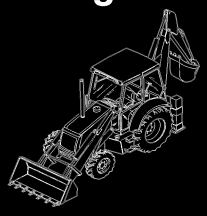
NEW HOLLAND CONSTRUCTION

LB75

SERVICE MANUAL

Section # 1
Engine



86618975
August, 2000

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NEW HOLLAND

LB75 REPAIR MANUAL CONTENTS

The sections used throughout all New Holland Construction product Service Manuals may not be used for each product. Each Service Manual will be made up of several books. Each book will be labeled as to which sections are in the overall Service Manual, and which sections are in each book.

The sections listed above are the sections utilized for the LB75 Backhoe Loader.

SECTION 1
ENGINE
CONTENTS

ENGINE

GENERAL SPECIFICATIONS

ENGINE APPLICATION

ENGINE	PART NUMBER
75 hp Naturally Aspirated	8045.05B – IVECO

ENGINE

GENERAL	SPECIFICATIONS
Cycle	Diesel, 4-stroke
Fuel injection	Direct
No. of in-line cylinders	4
Cylinder liners	dry force-fitted in cylinder block
Piston diameter	
– mod. 75 hp	104 mm (4.0976 in)
Piston stroke	115 mm (4.531 in)
Total displacement:	
– mod. 75 hp	3908 cm^3 (238.5 in^3)
Compression ratio	17 to 1 normally aspirated

GENERAL	SPECIFICATIONS
Maximum power:	
– mod. 75 hp	56 kW (75 hp)
Max. power speed	2300 rpm
Max. torque speed: 75 hp model	1400 rpm
Number of main bearings	5
Sump pan	Structural, cast iron

TIMING	SPECIFICATIONS
TIMING	Overhead valves are operated by the camshaft located in the engine block via tappets, pushrods and rockers. The camshaft is driven by the crankshaft through helical gears.
Inlet:	
– start: before TDC	12°
– end: after BDC	31°
Exhaust:	
– start: before BDC	50°
– end: after TDC	16°
Valve clearance for timing check	0.45 mm (0.0177 in)
Valve clearance for normal running (engine cold):	
– inlet	0.30 ± 0.05 mm (0.0118 ± 0.0197 in)
– exhaust	0.35 ± 0.05 mm (0.0137 ± 0.0197 in)

CYLINDER BLOCK	
Cylinder block	Cast iron monobloc with replaceable dry – fitted cylinder liners, incorporating seatings for crankshaft bearings, camshaft and pushrod tappet assemblies
Internal diameter of cylinder liners *	104.000 to 104.024 mm (4.0976 to 4.0985 in)
External diameter of cylinder liners *	107.020 to 107.050 mm (4.2165 to 4.2177 in)
Diameter of cylinder bores *	106.850 to 106.900 mm (4.2098 to 4.2118 in)
Interference fit between cylinder liners and bores	0.120 to 0.200 mm (0.047 to 0.0788 in)
Liner internal diameter oversizes	0.6 mm (0.0236 in)
Liner external diameter oversizes	0.2 mm (0.00788 in)
Maximum permissible liner ovality or taper due to wear **	0.12 mm (0.004728 in)
Diameter of main shell bearing seats	84.200 to 84.230 mm (3.317 to 3.31866 in)
Diameter of camshaft bearing seats:	
– front	54.780 to 54.805 mm (2.158 to 2.161 in)
– centre	54.280 to 54.305 mm (2.1386 to 2.1396 in)
– rear	53.780 to 53.805 mm (2.1189 to 2.1199 in)
Diameter of standard tappet bores in crankcase	15.000 to 15.018 mm (0.591 to 0.5917 in
Tappet oversizes	0.1 –0.2 –0.3 mm (0.0039, 0.0078, 0.0118 in)

* = After reaming ** = In area swept by the piston rings

CRANKSHAFT AND BEARINGS DATA	SPECIFICATIONS
Standard journal diameter	79.791 to 79.810 mm ([1]) (3.143 to 3.144 in)
Journal undersizes	0.254 – 0.508 – 0.762 – 1.016 mm (0.010 – 0.020 – 0.030 – 0.040 in)
Standard main bearing shell thickness	2.168 to 2.178 mm (0.0854 to 0.0858 in)
Main bearing shell undersizes (internal diameter)	0.254 – 0.508 – 0.762 – 1.016 mm (0.010 – 0.020 – 0.030 – 0.040 in)
Bearing shell to journal clearance	0.034 to 0.103 mm (0.00134 to 0.004 in)
Maximum permitted wear clearance	0.180 mm (0.007092 in)
Standard crankpin diameter	63.725 to 63.744 mm ([1]) (2.510 to 2.5115 in)
Crankpin undersizes	0.254 – 0.508 – 0.762 – 1.016 mm (0.010 – 0.020 – 0.030 – 0.040 in)
Standard big-end bearing shell thickness	1.805 to 1.815 mm (0.0711 to 0.0715 in)
Big-end bearing shell undersizes (internal diameter)	0.254 – 0.508 – 0.762 – 1.016 mm (0.010 – 0.020 – 0.030 – 0.040 in)
Big-end bearing shell to crankpin clearance	0.033 to 0.087 mm (0.001300 to 0.00342 in)
Maximum permitted wear clearance	0.180 mm (0.007092 in)
Standard crankshaft thrust washer thickness	3.378 to 3.429 mm (0.133 to 0.135 in)
Thrust washer oversizes (thickness)	0.127 – 0.254 – 0.381 – 0.508 mm (0.005 – 0.010 – 0.015 – 0.0200 in)
Width of main bearing including thrust washers	31.766 to 31.918 mm (1.25 to 1.257 in)
Width of corresponding crankshaft journal	32.000 to 32.100 mm (1.26 to 1.264 in)
Crankshaft assembly endfloat	0.082 to 0.334 mm (0.0032 to 0.013 in)
Max. permitted wear endfloat	0.40 mm (0.01576 in)
Maximum ovality or taper of journals and crankpin after regrinding	0.01 mm (0.000394 in)
Maximum ovality or taper of worn journals and crankpin	0.05 mm 0.00197 in)
Maximum tolerance for alignment of crankshaft journals with crankshaft supported on the two outer journals	0.10 mm (3.94 in)
Maximum tolerance for alignment, in both directions, of crankpins (3-cylinder engines) or each pair of crankpins (4-cylinder engines) relative to crankshaft journals	0.25 mm (0.00985 in)
Maximum tolerance for run-out between the outer surfaces of the crankshaft journals and the crankshaft centreline	± 0.10 mm (0.00394 in)

(1) Crankshafts with 0.1 mm (0.00394 in) undersize journals and crankpins and consequently undersize bearing shells may be fitted in factory production.

CRANKSHAFT AND BEARINGS DATA	SPECIFICATIONS
Maximum permitted tolerance on run-out of flywheel mounting flange surface relative to the crankshaft centreline, measured with 1/100 mm scale dial gauge resting on front flange surface (A, at a diameter of 108 mm (4.225 in) (total gauge reading).	0.025 mm (0.000985 in)
Maximum permitted tolerance on co-axial alignment of flywheel centering seat (B, relative to the crankshaft journals (total gauge reading)	0.04 mm (0.001576 in)

CONNECTING ROD DATA	SPECIFICATIONS
Connecting rods	cast-iron with oil way
Diameter of small end bushing seat	41.846 to 41.884 mm (1.6487 to 1.650 in)
Outside diameter of small end bushing	41.979 to 42.017 mm (1.654 to 1.655 in)
Interference between small end bushing and seat	0.095 to 0.171 mm (0.00374 to 0.00673 in)
Inside diameter of small end bushing (measured after fitting) . . .	38.004 to 38.014 mm (1.497 to 1.4977 in)
Diameter of big end shell bearing seats	67.407 to 67.422 mm (2.655 to 2.656 in)
Max. tolerance for parallelism between the small end and big end axes measured at 25 mm (0.985 in)	± 0.07 mm (0.002758 in)
Max. weight difference between con rods in same engine	25 grams (0.88 ounces)

PISTON DATA	SPECIFICATIONS
Pistons	Light alloy with two compression and one oil control rings
Standard piston diameter, measured at 57 mm from base from skirt and perpendicularly to the gudgeon pin axis	103.852 to 103.870 mm (4.0917 to 4.092 in)
Piston clearance in cylinder liner	0.130 to 0.172 mm (0.0051 to 0.00677 in)
Max. permissible clearance due to wear	0.30 mm (0.0118 in)
Piston oversizes	0.6 mm (0.0236 in)
Piston protrusion at TDC from cylinder block face	0.355 to 0.761 mm (0.0139 to 0.0299 in)
Gudgeon pin diameter	37.983 to 37.990 mm (1.496 to 1.4968 in)
Diameter of gudgeon pin seat in piston	38.000 to 38.006 mm (1.497 to 1.4974 in)
Gudgeon pin to seat clearance	0.010 to 0.023 mm (0.000394 to 0.000906 in)
Gudgeon pin to small end bearing clearance	0.014 to 0.031 mm (0.000551 to 0.00122 in)
Max. permissible clearance due to wear	0.06 mm (0.00236 in)
Max. weight difference between pistons in same engine	20 grams (0.7 ounces)
Piston ring groove clearance (measured vertically):	
- Top	0.090 to 0.122 mm (0.00351 to 0.004806 in)
- Second	0.060 to 0.092 mm (0.00236 to 0.00362 in)
- Bottom	0.040 to 0.075 mm (0.001576 to 0.002955 in)
Max. permissible clearance (wear limit):	
- Top	0.50 mm (0.0197 in)
- Second and bottom	0.20 mm (0.00788 in)
Piston ring end gap (fitted):	
- Top	0.40 to 0.65 mm (0.01576 to 0.0256 in)
- Second	0.30 to 0.55 mm (0.01182 to 0.0216 in)
- Bottom	0.30 to 0.60 mm (0.01182 to 0.0236 in)
Max. permissible gap (wear limit)	1.20 mm (0.04728 in)

VALVE TIMING GEAR DATA	SPECIFICATIONS
Timing gear tooth backlash	0.160 mm (0.006304 in)
Inside diameter of intermediate gear bushings (fitted and reamed)	37.050 to 37.075 mm (1.4597 to 1.460 in)
Diameter of intermediate gear journal	36.975 to 37.000 mm (1.4568 to 1.4578 in)
Journal to bushing clearance	0.050 to 0.100 mm (0.00197 to 0.00394 in)
Max. permissible clearance (wear limit)	0.15 mm (0.00591 in)
Busing interference fit in seat in intermediate gear	0.063 to 0.140 mm (0.00248 to 0.00551 in)
Outside diameter of camshaft bearings:	
– front	54.875 to 54.930 mm (2.162 to 2.164 in)
– centre	54.375 to 54.430 mm (2.142 to 2.144 in)
– rear	53.875 to 53.930 mm 2.122 to 2.248 in)
Interference between bearings and seats in cylinder block	0.070 to 0.150 mm (0.00275 to 0.00591 in)
Inside diameter of camshaft bearings (fitted and reamed):	
– front	51.080 to 51.130 mm (2.0125 to 2.0145 in)
– centre	50.580 to 50.630 mm (1.992 to 1.995 in)
– rear	50.080 to 50.130 mm (1.973 to 1.975 in)
Diameter of camshaft journals:	
– front	50.970 to 51.000 mm (2.008 to 2.009 in)
– centre	50.470 to 50.500 mm (1.9885 to 1.9897 in)
– rear	49.970 to 50.000 mm (1.9688 to 1.97 in)
Clearance between camshaft journals and bearings	0.080 to 0.160 mm (0.003152 to 0.006304 in)
Max. permissible clearance (wear limit)	0.20 mm (0.00788 in)
Camshaft endfloat between thrust plate and seat on camshaft	0.070 to 0.220 mm (0.002758 to 0.008668 in)

TAPPET DATA	SPECIFICATIONS
Tappet bore in crankcase	15.000 to 15.018 mm (0.591 to 0.5917 in)
Outside diameter of standard tappet	14.950 to 14.970 mm (0.589 to 0.5898 in)
Tappet running clearance	0.030 to 0.068 mm (0.001182 to 0.0267 in)
Max. permissible clearance (wear limit)	0.15 mm (0.00591 in)
Tappet oversizes	0.1 – 0.2 – 0.3 mm (0.0039, 0.0078, 0.0118 in)

ROCKER ARM - VALVE DATA	SPECIFICATIONS
Diameter of shaft bores in rocker arms	18.016 to 18.034 mm (0.709 to 0.7105 in)
Diameter of rocker arm shaft	17.982 to 18.000 mm (0.708 to 0.709 in)
Rocker shaft to rocker arm bore clearance	0.016 to 0.052 mm (0.00063 to 0.00204 in)
Maximum permissible clearance (wear limit)	0.15 mm (0.00591 mm)
Rocker arm spacing springs:	
- free length	59.5 mm (2.344 in)
- length under load of 46 to 52 N (4.7 to 5.3 kg)	44 mm (1.733 in)
Valve clearance for timing check	0.45 mm (0.0177 in)
Valve clearance for normal running (engine cold):	
- inlet valve	0.30 ± 0.05 mm (0.0118 ± 0.00197 in)
- exhaust valve	0.35 ± 0.05 mm (0.0137 ± 0.00197 in)
Cam lift:	
- inlet valve	5.67mm (0.223 in)
- exhaust valve	5.95 mm (0.234 in)

CYLINDER HEAD DATA	SPECIFICATIONS
Cylinder head	with valve seats cut directly in the casting and press-fitted steel valve guides.
Original height of cylinder head	92 mm (3.62 in)
Max. face re-grinding depth	0.5 mm (0.0197 in)
Diameter of standard valve guide bores in head	13.950 to 13.983 mm (0.5496 to 0.551 in)
Outside diameter of standard valve guides	13.993 to 14.016 mm (0.551 to 0.552 in)
Guide interference fit in bores	0.010 to 0.066 mm (0.000394 to 0.00260 in)
Inside diameter of valve guide (fitted in head)	8.023 to 8.043 mm (0.316 to 0.3169 in)
Valve stem diameter	7. 985 to 8.000 mm (0.314 to 0.315 in)
Assembly clearance between valve stem and guide	0.023 to 0.058 mm (0.00090 to 0.00228 in)
Maximum permissible clearance (wear limit)	0.13 mm (0.00512 in)
Maximum run-out of valve guided on its stem measured through 360_ with dial gauge contact point resting on valve head contact band	0.03 mm (0.00118 in)
Valve guide oversizes	0.2 mm (0.00788 in)
Valve seat angle in head: – inlet valve – exhaust valve	 60° ± 5′ 45° ± 5′
Valve face angle: – inlet valve – exhaust valve	 60° 30′ ± 7′ 45° 30′ ± 7′
Valve head diameter: – inlet valve – exhaust valve	 45.300 to 45.500 mm (1.784 to 1.792 in) 37.500 to 37.750 mm (1.477 to 1.487 in)
Valve stand-in relative to cylinder head face	0.7 to 1.0 mm (0.0275 to 0.0394 in)
Max. permissible valve stand-in	1.3 mm (0.0512 in)
Inlet and exhaust valve springs:	
– free length	44.6 mm (1.757 in)
– length with valve closed, under load of 256 to 284 N (26.1 to 28.9 kg)	34 mm (1.34 in)
– length with valve open, under load of 502 to 544 N (51.2 to 56.6 kg)	23.8 mm (0.937 in)
Injector protrusion relative to head face:	
BOSCH injector	0.3 to 1.1 mm (0.0118 to 0.0433 in)

ANGULAR TORQUE DATA

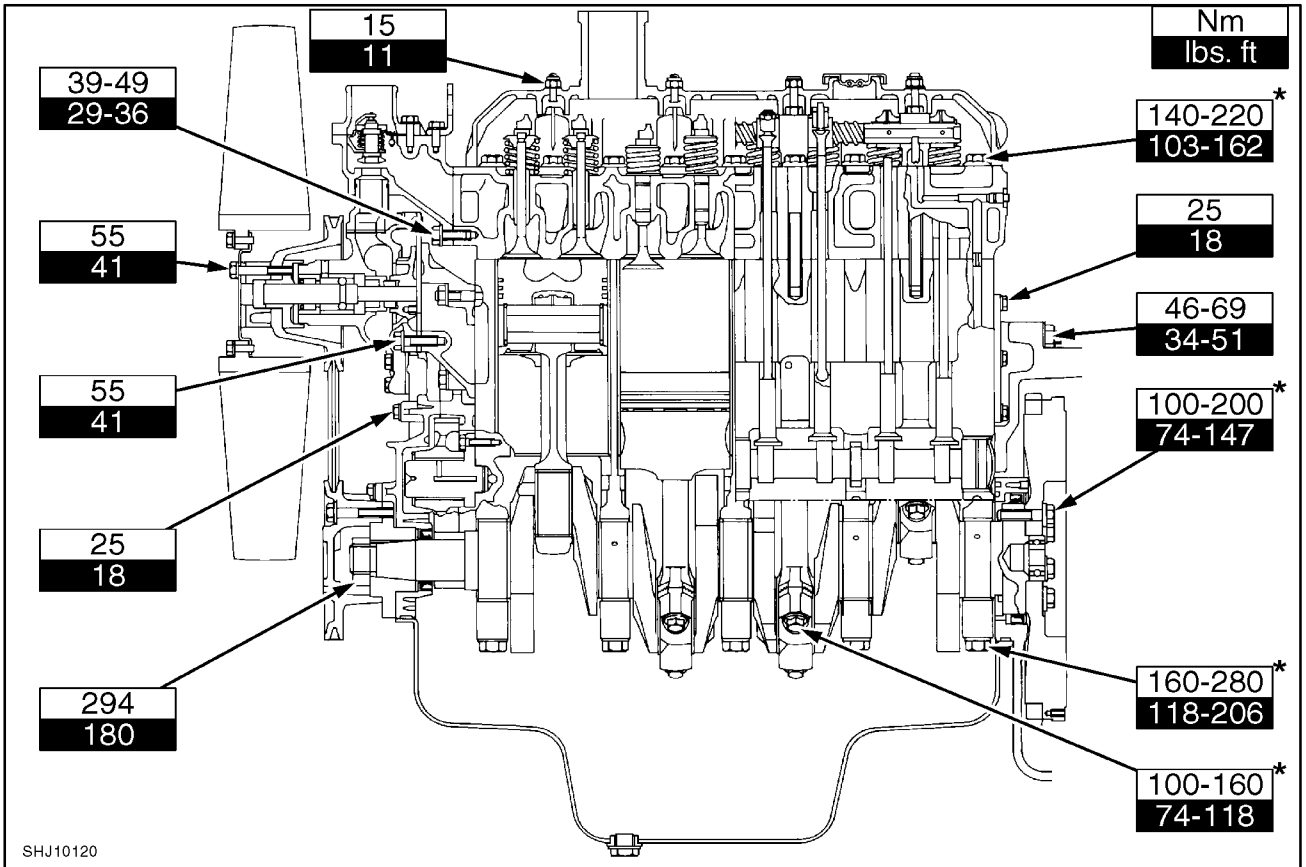
PART	Thread size	1st Stage torque		Angle 2nd Stage (*)	Stabilised Torque N·m	Stabilised Torque lbf ft
		N·m	lbf ft			
Cylinder head bolts	M 12 x 1.25	40	29.0	240°	140–220	103 – 162
Main bearing cap bolts	M 14 x 1.5	80	59.0	90°	160–280	118 – 162
Connecting rod cap bolts	M 11 x 1.5	40	29.0	60°	100–160	74 – 118
Flywheel mounting bolts	M 12 x 1.25	40	29.0	60°	100–200	74 – 147

(*) Tighten nuts in two stages:

TIGHTENING TORQUE DATA

PART	Thread size	Tightening torque	
		N·m	lbf ft
Rocker shaft pedestal bolts	M 8	25	18.4
Crankshaft hub retaining nut	M 30 x 1.5	294	217
Fan and alternator pulley bolts	M 10 x 1.25	55	41
Inlet manifold retaining bolts	M 8	25	18.4
Alternator and belt tension adjustment nut	M 10 x 1.25	55	41
Coolant pump retaining bolts	M 10 x 1.25	55	41
Nuts for injector mounting studs	M 8	25 **(*)**	18.4
Rocker cover nuts	M 8	15	11.0
Oil pump and pump cover retaining bolts	M 8	25	18.4
Timing gear case and cover bolts	M 8	25	18.4
Intermediate flanged journal bolts	M 10 x 1.25	55	41
Camshaft thrust plate retaining bolts	M 8	35	26
Rear crankcase cover bolts	M 8	25	18.4
Tappet adjuster locknuts	M 8	22	16.2
Exhaust manifold retaining bolts	M 8	25	18.4
Injection pump mounting bolts	M 8	25	18.4
Sump pan retaining bolts to – inner rear timing cover and gear case – cylinder block and flywheel case – 75 hp	 M 10 X 1.25 M 10 X 1.25	 39 – 49 49 – 59	 29 – 36 36 – 43

(*) Tighten nuts in two stages:


Nm
lbs. ft
15
11
39-49
29-36
55
41
55
41
25
18
294
180
140-220*
103-162
25
18
46-69
34-51
100-200*
74-147
160-280*
118-206
100-160*
74-118
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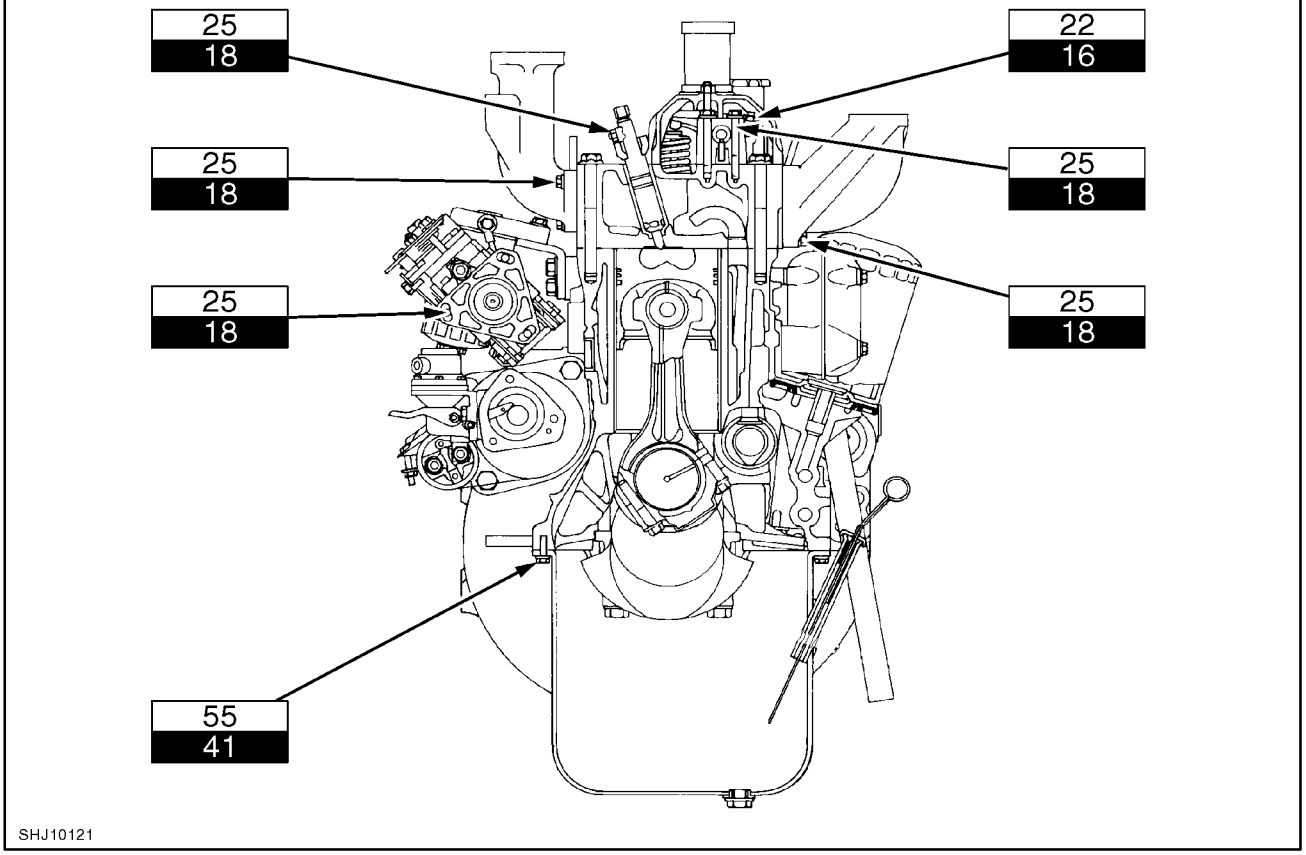
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1

TOOLS

Warning – The operations described in this section can only be carried out with the **ESSENTIAL** tools indicated by an **(X)**.

To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools which are to be made according to the drawings included in this manual.

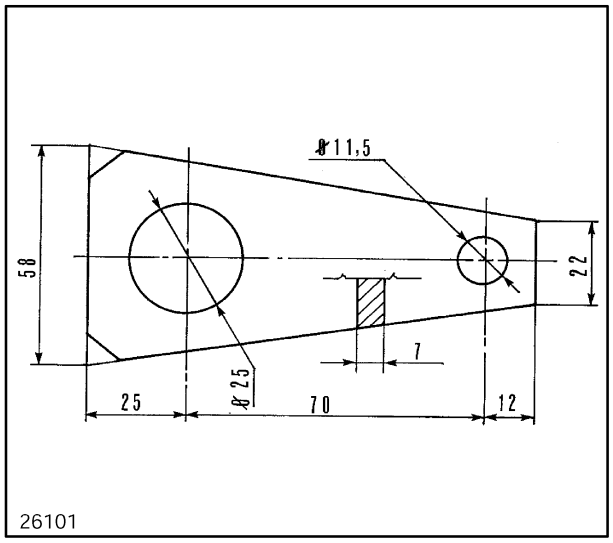
List of specific tools required for the various operations described in this section.

	290740	Engine Lift Hook
	293860	Set of engine mounting brackets for revolving stand **290090**.
X	**291309**	Compression test kit (complete with dummy injector **293862**).
	292870	Engine oil pressure test kit.
X	**291160**	Piston ring pliers.
X	**291048**	Piston ring clamp.
X	**292248**	Protractor for angular torque measurement.
X	**291504**	Puller for crankshaft pulley hub.
X	**291883**	Wrench for valve clearance adjustment.
X	**291046**	Drift for valve guide extraction/ installation.
X	**293231**	Bush for valve guide installation (with **291046**)
X	**294027**	Twist bit for enlarging valve guide bore.
X	**294028**	8° Tapered grinder for swaging exhaust valve guides.
X	**291177**	Valve guide reamer
X	**291050**	Valve spring compressor
X	**293270**	Set of grinding tools for regrinding injector seat.
X	**291182**	Puller for coolant pump impeller.
X	**293280**	Drift for installation of coolant pump impeller seal.
	293761	Wrench set – Injector removal

Injection pump

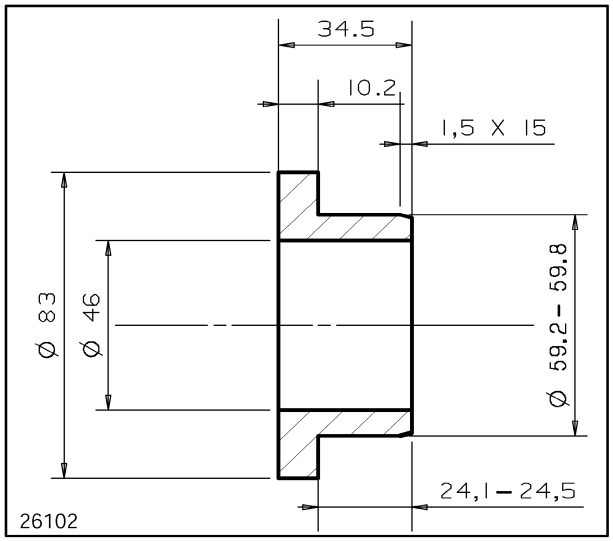
	291754	Dial gauge (1/100mm scale, 5 mm (0.197 in) stroke, ∅ 40mm (1.576 in) with **291755**).
	291755	Device for BOSCH injection pump timing on engine.
X	**295042**	Extractor for injection pump drive gear.

Mounting for engine lifting hook (No. **50075** - measurements in mm).
Make with UNI FE 42 material.



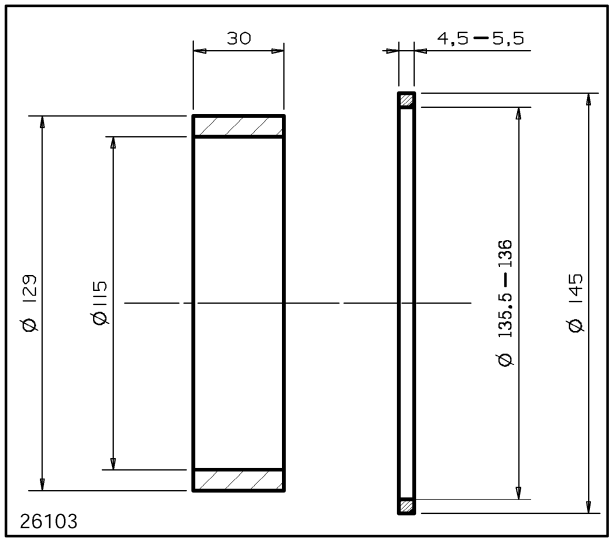
2

Splining tool to be manufactured for assembling the crankshaft front seal (print on the tool no. **50138** - values in mm).
Material UNI C40.



3

Splining tool to be manufactured for assembling the crankshaft rear seal (print on the tool no. **50139** - values in mm).
Material UNI C40.



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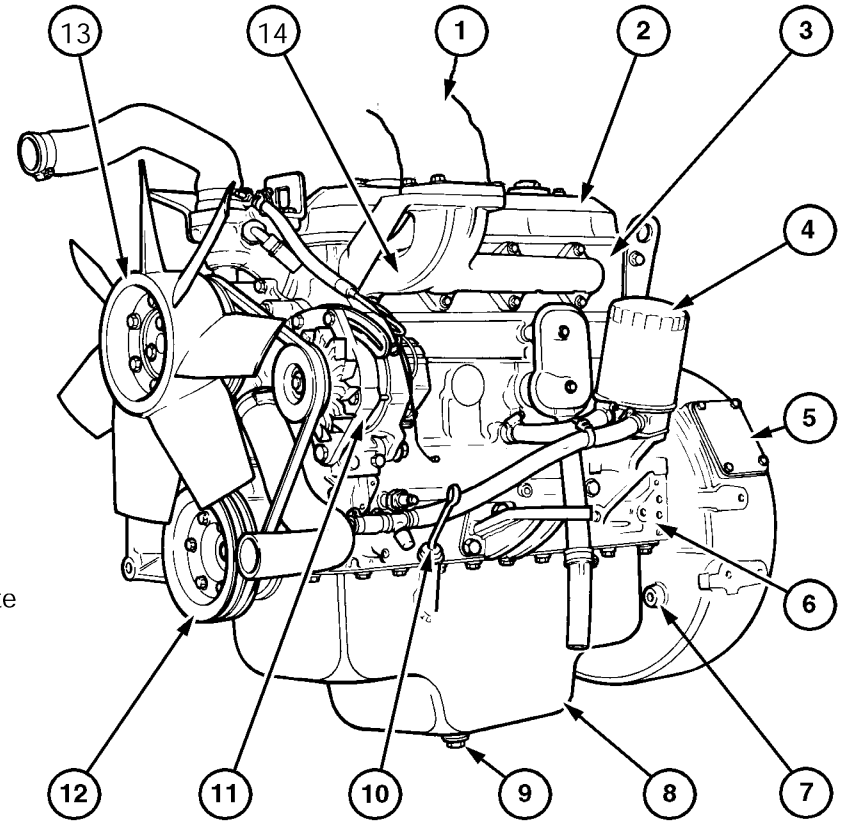
ENGINE LEFT HAND VIEW:



1. Muffler Assembly:
2. Tappet cover:
3. Cylinder head:
4. Engine oil filter:
5. Timing cover plate:
6. Block:
7. Flywheel Timing Inspection Plate
8. Oil sump:
9. Engine oil drain plug:
10. Dipstick:
11. Alternator:
12. Driving shaft pulley:
13. Fan:
14. Exhaust manifold

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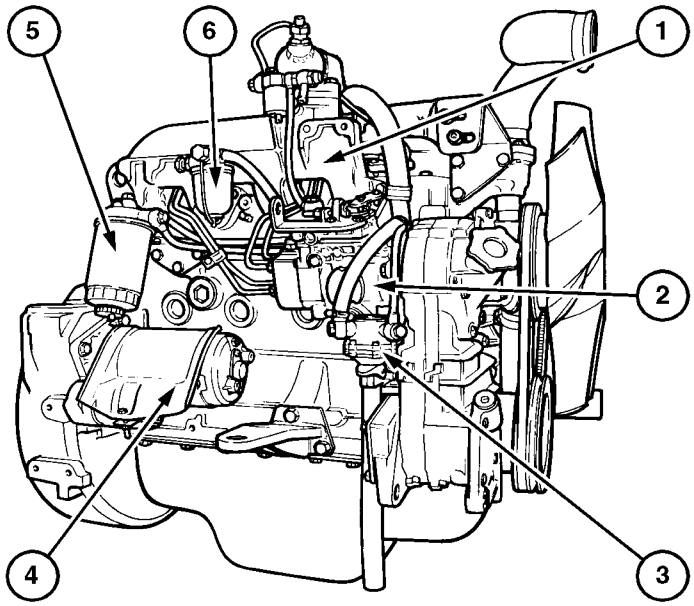
5

ENGINE RIGHT HAND VIEW:



1. Air intake manifold:
2. Injection pump:
3. Fuel lift pump:
4. Starter motor:
5. Fuel filter.
6. Water Sedimentor Separater

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6

TROUBLESHOOTING

Problem	Possible cause	Remedy
Engine does not start.	1. Battery partially discharged.	Check and recharge battery. Replace if necessary.
	2. Battery terminal connections corroded or loose.	Clean, inspect and tighten terminal nuts. Replace terminals and nuts if excessively corroded.
	3. Injection pump timing incorrect.	Adjust injection pump timing.
	4. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary clean and dry the fuel tank.
	5. No fuel in tank.	Fill tank.
	6. Fuel supply pump malfunction.	Check and replace pump if necessary.
	7. Air in fuel system.	Check fuel lines, unions, supply pump, filters and injection pump for air, then bleed system.
	8. Starter motor faulty.	Repair or replace starter motor.
	9. Thermostarter faulty.	Check and replace thermostarter if necessary.
Engine stalls.	1. Idle speed too low.	Adjust idle speed.
	2. Irregular delivery from injection pump.	Check injection pump delivery on test bench.
	3. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary clean and dry the fuel tank.
	4. Fuel filters clogged.	Renew filter cartridges.
	5. Incorrect valve clearances.	Adjust valve clearances.
	6. Burnt or cracked valves	Replace valves.
	7. Air in fuel system.	Check fuel lines, unions, supply pump, filters and injection pump for air, then bleed system.
	8. Injection pump drive mechanism damaged.	Replace damaged parts.

(continued)

TROUBLESHOOTING

(overleaf)

Problem	Possible cause	Remedy
Engine overheats.	1. Coolant pump malfunction.	Overhaul pump or replace.
	2. Thermostat faulty.	Replace thermostat.
	3. Radiator inefficient.	Remove internal deposits by flushing. Check for leaks and repair.
	4. Deposits in cylinder head and crankcase coolant passages.	Flush out coolant system.
	5. Coolant pump and fan drive belt slack.	Check and adjust belt tension.
	6. Coolant level low.	Top up expansion tank with specified coolant mixture.
	7. Incorrect timing.	Check and adjust.
	8. Injection pump calibration incorrect – delivering too much or too little fuel.	Calibrate pump on test bench to values specified in calibration tables.
	9. Air filter clogged.	Clean filter unit and replace filter element if necessary.
Engine lacks power and runs unevenly.	1. Injection pump timing incorrect.	Adjust pump timing.
	2. Auto advance regulator in injection pump damaged.	Overhaul injection pump and adjust on test bench to the values specified in calibration table.
	3. Distributor journal worn.	Overhaul injection pump and adjust on test bench to the values specified in calibration table.
	4. Injection pump delivery irregular.	Overhaul injection pump and adjust on test bench to the values specified in calibration table.
	5. All-speed governor damaged.	Overhaul injection pump and adjust on test bench to the values specified in calibration table.
	6. Injectors partially obstructed or damaged.	Clean, overhaul and calibrate injectors.
	7. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary clean and dry the fuel tank.

(continued)

TROUBLESHOOTING

(overleaf)

Problem	Possible cause	Remedy
Engine lacks power and runs unevenly.	1. Fuel supply pump damaged.	Replace fuel supply pump.
	2. Incorrect valve clearances.	Adjust valve clearances.
	3. Cylinder compression low.	Test compression and overhaul engine if necessary.
	4. Air filter clogged.	Clear air filter unit and replace element if necessary.
	5. Tie-rod in linkage between accelerator and injection pump incorrectly adjusted.	Adjust to correct length.
	6. Maximum speed screw on injection pump incorrectly adjusted.	Adjust max. speed screw.
Engine produces abnormal knocking noises.	1. Injectors partially obstructed or damaged.	Clean, overhaul and calibrate injectors.
	2. Impurities accumulating in fuel lines.	Clean fuel lines and replace severely dented pipes. Clean injection pump if necessary.
	3. Incorrect injection pump timing.	Adjust injection pump timing.
	4. Crankshaft knocking due to excessive play in one or more main or big-end bearings or excessive endfloat.	Re-grind crankshaft journals and crankpins. Fit oversize shell bearings and thrust washers.
	5. Crankshaft unbalanced.	Check crankshaft alignment and balance; replace if necessary.
	6. Flywheel bolts loose.	Replace any bolts that have worked loose and tighten all bolts to the specified preliminary and angular torque values.
	7. Connecting rod axes not parallel.	Straighten connecting rods, check axes parallelism; replace con rods if necessary.
	8. Piston knock due to excessive wear.	Rebore cylinder liners and fit oversize pistons.
	9. Noise caused by excessive play of gudgeon pins in small-end and piston bushings, or loose fit of small-end bushing.	Fit oversize gudgeon pin, rebore piston seats and small-end bushings. Replace bushings.
	10. Excessive tappet/valve noise.	Check for broken springs or excessive play between valve stems and guides, cam followers and bores. Adjust valve clearances.

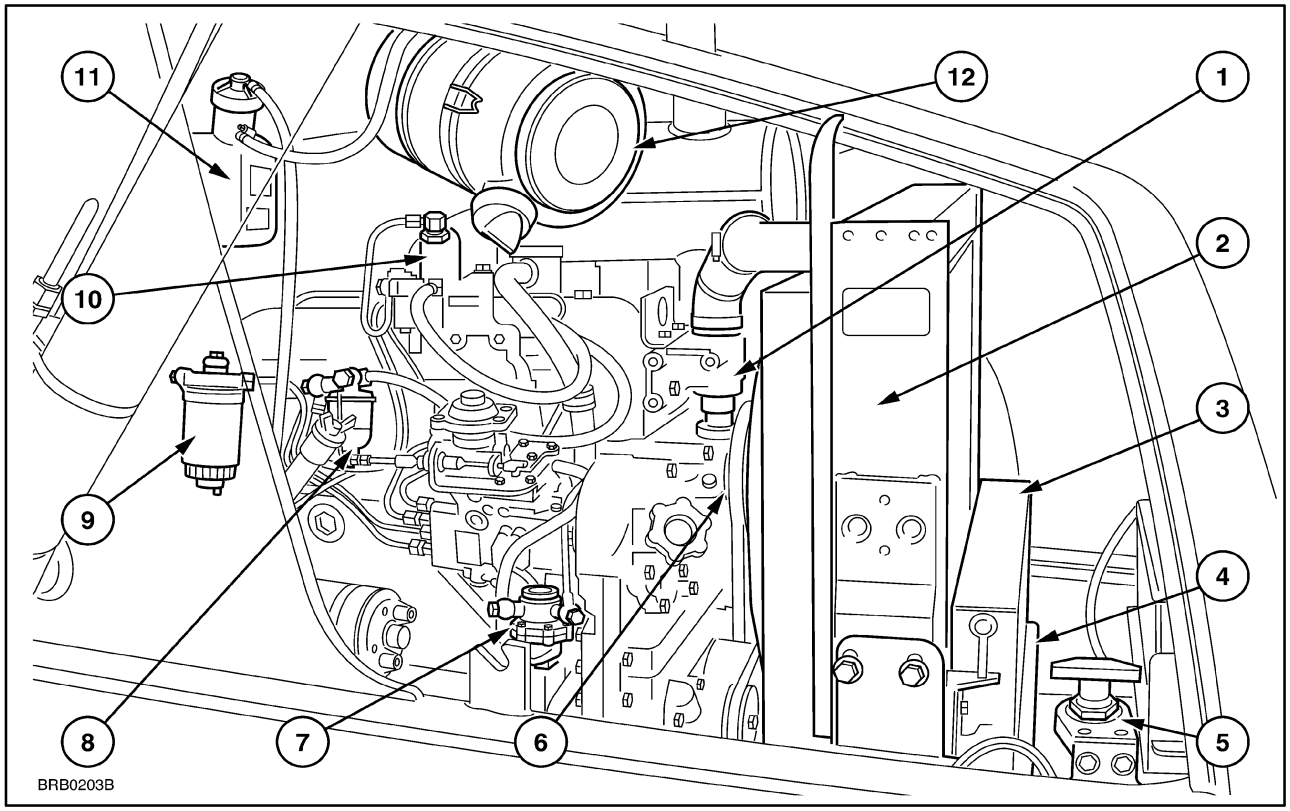
(continued)

TROUBLESHOOTING

(overleaf)

Problem	Possible cause	Remedy
Engine produces excessive black or dark grey smoke.	1. Maximum delivery of injection pump too high.	Adjust injection pump on test bench to the values specified in calibration chart.
	2. Injection pump delivery excessively retarded or automatic advance regulator damaged.	Adjust injection pump/engine timing or check automatic advance regulator.
	3. Injection pump delivery excessively advanced.	Adjust injection pump/engine timing.
	4. Injectors partially or totally obstructed or incorrectly adjusted.	Clean and overhaul injectors and adjust pressure setting; replace if necessary.
	5. Air filter clogged.	Clean air cleaner and replace filter element if necessary.
	6. Loss of engine compression due to: – piston rings sticking; – cylinder liner wear; – worn or incorrectly adjusted valves.	Replace damaged parts or, if necessary, recondition engine.
	7. Damaged high-pressure fuel lines.	Inspect and replace if necessary.
Blue, grey-blue or grey-white smoke.	1. Injection pump delivery excessively retarded or automatic advance regulator damaged.	Adjust injection pump/engine timing or check automatic advance regulator.
	2. Injectors obstructed or damaged.	Clean and overhaul injectors and adjust pressure setting; replace if necessary.
	3. Oil leaking past piston rings due to sticking rings or cylinder liner wear.	Replace damaged parts or, if necessary, recondition engine.
	4. Oil leaking through the inlet valve guides due to guide or valve stem wear.	Recondition cylinder head.
	5. Engine does not reach correct operating temperature (thermostat faulty).	Replace thermostat.
Engine runs on after switching off.	1. Engine stop solenoid damaged.	Replace solenoid.
	2. All-speed governor damaged.	Recondition injection pump and adjust on test bench to values specified in calibration data chart.

ENGINE DISASSEMBLY



Right Hand View of Engine 7

1. Thermostat
2. Coolant Radiator
3. Air Conditioning Condenser (when fitted)
4. Transmission Oil Cooler
5. Battery Isolator
6. Water Pump
7. Fuel Lift Pump
8. Fuel Sedimentor/Separator
9. Fuel Filter
10. Cold Start
11. Coolant Recovery Tank
12. Air Cleaner

⚠ WARNING ⚠

Allow the engine to cool too ambient temperature before cleaning. Cleaning a hot engine in cool water could result in damage to the Fuel Pump and other components.

In the following procedures and illustrations the engine in the main is shown removed from the tractor.

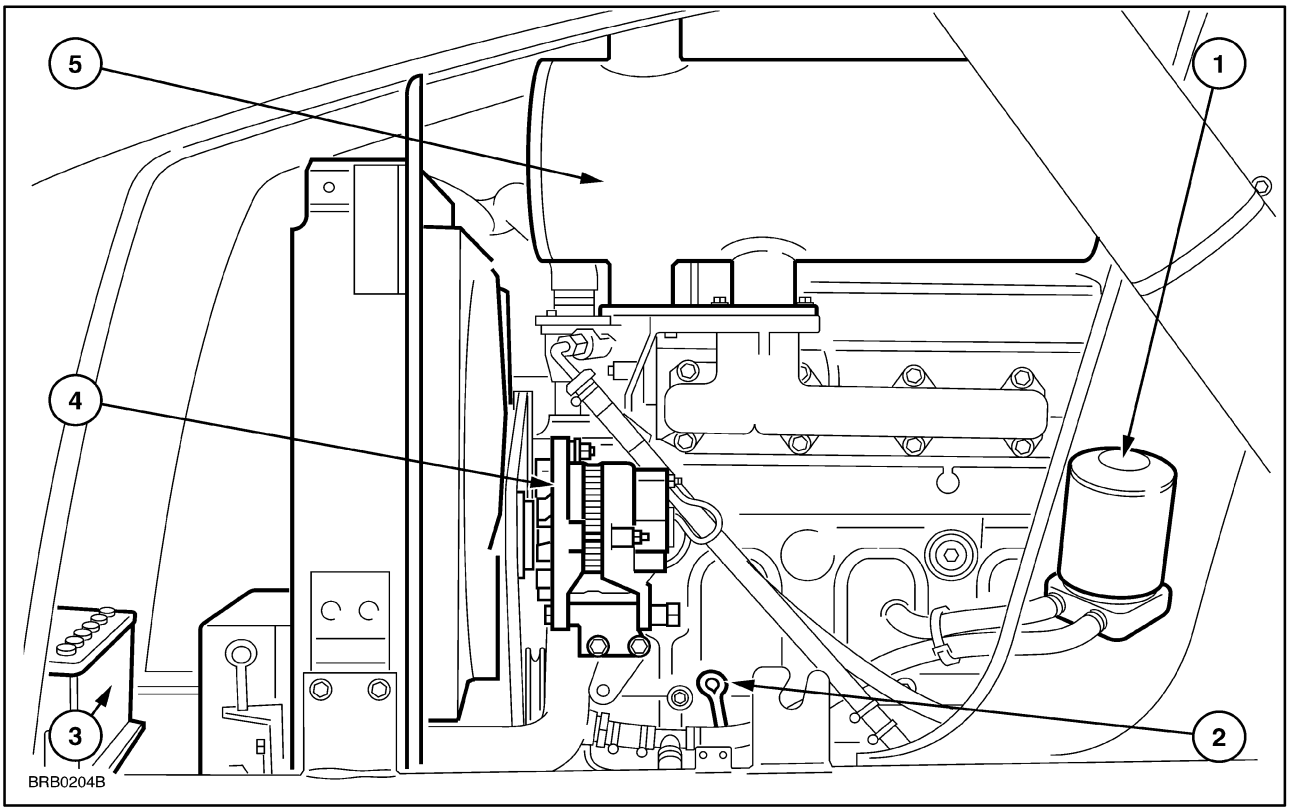
The engine overhaul procedure initially describes the assembly process for rebuilding an engine using all new components. Following this section are defined headings which describe detailed repair specifications and procedures, where components are suitable for re-use. Refer to the specifications section to ensure components are serviceable.

Where overhaul of components is required without engine being removed from the tractor refer to the following headings, and the relevant paragraphs, in the main overhaul procedure.

Operations or repairs that can be performed with the engine still in the tractor.

- Cylinder head and associated components.
- Fuel injection pump and related parts.

ENGINE DISASSEMBLY



Left Hand View of Engine 8

1. Oil Filter
2. Engine Oil Level Dipstick
3. Battery
4. Alternator
5. Muffler

Removal of Engine / transmission from the Vehicle

⚠ WARNING ⚠

Before performing any service or maintenance on the machine ensure the wheels are choked / blocked to prevent the machine from moving.

1. Lock loader in raised position and crowd bucket fully forward
2. Drop backhoe to the ground, switch off engine and release any pressure in the system.
3. Isolate battery
4. Remove all engine panels.
5. Remove front cast cowling
6. Drain engine coolant and remove hoses
7. Pull main hydraulic cooler over radiator tabs
8. Remove all fixing bolts and move radiator forward
9. Disconnect transmission cooler pipes.
10. Remove radiator, taking care not to damage the fan or hydraulic oil cooler.
11. Remove Air Cleaner assembly
12. Disconnect all electrical connections
13. Disconnect cable and hydraulic pipe clamp

14. Disconnect the heater and Air Conditioning hoses.

IMPORTANT: *If air conditioning is fitted, disconnect at the air conditioning quick release couplings only. If it is necessary to disassemble the air conditioning at any other point, it will be necessary to discharge the system using a suitable reclaim/recharging station.*

15. Disconnect the fuel tank feed and return pipes pipes

16. Disconnect the foot throttle cable at the injection pump.

17. Remove the cab mat

18. Remove the cab floor access panel

19. Disconnect the electrical connections
    - Forward Reverse solenoids (on top of the transmission)
    - Transmission lever at base of lever
    - FWD solenoid

20. Disconnect the transmission to lock out valve pipe

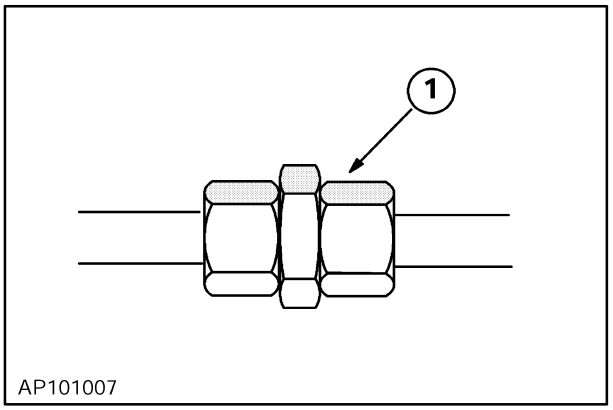
21. Disconnect lock out return pipe and plug the hole (oil will leak out of transmission)

22. Remove front drive shaft (where fitted) and remove rear drive shaft

23. Disconnect the hand brake cable

24. Disconnect the gear lever

25. Pull back hydraulic pumps (leaving all pipes attached). Check that the oil pump drive shaft does not slide out with the pump



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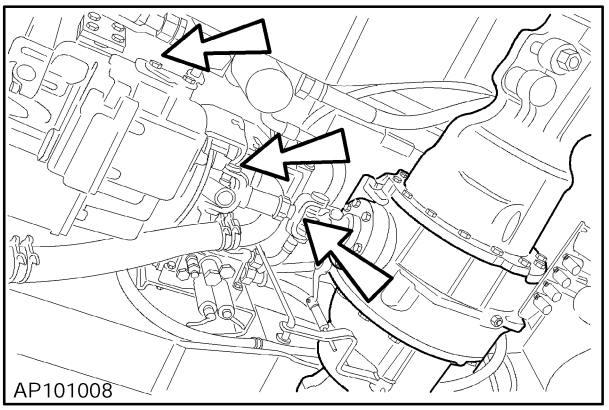

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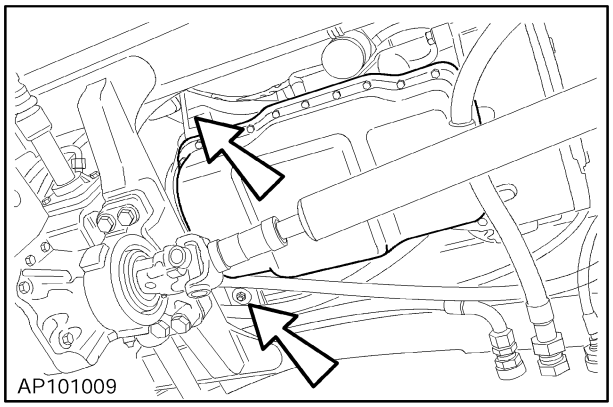


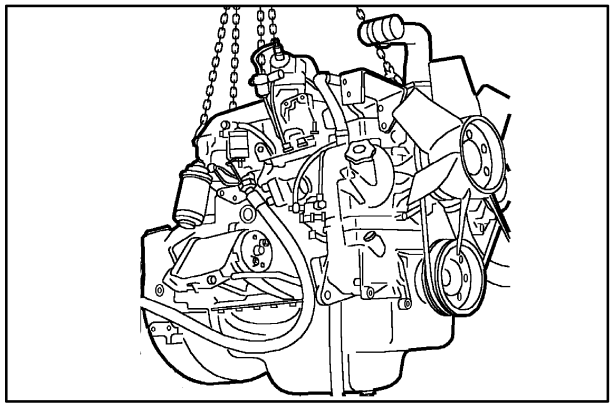
11

26. Check return from steering motor is on the outside of transmission oil level tube.

27. With the engine supported and using a 'hoist' capable of supporting a total weight of 800 kgs 1760 lbs loosen and remove the Engine and Transmission mounting bolts

28. Using lifting tool very carefully raise the hoist and guide the engine/transmission assembly from the vehicle

29. Gently slide the transmission with the torque convertor from the engine



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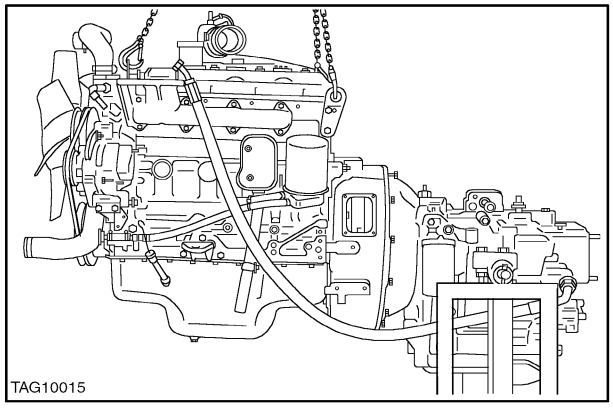
30. Hoist the engine/transmission assembly clear of the machine. Attach the transmission to a suitable stand before attempting to disassemble the engine, from the transmission.



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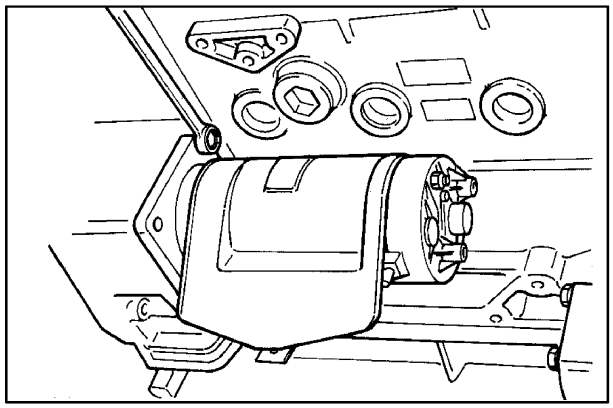
31. Remove the starter motor bolts and place to one side.



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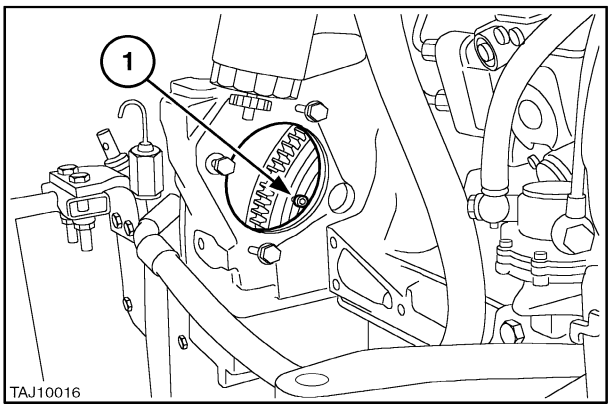
Using an allen key remove the x8 bolts, 1, securing the torque convertor to the flywheel.

This allows the torque convertor to remain with the transmission when the engine is removed.



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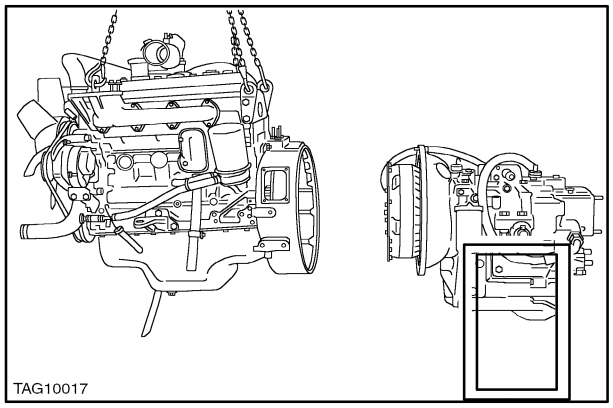
32. Remove the engine to transmission securing bolts and position the engine on a suitable stand for disassembly.



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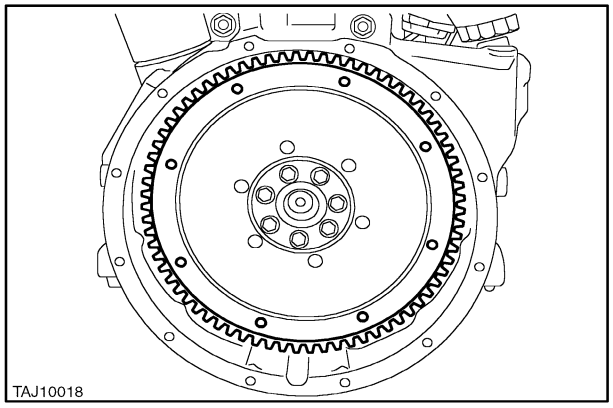
33. After repair the re-assembly of the transmission to engine is the reverse procedure.

IMPORTANT: *In the rear of the flywheel are x6 counterbores, these must be aligned with the bolt heads on the torque convertor when bolting up the assembly.*

If they are not aligned an interference fit between torque convertor and flywheel will result in a lock up situation.



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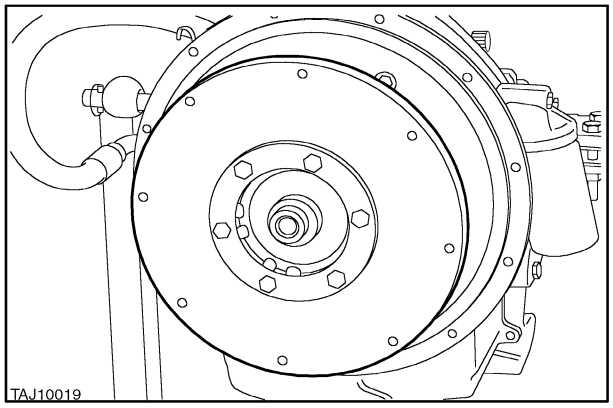

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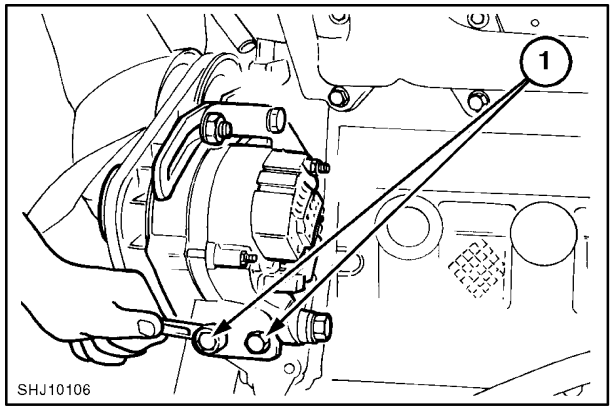
ENGINE TEARDOWN AND OVERHAUL

1. Undo the alternator support retaining bolts, 1, and remove the complete alternator assembly.



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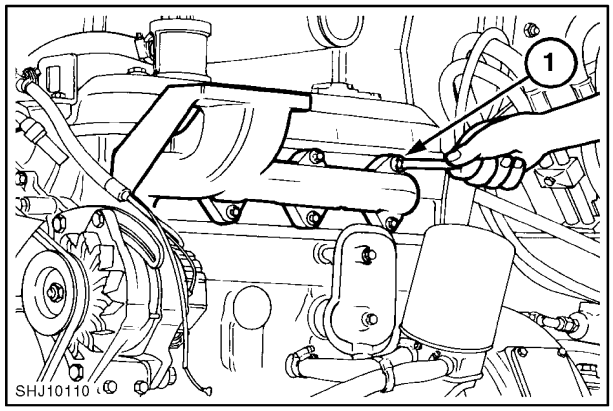
2. Where fitted remove the turbocharger and then remove the bolts, 1, securing the exhaust manifold to the cylinder head, remove the manifold.



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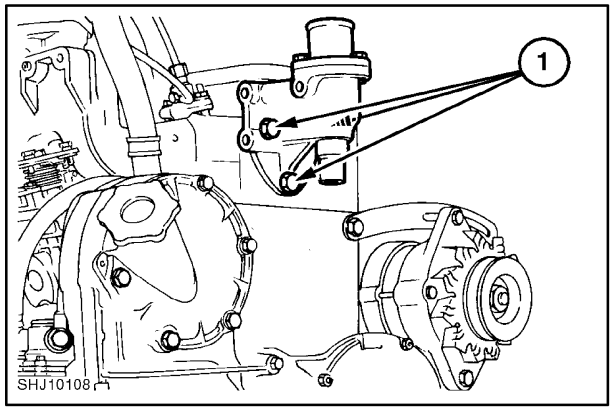
3. Remove the thermostat housing retaining bolts, 1, and remove the thermostat housing.



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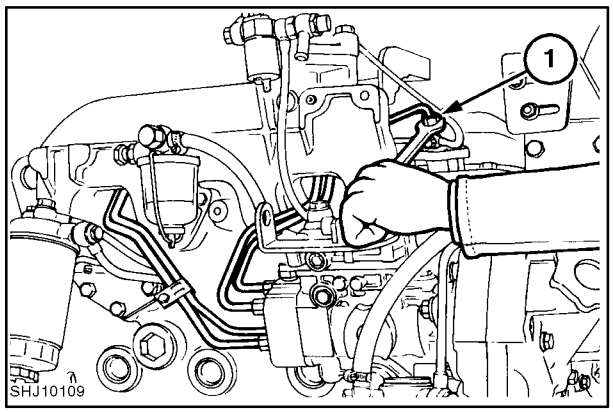
4. Unscrew the high pressure fuel line unions, 1, on the injection pump and remove the fuel lines.



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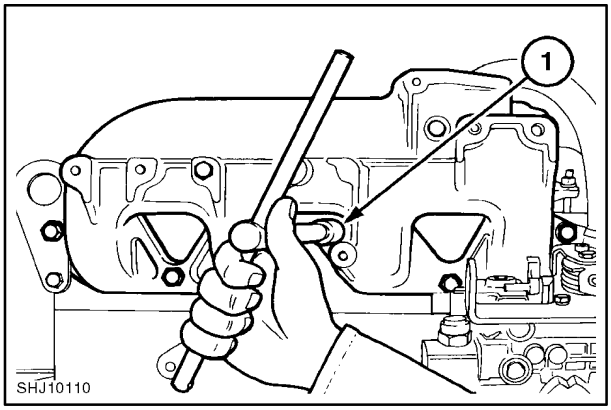
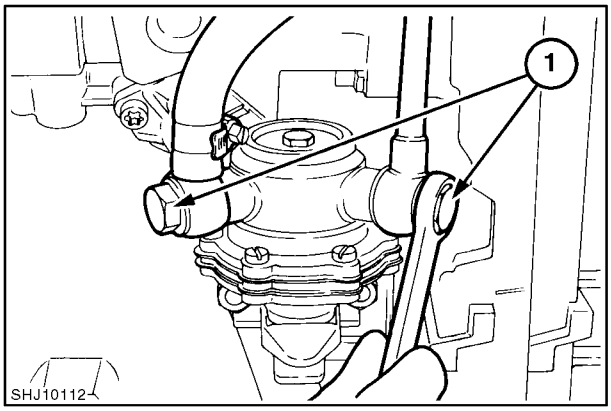
5. Unscrew the bolts, 1, securing the inlet manifold to the cylinder head and remove the manifold.



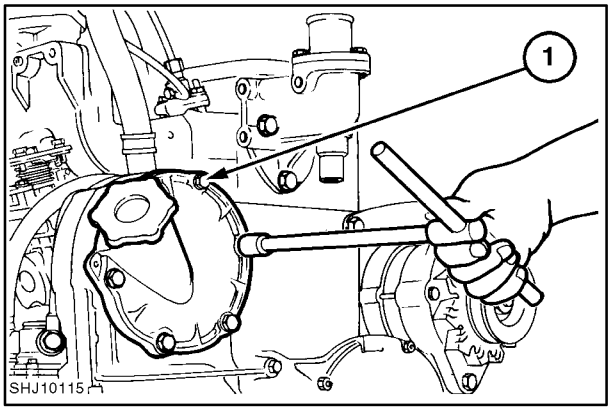
23

6. Unscrew the unions, 1, on the fuel supply pump and detach the fuel lines.



24

7. Undo screws, 1, and remove the injection pump drive gear cover.



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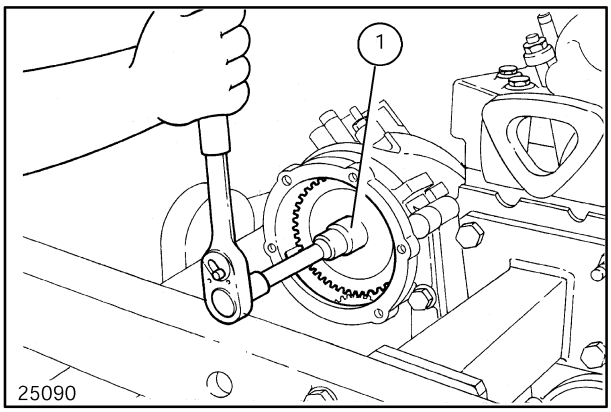
8. Unscrew the nut, 1, securing the injection pump shaft to the drive gear.



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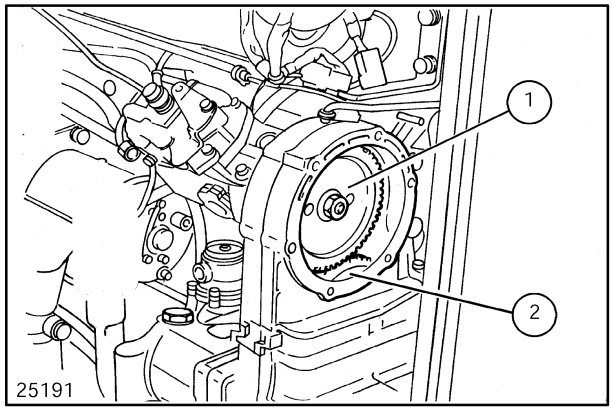
9. Rotate the flywheel, using a screwdriver as a lever, until the two 4_ reference marks stamped on the gears, 1, and, 2, coincide.



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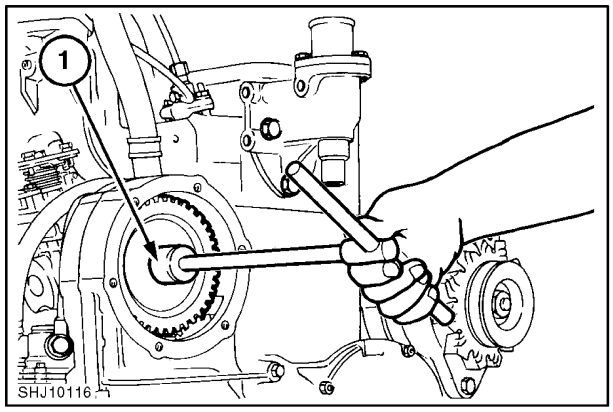
10. Withdraw the injection pump drive gear using tool **295942**, 1, and recover the injection pump and the woodruff key.



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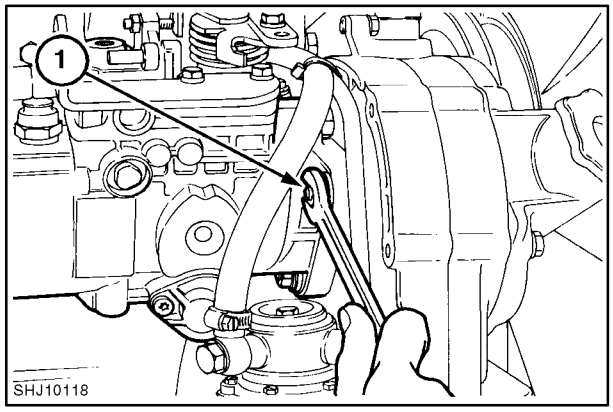
11. Unscrew the nuts, 1, securing the injection pump to the timing gear case.

IMPORTANT: *When refitting the fuel injection pump or any fuel injection components to the engine refer to Chapter 2 Fuel System.*



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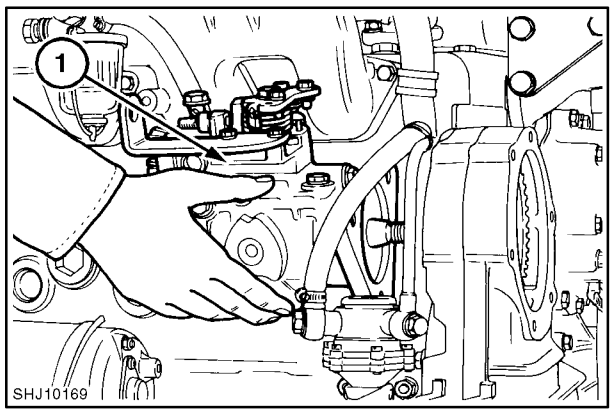
12. Lift off the injection pump, 1.



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