

Engine Damage After Head Repair

**Toyota HiLux/HiAce
2TR-FE 2.7L 2005 - 2016**

**Mazda BT-50/Ford Ranger
WL-C/WE-C 2.5L/3.0L
2006 - 2011**

When replacing cylinder heads, failure to refit all valve lash caps can cause costly engine damage.

This information has been supplied by Geoff Gillam, from All Head Services, Hallam, Victoria. These relatively small and easily overlooked parts must be correctly installed after repairs or other work to cylinder head or rocker gear.

Concern

Many modern engines, in particular diesel engines have a lash cap fitted on the end of the valve that the rocker arm pushes on. *Refer to picture next page.*

The lash caps, particularly when coated with diesel engine oil, are hard to see and very easily missed when dismantling the cylinder heads.

The lash caps do not come with a new or exchange cylinder head, unless the head is a fully assembled head with the rockers and/or camshaft already installed.

We have had several instances where a customer has purchased a cylinder head and fitted it without swapping over the lash caps from the original cylinder head with catastrophic results!

Causes

A customer had fit a Toyota HiLux 2TR-FE engine with a changeover cylinder head. The vehicle ran fine for 4 months with no obvious noises or rattles. These engines use hydraulic lifters and the lifters will take up the clearance caused by missing lash caps. So there was no apparent rattle or indication that there is any issue.

The engine dropped a valve and the cylinder head was sent back for inspection. When the cylinder head was inspected

Overlooking just one small valve lash cap can cause expensive damage.

A bent and broken valve and rocker from a HiLux 2TR-Fe engine that had a valve lash cap missing on reassembly.



it was found that the lash caps from the original head had not been fitted by the customer. The valve and rocker on the affected cylinder were severely damaged. *Refer to the above picture.*

Without the lash caps fitted to the valve tips, it allows the rocker arms to slide off the centre of the valve tips. The rocker arms then push on the valve spring retainer, rather than the centre of the valve stem, which in turn allowed the valve collets to pop out. With the collets gone the valve dropped and broke after hitting the piston.

Service Fix

When dismantling any cylinder head, always check the end of the valve stems to see if there are any lash caps fitted. ▶

Note: Valve lash caps are used on an assortment of engines from different manufacturers, so you really need to check each cylinder head to see if these caps are fitted on every vehicle that you remove the valve gear from.

In particular, we have seen issues with Toyota 2TR and Ford/Mazda 3.0 Litre WEC engines dropping valves for this reason. As the clearance is taken up by the hydraulic lifter in the 2TR and can be adjusted out when setting the valve clearances on the Ford/Mazda WEC there is usually no apparent indication of the lash caps being missing until the valve drops! 🚩

We would like to thank Geoff, from All Head Services, for sharing this timely reminder, information and photos.

Note: Always apply clean oil to lash caps before fitting.



Cylinder Head Specifications

Toyota HiLux/HiAce 2TR-FE 2.7L 2005 - 2016

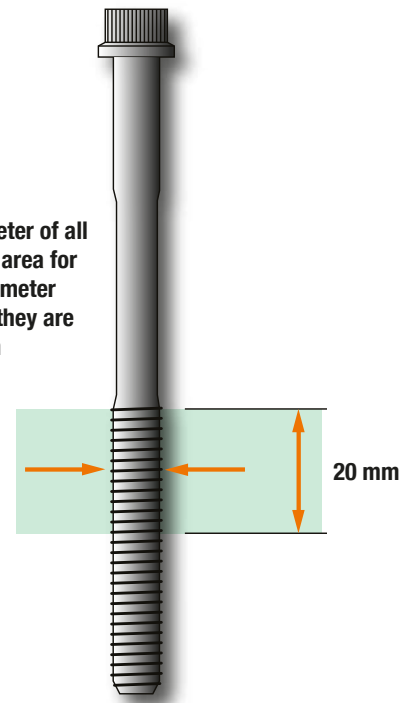
Note: Apply sealant to top and bottom edge of head gasket where it meets the timing case.

Valve Clearance - Hydraulic

Cylinder Head Bolt Diameter - 10.40 mm Minimum *See Diagram*

Component	Torque
Camshaft Bearing Caps	15.5 Nm all bolts, except for centre bolt on front bearing which is 12 Nm
Camshaft Sprocket Bolt	78 Nm
Crankshaft Pulley Bolt	260 Nm
Cylinder Head Bolts	Oiled Thread & Washer
• 1st Step	39 Nm
• 2nd Step	90°
• 3rd Step	90°
Exhaust Manifold	36 Nm
Intake Manifold	25 Nm
Spark Plugs	18 Nm
Valve Cover	9 Nm

Check diameter of all bolts in this area for smallest diameter and ensure they are greater than minimum



Standard Diameter	10.76 - 10.97 mm
Minimum Diameter	10.40 mm

Cylinder Head Specifications

Mazda BT-50/Ford Ranger WL-C/WE-C 2.5L/3.0L 2006 - 2011

Valve Clearance - Cold

- Intake 0.10 – 0.16 mm
- Exhaust 0.17 – 0.23 mm

Component	Torque
Camshaft Bearing Cap	10 Nm
Camshaft Gear	130 Nm
Crankshaft Pulley	415 Nm
Cylinder Head (Not Bolts #19 - See Diagram)	Oiled Thread & Washer
• 1st Step	29 Nm
• 2nd Step	29 Nm
• 3rd Step	90°
• 4th Step	90°
• 5th Step	90°
Engine Oil Drain Plug	35 Nm
Exhaust Manifold	25 Nm
Glow Plugs	18 Nm
Injection Pipes	27 Nm *
Injector Clamp Bolt	23 Nm *
Intake Manifold	22 Nm
Oil Pan	35 Nm
Timing Case	10 Nm
Valve Cover	10 Nm

* Important Notes:

- Injector pipes can only be reused a maximum of five times.
- Do not remove clip from injector when removing fuel return hose.

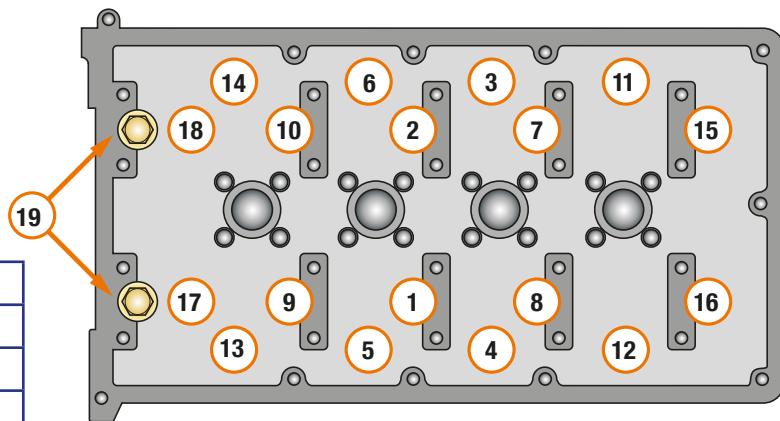
Old Timer

Do You Remember

When hubcaps were made from almost as much metal as the entire wheel on a modern car.

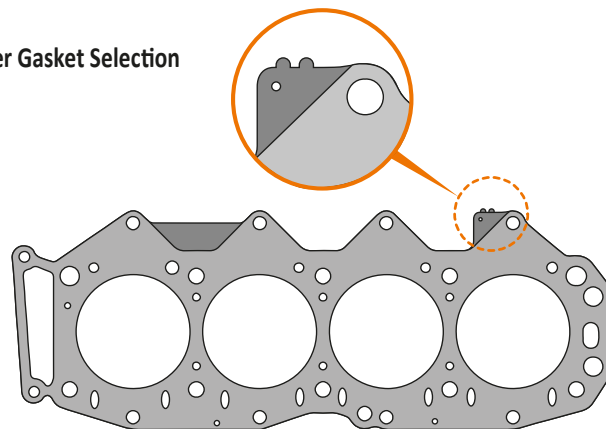


Cylinder Head Bolt Torque & Sequence



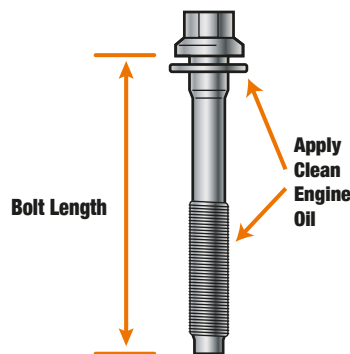
Bolts 1 to 18: 1st: 29 Nm 2nd: 29 Nm 3rd: 90° 4th: 90° 5th: 90°
Bolts 19: 19 Nm - Use sealant on bolt threads

Cylinder Gasket Selection



Piston Protrusion	Gasket Selection
0.080 - 0.190 mm	One Mark (0.75 mm)
0.135 - 0.255 mm	No Mark (0.80 mm)
0.200 - 0.310 mm	Two Marks (0.85 mm)

Cylinder Head Bolt Checking



*Note: See mark on head of bolt

"I" Bolt Length	
New	Wear Limit
149.0 - 150.0 mm	150.5 mm

"W" Bolt Length	
New	Wear Limit
101.2 - 101.8 mm	102.5 mm

"N" Bolt Length	
New	Wear Limit
113.2 - 113.8 mm	114.5 mm