

DL420

Shop Manual

950106-00009E

Serial Number 5001 and Up

DOOSAN reserves the right to improve our products in a continuing process to provide the best possible product to the market place. These improvements can be implemented at any time with no obligation to change materials on previously sold products. It is recommended that consumers periodically contact their distributors for recent documentation on purchased equipment.

This documentation may include attachments and optional equipment that is not available in your machine's package. Please call your distributor for additional items that you may require.

Illustrations used throughout this manual are used only as a representation of the actual piece of equipment, and may vary from the actual item.

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Wheel Loader Safety

Edition 1

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Wheel Loader Safety

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SAFETY PRECAUTIONS



CAUTION

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DL300	5001 and Up
DL400	5001 and Up

TO THE OPERATOR OF A DOOSAN WHEEL LOADER



DANGER

Unsafe use of the wheel loader could lead to serious injury or death. Operating procedures, maintenance and equipment practices or traveling or shipping methods that do not follow the safety guidelines on the following pages could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property.

Please respect the importance of taking responsibility for your own safety, and that other people who may be affected by your actions.

Safety information on the following pages is organized into the following topics.

1. "General Safety Essentials" on page 1-10.
2. "Location of Safety Labels" on page 1-10.
3. "Unauthorized Modifications" on page 1-10.
4. "General Hazard Information" on page 1-12.
5. "Before Starting Engine" on page 1-21.
6. "Machine Operation" on page 1-26.
7. "Maintenance" on page 1-33.
8. "Battery" on page 1-42.
9. "Towing" on page 1-44.
10. "Shipping and Transportation" on page 1-45.



WARNING

Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

Operator and maintenance personnel should read this manual thoroughly before beginning operation or maintenance.

Keep this manual in the storage compartment to the rear of the operator's seat, and have all personnel involved in working on the machine periodically read the manual.

Some actions involved in operation and maintenance of the machine can cause a serious accident, if they are not done in a manner described in this manual.

The procedures and precautions given in this manual apply only to intended uses of the machine.

If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for any others. In no event should you or others engage in prohibited uses or actions as described in this manual.

DOOSAN delivers machines that comply with all applicable regulations and standards of the country to which it has been shipped. If this machine has been purchased in another country or purchased from someone in another country, it may lack certain safety devices and specifications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult *DOOSAN* or your *DOOSAN* distributor before operating the machine.



SAFETY ALERT SYMBOL



Be Prepared - Get to Know All Operating and Safety Instructions.

This is the Safety Alert Symbol. Wherever it appears in this manual or on safety signs on the machine you should be alert to the potential for personal injury or accidents. Always observe safety precautions and follow recommended procedures.

Learn the Signal Words Used with the Safety Alert Symbol

The words "**CAUTION**," "**WARNING**," and "**DANGER**" used throughout this manual and on decals on the machine indicate degree of risk of hazards or unsafe practices. All three degrees of risk indicate that safety is involved. Observe precautions indicated whenever you see the Safety Alert "Triangle," no matter which signal word appears next to the "Exclamation Point" symbol.



CAUTION

This word is used on safety messages and safety labels and indicates potential of a hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against a generally unsafe practice.



WARNING

This word is used on safety messages and safety labels and indicates potential of a hazardous situation that, if not avoided, could result in serious injury or death. It may also be used to alert against a highly unsafe practice.



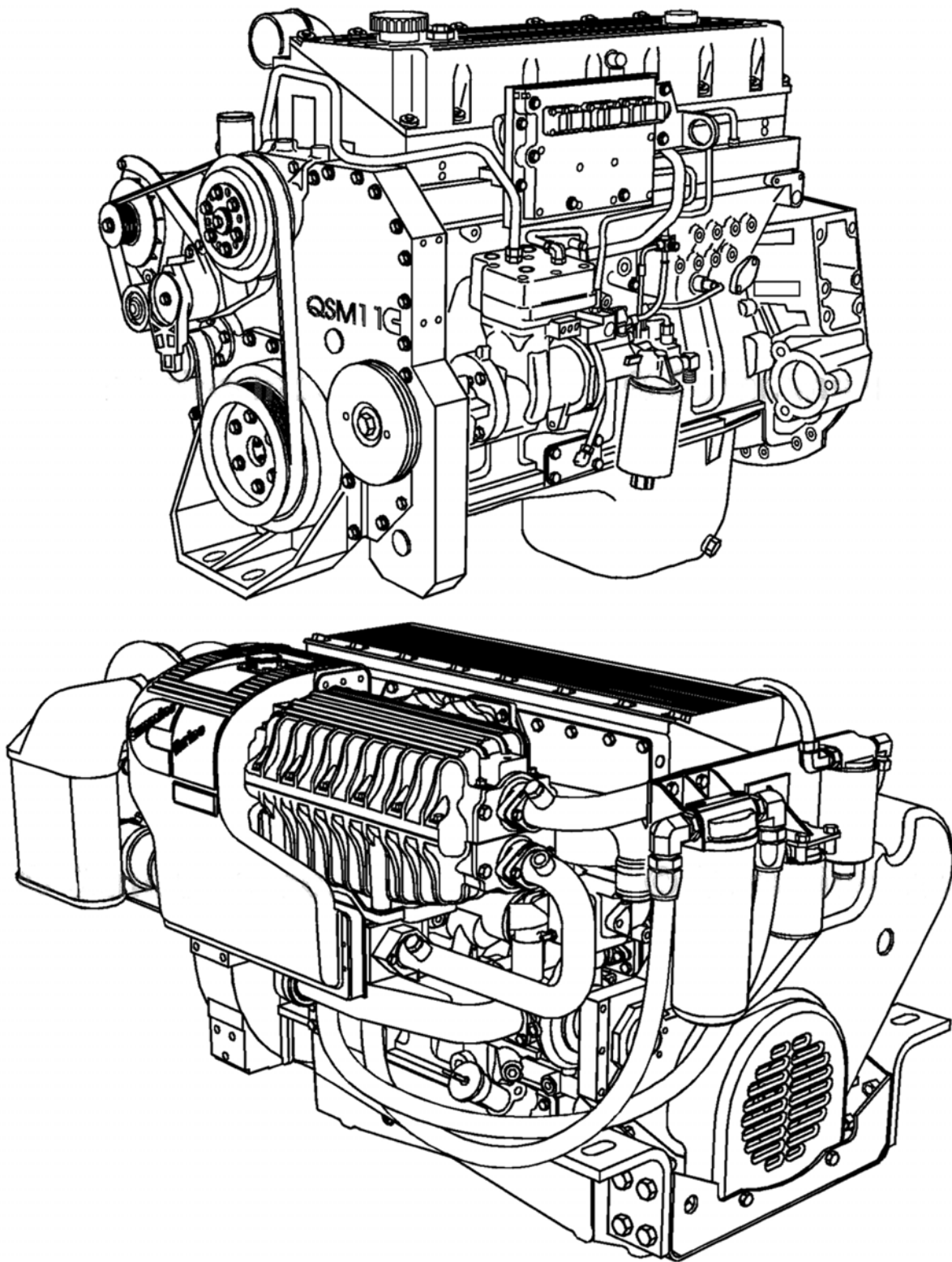
DANGER

This word is used on safety messages and safety labels and indicates an imminent hazard of a situation that, if not avoided, is very likely to cause death or extremely serious injury. It may also be used to alert against equipment that may explode or detonate if handled or treated carelessly.

QSM11 Engine

Edition 1

QSM11 ENGINE



FG005547

Figure 1

Belt Tensioner, Automatic (Alternator)

General Information

A new automatic tensioning single belt fan and alternator drive is the standard option for the QSM industrial engine. The design uses an eight-rib poly-vee belt with an automatic tensioner and a fixed idler.

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops when the belt length and geometry are correct. If the tensioner is hitting either of the limits during operation, check the mounting brackets and the belt length. Loose brackets, bracket failure, alternator movement, incorrect belt length, or belt failure can cause the tensioner to hit the limits.

Remove

Remove the mounting capscrews and the belt tensioner from the bracket.

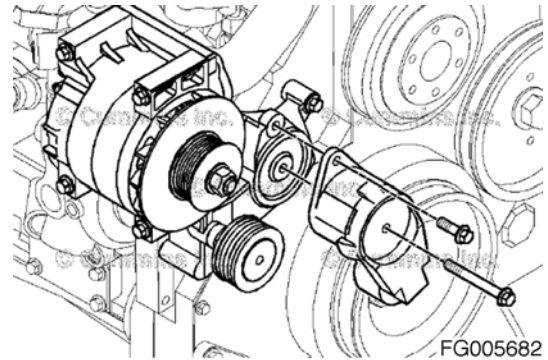


Figure 182

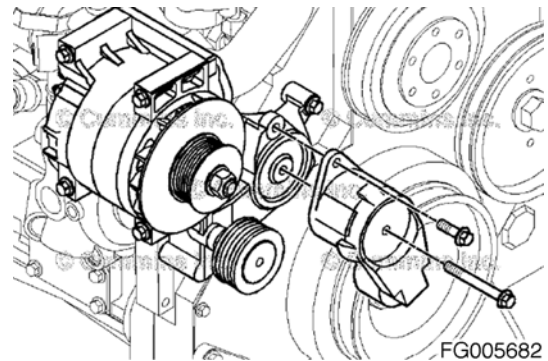


Figure 183

Use a 3/4-inch drive breaker bar to hold back the tensioner and relieve the belt tension.

Rotate the tensioner away from the belt until it stops.

Remove the alternator belt while holding the tensioner back.

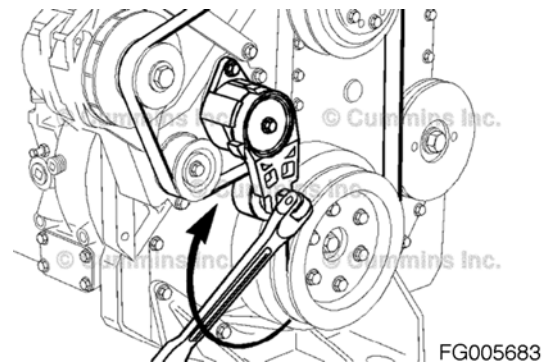


Figure 184

Remove the belt tensioner from the engine.

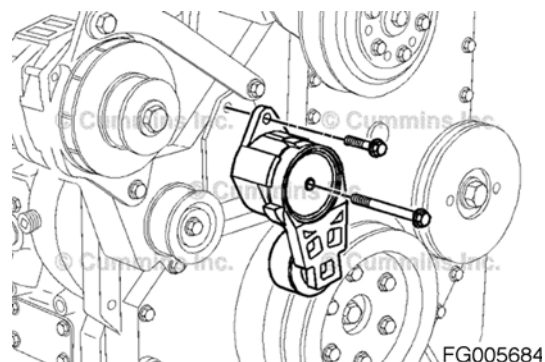


Figure 185

Install

Install the belt tensioner.

Install and tighten capscrews.

Torque Value: 47 Nm [35 ft-lb]

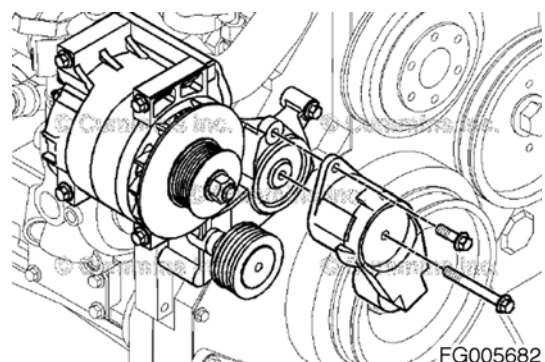


Figure 186

Tighten the tensioner mounting capscrew.

Torque Value: 47 Nm [35 ft-lb]

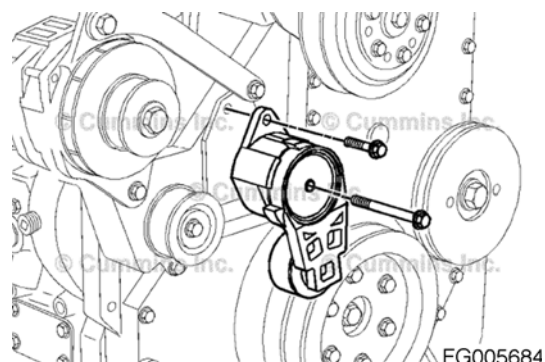


Figure 187

Install the alternator belt over the pulleys while holding the tensioner back with a $\frac{3}{4}$ -inch drive breaker bar. Use care in working belt over the edge of flanged pulleys.

Release the tensioner and remove the breaker bar.

The belt tensioner is designed to operate well within the limit of arm movement, provided by the cast stops, when the belt length and geometry are correct.

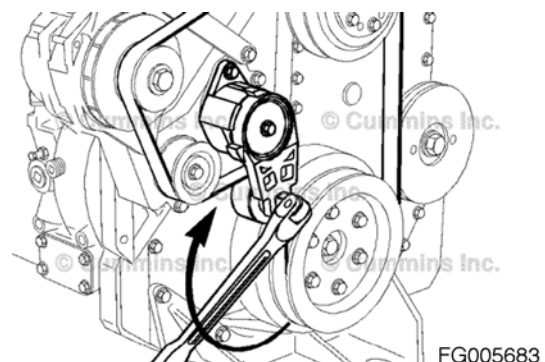


Figure 188

Water Pump

Remove

Remove the dust seal.

Remove the five water pump oil seal capscrews, clamping ring, oil seal, and gasket.

Remove the dust seal as the seal carrier is removed; or use a heel bar, or similar tool, to pry the dust seal away from the seal case. Then remove the dust seal by hand.

Discard the oil seal and dust seal.

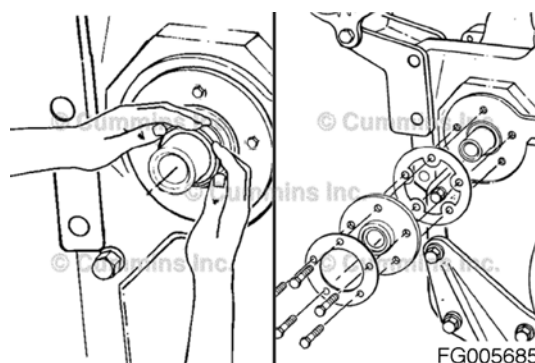


Figure 189

The coolant flow that provides cooling to the torque converter (if equipped) is achieved in different manners.

ISM and QSM Series engines use a torque converter cooler disc inside the coolant bypass hose to direct engine coolant to the inlet side of the torque converter cooler.

1. Torque converter coolant supply
2. Torque converter disc (orifice)
3. Bypass hose
4. Water pump

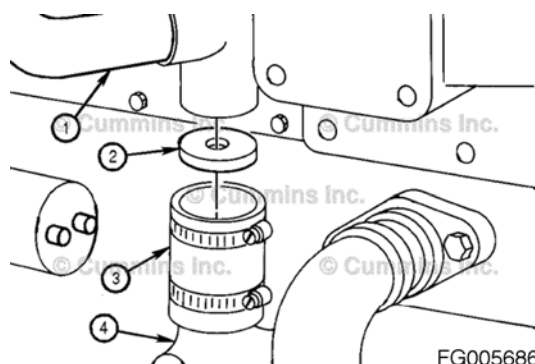


Figure 190

Loosen the EGR cooler coolant supply lower tube retaining clamp capscrew. Remove the EGR cooler coolant supply lower tube retaining clamp and tube.

Remove and discard the o-ring.

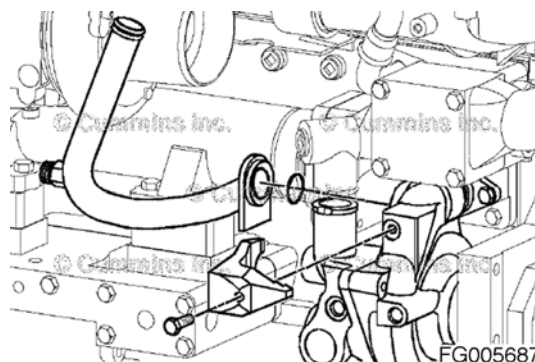


Figure 191

Remove the three water pump mounting capscrews.

Remove the two water pump water transfer connection capscrews and push the water pump transfer connection into the water pump as far as possible to facilitate water pump removal.

Remove the water pump. Twist the pump outward from the top, and angle the rear of the pump downward as it is being removed to allow the pump to pass the thermostat housing support.

Remove the water pump water transfer connection from the water pump.

Check the needle bearing for damage and freedom of needle rotation. Replace the bearing if it is damaged or if it does not turn freely.

If the bearing is replaced, use bearing installation tool, Part Number 3824117, along with a cup driver to remove the needle bearing from the gear housing. Gently tap the bearing out from the rear side of the housing.

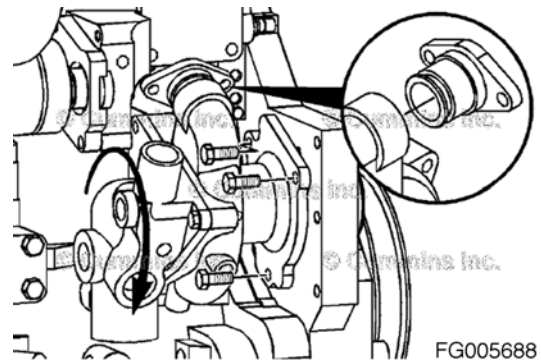


Figure 192

FG005688

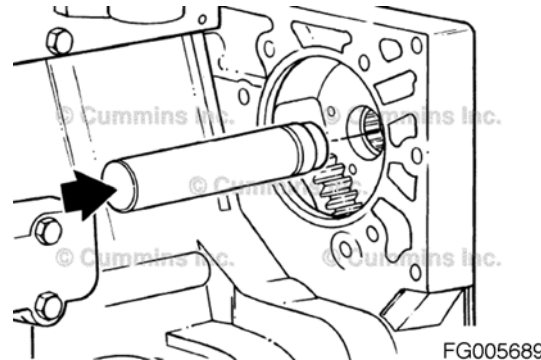


Figure 193

FG005689



WARNING

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [120°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Remove the pressure cap when the engine is cool.

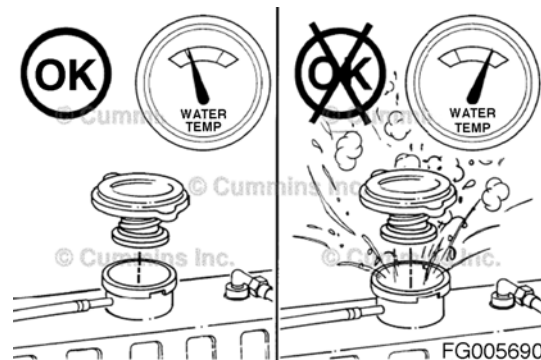


Figure 194

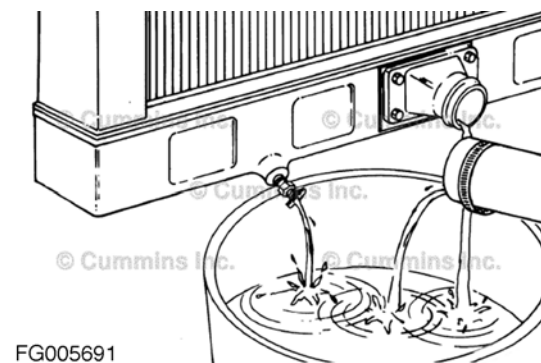
FG005690



WARNING

Coolant is toxic. Keep away from children and pets. If not reused, dispose of in accordance with local environmental regulations.

Drain the cooling system. Refer to Procedure 008-018 (Cooling System) in page -89.



FG005691

Figure 195

NOTE: Be sure the puller capscrews are threaded all the way through the puller before applying pressure to the puller screw.

Remove the alternator drive belt. Refer to Procedure 013°005 (Drive Belt, Alternator) in Section A.

Remove the water pump pulley retaining capscrew.

Use the standard pulley puller, Part Number ST-647, or equivalent, and two 5/16 x 18 x 2 capscrews to remove the pulley.

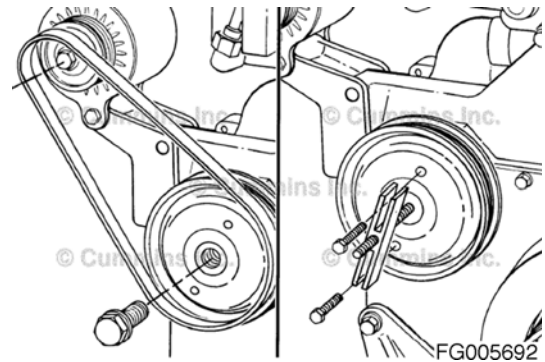


Figure 196

Remove the alternator. Refer to a Cummins Authorized Repair Location.

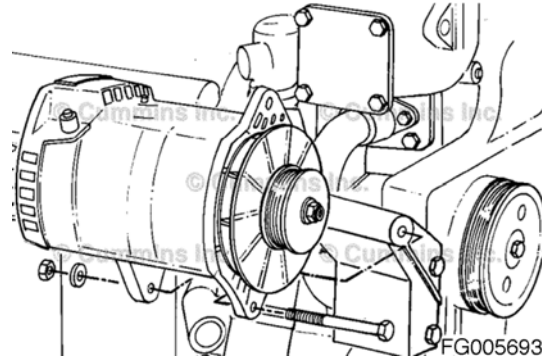


Figure 197

NOTE: Remove the dust seal as the seal carrier is removed, or use a heel bar, or similar tool, to pry the dust seal away from the seal case. Then remove the dust seal by hand.

Remove the dust seal.

Remove the five water pump oil seal capscrews, clamping ring, oil seal, and gasket.

Discard the oil seal and dust seal.

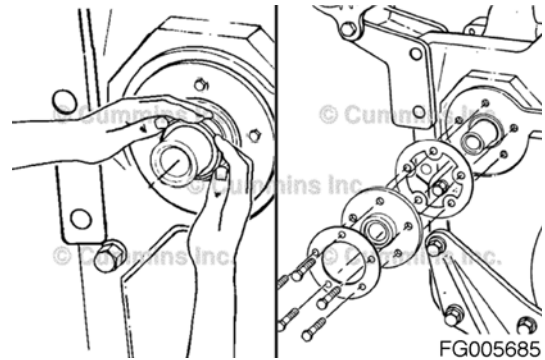


Figure 198

Loosen the coolant bypass hose clamps on both the upper and lower hoses.

Remove the upper coolant hose from the thermostat housing.

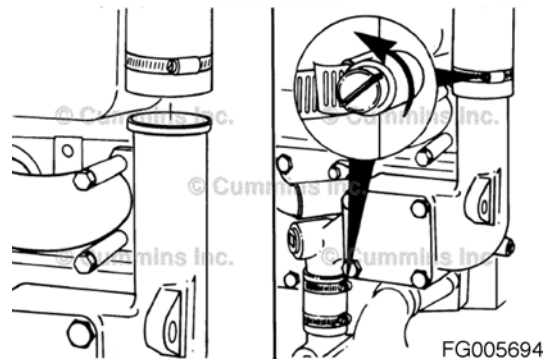


Figure 199

Remove the four thermostat housing mounting capscrews and the thermostat housing.

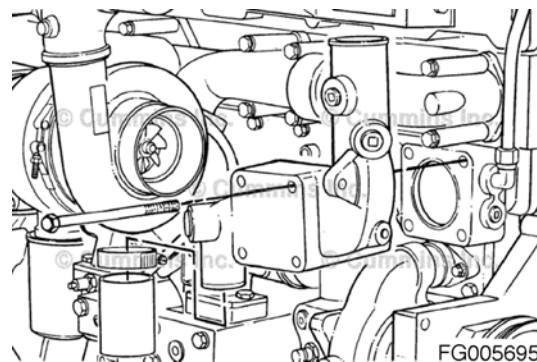


Figure 200

The coolant flow that provides cooling to the torque converter (if equipped) is achieved in different manners.

ISM and QSM Series engines use a torque converter cooler disc inside the coolant bypass hose to direct engine coolant to the inlet side of the torque converter cooler.

1. Torque converter coolant supply.
2. Torque converter disc (orifice).
3. Bypass hose.
4. Water pump.

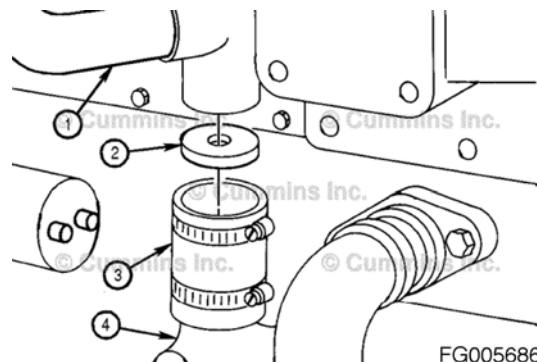


Figure 201

Remove the two water pump water transfer connection capscrews.

Remove the three water pump mounting capscrews.

Rotate the water pump outward so the water transfer connection can be removed from the water pump.

Remove the water transfer connection from the water pump.

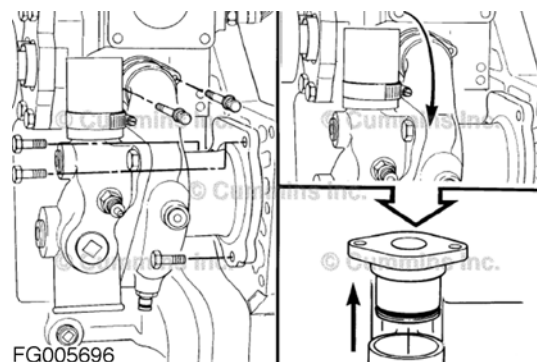


Figure 202

Remove the water pump. Twist the pump outward from the top, and angle the rear of the pump downward as it is being removed to allow the pump to pass the thermostat housing support.

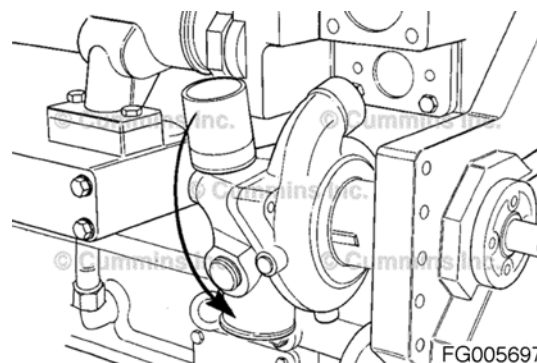


Figure 203

Install

If the needle bearing was removed, use bearing installation tool, Part Number 3824117, to install a new needle bearing in the gear housing.

The bearing must be installed with the part number side of the bearing against the installation tool to prevent damage to the bearing during the installation.

Install the bearing from the front side of the gear housing until the bearing is flush with the front edge of the housing bore.

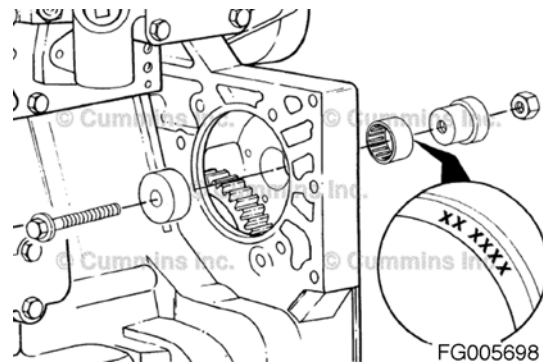


Figure 204



CAUTION

In order to reduce the possibility of pinching or rolling the o-rings during assembly do not lubricate the o-rings. Lubricate the o-ring connection mating surface with clean engine coolant, soapy water, or vegetable oil.

Install the water pump cover. Use a new o-ring seal.

Torque Value: 47 Nm [35 ft-lb]

Install the water pump water transfer connection into the water pump.

Install a new o-ring on the water pump mounting flange.

The water pump must be twisted outward from the top until the transfer outlet clears the thermostat housing support during installation

Install the water pump.

Twist the water pump inward and install the three water pump mounting capscrews.

Torque Value: 47 Nm [35 ft-lb]

Install a new gasket on the water pump water transfer connection. Install and tighten the water transfer connection capscrews.

Torque Value: 25 Nm [18 ft-lb]

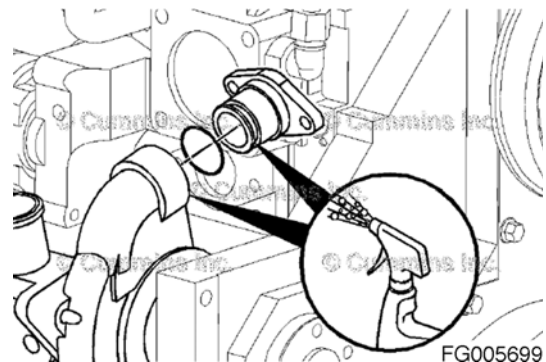


Figure 205

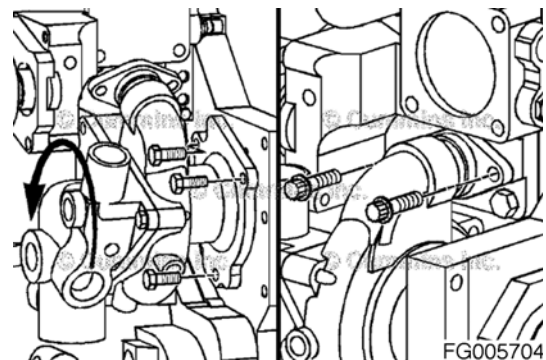


Figure 206

If the engine is equipped with a torque converter cooler, install the disc in the bypass hose before installing the thermostat housing.

1. Torque converter coolant supply
2. Torque converter disc (orifice)
3. Bypass hose
4. Water pump.

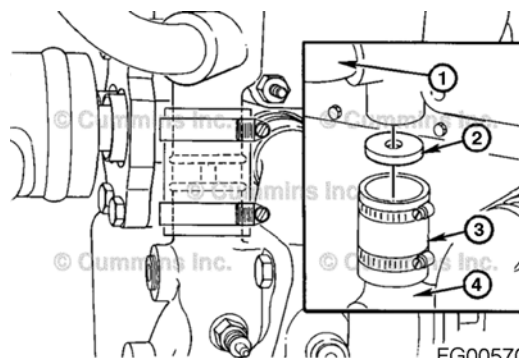


Figure 207



CAUTION

In order to reduce the possibility of pinching or rolling the o-rings during assembly do not lubricate the o-rings. Lubricate the o-ring connection mating surface with clean engine coolant, soapy water, or vegetable oil.

Install a new o-ring on the EGR cooler coolant supply lower tube.

Insert the EGR cooler coolant supply lower tube into the water pump body.

Install the EGR cooler coolant supply lower tube is seated completely in the water pump body before tightening the EGR cooler coolant supply lower tube retaining clamp capscrew to reduce the possibility of pinching the o-ring.

Tighten the capscrew.

Torque Value: 34 Nm [25 ft-lb]

The oil seal must be installed with the lip of the seal and the shaft clean and dry. Do not lubricate. The yellow dust lip must be facing out.

Install the new gasket and oil seal. Use the installation sleeve provided with the new seal to install the seal.

The capscrew threads must be coated with thread sealant, Part Number 3823494, or equivalent, to prevent oil leakage.

Torque Value : Step1 7 Nm [60 in-lb]

Step2 20 Nm [180 in-lb]

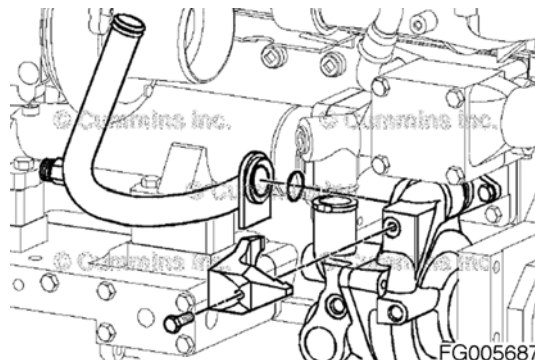


Figure 208

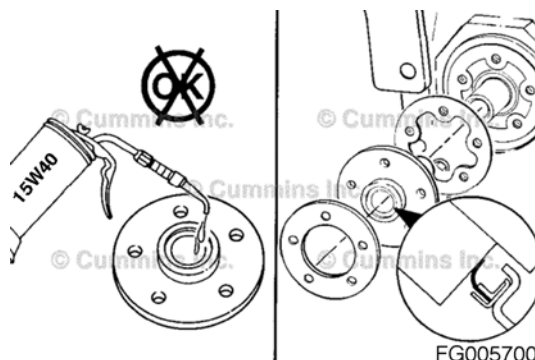


Figure 209

Place a light film of oil or antifreeze on the inside of the oil seal dust seal.

Install the dust seal onto the shaft with a larger outside surface facing the engine.

Push the dust seal back by hand on the shaft until the entire dust seal contacts the oil seal case.

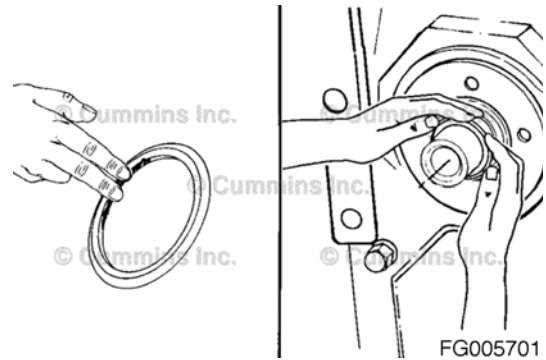


Figure 210

NOTE: *The water pump must be twisted outward from the top until the transfer outlet clears the thermostat housing support during installation.*

Install a new o-ring on the water pump mounting flange.

Install the water pump.

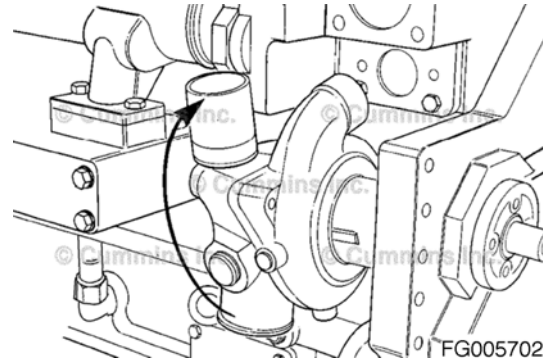


Figure 211

Install a new o-ring on the water pump water transfer tube. Install the connection into the water pump.

Twist the water pump inward, and install the three water pump mounting capscrews.

Torque Value: 47 Nm [35 ft-lb]

Install a new gasket on the water pump water transfer connection. Install and tighten the water transfer connection capscrews.

Torque Value: 25 Nm [221 in-lb]

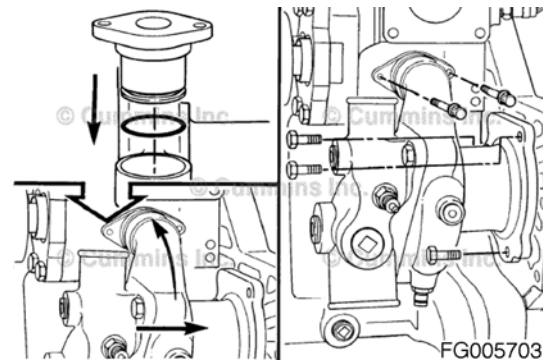


Figure 212

If the engine is equipped with a torque converter cooler, install the disc in the bypass hose before installing the thermostat housing.

1. Torque converter cooler coolant supply.
2. Torque converter cooler disc (orifice).
3. Bypass hose.
4. Water pump.

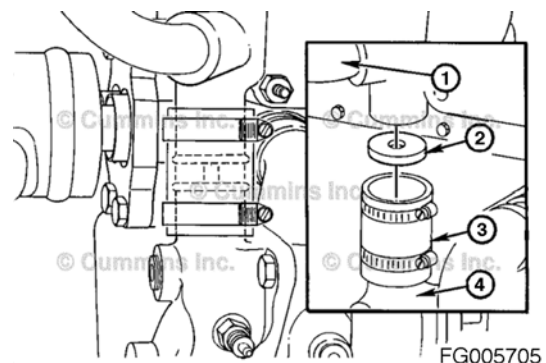


Figure 213

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