

Document Title: Engine, description	Function Group: 210	Information Type: Service Information	Date: 2014/7/10
Profile:			

Engine, description

Cummins LTA 10-C & M11-C

- The engine is a 6-cylinder, 4-stroke, direct injected, turbocharged, 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.

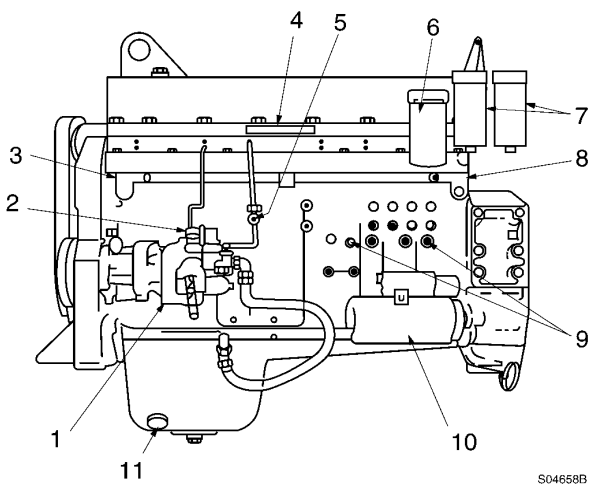


Figure 1
Engine fuel pump side

1. Fuel pump
2. Fuel shut-off manual override
3. Refrigerant compressor mounting location
4. Engine data tag
5. Fuel return to tank
6. Coolant filter
7. Fuel filter
8. Engine serial number
9. Oil pressure pick-up
10. Starter
11. Side oil drain

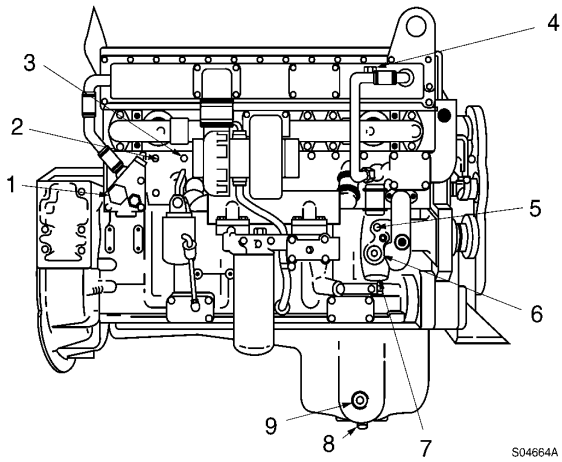


Figure 2
Engine exhaust side

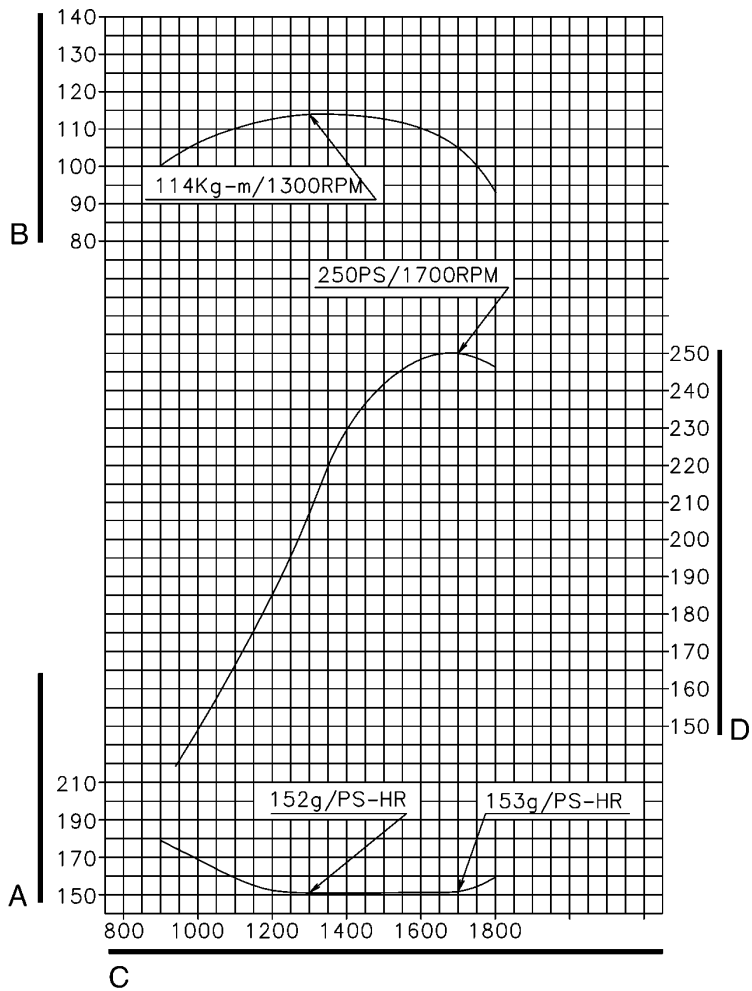
1. Provision for coolant heater
2. Heater supply
3. Coolant temperature pick-up
4. Engine vent (coolant)
5. Heater return
6. Make-up line from radiator
7. Coolant inlet
8. Oil drain
9. Provision for oil pan sump heater

Engine characteristic curve (EC360)

Cummins LTA 10-C

Engine characteristics

Item	Specifications
Rated output (Net)	250 PS / 1700 rpm (248 HP / 1700 rpm)
Max. torque (Net)	114 kgf·m /1300 rpm (823 lbf·ft / 1300 rpm)
Min. fuel consumption	152 g / PS·h
Rated fuel consumption	153 g / PS·h



S04700B

Figure 3
Engine, characteristic curve (EC360)

- A Fuel consumption (g/PS-HR)
- B Torque (kg-m)
- C Engine speed (RPM)
- D Power (PS)

NOTE!

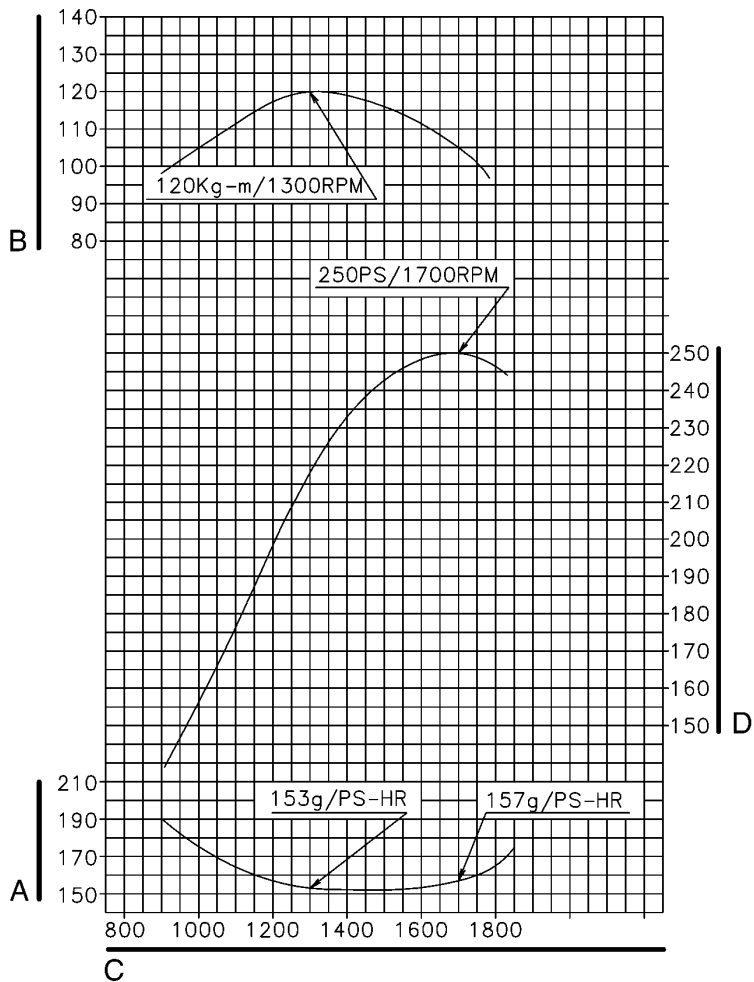
For detailed information on the engine, consult the separate engine service manual

Engine characteristic curve (EC360)

Cummins M11-C

Engine characteristics

Item	Specifications
Rated output (Net)	250 PS / 1700 rpm (248 HP / 1700 rpm)
Max. torque (Net)	120 kgf·m / 1300 rpm (866 lbf·ft / 1300 rpm)
Min. fuel consumption	153 g / PS·h
Rated fuel consumption	157 g / PS·h



S04776B

Figure 4
Engine, characteristic curve (EC360)

- | | | | |
|---|----------------------------|---|--------------------|
| A | Fuel consumption (g/PS-HR) | C | Engine speed (RPM) |
| B | Torque (kg-m) | D | Power (PS) |

NOTE!

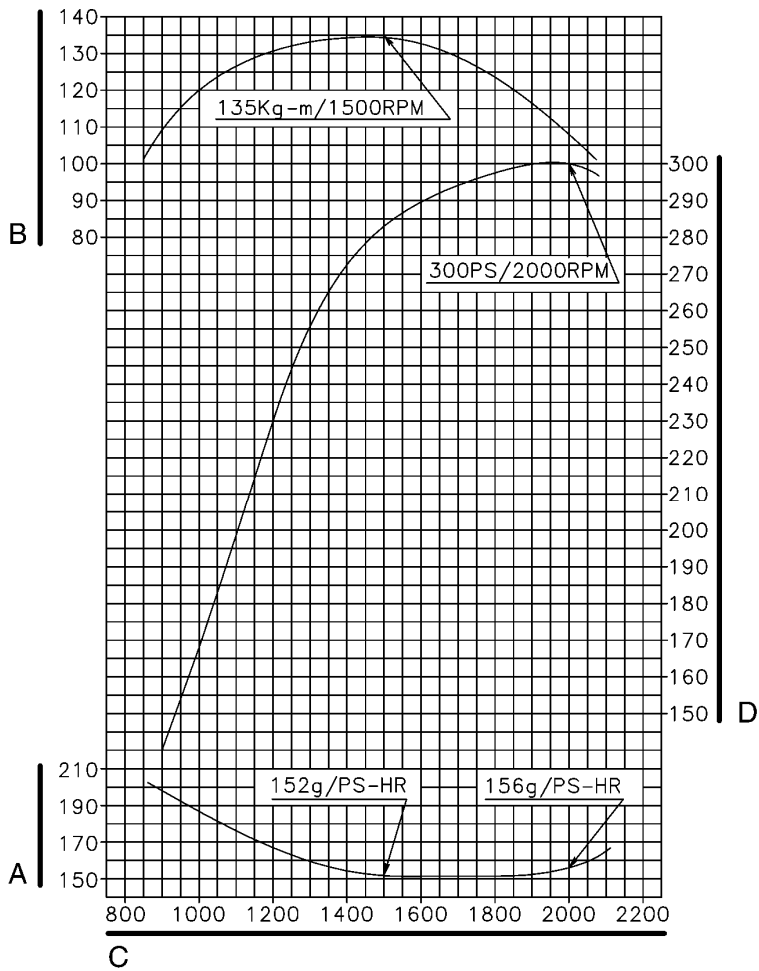
For detailed information on the engine, consult the separate engine service manual

Engine characteristic curve (EC460)

Cummins LTA 10-C

Engine characteristics

Item	Specifications
Rated output (Net)	300 PS / 2000 rpm (298 HP / 2000 rpm)
Max. torque (Net)	135 kgf-m /1500 rpm (975 lbf-ft / 1500 rpm)
Min. fuel consumption	152 g / PS-h
Rated fuel consumption	156 g / PS-h



S04804B

Figure 5
Engine, characteristic curve (EC460)

A Fuel consumption (g/PS-HR)
B Torque (kg-m)

C Engine speed (RPM)
D Power (PS)

NOTE!

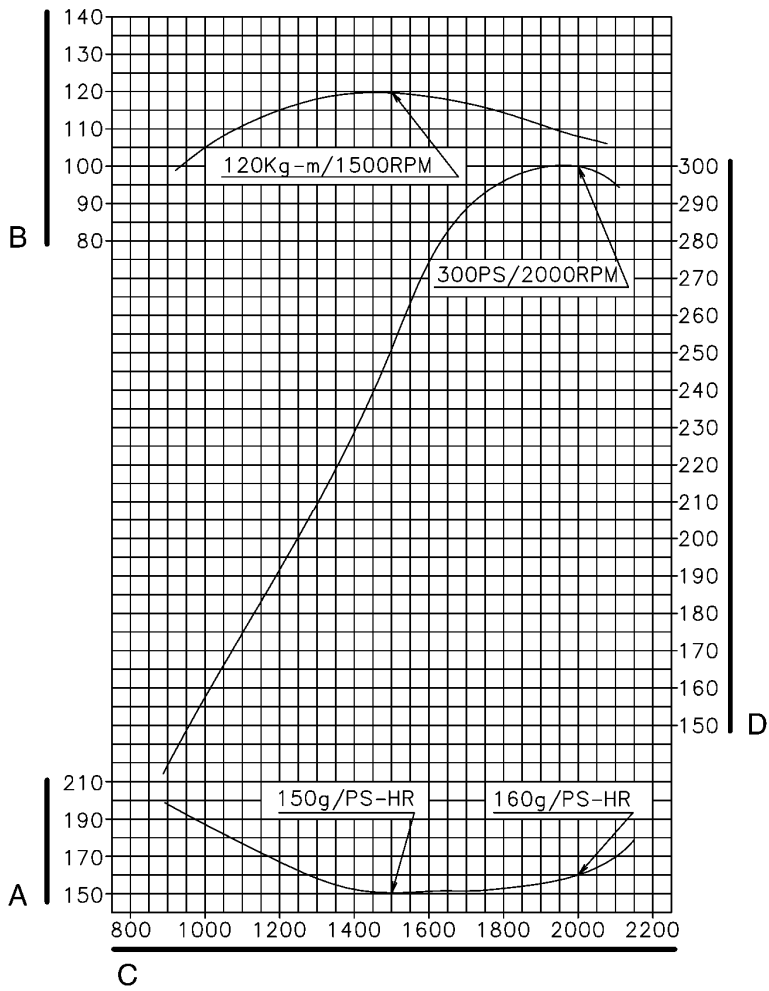
For detailed information on the engine, consult the separate engine service manual

Engine characteristic curve(EC460)

Cummins M11-C

Engine characteristics

Item	Specifications
Rated output (Net)	300 PS / 2000 rpm (298 HP / 2000 rpm)
Max. torque (Net)	120 kgf·m / 1500 rpm (866 lbf·ft / 1500 rpm)
Min. fuel consumption	150 g / PS·h
Rated fuel consumption	160 g / PS·h



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Figure 6
Engine, characteristic curve (EC460)

- | | | | |
|---|----------------------------|---|--------------------|
| A | Fuel consumption (g/PS-HR) | C | Engine speed (RPM) |
| B | Torque (kg-m) | D | Power (PS) |

NOTE!

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

Document Title: Adjusting engine valve and injectors	Function Group: 214	Information Type: Service Information	Date: 2014/7/1 0
Profile:			

Adjusting engine valve and injectors

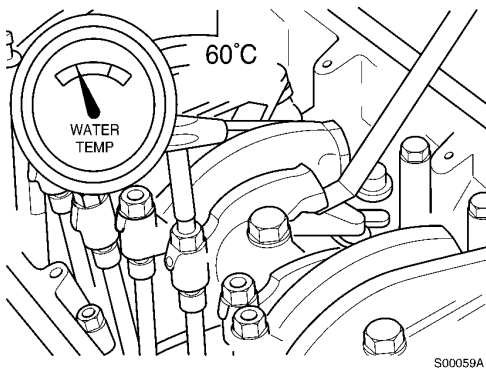
Valves and injectors must be correctly adjusted for the engine to operate efficiently. Valve and injector adjustment must be performed using the values listed in this section. The table gives the adjustment limits for fixed timed engines.

Adjust the valves and the injectors at each 1500 hours or 1 year maintenance interval. If the valves and injectors have been adjusted during troubleshooting or before the 1500 hours or 1 year scheduled maintenance interval, adjustment is not required at this time.

Valve and injector adjustment limits

Valve and injector Adjustment Limits			
"Top stop" Injector Preload : 0.6 ~ 0.7 N·m			
Intake valve	mm	0.35	0.014
Exhaust valve	in	0.68	0.027

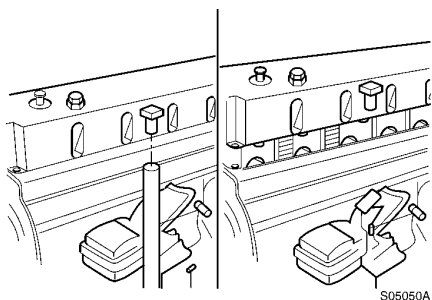
All overhead valve and injector adjustments must be made when the engine is cold, and stabilized coolant temperature is 60 °C (140 °F) or below.



S00059A

Figure 1
Valve and injector adjustment condition

Remove the crankcase breather tube from the crankcase breather outlet.
Remove the 16 capscrews, isolators and spacers from the cover.
Remove the rocker lever cover and gasket.



S05050A

Figure 2
Remove the rocker lever cover and gasket

Each cylinder has three rocker levers :

- The long rocker lever (E) is the exhaust lever.
- The center rocker lever is the injector lever.
- The short rocker lever (I) is the intake lever.

Refer to the figure for valve rocker lever locations.

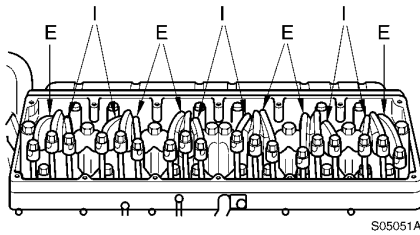


Figure 3
Valve rocker lever locations

The crankshaft rotation is clockwise when viewed from the front of the engine.
The cylinders are numbered from the front gear cover end of the engine.
The engine firing order is 1-5-3-6-2-4

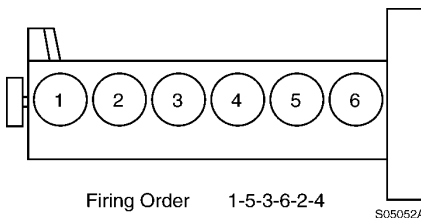


Figure 4
The engine firing order

The valves and injectors on the same cylinders are not adjusted at the same index mark on the accessory drive pulley on fixed timed engines.
One pair of valves and one injector are adjusted at each pulley index mark before rotating the accessory drive to the next index mark.
Two crankshaft revolutions are required to adjust all the valves and injectors.

Injector and valve adjustment sequence

Injector and valve adjustment sequence			
Bar engine in direction of rotation	Pulley position	Set cylinder	
		Injector	Valve
Start	A	3	5
Advance to	B	6	3
Advance to	C	2	6
Advance to	A	4	2
Advance to	B	1	4
Advance to	C	5	1

Firing order : 1 – 5 – 3 – 6 – 2 – 4

WARNING

Do not pull or pry on the fan to manually rotate the crankshaft. To do so can damage the fan blades. Damaged fan blades can cause premature fan failures which can result in serious personal injury or property damage.

The valve set marks are located on the accessory drive pulley. The marks align with a pointer on the gear cover. Use the accessory drive shaft to rotate the crankshaft.

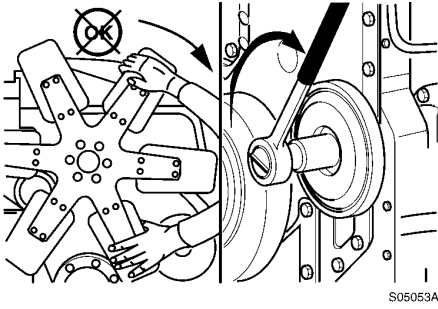


Figure 5
Rotation, crankshaft

The adjustment can begin on any valve set mark. In the following example the adjustment will begin on the 'A' valve set mark with cylinder No. 5 valves closed and cylinder No. 3 injector ready for adjustment.

Rotate the accessory drive shaft clockwise until the 'A' valve set mark on the accessory drive pulley is aligned with the pointer on the gear cover.

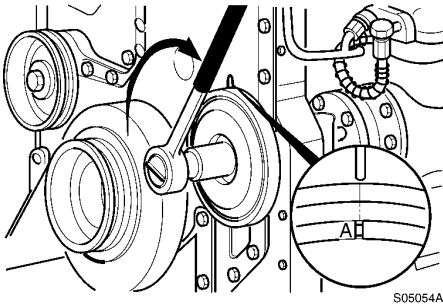


Figure 6
Position, valve mark

When the 'A' mark is aligned with the pointer, the intake and exhaust valves for cylinder No. 5 must be closed. If these conditions are correct, cylinder No. 4 injector and cylinder No. 2 valves are ready to set. Both valves are closed when both rockers are loose, and can be moved from side to side.

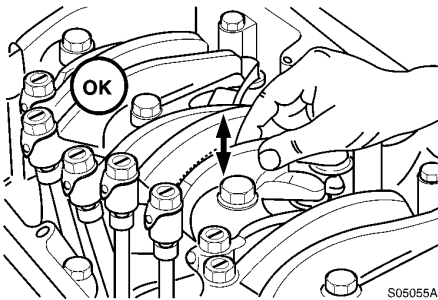


Figure 7
Position, valve

Loosen the injector adjusting screw locknut on cylinder No. 3 Tighten the adjusting screw until all the clearance is removed from the injector train.

Tighten the adjusting screw one additional turn to correctly seat the link.

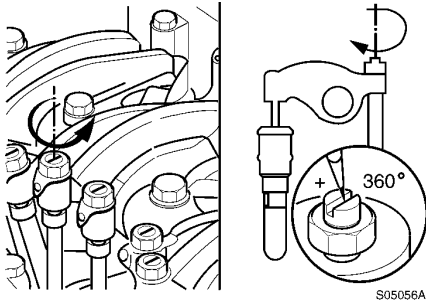


Figure 8
Adjustment, injector

Loosen the injector adjusting screw until the injector spring retainer washer touches the top stop screw.

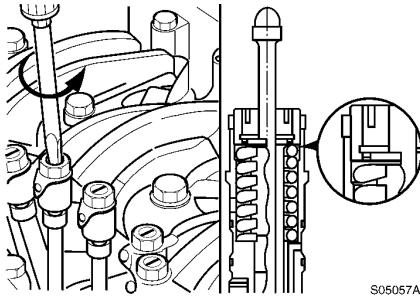


Figure 9
Adjustment, injector

CAUTION

An over-tightened setting on the injector adjusting screw will produce increased stress on the injector train and the camshaft injector lobe which can result in engine damage. Use torque wrench to tighten the adjusting screw.

Tightening torque : 0.6 ~ 0.7 N·m (5 ~6 lb-in)

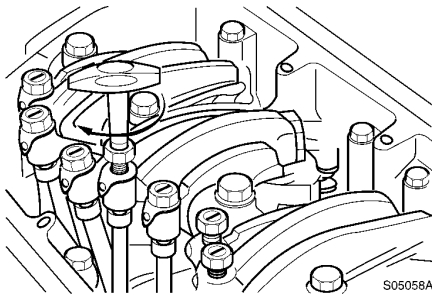


Figure 10
Tightening torque, adjusting screw

Hold the adjusting screw in this position.
The adjusting screw must not turn when the locknut is tightened.

Tightening torque :

- Without torque wrench adapter : 61 N·m (45 lbf-ft)
- With torque wrench adapter (1) : (Part no. ST-669) 47 N·m (35 lbf-ft)

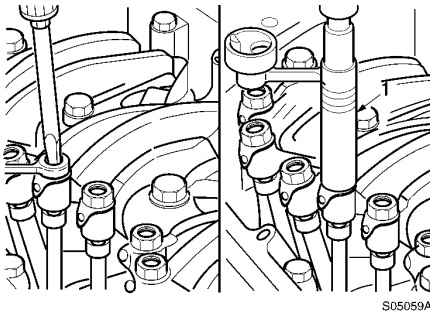


Figure 11
Tightening torque, adjusting screw

Adjust the valves on the appropriate cylinder according to the sequence chart before rotating the accessory drive to the next valve set mark.

Injector and valve adjustment sequence

Injector and valve adjustment sequence			
Bar engine in direction of rotation	Pulley position	Set cylinder	
		Injector	Valve
Start	A	3	5
Advance to	B	6	3
Advance to	C	2	6
Advance to	A	4	2
Advance to	B	1	4
Advance to	C	5	1

Firing order : 1 – 5 – 3 – 6 – 2 – 4

Select a feeler gauge for the correct valve lash specifications.

Valve lash specifications

Valve lash specifications	
Intake	Exhaust
0.36 mm (0.014 in)	0.69 mm (0.027 in)

Insert the feeler gauge between the top of the cross-head and the rocker lever pad.

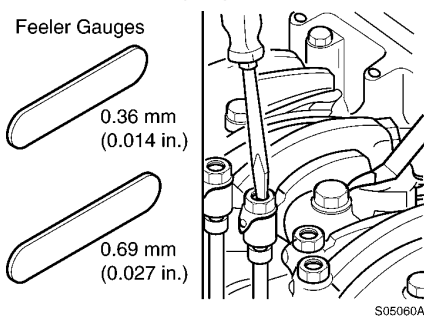


Figure 12
Checking, clearance

Two different methods for establishing valve lash clearance are described below. Either method can be used, however, the torque wrench method has proven to be the most consistent. It eliminated the need to feel the drag on the feeler gauge.

- Torque wrench method :

Use the inch pound torque wrench, (Part No. 3376592) (Normally used to set preload on top stop injectors) and tighten the adjusting screw.

Tightening torque : 0.7 N·m (6 lb·in)

- Touch method :

Tighten the adjusting screw until a light drag is felt on the feeler gauge.

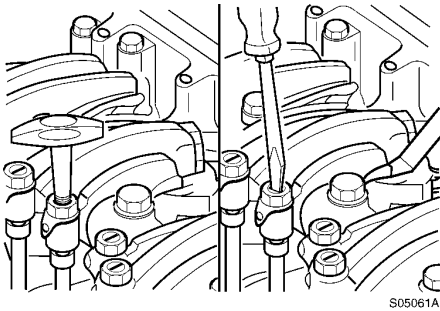


Figure 13
Adjusting, valve clearance

Hold the adjusting screw in this position. The adjusting screw must not turn when the locknut is tightened.

Tighten the locknut.

Tightening torque :

- Without torque wrench adapter : 61 N·m (45 lbf·ft)
- With torque wrench adapter (1) :
(Part no. St-669) 47 N·m (35 lbf·ft)

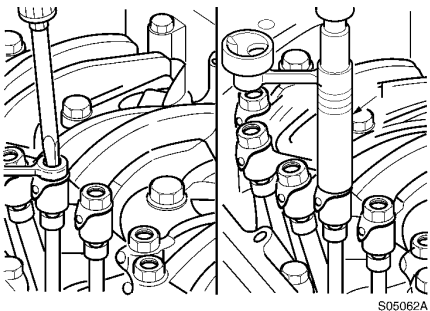


Figure 14
Tightening torque, locknut

After tightening the locknut to the correct torque value, check to make sure the feeler gauge will slide backward and forward between the cross-head and the rocker lever with only a slight drag.

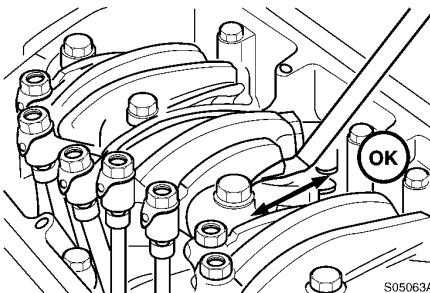


Figure 15
Checking, locknut torque

If using the touch method, attempt to insert a feeler gauge that is 0.03 mm (0.001 in) thick between the cross-head and the

rocker lever pad. The valve lash is not correct when a thicker feeler gauge will fit.

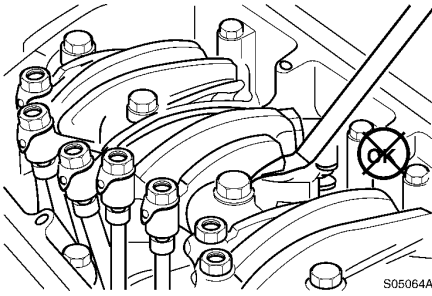


Figure 16
Checking, valve lash

Adjust the Jacobs engine brake, if applicable, after adjusting the valves before rotating the accessory drive pulley to the next index mark.

Refer to Jacobs engine brake—adjustment following this procedure.

After adjusting the valves, rotate the accessory drive and align the next valve set mark on the accessory drive pulley with the pointer on the gear cover.

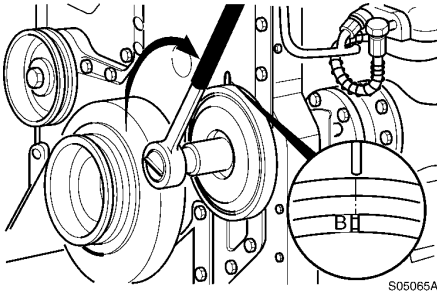


Figure 17
Marking, drive pulley with the pointer on the gear cover

Adjust the appropriate injector and valves following the injector and valve adjustment sequence chart.

Repeat the process to adjust all injectors and valves.

After adjusting all the valves and injectors, check the torque on the adjusting screw locknuts to make sure none were overlooked.

Injector and valve adjustment sequence

Injector and valve adjustment sequence			
Bar engine in direction of rotation	Pulley position	Set cylinder	
		Injector	Valve
Start	A	3	5
Advance to	B	6	3
Advance to	C	2	6
Advance to	A	4	2
Advance to	B	1	4
Advance to	C	5	1

Firing order : 1 – 5 – 3 – 6 – 2 – 4

If the valve cover gasket was not damaged, it can be used again. If the gasket was damaged, it must be discarded and a new one used.

Install the gasket on the cover.

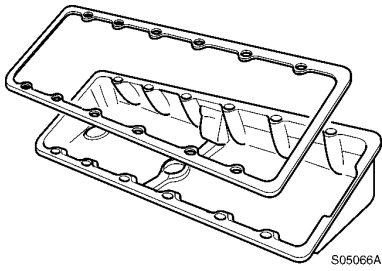


Figure 18
Install the gasket on the cover

Install the cover on the rocker lever housing.
 Install the 16 isolators, spacers and capscrews in the cover.

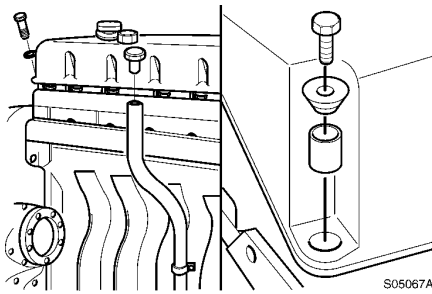


Figure 19
Install the cover on the rocker lever housing

Tighten the capscrews in the sequence shown.
 Torque value : 15 N·m (130 lb·in)

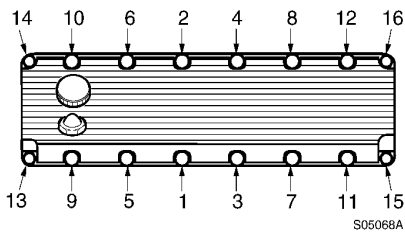


Figure 20
Tighten the capscrews

Install the hose on the crankcase breather.

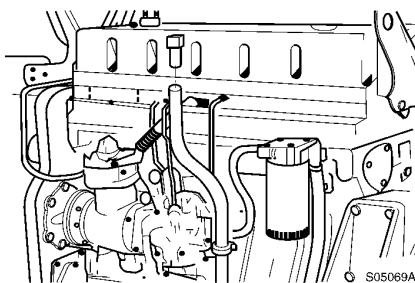


Figure 21
Install, breather

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