

Saab Model Year 2002

MY02 Product Information: Saab Way 2002 Self-study Guide for On-line Griffin Test

Foreword

This book is intended for use by all Saab Dealership Personnel, except technicians, as an introduction to the Model Year 2002 products. The information in this book is based on information from the Service Manual update with descriptions of the most important changes and additions to the Saab 9-5 and 9-3. This publication presents new features in terms to help you describe them to your customers. Some explanations are technical in nature to clearly describe how the features work.

- *The Griffin Society test must now be taken on-line at www.saab-edu.com *. This self-study book no longer includes the Griffin Society test, which ALL dealership personnel (except technicians, who have a separate Griffin Society Test) must pass in order to qualify for recognition in the 2002 Saab Griffin Society program, as well as meeting the minimum dealer training standards.*

** If you already completed a written version of S02T, you do not have to retake this test using the eLearning version.*

- **In order to participate in the 2002 Saab Griffin Society recognition program, you must successfully PASS the on-line S02T test with a score of 80% or better. You must participate each year in order to maintain your status – Bronze, Silver or Gold.**
- All Griffin Society and training requirement information can be found on IRIS.
- The prerequisite for this course is the MY01 Self-Study (S01T), which was required for qualification into the 2001 Griffin Society. If you have not completed the 2001 test, ordering instructions for that test can be found on IRIS.
- The S02T test must be successfully completed during calendar year 2002 to receive 2002 Saab Griffin Society credit and to meet 2002 Dealer Standards.

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General information

Warning, Important and Note

The headings Warning, Important and Note appear from time to time in this service manual. They are used to draw the attention of the reader to information of special interest and seriousness. The importance of the information is indicated by the three different headings and the difference between them is explained below.



WARNING

Warns of the risk of material damage and grave injury to mechanics and the driver, as well as serious damage to the car.

Important

Points out the risk of minor damage to the car and also warns the mechanic of difficulties and time-wasting mistakes.

Note

Hints and tips on how the work can be done in a way that saves both time and labor. This information is provided as a means of improving efficiency, not for reasons of safety.

Market codes

The codes refer to market specifications.

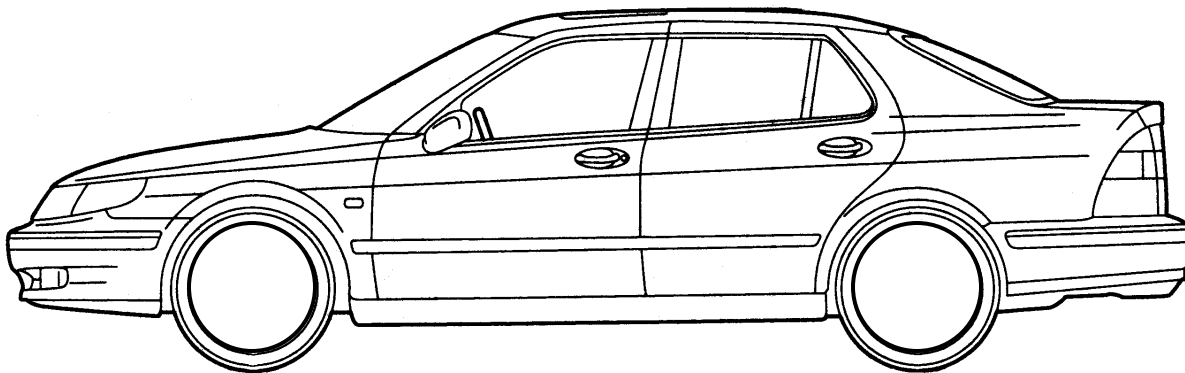
AT	Austria
AU	Australia
BE	Belgium
CA	Canada
CH	Switzerland
CN	China
DE	Germany
DK	Denmark
ES	Spain
EU	Europe
FI	Finland
FR	France
GB	Great Britain
GR	Greece
IE	Ireland
IL	Israel
IS	Iceland
IT	Italy
JP	Japan
LA	Latin America
ME	Middle East
MT	Malta
NL	Netherlands
NO	Norway
PA	Asia/Pacific region
PT	Portugal
RU	Russia
SE	Sweden
TR	Turkey
US	USA
UC	US California
ZN	New Zealand

9-5 - Introduction – Model Year 2002

Saab 9-5 Product Range - Model Year 2002 - US

For model year 2002, the trim level of Saab 9-5 models will be designated by new form names. In the U.S., the 9-5 will be available in three models, each available as a sedan or wagon:

- Linear 2.3t
- Arc 3.0t
- Aero



9-5 Linear 2.3t

The Saab 9-5 Linear 2.3t is the entry-level model in the 9-5 lineup. 9-5 Linear 2.3t models will be equipped with the B235E engine with manual as standard equipment or the optional new 5-speed automatic transmission.

All 9-5 models in the U.S. will be equipped with the sliding glass sunroof. Linear models will have leather seating surfaces as standard equipment. Cloth interior fabric will be available as a special order no cost option. Power driver and passenger front seats are also standard equipment on Linear models. For 2002, heated front seats will be standard equipment on all 9-5 models in the U.S. Rear heated seats are available as part of a Premium Package, however ventilated seats will not be available on Linear models.

All Saab models sold in the US will be equipped with OnStar as standard equipment. All 9-5 vehicles sold in the U.S. will also include "No Charge Scheduled Maintenance."

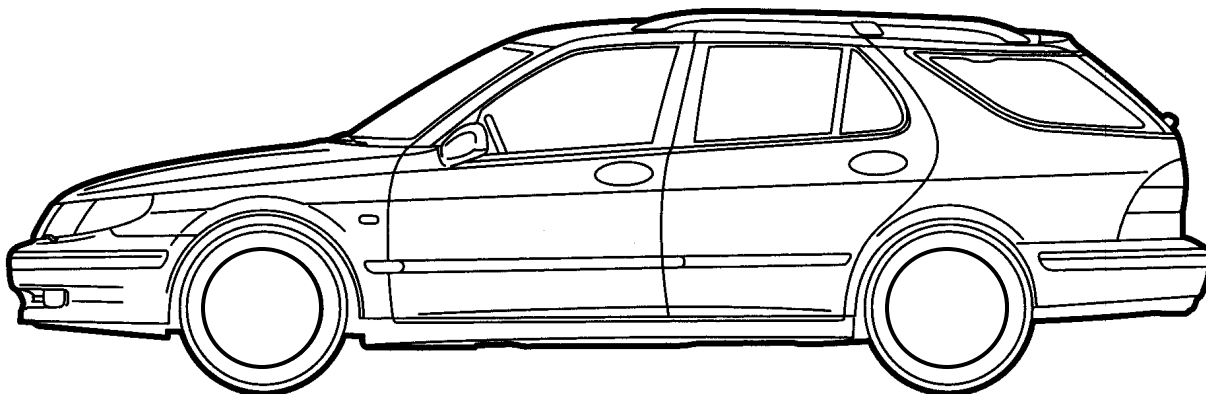
New 10-spoke, 16in alloy wheels are standard on all 9-5 Linear models in the US.

The options available on Linear models are:

- 5-Speed Automatic Transmission
- The Premium Package
- Mica/Metallic Paint

The 9-5 Linear 2.3t Premium Package includes:

- Memory driver's seat
- Power Memory Mirrors
- The Harman Kardon prestige audio system.
- Electronic Stability Program (ESP)
- Heated rear seats
- Auto-dimming rearview mirror



9-5 Arc 3.0t

The next model in the 9-5 lineup is the 9-5 Arc 3.0t. All 9-5 Arc 3.0t models in the U.S. will be equipped with the B308E V6 turbo engine with the new 5-speed automatic transmission. A manual transmission is not available on Arc models.

9-5 Arc 3.0t models have an extensive list of standard features:

- Perforated leather seating surfaces and leather door inserts
- Power seats with memory on the driver's seat and power memory mirrors
- The Harman Kardon prestige audio system
- Auto-dimming rear view mirror
- Heated & ventilated front seats
- Heated rear seats
- Electronic Stability Program (ESP)



New 5-spoke, 16in BBS wheels are included on all 9-5 Arc 3.0t models in the U.S.

Two special option packages will be offered on Arc models sold in the U.S.:

An optional "Visibility Package" will be offered from November through February production. This package includes:

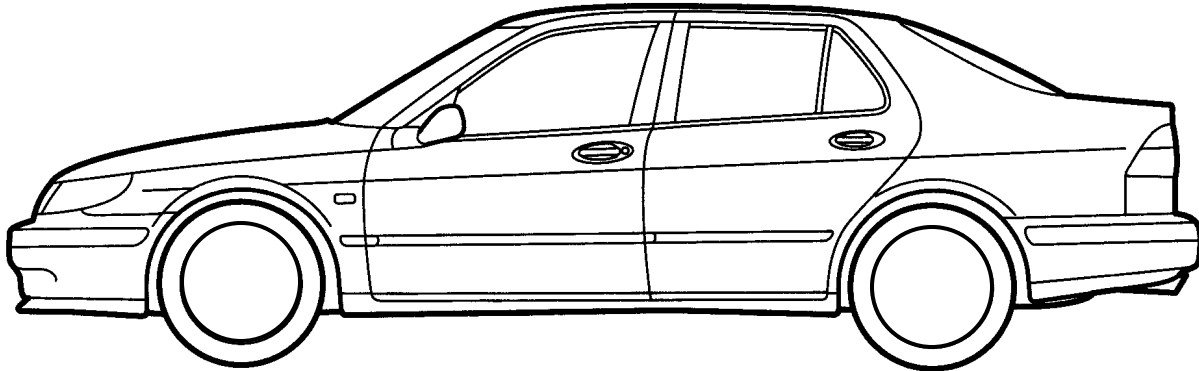
- Bi-Xenon headlights with Automatic Headlight Levelling (AHL)
- The Rain Sensing Wiper system

In February, 2002, the "Visibility Package" will be replaced by an optional "Touring Package" which includes:

- Bi-Xenon headlights with Automatic Headlight Levelling (AHL)
- The Saab Parking Assistance system (SPA)
- The Rain Sensing Wiper system

The only other option is:

- Mica/Metallic Paint



9-5 Aero

The 9-5 Aero will be equipped with the B235R engine. Aero models are available with either manual or automatic transmissions. For model year 2002, the horsepower of B235R engine has been increased to 250 HP, while retaining the previous torque rating. Note that Aero models equipped with both automatic transmission and manual transmission have the same horsepower and torque ratings for 2002, however the RPM range for maximum torque differs slightly between the two versions (see chart on page 11).

Aero models have the same extensive list of standard features as 9-5 Arc 3.0t models, but also include:

- New Leather Sport seats
- A new "Aluminum-look" dash
- Sport-tuned chassis
- Aero skirts and air flow panels
- Leather-wrapped sport steering wheel



10-spoke, 17in BBS wheels are standard equipment on all 9-5 Aero models in the U.S.

Two special option packages will be offered on Aero models sold in the U.S.:

An optional "Visibility Package" will be offered from November through February production. This package includes:

- Bi-Xenon headlights with Automatic Headlight Levelling (AHL)
- The Rain Sensing Wiper system

In February 2002, the "Visibility Package" will be replaced by an optional "Touring Package" which includes:

- Bi-Xenon headlights with Automatic Headlight Levelling (AHL)
- The Saab Parking Assistance system (SPA)
- The Rain Sensing Wiper system

The only other options are:

- 5-Speed Automatic Transmission
- Mica/Metallic Paint

Note

As a result of the Leather Sport seats being added, ventilated seats are not available on the Aero models.

Brief Overview of Changes: 9-5

Saab 9-5

The following major revisions have been made on the Saab 9-5 for model year 2002:

Engine

Engine variants

The following engine variants are available in the U.S. market for the Saab 9-5 model year 2002:

- 2.3t Ecopower 185hp (207 ft. lbs. / 280Nm) B235E (Linear)
- 3.0t Ecopower 200 hp (229 ft. lbs. / 310 Nm) B308E (Arc)
- 2.3T Ecopower 250hp (258 ft. lbs./350Nm) B235R (Aero)

Note

B235R and B308E must be run on high-octane fuel (min. 92 AON) in order to deliver the specified engine torque.

Electrical system

Charging system

New generator and new cooled battery.

Lighting system, Bi-Xenon

Bi-Xenon lighting is available as an option.

High pressure headlight washers

Headlight lenses are washed with high pressure jets that replace the wash/wipe system.

Rain Sensing Wiper

A rain sensor is integrated into the wiper delay function of DICE

Saab Parking Assistance system (SPA)

The Saab Parking Assistance system is designed to inform the driver of an obstacle behind the car. The system is operational when driving the car in reverse.

Main instrument unit

New compact and lighter main instrument unit with several enhancements, such as LEDs instead of bulbs, has been introduced.

Transmission

5-speed automatic transmission

New 5-speed automatic transmission replaces the previous 4-speed.

Brakes

Brake system

New master cylinders and power assisted brakes on all models. Ventilated rear brake discs on certain models.

Electronic Stability Program (ESP)

This safety system governs the engine torque and brake force to aid the driver during evasive maneuvers.

Body

Exterior

New integrated front & rear bumpers.

Impact protection

Enhanced impact protection.

Airbag system

Highly developed system with 2-stage driver and passenger airbags, front sensor.

Diesel in the US?

Many of the revisions under the skin to the MY2002 9-5 are as a result of the introduction of the diesel engine for the European markets. Several of these changes are improvements that carry over into gasoline vehicles and are a benefit to the U.S. specification vehicles as well.

Diesel engines naturally produce soot or Particulate Matter (PM). PMs are limited as it pertains to emissions with the California Low Emissions Vehicle (LEV) standards being the most rigid with a PM tolerance of 0.0 gm. Even with several upgrades, today's diesel technology engines are not currently allowed to be sold in California. Starting in MY 2004, the following states will adopt the California LEV standards: New York, Massachusetts, Vermont and Maine. More than 30% of our sales are represented from these four states and California.

Although Diesel technology is much cleaner than it used to be, the U.S. car buying public does not view diesel as "Premium." There currently is no direct competitor of ours that is offering a diesel engine in the U.S. Mercedes-Benz offered a diesel on the 300 Sedan/Wagon, but with the introduction of the new E-class, they opted to stop production in 1999. As a result of this and many other factors, the U.S. will opt to remain with gasoline engines only.

Diesel technology is readily accepted and utilized in other world markets, because of fuel prices and different emission testing standards.

Vehicle Identification Number (VIN) M2002

Example: YS3EF45C623008642

1 -	Geographical area	Y = Northern Europe
2 -	Country	S = Sweden
3 -	Car manufacturer	3 = Saab Automobile AB
4 -	Product line	E = 9-5
5 -	Model Series	B = Saab 9-5 Linear 2.3t with driver and passenger airbag D = Saab 9-5 Arc 3.0t with driver and passenger airbag H = Saab 9-5 Aero with driver and passenger airbag
6 -	Body type	4 = 4-door 5 = 5-door (SportWagon)
7 -	Gearbox	5 = Manual 5-speed 9 = Automatic 5-speed
8 -	Engine variant	E = 2.3t G = 2.3 Turbo (High Output) Z = 3.0t V6
9 -	Check character	0 - 9 or X
10 -	Model year	2 = 2002
11 -	Place of manufacture	3 = Trollhättan
12 -	Serial number	000001-999999

Service

Service Saab 9-5

Revisions

- “No Charge Scheduled Maintenance” is included on all 9-5 models in the U.S. for 2002. (Also included on all 9-3 SE 5-door models with the “Premium Package”, all SE convertibles, and all Viggens.)
- The customer can request the car to be programmed to an optional level of customization at the first service.
- Oil level check on manual gearboxes has been discontinued while check for oil leaks remains.
- Change of brake and clutch fluid has been changed from the mileage-based service interval to a time-based service interval. For the U.S. market, the new brake and clutch fluid change interval is 24 months.
- New item where the drain hose to the false bulkhead space cover must be cleaned on each service occasion.
- An extended change interval in CA/US for platinum plugs in B235R engines. The new interval is 40,000 miles (30,000 miles in other markets). The extended change interval also applies to 9-3 models with B205R and B235R engines.
- Drive belt (multi-groove belt) checked on each service occasion.
- A new coolant with a life-expectancy of the car has been introduced during the spring of 2001.
- A maintenance-free battery has been introduced together with cooling box and new generator. These additions will greatly increase battery life expectancy and reduce evaporation.

The window indicating electrolyte level must be checked at every service.

- If the indicator is dark, the electrolyte level is correct.
- If the indicator is clear, i.e. if it reflects the light like a mirror, the electrolyte level is too low and the battery must be changed.

Engine

Engine range, Saab 9-5 model year 2002 (US)

Engine	B235E (Linear)	B235R (Aero)	B308E (Arc)
Compression ratios	9.3:1	9.3:1	9.5:1
Turbocharger make, type	Garrett GT17	Mitsubishi TD04HL-15T	Garrett GT15
Wastegate pre-stressing	2 mm	2 mm	-
Basic charging pressure	0.40 Bar \pm 0.03	0.45 Bar \pm 0.03	0.27 Bar \pm 0.03
Max. power, EEC	185hp/136kW at 5500 rpm	250hp/183kW at 5500 rpm	200hp/147kW at 5000 rpm
Max, torque, EEC	207 ft. lbs. (280 Nm) at 1800-3500 rpm	258 ft. lbs. (350 Nm) at 1900-4000 rpm (man) 258 ft. lbs. (350 Nm) at 1900-4700 rpm (aut)	229 ft. lbs. (310 Nm) at 2300-4500 rpm
Spark plugs make, type	NGK, BCP6ES-11	NGK, PFR6H-10	NGK, BKR7ES-11
Spark plugs electrode gap	1.05 mm \pm 0.05	0.95 mm \pm 0.05	1.05 mm \pm 0.05
Engine management system	Trionic T7	Trionic T7	Trionic T7
Recommended fuel octane number (AON)	87	92	92

Cooling system

New coolant

A new "Long-life" coolant is used in all Saab engines for model year 2002. The new coolant was actually introduced during late 2001 production.

The coolant that is filled in production does not require changing throughout the service life of the car. The fluid is orange in color to distinguish it from earlier types of coolant that were blue-green.

Saab Original "Long-life" Coolant must be used in order to obtain the desired coolant properties.

The normal mixture of 50% coolant still applies.

The earlier blue-green type and the new orange type will both be available as spare parts.

Technical Data

Saab Original "Long-life" Coolant

Type:	Ethylene glycol
Color:	Orange
Mixing	50 %
Part Number	-200 l (drum) available later
	-4 l (can) 02-86-542

Note

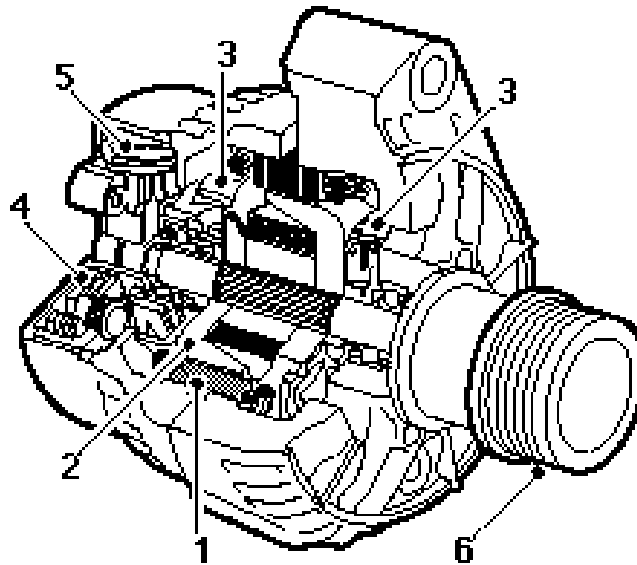
Do not top up with the earlier type of coolant (blue-green), as this will impair the corrosion protection properties.

The orange coolant will also be discolored by the blue-green coolant and may appear to be contaminated with engine oil, etc.

In an emergency, conventional (blue-green) coolant can be mixed with the "Long-life" (orange) coolant. However, once the conventional coolant has been added, the "Long-life" properties are lost and the coolant must be changed at normal intervals. For this reason, care must be taken when topping off a vehicle with "Long-life" coolant to be sure contamination does not result. Adding any conventional coolant (or even using shared containers) may contaminate the system enough to affect the "Long-life" properties.

Electrical system

Charging system



E321D026

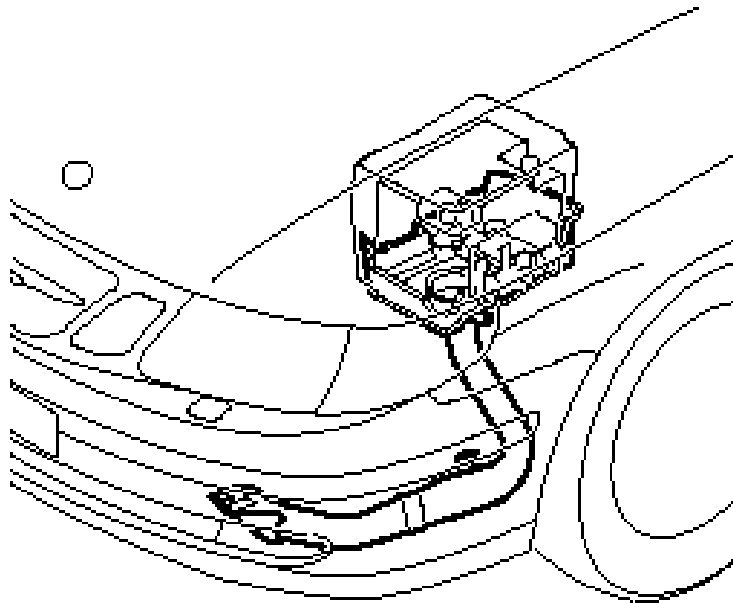
Generator

1. Stator
2. Rotor with slip rings
3. Integrated fans
4. Rectifier
5. Regulator
6. Pulley

The generator is an alternating current generator with integrated charge regulator. Maximum current is now 140 A, up from 130 A in 2001.

The generator is driven by the engine through a multi-groove V-belt from the crankshaft belt pulley.

The drive ratio is 1:2.85.



E321 D025

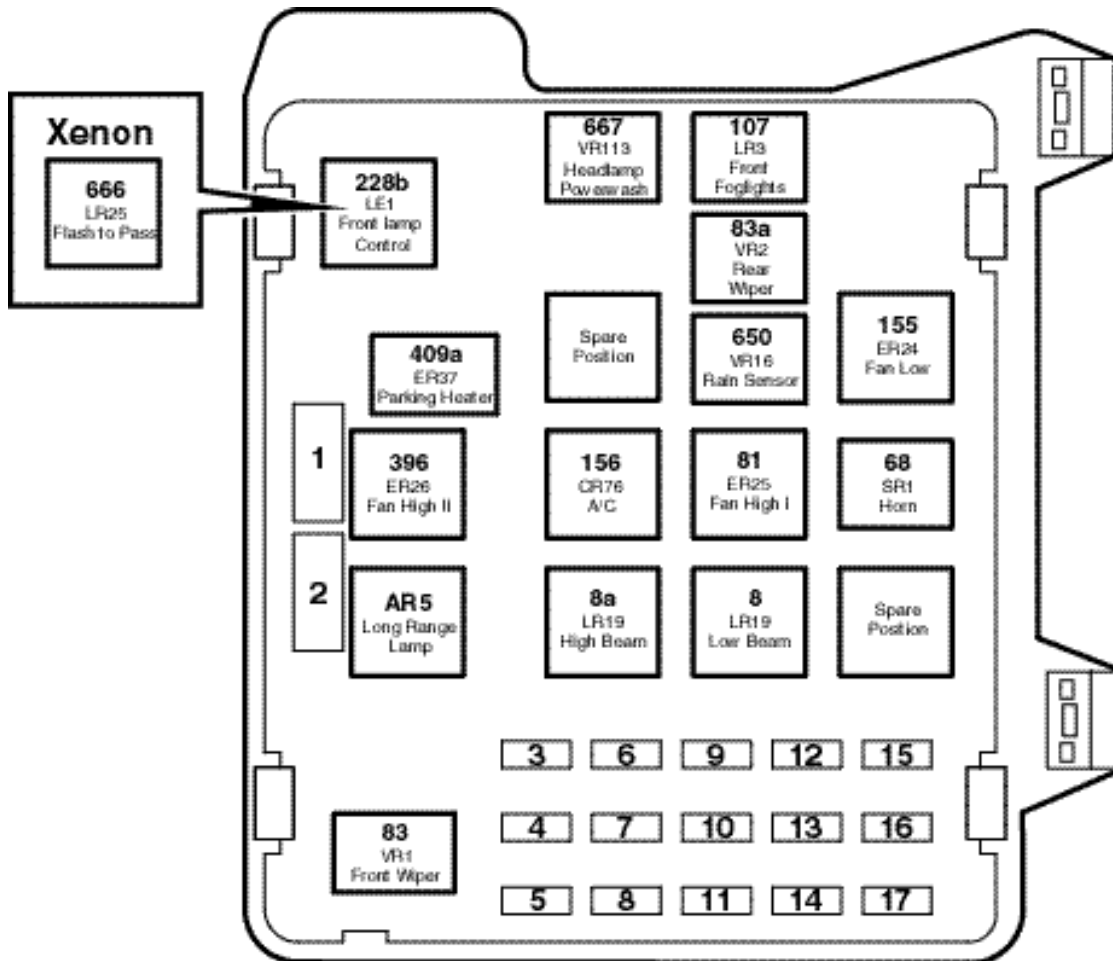
Battery and battery cooling

A new style battery is introduced for model year 2002. It is a sealed, maintenance-free battery. The battery has a capacity of 70 Ah, and a cold cranking rating of 700 CCA.

The battery has a level window to indicate whether there is sufficient electrolyte (battery fluid) in the battery. The window should normally be dark/black when the level is sufficient. If it is shiny like a mirror, the battery should be changed as the level is too low.

The battery is enclosed in a battery cover to reduce heating. An air duct allows air to pass from an opening in the car's spoiler. The air from the air duct passes through the battery cover and cools the battery.

Relay and Fuse Box



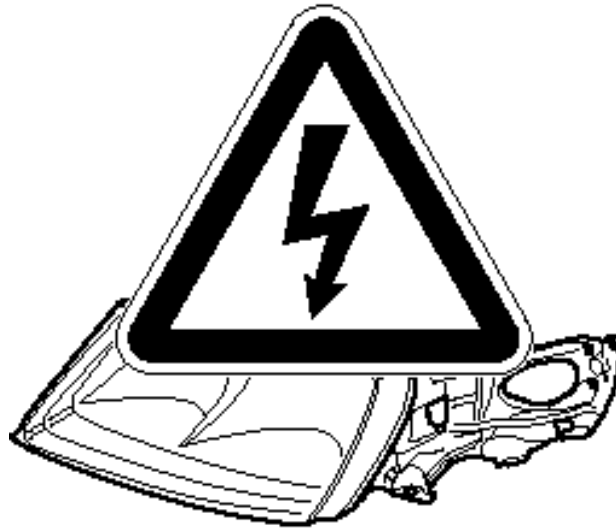
E371D124

Relay and fuse box

A new relay and fuse box has been introduced on model year 2002.

A new type of fuse, a microfuse, has been introduced. These fuses have the same function as earlier types, but are smaller in size.

Bi-Xenon Headlights (Available on Arc & Aero)



E351 D125

Brief description

The headlight assembly contains a xenon lamp with ignition transformer, control module, beam length adjustment motor, halogen bulb and parking light bulb.

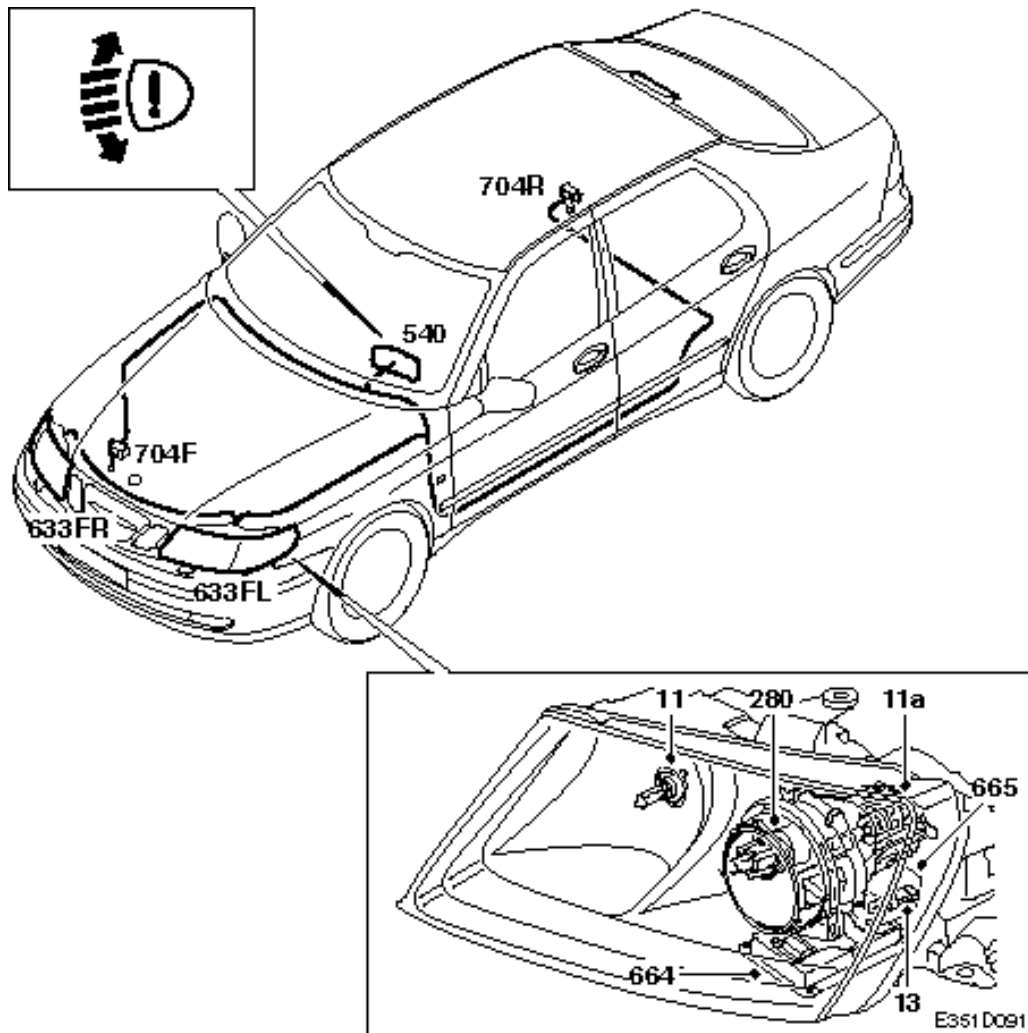
The AHL (Automatic Headlight Levelling) control module governs the current/voltage supply to the xenon lamp. These lamps require very high voltages (approx. 23000 volts) before they ignite. The normal operating voltage is around 85V. The control module also governs the stepping motors for the automatic beam length adjustment. The AHL control module receives information from the front and rear load angle sensors concerning the front and rear height of the car and then adjusts the angle of the headlights based on this information.

Xenon lamps always light with the same brightness. The light beam from a xenon lamp is limited by a screen which is opened for main beam use by a solenoid that is activated from the control module. This increases the beam of light from the lamp.

There is a halogen bulb mounted in the headlight assembly housing. When the headlight flashers are used while the low beam is turned off, only the halogen bulb lights up (sometimes called the "flash to pass" function).

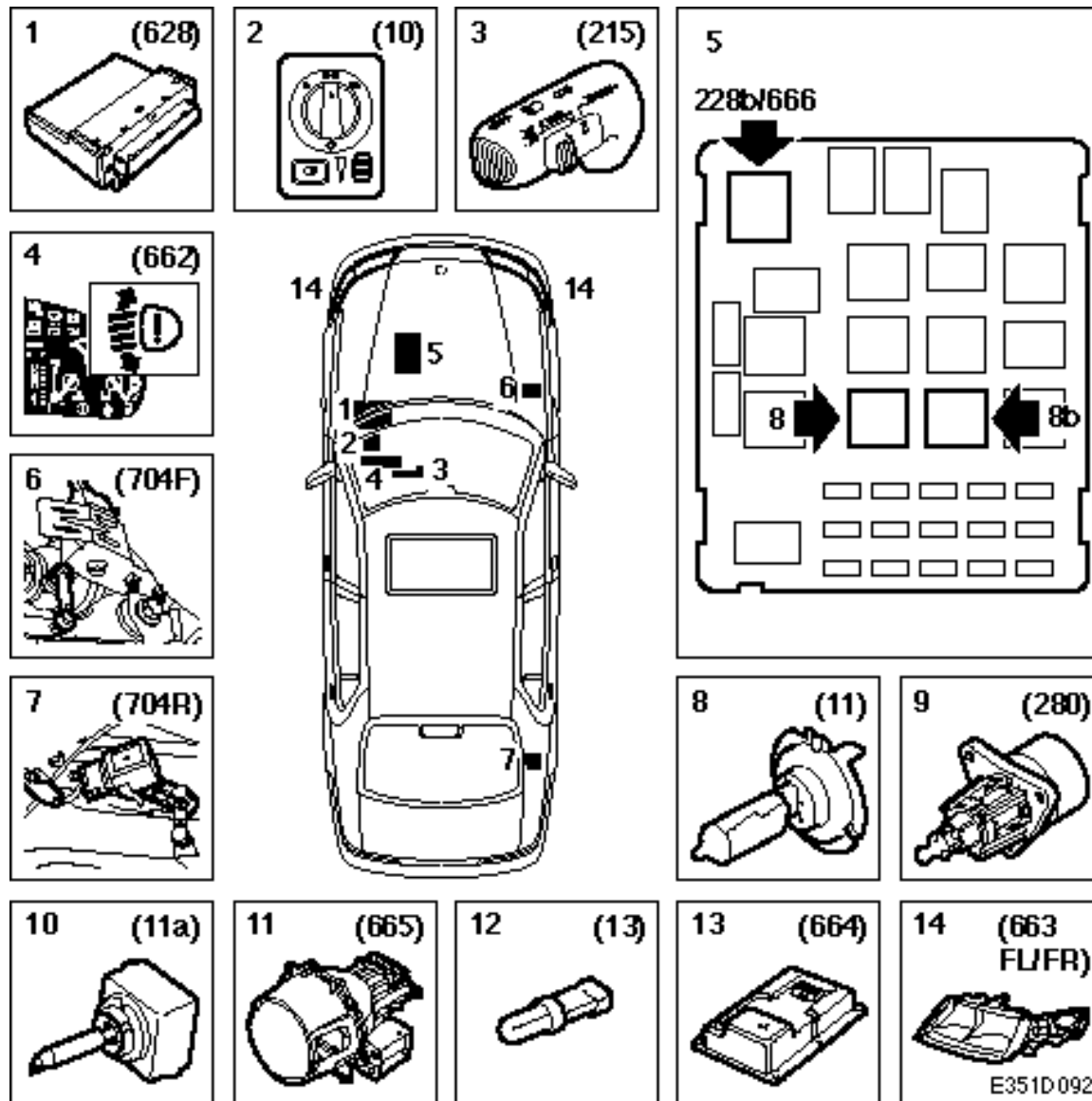
In many world markets, the halogen bulb comes on together with the xenon lamp for main beam (high beam).

Due to U.S. Federal Regulations, the halogen bulb does not come on simultaneously with the xenon lamp for main beam (high beam) on the U.S. specification vehicles.



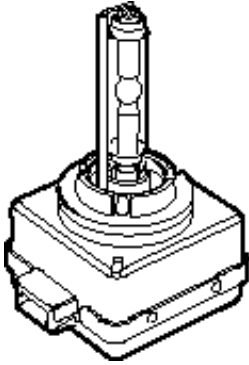
System overview

- Halogen bulb (11)
- Xenon headlight (11a)
- Parking light bulb (13)
- Headlight beam length adjustment motor (280)
- Main instrument unit (540)
- Headlamps (663FL/FR)
- AHL control module (664)
- Main beam damping solenoid (665)
- Load angle sensor, front (704F)
- Load angle sensor, rear (704R)

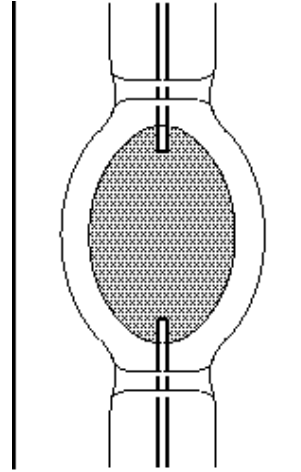


Principal components

1. DICE control module (628)
2. Light switch (10)
3. Light switch (215)
4. Xenon lamp indicator (662)
5. Headlight filament monitor (228b)
Main beam flasher relay (666)
Dipped beam relay (8)
Main beam relay (8a)
6. Load angle sensor, front (704F)
7. Load angle sensor, rear (704R)
8. Halogen bulb (11)
9. Headlight beam length adjustment motor (280)
10. Xenon headlight (11a)
11. Main beam damping solenoid (665)
12. Parking light bulb (13)
13. AHL control module (664)
14. Headlight Assembly (663FL/FR)



E351D113



E351D114

Description of operation

General

The headlight contains a xenon lamp with ignition transformer, control module, beam length adjustment motor, H7 halogen bulb and parking light bulb.

A 70mm (2.75in) ellipsoid lens forms the light pattern together with the xenon lamp and reflector. The headlight is equipped with a clear plastic protective lens that does not refract the light.

There is a halogen bulb mounted in the headlight assembly housing. When the headlight flashers are used while the low beam is turned off, only the halogen bulb lights up (sometimes called the "flash to pass" function).

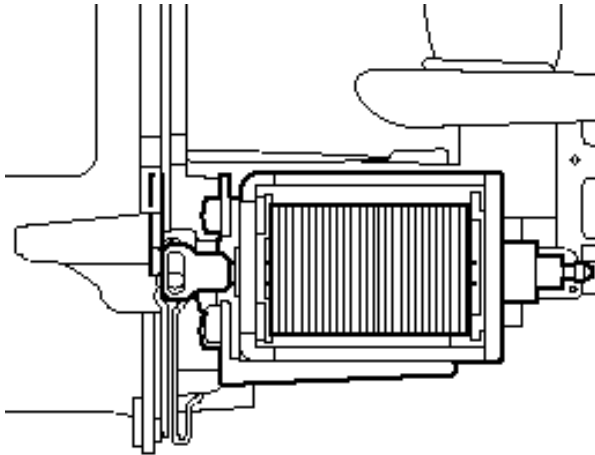
Xenon lamp

The xenon lamp is a gas discharge lamp and therefore does not have a filament. The light is generated by an electrical discharge between two electrodes. The igniter is the capsule in which the discharge takes place and is filled with xenon gas and metal halogens under high pressure. The discharge generates a large amount of visible light and a certain amount of ultraviolet radiation. The xenon lamp has an outer casing that reduces the dispersion of ultraviolet radiation.

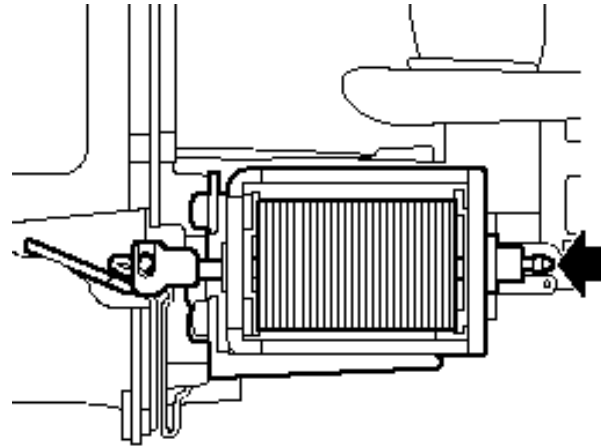
The xenon lamp is driven by the AHL control module. The control module sends high voltage pulses to the ignition transformer for turning on the lamp. The ignition transformer, which is integrated in the xenon lamp, generates the ignition voltage (approx. 23,000 volts) that is required to turn on the lamp. Once the discharge is in progress, the voltage requirement will drop to around 85V. The AHL control module governs the current/voltage supply to the lamp.

Important

Make sure to use only lamps with the correct output when changing or some components may be damaged.



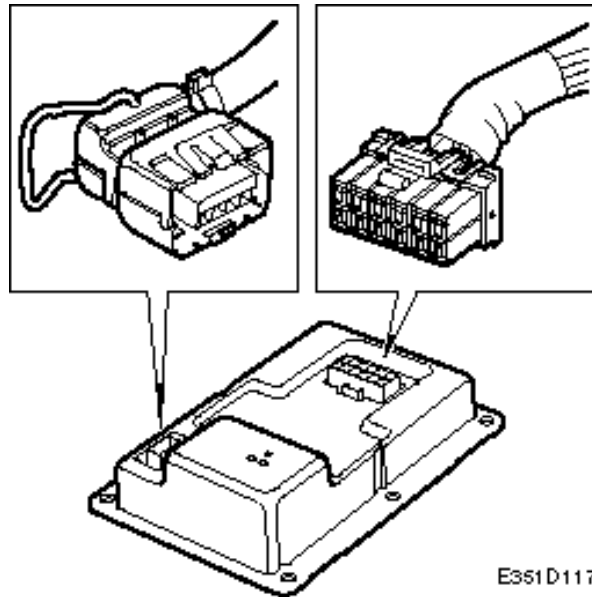
E351D115



E351D116

Dip switch solenoid

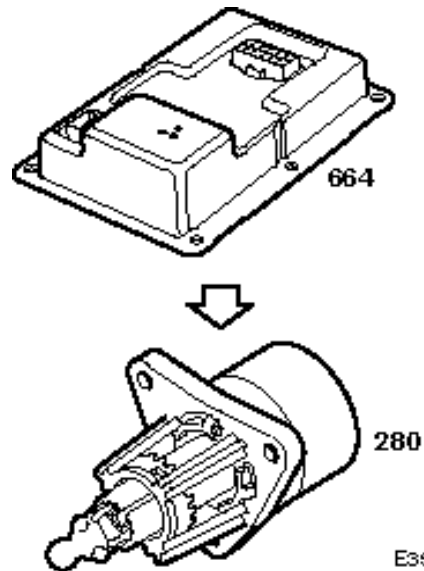
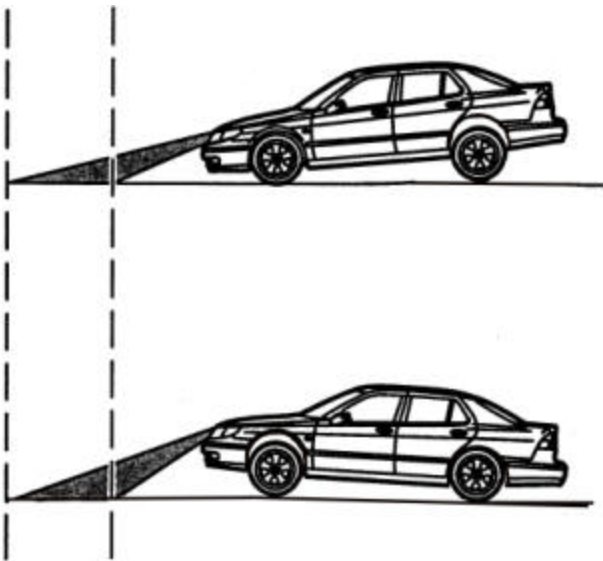
Xenon lamps always have the same brightness. The beam of light from a xenon lamp is limited for dipped beam (low beam) use by a screen, which is opened by a solenoid for main beam (high beam) use to give a brighter light.



E351D117

AHL control module, xenon

There is a control module located inside the headlight housing that governs the supply of current/voltage to the xenon lamps. The control module also governs the stepping motors for the automatic beam length adjustment. The control module receives information on the angle of the car from the load angle sensors and regulates the angle of the headlamps based on that information.



Automatic headlight beam adjustment

Cars with the Bi-Xenon headlight system are equipped with automatic headlight beam adjustment. The control system ensures that the headlights are always at an optimum angle during acceleration, braking and at varying loads. When the front of the car lifts during fast acceleration, the headlights will be angled down and during heavy braking when the front of the car dips, they will be angled up. The correct angle is maintained even when the car is heavily loaded.

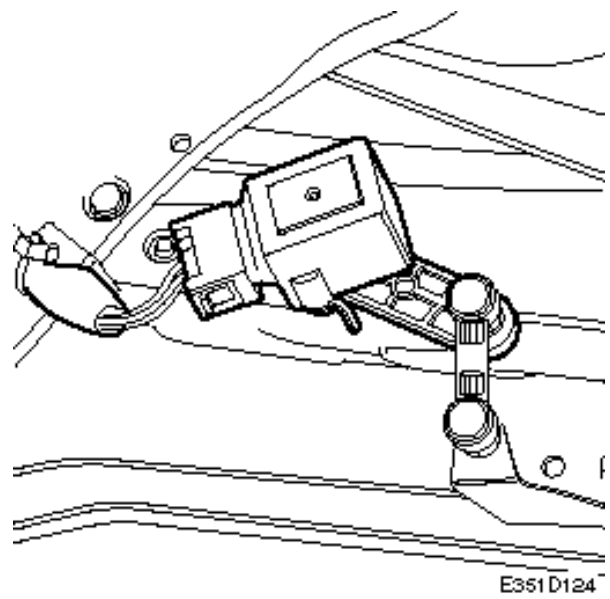
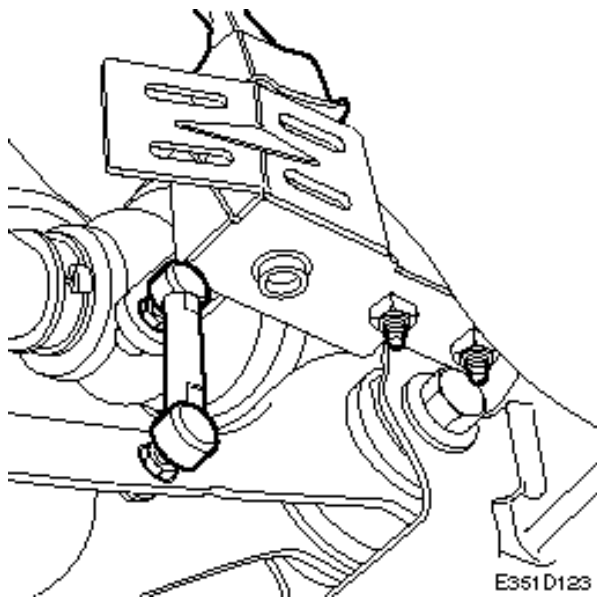
The headlight beam adjustment system is equipped with two load angle sensors located by the front and rear axle respectively. These Hall sensors detect whether the front of the car is lifting or dipping. The two AHL control modules, one for each headlight, receive information on the car's movement from the load angle sensor and instruct the motors to adjust the angle of the headlights.

The system is calibrated when the xenon lamps are ignited by angling down the headlights to their lowest position and then up again to their normal position.

In the event of a system malfunction, the headlights will be adjusted to a position slightly below normal and an indicator lamp in the dashboard will come on.

Headlight beam adjustment motor

There is a stepping motor located in each headlight housing. The headlight beam adjustment motors change the angle of the headlights according to instructions from the AHL control module.



Load angle sensors

Cars with automatic headlight beam adjustment are fitted with a front and rear load angle sensor.

The front sensor is fitted between the subframe and the wishbone and receives information on the wishbone movement in relation to the subframe. This information is sent on to the AHL control module as a pulse width modulated signal.

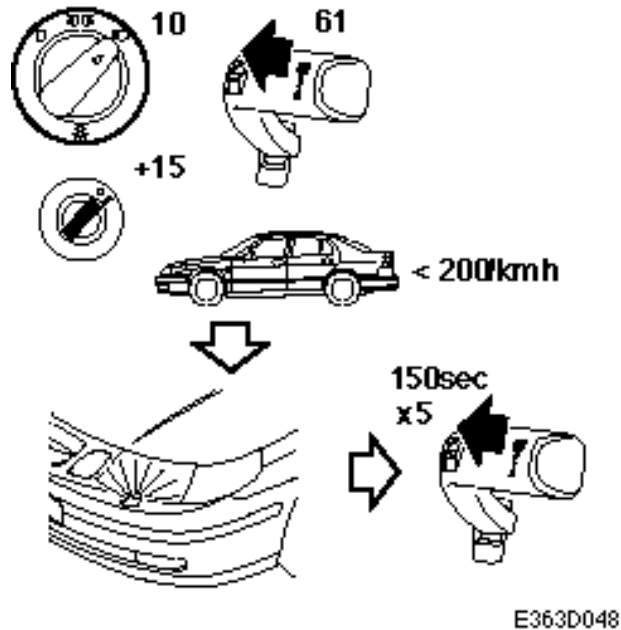
The rear sensor is fitted between the subframe and the lower transverse link and receives information on the transverse link movement in relation to the subframe. This information is sent on to the AHL control module as a pulse width modulated signal.

The AHL control module governs the angle of the headlamps using the information provided by the two load angle sensors.

Bi-Xenon Headlight System - Electronic Calibration

The Automatic Headlight Leveling system (AHL) must be calibrated after changing the headlamp, AHL control module or the front and rear load angle sensors. The system must also be calibrated after performing any work requiring dismantling of the front or rear load angle sensor.

Wash/wipe systems (Standard on all 9-5 Models)



Description of operation, high pressure headlight washers

All 9-5 models sold in the U.S. for model year 2002 will be equipped with the new "High Pressure Headlight Washer" system. (Including models not equipped with Bi-Xenon headlights.)

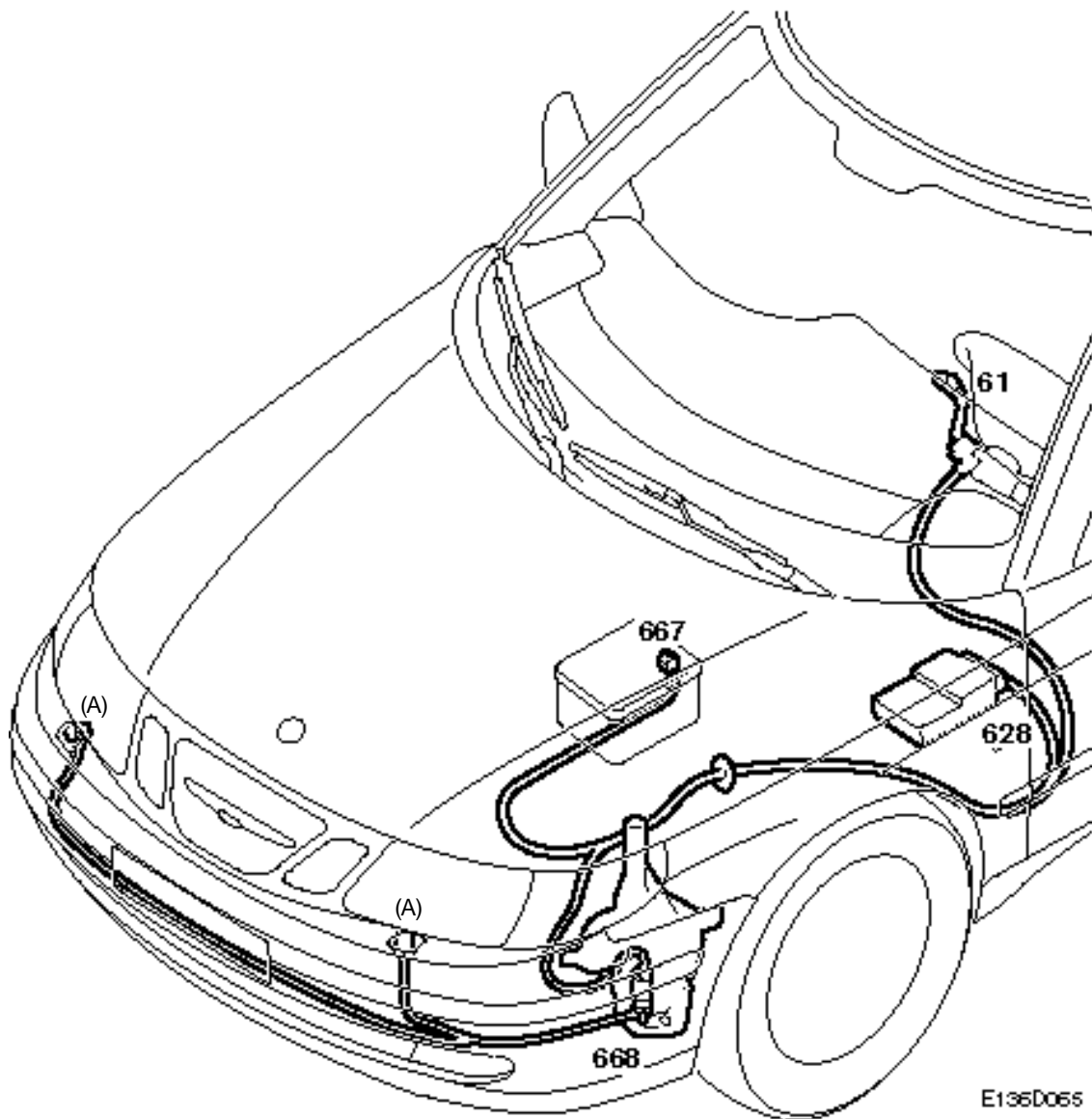
There is a washer nozzle fitted on a cylinder in the spoiler in front of each headlamp. The washer nozzles are covered in the spoiler when not in operation. The cylinder raises the nozzle from the spoiler for washing, whereby two jets are directed onto the protective headlight lens.

The headlight washers are started by activating the windshield washer switch (61) for longer than 0.5 seconds. The ignition must be ON and the vehicle speed must be below 200 km/h (124.3 mph) before the washers will start. The washer jets are active for about one second and then again briefly after one more second.

In order to activate the headlight washers again, a period of **more than 120 seconds** must have passed since the washer pump was last activated or the windshield washers must have been used **at least 5 times**. If the ignition is turned off and then on again, the headlight washer pump will operate the next time the windshield washer switch (61) is activated.

Note

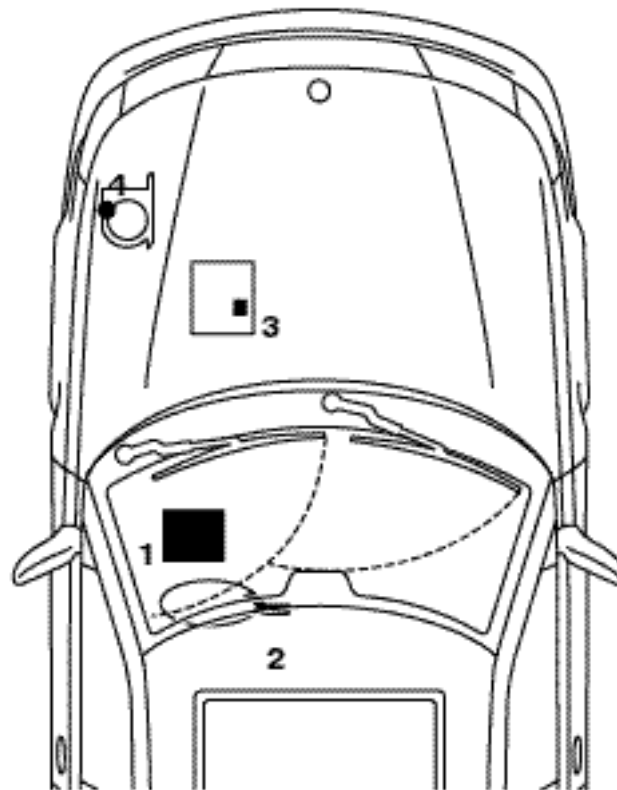
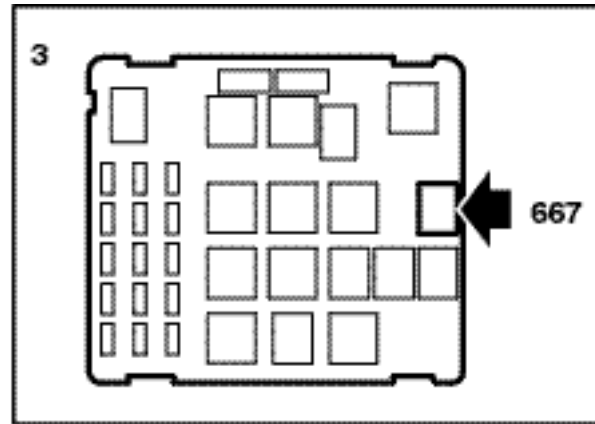
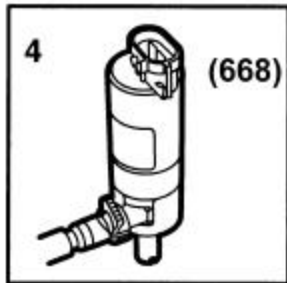
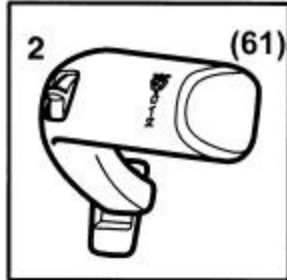
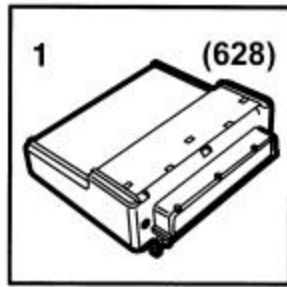
If the fuse (#35) for Daytime Running lamps is pulled, the headlamp washer system will not activate when the headlamp selector is in the OFF position.



E135D065

System overview, high pressure headlight washers

- DICE control module (628)
- Windshield wiper stalk switch (61)
- Relay, high pressure headlight washer fluid pump (667)
- Motor, high pressure headlight washer pump (668)
- High pressure "pop-up" sprayer washers (A)

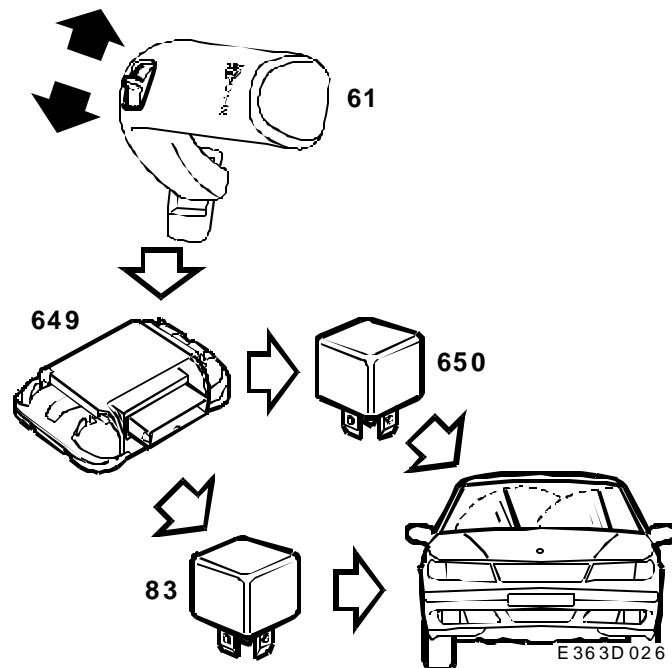


E136D066

Main components, high pressure headlight washers

1. DICE control module (628)
2. Windshield wiper stalk switch (61)
3. Relay, high pressure headlight washer fluid pump (667)
4. Motor, high pressure headlight washer pump (668)

Rain Sensing Wipers (Available on Arc and Aero)



Brief description

- Stalk switch (61)
- Rain sensor (649)
- Relay (83 and 650)

Windshield wipers with rain sensor

The windshield wiper unit is located under the cover below the windshield and comprises a motor, arm system and two wiper arms with wiper blades. The function is controlled by the rain sensor via two wiper relays.

The windshield wipers have two speeds, high/low, and an automatic mode. In automatic mode, the rain sensor sensitivity can be adjusted using a control on the stalk switch.

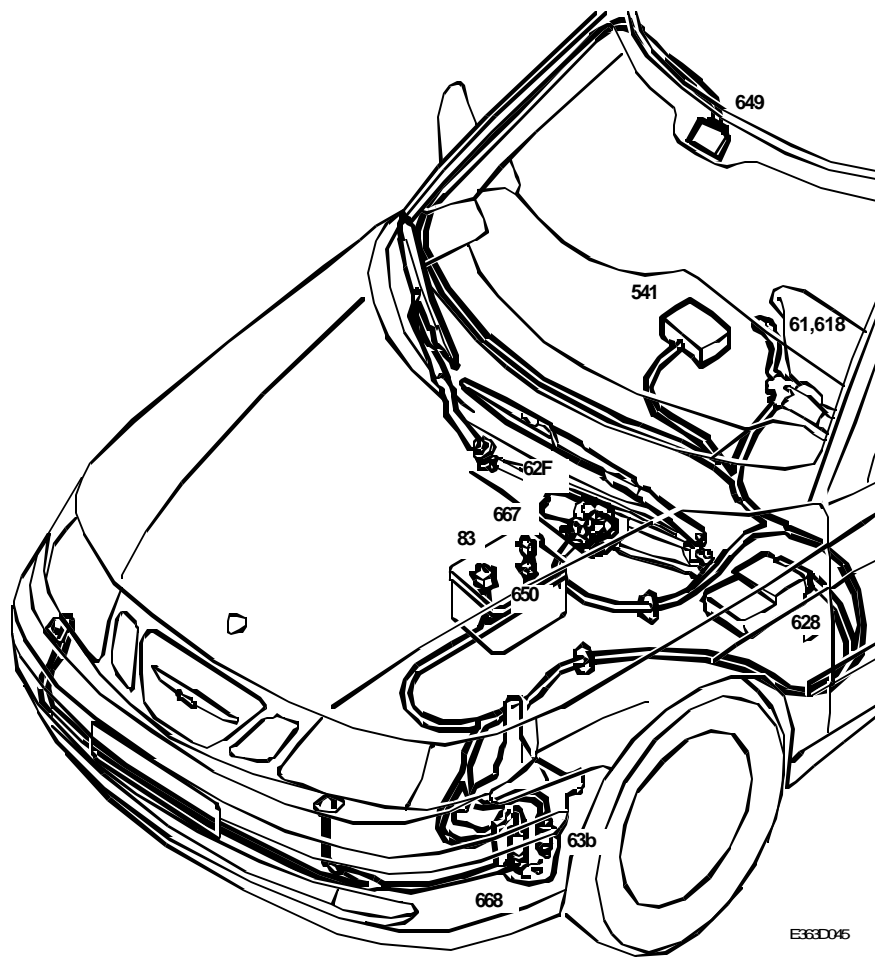
The rain sensor measures the amount of moisture on the windshield using sensors that generate infrared light. The sensor automatically starts the wiper blade on the windshield and adjusts the speed to the current weather conditions. The system calculates the need to activate the windshield wipers in all weather conditions.

The rain sensor assumes the DICE functions regarding windshield wipers.

The system is activated by moving the stalk switch on the steering wheel (located to the right of the steering wheel) to position 1. On cars without rain sensor, this position is for intermittent wiper operation. How sensitive the sensor is and how often the wipers operate can be adjusted with the knob on the stalk switch. The sensor is most sensitive with the knob in its uppermost position.

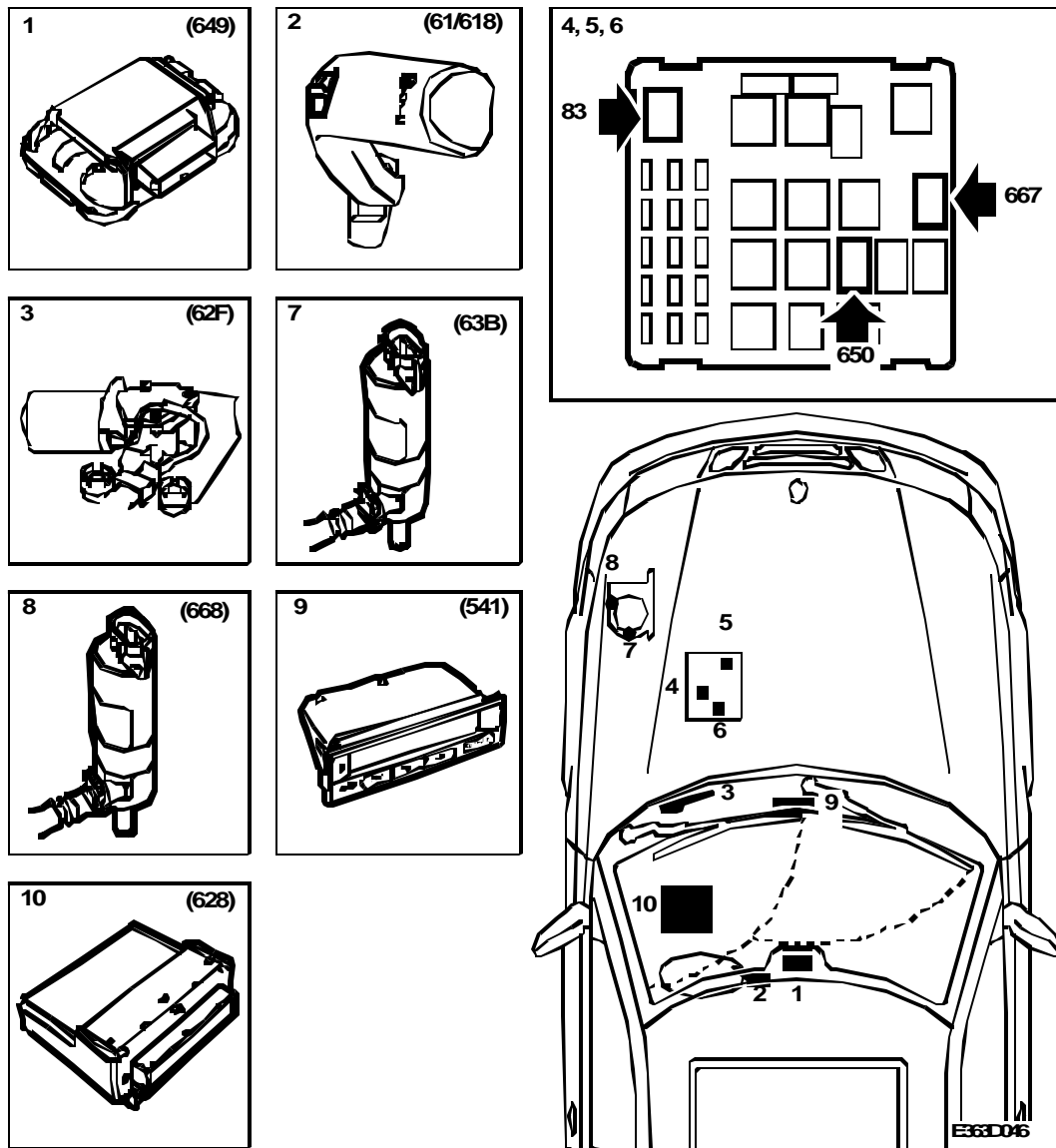
The system switches between single and continuous strokes depending on the amount of snow or water that is on the windscreen. The sensitivity will increase in darkness.

In the U.S., the system will be available as part of an optional package on Saab 9-5 Arc 3.0t and Aero models.



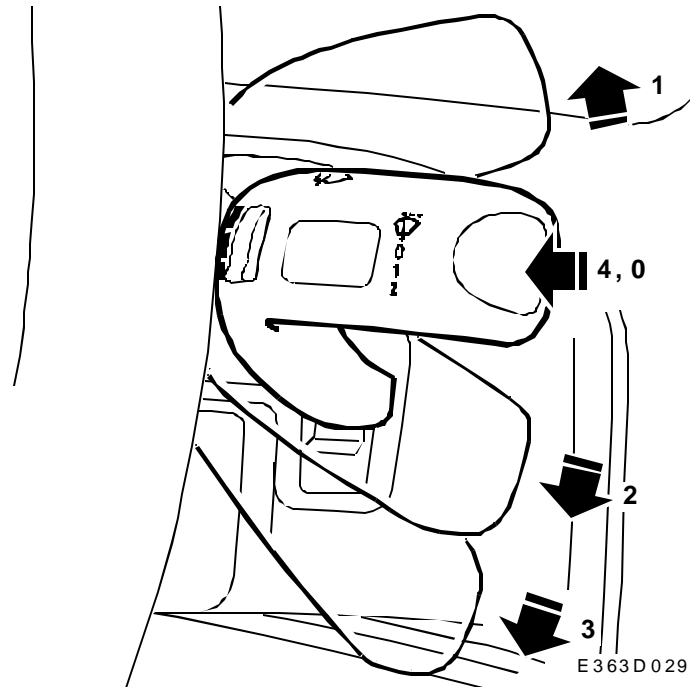
System overview

- Rain sensor (649)
- Relay, rain sensor (650)
- Relay, headlamp washer fluid pump (667)
- Windshield wiper stalk switch (61,618)
- Windshield wiper motor (62F)
- Washer fluid motor, windshield (63a, 63b)
- Washer fluid motor, headlamps (668)
- Relay, intermittent wiper (83)
- DICE (628)
- SID (541)



Principal components

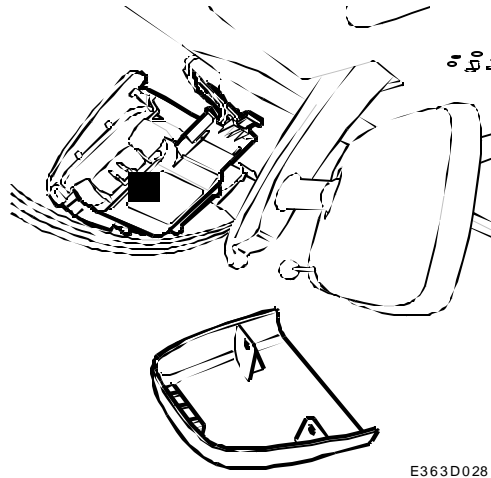
1. Rain sensor (649)
2. Windshield wiper stalk switch (61,618)
3. Windshield wiper motor (62F)
4. Relay, rain sensor (650)
5. Relay, intermittent wiper (83)
6. Relay, headlamp washer fluid pump (667)
7. Washer fluid motor (63b)
8. Washer fluid motor (668)
9. SID (541)
10. DICE (628)



Activating positions

Wipers are activated with the stalk switch in the following positions:

1. Automatic mode
The rain sensor controls the wiper motor from intermittent to high speed.
2. Low speed
The wiper motor is activated at low speed without the assistance of the rain sensor.
3. High speed
The wiper motor is activated at high speed with the assistance of the rain sensor.
4. Washing
The washer pumps are activated and the rain sensor starts the windshield wipers.



Rain sensor

The rain sensor is a control module with its own logic. It is NOT connected to the bus and, therefore, will not generate fault codes or communicate with Tech 2. The sensor is located on the windshield in front of the rear-view mirror. It is pressed against the inside of the windshield and secured with two clips. A silicone cushion is located between the sensor and the windshield to follow the shape of the windscreen. The rain sensor is protected by a cover. The cover can be removed using tool 82-93-474.

When activated in automatic mode (position 1), the wipers will make one reference stroke to calibrate the sensor while the windshield is clear and to inform the driver that the sensor is activated. If the ignition has been turned off, the sensor must be reactivated by moving the stalk switch to position 0 and then back to position 1.

The rain sensor consists of two LEDs that generate infrared light, two photo diodes that receive light signals, and one photo diode to distinguish between night and day.

The sensor controls automatic mode (position 1), high speed (position 3), and wash/wipe (position 4).

Function

A night/day photo diode measures the external light and informs the rain sensor so it can adapt its sensitivity. The system recognizes that the driver needs increased sensitivity in darkness.

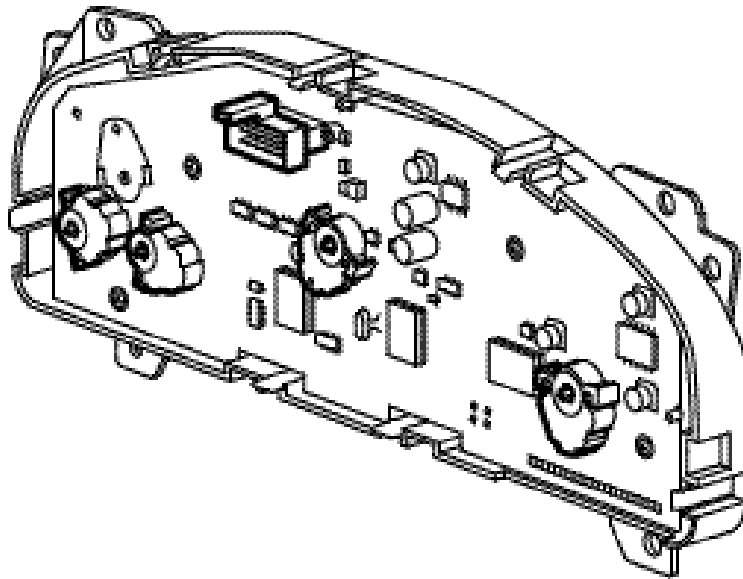
The light sensors generate infrared light that is refracted at a certain angle in the surface layer of the windshield if there is no snow or rain on the windscreen. When there are raindrops or snowflakes on the area that the sensors cover, the light will refract at a different angle.

The photo diodes receive incoming light and, from this information, the microprocessor can determine whether the rain sensor should activate the wipers.

Operation in special conditions

- Tunnels - When the car is driven through a tunnel, the wipers will be interrupted. Outside the tunnel (after the interruption), high speed can be activated rapidly if the sensor detects any drops of water.
- Splash - If a shower of water washes over the windscreen, high speed will be activated until the water has been wiped away.
- Worn wiper blades (smearing) - Worn or dirty wiper blades will form a fast-drying film of water that covers the sensor surface. The sensor will prevent unnecessary wiper action and excessive wear of the wiper blades.
- Dirt function - The wiper blades will not be activated if the sensor detects a dirty windscreen. The driver will have to wash the windshield first.

Main instrument unit, MIU



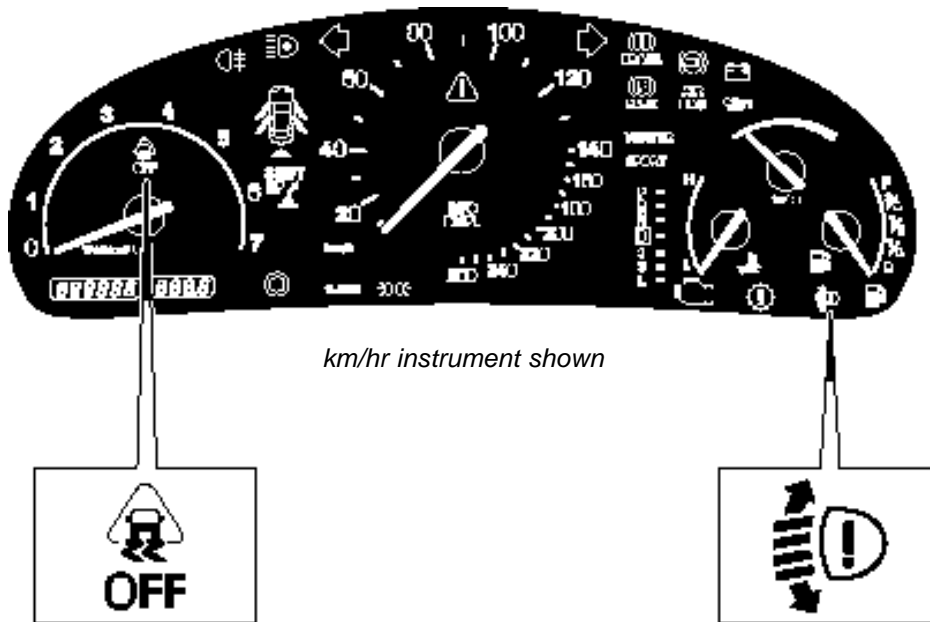
E381 D250

A new main instrument unit with several modifications has been introduced on the Saab 9-5. All the electronics and other components are now combined on one circuit board, thus reducing the depth and weight of the main instrument unit. Instrument lighting comprises only LEDs, which provide a more agreeable light and are very reliable.

Four new warning and indicator lamps have been added and certain functions have been revised.

The following changes have also been carried out:

- Only one 22-pin connector.
- All lamp bulbs have been replaced with LEDs. Some lamps have been moved.
- Stepping motors for all gauges instead of moving coil instruments. The stepping motors are controlled internally by the main instrument unit control module. The main instrument unit calibrates the stepping motors automatically as soon as the instrument is powered up (+30). The motors then take up a mechanical stop position on their shafts.
- Only the front glass and complete units are available as spare parts.



E381D249

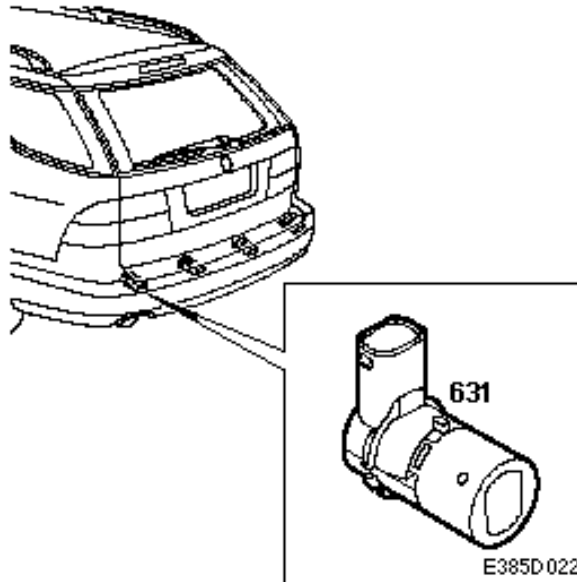
New warning and indicator lamps

- ESP (Electronic Stability Program) indicator. The lamp is available on cars equipped with ESP and comes on when it is active. TC/ABS is included in the ESP system and the TCS lamp has been replaced with a new symbol on cars with optional ESP or TC/ABS.
- ESP OFF or TCS OFF indicator. The lamp comes on when ESP has been disengaged. It also comes on in case of a fault in the TCS or ESP functions. Available on cars with ESP or TC/ABS.
- Xenon indicator. The lamp is available on cars with optional Bi-Xenon headlamps. The lamp comes on in case of a fault in the system.

Functional changes

- The miles graduation is more compressed in the higher speeds.
- The airbag lamp is now governed via bus information from SRS to the main instrument unit. The main instrument unit uses the information to turn the lamp on/off.

Saab Parking Assistance, SPA (Available on Arc and Aero)



Brief description

To facilitate reversing and parking, the Saab 9-5 (Sedans and SportWagons) can be equipped with **Saab Parking Assistance (SPA)**. SPA will be available in an option package on Arc and Aero models in the U.S. market for model year 2002.

SPA measures and indicates the distance to the closest object behind the vehicle. The distance is indicated via the SID (Saab Information Display) in the form of acoustic signals (beeps) in addition to the message "PARK ASSIST" displayed on SID.

While the vehicle is reversing, as it gets closer to an object, the signal (beeps) from the SID become more frequent (more signals per unit of time). In this way the driver can avoid damage to the vehicle when reversing (e.g. when parking). SPA is activated only when the reverse gear is selected.

In the Sedan variant, the control module is located behind the backrest member, under the side trim on the left-hand side.

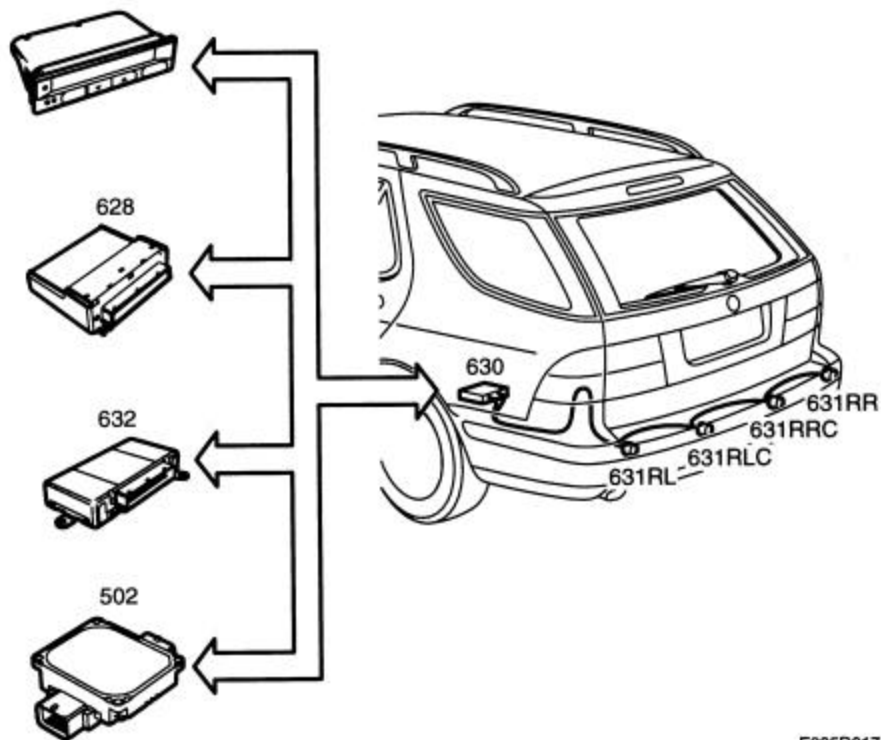
In the SportWagon variant, the control module is located under the front floor in luggage compartment.

The four distance sensors use ultrasound to measure the distance to the closest object behind or alongside the car. The sensors are located in the rear bumper and are named as follows:

- Left-hand outer distance sensor (RL)
- Left-hand center distance sensor (RLC)
- Right-hand center distance sensor (RRC)
- Right-hand outer distance sensor (RR)

(Note that this system will not be available until February, 2002)

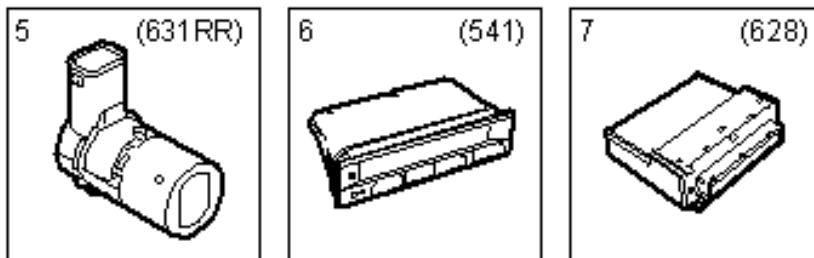
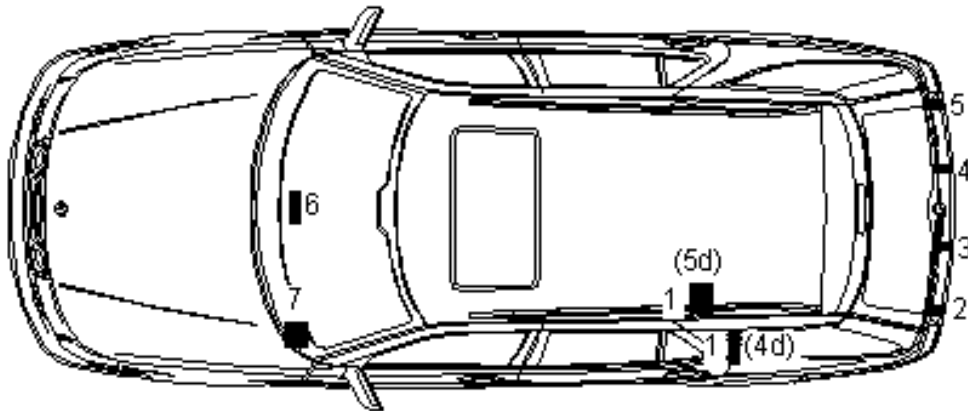
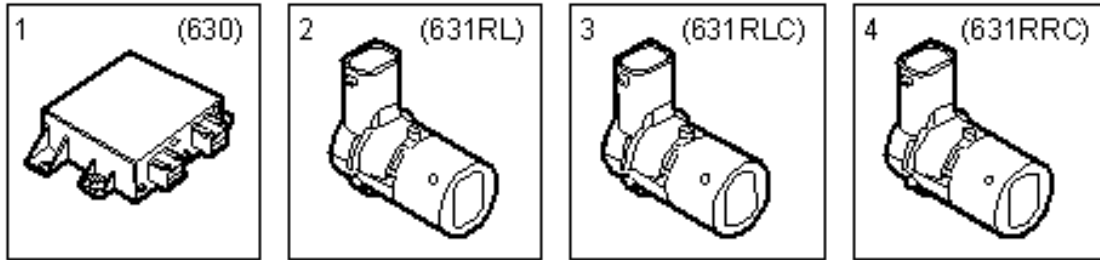
System overview



E385D017

- Ultrasound distance sensors:
 - Right-hand outer sensor (631RR)
 - Right-hand center sensor (631RRC)
 - Left-hand center sensor (631RLC)
 - Left-hand outer sensor (631RL)
- SPA control module (630)
- SID control module (541)
- DICE control module (628)
- TWICE control module (632)
- TCM control module (502)

Main components



E385D004

1. SPA control module (630)
2. Distance sensor, LH outer (631RL)
3. Distance sensor, LH center (631RLC)
4. Distance sensor, RH center (631RRC)
5. Distance sensor, RH outer (631RR)
6. SID (541)
7. DICE control module (628)

Turning off SPA

If you wish to turn off the SPA, for example, when towing a trailer, press the CLEAR button on the SID when "PARK ASSIST" is displayed until "PARK ASSIST OFF" appears, approx. 1-2 seconds.

If you wish to reactivate the SPA there are two methods:

- Press CLEAR until the SID text changes (the text is not shown until the function is ON/OFF).
- Turn the ignition ON and OFF.

Note

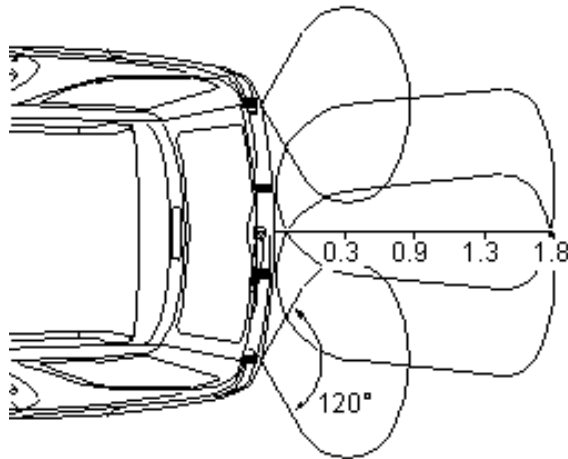
To deactivate SPA, you must press the CLEAR button on the SID until it shows "PARK ASSIST OFF" each time the ignition is cycled.

The text message is stored in English, Swedish, German, Spanish, French and Italian in the SPA unit. It is sent via the I bus to the SID, where it is displayed.

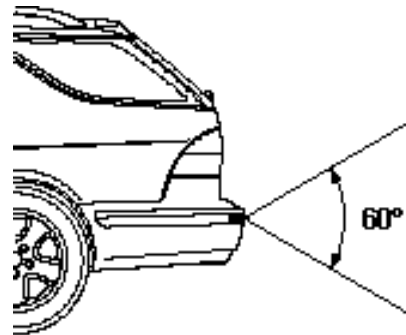
The text messages are as follows:

- PARK ASSIST
- PARK ASSIST FAILURE
- PARK ASSIST OFF

Distance measurement and indication



E385D002



E385D023

The control module receives information from the DICE when reverse gear is selected. The control module accordingly activates the distance sensors. The sensors emit and receive ultrasound signals, sent in a preset pattern, see Distance sensors.

The control module processes continuous data input from the sensors in order to send the correct signal to the SID, and, in turn, to the driver.

The driver receives information from the SID regarding the closest object behind the vehicle in the form of pulses of sound of varying frequencies. The first indication is given when there is an object 1.8m / 5.9ft behind the vehicle. The frequency of the signal is then 2 pulses per second.

The frequency of the signal increases the closer to the object the car comes. The signal changes as follows:

- 1.8m (71in) - 1.3m (51in): 2 pulses/second
- 1.3m (51in) - 0.9m (35in): 3 pulses/second
- 0.9m (35in) - 0.3m (12in): from 5 to 12 pulses/second in close steps
- 0.3m (12in) or closer: continuous tone

If the driver reverses at a speed greater than 1.8 m/s (6.5 km/h or 4 mph), the SPA is of no benefit, since the indication of distance is limited to 1.8m / 5.9ft behind the car. The driver has

therefore only 1 second to react and bring the car to a halt. In addition, the braking distance must be taken into account. For the SPA to be of benefit, moderate speeds must be maintained.

If the distance sensors are covered by ice, snow or dirt, their function will be impaired. In such cases, the distance sensors should be wiped clean.

When reversing on a surface that is highly reflective to ultrasound, the system can indicate the distance to the ground instead of the closest object behind the car. This can occur, for example, on unpaved roads or other uneven surfaces. Testing of the function of the SPA must be carried out on an even surface with no objects placed on the ground.

Objects alongside the car

The SPA also takes objects beside the car into consideration, such as when reversing alongside a garage wall. In cases where the outer distance sensors detect an object that is not detected by the center sensors, the object is indicated as an object alongside the car. The threshold for detection of objects beside the car is approx. 40 cm (16 in).

If the object alongside the car remains at a constant distance for longer than 3 seconds, side indication is halted, and only objects directly behind the car are indicated. If the object alongside the car subsequently comes 5 cm (2 in) closer to the car, the control module will again inform the driver of the object via the SID.

Transmission

5-Speed automatic transmission (Available on Linear and Aero, Standard on Arc)

Brief description

A new 5-speed automatic transmission has been introduced on the 9-5 engines.

The new transmission is based on the tried and tested 4-speed Aisin-AW that has been fitted on the 9-5 since its introduction. Special advantages of the new transmission include faster acceleration, lower fuel consumption, and improved utilization of engine capacity through more gear steps.

The control module (TCM) is also new and now has adaptive functions with two 38-pin connectors. The control module software is updateable using procedures in SPS.

The AF33/5 automatic transmission has a 5-speed gearbox with Lock-Up. The AF33/5 is principally built around 4 planetary gears, a torque converter with lock-up, a hydraulic control system and an electric control system.

The transmission is governed by a control module (TCM) that continuously processes the information it receives from its own sensor and from other control modules. Using this information, the control module governs the transmission hydraulic system so that the correct gear is selected with respect to the conditions at hand. The TCM also takes into consideration any wear that may be present in the gearbox to ensure smooth gear changing even when the gearbox is worn. In this adaptive system, the TCM compares the current gear changing performance with a gear changing matrix in the software and "learns" whatever each gear changing situation requires with respect to pressure/time in order to perform the gear change comfortably.

This memory, as well as the memory for fault codes, is stored in an EEPROM, which means that the information will remain in memory even if the power is cut. Because of this, the TCM must be reset (using Tech 2) after carrying out repairs, exchanging the gearbox or TCM, and after SPS programming. The TCM is located in the same

position, inside the cabin between the glove box and the bulkhead.

The TCM self-diagnosis continuously monitors all the functions of the system and sets DTC's if necessary.

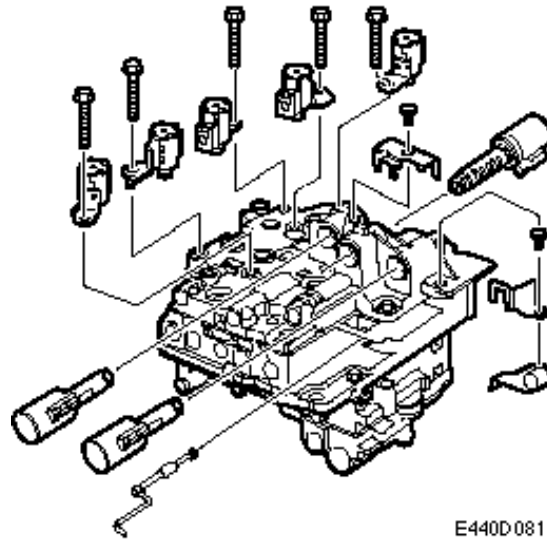
As before, it is possible to choose between three different driving programs:

- Normal
- Sport
- Winter

"Slipping" lock-up

A new feature with this gearbox is that the lock-up clutch is allowed to "slip" under certain driving conditions (allows a difference in speed of 50-200 rpm between the pump and turbine wheels to avoid downshifting unnecessarily for moderate torque requests). This feature saves fuel and prevents vibration and noise in the body. Slipping lock-up is allowed in 4th and 5th gears and only when the transmission fluid temperature is above 40°C (104°F).

The fluid used in this transmission system is a completely new type due to the increased stress caused by the slipping lock-up. The fluid is designated JWS 3309, (Aisin-AW spec). JWS 3309 is a mineral-based ATF with unique additives, high coefficient of friction and very high resistance to thermal oxidation. This fluid is factory standard on model -02 cars and applies also to 9-3 (4-speed aut.). JWS 3309 will mix with Dexron II and III. JWS 3309 is therefore "backwards compatible," but will not provide any advantages over standard fluid in earlier 4-speed automatic transmissions. However, only JWS 3309 is to be used in Aisin AW 33/5 and **no** other fluid. The gearbox can withstand a torque of 350 Nm (258 ft.lb.) that is allowed in 3rd, 4th and 5th gears. In 1st and 2nd gears, a torque of 330 Nm is allowed. Overboost (2.3HOT on Aero) is not allowed.



Another new feature is the Hall sensor used for the input and output shaft speed sensors that have previously been of the inductive type. This change in sensor has been made because Hall sensors are more precise, they supply a clear square wave at speeds as low as 20 rpm where the earlier inductive sensors required at least 50 rpm to supply a sine wave that changed with respect to frequency and amplitude.

The valve body now contains 5 "on-off" solenoids and 3 PWM solenoids. Solenoids S1-S5 control the flow of oil to the various clutches and brakes as before. The current consumption of the 5 "on-off" solenoids is 1A continuous and 2A maximum.

As on earlier models, the new transmission has shifting programs for different situations. In short, the TCM detects the driving conditions with respect to terrain and driver characteristics, and can adapt the shifting points according to this information. For example, when driving up a long hill, the TCM will detect that the load is not decreasing despite the fact that a higher gear should have been engaged at the current speed.

This means that the transmission will stay in the lower gear to avoid "hunting" due to continual up and down shifting. This system provides a pronounced improvement in riding comfort.

Three different temperature programs are also stored in the TCM in order to spare the gearbox from thermal damage that can result in burned discs and black, oxidized, burned oil:

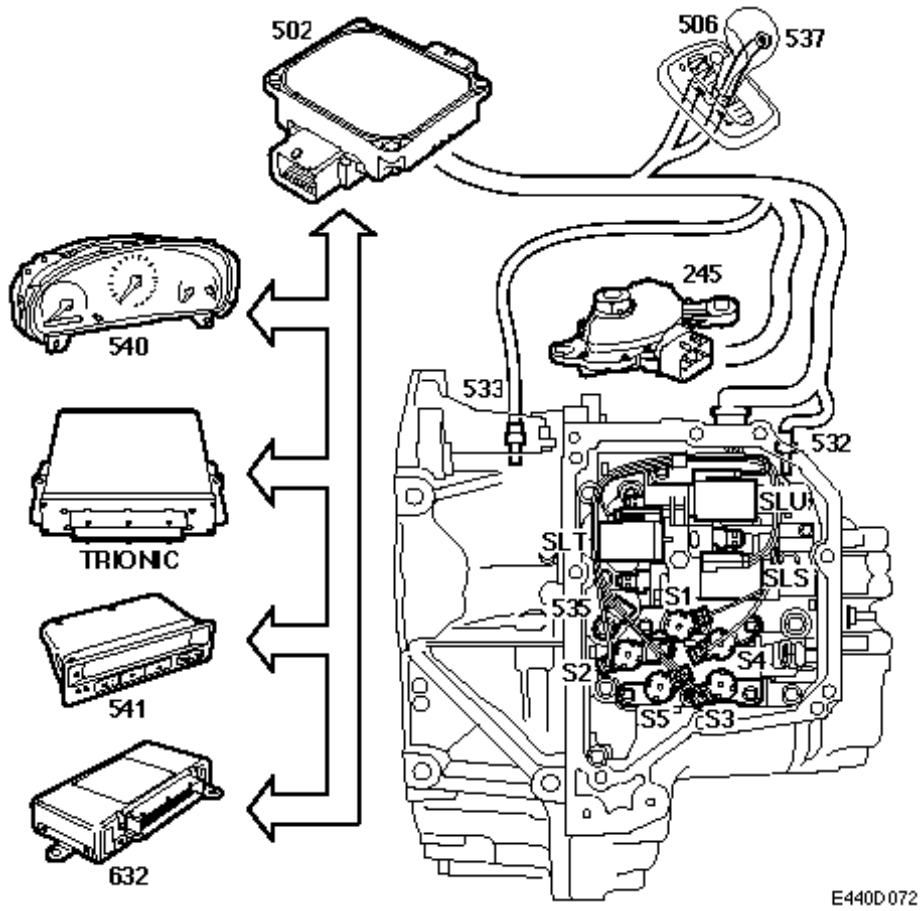
HOT 1 activated at a transmission temperature of 128°C/262°F and deactivated at 120°C/248°F. This is achieved by engaging lock-up in 3rd gear (lock-up is normally allowed in 4th and 5th gears only), which gives lower oil temperatures thanks to the elimination of slip in the converter.

HOT 2 activated at 135°C/275°F and deactivated at 130°C/266°F. This is achieved by engaging lock-up in 2nd gear.

HOT 3 activated at 145°C/293°F and deactivated at 135°C/275°F. At this temperature, TCM will request torque limitation to 200Nm from Trionic 7.

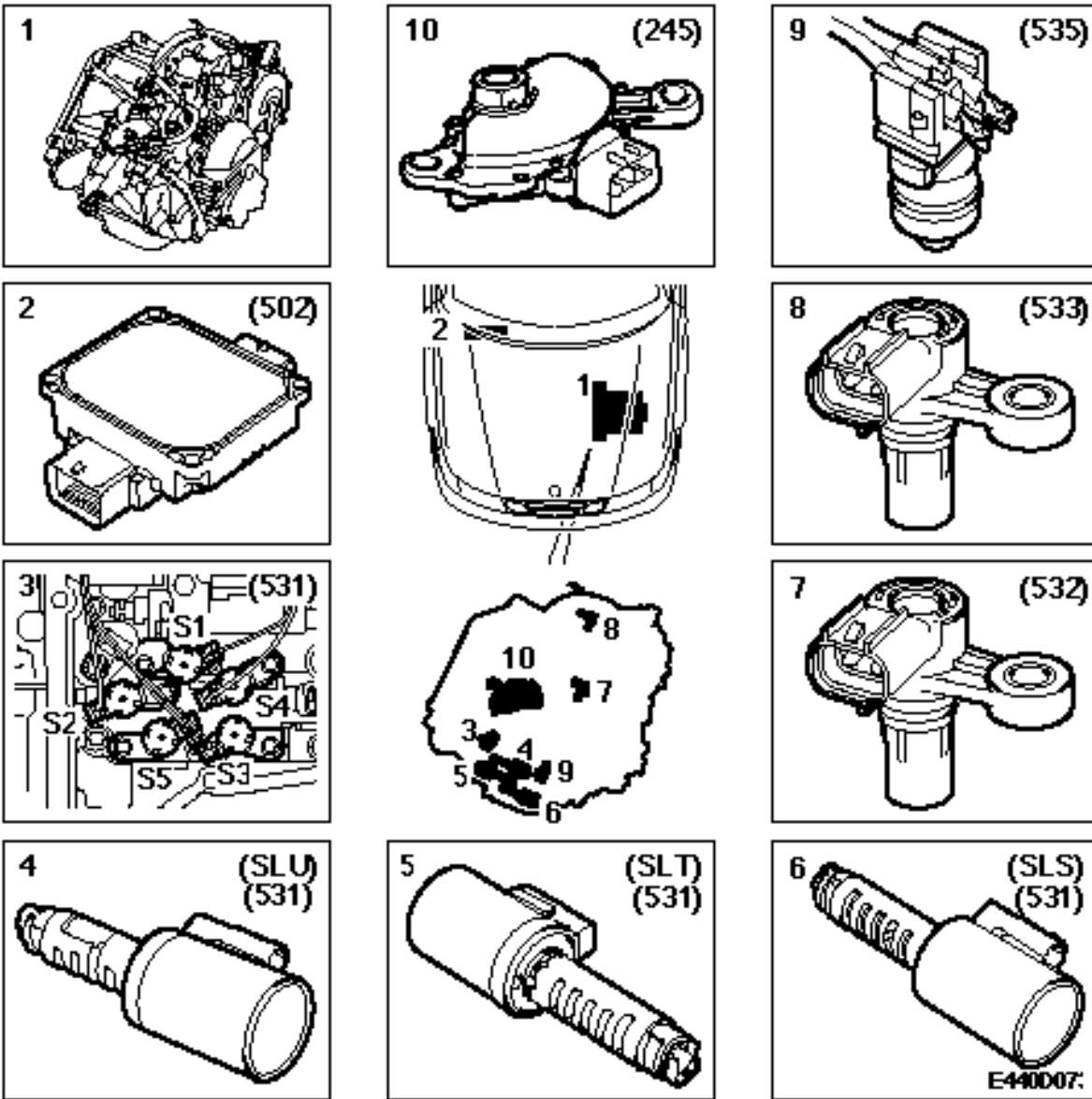
If the temperature still rises above 155°C/311°F for longer than 10 seconds or 140°C/284°F for longer than 60 seconds at speeds above 180 km/h (111 mph), DTC P0218 will be set. A bus message "TRANSMISSION OVERHEATING" will be sent from the TCM to the SID display and the transmission will go into limp-home mode (only 5th gear, 2nd gear and reverse will be available).

System overview



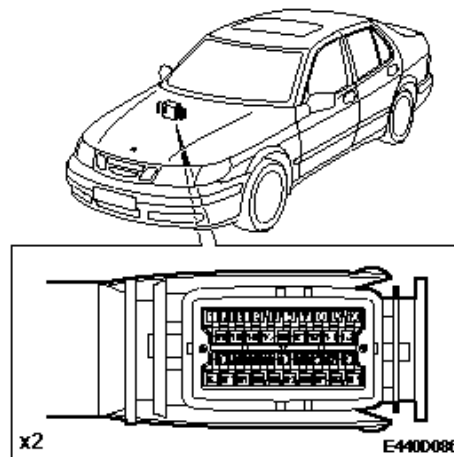
E440D072

Principal components



The automatic transmission consists of the following principal components:

- | | |
|--|--|
| 1. Gearbox | 6. Clutch disc pressure solenoid valve (SLS) 531 |
| 2. Control module, (TCM) 502 | 7. Input shaft speed sensor, 532 |
| 3. Gearshift solenoid valves, (S1-S5) 531 | 8. Output shaft speed sensor, 533 |
| 4. Lock Up solenoid valve, (SLU) 531 | 9. Transmission fluid temperature sensor, 535 |
| 5. System pressure solenoid valve, (SLT) 531 | 10. Gear selector position sensor, 245 |



Control modules

The transmission control module primarily controls

- Shift points
- System pressure
- Lock-up engagement (fixed or slipping)

The control module has two 38-pin connections and is located behind the glove box in the passenger compartment. It is programmed for one of the engine variants B235E/R or B308E and is only to be used in the Saab 9-5 together with the relevant engine variant. The control module is delivered unprogrammed when purchased as a spare part and must therefore be programmed for the correct engine type using Tech 2 and the SPS procedure. The control module receives information from a number of its own sensors as well as from other electronic systems. This information is processed by the control module for controlling the current gear and shift points based on the selected driving program (NORMAL, SPORT or WINTER).

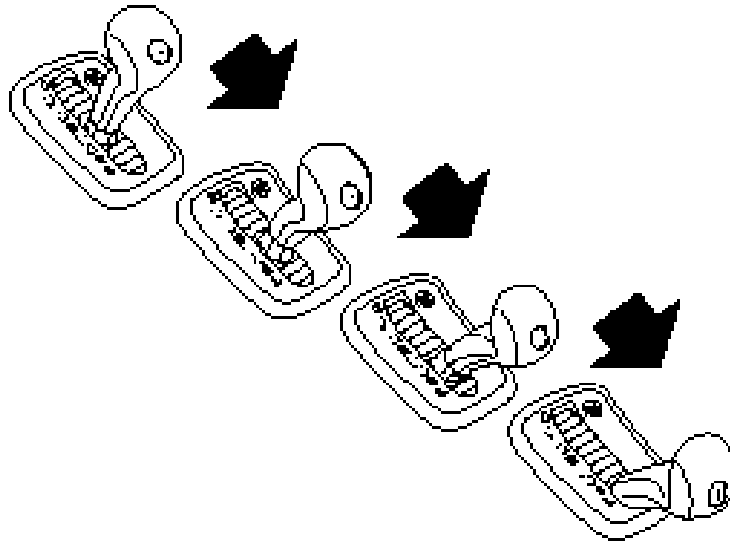
Gear changing takes place when the control module acts on solenoid valves S1, S2, S3, S4 and S5, which are mounted in the transmission valve body. The control module also determines if and when the torque converter lock-up is to be engaged based on a certain combination of solenoid valve settings. Three linear solenoids are mounted in the valve body and control the lock-up (SLU), system pressure (SLT) and the clutch disc pressure (SLS).

When the ignition switch is turned to the ON position, the control module will be activated and turn on the CHECK GEARBOX lamp as a function check. If no faults are found, TCM will turn off the lamp after three seconds.

In the event of a fault in any of the inputs/outputs, the transmission will go into Limp-home mode. All control module functions will then be disengaged or an emergency operation program will be activated. The car can then be driven but with limited shifting capability.

TCM also takes into consideration any wear that may be present in the gearbox, which ensures smooth gear changing even when the gearbox is worn. This adaptive system means the TCM compares the current gear changing performance with a gear changing matrix in the software and "learns" whatever each gear changing situation requires with respect to pressure/time in order to perform the gear change comfortably. Because of this, the TCM must be reset (using Tech 2) after carrying out repairs, or exchanging the gearbox or TCM, and after SPS programming.

The control module can be SPS programmed using the diagnostic instrument.

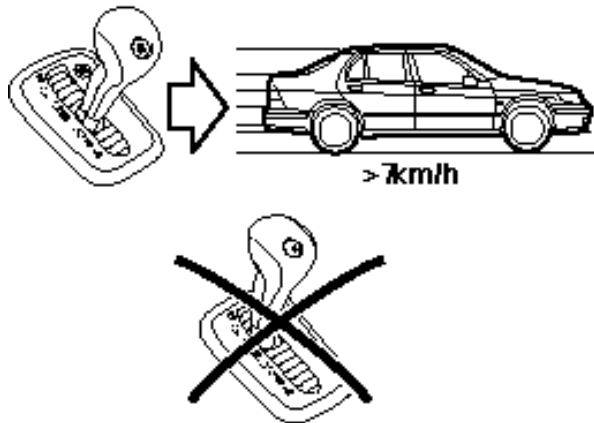


E440D 127

Electronic overspeed protection

In order to prevent the engine from overspeeding, the transmission control module is programmed with an electronic overspeed protection function. This means that it is not possible to gear down until the vehicle speed is below the relevant limit.

Gear changing	Max speed km/h	Max speed mph
5-4	175	109
4-3	125	78
3-2	75	47
2-1	35	22

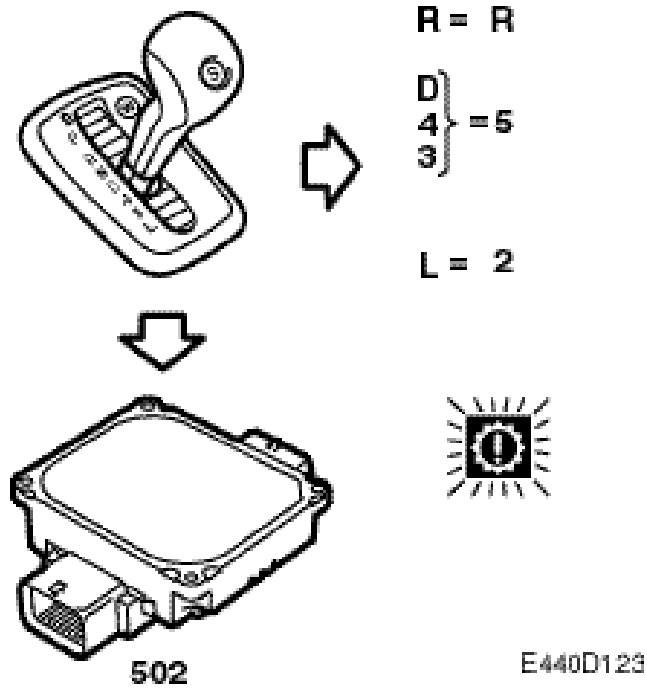


E440D 124

Electronic reverse gear detent

When changing to R from D, 4, 3 or L while the vehicle speed exceeds 7 km/h (4.3 mph), the control module will energize the S1 solenoid to prevent reverse gear from being engaged (brake B3 released).

The electronic reverse gear detent is disengaged when the speed of the car is below 7 km/h (4.3 mph) or the selector lever is moved to a position other than R.



Limp-home

In case of a major system error, such as a mechanical fault with the system input or output functions, or an internal fault in the control module, all the control module functions will be deactivated at the same time as the control module sends the bus message "CHECK GEARBOX unit ON" to turn on the indicator lamp in the main instrument unit. A fault code will also be stored.

The transmission will now be controlled solely by the hydraulic system. This means that the transmission functions will be limited to enable the car to be driven to a garage, thus the name limp-home.

Limp-home mode provides the following gear positions:

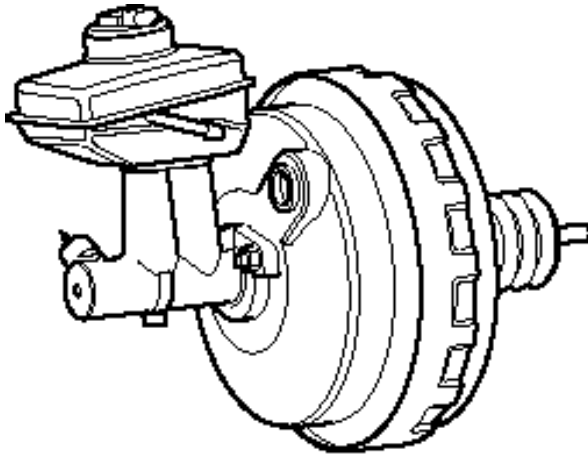
Gear position	P	R	N	D	4	3	L=2, 1
Limp-home	P	R	N	5	5	5	2

Note that 2nd gear must be engaged manually.

The CHECK GEARBOX lamp lights up and a diagnostic trouble code is stored in the memory.

Brakes

Brake system



Es22D026

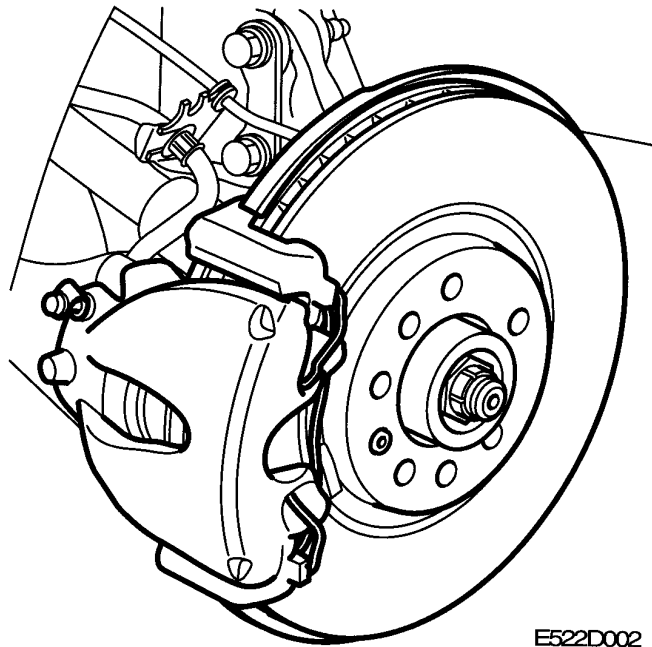
System revisions

A number of revisions and adaptations have been made on the Saab 9-5 to give more space in the engine compartment – mostly as a result of the introduction of the new V6 diesel engine in some markets.

Other improvements include better flow capacity to the hydraulic unit for the ESP stabilizing system and modifications to the brake disks that will provide better braking performance on 9-5 models with 2.3 Turbo (Aero) and 3.0t V6 engines. (In the U.S. market, these changes will be included on Arc and Aero models.)

The following are new:

- Master cylinder
- Brake servo
- The carrier up to the brake caliper has been adapted to the steering swivel member
- More powerful brake system for 2.3 Turbo (Aero) and 3.0t V6 (Arc). Larger ventilated rear discs (300mm / 11.81in), with new carrier and new rear brake caliper. The 3.0t V6 is equipped with larger front discs, previously fitted only on 9-5 Aero models (306mm / 12.05in). In the U.S. market, these changes will NOT pertain to Linear models.
- Location of ABS unit
- Front wheel sensor mounting
- Disc backing plates front and rear



Front brake system

A number of modifications have been made at the front. With the new steering swivel member, the wheel sensors are now screwed directly into the steering swivel member.

9-5 models with the 3.0t V6 engines will be equipped with larger front discs, previously fitted only on 9-5 Aero models (306mm / 12.05in). In the U.S. market, this change means that Arc models will get the larger front disks previously fitted only to Aero models.

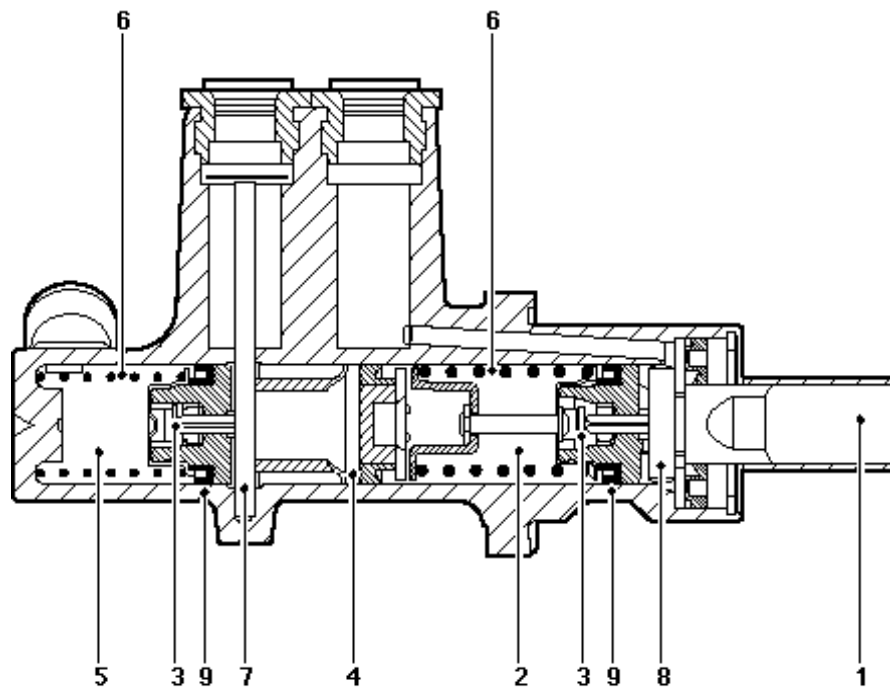
A new carrier has been introduced for the front caliper. The distance between the bolts has been increased to reduce strain and to improve stiffness. Torx M14 bolts have been used with a fixed washer to protect the aluminium steering swivel member.

ABS/ESP (Available on Arc and Aero)

A number of changes have been made in the engine bay and, because of this, the ABS unit has been located on a new bracket closest to the bulkhead.

The ESP stabilizing system (Electronic Stability Program) is available as an option. The master cylinder and lines to the hydraulic unit have been changed, because the ESP unit requires a greater flow from the master cylinder to and from the hydraulic unit. The pipe diameter in the brake lines between the unit and the master cylinder has been increased from 4.7mm (0.19in) to 6mm (0.24in).

All the brake systems (ABS, TC/ABS and ESP) from model year 2002 have 6.0mm (0.24in) brake lines between the primary cylinder and the unit. The ABS and TC/ABS systems have 4.7mm (0.19in) lines between the secondary and the hydraulic unit as before.



E521D086

Brake servo and master cylinder

Master cylinder

1. Pushrod with primary piston
2. Pressure chamber, primary circuit
3. Central valves
4. Secondary piston
5. Pressure chamber, secondary circuit
6. Return spring
7. Stop pin
8. Stop pin
9. Seals

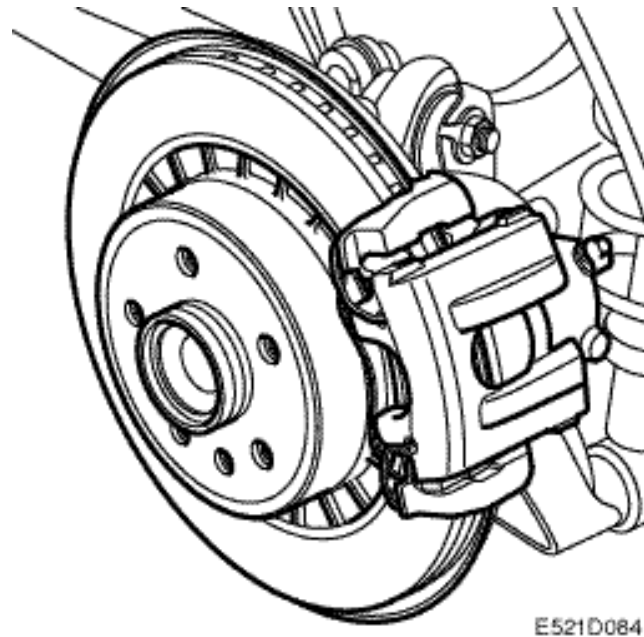
The brake servo and brake fluid reservoir are new and adapted to the new master cylinders.

The new master cylinders allow a greater flow of fluid between the ESP hydraulic unit and the master cylinders. Brake fluid pulses at a much greater extent than was necessary for TC/ABS.

The master cylinder has been modified by raising the height of the brake fluid reservoir tower by 35mm (1.37in). This is so that the brake fluid reservoir will come above the hydraulic unit, which has been given a new location adjacent to the bulkhead.

The primary cylinder is identical with the earlier master cylinders on the 9-5.

The secondary cylinder is a plunger-type deep cylinder without central valve, but with seals. Half the function is now integrated in the brake servo.



Brake system, rear

The rear brakes have been changed and now have larger, ventilated brake discs on engine models B235R (Aero) and B308E (Arc). A new carrier has been introduced and the brake caliper has been redesigned to better suit the large diameter brakes discs, 300mm (11.8in) compared with the standard 278mm (10.9in), and the 20mm (0.78in) thick disc compared with the standard single brake disc of 12mm (0.47in).

The brake caliper piston diameter has been changed from the earlier standard 38mm (1.49in) to 40mm (1.57in) on the new brake caliper with ventilated disc. Other brake calipers still have 38mm (1.49in) pistons.

Electronic Stability Program, ESP (Available on Linear, Standard on Arc and Aero)

Brief description, ESP

ESP (Electronic Stability Program) is a system that regulates the engine torque and braking to assist the driver with stabilizing the vehicle during unexpected situations that would otherwise be difficult to handle.

ESP also includes ABS and TCS, which have the same function as before.

ESP is a development of these two systems with each function acting individually as well as together in one control module. A fault in either the ESP or TCS function will disengage them both but not the ABS, which will continue to function unless it is affected by the fault. The system includes a switch on the dash to shut off the ESP (and TCS) functions.

When ESP engages during a skid, it will counteract the skid by braking one or more wheels without the driver needing to touch the brake pedal. Engine power can also be reduced to prevent wheelspin after the ESP control module requests an engine torque. The engine control module governs the engine torque according to this request.

The system receives information from a number of sensors that measure the wheel speed, side acceleration, yaw rate, steering angle and brake pressure. These values are used by the ESP system control module, which is integrated in the hydraulic unit. The control module continuously calculates the course of the vehicle, ACTUAL VALUE (the direction of the vehicle), and compares it with the direction determined by the driver with the steering wheel, DESIRED VALUE. If the ACTUAL VALUE does not correspond to the DESIRED VALUE, the system will intervene as necessary by braking one or two wheels and limiting the engine torque.

- If the car starts to **understeer** (when the front tends to continue straight ahead in a bend), the inside rear wheel will be braked.
- If the car starts to **oversteer** (the rear tends to drift out), the system will engage and brake the outside wheel until the measured and the calculated yaw rate correspond.

In the U.S. market, ESP will be standard equipment on the Aero and Arc models. ESP will be optional on the Linear model.

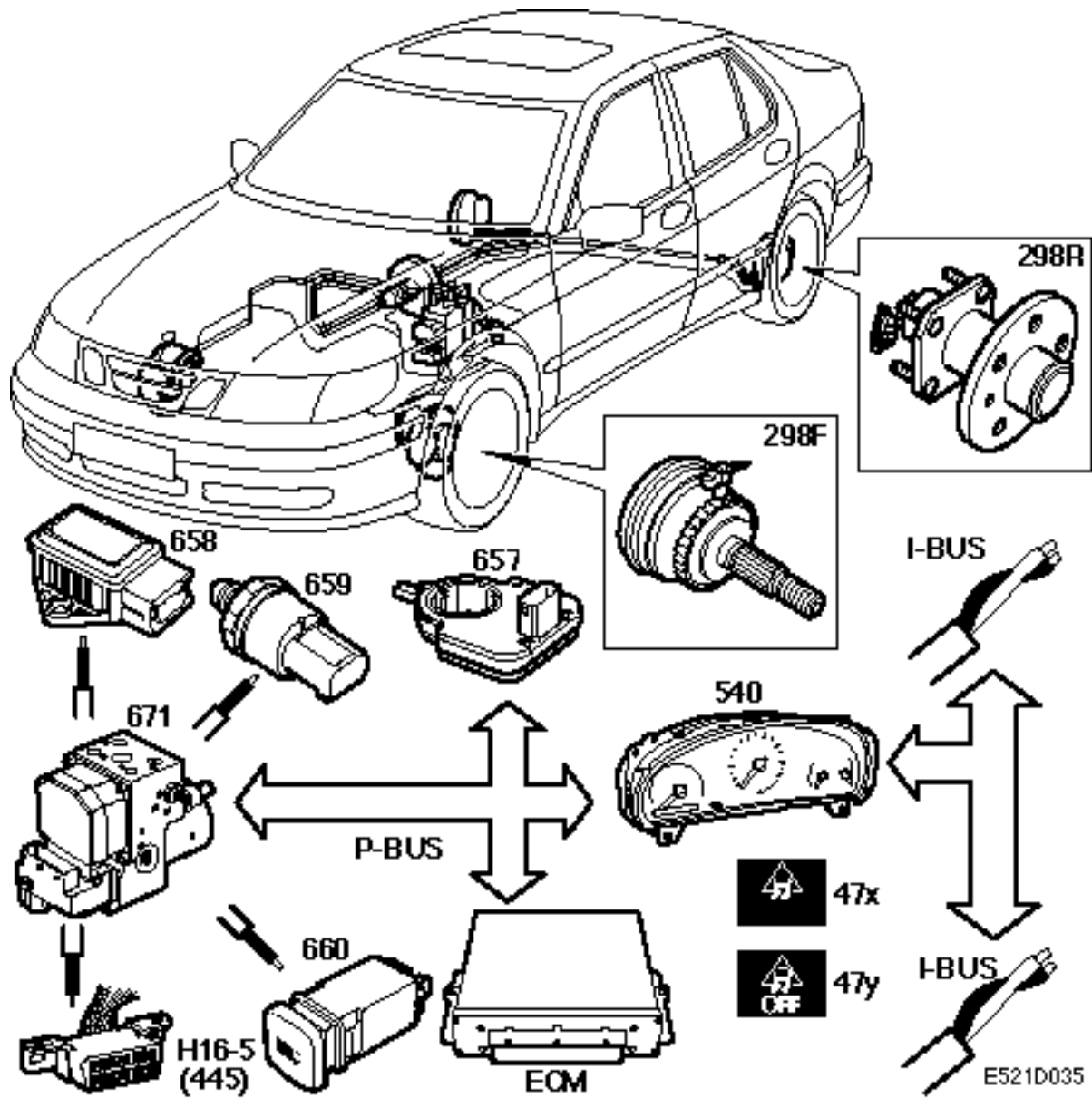
Note

The course of the car is compared with the one determined by the driver with the steering wheel and, if they do not agree, ESP will be engaged. The driver must turn the steering wheel to the correct direction of travel if the system is to be able to function correctly.

ESP does not mean you can drive faster, but should be regarded as a safety net for unexpected situations.

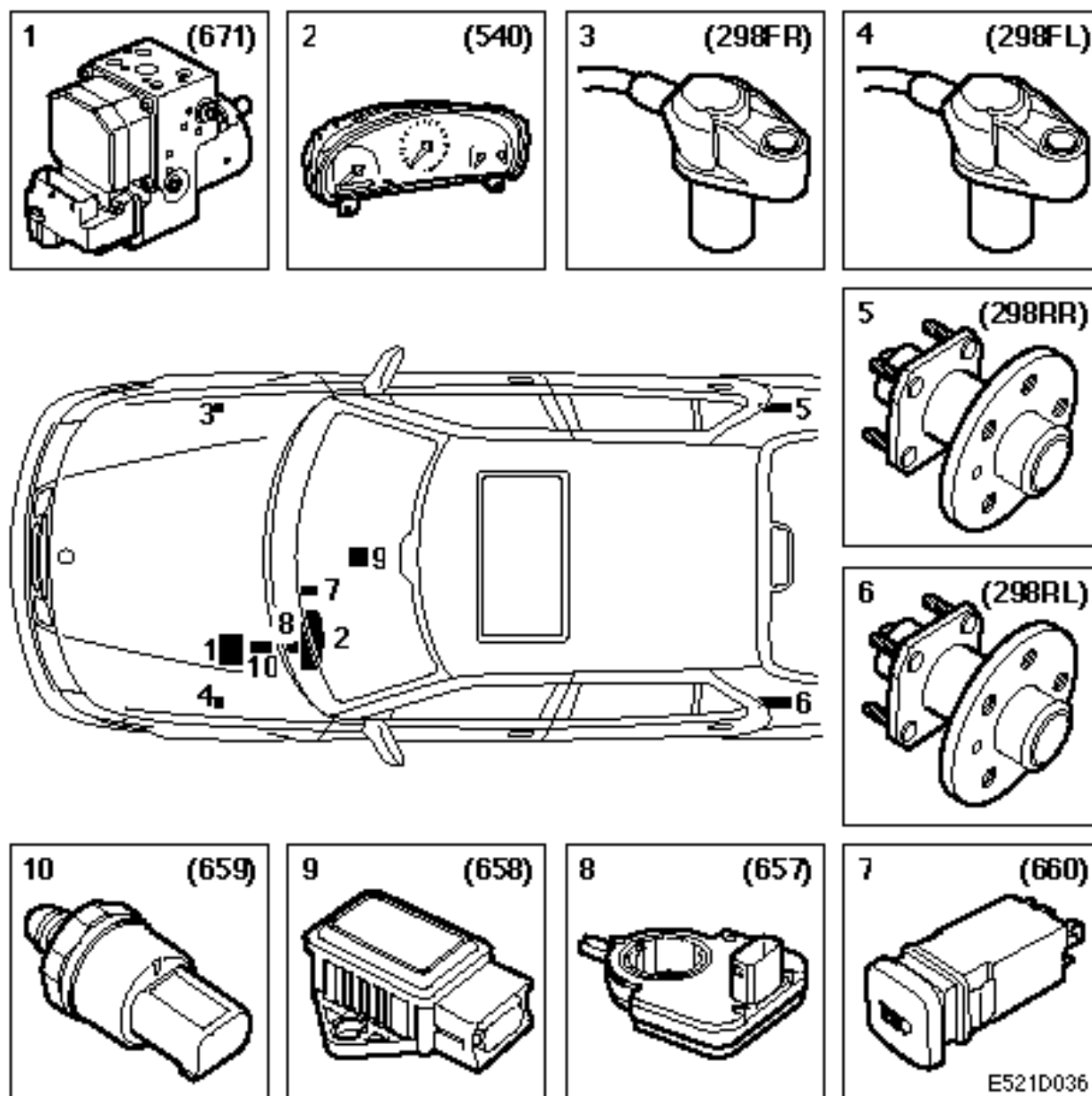
On road surfaces with low friction, it does not matter much how you turn the steering wheel. When the lateral forces between the tires and the road surface are close to zero, it is extremely difficult to correct the direction of travel of the car.

Cars with standard chassis equipped with ESP must not be fitted with a sports chassis because the ESP system cannot be reprogrammed to accept it. This feature will be available later during the model year. If the car chassis is too stiff, ESP will respond too quickly.



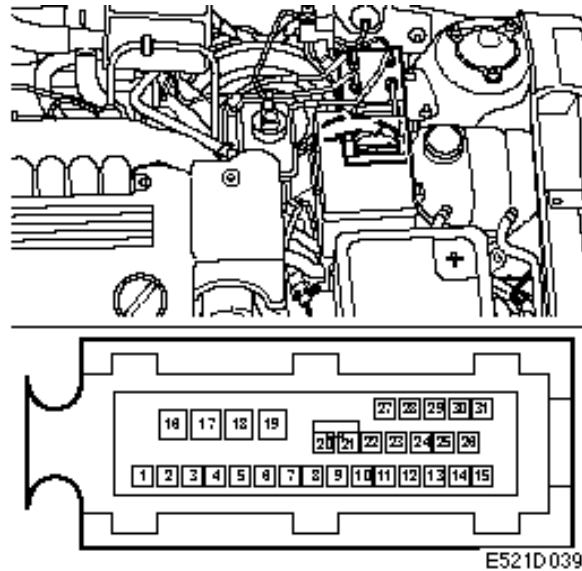
System overview

- Hydraulic unit with control module (671)
- Yaw rate sensor, side acceleration sensor (658)
- Steering angle sensor (657)
- Brake pressure sensor (659)
- Wheel sensor (298)
- ESP switch (660)
- ESP indicator lamp (47x)
- ESP OFF indicator lamp (47y)



Principal components

1. Brake unit including control module, valve body and pump (671)
2. ABS warning lamp. TCS and ESP indicator lamp. TCS OFF and ESP OFF indicator lamp (540)
3. Front left wheel sensor (298FL)
4. Front right wheel sensor (298FR)
5. Rear left wheel sensor (298RL)
6. Rear right wheel sensor (298RR)
7. ESP/TCS ON/OFF switch (660)
8. Steering angle sensor (657)
9. Yaw rate sensor, side acceleration sensor (658)
10. Brake pressure sensor (659)



Control module

The control module is integrated in the ESP unit and has a 31-pin connector. The control module also governs the coordinated functions of ABS, EBD and TCS.

The ESP function reduces engine torque and handles the braking on all four wheels. Torque reduction takes place after the ESP control module sends a bus message requesting a certain engine torque. The engine control module uses this request to regulate the air mass/combustion.

The stabilizing action of the ESP system is based on calculations made in the control module microprocessor. The control module evaluates the information from the system sensors: wheel speed sensors, steering angle sensor, yaw rate sensor, side acceleration sensor and pressure sensor. Data from these sensors informs the control module of the driver's intentions, e.g. the direction in which the driver wants to go, if the driver is braking, etc.

These values are processed in the control module, which continuously calculates the course (ACTUAL VALUE) and compares it with the course determined by the driver with the steering wheel (DESIRED VALUE).

- If the car starts to **understeer** (when the front tends to continue straight ahead in a bend), the inside rear wheel will be braked.

- If the car starts to **oversteer** (the rear tends to drift out), the system will engage and brake the outside wheel until the measured and the calculated yaw rate correspond.

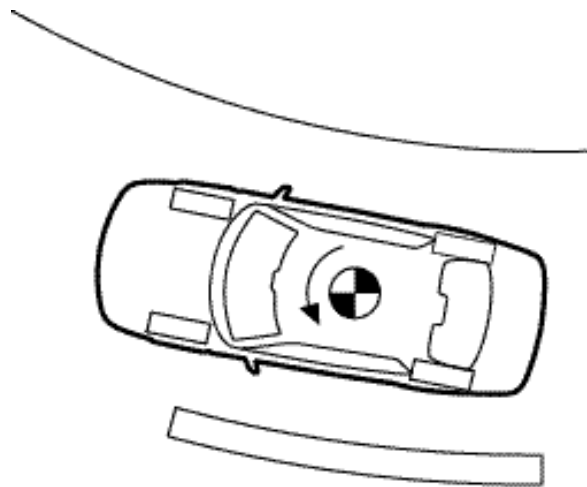
Programming

The ESP control module automatically reads all the information concerning the engine and transmission from DICE. Tech 2 is used to program the chassis variant, sport or standard.

Steering angle sensor

The steering angle sensor is located on the steering column, between the steering wheel and the intermediate steering shaft with universal joint. The sensor has its own microprocessor with self-diagnosis and is connected to the P-bus. It is used to send information on the steering angle (+530° is turns to the right, -530° is turns to the left).

The control module receives information concerning the intention of the driver, i.e. steering wheel rotation, and the control module calculates the speed at which the steering wheel was rotated. This information is very important to the ESP control module, which has to calculate a possible regulation using this DESIRED VALUE.



E521D085

Yaw Rate / Side Acceleration Sensor

This sensor consists of a combined micro-mechanical yaw rate sensor and a side acceleration sensor. It is located on a bracket on the exhaust tunnel in front of the gear lever. This location positions the sensor as close to the car's center of gravity and center-line (X-axis) as possible.

Its housing is hermetically sealed and filled with nitrogen to protect the components from being affected by the environment. The sensor is used to measure the physical forces of the yaw rate and the side acceleration of the vehicle.

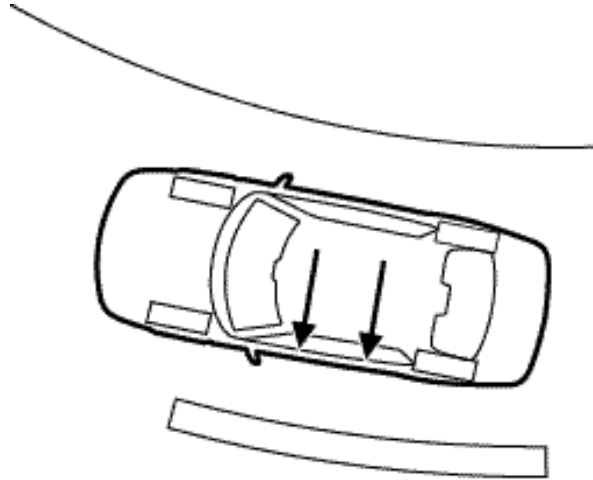
Function, micro-mechanical yaw rate sensor

This sensor measures the rotational movement around an optional axis. The yaw rate sensor is used to detect and register all the rotational movement around the car's vertical axis, i.e. whether the car is turning. The sensor sends this ACTUAL VALUE to the ESP control module, which compares it with a DESIRED VALUE given by the steering angle sensor.

The yaw rate is calculated as the car rotates around its own axis and is expressed in degrees/seconds.

Yaw rate can also be calculated by measuring side acceleration, vehicle speed and steering angle. If these three values correspond with the value measured by the Yaw Rate Sensor (YRS), then the system will assume that the car is stable.

The main components in the YRS are two flexible oscillator elements.



E521D089

Function, side acceleration sensor

The side acceleration sensor registers the lateral forces that arise during cornering. It provides the ESP control module with information on the magnitude of the lateral forces that are trying to make the car change direction. It sends this ACTUAL VALUE to the ESP control module, which compares it with the DESIRED VALUE given by the steering angle sensor.

A capacitive principle is used to measure the side acceleration.

A capacitor plate with moveable mass is suspended so that it can swing to and fro. On either side of the moveable capacitor plates are two more fixed capacitor plates. In this way, it is constructed of two capacitors connected in series. Electrodes are used to measure the charge that the capacitors are able to store. When the sensor is affected by side acceleration, the capacitor with the moveable mass will move towards the fixed capacitors and, thereby, increase the charge in the capacitor towards which the moveable mass is approaching (measured in amperes).

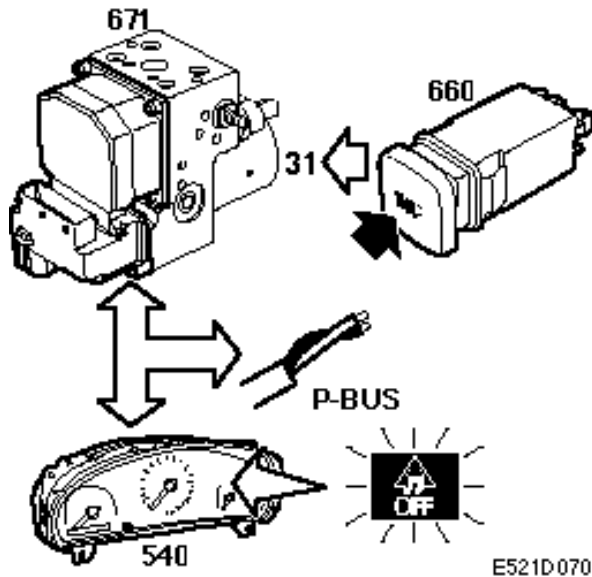
Main components of side acceleration sensor

1. Fixed capacitors
2. Capacitor plate with moveable mass
3. Electrodes

Brake pressure sensor

The brake pressure sensor is located on the ESP unit and is connected between the master cylinder and the ESP unit. It measures the input brake pressure from the master cylinder primary circuit (FL & RR) up to 250 bar (3,626 psi).

The ESP control module uses the information on the current brake pressure in order to calculate the correct braking force on the wheels.



ESP switch

A spring-loaded switch is located on the dashboard to the right of the steering wheel for turning the ESP function ON/OFF. The TCS function will also be turned off when the ESP function is turned off. The ESP OFF lamp in the main instrument unit will come on.

The switch can be used to disengage ESP and TCS at speeds below 60 km/h (37.5 mph). ESP can be engaged at any speed.

ESP will remain active during braking as a safety aid for the driver, irrespective of whether the system is disengaged or not.

This means that if the control module detects that the conditions for ESP regulation have been fulfilled and the driver starts to brake, the control module will control the application of the brakes.

ESP indicator lamp

If the ESP or TCS function is activated while driving, a symbol in the main instrument unit will light up and go out again when the function is deactivated. The lamp is turned on/off by a bus message (ON/OFF) from the ESP control module to the main instrument unit.

The lamp only comes on if engine torque is reduced and the brakes are applied.

ESP OFF indicator lamp

The ESP OFF lamp comes on in case of a fault in the ESP or TCS system, or when the system has been turned off manually.

The lamp is turned on/off by a bus message (ON/OFF) from the ESP control module to the main instrument unit. The switch can be used to disengage ESP and TCS at speeds below 60 km/h (37.5 mph). ESP can be engaged at any speed.

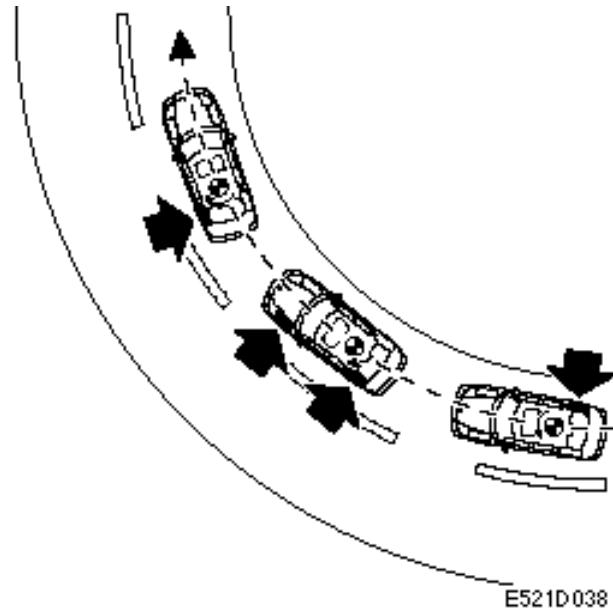
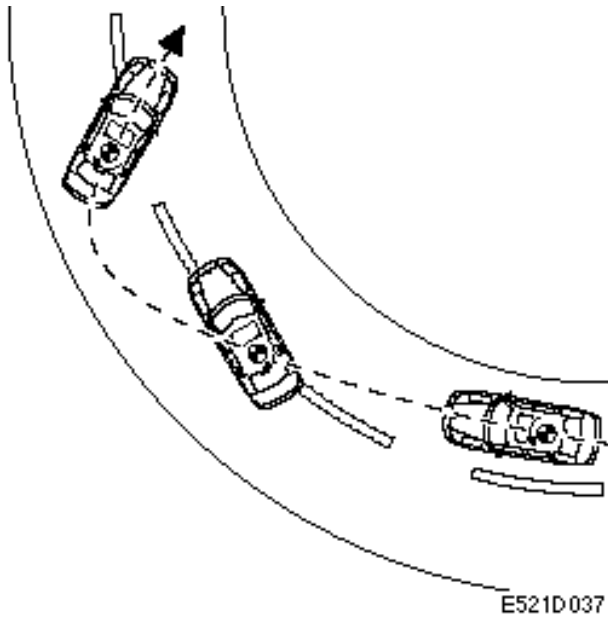
Note that even if ESP is shut OFF, the ESP function will remain active during braking as a safety aid for the driver, even though the ESP OFF indicator is illuminated.

Request for engine torque

Engine torque regulation takes place through throttle control and ignition retardation. Throttle control is relatively slow in comparison with ignition retardation. A rapid engine torque regulation means that the brake will not have to be applied as often and therefore offers a much higher level of comfort.

Torque request during engine braking

The function is the same as in earlier TC/ABS systems. The request for higher engine torque is sent by the control module in order to maintain course stability. The function is activated when downshifting severely and on slippery surfaces.



ESP function

ESP is a stabilization system that helps to keep the vehicle on the right course when cornering, taking evasive action, braking and accelerating. The stabilizing effect of the ESP system is based on calculations made by the control module, which evaluates information sent from the various system sensors:

- Wheel speed sensors
- Steering wheel angle sensor
- Yaw rate sensor
- Side acceleration sensor
- Brake pressure sensor

Data from these sensors inform the control module of the driver's intentions, such as the direction in which the driver wants to travel, if the driver is braking, etc. The ESP control module, which is integrated in the hydraulic unit, continuously calculates the course of the vehicle (ACTUAL VALUE) and compares it with the course chosen by the driver with the steering wheel (DESIRED VALUE).

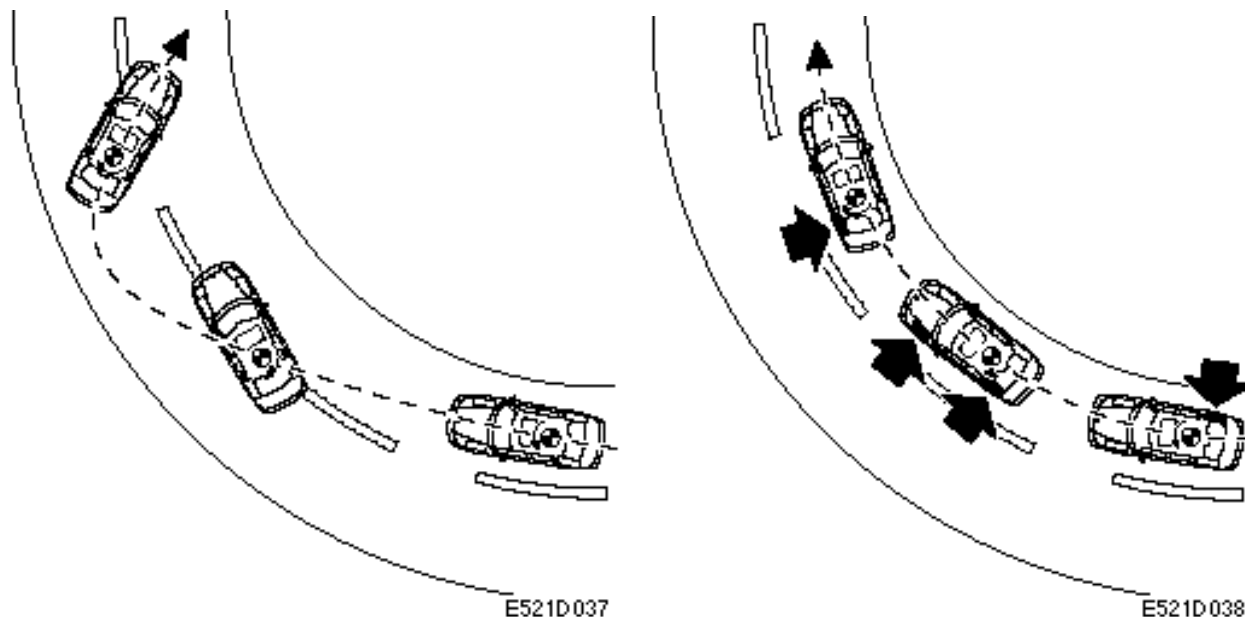
1. If the car starts to **understeer** (when the front tends to continue straight ahead in a bend), the measured yaw rate (ACTUAL VALUE) will be lower than the calculated. The system will brake the inside rear wheel in the bend until the measured and the calculated yaw rate (DESIRED VALUE) correspond with each other.

2. If the car starts to **oversteer** (the rear tends to drift out), the measured yaw rate (ACTUAL VALUE) will be higher than the calculated. The system will then brake the outer wheels until the measured and the calculated yaw rate (DESIRED VALUE) correspond with each other.

When the system is activated, it can counteract a skid by braking one or two of the wheels without the driver needing to touch the brake pedal. The system reduces engine torque after an engine torque request to the engine control module and applies the brakes on the wheels individually.

The ESP system comprises three different functions: ABS, TCS and ESP. ABS and TCS have the same function as earlier. See the respective description of operation.

The wheel brakes are the most efficient and fastest way of stopping a spinning wheel, while engine torque regulation is the smoothest and most comfortable. These two methods often work simultaneously.



Engine torque regulation

Engine torque regulation takes place after bus communication with the engine control module. The ESP control module requests an engine torque between -100 and $+400$ Nm. This is achieved through ignition retardation and throttle control, i.e. by changing the throttle angle and the boost pressure (air mass/combustion). Using engine torque regulation means that the brakes need not be applied as often, resulting in a higher degree of smoothness.

These actions mean that kinetic energy in the drive wheels is converted into heat in both cases. Applying the brakes heats the wheel brakes and ignition retardation increases the exhaust temperature. Ignition retardation is not allowed at high exhaust temperatures to protect the turbocharger and catalytic converter.

Brake application

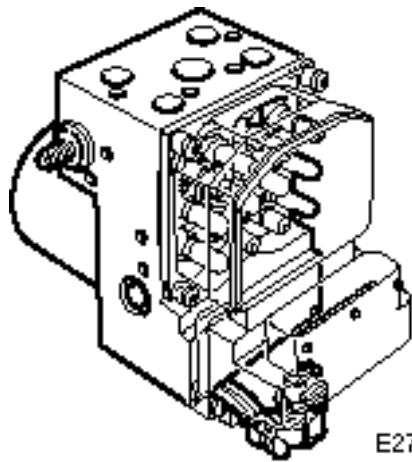
The brakes are applied through the ESP control module governing the pump motor, the pressure-increase and pressure-reducing valves, and the inlet and outlet valves in the hydraulic unit so that the braking force on each wheel can be controlled individually. The ESP control module receives information on the brake pressure from the brake pressure sensor. This information is used to control the braking force on each wheel to correspond to the braking force applied by the driver. An ESP regulated wheel is controlled using the ESP criteria.

Both front wheels and rear wheels are connected to the pressure-increase and pressure-reducing valves in the hydraulic unit. This arrangement allows each wheel to be controlled independently.

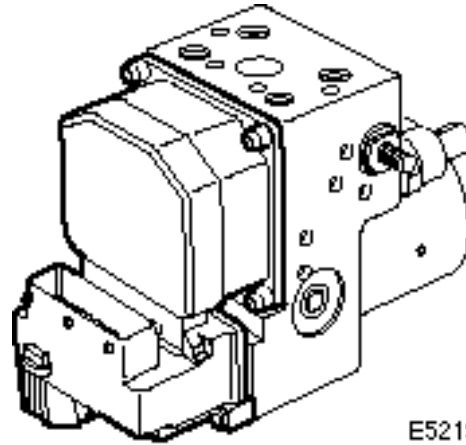
Friction is estimated by calculating the drive wheel torque during acceleration (which is a function of the engine torque) or braking (which is a function of braking force).

If performing evasive action during emergency braking, the vehicle can be maneuvered by regulating the braking pressure applied by the driver using the control module and the pump. The applied braking force on each wheel can therefore be both above and below that requested by the driver.

Braking distance is given priority when braking in a straight line and stability is given priority during evasive action. ESP can be active both when the driver applies the brakes and when the driver is not even touching the brake pedal.



E271S001



E521S009

ESP valve block

The hydraulic unit comprises 12 solenoid valves that govern the brake pressure to the brake units during ABS, TCS or ESP regulation.

The pressure-increase and pressure-reducing valves in the TC/ABS unit are similar in their design and operation. In order to enable ESP regulation, the valves are connected to the rear wheel brakes and the inlet and outlet valves are also activated during ESP regulation. This arrangement enables the brake pressure on all four wheels to be modulated. This solution makes it possible to build up pressure, maintain pressure and reduce pressure individually on all four wheels.

If the driver applies the brakes while ESP regulation is active, the brake pressure sensor will inform the control module of the input brake pressure in the hydraulic unit. With this information, the brake pressure to the wheels not under ESP regulation can be controlled to correspond to the driver's braking force. The wheel under ESP regulation when the brakes are applied is controlled according to the ESP criteria.

The pump is active continuously during ESP regulation.

Brake application

For ESP regulation, the control module starts the pump, which continues during the entire regulating process, at the same time as the pressure-reducing valve is closed to enable a build up of pressure. Pressure is built up by opening the pressure-increase valve to supply the pump with brake fluid.

The control module closes the pressure-increase valve when a predetermined pressure has been attained. The pressure is then modulated by the control module opening the pressure-increase valve. It will keep the pressure-increase and pressure-reducing valves closed to retain pressure and open the pressure-reducing valve for pressure reduction. The inlet and outlet valves are activated to regulate each wheel independently.

The valves are activated by a pulse train, where the duration corresponds to a pressure increase or a pressure reduction. Any excess brake fluid resulting from the pressure-reduction valve opening is returned to the master cylinder.

The ESP function will regulate up to two wheels simultaneously.

Braking phases

Phase 1. Pressure build up on all four wheels (filling pulse and pressure retention)

Driver not braking

Filler pulse

Regulation starts with a filler pulse. This means that a slight, equal pressure build up takes place in all the wheel cylinders, irrespective of the wheel to be regulated during braking. The pump starts, the pressure-reduction valve closes and the pressure-increase valve opens (limited duration).

The inlet and outlet valves are in their normal position in the valve block, i.e. the inlet valves are open and the outlet valves are closed.

Pressure retention

As the filler pulse finishes, each inlet valve will close to prepare for individual regulation of each wheel.

On wheels that ESP will not be applying the brakes, pressure retention will take place as the pressure-increase and pressure-reduction valves on each circuit are closed and the inlet and outlet valves for each wheel are closed. This is to prepare them for a possible brake application.

Phase 2. Pressure increase on wheels under ESP regulation

The pressure-increase valve opens to supply the pump with brake fluid that is to be pumped into the circuit. The pressure-reduction valve is closed.

The inlet valve on the wheel having its brakes applied will be open until the conditions that apply for pressure build up have been attained.

This means that the pressure to the wheel cylinders also increases and the wheel brake is applied. The pump is running.

Phase 3. Pressure reduction on wheels under ESP regulation

The pressure-increase valve is closed and the pressure-reduction valve opens to lower the pressure in the circuit.

The inlet valve is closed and the outlet valve opens to lower the pressure at the wheels.

Brake fluid is returned from the wheel outlet valve through the pressure-reducing valve to the master cylinder. The pump is running.

Driver applying the brakes, see phases 1-3

If the driver applies the brakes while ESP regulation is active, the brake pressure sensor will inform the control module of the input brake pressure in the hydraulic unit. With this information, the brake pressure to the wheels not under ESP regulation can be controlled to correspond to the driver's braking force.

The wheel under ESP regulation when the brakes are applied is controlled according to the ESP criteria.

Phase 4. Termination

The criteria for ESP regulation have ceased to apply. All the valves take their normal positions, i.e. the pressure-reducing valves are open, the pressure-increase valves are closed, the inlet valves are open and the outlet valves are closed. The pump stops.

Regulation continues until:

- the wheel/wheels are below limits for ESP regulation.
- regulation is terminated by the ESP control module because there is a risk of the brakes overheating.

After regulation is terminated, the control module will stop the pump, close the pressure-increase valve and open the pressure-reduction valve. The valves and the pump return to their normal states.

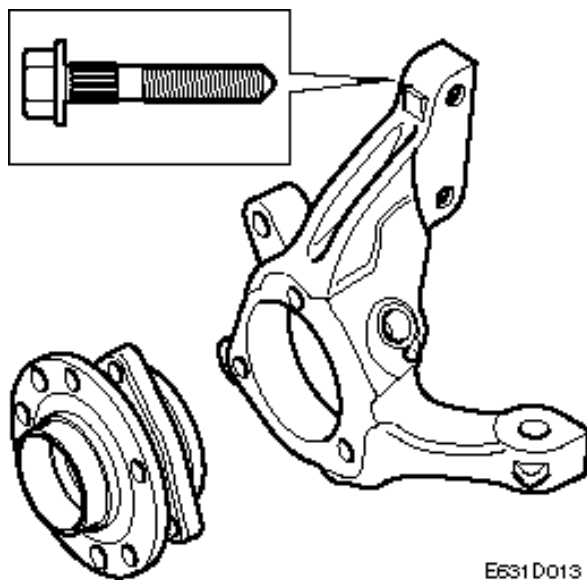
A termination of regulation with brake application due to the risk of overheating the brakes is achieved by the ESP control module continuously registering the total time that regulation with brake application has been active during a certain period of time.

This value is then compared to a programmed maximum value. If this value is exceeded, regulation with brake application will be terminated.

Steering assembly

Steering

arrangement for steering wheel adjustment.



System overview

The steering system now has a number of new components that have been replaced and modified due to adaptation to the new V6 diesel engine and to lower the gross weight of the chassis. All 9-5 models benefit from these changes.

Steering swivel member

The steering swivel member is cast in aluminum (die casting) with integrated hub. The front wheel bearing is a complete hub that is bolted directly to the steering swivel member with three bolts. Replacement hubs are fitted complete with three bolts. This arrangement has reduced the weight of each steering swivel member by 1.5kg (3.3lb.) A number of other adaptations have also been made. These changes are designed to help the overall handling of the vehicle.

Steering column

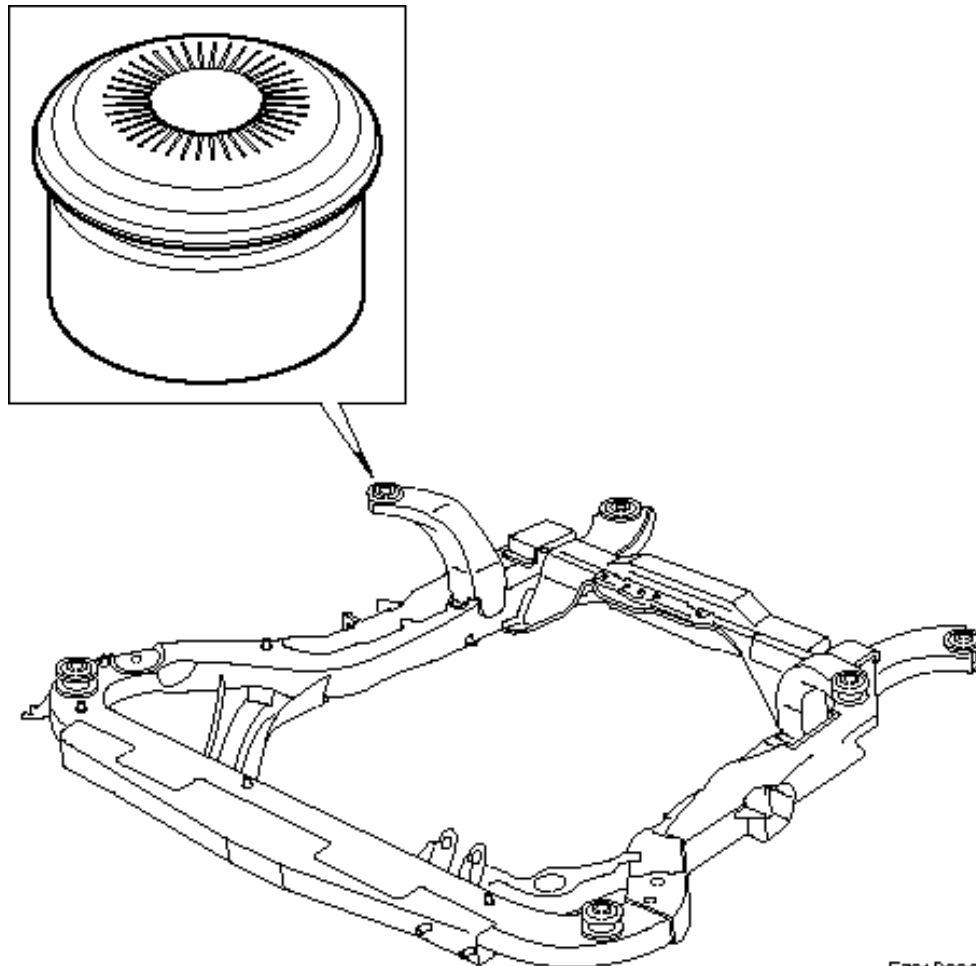
The steering column assembly has been adapted for the new steering angle sensor, which is located on the steering column between the steering wheel and the intermediate shaft with the universal joint. It has also been given a new

Miscellaneous

Because the new V6 diesel engine has a new power steering pump, the front and rear pressure lines are new and have been replaced for space reasons in the engine compartment. A new, longer, cooling coil has been introduced on the front pressure line to provide improved cooling. There is an additional cooling fin on the B235R and B308E. The steering gear now has narrower tolerances to provide the best possible characteristics for all models. The control valve has a new specification and is not backward compatible.

Suspension

Suspension



E731 D005

A number of modifications have been made to the Saab 9-5 to increase safety and adapt it to the new V6 diesel engine. These modifications have meant that the chassis has been given sportier characteristics. It has become even more balanced and remains stable when negotiating tight turns on dry asphalt.

The car's steering is more responsive, which the driver experiences as the car responds better and faster.

A number of different measures have resulted in these new characteristics.

The front subframe has been modified at several points to further improve impact characteristics. The new towers with center bushings are now designed so that the bushings will give in case of head-on impact, allowing the subframe and drive unit to slide downward and cushion the impact.

The following parts and modifications are unique to the 2002 model and affect its characteristics:

- Front subframe is approximately 20% stiffer.
- Changes to the front strut thrust bearing have increased the car's lateral stiffness.
- Steering swivel member has an integrated hub and new wheel bearings.
- Anti-roll bar with 21mm / 0.83in diameter (20mm / 0.79in earlier) on sports chassis and 20mm / 0.79in (19mm / 0.75in earlier) on standard chassis. New integrated brackets in the subframe for the anti-roll bar.
- Rear subframe bushings are 20% stiffer and A-bushings in the longitudinal link are also 20% stiffer.
- The arm between the MacPherson strut and the anti-roll bar has been given a larger contact surface and is secured with flange nuts.

The rear wishbone mounting is also new. The bracket for the front anti-roll bar is integrated in the subframe.

In Fall, 2002, it will be possible to equip the sports and standard chassis with the Nivomat "Load Compensating Rear Shocks" as an option.

Body

Body colors

Two new body colors have been introduced and one shade has been discontinued:

- Polar White (283), a base solid paint, replaces Cirrus White.
- Hazelnut (286) is a new metallic paint.

Note that Cosmic Blue (264) is once again available in the U.S. market.

Color code	Color	Paint type	Note	9-5 Linear/Arc	9-5 Aero
170	Black	Base solid		X	X
278	Laser Red	Base solid		X	X
283	Polar White	Base solid		X	
257	Midnight Blue	Metallic	Mica	X	X
264	Cosmic Blue	Metallic	Mica		X
268	Silver	Metallic		X	X
273	Sun Green	Metallic	Mica	X	
279	Steel Grey	Metallic		X	X
286	Hazelnut	Metallic		X	X

All exterior colors are available with either Sand Beige or Charcoal interior upholstery.

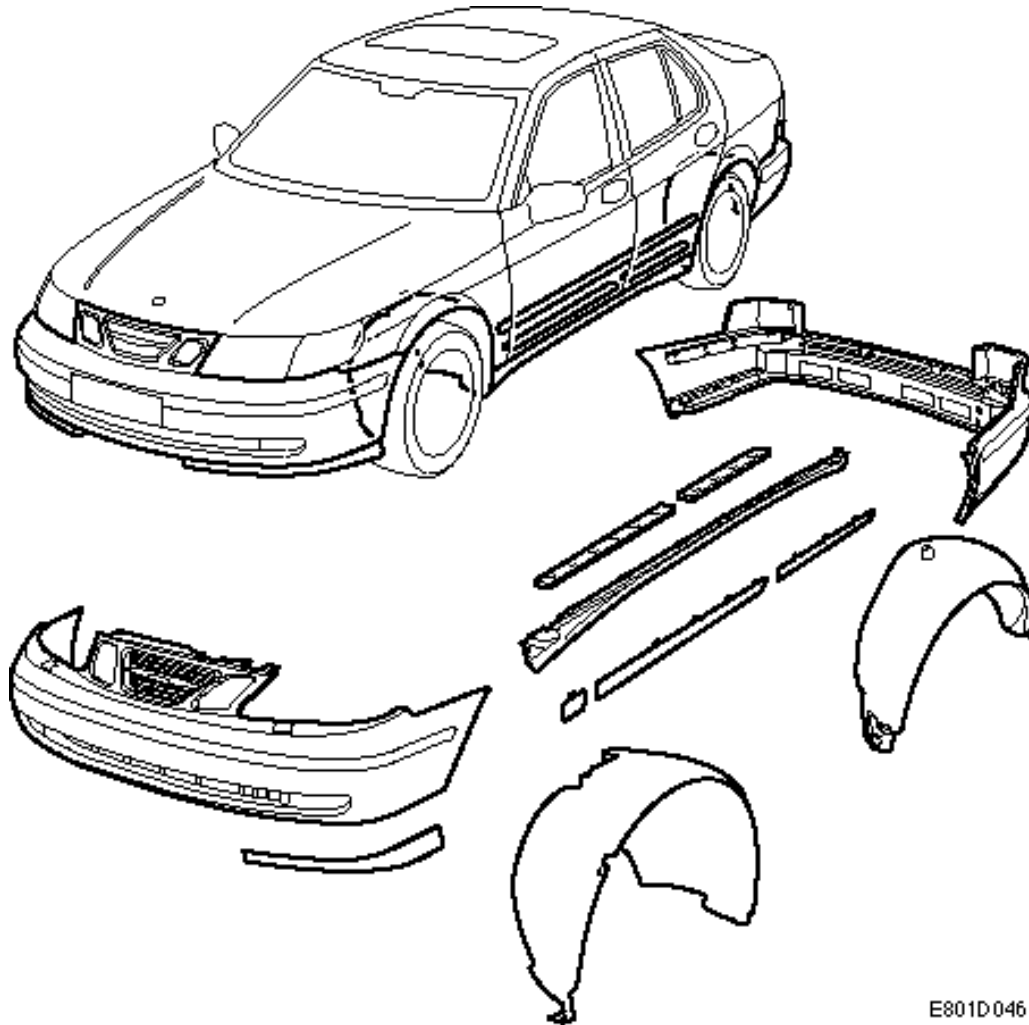
Important

Use car color code for all paint repairs.

Base solid paint with clear varnish

All solid paints have now been superseded by base solid paint with clear varnish. The risk of mistaking these two paint systems is high when repainting.

Cars with base solid paint are marked BASE on the color code and tire pressure label.



E801D046

Exterior

Front bumper

The front bumper consists of a cellular plastic core and a shell of painted plastic in which the grille is an integral part. There is a three-piece removable decor strip inset in the shell, two outer pieces and one center piece. The covers for the headlight washer nozzles are also in the shell.

The bumper shell is fastened on attachment rails in the fenders and bolted to the fender liners and body. The upper section with integrated grille is fastened to the body with clips.

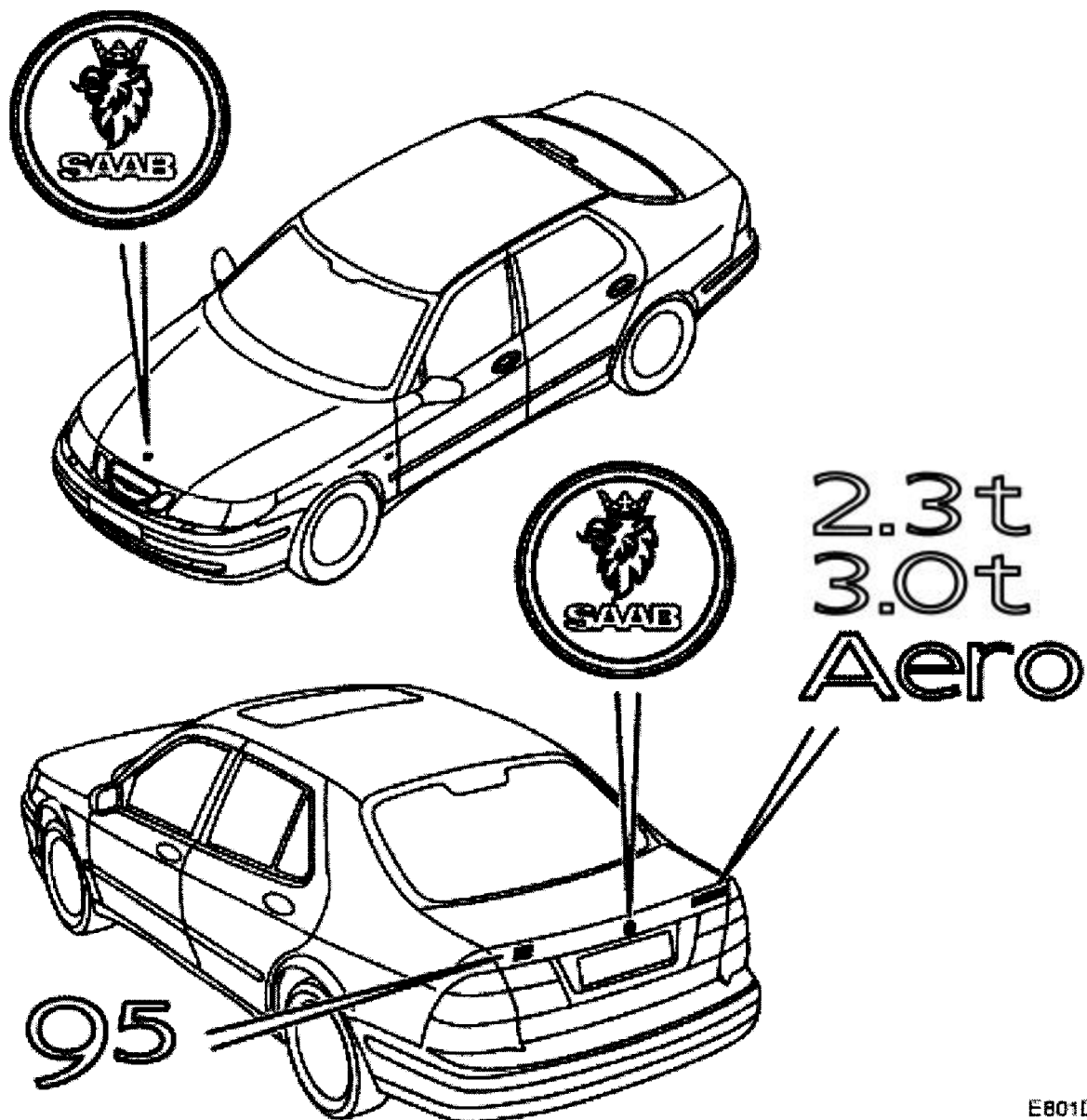
Grill

The grill is integrated in the front bumper and has three detachable louvers.

Rear bumper

The rear bumper comprises an aluminum rail, a core of cellular plastic and a painted plastic shell with integrated corner covers. There is a three-piece removable decor strip inset in the shell, two outer pieces and one center piece. The center decor strip contains the SPA sensors.

The lower section of bumper shell is painted black on the Linear and Arc, and body color-matched on the Aero. The Arc and Aero variants also have a cutout for the tailpipe at the bottom. On the SportWagons, the top section of bumper is black and can be replaced separately. The bumper is fastened to the body and fender liners.



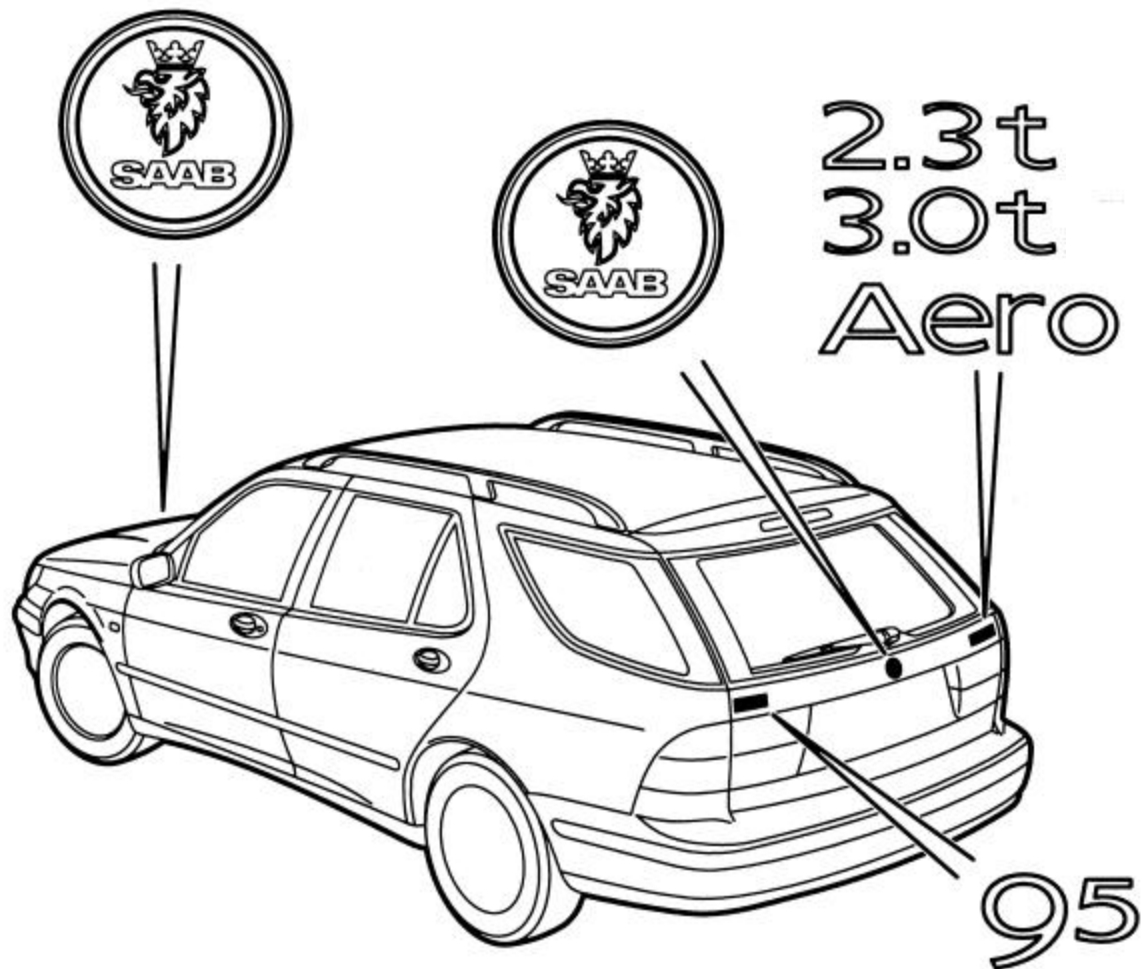
E801D047

Emblem

Sedan

Emblems on the hood and trunk lid are attached with double-sided adhesive tape.

The 9-5 emblem is affixed to the left-hand side of the trunk lid and the emblem showing the engine variant is on the right-hand side.



E801D048

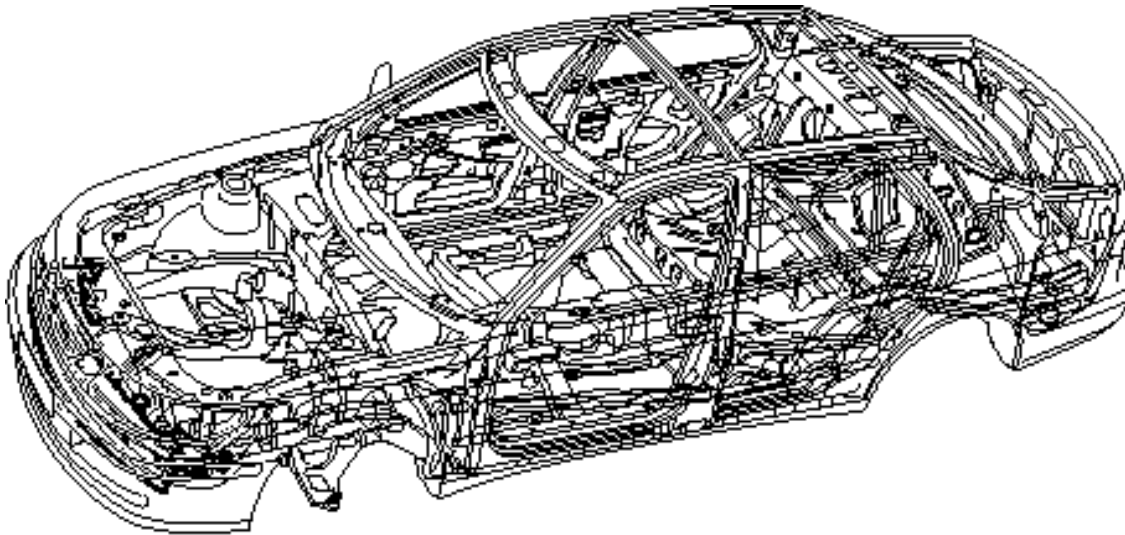
SportWagon

The emblems on the Saab 9-5 SportWagon are affixed in the same way as the 9-5 Sedan, with double-sided adhesive tape.

The emblems are affixed in the same location as on the Sedan model with the 9-5 emblem on the left-hand side of the tailgate and the emblem showing the engine variant on the right-hand side.

Decor panel

There is a decor panel mounted in the space for the licence plate on the trunk lid or tailgate.



Body modifications

Body modifications have been made for three reasons:

- Improved impact characteristics
- Exterior modifications
- Engine modifications

Enhanced impact characteristics

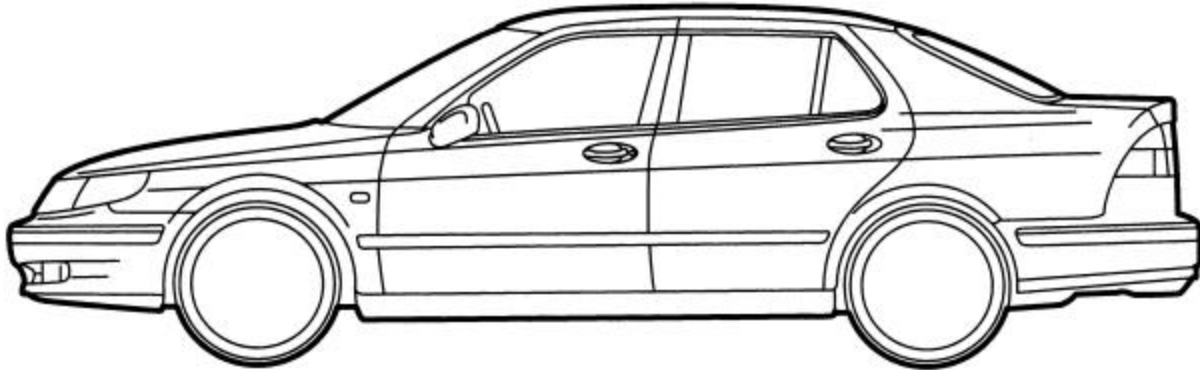
In order to enhance impact characteristics in case of head-on collisions, the Saab 9-5 now has a new bumper member of press-hardened steel with new, much larger, integrated impact boxes. The objective is to absorb the forces from the impact more efficiently, both at low speed and high speed. As the impact boxes absorb the impact forces and delay the actual impact inside the car, the airbag control module must be informed of the collision earlier. For this reason, front sensors (accelerometers) have been fitted that detect the impact in the bumper rail.

The bottom part of the bulkhead has been reinforced with 3mm (0.12in) thick aluminum plate to prevent the entry of the engine mounting system into the passenger compartment in case of a collision.

Exterior modifications and engine modifications

New support sections around the headlight housing are included in the exterior adaptations. Engine modifications include adaptations of the engine mounting near the battery. The battery bracket is new with a longitudinally mounted battery and a plastic battery tray. The ABS bracket has been moved close to the bulkhead.

Interior equipment

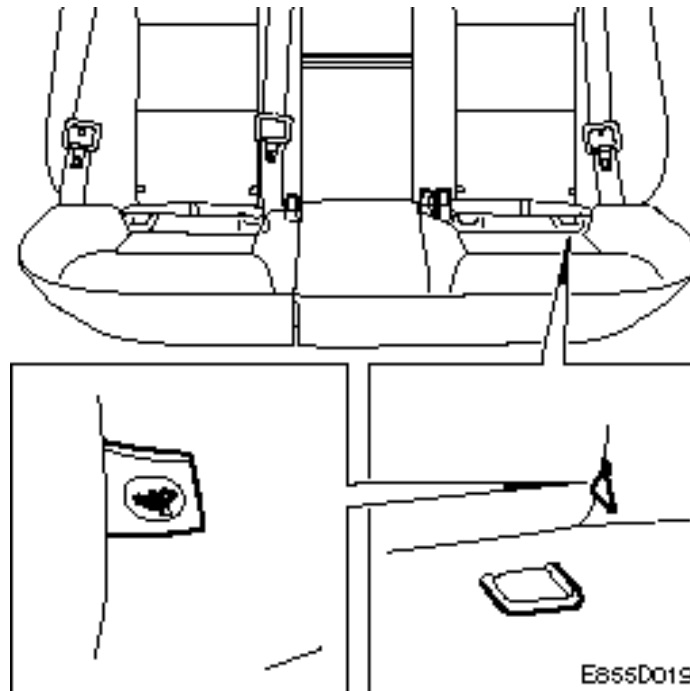


Energy absorber for improved head protection in case of impact.

The joints between the A-pillars and the roof and the C-pillars and the roof now have energy absorbers to increase internal safety. The absorbers are fixed to the top of the headlining, which means that the entire headlining must be replaced if there is any damage. The new courtesy handles are also part of the improved internal safety features as they protect the head in case of impact.

A, B, C pillars

The covering on the pillars is completely new and much thicker than before. The B-pillars also contain a new seat-belt slider to help the movement of the belt.



ISO-fix mounting for child seat

“ISO-fix” is an international standard for child safety seat mounting. ISO-fix brackets are now fitted as standard on the rear floor of the 9-5, between the seat and the backrest (seat back).

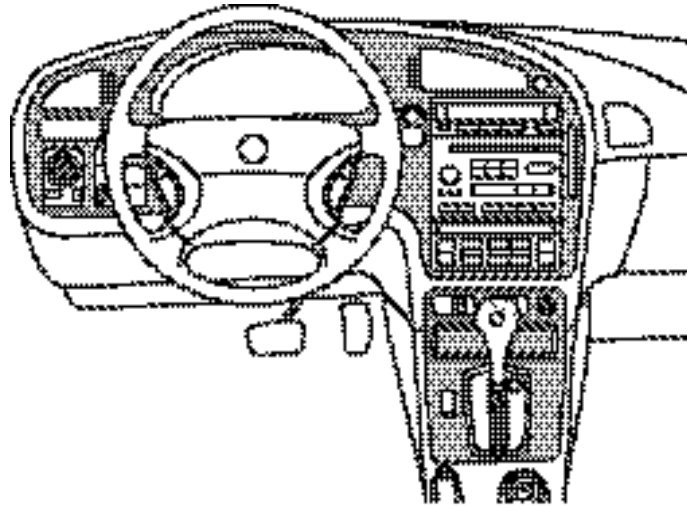
The child seat bracket is intended to provide a simple and safe child seat installation, and good protection to children inside the car in case of a collision. It also offers a comfortable ride for the children.

The child safety equipment fulfils the demands of different countries and markets.

ISO-fix cannot be used together with integrated child seats. The backrest with mounted child seat is slightly longer and does not allow access to the ISO-fix hooks.

Note

Customers must purchase an ISO-fix compatible child seat in order for this feature to function properly.



E855D018

Dashboard

- **Linear**
The classy and simple model of the Saab 9-5 range. Includes new style wood inserts in the dashboard (a lighter shade of walnut).
- **Arc**
The elegant touring model in the Saab 9-5 range. Includes new style wood inserts in the dashboard (a lighter shade of walnut).
- **Aero**
The top of the line model, exuding sporty features with high performance. Very high equipment level with "Aluminum-look" dashboard.

Airbag (SRS)

Brief description

The airbag system has been further developed to provide optimum personal protection through differentiated protective features that take into account the seat position, whether the person is buckled up, and the force of the impact. The side impact sensor has also been improved with a new accelerometer in the control module that measures the lateral acceleration forces.

The system has been adapted and supplements the improved impact characteristics that have been developed in the chassis and body. The protection has been optimized for minimum injury to the passengers.

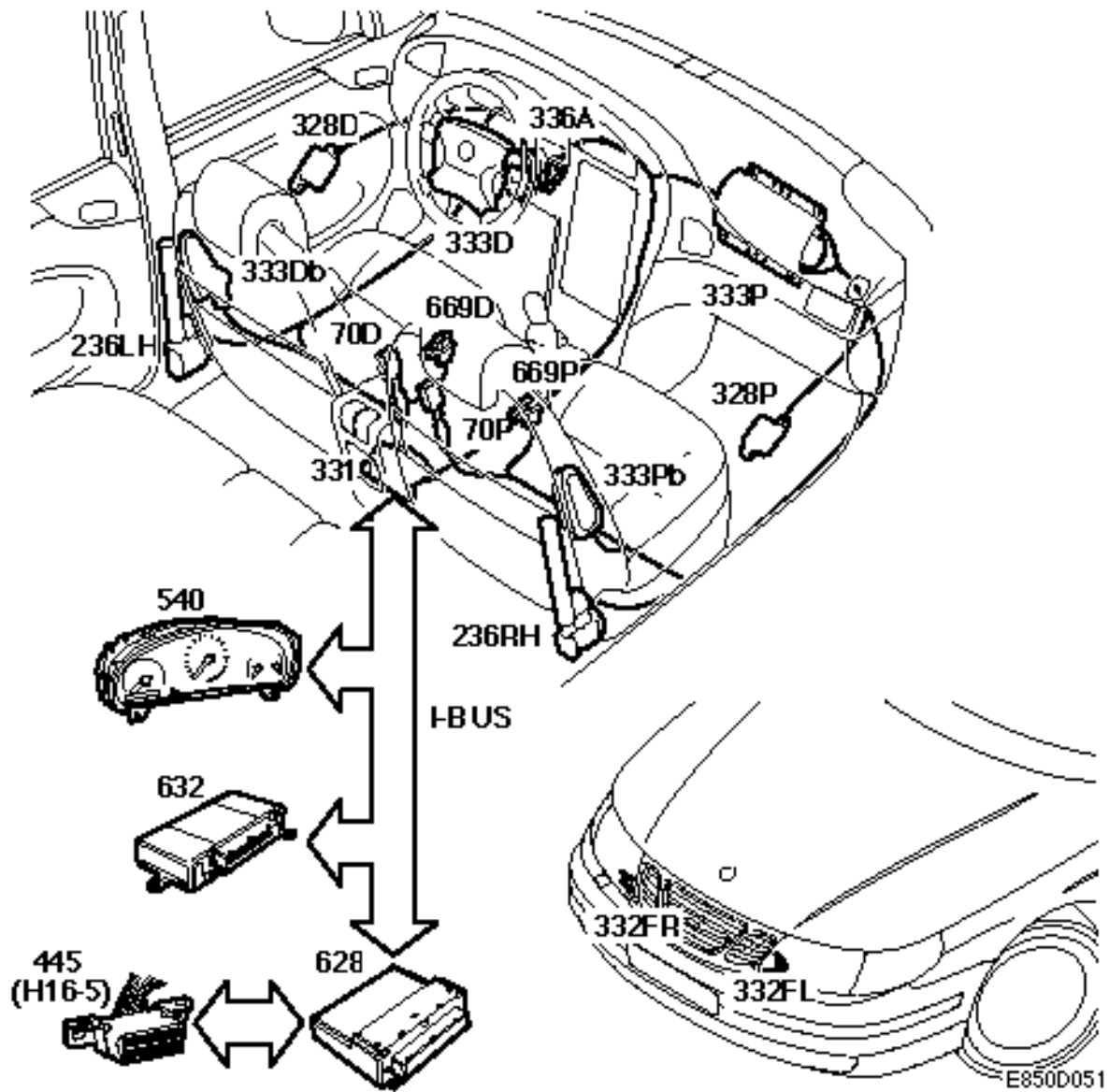
The following components and functions are new on all Saab 9-5 models:

- 2-stage driver and passenger airbags
- Two front impact sensors
- Seat-belt buckle (active Hall sensor)
- Seat position sensor (active Hall sensor)
- Control module

The airbag system has been given a new control module with higher capacity to activate more ignition circuits and to improve diagnostics. It can define impact force more reliably and earlier using two new front impact sensors mounted on the bumper member.

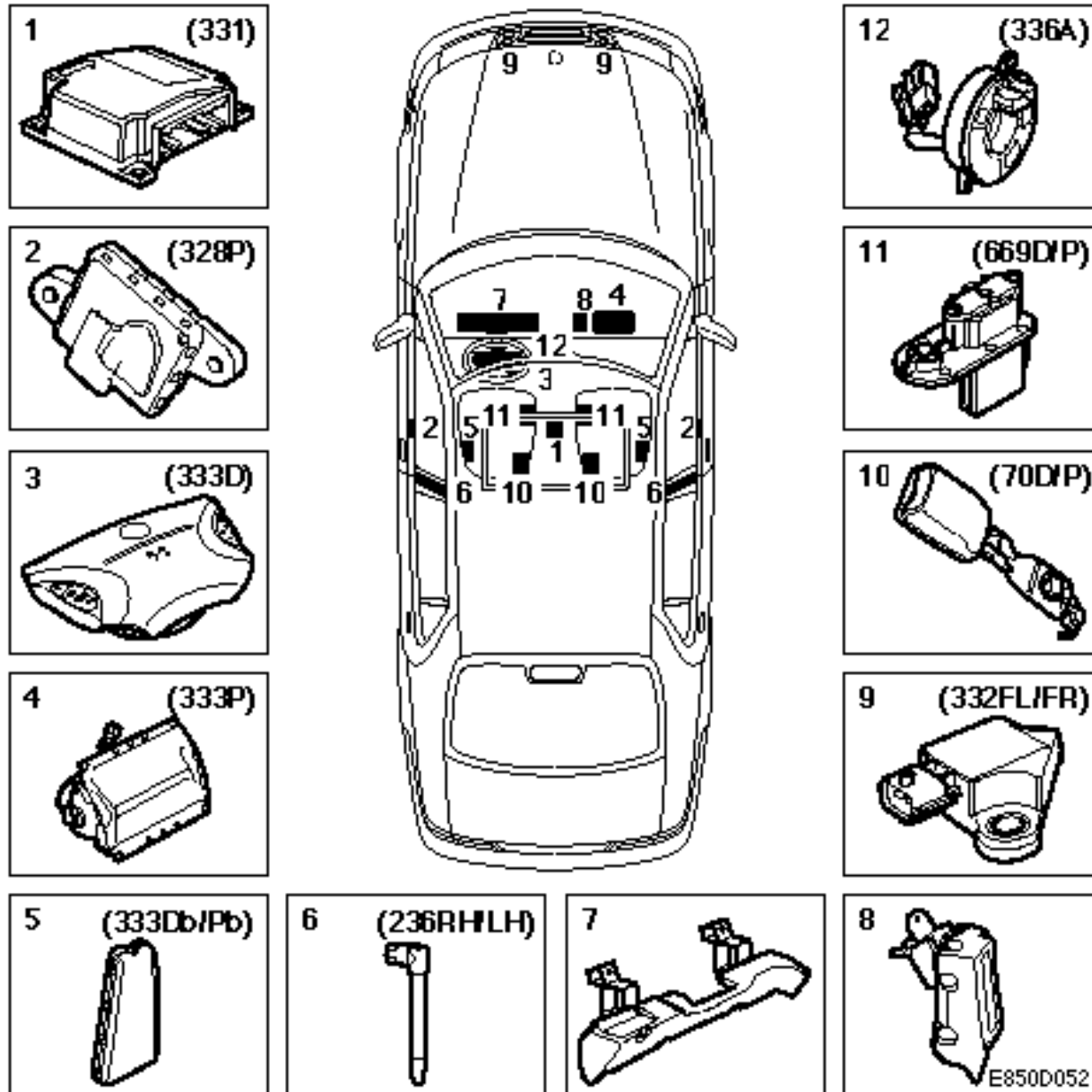
Using sensors in the seat-belt buckles and seat position sensors, the control module can define the way in which the front airbags are to be inflated and whether the seat belt tensioners should also be ignited.

The cars are equipped with driver and passenger airbags as standard.



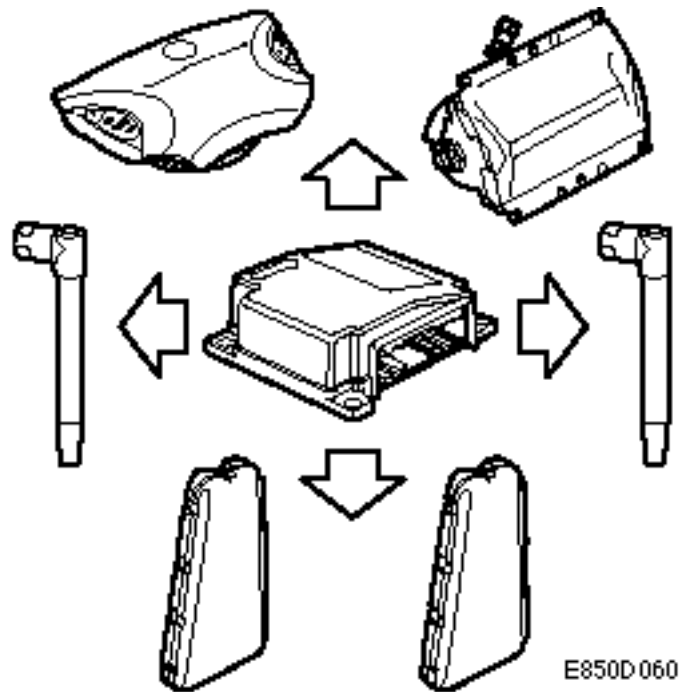
System overview

- Dual-stage airbag, driver (333D)
- Dual-stage airbag, passenger (333P)
- Seat position sensor (669D, 669P)
- Seat-belt buckle (70D, 70P)
- Front impact sensor (332FL, 332FR)
- Contact roller (336a)
- Side airbags (333Db, 333Pb)
- Side impact sensors (328D, 328P)
- Seat-belt tensioners (236LH, 236RH)
- Airbag warning lamp in main instrument unit (540-47t)
- SRS control module (331)
- TWICE control module (632)
- DICE control module (628)
- Data link connector (445)



Principal components

- | | |
|--|---------------------------------------|
| 1. Airbag control module (331) | 7. Knee shield, driver, 3-piece |
| 2. Side impact sensors (328D, 328P) | 8. Knee shield, passenger |
| 3. Dual-stage airbag, driver (333D) | 9. Front impact sensor (332FL, 332FR) |
| 4. Dual-stage airbag, passenger (333P) | 10. Seat-belt buckle (70D, 70P) |
| 5. Side impact airbags (333Db, 333Pb) | 11. Seat position sensor (669D, 669P) |
| 6. Seat-belt tensioners (236LH, 236RH) | 12. Contact roller (336a) |



Control modules

The main task of the control module is to recognize the situation arising from a collision and inflate the airbag with the correct force and/or ignite the correct seat-belt tensioner. The control module contains two accelerometers, a microprocessor, a reserve power source and a voltage converter.

The control module has the capacity to activate eight ignition circuits:

- Driver airbag, dual stage
- Passenger airbag, dual stage
- Side airbag, driver and passenger
- Seat-belt tensioner, driver and passenger

The activating time after a collision is different for the various circuits.

The primary acceleration sensor measures the acceleration and retardation forces in the longitudinal and lateral directions of the car. The secondary sensor measures the longitudinal acceleration and retardation forces only.

The control module receives its information from the two front impact sensors. The sensors are located on the car's bumper member so that collision forces can be detected as early as possible.

A side impact sensor in each front door provides information to the control module on collision forces from the side. This information is provided together with signals from the seat position sensors and seat-belt buckle sensors for calculating if, and how, the front airbags, side airbags and belt tensioners should be activated.

If the seat-belt buckle is not locked or the seat is far forward, the airbag will be inflated earlier than normal. The seat-belt tensioner is activated only if the seat-belt buckle is locked.

The front impact sensors contain an acceleration sensor and a communication circuit for sending information that is used by the control module. If the values obtained from the impact sensors and the control module accelerometers correspond concerning collision force, the control module will activate the seat-belt tensioners and airbags.

Conditions for Airbag Activation

If the control module detects a high collision force and the seat is more than 30% from its front position, the front airbags will be inflated in two stages with a 5 to 20 ms delay between the deployment of the two stages. If the collision force is low, only stage 1 will be activated. If the seat position sensor indicates that the seat is less than 30% from its front position, stage 1 will be activated. The front airbags will be activated earlier if the seat-belt buckle is not locked.

A collision on one side of the car will activate the side airbag only on the side where the collision has taken place.

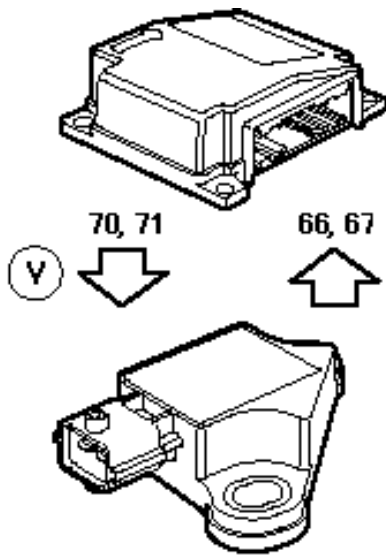
In situations where the front airbags are activated to stage 1 only, there will be a safety activation of stage 2 after 100 ms. This will disarm the airbag so that there is no charge left to activate after the collision.

The seat-belt tensioners will not be activated if the seat-belt buckle is not locked.

Reserve power supply

The control module has an integrated reserve power supply that supplies it with current for 150 ms after the normal power supply has ceased.

This function has three capacitors that maintain the level of current to the system and enable the front airbags to be activated for 150 ms. The side impact sensors are then turned off to save energy. Bus communication continues during this time.



Front impact sensor

The front impact sensor is used to detect collision forces at an early stage and send information to the control module.

The system has two front impact sensors. They are located on the bumper rail at the same height as the detachable grille on the front of the car. The two sensors are identical and both have two leads connected to them, one for the power supply and one for transmitting the signal to the control module.

The sensor contains an acceleration sensor and a communication circuit. It sends digital information containing status messages for diagnosis and acceleration values from 0-127 g on a lead to the control module. Calculations concerning the igniter and whether it should be activated are made in the control module. In case of a fault in the front impact sensor, the airbags will still inflate, but somewhat later than would otherwise be the case.

The front impact sensors communicate by modulating the continuous power supply from the airbag control module, which means that the sensors draw more or less current. These changes are detected by the microprocessor in the control module.

Side impact sensor

The pressure from the side impact sensors is compared by the control module with the lateral value from the accelerometer before it activates the side airbag. This is the same side impact sensor used previously, but the control unit has new software.

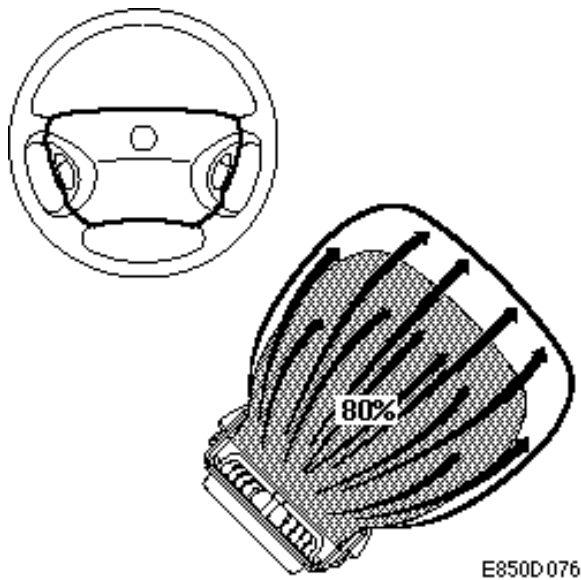
Seat-belt buckle sensor

This sensor is used to detect whether the seat-belt buckle is locked or not. Using information from the seat-belt buckle sensors and the seat position sensors, the control module will be able to decide how the ignition circuits for the belt tensioners and the front airbags should be activated.

Seat position sensor

The seat position sensors are used to detect whether the seat is in a forward position, i.e. less than 30% away from the front position, or in a rear position, i.e. more than 30% or approx. 65mm (2.56in) from the front position of the seat. Using this information from the seat position sensor, the control module will be able to determine how to activate the ignition circuits. See control module information, p.77.

The seat position sensors are mounted on manual seats as well as electrically adjustable seats.



Driver airbag

The driver airbag is mounted inside the steering wheel.

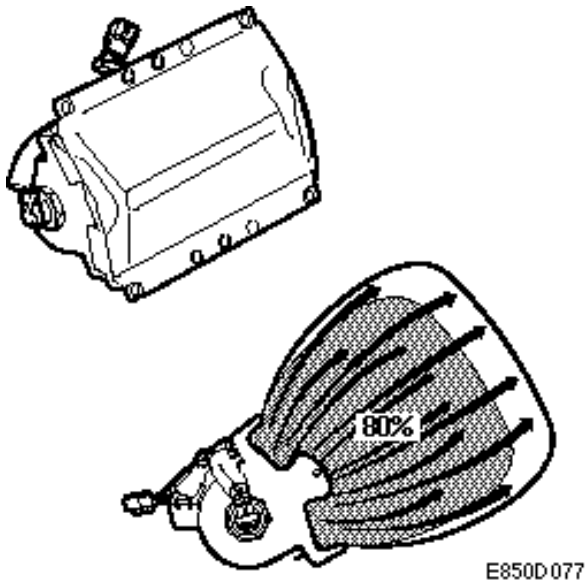
The driver airbag is a dual-stage type. This means that it can be inflated in two stages at different pressures depending on the force of the impact and the position of the seat.

If the seat is in a forward position, i.e. less than 30% (approx 65mm / 2.56in) from its front position, stage 1 will be inflated. This means that only 80% of the maximum pressure in the airbag will be utilized. This function is an adaptation of the personal protection system, i.e. the protection will be optimized according to the present circumstances and the airbag will not be inflated to full pressure if the seat occupant is sitting far forward.

With the seat in a rearward position, i.e. more than 30% from its front position, stage 2 can also be inflated depending on the force of impact. This means that 100% of the maximum pressure in the airbag will be utilized.

After an activation command, the control module will apply a current to ignite the driver charges. The driver charges generate a gas when they burn. The filter cools the gas and removes any particles before it passes to the airbag.

The charge is split into two stages. These stages are a primary stage (1) that provides 80% of the pressure and a secondary stage (2) that provides another 20%. Depending on the information that the control module receives from the different sensors, the two stages will ignite at different times.



Passenger airbag

The passenger airbag is standard on all Saab 9-5 models in all markets.

The passenger airbag is dual-stage type. This means that it can be inflated in two stages at different pressures depending on the force of the impact and the position of the seat.

If the seat is in a forward position, i.e. less than 30% from its front position, stage 1 will be inflated. This means that only 80% of the maximum pressure in the airbag will be utilized. This function is an adaptation of the personal protection system, i.e. the protection will be optimized according to the present circumstances and the airbag will not be inflated to full pressure if the seat occupant is sitting far forward.

With the seat in a rearward position, i.e. more than 30% from its front position, stage 2 will be inflated. This means that 100% of the maximum pressure in the airbag will be utilized.

The passenger airbag consists of a gas generator and an airbag. It has a volume of approx. 120 l (4.2 cu.ft.). The airbag is screwed to the dashboard and held in place with fabric foil.

The wiring harness is connected to a 4-pin connector that branches off to two 2-pin connectors on each igniter.

The gas generator comprises a steel housing with two electric igniters with individual coding, two pyrotechnical ignition charges of different strengths for stage one and stage two, pressurized gas, and a gas distributor for cooling and distributing the gas pressure.

After an activation command, the control module will apply a current to ignite the driver charges. In stage 1, a projectile (1) is shot through a diaphragm (2), which opens the pressure vessel (3) containing the gas mixture. The projectile continues on its path and ignites the 28g driver charge for stage 1 (4). The compressed gas will expand due to the heat release and pass the gas distributor (6) before reaching the airbag.

When stage 2 is activated, a 6g charge (5) will be ignited by an electric igniter and heat the compressed gas even more.

The gas generator is divided into two stages. These stages are a primary stage that provides 80% of the pressure and a secondary stage that provides another 20%. Depending on the information that the control module receives from the different sensors, the two stages will ignite at different times. See control module information

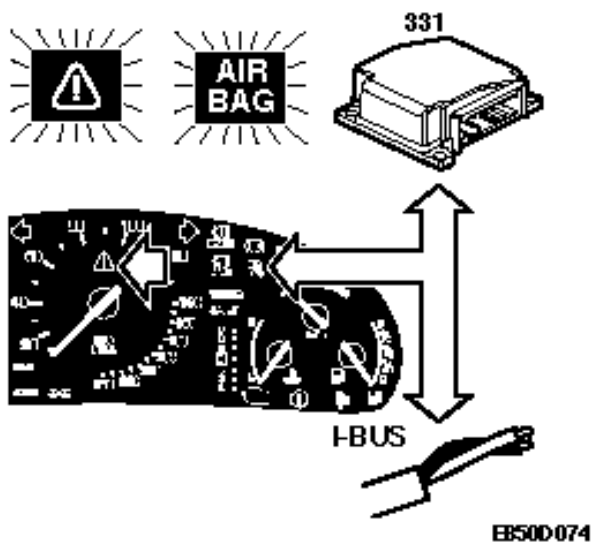
The gas composition is

- 70% argon
- 20% nitrogen
- 10% helium

Seat-belt tensioners

U.S. specification vehicles have a new type of seat-belt tensioner with new internal tuning in the torsion section.

This tensioner is not compatible with previous model year vehicles.



Airbag warning lamp

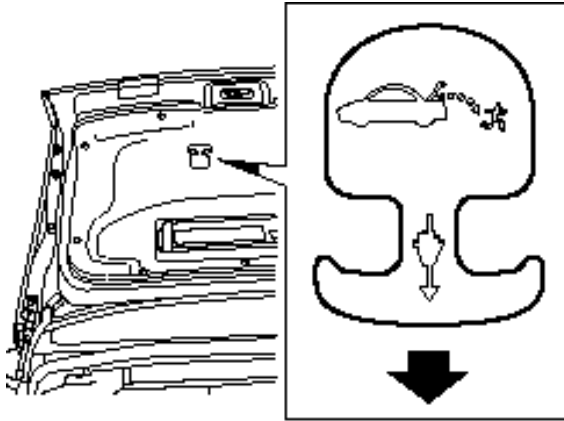
A new feature this year is that the airbag warning lamp is turned on by a bus message that is sent by the airbag control module "Airbag warning lamp: Off/On". If the airbag control module does not send this message, the lamp will be turned on by the MIU. Previous models do have an SRS warning lamp, but this function was not communicated using the bus.

A system fault will be indicated by the airbag warning lamp in the main instrument unit coming on. The car is equipped with a central warning lamp that MIU turns on together with the airbag warning lamp.

The airbag warning lamp will come on when the ignition key is turned to ON and stays on for 3-4 seconds provided there are no DTCs stored. If a DTC is present, the lamp will continue to be lit.

The airbag warning lamp does not have its own diagnostics.

Doors and locks



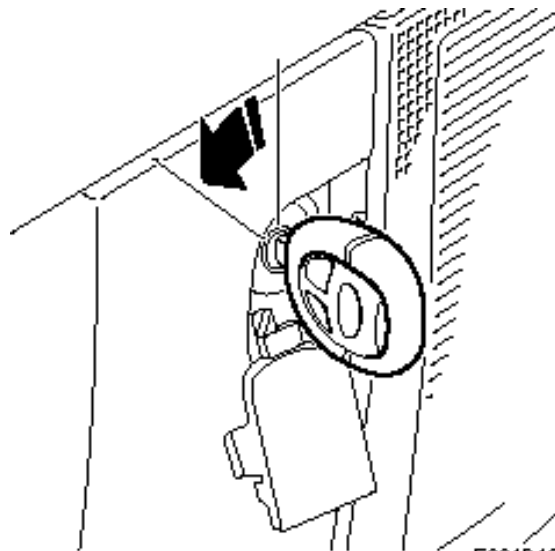
E831D160

Trunk lid lock cylinder, Sedan

The lock cylinder in the trunk lid of the Sedans has been removed. The trunk lid can now be opened by pressing the trunk lid button on the remote control or the switch located in the driver's door.

Emergency opening of trunk lid

There is a luminous handle on the inside of the tailgate in case someone gets trapped in the luggage compartment. The handle can be pulled down towards the floor in order to release the lock so that the luggage compartment can be opened from the inside.



E831D161

Tailgate lock cylinder, SportWagon

The tailgate lock cylinder remains on the SportWagon, but is protected by a cover (see illustration, above right).

Note

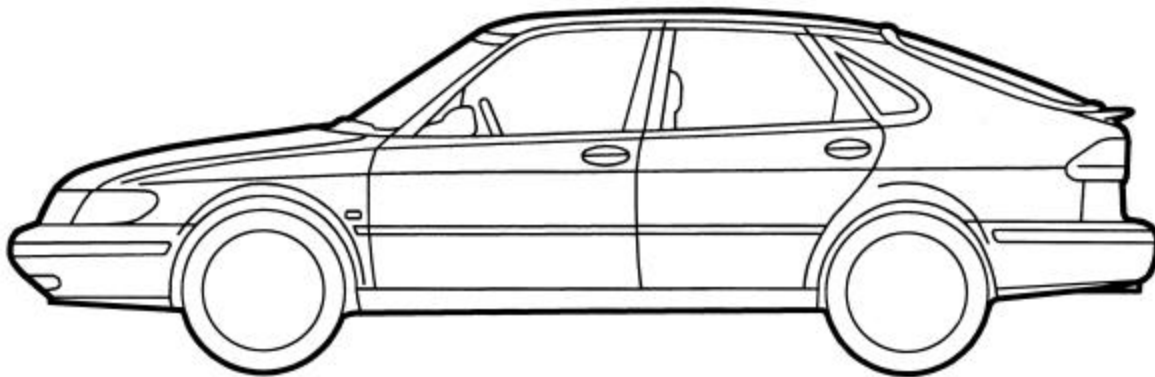
The SportWagons do not require the emergency handle, because a release latch is already located on the liftgate and it is possible for the trapped occupant to crawl over the seat back to exit the vehicle in an emergency.

9-3 - Introduction – Model Year 2002

Saab 9-3 product range - model year 2002 - U.S.

In the U.S. for 2002, the Saab 9-3 will be available in two models:

- SE (5 door & convertible only)
- Viggen (3 door, 5 door, and convertible)



9-3 SE 5 Door

For 2002 in the U.S., the 9-3 SE will be available as a 5-door model and also as a convertible. All 9-3 SE models in the U.S. will be equipped with the B205R engine.

Standard equipment on 9-3 SE 5 door models include:

- Power driver's seat
- Sunroof
- Woodgrain dash
- New Leather/textile seats
- Leather door inserts
- Manual climate control

New 5-spoke, 16in alloy wheels are standard on 9-3 SE models.

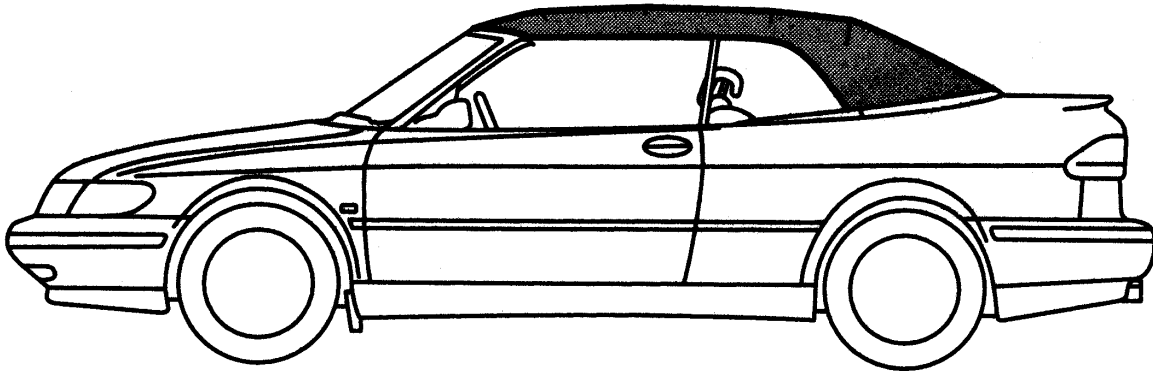


Options available on 9-3 SE 5 door include:

- Automatic transmission
- Heated front seats
- Premium Package
- Mica/Metallic paint

The 9-3 SE "Premium Package" includes:

- Memory driver's seat
- Power passenger's seat
- Automatic Climate Control (ACC)
- Upgraded audio system with amplifier
- Full leather interior
- No charge scheduled maintenance
- Sport chassis
- Leather sport steering wheel



9-3 SE Convertible

As mentioned on the previous page, all 9-3 SE models in the U.S. (including the SE convertible), will be equipped with the B205R engine.

Standard equipment on 9-3 SE convertible models include:

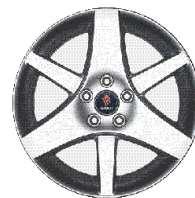
- Power memory driver's seat
- Power passenger's seat
- Woodgrain dash
- Leather seats
- Leather door inserts
- Automatic Climate Control
- No Charge Scheduled Maintenance

Options available on 9-3 SE convertible include:

- Automatic transmission
- Heated front seats
- Mica/Metallic paint
- Blue convertible top
- Sport Package

The 9-3 SE convertible Sport Package includes:

- 17in double 3-spoke wheel
- 17in Pirelli performance tires
- Rear spoiler
- Leather Sport steering wheel





9-3 Viggen 3D/5D/Convertible

The Viggen will only be available in the CA/US market. The Viggen will be available as a 3-door, 5-door or convertible.

The Viggen will be equipped with the B235R engine and manual transmission only.

The Viggen is equipped with all of the standard features found on SE models. In addition, the Viggen is equipped with:

- Viggen sports suspension
- Skirts and air flow panels
- 17in alloy wheels & high performance tires
- High performance brakes
- Metal-look dash panel with “Rocky Black” interior
- Carbon fiber dash panel with “Sand Beige” interior
- Heated front seats
- No Charge Scheduled Maintenance

For M2002, the Viggen will be available in Black, Silver, Laser Red, and Steel Gray. The interior will be available in black leather with charcoal inserts, or sand beige leather. The seats are Viggen-embossed, bolstered leather.

Options available on 9-3 Viggen include:

- Mica/Metallic paint
- Blue convertible top
(Only available on silver exterior)

Brief Overview of Changes: 9-3

9-3

The following major revisions have been made on the Saab 9-3, model year 2002:

Engine

The 2.0t 185hp engine (B205R) will no longer be offered in the U.S. market.

Cooling System

New "Long-life" coolant.

Electrical system

Main instrument unit

New compact and lighter main instrument unit with several enhancements, such as LEDs instead of bulbs, has been introduced.

Body

Exterior

- SE body-colored skirt kits for all non-Viggen models

Interior

- New Leather/Textile with "Turbo" embossment seats as standard equipment.
- New Full Leather interior with "Turbo" embossment.

Vehicle Identification Number (VIN) M2002

Example: YS3EF45C623008642

1 -	Geographical area	Y = Northern Europe
2 -	Country	S = Sweden
3 -	Car manufacturer	3 = Saab Automobile AB
4 -	Product line	D = 9-3
5 -	Model Series	F = Saab 9-3 SE with driver and passenger airbag P = Saab 9-3 Viggen with driver and passenger airbag
6 -	Body type	3 = 3-door 5 = 5-door 7 = 2-door (convertible)
7 -	Gearbox	5 = Manual 5-speed 8 = Automatic 4-speed
8 -	Engine variant	K = 2.0 turbo (High Output) G = 2.3 Turbo (High Output)
9 -	Check character	0 - 9 or X
10 -	Model year	2 = 2002
11 -	Place of manufacture	2 = Trollhättan 7 = Nystad, Finland
12 -	Serial number	000001-999999

Engine

Engine range, Saab 9-3 model year 2002

Engine	B205R (SE)	B235R (Viggen)
Compression ratios	8.8:1	9.3:1
Turbocharger make, type	Mitsubishi TD04HL-15T	Mitsubishi TD04HL-15T
Wastegate prestressing	2mm	2mm
Basic charging pressure	0.45 bar +/- 0.03	0.45 bar +/- 0.03
Max. power, EEC	205hp/151kW at 5500 rpm (man) 5750 rpm (aut)	230hp/169kW at 5500 rpm
Max torque, EEC	205 ft.lb. (280Nm at) 2200-5000 rpm (man) 250Nm at 1900-5750 rpm (aut)	258 ft.lb. (350Nm at) 1900-4200 rpm (man)
Spark plugs make, type	NGK, PFR6H-10	NGK, PFR6H-10
Spark plugs electrode gap	0.95 mm +/- 0.05	0.95 mm +/- 0.05
Engine management system	Trionic T7	Trionic T7
Recommended fuel octane number (AON)	92	92

Cooling system

A new "Long-life" coolant will be used in all Saab engines for model year 2002. The new coolant was actually introduced during late 2001 production.

The coolant that is filled in production does not require changing throughout the service life of the car. The fluid is orange in color to distinguish it from earlier types of coolant that were blue-green.

Saab original "Long-life" Coolant must be used in order to obtain the desired coolant properties.

The normal mixture of 50% coolant still applies.

The earlier blue-green type and the new orange type will both be available as spare parts.

Technical Data

Saab Original "Long-Life" Coolant

Type:	Ethylene glycol
Color:	Orange
Mixing	50 %
Part Number	-200 l (drum) available later
	-4 l (can) 02-86-542

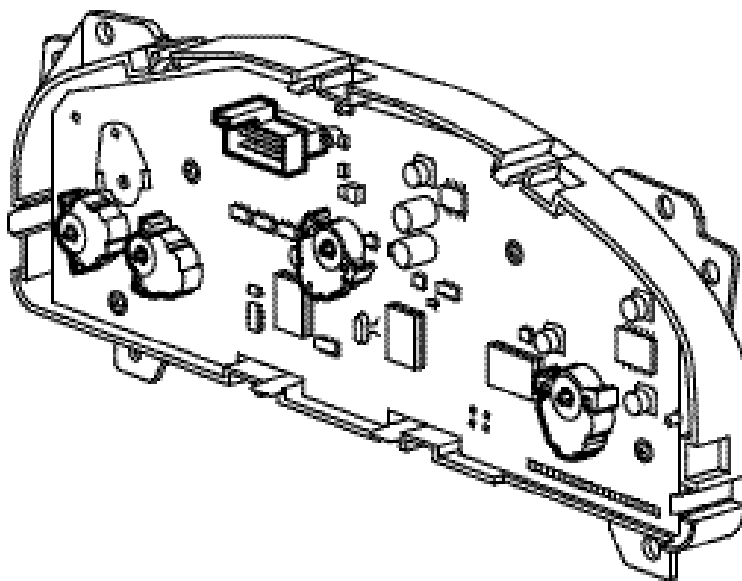
Note

Do not top up with the earlier type of coolant (blue-green), as this will impair the corrosion protection properties.

The orange coolant will also be discolored by the blue-green coolant and may appear to be contaminated with engine oil, etc.

In an emergency, conventional (blue-green) coolant can be mixed with the "Long-life" (orange) coolant. However, once the conventional coolant has been added, the "Long-life" properties are lost and the coolant must be changed at normal intervals. For this reason, care must be taken when topping off a vehicle with "Long-life" coolant to be sure contamination does not result. Adding any conventional coolant (or even using shared containers) may contaminate the system enough to affect the "Long-life" properties.

Main instrument unit, MIU



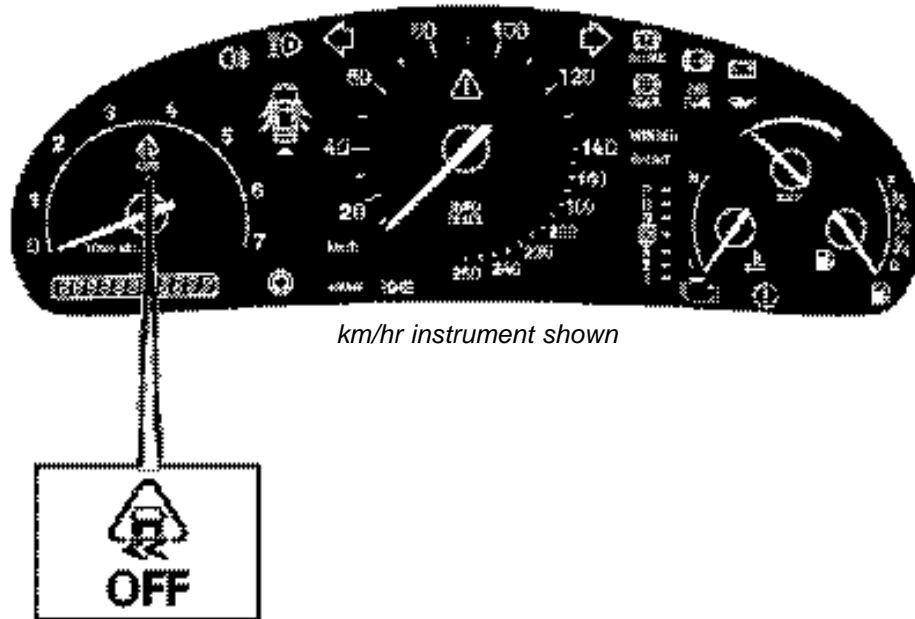
E381 D250

A new main instrument unit with several modifications has been introduced on the Saab 9-3. All the electronics and other components are now combined on one circuit board, thus reducing the depth and weight of the main instrument unit. Instrument lighting comprises only LEDs, which provide less harsh light and are very reliable.

Four new warning and indicator lamps have been added and certain functions have been revised.

The following changes have also been made:

- Only one 22-pin connector.
- All lamp bulbs have been replaced with LEDs. Some lamps have been moved.
- Stepping motors for all gauges instead of moving coil instruments. The stepping motors are controlled internally by the main instrument unit control module. The main instrument unit calibrates the stepping motors automatically as soon as the instrument is powered up (+30). The motors then take up a mechanical stop position on their shafts.
- Only the front glass and complete units are available as spare parts.



D381D342

New warning and indicator lamps

- TCS indicator lamp. The lamp comes on when TCS is active.
- TCS/ABS OFF lamp. The lamp comes on when TCS is disengaged and also in case of a fault in TCS.

Functional changes

- The miles graduation is more compressed in the higher speeds.

Body

Body color range

Two new colors have been introduced:

- Hazelnut (286)
- Polar White (283), a base solid paint, replaces Cirrus White.

Note that Cosmic Blue (264) is once again available in the U.S. market.

Color code	Color	Paint type	Note	9-3 SE	9-3 Vigen
170	Black	Base solid		X	X
278	Laser Red	Base solid		X	X
283	Polar White	Base solid		X	
257	Midnight Blue	Metallic	Mica	X	
264	Cosmic Blue	Metallic		X	
268	Silver	Metallic		X	X
273	Sun Green	Metallic	Mica	X	
279	Steel Grey	Metallic		X	X
281	Grey	Structure	For bumpers and trim		X
286	Hazelnut	Metallic		X	

All exterior colors are available with either Sand Beige or Charcoal interior upholstery.

Important

Use car color code for all paint repairs.

Base solid paint with clear varnish

All solid paints have now been superseded by base solid paint with clear varnish. The risk of mistaking these two paint systems is high when repainting.

Cars with base solid paint are marked BASE on the color code and tire pressure label.

Note

Vigen interior is Rocky Black with Charcoal inserts or Sand Beige Leather Sport Seats.

Exterior/interior

The following features are new for the 9-3 model year 2002:

- Upgraded interior
- New 16in 5-spoke alloy wheels
- Body colored skirting on all SE models
- New color options
- ISO-fix mounting for child seat

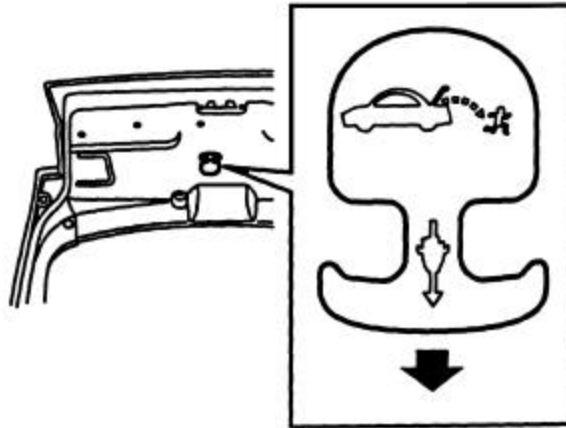
To mark the occasion of Saab's 25 years using turbo technology, the word "Turbo" will be embossed on all outboard seats of the SE models.

- All SE models will be fitted with new wheel rims, ALU37 (see page 103)
- Two new interior options have also been introduced:
 - Full Leather seats with "Turbo" embossed backrest
 - Leather/textile seats with "Turbo" embossed backrest (standard interior)
- The "Turbo" leather seats replace the existing leather seats.
- Both interior options will have leather inserts in the doors.

ISO-fix mounting for child seat

ISO-fix is standard on all 9-3 3-door and 5-door models. It will also be standard on the convertible from model year 02.

Doors and Locks



D831D079

Emergency opening of tailgate (US/CA)

There is a luminous handle on the inside of the tailgate in case someone gets trapped in the luggage compartment. The handle can be pulled down towards the floor in order to release the lock so that the luggage compartment can be opened from the inside.

Signature Technologies

Saab Active Head Restraint (SAHR)

Neck injuries are one of the most common results of rear-end collisions, and the majority occur during low-speed collisions. In fact, statistics indicate that 25% of automobile accidents with injuries involve rear-end collisions and 75% of those result in neck injuries. Injuries of this type - often called whiplash - seem to be caused by the differential movement of the occupant's head, relative to the neck and spine that occurs during an impact from behind. In certain situations, the result can be a serious long-term injury.

With the launch of the 9-5 and the 9-3 in early 1998, the Saab Active Head Restraint (SAHR) introduced a world-first innovation, which effectively reduces the relative movement of the front-seat occupant's head, and consequently also reduces the risk of whiplash. Volvo has a system called Whiplash Protection System (WHIPS), intended to achieve the same objectives. WHIPS is standard on all Volvos, just as SAHR is standard on all Saabs.

While SAHR and WHIPS have the same objective, they accomplish it in very different ways. Saab's SAHR is a mechanical device based on the lever principle, and is designed to operate in rear collisions equivalent to as little as a 10-mph impact. In a rear collision of sufficient force, the occupant's body is naturally forced into the seat back, engaging a pressure plate, which moves toward the rear of the seat. A lever attached to the pressure plate moves the head restraint up and forward to "catch" the occupant's head before the occupant's head can "whip" back. Whiplash generally occurs when the head passes beyond parallel when being

forced back. The occupant is naturally forced down and into the seat; SAHR helps keep the occupant in position and maintain head, neck and spine (cervical and lumbar) alignment. In fact, lumbar injuries can be reduced by up to 70%. The SAHR system may also reduce injuries during a strong rebound from the restraint system caused by a frontal impact.

After SAHR has been activated, it simply returns to its original position - there is nothing to reset and no costly repairs are necessary to restore the seat to its fully functional condition. Therefore, the seat is ready for any subsequent impacts caused by multiple car collisions. Accidents involving more than two cars (or more than one impact) account for approximately 25-30% of rear-impact collisions

Volvo's WHIPS reacts differently. As the occupant's body is forced back into the seat, a pin and bracket in the base of the seat breaks or bends, allowing the entire seatback to fall backwards towards the rear passenger compartment. As a result, repairs may be necessary. In contrast, SAHR has no maintenance and is reusable over and over during the lifetime of the car.

The SAHR system has been tested in over 90 separate "real-world" crash conditions involving different occupant sizes, occupant positions, seatback angles and differing impact speeds.

Note: Insurance companies average \$4.1 billion per year in spending on whiplash injury claims alone.

Triple Load Paths

The body of the 9-5 is designed to maintain a survival area for the occupants in the event of a collision. Basically, the energy caused by a collision is directed along designated paths to avoid an intrusion into the passenger compartment. U-shaped beams are placed in the front and rear of the vehicle, which split into three paths to direct the energy in such a way that is less likely to invade the passenger compartment, thus avoiding or minimizing injuries.

The large front and rear beams are designed to create a stable and robust characteristic through their broad structure. The front and rear structure has three load distribution paths where 50% of the total impact goes through the central-lower member and 25% through each of the upper and lower paths. Therefore, 75% of the energy caused by an impact is directed down and away from the passenger compartment. The remaining 25% is directed on a higher path and will be sent toward the A-Pillar (or C-Pillar in the event of a rear-end collision), if necessary, depending on the severity of the crash. By directing the energy down, if the collision was severe enough to invade the passenger compartment, the impact to the passengers would be in the foot/leg/pelvis region, rather than the more critical and life-threatening head and chest region.

Saab's Triple Load Path system is different from most of the industry in that it is designed to protect passengers during both typical and atypical crashes. The U-shaped beams in the front and rear provide protection for passengers during collisions in which the bumper is not squarely impacted, (e.g. off-set collisions). The beams are designed in this U-shape to still be as effective during any angle of impact.

Most other manufacturers simply use sheet metal or "crumple-zones" to absorb the energy caused by a collision to avoid an intrusion into the passenger cabin. "Crumple-zones" are simply how the sheet metal distorts to absorb energy during a collision. Saab also uses "crumple-zone" technology to assist in the energy absorption process, but will not rely solely on it for passenger safety.

Pendulum B-Pillar

For decades, Saab has worked diligently to develop and refine side-impact protection systems to better protect the vehicle's occupants. One of the most recent Saab safety developments is a system that actually directs side impact collision forces away from the upper body area of front-seat and rear-seat passengers. Detailed automotive safety studies and computer simulations have helped Saab engineers learn how a car's structure should deform in a collision to minimize occupant injury. As a result, Saab has configured the side structure - particularly the B-pillar directly behind the front door, door beams, and floor structure - to act like a pendulum.

Here's how it works: the B-pillar in all Saab hardtop models is constructed of high-strength steel to be very stiff in the upper and center sections. This helps prevent the pillar from deforming into the driver's and front passenger's upper body area, and to direct the energy caused by the impact into the lower structure. The lower part of the pillar is more flexible, therefore it will give way easier and will absorb more of the collision force. The collision force or impact energy is naturally directed down so that if the passenger compartment is intruded into the occupant, the contact will occur in the stronger pelvic area, not the rib cage, head or chest, where our more vulnerable organs are located.

After the side structure has directed the collision forces downward, strong cross-member beams under the floor of the passenger compartment serve to further distribute side impact forces to other areas of the vehicle's body structure, away from the passenger compartment.

Fact: 30% of fatalities from automobile accidents are caused by side-impact collisions.

Fact: Saab has been a pioneer in side-impact protection. As early as Model Year 1973, Saab incorporated side-impact protection technology into Saab 99 models.

Turbocharger

The basics of why a turbocharger works

The Ideal Gas Law states that gas temperature, pressure, and volume are all related. Compress a gas (reduce the volume) and pressure and temperature goes up. Let it expand, and temperature and pressure go down. Increase the temperature, and the pressure goes up (in an enclosed space) or the volume goes up (it expands). Also, gases naturally flow from a high-pressure (low volume) area to a low-pressure (larger volume) area and the greater the difference, the bigger the push.

A 4-stroke engine produces energy by expanding a gas in a confined space where the high pressures created can push against a piston. The process of creating this energy heats the gas, so you get even higher pressures and more power. Unfortunately, most of that heat (which is the same as energy) is dumped into the exhaust before it can be used. The energy is simply not in the cylinder long enough to transfer all of the heat into useful mechanical energy.

Enter the turbocharger. A turbocharger has two turbines; the exhaust gases spin one turbine, which is connected (via a simple shaft) to the turbine on the compressor-side. The compressor turbine is connected to the air intake of the engine. This results in more air being forced into the air intake, which eventually is routed to the combustion chamber. When you force more air into the combustion chamber you must force in more fuel, and the result is more power.

Using the exhausted air is a good thing, because energy (heat) that would have otherwise been wasted is creating additional energy without putting any major stress on the engine. Supercharging accomplishes the same goal, but is generally belt-driven, which requires more energy to be spent to create the increased airflow. This means that comparable power by the use of a turbocharger can be created out of a 4-cylinder engine as opposed to using 6-cylinder or 8-cylinder engines, which are far less fuel-efficient.

The exhaust side of a turbo

When an exhaust pulse exits the cylinder at high temperature and high pressure, it gets merged with other exhaust pulses and enters the turbine inlet. Since the inlet is a very small space, very

high pressure and very high heat exists, which means the gas has a very high energy level.

As the gas is released from the combustion chamber into the turbine housing, it moves from a small space to a larger space. Accordingly, it expands, cools, slows down and dumps all of the energy by pushing against the turbine blades, causing it to rotate.

Thus, with all else being equal, the amount of energy that can be created with exhaust turbine is determined by the pressure differential at the inlet and outlet (i.e. raise the turbo inlet pressure and lower the outlet pressure, or both, and more power is made). Raising the inlet pressure is possible but is more difficult to accomplish. Lowering the outlet pressure is much easier to accomplish by simply using a freer-flowing exhaust.

The compressor side of a turbo

Since it is possible to extract energy from an expanding gas via a turbine, it stands to reason that it is possible to use that energy to compress a gas via a turbine. In other words, the compressor side is just the exhaust turbine side driven backwards. The exact same laws of physics apply, just in reverse. Unfortunately, the laws of physics have worked negatively because the act of creating energy with the air intake to compress it has significantly raised its temperature. So, the air must be cooled again without losing any pressure – thus the need for an intercooler.

An intercooler simply places the airflow stream between the turbo compressor outlet and the combustion chamber through a radiator. The more you can cool the airflow, the better, because compressed or cooler air allows for more air particles to be burned, once it reaches the combustion chamber. The intercooler using air and water allows for two stages of cooling to take place in one area to be more effective in the cooling process of turbocharging. Oil is used on the moving parts within the turbocharger as a cooling agent as well.

Why use Turbocharging?

Turbocharging is a typical Swedish concept. The use of 4-cylinder engines provides far better fuel economy than 6 or 8-cylinder engine. The fact that we can achieve ample power out of the smaller 4-cylinder engines is a testament to our ingenuity. There are also tax implications in Europe, which are more favorable if you own a vehicle that has a lower displacement engine. The process also has its use in aircraft technology, which we find relevant to implement into our vehicles as a cornerstone of our brand.

Trionic Engine Management

The Trionic system is called "Tri" because it originally simultaneously controlled three engine functions: ignition timing, fuel injection and boost pressure (beginning with the 1999 9-5 and 2000 9-3, Trionic also controls the electronic throttle). One clear benefit of controlling these functions is reduced emissions: with Trionic, both exhaust emissions and fuel consumption are reduced to the point that they conform with the most rigorous emission standards in the U.S.

Serving as the main sensors required to gather information about the combustion process, the spark plugs constitute one of the latest improvements of the Saab Trionic Engine Management System. A low voltage across the electrodes continuously senses combustion conditions within the chamber, where the actual combustion occurs.

This eliminates the need for a separate knock sensor. This is possible because the Saab Direct Ignition (DI) system is integrated into the Trionic system. Earlier systems used a separate knock sensor to detect engine knocks, which may occur due to variations in fuel quality. It worked like a microphone mounted to the engine block, but its sensing function could become erratic in the case of other mechanical clatter in the engine.

The "brain" of the Saab Trionic Engine Management System is a powerful microprocessor. The processor is 32 bits wide and is capable of performing two million calculations per second. While driving at 55 miles per hour, the processor is able to perform calculations equivalent to a whole binder full of single-spaced pages, all in the time required for the car to roll half a yard down the road. It has deliberately been designed with excess capacity in order to accommodate future additions to the system.

The microprocessor contains a stored data set that defines ideal driving conditions. Using this data as a reference, it simultaneously monitors, compares and adjusts ignition, fuel injection and turbo boost pressure to operate the engine more efficiently.

The Saab Trionic is an adaptive system, meaning that it "learns" about different driving conditions, storing this information for use when similar driving conditions reoccur. It makes instantaneous adjustments to fuel injection, ignition and boost pressure parameters, depending on external conditions.

Precise management of the engine's combustion process yields numerous advantages. It becomes easier to reduce exhaust emissions than in a conventional system. Fuel consumption is also reduced as a result of a more precise combustion.

In the Trionic system, the fuel injection valves are individually controlled for each cylinder. Each injection valve sprays two jets of fuel toward the two intake valves of the cylinder. In this way, fuel can be supplied to the engine with even greater precision.

Before the injection valve opens, the microprocessor initiates a phase in which it computes the exact amount of fuel to be injected into the cylinders based on engine load, RPM, temperature, and other factors. Immediately before the fuel injection phase is terminated, the processor monitors whether the driver has moved the accelerator pedal since this phase began, and takes any necessary corrective action. Fuel injection can be varied from two milliseconds to the entire injection phase.

The wide range of control capability in fuel injection is important when the fuel used may be pure gasoline or a variety of different mixtures of gasoline and alternative fuels, such as methanol or ethanol. A Trionic system, in fact, is the key to Saab's prototype multi-fuel engine. This is because in principle, fuel consumption is doubled when the engine is burning alcohol instead of gasoline.

Saab's unique Direct Ignition (DI) system is also incorporated in the Trionic system. The Saab DI cassette is a capacitive ignition system without moving parts. This eliminates starting problems during moist and cold weather. The DI cassette supplies a constant spark to each spark plug and eliminates the need for a distributor cap and spark plug wires. Each spark plug is equipped with its own ignition coil, mounted inside a cassette attached directly to the spark plug itself, thus eliminating the need for ignition cables as well. All ignition system components are housed inside the cassette, where they are well protected from dirt and moisture.

The spark plugs last several times longer than the plugs in a conventional ignition system, because the DI system can handle larger variability in the electrode gap size of the spark plugs. Ignition timing is set permanently at time of production at the factory.

The fact that each combustion event forms ions (electrically charged molecules) in the combustion chamber opens up a unique opportunity to monitor the combustion process. This is accomplished by imposing a voltage across the electrode gap during the combustion phase of each plug. Measuring the current at the control unit that is due to ionization makes it possible to analyze the combustion process in each cylinder. If knocking or misfiring occurs, the boost pressure is adjusted immediately.

The Saab Trionic shows very good results in terms of exhaust emissions, reducing hydrocarbon, carbon monoxide and nitrogen oxide levels. Previous Saab models already achieved emissions below California's legally mandated maximum levels beginning with 1993 models. The Saab Trionic also provides unique opportunities to further enhance the performance of Saab engines. The 2.3-liter turbocharged engine, for example, already reaches its maximum output torque at a very low 1,800 RPM.

Night Panel

When activated, the night panel mode can assist nighttime driving by extinguishing most instruments and displays as long as the information is non-essential. The night panel feature not only turns off the associated lights to the gauges, but the gauges themselves (this can be seen by activating it during the day). The sole remaining light from the Main Instrument Unit will be the speedometer, which is only displayed up to 90 mph (when 85 mph is approached, the rest of the speedometer will illuminate). Also, any gauge will be individually reactivated if necessary. For example, if the fuel level drops below 4 gallons, the fuel gauge cluster will light up. Or, if the radio is adjusted, the Saab Information Display (SID) will illuminate for about 10 seconds. If any warning lamps need to illuminate, the Main Instrument Unit will provide the driver with the information they need.

The Night Panel feature benefits our customers because glare from the instruments at night is often enough to cause significant eye fatigue. When a customer wears eyeglasses, the sensitivity to the light becomes greater and eye fatigue is increased.

Console-Mounted Ignition

Building on our aircraft heritage, the console-mounted ignition is designed to be both safe and convenient for the driver and provide additional security for the car itself. For the driver, this location keeps the key (and any other items on a key chain) away from his/her knee in the event of an accident, minimizing the chance of injury. Saab's real life crash investigations revealed a number of knee injuries due to steering column-mounted ignitions.

From a convenience and ergonomic perspective, placing the ignition in the center console allows the driver to make one simple move to buckle their seatbelt, start the vehicle, release the emergency brake, select the appropriate gear and put their hand back on the steering wheel in one fluid motion. Searching for the ignition on the steering column and then performing all of those other functions in most cars is far from ergonomic.

The ignition is also located in the center console for simplicity in design and manufacturing. All Saab vehicles have a gearbox lock mechanism, meaning that the gear selector must be in the appropriate position to get the key out of the ignition, (e.g. reverse for manual transmission vehicles). Placing the ignition cylinder, which is used to lock the vehicle's gearbox near the gear selector, allows for fewer parts and a simpler, more efficient design.

Saab Real Life Safety

"My beautiful 9-3 Convertible was totaled and I got out with only a scratch on my thumb. The car's engineering, the seat belt, and the reinforced roof saved my life." -- Marsha Metzger, North Caldwell, NJ

"I was in a head-on collision with my Saab, I opened the door and walked out. I love and appreciate my new Saab as much as my last." -- Bill Berg, Atlanta, GA

These customers know first-hand about Saab Real Life Safety. They may not know about the Saab accident investigation research team that has studied over 6,000 cases in which a Saab car has been involved in an accident since 1969. But they experienced everything the accident investigation and research team has learned, because that knowledge goes directly into the design and development of every Saab. That's why Saab's Real Life Safety is such an integral part of our Safety Brand Pillar — and why automobile consumers know that Saab builds safe cars.

Saab engineers have set the standard when it comes to safety. OnStar helps take that standard to another level. Having OnStar on board is like driving with a personal assistant ready to summon help at a moment's notice. That help can be a lifesaver.

OnStar Information

Automatic Emergency Response - If one of your customers is involved in a traffic accident that is severe enough to set off the airbags, the OnStar system will automatically connect the driver with an OnStar Advisor. Also, exclusively in Saab models equipped with OnStar, if the automatic front seat belt pretensioners are activated, the OnStar system will automatically connect the driver with an OnStar Advisor.

Emergency Button - Pressing the "red cross" button on the OnStar keypad makes a call that is given top priority at one of OnStar's three call centers. The following letter and newspaper excerpt demonstrate how valuable the emergency button can be.

Louise Srofe, from Palm Harbor, Florida, credits OnStar with saving her life.

"On December 26, 2000, while driving in Clearwater, Florida, I suffered a stroke (I'm only 48 years old). I had a cell phone with me but was rapidly losing the vision in my eye and was becoming paralyzed on the right side. I didn't think I had the where-with-all to even call 911. I was able to pull into a grocery store parking lot and pressed the "Medic" [Emergency] button on OnStar. A young lady came on and asked if I had a medical emergency. It seemed it was all I could do just to say "yes". She dialed 911 and stay on the line with me, talking to me. It was only minutes before I heard the sirens. From OnStar they knew who I was, where I was, what kind of vehicle I was in. OnStar saved my life.

I wanted to write and tell you there is absolutely no doubt that OnStar saved my life. No doubt. None. I know it, my family knows it, my friends know it. I tell everyone I know about what happened to me because I know how valuable OnStar is... I know there are other benefits to OnStar. But, please tell people OnStar saves lives. I'm living proof of that."

Here is an excerpt from the August 22, 2001 edition of the [Detroit Free Press](#) that credits OnStar with saving another life.

OnStar saves GM official's wife Woman one of many boosting new service

Don Trabolso, a General Motors Corp. business manager, never thought he'd be telling a harrowing first-person tale about his company's OnStar vehicle communications system...

Trabolso, who works for GM's preproduction operations division in Pontiac, is one of hundreds of people around the country who [OnStar President] Huber says have become unexpected boosters through real life experience. Trabolso says the technology saved his wife's life last month when he took his OnStar-equipped Buick to a weekend getaway at a friend's northern Michigan cottage. His wife, Brenda, suffered a

sudden allergic reaction to an avocado dip appetizer. Trabolsy found himself hurtling down M-32 at 90 mph, trying to find a hospital in Alpena.

"I can't ...breathe," he remembers his wife gasping, her head half out of the open passenger window. Fluid poured out of her eyes and ears. Her throat was swelling shut.

And Trabolsy hadn't a clue how to get to the hospital.

He pushed a button on the dashboard that, in seconds, connected him with an OnStar adviser, who patched him directly into the hospital for emergency instructions from a nurse and then gave him street-by-street, turn-by-turn directions to the hospital.

"I am not being overly dramatic when I say that OnStar saved my wife's life," he says. "The doctor told us that if there had been much more of a delay getting there, she would have died." Brenda Trabolsy was treated and released the next day.

Hands-free Telephone

New York recently passed a law banning the use of hand-held telephones in automobiles. OnStar's hands-free embedded cellular phone meets the demands of the NY law that went into effect on November 1, 2001. As other states consider and pass similar legislation, the hands-free telephone technology in each Saab equipped with OnStar will become more and more important to Saab customers and potential new Saab buyers.

Hands-free telephone capability also provides another Saab Real Life level of safety.

The following is from a GM news release dated August 22, 2001:

An unprecedented study, conducted as part of General Motors' "SenseAble driving" program (a \$10 million, multi-year effort to address driver distraction), reveals that the embedded cellular phone used in GM's OnStar system has had an outstanding safety performance record since it was initiated five years ago.

The study is the world's first analysis of a database that has extensive and actual — not estimated — information about whether a crash occurred at the same time a cell phone was in use. This database, maintained by GM's OnStar subsidiary, consists of automated information with time stamps that show exactly when a cell phone voice call was initiated and when the OnStar advisor was in contact with a vehicle after an airbag deployment...

Previous studies that have attempted to associate cell phone use with crashes — including a much-publicized 1997 University of Toronto report — could use only small statistical samples and estimates of when calls were made in relation to a crash.

Using the actual OnStar data, the GM study concludes that an air bag deployment crash associated with the use of OnStar's embedded phone system was rare, and that the chance an embedded cell phone actually caused a crash was even more rare.

Here are the facts:

-For the period from October, 1996 through May, 2000, a driver was on the phone at the time of a crash severe enough to deploy the vehicle's air bags during only two of the 8.1 million embedded cell phone calls placed to an OnStar Call Center

-In six other cases, it was determined that the driver was on the phone within 10 minutes before a crash that deployed the air bags.

- In all eight incidents, there is no evidence that these calls actively contributed to the crashes.

"We already knew from our research and thousands of customers' testimonials that OnStar enhances vehicle safety and security," said Chet Huber, president of OnStar, in announcing the findings. "This study confirms that our customers can safely use the embedded cell phone technology of OnStar. From the beginning, OnStar's unique three-button system was designed with safety as a priority."

This is another example of how OnStar helps take Saab Real Life Safety to another level.

Cellular Overview

When equipped with OnStar, you have to think of the Saab 9-3 or 9-5 as a very big cellular phone that your customers can drive. The main components of OnStar are the Vehicle Communications Unit (VCU), a cellular antenna and an antenna for the Global Positioning System (GPS) antenna. These work through the Vehicle Interface Unit (VIU). The cellular and GPS antennas are housed in the "sharkfin" antenna found on the roof of the 9-5 and 9-3 SE hardtop. For the Viggen and the convertible, the GPS antenna can be found attached to the inside of the windshield. The cellular antenna is in the roof antenna for the Viggen hardtop and the short rubber antenna on the right rear fender on convertibles.

When OnStar is activated, the system generates a phone number with a 500 area code. If the customer wants OnStar's Personal Calling service, then a new phone number is generated with an area code based upon where the

customer lives. On occasion the process may take what seems to be a very long time to generate a new number. At this point OnStar is competing for telephone numbers in the customer's area along with every other phone company, cellular service or pager company. Once a new number is generated, your customer's number is then downloaded into every cellular tower in the country so that when a call is made the system will recognize the caller as having authorization to make the call. You may have noticed at times when you travel out of your home market with your hand held cellular phone the display may say, "No Service." This is because you are either too far from a tower or your cellular provider doesn't have a reciprocal agreement with the owner of the nearest tower and that tower doesn't recognize your phone.

Verizon Wireless is OnStar's cellular provider. Verizon has the largest coverage of any national provider in the U.S. market. In those areas where Verizon doesn't have direct coverage, they have signed agreements with local companies.

The FCC mandated that the cellular industry build into the system an "A" and a "B" side to the signal being carried. You or your customer may experience a message when trying to call OnStar or make a Personal Calling call that says something like "not authorized to make a call" or "press your authorization number into the keypad." Don't end the call. Because, if a call is not successful in going through, the system will flip over from the A side to the B side (or vice versa) and will try completing the call again. This is more likely to happen if your customer is traveling outside their home cellular market.

Testing the OnStar System at PDI

Be sure the technician tests the OnStar system during the test drive when completing initial PDI. All the technician needs to do is push the blue OnStar button twice to connect to OnStar. The technician should tell the advisor he is testing the system and ask if they received a GPS signal. If a cellular call is not established or there is no GPS signal, the technician should write a Repair Order (RO) to fix the problem. This will reduce the likelihood of experiencing a problem at delivery with the customer.

Enrolling Customers at Dedicated Delivery

It is recommended that you pre-register a customer car prior to the customer picking up their new Saab. This can be done by calling the OnStar enrollment center at 888-ONSTAR1 (888-667-8271). Be sure to have the customer's name, customer's address, the make, model, color and license plate number of the new Saab. An OnStar advisor will provide this information to emergency workers to help them locate and identify the car.

When your customers arrive for their Dedicated Delivery appointment, push the OnStar button while in the car and complete the process. This is an impressive demonstration for your customers when the Advisor comes on the line and says, "How may I help you, Mr. Jones?" The activation must be completed from the car as data is exchanged with the Saab and the OnStar center. Be sure to tell the customer the PIN you assigned in the event the customer didn't supply one. The customer can change the PIN at any time.

Glossary

ABS Anti-lock Brake System – The system that monitors the amount of brake pressure and individual wheel speed to assist in a hard braking situation. ABS essentially pumps the brakes for you to prevent wheel lock-up, which keeps the vehicle under control.

Aero – The high performance meets high-end luxury form. Aero for 2002 is more aggressive and sportier. Aero has been a nameplate for Saab since MY 1993.

Ah Amp hour – A rating used to classify the strength of a battery.

AHL Automatic Headlamp Leveling – The system that maintains the appropriate angle of the beam emitted by the new Bi-Xenon lights. It will adjust up or down, as necessary, based on the load forces being placed on the front and rear of the vehicle (e.g. going up a steep driveway, the AHL will adjust the lamps down to keep them on the driving surface).

AON Average Octane Number – A number used to rate the quality of fuel (e.g. 87, 89, 92, etc.).

Arc – The touring edition of the form names. The next progression in the level of luxury and comfort. This form essentially replaces the SE model in the model designations.

ATF Automatic Transmission Fluid – A lubricant required for the proper operation of the automatic transmission.

A-Pillar – The front structure of the vehicle that the windshield fits into. The A-Pillar has reinforced beams to assist in a front impact collision and is a crucial part of the safety cage construction, which greatly effects the structural rigidity of the passenger compartment.

BBS – The supplier used by Saab for the new wheels on the 9-5 Arc 3.0t and the 9-5 Aero.

B-Pillar – The middle beam connecting the roof to the rest of the vehicle. The front doors latch into and the rear doors are hinged from the B-Pillar. The B-Pillar is reinforced and is a crucial part of the safety cage construction and the structural rigidity of the vehicle. The B-Pillar is Pendulum-styled on all hardtop vehicles.

Convertibles do not have a B-Pillar, and therefore do not have a Pendulum B-Pillar.

CCA Cold Cranking Amp – A rating used to classify the strength of a battery in cold weather conditions. It is measured at 32 degrees Fahrenheit.

C-Pillar – The rear pillar connecting the roof to the rest of the vehicle on a Sedan. The C-Pillar is reinforced and is a crucial part of the safety cage construction and the structural rigidity of the vehicle. Convertibles do not have a C-Pillar.

Databus – The system that allows the ECMs to communicate to one another if necessary. Electronic signals are sent “on the bus” with instructions or notifications of certain on-board changes.

DICE Dashboard Integrated Central Electronics – An ECM which is responsible for many of the lighting circuits on the vehicle (e.g. headlamps, turn signals, etc.). DICE is also responsible for activating the AC system compressor. DICE acts as the gateway for the databus system, meaning Tech 2 uses this system to communicate with the other ECMs.

DTC Diagnostic Trouble Code – The code that identifies a fault or failure. The DTCs are stored in the memory of the respective ECM and can be read using the Tech 2 device.

D-Pillar – The rear pillar connecting the roof to the rest of the vehicle on a SportWagon and a 3D/5D. The D-pillar is reinforced and is a crucial part of the safety cage construction and the structural rigidity of the vehicle. Convertibles do not have a D-Pillar.

ECM Electronic Control Module – A microprocessor that has its own area of responsibility. Each ECM monitors and adjusts for optimal performance in its specific area. Most ECMs communicate via a databus system.

ESP Electronic Stability Program – A system that uses the brake system and throttle to help correct for Oversteer and Understeer in abnormal driving conditions, (i.e. crash avoidance).

Fuse – Conducts electricity to a component to enable it to work. If a fuse is pulled or blown, the feature will not operate properly. A fuse protects a circuit from a short-circuit or an overloaded circuit.

Hp Horsepower – The amount of stamina power that a vehicle has in order to maintain a desired speed. More aerodynamic vehicles require less Hp as a result of lower resistance.

IR Infrared – A signal sent to detect items that are different from ideal or stable conditions (e.g. Rain Sensing Wipers use an infrared signal to detect water on the windshield).

LED Light Emitting Diode – These are used in lieu of bulbs. LEDs last much longer and provide more subtle, but effective lighting. LEDs are used on the SID, ACC and MIU, for example.

Linear – The entry-level form designation for our brand strategy moving forward. Our vehicles should not ever be considered “base” cars. The replacement for the 9-3 will carry these form names as well.

MED-NET – An OnStar service that can store a customer’s personal medical information to assist in an emergency.

MIU Main Instrument Unit – The component that is located in the dash that illuminates the necessary information that the driver needs while operating the vehicle, (e.g. speedometer).

Nm Newton Meters – The measurement used to measure torque. This measurement is used mostly outside of the U.S. Torque in the U.S. is measured in foot-pounds (ft. lb.).

Oversteer – The rear end of the vehicle tends to drift out or “fish-tail” in a turn.

Relay – An electro-mechanical switch that powers up a component or components. It is able to withstand a high electrical current draw.

RPM Revolutions Per Minute – A measurement to describe the amount of times something cycles (e.g. engine cycles, turbochargers, etc.).

SAHR Saab Active Head Restraint – The whiplash reduction system that uses natural body weight and forces to react in a way to help keep the front seat occupants head and neck in a position that will not cause serious injuries.

Sensor – A device used to provide information to the various ECMs. Many different types of sensors are used on our vehicles. Some main components act as sensors to provide information (e.g. spark plugs for the T7 Trionic Engine Management system).

SPS Service Programming System – A software system that allows for different settings to be adjusted on the various ECMs located throughout the vehicle.

SID Saab Information Display – The component that is located above the radio, which includes the Saab Car Computer. The date, time and radio function are normally illuminated here (e.g. radio station, CD Play, etc.).

SRS Supplemental Restraint System – The system that controls various airbags located in the vehicle. Please note, these are supplemental, meaning the primary restraint system is always the seat belt. SRS is designed to work in conjunction with seat belts fastened.

T7 Trionic – The ECM that controls the Trionic Engine Management system. T7 is the seventh generation of the system that Saab invented and implemented as early as model year 1993.

Torque – The amount of power (twisting force) being sent to the drive wheels. Torque is the acceleration power that gets you from 0-60. A favorable torque rating at low RPMs can provide excellent power. Torque is measured in ft. lb. @ RPM.

Torx – A special head on a screw or bolt, which require a torx-driver. There are a variety of different sizes and they are used throughout the vehicle (e.g. the license plate screws have a torx head).

TCS Traction Control System – TCS works in conjunction with ABS and the electronic throttle to either limit torque to the drive wheels or actually apply brakes to the drive wheels to keep them from spinning.

TWICE Theft Warning Integrated Central Electronics – The ECM that is responsible for the door locks, the alarm and the immobilizer features of the vehicle. It also controls the brake light illumination, the power front seats and the heated rear seat timer functions.

Understeer – The front of the vehicle tends to continue straight ahead in a turn as the steering wheel is being turned in the intended direction.

VIN Vehicle Identification Number – A number assigned to each individual vehicle that is manufactured. Each VIN is unique to its vehicle.

Viggen – Swedish for “Thunderbolt.”

YRS Yaw Rate Sensor – The sensor used with ESP to measure side acceleration, vehicle speed and the steering angle of the vehicle. If the sensor detects that the vehicle is within ideal conditions, it will send a signal to the ECM advising that the vehicle is stable.

Notes

IMPORTANT - Test Instructions!!

- The 2002 Griffin Society Product Test, S02T, must be taken on-line at www.saab-edu.com.*

** This only applies to those employees still needing to take the test. If you already completed a written version of S02T, you do not have to retake this test using the eLearning version.*

- Detailed test instructions are provided at www.saab-edu.com. Just click on [How to Take an Online Test](#).
- When you are ready to take the test, go to www.saab-edu.com and click on the [S02T Product Test](#).
- **Take your time and research your answers carefully - You must score 80% or higher in order to pass this test and achieve the proper recognition level in the 2002 Griffin Society Program.**

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