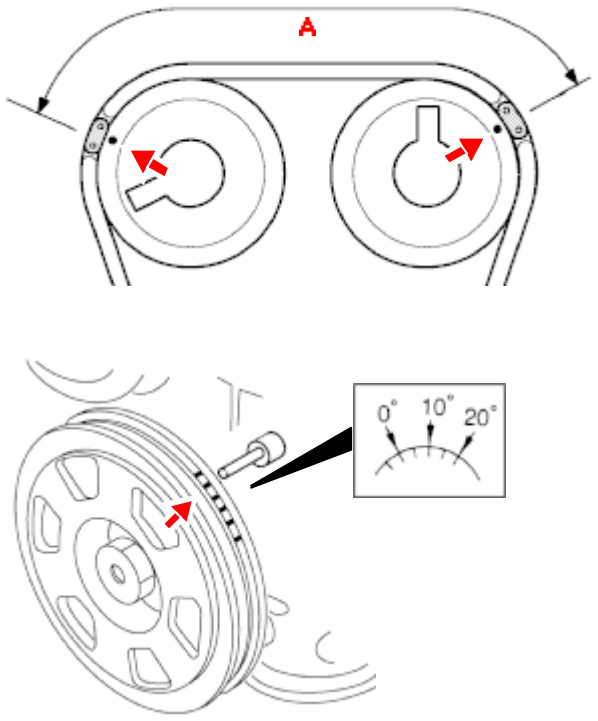
Engine - Mechanical

- GA14DE, GA16DE

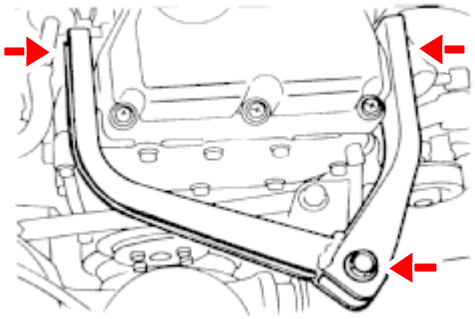
Timing chain

Removal



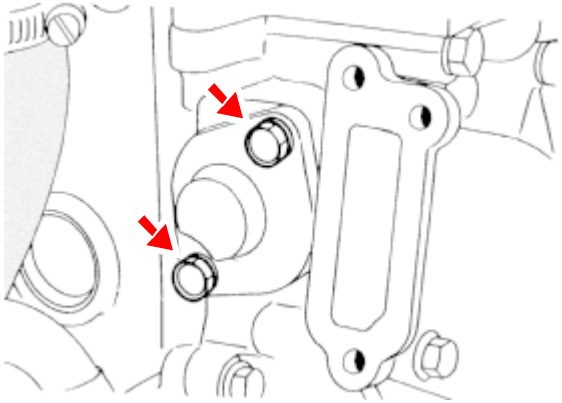
distribution timing markings

A= 8 links
unit: ° before TDC

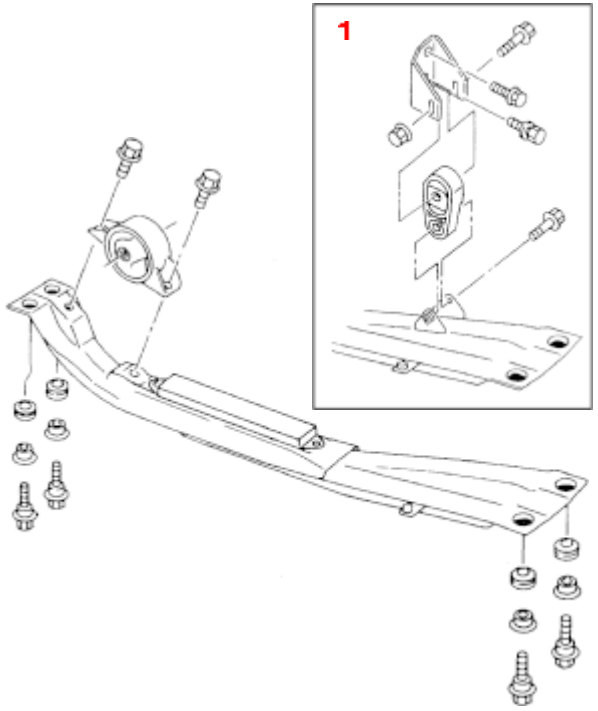


removing top right mounting

torque setting: 44 - 54 Nm



removing chain tensioner; lower timing chain



removing engine longitudinal member

torque setting: 44 – 54 Nm

1. only: versions with manual gearbox

Before removing the timing chain, first take off the cylinder head.

Drain: the coolant.

Remove:

- the poly-V-belts
- the power steering pump pulley.

Lay aside: the power steering pump; together with the mounting.

Remove:

- the air intake channel
- the RH front wheel
- the RH inner wing panel
- the shields; below the engine
- the front exhaust pipe
- the upper section of the RH engine mounting bracket; see illustration
- the valve cover
- the distributor cap
- the spark plugs
- the inlet manifold mounting.

Rotate the crankshaft clockwise until the timing marks are aligned.

Note: It is possible that the crankshaft will require several turns.

Remove:

- the distributor
- the auxiliary shaft gear protector plate
- the water pump pulley
- the thermostat housing
- the lower timing chain tensioner; see illustration
- the upper timing chain tensioner.

Slacken: the auxiliary shaft gear securing bolt.

Note: Don't remove the auxiliary shaft gear.

Remove:

- the camshaft timing gears
- the camshafts
- the auxiliary shaft gear securing bolt.

Detach / disconnect: all cables and hoses between the cylinder head and the rest of the vehicle.

Remove:

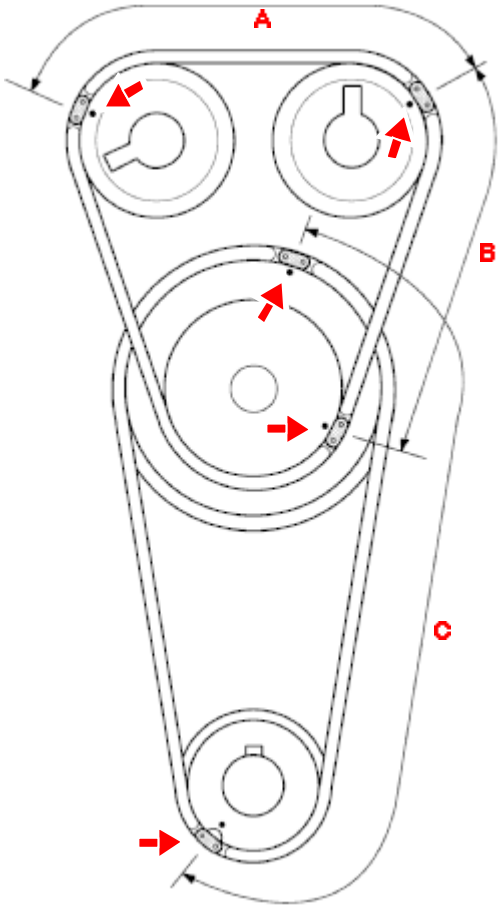
- the cylinder head; together with the inlet manifold and exhaust manifold
- the auxiliary shaft
- the upper timing chain
- the engine longitudinal member
- the engine sump
- the pick-up screen
- the crankshaft pulley.

Support the engine with a hoist.

Remove:

- the lower section of the RH engine mounting bracket
- the timing cover
- the auxiliary shaft gear
- the lower timing chain
- the chain guides from the lower timing chain
- the crankshaft gear.

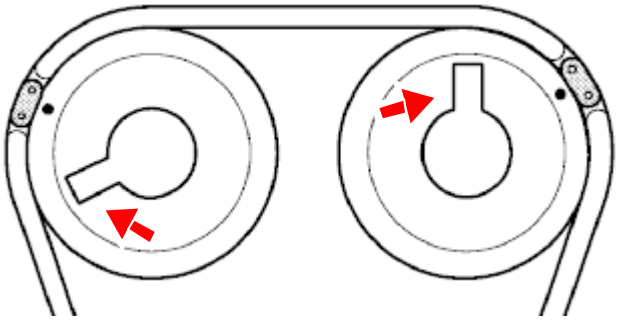
Installation



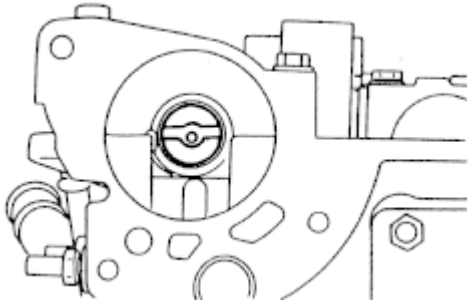
distribution timing markings

A = B = 8 links

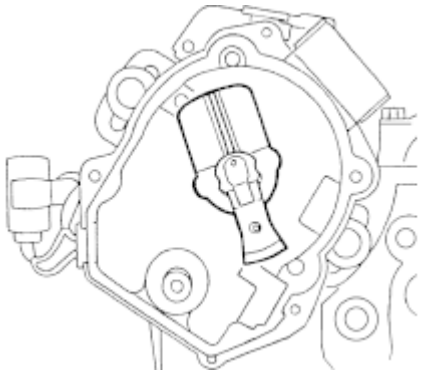
C = 20 chain links



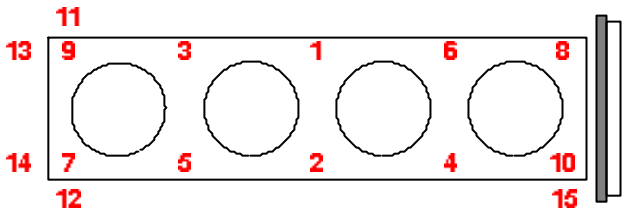
position of camshafts



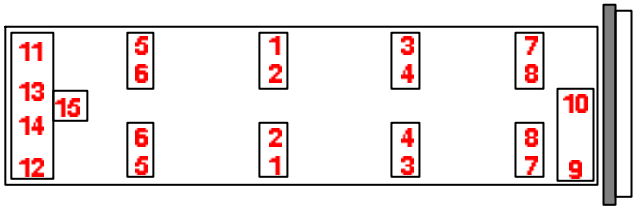
camshaft position; fitting distributor



rotor position



tightening sequence: cylinder head bolts



tightening sequence: camshaft bearing caps

bolt 15: only GA16DE engine

torque settings	
cylinder head bolts **Note:** lubricate bolts	
– step 1	bolts 1 to 10: 29 Nm
– step: 2	bolts 1 to 10: 59 Nm
– step: 3	bolts 1 to 10: slacken
– step: 4	bolts 1 to 10: 29 Nm
– step: 5	bolts 1 to 10: 59 Nm
– step: 6	bolts 11 to 15: 6,3 - 8,3 Nm
camshaft bearing caps **Note:** lubricate bolts **Note:** tighten bolts in the specified sequence	
– step: 1	bolts 11 to 15 inclusive: 2 Nm
– step: 2	bolts 1 to 10 inclusive: 2 Nm
– step: 3	bolts 1 to 15 inclusive: 6 Nm
– step: 4	bolts 1 to 14 inclusive: 10 - 12 Nm
– step: 5	bolt 15: 6,3 - 8,3 Nm
power steering pump pulley	54 - 68 Nm
power steering pump	no data available
wheel nut	98 - 118 Nm
front exhaust pipe	
– to exhaust manifold	28 - 33 Nm
– to catalytic converter	43 - 55 Nm

RH engine mounting bracket; upper section	44 - 54 Nm
RH engine mounting bracket; lower section	44 - 54 Nm
valve cover	2 - 4 Nm
spark plugs	20 - 29 Nm
inlet manifold mounting	16 - 21 Nm
distributor	9 - 12Nm
auxiliary shaft gear protector plate	4 - 5 Nm
water pump pulley	6 - 8 Nm
thermostat housing	6 - 8 Nm
chain tensioner; lower timing chain	6 - 8 Nm
chain guide; lower timing chain	13 - 19 Nm
chain tensioner; upper timing chain	6 - 8 Nm
auxiliary shaft gear	43 - 58 Nm
camshaft timing gear **Note:** lubricate bolt	108 - 118 Nm
engine longitudinal member	44 - 54 Nm
engine sump	6 - 8 Nm
crankshaft pulley **Note:** lubricate bolt	133 - 152 Nm
timing cover	6 - 8 Nm

Check that the key in the crankshaft is pointing upwards.

Fit / apply:

- the crankshaft gear
- the lower timing chain guides
- the lower timing chain; over the crankshaft gear. Ensure that the timing marks are aligned.
- the timing cover.

Note: Ensure that the timing chain doesn't slip over the crankshaft gear.

Fit / apply:

- the lower section of the RH engine mounting bracket
- the pick-up screen
- the engine sump
- the crankshaft pulley
- the engine longitudinal member
- the auxiliary shaft gear; together with the upper and lower timing chain. Ensure that the timing marks are aligned.

Note: Ensure that the timing setting is maintained.

Fit / apply:

- the cylinder head; together with the inlet manifold and exhaust manifold
- the camshafts; see illustration
- the camshaft timing gears
- the upper timing chain; over the camshaft timing gears.

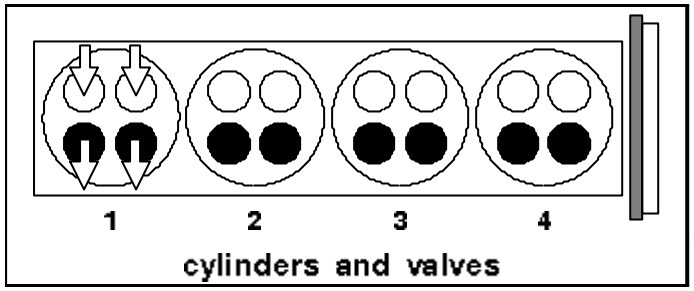
Check that the distribution timing markings are aligned.

Fit / apply:

- the upper timing chain tensioner
- the lower timing chain tensioner
- the distributor; check that the camshaft and rotor are in the position illustrated.

Complete the installation in reverse order of removal.

Valves, rocker arms and tappets



cylinders and valves

technical specifications	
firing order	1 - 3 - 4 - 2
valve operation	DOHC; tappets
valve clearance	
– check	between cam and tappet
– adjustment	shim on tappet
shims	2,00 - 2,98 mm; with intermediate steps of 0,02 mm

torque settings	
valve cover	2 - 4 Nm

Valve clearance

Check

valve clearance	
check value; engine at operating temperature	
– inlet	0,21 - 0,49 mm
– exhaust	0,30 - 0,58 mm
adjustment value; engine at operating temperature	
– inlet	0,32 - 0,40 mm
– exhaust	0,37 - 0,45 mm
adjustment value; with engine cold	
– inlet	0,25 - 0,33 mm
– exhaust	0,32 - 0,40 mm

Rotate the crankshaft until both cams of one cylinder point upwards equally.

Measure the valve clearance.

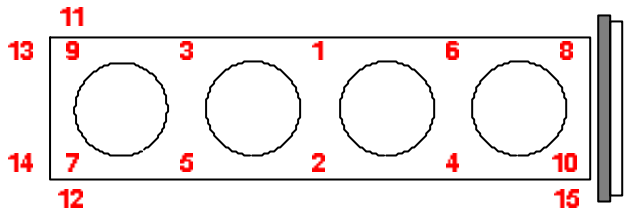
Adjustment

special tools	
valve adjustment tool	KV10115180

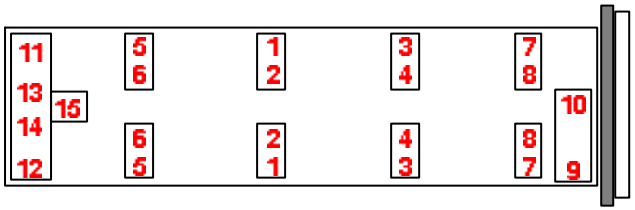
Per tappet: Replace the shim with one of the required thickness.

Re-check the valve clearance.

Torque settings

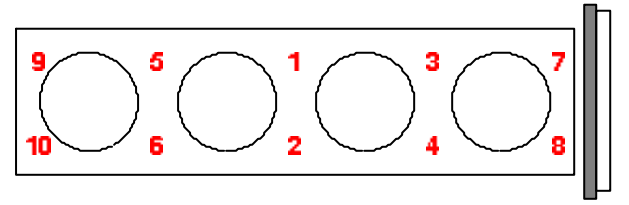


tightening sequence: cylinder head bolts



tightening sequence: camshaft bearing caps

bolt 15: only GA16DE engine



tightening sequence: main bearing caps

cylinder head	
cylinder head bolts **Note:** lubricate bolts	
– step 1	bolts 1 to 10 inclusive: 29 Nm
– step: 2	bolts 1 to 10 inclusive: 59 Nm
– step: 3	bolts 1 to 10 inclusive: slacken
– step: 4	bolts 1 to 10 inclusive: 29 Nm
– step: 5	bolts 1 to 10 inclusive: 59 Nm
– step: 6	bolts 11 to 15 inclusive: 6,3 - 8,3 Nm
camshaft bearing caps **Note:** lubricate bolts **Note:** tighten bolts in the specified sequence	
– step: 1	bolts 11 to 15 inclusive: 2 Nm
– step: 2	bolts 1 to 10 inclusive: 2 Nm
– step: 3	bolts 1 to 15 inclusive: 6 Nm
– step: 4	bolts 1 to 14 inclusive: 10 - 12 Nm
– step: 5	bolt 15: 6,3 - 8,3 Nm

exhaust manifold	25 - 29 Nm
inlet manifold	16 - 21 Nm
valve cover	2 - 4 Nm
engine block	
big end bearing caps	
– step: 1	14 - 16 Nm
– step: 2	23 - 28 Nm
main bearing caps **Note:** tighten bolts in the specified sequence	
– step: 1	5 - 10 Nm
– step: 2	20 - 30 Nm
– step: 3	46 - 52 Nm
drive plate **Note:** lubricate bolts	93 - 103 Nm
flywheel **Note:** lubricate bolts	84 - 93 Nm
timing	
timing cover	6 - 8 Nm
chain tensioner; lower timing chain	6 - 8 Nm
chain guide; lower timing chain	13 - 19 Nm
chain tensioner; upper timing chain	6 - 8 Nm
auxiliary shaft gear	43 - 58 Nm
camshaft timing gear **Note:** lubricate bolt	108 - 118 Nm
crankshaft pulley **Note:** lubricate bolt	133 - 152 Nm
lubrication system	
engine sump	6 - 8 Nm
oil drain plug	29 - 39 Nm
oil pressure switch	no data available
cooling system	
coolant temperature sensor	no data available
coolant drain plug in engine block	34 - 44 Nm
thermostat housing	6 - 8 Nm
water pump	6 - 8 Nm
water pump pulley	6 - 8 Nm
auxiliary units	
starter motor	31 - 42 Nm
alternator	
– adjustment bolt	16 - 21 Nm
– bolt	37 - 50 Nm
power steering pump	no data available
ignition/fuel system	
spark plugs	20 - 29 Nm
oxygen sensor	40 - 50 Nm