

# Service Manual

## Repairs and maintenance

Section 1 (17)

7,500 Mile  
Maintenance Service  
1984  
DL, GL  
GLE (Canada)  
Turbo, Diesel

# VOLVO

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**TP 30600/1**

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# 7,500 Mile 12,500 km Maintenance Service

## Introduction

These maintenance instructions are presented in a "Work Related Sequence". Step by step procedures are designed to assist the technician in performing the tasks in an efficient and logical manner.

## Volvo Maintenance Service Chart

The Volvo Maintenance Service procedures are listed on the following pages (see chart). They appear in the same order as in the Warranties and Maintenance Records Manual supplied with each new vehicle. The certificates in the manual should be signed by the Service Manager, dated and stamped.

The chart, as well as the operations inside the manual, lists the **actual mileage** when the service inspection should be performed.

Great care has been exercised to make the chart easy to read. Grouping of mileage and services facilitate finding of intervals for the service operations.

### Emissions

Items marked EMISSIONS have been determined part of emission related service maintenance program.

These items require service maintenance at mileage intervals shown to ensure trouble-free operation.

### EMISSIONS

Service every 7,500 miles = 12,500 km

### Service at:

15-30-45-60-75-90-105-120-thousand miles  
25-50-75-100-125-150-175-200-thousand km

### EMISSIONS

### Service at:

30-60-90-120-thousand miles  
50-100-150-200-thousand km

### EMISSIONS

# Volvo 7,500 Mile (12,500 km) Maintenance Service Chart

## Controls and lighting

1	Hazard warning flasher	10	Parking lights
2	Blower	11	Brake lights
3	Heater controls	12	Tail lights
4	Rear demist	13	Back-up lights
5	AIR COND control	14	Reflectors and lenses
6	Horn	15	Fill washer fluid
7	Turn signals	16	Wiper blades
8	Headlights and LIGHTS switch	17	Wiper control
9	Instrument panel lights	18	Washer jets

### In car

A1	Power brake function
A2	Pressure test brake system
A3	Parking brake
A4	Warning lights
A5	Auto trans shift control
A6	Steering

All items on this page should be inspected at 7,500 mile = 12,500 km intervals:

miles	km
7,500 =	12,500
15,000 =	25,000
22,500 =	37,500
30,000 =	50,000
37,500 =	62,500
45,000 =	75,000
52,500 =	87,500
60,000 =	100,000
67,500 =	112,500
75,000 =	125,000
82,500 =	137,500
90,000 =	150,500
97,500 =	162,500
105,000 =	175,000
112,500 =	187,500
120,000 =	200,000

### Exterior - lubrication

B1	Hood hinges
B2	Door hinges
B3	Trunk lid

### On lift

#### Tires, wheels

C1	Tires
C2	Tire pressure
C3	Wheel bearing play
C4	Wheel bearing noise

#### Front end

D1	Front shock absorbers
D2	Front springs
D3	Steering gear
D4	Steering rack
D5	Control arm bushings, strut
D6	Steering rod play
D7	Ball joints
D8	Steering rod ends
D9	Control arms
D10	Stabilizer bar and links

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7,500 = 12,500  
 15,000 = 25,000  
 22,500 = 37,500  
 30,000 = 50,000  
 37,500 = 62,500  
 45,000 = 75,000  
 52,500 = 87,500  
 60,000 = 100,000  
 67,500 = 112,500  
 75,000 = 125,000  
 82,500 = 137,500  
 90,000 = 150,000

km  
 miles

•••••  
 •••••  
 •••••  
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 •••••

E1  
 E2  
 E3  
 E4

**Brakes**  
 Brake hoses  
 Brake lines  
 Parking brake  
 Wheel brakes

•••••  
 •••••  
 •••••  
 •••••  
 •••••

F1  
 F2  
 F3  
 F4

**Power transmission**  
 Clutch play  
 B21F-Turbo and B23F:  
 clutch negative play  
 Auto trans: shift control  
 Propeller shaft

•••••  
 •••••

G1  
 G2

**Rear end**  
 Rear shock absorbers  
 Rear suspension

•••••  
 •••••  
 •••••

H1  
 H2  
 H3

**Exhaust system**  
 B21-Turbo  
 B23F  
 D24 diesel

•••••  
 •••••  
 •••••

I1  
 I2

**Fluids**  
 Rear axle  
 M46 manual transmission

**EMISSIONS**  
**EMISSIONS**

•••••  
 •••••  
 •••••

Engine oil and filter:  
 J1-J2  
 J3-J4

Gasoline engines  
 (NOTE: Turbo intervals!)  
 Diesel engine

**EMISSIONS**  
**EMISSIONS**

•••••  
 •••••

Engine cooling system:  
 K1  
 K2

Check anti-freeze  
 Replace coolant

Fluids:  
 K3  
 K4  
 K5

Brake fluid level  
 Power steering gear  
 Battery

•••••  
 •••••  
 •••••

**Automatic transmission**  
 Replace fluid  
 Check oil level

**EMISSIONS**

•••••  
 •••••

L1-L10  
 L11

**B21 and B23 (all)**  
 Auto trans: adjust kickdown cable  
 Engine controls  
 Drive belt tension  
 Adjust valves  
 Replace timing gear belt

**EMISSIONS**  
**EMISSIONS**

•••••  
 •••••  
 •••••  
 •••••

M1  
 M2  
 M3  
 N1-N15  
 01-07



7,500 = 12,500  
 15,000 = 25,000  
 22,500 = 37,500  
 30,000 = 50,000  
 37,500 = 62,500  
 45,000 = 75,000  
 52,500 = 87,500  
 60,000 = 100,000  
 67,500 = 112,500  
 75,000 = 125,000  
 82,500 = 137,500  
 90,000 = 150,000

km

miles

**B23F**

- S1 Replace air filter cartridge
- S2 Replace spark plugs
- S3-S4 Replace oxygen sensor, reset light
- S5 Replace fuel filter
- S6 Positive crankcase ventilation - same; adverse conditions
- S7 Replace fuel tank filter

**EMISSIONS**  
**EMISSIONS**

**EMISSIONS**

**D24 diesel**

- a1 Drain condensate
- a2 Positive crankcase ventilation
- a3 Cooling system pressure check
- a4 Replacing air filter cartridge
- a5 Replace fuel filter
- a6 Check fuel lines
- a7 Drive belt tension
- b1-b12 Valve clearance adjustment
- c1-d7 Engine controls

**EMISSIONS**

**EMISSIONS**

**EMISSIONS**

**EMISSIONS**

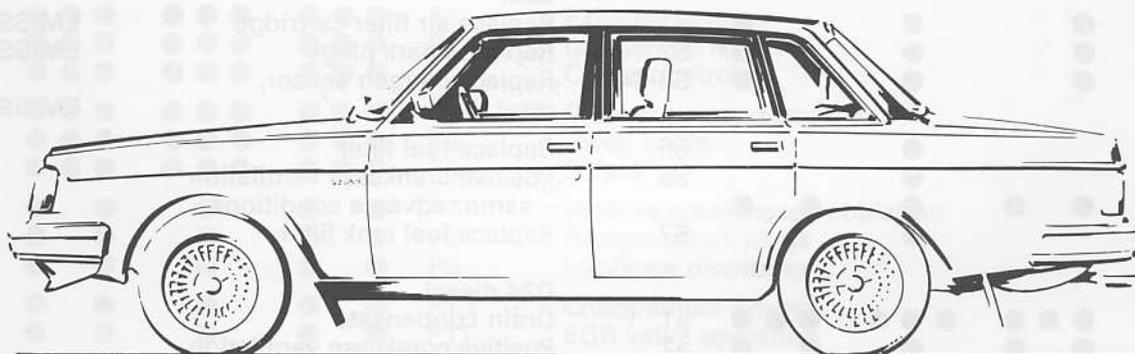
**EMISSIONS**

**EMISSIONS**

Maintenance services at 75,000 mile intervals:

- e1-e10 Compression test
- f1-f8 Checking/adjusting injectors
- g1-g33 Replacing timing gear belts

# Road test



133594

Item    OK    Adjust

### Engine

1	___	___	Starting ability
1	___	___	Fast idle (cold engine)
3	___	___	Idle (warm engine)
4	___	___	No stalls on acceleration or deceleration
5	___	___	No noise from engine
6	___	___	Normal warm up
7	___	___	Normal engine operation
8	___	___	Normal acceleration
9	___	___	Leaks
10	___	___	Reinstall hardware removed at factory

### Electrical

1	___	___	Starter/alternator operation
2	___	___	Wipers/washers
3	___	___	Ignition and steering lock
4	___	___	Instruments, control lights

### Drive train

1	___	___	Clutch adjustment
2	___	___	Clutch operation

### Manual transmission

1	___	___	Correct operation
---	-----	-----	-------------------

Item OK Adjust

**Automatic transmission**

1	___	___	Gear selector play
2	___	___	Starter operation only in P and N
3	___	___	Run to normal operating temperature
4	___	___	No slippage at stall speed
5	___	___	Upshift
6	___	___	No slippage during shifting
7	___	___	Kick down
8	___	___	Upshift with kick down
9	___	___	Gear selector in 2, downshift and braking
10	___	___	Gear selector in 1, downshift and braking
11	___	___	Park position operation
12	___	___	Drive shafts and bearing noises

**Brakes**

1	___	___	Power assist
2	___	___	No pull when braking hard
3	___	___	Pedal pulsation
4	___	___	"Spongy" brake pedal
5	___	___	Parking brake

**Steering**

1	___	___	Correct steering
2	___	___	Steering wheel position and return
3	___	___	Steering wheel effort
4	___	___	Steering looseness
5	___	___	Power steering function

**Springs and wheels**

1	___	___	No suspension noises
2	___	___	Rear axle tight
3	___	___	Tire unbalance

**Body and equipment**

1	___	___	Accessory operation
2	___	___	Heater and heater controls
3	___	___	Speed noises
4	___	___	Body noises
5	___	___	Visible defects
6	___	___	Clean steering wheel etc
7	___	___	Note faults detected
8	___	___	Check off
9	___	___	Remedy faults

Item	OK	Adjust
Automatic transmission		
1 Gear selector dial		
2 Starter operation only in P and N		
3 Run to normal operating temperature		
4 No slippage at stall speed		
5 Upshift		
6 No slippage during shifting		
7 Downshift with full throttle		
8 Downshift with full throttle		
9 Gear selector in D, downshift and parking		
10 Gear selector in L, downshift and parking		
11 Park position operation		
12 Drive shafts and bearing noises		
Brakes		
1 Power assist		
2 No pull when braking hard		
3 Pedal pulsation		
4 "Spongy" brake pedal		
5 Parking brake		
Steering		
1 Correct steering		
2 Steering wheel position and return		
3 Steering wheel free play		
4 Steering wheel shimmy		
5 Steering wheel vibration		
6 Steering wheel shimmy		
7 Steering wheel shimmy		
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100 Steering wheel shimmy		

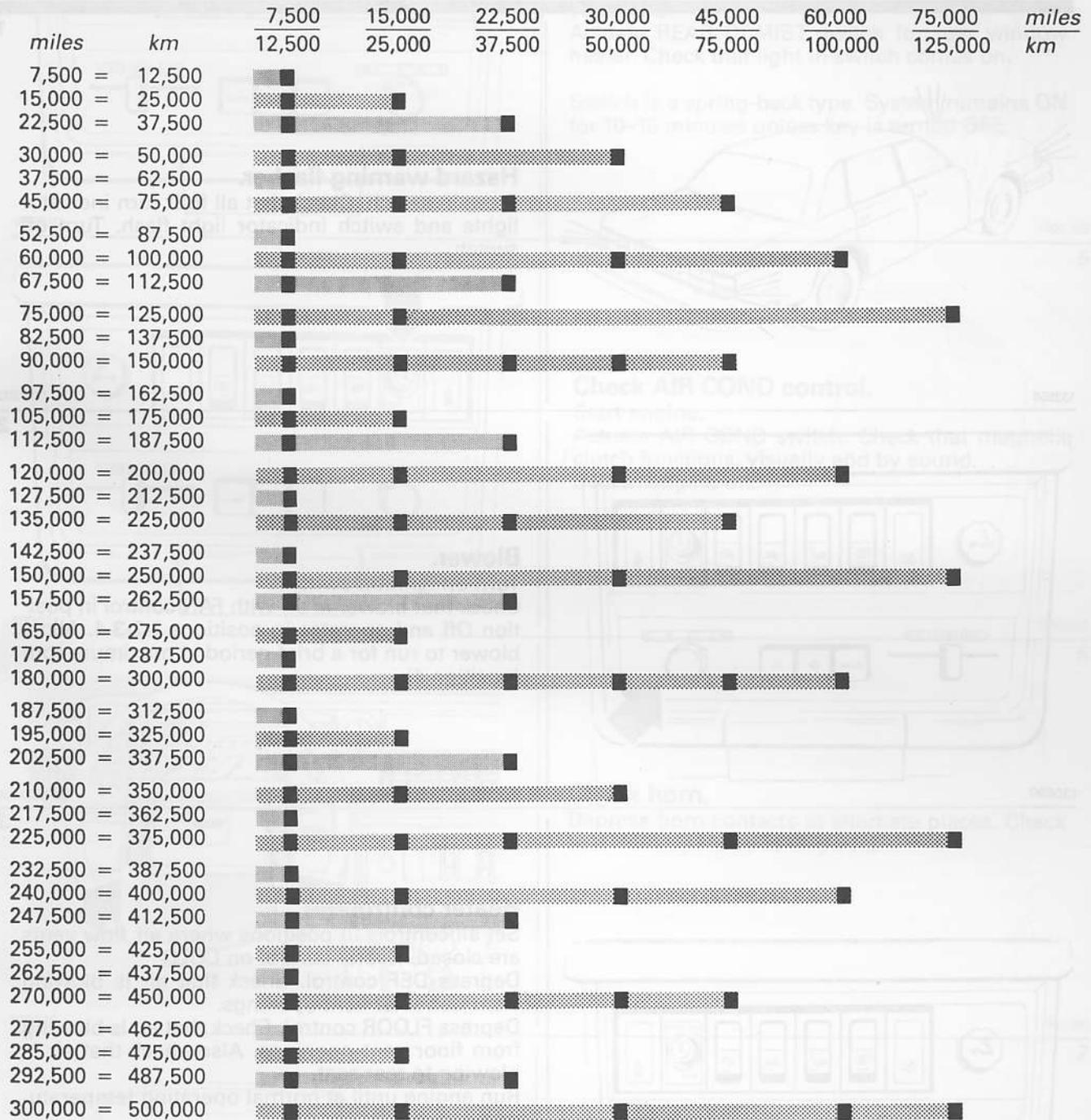
### Services beyond 90,000 miles = 150,000 km

The service charts list mileage up to 90,000 miles = 150,000 km. Space and readability sets a limit. On the following page is a list that goes to 300,000 miles = 500,000 km. It cross references actual mileage when a service should be performed and what interval services should be performed at that mileage.

Item	OK	Adjust
Engine		
1 No suspension noises		
2 Rear axle tight		
3 Tire unbalances		
4 Visible tire flats		
5 Excessive tire wear		
6 Accessory operation switches on/off OK		
7 Heater and heater controls work on/off OK		
8 Speed noise		
9 Body noise		
10 Visible defects		
11 Clean steering wheel etc.		
12 Note for/against correct steering		
13 Check oil		
14 Remedy faults		
Electrical		
1 Wiper/washers		
2 Ignition and steering lock		
3 Clutch adjustment		
4 Clutch operation		
5 Correct operation		

Services at the  
mileages indicated  
below - -----

----- include service operations performed at these intervals:



# Procedures

## Controls and lighting



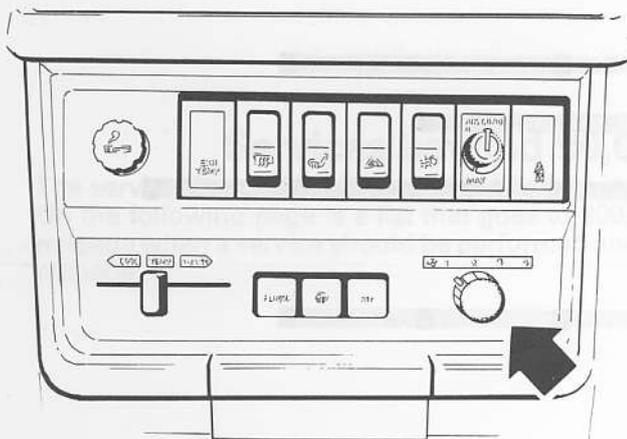
133556

### Hazard warning flasher.

Press in switch. Check that all four turn indicator lights and switch indicator light flash. Turn off switch.

1700.013

2



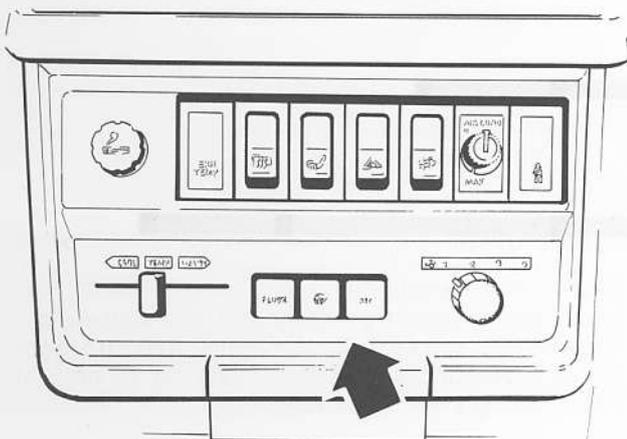
130690

### Blower.

Turn on ignition switch. Check that blower is off with FAN control in position Off and operates in positions 1-2-3-4. Allow blower to run for a brief period at maximum rpm (position 4).

1700.035

3



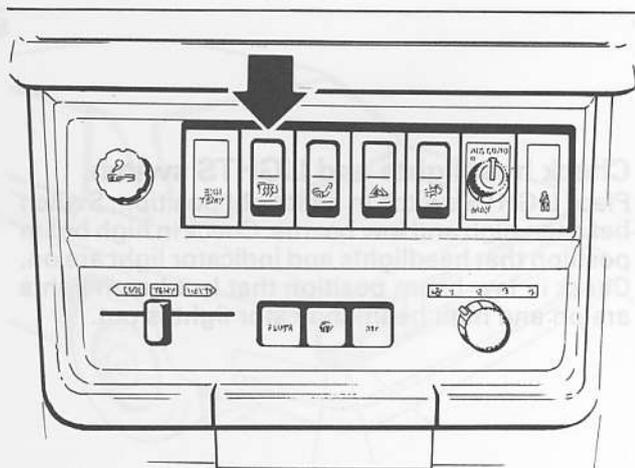
130691

### Heater controls.

Set all controls in positions where air flow vents are closed. Heater control on COLD. Depress DEF control. Check that air is blowing from defroster vent openings. Depress FLOOR control. Check that air is blowing from floor vent openings. Also check that air is blowing to rear seat. Run engine until at normal operating temperature. Check that air exiting vents is still cold. Set heater control to WARM. Check that heated air now exits vents. Check that air exits from all outlets on instrument panel. Switch off blower. Check that REC (recirculate) valve operates. Listen to valve functioning when depressing control. Stop engine.

1700.034

4



130610

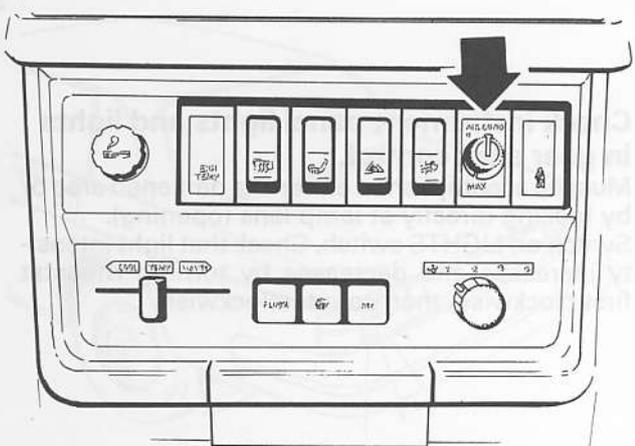
**Check electrically heated rear window (demist).**

Actuate REAR DEMIST switch for rear window heater. Check that light in switch comes on.

Switch is a spring-back type. System remains ON for 10-15 minutes unless key is turned OFF.

1700.008

5



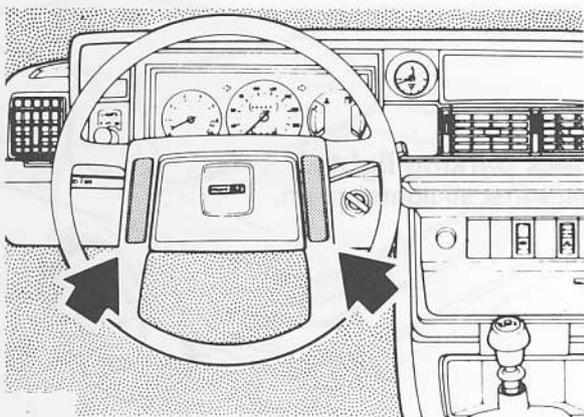
130611

**Check AIR COND control.**

Start engine.  
Actuate AIR COND switch. Check that magnetic clutch functions, visually and by sound.  
Switch engine off.

1700.009

6



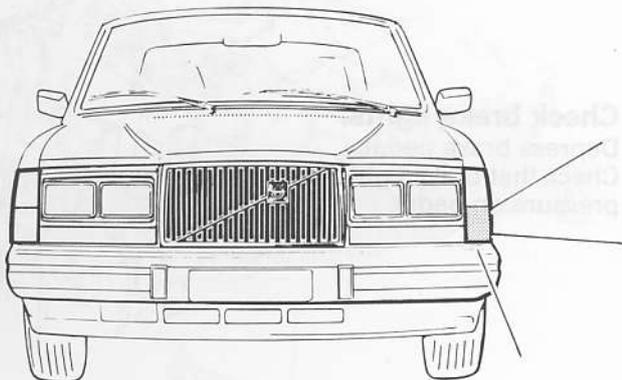
130612

**Check horn.**

Depress horn contacts at alternate places. Check that horn operates at all points.

1700.011

7

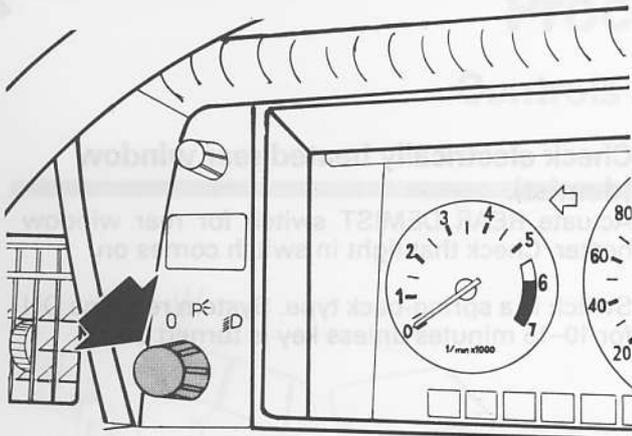


133555

**Check turn signals.**

Check that left and right front and rear turn indicator lights as well as indicator lights on instrument panel flash. Check that lever returns to neutral after turning steering wheel.

1700.012



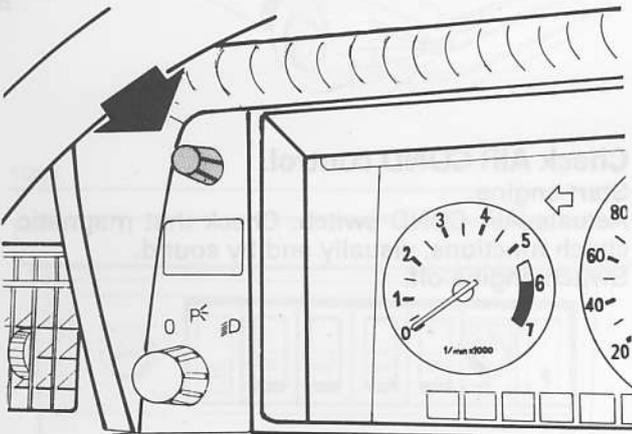
133207

8

**Check headlights and LIGHTS switch.**

Place LIGHTS switch in headlight position. Switch between high and low beams. Check in high beam position that headlights and indicator light are on. Check in low beam position that low beam lights are on and high beam indicator light is out.

1700.015



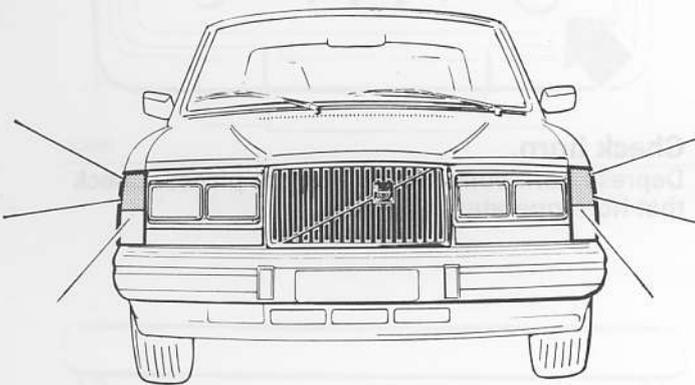
133208

9

**Check instrument panel lights and lights in gear shift control.**

Must be accomplished either in a darkened area or by looking directly at lamp lens (opening). Switch on LIGHTS switch. Check that light intensity increases and decreases by turning rheostat first clockwise, then counterclockwise.

1700.014



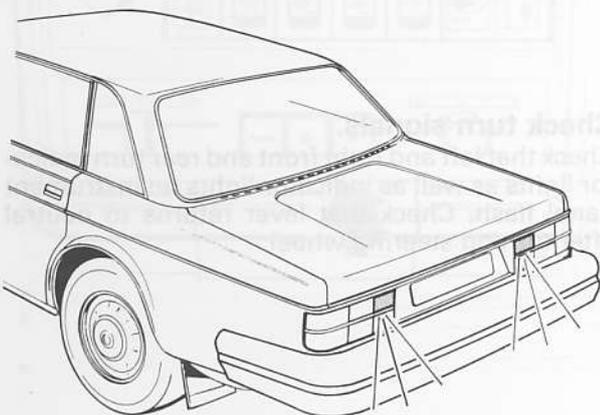
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10

**Check parking lights.**

Check that all lights are on.

1700.017



133558

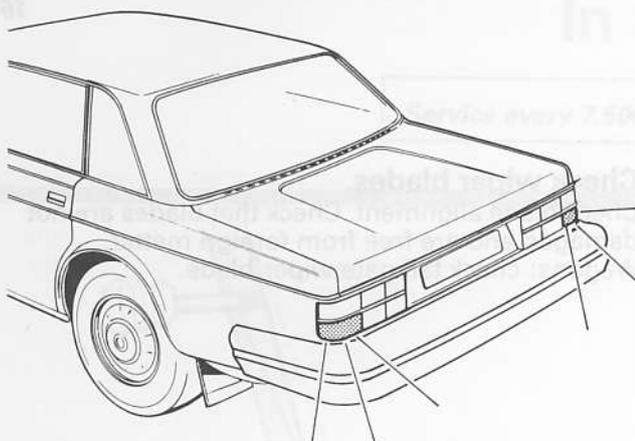
11

**Check brake lights.**

Depress brake pedal. Check that brake lights come on with light pressure on pedal.

1700.018

12



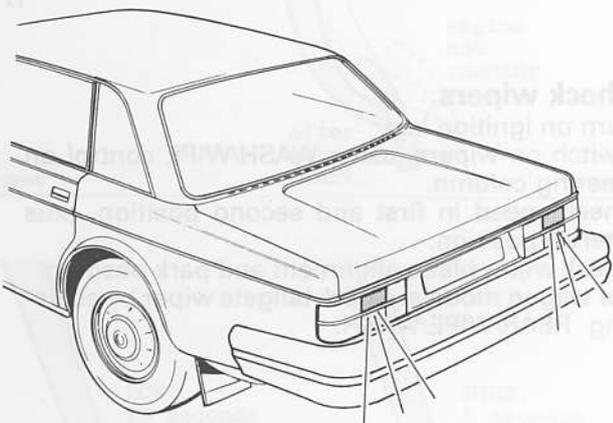
133559

**Check tail lights.**

Check that all lights are on.

1700.019

13



133560

**Check back-up lights.**

Set shift selector to reverse.  
Check that both lights are on.

1700.020

14



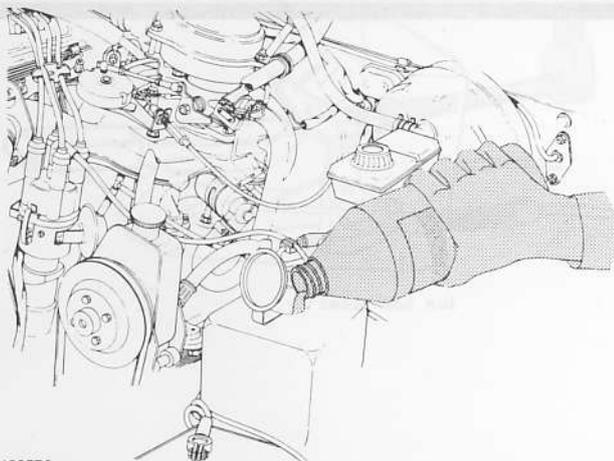
133563

**Check rear reflectors and lenses.**

Check that reflectors and lenses are not damaged.

1700.052

15

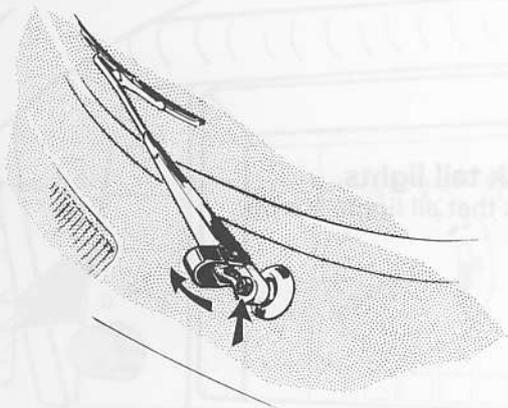


133570

**Fill washer fluid reservoir.**

Use clean water and solvent. In below freezing conditions use washer solvent anti-freeze.

1700.072

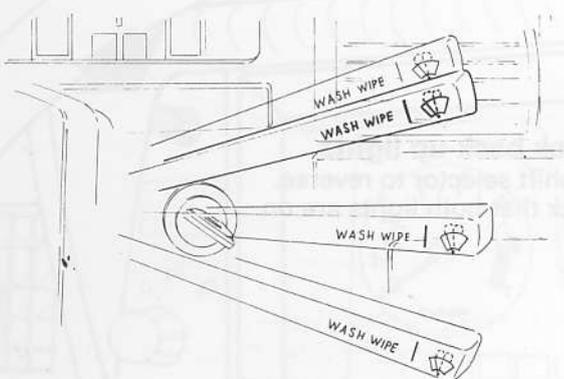


131425

**Check wiper blades.**

Check blade alignment. Check that blades are not damaged and are free from foreign matter. Wagons: check tail gate wiper blade.

1700.071

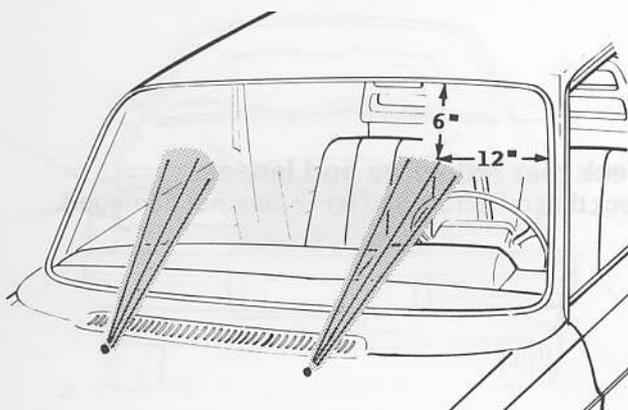


124013

**Check wipers.**

Turn on ignition key. Switch on wipers, using WASH/WIPE control on steering column. Check speed in first and second position, plus interval position. Check wiper blade alignment and park position. For wagon models: Check tailgate wiper by actuating REAR/WIPE/WASH.

1700.059



133691

**Adjust windshield washer discharge nozzles.**

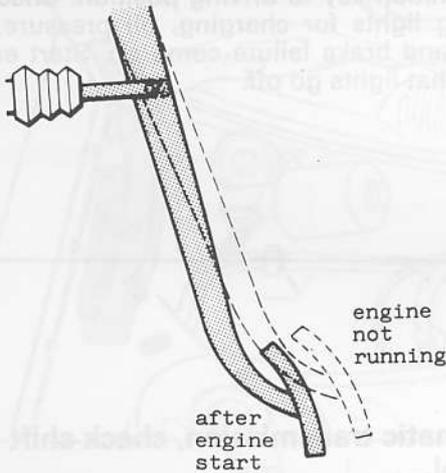
Washer jets should hit windshield 10-20 cm (4-8") from upper edge and approx. 35 cm (12") from door pillar. Adjust nozzles by inserting a needle in metal insert and rotate insert. For wagon models: Also check tailgate window washer alignment.

1700.069

# In car

Service every 7,500 miles = 12,500 km

A1



### Check power brake function.

Remove vacuum by depressing brake pedal 5 times.

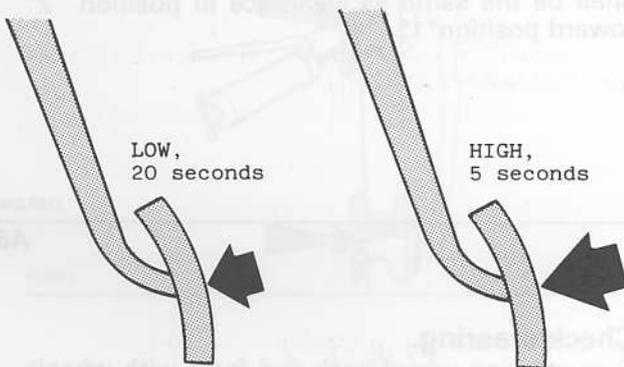
Depress brake pedal, start engine.

Pedal position should drop slightly if power brake functions.

133595

1700.030

A2



### Pressure test brake system.

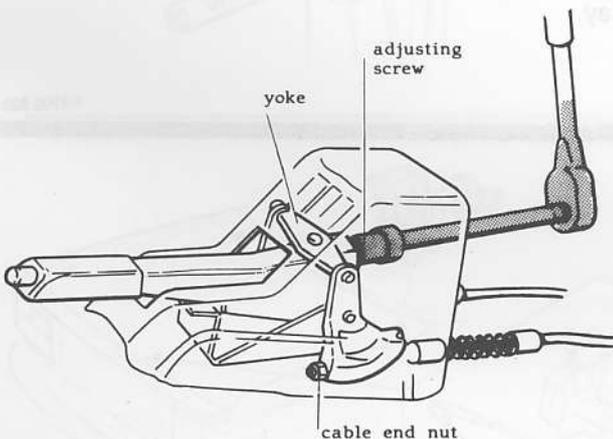
Keep brake pedal depressed 20 seconds with low pedal pressure.

Repeat with high pedal pressure for 5 seconds. Pedal position must not drop. A drop indicates brake fluid leakage or booster vacuum leak.

133708

1700.031

A3



### Check parking brake.

Apply parking brake. Adjust if it is not fully applied after pulling 10-11 notches.

After adjustment, adequate braking power should be obtained after pulling 2-8 notches, pulling force approx. 65 lbs. Adjust through rear of parking brake console.

Check that catch is operating correctly.

Check that indicator light on instrument panel goes on. Release lever and check that light is out when lever is in bottom position.

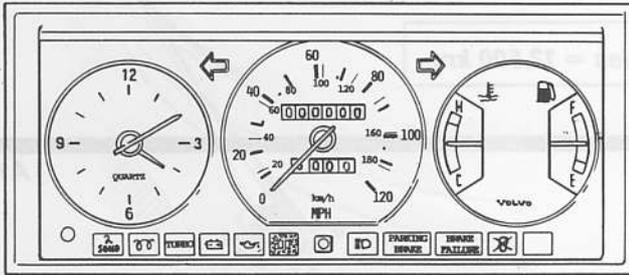
Yoke should be at right angles to parking brake lever.

If yoke is askew, use nuts at cable ends to adjust. There should always be at least 2 mm thread protruding.

133200

1700.032

A4



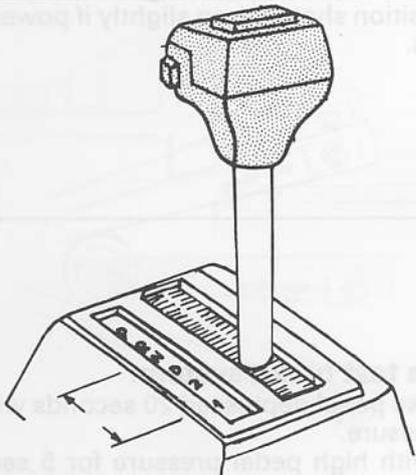
**Check warning lights.**

Turn ignition key to driving position. Check that warning lights for charging, oil pressure, bulb failure and brake failure come on. Start engine. Check that lights go off.

130608

1700.006

A5



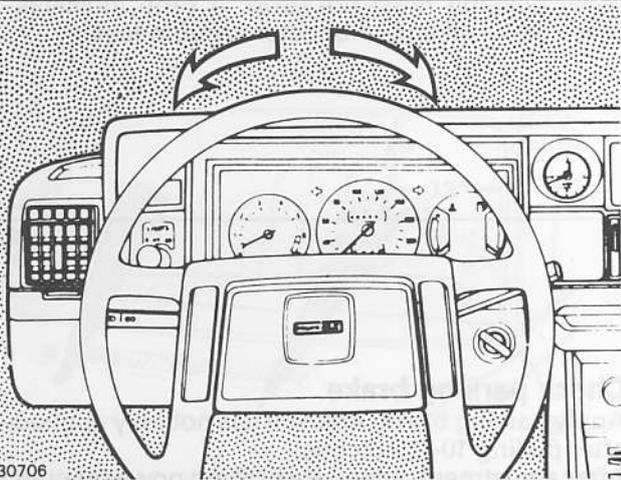
**Automatic transmission, check shift control.**

Clearance in position "D" toward position "N" shall be the same as clearance in position "2" toward position "1".

133222

1700.026

A6



**Check steering.**

Turn steering wheel back and forth with wheels resting on ground. Check steering wheel play with wheels pointing straight forward. Jack up front end and place stands under control arms close to wheels. Turn steering wheel fully to right and left positions. Check steering effort and steering gear for play.

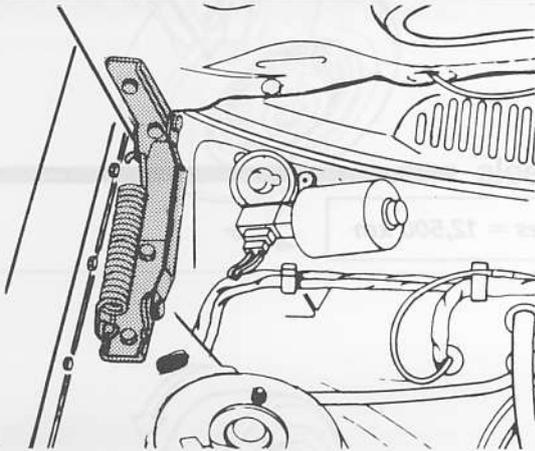
130706

1700.033

# Exterior - lubrication

Service every 7,500 miles = 12,500 km

B1

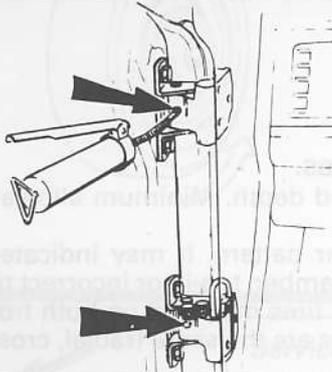


133596

**Lubricate hood hinges.**  
Use oil can and heavy oil.

1700.061

B2



118557

**Lubricate door hinges, door stops and striker plates.**

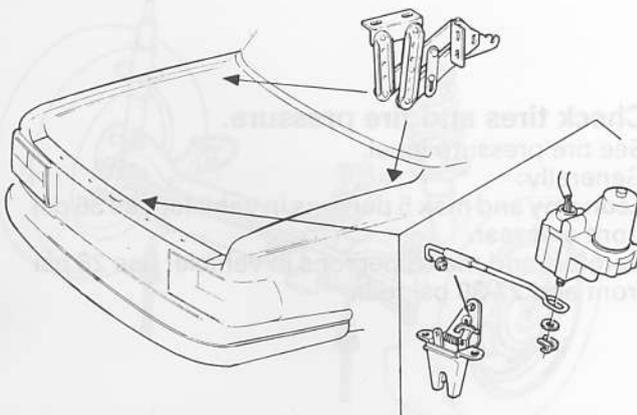
Lubricate door hinges with heavy oil. Use door wax to lubricate door stops. Check that latches lock in both outer and inner positions. Check that door stops are in working order and provide positive locking in intermediate and outer positions.



118558

1700.068

B3



133598

**Lubricate trunk lid (tail gate for wagons).**  
Lubricate lid/gate hinges. Use heavy oil.

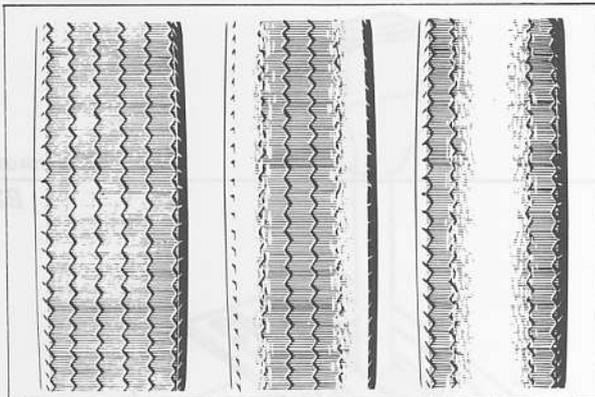
1700.063

# On lift

## Tires, wheels

Service every 7,500 miles = 12,500 km

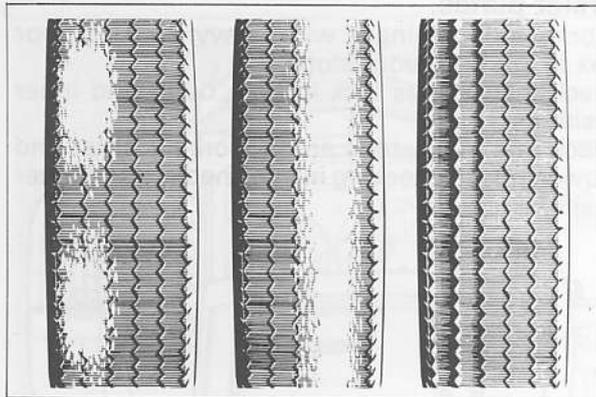
C1



normal wear

air pressure too low

air pressure too high



wheel unbalance

incorrect camber

incorrect toe-in

104769 + 104770

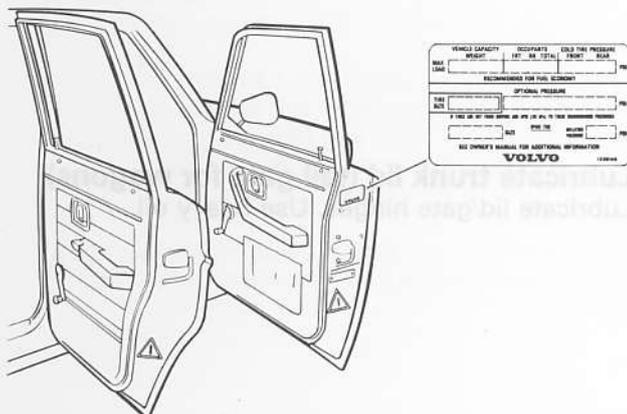
1700.106

### Check tires.

Check tread depth. Minimum allowable is 1 mm (=1/32").

Check wear pattern. It may indicate unbalance, incorrect camber, toe-in or incorrect tire pressure. Check that tires mounted on both front and both rear wheels are the same (radial, cross-ply, tread, studded).

C2



133567

1700.065

### Check tires and tire pressure.

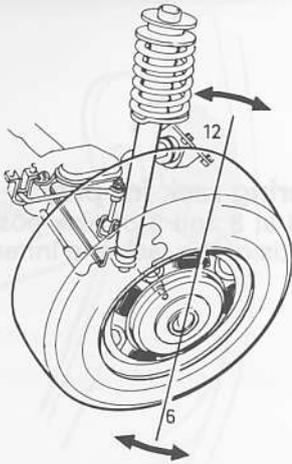
See tire pressure label.

Generally:

**Economy** and max 5 persons in vehicle: use 36 psi front and rear.

**Comfort** and max 3 persons in vehicle: use 26 psi front and 27-30 psi rear.

C3



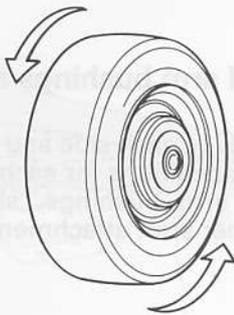
124029

**Check wheel bearing play.**

Rock the wheel at 12 and 6 o'clock position. If there is play, wheel bearings should be serviced immediately.

1700.107

C4



118561

**Check wheel bearing noise.**

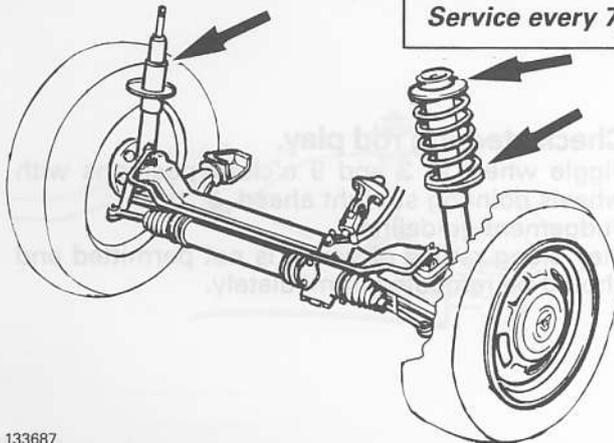
Let the wheel rotate freely after spinning. Check wheel bearing for noise. Wheel bearings which are not adjusted properly can cause noise.

1700.108

**Front end**

D1

Service every 7,500 miles = 12,500 km



133687

**Check front shock absorbers.**

Visually check shock absorbers for leakage.

**NOTE:**

Do not mistake moisture on shock absorber for leakage.

1700.109. M1

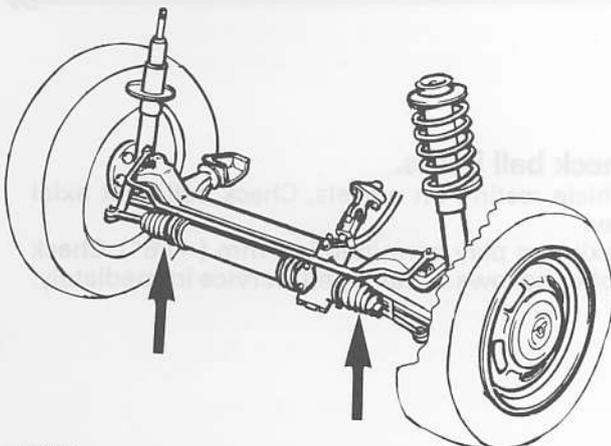
D2

**Check front springs.**

Check spring attachment and condition.

1700.110

D3



133688

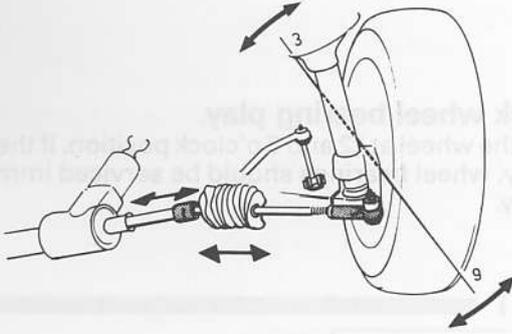
**Check steering gear.**

Check steering gear rubber bellows for damage.

Check that steering gear is firmly attached by trying to move it by hand.

1700.111

D4



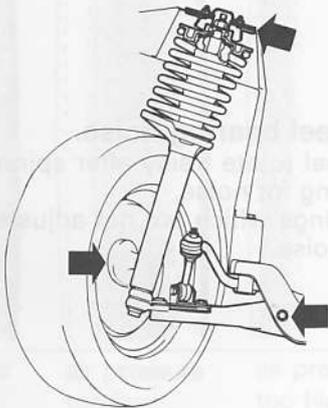
124031

1700.112

**Check steering rack for play.**

Jiggle wheel at 3 and 9 o'clock positions. Check play along axis of the rack and inner steering rod joint.

D5



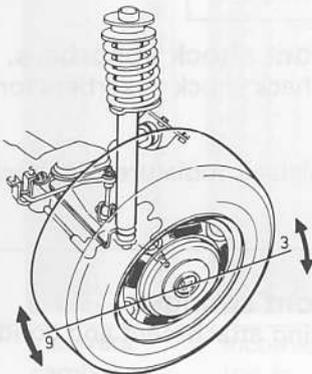
118564

1700.113

**Check control arm bushings and strut attachment.**

Turn wheels fully to each side and jiggle wheel at 12 and 6 o'clock positions for each extreme. Check control arm bushings, shock absorber spindle and upper strut attachment for play.

D6



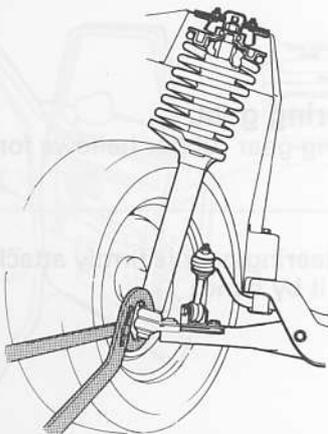
124030

1700.114

**Check steering rod play.**

Jiggle wheel at 3 and 9 o'clock positions with wheels pointing straight ahead. Judgement guideline: Play along radius of wheel is not permitted and should be remedied immediately.

D7



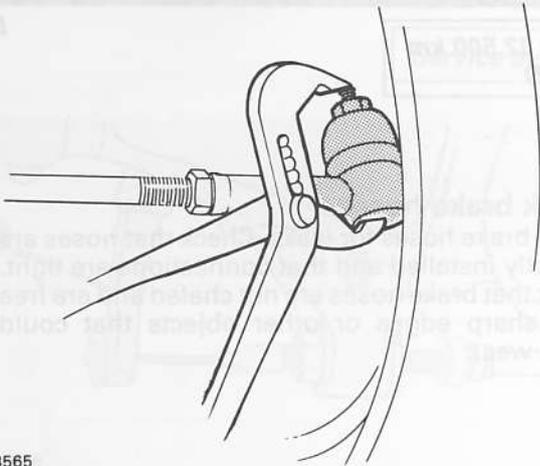
118564

1700.115

**Check ball joints.**

Vehicle resting on wheels. Check ball joint axial play. Maximum play permitted is 3 mm (=1/8"). Check rubber bellows. If damaged, service immediately.

D8



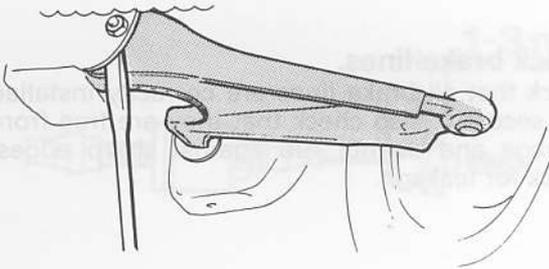
118565

1700.116

**Check steering rod ends.**

Check rubber seals for damage. Check that nuts are locked. If not, correct immediately. Check steering rod for damage. Jiggle with a pair of pliers. Check that joint does not have any wear. Squeeze joints with a pair of pliers to check for axial play, as shown in illustration. Rubber seal damaged = service immediately. Rod damaged = service immediately. Joint worn = service immediately. Maximum allowable axial play for joint = 3 mm (=1/8").

D9



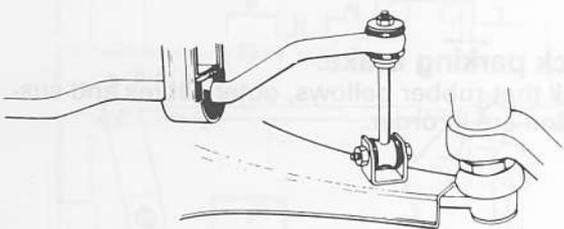
118566

1700.117

**Check control arms.**

Check control arms for damage. Check control arm bushings using a pry bar as shown in illustration. Check for wear, cracks or other damage. Control arm damaged = service immediately. Bushing play = service immediately. Bushing damaged = service immediately.

D10



118567

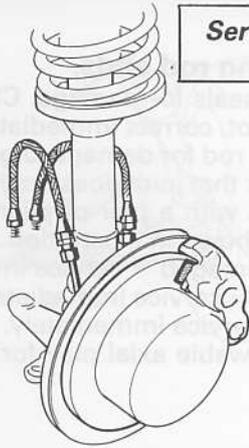
1700.118

**Check stabilizer bar and links.**

Check attachment and rubber bushings.

## Brakes

E1



Service every 7,500 miles = 12,500 km  
EXCEPT AS STATED

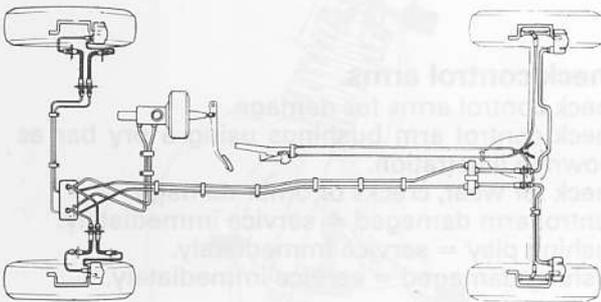
### Check brake hoses.

Check brake hoses for leaks. Check that hoses are correctly installed and that connections are tight. Check that brake hoses are not chafed and are free from sharp edges or other objects that could cause wear.

118507

1700.092

E2



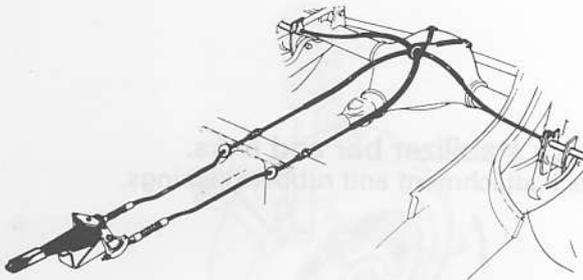
### Check brake lines.

Check that all brake lines are correctly installed and secured. Also check that they are free from damage and do not rub against sharp edges. Check for leakage.

129396

1700.093

E3



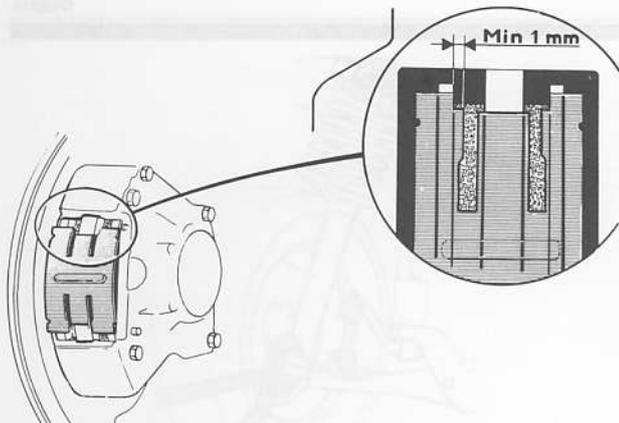
### Check parking brake.

Check that rubber bellows, outer cables and suspension are in order.

129570

1700.119

E4



Service at:  
15-30-45-60-75-90-thousand miles  
25-50-75-100-125-150-thousand km  
Intervals: 15,000 miles = 25,000 km

### Check wheel brakes.

Remove wheels. Check pad thickness with mirror and wire gauge 3 mm = 0.12".

If pad thickness is less than 3 mm (wire gauge cannot be inserted), pads are considered worn.

If wire gauge fits but little clearance is left, pads will have to be replaced within less than 15,000 miles.

Check for signs of leakage at caliper or connection.

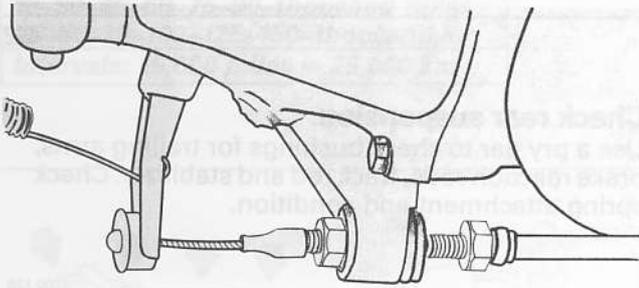
118612

1700.120

**Power transmission**

F1

Service every 7,500 miles = 12,500 km



133689

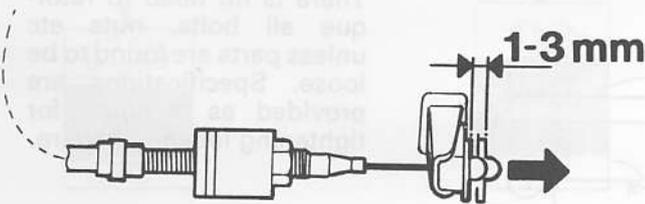
**Diesel.**

**Check clutch play.**

Check free play of clutch fork. It should be 3-5 mm = 1/8"-3/16".

1700.121. M1

F2



133690

**B21F-Turbo+ B23F.**

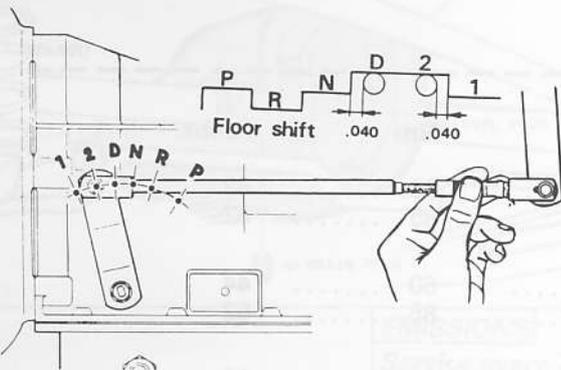
**Clutch negative play.**

Throw-out bearing has a small pre-load applied by a spring at pedal bracket. Pedal and clutch fork must have a free movement rearward (=negative play) to allow for wear.

Free movement rearward should be 1-3 mm = approx. 5/64".

1700.122

F3



118571

**Automatic transmission:**

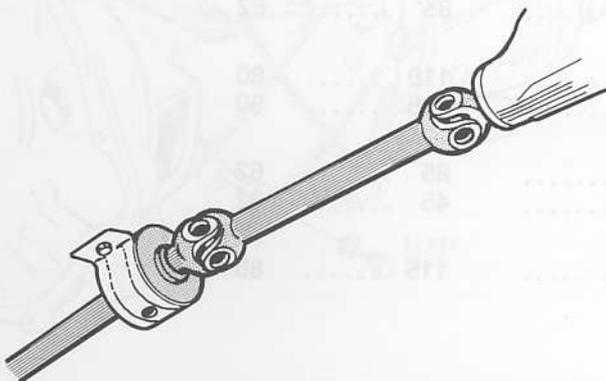
**Adjust shift control.**

Clearance between positions D and N shall be the same as clearance between position 2 and 1.

If necessary, adjust at the bottom end of gear selector.

1700.123

F4



**Check propeller shaft and support bearings.**

Check that U-joint bolts are tight. Turn shafts to find out if U-joints are worn.

Check support bearings and retainer for play.

Check that rubber bellows are not worn or damaged and are correctly installed.

1700.124

**Rear end**

Service every 7,500 miles = 12,500 km

G1

G2

**Check rear shock absorbers.**

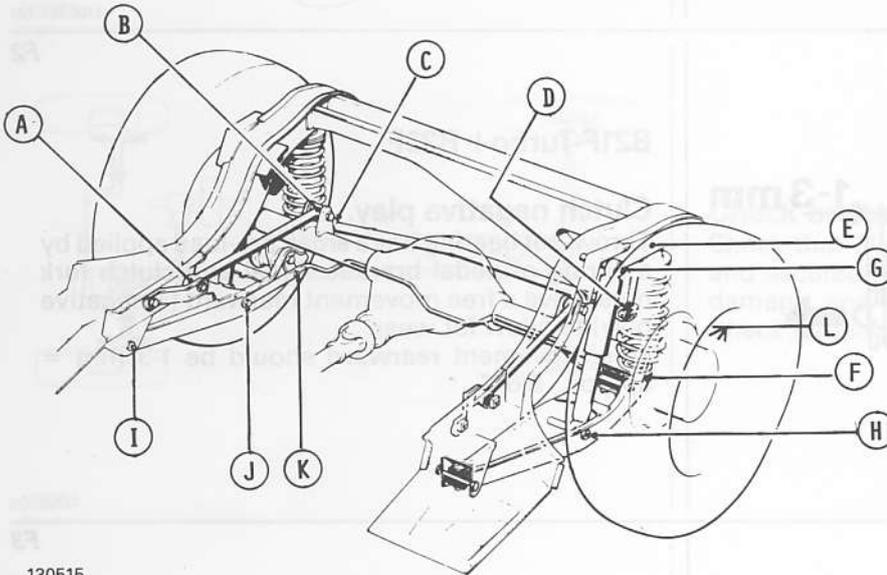
Manually check shock absorber attachment. Check for leaks. Do not mistake moisture on shock absorber for leakage.

1700.125. M1

**Check rear suspension.**

Use a pry bar to check bushings for trailing arms, brake reaction rods, track rod and stabilizer. Check spring attachment and condition.

1700.128



130515

1700.489

**NOTE:**

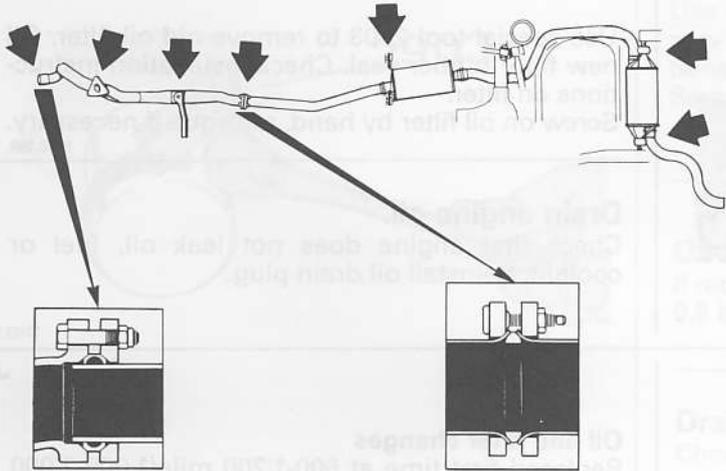
There is no need to retorque all bolts, nuts etc unless parts are found to be loose. Specifications are provided as a guide for tightening loose hardware.

	Nm	ft. lbs.
<b>Reaction rod:</b>		
A Body attachment .....	85	62
B Rear axle attachment .....	85	62
<b>Track rod (Panhard rod):</b>		
C Rear axle attachment .....	60	44
D Body attachment .....	85	62
<b>Rear Spring:</b>		
E Upper attachment .....	45	32
F Lower attachment .....	19	14
<b>Shock absorber:</b>		
G Upper attachment .....	85	62
H Lower attachment .....	85	62
<b>Trailing arm:</b>		
I Body attachment .....	110	80
F Rear attachment (at rear axle) .....	125	90
<b>Stabilizer:</b>		
J Front attachment (=shock absorber) .....	85	62
K Rear attachment .....	45	32
<b>Wheels:</b>		
L Nuts, tightened criss-cross .....	115	85

**Service at:**  
 15-30-45-60-75-90-thousand miles  
 25-50-75-100-125-150-thousand km  
 Intervals: 15,000 miles = 25,000 km

**Check exhaust system.**  
 Check condition, alignment and suspension.

1700.238

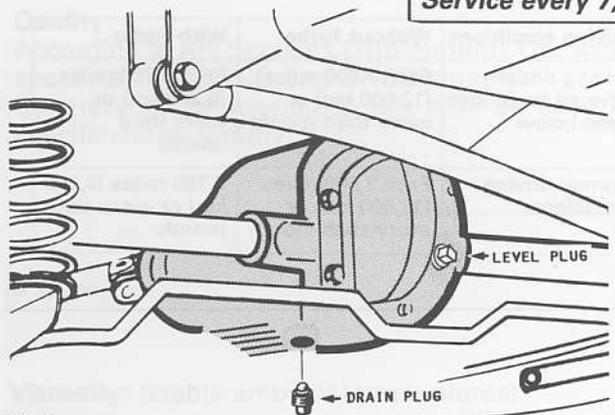


D24 Diesel

129575

**EMISSIONS**  
 Service every 7,500 miles = 12,500 km

11



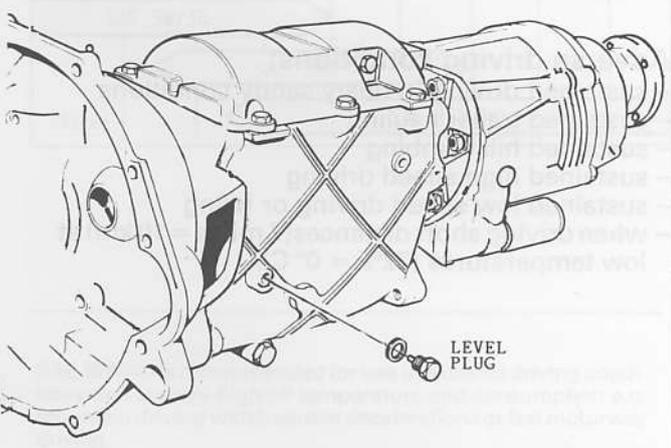
**Check rear axle.**  
 Check for leakage and oil level.  
 Oil level should be up to filler plug hole.  
**Fluid type:** API GL-5 (MIL-L-2105 B or C)  
**Viscosity:** SAE 90  
 When temperature is steadily below 15°F = -10°C,  
 use API GL-5 SAE 80 W oil.  
 Use oils with proper additives for cars equipped  
 with limited slip differential.

133573

1700.098

**EMISSIONS**  
 Service every 7,500 miles = 12,500 km

12



**Manual 4-speed transmission with overdrive, M46.**  
 Check for leakage and oil level. Oil level should be up to filler plug hole. Transmission and overdrive are lubricated by the same oil.  
**Fluid type:** Automatic Transmission Fluid type F or G.

133681

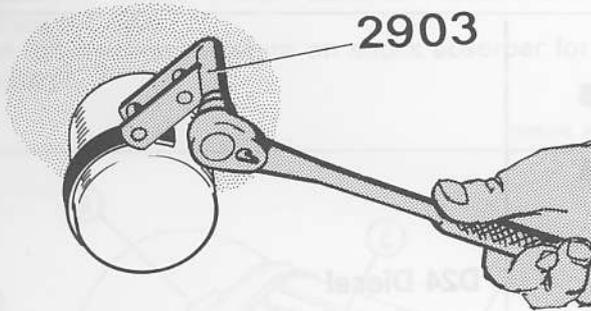
1700.102

## Gasoline engines

### EMISSIONS

Service every 7,500 miles = 12,500 km

**NOTE: Turbo frequency, twice as often.**



133682

### Replace oil filter.

J1

Oil filter is normally replaced at 15,000 mile intervals. However, any adverse conditions require oil filter change more often.

Use special tool 2903 to remove old oil filter. Oil new filter rubber seal. Check installation instructions on filter.

Screw on oil filter by hand, retorque if necessary.

1700.189. M1

### Drain engine oil.

Check that engine does not leak oil, fuel or coolant. Reinstall oil drain plug.

1700.188

## Gasoline engines

### Quality:

According to API Service SF (minimum). (Oils with specifications SF, SF/CC and SF/CD comply.)

Synthetic or semisynthetic oils may be used if specifications comply.

Fuel-saving oils are recommended. When using such oils, oil change intervals recommended by Volvo **must** be followed.

1700.190

### Oil and filter changes

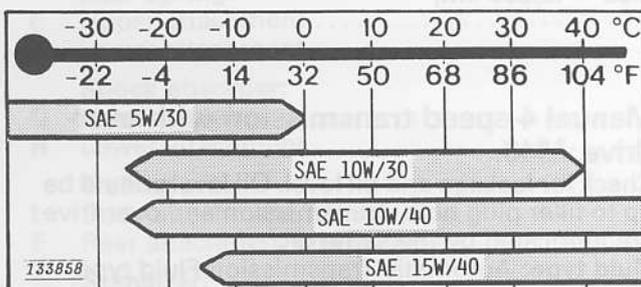
Replaced first time at 600-1,200 mile(1,000-2,000 km) inspection.

**Subsequent changes:** Mileage or time interval (whichever comes first). See chart below:

Driving conditions	Without Turbo	With Turbo
Driving under adverse conditions – see below	Each 7,500 miles (12,500 km) or every third month	Each 3,750 miles (6,250 km) or every third month
Normal driving conditions	Each 7,500 miles (12,500 km) or every sixth month	3,750 miles (6,250 km) or every sixth month.

1700.197. M1

### Viscosity: (stable ambient temperatures)



133858

SAE 15W/40 is recommended for use in extreme driving conditions that involve high oil temperature and consumption e.g. mountain driving with frequent decelerations or fast motorway driving.

Note however the lower temperature limits.

1700.192

### Adverse driving conditions:

- sustained driving in dusty/sandy conditions
- sustained trailer hauling
- sustained hill climbing
- sustained high speed driving
- sustained low speed driving or idling
- when driving short distances(7 miles = 10 km) at low temperatures (32°F = 0° C).

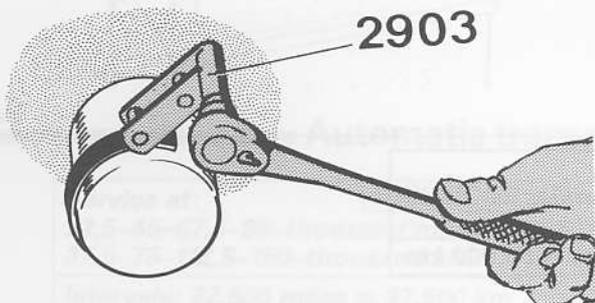
1700.198

**Diesel engine**

**EMISSIONS**

Service every 7,500 miles = 12,500 km

J3



**Replace oil filter.**

Oil filter is normally replaced at 15,000 mile intervals, However, any adverse conditions require oil filter change more often.

Use special tool 2903 to remove old oil filter. Oil new filter rubber seal. Check installation instructions on filter.

Screw on oil filter by hand, retorque if necessary.

1700.189

**Oil filter, diesel.**

If replacing oil filter separately (no oil change) add **0.8 liter = 0.85 US qt.**

1700.196. M1

J4

**Drain engine oil.**

Check that engine does not leak oil, fuel or coolant. Reinstall oil drain plug.

1700.188

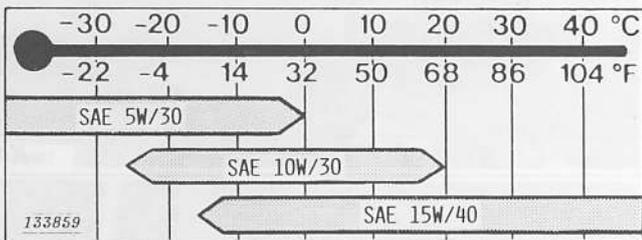
133682

**Quality:**

According to API Service CD (minimum). Oils with specifications SE/CD and SF/CD comply. Synthetic or semisynthetic oils may be used if specifications comply.

1700.193.M1

**Viscosity: (stable ambient temperatures)**



1700.194

**Oil and filter changes.**

Replaced first time at 600-1,200 mile (1,000-2,000 km) inspection.

**Subsequent changes:** Mileage or time interval (whichever comes first). See chart below:

Driving conditions	Oil change interval
Driving under adverse conditions - see below	Each 7,500 miles (12,500 km) or every third month with oil filter change every second oil change.
Normal driving conditions	Each 7,500 miles (12,500 km) or every sixth month with oil filter change every second oil change.

**Adverse driving conditions:**

- sustained driving in dusty/sandy conditions
- sustained trailer hauling
- sustained hill climbing
- sustained high speed driving
- sustained low speed driving or idling
- when driving short distances (7 miles = 10 km) at low temperatures (32°F = 0°C).

1700.198

**Capacities:**

**D24:**

Excl. oil filter: **6.2 liters** = 6.6 US qts

Incl. oil filter: **7.0** = 7.4 US qts

Difference between Min. and Max: **1.0 liters** = 1 US qt.

SAE 15W/40 is recommended for use in extreme driving conditions that involve high oil temperature and consumption e.g. mountain driving with frequent decelerations or fast motorway driving. Note however the lower temperature limits.

1700.192

031.202

## Engine cooling system

K1

Service every 7,500 miles = 12,500 km

Volvo all weather Anti-Freeze Type C (blue-green) should be used all year round. Cooling system should always contain water plus anti-freeze, even during summer. Experience has also shown that extremely weak anti-freeze solutions (10-20%) provide poor rust protection. For this reason ratio of anti-freeze/summer coolant to water should be 1 to 1.

### Coolant: check anti-freeze.

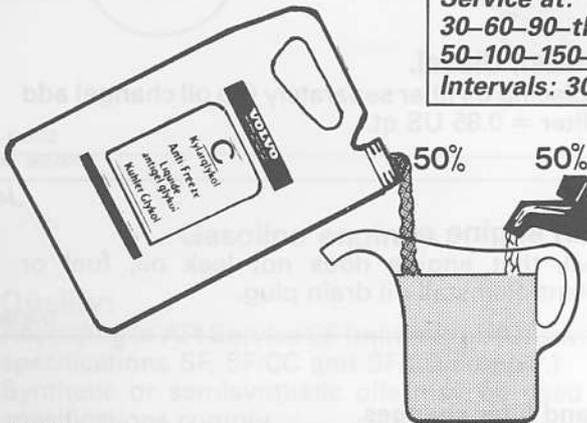
Check coolant freezing point. Fill coolant (50% water, 50% anti-freeze) to correct level.

1700.169

1700.173

Service at:  
30-60-90-thousand miles  
50-100-150-thousand km  
Intervals: 30,000 miles = 50,000 km

K2



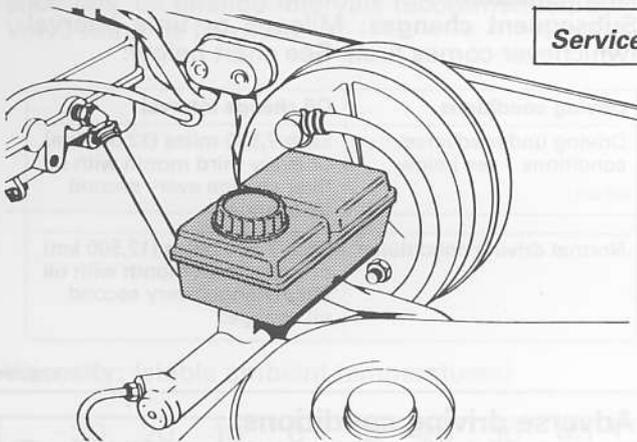
133542

1700.171

## Fluids

Service every 7,500 miles = 12,500 km

K3



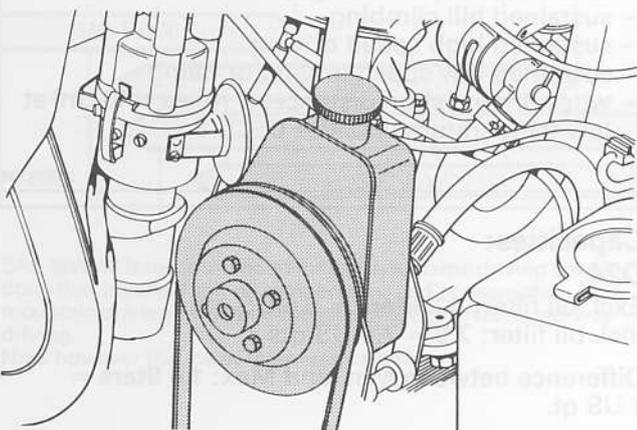
133543

1700.177

### Brake fluid level.

In engine compartment, check brake lines and brake fluid reservoir for leaks. Check brake fluid level without removing cap. If brake fluid has to be refilled, use brake fluid according to specification DOT 4.

K4



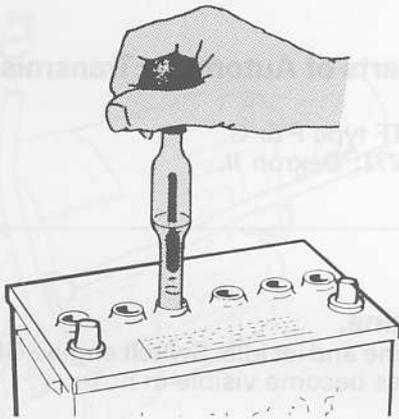
133544

1700.178. M1

### Check oil level of power steering reservoir.

If necessary, fill Automatic Transmission Fluid to normal level. Check fluid level with engine idling while fluid is still hot from driving. Wipe reservoir clean. Fluid level should be within markings on dipstick which is attached to cover.

K5



133571

### Battery.

Check battery electrolyte level. (Fill with distilled water only.)

Check battery holddown bracket for tightness and that cables are secured.

1700.176

## Automatic transmission: replace fluid

L1

<b>Service at:</b> 22,5–45–67,5–90–thousand miles 37,5–75–112,5–150–thousand km	<b>EMISSIONS</b>
<b>Intervals: 22,500 miles = 37,500 km</b>	

For Volvos with automatic transmission, an optional Volvo automatic transmission oil cooler must be installed when trailer weight exceeds 2,000 lbs = 908 kgs.

**Overdrive should not be used while towing.**

Observe legal requirements of the state in which the vehicles are registered.

### Check condition of Automatic Transmission Fluid.

Discoloration and smell can be caused by heavy engine loads, such as towing.

If this is the case, remove and clean oil pan, oil strainer and particle magnet. Follow procedures outlined in L7–L10.

Under normal conditions, drain fluid by removing drain plug.

Follow procedures outlined in L2–L6.

1700.490

1700.500

## Draining through drain plug

L2



136087

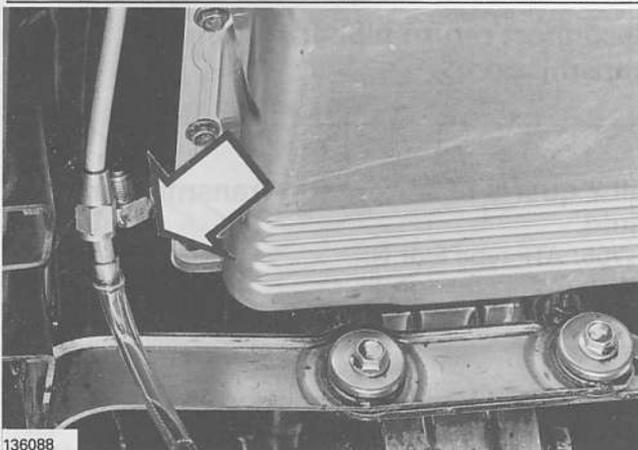
### Drain automatic transmission.

Remove drain plug and drain. Reinstall drain plug.

#### WARNING:

Oil can be scalding hot if vehicle was recently driven.

1700.491



136088

### Disconnect oil cooler return pipe from rear end of transmission.

Connect one end of a transparent plastic hose to oil cooler return pipe. Let other end of plastic hose end in engine bay with a drip pan beneath hose end.

1700.492

L4

**Fill 2 quarts of Automatic Transmission Fluid.**

BW55: ATF type F or G.  
AW70/AW71: Dexron II.

1700.493

**Run engine.**

Start engine and let idle. Switch engine OFF when air bubbles become visible in hose.

1700.494

**Fill 2 quarts of Automatic Transmission Fluid.**

BW55: ATF type F or G.  
AW70/AW71: Dexron II.

1700.493

**Run engine.**

Start engine and let idle. Switch engine OFF when air bubbles become visible in hose.

1700.494

L5

**Check condition of Automatic Transmission Fluid.**

Fluid must not carry impurities, discoloration or smell.

1700.495

L6

**Reconnect return pipe to automatic transmission.**

1700.496

**Fill 2 quarts of Automatic Transmission Fluid.**

BW55: ATF type F or G.  
AW70/AW71: Dexron II.

1700.493

**Adjust fluid level as described in L11.**

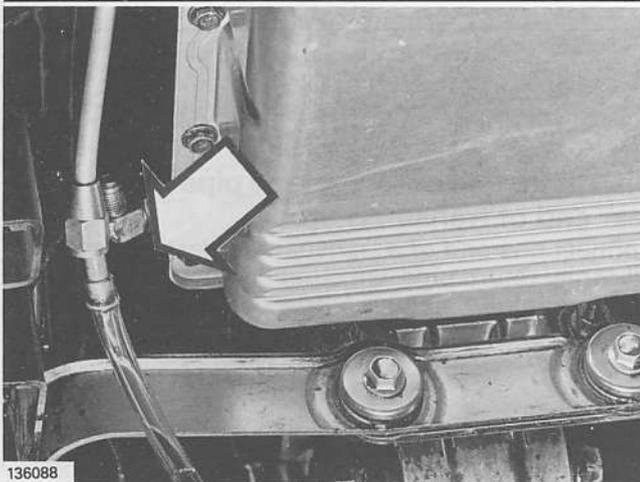
1700.497



136102



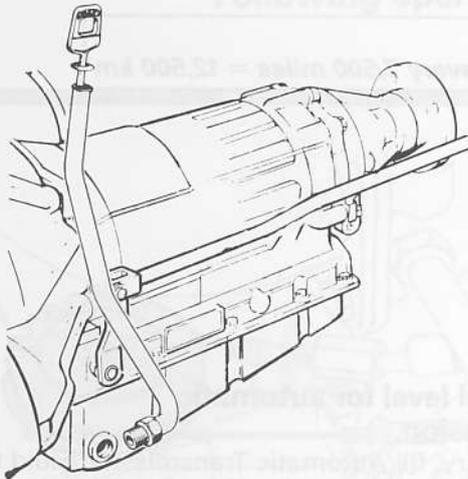
133906



136088

**Removing oil pan**

L7



133692

**Drain automatic transmission.**

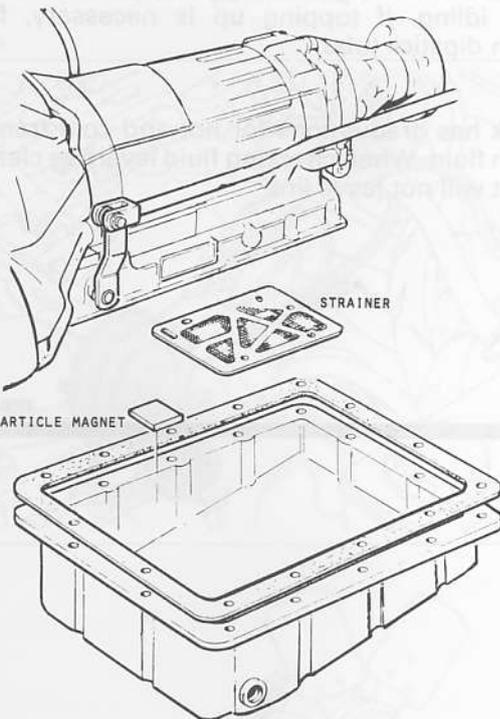
Disconnect filler tube at pan and drain.

**WARNING!**

Oil can be scalding hot if vehicle was recently driven.

1700.454

L8



133693

**Remove oil pan.**

Clean oil pan, strainer and particle magnet.

**NOTE!**

Also clean oil cooler.

1700.455. M1

L9

**Reinstall oil pan and filler tube.**

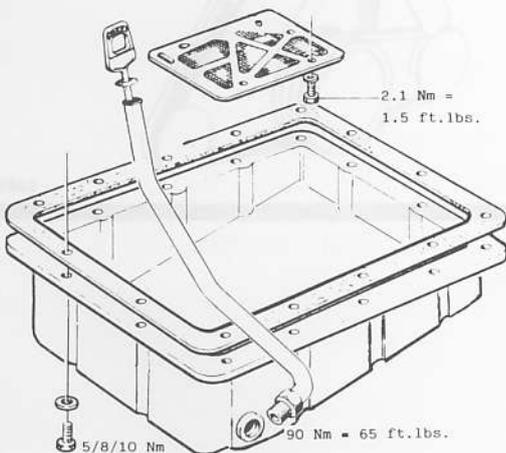
Apply oil to pan gasket prior to installation. Use new gasket.

**Torques:**

	Nm	ft.lbs.
– Filler tube connector.....	90	65
– Pan bolts:		
BW55, yellow marking .....	8	6
BW55, blue marking .....	10	7
AW70/AW71 .....	5	3.5

1700.456

L10



133694

**Fill oil.**

Total oil capacity cannot be refilled. Approx. 3.4 liters = 3.6 qts was drained, the rest being stored in torque converter and control systems.

Fill 2.9 liters = 3 US qts of Automatic Transmission Fluid:

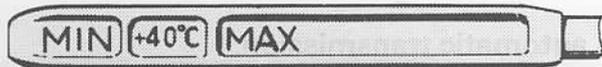
- BW55: ATF type F or G.
- AW70/AW71: Dexron II.

**DO NOT** start engine until oil is filled.

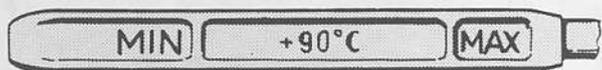
Start engine and adjust oil level as described in next operation.

1700.457. M1

### Dipstick markings.



Cold oil – oil temperature +105°(+40°C). This is a normal temperature for transmission after idling for about 10 minutes. At oil temperature below +40°C, level may be below MIN mark.



Warm oil – oil temperature +195°F(+90°C). This temperature is obtained when driving for about 30 minutes. At oil temperature above +90°C, level may be above MAX mark.

Service every 7,500 miles = 12,500 km

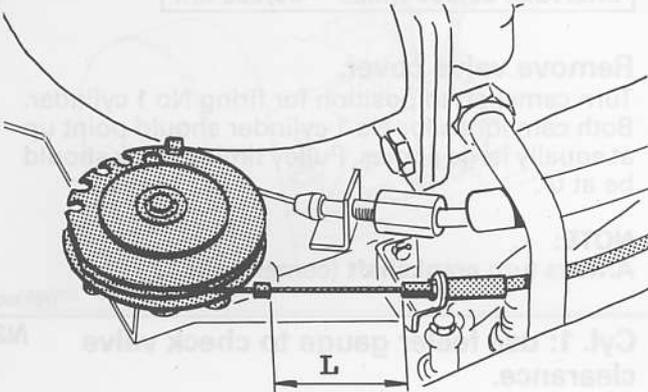
### Check oil level for automatic transmission.

If necessary, fill Automatic Transmission Fluid to normal level. When checking fluid level, car should be on level ground in PARK position with engine idling. If topping up is necessary, fill through dipstick tube.

#### NOTE:

Dipstick has graduations for hot and cold transmission fluid. When checking fluid level use clean rag that will not leave lint.

Following operations refer to B21 and B23 (all)



130636

Service every 7,500 miles = 12,500 km

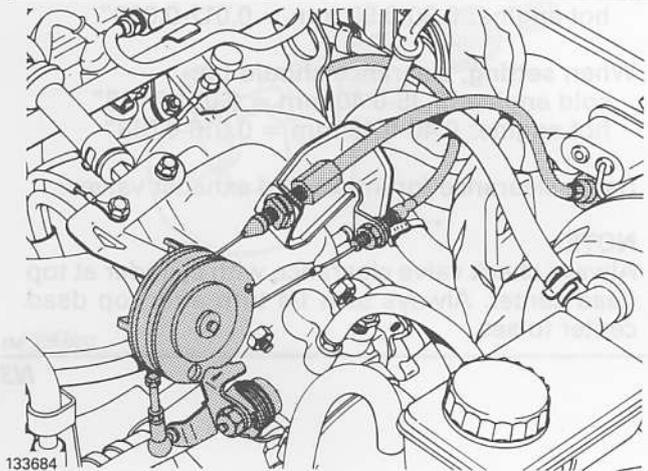
M1

**Automatic transmission:  
Adjust kickdown cable.**

Check cable length at closed and open throttle (engine off). Adjust if necessary. Open throttle measurement should be checked with throttle pedal in car depressed, NOT by actuating linkage by hand.

Closed throttle: L = 1 mm = 0.04"  
Open throttle: L = 51 mm = 2.01"

1700.185



133684

Service every 7,500 miles = 12,500 km

M2

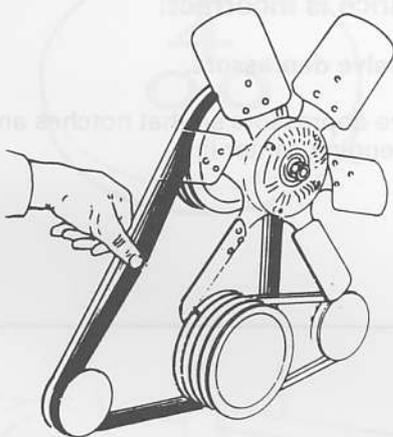
**Check engine controls**

Check joints, bushings and throttle shaft for wear. Check that cable, links and springs are serviceable and correctly installed. Adjust play. Lubricate joints, using a light oil.

**NOTE:**

Do not apply lubricant to cable.

1700.271



129562

Service at:	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
Intervals: 30,000 miles = 50,000 km	

M3

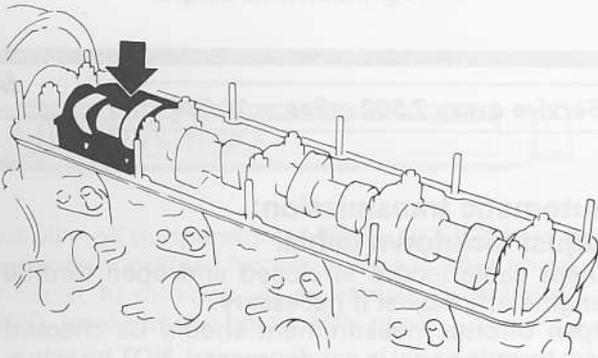
**Check drive belt tension.**

If necessary adjust. It should be possible to depress drive belts 5-10 mm = 3/16-5/16" halfway between pulleys.

1700.241

## B21 and B23 adjust valves

N1



120777

<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
Intervals: 30,000 miles = 50,000 km	

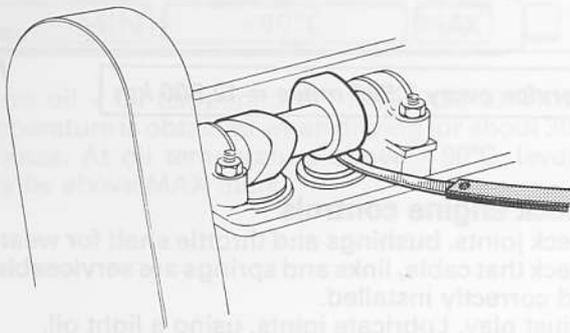
### Remove valve cover.

Turn camshaft to position for firing No 1 cylinder. Both cam lobes for No 1 cylinder should point up at equally large angles. Pulley timing mark should be at 0°.

### NOTE:

Always turn **crankshaft** (center bolt).

1700.400



118668

### Cyl. 1: use feeler gauge to check valve clearance.

N2

When **checking**, clearance should be:  
cold engine: 0.25-0.45 mm = 0.010-0.018"  
hot engine: 0.30-0.50 mm = 0.012-0.020"

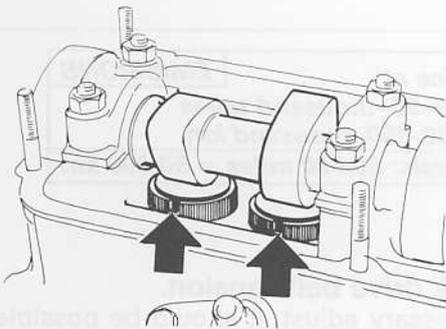
When **setting**, clearance should be:  
cold engine: 0.35-0.40 mm = 0.014-0.016"  
hot engine: 0.40-0.45 mm = 0.016-0.018"

Same clearance for intake and exhaust valves.

### NOTE:

Always check valve clearance with cylinder at top dead center. Always turn 1/4 turn after top dead center to **set**.

1700.401. M1



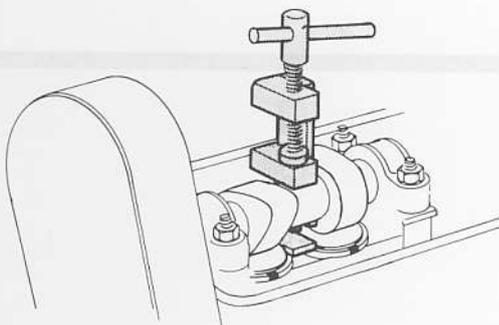
120778

### If clearance is incorrect:

#### Line up valve depressors.

Turn valve depressors so that notches are at right angle to engine center line.

1700.402



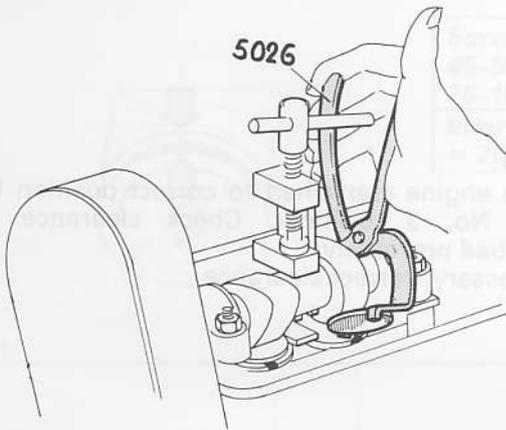
118669

### Attach tool 5022 and depress valve depressors.

Screw down tool spindle until depressor groove is just above edge and accessible with pliers.

1700.403

N5

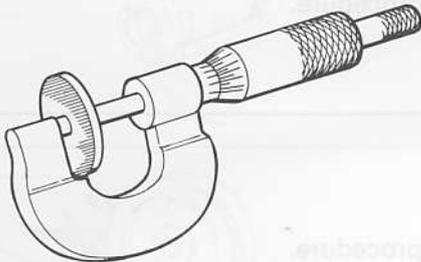


118670

Use tool 5026 to remove disc.

1700.404

N6



118671

Use micrometer to measure disc thickness. Calculate thickness of disc to be used.

Example:

Measured clearance 0.50 mm. Correct clearance 0.40 mm. Difference +0.10 mm.

Measured thickness on existing disc: 3.80 mm. Correct thickness on new disc will thus be 3.80 + 0.10 mm = 3.90 mm.

1700.405

N7



119745

Discs available.

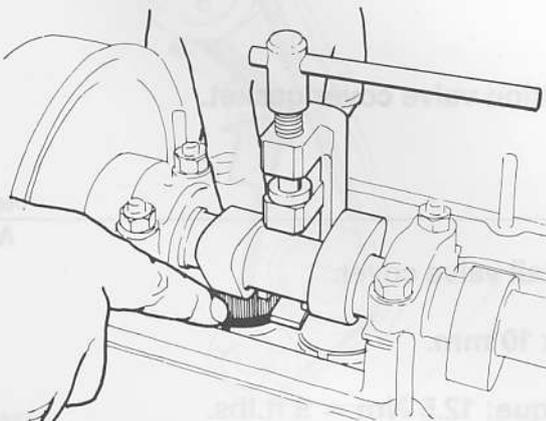
From 3.30 to 4.50 mm in increments of 0.05 mm.

NOTE:

Install discs with marks down.

1700.406

N8



120779

Position new disc.

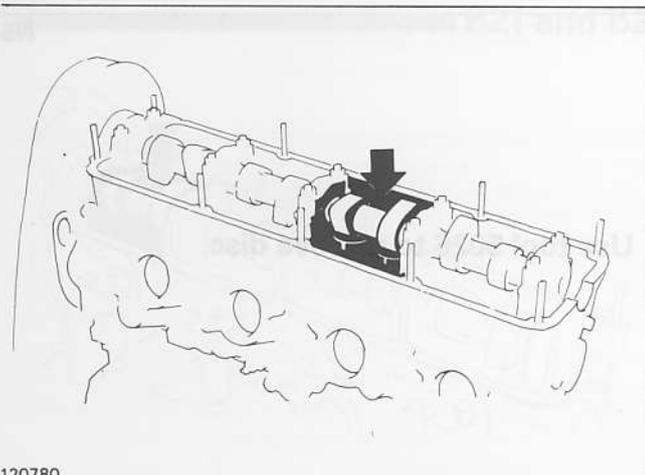
It should be oiled.

1700.407

N9

Remove tool 5022.

1700.408

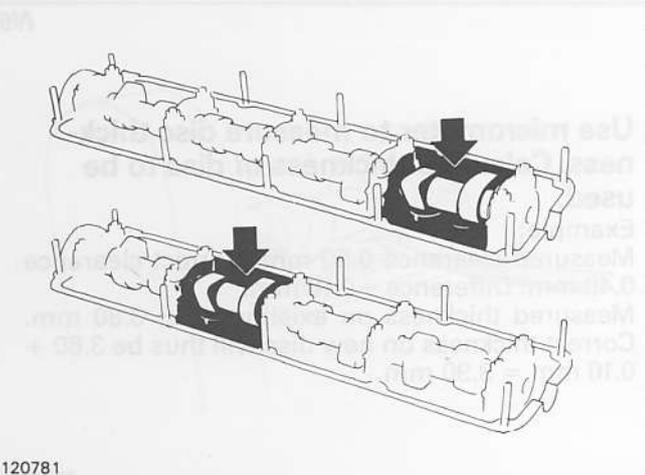


N10

**Cyl. 3:**

Rotate engine crankshaft to correct position for firing No. 3. cylinder. Check clearance as described previously. If necessary, correct clearance.

1700.409



N11

**Cyl. 4:**

Repeat procedure.

1700.410

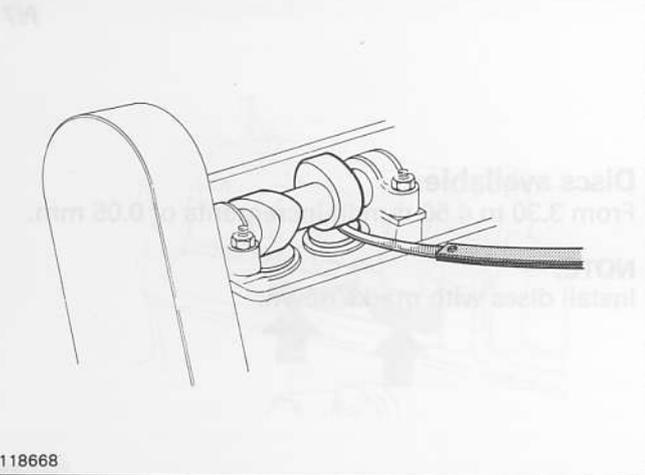
N12

**Cyl. 2:**

Repeat procedure.

1700.411

N13



**Re-check on all cylinders.**

Turn engine a few turns before checking.

1700.412

N14

**Position valve cover gasket.**

1700.413

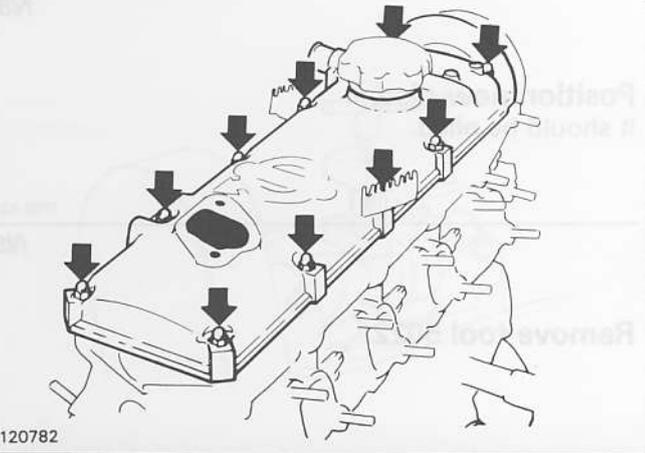
**Install valve cover.**

N15

Hex 10 mm.

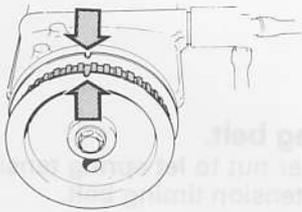
Torque: 12.5 Nm = 9 ft.lbs.

1700.414



## B21 and B23: replace timing gear belt

01



**Service at:**  
45-90-thousand miles  
75-150-thousand km  
**Intervals: 45,000 miles**  
**= 75,000 km**

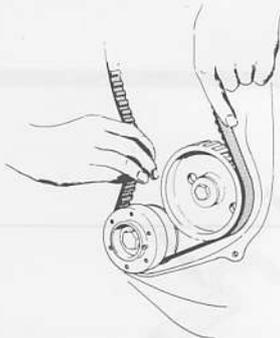
### Line up timing belt.

Remove valve cover and rotate engine to line up camshaft marks (shown), crankshaft and intermediate shaft marks. Remove old belt.

124187

1700.416

02



### Install new timing belt.

Timing belt should be in good condition and free from grease and dirt.

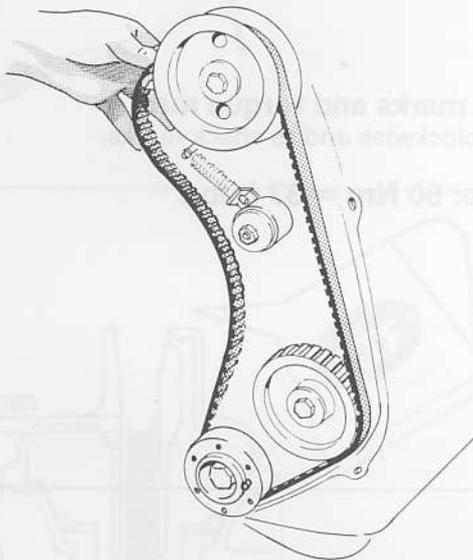
First place timing belt on crankshaft sprocket and then on intermediate shaft sprocket.

New belts have yellow marks. Two lines on timing belt should fit toward crankshaft marks. Next mark should then fit toward intermediate shaft marks, etc.

124188

1700.417

03

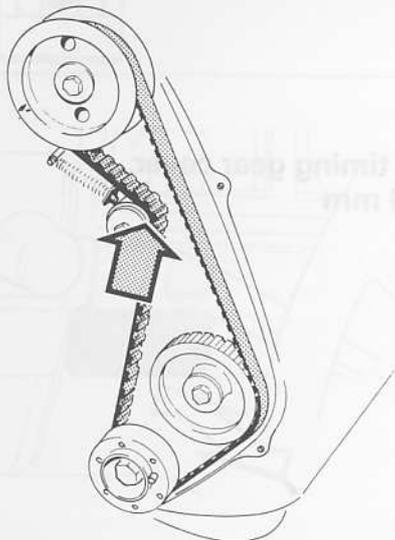


Stretch on tension side and fit timing belt on camshaft sprocket.

124189

1700.418

04



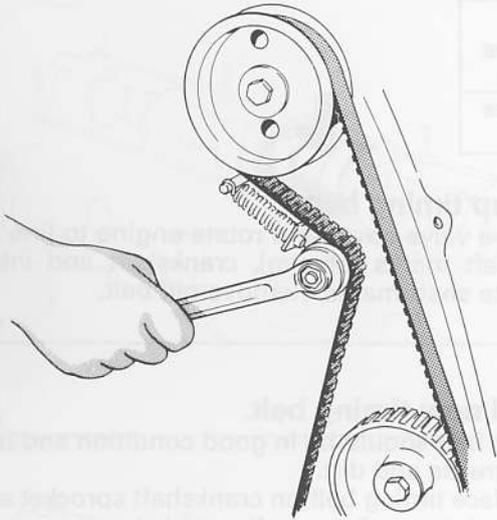
### Fit timing belt on tensioner roller.

Use of tools may damage timing belt.

124190

1700.419

05



**Tension timing belt.**

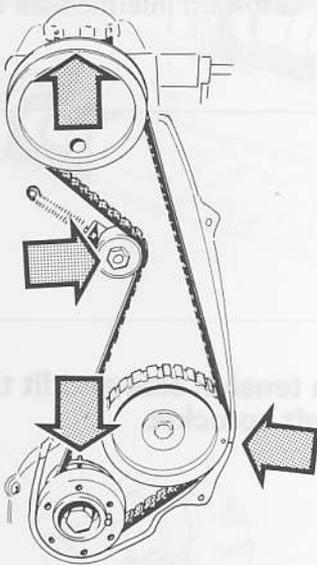
Loosen tensioner nut to let spring tension act on roller and thus tension timing belt. Tighten nut.

**Hex 17 mm**

124191

1700.420

06



**Check marks and torque nut.**

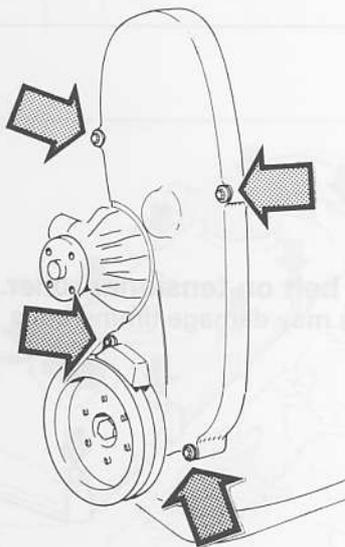
Rotate clockwise and re-check marks.

**Torque: 50 Nm = 37 ft.lbs.**

124192

1700.421

07



**Install timing gear cover.**

**Hex 10 mm**

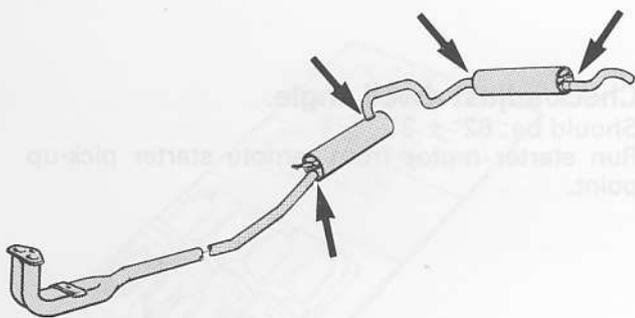
124193

1700.422

## B21A/Canada

Service every 12,500 km

P1



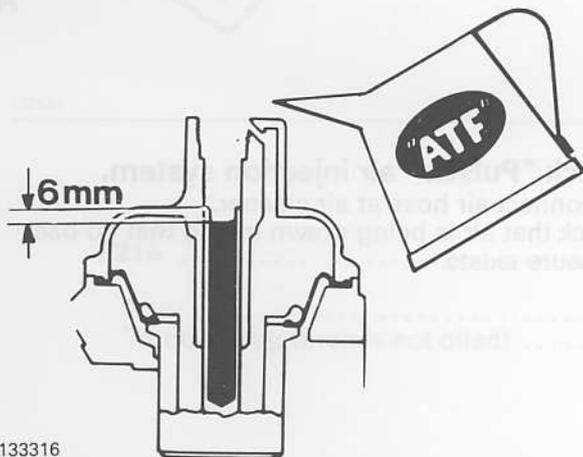
133700

### Check exhaust system.

Check condition, alignment and suspension.

1700.238

P2



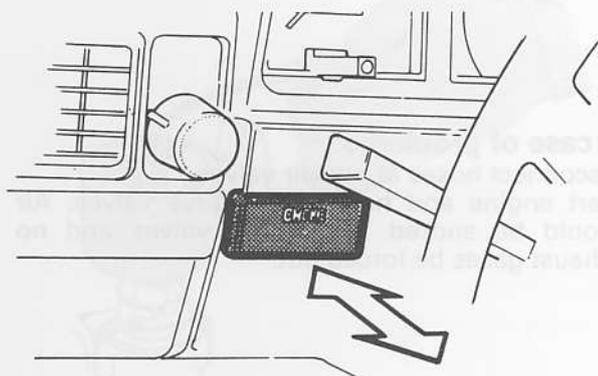
133316

### Check damper oil level.

Automatic Transmission Fluid to 6 mm from top of cylinder.

1700.217

P3



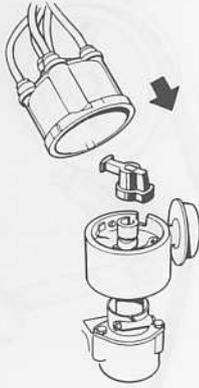
129569

### Check choke control.

Check operation of choke control. Check that indicator light comes on when choke control is engaged.

1700.218

P4



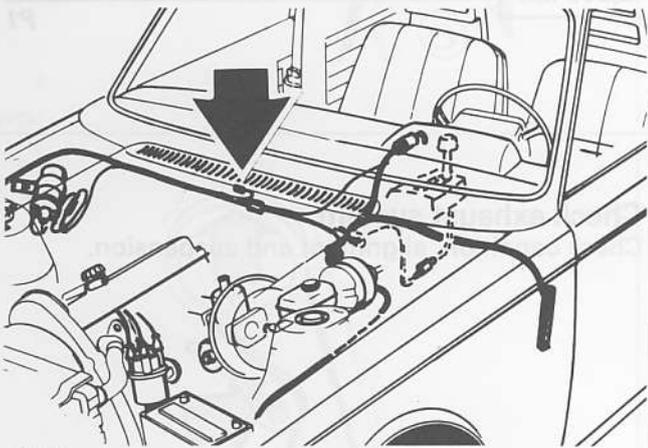
**Breaker points, check condition.**  
Worn points may indicate defective capacitor.

**Rotor, cap and cables, check condition.**  
Also check rubber seals and attachments

118676

1700.245

P5

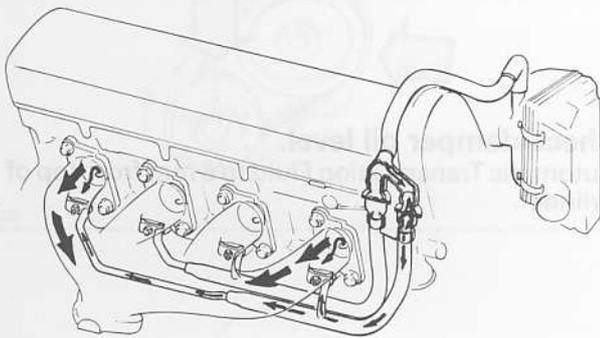


**Check/adjust dwell angle.**  
Should be:  $62^\circ \pm 3^\circ$ .  
Run starter motor from remote starter pick-up point.

130695

1700.219

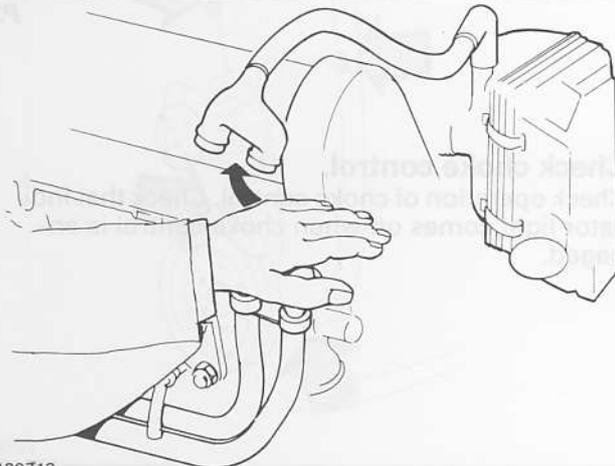
P6



**Check "Pulsair" air injection system.**  
Disconnect air hose at air cleaner.  
Check that air is being drawn in and that no back pressure exists.

127165

1700.254



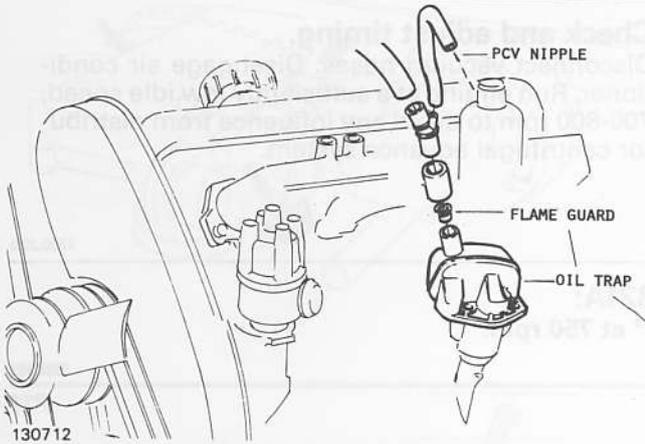
**In case of problems:**  
Disconnect hoses at Pulsair valves.  
Start engine and hold hand above valves. Air should be sucked in through valves and no exhaust gases be forced out.

130713

1700.255

**Service following at:**  
**25-50-75-100-125-150-thousand km**  
**Intervals: 25,000 km**

P7



**NOTE:**

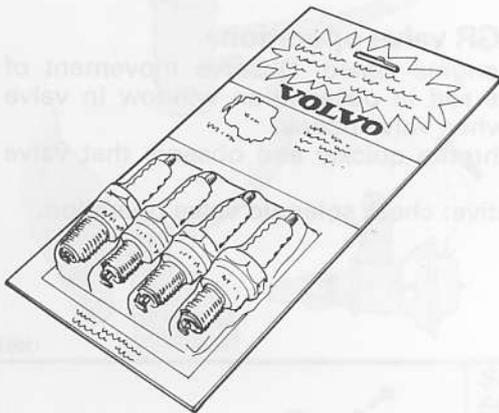
Driving under adverse conditions (for instance city driving under hot conditions) requires service more often (15,000 mile intervals). Volvo recommends cleaning flame guard at 15,000 mile intervals.

**Positive crankcase ventilation.**

Check hoses for condition and clogging. Clean nipple and flame guard.

1700.239

P8



**Replace spark plugs.**

Spark plugs must be tightened to specific torque for proper operation and to avoid damage to threads.

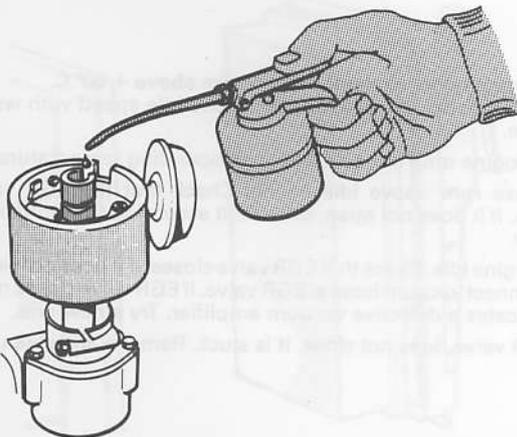
Spark plug removal and installation must be performed when engine is cold (low reading on temperature gauge).

1700.240

<b>B21A</b> .....	Volvo P/N 273592-6 (set of four) or Bosch W7DC
Gap .....	0.7-0.8 mm = 0.028-0.032"
Torque (plug threads not oiled) .....	20-30 Nm = 15-18 ft. lbs.

031.309

P9



**Lubricate distributor.**

Remove rotor and lubricate felt wick in distributor shaft center springly.

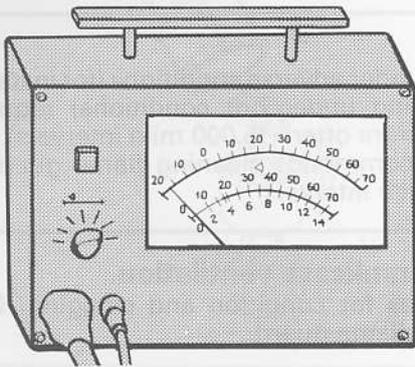
**NOTE:**

Maximum amount of oil required is 1-2 drops.

1700.257

Instruments used are Volvo Mono-Tester or "Magnetic Timing Units" equipped with proper adapter.

1700.205



P10

**Check and adjust timing.**

Disconnect vacuum hoses. Disengage air conditioner. Run engine at a sufficiently low idle speed, 700-800 rpm to avoid any influence from distributor centrifugal advance system.

1700.220

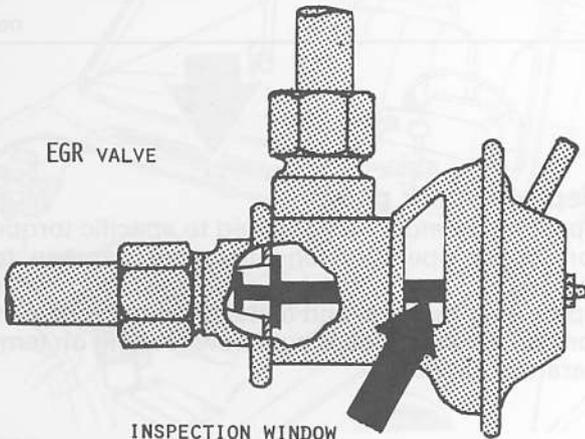
**B21A:**

7° at 750 rpm.

031.301

P11

EGR VALVE



INSPECTION WINDOW

129568

**Check EGR valve operation.**

Increase engine speed. Observe movement of EGR valve rod in observation window in valve housing when valve opens.

Release throttle quickly and observe that valve closes.

If inoperative: check solenoid valve operation.

1700.249

**In case of problems:**

Perform a more thorough function test.

**Function test.**

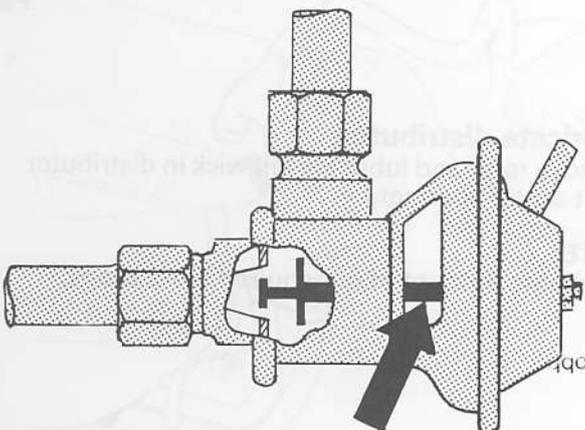
**1. Cold engine, coolant temperature below + 55° C.**

EGR valve should be closed at all speeds with a cold engine. Start engine.

Increase rpm and check that EGR valve does not open. Check by observing control rod, see illustration.

If EGR valve opens, it is an indication that thermostatic valve is defective and should be replaced. It should not open until coolant temperature has reached + 55-60° C = 130-140° F.

1700.250



128708

**2. Warm engine, coolant temperature above + 60° C.**

EGR valve should open at rpms above idle speed with warm engine.

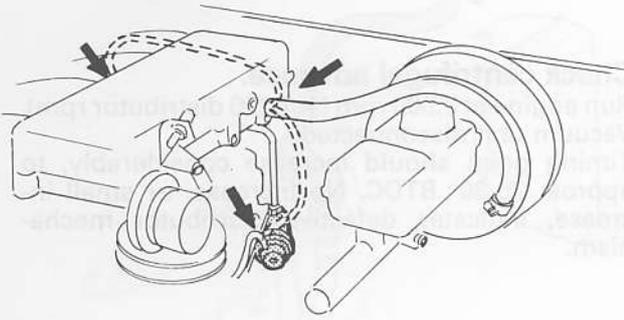
Run engine until it reaches normal operating temperature.

Increase rpm above idle speed. Check that the EGR valve opens. If it does not open, trace fault according to instructions below.

Let engine idle. Check that EGR valve closes. If it does not close, disconnect vacuum hose at EGR valve. If EGR valve closes now, it indicates a defective vacuum amplifier. Try a new one.

If EGR valve does not close, it is stuck. Remove and clean.

1700.251



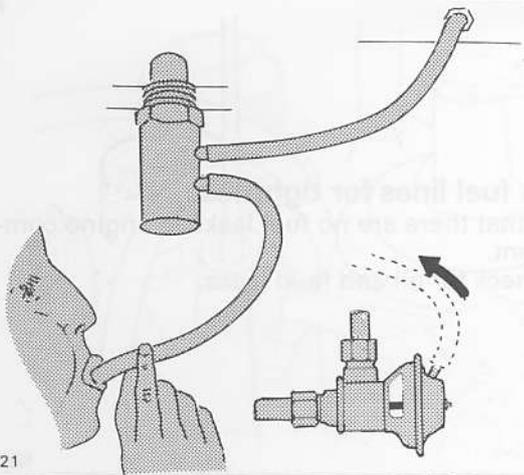
128399

**Alternative test method.**

An alternative test method is to use the strong vacuum created in engine intake manifold at idle. The connection is used for vacuum control of ignition distributor or for power brake unit.

If this vacuum is connected to EGR valve when engine is idling, valve should open. Exhaust gases are diverted to engine and it should run very poorly or stop.

1700.252



128521

**Checking thermostatic valve.**

(Wax thermostat).

Engine at operating temperature but not running.

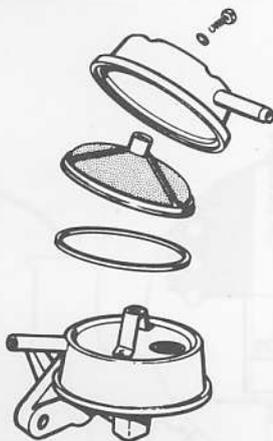
Disconnect vacuum hose at EGR valve and vacuum amplifier (connection marked "R"). Use mouth to blow through and check that thermostatic valve is open and vacuum lines not obstructed.

If thermostatic valve does not open, first check that coolant temperature is high enough to open. Coolant temperature should be well above + 60° C = 140° F.

1700.253

**Service following at:  
50-100-150-thousand km  
Intervals: 50,000 km**

**P12**

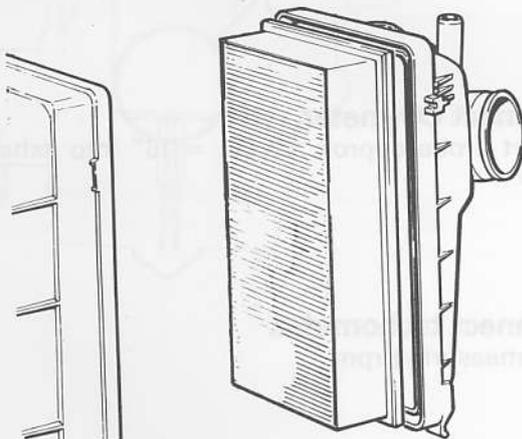


129566

**Clean fuel pump strainer.**

Also clean fuel pump sludge accumulator. Carefully check seal and sealing surfaces before re-installing.

1700.242



130707

**Replace air filter cartridge.**

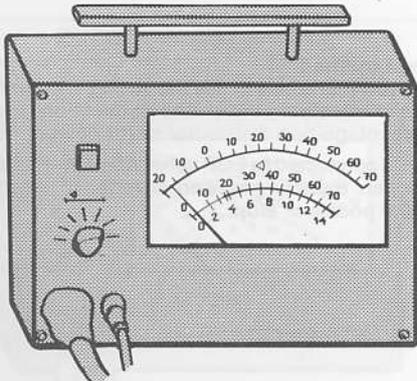
When driving under dirty and dusty conditions, air filter cartridge should be replaced more often.

1700.462

For dry, dusty, polluted regions an air filter cartridge with superior filtering ability is available. It should be used only in such regions. Replacement intervals depend on operating conditions.

1700.463. M1

P14

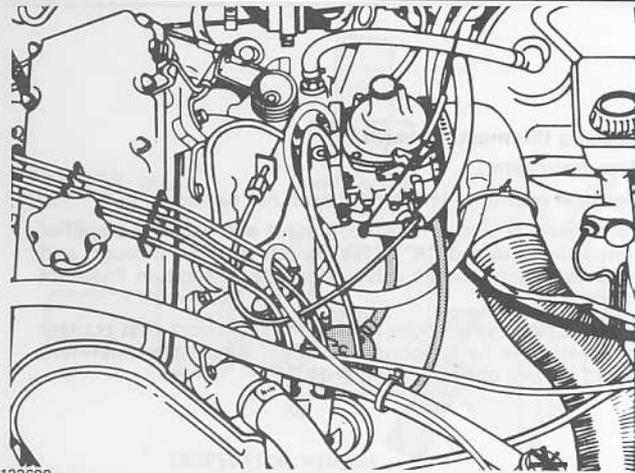


133701

**Check centrifugal advance.**

Run engine at 2,500 rpm (= 1,250 distributor rpm). Vacuum unit disconnected. Timing point should increase considerably, to approx. 25-30° BTDC. No increase, or small increase, indicates defective distributor mechanism.

1700.248



133698

P15

**Check fuel lines for tightness.**

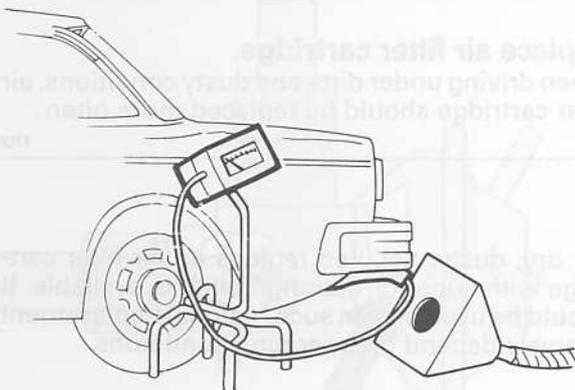
Check that there are no fuel leaks in engine compartment. Also check for oil and fluid leaks.

1700.256

**CO emissions check  
B21A, Canada**

<b>Service at:</b> <b>25-50-75-100-125-150-thousand km</b> <b>Intervals: 25,000 km</b>
--

Q1



118519

**Connect CO-meter.**

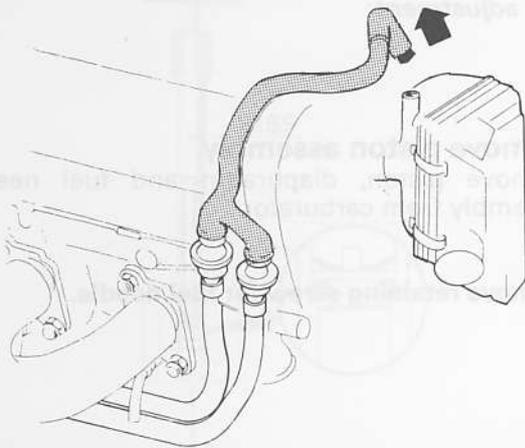
Insert probe approx. 40 cm = 16" into exhaust pipe.

**Connect tachometer.**

For measuring rpm.

1700.221

Q2



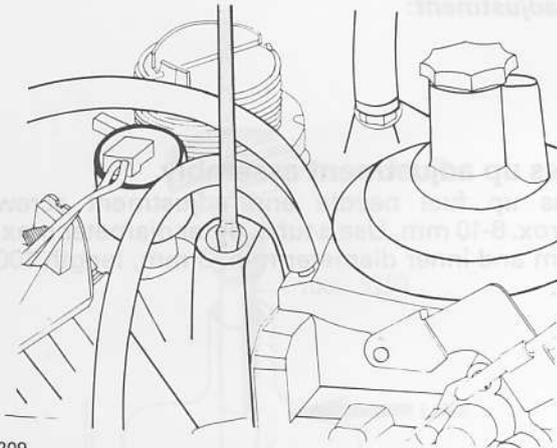
130696

**Disconnect Pulsair.**

Disconnect hose from air cleaner. Plug disconnected end.

1700.222

Q3



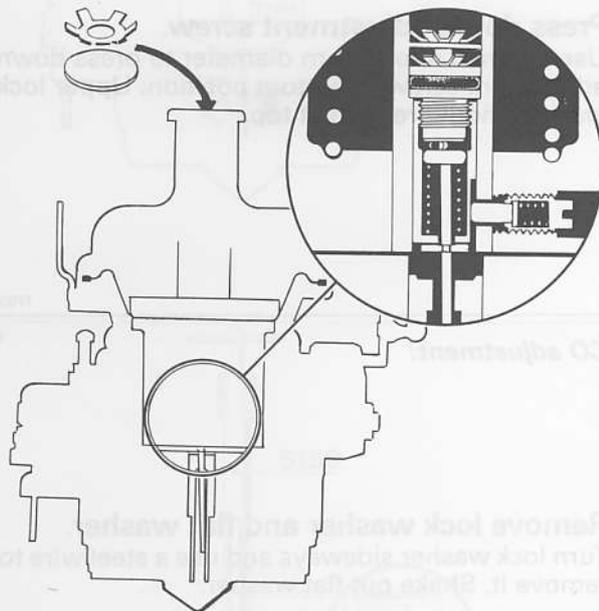
133209

**Adjust idle speed.**

Engine at normal operating temperature. During and after CO adjustment, idle speed should be:  $900 \pm 50$  rpm.

1700.224

Q4



133545

**Check CO.**

CO values of 2.5-4.0 % are permitted, provided engine runs properly. Prior to readings increase engine speed momentarily to 1500 rpm to allow cold fuel to enter carburetor.

1700.225

Q5

**CO setting.**

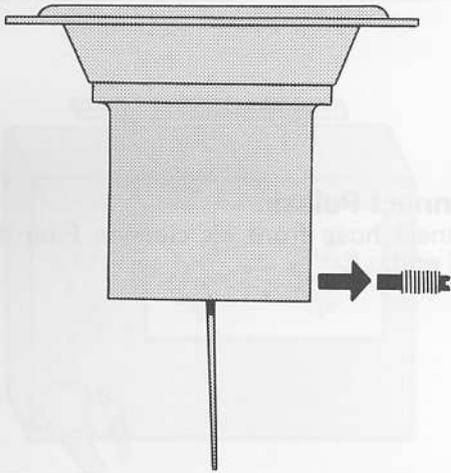
Initial CO setting is made at the factory and should not need to be changed. The CO adjustment screw is sealed from access. If CO is outside limits, and all other causes for incorrect CO readings have been checked, use the procedures that follow.

1700.485

**CO adjustment.**

If CO is outside limits, it should be set to 3%. The adjustment screw is sealed with a flat washer and a lock washer.

1700.486



**CO adjustment:**

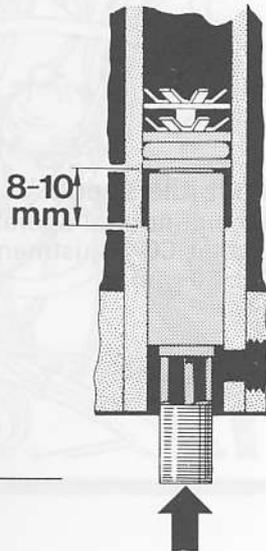
**Q6**

**Remove piston assembly.**

Remove piston, diaphragm and fuel needle assembly from carburetor.

**Remove retaining screw for fuel needle.**

1700.230



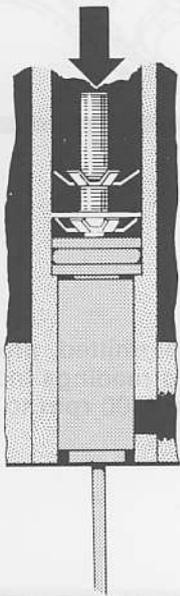
**CO adjustment:**

**Q7**

**Press up adjustment assembly.**

Press up fuel needle and adjustment screw approx. 8-10 mm. Use a tube, outer diameter max. 7 mm and inner diameter min. 3 mm, length 100 mm.

1700.231



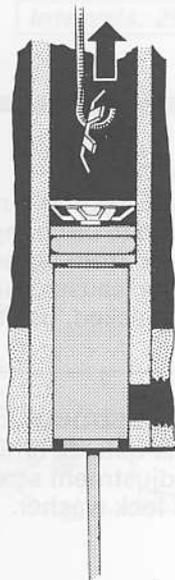
**CO adjustment:**

**Q8**

**Press down adjustment screw.**

Use a punch max. 3 mm diameter to press down adjustment screw to bottom top position. Upper lock washer should remain at top.

1700.232



**CO adjustment:**

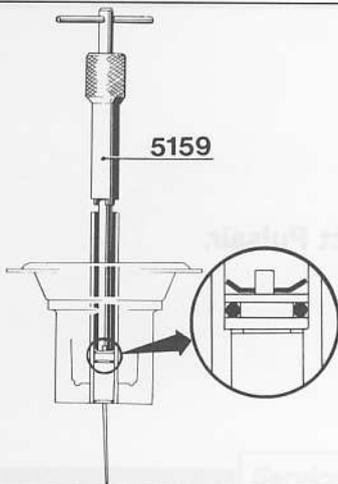
**Q9**

**Remove lock washer and flat washer.**

Turn lock washer sideways and use a steel wire to remove it. Shake out flat washer.

1700.233

Q10



**CO adjustment:**

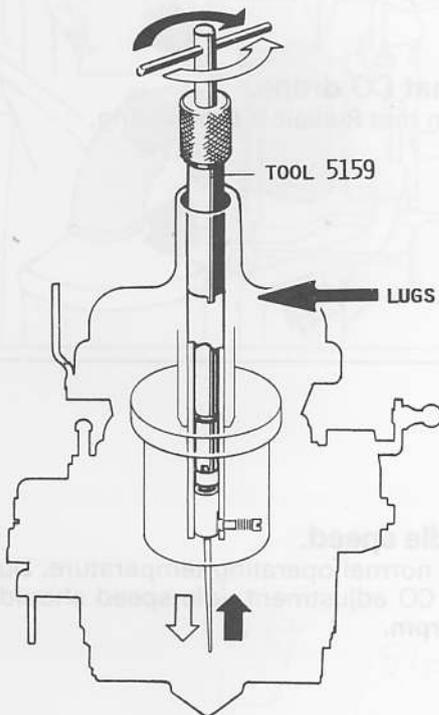
**Press down lower lock washer.**

Use tool 5159.

Install retaining screw for fuel needle. Install piston, diaphragm and needle assembly in carburetor.

1700.234

Q11



**CO adjustment:**

**Prior to checking CO:**

- Check damper oil level.
- Install damper plunger.
- Momentarily rev engine to 3000 rpm (50 r/s)

1700.235

**CO adjustment:**

Q12

**Adjust CO.**

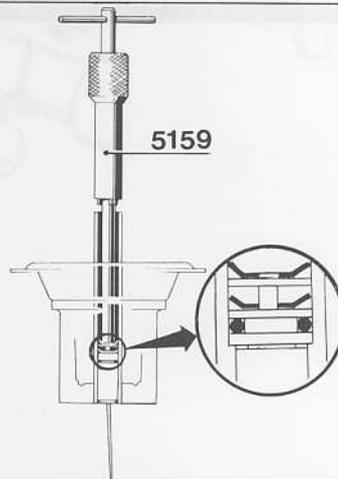
Use tool 5159 to adjust fuel needle position in carburetor. Adjusting range is approx. 4 turns. Turning tool clockwise increases CO, counter-clockwise reduces CO.

Make sure tool lugs grip recesses in air valve spindle. Otherwise carburetor diaphragm may become damaged.

1700.236

**CO adjustment:**

Q13



**Install CO adjustment seal.**

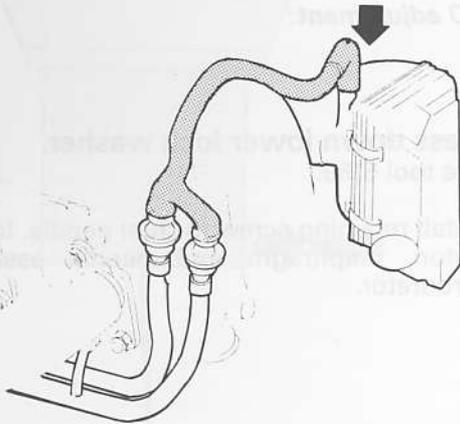
Remove damper oil. Use paper to absorb it or remove piston and pour it out.

Install **new** flat washer and **new** lock washer. Use tool 5159.

Fill damper oil and install damper plunger.

1700.237

Q14

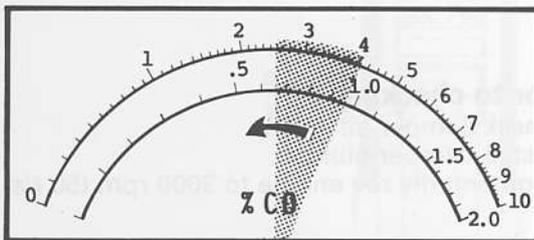


**Reconnect Pulsair.**

130692

1700.228

Q15



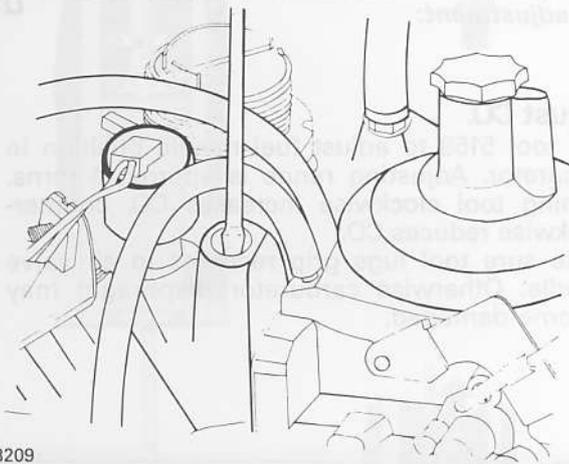
**Check that CO drops.**

To confirm that Pulsair is functioning.

130693

1700.229

Q16



**Adjust idle speed.**

Engine at normal operating temperature. During and after CO adjustment, idle speed should be:  $900 \pm 50$  rpm.

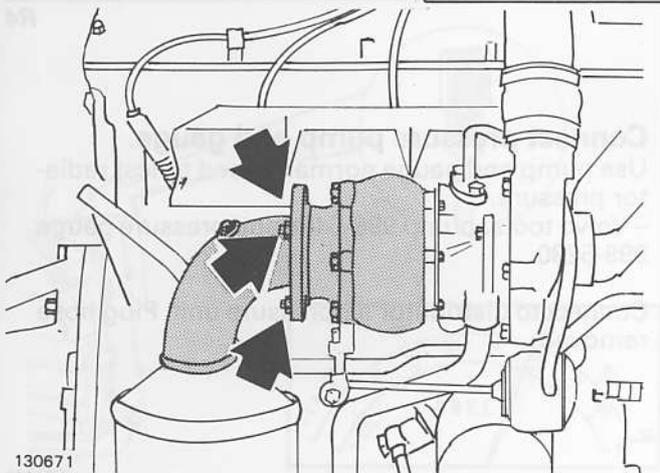
133209

1700.224

## B21F-Turbo

Service every 7,500 miles = 12,500 km

R1



130671

### Tighten nuts, check for leakage.

Exhaust pipe to turbo (three nuts)

Hex: 13 mm

Torque: 22-25 Nm 16-18 ft.lbs.

1700.213

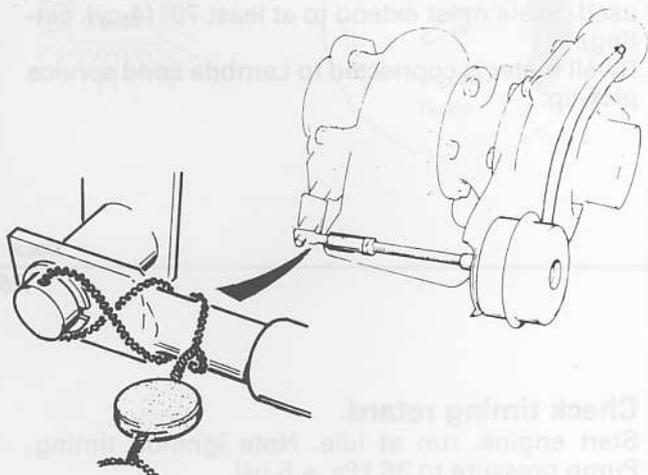
R2

### B21F-Turbo:

### Check adjustment sealing.

Seal on control rod from pressure regulator to wastegate actuator must be unbroken and intact. Seal can be a compressed sleeve nut or wire and lead seal.

1700.104. M1



133212

### Anti-tamper seal.

It is important to wind wire tightly around actuator rod, as shown, otherwise seal will loosen due to vibrations.

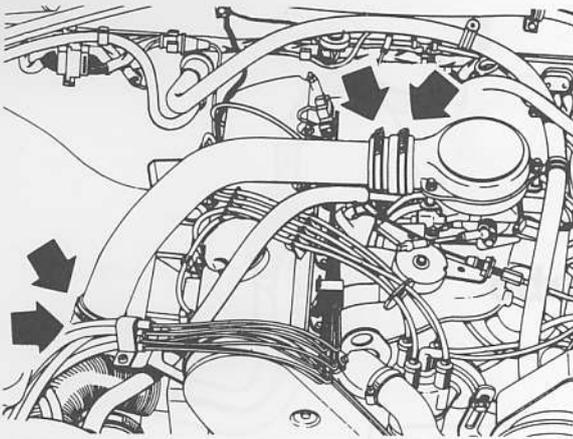
Volvo anti-tamper seal tongs, Part Number 998 6408-4 have "Volvo" stamped on grips.

### NOTE:

Tampering with emission control components may be a violation of Federal regulation.

1700.105

R3



133224

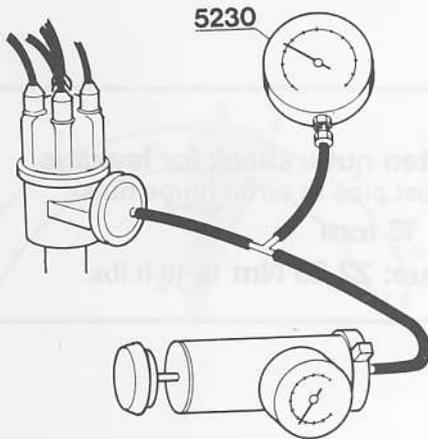
**Torque clamp screws.**

Four clamps, two at each end of intermediate pipe between compressor and throttle housing, should be torqued.

**Torque: 3 Nm = 2.5 ft.lbs.**

1700.202

R4



130639

**Connect pressure pump and gauge.**

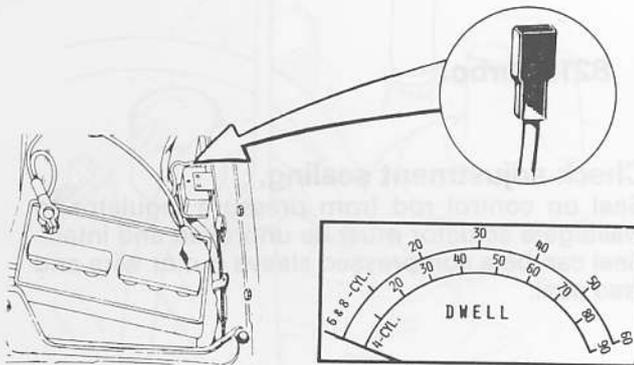
Use pump and gauge normally used to test radiator pressure.

- Volvo tools: pump 998-5496 and pressure gauge 999-5230.

Connect to distributor air pressure unit. Plug hose removed.

1700.203

R5



130676

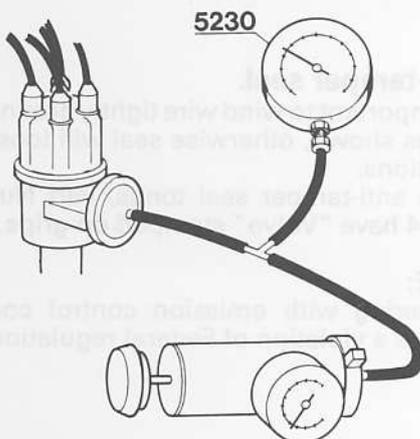
**Connect instrument to check Lambda system duty cycle.**

For this purpose a high quality dwell meter can be used. Scale must extend to at least 70° (4-cyl. setting).

Dwell meter is connected to Lambda sond service pick-up.

1700.207

R6



130639

**Check timing retard.**

Start engine, run at idle. Note ignition timing.

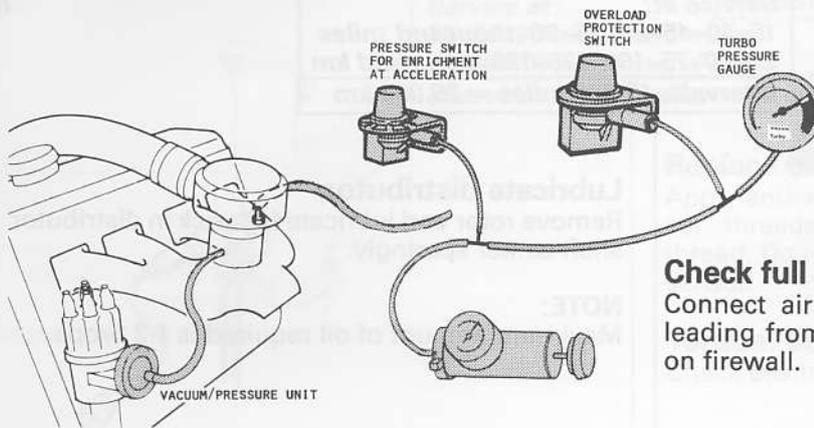
Pump pressure to 36 kPa = 5 psi.

Ignition timing should retard 6-10°. In case of incorrect reading: check distributor, replace distributor pressure unit, as appropriate.

Reinstall and clamp pressure hose.

1700.208

R7

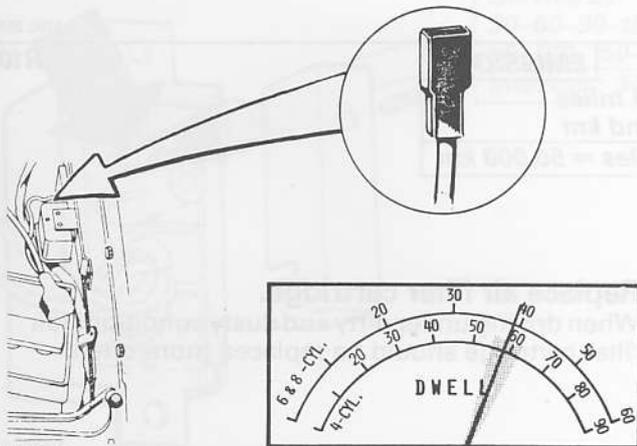


**Check full load enrichment system.**

Connect air pressure pump and gauge in line leading from intake manifold to pressure switch on firewall.

130711

1700.209

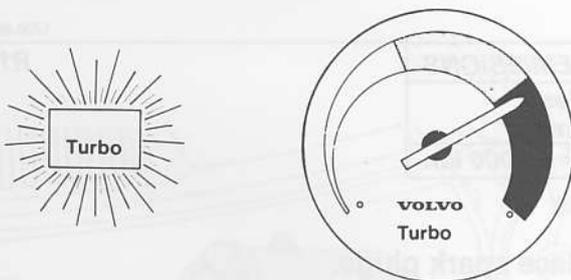


Engine running, pump air pressure until dwell meter (measuring duty cycle of Lambda sond system) displays steady reading of 58.5° (56-62° allowed). Air pressure reading at that instant should be 20.3 kPa = 2.9 psi.

130677

1700.210

R8



**Check overload protection switch.**

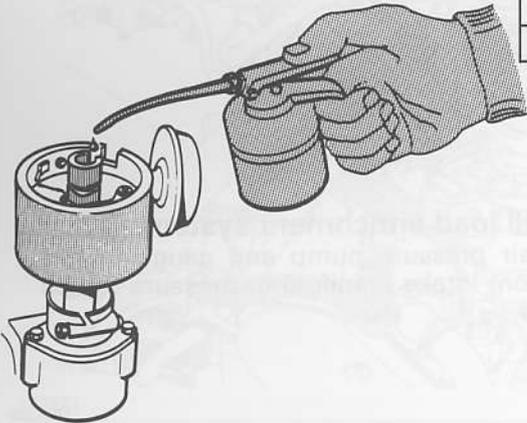
Pump pressure until engine stalls. Air pressure reading should be 70 kPa = 10 psi.

At the same time air pressure gauge on instrument panel should go to red and red "Turbo" warning light on instrument cluster should illuminate.

In case of incorrect reading: replace overload protection switch (inside firewall, close to clutch pedal bracket).

130678

1700.211



**Service at:**  
 15-30-45-60-75-90-thousand miles  
 25-50-75-100-125-150-thousand km  
 Intervals: 15,000 miles = 25,000 km

R9

**Lubricate distributor.**

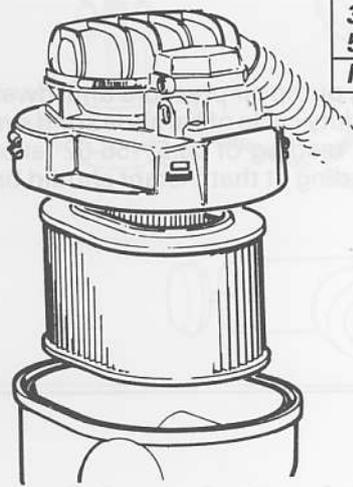
Remove rotor and lubricate felt wick in distributor shaft center sparingly.

**NOTE:**

Maximum amount of oil required is 1-2 drops.

133697

1700.257



<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
Intervals: 30,000 miles = 50,000 km	

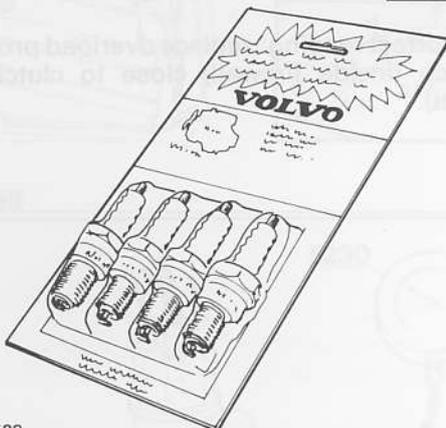
R10

**Replace air filter cartridge.**

When driving under dirty and dusty conditions, air filter cartridge should be replaced more often.

130708

1700.462



<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
Intervals: 30,000 miles = 50,000 km	

R11

**Replace spark plugs.**

Spark plugs must be tightened to specific torque for proper operation and to avoid damage to threads.

Spark plug removal and installation must be performed when engine is cold (low reading on temperature gauge).

127523

1700.240

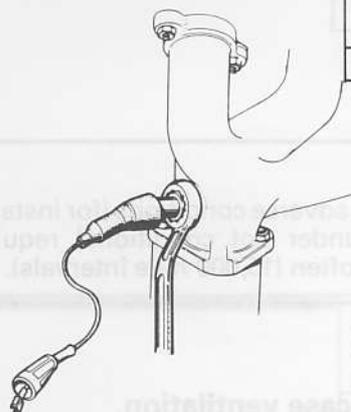
B21F-Turbo .....  
 Gap .....  
 Torque (plug threads not oiled) .....

"Super" spark plug Volvo P/N 273594-2 (set of four)  
 or Bosch WR7DS  
 0.7-0.8 mm = 0.028-0.032"  
 20-30 Nm = 15-22 ft. lbs.

031.310

R12

<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	



120995

**Replace oxygen sensor.**

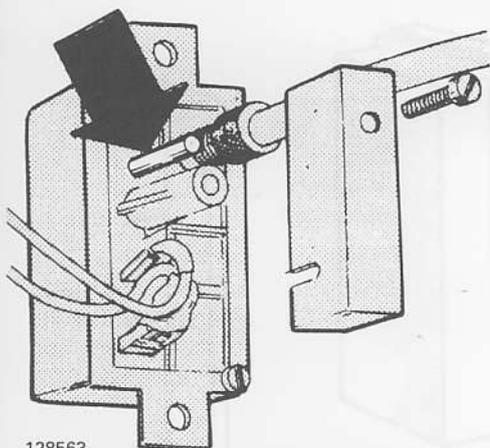
Apply anti-seize compound "Never-Seez" to sensor threads prior to installation. Coat entire thread. Do not apply compound to slotted part of sensor.

**Torque: 55 ± 5 Nm = 40 ± 4 ft.lbs.**  
Check electrical connections.

1700.466

R13

<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	



128563

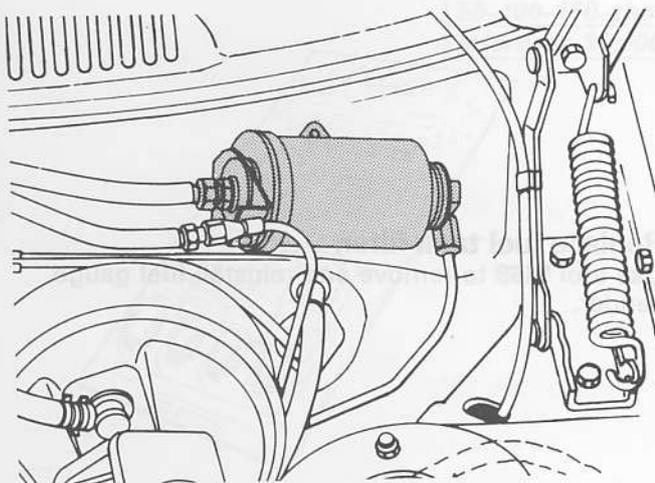
**Reset Lambda-sond reminder light.**

Remove panel and switch cover. Press button. Re-install cover panel.

1700.467

<b>Service at: 60,000 miles = 100,000 km</b>
<b>Intervals: 60,000 miles = 100,000 km</b>

R14



133703

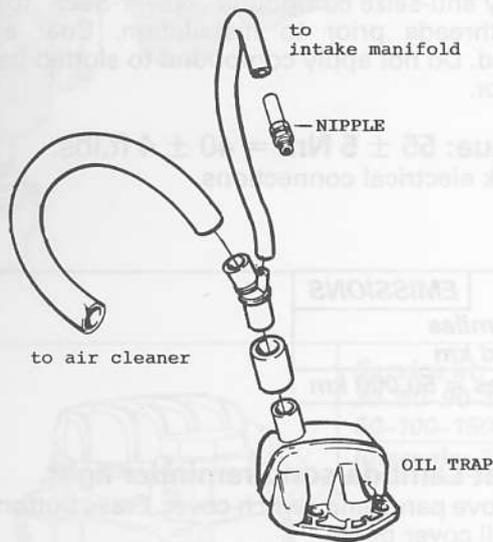
**Replace fuel filter.**

Fuel filter located on firewall. Note flow direction arrow on filter

1700.425

Service at: 60,000 miles = 100,000 km  
Intervals: 60,000 miles = 100,000 km

R15



**NOTE:**

Driving under adverse conditions (for instance city driving under hot conditions) requires service more often (15,000 mile intervals).

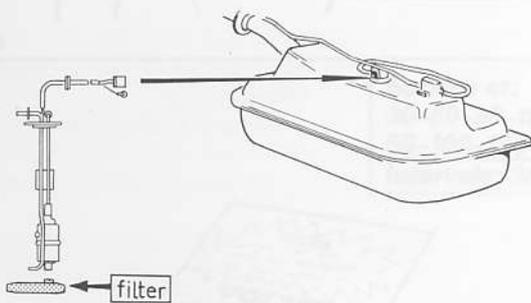
**Positive crankcase ventilation.**

Check hoses for condition and clogging. Clean nipple.

1700.498

Service at: 60,000 miles = 100,000 km  
Intervals: 60,000 miles = 100,000 km

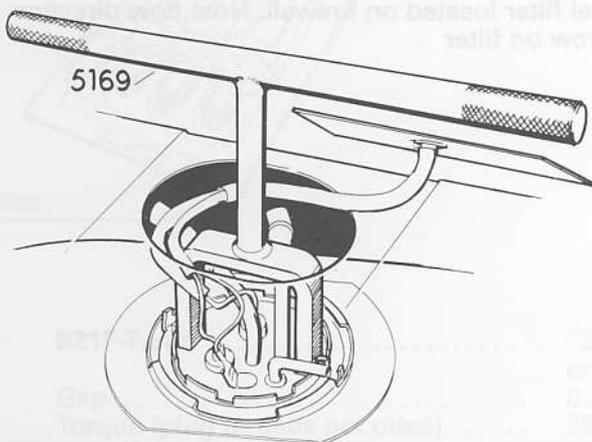
R16



124032

**Replace fuel tank filter.**

Use tool 5169 to remove and reinstall fuel gauge sender.



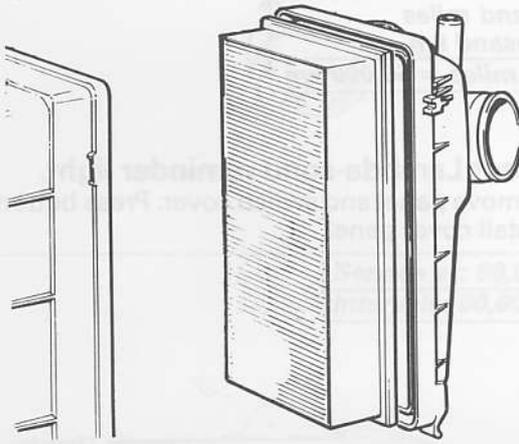
123125

1700.424

# B23F

<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	

S1



### Replace air filter cartridge.

When driving under dirty and dusty conditions, air filter cartridge should be replaced more often.

1700.462

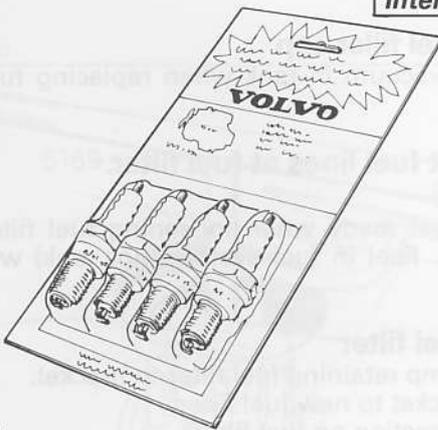
For dry, dusty, polluted regions an air filter cartridge with superior filtering ability is available. It should be used only in such regions. Replacement intervals depend on operating conditions.

130707

1700.463. M1

<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	

S2



### Replace spark plugs.

Spark plugs must be tightened to specific torque for proper operation and to avoid damage to threads.

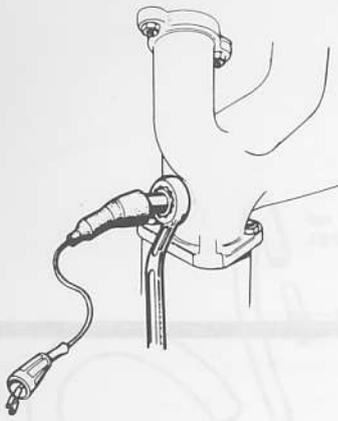
Spark plug removal and installation must be performed when engine is cold (low reading on temperature gauge).

127523

1700.240

<b>B23F</b> .....	"Super" spark plug Volvo P/N 273594-2 (set of four) or Bosch WR7DS
Gap .....	0.7-0.8 mm = 0.028-0.032"
Torque (plug threads not oiled) .....	20-30 Nm = 15-22 ft. lbs.

031.312



<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	

S3

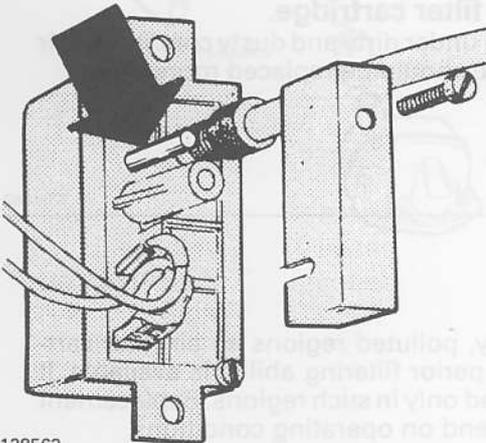
**Replace oxygen sensor.**

Apply anti-seize compound "Never-Seez" to sensor threads prior to installation. Coat entire thread. Do not apply compound to slotted part of sensor.

**Torque: 55 ± 5 Nm = 40 ± 4 ft.lbs.**  
Check electrical connections.

120995

1700.466



<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	

S4

**Reset Lambda-sond reminder light.**

Remove panel and switch cover. Press button. Re-install cover panel.

128563

1700.467

<b>Service at: 60,000 miles = 100,000 km</b>
<b>Intervals: 60,000 miles = 100,000 km</b>

S5



**LH-Jetronic:**  
**Replace fuel filter**

Fuel filter located underneath car, under left rear seat.

**Remove fuel filler cap**

To prevent vacuum in tank when replacing fuel filter

**Disconnect fuel lines at fuel filter.**

**Important:**

Have a vessel ready when loosening fuel filter connections. Fuel in fuel system (not tank) will come out.

**Replace fuel filter**

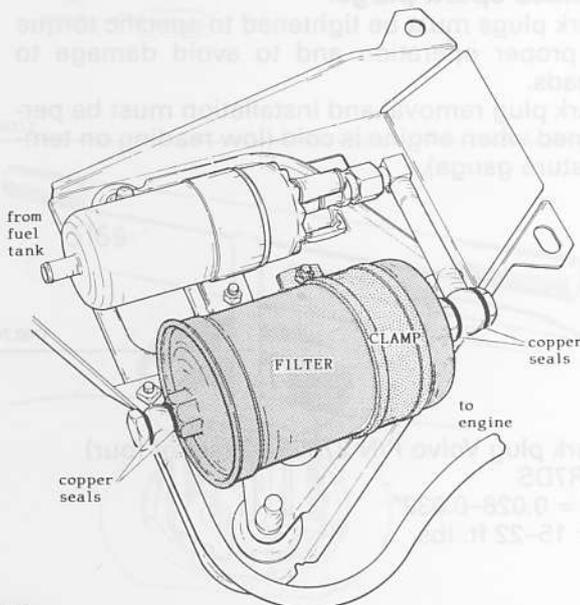
Remove clamp retaining fuel filter to bracket. Transfer bracket to new fuel filter. Note flow direction on fuel filter. Install fuel filter and clamp assembly to bracket.

**Check fuel flow direction on fuel filter.**

**Connect fuel lines to fuel filter.**

Make sure copper seals are correctly installed.

**Install fuel filler cap.**

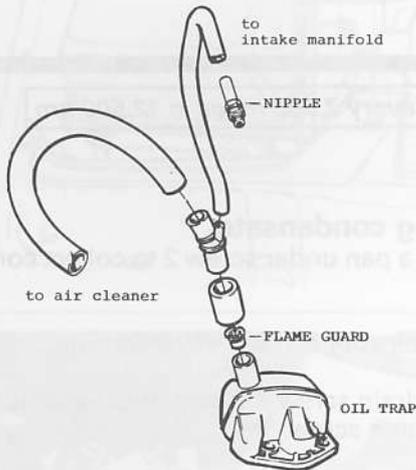


133201

1700.428

**Service at: 60,000 miles = 100,000 km**  
**Intervals: 60,000 miles = 100,000 km**

S6



**NOTE:**

Driving under adverse conditions (for instance city driving under hot conditions) requires service more often (15,000 mile intervals). Volvo recommends cleaning flame guard at 15,000 mile intervals.

**Positive crankcase ventilation.**

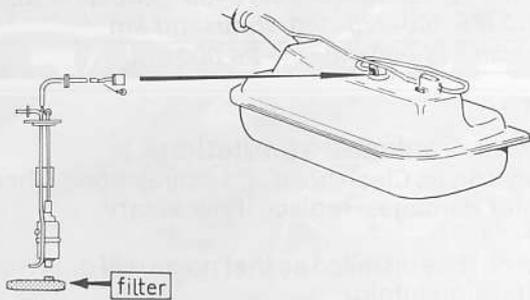
Check hoses for condition and clogging. Clean nipple and flame guard.

130999

1700.239

**Service at: 60,000 miles = 100,000 km**  
**Intervals: 60,000 miles = 100,000 km**

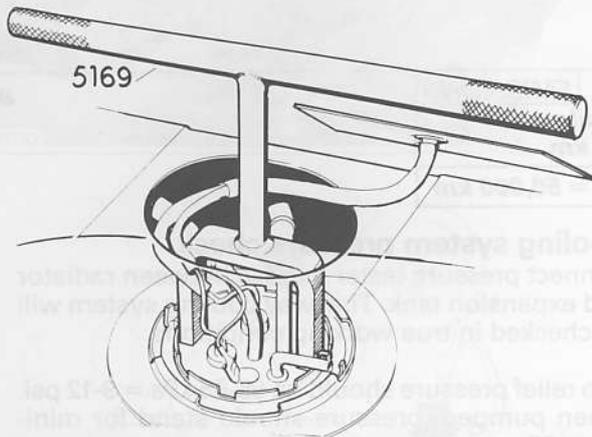
S7



124032

**Replace fuel tank filter.**

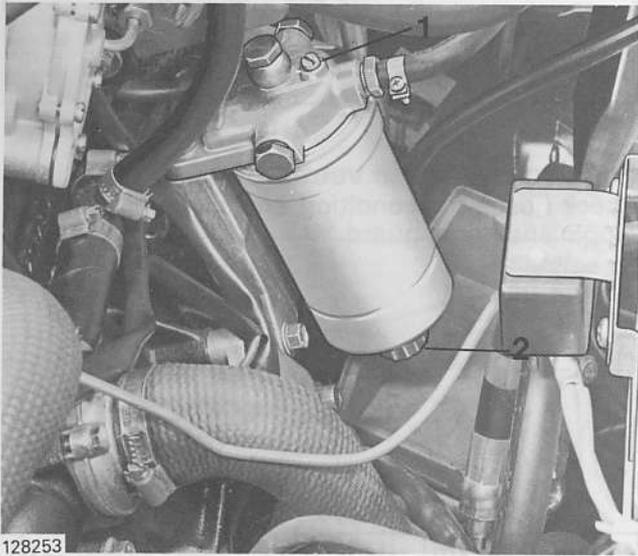
Use tool **5169** to remove and reinstall fuel gauge sender.



123125

1700.424

## D24 diesel



128253

**Service every 7,500 miles = 12,500 km**

**a1**

### Draining condensate.

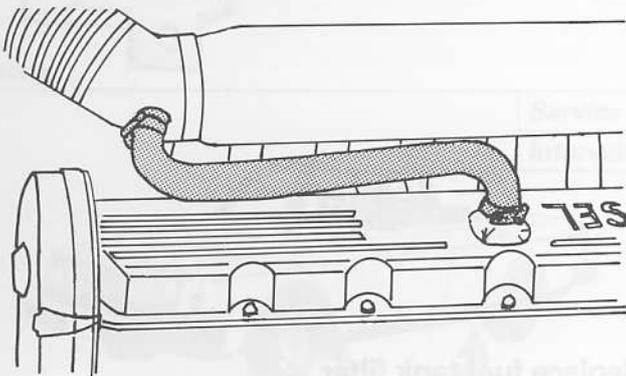
Position a pan under screw 2 to collect condensate.

Loosen bleeder screw 1 several turns.

Loosen drain screw 2. Drain until clean fuel flows out. Tighten screw.

Tighten bleeder screw 1.

1700.320



129584

**Service at: 15-30-45-60-75-90-thousand miles  
25-50-75-100-125-150-thousand km**

**Intervals: 15,000 miles = 25,000 km**

**a2**

### Positive crankcase ventilation.

Remove hose. Clean hose and connections. Check hose for damages, replace if necessary.

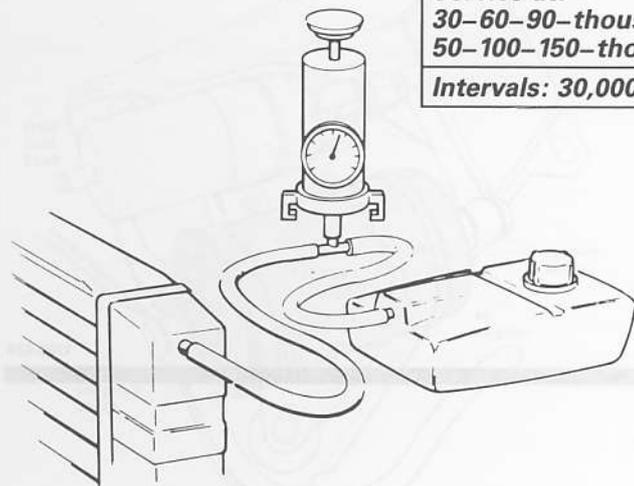
Hose must be installed so that no oil will drain into air intake manifold.

1700.322

**Service at:**  
**30-60-90-thousand miles**  
**50-100-150-thousand km**  
**Intervals: 30,000 miles = 50,000 km**

**EMISSIONS**

**a3**



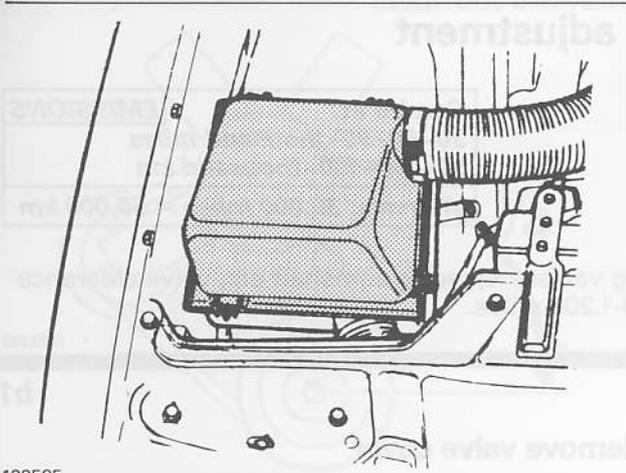
128186

### Cooling system pressure check.

Connect pressure tester in hose between radiator and expansion tank. This way cooling system will be checked in true working conditions.

Cap relief pressure should be 65-85 kPa = 9-12 psi. When pumped, pressure should stand for minimum 30 seconds.

1700.172



129585

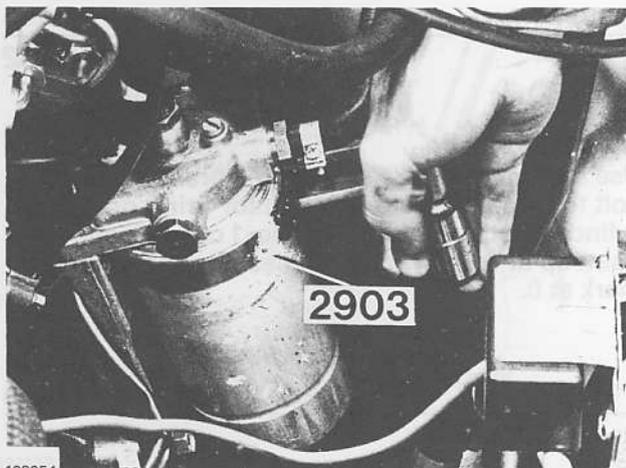
<b>Service at:</b> 30-60-90-thousand miles 50-100-150-thousand km	<b>EMISSIONS</b>
<b>Intervals: 30,000 miles = 50,000 km</b>	

a4

**Replace air filter cartridge.**

For dry, dusty, polluted regions an air filter cartridge with superior filtering ability is available. It should be used only in such regions. Replacement intervals depend on operating conditions.

1700.463. M1



128254

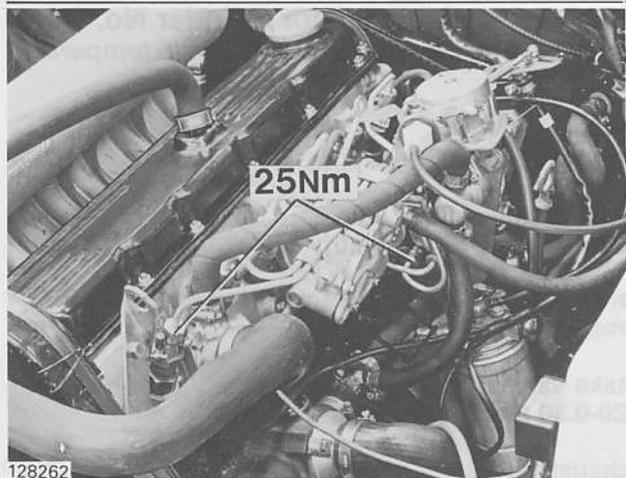
<b>Service at:</b> 30-60-90-thousand miles 50-100-150-thousand km	<b>EMISSIONS</b>
<b>Intervals: 30,000 miles = 50,000 km</b>	

a5

**Replacing fuel filter.**

Position oil filter wrench as high up on fuel filter as possible. Remove filter. Apply diesel fuel to rubber seal on new filter. Install seal. Tighten **by hand** until seal makes tight fit. Then tighten 1/4 turn **by hand**. DO NOT use any tools to install fuel filter. Start engine and check for leakage. If rubber seal does not seal properly, air will be sucked into system and impair operation.

1700.321. M1



128262

<b>Service at:</b> 30-60-90-thousand miles 50-100-150-thousand km	<b>EMISSIONS</b>
<b>Intervals: 30,000 miles = 50,000 km</b>	

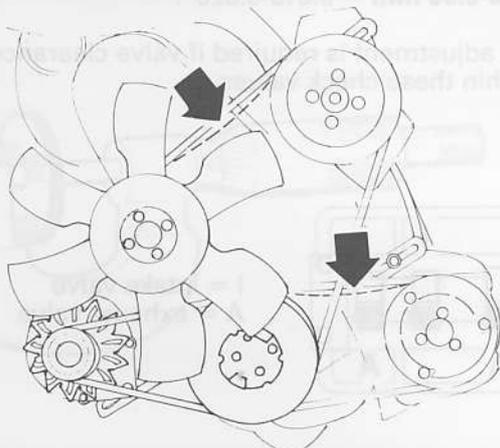
a6

**Fuel lines.**

Check for leaks from supply and return lines, as well as from delivery pipe system and fuel system components.

Repair as necessary. Torque for delivery pipes is 25 Nm = 18 ft.lbs.

1700.323



133229

<b>Service at:</b> 30-60-90-thousand miles 50-100-150-thousand km	<b>EMISSIONS</b>
<b>Intervals: 30,000 miles = 50,000 km</b>	

a7

**Check drive belt tension.**

If necessary adjust. It should be possible to depress drive belts 5-10 mm = 3/16-5/16" halfway between pulleys.

1700.241

## Valve clearance adjustment

### Special tools: 5195 Pliers

For removing valve depressor disc.

### 5196 Press tool

For valve depressors

Service at:

**EMISSIONS**

30-60-90-thousand miles

50-100-150-thousand km

Intervals: 30,000 miles = 50,000 km

After repairs to the cylinder head, for example grinding valves, replacing camshaft etc, valve clearance should be re-checked after driving 1000-2000 km = 600-1,200 miles.

1700.289

**b1**

### Remove valve cover

1700.285

**b2**

### Cylinder No. 1.

Use a 27 mm - 1-1/16" socket on vibration damper bolt to turn engine to position for firing on No. 1 cylinder. Both cam lobes for No. 1 cylinder should point up at equally large angles. Flywheel timing mark at 0.

1700.286

**b3**

### Check valve clearance for cylinder No. 1.

Valve clearance, cold engine (= at room temperature):

Intake valves:

**0.15-0.25 mm = 0.006-0.010"**

Exhaust valves:

**0.35-0.45 mm = 0.014-0.018"**

Valve clearances, warm engine (= near operating temperature):

Intake valves:

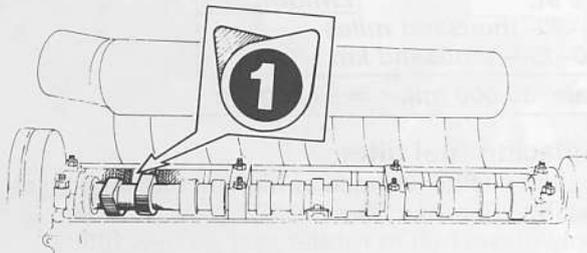
**0.20-0.30 mm = 0.008-0.012"**

Exhaust valves:

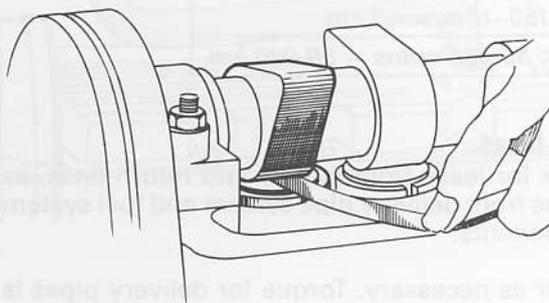
**0.40-0.50 mm = 0.016-0.020"**

No adjustment is required if valve clearances are within these check values.

I = intake valve  
A = exhaust valve



128155

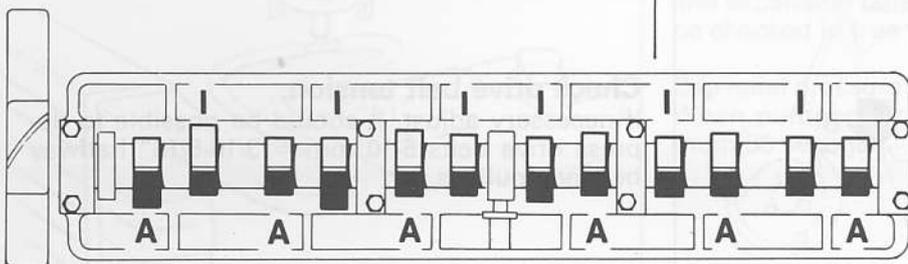


128156

#### NOTE:

Always check valve clearance with cylinder at top dead center. Always turn 1/4 turn after top dead center to set.

1700.499

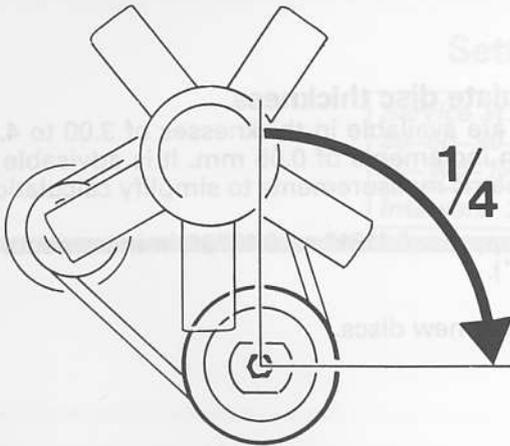


128157

1700.290

**Incorrent clearance, adjustment required**

**b4**



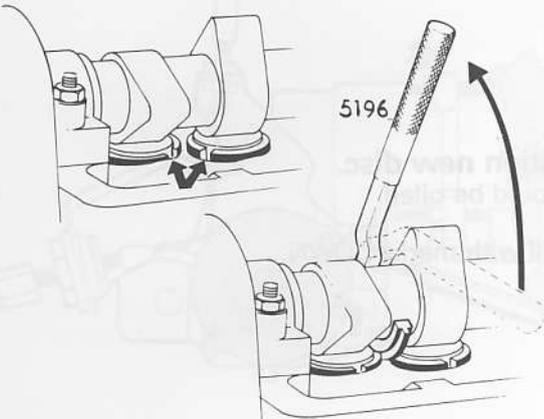
133522

1700.287

**Turn engine approx. 1/4 turn.**

Engine must not be at top dead center when setting valve clearance. With piston at top there is no space for depressing.

**b5**



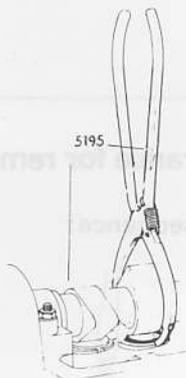
128159

1700.288

**Depress valve depressors.**

Line up valve depressors. Turn them so that notches point slightly inward. Use tool **5196** to depress valve depressors. Depressor grooves must be above the face so that disc can be gripped with pliers **5195**.

**b6**

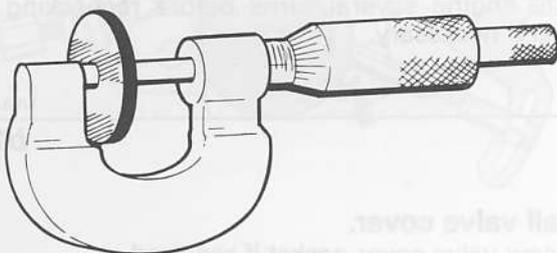


128160

1700.291

**Remove disc.**  
Use pliers **5195**.

**b7**



118671

1700.292

**Calculate thickness of disc to be used.**

Valve clearances when setting:

Cold engine:

Intake valves: **0.20 mm = 0.008"**.

Exhaust valves: **0.40 mm = 0.016"**.

Warm engine:

Intake valves: **0.25 mm = 0.010"**.

Exhaust valves: **0.45 mm = 0.018"**.

Use micrometer to measure disc thickness.

b8



**Calculate disc thickness.**

Discs are available in thicknesses of 3.00 to 4.25 mm in increments of 0.05 mm. It is advisable to use metric measurements to simplify calculation.

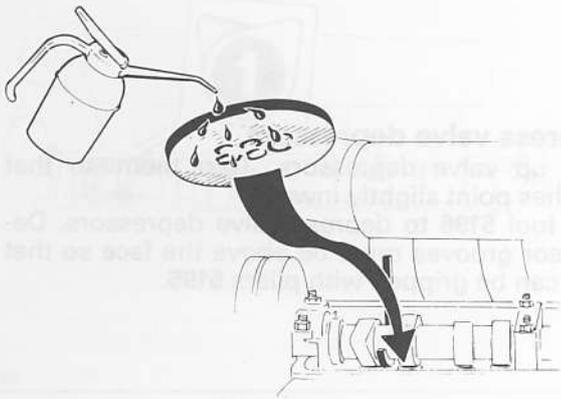
(US: approx. 0.1181" to 0.1673" in increments of 0.002").

Use only new discs.

128161

1700.293

b9



**Position new disc.**

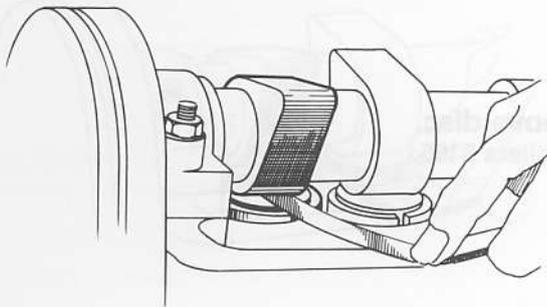
It should be oiled.

Install with marks DOWN.

128162

1700.294

b10



**Check/set valve clearance for remaining cylinders.**

Use following cylinder sequence:  
1-5-3-6-2-4

128156

1700.295, M1

b11

**Recheck valve clearance for all cylinders.**

Rotate engine several turns before rechecking.  
Adjust if necessary.

1700.296

b12

**Install valve cover.**

Use new valve cover gasket if required.

133709

1700.297

## Setting idle speeds

<b>Service at:</b>	<b>EMISSIONS</b>
30-60-90-thousand miles	
50-100-150-thousand km	
<b>Intervals: 30,000 miles = 50,000 km</b>	

c1

### Connect tachometer.

Use Volvo Monotester and adapter 9950. If Volvo Monotester is not available, use photo-electric tachometer (Volvo P/N 999 9795-9 or 999 0901-2, or similar).

1700.298

c2

### Run engine to normal operating temperature.

1700.299

c3

### Check/adjust low idle speed.

Should be  $750 \pm 50$  rpm. Apply tamper seal on screw and lock nut with paint after adjustment.

1700.300

c4

### Check/adjust high idle speed.

Maximum speed is  $5200 \pm 100$  rpm. Apply tamper seal on screw and lock nut with paint after adjustment. DO NOT race engine longer than absolutely necessary.

1700.301

c5

### Remove instrument.

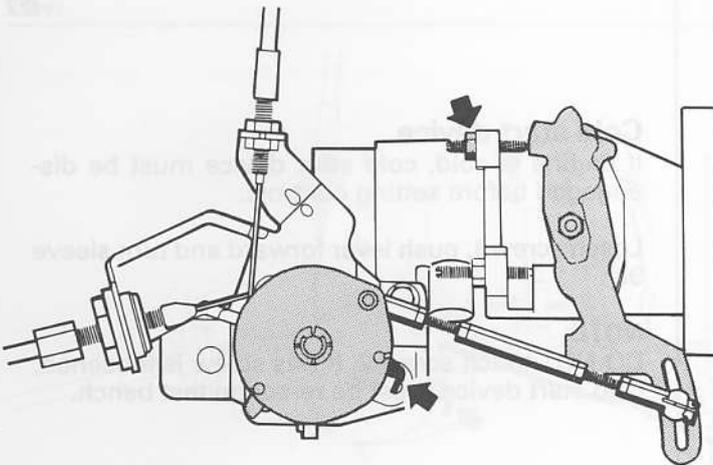
1700.302

c6

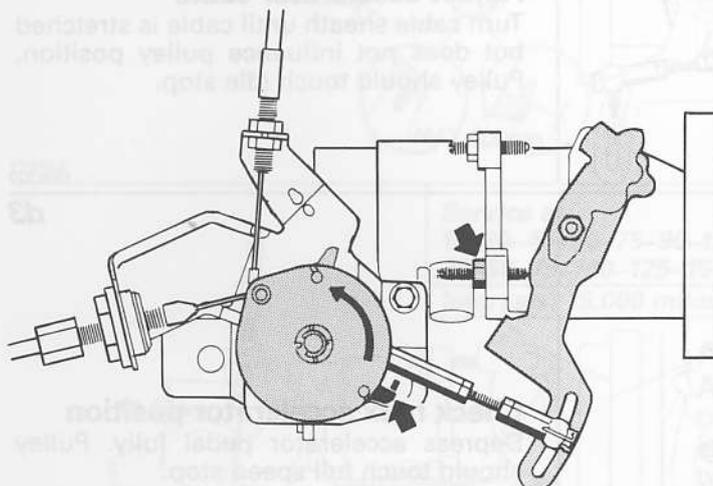
### Check/adjust engine controls.

This should always be done after idle adjustment.

1700.303



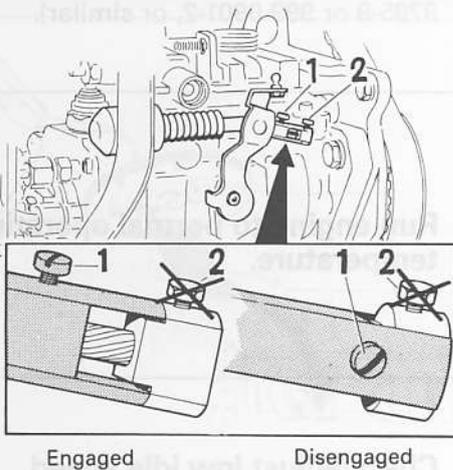
133712



133713

## Setting engine controls

**Service at:**  
30-60-90-thousand miles  
50-100-150-thousand km  
**Intervals: 30,000 miles = 50,000 km**



Engaged

Disengaged

d1

### Cold start device.

If engine is cold, cold start device must be disengaged before setting controls.

Loosen screw 1, push lever forward and turn sleeve 90°.

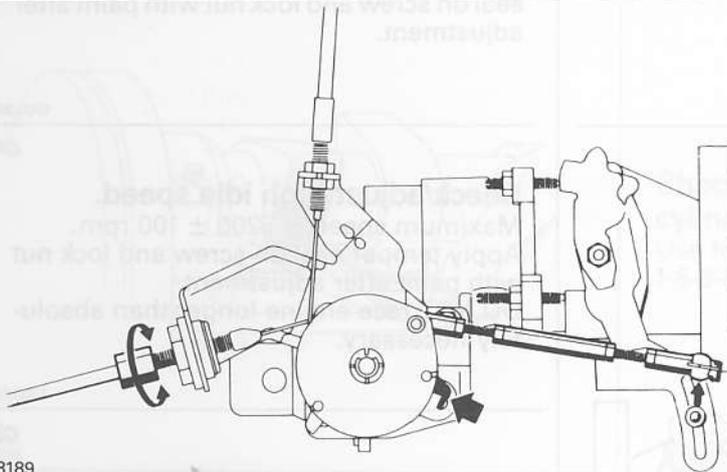
### NOTE:

DO NOT touch screw 2. If this screw is loosened, cold start device must be re-set on test bench.

128169

1700.326

d2



### Disconnect link rod at lever on injection pump.

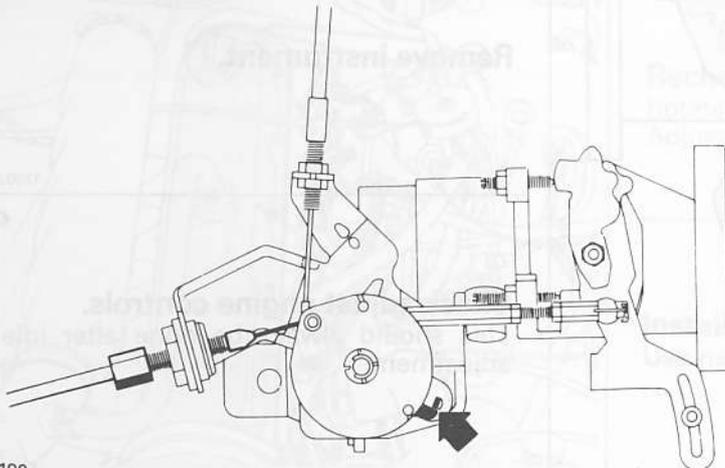
### Adjust accelerator cable

Turn cable sheath until cable is stretched but does not influence pulley position. Pulley should touch idle stop.

128189

1700.327

d3



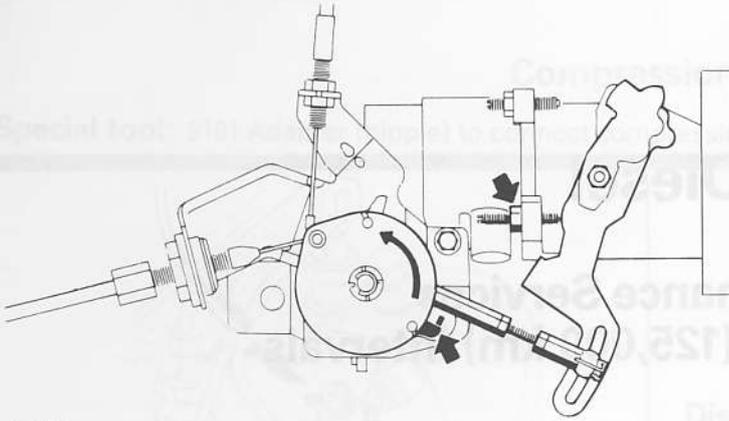
### Check max accelerator position

Depress accelerator pedal fully. Pulley should touch full speed stop.

128190

1700.328

d4



128192

**Connect link rod to injection pump lever.**

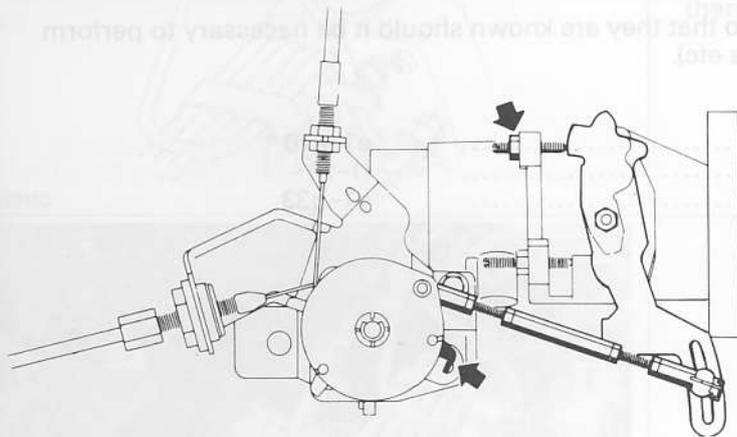
Service interval:  
 75,000 miles = 125,000 km

**Adjust link rod in max. position**

Turn pulley to max. position. Adjust link rod length so that injection pump lever touches max. speed adjusting screw.

1700.329

d5



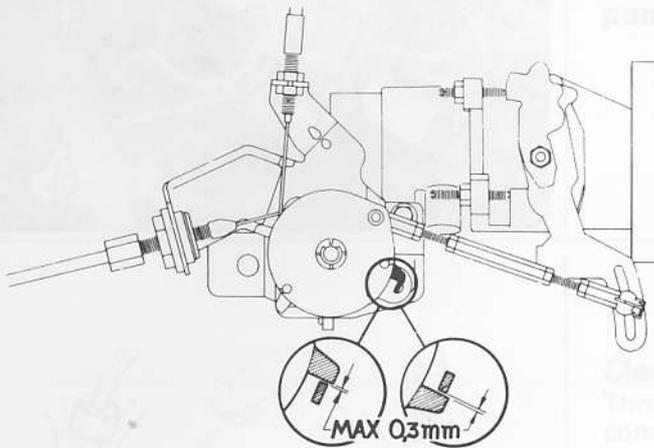
128193

**Adjust link rod in idle position**

Return pulley to idle stop. Move link rod ball joint in oblong hole in injection pump lever until lever touches idle adjusting screw.

1700.330

d6



128194

**Re-adjust link rod**

Repeat operations 7 and 8 until control is correctly adjusted.

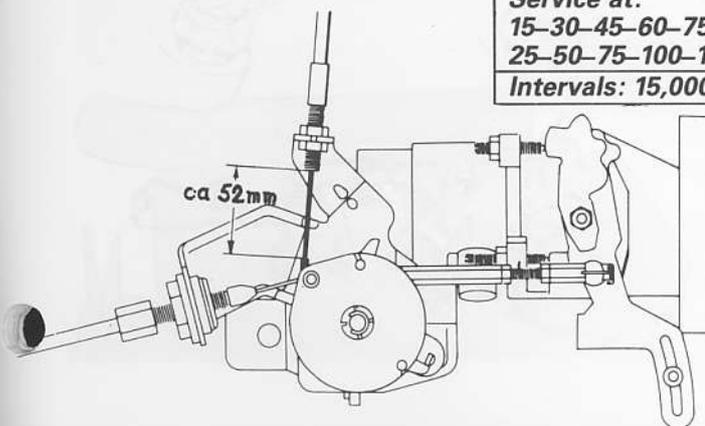
A clearance of max 0.3 mm = 0.012" is permitted between pulley and max. speed stop.

1700.331

**Re-connect cold start device**  
 (If disconnected)

d7

**Service at:**  
 15-30-45-60-75-90-thousand miles  
 25-50-75-100-125-150-thousand km  
**Intervals: 15,000 miles = 25,000 km**



128191

**Automatic transmission:**  
**Adjust kickdown cable.**

Depress accelerator pedal to floor. Kickdown cable should move approx. 52 mm = 2.05" between end positions.

Kickdown cable should be stretched in idle position and distance between kickdown cable clip and cable sheath should be 0.25-1.00 mm = 0.01-0.04".

1700.277

# Diesel

## Maintenance Services at 75,000 mile (125,000 km) intervals

The following maintenance service items are to be performed at 75,000 mile (125,000 km) intervals.

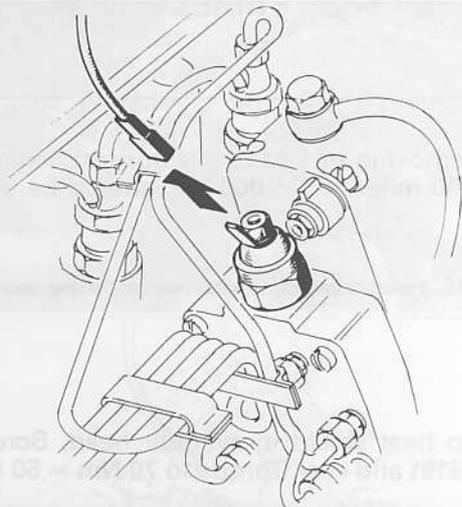
Read through and understand these items so that they are known should it be necessary to perform them at an earlier interval (i.e. during repairs etc).

- Compression test ..... e1-e10
- Checking/adjusting injectors ..... f1-f7
- Replacing timing gear belts ..... g1-g33

## Compression test

**Service intervals:**  
75,000 miles = 125,000 km

**Special tool:** 5191 Adapter (nipple) to connect compression tester.



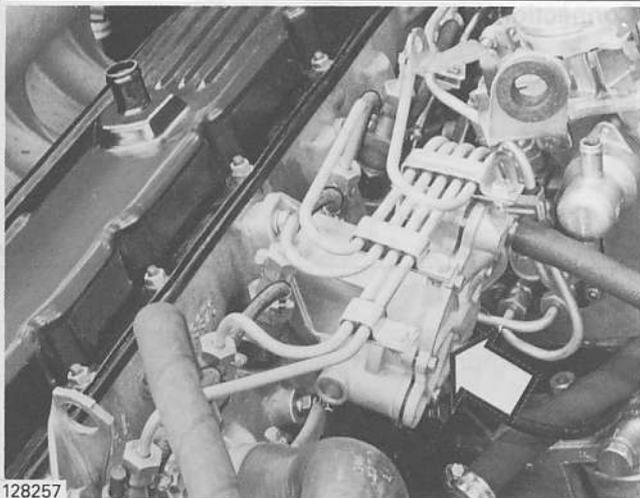
128150

e1

**Disconnect wire at stop valve.**

Injection pump will not pump fuel and fuel spill is thereby avoided.

1700.334

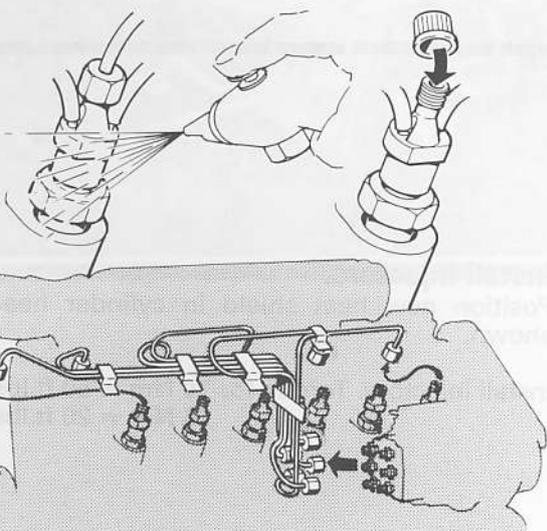


128257

e2

**Remove vacuum pump and vacuum pump plunger.**

1700.335



128151

e3

**Clean.**

Thoroughly clean fuel delivery pipes and connections.

1700.336

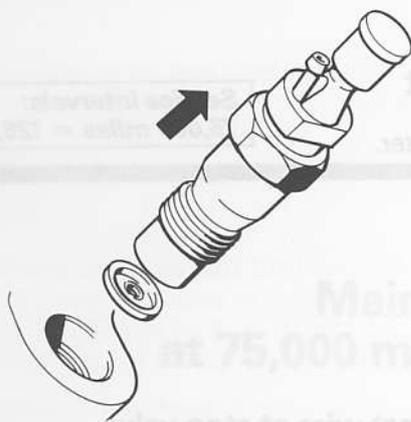
e4

**Remove fuel delivery pipes.**

Plug all connections to prevent dirt from entering fuel system.

1700.337

e5



**Remove injectors.**

Use 27 mm socket (Volvo P/N 1158146) = 1-1/16". Lift out heat shields under injectors. Otherwise they will fly up during compression test.

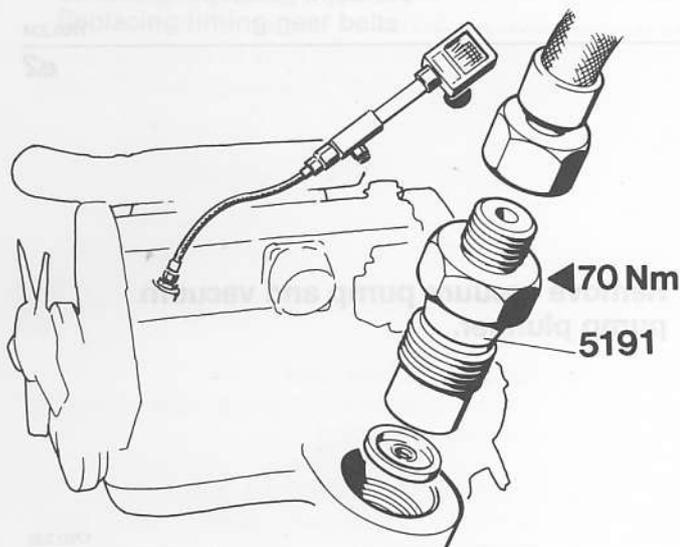
After removing injectors, injector test scheduled at 75,000 miles = 125,000 km, should be performed.

128152

1700.338

**Compression test**

e6



Position heat shield in cylinder head, Screw in nipple **5191** and seal. Torque to **70 Nm = 50 ft.lbs.**

Connection compression tester to nipple 5191.

Run engine with starter motor and read compression pressure.

1700.339

Correct compression pressures:

- New engine: **3.2 MPa = 455 psi.**

- Minimum: **2.4 MPa = 340 psi.**

- Max. difference between cylinders: **0.8 MPa = 115 psi.**

128153

1700.340

e7



**Install injectors.**

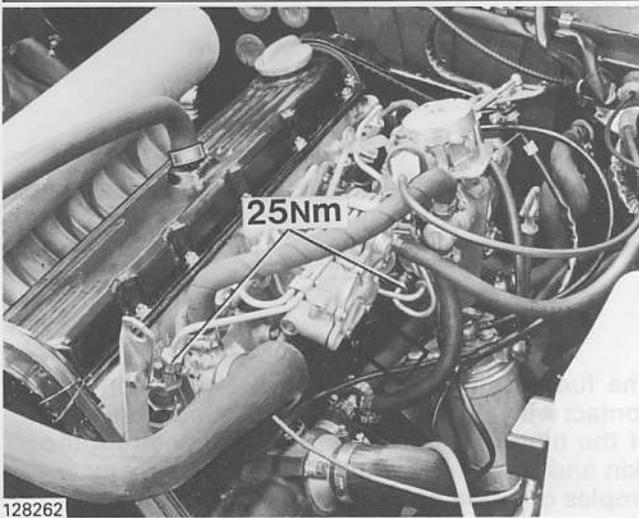
Position new heat shield in cylinder head as shown.

Install injectors. Torque to: **70 Nm = 50 ft.lbs.**  
**25 Nm = 20 ft.lbs.**

128154

1700.341

e8



**Install fuel delivery pipes.**

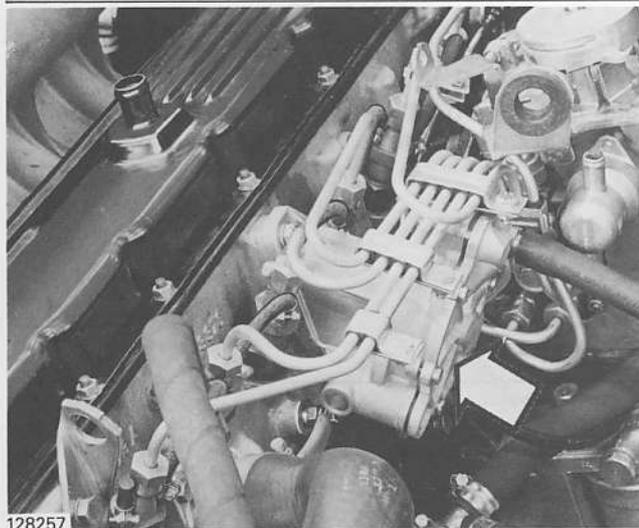
Torque to:  
25 Nm = 18 ft.lbs.

1700.342



**Connect wire to stop valve.**

1700.343



**Install vacuum pump plunger and vacuum pump.**

Check O-ring on vacuum pump, replace if necessary.

1700.344

## Checking/adjusting injectors

**Service only in case of injector malfunction.**

### CAUTION.

Extreme cleanliness must be observed when working with injectors. Any contamination will cause malfunction of the fuel system.

Tests and repairs should be accomplished in a dirt and dust free areas.

For testing, only use test oil or filtered diesel oil. Gasoline **MUST NOT** be used. Volatile fuels may cause explosion.

1700.350

### WARNING.

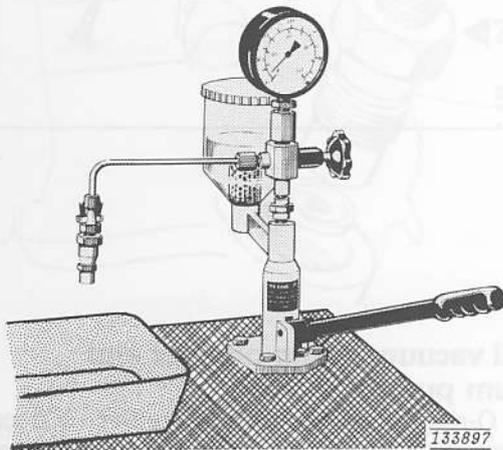
The fuel jet during testing **MUST NOT** come in contact with any part of the human body. Because of the high pressure, the fuel can penetrate the skin and cause severe injury. There are many examples of blood poisoning and amputation. Many states require operation of air evacuation equipment during testing of diesel injectors. The fuel fumes may be dangerous if inhaled.

1700.351

When testing, opening pressure and injector tightness are most important. Spray pattern and injection sound are more difficult to assess. They do not give any satisfactory indication of nozzle condition.

One must consider that real injection is into a completely different environment than the test bay. Quite often injectors function satisfactorily in the engine in spite of questionable spray pattern and injection sound.

1700.352

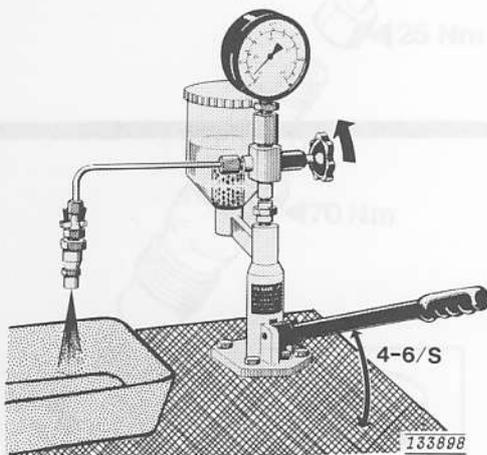


f1

### Install injector in injector tester.

Seal fuel return line connections with rubber plugs and hose clamps.

1700.353



f2

### Check spray pattern.

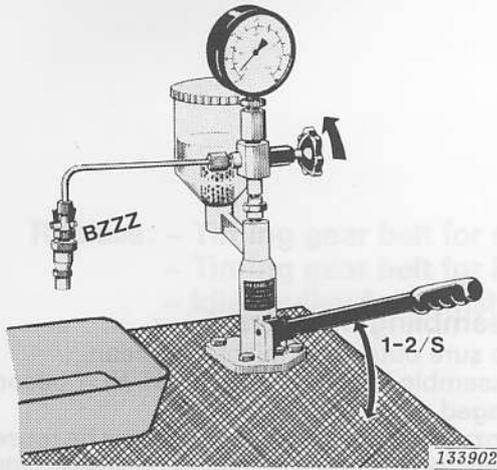
Pressure gauge disengaged.

Pump with short, quick strokes (4-6 strokes per second).

Spray jet should be fairly compact and stop abruptly. Injector must not drip.

1700.354

f3

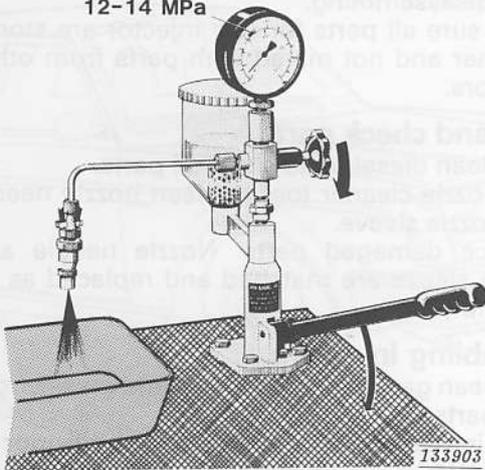


**Check injection sound.**

Pressure gauge disengaged.  
Slowly depress tester lever fully (1-2 strokes per second).  
A correct injector will whirl during spray.

1700.355

12-14 MPa



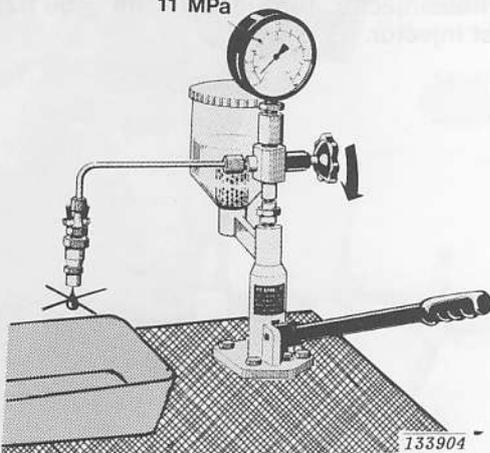
**Check injector opening pressure.**

Pressure gauge engaged.  
Slowly depress lever and read injector opening pressure.  
It should be **12-13 MPa = 1700-1850 psi**.  
If opening pressure is incorrect, first perform leak test (next operation) before adjusting.

f4

1700.356

11 MPa

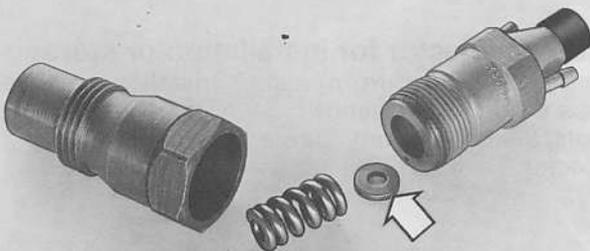


**Leak test.**

Pressure gauge engaged.  
Wipe injector nozzle. Pump pressure **11 MPa = 1560 psi** and retain this pressure for 10 seconds.  
There must be no fuel drip from nozzle. A moist nozzle is acceptable.

f5

1700.357



**Adjusting injector opening pressure.**

Opening pressure is adjusted by washers. Washers are available in thicknesses 1.00-1.95 mm = 0.040"-0.0768" in increments of 0.05 mm = 0.002".

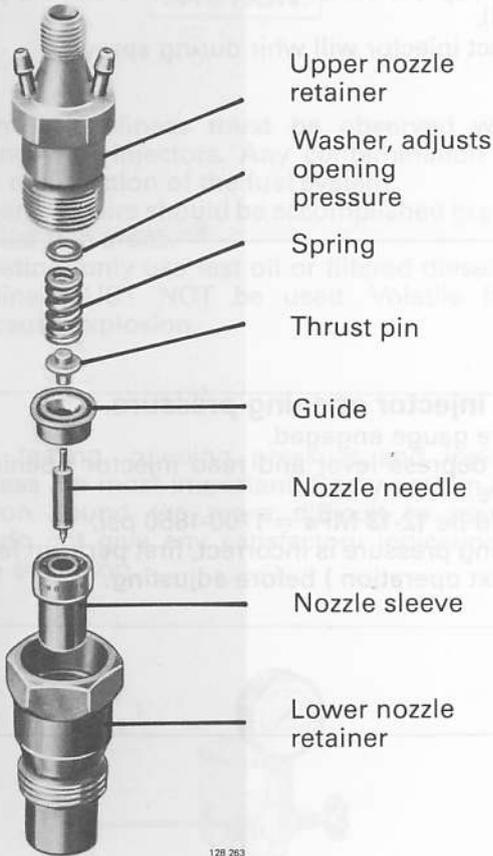
A 0.05 mm thicker washer will increase opening pressure by approx. **5 kPa = 7 psi**.

For disassembling injectors, see instructions that follow.

f6

1700.358

128269



### Disassembling injectors.

- Make sure outside of injector is clean.
- Disassemble injector. Parts **MUST NOT** become damaged.  
If a nozzle needle is dropped, it cannot be reused.
- Immerse parts in clean diesel oil immediately after disassembling.
- Make sure all parts for one injector are stored together and not mixed with parts from other injectors.

### Clean and check parts.

- Use clean diesel oil to clean all parts.
- Use nozzle cleaner tool to clean nozzle needle and nozzle sleeve.
- Replace damaged parts. Nozzle needle and nozzle sleeve are matched and replaced as an assembly.

### Assembling injectors.

- Use clean gasoline to clean storage grease from new parts.
- Then immerse new parts in diesel oil prior to assembly.
- Assemble injector. Torque to **70 Nm = 50 ft.lbs.**
- Re-test injector.

128263

1700.359



### Prepare injector for installation or storage

Remove injector from tester. Install protective caps on pipe connection.  
Protect nozzle from damage when installing injector.

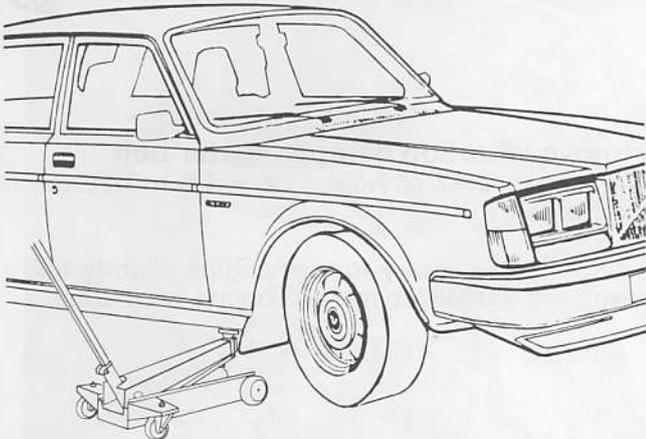
1700.360

- Replace:**
- Timing gear belt for camshaft
  - Timing gear belt for injection pump
  - Idler pulley for camshaft timing gear belt

**Service intervals:**  
75,000 miles = 125,000 km

1700.365

**g1**



133704

**Disconnect battery ground cable.**

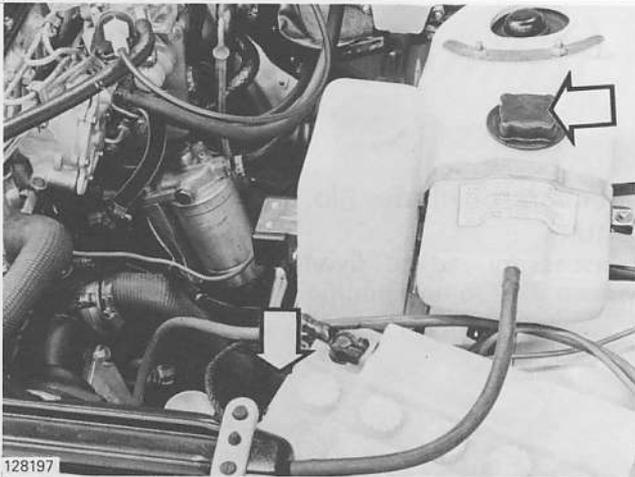
**Jack up vehicle.**

Use front right jack support. When draining coolant, it runs along splash guard under engine and does not mess floor.

Place vessel under left steering rod.

1700.364

**g2**



128197

**Drain coolant.**

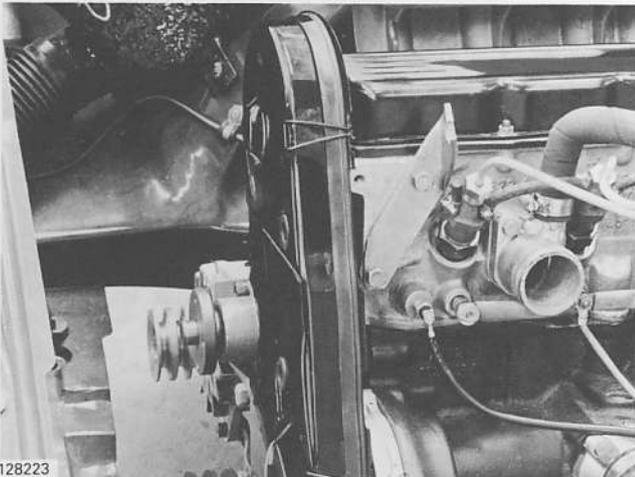
Remove expansion tank cap.

Disconnect lower radiator hose at radiator. Disconnect lower hose at thermostat for cold start device. Point hose downward and drain engine coolant. There are no drain cocks.

Lower vehicle and remove jack.

1700.366

**g3**

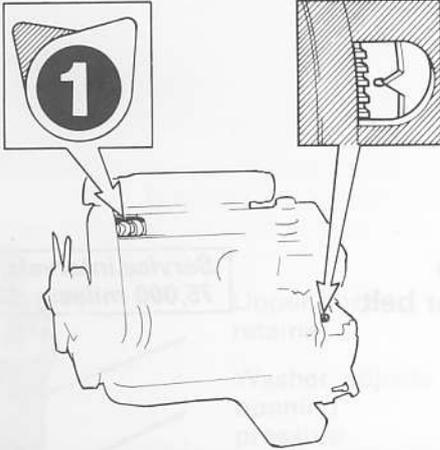


128223

**Remove:**

- radiator.
- cooling fan with spacer and pulley.
- fan belt.
- drive belt for power steering pump.
- timing gear belt cover.
- valve cover.

1700.367



g4

**Set cylinder No. 1 to top dead center and injection.**

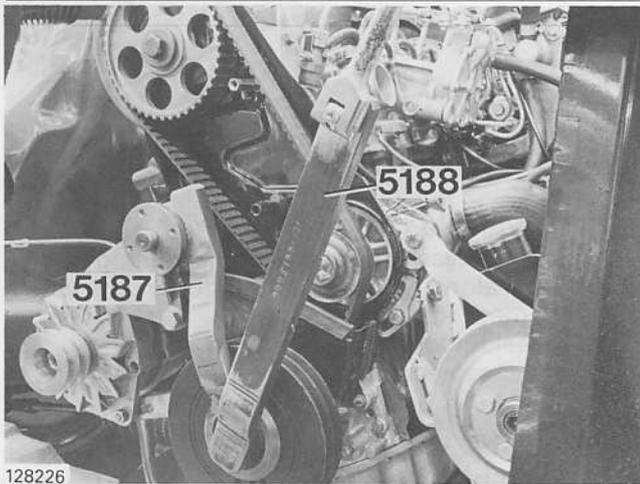
Use a 27 mm = 1-1/16" socket on vibration damper bolt to turn engine to position for injection of cylinder No. 1.

Both cam lobes should point up at equally large angles.

Flywheel timing mark at 0.

128163

1700.368



g5

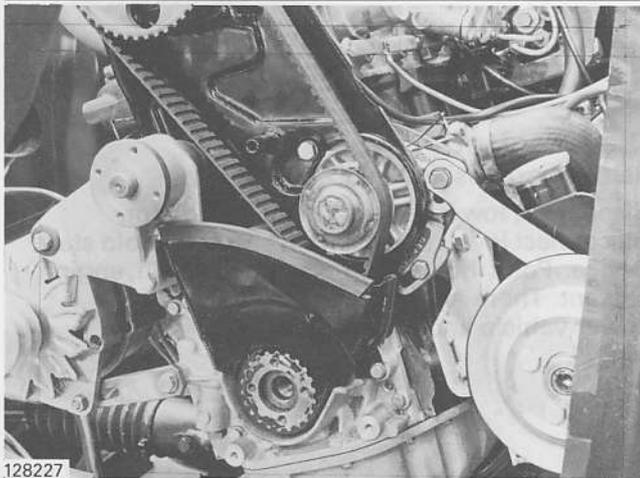
**Remove vibration damper center bolt.**

Use wrench 5187 to hold. Use wrench 5188 to remove bolt.

It might be necessary to turn engine slightly to permit wrench 5187 to rest on cooling fan journal.

128226

1700.369



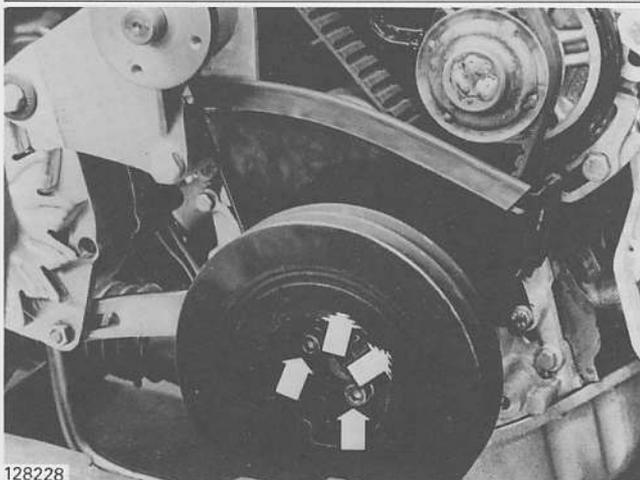
g6

**Check that cylinder No. 1 is at top dead center.**

If necessary, adjust flywheel to 0-mark. Use wrench 5187 to turn engine.

128227

1700.370



g7

**Remove vibration damper.**

Remove four screws, inhex 6 mm. Pull vibration damper.

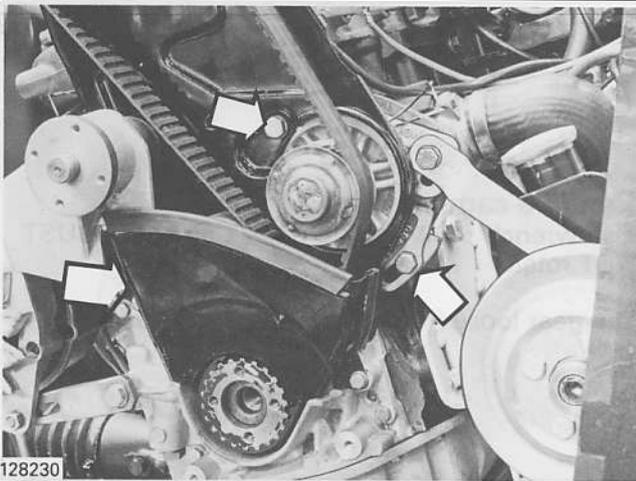
**NOTE:**

Vibration damper and crankshaft gear may be stuck together. Tap them apart.

128228

1700.371

g8

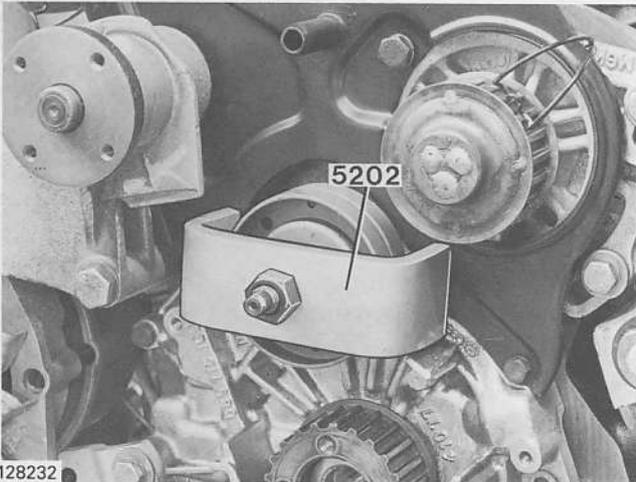


**Remove lower belt shield.**

Release retaining bolts for coolant pump. Loosen and remove timing gear belt.

1700.372

g9



**Replace idler pulley.**

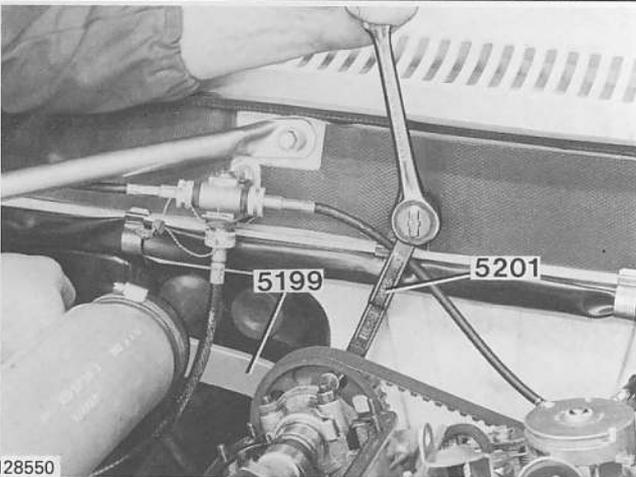
MUST be replaced when replacing timing gear belt.

Remove center bolt. Use puller **5202** to remove idler pulley.

Tap new idler pulley into position. Install center bolt.

1700.373

g10



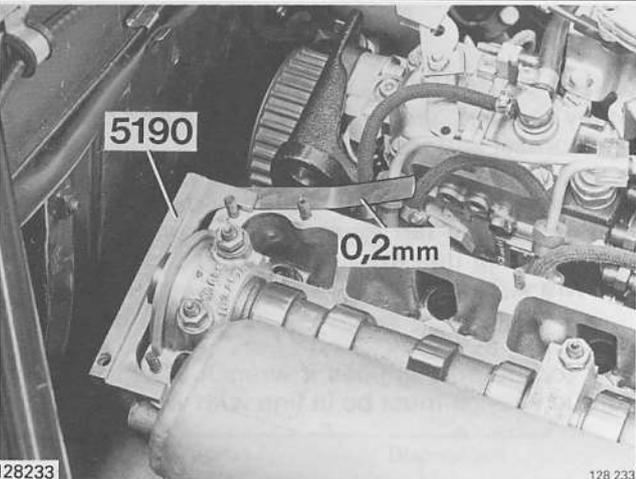
**Remove rear gear on camshaft.**

Use wrench **5199** to hold rear gear. Use wrench **5201** to remove center bolt.

Make sure camshaft is not rotated.

1700.374

g11

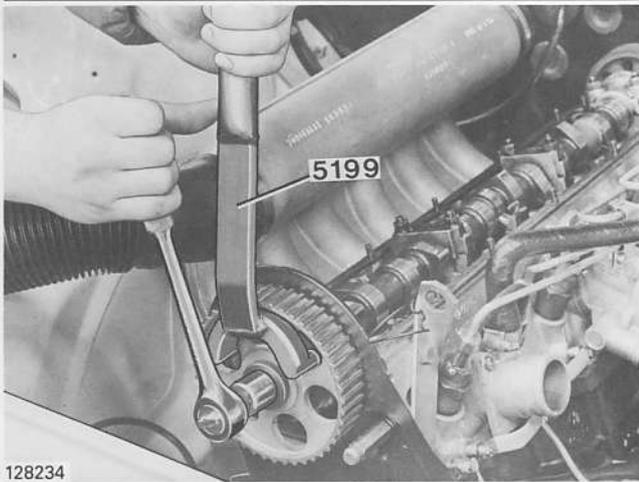


**Lock camshaft in position.**

Lift valve cover gasket. Install gauge **5190** in groove on camshaft gear rear end. Position a **0.2 mm = 0.008"** feeler gauge under left side of gauge **5190**.

The 0.2 mm gap is to compensate for clearances in timing gears.

1700.375



128234

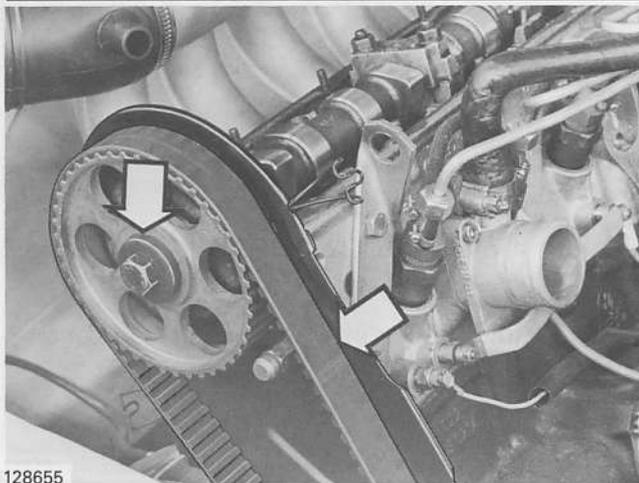
**g12**

**Remove camshaft front gear.**

Use wrench **5199** to hold gear. Camshaft **MUST NOT** rotate.

Tap gear loose from camshaft tapered end.

1700.376



128655

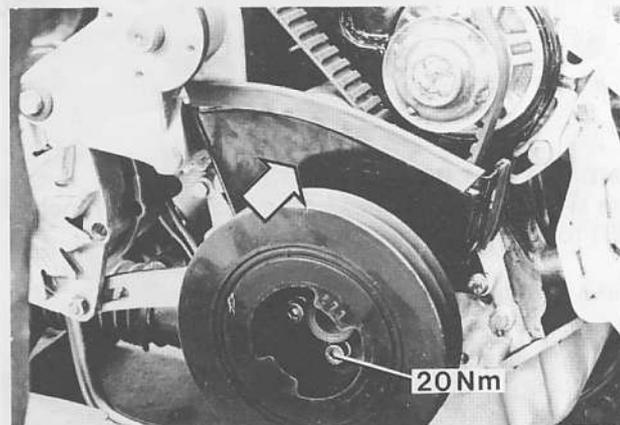
**g13**

**Install gear belt and camshaft front gear.**

Make sure gear belt fits securely on gears.

Install center bolt finger tight. Gear must be allowed to rotate. Camshaft **MUST NOT** rotate.

1700.377



128229

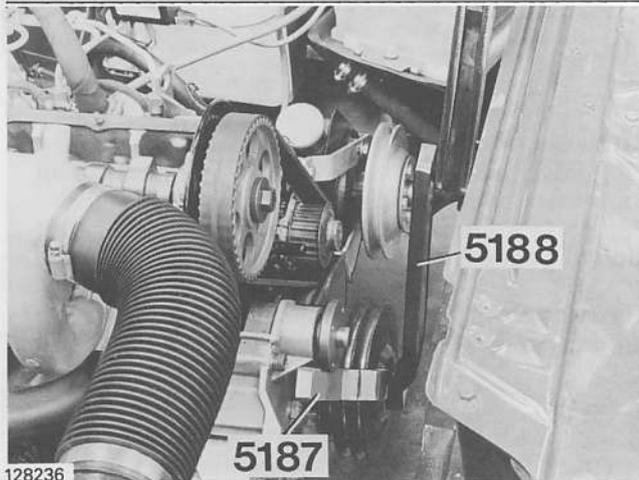
**g14**

**Install lower belt shield and vibration damper.**

Vibration damper fits one way only. There is a pin on crankshaft gear to locate vibration damper.

Install 6 mm inhex bolts. Torque to:  
**20 Nm = 15 ft.lbs.**

1700.378



128236

**g15**

**Install center bolt.**

Apply sealing agent (P/N 277961-9) to bolt threads and contact surfaces.

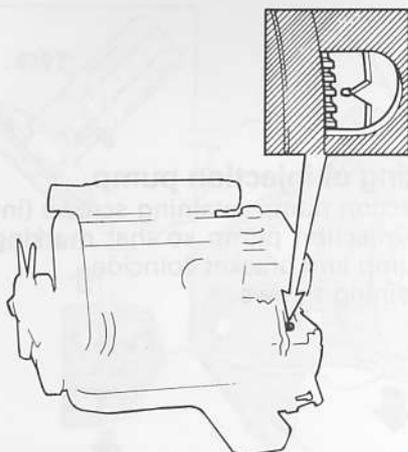
Use wrench **5187** to hold vibration damper. It can rest on cooling fan journal. Use wrench **5188** to torque center bolt to:  
**350 Nm = 255 ft.lbs.**

**NOTE:**

This torque only applies if wrench **5188** is used. Torque wrench must be in line with wrench **5188**.

1700.379

g16



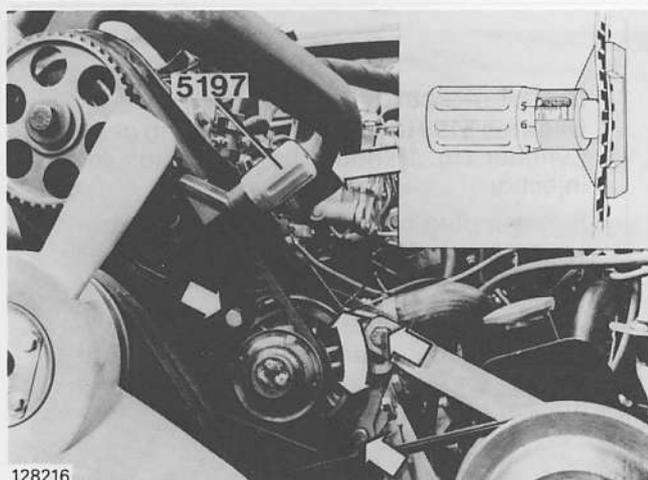
**Check that cylinder No. 1 is at top dead center.**

Flywheel mark at O.

128175

1700.380

g17



**Tension timing gear belt.**

Use coolant pump to adjust timing gear belt tension.

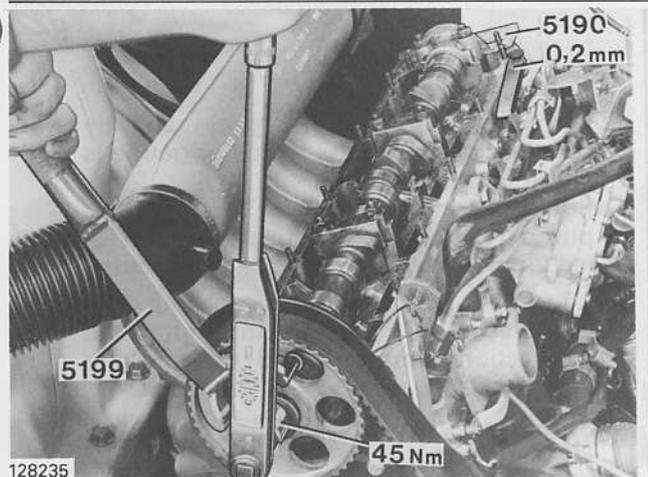
Install belt tension gauge **5197** on timing gear belt. Set gauge to 12.5. Tension timing gear belt until mark on plunger is flush with gauge sleeve.

Depress timing gear belt heavily by hand. Recheck timing gear belt tension. Adjust if required.

128216

1700.381

g18



**Tighten camshaft front gear.**

Use wrench **5199** to hold gear. Make sure camshaft or gear does not rotate.

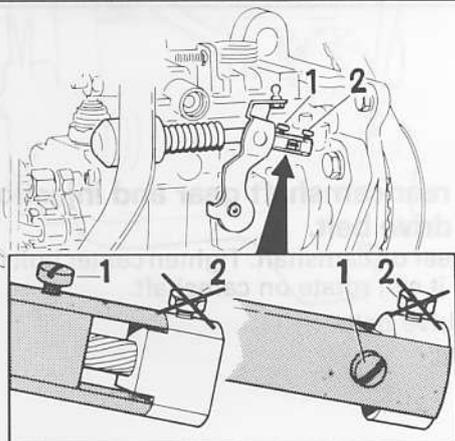
Torque center bolt to:  
**45 Nm = 33 ft.lbs.**

Remove gauge 5190 and feeler gauge.

128235

1700.382

g19



**Disconnect cold start device.**

Loosen screw 1. Push lever forward. Rotate sleeve 90°.

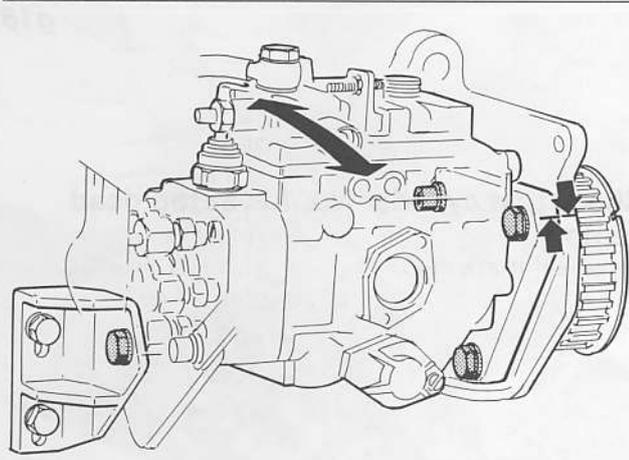
Push lever back against stop.

**NOTE:**

DO NOT touch screw 2. If it is loosened, cold start device must be re-set on test bench.

128169

1700.383



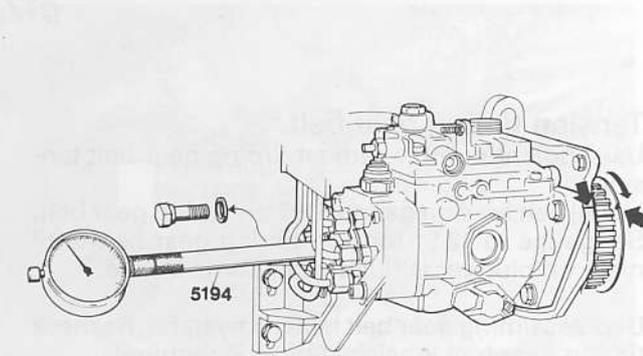
128167

g20

### Basic setting of injection pump.

Loosen injection pump retaining screws (inhex 6 mm). Turn injection pump so that markings on injection pump and bracket coincide. Tighten retaining screws.

1700.384



128177

g21

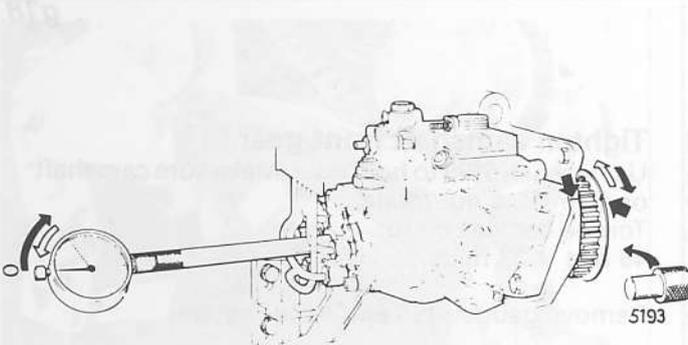
### Install indicator gauge.

Use stop **5193** to lock injection pump gear. Cylinder No. 1 should be at position for injection.

Remove plug of injection pump distributor. Install holder **5194** and an indicator gauge with a measuring range of 0-3 mm. Set indicator gauge at approx. 2 mm.

Turn injection pump clockwise until marks on injection pump gear and bracket coincide.

1700.385



128670

g22

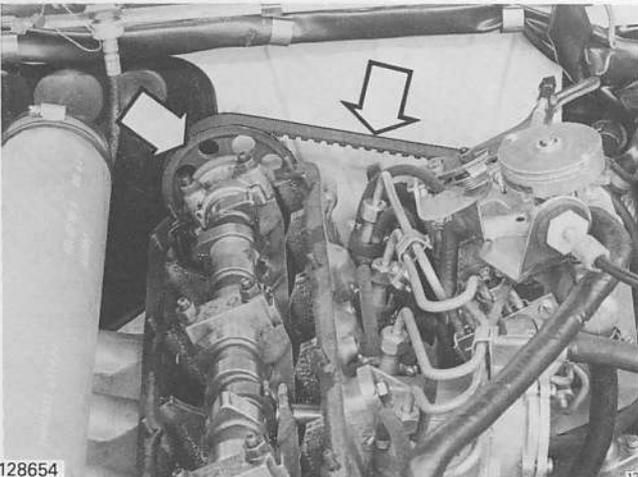
### Set indicator gauge.

Turn injection pump gear slightly counterclockwise until indicator gauge is at minimum reading.

Set indicator gauge at zero. Turn injection pump gear clockwise until marking on injection pump gear and bracket coincide.

Use stop **5193** to lock injection pump gear in this position. Insert stop through a hole in injection pump gear and into a hole in bracket.

1700.386



128654

g23

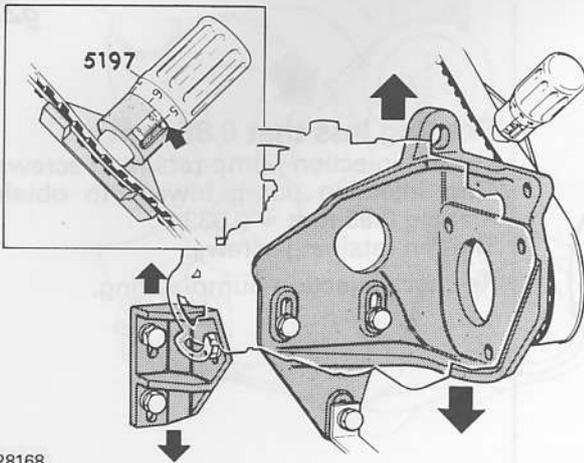
### Install rear camshaft gear and injection pump drive belt.

Install gear on camshaft. Tighten center bolt finger tight so it can rotate on camshaft.

Install drive belt.

1700.387

**g24**



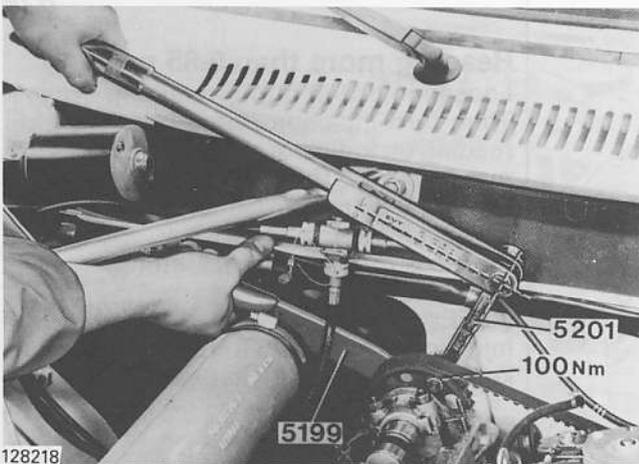
128168

**Tension injection pump gear belt.**

Use injection pump bracket to tension gear belt. Use belt tension gauge **5197** to set belt tension. Install gauge on belt and set it to **12.5**. Tension belt until mark on plunger is flush with tool sleeve. Tighten injection pump retaining screws. Depress belt heavily by hand. Re-check belt tension. Adjust if required.

1700.388

**g25**



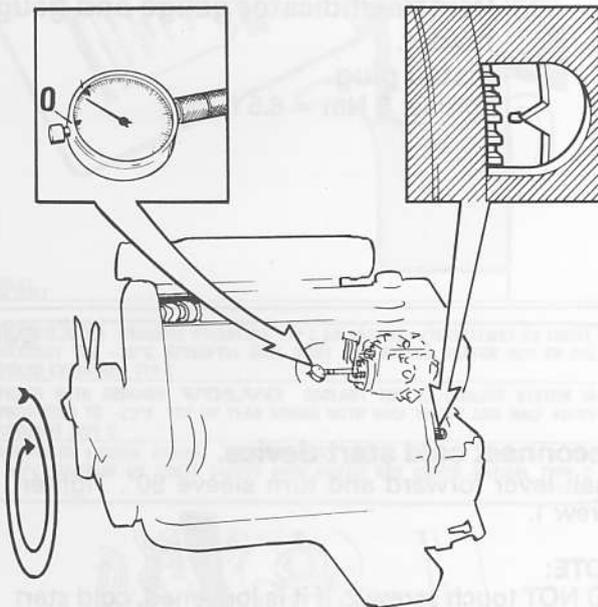
128218

**Set injection pump.**

Install wrench **5199** to hold camshaft rear gear. Install wrench **5201** with a torque wrench. It should be at a right angle to wrench **5201** to give correct readings. Use wrench **5199** to turn camshaft gear until the indicator gauge registers **0.85 mm = 0.0334"**. Hold camshaft gear in this position while tightening center bolt to **100 Nm = 73 ft.lbs.** Camshaft or gear must not change position.

1700-389

**g26**



128173

**Remove stop 5193.**

1700.390

**Check injection pump setting.**

Turn engine two full turns until cylinder No. 1 is at top dead center and injection (= both cam lobes for cylinder No. 1 should point up equally large angles, flywheel timing mark at 0). Indicator gauge should now read **0.85 mm = 0.0334"**.

**Correct reading:**

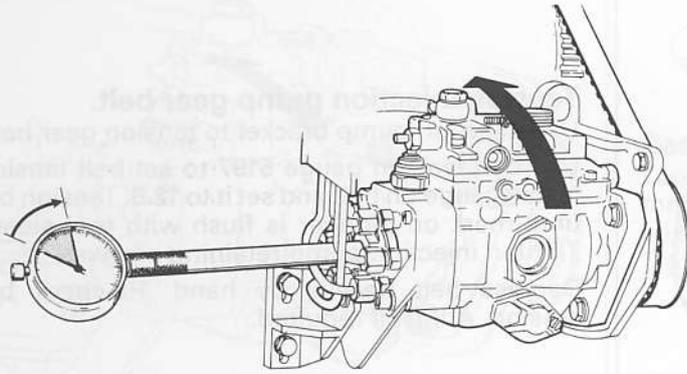
Tighten injection pump retaining screws. Then continue from op. 29.

**Incorrect reading:**

Re-adjust according to instructions.

1700.391

g27



128668

1700.392

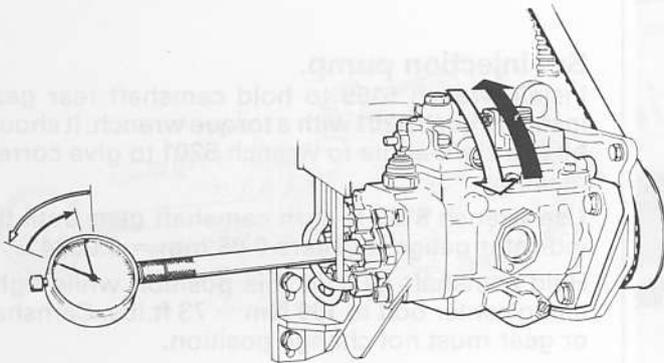
**Reading less than 0.85 mm:**

Loosen injection pump retaining screws. Turn injection pump inward to obtain reading **0.85 mm = 0.0334"**.

Tighten retaining screws.

Re-check injection pump setting.

g28



128671

1700.393

**Reading more than 0.85 mm:**

Loosen injection pump retaining screws. Then turn injection pump outward until reading on indicator gauge is approx. **0.75 mm = 0.029"**. Then turn inward to obtain reading **0.85 mm = 0.0334"**.

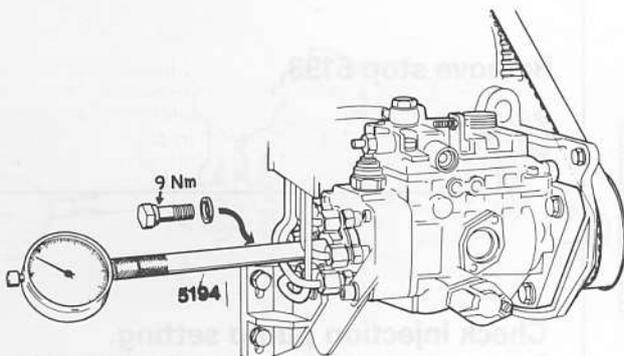
Tighten retaining screws.

Re-check injection pump setting.

**NOTE:**

Injection pump **MUST NOT** be tapped or knocked as this will alter settings.

g29



128174

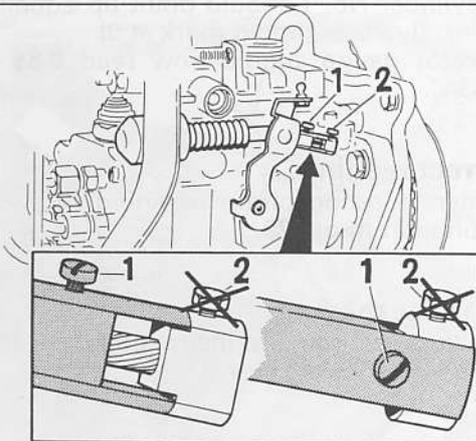
1700.394

**Remove indicator gauge and gauge holder.**

**Install plug.**

Torque: **9 Nm = 6.5 ft.lbs.**

g30



Engaged

Disengaged

**Reconnect cold start device.**

Push lever forward and turn sleeve 90°. Tighten screw 1.

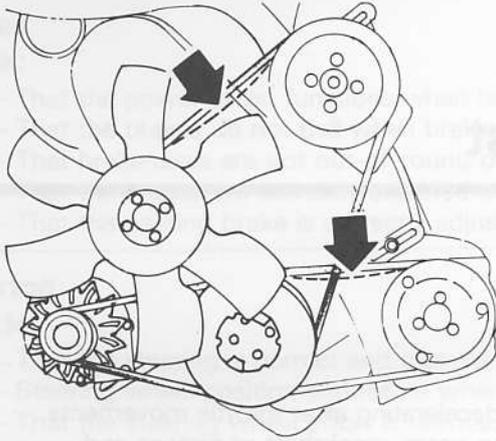
**NOTE:**

**DO NOT** touch screw 2. If it is loosened, cold start device must be re-set on test bench.

128169

1700.395

**g31**



133229

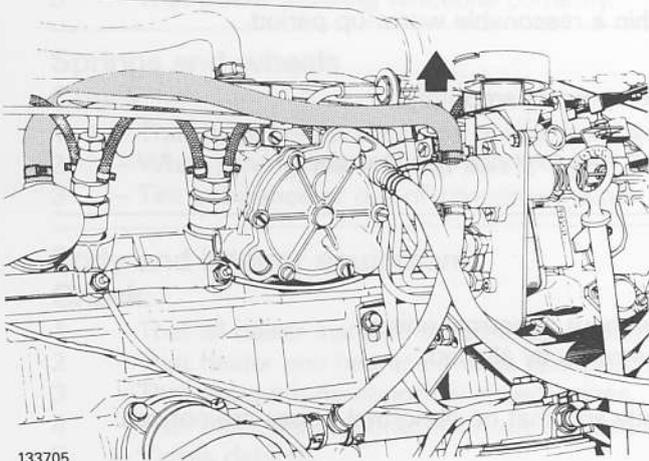
1700.396

**Install.**

Install cooling fan with spacer and pulley. Torque retaining bolts to **9 Nm** = 6.5 ft.lbs. Install fan belt and power steering pump drive belt. Adjust belt tension.

Install radiator and radiator hoses. Install splash guard under engine.

**g32**



133705

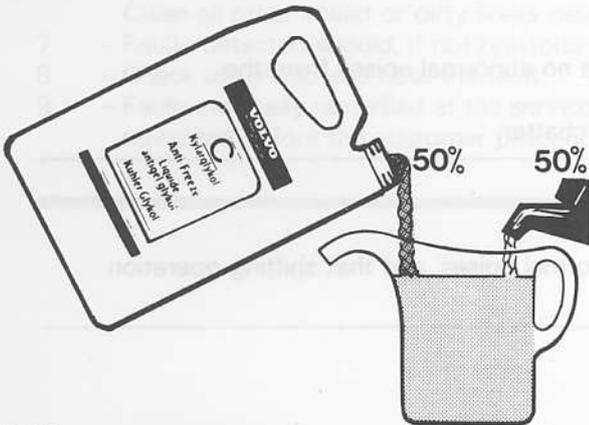
1700.363

**Prepare bleeding of cooling system.**

Disconnect upper hose at cold start device. Place vessel under hose end. Hold hose end in level with expansion tank top.

Using this method will bleed cooling system quickly and efficiently and eliminate air pockets.

**g33**



133542

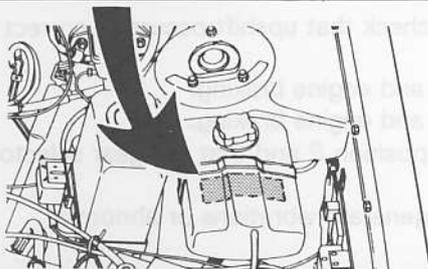
1700.169

Volvo all weather Anti-Freeze Type C (blue-green) should be used all year round. Cooling system should always contain water plus anti-freeze, even during summer. Experience has also shown that extremely weak anti-freeze solutions (10-20%) provide poor rust protection. For this reason ratio of anti-freeze/summer coolant to water should be 1 to 1.

**VOLVO ORIGINAL KYLVÄTSKA TYP C** ÄR PÅFYLLD. KYLSYSTEMET ÄR FROSTSKYDDAT TILL -30°C. EFTERFYLL ÅRET RUNT MED EN DEL VATTEN OCH EN DEL VOLVO KYLVÄTSKA TYP C.

FILLED WITH GENUINE **VOLVO COOLANT TYPE C**. COOLING SYSTEM IS PROTECTED TO -22°F. TOP UP YEAR ROUND WITH HALF WATER AND HALF VOLVO COOLANT TYPE C.

REMPLI DE LIQUIDE ANTIGEL **VOLVO** TYPE C VALABLE JUSQU'À -22°F/-30°C. REMPLIR EN TOUTE SAISON AVEC MOITIÉ EAU MOITIÉ ANTIGEL TYPE C. 1297524



133477

1700.362

**Fill coolant.**

Manual transmission: 9.4 liters = 10 US qts – 9.4 liters = 10 US qts

Automatic transmission:  
– 9.2 liters = 9.8 US qts

Flush cooling system prior to filling **new** coolant. Otherwise refill old coolant.

Set heat control to MAX. Start engine and run at increased idle speed for 5 minutes while refilling coolant.

Reconnect hose at cold start device. Fill expansion tank **FULL** (above MAX) and install cap.

## Road test

---

### Engine

#### Check and adjust as necessary:

- 1 – Starting ability, cold and hot engine.
  - 2 – Fast idle.
  - 3 – Correct idle speed and no misfiring.
  - 4 – That the engine does not stall when accelerating or decelerating after throttle movements.
  - 5 – That there are no abnormal noises from valves, timing gears, crankshaft or pistons and connecting rods, water pump etc.
  - 6 – That normal operating temperature is reached within a reasonable warm-up period.
  - 7 – That the engine does not behave abnormally.
  - 8 – That the acceleration is normal and that the engine operates smoothly.
  - 9 – Open the hood. Check for visible leaks.
  - 10 – That hardware removed at factory is reinstalled and that everything is in order.
- 

### Electrical

#### Check:

- 1 – That starter and alternator operate correctly and without abnormal noises.
  - 2 – That wipers and washers operate correctly and are correctly aligned.
  - 3 – That steering lock operates correctly.
  - 4 – That instruments and control lights operate correctly and that no abnormal noises are noticed.
- 

### Drive train

#### Check:

- 1 – That the clutch is correctly adjusted and that there are no abnormal noises from the throw-out bearing.
  - 2 – That the clutch operates correctly without slipping or chatter.
- 

### Manual transmission

#### Check:

- 1 – That the transmission operates correctly, without abnormal noises, and that shifting operation is smooth.
- 

### Automatic transmission

#### Check:

- 1 – That the gear selector play is correct.
  - 2 – That the starter operates only in position P or N and the back-up lights operate in position R only.
  - 3 – Run the transmission to normal operating temperature.
  - 4 – That there is no slippage at stall speed in position D and R (see Service Manual).
  - 5 – Upshift 1–2 and 2–3 by accelerating on part throttle with the gear selector in position D.
  - 6 – That the engine does not slip during shifting, which would indicate that a brake or clutch slips.
  - 7 – Employ kick-down operation and check downshift.
  - 8 – If traffic conditions permit, retain kick-down position and check that upshift occurs at correct speeds.
  - 9 – Place the gear selector in position 2 and check downshift and engine braking.
  - 10 – Place the gear selector in position 1 and check downshift and engine braking.
  - 11 – If possible, park on incline and check holding capability in position P and that the gear selector does not move out of position P by itself.
  - 12 – That drive shafts, rear axle or drive shaft bearings do not generate vibrations or abnormal noises.
-

---

## Brakes

### Check:

- 1 - That the power assist functions when braking by noting pedal pressure.
  - 2 - That the brakes do not pull when braking hard.
  - 3 - That brake discs are not out-of-round or warped by noting pedal pulsation or movement.
  - 4 - That the brakes are correctly adjusted and that the brake pedal does not feel "spongy".
  - 5 - That the parking brake is correctly adjusted and operates correctly.
- 

## Steering

### Check:

- 1 - That the steering is correct and that the vehicle does not pull or is unstable.
  - 2 - Steering wheel position and return when driving.
  - 3 - That the steering wheel effort is normal.
  - 4 - Steering looseness.
  - 5 - That power steering functions correctly.
- 

## Springs and wheels

### Check:

- 1 - That there are no abnormal noises from shock absorbers or rear wheel suspension.
  - 2 - When driving that the rear axle is tight.
  - 3 - Tire unbalance or out-of-roundness, when driving.
- 

## Body and interior equipment

### Check:

- 1 - That all dealer installed accessories operate correctly.
  - 2 - That heater and heater controls operate correctly.
  - 3 - That there are no abnormal speed noises.
  - 4 - That there are no abnormal body noises (rattle, vibrations etc.)
  - 5 - Visible defects.
  - 6 - Wipe off steering wheel and gear selector.  
Clean all other soiled or dirty areas caused by the maintenance procedures.
  - 7 - Faults detected should, if not previously noted, be noted in the service record.
  - 8 - Check off group and note the fault.
  - 9 - Faults normally remedied at the service should not be noted. Make sure all faults are remedied before the customer picks up his car.
-

**Brakes**

- Check:**
- 1 - That the power assist functions when braking by noting pedal pressure.
  - 2 - That the brakes do not pull when in either gear.
  - 3 - That the brake disc are not out-of-round or warped by noting pedal vibration or movement.
  - 4 - That the brake pads are evenly adjusted and that the brake pads do not touch the brake disc.
  - 5 - That the parking brake is correctly adjusted and operates correctly.

**Engine**

**Check and adjust as necessary:**

- Check:**
- 1 - Starting ability, cold and hot engine.
  - 2 - Fan life.
  - 3 - Correct idle speed and mixture.
  - 4 - That the engine oil level is correct and that the vehicle does not pull or is unstable.
  - 5 - That the engine oil level is correct and that the vehicle does not pull or is unstable.
  - 6 - That the engine oil level is correct and that the vehicle does not pull or is unstable.
  - 7 - That the engine oil level is correct and that the vehicle does not pull or is unstable.
  - 8 - That the engine oil level is correct and that the vehicle does not pull or is unstable.

**Steering and wheels**

- Check:**
- 1 - That there are no abnormal noises from front-wheel suspension.
  - 2 - When driving that the wheel is rigid.
  - 3 - The resistance to out-of-roundness when driving.
  - 4 - That the steering wheel is correctly adjusted and operates correctly.
  - 5 - That the steering wheel is correctly adjusted and operates correctly.
  - 6 - That the steering wheel is correctly adjusted and operates correctly.
  - 7 - That the steering wheel is correctly adjusted and operates correctly.
  - 8 - That the steering wheel is correctly adjusted and operates correctly.
  - 9 - That the steering wheel is correctly adjusted and operates correctly.
  - 10 - That the steering wheel is correctly adjusted and operates correctly.

**Electrical**

**Check:**

- Check:**
- 1 - That all down-related accessories operate correctly.
  - 2 - That the battery is correctly charged.
  - 3 - That the battery is correctly charged.
  - 4 - That the battery is correctly charged.
  - 5 - That the battery is correctly charged.
  - 6 - That the battery is correctly charged.
  - 7 - That the battery is correctly charged.
  - 8 - That the battery is correctly charged.
  - 9 - That the battery is correctly charged.
  - 10 - That the battery is correctly charged.

**Drive train**

- Check:**
- 1 - That the drive shaft is correctly adjusted and operates correctly.
  - 2 - That the drive shaft is correctly adjusted and operates correctly.
  - 3 - That the drive shaft is correctly adjusted and operates correctly.
  - 4 - That the drive shaft is correctly adjusted and operates correctly.
  - 5 - That the drive shaft is correctly adjusted and operates correctly.
  - 6 - That the drive shaft is correctly adjusted and operates correctly.
  - 7 - That the drive shaft is correctly adjusted and operates correctly.
  - 8 - That the drive shaft is correctly adjusted and operates correctly.
  - 9 - That the drive shaft is correctly adjusted and operates correctly.
  - 10 - That the drive shaft is correctly adjusted and operates correctly.

**Manual transmission**

- Check:**
- 1 - That the transmission is correctly adjusted and operates correctly.
  - 2 - That the transmission is correctly adjusted and operates correctly.
  - 3 - That the transmission is correctly adjusted and operates correctly.
  - 4 - That the transmission is correctly adjusted and operates correctly.
  - 5 - That the transmission is correctly adjusted and operates correctly.
  - 6 - That the transmission is correctly adjusted and operates correctly.
  - 7 - That the transmission is correctly adjusted and operates correctly.
  - 8 - That the transmission is correctly adjusted and operates correctly.
  - 9 - That the transmission is correctly adjusted and operates correctly.
  - 10 - That the transmission is correctly adjusted and operates correctly.

**Automatic transmission**

- Check:**
- 1 - That the gear selector plate is correct.
  - 2 - That the starter operates only in position P or N and the hand-up lights operate only in position P.
  - 3 - That the transmission is correctly adjusted and operates correctly.
  - 4 - That the transmission is correctly adjusted and operates correctly.
  - 5 - That the transmission is correctly adjusted and operates correctly.
  - 6 - That the transmission is correctly adjusted and operates correctly.
  - 7 - That the transmission is correctly adjusted and operates correctly.
  - 8 - That the transmission is correctly adjusted and operates correctly.
  - 9 - That the transmission is correctly adjusted and operates correctly.
  - 10 - That the transmission is correctly adjusted and operates correctly.
  - 11 - That the transmission is correctly adjusted and operates correctly.
  - 12 - That the transmission is correctly adjusted and operates correctly.



**VOLVO SUPPORTS VOLUNTARY  
MECHANIC CERTIFICATION  
BY THE N.I.A.S.E.**

**(USA ONLY)**

***Service literature***

*Your  
most important  
special tool*

# VOLVO

**TP 30600/1**  
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