Section 4 Topics

Engine Removal and Disassembly

- Engine Removal Precautions
- Part Organization & Labeling
- Fuel Pressure Discharge
- Fluid Drain
- Hood Removal
- Engine Removal
- Engine Stand Mounting
- Disassembly
  - Engine Disassembly Worksheet

Engine Removal Precautions

General Precautions

- Work in a well ventilated area
- Wear safety glasses
- Avoid sparks or open flame around fuel lines
- Do not disconnect refrigerant lines unless you are certified to service A/C systems
- Protect fenders, grille, and windshield
- Always disconnect the negative battery terminal

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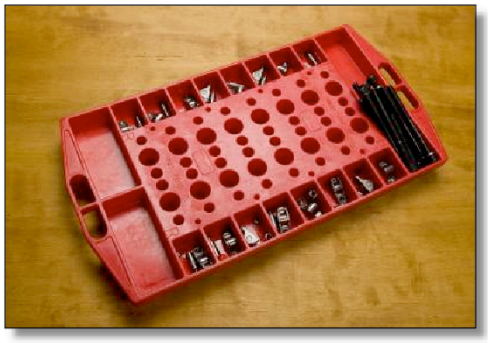
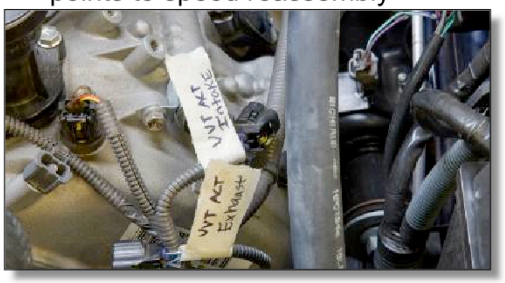
Part Organization & Labeling

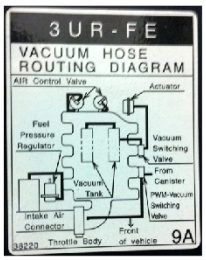
Use divided trays to keep removed parts organized



Most internal mechanical parts are wear mated and must be reinstalled in the same order and position they were disassembled.

As you disconnect hoses and wires, label them and their connection points to speed reassembly





When available, refer to the vacuum hose routing diagram under the hood.

Parts Organization and Labeling

Keeping parts organized is especially important because rocker arms, valve springs and other valve components must be reinstalled in their original locations.

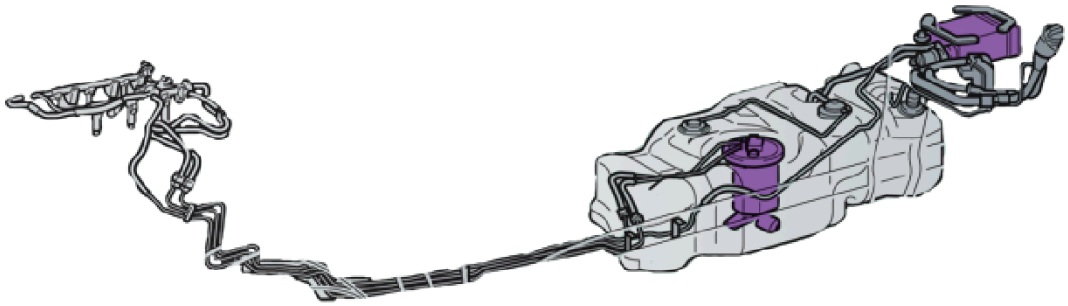
- Rolls of numbered tape can be used to mark hoses or wires and their connection points.
- Have a marking pen handy for marking components.
  - For alignment
  - For marking bolt holes for different size bolts
- Use plastic sandwich bags to keep small components together.
- Masking tape can also be used to label components.
- When removing accessory brackets, label them or attach them to the accessory, and mark their location on the engine block.

Fuel Pressure Discharge

Overview

- Disable fuel pump according to RM instructions.
- Start engine and let it run until it stops.
- Crank engine to verify it will not start.
- Remove cap from gas tank to discharge air from tank.

Note: This is a generic description. Always follow the specific instructions in the Repair Manual for the vehicle you're servicing.



Fuel Pressure Discharge

Be sure to plug all fuel lines to keep dirt and contaminants from entering the fuel system. Remove the gas cap to depressurize the fuel tank.

CAUTION

Do not disconnect any part of the fuel system until you have discharged the fuel system pressure.

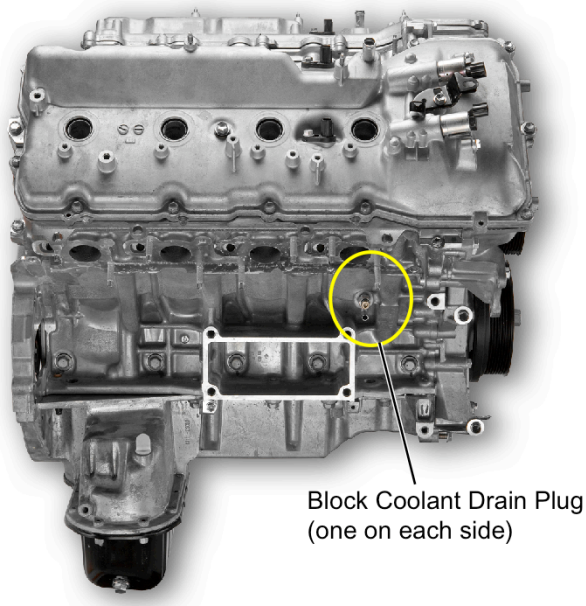
Some pressure may remain in the fuel line after this procedure. To reduce the risk of fuel spray when disconnecting the fuel line, place a cloth or equivalent over fittings before loosening.

Some fuel lines are rubber coated plastic and cannot be crimped without damaging the fuel line.

Fluid Drain

- **Coolant**
- **Engine Oil**
- **Power Steering Fluid***
- **Refrigerant***
- **Transmission Fluid***
- **Cylinder Block Drain**

* May not need to be drained if proper Repair Manual procedures are followed



Fluid Drain

Coolant

- Drain coolant from radiator
- If block has a coolant drain plug, drain coolant from block
- Dispose of coolant properly

Engine Oil

- Drain engine oil
- Remove oil filter

Power Steering Fluid

Power steering fluid does not need to be drained if the engine can be removed without disconnecting hoses from the power steering pump.

A/C Refrigerant

In many cases, A/C refrigerant does not need to be drained if the engine can be removed without disconnecting hoses from the compressor.

CAUTION

Refrigerant lines are under pressure and refrigerant can cause serious bodily injury. Lethal gas (phosgene) can result if refrigerant is discharged onto hot components. Refrigerant must be recovered and recycled by a technician certified to operate approved refrigerant recovery equipment.

Transmission Fluid

In most cases, some transmission fluid may be spilled during engine removal, but draining the transmission is not necessary. If the engine has a transmission cooler, however, the lines from the transmission to the cooler must be plugged after they are removed.

Hood Removal

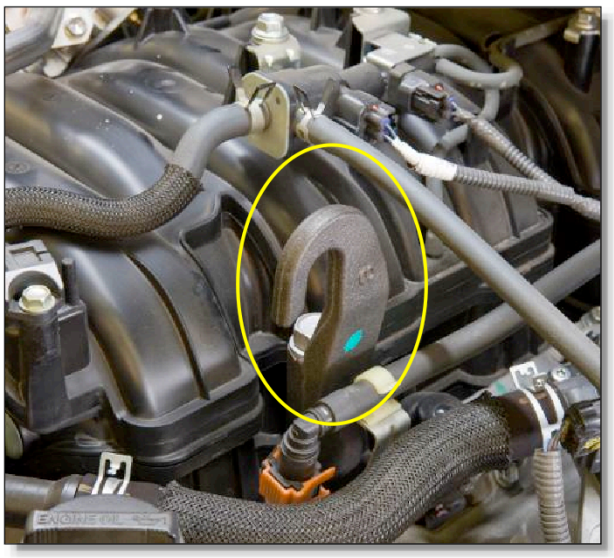
- Mark the hood hinge to the hood so it can be reinstalled properly.
- To avoid damage, do not store the hood on its corners or on edge. Lay hood flat on a protective surface.

Hood Removal During engine removal it might be necessary to remove the hood to allow maximum access to the engine compartment. Extreme caution should be taken when removing the hood to not damage the windshield or exterior paint. The hood should be stored flat and away from the work area.

Engine Hangers

Some engines have built-in lifting brackets, but most require installing special engine hangers.

Part No.: 12281-38150 (hook)
90119-A0166 (bolt)



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Engine Hangers

Though some engines have built-in lifting brackets, most require installing special engine hangers.

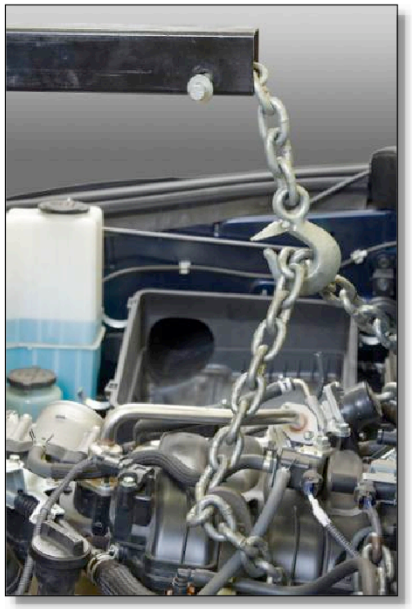
- Engine hangers and bolts are **separate parts** installed when the engine needs to be removed.
- Engine hangers are **specific to each engine** model. Use only the correct parts for the engine you're servicing.

NOTE The engine removal procedure in the Repair Manual typically specifies the part numbers for engine hangers and bolts when needed.

Engine Lifting

- Verify hoist and chains are rated for engine weight
- Engine hanger bolts must be fully tightened
- Properly support the transmission if left in vehicle
- Be sure fender and grille are protected
- Keep engine as level as possible while lifting

Note: Some front-wheel drive models may require placing the vehicle on a lift and lowering the engine through the bottom.



What's wrong with this picture?

Engine Lifting

Before attempting to lift the engine:

- Be certain that all relevant components have been disconnected according to Repair Manual procedures.
- Properly support the transmission if it is left in the vehicle.
- Verify that the hoist and chains you are using are rated for the engine weight.
- Check that the engine hangers are installed securely.
- Ensure that the fenders and grille are protected.
- Check that the engine hoist is stable

When lifting the engine:

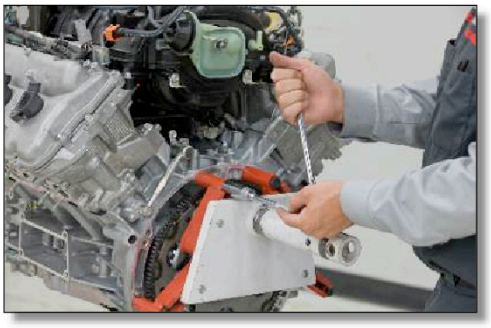
- Keep it as level as possible while lifting.
- Lower the engine immediately after it is clear of the vehicle.

NOTE Do not attempt to lift the engine by bolting the chains directly to the block without the proper hangers. The chains can possibly crack the intake manifold.

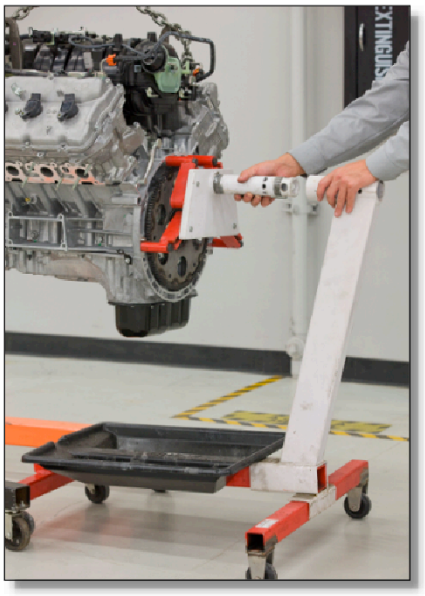
Engine Stand Mounting

- Attach the engine stand adapter to the engine while the engine is on the hoist
- When the engine and adapter is secured to the engine stand, the hoist can be disconnected and stowed

Installing Engine Stand Adapter



Mating Adapter to Stand



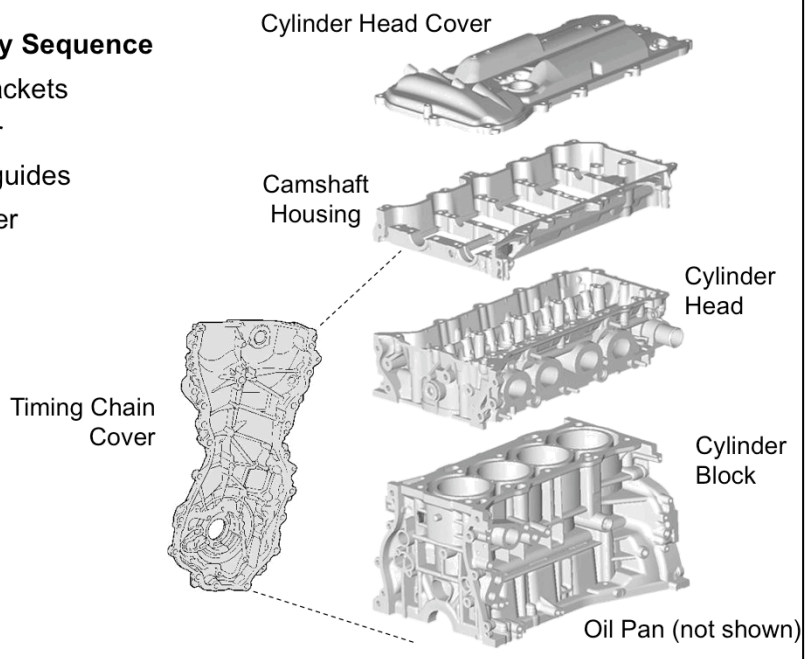
Engine Stand Mounting

When connecting the engine stand adapter to the engine, try to center the point of rotation with the engine's center of gravity. If too much weight is above or below the engine stand's rotation point, the engine will want to rotate so that the excess weight is at the bottom. This can make the engine difficult to rotate the other way or cause unexpected and unwanted rotation.

Disassembly

Typical Disassembly Sequence

- Water pump & brackets
- Timing chain cover
- Timing chain and guides
- Cylinder head cover
- Camshaft housing
- Cylinder head
- Oil pan



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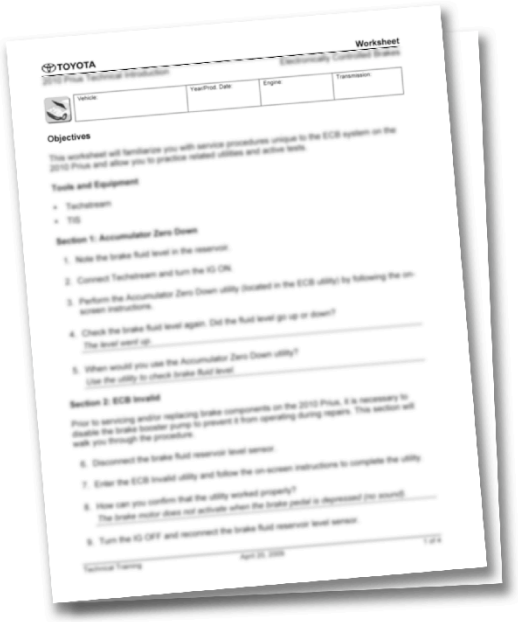
NOTES:

Worksheet

Engine Unit Disassembly

Using this worksheet, you will follow Repair Manual procedures to disassemble an engine unit.



Please note the following symbols you will encounter in this and other worksheets:

SKIP = *Read the procedure but DO NOT perform it.*

STOP = *STOP until you have checked with your instructor.*

Use this space to write any questions you may have for your instructor.

NOTES:

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