 0.	
	2	Disconnect connector C428 from automatic transmission module.	

DIAGNOSIS AND TESTING

TEST CONDITIONS



E47283

DETAILS/RESULTS/ACTIONS

- ☐ Measure the voltage between the TCM, connector C428, pin 22, circuit 29-TA55A (OGIBK), wiring harness side and ground.

- 4** Measure the voltage between the TCM, connector C428, pin 31, circuit 29-TA55B (OGIBK), wiring harness side and ground.

- Is battery voltage measured in both cases?

→ **Yes**

GO to K7.

→ **No**

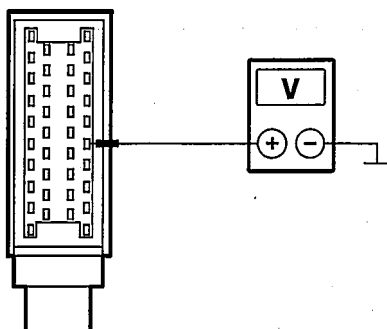
- If battery voltage is not measured during a measurement:

LOCATE and REPAIR the break in the relevant circuit between the TCM and soldered connection S128 using the Wiring Diagrams. CHECK the operation of the system.

- If battery voltage is not measured during both measurements:

LOCATE and REPAIR the break in the circuit between soldered connection S128 and fuse F7 using the Wiring Diagrams. CHECK the operation of the system.

K7: CHECK VOLTAGE AT TCM



E47284

- 1** Ignition switch in position II.

- 2** Measure the voltage between the TCM, connector C428, pin 33, circuit 15-TA55A (GN/BK), wiring harness side and ground.

- Is battery voltage measured?

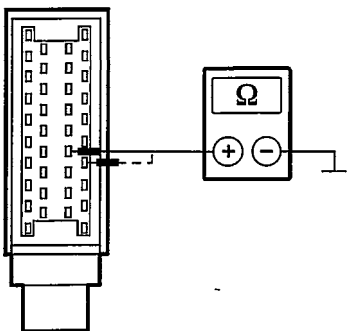
→ **Yes**

GO to K8.

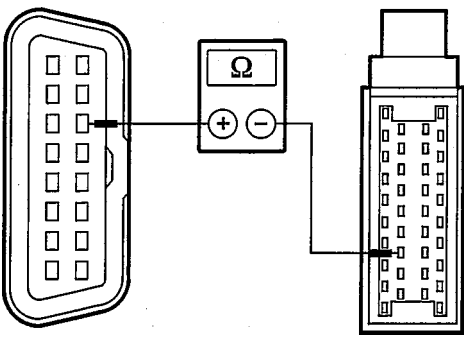
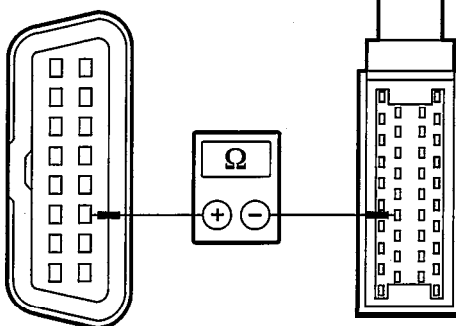
→ **No**

LOCATE and REPAIR the break in the circuit between the TCM and fuse F40 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K8: CHECK GROUND CONNECTION OF TCM	
 E47285	☐ Ignition switch in position 0. 2 Measure the resistance between the TCM, connector C428, pin 23, circuit 91-TA55A (BWGN), wiring harness side and ground.
	3 Measure the resistance between the TCM, connector C428, pin 32, circuit 91-TA55B (BWGN), wiring harness side and ground. - Is a resistance of less than 2 Ohms measured in both cases? → Yes GO to K9. → No - If a resistance of more than 2 Ohms is measured in one of the measurements: LOCATE and REPAIR the break in the relevant circuit between the TCM and soldered connection S132 using the Wiring Diagrams. CHECK the operation of the system. - If a resistance of more than 2 Ohms is measured in both of the measurements: LOCATE and REPAIR the break in the relevant circuit between soldered connection S132 and battery negative using the Wiring Diagrams. CHECK the operation of the system.

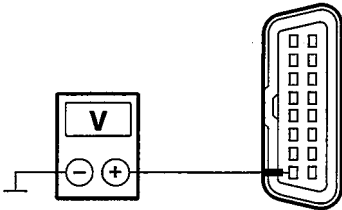
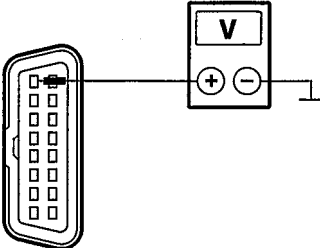
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K9: CHECK THE CIRCUIT BETWEEN THE TCM AND THE DLC FOR CONTINUITY.	
 E47293	Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/IR), wiring harness side and the TCM, connector C428, pin 26, circuit 5-EC16 (BU/OG), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to K10. → No LOCATE and REPAIR the break in the circuit between the TCM and soldered connection S131 using the Wiring Diagrams. CHECK the operation of the system.
K10: CHECK THE CIRCUIT BETWEEN THE TCM AND THE DLC FOR CONTINUITY.	
 E47292	1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and the TCM, connector C428, pin 25, circuit 4-EC16 (GY/WH), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK the TCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the TCM and soldered connection S130 using the Wiring Diagrams. CHECK the operation of the system.

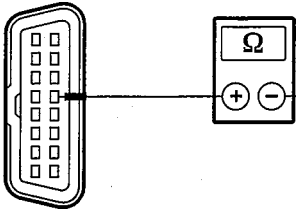
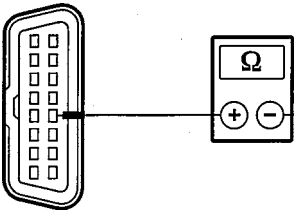
PINPOINT TEST V : FAULTY COMMUNICATION BETWEEN THE MODULES (ISO 9141 BUS).

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L1: CHECK FUSE F18	
	☐ Ignition switch in position 0. 2 CHECK fuse F18 (CJB). • Is the fuse OK? → Yes GO to L2. → No RENEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L2: CHECK THE VOLTAGE AT FUSE F18	
	1 Connect fuse F18 (CJB). 2 Measure the voltage between fuse F18 (15 A) and ground. • Is battery voltage measured? → Yes GO to L3. → No REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
L3: CHECK THE VOLTAGE AT THE DATA LINK CONNECTOR (DLC)	
 VFE0028957	1 Measure the voltage between the DLC, connector C308, pin 16, circuit 29-RA1 (OG), wiring harness side and ground. • Is battery voltage measured? → Yes - Vehicles with ABS or electronic stability program: GO to L4. - Vehicles without ABS or electronic stability program: GO to L5. → No LOCATE and REPAIR the open circuit between the DLC and fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
L4: CHECK THE VOLTAGE AT THE DLC	
 VFE0028963	1 Ignition switch in position II. 2 Measure the voltage between the DLC, connector C308, pin 9, circuit 15-RA1 (GNIRD), wiring harness side and ground. • Is battery voltage measured? → Yes GO to L5. → No LOCATE and REPAIR the break in circuit 15-RA1 (GNIRD) between the DLC and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

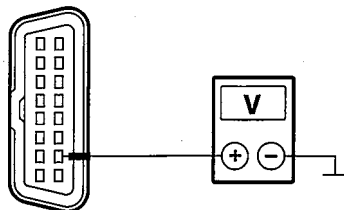
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L5: CHECK THE GROUND CONNECTION OF THE DLC	
 VFE0028965	1 Ignition switch in position 0. 2 Measure the resistance between the DLC, connector C308, pin 4, circuit 31-RA1 (BK), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → Yes GO to L6. → No LOCATE and REPAIR the open circuit between the DLC and ground connection G25 using the Wiring Diagrams. CHECK the operation of the system.
L6: CHECK THE GROUND CONNECTION OF THE DLC	
 VFE0028964	1 Measure the resistance between the DLC, connector C308, pin 5, circuit 91-RA1 (BWOG), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → Yes GO to L7. → No LOCATE and REPAIR the break in circuit 91-RA1 (BWOG) between the DLC and ground connection G31 using the Wiring Diagrams. CHECK the operation of the system.
L7: PERFORM NETWORK TEST	
	1 Disconnect - Vehicles with electronic stability program module: Connector 303 from electronic stability program module. 2 Disconnect - Vehicles with anti-lock braking system: connector C304 from ABS module. 3 Connect the diagnostic tool. 4 Select the vehicle with the diagnostic tester. • Is it possible to establish a connection between the vehicle and the generic electronic module (GEM)? → Yes CHECK and if necessary RENEW the ABS module or electronic stability program module (ESP). CHECK the operation of the system. → No GO to L8.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L8: PERFORM NETWORK TEST (RESTRAINTS CONTROL MODULE (RCM))	
WARNINGS:	
▲ After disconnecting the battery, wait for at least one minute before working on the supplementary restraint system to prevent the risk of accidental airbag deployment. Failure to follow these instructions may result in personal injury.	
▲ Do not program any keycodes while working on the safety restraint system in order to prevent the risk of accidental deployment of safety restraint system components. Failure to follow these instructions may result in personal injury.	
▲ Always use adapters for terminal probe kit when testing any connectors of the airbag systems or of any other safety restraint systems. Failure to follow these instructions may result in personal injury.	
	☐ 1 Disconnect ground cable from battery.
	☐ 2 Disconnect connector C500 from restraints control module (RCM).
	☐ Connect ground cable from battery.
	☐ Select the vehicle with the diagnostic tester. - Is it possible to establish a connection between the vehicle and the generic electronic module (GEM)? → Yes CHECK and if necessary RENEW the restraints control module (RCM). CHECK the operation of the system. → No GO to L9.
L9: TEST THE ISO 9141 BUS FOR A SHORT TO VOLTAGE SUPPLY	
	☐ Ignition switch in position 0.
	☐ Disconnect connector C320 (brown) from GEM.
	☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E0029118

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the DLC, connector C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side and ground.

- Is a voltage measured?

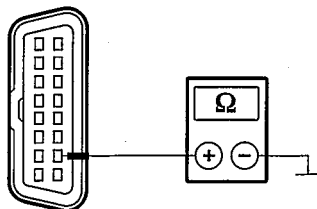
→ **Yes**

LOCATE and REPAIR the short to voltage in the circuits connected to soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to L10.

L10: CHECK THE ISO 9141 BUS FOR A SHORT TO GROUND



E0029119

- 1 Ignition switch in position 0.

- 2 Measure the resistance between the DLC, connector C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side and ground.

- Is a resistance of more than 10,000 ohms measured?

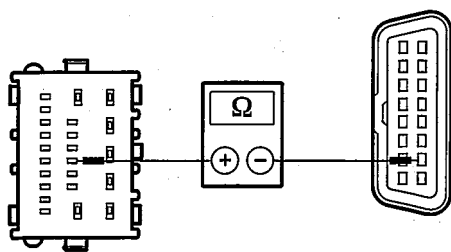
→ **Yes**

GO to L11.

→ **No**

LOCATE and REPAIR the short to ground in the circuits connected to soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

L11: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.



VFE0033612

- 1 Measure the resistance between GEM, connector C320 (brown), pin 10, circuit 4-EE11 (GY/WH), wiring harness side and DLC, C308, pin 7, circuit 4-EE10 (GY/BK), wiring harness side.

- Is a resistance of less than 2 Ohms registered?

→ **Yes**

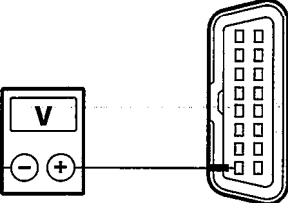
TEST the GEM and RENEW as necessary. CHECK the operation of the system.

→ **No**

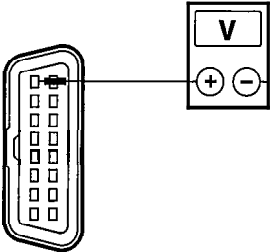
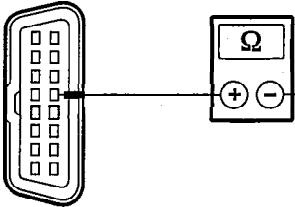
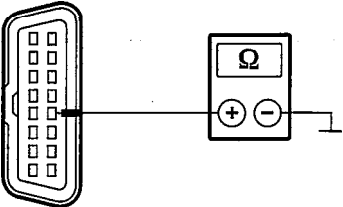
LOCATE and REPAIR the break in circuit 4-EE10 (GY/BK) between the DLC and soldered connection S270 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

PINPOINT TEST W : FAULTY COMMUNICATION BETWEEN THE MODULES - HS CAN BUS.

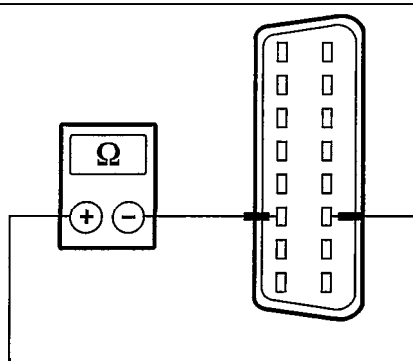
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The number of modules connected to the HS CAN bus depends on the equipment levels of the vehicle. Therefore not every vehicle will have all the modules mentioned below.	
M1: CHECK FUSE F18	
	1 Ignition switch in position 0. 2 CHECK fuse F18 (CJB). • Is the fuse OK? → Yes GO to M2. → No RENEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
M2: CHECK THE VOLTAGE AT FUSE F18	
	1 Connect fuse F18 (CJB). 2 Measure the voltage between fuse F18 (15 A) and ground. • Is battery voltage measured? → Yes GO to M3. → No REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
M3: CHECK THE VOLTAGE AT THE DATA LINK CONNECTOR (DLC)	
 VFE0028957	1 Measure the voltage between the DLC, connector C308, pin 16, circuit 29-RA1 (OG), wiring harness side and ground. • Is battery voltage measured? → Yes - Vehicles with ABS or electronic stability program: GO to M4. - Vehicles without ABS or electronic stability program: GO to M5. → No LOCATE and REPAIR the open circuit between the DLC and fuse F18 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M4: CHECK THE VOLTAGE AT THE DLC	
 VFE0028963	☐ Ignition switch in position II. 2 Measure the voltage between the DLC, connector C308, pin 9, circuit 15-RA1 (GN/RD), wiring harness side and ground. Is battery voltage measured? → Yes GO to M5. → No LOCATE and REPAIR the break in circuit 15-RA1 (GN/RD) between the DLC and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
M5: CHECK THE GROUND CONNECTION OF THE DLC	
 VFE0028965	1 Ignition switch in position 0. ☐ Measure the resistance between the DLC, connector C308, pin 4, circuit 31-RA1 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to M6. → No LOCATE and REPAIR the open circuit between the DLC and ground connection G25 using the Wiring Diagrams. CHECK the operation of the system.
M6: CHECK THE GROUND CONNECTION OF THE DLC	
 VFE0028964	1 Measure the resistance between the DLC, connector C308, pin 5, circuit 91-RA1 (BWO), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to M7. → No LOCATE and REPAIR the break in circuit 91-RA1 (BWO) between the DLC and ground connection G31 using the Wiring Diagrams. CHECK the operation of the system.
M7: CHECK THE HS CAN BUS FOR SHORT CIRCUIT	
	1 Disconnect the ground cable from the battery.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E45951

DETAILS/RESULTS/ACTIONS

2 Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/IRD), wiring harness side and pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

- Is a resistance of between 55 and 65 Ohms measured?

→ **Yes**

- Vehicles without automatic clutch and gear-shift actuation:

GO to M14.

- Vehicles with automatic clutch and gearshift actuation:

GO to M8.

→ **No**

- A resistance of between 115 and 125 Ohms is measured:

GO to M17.

- A resistance of between 115 and 125 Ohms is not measured:

GO to M35.

M8: PERFORM NETWORK TEST

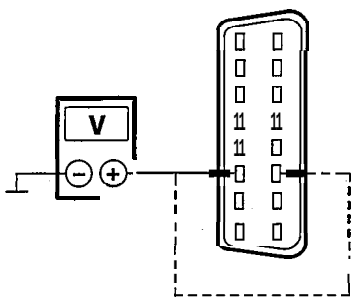
- ☐ Connect the ground cable to the battery.

2 Connect the diagnostic tool.

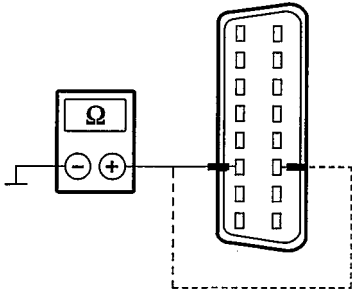
3 Disconnect a listed component, then perform the following test step:

- Vehicles with ESP: Connector 303 from electronic stability program module
- Vehicles with ABS: connector C304 from ABS module
- connector C679 from transmission selector unit
- Connector C281 from the power steering pump module
- Connector C339 from electronic instrument cluster

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Select the vehicle with the diagnostic tester. - Is it possible to establish communication with the PCM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: Key in the OFF position. DISCONNECT the next component (go to test step 3). - If all the listed components are disconnected: GO to M9.
M9: CHECK THE HS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
	1 Ignition switch in position 0. 2 Disconnect connector C676 from transmission control module (TCM). 3 Disconnect Vehicles with 1.6L diesel engine: connector C384 from the PCM. ☐ Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from the PCM. 5 Disconnect Vehicles with 1.4L petrol engine: connector C343 from the PCM. 6 Ignition switch in position II.
 VFE0038142	7 Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.

DIAGNOSIS AND TESTING

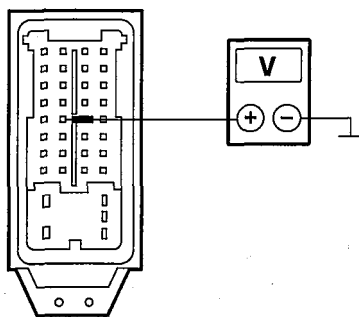
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☒ Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system. → No GO to M10.
M10: CHECK THE HS CAN BUS FOR A SHORT TO GROUND	
	Ignition switch in position 0.
 VFE0038143	☐ Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.
	☐ Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and ground. Is a resistance greater than 10,000 Ohm measured in both cases? → Yes GO to M11. → No LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

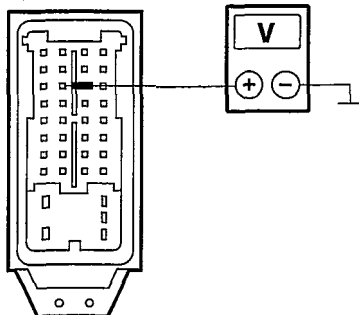
DETAILS/RESULTS/ACTIONS

M11: CHECK THE HS CAN BUS BETWEEN TCM AND PCM FOR SHORT TO VOLTAGE



VFE0033767

- ☐ Measure the voltage between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/IRD) and ground.



VFE0033768

- 2 Measure the voltage between the TCM, connector C676, pin 63, circuit 5-EC7 (BU/RD) and ground.

- Is a voltage measured?

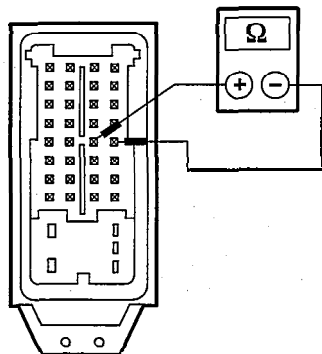
→ **Yes**

LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to M12.

M12: CHECK THE TCM FOR BREAKS



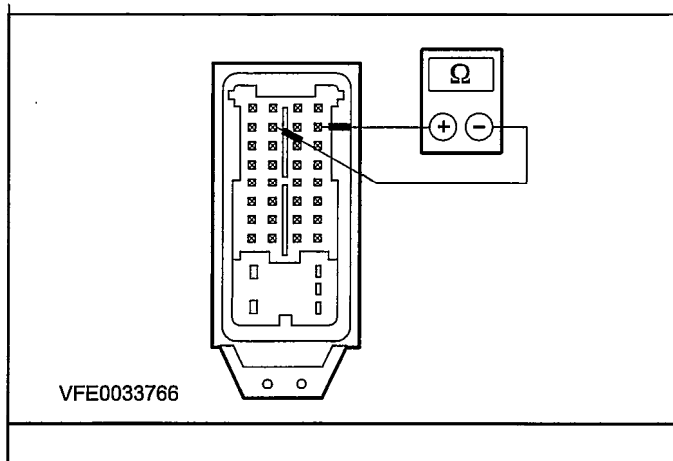
VFE0033765

- ☐ Measure the resistance at TCM, connector C676, between pin 54 and pin 61, component side.

DIAGNOSIS AND TESTING

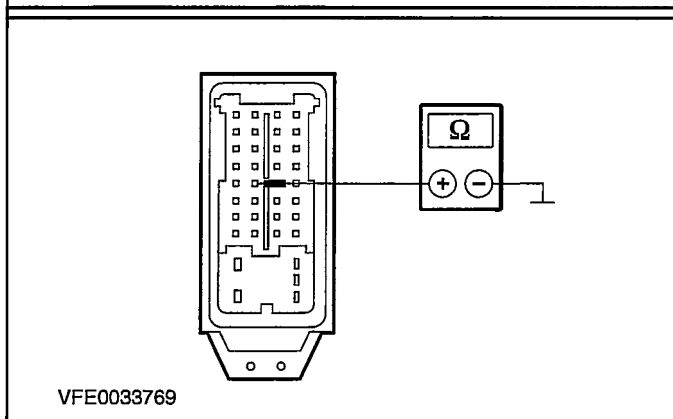
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

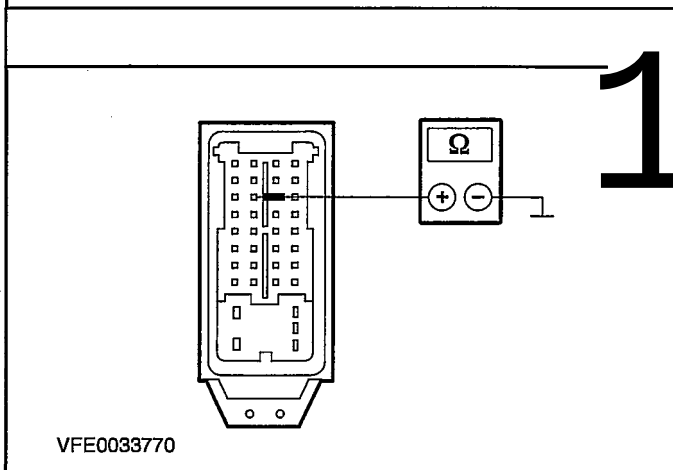


- 2 Measure the resistance at TCM, connector C676, between pin 56 and pin 63, component side.
- Is a resistance of less than 2 Ohms measured in both cases?
- **Yes**
GO to M13.
- **No**
CHECK the TCM and RENEW as necessary.
CHECK the operation of the system.

M13: CHECK THE HS CAN BUS BETWEEN TCM AND PCM FOR SHORT TO GROUND



- 1 Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/RD), wiring harness side and ground.



- 2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BU/RD), wiring harness side and ground.
- Is a resistance greater than 10,000 Ohm measured in both cases?
- **Yes**
CHECK the TCM and RENEW as necessary.
CHECK the operation of the system. If the system is still inoperative, CHECK the PCM and RENEW if necessary. CHECK the operation of the system.
- **No**
LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

M14: PERFORM NETWORK TEST

- 1 Connect the ground cable to the battery.
- Connect the diagnostic tool.

DIAGNOSIS AND TESTING

TEST CONDITIONS

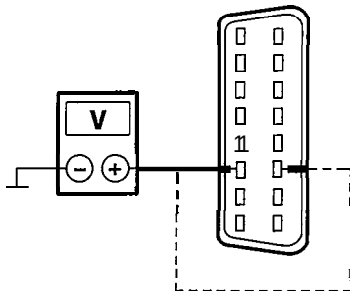
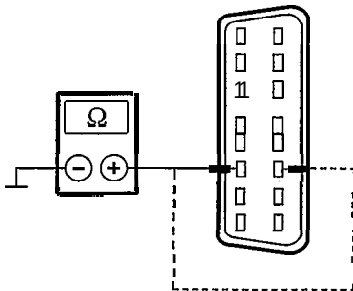
DETAILS/RESULTS/ACTIONS

	3 Disconnect a listed component, then perform the following test step: - Vehicles with ESP: Connector 303 from electronic stability program module - Vehicles with ABS: connector C304 from ABS module - Vehicles with automatic transmission: connector C428 from automatic transmission module - Connector C281 from the power steering pump module - Connector C339 from electronic instrument cluster 4 Select the vehicle with the diagnostic tester. • Is it possible to establish communication with the PCM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: Key in the OFF position. DISCONNECT the next component (go to test step 3). - If all the listed components are disconnected: GO to M15.
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M15: CHECK THE HS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY

	1 Ignition switch in position 0. 2 Disconnect Vehicles with 1.6L diesel engine: connector C384 from the PCM. 3 Disconnect Vehicles with 2.0L petrol engine: connector C380 from the PCM. 4 Disconnect Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): connector C375 from the PCM. ☐ Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from the PCM. 6 Disconnect Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: connector C343 from the PCM. 7 Ignition switch in position II.
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DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS	
 VFE0038142		8 Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.	
		9 Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system. → No GO to M16.	
M16: CHECK THE HS CAN BUS FOR A SHORT TO GROUND			
 VFE0038143		1 Ignition switch in position 0.	
		2 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.	

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

3 Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground.

- Is a resistance greater than 10,000 Ohm measured in both cases?

→ **Yes**

CHECK the PCM and RENEW if necessary.
CHECK the operation of the system.

→ **No**

LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

M17: CHECK THE ELECTRONIC INSTRUMENT CLUSTER

1 Disconnect Connector C339 from electronic instrument cluster.

2 Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BU/RD), wiring harness side.

- Is a resistance of between 115 and 125 Ohms measured?

→ **Yes**

GO to M18.

→ **No**

- Vehicles with automatic clutch and gearshift actuation:

GO to M20.

- Vehicles with 1.6L diesel engine without automatic clutch and gearshift actuation:

GO to M29.

- Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR) and without automatic clutch and gearshift actuation:

GO to M27.

- Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR) and without automatic clutch and gearshift actuation:

GO to M33.

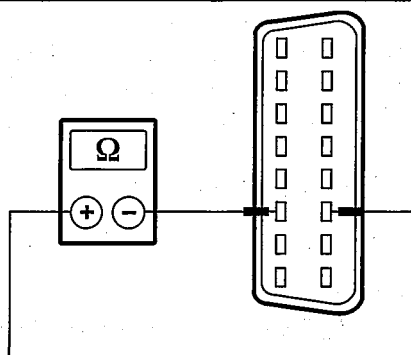
- Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V

(Rocam) engine without automatic clutch and gearshift actuation:

GO to M31.

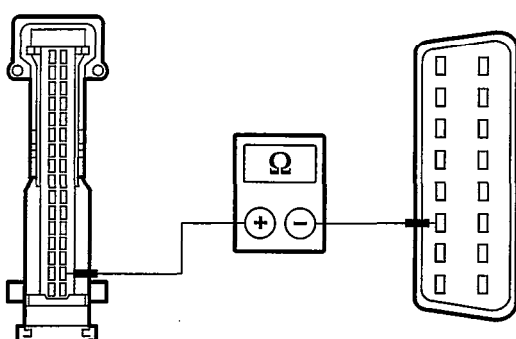
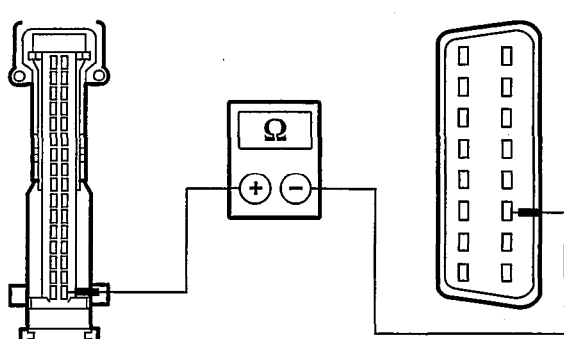
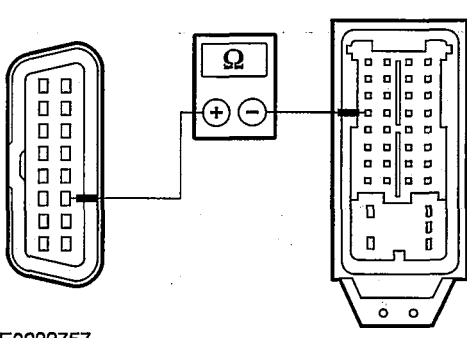
- Vehicles with 2.0L petrol engine:

GO to M25.



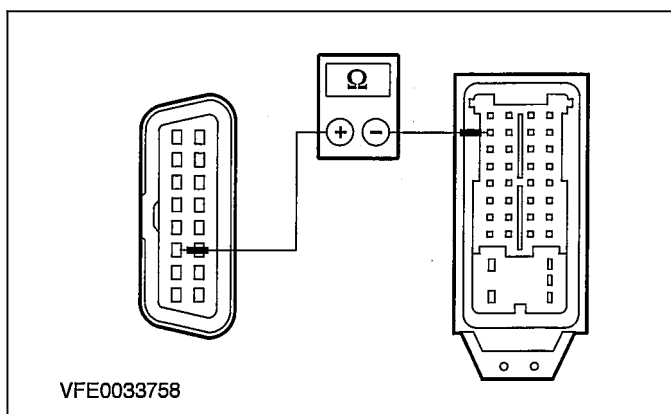
E45951

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M18: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC  VFE58689	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 31, circuit 5-EC8A (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to M19. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M19: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC  VFE58690	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 32, circuit 4-EC8A (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the electronic instrument cluster. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M20: CHECK THE CIRCUIT BETWEEN THE TCM AND THE DLC FOR CONTINUITY.  VFE0033757	1 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side and the TCM, connector C676, pin 54, circuit 4-EC8 (GY/VT), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and the TCM, connector C676, pin 56, circuit 5-EC8 (BU/WH), wiring harness side.

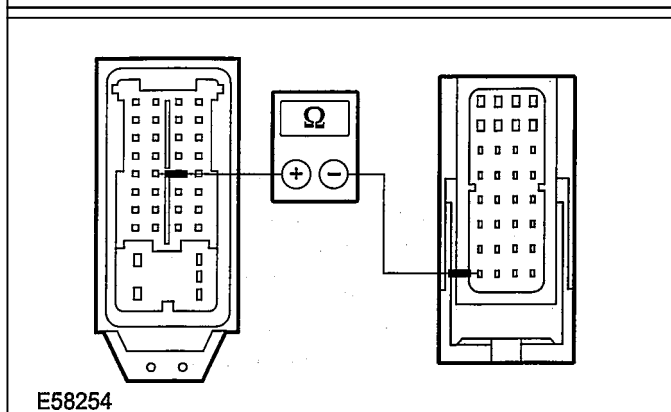
- Is a resistance of less than 2 Ohms measured in all of the cases?

→ **Yes**

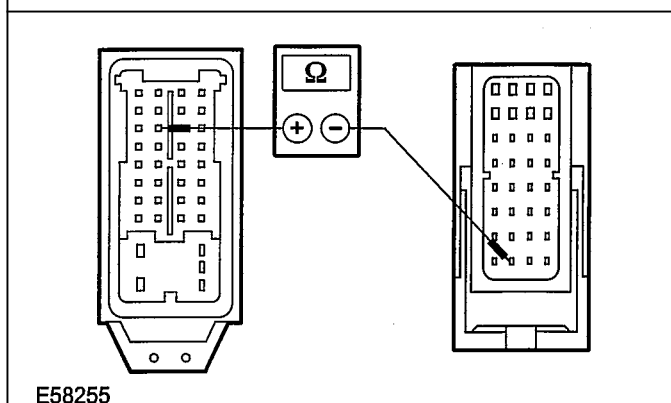
- Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): GO to M22.
- Vehicles with 1.4L petrol engine: GO to M23.
- Vehicles with 1.6L diesel engine: GO to M21.

→ **No**

LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.

M21: CHECK THE CIRCUIT BETWEEN THE TCM AND THE PCM FOR CONTINUITY.

- 1 Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GYIRD), wiring harness side and the PCM, connector C384, pin A4, circuit 4-EC7 (GYIRD), wiring harness side.



- 2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BUIRD), wiring harness side and the PCM, connector C384, pin A3, circuit 5-EC7 (BUIRD), wiring harness side.

- Is a resistance of less than 2 Ohms measured in all of the cases?

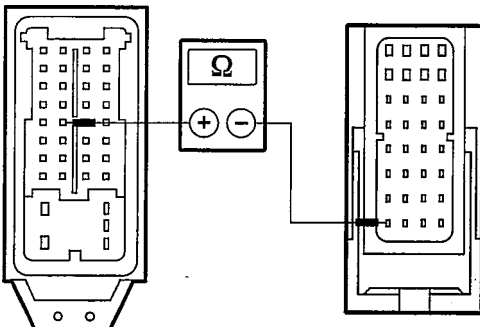
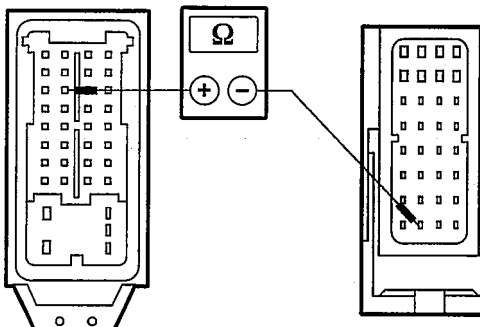
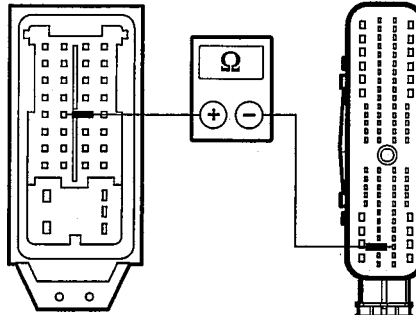
→ **Yes**

GO to M24.

→ **No**

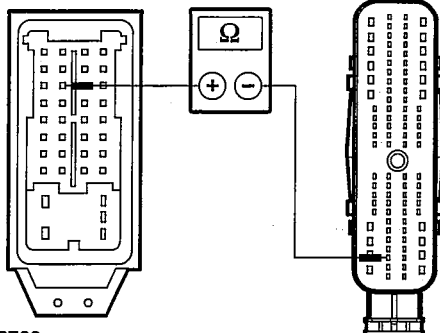
LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M22: CHECK THE CIRCUIT BETWEEN THE TCM AND THE PCM FOR CONTINUITY.  E58254	Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GYIRD), wiring harness side and the PCM, connector C370, pin A4, circuit 4-EC7 (GYIRD), wiring harness side.
 E58255	2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BU/RD), wiring harness side and the PCM, connector C370, pin A3, circuit 5-EC7 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms measured in all of the cases? → Yes GO to M24. → No LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.
M23: CHECK THE CIRCUIT BETWEEN THE TCM AND THE PCM FOR CONTINUITY.  VFE0033759	☐ Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GYIRD), wiring harness side and the PCM, connector C343, pin F31, circuit 4-EC7 (GYIRD), wiring harness side.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0033760

DETAILS RESULTS ACTIONS

- 2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BU/RD), wiring harness side and the PCM, connector C343, pin F19, circuit 5-EC7 (BU/RD), wiring harness side.

- Is a resistance of less than 2 Ohms measured in all of the cases?

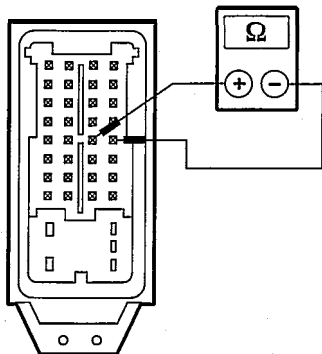
→ Yes

GO to M24.

→ No

LOCATE and REPAIR the break in the relevant circuit using the Wiring Diagrams. CHECK the operation of the system.

M24: CHECK THE TCM FOR BREAKS



VFE0033765

- 1 Measure the resistance at TCM, connector C676, between pin 54 and pin 61, component side.

- 2 Measure the resistance at TCM, connector C676, between pin 56 and pin 63, component side.

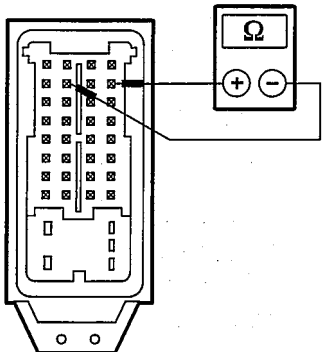
- Is a resistance of less than 2 Ohms measured in both cases?

→ Yes

CHECK the PCM and RENEW if necessary. CHECK the operation of the system.

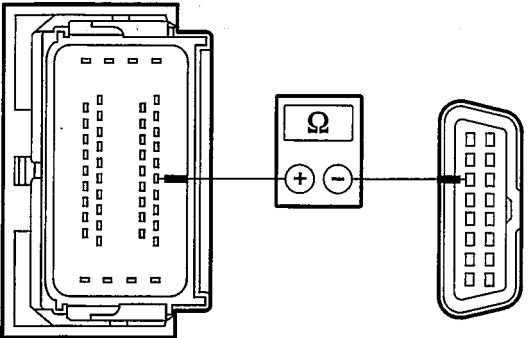
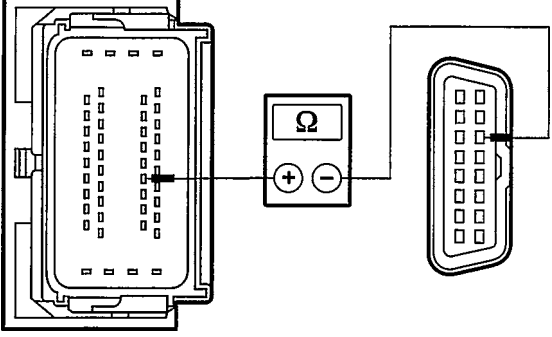
→ No

CHECK the TCM and RENEW as necessary. CHECK the operation of the system.

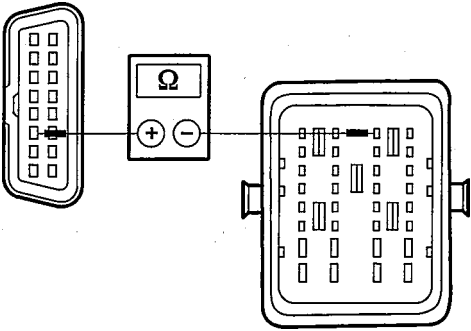
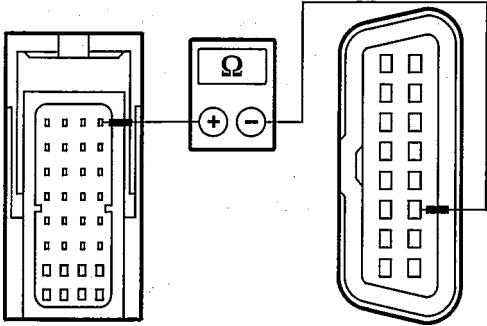
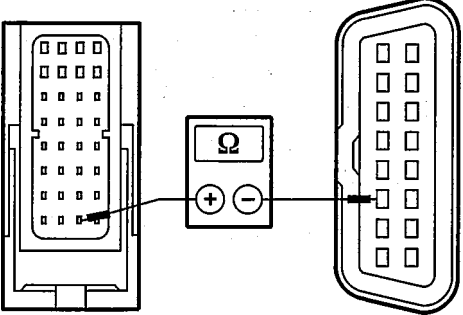


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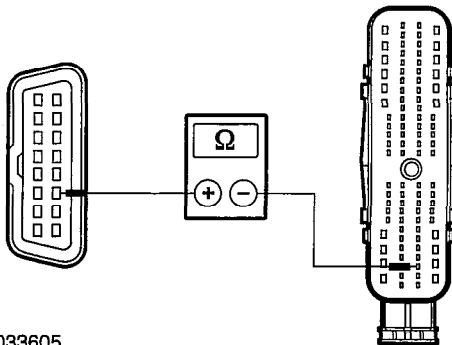
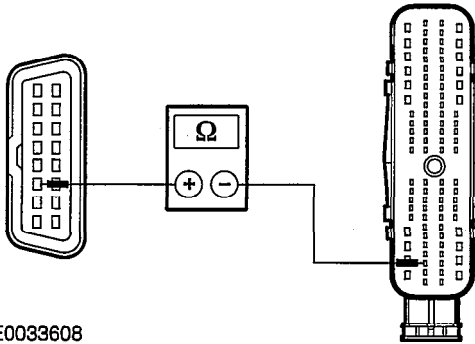
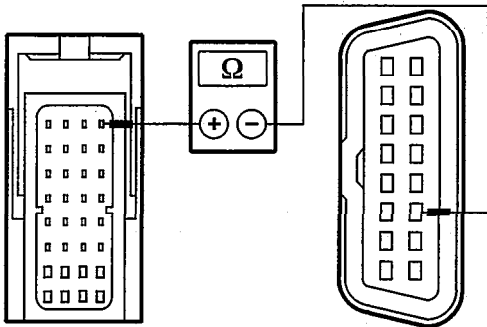
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M25: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E65382	1 Measure the resistance between the PCM, connector C380, pin 41, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to M26. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M26: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E65383	1 Measure the resistance between the PCM, connector C380, pin 30, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M27: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	☐ Disconnect connector C370 from the PCM. 2 Measure the resistance between the PCM, connector C370, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to M28. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

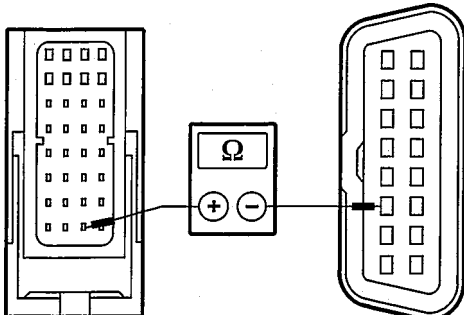
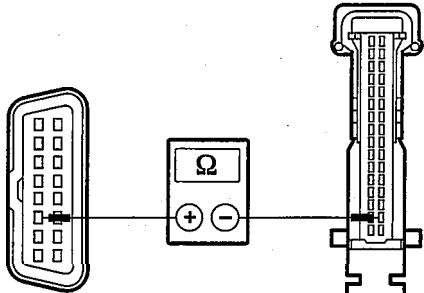
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M28: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  VFE0033610	□ Measure the resistance between the PCM, connector C370, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M29: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58252	1 Measure the resistance between the PCM, connector C384, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to M30. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M30: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT  E58253	1 Measure the resistance between the PCM, connector C384, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

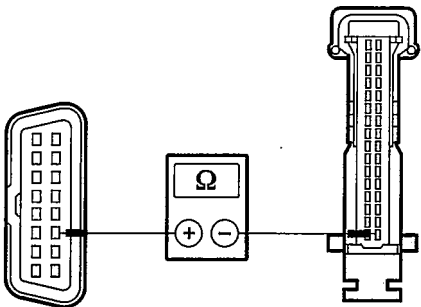
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M31: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
 VFE0033605	1 Disconnect connector C343 from the PCM. 2 Measure the resistance between the PCM, connector C343, pin F31, circuit 4-EC7 (GY/RD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to M32. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M32: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
 VFE0033608	1 Measure the resistance between the PCM, connector C343, pin F19, circuit 5-EC7 (BU/RD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M33: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT	
 E58252	1 Measure the resistance between the PCM, connector C375, pin A4, circuit 4-EC7 (GYIRD), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GYIRD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to M34. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS		DETAILS/RESULTS/ACTIONS	
M34: CHECK THE CIRCUIT BETWEEN THE PCM AND THE DLC FOR OPEN CIRCUIT			
 E58253		Measure the resistance between the PCM, connector C375, pin A3, circuit 5-EC7 (BUIRD), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the PCM and the DLC using the Wiring Diagrams. CHECK the operation of the system.	
M35: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC			
 VFE0033606		☐ Disconnect Connector C339 from electronic instrument cluster. 2 Measure the resistance between the electronic instrument cluster, connector C339, pin 31, circuit 5-EC8A (BU/WH), wiring harness side and the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to M36. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.	

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M36: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC	
 VFE0033603	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 32, circuit 4-EC8A (GY/VT), wiring harness side and the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side. - Is a resistance of less than 2 Ohms registered? → Yes - Vehicles without automatic clutch and gear-shift actuation: GO to M37. - Vehicles with automatic clutch and gearshift actuation: GO to M41. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
M37: PERFORM NETWORK TEST	
NOTE:The number of modules connected to the HS CAN bus depends on the equipment levels of the vehicle. Therefore not every vehicle will have all the modules mentioned below.	
	☐ Connect the ground cable to the battery. 2 Connect the diagnostic tool. ☐ Disconnect a listed component, then perform the following test step: - Vehicles with ESP: connector 303 from electronic stability program module - Vehicles with ABS: connector C304 from ABS module - Vehicles with automatic transmission connector C428 from automatic transmission module - Connector C281 from the power steering pump module

DIAGNOSIS AND TESTING

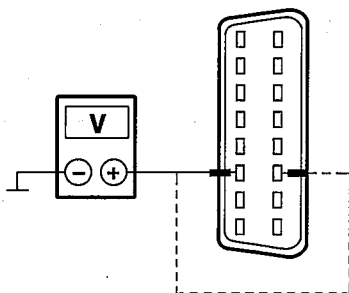
TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

- 4** Select the vehicle with the diagnostic tester.
- Is it possible to establish communication with the PCM?
- **Yes**
The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system.
- **No**
- If not all the listed components are disconnected:
Key in the OFF position. DISCONNECT the next component (go to test step 3).
 - If all the listed components are disconnected:
GO to M38.

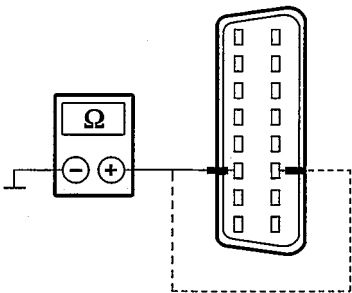
M38: CHECK THE HS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY

- 1** Ignition switch in position 0.
- 2** Disconnect Vehicles with 1.6L diesel engine: connector C384 from the PCM.
- 3** Disconnect Vehicles with 2.0L petrol engine: connector C380 from the PCM.
- ☐ Disconnect Vehicles with 1.4L diesel engine with electric exhaust gas recirculation valve (EGR): connector C375 from the PCM.
- 5** Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from the PCM.
- 6** Disconnect Vehicles with 1.25L, 1.4L or 1.6L petrol engine / vehicles with 1.3L Duratec-8V (Rocam) engine: connector C343 from the PCM.
- 7** Ignition switch in position II.
- ☐ Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.

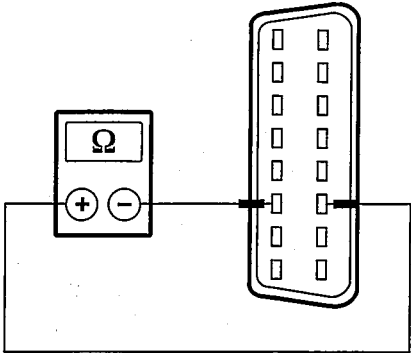


VFE0038142

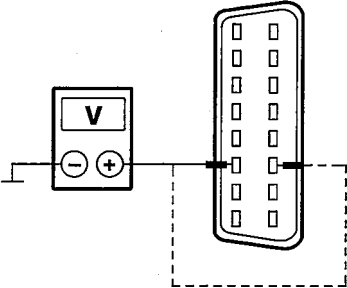
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	9 Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system. → No GO to M39.
M39: CHECK THE HS CAN BUS FOR A SHORT TO GROUND	
 VFE0038143	1 Ignition switch in position 0. 2 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.
	☐ Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BUIRD), wiring harness side and ground. Is a resistance greater than 10,000 Ohm measured in both cases? → Yes GO to M40. → No LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

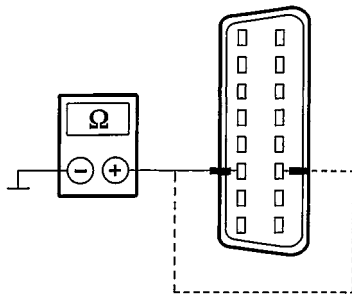
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M40: CHECK THE HS CAN BUS FOR SHORT CIRCUIT  E45951	1 Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance greater than 10,000 Ohm measured in both cases? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the short circuit in the HS CAN Bus using the Wiring Diagrams. CHECK the operation of the system.
M41: PERFORM NETWORK TEST	1 Connect the ground cable to the battery. 2 Connect the diagnostic tool. 3 Disconnect a listed component, then perform the following test step: - Vehicles with ESP: connector 303 from electronic stability program module - Vehicles with ABS: connector C304 from ABS module - Vehicles with automatic clutch and gearshift actuation: connector C679 from transmission selector unit - Connector C339 from electronic instrument cluster - Connector C281 from the power steering pump module ☐ Select the vehicle with the diagnostic tester. - Is it possible to establish communication with the PCM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: Key in the OFF position. DISCONNECT the next component (go to test step 3). - If all the listed components are disconnected: GO to M42.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILSIREULTSIACIONS
M42: CHECK THE HS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
	1 Ignition switch in position 0.
	2 Disconnect connector C676 from transmission control module (TCM).
	3 Disconnect Vehicles with 1.6L diesel engine: connector C384 from the PCM.
	4 Disconnect Vehicles with 1.4L diesel engine without electric exhaust gas recirculation valve (EGR): connector C370 from the PCM.
	5 Disconnect Vehicles with 1.4L petrol engine: connector C343 from the PCM.
	6 Ignition switch in position II.
 VFE0038142	☐ Measure the voltage between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.
	☐ Measure the voltage between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams. CHECK the operation of the system. → No GO to M43.
M43: CHECK THE HS CAN BUS FOR A SHORT TO GROUND	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VFE0038143

DETAILS/RESULTS/ACTIONS

- 2 Measure the resistance between the DLC, connector C308, pin 6, circuit 4-EC1 (GY/RD), wiring harness side and ground.

- Measure the resistance between the DLC, connector C308, pin 14, circuit 5-EC1 (BU/RD), wiring harness side and ground.

- Is a resistance greater than 10,000 Ohm measured in both cases?

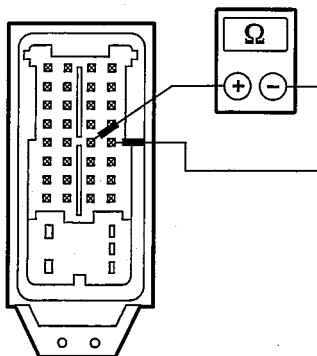
→ **Yes**

GO to M44.

→ **No**

LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

M44: CHECK THE TCM FOR BREAKS



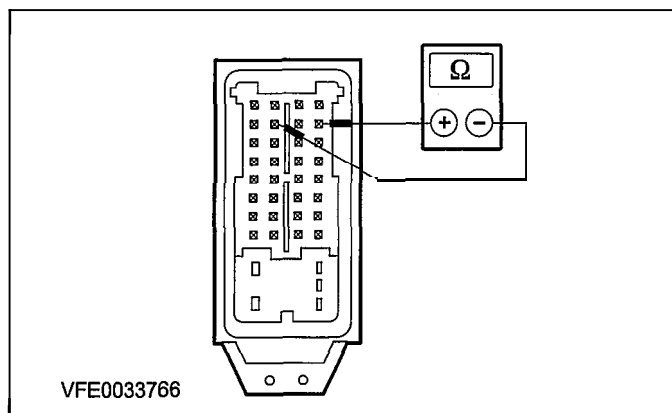
VFE0033765

- 1 Measure the resistance at TCM, connector C676, between pin 54 and pin 61, component side.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS



☐ Measure the resistance at TCM, connector C676, between pin 56 and pin 63, component side.

- Is a resistance of less than 2 Ohms measured in both cases?

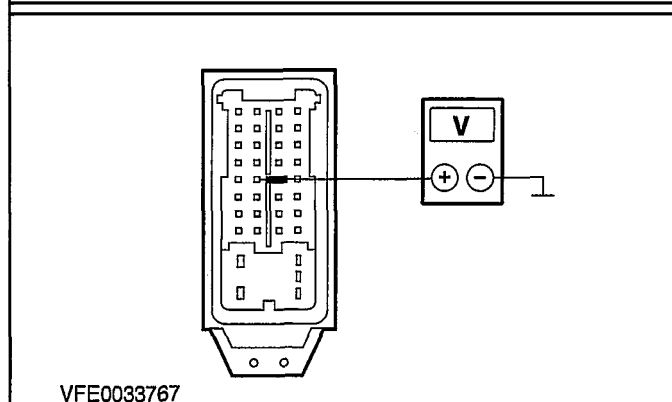
→ **Yes**

GO to M45.

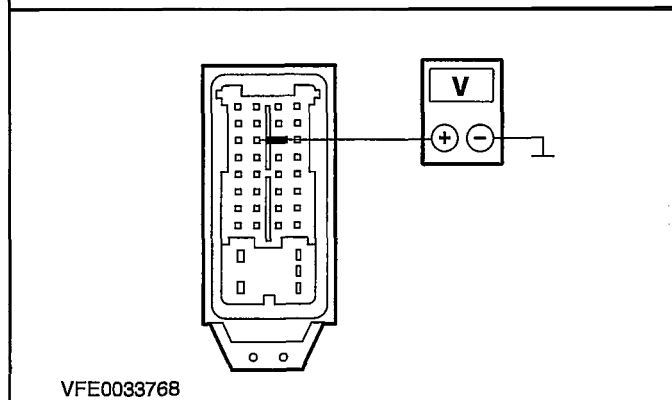
→ **No**

CHECK the TCM and RENEW as necessary.
CHECK the operation of the system.

M45: CHECK THE HS CAN BUS BETWEEN TCM AND PCM FOR SHORT TO VOLTAGE



1 Measure the voltage between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/RD) and ground.



☐ Measure the voltage between the TCM, connector C676, pin 63, circuit 5-EC7 (BU/RD) and ground.

- Is a voltage measured?

→ **Yes**

LOCATE and REPAIR the short to voltage in the affected circuit using the Wiring Diagrams.
CHECK the operation of the system.

→ **No**

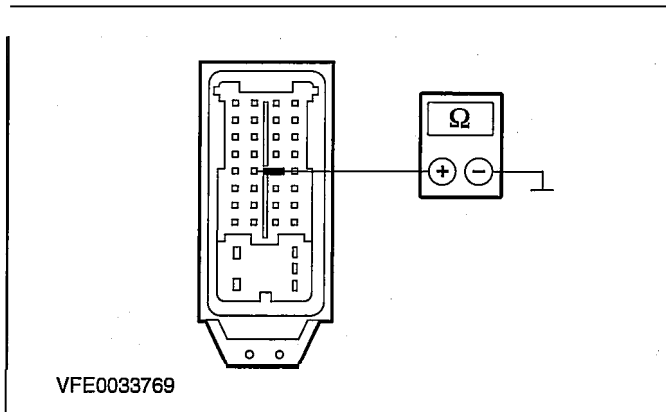
GO to M46.

DIAGNOSIS AND TESTING

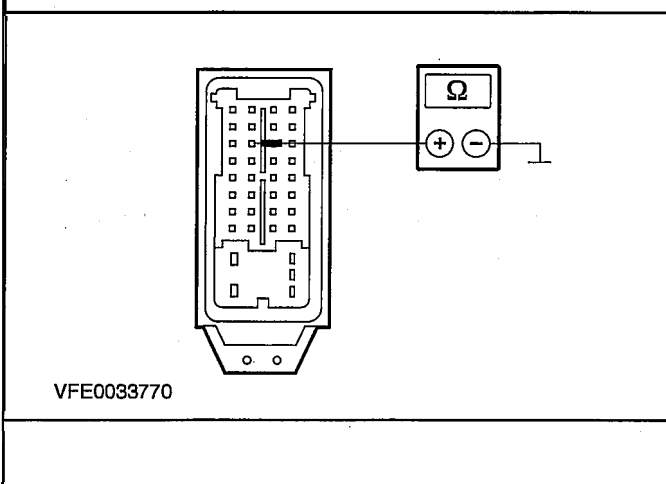
TEST CONDITIONS

DETAILS RESULTS ACTIONS

M46: CHECK THE HS CAN BUS BETWEEN TCM AND PCM FOR SHORT TO GROUND

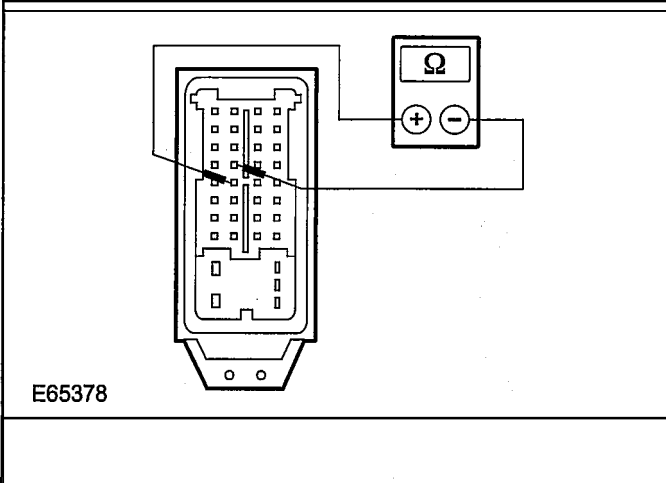


- 1 Measure the resistance between the TCM, connector C676, pin 61, circuit 4-EC7 (GY/RD) and ground.



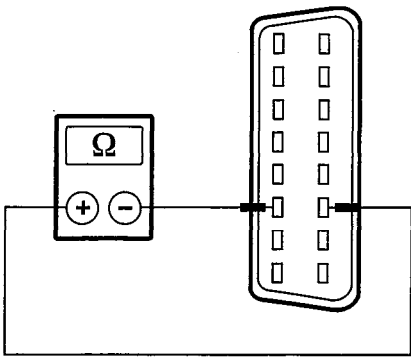
- 2 Measure the resistance between the TCM, connector C676, pin 63, circuit 5-EC7 (BUIRD) and ground.
 - Is a resistance greater than 10,000 Ohm measured in both cases?
 - **Yes**
GO to M47.
 - **No**
LOCATE and RECTIFY the short to ground in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.

M47: CHECK THE HS CAN BUS FOR SHORT CIRCUIT



- 1 Measure the resistance at the TCM, connector C676, between pin 61, circuit 4-EC7 (GY/RD), wiring harness side and pin 63, circuit 5-EC7 (BUIRD), wiring harness side.
 - Is a resistance greater than 10,000 Ohm measured in both cases?
 - **Yes**
GO to M48.
 - **No**
LOCATE and REPAIR the short circuit in the HS CAN Bus using the Wiring Diagrams. CHECK the operation of the system.

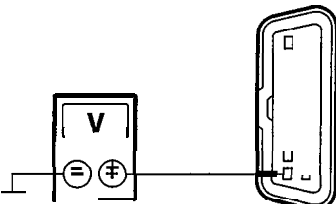
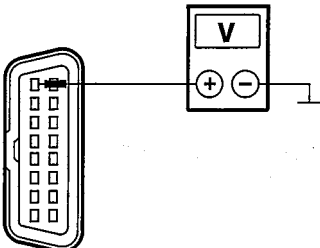
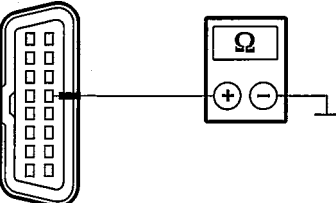
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M48: CHECK THE HS CAN BUS FOR SHORT CIRCUIT	
 E45951	1 Measure the resistance at the DLC, connector C308, between pin 6, circuit 4-EC1 (GY/RD), wiring harness side and pin 14, circuit 5-EC1 (BU/RD), wiring harness side. Is a resistance greater than 10,000 Ohm measured in both cases? → Yes CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → No LOCATE and REPAIR the short circuit in the HS CAN Bus using the Wiring Diagrams. CHECK the operation of the system.

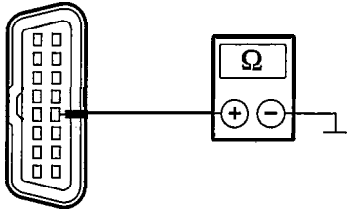
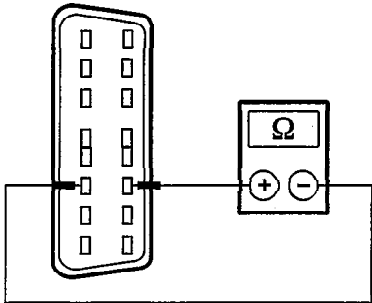
PINPOINT TEST X : FAULTY COMMUNICATION BETWEEN THE MODULES • MS CAN BUS.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
⚠ CAUTION: The measurements below may only be performed using the WDS digital multimeter. Failure to observe this instruction can lead to damage.	
N1: CHECK FUSE F18	
	1 Ignition switch in position 0. ☐ CHECK fuse F18 (CJB). Is the fuse OK? → Yes GO to N2. → No RENEW fuse F18 (15 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.
N2: CHECK THE VOLTAGE AT FUSE F18	
	1 Connect fuse F18 (CJB). 2 Measure the voltage between fuse F18 (15 A) and ground. Is battery voltage measured? → Yes GO to N3. → No REPAIR the voltage supply to fuse F18 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N3: CHECK THE VOLTAGE AT THE DATA LINK CONNECTOR (DLC)	
 VFE0028957	☐ Measure the voltage between the DLC, connector C308, pin 16, circuit 29-RA1 (OG), wiring harness side and ground. - Is battery voltage measured? → Yes - Vehicles with ABS or electronic stability program: GO to N4. - Vehicles without ABS or electronic stability program: GO to N5. → No LOCATE and RECTIFY the break in circuit 29-RA1 (OG) between DLC and fuse F18 using the Wiring Diagrams. CHECK the operation of the system.
N4: CHECK THE VOLTAGE AT THE DLC	
 VFE0028963	1 Ignition switch in position II. 2 Measure the voltage between the DLC, connector C308, pin 9, circuit 15-RA1 (GNIRD), wiring harness side and ground. Is battery voltage measured? → Yes GO to N5. → No LOCATE and REPAIR the break in circuit 15-RA1 (GNIRD) between the DLC and the ignition switch using the Wiring Diagrams. CHECK the operation of the system.
N5: CHECK THE GROUND CONNECTION OF THE DLC - PIN 4	
 VFE0028965	☐ Ignition switch in position 0. 2 Measure the resistance between the DLC, connector C308, pin 4, circuit 31-RA1 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohms registered? → Yes GO to N6. → No LOCATE and REPAIR the open circuit between the DLC and ground connection G25 using the Wiring Diagrams. CHECK the operation of the system.

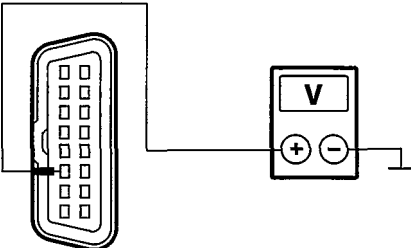
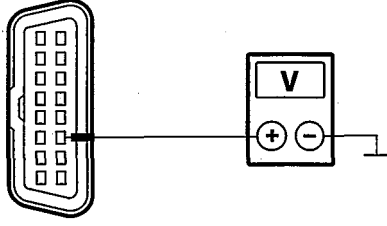
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N6: CHECK THE GROUND CONNECTION OF THE DLC - PIN 5  VFE0028964	☐ Measure the resistance between the DLC, connector C308, pin 5, circuit 91-RA1 (BWO), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → Yes GO to N7. → No LOCATE and REPAIR the break in circuit 91-RA1 (BWO) between the DLC and ground connection G31 using the Wiring Diagrams. CHECK the operation of the system.
N7: CHECK THE MS CAN BUS FOR SHORT CIRCUIT  E45952	1 Disconnect the ground cable from the battery. Measure the resistance between the DLC, connector C308, between pin 3, circuit 4-EC2 (GY/RD), wiring harness side and pin 11, circuit 5-EC2 (BU/RD), wiring harness side. • Is a resistance of between 55 and 65 Ohms measured? → Yes GO to N8. → No If a resistance between 115 and 120 Ohms is measured: GO to N14. If no resistance between 115 and 120 Ohms is measured: GO to N19.

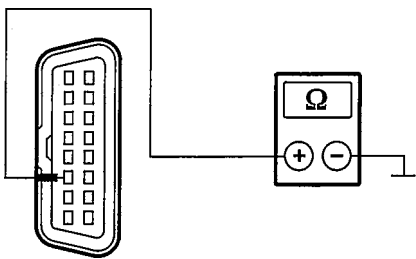
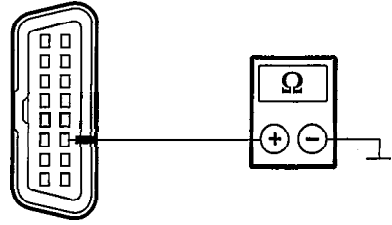
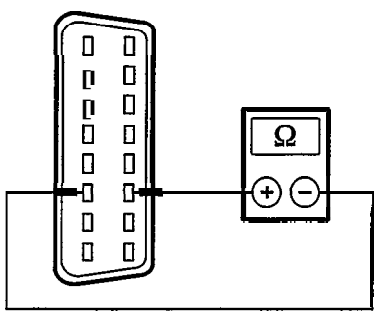
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N8: PERFORM NETWORK TEST (RESTRAINTS CONTROL MODULE (RCM))	
WARNINGS:  The backup power supply must be depleted to prevent the risk of accidental airbag deployment. After disconnecting the battery, wait at least 1 minute before starting work on the safety restraint system (SRS). Failure to follow these instructions may result in personal injury.	
 Do not program any keycodes while working on the safety restraint system in order to prevent the risk of accidental deployment of safety restraint system components. Failure to follow these instructions may result in personal injury.	
 Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow these instructions may result in personal injury.	
NOTE: After connecting the battery, initialize the power window motors.	
	☐ 1 Disconnect connector C500 from restraints control module (RCM).
	☐ 2 Connect ground cable from battery.
	☐ Connect the diagnostic tool.
	☐ 4 Select the vehicle with the diagnostic tester. - Is it possible to establish communication with the GEM? → Yes CHECK and if necessary RENEW the restraints control module. CHECK the operation of the system. → No GO to N9.
N9: PERFORM NETWORK TEST	
NOTE: The number of modules connected to the MS CAN bus depends on the equipment levels of the vehicle. Therefore not every vehicle will have all the modules mentioned below.	
	☐ 1 Ignition switch in position 0.
	☐ Disconnect a listed component, then perform the following test step: - Audio system control panel C775 - Electronic automatic temperature control (EATC) module C367 - Bluetooth/voice control module C796 - Electronic instrument cluster C339

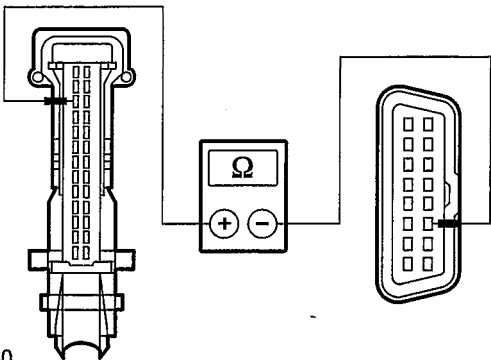
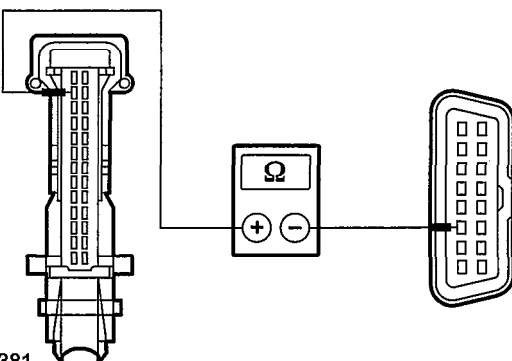
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Select the vehicle with the diagnostic tester. Is it possible to establish communication with the GEM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: DISCONNECT the next component (go to test step 1). - If all the listed components are disconnected: GO to N10.
N10: CHECK THE MS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
	☐ 1 Ignition switch in position 0. ☐ Disconnect Connector C320 from GEM. ☐ 3 Ignition switch in position II.
 E65386	☐ Measure the voltage between the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and RECTIFY the short to voltage supply in the circuits connected to soldered connection S278 using the Wiring Diagrams. CHECK the operation of the system. → No GO to N11.
N11: CHECK THE MS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
 E65387	☐ Measure the voltage between the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and RECTIFY the short to voltage supply in the circuits connected to soldered connection S277 using the Wiring Diagrams. CHECK the operation of the system. → No GO to N12.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N12: CHECK THE MS CAN BUS FOR A SHORT TO GROUND	
 E65388	☐ Ignition switch in position 0. 2 Measure the resistance between the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes GO to N13. → No LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S278 using the Wiring Diagrams. CHECK the operation of the system.
N13: CHECK THE MS CAN BUS FOR A SHORT TO GROUND	
 E65389	1 Measure the resistance between the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes TEST the GEM and RENEW as necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S277 using the Wiring Diagrams. CHECK the operation of the system.
N14: CHECK THE MS CAN BUS FOR SHORT CIRCUIT	
 E45952	1 Disconnect Connector C339 from electronic instrument cluster. ☐ Measure the resistance between the DLC, connector C308, between pin 3, circuit 4-EC2 (GY/RD), wiring harness side and pin 11, circuit 5-EC1QJ (BU), wiring harness side. is a resistance of between 115 and 120 Ohms measured? → Yes GO to N15. → No GO to N17.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N15: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DATA LINK CONNECTOR (DLC)	
 E65380	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 11, circuit 5-EC10 (BU), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes GO to N16. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
N16: CHECK FOR OPEN CIRCUIT BETWEEN THE ELECTRONIC INSTRUMENT CLUSTER AND THE DLC	
 E65381	1 Measure the resistance between the electronic instrument cluster, connector C339, pin 12, circuit 4-EC10 (GY), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes CHECK and if necessary RENEW the electronic instrument cluster. CHECK the operation of the system. → No LOCATE and RECTIFY the break in the circuit between the electronic instrument cluster and the DLC using the Wiring Diagrams. CHECK the operation of the system.
N17: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.	
	1 Disconnect Connector C320 from GEM.

DIAGNOSIS AND TESTING

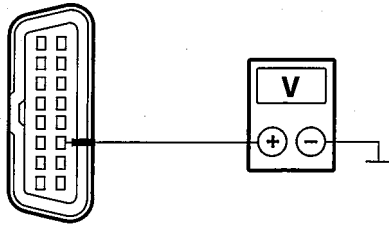
TEST CONDITIONS	DETAILS RESULTS ACTIONS
E65376	Measure the resistance between the GEM, connector C320, pin 23, circuit 4-EC14 (GY/OG), wiring harness side and the DLC, connector C308, pin 3, circuit 4-EC2 (GY/RD), wiring harness side. Is a resistance of less than 2 Ohms registered? → Yes GO to N18. → No LOCATE and REPAIR the break in the circuit between the GEM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
N18: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC.	
E65377	Measure the resistance between the GEM, connector C320, pin 22, circuit 5-EC14 (BU/BK), wiring harness side and the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side. • Is a resistance of less than 2 Ohms registered? → Yes TEST the GEM and RENEW as necessary. CHECK the operation of the system. → No LOCATE and REPAIR the break in the circuit between the GEM and the DLC using the Wiring Diagrams. CHECK the operation of the system.
N19: PERFORM NETWORK TEST (RESTRAINTS CONTROL MODULE (RCM))	
WARNINGS: ▲ The backup power supply must be depleted to prevent the risk of accidental airbag deployment. After disconnecting the battery, wait at least 1 minute before starting work on the safety restraint system (SRS). Failure to follow these instructions may result in personal injury.	
▲ Do not program any keycodes while working on the safety restraint system in order to prevent the risk of accidental deployment of safety restraint system components. Failure to follow these instructions may result in personal injury.	
▲ Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow these instructions may result in personal injury.	
NOTE: After connecting the battery, initialize the power window motors.	
	Disconnect connector C500 from restraints control module (RCM).

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	☐ Connect ground cable from battery. ☐ Connect the diagnostic tool. 4 Select the vehicle with the diagnostic tester. Is it possible to establish communication with the GEM? → Yes CHECK and if necessary RENEW the restraints control module. CHECK the operation of the system. → No GO to N20.
N20: PERFORM NETWORK TEST	
NOTE: The number of modules connected to the MS CAN bus depends on the equipment levels of the vehicle. Therefore not every vehicle will have all the modules mentioned below.	
	☐ Disconnect a listed component, then perform the following test step: - Electronic instrument cluster C339 - Audio system control panel C775 - Electronic automatic temperature control (EATC) module C367 - Bluetooth/voice control module C796 ☐ Select the vehicle with the diagnostic tester. - Is it possible to establish communication with the GEM? → Yes The component disconnected last is the cause of the concern, CHECK component and if necessary RENEW. CHECK the operation of the system. → No - If not all the listed components are disconnected: DISCONNECT the next component (go to test step I). - If all the listed components are disconnected: GO to N21.
N21: CHECK THE MS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY	
	☐ Ignition switch in position 0. ☐ Disconnect Connector C320 from GEM. ☐ Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS



E65387

DETAILS/RESULTS/ACTIONS

- 4 Measure the voltage between the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side and ground.

- Is a voltage measured?

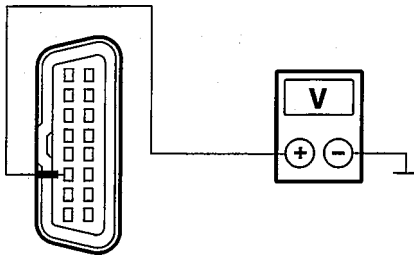
→ **Yes**

LOCATE and RECTIFY the short to voltage supply in the circuits connected to soldered connection S277 using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to N22.

N22: CHECK THE MS CAN BUS FOR A SHORT TO VOLTAGE SUPPLY



E65386

- Measure the voltage between the DLC, connector C308, pin 3, circuit 4-EC2 (GYIRD), wiring harness side and ground.

- Is a voltage measured?

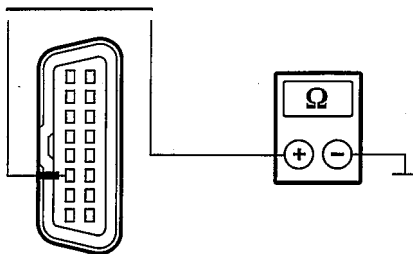
→ **Yes**

LOCATE and RECTIFY the short to voltage supply in the circuits connected to soldered connection S278 using the Wiring Diagrams. CHECK the operation of the system.

→ **No**

GO to N23.

N23: CHECK THE MS CAN BUS FOR A SHORT TO GROUND



E65388

- 1 Ignition switch in position 0.

- 2 Measure the resistance, between the DLC, connector C308, pin 3, circuit 4-EC2 (GYIRD), wiring harness side and ground.

- Is a resistance of more than 10,000 ohms measured?

→ **Yes**

GO to N24.

→ **No**

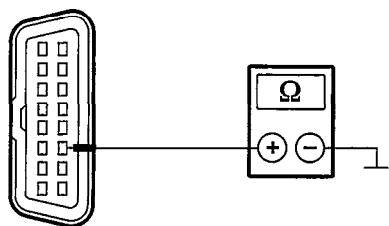
LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S278 using the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

N24: CHECK THE MS CAN BUS FOR A SHORT TO GROUND



E65389

- 1 Measure the resistance between the DLC, connector C308, pin 11, circuit 5-EC2 (BU/RD), wiring harness side and ground.

- Is a resistance of more than 10,000 ohms measured?

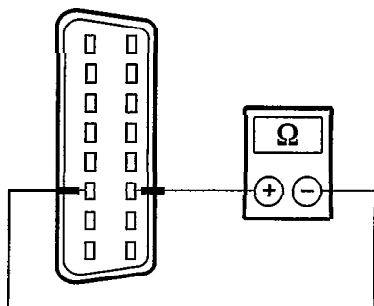
→ **Yes**

GO to N25.

→ **No**

LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S277 using the Wiring Diagrams. CHECK the operation of the system.

N25: CHECK THE MS CAN BUS FOR SHORT CIRCUIT



E45952

- 1 Measure the resistance between the DLC, connector C308, between pin 3, circuit 4-EC2 (GY/RD), wiring harness side and pin 11, circuit 5-EC2 (BU/RD), wiring harness side.

- Is a resistance greater than 10,000 Ohm measured in both cases?

→ **Yes**

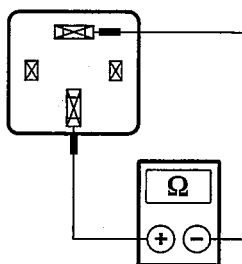
TEST the GEM and RENEW as necessary. CHECK the operation of the system.

→ **No**

LOCATE and REPAIR the short circuit in the MS CAN bus using the Wiring Diagrams. CHECK the operation of the system.

Component Tests

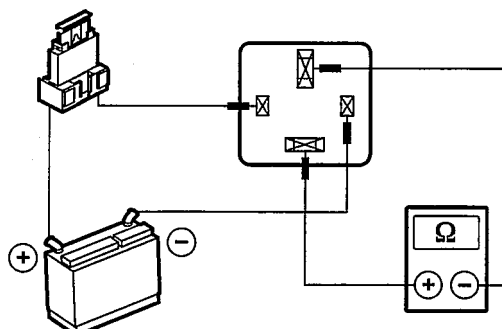
PCM module relay



VFE0031236

1. Check the normally open contact in the unswitched state:

1. Measure the resistance at the PCM module relay, between pin 3, component side and pin 5, component side.
2. Is a resistance of more than 40,000 ohms measured?
3. If yes, go to 2.
4. If no, RENEW the PCM module relay.



VFE0037802

DIAGNOSIS AND TESTING

2. Check the normally open contact in the switched state:
 1. Use a fused test cable (A) to connect pin 1 of the PCM module relay, component side, to the battery positive terminal.
 2. Use a test cable to connect pin 2 of the PCM module relay, component side, to the battery negative terminal.
 3. Measure the resistance at the PCM module relay, between pin 3, component side and pin 5, component side.
 4. Is a resistance of less than 2 Ohms registered?
 5. If yes, then the PCM module relay is OK.
 6. If no, RENEW the PCM module relay.



SECTION 418-01 Module Configuration

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DIAGNOSIS AND TESTING	
Module Configuration.....	418-01-2
Description of operation.....	418-01-2

DIAGNOSIS AND TESTING**Module Configuration****Description of operation**

Configuration of a new module is performed using WDS. In doing so, the same system requirements must apply as for the diagnosis of the respective module:

- The BUS connection between the module and WDS must be in order.
- The voltage supply to the module and to WDS must be guaranteed.

For this reason, if there are communication problems which cannot be attributed to the incorrect software version in WDS, the system test for module communication of the particular module must be performed. For further information, refer to REFER to Section 418-00 [Module Communications Network].

SECTION 419-01A Anti-Theft - Active

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DIAGNOSIS AND TESTING

Anti-Theft - Active.....	419-01A-2
Inspection and Verification.....	419-01A-2

DIAGNOSIS AND TESTING**Anti-Theft - Active**

Refer to Wiring Diagrams Section 419-01A, for schematic and connector information.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Misaligned door(s), hood or liftgate • Latch(es) • Cable(s) • Switch(es) • Lock cylinder(s) • Linkage(s)	• Fuse(s) • Wiring harness • Electrical connector(s) • Relay(s) • Generic electronic module (GEM) • Anti-theft alarm horn • Anti-theft alarm horn with integral battery

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to WDS to diagnose the system.

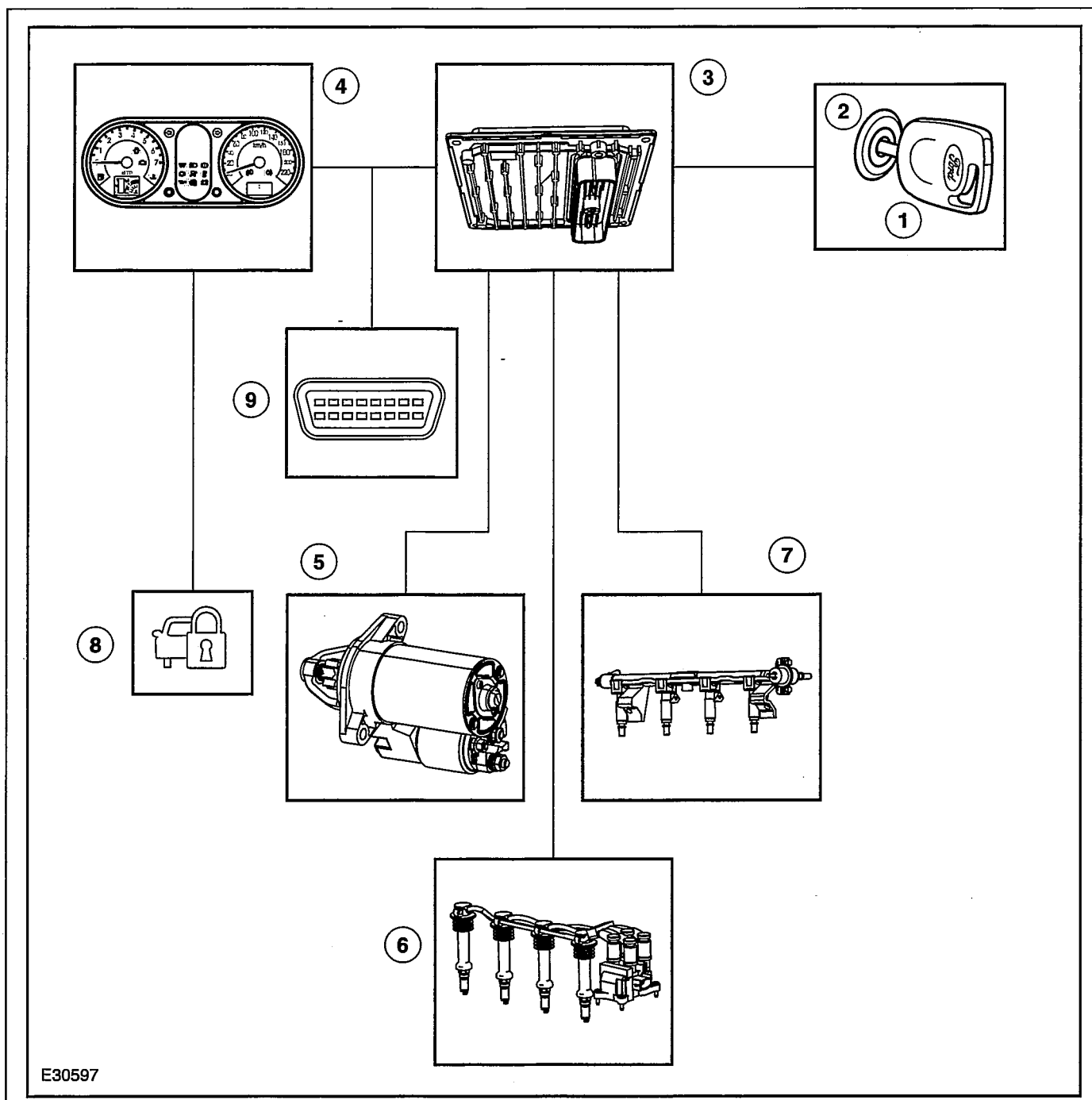
SECTION 419-01B Anti-Theft - Passive

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DESCRIPTION AND OPERATION	
Anti-Theft - Passive.....	419-01B-2
Function.....	419-01B-2
Key programming.....	419-01B-3
Anti-Theft - Passive.....	419-01B-4
Expanded passive anti-theft system (PATS) functionality.....	419-01B-4
DIAGNOSIS AND TESTING	
Anti-Theft - Passive.....	419-01B-5
Inspection and Verification.....	419-01B-5
GENERALPROCEDURES	
Key Programming Using Two Programmed Keys..... (33 005 0)	419-01B-10
Key Programming Using Diagnostic Equipment..... (33 005 0)	419-01B-11
Key Programming Switch State Control.....	419-01B-12
Erasing All Key Codes Using Diagnostic Equipment.....	419-01B-13
Anti-Theft Security Access..... (33 004 0)	419-01B-14

DESCRIPTION AND OPERATION

Anti-Theft - Passive



Item	Description
1	Transponder in the key
2	Transceiver in the ignition lock
3	Powertrain control module (PCM)
4	Instrument Cluster
5	Starter motor
6	Electronic ignition (EI)
7	Injectors

Item	Description
8	Passive anti-theft system (PATS) warning lamp
9	Data link connector (DLC)

Function

PATS is a passive system designed to increase the anti-theft security of a vehicle. It does not need to be activated or deactivated by the driver.

DESCRIPTION AND OPERATION

The PATS system uses specially encoded keys:
Every encoded ignition key contains a transponder which is permanently fitted to the key. This transponder contains an identification code randomly selected from millions of possible combinations (crypto-transponder with automatically changing code).

The transmitter/receiver (transceiver) is located on the ignition lock. The transceiver incorporates an antenna which is connected to an integrated electronics module.

When the ignition key is turned to position II, communications take place initially between the transceiver and the PCM.

If these communications are free of errors, then the transponder is actuated by the PCM via the transceiver.

The transponder returns the identification code to the PCM for processing.

In the event of a system fault, the PATS outputs a corresponding flash code.

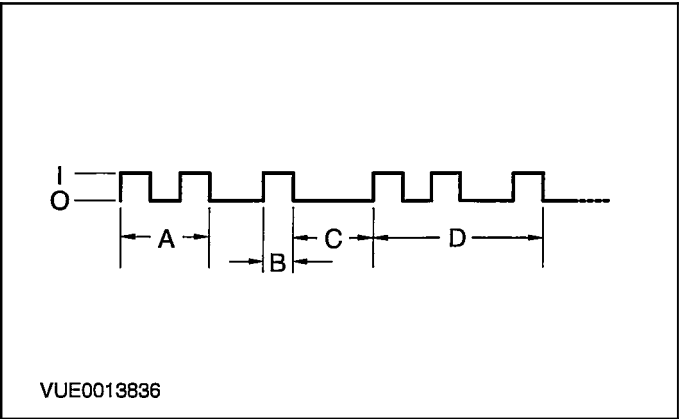
Key programming

Every encoded key must be programmed into the (PCM) before it can be used to start the engine.

Keys can be programmed either by authorised Ford dealers with WDS and access to OASIS, or directly by the customer if two keys which have already been programmed are available.

Up to eight keys can be programmed.

PATS warning lamp



Flash code for PATS (example: code 21)

Item	Description
0	Warning lamp OFF
1	Warning lamp ON
A	Two flashing signals (1st digit)
B	One flashing signal (2nd digit)
C	Approx. 3-second pause
D	Repetition of the flash code

As an optical signal, the (PATS) system sends an actuation signal to the PATS warning lamp approx. every 2 seconds when the ignition lock is in position "0" .

DESCRIPTION AND OPERATION**Anti-Theft - Passive****Expanded passive anti-theft system (PATS) functionality**

The PATS functionality has been expanded to increase anti-theft security. The new system also uses new keys.

NOTE: Only keys with a blue insert and the labelling "W1" can be used.

After completion of the usual PATS communications between the transponder, transceiver and the powertrain control module (PCM), the PCM also requests a code from the instrument cluster module via the CAN databus in order to increase the passive anti-theft security.

As a result, a further component which is not easily removable is required to enable an engine start.

All of the code requests must be completed successfully before the PCM will start the engine.

NOTE: When renewing the instrument cluster or the PCM an initialisation with WDS is required.

In order to ensure that the engine can be started as quickly as possible, the initial starting procedure is initiated provided the correct key has been detected and no communications errors to the instrument cluster have arisen.

However, if the PCM determines within a maximum of three seconds that not all of the PATS conditions have been satisfied, then the engine is switched back off and cannot be restarted (no starter signal, no fuel injection signal, no ignition signal).

DIAGNOSIS AND TESTING

Anti-Theft - Passive

Refer to Wiring Diagrams Section 419-01B, for schematic and connector information.

General Equipment

Worldwide Diagnostic System (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
- Ignition lock cylinder - Passive anti-theft system (PATS) ignition key (blue dot) - Non-PATS ignition key - Use of a non-programmed PATS ignition key - Use of a non-encoded PATS ignition key - More than one PATS key in close proximity of the PATS transceiver	- Fuse(s) - Wiring harness(s) - Electrical connector(s) - Relay(s) - PATS transceiver - Ignition switch - Powertrain control module (PCM) - Instrument cluster

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, use WDS to retrieve any DTCs and refer to the Diagnostic Trouble Code (DTC) Index.

Diagnostic Trouble Code (DTC) Index

DTC	Indicator Flash Code	Description/Condition	Possible Source	Action
0000	-	No DTCs, vehicle OK	-	
B1681	11	PATS transceiver signal is not received	PATS transceiver wiring, PATS transceiver connector, PATS transceiver, PCM or instrument cluster	REFER to WDS.
B1232 and B2103	12	PATS transceiver antenna coil fault, vehicle does not start	PATS transceiver, PATS transceiver mounting	Make sure the PATS transceiver is connected correctly, if OK, install a new PATS transceiver.

DIAGNOSIS AND TESTING

DTC	Indicator Flash Code	Description/Condition	Possible Source	Action
B1600	13	Non-PATS key or damaged encoded ignition key, or no key code received, vehicle does not start	PATS encoded ignition key	REFER to WDS. PATS test. Follow the instructions.
B2431	13	PATS transponder programming failed crypto transponder only, vehicle does not start	Ignition key	REFER to WDS. PATS test. Follow the instructions.
B1602	14	Partial key read of PATS key, vehicle does not start	PATS encoded ignition key, PATS transceiver	REFER to WDS. PATS test. Follow the instructions.
B1601	15	Incorrect key code, Unprogrammed PATS key (keycode format OK), vehicle does not start (20 second anti-scan invoked)	PATS encoded ignition key	REFER to WDS. PATS test. Follow the instructions.
U2510	16	CAN communication link between the PCM and instrument cluster, vehicle does not start	Circuit, PCM or instrument cluster	REFER to WDS. PATS test. Follow the instructions.
B1213	21	Number of programmed PATS encoded keys below minimum, vehicle does not start	Incorrect number of keys programmed or PATS encoded ignition key	REFER to WDS. PATS test. Follow the instructions.
B2141	22	NVM Configuration failure. No security ID exchange between PCM and instrument cluster, vehicle does not start	PCM or instrument cluster	REFER to WDS. PATS test. Follow the instructions.



DIAGNOSIS AND TESTING

DTC	Indicator Flash Code	Description/Condition	Possible Source	Action
B2139	23	Data mismatch (received data does not match what was expected). Security messages do not match between PCM and instrument cluster, vehicle does not start	PCM or instrument cluster	

DIAGNOSIS AND TESTING

DTC	Indicator Flash Code	Description/Condition	Possible Source	Action
				REFER to WDS. PATS test. Follow the instructions. If the concern persists. INSTALL a new PCM. REFER to: Powertrain Control Module (PCM) - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma) (303-14 Electronic Engine Controls, Removal and Installation) / Powertrain Control Module (PCM) - 1.4L Duratorq-TDCi (DV) Diesel (303-14 Electronic Engine Controls, Removal and Installation) / Powertrain Control Module (PCM) - 2.0L Duratec-HE (M14), Vehicles Without: PCM Security Shield (303-14 Electronic Engine Controls, Removal and

DIAGNOSIS AND TESTING

DTC	Indicator Flash Code	Description/Condition	Possible Source	Action
				Installation) / Powertrain Control Module (PCM) - 2.0L Duratec-HE (M14), Vehicles With: PCM Security Shield (303-14 Electronic Engine Controls, Removal and Installation) / Powertrain Control Module (PCM) - 1.6L Duratorq-TDCi (DV) Diesel (303-14 Electronic Engine Controls, Removal and Installation).
P1260	-	PCM disabled	PCM or instrument cluster	REFER to WDS. PATS test. Follow the instructions.

GENERAL PROCEDURES**Key Programming Using Two Programmed Keys(33 005 0)**

NOTE: This procedure only works if two or more programmed ignition keys are available.

For additional information, refer to Key Programming Using Diagnostic Equipment - in this section.

NOTE: If the programming procedure is successful, the new **key(s)** will start the vehicle and the anti-theft indicator will illuminate for approximately three seconds.

NOTE: If the programming procedure is not successful, the new **key(s)** will not start the engine. If the programming procedure was not successful, repeat the Key Programming procedure from Step 1. If the failure repeats, refer to Diagnostic and Testing to review **DTCs**.

NOTE: A maximum of eight ignition keys can be programmed to a passive anti-theft system (PATS) equipped vehicle.

NOTE: If the steps are not carried out as outlined, the programming procedure will end.

NOTE: Ignition keys must have correct mechanical key cut for the vehicle and must be a PATS encoded key.

NOTE: If this procedure does not program new ignition **key(s)** using two programmed ignition keys, check that the Key Programming Switch State Control is in the **DISABLE** position.

For additional information, refer to Key Programming Switch State Control - in this section.

1. Insert the first programmed ignition key into the ignition lock cylinder and turn the ignition key from the **0** position to the **II** Position (maintain the ignition key in the **II** position for one second).
2. Turn the ignition key to the **0** position and remove the first ignition key from the ignition lock cylinder.
3. Within five seconds of turning the first ignition key to the **0** position, insert the second programmed ignition key into the ignition lock cylinder and turn the ignition key from the **0** position to the **II** position (maintain the ignition key in the **II** position for one second).
4. Turn the ignition key to the **0** position and remove the second ignition key from the ignition lock cylinder.
5. Within ten seconds of turning the second ignition key to the **0** position, insert the unprogrammed ignition key (new key) into the ignition lock cylinder and turn the ignition key from the **0** position to the **II** position (maintain the ignition key in the **II** position for one second).
6. If it is desired to program additional **key(s)**, repeat the applicable ignition key programming procedure from Step 1.
7. Verify that the engine starts using the new programmed **key(s)**.

GENERAL PROCEDURES

Key Programming Using Diagnostic Equipment(33 005 0)

General Equipment

Worldwide Diagnostic System (WDS) (418-F224)
--

NOTE: This procedure is used when a customer needs keys programmed into the system or after keys have been erased using diagnostic equipment.

NOTE: During this procedure it will be necessary to utilize the Anti-Theft System (PATS) Security Access Procedure. PATS security access must be granted to erase or program ignition keys. The anti-theft security access procedure requires access to the **GSEVIN** database in order to obtain the coded security access.

NOTE: This procedure will not erase programmed ignition keys from the passive anti-theft alarm system (PATS) memory.

NOTE: A maximum of eight ignition keys can be programmed to a passive anti-theft system (PATS) equipped vehicle.

1. Insert an ignition key into the ignition lock cylinder and turn the ignition key from the **0** position to the **II** position.
2. From the diagnostic tool menu Select: **Body/Security/PATS** Functions. Follow the instructions on the screen.
3. From the diagnostic tool menu Select: Ignition Key Programming. Follow the instructions on the screen.

GENERAL PROCEDURES

Key Programming Switch State Control

General Equipment

Worldwide Diagnostic System (WDS) (418-F224)

NOTE: The spare key programming switch is a programmable switch which provides the capability to enable or disable the normal customer spare key programming procedure detailed in the Owner's Manual. This programmable switch is provided as a convenience for rental company fleets or other fleet purchasers who may not want the spare key programming procedure available to the vehicle driver.

NOTE: During this procedure it will be necessary to utilize the Anti-Theft System (PATS) Security Access Procedure. PATS security access must be granted to erase or program ignition keys or to enable or disable the ignition key programming switch state control. The anti-theft security access procedure requires access to the **GSEVIN** database in order to obtain the coded security access.

1. Insert a programmed ignition key into the ignition lock cylinder and turn the ignition key from the **0** position to the **II** position.
2. From the diagnostic tool menu Select:
Body/Security/PATS Functions Follow the instructions on the screen.
3. From the diagnostic tool menu Select:
Enable Fleet or Hire vehicle mode or Disable Fleet or Hire vehicle mode. Follow the instructions on the screen.

GENERAL PROCEDURES

Erasing All Key Codes Using Diagnostic Equipment

General Equipment

Worldwide Diagnostic System (WDS) (418-F224)

NOTE: This procedure is used when a customer needs ignition keys programmed into the system. This procedure is also useful when programmed ignition key(s) have been lost or when the ignition lock cylinder has been replaced or when it is necessary to erase a key(s) from the passive anti-theft alarm system (PATS) memory.

NOTE: During this procedure it will be necessary to utilize the Anti-Theft System (PATS) Security Access Procedure. PATS security access must be granted to erase or program ignition keys. The anti-theft security access procedure requires access to the GSEVIN database in order to obtain the coded security access.

NOTE: This procedure will erase all programmed ignition keys from the passive anti-theft alarm system (PATS) memory and the engine will not start until two keys have been reprogrammed to the system.

For additional information, refer to Key Programming Using Diagnostic Equipment - in this section.

NOTE: Two PATS encoded keys with the correct mechanical cut must be available to carry out this procedure. One or both of them may be the original keys.

NOTE: If the remaining keys are with the customer and are not available with the vehicle, instruct the customer that the remaining keys are no longer valid to start the vehicle. If the customer wants to have these keys to be valid for the vehicle, the keys must be programmed using WDS.

For additional information, refer to Key Programming Using Diagnostic Equipment - in this section.

1. Turn the ignition lock cylinder from the 0 position to the II position.
2. From the diagnostic tool menu Select: **Body/Security/PATS Functions** from the menu. Follow the instructions on the screen.
3. From the diagnostic tool menu Select: **Ignition Key Erase**. Follow the instructions on the screen.
4. From the diagnostic tool menu Select: **Ignition Key Programming**. Follow the instructions on the screen.

GENERAL PROCEDURES**Anti-Theft Security Access(33 004 0)****General Equipment**

Worldwide Diagnostic System (WDS) (418-F224)
--

NOTE:Anti-Theft System (PATS) security access must be granted to erase or program ignition keys or to enable or disable the ignition key programming switch state control. The anti-theft security access procedure requires access to the GSEVIN database in order to obtain the coded security access.

NOTE:When installing a new powertrain control module (PCM), the following sequence must be completed:

- 1. Ignition Key Programming.
- 2. Module Initialization.

NOTE:When installing a new instrument cluster, the following must be completed:

- 1. Module Initialization.

- 1. Insert an ignition key into the ignition lock cylinder and turn the ignition key from the 0 position to the II position.**
- 2. From the diagnostic tool menu Select: Body/Security/PATS Functions. Follow the instructions on the screen.**

SECTION 419-08 Cellular Phone

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
DIAGNOSIS AND TESTING	
Cellular Phone.....	419-08-2
Inspection and Verification.....	419-08-2
Symptom Chart.....	419-08-2
Pinpoint Test.....	419-08-4

DIAGNOSIS AND TESTING

Cellular Phone

Refer to Wiring Diagrams Section 419-08, for schematic and connector information.

Inspection and Verification

1. Verify the customers concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
- Fuse(s)
- Wiring Harness
- Electrical connector(s)
- Microphone
- Cellular phone antenna

Electrical
- Cellular phone speaker
- Handset holder
- Cellular phone
- Portable Support Electronics (PSE) Module

3. Verify that the cellular phone operates correctly out of the vehicle before proceeding to the next step.
4. Verify the audio unit or navigation system display module is working correctly before proceeding to the next step.
5. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
6. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• The handset battery does not charge	• Circuit(s). • Handset holder. • Cellular phone. • PSE Module.	• GO to Pinpoint Test A.
• Interference from the cellular phone speaker - vehicles with Traffic Pro navigation system	• Incorrect settings of the navigation system display module.	• MAKE sure that MUTE is selected in the navigation system display module RADIO MODE. TEST the system for normal operation.
• Reduced sound or no sound through the speaker	• Circuit(s). • Cellular phone speaker. • Handset holder. • PSE Module.	• GO to Pinpoint Test B.
• No SVC display stays on	• Cellular phone antenna. • Handset holder.	• GO to Pinpoint Test C.
• The hands-free system is inoperative - vehicles built up to 1012005	• Cellular phone and handset holder electrical contacts.	• CHECK the cellular phone is correctly installed into the handset holder. TEST the system for normal operation.
• The hands-free system is inoperative - vehicles built 1012005 onwards	• Circuit(s). • Microphone. • PSE Module.	• GO to Pinpoint Test D.
	• MS CAN bus.	• REFER to WDS.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
Microphone sensitivity too low (user is difficult to hear when making calls)	Microphone incorrectly adjusted.	INCREASE the microphone sensitivity on the PSE module during a conversation.
	Microphone location incorrect.	CHECK the location of the microphone. INSTALL the microphone in the correct location if necessary.
Microphone sensitivity too high (user hears their own voice when making calls)	Microphone incorrectly adjusted.	DECREASE the microphone sensitivity on the PSE module during a conversation.
Whistling noise when the cellular phone is in use	Microphone incorrectly adjusted.	DECREASE the microphone sensitivity on the PSE module during a conversation.
The cellular phone speaker operates but the audio unit speakers do not mute.	- PSE module wiring harness. - Electrical connection to the audio unit or navigation system display module. - Threshold voltage to the audio unit or navigation system display module is not achieved.	INSTALL a new PSE module wiring harness. TEST the system for normal operation. If the concern persists, INSTALL a new PSE module. TEST the system for normal operation.
	Audio unit or navigation system display module.	- INSTALL a new audio unit. REFER to: Audio Unit - Vehicles Built Up To: 1012005 (415-01 Audio Unit, Removal and Installation) / Audio Unit - Vehicles Built From: 1012005 (415-01 Audio Unit, Removal and Installation). - INSTALL a new navigation system display module. Vehicles with Travel Pilot, REFER to: Navigation System Display Module (419-07 Navigation System - Vehicles With: Travel Pilot, Removal and Installation). Vehicles with Traffic Pro, REFER to: Navigation System Display Module (419-07 Navigation System - Vehicles With: Traffic Pro, Removal and Installation).

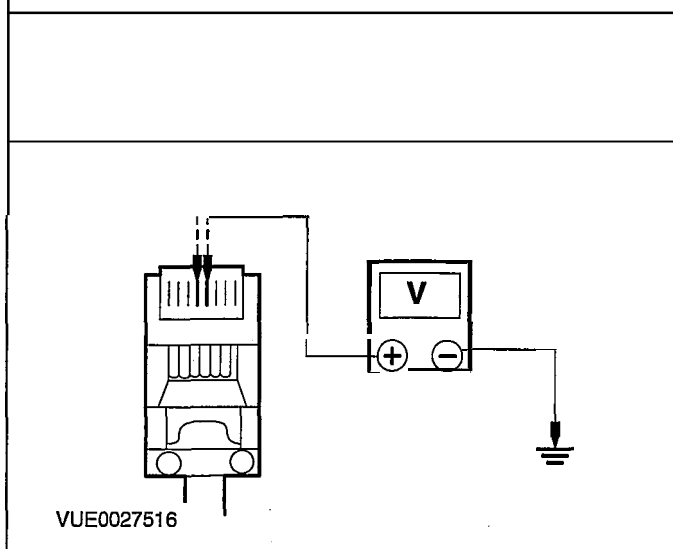
DIAGNOSIS AND TESTING

Pinpoint Test

PINPOINT TEST A : THE HANDSET BATTERY DOES NOT POWER UP

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A1: CHECK THE POWER SUPPLY TO THE PSE MODULE
☐ Disconnect PSE Module C1026.

2 Ignition switch in position I.

3 Measure the voltage between the PSE module C1026 pin 4, (PK), harness side and ground; and the PSE module C1026 pin 5, (GY), harness side and ground.

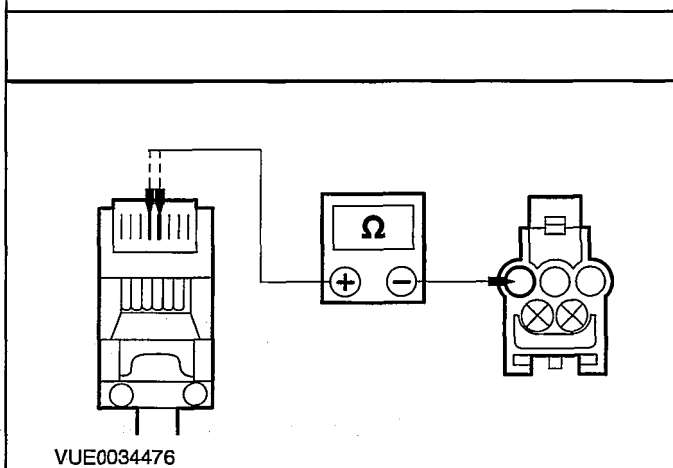
- Is the voltage greater than 10 volts?

→ **Yes**

GO to A3.

→ **No**

GO to A2.

A2: CHECK THE PSE MODULE POWER WIRING HARNESS FOR OPEN CIRCUIT
1 Disconnect PSE Harness C1025.

2 Measure the resistance between the PSE module C1026 pin 4, (PK), harness side and PSE harness C1025 pin 1, (YE), harness side; and the PSE module C1026 pin 5, (GY), harness side and PSE harness C1025 pin 1, (YE), harness side.

- Is the resistances less than 5 ohms?

→ **Yes**

For audio unit, GO to A5.

For navigation display module, GO to A6.

→ **No**

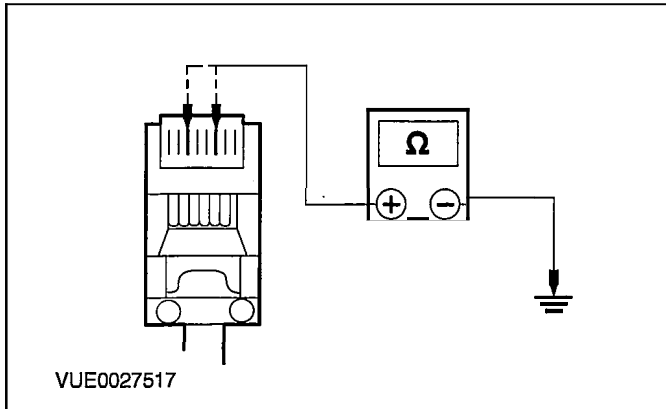
REPAIR the circuit. TEST the system for normal operation.

A3: CHECK THE PSE MODULE FOR GROUND
☐ Connect PSE Harness C1025.

2 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

Measure the resistance between the PSE module C1026 pin 3, (BN), harness side and ground; and the PSE module C1026 pin 6, (YE), harness side and ground.

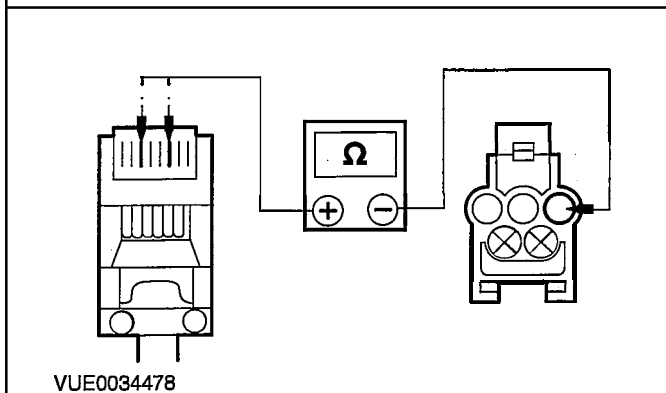
- Is the resistance less than 5 ohms?

→ **Yes**

CLEAN the handset holder and cellular phone electrical connectors. TEST the system for normal operation. If the concern persists, INSTALL a new handset holder. TEST the system for normal operation. If the concern persists, INSTALL a new PSE module.

→ **No**
GO to A4.

A4: CHECK THE PSE MODULE GROUND WIRING HARNESS FOR OPEN CIRCUIT



☐ Disconnect PSE Harness C1025.

2 Measure the resistance between the PSE module C1026 pin 3, (BN), harness side and PSE harness C1025 pin 3, (YE), harness side; and the PSE module C1026 pin 6, (YE), harness side and PSE harness C1025 pin 3, (YE), harness side.

- Is the resistances less than 5 ohms?

→ **Yes**

For audio unit, GO to A7.

For navigation display module, GO to A8.

→ **No**

INSTALL a new PSE module wiring harness. TEST the system for normal operation.

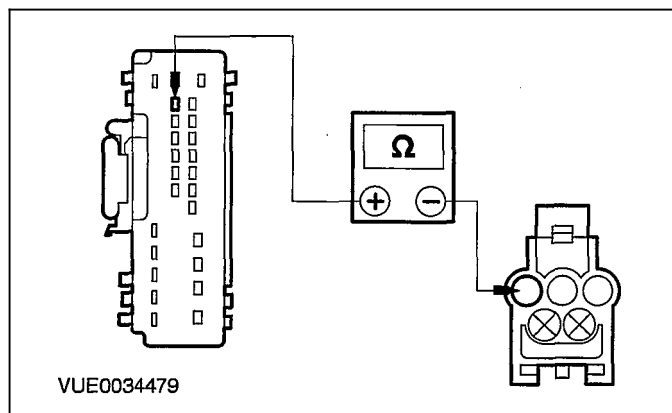
A5: CHECK THE PSE MODULE POWER WIRING HARNESS TO AUDIO UNIT WIRING HARNESS FOR OPEN CIRCUIT

Disconnect Audio Unit C344.

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS RESULTS ACTIONS



- ☐ Measure the resistance between the PSE module C1025 pin 1, (YE), harness side and audio unit C344 pin 2, circuit 75-MD15 (YE/GN), harness side.

- Is the resistance less than 5 ohms?

→ Yes

For additional information.

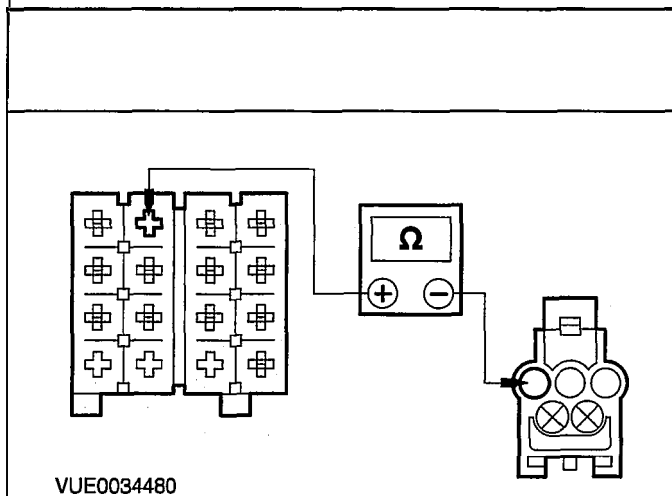
REFER to: Audio System - Vehicles Built Up To: 1012005 (415-00 Information and Entertainment System - General Information, Diagnosis and Testing)

/ Audio System - Vehicles Built From: 1012005 (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

→ No

REPAIR the circuit. TEST the system for normal operation.

A6: CHECK THE PSE MODULE POWER WIRING HARNESS TO NAVIGATION SYSTEM DISPLAY MODULE WIRING HARNESS FOR OPEN CIRCUIT



- ☐ Disconnect Navigation System Display Module C717.

- ☐ Measure the resistance between the PSE module C1025 pin 1, (YE), harness side and navigation system display module C717 pin 7, circuit 75-MD15 (YE/GN), harness side.

- Is the resistance less than 5 ohms?

→ Yes

For additional information, for vehicles with Travel Pilot

REFER to: Navigation System (419-07 Navigation System - Vehicles With: Travel Pilot, Diagnosis and Testing).

for vehicles with Traffic Pro, REFER to: Navigation System (419-07 Navigation System - Vehicles With: Traffic Pro, Diagnosis and Testing).

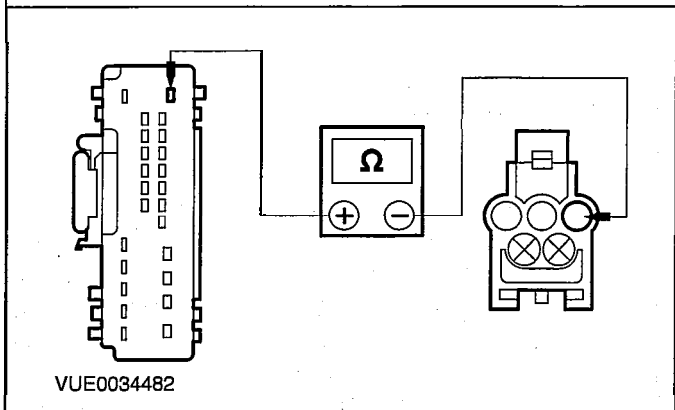
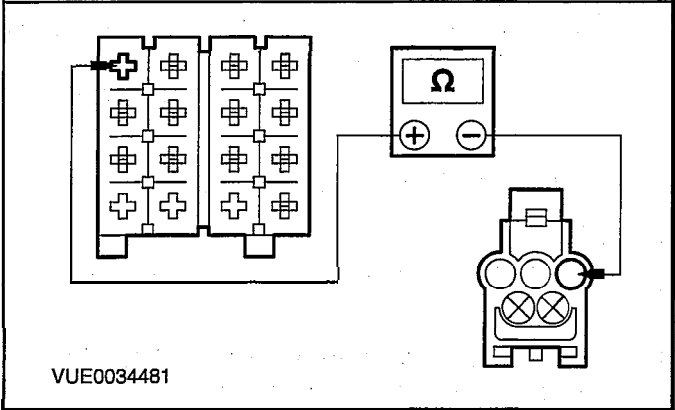
→ No

REPAIR the circuit. TEST the system for normal operation.

A7: CHECK THE PSE MODULE GROUND WIRING HARNESS TO AUDIO UNIT WIRING HARNESS FOR OPEN CIRCUIT

- ☐ Disconnect Audio Unit C344.

DIAGNOSIS AND TESTING

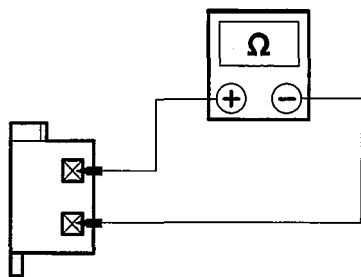
TEST CONDITIONS		DETAILS/RESULTS/ACTIONS
 VUE0034482		☐ Measure the resistance between the PSE module C1025 pin 3, (BN), harness side and audio unit C344 pin 13, circuit 91-MD15 (BWGN), harness side. Is the resistances less than 5 ohms? → Yes For additional information, REFER to: Audio System - Vehicles Built Up To: 1012005 (415-00 Information and Entertainment System - General Information, Diagnosis and Testing) / Audio System - Vehicles Built From: 1012005 (415-00 Information and Entertainment System - General Information, Diagnosis and Testing). → No REPAIR the circuit. TEST the system for normal operation.
A8: CHECK THE PSE MODULE GROUND WIRING HARNESS TO NAVIGATION SYSTEM DISPLAY MODULE WIRING HARNESS FOR OPEN CIRCUIT		
 VUE0034481		1 Disconnect Navigation System Display Module C717. 2 Measure the resistance between the PSE module C1025 pin 3, (BN), harness side and navigation system display module C717 pin 8, circuit 91-MD15 (BWGN), harness side. Is the resistances less than 5 ohms? → Yes For additional information, for vehicles with Travel Pilot REFER to: Navigation System (419-07 Navigation System - Vehicles With: Travel Pilot, Diagnosis and Testing). for vehicles with Traffic Pro, REFER to: Navigation System (419-07 Navigation System - Vehicles With: Traffic Pro, Diagnosis and Testing). → No REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST B : REDUCED SOUND OR NO SOUND THROUGH THE SPEAKER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE CELLULAR PHONE SPEAKER	
	1 Disconnect Cellular Phone Speaker.

DIAGNOSIS AND TESTING

TEST CONDITIONS



VUE0032779

DETAILS/RESULTS/ACTIONS

- Measure the resistance between the speaker terminals (component side).

- Is the resistance between 3 and 5 ohms?

→ **Yes**

REPAIR if necessary the circuit between the cellular phone speaker and the PSE module. TEST the system for normal operation. If the concern persists, CLEAN the handset holder and cellular phone electrical connectors. TEST the system for normal operation. INSTALL a new handset holder. TEST the system for normal operation. If the concern persists, INSTALL a new PSE module. TEST the system for normal operation.

→ **No**

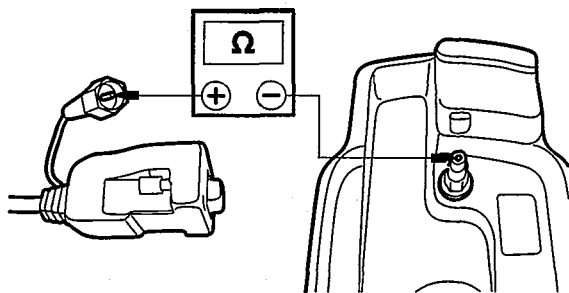
INSTALL a new cellular phone speaker. TEST the system for normal operation.

PINPOINT TEST C : NO SVC DISPLAY STAYS ON

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

C1: CHECK THE HANDSET HOLDER ANTENNA CABLE FOR OPEN CIRCUIT



VUE0027521

- 1 Disconnect Handset Holder Antenna Cable.

- 2 Measure the resistance between the center pin of the cellular phone handset holder antenna connection and the center pin of the antenna cable connector.

- Is the resistance less than 1 ohm?

→ **Yes**

TEST the system for normal operation.

→ **No**

INSTALL a new handset holder. TEST the system for normal operation.

PINPOINT TEST D : THE HANDS-FREE SYSTEM IS INOPERATIVE - VEHICLES BUILT 10/2005 ONWARDS

TEST CONDITIONS

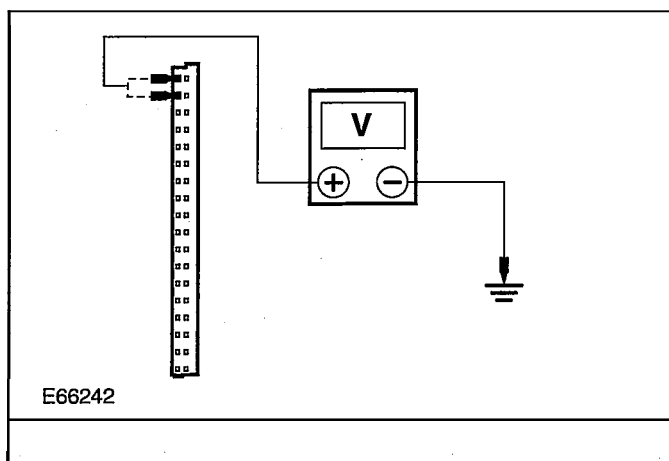
DETAILS/RESULTS/ACTIONS

D1: CHECK THE PSE MODULE CIRCUIT FOR POWER

- 1 Disconnect PSE Module C796.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the voltage between the PSE module C796 pin 17, circuit 29-MC12A (OGNE) and between the PSE module C796 pin 18, circuit 29-MC12 (OGNE), harness side and ground.

• Are the voltages greater than 10 volts?

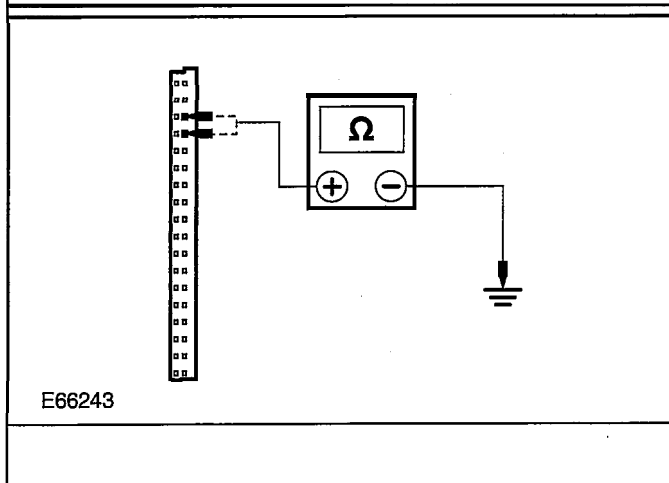
→ **Yes**

GO to D2.

→ **No**

REPAIR circuit 29-MC12A (OGNE) or circuit 29-MC12 (OGNE). TEST the system for normal operation.

D2: CHECK THE PSE MODULE CIRCUIT FOR GROUND



- Measure the resistance between the PSE module C796 pin 33, circuit 91-MC12A (BKNE), harness side and ground, and between the PSE module C796 pin 34, circuit 91-MC12 (BKNE), harness side and ground.

• Are the resistances less than 5 ohms?

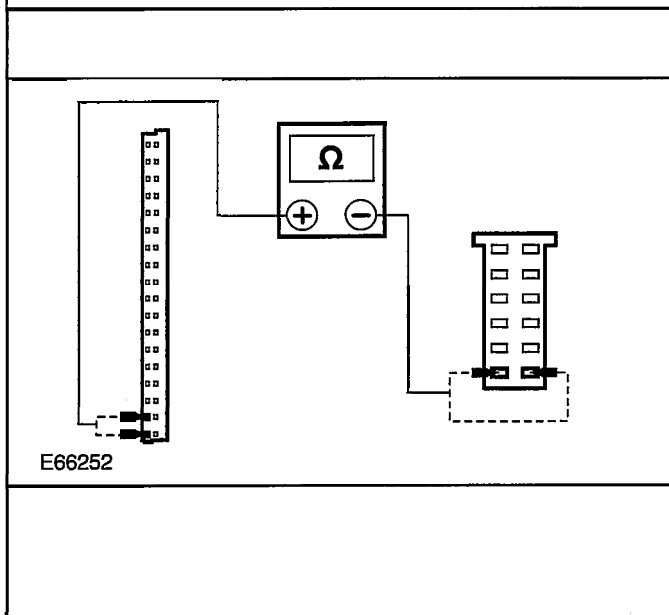
→ **Yes**

GO to D3.

→ **No**

REPAIR circuit 91-MC12A (BKNE) or circuit 91-MC12 (BKNE). TEST the system for normal operation.

D3: CHECK CIRCUIT 8-MC12 (WH) AND CIRCUIT 9-MC12 (BN) FOR OPEN CIRCUIT



- 1 Disconnect Audio Unit C777.

- 2 Measure the resistances between:
- the PSE module C796 pin 1, circuit 8-MC12 (WH), harness side and the audio unit C777 pin 1, circuit 8-MC12 (WH), harness side.
 - the PSE module C796 pin 2, circuit 9-MC12 (BN), harness side and the audio unit C777 pin 7, circuit 9-MC12 (BN), harness side.

• Are the resistances less than 5 ohms?

→ **Yes**

GO to D4.

→ **No**

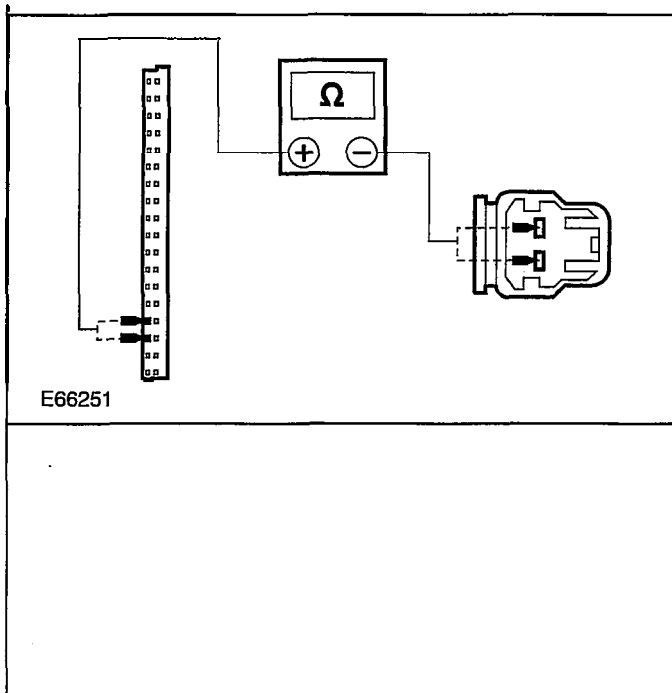
REPAIR circuit 8-MC12 (WH) or circuit 9-MC12 (BN). TEST the system for normal operation.

D4: CHECK THE MICROPHONE CIRCUITS FOR OPEN CIRCUIT

- 1 Disconnect Microphone C798.

DIAGNOSIS AND TESTING

TEST CONDITIONS



DETAILS/RESULTS/ACTIONS

- 2 Measure the resistances between:
- the PSE module C796 pin 3, circuit 8-MC8 (WHIRD), harness side and the microphone C798 pin 1, circuit 8-MC8 (WHIRD), harness side.
 - the PSE module C796 pin 4, circuit 48-MC8A (BK), harness side and the microphone C798 pin 2, circuit 48-MC8B (BK), harness side.
- Are the resistances less than 5 ohms?
- **Yes**
INSTALL a new microphone. TEST the system for normal operation. If the concern persists, INSTALL a new PSE module. TEST the system for normal operation.
- **No**
REPAIR circuit 8-MC8 (WHIRD) or circuit 48-MC8A (BK). TEST the system for normal operation.

SECTION 419-10 Multifunction Electronic Modules

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

DESCRIPTION AND OPERATION

Module Controlled Functions.....	419-10-3
Generic Electronic Module (GEM).....	419-10-3
GEM - vehicles built from 0812005.....	419-10-4
Headlamp switch-off delay - vehicles built from 0812005.....	419-10-6
Peripheral lights - vehicles built from 0812005.....	419-10-6
Autolamps - vehicles built from 0812005.....	419-10-7
Combined rain sensor/light sensor - vehicles built from 0812005.....	419-10-7
Turn signals.....	419-10-7
Lane-change flasher - vehicles built from 0812005.....	419-10-8
Interior lighting.....	419-10-8
Heated windshield.....	419-10-9
Rear window heating.....	419-10-9
Windshield washwipe functions.....	419-10-9
Windshield washwipe function.....	419-10-9
Automatic windshield wipers - vehicles built from 0812005.....	419-10-10
Rain sensor operating principle - vehicles built from 0812005.....	419-10-10
Rear window washwipe function.....	419-10-11
Rear window washwipe function.....	419-10-11
Information/warning functions.....	419-10-11
Message center - vehicles built from 0812005.....	419-10-12
Locking/unlocking - central locking.....	419-10-12
Locking/unlocking - driver's door unlocking system.....	419-10-12
Locking/unlocking - central unlocking.....	419-10-13
Locking/unlocking - automatic central locking.....	419-10-13
Programming of radio remote control operations.....	419-10-13
Anti-theft alarm system.....	419-10-13
Liftgate release.....	419-10-14
Folding exterior mirrors - vehicles built from 0812005.....	419-10-14
Battery protection function.....	419-10-14
Low-power/high-power mode - vehicles built from 0812005.....	419-10-14
Diagnosis.....	419-10-15

DIAGNOSIS AND TESTING

Generic Electronic Module (GEM) — Vehicles Built Up To: 1012005.....	419-10-17
Description of operation.....	419-10-17
Inspection and Checking.....	419-10-17
Defect Identification Table.....	419-10-18
System Check.....	419-10-18
Generic Electronic Module (GEM) — Vehicles Built From: 1012005.....	419-10-24
Description of operation.....	419-10-24
Inspection and Testing.....	419-10-24
Fault Code Table.....	419-10-26
Symptom chart.....	419-10-32
System Check.....	419-10-32

REMOVAL AND INSTALLATION

Generic Electronic Module (GEM).....	419-10-34
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DESCRIPTION AND OPERATION

Module Controlled Functions

Generic Electronic Module (GEM)

The GEM is an independent control module which controls a series of functions of the body electrics.

It replaces various previously used components, such as the turn signal relay, the Central Timer Module (CTM) and the central locking module.

Four different versions are available depending on the equipment level of the vehicle:

- A - vehicles with manual unlocking
- B - vehicles with central locking
- C - vehicles with central locking and remote control
- D - vehicles with central double locking, anti-theft warning system and remote control

Overview of operation

Functions	B- GEM Ax	B- GEM Bx	B- GEM Cx	B- GEM Dx
Turn signals				
Turn signals and hazard flasher	X	X	X	X
Interior lighting				
On/off	X	X	--	--
Dimmer function	--	--	X	X
Window heating				
Windshield	--	X	X	X
Rear window	X	X	X	X
Wipers				
Windshield wash/wipe function	X	X	X	X
Windshield after-wipe	X	X	X	X
Rear window wipe during reversing	X	X	X	X
Rear window wash/wipe function	X	X	X	X
Information/warning functions				
Door open warning lamp	--	X	X	X
Lights on warning lamp	X	X	X	X
Locking/unlocking				
Manual locking/unlocking with a key	X	X	X	X
Locking/unlocking via central locking system	--	X	X	X
Remote control				
Locking/unlocking with remote control	--	--	X	X
Double locking	--	--	--	X
Programming of remote control operations	--	--	X	X
Alarm				
Anti-theft alarm system	--	--	--	X
Liftgate release				

DESCRIPTION AND OPERATION

Functions	B- GEM Ax	B- GEM Bx	B- GEM Cx	B- GEM Dx
Release via switch in the passenger compartment	--	X	X	X
Release via remote control	--	--	X	X
Other functions				
Battery protection function	X	X	X	X
Diagnosis				
Diagnosis	X	X	X	X
Service mode	X	X	X	X

GEM - vehicles built from 0812005

The GEM is an independent control module which controls a series of functions of the body electrics.

Four different versions are available depending on the equipment level of the vehicle:

- A - Vehicles with manual central locking system
- B - Vehicles with central locking system and radio remote control

- C - Vehicles with central/double locking, anti-theft alarm system and radio remote control
- D - Vehicles with central locking and radio remote control (with different remote control frequency for the Japanese market)

Overview of operation

Versions	B- GEM Ax	B- GEM Bx	B- GEM Cx	B- GEM Cx	B- GEM Dx
Functions	CL	CURF	DURF	ST150 (RHD)	Japan
Voltage supply					
Battery protection function	X	X	X	X	X
Voltage supply management	X	X	X	X	X
Exterior lighting					
Turn signals and hazard flasher	X	X	X	X	X
Lane-change flasher	X	X	X	X	X
Hazard flasher during sharp braking	X	X	X	X	X
Headlamp switch-off delay	X	X	X	X	X
Peripheral lights	--	X	X	X	X
Autolamps	--	X	X	X	X
Interior lighting					
Interior lamp switch-off delay	X	X	X	X	X
Interior lamp extended switch-off delay	X	X	X	X	X
Activated when doors are unlocked	--	X	X	X	X
Window heating					
Windshield	X	X	X	X	X

DESCRIPTION AND OPERATION

Versions	B- GEM Ax	B- GEM Bx	B- GEM Cx	B- GEM Cx	B- GEM Dx
Functions	CL	CURF	DURF	ST150 (RHD)	Japan
Rear window	X	X	X	X	X
Wipers					
Programmable windshield wiper interval	X	X	X	X	X
Windshield wiper interval adjustable via rotary switch	X	X	X	X	X
Rain sensor	--	X	X	X	X
Windshield washwipe function	X	X	X	X	X
Windshield after-wipe	X	X	X	X	X
Rear window intermittent wipe	X	X	X	X	X
Rear window washwipe function	X	X	X	X	X
Rear window wipe during reversing	X	X	X	X	X
Folding exterior mirrors					
Exterior mirror folding function via locking/unlocking		X	X	X	X
Information/warning functions					
Door open warning indicator	X	X	X	X	X
Lights on warning buzzer	X	X	X	X	X
Personalization	X	X	X	X	X
Locking/unlocking					
Manual locking/unlocking with a key	X	X	X	X	X
Central locking/unlocking with 433MHz radio remote control	--	X	--	--	--
Central locking/unlocking with 315MHz radio remote control	--	--	--	--	X
Central locking/unlocking and double locking with 433MHz radio remote control	--	--	X	X	--
Two-stage unlocking (driver door/all doors)	--	X	X	X	X
Locking status feedback via turn signals	X	X	X	X	X
Programming of double locking/single locking	--	--	X	--	--
Vehicle locking at start of trip (not for European markets)	X	X	X	X	X
Liftgate release					
Release via radio remote control	--	X	X	X	X
Release via switch in the passenger compartment	X	X	X	X	X
Alarm					
Anti-theft alarm system (perimeter)	--	--	X	--	--

DESCRIPTION AND OPERATION

Versions	B-GEM Ax	B- GEM Bx	B-GEM Cx	B-GEM Cx	B- GEM Dx
Functions	CL	CURF	DURF	ST150 (RHD)	Japan
Anti-theft alarm system (Thatcham CatI)	--	--	--	X	--
Radio/DVD input signal for alarm system	--	--	X	X	--
Interior scanning	--	--	X	X	--
Deactivation of the anti-theft alarm system with valid PATS key	--	--	--	X	--
Anti-theft alarm horn with integral battery	--	--	--	X	--
Horns					
Vehicle horn	X	X	X	X	X
Alarm horn	--	--	X	--	--
Diagnosis					
Diagnosis	X	X	X	X	X
Service mode	X	X	X	X	X
Programming of PATS key	--	X	X	X	X

Headlamp switch-off delay - vehicles built from 0812005

The headlamp switch-off delay utilizes the low beam together with the peripheral lights (if equipped) to illuminate the area surrounding the vehicle. The function is activated by turning the light switch to the "headlamps" position with the ignition switch in the "O" position.

On vehicles with "autolamps", the function is activated by turning the light switch to the "Auto" position with the ignition switch in the "O" position.

After the last door has been closed, the function remains active for a further 30 seconds and then switches off automatically.

When a door or the **liftgate** is open, the switch-off time is extended to 180 seconds. After the last door has been closed, the switch-off time is reset to 30 seconds.

The headlamp switch-off delay can be deactivated by operating the high beam switch again or by switching on the ignition prematurely.

Peripheral lights - vehicles built from 0812005

The lamps used for the peripheral lights are the front side lamps, rear lamps and license plate lamps.

The peripheral lights are switched on when a door or the **liftgate** are opened or an unlock command is detected and the following conditions are fulfilled:

- The ignition key is in position "O" or "I".
- Reverse gear is not engaged.
- The vehicle speed is below 7 km/h.

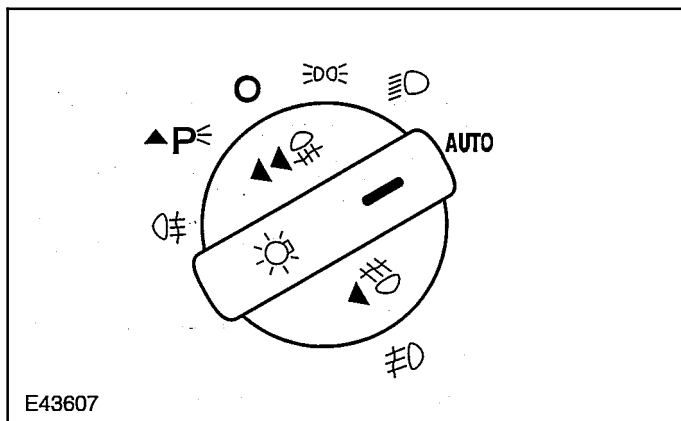
The peripheral lights are switched off when one of the following conditions is fulfilled:

- The ignition switch is turned to position "II" or "III".
- Reverse gear is engaged.
- The vehicle speed exceeds 7 km/h.
- More than 25 seconds have elapsed since the **liftgate** was closed or a central locking command was determined.
- The time set for the battery protection function for the interior lighting has elapsed.

DESCRIPTION AND OPERATION

- More than 5 seconds have elapsed since the doors and the liftgate were closed.
- More than 5 seconds have elapsed since a central locking command was received and all the doors and the liftgate were closed.

Autolamps-vehicles built from 0812005

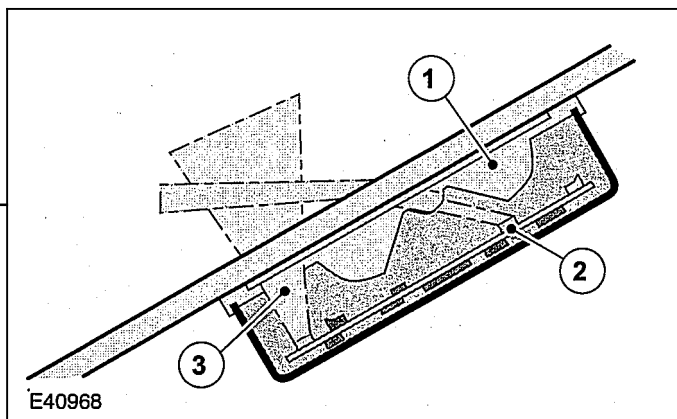


The dipped beam headlamps and side lights are switched on automatically if all the following conditions are satisfied:

- Ignition switch in the "II" or "III" position
- Light switch in the "AUTO" position
- Determined ambient light conditions below a stored threshold value

The low beams and the side lights are switched on or off by the GEM according to the input signals of the combined rain sensor/light sensor. This takes place in the GEM by activating the low beam relay and the autolamp relay (side lamps/license plate lamps).

Combined rain sensor/light sensor - vehicles built from 0812005



Item	Description
1	Lens
2	Front light sensor
3	Ambient light sensor

The combined rain sensor/light sensor is attached to the windshield, near the interior rear view mirror.

The ambient light sensor determines the general light intensity. For this purpose, it detects the light over as wide an angle as possible, without taking the direction of incidence into account.

The front light sensor determines the light intensity directly in front of the vehicle.

If both the ambient light sensor and the front light sensor detect a sudden reduction in light intensity at the same time, then an algorithm-based calculation is used to determine the fact that the vehicle has entered a tunnel, a multi-storey car park or a long underpass.

In this case the request for switching on the external lighting and the indicator in the instrument cluster is transmitted to the GEM.

If the vehicle enters into the shade thrown by a large truck, the two sensors will register different light intensities. In this case, the algorithm-based calculation will not result in the lights being switched on.

Turn signals

The GEM actuates the turn signal lamps for direction indication and the hazard flasher. It therefore replaces the conventional turn signal relay.

DESCRIPTION AND OPERATION

For the turn signal, the turn signal lamps at the front, rear and on the side of the vehicle, as well as the indicator in the instrument cluster are activated according to the position of the turn signal switch at approx. 80 impulses per minute.

An audible sound is generated with the same rhythm by a sound generator in the instrument cluster as an audible check for the driver.

If one of the turn signal lamp bulbs fails then the flashing frequency is increased to around 160 impulses per minute. On vehicles with message center in the instrument cluster, a message is generated.

The turn signal lamps are also used for the following signals:

- Confirmation of **locking/unlocking** and alarm activation (central **locking/anti-theft** alarm system)
- Alarm triggered (anti-theft alarm system)
- Confirmation of reprogramming (radio remote control)

As these signals could overlap in certain situations, a priority level has been assigned to each one.

- Priority 1: hazard signal
- Priority 2: alarm triggered
- Priority 3: turn signal
- Priority 4: confirmation of **locking/activation** of alarm
- Priority 5: confirmation of reprogramming

Lane-change flasher - vehicles built from 08/2005

With the lane-change flasher, the turn signals flash in a three-flash mode. For this purpose, the turn signal lamp switch is turned to the first non-engaged position and released again within 0.1 to 0.7 seconds. If the turn signal lamp switch is held in this first position for less than 0.1 seconds or longer than 0.7 seconds, the **turn** signal system responds in single-flash mode for as long as the **turn** signal switch is held or remains in the engaged position. The three-flash mode can be configured via Worldwide Diagnostic System (WDS) or the instrument cluster personalization menu.

Interior lighting

Depending on the model and the equipment level of the vehicle, the interior lighting controlled by the GEM includes the overhead light at the front and rear and the luggage compartment light.

The overhead lamps are only switched by the GEM if the corresponding lamp has been set to "Door operation" (not if the light is in the "Continuous" or "OW" settings).

The lamps are switched on as soon as one of the following conditions is satisfied:

- A door or the **liftgate** has been opened (switch in the **door/liftgate** lock).
- The ignition lock is in position "0" or "I" and the vehicle is unlocked centrally.
- The ignition lock is turned from position "II" to position "I" or "0"

NOTE: On vehicles built up to 0812005 with Ax GEM, there are no switches in the locks of the rear doors. As a result the overhead lights are not switched on when the rear doors are opened.

NOTE: On vehicles built from 0812005 with Ax GEM and manual **locking/unlocking** with a key, there are no switches in the locks of the rear doors. Vehicles with central **locking/unlocking** with remote radio control are equipped with switches in the locks of the rear doors.

The lights are switched off when all the doors and the **liftgate** are closed and one of the following conditions is satisfied:

- 25 seconds after the lights are switched on or after closing the last door on non centrally locked vehicles
- On closing the last door on centrally locked vehicles
- The ignition lock is turned from position "0" or "I" to position "II"
- Ignition lock in position "0" or "I" while the vehicle is being locked

On vehicles built up to 0812005, dimming is used when switching on and off in the case of the Cx and Dx GEM versions.

On vehicles built from 0812005, dimming is used when switching on and off in the case of the Ax, Bx, Cx and Dx GEM versions.

When the lights are switched on, their operating voltage is brought from OV to operating voltage within a period of 0.7 seconds.

DESCRIPTION AND OPERATION

When the lights are switched off, the operating voltage is continuously reduced to OV within a period of 1.7 seconds.

The dimmer function is not utilised if the lights are switched off by the battery protection function.

Heated windshield

The heated windshield can only be switched on if the engine is running.

The GEM switches on the relay for the heated windshield in response to a request from the switch in the instrument panel.

On vehicles built from 0812005, the GEM also switches on the relay for the heated windshield in response to a request from the "Max Defrost" button on the Electronic Automatic Temperature Control (EATC) climate control assembly.

The Light Emitting Diode (LED) in the corresponding switch lights up continuously while the windshield is being heated.

The GEM switches the relay off when

- four minutes have passed since switching on
- the switch in the instrument panel is pressed again
- the engine is switched off

Rear window heating

The rear window heating can only be switched on with the ignition key in position "II".

The GEM switches on the relay for the heated rear window in response to a request from the switch in the instrument panel.

On vehicles built from 0812005, the GEM also switches on the relay for the heated rear window in response to a request from the "Max Defrost" button on the EATC climate control assembly.

The LED in the switch lights up continuously while the rear window is being heated.

NOTE: If the vehicle is equipped with heated exterior mirrors, then these are operated together with the rear window heating.

The GEM switches the relay off when

- 14 minutes have passed since switching on
- the switch in the instrument panel is pressed again
- the ignition key is turned to position "I" or "0"

Windshield wash/wipe functions

NOTE: All the wash/wipe functions are only available if the ignition key is in position "II".

The windshield wiper switch has four settings: Off, Intermittent, Level 1 and Level 2.

On vehicles built from 0812005 with rain sensor, the wiper switch also features an Auto function.

In levels 1 and 2 the wipers run continuously at normal or high speed.

In the intermittent setting a wipe is performed every 7 seconds when the basic setting is selected.

On vehicles built up to 0812005, the interval is continuously adjustable. For this purpose, the wiper switch is set to the intermittent wipe position and then switched back off after the first wipe. After the desired wipe interval has elapsed the switch is again moved to the intermittent wipe position. The intermittent wipe delay time is then stored in the GEM.

The time delay can be adjusted to between 1 and 25 seconds.

When the ignition is switched off the time delay is reset to the basic setting.

On vehicles built from 0812005, the intermittent mode can be adjusted in 6 stages via a rotary switch on the wiper lever.

Windshield wash/wipe function

If the washer switch has been activated with the wiper switch in the "Off" position, the washer pump is switched on first to protect the wiper blades, and then after a short delay the wipers. The wipers then perform 2 or 3 wipes.

The after-wipe function on the windshield ensures that any water remaining on the windshield after washing is wiped away. It is only required if the wipers are switched off or set to intermittent mode.

If the wiper switch is in the "Off" position then an after-wipe operation is performed 4 seconds after the washing process is finished.

When the wipers are in intermittent mode the after-wipe is performed after 6 seconds, but only if the wiper delay time is set to more than 6 seconds. Afterwards the wipers continue in intermittent mode.

If the wipers are in operation at normal or high speed when the washer is activated then they continue to run at this speed.

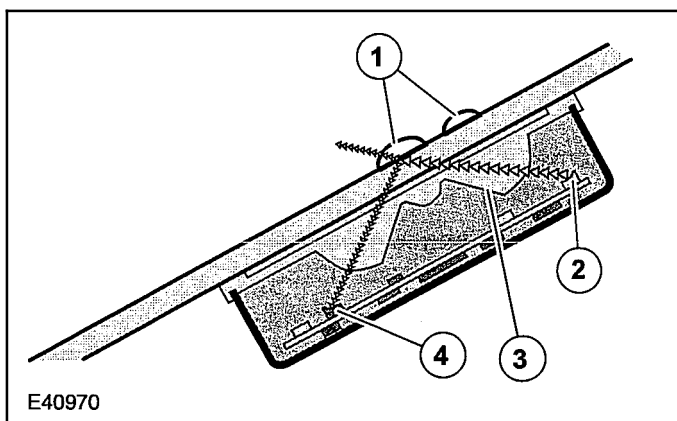
DESCRIPTION AND OPERATION

Automatic windshield wipers -vehicles built from 0812005

The rain sensor and the light sensor are integrated into one housing.

The rain sensor consists of an opto-electronic measuring and evaluation circuit. The sensor calculates the amount of precipitation falling on the windshield and request that the windshield wipers are switched on.

On the basis of the information provided by the rain sensor, the windshield wipers are then automatically set to the required wipe speed.

Rain sensor operating principle - vehicles built from 0812005

Item	Description
1	Raindrops
2	LED
3	Lens
4	Photodiode

CAUTIONS:

- ⚠ **The automatic windshield wipers must be switched off before the vehicle is driven into a car wash.**
- ⚠ **If the windshield is iced up, the wipers may only be activated by the rain sensor after the windshield has been completely defrosted.**

NOTE: The rain sensor is an optical measuring instrument. Contamination such as oil, grease or dust impair its correct operation. Before switching on the automatic windshield wipers, the windshield must be clean in the area of the rain sensor.

The rain sensor consists of three components:

- an LED
- a photodiode
- the lens

When the automatic windshield wipers are switched on, the rain sensor is switched on and performs an automatic calibration according to the current conditions on the windshield.

In order to enable this automatic calibration procedure, the windshield wipers perform one wipe during which any moisture is removed from the area of the rain sensor.

Automatic calibration only takes place if the wiper switch was not set to the automatic function before the ignition was switched on.

The LED emits a light beam of known intensity. The emitted beam emerges through the lens and is then **reflected** by the windshield.

The reflected light beam returns through the lens and reaches the photodiode. The corresponding value taken without moisture on the windshield is used as the reference value for the automatic calibration procedure.

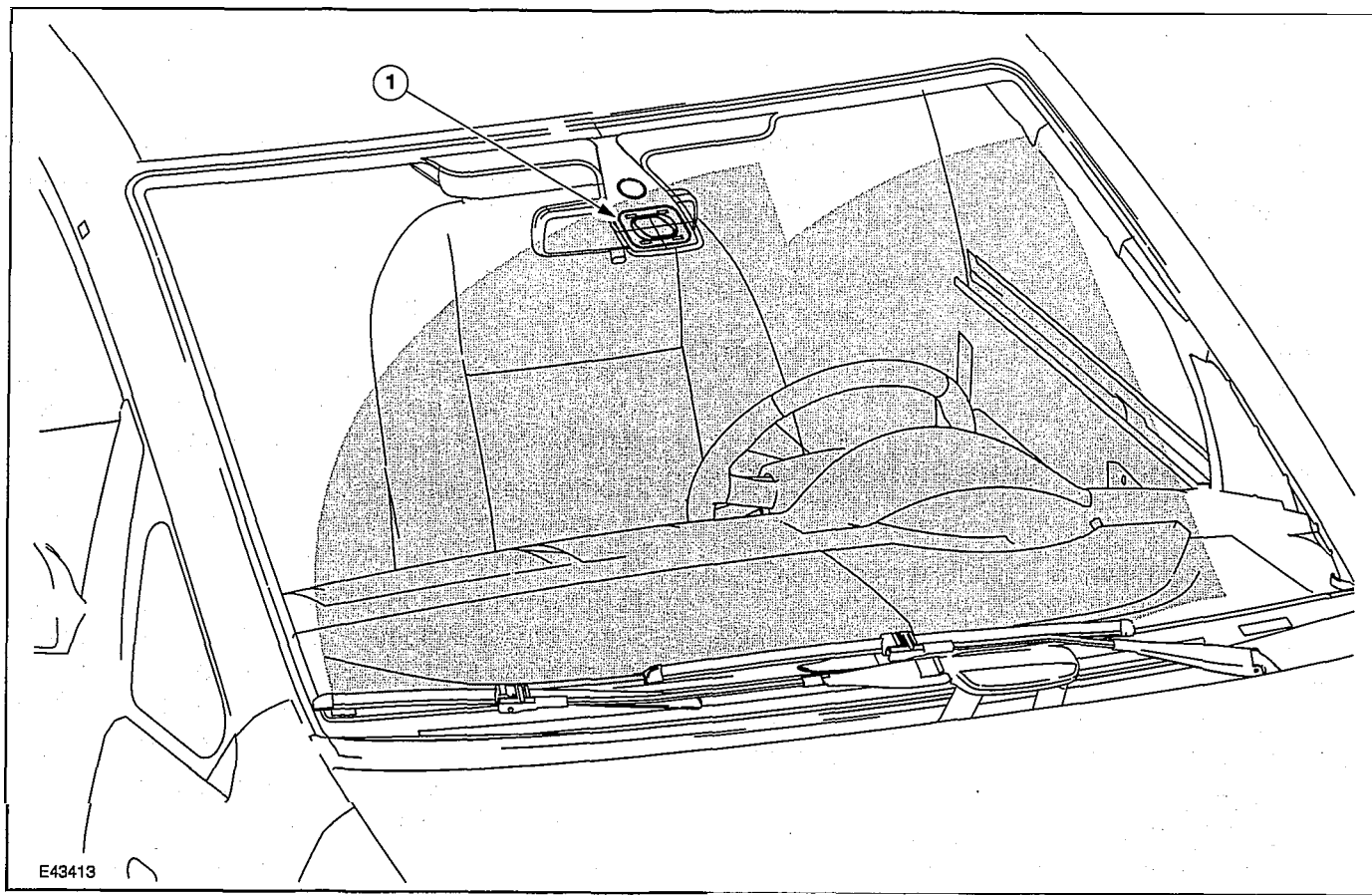
Subsequent deviations from this value cause the windshield wipers to be switched on.

If rain falls on the windshield, the light reflected by the windshield has a lower intensity. This loss of intensity is registered by the photodiode and, proportionally to the loss of intensity, the GEM switches on the windshield wipers at the required wipe speed.

The sensitivity of the rain sensor is set by adjusting the variable resistor at the wiper switch.

- Switch position 1: High sensitivity
 - The wipers wipe even if only a small amount of water has been measured on the windshield.
- Switch position 6: Low sensitivity
 - The wipers only wipe if a large amount of water has been measured on the windshield.

DESCRIPTION AND OPERATION



E43413

Item	Description
1	Installation position of the combined rain/light sensor

Rear window washwipe function

The rear window wiper changes the wiper delay interval according to the setting of the windshield wiper switch.

If the windshield wiper switch is set to Level 2 and the rear window wiper is switched on, then the wiper delay interval is 6 seconds.

If the windshield wiper switch is in the Intermittent or Level 1 position and the rear window wiper is switched on, the wiper delay interval is 10 seconds.

If reverse gear is engaged while the windshield wiper is switched on and the rear window wiper is switched off, then the GEM automatically switches on the rear wiper with the wiper delay interval as described above. This function remains activated until reverse gear is no longer engaged or the windshield wiper is switched off.

Rear window washwipe function

When the switch for the rear window washer is activated the wipers perform wipe operations (while the switch is being activated).

When the switch is released the wipers perform 2-3 more wipes.

Information/warning functions

A warning lamp in the instrument cluster is actuated if at least one door or the liftgate is not fully closed with the ignition lock in position "II".

NOTE: On vehicles built from 0812005, a message is transmitted to the instrument cluster by the GEM via the medium-speed Controller Area Network (CAN) bus in order to generate an acoustic signal.

DESCRIPTION AND OPERATION

An acoustic signal is generated by the GEM if:

- the system changes over to the programming mode for the radio remote control (once).
- in diagnostic mode as entry confirmation (once), as confirmation of input signals (once each) and as exit confirmation when leaving the diagnostic mode (3 times).
- the ignition lock is in position "I" or "0" and the light switch is in position "1" or "2" and the driver's door is opened (continuous "Lights on" warning sound).

Message center - vehicles built from 0812005

Depending on the various model versions, different information is transmitted by the GEM to the message center integrated in the instrument cluster via the medium-speed CAN bus.

The various information can be displayed by pressing a button on the turn signal lamp switch.

▲ WARNING: For reasons of safety, modification of the various functions should only be performed when the vehicle is stationary.

Various functions which are monitored and controlled by the GEM can be modified by means of the button on the turn signal lamp switch.

Modifiable functions

- Confirmation tone (all/minimal)
- Vehicle remote keyless entry (all doors/only driver door)
- Lane-change flasher (3x flashing/1x flashing)
- Hazard flasher during sharp braking (activated/deactivated (only for certain markets))

Locking/unlocking - central locking

Locking/unlocking - central locking

The central locking system locks all doors and the liftgate so that they can no longer be opened from the outside.

The central locking system is activated by turning a key in one of the door lock cylinders to the locking position.

The central locking can also be activated by pressing the internal door openers into the locking position.

If during the central locking process one of the front doors is not fully closed then all the doors are unlocked again.

If during the central locking process one of the rear doors is not fully closed then all the doors are still centrally locked.

Locking/unlocking - double locking

The double locking system locks all doors in such a way that they can neither be opened from the outside nor the inside of the vehicle.

The double locking mechanism is only available if the ignition lock is in the position "0" or "I" and the front doors are fully closed.

To activate the double locking, press the locking button on the radio remote control twice within 3 seconds, or insert the key into one of the door locks and turn it first to the unlocking position and then within 3 seconds to the locking position.

All the turn signal lamps flash twice to confirm activation of the double locking.

If the ignition lock is in the **position** "II" or one of the rear doors is not fully closed then the vehicle is centrally locked but not double locked.

If within 45 seconds of double locking the vehicle the ignition lock is moved to a different position then the system reverts back from double locking to central locking.

If the engine is started after the 45 seconds have elapsed then the double locking remains in force provided the speed of the vehicle does not reach 7 km/h. Once this speed is reached, the system reverts from double locking back to central locking.

Locking/unlocking - driver's door unlocking system

NOTE: The following description only applies if the driver's door unlocking system has been programmed.

If the unlocking button on the radio remote control is only pressed once within 3 seconds, then only the driver's door is unlocked.

If the vehicle was double locked beforehand, then all the other doors switch over to central locking.

If the unlocking button on the radio remote control is pressed twice within 3 seconds then the vehicle is centrally unlocked.

DESCRIPTION AND OPERATION

The driver's door unlocking system can be programmed and cancelled with the aid of the radio remote control.

However, this is only possible if the ignition lock is not in position "II".

Reprogramming is performed by simultaneously pressing the unlocking and locking buttons on the radio remote control for at least 4 seconds. The turn signal lamps flash twice to confirm the reprogramming.

On vehicles built from 0812005, reprogramming can also be performed via the message center integrated in the instrument cluster.

Locking/unlocking - central unlocking

The vehicle is centrally unlocked if:

- one of the door locks is turned with a key to the unlocking position (also applies to double locking)
- the unlocking button on the radio remote control is pressed (also applies to double locking)
- the internal door openers are pulled to the unlocking position (does not apply to double locking)

Locking/unlocking - automatic central locking

The vehicle is centrally locked again automatically after unlocking with the radio remote control if within 45 seconds neither a door or the **liftgate** are opened or the radio remote control is operated.

Programming of radio remote control operations

NOTE: Up to a maximum of four radio remote control operations can be programmed per vehicle.

During the programming process the memory for the known radio remote control operations in the **GEM** is deleted and the existing and new operations are reprogrammed.

To enter the programming mode for the radio remote controls, turn the ignition lock four times from position "0" to position "II" within 6 seconds.

The programming mode is confirmed with an acoustic signal. Afterwards, the corresponding remote control operations can be programmed within 10 seconds.

To start the programming process, press one of the buttons on the remote control.

The **GEM** or the instrument cluster (vehicles built from 0812005) confirms the programming by means of an acoustic signal.

Anti-theft alarm system

The anti-theft alarm system provides a visual and acoustic signal that an unauthorised person is attempting to gain access to the vehicle or that an attempt is being made to turn the ignition key while the anti-theft alarm system is activated.

The system monitors:

- Hood
- Doors
- **Liftgate**
- Ignition lock

In the event of an alarm, the system actuates a separate signal horn (acoustic alarm) for 30 seconds and the hazard flasher (visual alarm) for 5 minutes.

The anti-theft alarm system is activated with a delay of 20 seconds by centrally locking or double locking the vehicle. To do this the ignition lock must be in the position "0".

After the time delay of 20 seconds the hood, all doors and the **liftgate** are alarmed, provided they are fully closed.

If the hood, one of the doors or the **liftgate** are not fully closed then they can be opened without triggering an alarm. If they are then closed, the same time delay of 20 seconds applies before they are alarmed.

The anti-theft alarm system can be switched off by centrally unlocking the vehicle either at the lock or on one of the doors or with the remote control.

If the **liftgate** is opened manually with a key or with the remote control then only the anti-theft alarm for the **liftgate** is deactivated.

If the **liftgate** is then closed again, the anti-theft alarm is reactivated for the tailgate after 20 seconds.

The current status of the anti-theft alarm system is stored if the voltage supply to the **GEM** is interrupted. This means that as soon as the voltage supply to the **GEM** is restored it reverts to the stored status (if for example the vehicle was alarmed beforehand, it is then re-alarmed).

DESCRIPTION AND OPERATION

On vehicles with Thatcham Cat1 alarm system (only available in certain markets) the anti-theft alarm system can be deactivated by pressing the release key on the radio remote control. The anti-theft alarm system is not switched off if the vehicle has been unlocked with the key. In order to deactivate the anti-theft alarm system without the radio remote control, the driver door must first be unlocked with the key. A warning signal sounds for 12 seconds before the alarm is triggered. The anti-theft alarm system is deactivated by turning the key to position "II" in the ignition lock within this time.

NOTE: The interior sensors only operate error-free when all windows and the roof opening panel are completely closed. Furthermore, the sensors must not be covered. The system should not be activated when persons, animals or potentially moving objects are present in the vehicle interior.

NOTE: Do not activate the interior sensors while operating an auxiliary heater. This may trigger the alarm.

On vehicles with enhanced anti-theft warning system (optional), the interior sensors register every movement within the vehicle. They are located in the interior lamp assembly. The interior sensors are activated when double locking is activated.

Liftgate release

The tailgate can be unlocked manually:

- with the key
- with the remote release button in the passenger compartment
- with the remote control

The remote release button will not unlock the **liftgate** if the vehicle is centrally locked or if the vehicle is travelling in excess of 6 km/h.

The remote control can be used to unlock the **liftgate** by pressing the corresponding button twice within 3 seconds.

Folding exterior mirrors - vehicles built from 08/2005

Folding in/out of the exterior mirrors can be activated via three different functions:

- activating the exterior mirror foldback switch.
- locking/unlocking the vehicle using the radio remote control.
- switching the ignition on/off.

The folding exterior mirrors can only be activated if this function has been configured in the GEM using WDS or the message center in the instrument.

Battery protection function

The battery protection function prevents the battery from discharging as a result of the interior lighting or the warning sound generator when the engine is switched off.

As soon as the ignition lock is turned to position "I" or "0", a time counter is started in the GEM.

If a door is open the interior lights are switched off after 10 minutes.

If the doors are closed the interior lights, reading lights, luggage compartment lights and the warning sound generator are switched off after 30 minutes.

The battery protection function and the time counter are stopped after the following actions and then if necessary restarted:

- Ignition lock in position "II"
- Opening of a door or the **liftgate**
- Unlocking of a door or the **liftgate** (with a key or the remote control)

The battery protection function continues to operate when the GEM is in service mode or diagnostic mode.

Low-power ■ high-power mode - vehicles built from 08/2005

The GEM has two normal operating modes. In high-power mode, all the functions are executed to their full extent in accordance with the GEM specification. In low-power mode, the GEM functions are minimized in order to spare the battery as much as possible.

DESCRIPTION AND OPERATION

When all the following conditions are fulfilled, the GEM switches to low-power mode:

- Ignition lock is in "0" or "I" position.
- Interior lighting is switched off
- Hazard flasher is switched off
- Alarm system is activated or deactivated
- The exterior lighting is not activated via the peripheral lights or headlamp switch-off delay functions
- Automatic closing function is not activated
- Remote control programming mode is not activated
- Service mode is not activated
- CAN is in standby mode
- Remote control receiver signal is stable
- All software function counters are in standby mode

When one of the following conditions occurs in low-power mode, the GEM switches to high-power mode:

- Ignition lock is in position "II" or "III".
- Door switch (incl. liftgate switch or hood switch) status changes
- Audio unit monitoring status changes
- Anti-theft alarm inhibit switch status changes
- Door lock control switch status changes
- Hazard flasher switch status changes
- Central locking button status changes
- Liftgate release switch status changes
- Heated rear window switch status changes
- Remote control signal is received
- CAN is in active mode

When the GEM is in low-power mode, the further power consumption is reduced by changing the remote control receiver reception strategy following certain time periods as follows:

Time since activation of low-power mode	Duration of remote control receiver "Off" phase
1 – 4 days	Normal duration
5 - 10 days	Double duration
11 -22 days	Quadruple duration
23 -31 days	Remote control receiver is permanently switched off

During days 5 to 22 following commencement of low-power mode, it is still possible to lock or unlock the vehicle using the remote control, however the locking button and the unlocking button must be pressed simultaneously for 1.2 seconds in order to ensure that the GEM receives the remote control transmission signals and responds correctly. From day 23 onwards, the vehicle can only be locked or unlocked using the vehicle key.

Diagnosis

The GEM can be diagnosed using WDS.

There is also an additional service mode.

This service mode allows testing of various input and output signals.

Service mode is activated by:

- Pressing and holding the switch for the heated rear window
- Turning the ignition key to position "II"

- Releasing the switch for the heated rear window
- Pressing the switch for the heated rear window 8 times in 6 seconds

A signal sounds and the turn signal lamps come on to indicate that service mode has been successfully activated.

NOTE: If the alarm has been triggered (in vehicles equipped with an anti-theft alarm system), service mode cannot be activated.

The wiper switch must be in the "Off" position for testing the input signals.

The relevant input signals are indicated with an acoustic signal and by the flashing of the turn signal lamps.

The following signals can be tested in any order:

- Turn signals (right, left, hazard signal)
- "Lights on" warning signal
- Interior lighting
- Windshield wipe function
- Windshield wash function

DESCRIPTION AND OPERATION

- Rear window wipe function
- Rear window wash function
- Doors/liftgate
- Central locking
- Hood (only on vehicles with an anti-theft alarm system)
- Heated rear window
- Heated windshield

The wiper switch must be in the "Intermittent" position for testing of the output signals.

Each operation of the heated rear window switch activates and deactivates the following output signals in this order:

- Front wipers (a signal sounds and the turn signal lamps flash when the "**Park**" position is reached)
- Heated rear window
- Interior light(s) (the switch for the interior lights must be in the "Door operation" setting)
- Rear window wiper
- Heated windshield (only activated if the engine is running)

The GEM automatically exits the service mode 20 seconds after the last input.

It is however also possible to manually exit the service mode by:

- Pressing and holding the switch for the heated rear window
- Turning the ignition key out of position "II"
- Releasing the switch for the heated rear window

3 acoustic signals sound and the turn signal lamps come on to confirm that the service mode has been exited.

DIAGNOSIS AND TESTING**Generic Electronic Module (GEM) — Vehicles Built Up To: 1012005****Description of operation**

A diagnosis of the generic electronic module (GEM) can be performed with WDS. Furthermore, an integrated service mode enables testing of the input and output signals without the need for further tools. To enable activation of service mode:

- Switch off the ignition
- Switch off all other electrical consumers
 - Apply the handbrake
 - Shift to neutral
- Close the doors.

Activate service mode

Proceed as follows to activate service mode:

- OPERATE the switch of the heated rear window and HOLD IT THERE
- Turn on the ignition.
- RELEASE the switch of the heated rear window
- PRESS the heated rear window switch 8 times within 6 seconds

A signal sounds and the direction indicator lamps come on to indicate that service mode has been successfully activated.

NOTE: If the alarm sounds (in vehicles fitted with an anti-theft alarm system), service mode cannot be activated.

Input signals

SWITCH the wiper switch to the "Off" position to test the input signals. The following is a list of the signals to be tested, in no particular order:

- Direction indicators (right, left, hazard warning lights)
- "Lights on" warning (terminal 58)
- windshield wiper (intermittent wipe)
- windshield washer system
- rear window wiper
- rear window washer system
- Doors open/closed
- Central locking (if fitted)
- Bonnet up/down (in vehicles fitted with anti-theft alarm system)
- Heated rear window
- Heated windscreen (if fitted)

An acoustic signal sounds and the turn signal lamps flash to indicate receipt of each input signal by the generic electronic module.

Output signals

SWITCH the wiper switch to the "Intermittent" position to test the output signals. PRESSING the heated rear window switch activates or deactivates the output signals in the following order:

- a. Windshield wipers (a signal sounds and the direction indicator lamps flash when the "Park" position is reached)
- b. Heated rear window
- c. Interior light(s) (the interior light switch must be in the "ON" position)
- d. rear window wiper
- e. heated windshield (if equipped, is only activated when engine is running)

If the heated rear window switch is operated again, the sequence restarts with point 'a' and the functions are activated again in this order.

End service mode

The GEM automatically ends service mode 20 seconds after the final input. However, service mode can be manually ended at any time by proceeding as follows:

- OPERATE the switch of the heated rear window and HOLD IT THERE
- Switch off the ignition.
- RELEASE the switch of the heated rear window

3 signals sound and the direction indicator lamps come on to indicate that service mode has ended.

Inspection and Checking

1. CHECK the concern.
2. Visually CHECK for any obvious mechanical or electrical damage.

Visual Inspection

Electrical
— Wiring harness Connectors

DIAGNOSIS AND TESTING

3. RESOLVE any obvious causes for a concern found during the visual inspection before carrying out any further tests. CHECK operation of system.
4. If the concern persists after the visual inspection, PERFORM a fault diagnosis using WDS and RESOLVE the fault(s) displayed according to the fault description. CHECK operation of system.
5. On a vehicle without stored fault(s), continue according to the Symptom Chart and the corresponding symptom.
6. After testing and resolving the fault, the fault memory of all vehicles should be READ OUT and any stored faults CLEARED. READ OUT the all fault memory again after a road test.

Defect Identification Table**Defect Identification Table**

Symptom	Possible Sources	Action
• Service mode cannot be activated	• Fuse(s). • Circuit(s). • Integrated control assembly • Generic electronic module (GEM)	• GO to Pinpoint Test A.
• Generic electronic module (GEM) not communicating with the diagnostic unit	• Fuse(s). • Circuit(s). • Generic electronic module (GEM)	• REFER to Section 418-00 [Module Communications Network].

System Check**PINPOINT TEST A : SERVICE MODE CANNOT BE ACTIVATED**

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FUSE F24	
	1 Ignition switch in position 0.
	2 CHECK Fuse F24 (CJB). • Is the fuse OK? → Yes GO to A2. → No RENEW fuse F24 (20 A). CHECK the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground with the aid of the Wiring Diagrams.
A2: TEST VOLTAGE AT FUSE F24	
	1 Connect Fuse F24 (CJB).

DIAGNOSIS AND TESTING

TEST CONDITIONS

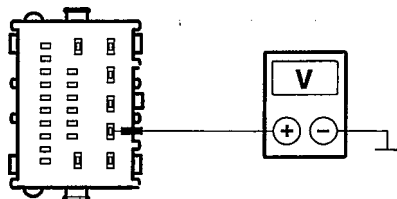
DETAILS RESULTS ACTIONS

	2 Measure the voltage between fuse F24 (20 A) and ground. Does the meter display battery voltage? → Yes GO to A3. → No REPAIR the voltage supply to fuse F24 with the aid of the Wiring Diagrams. CHECK operation of system.
A3: CHECK FUSE F38	
	1 CHECK Fuse F38 (CJB). Is the fuse OK? → Yes GO to A4. → No RENEW fuse F38 (7.5 A). CHECK operation of system. If the fuse blows again, LOCATE and RECTIFY the short to ground with the aid of the Wiring Diagrams.
A4: CHECK THE VOLTAGE AT FUSE F38	
	1 Connect Fuse F38 (CJB).
	☐ Ignition switch in position II.
	3 Measure the voltage between fuse F38 (7.5 A) and ground. Does the meter display battery voltage? → Yes GO to A5. → No REPAIR the voltage supply to fuse F38 with the aid of the Wiring Diagrams. CHECK operation of system.
A5: CHECK THE VOLTAGE AT THE GENERIC ELECTRONIC MODULE (GEM)	
	1 Ignition switch in position 0.
	2 Disconnect GEM C318 (blue).

DIAGNOSIS AND TESTING

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS



E0033611

☐ Measure the voltage between the GEM, connector C318, pin 2, circuit 29-AA80 (OGIWH), wiring harness side and ground.

• Does the meter display battery voltage?

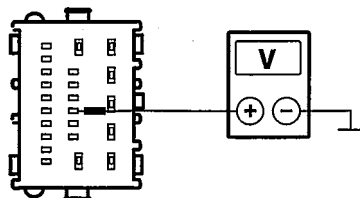
→ **Yes**

GO to A6.

→ **No**

LOCATE and RECTIFY the break in circuit 29-AA80 (OGIWH) between GEM and fuse F24 with the aid of the Wiring Diagrams. CHECK operation of system.

A6: CHECK THE VOLTAGE AT THE GEM



VFE0028972

☐ 1 Disconnect GEM C319 (white).

☐ 2 Ignition switch in position II.

☐ 3 Measure the voltage between the GEM, connector C319, pin 10, circuit 15-DK20 (GNI OG), wiring harness side and ground.

• Does the meter display battery voltage?

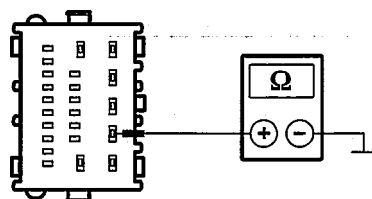
→ **Yes**

GO to A7.

→ **No**

LOCATE and RECTIFY the break in circuit 15-DK20 (GNI OG) between the GEM and solder point S3 with the aid of the Wiring Diagrams. CHECK operation of system.

A7: TEST THE GEM GROUND CONNECTION



VFE0028971

☐ 1 Ignition switch in position 0.

☐ Disconnect GEM C316 (black).

☐ 3 Measure the resistance between the GEM, connector C316, pin 2, circuit 31-DK20 (BK), wiring harness side and ground.

• Is a resistance of less than 2 Ohm registered?

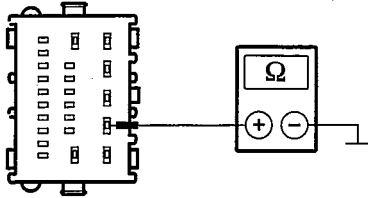
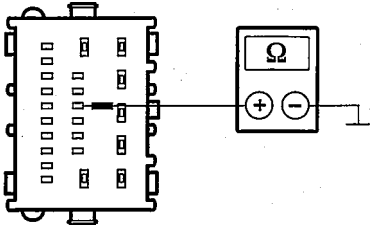
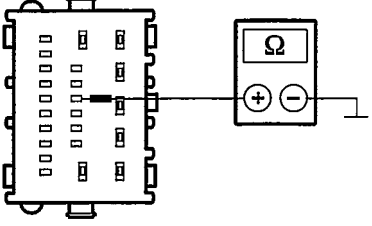
→ **Yes**

GO to A8.

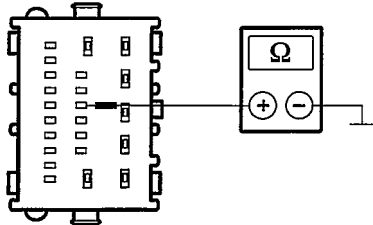
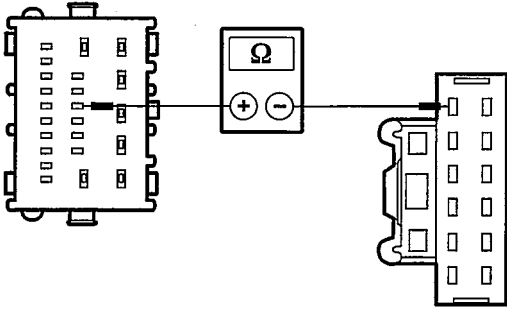
→ **No**

LOCATE and REPAIR the break in the circuit between the GEM and ground point G13 with the aid of the Wiring Diagrams. CHECK operation of system.

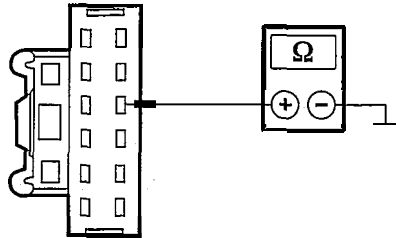
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
A8: TEST THE GEM GROUND CONNECTION	
 VFE0028975	☐ Disconnect GEM C320 (brown). 2 Measure the resistance between the GEM, connector C320, pin 2, circuit 91-DK20 (BWRD), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes GO to A9. → No LOCATE and RECTIFY the break in circuit 91-DK20 (BWRD) between the GEM and ground connection G14 with the aid of the Wiring Diagrams. CHECK the operation of the system.
A9: CHECK THE CONTROL IMPULSE OF THE HEATED REAR WINDOW SWITCH	
 VFE0029217	1 Operate the heated rear window switch and keep it operated. 2 Measure the resistance between the GEM, connector C320, pin 11, circuit 31S-HB22 (BWGN), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes GO to A10. → No GO to A12.
A10: CHECK THE SWITCH OF THE HEATED REAR WINDOW	
 VFE0029217	1 Release the switch of the heated rear window. 2 Measure the resistance between the GEM, connector C320, pin 11, circuit 31S-HB22 (BWGN), wiring harness side and ground. Is a resistance of more than 10 kOhms measured? → Yes TEST the GEM and RENEW as necessary. CHECK the operation of the system. → No GO to A11.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS RESULTS ACTIONS
A11: CHECK THE CIRCUIT BETWEEN THE GEM AND THE INTEGRATED CONTROL ASSEMBLY FOR A SHORT TO GROUND	
 VFE0029217	1 Disconnect Integrated control assembly C714. 2 Measure the resistance between the GEM, connector C320, pin 11, circuit 31S-HB22 (BWGN), wiring harness side and ground. Is a resistance of more than 10 kOhms measured? → Yes RENEW the integrated control assembly. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in circuit 31S-HB22 (BWGN) with the aid of the Wiring Diagrams. CHECK operation of system.
A12: TEST THE CIRCUIT BETWEEN THE GEM AND THE INTEGRATED CONTROL ASSEMBLY FOR OPEN CIRCUIT	
 VFE0029218	1 Disconnect Integrated control assembly C714. 2 Measure the resistance between the GEM, connector C320, pin 11, circuit 31S-HB22 (BWGN), wiring harness side and the integrated control assembly, connector C714, pin 1, circuit 31S-HB22 (BWGN), wiring harness side. Is a resistance of less than 2 Ohm registered? → Yes GO to A13. → No LOCATE and REPAIR the break in circuit 31S-HB22 (BWGN) between the GEM and the integrated control assembly with the aid of the Wiring Diagrams. CHECK the operation of the system.

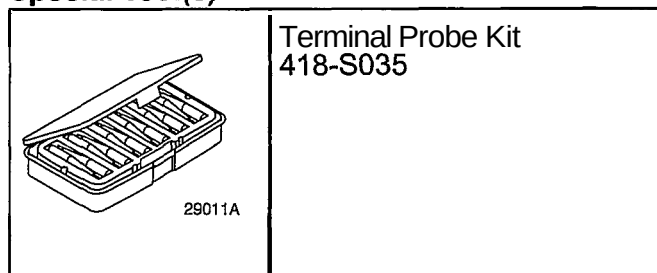
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A13: TEST THE GROUND CONNECTION OF THE INTEGRATED CONTROL ASSEMBLY	
 VFE0029219	Measure the resistance between the integrated control assembly, connector C714, pin 9, circuit 31-DK1 (BK), wiring harness side and ground. Is a resistance of less than 2 Ohm registered? → Yes RENEW the integrated control assembly. CHECK the operation of the system. → No LOCATE and RECTIFY the break in circuit 31-DK1 (BK) between the integrated control assembly and soldered connection S265 with the aid of the Wiring Diagrams. CHECK the operation of the system.

DIAGNOSIS AND TESTING

Generic Electronic Module (GEM) — Vehicles Built From: 1012005

Special Tool(s)



General Equipment

Digital multimeter

Worldwide Diagnostic System (WDS)

- Windshield wiper (intermittent wipe)
- Windshield washer system
- Rear window wiper
- Rear window washer system
- Doors open/closed
- Central locking (if fitted)
- Hood open/closed (in vehicles equipped with an anti-theft alarm system)
- Heated rear window
- Heated windscreen (if fitted)

An acoustic signal sounds and the turn signal lamps flash to indicate receipt of each input signal by the generic electronic module.

Description of operation

A diagnosis of the generic electronic module (GEM) can be performed with WDS. Furthermore, an integrated service mode enables testing of the input and output signals without the need for further tools. To enable activation of service mode:

- switch off the ignition,
- switch off all other electrical consumers,
- apply the handbrake,
- shift to neutral
- and close the doors.

Activating the service mode

Proceed as follows to activate the service mode:

- OPERATE the switch of the heated rear window and HOLD IT THERE
- Turn on the ignition.
- RELEASE the switch of the heated rear window
PRESS the heated rear window switch 8 times within 6 seconds

A signal sounds and the turn signal lamps flash to indicate that service mode has been successfully activated.

NOTE: If the alarm has been triggered (in vehicles equipped with an anti-theft alarm system), service mode cannot be activated.

Input signals

SWITCH the wiper switch to the "Off" position to test the input signals. The following is a list of the signals to be tested, in no particular order:

- Turn signals (right, left, hazard warning lights)
- "Lights on" warning (terminal 58)

Output signals

SWITCH the wiper switch to the "Intermittent" position to test the output signals. PRESSING the heated rear window switch activates or deactivates the output signals in the following order:

- a. Windshield wipers (a signal sounds and the direction indicator lamps flash when the "Park" position is reached)
- b. Heated rear window
- c. Interior light(s) (the interior light switch must be in the "ON" position)
- d. Rear window wiper
- e. heated windshield (if fitted, is only activated when engine is running)

If the heated rear window switch is operated again, the sequence restarts with point 'a' and the functions are activated again in this order.

Ending the service mode

The GEM automatically ends service mode 20 seconds after the last input. However, service mode can be manually ended at any time by proceeding as follows:

- OPERATE the switch of the heated rear window and HOLD IT THERE
- SWITCH OFF the ignition
RELEASE the switch of the heated rear window

3 signals sound and the turn signal lamps illuminate to indicate that service mode has ended.

Inspection and Testing

1. VERIFY the customer concern.

DIAGNOSIS AND TESTING

2. Visually CHECK for any obvious mechanical or electrical damage.

NOTE: Ensure correct locking of wiring harness connector.

Visual Inspection

Electrical
Fuses.
Wiring harness.
Electrical connectors.

3. RECTIFY any obvious causes for a concern found during the visual inspection before performing any further tests. CHECK the operation of the system.

4. If the concern persists after the visual inspection, PERFORM a fault diagnosis with WDS and RECTIFY any displayed faults in accordance with the displayed fault description. CHECK the operation of the system.
5. For vehicles with no stored faults, PROCEED in accordance with the Symptom Chart and the corresponding fault symptom.
6. Following checking or elimination of the fault and after completion of operations, the fault memories of all vehicle modules must be READ OUT and any stored faults must be DELETED. READ OUT all fault memories again following a road test.

DIAGNOSIS AND TESTING**Fault Code Table**

DTC:	Description	Action
B2496	Circuit of anti-theft alarm horn faulty (short to ground).	REFER to: Anti-Theft - Active (419-01A, Diagnosis and Testing).
B2494	Circuit of anti-theft alarm horn faulty (short to voltage).	REFER to: Anti-Theft - Active (419-01A, Diagnosis and Testing).
B1300	Circuit of central locking switch faulty.	REFER to: Locks, Latches and Entry Systems (501-14, Diagnosis and Testing).
B1310	Circuit of door lock release switch faulty.	REFER to: Locks, Latches and Entry Systems (501-14, Diagnosis and Testing).
B1317	Battery voltage too high (more than 16.5 V).	REFER to: Charging System (414-00, Diagnosis & Testing).
B1318	Battery voltage too low (less than 7.5 V).	REFER to: Charging System (414-00, Diagnosis & Testing).
B1319	Circuit of driver side door contact switch faulty (open circuit).	REFER to: Interior Lighting (417-02, Diagnosis and Testing).
B1327	Circuit of passenger door contact switch faulty (open circuit).	REFER to: Interior Lighting (417-02, Diagnosis and Testing).
B1571	Circuit of rear left door contact switch faulty (open circuit).	REFER to: Interior Lighting (417-02, Diagnosis and Testing).
B1335	Circuit of rear right door contact switch faulty (open circuit).	REFER to: Interior Lighting (417-02, Diagnosis and Testing).
B1331	Circuit of tailgate contact switch faulty (open circuit).	REFER to: Interior Lighting (417-02, Diagnosis and Testing).
B1342	Module fault.	INSTALL a new GEM.
B1343	Circuit of rear window heater switch faulty (short to ground).	REFER to: (501-11) Glass Frames and Mechanisms (Diagnosis and Testing), Glass Frames and Mechanisms 2.0L Duratec-HE (MI4) (Diagnosis and Testing).

DIAGNOSIS AND TESTING

DTC:	Description	Action
B1350	Circuit of heated rear window relay faulty (short to ground).	REFER to: (501-11) Glass Frames and Mechanisms (Diagnosis and Testing), Glass Frames and Mechanisms - 2.0L Duratec-HE (M14) (Diagnosis and Testing).
B1349	Circuit of heated rear window relay faulty (short to voltage).	REFER to: (501-11) Glass Frames and Mechanisms (Diagnosis and Testing), Glass Frames and Mechanisms - 2.0L Duratec-HE (M14) (Diagnosis and Testing).

DIAGNOSIS AND TESTING

DTC:	Description	Action
B1446	Circuit of windshield wiper limit switch (park position) faulty (short to ground).	REFER to: Wipers and Washers (501-16, Diagnosis and Testing).
B1499	Circuit of left-hand turn signal lamp faulty (short to ground).	REFER to: Turn Signal and Hazard Lamps (417-01, Diagnosis and Testing).
B1503	Circuit of right-hand turn signal lamp faulty (short to ground).	REFER to: Turn Signal and Hazard Lamps (417-01, Diagnosis and Testing).
B2282	Circuit of left-hand turn signal lamp switch faulty (short to ground).	REFER to: Turn Signal and Hazard Lamps (417-01, Diagnosis and Testing).
B2281	Circuit of right-hand turn signal lamp switch faulty (short to ground).	REFER to: Turn Signal and Hazard Lamps (417-01, Diagnosis and Testing).
B1519	Circuit of hood contact switch faulty (open circuit).	REFER to: Anti-Theft - Active (419-01A, Diagnosis and Testing).
B2555	Circuit of interior light faulty (short to voltage)	REFER to: Interior Lighting (417-02, Diagnosis and Testing).
B2598	Circuit of exterior lighting relay faulty (short to voltage)	REFER to: Headlamps (417-01, Diagnosis and Testing).
B1695	Circuit of headlamp switch (Autolamps) faulty (short to voltage) - vehicles with auto-on system for exterior lighting.	REFER to: Headlamps (417-01, Diagnosis and Testing).
B1578	Circuit of marker lamp faulty (short to ground).	REFER to: Parking, Rear and License Plate Lamps (417-01, Diagnosis and Testing).
B1810	Circuit of reversing light switch faulty (short to voltage).	REFER to: Reversing Lamps (417-01, Diagnosis and Testing).
B1315	Circuit of battery protection relay faulty (short to voltage).	Refer to WDS.
B1316	Circuit of battery protection relay faulty (short to ground).	Refer to WDS.

DIAGNOSIS AND TESTING

DTC:	Description	Action
B1875	Circuit of hazard warning light switch faulty (short to ground).	REFER to: Turn Signal and Hazard Lamps (417-01, Diagnosis and Testing).
B2248	Circuit of heated windshield relay faulty (short to voltage).	REFER to: (501-11) Glass Frames and Mechanisms (Diagnosis and Testing), Glass Frames and Mechanisms - 2.0L Duratec-HE (MI4) (Diagnosis and Testing).
B2256	Circuit of heated windshield relay faulty (short to ground).	REFER to: (501-11) Glass Frames and Mechanisms (Diagnosis and Testing), Glass Frames and Mechanisms - 2.0L Duratec-HE (MI4) (Diagnosis and Testing).
B2113	Circuit of windshield heating switch faulty (short to ground).	REFER to: (501-11) Glass Frames and Mechanisms (Diagnosis and Testing), Glass Frames and Mechanisms - 2.0L Duratec-HE (MI4) (Diagnosis and Testing).

DIAGNOSIS AND TESTING

DTC:	Description	Action
B2114	Circuit of windshield washer system switch faulty (short to ground).	REFER to: Wipers and Washers (501-16, Diagnosis and Testing).
B2115	Circuit of rear window washer system switch faulty (short to ground).	REFER to: Wipers and Washers (501-16, Diagnosis and Testing).
B2177	Circuit of interior scanning sensor faulty.	REFER to: Anti-Theft - Active (419-OI A, Diagnosis and Testing).
B1439	Circuit of windshield wash/wipe system switch (intermittent position) faulty (open circuit).	REFER to: Wipers and Washers (501-16, Diagnosis and Testing).
B1611	Circuit of rear wash/wipe system switch faulty.	REFER to: Wipers and Washers (501-16, Diagnosis and Testing).
B2339	Circuit of switch for electrically adjustable exterior mirrors faulty.	REFER to: (501-09) Exterior Mirror (Diagnosis and Testing), Exterior Mirror - 2.0L Duratec-HE (M14) (Diagnosis and Testing), Exterior Mirror (Diagnosis and Testing).
B1101	Circuit of electrically adjustable exterior mirrors faulty (short to ground).	REFER to: (501-09) Exterior Mirror (Diagnosis and Testing), Exterior Mirror - 2.0L Duratec-HE (M14) (Diagnosis and Testing), Exterior Mirror (Diagnosis and Testing).
B110B	Circuit of relay for electrically adjustable exterior mirrors faulty (short to ground).	REFER to: (501-09) Exterior Mirror (Diagnosis and Testing), Exterior Mirror - 2.0L Duratec-HE (M14) (Diagnosis and Testing), Exterior Mirror (Diagnosis and Testing).

DIAGNOSIS AND TESTING

DTC:	Description	Action
B211A	Circuit of windshield washer system relay faulty (short to ground).	REFER to: Wipers and Washers (501-16, Diagnosis and Testing).
B2477	Module configuration faulty.	CONFIGURE GEM again using WDS. If the fault occurs again, RENEW THE GEM.
B2112	Circuit of anti-theft alarm system activation switch faulty (short to ground).	REFER to: Anti-Theft - Active (419-01A, Diagnosis and Testing).
B2116	Circuit of anti-theft alarm system deactivation switch faulty (short to ground).	REFER to: Anti-Theft - Active (419-01A, Diagnosis and Testing).
B2665	Circuit of alarm horn with battery faulty (short to voltage).	REFER to: Anti-Theft - Active (419-01A, Diagnosis and Testing).
B1554	Tailgate unlocking circuit faulty (short to ground)	REFER to: Locks, Latches and Entry Systems (501-14, Diagnosis and Testing).
B1553	Tailgate unlocking circuit faulty (short to voltage)	REFER to: Locks, Latches and Entry Systems (501-14, Diagnosis and Testing).
B1551	Circuit of tailgate unlocking switch faulty (short to ground).	REFER to: Locks, Latches and Entry Systems (501-14, Diagnosis and Testing).
B1600	Circuit of PATS transponder faulty.	Refer to WDS.
B2108	Circuit of tailgate contact switch faulty.	REFER to: Locks, Latches and Entry Systems (501-14, Diagnosis and Testing).
B1298	Circuit of power supply sensor (terminal 15) faulty (short to voltage).	GO to Pinpoint Test A.
B1299	Circuit of power supply sensor (terminal 15) faulty (short to ground).	GO to Pinpoint Test A.
B2432	Circuit of driver's side belt buckle switch faulty.	Refer to WDS.

DIAGNOSIS AND TESTING

DTC:	Description	Action
U0146	No communication with gateway A.	REFER to: Communications-Network - Vehicles Built From: 0812005 (418-00, Diagnosis and Testing).
U0151	No communication with the restraints control module.	REFER to: Communications-Network - Vehicles Built From: 0812005 (418-00, Diagnosis and Testing).
U0155	No communication with the electronic instrument cluster.	REFER to: Communications-Network - Vehicles Built From: 0812005 (418-00, Diagnosis and Testing).
U0231	No communication with the light switch module.	REFER to: Communications-Network - Vehicles Built From: 0812005 (418-00, Diagnosis and Testing).
U0166	No communication with the fuel fired booster heater.	REFER to: Communications-Network - Vehicles Built From: 0812005 (418-00, Diagnosis and Testing).

Symptom chart

Symptom chart

Symptom	Possible Sources	Action
• Generic electronic module (GEM) not communicating with the diagnostic unit.	• Fuse(s). • Circuit(s). • Generic electronic module (GEM).	• REFER to: Communications-Network - Vehicles Built From: 0812005 (418-00, Diagnosis and Testing).

System Check

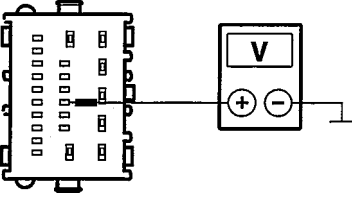
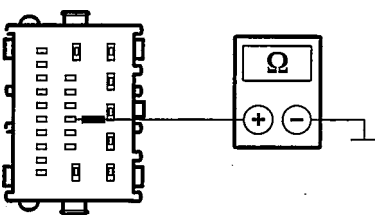
PINPOINT TEST B : VOLTAGE SUPPLY (TERM. 15) FAULTY.

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

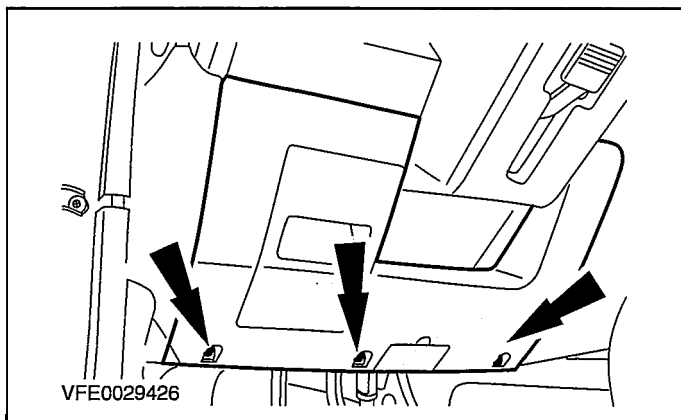
A1: CHECK FUSE F38	
	☐ Ignition switch in position 0.
	2 CHECK fuse F38 (CJB). • Is the fuse OK? → Yes GO to A2. → No RENEW fuse F38 (7.5 A). CHECK the operation of the system. If the fuse blows again, LOCATE and REPAIR the short using the Wiring Diagrams.

DIAGNOSIS AND TESTING

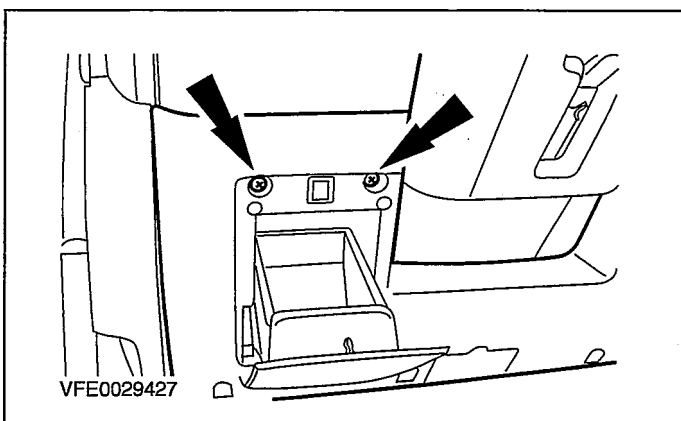
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A2: CHECK THE VOLTAGE AT FUSE F38	
	1 Connect fuse F38 (CJB).
	☐ Ignition switch in position II.
	☐ Measure the voltage between fuse F38 (7.5 A) and ground. Is battery voltage measured? → Yes GO to A3. → No CHECK the voltage supply to fuse F38 and REPAIR using the Wiring Diagrams. CHECK the operation of the system.
A3: CHECK CIRCUIT BETWEEN FUSE F38 AND GENERIC ELECTRONIC MODULE (GEM) FOR SHORT TO VOLTAGE	
	1 Ignition switch in position 0.
	2 Disconnect Connector C319 from GEM.
 VFE0028972	☐ Measure the voltage between the GEM, connector C319, pin 10, circuit 15-DK20 (GNIOG), wiring harness side and ground. Is a voltage measured? → Yes LOCATE and RECTIFY the short to voltage supply in the circuits connected to soldered connection S3 using the Wiring Diagrams. CHECK the operation of the system. → No GO to A4.
A4: CHECK CIRCUIT BETWEEN FUSE F38 AND GENERIC ELECTRONIC MODULE (GEM) FOR SHORT TO GROUND	
 E59040	1 Measure the resistance between the GEM, connector C319, pin 10, circuit 15-DK20 (GNIOG), wiring harness side and ground. Is a resistance of more than 10,000 ohms measured? → Yes TEST the GEM and RENEW as necessary. CHECK the operation of the system. → No LOCATE and RECTIFY the short to ground in the circuits connected to soldered connection S3 using the Wiring Diagrams. CHECK the operation of the system.

REMOVAL AND INSTALLATION**Generic Electronic Module (GEM)****Removal**

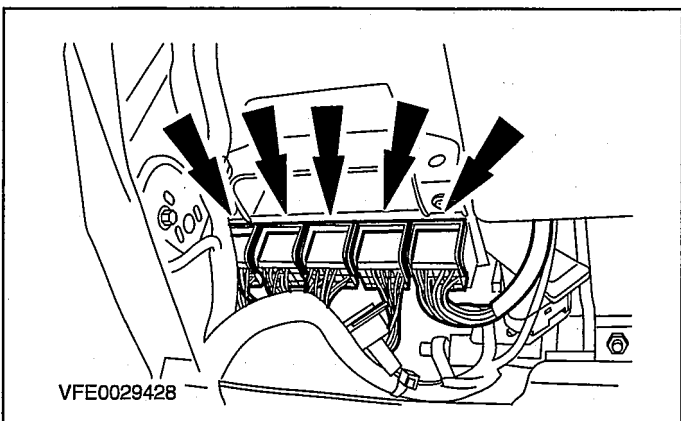
1. Unscrew and remove the bolts for the lower fascia/crash padding cover.



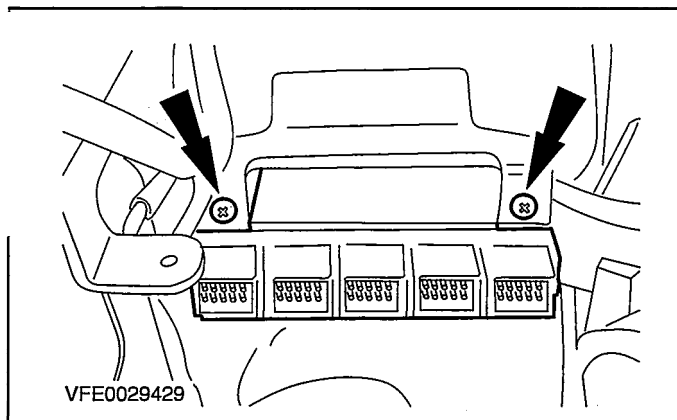
2. Detach the lower fascia/crash padding cover.



3. Disconnect the GEM connector.



4. Remove the GEM.

**Installation**

1. **NOTE:**Initialise the GEM with WDS after installation.

Refit the components in reverse order.

2006.0 Fiesta

Wiring Diagrams



Table of Contents

GROUP 2 chassis

Brake System	
Parking Brake and Actuation	206-05
Hydraulic Brake Actuation	206-06
Anti-Lock Control	206-09A
Anti-Lock Control - Stability Assist	206-09B
Steering System	
Power Steering	211-02
Steering Column Switches	211-05

GROUP 3 Powertrain

Engine	
Engine Cooling - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-03A
Engine Cooling - 2.0L Duratec-HE (MI4)	303-03B
Fuel Charging and Controls - 1.3L Duratec-8V (Rocam)	303-04A
Fuel Charging and Controls - 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-04B
Fuel Charging and Controls - 1.4L Duratorq-TDCi (DV) Diesel	303-04C
Fuel Charging and Controls - Turbocharger - 1.4L Duratorq-TDCi (DV) Diesel	303-04D
Fuel Charging and Controls - 2.0L Duratec-HE (MI4)	303-04E
Fuel Charging and Controls - 1.6L Duratorq-TDCi (DV) Diesel	303-04F
Starting System	303-06

Engine Ignition	303-07A
Glow Plug System - 1.4L Duratorq-TDCi (DV) Diesel	303-07B
Engine Ignition - 2.0L Duratec-HE (MI4)	303-07C
Engine Emission Control - 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma)	303-08
Evaporative Emissions	303-13
Electronic Engine Controls	303-14
Automatic Transmission/Transaxle	
Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40)	307-01A
Automatic Transmission/Transaxle - Vehicles With: 4-Speed Automatic Transmission (AW81-40)	307-01B
Automatic Transmission/Transaxle External Controls - Vehicles With: 4-Speed Automatic Transmission (AW81-40)	307-05
Manual Transmission/Transaxle, Clutch and Transfer Case	
Manual Transmission/Transaxle Automated Gearshift System	308-11
Fuel System	
Fuel Tank and Lines	310-01

GROUP 4 Electrical

Climate Control System	
Climate Control	412-01
Heating and Ventilation	412-02A
Auxiliary Heating	412-02B
Auxiliary Climate Control	412-02C
Air Conditioning	412-03

Instrumentation and Warning Systems

Instrument Cluster and Panel Illumination	413-00
Instrument Cluster	413-01
Horn	413-06
Information and Message Center	413-08

Battery and Charging System

Battery, Mounting and Cables	414-01
Generator and Regulator	414-02

Information and Entertainment Systems

Audio Unit	415-OIA
Information and Entertainment System	415-01B

Lighting

Exterior Lighting	417-01
Interior Lighting	417-02
Daytime Running Lamps (DRL)	417-04

Electrical Distribution

Module Communications Network	418-00
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Electronic Feature Group

Anti-Theft - Active	419-OIA
Anti-Theft - Passive	419-01B

Multifunction Electronic Modules

419-10

GROUP 5 Body and Paint**Body and Paint**

Rear View Mirrors	501-09
Seating	501-10
Glass, Frames and Mechanisms	501-11
Instrument Panel and Console	501-12
Handles, Locks, Latches and Entry Systems	501-14
Wipers and Washers	501-16
Safety Belt System	501-20A
Supplemental Restraint System	501-20B

GROUP 7 General Wiring Information**Wiring Information**

General Information	700-00
Fuse and Relay Information	700-01
Power Distribution	700-02
Grounding Strategy	700-03
Wiring Harness Information	700-05

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GROUP

Chassis 2

SECTION TITLE	PAGE
Brake System	
Parking Brake and Actuation.....	206-05
Hydraulic Brake Actuation.....	206-06
Anti-Lock Control.....	206-09A
Anti-Lock Control - Stability Assist.....	206-09B
Steering System	
Power Steering.....	211-02
Steering Column Switches.....	211-05



Powertrain 3

SECTION TITLE	PAGE
Engine	
Engine Cooling1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-03A
Engine Cooling2.0L Duratec-HE (MI4).....	303-03B
Fuel Charging and Controls1.3L Duratec-8V (Rocam).....	303-04A
Fuel Charging and Controls1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-04B
Fuel Charging and Controls1.4L Duratorq-TDCi (DV) Diesel.....	303-04C
Fuel Charging and Controls - Turbocharger1.4L Duratorq-TDCi (DV) Diesel.....	303-04D
Fuel Charging and Controls2.0L Duratec-HE (MI4).....	303-04E
Fuel Charging and Controls1.6L Duratorq-TDCi (DV) Diesel.....	303-04F
Starting System.....	303-06
Engine Ignition.....	303-07A
Glow Plug System1.4L Duratorq-TDCi (DV) Diesel.....	303-07B
Engine Ignition2.0L Duratec-HE (MI4).....	303-07C
Engine Emission Control1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	303-08
Evaporative Emissions.....	303-13
Electronic Engine Controls.....	303-14
Automatic Transmission/Transaxle	
Automatic Transmission/TransaxleVehicles With: 4-Speed Automatic Transmission (AW81-40).....	307-01A
Automatic Transmission/TransaxleVehicles With: 4-Speed Automatic Transmission (AW81-40).....	307-01B
Automatic Transmission/Transaxle External ControlsVehicles With: 4-Speed Automatic Transmission (AW81-40).....	307-05
Manual Transmission/Transaxle, Clutch and Transfer Case	
Manual Transmission/Transaxle Automated Gearshift System.....	308-11
Fuel System	
Fuel Tank and Lines.....	310-01

Electrical

GROUP 4

SECTION TITLE	PAGE
Climate Control System	
Climate Control.....	412-01
Heating and Ventilation.....	412-02A
Auxiliary Heating.....	412-02B
Auxiliary Climate Control.....	412-02C
Air Conditioning.....	412-03
Instrumentation and Warning Systems	
Instrument Cluster and Panel Illumination.....	413-00
Instrument Cluster.....	413-01
Horn.....	413-06
Information and Message Center.....	413-08
Battery and Charging System	
Battery, Mounting and Cables.....	414-01
Generator and Regulator.....	414-02
Information and Entertainment Systems	
Audio Unit.....	415-01A
Information and Entertainment System.....	415-01B
Lighting	
Exterior Lighting.....	417-01
Interior Lighting.....	417-02
Daytime Running Lamps (DRL).....	417-04
Electrical Distribution	
Module Communications Network.....	418-00
Electronic Feature Group	
Anti-Theft - Active.....	419-01A
Anti-Theft - Passive.....	419-01B
Multifunction Electronic Modules.....	419-10

GROUP

5

Body and Paint

SECTION TITLE	PAGE
Body and Paint	
Rear View Mirrors.....	501-09
Seating.....	501-10
Glass, Frames and Mechanisms.....	501-11
Instrument Panel and Console.....	501-12
Handles, Locks, Latches and Entry Systems.....	501-14
Wipers and Washers.....	501-16
Safety Belt System.....	501-20A
Supplemental Restraint System.....	501-20B

General Wiring Information

GROUP

7

SECTION TITLE	PAGE
Wiring Information	
General Information.....	700-00
Fuse and Relay Information.....	700-01
Power Distribution.....	700-02
Grounding Strategy.....	700-03
Wiring Harness Information.....	700-05

SECTION 412-01 Climate Control

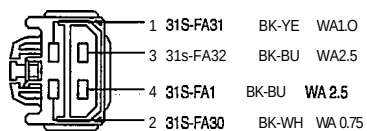
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

CONNECTORS

Blower Motor Resistor.....	412-01-2
Blower Motor Switch.....	412-01-3
Air Conditioning (NC) Cycling Switch.....	412-01-4
Air Conditioning (A/C) Pressure Transducer.....	412-01-5
Ambient Air Temperature Sensor.....	412-01-6
Air Conditioning (A/C) Switch.....	412-01-7
Blower Motor.....	412-01-8
Blower Motor Control Module.....	412-01-9
Footwell Air Discharge Temperature Sensor.....	412-01-10
Electronic Automatic Temperature Control (EATC) Module.....	412-01-11
Temperature Blend Door Actuator.....	412-01-12
In-Vehicle Temperature Sensor LH.....	412-01-13
In-Vehicle Temperature Sensor RH.....	412-01-14
Sunload Sensor.....	412-01-15
Clutch and Clutch Field Coil.....	412-01-16
Air Conditioning (NC) Clutch Diode.....	412-01-17
Air Conditioning (NC) Wide Open Throttle (WOT) Relay.....	412-01-18
Air Conditioning (A/C) Dual Pressure Switch.....	412-01-19
Recirculation Blend Door Actuator.....	412-01-20
Climate Control Assembly Illumination Bulbs.....	412-01-21
Center Register Air Discharge Temperature Sensor.....	412-01-22
Defrost Vent/Register Blend Door Actuator.....	412-01-23
Electronic Automatic Temperature Control (EATC) Module.....	412-01-24
Clutch and Clutch Field Coil.....	412-01-25
Clutch and Clutch Field Coil.....	412-01-26



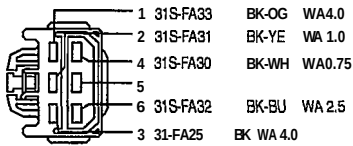
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C-323

TO HEATER BLOWER SERIES RESISTOR

HARNESS 14K024

PIN4 => 31S-FA13 BK-OG 0.35 WA + 31S-FA30 BK-WH 0.75 WA



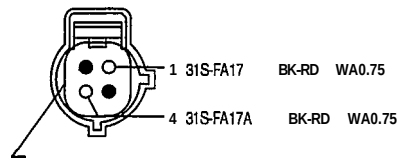
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C-324

TO HEATER BLOWER SWITCH

HARNESS 14K024

PIN 4 ⇒ 31S-FA17A BK-RD 0.75 WK
PIN 1 ⇒ 31S-FA17 BK-RD 0.75 WK

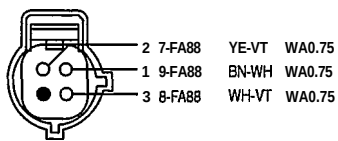


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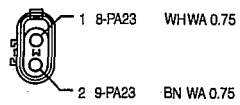
C-402

TO A/C COMPRESSOR CYCLING SWITCH

HARNESS 14K011



XW4T-14A464-AVA
G427
TO A/C PRESSURE TRANSDUCER SENSOR (ST150)
HARNESS 12A522

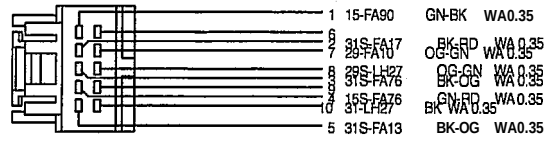


91AG-14A464-BBC

C-245

TO AMBIENTE AIR TEMPESENSOR (ST150)

HARNESS12A522

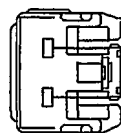


2L1T-14A464-HA

C-302

TO A/C SWITCH (HV AC CONTROL PANEL)

HAANESS14K024



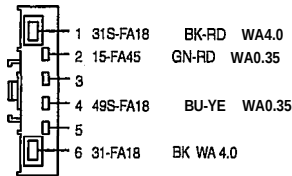
2 31S-FA18 BK-RD WA4.0
1 15-FA18 GN-OG WA4.0

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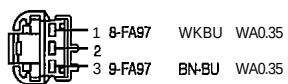
C-322

TO HEATER BLOWER MOTOR

HARNESS 14K024



3M5T-14489-VFA
C-382
m HEATER BLOWER CONTROL MODULE
HARNES14K024

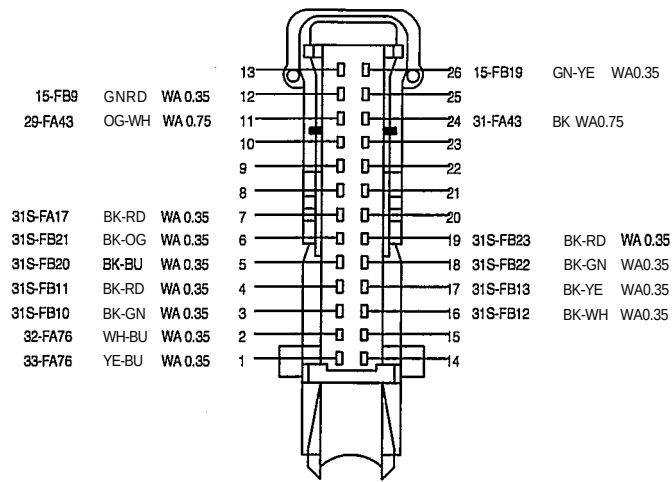


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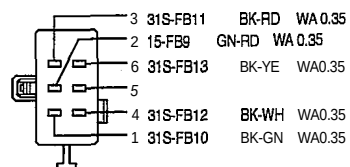
C-363

TO FLOOR DISCHARGE SENSOR

HARNESS 14K024



98BG-14489-RZA
C-366
TO EATC MODULE (C1)
HARNES14K024

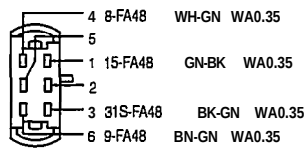


95AG-14489-RFA

C-369

TO AIR TEMP DOOR MOTOR

HARNESS 14K024



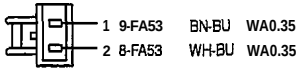
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C-388

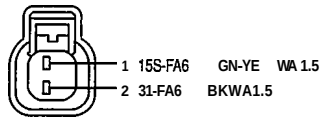
TO LEFT INTERIOR TEMP. SENSOR

HARNESS 14K024

412-01-14 In-Vehicle Temperature Sensor RH
Information not available at this time



95GG-14489-NBA
C-389
TOSUNLOADSENSOR
HARNESS 14K024

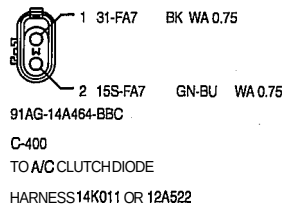


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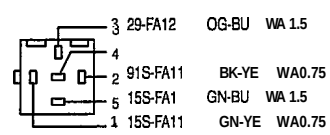
C-398

TO A/C CLUTCH SOLENOID (ST150)

HARNESS 12A522



PIN 5 => 15S-FA6 GN-YE 1.5 WK
PIN 5 => 15S-FA6 GN-YE 1.0 WK



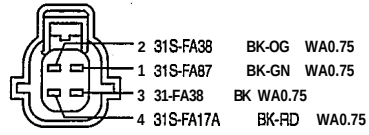
2S6T-14A481-BA

C-403

TO A/C WIDE OPEN THROTTLE WOT RELAY

HARNESS 14K011 OR 12A522

PIN 4 => 31S-FA17A BK-RD 0.75 WK
 PIN 3 => 31-FA38 BK 0.75 WK
 PIN 1 => 31S-FA87 BK-GN 0.75 WK
 PIN 2 => 31S-FA38 BK-OG 0.75 WK



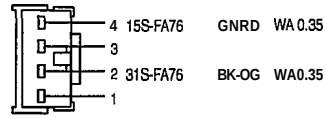
YF1T-14A464-BA

C-405

TO DUAL PRESSURE SWITCH

HARNESS 14K011

PIN 2 => 33-FA76 YE-BU 0.35 VA
PIN 4 => 32-FA76 WH-BU 0.35 WA

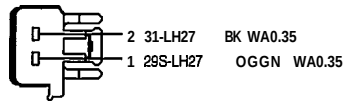


XR8T-14489-UA

C-611

TO RECIRCULATION DOOR MOTOR

HARNES 14K024

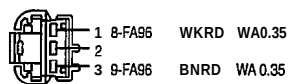


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G620

TO HEATER PANEL ILLUMINATION LAMP

HARNESS 14K024

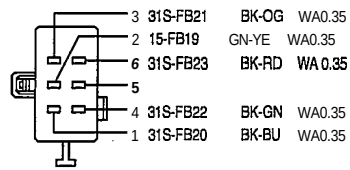


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C-364

TO PANEL DISCHARGE SENSOR

HARNESS14K024

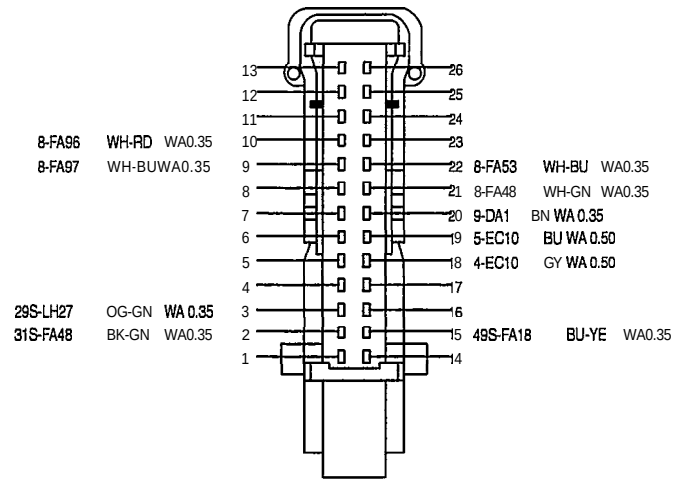


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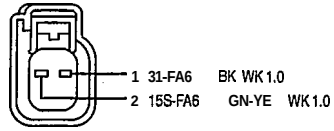
C-368

TO MODE DOOR MOTOR

HARNESS 14K024

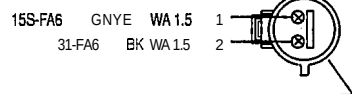


98AG-14489-RZA
C-367
TO EATC MODULE (C2)
HARNESS14K024



YF1T-14A464-FA
C-399
TO A/C CLUTCH SOLENOID (DV6)
HARNESS 14K011

PIN 1 => 15S-FA6 GN-YE 1.5 WK
PIN 2 => 31-FA6 BK 1.5 WK

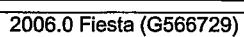


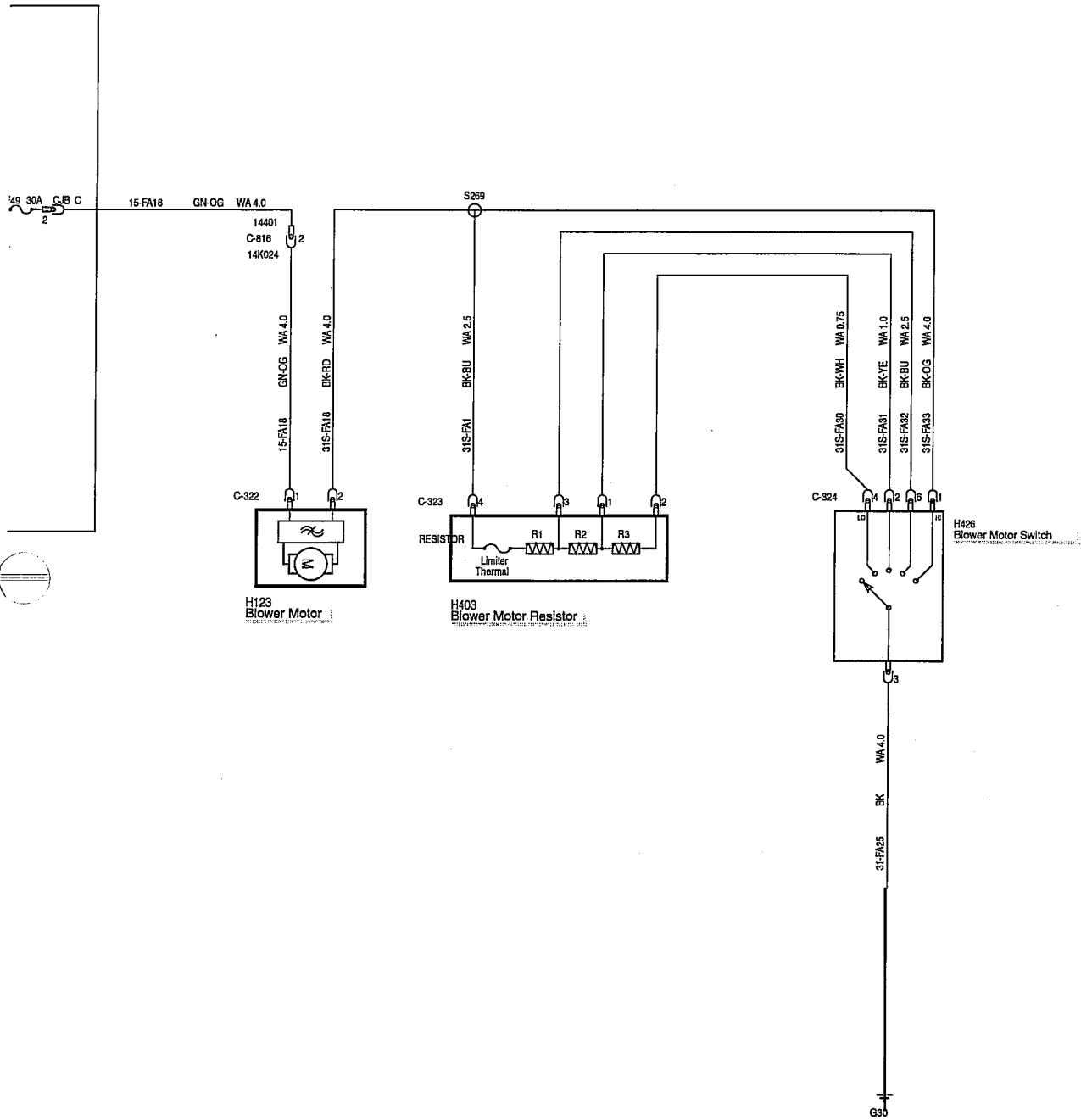
C-401
TO A/C CLUTCH SOLENOID
HARNESS 14K011

SECTION 412-02A Heating and Ventilation

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SCHEMATICS	
Blower Motor.....	412-02A-2







SECTION 412-02B Auxiliary Heating

VEHICLE APPLICATION: 2006.0 Fiesta

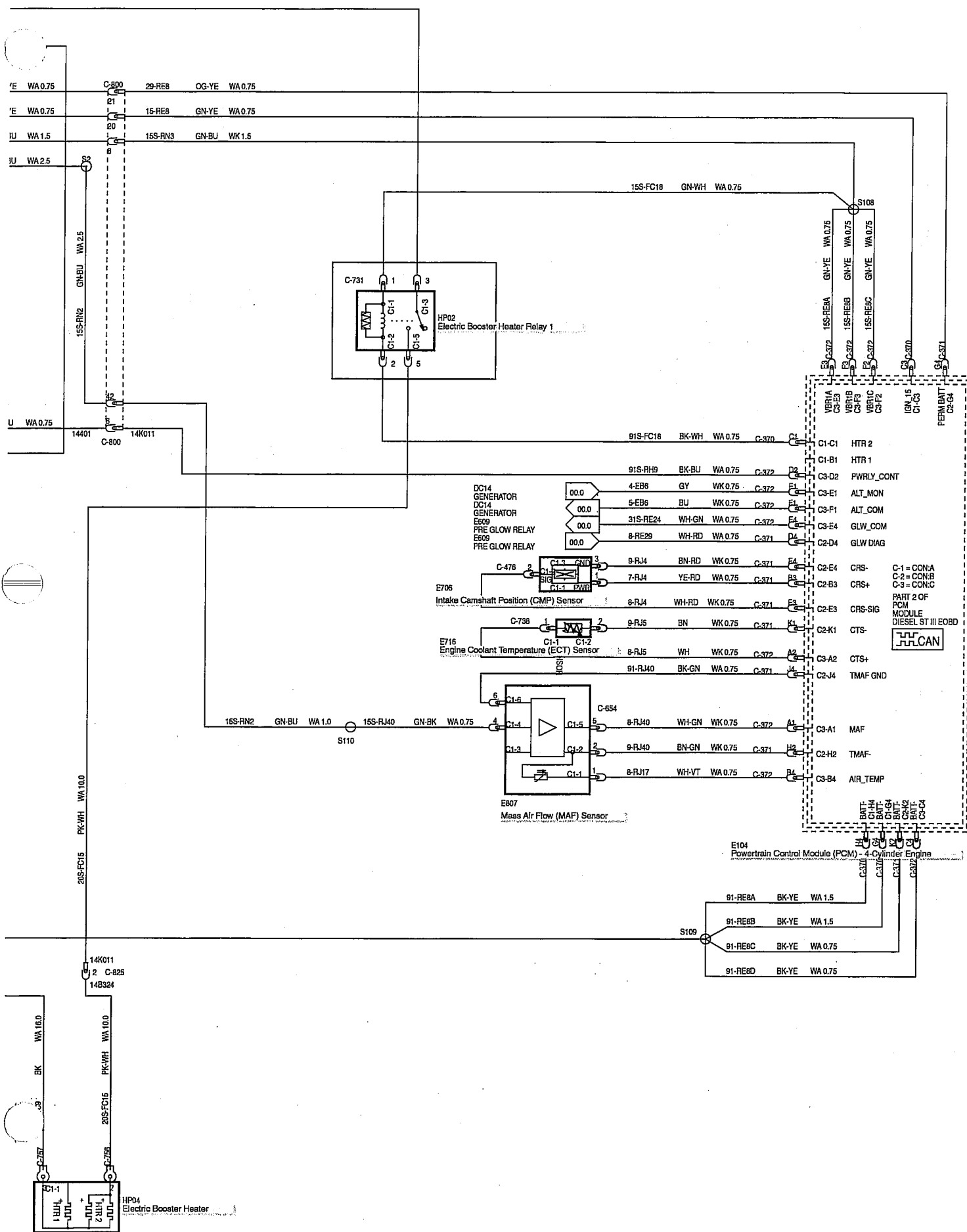
CONTENTS

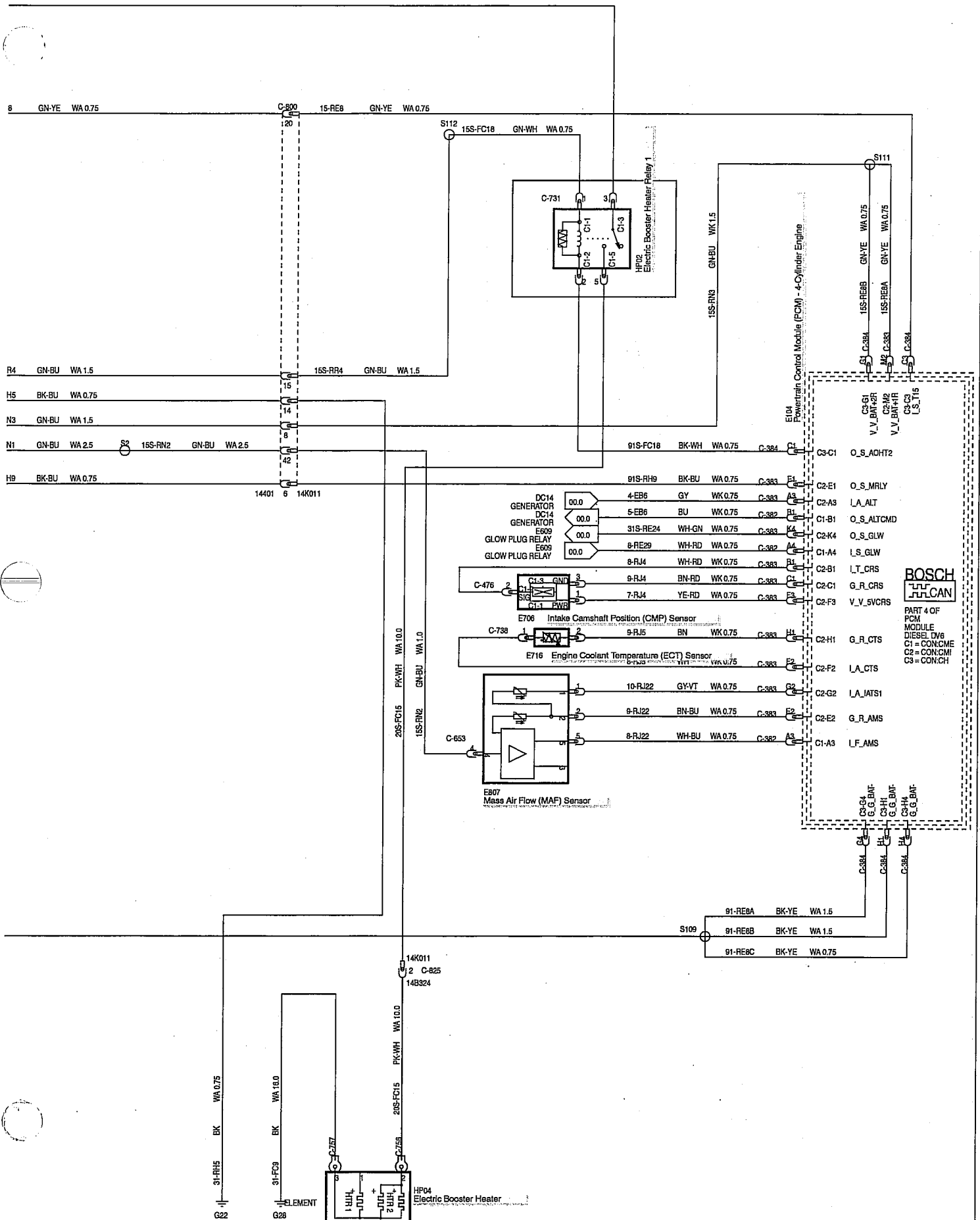
PAGE

SCHEMATICS

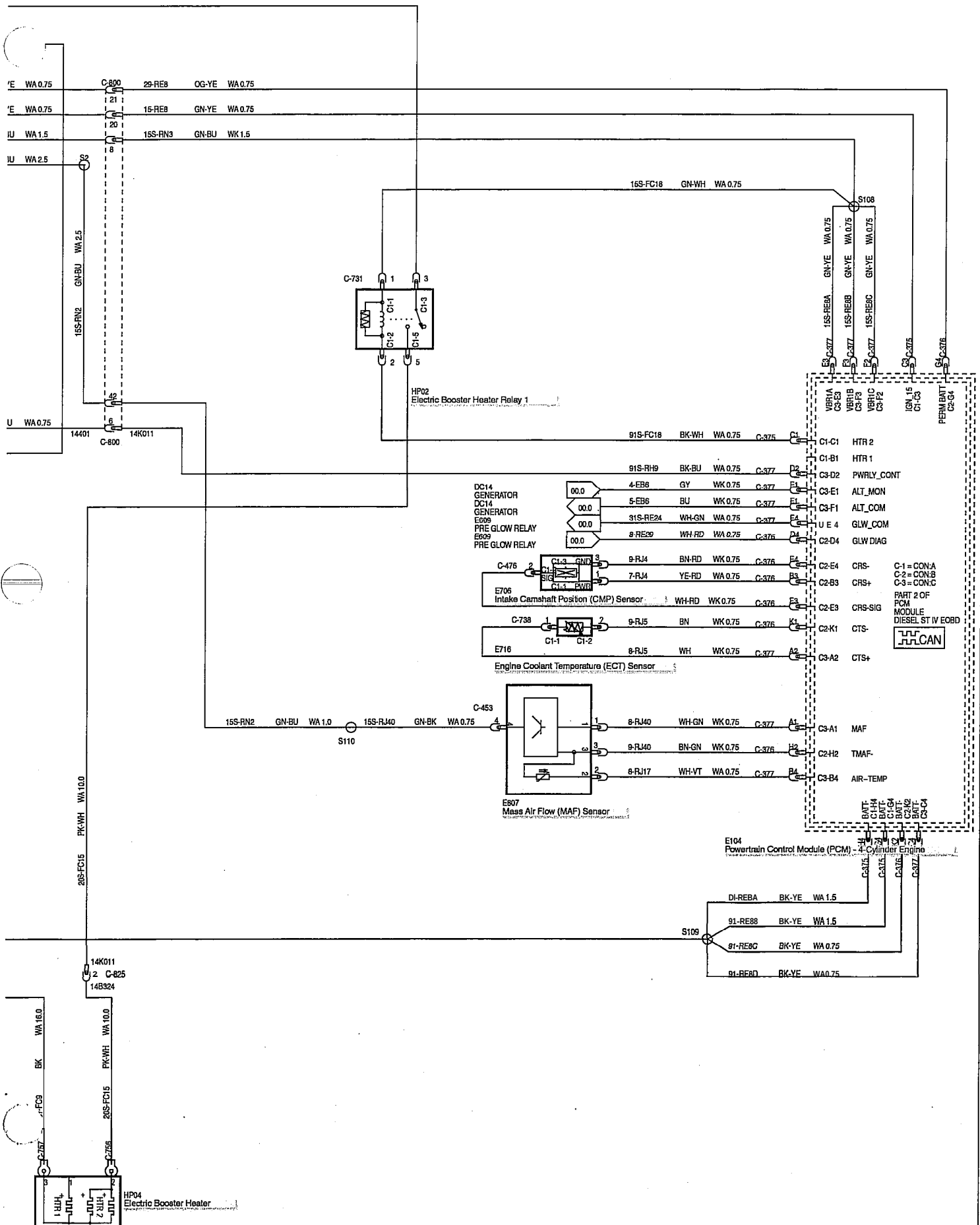
Electric Booster Heater — VIN Plate Emission Level Code: S.....	412-02B-2
Electric Booster Heater — 1.6L Duratorq-TDCi (DV) Diesel.....	412-02B-4
Electric Booster Heater — VIN Plate Emission Level Code: 7.....	412-02B-6











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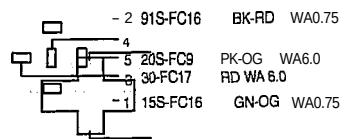
C

SECTION 412-02C Auxiliary Climate Control

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Electric Booster Heater Relay 1.....	412-02C-2
Electric Booster Heater Relay 2.....	412-02C-3
Electric Booster Heater.....	412-02C-4
Electric Booster Heater.....	412-02C-5
Electric Booster Heater.....	412-02C-6
Electric Booster Heater.....	412-02C-7



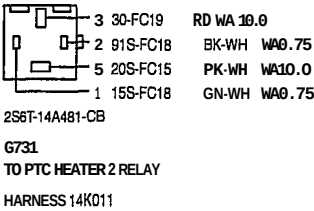


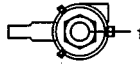
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C-730

TO PTC HEATER 1 RELAY

HARNES14K011





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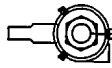
C-755

TO PTC HEATER (1)

HARNESS 140324

412-02C-5 Electric Booster Heater
Information not available at this time





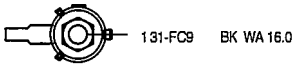
120S-FC15 PK-WH WA 10.0

2S6T-14463-GA

C-756

m PTC HEATER (2)

HARNESS148324



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C-757
TO PTC HEATER (3)
HARNESS14B324

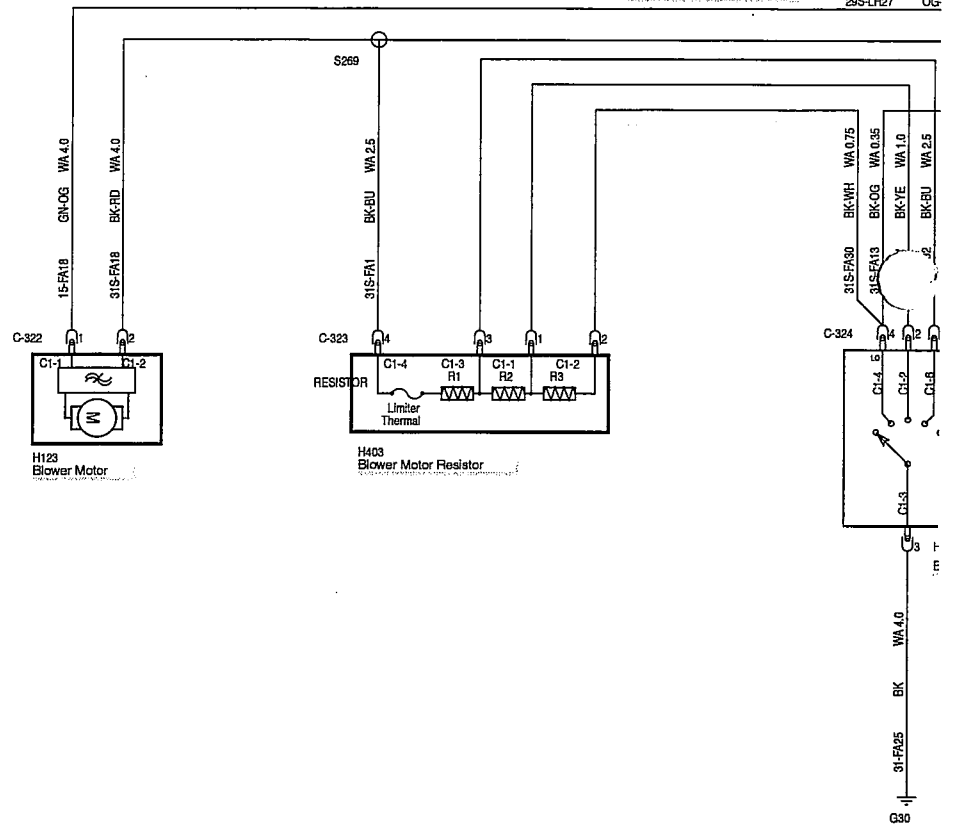


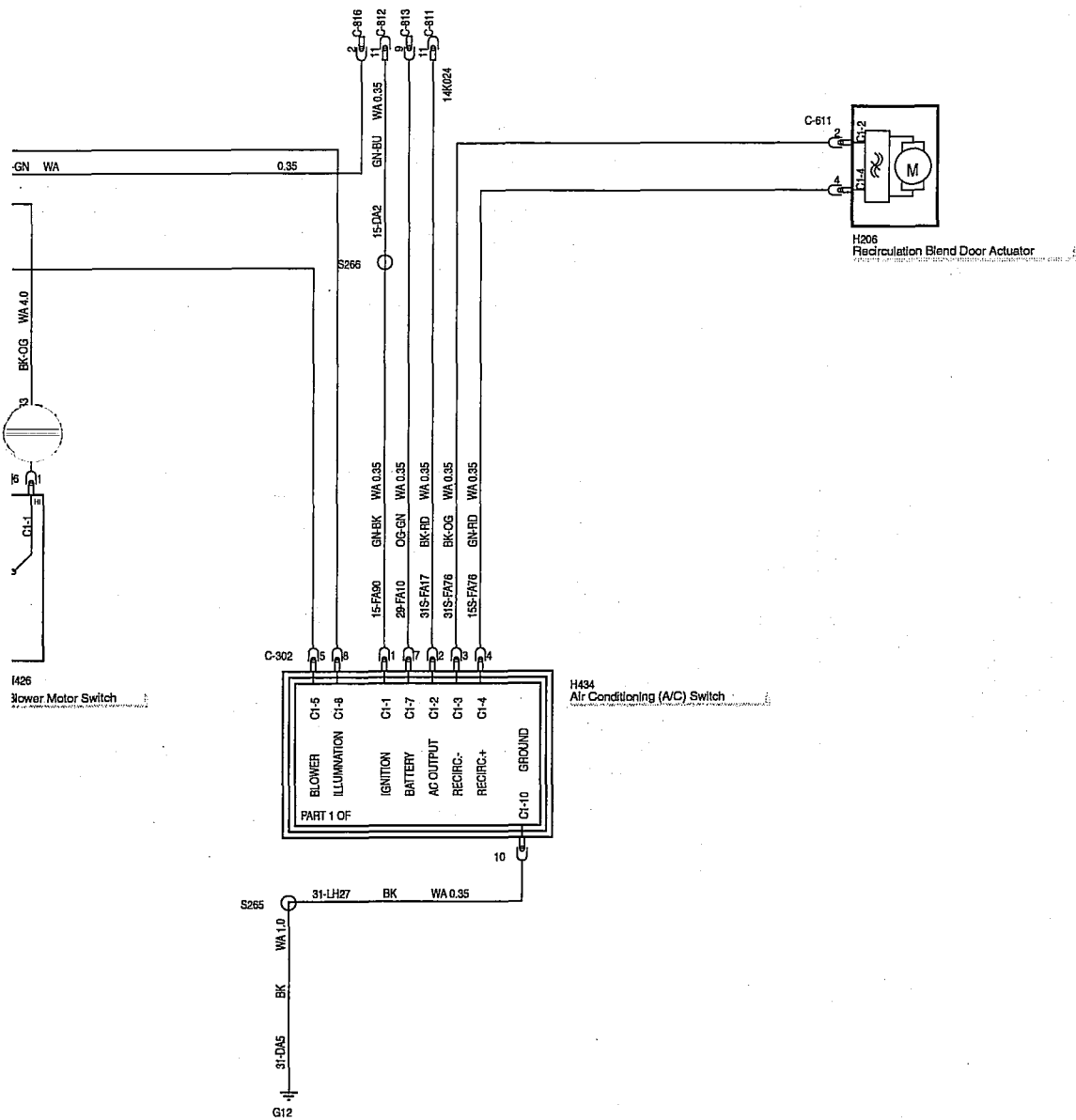
SECTION 412-03 Air Conditioning

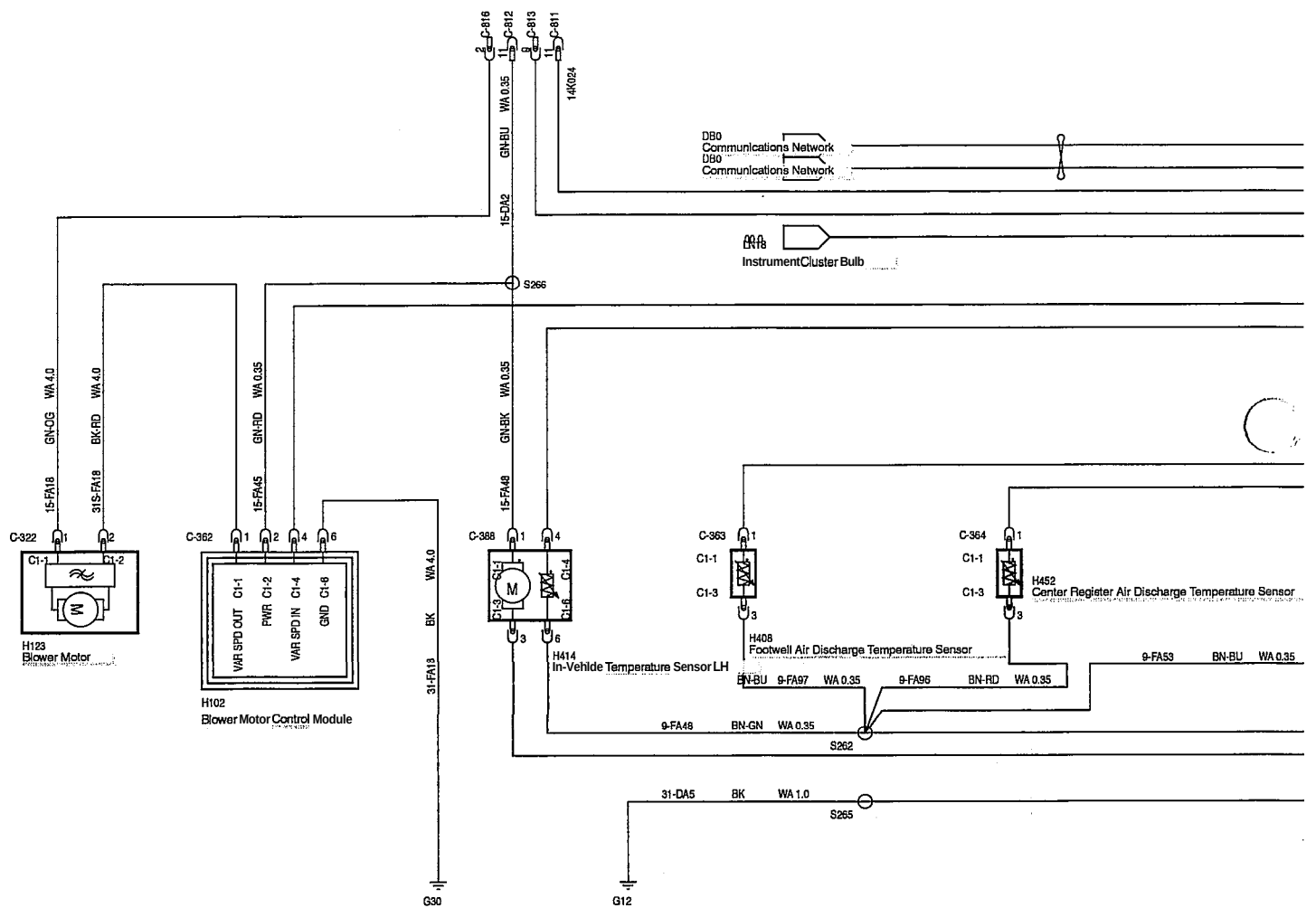
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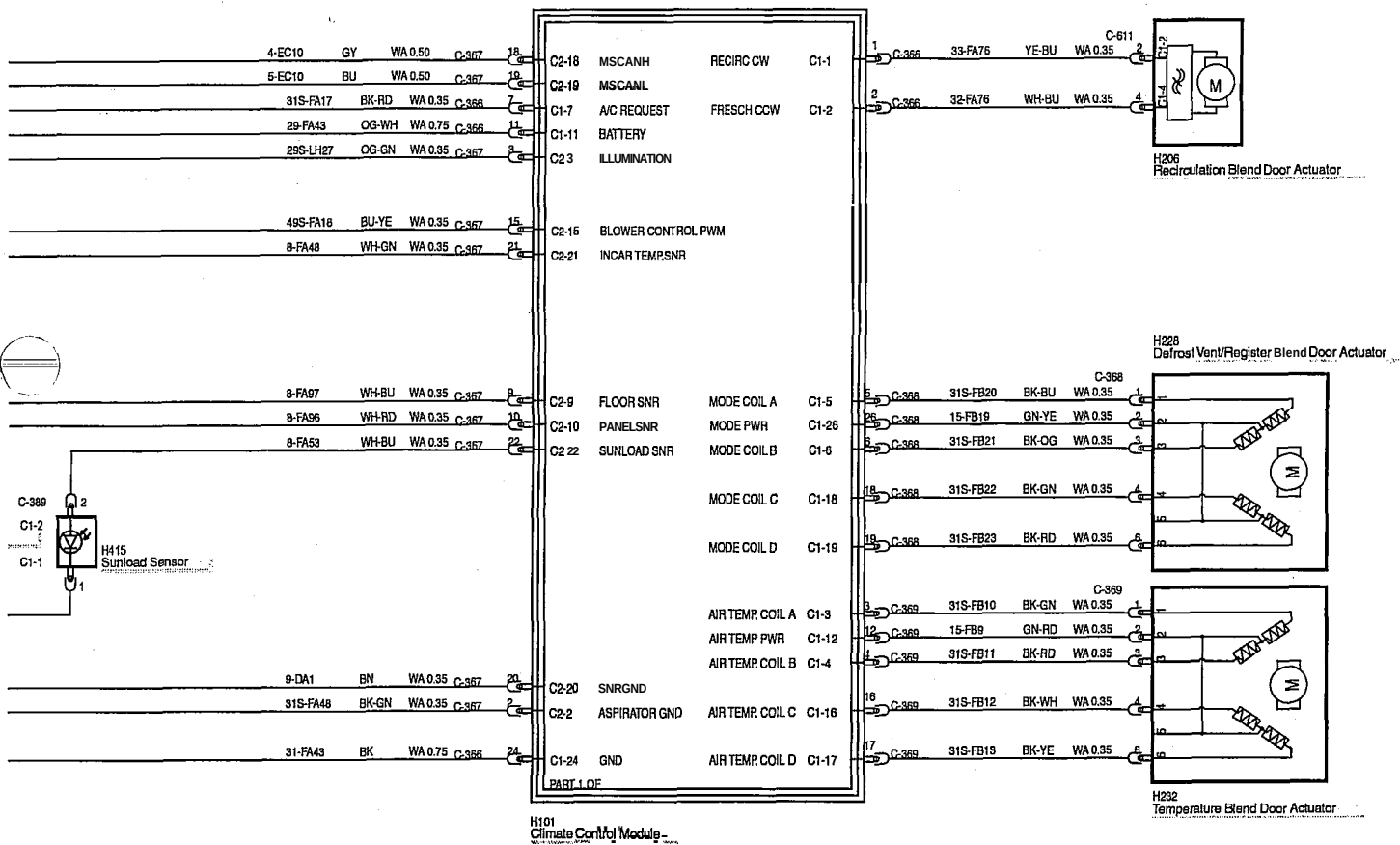
CONTENTS	PAGE
SCHEMATICS	
Air Conditioning.....	412-03-2
Air Conditioning — Vehicles With: Automatic Temperature Control.....	412-03-4
Air Conditioning — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	412-03-6
Air Conditioning — 1.4L Duratorq-TDCi (DV) Diesel, VIN Plate Emission Level Code: S..	412-03-8
Air Conditioning — 1.4L Duratorq-TDCi (DV) Diesel, VIN Plate Emission Level Code: 7...	412-03-10
Air Conditioning — 1.6L Duratec-16V (Sigma), Vehicles With: 4-Speed Automatic Transmission (AW81-40).....	412-03-12
Air Conditioning — 1.6L Duratorq-TDCi (DV) Diesel.....	412-03-14
Air Conditioning — 2.0L Duratec-ST (MI4).....	412-03-16

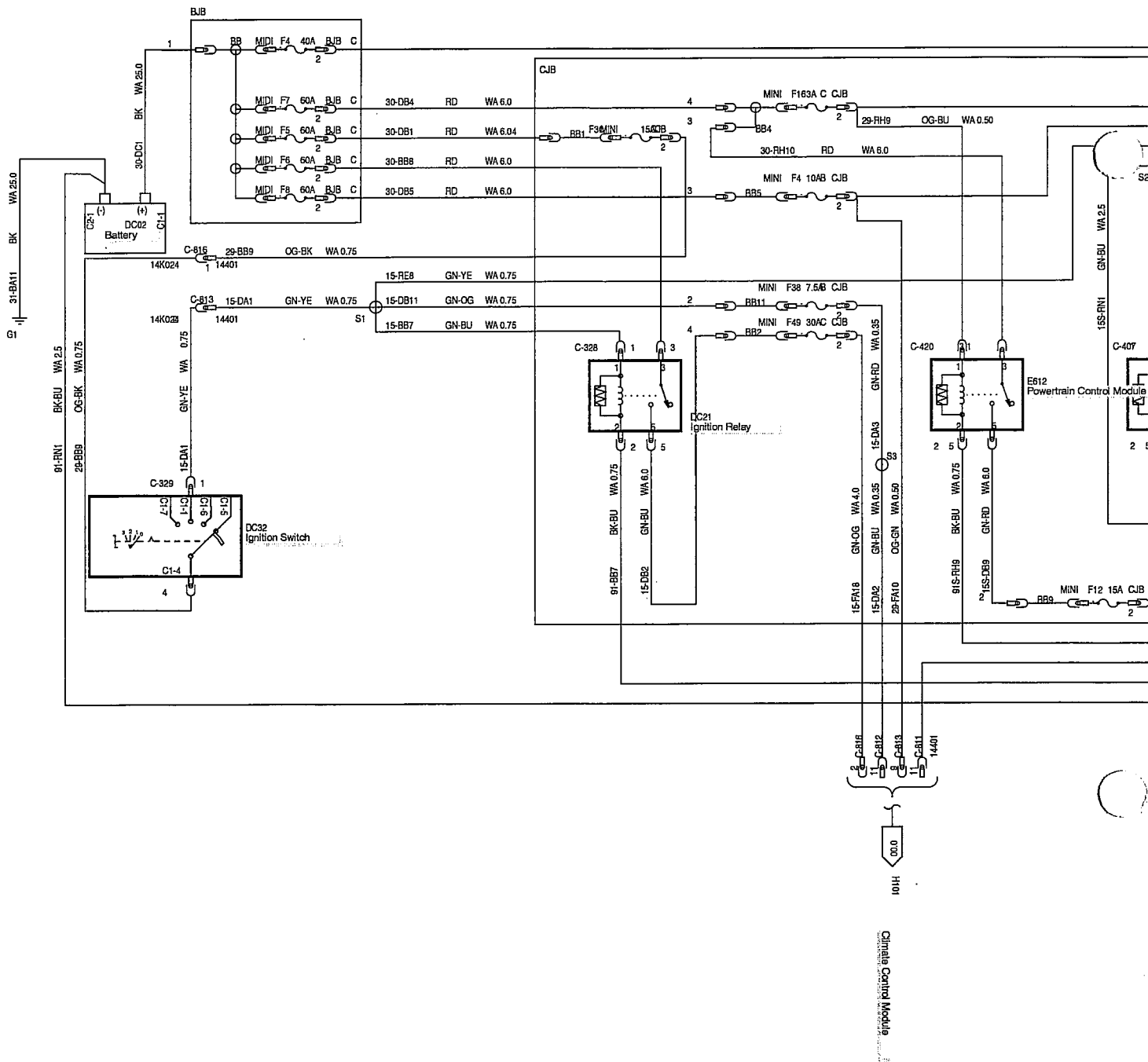
LN18 Instrument Cluster Bulb 29S-LH27 OG

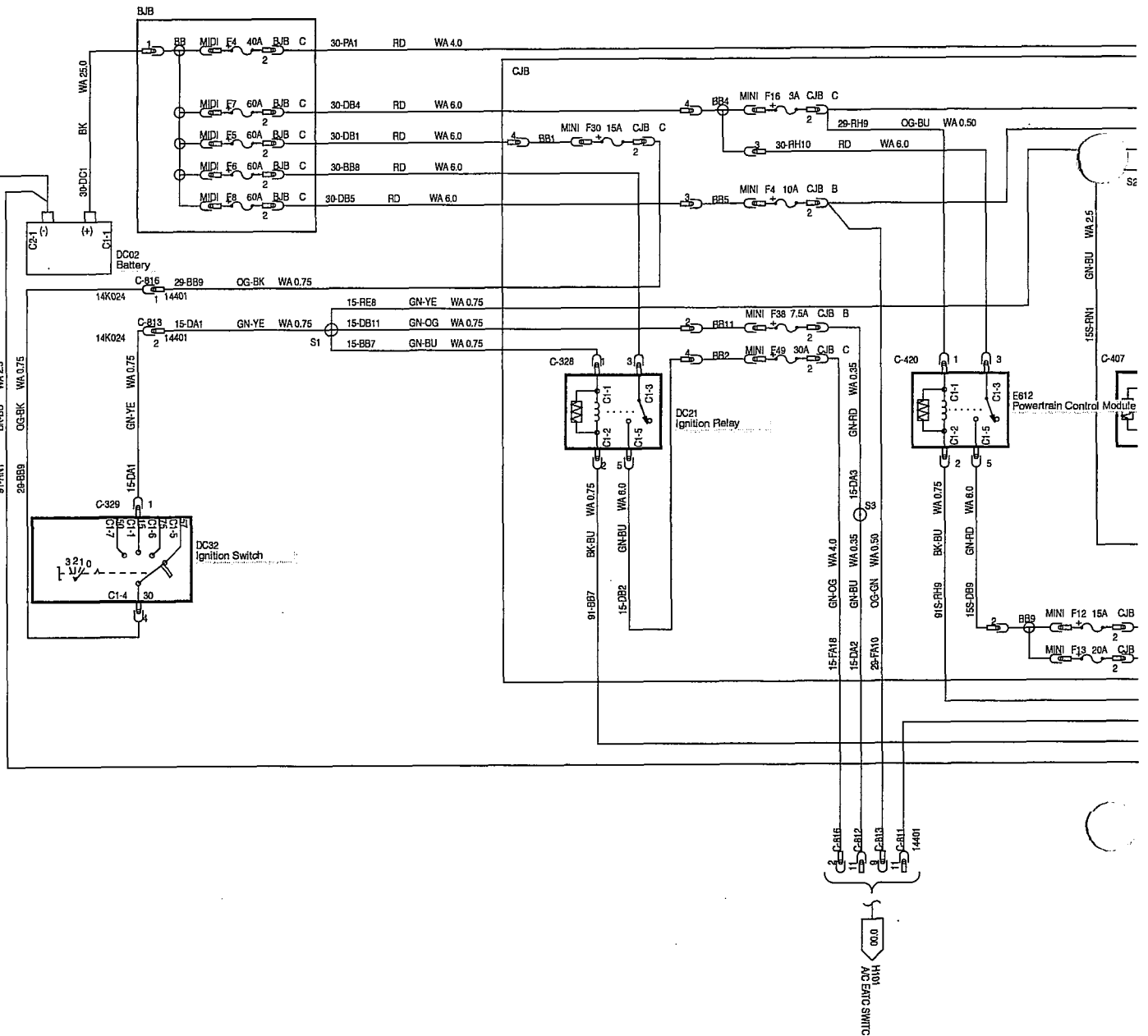


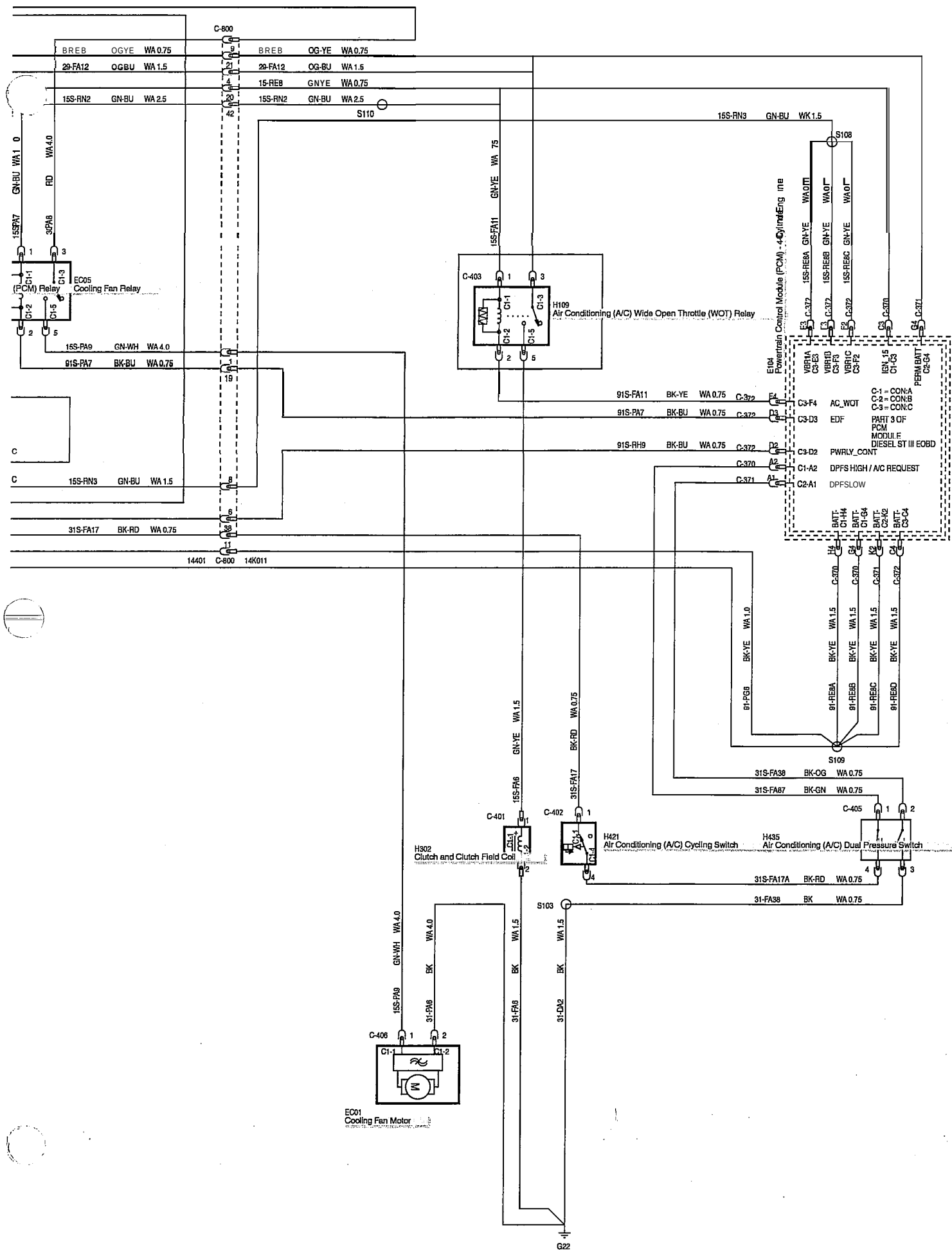


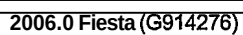


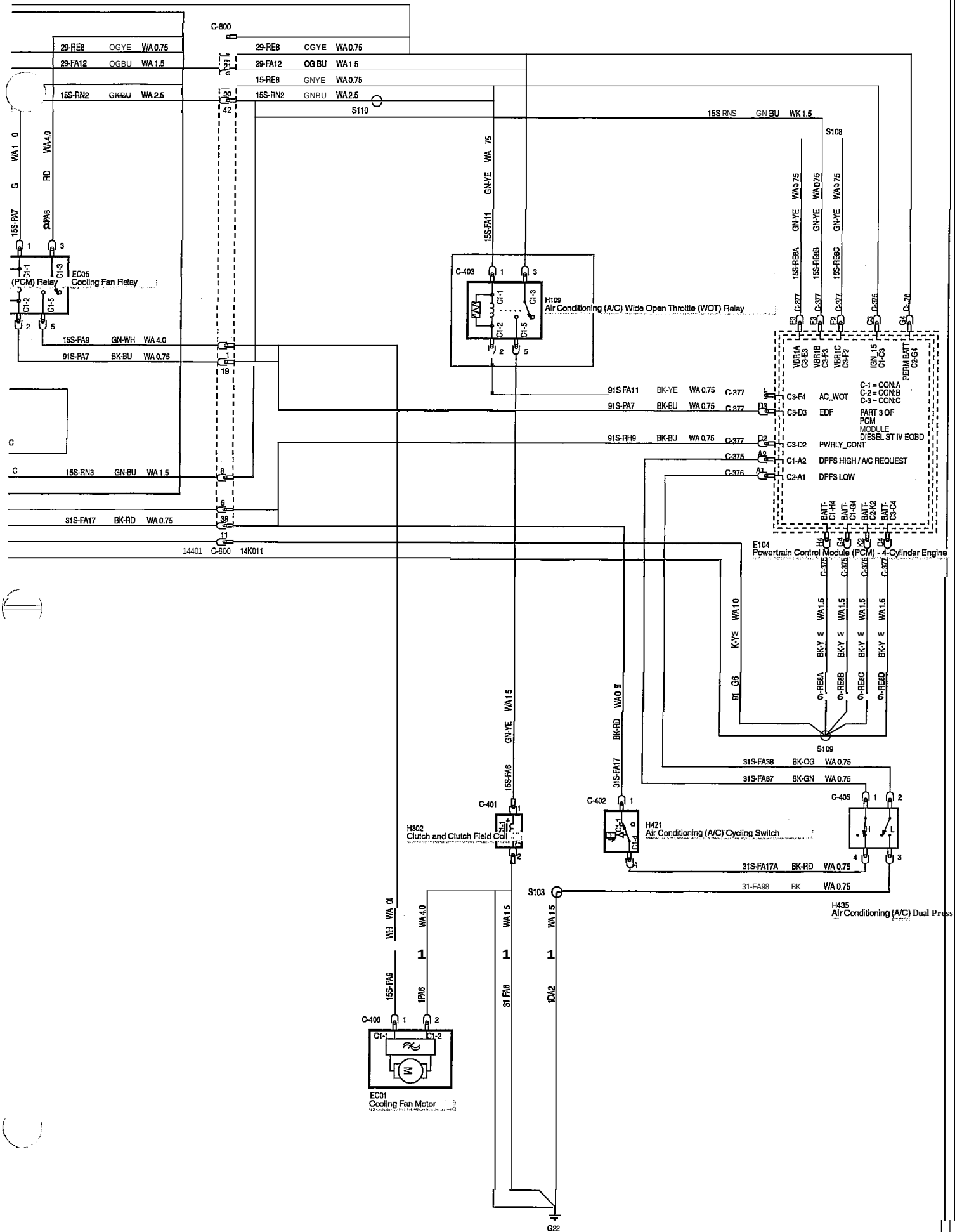


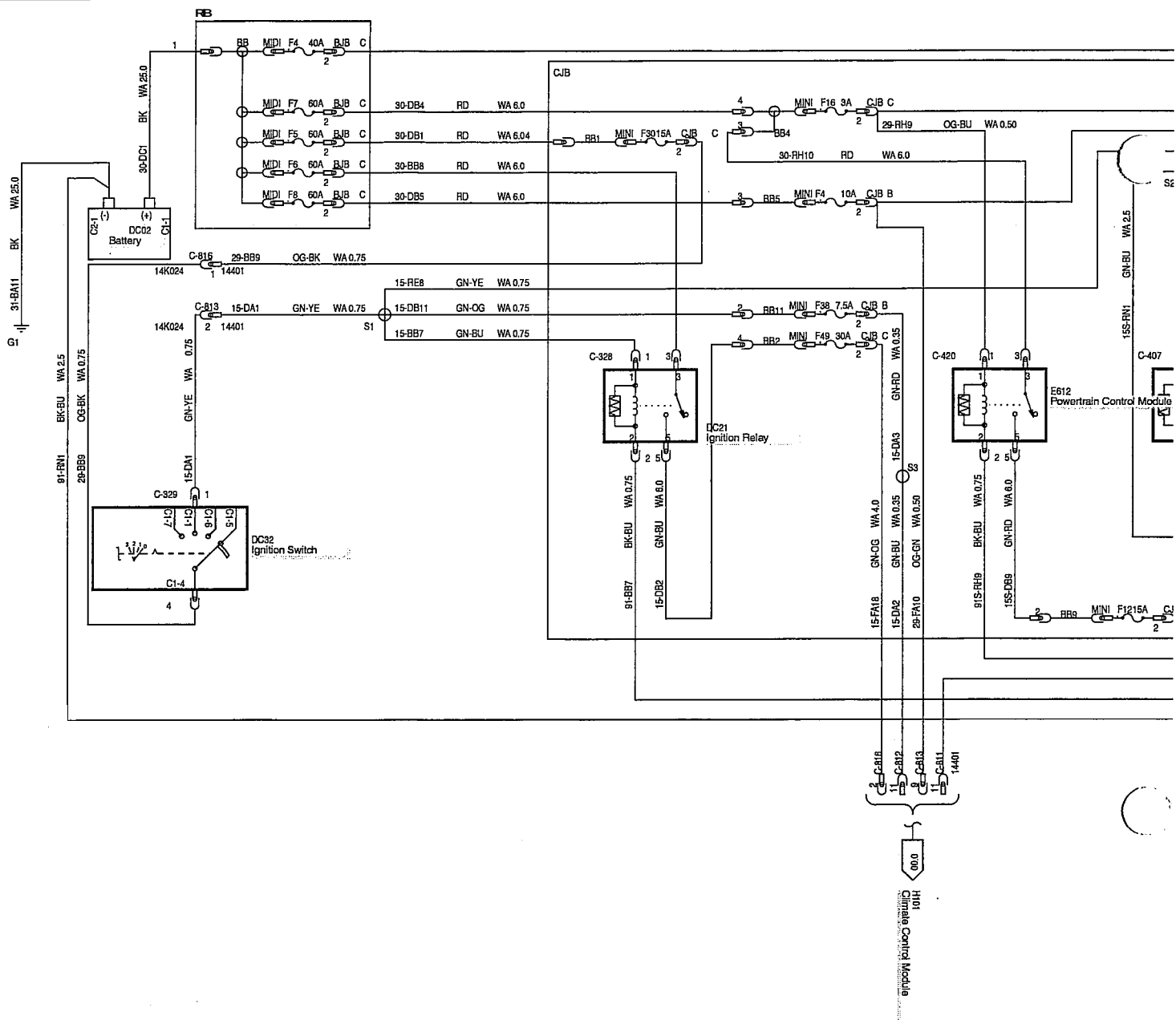


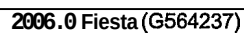














SECTION 413-00 Instrument Cluster and Panel Illumination

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

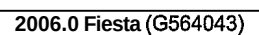
SCHEMATICS

Instrument Cluster and Panel Illumination — Vehicles With: Automatic Temperature Control.....	413-00-2
Instrument Cluster and Panel Illumination — Vehicles With: Air Conditioning.....	413-00-4
Instrument Cluster and Panel Illumination — Vehicles With: Navigation System, Vehicles Without: Air Conditioning.....	413-00-?
Instrument Cluster and Panel Illumination — 2.0L Duratec-ST (M14), Vehicles With: Automatic Temperature Control.....	413-00-7









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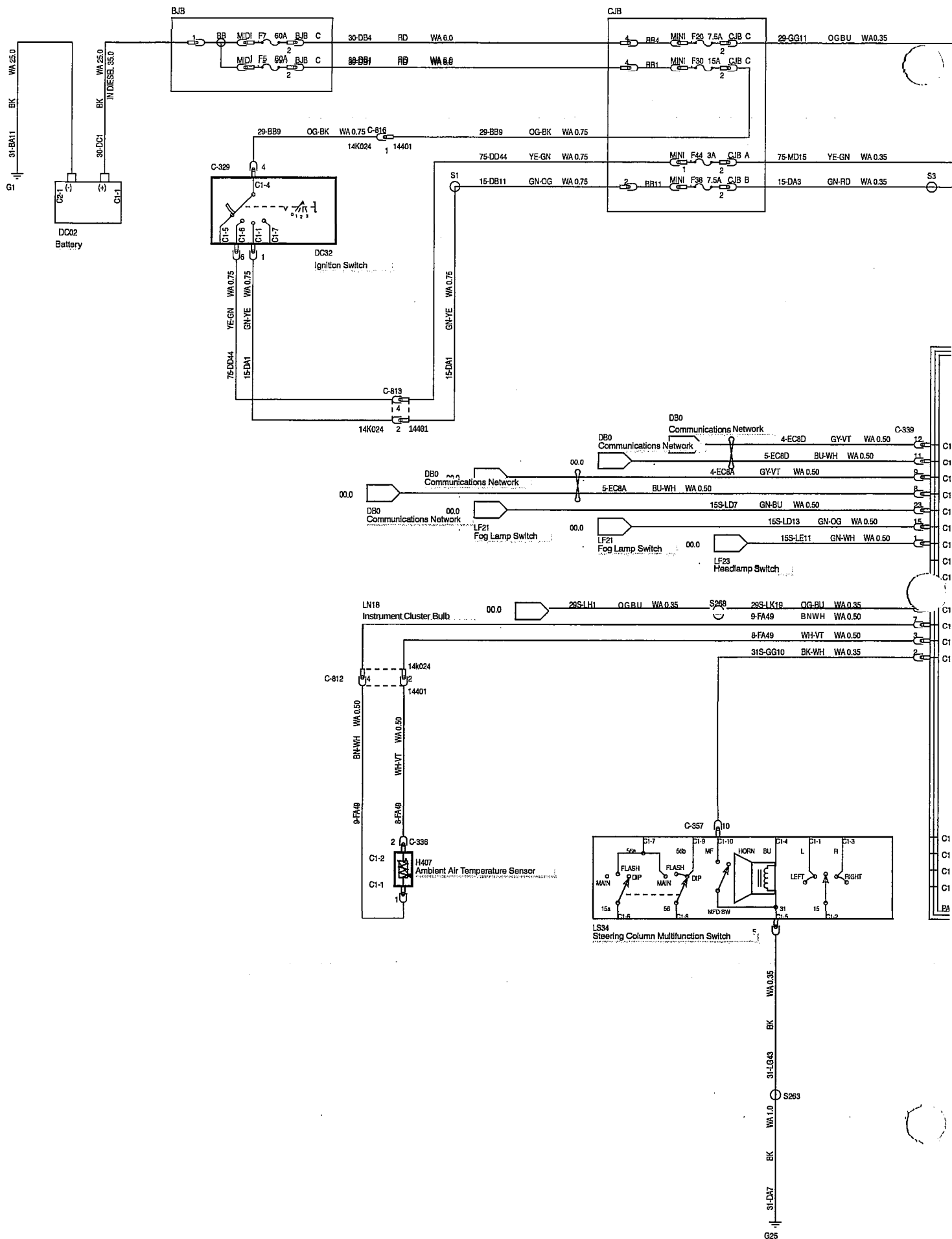


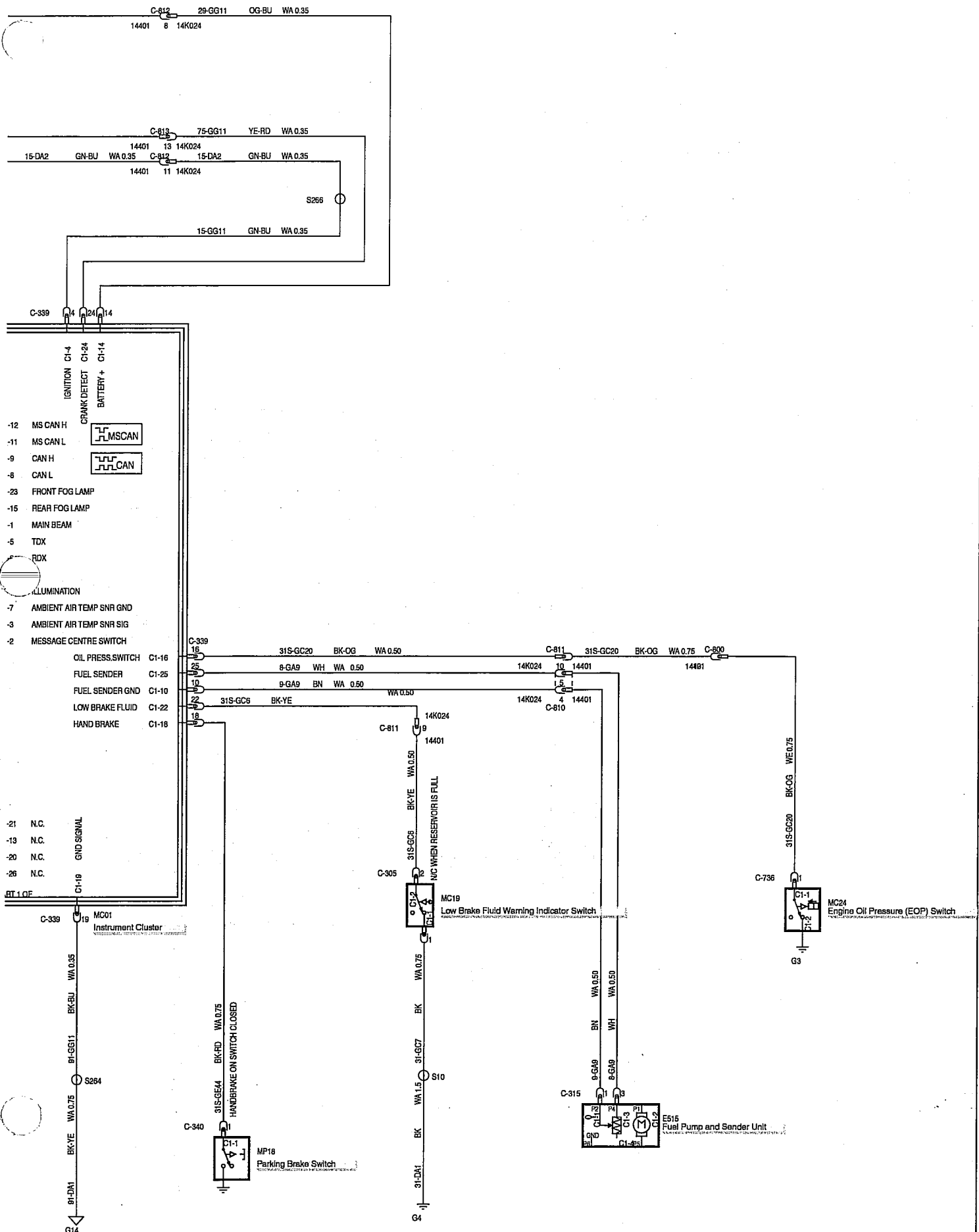
SECTION 413-01 Instrument Cluster

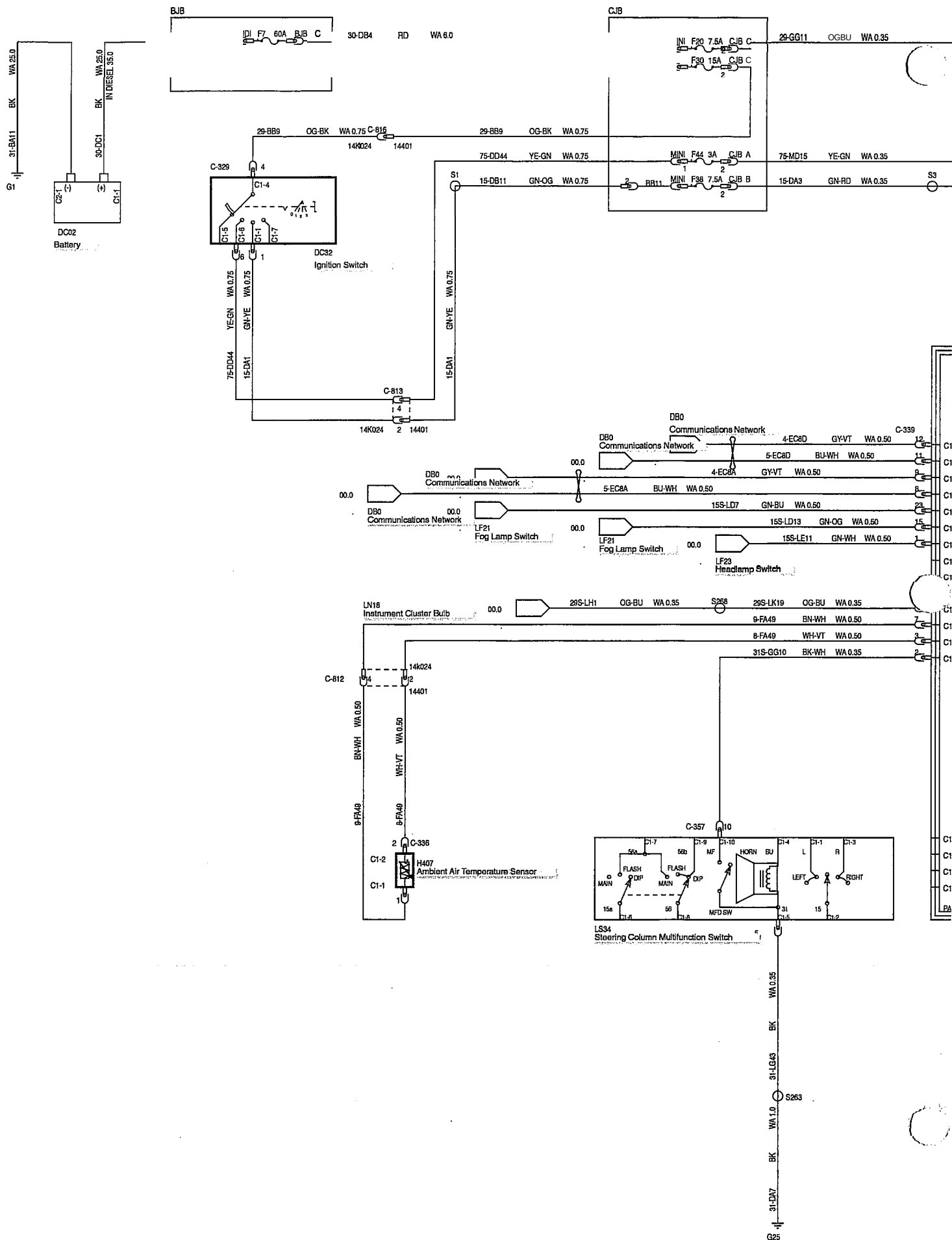
VEHICLE APPLICATION:2006.0 Fiesta

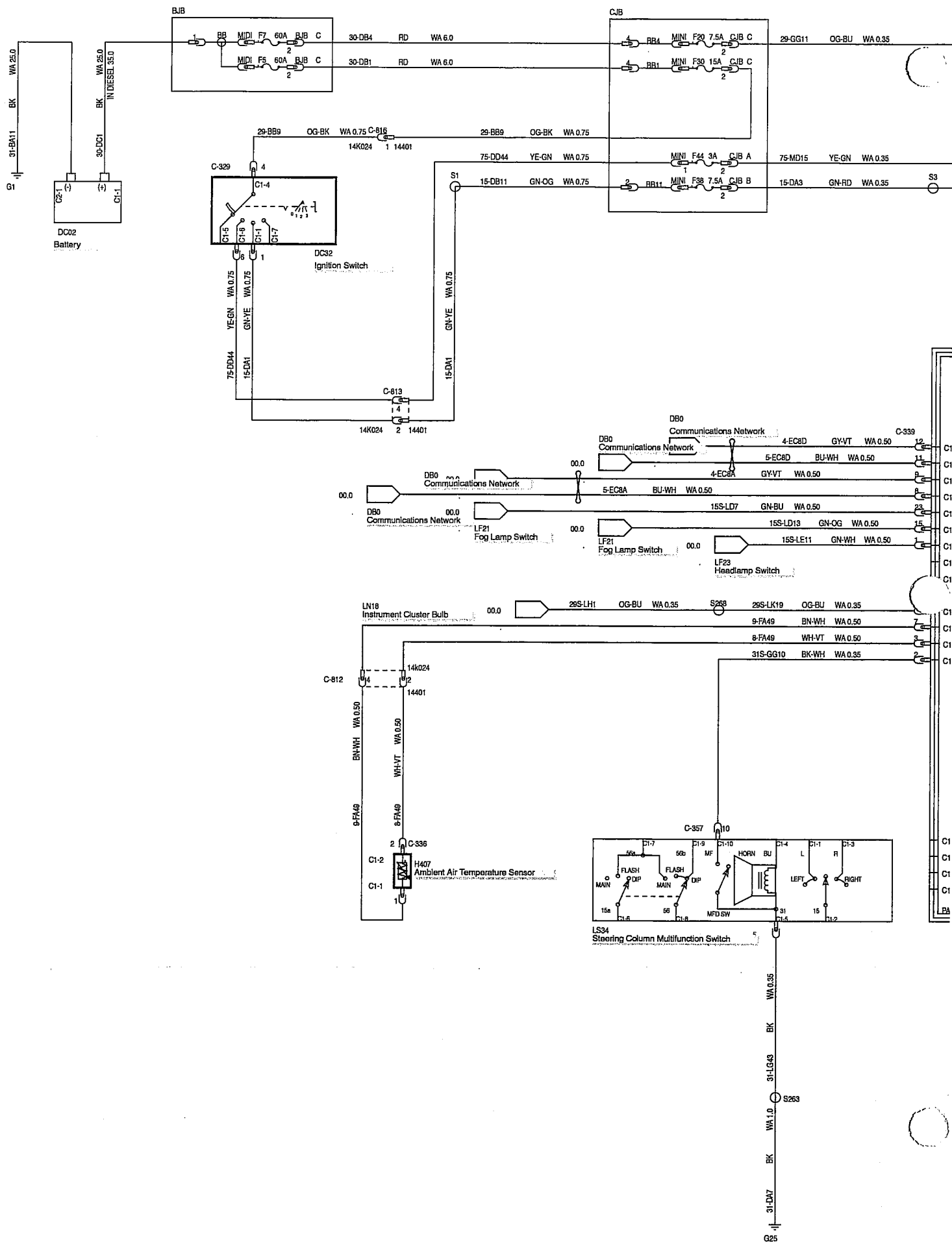
CONTENTS	PAGE
SCHEMATICS	
Instrument Cluster — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	413-01-2
Instrument Cluster — 1.3L Duratec-8V (Rocam).....	413-01-4
Instrument Cluster — 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel...	413-01-6
Instrument Cluster — 2.0L Duratec-ST (MI4).....	413-01-8
CONNECTORS	
Instrument Cluster.....	413-01-10

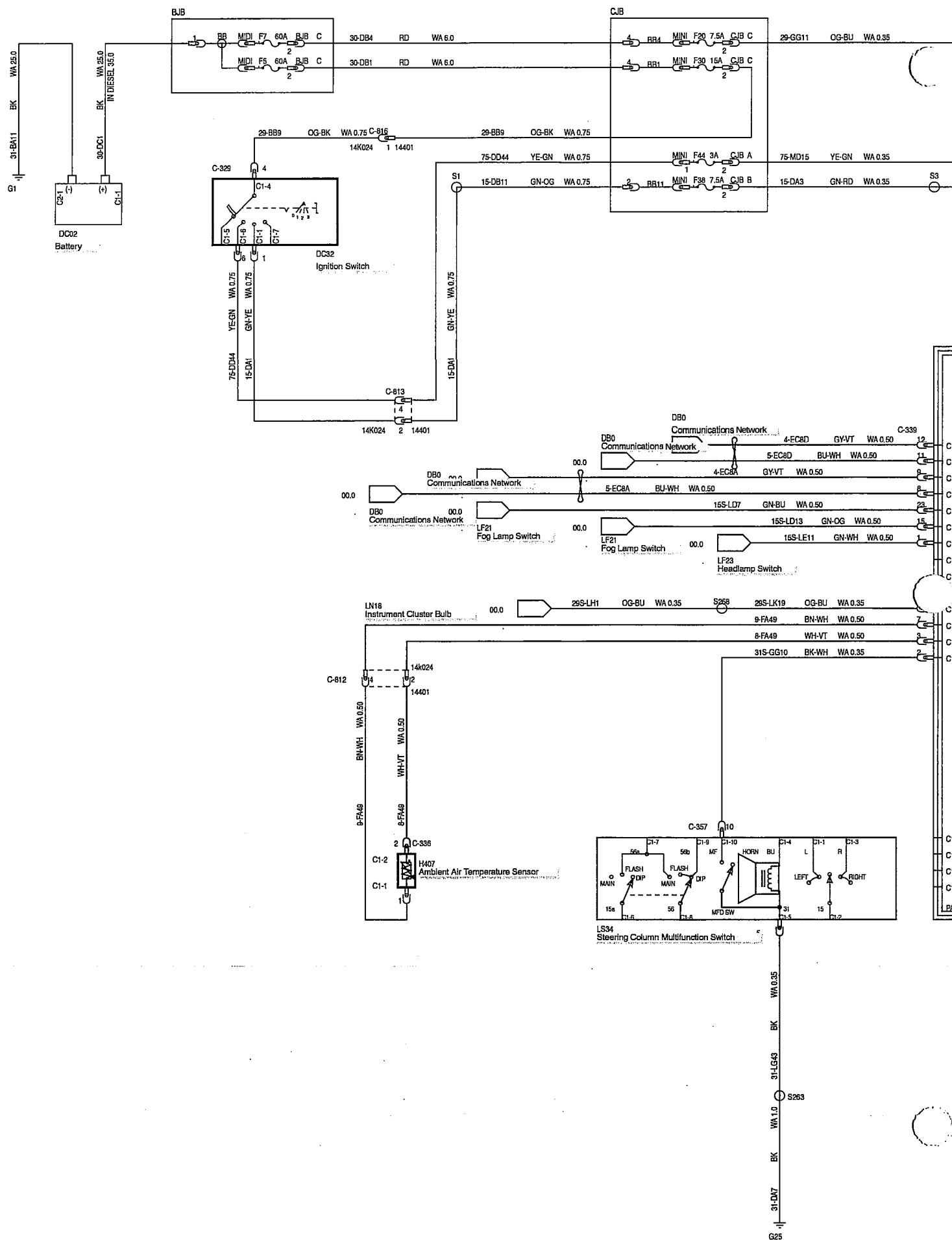


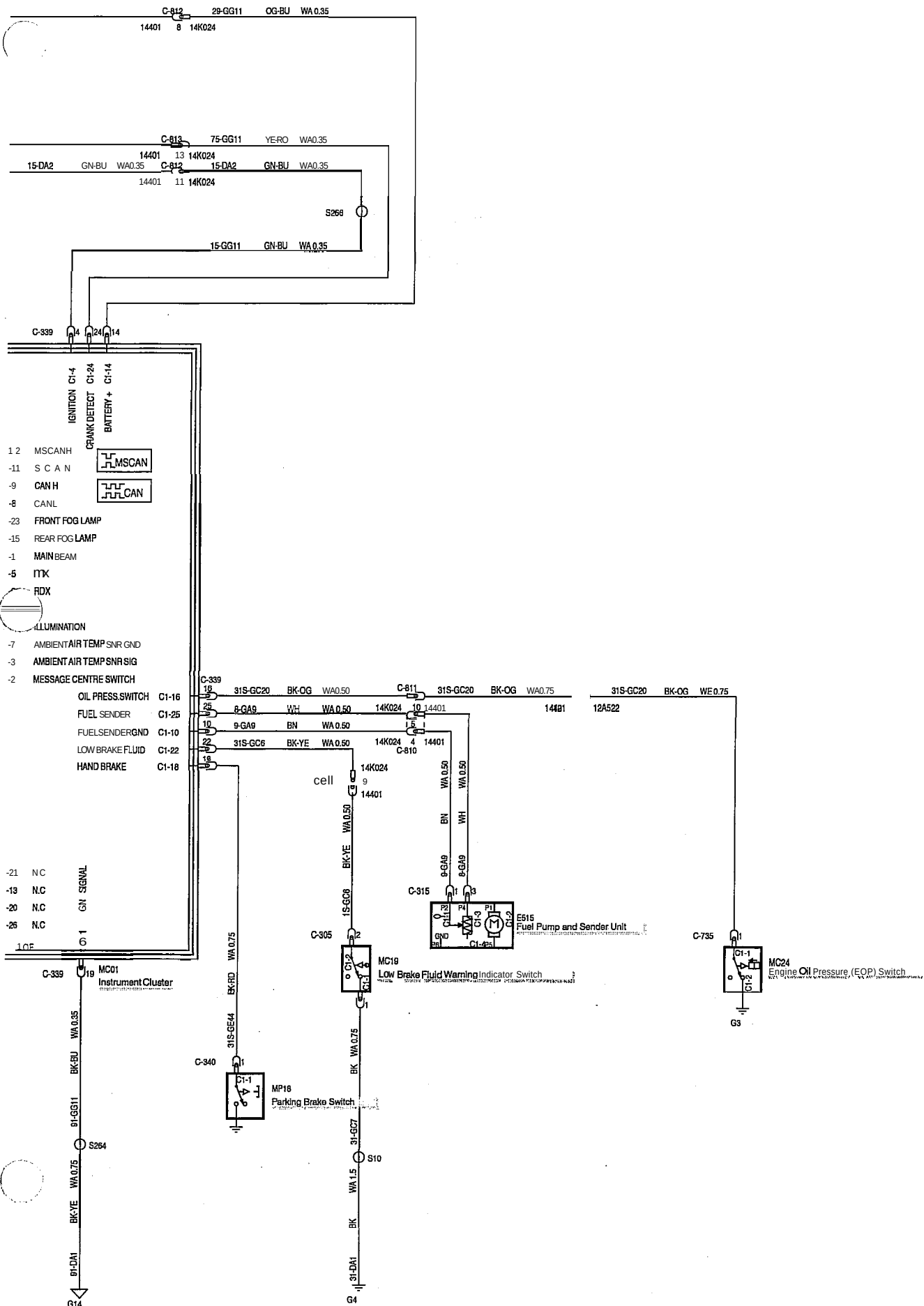


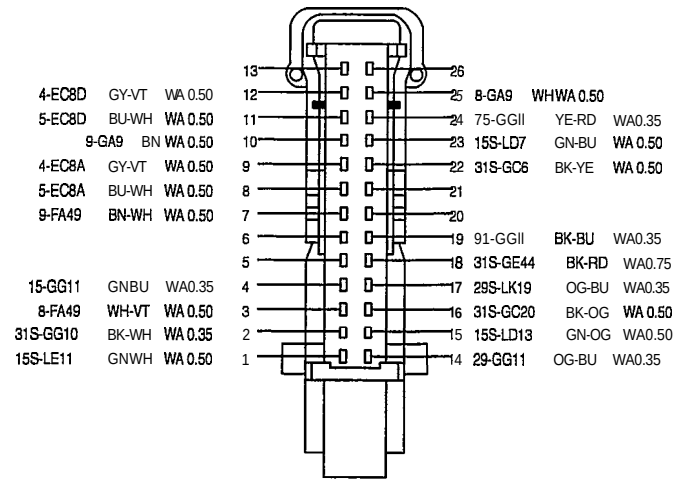










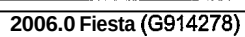


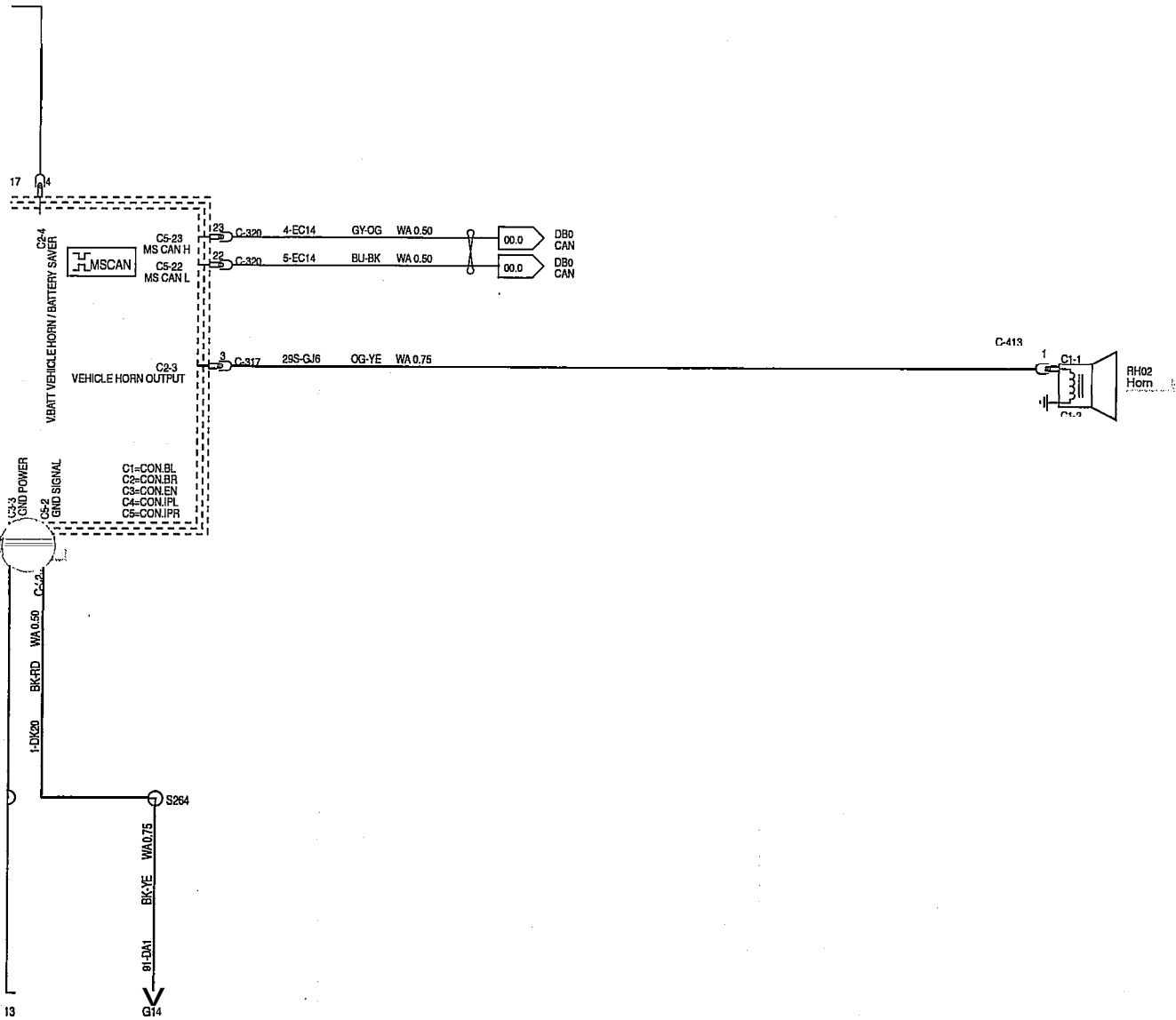
98AG-14489-RZA
 C-339
 TO ELECTRONICINSTRUMENTCLUSTER
 HARNESS 14K024

SECTION 413-06 Horn

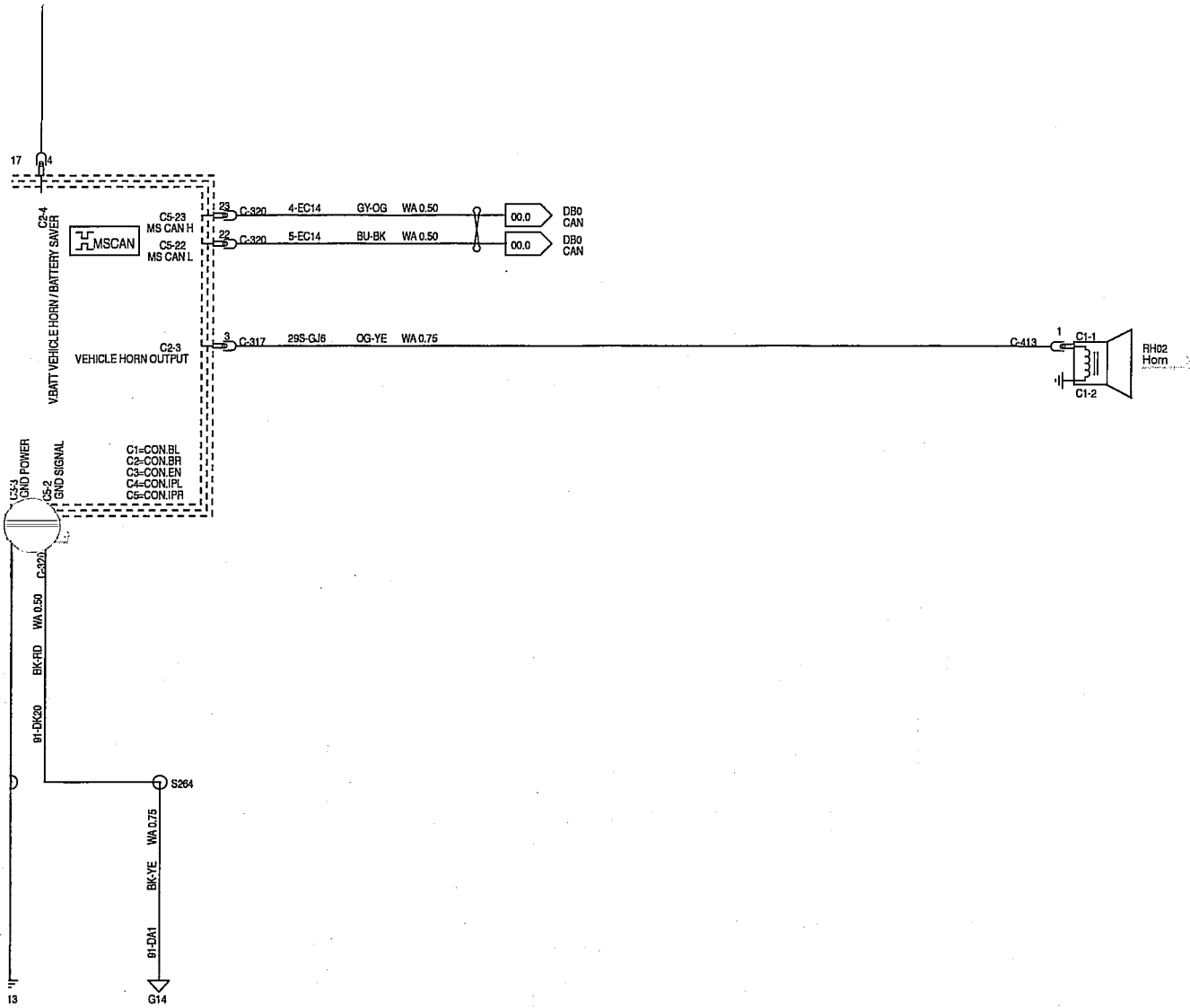
VEHICLE APPLICATION:2006.0 Fiesta

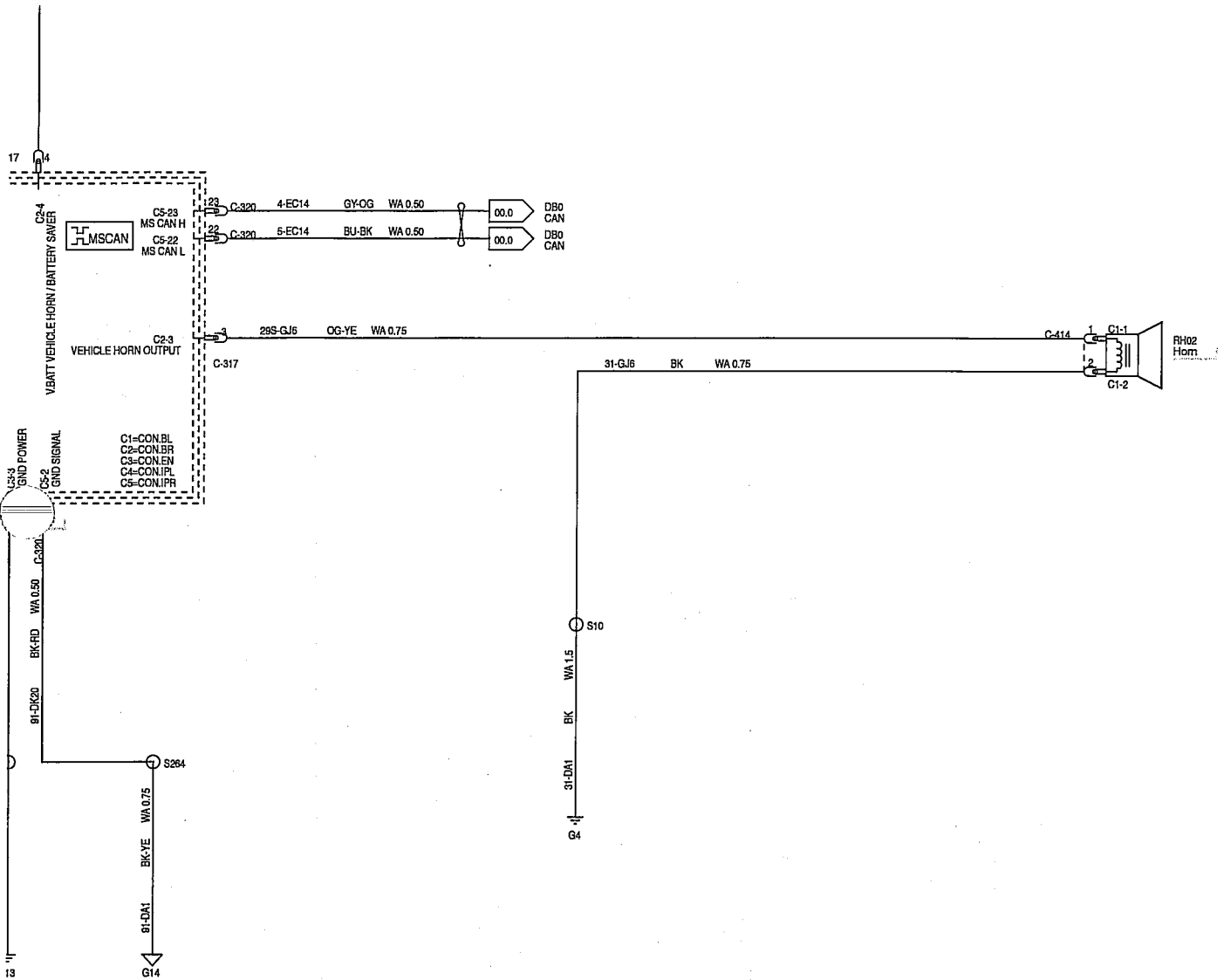
CONTENTS	PAGE
SCHEMATICS	
Horn — Vehicles With: Stability Assist.....	413-06-2
Horn — Vehicles Without: Stability Assist.....	413-06-4
Horn — 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Stability Assist.....	413-06-6
Horn — 1.6L Duratorq-TDCi (DV) Diesel, Vehicles Without: Stability Assist.....	413-06-8
CONNECTORS	
Horn.....	413-06-10
Horn.....	413-06-11
Horn.....	413-06-12

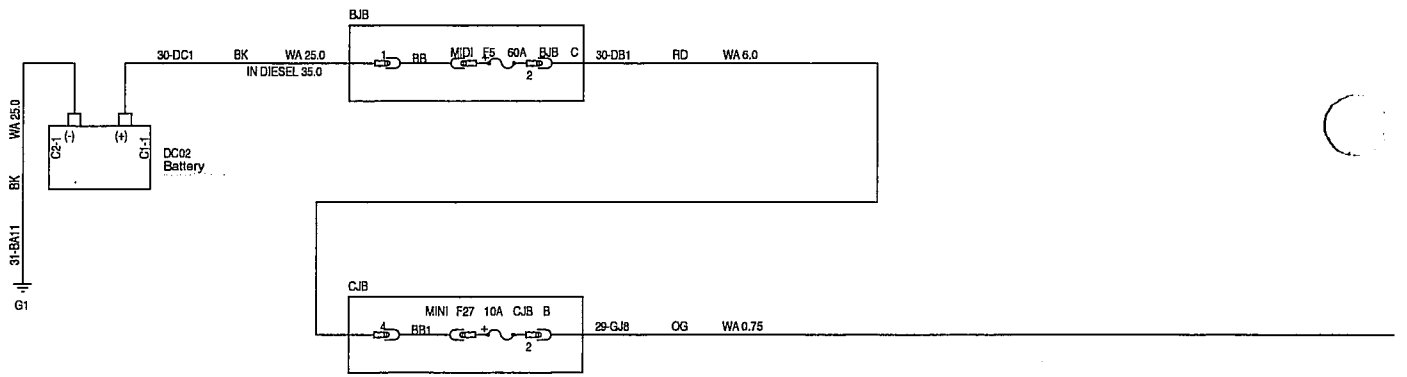




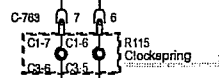








RH03
Horn Switch



31S-GJ7 BK-BU WA 0.50

31-GJ9 BK WA 0.50

S263

C-320

15

C5-15
VEHICLE HORN SWITCH

PART 11 OF
BP01
Generic Electronics

31-DA7 BK WA 1.0
G25

S15

WA 1.5

BK

31-DA12

G1

C-318

WA 1.0

BK

31-DX20

C-316

WA 1.0

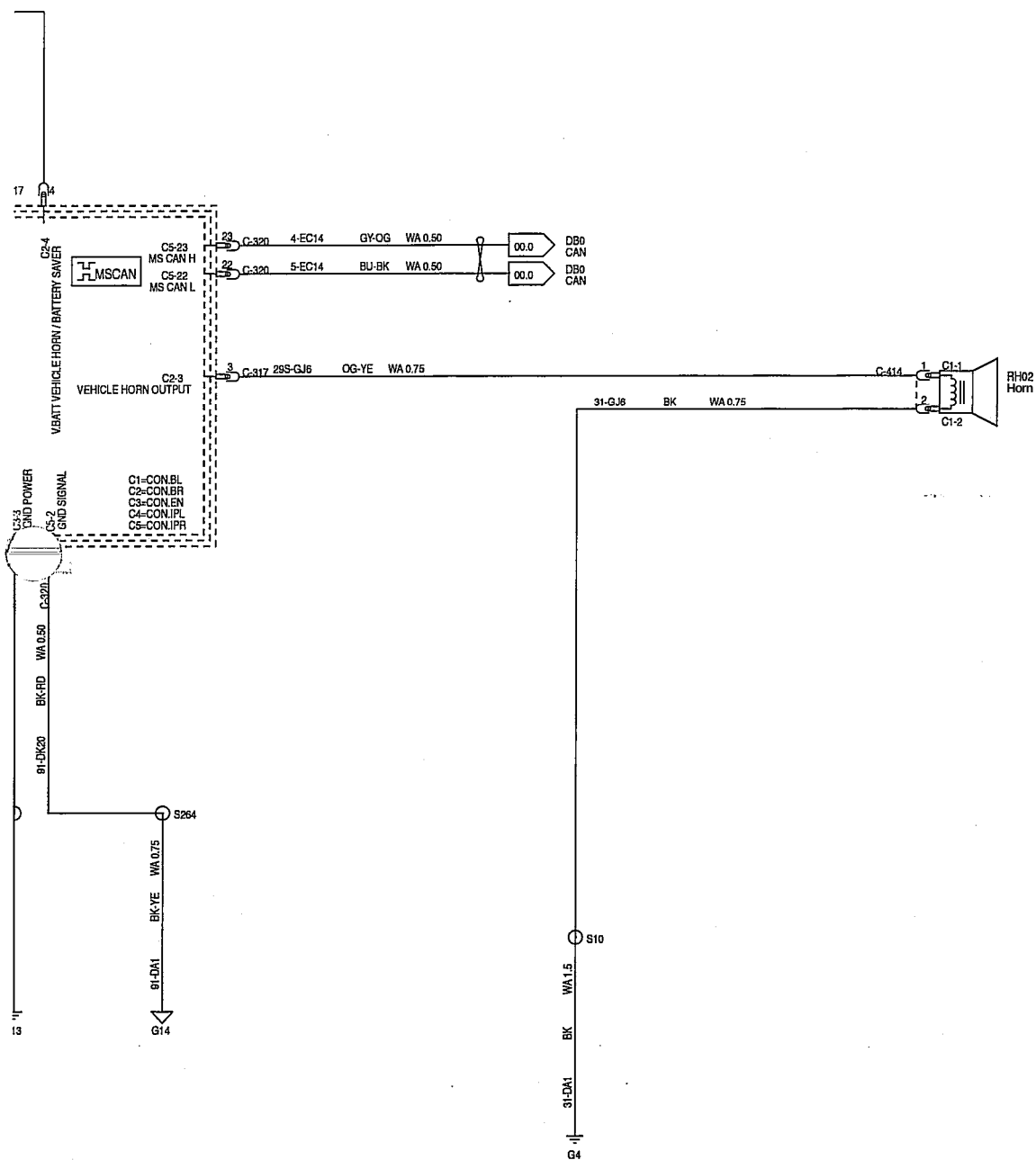
BK

31-DX20

C-316

WA 1.0

BK



~~413-06-10~~ Horn

Information not available at this time

 1 28S-GJ6 OG-YE WA0.75

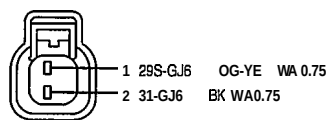
81AG-14488-ACA

C-413

TO HORN

HARNESS14401





XR3T-14A464-AA

G414

TO HORN

HARNESS14401

SECTION 413-08 Information and Message Center

VEHICLE APPLICATION:2006.0 Fiesta

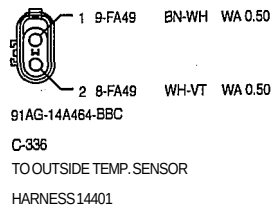
CONTENTS

PAGE

CONNECTORS

Outside Air Temperature Sensor..... **413-08-2**

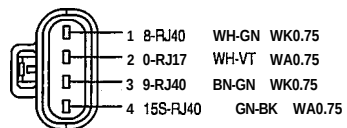




SECTION 414-01 Battery, Mounting and Cables

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
CONNECTORS	
Battery Saver Relay.....	414-01-2



3M5T-14A464-FDB

C-453

TO MASS AIR FLOW SENSOR (DIESEL IV EOBID)

HARNESS 14K011

SECTION 414-02 Generator and Regulator

VEHICLE APPLICATION: 2006.0 Fiesta

CONTENTS

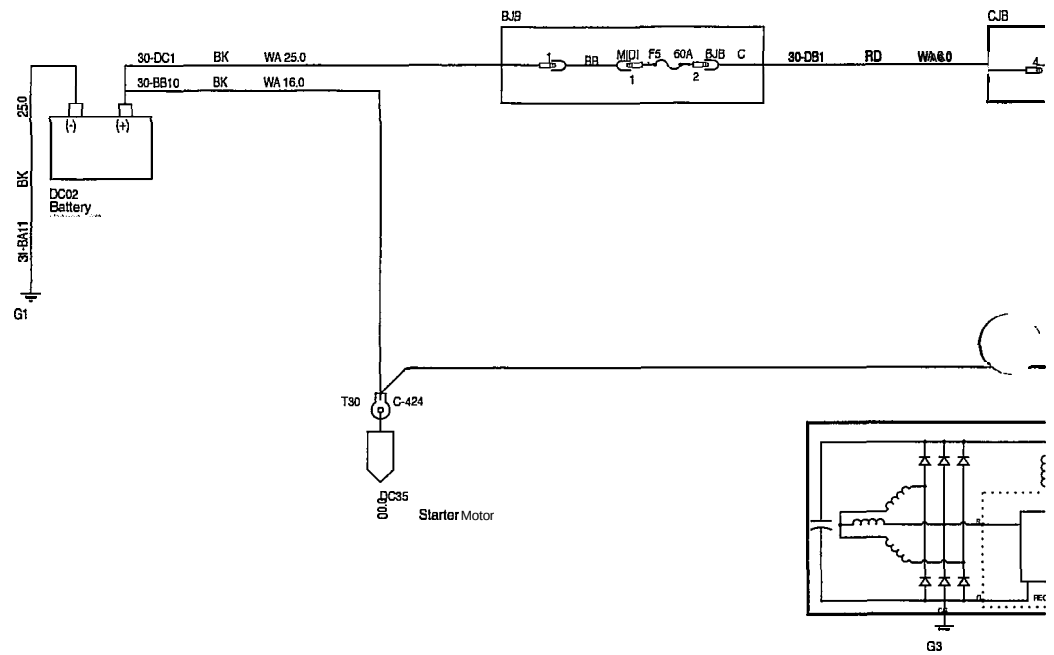
PAGE

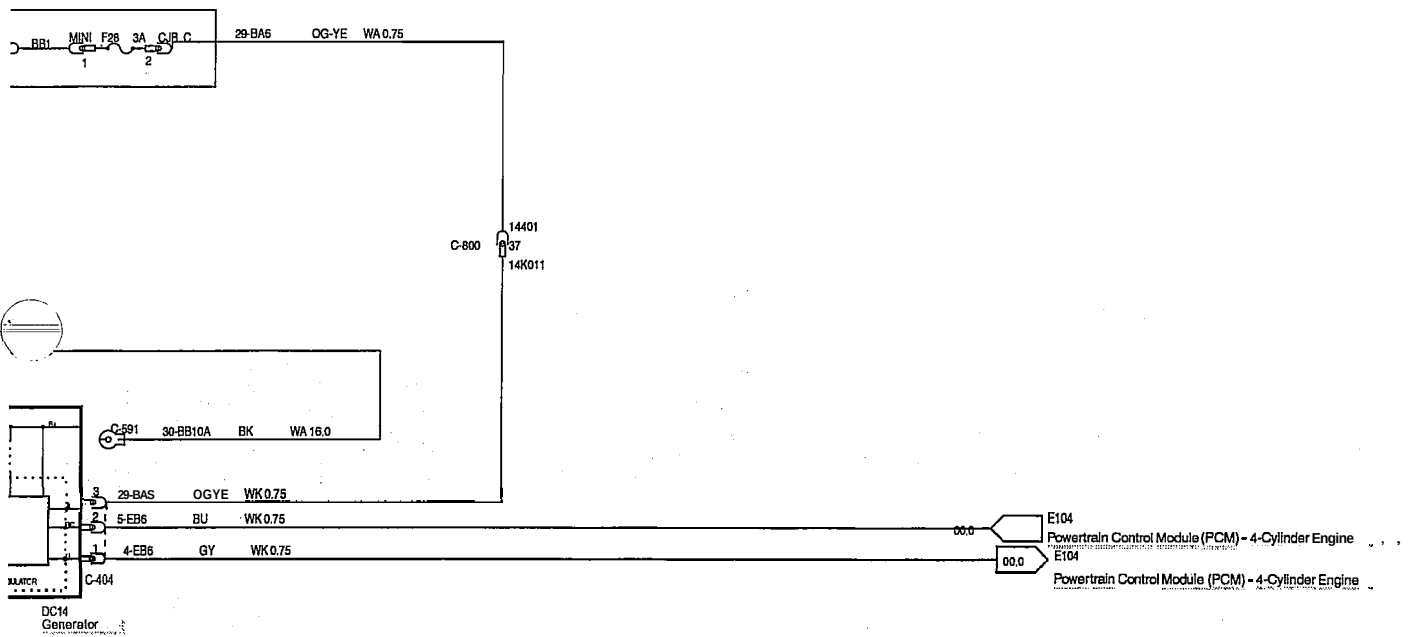
SCHEMATICS

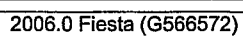
Charging System — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	414-02-2
Charging System — 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel....	414-02-4

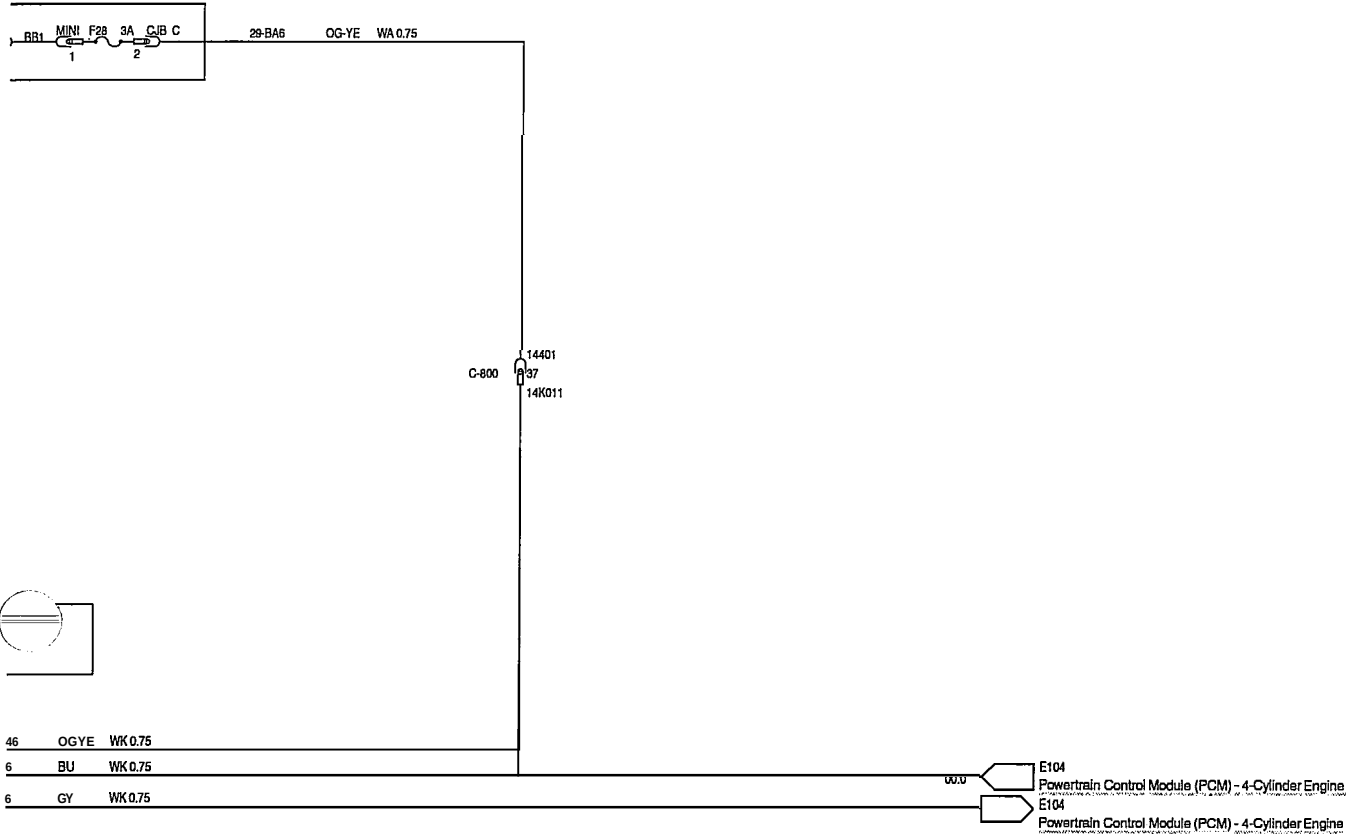
CONNECTORS

Generator.....	414-02-6
Generator — 2.0L Duratec-ST (M14).....	414-02-7
Generator — 1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma).....	414-02-8

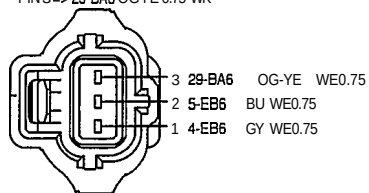








PIN 1=> 4-EB6 GY 0.75 WK
PIN 2=> 5-EB6 BU 0.75WK
PIN 3=> 29-BA6 OGYE 0.75 WK



F6DB-14A464-AGA(XXX)

C-404

TO ALTERNATOR

HARNESS14K011 OR 14300

 1 30-BB10B RD WE25.0
F65B-14463-CA
C-592
TO ALTERNATOR(90A ST150)
HARNESS14300

PIN1=>30-BB10 BK 25.0 WA

 1 30-BB10 BK WA16.0

F65B-14463-DA

C-591

TO ALTERNATOR(70/90A SIGMA/ 90A SOHC II DIESEL)

HARNESS 14300

SECTION 415-01A Audio Unit

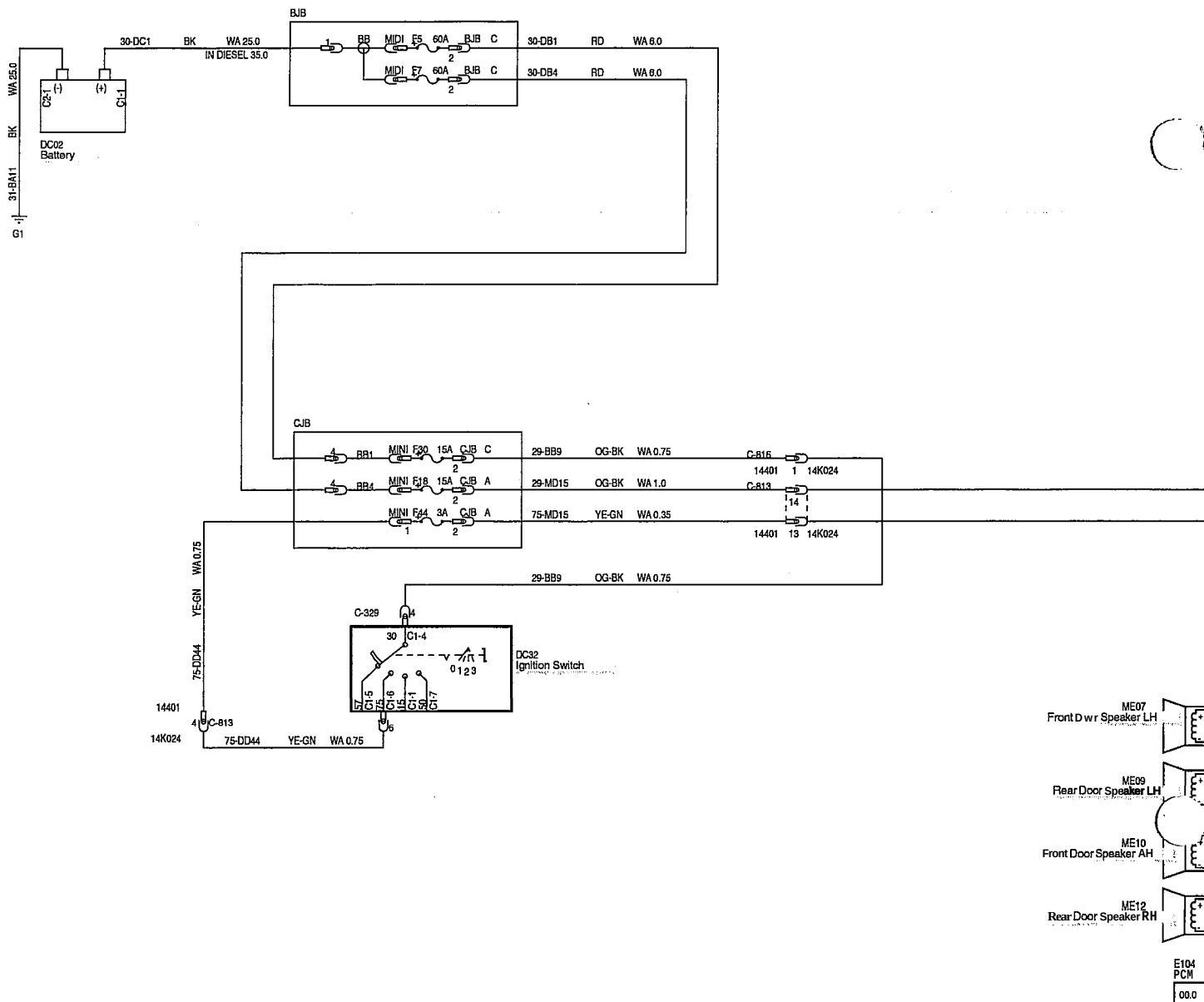
VEHICLE APPLICATION: 2006.0 Fiesta

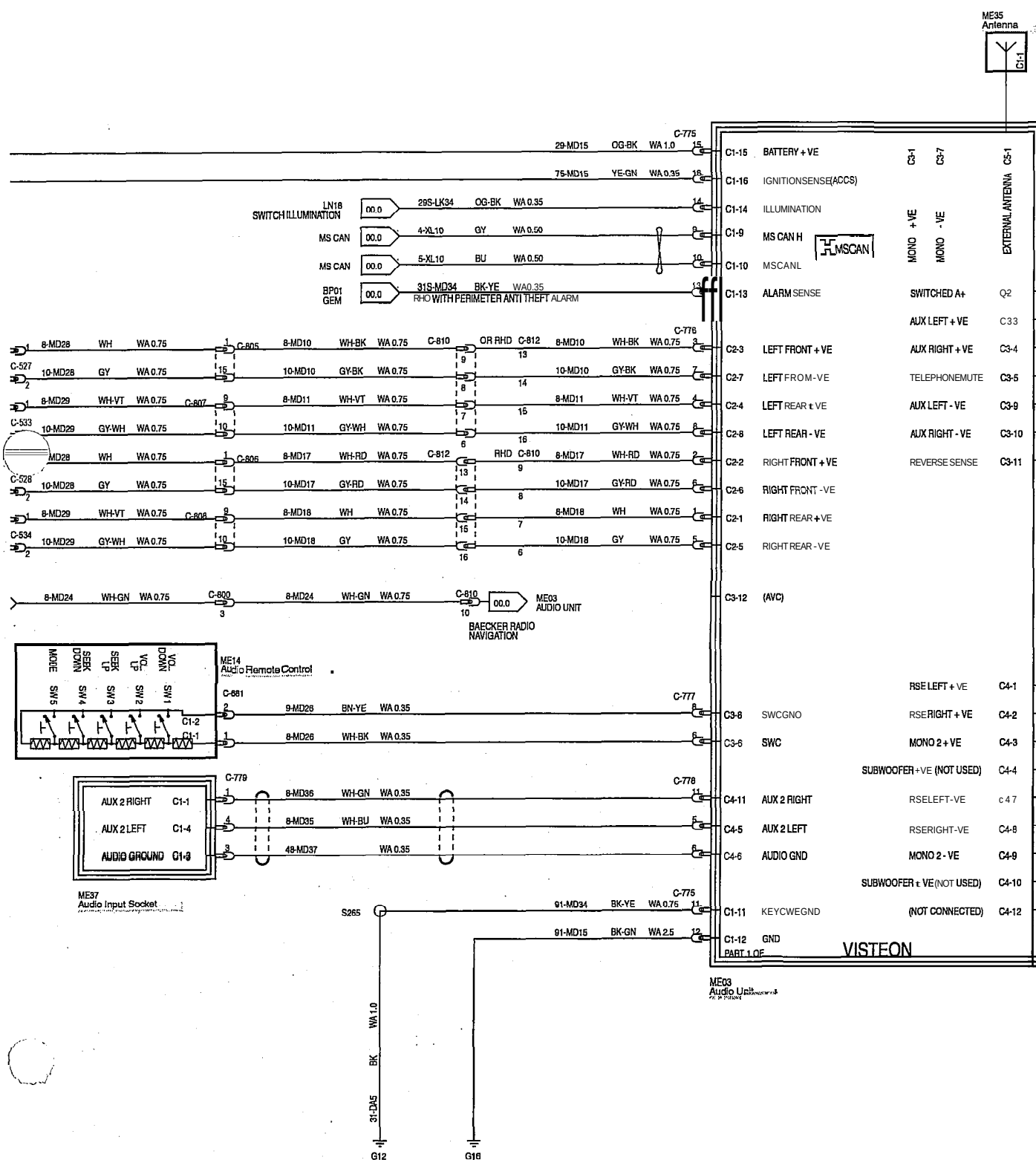
CONTENTS

PAGE

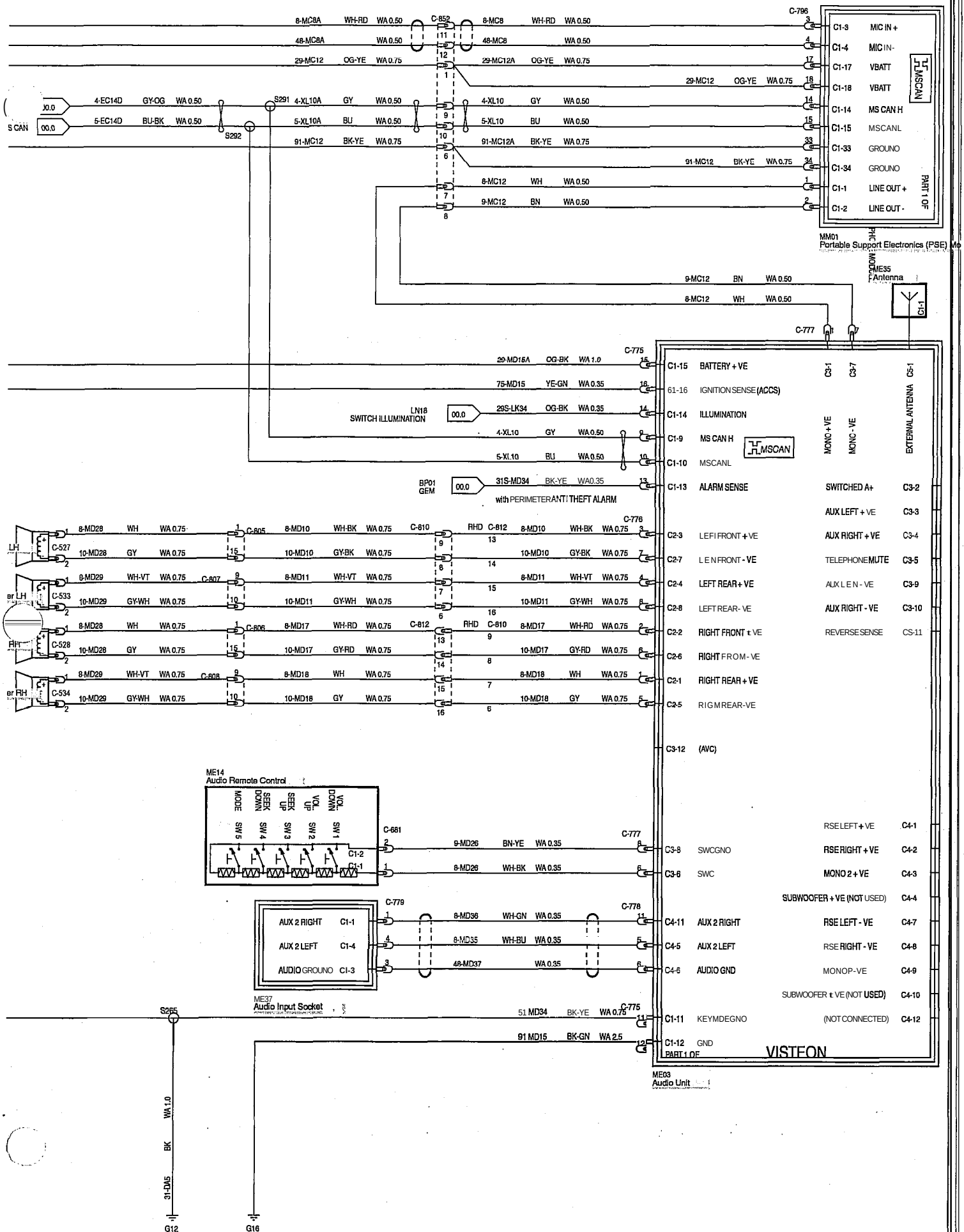
SCHEMATICS

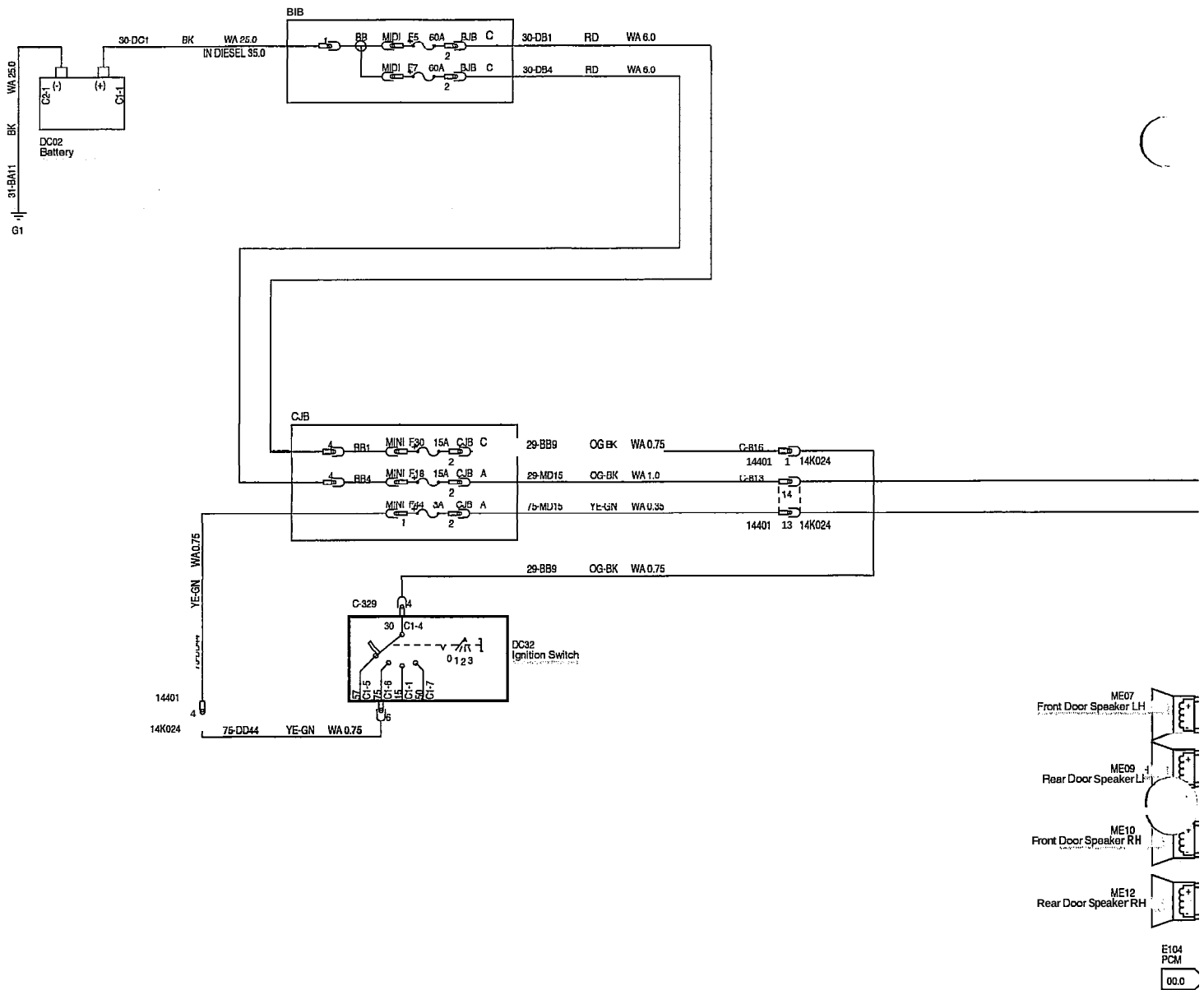
Audio System.....	415-01A-2
Audio System — Vehicles With: Passenger Air Bag Deactivation Switch/Corded Cellular Phone/Cordless Cellular Phone.....	415-01A-4
Audio System — 2.0L Duratec-ST (M14).....	415-01A-6
Audio System — Vehicles With: Corded Cellular Phone/Cordless Cellular Phone, Vehicles Without: Passenger Air Bag Deactivation Switch.....	415-01A-8

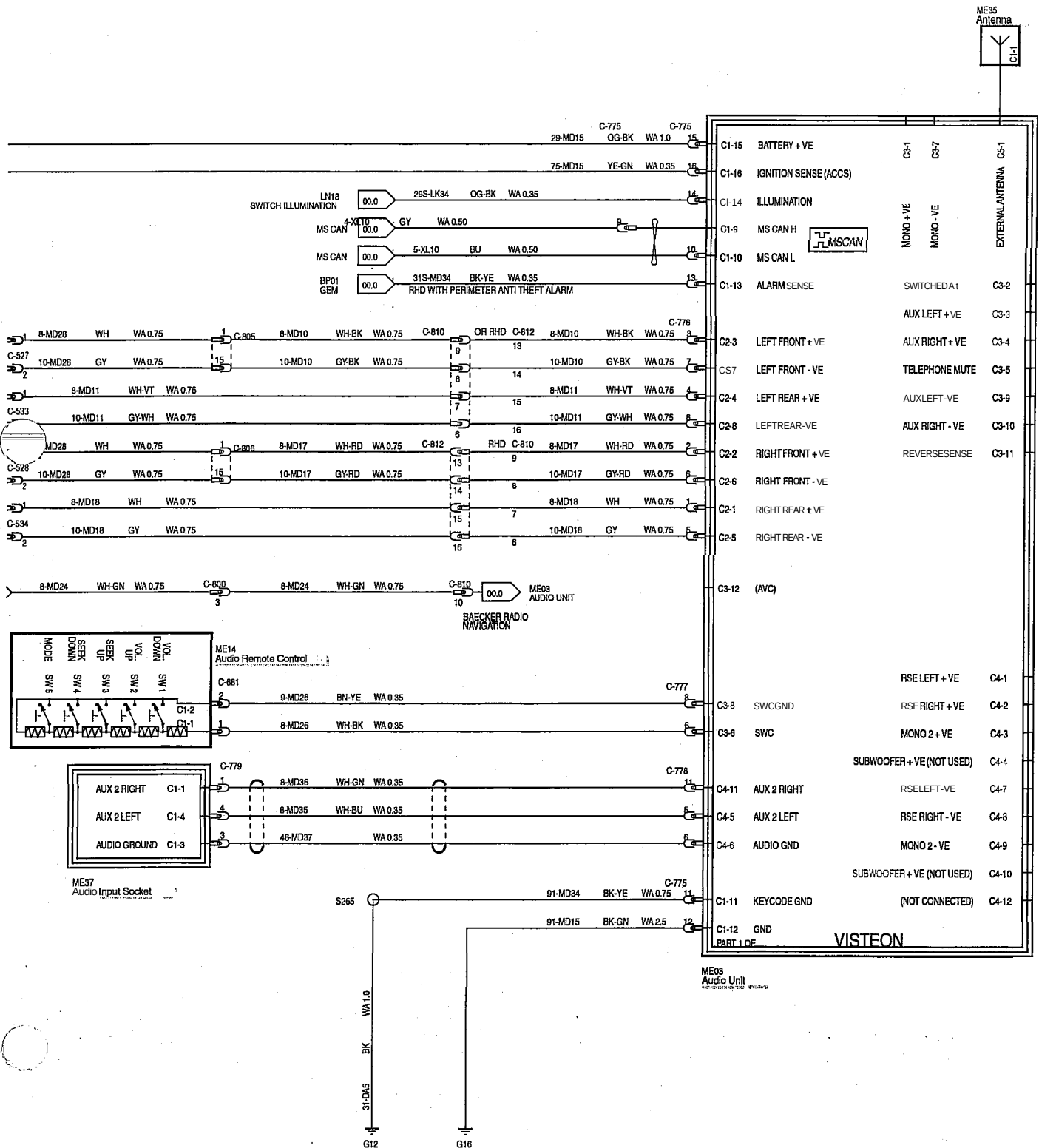




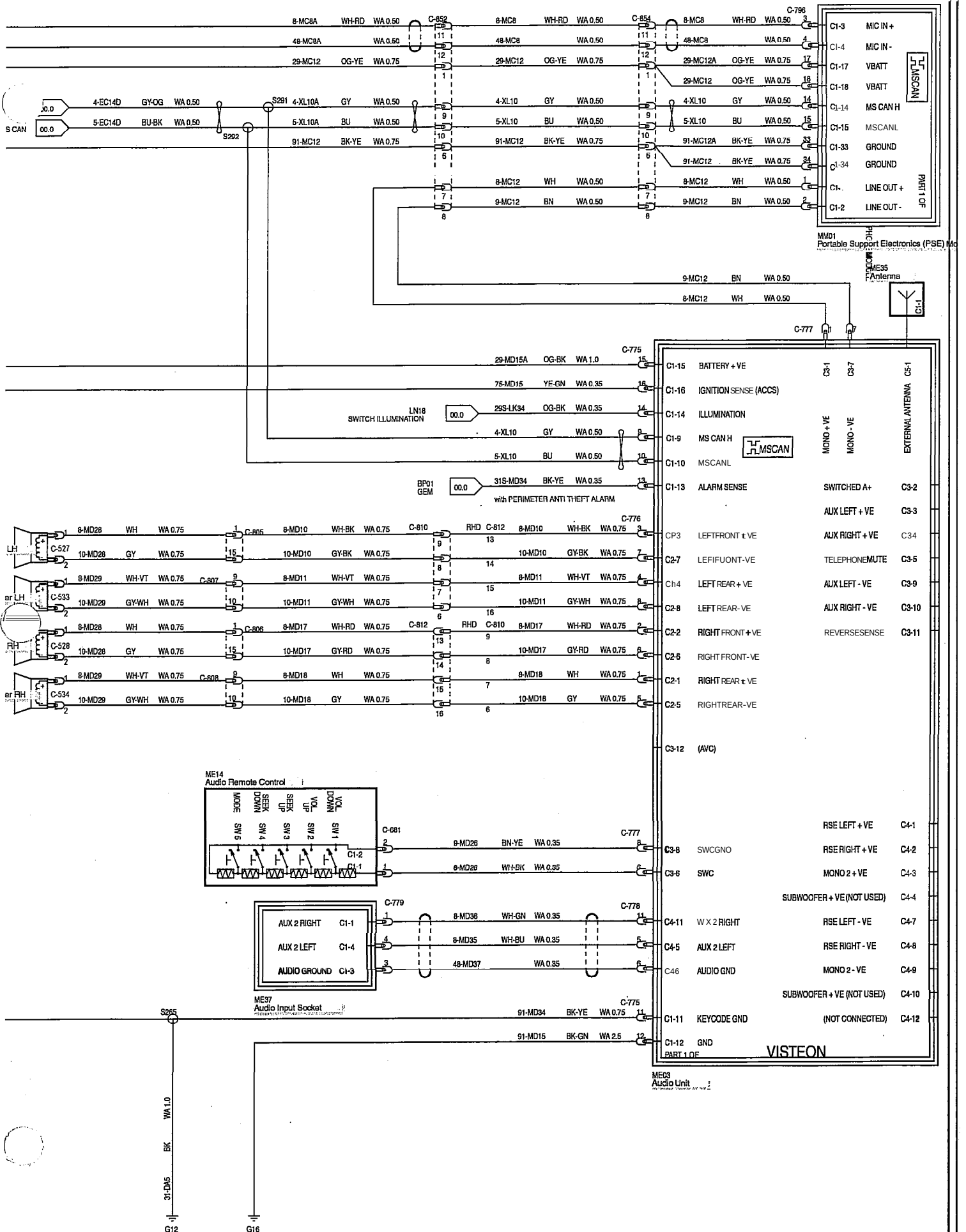












C

C

C

SECTION 415-01B Information and Entertainment System

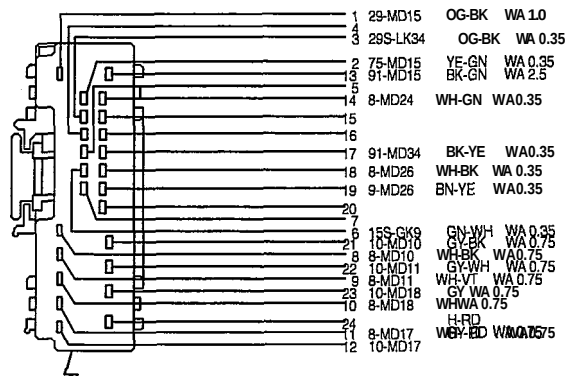
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

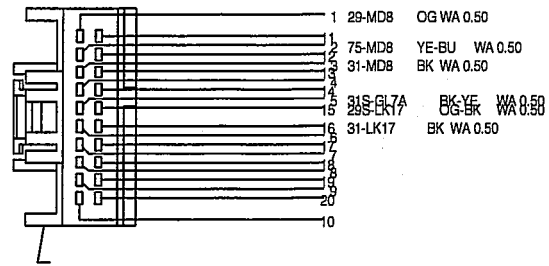
PAGE

CONNECTORS

Audio Unit.....	415-01B-2
Digital Versatile Disc (DVD) Player.....	415-01B-3
Front Door Speaker LH.....	415-01B-4
Front Door Speaker RH.....	415-01B-5
Rear Door Speaker LH.....	415-01B-6
Rear Door Speaker RH.....	415-01B-7
Audio Remote Control.....	415-01B-8
Audio Input Socket.....	415-01B-9
Portable Support Electronics (PSE) Module.....	415-01B-10
Microphone.....	415-01B-11
Audio Unit.....	415-01B-12
Audio Unit.....	415-01B-13
Audio Unit.....	415-01B-14
Audio Unit.....	415-01B-15

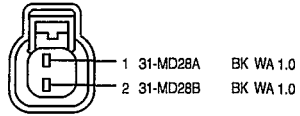


2L1T-14A464-CA
 C-344
 TO RADIO
 HARNESS14K024



2L1T-14A464-DA
C-437
TO DVD PLAYER MODULE
HARNESS148549

PIN 2 => 10-MD28 GY 0.75 WA
PIN 1 => 8-MD28 WH 0.75 WA



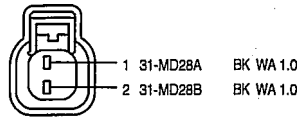
XR3T-14A464-AA

C-527

TO FROM DOOR SPEAKER (LHS)

HARNESS14A584

PIN 2 => 10-MD28 GY 0.75 WA
PIN 1 => 8-MD28 WH 0.75 WA



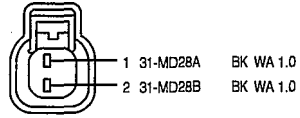
XR3T-14A464-AA

C-528

TO FRONT DOOR SPEAKER (RHS)

HARNESS14A584

PIN 2 ⇒ 10-MD29 GY-WH 0.75 WA
PIN 1 ⇒ 8-MD29 WH-M0.75 WA



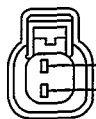
XR3T-14A464-AA

C-533

TO REAR DOOR SPEAKER (LHS)

HARNESS 14A584

PIN 2 => 10-MD29 GY-WH 0.75 WA
 PIN 1 => 8-MD29 WH-VT 0.75 WA



1 31-MD28A BK WA 1.0
 2 31-MD28B BK WA 1.0

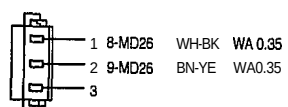
XR3T-14A464-AA

C-534

TO REAR DOOR SPEAKER (RHS)

HARNESS 14A584



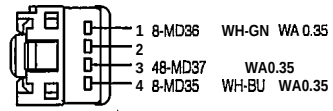


94BG-14489-LCB

C-681

TO RADIO REMOTE CONTROL SWITCH

HARNESS 14K024

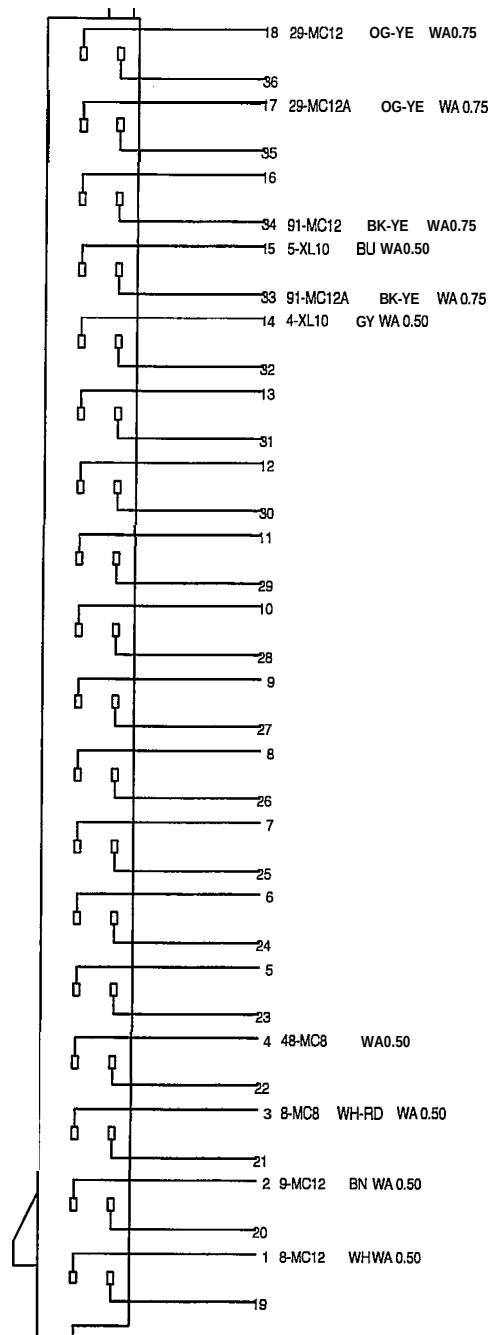


1L2T-14489-GB

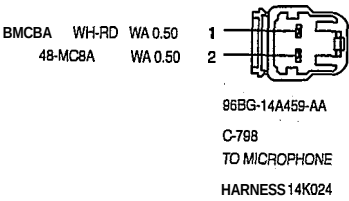
C-779

TO AUDIO JACK

HARNESS14K024



1X4T-14489-HA
 G796
 TO HANDSFREE PHONE MODULE
 HARNESS 14C007



PIN15 => 29-MD15A OGBK 1.0 WA

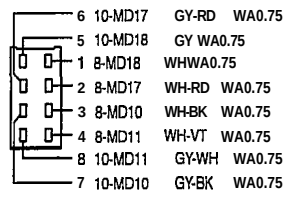
31S-MD34	BK-YE	WA0.35	13		9	4-XL10	GY	WA 0.50
29S-LK34	OG-BK	WA0.35	14		10	5-XL10	BU	WA0.50
29-MD15	OGBK	WA1.0	15		11	91-MD34	BK-YE	WA 0.75
75-MD15	YE-GN	WA0.35	16		12	91-MD15	BK-GN	WA2.5

3S7T-14A541-AB

C-775

TO RADIO (CONN.C1)

HARNESS 14K024

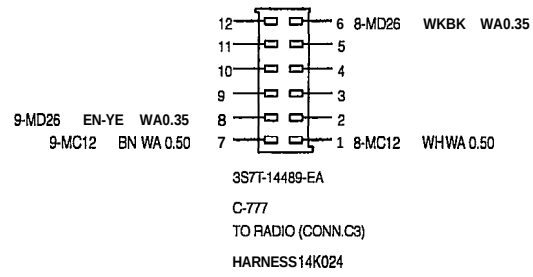


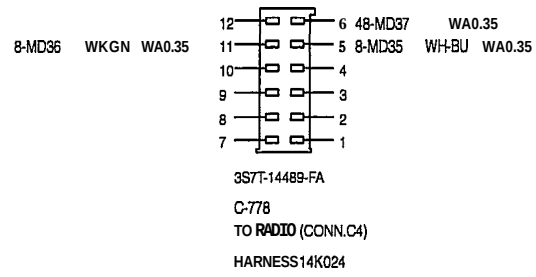
3S7T-14489-DA

C-776

TO RADIO (CONN.C2)

HARNESS 14K024







SECTION 417-01 Exterior Lighting

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

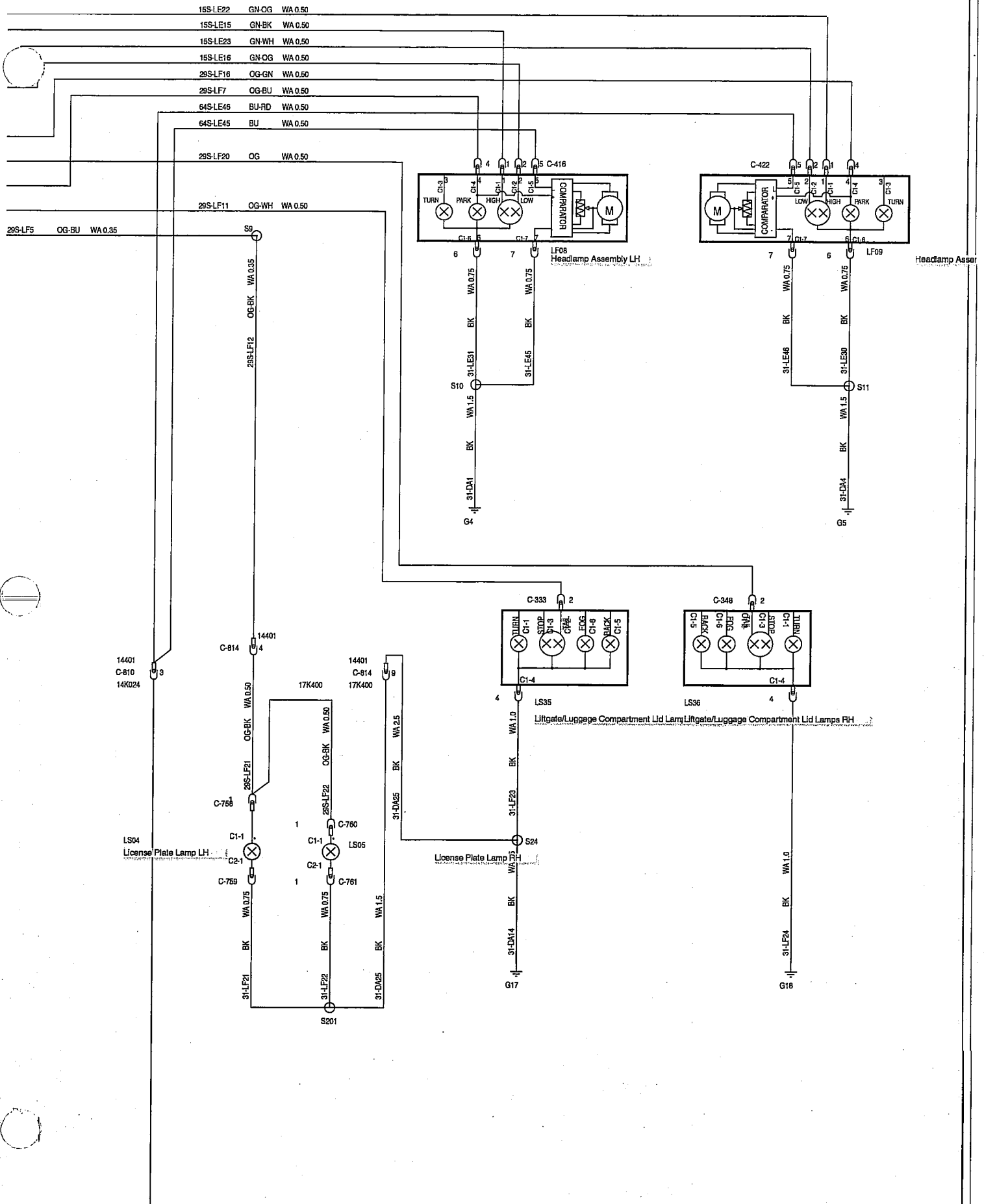
PAGE

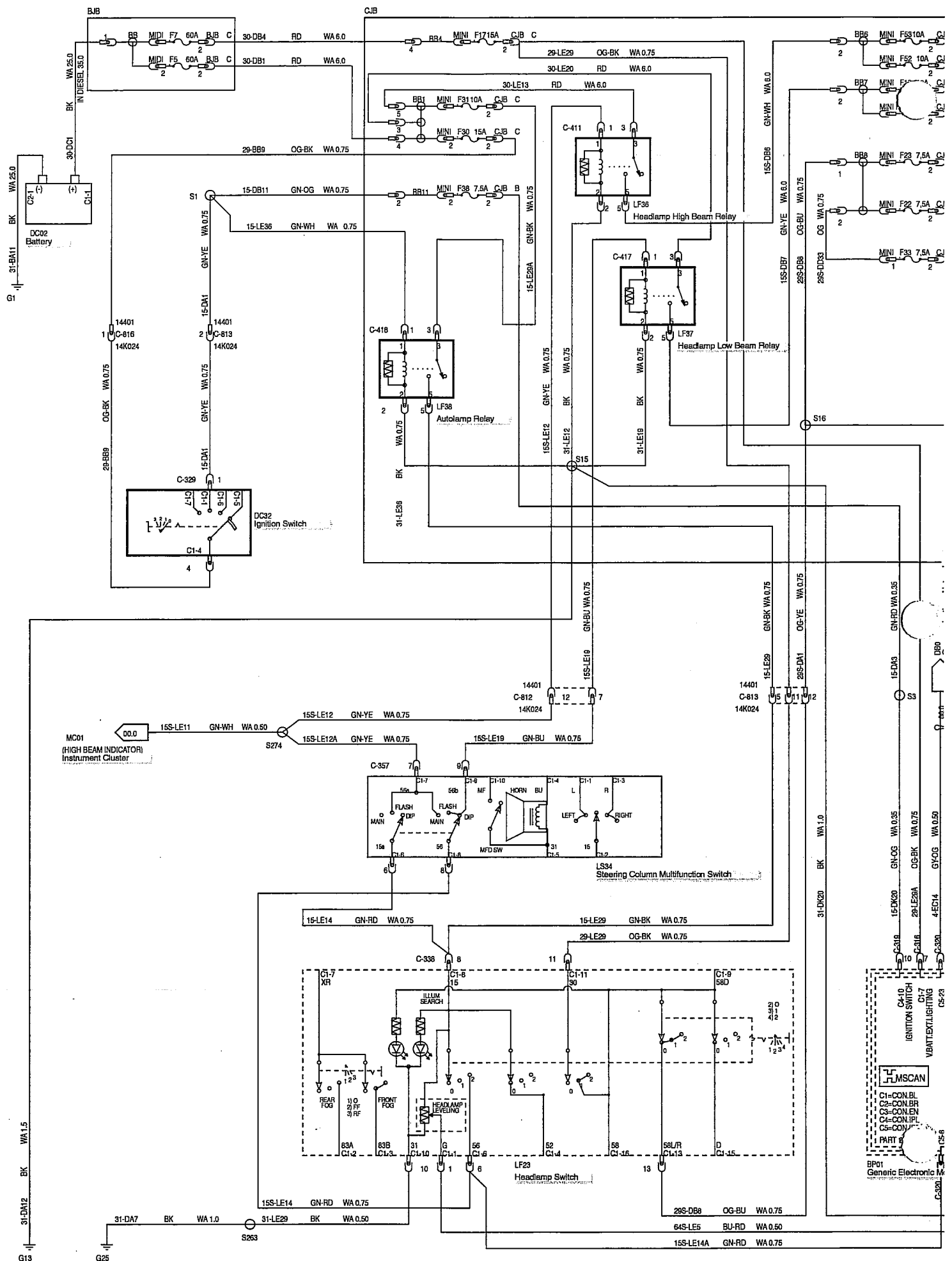
SCHEMATICS

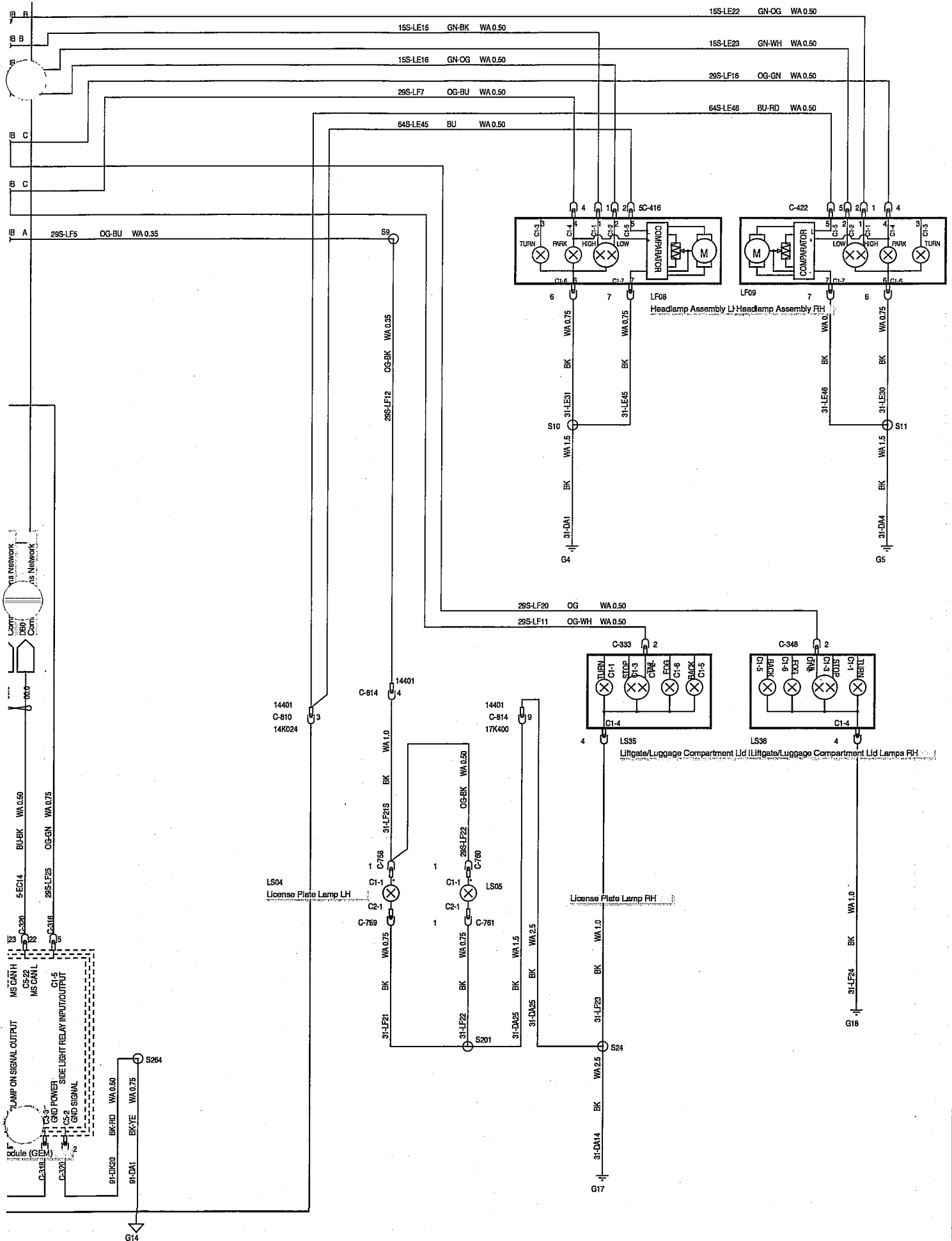
Headlamps.....	417-01-2
Headlamps — Vehicles With: Headlamp Leveling.....	417-01-4
Headlamps — 2.0L Duratec-HE (MI4), Vehicles With: Headlamp Leveling.....	417-01-6
Headlamps — Vehicles With: Autolamps.....	417-01-8
Fog Lamps.....	417-01-10
Stoplamps.....	417-01-12
Stoplamps — 2.0L Duratec-ST (MI4).....	417-01-14
Turn Signal and Hazard Lamps.....	417-01-16
Reversing Lamps — Vehicles With: 4-Speed Automatic Transmission (AW81-40).....	417-01-18
Reversing Lamps — 1.4L Duratorq-TDCi (DV) Diesel/1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: 5-Speed Manual Transmission (iB5).....	417-01-20
Reversing Lamps — 2.0L Duratec-ST (MI4).....	417-01-22
Reversing Lamps — Vehicles With: 5-Speed Manual Transmission (iB5).....	417-01-24

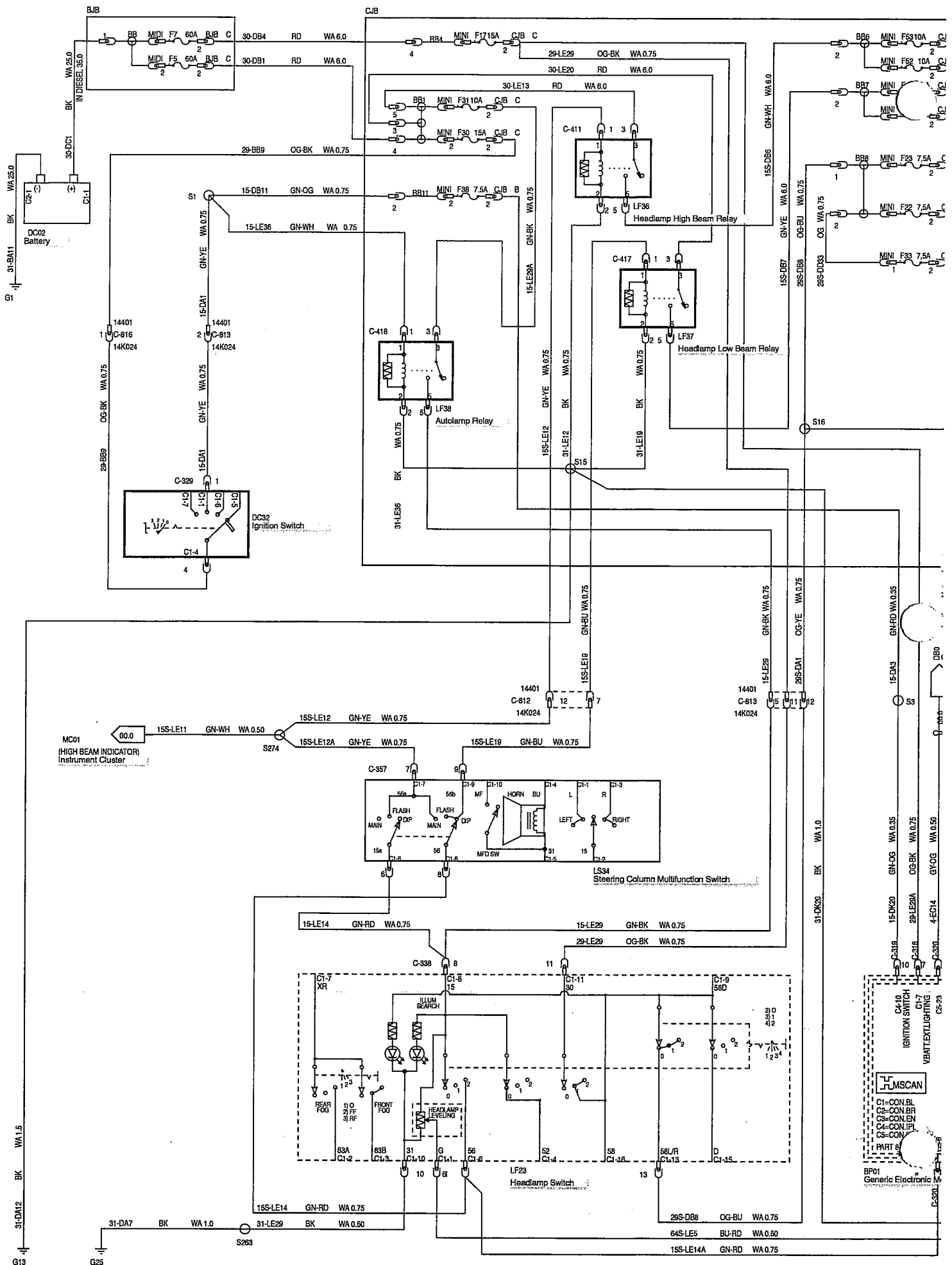
CONNECTORS

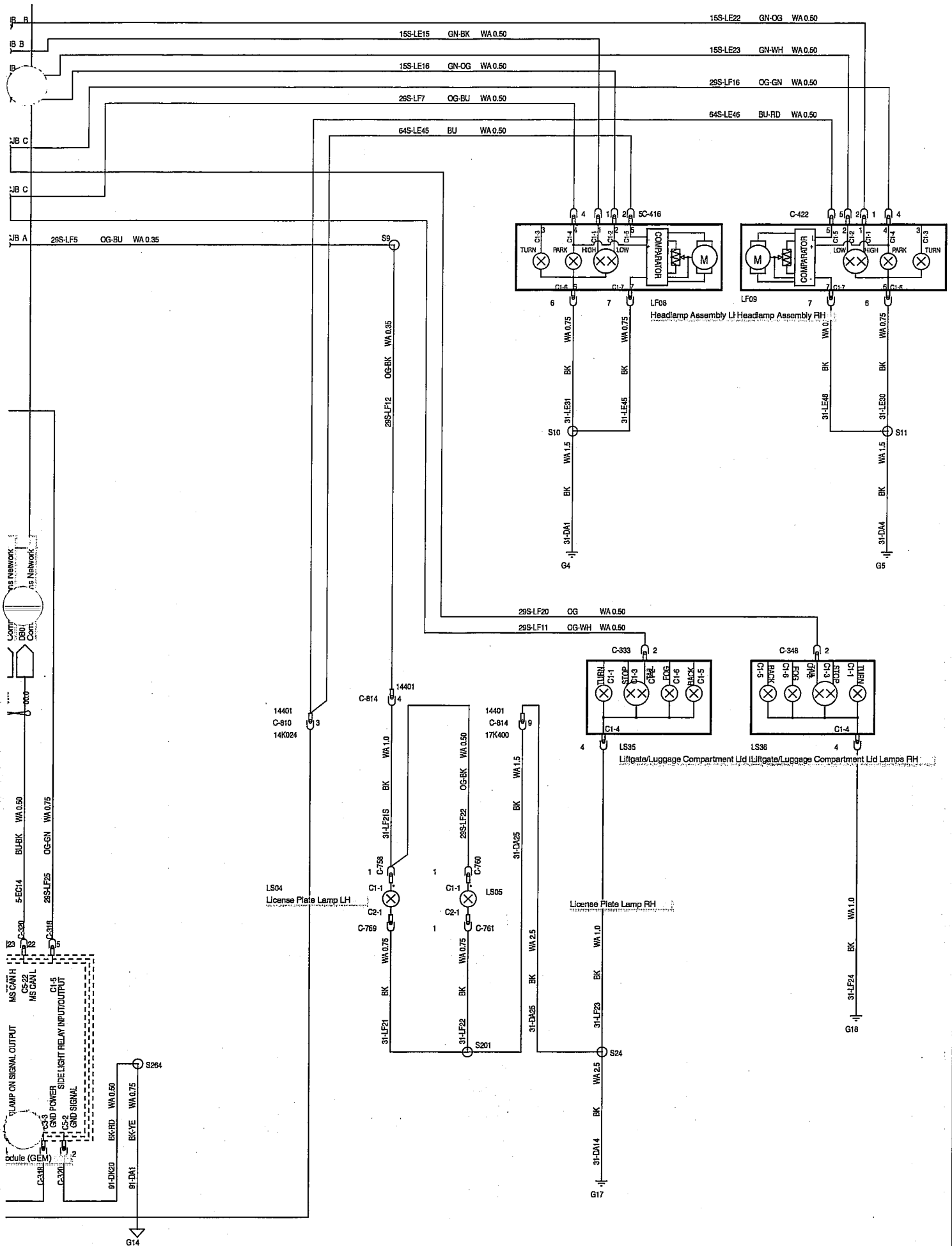
Autolamp and Rain Sensor.....	417-01-26
Autolamp Relay.....	417-01-27
Reversing Lamp Relay.....	417-01-28
Headlamp High Beam Relay.....	417-01-29
Headlamp Low Beam Relay.....	417-01-30
Side Turn Signal Lamp RH.....	417-01-31
Headlamp Assembly LH.....	417-01-32
Side Turn Signal Lamp LH.....	417-01-33
Headlamp Assembly RH.....	417-01-34
Rear Lamp Assembly LH.....	417-01-35
High Mounted Stoplamp.....	417-01-36
Front Fog Lamp RH.....	417-01-37
Front Fog Lamp LH.....	417-01-38
License Plate Lamp LH.....	417-01-39
License Plate Lamp RH.....	417-01-40
Headlamp Switch.....	417-01-41
Stoplamp Switch.....	417-01-42
Rear Lamp Assembly RH.....	417-01-43
High Mounted Stoplamp.....	417-01-44
License Plate Lamp LH.....	417-01-45
License Plate Lamp RH.....	417-01-46

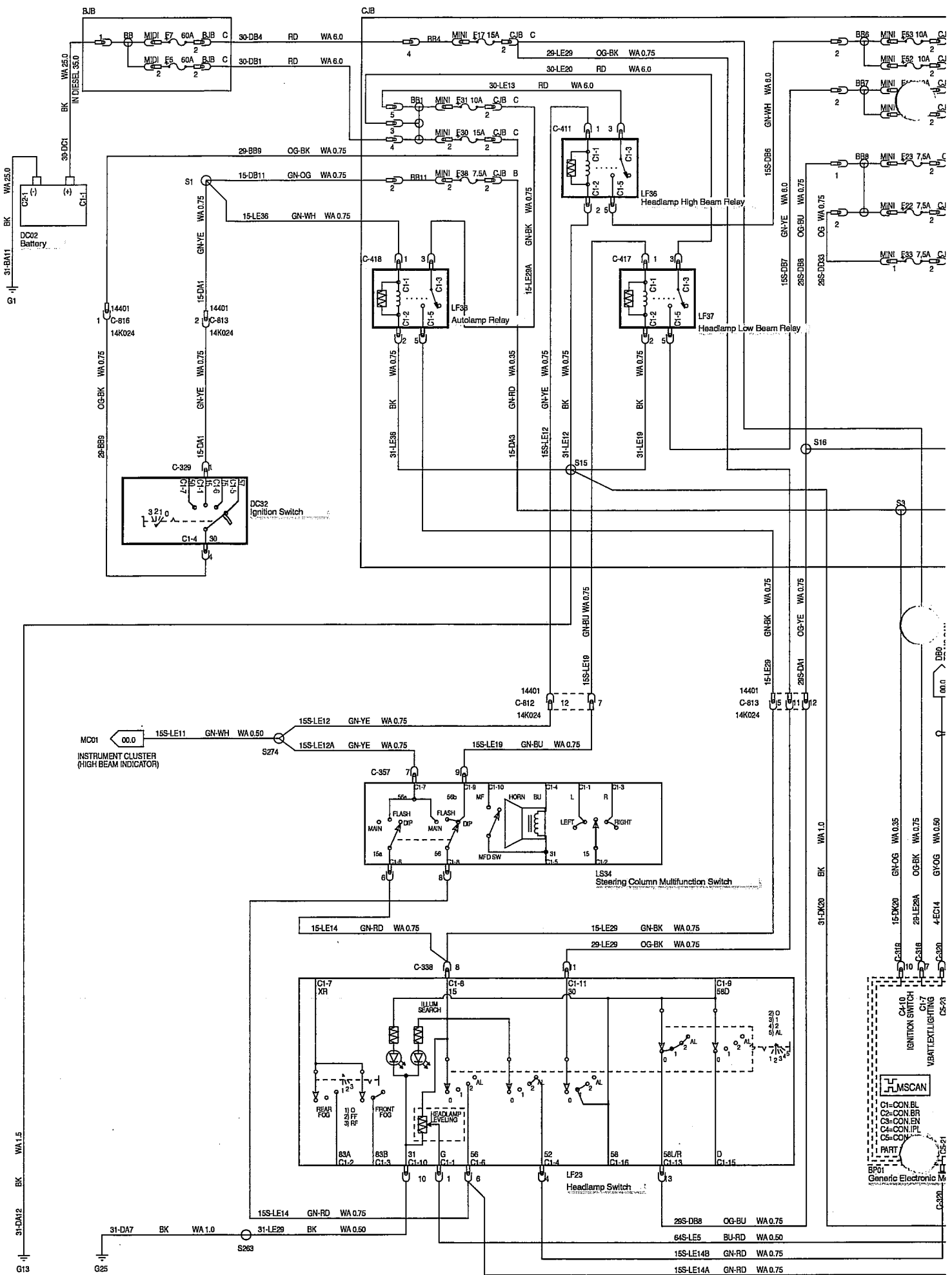


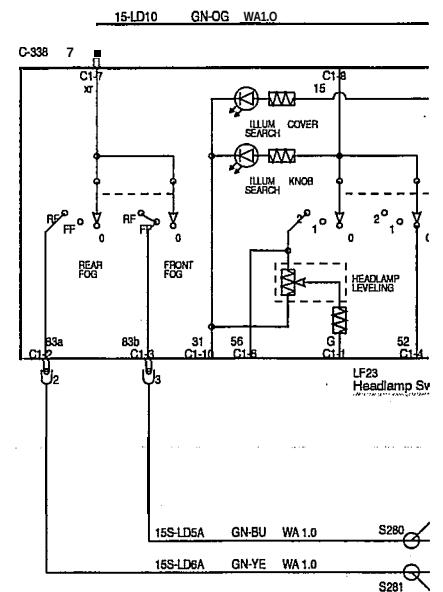
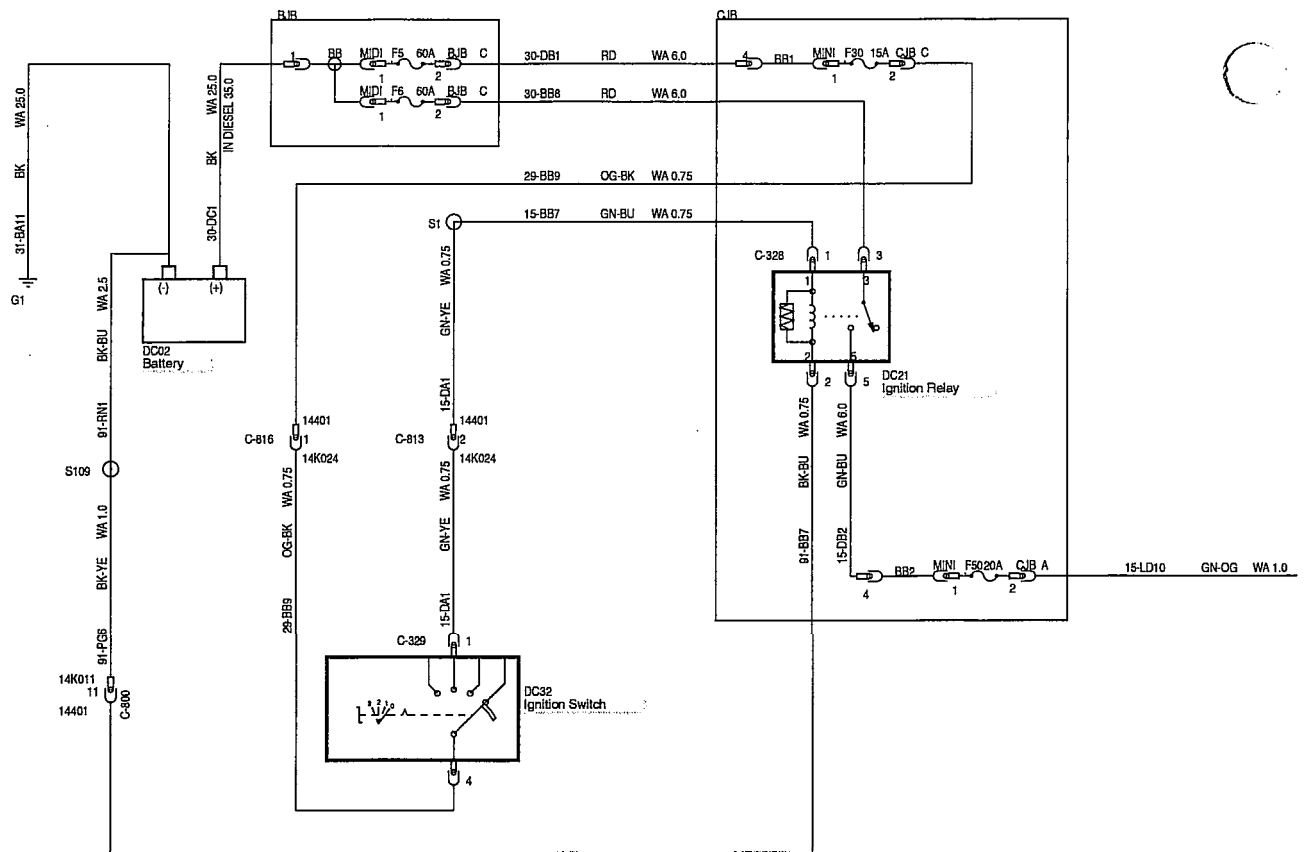


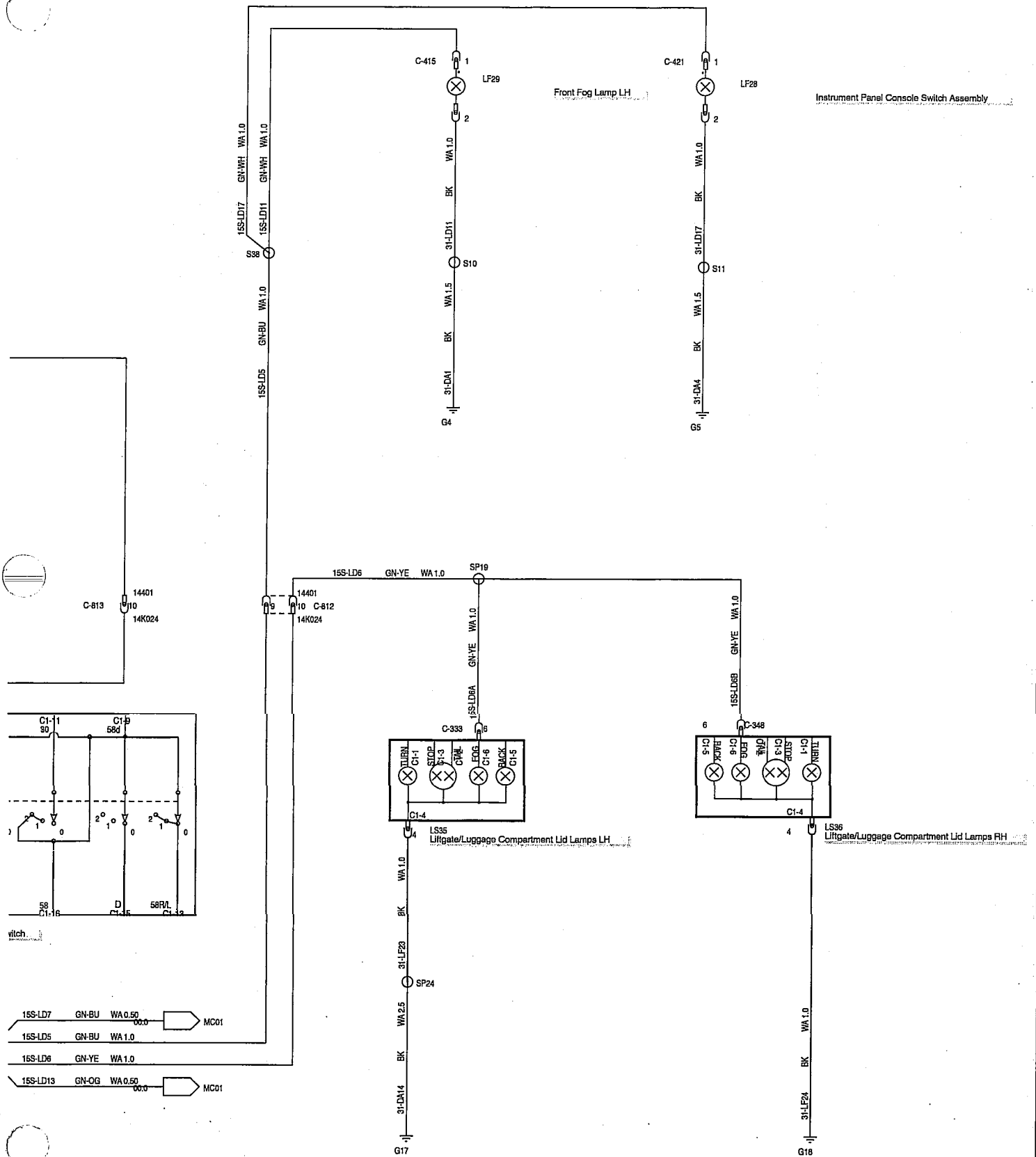


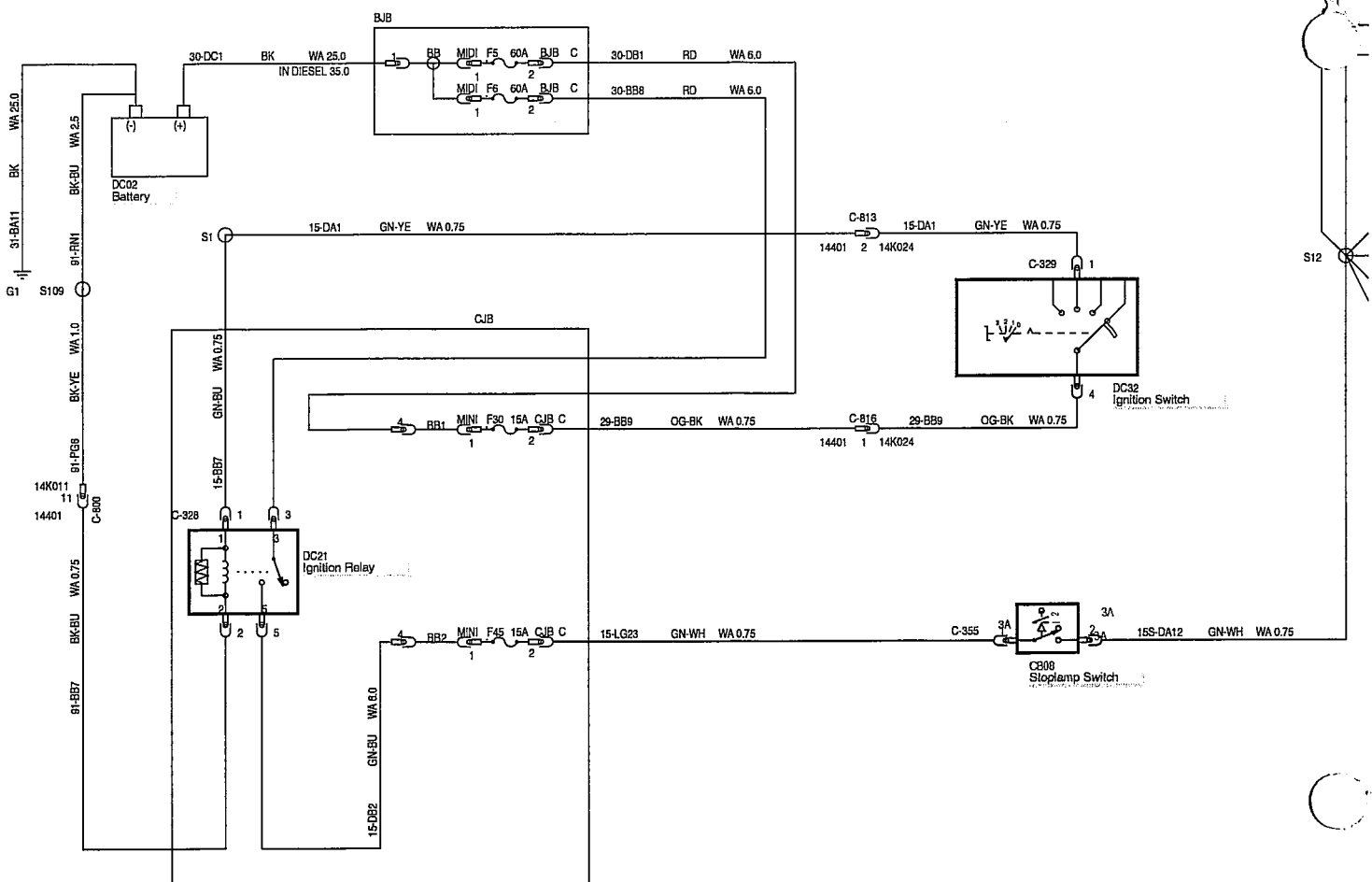




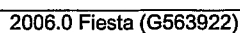


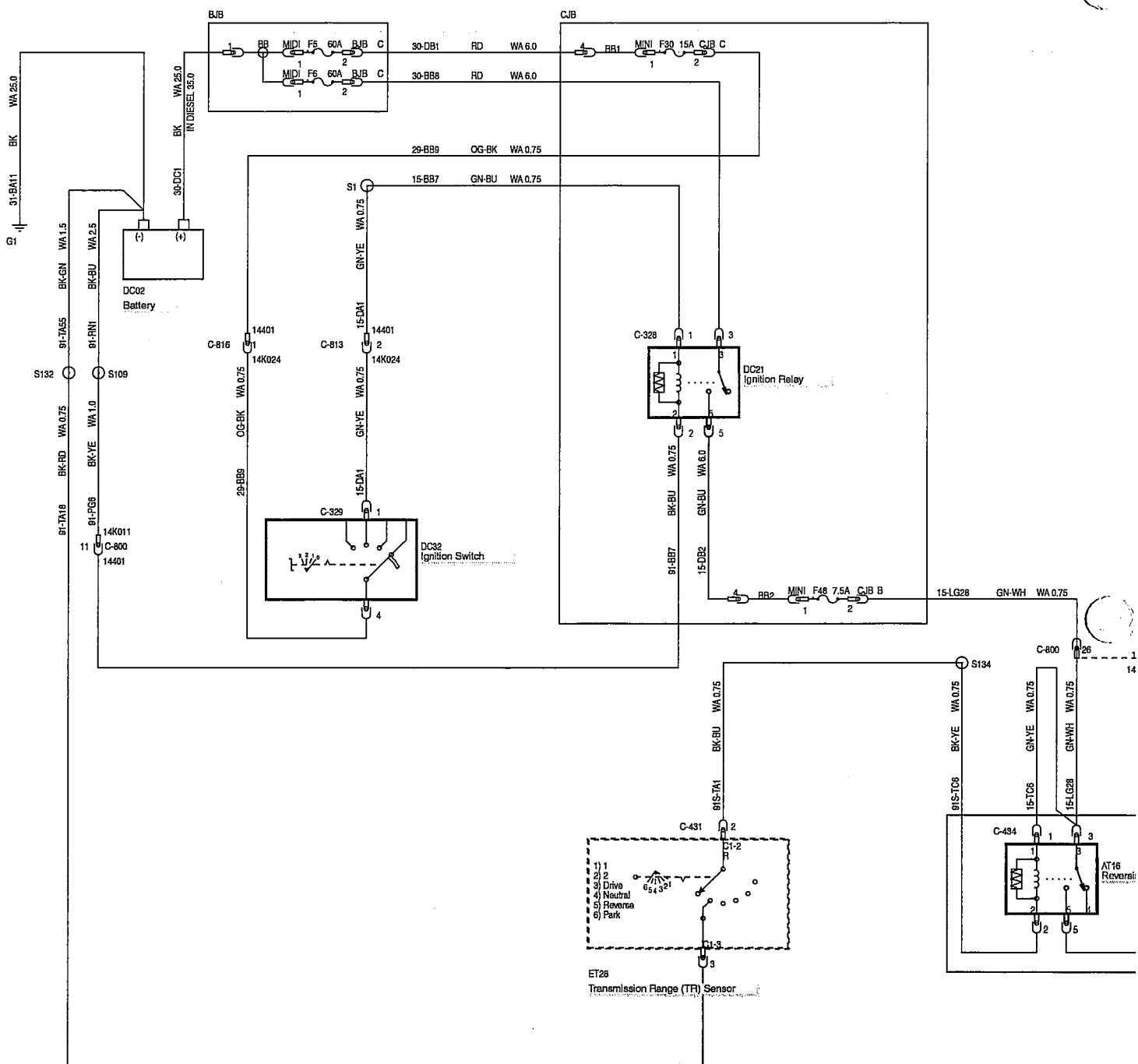


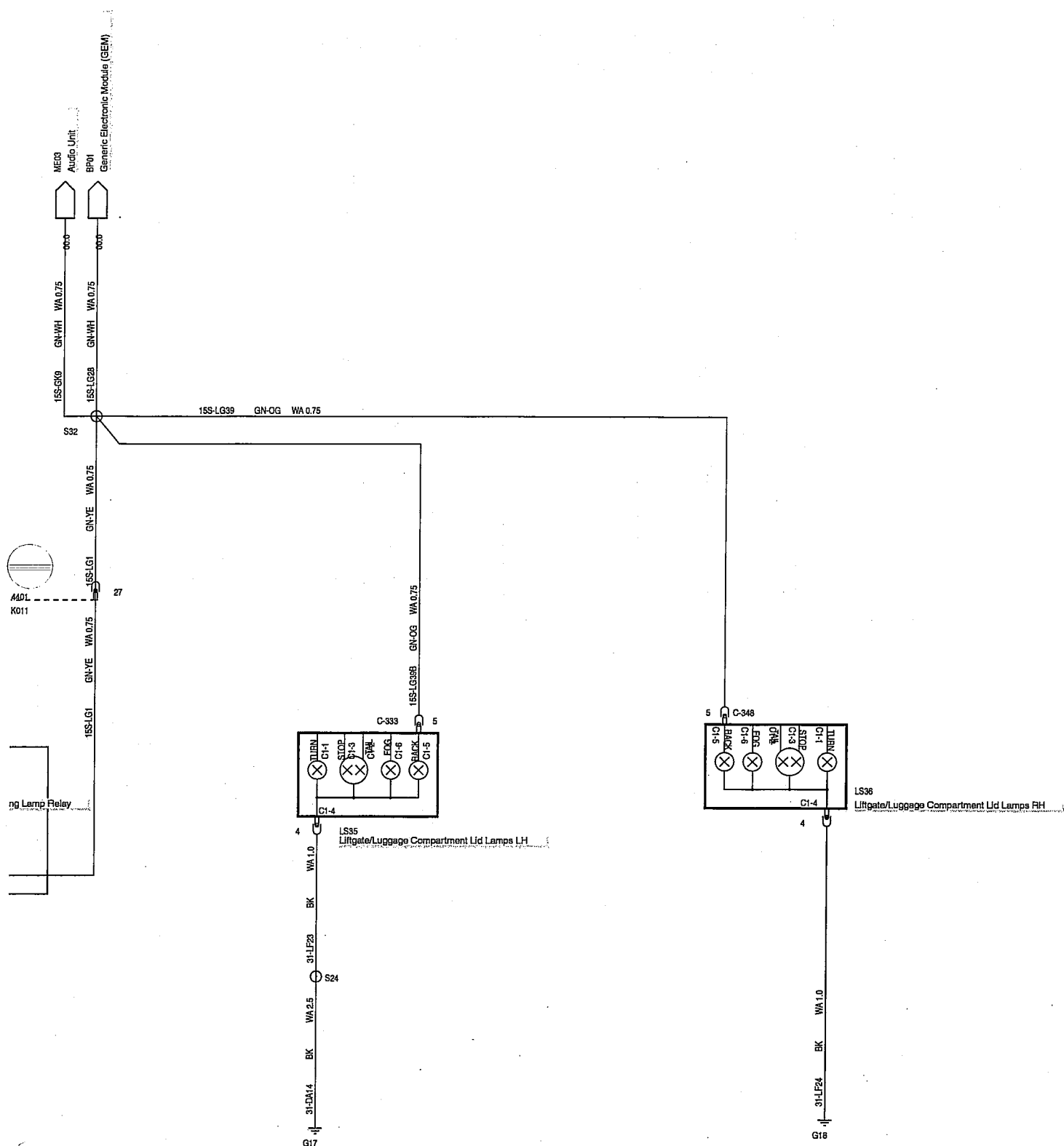




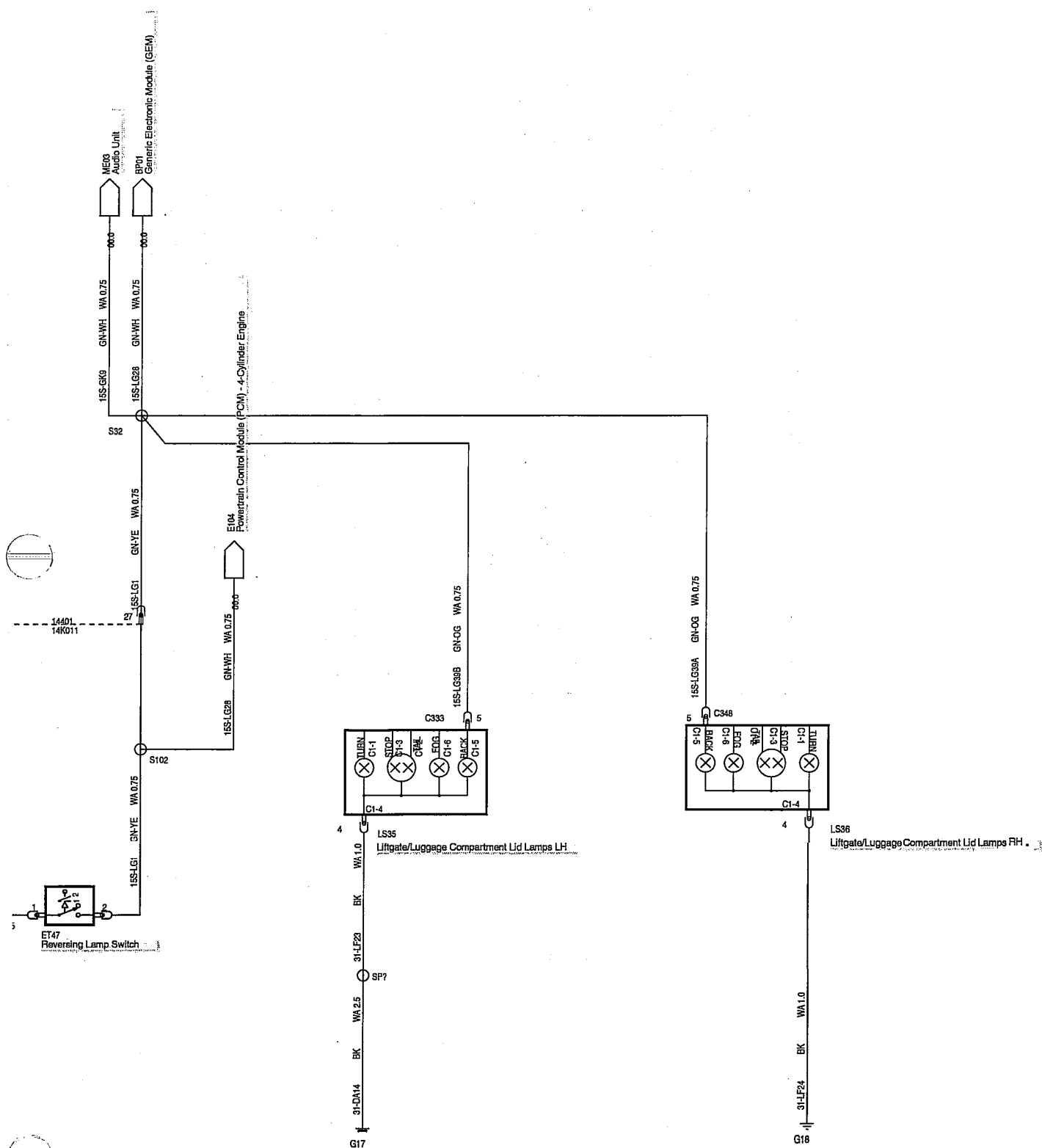




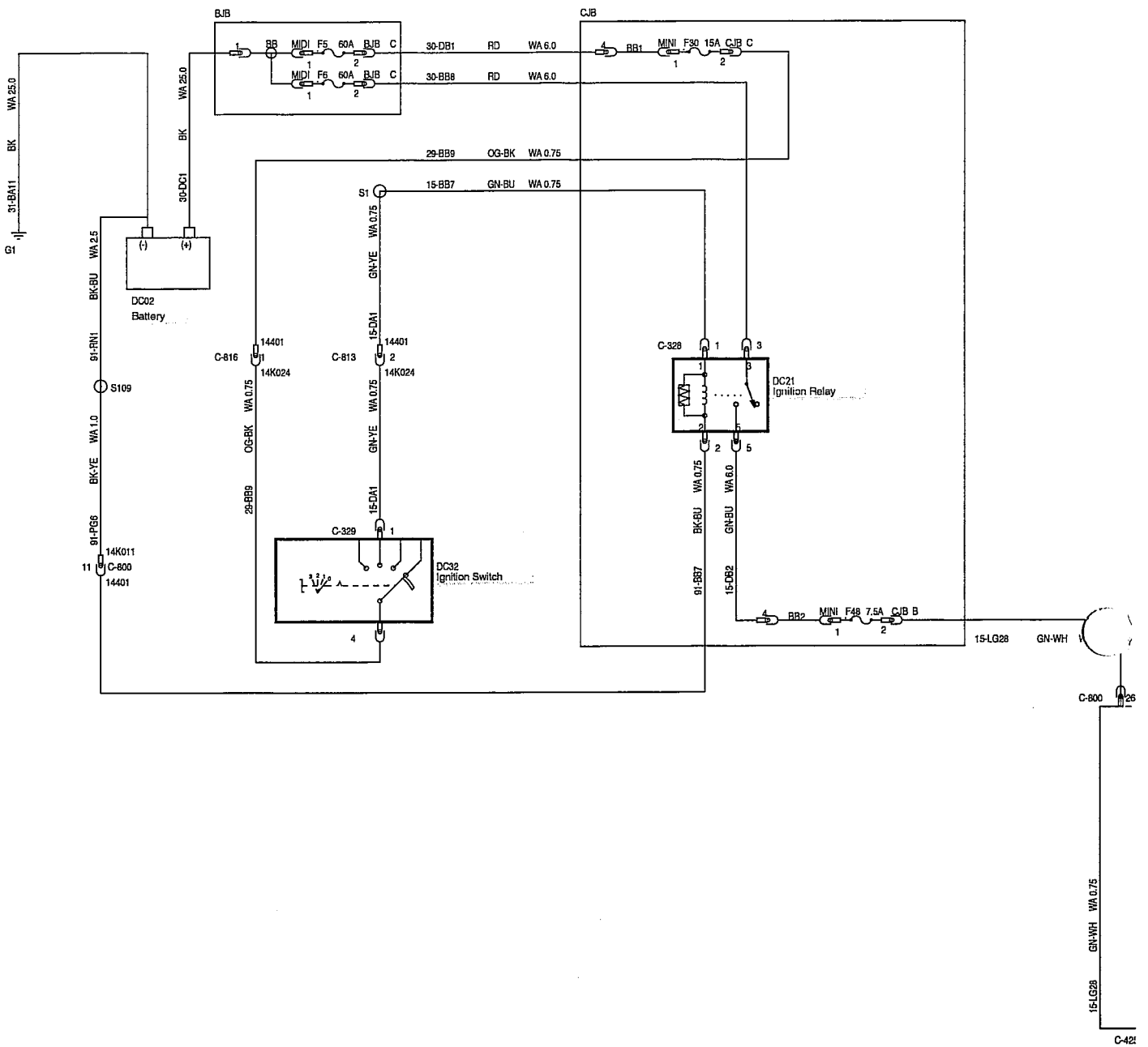


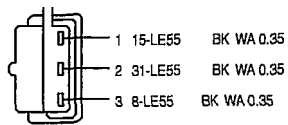












1X4T-14489-RA

C-754

TO AUTOLAMP RAIN SENSOR

HARNESS 14335

PIN 5 ⇒ 15-LE32 GN-WH 0.75 WA + 15-LE29 GN-BK 0.75 WA



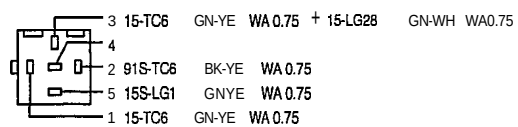
2S6T-14A481-BA

C-418

TO AUTOLAMP RELAY

HARNESS 14401

PIN3 => 15-LG28 GN-WH 0.75 WA+ 15-TC6 GN-YE 0.75 WA

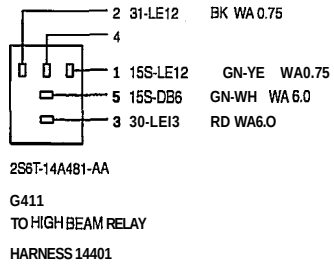


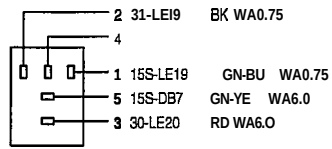
2S6T-14A481-BA

C-434

TO BACKUPLAMP RELAY

HARNESS 14K011



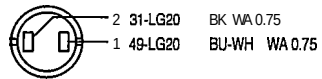


256T-14A481-AA

C-417

TO LOW BEAM RELAY

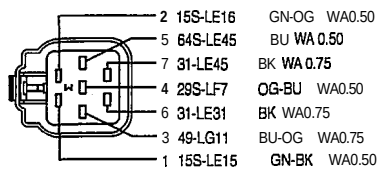
HARNESS 14401



4M5T-13K370-AA_DUMMY
C-352

TO RIGHT SIDE TURN SIGNAL LAMP

HARNESS14401

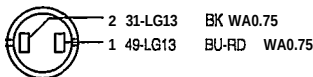


97AG-14A464-GGA

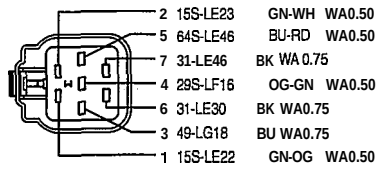
C-416

TO LEFT HEAD LAMP

HARNESS 14401



4M5T-13K370-AA_DUMMY
C-337
TO LEFT SIDE TURN SIGNAL LAMP
HARNESS 14401

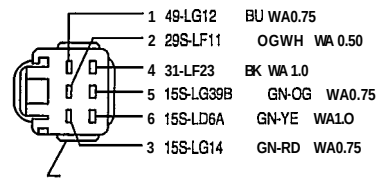


97AG-14A464-GGA

6422

TO RIGHT HEADLAMP

HARNESS14401

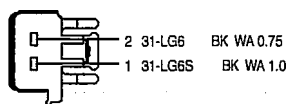


5F9T-14489-CA

C-333

TO LEFT COMBINED REAR LAMP

HARNES14401

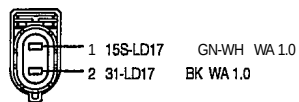


4S7T-14489-VNA

C-550

TO CENTER HIGH STOP LAMP

HARNESS 17K400



5S6T-14A464-FB
C-421
TO RIGHT FRONT FOG LAMP
HARNESS 14401



- 1 15S-LD11 GN-WH WA 1.0
- 2 31-LD11 BK WA 1.0

5S8T-14A464-FB

C-415

TO LEFT FROM FOG LAMP

HARNESS14401

PIN 1 => 31-LF21S BK 1.0 WA + 29S-LF22 OG-BK 0.50 WA
 PIN 1 => 29S-LF21 OG-BK 0.50 WA + 29S-LF22 OG-BK 0.50 WA

□ 1 29S-LF22 OG-BK WA0.50 + 29S-LF21 OGBK WA 0.50

93BG-14474-ZAA

C-758

M LEFT LICENSE PLATE LAMP

HARNES 17K400



1 29S-LF22 OG-BK WA0.50

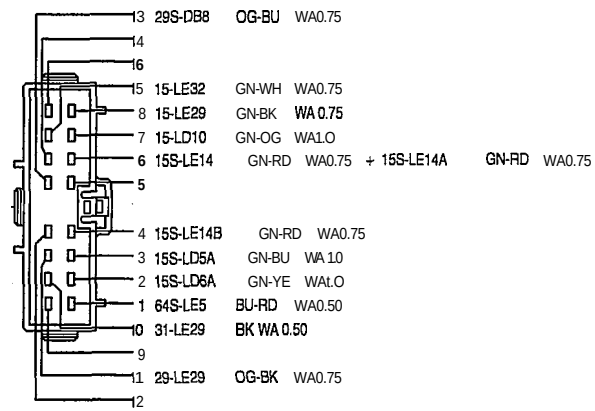
93BG-14474-ZAA

C-760

TO RIGHT UCENSEPLATE LAMP

HARNESS 17K400

PIN 4 => 15S-LE6 GN-YE 0.75 WA
 PIN 8 => 15-LE14 GN-RD 0.75 WA + 15-LE29 GN-BK 0.75 WA
 PIN 6 => 15S-LE14A GN-RD 0.75 WA + 15S-LE14 GN-RD 0.75 WA

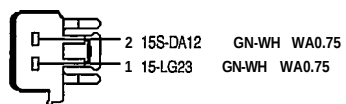


98AG-14489-TTB

C-338

TO LIGHT SWITCH

HARNESS 14K024

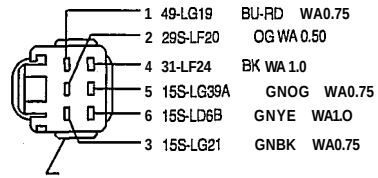


4S7T-14489-VNA

C-355

TO STOP LAMP SWITCH

HARNESS 14401



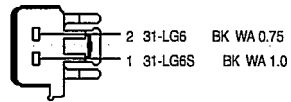
5F9T-14489-CA

C-348

TO RIGHT COMBINED REAR LAMP

HARNES14401

PIN 1 => 15S-LG6 GNYE 0.75VA



4S7T-14489-VNA

C-550

TO CENTER HIGH STOP LAMP

HARNESS 17K400

1 31-LF21 BK WA 0.75

93BG-14474-ZAA

C-759

TO LEFT LICENSE PLATE LAMP

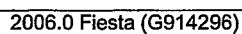
HARNES 17K400

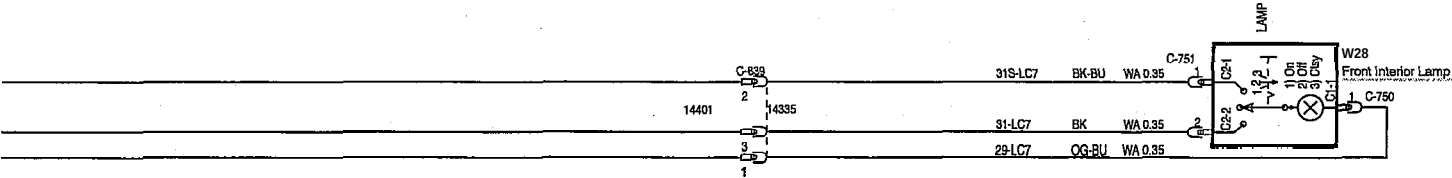
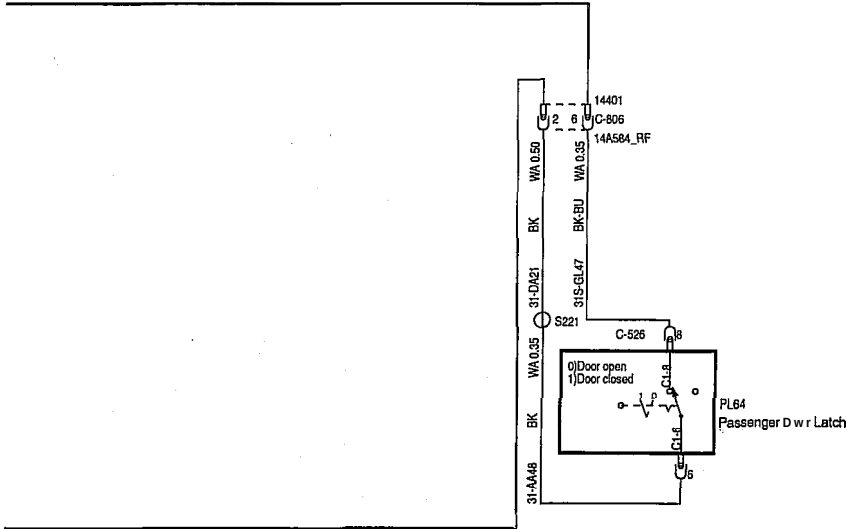
 1 31-LF22 BK WA0.75
93BG-14474-ZAA
C-761
TO RIGHT UCENSE PLATE LAMP
HARNESS 17K400

SECTION 417-02 Interior Lighting

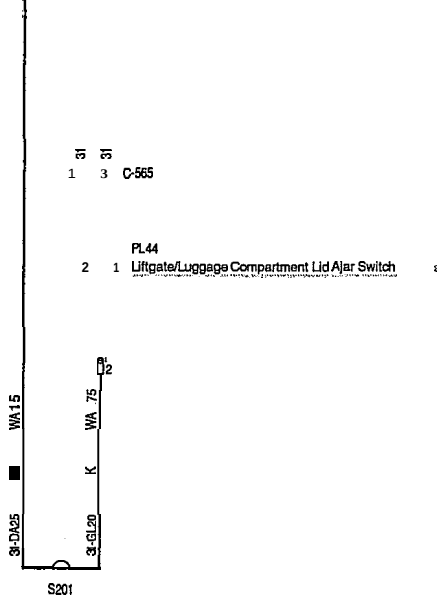
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SCHEMATICS	
Courtesy and Demand Lighting — 3-Door.....	417-02-2
Courtesy and Demand Lighting — 5-Door.....	417-02-4
Courtesy and Demand Lighting — 2.0L Duratec-ST (MI4) RHD.....	417-02-6
CONNECTORS	
Front Interior Lamp.....	417-02-8
Rear Interior Lamp.....	417-02-9
Luggage Compartment Lamp.....	417-02-10
Rear Map Reading Lamp LH.....	417-02-11
Rear Map Reading Lamp RH.....	417-02-12
Front Interior Lamp.....	417-02-13
Rear Interior Lamp.....	417-02-14
Front Interior Lamp.....	417-02-15

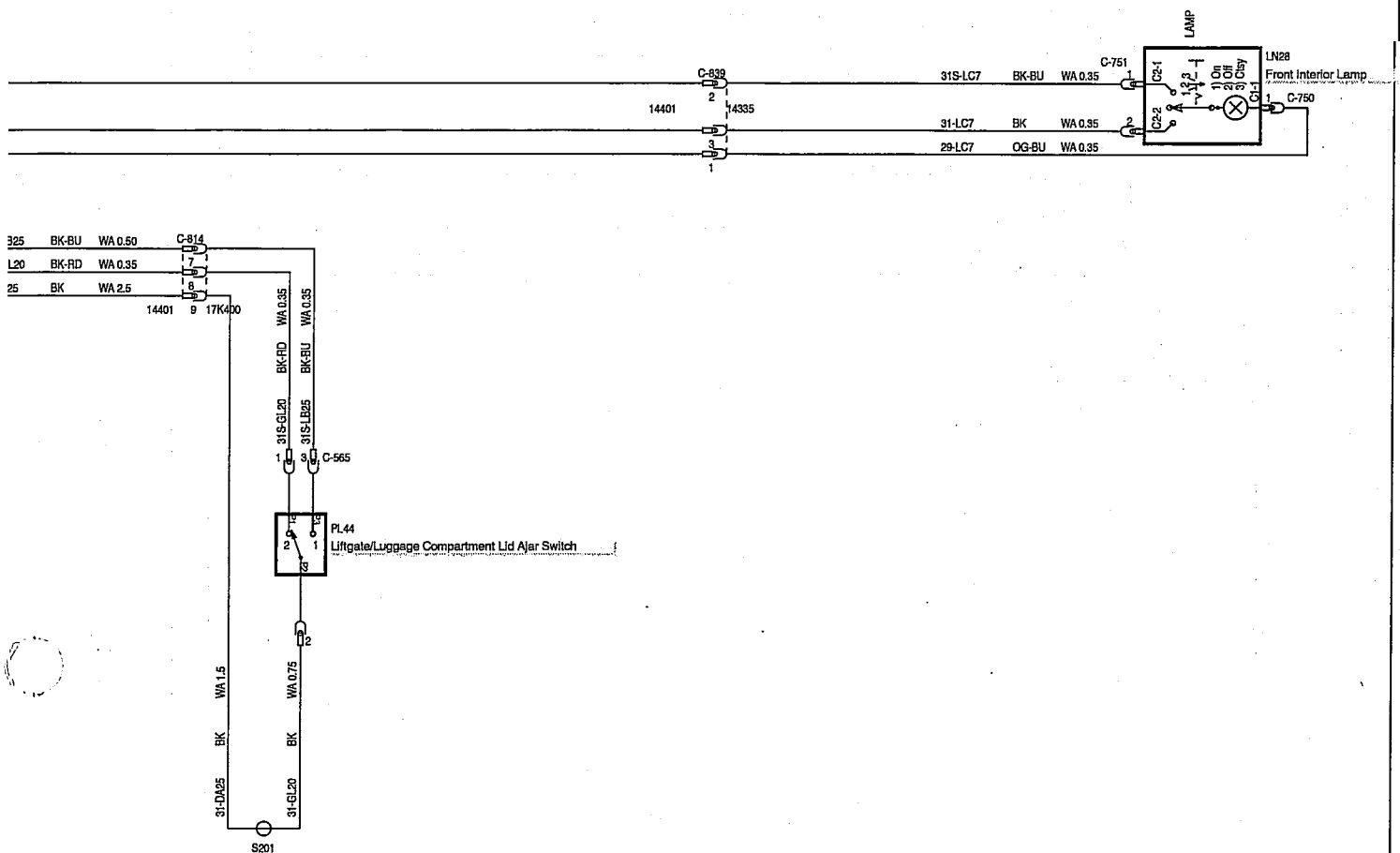
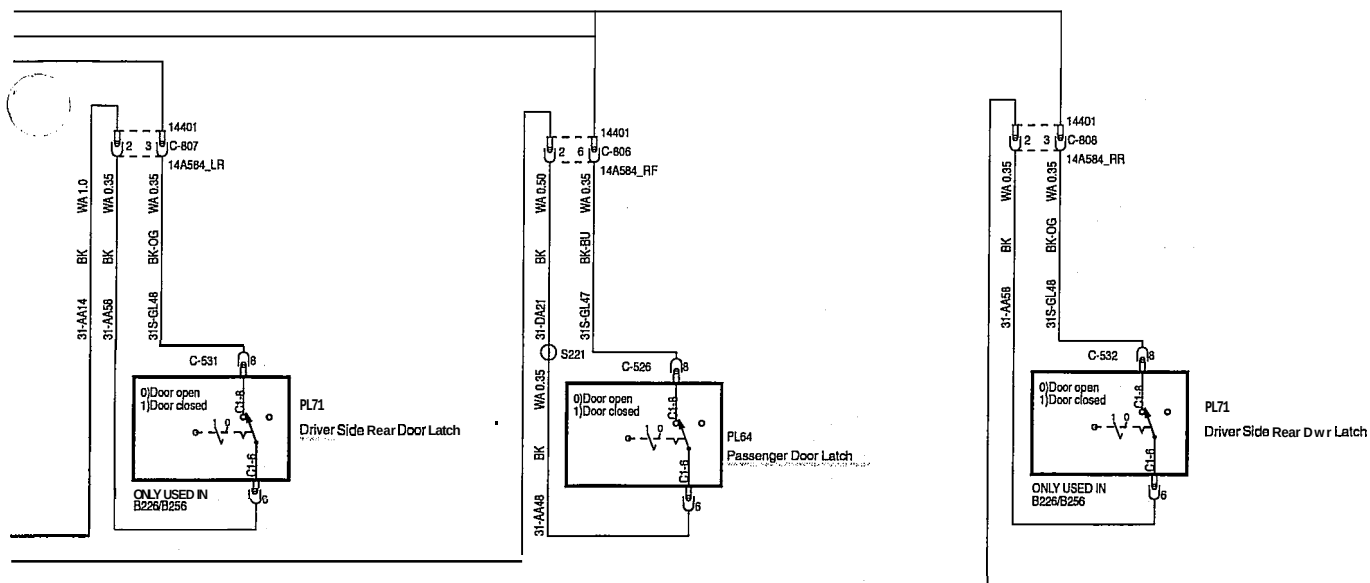


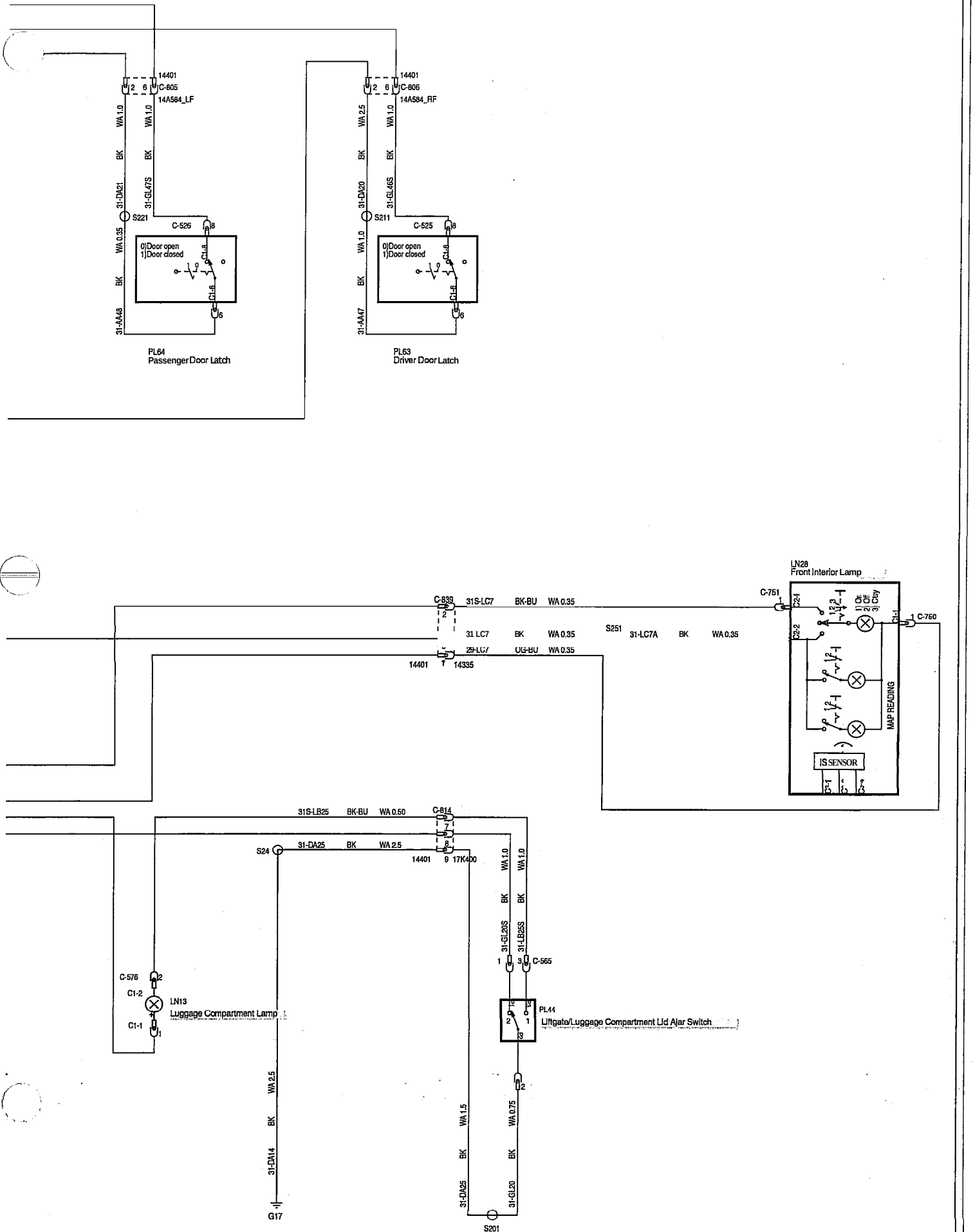


325	BK-BU	WA 0.50	C-81
L20	BK-RD	WA 0.35	C-7
25	BK	WA 2.5	C-7









 1 29-LC7 OG-BU WA0.35
78GG-14488-SA
C-750
TO FROM DOME LAMP
HARNES 14335

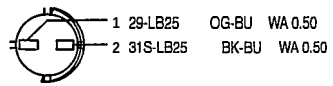
 1 29-LC17 OG-YE WA0.35

85AG-14488-JA

C-752

TO REAR DOME LAMP

HARNESS14335

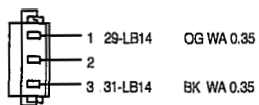


91AG-13K370-AB

C-576

TO LUGGAGE COMPARTMENT LAMP

HARNESS14401

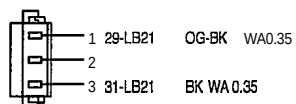


94BG-14469-LCB

C-491

TO LEFT REAR MAP-READING LAMP

HARNESS 14335



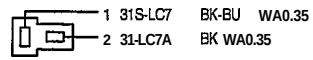
94BG-14489-LCB

C-490

TO RIGHT REAR MAP-READING LAMP

HARNESS 14335

PIN 2 => 31-LC7BK 0.35 WA

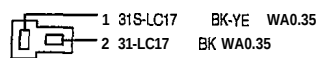


81AG-14488-GA

C-751

TO FRONT DOME LAMP

HARNESS 14335

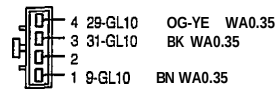


81AG-14488-GA

C-753

TO REAR DOME LAMP

HARNESS 14335



2S7T-14489-DA

G769

TO FRONT DOME LAMP (ST150)

HARNESS 14335



SECTION 417-04 Daytime Running Lamps (DRL)

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

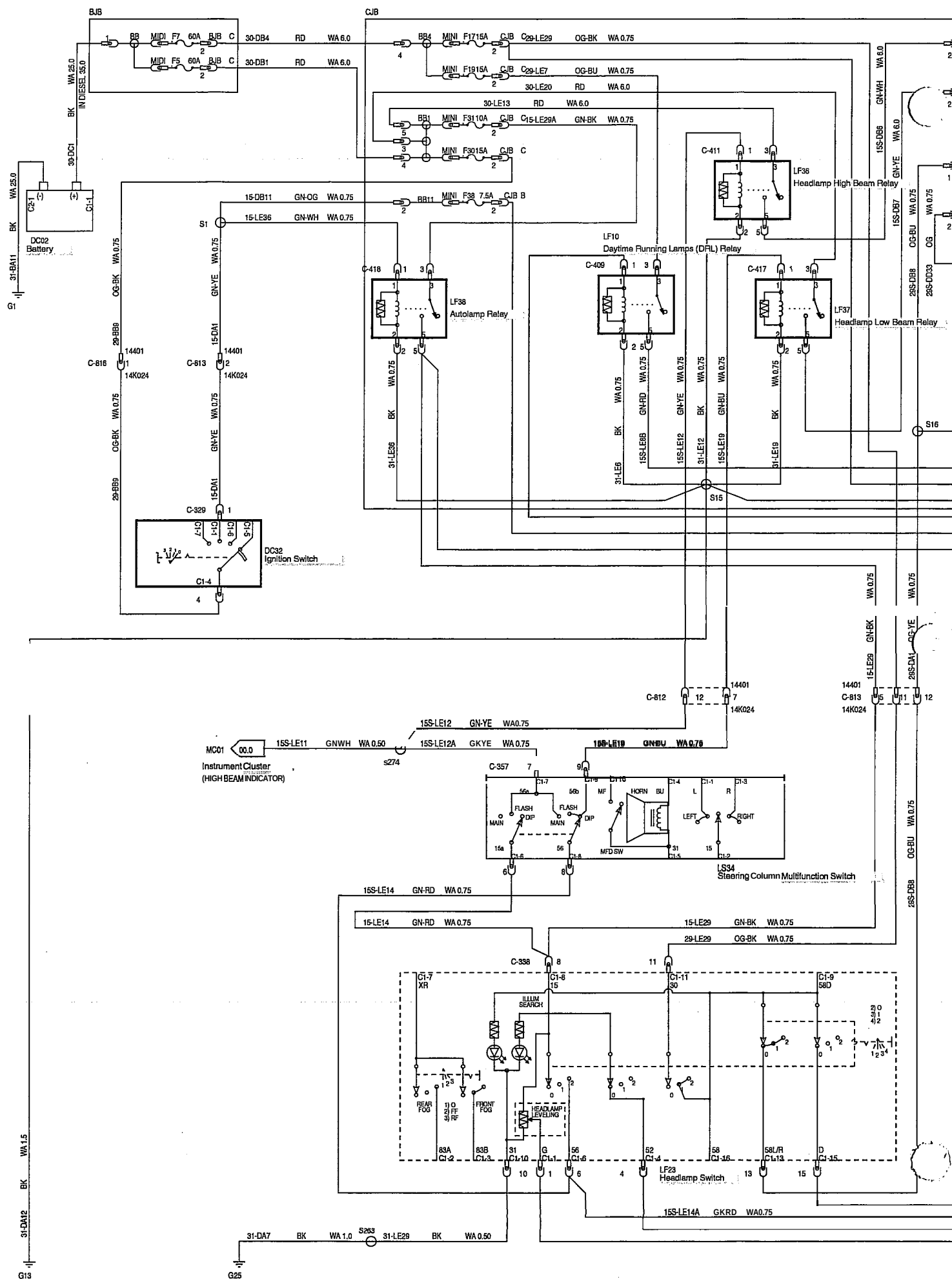
PAGE

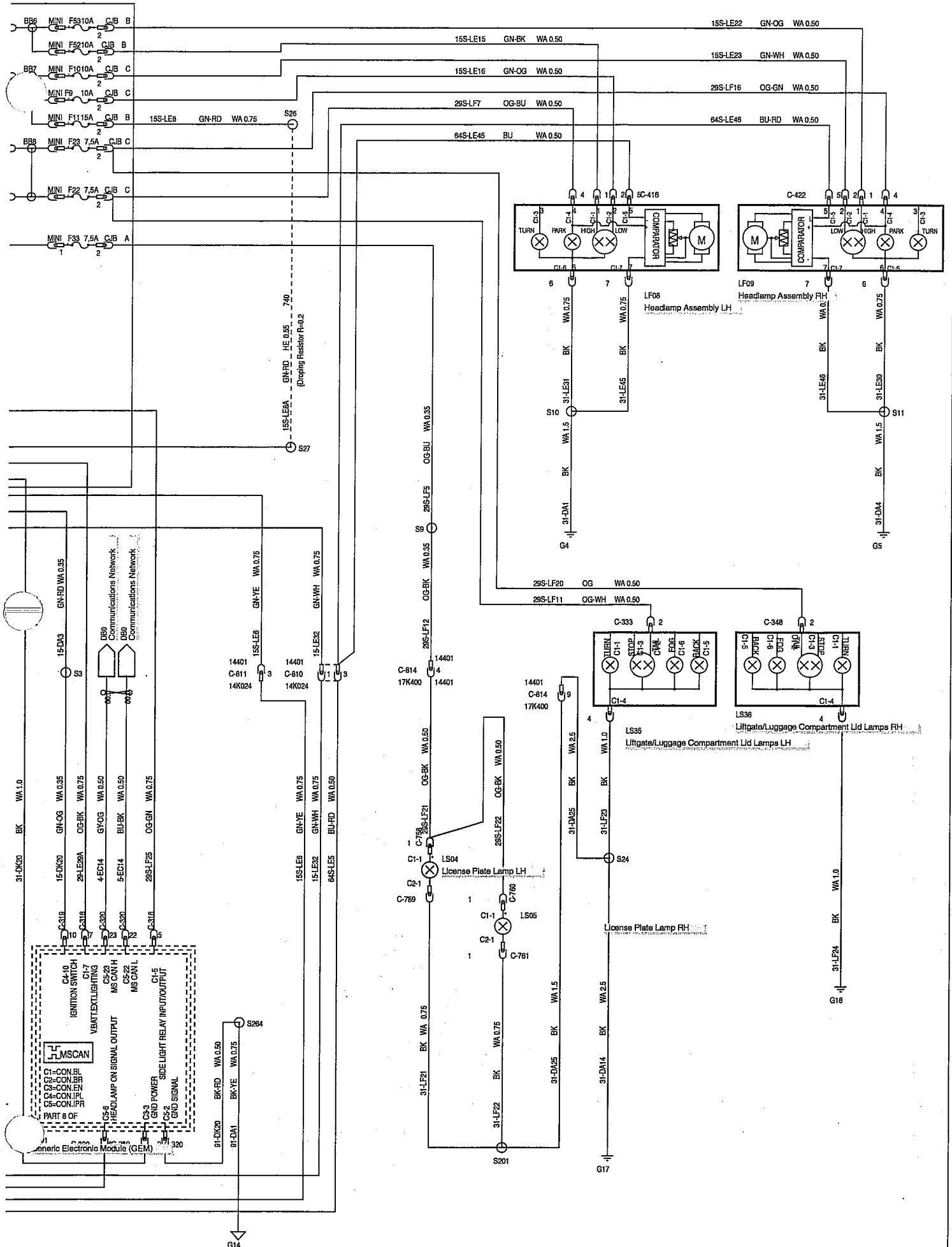
SCHEMATICS

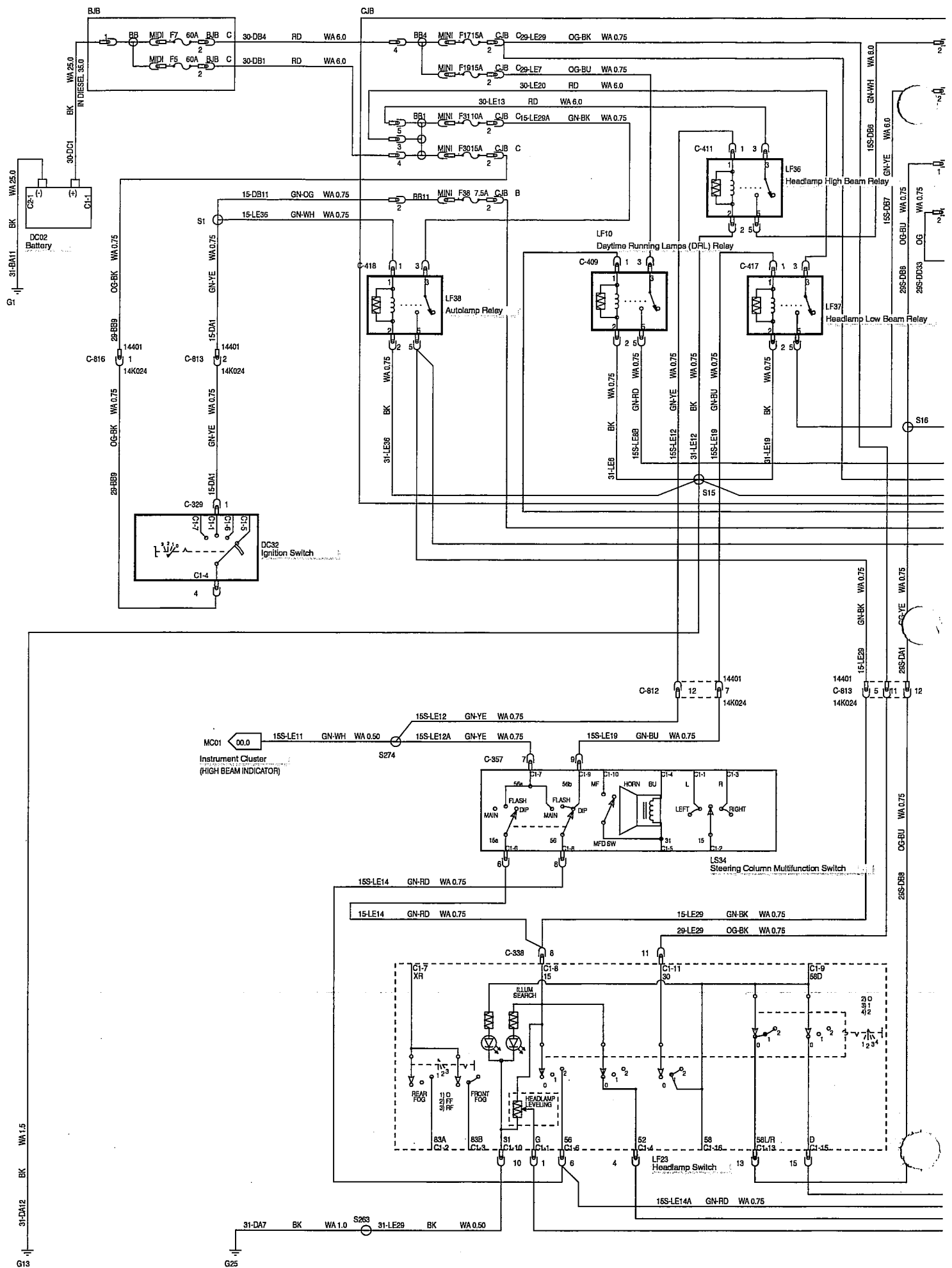
Daytime Running Lamps (DRL).....	417-04-2
Daytime Running Lamps (DRL) — 2.0L Duratec-ST (M14).....	417-04-4

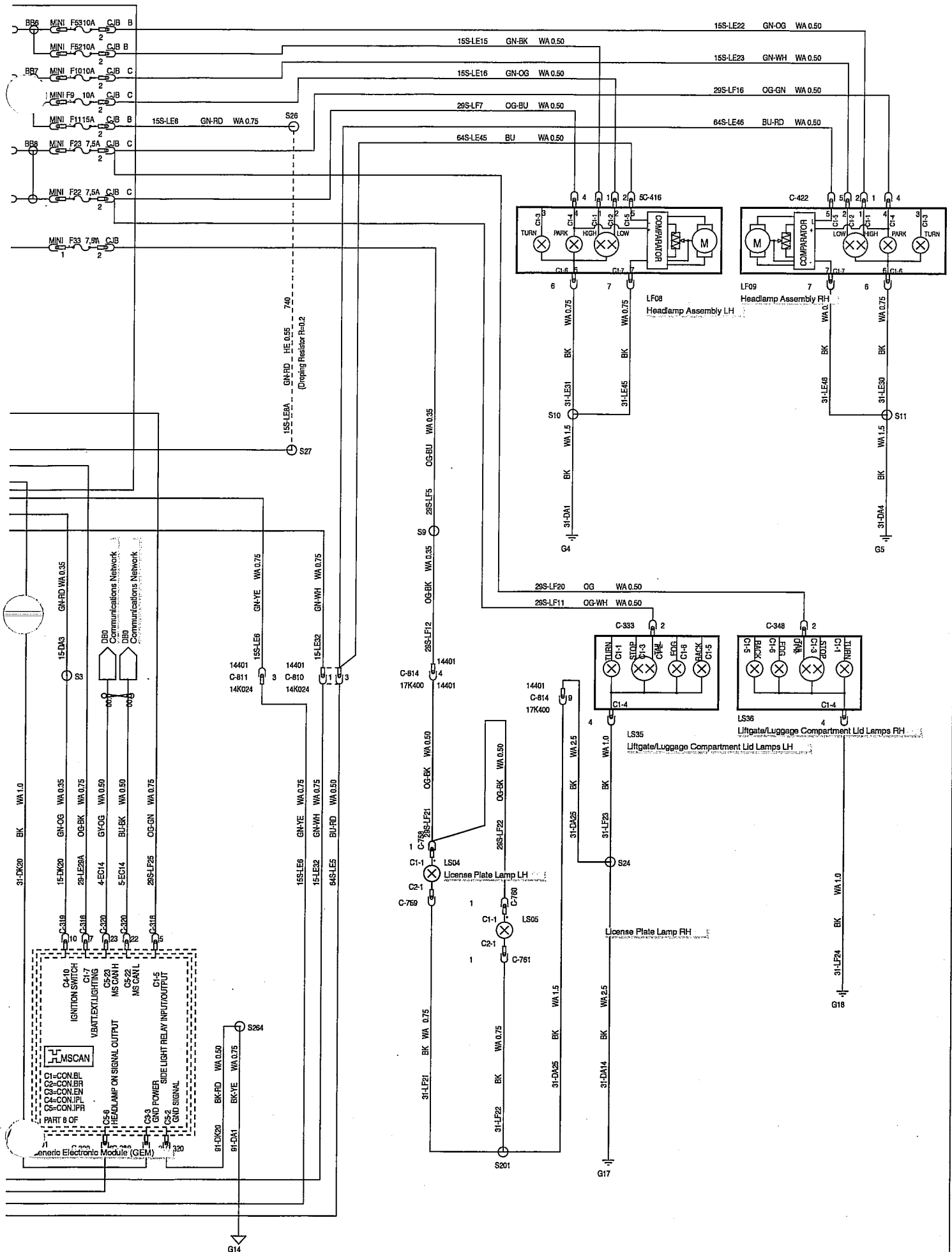
CONNECTORS

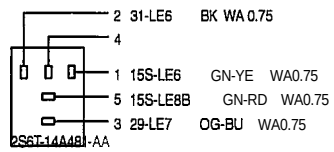
Daytime Running Lamps (DRL) Relay.....	417-04-6
--	----------









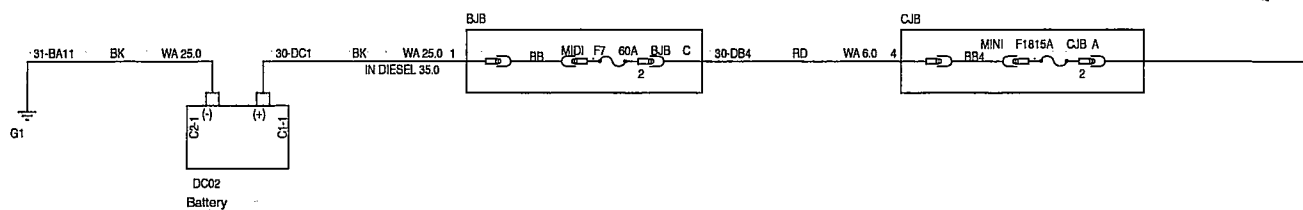


C-409
TO DAYTIME RUNNING LIGHT RELAY
HARNESS 14401

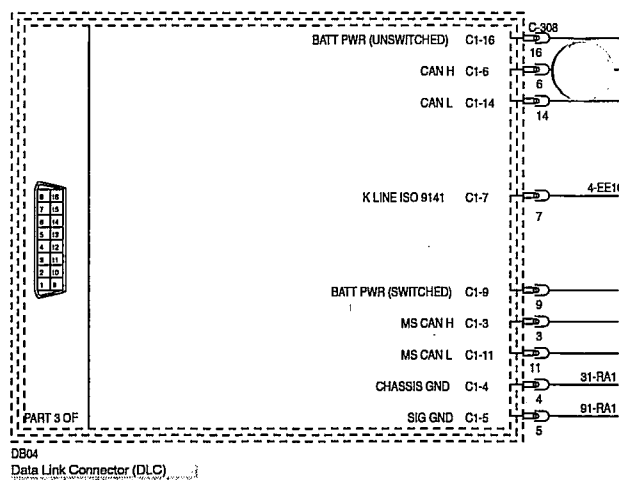
SECTION 418-00 Module Communications Network

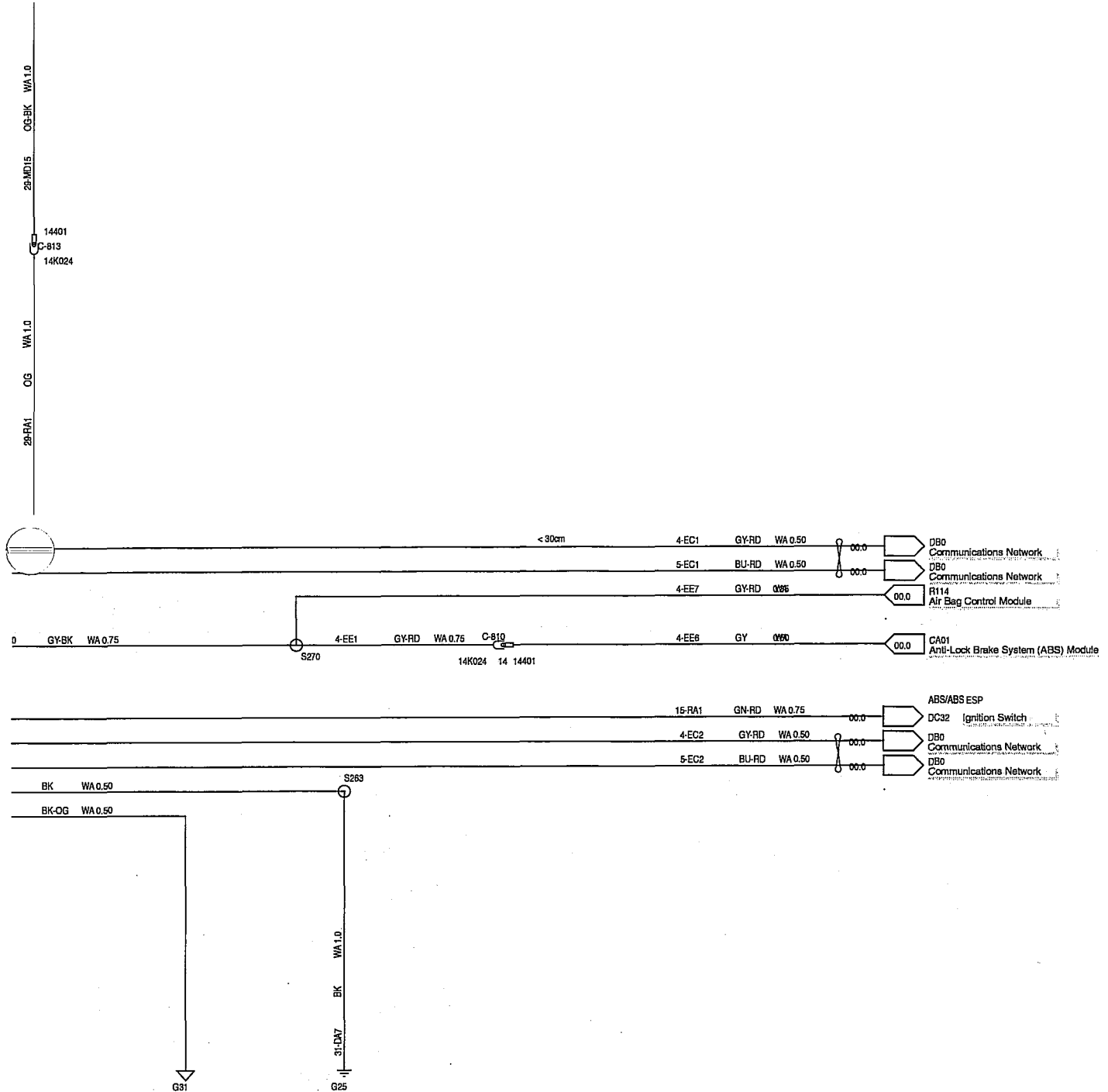
VEHICLE APPLICATION:2006.0 Fiesta

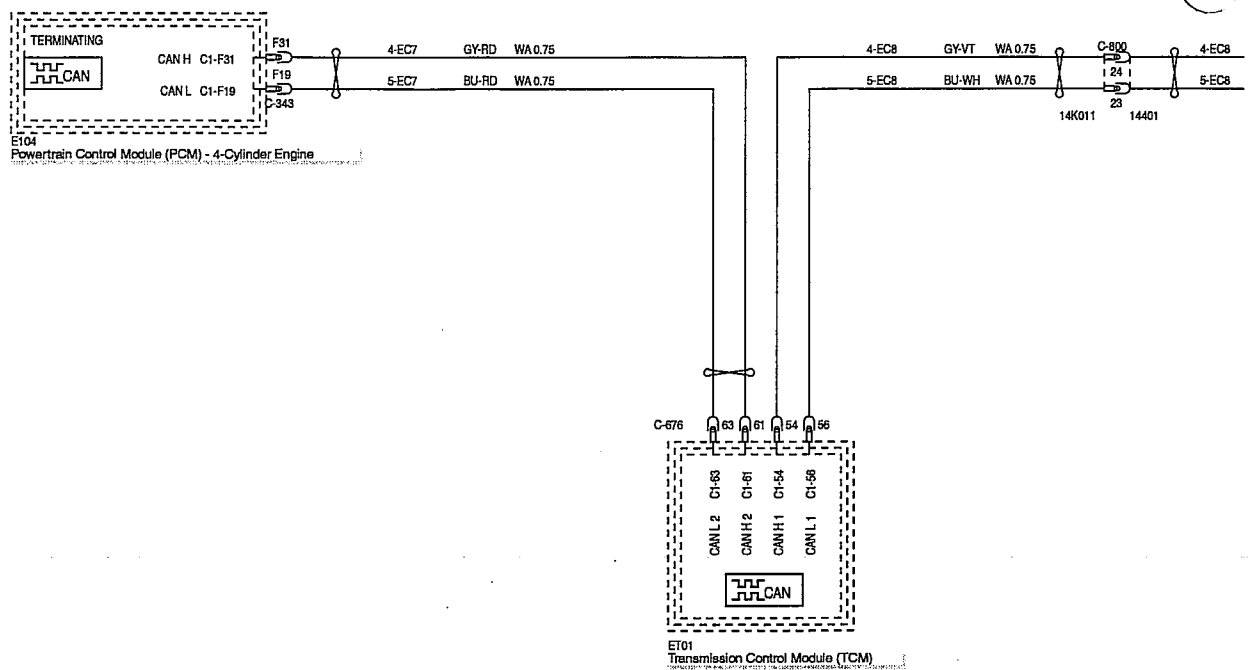
CONTENTS	PAGE
SCHEMATICS	
Diagnostics.....	418-00-2
Communications Network — 1.4L Duratec-16V (Sigma), Vehicles With: Automated Gearshift.....	418-00-4
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel, Vehicles With: Automated Gearshift.....	418-00-6
Communications Network — Vehicles With: 4-Speed Automatic Transmission (AW81-40).	418-00-8
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel.....	418-00-10
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel, VIN Plate Emission Level Code: S, Vehicles With: Anti-Lock Brake System (ABS).....	418-00-12
Communications Network — 1.3L Duratec-8V (Rocam)/1.25L Duratec-16V (Sigma)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma).....	418-00-14
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel, VIN Plate Emission Level Code: S, Vehicles With: Stability Assist/Anti-Lock Brake System (ABS).....	418-00-16
Communications Network — 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Anti-Lock Brake System (ABS).....	418-00-18
Communications Network — 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Stability Assist/Anti-Lock Brake System (ABS).....	418-00-20
Communications Network — 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Traction Control/Stability Assist.....	418-00-22
Communications Network — 1.6L Duratorq-TDCi (DV) Diesel, Vehicles With: Anti-Lock Brake System (ABS).....	418-00-24
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel, Vehicles With: Stability Assist/Anti-Lock Brake System (ABS).....	418-00-26
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel, Vehicles With: Anti-Lock Brake System (ABS).....	418-00-28
Communications Network — 1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Stability Assist/Anti-Lock Brake System (ABS).....	418-00-30
Communications Network — 1.3L Duratec-8V (Rocam)/1.4L Duratec-16V (Sigma)/1.6L Duratec-16V (Sigma), Vehicles With: Anti-Lock Brake System (ABS).....	418-00-32
Communications Network — 1.4L Duratorq-TDCi (DV) Diesel.....	418-00-34
Communications Network - Mid-Speed (MS) Controller Area Network (CAN) Bus — Vehicles Without: Passenger Air Bag Deactivation Switch.....	418-00-36
Communications Network - Mid-Speed (MS) Controller Area Network (CAN) Bus — Vehicles With: Passenger Air Bag Deactivation Switch.....	418-00-38
CONNECTORS	
Data Link Connector (DLC).....	418-00-40

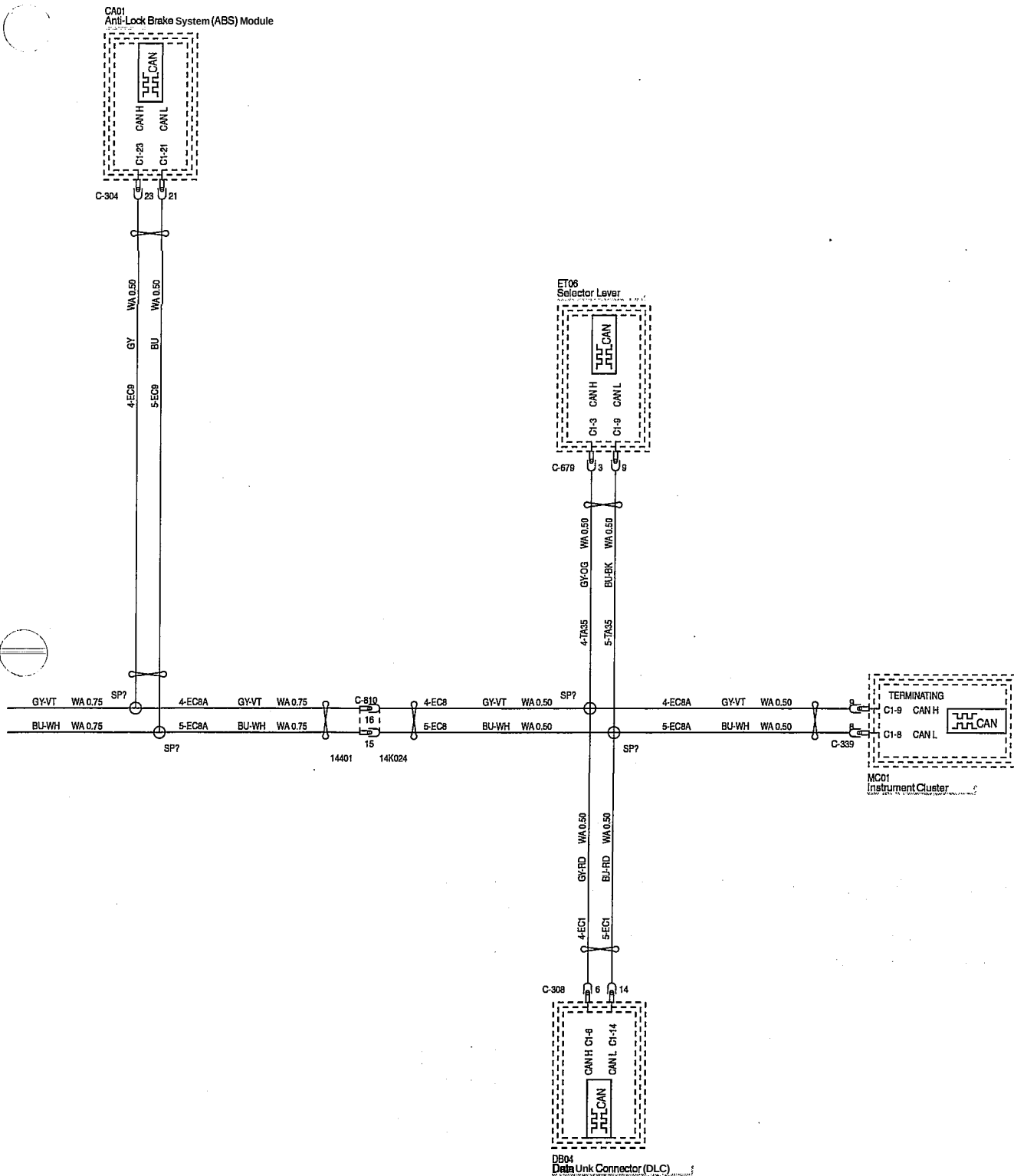


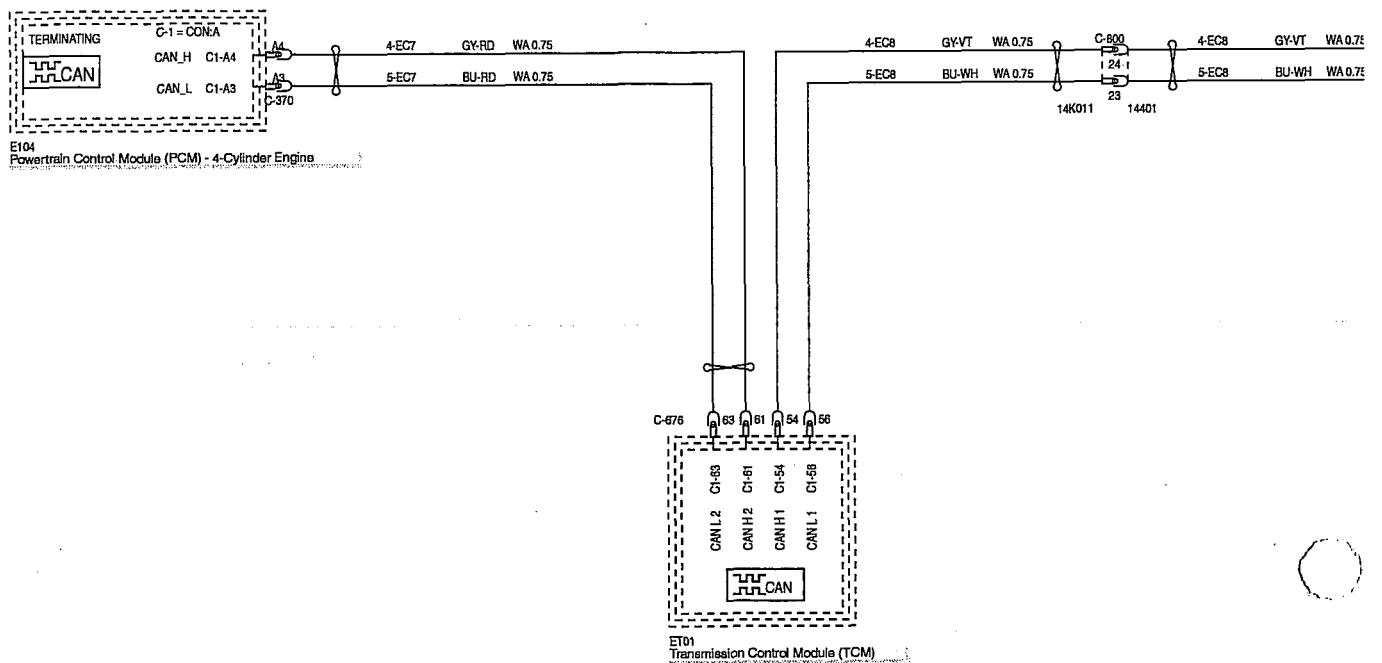
14

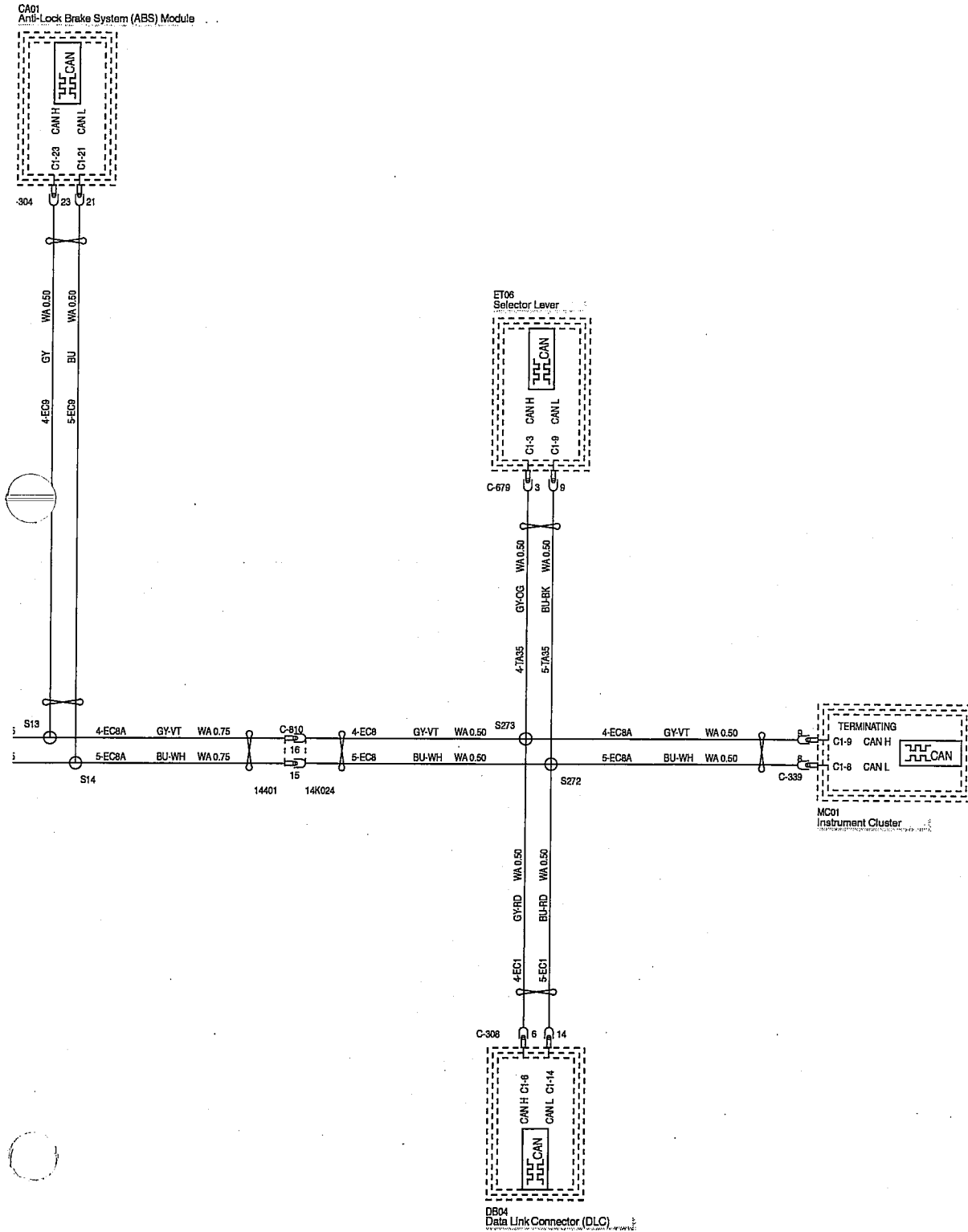


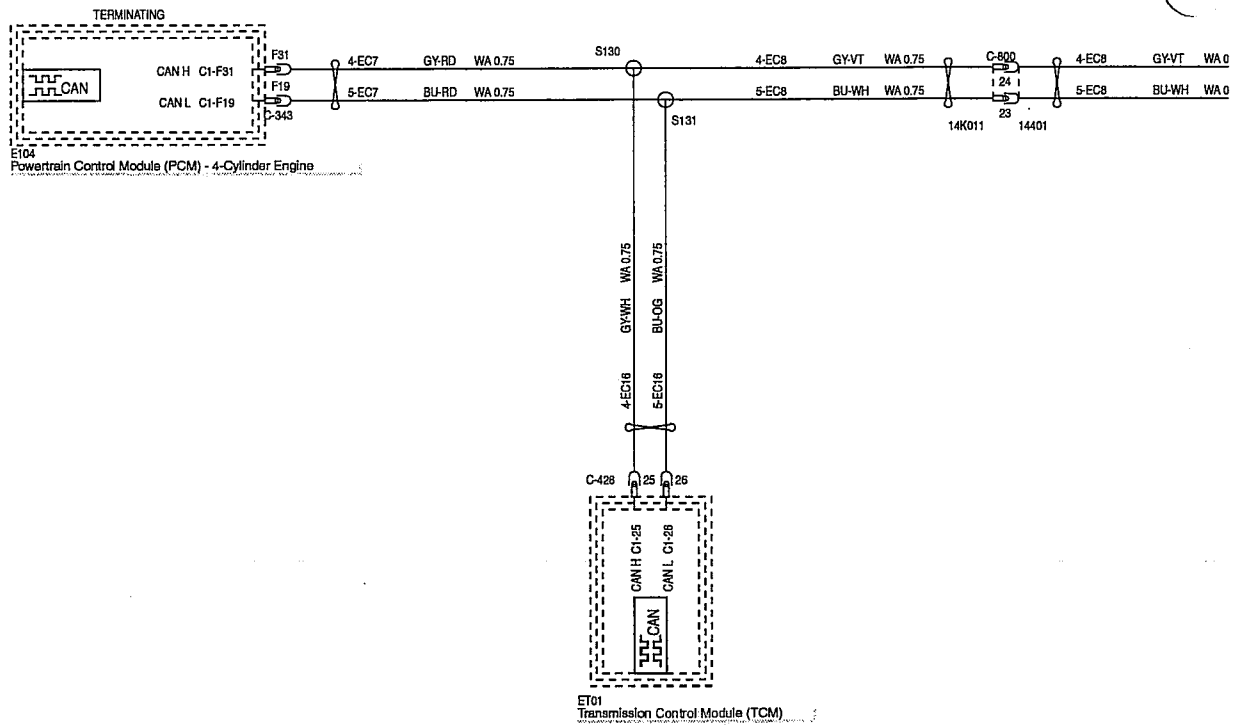


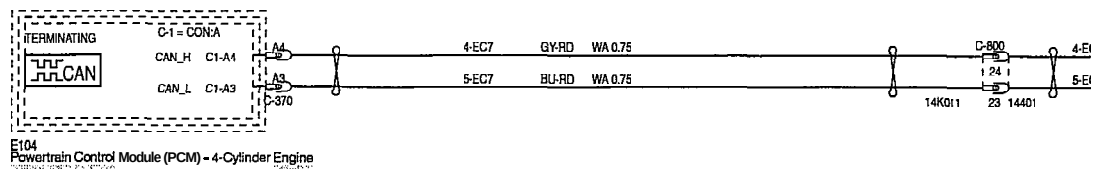


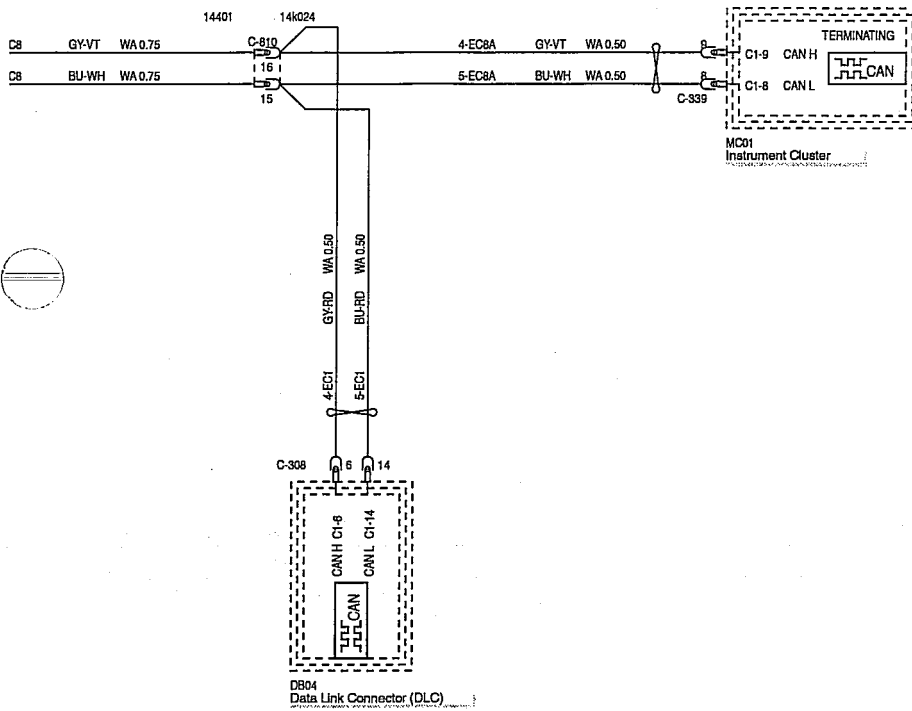


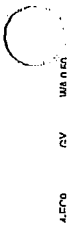




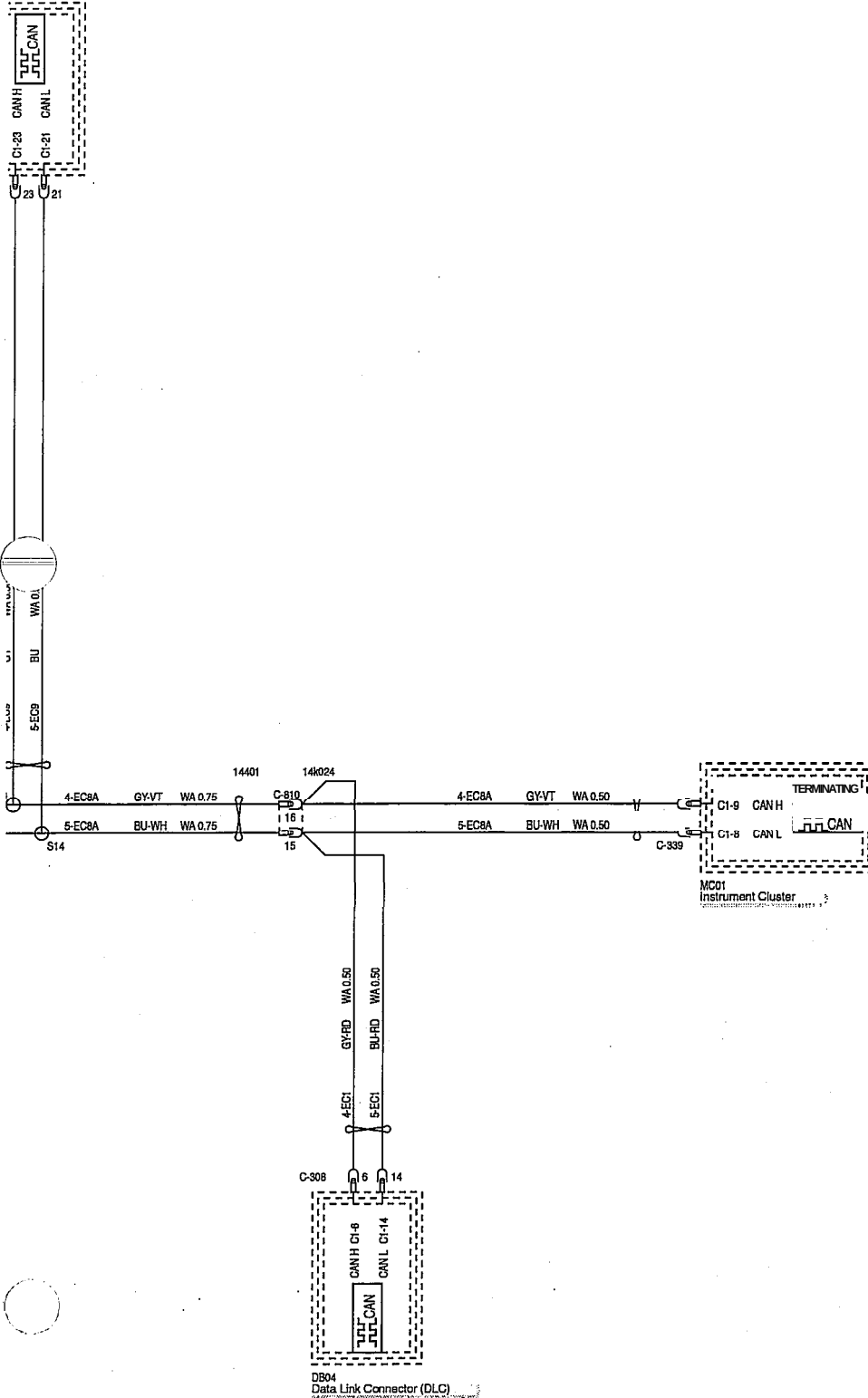


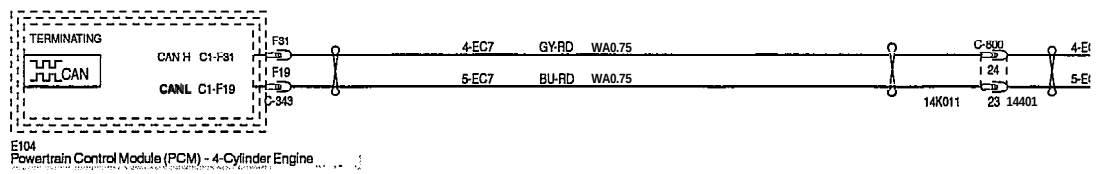




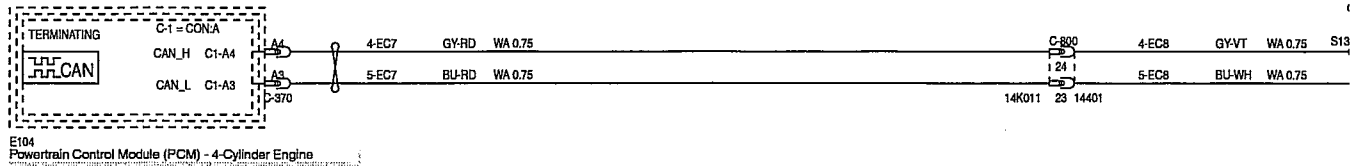
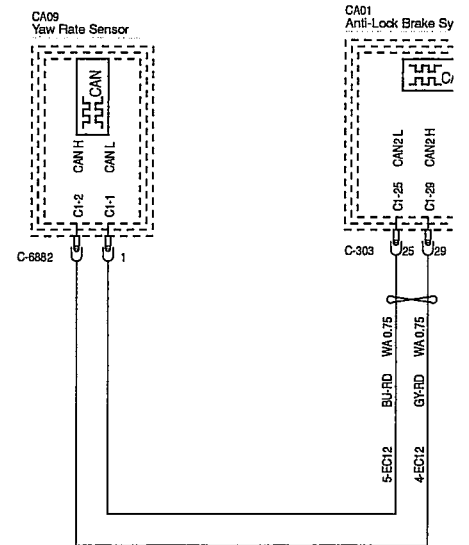


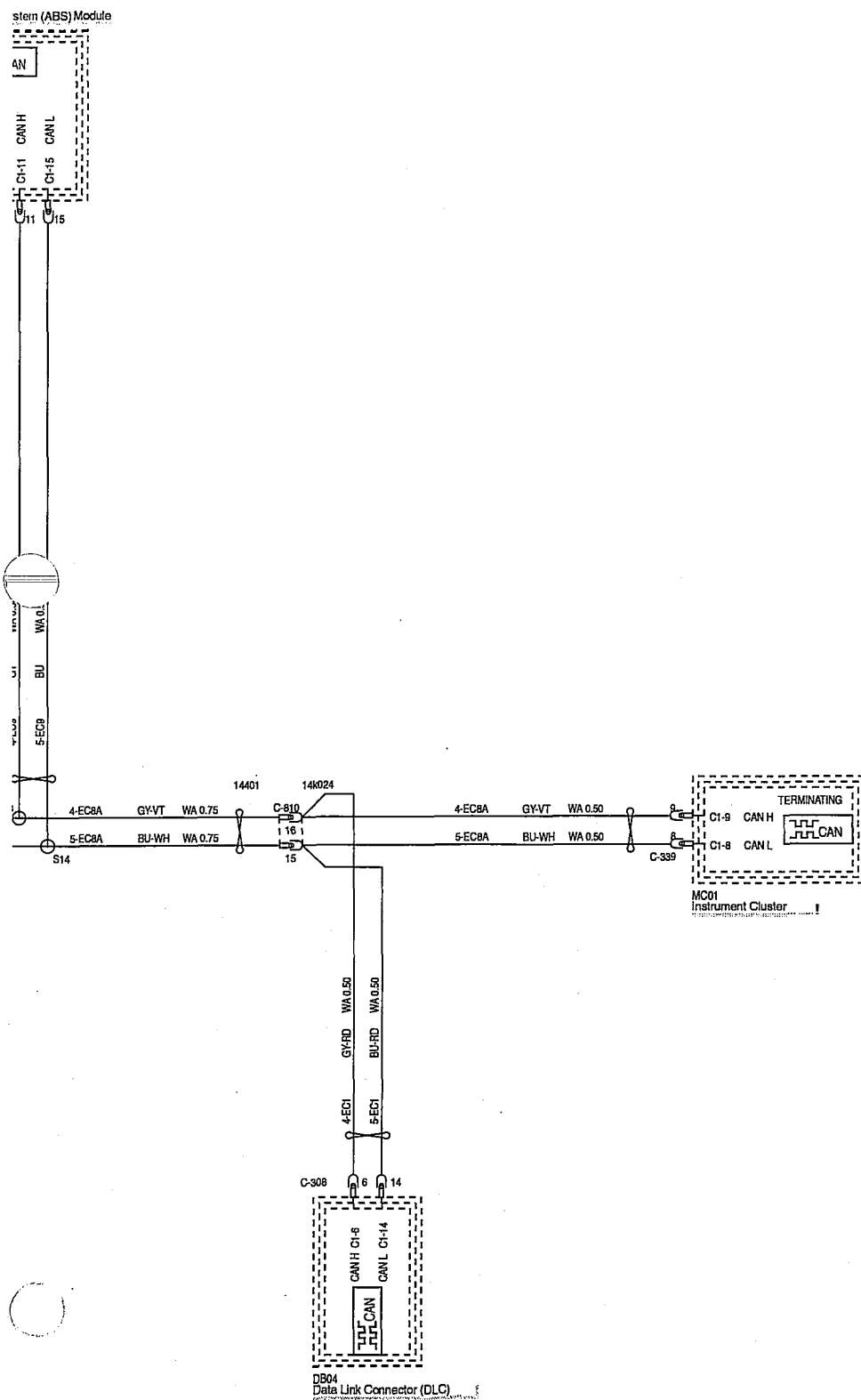
xck Brake System (ABS) Module



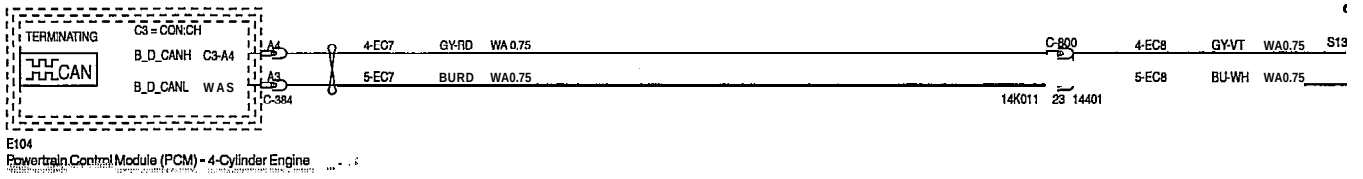


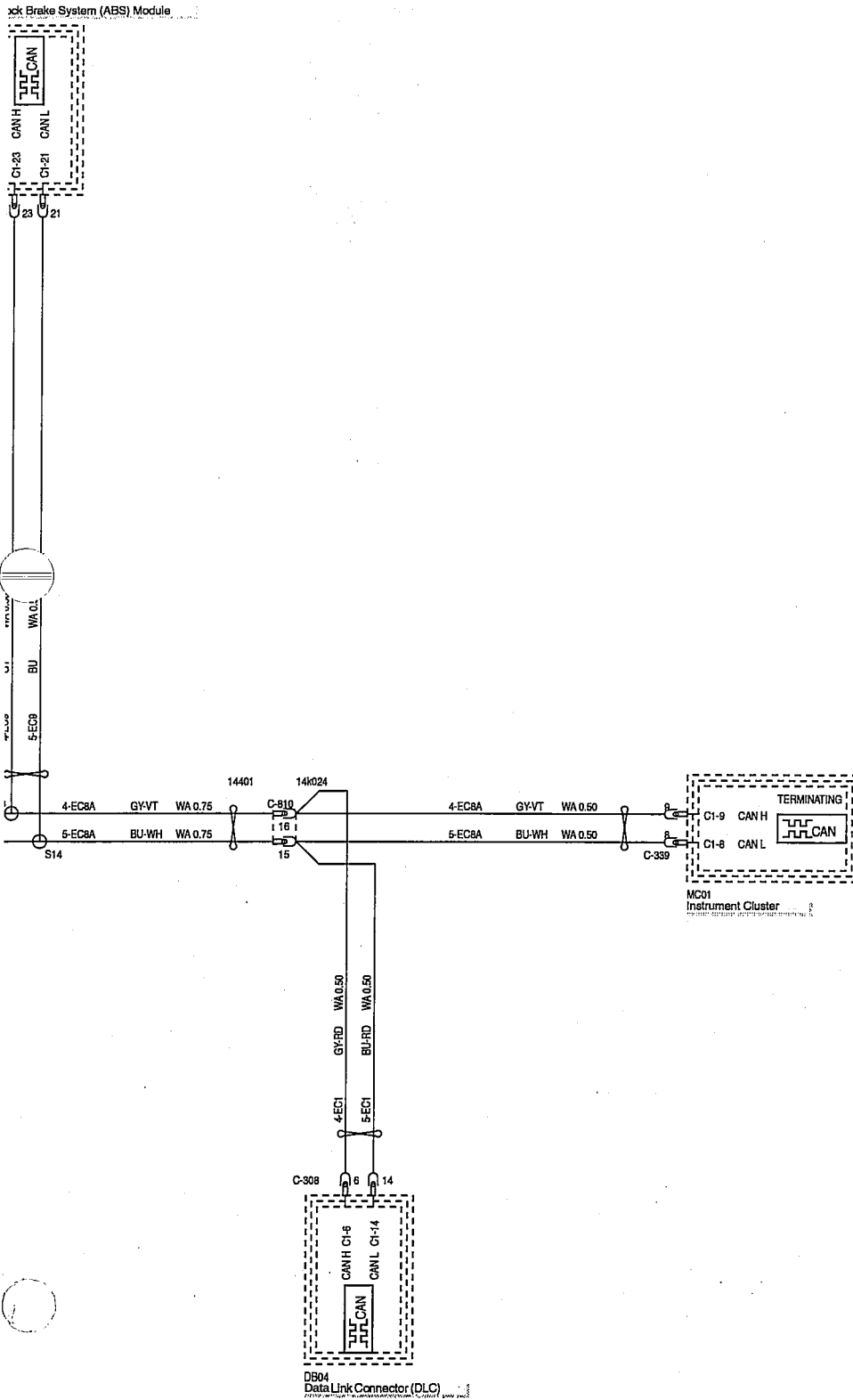
Brake System (ABS)

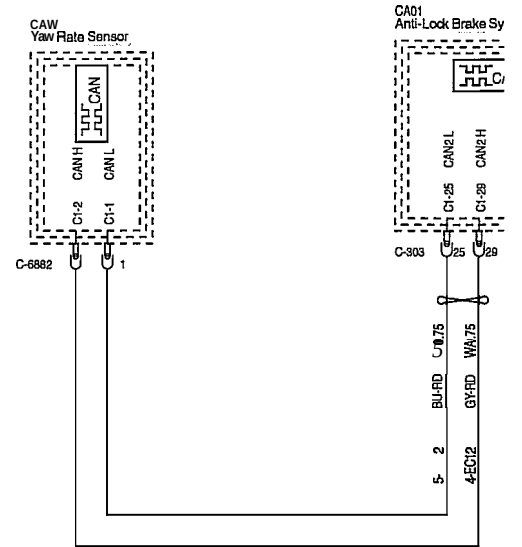
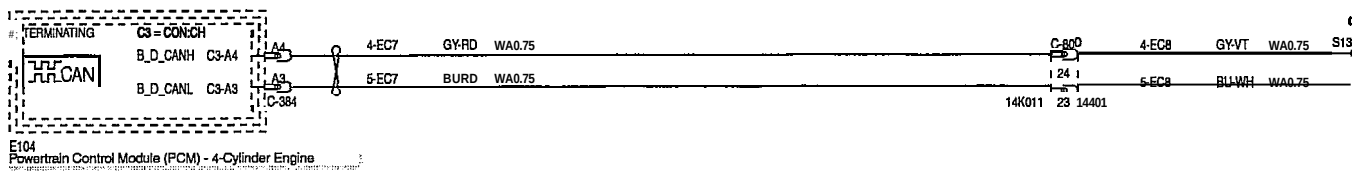


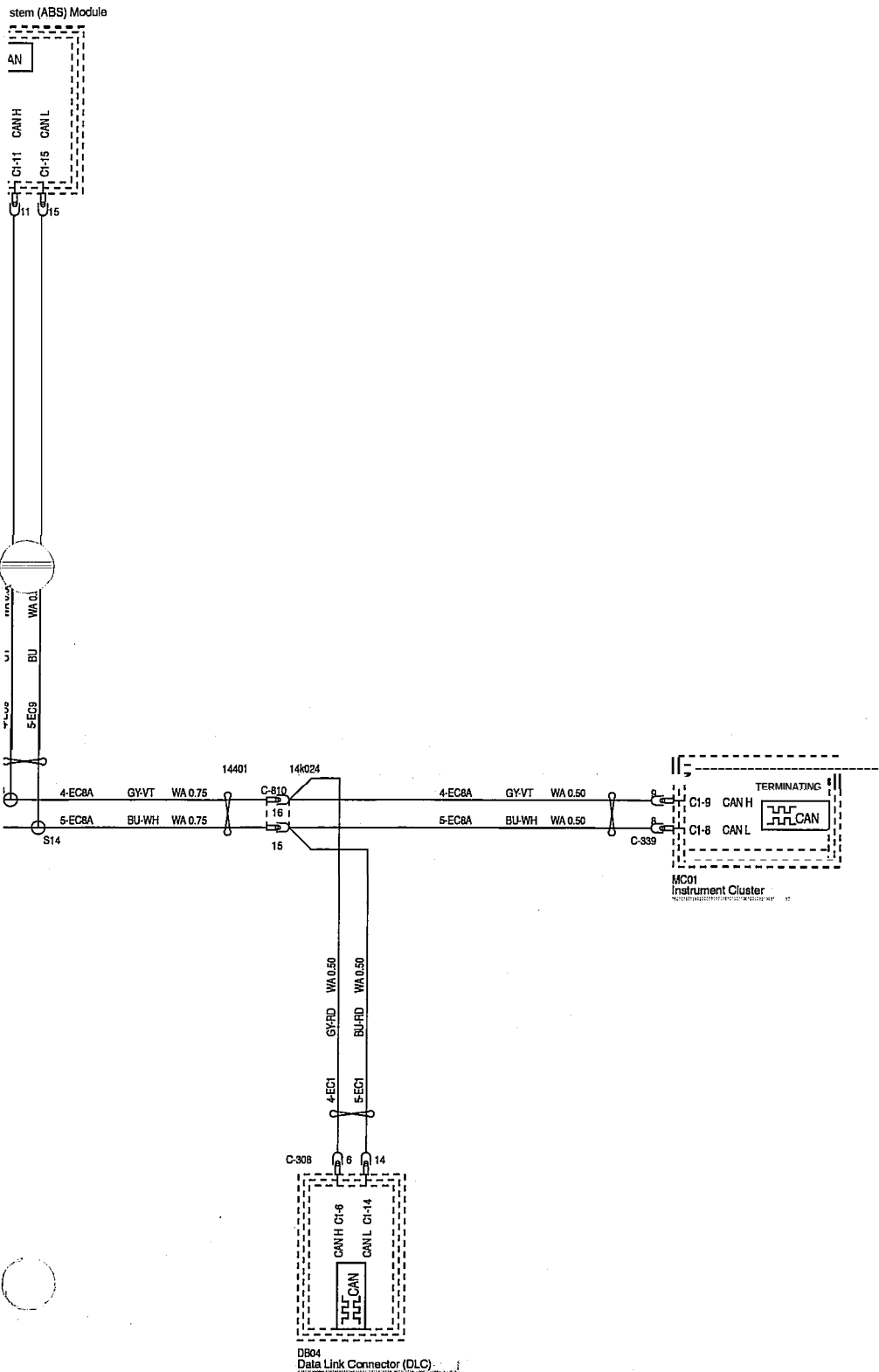


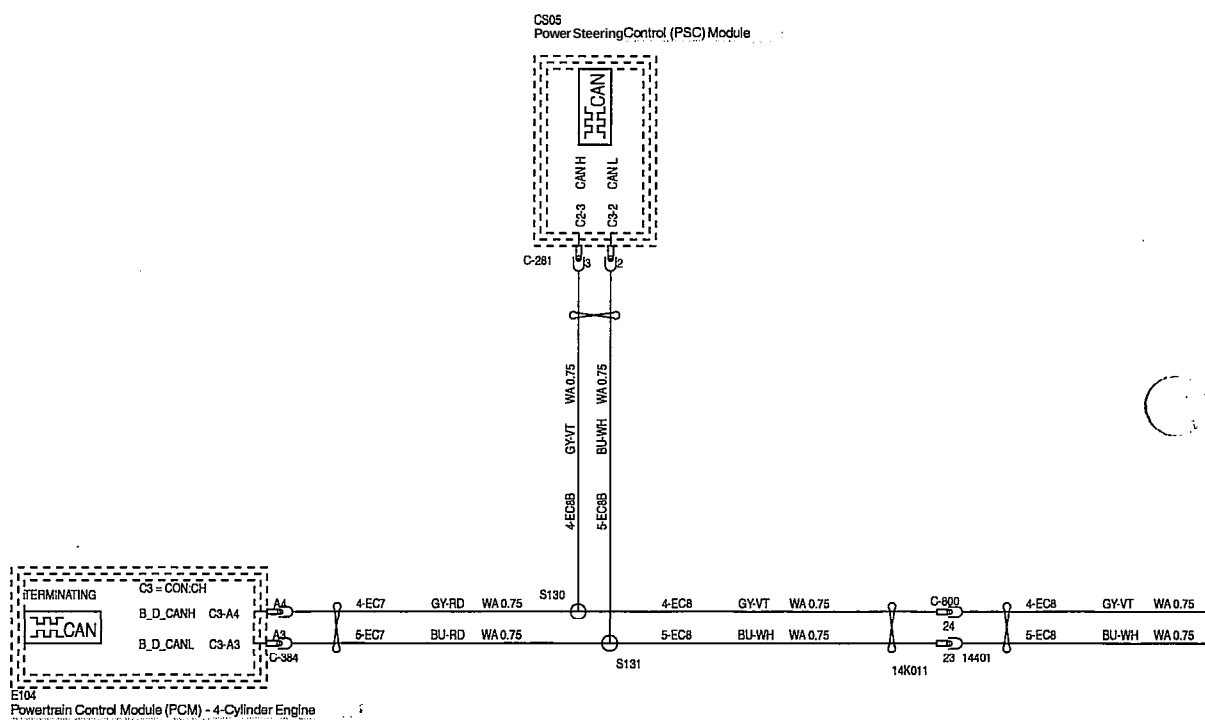
CA01
Anti-Lc
C-304



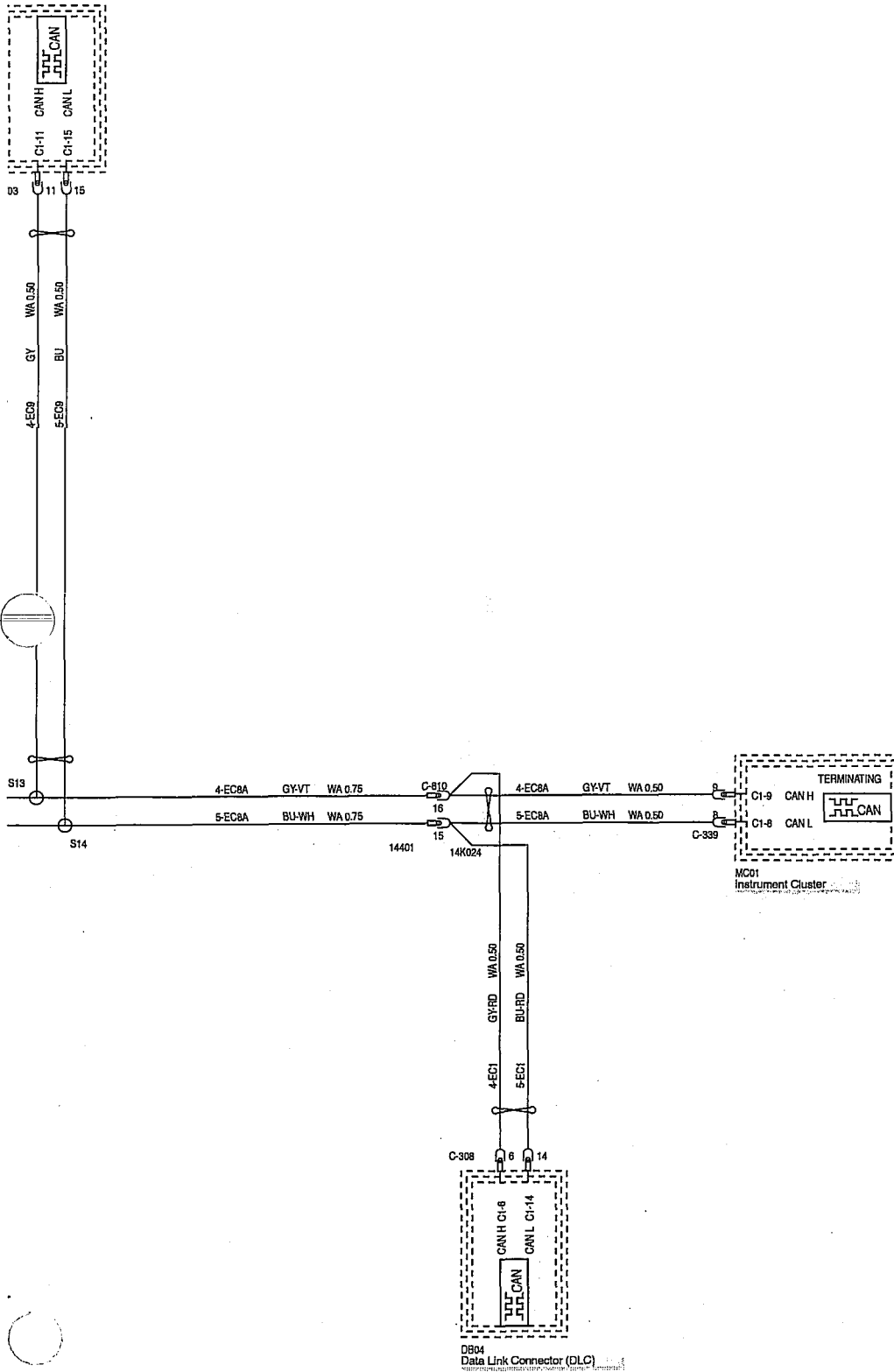


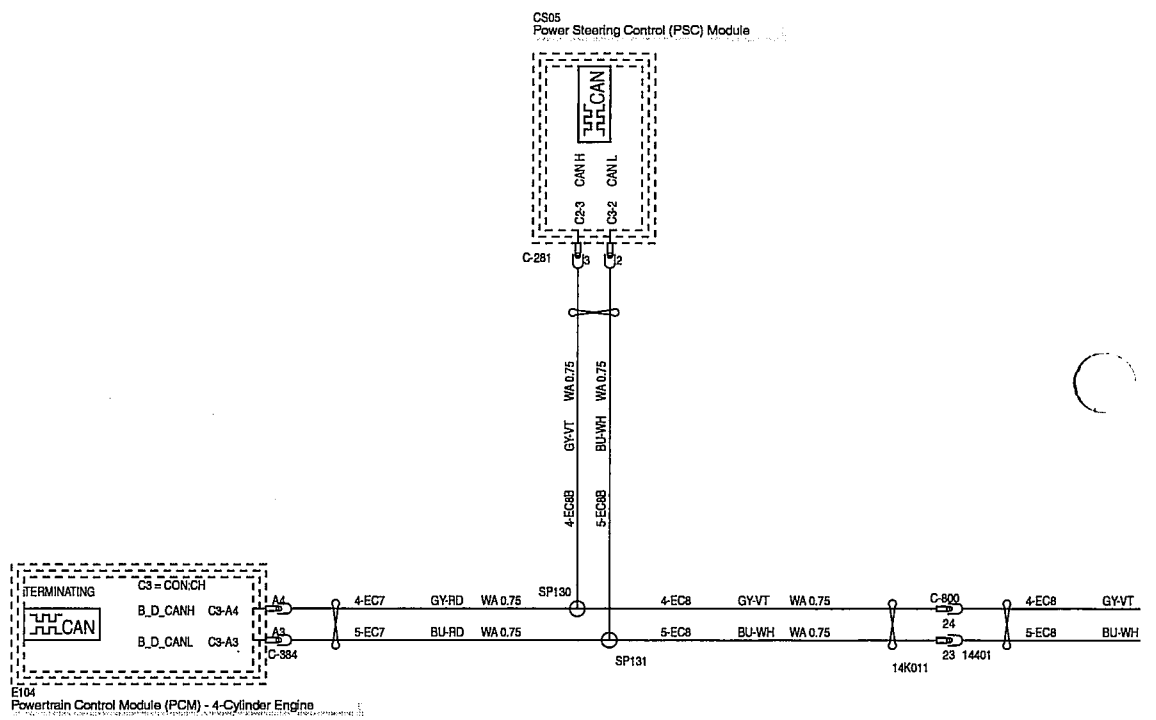


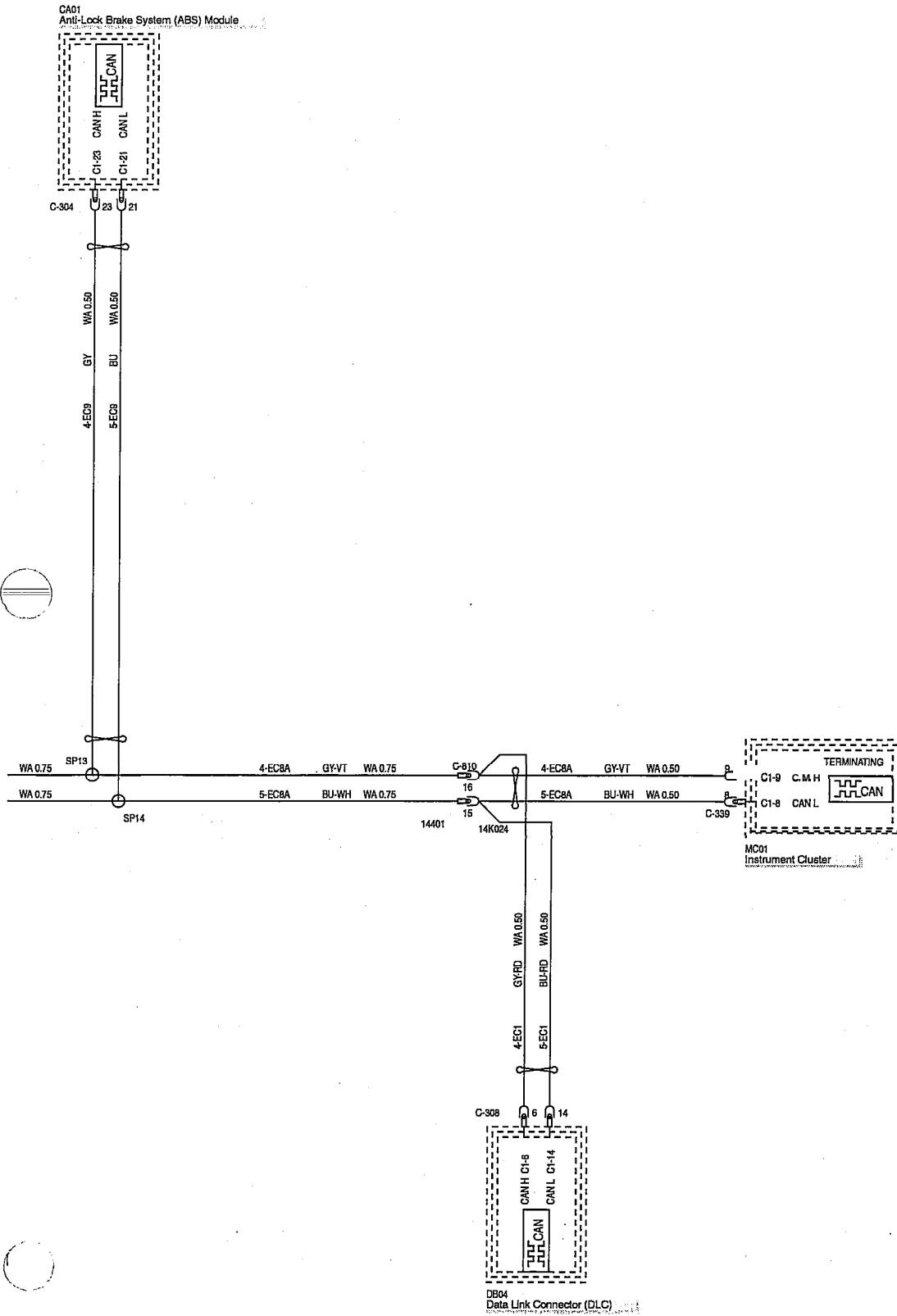


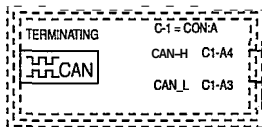


101
Anti-Lock Brake System (ABS) Module

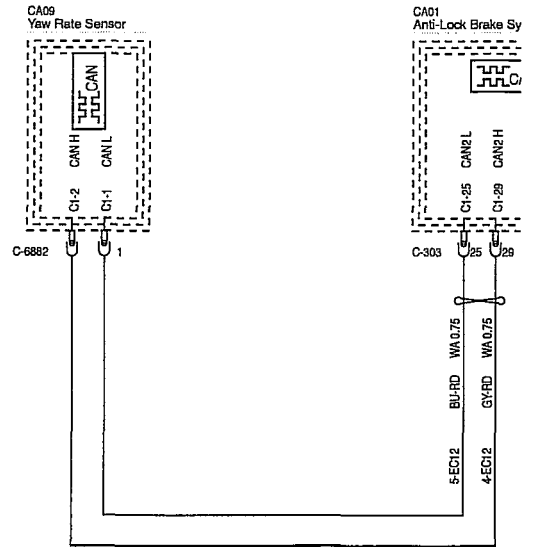


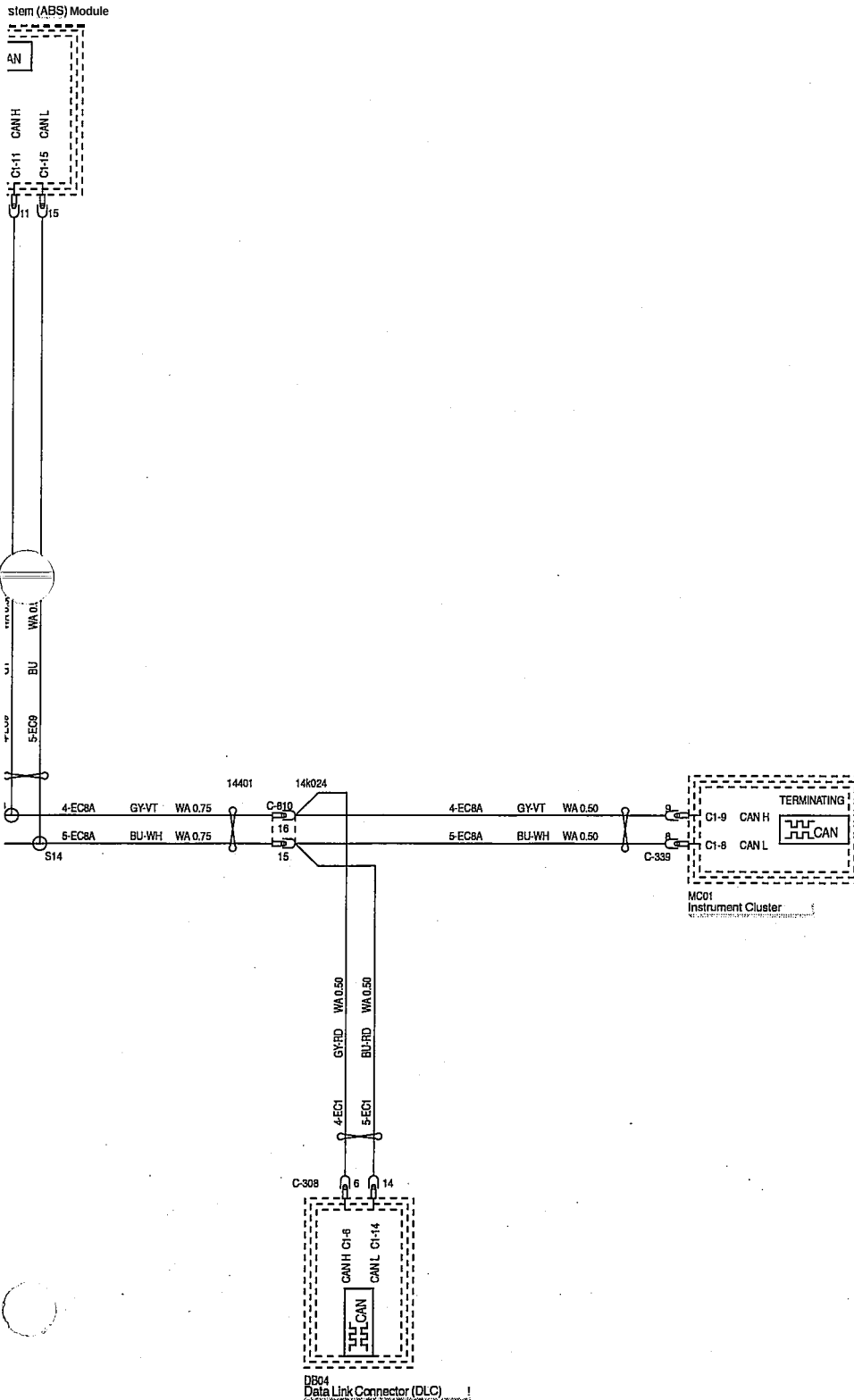






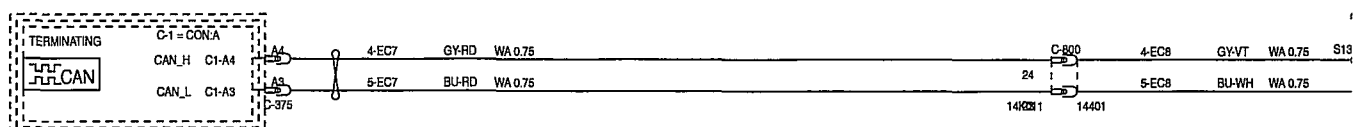
E104
Powertrain Control Module (PCM) - 4-Cylinder Engine



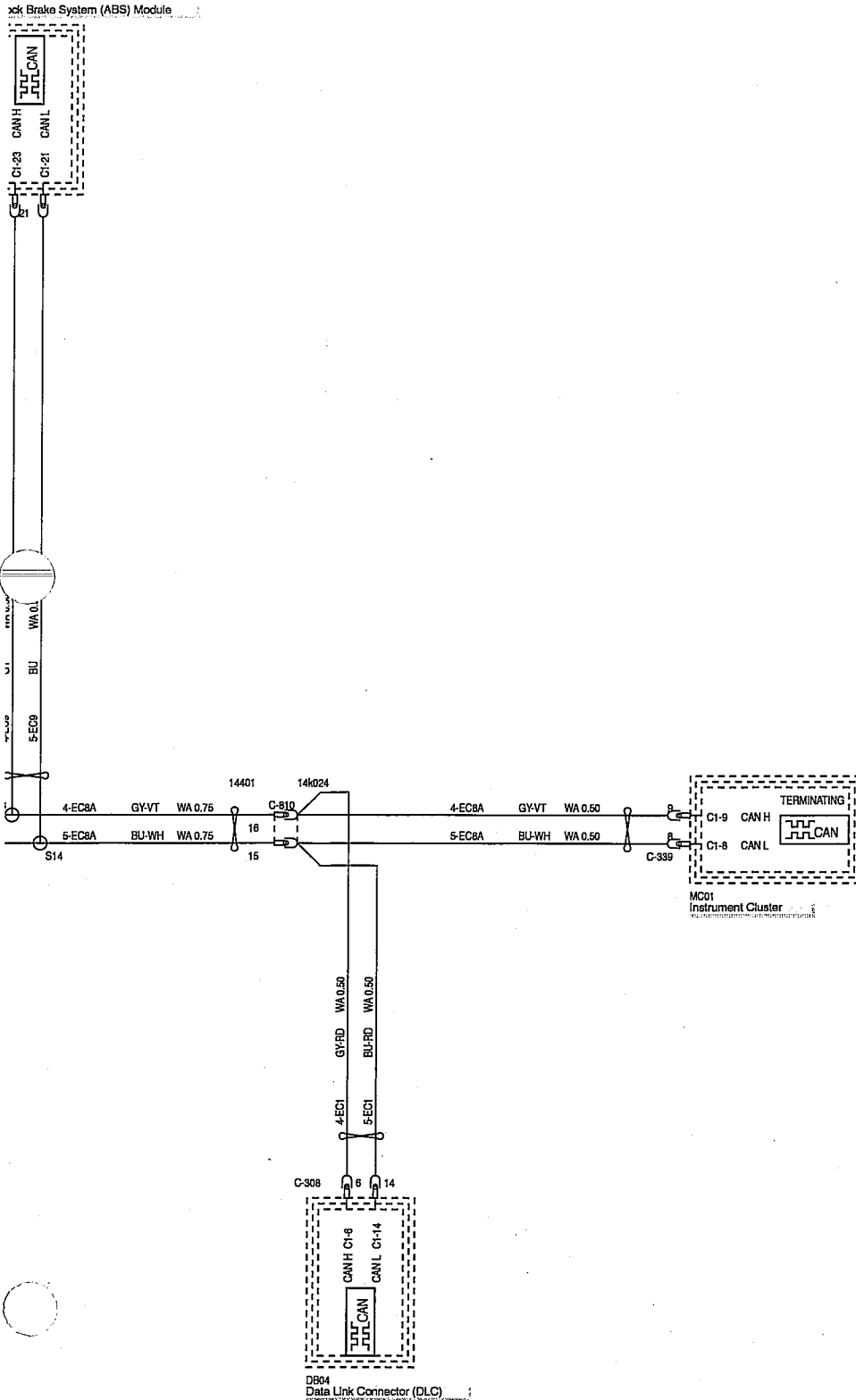


CAOI
Anti-LC

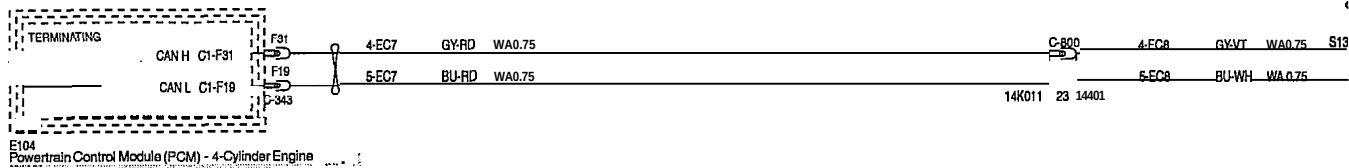
C-30423

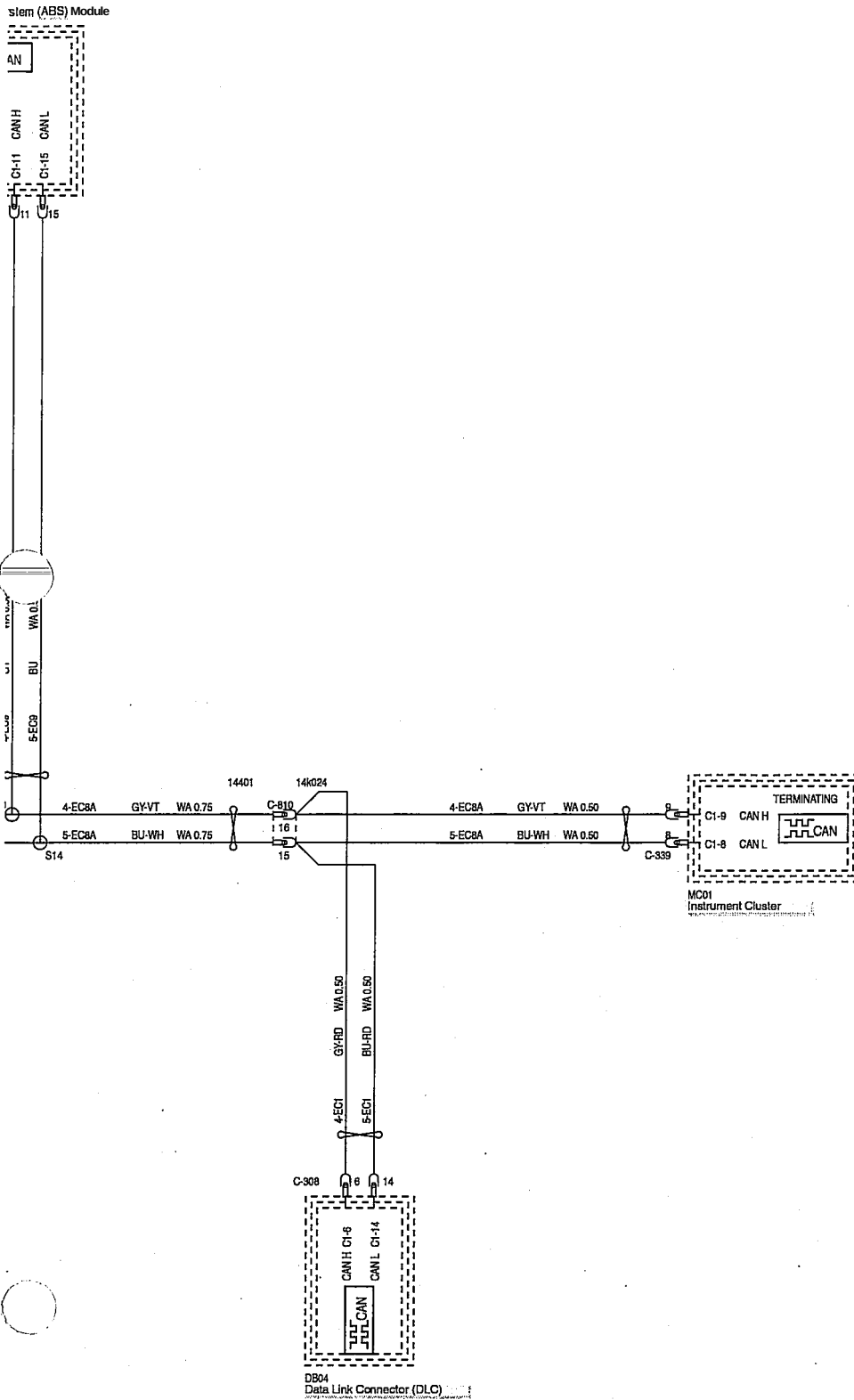


E104
Powertrain Control Module (PCM) - 4-Cylinder Engine



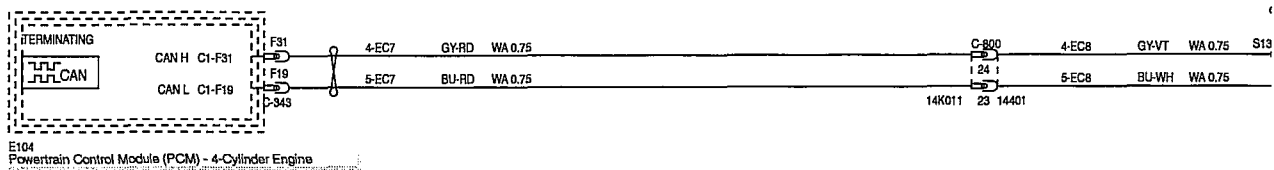
Assist/Anti-Lock Brake System (ABS)



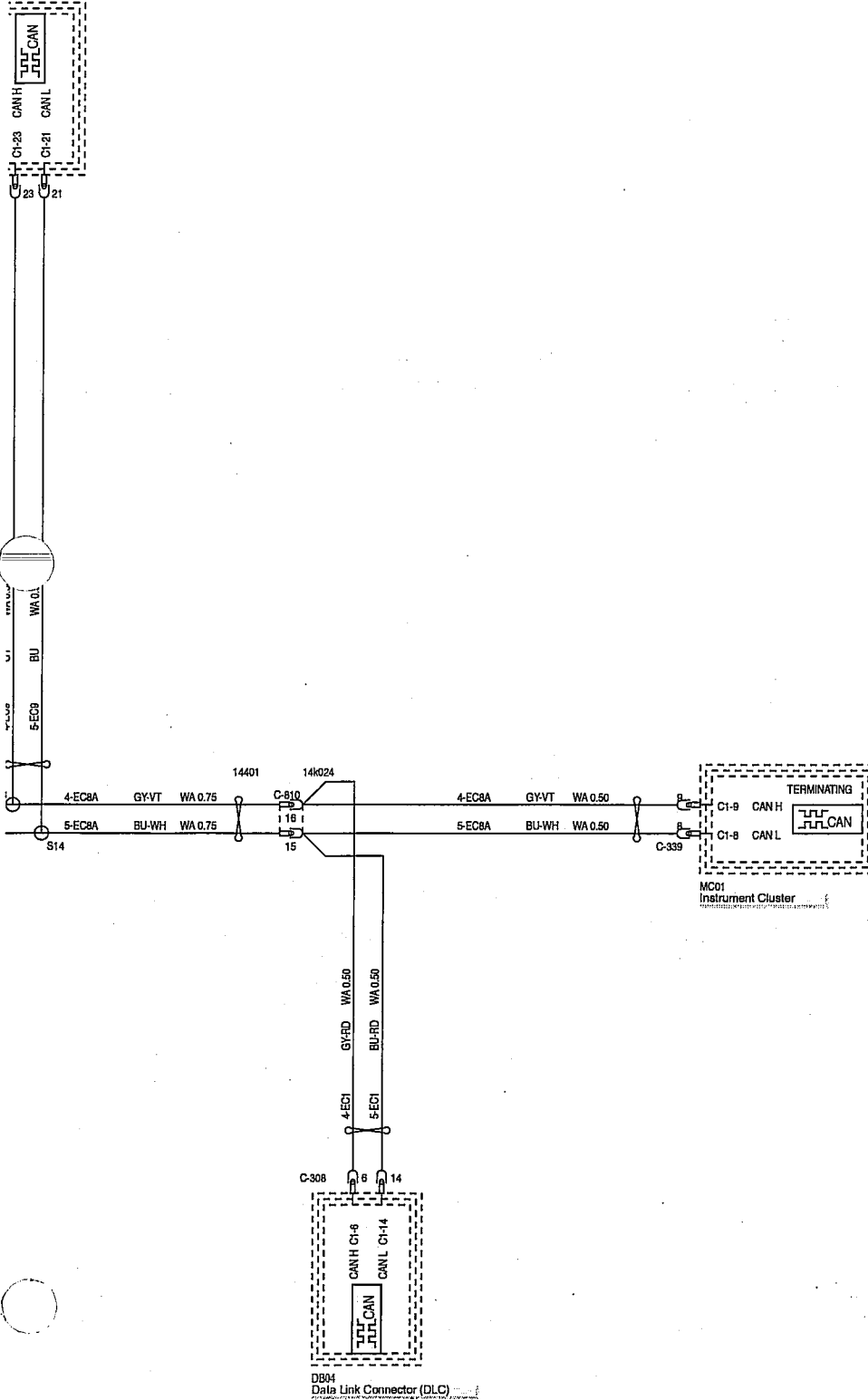


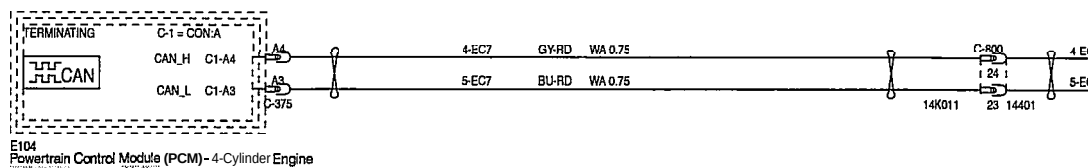
Brake System (ABS)

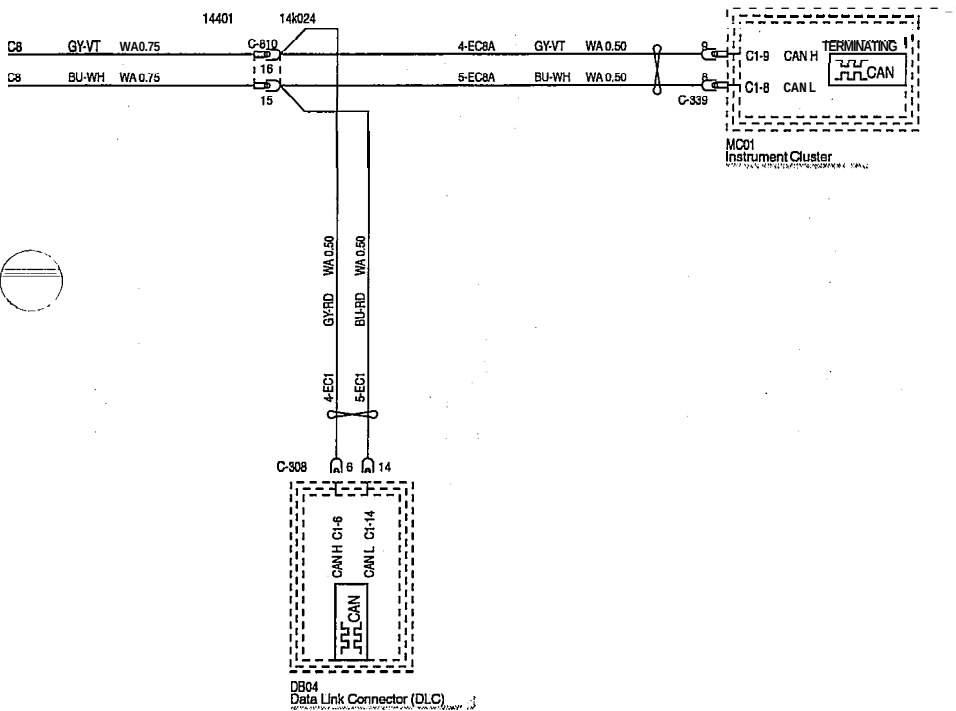
CA01
Anti-Lc
C-304



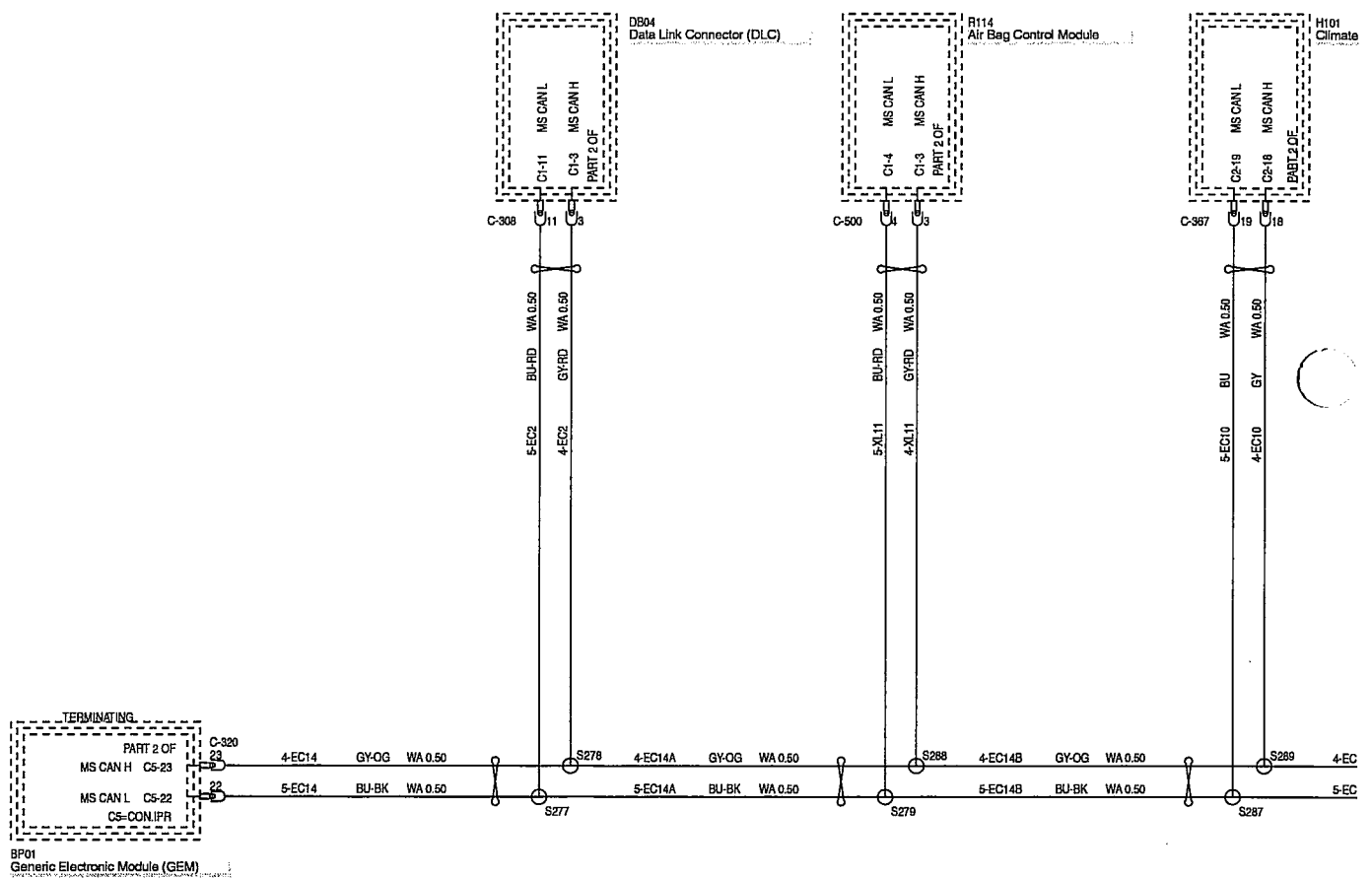
xxk Brake System (ABS) Module



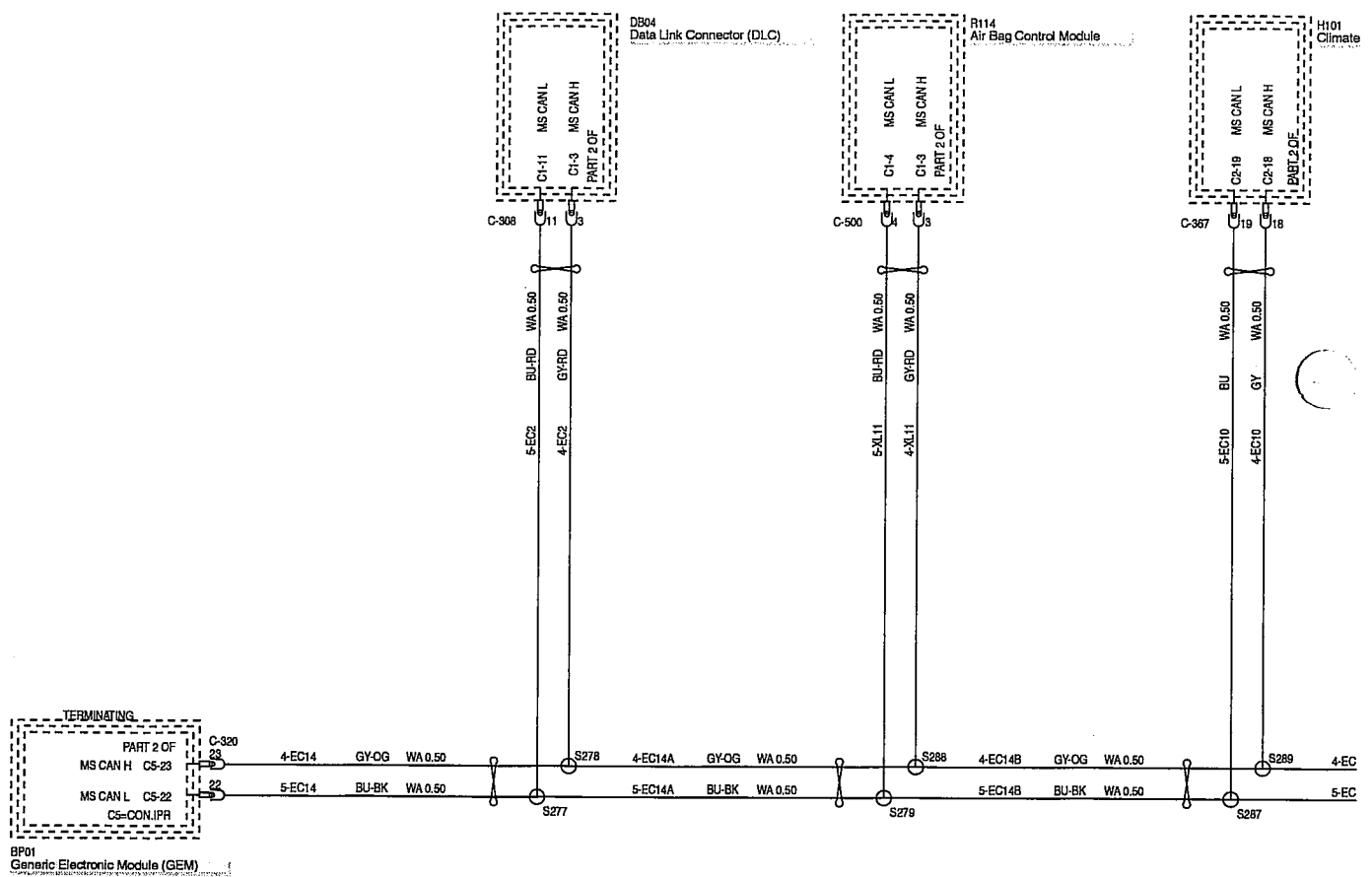


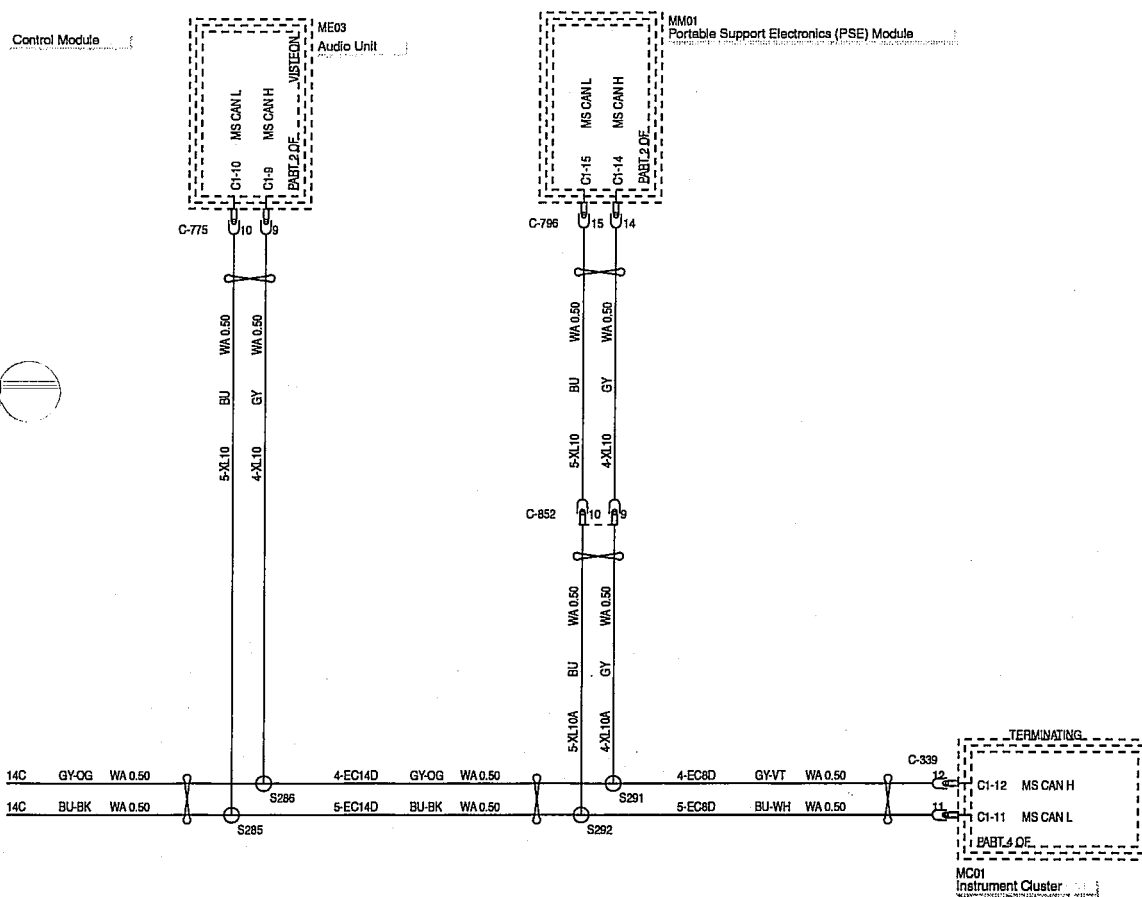


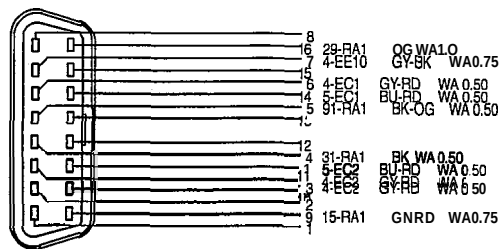
Switch











95GG-14489-ZTA
 C-308
 TO DATA UNK CONNECTOR
 HARNESS 14K024

SECTION 419-01A Anti-Theft - Active

VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS

PAGE

SCHEMATICS

Anti-Theft Alarm System — RHD.....	419-01A-2
Anti-Theft Alarm System — 2.0L Duratec-ST (M14), Vehicles With: Anti-Theft Alarm Horn with Integral Battery.....	419-01A-4

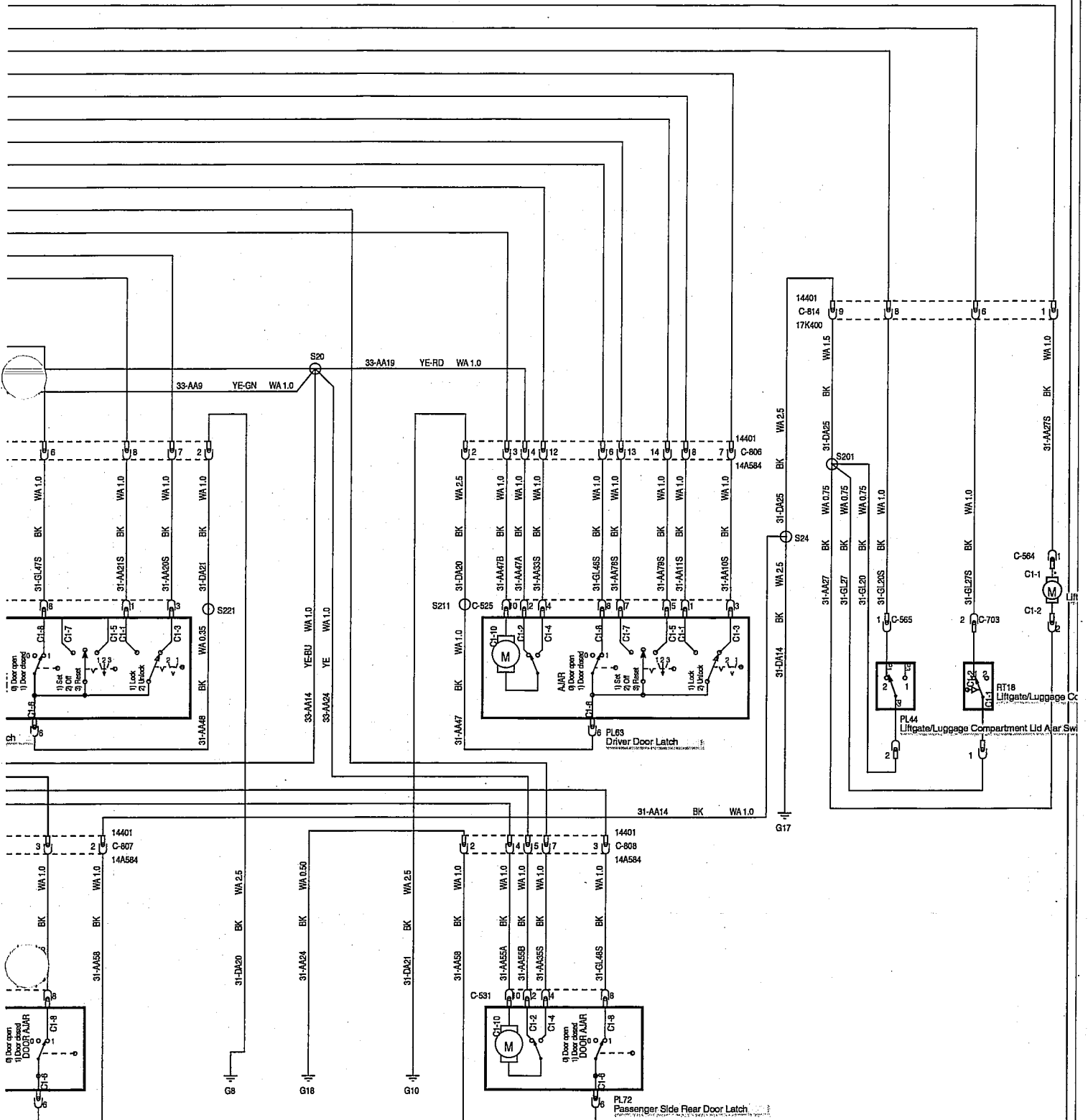
CONNECTORS

Anti-Theft Alarm Horn.....	419-01A-6
Anti-Theft Alarm Horn with Integral Battery.....	419-01A-7
Liftgate/Luggage Compartment Lid Anti-Theft Inhibit Switch.....	419-01A-8
Liftgate/Luggage Compartment Lid Ajar Switch.....	419-01A-9
Hood Switch.....	419-01A-10





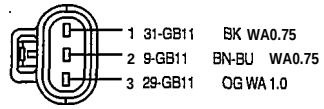
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1 28S-GL26 OG-GN WA10
92BG-14474-ZFA
C-603
TO ANTI THEFT HORN
HARNESS 14401



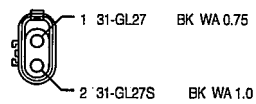
3M5T-14A464-DCA

C-771

TO BATTERY BACKUP SOUNDER

HARNESS 14401



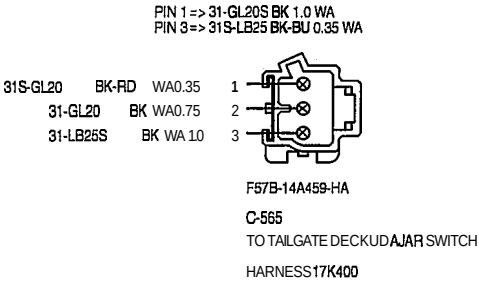


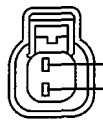
91AG-14489-BBC

C-703

TO TAILGATE DECKLID ANTI THEFT INHIBIT SWITCH

HARNESS 17K400





1	31-GL7	BK	WA0.35
2	31S-GL7	BK-YE	WA0.35

XR3T-14A464-AA

C-604

TO HOOD SWITCH

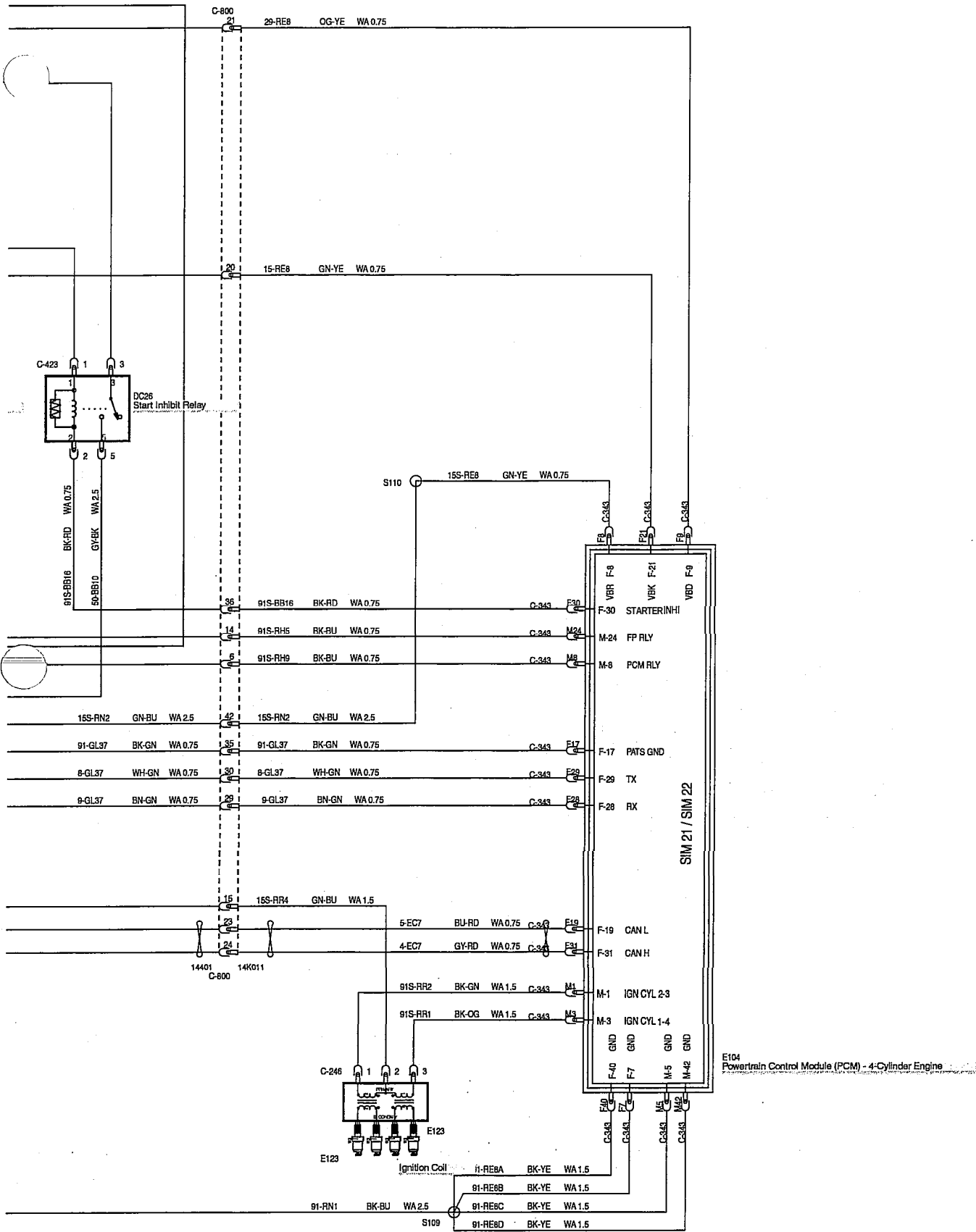
HARNESS 971113

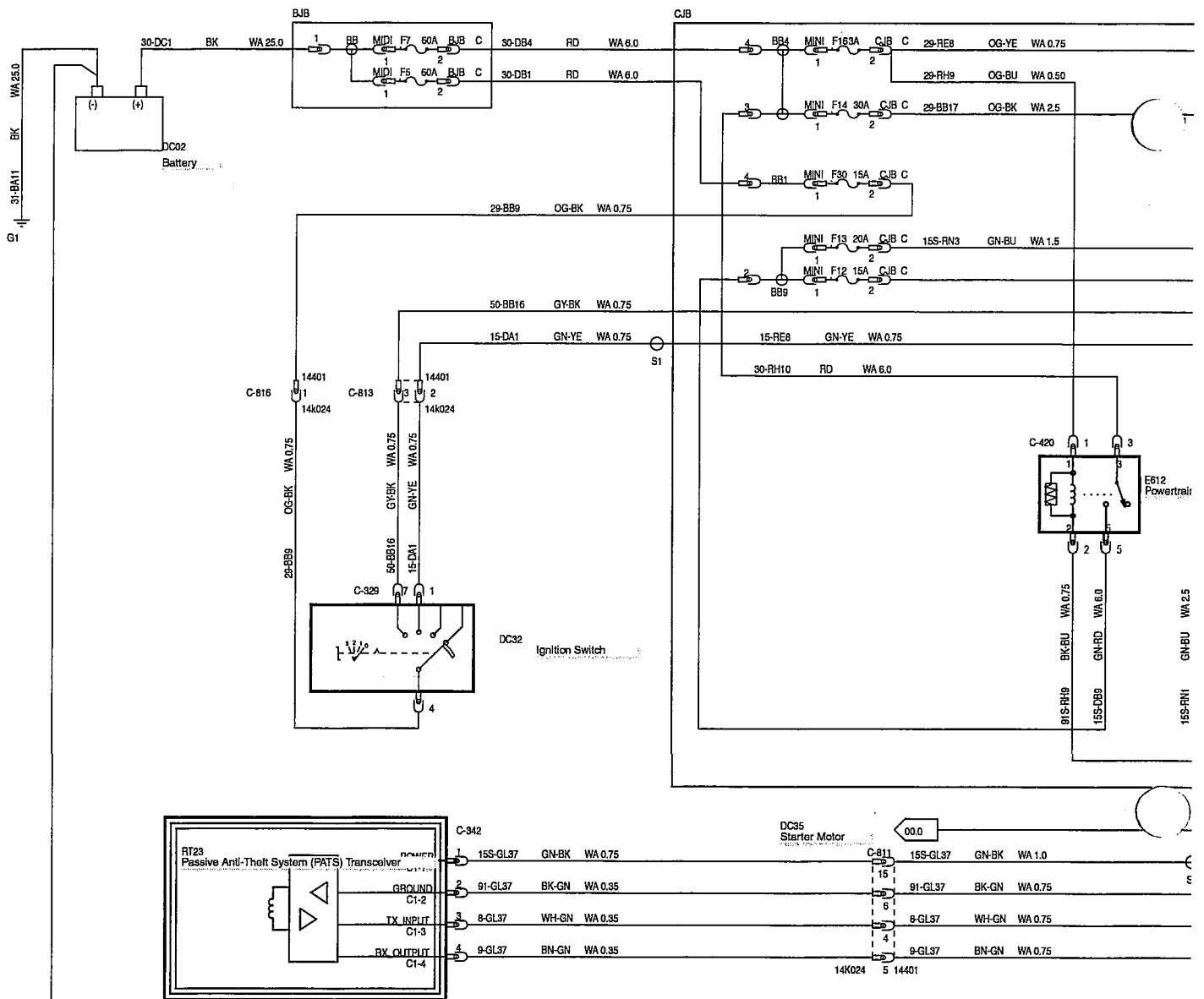
SECTION 419-01B Anti-Theft - Passive

VEHICLE APPLICATION: 2006.0 Fiesta

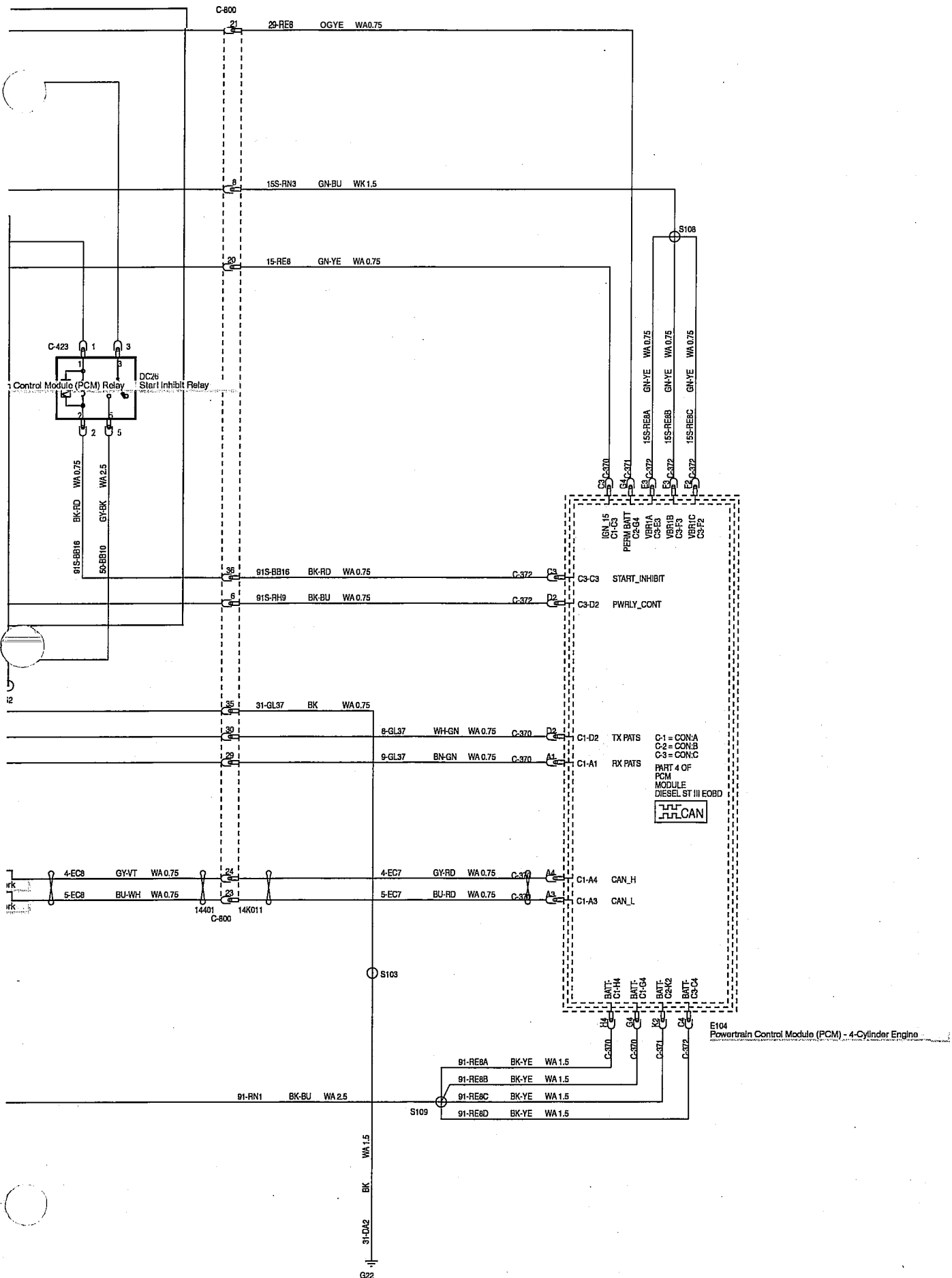
CONTENTS	PAGE
SCHEMATICS	
Passive Anti-Theft System (PATS).....	419-01B-2
Passive Anti-Theft System (PATS) — 1.4L Duratorq-TDCi (DV) Diesel, VIN Plate Emission Level Code: S.....	419-01B-4
Passive Anti-Theft System (PATS) — 1.4L Duratorq-TDCi (DV) Diesel, VIN Plate Emission Level Code: 7.....	419-01B-6
Passive Anti-Theft System (PATS) — 2.0L Duratec-ST (M14).....	419-01B-8
Passive Anti-Theft System (PATS) — 1.6L Duratorq-TDCi (DV) Diesel.....	419-01B-10
CONNECTORS	
Passive Anti-Theft System (PATS) Module.....	419-01B-12

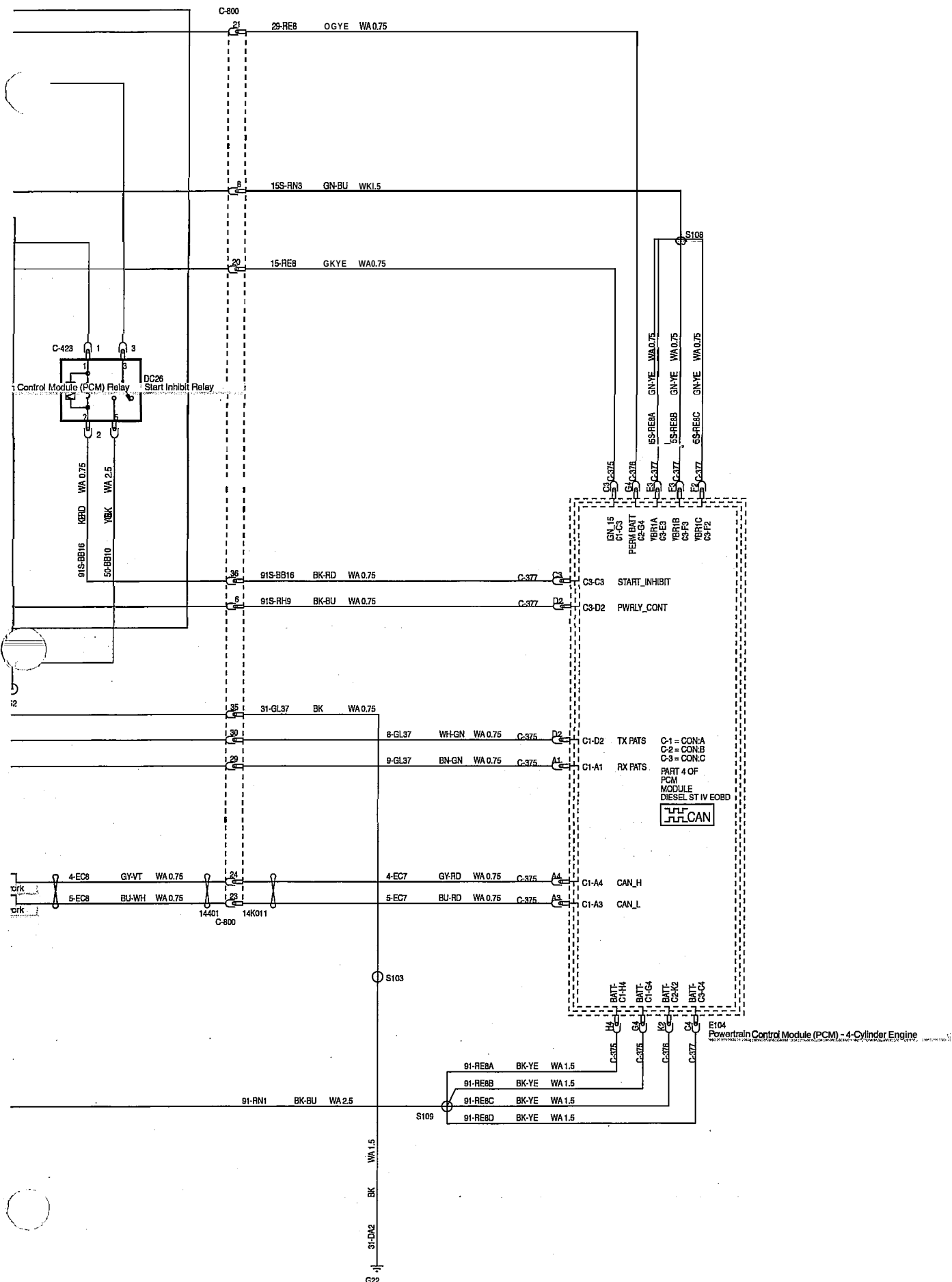


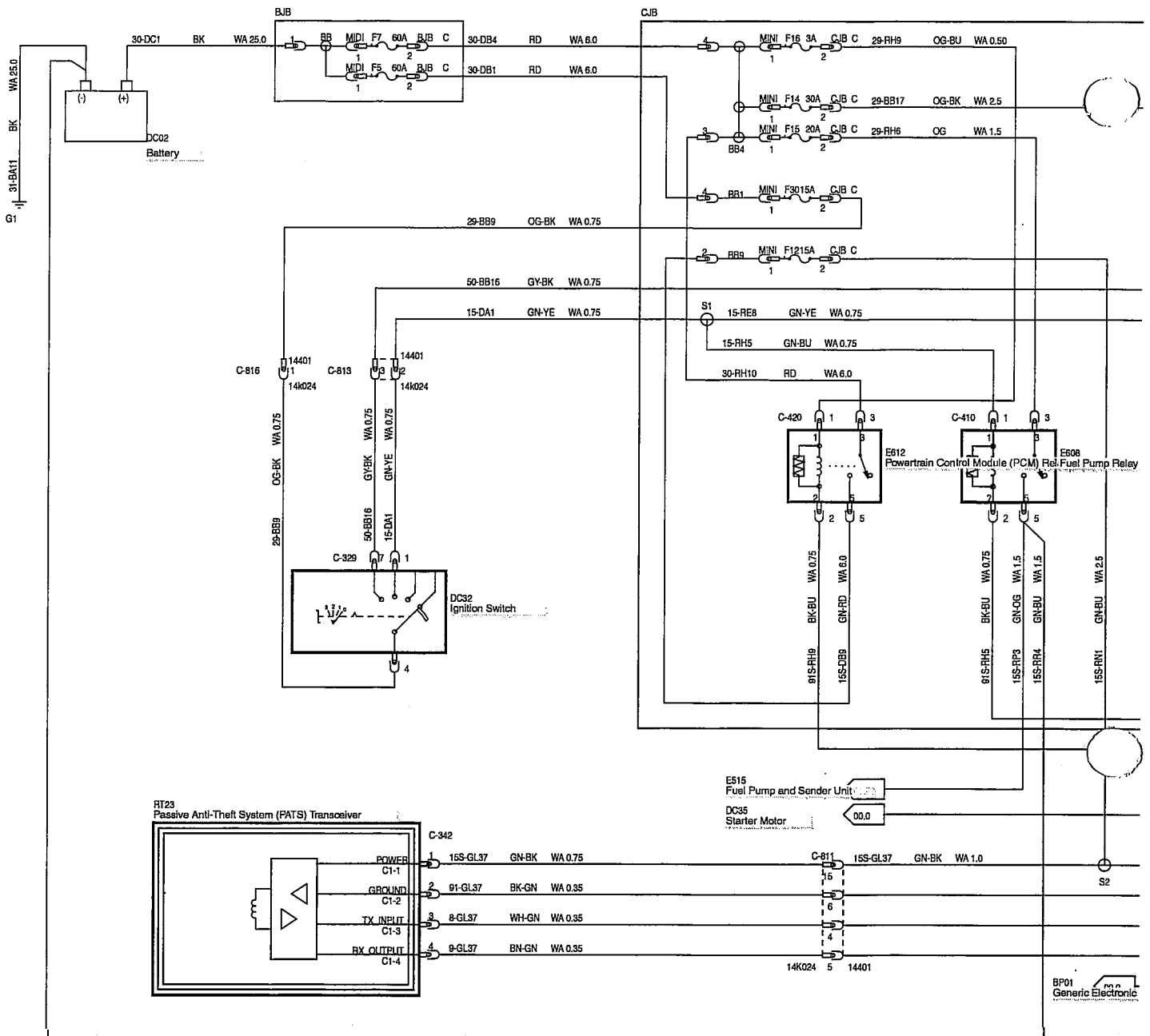


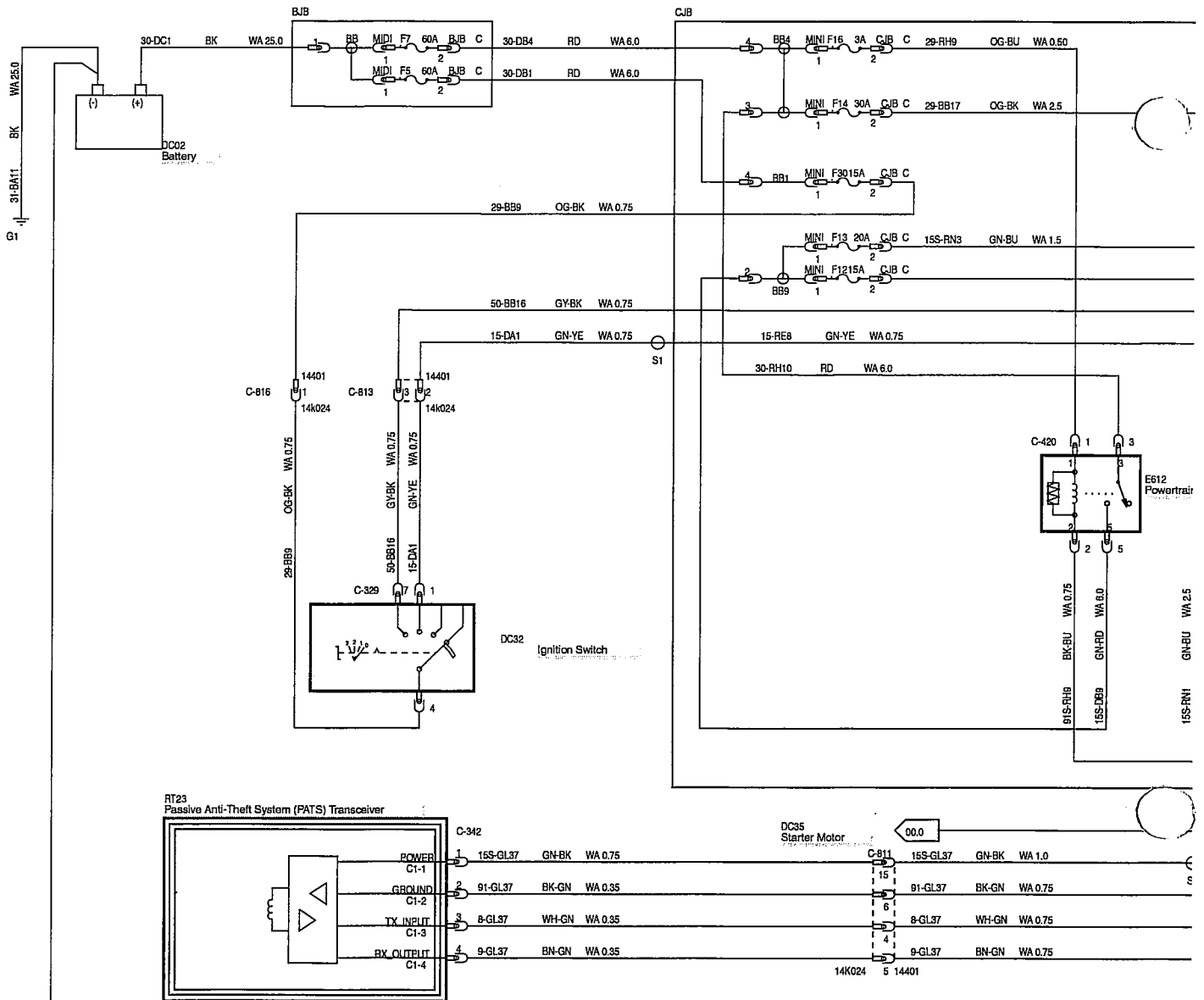


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Communications Netwc
DB0
Communications Netwc

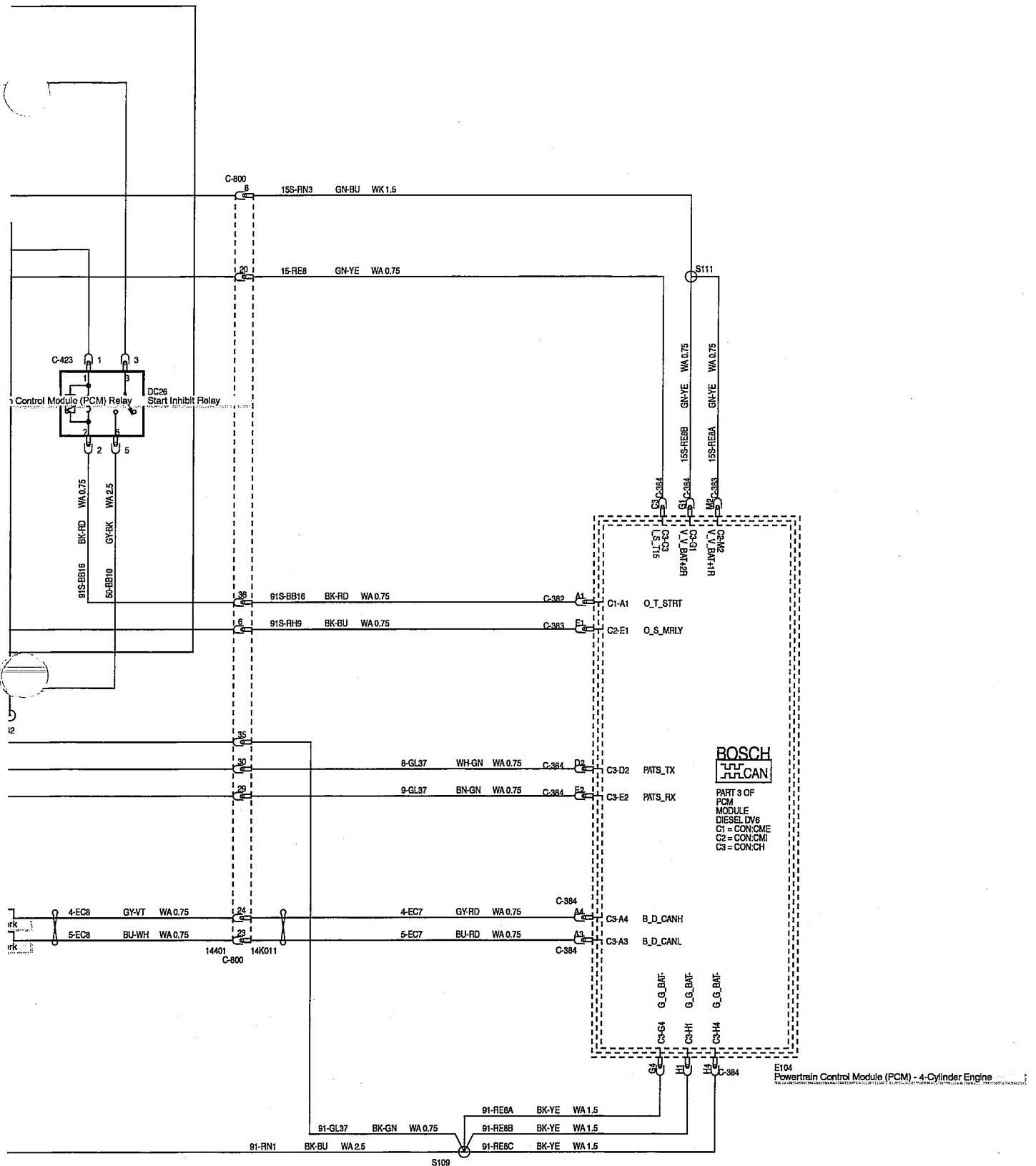


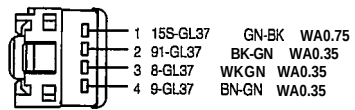






DB0
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Communications Netwc





1L2T-14489-GB

C-342

TO PASSIVE ANTI THEFT TRANSCEIVER MODULE

HARNESS 14K024

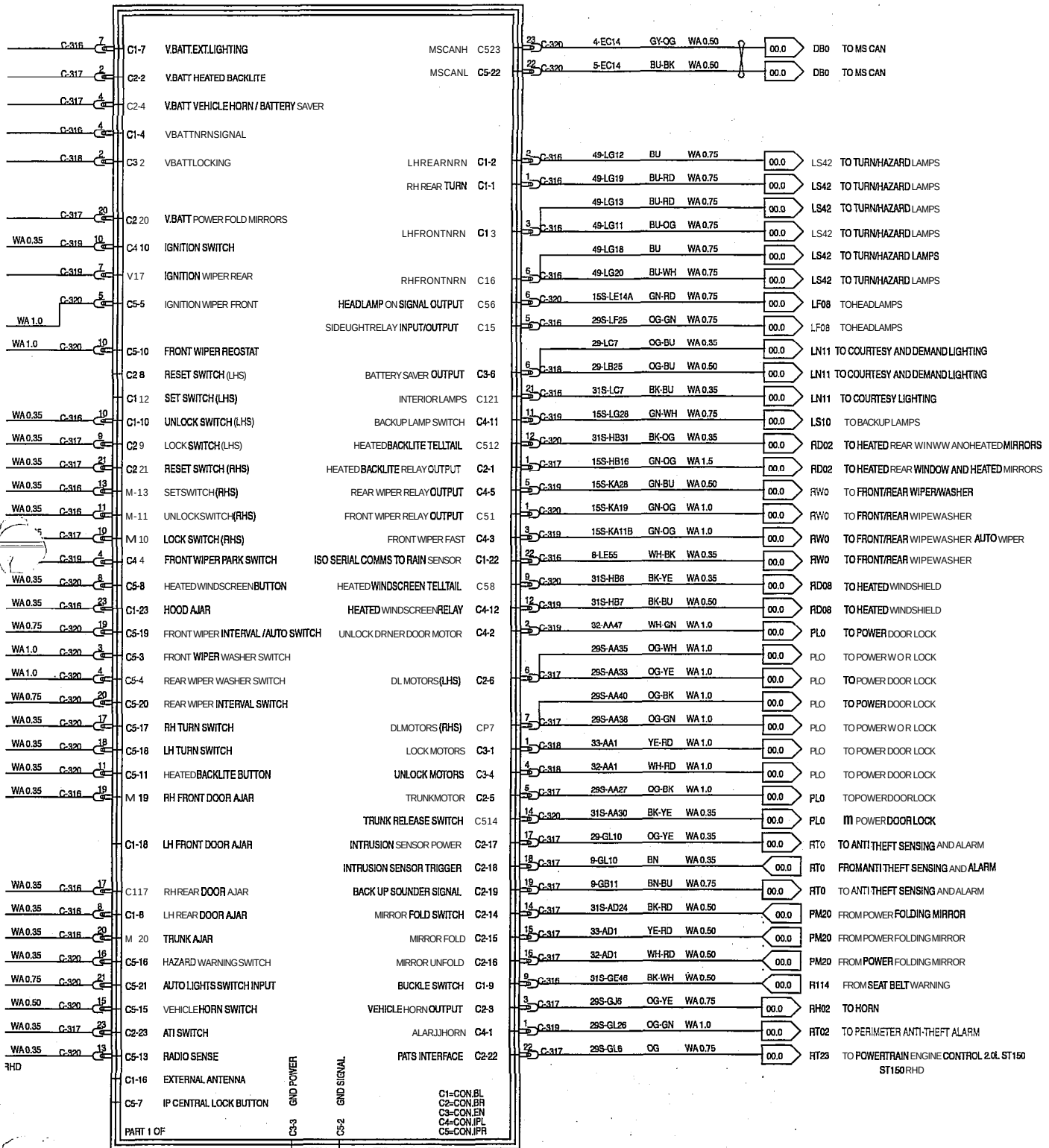
SECTION 419-10 Multifunction Electronic Modules

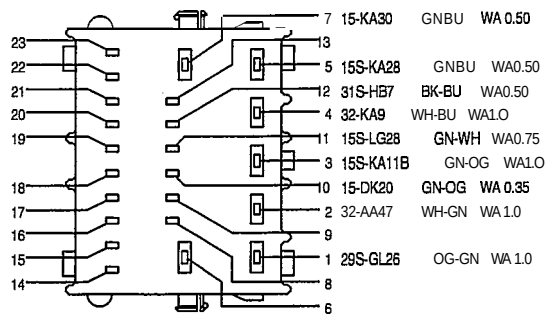
VEHICLE APPLICATION:2006.0 Fiesta

CONTENTS	PAGE
SCHEMATICS	
Generic Electronic Module (GEM) — LHD.....	419-10-2
Generic Electronic Module (GEM) — RHD.....	419-10-4
CONNECTORS	
Generic Electronic Module (GEM).....	419-10-6
Generic Electronic Module (GEM).....	419-10-7
Generic Electronic Module (GEM).....	419-10-8
Generic Electronic Module (GEM).....	419-10-9
Generic Electronic Module (GEM).....	419-10-10









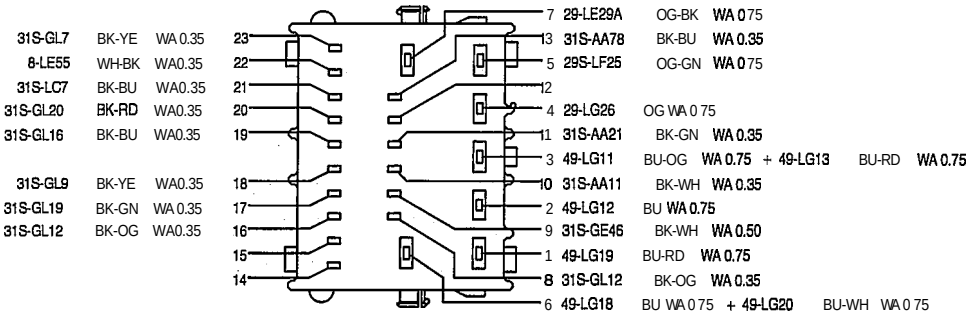
1S7T-14489-HC

C-319

TO GENERIC ELECTRONIC MODULE (PE1)/(IPL)

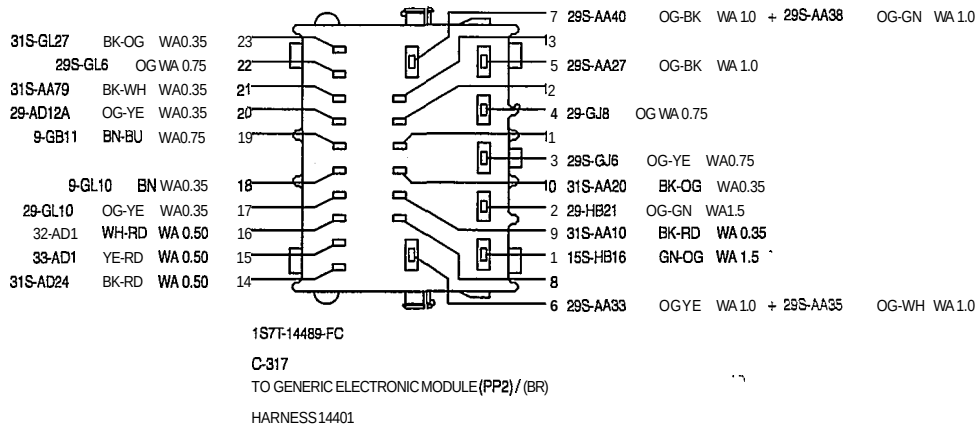
HARNESS14401

PIN 3 => 49-LG13 BU-RD 0.75 WA + 49-LG11 BU-OG 0.75 WA
PIN 19 => 31S-GL16A BK-BU 0.35 WA
PIN 6 => 49-LG20 BU-WH 0.75 WA + 49-LG18 BU 0.75 WA
PIN 18 => 31S-GL9A BK-YE 0.35 WA

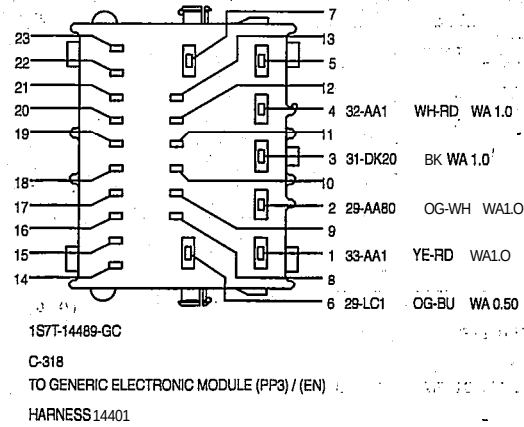


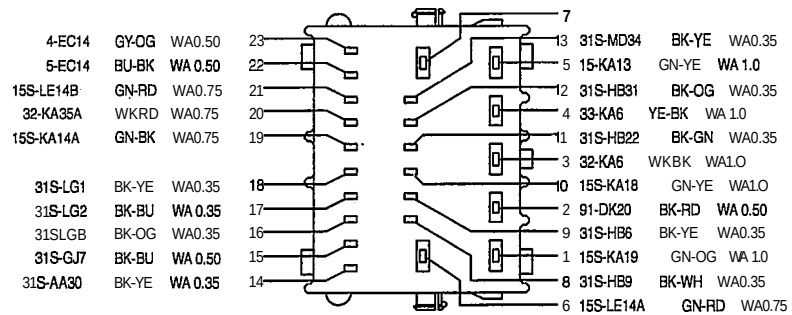
1S7T-14489-EC
C-316
TO GENERIC ELECTRONIC MODULE (PP1) / (BL)
HARNESS 14401

PIN7 => 29S-AA38 OGGN1.0 WA + 29S-AA40 OG-BK1.0 WA
 PIN7 => 29S-AA38 OGGN1.0 WA
 PIN1 => 15S-HB19B GN-BU1.5 WA



PIN6 => 29-LC7 OG-BU 0.35 WA + 29-LB25 OG-BU 0.50 WA
 PIN4 => 32-AA48 WKRD 1.0 WA
 PIN6 => 29-LB25 OGBU 0.50 WA + 29-LC7 OG-BU 0.35 WA





1STT-14489-JC

C-320

TO GENERIC ELECTRONIC MODULE (PE2) / (IPR)

HARNESS 14K024