# Perkins
# Peregrine EDi and 1300 Series EDi

Models WK to WS

# WORKSHOP MANUAL

**Peregrine** — **6 cylinder turbocharged diesel engines with electronic management system for automotive applications**

**1300 Series** — **6 cylinder turbocharged diesel engines with electronic management system for agricultural and industrial applications**

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# 2

# Specifications

## Basic engine data

Number of cylinders ... 6
Cylinder arrangement ... In line
Cycle ... Four stroke
Induction system ... Turbocharged or Turbocharged / intercooled
Combustion system ... Direct injection

Nominal bore:

WK, WL ... 109,2 mm (4.301 in)
WM, WN, WP, WQ, WR and WS ... 116,6 mm (4.590 in)

Stroke:

WP and WQ ... 118,9 mm (4.681 in)
WK, WL, WM, WN, WR and WS ... 135,9 mm (5.350 in)

Compression ratio:

WK, WL, WP and WQ ... 16.5:1
WM, WN, WR, and WS up to 205 kw (275 bhp) ... 16.9:1
WM, WN, WR, and WS over 205 kw (275 bhp) ... 17.2:1

Cubic capacity:

WK, WL, WP and WQ ... 7,64 litres (466.4 $in^3$)
WM, WN, WR and WS ... 8,71 litres (531.0 $in^3$)
Firing order ... 1, 5, 3, 6, 2, 4

Valve tip clearances (cold):

Inlet and exhaust ... 0,64 mm (0.025 in)

Lubricating oil pressure:

Idle (minimum) ... 103 kPa (15 $lbf/in^2$) 1,06 $kgf/cm^2$
Maximum engine speed and normal engine temperature ... 276/483 kPa (40/70 $lbf/in^2$) 2,81/4,92 $kgf/cm^2$

Capacity of a typical lubricating oil sump (1):

Without filter canister ... 22,7 litres (40.0 UK pints) 24 US quarts
With filter canister ... 28,3 litres (49.9 UK pints) 28 US quarts
Typical coolant capacity (engine only) ... 12,8 litres (22.5 UK pints) 13,5 US quarts
Direction of rotation ... Clockwise from the front

**(1)** The capacity of the sump may vary according to the application. Fill to the "Full" mark on the dipstick. Do not exceed the "Full" mark.

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## Rocker cover

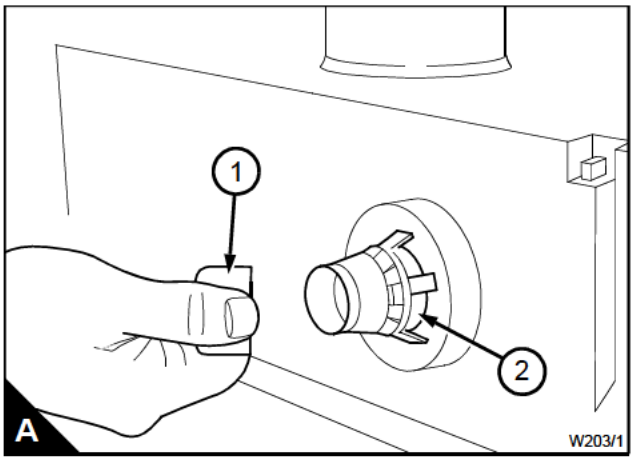
### To remove — Operation 3-1

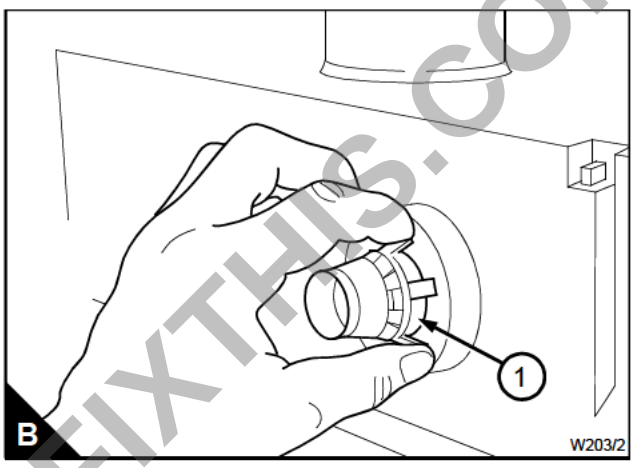
1 Remove the pipe for the air inlet from the rocker cover.

2 Remove the setscrews that retain the engine breather pipe, and remove the pipe.

3 Disconnect the wiring loom (A1) for the fuel injector units, at the rocker cover electrical connector (A2).

4 Press the four tags (B1) that secure the rocker cover electrical connector for the wiring loom to the rocker cover, and push the connector into the rocker cover.

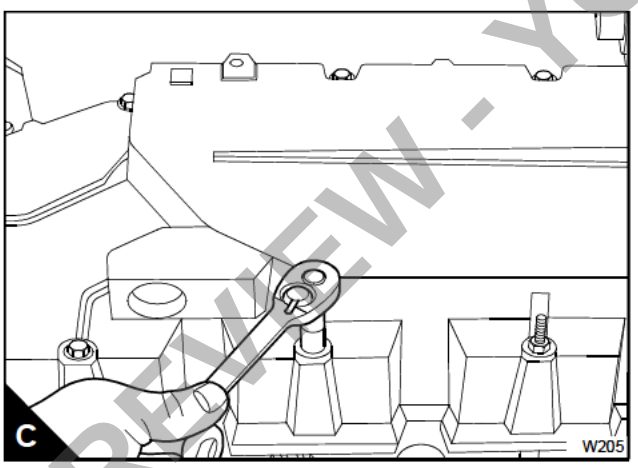



5 Remove the 13 setscrews (C) that retain the rocker cover.

6 Lift carefully the rocker cover and tilt it away from the exhaust manifold. Ensure that the electrical connector for the wiring loom is free from the rocker cover then remove the rocker cover from the engine.

7 Remove the rocker cover gasket from the cylinder head.




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## Recommended torque settings

**Notes:**

- The torque tensions below apply to components lubricated lightly with clean engine oil before they are fitted.
- The setscrew for the upper idler gear is supplied with a sealant on its thread. Do not put lubricating oil on the thread of this setscrew.

### Standard torques

| Thread size | Flanged head fasteners | | | | Non-flanged head fasteners | | | |
|---|---|---|---|---|---|---|---|---|
| | Nm | lbf ft | kgf m | Spanner size mm | Nm | lbf ft | kgf m | Spanner size mm |
| M6 x 1 | 11 | 8 | 1,1 | 8 | 8 | 6 | 0,8 | 10 |
| M8 x 1,25 | 24 | 18 | 2,5 | 10 | 20 | 15 | 2,1 | 13 |
| M10 x 1,5 | 49 | 36 | 5,0 | 13 | 41 | 30 | 4,1 | 16 |
| M12 x 1,75 | 83 | 61 | 8,4 | 15 | 69 | 51 | 7,1 | 18 |
| M16 x 2 | 209 | 154 | 21,3 | 21 | 174 | 128 | 17,7 | 24 |

### Specific torques

| Description | Nm | lbf ft | kgf m |
|---|---|---|---|
| **Aspiration system** | | | |
| Setscrew, breather pipe, bottom | 49 | 36 | 5,0 |
| Setscrew, breather pipe, top | 83 | 61 | 8,4 |
| Setscrews, turbocharger to exhaust manifold | 66 | 49 | 6,8 |
| Setscrews, turbocharger compressor housing to backplate | 23 | 17 | 2,35 |
| Setscrews, turbocharger turbine housing to bearing housing | 13 | 9.6 | 1,3 |
| **Auxiliary equipment** | | | |
| Nut, air compressor drive gear | 149 | 110 | 15,21 |
| Setscrews, air compressor mounting bracket to engine | 115 | 85 | 11,9 |
| Setscrews, air compressor to engine | 62 | 46 | 6,4 |
| Setscrews, air compressor to mounting bracket | 66 | 49 | 6,7 |
| **Cooling system** | | | |
| Setscrews, coolant filter flange to timing case | 26 | 19 | 2,6 |
| Setscrews, fan drive | 22 | 16 | 2,2 |
| Setscrews, fan drive pulley | 7 | 5.5 | 0,8 |
| Setscrews, fan belt tensioner to timing case | 50 | 37 | 5,1 |
| Setscrews, coolant pump pulley | 7 | 5.5 | 0,8 |
| Fasteners, coolant pump to timing case cover | 7 | 5.5 | 0,8 |
| **Crankshaft assembly** | | | |
| Setscrews, main bearings | See Operation 5-8 | | |
| Setscrews, main bearings (engine serial number 850000 or more) | See Operation 5-8 | | |
| Setscrews, pulley / damper assembly | 217 | 100 | 22,0 |
| Setscrews, rear oil seal housing to cylinder block | 24 | 18 | 2,5 |
| **Cylinder head assembly** | | | |
| Setscrews, cylinder head | See Operation 3-9 | | |
| Setscrews, engine lift brackets | 60 | 44 | 6,0 |
| Setscrews, exhaust manifold to cylinder head | 81 | 60 | 8,3 |
| Setscrews, rocker cover | 18 | 13 | 1,8 |
| Setscrews, supply manifold to cylinder head | 27 | 20 | 2,8 |
| **Flywheel and flywheel housing** | | | |
| Setscrews, flywheel | 136 | 100 | 13,8 |
| Setscrews, flywheel housing | 108 | 80 | 11,0 |

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## Flash codes

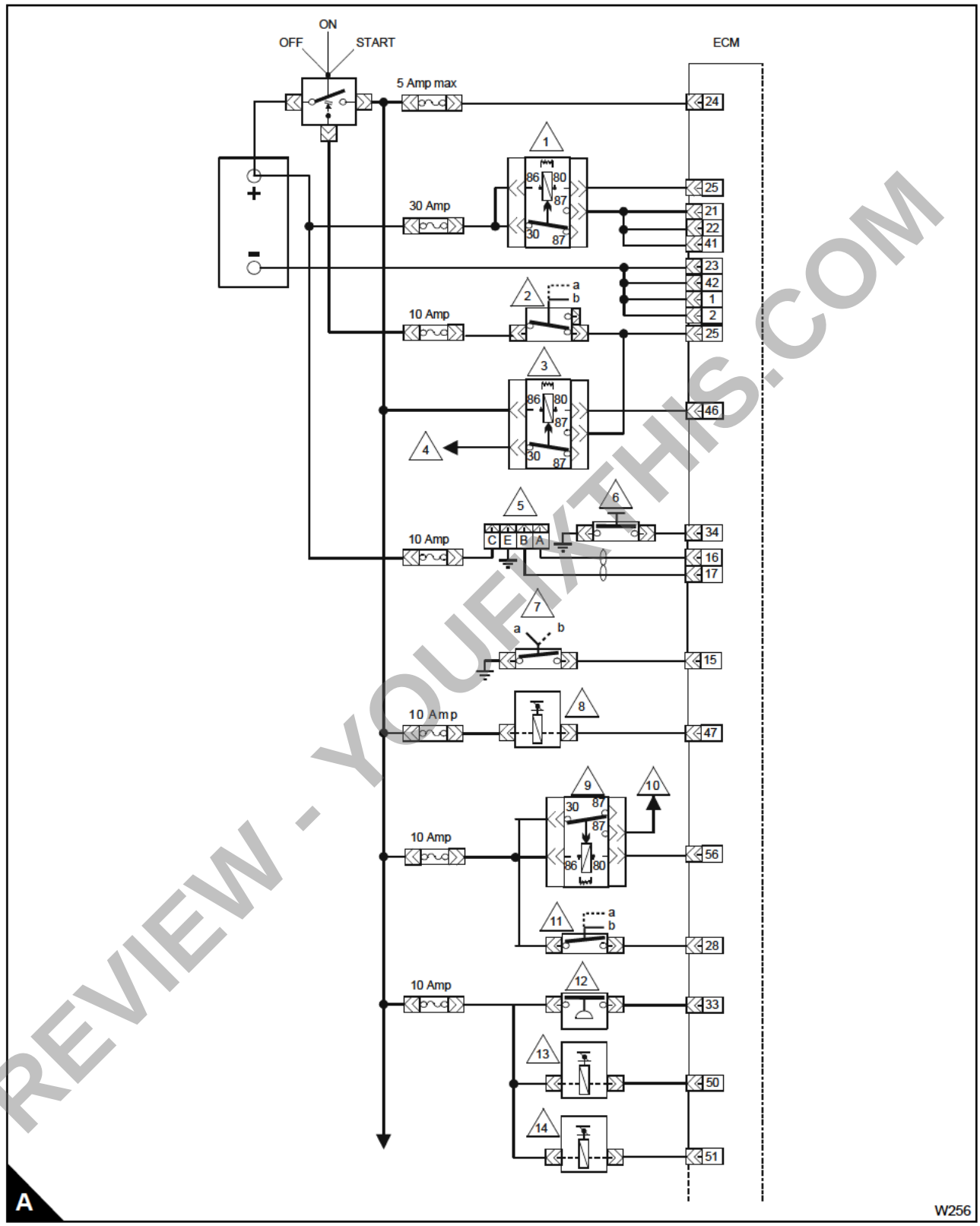
| Flash code | Condition description | Comments | Probable causes |
|---|---|---|---|
| 111 | No errors found | - | - |
| 112 | Electrical system voltage B+ out of range: high | ECM voltage is continuously more than 18v | Charging system fault |
| 113 | Electrical system voltage B+ out of range: low | ECM voltage is continuously less than 6.5v.<br>Cause of no start/misfire | Low battery voltage. Loose connections. High resistance in circuit |
| 114 | Engine coolant temperature signal out of range: low | Defaults to 180 °F (82 °C). No fast idle.<br>Signal voltage less than 0.127v | Circuit or sensor short circuit to earth |
| 115 | Engine coolant temperature signal out of range: high | Defaults to 180 °F (82 °C). No fast idle.<br>Signal voltage greater than 4.6v | Open circuit. Sensor failure |
| 121 | Manifold absolute pressure signal out of range: high | Defaults to ECM setting.<br>Low power. Slow acceleration.<br>Signal voltage greater than 4.6v | Sensor failure |
| 122 | Manifold absolute pressure signal out of range: low | Defaults to ECM setting.<br>Low power. Slow acceleration.<br>Signal voltage greater than 4.6v | Short circuit to earth. Sensor failure |
| 123 | Manifold absolute pressure fault: in range | Defaults to ECM setting.<br>Low power. Slow acceleration | Hose or MAP sensor blocked |
| 124 | Injection control pressure signal out of range: low | Defaults to open-loop control.<br>Underrun at low idle.<br>Signal voltage less than 0.039v | Short circuit low.<br>Open circuit. Sensor failure |
| 125 | Injection control pressure signal out of range: high | Defaults to open loop control<br>Underrun at low idle.<br>Signal voltage greater than 4.897v | Short circuit high. Sensor failure |
| 131 | Speed control signal out of range: low | Signal voltage less than 0.152v<br>Engine at low idle only | Short circuit to grid, or open in circuit. Sensor failure. |
| 132 | Speed control signal out of range: high | Signal voltage greater than 4.55v.<br>Engine idle only | Short circuit to reference voltage or 12 volts. Sensor failure |
| 133 | Speed control signal fault: in range | Speed control position does not match the idle validation switch.<br>Kept to 0% of Speed control position | Speed control failure |
| 134 | Speed control position does not match the idle validation switch | Kept to 0% of Speed control position | Speed control and idle validation switch failure |
| 135 | ECM low idle validation switch circuit faulty | Speed control position does not match the idle validation switch.<br>Kept to 50% of Speed control position.<br>Engine speed limited | Idle validation switch failure |
| 141 | Vehicle speed signal out of range: low | Speed sensor signal is less than 0.48v (0 Kmh/mph).<br>Cruise control and PTO disabled.<br>Engine speed limited | VSS sensor open circuit or short circuit to earth |
| 142 | Vehicle speed signal out of range: high | Speed sensor signal is greater than 4.492v (0 Kmh/mph).<br>Cruise control and PTO disabled | Short circuit to reference voltage or 12 volts |
| 143 | Wrong number of pulses per revolution from the camshaft position sensor | Intermittent signal | Poor connection or camshaft position sensor failure |
| 144 | Interference found at the camshaft position sensor | ECM found excessive external inputs | Interference. Injector unit voltage short circuit to earth |
| 145 | No signal from the camshaft position sensor but the injection control pressure has increased | Found by the ECM | Short circuit to earth. Open circuit. Sensor failure |

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**Wiring diagram (A)**




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# 3 Cylinder head assembly

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**Cylinder head assembly**

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## To correct a valve seat with a valve seat cutter — Operation 3-18

**Special requirements**

| Special tools | |
|---|---|
| **Description** | **Part number** |
| Set of adjustable cutters for valve seats | 21825938 |

**1** Before work is done on the valve seats, new valve guides must be fitted.

**2** Fit the pilot in the valve guide and tighten the pilot.

**3** Select the relevant cutter. Set the blades of the cutters to the diameter of the valve seat to be cut. Fit the cutter on the pilot and fit the handle. Ensure that the cutter is not allowed to fall on to the seat as this can damage the blades.

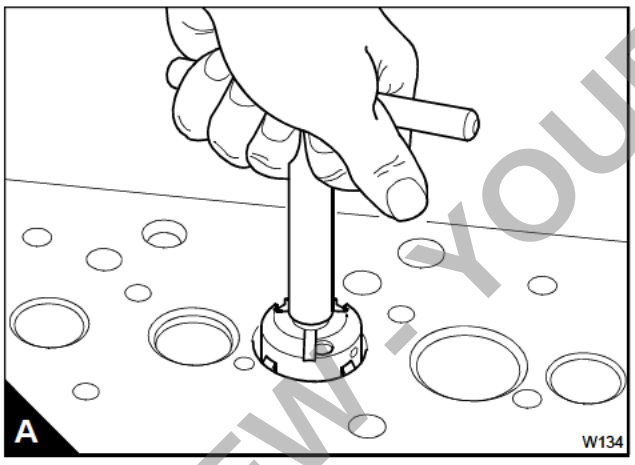
**4** Carefully rotate the cutter in a clockwise direction (A). Remove only the minimum material to ensure a good seat. Keep the seat as narrow as possible.

**5** When the seat is cut, remove the cutter and the pilot. Remove any debris from the area of the valve seat and the port.

**6** Fit the valve and lightly lap the valve and the seat.

**7** Check that the valve depth is within limits, see Operation 3-12.

**8** If a valve seat has become too damaged or too worn to correct, a new valve seat insert can be fitted, see Operation 3-19.




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To fit **Operation 6-6**

**1** Clean and inspect all components for wear or damage. Inspect the timing case for cracks, especially around the channels for the engine fluids.

**2** Fit a new joint (A5) to the backplate.

**3** Engage the backplate dowels (A3) and push the backplate onto the engine.

**4** Lightly lubricate the threads and shoulders of the setscrews for the backplate with clean engine lubricating oil.

**5** Fit and tighten the setscrews to 26 Nm (19 lbf ft) 2,6 kgf m.

**6** Fit the camshaft, see Operation 6-8.

**7** Fit the tappets into their original bores.

**8** Fit the cylinder head, see Operation 3-9.

**9** Fit the oil pressure relief valve together with its 'O' ring (A6).

**10** Fit the idler gears, see Operation 6-4.

**11** Fit a new coolant filter.

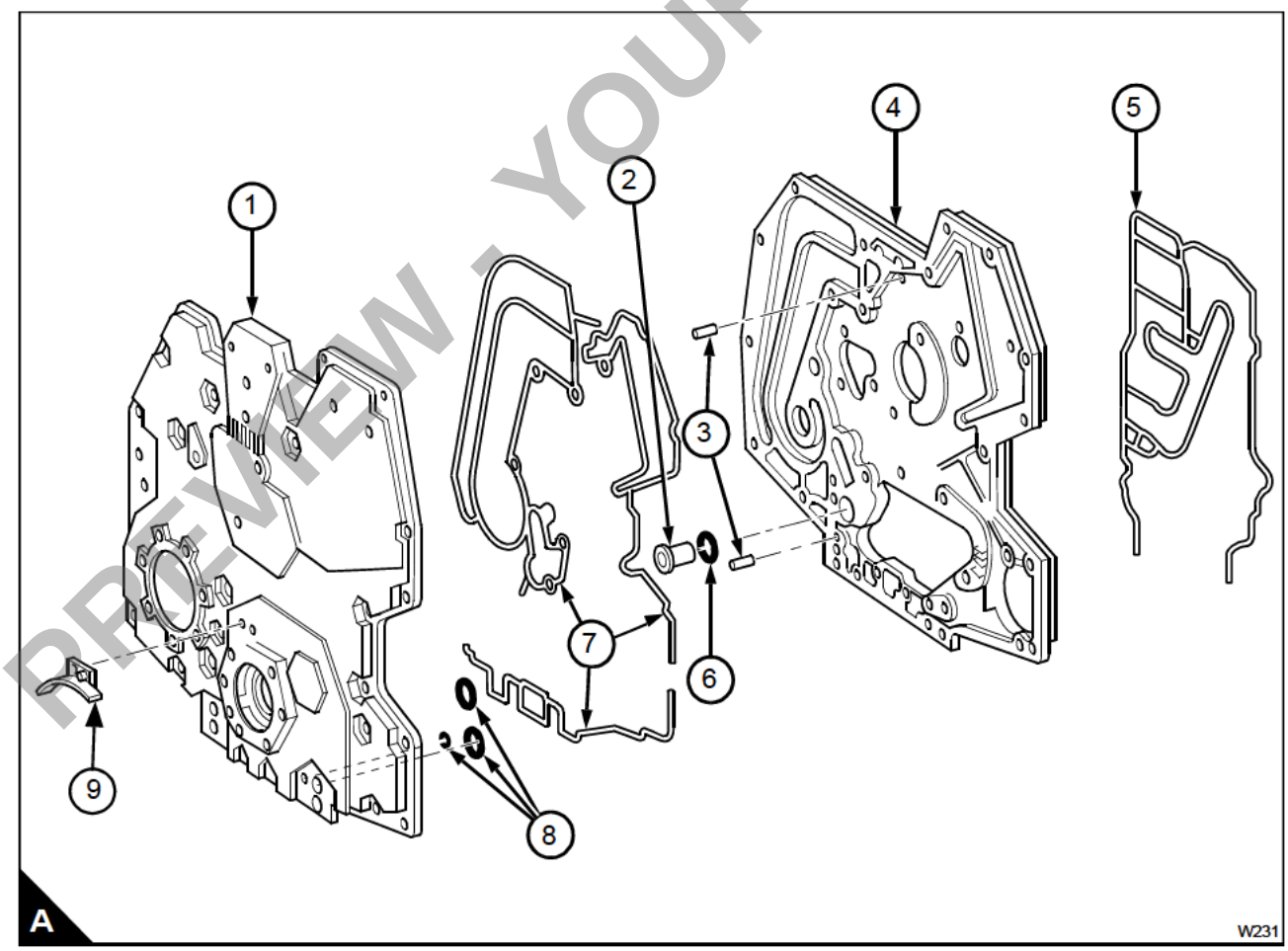
**12** Fit the power steering pump, see Operation 15-2, the compressor, see Operation 15-1, and their mounting brackets, if removed earlier.

**13** Fit the high-pressure pump, see Operation 10-22.

**14** Fit the timing case cover, see Operation 6-2.

**15** Fill the cooling system to the correct level.

**16** Fill the lubricating system to the correct level with an approved oil, see Chapter 5 in the User's Handbook.




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## To renew (oil pump fitted) — Operation 10-16

**Special requirements**

| Special tools | | Consumable products | |
|---|---|---|---|
| **Description** | **Part number** | **Description** | **Part number** |
| Crankshaft front oil seal replacer | 21825577 | POWERPART Compound | 1861147 |

**1** Remove the pulley / damper assembly, see Operation 5-1.

**Notes:**

- The 'positive on-shaft excluder' (POSE) is not fitted on WK, WL, WP, and WQ engines.
- Do not separate the wear sleeve from the POSE excluder.

**2** Use a suitable hand tool, e.g. a chisel in an air hammer, to remove the wear sleeve, and the POSE, if fitted, from the pulley / damper assembly (A).

***Caution:*** *Care must be taken not to damage the pulley flange.*

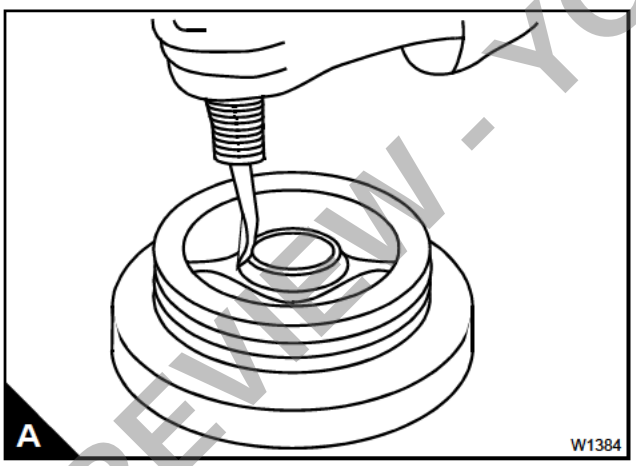
**3** Remove the oil seal from the pump with a suitable lever behind the main lip of the oil seal. Do not damage the edge of the oil pump housing or the crankshaft nose.

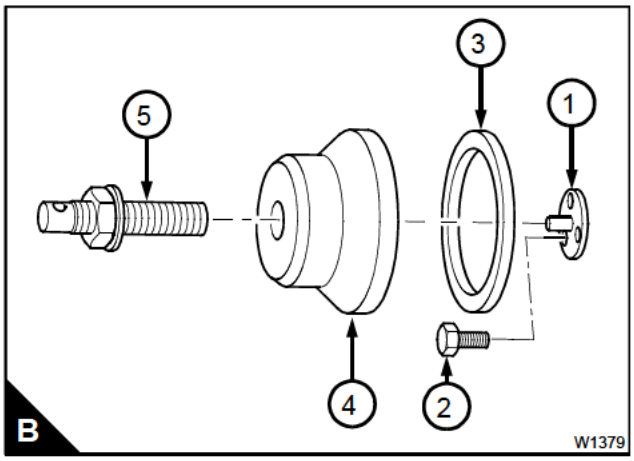
**4** Fit adaptor (B1) of the installer to the crankshaft nose with three locally obtained hexagon head M12 x 1,25 x 40 long setscrews (B2), the heads must be small enough not to obstruct the thread of the replacer tool (B5).

**5** Fit a new oil seal (B3) onto tool 21825953 (B4) and align to the oil pump housing. Apply POWERPART Compound to the outer surface of the oil seal.

**6** Fit the replacer tool (B5) through the installer (B4) and fully engage the thread of the adaptor (B1). Tighten the nut of the replacer tool (B5) to push the oil seal (B3) into the pump housing until the seal is aligned with the front of the housing.

**7** Remove the replacer tool (B5), the installer tool (B4), the three setscrews (B2), and the adaptor (B1). Remove excess compound from the housing / seal.




*Continued*

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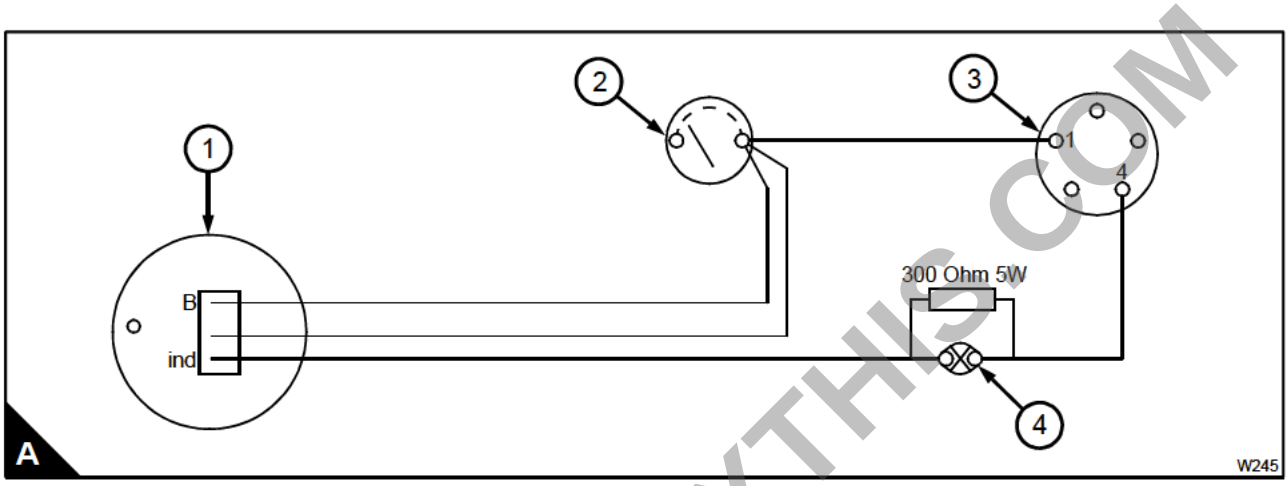


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## Alternator wiring diagrams

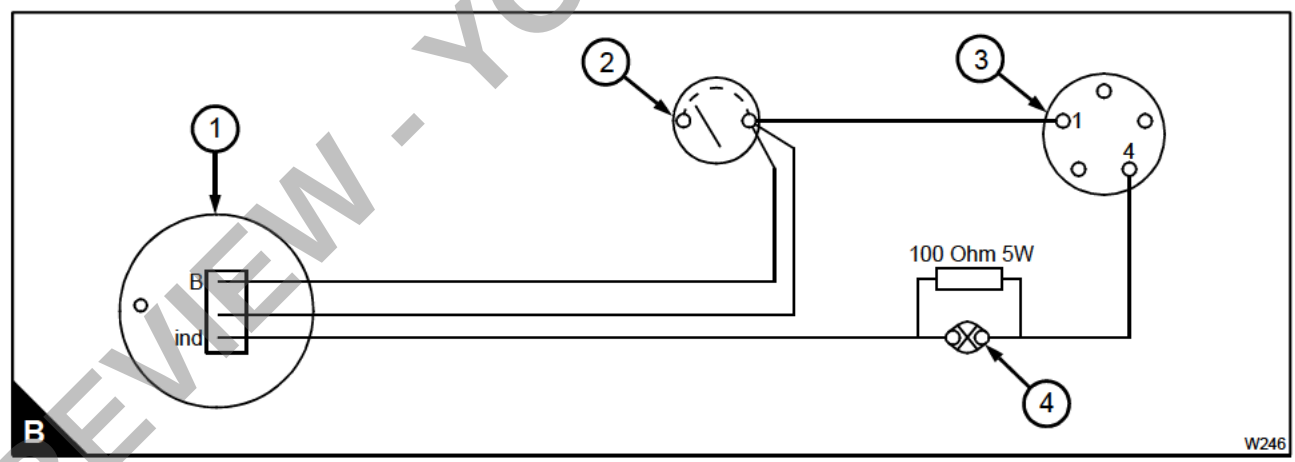
### Prestolite AC5RS, 55A

**A1** Alternator
**A2** Ammeter (if fitted)
**A3** Ignition switch
**A4** Alternator warning lamp 24v 24W




### Prestolite ACR5RS, 60A

**B1** Alternator
**B2** Ammeter (if fitted)
**B3** Ignition switch
**B4** Alternator warning lamp 12v 2,2W




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