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GENERAL

Although the Saab 900 is a sophisticated and complex machine, nearly all basic maintenance and most repairs can be accomplished by any interested owner with basic mechanical skills and the right information. While some of the repairs covered in this manual are complicated and require special knowledge and equipment, most of the care that is required in the lifetime of the average Saab is well within the capabilities of the do-it-yourselfer.

CAUTION

Do not use this manual unless you are familiar with basic automotive repair procedures and safe workshop practices. This manual illustrates the workshop procedures required for most service work; it is not a substitute for full and up-to-date information from the vehicle manufacturer or for proper training as an automotive technician. Note that it is not possible for us to anticipate all of the ways or conditions under which vehicles may be serviced or to provide cautions as to all of the possible hazards that may result.

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CAUTION

Your common sense and good judgment are crucial to safe and successful service work. Read procedures through before starting them. Think about whether the condition of your car, your level of mechanical skill, or your level of reading comprehension might result in or contribute in some way to an occurrence which might cause you injury, damage your car, or result in an unsafe repair. If you have doubts for these or other reasons about your ability to perform safe repair work on your car, have the work done at an authorized Saab dealer or other qualified shop.

This section of the manual is intended to help the beginner get started smartly and safely with Saab maintenance and repair. The section begins with **Form and Function,** a general description of the car and its individual systems, followed by a discussion on **How To Use This Manual.**

Tips on mechanic's skills and workshop practices that can help the beginner do a faster, complete, and more thorough job can be found under **Getting Started. Tools** describes the basic tools needed to do most of the procedures in this manual.

The section ends with a quick reference guide to emergencies—what to do when the car won't start or when a warning light comes on, including basic troubleshooting and information on how to gauge the seriousness of a problem.

FORM AND FUNCTION

While the complexity of the Saab 900 may at first seem overwhelming to the do-it-yourself owner, it can be simplified and more easily understood by viewing the car as an assembly of simpler systems, each performing its own independent functions.

Engine

The Saab 900 models covered by this manual are powered by a liquid-cooled, four-cylinder, 16-valve, in-line engine. The power train is integrated with the clutch, transmission, and differential in a compact, lightweight power unit that occupies very little space. See Fig. 1.

The 16 valve cylinder head uses self-adjusting hydraulic cam followers to actuate the valves. Each valve has a large flow area to allow the engine to breath efficiently. Because the cylinder head has four valves per cylinder instead of two, individual valves are subject to far less demanding working conditions. See Fig. 2.

Saab Turbo with APC

In addition to the naturally aspirated engine family, the 900 is available with a turbocharged engine. See Fig. 3. The turbo

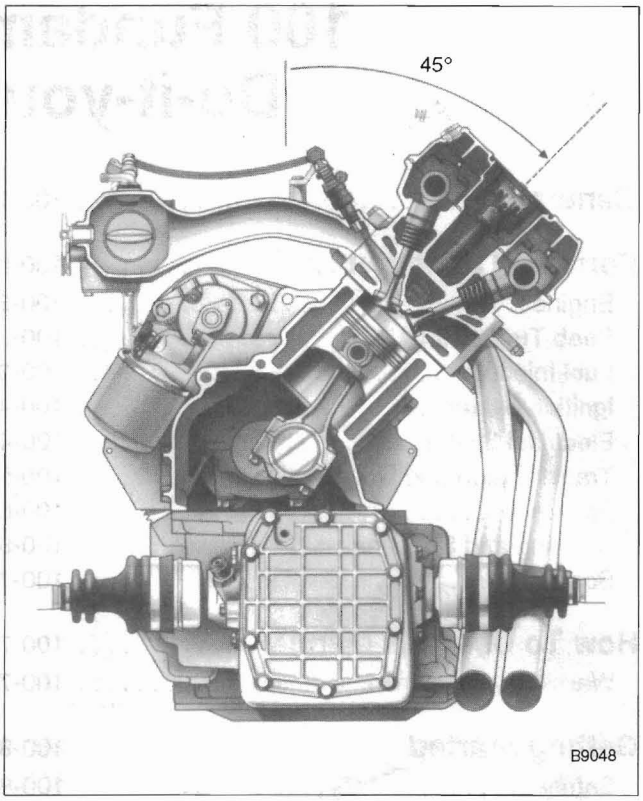

Fig. 1. Cutaway of Saab 900 16 valve overhead camshaft engine. The engine is sloped at 45% to lower the car's center of gravity and to allow for a low hood line. The transmission is bolted to the bottom of the engine.

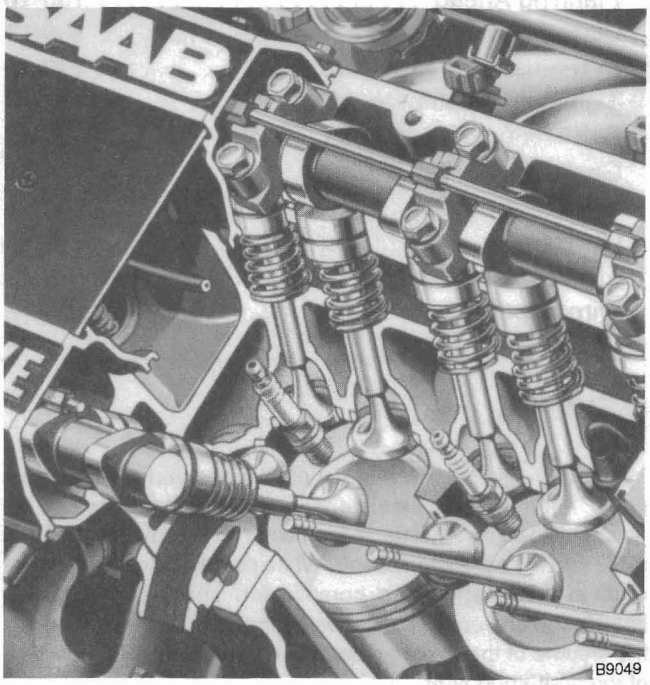

Fig. 2. Cutaway view of valve train.

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engine delivers extra power at low engine speeds when demanded, but during normal driving it is as economical as the naturally aspirated engine. The turbocharged engine offers the same acceleration as many six-cylinder and eight-cylinder engines, but without the well-known disadvantages of excessive weight, unwieldy bulk with too many moving parts, and high fuel consumption.

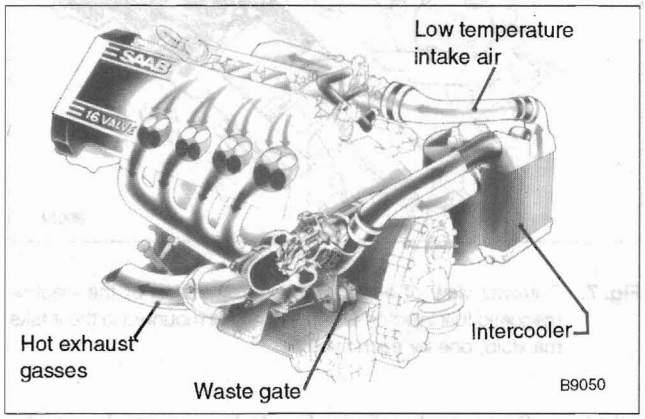

Fig. 3. Cutaway of turbocharger system. The intake air is compressed by the exhaust-driven turbocharger. It is then cooled by as much as 110°F in the intercooler before it enters the engine. The intercooler increases power and reduces the thermal stresses in the engine.

Safety margins must be built into the design of an internal combustion engine to allow for manufacturing tolerances, changes in the condition of the engine, and varying climatic conditions and fuel quality. As a result, the energy content of the fuel cannot be fully utilized. To answer this problem, the Saab APC system was designed to ensure maximum utilization of the energy in the fuel at all times. The boost pressure delivered by the turbocharger is continually adjusted to suit the knocking limit of the air/fuel mixture in the cylinders. Therefore, the engine adjusts itself automatically to the fuel being used. The higher the octane, the higher the maximum engine power. See Fig. 4.

NOTE

On Saab Turbo SPG models, premium unleaded fuel is required at all times.

The APC system consists of simple electronics. A knock sensor on the engine block senses the onset and degree of engine knock and transmits an electrical signal to the control unit. The control unit also receives signals from the intake manifold pressure sensor and the ignition system (engine rpm). The data is processed by the control unit, which transmits a signal to the APC solenoid valve to regulate the boost pressure (via the wastegate) of the turbocharger. Therefore, maximum operating boost pressure under full engine load is electronically governed. In the event of an APC system malfunction, the wastegate is mechanically adjusted to provide a safe, low boost pressure limit.

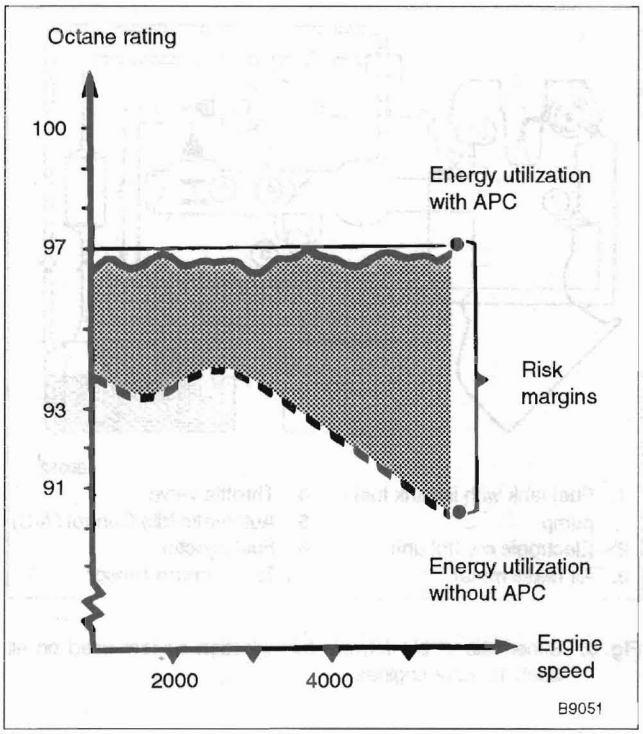

Fig. 4. A conventional engine must incorporate safety margins for engine tolerances, various climatic conditions, and variations in fuel grades available. The Saab APC turbo engine adjusts itself automatically to suit the operating conditions.

Fuel Injection

All Saab 900 16-valve models use an electronically controlled Bosch LH-Jetronic fuel injection system. See Fig. 5. LH is a German acronym for hot wire, or "Luft masse messen mit hitzdraht". Hot wire refers to the operation of the air mass meter, which is used to measure the air entering the engine.

The intake air flows across an electrically heated platinum wire in the tubular air meter. See Fig. 6. The control unit then measures the electrical energy necessary to maintain the wire at a constant temperature as a measure of the air mass. At the same time the control unit senses the engine speed and the engine temperature, which enables it to meter the correct quantity of fuel to suit the requirements of the engine at all times.

Fuel is delivered to the engine through the fuel injectors. The intake manifold is equipped with one fuel injector per cylinder. Each injector is fitted upstream of the corresponding intake valves and actuated electro-magnetically by signals from the electronic control unit. The control unit calculates the opening time for the injectors so that the quantity of the fuel injected will be correct in relation to the quantity of air flowing to the engine. See Fig. 7.

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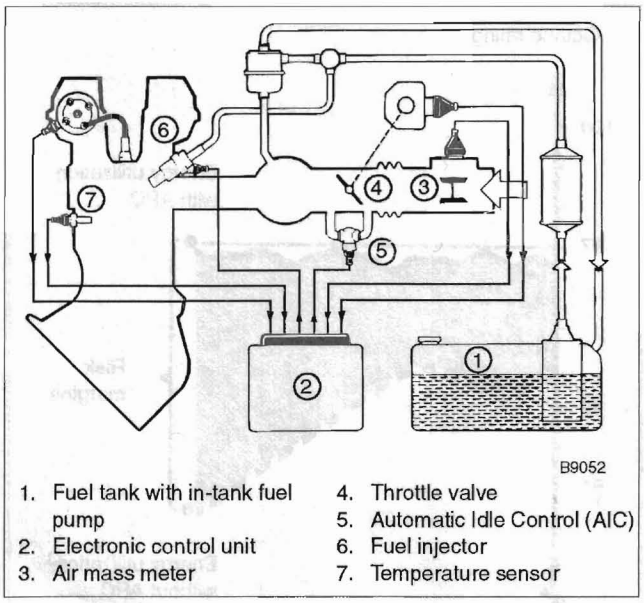

1. Fuel tank with in-tank fuel pump
2. Electronic control unit
3. Air mass meter
4. Throttle valve
5. Automatic Idle Control (AIC)
6. Fuel injector
7. Temperature sensor

Fig. 5. Schematic of LH-Jetronic fuel injection system used on all Saab 16 valve engines.

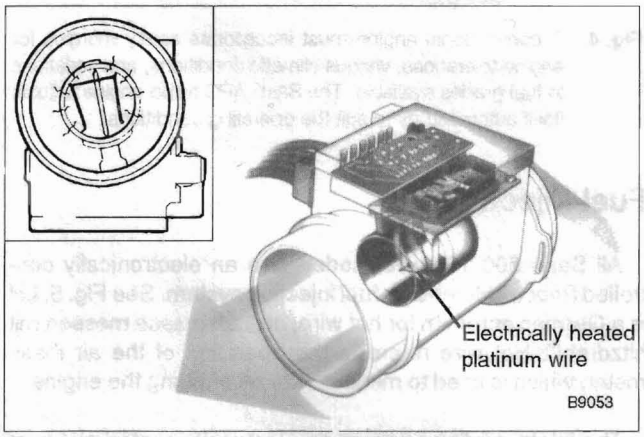

Fig. 6. View of LH (hot wire) air mass meter. The platinum heated wire is maintained at a constant temperature and measures the mass of the air flow going into the engine. It uses solid-state circuitry and has no moving parts to wear out. The inset shows a front view of air mass meter.

Ignition System

The electronic ignition system creates the high-voltage spark necessary to ignite the combustible air/fuel mixture in the cylinders. The ignition coil boosts the voltage so that the spark will be hot enough to ignite the air/fuel mixture. The timing of the spark is controlled by the ignition control unit.

The ignition distributor, synchronized to the rotation of the engine, delivers the spark to the right cylinder at precisely the right time. Since each cylinder has to have a spark once for every two revolutions of the crankshaft, the distributor turns at one-half crankshaft speed. The basic system is shown schematically in Fig. 8.

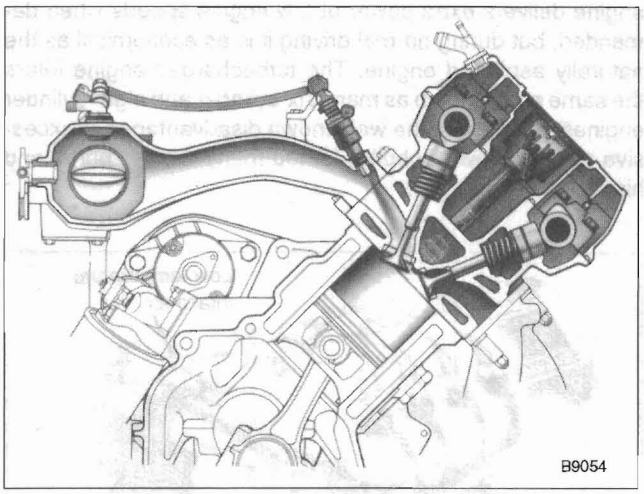

Fig. 7. Cutaway view of engine showing operation of the electromagnetic fuel injector. The injectors are mounted in the intake manifold, one for each cylinder.

Electrical System

Many components, and all electrical accessories, are powered by the car's electrical system. The electrical system uses a battery to store energy, an engine-driven alternator to generate electricity and recharge the battery, and various wiring harnesses and other circuits to distribute electric power to the rest of the car. The electrical system is represented in Fig. 9.

The flow of electricity depends upon a closed-loop path—a complete circuit. Electrical current flows through wires to the consumer, a light bulb for example, and back to the battery in a complete circuit. The electrical route back to the source, which completes the circuit, is called a path to ground. Every consumer of electrical power in the car must have a source of power and a path to ground in order to operate.

Commonly, the electrically conductive metal structure of the automobile is used as a ground path. The negative (–) terminal of the battery connects to the car body, and all of the electrical consumers in the car make a ground connection to the car body, thus eliminating the need for many feet of additional wire.

Electrical components near the engine are often grounded directly to the engine, which is then grounded to the body. Some components are grounded through their housings which are bolted to a ground. Electrically, the effect is the same.

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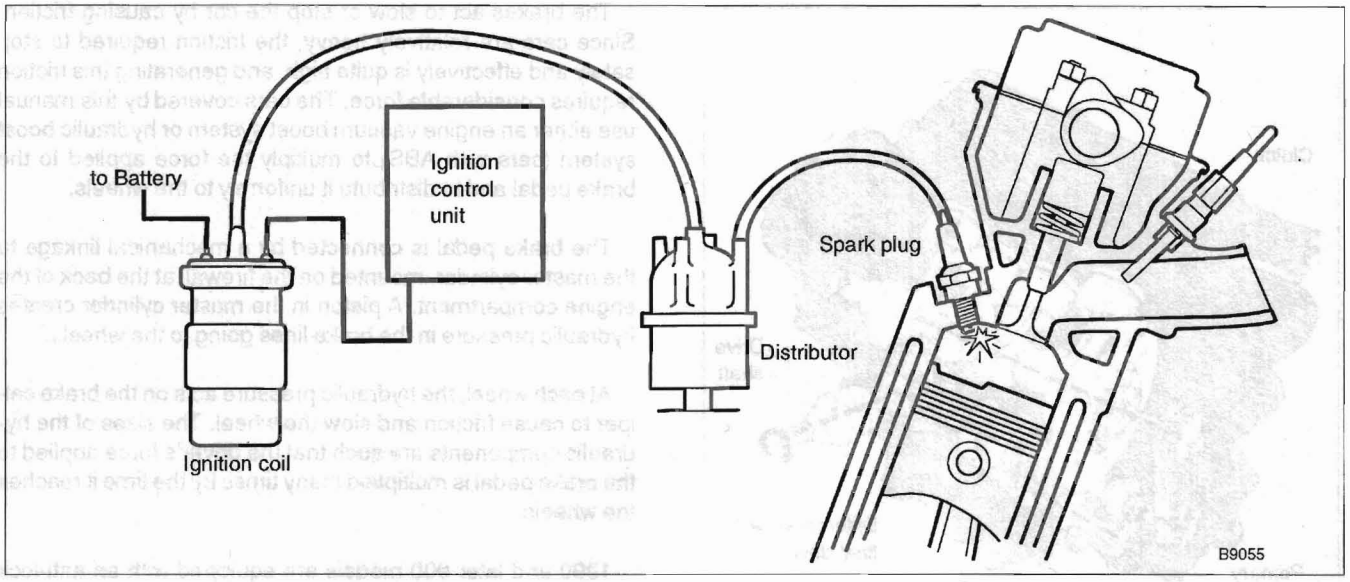

Fig. 8. Schematic of typical ignition system.

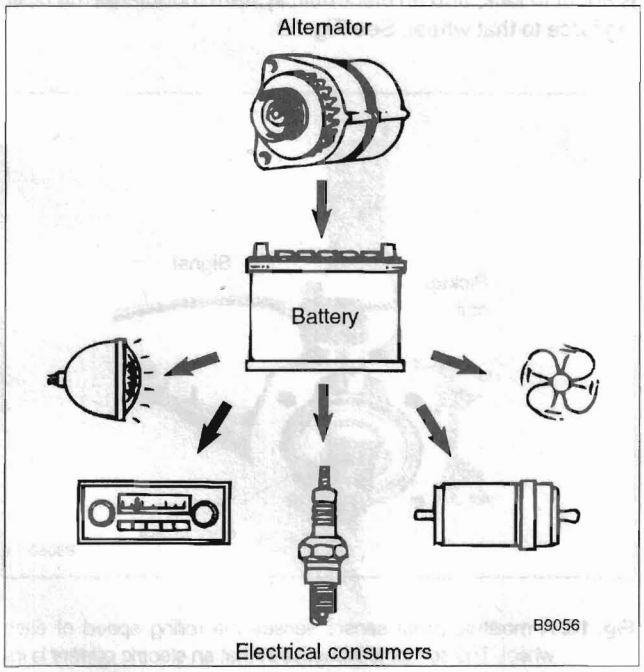

Fig. 9. The alternator generates electricity to recharge battery and power other electrical consumers.

Transmission and Drive Train

The transmission is mounted beneath the engine and is arranged in a housing together with the final drive. See Fig. 10. The transmission is chain driven off the engine via the clutch.

Although the Saab engine develops a substantial amount of power, it does so best at relatively high revolutions per minute (rpm). To handle all driving conditions, it is necessary to use

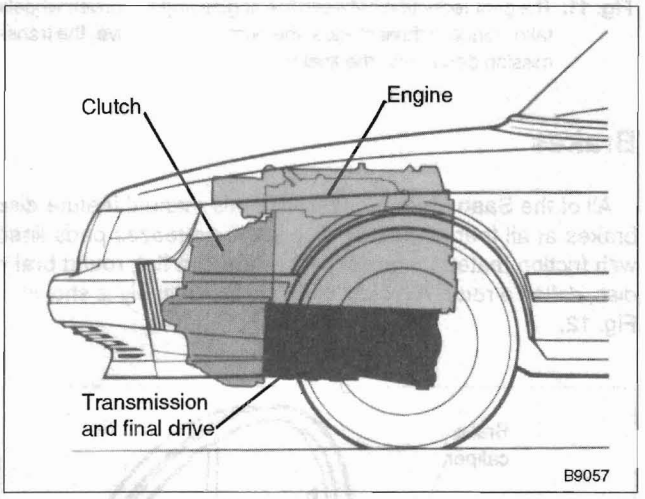

Fig. 10. The transmission and final drive are mounted beneath engine.

gearing to change the ratio of engine rpm to vehicle speed. See Fig. 11.

A manual transmission arranges several sets of gears in a common housing. A set of two gears determines a gear ratio, each suited to a particular range of driving speeds. A shifting mechanism allows the driver to change from one gear ratio to the next to match vehicle speed.

In an automatic transmission, hydraulic fluid under pressure in a complex network of passages, valves and control mechanisms engage and disengage constantly meshed planetary gear sets. Hydraulic controls responding to vehicle speed, engine load, throttle position and gear shift position select the appropriate gear ratio.

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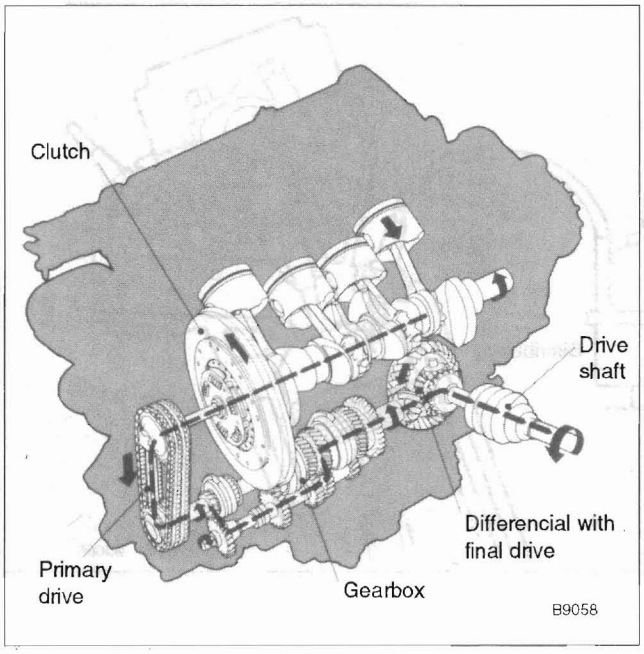

Fig. 11. The gear reduction between the engine and the driven wheels takes place in three stages: the primary chain drive, the transmission gears, and the final drive.

Brakes

All of the Saab models covered in this manual feature disc brakes at all four wheels. A disc brake squeezes pads lined with friction material against both sides of a flat, round brake disc, called a rotor. A typical disc brake assembly is shown in Fig. 12.

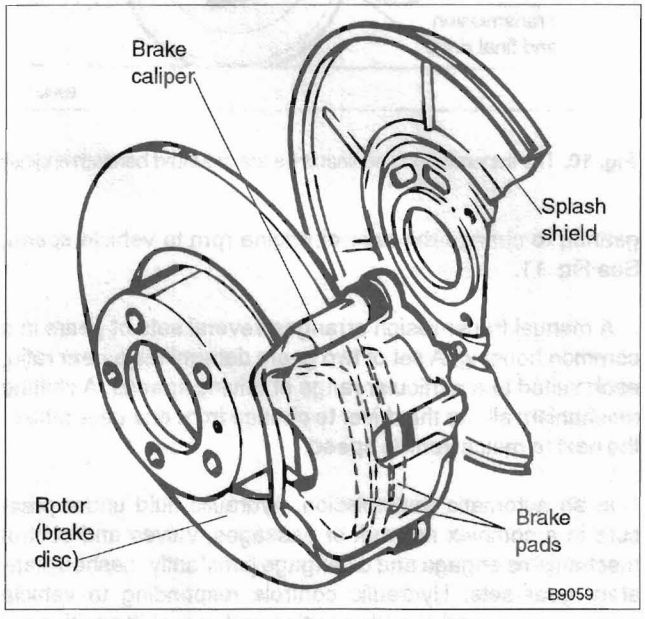

Fig. 12. Disc brake assembly showing disc, caliper, and splash shield. Caliper assembly holds pads with friction material.

The brakes act to slow or stop the car by causing friction. Since cars are relatively heavy, the friction required to stop safely and effectively is quite high, and generating this friction requires considerable force. The cars covered by this manual use either an engine vacuum boost system or hydraulic boost system (cars with ABS) to multiply the force applied to the brake pedal and to distribute it uniformly to the wheels.

The brake pedal is connected by a mechanical linkage to the master cylinder, mounted on the firewall at the back of the engine compartment. A piston in the master cylinder creates hydraulic pressure in the brake lines going to the wheels.

At each wheel, the hydraulic pressure acts on the brake caliper to cause friction and slow the wheel. The sizes of the hydraulic components are such that the driver's force applied to the brake pedal is multiplied many times by the time it reaches the wheels.

1990 and later 900 models are equipped with an anti-lock braking system (ABS). As the name implies, the purpose of this system is to prevent the wheels from locking during hard braking. Speed sensors at each wheel sense when the wheel is about to lock, and an electronic system modulates the braking force to that wheel. See Fig. 13.

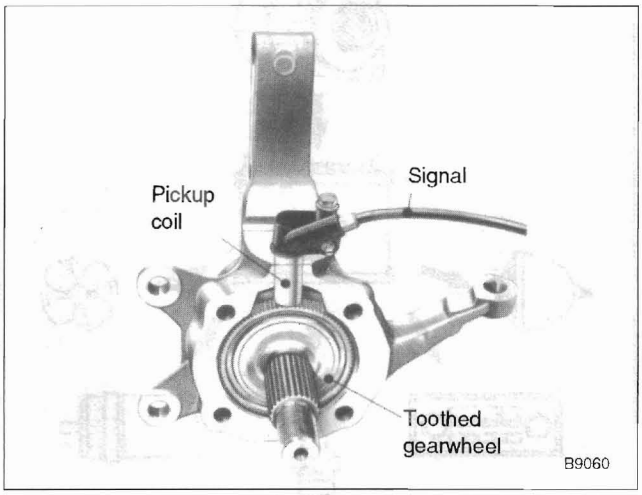

Fig. 13. A moisture-proof sensor senses the rolling speed of each wheel. The sensor is inductive in that an electric current is induced in the pickup coil every time a tooth on the gearwheel passes the sensor.

Steering and Suspension

The suspension and steering systems are what allow the wheels to move and turn for a smooth ride, stability and directional control. See Fig. 14. The suspension system is the combination of springs, shock absorbers, and other stabilizing devices that support the weight of the car and cushion the effects of bumps. On some models, stabilizer bars aid stability by transferring some of the cornering force acting on the suspension.

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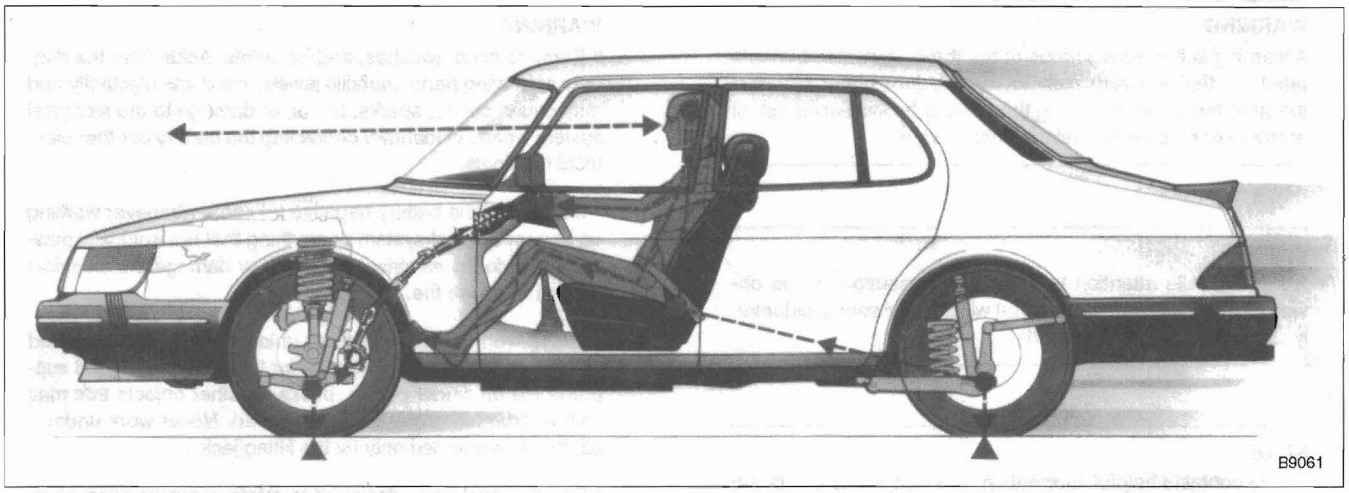

Fig. 14. The suspension and steering system gives the driver control over the car by supplying constant feedback on the car's reactions.

The steering system consists of the steering rack mechanisms, linkages, and a belt-driven hydraulic pump. Power-assisted steering uses hydraulic fluid under pressure to do some of the work normally done by the driver turning the steering wheel.

Body

The body is the basic building block. All of the Saab models covered in this manual feature unitized body construction, meaning that they do not have a separate frame. A complex body shell is the main structural platform to which all the other systems are attached. Subassemblies attach engine, drivetrain, suspension, and steering systems to the basic body structure.

The doors, the instrument panel, the seats, and other interior trim pieces are also added to the body shell. Other parts of the body shell function as mounting points for the other major and minor subsystems.

How To Use This Manual

The manual is divided into 9 sections:

0 TECHNICAL DATA
1 LUBRICATION AND MAINTENANCE
2 ENGINE
3 ELECTRICAL SYSTEM
4 TRANSMISSION
5 BRAKES
6 STEERING AND WHEEL ALIGNMENT
7 SUSPENSION
8 BODY AND STEERING

0 TECHNICAL DATA lists all of the specifications used throughout the manual and is intended to be used as a quick reference guide for the more experienced technician familiar with Saab 900 cars. **1 LUBRICATION AND MAINTENANCE** covers the maintenance schedules and service procedures needed to do all of the Saab recommended scheduled maintenance work.

The remaining seven sections (2 through 8) are repair oriented and are divided into multiple repair groups. For clarity and ease of use, each major section begins with a **General** repair group, e.g. **200 Engine—General.** These "00" (double zero) groups are mostly descriptive in nature, covering topics such as theory of operation and troubleshooting. The remainder of the repair groups contain the more involved and more detailed system repair information.

A master listing of the 9 sections and the corresponding 69 individual repair groups can be found at the beginning of each section. Thumb tabs on the first page of each repair group page help locate the groups quickly.

Each repair group has its own Table of Contents listing the major subject headings within the group, and the pages on which they begin. Page numbers throughout the manual are organized according to the repair group system. For example, you can expect to find information on the turbocharger (Repair Group 291) beginning on page 291-1. A comprehensive index is found at the back of the manual.

Warnings, Cautions and Notes

Throughout this manual are many passages with the headings **WARNING**, **CAUTION**, or **NOTE**. These very important headings have different meanings.

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WARNING
A warning is the most serious of the three. It warns of unsafe practices that are very likely to cause injury, either by direct threat to the person(s) doing the work or by increased risk of accident or mechanical failure while driving.

CAUTION
A caution calls attention to important precautions to be observed during the repair work that will help prevent accidentally damaging the car or its parts.

NOTE
A note contains helpful information, tips that will help in doing a better job and completing it more easily.

Please read every **WARNING**, **CAUTION**, and **NOTE** at the front of the manual and as they appear in repair procedures. They are very important. Read them before you begin any maintenance or repair job.

Some **WARNING**s and **CAUTION**s are repeated wherever they apply. Read them all. Do not skip any. These messages are important, even to the owner who never intends to work on the car.

GETTING STARTED

Most of the necessary maintenance and minor repair that a Saab will need can be done with ordinary tools, even by owners with little or no experience in car repair. Below is some important information on how to work safely, a discussion of what tools will be needed and how to use them, and a series of mechanic's tips on methods and workmanship.

Safety

Although an automobile presents many hazards, common sense and good equipment can ensure safety. Accidents happen because of carelessness. Pay attention and stick to these few important safety rules.

WARNING
- Never run the engine in the work area unless it is well-ventilated. The exhaust should be vented to the outside. Carbon Monoxide (CO) in the exhaust kills.
- Remove all neckties, scarfs, loose clothing, or jewelry when working near running engines or power tools. Tuck in shirts. Tie long hair and secure it under a cap. Severe injury can result from these things being caught in rotating parts.

WARNING
- Remove rings, watches, and bracelets. Aside from the dangers of moving parts, metallic jewelry conducts electricity and may cause shorts, sparks, burns, or damage to the electrical system when accidentally contacting the battery or other electrical terminals.
- Disconnect the battery negative (–) cable whenever working on or near the fuel system or anything that is electrically powered. Accidental electrical contact may damage the electrical system or cause fire.
- Never work under a lifted car unless it is solidly supported on jack stands that are intended for that purpose. Do not support a car on cinder blocks, bricks, or other objects that may shift or crumble under continuous load. Never work under a car that is supported only by the lifting jack.
- The fuel system is designed to retain pressure even when the ignition is off. When working with the fuel system, loosen the fuel lines very slowly to allow the residual pressure to dissipate gradually. Avoid spraying fuel.
- Fuel is highly flammable. When working around fuel, do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Illuminate the work area adequately and safely. Use a portable safety light for working inside or under the car. A fluorescent type light is best because it gives off less heat. If using a light with a normal incandescent bulb, use rough service bulbs to avoid breakage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Keep sparks, lighted matches, and open flame away from the top of the battery. Hydrogen gas emitted by the battery is highly flammable. Any nearby source of ignition may cause the battery to explode.
- Never lay tools or parts in the engine compartment or on top of the battery. They may fall into confined spaces and be difficult to retrieve, become caught in belts or other rotating parts when the engine is started, or cause electrical shorts and damage to the electrical system.
- Some of the cars covered by this manual are equipped with a Supplemental Restraint System (SRS) that automatically deploys an airbag. The airbag unit uses an explosive device to electrically ignite a powerful gas. On cars so equipped, any work involving the steering wheel should only be performed by an authorized Saab dealer. Performing repairs without disarming the SRS may cause serious personal injury.

Lifting the Car

For those repairs that require raising the car, the proper jacking points should be used to raise the car safely and avoid damage. There are six jacking points from which the car can be safely raised. The jack supplied with the car by Saab can only be used at the four side points—just behind the front wheel or just in front of the rear wheel. In addition to the four side points, there are front and rear center jacking points that can be used to lift one end. See Fig. 15.

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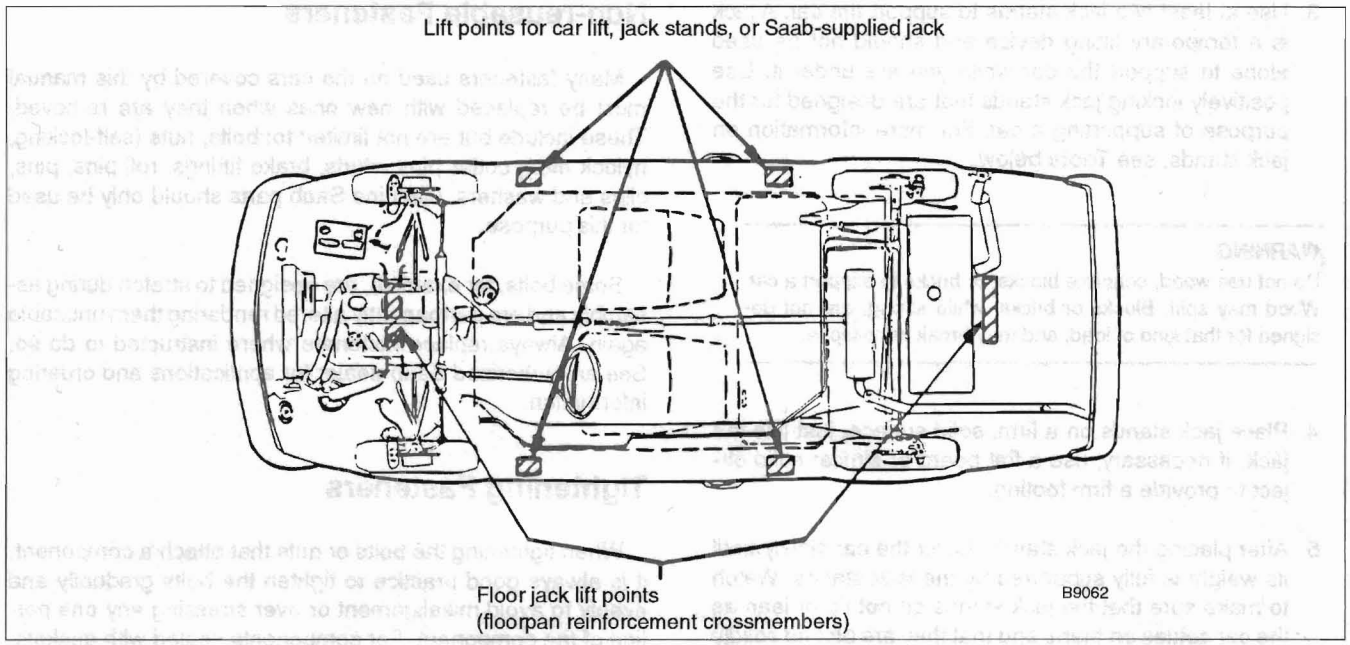

Fig. 15. Saab jacking points.

CAUTION
When raising the car using a floor jack or a hydraulic lift, carefully position the jack pad so that it does not damage the body. A suitable liner (wood, rubber. etc.) should be placed between the jack and the car so that the underbody will not be damaged.

To raise car safely

1. Park the car on a flat, level surface.
2. Place the jack in position. See Fig. 16. Make sure the jack is resting on flat, solid ground. Use a board or other support to provide a firm surface for the jack, if necessary.

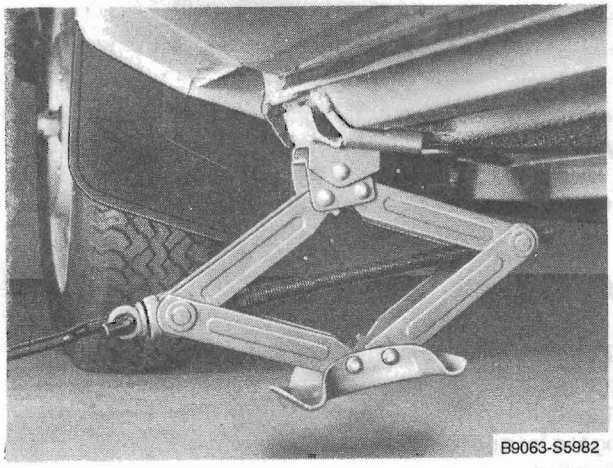

Fig. 16. Saab-supplied jack correctly installed at front left jacking point.

3. Raise the car slowly.

WARNING
Watch the jack closely. Make it stays stable and does not shift or tilt. As the car is raised, the car will want to roll slightly and the jack will want to shift.

4. Once the car is raised, block the wheel that is opposite and farthest from the jack to prevent the car from unexpectedly rolling.

WARNING
Do not rely on the transmission or the emergency brake to keep the car from rolling. While they will help, they are not a substitute for positively blocking the opposite wheel.

Never work under a car that is supported only by a jack. Use jack stands that are properly designed to support the car. See **Tools**.

To work safely under a car

1. Disconnect the battery negative (–) cable so that no one else can start the car. Let others know what you will be doing.
2. Raise the car slowly as described above.

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3. Use at least two jack stands to support the car. A jack is a temporary lifting device and should not be used alone to support the car while you are under it. Use positively locking jack stands that are designed for the purpose of supporting a car. For more information on jack stands, see **Tools** below.

WARNING
Do not use wood, concrete blocks, or bricks to support a car. Wood may split. Blocks or bricks, while strong, are not designed for that kind of load, and may break or collapse.

4. Place jack stands on a firm, solid surface, just like the jack. If necessary, use a flat board or similar solid object to provide a firm footing.

5. After placing the jack stands, lower the car slowly until its weight is fully supported by the jack stands. Watch to make sure that the jack stands do not tip or lean as the car settles on them, and that they are placed solidly and will not move.

6. Observe all jacking precautions again when raising the car to remove the jack stands.

GENERAL ADVICE FOR THE BEGINNER

The tips in the paragraphs that follow are general advice to help any do-it-yourself Saab owner perform repairs and maintenance tasks more easily and more professionally.

Planning Ahead

Most of the repairs and maintenance tasks described in this manual can be successfully completed by anyone with basic tools and abilities. Some cannot. To prevent getting in too deep, know what the whole job requires before starting. Read the procedure thoroughly, from beginning to end, in order to know just what to expect and what parts will have to be replaced.

Cleanliness

Keeping things organized, neat, and clean is essential to doing a good job, and a more satisfying way to work. When working under the hood, fender covers will protect the finish from scratches and other damage. Make sure the car is relatively clean so that dirt under the cover does not scratch.

Avoid getting tools or clothing near the battery. Battery electrolyte is a corrosive acid. Be careful with brake fluid, as it can cause permanent damage to the car's paint. Finally, keep rubber parts such as hoses and belts free from oil or gasoline, as they will cause the material to soften and fail prematurely.

Non-reusable Fasteners

Many fasteners used on the cars covered by this manual must be replaced with new ones when they are removed. These include but are not limited to: bolts, nuts (self-locking, nylock etc.), cotter pins, studs, brake fittings, roll pins, pins, clips and washers. Genuine Saab parts should only be used for this purpose.

Some bolts, for example, are designed to stretch during assembly and are permanently altered rendering them unusable again. Always replace fasteners where instructed to do so. See an authorized Saab dealer for applications and ordering information.

Tightening Fasteners

When tightening the bolts or nuts that attach a component, it is always good practice to tighten the bolts gradually and evenly to avoid misalignment or over stressing any one portion of the component. For components sealed with gaskets, this method helps to ensure that the gasket will seal properly and completely.

Where there are several fasteners, tighten them in a sequence alternating between opposite sides of the component. Fig. 17 shows such a sequence for tightening six bolts attaching a typical component. Repeat the sequence until all the bolts are evenly tightened to the proper specification.

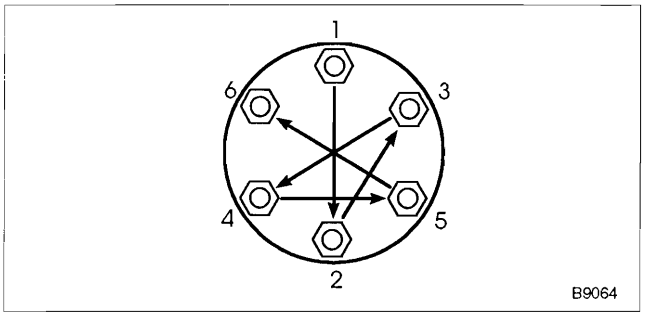

Fig. 17. Sequence for alternately tightening multiple fasteners.

For some repairs a specific tightening sequence is necessary, or a particular order of assembly is required. Such special conditions are noted in the text, and the necessary sequence is described or illustrated.

Bolt Torque

Tightening fasteners to a specified torque value using a torque wrench is a good way to ensure that bolts are correctly tightened. If a torque wrench is not used there is a danger of going too far and damaging the fastener or the threads in the mating part.

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Too little torque on a fastener can also cause problems. Vibration of assembled parts can subject fasteners to stress alternating in opposite directions that will eventually cause them to loosen. To counter this loosening, fasteners are tightened more and actually stretched a small amount.

When special tightening torques are required, they are listed in the text where the fastener is being installed. If there is no torque listed for a specific fastener, use **Table a** as a general guide. The sizes listed are for the bolt thread diameter, not the size of the wrench. **Table b** lists the most common wrench sizes for the bolts used on the cars covered by this manual.

Table a. General Tightening Torques (unless noted otherwise in text)

Bolt diameter	Nm	ft-lb
M5	5	3.5 (44 in-lb)
M6	10	7.5 (89 in-lb)
M8	20	15
M10	40	30

Table b. Bolt Diameter and Wrench Size

Bolt diameter	Most Common Wrench Size
M5	8 mm
M6	10 mm
M8	12mm or 13mm
M10	17mm
M12	19mm
M14	22mm

Gaskets

The smoothest metal mating surfaces still have imperfections that can allow leakage. To prevent leakage at critical joints, gaskets of soft, form-fitting material are used to fill in the imperfections.

To be most effective, gaskets are designed to crush and become thinner as the mating parts are bolted together. Once a gasket has been used and crushed, it is no longer capable of making as good a seal as when new, and is much more likely to leak. For this reason, gaskets should not be reused. Always plan to use new gaskets for any reassembly. Some gaskets — such as headgaskets are directional. Make sure that these are being installed correctly. This same logic applies to any part used for sealing, including rubber O-rings and copper sealing washers.

Seals

In places where a shaft must pass through a housing, flexible lip seals are used to keep the lubricating oil or grease from leaking out past the rotating shaft.

Seals are designed to be installed in the housing only once and should never be reused. As long as they are not removed from the housing and not leaking, they need not be replaced. Seals, however, do age and deteriorate, and there is no easier time to replace them than when the car is already apart for some other repair.

When doing repairs that require removing a seal, be very careful not to scratch or otherwise damage the metal surfaces. Even minor damage to sealing surfaces can cause seal damage and leakage.

The key to seal installation is to get the seal in straight without damaging it. Use an object that is the same diameter as the seal housing to gently and evenly drive it into place. If a proper size seal driver is not available, a socket of the right size will do.

Coat the entire seal with oil to help it go in more easily. Seals are directional. Make sure that it is being installed with the lip facing the correct way. Normally the lip faces the inside. Notice the installation direction of the old seal before removing it.

Cleaning

Any repair job will be less troublesome if the parts are clean. For cleaning old parts, there are any number of solvents and parts cleaners available commercially.

For cleaning parts prior to assembly, commercially available aerosol cans of carburetor cleaner or brake cleaner are handy to use, and the cleaner will evaporate completely, leaving no residue.

WARNING
Virtually all solvents used for cleaning parts are highly flammable, especially in aerosol form. Use with extreme care. Do not smoke. Do not use these products near any source of sparks or flame.

Let any solvent or cleaning product dry completely. Low-pressure, dry compressed air is helpful if available. Also, use only lint-free rags for cleaning and drying.

Electrical Testing

A great many electrical problems can be understood and solved with only a little fundamental knowledge of how electrical circuits function.

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Electric current only flows in a complete circuit. To operate, every electrical device in the car requires a complete circuit including a voltage source and a path to ground. The positive (+) side of the battery is the original voltage source, and ground is any return path to the negative (–) side of the battery, whether through the wiring harness or the car body. Except for portions of the charging system, all electrical current in the car is direct current (DC) and flows from positive (+) to negative (–).

Switches are used to turn components on or off by completing or interrupting the circuit. A switch is "open" when the circuit is interrupted, and "closed" when the circuit is completed. Fig. 18 shows a complete circuit schematically. See **3 ELECTRICAL SYSTEM** for electrical troubleshooting.

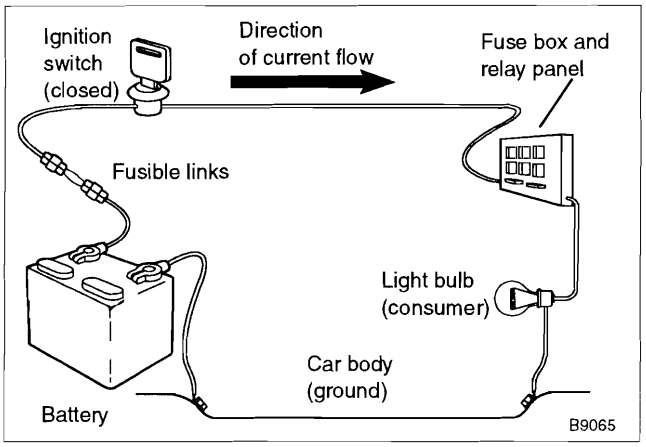

Fig. 18. Schematic representation of simple circuit for light bulb. Switch is shown closed, making circuit complete.

Wire Repairs

Repairs to a wiring harness to reconnect broken wires or correct shorts to ground deserve special care to make the repair permanent. The wire ends must be clean. If frayed or otherwise damaged, cut off the end. If the wire is too short, splice in a new piece of wire of the same size and make two connections.

Use connectors that are designed for the purpose. Crimped-on or soldered-on connectors are best. Crimp connectors and special crimping pliers are widely available. If soldering, use a needlenose pliers to hold the wire near the solder joint and create a "heat dam". This keeps the heat and the solder from traveling up the wire. Always use a solder made specifically for electrical work.

NOTE
Twisting wires together is really only a temporary repair, since corrosion and vibration will eventually spoil the connection.

Insulate the finished connection. Electronics stores can supply heat-shrinkable insulating tubing that can be placed onto the wire before connecting, slid over the finished joint, and shrunk to a tight fit with a heat gun or hair dryer. The next best alternative is electrical tape. Make sure the wire is clean and free of solder flux or other contamination. Wrap the joint tightly and completely to seal out moisture.

BUYING PARTS

Many of the maintenance and repair tasks in this manual call for the installation of new parts, or the use of new gaskets and other materials when reinstalling parts. Most often, the parts that will be needed should be on hand before beginning the job. Read the introductory text and the complete procedure to determine which parts will be needed.

NOTE
For some bigger jobs, partial disassembly and inspection are required to determine a complete parts list. Read the procedure carefully and, if necessary, make other arrangements to get the necessary parts while your car is disassembled.

Information You Need To Know

Fig. 19 shows the locations of the important information that may be necessary to have on hand when buying parts or having work done on the car.

Genuine Saab Parts

Genuine Saab replacement parts from an authorized Saab dealer are designed and manufactured to the same high standards as the original parts. They will be the correct material, manufactured to the same specifications, and guaranteed to fit and work as intended by the engineers who designed the car. Some genuine Saab parts have a limited warranty.

Many independent repair shops make a point of using genuine Saab parts, even though they may at times be more expensive. They know the value of doing the job right with the right parts. Parts from other sources can be as good, particularly if manufactured by one of Saabs original equipment suppliers, but it is often difficult to know.

Saab is constantly updating and improving their cars, often making improvements during a given model year. Saab may recommend a newer, improved part as a replacement, and your authorized dealer's parts department will know about it and provide it. The Saab parts organization is best equipped to deal with any Saab parts needs.

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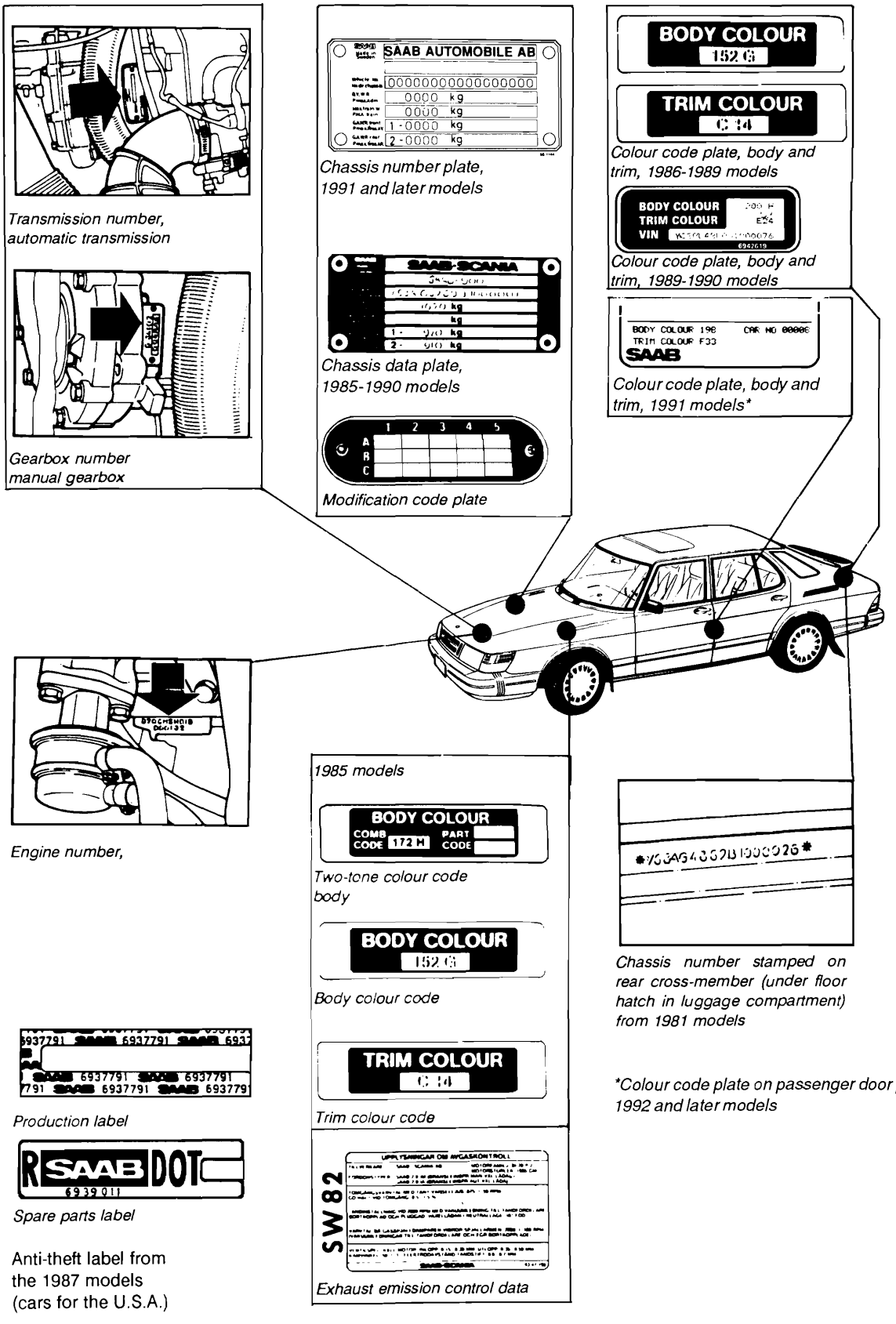

Fig. 19. Locations of important information that may be required when buying parts.

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Non-returnable Parts

Some parts cannot be returned for credit, even if they are the wrong parts for the car. The best example is electrical parts, which are almost universally considered non-returnable because they are so easily damaged internally.

Buy electrical parts carefully, and be as sure as possible that a replacement is needed, especially for expensive parts such as control units. It may be wise to let an authorized Saab dealer or other qualified shop confirm your diagnosis before replacing an expensive part that cannot be returned.

TOOLS

Most maintenance can be accomplished with a small selection of the right tools. Tools range in quality from inexpensive junk, which may break at first use, to very expensive and well-made tools which, to the professional, are worth every bit of their high cost. The best tools for most do-it-yourself Saab owners lie somewhere in between.

Cheap tools are not a bargain. They often do not hold up to even casual use, and they present a greater risk of personal injury. If they fit poorly, they can actually damage the fasteners they are intended to remove, making it that much harder to use a good tool the next time around.

Many reputable tool manufacturers offer good quality, moderately priced tools with a lifetime guarantee. A broken tool can be exchanged for a new one, for the life of the tool. These are your best buy. They cost a little more, but they are good quality tools that will do what is expected of them. Sears' Craftsman® line is one such source of good quality, reasonably priced, and guaranteed tools. Other sources of special tools are:

Schley Products Inc.
5350 E. Hunter Ave., Anaheim Hills, CA 92807
(714) 693-7666

Baum Tools Unltd. Inc.
P.O. Box 87, Longboat Key, FL 34228
(800) 848-6657

Assenmacher Specialty Tools
6440 Odell Place, Boulder, CO 80301
(303) 530-2424

Basic Tool Requirements

NOTE
Saabs are delivered with a tool kit mounted to the underside of the trunk lid. The kit contains a basic selection of tools that may fulfill some of the requirements listed in this section.

The basic hand tools described below can be used to accomplish most of the simple maintenance and repair tasks.

Screwdrivers. Three types, the common flat-blade type, the Phillips type will handle almost all screws used on Saabs. Two or three different sizes of each type will be best, since a screwdriver of the wrong size will damage the screw head. On late models Saabs, Torx® screw are quite common. A T25 size Torx driver will handle most of these screws.

A complete set of screwdrivers can often be purchased for about the same money as the four or six individual ones that are really necessary. See Fig. 20.

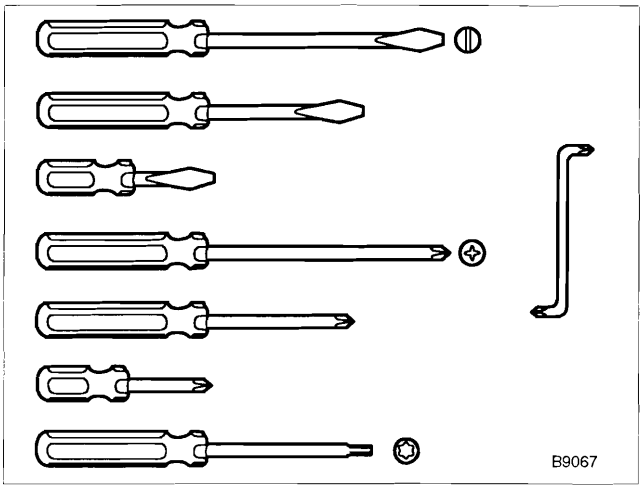

Fig. 20. Common flat-blade (top), Phillips (middle) and Torx® (bottom) screwdrivers. Offset screwdriver (right) is used for screws with limited access.

For a more complete tool box, include "stubby" screwdrivers or offset screwdrivers for use in tight spots where a normal length screwdriver will not easily fit and Torx®head screwdrivers.

Wrenches. Wrenches come in different styles for different uses. Fig. 21 shows several. The basic open-end wrench is the most widely used, but grips on only two sides. It can spread apart and slip off more easily. The box-end wrench has better grip, on all six sides of a nut or bolt, and is much less prone to slip.

A 12-point box-end can loosen a nut or bolt where there is less room for movement, while a 6-point box-end provides better grip. For hex fasteners on fluid lines, like brake lines and fuel lines, a flare-nut wrench offers the advantages of a box-end wrench with a slot that allows it to fit over the line.

The combination wrench, shown in Fig. 22, is the most universal. It has one open-end and one 12-point box-end. For Saabs, 10mm and 13mm wrenches are the most common sizes needed. On most models, a 19mm wrench is needed to loosen and tighten the engine oil drain plug. A complete set should also include 6mm, 7mm, 8mm, 9mm, 11mm, 12mm, 14mm, and 15mm.

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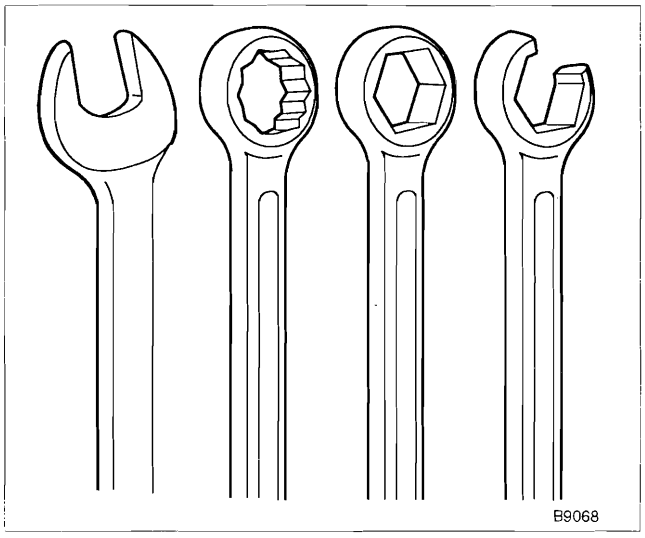

Fig. 21. Types of wrench heads. From left, open-end, 12-point box-end, 6-point box-end, flare nut.

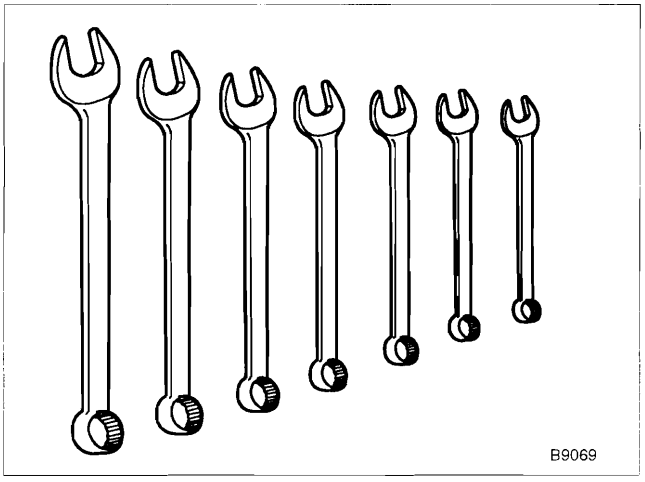

Fig. 22. Combination wrenches with one open-end and one 12-point box-end.

Sockets. Sockets perform the same job as box-end wrenches, but offer greater flexibility. They are normally used with a ratchet handle for speed and convenience, and can be combined with extensions to reach fasteners more easily.

Standard sockets come in 6-point and 12-point styles. For use with a ratchet the 6-point offers a better grip on tight nuts and bolts. As with wrenches, 6mm to 15mm, 17mm, and 19mm are the most needed sizes. See Fig. 23.

Sockets come with different size connections to drive handles or extensions, called the drive size. The most common drive sizes are 1/4 in., 3/8 in., and 1/2 in.

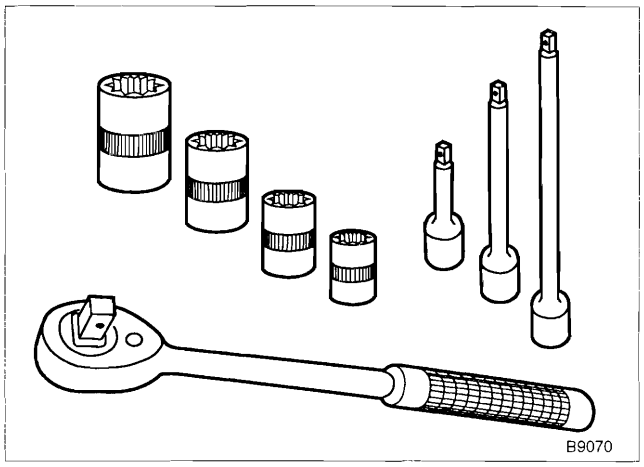

Fig. 23. Sockets, extensions, and a ratchet handle.

As a start, 6-point sockets with a 3/8 in. square drive, two or three 3/8 in. extensions of different lengths, and a 3/8 in. drive ratchet handle will be suitable for most jobs.

For a more complete tool box, add deep sockets and a greater variety of handles and extensions. A universal joint extension can allow access from an angle where a straight extension will not quite fit.

Spark Plug Socket. A special socket for spark plugs is the correct size, is deep enough to accommodate a spark plug's length, and includes a rubber insert to both protect the spark plug from damage and grip it for easier removal. The spark plugs used in Saab engines require a 5/8 in. socket. See Fig. 24.

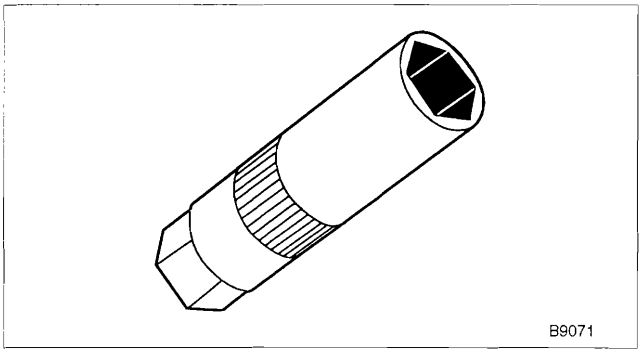

Fig. 24. Spark plug socket (5/8 in.).

Pliers. A few of the many types of pliers are shown in Fig. 25. Most are used for holding irregular objects, bending, or crimping. Some have special applications.

A needlenose plier is used for gripping small and poorly accessible objects, and is useful for wiring and other electrical work. A locking plier such as the well-known Vise-Grip® is useful because of its tight grip.

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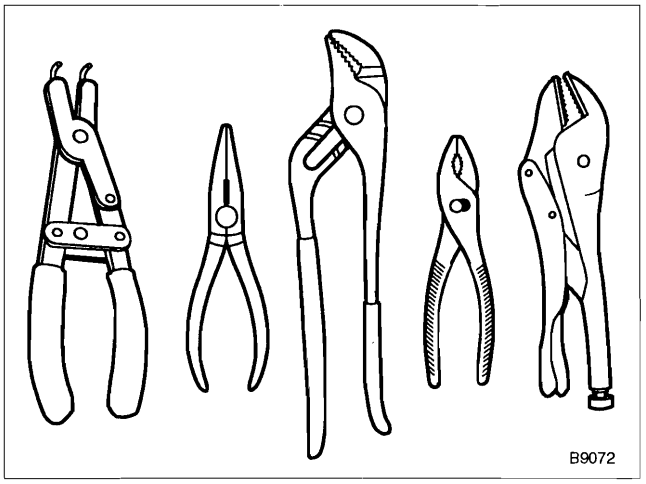

Fig. 25. Pliers. From left, snap-ring, needlenose, Channel-lock®, common, locking.

Snap-ring and circlip pliers with special tipped jaws are used to remove and install snap-rings or circlips. A Channel-lock® or water pump plier has adjustable jaws that can be quickly changed to match the size of the object being held to give greater leverage.

Adjustable wrench can be a useful addition to a small tool kit. See Fig. 26. It can substitute in a pinch, if two wrenches of the same size are needed to remove a nut and bolt. Use extra care with adjustable wrenches, as they especially tend to loosen, slip, and damage fasteners.

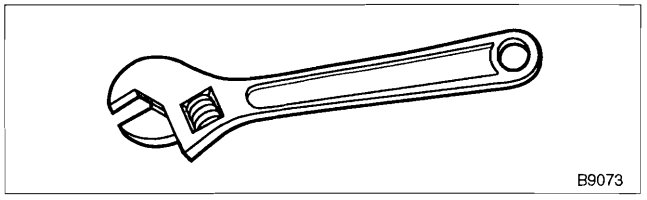

Fig. 26. Adjustable wrench.

Compared to a wrench of the correct size, an adjustable wrench is always second best. They should only be used when the correct size wrench is not available. Choose one of average size range, about 6 to 8 inches in length.

Jack Stands

Strong jack stands are extremely important for any work that is done under the car. Jacks are designed only for short term use and are not solid enough to support the car for a long period. A jack should never be used alone to support the car while working underneath.

Use only jack stands that are designed for the purpose. Blocks of wood, concrete, bricks, etc. are not safe or suitable substitutes.

Jack stands are available in several styles. A typical jack stand is shown in Fig. 27. The best ones are made of heavy material for strength, have a wide base for stability, and are equipped to positively lock in their raised positions. Get the best ones available.

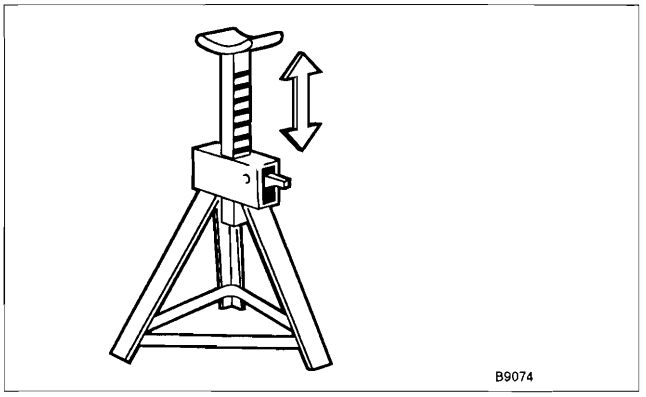

Fig. 27. Jack stand for safely supporting car to work underneath.

Oil Change Equipment

Changing engine oil requires a box-end wrench or socket to loosen and tighten the drain plug 19mm (13mm on 1991 and later cars), a drain pan (at least 7 qt. capacity), and an oil filter wrench. These items are shown in Fig. 28. A wide, low drain pan will fit more easily under the car. Use a funnel to pour the new oil into the engine.

An oil filter wrench is needed for some models to remove the oil filter. Be sure to get a filter wrench that will grip the Saab oil filter tightly.

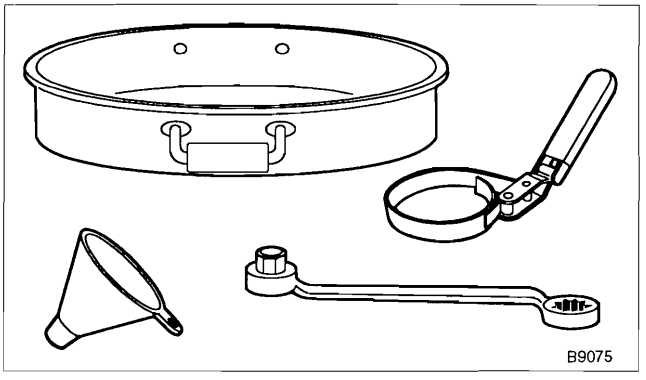

Fig. 28. Oil change equipment includes drain plug wrench (19mm or 13mm), 7 qt. drain pan, oil filter wrench, and funnel.

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Torque Wrench

A torque wrench is used to precisely tighten threaded fasteners to a predetermined value. Nearly all of the repair procedures in this manual include Saab-specified torque values in Newton-meters (Nm) and the equivalent values in foot-pounds (ft-lb).

Several types of torque wrenches are widely available. They all do the same job, but offer different convenience features at different prices. Two typical torque wrenches are shown in Fig. 29. The most convenient ones have a built-in ratchet, and can be preset to indicate when a specific torque value has been reached. Follow the wrench manufacturer's directions for use to achieve the greatest accuracy.

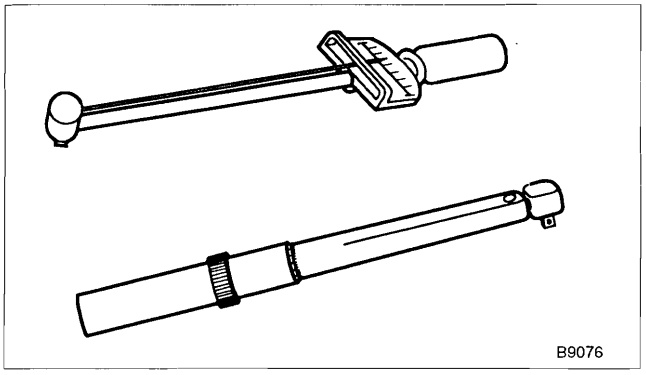

Fig. 29. Torque wrenches. Inexpensive beam-type (top) is adequate but must be read visually. Ratchet-type (bottom) can be preset to indicate when torque value has been reached.

A torque wrench with a range up to about 250 Nm (185 ft-lb) has adequate capacity for most of the repairs covered in this manual. For recommended torque values of 10 Nm or below, the English system equivalent is given in inch-pounds (in-lb). These small values may be most easily reached using a torque wrench calibrated in inch-pounds. To convert foot-pounds to inch-pounds, multiply by 12. To convert inch-pounds to foot-pounds, divide by 12.

Feeler Gauges

Feeler gauges are thin metal strips of precise thickness, used to measure small clearances. They are normally available as a set, covering a range of sizes. For Saabs, metric feeler gauges (in millimeters) are the best choice. Fig. 30 shows a set of feeler gauges.

Volt-Ohm Meter (VOM) or Multimeter

Many of the electrical tests in this manual call for the measurement of resistance (ohms) or voltage values. For safe and accurate tests of ignition, fuel injection, and emission control systems, the multimeter, shown in Fig. 31, should be digital, with high (at least 10,000 ohms) input impedance. Some

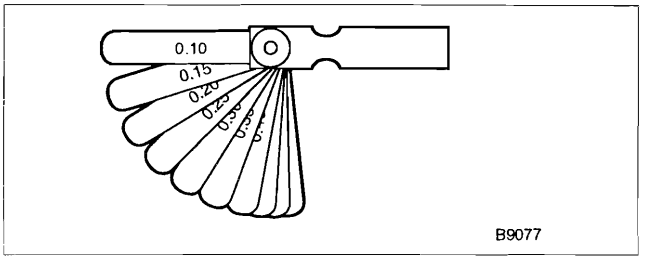

Fig. 30. Feeler gauge set, used for precise measurement of clearances between parts.

meters have automotive functions such as dwell and pulse width that are useful for troubleshooting ignition and fuel injection problems.

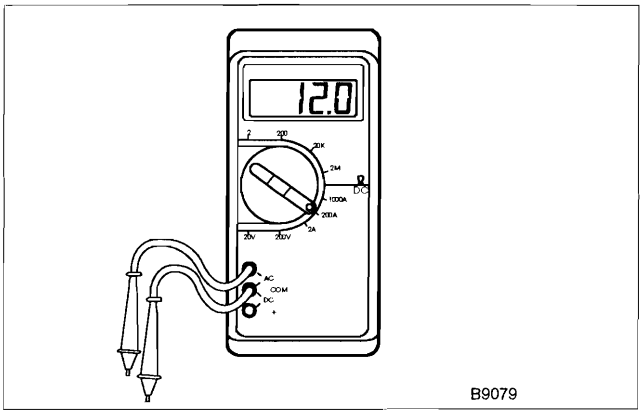

Fig. 31. Multimeter with test probes.

CAUTION
Ignition, fuel injection, emission controls and other electronic systems may be damaged by the high current draw of a test light with a normal incandescent bulb. As a general rule, use a high impedance digital multimeter or an LED test light for all electrical testing.

Saab Special Tools

Some of the more challenging repairs covered in this manual call for the use of Saab special tools. This, however, does not automatically mean that the job is too complicated or out of reach of the novice.

Many of the Saab special tools mentioned in this manual are inexpensive and are simply the best thing to use to do the job correctly. In these cases, the tool is identified with a Saab part number. See your authorized Saab dealer parts department for information on how to order special tools.

There are some jobs for which expensive special tools are essential, and not a cost-effective purchase for one-time re-

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pair by the do-it-yourself owner. This manual includes such repairs for the benefit of those with the necessary experience and access to tools. For the do-it-yourselfer, the need for special tools is noted in the text, and whether or not Saab dealer service is recommended.

EMERGENCIES

Changing a Tire

If a tire goes flat while driving, pull well off the road. Changing a tire on a busy street or highway is very dangerous. If necessary, drive a short distance on the flat tire to get to a safe place. It is much better to ruin a tire or rim than to risk being hit.

Stop the car on as flat a surface as possible, in a place where you can be easily seen by other drivers. Avoid stopping just over the crest of a hill. Turn on the emergency flashers, and set out flares or emergency markers well behind the car. Passengers should get out of the car and stand well away from the road. Take the jack, tools, and spare wheel from the trunk. Chock the wheel diagonally opposite to the one being changed.

Loosen the wheel bolts while the car is on the ground, but leave them a little snug. Place the jack under in the lifting point nearest the wheel being changed (lifting points are shown above in Fig. 15). Use a board to provide a firm footing for the jack if the ground is soft. Raise the car only far enough so that the wheel is off the ground, and then remove the wheel bolts and the wheel. Remove the lug bolts or nuts and remove the tire.

Install the spare wheel. Install the wheel bolts or nuts and tighten them by hand, then lower the car. With all wheels on the ground, fully tighten the bolts in a cross-wise pattern. Torque the wheel bolts when installing the wheel.

Tightening torques

- wheel lug bolts . . . . . 105 to 125 Nm (77 to 92 ft-lb)
- wheel lug nuts . . . . . 90 to 110 Nm (66 to 81 ft-lb)

If torquing the wheel fasteners is not possible, tighten them as much as possible, then loosen and retorque the bolts to the proper specification at the earliest opportunity. Check the inflation pressure of the spare tire.

Car Will Not Start

If the engine turns over slowly or not at all, especially on cold mornings, the battery may not be sufficiently charged. Jump-starting the battery from another car may help. Jump-starting is described below.

NOTE

Be sure to read the cautions under **Jump Starting** prior to jump starting a low battery. Failure to follow the cautions may result in damage to the electronic components in the car.

Push starting (or tow starting) a car with an insufficiently charged battery is another option. To push start the car, turn on the ignition, put the car in second or third gear and push in the clutch pedal. Push or tow the car. When the car is moving at a fair speed (10 to 15 mph), release the clutch pedal. After the engine has started, push the clutch pedal back in and allow the engine to idle. Rev the engine for a few minutes to help restore the charge to the battery.

WARNING

Use extreme caution when push starting a car. Be aware of other traffic. Use the emergency flashers.

NOTE

On cars with automatic transmissions, the design of the transmission makes it impossible to start the engine by pushing the car.

If the engine is turning over at normal speed with the starter motor, the battery and starter are fine. Check to make sure that there is fuel in the tank. Don't rely on the fuel gauge, it may be faulty. Instead, remove the gas filler cap and rock the car. If there is gas in the tank, you should hear a sloshing sound at the filler neck. If so, turn the ignition on and listen for the sound of the fuel pump. It should run for a few seconds, then stop. If it doesn't, fuel may not be reaching the engine.

The engine also may have difficulty starting because it has too much fuel, because the fuel system is vapor-locked on a hot day, or because the ignition system is wet on a very damp day. There will probably be a strong smell of gas if the engine has too much fuel (referred to as "flooded").

Try holding the accelerator pedal fully to the floor while starting. This electrically turns off the fuel injectors. If the engine stills does not start, wait for a few minutes and then try starting the engine again. If you suspect vapor-lock, raise the hood, let the engine cool, and then try to start the engine.

On damp days, check the distributor cap and spark plug wires for condensation. If they are wet, remove and replace the wires one at a time and dry them off with a clean dry cloth, then remove the distributor cap and wipe it dry inside and out.

Jump-Starting

Cars with partially discharged or completely dead batteries can be jump-started using the good battery from another car.

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When jump-starting the engine, always heed the following warnings and cautions.

WARNING

- Battery acid (electrolyte) can cause severe burns, and will damage the car and clothing. If electrolyte is spilled, wash the surface with large quantities of water. If it gets into eyes, flush them with water for several minutes and call a doctor.
- Batteries produce explosive and noxious gasses. Keep sparks and flames away. Do not smoke near batteries.
- Do not jump-start the engine if you suspect that the battery is frozen. Trapped gas may explode. Allow the battery to thaw first.
- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 15 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.

To jump-start the engine, place the cars close together, but do not allow them to touch. Turn off the engine of the car with the good battery. Connect the jumper cables as shown in Fig. 32.

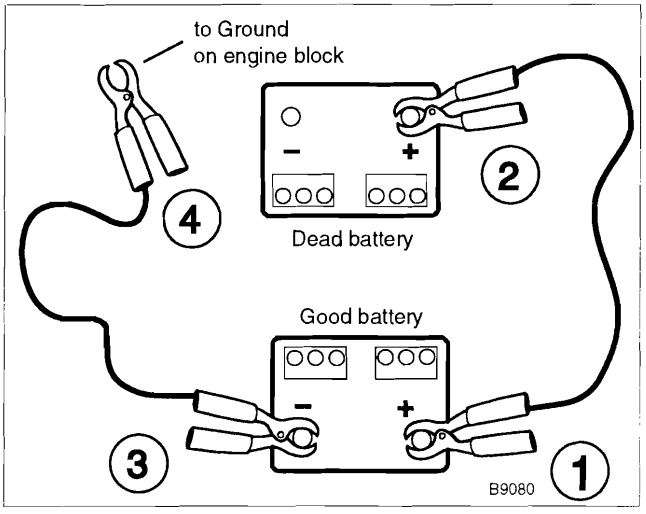

Fig. 32. Battery jumper cables connections. Numbers indicate correct sequence for cable attachment.

The battery is mounted in the front right corner of the engine compartment. Connect the end of one cable to the positive post of the good battery, and the other end of the same cable to the positive post of the dead battery. The positive post is marked with a plus (+) sign.

Connect one end of the other cable to the negative (–) post of the good battery, and connect the other end of the same cable to the engine block of the car with the dead battery. Make the connection as far away from the battery as possible, as there may be sparks.

Have a helper start the car with the good battery and race the engine slightly, then start the car with the dead battery. Leave the cars running and disconnect the cables in the reverse order in which they were installed. The car with the dead battery will need to run for about a 1/2 hour to recharge the battery.

Overheating

If the coolant temperature is too high, find a safe place to stop and turn the engine off. Open the hood and allow the engine to cool until the temperature gauge needle is at the lower third of the scale. Continuing to drive an overheated car can cause expensive engine damage.

WARNING

Do not remove the coolant reservoir or radiator cap with the engine hot. Undoing either could spray hot coolant, and cause burns, or damage the engine.

NOTE

If the engine cannot be safely turned off, make sure the air conditioner is off and turn the heater to high. This will help cool the engine until a safe stopping place can be reached.

Overheating may be caused by low coolant level or a damaged V-belt. Visually check the coolant level and V-belts as described in **110 Maintenance Program**. If coolant is lost, check the filler cap, hoses, clamps and radiator for signs of leakage. Check for leaks at the water pump on the rear of the engine.

If no leaks are found, add coolant after the engine has cooled. The car can be driven, but have the cooling system thoroughly checked as soon as possible. If replacement coolant is not available, then plain water can be used, but the coolant should later be drained and refilled with the proper mixture of anti-freeze and water.

CAUTION

Do not add cold water or coolant to a hot engine. Severe engine damage could result from the sudden temperature change.

If steam is coming from the engine compartment then there is most likely a burst coolant hose or a large leak in the cooling system. To find the leak, look for signs of coolant leakage on hoses, at hose connections, or on the radiator. Let the engine cool thoroughly, then add coolant or water to fill the system and start the engine. If a great deal of water or coolant flows out of the hole, then the car should not be driven until repairs are made. If there is a slight seepage, then it may be possible to drive a short distance, adding coolant as needed.

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Oil Pressure Warning Light

If the oil pressure warning light does not go out immediately after the engine starts, or if it comes on while driving the car, stop the engine immediately to prevent severe engine damage.

Check the oil level as described in **110 Maintenance Program**. If the level is low, add oil to the correct level and start the engine. If the light is still on, do not run the car at all. Have it towed.

Brake Fluid Level Warning Light

The red brake fluid level warning light is an indicator of brake fluid loss. Problems with the brake system should be checked and repaired immediately. See **5 BRAKES** for more information.

Anti-Lock Brake System Warning Indicator

If the anti-lock brake system warning indicator comes on at normal driving speeds, the anti-lock braking system is out of service. Under normal conditions, there will be no change in the effectiveness of the brakes. In an emergency situation, however, the normal anti-lock function is lost and the brakes could lock. Check the system as described in **5 BRAKES**.

Dim Lights

Headlights that are dim or gradually getting dimmer generally indicate a problem with the battery or charging system. The battery charge indicator light may come on as the lights are dimming. In either case, the engine and accessories are running off of the battery alone, and will soon discharge it altogether.

If possible, do not stop the engine unless you have the capability to jump start it. There may not be enough power in the starting system to restart the engine. Instead, turn off as many electrical consumers as possible. This will reduce the current drain and will allow the car to be driven farther before you lose all battery power.

With the engine and ignition off, check to see if the battery cables are firmly attached, or if there are any loose wires leading to the battery or to the alternator. Look for heavily corroded (covered by fluffy white deposits) wires and connectors.

Disconnecting, cleaning, and reinstalling corroded wires and connectors may solve the problem. Also check V-belt tension as described in **110 Maintenance Program.**

Towing

The cars covered by this manual should be towed with a tow truck using wheel lift or flat bed equipment. Do not tow the car on all four wheels except for very short distances to move it to a safe place. If flat-towing the car, use the towing eyes at the front of the car under the bumper. Set the transmission in neutral.

When towing the car from the rear with the front wheels on the ground, a maximum distance of 30 miles is acceptable. If the car needs to be towed further, have the front wheels placed on dollies.

NOTE
Do not tow with sling-type equipment. The front spoilers and the bumpers may sustain damage.

Towing a Saab with an automatic transmission with the front wheels on the ground can result in transmission damage due to lack of lubrication. Always tow the car with the transmission lever in "N" (neutral) and the key in position "1". Saab recommends that cars with automatic transmission be towed with the rear wheels on the ground for no more than 30 miles (50 km), at no more than 25 mph (40 km/h). Be sure the transmission fluid has been topped off before starting the tow.

Spare Parts Kit

Carrying a basic set of spare parts can prevent a minor breakdown from turning into a major annoyance. Many of the following items won't allow you to do major repair work on the car, but they will help in the event of the failure of something that can disable the car or compromise its safety.

Spare Parts Kit - Basic Contents:

- V-belts for the alternator and water pump
- one or two quarts of engine oil
- a gallon container of engine coolant (premixed 50/50 anti-freeze and water)
- spare fuel pump relay, also spare main relay
- a new, unopened bottle of brake fluid (DOT 4 specifications)
- 10 amp, 15 amp, and 20 amp fuses
- upper and lower radiator hoses

Spare Parts Kit - Additional Contents

- replacement headlight (sealed beam or bulb)
- brake light, turn signal light, and tail light bulbs
- wiper blades
- distributor cap and rotor

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GENERAL

The useful life of any car depends on the kind of maintenance it receives. The procedures described in this section of the manual include all of the routine checks and maintenance steps that are both required by Saab under the terms of their warranty protection and recommended by Saab to ensure long and reliable operation of your car. Also included are some instructions and recommendations for more basic car care.

Some maintenance procedures, such as oil change service, require no special tools and can be carried out by almost any interested Saab owner, regardless of his or her previous mechanical experience. Certain other maintenance tasks require special tools and equipment. Idle speed and ignition timing adjustments are some examples. If you lack the tools or a suitable workplace for doing any of the maintenance described in this section, we suggest you leave this work to an authorized Saab dealer or other qualified shop. We especially urge you to consult an authorized Saab dealer before beginning any repairs on a car still covered by the manufacturer's warranty.

All of the maintenance work described here is important and should be carried out at the correct time or mileage interval. Your Saab should not be thought of as a maintenance-free machine. Correct care will protect your investment and help you to get many years of driving reliability and enjoyment from your Saab.

Saab is constantly updating their recommended maintenance procedures and requirements. The information contained here is as accurate as possible at the time of publication. If there is any doubt about what procedures apply to a specific model or model year, or what intervals should be followed, remember that an authorized Saab dealer always has the latest information on factory-recommended maintenance.

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SAAB RECOMMENDED MAINTENANCE PROGRAM

Table a and **Table b** list the maintenance tasks specified by Saab that should be done at specified mileage intervals to ensure the proper function, safety and durability of the Saab automobile under normal use. The schedules are divided into two parts; **Oil Change/Safety Inspection** and **Major Service.**

NOTE
Aside from keeping your car in the best possible condition, proper maintenance plays a role in maintaining full protection under Saab's new-car warranty coverage. If in doubt about the terms and conditions of your car's warranty, an authorized Saab dealer should be able to explain them.

The **Oil Change/Safety Inspection** covers the most basic level of routine maintenance. Saab's required Oil Change/-Safety Inspection specifies changing the engine oil and oil filter, rotating the tires, and checking other systems and their fluids. This service should be made at 7,500 mile intervals on all models except 1992 nad later, models. On 1992 and later models, the service should be made at 10,000 mile intervals, beginning at 15,000 miles.

NOTE
On 1992 and later, Saab specifies a one-time 5,000 mile "First Service", which should be done by an authorized dealer. There is no charge for this service. For more information on the Saab maintenance system, see your glove box information or an authorized Saab dealer.

The **Major Service** interval signals the need for more comprehensive maintenance and inspection. This service should be performed every 30,000 miles.

NOTE
On 1992 and later models, the first Major Service should be done at 35,000 miles, then at 30,000 mile intervals thereafter.

Except where noted, the maintenance items listed apply to all models covered by this manual. The columns on the right side of each table give quick-reference information about the job—whether tools are needed, whether the procedure requires new parts, whether the car should be warmed-up to normal operating temperature and, in some cases, a recommendation that the job be turned over to an authorized Saab dealer because of the need for special equipment or expertise.

Following the Saab recommended maintenance tables are detailed descriptions of all of the tasks, in the order in which they appear in the tables.

Table a. Oil Service/Safety Inspection
1985-1991: every 7,500 miles
1992 and later: every 10,000 miles

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Engine maintenance				
Change oil and oil filter	*	*	*	
Check engine coolant level and add as required. Check coolant freezing point. Inspect coolant hoses and hose clamps	*	*		
Check engine drive belt (V-belt) condition and tension	*			
Inspect exhaust system				
Inspect fuel system components, fuel lines, and vacuum hoses				
Electrical System Maintenance				
Check battery terminal connections and electrolyte level. Clean terminals if necessary				
Check for proper function of exterior and interior lights				

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Table a. Oil Service/Safety Inspection (continued)
1985-1991: every 7,500 miles
1992 and later: every 10,000 miles

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Transmission Maintenance				
Check manual transmission oil level and add as required		*		
Check automatic transmission fluid level and add as required		*		
Check automatic transmission final drive oil level and add as required	*	*		
Inspect rubber boots for inner and outer drive axle joints				
Chassis Maintenance				
Inspect brake system for damaged hoses and lines, leaks or damage				
Check brake pad wear (road wheels removed)	*			
Check brake (and clutch) fluid level and add as required		*		
Check parking brake operation				
Check power steering fluid level and add as required		*		
Check windshield washer fluid level and add as required				
Check shock absorber bushings and shock function				
Inspect rubber boots for ball joints, tie-rod ends, and steering rack				
Check tire pressure, including spare	*			
Rotate tires. Inspect tires for uneven wear	*			
Check front wheel toe-in alignment (1985-1991 models only)	*		*	*
Body Maintenance				
Check operation of doors. Lubricate door hinges, stops, and locks				
Road Test				
Check engine, transmission, clutch, steering, and brake performance. Check cruise control control and ventilation system. Check for any noises (brake squeal, rattle, etc.)				

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Table b. Major Service
(every 30,000 miles*)

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Engine Maintenance				
Change oil and oil filter	*	*	*	
Flush and replace engine coolant (maximum 2-year intervals)	*	*		
Inspect coolant hoses and hose clamps	*			
Check engine drive belt (V-belt) condition and tension*	*			
Replace distributor cap and rotor**	*	*		
Replace and gap spark plugs	*	*		
Inspect and check resistance of spark plug wires***	*			
Check and adjust ignition timing** (all except models with crankshaft mounted EZK Ignition Hall Sender. See **340 Ignition System** for application information)	*		*	*
Check and adjust idle speed (cars with LH 2.2 Fuel Injection only, see **240 Fuel Injection** for application information)	*		*	*
Check and adjust deceleration system** (cars with LH 2.2 Fuel Injection only, see **240 Fuel Injection** for application information)	*		*	*
Check turbo overpressure safety switch (1985-1988 Turbo models only)	*	*	*	*
Replace oxygen sensor** (cars with LH 2.2 Fuel Injection only, see **240 Fuel Injection** for application information)	*	*		
Inspect crankcase ventilation system***				
Inspect Evaporative Loss Control Device (ELCD) system***				
Replace charcoal canister (1985-1990 models)**	*	*		
Replace air filter element		*		
Inspect fuel system components, fuel lines, and vacuum hoses				
Lubricate accelerator and throttle linkage				
Replace fuel filter	*	*		
Inspect exhaust system				
Electrical System Maintenance				
Check battery terminal connections and electrolyte level. Clean terminals if necessary				
Check for proper function of exterior and interior lights				
Check headlight aim	*			*
Transmission Maintenance				
Check manual transmission oil level and add as required	*	*		
Drain and refill automatic transmission fluid. Remove front pan and clean transmission filter****	*	*	*	*
Check automatic transmission final drive oil level and add as required	*	*		
Inspect rubber boots for inner and outer drive axle joints				

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Table b. Major Service (continued)
(every 30,000 miles*)

Maintenance item	Tools required	New parts required	Warm engine required	Dealer service recommended
Chassis Maintenance				
Inspect brake system for damaged hoses and lines, leaks or damage				
Check brake pad wear (road wheels removed)	*			
Replace brake fluid and flush and bleed brake system	*	*		*
Check parking brake operation				
Check power steering fluid level				
Check windshield washer fluid level				
Check shock absorber bushings and shock function				
Inspect rubber boots for ball joints, tie-rod ends, and steering rack				
Check tire pressure, including spare	*			
Rotate tires. Inspect tires for uneven wear	*			
Check front wheel alignment (camber, caster, toe-in)	*	*		*
Body Maintenance				
Check operation of doors. Lubricate door hinges, stops, and locks				
Check and lubricate convertible top latches				
Road Test				
Check engine, transmission, clutch, steering, and brake performance. Check function of instruments, controls, horn, windshield wipers, cruise control control and ventilation system. Check for any noises (brake squeal, rattle, etc.)				

* Every 12 months or 30,000 miles, which ever comes first only
** Every 60,000 miles
*** At the first 60,000 miles, then every 12 months thereafter
**** An automatic transmission service is recommended every 15,000 miles if the vehicle is under the severe service conditions of trailer towing, extensive city driving or driving in hot climates.

ENGINE MAINTENANCE

Engine Oil and Oil Filter

The engine oil level is checked with a dipstick located on the in the engine block on the side of the intake manifold. See Fig. 1. Make sure the car is on level ground. If the engine has been run, allow it to cool for about 3 minutes for the most accurate check.

Check the level by pulling out the dipstick and wiping it clean. Reinsert it all the way and withdraw it again. The oil level is correct if it is between the maximum and minimum marks on the end of the stick. The distance between the marks corresponds to approximately one quart of oil.

Top up the oil through the dipstick tube. Add only the amount needed to bring the level to the maximum mark on the dipstick, using an oil of the correct viscosity and grade as listed below. Too much oil can be just as harmful as too little. Make sure the dipstick is screwed down properly after use.

CAUTION
The use of fluids or lubricants that do not meet Saab's specifications may impair performance and reliability, and may void warranty coverage.

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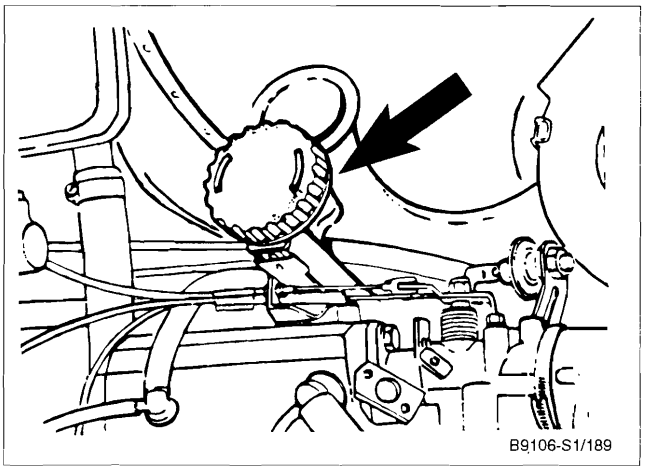

Fig. 1. Location of oil filler cap with dipstick (arrow). Remove and install by turning.

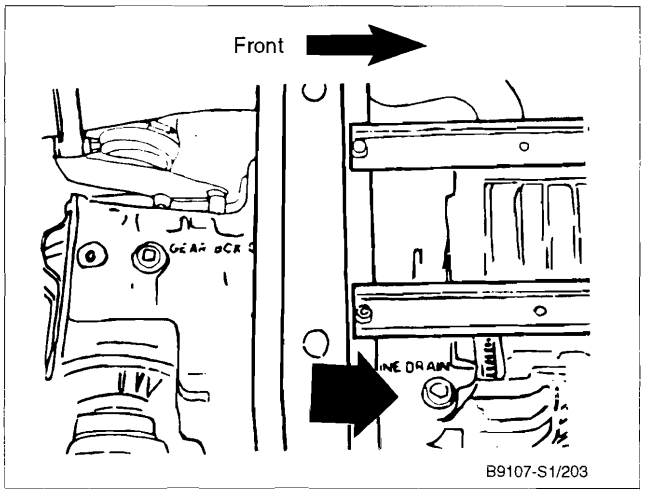

Fig. 2. Engine oil drain plug (arrow) in oil pan underneath engine.

Saab Recommended Engine Oil

- SAE 10W-30, API Service Rating SG or SF/CD
- Alternate for extremely hot climates: 15W-40, API Service Rating SG or SF/CD

NOTE

The amount of oil that needs to be added between oil changes varies from one engine to another. Generally, a new engine or an engine operated routinely at high speeds will consume more oil. It is helpful to become familiar with the rate at which a particular engine requires oil. A sudden increase may be an early warning of engine mechanical problems.

If the car is used primarily for short trips in slow moving traffic, or routinely operated aggressively, the oil should be changed at more frequent intervals (twice as often) to promote longer engine life.

A complete oil change requires new oil, a new oil filter, and a new drain plug sealing washer. The tools needed are a drain plug socket or box wrench (19 or 13 mm), a drain pan of at least 6 US qt. (5.6 L) capacity, and an oil filter wrench.

To change oil and filter

1. Run the car for a few minutes to slightly warm the engine and the oil, then shut the engine off.

2. With the car on level ground, place a drain pan under the oil drain plug shown in Fig. 2.

NOTE

The car will not need to be raised if a shallow drain pan is used.

3. Using a socket or box wrench, loosen the drain plug. By hand, remove the plug and let the oil drain into the pan.

WARNING

Pull the loose plug away from the hole quickly to avoid being burned by the hot oil. If possible, use gloves to protect your hands.

4. When the oil flow has diminished to an occasional drip, reinstall the drain plug with a new sealing washer and torque the plug.

CAUTION

If using a "fast-lube" service facility for oil changes, make sure the technician hand-starts and torques the engine oil drain plug using only hand-tools. Using power tools can strip the threads of the plug and the oil pan.

Tightening torque

- engine oil drain plug (13 mm or 19mm wrench size) . . . . . 29-39 Nm (21-29 ft-lb)

NOTE

On mid-1991 and later cars with manual transmission, the engine oil drain plug was changed from a 19mm wrench size to a 13mm wrench size. The plugs are identical except for the bolt head size. This change was made to reduce the possibility of overtightening the larger head drain plug and cracking the transmission case. If replacing the larger drain plug with the smaller plug, be sure to use a new steel washer with the rubber bonded to the perimeter. Do not use the old design copper drain plug gasket with the larger head bolt.

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5. Position the drain pan directly under the oil filter. Using an oil filter wrench, loosen it in a counterclockwise direction, then remove it by hand. See Fig. 3.

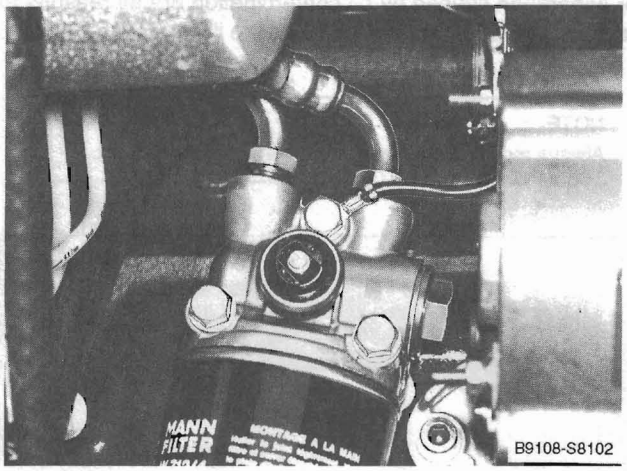

Fig. 3. Engine oil filter on left-hand (driver's) side of engine.

6. After the oil stops dripping, wipe clean the oil filter gasket surface on the filter mounting flange. Lubricate the rubber gasket of the new oil filter with a light coating of clean engine oil.

7. Install the filter by hand until the gasket contacts the mounting flange, then turn the filter another 1/2 turn to tighten it.

CAUTION
Overtightening the oil filter will make the next change much more difficult.

8. Refill the crankcase with oil. Use the dipstick to check for the correct oil level.

Engine Oil Capacity (including filter)
- 4.2 quarts (4.0 liters)

Saab Recommended Engine Oil
- SAE 10W-30, API Service Rating SG or SF/CD
- Alternate for extremely hot climates:
  15W-40, API Service Rating SG or SF/CD

9. Start the engine and check that the oil pressure warning light immediately goes out. Allow the engine to run for a few minutes to circulate the new oil, then check for leaks at the drain plug and around the oil filter. Stop the engine and recheck the oil level.

NOTE
Dispose of the used oil properly. Use tight-sealing containers and mark them clearly. Check with the place of purchase about disposal.

Coolant (Antifreeze) and Cooling System

Cooling system maintenance consists of maintaining the coolant level and its freezing point as well inspecting the hoses. Because the coolant's anti-corrosion and anti-freeze additives gradually lose their effectiveness, replacement of the coolant is recommended every 30,000 miles or 2 years, whichever comes first. Drain and refill the coolant as described in **261 Radiator and Cooling System.**

Cooling System Capacity
- 10.5 quarts (10 liters)

CAUTION
Use only Saab original anti-freeze when filling the cooling system. Use of any other anti-freeze may be harmful to the cooling system. If Saab original anti-freeze is not used, Saab recommends changing the coolant every 12 months.

A translucent expansion tank, or overflow reservoir, provides easy monitoring of coolant level without opening the system. The coolant level should always be checked when the engine is cold. The coolant level should be between the maximum and the minimum mark on the expansion tank, as shown in Fig. 4.

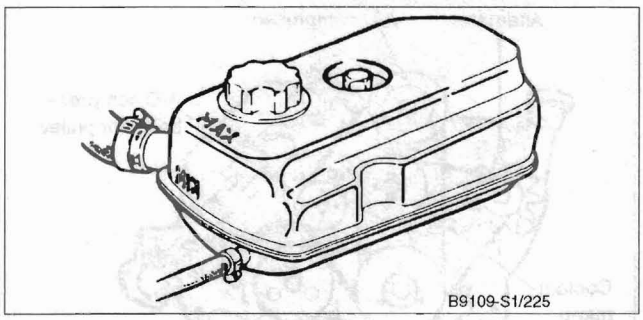

Fig. 4. Fill mark on coolant expansion tank. Coolant level should be between MAX and MIN marks.

Inspect the hose by first checking that all connections are tight and dry. Coolant seepage indicates either that the hose clamp is loose, that the hose is damaged, or that the connection is dirty or corroded. Dried coolant has a chalky appearance. Check the hose condition by pinching them. Hoses should be firm and springy. Replace any hose that is cracked, that has become soft and limp, or has been contaminated by oil. See Fig. 5.

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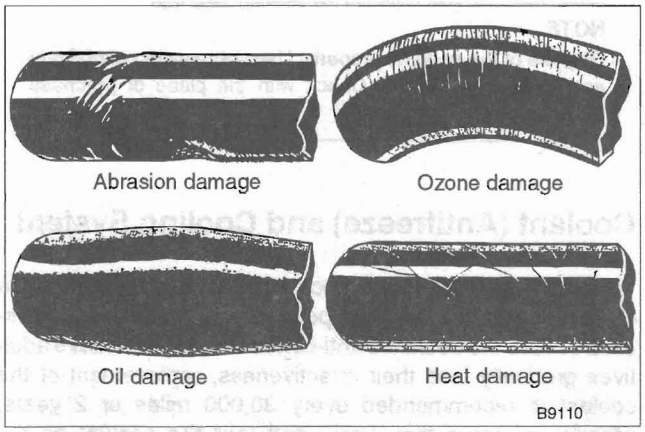

Fig. 5. Examples of damaged coolant hoses. Any of conditions shown is cause for replacement. Courtesy of Gates Rubber Inc.

To check the freezing point of the coolant, use a hydrometer. With the engine cold, remove the cap from the expansion tank and draw up some coolant with the hydrometer. Saab recommends using a 50/50 mixture of anti-freeze and water, which has a freezing point of -35°F (-38°C). If the freezing point is too high, drain a small amount of coolant from the system and add new anti-freeze until the proper protection level is obtained.

Drive Belts

Drive belts (or V-belts) and pulleys transfer power from the engine crankshaft to various accessories. Cars covered by this manual have four drive belts. The alternator and coolant pump are driven by two belts, side by side. See Fig. 6.

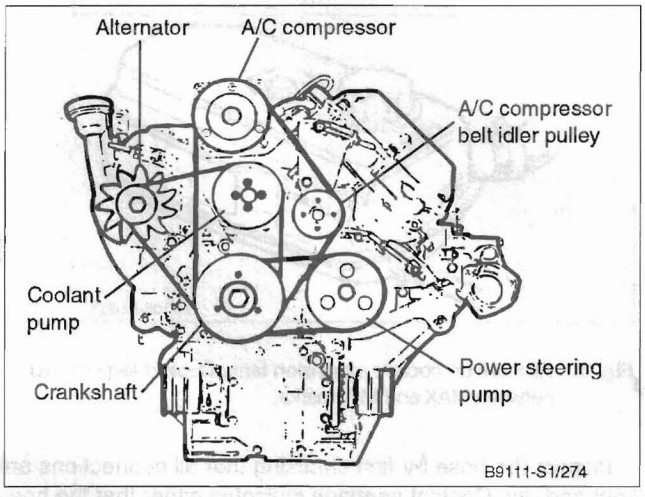

Fig. 6. Drive belt configuration.

Incorrect drive belt tension can decrease the life of the belt and the component it drives. Inspect belts with the engine off. Twist the belt to inspect its sidewalls and bottom. Belt structural damage, glazed or shiny sidewalls caused by a loose belt, or separation caused by oil contamination are all reasons to replace a belt. Some of these faults are illustrated in Fig. 7.

NOTE
Always replace both alternator belts as a matched set.

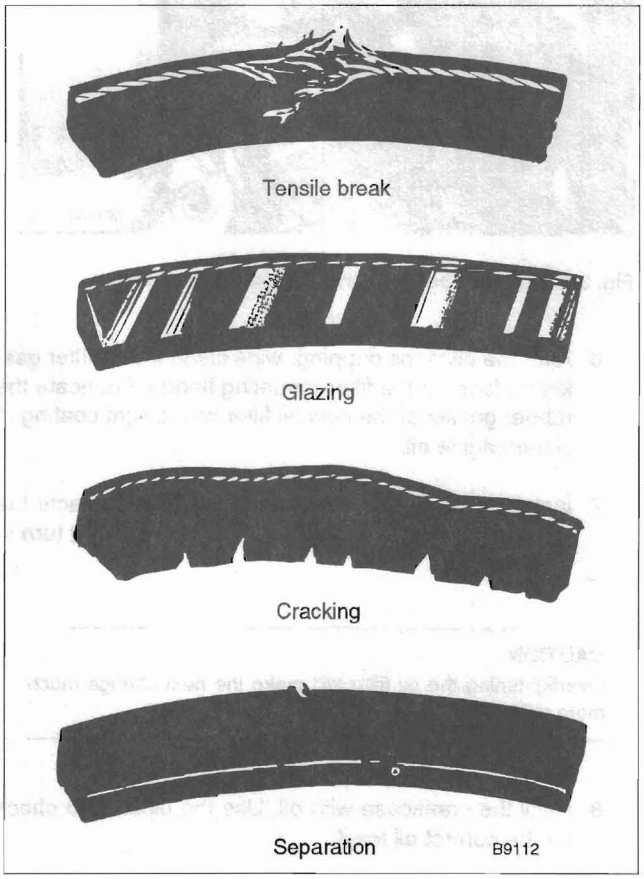

Fig. 7. Examples of belt failure. Courtesy of Gates Rubber Inc.

Drive belt squealing is normally caused by incorrect belt tension (too loose) or by a worn belt. Extremely loud squealing may only be corrected by replacing the belt. To accurately tension the drive belts, a special drive belt tensioning tool should be used. Correct belt tensions are listed in **Table c.**

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Table c. Drive Belt Tensions (measure using special belt tensioning gauge)

Drive belt	Tension N (lb)
Alternator	
checking (minimum)	
one belt	200 (45)
two belts	420 (95)
adjusting, used belts	
one belt	310±20 (70±5)
two belts	645±20 (145±5)
adjusting, new belts	
one belt	535±45 (120±10)
A/C compressor	
checking (minimum)	245 (55)
adjusting, used belt	355±20 (80±5)
adjusting, new belt	535±45 (120±10)
Power steering	
checking (minimum)	220 (50)
adjusting, used belt	310±20 (70±5)
adjusting, new belt	445±45 (100±10)

Adjust the alternator belt by first disconnecting the negative (–) battery cable. Loosen the lower (pivot) mounting bolt and then adjust the belt tension through the adjusting nut. See Fig. 8. When the belt is correctly tensioned, there should be approximately 0.2 in (5 mm) of deflection in either direction at the midpoint of the belt. For the most accurate check, use a belt tensioning gauge.

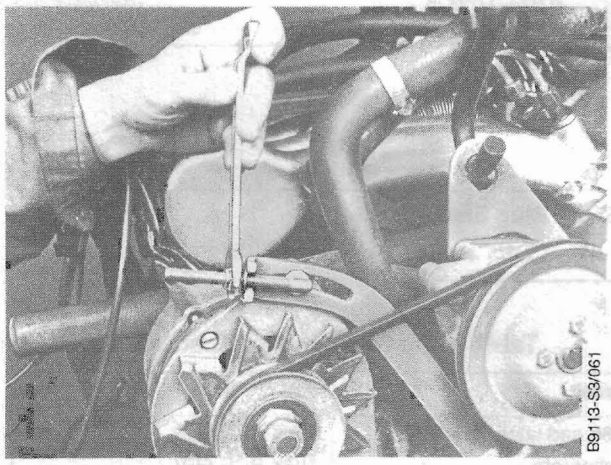

Fig. 8. Alternator drive belt tension being adjusted.

The A/C compressor drive belt is adjusted through the belt's idler pulley. See Fig. 7 above. To adjust the A/C compressor belt, simply loosen the idler pulley mounting bolts, adjust the position of the pulley until the belt tension is correct, and tighten the mounting bolts. Check the belt tension using a drive belt tensioning gauge.

To adjust the power steering drive belt, first loosen the pump's mounting bolts. Then adjust the belt tension by turning the adjusting nut. See Fig. 9. Check the belt tension using a drive belt tensioning gauge.

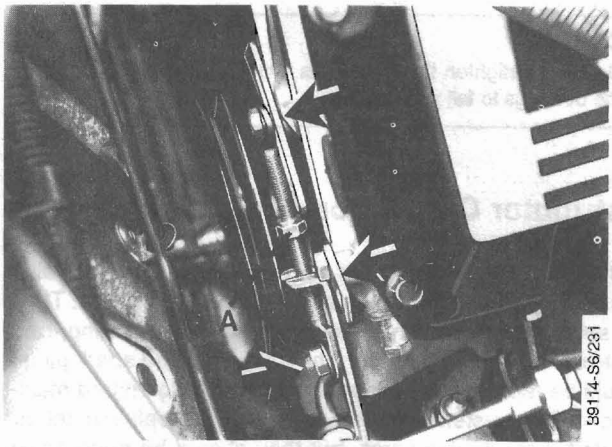

Fig. 9. To adjust power steering drive belt, loosen pump mounting bolts (arrows), and then turn adjusting nut (**A**).

To reduce the chance of drive belt failure while driving, replacement of the belts every four years is recommended. Loosen the mounting and belt adjusting bolts and adjust until the belt tension is as loose as possible, then remove the belt by slipping it over the pulleys. In some cases it may be necessary to remove one drive belt to get to another. Cross section and length determine belt size. Use the old belt for comparison, or make sure that the new belt fits into the pulley groove as shown in Fig. 10.

NOTE
When belts are replaced with new ones, keep the old set in the luggage compartment by the spare tire for emergency use.

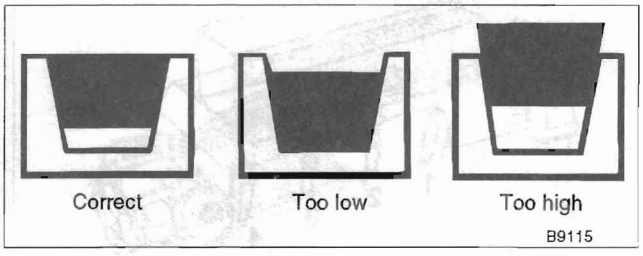

Fig. 10. Cross-section of correct drive belt position in pulley. Courtesy of Gates Rubber Inc.

With the belt off, clean the pulleys using a suitable solvent. Inspect the pulleys for wear or damage that may cause early failure of the new belt. This is also a good opportunity to inspect the belt-driven accessory, checking for bearing wear

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and excess play, for example. When installing the new belt, gently pry it over the pulleys. Too much force may damage the belt or the accessory. Tension the belt(s), run the engine for a few minutes (at least 1500 rpm), then recheck the belt tension.

CAUTION
Do not overtighten the drive belts. Overtightening will cause the bearings to fail prematurely.

Distributor Cap, Rotor, and Spark Plugs

The distributor cap, the rotor, and the spark plug wires deliver a high-voltage spark to the spark plugs. See Fig. 11. They are subject to insulation breakdown, corrosion fouling, and electrode wear and damage. The cap, rotor and spark plugs should be replaced at the specified intervals to ensure maximum ignition system efficiency. There is no replacement intervals for spark plug wires, but they should be periodically tested and inspected. Guidelines for visual inspection and testing, and instructions for distributor cap and rotor replacement are found in **340 Ignition System**.

WARNING
Lethal voltages are present at the distributor, ignition coil, spark plug wires, and spark plugs when the key is turned on or the engine is running.

NOTE
When removing the spark plug wires, label their positions so that they can be reinstalled in the proper places. If the wires get mixed up, see **340 Ignition System** for more information on the firing order.

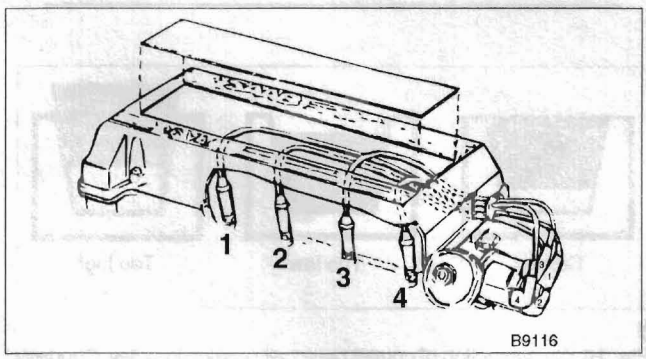

Fig. 11. Ignition system.

To replace the spark plugs, first remove the center cover above the plugs. Gently remove the spark plug wire by pulling on the protective boot, and blow or brush away any dirt from around the base of the plug to prevent it from entering the engine when the plug is removed.

Use a 5/8 in. spark plug socket to remove spark plugs. See Fig. 12. The correct spark plugs for the different engines covered by this manual are listed in **Table d**. Use a spark plug gap gauge to check the gap. If necessary, bend the outer electrode slightly to adjust the gap to meet the specification. Do not bend or file the center electrode. See Fig. 13.

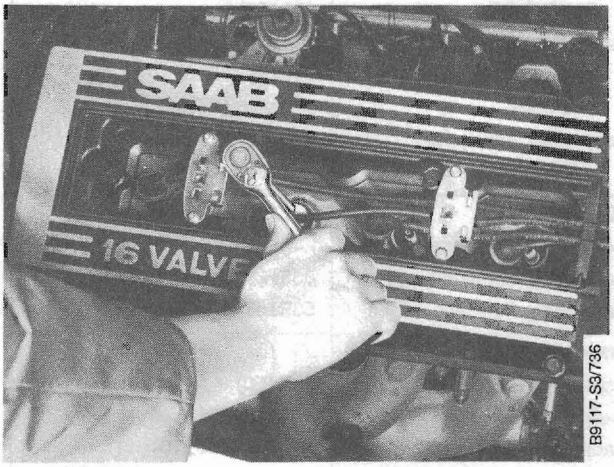

Fig. 12. Spark plug being removed.

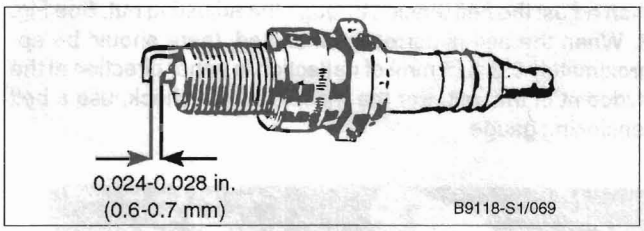

Fig. 13. Spark plug electrode gap.

Spark Plug Electrode Gap
- All . . . . . 0.024-0.028 in. (0.6-0.7 mm)

Table d. Spark Plug Applications

Model	Spark Plug
1986 and later, Non-turbo	NGK BCP 6ES
alternate	NGK BCP 6EV
1989 and later, Non-turbo	NGK BCP 5ES
1985 and later, Turbo	
normal driving	NGK BCP 7EV
alternate	NGK BCP 7ES
city driving*	NGK BCP 6EV
alternate	NGK BCP 6ES

* On 1985 through 1987 turbo models, the Saab recommended spark plug replacement interval for city driving is 15,000 miles. On 1988 and later turbo, this interval is 30,000 miles.

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Lightly lubricate the new spark plug threads with a little oil. Thread the plugs into the cylinder head by hand to prevent cross-threading. Torque the spark plugs.

Tightening torque

- sparkplugs . . . . . .25 to 29 Nm (18 to 22 ft-lb)

Ignition Timing, Idle Speed, Deceleration System

Ignition timing should be checked every 60,000 miles on all cars with distributor-mounted Hall sensors. See **340 Ignition System** for Hall sensor applications and procedures for checking and adjusting ignition timing. It is not necessary to check/adjust ignition timing on cars with a crankshaft-mounted Hall sensor.

Ignition Timing (distributor vacuum hose disconnected and plug, where applicable)

- Turbo models. . . . . 16°BTDC @ 850 rpm
- Normally aspirated models . . . 14°BTDC @ 850 rpm

On all cars covered by this manual, the idle speed is electronically controlled by the Automatic Idle Control (AIC) System. On cars with LH 2.2 Fuel Injection, the idle speed should be checked and adjusted through the AIC system at the specified mileage interval as described in **240 Fuel Injection.**

NOTE
It is not necessary to check the idle speed on cars with LH 2.4 or LH 2.4.2 Fuel Injection, as the idle speed is fully adaptive (self-correcting) through the LH control unit.

On cars with LH 2.2 Fuel injection and automatic transmission, a mechanical deceleration dashpot is mounted to the throttle housing to hold the throttle open for a short period when the throttle is quickly closed. The dashpot plunger should be adjusted to touch the throttle lever at a specified engine speed. See **240 Fuel Injection** for dashpot adjustment procedures and specifications.

Turbo Overpressure Safety Switch (1985-1998 Turbo models)

The turbo overpressure safety switch turns the fuel pump off when the manifold pressure reaches a higher than normal level. This is a safety feature in the event the turbocharger wastegate malfunctions. Checking the switch requires a hand-held pressure/vacuum pump and an accurate pressure gauge. This procedure is described in detail in **234 Fuel Pump and Fuel Tank.**

Oxygen Sensor

The oxygen sensor monitors engine combustion efficiency by measuring the oxygen content of the exhaust gasses. That information in turn is used to control the fuel injection system and reduce exhaust emissions. Any problems with the oxygen sensor will directly affect exhaust emissions and the way the engine runs.

Replacement of the oxygen sensor at the specified interval ensures that the engine and emission control system will continue to operate as designed. The sensor is mounted in the front exhaust pipe, ahead of the catalytic convertor.

NOTE
On 1991 and later models, there is no recommended replacement interval for the oxygen sensor. When the sensor is no longer operating correctly the Check Engine light will come on signaling the need for the sensor's replacement.

The sensor is threaded into place and has wires extending from the tip. Trace the sensor wiring back from the sensor and disconnect the electrical connector. When installing a new sensor, apply a light coat of anti-seize compound to the sensor threads. Torque the sensor and reconnect the wiring.

Tightening torque

- oxygen sensor to exhaust pipe . . . . 40 Nm (30 ft-lb)

CAUTION
Do not get any anti-seize compound on the sensor tip or in the sensor slits. The anti-seize compound will quickly foul the sensor element and render the sensor inoperative.

NOTE
Special sockets for replacing the oxygen sensor are available from most automotive parts stores to allow the sensor to be installed without damaging the wiring.

Crankcase Ventilation and Vacuum Hoses

The rubber vacuum hoses for the crankcase ventilation system should be carefully inspected for cracks or deterioration. Gently bend the hoses at all connecting points to check for cracks. Fig. 14 shows a typical hose routing diagram.

Evaporative Loss Control Device (ELCD)

The ELCD system collect fuel vapors from the fuel tank. Check all of the rubber vapor hoses for cracks or deteriora-

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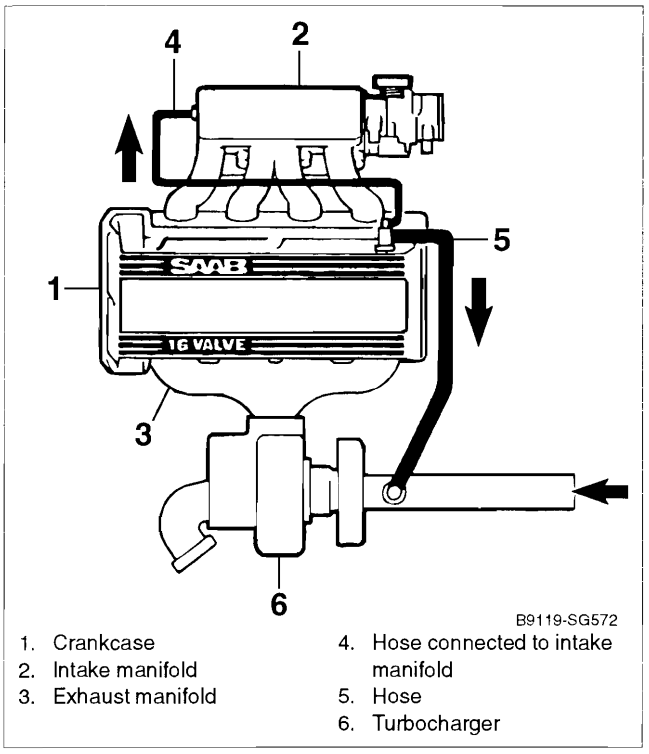


1. Crankcase
2. Intake manifold
3. Exhaust manifold
4. Hose connected to intake manifold
5. Hose
6. Turbocharger

Fig. 14. Hose routing for typical crankcase ventilation system.

tion. On all models up to 1990, the charcoal canister should be replaced at 60,000 mile intervals. The canister is mounted in the left-front corner of the engine compartment and is easily removed. Fig. 15 shows the canister. For more information on the ELCD system, see **254 Exhaust Emission Control.**

NOTE
On 1991 and later models, there is no recommended replacement interval for the charcoal canister.

Fuel System

A fuel system safety inspection should be made at the specified mileage intervals listed in the maintenance program tables given earlier. Inspect the fuel tank, fuel lines and hoses, and fuel system for damage or leaks. If fuel odors are detected in the passenger compartment, the fuel pump seal (beneath the luggage compartment) may be faulty. Also check the ELCD vapor hoses that run overhead through the headliner. See **234 Fuel Tank and Fuel Pump** for replacement of the fuel pump seal. Inspect all electrical connections for corrosion or damage or loose connections.

Air Filter Element

The specified replacement interval (30,000 miles) for the air filter element is based on normal use. If the car is operated primarily in dusty conditions, the air filter should be serviced more frequently. A dirty air filter starves the engine for air, reducing power output and increasing fuel consumption. Fig. 16 shows the typical air filter housing for the engines covered by this manual.

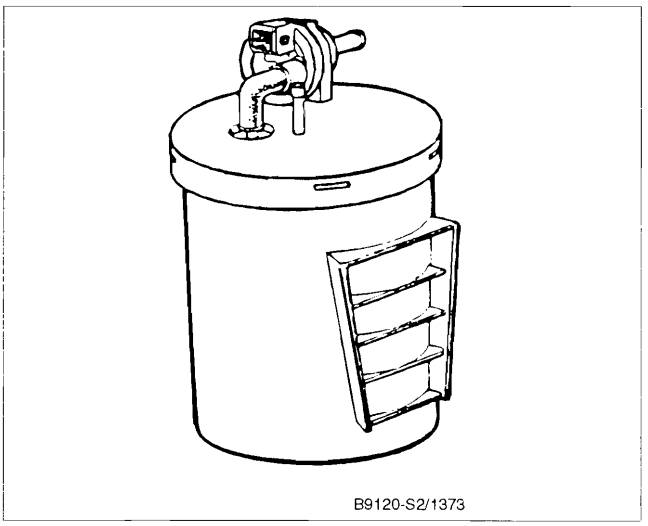
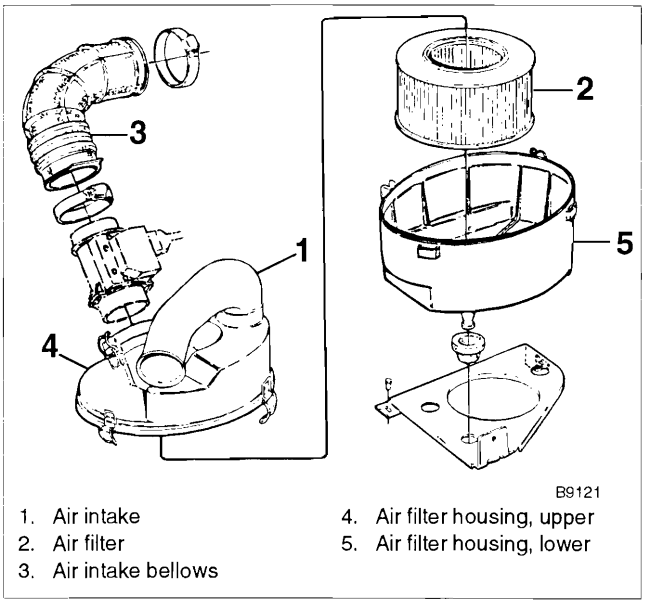


Fig. 15. Charcoal canister for ELCD system.



1. Air intake
2. Air filter
3. Air intake bellows
4. Air filter housing, upper
5. Air filter housing, lower

Fig. 16. Typical air filter housing in front left corner of engine compartment.

The upper and lower parts of the air filter housing are fastened together with spring clips around the outside edge. To replace the air filter element, unfasten the clips and separate the upper air filter housing from the lower housing just enough to remove the filter element. Take note of the filter's installed position. Wipe the inside of the air filter housing using a lint-free cloth and install the new filter and housing.

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Fuel Filter

Because of varying quality of gasoline, the fuel filter may become contaminated or clogged enough to restrict fuel flow. To prevent any such problems, and to guarantee continued good performance, the filter should be replaced every 30,000 miles. The fuel filter is located beneath the right rear of the car, just in front of the gas tank.

When replacing the fuel filter, disconnect the battery negative (–) cable and clamp the filter inlet and outlet hoses to lessen fuel spillage. Loosen the center mounting bracket and the two banjo fittings on either end of the filter. See Fig. 17. Note the arrow or markings indicating direction of flow on the new filter. Install the filter and using new sealing washers at the banjo fitting.

WARNING
Fuel will be expelled when the filter is removed. Do not smoke or work near heaters or other fire hazards. Keep a fire extinguisher handy.

CAUTION
Clean thoroughly around the filter connections before removing them, and make sure that no dirt gets into the fuel lines.

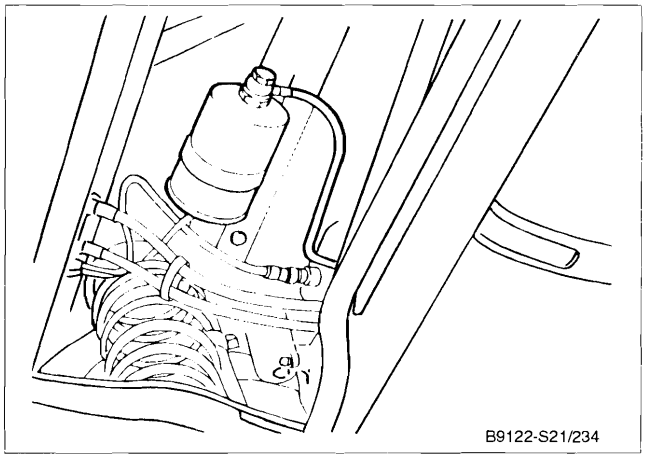

Fig. 17. Fuel filter beneath car near right rear wheel. Direction of flow is indicated by arrow or markings on filter housing.

Accelerator and Throttle Linkage

The accelerator and throttle linkage should be lubricated at the intervals specified in the tables given earlier. Use a general purpose oil on the joints and bearings of the linkage. Use a multipurpose grease on the bearing points of the throttle plate.

Exhaust System

Scheduled maintenance of the exhaust system is limited to inspection. Check for restrictions due to dents or kinks. Check for weakness or perforation due to rust. Check to see that all the hangers are in place and properly supporting the system and that the system does not strike the body. Alignment of the system and the location of the hangers are described in **252 Exhaust System**.

Exhaust system life varies widely according to driving habits and environmental conditions. If short-distance driving predominates, the moisture and condensation in the system will not fully dry out. This will lead to early corrosion damage and more frequent replacement.

ELECTRICAL SYSTEM AND BATTERY SERVICE

Electrical System Functional Check

Electrical system service includes checking that all electrical components, including interior and exterior lighting, are working correctly. Replace any faulty bulbs found. If more involved electrical work is required, refer to **3 ELECTRICAL SYSTEM** for system troubleshooting and wiring diagrams.

Battery Service

Battery maintenance includes keeping the battery and terminals clean and keeping the connections tight. See Fig. 18. Even a thin layer of dust containing conductive acid salts can cause the battery to slowly discharge. Inspect the battery cables for chafing and deterioration of the insulation caused by high heat. For a more detailed discussion of the battery, including testing and charging, see **311 Battery**.

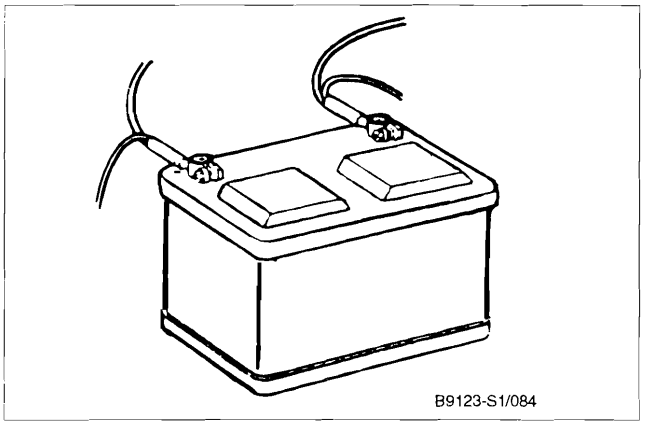

Fig. 18. Battery.

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To remove battery corrosion, begin by disconnecting the cables. Disconnect the negative (–) cable first. Clean the terminal posts and the cable clamps with a wire brush. Clean the main chassis ground terminal on the opposite end of the negative (–) cable.

Corrosion can be washed away with a baking soda and water solution that will neutralize the acid. Apply the solution carefully, though, since it will also neutralize the acid inside the battery. Avoid getting the solution into the battery cells through vent holes. Reconnect the cable clamps, positive (+) cable first. Lightly coat the outsides of the terminals, hold down screw, and clamps with petroleum jelly, grease, or a commercial battery terminal corrosion inhibitor.

WARNING
Battery acid is extremely dangerous. Take care to keep it from contacting eyes, skin, or clothing. Wear eye protection. Extinguish all smoking materials and do not work near any open flames.

CAUTION
Disconnecting the battery cables with the engine running, or reconnecting the cables to the incorrect posts will damage the electrical system.

Battery electrolyte should be maintained at the correct level just above the battery plates and their separators. The correct level is approximately 5 mm (1/4 in.) above the top of battery plates or to the top of the indicator marks (if applicable). The battery plates and the indicator marks can be seen once the filler caps are removed. If the electrolyte level is low, replenish it by adding distilled water only.

TRANSMISSION SERVICE

Automatic Transmission

Many automatic transmission problems can be traced to an incorrect fluid level, incorrect type of fluid, a clogged ATF filter, or contaminated fluid. With regular preventative maintenance, expensive and unnecessary automatic transmission repair may be avoided.

Before checking the ATF level, inspect for leaks. ATF leaks are most likely to be seen around the ATF oil pan gaskets. Leaks should be promptly corrected to avoid costly repairs. If necessary, replace a leaky ATF oil pan gasket as described in **472 Automatic Transmission Seals and Gaskets.**

CAUTION
Extreme cleanliness is important when working on the automatic transmission. Use lint-free rags to check the level, and use a clean funnel when adding fluid.

The location of the dipstick for checking the ATF is shown in Fig. 19. The area between the **MIN** mark and the **MAX** mark on the dipstick represents approximately 1 pint (1/2 liter) of ATF.

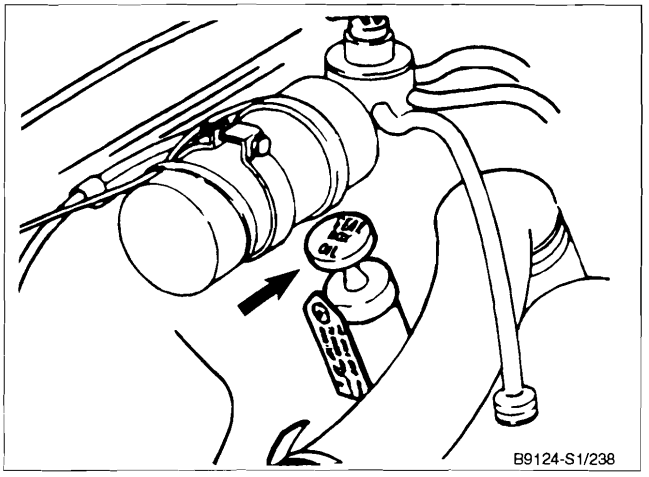

Fig. 19. ATF dipstick location (arrow).

The ATF level should be checked with the car on a level surface with the engine idling and the transmission fully warmed. Firmly set the parking brake and place the transmission selector lever in park or neutral and remove the ATF dipstick. The ATF level is correct if it is between the **MIN** and **MAX** marks. See Fig. 20.

NOTE
Driving the car for five to ten minutes around town, or approximately 12 miles (20 km) on the highway will ensure a fully warmed transmission.

If the level is too low, use a clean funnel to add ATF through the dipstick/filler tube until the fluid level is correct.

Automatic Transmission Fluid (ATF)
- Ford Specification M2C-33F (alternate: Ford Specification G)

Check the condition of the ATF by rubbing some between your fingers and sniffing it. The ATF should not be foamy, gritty, or have a burnt odor. Contaminated ATF should be drained

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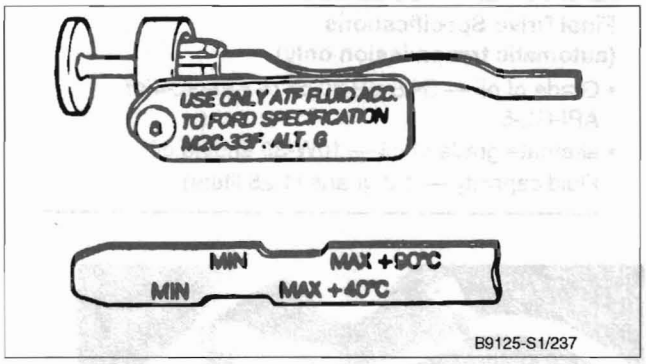

Fig. 20. ATF dipstick and fluid level marks.

and replaced to prevent further damage, but doing so will not repair any internal transmission damage that has already occurred.

NOTE
Because ATF is a red/brown color that discolors to black/-brown during normal use, ATF color may not be a good indicator of its condition.

To replace ATF and clean ATF filter

The ATF should be changed and the filter cleaned every 30,000 miles under normal conditions. If the car is operated under severe service conditions of trailer towing, extensive city driving or driving in hot climates Saab recommends that the fluid be changed every 15,000 miles.

CAUTION
Towing the car or running the engine without ATF in the transmission will severely damage the transmission. See **100 Fundamentals for the Do-it-yourself Owner** for towing instructions.

1. Raise the car and support it on jackstands.
2. Remove the support member or protective plate from beneath the transmission.
3. Place a drain pan of at least 10 quarts (10 liters) capacity under the transmission and remove the transmission drain plug. See Fig. 21.
4. Clean the front transmission pan (sump) and surrounding areas. Remove the front pan mounting bolts and remove the pan from the transmission.
5. Remove the filter mounting bolts and remove the filter. See Fig. 22. Clean the filter using a suitable solvent or fresh ATF.

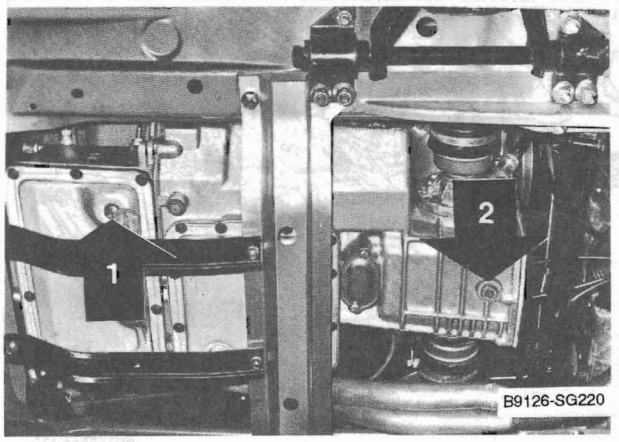

Fig. 21. Automatic transmission fluid drain plug (**1**). Final drive drain plug is shown at **2**.

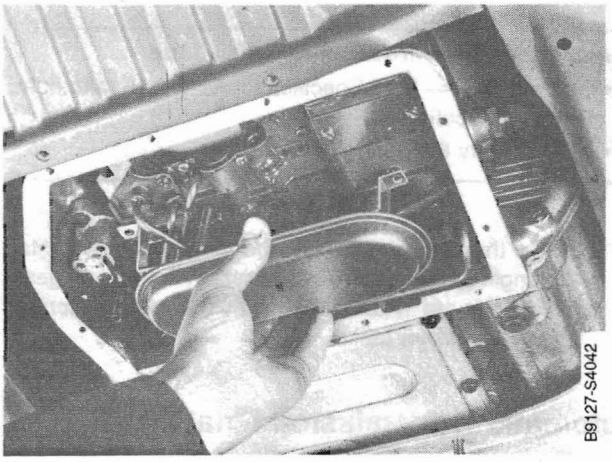

Fig. 22. ATF filter being removed.

6. Remove and clean the magnet in the oil pan. Note the position of the magnet.
7. Clean the oil pan and install the pan magnet. See Fig. 23. Make sure the pan is completely dry. Remount the filter using a new O-ring and tighten the mounting bolts.
8. Using a new pan gasket without any sealer, install the front pan. Install the ATF drain plug. Tighten the bolts and the plug to the torque listed below.

Tightening torques
- ATF pan mounting bolts . . . . . 8-12 Nm (71-106 in-lb)
- ATF drain plug . . . . . 5-8 Nm (44-71 in-lb)

9. Install the support member or protective plate.
10. Refill the transmission with fluid according to the type and amount specified below.

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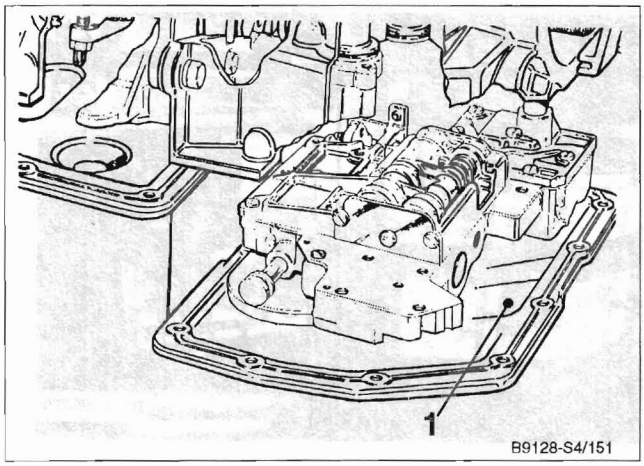

Fig. 23. Correct location of pan magnet (**1**) in front pan.

Automatic Transmissions Specifications

- Grade of ATF — Ford Specification M2C-33F (alternate: Ford Specification G)
- ATF capacity 8.5 quarts (8.0 liters)

11. Lower the car. Firmly apply the handbrake, then start the engine and shift the transmission through all gears to circulate the fluid. Check the fluid level as described earlier. Check for leaks.

Automatic Transmission Final Drive

The final drive on cars with automatic transmission is lubricated with a separate gear oil. Final drive service consists of checking the gear oil level and inspecting for leaks.

The final drive gear oil level should be checked regularly, although there is no specified replacement interval specified by Saab. The final drive oil drain plug is shown earlier in Fig. 20.

Check the lubricant level with the car level. Remove the oil filler plug, shown in Fig. 24. The level is correct when the fluid just reaches the edge of the filler hole. If the oil level is low, Add oil through the filler plug until it begins to run out of the filler hole. Install and torque the filler plug.

Tightening torque

- final drive drain or filler plug . . 39-59 Nm (29-44 ft-lb)

Final Drive Specifications (automatic transmission only)

- Grade of oil — SAE EP 80 or 75 API-GL-4 or API-GL-5
- alternate grade of oil — 10W-30 engine oil
- Fluid capacity — 1.3 quarts (1.25 liters)

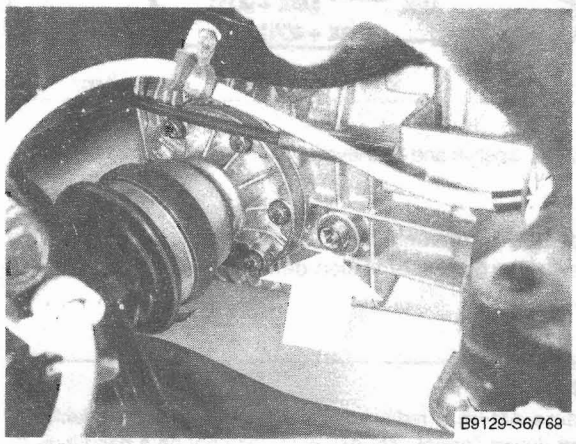

Fig. 24. Final drive fill plug (arrow).

Manual Transmission

Manual transmission service consists of checking the gear oil level and inspecting for leaks. The gear oil level should be checked regularly, although there is no specified replacement interval specified by Saab. In addition, 1990 and later models do not have a drain plug. Two types of manual transmission oil dipsticks are used on the cars covered by this manual.

On 1985 through 1990 models, the dipstick is similar to the engine oil dipstick. See Fig. 25. On 1991 and later cars, the manual transmission oil dipstick is shown in Fig. 26.

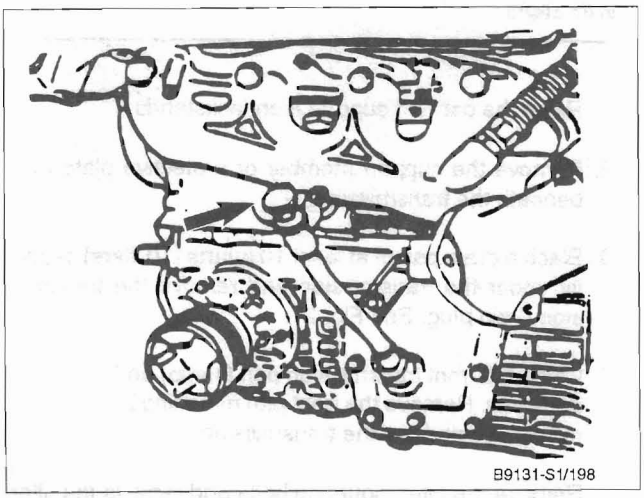

Fig. 25. Manual transmission oil dipstick (arrow) used on 1985-1990 models.

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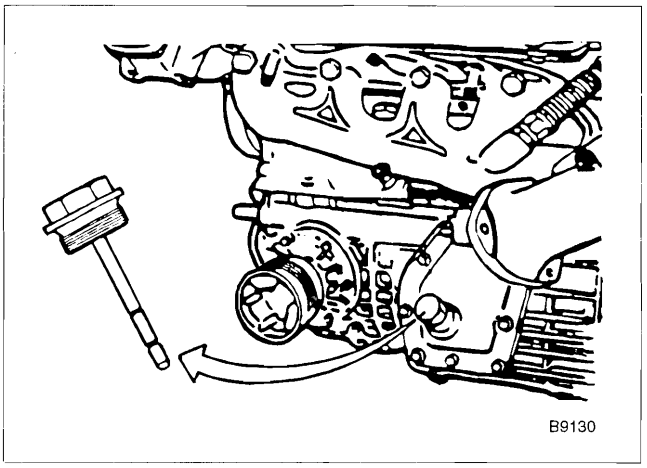

Fig. 26. Manual transmission oil dipstick (arrow) used on 1991 and later cars.

Check and fill the transmission with the car on a level surface. Remove the dipstick from the side of the transmission wipe the stick clean. Then reinsert it fully and remove it. On 1985 through 1990 models, the oil level should be between the MAX and MIN marks. On 1991 and later models, the oil level should be between the two grooves cut on the dipstick. Add oil as necessary.

Manual Transmission Oil Specifications

- Grade of oil — SAE 10W-30 SF/CC, SF/CD, SG
- alternate grade of oil — SAE EP 75 API-GL-4 or API-GL-5
- Oil capacity — 3.1 quarts (3.0 liters)

Drive Axle Joint Boots

The inner and outer boots on the front drive axles should be closely inspected for cracks and any other damage that will allow contaminants to get into the joint. See Fig. 27. If the rubber boots fail, water and dirt can enter the joint and quickly damage it. Replacement of the drive axle joint boots and inspection of the joints are described in **774 Wheel Bearings and Drive Axles.**

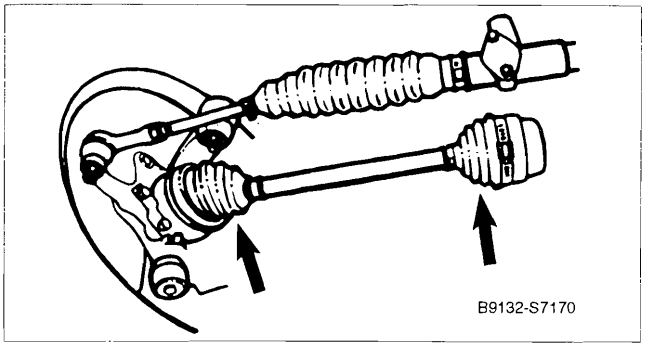

Fig. 27. Drive axle joint boots (inner and outer) should be inspected for tears and cracks. Also check that the boot clamps are tight and in good condition.

CHASSIS SERVICE

Brakes

Routine maintenance of the brake system includes maintaining an adequate level of brake fluid in the reservoir, checking brake pads for wear, checking hand brake function, and inspecting the system for fluid leaks or other damage.

WARNING

- Friction materials such as brake linings may contain asbestos fibers. Do not create dust by grinding, sanding, or cleaning the pads with compressed air. Avoid breathing asbestos fibers and asbestos dust, as it may result in serious diseases such as asbestosis and cancer, or in death.
- Brake fluid is poisonous. Do not siphon brake fluid by mouth. Wear gloves when working with brake fluid or brake pads to prevent contamination of cuts.

The level of the brake fluid will drop slightly as the brakes wear. Check the fluid level at the brake fluid reservoir, located on the driver's side, near the firewall. See Fig. 28. When filling the reservoir, use only new brake fluid from previously unopened containers.

Brake Fluid Grade

- SAE DOT 4

WARNING

Do not use SAE DOT 5 brake fluid. Brake system failure may result.

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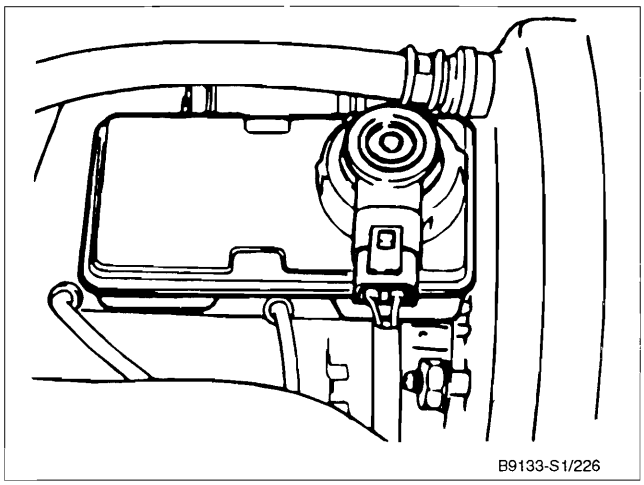

Fig. 28. Brake fluid reservoir on driver's side of engine compartment, at the firewall. Reservoir has MAX and MIN marks molded into its side.

To inspect brake hoses, gently bend them to check for cracks. Check that all hoses are correctly routed to avoid chafing or kinking. Inspect the unions and the brake calipers for signs of fluid leaks. Inspect the lines for corrosion, dents, or other damage. Replace faulty hoses or lines and bleed the brake system as described in **520 Brake Fluid and Brake Bleeding**.

WARNING
Incorrect installation or overtightening hoses, lines, and unions may cause chafing or leakage. This can lead to partial or complete brake system failure.

Brake pad thickness should be regularly checked. Brake pad thickness can be inspected by looking through an opening in the caliper after removing the wheel. See Fig. 29. For information on replacing worn pads, see **517 Brake Pads.**

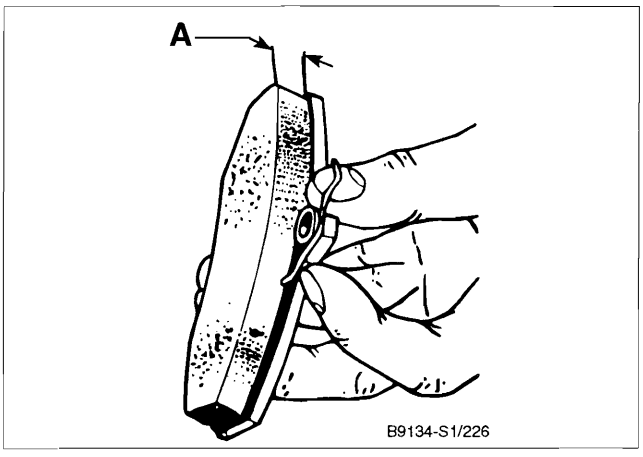

Fig. 29. Brake pad thickness (**A**)

Brake Pad Wear Limit (dimension A)
- 1985-1987 models . . . . . 1.0 mm (0.04 in.)
- 1988 and later models . . . . . 4.0 mm (0.16 in.)

Brake Fluid

Saab strictly recommends replacing the brake fluid every two years. Doing this will help protect against corrosion and the effects of moisture in the fluid. The procedure is described in detail in **520 Brake Fluid and Brake Bleeding**.

Parking Brake

The parking brake system is independent of the main braking system and does not require any periodic adjustment, although the function of the parking brake should be checked regularly. Check that the cable moves freely in its housing. A complete description of the parking brake is described in **551 Parking Brake.**

Power Steering Fluid

The only maintenance of the power steering system is to check the power steering fluid and add as necessary. The power steering fluid level can be easily checked through the translucent reservoir on the right side wheel housing in the engine compartment. See Fig. 30. When the car is at normal operating temperature, the fluid level should be between the HOT and COLD marks. If the level is checked when the car is cold, it should be between the COLD mark and the ADD mark.

Power Steering Fluid
- GM Power Steering Fluid (GM 9985010), Texaco TL4634 or equivalent

Windshield Washer Fluid

Check and add windshield washer fluid as necessary. The fluid reservoir in the front right wheel housing, directly behind the corner parking light assembly.

Ball Joints, Steering Joints (Tie Rod Ends)

The control arm ball joints and steering rack tie rod ends should be carefully checked for play with the front of the car raised. Also inspect the joint's rubber boots for damage. If the boots are torn open, water and dirt can enter the joint and quickly damage it. If the ball joint or tie rod boots are damaged, the complete joint will need to be replaced.

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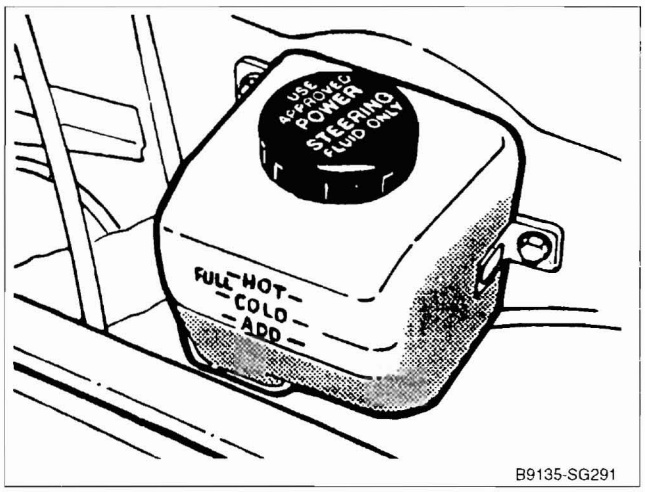

Fig. 30. Power steering fluid reservoir.

Replacement of the control arm ball joints is covered in **631 Ball Joints**. Replacement of the steering rack tie rod ends is covered in **643 Tie Rod Ends.**

Shock Absorbers and Bushings

Inspect the shock absorber bushings carefully, especially checking the lower bushing. See Fig. 31. If the lower bushing is worn, there is usually a constant clunking sound when traveling over rough road surfaces. The shock absorber's function should also be periodically checked. See **731 Front Suspension** for a quick check of the shock absorber condition.

NOTE
Individual shock absorber bushings are available through an authorized Saab dealer.

Tires

For stability and car control, the wheels and tires must be of the correct size and in good condition. Tires must be inflated to the recommended air pressures and the wheels must be in proper alignment. For maximum safety and best all-around handling, always install replacement radial tires having the same specifications. When possible, all four tires should be replaced at once, or at least in pairs on the front or rear. New tires do not provide maximum traction, and should be broken in gently for the first 100 miles (160 kilometers) or so.

NOTE
Be sure to also check the compact spare tire condition and inflation pressure. Keep the spare inflated to 60 psi.

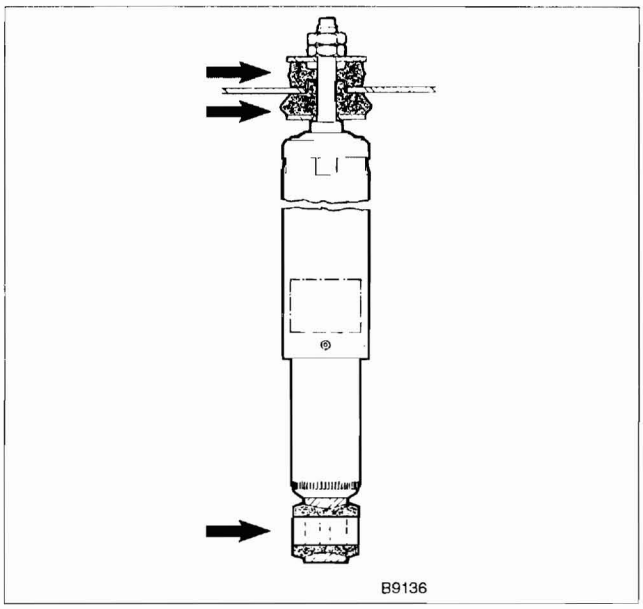

Fig. 31. Shock absorber bushings should be inspected (arrows).

Correct tire inflation pressures are important to handling and stability, fuel economy, and tire wear. Tire pressures change with temperature. Pressures should be checked often during seasonal temperature changes. The correct inflation pressures for cars covered by this manual are listed in the glovebox owner's manual. Tire pressures are also listed on a sticker located on one of the door jambs. Notice that the pressures should be higher when the car is more heavily loaded.

All inflation pressures are for cold inflation. That is, when the car has not been driven for at least three hours, or for more than one mile after sitting for at least three hours.

WARNING
Do not inflate any tire to a higher pressure than the tire's maximum inflation pressure listed on the sidewall. Use care when adding air to warm tires. Warm tire pressures can increase as much as 4 psi (0.3 bar) over their cold pressures.

To promote even wear and maximum tire life, Saab recommends rotating the tires from the front to the rear on the same side at the specified intervals listed earlier. Owing to the car's suspension design, the front tires begin to wear first at the outer shoulder and the rear tires begin to wear first at the middle of the tread or inner shoulder.

Tightening torques
- wheel lug nuts . . . . . 90-110 Nm (66-81 ft-lb)
- wheel lug bolts . . . . . 105-125 Nm (77-92 ft-lb)

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Front Wheel Alignment

Saab recommends checking the front and rear wheel alignment at the specified interval or whenever new tires are installed. Only the front wheel alignment is adjustable. See **601 Wheel Alignment** for a more detailed discussion of alignment requirements and specifications.

BODY MAINTENANCE

Maintenance of the body includes lubricating various hinges, locks and slides.

Lubricate the seat runners with multipurpose grease. Do not apply any oil to rubber parts. Lubricate the sunroof guide rails with silicone spray. If door weatherstrips are sticking, lubricate them with silicone spray or talcum powder. The hood release cable should be lubricated as well. The radio antenna mast should be cleaned and lubricated with a product such as WD-40.

The door locks, hinges and lock cylinders can be lubricated with an oil that contains graphite. The body and door hinges, the hood latch, and the door check rods should be lubricated with SAE 30 or SAE 40 engine oil. See Fig. 32.

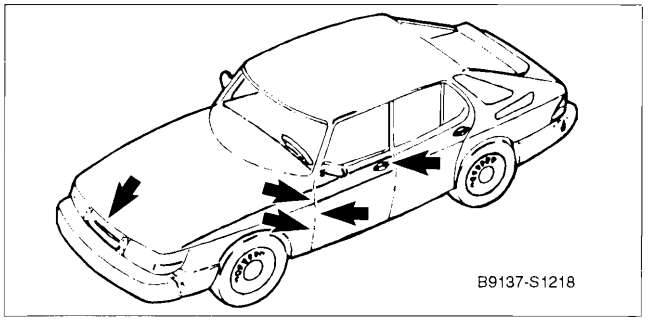

Fig. 32. Exterior body lubrication points.

Air Bag System

The air bag should be replaced every 10 years. See an authorized Saab dealer for all service relating to the SRS air bag system.

WARNING

On cars equipped with an SRS airbag system, do not attempt to service the air bag, the wiring in the steering wheel, the steering column assembly, or the airbag control unit. The airbag may ignite causing injury. See an authorized Saab dealer for all service and repairs to the SRS airbag system.

ROAD TEST

As a final check, the car should be taken for a test drive. Check the overall condition of the various systems, noting especially the function of the brakes, clutch, general engine performance and driving comfort. Check that the cruise control system and the air conditioning system are functioning correctly. See Fig. 33.

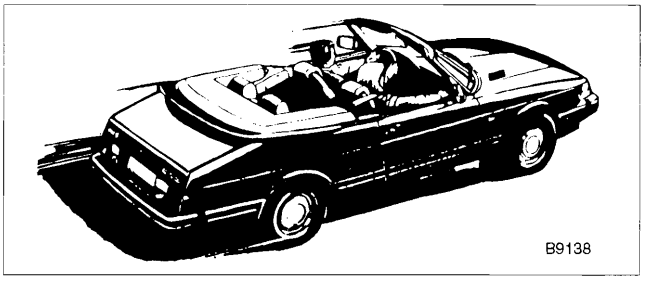

Fig. 33. Road test.

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