

S80 (-06), 2000, B6294S, M65, L.H.D, YV1TS94K2Y1079445, 079445



9/5/2013

PRINT

Valve clearance, setting / adjusting

Note! As the illustrations in this service information are used for different model years and / or models, some variation may occur. However, the essential information in the illustrations is always correct.

Preparation

Remove the cable from the battery negative terminal. First read Battery, disconnecting . Check the valve clearance according to Checking valve clearance .

Note! Make a note of the valve clearance in the inspection form!



Remove (B6284T)

- the camshaft position (CMP) sensor housing. Place to one side
- the trigger wheel
- the screw holding the control pipe for the pressure regulator to the top of the cylinder head
- the protective cover over the injector connectors.

Remove (B6294S)

- the cover at the rear of the exhaust camshaft
- the vacuum hoses from the intake manifold
- the screws at the intake

manifold junction.

Lift out the upper section of the intake manifold. Remove the gasket. Install guard 999 5723 .

Remove (common)

- the ground strip from the firewall
- the connector for the variable valve timing solenoid
- the connector for the coolant temperature sensor
- the screw holding the cable duct for the temperature sensor to the top of the cylinder head
- the radiator breather tube from the expansion tank. Install lock grip pliers.

Lift up the brake fluid reservoir.

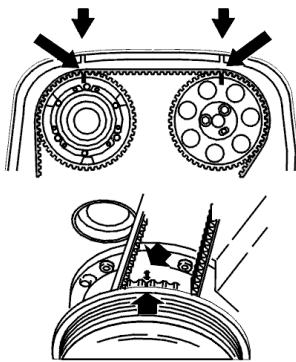
Disconnect the ABS sensor connector.

Place the brake fluid reservoir over the engine.

Warning! Ensure that no fluid is spilled on the engine. It is extremely flammable!

Disconnect the connector for the level sensor in the expansion tank.

Lift up and place the expansion tank on top of the engine.



Remove

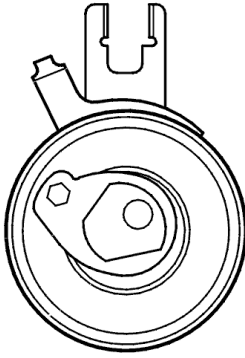
- the auxiliaries belt
- the front timing cover.

Position the upper timing cover.

Turn the crankshaft clockwise until the markings on the crankshaft belt pulley and the timing belt pulley are aligned with the markings on the oil pump and the upper timing cover. Remove the upper timing cover.

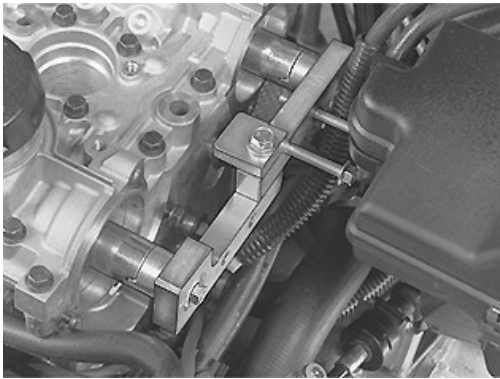
Caution! Crankshaft and camshafts must not be turned more than is stated in the method description. If the shafts are turned in any other way the valves may be damaged.

Removing the timing belt



Slacken off the centre screw for the belt tensioner slightly.
Hold the centre screw still. Turn the tensioner eccentric **clockwise** to 10 o'clock using a 6 mm Allen key.
Remove the timing belt from the camshaft pulleys.

Removing the timing gear pulley



Install camshaft adjustment tool 999 5452 at the rear of the camshafts.
Check that the screws securing the adjustment tool to the camshafts and the screw holding the tool together are well tightened

Remove (timing gear pulley with variable valve timing unit)

- the plug at the front of the variable valve timing unit (Tx55)
- the centre screw in the variable valve timing unit (Tx55). Carefully pull out the variable valve timing unit with the timing gear pulley.

Remove (timing gear pulley without variable valve timing unit)

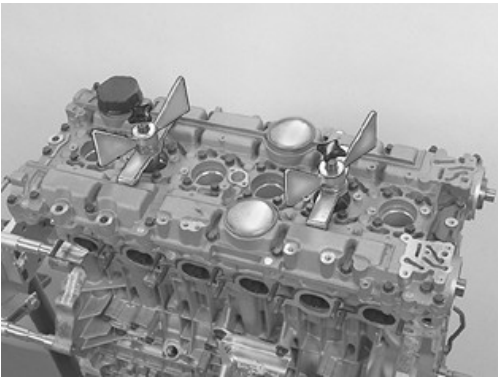
- the screws securing the timing gear pulley on the camshaft
- the timing gear pulley.

Remove tool 999 5452.
Reinstall the expansion tank and the brake fluid reservoir at the fender liner.

Removing the camshaft cover

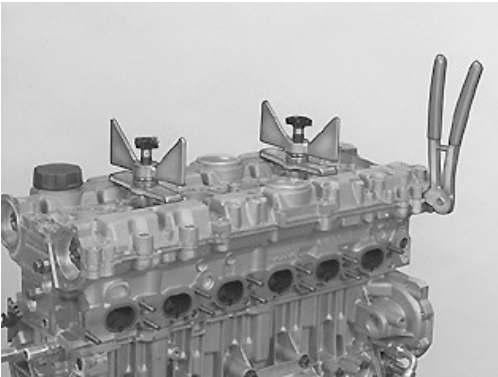
Remove

- the variable valve timing (VVT) solenoid
- spark plugs for cylinders 1 and

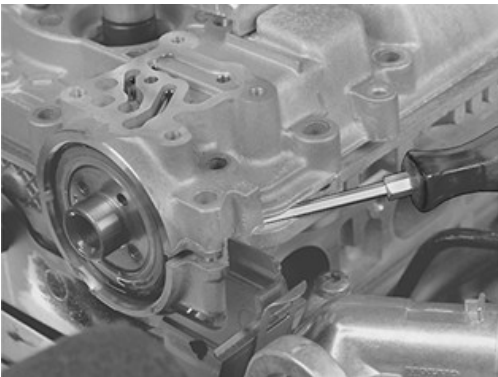


5.

Install 2 tools 999 5454 . Leave a 2-3 mm gap to the camshaft cover. Ensure that the screw in the spark plug well is fully tightened. Remove all the screws securing the camshaft cover to the cylinder head.

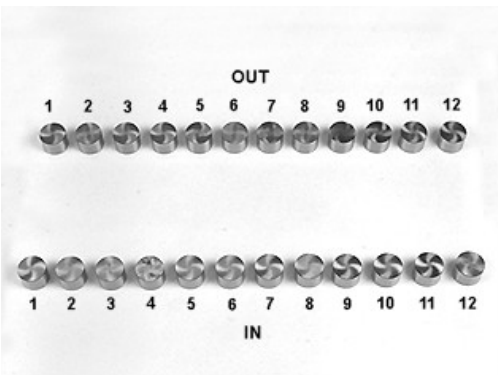


Use pliers 999 5670 to lift the cover from the cylinder head. Install the pliers at the stop lugs. Start with cylinder 1 and work alternately backward. Slacken off the wing nuts approximately 2 turns. Repeat the procedure with the pliers.



Carefully press the camshaft seals free.

Note! Take care not to damage the sealing surfaces on the camshafts.



Remove

- tool 999 5454
- the camshaft cover
- the camshafts.

Lift out the tappets. Mark up the tappets so that the original positions can be established.

Cleaning

Use a razor blade or a gasket scraper and gasket solvent P/N 1161 440 on the

camshaft cover.

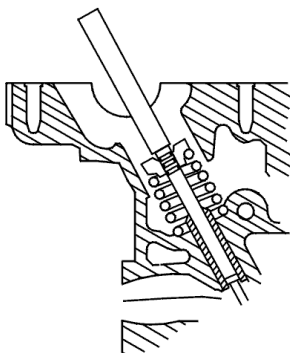
Warning! Use a fume bonnet or extractor when using gasket solvent!

Use only a gasket scraper or razor blade on the cylinder head.

Caution! Take great care around the oil ducts for the variable valve timing solenoid. This applies to both the camshaft cover and the cylinder head. The solenoid is extremely sensitive to contaminants.

Dry and blow all surfaces clean.

Preparations

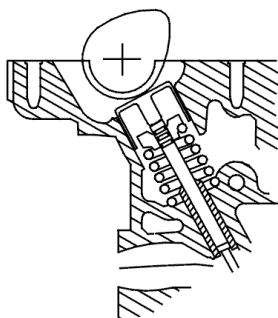


Carefully tap the end of the valve stem to ensure that the valve is correctly located in the seat. Use a plastic, aluminium or brass drift to protect the valve and the surface of the valve lifter. The sound made by tapping reveals if the valve is correctly seated.

Installing the camshaft and valve lifter

Install both the tappets for the inlet valves at cylinder 1. Check the notes made earlier. Select new tappets if necessary.

Note! Only install two tappets. The tappets should be placed at the same cylinder!



Other tappets are available as replacement part / replacement part kits.

**The valve clearance on a cold engine
(approximately 20° C) should be:**

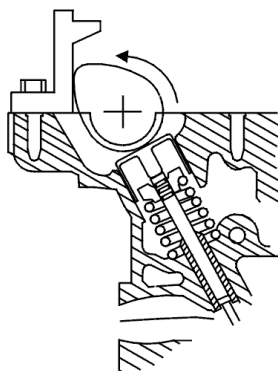
Inlet valve:..... 0.20 ± 0.03 mm.

Exhaust valve:..... 0.40 ± 0.03 mm.

**Note! The tolerances are less at setting!
When checking the valve clearance through the plug hole the tolerances are larger.**

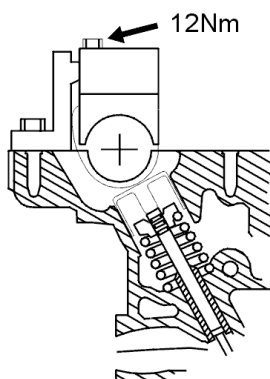
Position the intake camshaft. Ensure that the lobes at cylinder 1 point upwards.
Apply a little oil to the cam lobe and the upper side of the valve lifter to facilitate later measurement.

Installing the camshaft press



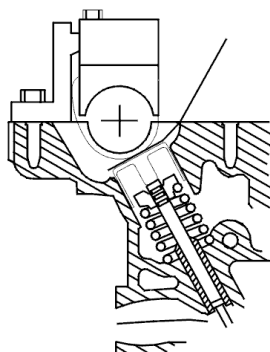
Install the lower section of the camshaft press 999 5765 at the inlet valves for cylinder 1.
Tighten the tool against the cylinder head. Tighten to **17 Nm**.
Turn the camshaft until it stops against the camshaft press.

Install the upper section of the camshaft press.
Tighten the screw which tensions



the camshaft. Tighten to **12 Nm**.

Checking the valve clearance



Note! Measurements should only be taken on a cold engine. Suitable temperature is approximately 20° C / 68° F.

Use feeler gauge 999 5752 .
Press with a finger so that the feeler gauge lies parallel to the upper side of the tappet (see illustration).
Move the feeler gauge sideways when taking the reading in order to obtain as accurate a measurement as possible.

The valve clearance measured on cold engines (approximately 20°C/68°F) should be:

Inlet valve:.....0.20 ± 0.03 mm.

Exhaust valve:.....0.40 ± 0.03 mm.

Note! The tolerances are less at setting! When checking the valve clearance through the plug hole the tolerances are larger.

Differences in valve clearance for different engines / ambient temperatures:

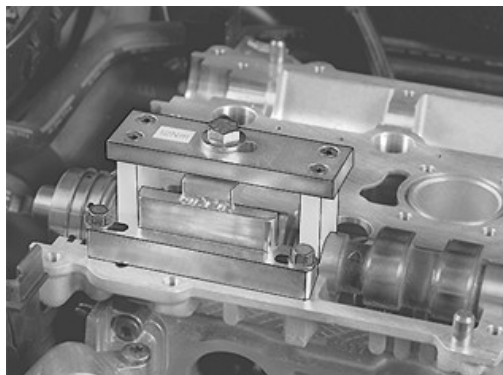
- 0.01 mm at 15° C
- + 0.01 mm at 25° C
- + 0.02 mm at 30° C
- + 0.03 mm at 35° C
- + 0.04 mm at 45° C

Correcting measured clearance

Lift out the upper

section of the press tool.
 Lift out the camshaft.
 Adjust the play by replacing the tappets.
 Other tappets are available as replacement part / replacement part kits.
 Reinstall the camshaft and the upper section of the press tool. Tighten to **12 Nm**.
 Take a new measurement according to Valve clearance, setting / adjusting:Checking the valve clearance .

When the correct valve clearance is reached



Remove

- the press tool 999 5765
- the camshaft
- the tappets.

Note! Carefully mark the tappets so that exact reinstallation can be carried out.

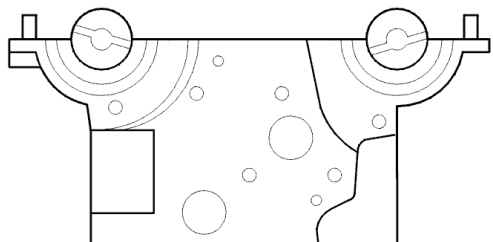
For example: Intake side:
 Exhaust side:

I1, I2, I3.....I12.

A1, A2, A3.....A12.

Repeat the procedure for measuring the valve clearance for all cylinders on both the intake and exhaust sides. See Valve clearance, setting / adjusting:Checking the valve clearance .

Installing tappets and camshafts



Note! For tightening torques not in the text, see Tightening torque .

Lubricate the valve guide wells.

Install all the tappets.

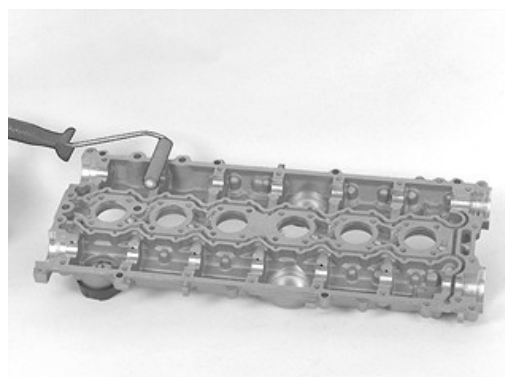
Lubricate the camshaft bearing seats and the upper sides of the tappets.

Position the intake camshaft. Ensure that the groove at the rear edge of the camshaft is **above** an imaginary centre line.

Position the exhaust camshaft.

Ensure that the groove at the rear edge of the camshaft is **below** an imaginary centre line.

Applying liquid gasket



Wipe the oil film off the mating surfaces on the camshaft cover and cylinder head.

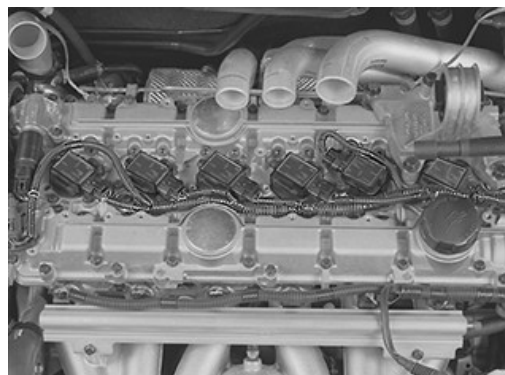
Install new O-rings around the spark plug wells at the cylinder head.

Apply liquid gasket 1161 059 on the camshaft cover. Use roller 951 2767 .

Note! The surface must be completely covered without any excess.

Caution! Ensure that no liquid gasket gets in to the oil ducts.

Installing the camshaft covers



Lubricate the camshaft lobes, the camshaft bearing surfaces and the tappets.

Install the camshaft cover.

Install press tool 999 5454 (2x).

Tighten the camshaft cover screws alternately, keeping it parallel to the cylinder head with the press tools.

Install the intake manifold and lifting eyes, tighten screws from the middle and outwards.

Remove the press tool 999 5454

Install

- the spark plugs. Tighten to **30 Nm**
- the variable valve timing (VVT) solenoid with a new gasket
- the plugs for the test holes. Tighten to **20 Nm**
- the ignition coils according to the earlier marking
- the ground terminals between the ignition coils
- the upper engine stabiliser brace
- the cable duct for the coolant temperature sensor.

Connect the connectors for the

- the coolant temperature sensor
- Variable valve timing solenoid.

Installing the rear camshaft seal



Use drift 999 5450 .

Lubricate the surface of the seal that the camshaft rotates against. Press in the seal until the drift bottoms out.

Note! If there are wear grooves on the camshaft, the seal can be pressed in a further 2 mm by reversing the sleeve.

B6284T: The seal at the rear edge of the exhaust camshaft.

B6294S: The seal at the rear of the intake camshaft.

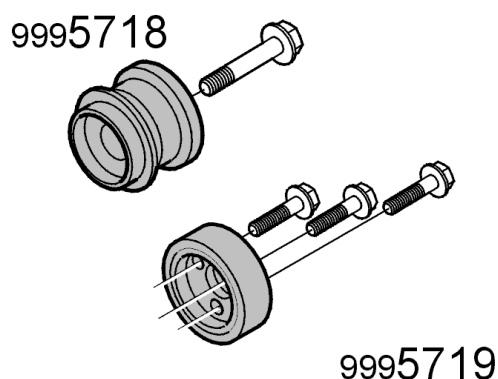
Install the camshaft adjustment tool 999 5452 at the rear of the camshafts.

Check that the screws securing the adjustment tool to the camshafts and the screws holding the tool together are well tightened.

Installing the front camshaft seal

Lift up and position the brake fluid reservoir and the expansion tank on top of the engine.

Use drift 999 5718 on camshafts with variable valve timing units and



drift 999 5719 on camshafts without variable valve timing. Use new seals and lubricate the surface of the seal that the camshaft rotates against. Use the variable valve timing unit / timing belt pulley mounting screws. Tighten the screws until the drift bottoms out. Remove the drift.

Fixing the crankshaft position

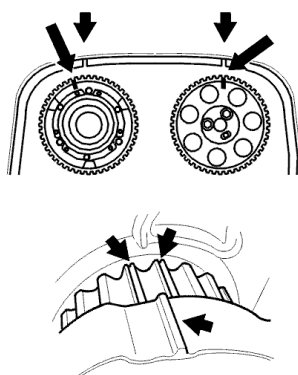
Remove

- the air cleaner (ACL) intake pipe
- the mounting screws for the starter motor. Pull off the starter motor. Place the starter motor to one side
- the blind cover plug and the seal washer.



Turn the crankshaft **clockwise**. Install the crankshaft stop 999 5451. Ensure that it bottoms out against the cylinder block. Turn the crankshaft **counter-clockwise** until it stops against the crankshaft stop. Check that the marking on the crankshaft timing gear pulley corresponds with the marking on the oil pump.

Installing the camshafts timing gear pulleys (B6284T)



Timing gear pulleys with variable valve timing units

Slacken off, but do not remove the screws which secure the timing gear pulley to the variable valve timing unit.

Press the variable valve timing unit / timing gear onto the camshaft.

Install the centre screw which secures the variable valve timing unit to the camshaft. Tighten slightly.

Position the upper timing cover.
Turn the timing gear pulley clockwise until the screws at the oval holes are in the limit position. Continue turning clockwise until the timing gear pulley marking is **1½ tooth** before the marking on the upper timing cover.

Check that the timing gear pulley is still in its limit position at the oval holes.

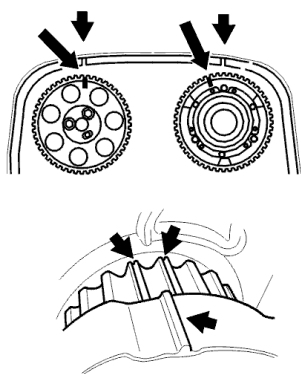
Tighten the centre screw for the variable valve timing (VVT) unit. Tighten to **120 Nm**. Check that the variable valve timing unit does not rotate when tightening.

Install the centre plug. Tighten to **35 Nm**.

Timing gear pulleys without variable valve timing units

Install the timing gear pulley with two screws but do not tighten. Check that the markings on the timing gear pulley and the upper timing cover correspond.

Installing the camshafts timing gear pulleys (B6294S)



Timing gear pulleys with variable valve timing units

Slacken off, but do not remove the screws which secure the timing gear pulley to the variable valve timing unit.

Press the variable valve timing unit / timing gear onto the camshaft.

Install the centre screw which secures the variable valve timing unit to the camshaft. Tighten slightly.

Turn the variable valve timing unit anti-clockwise as far as it will go.

Slacken off the centre screw

Position the upper timing cover.

Turn the timing gear pulley clockwise until the screws at the oval holes are in the limit position. Continue turning clockwise until the timing gear pulley marking is **1½ tooth** before the marking on the upper timing cover.

Check that the timing gear pulley is still in its limit position at the oval holes.

Tighten the centre screw for the variable valve timing (VVT) unit. Tighten to **120 Nm**. Check that the variable valve timing unit does not rotate when tightening.

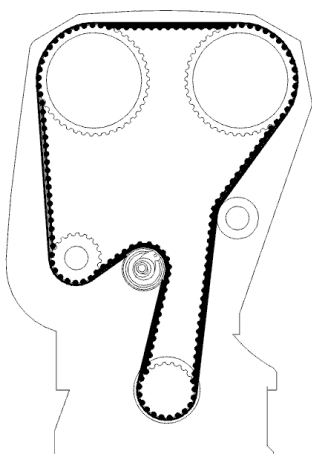
Install the centre plug. Tighten to **35 Nm**.

Timing gear pulleys without variable valve timing units

Install the timing gear pulley with two screws but do not tighten.

Check that the markings on the timing gear pulley and the upper timing cover correspond.

Installing the timing belt



Tighten the centre screw on the belt tensioner. Tighten to **5 Nm**.

Turn the variable valve timing unit clockwise until stop.

Hold it secure in the limit position.

Install the belt in the following order:

- crankshaft
- the idler pulley
- intake cam
- exhaust cam
- water pump
- belt tensioner.

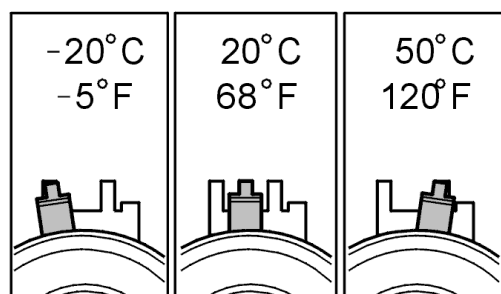
Note! Adjust the timing gear pulleys so that the screws are not at a limit position in the oval holes. Also check that the markings correspond.

Tensioning the timing belt

This adjustment is always carried out on a cold engine. A suitable temperature is approximately 20°C.

At higher temperatures (with the engine at operating temperature or a high outside temperature for example) the indicator is further to the right.

The illustration shows the position of



the indicator when aligning the timing belt tensioner at different temperatures.

Hold the centre screw secure and turn the belt tensioner eccentric counter-clockwise until the tensioner indicator passes the marked position.

Note! Check that the variable valve timing unit is in its limit position.

Tighten the three screws at the timing gear pulley for the intake camshaft.

Tighten to **10 Nm**.

Tighten the three screws at the timing gear pulley for the exhaust camshaft.

Tighten to **20 Nm**.

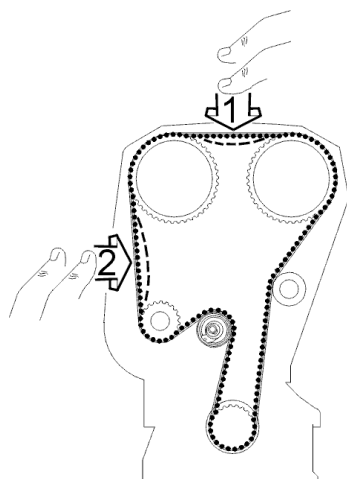
Turn the eccentric on the belt tensioner back so that the indicator reaches the marked position in the centre of the window. Remember to hold the centre screw secure at the same time.

Hold the eccentric secure and tighten the centre screw to **20 Nm**. Check that the indicator is in the correct position.

Remove camshaft adjustment tool

999 5451 and
crankshaft stop
999 5452.
Install the plug with a
new blind cover plug.
Tighten to **40 Nm**.

Checking the markings and belt tension



Press the timing belt to check that the indicator on the tensioner moves easily.

Turn the crankshaft two turns.

Check that the markings on the crankshaft timing gear pulley and the camshaft timing gear pulley match up with the markings on the oil pump and upper timing cover respectively.

Check that the indicator on the belt tensioner is within the marked position.

Remove the upper timing cover.

Finishing

Install

- front timing cover
- the auxiliaries belt
- the expansion tank
- the servo oil reservoir
- the bleed hose for the expansion tank.

Close the clamp and check that the hoses lie correctly.

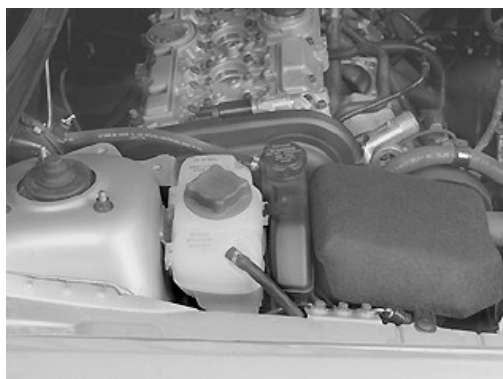
Connect the connectors for the

- The ABS sensor by the right suspension turret
- the coolant level sensor in the expansion tank.

Install

- the starter motor
- the air cleaner (ACL) intake pipe
- the trigger wheel.

Note! Ensure that the trigger wheel is correctly positioned against the camshaft.





- the camshaft position (CMP) sensor housing
- the cover at the rear edge of the camshaft
- the screws holding both the ground strips from the firewall to the cylinder head
- the cover over the ignition coils
- the upper timing cover.

Install (B6284T)

- the protective cover over the injector connectors
- plastic charge air / intake pipe over the engine. Tighten the clamps
- the crankcase ventilation hose to the PTC valve. Use a new clamp
- the connector for the PTC valve
- the cover over the PTC valve
- EVAP, "bypass" hoses and control hoses for boost pressure.

Install (B6294S)

- the upper section of the intake manifold. Use a new gasket
- vacuum hoses to the intake manifold.

Install (common)

- the engine stabiliser brace between the suspension turrets
Clamp the servo hose to the right mounting for the engine stabiliser brace in the bodywork
- the plastic nuts for the cover in fender liner
- the right front wheel according to Installing wheels
- the cable to the battery negative terminal. See Battery, disconnecting .

Check

Check the level in the expansion tank and the brake fluid reservoir.
Top up if necessary.
Test drive the engine until the thermostat opens and check for any

leakage.

9/5/2013

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