

Document Title: Engine, description (EC210)	Function Group: 210	Information Type: Service Information	Date: 2014/9/22
Profile:			

Engine, description (EC210)

(CUMMINS B5.9-C)

- The engine is a 6-cylinder, 4-stroke, direct injected, turbocharged, aftercooled, water cooled assembly with a cast iron block and cylinder head.
- Gears in the engine gear case are hardened helical type for strength and reduced noise, arranged to provide quiet, smooth transmission of power.
- The cylinder block and head are designed with internal passages formed as sets for lubrication and cooling. The water pump and oil cooler are integrally mounted.
- The fan belt is a poly type V-belt for improved performance and an auto tension adjuster maintains belt tension.

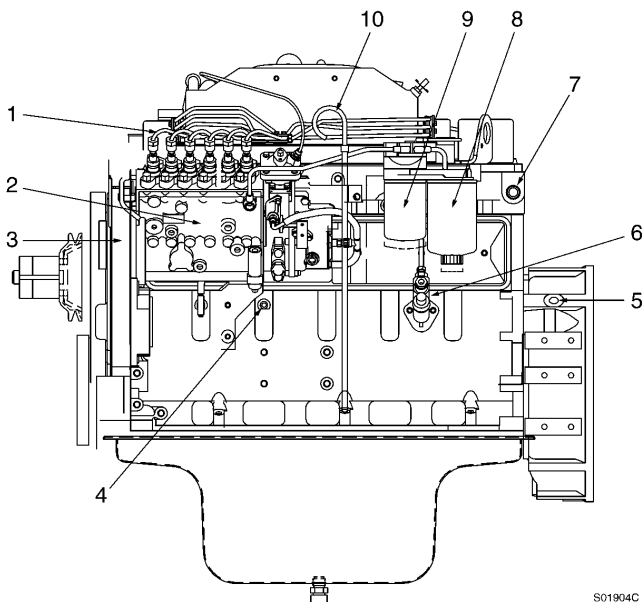


Figure 1
Engine, structure(EC210)

1. High pressure fuel line
2. Fuel injection pump
3. Engine data plate
4. Engine oil pressure sensor port (M10 × 1.0)
5. Speed sensor port (3/4" 16UNF)
6. Fuel feed pump
7. Water temperature sensor (3/4" NPTF)
8. Primary fuel filter/water separator
9. Secondary fuel filter
10. Dipstick gauge

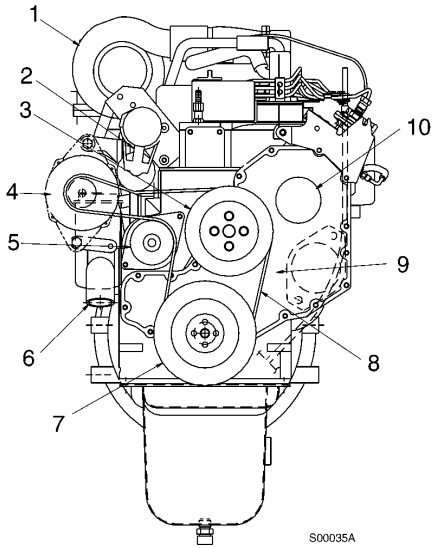


Figure 2
Engine, front view (EC210)

- | | |
|----------------------------|-----------------------------------|
| 1 Turbocharger | 6 Water inlet |
| 2 Automatic belt tensioner | 7 Vibration damper |
| 3 Fan pulley | 8 Fan belt |
| 4 Alternator | 9 Gear cover |
| 5 Water pump | 10 Fuel injection pump gear cover |

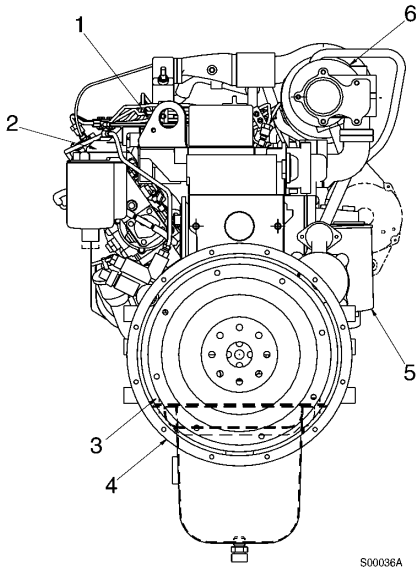
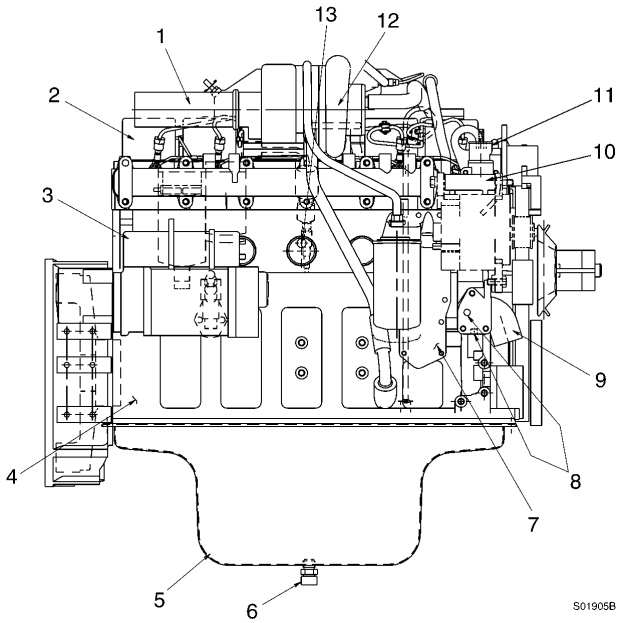


Figure 3
Engine, rear view (EC210)

1 Engine lifting eye	4 Flywheel housing
2 Fuel filter head	5 Engine oil filter
3 Flywheel	6 Turbocharger

NOTE!

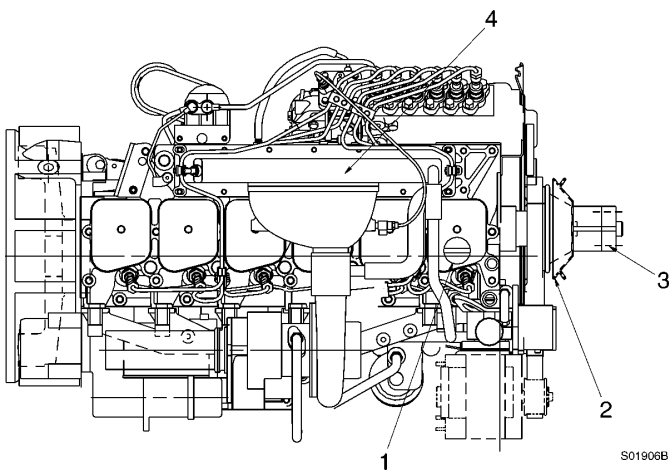
For detailed information on the engine, consult the separate engine service manual.



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Figure 4
Engine turbocharger, side view (EC210)

1. Exhaust gas discharge port
2. Valve cover
3. Starter
4. Engine block
5. Oil pan
6. Engine oil drain valve (M22 X 1.5P)
7. Engine oil cooler
8. Water temperature switch port (PT 1/2")
9. Water inlet
10. Alternator
11. Thermostat / Water outlet
12. Turbocharger
13. Block heater port



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Figure 5
Engine, top view (EC210)

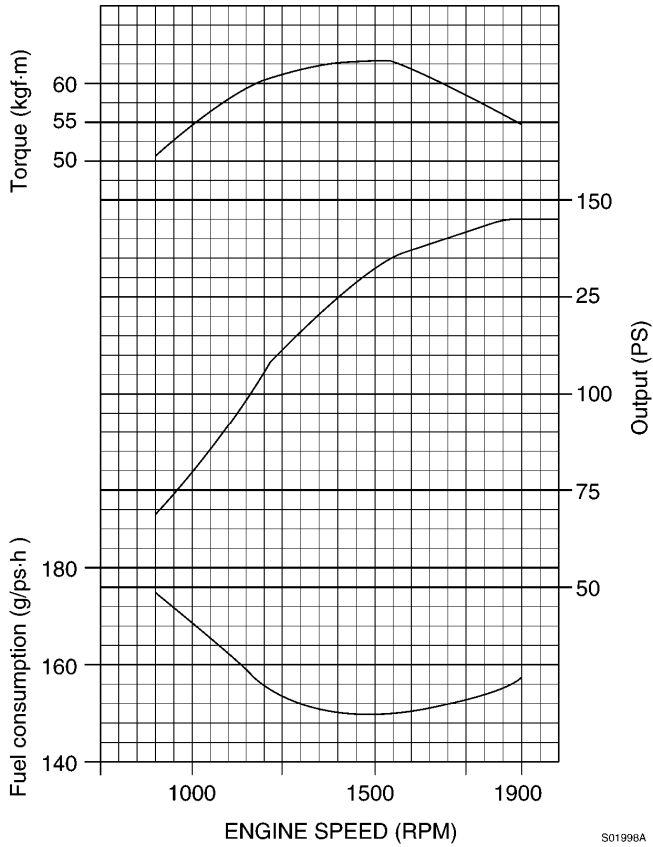
1. Engine oil refill plug
2. Air conditioner compressor drive pulley
3. Fan spacer

4. After cooler

Engine characteristic curve

Engine characteristics

Specification	KSR 1004
Rated output	145 ps / 1900 rpm
Max. torque (Net)	63 kgf·m / 1500 rpm (455 lbf·ft / 1500 rpm)
Min. fuel consumption	151 g / ps-h
Rated fuel consumption	158 g / ps-h



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Figure 6
Engine, characteristic curve (EC210)

NOTE!

For detailed information on the engine, consult the separate engine service manual.

Document Title: Engine, specifications	Function Group: 210	Information Type: Service Information	Date: 2014/9/22
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Engine, specifications

Specifications

Item	Unit	EC210	EC240
Make	–	Cummins diesel	
Model	–	B 5.9-C	C 8.3-C
Type	–	4-stroke, 6-cylinder, water cooling, upright series, direct injection, diesel engine, turbo-charged, aftercooled	4-stroke, 6-cylinder, water cooling, upright series, direct injection, diesel engine, turbo-charged
Rated output	PS / rpm	145 / 1900	170 / 2000
Maximum torque (Net)	kgf·m / rpm (lbf·ft / rpm)	63 / 1500 (455 / 1500)	76.5 / 1500 (722 / 1500)
Number of cylinder Bore×Stroke	mm	6 – 102 × 120	6 – 114 × 135
Total displacement	cc(cu-in)	5880(358)	8270(505)
Compression ratio	–	17.3 : 1	17.5 : 1
Low idle (No-load)	rpm	800 ~ 900	800~900
High idle (No-load)		2030 ~ 2110	2130~2210
Firing order	–	1 – 5 – 3 – 6 – 2 – 4	
Nozzle pressure	kgf / cm2 (psi)	245 (3484)	265 (3768)
Valve clearance	Inlet	mm	0.25 (0.010)
	Exhaust	(inch)	0.51 (0.020)
Turbocharger	–	Installed	
Fan	–	Suction	
Drive		V-rib belt	
Weight of engine (dry / wet)	kg	416 / 458	624 / 658
	lb	915 / 1009	1375 / 1450

Document Title: Valve clearance adjustment	Function Group: 214	Information Type: Service Information	Date: 2014/9/22
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Valve clearance adjustment

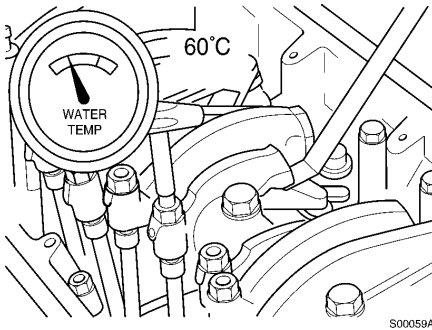
Cummins B5.9-C (EC210 series)

Valves must be correctly adjusted for the engine to operate efficiently. Valve adjustment must be performed using the specified values.

Adjust the valves at each 1000 hours or 1 year maintenance interval.

All the valve adjustments must be made when the engine is cold and stabilized coolant temperature is 60°C or below.

- Turn the valve adjustment screws in until touching the push rod sockets, and then loosen them one full turn. Use 1/2" drive, Part No. 3377371 Engine Barring Tool.

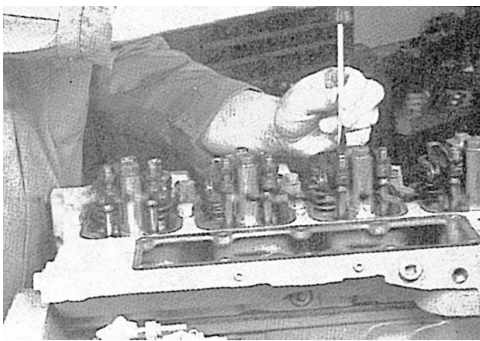


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Figure 1

Valve clearance adjustment condition

- Locate top dead center for cylinder No.1 by rotating the crankshaft slowly while pressing on the engine timing pin. When the pin engages the hole in the camshaft gear, cylinder No.1 is at top dead center on the compression stroke.



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Figure 2

Valve clearance

Inlet valve	0.25 mm	0.010 in
Exhaust valve	0.51 mm	0.020 in

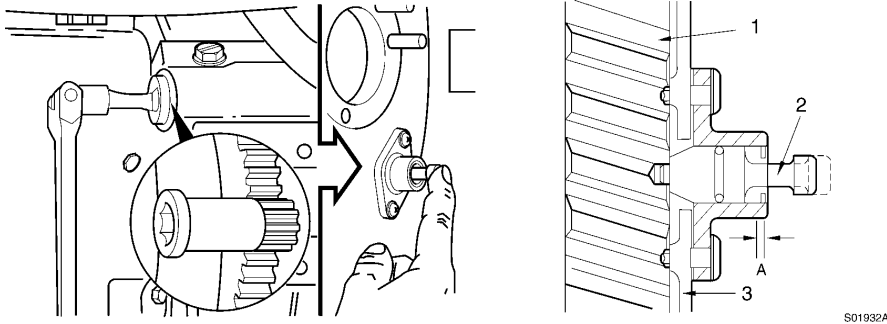


Figure 3
Rotation, camshaft gear

1. Camshaft gear
 2. Timing pin
 3. Gear housing
- A. Compression stroke

CAUTION

Disengage the timing pin. Engine components may be damaged if the engine is rotated with the timing pin engaged.

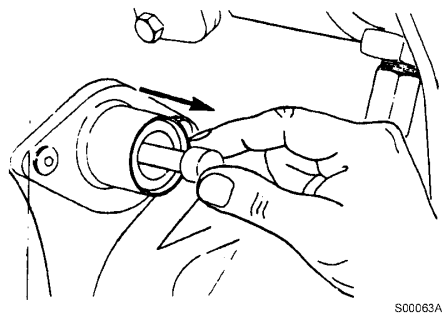


Figure 4
Removal, timing pin

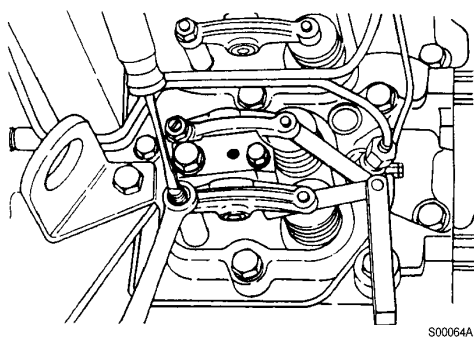


Figure 5
Adjustment, clearance between the valve stem and rocker lever

Tools : 14 mm spanner, "—" screwdriver, feeler gauge.

- The clearance is correct when slight resistance is felt as the feeler gauge is moved between the valve stem and rocker lever. At that point, tighten the lock nut. (Tightening torque : 24 N·m)
- Adjust the valves indicated (*) in the table below.

- After tightening the lock nut, check the valve clearance again. If the clearance is not correct, readjust.

Valves to be adjusted (*)

Cylinder	1	2	3	4	5	6
Inlet (I)	*	*		*		
Exhaust (E)	*		*		*	

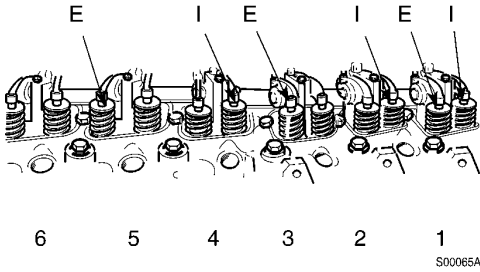


Figure 6
Valves to be adjusted

CAUTION

Be sure the timing pin is disengaged.

NOTE!

Mark the crankpulley and cover.

NOTE!

Rotate the crankshaft 360°.

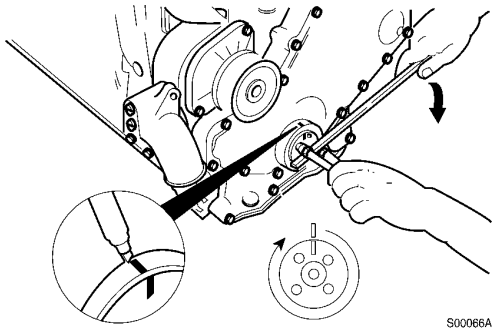


Figure 7
Marking, crankpulley

- Adjust the valves indicated (*) in the table below.
After tightening the lock nut, check the valve clearance again.
If the clearance is not correct, readjust.

Valves to be adjusted (*)

Cylinder	1	2	3	4	5	6
Inlet (I)			*		*	*
Exhaust (E)		*		*		*

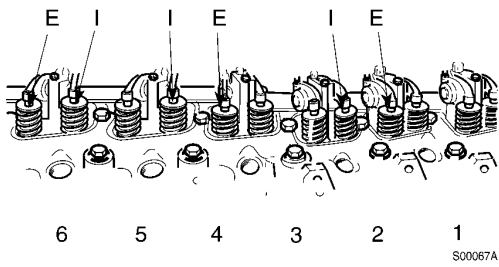


Figure 8
Valves to be adjusted

- Assemble the gaskets, valve covers, o-rings and special screws.

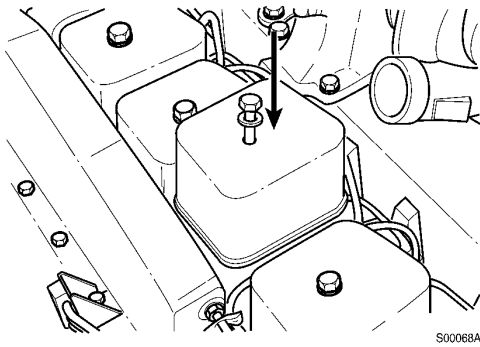


Figure 9
Assembly, valve covers

Tools : 16 mm spanner
Tightening torque : 24 N·m (18 lbf·ft)

NOTE!

Check valve covers and o-rings. If damaged, replace with a new one.

Injection nozzles installation

- Assemble a sealing washer on each injection nozzle. Use only one sealing washer.

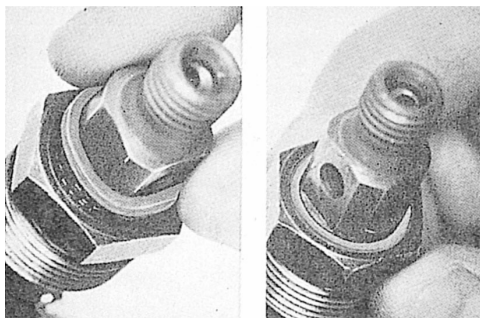
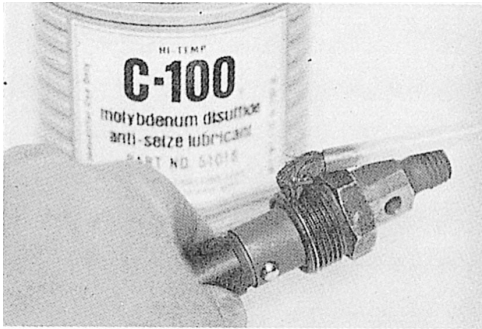


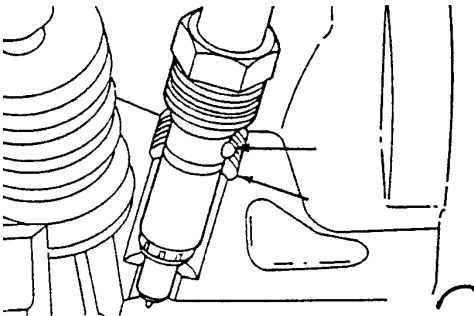
Figure 10
Assembly, injection nozzles

- Apply anti-seize compound to the threads of the injector hold-down nut and between the top of the nut and injector body.



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Figure 11
Apply, anti-seize compound



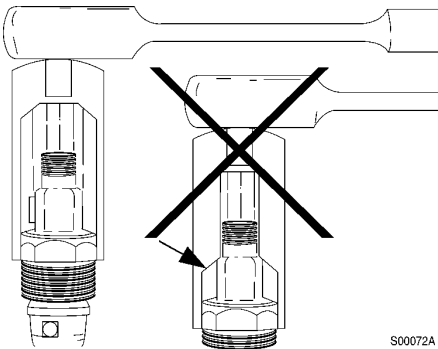
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Figure 12
Installation, injection nozzle

Tools : 16 mm spanner, 24 mm Deep socket
Tightening torque : 60 N·m (44 lbf·ft)

NOTE!

Install the injection nozzle. The protrusion on the injector body fits into a notch in the cylinder head to position the injector. Tighten the injection nozzle nuts.



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Figure 13
Tightening, injection nozzle

NOTE!

Some sockets can damage the sealing surface of the fuel drain outlet.

Cummins C8.3-C (EC240 series)

Valve clearance adjustment

Valves must be correctly adjusted for the engine to operate efficiently. Valve adjustment must be performed using the specified values.

Adjust the valves at each 1000 hours or 1 year maintenance interval.

All the valve adjustments must be made when the engine is cold, and stabilized coolant temperature is 60°C or below.

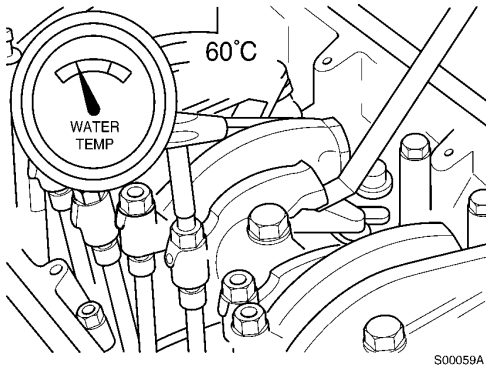


Figure 14
Adjustment condition

Valve clearance

Inlet valve	0.30 mm	0.012 in
Exhaust valve	0.61 mm	0.024 in

- Remove the air inlet hose.

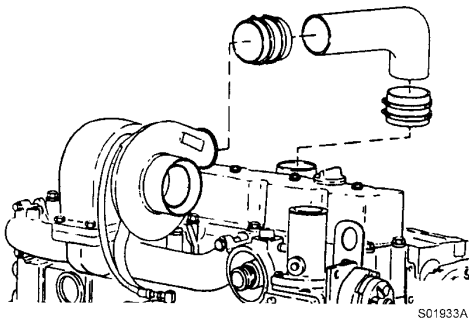


Figure 15
Removal, inlet hose

- Remove the wastegate sensing line, support clamps and crankcase vent tube.

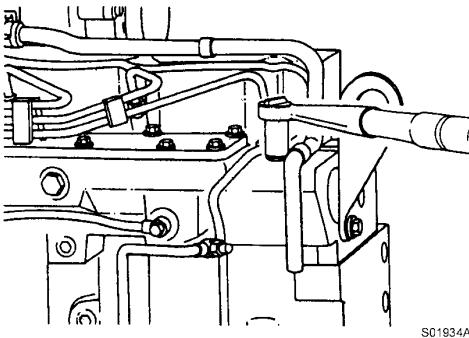


Figure 16
Removal, crankcase vent tube

Tools : 13, 18 mm Socket

- Remove the valve cover.

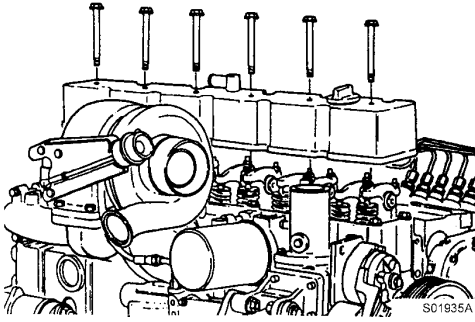


Figure 17
Removal, valve cover

Tools : 15 mm Wrench

- Locate top dead center for cylinder No.1 by rotating the crankshaft slowly while pressing on the engine timing pin.

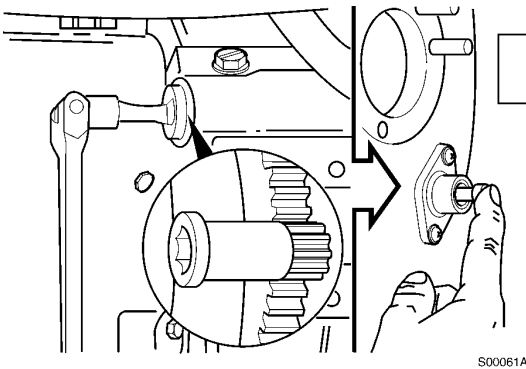


Figure 18
Rotation, camshaft gear

Tools : 1/2" driver, Part No. 3377371 Engine Barring tool.

- When the pin engages the hole in the camshaft gear, cylinder No. 1 is at top dead center on the compression stroke.

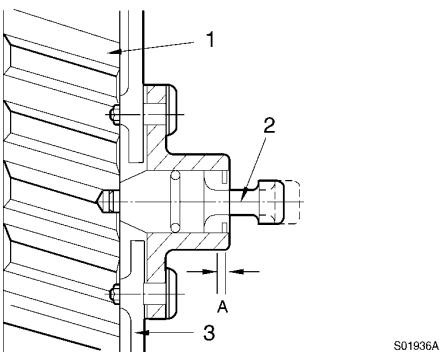


Figure 19
Position, cylinder No.1

1. Camshaft gear
 2. Engine timing pin
 3. Gear housing
- A. Compression stroke

CAUTION

Disengage the timing pin. Engine components may be damaged if the engine is rotated with the timing pin engaged.

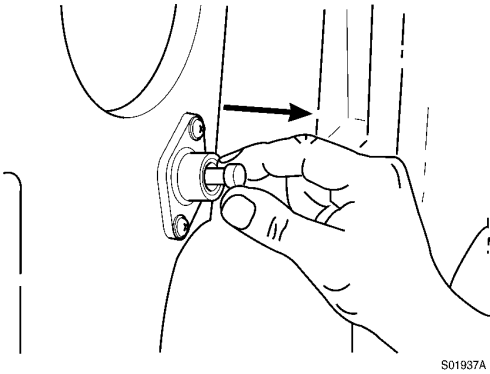


Figure 20
Removal, timing pin

CAUTION

To prevent damage of push rod, make sure the adjusting screw ball is positioned in the socket of the push rod when tightening.

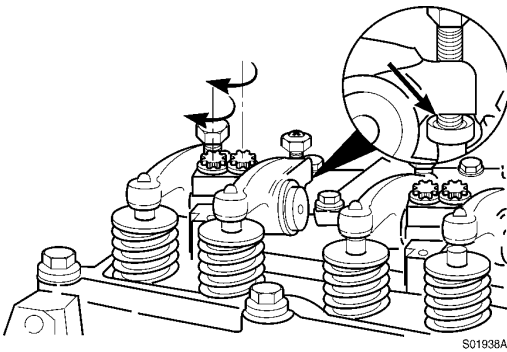


Figure 21
Position, adjusting screw ball

- The clearance is correct when slight resistance is felt as the feeler gauge is moved between the valve stem and rocker lever.
At that point, tighten the lock nut.

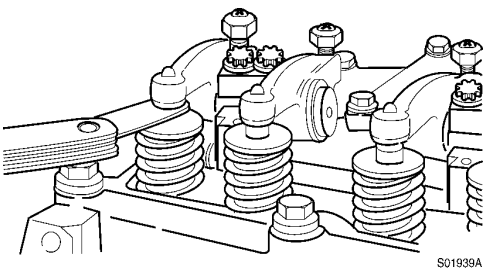


Figure 22
Checking, clearance

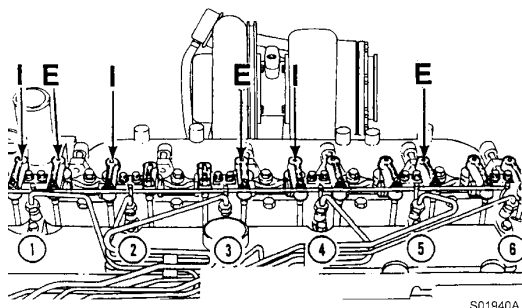
Tools : Spanner 14mm, "-"- Driver, feeler gauge.

- Adjust the valves indicated (*) in the table below.
After tightening the lock nut, check the valve clearance again.

If the clearance is not correct, readjust.

Valves to be adjusted (*)

Cylinder	1	2	3	4	5	6
Inlet (I)	*	*		*		
Exhaust (E)	*		*		*	



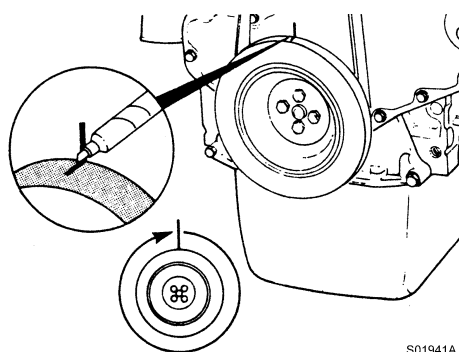
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Figure 23
Valves to be adjusted

CAUTION

Be sure the timing pin is disengaged.

- Mark the crankpulley and cover.
- Rotate the crankshaft 360°.



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Figure 24
Marking, crankpulley

- Adjust the valves indicated (*) in the table below.
After tightening the lock nut, check the valve clearance again.
If the clearance is not correct, readjust.

Valves to be adjusted (*)

Cylinder	1	2	3	4	5	6
Inlet (I)		*		*	*	
Exhaust (E)		*		*		*

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