

Saab Engines

900 & 900 TURBO 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine number is stamped on engine block and is located in the left front corner of the engine compartment. The 4th character of the number indicates whether the engine is turbo-charged or normally aspirated, the 5th character indicates automatic or manual transmission.

ENGINE IDENTIFICATION

| Application | Code |
|-------------------|---------|
| 900 | |
| Man. Trans. | B20IMUC |
| Auto. Trans. | B20IAUC |
| 900 Turbo | |
| Man. Trans. | B20SMUC |
| Auto. Trans. | B20SAUC |

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

NOTE: Engine and transaxle assembly are removed as a unit. Transaxle housing is engine lower crankcase (pan).

Removal

1) Disconnect and remove battery. Disconnect windshield washer hose. Remove hood and drain cooling system.

2) Disconnect ground strap between engine and chassis and disconnect positive cable from starter motor. Disconnect servo vacuum hose at manifold and remove bellows between air flow sensor and intake manifold.

3) Clean area around fuel distributor lines and detach at connectors. Cover openings and plug fuel line ends. Remove air cleaner assembly along with mixture control unit. Disconnect EGR system (if equipped). Disconnect upper and lower radiator hoses and heater hoses.

4) Disconnect all ignition wiring connectors as well as sensors, emission control and electrical power connections between chassis and engine. Disconnect heating system and vacuum hoses.

5) Disconnect throttle control wire. Disconnect 2 hydraulic lines at power steering pump (if equipped).

6) On manual transmission models, disconnect clutch line from slave cylinder. Cap hose and slave cylinder opening, put gear lever in neutral, and drive front taper pin from shift rod joint. Separate joint from gear shift rod.

7) On automatic transmission models, remove protective cover from exhaust manifold (if equipped), and place gear selector in "P" position. Remove selector cable retaining screw, push back spring loaded sleeve on shift rod, and disconnect cable.

8) On all models, disconnect exhaust pipe at manifold. Disconnect speedometer cable at transmission.

9) Loosen clamps and remove bellows from inner universal joints at transaxle. Place spacer tool (83 93 209) between upper control arm and body so front suspension will be unloaded when car is raised.

10) Raise and support vehicle, then remove lower end piece from right side control arm. Remove rear engine mounting bolts and loosen the front engine mounting nut so mount can be lifted from the bracket. Attach lifting sling and slightly raise engine.

11) Move engine to the right and remove left universal joint, then move engine to left and remove right universal joint. Ensure that all cables and lines are free from engine and remove entire power unit from vehicle.

Installation

1) Ensure that universal joints are packed with grease. Fit new gaskets to the exhaust pipe flanges. Suspend engine and balance it so the front engine mount will locate in its bracket before the rear.

2) Lower the assembly, guiding the front mount into its bracket and continue to lower engine until rear of engine is 2" (50-60 mm) above mountings.

3) Move the engine to the right and guide in the left universal joint. Lower the engine carefully, guiding it into the mountings, and at the same time aligning the right universal joint. Ensure that exhaust pipe flanges line up.

4) Refit the right end piece to the control arm. Tighten universal joints and install rear engine mounting bolts. Tighten all engine mountings. To complete installation, reverse removal procedures.

CYLINDER HEAD & MANIFOLDS

Removal

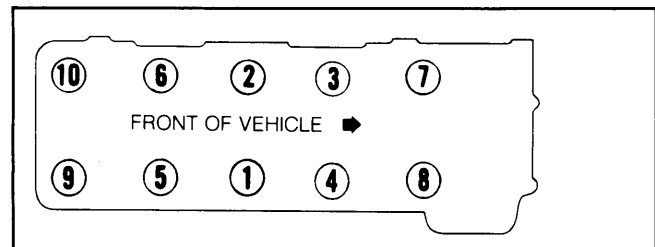
1) Remove battery leads. Drain cooling system. Remove upper radiator hose. Remove PCV hose from valve cover. Remove wiring from distributor and temperature sending unit. Remove warm-up regulator and auxiliary air valve from cylinder head.

2) Rotate crankshaft to TDC position on firing stroke of No. 1 cylinder. Remove valve cover. Place a jack under the transmission case. Detach the stay between right engine mount and cylinder head and rotate it to one side.

3) Jack up engine slightly and support it with a piece of wood between cross member and transmission case. Detach and support the intake and exhaust manifolds. Detach the chainwheel from the camshaft but keep the chain hanging on the chainwheel.

4) Place the chainwheel between the chain guide and tensioner. Remove 2 timing cover-to-cylinder head bolts. Remove cylinder head bolts in the reverse of sequence shown in Fig. 1. Lift the cylinder head off block and remove from vehicle.

Fig. 1: Cylinder Head Tightening Sequence



Loosen in reverse order.

Installation

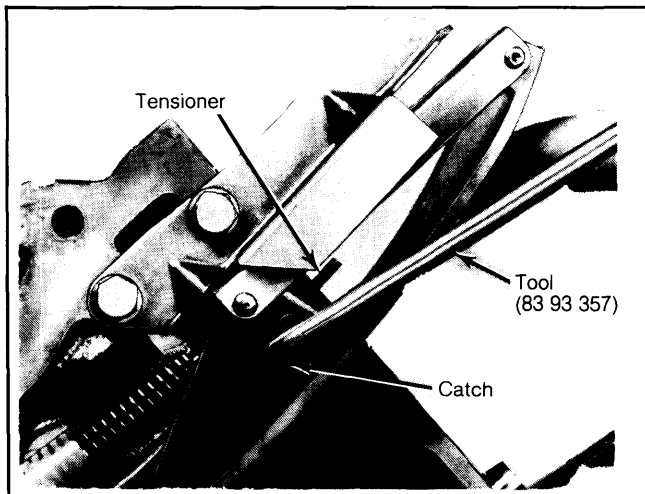
1) Place a new gasket on engine block. With crankshaft at "O" position, temporarily install the camshaft chainwheel and place camshaft at TDC position on No. 1

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cylinder firing stroke. Position the chain on the chainwheel and place chain between chain guide and tensioner.

2) Install the cylinder head and tighten the bolts in 2 stages in the sequence shown in *Fig. 1*. Install the cylinder head-to-timing cover bolts. Take tension off of timing chain tensioner by inserting tool (83 93 357) into tensioner catch and pulling upward. See *Fig. 2*.

Fig. 2: Chain Tensioner and Tensioner Tool



Shown in tension release position.

3) Place the chainwheel on the camshaft so that the marks on bearing cap, chainwheel, and screw holes align. If necessary, alter position of chain. Install the camshaft chainwheel retaining bolts using flat washers.

4) Using tool (83 93 357), push tensioner catch down to tension chain. To complete installation, reverse removal procedures.

NOTE: Cylinder head bolts should be retightened in the following manner. Run engine until warm. Then, allow it to cool 30 minutes. Loosen each head bolt slightly, following proper sequence. Retighten bolts. Then, tighten each bolt an additional 1/4 turn (90°), following the proper sequence.

CAMSHAFT

TIMING CHAIN ASSEMBLY

Removal

1) With engine removed from vehicle, place cylinder No. 1 at TDC of compression stroke. Remove valve cover. Remove chainwheel from camshaft and hang between tensioner and chain guide.

2) Remove crankshaft pulley and oil pump. Remove water pump. See Oil Pump and Water Pump Removal procedures. Remove 2 cylinder head-to-timing cover bolts.

3) Remove timing cover bolts and remove timing cover. Remove timing chain, camshaft chainwheel, tensioner and chain guide.

Installation

1) Ensure that both crankshaft and camshaft are in TDC position for No. 1 cylinder compression stroke. Install chain tensioner and chain guide.

2) Temporarily install camshaft chainwheel. Position the chain on the camshaft and crankshaft chainwheels and between the tensioner and chain guide.

3) Install the timing cover, oil pump and water pump. Take the tension off of the timing chain by inserting tool (83 93 357) into tensioner catch and pressing down.

4) Place the chainwheel on the camshaft sprocket so that marks on the camshaft bearing cap, chainwheel and screw holes align. Install the camshaft chainwheel using flat washers.

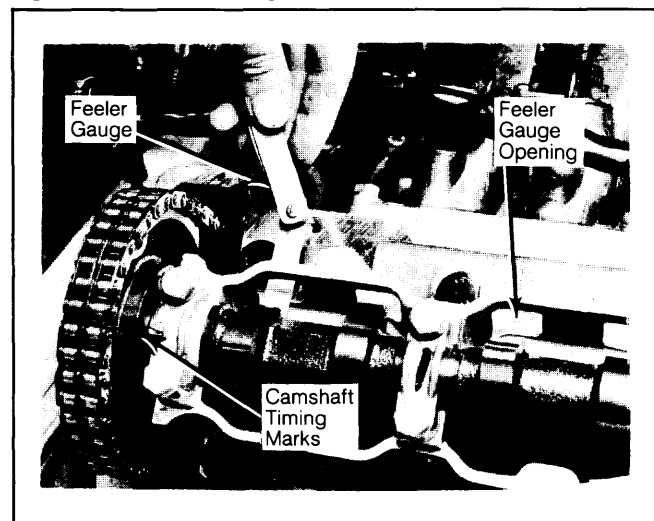
5) Tension chain by inserting tool (83 93 357) into tensioner catch and pushing down to turn catch over latch arm. See *Fig. 2*. To complete installation, reverse removal procedures.

CAMSHAFT

Removal

Remove valve cover and camshaft chainwheel. Hang chainwheel and chain between tensioner and chain guide. Remove camshaft bearing caps and lift out camshaft.

Fig. 3: Camshaft Timing Marks



Align arrow on sprocket with mark on bearing cap.

Installation

Install camshaft and bearing assembly so that feeler gauge openings are at top. Ensure that crankshaft is still at TDC for No. 1 cylinder and reverse removal procedure.

VALVES

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (Front-to-rear).

VALVE SPRINGS

NOTE: Valve spring replacement is possible without removing cylinder head from engine.

Removal

1) Remove camshaft as previously described. Remove camshaft bearing support assembly. With cylinder head installed, take spark plug out of cylinder and fit air hose connector.

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2) Supply air pressure to keep valve from dropping into cylinder. Remove valve depressors and adjusting pallets. Use a valve compressor and remove retainers (keepers) with a magnet.

Installation

To install, reverse removal procedures.

VALVE GUIDE SERVICING

1) To check for wear, pull valve about .12" (3 mm) from its seat and check radial play at valve head. If play exceeds .020" (.5 mm), replace valve and/or guide.

2) To replace guide, run hot water through head and pull guide from head using puller (8392631). To install, ensure that head is warm as in removal. Use guide tool (8392631) and press in new guide from the top.

VALVE CLEARANCE ADJUSTMENT

1) Check clearance with valve cover removed by rotating crankshaft so that cam lobe of valve to be measured points away from valve. Measure clearance with feeler gauge between heel of cam and follower.

2) Clearance should be between .006-.012" (.15-.30 mm) for intake and .014-.020" (.35-.50 mm) for exhaust. Turbo exhaust valve clearance is .016-.020" (.40-.50 mm).

3) If any valve clearance is beyond limits, direct measurement of all valve clearance is required. Use tool (8391450) and a dial indicator to measure actual clearance. Record clearance readings on all valves.

4) Adjust intake clearances if beyond .008-.010" (.20-.25 mm) and exhaust clearances if beyond .016-.018" (.40-.45 mm). Turbo exhaust clearance should be adjusted if beyond .018-.020" (.45-.50 mm).

5) Remove camshaft, followers and adjusting pallets of any valve requiring adjustment. Measure pallet thickness and add noted valve clearance to determine total clearance.

6) Subtract proper valve clearance to find needed pallet thickness. Install new pallets. Install followers and camshaft and recheck valve clearance.

PISTONS, PINS & RINGS

PISTON & ROD ASSEMBLY

Removal

With cylinder head and pan removed, note that rods and rod caps are numbered. Remove carbon or wear ridge from top of cylinders. Remove bearing caps and place plastic sleeves over rod bolts. Push piston/rod assembly out of cylinder.

Installation

Ensure that ring gaps are staggered and install ring compressor. Compression ring gaps should be equally spaced from each other. Notch on piston top must face timing cover and connecting rod numbers face exhaust side.

PISTON PIN REPLACEMENT

Piston pins are retained by circlips. Remove circlips and press out piston pins. Check pins and bearings for wear or damage and replace as required.

FITTING PISTONS

1) To fit pistons to cylinder bores, use a feeler gauge .500" (12.7 mm) wide and .0005-.0016" (.014-.040

mm) thick. Oil cylinder lightly and insert piston without rings.

2) Attach feeler gauge to a spring scale. Insert feeler gauge between piston and cylinder wall at right angles to piston pin. When feeler gauge can be pulled out of cylinder with a force of 1.8-2.6 lbs. (.816-1.18 kg), piston clearance has been determined.

3) Repeat test at several different depths in cylinder bore. Graded standard and non-graded oversize pistons are available.

PISTON SPECIFICATIONS

| Application | Diameter In. (mm) |
|--------------------|-------------------------------|
| Exc. Turbo | |
| Std. (AB) | 3.5425-3.5427 (89.980-89.986) |
| Std. (C) | 3.5433-3.5437 (89.999-90.010) |
| 1st Oversize | 3.5619-3.5625 (90.472-90.487) |
| 2nd Oversize | 3.5816-3.5822 (90.972-90.987) |
| Turbo | |
| Std. (AB) | 3.5421-3.5424 (89.970-89.976) |
| Std. (C) | 3.5427-3.5434 (89.986-90.002) |
| 1st Oversize | 3.5614-3.5620 (90.460-90.475) |
| 2nd Oversize | 3.5811-3.5817 (90.960-90.975) |

4) Check piston rings for end gap and side clearance, using an inverted piston to position ring in bore. On worn bores, measure at lower end of bore.

5) Install rings on pistons, staggering ring gaps. Compression ring gaps should be located above piston pin (180° from each other). Oil ring gaps should be equally spaced from each other.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

BEARING SERVICE

1) Remove connecting rods and main bearing caps. Measure journals with a micrometer. Out-of-round should not exceed .002" (.051 mm). If crankshaft is near or over stated limit of wear, regrind journals and fit undersize bearings.

2) Using "V" blocks and a dial indicator check crankshaft for bend. If bend exceeds .002" (.051 mm), replace or repair crankshaft.

3) Using Plastigage method, check main bearing and connecting rod bearing journals. If clearance is found excessive, combine undersize bearings to correct clearance. Undersize bearings are available in various thicknesses.

THRUST BEARING ALIGNMENT

Center main bearing is thrust bearing. Check crankshaft end play. If beyond specifications, replace thrust washers with oil grooves facing crankshaft.

ENGINE OILING

CRANKCASE CAPACITY

3.7 quarts (3.5L) with filter for engines without turbo. 4.5 quarts (4.3L) for turbocharged engine.

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OIL FILTER

Full-flow type.

NORMAL OIL PRESSURE

43 psi (3.0 kg/cm²) @2000 RPM.

PRESSURE REGULATOR VALVE

Valve is non-adjustable. It opens at 51-74 psi (3.6-5.2 kg/cm²).

ENGINE OILING SYSTEM

Oil pressure is generated by a gear type oil pump with one gear wheel and an eccentric ring gear. The pump is mounted on the timing cover and is driven by a crankshaft mounted driving plate. Oil is forced through a full flow filter and oil channels to crankshaft main and connecting rod bearings and valve train.

OIL PUMP

Removal

Clean area around pump. Immobilize crankshaft by attaching locking device (83 92 987) to flywheel ring gear. Remove crankshaft pulley retaining bolt and remove pulley from crankshaft. Remove oil pump retaining bolts and extract the pump.

Inspection

Using a straight edge and feeler gauge, check end float between pump body and gear wheel.

Installation

Oil the gear wheels. Install the ring gear so that the mark on its face is visible. Fit a new sealing ring in groove in pump body. Prime pump with oil and install to engine. Remove oil filter adapter casting and fill passage with oil. Reinstall casting.

NOTE: It may be necessary to extract the pump gear slightly to locate it on driving plate.

ENGINE COOLING

COOLING SYSTEM CAPACITY

10.8 qts. (10.0L).

THERMOSTAT

Thermostat begins to open at 190°F (88°C).

RADIATOR CAP

Opens at 12.9-17.1 psi (0.9-1.2 kg/cm²).

WATER PUMP

Removal

Drain coolant. Remove driving belt. Remove water pump attaching screws and remove water pump.

Installation

Clean gasket mating surfaces and install a new gasket. Install pump to timing cover. Install pulley and driving belt.

TIGHTENING SPECIFICATIONS

| Application | Ft. Lbs. (N.m) |
|-----------------------------|----------------|
| Main Bearings | 79 (108) |
| Rod Bearings | 40 (54) |
| Camshaft Bearing Caps | 13 (18) |
| Crankshaft Pulley | 137 (190) |
| Cylinder Head ¹ | |
| Step 1 | 45 (60) |
| Step 2 | 65 (90) |
| Flywheel | 43 (59) |
| Oil Pump | 13 (18) |
| Camshaft Sprocket | 14 (20) |
| Intake Manifold | 13 (18) |
| Exhaust Manifold | 18 (25) |

¹ — Retighten as described in Installation procedure.

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

| Year | Displacement | | Fuel System | HP@RPM | Torque Ft. Lbs.@RPM | Compr. Ratio | Bore | | Stroke | |
|--------------|--------------|------|-------------|----------|------------------------|-----------------|------|----|--------|----|
| | Cu. In. | cc | | | | | In. | mm | In. | mm |
| 1982 | 121 | 1985 | Fuel Inj. | 110@5200 | 119@3500 | 9.25:1 | 3.54 | 90 | 3.07 | 78 |
| 900 Turbo | 121 | 1985 | Fuel Inj. | 135@5000 | 160@3500 | 7.20:1 | 3.54 | 90 | 3.07 | 78 |

VALVES

| Engine Size & Valve | Head Diam. In. (mm) | Face Angle | Seat Angle | Seat Width In. (mm) | Stem Diameter In. (mm) | Stem Clearance In. (mm) | Valve Lift In. (mm) |
|---------------------|------------------------|------------|------------|------------------------|----------------------------|----------------------------|------------------------|
| 1985 cc Intake | 1.654 (42.0) | 44.5° | 45° | .004-.008 (1-2) | .313-.314 (7.960-7.975) | 0.02 (0.5) | |
| Exhaust | 1.398 (35.5) | 44.5° | 45° | .004-.008 (1-2) | .313-.314 (7.955-7.980) | 0.02 (0.5) | |

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ENGINE SPECIFICATIONS (Cont.)

PISTONS, PINS, RINGS

| Engine | PISTONS | PINS | | RINGS | | |
|---------|---|----------------------------|---------------------|-------------|-------------------------|----------------------------|
| | Clearance In. (mm) | Piston Fit In. (mm) | Rod Fit In. (mm) | Ring No. | End Gap In. (mm) | Side Clearance In. (mm) |
| 1985 cc | .0006-.0016 ¹ (.014-.040) | .0002-.0006 (.005-.014) | ² | No. 1 | .014-.021 (.35-.55) | .002-.003 (.050-.082) |
| | | | | No. 2 | .012-.018 (.30-.45) | .0016-.003 (.040-.072) |
| | | | | Oil | .015-.055 (.38-1.40) | |

¹ — Turbo clearance .0009-.0020" (.024-.050 mm).

² — Interference fit.

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

| Engine | MAIN BEARINGS | | | | CONNECTING ROD BEARINGS | | |
|---------|--------------------------------|--------------------------|-------------------|------------------------------------|--------------------------------|--------------------------|-----------------------|
| | Journal Diam. In. (mm) | Clearance In. (mm) | Thrust Bearing | Crankshaft End Play In. (mm) | Journal Diam. In. (mm) | Clearance In. (mm) | Side Play In. (mm) |
| 1985 cc | 2.283-2.284 (57.981-58.000) | .001-.002 (.020-.062) | Center | .003-.011 (.08-.28) | 2.046-2.047 (51.981-52.000) | .001-.002 (.026-.062) | |

VALVE TIMING

| Engine | INTAKE | | EXHAUST | |
|-------------------------|----------------|-----------------|----------------|-----------------|
| | Open (BTDC) | Close (ABDC) | Open (BBDC) | Close (ATDC) |
| 1985 cc 900 Turbo | 10° | 54° | 46° | 18° |
| | 12° | 40° | 62° | 2° |

VALVE SPRINGS

| Engine | Free Length In. (mm) | PRESSURE Lbs. @ In. (Kg @ mm) | |
|---------|----------------------------|----------------------------------|-------------------------------|
| | | Valve Closed | Valve Open |
| 1985 cc | 1.700 (43.1) | | 170-183@1.161 (77-83@29.5) |

CAMSHAFT

| Engine | Journal Diam. In. (mm) | Clearance In. (mm) ¹ | Lobe Lift In. (mm) ² |
|---------|---------------------------|------------------------------------|--|
| 1985 cc | 1.139 (28.94) | | Int. .421 (10.8) Exh. .433 (11.0) |

¹ — End play is .003-.010" (.08-.25 mm).

² — Turbo lobe lift is .358" (9.1 mm) for intake, .413" (10.5 mm) for exhaust.