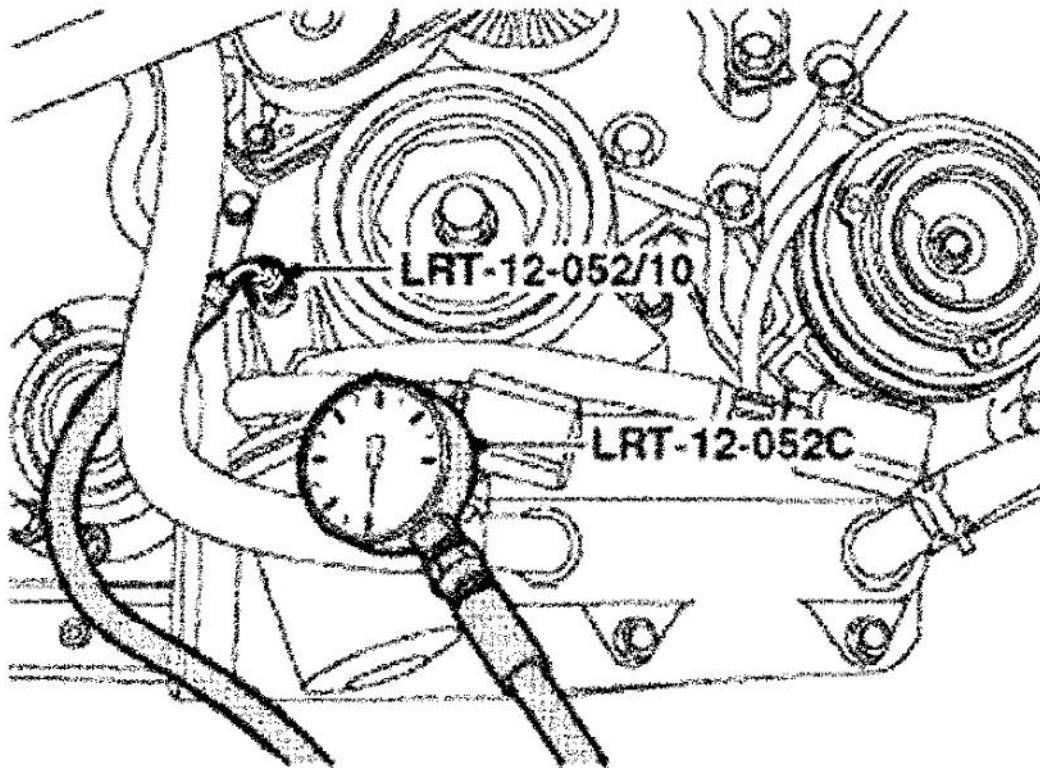


2002-05 ENGINES**2.5L - Freelander KV6****ADJUSTMENTS****ENGINE OIL PRESSURE CHECK****Check**

1. Remove oil pressure switch. See **SWITCH - OIL PRESSURE**.
2. Fit sealing washer from oil pressure switch to LRT-12-052/10 oil pressure gauge adaptor. See **Fig. 1**.
3. Fit and tighten oil pressure gauge adaptor LRT-12-052/10 to oil pump housing.
4. Connect oil pressure gauge LRT-12-052C and tighten union.
5. Check and if necessary top up engine oil. See **ENGINE OIL AND FILTER - KV6** .
6. Start and run engine until normal operating temperature is reached.
7. Note oil pressure readings with the engine running at idle and at 3000 rev/min.
8. Switch off engine, unscrew gauge union and remove gauge.
9. Remove adaptor.
10. Wipe off oil spillage
11. Fit oil pressure switch.
12. Recheck engine oil and top up if necessary. See **ENGINE OIL AND FILTER - KV6** .



G00373641

Fig. 1: Checking Oil Pressure

Courtesy of LAND ROVER NORTH AMERICA, INC.

REPAIRS

CAMSHAFTS - LEFT CYLINDER HEAD

Removal

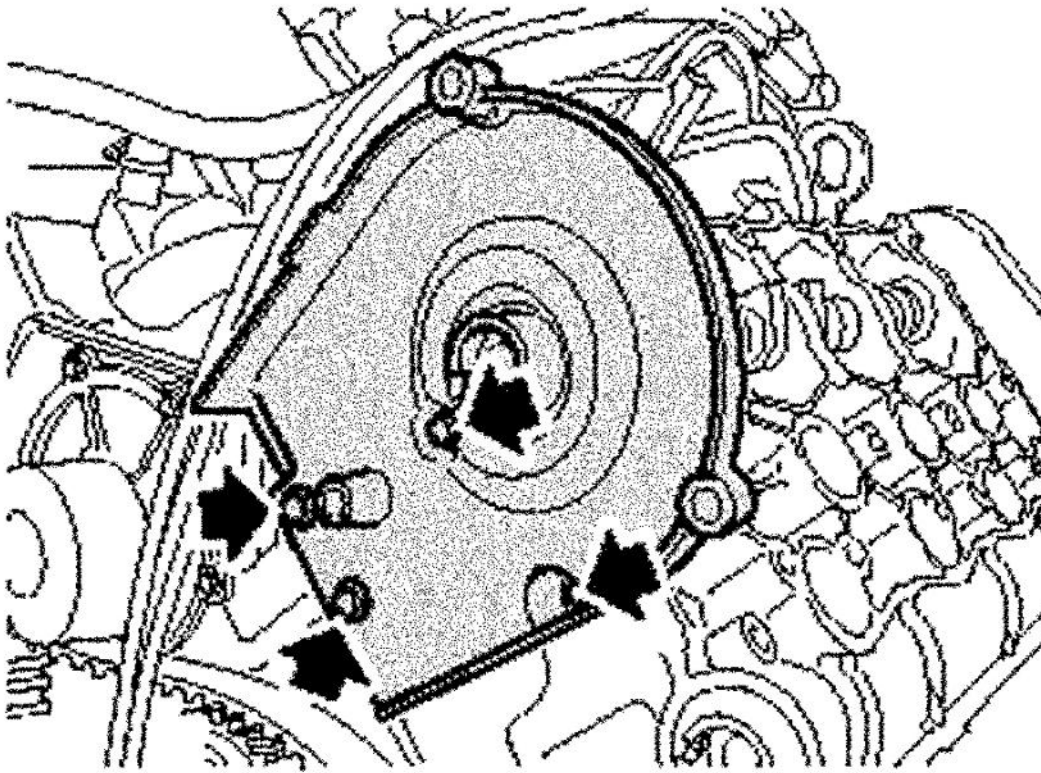
1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Remove camshaft timing belt. See **CAMSHAFT TIMING BELT**.
3. Remove left camshaft rear timing belt. See **CAMSHAFT TIMING BELT COVER - LEFT REAR**.
4. Remove left camshaft cover gasket. See **CAMSHAFT COVER GASKET - LEFT- UP TO MODEL YEAR 2003** or **CAMSHAFT COVER GASKET - LEFT- FROM MODEL YEAR 2003**.
5. Remove 4 bolts and remove front camshaft drive belt cover backplate from cylinder head. See **Fig. 2**.
6. Remove 2 bolts securing left rear camshaft drive belt cover backplate to cylinder head and remove backplate. See **Fig. 3**.
7. Using sequence shown, progressively loosen 22 bolts securing camshaft carrier to cylinder head until valve spring pressure is released, remove bolts. See **Fig. 4**.

8. Release camshaft carrier from dowels and remove carrier.
9. Remove camshafts and discard oil seals.
10. Using a stick magnet, remove 12 hydraulic tappets from cylinder head.

CAUTION: Store hydraulic tappets in their fitted order and store upright.
Maintain absolute cleanliness when handling hydraulic tappets.
Failure to observe these precautions can result in engine failure.

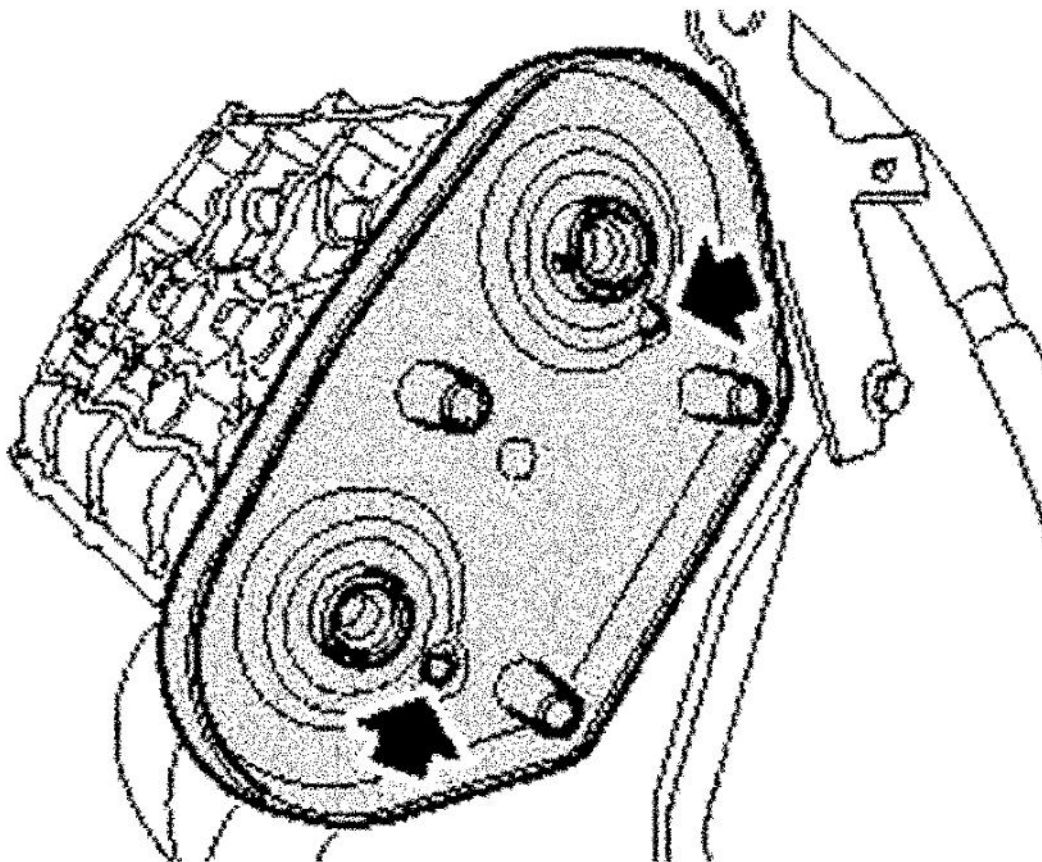
11. Clean camshafts and bearing running surfaces in camshaft carrier and cylinder head.
12. Inspect camshafts and replace camshafts if scored, pitted or excessively worn. See **Fig. 5**.

NOTE: Camshafts are color coded - Inlet - ORANGE; Exhaust - BLUE.



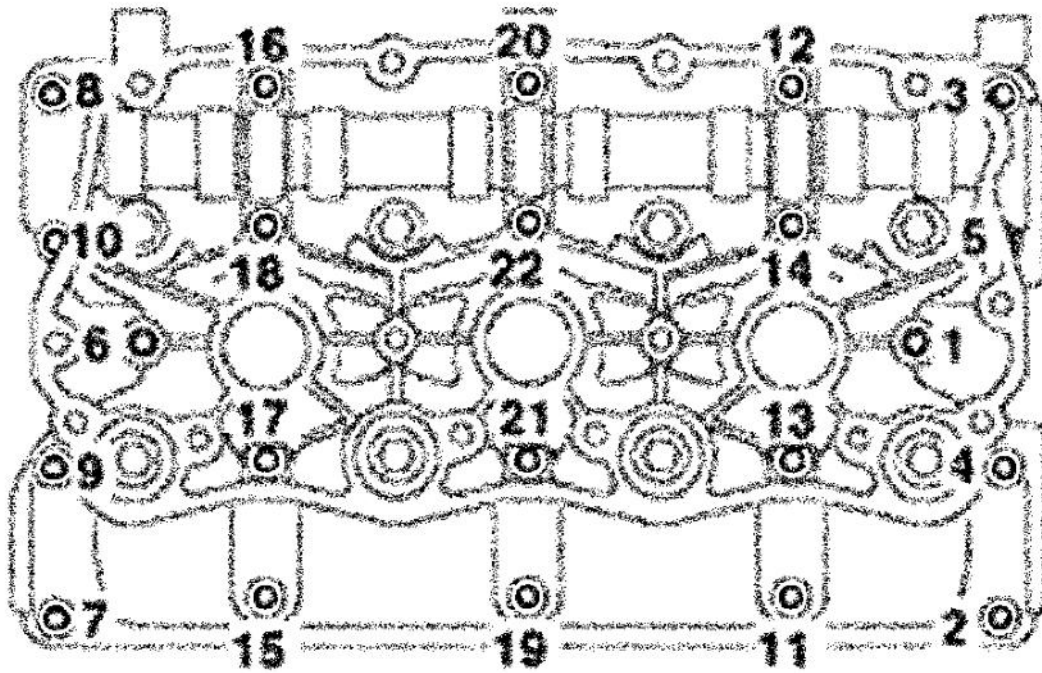
G00373642

Fig. 2: Removing Front Camshaft Drive Belt Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



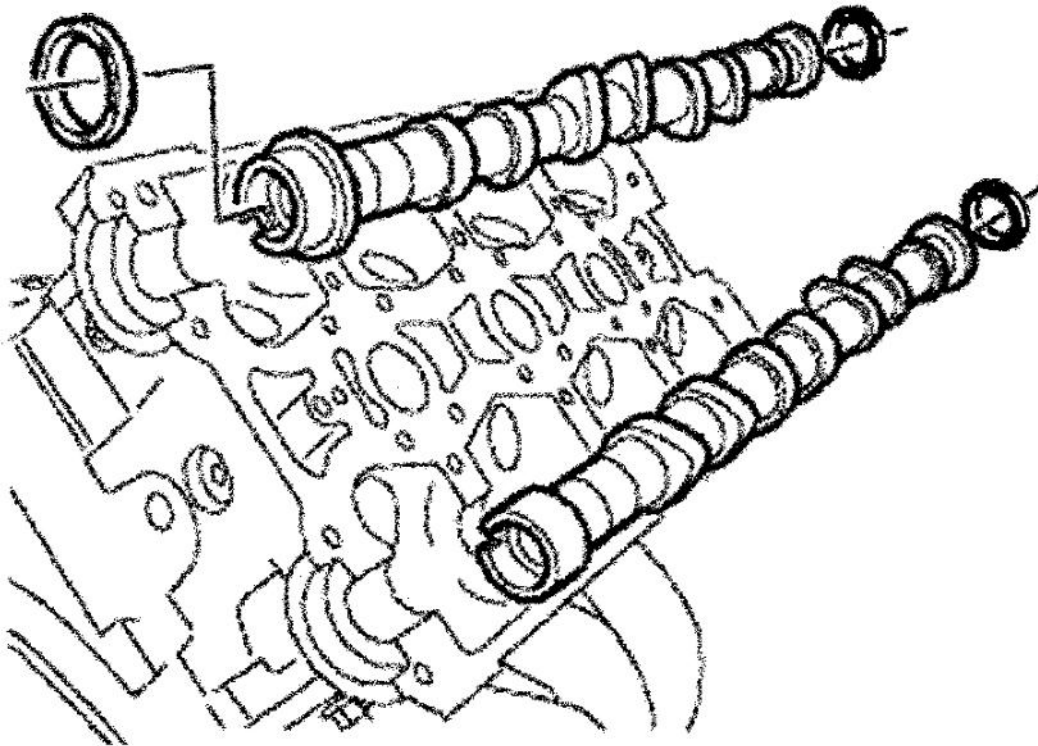
G00373643

Fig. 3: Removing Left Rear Camshaft Drive Belt Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381881

Fig. 4: Removing Camshaft-To-Cylinder Head Bolts In Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.



G00373644

Fig. 5: Discarding Camshaft Oil Seals

Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Thoroughly clean and lubricate hydraulic tappets with clean engine oil. Fit hydraulic tappets to original bores in cylinder head.
2. Ensure that mating faces of camshaft carrier and cylinder head are clean and dry.
3. Lubricate camshafts and bearing journals with clean engine oil.
4. Position camshafts in cylinder head with rear timing gear drive slots in each camshaft facing towards the center as shown. See **Fig. 6**.

CAUTION: Ensure camshafts are in their correct fitted locations, camshafts are color coded - Inlet - ORANGE; Exhaust - BLUE.

5. Apply continuous thin beads of sealant, Part No. STC 4600, to paths on camshaft carrier as shown. Spread sealant to an even film using a roller.

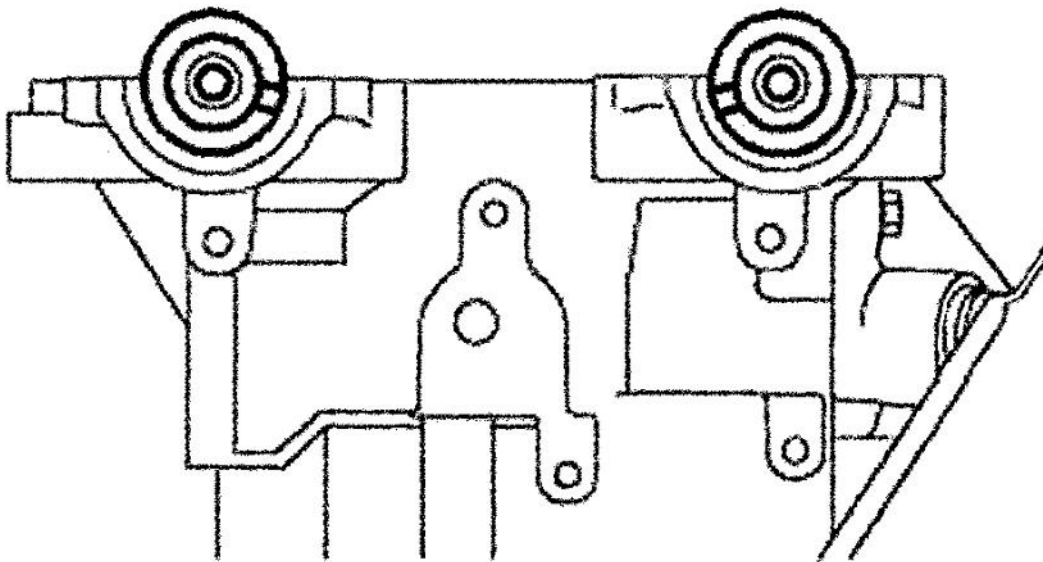
CAUTION: Ensure sealant does not enter oil feed holes or grooves and that

assembly is completed within 20 minutes. See Fig. 7.

6. Position camshaft carrier, fit and progressively tighten bolts in the sequence shown to 10 Nm (7.5 ft. lbs.). See **Fig. 8**.
7. Noting that the front camshaft oil seals are black in color and the rear oil seals are red, fit new camshaft oil seals using LRT-12-203 and LRT-12-148A. See **Fig. 9**.

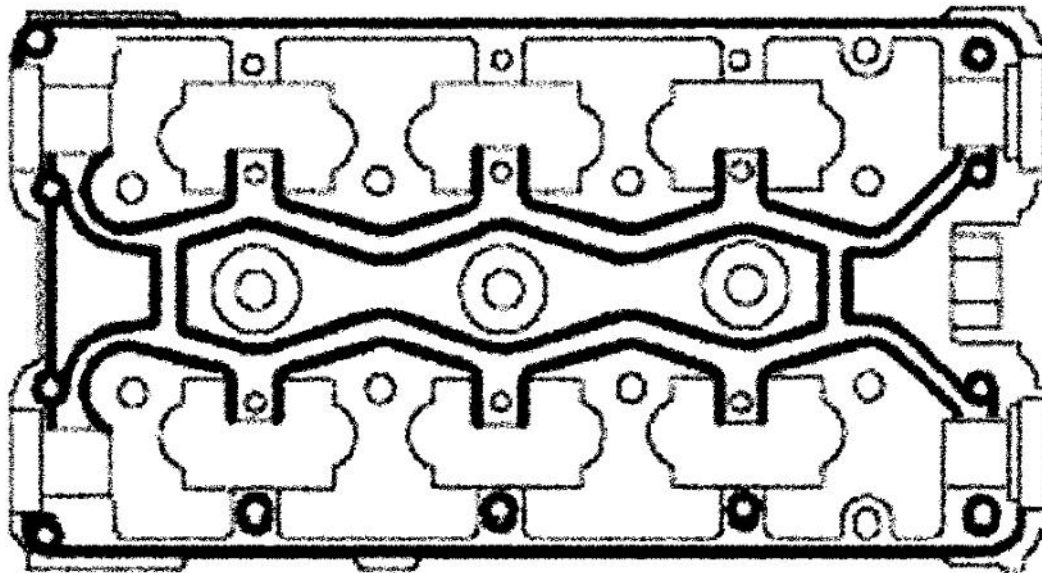
CAUTION: Oil seals must be fitted dry. Do not use tool LRT-12-148 for fitting seals.

8. Clean camshaft timing belt cover backplate bolts and apply sealant, Part No. STC 50552 to the first 3 threads.
9. Position camshaft timing belt rear cover backplates to cylinder head, fit and tighten bolts to 9 Nm (7 ft. lbs.).
10. Fit left camshaft cover gasket.
11. Fit camshaft timing belt.
12. Fit left camshaft rear timing belt.
13. Top-up engine oil.
14. Connect battery earth lead. See **DISCONNECT/CONNECT** .



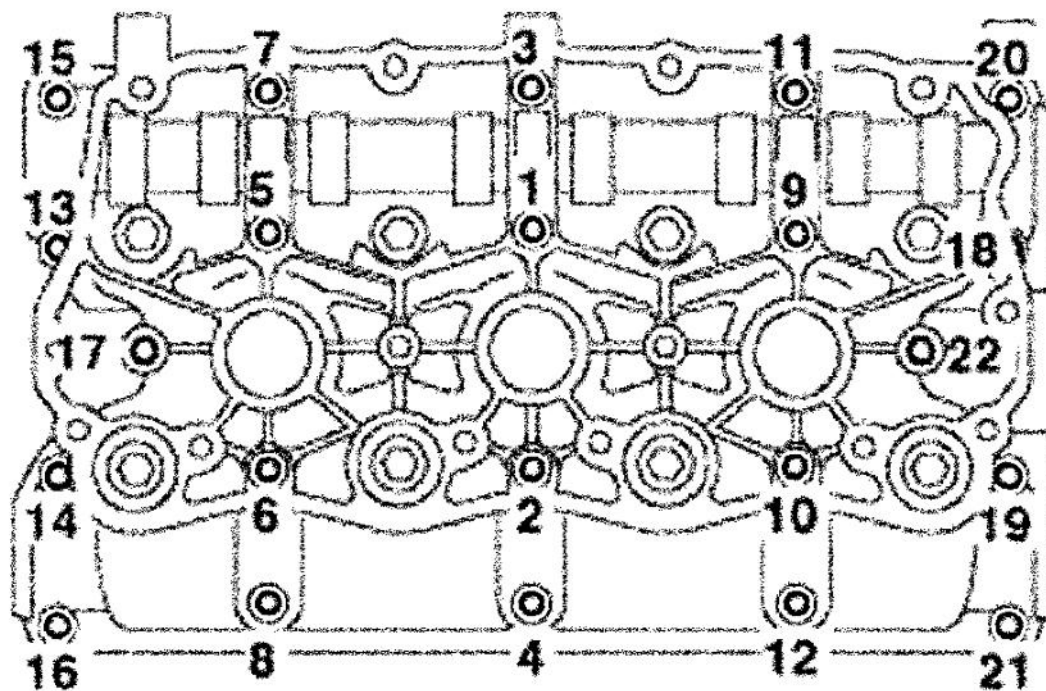
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Fig. 6: Positioning Camshafts In Cylinder Head
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381883

Fig. 7: Applying Camshaft Sealant
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 8: Tightening Camshaft Carrier Bolts

Courtesy of LAND ROVER NORTH AMERICA, INC.

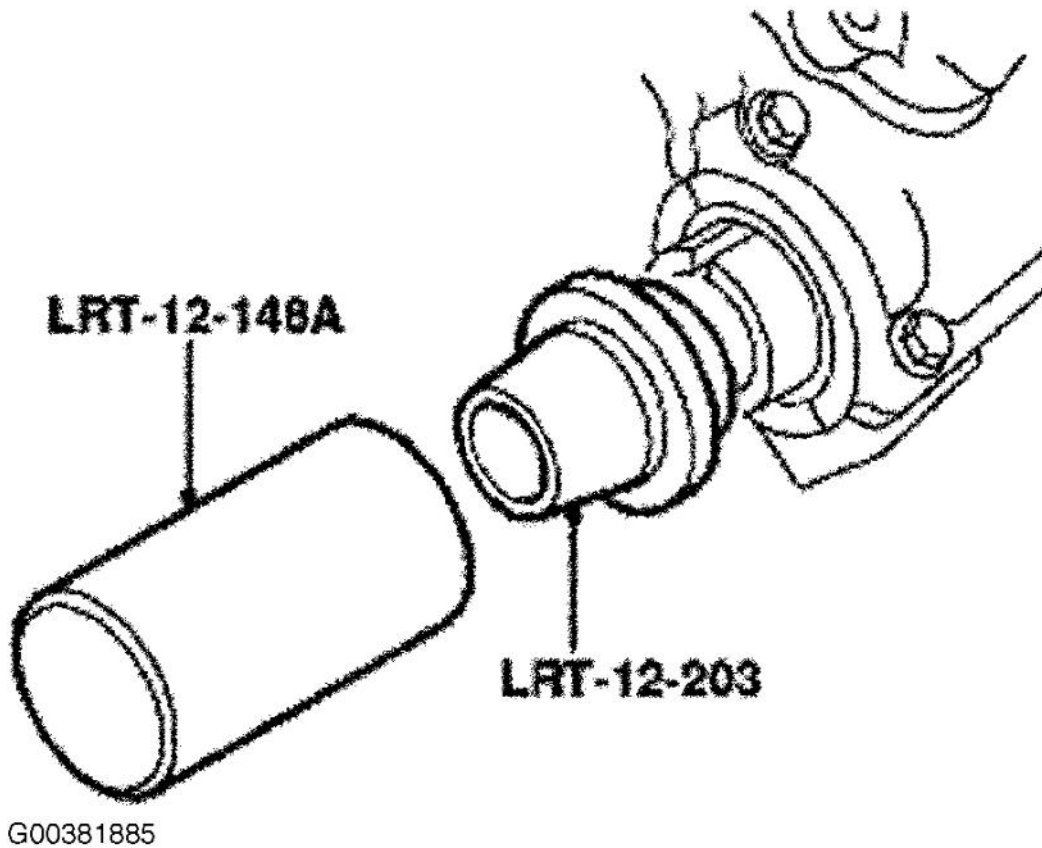


Fig. 9: Installing Oil Seals

Courtesy of LAND ROVER NORTH AMERICA, INC.

CAMSHAFTS - RIGHT CYLINDER HEAD

Removal

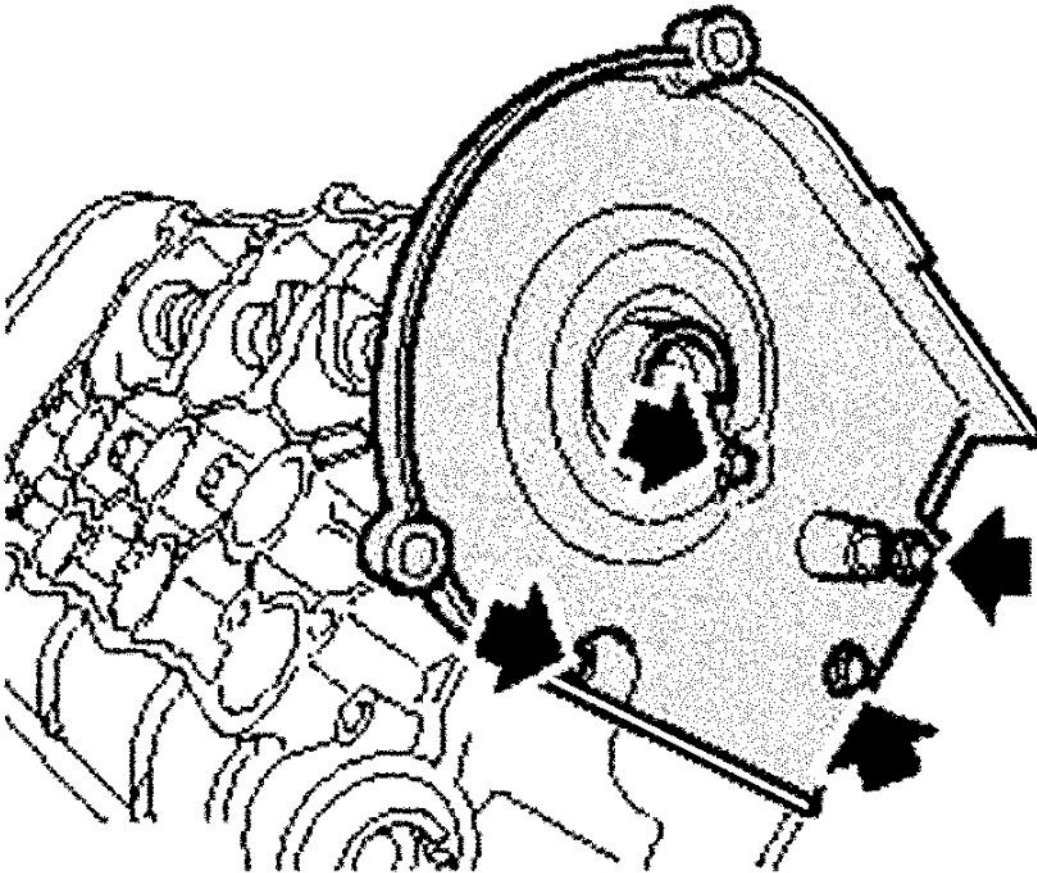
1. Disconnect battery earth lead. See DISCONNECT/CONNECT.
2. Remove camshaft timing belt. See CAMSHAFT TIMING BELT.
3. Remove right rear camshaft timing belt. See CAMSHAFT TIMING BELT COVER - RIGHT REAR.
4. Remove right camshaft cover gasket. See CAMSHAFT COVER GASKET - RIGHT.
5. Remove 4 bolts securing right front timing belt cover backplate to cylinder head and remove backplate. See Fig. 10.
6. Remove 2 bolts securing right rear timing belt cover backplate and remove backplate. See Fig. 11.
7. Using sequence shown, progressively loosen 22 bolts securing camshaft carrier to cylinder head until valve spring pressure is released and remove bolts. See Fig. 4.
8. Release camshaft carrier from dowels and remove carrier.

9. Remove both camshafts and discard oil seals. See **Fig. 12**.
10. Using a stick magnet, remove 12 hydraulic tappets from cylinder head.

CAUTION: Store hydraulic tappets in their fitted order and store upright.
Maintain absolute cleanliness when handling hydraulic tappets.
Failure to observe these precautions can result in engine failure.

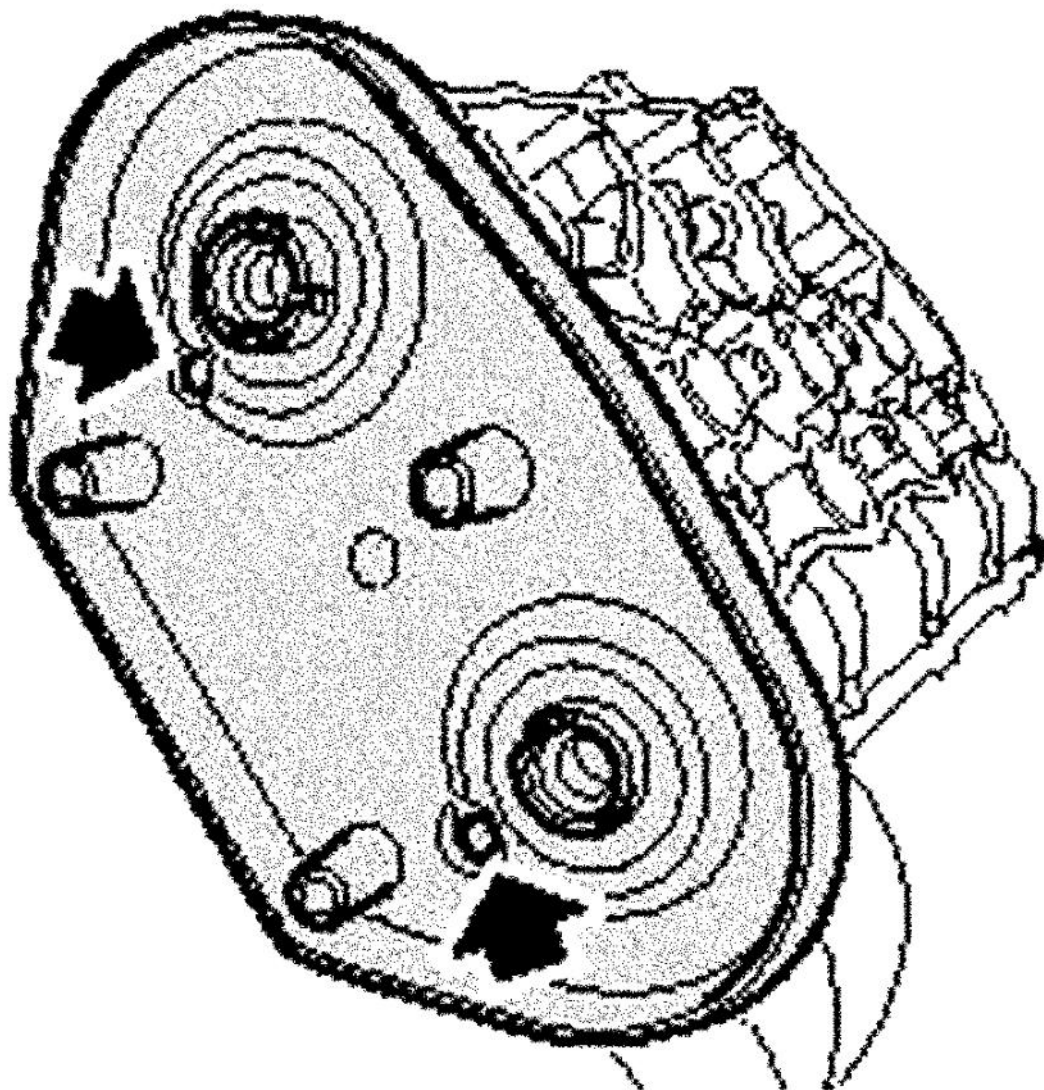
11. Clean camshafts and bearing running surfaces in camshaft carrier and cylinder head.
12. Inspect camshafts and replace camshafts if scored, pitted or excessively worn.

NOTE: Camshafts are color coded - Inlet - ORANGE; Exhaust - BLUE.



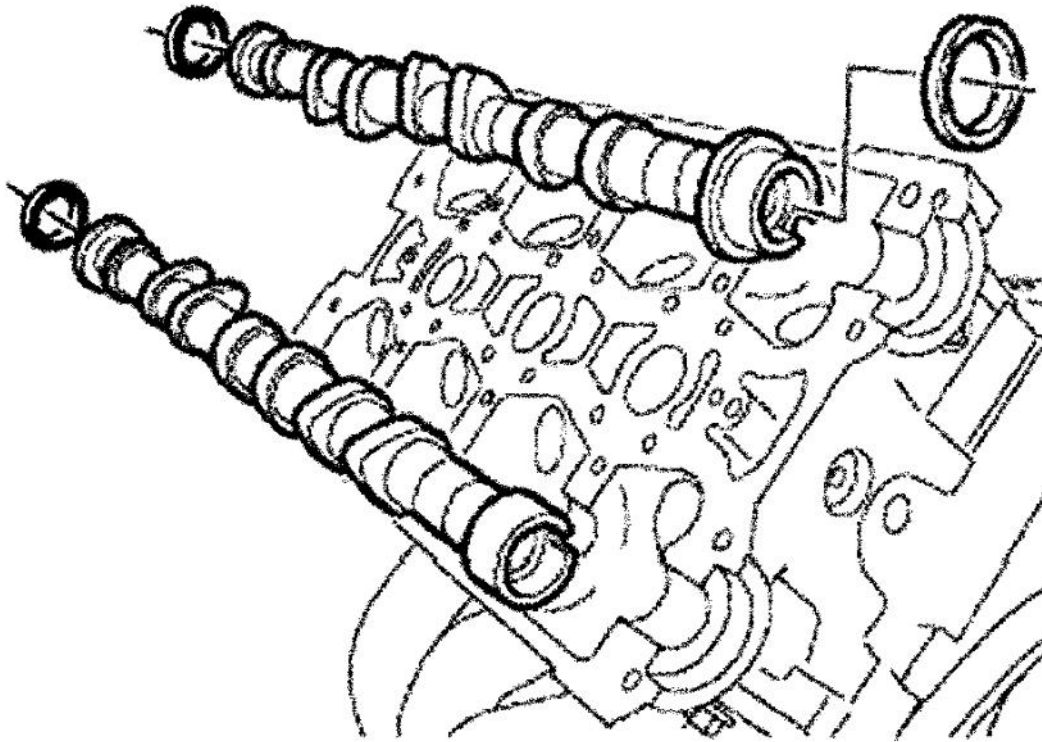
G00381886

Fig. 10: Removing Right Front Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381887

Fig. 11: Removing Right Rear Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381888

Fig. 12: Removing Camshafts & Discarding Oil Seals
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Thoroughly clean and lubricate hydraulic tappets with clean engine oil. Fit hydraulic tappets to original bores in cylinder head.
2. Ensure that mating faces of camshaft carrier and cylinder head are clean and dry.
3. Lubricate camshafts and bearing journals with clean engine oil.
4. Position camshafts in cylinder head with rear timing gear drive slots in each camshaft facing towards the center as shown. See **Fig. 6**.

CAUTION: Ensure camshafts are in their correct fitted locations, camshafts are color coded - Inlet - ORANGE, Exhaust - BLUE.

5. Apply continuous thin beads of sealant, Part No. STC 4600, to paths on camshaft carrier as shown. Spread sealant to an even film using a roller. Ensure sealant does not enter oil feed holes or grooves and that assembly is completed within 20 minutes. See **Fig. 7**.
6. Position camshaft carrier, fit and progressively tighten bolts in the sequence shown to 10 Nm (7.5 ft. lbs.).

7. Noting that the front camshaft oil seals are black in color and the rear oil seals are red, fit new camshaft oil seals using LRT-12-203 and LRT-12-148A. See **Fig. 9**.

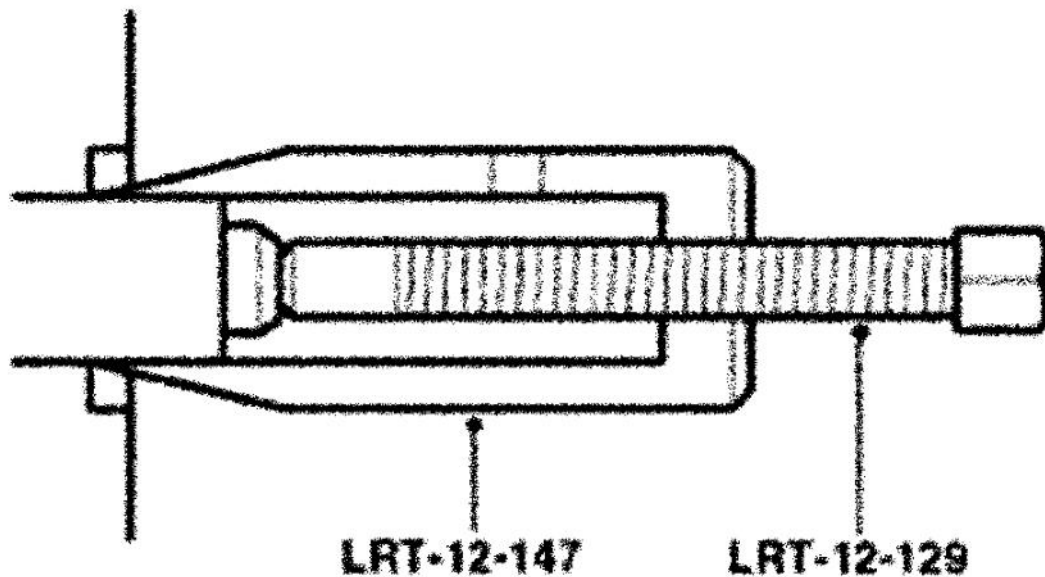
CAUTION: Oil seals must be fitted dry. Do not use tool LRT-12-148 for fitting seals.

8. Clean camshaft timing cover backplate bolts and apply sealant, Part No. STC 50552 to first 3 threads.
9. Fit camshaft cover backplates fit and tighten bolts to 9 Nm (7 ft. lbs.).
10. Fit right camshaft cover gasket. See **CAMSHAFT COVER GASKET - RIGHT**.
11. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT**.
12. Fit right rear camshaft timing belt. See **CAMSHAFT REAR TIMING BELT - LEFT CYLINDER HEAD**.
13. Top-up engine oil. See **ENGINE OIL AND FILTER - KV6**.
14. Connect battery earth lead. See **DISCONNECT/CONNECT**.

INLET CAMSHAFT FRONT OIL SEAL

Removal

1. Remove camshaft timing belt. See **CAMSHAFT TIMING BELT**.
2. Remove camshaft oil seal using LRT-12-147 and center bolt LRT-12-129. See **Fig. 13**.
3. Remove and discard oil seal from LRT-12-147.



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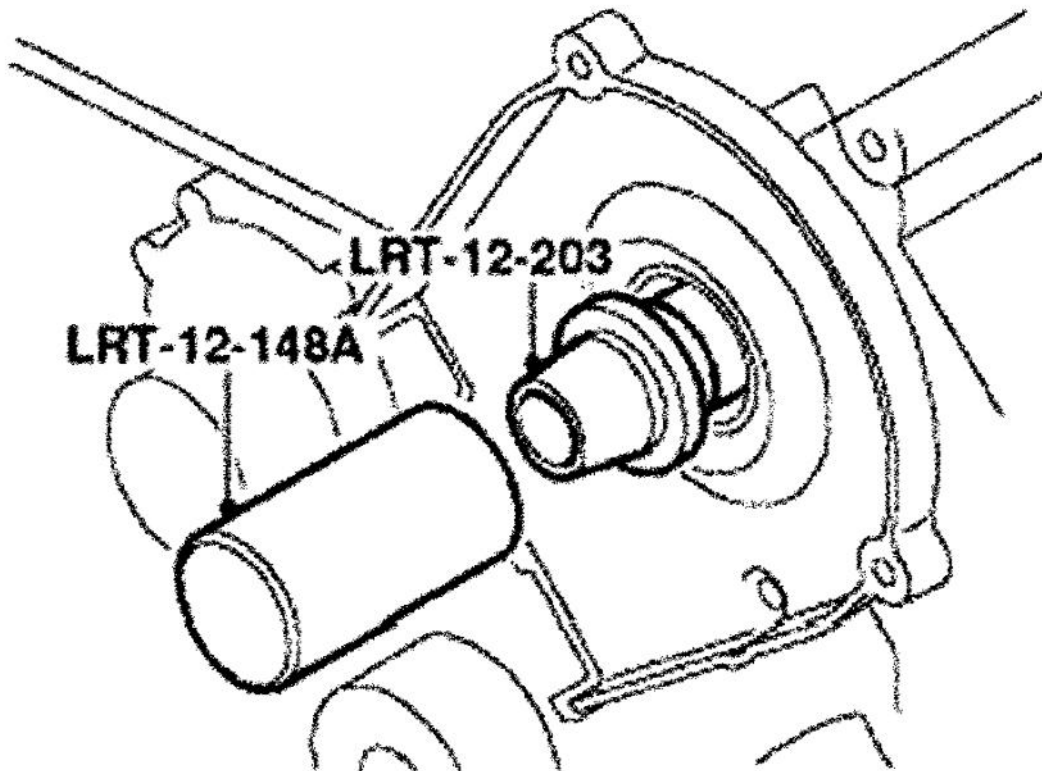
Fig. 13: Removing Inlet Camshaft Front Oil Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean oil seal recess and camshaft.
2. Ensure oil seal protector sleeve LRT-12-203, is clean. Fit sleeve to camshaft. See **Fig. 14**.
3. Position oil seal and using LRT-12-148A, drift seal into position.

CAUTION: Oil seal must be fitted dry. Do not use tool LRT-12-148 for fitting seal.

4. Remove seal protector, LRT-12-203, from end of camshaft.
5. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT**.
6. Top-up engine oil. See **ENGINE OIL AND FILTER - KV6**.



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Fig. 14: Installing Inlet Camshaft Front Oil Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.

CAMSHAFT REAR OIL SEAL**Removal**

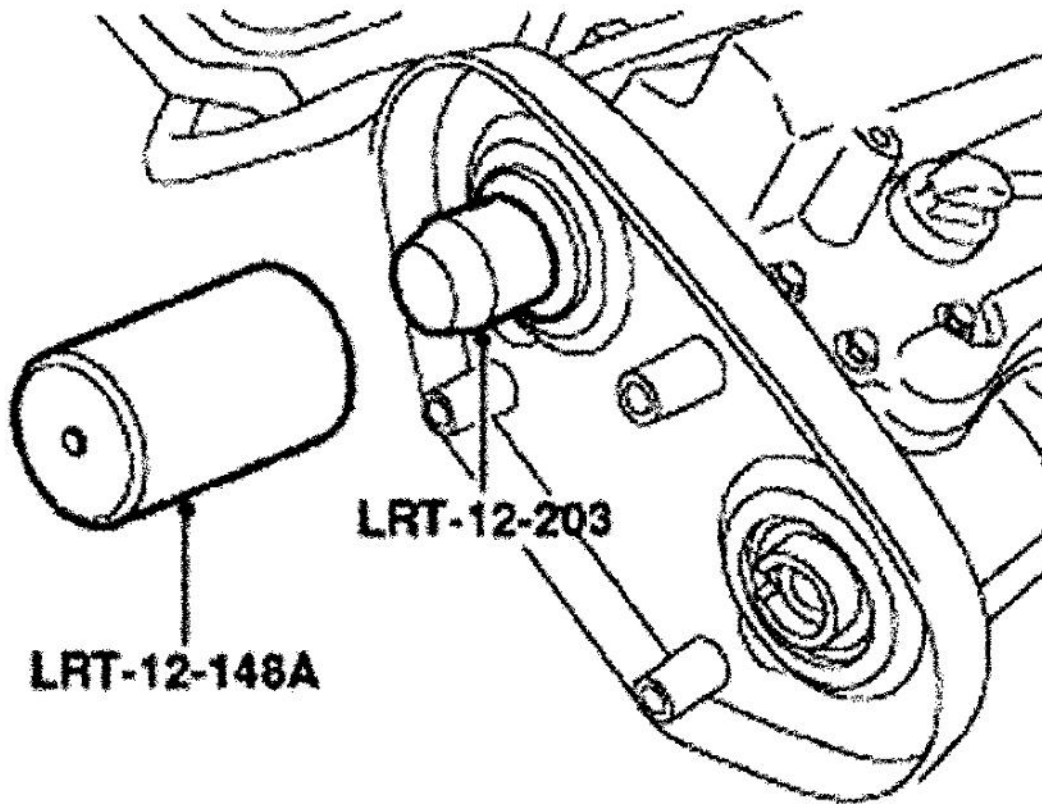
1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Left bank only: Remove left rear camshaft timing belt. See **CAMSHAFT REAR TIMING BELT - LEFT CYLINDER HEAD**.
3. Right bank only: Remove right rear camshaft timing belt. See **CAMSHAFT REAR TIMING BELT - RIGHT CYLINDER HEAD**.
4. Remove camshaft rear oil seal using LRT-12-147 and the center bolt from LRT-12-129. See **Fig. 13**.
5. Remove and discard oil seal from LRT-12-147.

Installation

1. Clean oil seal recess and camshaft.
2. Ensure oil seal protector sleeve LRT-12-203, is clean. Fit sleeve to camshaft. See **Fig. 15**.
3. Position oil seal and using LRT-12-148A, drift seal into position.

CAUTION: Do not use tool LRT-12-148 for fitting seal.

4. Remove seal protector, LRT-12-203, from end of camshaft.
5. Left bank only: Fit left rear camshaft timing belt. See **CAMSHAFT REAR TIMING BELT - LEFT CYLINDER HEAD**.
6. Right bank only: Fit right rear camshaft timing belt. See **CAMSHAFT REAR TIMING BELT - RIGHT CYLINDER HEAD**.
7. Connect battery earth lead. See **DISCONNECT/CONNECT** .
8. Top-up engine oil.



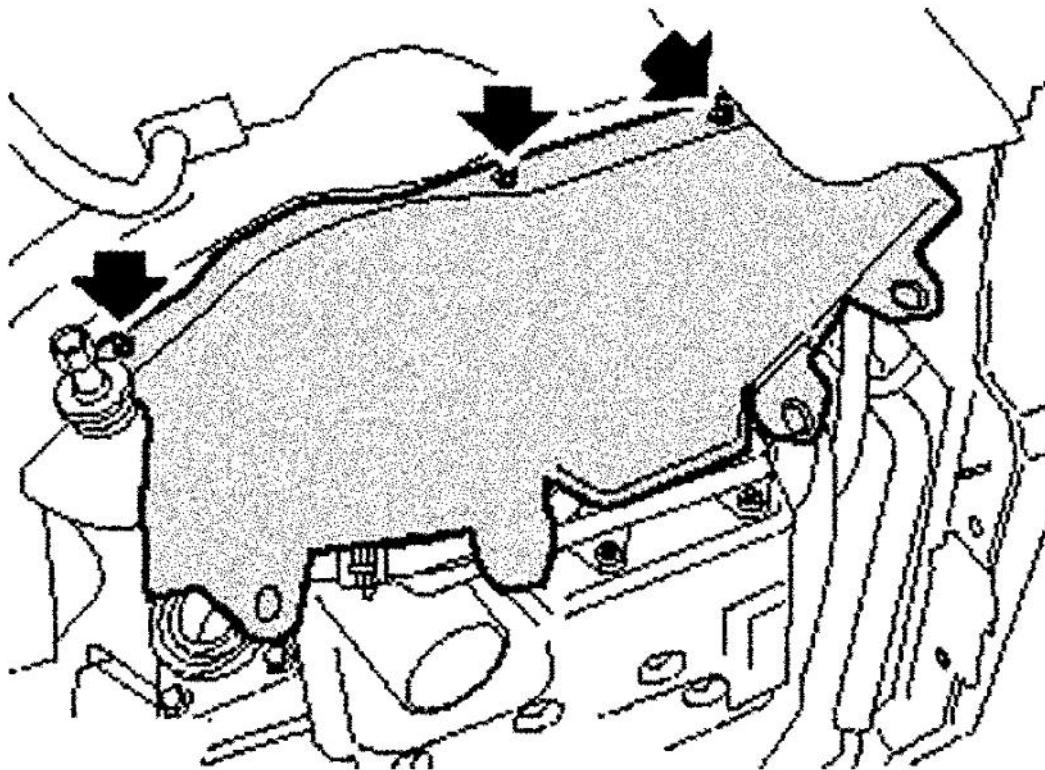
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Fig. 15: Installing Camshaft Rear Oil Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.

PULLEY - CRANKSHAFT

Removal

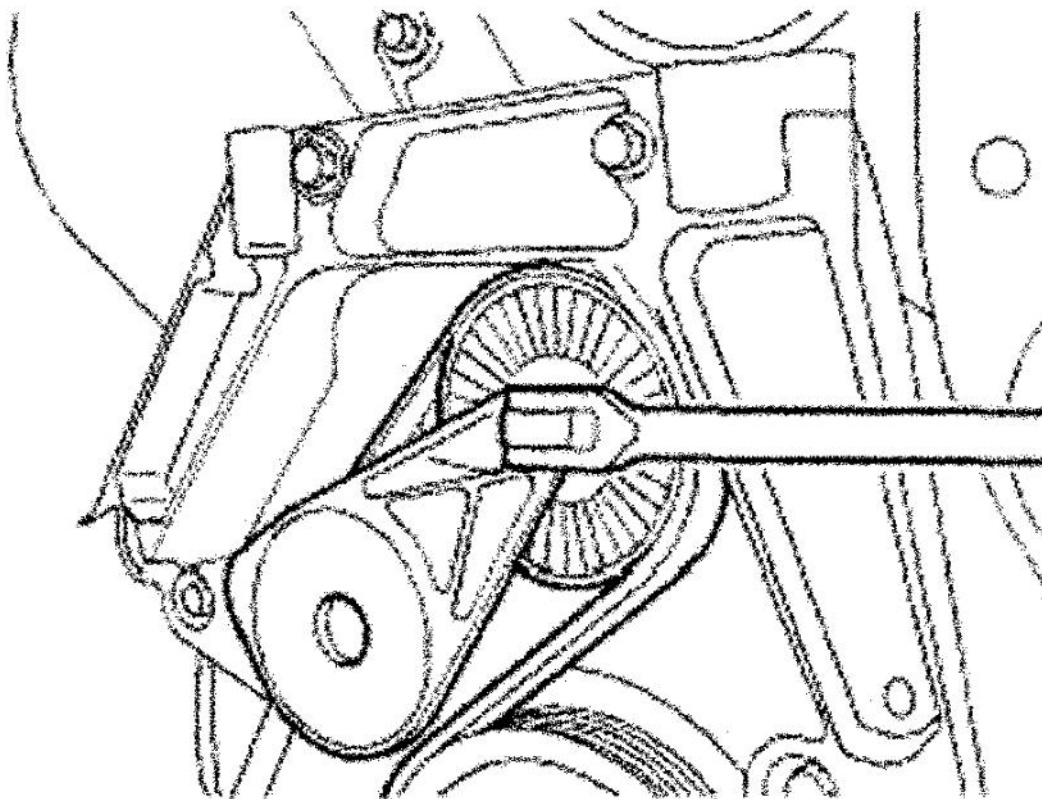
1. Remove underbelly panel. See **76.10.50 PANEL - UNDERBELLY**.
2. Remove right front road wheel.
3. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
4. Using a 3/8 square drive socket bar, raise ancillary drive belt tensioner and release drive belt from crankshaft pulley. See **Fig. 17**.
5. Assemble LRT-12-161 to LRT-12-199 and secure with clamp bolt. See **Fig. 18**.
6. Insert LRT-12-161 with LRT-12-199 into crankshaft pulley, loosen and remove pulley bolt.
7. Remove tools from crankshaft pulley, remove crankshaft pulley.



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Fig. 16: Removing Right Splash Shield

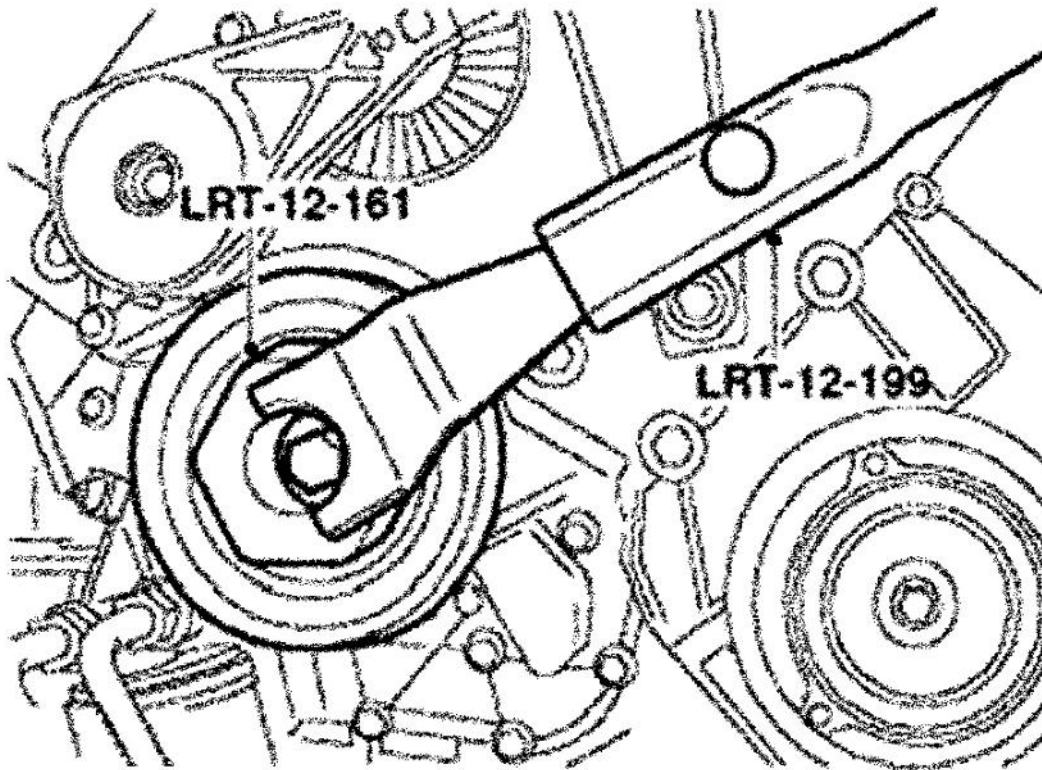
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381895

Fig. 17: Releasing Drive Belt

Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381896

Fig. 18: Assembling LRT-12-161 & LRT-12-199 For Removing Pulley Bolt
Courtesy of LAND ROVER NORTH AMERICA, INC.

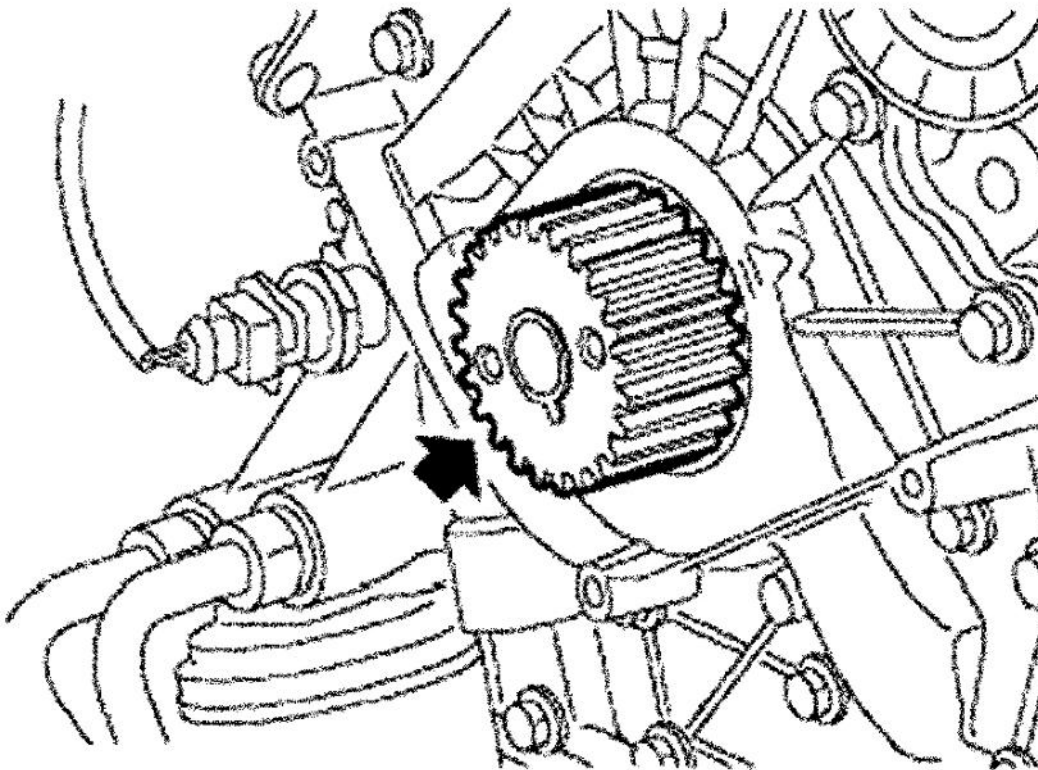
Installation

1. Clean crankshaft pulley and crankshaft gear mating faces.
2. Fit crankshaft pulley to crankshaft gear and ensure that the indent on pulley locates over the lug on crankshaft gear.
3. Fit crankshaft pulley bolt and washer, position LRT-12-161 with LRT-12-199 into crankshaft pulley. Tighten pulley bolt to 160 Nm (118 ft. lbs.).
4. Remove tools from crankshaft pulley.
5. Ensure drive belt is located on ancillary pulleys, raise belt tensioner and fit drive belt to crankshaft pulley.
6. Fit splash shield and secure with bolts.
7. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.)
8. Fit underbelly panel. See **76.10.50 PANEL - UNDERBELLY** .

CRANKSHAFT FRONT OIL SEAL

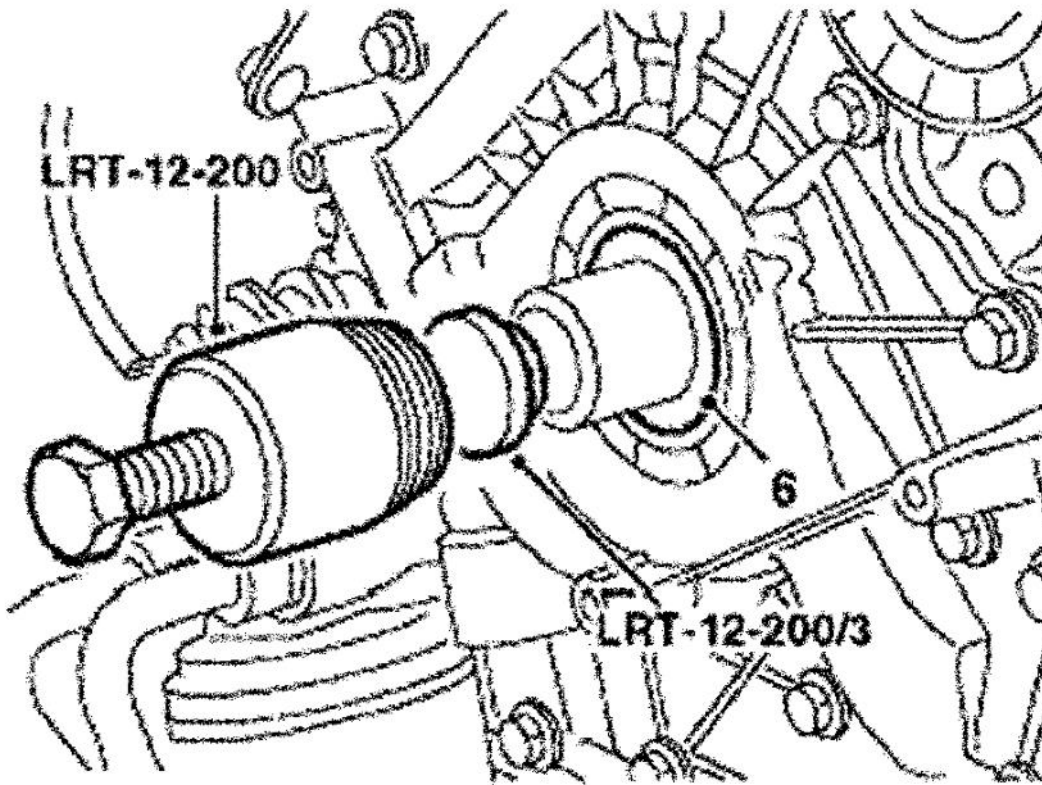
Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Remove camshaft timing belt. See **CAMSHAFT TIMING BELT**.
3. Remove crankshaft gear. See **Fig. 19**.
4. Fit thrust button, LRT-12-200/3 to end of crankshaft. See **Fig. 20**.
5. Screw LRT-12-200 into crankshaft front oil seal.
6. Tighten center bolt of LRT-12-200 to remove oil seal.
7. Remove and discard oil seal from special tool.
8. Remove thrust button from crankshaft.



G00381956

Fig. 19: Removing Crankshaft Gear
Courtesy of LAND ROVER NORTH AMERICA, INC.

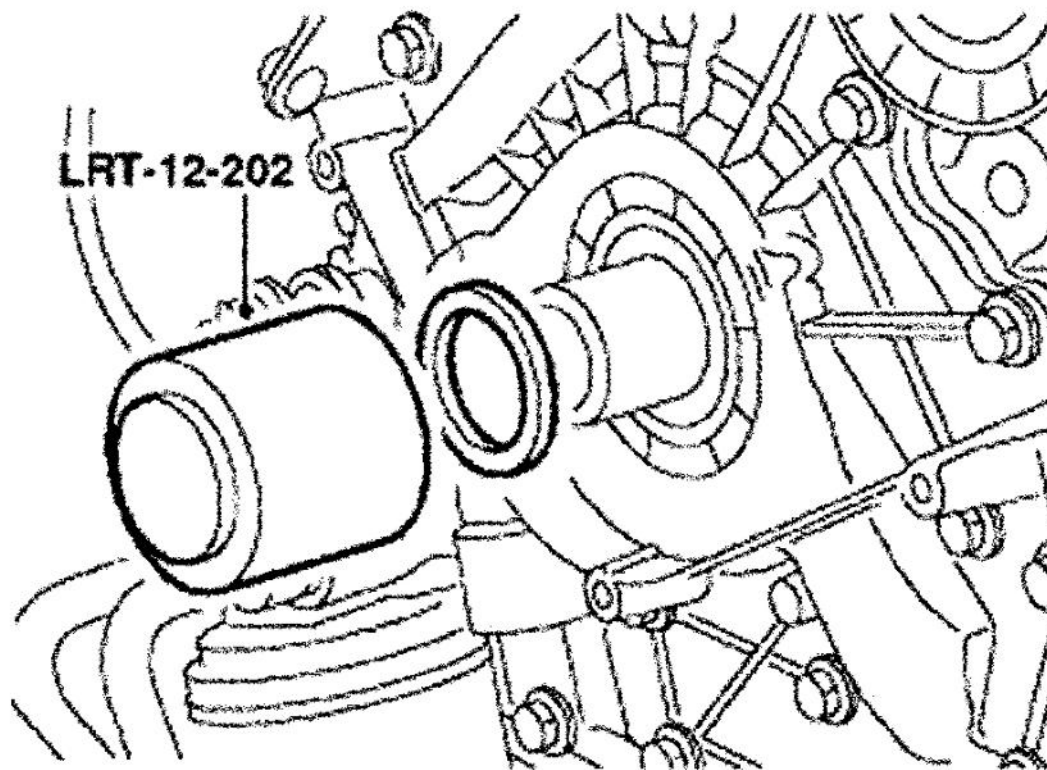


G00381957

Fig. 20: Removing Crankshaft Front Oil Seal With Special Tools
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean oil seal recess in oil pump and running surface on crankshaft, ensure bolt holes are clean and dry.
2. Fit oil seal guide, from seal kit, over end of crankshaft. See **Fig. 21**.
3. Position new seal on crankshaft up against oil pump housing. Drift seal into place using tool LRT-12-202.
4. Remove LRT-12-202 and oil seal guide from crankshaft.
5. Fit gear to crankshaft.
6. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT**.
7. Connect battery earth lead. See **DISCONNECT/CONNECT**.
8. Top-up engine oil. See **ENGINE OIL AND FILTER - KV6**.



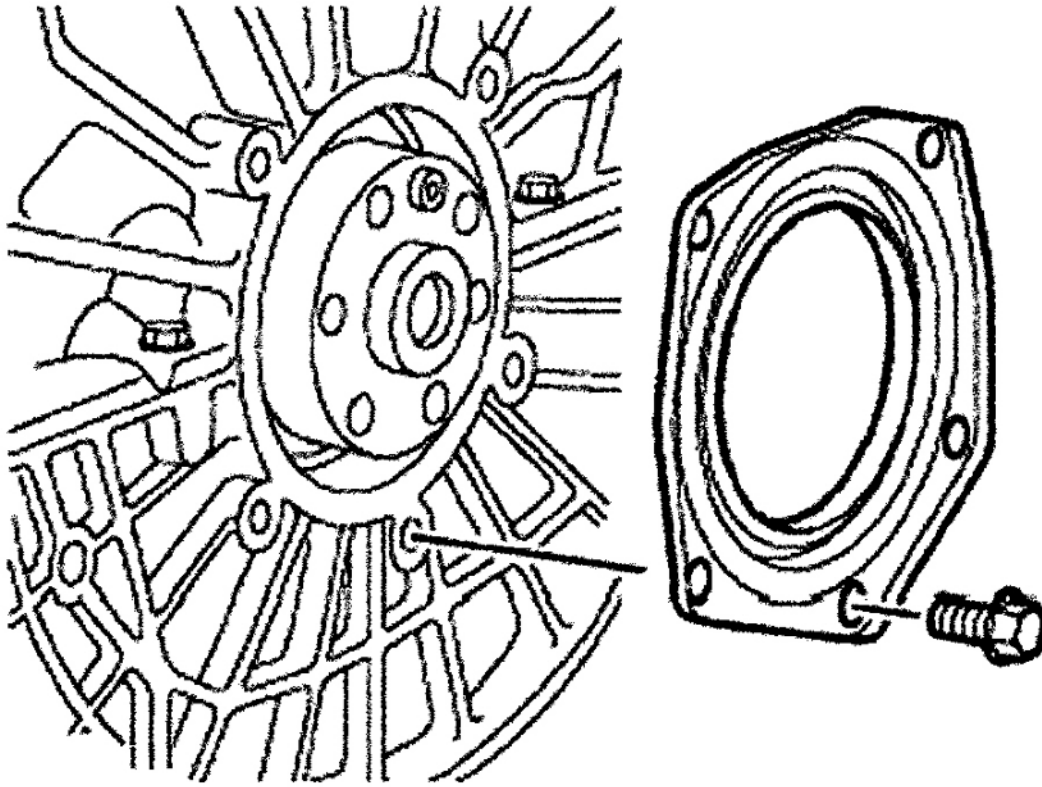
G00381958

Fig. 21: Installing Crankshaft Front Oil Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.

CRANKSHAFT REAR OIL SEAL

Removal

1. Remove torque converter drive plate. See **TORQUE CONVERTER OIL SEAL** .
2. Remove and discard 5 bolts securing crankshaft rear oil seal to cylinder block. See **Fig. 22**.
3. Remove and discard crankshaft rear oil seal.



G00381952

Fig. 22: Removing Crankshaft Rear Oil Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean cylinder block face and oil seal running surface on crankshaft; ensure bolt holes are clean and dry.
2. Position oil seal protector, LRT-12-061 to crankshaft.
3. Position oil seal to crankshaft.

CAUTION: Oil seal must be fitted dry.

4. Fit new Patchlok bolts securing oil seal to cylinder block and using sequence shown, tighten to 8 Nm (6 ft. lbs.).
5. Remove oil seal protector.
6. Fit torque converter drive plate. See **TORQUE CONVERTER OIL SEAL** .
7. Check engine oil level, top-up if necessary. See **ENGINE OIL AND FILTER - KV6** .

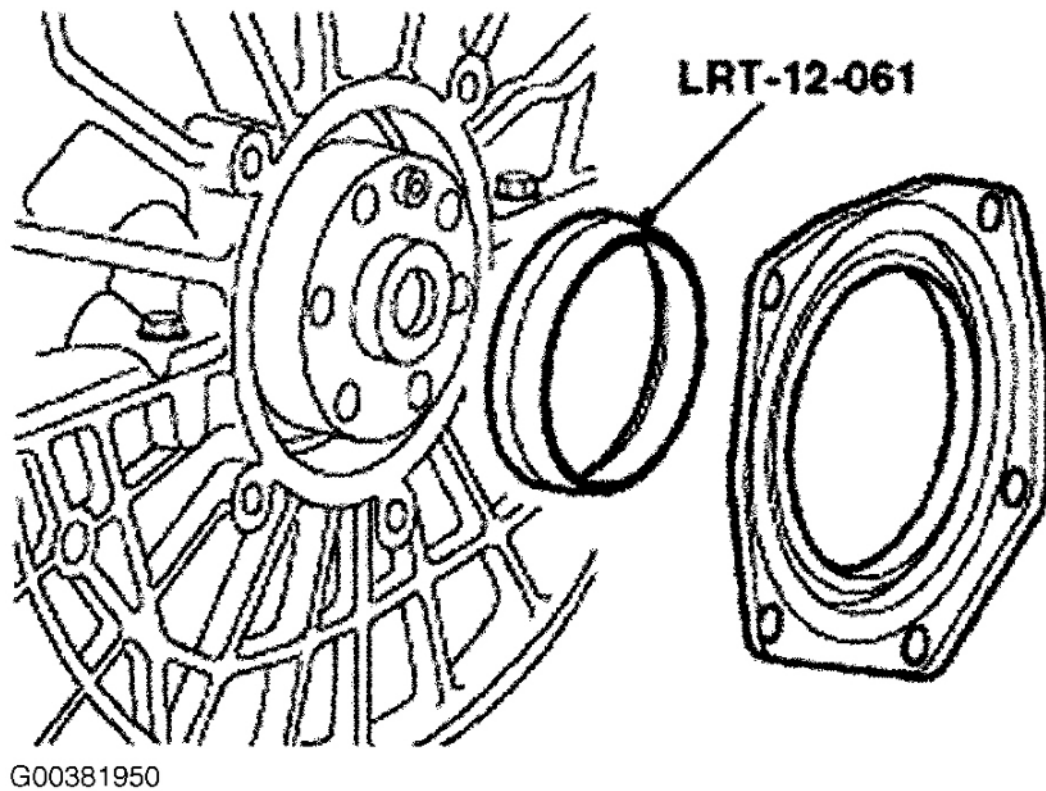
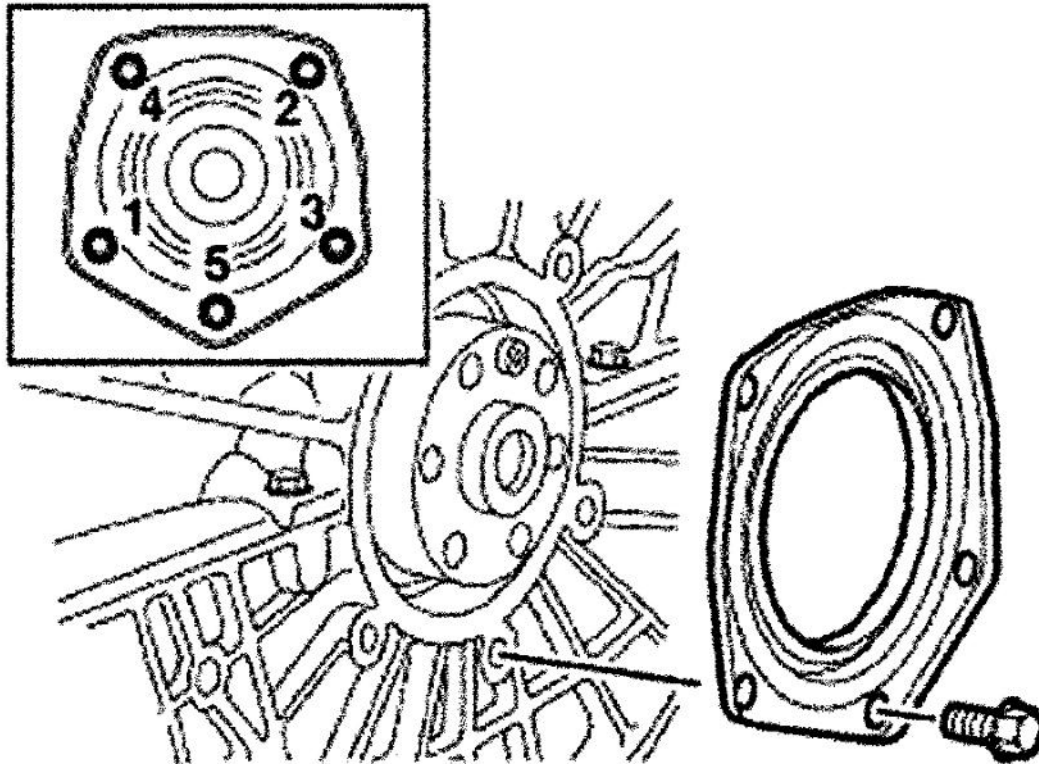


Fig. 23: Identifying Oil Seal Protector (LRT-12-061)
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381951

Fig. 24: Installing Patchlok Bolts Oil Seal To Cylinder In Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.

CYLINDER HEAD GASKET - LEFT

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Drain cooling system. See **DRAINING & REFILLING COOLING SYSTEM** .
3. Remove inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY** .
4. Remove left exhaust manifold gasket. See **30.15.17 GASKET -- EXHAUST MANIFOLD -- LH -- NON NAS** .
5. Remove camshaft timing belt. See **CAMSHAFT TIMING BELT**.
6. Remove 4 bolts securing left front camshaft timing belt cover backplate to cylinder head; remove backplate. See **Fig. 2**.
7. Remove left camshaft cover gasket. See **CAMSHAFT COVER GASKET - LEFT- UP TO MODEL YEAR 2003**.
8. Remove 3 nuts and 3 bolts securing ignition coils to left inlet manifold and release coil earth lead, if

fitted. See **Fig. 25**.

9. Remove ignition coils and position aside, if fitted.
10. Release clip and disconnect coolant bleed hose from inlet manifold and move hose aside. See **Fig. 26**.
11. Depress locking collar and release breather hose from left inlet manifold. See **Fig. 27**.
12. Disconnect clips securing right injector harness to injector protection cover - if fitted or from bosses on fuel rail. See **Fig. 28**.
13. Remove 2 bolts securing protection cover - if fitted and fuel rail to right inlet manifold, remove cover. See **Fig. 29**.
14. Remove 2 bolts securing fuel rail to left inlet manifold. See **Fig. 30**.
15. Release injectors from manifolds and carefully lay fuel rail and injectors aside.

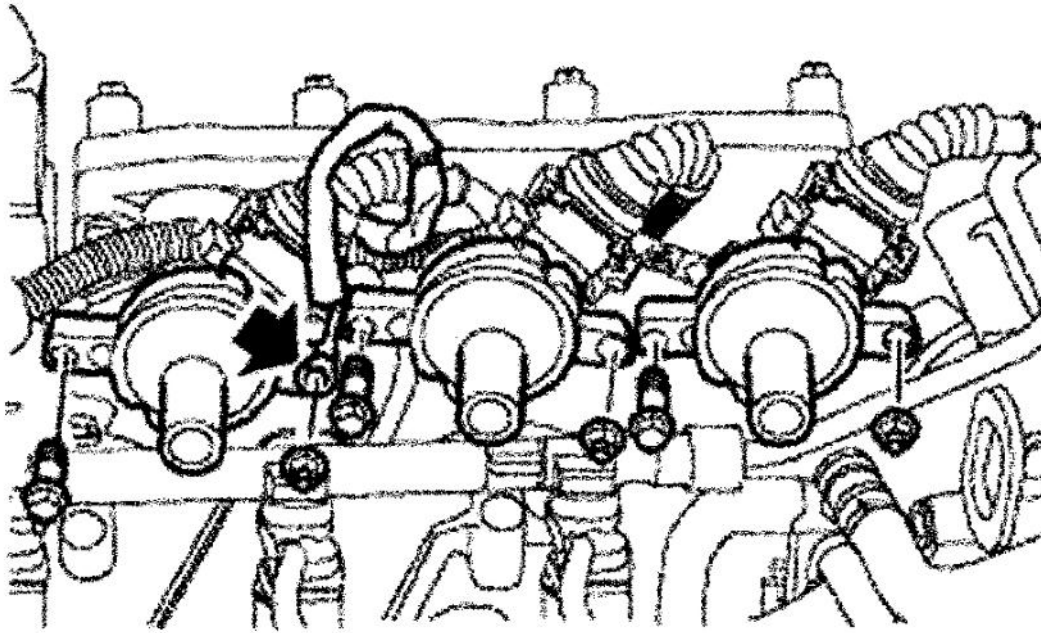
CAUTION: Always fit plugs to open connections to prevent contamination.

16. Using sequence shown, progressively loosen and remove 8 cylinder head bolts. See **Fig. 31**.
17. With assistance, remove cylinder head assembly.

CAUTION: Support both ends of cylinder head on blocks of wood.

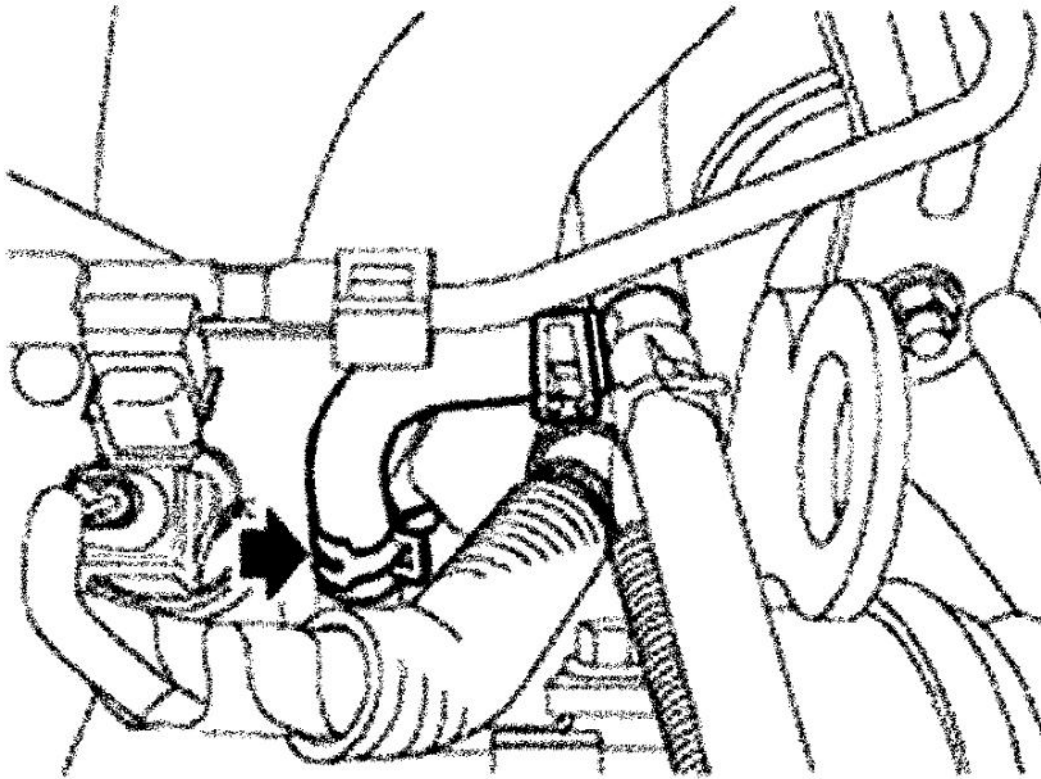
18. Remove and discard cylinder head gasket. Do not rotate crankshaft while right cylinder head is fitted.
19. Fit cylinder liner clamps LRT-12-144 and secure with cylinder head bolts. See **Fig. 32**.

CAUTION: Ensure that feet of clamps do not protrude over bores.



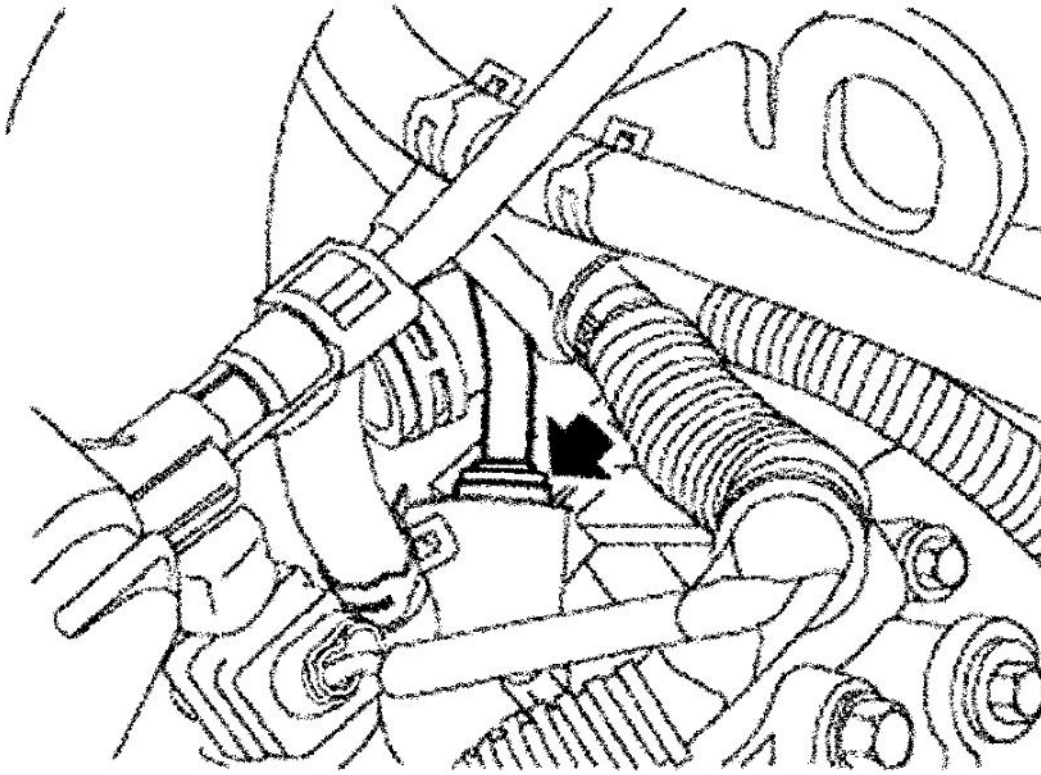
G00381897

Fig. 25: Removing Ignition Coils To Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



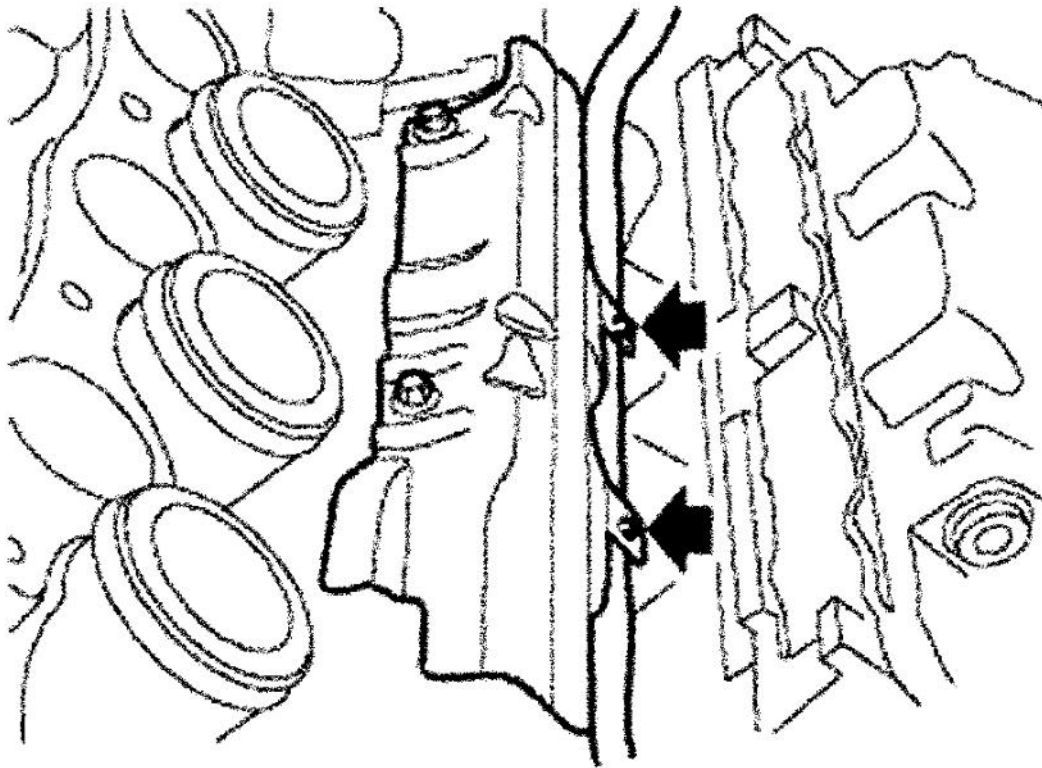
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Fig. 26: Disconnecting Coolant Bleed Hose From Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



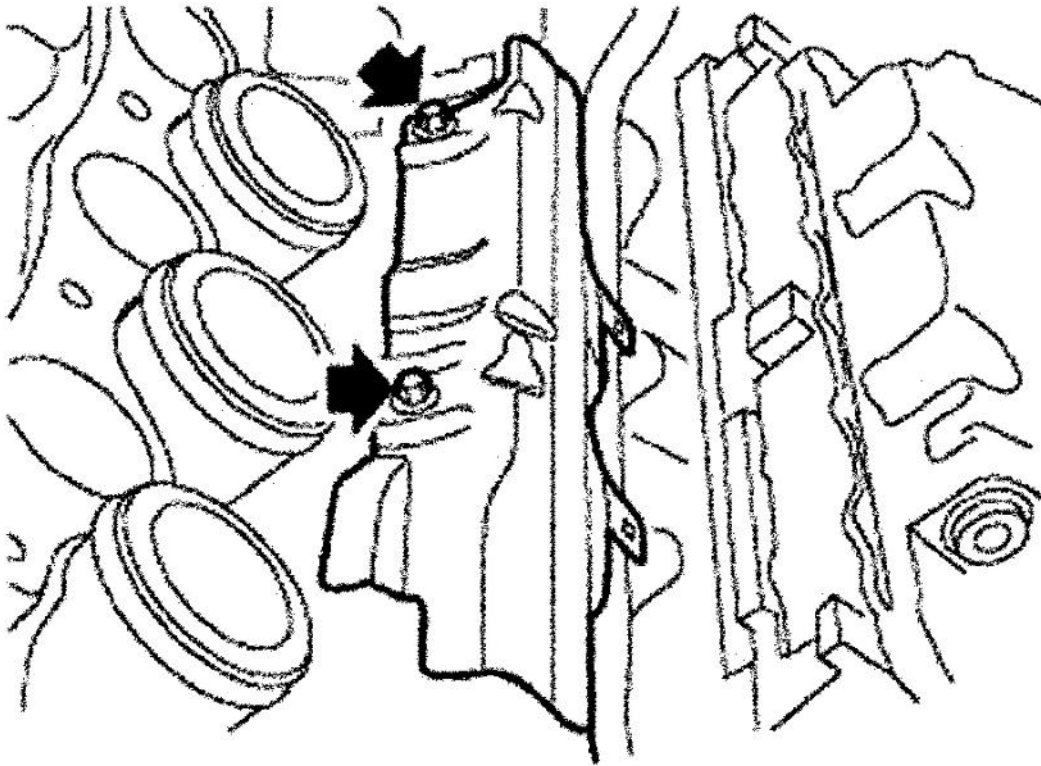
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Fig. 27: Releasing Breather Hose From Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



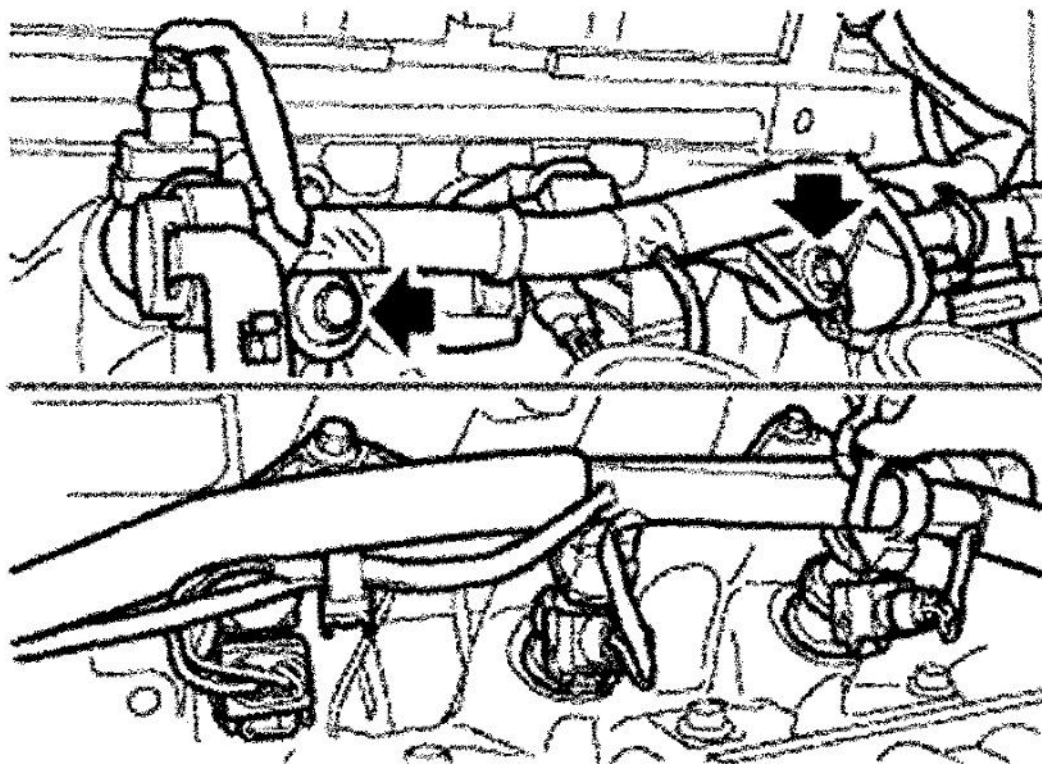
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Fig. 28: Disconnecting Right Injector Harness Clips To Injector Protection Cover (If Fitted)
Courtesy of LAND ROVER NORTH AMERICA, INC.



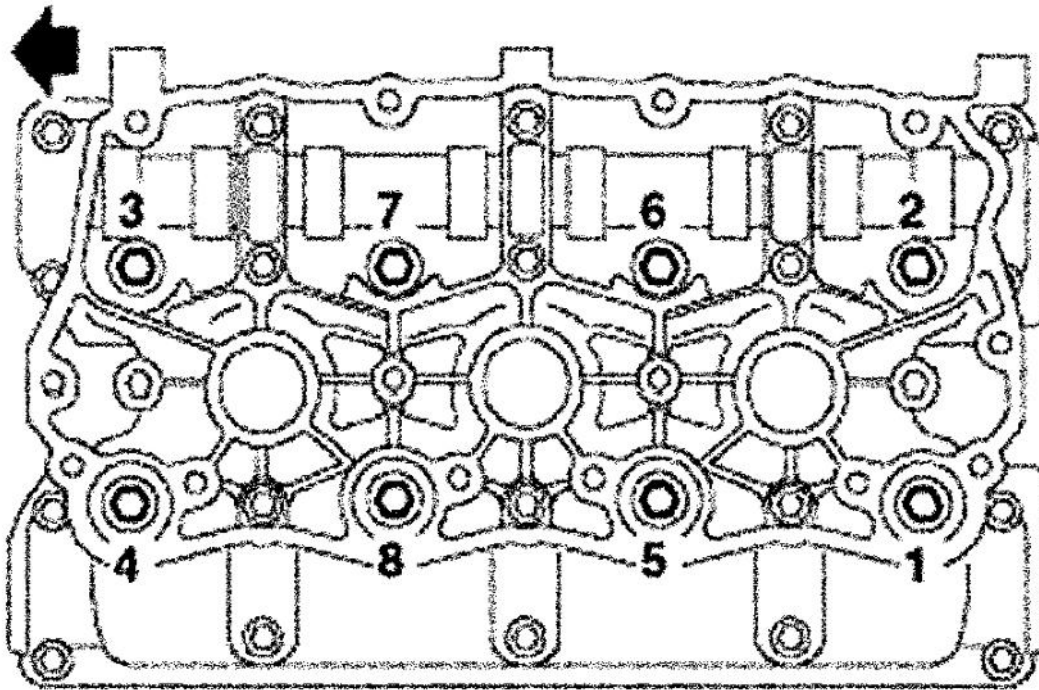
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Fig. 29: Removing Fuel Rail To Right Inlet Manifold Protection Cover (If Fitted)
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381902

Fig. 30: Removing Fuel Rail Bolts To Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381903

Fig. 31: Removing Cylinder Head (Left) Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

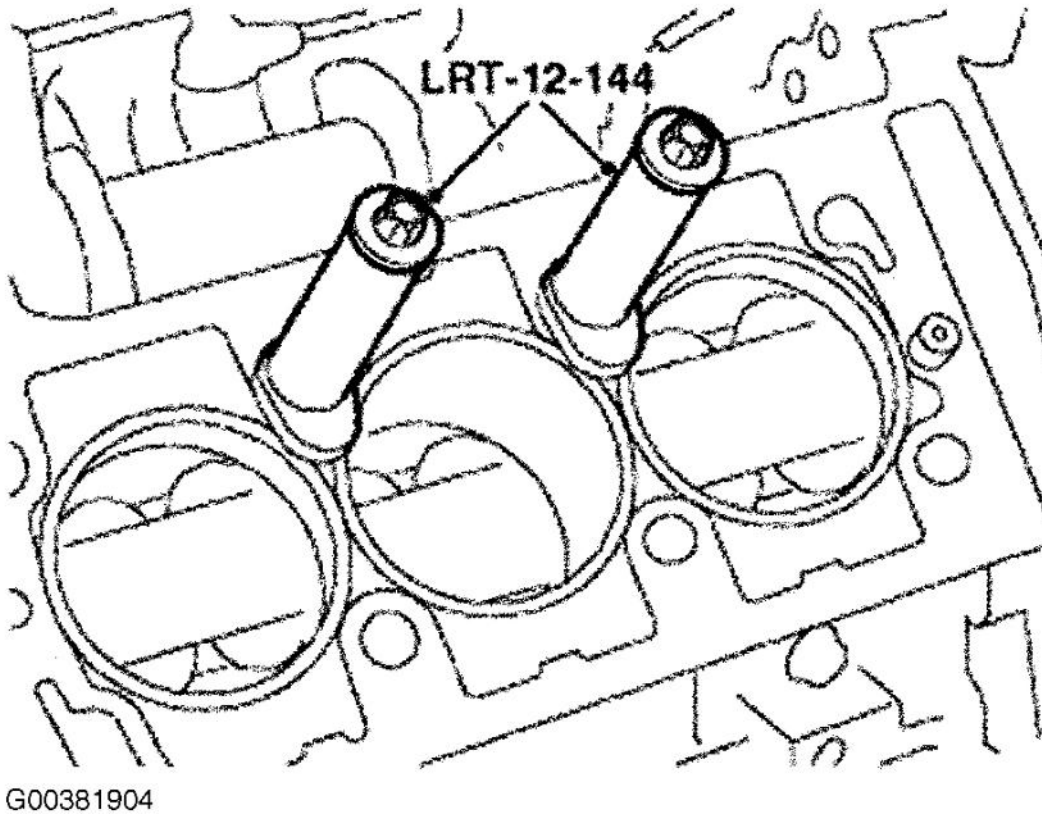


Fig. 32: Installing Or Removing Cylinder Liner Clamps LRT-12-144 With Cylinder Head Bolts
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean cylinder head mating face.

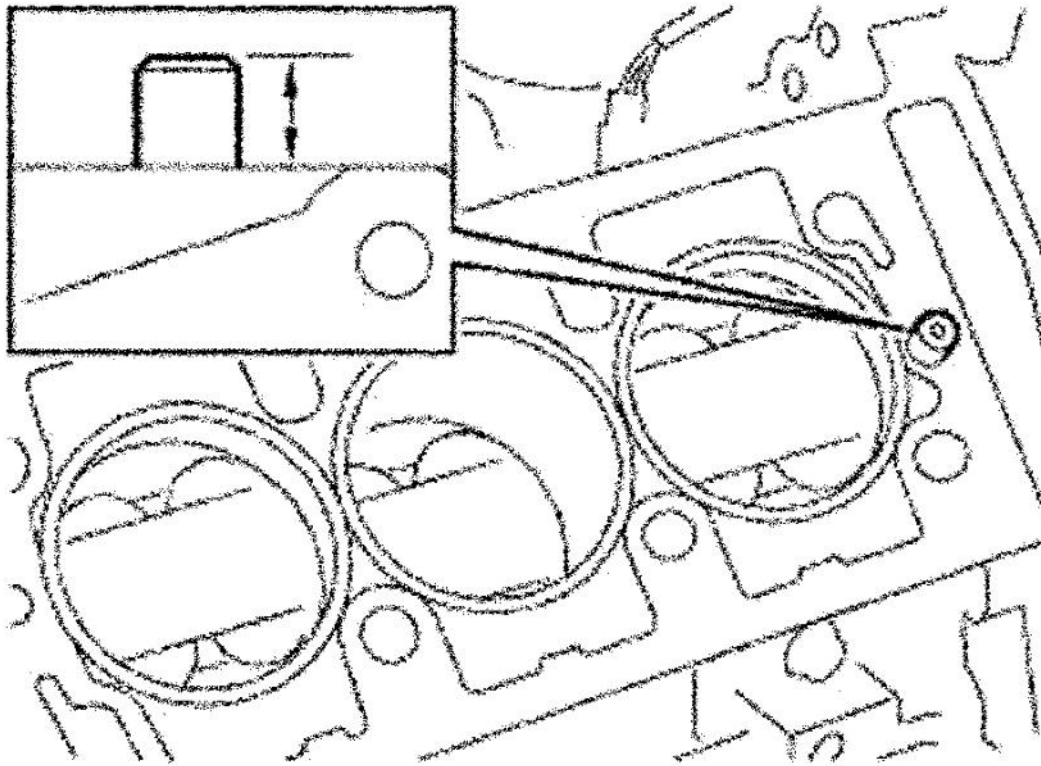
CAUTION: Use suitable gasket removal spray and a plastic scraper.

2. Remove bolts securing cylinder liner clamps LRT-12-144 to cylinder block and remove clamps. See **Fig. 38**.

CAUTION: Do not rotate crankshaft.

3. Clean cylinder block face and dowel holes.
4. Clean cylinder head bolts and wipe dry.

5. Lightly lubricate threads and beneath heads of cylinder head bolts with clean engine oil.
6. Check that fitted height of dowels is between 10 to 11 mm (0.40 to 0.43 in) above cylinder block top face. Replace dowels if fitted height is incorrect. See **Fig. 33**.
7. Fit new cylinder head gasket onto cylinder block with the word "TOP" uppermost.
8. With assistance, fit cylinder head and carefully position left inlet to right inlet manifold.
9. Carefully enter cylinder head bolts, DO NOT DROP. Screw bolts into place by hand.
10. Tighten cylinder head bolts progressively in the sequence shown. See **Fig. 250**:
 - Stage 1 - 25 Nm (18 ft. lbs.)
 - Stage 2 - Tighten in the same sequence to 25 Nm (18 ft. lbs.)
 - Stage 3 - Tighten in the same sequence to 25 Nm (18 ft. lbs.)
 - Stage 4 - Using an angle torque gauge, tighten bolts in the same sequence a further 180°
11. Fit left camshaft cover gasket. See **CAMSHAFT COVER GASKET - LEFT- FROM MODEL YEAR 2003.**
12. Remove and discard "O" rings from injectors.
13. Clean injectors and injector locations in fuel rail.
14. Lubricate new "O" rings with castor oil and fit to injectors.
15. Position fuel rail assembly and secure injectors to inlet manifolds.
16. Position injector protection cover - if fitted to right fuel rail and secure injector harness to protection cover or fuel rail with clips
17. Fit bolts securing fuel rail to inlet manifolds and tighten to 9 Nm (7 ft. lbs.).
18. Position CMP sensor bracket, fit and tighten bolt to 9 Nm (7 ft. lbs.).
19. Connect CMP sensor multiplug and secure to bracket.
20. Connect breather hose to left inlet manifold.
21. Connect coolant bleed hose to inlet manifold and secure with clip.
22. Position ignition coils to left inlet manifold.
23. Position earth lead, fit nuts and bolts securing ignition coils to left inlet manifold and tighten to 9 Nm (7 ft. lbs.).
24. Position the lead guide bracket, fit and tighten special bolt.
25. Connect the leads to spark plugs and secure the leads in guide clips.
26. Clean camshaft timing belt cover backplate bolts and apply sealant, Part No. STC 50552 to the first 3 threads.
27. Position backplate, fit and tighten bolts to 9 Nm.
28. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT.**
29. Fit left exhaust manifold gasket. See **30.15.17 GASKET -- EXHAUST MANIFOLD -- LH -- NON NAS .**
30. Fit inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY .**
31. Fill cooling system. See **DRAINING & REFILLING COOLING SYSTEM .**
32. Check engine oil level and top-up if necessary. See **ENGINE OIL AND FILTER - KV6 .**



G00381905

Fig. 33: Checking Dowel Height
 Courtesy of LAND ROVER NORTH AMERICA, INC.

CYLINDER HEAD GASKET - RIGHT

Removal

1. Disconnect battery earth lead. See DISCONNECT/CONNECT .
2. Drain cooling system. See DRAINING & REFILLING COOLING SYSTEM .
3. Remove inlet manifold chamber. See 30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY .
4. Remove right exhaust manifold gasket. See 30.15.16 GASKET -- EXHAUST MANIFOLD -- RH -- NON NAS .
5. Remove camshaft timing belt. See CAMSHAFT TIMING BELT.
6. Remove 4 bolts securing right front timing belt cover backplate to cylinder head and remove backplate. See Fig. 34.
7. Depress locking collar and release breather hose from right inlet manifold. See Fig. 35.
8. Remove right camshaft cover gasket. See CAMSHAFT COVER GASKET - RIGHT.

9. Release clip and disconnect coolant bleed hose from right inlet manifold, position hose aside. See **Fig. 36**.
10. Release injector harness clips from injector protection cover - if fitted or from bosses on fuel rail. See **Fig. 28**.
11. Remove 2 bolts securing protection cover - if fitted and right fuel rail to right inlet manifold, remove cover. See **Fig. 29**.
12. Remove 2 bolts securing fuel rail to left inlet manifold. See **Fig. 30**.
13. Release injectors from manifolds and carefully lay fuel rail and injectors aside.

CAUTION: Always fit plugs to open connections to prevent contamination.

14. Using sequence shown, progressively loosen and remove 8 cylinder head bolts. See **Fig. 37**.
15. With assistance, remove cylinder head assembly.

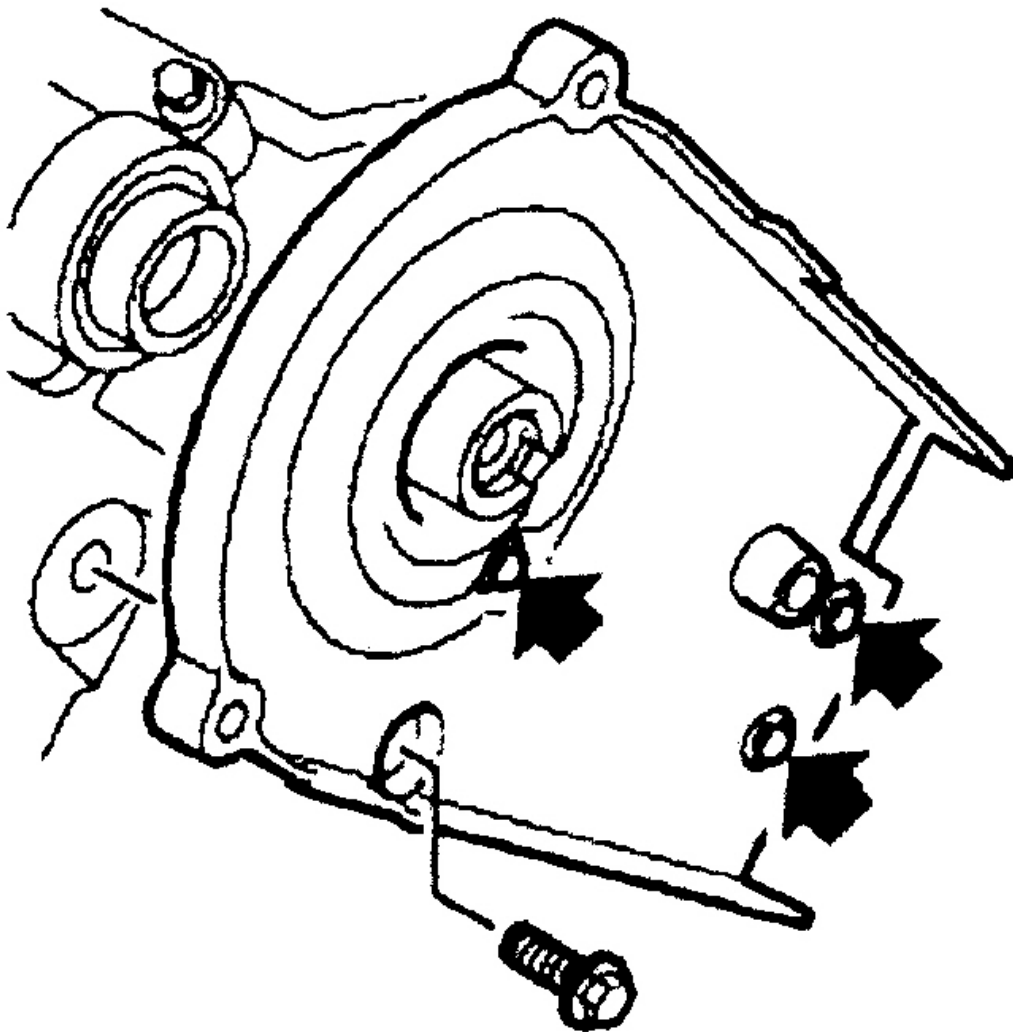
CAUTION: Support both ends of cylinder head on blocks of wood.

16. Remove and discard cylinder head gasket.

CAUTION: Do not rotate crankshaft while left cylinder head is fitted.

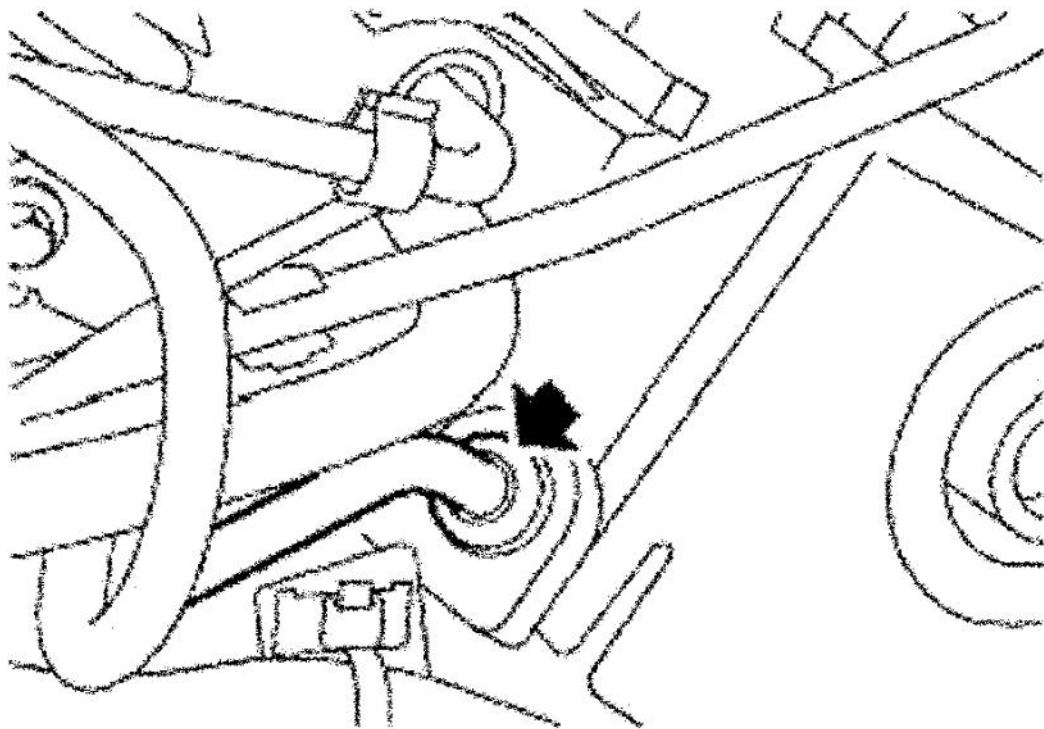
17. Fit cylinder liner clamps LRT-12-144 and secure with cylinder head bolts. See **Fig. 38**.

CAUTION: Ensure that feet of clamps do not protrude over bores.



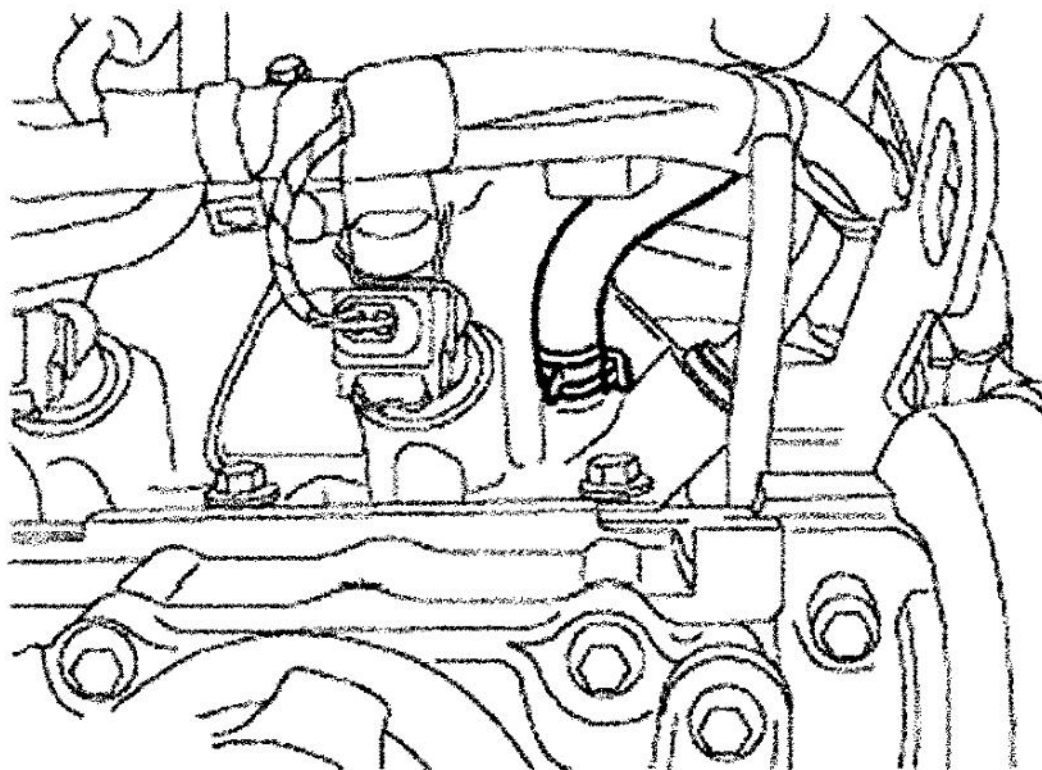
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Fig. 34: Removing Right Front Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



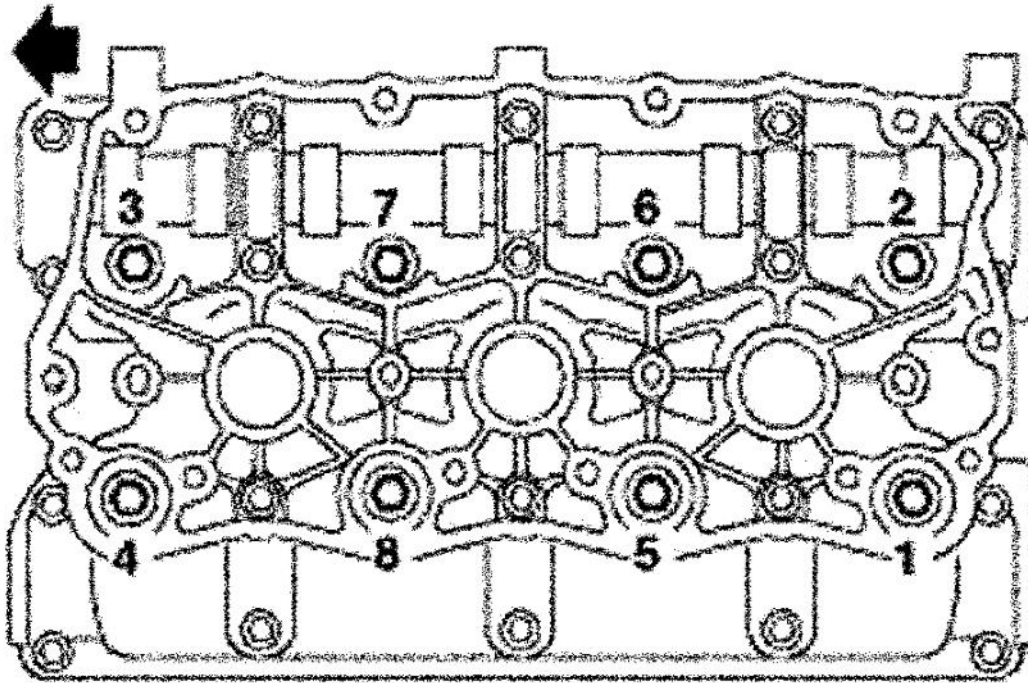
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Fig. 35: Releasing Breather From Right Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381908

Fig. 36: Disconnecting Coolant Bleed Hose From Right Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381909

Fig. 37: Removing Cylinder Head (Right) Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

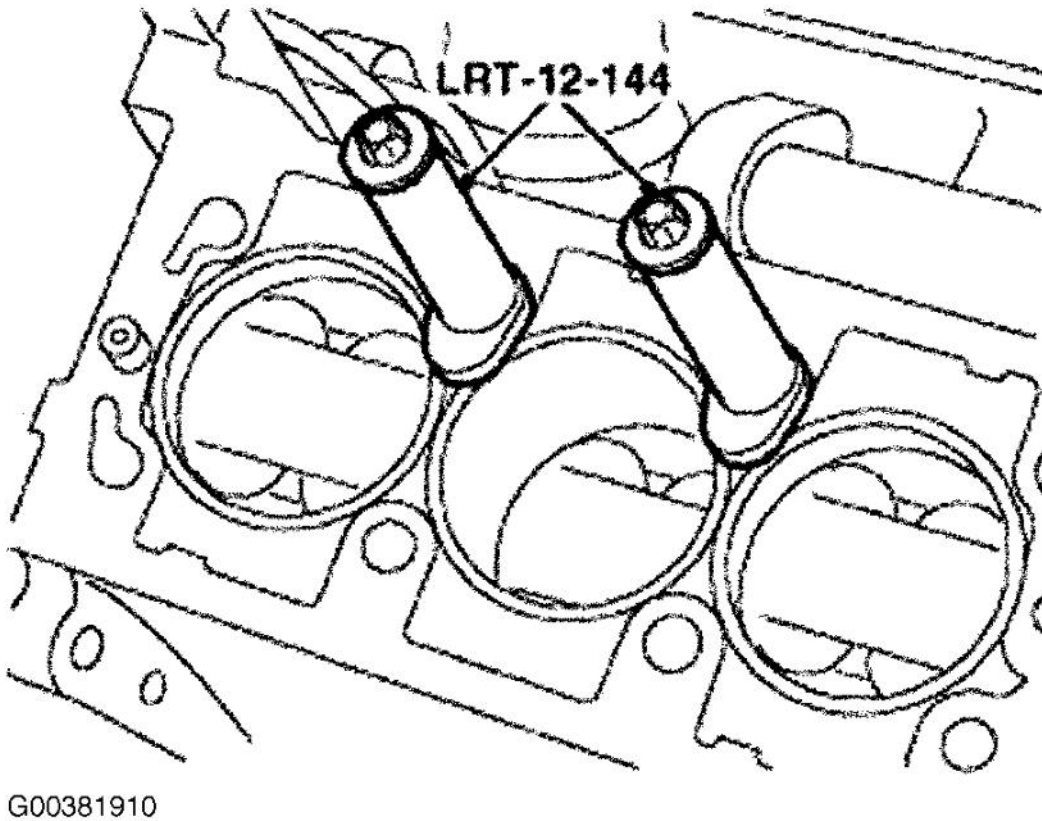


Fig. 38: Removing & Installing Cylinder Liner Clamps With Bolts (Right)
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean cylinder head mating face.

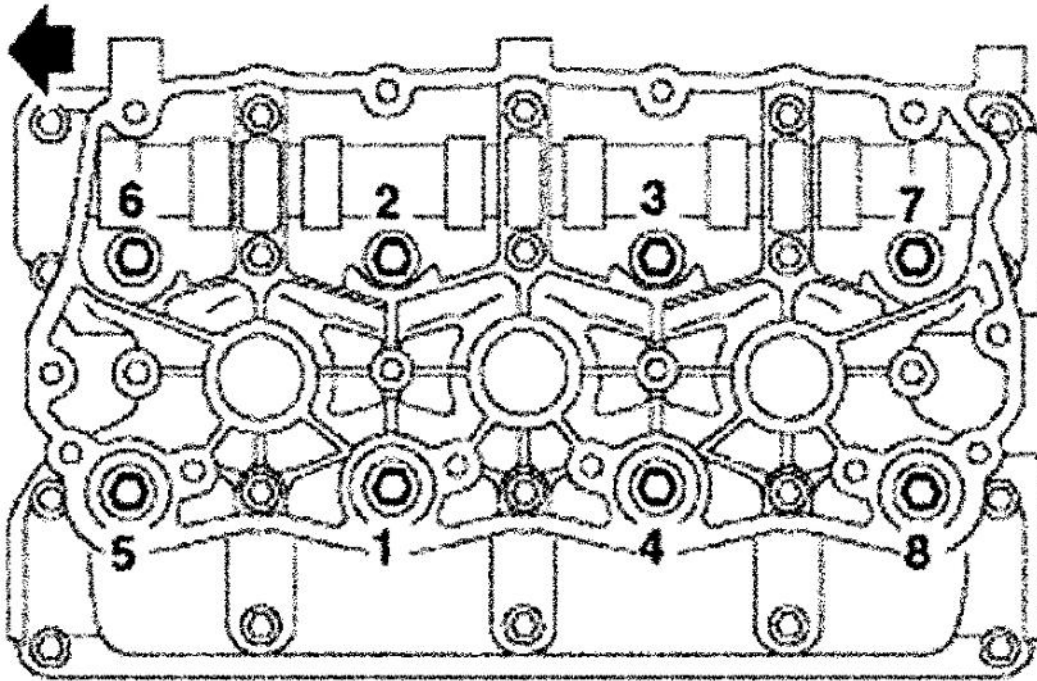
CAUTION: Use suitable gasket removal spray and a plastic scraper.

2. Remove bolts securing cylinder liner clamps LRT-12-144 to cylinder block and remove clamps. See **Fig. 32.**

CAUTION: Do not rotate crankshaft.

3. Clean cylinder block mating face and dowel holes.
4. Clean cylinder head bolts and wipe dry.

5. Lightly lubricate threads and beneath heads of cylinder head bolts with clean engine oil.
6. Check that fitted height of dowels is between 10 to 11 mm (0.40 to 0.43 in) above cylinder block top face. Replace dowels if fitted height is incorrect. See **Fig. 33**.
7. Fit new cylinder head gasket onto cylinder block with the word "TOP" uppermost.
8. With assistance, fit cylinder head and carefully position right inlet to left inlet manifold.
9. Carefully enter cylinder head bolts, DO NOT DROP. Screw bolts into place by hand.
10. Tighten cylinder head bolts progressively in the sequence illustrated. See **Fig. 39**:
 - Stage 1 - 25 Nm (18 ft. lbs.)
 - Stage 2 - Tighten in the same sequence to 25 Nm (18 ft. lbs.)
 - Stage 3 - Tighten in the same sequence to 25 Nm (18 ft. lbs.)
 - Stage 4 - Using an angle torque gauge, tighten bolts in the same sequence a further 180°.
11. Fit right camshaft cover gasket. See **CAMSHAFT COVER GASKET - RIGHT**.
12. Remove and discard lower "O" rings from injectors.
13. Clean injectors and injector locations in fuel rail.
14. Lubricate new "O" rings with castor oil and fit to injectors.
15. Position fuel rail assembly and secure injectors to inlet manifolds.
16. Position injector protection cover - if fitted to right fuel rail; secure injector harness to protection cover or fuel rail with clips.
17. Fit bolts securing fuel rail to inlet manifolds and tighten to 9 Nm (7 ft. lbs.).
18. Connect coolant bleed hose to inlet manifold and secure with clip.
19. Connect breather hoses to right camshaft cover and inlet manifold.
20. Position ignition coils to left inlet manifold.
21. Position earth lead, fit nuts and bolts securing ignition coils to left inlet manifold and tighten to 9 Nm (7 ft. lbs.).
22. Connect multiplugs to plug top coils and secure with locking clips.
23. Clean camshaft timing belt cover backplate bolts and apply sealant, Part No. STC 50552 to the first 3 threads.
24. Position backplate, fit and tighten bolts to 9 Nm (7 ft. lbs.).
25. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT**.
26. Fit right exhaust manifold gasket. See **30.15.16 GASKET -- EXHAUST MANIFOLD -- RH -- NON NAS**.
27. Fit inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY**.
28. Fill cooling system. See **DRAINING & REFILLING COOLING SYSTEM**.
29. Check engine oil level and top-up if necessary. See **ENGINE OIL AND FILTER - KV6**.



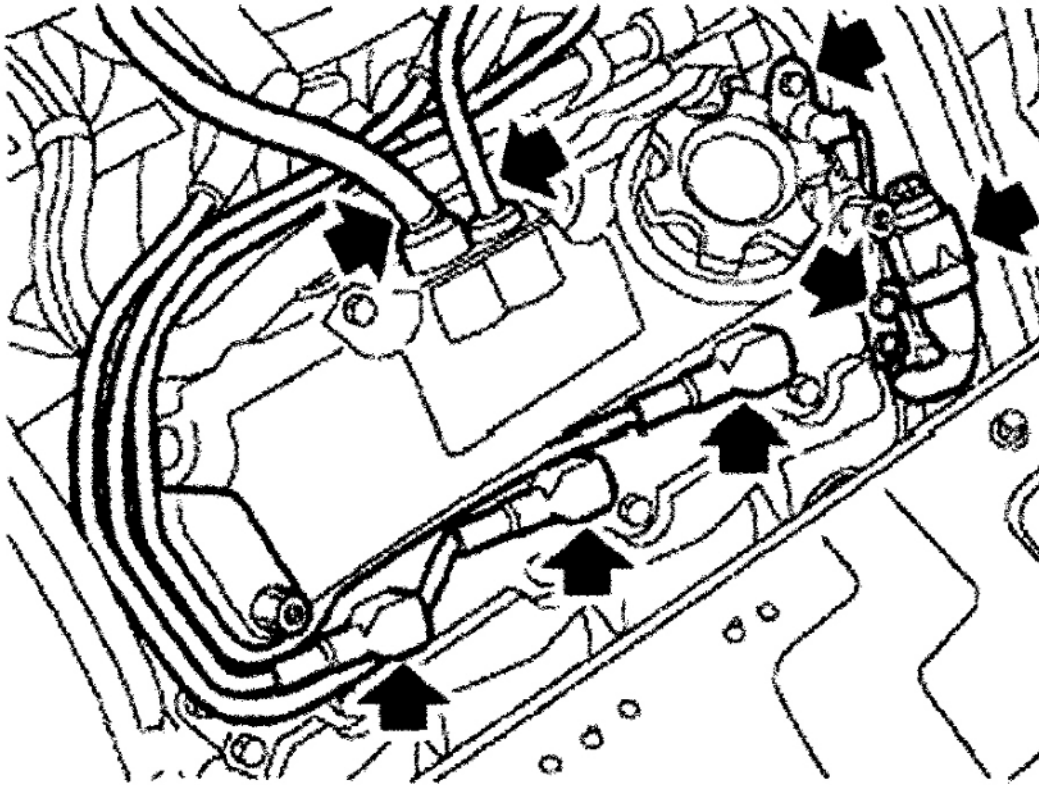
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Fig. 39: Tightening Sequence For Cylinder Head Gasket
 Courtesy of LAND ROVER NORTH AMERICA, INC.

CAMSHAFT COVER GASKET - LEFT- UP TO MODEL YEAR 2003

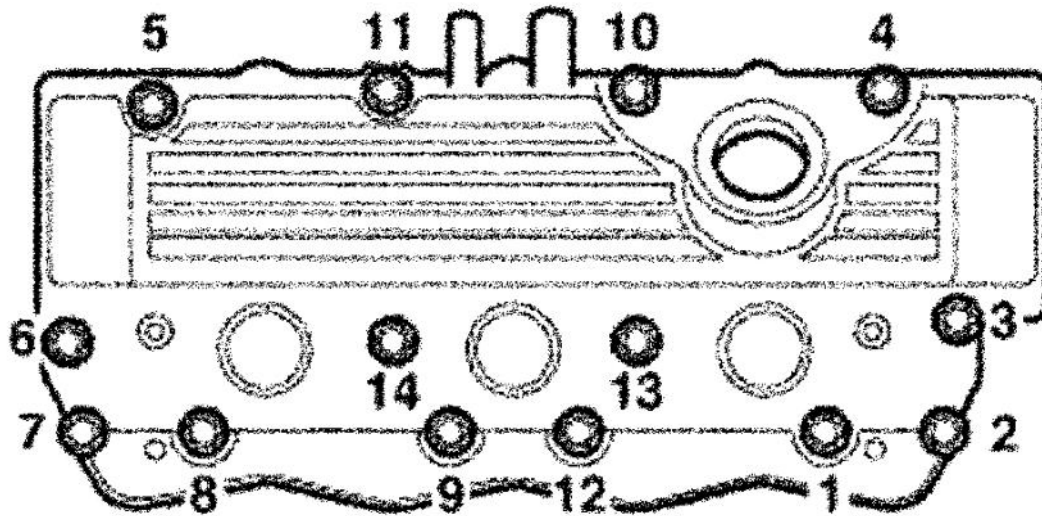
Removal

1. Remove engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
2. Depress locking collars and release 2 breather hoses from left camshaft cover. See **Fig. 40**.
3. Disconnect 3 hot leads from spark plugs.
4. Remove special bolt securing hot lead guide bracket to left cylinder head and position hot leads aside.
5. Disconnect CMP sensor multiplug and release male end of multiplug from bracket.
6. Remove bolt securing multiplug bracket which also retains front HO2S multiplug, move bracket and multiplug aside.
7. Using sequence shown, progressively loosen and remove 14 bolts securing camshaft cover. See **Fig. 41**.
8. Remove camshaft cover, remove and discard gasket. See **Fig. 42**.



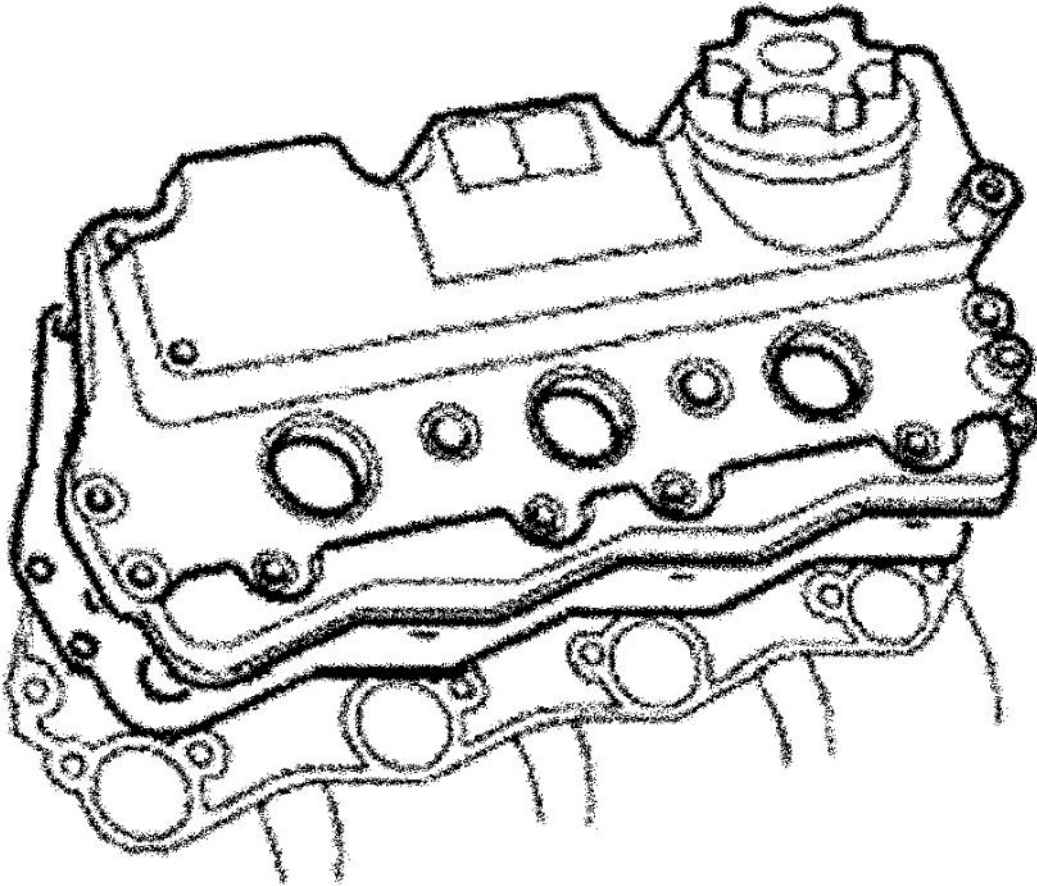
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Fig. 40: Releasing Breather Hoses From Left Camshaft Cover Up To Model Year 2003
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381913

Fig. 41: Removing Camshaft Cover Bolts In Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 42: Removing & Discarding Camshaft Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.

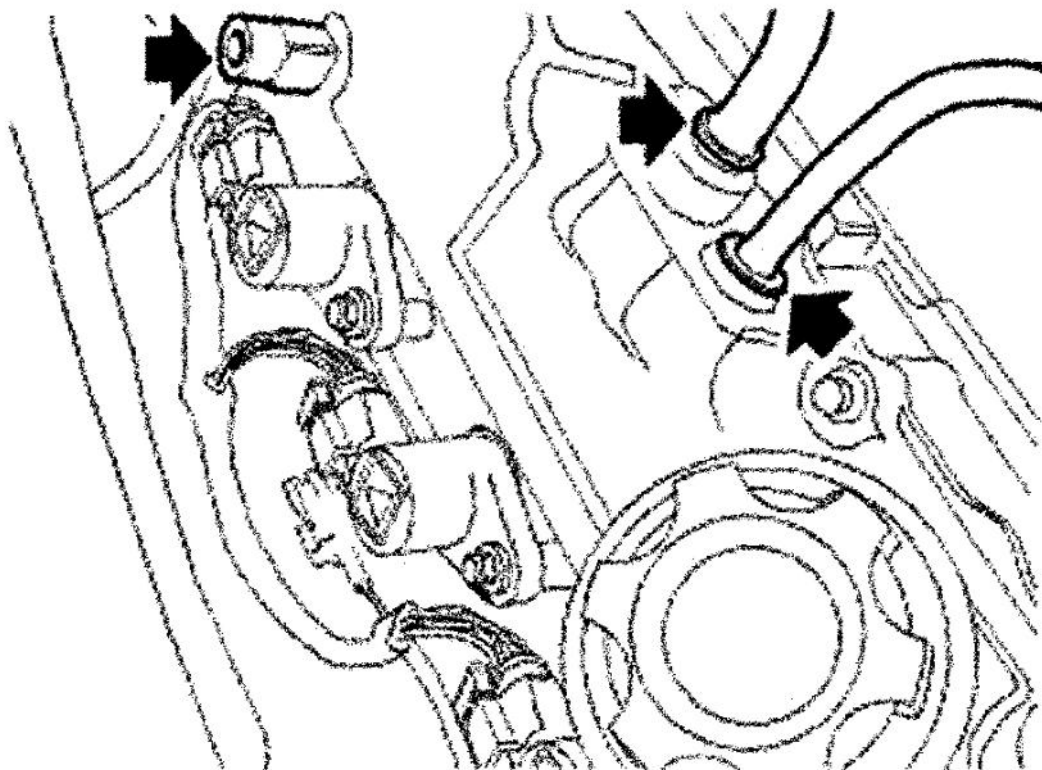
Installation

1. Clean mating surfaces of camshaft cover and carrier.
2. Clean inside of camshaft cover. If necessary, wash oil separator elements in solvent and blow dry.
3. Position new gasket to camshaft carrier with arrows on gasket pointing towards inlet manifold.
4. Position camshaft cover, fit and tighten bolts progressively in the sequence shown to 9 Nm (7 ft. lbs.). See **Fig. 257**.
5. Position multiplug bracket, fit and tighten bolt to 9 Nm (7 ft. lbs.).
6. Secure male end of CMP sensor multiplug to bracket and connect multiplug.
7. Connect hot leads to spark plugs in their correct fitted order.
8. Position hot lead guide bracket, fit and tighten special bolt.
9. Connect breather hoses to left camshaft cover.

10. Fit engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
11. Check engine oil, top-up if necessary. See **ENGINE OIL AND FILTER - KV6**.

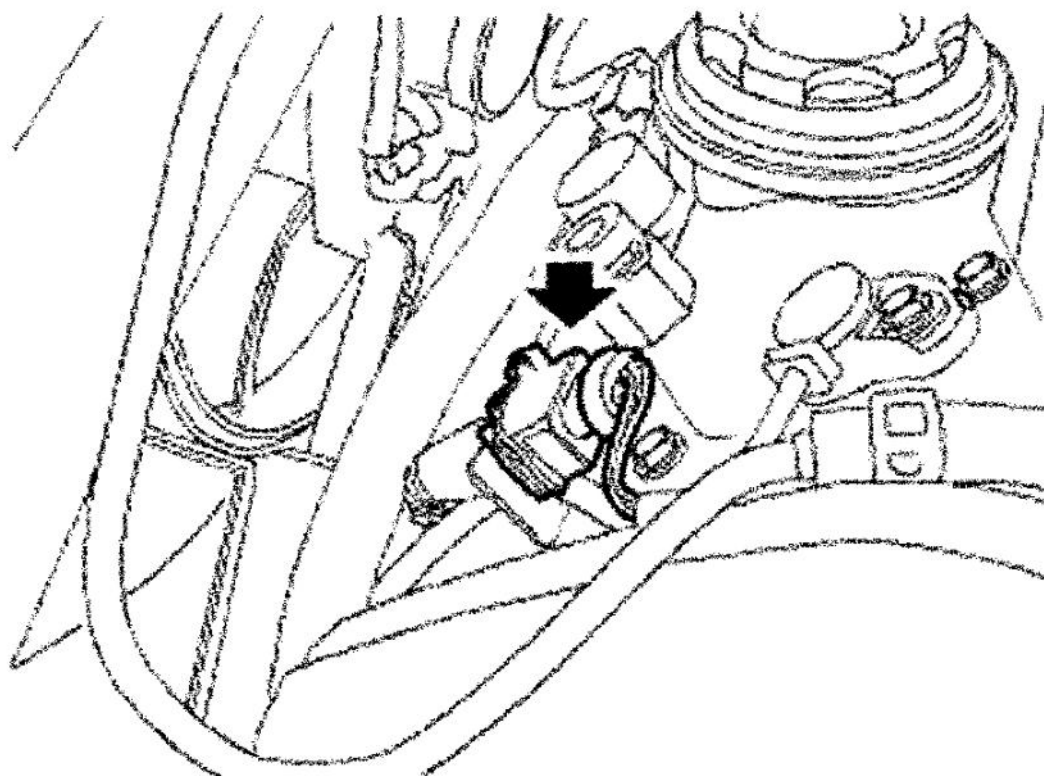
CAMSHAFT COVER GASKET - LEFT- FROM MODEL YEAR 2003**Removal**

1. Remove the engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
2. Depress locking collars and release 2 breather hoses from left camshaft cover. See **Fig. 43**.
3. Remove acoustic cover retainer and remove plug top coil harness clip.
4. Disconnect CMP sensor multiplug and release male end of multiplug from bracket. See **Fig. 44**.
5. Remove bolt securing multiplug bracket which also retains front HO2S multiplug, move bracket and multiplug aside. See **Fig. 45**.
6. Withdraw multiplug lock and disconnect multiplug from each plug top coil. See **Fig. 46**.
7. Remove bolt securing each plug top coil to camshaft cover and remove 3 plug top coils.
8. Noting location of earth lead and using sequence shown, progressively loosen and remove 14 bolts securing camshaft cover.
9. Remove camshaft cover and discard gasket. See **Fig. 42**.



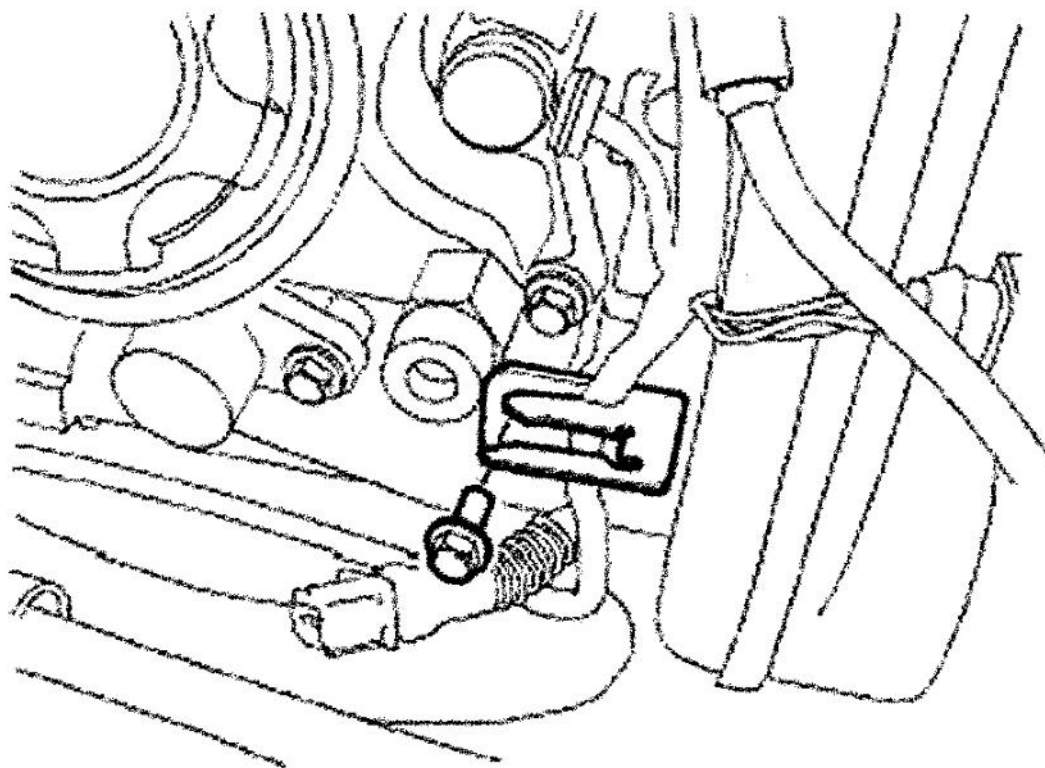
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Fig. 43: Releasing Breather Hoses From Left Camshaft Cover From Model Year 2003
Courtesy of LAND ROVER NORTH AMERICA, INC.



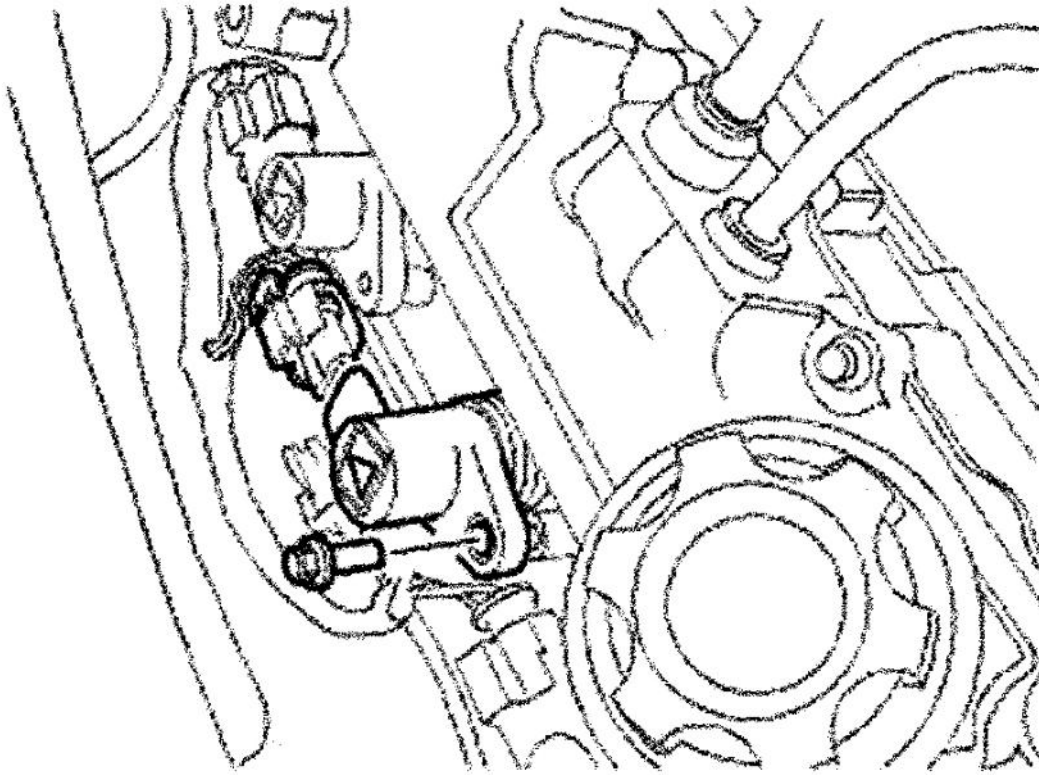
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Fig. 44: Disconnecting Camshaft Sensor
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381917

Fig. 45: Removing HO2S Multiplug Bracket
Courtesy of LAND ROVER NORTH AMERICA, INC.



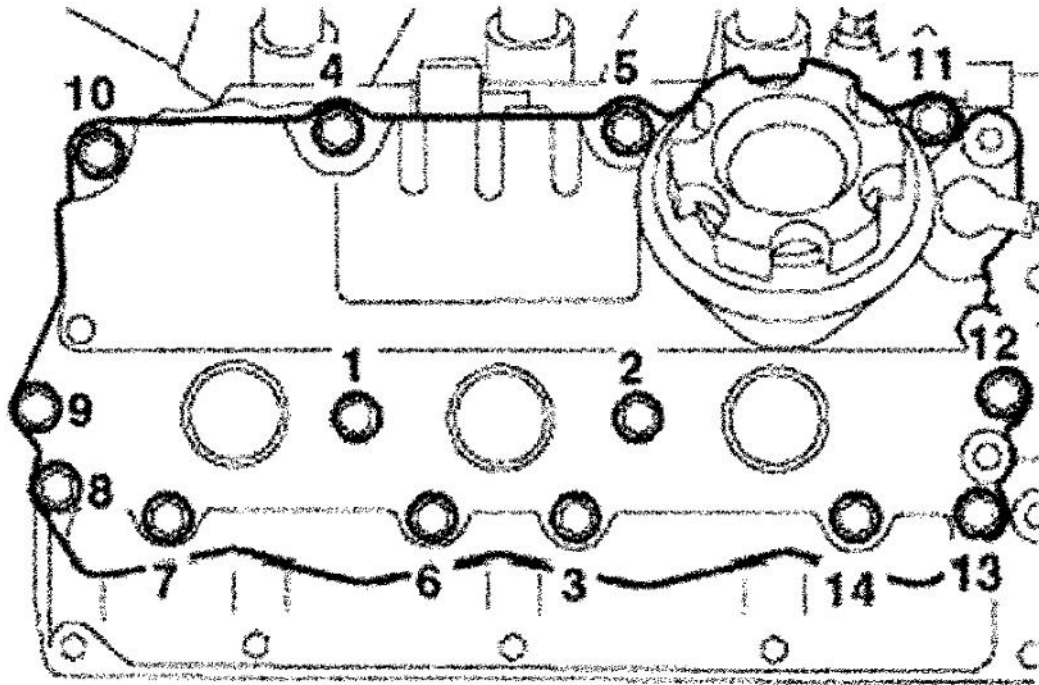
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Fig. 46: Disconnecting Multiplug From Each Plug Top Coil
 Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean mating surfaces of camshaft cover and carrier.
2. Clean inside of camshaft cover. If necessary, wash oil separator elements in solvent and blow dry.
3. Position new gasket to camshaft carrier with arrows on gasket pointing towards inlet manifold.
4. Position camshaft cover, align earth lead and fit and tighten bolts progressively in sequence shown to 9 Nm (7 ft. lbs.). See **Fig. 47**.
5. Fit plug top coils, fit bolts and tighten to 5 Nm (3.7 ft. lbs.).
6. Connect and secure multiplugs to plug top coils.
7. Fit coil harness clip, fit acoustic cover retainer and tighten to 3 Nm (2.2 ft. lbs.).
8. Position multiplug bracket to camshaft cover, fit and tighten bolt to 9 Nm (7 ft. lbs.).
9. Secure male end of CMP sensor multiplug to bracket and connect multiplug.
10. Connect breather hoses to left camshaft cover.
11. Check engine oil level, top-up if necessary. See **ENGINE OIL AND FILTER - KV6**

12. Fit the engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.



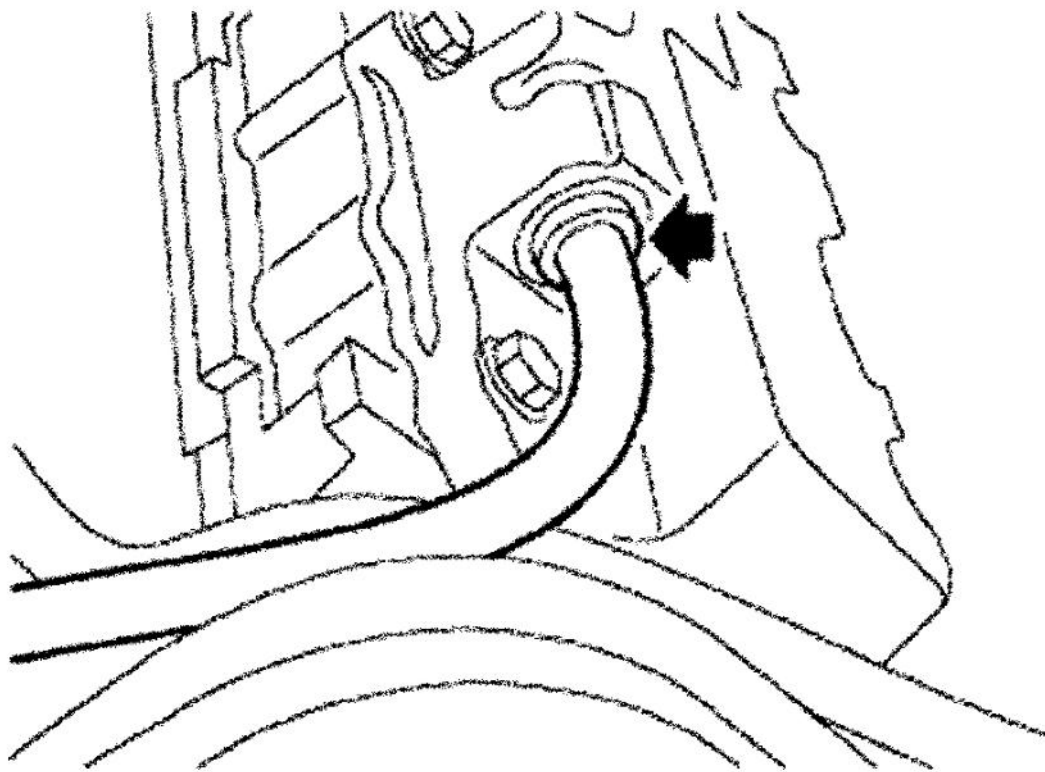
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Fig. 47: Tightening Bolts In Sequence On Camshaft Cover Gasket (Left) From Model Year 2003
 Courtesy of LAND ROVER NORTH AMERICA, INC.

CAMSHAFT COVER GASKET - RIGHT

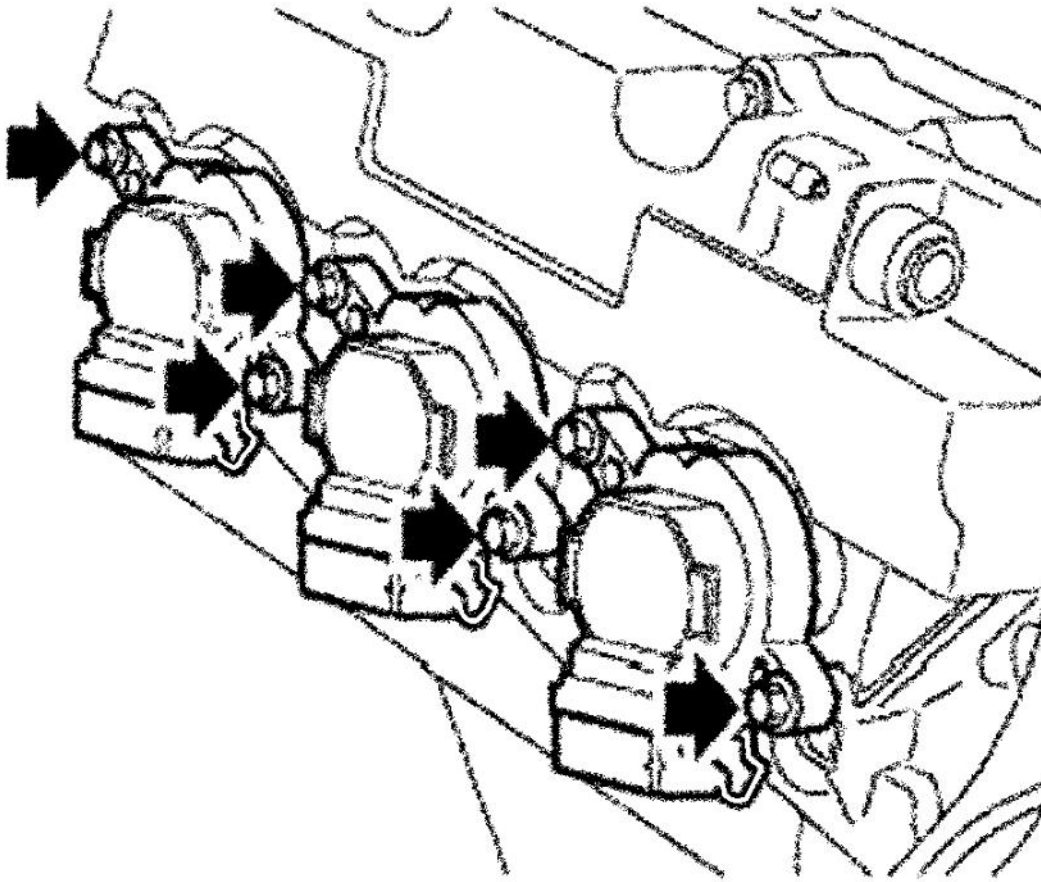
Removal

1. Remove inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY**.
2. Depress locking collar and release breather hose from right camshaft cover. See **Fig. 48**.
3. Up to Model Year 2003: Remove 6 bolts securing plug top coils to right camshaft cover and remove coils. See **Fig. 49**.
4. From Model Year 2003: Remove 3 bolts securing plug top coils to right camshaft cover and remove coils. See **Fig. 50**.
5. Remove bolt securing earth lead to right camshaft cover and release earth lead. See **Fig. 51**.
6. Using sequence shown, progressively loosen and remove 14 bolts securing camshaft cover. See **Fig. 52**.
7. Remove camshaft cover, remove and discard gasket. See **Fig. 53**.



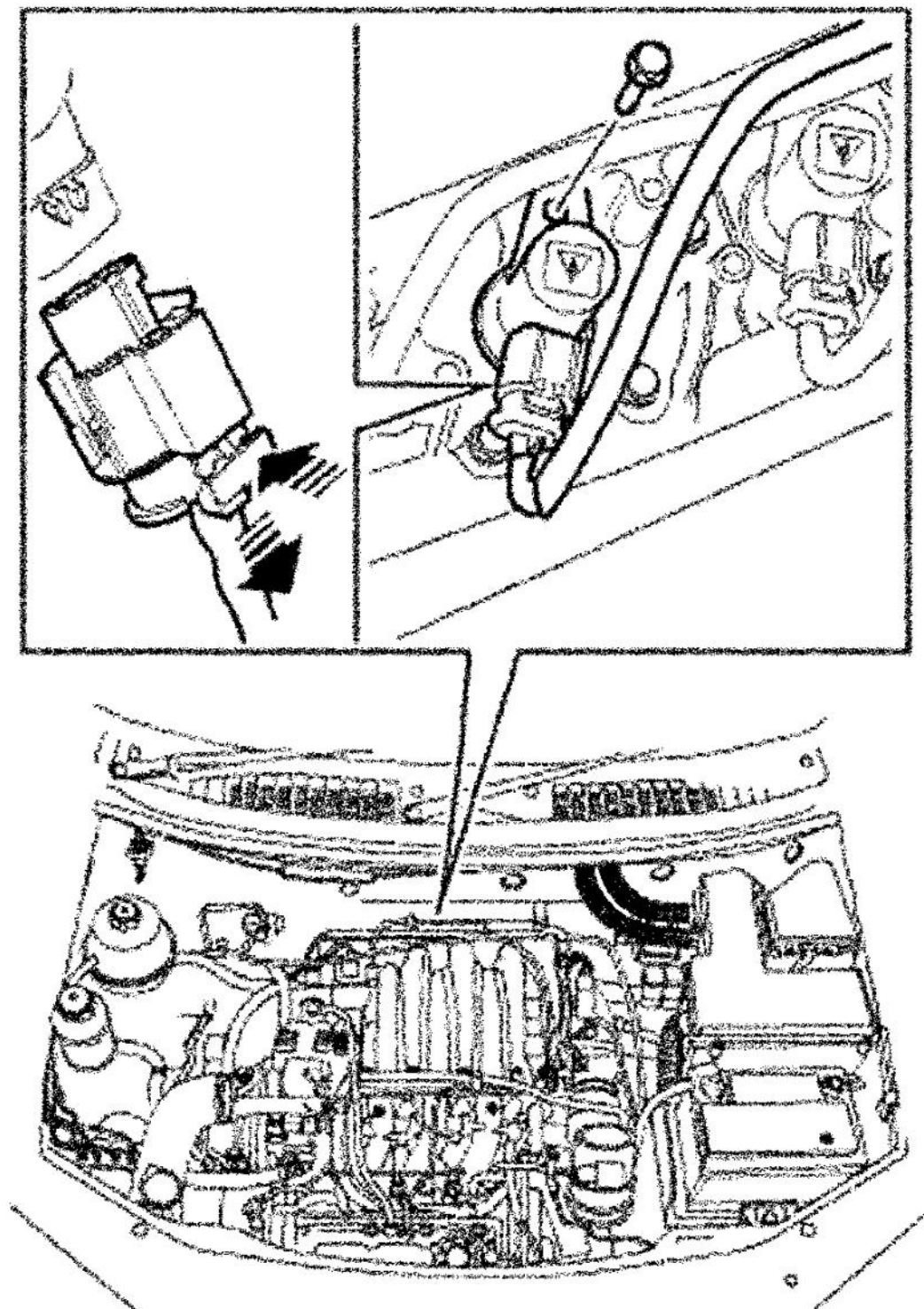
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Fig. 48: Releasing Breather Hose From Right Camshaft Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



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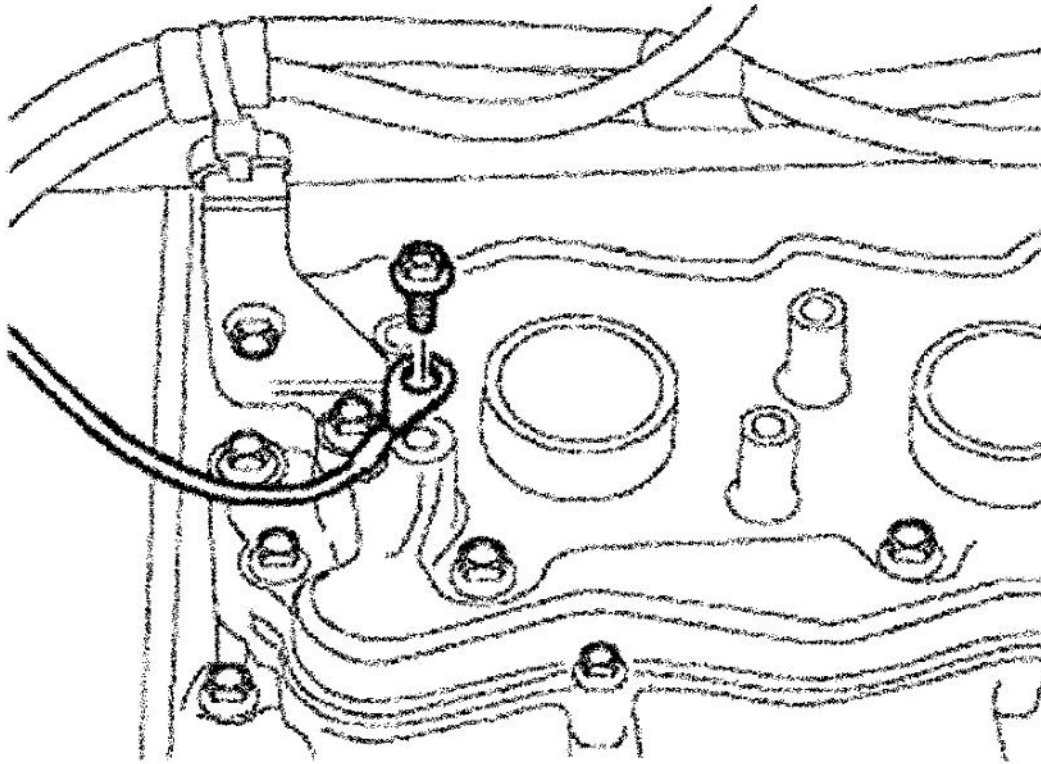
Fig. 49: Removing Plug Top Coil Bolts Right Camshaft Cover Up To Model Year 2003
Courtesy of LAND ROVER NORTH AMERICA, INC.



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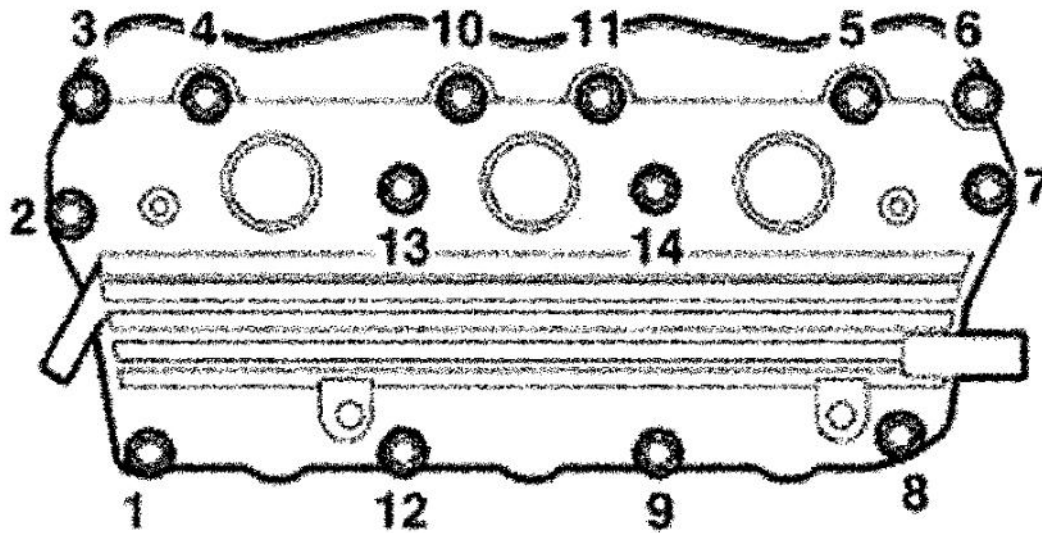
Fig. 50: Removing Plug Top Coils To right Camshaft Cover From Model Year 2003

Courtesy of LAND ROVER NORTH AMERICA, INC.



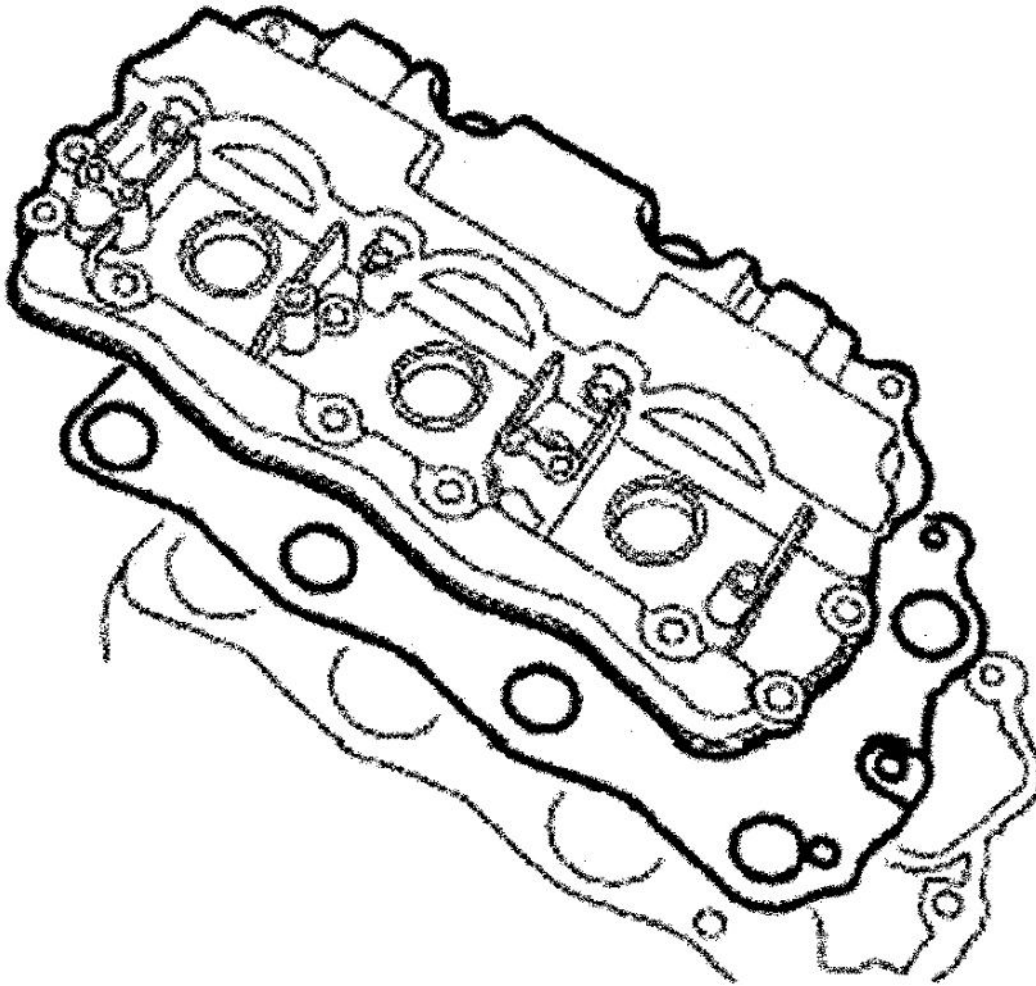
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Fig. 51: Disconnecting Earth Lead To Right Camshaft Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381924

Fig. 52: Removing Camshaft Cover Bolts In Sequence (Right)
 Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 53: Removing Camshaft Cover Gasket (Right)
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

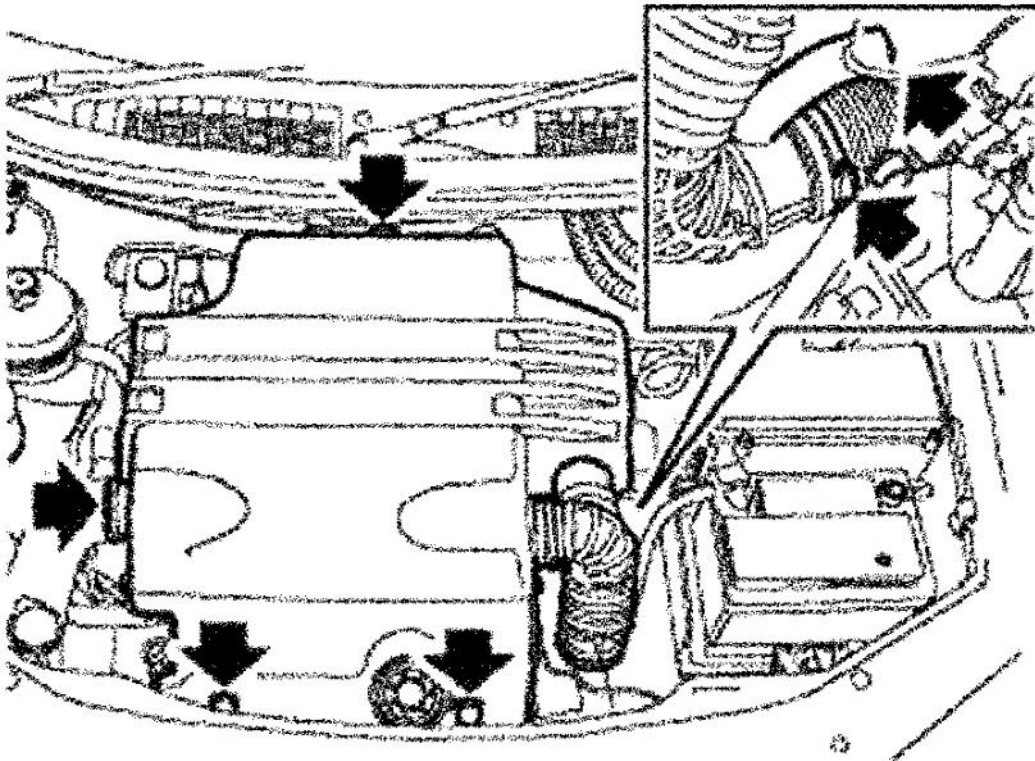
1. Clean mating surfaces of camshaft cover and carrier.
2. Position new gasket to camshaft carrier with arrows on gasket pointing towards inlet manifold.
3. Position camshaft cover, fit and tighten bolts progressively in the sequence shown to 9 Nm (7 ft. lbs.). See **Fig. 258**.
4. Position plug top coils, fit bolts and tighten to 9 Nm (7 ft. lbs.).
5. Position earth lead to right camshaft cover, fit bolt and tighten to 9 Nm (7 ft. lbs.).
6. Secure breather hose to camshaft cover.
7. Fit inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO**

03MY .

8. Check engine oil, top-up if necessary. See **ENGINE OIL AND FILTER - KV6** .

COVER - ENGINE ACOUSTIC**Removal**

1. Loosen clip and disconnect fresh air intake hose from acoustic cover. See **Fig. 54**.
2. Non NAS: Loosen clip and release air intake and air bypass hose from throttle body.
3. NAS: Loosen clip and disconnect air intake hose from air flow meter (MAF) sensor.
4. Release 2 turnbuckles securing acoustic cover to left camshaft cover.
5. Release retaining strap and remove acoustic cover.



G00381927

Fig. 54: Disconnecting Fresh Air Intake Hose From Acoustic Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Fit and secure engine acoustic cover.

2. Connect air intake and air bypass hoses, secure clip.
3. Connect fresh air intake hose to acoustic cover and tighten clip screw. Engine and automatic gearbox - up to Model Year 2003.

ENGINE & AUTOMATIC GEARBOX - UP TO MODEL YEAR 2003

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Tie bonnet back in upright position.
3. Drain cooling system. See **DRAINING & REFILLING COOLING SYSTEM** .
4. Remove engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
5. Remove battery carrier. See **BATTERY CARRIER** .
6. Remove Engine Control Module (ECM). See **18.30.01 ENGINE CONTROL MODULE (ECM) -- NON NAS** .
7. Remove 2 screws securing harness clamp and remove clamp. See **Fig. 55**.
8. Disconnect 2 engine harness to main harness multiplugs.
9. Release air duct and harness rubber sleeve from "E" box. See **Fig. 56**.
10. Release 4 clips securing carrier in "E" box, remove carrier from "E" box and position aside.
11. Remove nut, release retainer and remove "E" box. See **Fig. 57**.
12. Remove engine compartment fuse box cover. See **Fig. 58**.
13. Remove 2 bolts securing battery and starter lead to fuse box. See **Fig. 59**.
14. Disconnect multiplug from fuse box.
15. Disconnect earth header multiplug. See **Fig. 60**.
16. Release 3 clips securing engine harness to "E" box mounting bracket, lay harness over engine.
17. Remove bolt securing engine earth lead. See **Fig. 61**.
18. Disconnect Lucar from starter solenoid. See **Fig. 62**.
19. Release 2 gearbox harness multiplugs from mounting bracket clips and disconnect multiplugs. See **Fig. 63**.
20. Position absorbent cloth around fuel feed pipe connection to collect spillage. See **Fig. 64**.

WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

21. Pull back rubber sleeve on fuel pipe connector, release connector and disconnect fuel pipe from fuel rail pipe.

CAUTION: Always fit plugs to open connections to prevent contamination.

22. Release clip and disconnect hose from purge control valve.

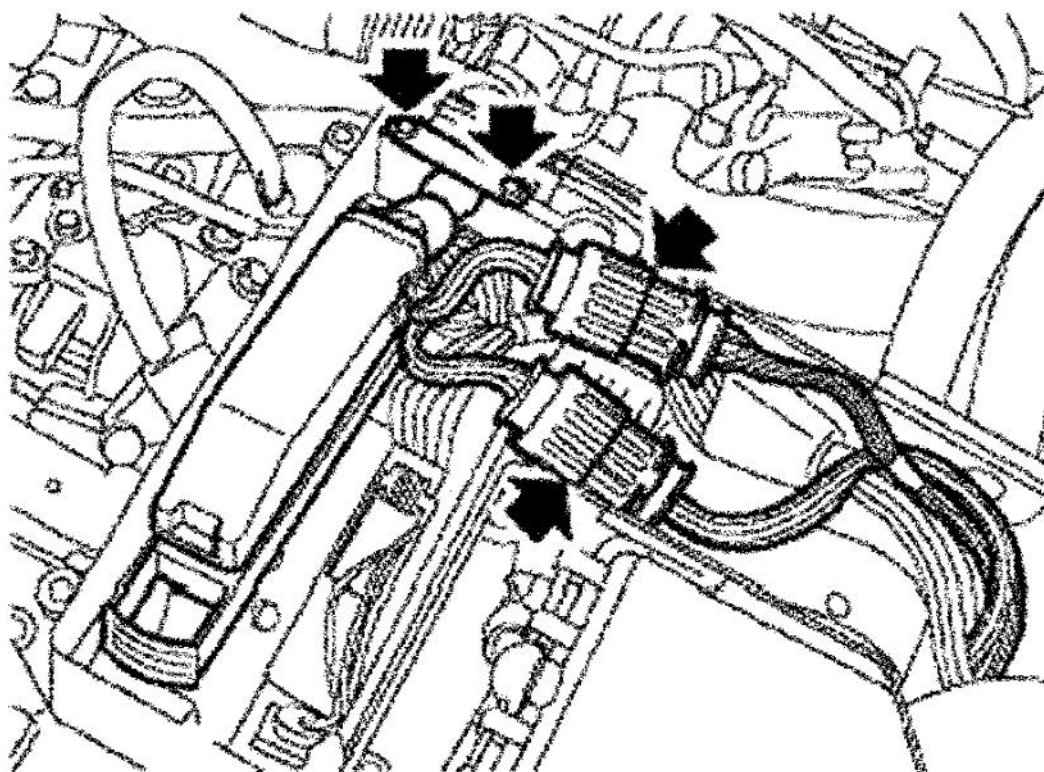
CAUTION: Always fit plugs to open connections to prevent contamination.

23. Release throttle cable from clips on harness brackets, if fitted. See **Fig. 65**.
24. Release throttle cable from abutment bracket and disconnect cable from throttle body cam, if fitted.
25. Release clips and disconnect heater feed and return hoses. See **Fig. 66**.
26. Release top hose from support bracket, release clip and disconnect top hose from radiator. See **Fig. 67**.
27. Release clip and disconnect expansion tank hose from inlet manifold. See **Fig. 68**.
28. Release clip and disconnect hose from underside of expansion tank. See **Fig. 69**.
29. Depress locking collar and disconnect brake servo hose from inlet manifold chamber. See **Fig. 70**.
30. Raise vehicle on ramp.
31. Remove front road wheels.
32. Release stake in drive shaft nuts.
33. With an assistant depressing the brake pedal, remove and discard left and right drive shaft nuts. See **Fig. 71**.
34. Remove rear beam. See **REAR BEAM**.
35. Remove exhaust front pipe. See **30.10.09 FRONT PIPE -- NON NAS & 30.10.09 FRONT PIPE -- NAS**.
36. Raise one rear wheel for rotation of propeller shaft to access bolts.
37. Reference mark position of viscous coupling flange to IRD unit flange to aid reassembly.
38. Remove 6 nuts and bolts securing propeller shaft to IRD drive flange. See **Fig. 72**.
39. Release propeller shaft from IRD drive flange and tie shaft aside.

CAUTION: Care must be taken to support the Tripod joint when removed from the IRD unit. To avoid damage to gaiter or steel can, the joint should not be allowed to fully extend or be dropped.

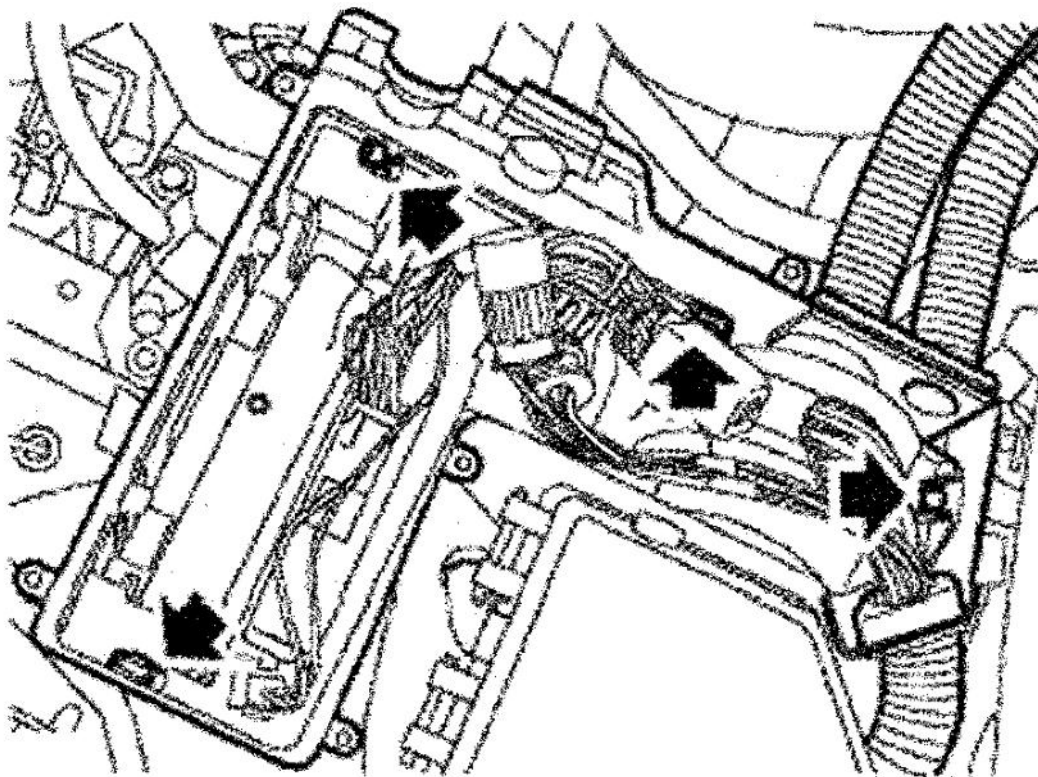
40. Drain gearbox fluid. See **JATCO A/T -- DRAIN & REFILL**.
41. Drain fluid from Intermediate Reduction Drive (IRD). See **INTERMEDIATE REDUCTION DRIVE (IRD)**.
42. Remove 6 bolts securing right and left front splash shields and remove shields. See **Fig. 73**.
43. Remove clips securing brake hoses to right and left damper brackets. See **Fig. 74**.
44. Release ABS sensor leads from bracket.
45. Release ABS sensors from right and left front hubs.
46. Remove nuts securing right and left track rod end ball joints. See **Fig. 75**.
47. Fit an M12 nut to each ball pin, flush with end of each pin.
48. Using LRT-57-043, separate ball pins from right and left steering arms. Remove M12 nuts and release ball pins from steering arms.
49. Pull right and left hubs outwards and release driveshafts from hubs.
50. Using LRT-54-026, release drive shafts from IRD unit and gearbox. See **Fig. 76**.

51. Remove nut securing selector lever to selector shaft on gearbox and release lever from selector shaft. See **Fig. 77**.
52. Release clip securing selector cable to gearbox bracket, remove cable and tie aside.
53. Using a 3/8" square drive socket bar, raise ancillary drive belt tensioner and release drive belt from A/C compressor pulley. See **Fig. 78**.
54. Disconnect multiplug from A/C compressor. See **Fig. 79**.
55. Note fitted position of heat shield on A/C compressor and remove 3 bolts securing A/C compressor to front mounting plate and cylinder block. Release A/C compressor and heat shield and position aside.
56. Lower vehicle on ramp.
57. Using a hoist, connect adjustable lifting bracket, LRT-12-138 to engine. See **Fig. 80**.
58. Raise hoist to take weight without exerting any load on the engine mountings.
59. Remove through bolt securing left engine mounting to gearbox bracket. See **Fig. 81**.
60. Remove 4 bolts securing left mounting to body and remove mounting.
61. Remove 4 bolts securing left mounting bracket to gearbox and remove bracket. See **Fig. 82**.
62. Using gearbox bracket bolts, secure LRT-44-026 lifting bracket to gearbox. See **Fig. 83**.
63. Place a wooden block on jack, position jack under gearbox and raise jack sufficient to support weight of gearbox. Release lifting hook from rear engine lifting bracket and connect to lifting bracket on gearbox.
64. Remove bolt securing upper right engine steady to top arm. See **Fig. 84**.
65. Loosen bolt securing upper right engine steady to body, pivot engine steady away from top arm.
66. Remove bolt securing PAS pipe to engine front mounting plate. See **Fig. 85**.
67. Remove nut and 4 bolts securing engine top arm bracket to right hydramount and to engine front mounting bracket. See **Fig. 86**.
68. Release PAS pipe support bracket from hydramount and position pipe aside.
69. Remove top arm.
70. Remove 3 Torx screws securing PAS pump pulley and remove pulley. See **Fig. 87**.
71. Remove 3 bolts securing PAS pump to front mounting plate and tie pump aside. See **Fig. 88**.
72. With assistance, maneuver and lower engine and gearbox to floor.



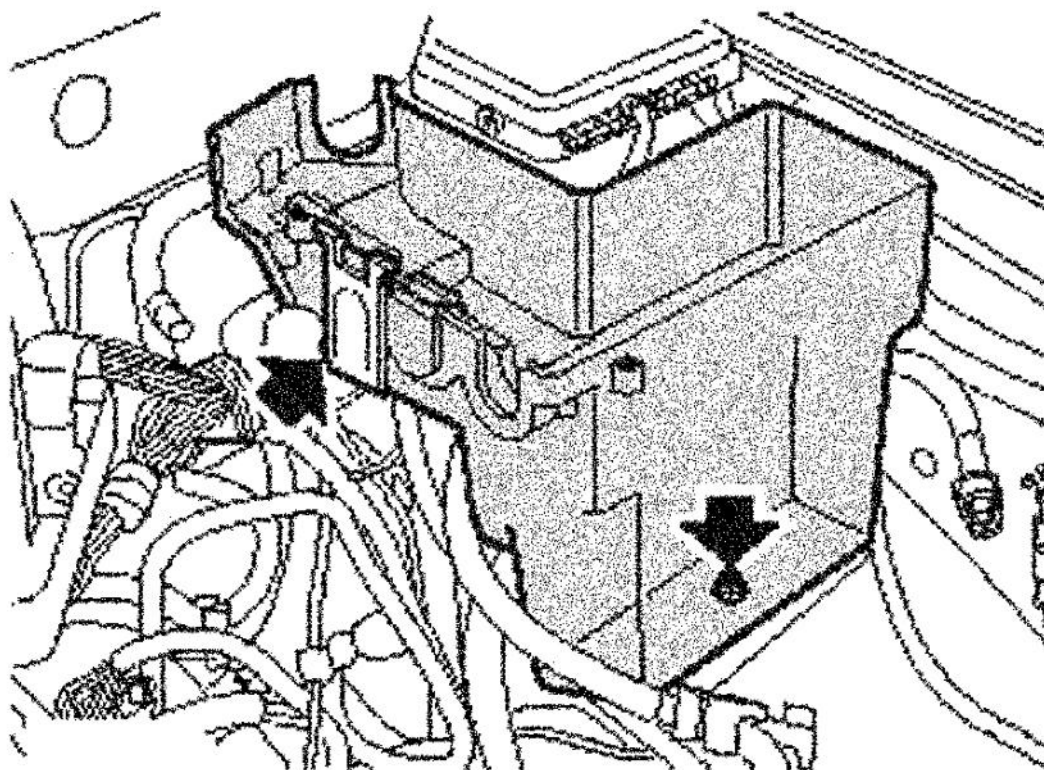
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Fig. 55: Removing Harness Clamp Screws
Courtesy of LAND ROVER NORTH AMERICA, INC.



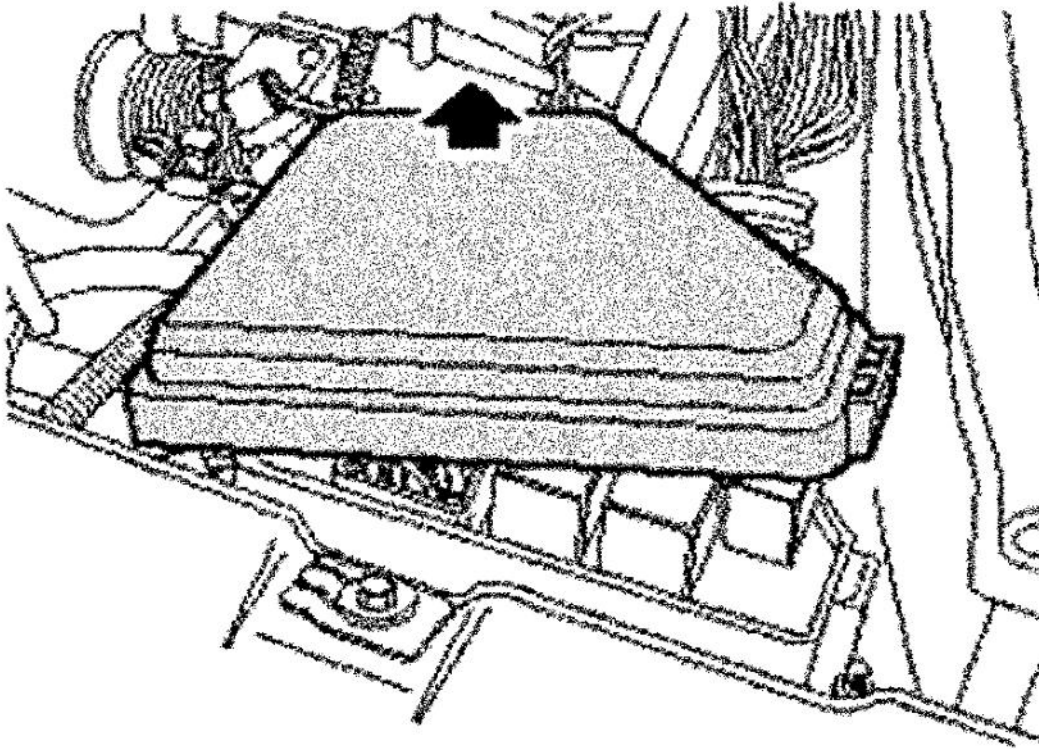
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Fig. 56: Releasing Air Duct & Harness Rubber Sleeve From "E" Box
Courtesy of LAND ROVER NORTH AMERICA, INC.



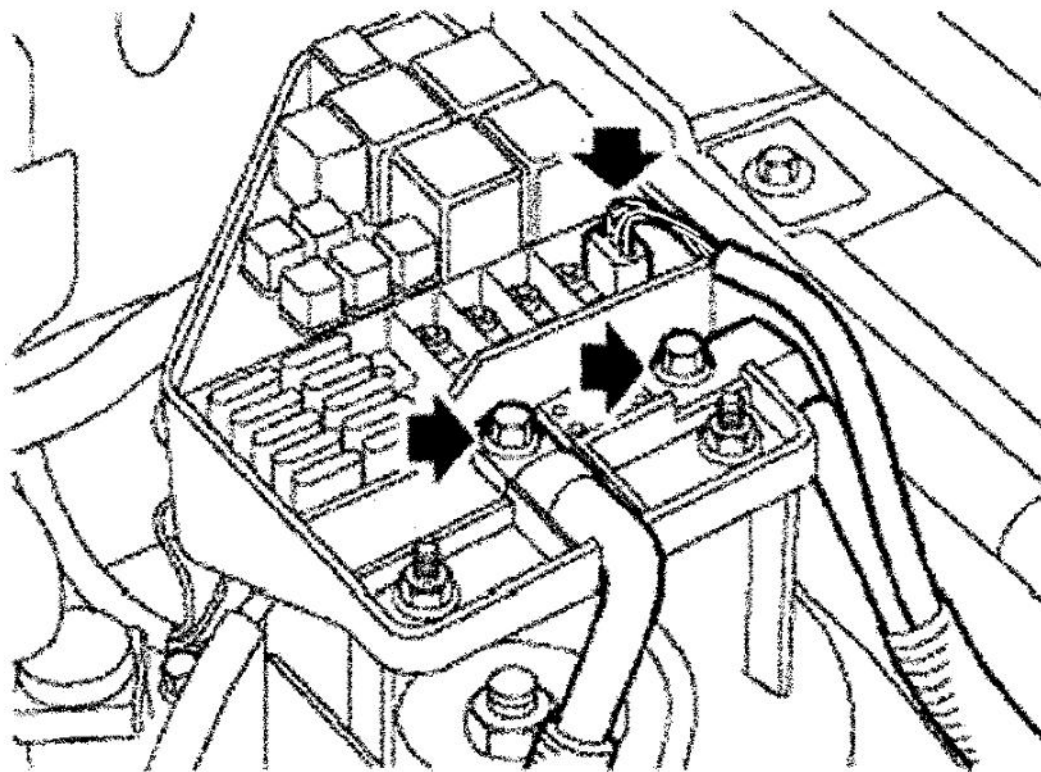
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Fig. 57: Removing "E" Box Nut
Courtesy of LAND ROVER NORTH AMERICA, INC.



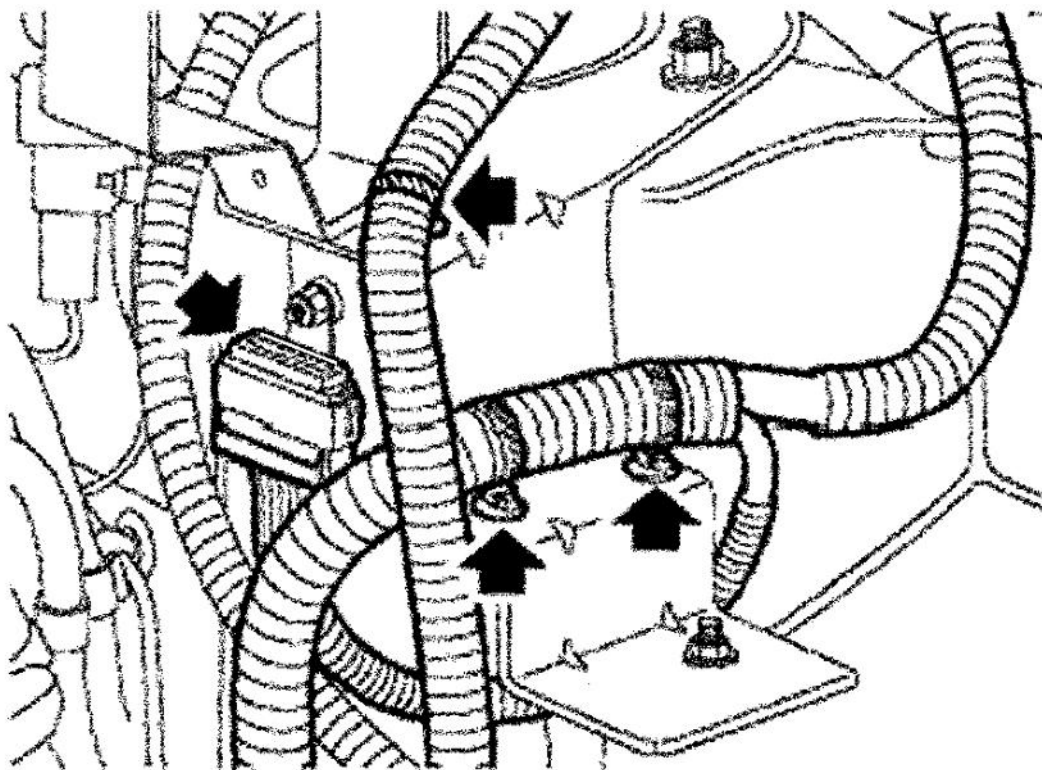
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Fig. 58: Removing Fuse Box Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



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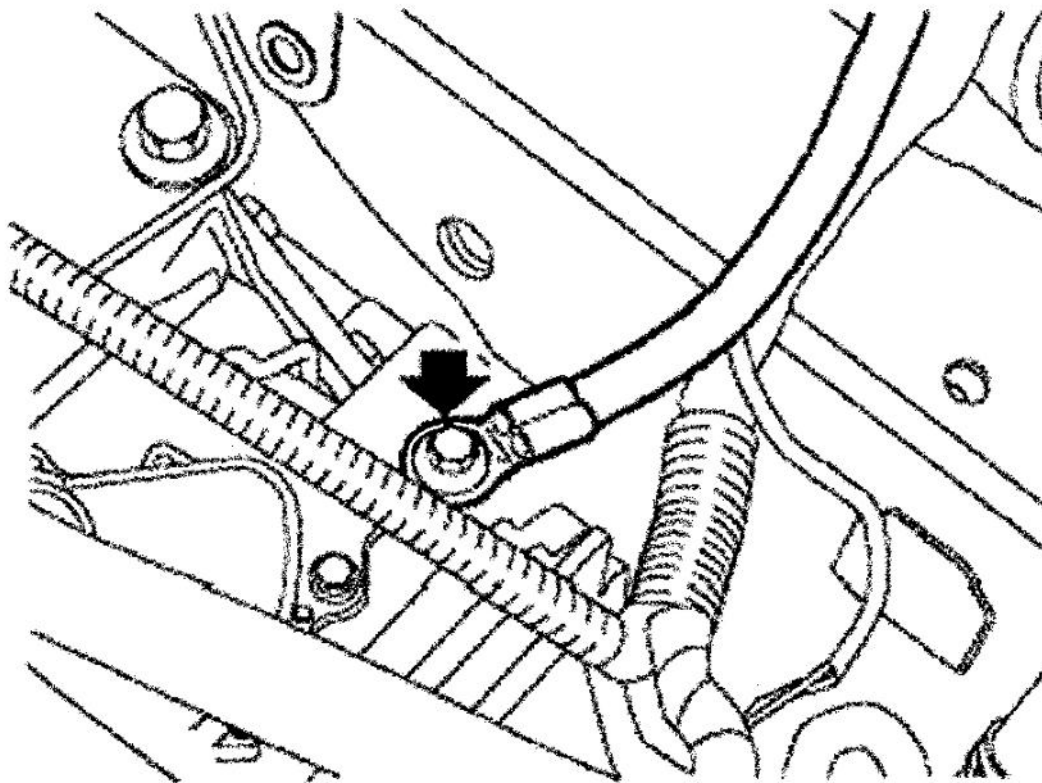
Fig. 59: Removing Leads-To-Fuse Box
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381933

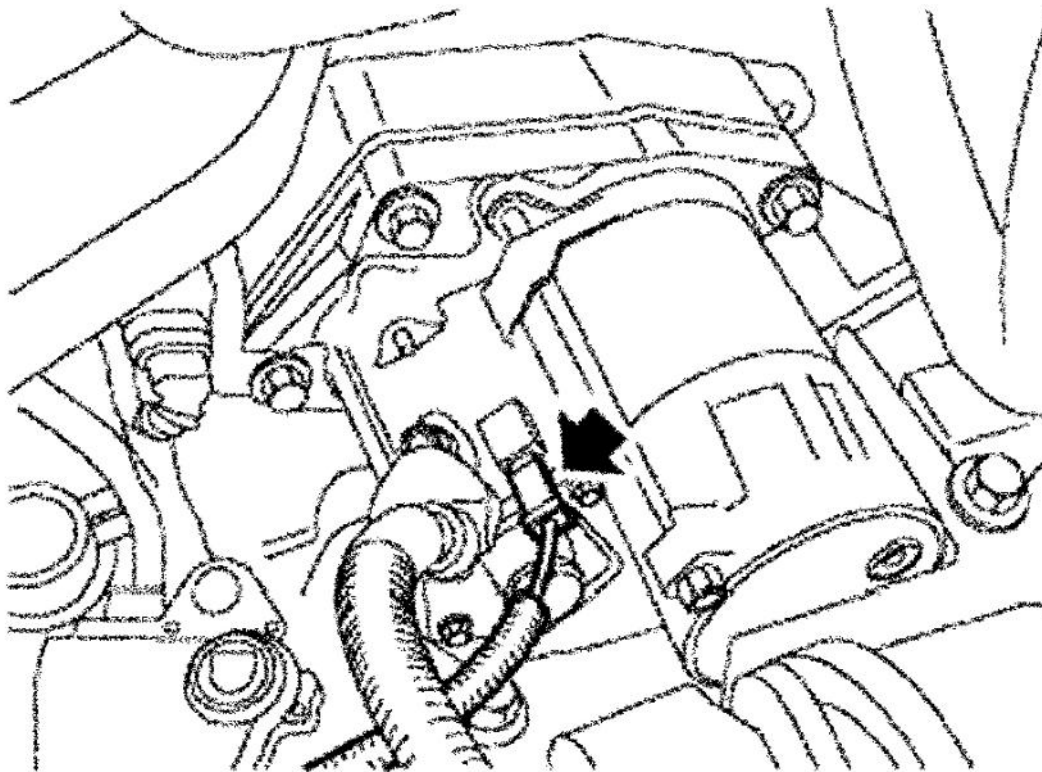
Fig. 60: Disconnecting Header Multiplugs

Courtesy of LAND ROVER NORTH AMERICA, INC.



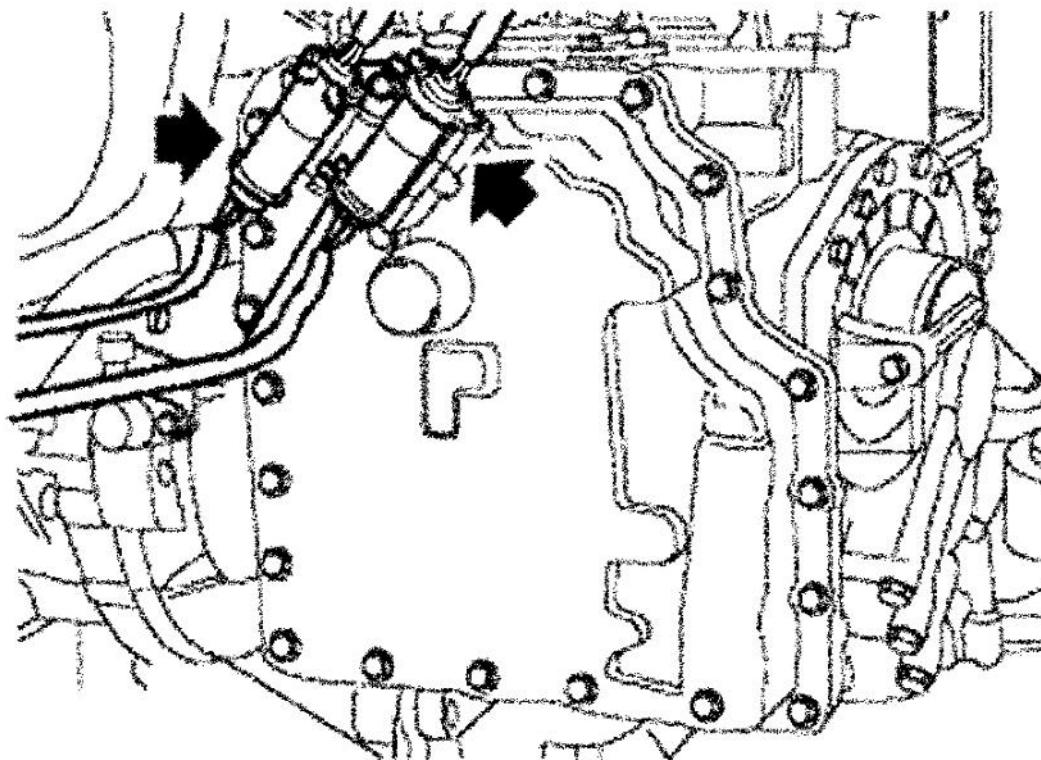
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Fig. 61: Removing Engine Earth Lead Bolt
Courtesy of LAND ROVER NORTH AMERICA, INC.



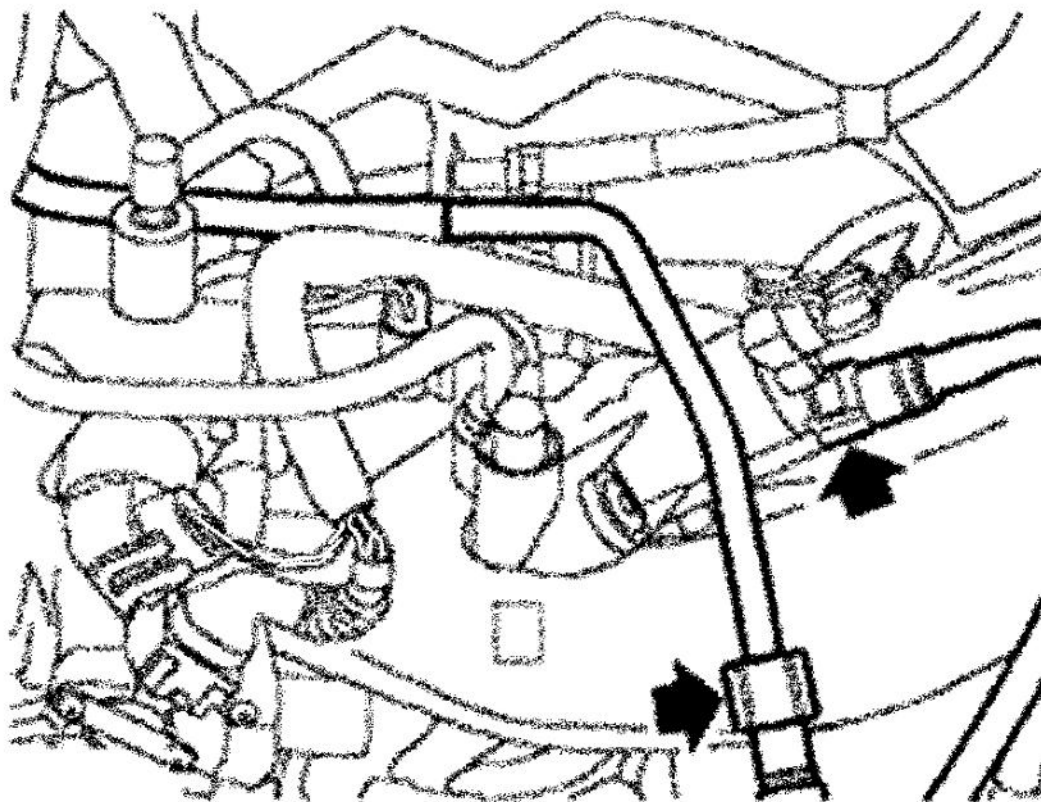
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Fig. 62: Disconnecting Starter Solenoid Lucar
Courtesy of LAND ROVER NORTH AMERICA, INC.



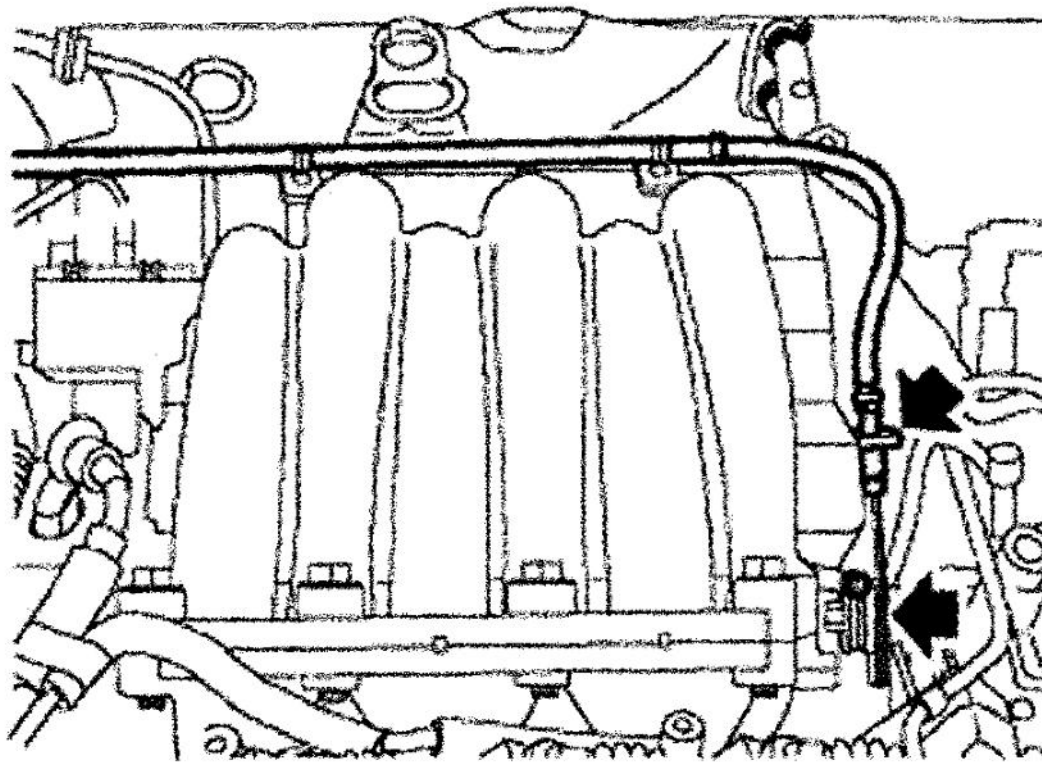
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Fig. 63: Removing Gearbox Harness Multiplugs
Courtesy of LAND ROVER NORTH AMERICA, INC.



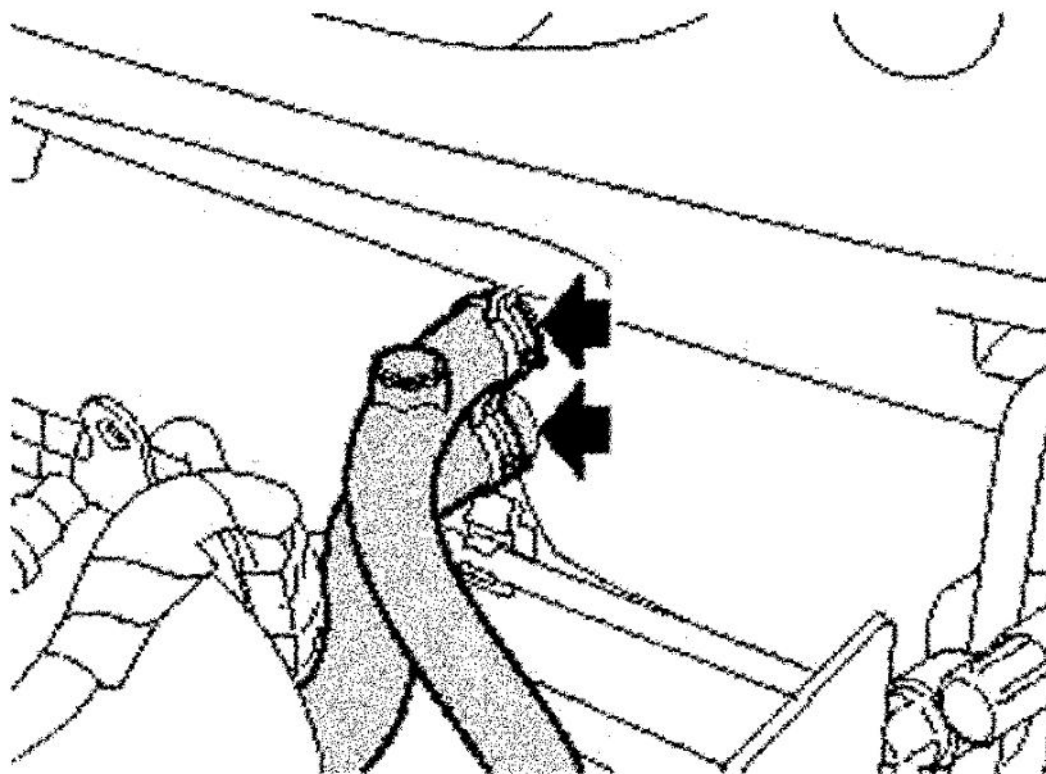
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Fig. 64: Disconnecting Fuel Pipe
Courtesy of LAND ROVER NORTH AMERICA, INC.



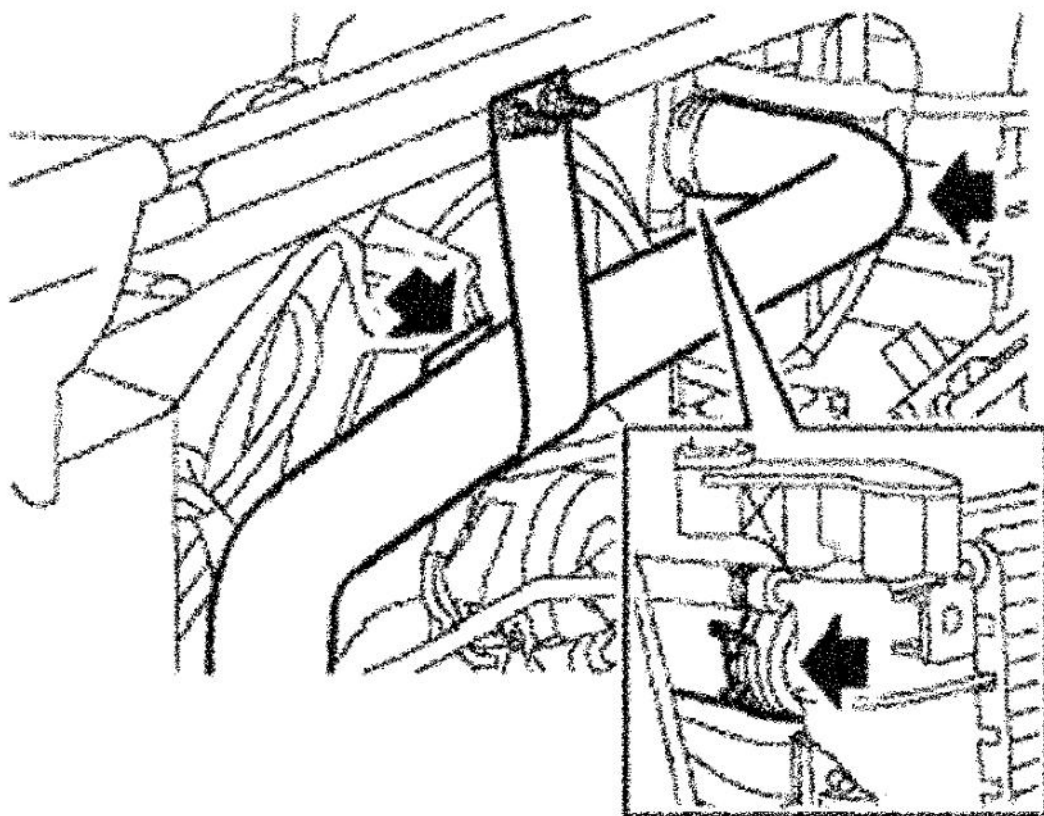
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Fig. 65: Disconnecting Throttle Cable (If Fitted)
Courtesy of LAND ROVER NORTH AMERICA, INC.



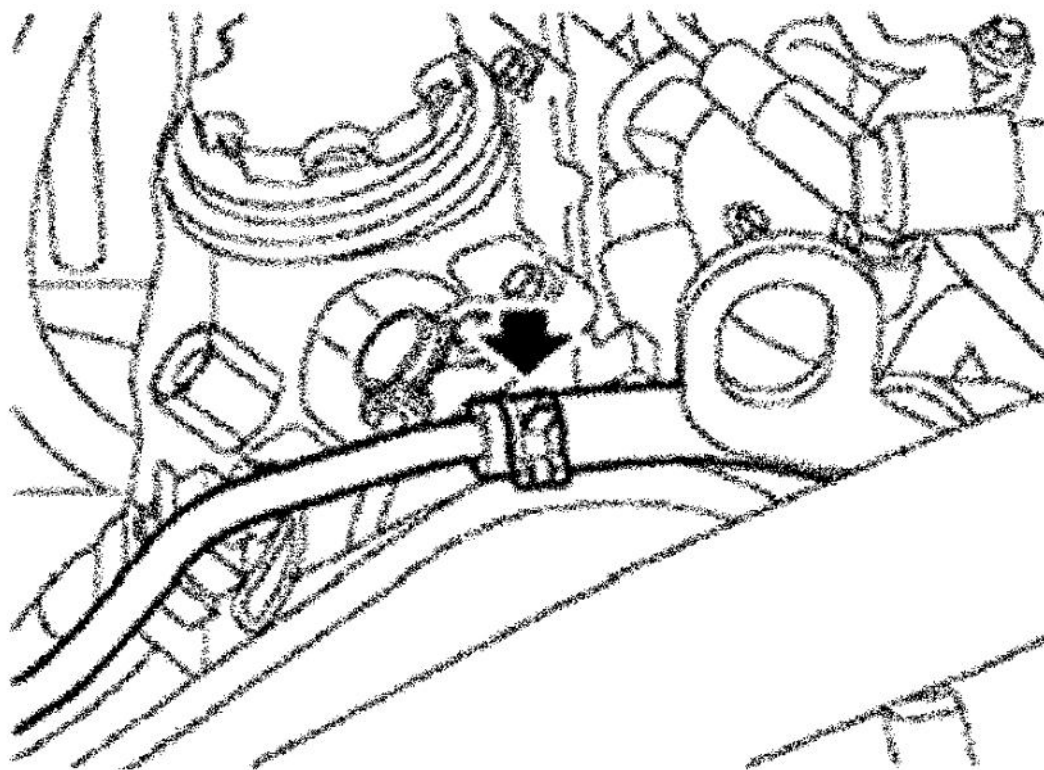
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Fig. 66: Disconnecting Heater Feed & Return Hoses
Courtesy of LAND ROVER NORTH AMERICA, INC.



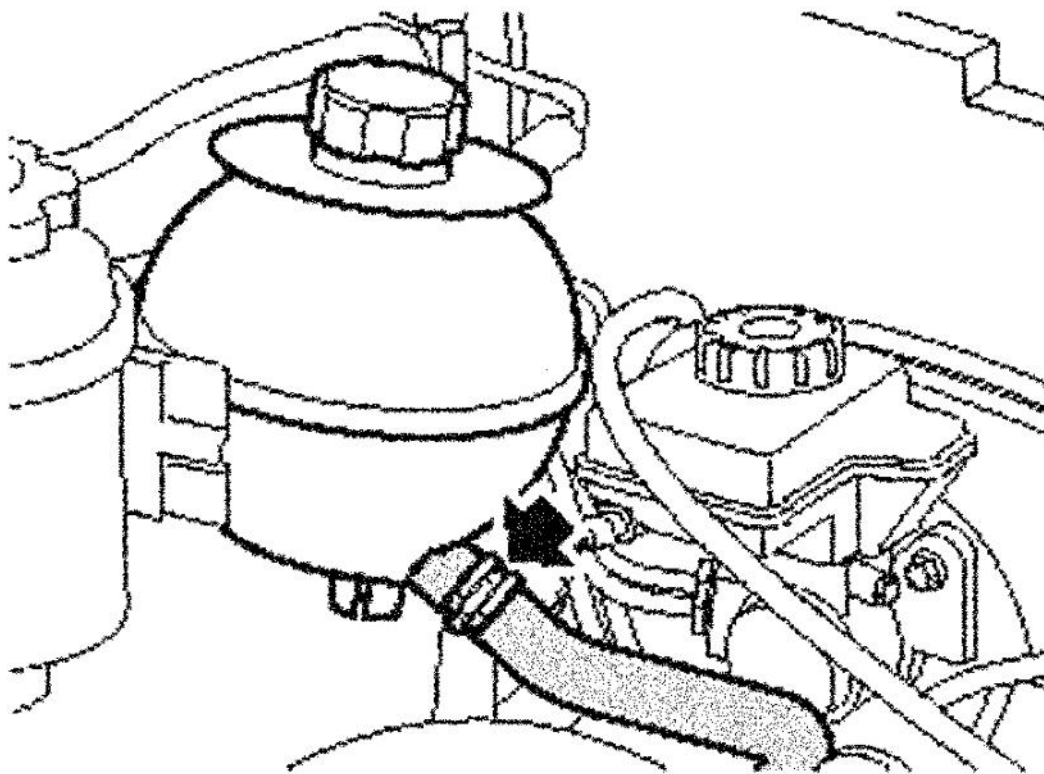
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Fig. 67: Disconnecting Top Hose From Radiator
Courtesy of LAND ROVER NORTH AMERICA, INC.



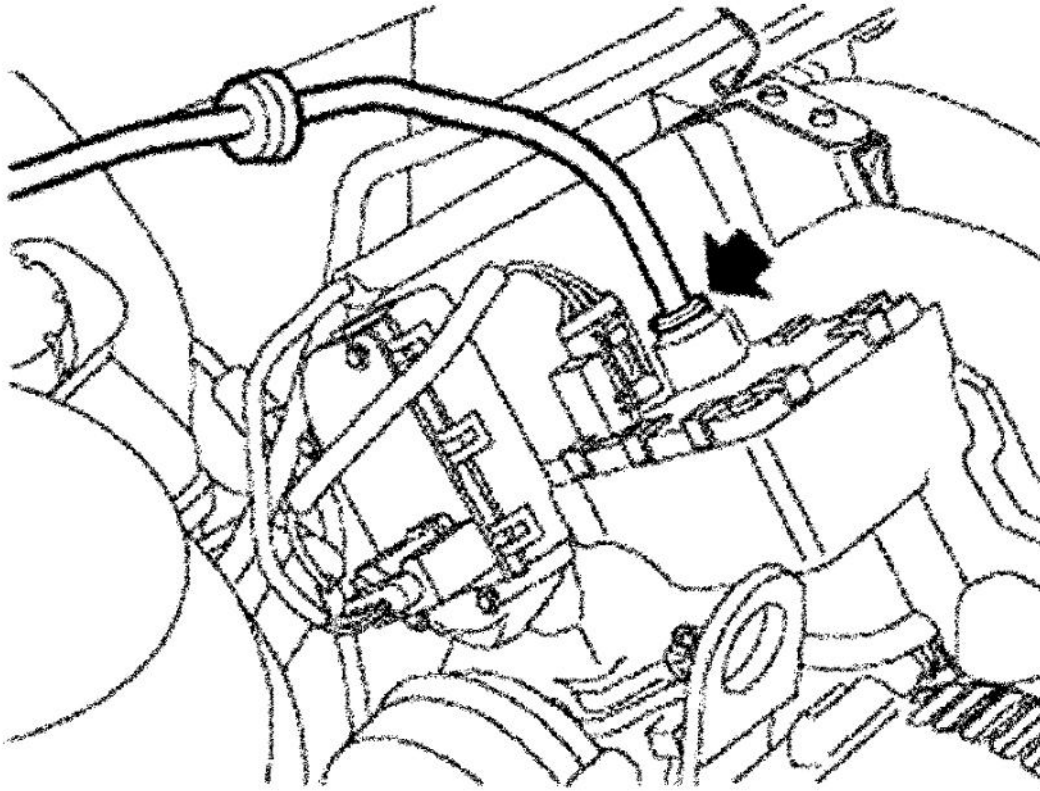
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Fig. 68: Disconnect Expansion Tank Hose From Inlet Man
Courtesy of LAND ROVER NORTH AMERICA, INC.



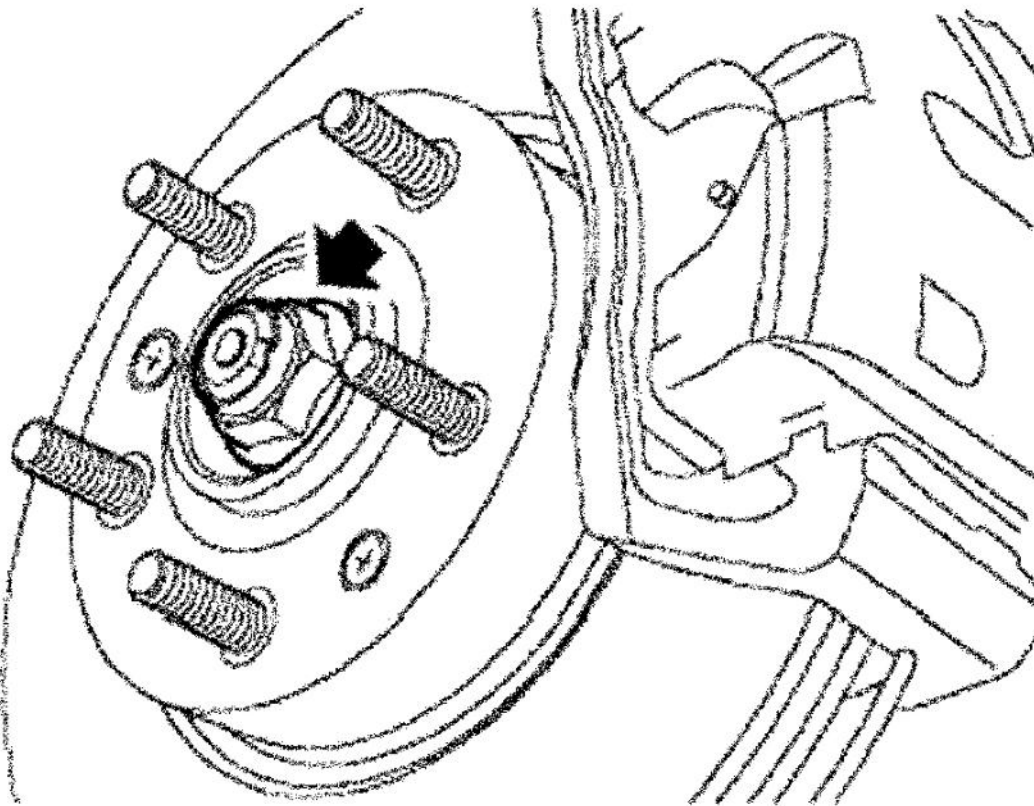
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Fig. 69: Disconnecting Hose From Underside Of Expansion Tank
Courtesy of LAND ROVER NORTH AMERICA, INC.



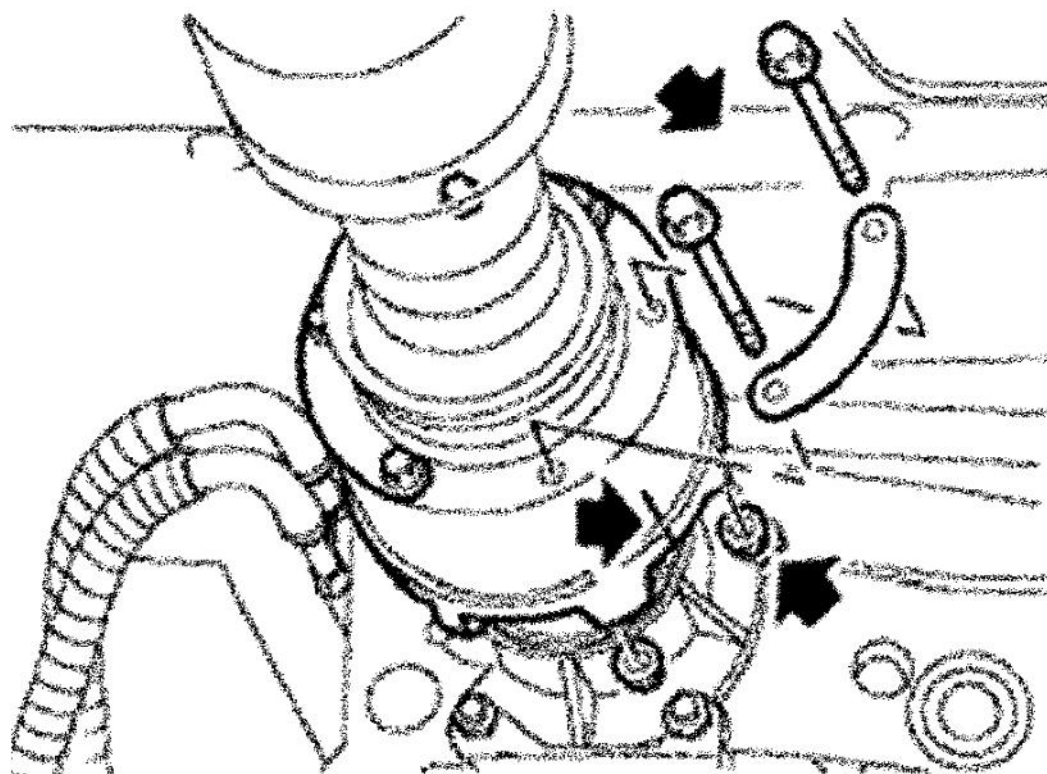
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Fig. 70: Disconnecting Brake Servo Hose From Inlet Manifold Chamber
Courtesy of LAND ROVER NORTH AMERICA, INC.



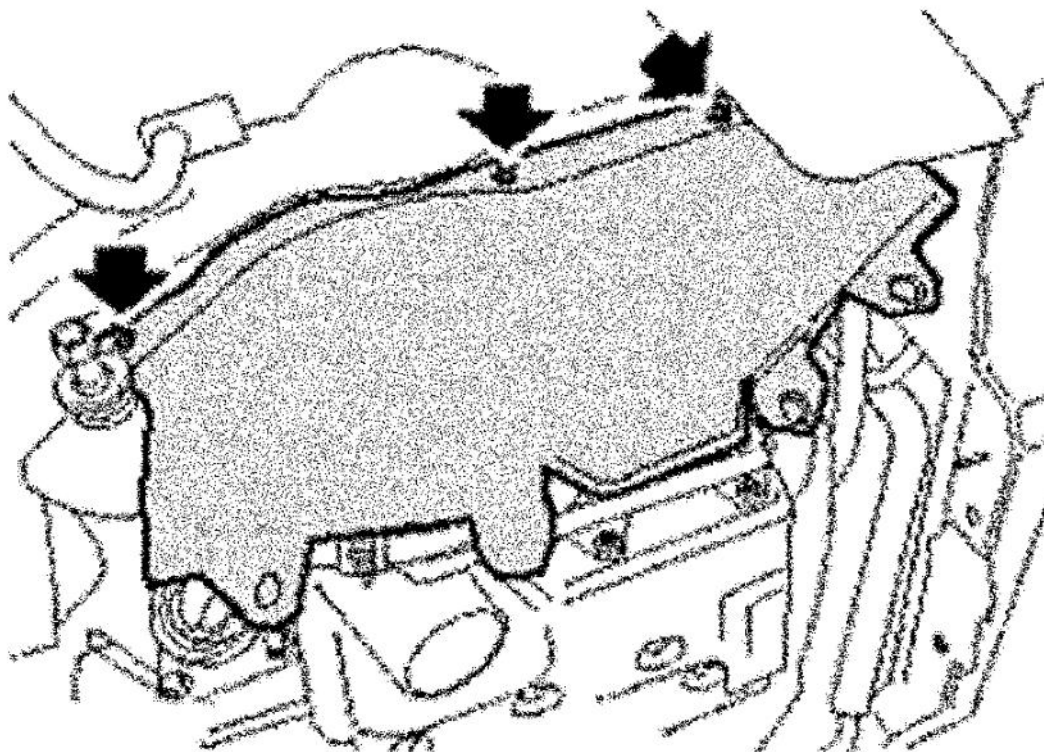
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Fig. 71: Removing Drive Shaft Nut
Courtesy of LAND ROVER NORTH AMERICA, INC.



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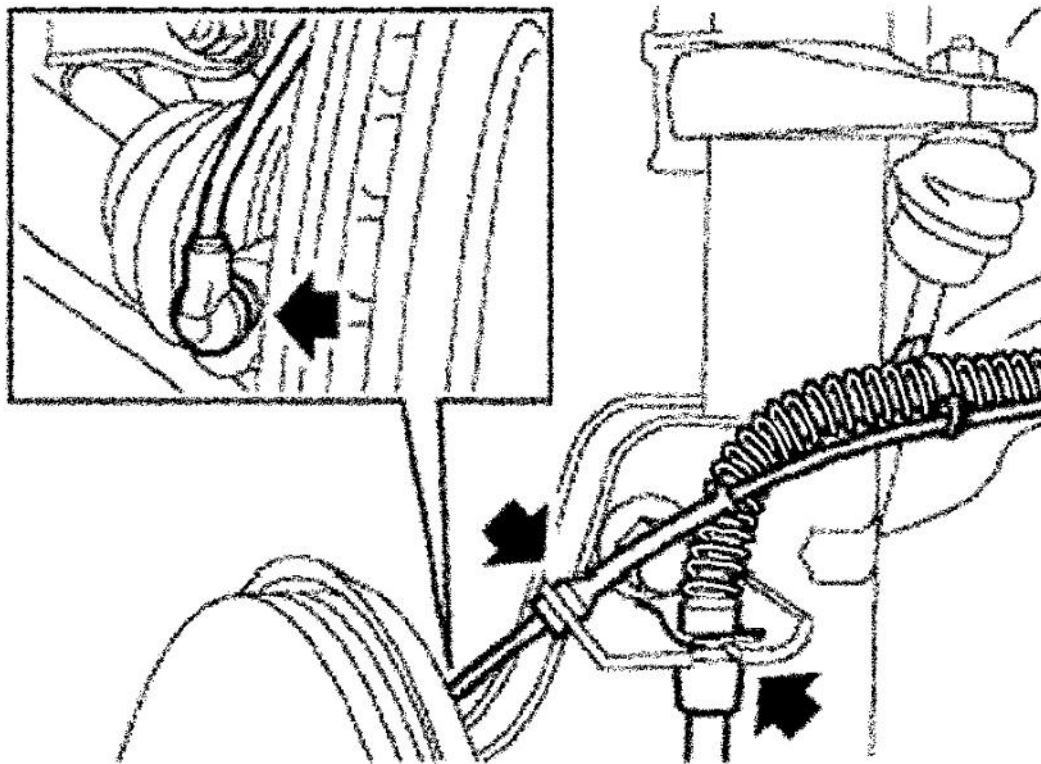
Fig. 72: Releasing Propeller Shaft From IRD Drive Flange
Courtesy of LAND ROVER NORTH AMERICA, INC.



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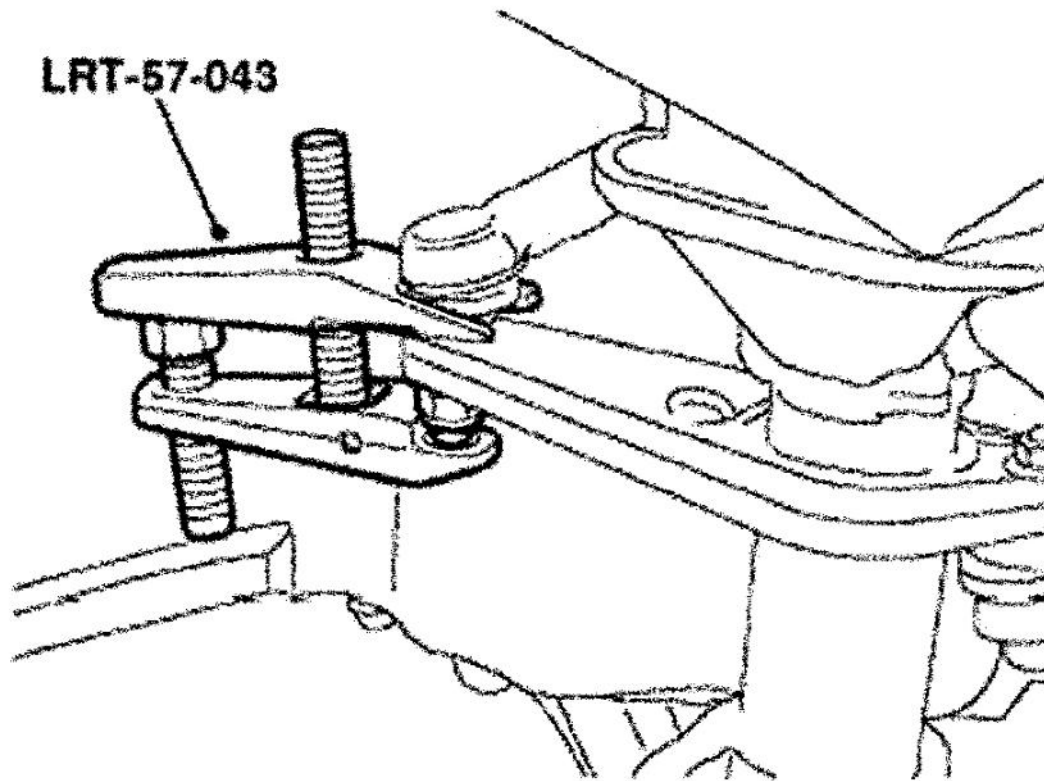
Fig. 73: Removing Splash Shield

Courtesy of LAND ROVER NORTH AMERICA, INC.



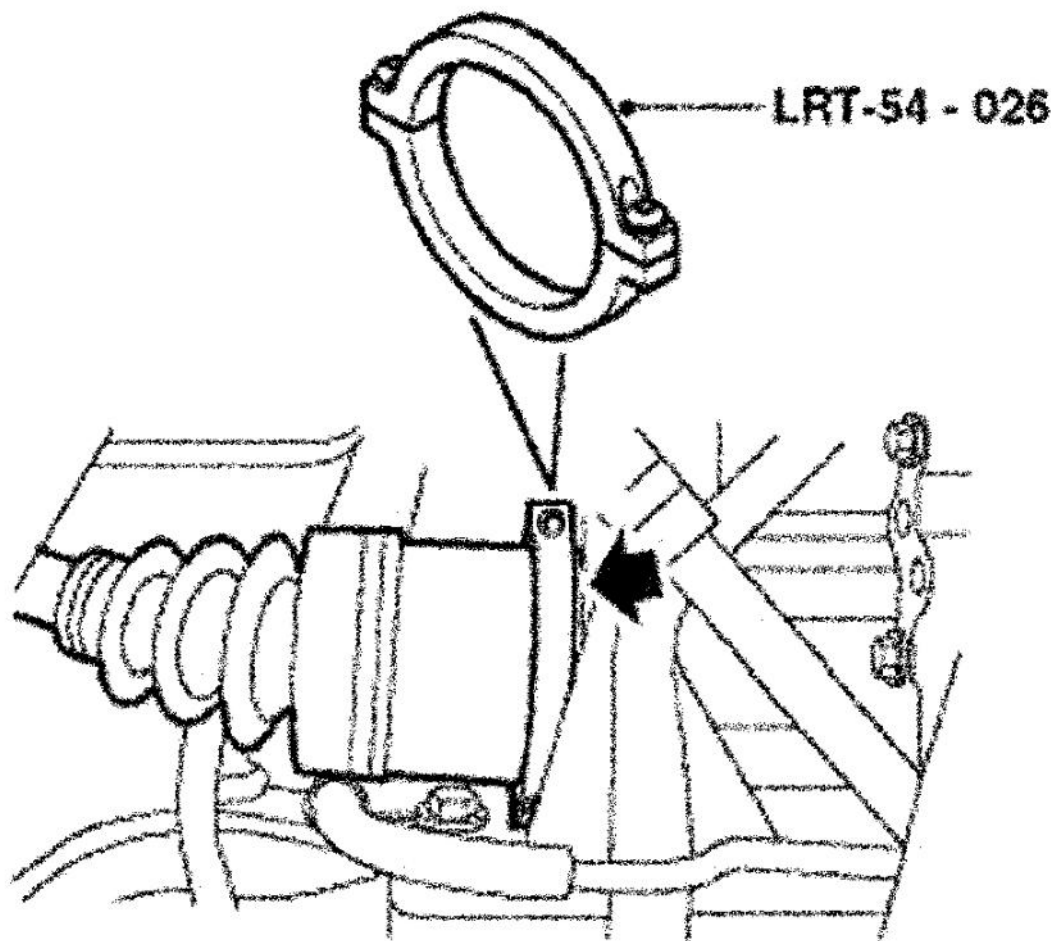
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Fig. 74: Removing Brake Hoses From Damper Bracket
Courtesy of LAND ROVER NORTH AMERICA, INC.



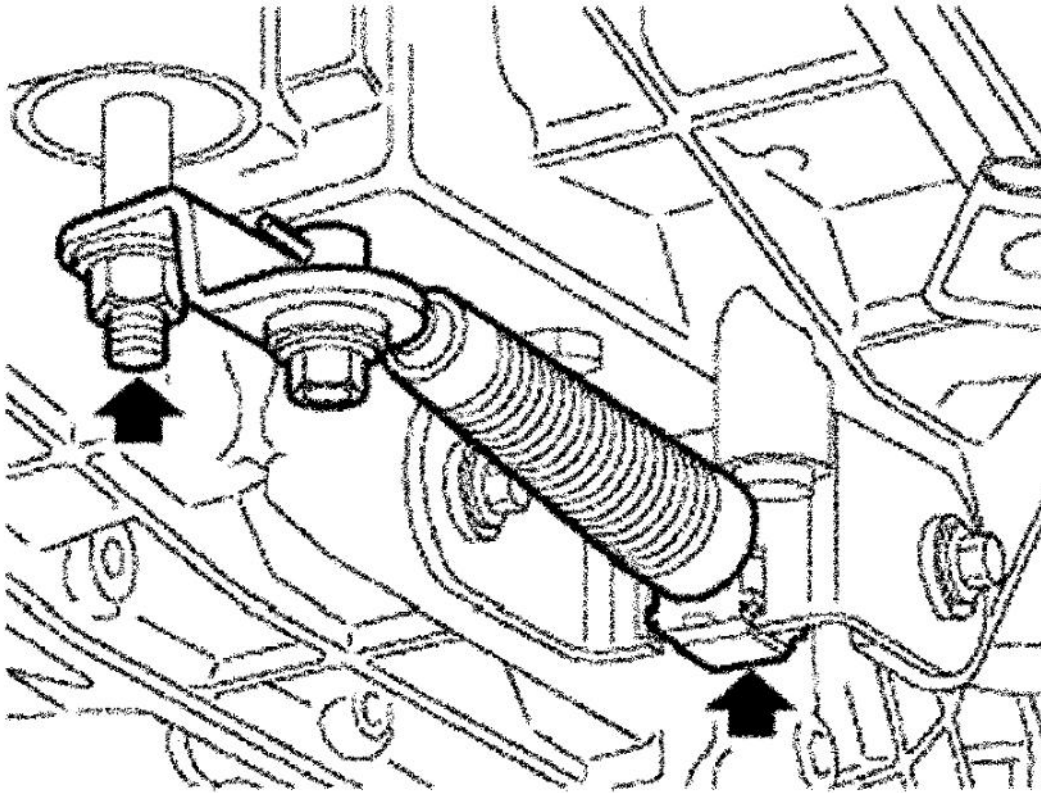
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Fig. 75: Removing Track Rod End Ball Joints
Courtesy of LAND ROVER NORTH AMERICA, INC.



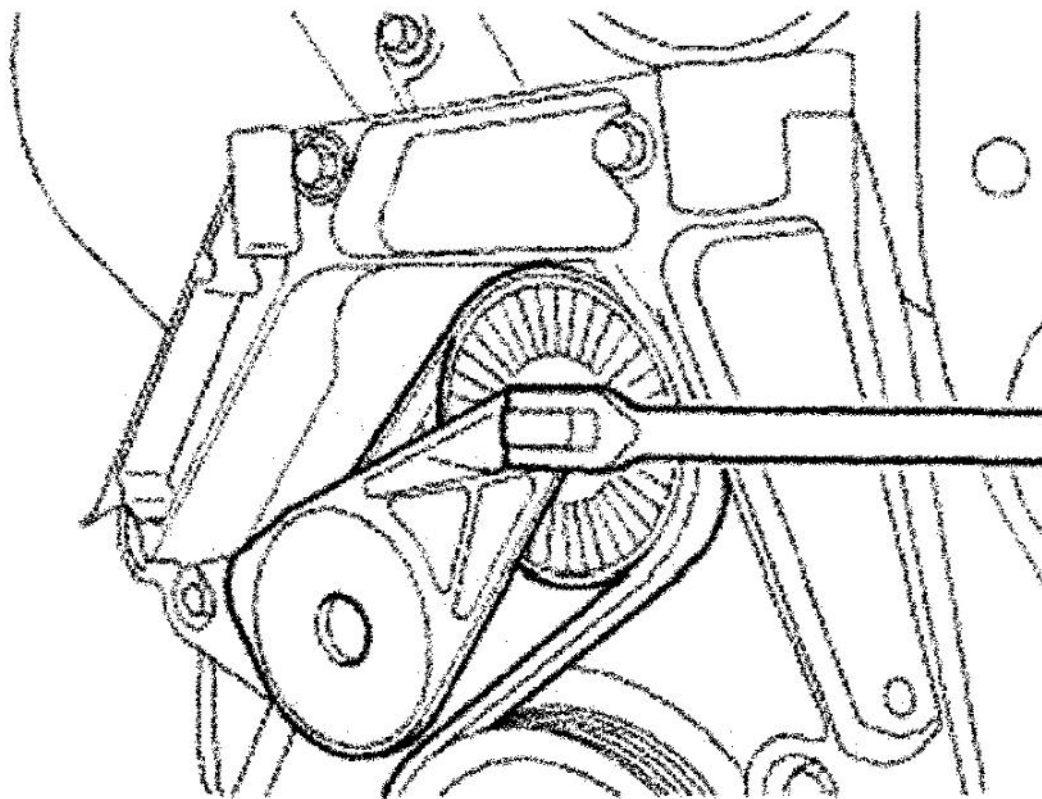
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Fig. 76: Releasing Drive Shafts From IRD Unit And Gearbox
Courtesy of LAND ROVER NORTH AMERICA, INC.



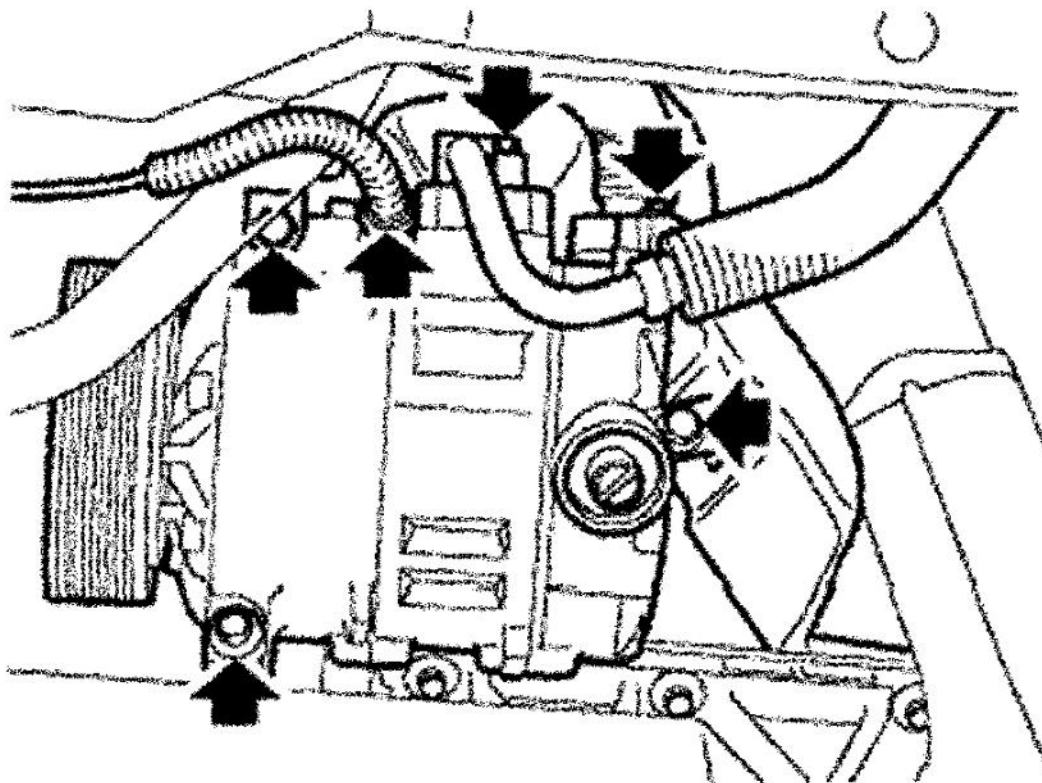
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Fig. 77: Removing Selector Lever From Selector Shaft
Courtesy of LAND ROVER NORTH AMERICA, INC.



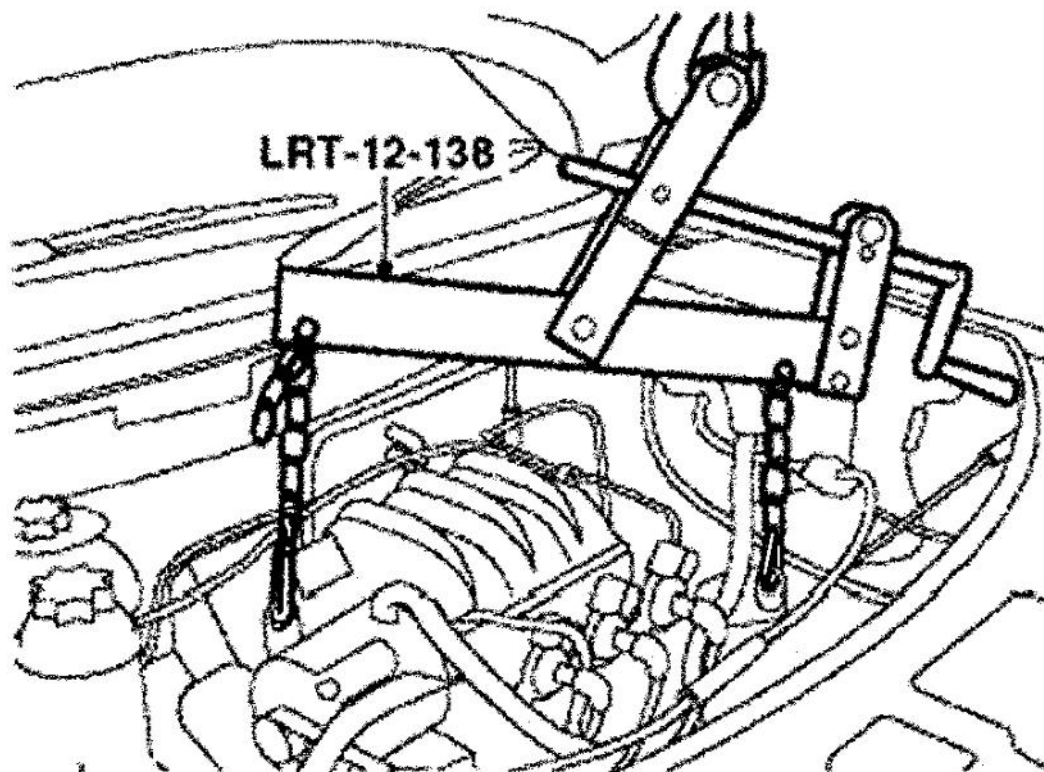
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Fig. 78: Releasing Drive Belt From A/C Compressor Pulley
Courtesy of LAND ROVER NORTH AMERICA, INC.



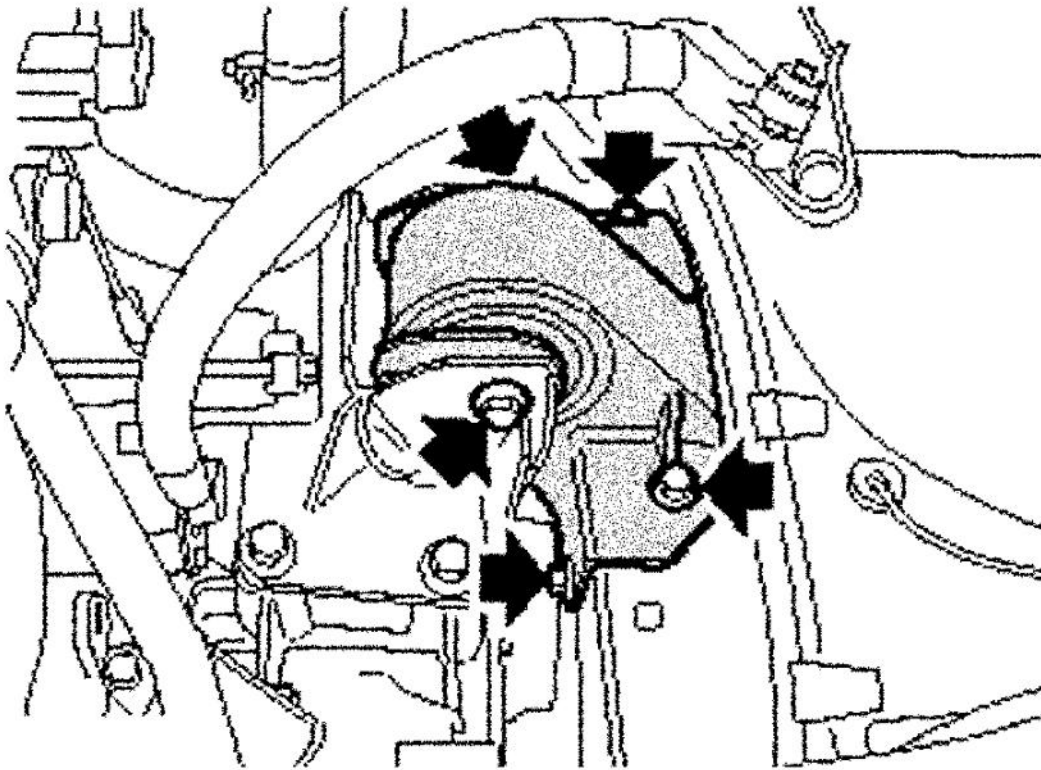
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Fig. 79: Disconnecting A/C Compressor
Courtesy of LAND ROVER NORTH AMERICA, INC.



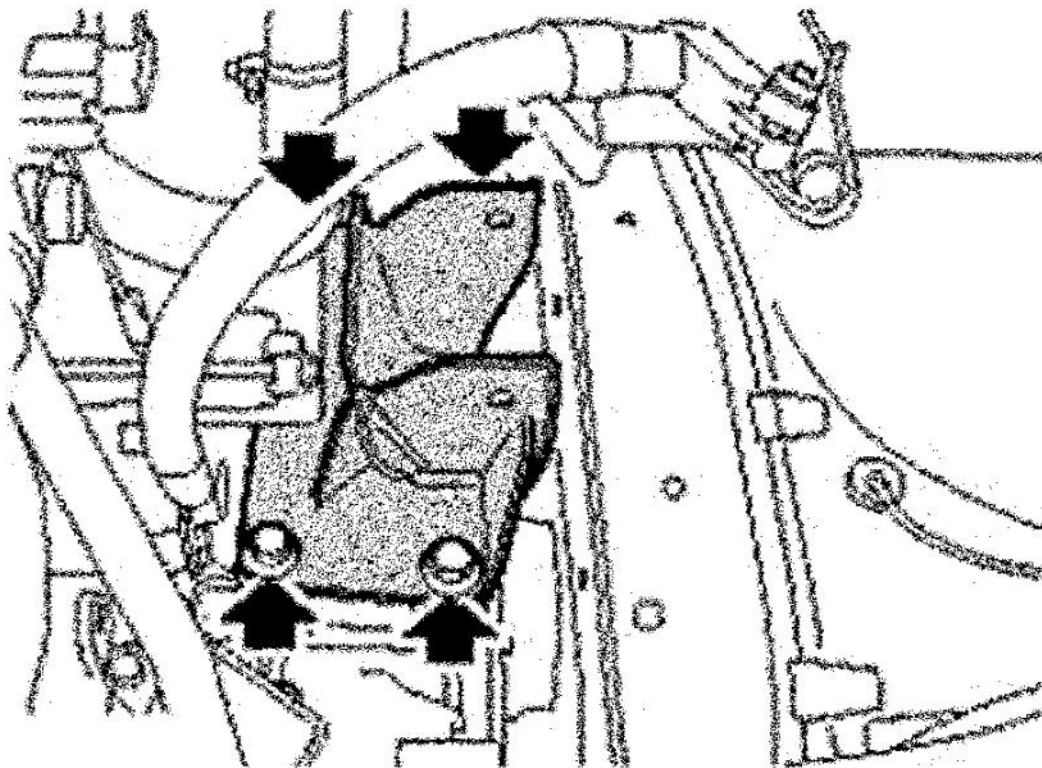
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Fig. 80: Connecting Adjustable Lifting Bracket To Engine
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381965

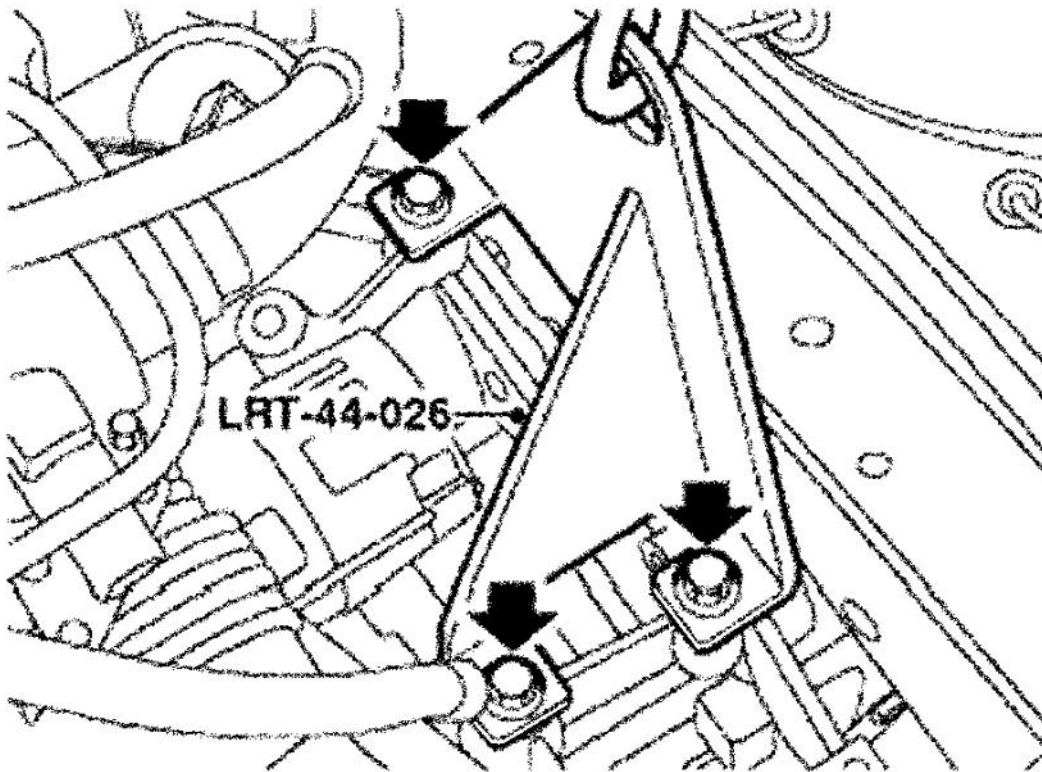
Fig. 81: Removing Through Bolt Securing Left Engine Mount
Courtesy of LAND ROVER NORTH AMERICA, INC.



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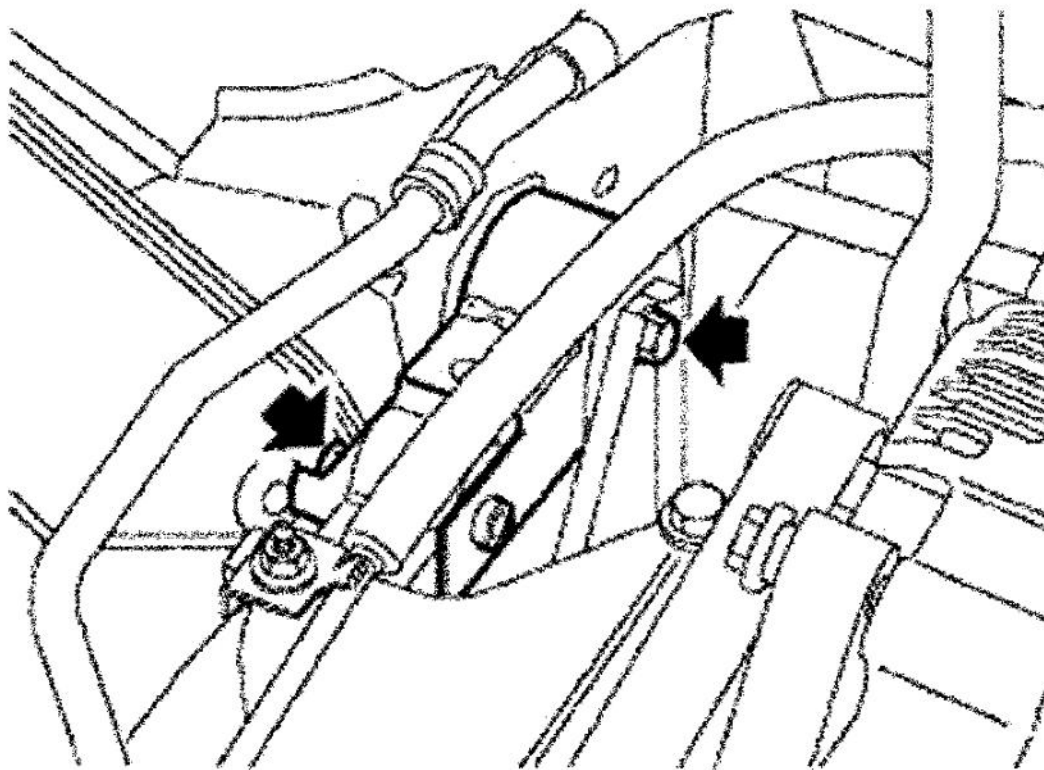
Fig. 82: Removing Left Mount Bracket

Courtesy of LAND ROVER NORTH AMERICA, INC.



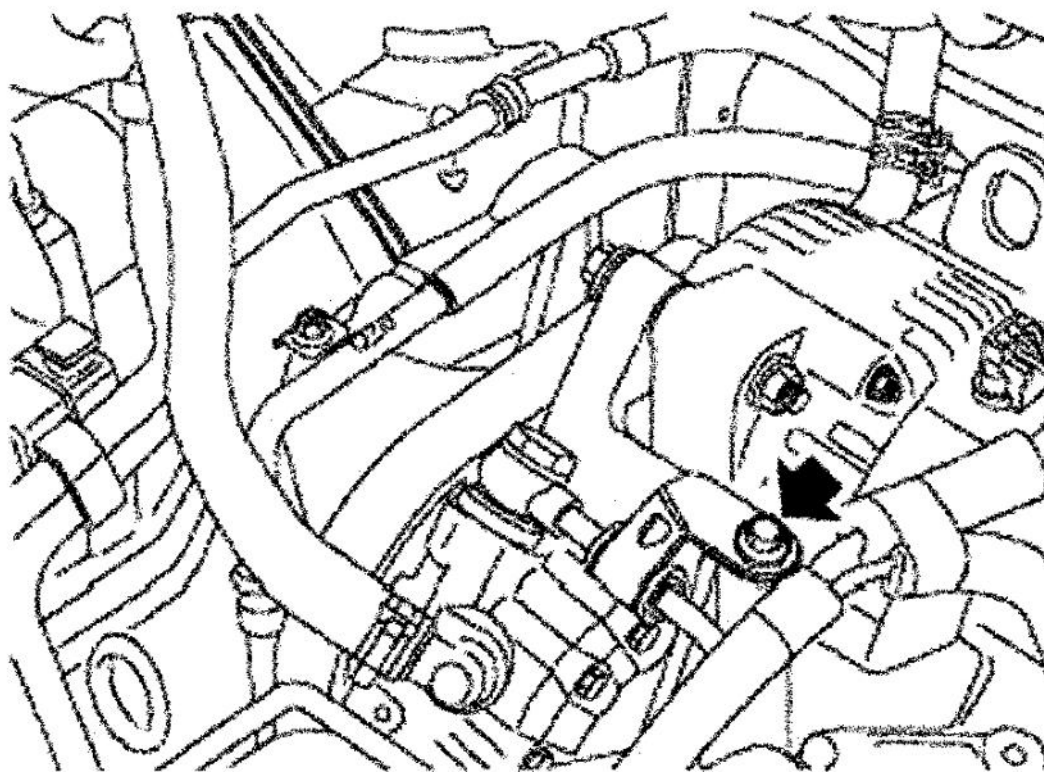
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Fig. 83: Installing Lifting Bracket To Gearbox
Courtesy of LAND ROVER NORTH AMERICA, INC.



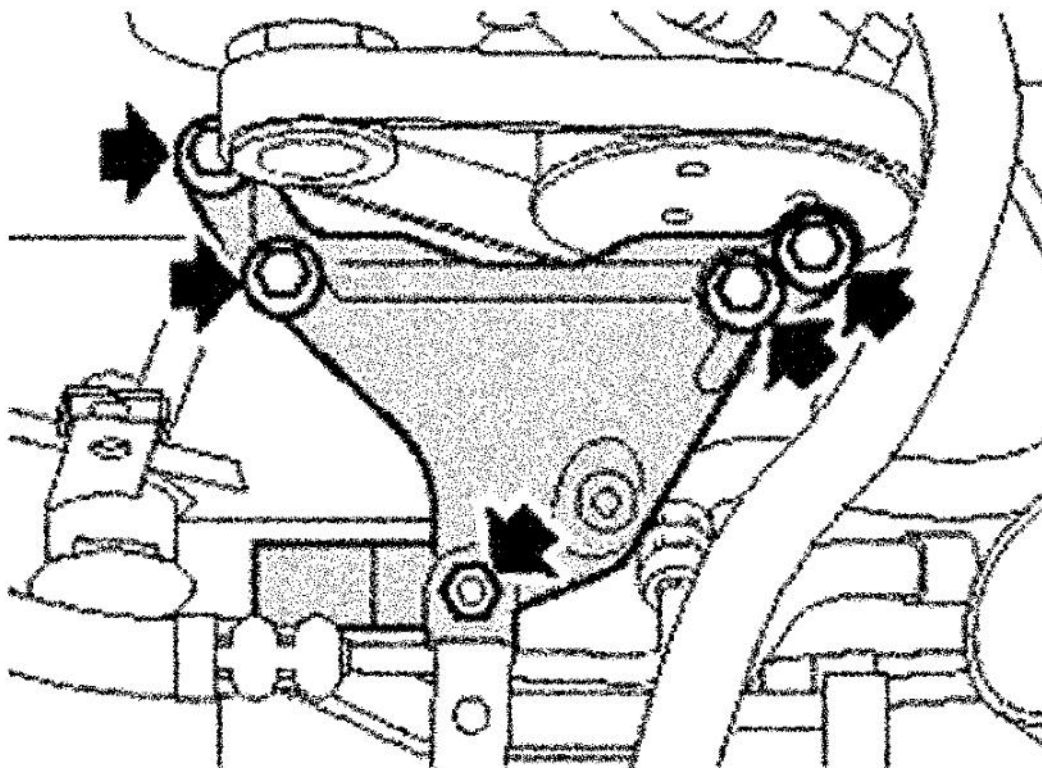
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Fig. 84: Removing Upper Right Engine Steady Bolt To Top Arm
Courtesy of LAND ROVER NORTH AMERICA, INC.



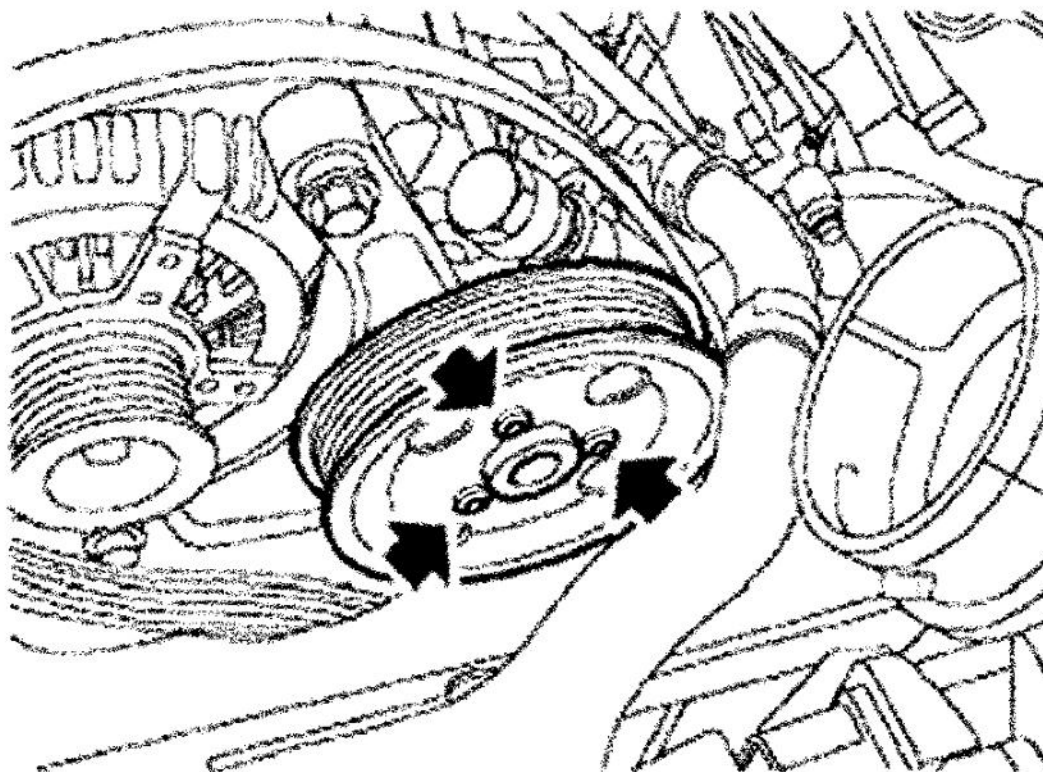
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Fig. 85: Removing PAS Pipe-To-Engine Front Mounting Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381970

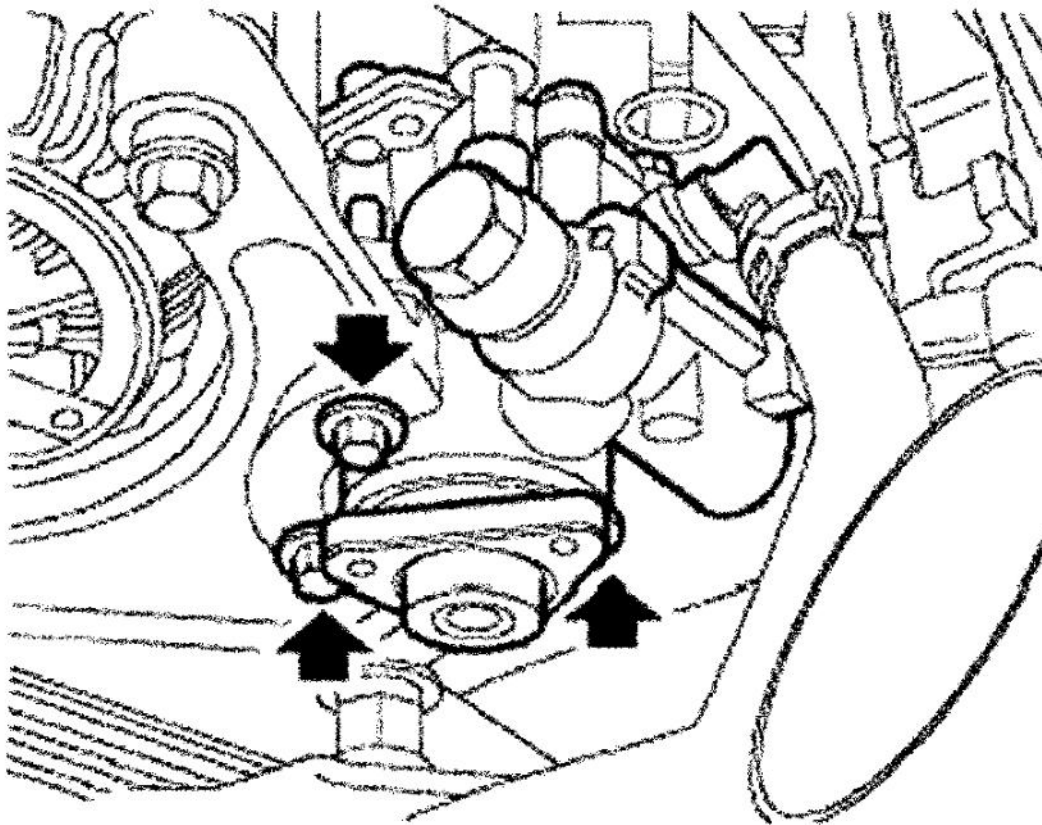
Fig. 86: Removing Engine Top Arm Bracket
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381971

Fig. 87: Removing PAS Pulley

Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381972

Fig. 88: Removing PAS Pump Bolts

Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. With assistance, raise engine and gearbox into engine compartment.
2. Position PAS pump to front mounting plate, fit and tighten bolts to 25 Nm (18 ft. lbs.).
3. Position PAS pump pulley, fit and tighten Torx screws to 9 Nm (7 ft. lbs.).
4. Position top arm to engine mounting bracket and right hydramount, fit and tighten bolts to 100 Nm (74 ft. lbs.).
5. Position PAS pipe support bracket to right hydramount, fit and tighten nut to 85 Nm (63 ft. lbs.).
6. Place a wooden block on jack, position jack under gearbox and raise jack sufficient to support weight of gearbox. Release lifting hook from lifting bracket on gearbox and connect to rear engine lifting bracket.
7. Lower and remove jack supporting gearbox.
8. Remove bolts securing LRT-44-026 lifting bracket to gearbox and remove bracket.
9. Position left mounting bracket to gearbox, fit and tighten bolts to 85 Nm (63 ft. lbs.).

10. Position left mounting to body, fit and tighten bolts to 48 Nm (35 ft. lbs.).
11. Align gearbox bracket to left body mounting, fit and tighten through bolt to 100 Nm (74 ft. lbs.).
12. Position upper right engine steady to top arm, fit and tighten bolt to 100 Nm (74 ft. lbs.).
13. Tighten bolt securing upper right engine steady to body to 100 Nm (74 ft. lbs.).
14. Position PAS pipe to engine front mounting plate, fit and tighten bolt to 25 Nm (18 ft. lbs.).
15. Lower hoist, disconnect and remove lifting bracket, LRT-12-138.
16. Raise vehicle on ramp.
17. Position A/C compressor to front mounting plate and cylinder block, align heat shield, fit and tighten bolts to 25 Nm (18 ft. lbs.).
18. Connect multiplug to A/C compressor.
19. Using a 3/8 square drive socket bar, raise ancillary drive belt tensioner and fit drive belt to pulleys.
20. Position selector cable to gearbox bracket and secure with clip.
21. Position selector lever to selector shaft, fit and tighten nut to 25 Nm (18 ft. lbs.).
22. Clean splines and seal areas on each driveshaft and mating faces in front hubs.
23. Fit new circlips to right and left driveshaft inner joint splines.
24. Fit driveshafts to IRD and gearbox, ensuring that the circlip on each driveshaft is fully engaged.
25. Engage left and right driveshafts into front hubs.
26. Fit new driveshaft flange nuts but do not tighten at this stage.
27. Clean ball joint tapers and taper seats.
28. Position left and right track rod ends to steering arms, fit new nuts and tighten to 55 Nm (40 ft. lbs.).
29. Clean ABS sensors and mating faces.
30. Apply anti-seize grease to both ABS sensors and position sensors in front hubs. Ensure ABS sensor is fully located into hub, so that sensor touches pole wheel teeth.
31. Position left and right brake hoses to front damper brackets and secure with clips
32. Position left and right splash shields, fit and tighten bolts.
33. Ensure mating face of propeller shaft and IRD drive flange are clean.
34. Fit propeller shaft to IRD flange and align marks. Tighten nuts and bolts to 42 Nm (31 ft. lbs.).
35. Fit rear beam. See **REAR BEAM** .
36. Fill IRD to correct level with fluid. See **INTERMEDIATE REDUCTION DRIVE (IRD)** .
37. Fit exhaust front pipe. See **30.10.09 FRONT PIPE -- NAS** .
38. With assistant depressing the brake pedal, tighten front hub nuts to 400 Nm (295 ft. lbs.).
39. Stake nut to shaft.
40. Fit front road wheels, fit and tighten nuts to 115 Nm (85 ft. lbs.).
41. Lower vehicle on ramp.
42. Connect brake servo vacuum hose to inlet manifold chamber.
43. Connect coolant hose to underside of expansion tank and secure with clip.
44. Connect expansion tank hose to inlet manifold and secure clip.
45. Connect top hose to radiator and secure with clip. Position hose in bracket.

46. Connect heater feed and return hoses and secure with clips.
47. Connect throttle inner cable to throttle cam and secure outer cable in abutment bracket, if fitted.
48. Secure throttle cable in clips on harness brackets, if fitted.
49. Adjust throttle cable, if fitted. See **19.20.05 THROTTLE CABLE -- CHECK AND ADJUST -- KV6**.
50. Connect hose to purge control valve.
51. Connect fuel hose to fuel rail pipe, fit rubber sleeve over hose connector.
52. Connect gearbox harness multiplugs and secure multiplugs in mounting bracket clips.
53. Connect Lucar connector to starter solenoid.
54. Position earth lead to gearbox housing, fit and tighten bolt to 25 Nm (18 ft. lbs.).
55. Position engine harness to "E" box mounting bracket and secure with clips.
56. Connect earth header multiplug.
57. Connect multiplug to underbonnet fuse box.
58. Position battery and starter motor lead to underbonnet fuse box, fit and tighten bolts to 8 Nm (6 ft. lbs.).
59. Fit underbonnet fuse box cover.
60. Position "E" box, secure in retaining clip, fit and tighten nut to 9 Nm (7 ft. lbs.).
61. Position carrier in "E" box and secure with clips.
62. Position and secure air duct and harness rubber sleeve in "E" box.
63. Connect multiplugs securing main harness to engine harness.
64. Position ECM harness and multiplug to "E" box, align harness clamp and secure screws to "E" box.
65. Fit Engine Control Module (ECM). See **18.30.01 ENGINE CONTROL MODULE (ECM) -- NON NAS**.
66. Fit battery carrier. See **BATTERY CARRIER**.
67. Fill cooling system. See **DRAINING & REFILLING COOLING SYSTEM**.
68. Connect battery earth lead. See **DISCONNECT/CONNECT**.
69. Fill gearbox with fluid. See **JATCO A/T -- DRAIN & REFILL**.
70. Fit engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.

ENGINE & AUTOMATIC GEARBOX - FROM MODEL YEAR 2003

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Tie bonnet back in upright position.
3. Drain cooling system. See **DRAINING & REFILLING COOLING SYSTEM**.
4. Remove the engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
5. Remove battery carrier. See **BATTERY CARRIER**.
6. Remove Engine Control Module (ECM). See **18.30.03 ENGINE CONTROL MODULE (ECM) -- FUEL -- NAS**.
7. Remove bolt securing heated front screen harness to battery positive cable. See **Fig. 89**.

8. Remove 2 screws securing harness clamp and remove clamp.
9. Release multiplug from "E" box and disconnect body harness from engine harness.
10. Move engine harness aside.
11. Disconnect multiplug from "E" box temperature sensor. See **Fig. 90**.
12. Disconnect multiplug from automatic gearbox ECU.
13. Disconnect "E" box cooling fan multiplug.
14. Release body harness clip from "E" box.
15. Move body harness aside.
16. Release air duct from "E" box. See **Fig. 91**.
17. Rotate heated front screen relay anti-clockwise and release it from "E" box bracket. See **Fig. 92**.
18. Release 4 clips and remove carrier from "E" box. See **Fig. 93**.
19. Remove nut, release retainer and remove "E" box. See **Fig. 94**.
20. Remove engine compartment fuse box cover. See **Fig. 58**.
21. Remove 2 bolts securing battery and starter lead to fuse box. See **Fig. 95**.
22. Disconnect multiplug from fuse box.
23. Disconnect earth header multiplug. See **Fig. 96**.
24. Release 3 clips securing engine harness to "E" box mounting bracket, lay harness over engine.
25. Remove bolt securing engine earth lead. See **Fig. 61**.
26. Disconnect Lucar from starter solenoid. See **Fig. 62**.
27. Release 2 gearbox harness multiplugs from mounting bracket clips and disconnect multiplugs. See **Fig. 97**.

WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

28. Position absorbent cloth around fuel feed pipe connection to collect spillage.
29. Pull back rubber sleeve on fuel pipe connector, release connector and disconnect fuel pipe from fuel rail pipe. See **Fig. 98**.

CAUTION: Always fit plugs to open connections to prevent contamination.

30. Release purge hose from clip.
31. Release and disconnect hose from purge control valve.

CAUTION: Always fit plugs to open connections to prevent contamination.

32. Release clips and disconnect heater feed and return hoses from matrix. See **Fig. 99**.

33. Release top hose from support bracket, release clip and disconnect top hose from radiator. See **Fig. 100**.
34. Release clip and disconnect expansion tank hose from inlet manifold. See **Fig. 101**.
35. Release clip and disconnect hose from underside of expansion tank. See **Fig. 69**.
36. Depress locking collar and disconnect brake servo hose from inlet manifold chamber. See **Fig. 70**.

CAUTION: Always fit plugs to open connections to prevent contamination.

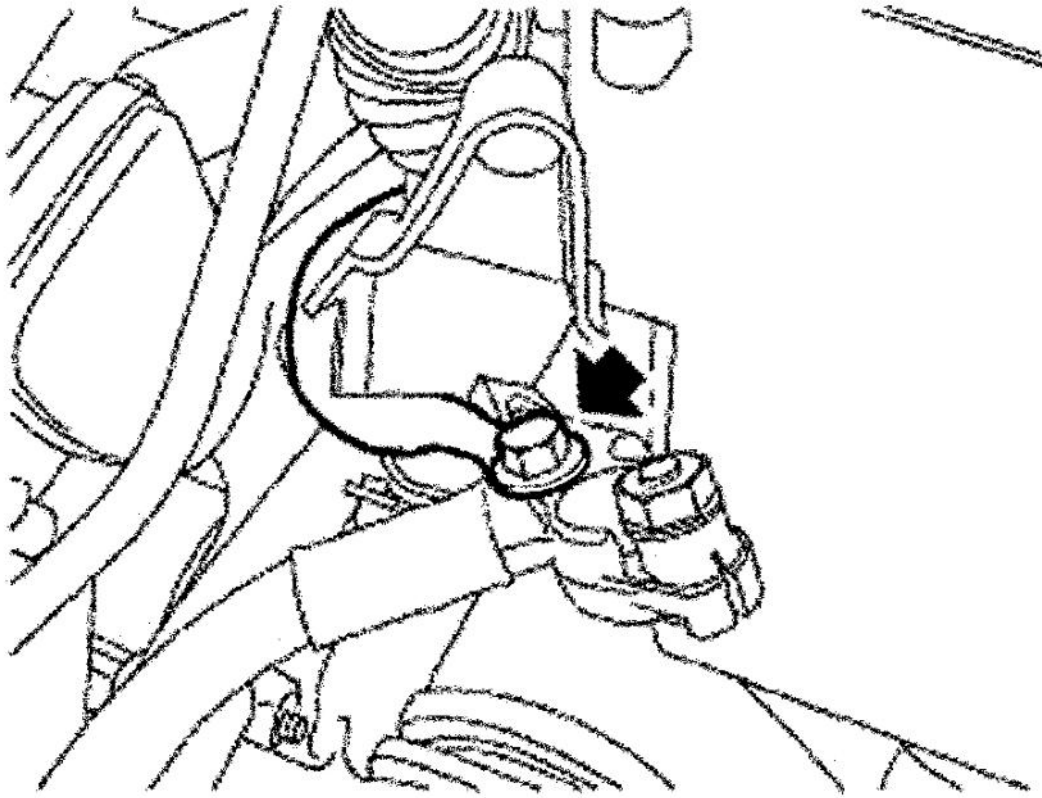
37. Raise vehicle on lift. See **JACKING**.
38. Remove front road wheels.
39. Release stake in drive shaft nuts.
40. With assistant depressing the brake pedal, remove and discard left and right drive shaft nuts. See **Fig. 71**.
41. Remove rear beam. See **REAR BEAM**.
42. Remove exhaust front pipe. See **30.10.09 FRONT PIPE -- NAS**.
43. Raise one rear wheel for rotation of propeller shaft to access bolts.
44. Reference mark position of viscous coupling flange to Intermediate Reduction Drive (IRD) unit flange to aid reassembly. See **Fig. 72**.
45. Remove 6 nuts and bolts securing propeller shaft to IRD drive flange

CAUTION: Care must be taken to support the Tripod joint when removed from the IRD unit. To avoid damage to gaiter or steel can, the joint should not be allowed to fully extend or be dropped.

46. Release propeller shaft from IRD drive flange and tie shaft aside.
47. Drain gearbox fluid. See **JATCO A/T -- DRAIN & REFILL**.
48. Drain fluid from IRD. See **INTERMEDIATE REDUCTION DRIVE (IRD)**.
49. Remove 6 bolts securing right and left front splash shields and remove shields. See **Fig. 73**.
50. Remove clips securing brake hoses to right and left damper brackets. See **Fig. 74**.
51. Release Anti-lock Brake System (ABS) sensor leads from bracket.
52. Release ABS sensors from right and left front hubs.
53. Remove nuts securing right and left track rod end ball joints. See **Fig. 75**.
54. Fit an M12 nut to each ball pin, flush with end of each pin.
55. Using LRT-57-043, separate ball pins from right and left steering arms. Remove M12 nuts and release ball pins from steering arms. See **Fig. 75**.
56. Pull right and left hubs outwards and release drive shafts from hubs.
57. Using LRT-54-026, release drive shafts from IRD unit and gearbox. See **Fig. 76**.
58. Remove nut securing selector lever to selector shaft on gearbox and release lever from selector shaft. See **Fig. 77**.
59. Release clip securing selector cable to gearbox bracket, remove cable and tie aside.
60. Using a 3/8 square drive socket bar, raise ancillary drive belt tensioner and release drive belt from A/C

compressor pulley. See **Fig. 78**.

61. Disconnect multiplug from A/C compressor. See **Fig. 79**.
62. Note fitted position of heat shield on A/C compressor and remove 3 bolts securing A/C compressor to front mounting plate and cylinder block. Release A/C compressor and heat shield and position aside.
63. Lower vehicle on lift.
64. Using a hoist, connect adjustable lifting bracket, LRT-12-138 to engine. See **Fig. 80**.
65. Raise hoist to take weight without exerting any load on the engine mountings.
66. Remove through bolt securing left engine mounting to gearbox bracket. See **Fig. 81**.
67. Remove 4 bolts securing left mounting to body and remove mounting.
68. Remove 4 bolts securing left mounting bracket to gearbox and remove bracket. See **Fig. 82**.
69. Using gearbox bracket bolts, secure LRT-44-026 lifting bracket to gearbox. See **Fig. 83**.
70. Place a wooden block on jack, position jack under gearbox and raise jack sufficient to support weight of gearbox. Release lifting hook from rear engine lifting bracket and connect to lifting bracket on gearbox.
71. Remove bolt securing upper right engine steady to top arm. See **Fig. 84**.
72. Loosen bolt securing upper right engine steady to body, pivot engine steady away from top arm.
73. Remove bolt securing PAS pipe to engine front mounting plate. See **Fig. 85**.
74. Remove nut and 4 bolts securing engine top arm bracket to right hydramount and to engine front mounting bracket. See **Fig. 86**.
75. Release Power Assisted Steering (PAS) pipe support bracket from hydramount and position pipe aside.
76. Remove bolt securing PAS pipe to engine front mounting plate.
77. Remove top arm.
78. Remove 3 Torx screws securing PAS pump pulley and remove pulley. See **Fig. 87**.
79. Remove 3 bolts securing PAS pump to front mounting plate and tie pump aside. See **Fig. 88**.
80. With assistance, maneuver and lower engine and gearbox to floor.



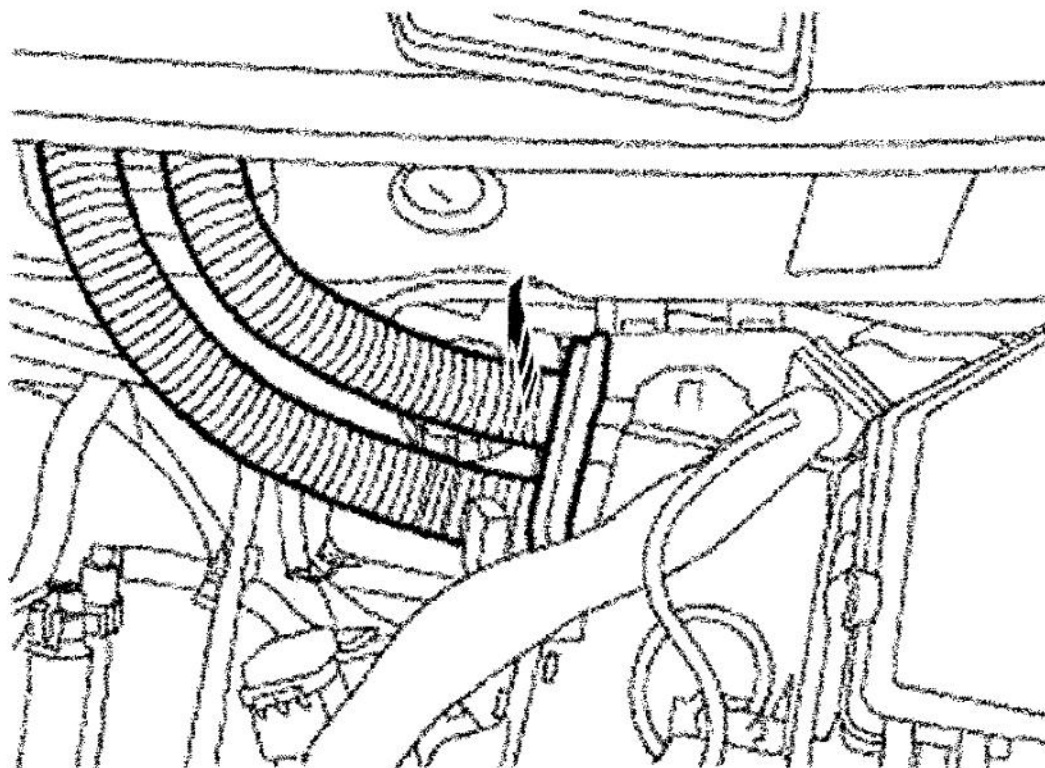
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Fig. 89: Removing Heated Front Screen Harness-To-Battery Positive Cable
Courtesy of LAND ROVER NORTH AMERICA, INC.



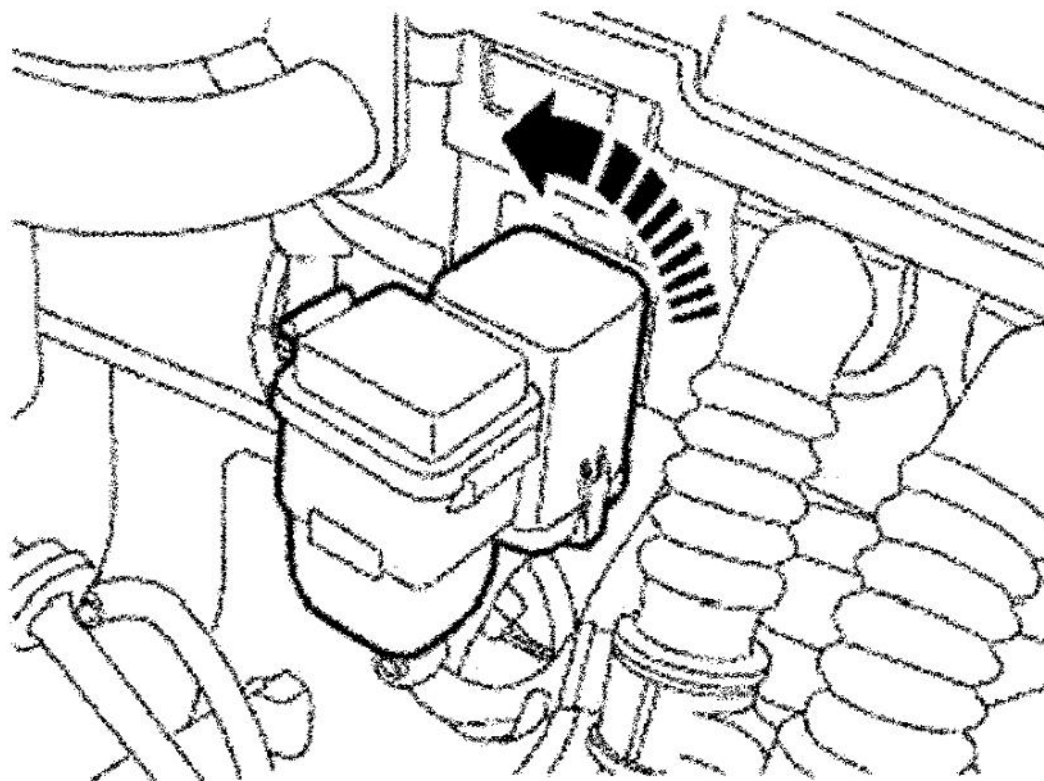
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Fig. 90: Disconnecting "E" Box Temperature Sensor Multiplug
Courtesy of LAND ROVER NORTH AMERICA, INC.



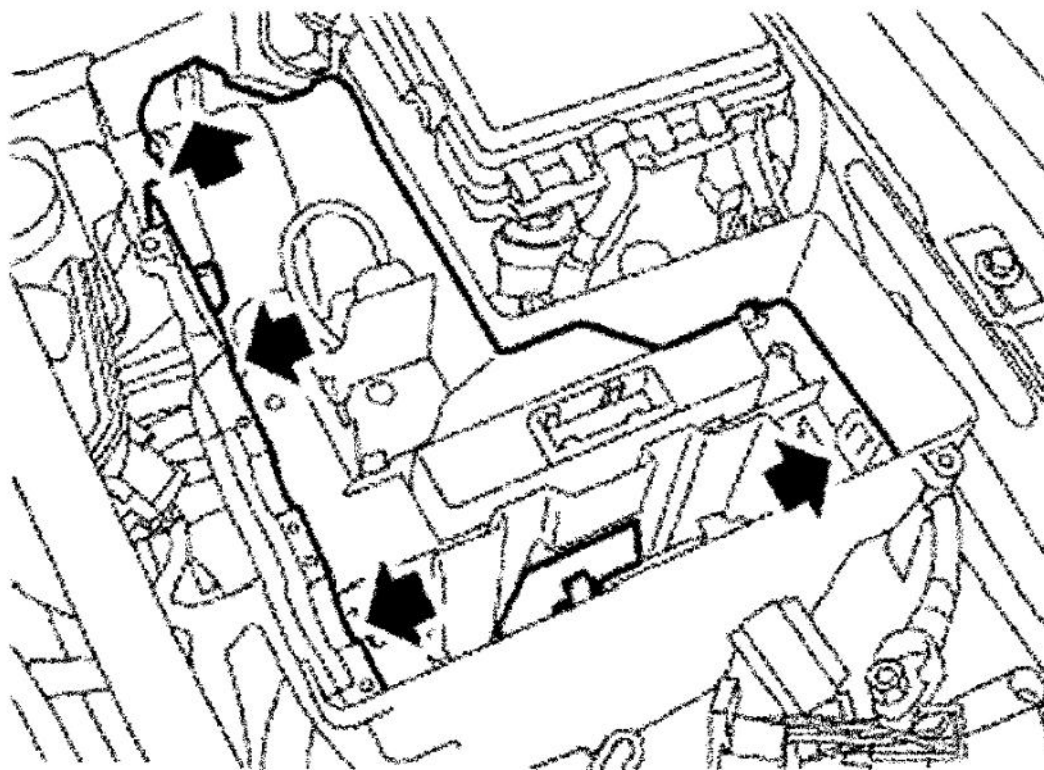
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Fig. 91: Releasing Air duct From "E" Box
Courtesy of LAND ROVER NORTH AMERICA, INC.



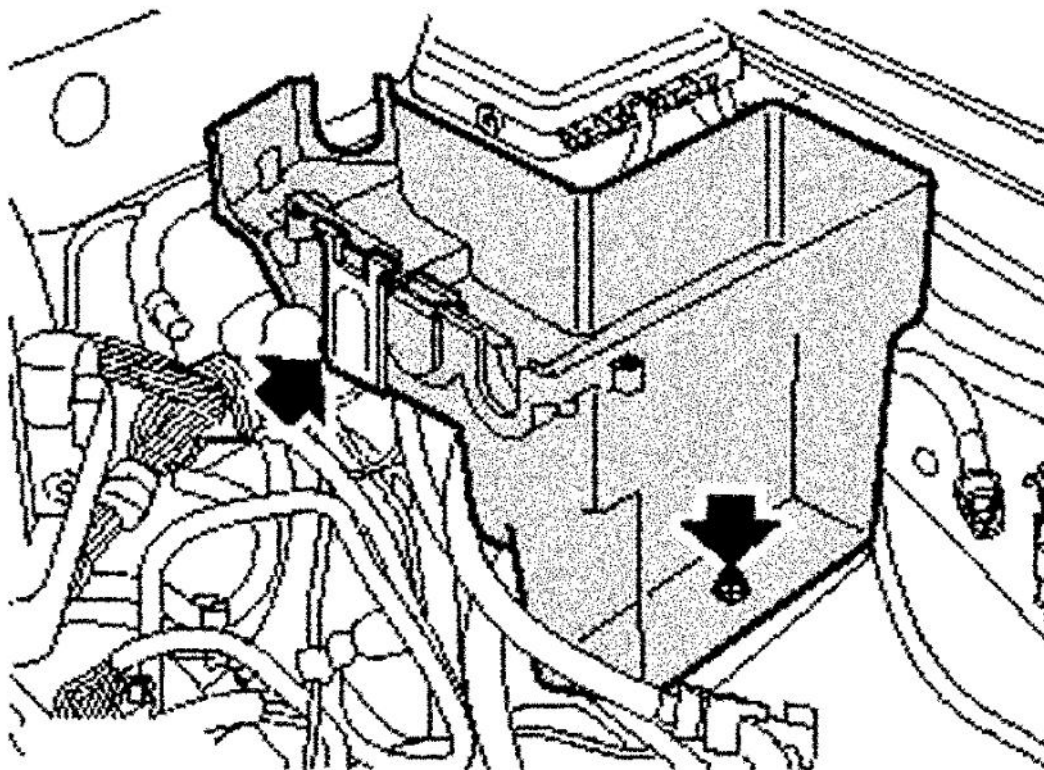
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Fig. 92: Removing Front Screen Relay
Courtesy of LAND ROVER NORTH AMERICA, INC.



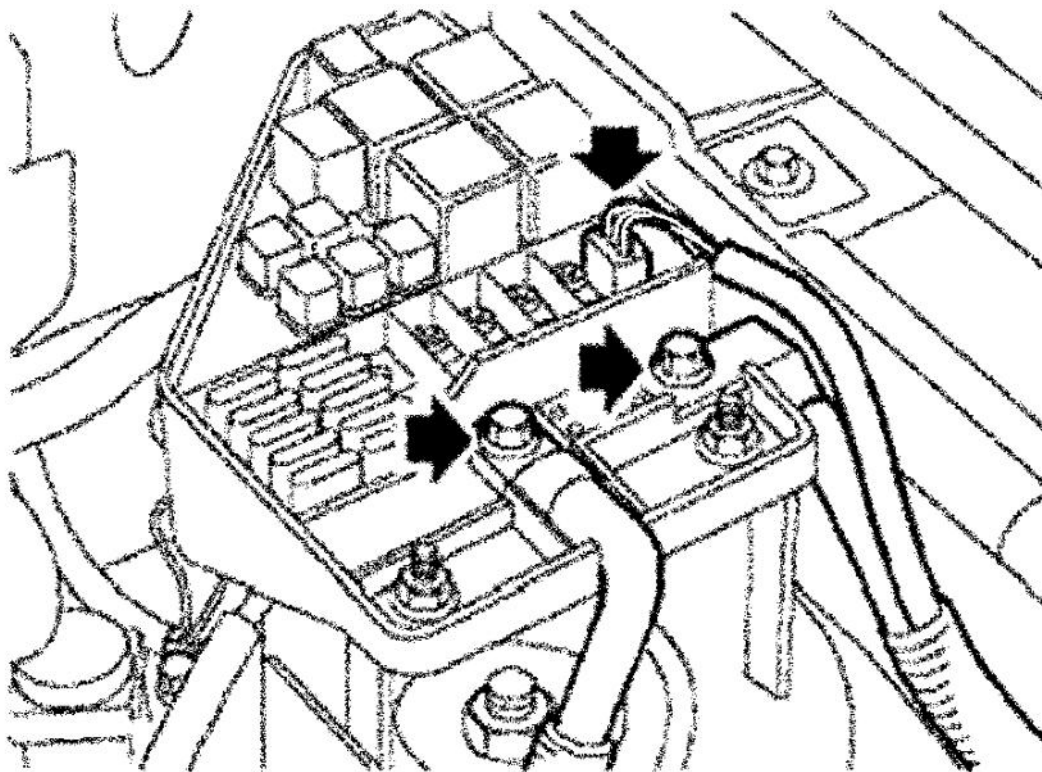
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Fig. 93: Removing Carrier From "E" Box
Courtesy of LAND ROVER NORTH AMERICA, INC.



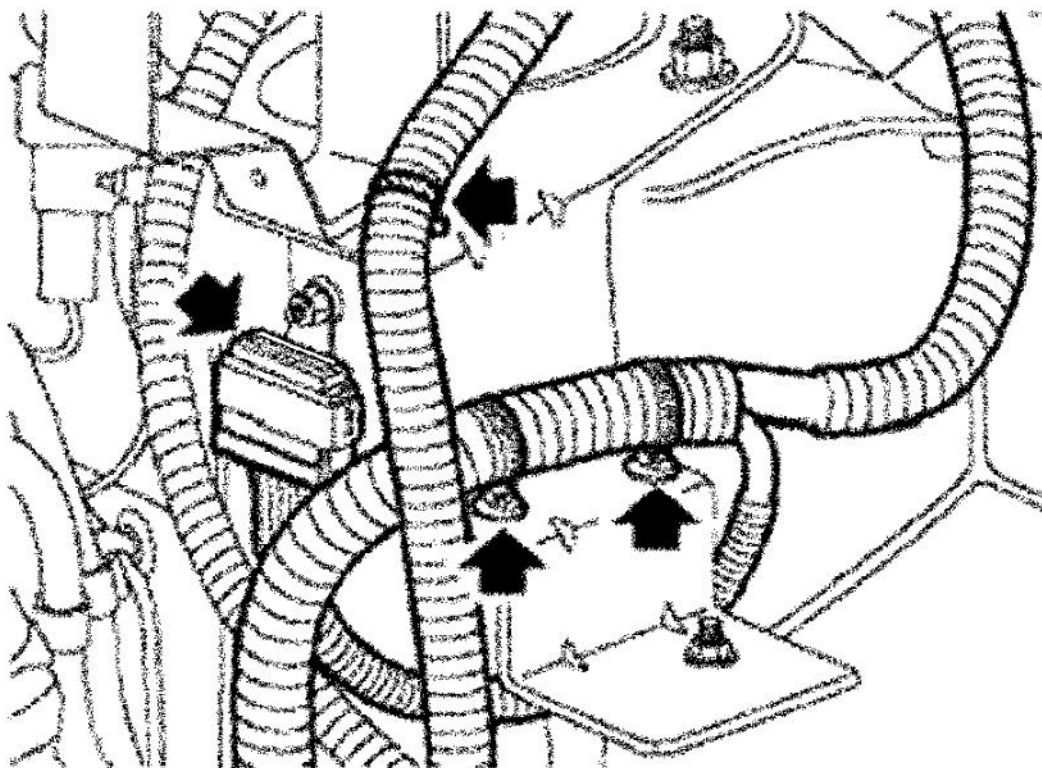
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Fig. 94: Removing "E" Box
Courtesy of LAND ROVER NORTH AMERICA, INC.



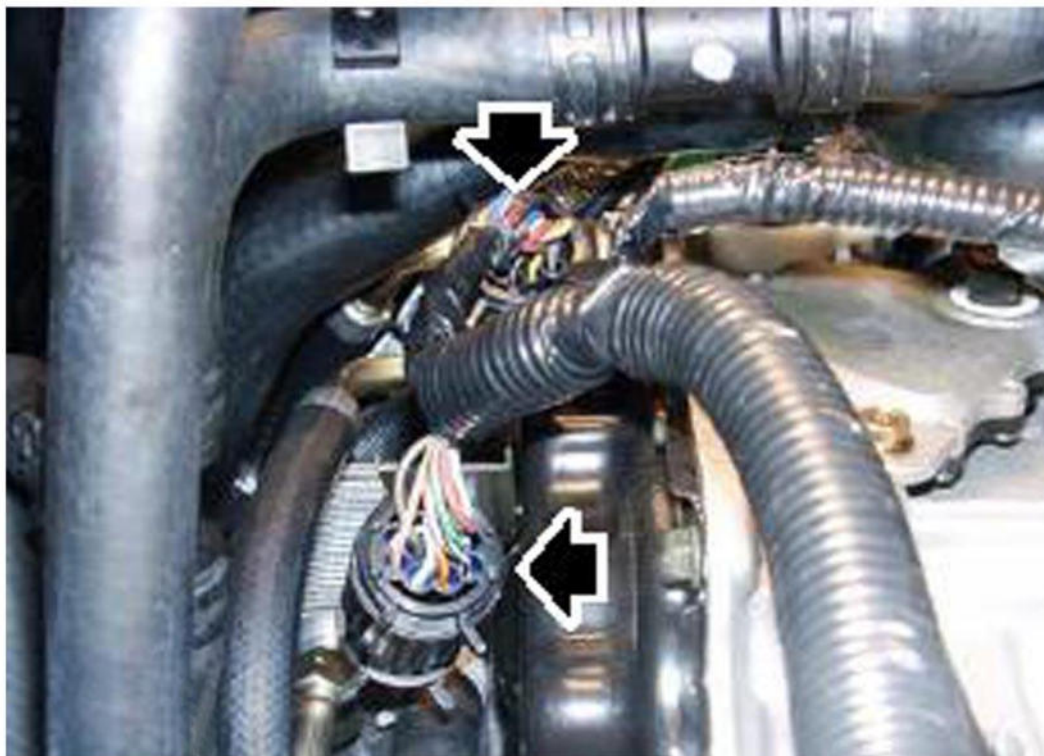
G00381979

Fig. 95: Removing Battery & Starter Lead Bolts
Courtesy of LAND ROVER NORTH AMERICA, INC.



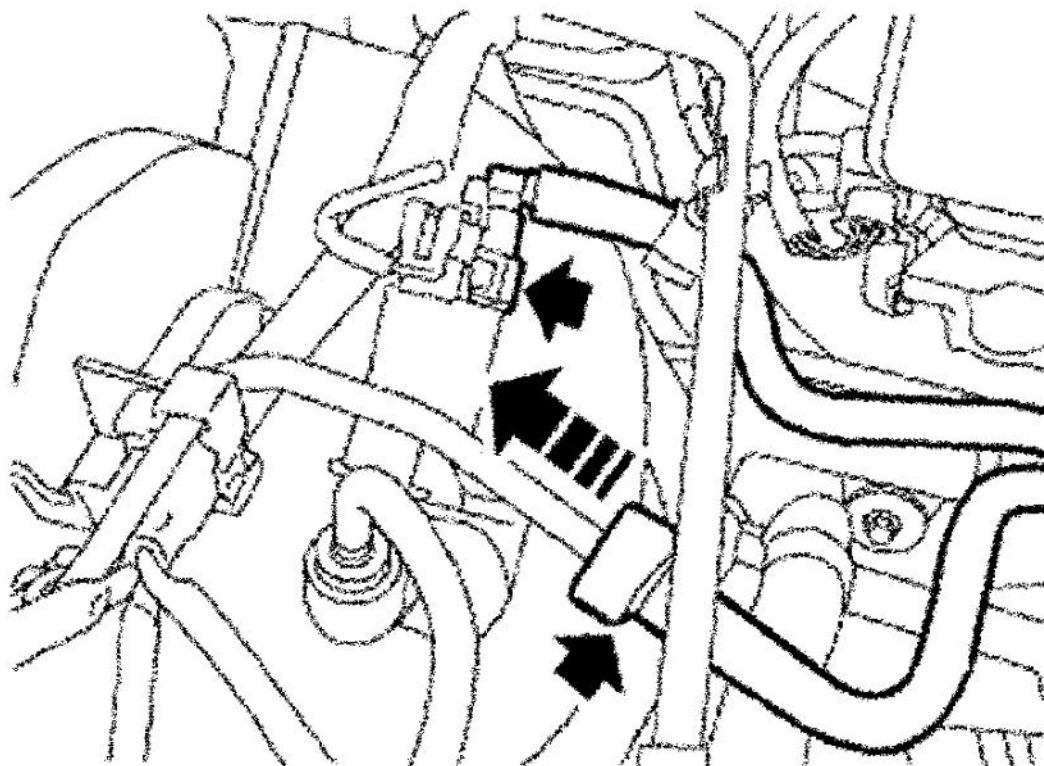
G00381980

Fig. 96: Disconnecting Earth Header Multiplug
Courtesy of LAND ROVER NORTH AMERICA, INC.



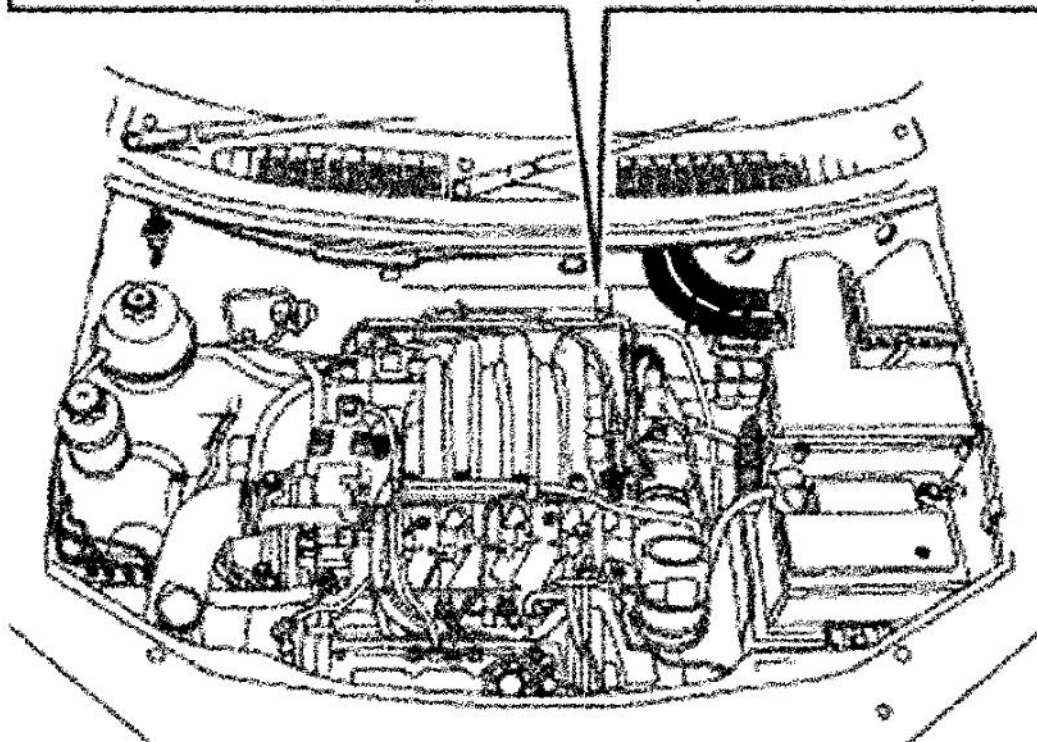
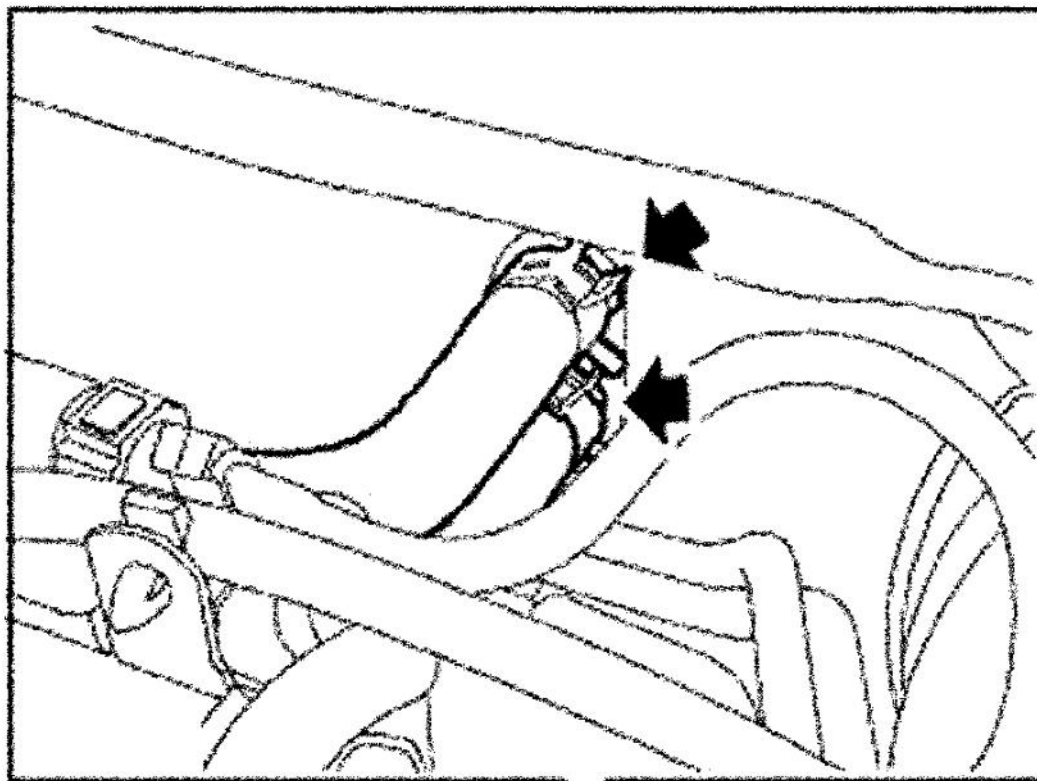
G00381981

Fig. 97: Releasing Gearbox Harness Multiplugs & Bracket
Courtesy of LAND ROVER NORTH AMERICA, INC.



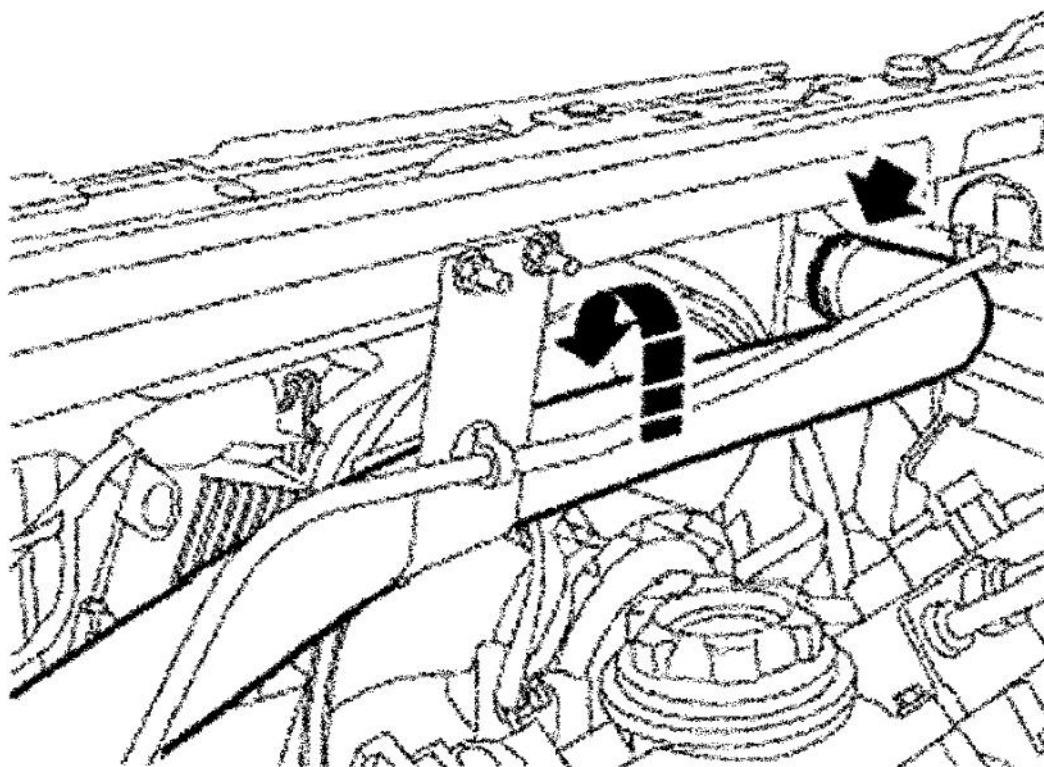
G00381982

Fig. 98: Disconnecting Fuel Pipe
Courtesy of LAND ROVER NORTH AMERICA, INC.



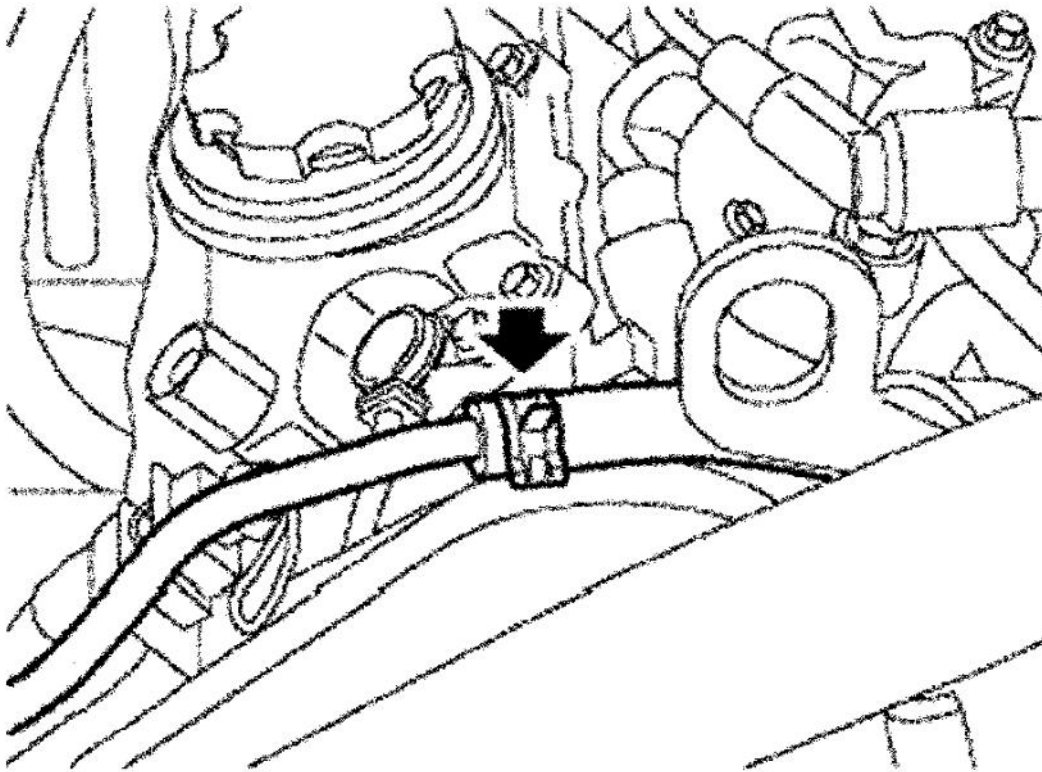
G00381983

Fig. 99: Disconnecting Heater Feed & Return Hoses From Matrix
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381984

Fig. 100: Releasing Top Hose From Support Bracket
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381985

Fig. 101: Disconnecting Expansion Tank Hose From Inlet Manifold

Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. With assistance, raise engine and gearbox into engine compartment.
2. Position Power Assisted Steering (PAS) pump to front mounting plate, fit and tighten bolts to 25 Nm (18 ft. lbs.).
3. Position PAS pump pulley, fit and tighten Torx screws to 9 Nm (7 ft. lbs.).
4. Position top arm to engine mounting bracket and right hydramount, fit and tighten bolts to 100 Nm (74 ft. lbs.).
5. Position PAS pipe support bracket to right hydramount, fit and tighten nut to 85 Nm (63 ft. lbs.).
6. Place a wooden block on jack, position jack under gearbox and raise jack sufficient to support weight of gearbox. Release lifting hook from lifting bracket on gearbox and connect to rear engine lifting bracket.
7. Lower and remove jack supporting gearbox.
8. Remove bolts securing LRT-44-026 lifting bracket to gearbox and remove bracket.
9. Position left mounting bracket to gearbox, fit and tighten bolts to 85 Nm (63 ft. lbs.).
10. Position left mounting to body, fit and tighten bolts to 48 Nm (35 ft. lbs.).

11. Align gearbox bracket to left body mounting, fit and tighten through bolt to 100 Nm (74 ft. lbs.).
12. Position upper right engine steady to top arm, fit and tighten bolt to 100 Nm (74 ft. lbs.).
13. Tighten bolt securing upper right engine steady to body to 100 Nm (74 ft. lbs.).
14. Position PAS pipe to engine front mounting plate, fit and tighten bolt to 25 Nm (18 ft. lbs.).
15. Lower hoist, disconnect and remove lifting bracket, LRT-12-138.
16. Raise vehicle on lift. See **JACKING** .
17. Position A/C compressor to front mounting plate and cylinder block, align heat shield, fit and tighten bolts to 25 Nm (18 ft. lbs.).
18. Connect multiplug to A/C compressor.
19. Using a 3/8" square drive socket bar, raise ancillary drive belt tensioner and fit drive belt to pulleys.
20. Position selector cable to gearbox bracket and secure with clip.
21. Position selector lever to selector shaft, fit and tighten nut to 25 Nm (18 ft. lbs.).
22. Clean splines and seal areas on each drive shaft and mating faces in front hubs.
23. Fit new circlips to right and left drive shaft inner joint splines.
24. Fit drive shafts to IRD and gearbox, ensuring that the circlip on each drive shaft is fully engaged.
25. Engage left and right drive shafts into front hubs.
26. Fit new drive shaft flange nuts but do not tighten at this stage.
27. Clean ball joint tapers and taper seats.
28. Position left and right track rod ends to steering arms, fit new nuts and tighten to 55 Nm (41 ft. lbs.).
29. Clean ABS sensors and mating faces.
30. Apply anti-seize grease to both ABS sensors and position sensors in front hubs.

CAUTION: Ensure ABS sensor is fully located into hub, so that sensor touches pole wheel teeth.

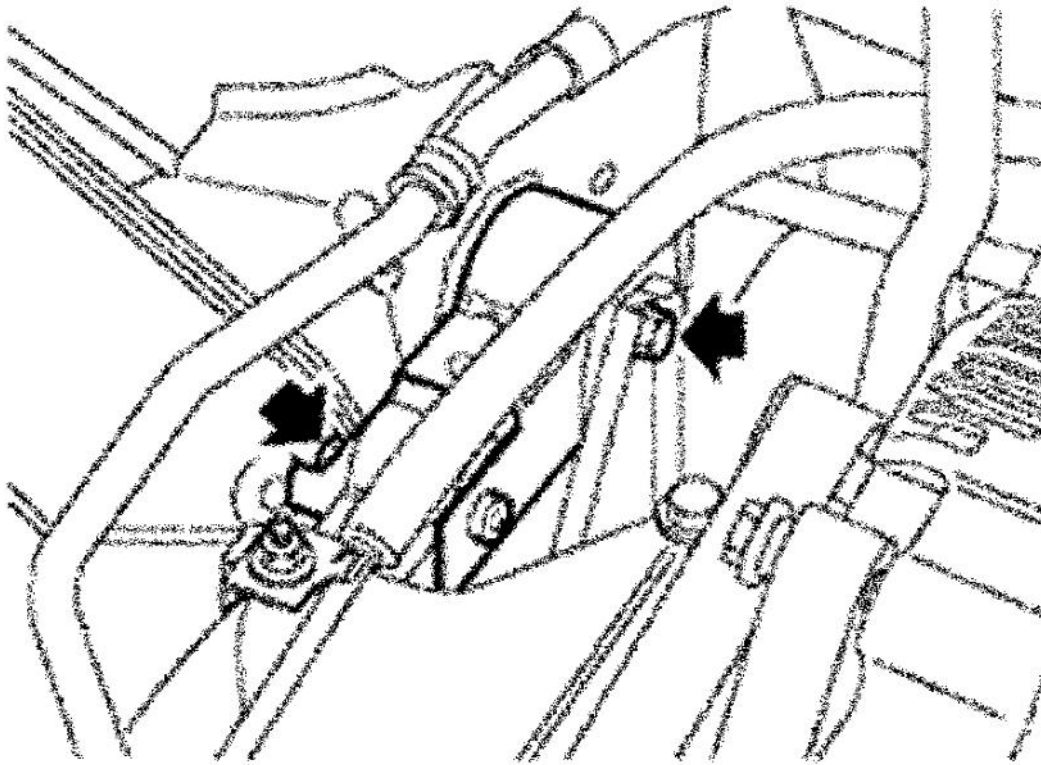
31. Position left and right brake hoses to front damper brackets and secure with clips.
32. Position left and right splash shields, fit and tighten bolts.
33. Ensure mating face of propeller shaft and IRD drive flange are clean.
34. Fit propeller shaft to IRD flange and align marks. Tighten nuts and bolts to 42 Nm (31 ft. lbs.).
35. Fit rear beam. See **REAR BEAM** .
36. Fill IRD to correct level with fluid. See **INTERMEDIATE REDUCTION DRIVE (IRD)** .
37. Fit exhaust front pipe. See **30.10.09 FRONT PIPE -- NAS** .
38. With assistant depressing the brake pedal, tighten front hub nuts to 400 Nm (295 ft. lbs.).
39. Stake nuts to drive shafts.
40. Fit front road wheels, fit and tighten nuts to 115 Nm (85 ft. lbs.).
41. Lower vehicle on lift. See **JACKING** .
42. Connect brake servo vacuum hose to inlet manifold chamber.
43. Connect coolant hose to underside of expansion tank and secure with clip.

44. Connect expansion tank hose to inlet manifold and secure clip.
45. Connect top hose to radiator and secure with clip. Position hose in bracket.
46. Connect heater feed and return hoses and secure with clips.
47. Connect throttle inner cable to throttle cam and secure outer cable in abutment bracket.
48. Connect hose to purge valve.
49. Fit purge hose into clip.
50. Connect fuel hose to fuel rail pipe, fit rubber sleeve over hose connector.
51. Connect gearbox harness multiplugs and secure multiplugs in mounting bracket clips.
52. Connect Lucar connector to starter solenoid.
53. Position earth lead to gearbox housing, fit and tighten bolt to 25 Nm (18 ft. lbs.).
54. Position engine harness to "E" box mounting bracket and secure with clips.
55. Connect earth header multiplug.
56. Connect multiplug to under bonnet fuse box.
57. Position battery and starter motor lead to under bonnet fuse box, fit and tighten bolts to 8 Nm (6 ft. lbs.).
58. Fit under bonnet fuse box cover.
59. Position "E" box, secure in retaining clip, fit and tighten nut to 9 Nm (7 ft. lbs.).
60. Fit carrier to "E" box.
61. Fit air ducting to "E" box.
62. Fit body harness to "E" box, secure grommet and harness clip.
63. Connect "E" box cooling fan multiplug.
64. Connect multiplug to "E" box temperature sensor.
65. Connect multiplug to gearbox ECU.
66. Position engine harness to "E" box and secure grommet.
67. Fit engine harness clamp and secure with screws.
68. Connect engine harness multiplug to body harness multiplug and fit multiplug to "E" box.
69. Fit heated front screen harness to battery positive cable and tighten bolt to 15 Nm (11 ft. lbs.).
70. Fit Engine Control Module (ECM). See **18.30.01 ENGINE CONTROL MODULE (ECM) -- NON NAS** .
71. Fit battery carrier. See **BATTERY CARRIER** .
72. Fill cooling system. See **DRAINING & REFILLING COOLING SYSTEM** .
73. Connect the battery earth lead. See **DISCONNECT/CONNECT** .
74. Fill gearbox with fluid. See **JATCO A/T -- DRAIN & REFILL** .
75. Fit the engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
76. Untie and close bonnet (hood).

ARM ASSEMBLY - ENGINE MOUNTING RIGHT

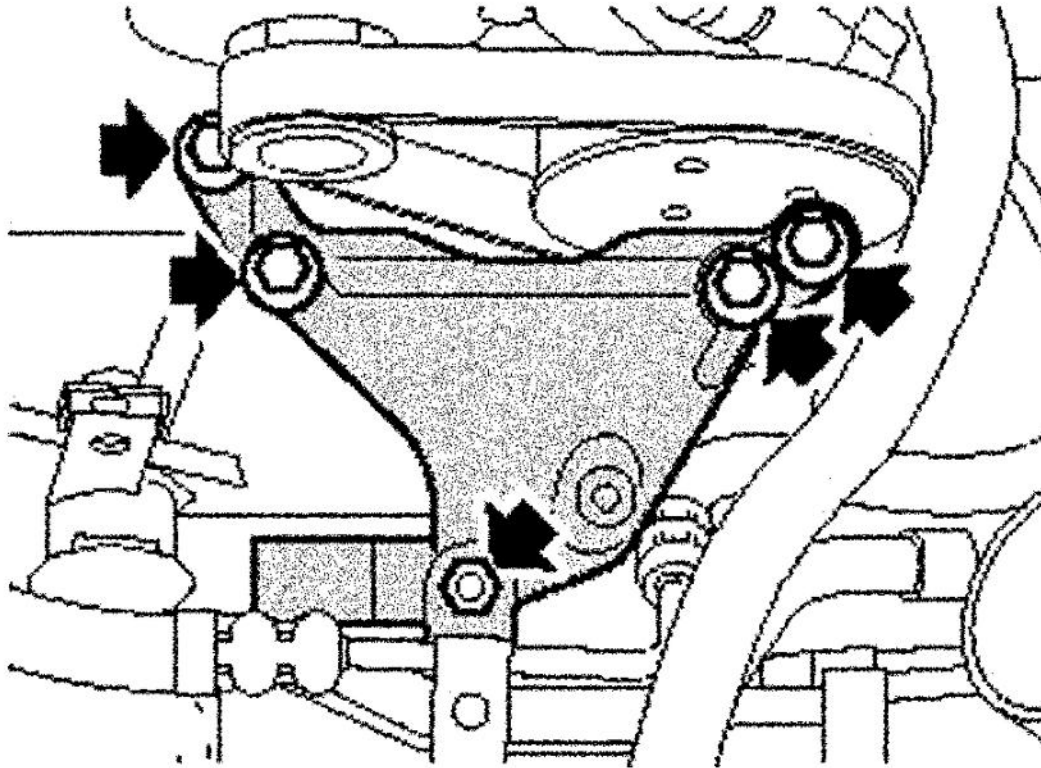
Removal

1. Remove underbelly panel. See **UNDERBELLY PANEL** .
2. Remove engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
3. Remove bolt securing upper right engine steady to top arm. See **Fig. 102**.
4. Loosen bolt securing upper right engine steady to body, pivot engine steady away from top arm.
5. Fit wooden block to jack, position jack under engine sump to support engine.
6. Remove nut and 4 bolts securing engine top arm bracket to right hydramount and to engine front mounting bracket. See **Fig. 103**.
7. Release Power Assisted Steering (PAS) pipe support bracket from hydramount and position pipe aside.
8. Remove top arm.



G00381986

Fig. 102: Removing Upper Right Engine Steady-To-Top Arm
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381987

Fig. 103: Removing Engine Top Arm Bracket To Right Hydramount & Engine Front Mounting Bracket
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

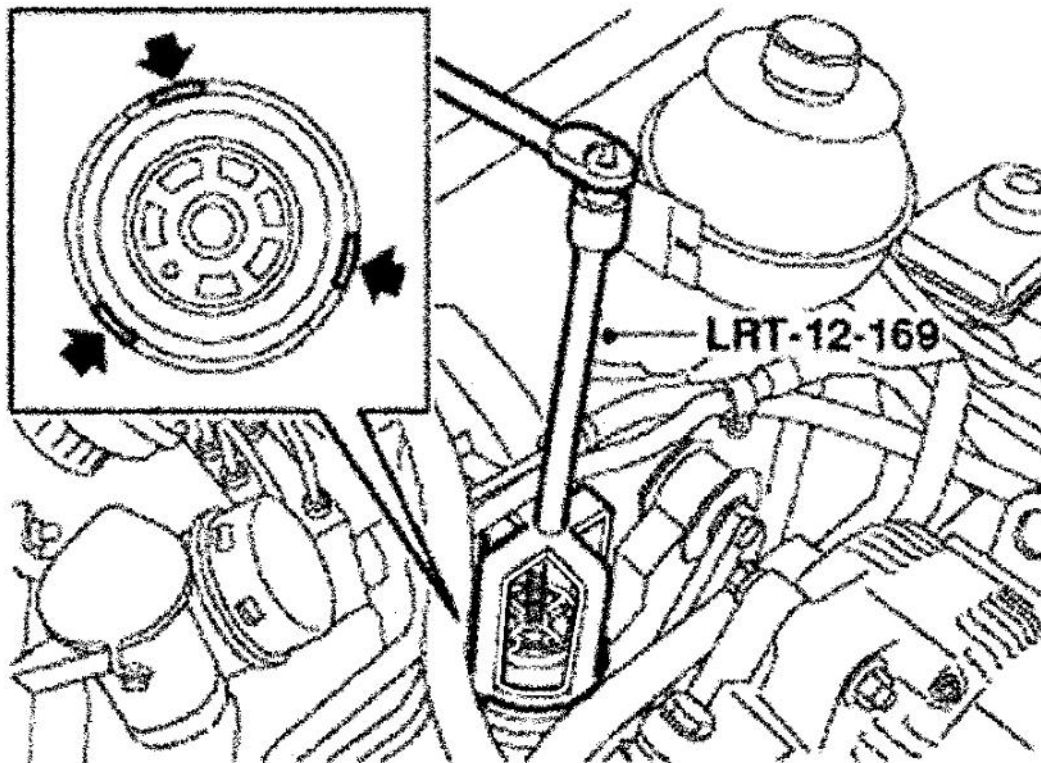
1. Position top arm to front engine mounting bracket, fit and tighten bolts to 100 Nm (74 ft. lbs.).
2. Lower and remove jack supporting engine.
3. Position Power Assisted Steering (PAS) pipe support bracket to hydramount.
4. Fit nut securing top arm to right hydramount and tighten to 85 Nm (63 ft. lbs.).
5. Position upper right engine steady to top arm, fit and tighten bolt to 100 Nm (74 ft. lbs.).
6. Tighten bolt securing upper right engine steady to body to 100 Nm (74 ft. lbs.).
7. Fit underbelly panel. See **UNDERBELLY PANEL**.
8. Fit engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.

HYDRAMOUNT - ENGINE - RIGHT

Removal

1. Remove top arm. See **ARM ASSEMBLY - ENGINE MOUNTING RIGHT**.

2. Position 3 pegs on LRT-12-169 into 3 slots in hydramount. See **Fig. 104**.
3. Connect a suitable socket bar to LRT-12-169, loosen and remove hydramount and LRT-12-169.



G00381988

Fig. 104: Removing Hydramount

Courtesy of LAND ROVER NORTH AMERICA, INC.

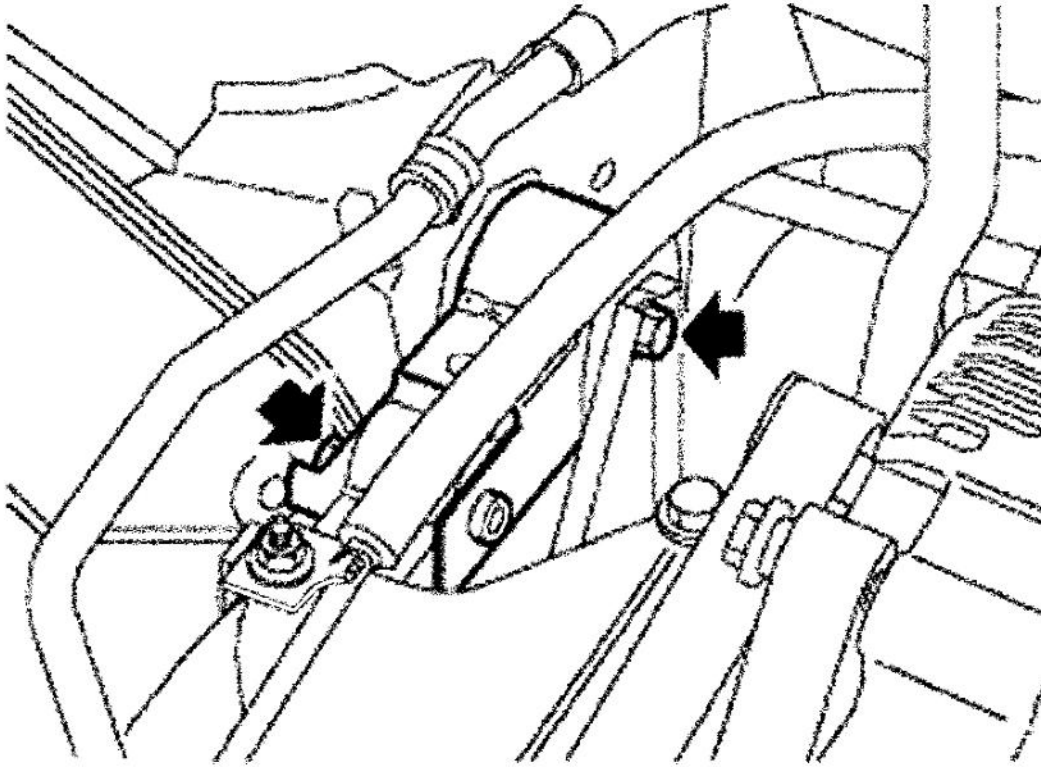
Installation

1. Clean hydramount and body mating faces.
2. Position hydramount to body.
3. Position 3 pegs on LRT-12-169 into 3 slots in hydramount.
4. Tighten hydramount to 85 Nm (63 ft. lbs.).
5. Fit top arm. See **ARM ASSEMBLY - ENGINE MOUNTING RIGHT**.

ENGINE STEADY - UPPER RIGHT**Removal**

1. Remove 2 bolts securing right engine steady to top arm and body. See **Fig. 105**.

2. Remove engine steady from mounting brackets.



G00381989

Fig. 105: Removing Engine Steady (Upper Right)
Courtesy of LAND ROVER NORTH AMERICA, INC.

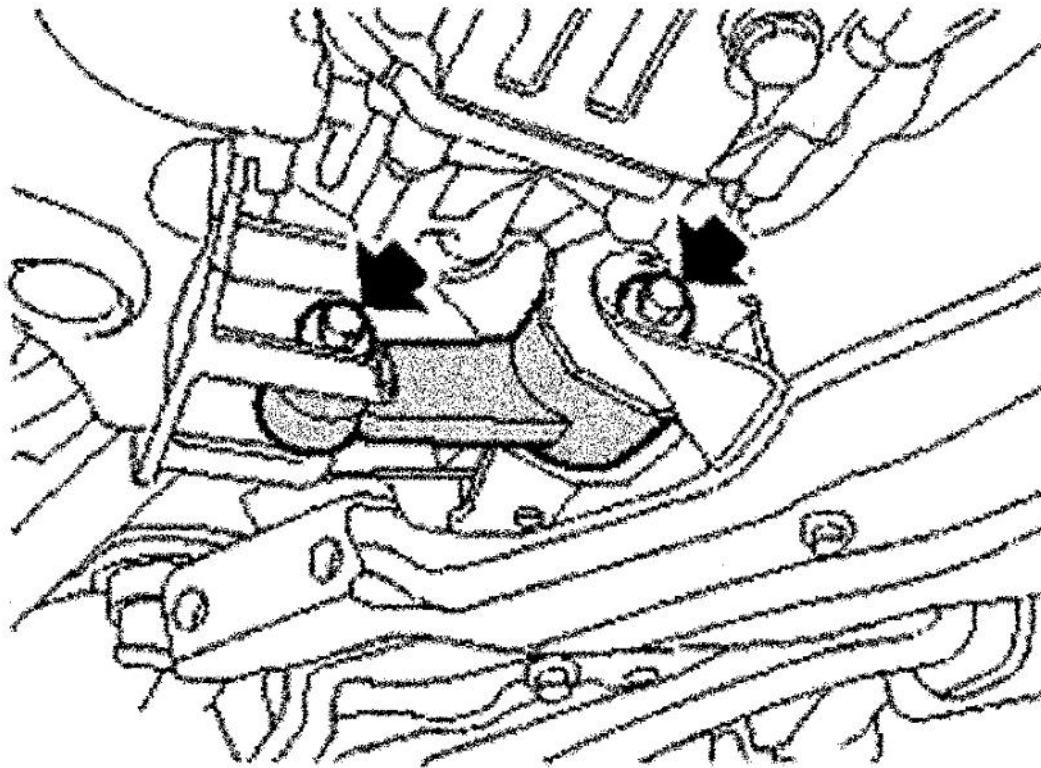
Installation

1. Position engine steady bar, fit bolts and tighten to 100 Nm (74 ft. lbs.).

ENGINE STEADY - LOWER

Removal

1. Remove underbelly panel. See **UNDERBELLY PANEL** .
2. Remove 2 bolts securing lower engine steady to sump bracket and subframe. See **Fig. 106**.
3. Remove lower engine steady noting that "TOP" mark on engine steady faces uppermost.



G00381990

Fig. 106: Removing Engine Steady (Lower)
Courtesy of LAND ROVER NORTH AMERICA, INC.

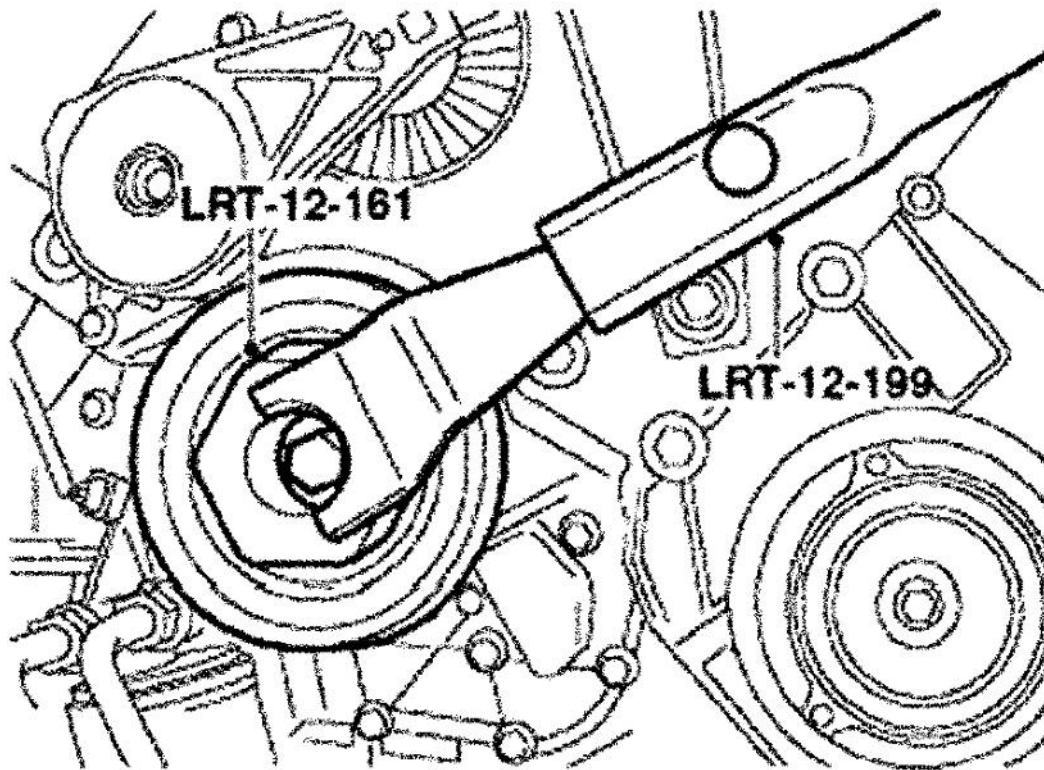
Installation

1. Position lower engine steady, "TOP" mark uppermost. Fit and tighten bolts to 100 Nm (74 ft. lbs.).
2. Fit underbelly panel. See UNDERBELLY PANEL .

TORQUE CONVERTER DRIVE PLATE

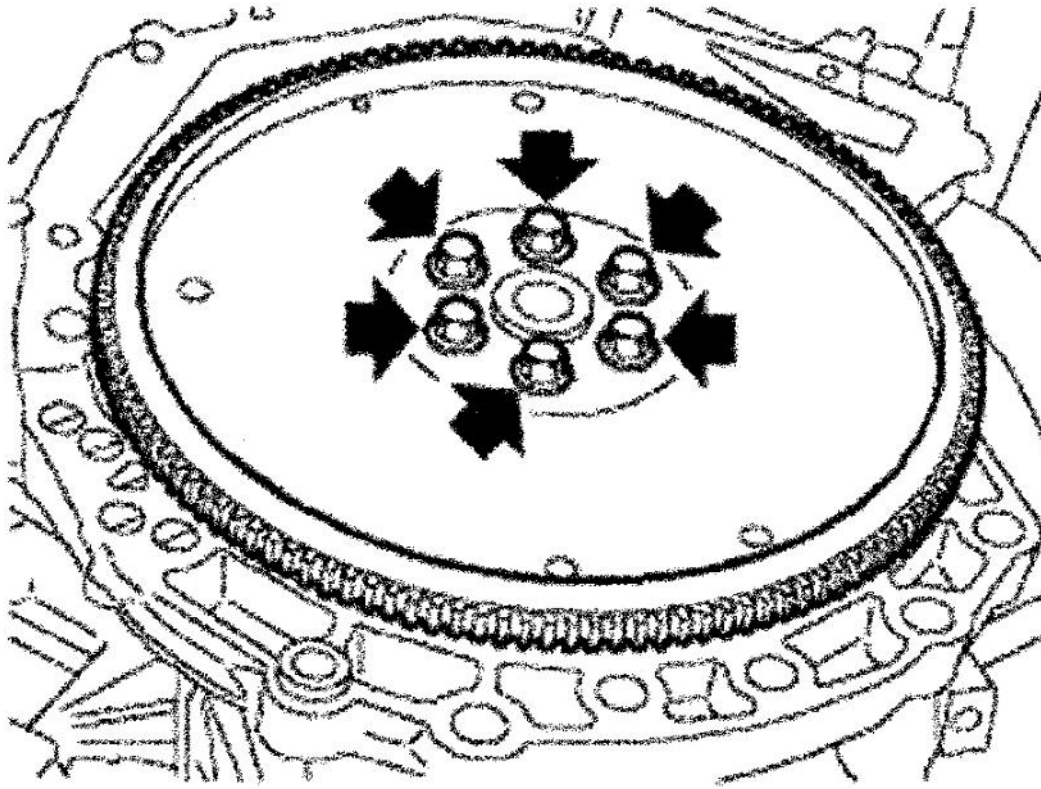
Removal

1. Remove automatic gearbox. See GEARBOX (KV6) .
2. Assemble LRT-12-161 to LRT-12-199 and secure with clamp bolt.
3. Position LRT-12-161 and LRT-12-199 to crankshaft pulley to restrain crankshaft. See Fig. 107.
4. Remove and discard 6 Patchlok bolts securing drive plate to crankshaft. See Fig. 108.
5. Remove drive plate from crankshaft.



G00381991

Fig. 107: Restraining Crankshaft Pulley
Courtesy of LAND ROVER NORTH AMERICA, INC.

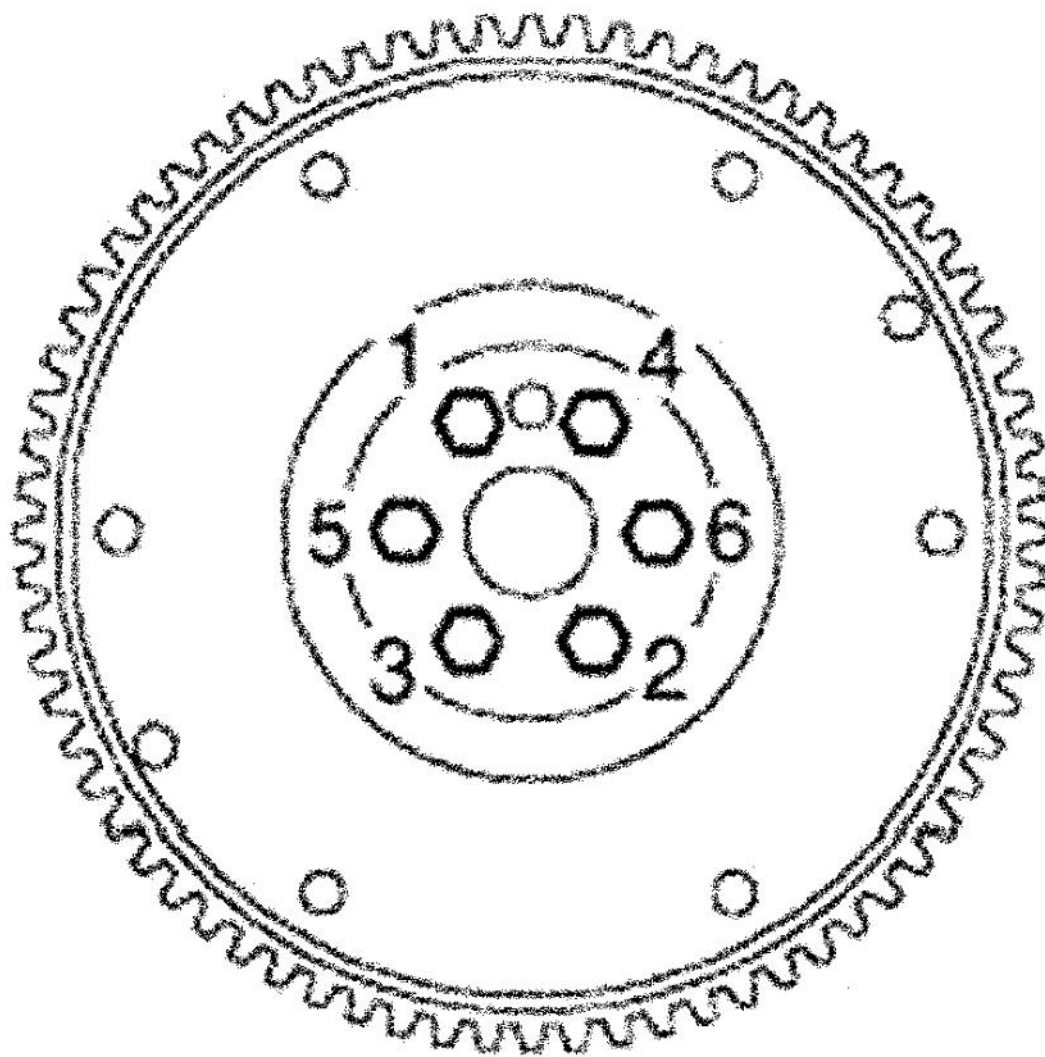


G00381992

Fig. 108: Removing Drive Plate-To-Crankshaft Bolts
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean bolt holes in crankshaft using an old drive plate bolt with two saw cuts at an angle of 45° to the bolt shank.
2. Clean drive plate and mating face of crankshaft.
3. Position LRT-12-161 and LRT-12-199 to crankshaft pulley to restrain crankshaft.
4. Position drive plate to crankshaft.
5. Fit new Patchlok bolts securing drive plate to crankshaft and tighten in sequence shown. See **Fig. 109**:
 - Stage 1 - 25 Nm (18 ft. lbs.)
 - Stage 2 - 100 Nm (74 ft. lbs.)
6. Remove LRT-12-161 and LRT-12-199 from crankshaft pulley.
7. Fit automatic gearbox. See **GEARBOX (KV6)**.



G00381993

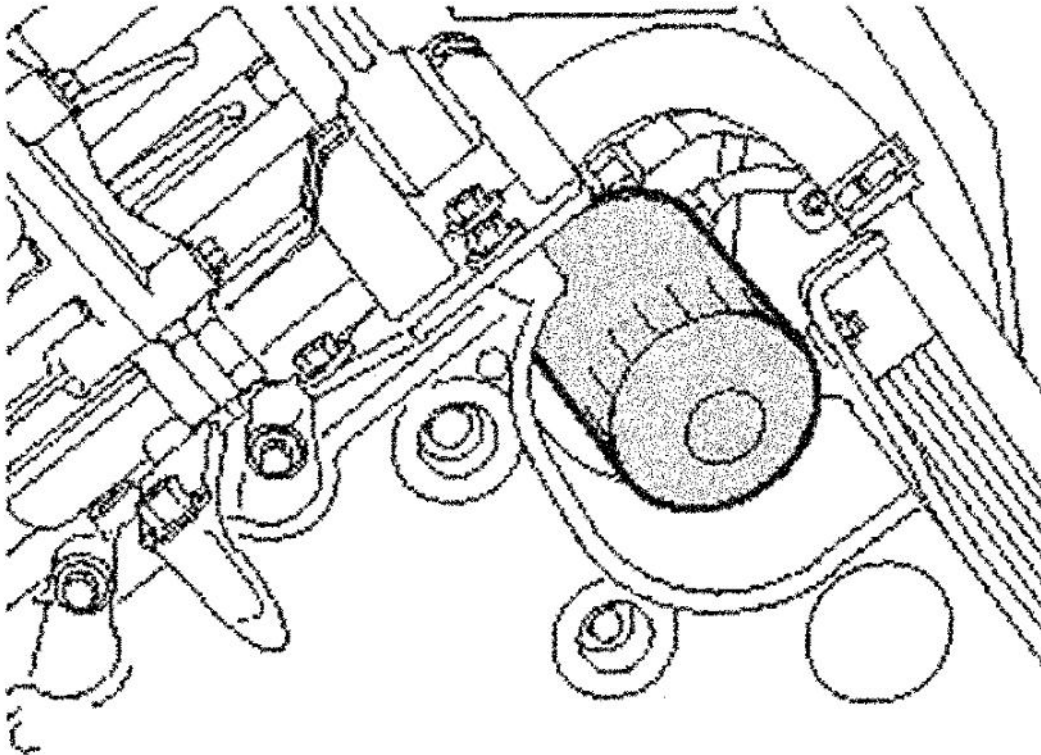
Fig. 109: Tightening Drive Plate-To-Crankshaft Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

FILTER - ENGINE OIL

Removal

1. Raise vehicle on a 4 post ramp. See **JACKING** .
2. Remove underbelly panel. See **UNDERBELLY PANEL** .
3. Place suitable container under oil filter to collect spillage.
4. Using strap wrench, remove and discard oil filter. See **Fig. 110**.

WARNING: Avoid excessive skin contact with used engine oil. Used engine oil contains potentially harmful contaminants which may cause skin cancer or other serious skin disorders.



G00381994

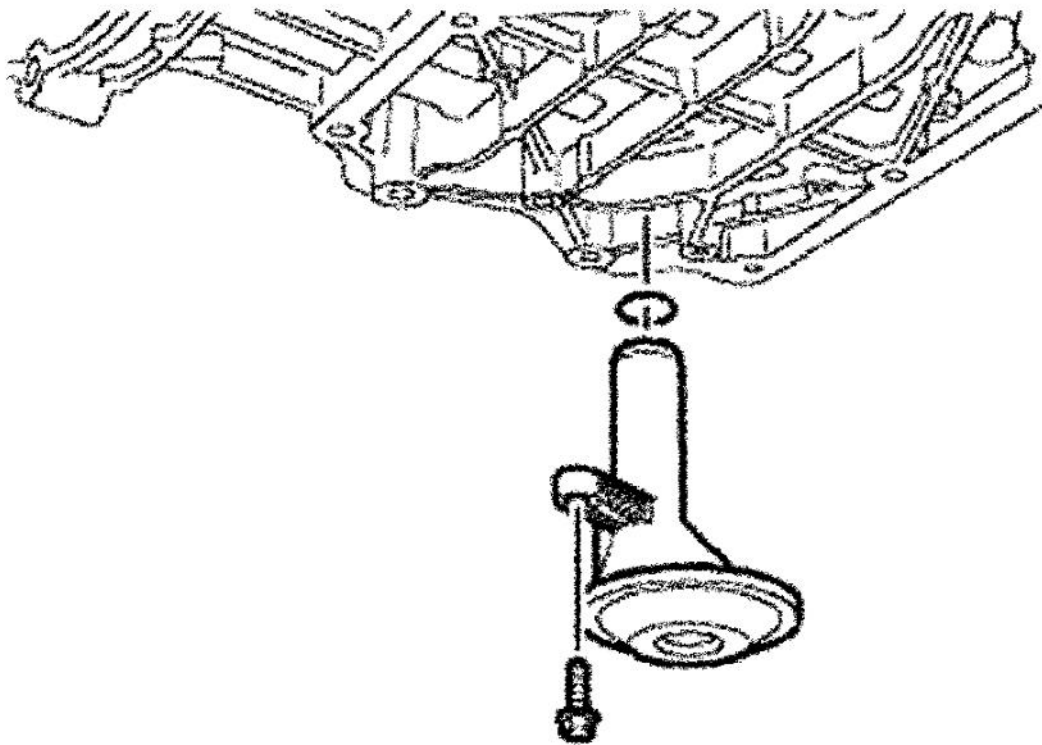
Fig. 110: Removing Oil Filter
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean oil filter mating face.
2. Fill canister of replacement oil filter with clean engine oil.
3. Lubricate new oil filter sealing ring with clean engine oil.
4. Fit new oil filter and tighten by hand until it seats, then tighten a further half turn.
5. Remove oil container from underneath of engine.
6. Fit underbelly panel. See UNDERBELLY PANEL .
7. Lower vehicle on ramp.
8. Start and run engine and check for leaks.
9. Stop engine, wait a few minutes, then check oil level. Top up if necessary. See ENGINE OIL AND

FILTER - KV6 .**OIL PICK-UP STRAINER****Removal**

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT .**
2. Remove engine sump. See **SUMP - RESEAL.**
3. Remove bolt and remove oil pick-up strainer. Remove and discard "O" ring. See **Fig. 111.**



G00381995

Fig. 111: Removing Oil Pick-Up Strainer
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean oil pick-up strainer and mating face.
2. Remove all traces of sealant from oil strainer bolt hole and bolt threads.

CAUTION: Do not use a tap.

3. Lubricate new "O" ring with clean engine oil and fit to pick-up strainer.

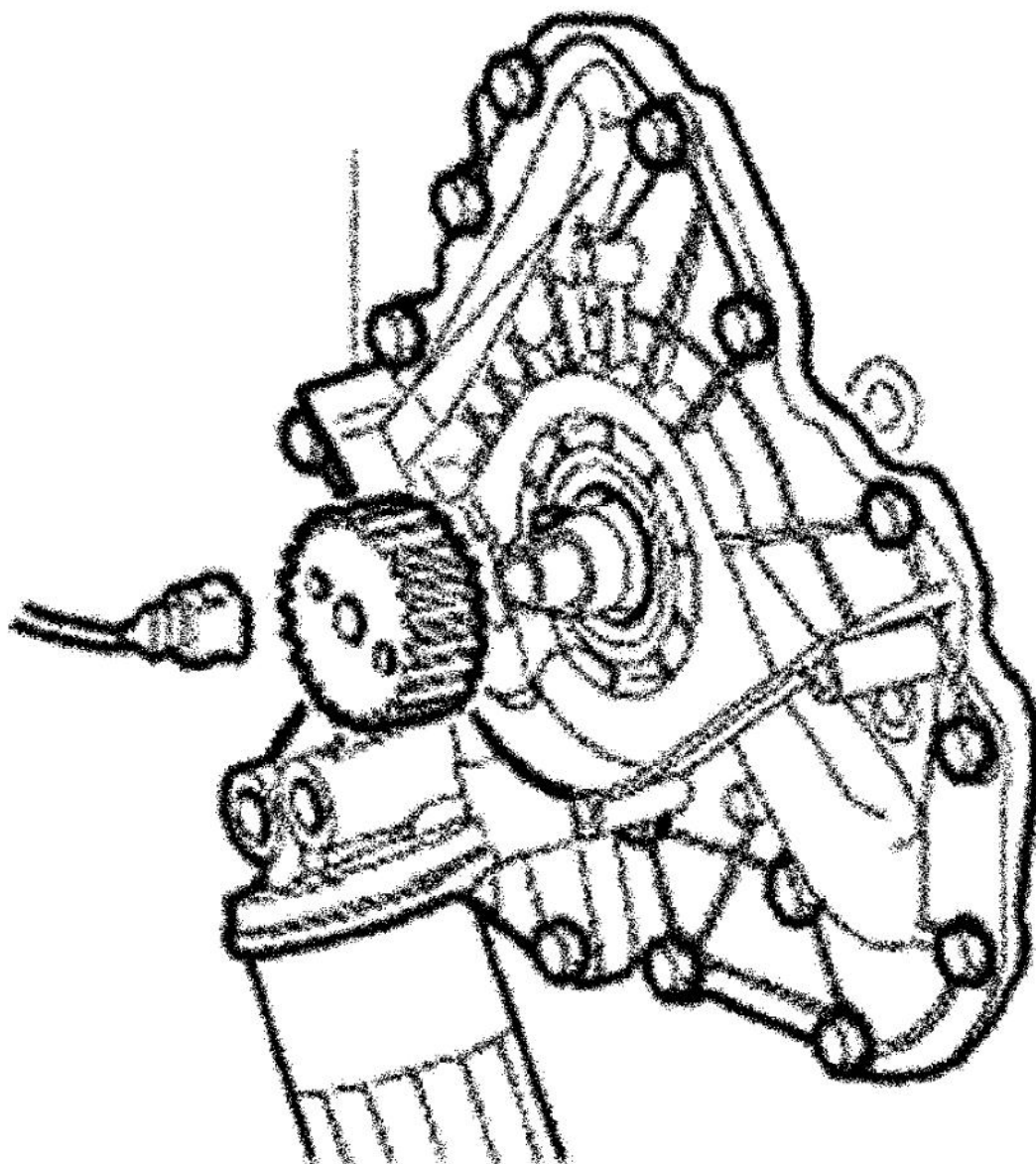
CAUTION: Ensure "O" ring, Part No. LYX000210L is fitted.

4. Apply sealant, Part No. STC 50552 to threads of oil pick-up strainer retaining bolt.
5. Position oil pick-up strainer, fit and tighten bolt to 8 Nm (6 ft. lbs.).
6. Fit engine sump. See **SUMP - RESEAL**.
7. Connect battery earth lead. See **DISCONNECT/CONNECT**.

GASKET - OIL PUMP

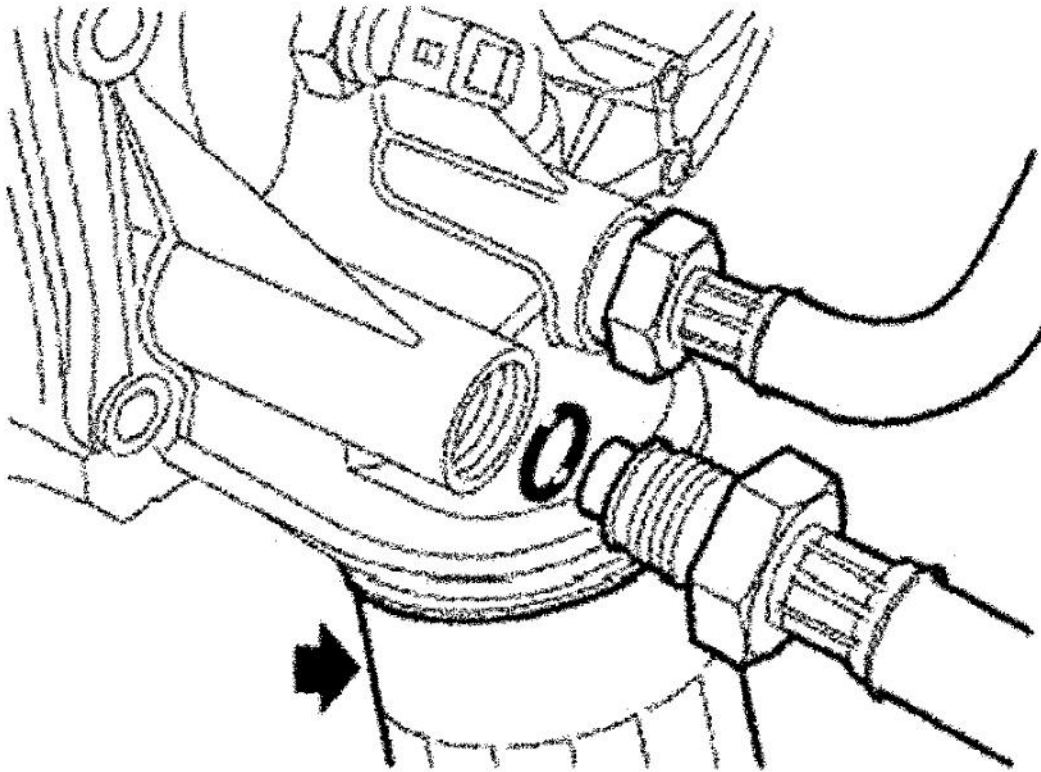
Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Drain engine oil. See **FILTER - ENGINE OIL**.
3. Remove camshaft timing belt. See **CAMSHAFT TIMING BELT**.
4. Remove crankshaft gear. See **Fig. 112**.
5. Disconnect multiplug from oil pressure switch.
6. Loosen and remove oil cooler pipe unions from oil filter housing, remove and discard 2 "O" rings. See **Fig. 113**.
7. Using strap wrench, remove and discard oil filter.
8. Using sequence shown, remove and discard 16 bolts securing oil pump to cylinder block. See **Fig. 114**.
9. Remove oil pump. See **Fig. 115**.
10. Remove and discard oil pump gasket.
11. Remove and discard crankshaft front oil seal from oil pump housing.



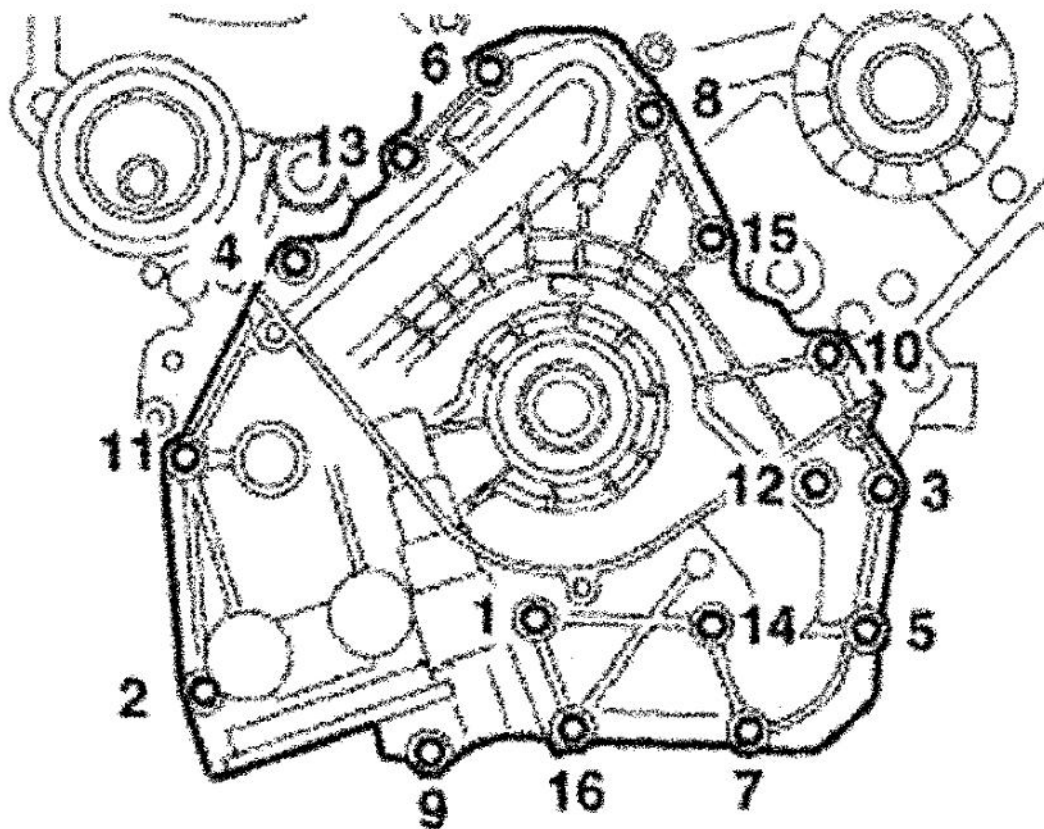
G00381996

Fig. 112: Removing Crankshaft Gear
Courtesy of LAND ROVER NORTH AMERICA, INC.



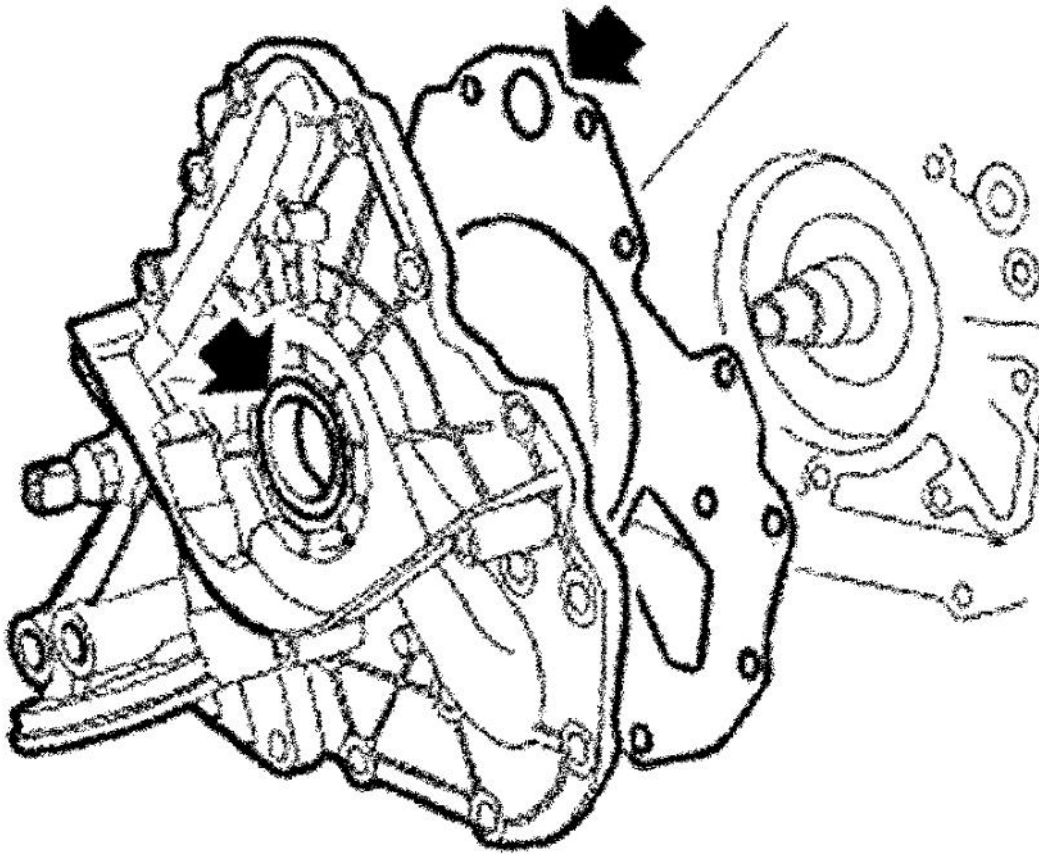
G00381997

Fig. 113: Removing Oil Cooler Pipe From Oil Filter Housing
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381998

Fig. 114: Removing Oil Pump-To-Cylinder Block Bolts
 Courtesy of LAND ROVER NORTH AMERICA, INC.



G00381999

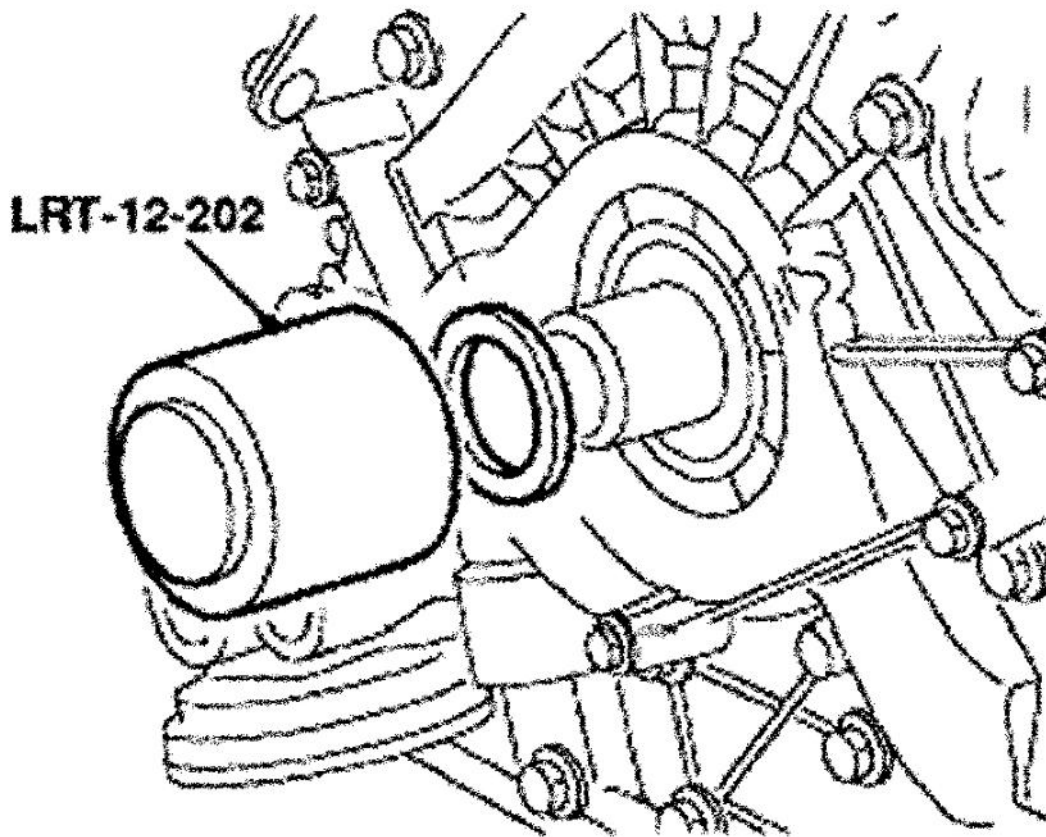
Fig. 115: Removing Oil Pump & Gasket
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean oil pump and mating face on cylinder block ensure bolt holes are clean and dry.
2. Clean oil seal recess in oil pump and running surface on crankshaft.
3. Fit new oil pump gasket, dry, to cylinder block.
4. Fit oil seal guide, from seal kit, over end of crankshaft.
5. Position oil pump, aligning flats on oil pump drive to flats on crankshaft. Fit new Patchlok bolts and tighten progressively in sequence shown. See **Fig. 260**:
 - Stage 1 - 5 Nm (4 ft. lbs.)
 - Stage 2 - 9 Nm (7 ft. lbs.)
6. Position new seal on crankshaft up against oil pump housing. Drift seal into place using tool LRT-12-202.

CAUTION: Oil seal must be fitted dry. See Fig. 116.

7. Remove oil seal guide from crankshaft.
8. Connect multiplug to oil pressure switch.
9. Fill canister of replacement oil filter with clean engine oil.
10. Lubricate oil filter sealing ring with clean engine oil.
11. Fit oil filter and tighten by hand until it seats then tighten a further half turn.
12. Lubricate new "O" rings with clean engine oil and fit to oil cooler pipe unions.
13. Connect oil cooler pipes to oil filter housing and tighten unions to 26 Nm (19 ft. lbs.).
14. Clean crankshaft gear and wipe end of crankshaft.
15. Fit crankshaft gear.
16. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT**.
17. Fill engine with oil. See **ENGINE OIL AND FILTER - KV6**.
18. Connect battery earth lead. See **DISCONNECT/CONNECT**.

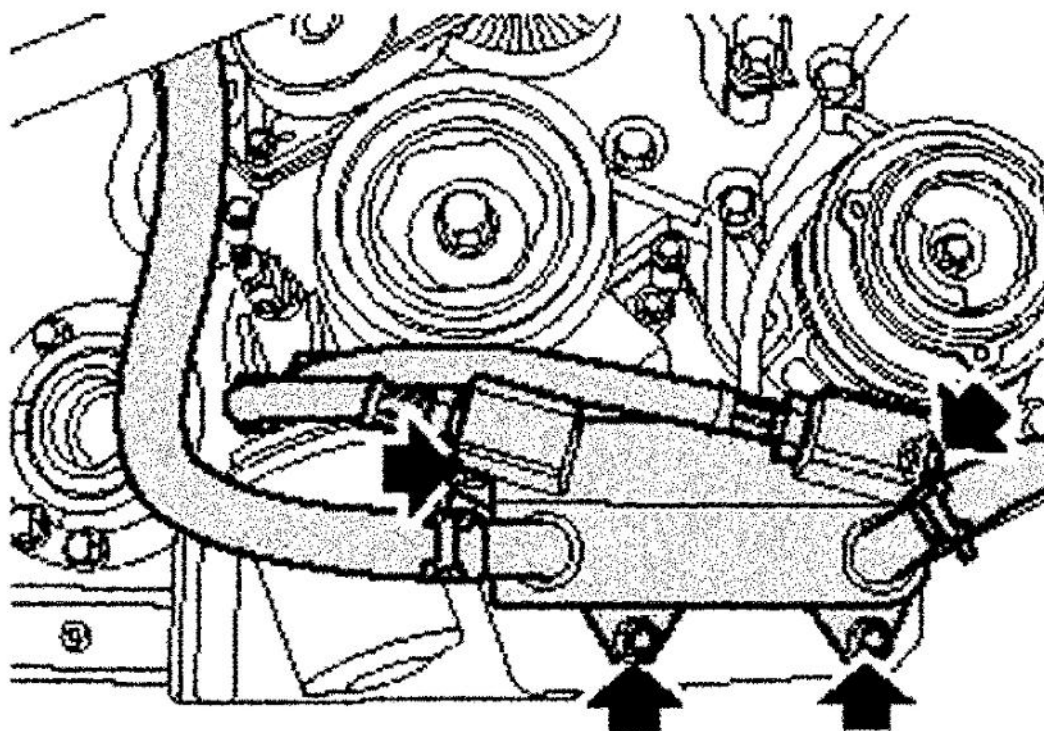


G00382000

Fig. 116: Installing Oil Pump Housing Seal**Courtesy of LAND ROVER NORTH AMERICA, INC.****SUMP - RESEAL****Removal**

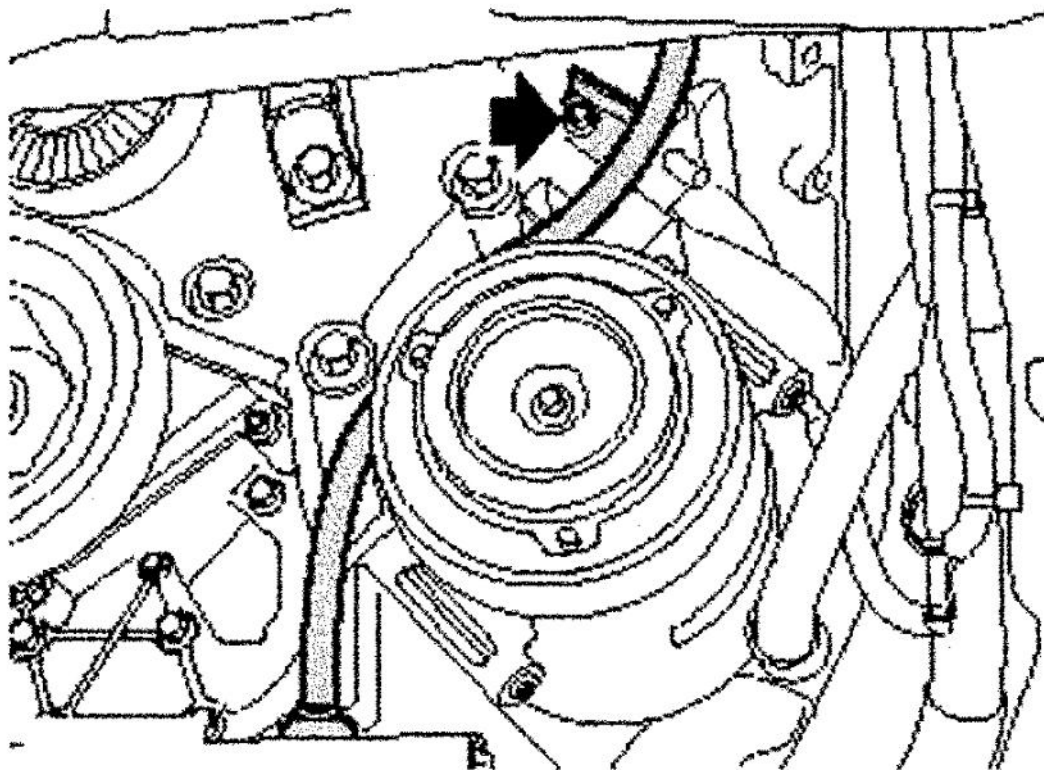
1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Remove engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
3. Drain engine oil. See **FILTER - ENGINE OIL**.
4. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
5. Remove 4 nuts securing engine oil cooler to mounting bracket and position oil cooler aside. See **Fig. 117**.
6. Remove bolt securing dipstick tube to cylinder block. See **Fig. 118**.
7. Depress and hold down dipstick collar, remove dipstick tube from sump.
8. Remove 3 bolts securing IRD support bracket to sump. See **Fig. 119**.
9. Using sequence shown and noting their fitted position, remove 10 bolts securing sump to lower crankcase. See **Fig. 120**.
10. Using a mallet, gently tap sump sideways to break sealant bond, remove sump.

CAUTION: Do not lever between sump and lower crankcase.



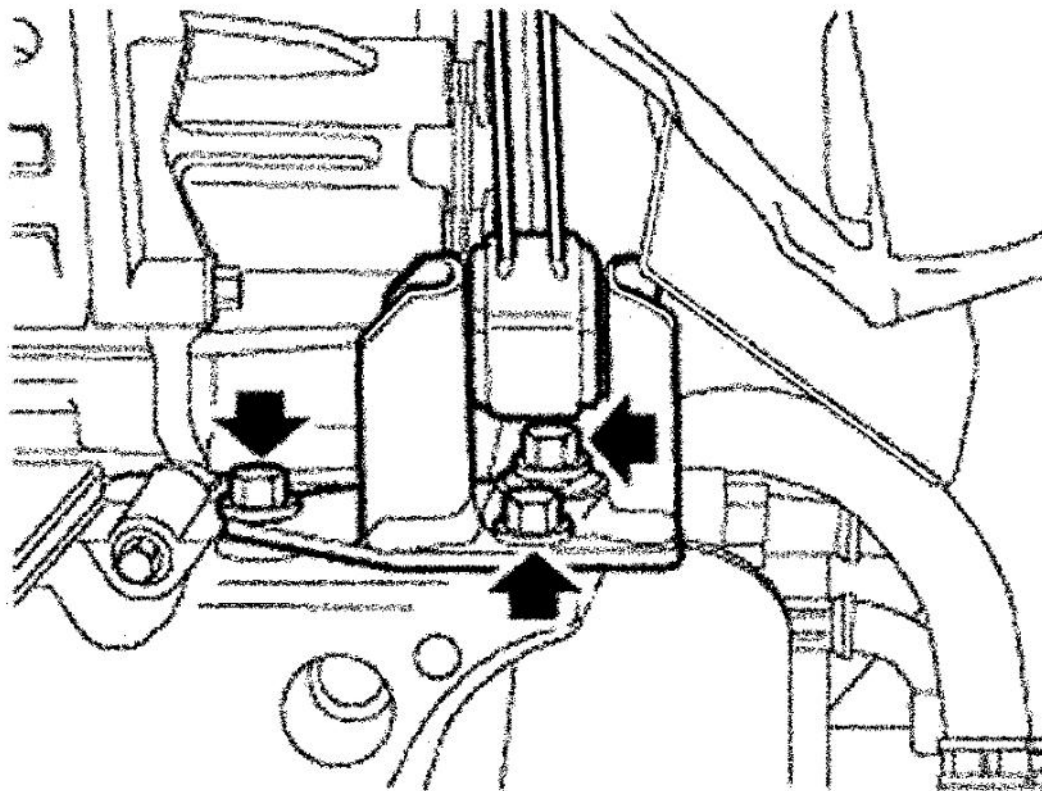
G00382001

Fig. 117: Removing Engine Oil Cooler
Courtesy of LAND ROVER NORTH AMERICA, INC.



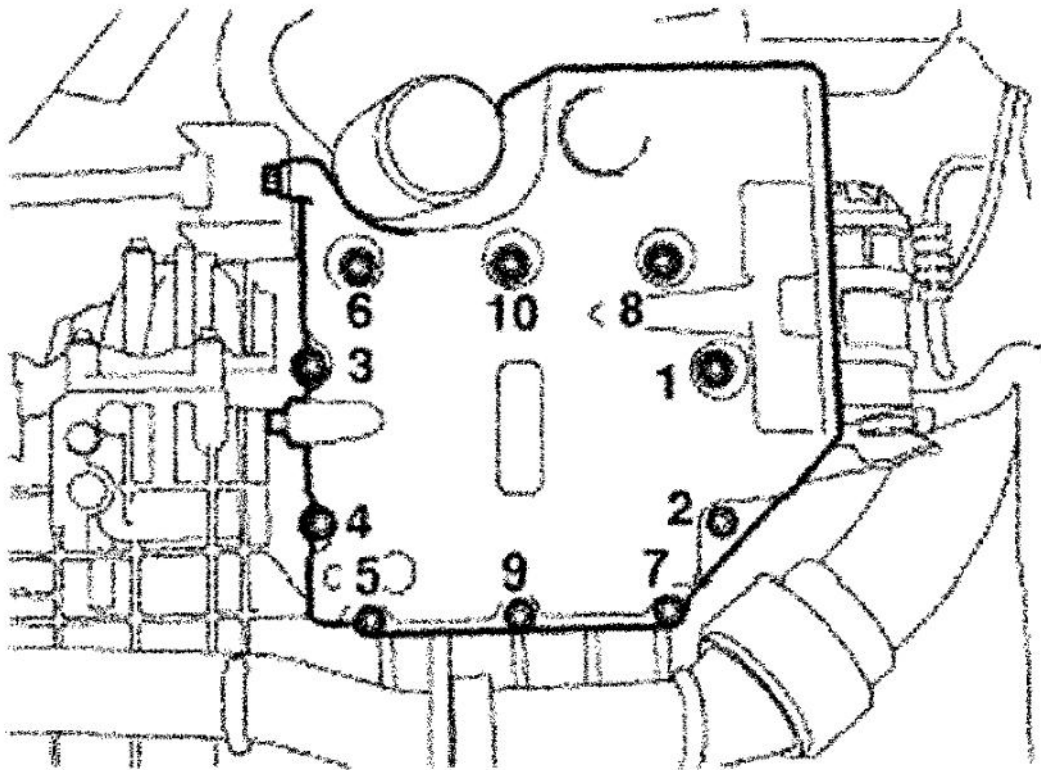
G00382002

Fig. 118: Removing Dipstick Tube-To-Cylinder Block
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382003

Fig. 119: Removing Intermediate Reduction Drive Support Bracket-To-Sump Bolts
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382004

Fig. 120: Removing Sump Bolts In Sequence

Courtesy of LAND ROVER NORTH AMERICA, INC.

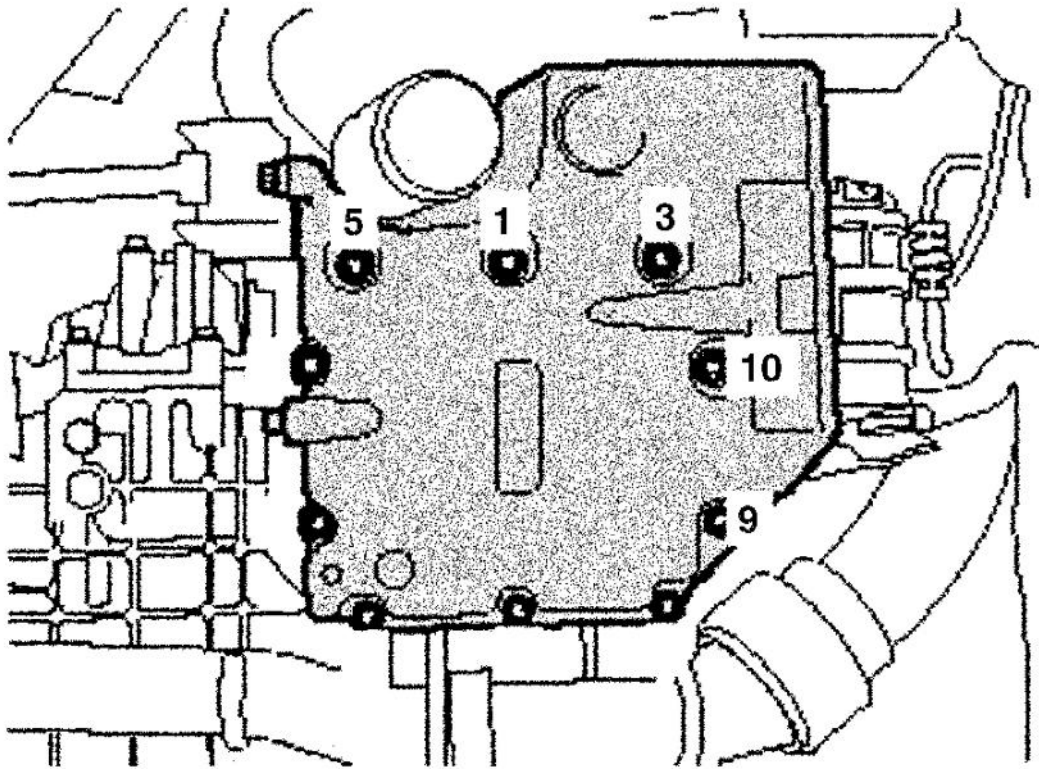
Installation

1. Using a suitable cleaning solvent, clean sump and mating face on lower crankcase. DO NOT use a metal scraper on sealing surfaces.
2. Apply a 2 mm (0.1 in) bead of sealant, Part No. STC 4600 along center of sump flange, then spread to an even film using a roller.

CAUTION: To avoid contamination, assembly must be completed immediately after application of sealant.

3. Position sump, fit bolts and tighten progressively in the sequence shown to 35 Nm (26 ft. lbs.). See **Fig. 121**.
4. Fit bolts securing IRD support bracket to sump and tighten to 88 Nm (65 ft. lbs.).
5. Position engine oil cooler to mounting bracket, fit and tighten nuts to 25 Nm (18 ft. lbs.).
6. Position dipstick tube to sump and cylinder block, fit bolt and tighten to 9 Nm (7 ft. lbs.).

7. Fit splash shield and secure with bolts.
8. Fill engine with correct quantity and grade of oil. See **ENGINE OIL AND FILTER - KV6**.
9. Fit engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
10. Connect battery earth lead. See **DISCONNECT/CONNECT**.



G00382005

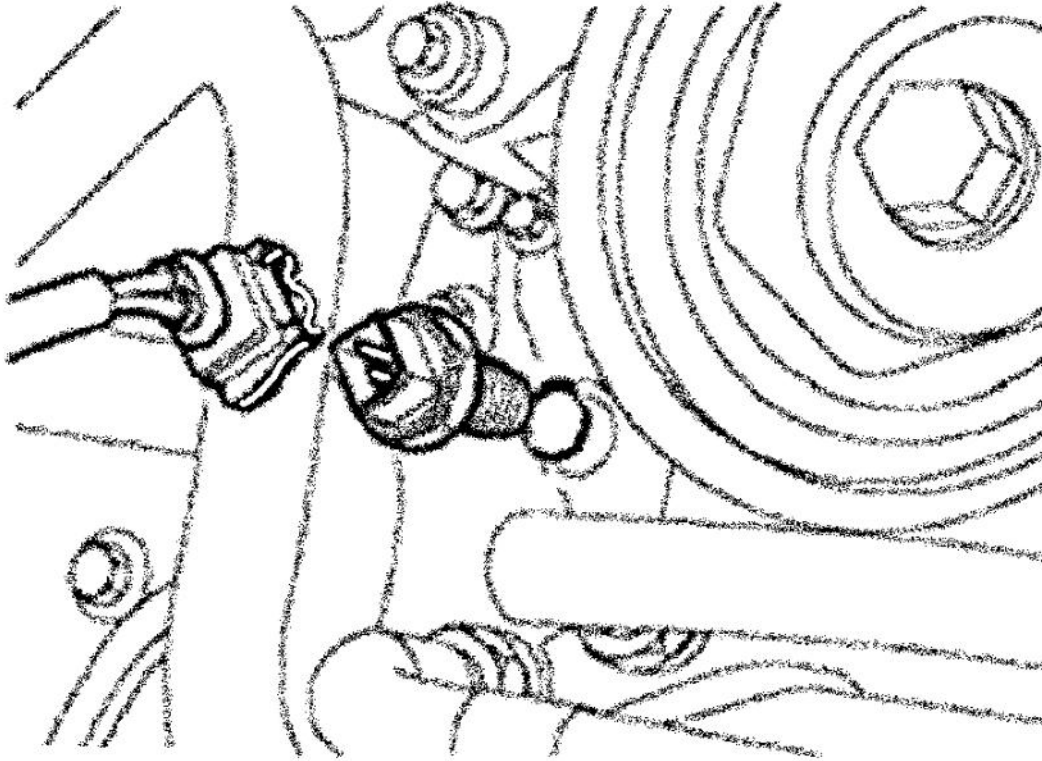
Fig. 121: Tightening Sump Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

SWITCH - OIL PRESSURE

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Remove underbelly panel. See **UNDERBELLY PANEL**.
3. Remove right front road wheel.
4. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
5. Place container below oil pressure switch to collect spillage.
6. Disconnect multiplug from oil pressure switch. See **Fig. 122**.

7. Remove oil pressure switch and discard sealing washer.



G00382006

Fig. 122: Disconnecting Oil Pressure Switch Multiplug
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Ensure oil pressure switch and mating face is clean.
2. Fit oil pressure switch using a new sealing washer and tighten to 14 Nm (10 ft. lbs.).
3. Connect multiplug to oil pressure switch.
4. Remove oil container from underneath of engine.
5. Fit splash shield and secure with bolts.
6. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.).
7. Fit underbelly panel. See **UNDERBELLY PANEL** .
8. Check engine oil level, top-up if necessary. See **ENGINE OIL AND FILTER - KV6** .
9. Connect battery earth lead. See **DISCONNECT/CONNECT** .

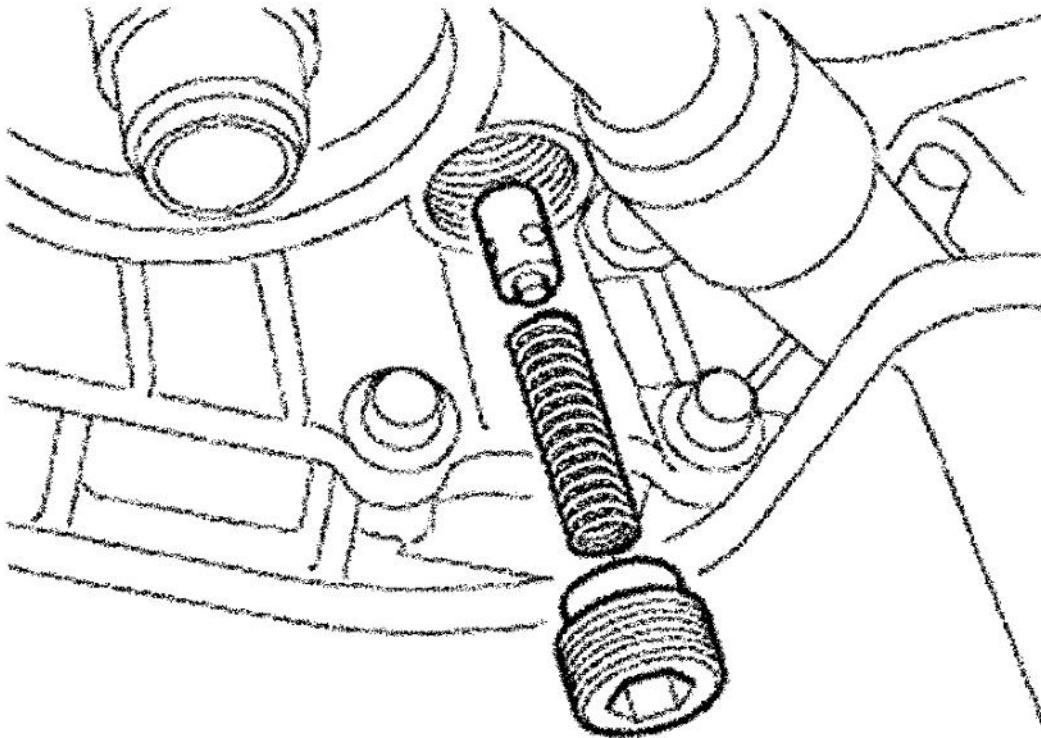
OIL PRESSURE RELIEF VALVE

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Remove underbelly panel. See **UNDERBELLY PANEL**.
3. Remove right front road wheel.
4. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
5. Place suitable container under oil filter to collect spillage.
6. Using strap wrench, remove and discard oil filter. See **Fig. 110**.
7. Remove 4 nuts securing engine oil cooler to mounting bracket and position oil cooler aside. See **Fig. 117**.
8. Remove oil pressure relief valve plug nut. See **Fig. 123**.

NOTE: If a hexagonal head plug and sealing washer are fitted, discard sealing washer.

9. Remove spring and valve.



G00382007

Fig. 123: Removing Oil Relief Valve Plug Nut
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean valve, spring and plug; remove all traces of sealant from threads in oil pressure relief valve bore and from threads of plug.

CAUTION: Do not use a tap.

2. Clean valve seating inside oil pump housing.
3. Check that valve slides freely in bore and that valve and bore are free from scoring and corrosion.

NOTE: Light corrosion may be removed using grade 600 emery cloth soaked in oil.

4. Check free length of spring 38.90 mm (1.531 in).
5. Apply sealant, Part No. STC 50552 to plug threads.

NOTE: If a hexagonal head plug and sealing washer were fitted, fit new sealing washer to plug.

6. Fit valve, spring and plug to oil pump housing. Tighten plug to 25 Nm (18 ft. lbs.).
7. Fill canister of replacement oil filter with clean engine oil.
8. Lubricate new oil filter seal with clean engine oil and fit filter.
9. Position engine oil cooler to mounting bracket, fit and tighten nuts to 25 Nm (18 ft. lbs.).
10. Remove oil container from underneath of engine.
11. Fit splash shield and secure with bolts.
12. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.).
13. Fit underbelly panel. See **UNDERBELLY PANEL** .
14. Connect battery earth lead. See **DISCONNECT/CONNECT** .
15. Check engine oil level, top-up if necessary. See **ENGINE OIL AND FILTER - KV6** .

OIL COOLER - ENGINE**Removal**

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Drain cooling system. See **DRAINING & REFILLING COOLING SYSTEM** .
3. Remove right front road wheel.
4. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
5. Position container to collect spillage under oil filter.
6. Loosen and remove oil cooler pipe unions from oil filter housing, remove and discard 2 "O" rings.

CAUTION: Failure to retain bosses will result in damage to oil cooler. Always fit plugs to open connections to prevent contamination

7. Position container to collect coolant spillage.
8. Release clips and disconnect coolant hoses from engine oil cooler. See **Fig. 117**.

CAUTION: Always fit plugs to open connections to prevent contamination.

9. Remove 4 nuts securing engine oil cooler to mounting bracket and remove oil cooler.
10. Restrain oil cooler pipe bosses on oil cooler housing, loosen and remove oil cooler pipes from oil cooler; remove and discard 2 "O" rings.

CAUTION: Always fit plugs to open connections to prevent contamination.

Installation

1. Clean oil cooler pipe unions and mating faces.
2. Lubricate new "O" rings with clean engine oil and fit to oil cooler pipes.
3. Fit pipes to engine oil cooler, restrain bosses on oil cooler body and tighten unions to 26 Nm (19 ft. lbs.).

CAUTION: To prevent damage to components, use two spanners when loosening or tightening unions.

4. Position engine oil cooler to mounting bracket, fit and tighten nuts to 25 Nm (18 ft. lbs.).
5. Position oil cooler pipes to oil filter housing and tighten unions to 26 Nm (19 ft. lbs.).
6. Connect coolant hoses to oil cooler and secure with clips.
7. Fit splash shield and secure with bolts.
8. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.).
9. Fill cooling system. See **DRAINING & REFILLING COOLING SYSTEM**.
10. Connect battery earth lead. See **DISCONNECT/CONNECT**.
11. Check engine oil level and top-up if necessary.

CAMSHAFT TIMING BELT

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Remove ancillary drive belt. See **ACCESSORY DRIVE BELT**.
3. Remove right front road wheel.

4. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
5. Remove 3 bolts securing camshaft timing belt left rear cover and remove cover. See **Fig. 124**.
6. Remove inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY** or **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- FROM 03MY**.
7. Remove 2 bolts securing right rear timing belt cover heat shield; remove heat shield. See **Fig. 125**.
8. Remove 3 bolts securing right rear timing belt cover; remove cover.
9. Using a socket on crankshaft pulley bolt, rotate crankshaft in a clockwise direction. Align the engine "SAFE" position, notch on crankshaft pulley with the "ARROW" on front mounting plate and the timing marks aligned on the rear camshaft gears as illustrated. See **Fig. 126**.

CAUTION: Do not use camshaft gear bolts or timing belt to rotate crankshaft.

10. Insert timing pin LRT-12-232 through hole in lower crankcase, ensuring pin is located in hole in drive plate. See **Fig. 127**.

CAUTION: Hole immediately adjacent to side of lower crankcase must be used.

11. Remove bolt securing PAS pipe to engine front mounting plate. See **Fig. 128**.
12. Remove 3 Torx screws securing PAS pump pulley and remove pulley. See **Fig. 129**.
13. Remove 3 bolts securing PAS pump to front mounting plate and tie pump aside. See **Fig. 130**.
14. Release alternator battery lead terminal cover, loosen terminal nut and disconnect lead from terminal. See **Fig. 131**.
15. Disconnect multiplug from alternator.
16. Remove lower bolt and upper nut and bolt securing alternator to front mounting plate.
17. Remove alternator.
18. Remove Torx screw securing idler pulley to front mounting plate and remove pulley. See **Fig. 132**.
19. Loosen bolt securing lower engine steady to front subframe. See **Fig. 133**.
20. Remove bolt securing lower engine steady to sump mounting, release lower engine steady from sump mounting.
21. Remove 3 bolts securing camshaft timing belt right front cover and remove cover. See **Fig. 134**.
22. Remove 3 bolts securing camshaft timing belt left front cover and remove cover. See **Fig. 135**.
23. Assemble LRT-12-161 to LRT-12-199 and secure with clamp bolt.
24. Insert LRT-12-161 with LRT-12-199 into crankshaft pulley, loosen and remove pulley bolt. Ensure crankshaft does not rotate during above operation. See **Fig. 136**.
25. Remove tools LRT-12-161 and LRT-12-199 from crankshaft pulley, remove pulley.
26. Remove 3 bolts securing camshaft timing belt lower cover to cylinder block and remove cover. See **Fig. 137**.
27. Remove 2 bolts securing ancillary drive belt tensioner and remove tensioner. See **Fig. 138**.

28. Note fitted position of heat shield on A/C compressor and remove 3 bolts securing A/C compressor to front mounting plate and cylinder block. Release A/C compressor and heat shield and position aside. See **Fig. 139**.
29. Remove bolt securing dipstick tube to cylinder block. See **Fig. 140**.
30. Depress and hold down dipstick tube locking collar, remove dipstick tube from engine sump.
31. Remove rubber blanking plug from around camshaft timing belt tensioner. See **Fig. 141**.
32. Remove 3 bolts securing engine front mounting plate and lifting bracket to cylinder block. See **Fig. 142**.
33. Remove bolt securing lifting bracket to right cylinder head and remove lifting bracket.
34. Remove 2 bolts securing IRD support bracket to engine front mounting plate. See **Fig. 143**.
35. Remove 5 bolts and 2 pillar bolts securing engine front mounting plate to cylinder block.
36. With care, release and remove front mounting plate from engine.
37. Insert a suitable 1.5 mm diameter pin through hole in tensioner body and into hole in plunger. See **Fig. 144**.

NOTE: If holes in body and plunger are not aligned, move tensioner backplate using a suitable broad bladed screwdriver; this will move plunger sufficiently to enable pin to be inserted.

38. Remove and discard 2 Patchlok bolts securing tensioner to cylinder block and remove tensioner.

CAUTION: Exercise great care when removing bolts, do not apply excessive torque. If bolts appear to be seized, apply suitable anti-seize lubricant prior to removing bolts. DO NOT loosen Allen screw securing tensioner pulley.

39. If camshaft timing belt is to be refitted, mark direction of rotation on timing belt before removal.
40. With care, ease camshaft timing belt from gears using fingers only and remove timing belt.

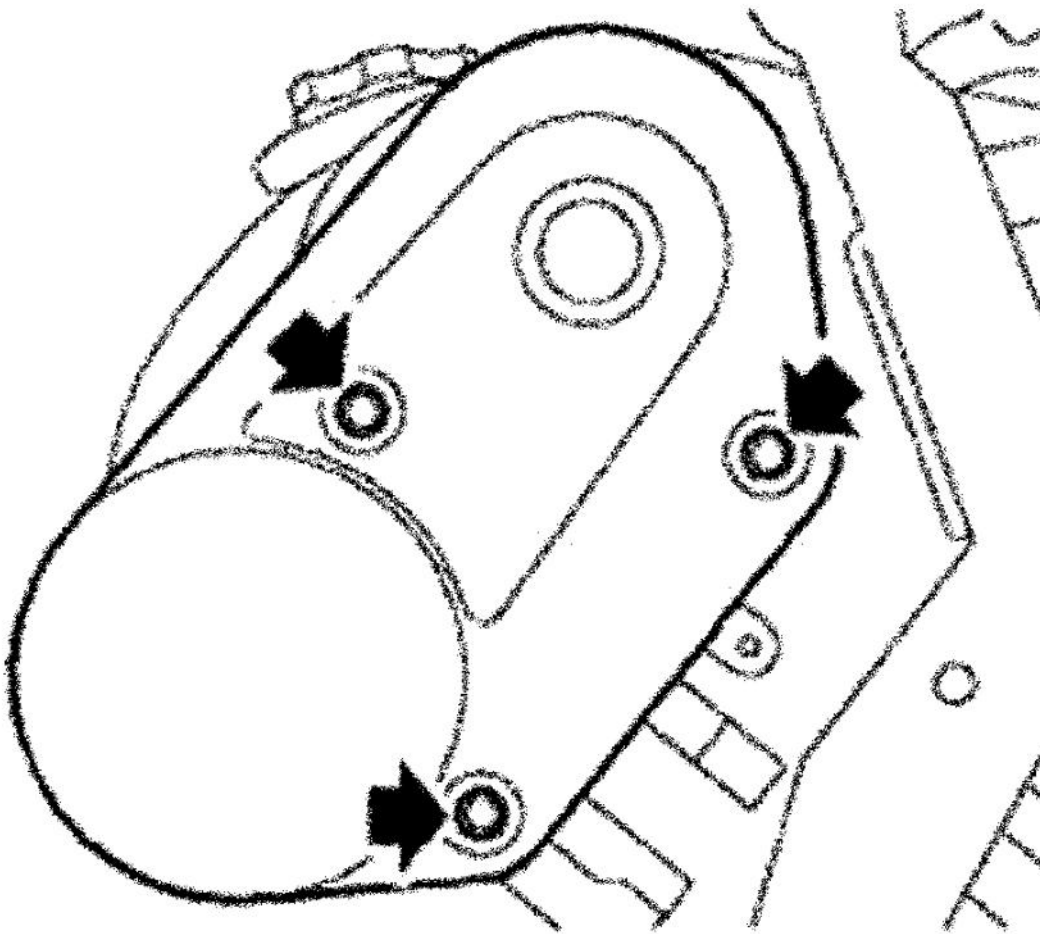
CAUTION: Do not rotate crankshaft or camshafts with timing belt removed and cylinder heads fitted.

CAUTION: Camshaft timing belt must be replaced if cylinder head is to be removed or new drive gears, tensioner or coolant pump are to be fitted. Camshaft timing belts must be stored and handled with care. Always store a camshaft timing belt on its edge with a bend radius greater than 50 mm (2.0 in). Do not use a camshaft timing belt that has been twisted or bent double as this will damage the reinforcing fibres. Do not use a camshaft timing belt if debris other than belt dust is found in timing belt covers. Do not use a camshaft timing belt if partial engine seizure has occurred. Do not use a camshaft timing belt if mileage exceeds 72,000 km (45,000 miles). Do not use an oil or coolant contaminated timing belt, cause of contamination must be rectified.

41. Remove and discard left and right exhaust camshaft cap seals. See **Fig. 145**.
42. Position tools LRT-12-196 to left and right front inlet camshaft gears and into the end of each exhaust camshaft. See **Fig. 146**.

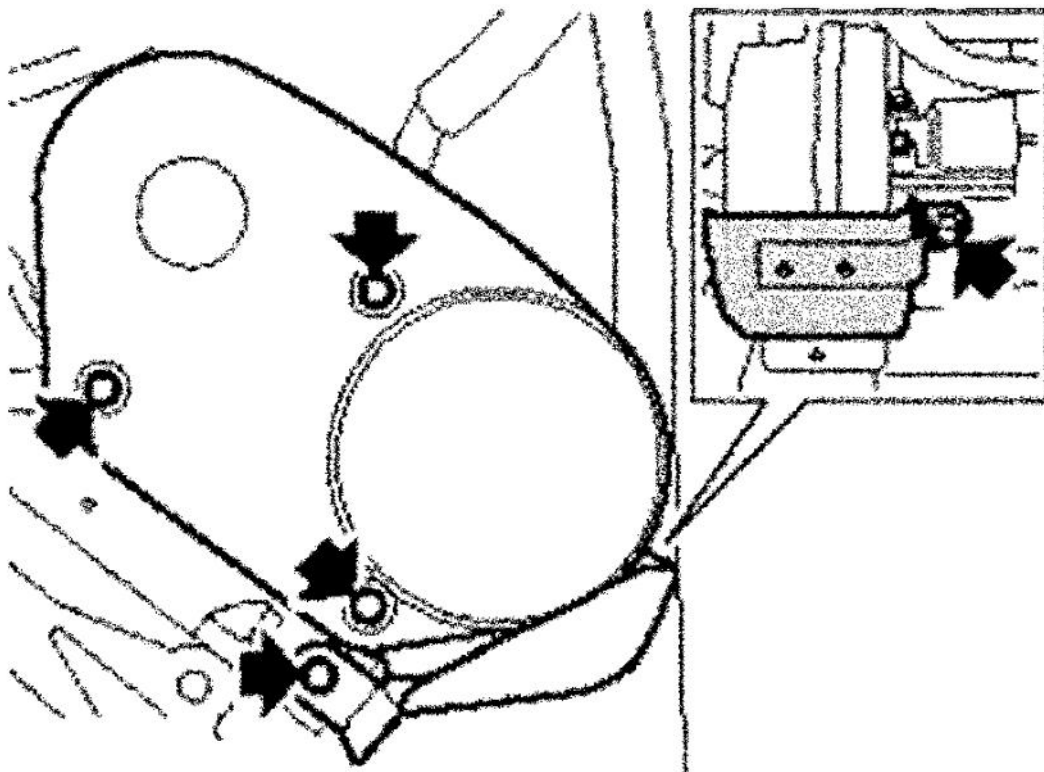
CAUTION: Special tools must be fitted when tightening or loosening gear retaining bolts, otherwise damage to camshafts may occur.

43. Remove and discard bolts retaining front inlet camshaft gears to camshafts.
44. Remove tools LRT-12-196 from both inlet camshaft gears and exhaust camshafts.
45. Remove camshaft drive gears and hub assemblies.



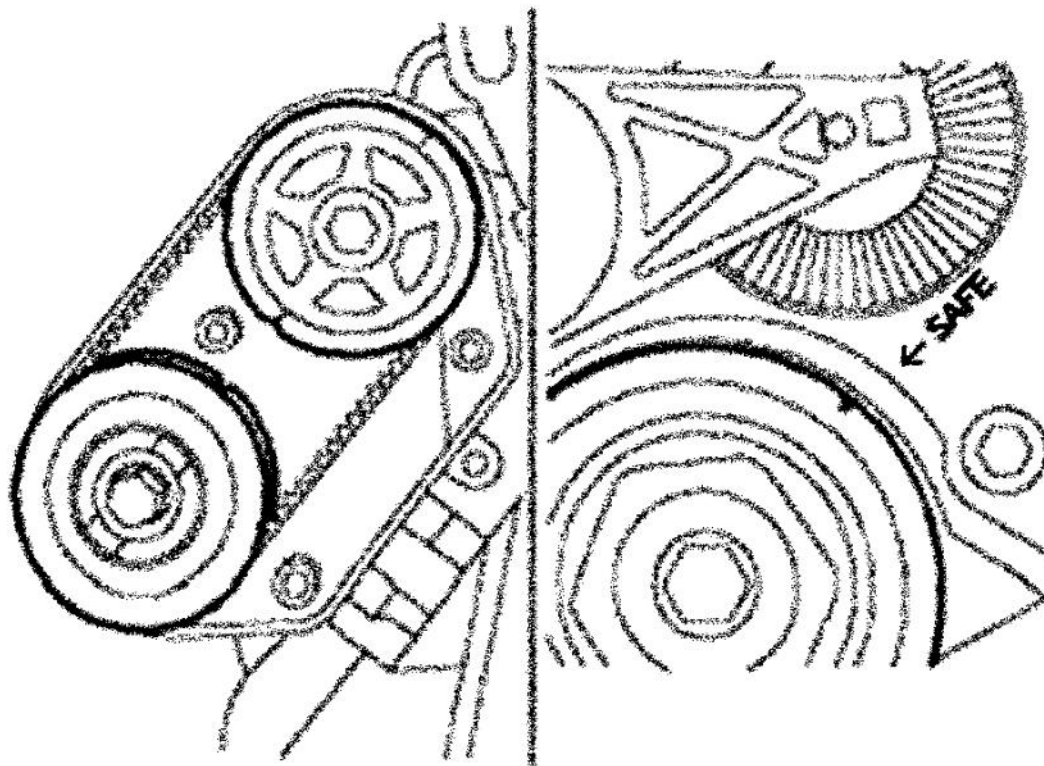
G00382008

Fig. 124: Removing Camshaft Timing Belt Left Rear Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382009

Fig. 125: Removing Right Rear Timing Belt Cover Heat Shield
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382010

Fig. 126: Aligning The SAFE Notch On Crankshaft Pulley With The ARROW
Courtesy of LAND ROVER NORTH AMERICA, INC.

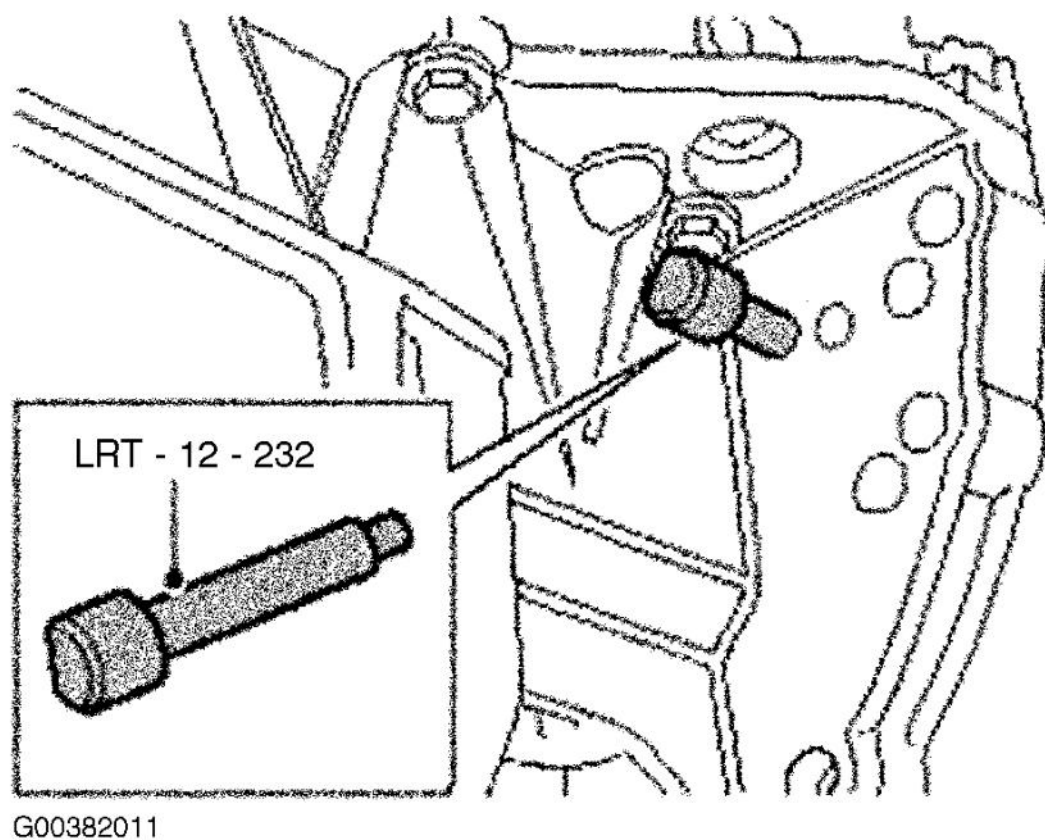
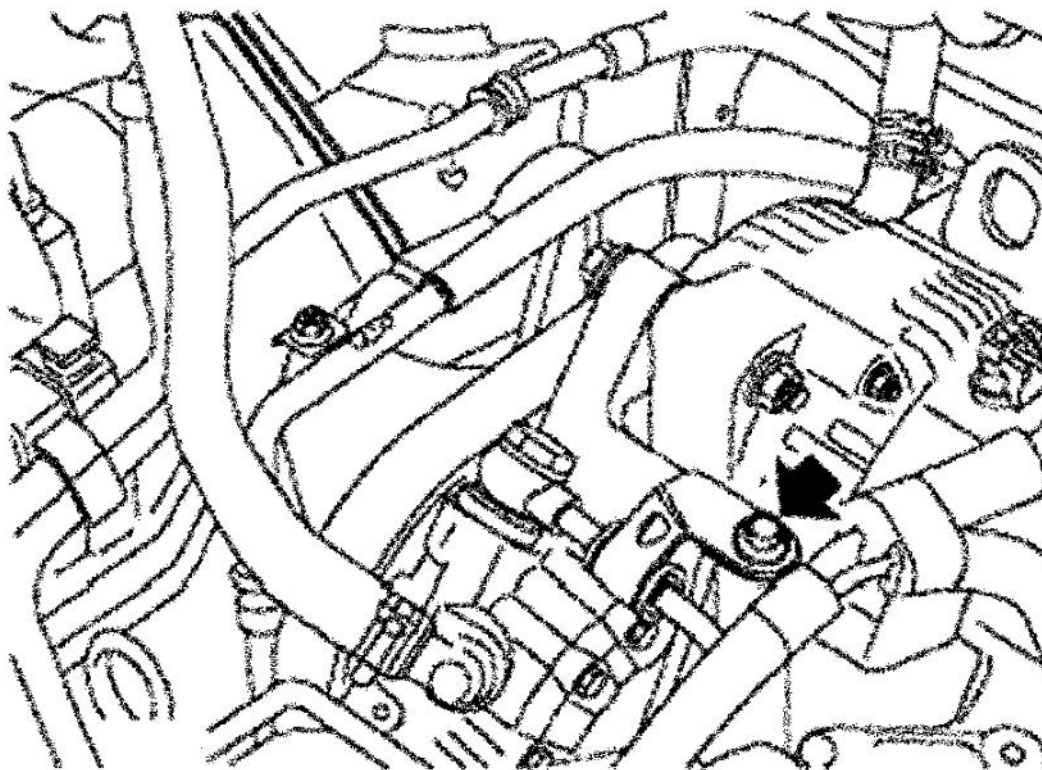
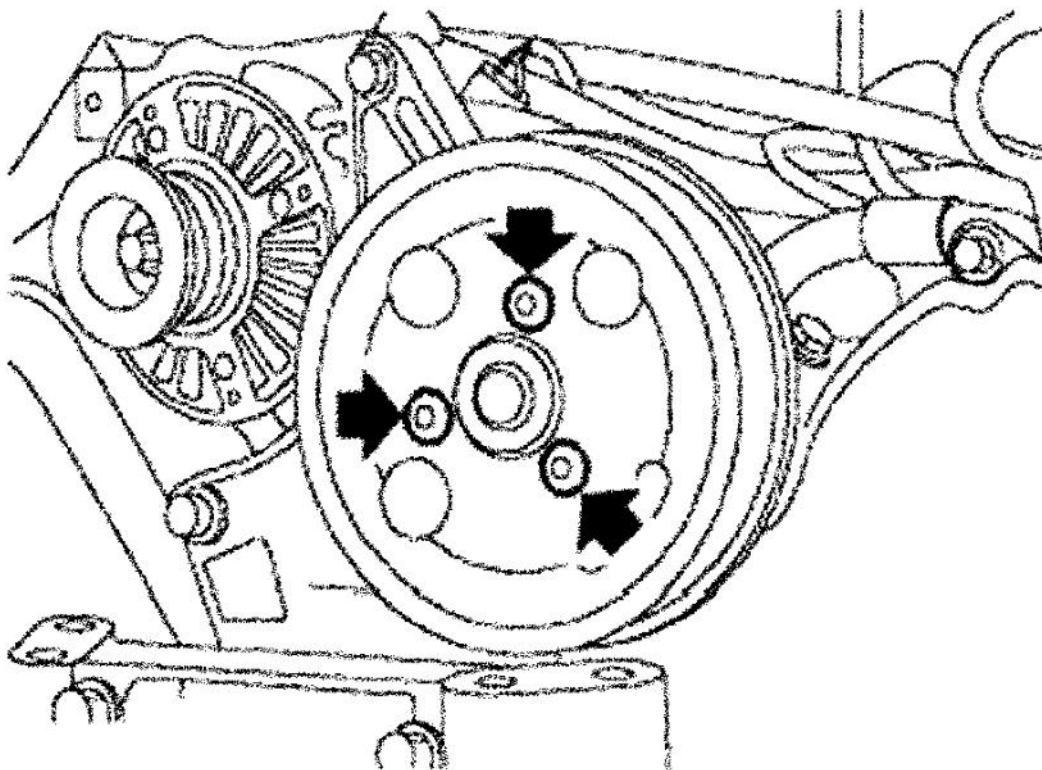


Fig. 127: Inserting Timing Pin LRT-12-232
Courtesy of LAND ROVER NORTH AMERICA, INC.



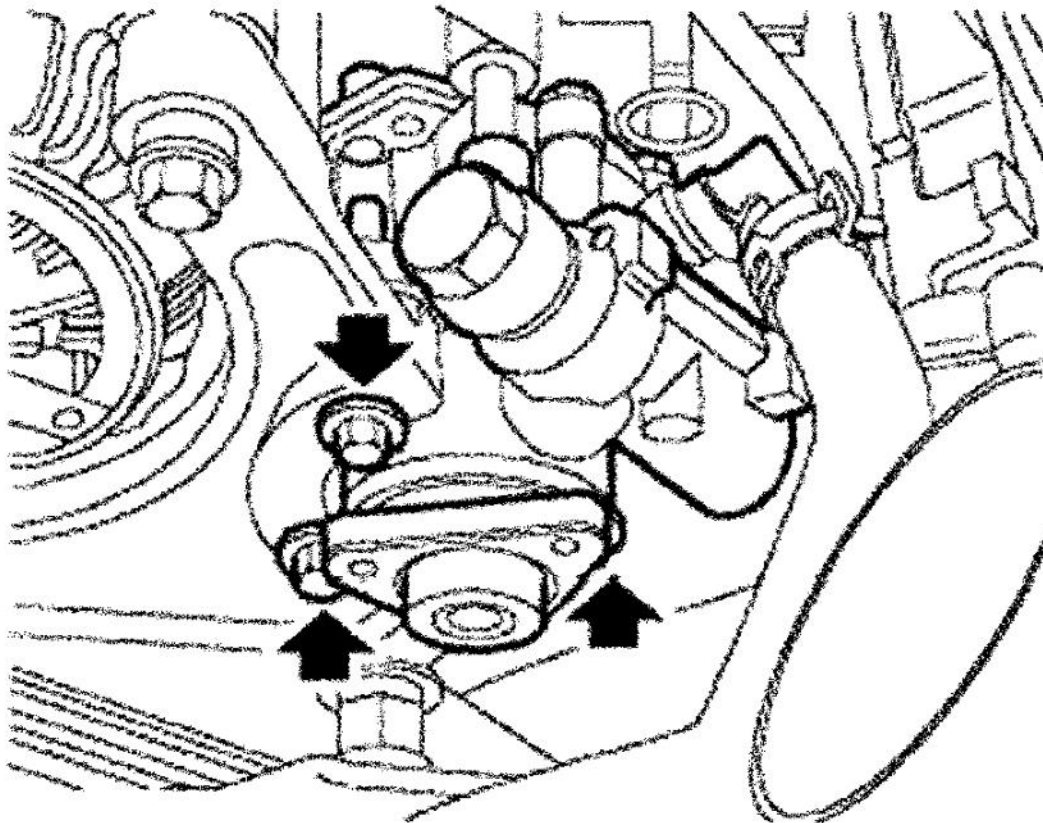
G00382012

Fig. 128: Removing PAS Pipe-To-Engine Front Mounting Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.



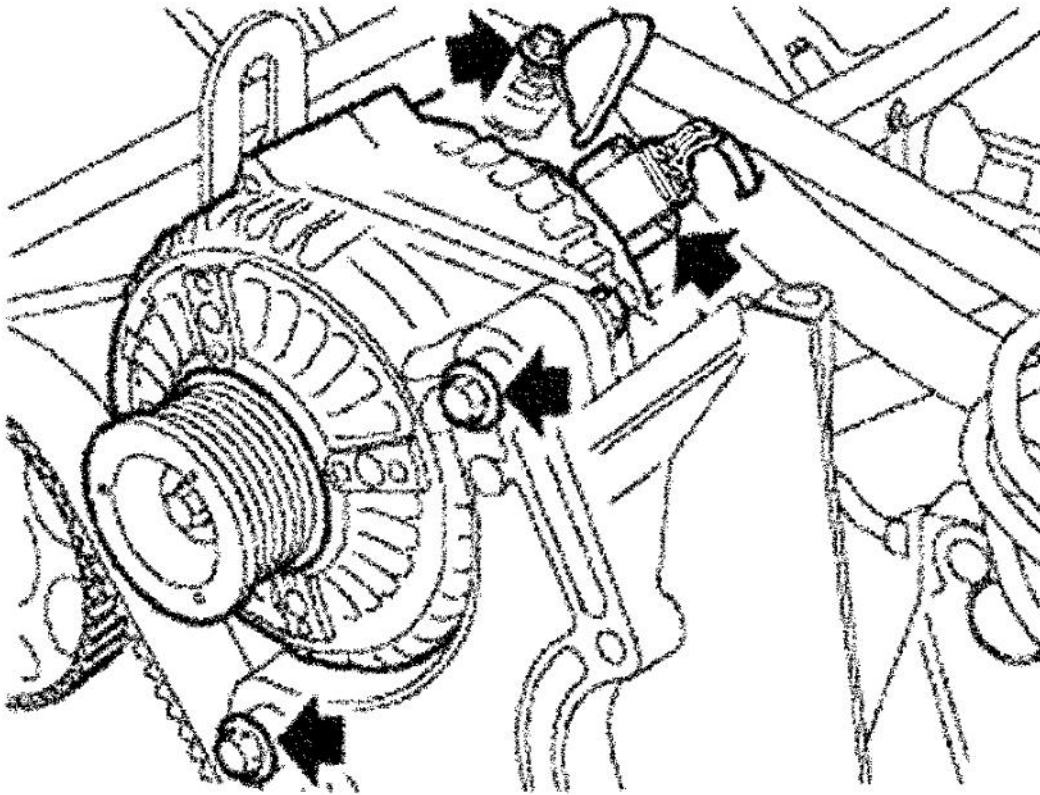
G00382013

Fig. 129: Removing PAS Pump Pulley
Courtesy of LAND ROVER NORTH AMERICA, INC.



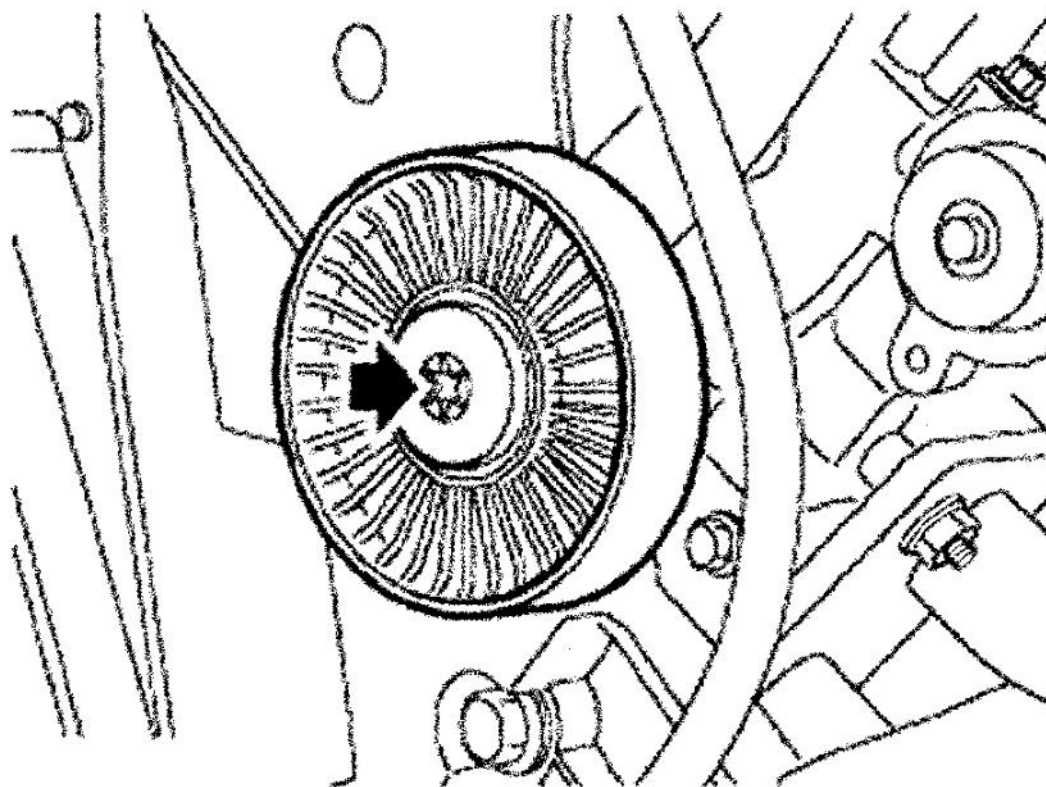
G00382014

Fig. 130: Removing PAS Pump-To-Front Mounting Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.



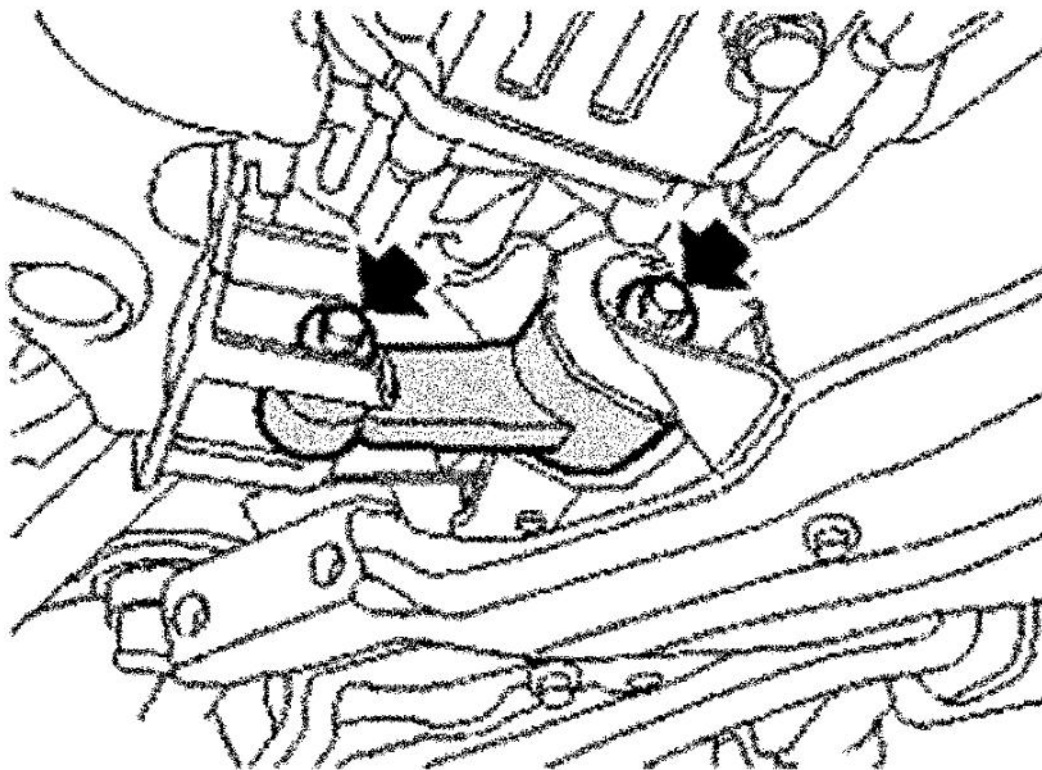
G00382015

Fig. 131: Disconnecting Battery Lead-To-Alternator
Courtesy of LAND ROVER NORTH AMERICA, INC.



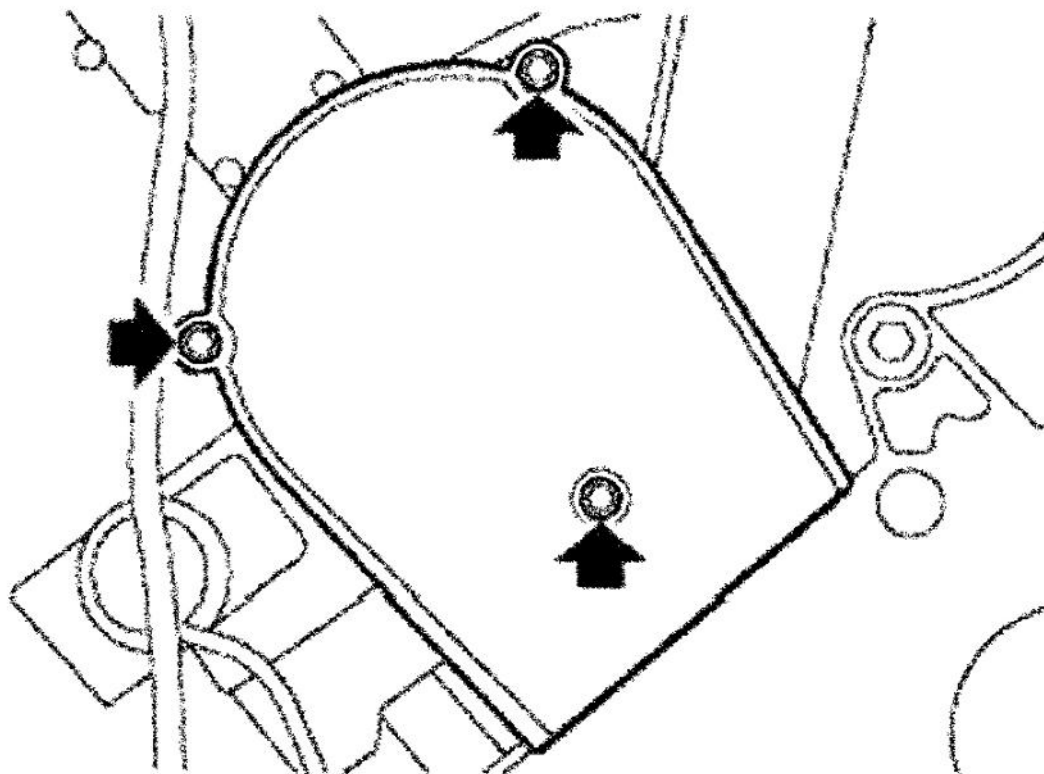
G00382016

Fig. 132: Removing Idler Pulley From Front Mounting Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.



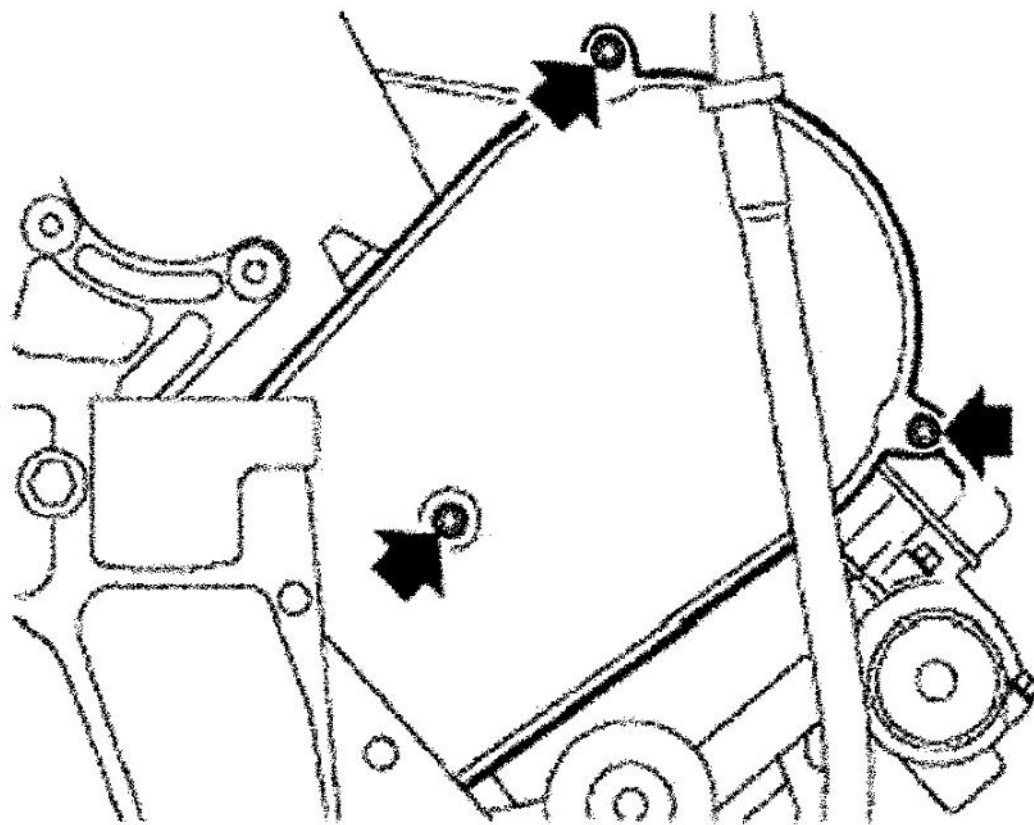
G00382017

Fig. 133: Removing Lower Engine Steady From Sump Mounting
Courtesy of LAND ROVER NORTH AMERICA, INC.



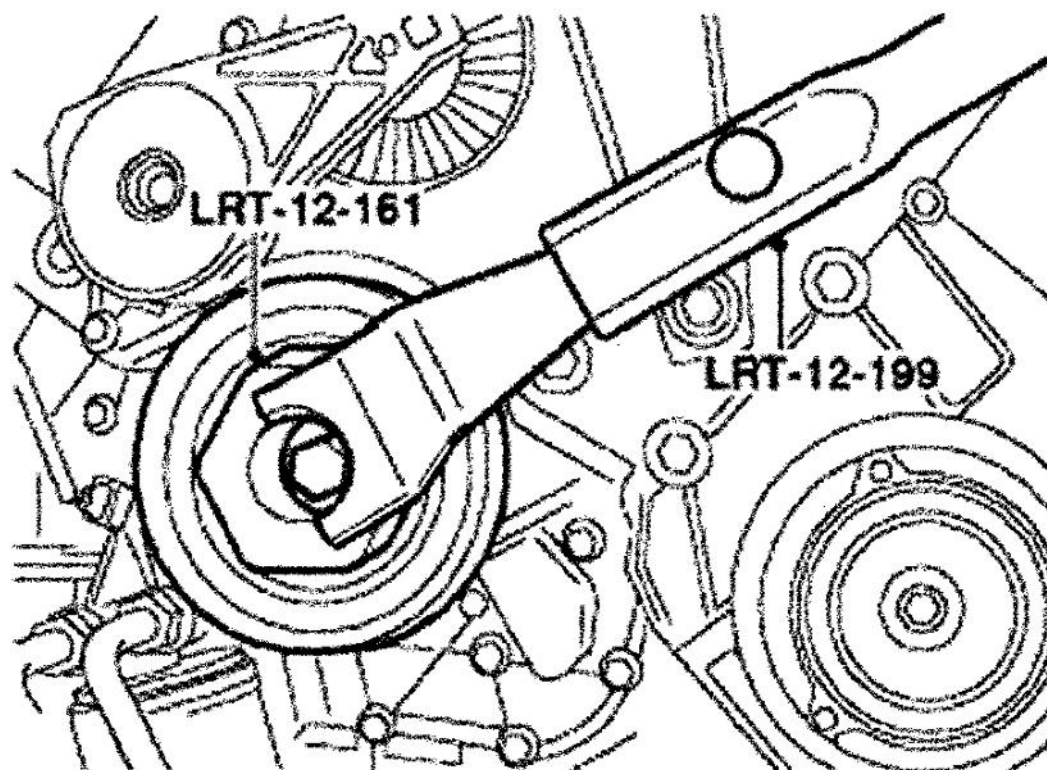
G00382018

Fig. 134: Removing Camshaft Timing Belt Right Front Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



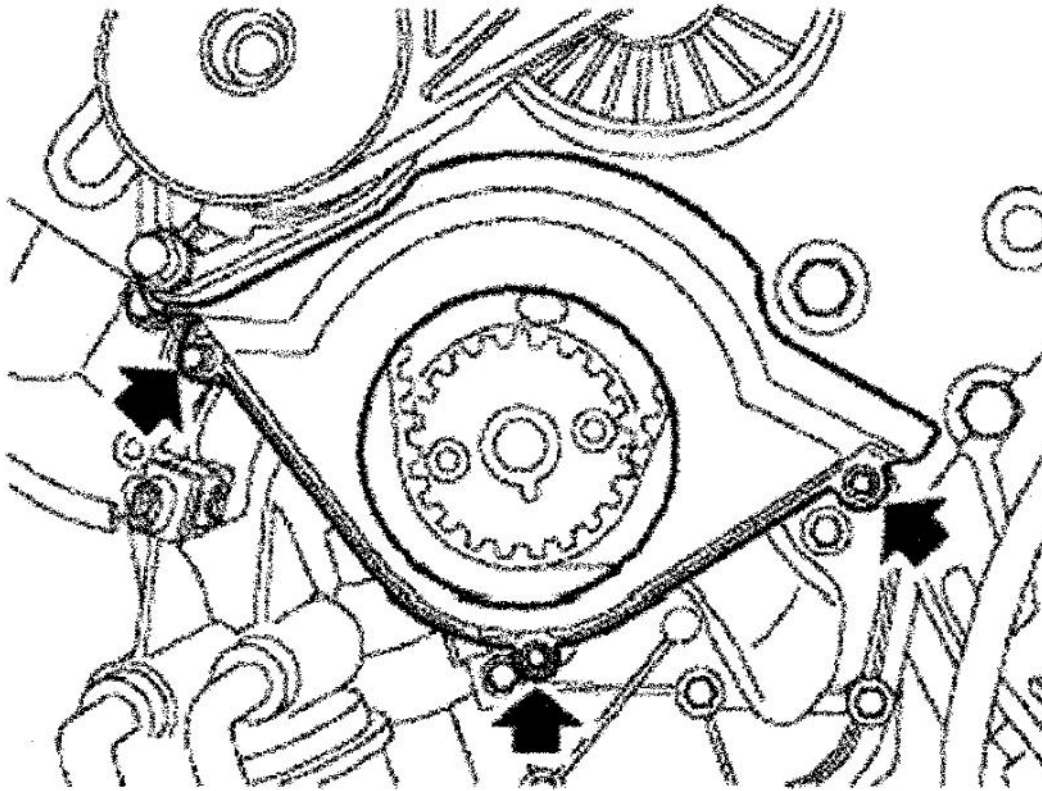
G00382019

Fig. 135: Removing Camshaft Timing Belt Left Front Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



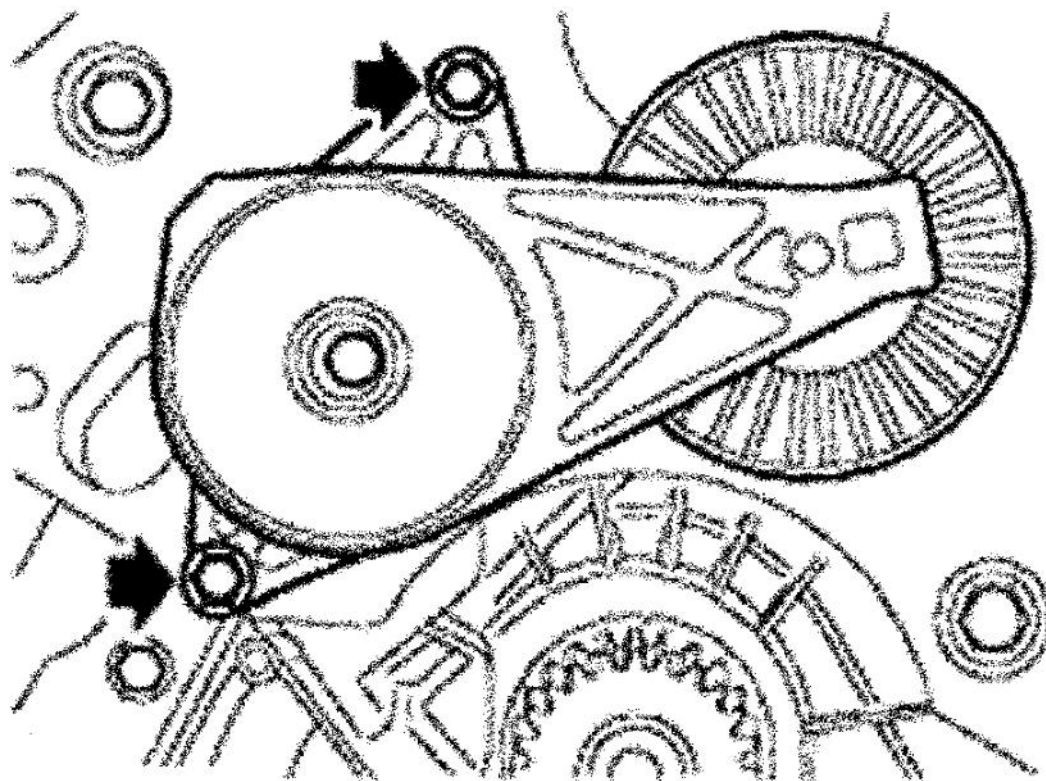
G00382020

Fig. 136: Using Tools LRT-12-161 With LRT-12-199 Remove Pulley Bolt
Courtesy of LAND ROVER NORTH AMERICA, INC.



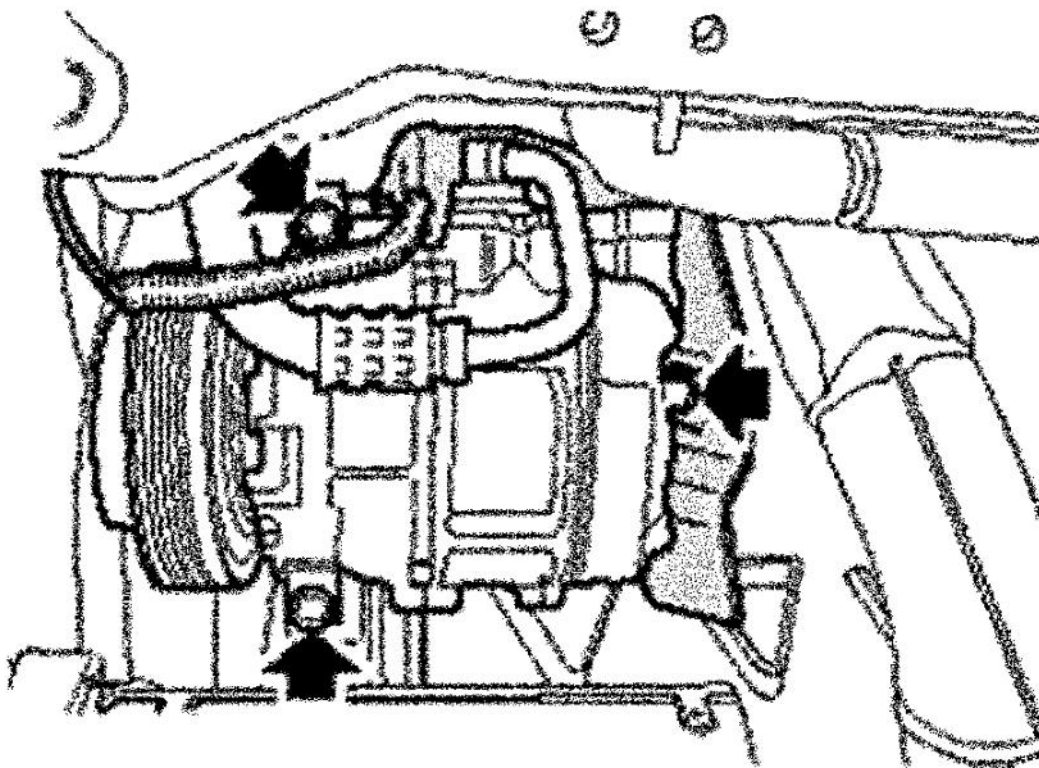
G00382021

Fig. 137: Removing Camshaft Timing Belt Lower Cover-To-Cylinder Block
Courtesy of LAND ROVER NORTH AMERICA, INC.



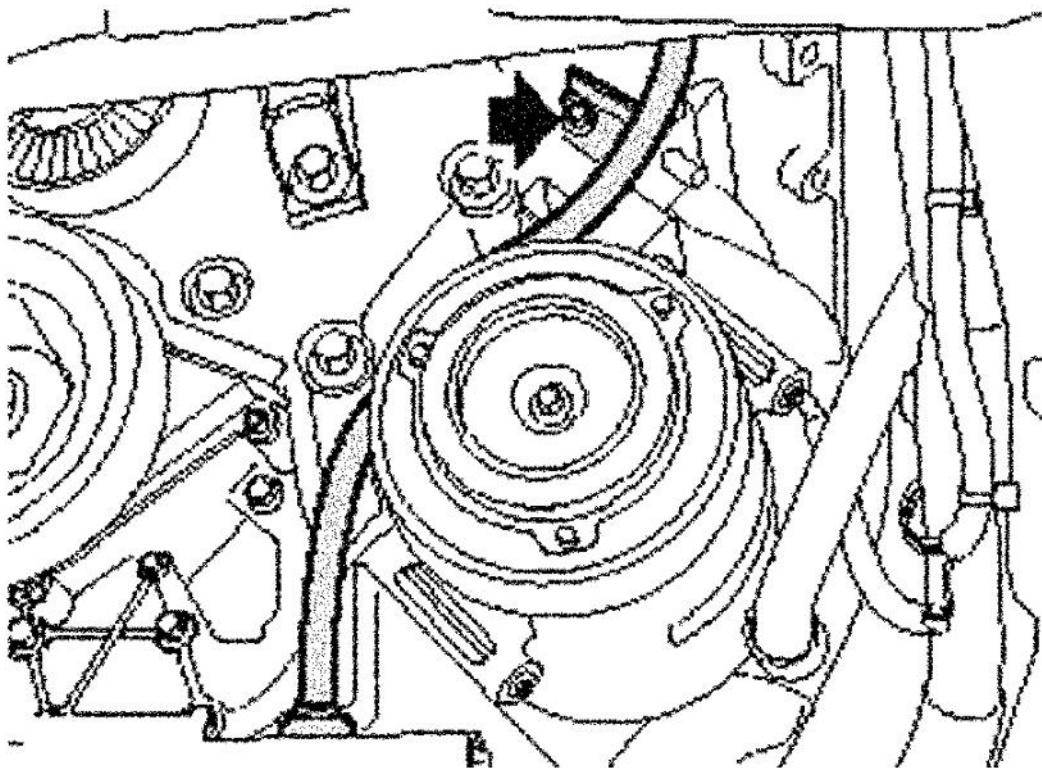
G00382022

Fig. 138: Removing Ancillary Drive Belt Tensioner
Courtesy of LAND ROVER NORTH AMERICA, INC.



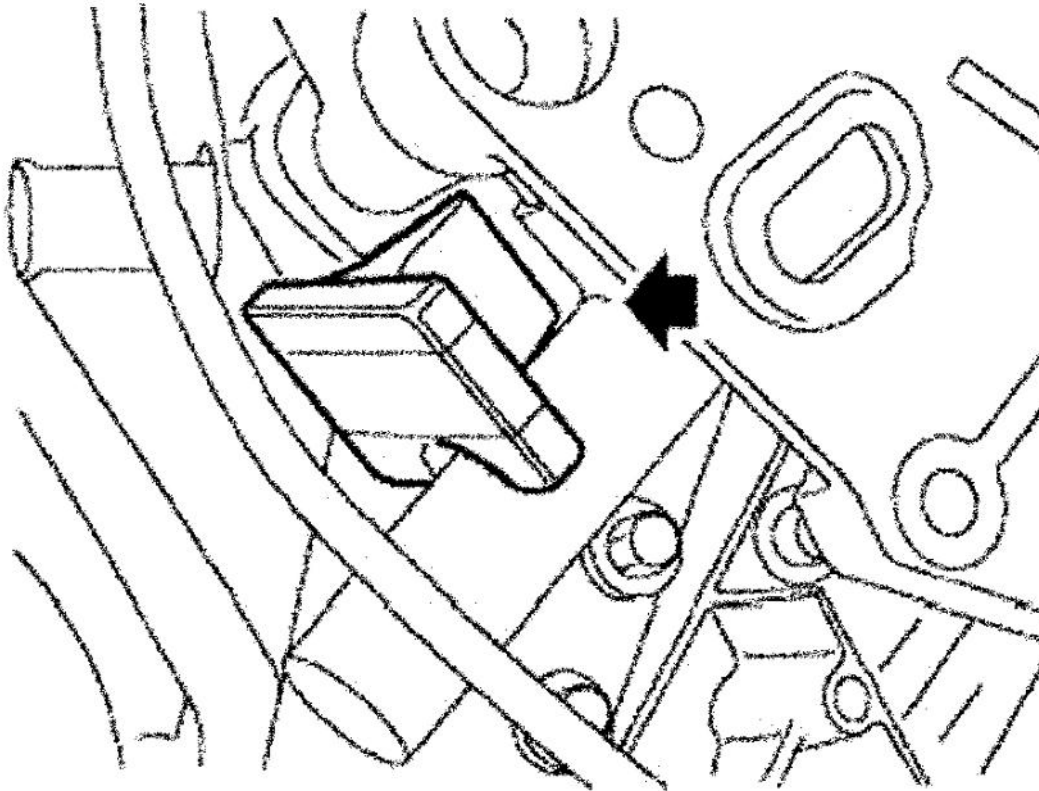
G00382023

Fig. 139: Removing A/C Compressor & Heat Shield
Courtesy of LAND ROVER NORTH AMERICA, INC.



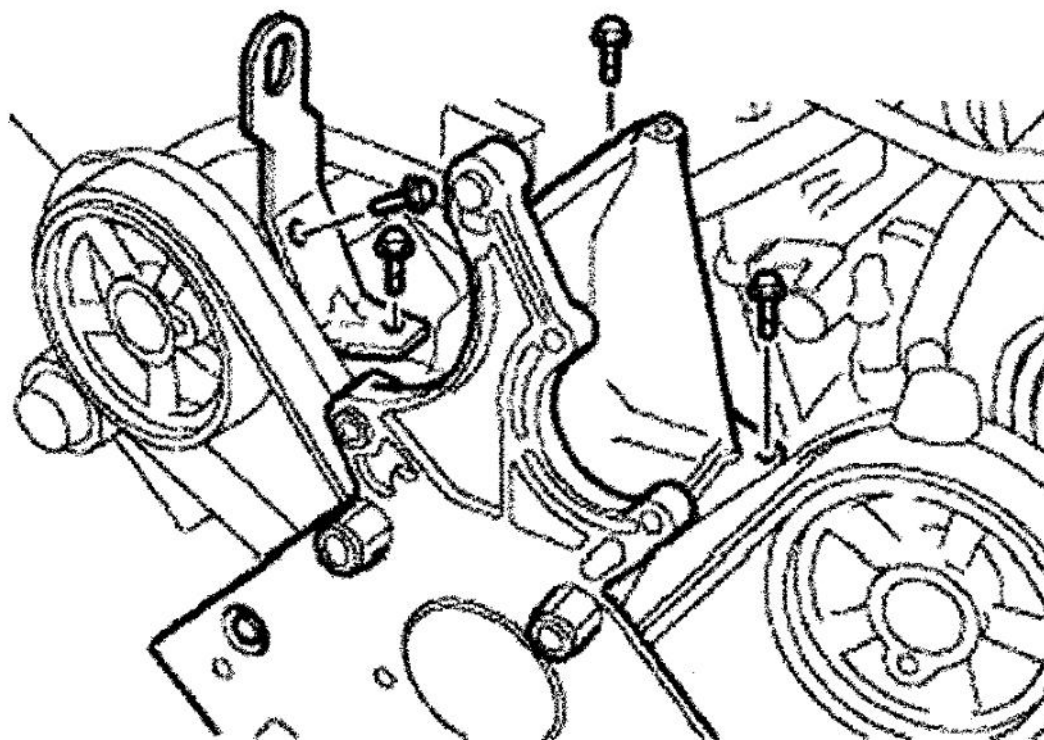
G00382024

Fig. 140: Removing Dipstick Tube Bolt-To-Cylinder Block
Courtesy of LAND ROVER NORTH AMERICA, INC.



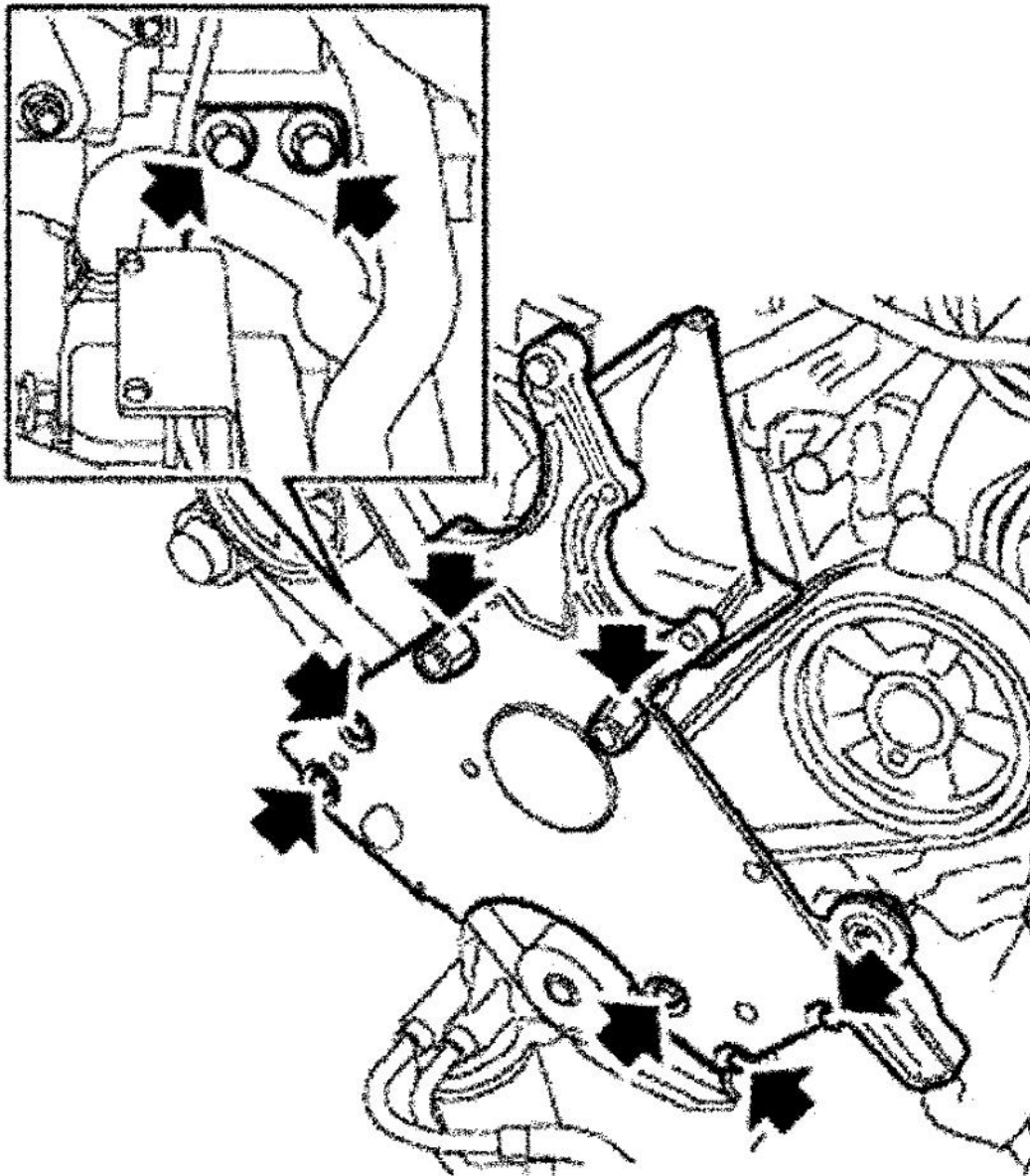
G00382025

Fig. 141: Removing Rubber Blanking Plug From Around Camshaft Timing Belt Tensioner
Courtesy of LAND ROVER NORTH AMERICA, INC.



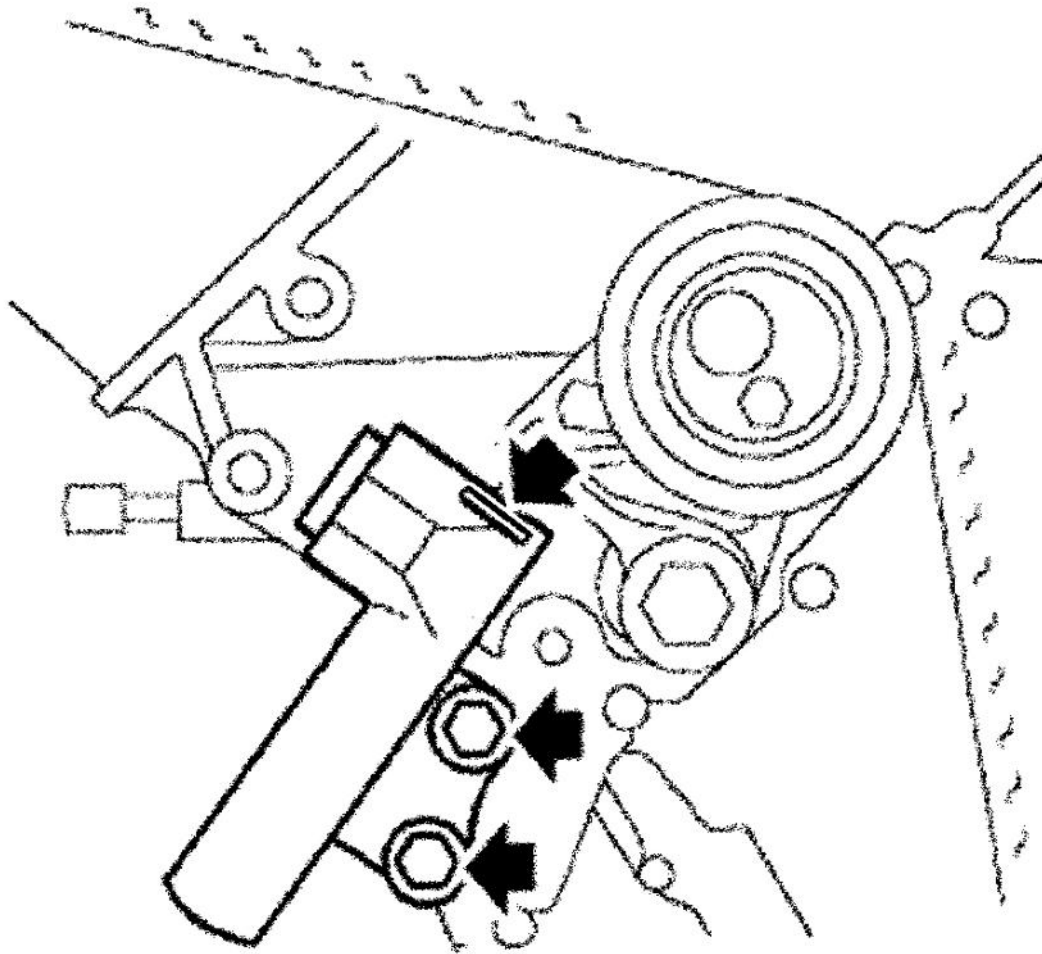
G00382026

Fig. 142: Removing Engine Front Mounting Plate & Lifting Bracket-To-Cylinder Block
Courtesy of LAND ROVER NORTH AMERICA, INC.



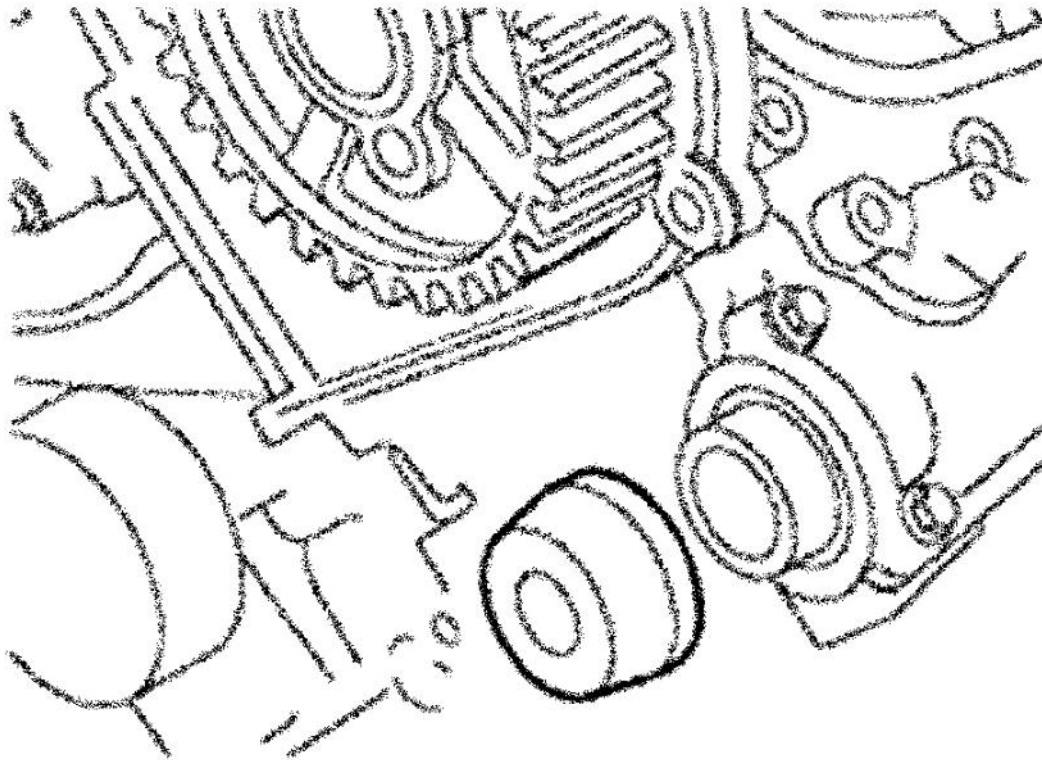
G00382027

Fig. 143: Removing IRD Support Bracket-To-Engine Front Mounting Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382028

Fig. 144: Inserting A 1.5 mm diameter Pin Through Hole In Tensioner Body & Hole In Plunger
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382029

Fig. 145: Removing Left & Right Exhaust Camshaft Cap Seals

Courtesy of LAND ROVER NORTH AMERICA, INC.

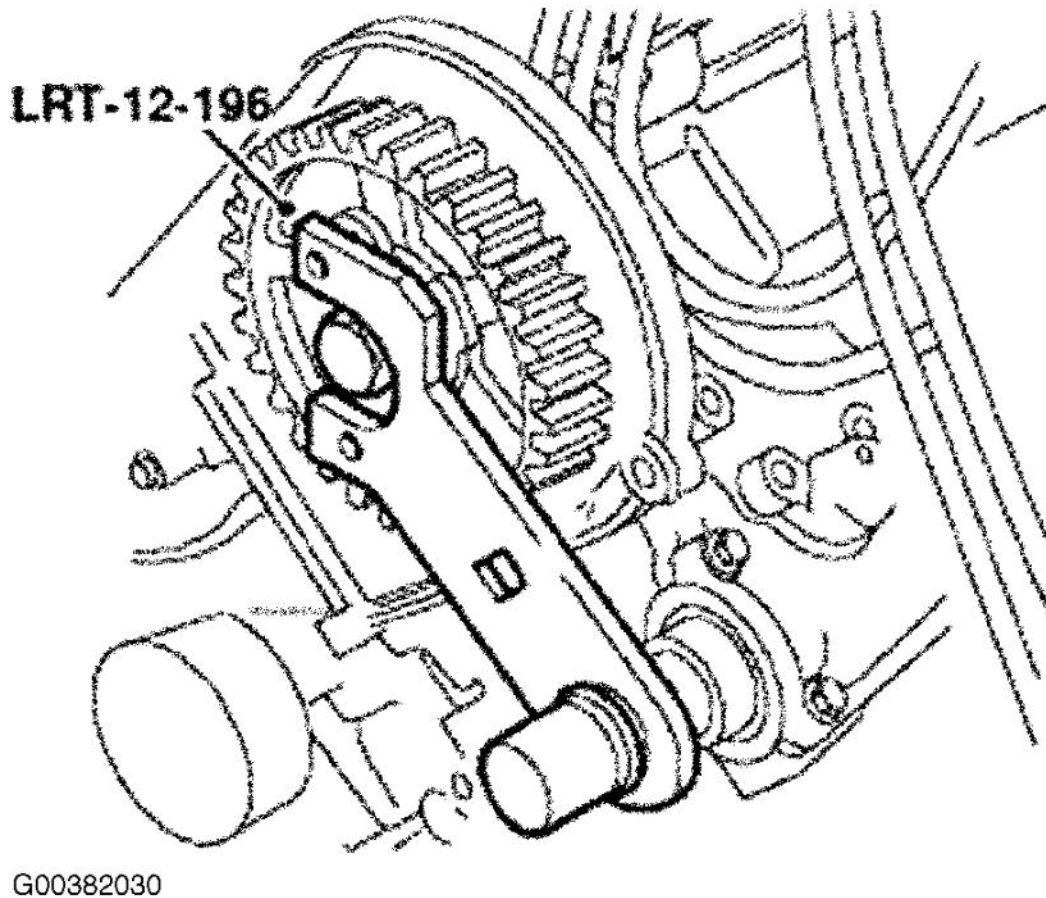


Fig. 146: Tightening Or Loosening Gear Retaining Bolts
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean camshaft gears and hubs, crankshaft gear, tensioner and water pump pulleys.

CAUTION: If the sintered gears have been subjected to prolonged oil contamination, they must be soaked in a solvent bath and then thoroughly washed in clean solvent before refitting. Because of the porous construction of sintered material, oil impregnated in the gears will emerge and contaminate the belt.

NOTE: Following front or rear timing belt refitment, it is possible that, after rotating the engine and positioning the crankshaft pulley to the 'SAFE' position, the timing marks on the rear timing gears may be misaligned. This misalignment is acceptable provided that the timing belt refitting

procedure was carried out correctly.

2. Fit hubs to camshaft gears and fit gears to camshafts. Fit new bolts and tighten sufficiently to allow gears to rotate without tipping.
3. Position timing belt to crankshaft gear.

NOTE: To prevent the timing belt from disengaging from the crankshaft gear when fitting, fit a suitable wedge between the belt and oil pump belt guard.

4. Fit tool LRT-12-197 into each exhaust camshaft in turn. See **Fig. 147**.
5. Using assistance, rotate each exhaust camshaft slightly and align timing marks on left and right rear camshaft gears.
6. Remove tool LRT-12-197 from exhaust camshaft.
7. Fit tools LRT-12-175 to left and right rear camshaft gears.
8. Rotate both front inlet camshaft gears fully clockwise as viewed from front of engine
9. Using fingers only, fit timing belt to gears, starting at the crankshaft gear and working in an anti-clockwise direction, keeping the belt run as taut as possible and turning the camshaft gears only a minimum amount anti-clockwise to fit timing belt.

CAUTION: Gears must not be rotated anti-clockwise more than one tooth.

10. Position an Allen key in tensioner backplate and hold tensioner pulley against timing belt.
11. With assistance, position tensioner, fit new Patchlok bolts and tighten to 25 Nm (18 ft. lbs.).

CAUTION: Ensure tensioner plunger is contacting underside of tensioner backplate.

12. Remove tools LRT-12-175 from rear timing belt gears.
13. Fit tools LRT-12-196 to both front inlet camshaft gears and into the end of each exhaust camshaft.

CAUTION: Special tools must be fitted when tightening or loosening gear retaining bolts, otherwise damage to camshafts may occur.

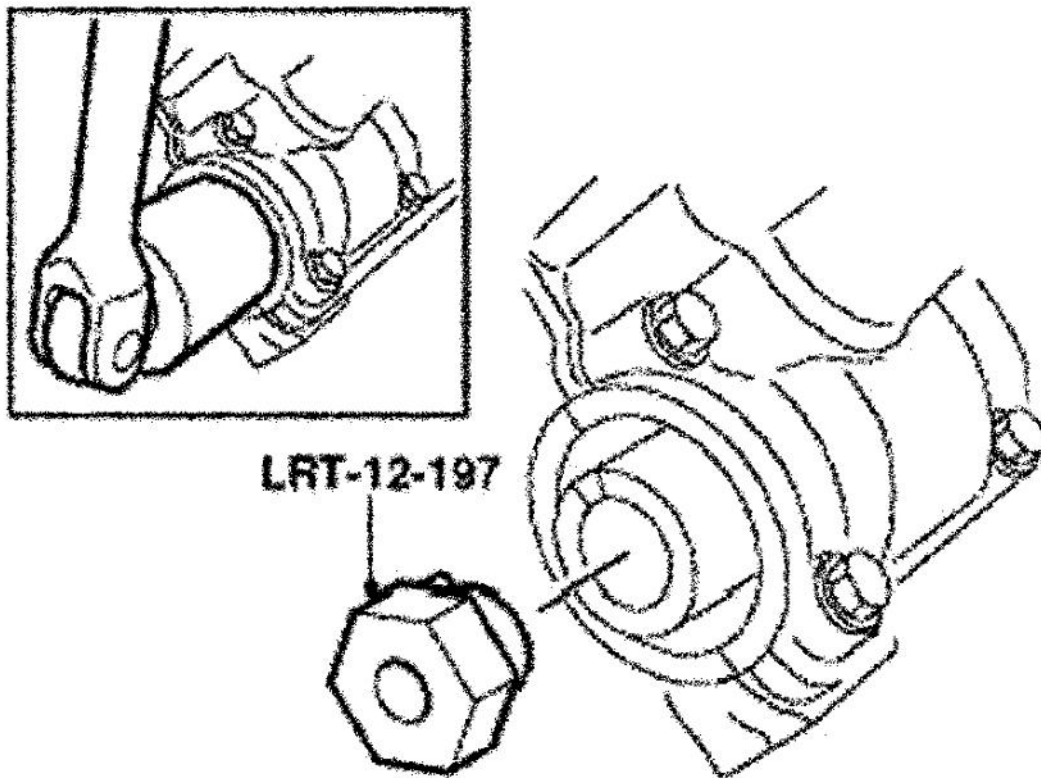
14. Tighten front inlet camshaft gear bolts:
 - Stage 1 - 27 Nm (20 ft. lbs.)
 - Stage 2 - Further 90°
15. Remove tools LRT-12-196 from both inlet camshaft gears and exhaust camshafts.
16. Remove wedge from between drive belt and oil pump belt guard.
17. Remove 1.5 mm diameter pin from tensioner.
18. Fit rubber blanking plug around tensioner.

19. Remove timing pin LRT-12-232.
20. Clean exhaust camshaft front cap seal locations and fit new cap seals.

CAUTION: The sealing edge of the cap seal and mating face must be clean and dry.

21. Position engine front mounting plate and maneuver plate into position. Fit bolts but do not tighten at this stage.
22. Fit bolts securing IRD support bracket to front mounting plate but do not tighten at this stage.
23. Tighten bolts in the sequence shown:
 - Bolt No. 1 - 25 Nm (18 ft. lbs.)
 - Bolt No. 5 - 45 Nm (33 ft. lbs.)
 - Bolts Nos. 2, 3, 4, 6 and 7 - 85 Nm (63 ft. lbs.)
24. Position engine lifting bracket, fit bolts securing lifting bracket and front mounting plate to cylinder block and right cylinder head. Tighten M10 bolts to 45 Nm (33 ft. lbs.) and M8 bolt to 25 Nm (18 ft. lbs.).
25. Clean end of dipstick tube.
26. Position dipstick tube to sump and cylinder block, fit bolt and tighten to 9 Nm (7 ft. lbs.).
27. Position A/C compressor to front mounting plate and cylinder block, align heat shield, fit and tighten bolts to 25 Nm (18 ft. lbs.).
28. Clean lower timing belt cover.
29. Position lower timing belt cover, fit and tighten bolts to 9 Nm (7 ft. lbs.).
30. Clean crankshaft pulley.
31. Fit crankshaft pulley to crankshaft gear and ensure that the indent on pulley locates over the lug on crankshaft gear.
32. Fit crankshaft pulley bolt and washer, position LRT-12-161 with LRT-12-199 into crankshaft pulley. Tighten pulley bolt to 160 Nm (118 ft. lbs.).
33. Remove tools LRT-12-161 and LRT-12-199 from crankshaft pulley.
34. Clean ancillary drive belt tensioner.
35. Position ancillary belt tensioner, fit bolts and tighten to 25 Nm (18 ft. lbs.).
36. Clean left and right front timing belt covers.
37. Position left and right front timing belt covers, fit and tighten bolts to 4 Nm (3 ft. lbs.).
38. Clean idler pulley, position pulley to engine front mounting plate and tighten Allen bolt to 45 Nm (33 ft. lbs.).
39. Position alternator to front mounting plate.
40. Fit bolt and nut and bolt securing alternator to front mounting plate and tighten to 45 Nm (33 ft. lbs.).
41. Connect alternator multiplug.
42. Connect battery lead to alternator, fit and tighten nut to 8 Nm (6 ft. lbs.), fit terminal cover.
43. Position PAS pump to front mounting plate, fit and tighten bolts to 25 Nm (18 ft. lbs.).
44. Position PAS pipe to engine front mounting plate, fit and tighten bolt to 25 Nm (18 ft. lbs.).

45. Clean PAS pump pulley mating faces.
46. Position PAS pump pulley, fit and tighten Torx screws to 9 Nm (7 ft. lbs.).
47. Position lower engine steady to sump mounting, fit and tighten bolt to 100 Nm (74 ft. lbs.).
48. Tighten bolt securing lower engine steady to subframe to 100 Nm (74 ft. lbs.).
49. Clean left rear timing belt cover.
50. Position left rear timing belt cover, fit and tighten bolts to 4 Nm (3 ft. lbs.).
51. Clean right rear timing belt cover.
52. Position right rear timing belt cover, fit bolts and tighten to 4 Nm (3 ft. lbs.).
53. Position heat shield, fit bolts and tighten M6 bolt to 9 Nm (7 ft. lbs.) and M8 bolt to 25 Nm (18 ft. lbs.).
54. Fit inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY** or **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- FROM 03MY** .
55. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.).
56. Fit ancillary drive belt. See **ACCESSORY DRIVE BELT** .



G00382031

Fig. 147: Positioning Exhaust Camshaft With LRT-12-197
 Courtesy of LAND ROVER NORTH AMERICA, INC.

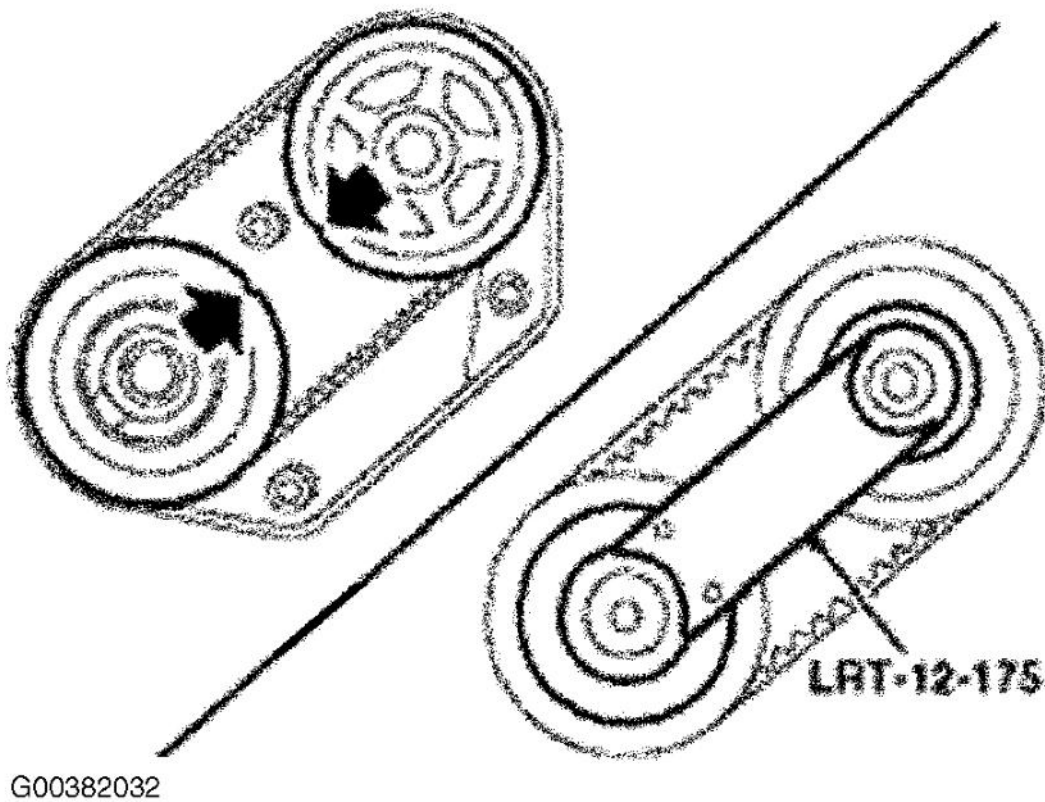
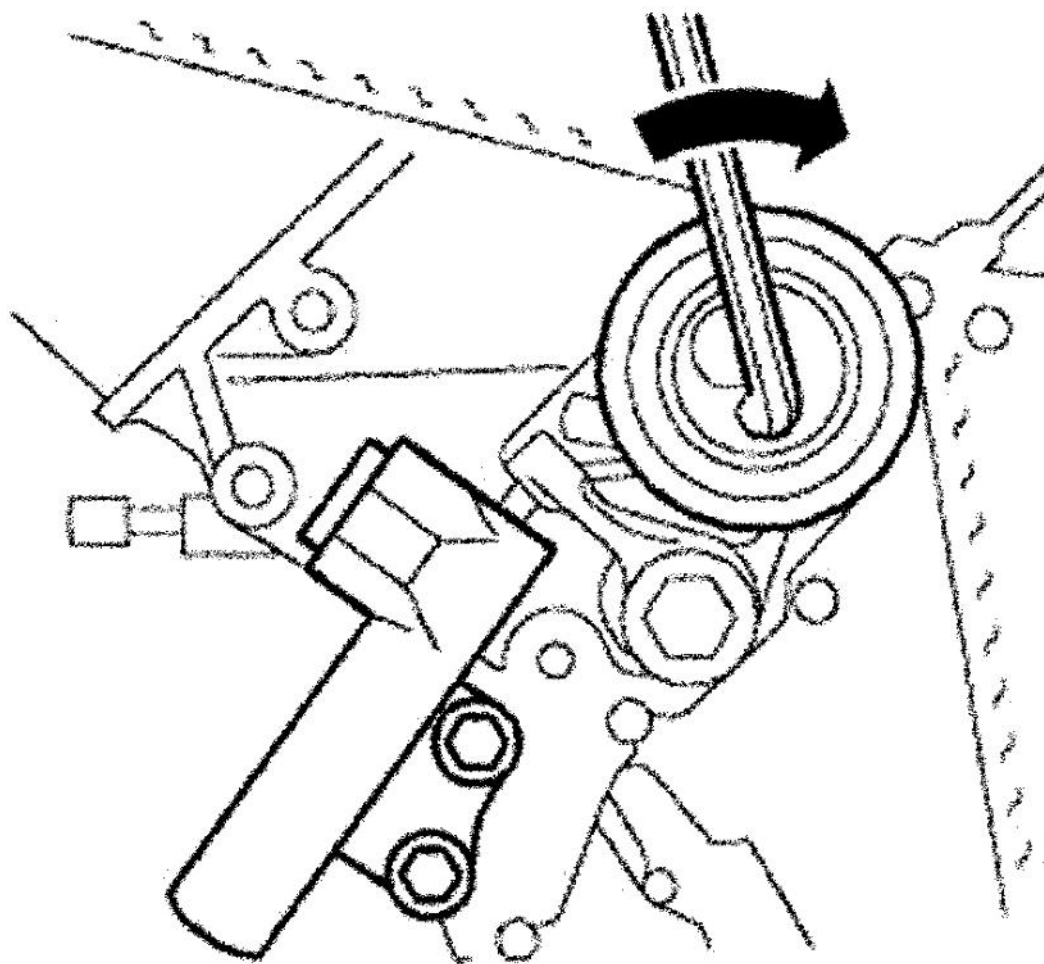


Fig. 148: Aligning Timing Marks On Left & Right Rear Camshaft Gears
Courtesy of LAND ROVER NORTH AMERICA, INC.



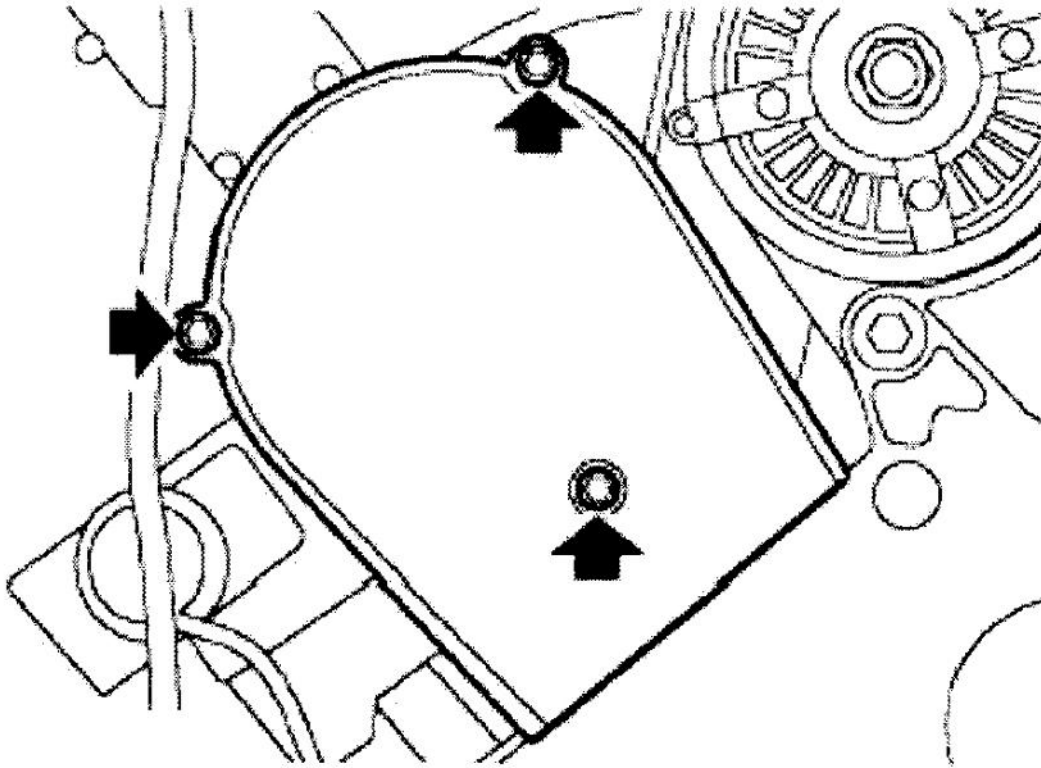
G00382033

Fig. 149: Holding Tensioner Pulley Against Timing Belt
Courtesy of LAND ROVER NORTH AMERICA, INC.

CAMSHAFT TIMING BELT COVER - RIGHT FRONT

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Remove ancillary drive belt. See **ACCESSORY DRIVE BELT**.
3. Remove 3 bolts securing camshaft timing belt right front cover and remove cover. See **Fig. 150**.



G00382034

Fig. 150: Removing Camshaft Timing Belt Right Front Cover
 Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

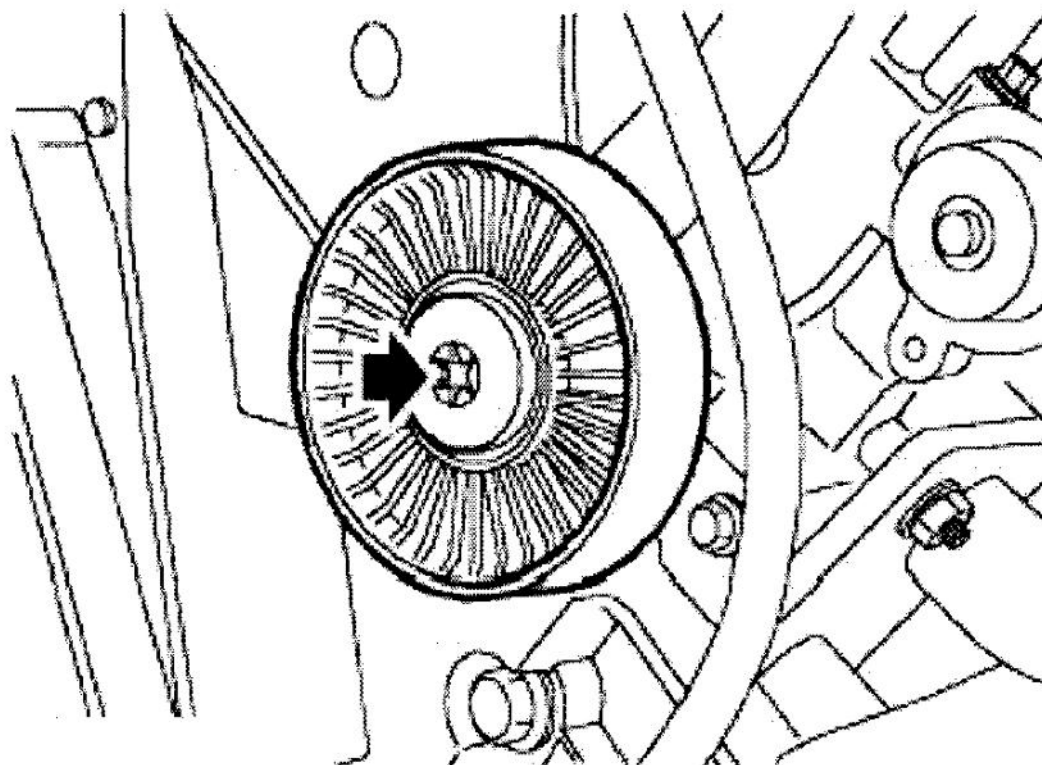
1. Clean right front timing belt cover.
2. Position right front timing belt cover, fit and tighten bolts to 4 Nm (3 ft. lbs.).
3. Fit ancillary drive belt. See **ACCESSORY DRIVE BELT** .
4. Connect battery earth lead. See **DISCONNECT/CONNECT** .

CAMSHAFT TIMING BELT COVER - LEFT FRONT

Removal

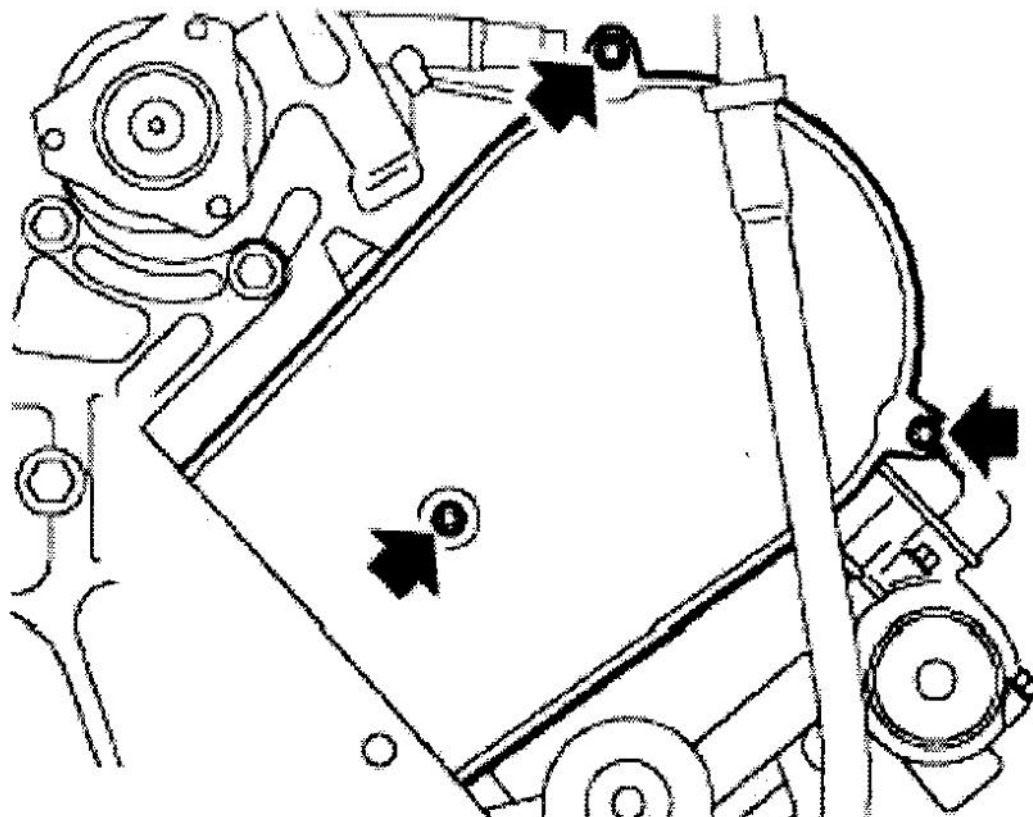
1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Remove ancillary drive belt. See **ACCESSORY DRIVE BELT** .
3. Remove 3 Torx screws securing PAS pump pulley, and remove pulley. See **Fig. 129**.
4. Remove Torx screw securing idler pulley to front mounting plate and remove pulley. See **Fig. 151**.

5. Remove bolt securing dipstick tube to cylinder block. See **Fig. 118**.
6. Remove 3 bolts securing camshaft timing belt left front cover and remove cover. See **Fig. 152**.



G00382036

Fig. 151: Removing Idler Pulley-To-Front Mounting Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00382038

Fig. 152: Removing Camshaft Timing Belt Left Front Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.

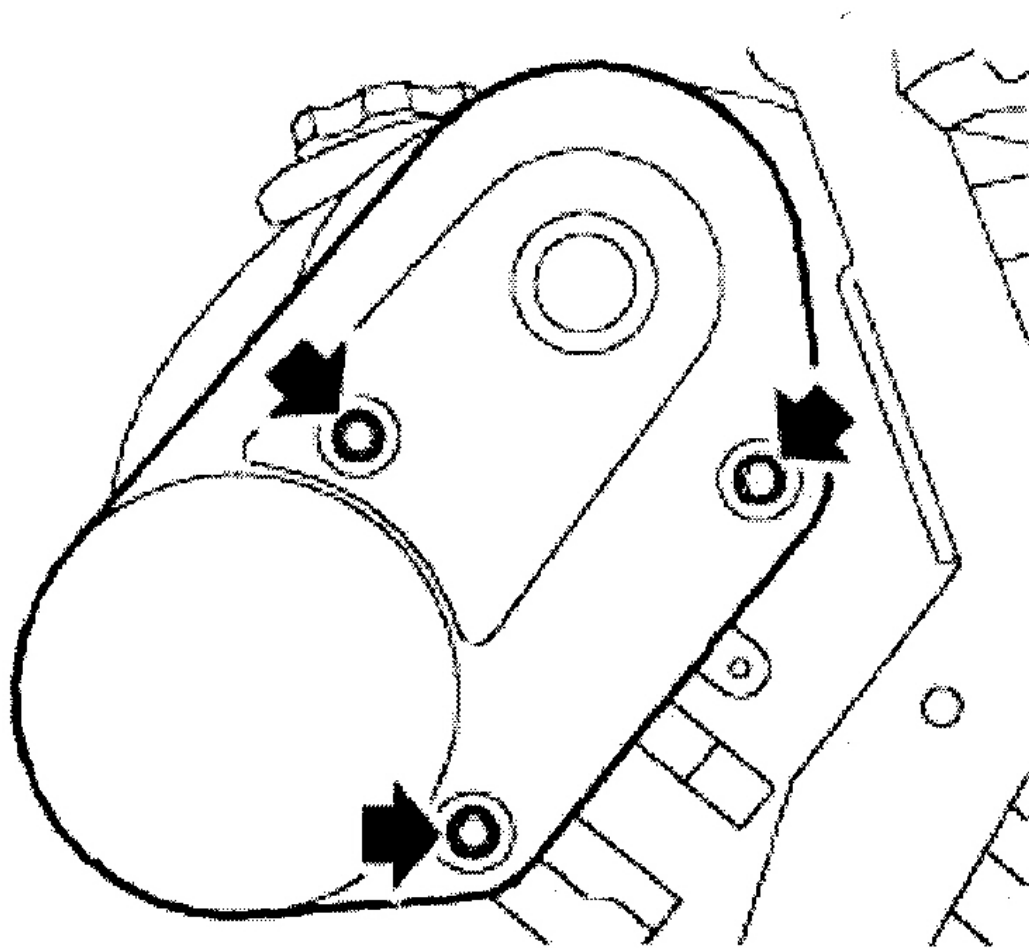
Installation

1. Clean left front timing belt cover.
2. Position left front timing belt cover, fit and tighten bolts to 4 Nm (3 ft. lbs.).
3. Position dipstick tube bracket to cylinder block and tighten bolt to 9 Nm (7 ft. lbs.).
4. Clean idler pulley, position pulley to engine front mounting plate and tighten Torx bolt to 45 Nm (33 ft. lbs.).
5. Position PAS pump pulley, fit and tighten Torx screws to 9 Nm (7 ft. lbs.).
6. Fit ancillary drive belt. See **ACCESSORY DRIVE BELT** .
7. Connect battery earth lead. See **DISCONNECT/CONNECT** .

CAMSHAFT TIMING BELT COVER - LEFT REAR

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT**.
2. Remove engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.
3. Remove 3 bolts securing left rear timing belt cover and remove cover. See **Fig. 153**.



G00382039

Fig. 153: Removing Left Rear Timing Belt Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean left rear timing belt cover.
2. Position left rear timing belt cover, fit bolts and tighten to 4 Nm (3 ft. lbs.).
3. Fit engine acoustic cover. See **COVER - ENGINE ACOUSTIC**.

4. Connect battery earth lead. See **DISCONNECT/CONNECT** .

CAMSHAFT TIMING BELT COVER - RIGHT REAR

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Remove inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY** or **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- FROM 03MY** .
3. Remove 2 bolts securing right rear timing belt cover heat shield to cylinder head and remove heat shield. See **Fig. 154**.
4. Remove 3 bolts securing right rear timing belt cover and remove cover.

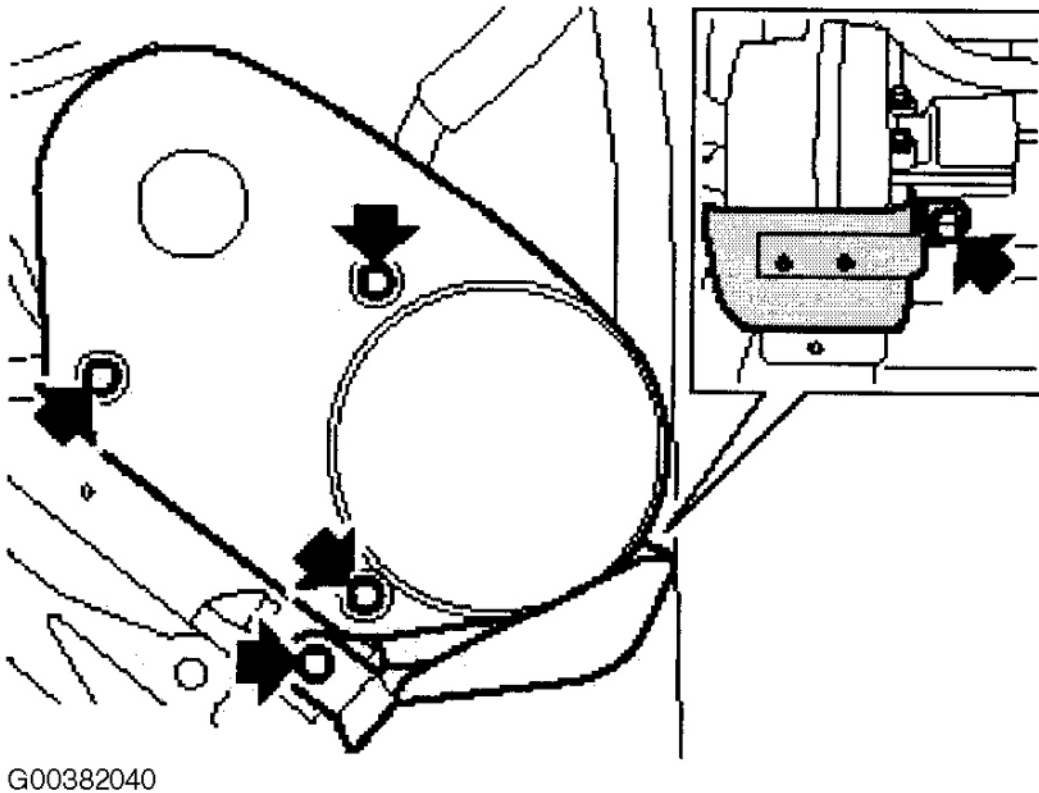


Fig. 154: Removing Right Rear Timing Belt Cover Heat Shield-To-Cylinder Head
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean right rear timing belt cover.
2. Position right rear timing belt cover, fit bolts and tighten to 4 Nm (3 ft. lbs.).

3. Position heat shield, fit bolts and tighten M6 bolt to 9 Nm (7 ft. lbs.) and M8 bolt to 25 Nm (18 ft. lbs.).
4. Fit inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY** or **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- FROM 03MY** .
5. Connect battery earth lead. See **DISCONNECT/CONNECT** .

CAMSHAFT REAR TIMING BELT - LEFT CYLINDER HEAD

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Remove underbelly panel. See **UNDERBELLY PANEL** .
3. Remove left rear timing belt cover. See **CAMSHAFT TIMING BELT COVER - LEFT REAR**.
4. Remove right front road wheel.
5. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
6. Using a socket on crankshaft pulley bolt, rotate crankshaft in a clockwise direction. Align the engine "SAFE" position, notch on crankshaft pulley aligned to the "ARROW" on front mounting plate and the timing marks aligned on the rear camshaft gears as illustrated. See **Fig. 126**.

**CAUTION: Do not use camshaft gear bolts or timing belt to rotate crankshaft.
Never use the arrow on the oil pump body as a timing reference.**

7. Insert timing pin LRT-12-232 through hole in lower crankcase, ensuring pin is located in hole in drive plate. See **Fig. 127**.

CAUTION: Hole immediately adjacent to side of lower crankcase must be used.

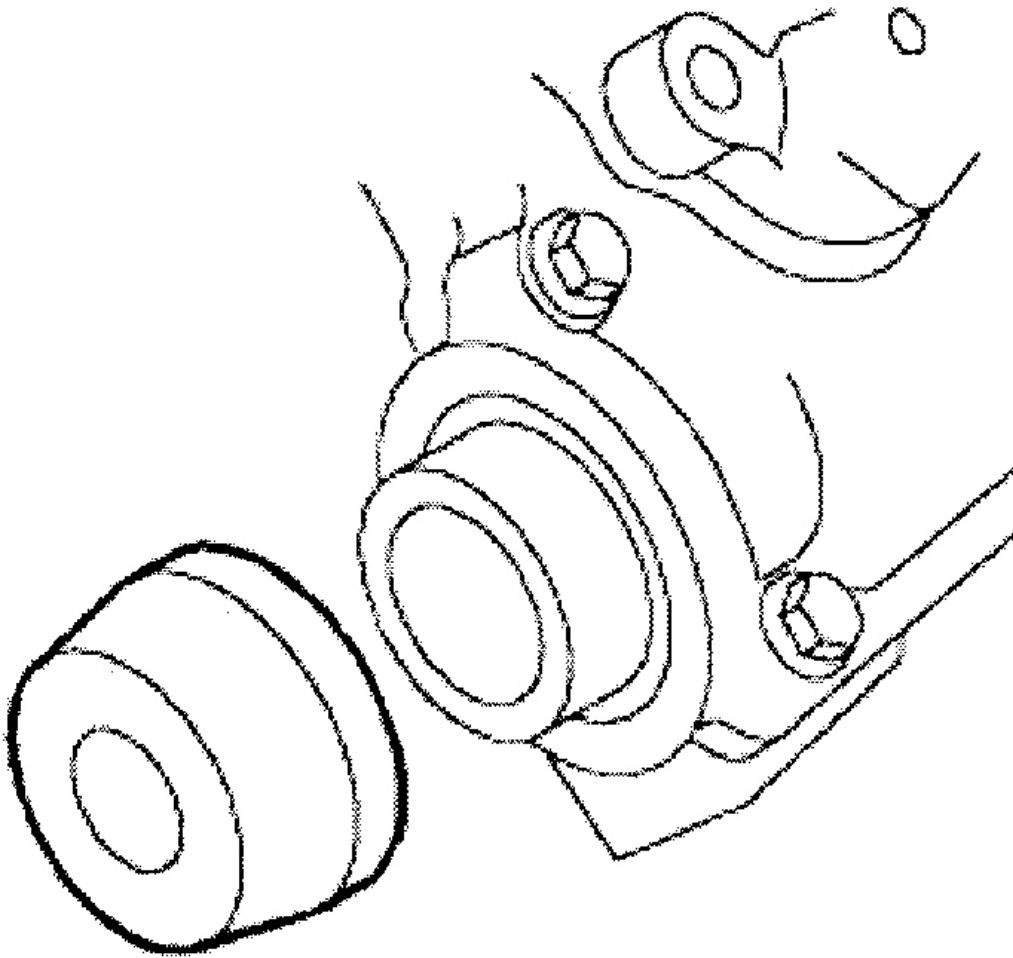
8. Remove and discard left front exhaust camshaft cap seal from cylinder head. See **Fig. 155**.
9. 9. Position LRT-12-175 to rear camshaft gears as illustrated, remove and discard bolts securing gears to camshafts. See **Fig. 156**.
10. Remove rear camshaft gears, timing belt and special tool as an assembly.

CAUTION: Do not turn the crankshaft or the camshafts while the timing belt is removed.

11. If camshaft timing belt is to be refitted, mark direction of rotation on timing belt.
12. Remove LRT-12-175 from camshaft gears and remove timing belt from gears.

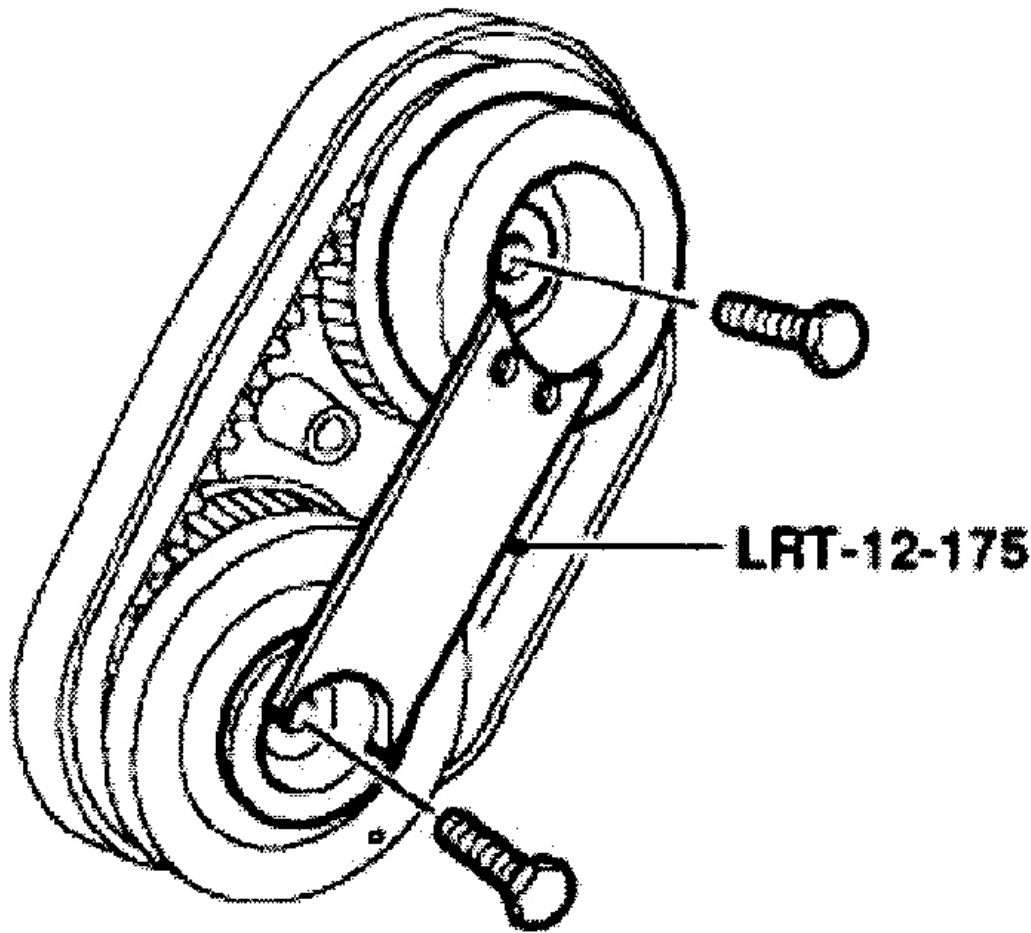
CAUTION: Do not rotate crankshaft or camshafts with timing belt removed and cylinder heads fitted.

CAUTION: Camshaft timing belts must be stored and handled with care. Always store a camshaft timing belt on its edge with a bend radius greater than 50 mm (2.0 in). Do not use a camshaft timing belt that has been twisted or bent double as this will damage the reinforcing fibres. Do not use a camshaft timing belt if debris other than belt dust is found in timing belt covers. Do not use a camshaft timing belt if partial engine seizure has occurred. Do not use a camshaft timing belt if mileage exceeds 72,000 km (45,000 miles). Do not use an oil or coolant contaminated timing belt, cause of contamination must be rectified.



G00383995

Fig. 155: Removing Left Front Exhaust Camshaft Cap Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00383996

Fig. 156: Removing Bolts Securing Gears-To-Camshaft
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

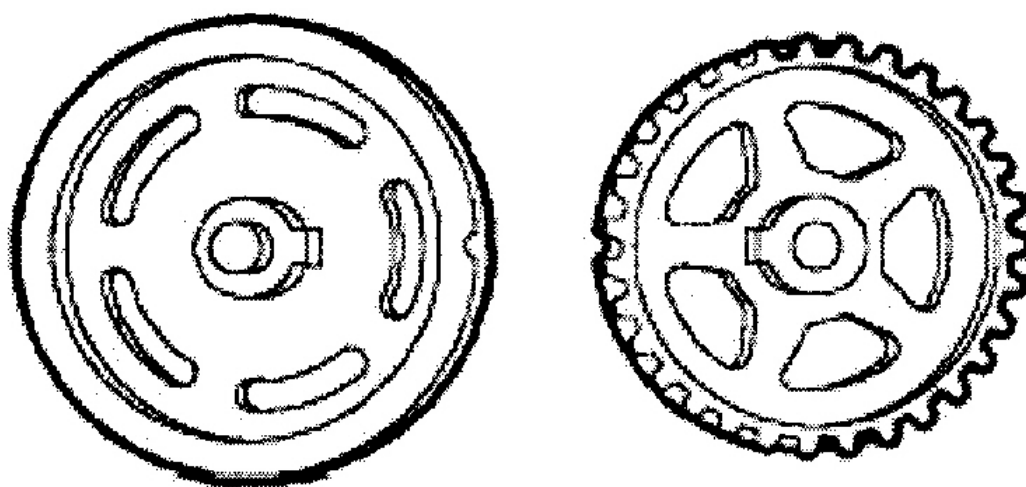
1. Clean camshaft gears and mating faces on camshafts.

NOTE: Following front or rear timing belt refitment, it is possible that after rotating the engine and positioning the crankshaft pulley to the "SAFE" position, the timing marks on the rear timing gears may be misaligned. This misalignment is acceptable provided that the timing belt refitting procedure was carried out correctly.

CAUTION: If the sintered gears have been subjected to prolonged oil

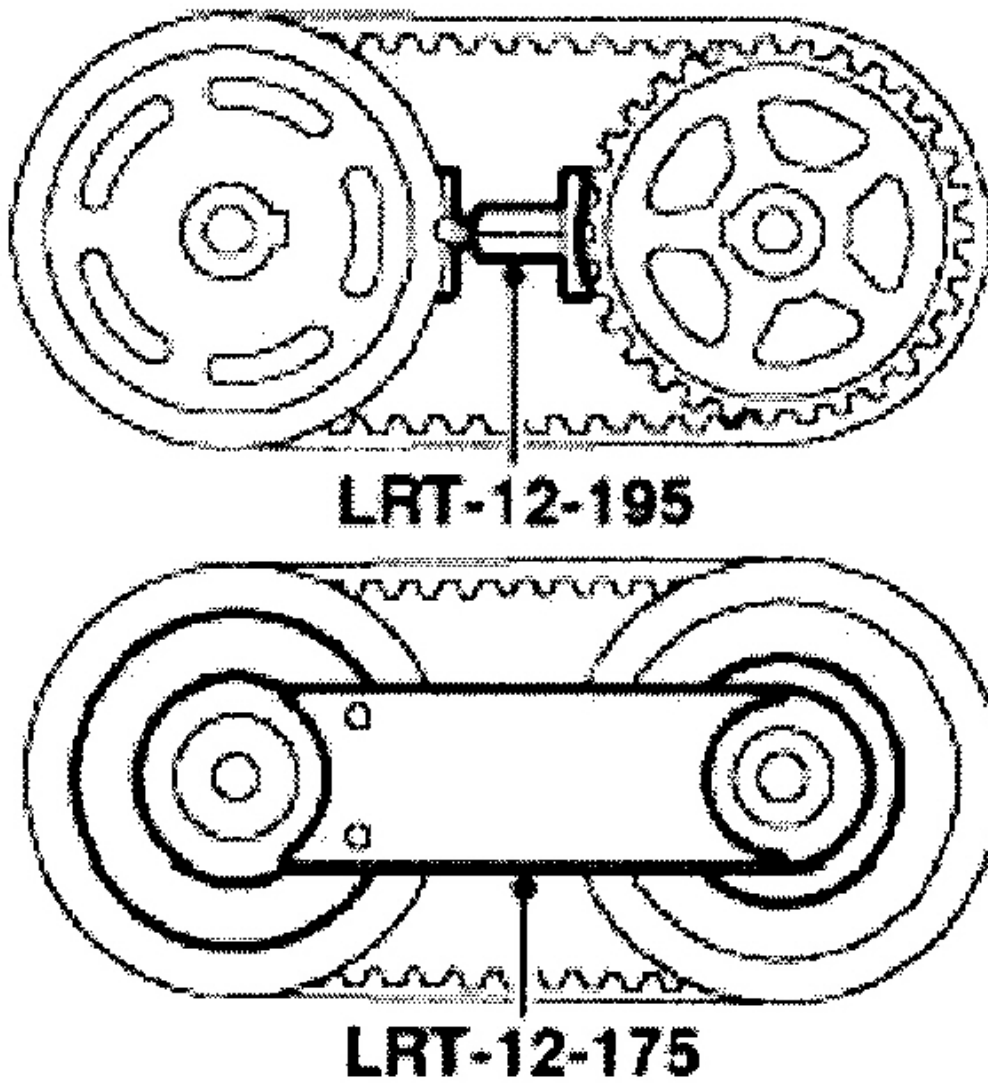
contamination, they must be soaked in a solvent bath and then thoroughly washed in clean solvent before refitting. Because of the porous construction of sintered material, oil impregnated in the gears will emerge and contaminate the belt.

2. Place gears inverted on a flat surface, with the locating lugs on the gears positioned as illustrated. See **Fig. 157**.
3. Keeping the timing marks aligned, position timing belt onto gears. See **Fig. 158**.
4. Position LRT-12-195 between the gears, turn center nut sufficiently to spread drive belt.
5. Invert gears and timing belt and position LRT-12-175 to camshaft gears.
6. Check that the locating lugs are still aligned and remove LRT-12-195 from between camshaft gears.
7. Fit LRT-12-198 alignment pins into the end of each camshaft. See **Fig. 159**
8. Position timing belt and gears over LRT-12-198 and locate gears onto camshafts.
9. Position LRT-12-197 into the front end of the left exhaust camshaft.
10. With assistance, using a 30-mm socket on LRT-12-197, turn the left exhaust camshaft sufficiently to align camshaft gears to the drive slots in each camshaft.
11. Remove LRT-12-198 alignment pins and fit new camshaft gear retaining bolts.
12. Tighten camshaft gear bolts:
 - Stage 1 - 27 Nm (20 ft. lbs.)
 - Stage 2 - Further 90°
13. Remove LRT-12-175 from camshaft gears.
14. Remove LRT-12-197 from front end of exhaust camshaft.
15. Clean left exhaust camshaft cap seal recess and fit new cap seal.
16. Remove timing pin LRT-12-232 from lower crankcase.
17. Fit splash shield and secure with bolts.
18. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.).
19. Fit left rear timing belt cover. See **CAMSHAFT TIMING BELT COVER - LEFT REAR**.
20. Fit underbelly panel. See **UNDERBELLY PANEL** .
21. Connect battery earth lead. See **DISCONNECT/CONNECT** .



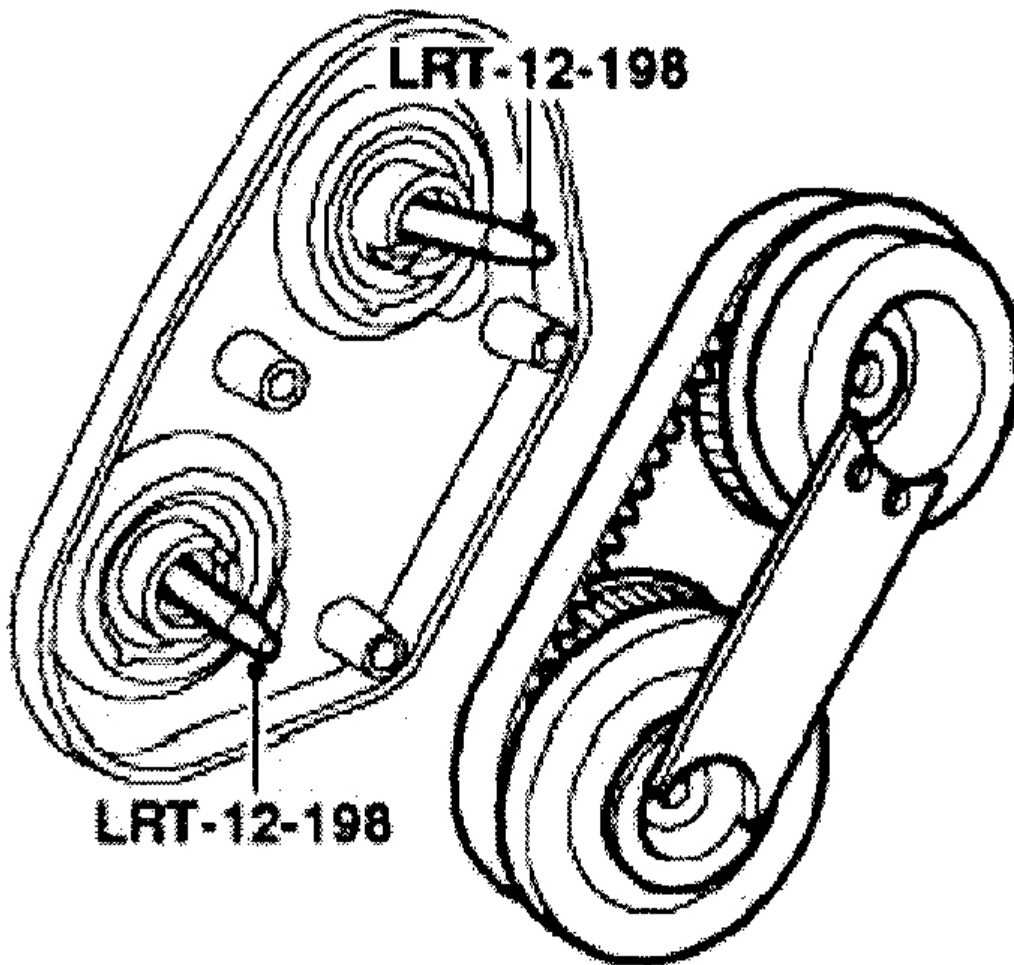
G00384003

Fig. 157: Placing Gears As Illustrated On A Flat Surface
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00383998

Fig. 158: Positioning Timing Belt Onto Gears
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00383999

Fig. 159: Installing Alignment Pins Into The End Of Each Camshaft
Courtesy of LAND ROVER NORTH AMERICA, INC.

CAMSHAFT REAR TIMING BELT - RIGHT CYLINDER HEAD

Removal

1. Disconnect battery earth lead. See **DISCONNECT/CONNECT** .
2. Remove underbelly panel. See **UNDERBELLY PANEL** .
3. Remove right front road wheel.
4. Remove 3 bolts securing right splash shield to body and remove shield. See **Fig. 16**.
5. Remove right rear timing belt cover. See **CAMSHAFT TIMING BELT COVER - RIGHT REAR**.

6. Using a socket on crankshaft pulley bolt, rotate crankshaft in a clockwise direction. Align the engine "SAFE" position, notch on crankshaft pulley aligned to the "ARROW" on front mounting plate and the timing marks aligned on the rear camshaft gears as illustrated. See **Fig. 160**.

CAUTION: Do not use camshaft gear bolts or timing belt to rotate crankshaft. Never use the arrow on the oil pump body as a timing reference.

7. Insert timing pin LRT-12-232 through hole in lower crankcase, ensuring pin is located in hole in drive plate. See **Fig. 127**.

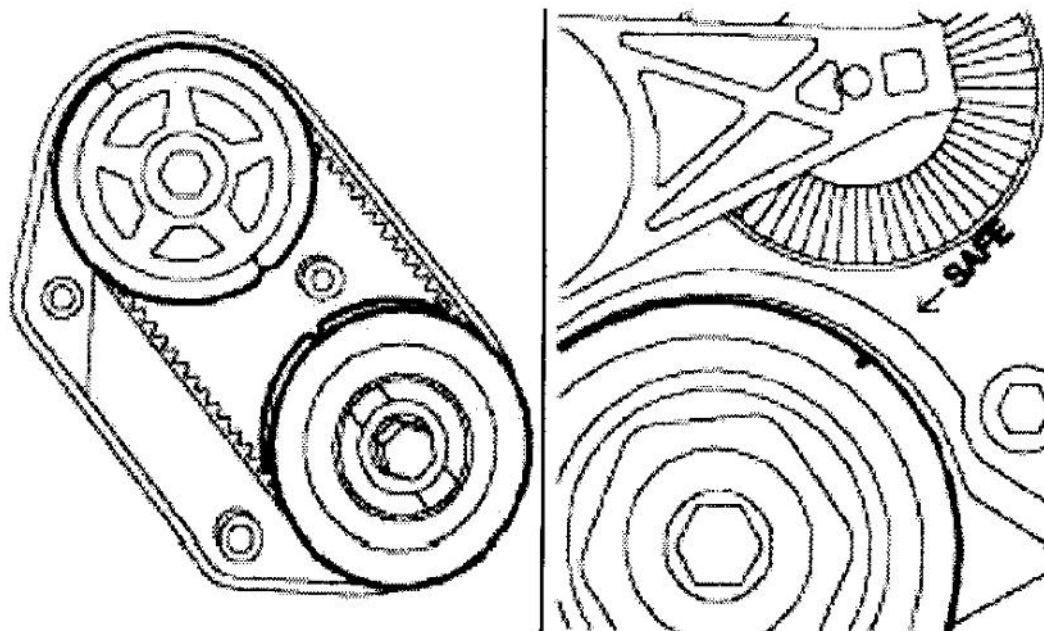
CAUTION: Hole immediately adjacent to side of lower crankcase must be used.

8. Remove and discard right front exhaust camshaft cap seal from cylinder head. See **Fig. 161**.
9. Position LRT-12-175 to rear camshaft gears as illustrated, remove and discard bolts securing gears to camshafts. See **Fig. 162**.
10. Remove rear camshaft gears, timing belt and special tool as an assembly.

CAUTION: Do not turn the crankshaft or the camshafts while the timing belt is removed.

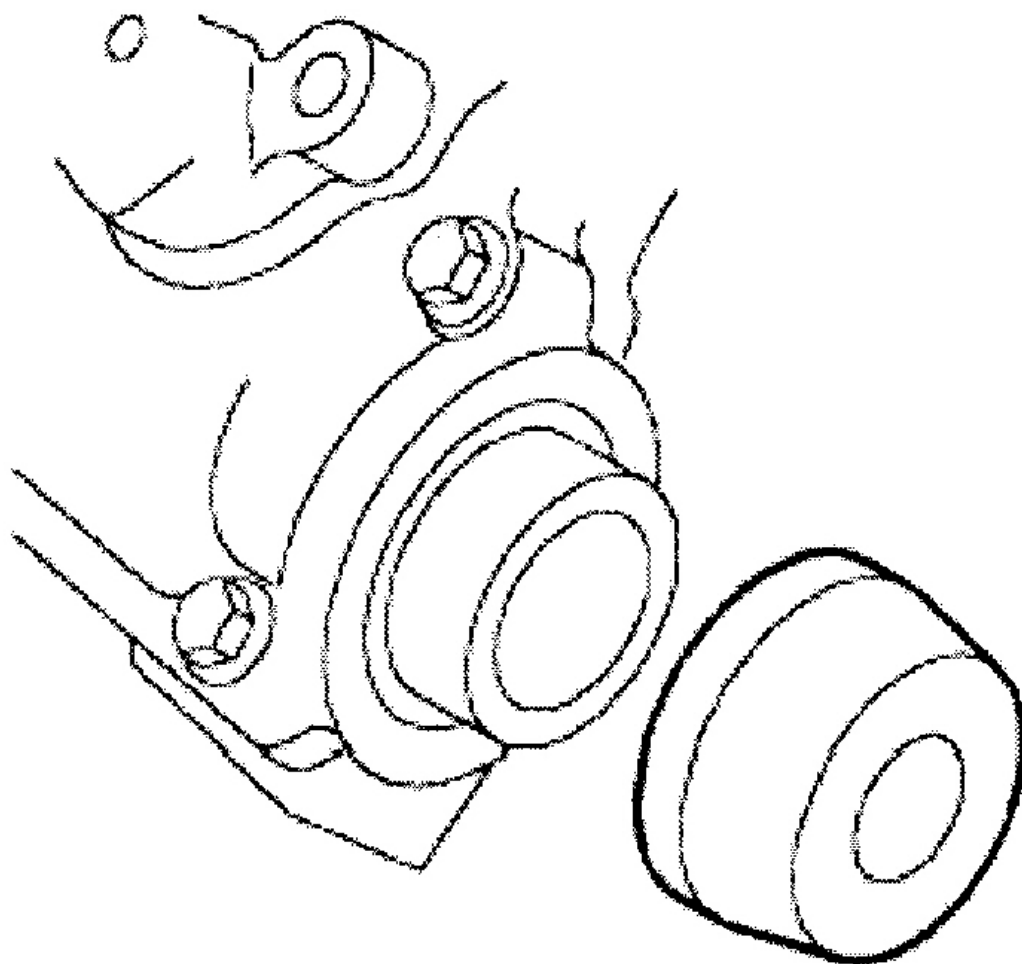
11. If camshaft timing belt is to be refitted, mark direction of rotation on timing belt.
12. Remove LRT-12-175 from camshaft gears and remove timing belt from gears.

CAUTION: Camshaft timing belts must be stored and handled with care. Always store a camshaft timing belt on its edge with a bend radius greater than 50 mm (2.0 in). Do not use a camshaft timing belt that has been twisted or bent double as this will damage the reinforcing fibres. Do not use a camshaft timing belt if debris other than belt dust is found in timing belt covers. Do not use a camshaft timing belt if partial engine seizure has occurred. Do not use a camshaft timing belt if mileage exceeds 72,000 km (45,000 miles). Do not use an oil or coolant contaminated timing belt, cause of contamination must be rectified.



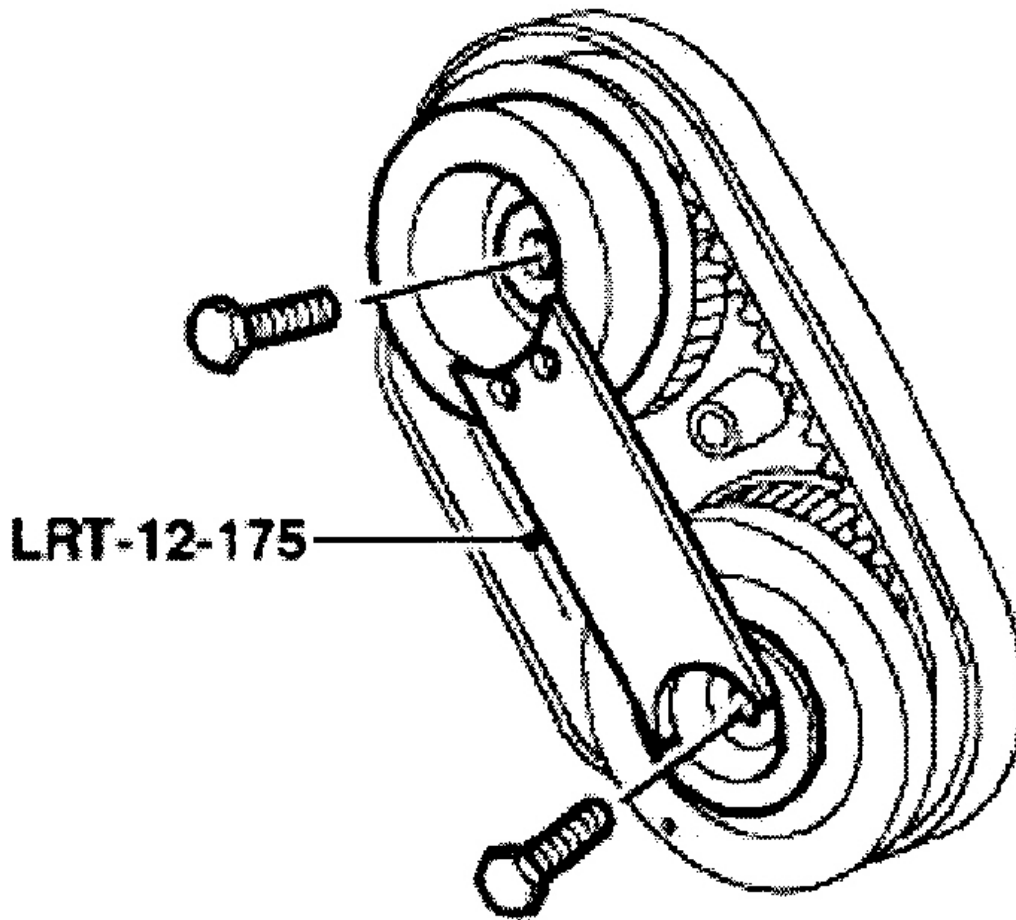
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Fig. 160: Aligning The "SAFE" Position To The "ARROW"
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384004

Fig. 161: Removing Right Front Exhaust Camshaft Cap Seal
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384005

Fig. 162: Removing Rear Camshaft Gears With Tool LRT-12-175

Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

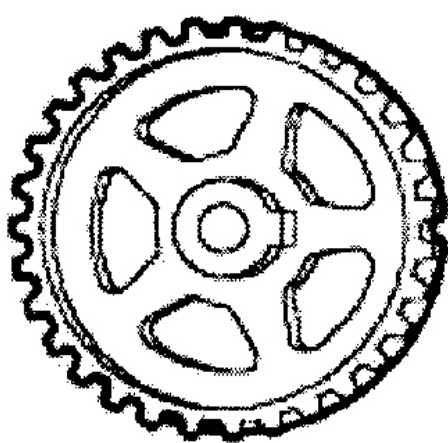
NOTE: Following front or rear timing belt refitment, it is possible that after rotating the engine and positioning the crankshaft pulley to the "SAFE" position, the timing marks on the rear timing gears may be misaligned. This misalignment is acceptable provided that the timing belt refitting procedure was carried out correctly.

1. Clean camshaft gears and mating faces on camshafts.

CAUTION: If the sintered gears have been subjected to prolonged oil

contamination, they must be soaked in a solvent bath and then thoroughly washed in clean solvent before refitting. Because of the porous construction of sintered material, oil impregnated in the gears will emerge and contaminate the belt.

2. Place gears inverted on a flat surface, with the locating lugs on the gears positioned as illustrated. See **Fig. 163**.
3. Keeping the timing marks aligned, position timing belt onto gears. See **Fig. 164**.
4. Position LRT-12-195 between the gears, turn center nut sufficiently to spread drive belt. See **Fig. 165**.
5. Invert gears and timing belt and position LRT-12-175 to camshaft gears.
6. Check that the locating lugs are correctly aligned and remove LRT-12-195 from between camshaft gears.
7. Fit LRT-12-198 alignment pins into the end of each camshaft. See **Fig. 166**.
8. Position timing belt and gears over LRT-12-198 and locate gears onto camshafts.
9. Position LRT-12-197 into the front end of the right exhaust camshaft. See **Fig. 167**.
10. With assistance, using a 30 mm socket on LRT-12-197, turn the right exhaust camshaft sufficiently to align camshaft gears to the drive slots in each camshaft.
11. Remove LRT-12-198 alignment pins and fit new camshaft gear retaining bolts. See **Fig. 162**.
12. Tighten camshaft gear bolts:
 - Stage 1 - 27 Nm (20 ft. lbs.)
 - Stage 2 - Further 90°
13. Remove LRT-12-175 from camshaft gears.
14. Remove LRT-12-197 from front end of exhaust camshaft.
15. Clean right exhaust camshaft cap seal recess and fit new cap seal.
16. Remove timing pin LRT-12-232 from lower crankcase.
17. Fit splash shield and secure with bolts.
18. Fit right road wheel and tighten nuts to 115 Nm (85 ft. lbs.).
19. Fit right rear timing belt cover. See **CAMSHAFT TIMING BELT COVER - RIGHT REAR**.
20. Fit underbelly panel. See **UNDERBELLY PANEL**.
21. Connect battery earth lead. See **DISCONNECT/CONNECT**.



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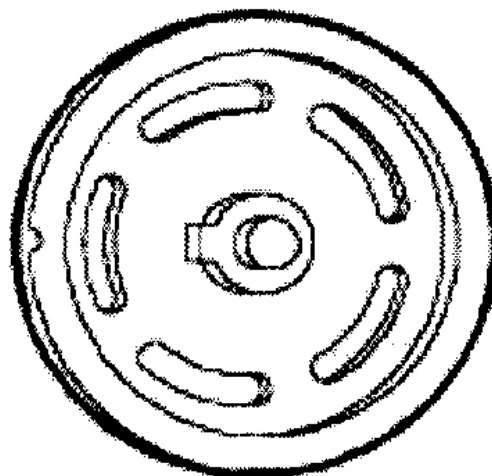
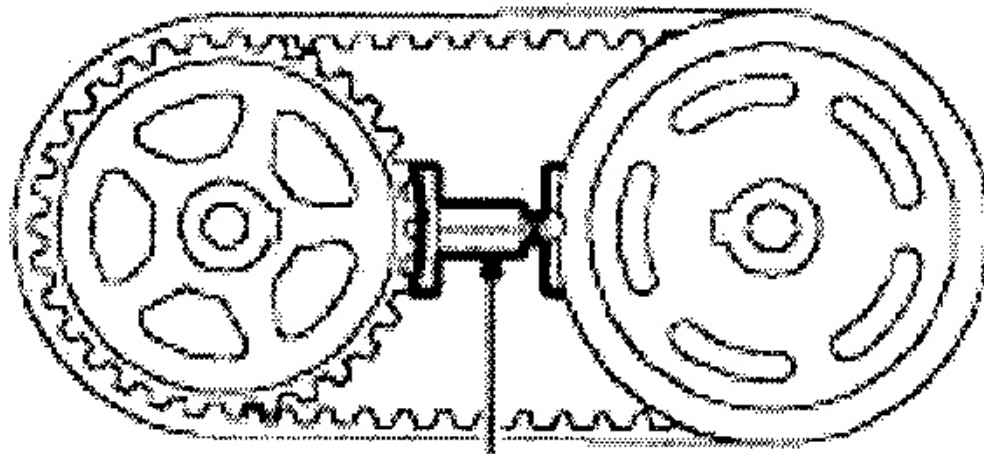
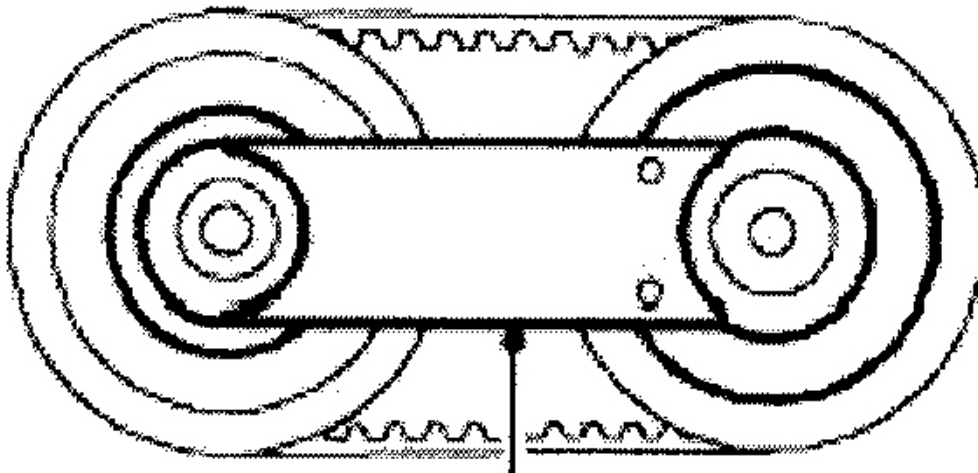


Fig. 163: Aligning Camshaft Rear Timing Belt Gears
Courtesy of LAND ROVER NORTH AMERICA, INC.



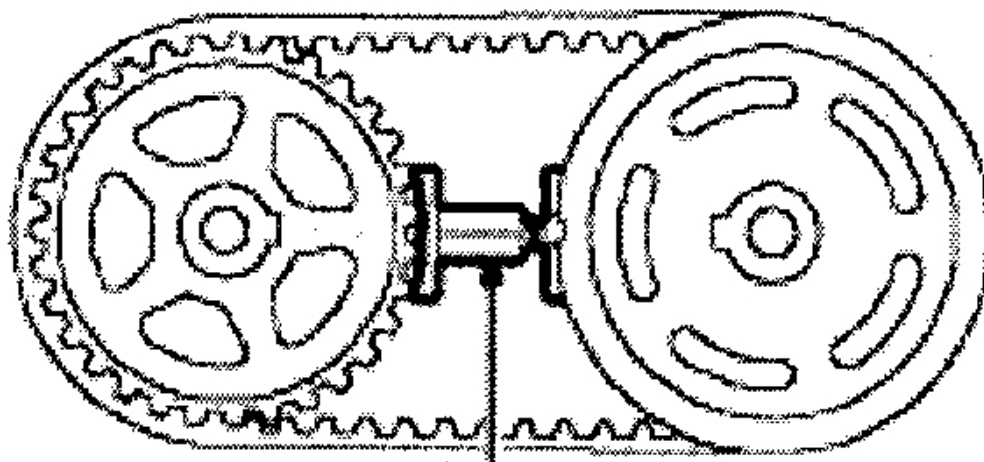
LRT-12-195



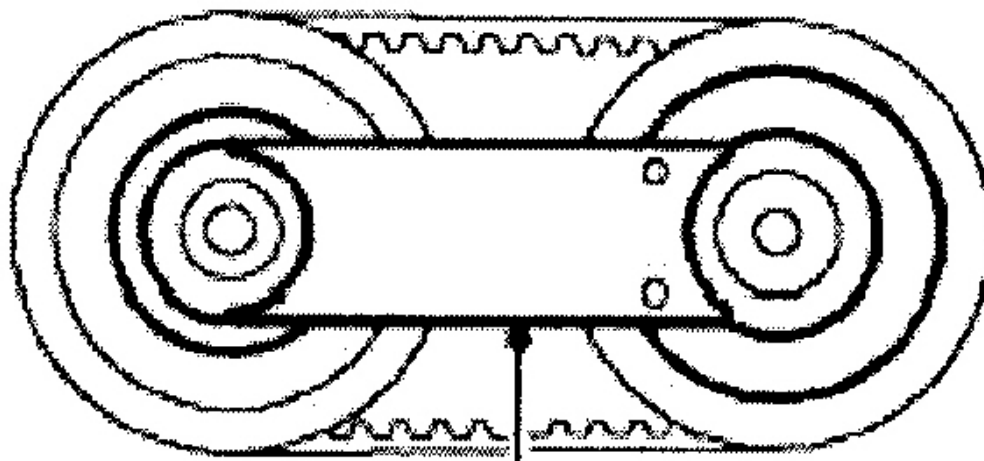
LRT-12-175

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Fig. 164: Positioning Timing Belt Onto Rear Timing Gears
Courtesy of LAND ROVER NORTH AMERICA, INC.



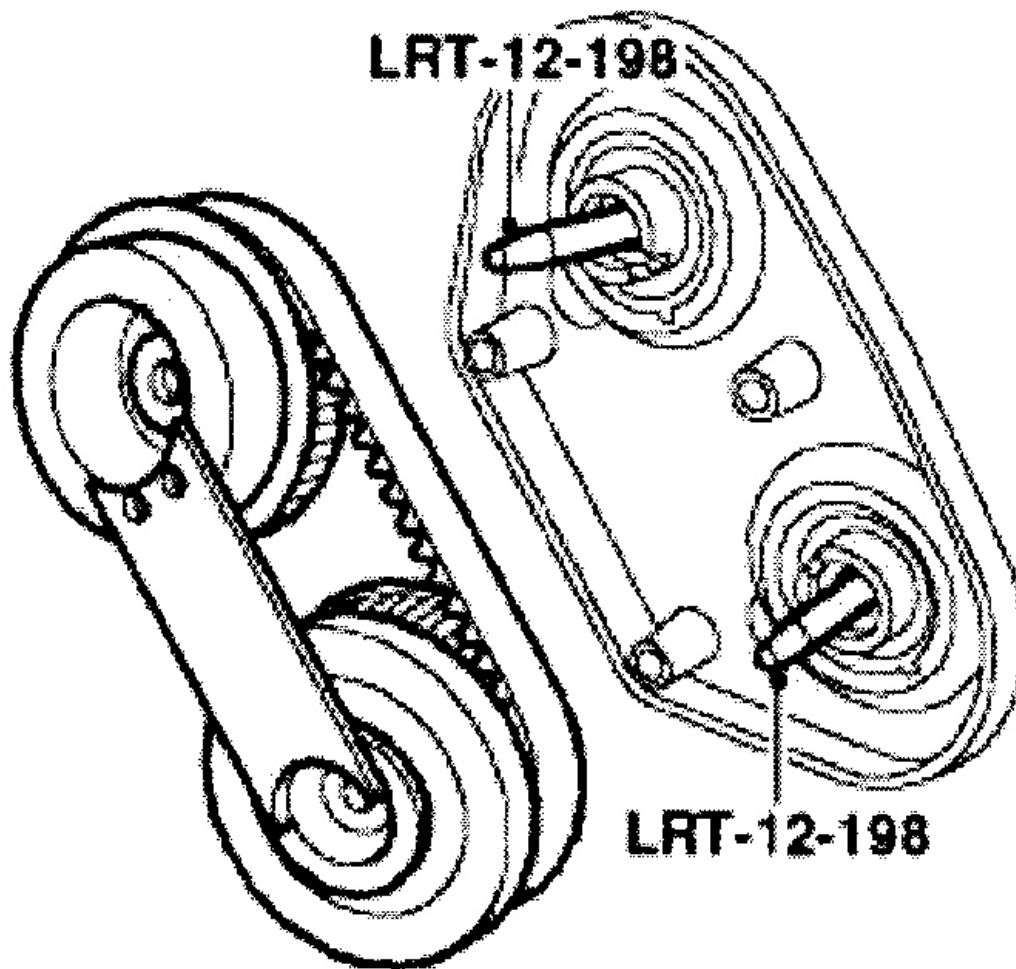
LRT-12-195



LRT-12-175

G00384008

Fig. 165: Spreading Rear Timing Belt Gear & Drive Belt With Tool LRT-12-195
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384009

Fig. 166: Installing LRT-12-198 Alignment Pins Into End Of Each Camshaft
Courtesy of LAND ROVER NORTH AMERICA, INC.

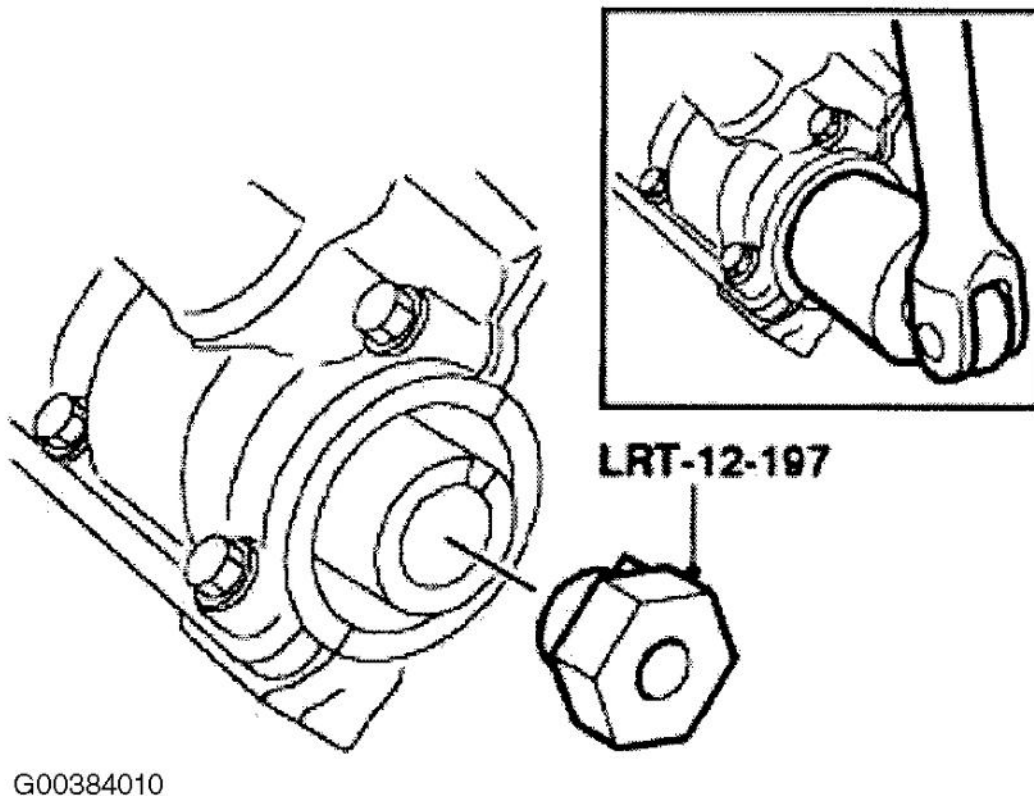


Fig. 167: Positioning LRT-12-197 Into The Front End Of The Right Exhaust Camshaft
Courtesy of LAND ROVER NORTH AMERICA, INC.

OVERHAUL

PISTON ASSEMBLIES - ENGINE SET

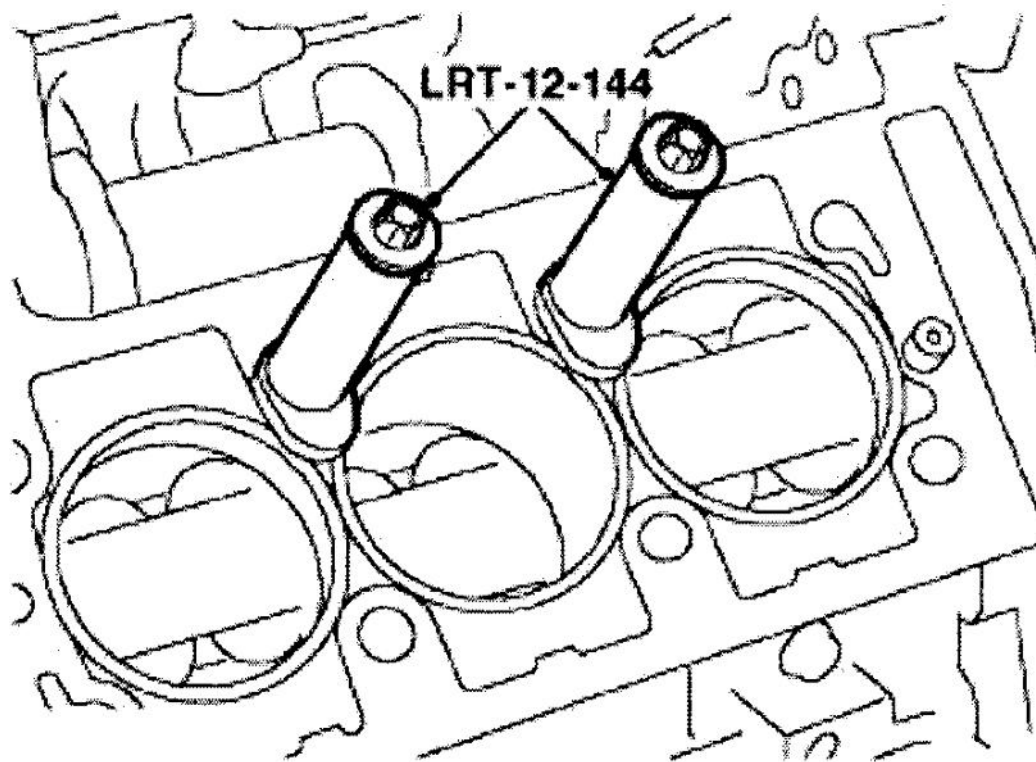
Disassembly

1. Remove crankshaft. See **CRANKSHAFT**.
2. Remove LRT-12-144 cylinder liner clamps from cylinder block. See **Fig. 168**.
3. Suitably identify each cylinder liner to its fitted position in cylinder block.
4. With assistance, position cylinder block to enable each piston and cylinder liner to be removed.
5. Carefully push each piston assembly and cylinder liner from cylinder block. See **Fig. 169**.

CAUTION: Suitably identify each piston with its respective cylinder liner.

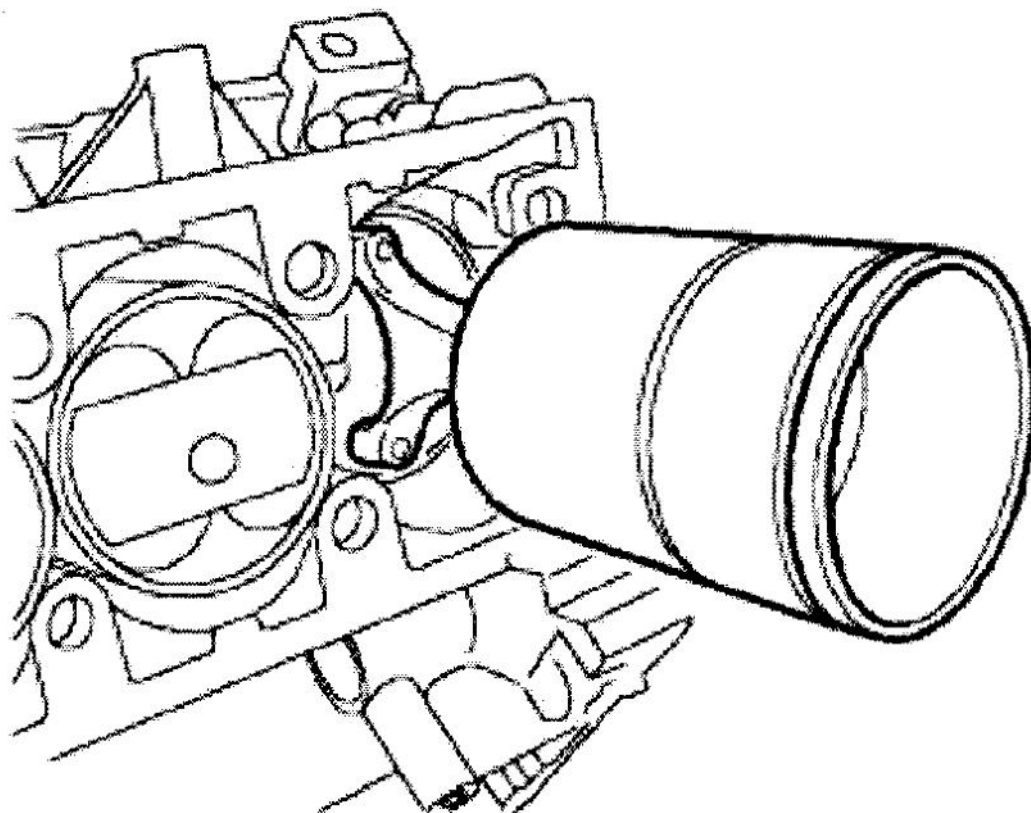
6. Remove piston assemblies from liners, keep liners in their fitted order. See **Fig. 170**.

7. Refit caps onto connecting rods, lightly tighten dowel bolts.
8. Using a suitable expander, remove and discard piston rings from each piston.
9. Using a squared off end of an old piston ring, remove carbon from piston ring grooves.



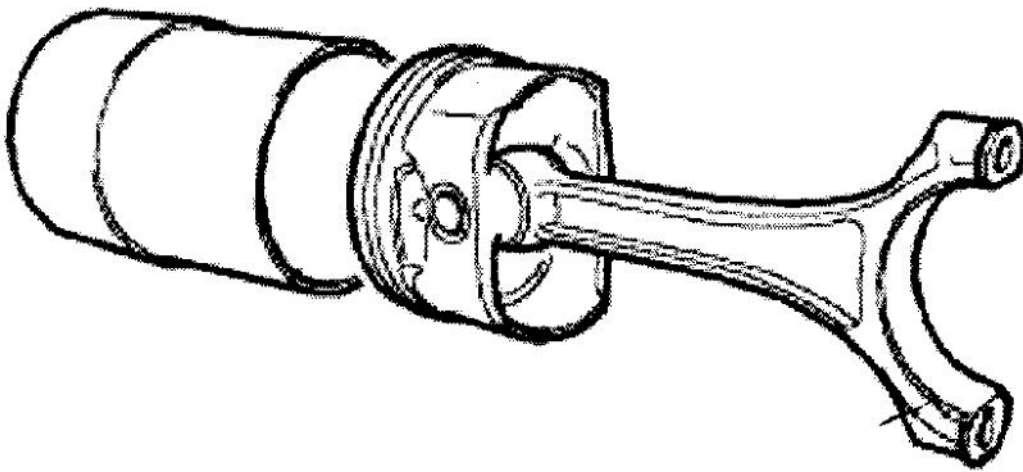
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Fig. 168: Removing LRT-12-144 Cylinder Liner Clamps From Cylinder Block
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384012

Fig. 169: Pushing Each Piston Assemble & Cylinder Liner
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384013

Fig. 170: Removing Piston Assemblies From Liners
Courtesy of LAND ROVER NORTH AMERICA, INC.

Inspection

1. Cylinder liner bores: Measure wear and taper in two axis 65 mm (2.5 in) from top of cylinder liner bore. The cylinder liner grade is marked on outside diameter of liner. See **Fig. 171**.

CAUTION: Cylinder liners with excessively glazed, worn, scratched or scored bores must be replaced. DO NOT attempt to hone or remove glazing from bore. Ensure that if original liners are to be refitted, reference marks made during dismantling are not erased.

2. Cylinder liners have their bore/grade and step height determined at manufacture. The bore/grade, Red, Blue (A) or (B), and step heights V or Z together with the cylinder liner part number and color code are marked on the external diameter of the cylinder liners. If cylinder(s) are to be replaced, the replacement liner(s) must have the same step height as the original liner(s). Both step heights are available in red (A) and blue (B) grades of cylinder liners. See **Fig. 172**.
3. Check pistons for distortion and cracks.

NOTE: Piston grades A or B are stamped on the crown of the piston.

4. Piston diameter check: Measure piston diameter at right angles to gudgeon pin and 8 mm (0.3 in) from bottom of skirt.

NOTE: Piston and connecting rods are only supplied as an assembly.

CAUTION: Ensure pistons are retained with their respective cylinder liners.

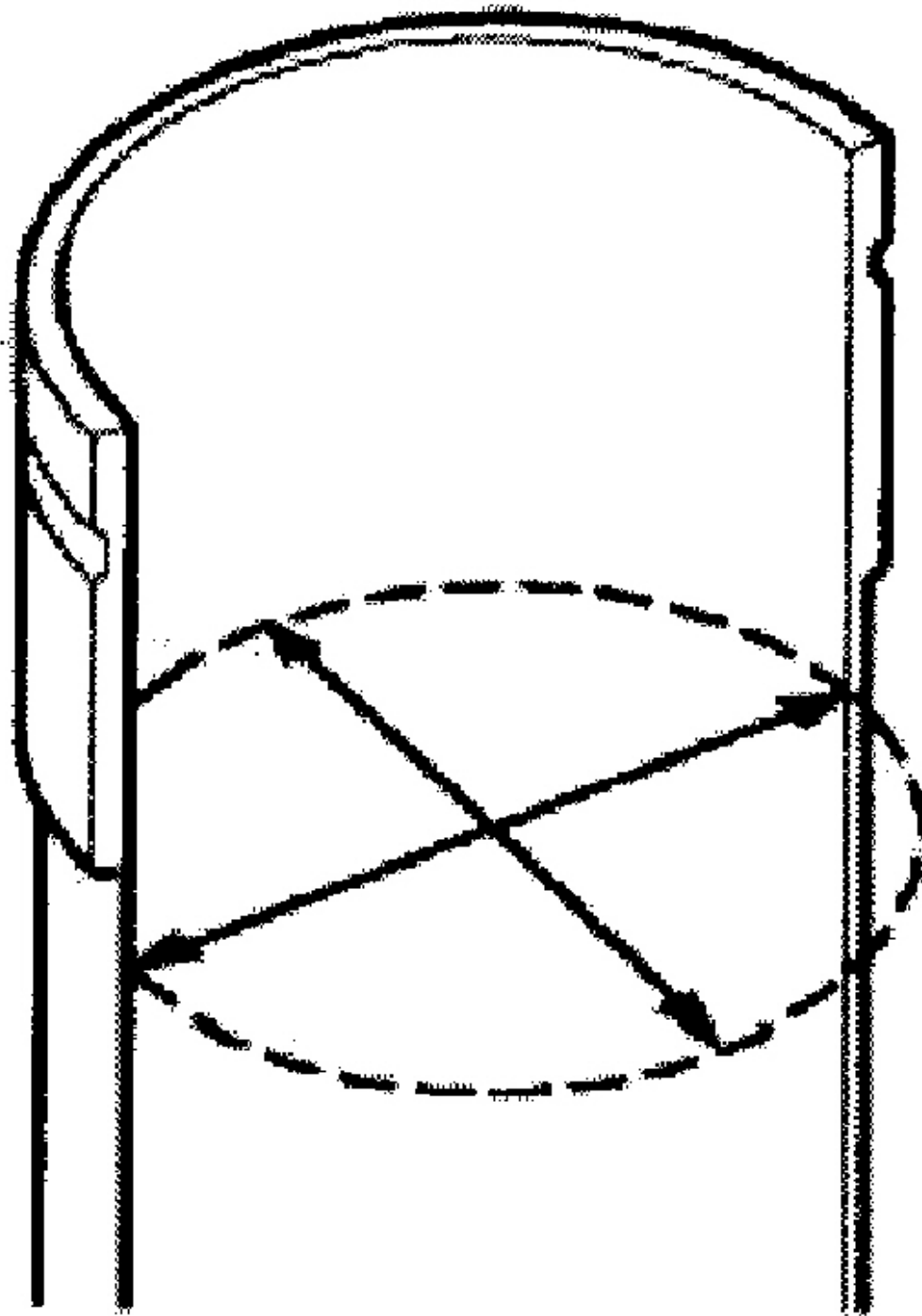
5. Position piston in cylinder liner and measure clearance 20 mm (0.75 in) from bottom of cylinder liner.
6. Piston ring gap: Position new top and second compression piston rings 20 mm (0.75 in) from top of cylinder bore and measure ring gaps. See **Fig. 173**.

CAUTION: Ensure piston rings are kept square to liner bore. Retain rings with the piston fitted to the liner in which they were checked.

7. Piston rings - refit: Using a suitable expander, fit oil control spring.
8. With "TOP" or identification markings to top of piston, use an expander to fit piston rings in sequence; oil control, 2nd and top compression.

NOTE: The second compression ring is stepped.

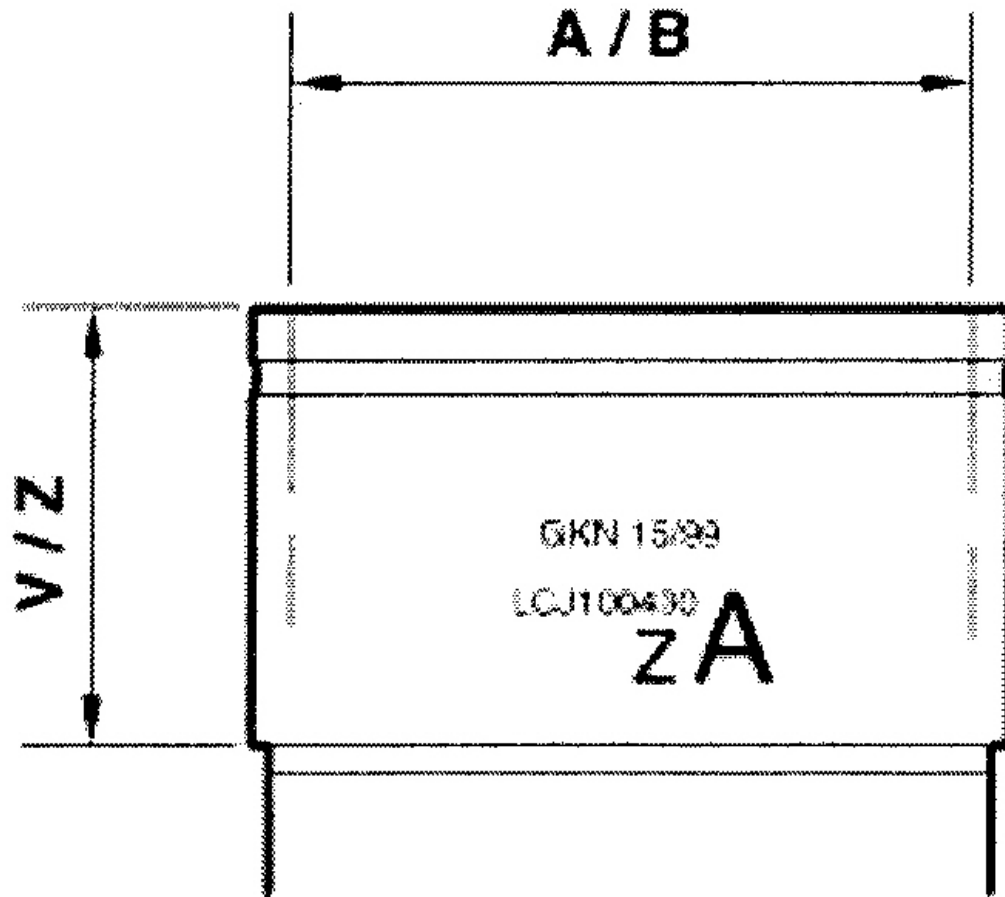
9. Ensure rings are free to rotate, position compression ring gaps A and B at 120° to each other and away from thrust side. Position oil control ring gap C and spring gap D at 30° on opposite side of gudgeon pin axis. See **Fig. 174**.
10. Check clearance of each piston ring to its respective groove. See **Fig. 175**.



G000384014

Fig. 171: Measuring Wear & Taper Of Cylinder

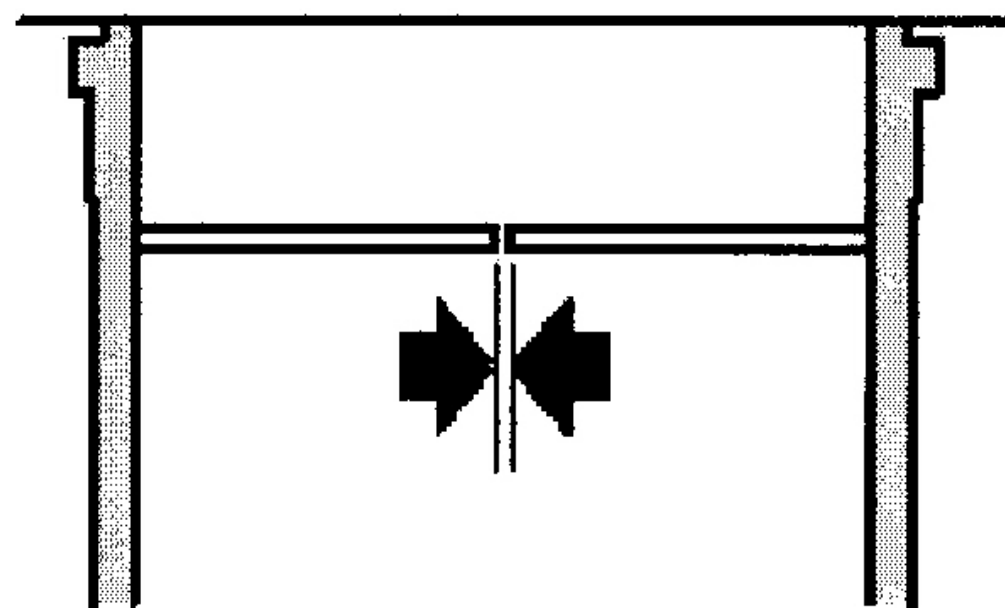
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384015

Fig. 172: The Bore Grade & Step Height

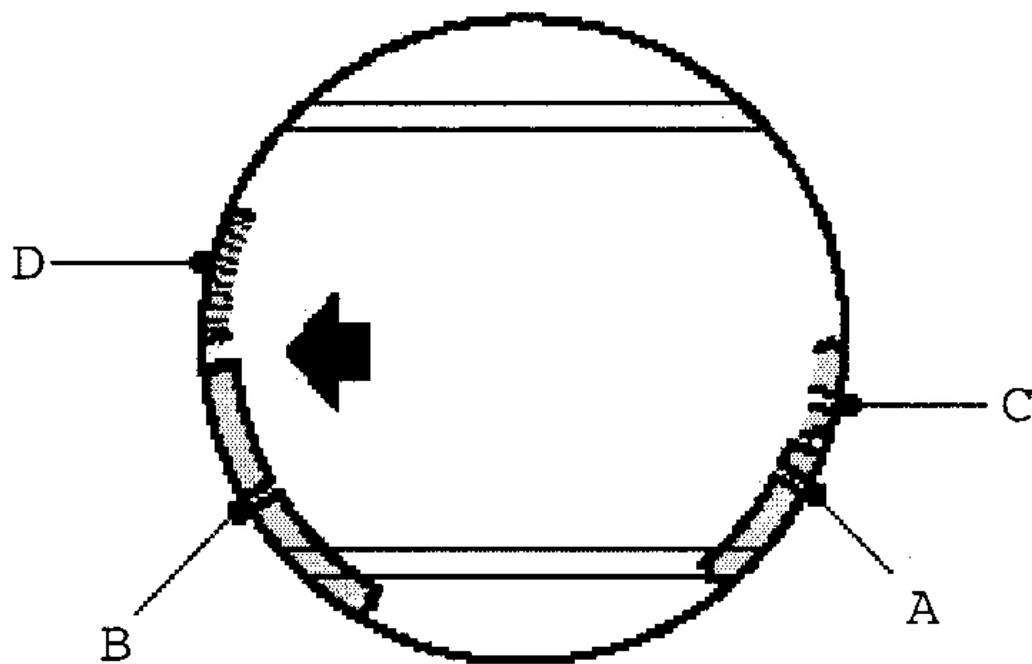
Courtesy of LAND ROVER NORTH AMERICA, INC.



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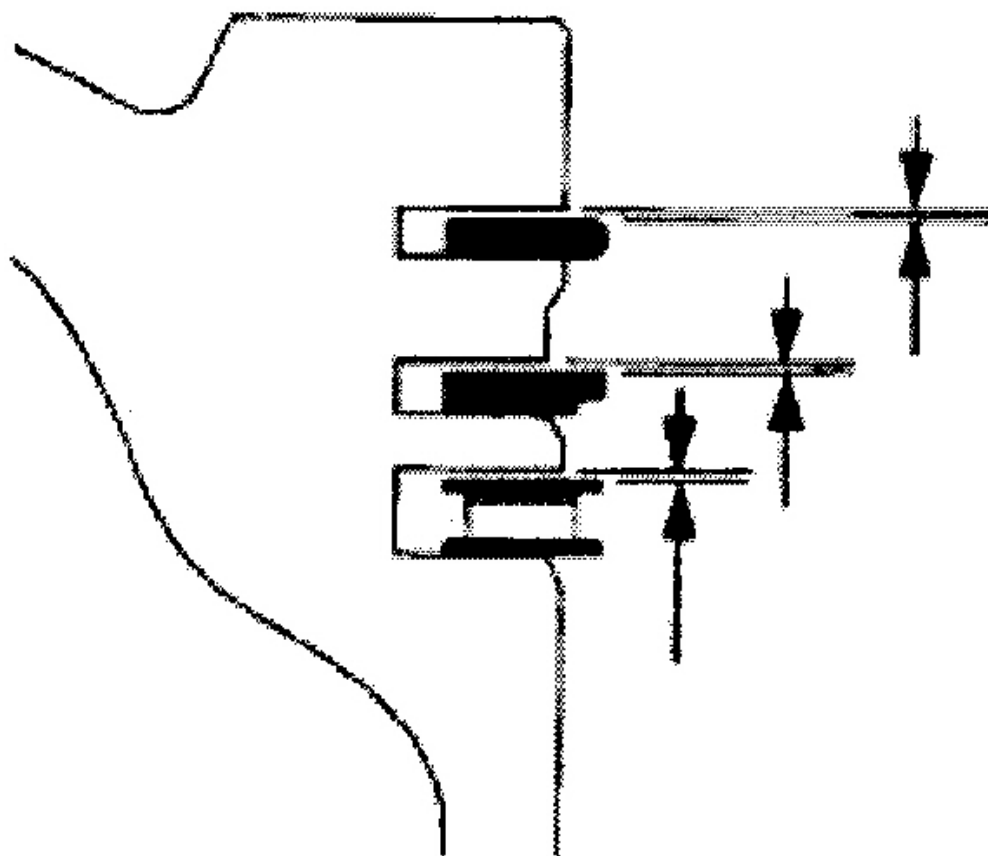
Fig. 173: Identifying Piston Ring Gap

Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384017

Fig. 174: Positioning Compression Ring Gaps
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384018

Fig. 175: Checking Clearance

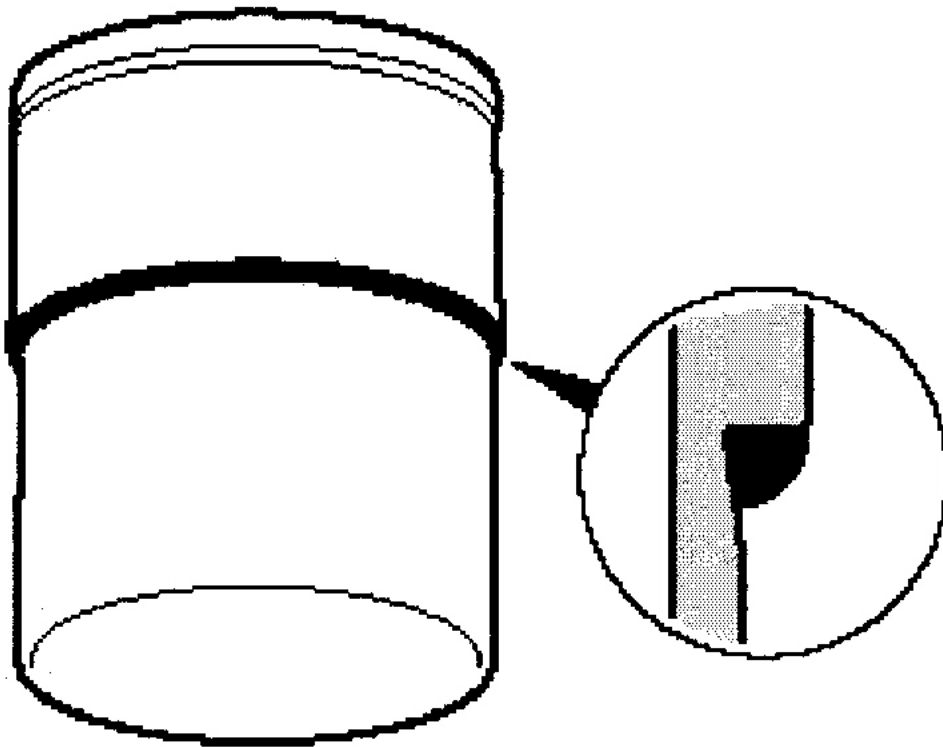
Courtesy of LAND ROVER NORTH AMERICA, INC.

Reassembly

1. Clean cylinder liners and liner recess in cylinder block.
2. Lubricate cylinder liner bores, pistons and rings with clean engine oil, ensure ring gaps are correctly spaced.
3. Clean bearing shell recesses in connecting rods and bearing caps.
4. Fit piston ring clamp, LRT-12-204 to each piston in turn and fit piston to its respective cylinder liner ensuring that when fitted, arrow on piston crown will be towards front of engine.

CAUTION: Do not push pistons fully down bores at this stage.

5. Remove piston ring clamp. See **Fig. 176**.
6. Apply a 2.00 mm (0.1 in) thick continuous bead of sealant, Part No. RTC 3347, around shoulder of each cylinder liner as shown.
7. Keeping cylinder liner 'square' to cylinder block, push each liner fully down until shoulder of liner seats against cylinder block ensuring that the arrow on the piston is towards front of engine.
8. To prevent cylinder liners from being displaced, position LRT-12-144 cylinder liner clamps and secure to cylinder block with cylinder head bolts. Ensure that feet of clamps do not protrude over liner bores.
9. Fit crankshaft. See **CRANKSHAFT**.



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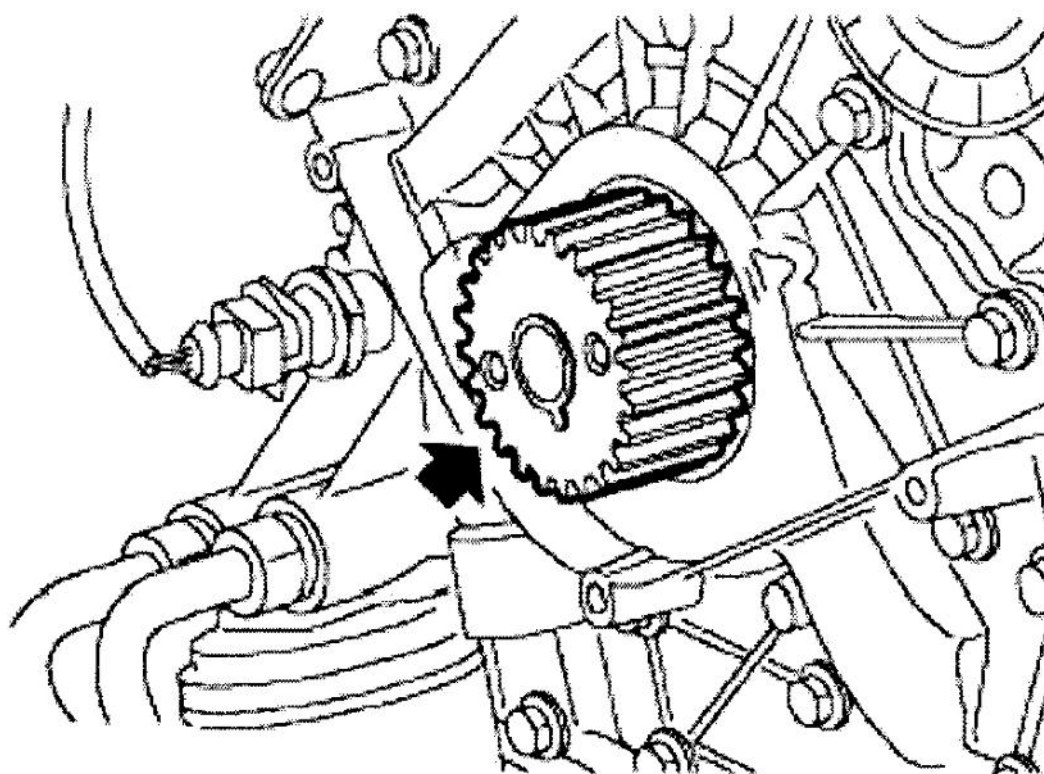
Fig. 176: Removing Piston Ring Clamp
Courtesy of LAND ROVER NORTH AMERICA, INC.

CRANKSHAFT FRONT OIL SEAL

Remove

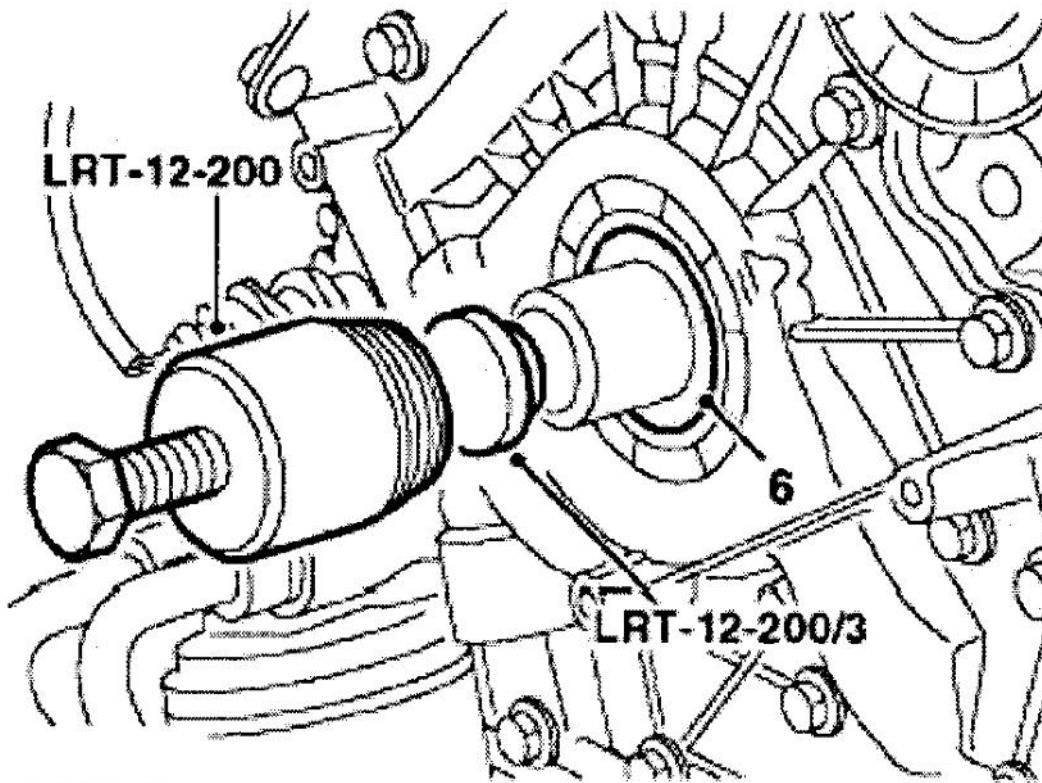
1. Remove camshaft timing belt. See **CAMSHAFT TIMING BELT**.

2. Remove crankshaft drive gear. See **Fig. 177**.
3. Fit thrust button, LRT-12-200/3 to end of crankshaft. See **Fig. 178**.
4. Screw LRT-12-200 into crankshaft front oil seal.
5. Tighten center bolt of LRT-12-200 to remove oil seal.
6. Remove and discard oil seal from LRT-12-200.
7. Remove thrust button from crankshaft.



G00384020

Fig. 177: Removing Crankshaft Drive Gear
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384021

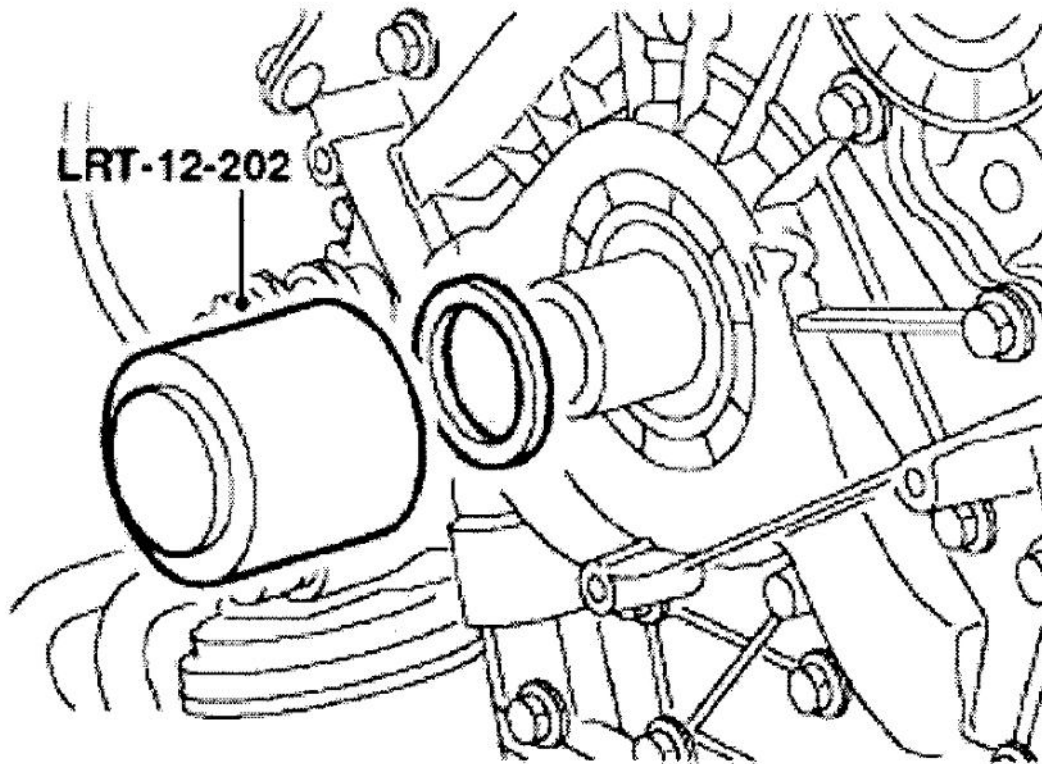
Fig. 178: Installing Thrust Button LRT-12-200/3
 Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean oil seal recess in oil pump and running surface on crankshaft, ensure bolt holes are clean and dry.
2. Fit oil seal guide from seal kit, over end of crankshaft.
3. Position new seal on crankshaft up against oil pump housing. Drift seal into place using tool LRT-12-202. See **Fig. 179**.

CAUTION: Oil seal must be fitted dry.

4. Remove LRT-12-202 and oil seal guide from crankshaft.
5. Clean crankshaft gear and wipe end of crankshaft.
6. Fit drive gear to crankshaft.
7. Fit camshaft timing belt. See **CAMSHAFT TIMING BELT**.



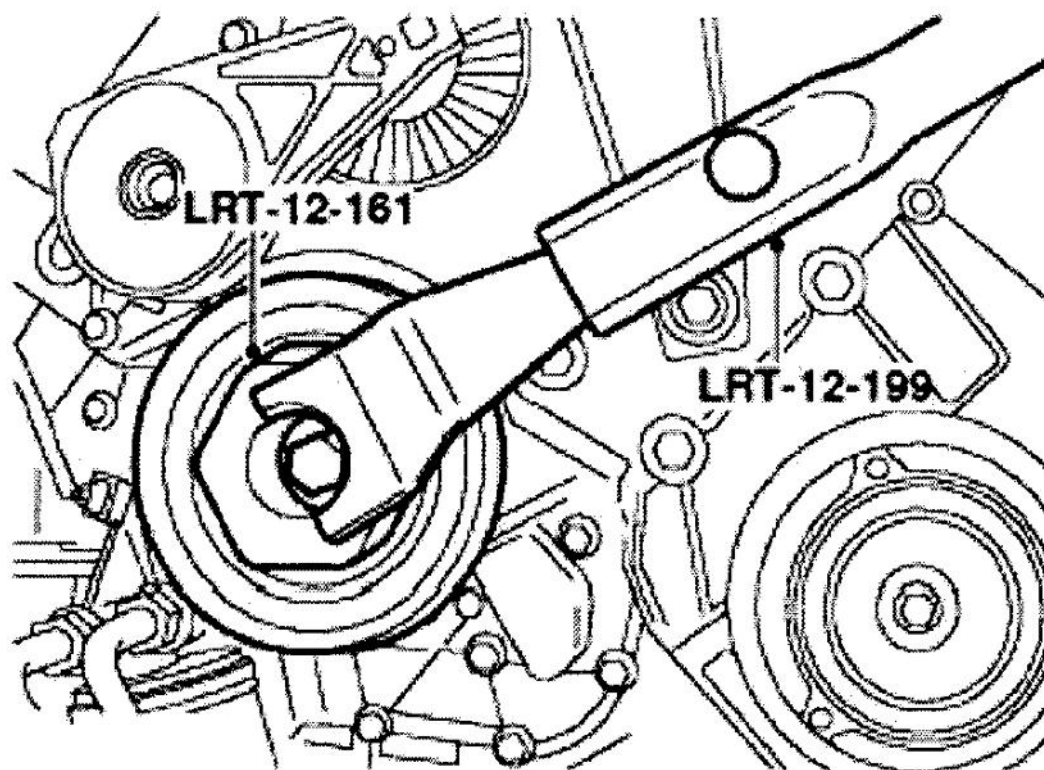
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Fig. 179: Drifting Oil Seal In Place Using Tool LRT-12-202
Courtesy of LAND ROVER NORTH AMERICA, INC.

CRANKSHAFT REAR OIL SEAL

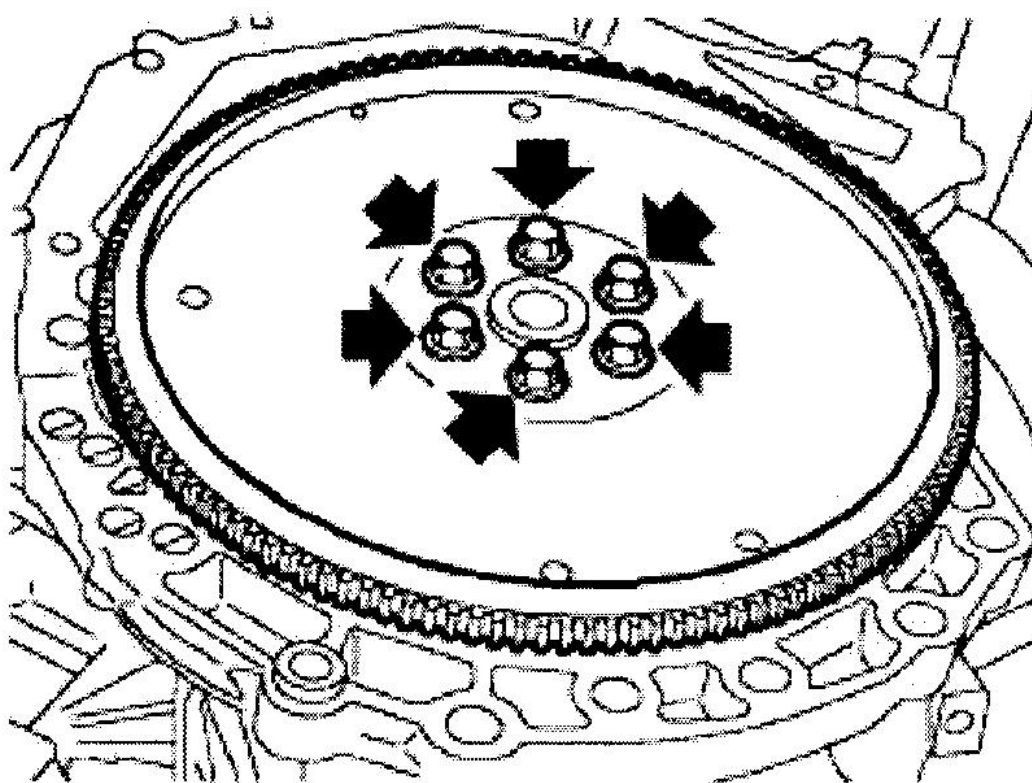
Disassemble

1. Remove automatic gearbox. See **ENGINE & AUTOMATIC GEARBOX - FROM MODEL YEAR 2003** or **ENGINE & AUTOMATIC GEARBOX - UP TO MODEL YEAR 2003** .
2. Assemble LRT-12-161 to LRT-12-199 and secure with clamp bolt.
3. Position LRT-12-161 and LRT-12-199 to crankshaft pulley to restrain crankshaft. See **Fig. 180**.
4. With assistance, remove and discard 6 bolts securing drive plate to crankshaft. See **Fig. 181**.
5. Remove drive plate from crankshaft.
6. Remove and discard 5 bolts securing crankshaft rear oil seal housing to cylinder block. See **Fig. 182**.
7. Remove crankshaft rear oil seal.



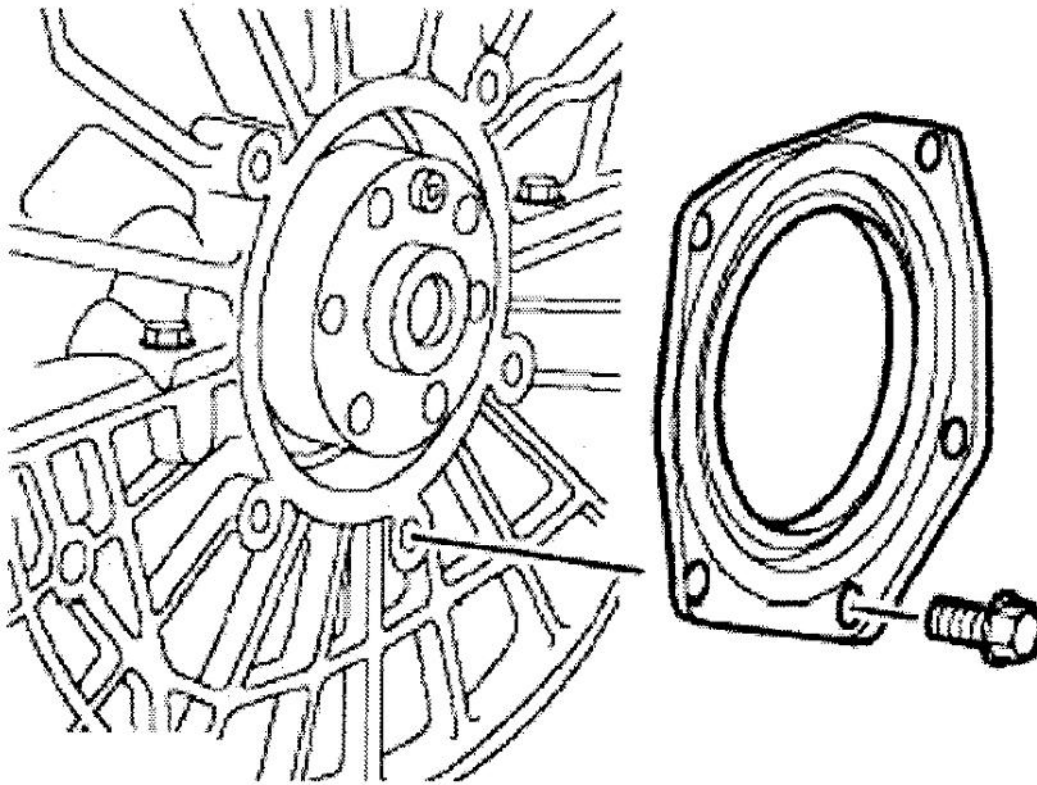
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Fig. 180: Restraining Crankshaft With Tools LRT-12-161 & LRT-12-199
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384024

Fig. 181: Removing Drive Plate-To-Crankshaft Bolts
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384025

Fig. 182: Removing Crankshaft Rear Oil Seal Housing-To-Cylinder Block
Courtesy of LAND ROVER NORTH AMERICA, INC.

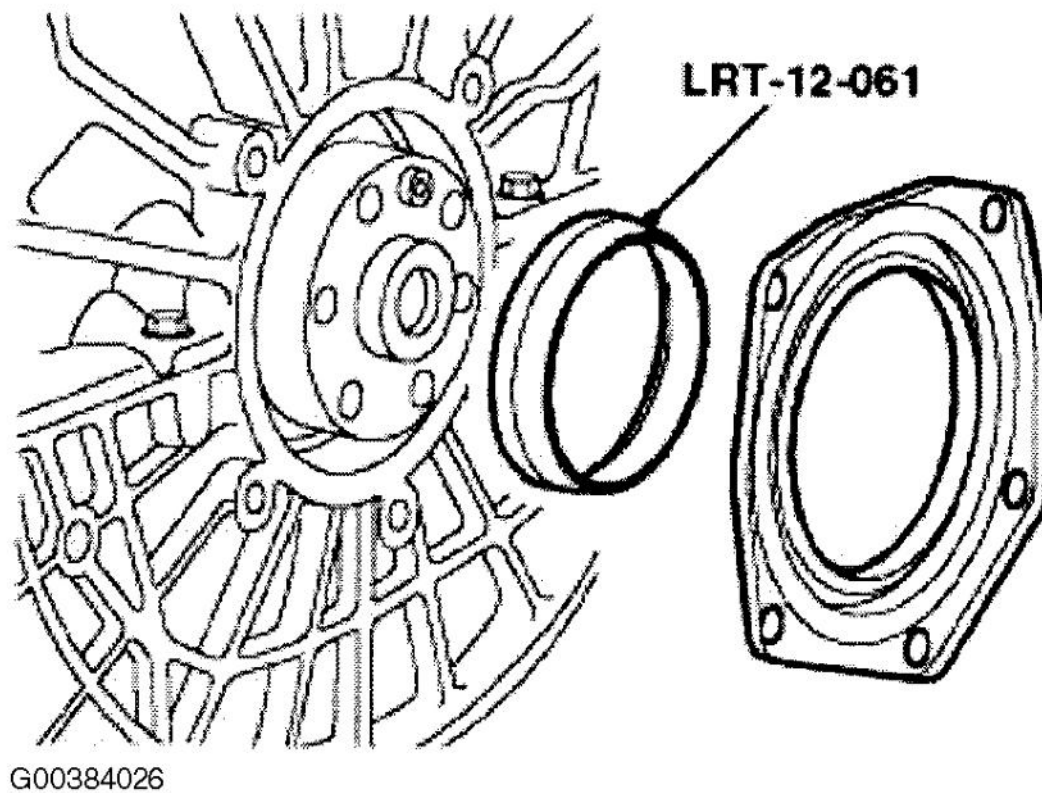
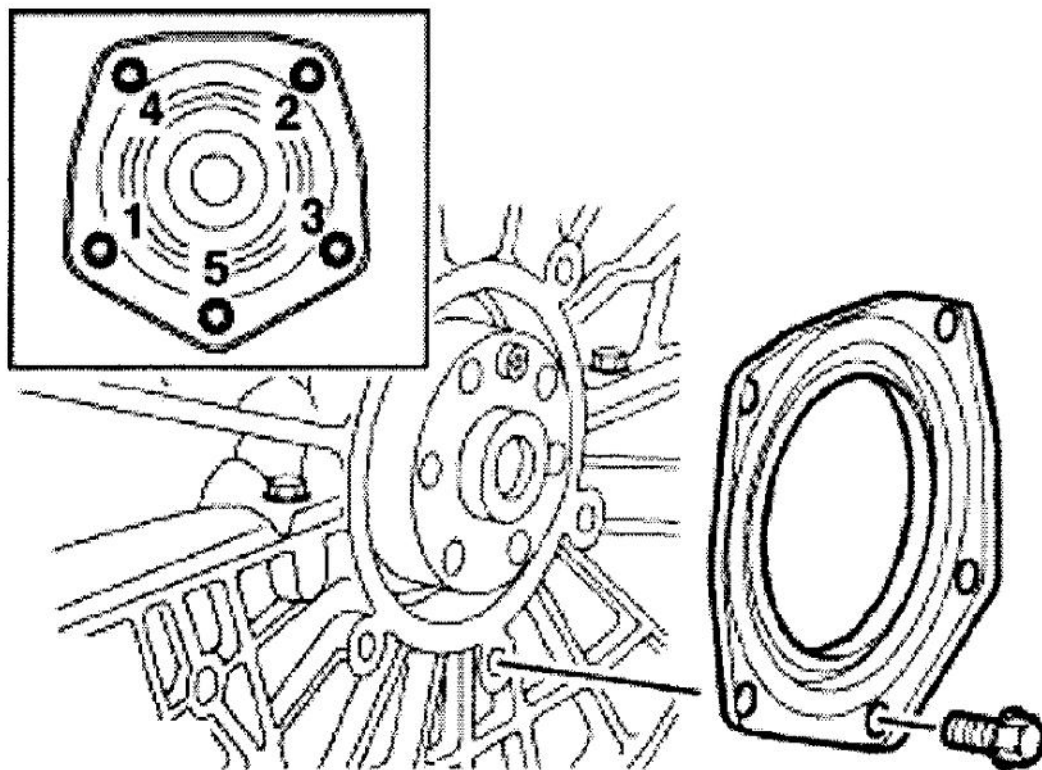
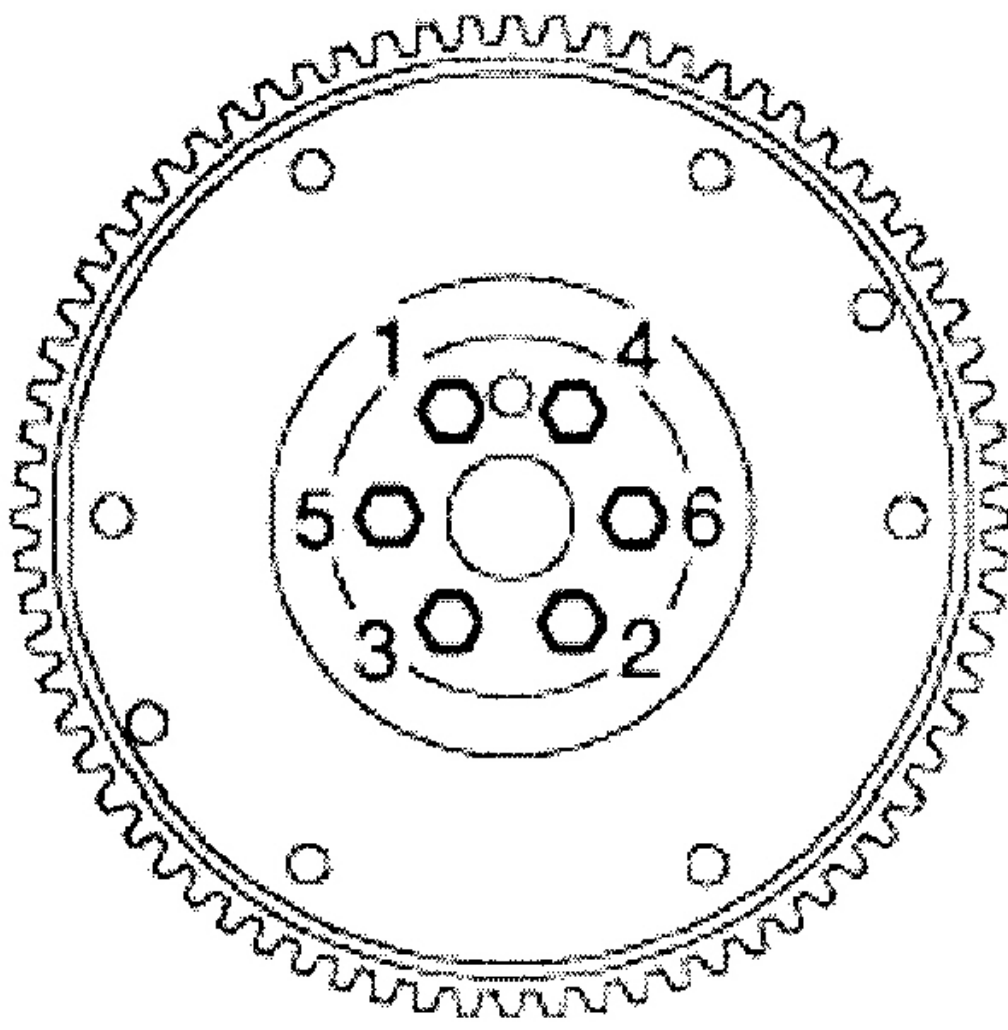


Fig. 183: Positioning Oil Seal Protector LRT-12-061-To-Crankshaft
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384027

Fig. 184: Installing Oil Seal-To-Cylinder Block Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384028

Fig. 185: Tightening Drive Plate Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

Assemble

1. Clean cylinder block face and oil seal running surface on crankshaft, ensure bolt holes are clean and dry.
2. Position oil seal protector, LRT-12-061 to crankshaft. See **Fig. 183**.
3. Position oil seal to crankshaft.

CAUTION: Oil seal must be fitted dry.

4. Fit new Patchlok bolts securing oil seal to cylinder block and using sequence shown, tighten to 8 Nm (6 ft. lbs.). See **Fig. 184**.
5. Remove oil seal protector LRT-12-061.
6. Clean bolt holes in crankshaft using an old drive plate bolt with two saw cuts at an angle of 45° to the bolt shank.
7. Clean drive plate and mating face of crankshaft.
8. Position drive plate to crankshaft and fit but do not tighten new Patchlok bolts.
9. Position LRT-12-161 and LRT-12-199 to crankshaft pulley to restrain crankshaft.
10. Using sequence shown, tighten bolts:
 - Stage 1 - 25 Nm (18 ft. lbs.)
 - Stage 2 - 100 Nm (74 ft. lbs.)
11. Remove special tool from crankshaft pulley, loosen bolt and remove LRT-12-161 from LRT-12-199
12. Fit automatic gearbox. See **ENGINE & AUTOMATIC GEARBOX - FROM MODEL YEAR 2003** or **ENGINE & AUTOMATIC GEARBOX - UP TO MODEL YEAR 2003**.

CRANKSHAFT

Remove

1. Remove cylinder head gaskets. See **CYLINDER HEAD GASKET - RIGHT** or **CYLINDER HEAD GASKET - LEFT**.
2. Remove oil pump gasket. See **OIL PUMP - OVERHAUL**.
3. Remove crankshaft rear oil seal. See **CRANKSHAFT REAR OIL SEAL**.
4. Remove engine sump. See **SUMP - ENGINE OIL**.

Disassembly

1. Remove bolt securing oil pick up strainer, remove strainer and discard "O" ring. See **Fig. 186**.
2. Using sequence shown, remove 8 M8 bolts securing lower crankcase to cylinder block. See **Fig. 187**.
3. Remove remaining M8 bolt and 2 M6 bolts securing lower crankcase to cylinder block.
4. Remove lower crankcase.
5. Using sequence shown, remove and discard 16 bolts securing bearing ladder to cylinder block. See **Fig. 188**.

NOTE: **Short length bolts are fitted to the outer edge of the bearing ladder.**

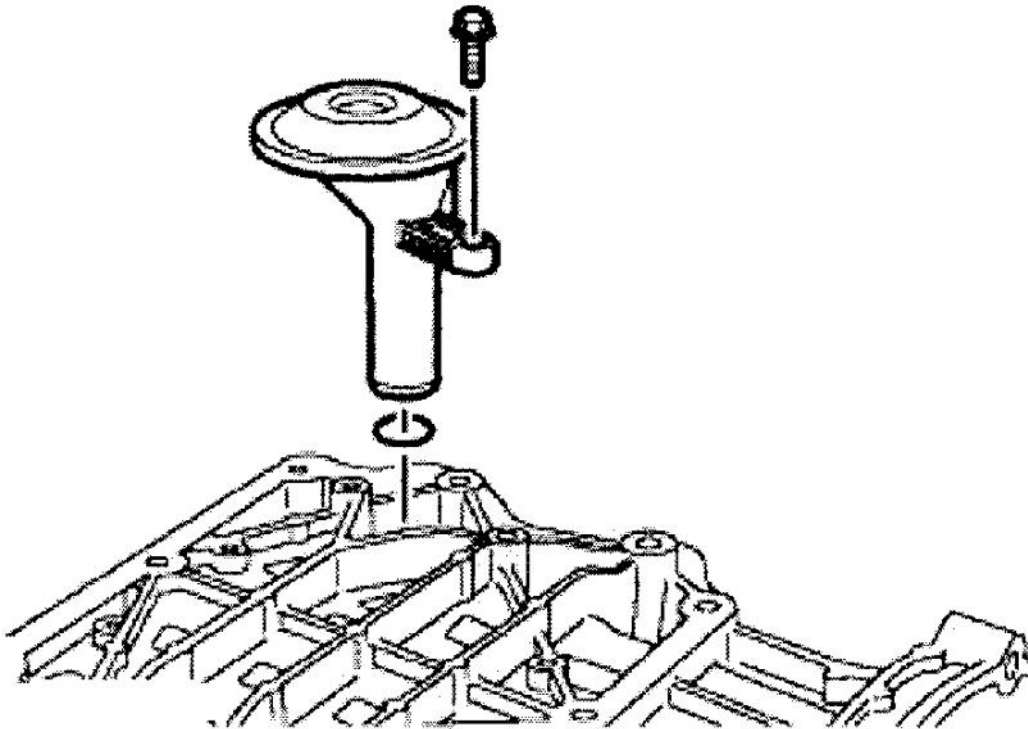
6. Release bearing ladder from dowels and remove from cylinder block.
7. Remove main bearing shells and 2 thrust washer halves from bearing ladder, keep main bearing shells in fitted order; discard thrust washers. See **Fig. 189**.
8. Temporarily fit crankshaft pulley bolt. See **Fig. 190**.

9. Remove 4 dowel bolts and remove big end bearing caps from No. 1 and No. 2 connecting rods. Keep bearing caps in order.

CAUTION: Do not remove cylinder clamps LRT-12-144 unless pistons and connecting rods are to be removed.

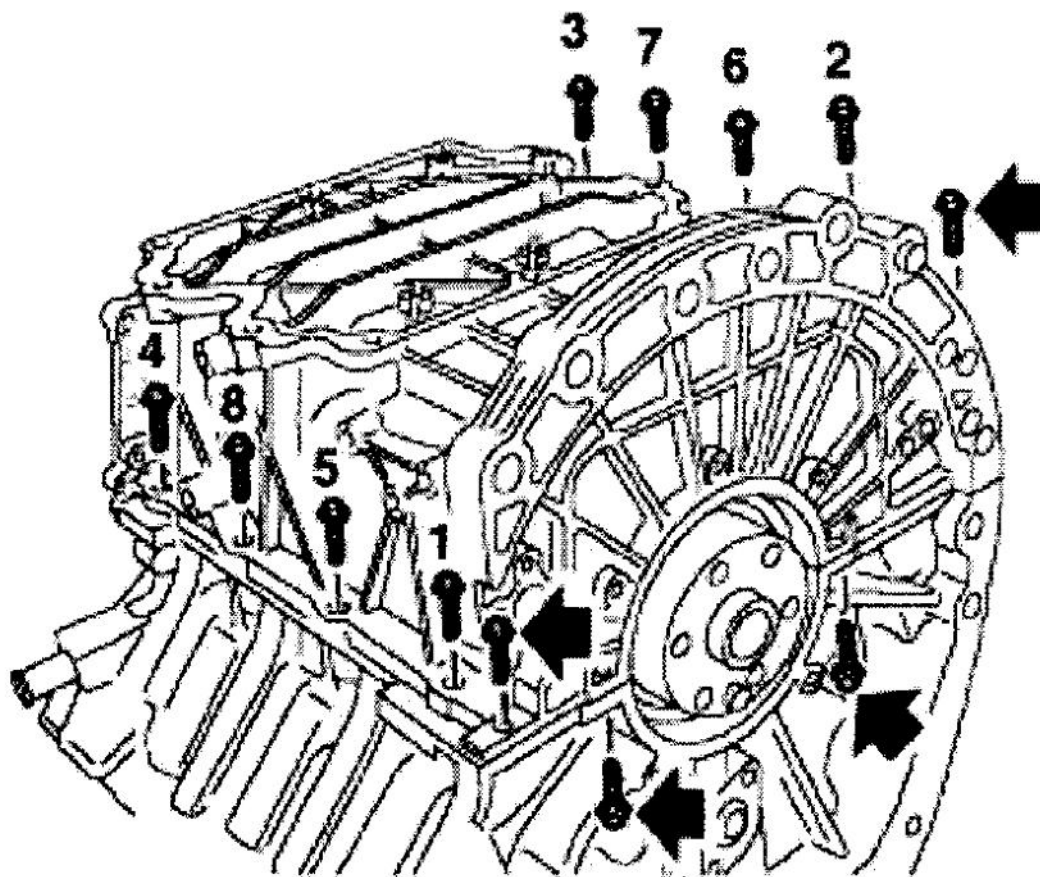
**NOTE: Number stamped below bearing cap bolt is bearing bore size code.
 Number stamped on connecting rod is cylinder number and letter is weight code.**

10. Release connecting rods from crankshaft.
11. Remove bearing shells from connecting rod and cap.
12. Rotate crankshaft using pulley bolt, remove bolts securing remaining connecting rod bearing caps. Remove bearing caps and bearing shells from caps. Keep bearing caps in their fitted order.
13. Remove crankshaft, remove main bearing shells and thrust washers from cylinder block. Discard thrust washers.
14. Main bearings - selection: record main bearing code letters from front face of cylinder block. Reading from left to right, the first letter relates to No. 1, (front) main bearing journal. See **Fig. 191**.
15. Record main bearing code numbers, located on the crankshaft rear web. The first number, reading left to right, relates to number one main bearing journal. See **Fig. 192**.



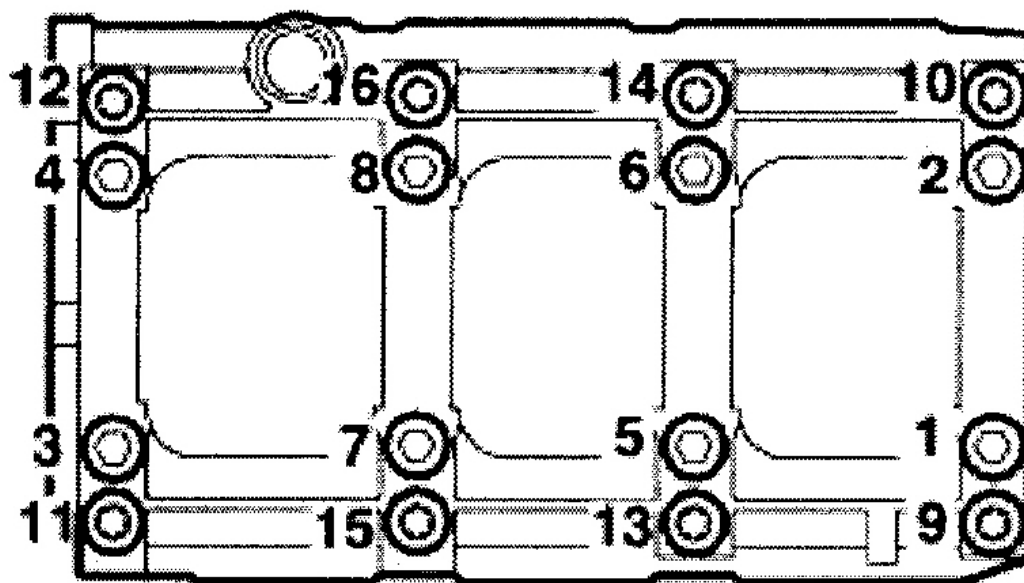
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Fig. 186: Removing Oil Pick Up Strainer
Courtesy of LAND ROVER NORTH AMERICA, INC.



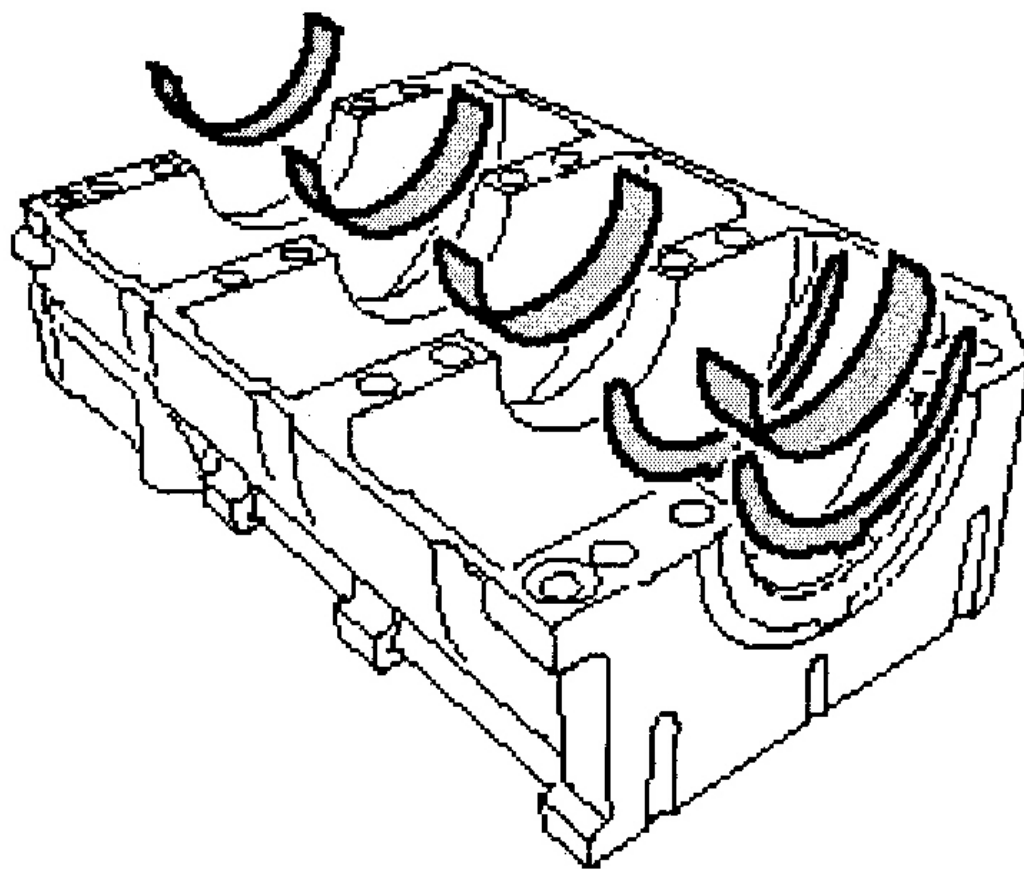
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Fig. 187: Removing Crankcase-To-Cylinder Block Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



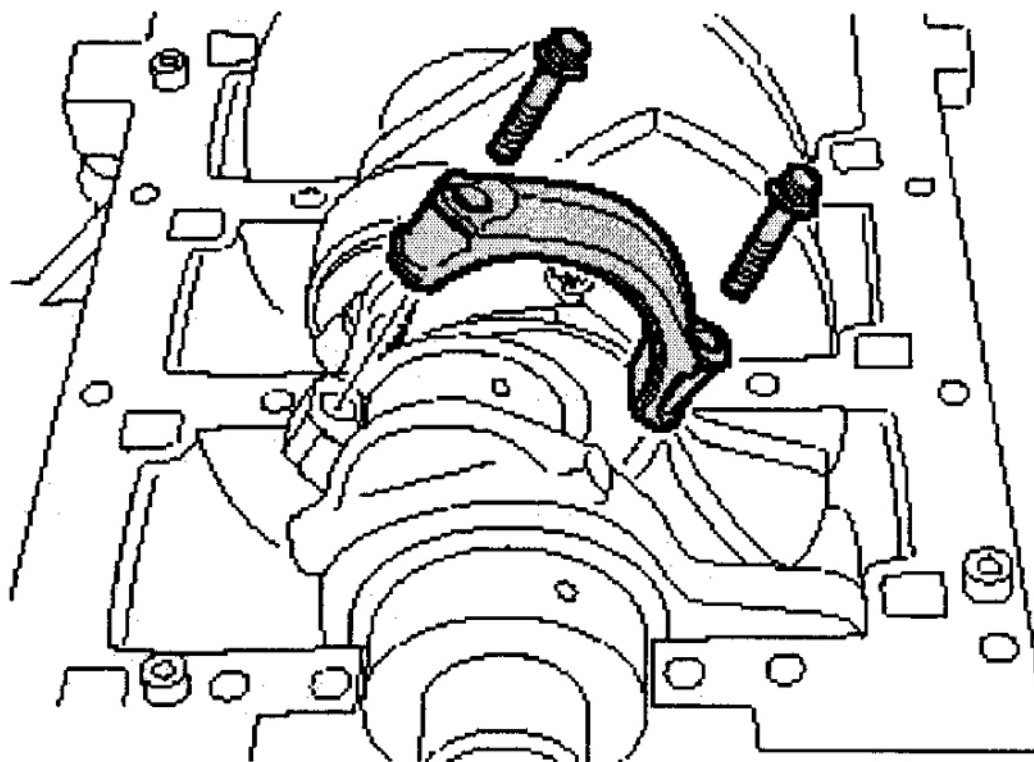
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Fig. 188: Removing Bearing Ladder-To-Cylinder Block Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



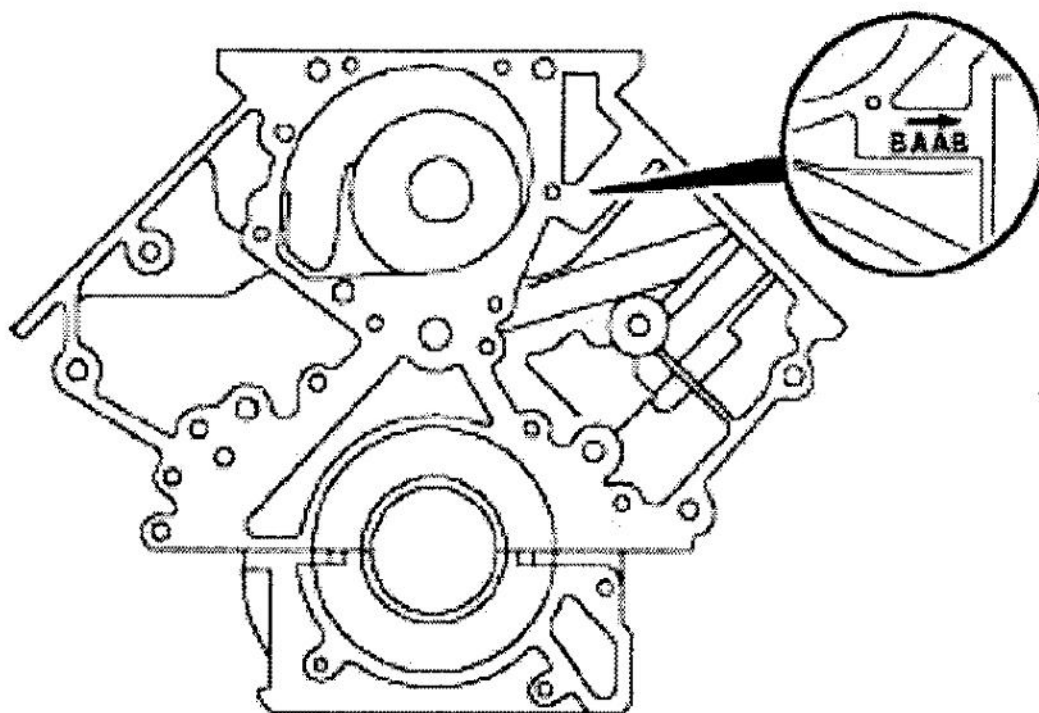
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Fig. 189: Removing Main Bearing Shells & Thrust Washer Halves
Courtesy of LAND ROVER NORTH AMERICA, INC.



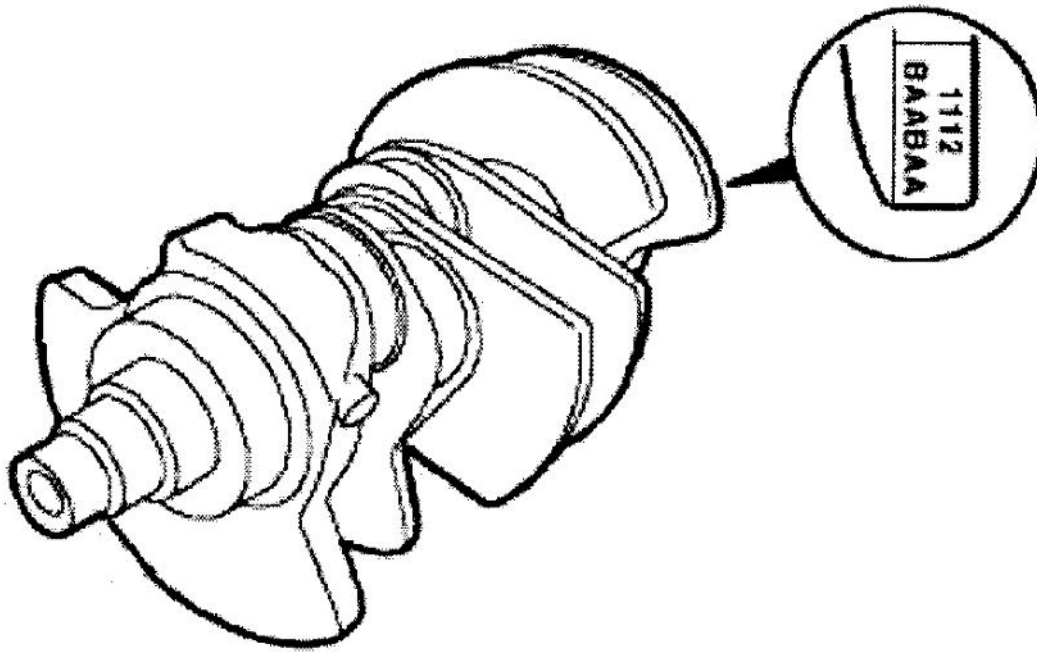
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Fig. 190: Installing Crankshaft Pulley Bolt Temporarily
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384035

Fig. 191: Recording Bearing Code Letters
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 192: Recording Main Bearing Code Numbers Located On Crankshaft Rear Web
 Courtesy of LAND ROVER NORTH AMERICA, INC.

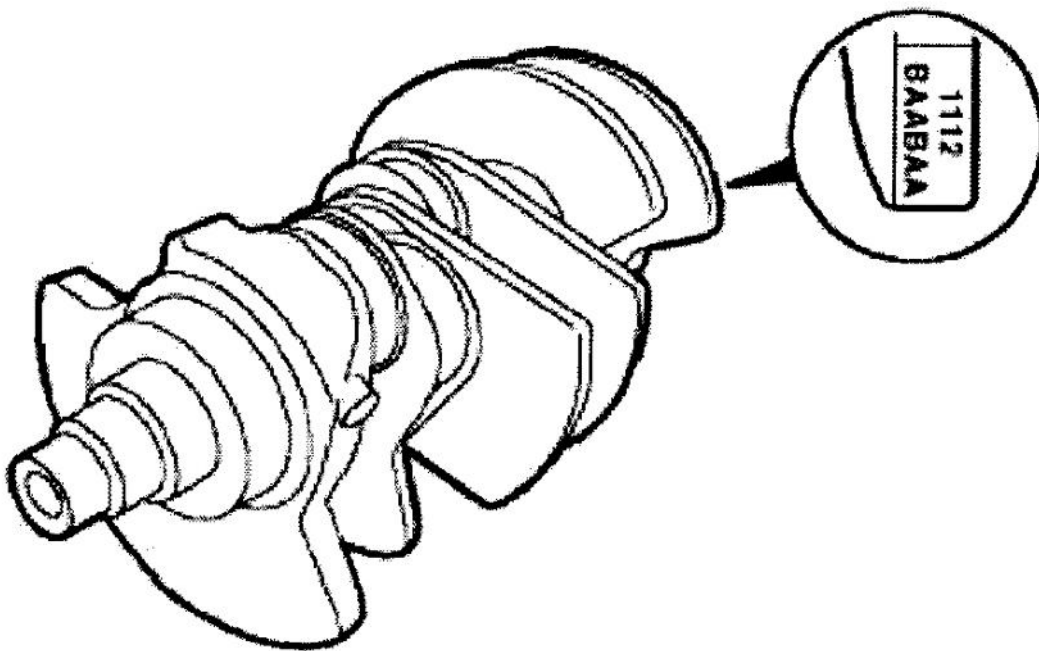
Inspection

1. Check crankshaft main journal diameters.
2. Diameters should be within tolerances. Replace crankshaft if outside tolerance.
3. Determine appropriate main bearing shells to be fitted from size selection and type tables in general data.
4. Determine main bearing thickness by color code on edge of bearing.
5. Crankshaft big-end journal diameters: Check crankshaft big-end journal diameters; replace crankshaft if outside tolerance.
6. Determine big-end bearing thickness by color code on edge of bearing.
7. Big-end bearings - selection: Record big-end journal code letters, located on the rear crankshaft web. The first letter, reading from left to right, relates to the number one big-end journal. See **Fig. 193**.
8. Record big-end bearing bore numbers, this will be 7, 8 or 9 located on the connecting rod bearing cap. See **Fig. 194**.
9. Big-end bearings selection: Select the required bearing shells from general data.
10. Ensure all bolt holes are clean and dry. Remove all traces of thread locking material from oil pick-up strainer bolt hole and threads of retaining bolt.

CAUTION: Do not use a tap.

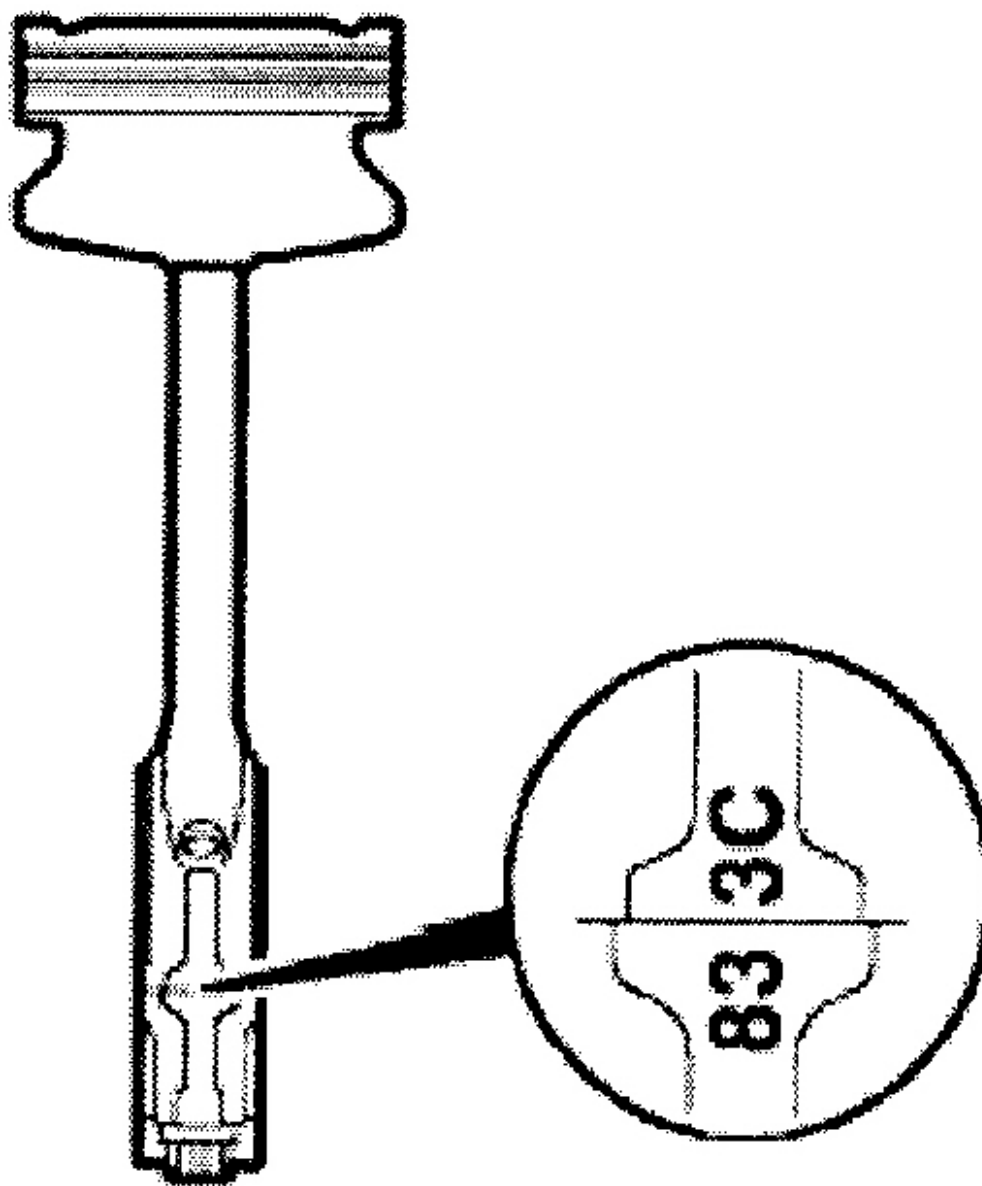
11. Ensure bearing ladder locating dowels are fitted and dowel holes in bearing ladder are clean and dry.
12. Check coolant stub pipe in cylinder block for signs of leakage and corrosion, replace as necessary. Apply sealant, Part No. STC 50554 to seal replacement pipe to cylinder block.
13. Clean main bearing shell recesses in cylinder block.
14. Clean crankshaft main bearing and big end bearing journals. Clean bearing shell locations in connecting rods and caps.
15. Fit selected main bearing shells, grooved into cylinder block and plain into bearing ladder.
16. Fit new thrust washers to cylinder block.
17. Position Dial Test Indicator (DTI) gauge stylus on end of crankshaft as illustrated, push crankshaft away from DTI, zero DTI gauge, push crankshaft in the opposite direction and note reading on gauge. See **Fig. 195**.

CAUTION: If end-float exceeds limits given, crankshaft must be replaced.



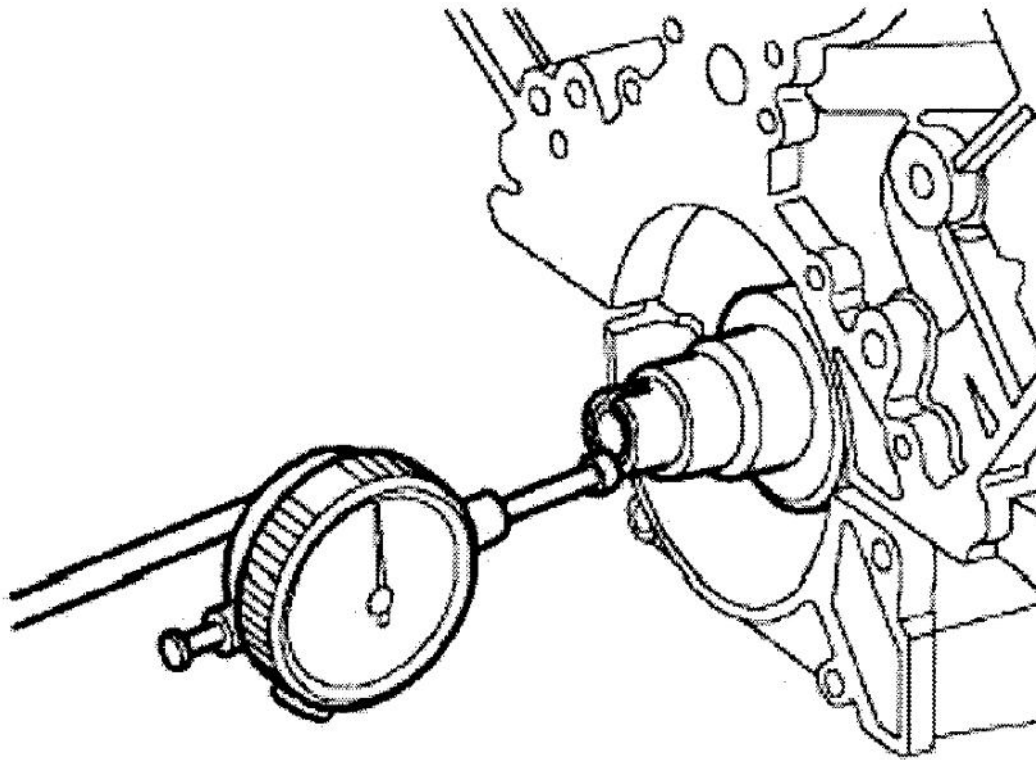
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Fig. 193: Recording Big-End Journal Code Letters
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384038

Fig. 194: Recording Big-End Bearing Bore Numbers
Courtesy of LAND ROVER NORTH AMERICA, INC.



DIAL TEST INDICATOR

G00384034

Fig. 195: Using Dial Test Indicator**Courtesy of LAND ROVER NORTH AMERICA, INC.****Reassembly**

1. Fit selected big-end bearing shells to connecting rods and caps.
2. Lubricate crankshaft journals with clean engine oil. Hold crankshaft with big end journals horizontal, lower crankshaft into main bearings.
3. Carefully pull connecting rods into place, fit connecting rod caps noting that featherways are on opposite sides; fit and lightly tighten dowel bolts.
4. Tighten dowel bolts:
 - Stage 1 - 20 Nm (15 ft. lbs.)
 - Stage 2 - Further 45°
5. Using a lint free cloth and a suitable cleaning solvent, clean bearing ladder and mating face on cylinder block.
6. Apply clean engine oil to crankshaft thrust washers and fit to bearing ladder with oil grooves facing outwards.

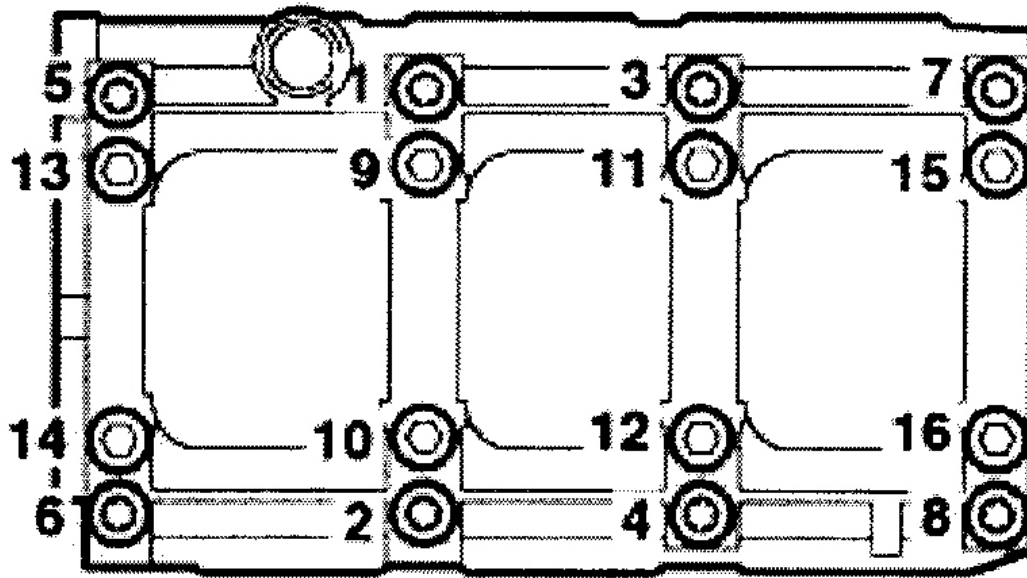
7. Fit bearing ladder and ensure that all bearing shells are seated correctly.
8. Noting that longest bolts must be fitted in inner holes in bearing ladder, fit new bolts and tighten. See **Fig. 196**:
 - Stage 1 - 20 Nm (15 ft. lbs.)
 - Stage 2 - Further 90°
9. Using a lint free cloth and a suitable cleaning solvent, clean mating surfaces on cylinder block and lower crankcase.
10. Apply a continuous bead of sealant, Part No. STC 50550, to paths on lower crankcase as shown then spread to an even film using a roller. See **Fig. 197**.

CAUTION: To avoid contamination, assembly must be completed immediately after application of sealant.

11. Fit 2 M8 slave guide studs into cylinder block at positions shown. See **Fig. 198**.
12. Position lower crankcase to cylinder block.
13. Fit and lightly tighten 6 M8 bolts, remove guide studs, fit and lightly tighten 2 remaining M8 bolts. See **Fig. 199**.
14. Using sequence shown, tighten bolts to 25 Nm (18 ft. lbs.).
15. Fit and tighten remaining M8 bolt to 25 Nm (18 ft. lbs.).
16. Fit 2 rear M6 bolts and tighten to 9 Nm (7 ft. lbs.).
17. Clean oil pick-up strainer and mating face.
18. Lubricate new "O" ring with clean engine oil and fit to pick-up strainer.

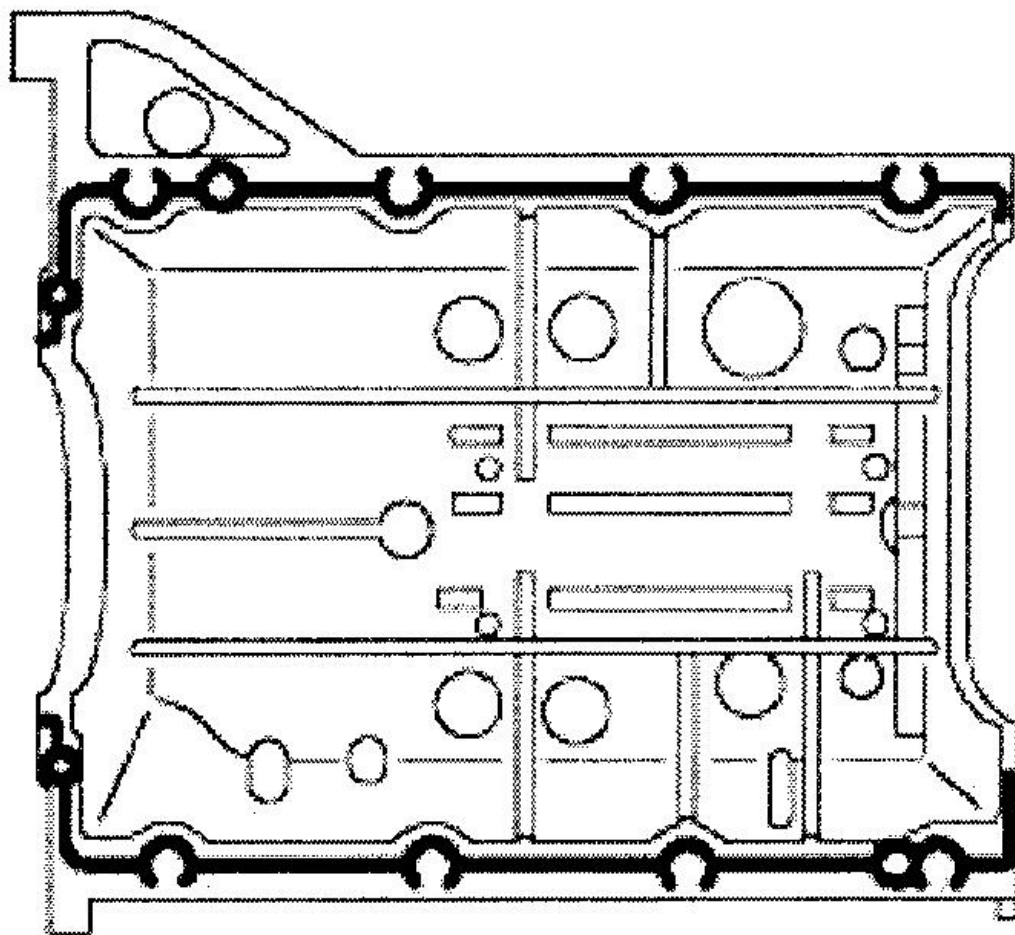
CAUTION: Ensure "O" ring, Part No. LYX 000210L is used.

19. Apply sealant, Part No. STC 50552 to threads of oil pick-up strainer retaining bolt.
20. Position oil pick-up strainer, fit and tighten bolt to 25 Nm (18 ft. lbs.).
21. Clean oil pump, oil seal recess in oil pump body and mating face on cylinder block, ensure bolt holes are clean and dry.
22. Clean oil seal running surface on crankshaft.



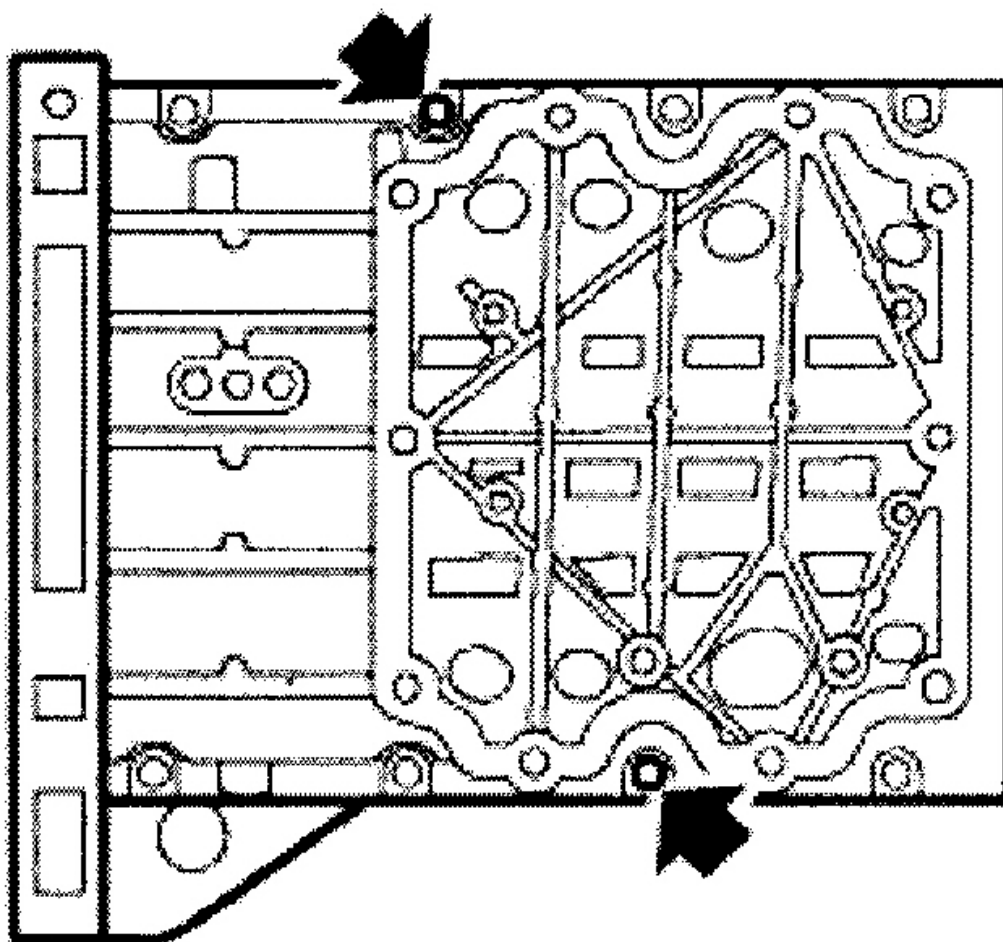
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Fig. 196: Tightening Sequence Of Crankshaft Bolts
 Courtesy of LAND ROVER NORTH AMERICA, INC.



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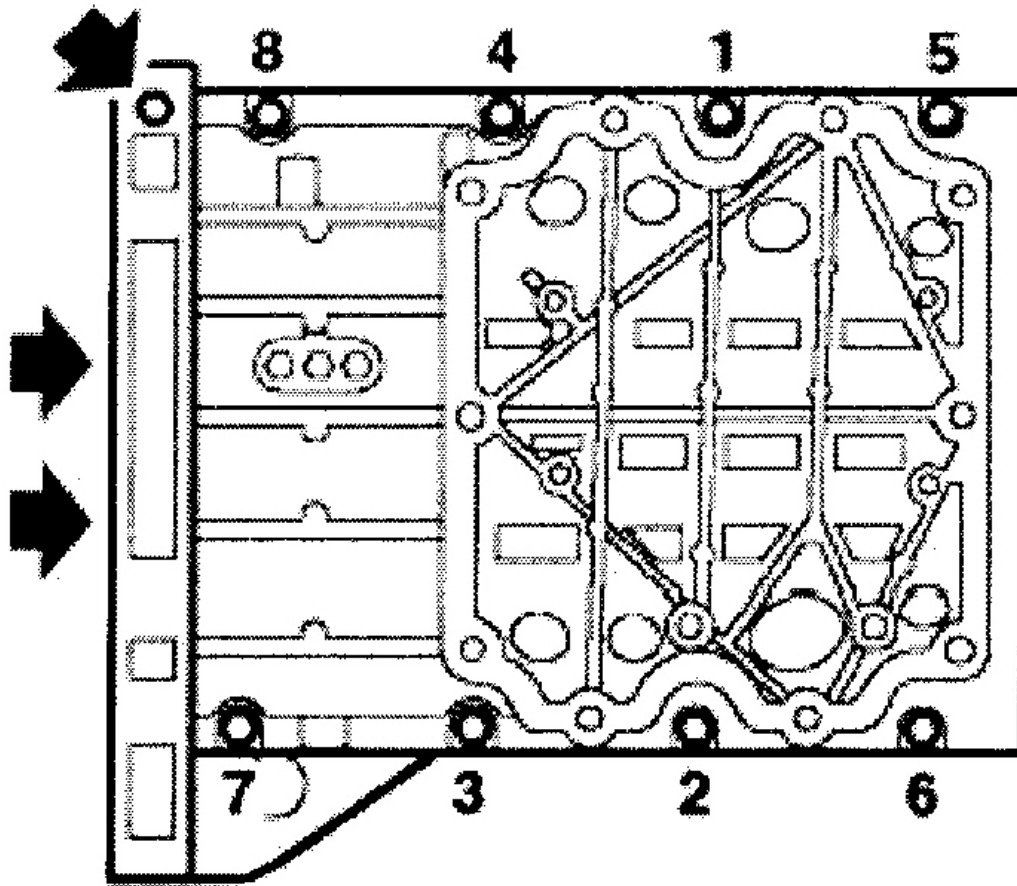
Fig. 197: Applying Sealant As Shown On Lower Crankcase
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384041

Fig. 198: Identifying Slave Guide Studs

Courtesy of LAND ROVER NORTH AMERICA, INC.



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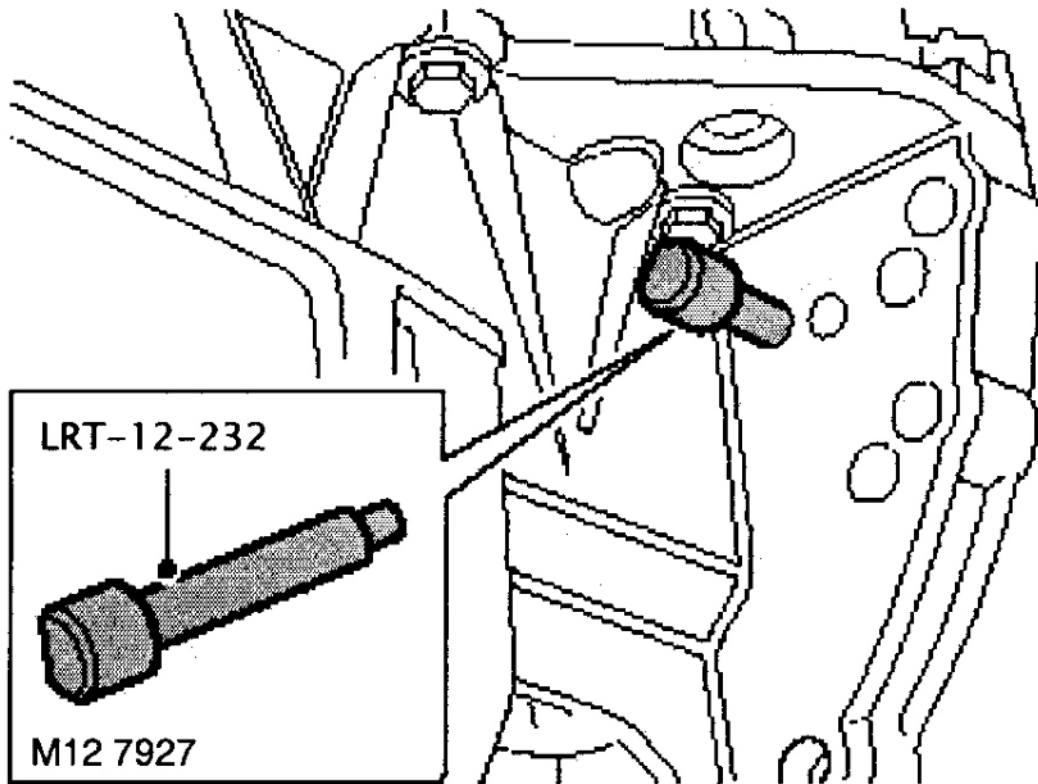
Fig. 199: Tightening Lower Crankcase Bolts In Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Fit oil pump gasket. See **OIL PUMP - OVERHAUL**.
2. Fit engine sump. See **SUMP - ENGINE OIL**.
3. Fit crankshaft rear oil seal. See **CRANKSHAFT REAR OIL SEAL**.
4. Rotate crankshaft until timing pin LRT-12-232 can be inserted through hole immediately adjacent to side of lower crankcase and into elongated hole in drive plate. See **Fig. 200**.

CAUTION: Ensure that pin is in elongated hole. Do not use cast arrow on oil pump body as a timing mark. Do not remove timing pin until timing belts are fitted.

5. Fit cylinder head gaskets. See **CYLINDER HEAD GASKET - RIGHT** or **CYLINDER HEAD GASKET - LEFT**.



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Fig. 200: Using Timing Pin LRT-12-232
Courtesy of LAND ROVER NORTH AMERICA, INC.

CYLINDER HEAD GASKET - LEFT

Removal

1. Remove and discard camshaft timing belt. See **CAMSHAFT TIMING BELT**.
2. Remove inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY**.
3. Remove 4 bolts securing left front camshaft timing belt cover backplate to cylinder head and remove backplate. See **Fig. 201**.
4. Release HO2S lead from clip on cylinder block.
5. Using sequence shown, loosen then remove 4 nuts securing exhaust manifold to cylinder head. Remove manifold, remove and discard gasket. See **Fig. 202**.

6. Remove left camshaft cover. See **CAMSHAFT COVER GASKET - LEFT- UP TO MODEL YEAR 2003.**
7. Release clip and disconnect coolant bleed hose from left inlet manifold, position hose aside. See **Fig. 203.**
8. Depress locking collar and release breather hose from left inlet manifold. See **Fig. 204.**
9. Release clips securing right injector harness to injector protection cover - if fitted, or from bosses on fuel rail. See **Fig. 205.**
10. Remove 2 bolts securing protection cover - if fitted and right fuel rail to right inlet manifold, remove cover. See **Fig. 206.**
11. Remove 2 bolts securing fuel rail to left inlet manifold. See **Fig. 207.**
12. Release injectors from manifolds and carefully lay fuel rail and injectors aside.

CAUTION: Always fit plugs to open connections to prevent contamination.

13. Using sequence shown, progressively loosen and remove 8 cylinder head bolts. See **Fig. 208.**
14. Remove cylinder head.

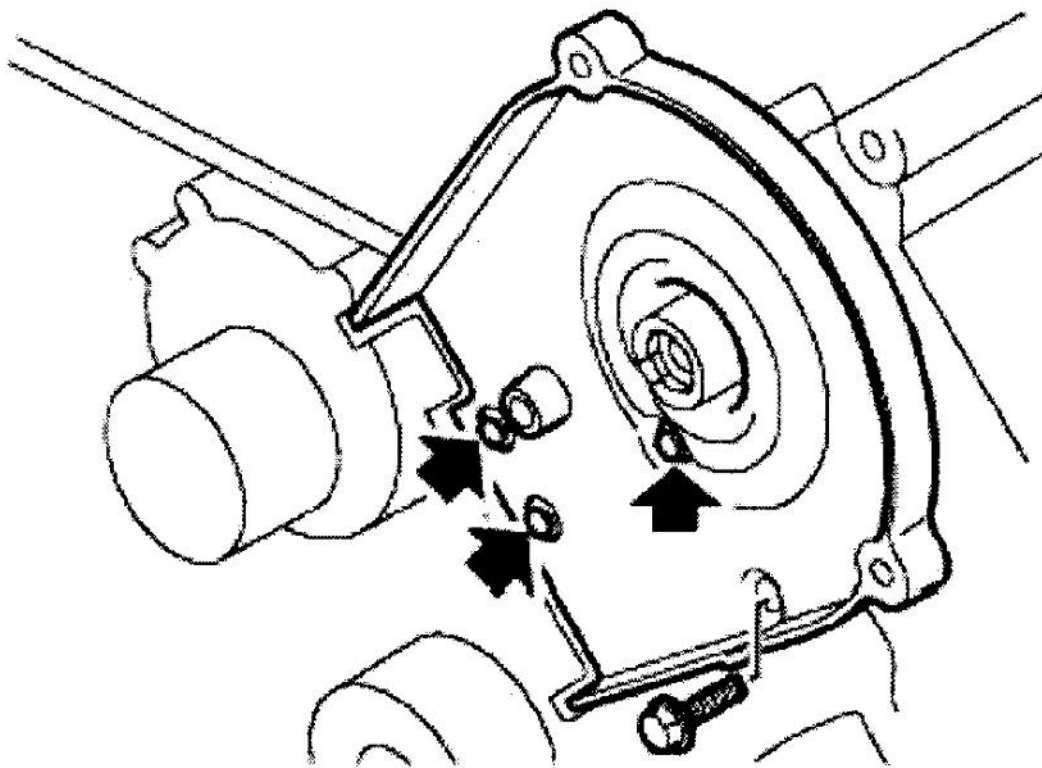
CAUTION: Support both ends of cylinder head on blocks of wood.

15. Remove and discard cylinder head gasket.

CAUTION: Do not rotate crankshaft with right cylinder head fitted.

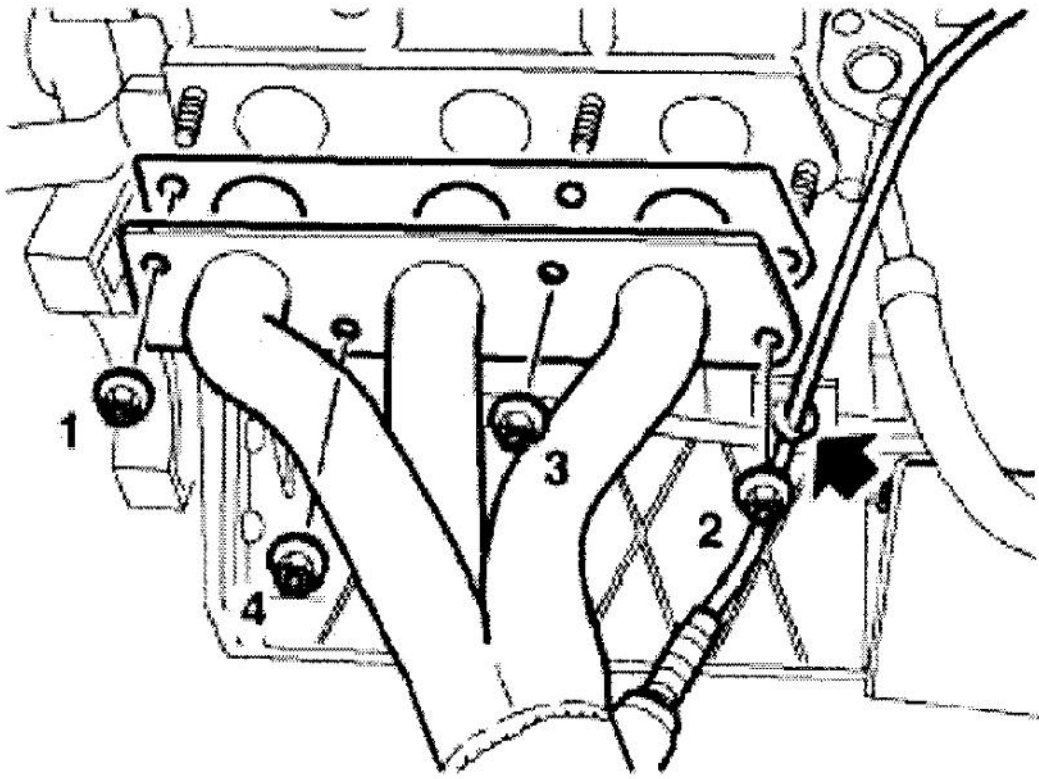
16. Fit cylinder liner clamps LRT-12-144 and secure with cylinder head bolts. See **Fig. 168.**

CAUTION: Ensure that feet of clamps do not protrude over bores.



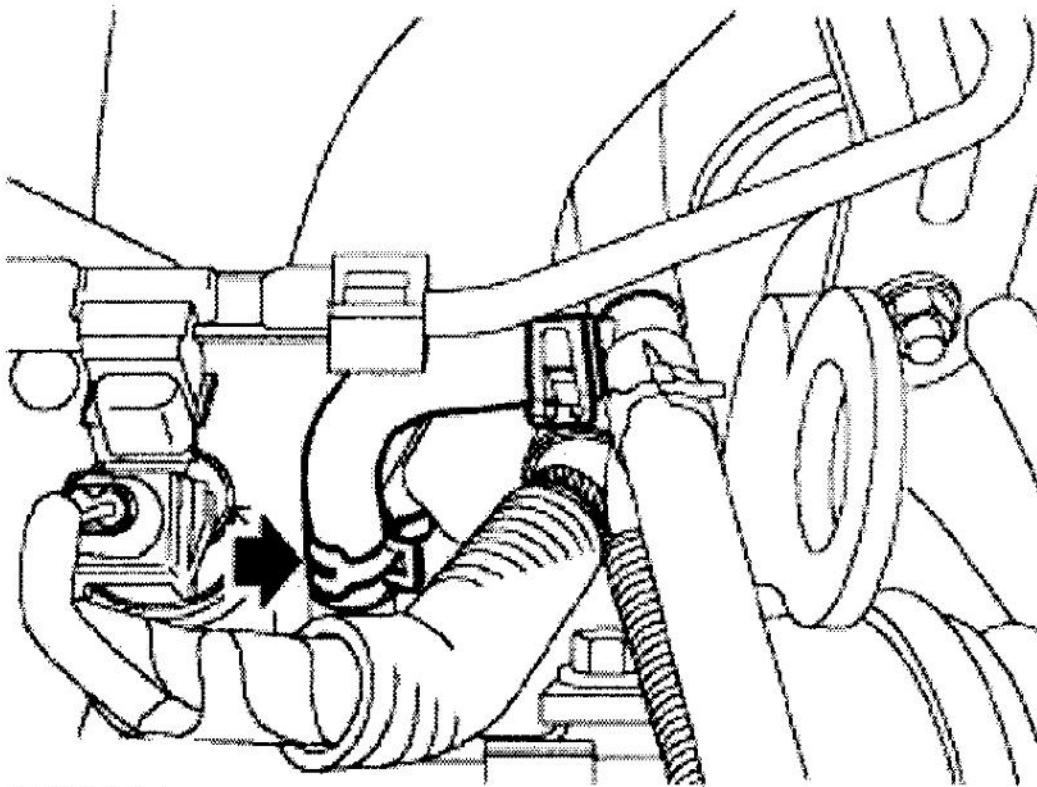
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Fig. 201: Removing Left Front Camshaft Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



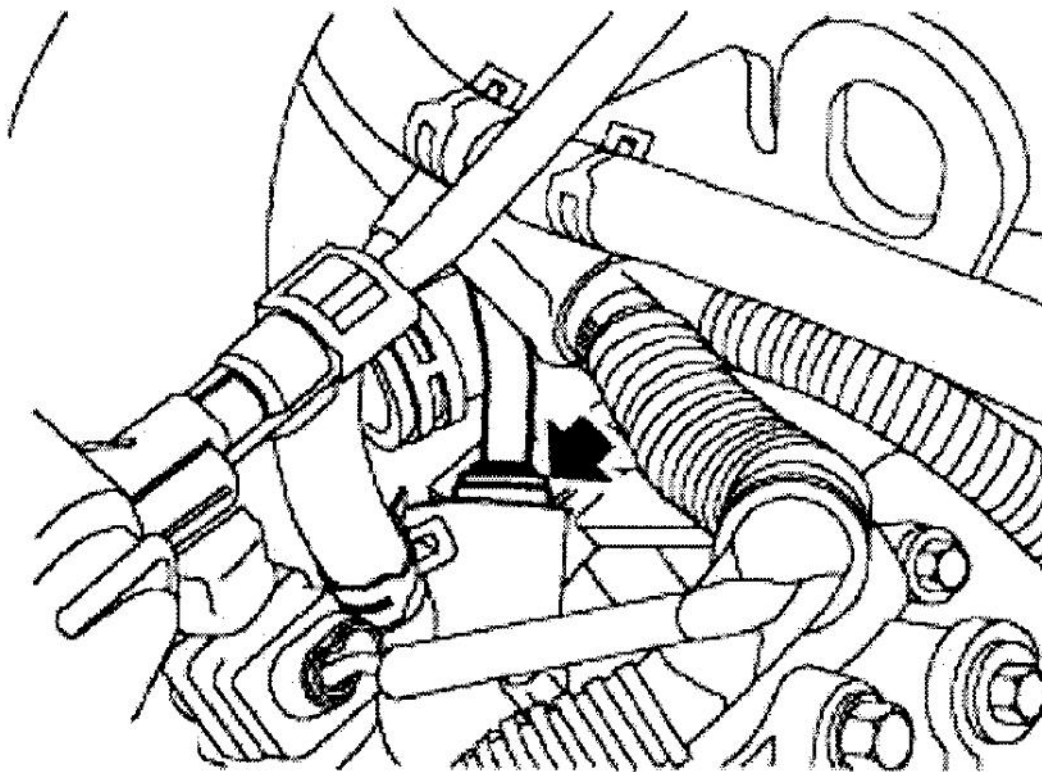
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Fig. 202: Loosening Exhaust Manifold-To-Cylinder Nuts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



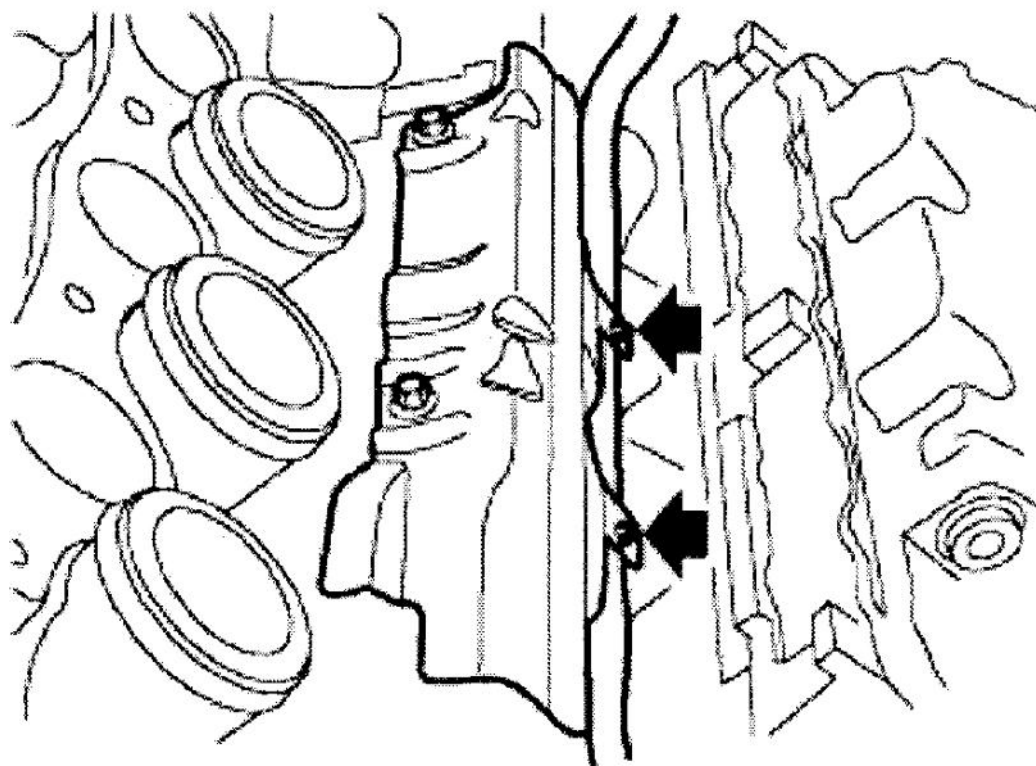
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Fig. 203: Disconnecting Coolant Bleed Hose From Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



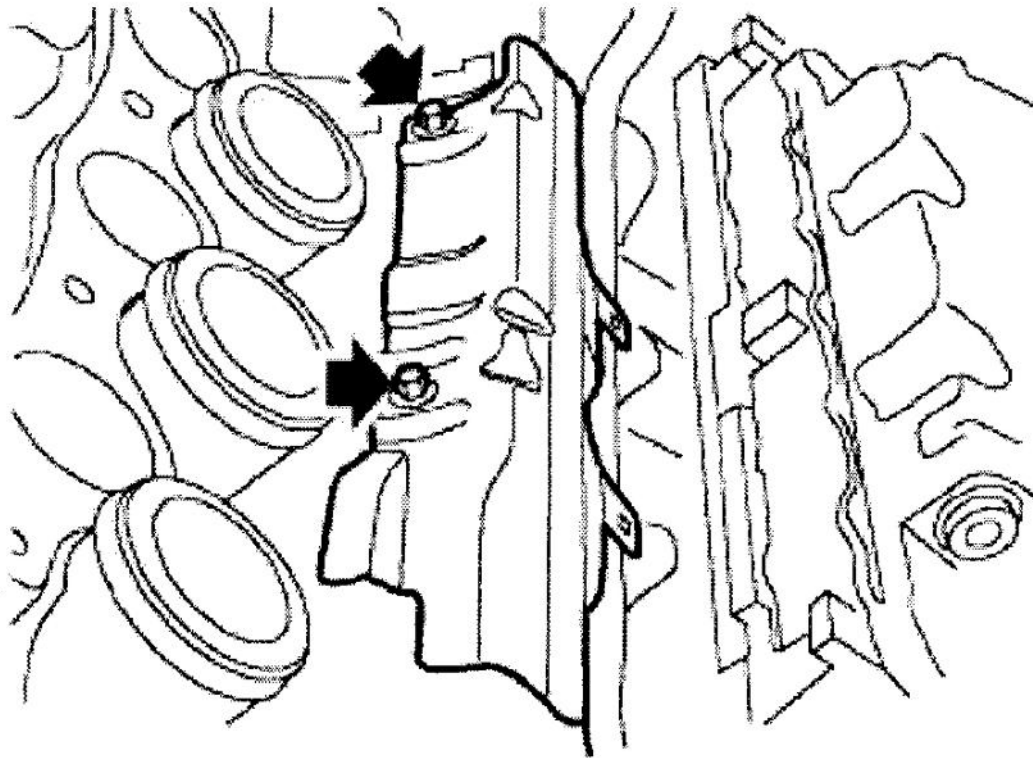
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Fig. 204: Removing Breather Hose From left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



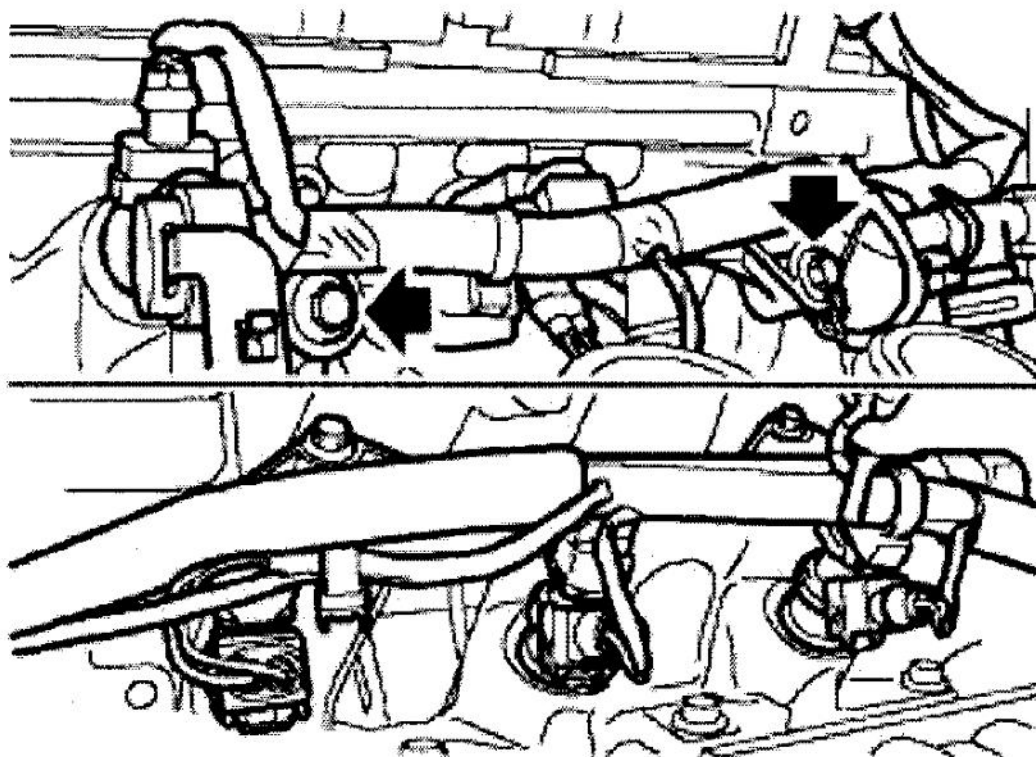
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Fig. 205: Releasing Right Injector Harness-To-Injector Protection Cover
Courtesy of LAND ROVER NORTH AMERICA, INC.



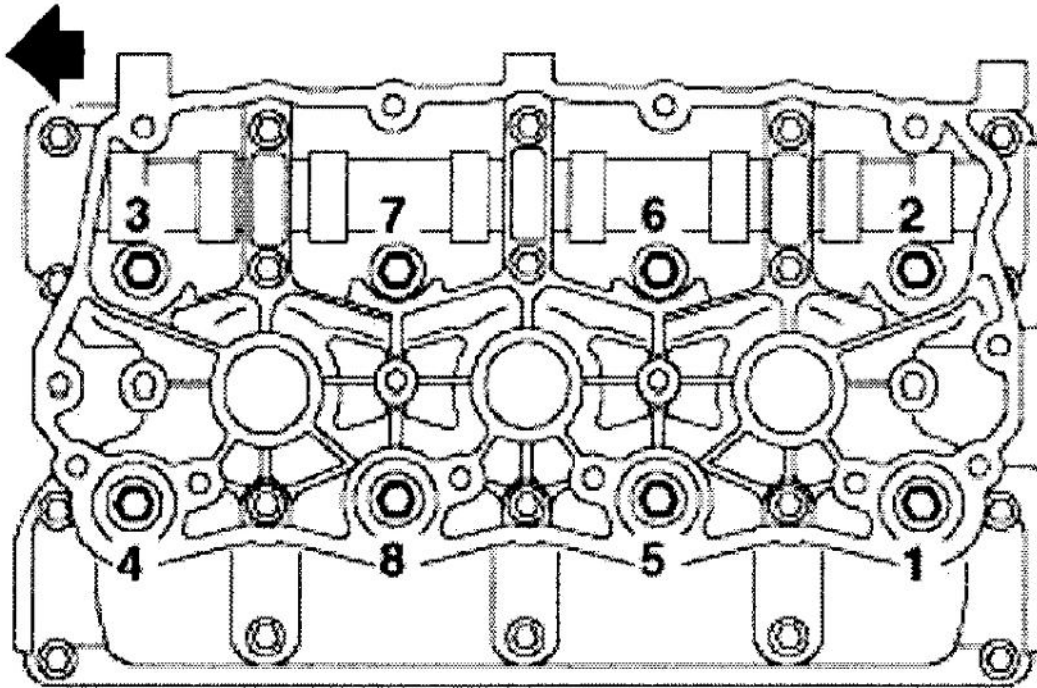
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Fig. 206: Removing Protection Cover (If Fitted) & Right Fuel Rail To Right Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 207: Removing Fuel Rail-To-Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384051

Fig. 208: Loosening Cylinder Head Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean cylinder head face. See **Fig. 168**.

CAUTION: Use suitable gasket removal spray and a plastic scraper.

2. Remove bolts securing cylinder liner clamps LRT-12-144 to cylinder block and remove clamps.

CAUTION: Do not rotate crankshaft.

3. Clean cylinder block face and dowel holes.
4. Clean cylinder head bolts and wipe dry.
5. Lightly lubricate threads and beneath heads of cylinder head bolts with clean engine oil.
6. Check that fitted height of dowels is between 10 to 11 mm (0.40 to 0.43 in) above cylinder block top face. Replace dowels if fitted height is incorrect. See **Fig. 33**.

7. Fit new cylinder head gasket onto cylinder block with the word "TOP" uppermost.
8. With assistance, fit cylinder head and carefully position left inlet to right inlet manifold.
9. Carefully enter cylinder head bolts, DO NOT DROP. Screw bolts into place by hand.
10. Tighten cylinder head bolts progressively in the sequence shown. See **Fig. 250**:
 - Stage 1 - 25 Nm (18 ft. lbs.)
 - Stage 2 - 25 Nm (18 ft. lbs.)
 - Stage 3 - 25 Nm (18 ft. lbs.)
 - Stage 4 - Using an angle torque gauge, tighten a bolts in same sequence a further 180°
11. Fit left camshaft cover gasket. See **CAMSHAFT COVER GASKET - LEFT- UP TO MODEL YEAR 2003.**
12. Remove and discard "O" rings from injectors.
13. Clean injectors and injector locations in fuel rail.
14. Lubricate new "O" rings with castor oil and fit to injectors.
15. Position fuel rail assembly and secure injectors to inlet manifolds.
16. Position injector protection cover - if fitted to right fuel rail and secure injector harness to protection cover or fuel rail with clips.
17. Fit bolts securing fuel rail to inlet manifolds and tighten to 9 Nm (7 ft. lbs.).
18. Connect coolant bleed hose to inlet manifold and secure with clip.
19. Connect breather hose to left inlet manifold.
20. Position ignition coils to left inlet manifold.
21. Position earth lead, fit nuts and bolts securing ignition coils to left inlet manifold and tighten to 9 Nm (7 ft. lbs.).
22. Clean camshaft drive belt cover backplate bolts and apply sealant, Part No. STC 50552 to first 3 threads.
23. Position backplate, fit and tighten bolts to 9 Nm (7 ft. lbs.).
24. Clean exhaust manifold and cylinder head mating face.
25. Fit new exhaust manifold gasket. Position exhaust manifold, fit nuts and using sequence shown, tighten to 45 Nm (33 ft. lbs.).
26. Secure HO2S lead in clip on cylinder block.
27. Connect HO2S multiplug and secure to support bracket.
28. Fit new camshaft timing belt. See **CAMSHAFT TIMING BELT.**

CYLINDER HEAD GASKET - RIGHT

Disassemble

1. Remove inlet manifold chamber. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY .**
2. Remove and discard camshaft timing belt. See **CAMSHAFT TIMING BELT.**
3. Release right HO2S multiplug from coolant rail bracket and disconnect multiplug. See **Fig. 209.**
4. Using sequence shown, loosen then remove 4 nuts securing right exhaust manifold to cylinder head. See

Fig. 210.

5. Remove exhaust manifold, remove and discard gasket.
6. Remove 4 bolts securing right front timing belt cover backplate to cylinder head and remove backplate. See **Fig. 211.**
7. Remove right camshaft cover gasket. See **CAMSHAFT COVER GASKET - RIGHT.**
8. Up to Model Year 2003: Remove 3 nuts and 3 bolts securing ignition coils to left inlet manifold and release coil earth lead. See **Fig. 212.**
9. Up to Model Year 2003: Remove ignition coils and position aside.
10. Release clip and disconnect coolant bleed hose from right inlet manifold, position hose aside. See **Fig. 213.**
11. Release injector harness clips from injector protection cover - if fitted, or from bosses on fuel rail. See **Fig. 214.**
12. Remove 2 bolts securing protection cover - if fitted and right fuel rail to right inlet manifold, remove cover. See **Fig. 215.**
13. Remove 2 bolts securing fuel rail to left inlet manifold. See **Fig. 216.**
14. Release injectors from manifolds and carefully lay fuel rail and injectors aside.

CAUTION: Always fit plugs to open connections to prevent contamination.

15. Using sequence shown, progressively loosen and remove 8 cylinder head bolts. See **Fig. 217.**
16. Remove cylinder head.

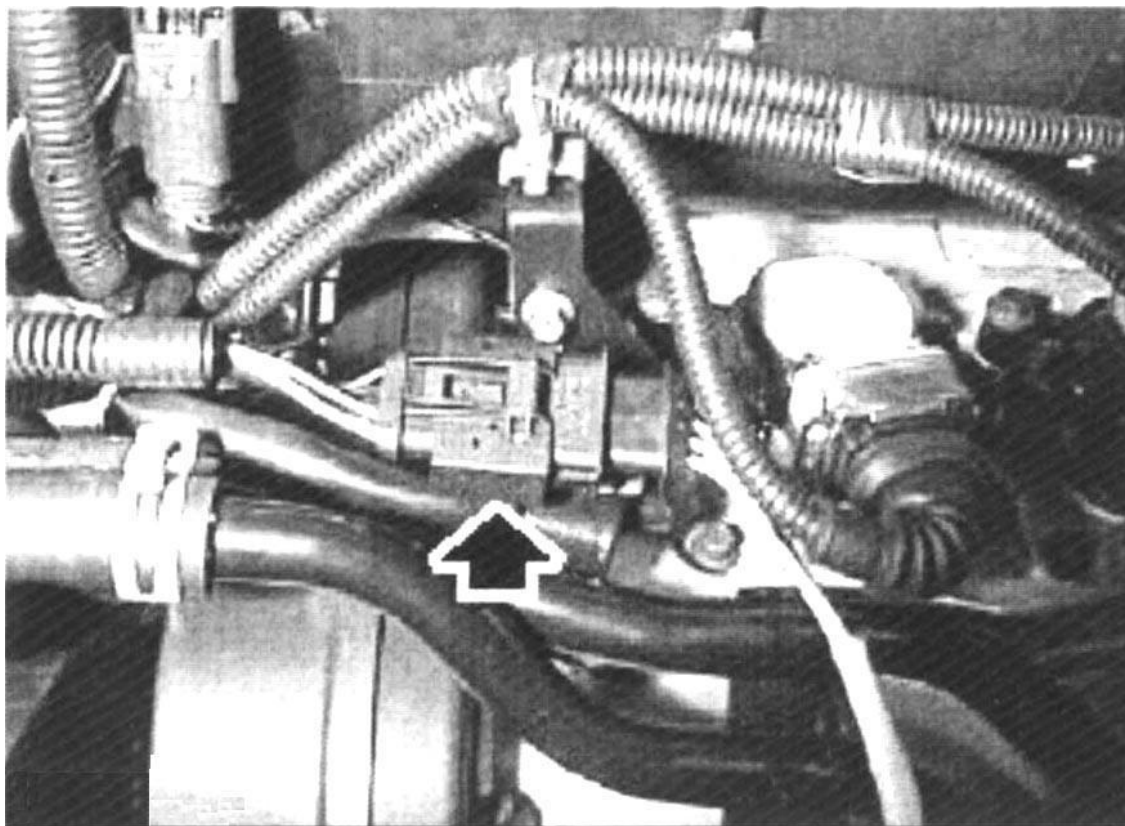
CAUTION: Support both ends of cylinder head on blocks of wood.

17. Remove and discard cylinder head gasket.

CAUTION: Do not rotate crankshaft with left cylinder head fitted.

18. Fit cylinder liner clamps LRT-12-144 and secure with cylinder head bolts. See **Fig. 38.**

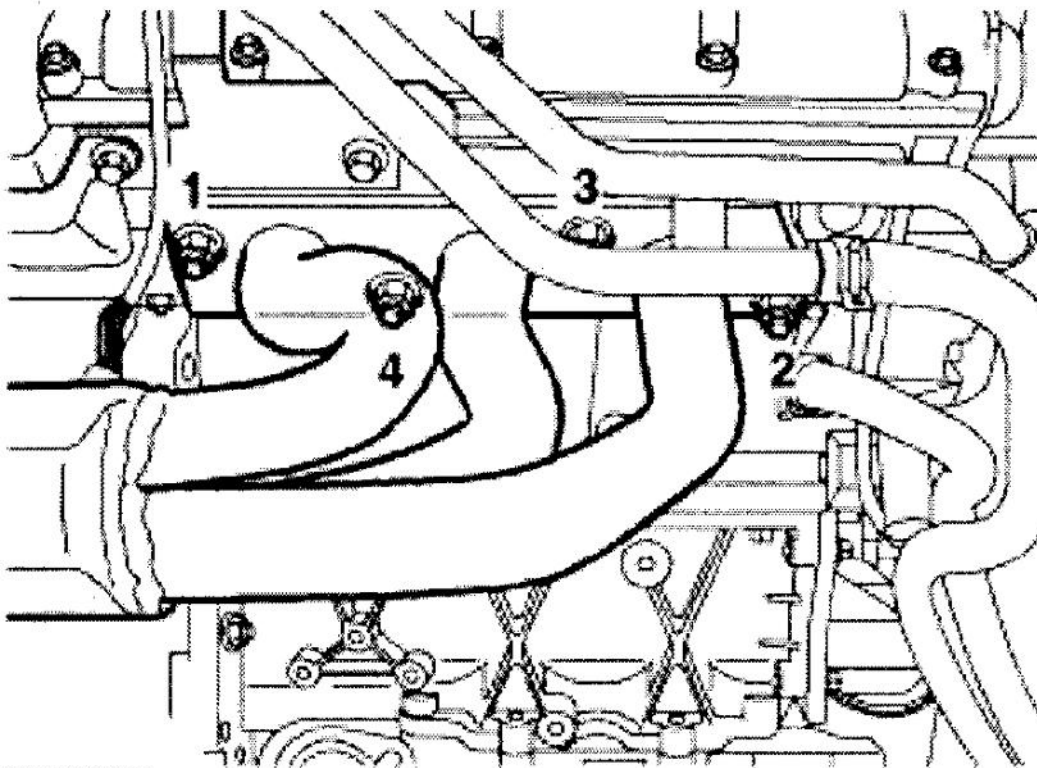
CAUTION: Ensure that feet of clamps do not protrude over bores.



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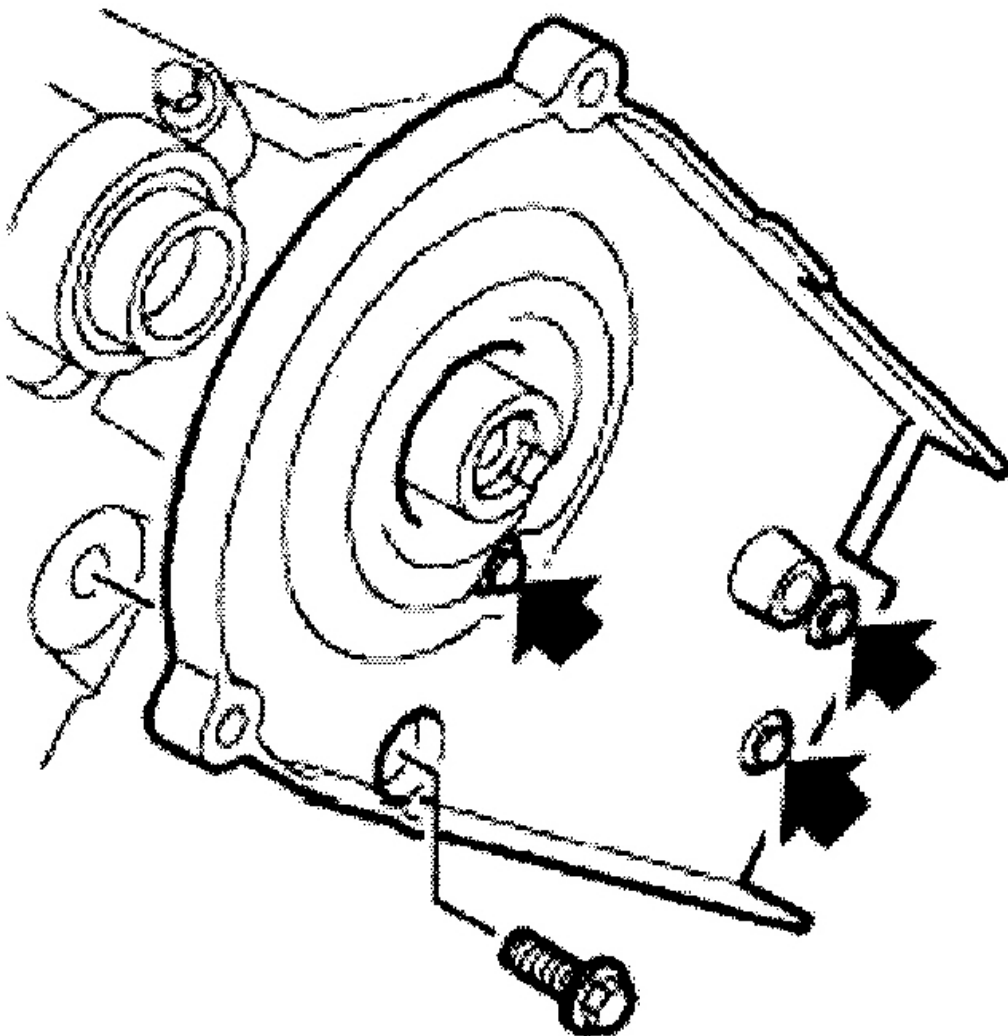
Fig. 209: Removing Right HO2S

Courtesy of LAND ROVER NORTH AMERICA, INC.



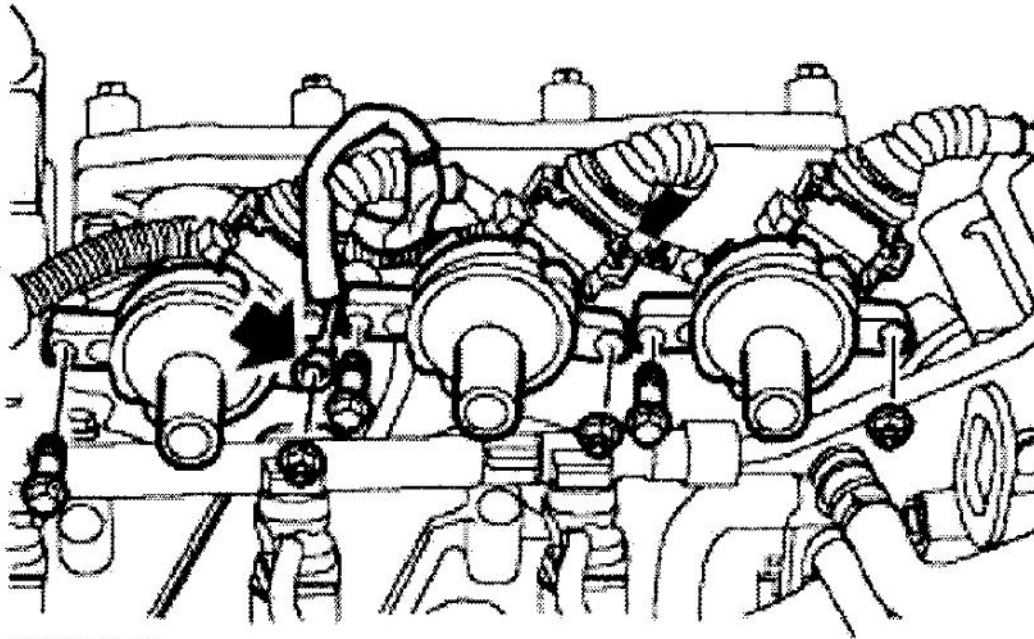
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Fig. 210: Removing Right Exhaust Manifold-To-Cylinder
Courtesy of LAND ROVER NORTH AMERICA, INC.



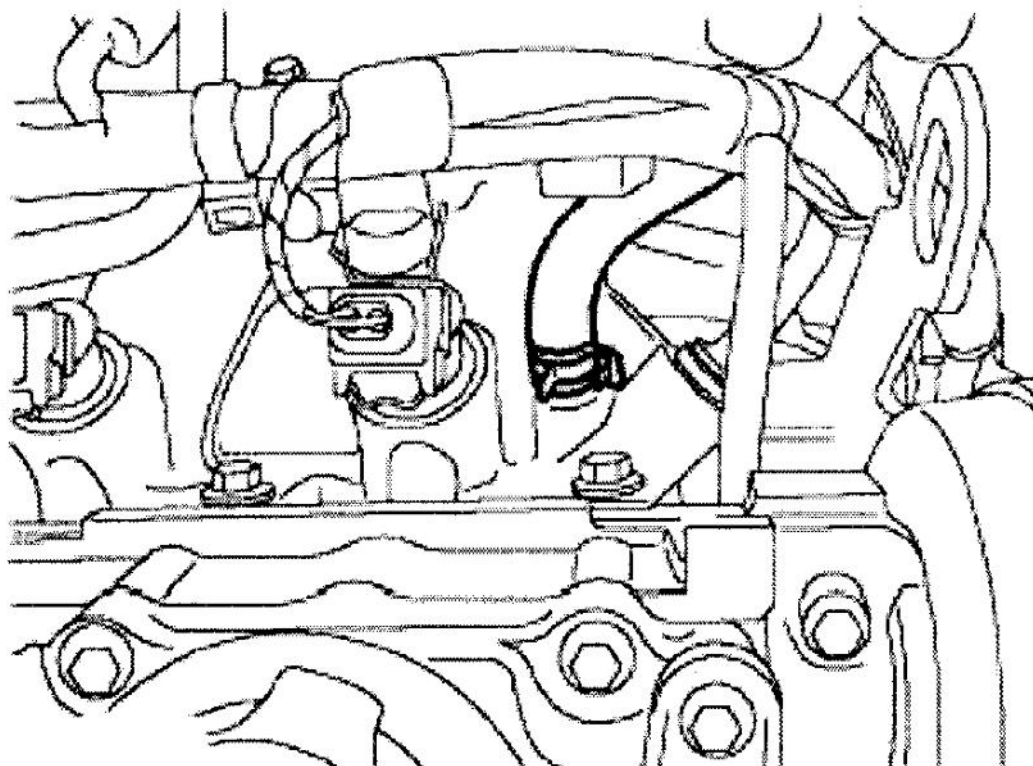
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Fig. 211: Removing Right Front Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



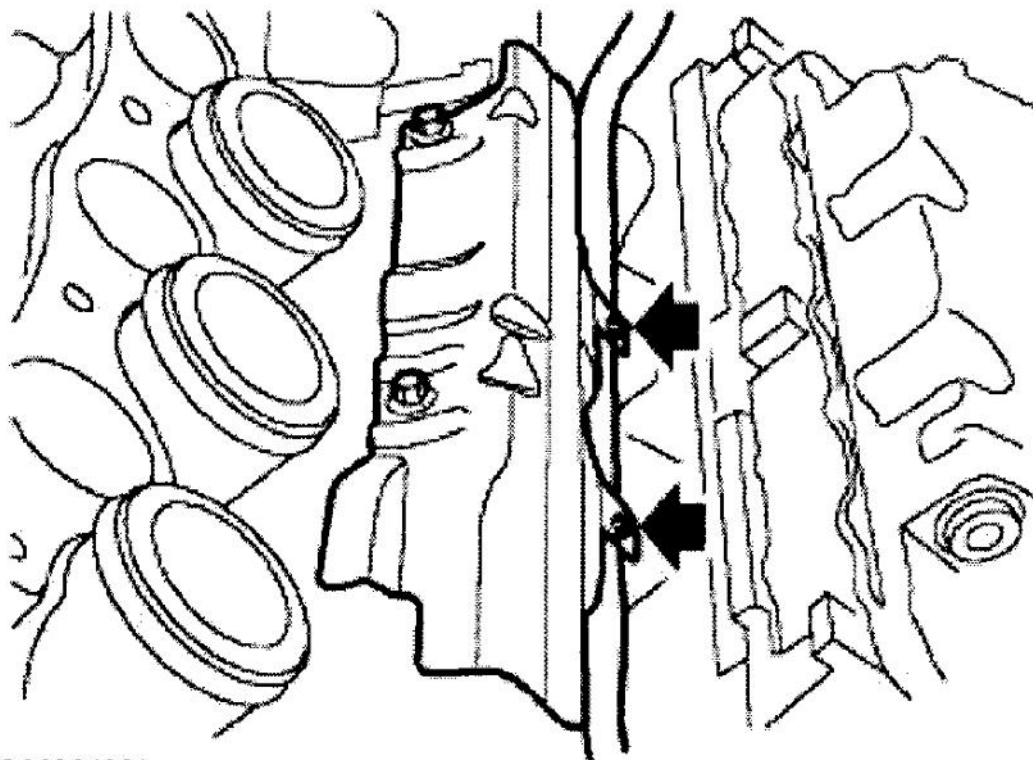
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Fig. 212: Removing Ignition Coils To Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



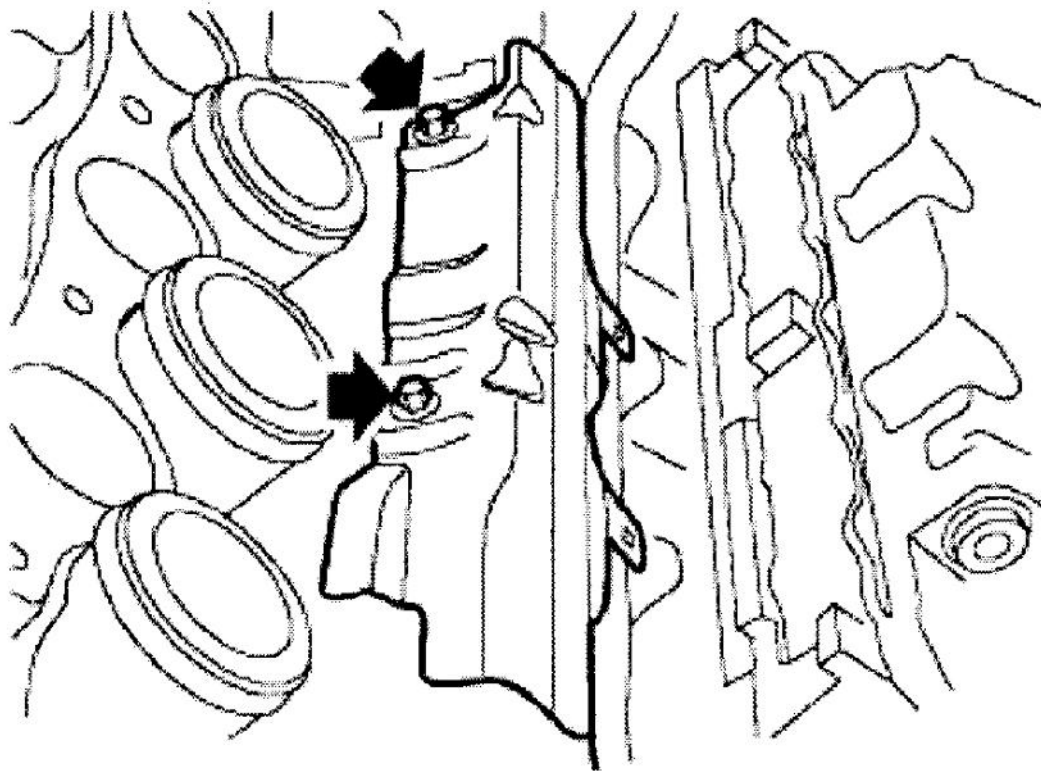
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Fig. 213: Disconnecting Coolant Bleed Hose From Right Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



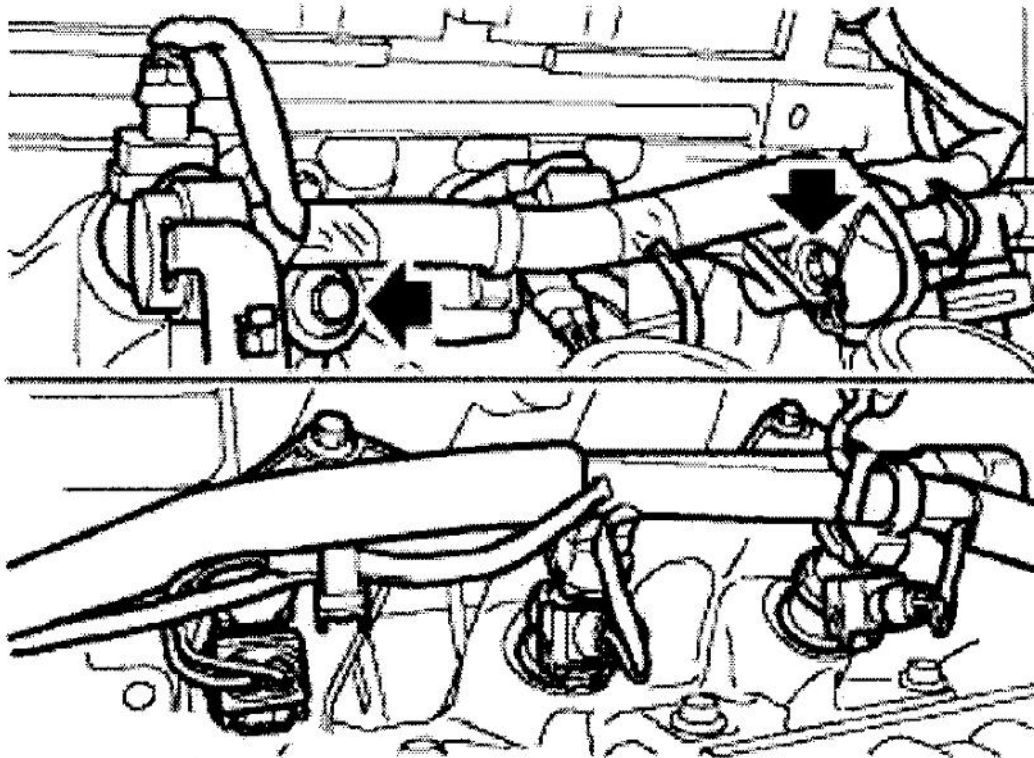
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Fig. 214: Releasing Injector Harness Clips From Injector Protection Cover (If Fitted)
Courtesy of LAND ROVER NORTH AMERICA, INC.



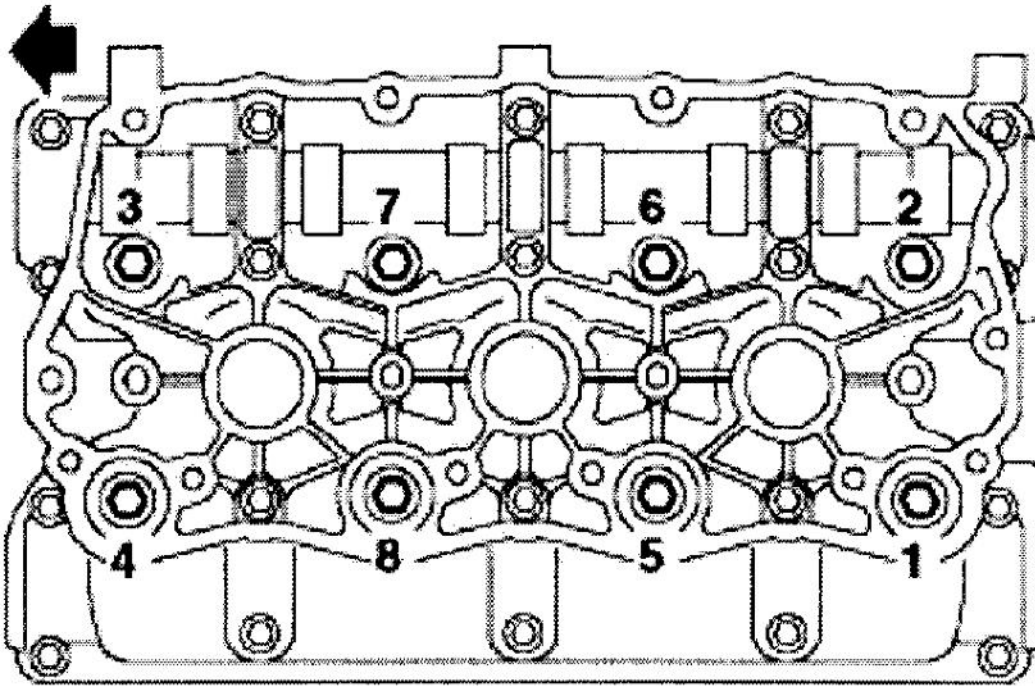
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Fig. 215: Removing Right Fuel Rail-To-Right Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 216: Removing Fuel Rail-To-Left Inlet Manifold
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384064

Fig. 217: Removing Cylinder Head Bolt In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

1. Clean cylinder head face.

CAUTION: Use suitable gasket removal spray and a plastic scraper.

2. Remove bolts securing cylinder liner clamps LRT-12-144 to cylinder block and remove clamps. See **Fig. 38**.

CAUTION: Do not rotate crankshaft.

3. Clean cylinder block face, dowels and dowel holes.
4. Clean cylinder head bolts and wipe dry.
5. Lightly lubricate threads and beneath heads of cylinder head bolts with clean engine oil.
6. Check that fitted height of dowels is between 10 to 11 mm (0.40 to 0.43 in) above cylinder block top face.

Replace dowels if fitted height is incorrect. See **Fig. 33**.

7. Fit new cylinder head gasket onto cylinder block with the word "TOP" uppermost.
8. With assistance, fit cylinder head and carefully position right inlet to left inlet manifold.
9. Carefully enter cylinder head bolts, DO NOT DROP. Screw bolts into place by hand.
10. Using sequence shown, tighten cylinder head bolts progressively. See **Fig. 250**:
 - Stage 1 - 25 Nm (18 ft. lbs.)
 - Stage 2 - 25 Nm (18 ft. lbs.)
 - Stage 3 - 25 Nm (18 ft. lbs.)
 - Stage 4 - Further 180°
11. Fit right camshaft cover gasket. See **CAMSHAFT COVER GASKET - RIGHT**.
12. Remove and discard lower "O" rings from injectors.
13. Clean injectors and injector locations in fuel rail.
14. Lubricate new "O" rings with castor oil and fit to injectors.
15. Position fuel rail assembly and secure injectors to inlet manifolds.
16. Position injector protection cover - if fitted to right fuel rail and secure injector harness to protection cover or fuel rail with clips. .
17. Fit bolts securing fuel rail to inlet manifolds and tighten to 9 Nm (7 ft. lbs.).
18. Connect coolant bleed hose to inlet manifold and secure with clip.
19. Up to Model Year 2003: Position ignition coils to left inlet manifold.
20. Up to Model Year 2003: Position earth lead, fit nuts and bolts securing ignition coils to left inlet manifold and tighten to 9 Nm (7 ft. lbs.).
21. Clean camshaft timing belt cover backplate bolts and apply sealant, Part No. STC 50552 to the first 3 threads.
22. Position backplate, fit and tighten bolts to 9 Nm (7 ft. lbs.)
23. Fit new camshaft timing belt. See **CAMSHAFT TIMING BELT**.
24. Clean exhaust manifold and mating face on cylinder head.
25. Fit new exhaust manifold gasket. Position exhaust manifold, fit nuts and using sequence shown, tighten to 45 Nm (33 ft. lbs.). See **Fig. 218**.
26. Connect right HO2S multiplug, secure multiplug in coolant rail bracket.

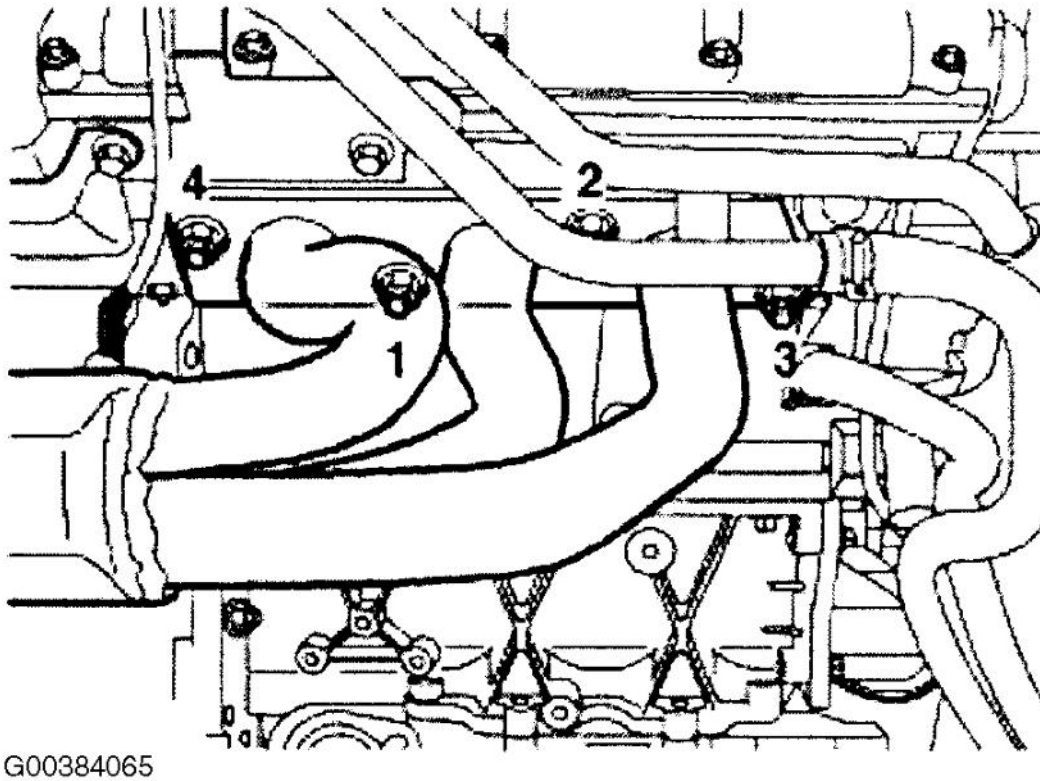


Fig. 218: Installing New Exhaust Manifold Gasket & Nuts In Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.

CYLINDER HEAD - DECARBONIZE

Remove

1. Remove cylinder head gaskets. See **CYLINDER HEAD GASKET - RIGHT CYLINDER HEAD GASKET - LEFT**.

Disassembly

1. Left Cylinder head: Remove 3 bolts securing left rear timing belt cover and remove cover. See **Fig. 153**.
2. Right Cylinder head: Remove 2 bolts securing right rear timing belt cover heat shield to cylinder head. See **Fig. 154**.
3. Right Cylinder head: Remove 3 bolts securing right rear timing belt cover; remove cover.
4. Position LRT-12-175 to rear camshaft gears as illustrated, remove and discard bolts securing gears to camshafts. See **Fig. 219**.
5. Remove rear camshaft gears, timing belt and LRT-12-175 as an assembly.
6. Remove LRT-12-175 from camshaft gears and remove timing belt from gears. Discard timing belt.

7. Remove spark plugs.
8. Remove and discard exhaust camshaft cap seal from cylinder head. See **Fig. 162**.

NOTE: Right cylinder head illustrated.

9. Progressively loosen then remove 7 bolts securing inlet manifold to cylinder head, remove inlet manifold and discard gasket. See **Fig. 220**.
10. Remove 4 bolts securing camshaft front timing belt cover backplate to cylinder head and remove backplate. See **Fig. 221**.

NOTE: Left backplate illustrated.

11. Remove 2 bolts securing camshaft rear timing belt cover backplate to cylinder head and remove backplate. See **Fig. 222**.

NOTE: left backplate illustrated.

12. Check end-float of camshafts using a Dial Test Indicator (DTI). See **Fig. 223**.

CAUTION: If camshaft end-float exceeds limits given, repeat check with new camshaft(s). If end-float is still excessive, replace cylinder head and camshaft carrier as an assembly.

13. Using sequence shown, progressively loosen 22 bolts securing camshaft carrier to cylinder head until valve spring pressure is released and remove bolts. See **Fig. 224**.
14. Remove camshaft carrier.
15. Remove camshafts and discard oil seals. Note: Inlet camshafts are color coded orange, exhaust camshafts. See **Fig. 5**.
16. Using a stick magnet, remove 12 hydraulic tappets from cylinder head.

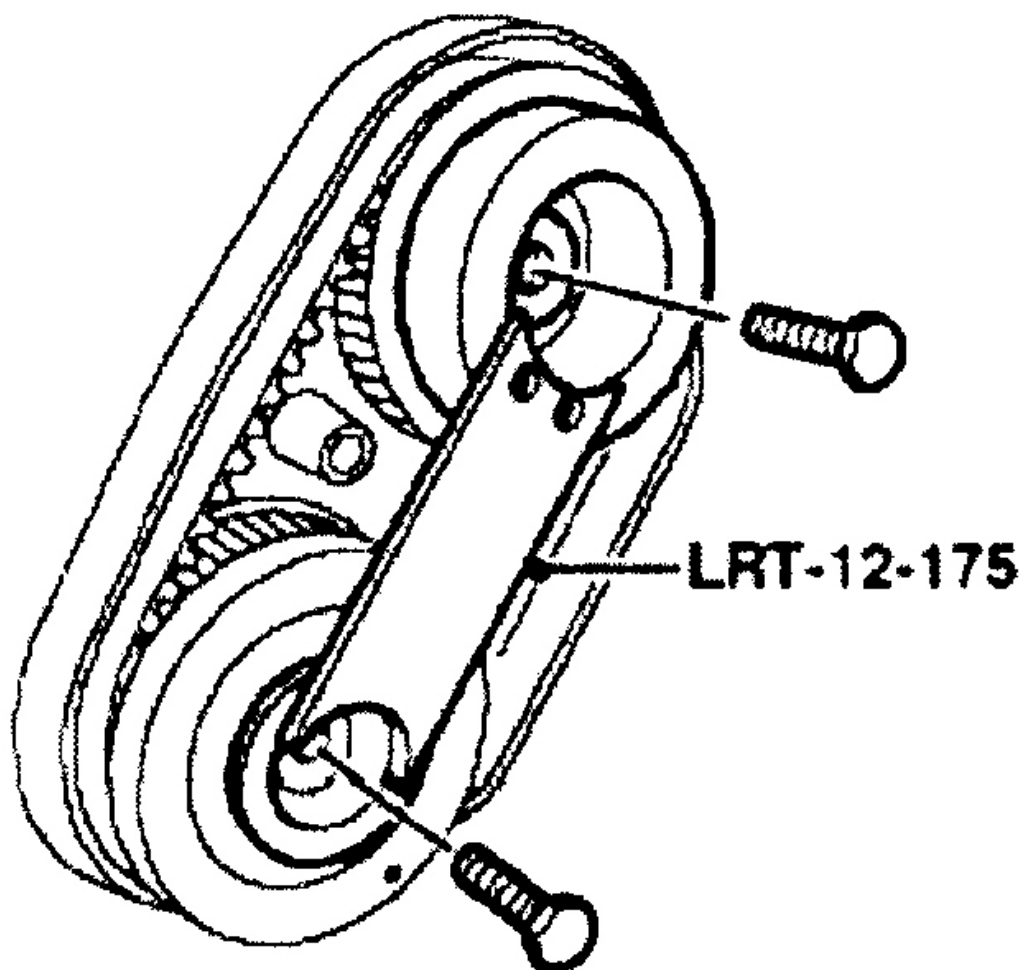
CAUTION: Store hydraulic tappets in their fitted order and store upright. Maintain absolute cleanliness when handling hydraulic tappets. Failure to observe these precautions can result in engine failure.

17. Measure the outside diameter of hydraulic tappets.

NOTE: Measurement must be taken half-way along tappet body.

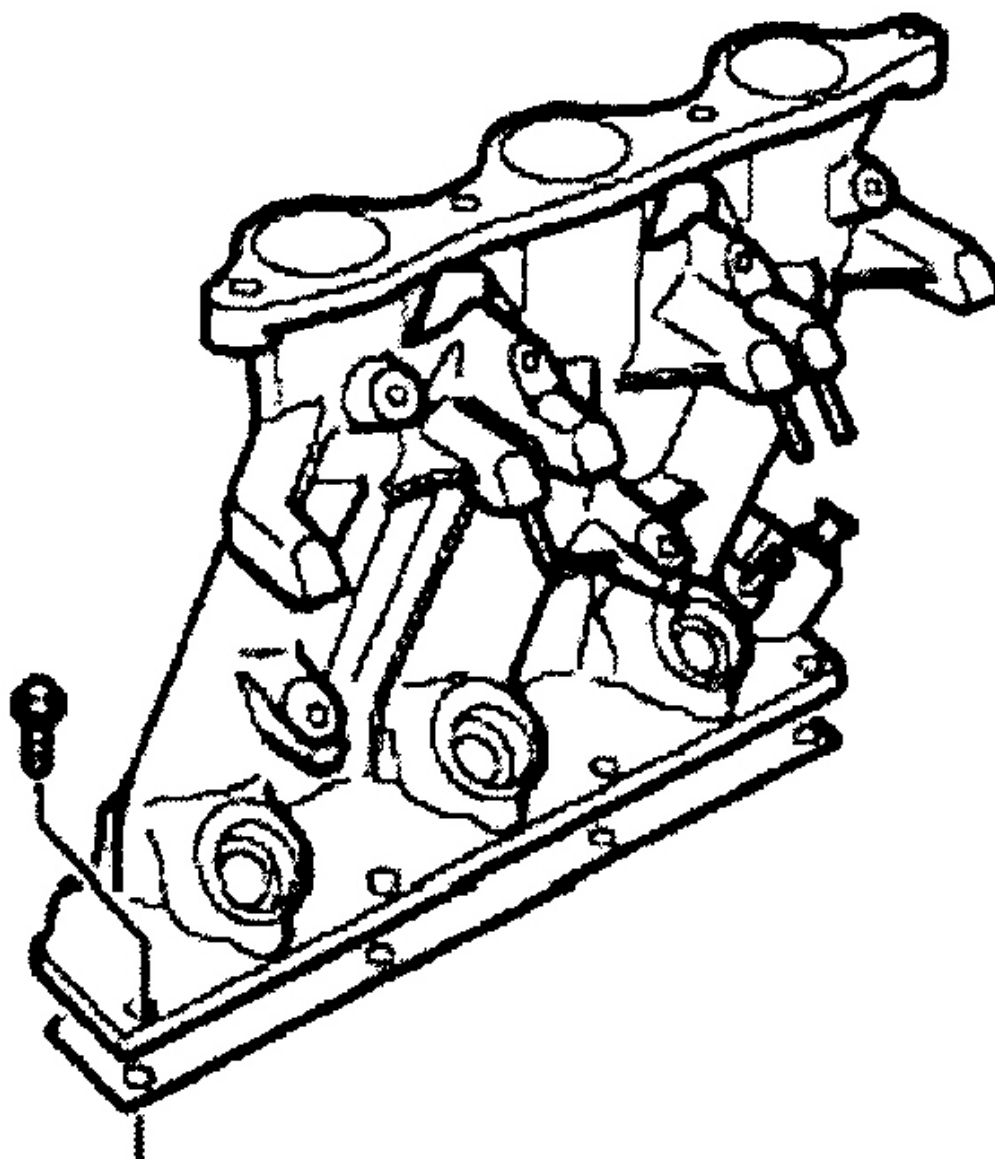
18. Using LRT-12-034, and adapter LRT-12-034/1, compress valve spring, remove 2 collets, release valve spring and remove LRT-12-034. See **Fig. 225**.
19. Remove valve spring cap and valve spring.
20. Remove valve from cylinder head.
21. Remove valve stem oil seal using LRT-12-071. Discard stem seal. See **Fig. 226**.

22. Repeat procedure for remaining valves, keeping components in their fitted order.



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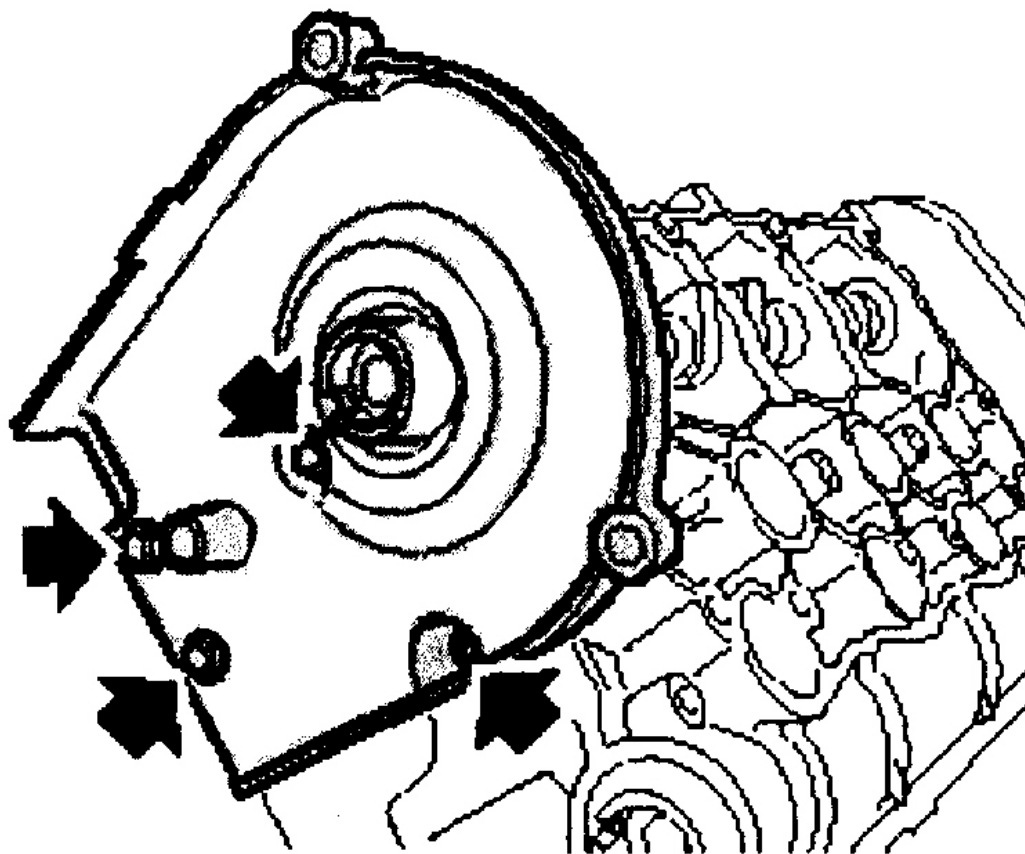
Fig. 219: Removing Rear Camshaft Gear With Tool LRT-12-175
Courtesy of LAND ROVER NORTH AMERICA, INC.



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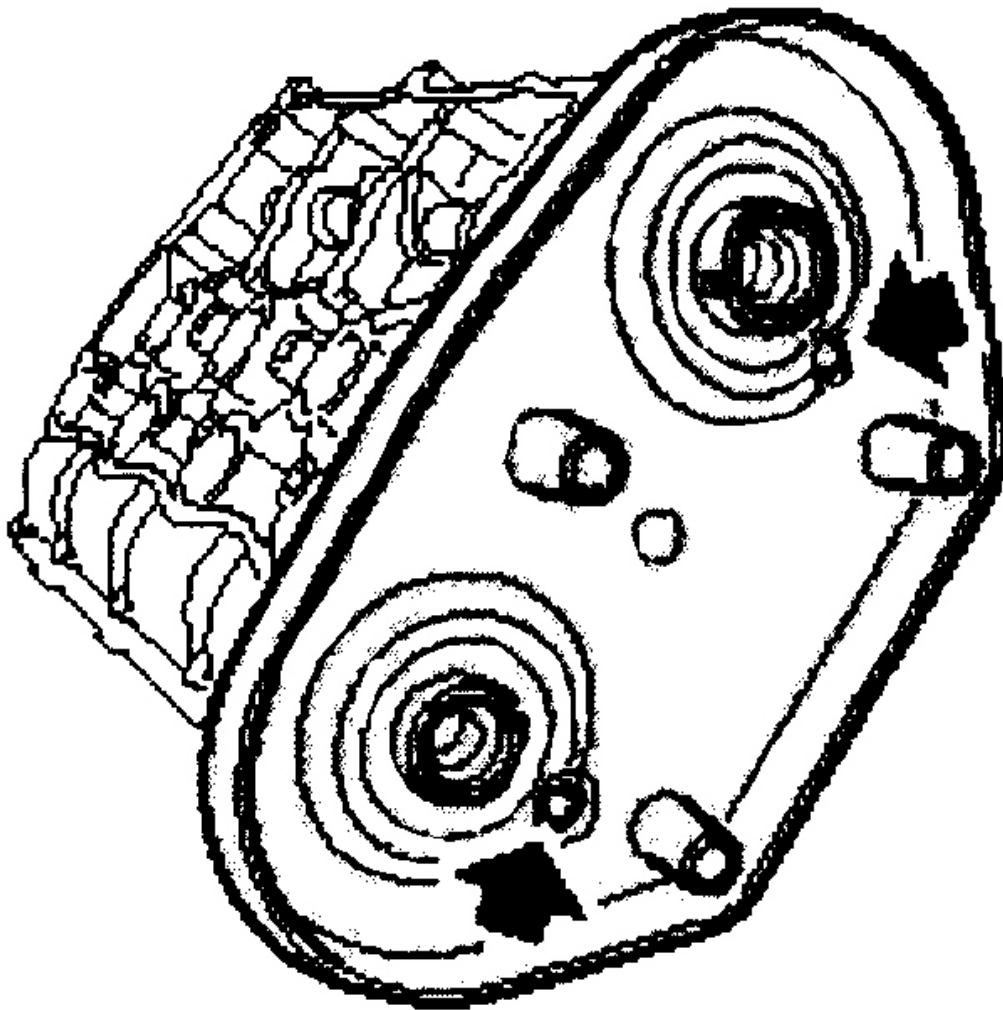
Fig. 220: Removing Inlet Manifold

Courtesy of LAND ROVER NORTH AMERICA, INC.



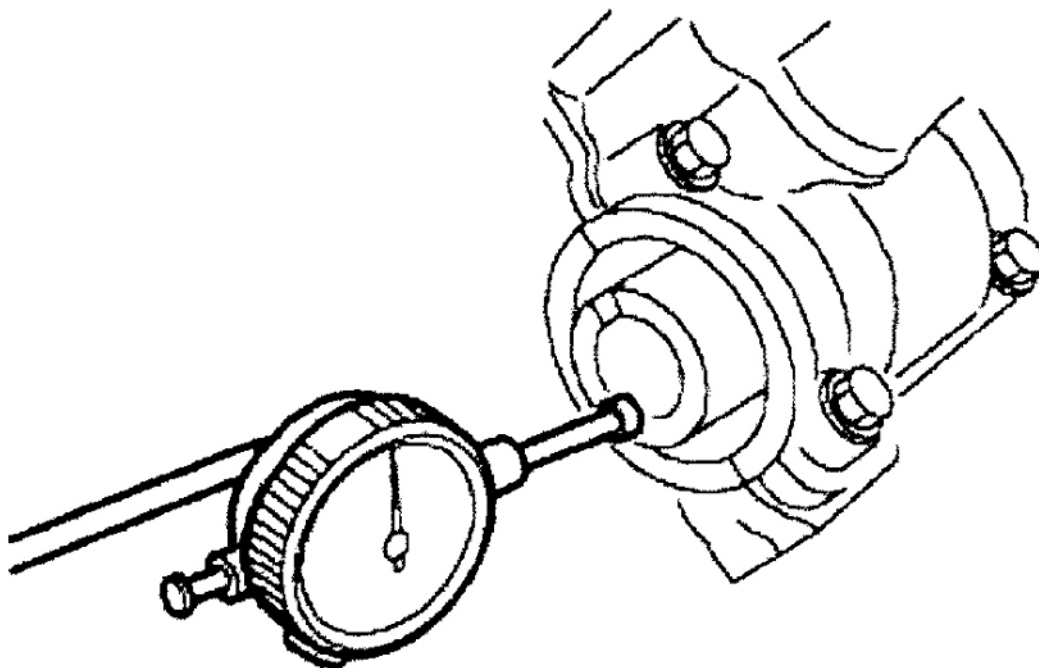
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Fig. 221: Removing Camshaft Front Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



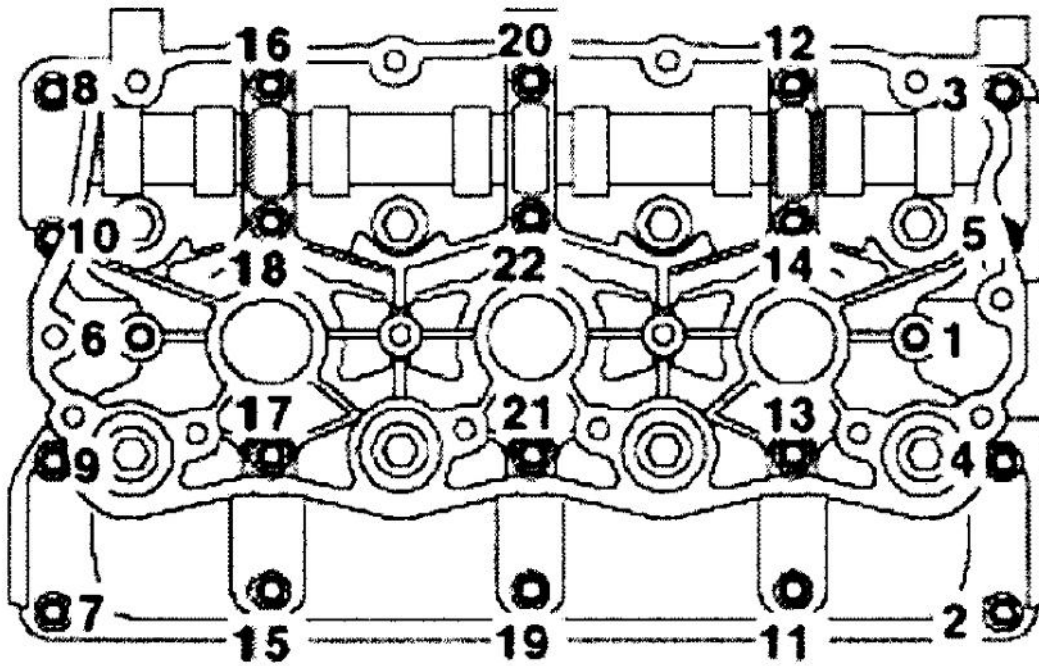
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Fig. 222: Removing Camshaft Rear Timing Belt Cover Backplate
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 223: Checking End-Float Of Camshafts Using A Dial Test Indicator
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 224: Removing Camshaft Carrier Bolts-To-Cylinder Head In Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.

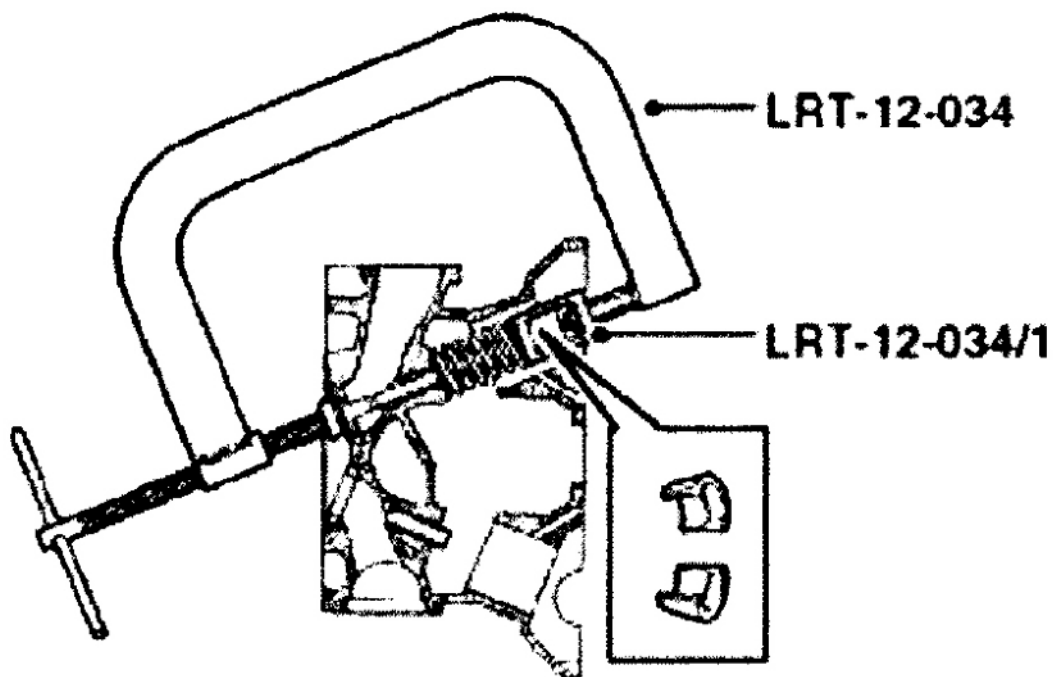
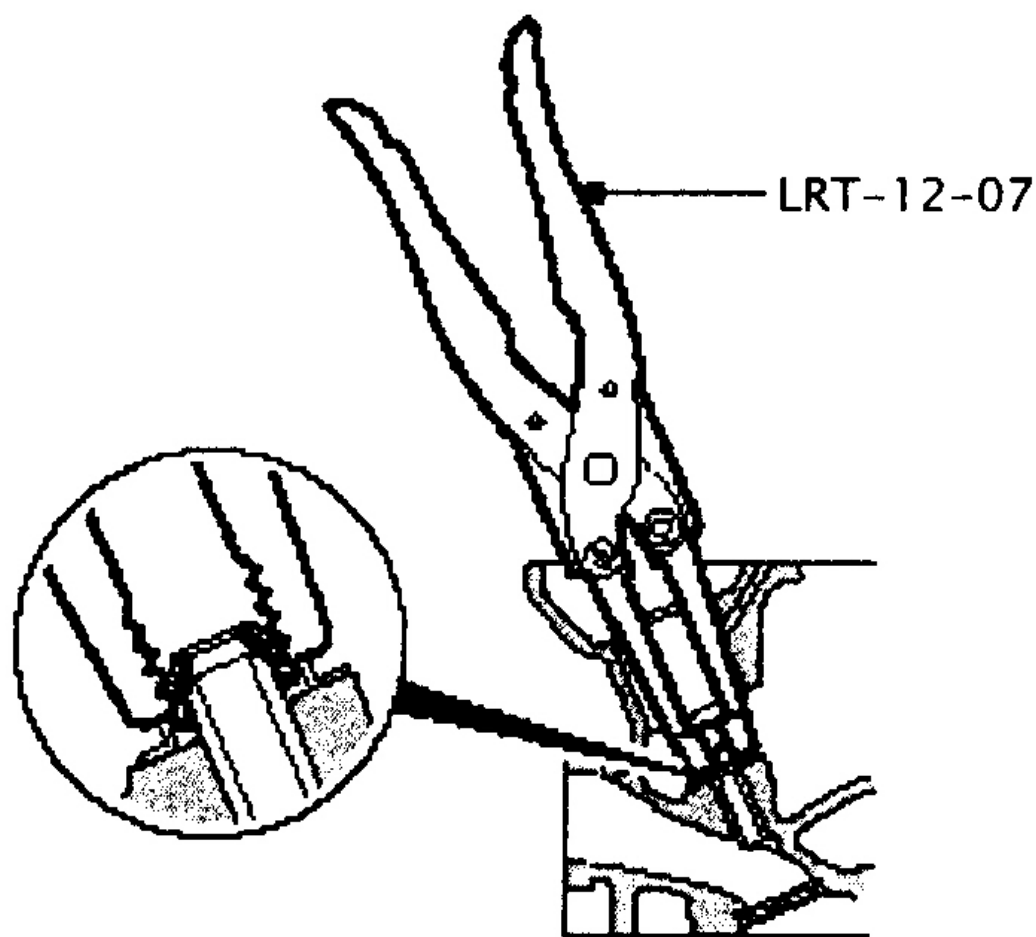


Fig. 225: Compressing Valve Springs & Removing Collets
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 226: Removing Valve Stem Oil Seal Using Tool LRT-12-071

Courtesy of LAND ROVER NORTH AMERICA, INC.

Inspection

1. Clean camshafts, bearing running surfaces in carrier and cylinder head, carrier and cylinder head mating faces.
2. Inspect camshafts and replace camshafts if scored, pitted or excessively worn.
3. Position camshafts in cylinder head and place Plastigage across each journal.

CAUTION: Ensure camshafts are in their correct fitted locations. Camshafts are color coded - Inlet - Orange; Exhaust - Blue.

4. Refit camshaft carrier, fit bolts and using sequence shown, tighten to 10 Nm (7 ft. lbs.). Do not rotate camshafts. See **Fig. 256**.
5. Using the sequence shown, progressively loosen and remove camshaft carrier bolts. Release and remove camshaft carrier from cylinder head. See **Fig. 224**.
6. Measure widest part of Plastigage on each journal. See **Fig. 227**.
7. If clearance is excessive, fit new camshafts and repeat check. If clearance is still excessive renew cylinder head.
8. Remove all traces of Plastigage using an oily rag.
9. Clean sealing surfaces of cylinder heads. Clean inlet and exhaust manifold mating faces.

CAUTION: Do not use a metal scraper.

10. Decarbonize combustion areas of cylinder heads.
11. Blow out all oilways and coolant passages.
12. Check cylinder head for damage, pay particular attention to sealing faces.
13. Check cylinder head face for warping, across center and from corner to corner. See **Fig. 228**.

NOTE: Provided that cylinder head height is kept within limits, cylinder heads may be refaced.

14. Check cylinder head height. See **Fig. 229**.
15. Check condition of valve springs and measure free length of springs.
16. Remove carbon deposits from exhaust valve guides using a 6 mm diameter reamer inserted from combustion side of cylinder head. See **Fig. 230**.
17. Remove carbon from inlet valve guides, inlet and exhaust valves and valve seat inserts. Remove all loose carbon on completion.
18. Check and record existing valve stem diameters "A", replace any valve with stem diameter less than specified. See **Fig. 231**.
19. Check inlet and exhaust valve to guide clearances "B" using the following procedures.
20. Insert each valve into its respective guide. See **Fig. 232**.
21. Extend valve head 15 mm (0.6 in) out of guide and position Dial Test Indicator (DTI) gauge to rear of valve head.
22. Move valve towards front of cylinder head and zero gauge ensuring that stylus of gauge remains in contact with valve head.
23. Move valve towards rear of cylinder head, record gauge reading obtained to give valve stem to guide clearance "B".
24. Remove valves ensuring they are retained in their fitted order.
25. Renew valves and/or guides as necessary.
26. To replace valve guides support cylinder head face down on wooden blocks.
27. Position LRT-12-519-3 in tappet bore and drift out valve guide using LRT-12-519-1. See **Fig. 233**.

CAUTION: Retain guides in their fitted order.

28. Identify type of valve guide fitted. See **Fig. 234**:

- "A" - Standard production
- "B" - Service replacement

CAUTION: Standard production valve guides A must be replaced with service replacement guides "B".

29. Locate valve guide in valve guide bore with identification groove towards valve seat and position depth gauge LRT-12-519-2 onto valve guide. See **Fig. 235**.

CAUTION: Cylinder head and valve guides must be at room temperature when fitting guides.

30. Position nylon guide LRT-12-519-3 in cylinder head, press guide into bore using driver LRT-12-519-1 until depth gauge contacts cylinder head.

31. Check that fitted height of valve guide, "A", is 6.00 mm (0.24 in). See **Fig. 236**.

32. Check condition of valve seats and existing valves that are to be re-used.

33. Renew valve seat inserts as necessary.

CAUTION: Do not damage counterbore when removing insert.

34. Cool replacement valve seat inserts using liquid nitrogen and press into cylinder head in one continuous operation.

CAUTION: Do not heat cylinder head. Inserts must not stand proud of combustion face on completion of cutting operation.

35. Cut valve seats using a suitable pilot and the following cutters:

- 15° - To cut first angle
- 45° - Make final cut and remove any burrs
- 60° - To narrow seat and obtain correct valve seat width

36. Check valve seat width and face angle. See **Fig. 237**:

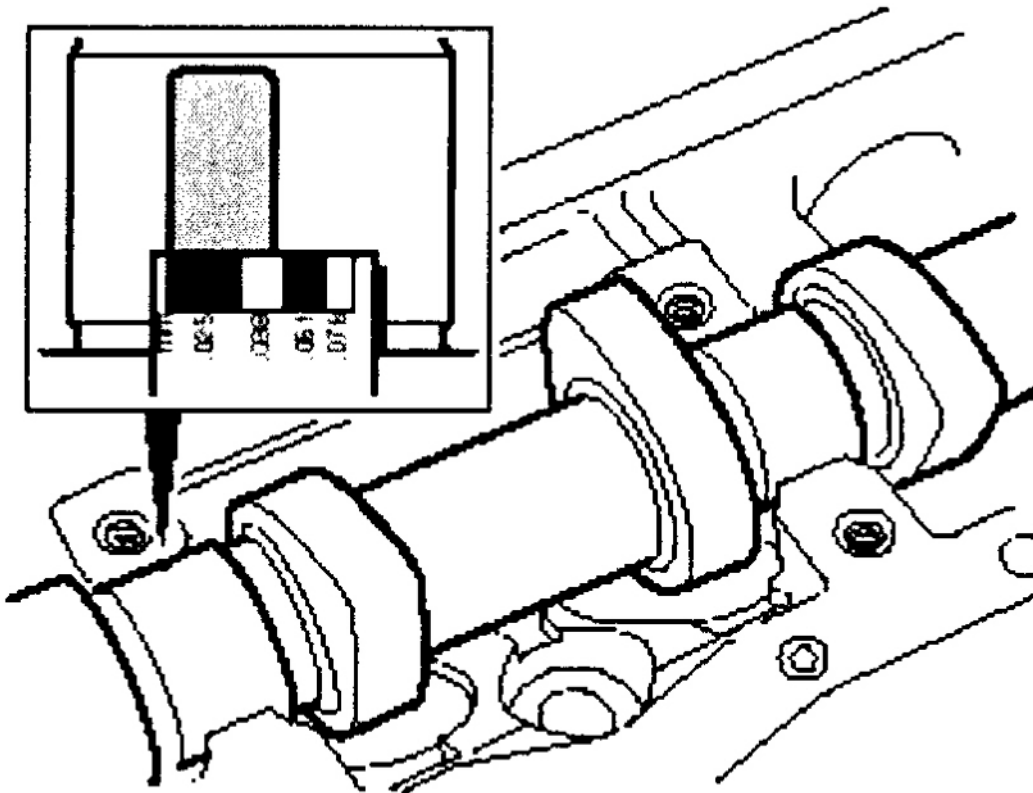
- Seat width - "A" - Inlet = 1.2 mm (0.05 in)
- Exhaust = 1.6 mm (0.06 in)
- Valve face angle - "B" - Inlet and exhaust = 45°

37. Lap each valve to its seat using grinding paste.

38. Apply Prussian Blue to valve seat, insert valve and press it into position several times without rotating. Remove and check valve for even and central seating: seating position shown by Prussian Blue should be in the center of valve face:
- A. High towards stem, increase 60° cut and restore seat width.
 - B. Low towards edge, increase 45° cut and restore seat width. Lap and recheck valve seating.
39. Check valve stem fitted height - "A". See **Fig. 238**.

CAUTION: If valve stem fitted height is above service limit, fit new valve and re-check. If still over limit, renew valve seat insert.

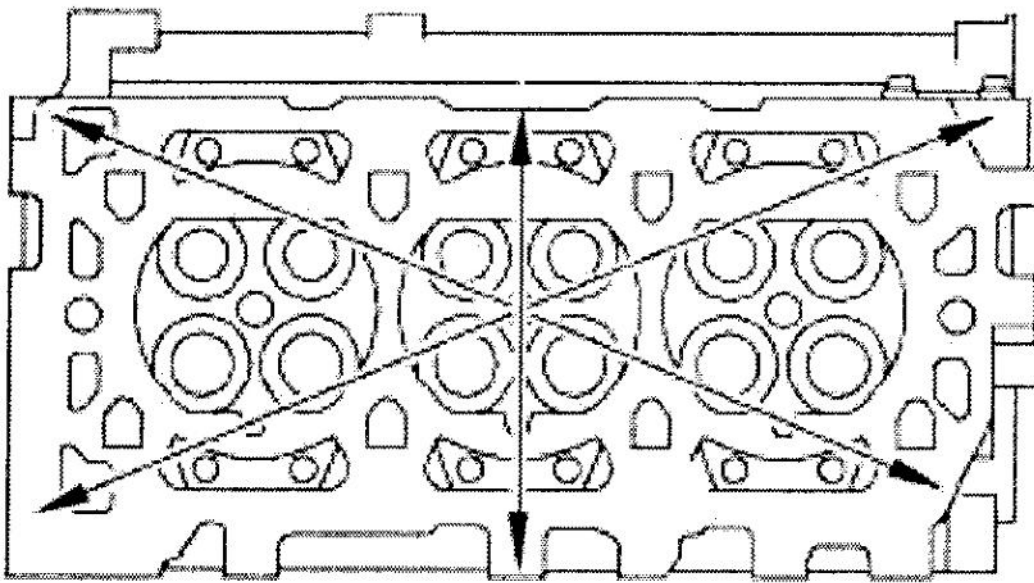
40. Clean valve springs and lubricate valves.



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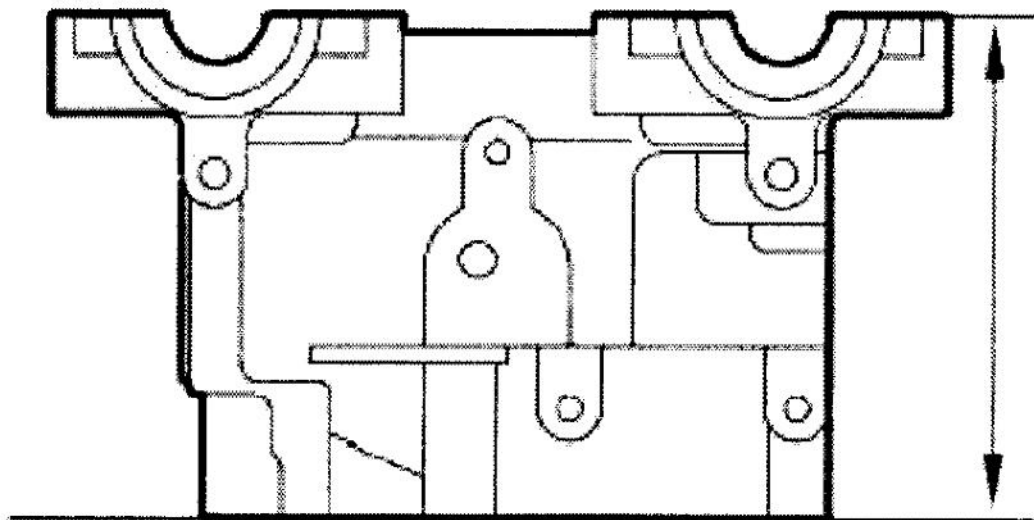
Fig. 227: Measuring Plastigage

Courtesy of LAND ROVER NORTH AMERICA, INC.



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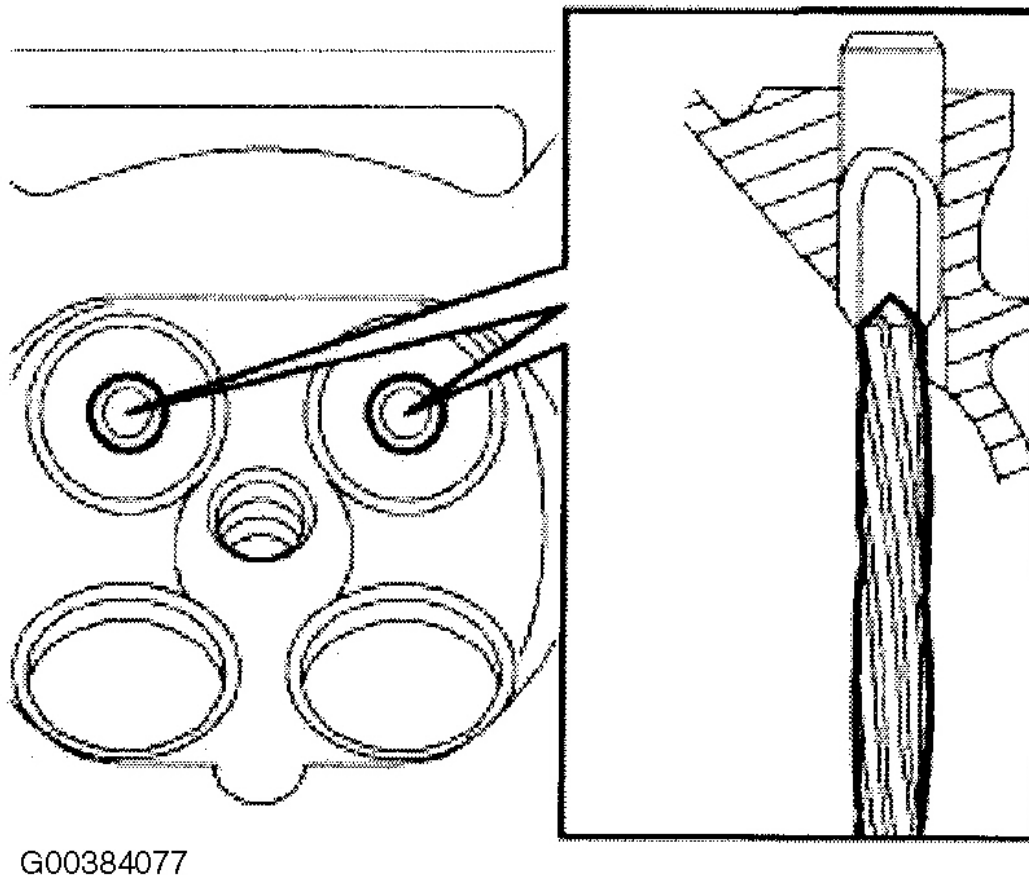
Fig. 228: Checking Cylinder Head For Warping
Courtesy of LAND ROVER NORTH AMERICA, INC.



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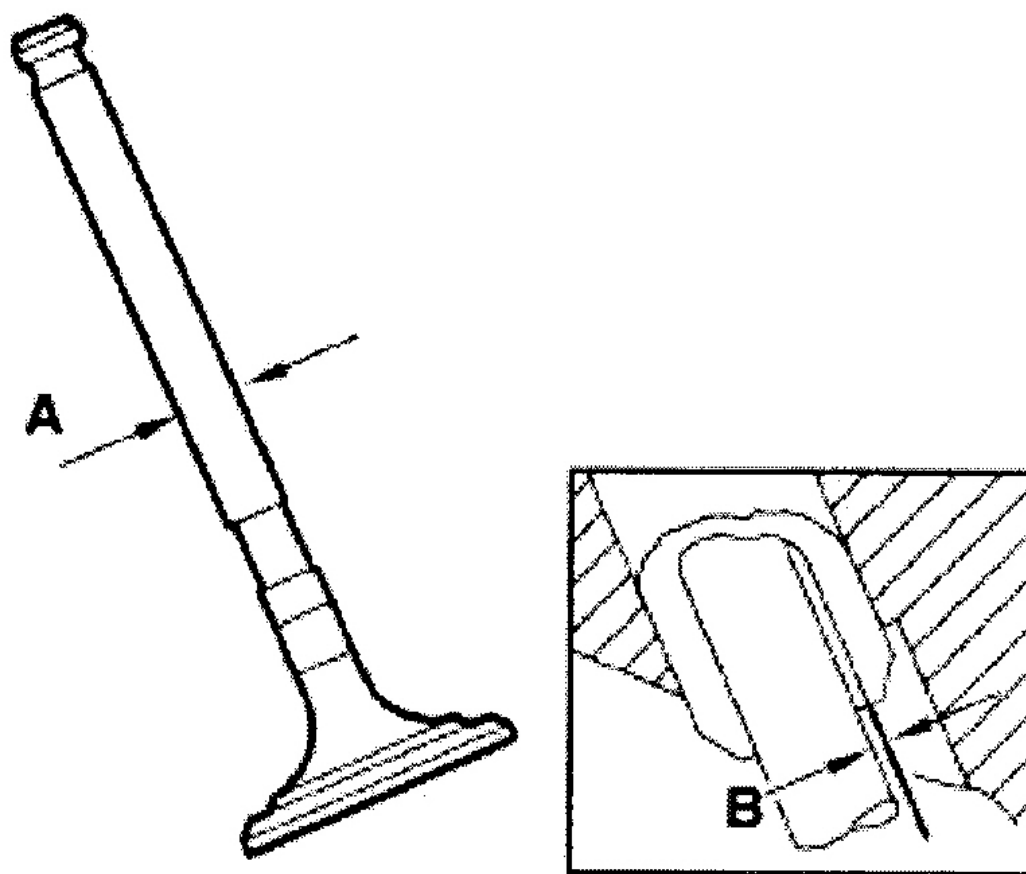
Fig. 229: Checking Cylinder Head Height

Courtesy of LAND ROVER NORTH AMERICA, INC.



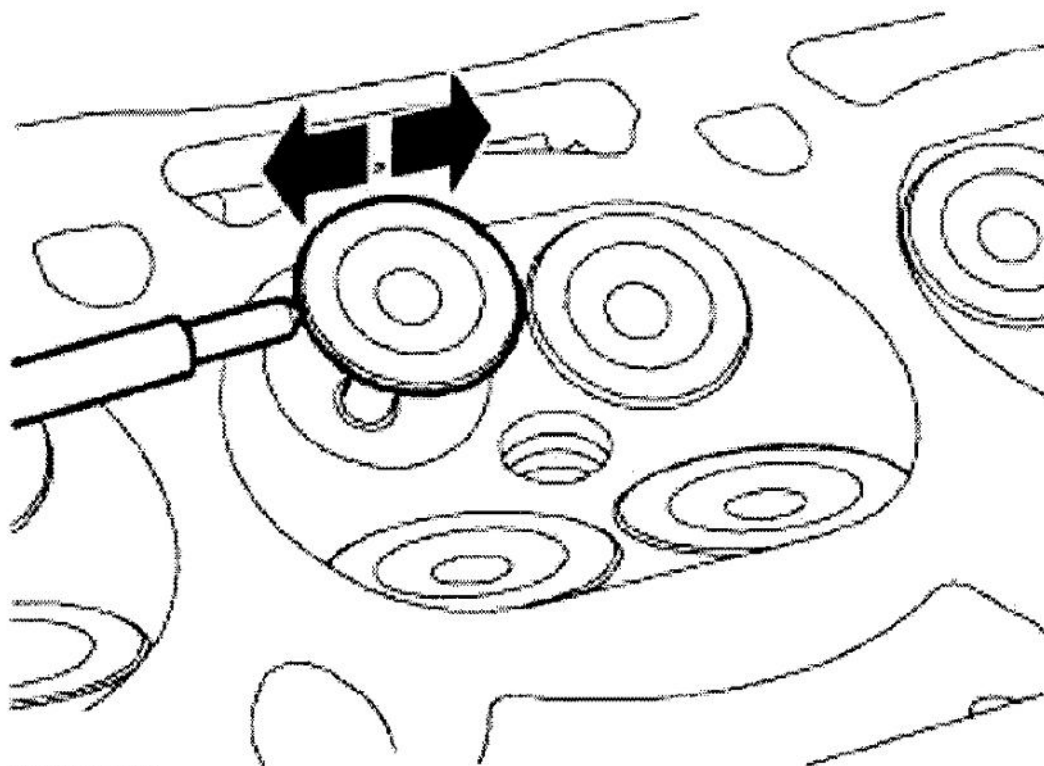
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Fig. 230: Removing Carbon Deposits With Reamer
Courtesy of LAND ROVER NORTH AMERICA, INC.



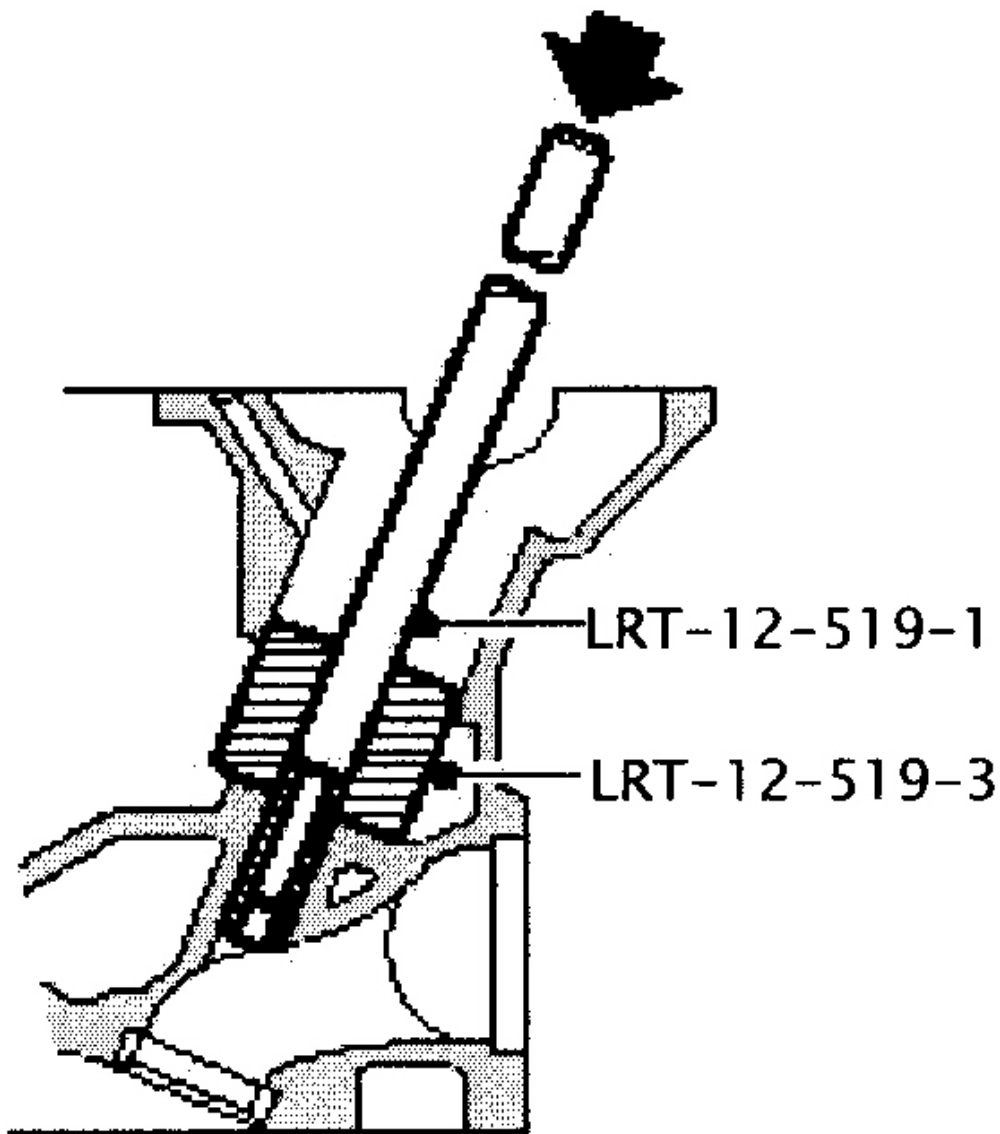
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Fig. 231: Checking Valve Stem Diameter & Exhaust Valve-To-Guide Clearance
Courtesy of LAND ROVER NORTH AMERICA, INC.



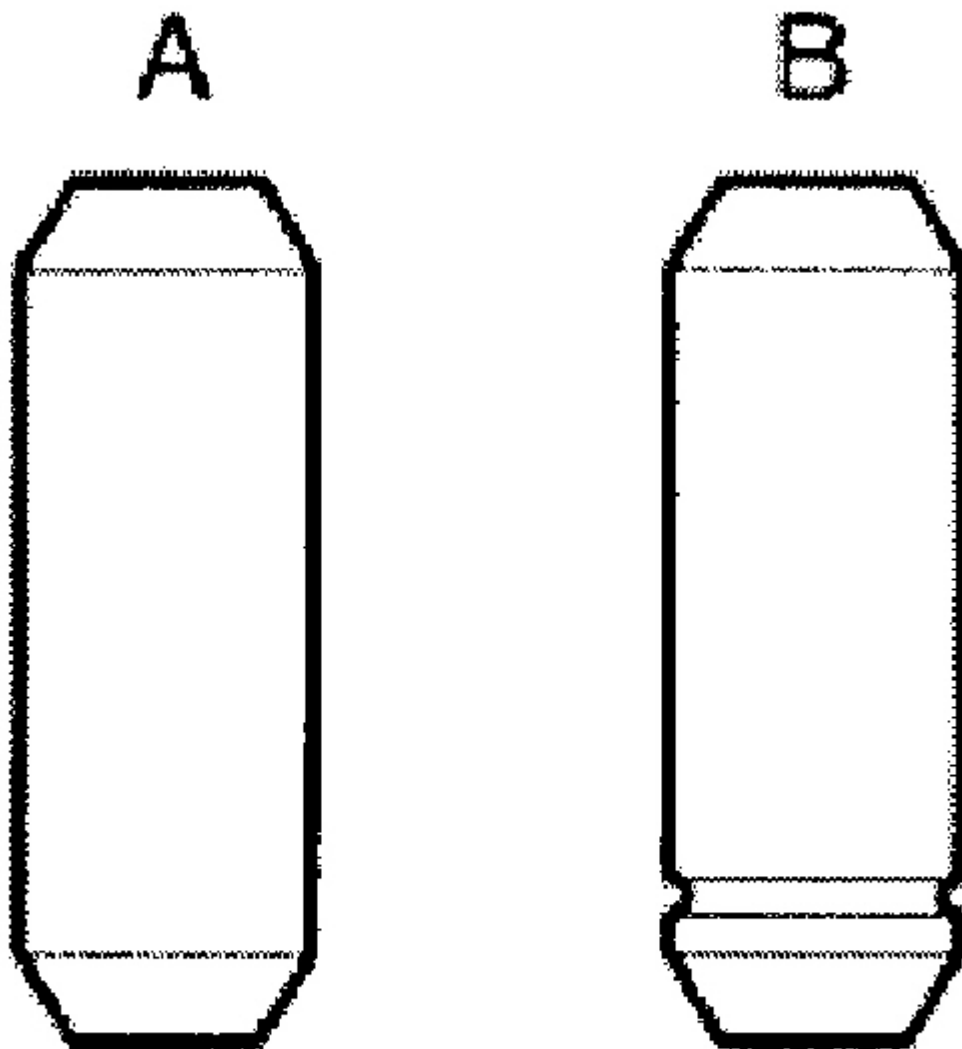
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Fig. 232: Inserting Each Valve In Guide
Courtesy of LAND ROVER NORTH AMERICA, INC.



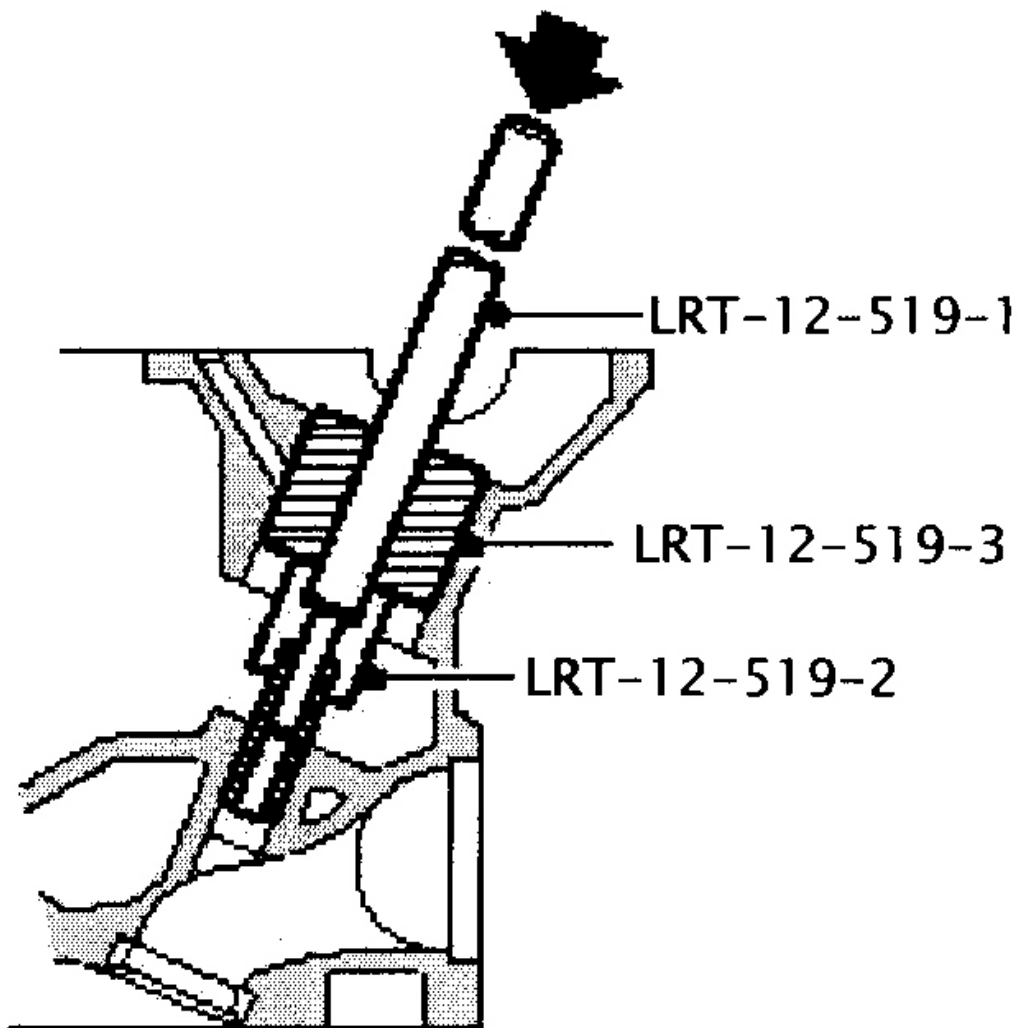
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Fig. 233: Positioning LRT-12-519-3 In Tappet Bore & Drift Out Valve Guide Using LRT-12-519-1
Courtesy of LAND ROVER NORTH AMERICA, INC.



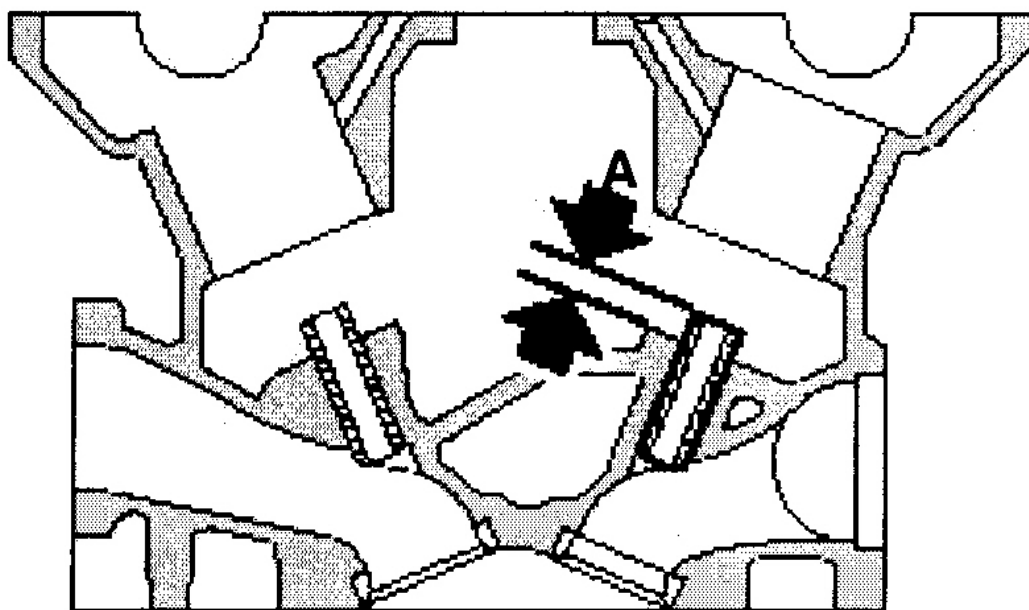
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Fig. 234: Identifying Type Of Valve Guide
Courtesy of LAND ROVER NORTH AMERICA, INC.



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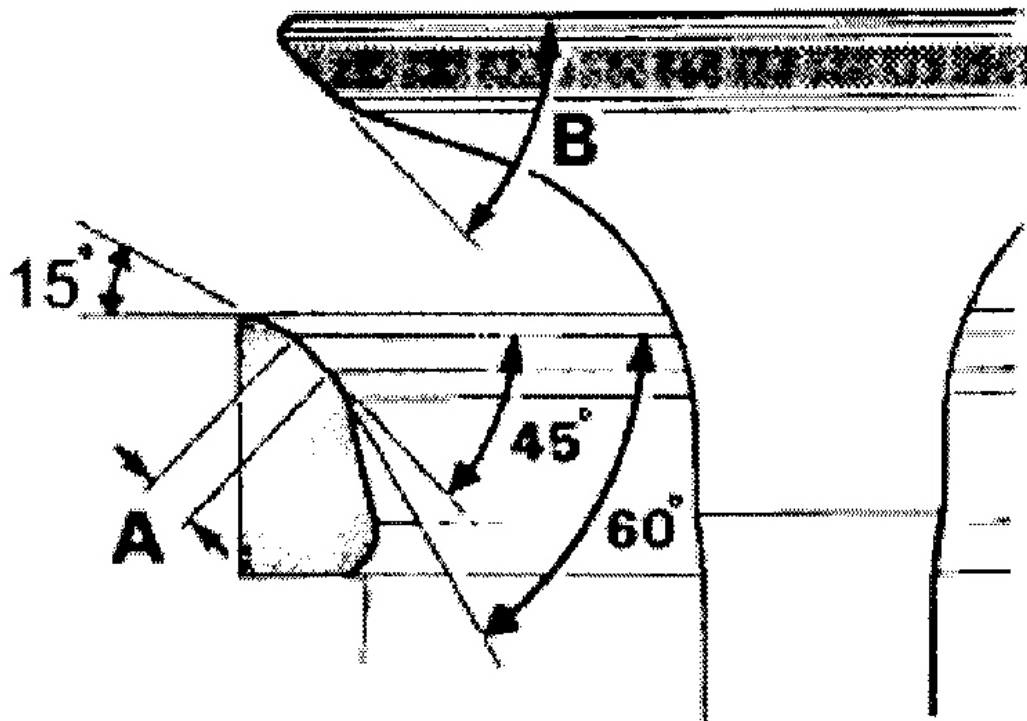
Fig. 235: Locating Valve Guide In Bore
Courtesy of LAND ROVER NORTH AMERICA, INC.



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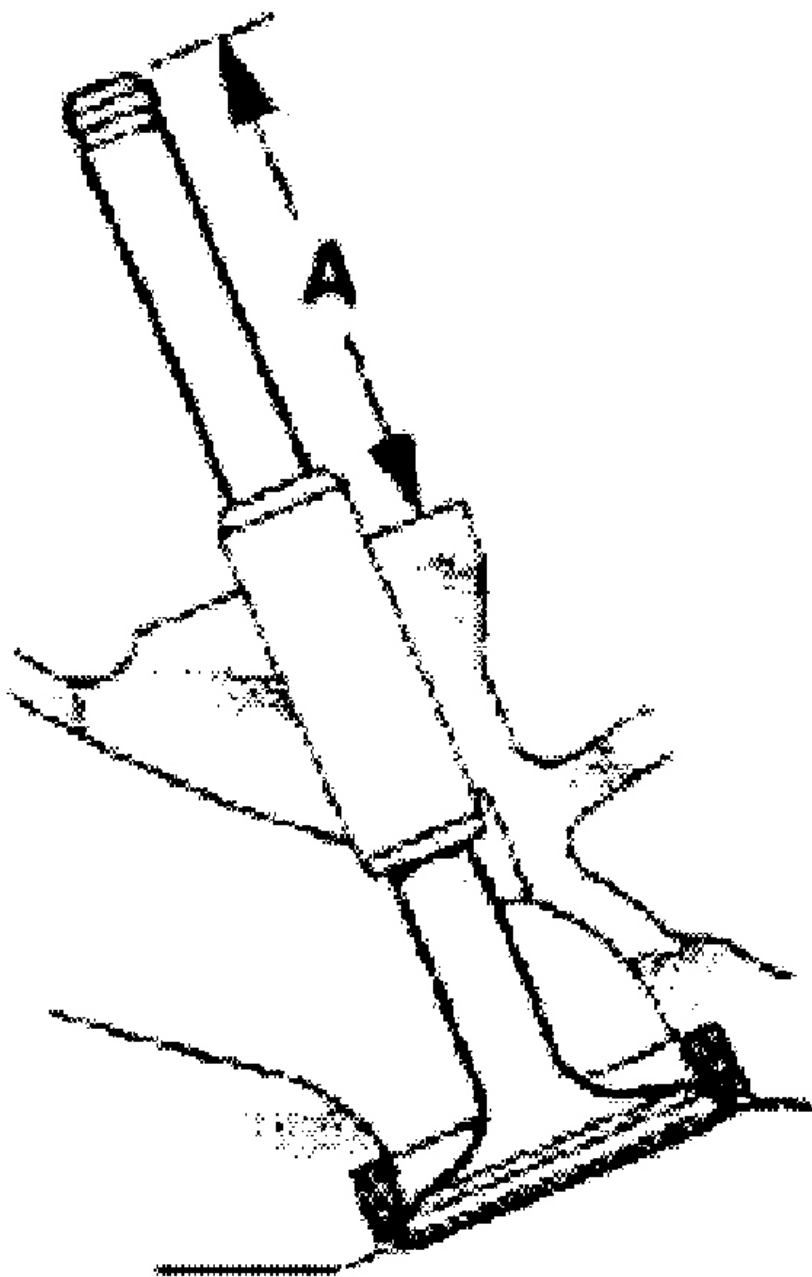
Fig. 236: Checking Valve Guide "A"

Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 237: Checking Valve Seat Width & Face Angle
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 238: Applying Prussian Blue To Check Valve Seat
Courtesy of LAND ROVER NORTH AMERICA, INC.

Reassembly

1. Lubricate new valve stem oil seals with clean engine oil.
2. Using tool LRT-12-071 fit new valve stem oil seals. See **Fig. 239**.
3. Fit valves.
4. Fit spring and spring cap.
5. Position LRT-12-034 and adapter LRT-12-034/1 to spring cap and compress valve spring. See **Fig. 225**.
6. Fit collets.
7. Release valve spring and remove tool LRT-12-034.
8. Using a wooden dowel and mallet, lightly tap top of each valve two or three times to seat valves and collets.
9. Thoroughly clean and lubricate hydraulic tappets with clean engine oil. Fit hydraulic tappets to original bores in cylinder head.
10. Ensure that mating faces of camshaft carrier and cylinder head are clean and dry.
11. Lubricate camshafts and bearing journals with clean engine oil.
12. Position camshafts in cylinder head with rear timing gear drive slots in each camshaft facing towards the center as shown. See **Fig. 240**.

CAUTION: Ensure camshafts are in their correct fitted locations. Camshafts are color coded - Inlet - Orange; Exhaust - Blue.

13. Apply continuous thin beads of sealant, Part No. STC 4600, to paths on camshaft carrier as shown. Spread sealant to an even film using a roller. See **Fig. 241**.

CAUTION: To avoid contamination, assembly should be completed immediately after application of sealant.

14. Position camshaft carrier, fit and progressively tighten bolts in the sequence shown to 10 Nm (7.5 ft. lbs.). See **Fig. 256**.
15. Noting that the front camshaft oil seals are black in color and the rear oil seals are red, fit new camshaft oil seals using LRT-12-203 and LRT-12-148A. See **Fig. 9**.

CAUTION: Oil seals must be fitted dry. Do not use tool LRT-12-148 for fitting seals.

16. Clean camshaft timing belt cover backplate bolts and apply sealant, Part No. STC 50552 to the first 3 threads.
17. Position camshaft timing belt rear cover backplates to cylinder head, fit and tighten bolts to 9 Nm (7.5 ft. lbs.).
18. Fit spark plugs.
19. Clean rear camshaft gears and mating faces on camshafts.

CAUTION: If sintered gears have been subjected to prolonged oil contamination,

they must be soaked in solvent and then thoroughly washed in clean solvent before refitting. Because of the porous construction of sintered material, oil impregnated in the gears will emerge and contaminate the timing belts.

20. Place gears inverted on a flat surface, with the locating lugs on the gears positioned as illustrated. See **Fig. 157**.
21. Keeping the timing marks aligned, position timing belt onto gears. See **Fig. 158**.
22. Position LRT-12-195 between the gears, turn center nut sufficiently to spread drive belt.
23. Invert gears and timing belt and position LRT-12-175 to camshaft gears.
24. Check that locating lugs are still aligned and remove LRT-12-195 from between camshaft gears.
25. Fit LRT-12-198 alignment pins into the end of each camshaft. See **Fig. 159**.
26. Position timing belt and gears over LRT-12-198 and locate gears onto camshafts.
27. Position LRT-12-197 into the front end of the exhaust camshaft. See **Fig. 147**.
28. With assistance, using a 30 mm socket on LRT-12-197, turn the exhaust camshaft sufficiently to align camshaft gears to the drive slots in each camshaft.
29. Remove LRT-12-198 alignment pins and fit new camshaft gear retaining bolts. See **Fig. 156**.
30. Tighten camshaft gear bolts:
 - Stage 1 - 27 Nm (20 ft. lbs.)
 - Stage 2 - Further 90°
31. Remove LRT-12-175 from camshaft gears.
32. Remove LRT-12-197 from front end of exhaust camshaft.

NOTE: **Following front or rear timing belt refitment, it is possible that after rotating the engine and positioning the crankshaft pulley to the "SAFE" position, the timing marks on the rear timing gears may be misaligned. This misalignment is acceptable provided that the timing belt refitting procedure was carried out correctly.**

33. Fit timing belt rear cover and tighten bolts to 9 Nm (7 ft. lbs.).

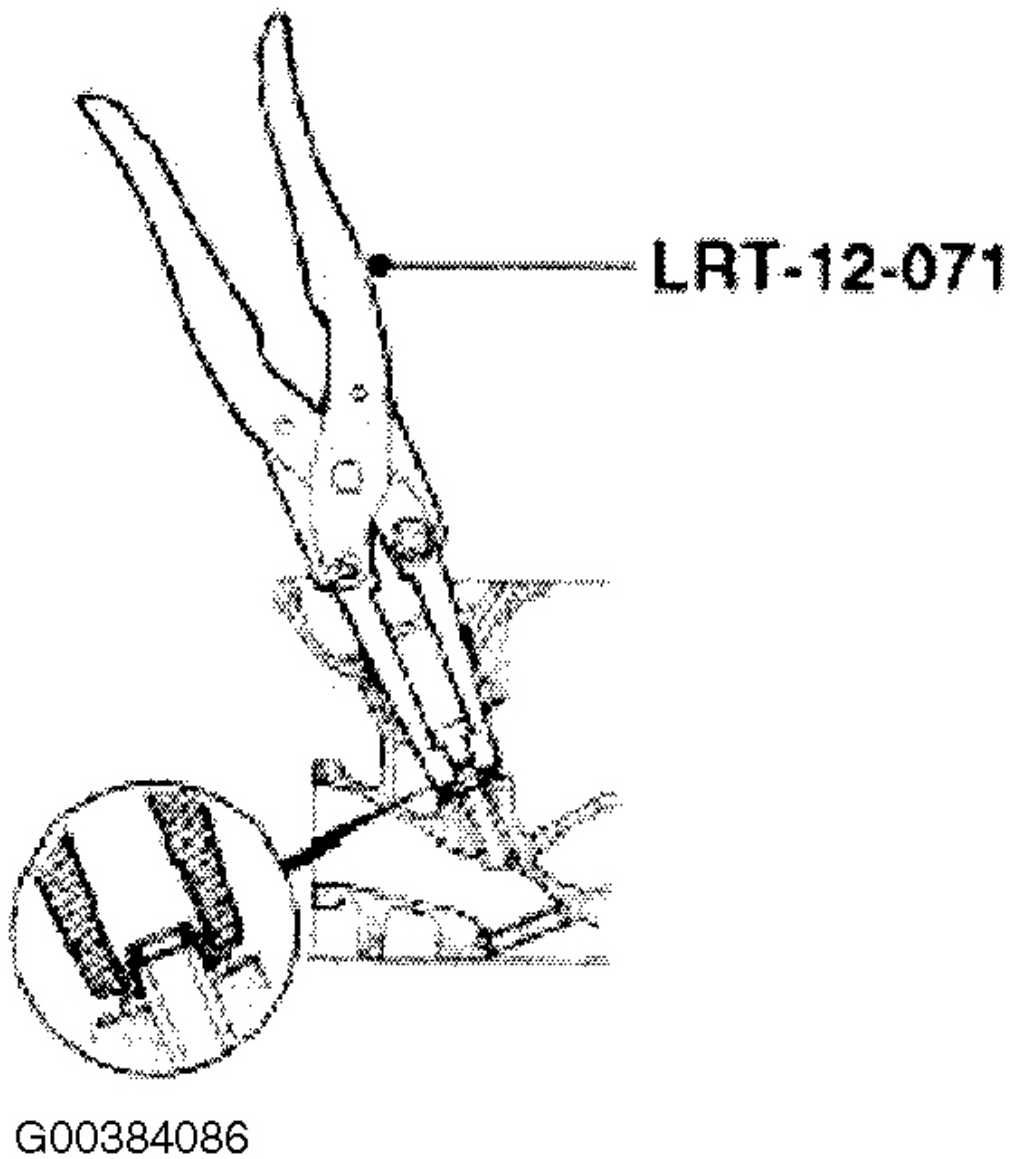
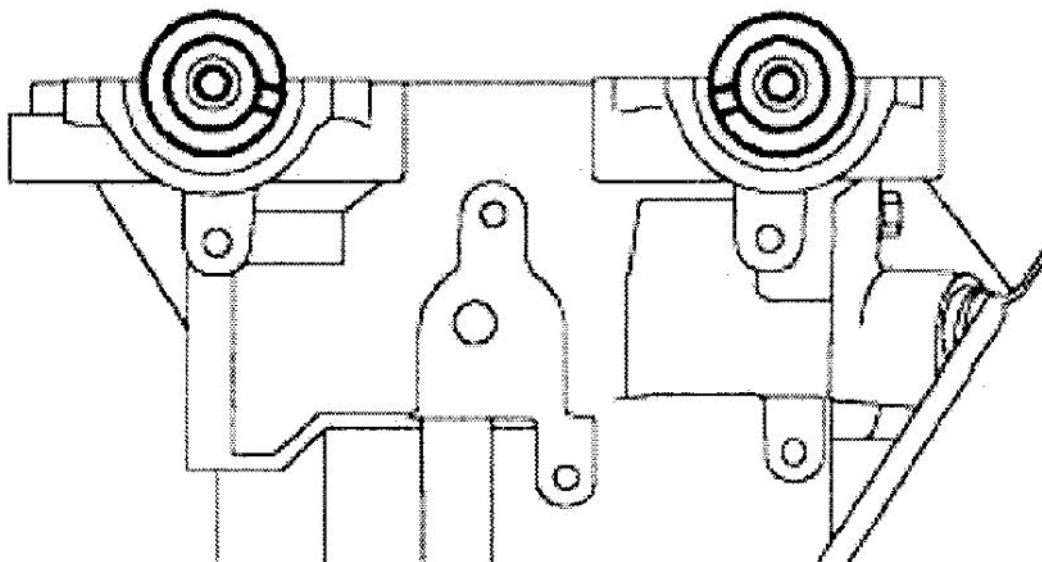
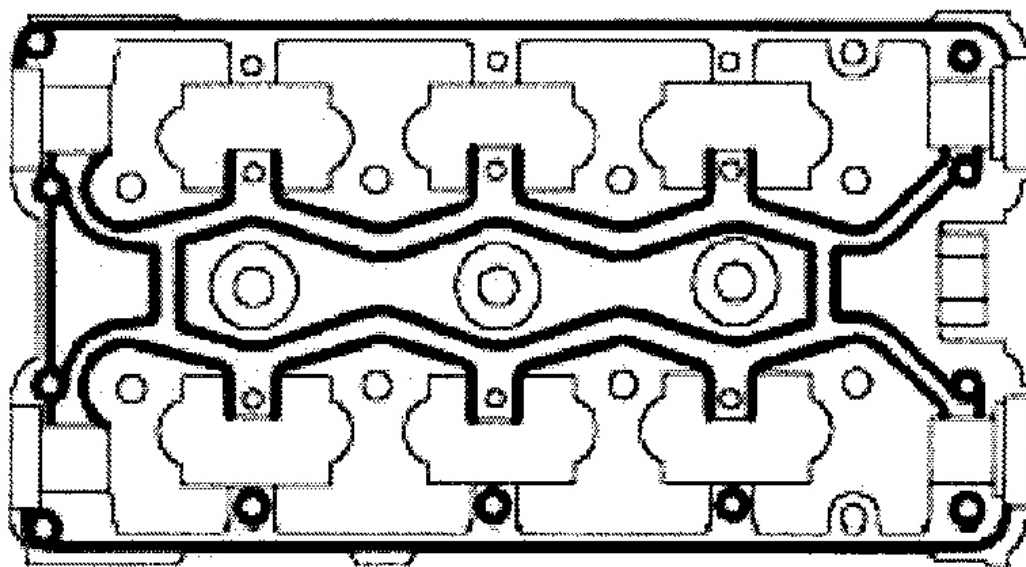


Fig. 239: Using Tool LRT-12-071 Installing Valve Stem Oil Seals
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 240: Positioning Camshafts In Cylinder Head
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 241: Applying Sealant To Cylinder Head

Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

Fit cylinder head gaskets. See **CYLINDER HEAD GASKET - RIGHT****CYLINDER HEAD GASKET - LEFT**.

OIL PUMP - OVERHAUL**Removal**

Remove oil pump gasket. See **GASKET - OIL PUMP**.

Disassembly

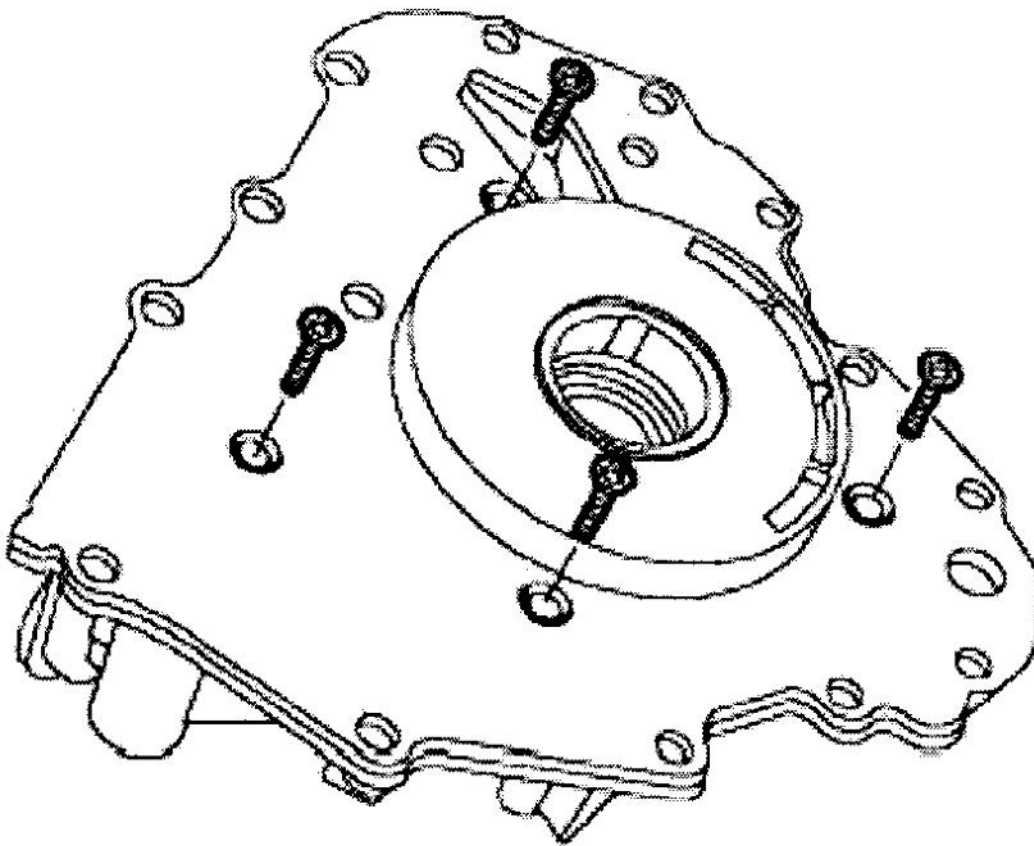
1. Remove 4 Torx screws securing cover plate to oil pump body. See **Fig. 242**.

CAUTION: Do not allow cover to separate from pump body.

2. Invert oil pump.
3. Carefully remove cover plate from oil pump body taking care to ensure that rotors are retained in pump body. See **Fig. 243**.

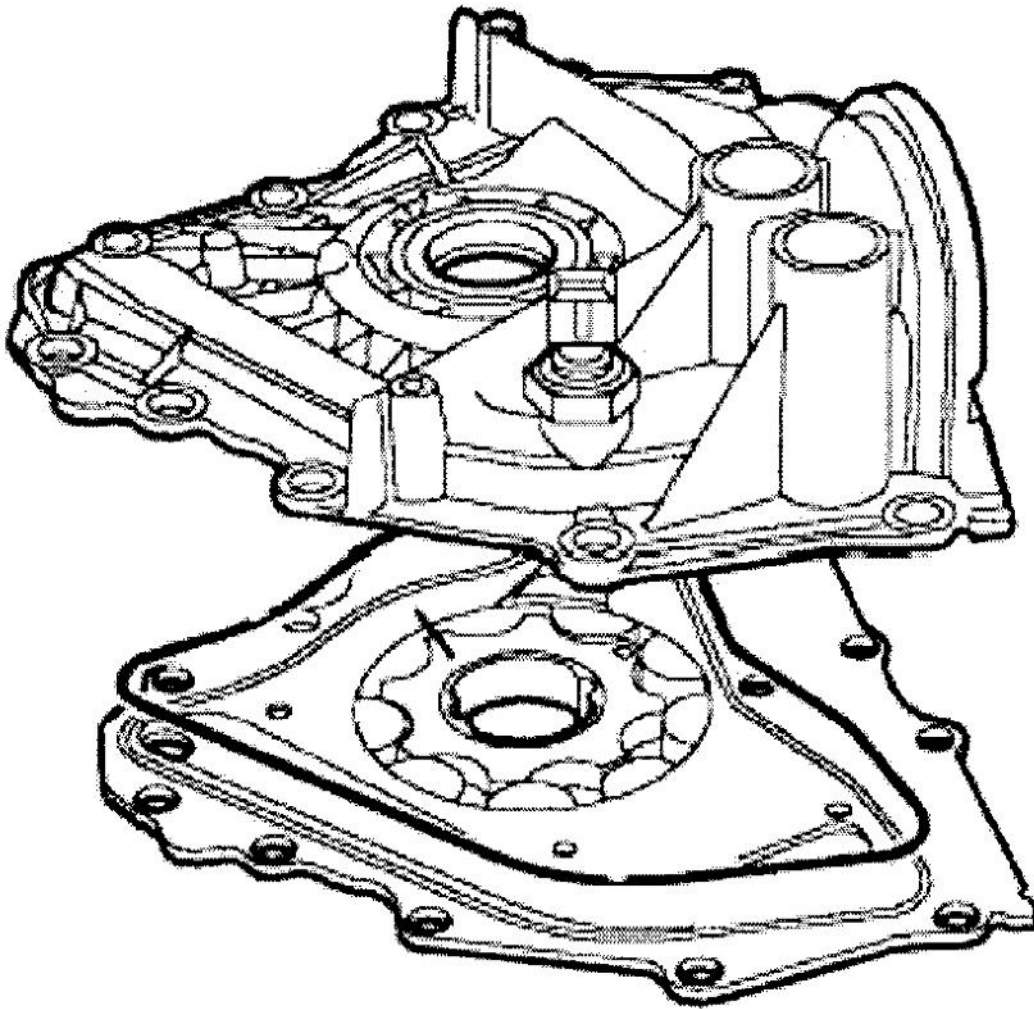
NOTE: Cover plate is dowel located.

4. Remove and discard cover plate sealing ring.
5. Make suitable alignment marks between inner and outer rotors and pump body.
6. Remove inner and outer rotors.
7. Clean inner and outer rotors and rotor housing.
8. Fit inner and outer rotors ensuring that reference marks are aligned.



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Fig. 242: Removing Cover Plate Torx Screws From Oil Pump Body
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00384091

Fig. 243: Removing Cover Plate From Oil Pump Body Ensuring Rotors Are Retained In Pump Body
Courtesy of LAND ROVER NORTH AMERICA, INC.

Inspection

1. Check rotor clearances. See **Fig. 244**:
 - Outer rotor to body = 0.13 - 0.23 mm (0.0051 - 0.0091 in)
 - Inner rotor tip = 0.05 - 0.13 mm (0.002 - 0.005 in)
 - Inner and outer rotor end-float = 0.04 - 0.09 mm (0.0016 - 0.0035 in)
2. Renew oil pump as an assembly if clearances are excessive.
3. Remove oil pressure relief valve plug. See **Fig. 117**.

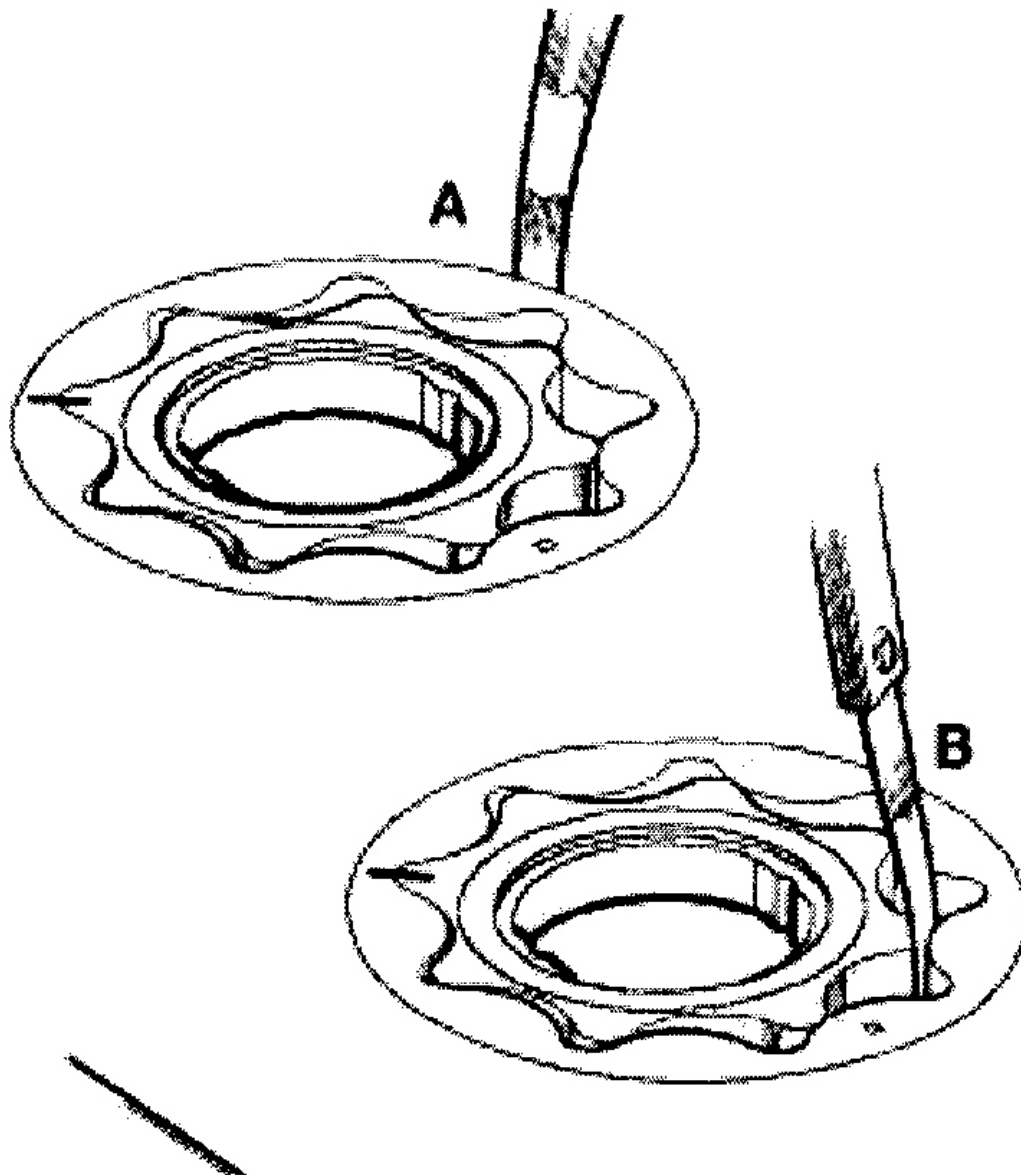
NOTE: If a hexagonal plug and sealing washer are fitted, discard washer.

4. Remove spring and valve.
5. Check that valve and bore are free from scoring and corrosion.

NOTE: Light corrosion may be removed using grade 600 emery cloth soaked in engine oil.

6. Check free length of spring.
7. Check that valve slides freely in bore.

CAUTION: If valve is scored, renew relief valve as an assembly. If valve bore is scored, renew oil pump as an assembly.



G00384092

Fig. 244: Checking Rotor Clearances

Courtesy of LAND ROVER, NORTH AMERICA, INC.

Reassembly

1. Clean cover plate and mating face of cylinder block; ensure bolt holes are clean and dry.
2. Clean running surface on crankshaft.

3. Remove all traces of sealant from relief valve plug, Torx screws and tapped holes in pump body.

CAUTION: Do not use a tap.

4. Lubricate relief valve, spring and bore with clean engine oil.
5. Fit relief valve and spring.
6. If a hexagonal plug and sealing washer were fitted, fit new sealing washer to plug.
7. Apply sealant, Part No. STC 50552 to plug threads; fit plug and tighten to 25 Nm (18 ft. lbs.).
8. Lubricate pump rotors and recess with clean engine oil.
9. Fit inner and outer rotors ensuring that identification mark on outer rotor is facing outwards and that reference marks are aligned.
10. Lubricate new cover plate sealing ring with clean engine oil.
11. Fit cover plate seal and cover plate.
12. Apply sealant, Part No. STC 50552 to threads of Torx screws, fit and tighten screws.
13. Check that pump rotates freely.

Installation

Fit oil pump gasket. See **GASKET - OIL PUMP**.

SUMP - ENGINE OIL

Removal

1. Drain engine oil. See **FILTER - ENGINE OIL**.
2. If fitted: Remove 4 nuts securing engine oil cooler to mounting bracket and position oil cooler aside. See **Fig. 117**.
3. Remove bolt securing dipstick tube to cylinder block. See **Fig. 118**.
4. Depress and hold down dipstick tube collar; remove dipstick tube from sump.
5. Using sequence shown and noting their fitted positions, remove 10 bolts securing sump to lower crankcase. See **Fig. 120**.
6. Using a mallet, gently tap sump sideways to break sealant bond, remove sump.

CAUTION: Do not lever between crankcase and sump.

Installation

1. Using a suitable cleaning solvent, clean sump and mating face on lower crankcase. DO NOT use a metal scraper on sealing surfaces.
2. Apply a 2 mm (0.1 in) bead of sealant, Part No. STC 4600 along center of sump flange, then spread to an

even film using a roller.

CAUTION: To avoid contamination, assembly should be completed immediately after application of sealant.

3. Position sump, fit bolts and tighten progressively in the sequence shown to 35 Nm (26 ft. lbs.). See **Fig. 121**.
4. If fitted: Position engine oil cooler to sump mounting bracket, fit and tighten nuts to 25 Nm (18 ft. lbs.).
5. Position dipstick tube to sump and cylinder block, fit bolt and tighten to 9 Nm (7 ft. lbs.).
6. Fill engine with oil.

CAMSHAFT TIMING BELT

Removal

1. Remove 4 bolts securing engine mounting bracket to engine front plate and remove bracket. See **Fig. 245**.
2. Release and remove ancillary drive belt from remaining pulleys.
3. Remove 2 bolts securing ancillary drive belt tensioner and remove tensioner. See **Fig. 138**.
4. Remove Torx screw securing idler pulley to front mounting plate and remove pulley. See **Fig. 132**.
5. Release alternator battery lead terminal cover, loosen terminal nut and disconnect lead from terminal. See **Fig. 131**.
6. Disconnect multiplug from alternator.
7. Remove lower bolt and upper nut and bolt securing alternator to front mounting plate.
8. Release alternator and remove.
9. Remove 3 bolts securing camshaft timing belt left rear cover and remove cover. See **Fig. 124**.
10. Remove inlet manifold chamber - if fitted. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY**.
11. Remove 2 bolts securing right rear timing belt cover heat shield to cylinder head; remove heat shield. See **Fig. 125**.
12. Remove 3 bolts securing right rear timing belt cover; remove cover.
13. Using a socket on crankshaft pulley bolt, rotate crankshaft in a clockwise direction and align the engine SAFE position - notch on crankshaft pulley aligned to the ARROW on front mounting plate. Check that the timing marks on the rear camshaft gears are aligned as illustrated.

CAUTION: Do not use the camshaft gear bolts or timing belts to rotate the crankshaft. Do not use the arrow on the oil pump body as a timing reference. See Fig. 126.

14. Insert timing pin LRT-12-232 through hole immediately adjacent to side of lower crankcase ensuring that pin is located in hole in drive plate. See **Fig. 127**.
15. Remove 3 bolts securing camshaft timing belt left front cover and remove cover. See **Fig. 135**.
16. Remove 3 bolts securing camshaft timing belt right front cover and remove cover. See **Fig. 134**.

17. Remove bolt securing dipstick tube to cylinder block. See **Fig. 118**.
18. Depress locking collar, release and remove dipstick tube from engine sump.
19. Assemble LRT-12-161 to LRT-12-199 and secure with clamp bolt. See **Fig. 136**.
20. Insert LRT-12-161 with LRT-12-199 into crankshaft pulley, loosen and remove pulley bolt.

CAUTION: Ensure crankshaft does not rotate during above operation.

21. Remove LRT-12-161 and LRT-12-199 from crankshaft pulley.
22. Remove crankshaft pulley.
23. Remove 3 bolts securing camshaft timing belt lower cover to cylinder block and remove cover. See **Fig. 137**.
24. Remove 3 bolts securing engine front mounting plate and lifting bracket to cylinder block. See **Fig. 142**.
25. Remove bolt securing lifting bracket to right cylinder head and remove lifting bracket.
26. Remove rubber blanking plug from around camshaft timing belt tensioner. See **Fig. 141**.
27. Remove 5 bolts and 2 pillar bolts securing engine front mounting plate to cylinder block. See **Fig. 143**.
28. Remove 2 bolts securing IRD support bracket to engine front mounting plate.
29. With care, release and remove front mounting plate from engine.
30. Fit a suitable 1.5 mm diameter pin through hole in tensioner body and into hole in plunger. See **Fig. 144**.

NOTE: If holes in body and plunger are not aligned, move tensioner backplate using a broad bladed screwdriver; this will move the plunger sufficiently to align the holes and allow the pin to be inserted.

31. Remove and discard 2 Patchlok bolts securing tensioner to cylinder block and remove tensioner.

CAUTION: Exercise great care when removing bolts, do not apply excessive torque. If bolts appear to be seized, apply suitable anti-seize lubricant prior to removing bolts. DO NOT loosen Allen screw securing tensioner pulley.

32. If camshaft timing belt is to be refitted, mark direction of rotation on timing belt before removal.
33. With care, ease camshaft timing belt from gears using fingers only and remove timing belt.

CAUTION: Do not rotate crankshaft or camshafts with timing belt removed.

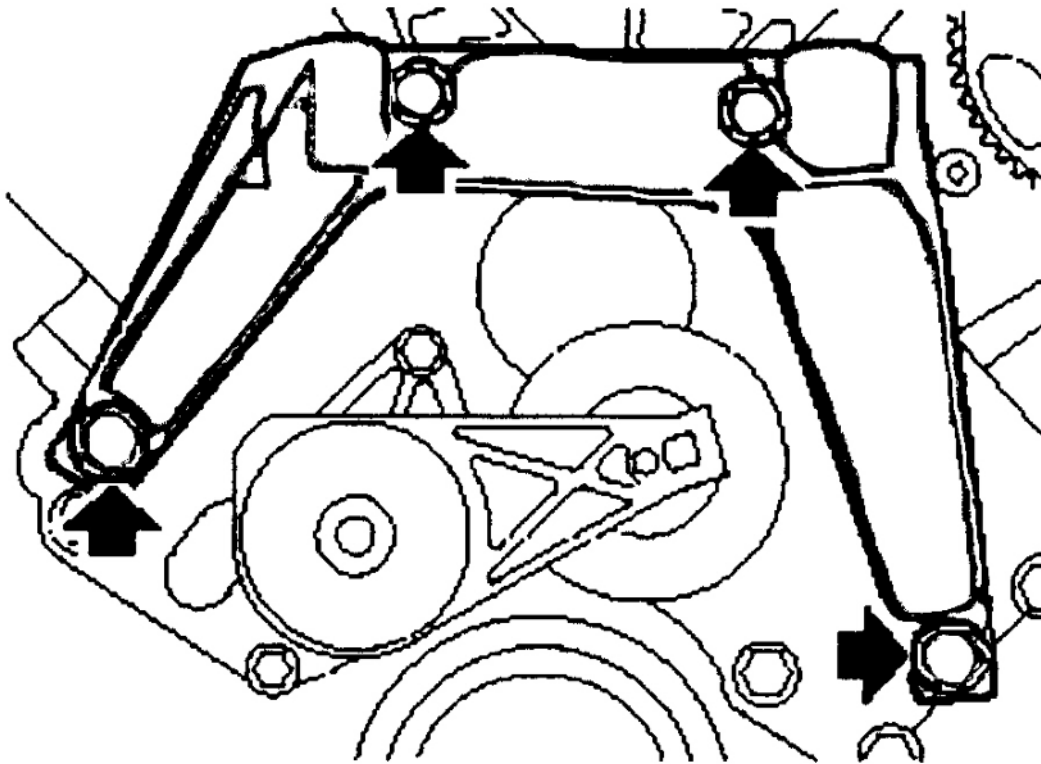
CAUTION: Camshaft timing belt must be replaced if cylinder head is to be removed or new drive gears, tensioner or coolant pump are to be fitted. Camshaft timing belts must be stored and handled with care. Always store a camshaft timing belt on its edge with a bend radius

greater than 50 mm (2.0 in). Do not use a camshaft timing belt that has been twisted or bent double as this will damage the reinforcing fibres. Do not use a camshaft timing belt if debris other than belt dust is found in timing belt covers. Do not use a camshaft timing belt if partial engine seizure has occurred. Do not use a camshaft timing belt if mileage exceeds 72,000 km (45,000 miles). Do not use an oil or coolant contaminated timing belt, cause of contamination must be rectified.

34. Remove and discard left and right exhaust camshaft cap seals. See **Fig. 145**.
35. Position tools LRT-12-196 to left and right front inlet camshaft gears and into the end of each exhaust camshaft.

CAUTION: Special tools must be fitted when tightening or loosening gear retaining bolts, otherwise damage to camshafts may occur. See **Fig. 146.**

36. Remove and discard bolts retaining front inlet camshaft gears to camshafts.
37. Remove tools LRT-12-196 from both inlet camshaft gears and exhaust camshafts.
38. Remove camshaft drive gears and hub assemblies.



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Fig. 245: Removing Engine Mounting Bracket Bolts-To-Engine Front Plate
Courtesy of LAND ROVER NORTH AMERICA, INC.

Installation

NOTE: Following front or rear timing belt refitment, it is possible that, after rotating the engine and positioning the crankshaft pulley to the **SAFE** position, the timing marks on the rear timing gears may be misaligned. This misalignment is acceptable provided that the timing belt refitting procedure was carried out correctly.

1. Clean camshaft gears and hubs, crankshaft gear, tensioner and water pump pulleys.

CAUTION: If sintered gears have been subjected to prolonged oil contamination, they must be soaked in solvent and then thoroughly washed in clean solvent before refitting. Because of the porous construction of sintered material, oil impregnated in the gears will emerge and contaminate the timing belts.

2. Fit hubs to camshaft gears and fit gears to camshafts.

3. Fit new camshaft gear bolts; tighten bolts sufficiently to allow gears to rotate without tipping.
4. Position timing belt to crankshaft gear.

NOTE: To prevent the timing belt from disengaging from the crankshaft gear when fitting, fit a suitable wedge between the belt and oil pump belt guard.

5. Fit tool LRT-12-197 into each exhaust camshaft in turn. See **Fig. 147**.
6. Using assistance, rotate each exhaust camshaft slightly and align timing marks on left and right rear camshaft gears. See **Fig. 148**.
7. Remove tool LRT-12-197.
8. Fit tools LRT-12-175 to left and right rear camshaft gears.
9. Rotate both front camshaft gears fully clockwise as viewed from front of engine.
10. Using fingers only, fit timing belt to gears, starting at the crankshaft gear and working in an anti-clockwise direction, keeping the belt run as taut as possible and turning the camshaft gears only a minimum amount anti-clockwise to fit timing belt.

CAUTION: Gears must not be rotated anti-clockwise more than one tooth.

11. Position an Allen key in tensioner backplate and hold tensioner pulley against timing belt. See **Fig. 246**.
12. With assistance, position timing belt tensioner, fit new Patchlok bolts and tighten to 25 Nm (18 ft. lbs.).

CAUTION: Ensure tensioner plunger is contacting underside of tensioner backplate.

13. Remove tools LRT-12-175 from rear timing belt gears.
14. Fit tools LRT-12-196 to both front inlet camshaft gears and into the end of each exhaust camshaft. See **Fig. 247**.

CAUTION: Special tools must be fitted when tightening or loosening gear retaining bolts, otherwise damage to camshafts may occur.

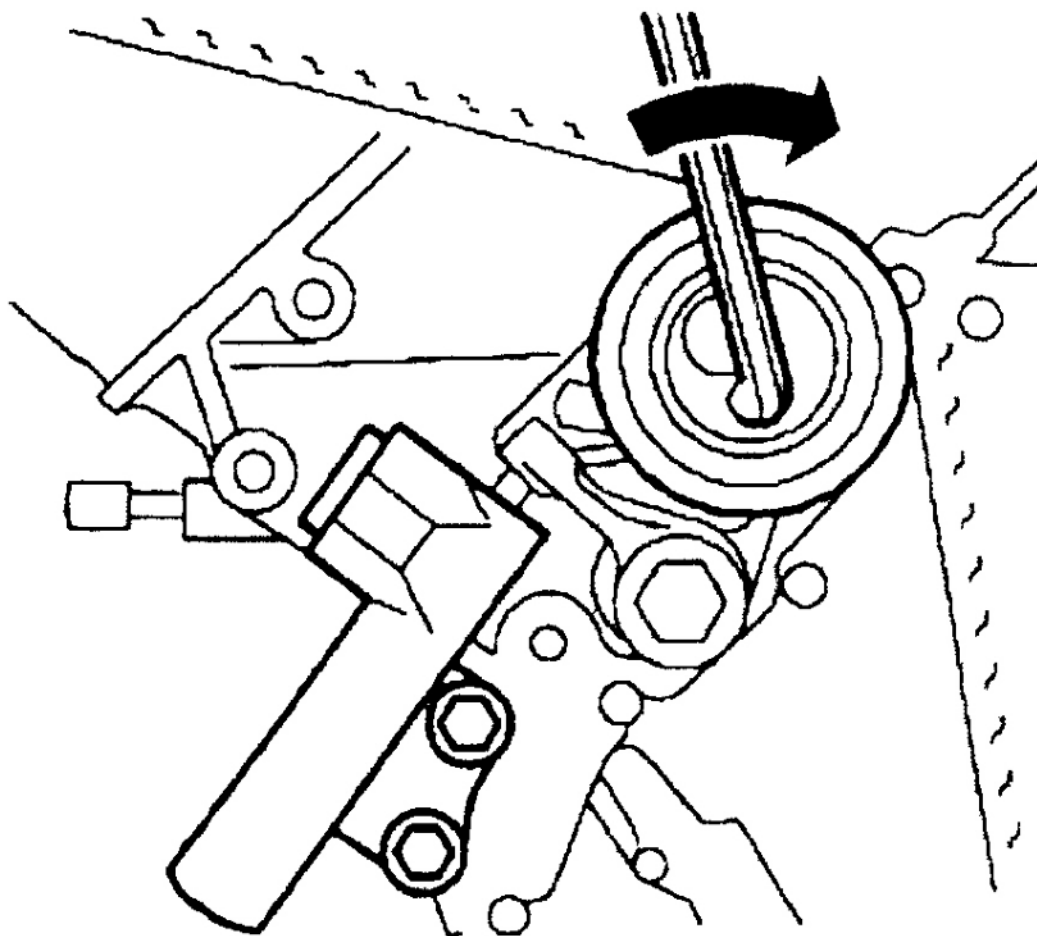
15. Tighten front inlet camshaft gear bolts:
 - Stage 1 - 27 Nm (20 ft. lbs.)
 - Stage 2 - Further 90°
16. Remove tools LRT-12-196 from both inlet camshaft gears and exhaust camshafts.
17. Remove wedge from between drive belt and oil pump belt guard.
18. Remove 1.5 mm diameter pin from tensioner.
19. Clean exhaust camshaft front cap seal locations and fit new cap seals.

CAUTION: The sealing edge of the cap seal and mating face must be clean and

dry.

20. Position engine front mounting plate and maneuver plate into position; fit bolts but do not tighten at this stage.
21. Fit bolts securing IRD support bracket to front mounting plate; do not tighten bolts at this stage.
22. Tighten bolts in the sequence shown. See **Fig. 248**:
 - M10 bolt - No. 1 - 25 Nm (18 ft. lbs.)
 - M10 bolt - No. 5 - 45 Nm (33 ft. lbs.)
 - Bolts Nos. 2, 3, 4, 6 and 7 - 85 Nm (63 ft. lbs.)
23. Position engine lifting bracket, fit bolts securing lifting bracket and front mounting plate to cylinder block and right cylinder head and tighten:
 - M8 bolt - 25 Nm (18 ft. lbs.)
 - M10 bolts - 45 Nm (33 ft. lbs.)
24. Fit rubber blanking plug around tensioner.
25. Clean end of dipstick tube.
26. Position dipstick tube to sump and cylinder block, fit bolt and tighten to 9 Nm (7 ft. lbs.).
27. Clean lower timing belt cover.
28. Position lower timing belt cover, fit and tighten bolts to 9 Nm (7 ft. lbs.).
29. Remove timing pin LRT-12-232.
30. Clean crankshaft pulley.
31. Fit crankshaft pulley to crankshaft gear and ensure that the indent on pulley locates over the lug on crankshaft gear.
32. Fit crankshaft pulley bolt and washer, position LRT-12-161 with LRT-12-199 into crankshaft pulley. Tighten pulley bolt to 160 Nm (118 ft. lbs.).
33. Remove tools LRT-12-161 and LRT-12-199.
34. Clean ancillary drive belt tensioner.
35. Position ancillary belt tensioner, fit bolts and tighten to 25 Nm (18 ft. lbs.).
36. Clean left and right front timing belt covers.
37. Position left and right front timing belt covers, fit and tighten bolts to 4 Nm (3 ft. lbs.).
38. Clean idler pulley, position pulley to engine front mounting plate and tighten Torx bolt to 45 Nm (33 ft. lbs.).
39. Position alternator to front mounting plate.
40. Fit bolt and nut and bolt securing alternator to front mounting plate and tighten to 45 Nm (33 ft. lbs.).
41. Connect alternator multiplug.
42. Connect battery lead to alternator, fit and tighten nut to 8 Nm (6 ft. lbs.), fit terminal cover.
43. Clean left rear timing belt cover.
44. Position left rear timing belt cover, fit and tighten bolts to 4 Nm (3 ft. lbs.).
45. Clean right rear timing belt cover.
46. Position right rear timing belt cover, fit bolts and tighten to 4 Nm (3 ft. lbs.).

47. Position heat shield, fit bolts and tighten M6 bolt to 9 Nm (7 ft. lbs.) and M8 bolt to 25 Nm (18 ft. lbs.).
48. Fit inlet manifold chamber - if fitted. See **30.15.37 SEALS -- INLET MANIFOLD CHAMBER -- UP TO 03MY**.
49. Position ancillary drive belt to crankshaft and alternator pulleys.
50. Position engine mounting front bracket to engine front plate and tighten bolts to 45 Nm (33 ft. lbs.).



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Fig. 246: Holding Tensioner Pulley Against Timing Belt
Courtesy of LAND ROVER NORTH AMERICA, INC.

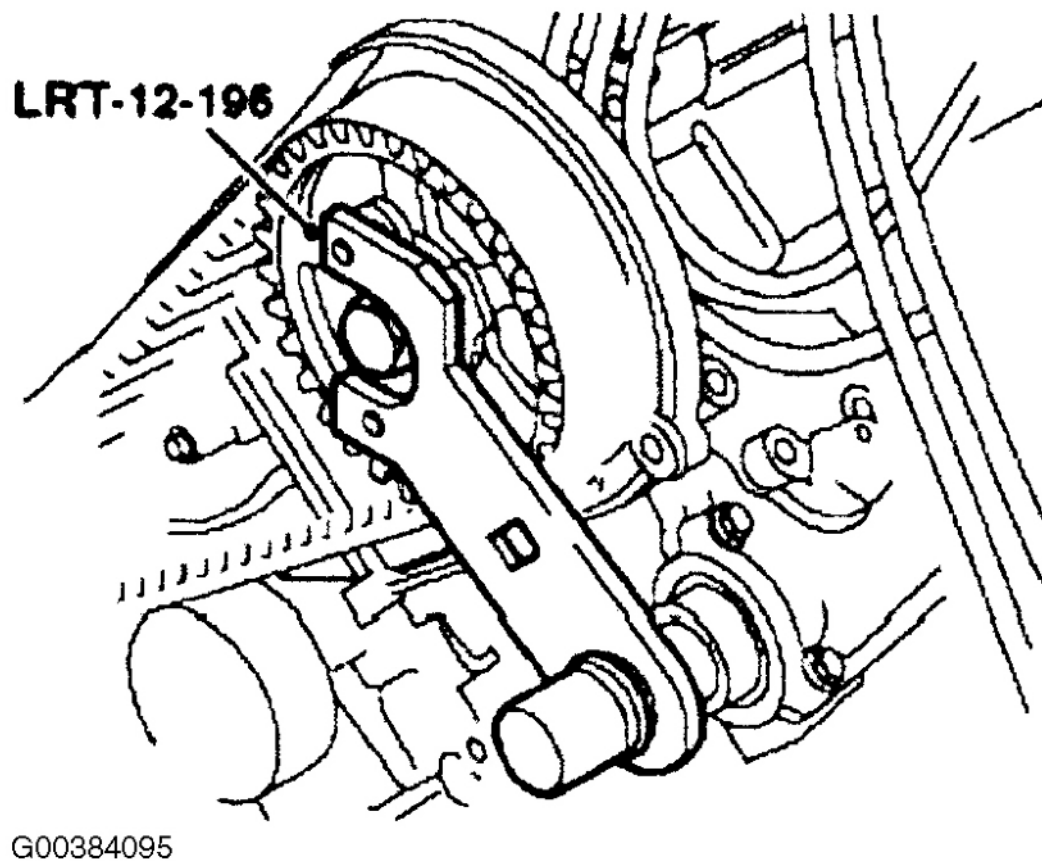
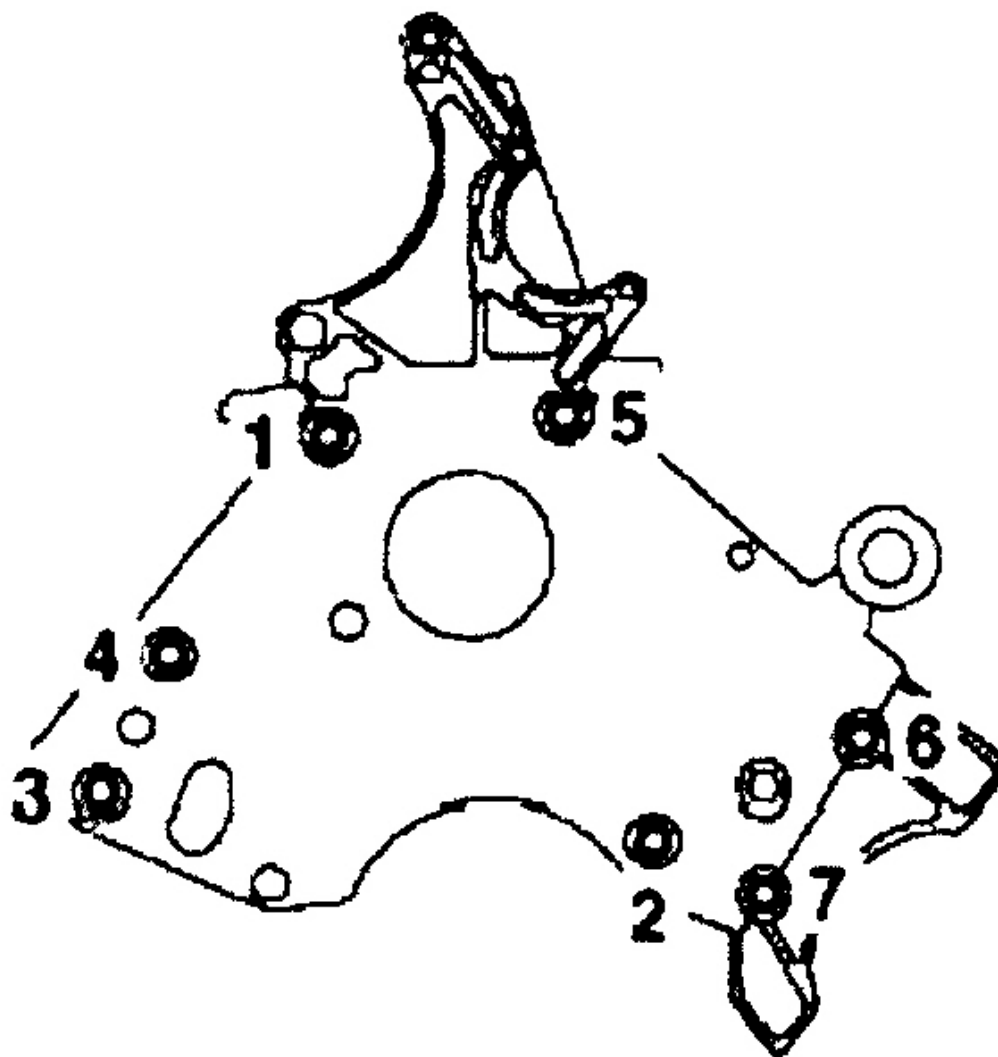


Fig. 247: Installing Tool LRT-12-196 To Front Inlet Camshaft & Exhaust Camshaft
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 248: Tightening IRD Support Bracket-To-Front Mounting Bolts In Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Bearing Ladder Bolts ⁽¹⁾	

2003 Land Rover Freelander S

2002-05 ENGINES 2.5L - Freelander KV6

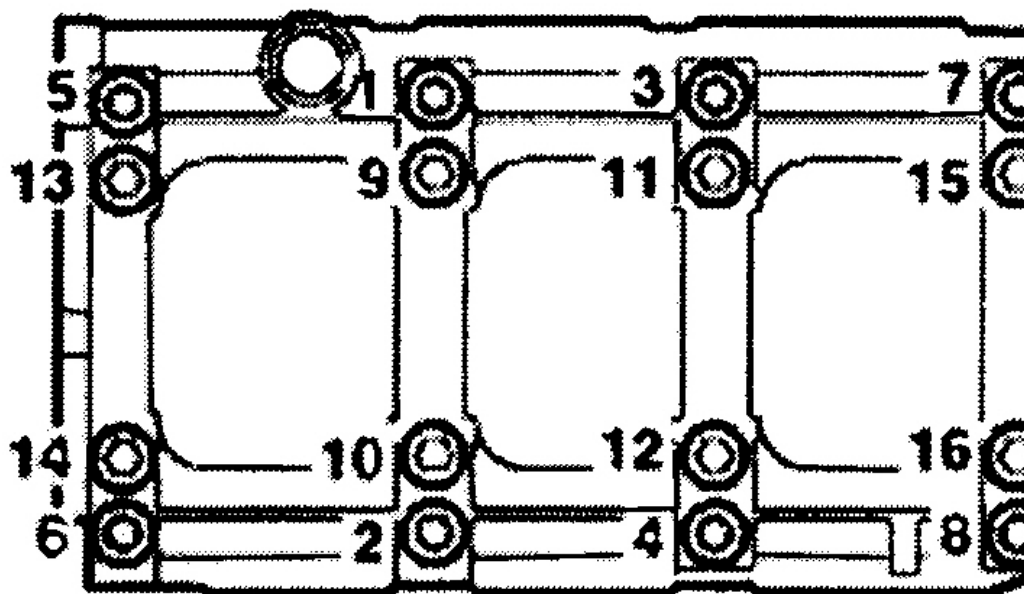
Step 1	15 (20)
Step 2	Tighten An Additional 90 Degrees
Camshaft Timing Belt Tensioner Bolts	18 (25)
Camshaft Timing Gear Bolt ⁽²⁾	
Step 1	20 (27)
Step 2	Tighten An Additional 90 Degrees
Connecting Rod Big End Bolts	
Step 1	15 (20)
Step 2	Tighten An Additional 45 Degrees
Crankshaft Pulley Bolt	118 (160)
Cylinder Block Coolant Drain Plug ⁽³⁾	15 (20)
Cylinder Head Bolts ⁽²⁾ ⁽⁴⁾	
Step 1	18 (25)
Step 2	18 (25)
Step 3	18 (25)
Step 4	Tighten An Additional 180 Degrees
Drive Plate-To-Crankshaft Bolts ⁽²⁾ ⁽⁵⁾	
Step 1	18 (25)
Step 2	74 (100)
Engine Front Mounting Plate-To-Block & Intermediate Reduction Drive ⁽⁶⁾	
10-mm - Bolt No. 1	18 (25)
10-mm - Bolt No. 5	33 (45)
12-mm Bolts	63 (85)
Engine Mount Bracket-To-Engine Front Mounting Plate Bolts	33 (45)
Engine Mount Bracket-To-Gearbox Bolts - Left Side	63 (85)
Engine Mount Bracket-To-Gearbox Bracket Through Bolt	74 (100)
Engine Mount-To-Body Bolts - Left Side	33 (45)
Exhaust Manifold-To-Cylinder Head Nuts ⁽⁷⁾	33 (45)
Exhaust Pipe-To-Manifold Nuts	37 (50)
Heated Oxygen Sensor	37 (50)
Hydramount	63 (85)
Idler Pulley-To-Engine Front Mount Plate Allen Bolt	33 (45)
Intake Manifold-To-Cylinder Head Bolts & Nuts	18 (25)
Intermediate Reduction Drive Support Bracket-To-Front Mount Plate Bolts	33 (45)
Intermediate Reduction Drive Support Bracket-To-Oil Sump Bolts	33 (45)
Lower Crankcase-To-Block Bolts ⁽⁸⁾ ⁽⁹⁾	

2003 Land Rover Freelander S

2002-05 ENGINES 2.5L - Freelander KV6

6-mm Bolts	(10)
8-mm Bolts	18 (25)
Lower Engine Steady-To-Oil Sump Bracket & Subframe Bolts	74 (100)
Oil Cooler-To-Oil Sump Mounting Bracket Nuts	18 (25)
Oil Cooler Pipes-To-Oil Filter & Oil Cooler Unions	19 (26)
Oil Drain Plug	18 (25)
Oil Pressure Relief Valve Plug Nut	18 (25)
Oil Sump-To-Lower Crankcase Bolts ⁽¹¹⁾ (12)	26 (35)
Power Steering Pipe-To-Front Mount Plate Bolt	18 (25)
Power Steering Pipe Support Bracket-To-Hydramount Nut	63 (85)
Right Rear Timing Belt Heat Shield-To-Cylinder Head Bolts	
6-mm Bolts	(10)
8-mm Bolts	18 (25)
Spark Plugs	20 (27)
Thermostat Housing Bolts	13 (18)
Upper Right Engine Steady-To-Body Bolts	74 (100)
Upper Right Engine Steady-To-Top Arm Bolt	74 (100)
INCH Lbs. (N.m)	
Camshaft Carrier-To-Cylinder Head Bolts ⁽¹²⁾ (13)	89 (10)
Camshaft Cover Bolts ⁽¹⁴⁾	80 (9)
Camshaft Position Sensor Bracket-To-Camshaft Cover Bolts	80 (9)
Camshaft Timing Belt Cover Bolts	35 (4)
Camshaft Timing Belt Front/Rear Cover Backplate-To-Cylinder Head Bolts ⁽³⁾	80 (9)
Crankshaft Rear Oil Seal Housing Bolts ⁽²⁾ (15)	71 (8)
Fuel Rail-To-Intake Manifold Bolts	80 (9)
Ground Strap-To-Camshaft Cover Bolt	80 (9)
Ignition Coils-To-Intake Manifold Bolts & Nuts	80 (9)
Ignition Plug Top Coils-To-Spark Plug Bolts	80 (9)
Oil Dipstick Tube Bracket Bolt	80 (9)
Oil Pick-Up Stainer-To-Bearing Ladder Bolts ⁽³⁾	71 (8)
Oil Pressure Switch	124 (14)
Oil Pump-To-Cylinder Block Bolts ⁽²⁾ (16)	
Step 1	44 (5)
Step 2	80 (9)
Water Pump Bolts ⁽³⁾	80 (9)
(1) Tighten bearing ladder bolts in sequence. See Fig. 249 .	
(2) Use NEW bolt/nut only.	

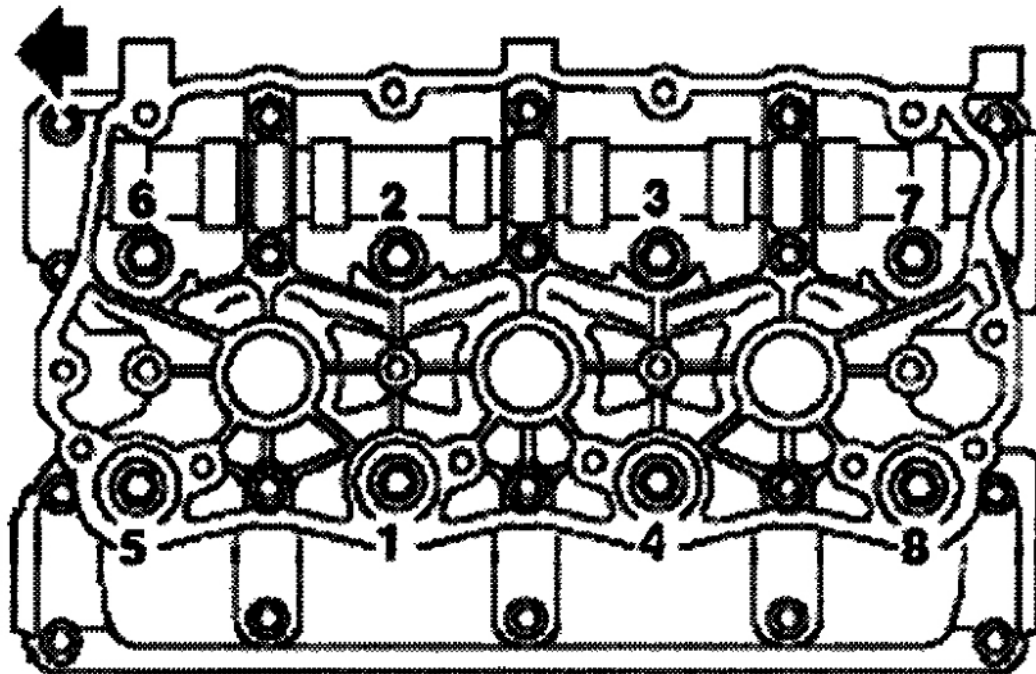
- (3) Apply Sealant (P/N STC-50552) to threads.
- (4) Tighten cylinder head bolts in sequence. See **Fig. 250**.
- (5) Tighten drive plate bolts in sequence. See **Fig. 251**.
- (6) Tighten engine front mounting plate bolts in sequence. See **Fig. 252**.
- (7) Tighten exhaust manifold nuts in sequence. See **Fig. 253**.
- (8) Apply Sealant (P/N STC-50550) to threads.
- (9) Tighten lower crankcase bolts in sequence. See **Fig. 254**.
- (10) Tighten to 80 INCH lbs. (9 N.m).
- (11) Tighten oil sump bolts in sequence. See **Fig. 255**.
- (12) Apply Sealant (P/N STC-4600) to threads.
- (13) Tighten camshaft carrier bolts in sequence. See **Fig. 256**.
- (14) Tighten camshaft cover bolts in sequence. See **Fig. 257** and **Fig. 258**.
- (15) Tighten crankshaft rear oil seal housing bolts in sequence. See **Fig. 259**.
- (16) Tighten oil pump bolts in sequence. See **Fig. 260**.



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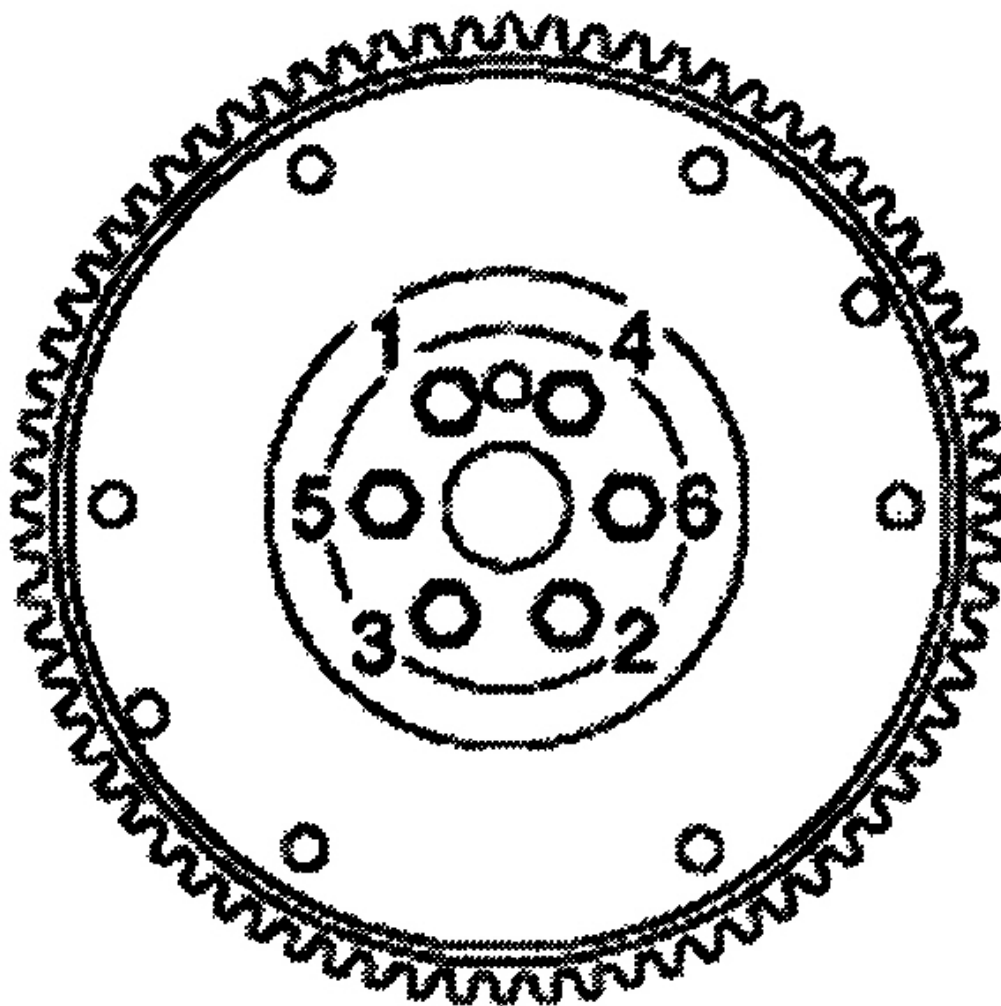
Fig. 249: Bearing Ladder Bolt Tightening Sequence

Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 250: Cylinder Head Bolt Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



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Fig. 251: Drive Plate Bolt Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.

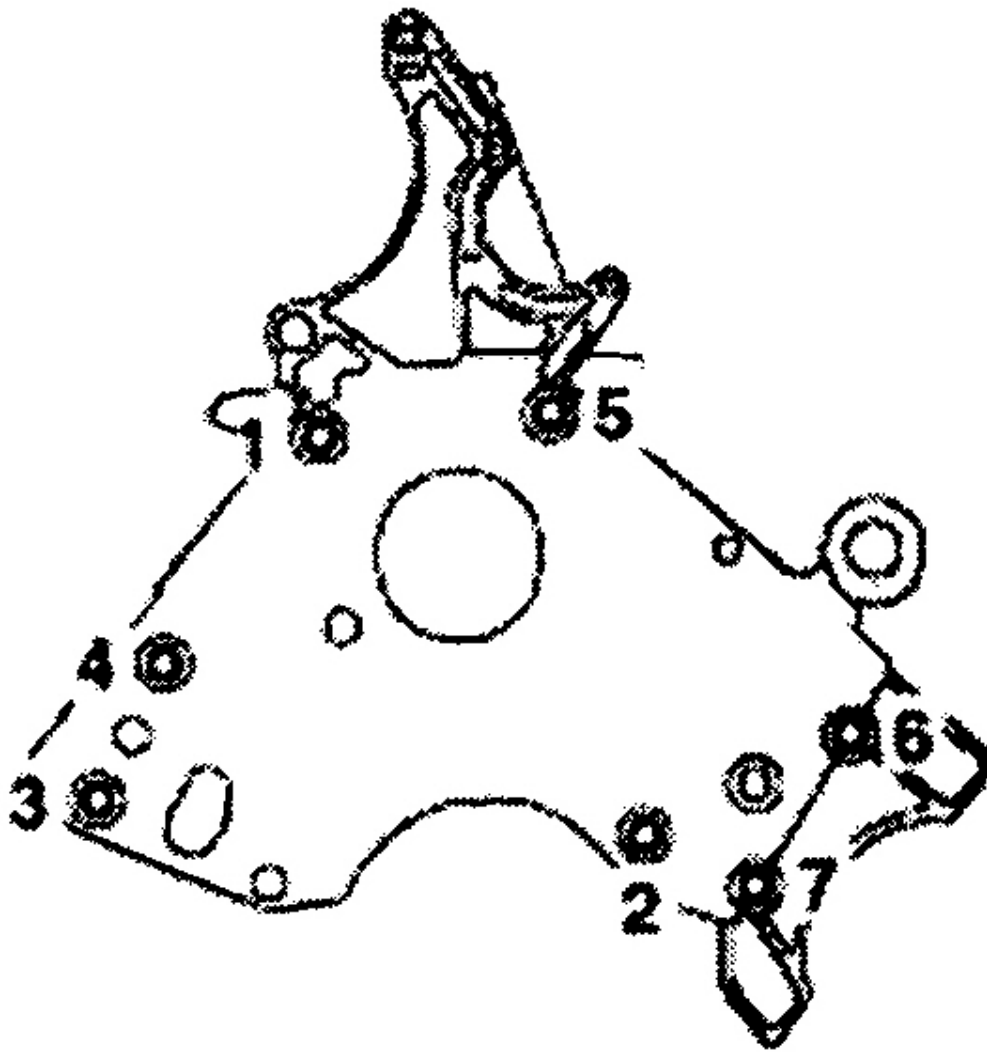
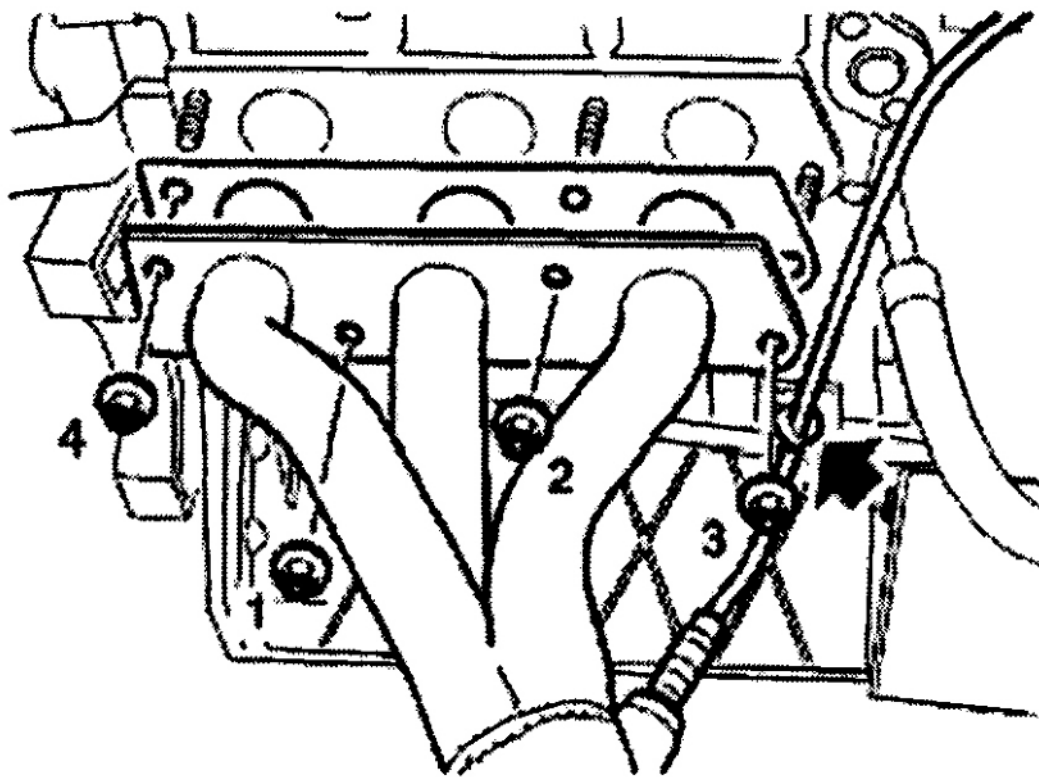
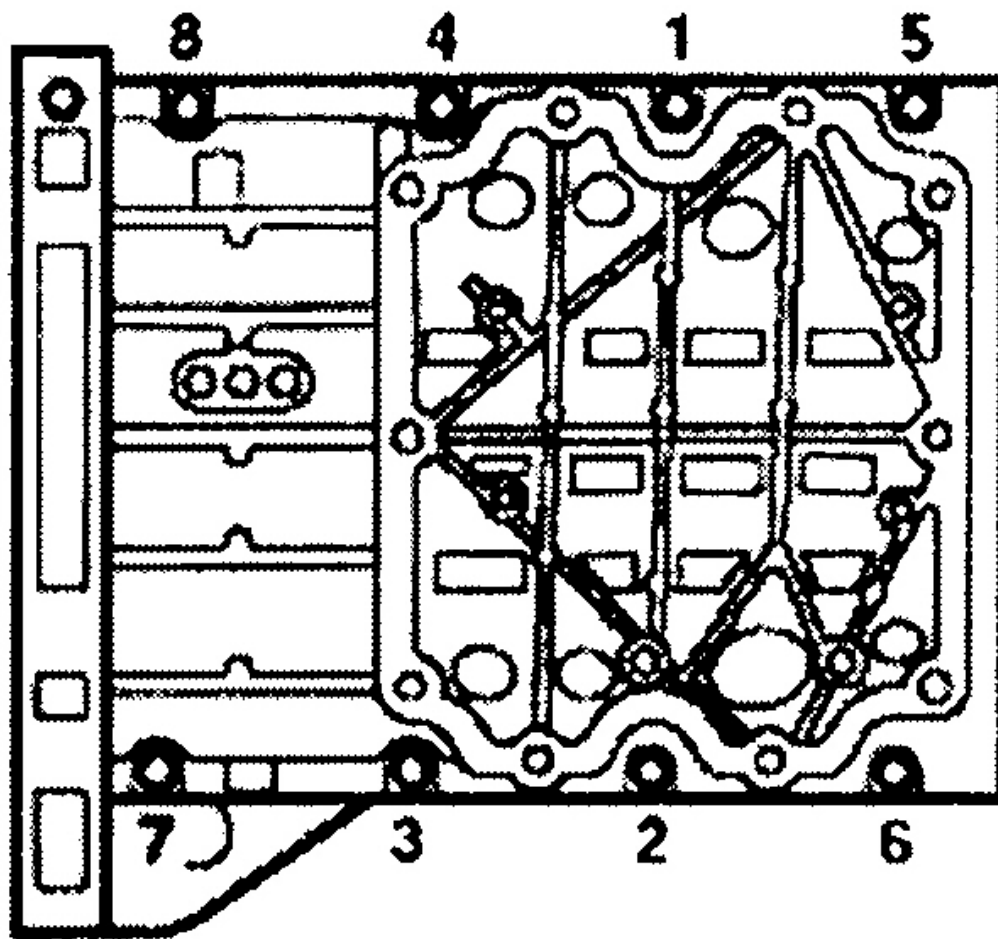


Fig. 252: Engine Front Mounting Plate Bolt Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



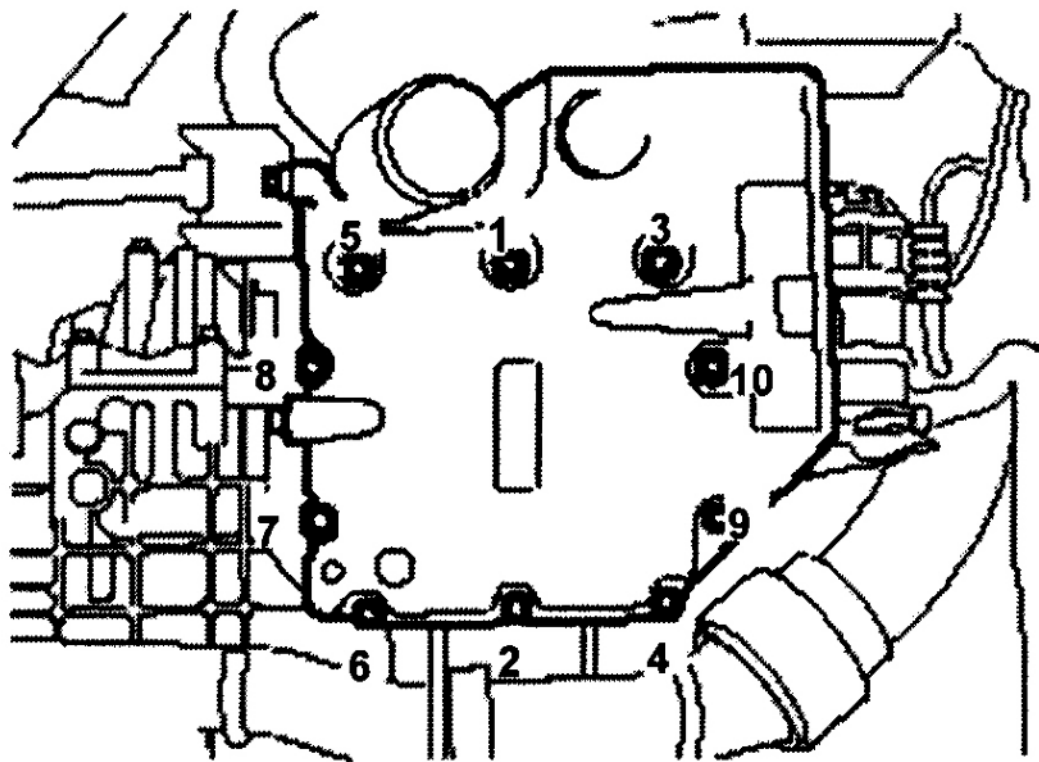
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Fig. 253: Exhaust Manifold Nut Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



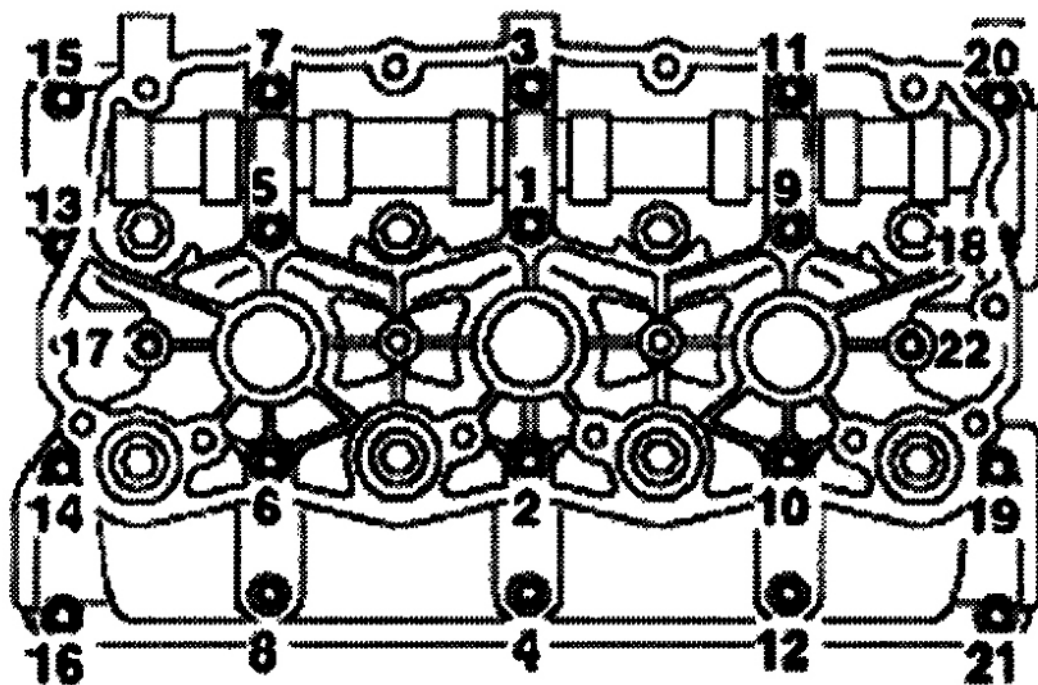
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Fig. 254: Lower Crankcase Bolt Tightening Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.



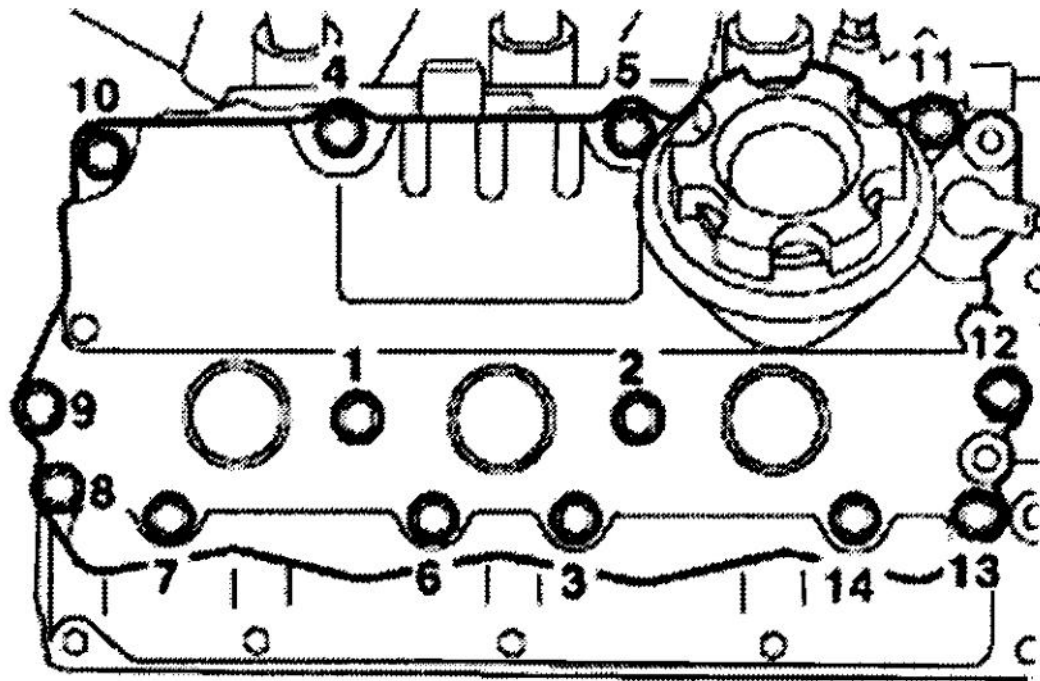
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Fig. 255: Oil Sump Bolt Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



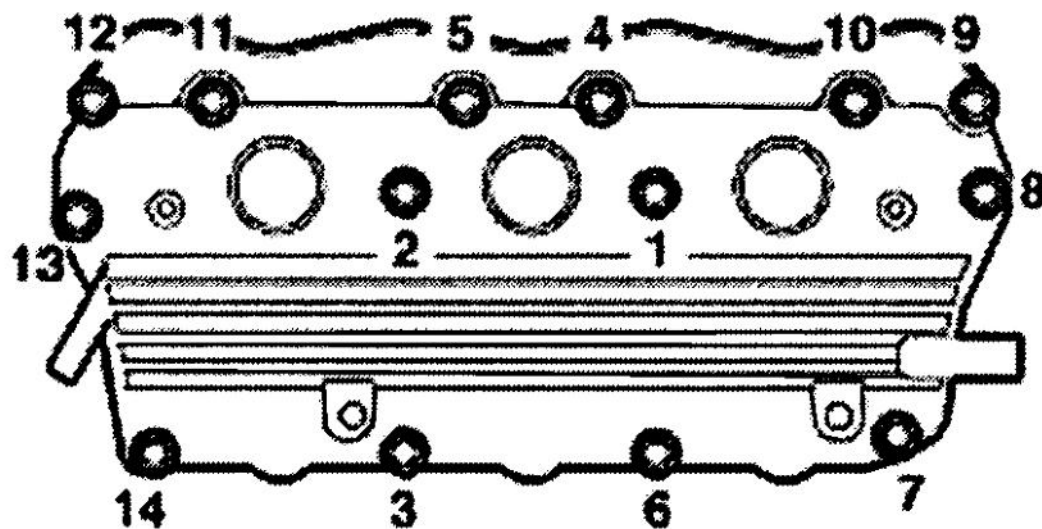
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Fig. 256: Camshaft Carrier Bolt Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



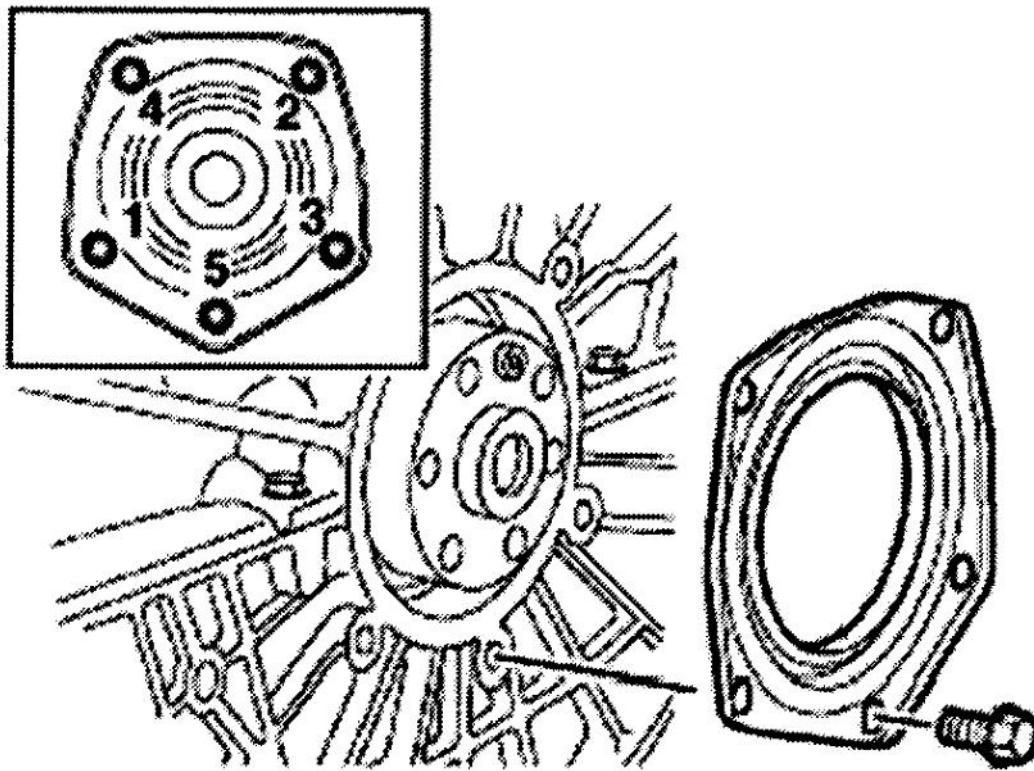
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Fig. 257: Camshaft Cover Bolt Tightening Sequence - Left Side
 Courtesy of LAND ROVER NORTH AMERICA, INC.



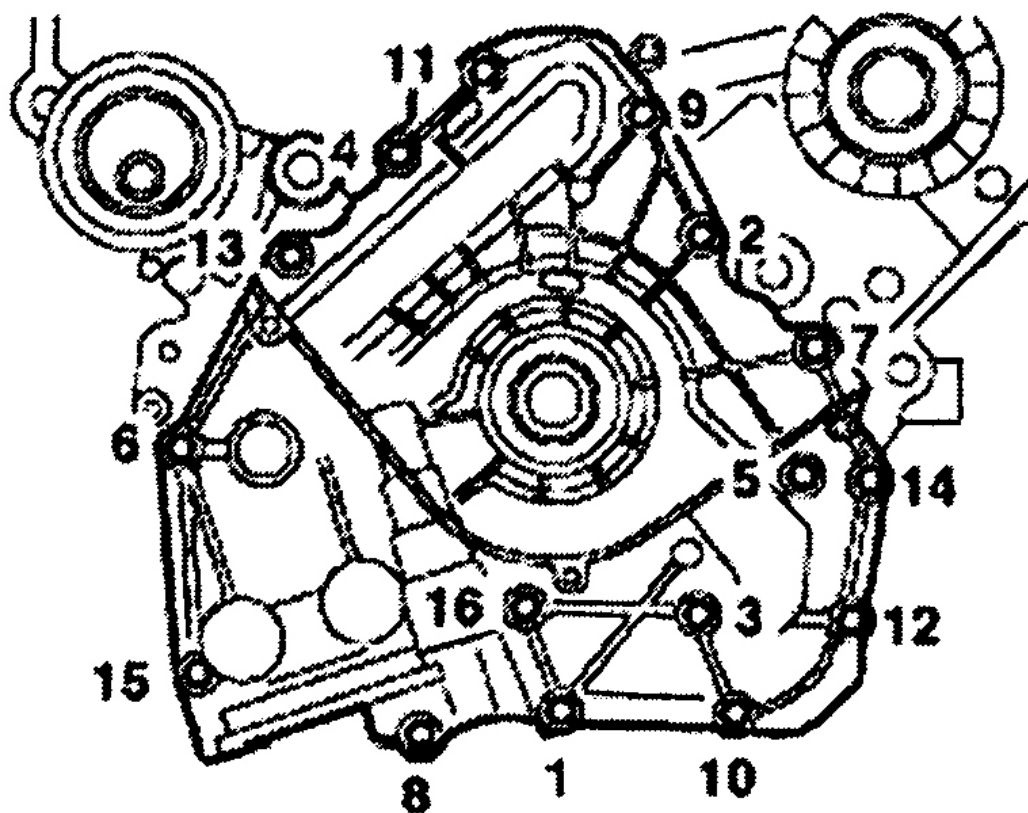
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Fig. 258: Camshaft Cover Bolt Tightening Sequence - Right Side
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00242098

Fig. 259: Crankshaft Rear Oil Seal Housing Bolt Tightening Sequence
Courtesy of LAND ROVER NORTH AMERICA, INC.



G00242105

Fig. 260: Oil Pump Bolt Tightening Sequence
 Courtesy of LAND ROVER NORTH AMERICA, INC.