



Service Department:

THE ROVER COMPANY LIMITED

By Appointment to
Her Majesty
Queen Elizabeth II



Manufacturers
of Motor Cars and
Land-Rovers

SOLIHULL
WARWICKSHIRE
ENGLAND

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Item 172 SUBJECT:

CYLINDER HEAD (Policy Item)

MODELS:

Land-Rover 2½ litre Diesel, Bonneted and Forward Control models.

REMARKS:

A considerable amount of development work has taken place to eliminate problems experienced in service of cylinder head cracking as a result of water loss. The modified cylinder head gasket (see Land-Rover News Letter Vol. 2, No. 20, item 79) and in particular the semi-sealed cooling system with overflow bottle (see Land-Rover News Letter Vol. 2, No. 28, item 129) have proved most successful. The effectiveness, however, of the various improvements made depends entirely on the correct tightening torque of the cylinder head bolts, to ensure a perfect gas seal between the combustion chambers and the water passages and also between adjoining cylinders.

Our experience in the field has shown that the injectors are not always being removed to tighten the cylinder head bolts adjacent to the injectors. Consequently, the cylinder head bolts that are partly obstructed by the injectors are not always being included in the recommended tightening sequence.

As a result of this uneven tightening, the very high operating pressures of the Diesel engine cause 'panting' of the cylinder head.

Thus, the essential seal between combustion chambers and water passages and adjoining cylinders is broken, permitting:

- (a) Pressurisation of crankcase and subsequent oil discharge through the breather, and
- (b) Water loss to combustion under induction, and to atmosphere under exhaust.

Fig. 1 below illustrates a typical cylinder head which shows unmistakably the symptoms of incorrectly tightened cylinder head bolts.

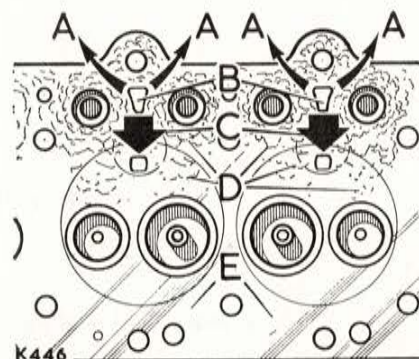


Fig. 1. Joint face of incorrectly tightened cylinder head

A—Water loss to atmosphere	C—Water loss to combustion
B—Water passages	D—Rust deposit
E—Cylinder head joint face	

The heavy rust deposit in the area of the water passages has been caused by the coolant escaping for the reasons outlined under (b) on the previous page.

We are repeating below the correct procedure for tightening cylinder head bolts.

1. Ensure engine temperature is really hot.
2. Remove top rocker cover.
3. Disconnect feed pipe to each injector and slacken pipe at distributor pump end. Then swing pipes clear of injectors.
4. Disconnect spill pipe at 'T' piece and slacken banjo bolts on nozzles.
5. **Early models.** Remove the nuts retaining the clamp bar on the top of the injector and remove the bar.
Late models. Remove flange securing nuts.
6. Check cylinder head bolt tightness in the order indicated at Fig. 2, ensuring that all the $\frac{1}{2}$ in. nuts and bolts are pulled down to 90 lb. ft (12,5 mkg).

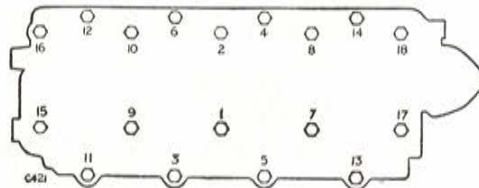


Fig. 2. Order of tightening cylinder head bolts

7. Check injectors as required.
8. Smear new copper joint washers with grease and fit one to each injector. Insert a new corrugated sealing washer into each injector nozzle recess in cylinder head, with raised portion upwards, then fit injector nozzles.
9. **Early models.** Replace clamp bar and nuts.
Late models. Refit flange securing nuts.
Do not tighten nuts fully at this stage.

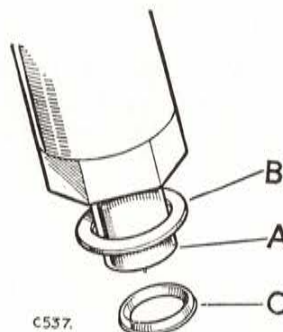


Fig. 3. Position of injector nozzle washers

A—Nozzle B—Copper washer C—Steel washer

10. Connect fuel feed pipes to injectors.
11. Tighten each clamp bar or flange securing nut alternately an equal amount to ensure that the injector goes into position evenly. The nuts must be tightened only to a torque of 6-8 lb. ft (0,8—1,0 mkg). Alternatively, a $\frac{1}{2}$ in. AF open-ended spanner of not more than 4 in. (100 mm) length can be used.
Failure to carry out the above precautions when replacing injector nozzles may result in nozzle distortion, giving rise to rough and uneven running.

12. Replace top rocker cover.

It is most important that the above procedure is carried out at the 1,000 miles (1500 km) Free Service.

Where the cylinder head has been removed for any reason at all, the cylinder head bolts must first be tightened to 90 lb. ft (12,5 mkg) on assembly, with the engine cold. Then with the engine hot repeat the above procedure.

Providing the above instructions are adhered to, no failure of the cylinder head due to cracking should occur.

Therefore, this News Letter item is to clarify that The Rover Company will not accept any obligations for cylinder heads that crack as a direct result of incorrect tightening.