

VISCOUS HEATER

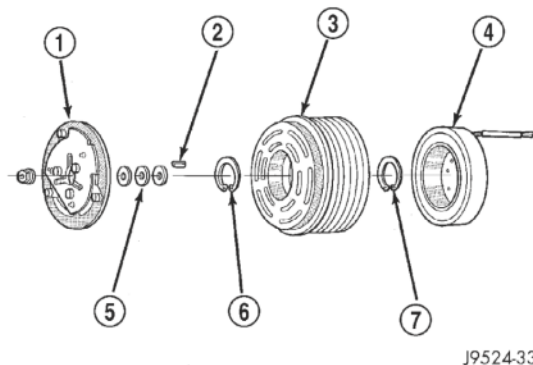
DESCRIPTION

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The diesel engine has an engine mounted mechanical device called a Viscous Heater that is used to heat the coolant coming from the engine to the heater core. The Viscous Heater is driven by the engine fan belt and has a electro-mechanical clutch which is controlled by the HVAC control unit.

DESCRIPTION - VISCOUS HEATER CLUTCH

The basic viscous heater clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly and a clutch plate. The electromagnetic coil unit and the hub bearing and pulley assembly are each retained on the nose of the compressor front housing with snap rings (Fig. 17). The clutch plate is keyed to the viscous heater shaft and secured with a nut. These components provide the means to engage and disengage the viscous heater from the engine accessory drive belt.



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Fig. 17 CLUTCH ASSEMBLY- typical

- 1 - CLUTCH PLATE
- 2 - SHAFT KEY
- 3 - PULLEY
- 4 - COIL
- 5 - CLUTCH SHIMS
- 6 - SNAP RING
- 7 - SNAP RING

OPERATION

OPERATION - VISCOUS HEATER

The Viscous Heater is driven by the engine fan belt. The Viscous Heater has an electro-mechanical clutch that receives a signal from the HVAC control head and the Viscous Heater controller that energizes and engages the clutch. Once engaged the

clutch allows the Viscous Heater to increase the temperature of the coolant flowing to the heater core, which provides heat the passenger compartment quicker than normal engines without the Viscous Heater. The Viscous Heater generates heat by means of friction which heats a special Silicon Oil within its housing which is then transferred to the engine coolant when the coolant passes over fins within the pump. Please note that the coolant is isolated from the silicon oil within the pump housing. When demand for passenger compartment heat decreases the Viscous Heater clutch will receive an input from the Viscous heater controller to disengage.

OPERATION - VISCOUS HEATER CLUTCH

When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the viscous heater shaft. When the coil is not energized the pulley freewheels on the clutch hub bearing, which is part of the pulley. The viscous heater clutch and coil are the only serviced parts on the viscous heater assembly. If the viscous heater is inoperative or damaged the entire assembly must be replaced. The viscous heater clutch engagement is controlled by several components: the viscous heater controller, the engine powertrain control module and the HVAC control head.

REMOVAL

REMOVAL - VISCOUS HEATER

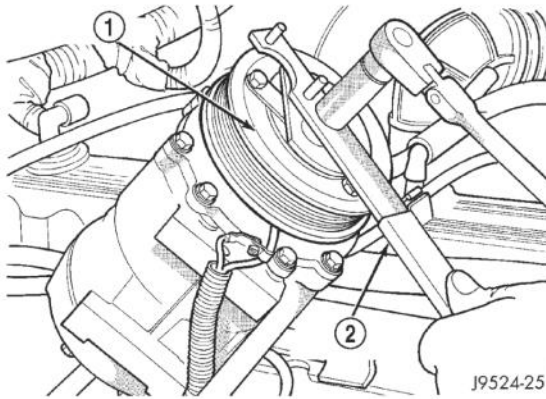
- (1) Drain the engine coolant(Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
- (2) Remove the engine accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
- (3) Remove the heater hose clamps at the Viscous Heater.
- (4) Remove the heater hoses from the Viscous Heater.
- (5) Unplug the Viscous Heater clutch electrical connector.
- (6) Remove the bolts holding the Viscous Heater to the mounting bracket.
- (7) Remove the Viscous Heater from the vehicle.

REMOVAL - VISCOUS HEATER CLUTCH

- (1) The viscous heater clutch can be serviced in the vehicle and the cooling system does not have to be drained.
- (2) Disconnect and isolate the battery negative cable.
- (3) Remove the serpentine drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

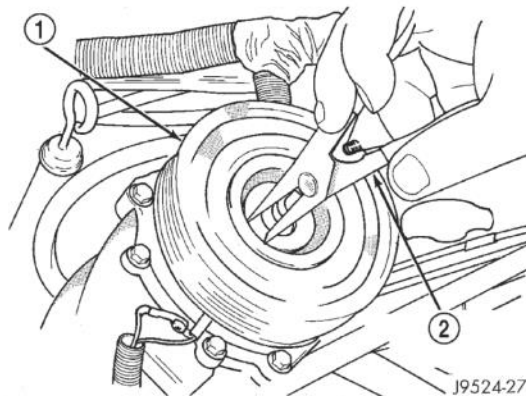
VISCOUS HEATER (Continued)

- (4) Unplug the clutch coil wire harness connector.
- (5) Remove the bolts that secure the viscous heater to the mounting bracket.
- (6) Remove the viscous heater from the mounting bracket. Support the viscous heater in the engine compartment while servicing the clutch.
- (7) Insert the two pins of the spanner wrench (special Tool C-4489 or equivalent) into the holes of the clutch plate. Hold the clutch plate stationary and remove the hex nut (Fig. 18).

**Fig. 18 CLUTCH NUT REMOVE-typical**

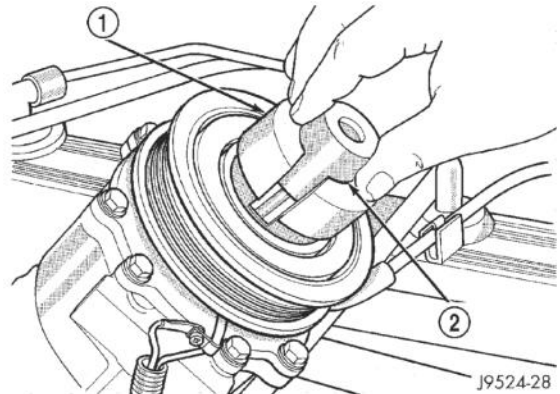
- 1 - CLUTCH PLATE
- 2 - SPANNER

- (8) Remove the clutch plate.
- (9) Remove the clutch shims.
- (10) Remove the external front housing snap ring with snap ring pliers (Fig. 19).

**Fig. 19 EXTERNAL SNAP RING REMOVE-typical**

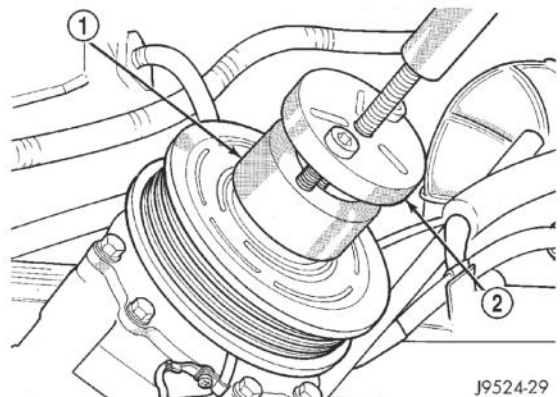
- 1 - PULLEY
- 2 - SNAP RING PLIERS

- (11) Install the lip of the rotor puller (Special Tool C-6141-1 or equivalent) into the snap ring groove exposed in the previous step, and install the shaft protector (Special Tool C-6141-2 or equivalent) (Fig. 20).

**Fig. 20 SHAFT PROTECTOR AND PULLER-typical**

- 1 - PULLER JAW
- 2 - SHAFT PROTECTOR

- (12) Install the puller through bolts (Special Tool C-6461 or equivalent) through the puller flange and into the jaws of the rotor puller and tighten. Turn the puller center bolt clockwise until the rotor is free (Fig. 21).

**Fig. 21 INSTALL PULLER PLATE-typical**

- 1 - PULLER JAW
- 2 - PULLER

- (13) Remove the screw and retainer from the clutch coil lead wire harness on the viscous heater housing.

VISCOUS HEATER (Continued)

(14) Remove the snap ring from the hub and remove the clutch field coil (Fig. 22). Slide the clutch field coil off of the hub.

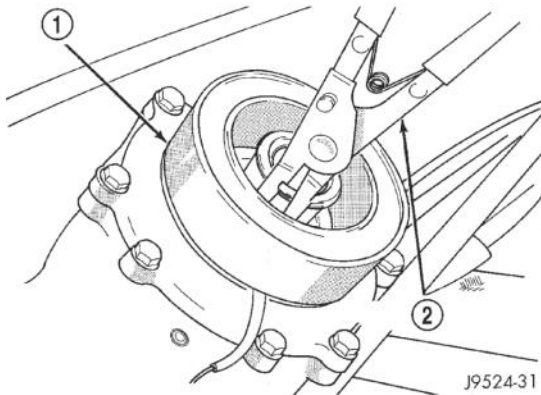


Fig. 22 CLUTCH FIELD COIL SNAP RING REMOVE-typical

- 1 - COIL
2 - SNAP RING PLIERS

INSTALLATION**INSTALLATION**

- (1) Install Viscous Heater to engine mounting bracket.
- (2) Install the Viscous Heater mounting bolts and tighten to 33 N·m (25 ft. lbs.).
- (3) Plug the wiring harness electrical connector to the Viscous Heater clutch.
- (4) Install heater hoses to the Viscous Heater connections.
- (5) Install heater hose clamps to Viscous Heater connections.
- (6) Install the engine accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
- (7) Refill the engine cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
- (8) Reconnect the battery negative cable.
- (9) Operate vehicle and check for any coolant leaks, repair as required.

INSTALLATION - VISCOUS HEATER CLUTCH

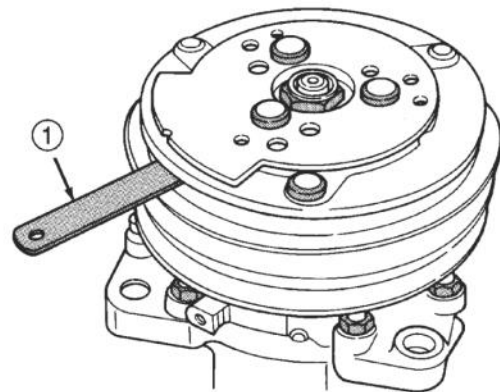
- (1) Install the clutch field coil and snap ring.
- (2) Install the screw and retainer on the clutch coil lead wire harness on the viscous heater housing. Tighten the screw to 2.2 N·m (20 in. lbs.).
- (3) Align the rotor assembly squarely on the front housing hub.
- (4) Install the rotor bearing assembly with the installer (Special Tool C-6871 or equivalent). Thread

the installer on the shaft, then turn the nut until the rotor assembly is seated.

(5) Install the external front housing snap ring with snap ring pliers. The bevel side of the snap ring must be facing outward. Press the snap ring to make sure it is properly seated in the groove.

CAUTION: If the snap ring is not fully seated in the groove it will vibrate out, resulting in a clutch failure and severe damage to the front housing of the compressor.

- (6) Install the original clutch shims on the shaft.
- (7) Install the clutch plate. Install the shaft hex nut and tighten to 15–20 N·m (11–15 ft. lbs.).



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Fig. 23 CHECK CLUTCH AIR GAP-typical

- 1 - FEELER GAUGE

(8) Check the clutch air gap with a feeler gauge (Fig. 23). If the gap does not meet specification, add or subtract shims as required. The air gap specification is 0.41 to 0.79 millimeters (0.016 to 0.031 inches).

NOTE: The air gap is determined by the spacer shims. When installing an original, or a new clutch assembly, try the original shims first. When installing a new clutch (and not having the old shims available) use a 1.0, 0.50 and 0.13 millimeter (0.040, 0.020 and 0.005 inch) shim from the new clutch hardware package that is provided with the new clutch.

(9) Reinstall the viscous heater to the mounting bracket. Tighten the mounting screws to 33 N·m (25 ft. lbs.).

(10) Reinstall the battery negative cable.