

Automotive Engines Theory and Servicing

Ninth Edition

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Chapter 35

Engine Installation and
Break-In

ALWAYS LEARNING

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OBJECTIVES

- 35.1** Discuss the preinstallation checklist.
- 35.2** Explain the procedure for transmission installation.
- 35.3** Explain the process of dressing the engine and engine installation.
- 35.4** Explain engine start and discuss the break-in precautions of an overhauled engine.

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PREINSTALLATION CHECKLIST (1 OF 4)

- Engine installation must be thoroughly checked to ensure that it is in proper condition to give the customer dependable operation for a long time.
- Using a checklist guarantees that all accessories are correctly reinstalled on the engine.

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PREINSTALLATION CHECKLIST (2 OF 4)

- Before installing or starting a new or rebuilt engine in a vehicle, be sure all of the following items have been checked.
 - Be sure the battery is fully charged.
 - Prelube the engine and check for proper oil pressure.
 - Check that all electrical wiring connectors and harnesses are properly installed.
 - Check that all of the vacuum lines are correctly installed and routed.

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PREINSTALLATION CHECKLIST (3 OF 4)

- Before installing or starting a new or rebuilt engine in a vehicle, be sure all of the following items have been checked.
 - Check that all fuel lines are properly connected and free from leaks.
 - Make sure all engine fluids are at the proper operating level such as coolant, engine oil, and power steering fluid.
 - Know the ignition timing specification and procedure.

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PREINSTALLATION CHECKLIST (4 OF 4)

- Before installing or starting a new or rebuilt engine in a vehicle, be sure all of the following items have been checked.
 - Check that fresh fuel is in the fuel tank.
 - Be sure that the radiator has been tested, is free from leaks, and flows correctly.
 - Check that all accessory drive belts are routed and tensioned correctly.

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FIGURE 35-1 A partially melted electrical connector indicates that excessive current flow was present. The cause of the excessive current should be located and corrected before the engine is started.



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TRANSMISSION INSTALLATION (1 OF 5)

- Manual
 - STEP 1 A new clutch assembly or, at the least, a new clutch friction disc should be installed.
 - STEP 2 The clutch friction disc must be held in position using an alignment tool that is secured in the pilot bearing.

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TRANSMISSION INSTALLATION (2 OF 5)

- STEP 3 The engine bell housing is put on the engine, if it was not installed before. The alignment of this type of bell housing is then checked.
- STEP 4 The clutch release yoke should be checked for free movement.

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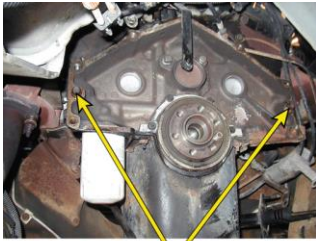
TRANSMISSION INSTALLATION (3 OF 5)

- STEP 5 The transmission is installed by carefully guiding the transmission input (clutch) shaft straight into the clutch disc and pilot bearing.
 - Rotate the transmission output shaft as needed to engage the splines of the clutch disc.

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FIGURE 35-2 Bell housing alignment dowel pins are used to ensure proper alignment between the engine block and the transmission.



ALIGNMENT DOWEL PINS

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TRANSMISSION INSTALLATION (4 OF 5)

- Automatic
 - STEP 1 The torque converter should be installed on the transmission before the transmission is put on the engine.
 - STEP 2 Rotate the torque converter while it is pushed onto the transmission shafts until the splines of all shafts are engaged in the torque converter.

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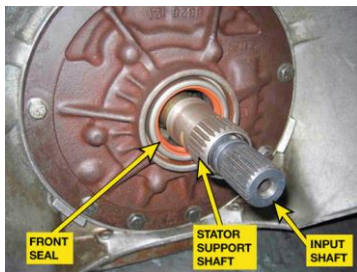
TRANSMISSION INSTALLATION (5 OF 5)

- STEP 3 The torque converter is held against the transmission as the transmission is fitted on the back of the engine. The transmission mounting bolts are attached finger tight.
- STEP 4 The torque converter should be rotated to make sure that there is no binding.
 - The bell housing is secured to the block and then the torque converter is fastened to the drive plate.

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FIGURE 35-4 The internal splines inside the torque converter must be properly aligned with all of the splines of the automatic transmission.



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DRESSING THE ENGINE (1 OF 2)

- "Dressing the engine" is a term used to describe the process of attaching all of the auxiliary items to the engine. The items include:
 - Starter motor
 - Fuel rail and related fuel system components
 - New oxygen sensor(s), to ensure that the engine will be operating at the correct air-fuel ratio

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DRESSING THE ENGINE (2 OF 2)

- Engine/transmission wiring harness
- Ignition components, such as the ignition coil(s) and spark plug wires, if equipped
- All belt-driven engine accessories, mounted on the front of the engine
- Front accessories, such as the power steering pump, alternator, and air-conditioning compressor.

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FIGURE 35-5 It is often easier to install all of the accessory drive belts before the engine is installed in the vehicle.



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ENGINE INSTALLATION

- Securing the Engine
- Installing the Engine
 - Rear-wheel Drive
 - Front-wheel Drive
- Reconnecting Components and Connectors
- Cooling System
- Electrical System

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FIGURE 35-6 A fixture installed that is used as a place to attach the hosting chains.



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ENGINE START

- Precautions
- Normal Operating Temperature
- How To Warm Up a Cold Engine



FIGURE 35-7 Even though the dash gauge may show normal operating temperature, a scan tool or an infrared pyrometer can also be used to verify proper coolant temperature.

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BREAK-IN PRECAUTIONS

- Any engine overhaul represents many hours of work and a large financial investment.
- Precautions should be taken to protect the investment, including the following:
 - Never add cold water to the cooling system while the engine is running.
 - Never lug any engine. Lugging means increasing the throttle opening without increasing engine speed.

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SUMMARY (1 OF 3)

- Precautions should be taken to protect the investment, including the following:
 - Applying loads to an engine for short periods of time creates higher piston ring pressure against the cylinder walls and assists the breaking-in process by helping to seat the rings.
 - Change the oil and filter at 500 miles (800 km) or after 20 hours of operation.

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SUMMARY (2 OF 3)

- Check for leaks after the engine has gone through several warm-up and cooling down periods.
- Carefully install all accessories.
- When installing the transmission and other components on the engine block, be sure to use a torque wrench and tighten all fasteners to factory specifications.

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SUMMARY (3 OF 3)

- Always adjust the clutch free play before starting the engine.
- Change the engine oil after 500 miles (800 km) or sooner, and use specified engine oil.

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